



MULTILAYER CERAMIC CHIP CAPACITORS

C Series

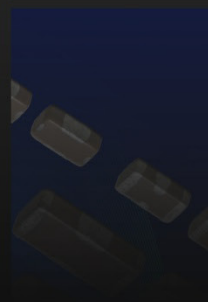
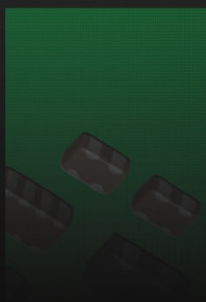
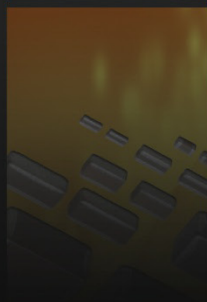
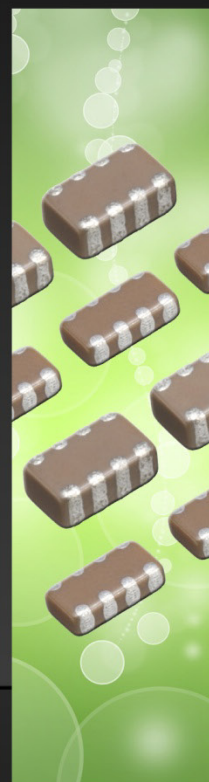
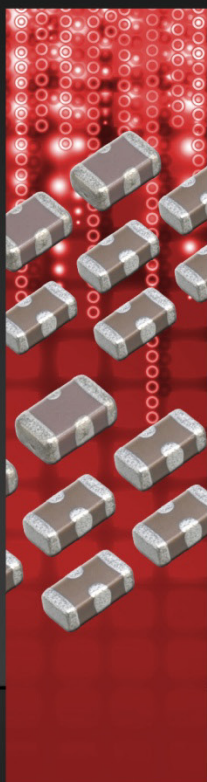
CER Series

CKC Series

CKD Series

CKG Series

CLL Series



TDK MLCC
US Catalog

Version B11

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MULTILAYER CERAMIC CHIP CAPACITORS



C Series General Application

Type:	C0402 [EIA CC01005]
	C0603 [EIA CC0201]
	C1005 [EIA CC0402]
	C1608 [EIA CC0603]
	C2012 [EIA CC0805]
	C3216 [EIA CC1206]
	C3225 [EIA CC1210]
	C4532 [EIA CC1812]
	C5750 [EIA CC2220]

Issue date:	April 2011
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**TDK MLCC
US Catalog**

Version B11

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C Series General Application

Type: C0402, C0603, C1005, C1608,
C2012, C3216, C3225, C4532, C5750

Features



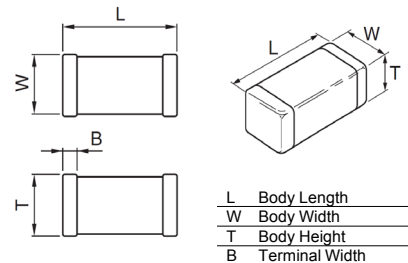
- High capacitance has been achieved through precision technologies that enable the use of multiple thinner ceramic dielectric layers.
- A monolithic structure ensures superior mechanical strength and reliability.
- High-accuracy automatic mounting is facilitated through the maintenance of very precise dimensional tolerances.
- Composed of only ceramics and metals, these capacitors provide extremely dependable performance, exhibiting virtually no degradation even when subjected to temperature extremes.
- Low stray capacitance ensures high conformity with nominal values, thereby simplifying the circuit design process.
- Low residual inductance assures superior frequency characteristics.
- Because electrostatic capacity has been obtained up to the electrolytic capacitor range, these capacitors offer long service life and are optimally suited for power supply designs that require high levels of reliability.
- Owing to their low ESR and excellent frequency characteristics, these products are optimally suited for high frequency and high-density type power supplies.

Applications



- Electronics equipment
- Mobile communications equipment
- Office automation equipment
- Automotive electronics
- Test and measurement equipment
- Hybrid ICs, etc.
- Decoupling
- Smoothing
- Charge pump

Shape & Dimensions



Dimensions in mm

L	Body Length
W	Body Width
T	Body Height
B	Terminal Width

Part Number Construction

Series Name **C** **2012** **X7R** **1E** **105** **K** **T** **XXXX**

Dimensions L x W (mm)

Case Code	Length	Width
C0402	0.40 ± 0.02	0.20 ± 0.02
C0603	0.60 ± 0.03	0.30 ± 0.03
C1005	1.00 ± 0.05	0.50 ± 0.05
C1608	1.60 ± 0.10	0.80 ± 0.10
C2012	2.00 ± 0.20	1.25 ± 0.20
C3216	3.20 ± 0.20	1.60 ± 0.20
C3225	3.20 ± 0.40	2.50 ± 0.30
C4532	4.50 ± 0.40	3.20 ± 0.40
C5750	5.70 ± 0.40	5.00 ± 0.40

Temperature Characteristic

Temperature Characteristics	Capacitance Change	Temperature Range
C0G	0±30 ppm/°C	-55 to +125°C
SL	+350/-1000 ppm/°C	-25 to +85°C
X5R	±15%	-55 to +85°C
X6S	+22%	-55 to +105°C
X7R	±15%	-55 to +125°C
X7S	+22%	-55 to +125°C
Y5V	+22/-82%	-33 to +85°C

Rated Voltage (DC)

Voltage Code	Voltage (DC)	Voltage Code	Voltage (DC)	Voltage Code	Voltage (DC)
0G	4V	1C	16V	1H	50V
0J	6.3V	1E	25V		
1A	10V	1V	35V		

Internal Codes

Packaging Style

Packaging Code	Style
T	Tape & Reel

Capacitance Tolerance

Tolerance Code	Tolerance
W	± 0.05 pF
B	± 0.10 pF
C	± 0.25 pF
D	± 0.50 pF
E	± 0.20 pF
G	± 2%
J	± 5%
K	± 10%
M	± 20%
Z	+80-20%

Nominal Capacitance (pF)

The capacitance is expressed in three digit codes and in units of pico Farads (pF). The first and second digits identify the first and second significant figures of the capacitance. The third digit identifies the multiplier. R designates a decimal point.

Capacitance Code	Capacitance
0R5	0.5pF
010	1pF
102	1,000pF (1nF)
105	1,000,000pF (1μF)



Capacitance Range Chart

C0402 [EIA CC01005]

Capacitance Range Chart

Temperature Characteristics: C0G ($0 \pm 30\text{ppm}/^\circ\text{C}$)
Rated Voltage: 16V (1C)

Capacitance (pF)	Cap Code	Tolerance	C0G 1C (16V)
0.1	0R1	W: $\pm 0.05\text{pF}$ B: $\pm 0.10\text{pF}$ C: $\pm 0.25\text{pF}$ D: $\pm 0.50\text{pF}$	
0.2	0R2		
0.3	0R3		
0.4	0R4		
0.5	0R5		
0.6	0R6		
0.7	0R7		
0.8	0R8		
0.9	0R9		
1	010		
1.1	1R1		
1.2	1R2		
1.3	1R3		
1.5	1R5		
1.6	1R6		
1.8	1R8		
2	020		
2.2	2R2		
2.4	2R4		
2.7	2R7		
3	030		
3.3	3R3		
3.6	3R6		
3.9	3R9		
4.3	4R3		
4.7	4R7		
5.1	5R1		
5.6	5R6		
6.2	6R2		

Capacitance (pF)	Cap Code	Tolerance	C0G 1C (16V)
6.8	6R8	B: $\pm 0.10\text{pF}$ E: $\pm 0.20\text{pF}$ C: $\pm 0.25\text{pF}$ D: $\pm 0.50\text{pF}$ G: $\pm 2\%$ J: $\pm 5\%$	
7.5	7R5		
8.2	8R2		
9.1	9R1		
10	100		
11	110		
12	120		
13	130		
15	150		
16	160		
18	180		
20	200		
22	220		
24	240		
27	270		
30	300		
33	330		
36	360		
39	390		
43	430		
47	470		
51	510		
56	560		
62	620		
68	680		
75	750		
82	820		
91	910		
100	101		

• Standard capacitance is shown. Please refer to Capacitance Range Table for additional capacitance values.

Capacitance Range Chart

Temperature Characteristics: X7R ($\pm 15\%$), X5R ($\pm 15\%$)
Rated Voltage: 16V (1C), 10V (1A), 6.3V (0J)

Capacitance (pF)	Cap Code	Tolerance	X7R				X5R			
			1A (10V)	1C (16V)	1A (10V)	0J (6.3V)	1A (10V)	1C (16V)	1A (10V)	0J (6.3V)
100	101	K: $\pm 10\%$								
150	151									
220	221									
330	331									
470	471									
680	681									
1,000	102									
1,500	152									
2,200	222									
3,300	332									
4,700	472									
6,800	682									
10,000	103									

Standard Thickness

0.20 mm



Capacitance Range Table

C0402 [EIA CC01005]

Class 1 (Temperature Compensating)

Temperature Characteristics: C0G (-55 to 125°C, 0±30 ppm/°C)

TDK Part Number (Ordering Code)	Temperature Characteristics	Rated Voltage	Capacitance (pF)	Capacitance Tolerance	Thickness (mm)
C0402C0G1C0R2W	C0G	16V	0.2	± 0.05pF	0.20 ± 0.02
C0402C0G1C0R2B	C0G	16V	0.2	± 0.10pF	0.20 ± 0.02
C0402C0G1C0R3W	C0G	16V	0.3	± 0.05pF	0.20 ± 0.02
C0402C0G1C0R3B	C0G	16V	0.3	± 0.10pF	0.20 ± 0.02
C0402C0G1C0R4W	C0G	16V	0.4	± 0.05pF	0.20 ± 0.02
C0402C0G1C0R4B	C0G	16V	0.4	± 0.10pF	0.20 ± 0.02
C0402C0G1C0R5W	C0G	16V	0.5	± 0.05pF	0.20 ± 0.02
C0402C0G1C0R5C	C0G	16V	0.5	± 0.25pF	0.20 ± 0.02
C0402C0G1C0R5B	C0G	16V	0.5	± 0.10pF	0.20 ± 0.02
C0402C0G1C0R6W	C0G	16V	0.6	± 0.05pF	0.20 ± 0.02
C0402C0G1C0R6B	C0G	16V	0.6	± 0.10pF	0.20 ± 0.02
C0402C0G1C0R7W	C0G	16V	0.7	± 0.05pF	0.20 ± 0.02
C0402C0G1C0R7B	C0G	16V	0.7	± 0.10pF	0.20 ± 0.02
C0402C0G1C0R8W	C0G	16V	0.8	± 0.05pF	0.20 ± 0.02
C0402C0G1C0R8B	C0G	16V	0.8	± 0.10pF	0.20 ± 0.02
C0402C0G1C0R9W	C0G	16V	0.9	± 0.05pF	0.20 ± 0.02
C0402C0G1C0R9B	C0G	16V	0.9	± 0.10pF	0.20 ± 0.02
C0402C0G1C010B	C0G	16V	1.0	± 0.10pF	0.20 ± 0.02
C0402C0G1C010C	C0G	16V	1.0	± 0.25pF	0.20 ± 0.02
C0402C0G1C1R1B	C0G	16V	1.1	± 0.10pF	0.20 ± 0.02
C0402C0G1C1R1C	C0G	16V	1.1	± 0.25pF	0.20 ± 0.02
C0402C0G1C1R2B	C0G	16V	1.2	± 0.10pF	0.20 ± 0.02
C0402C0G1C1R2C	C0G	16V	1.2	± 0.25pF	0.20 ± 0.02
C0402C0G1C1R3B	C0G	16V	1.3	± 0.10pF	0.20 ± 0.02
C0402C0G1C1R3C	C0G	16V	1.3	± 0.25pF	0.20 ± 0.02
C0402C0G1C1R5B	C0G	16V	1.5	± 0.10pF	0.20 ± 0.02
C0402C0G1C1R5C	C0G	16V	1.5	± 0.25pF	0.20 ± 0.02
C0402C0G1C1R6B	C0G	16V	1.6	± 0.10pF	0.20 ± 0.02
C0402C0G1C1R6C	C0G	16V	1.6	± 0.25pF	0.20 ± 0.02
C0402C0G1C1R8B	C0G	16V	1.8	± 0.10pF	0.20 ± 0.02
C0402C0G1C1R8C	C0G	16V	1.8	± 0.25pF	0.20 ± 0.02
C0402C0G1C020B	C0G	16V	2.0	± 0.10pF	0.20 ± 0.02
C0402C0G1C020C	C0G	16V	2.0	± 0.25pF	0.20 ± 0.02
C0402C0G1C2R2B	C0G	16V	2.2	± 0.10pF	0.20 ± 0.02
C0402C0G1C2R2C	C0G	16V	2.2	± 0.25pF	0.20 ± 0.02
C0402C0G1C2R4B	C0G	16V	2.4	± 0.10pF	0.20 ± 0.02
C0402C0G1C2R4C	C0G	16V	2.4	± 0.25pF	0.20 ± 0.02
C0402C0G1C2R7B	C0G	16V	2.7	± 0.10pF	0.20 ± 0.02
C0402C0G1C2R7C	C0G	16V	2.7	± 0.25pF	0.20 ± 0.02
C0402C0G1C030B	C0G	16V	3.0	± 0.10pF	0.20 ± 0.02
C0402C0G1C030C	C0G	16V	3.0	± 0.25pF	0.20 ± 0.02
C0402C0G1C3R3B	C0G	16V	3.3	± 0.10pF	0.20 ± 0.02
C0402C0G1C3R3C	C0G	16V	3.3	± 0.25pF	0.20 ± 0.02
C0402C0G1C3R6B	C0G	16V	3.6	± 0.10pF	0.20 ± 0.02



Capacitance Range Table

C0402 [EIA CC01005]

Class 1 (Temperature Compensating)

Temperature Characteristics: C0G (-55 to 125°C, 0±30 ppm/°C)

TDK Part Number (Ordering Code)	Temperature Characteristics	Rated Voltage	Capacitance (pF)	Capacitance Tolerance	Thickness (mm)
C0402C0G1C3R6C	C0G	16V	3.6	± 0.25pF	0.20 ± 0.02
C0402C0G1C3R9B	C0G	16V	3.9	± 0.10pF	0.20 ± 0.02
C0402C0G1C3R9C	C0G	16V	3.9	± 0.25pF	0.20 ± 0.02
C0402C0G1C040B	C0G	16V	4.0	± 0.10pF	0.20 ± 0.02
C0402C0G1C040C	C0G	16V	4.0	± 0.25pF	0.20 ± 0.02
C0402C0G1C4R3B	C0G	16V	4.3	± 0.10pF	0.20 ± 0.02
C0402C0G1C4R3C	C0G	16V	4.3	± 0.25pF	0.20 ± 0.02
C0402C0G1C4R7B	C0G	16V	4.7	± 0.10pF	0.20 ± 0.02
C0402C0G1C4R7C	C0G	16V	4.7	± 0.25pF	0.20 ± 0.02
C0402C0G1C050B	C0G	16V	5.0	± 0.10pF	0.20 ± 0.02
C0402C0G1C050C	C0G	16V	5.0	± 0.25pF	0.20 ± 0.02
C0402C0G1C5R1B	C0G	16V	5.1	± 0.10pF	0.20 ± 0.02
C0402C0G1C5R1C	C0G	16V	5.1	± 0.25pF	0.20 ± 0.02
C0402C0G1C5R1D	C0G	16V	5.1	± 0.50pF	0.20 ± 0.02
C0402C0G1C5R6B	C0G	16V	5.6	± 0.10pF	0.20 ± 0.02
C0402C0G1C5R6C	C0G	16V	5.6	± 0.25pF	0.20 ± 0.02
C0402C0G1C5R6D	C0G	16V	5.6	± 0.50pF	0.20 ± 0.02
C0402C0G1C060B	C0G	16V	6.0	± 0.10pF	0.20 ± 0.02
C0402C0G1C060C	C0G	16V	6.0	± 0.25pF	0.20 ± 0.02
C0402C0G1C060D	C0G	16V	6.0	± 0.50pF	0.20 ± 0.02
C0402C0G1C6R2B	C0G	16V	6.2	± 0.10pF	0.20 ± 0.02
C0402C0G1C6R2C	C0G	16V	6.2	± 0.25pF	0.20 ± 0.02
C0402C0G1C6R2D	C0G	16V	6.2	± 0.50pF	0.20 ± 0.02
C0402C0G1C6R8B	C0G	16V	6.8	± 0.10pF	0.20 ± 0.02
C0402C0G1C6R8C	C0G	16V	6.8	± 0.25pF	0.20 ± 0.02
C0402C0G1C6R8D	C0G	16V	6.8	± 0.50pF	0.20 ± 0.02
C0402C0G1C070B	C0G	16V	7.0	± 0.10pF	0.20 ± 0.02
C0402C0G1C070C	C0G	16V	7.0	± 0.25pF	0.20 ± 0.02
C0402C0G1C070D	C0G	16V	7.0	± 0.50pF	0.20 ± 0.02
C0402C0G1C7R5B	C0G	16V	7.5	± 0.10pF	0.20 ± 0.02
C0402C0G1C7R5C	C0G	16V	7.5	± 0.25pF	0.20 ± 0.02
C0402C0G1C7R5D	C0G	16V	7.5	± 0.50pF	0.20 ± 0.02
C0402C0G1C080B	C0G	16V	8.0	± 0.10pF	0.20 ± 0.02
C0402C0G1C080C	C0G	16V	8.0	± 0.25pF	0.20 ± 0.02
C0402C0G1C080D	C0G	16V	8.0	± 0.50pF	0.20 ± 0.02
C0402C0G1C8R2B	C0G	16V	8.2	± 0.10pF	0.20 ± 0.02
C0402C0G1C8R2C	C0G	16V	8.2	± 0.25pF	0.20 ± 0.02
C0402C0G1C8R2D	C0G	16V	8.2	± 0.50pF	0.20 ± 0.02
C0402C0G1C090B	C0G	16V	9.0	± 0.10pF	0.20 ± 0.02
C0402C0G1C090C	C0G	16V	9.0	± 0.25pF	0.20 ± 0.02
C0402C0G1C090D	C0G	16V	9.0	± 0.50pF	0.20 ± 0.02
C0402C0G1C9R1B	C0G	16V	9.1	± 0.10pF	0.20 ± 0.02
C0402C0G1C9R1C	C0G	16V	9.1	± 0.25pF	0.20 ± 0.02
C0402C0G1C9R1D	C0G	16V	9.1	± 0.50pF	0.20 ± 0.02



Capacitance Range Table

C0402 [EIA CC01005]

Class 1 (Temperature Compensating)

Temperature Characteristics: C0G (-55 to 125°C, 0±30 ppm/°C)

TDK Part Number (Ordering Code)	Temperature Characteristics	Rated Voltage	Capacitance (pF)	Capacitance Tolerance	Thickness (mm)
C0402C0G1C100E	C0G	16V	10	± 0.20pF	0.20 ± 0.02
C0402C0G1C100D	C0G	16V	10	± 0.50pF	0.20 ± 0.02
C0402C0G1C110G	C0G	16V	11	± 2%	0.20 ± 0.02
C0402C0G1C110J	C0G	16V	11	± 5%	0.20 ± 0.02
C0402C0G1C120G	C0G	16V	12	± 2%	0.20 ± 0.02
C0402C0G1C120J	C0G	16V	12	± 5%	0.20 ± 0.02
C0402C0G1C130G	C0G	16V	13	± 2%	0.20 ± 0.02
C0402C0G1C130J	C0G	16V	13	± 5%	0.20 ± 0.02
C0402C0G1C150G	C0G	16V	15	± 2%	0.20 ± 0.02
C0402C0G1C150J	C0G	16V	15	± 5%	0.20 ± 0.02
C0402C0G1C160G	C0G	16V	16	± 2%	0.20 ± 0.02
C0402C0G1C160J	C0G	16V	16	± 5%	0.20 ± 0.02
C0402C0G1C180G	C0G	16V	18	± 2%	0.20 ± 0.02
C0402C0G1C180J	C0G	16V	18	± 5%	0.20 ± 0.02
C0402C0G1C200G	C0G	16V	20	± 2%	0.20 ± 0.02
C0402C0G1C200J	C0G	16V	20	± 5%	0.20 ± 0.02
C0402C0G1C220G	C0G	16V	22	± 2%	0.20 ± 0.02
C0402C0G1C220J	C0G	16V	22	± 5%	0.20 ± 0.02
C0402C0G1C240G	C0G	16V	24	± 2%	0.20 ± 0.02
C0402C0G1C240J	C0G	16V	24	± 5%	0.20 ± 0.02
C0402C0G1C270G	C0G	16V	27	± 2%	0.20 ± 0.02
C0402C0G1C270J	C0G	16V	27	± 5%	0.20 ± 0.02
C0402C0G1C300G	C0G	16V	30	± 2%	0.20 ± 0.02
C0402C0G1C300J	C0G	16V	30	± 5%	0.20 ± 0.02
C0402C0G1C330G	C0G	16V	33	± 2%	0.20 ± 0.02
C0402C0G1C330J	C0G	16V	33	± 5%	0.20 ± 0.02
C0402C0G1C360G	C0G	16V	36	± 2%	0.20 ± 0.02
C0402C0G1C360J	C0G	16V	36	± 5%	0.20 ± 0.02
C0402C0G1C390G	C0G	16V	39	± 2%	0.20 ± 0.02
C0402C0G1C390J	C0G	16V	39	± 5%	0.20 ± 0.02
C0402C0G1C430G	C0G	16V	43	± 2%	0.20 ± 0.02
C0402C0G1C430J	C0G	16V	43	± 5%	0.20 ± 0.02
C0402C0G1C470G	C0G	16V	47	± 2%	0.20 ± 0.02
C0402C0G1C470J	C0G	16V	47	± 5%	0.20 ± 0.02
C0402C0G1C510G	C0G	16V	51	± 2%	0.20 ± 0.02
C0402C0G1C510J	C0G	16V	51	± 5%	0.20 ± 0.02
C0402C0G1C560G	C0G	16V	56	± 2%	0.20 ± 0.02
C0402C0G1C560J	C0G	16V	56	± 5%	0.20 ± 0.02
C0402C0G1C620G	C0G	16V	62	± 2%	0.20 ± 0.02
C0402C0G1C620J	C0G	16V	62	± 5%	0.20 ± 0.02
C0402C0G1C680G	C0G	16V	68	± 2%	0.20 ± 0.02
C0402C0G1C680J	C0G	16V	68	± 5%	0.20 ± 0.02
C0402C0G1C750G	C0G	16V	75	± 2%	0.20 ± 0.02
C0402C0G1C750J	C0G	16V	75	± 5%	0.20 ± 0.02



Capacitance Range Table

C0402 [EIA CC01005]

Class 1 (Temperature Compensating)

Temperature Characteristics: C0G (-55 to 125°C, 0±30 ppm/°C)

TDK Part Number (Ordering Code)	Temperature Characteristics	Rated Voltage	Capacitance (pF)	Capacitance Tolerance	Thickness (mm)
C0402C0G1C820G	C0G	16V	82	± 2%	0.20 ± 0.02
C0402C0G1C820J	C0G	16V	82	± 5%	0.20 ± 0.02
C0402C0G1C910G	C0G	16V	91	± 2%	0.20 ± 0.02
C0402C0G1C910J	C0G	16V	91	± 5%	0.20 ± 0.02
C0402C0G1C101G	C0G	16V	100	± 2%	0.20 ± 0.02
C0402C0G1C101J	C0G	16V	100	± 5%	0.20 ± 0.02

Class 2 (Temperature Stable)

Temperature Characteristics: X7R (-55 to +125°C, ±15%), X5R (-55 to +85°C, ±15%)

TDK Part Number (Ordering Code)	Temperature Characteristics	Rated Voltage	Capacitance (pF)	Capacitance Tolerance	Thickness (mm)
C0402X7R1A101K	X7R	10V	100	± 10%	0.20 ± 0.02
C0402X7R1A151K	X7R	10V	150	± 10%	0.20 ± 0.02
C0402X7R1A221K	X7R	10V	220	± 10%	0.20 ± 0.02
C0402X7R1A331K	X7R	10V	330	± 10%	0.20 ± 0.02
C0402X7R1A471K	X7R	10V	470	± 10%	0.20 ± 0.02
C0402X7R1A681K	X7R	10V	680	± 10%	0.20 ± 0.02
C0402X5R1C101K	X5R	16V	100	± 10%	0.20 ± 0.02
C0402X5R1C151K	X5R	16V	150	± 10%	0.20 ± 0.02
C0402X5R1C221K	X5R	16V	220	± 10%	0.20 ± 0.02
C0402X5R1C331K	X5R	16V	330	± 10%	0.20 ± 0.02
C0402X5R1C471K	X5R	16V	470	± 10%	0.20 ± 0.02
C0402X5R1C681K	X5R	16V	680	± 10%	0.20 ± 0.02
C0402X5R1A101K	X5R	10V	100	± 10%	0.20 ± 0.02
C0402X5R1A221K	X5R	10V	220	± 10%	0.20 ± 0.02
C0402X5R1A471K	X5R	10V	470	± 10%	0.20 ± 0.02
C0402X5R1A102K	X5R	10V	1,000	± 10%	0.20 ± 0.02
C0402X5R1A152K	X5R	10V	1,500	± 10%	0.20 ± 0.02
C0402X5R1A222K	X5R	10V	2,200	± 10%	0.20 ± 0.02
C0402X5R0J681K	X5R	6.3V	680	± 10%	0.20 ± 0.02
C0402X5R0J102K	X5R	6.3V	1,000	± 10%	0.20 ± 0.02
C0402X5R0J152K	X5R	6.3V	1,500	± 10%	0.20 ± 0.02
C0402X5R0J222K	X5R	6.3V	2,200	± 10%	0.20 ± 0.02
C0402X5R0J332K	X5R	6.3V	3,300	± 10%	0.20 ± 0.02
C0402X5R0J472K	X5R	6.3V	4,700	± 10%	0.20 ± 0.02
C0402X5R0J682K	X5R	6.3V	6,800	± 10%	0.20 ± 0.02
C0402X5R0J103K	X5R	6.3V	10,000	± 10%	0.20 ± 0.02



Capacitance Range Chart

C0603 [EIA CC0201]

Capacitance Range Chart

Temperature Characteristics: C0G ($0 \pm 30\text{ppm}/^\circ\text{C}$)
 Rated Voltage: 50V (1H), 25V (1E)

Capacitance (pF)	Cap Code	Tolerance	C0G		Capacitance (pF)	Cap Code	Tolerance	C0G	
			1H (50V)	1E (25V)				1H (50V)	1E (25V)
0.2	0R2	W: $\pm 0.05\text{pF}$			6.8	6R8	B: $\pm 0.10\text{pF}$		
0.3	0R3	B: $\pm 0.10\text{pF}$			7.5	7R5	E: $\pm 0.20\text{pF}$		
0.4	0R4	C: $\pm 0.25\text{pF}$			8.2	8R2	C: $\pm 0.25\text{pF}$		
0.5	0R5	D: $\pm 0.50\text{pF}$			9.1	9R1	D: $\pm 0.50\text{pF}$		
0.6	0R6				10	100	G: $\pm 2\%$		
0.7	0R7				11	110	J: $\pm 5\%$		
0.75	R75				12	120			
0.8	0R8				13	130			
0.9	0R9				15	150			
1	010				16	160			
1.1	1R1				18	180			
1.2	1R2				20	200			
1.3	1R3				22	220			
1.5	1R5				24	240			
1.6	1R6				27	270			
1.8	1R8				30	300			
2	020				33	330			
2.2	2R2				36	360			
2.4	2R4				39	390			
2.7	2R7				43	430			
3	030				47	470			
3.3	3R3				51	510			
3.6	3R6				56	560			
3.9	3R9				62	620			
4.3	4R3				68	680			
4.7	4R7				75	750			
5.1	5R1				82	820			
5.6	5R6				91	910			
6.2	6R2				100	101			

Standard Thickness
 0.30 mm

• Standard capacitance is shown. Please refer to Capacitance Range Table for additional capacitance values.



Capacitance Range Chart

C0603 [EIA CC0201]

Capacitance Range Chart

Temperature Characteristics: X7R ($\pm 15\%$), X5R ($\pm 15\%$)

Rated Voltage: 50V (1H), 25V (1E), 16V (1C), 10V (1A), 6.3V (0J)

Capacitance (pF)	Cap Code	Tolerance	X7R					X5R				
			1H (50V)	1E (25V)	1C (16V)	1A (10V)	0J (6.3V)	1H (50V)	1E (25V)	1C (16V)	1A (10V)	0J (6.3V)
100	101	K: $\pm 10\%$ M: $\pm 20\%$										
150	151											
220	221											
330	331											
470	471											
680	681											
1,000	102											
1,500	152											
2,200	222											
3,300	332											
4,700	472											
6,800	682											
10,000	103											
15,000	153											
22,000	223											
33,000	333											
47,000	473											
68,000	683											
100,000	104											
150,000	154											
220,000	224											

• Standard capacitance is shown. Please refer to Capacitance Range Table for additional capacitance values.

Standard Thickness

 0.30 mm



Capacitance Range Table

C0603 [EIA CC0201]

Class 1 (Temperature Compensating)

Temperature Characteristics: C0G (-55 to 125°C, 0±30 ppm/°C)

TDK Part Number (Ordering Code)	Temperature Characteristics	Rated Voltage	Capacitance (pF)	Capacitance Tolerance	Thickness (mm)
C0603C0G1H0R5B	C0G	50V	0.5	± 0.10pF	0.30 ± 0.03
C0603C0G1H0R5C	C0G	50V	0.5	± 0.25pF	0.30 ± 0.03
C0603C0G1H010B	C0G	50V	1.0	± 0.10pF	0.30 ± 0.03
C0603C0G1H010C	C0G	50V	1.0	± 0.25pF	0.30 ± 0.03
C0603C0G1H1R2C	C0G	50V	1.2	± 0.25pF	0.30 ± 0.03
C0603C0G1H1R5B	C0G	50V	1.5	± 0.10pF	0.30 ± 0.03
C0603C0G1H1R5C	C0G	50V	1.5	± 0.25pF	0.30 ± 0.03
C0603C0G1H1R8C	C0G	50V	1.8	± 0.25pF	0.30 ± 0.03
C0603C0G1H020B	C0G	50V	2.0	± 0.10pF	0.30 ± 0.03
C0603C0G1H020C	C0G	50V	2.0	± 0.25pF	0.30 ± 0.03
C0603C0G1H2R2B	C0G	50V	2.2	± 0.10pF	0.30 ± 0.03
C0603C0G1H2R2C	C0G	50V	2.2	± 0.25pF	0.30 ± 0.03
C0603C0G1H2R7C	C0G	50V	2.7	± 0.25pF	0.30 ± 0.03
C0603C0G1H030B	C0G	50V	3.0	± 0.10pF	0.30 ± 0.03
C0603C0G1H030C	C0G	50V	3.0	± 0.25pF	0.30 ± 0.03
C0603C0G1H3R3B	C0G	50V	3.3	± 0.10pF	0.30 ± 0.03
C0603C0G1H3R3C	C0G	50V	3.3	± 0.25pF	0.30 ± 0.03
C0603C0G1H3R9C	C0G	50V	3.9	± 0.25pF	0.30 ± 0.03
C0603C0G1H040B	C0G	50V	4.0	± 0.10pF	0.30 ± 0.03
C0603C0G1H040C	C0G	50V	4.0	± 0.25pF	0.30 ± 0.03
C0603C0G1H4R7B	C0G	50V	4.7	± 0.10pF	0.30 ± 0.03
C0603C0G1H4R7C	C0G	50V	4.7	± 0.25pF	0.30 ± 0.03
C0603C0G1H050B	C0G	50V	5.0	± 0.10pF	0.30 ± 0.03
C0603C0G1H050C	C0G	50V	5.0	± 0.25pF	0.30 ± 0.03
C0603C0G1H5R6C	C0G	50V	5.6	± 0.25pF	0.30 ± 0.03
C0603C0G1H060C	C0G	50V	6.0	± 0.25pF	0.30 ± 0.03
C0603C0G1H060D	C0G	50V	6.0	± 0.50pF	0.30 ± 0.03
C0603C0G1H6R8C	C0G	50V	6.8	± 0.25pF	0.30 ± 0.03
C0603C0G1H6R8D	C0G	50V	6.8	± 0.50pF	0.30 ± 0.03
C0603C0G1H070C	C0G	50V	7.0	± 0.25pF	0.30 ± 0.03
C0603C0G1H070D	C0G	50V	7.0	± 0.50pF	0.30 ± 0.03
C0603C0G1H080C	C0G	50V	8.0	± 0.25pF	0.30 ± 0.03
C0603C0G1H080D	C0G	50V	8.0	± 0.50pF	0.30 ± 0.03
C0603C0G1H8R2C	C0G	50V	8.2	± 0.25pF	0.30 ± 0.03
C0603C0G1H090C	C0G	50V	9.0	± 0.25pF	0.30 ± 0.03
C0603C0G1H090D	C0G	50V	9.0	± 0.50pF	0.30 ± 0.03
C0603C0G1H100C	C0G	50V	10	± 0.25pF	0.30 ± 0.03
C0603C0G1H100D	C0G	50V	10	± 0.50pF	0.30 ± 0.03
C0603C0G1H110J	C0G	50V	11	± 5%	0.30 ± 0.03
C0603C0G1H120J	C0G	50V	12	± 5%	0.30 ± 0.03
C0603C0G1H130J	C0G	50V	13	± 5%	0.30 ± 0.03
C0603C0G1H150J	C0G	50V	15	± 5%	0.30 ± 0.03
C0603C0G1H160J	C0G	50V	16	± 5%	0.30 ± 0.03
C0603C0G1H180J	C0G	50V	18	± 5%	0.30 ± 0.03



Capacitance Range Table

C0603 [EIA CC0201]

Class 1 (Temperature Compensating)

Temperature Characteristics: C0G (-55 to 125°C, 0±30 ppm/°C)

TDK Part Number (Ordering Code)	Temperature Characteristics	Rated Voltage	Capacitance (pF)	Capacitance Tolerance	Thickness (mm)
C0603C0G1H200J	C0G	50V	20	± 5%	0.30 ± 0.03
C0603C0G1H220J	C0G	50V	22	± 5%	0.30 ± 0.03
C0603C0G1H240J	C0G	50V	24	± 5%	0.30 ± 0.03
C0603C0G1H270J	C0G	50V	27	± 5%	0.30 ± 0.03
C0603C0G1H300J	C0G	50V	30	± 5%	0.30 ± 0.03
C0603C0G1H330J	C0G	50V	33	± 5%	0.30 ± 0.03
C0603C0G1H360J	C0G	50V	36	± 5%	0.30 ± 0.03
C0603C0G1H390J	C0G	50V	39	± 5%	0.30 ± 0.03
C0603C0G1H430J	C0G	50V	43	± 5%	0.30 ± 0.03
C0603C0G1H470J	C0G	50V	47	± 5%	0.30 ± 0.03
C0603C0G1H510J	C0G	50V	51	± 5%	0.30 ± 0.03
C0603C0G1H560J	C0G	50V	56	± 5%	0.30 ± 0.03
C0603C0G1H620J	C0G	50V	62	± 5%	0.30 ± 0.03
C0603C0G1H680J	C0G	50V	68	± 5%	0.30 ± 0.03
C0603C0G1H750J	C0G	50V	75	± 5%	0.30 ± 0.03
C0603C0G1H820J	C0G	50V	82	± 5%	0.30 ± 0.03
C0603C0G1H910J	C0G	50V	91	± 5%	0.30 ± 0.03
C0603C0G1H101J	C0G	50V	100	± 5%	0.30 ± 0.03
C0603C0G1E0R2W	C0G	25V	0.2	± 0.05pF	0.30 ± 0.03
C0603C0G1E0R2B	C0G	25V	0.2	± 0.10pF	0.30 ± 0.03
C0603C0G1E0R3W	C0G	25V	0.3	± 0.05pF	0.30 ± 0.03
C0603C0G1E0R3B	C0G	25V	0.3	± 0.10pF	0.30 ± 0.03
C0603C0G1E0R4W	C0G	25V	0.4	± 0.05pF	0.30 ± 0.03
C0603C0G1E0R4B	C0G	25V	0.4	± 0.10pF	0.30 ± 0.03
C0603C0G1E0R5W	C0G	25V	0.5	± 0.05pF	0.30 ± 0.03
C0603C0G1E0R5C	C0G	25V	0.5	± 0.25pF	0.30 ± 0.03
C0603C0G1E0R5B	C0G	25V	0.5	± 0.10pF	0.30 ± 0.03
C0603C0G1E0R6W	C0G	25V	0.6	± 0.05pF	0.30 ± 0.03
C0603C0G1E0R6B	C0G	25V	0.6	± 0.10pF	0.30 ± 0.03
C0603C0G1E0R7W	C0G	25V	0.7	± 0.05pF	0.30 ± 0.03
C0603C0G1E0R7B	C0G	25V	0.7	± 0.10pF	0.30 ± 0.03
C0603C0G1ER75B	C0G	25V	0.75	± 0.10pF	0.30 ± 0.03
C0603C0G1ER75C	C0G	25V	0.75	± 0.25pF	0.30 ± 0.03
C0603C0G1E0R8W	C0G	25V	0.8	± 0.05pF	0.30 ± 0.03
C0603C0G1E0R8B	C0G	25V	0.8	± 0.10pF	0.30 ± 0.03
C0603C0G1E0R9W	C0G	25V	0.9	± 0.05pF	0.30 ± 0.03
C0603C0G1E0R9B	C0G	25V	0.9	± 0.10pF	0.30 ± 0.03
C0603C0G1E010B	C0G	25V	1.0	± 0.10pF	0.30 ± 0.03
C0603C0G1E010C	C0G	25V	1.0	± 0.25pF	0.30 ± 0.03
C0603C0G1E1R1B	C0G	25V	1.1	± 0.10pF	0.30 ± 0.03
C0603C0G1E1R1C	C0G	25V	1.1	± 0.25pF	0.30 ± 0.03
C0603C0G1E1R2B	C0G	25V	1.2	± 0.10pF	0.30 ± 0.03
C0603C0G1E1R2C	C0G	25V	1.2	± 0.25pF	0.30 ± 0.03
C0603C0G1E1R3B	C0G	25V	1.3	± 0.10pF	0.30 ± 0.03



Capacitance Range Table

C0603 [EIA CC0201]

Class 1 (Temperature Compensating)

Temperature Characteristics: C0G (-55 to 125°C, 0±30 ppm/°C)

TDK Part Number (Ordering Code)	Temperature Characteristics	Rated Voltage	Capacitance (pF)	Capacitance Tolerance	Thickness (mm)
C0603C0G1E1R3C	C0G	25V	1.3	± 0.25pF	0.30 ± 0.03
C0603C0G1E1R5B	C0G	25V	1.5	± 0.10pF	0.30 ± 0.03
C0603C0G1E1R5C	C0G	25V	1.5	± 0.25pF	0.30 ± 0.03
C0603C0G1E1R6B	C0G	25V	1.6	± 0.10pF	0.30 ± 0.03
C0603C0G1E1R6C	C0G	25V	1.6	± 0.25pF	0.30 ± 0.03
C0603C0G1E1R8B	C0G	25V	1.8	± 0.10pF	0.30 ± 0.03
C0603C0G1E1R8C	C0G	25V	1.8	± 0.25pF	0.30 ± 0.03
C0603C0G1E020B	C0G	25V	2.0	± 0.10pF	0.30 ± 0.03
C0603C0G1E020C	C0G	25V	2.0	± 0.25pF	0.30 ± 0.03
C0603C0G1E2R2B	C0G	25V	2.2	± 0.10pF	0.30 ± 0.03
C0603C0G1E2R2C	C0G	25V	2.2	± 0.25pF	0.30 ± 0.03
C0603C0G1E2R4B	C0G	25V	2.4	± 0.10pF	0.30 ± 0.03
C0603C0G1E2R4C	C0G	25V	2.4	± 0.25pF	0.30 ± 0.03
C0603C0G1E2R7B	C0G	25V	2.7	± 0.10pF	0.30 ± 0.03
C0603C0G1E2R7C	C0G	25V	2.7	± 0.25pF	0.30 ± 0.03
C0603C0G1E030B	C0G	25V	3.0	± 0.10pF	0.30 ± 0.03
C0603C0G1E030C	C0G	25V	3.0	± 0.25pF	0.30 ± 0.03
C0603C0G1E3R3B	C0G	25V	3.3	± 0.10pF	0.30 ± 0.03
C0603C0G1E3R3C	C0G	25V	3.3	± 0.25pF	0.30 ± 0.03
C0603C0G1E3R6B	C0G	25V	3.6	± 0.10pF	0.30 ± 0.03
C0603C0G1E3R6C	C0G	25V	3.6	± 0.25pF	0.30 ± 0.03
C0603C0G1E3R9B	C0G	25V	3.9	± 0.10pF	0.30 ± 0.03
C0603C0G1E3R9C	C0G	25V	3.9	± 0.25pF	0.30 ± 0.03
C0603C0G1E040B	C0G	25V	4.0	± 0.10pF	0.30 ± 0.03
C0603C0G1E040C	C0G	25V	4.0	± 0.25pF	0.30 ± 0.03
C0603C0G1E4R3B	C0G	25V	4.3	± 0.10pF	0.30 ± 0.03
C0603C0G1E4R3C	C0G	25V	4.3	± 0.25pF	0.30 ± 0.03
C0603C0G1E4R7B	C0G	25V	4.7	± 0.10pF	0.30 ± 0.03
C0603C0G1E4R7C	C0G	25V	4.7	± 0.25pF	0.30 ± 0.03
C0603C0G1E050B	C0G	25V	5.0	± 0.10pF	0.30 ± 0.03
C0603C0G1E050C	C0G	25V	5.0	± 0.25pF	0.30 ± 0.03
C0603C0G1E5R1B	C0G	25V	5.1	± 0.10pF	0.30 ± 0.03
C0603C0G1E5R1C	C0G	25V	5.1	± 0.25pF	0.30 ± 0.03
C0603C0G1E5R1D	C0G	25V	5.1	± 0.50pF	0.30 ± 0.03
C0603C0G1E5R6B	C0G	25V	5.6	± 0.10pF	0.30 ± 0.03
C0603C0G1E5R6C	C0G	25V	5.6	± 0.25pF	0.30 ± 0.03
C0603C0G1E5R6D	C0G	25V	5.6	± 0.50pF	0.30 ± 0.03
C0603C0G1E060B	C0G	25V	6.0	± 0.10pF	0.30 ± 0.03
C0603C0G1E060C	C0G	25V	6.0	± 0.25pF	0.30 ± 0.03
C0603C0G1E060D	C0G	25V	6.0	± 0.50pF	0.30 ± 0.03
C0603C0G1E6R2B	C0G	25V	6.2	± 0.10pF	0.30 ± 0.03
C0603C0G1E6R2C	C0G	25V	6.2	± 0.25pF	0.30 ± 0.03
C0603C0G1E6R2D	C0G	25V	6.2	± 0.50pF	0.30 ± 0.03
C0603C0G1E6R8B	C0G	25V	6.8	± 0.10pF	0.30 ± 0.03



Capacitance Range Table

C0603 [EIA CC0201]

Class 1 (Temperature Compensating)

Temperature Characteristics: C0G (-55 to 125°C, 0±30 ppm/°C)

TDK Part Number (Ordering Code)	Temperature Characteristics	Rated Voltage	Capacitance (pF)	Capacitance Tolerance	Thickness (mm)
C0603C0G1E6R8C	C0G	25V	6.8	± 0.25pF	0.30 ± 0.03
C0603C0G1E6R8D	C0G	25V	6.8	± 0.50pF	0.30 ± 0.03
C0603C0G1E070B	C0G	25V	7.0	± 0.10pF	0.30 ± 0.03
C0603C0G1E070C	C0G	25V	7.0	± 0.25pF	0.30 ± 0.03
C0603C0G1E070D	C0G	25V	7.0	± 0.50pF	0.30 ± 0.03
C0603C0G1E7R5B	C0G	25V	7.5	± 0.10pF	0.30 ± 0.03
C0603C0G1E7R5C	C0G	25V	7.5	± 0.25pF	0.30 ± 0.03
C0603C0G1E7R5D	C0G	25V	7.5	± 0.50pF	0.30 ± 0.03
C0603C0G1E080B	C0G	25V	8.0	± 0.10pF	0.30 ± 0.03
C0603C0G1E080C	C0G	25V	8.0	± 0.25pF	0.30 ± 0.03
C0603C0G1E080D	C0G	25V	8.0	± 0.50pF	0.30 ± 0.03
C0603C0G1E8R2B	C0G	25V	8.2	± 0.10pF	0.30 ± 0.03
C0603C0G1E8R2C	C0G	25V	8.2	± 0.25pF	0.30 ± 0.03
C0603C0G1E8R2D	C0G	25V	8.2	± 0.50pF	0.30 ± 0.03
C0603C0G1E090B	C0G	25V	9.0	± 0.10pF	0.30 ± 0.03
C0603C0G1E090C	C0G	25V	9.0	± 0.25pF	0.30 ± 0.03
C0603C0G1E090D	C0G	25V	9.0	± 0.50pF	0.30 ± 0.03
C0603C0G1E9R1B	C0G	25V	9.1	± 0.10pF	0.30 ± 0.03
C0603C0G1E9R1C	C0G	25V	9.1	± 0.25pF	0.30 ± 0.03
C0603C0G1E9R1D	C0G	25V	9.1	± 0.50pF	0.30 ± 0.03
C0603C0G1E100E	C0G	25V	10	± 0.20pF	0.30 ± 0.03
C0603C0G1E100C	C0G	25V	10	± 0.25pF	0.30 ± 0.03
C0603C0G1E100D	C0G	25V	10	± 0.50pF	0.30 ± 0.03
C0603C0G1E110G	C0G	25V	11	± 2%	0.30 ± 0.03
C0603C0G1E110J	C0G	25V	11	± 5%	0.30 ± 0.03
C0603C0G1E120G	C0G	25V	12	± 2%	0.30 ± 0.03
C0603C0G1E120J	C0G	25V	12	± 5%	0.30 ± 0.03
C0603C0G1E130G	C0G	25V	13	± 2%	0.30 ± 0.03
C0603C0G1E130J	C0G	25V	13	± 5%	0.30 ± 0.03
C0603C0G1E150G	C0G	25V	15	± 2%	0.30 ± 0.03
C0603C0G1E150J	C0G	25V	15	± 5%	0.30 ± 0.03
C0603C0G1E160G	C0G	25V	16	± 2%	0.30 ± 0.03
C0603C0G1E160J	C0G	25V	16	± 5%	0.30 ± 0.03
C0603C0G1E180G	C0G	25V	18	± 2%	0.30 ± 0.03
C0603C0G1E180J	C0G	25V	18	± 5%	0.30 ± 0.03
C0603C0G1E200G	C0G	25V	20	± 2%	0.30 ± 0.03
C0603C0G1E200J	C0G	25V	20	± 5%	0.30 ± 0.03
C0603C0G1E220G	C0G	25V	22	± 2%	0.30 ± 0.03
C0603C0G1E220J	C0G	25V	22	± 5%	0.30 ± 0.03
C0603C0G1E240G	C0G	25V	24	± 2%	0.30 ± 0.03
C0603C0G1E240J	C0G	25V	24	± 5%	0.30 ± 0.03
C0603C0G1E270G	C0G	25V	27	± 2%	0.30 ± 0.03
C0603C0G1E270J	C0G	25V	27	± 5%	0.30 ± 0.03
C0603C0G1E300G	C0G	25V	30	± 2%	0.30 ± 0.03



Capacitance Range Table

C0603 [EIA CC0201]

Class 1 (Temperature Compensating)

Temperature Characteristics: C0G (-55 to 125°C, 0±30 ppm/°C)

TDK Part Number (Ordering Code)	Temperature Characteristics	Rated Voltage	Capacitance (pF)	Capacitance Tolerance	Thickness (mm)
C0603C0G1E300J	C0G	25V	30	± 5%	0.30 ± 0.03
C0603C0G1E330G	C0G	25V	33	± 2%	0.30 ± 0.03
C0603C0G1E330J	C0G	25V	33	± 5%	0.30 ± 0.03
C0603C0G1E360G	C0G	25V	36	± 2%	0.30 ± 0.03
C0603C0G1E360J	C0G	25V	36	± 5%	0.30 ± 0.03
C0603C0G1E390G	C0G	25V	39	± 2%	0.30 ± 0.03
C0603C0G1E390J	C0G	25V	39	± 5%	0.30 ± 0.03
C0603C0G1E430G	C0G	25V	43	± 2%	0.30 ± 0.03
C0603C0G1E430J	C0G	25V	43	± 5%	0.30 ± 0.03
C0603C0G1E470G	C0G	25V	47	± 2%	0.30 ± 0.03
C0603C0G1E470J	C0G	25V	47	± 5%	0.30 ± 0.03
C0603C0G1E510G	C0G	25V	51	± 2%	0.30 ± 0.03
C0603C0G1E510J	C0G	25V	51	± 5%	0.30 ± 0.03
C0603C0G1E560G	C0G	25V	56	± 2%	0.30 ± 0.03
C0603C0G1E560J	C0G	25V	56	± 5%	0.30 ± 0.03
C0603C0G1E620G	C0G	25V	62	± 2%	0.30 ± 0.03
C0603C0G1E620J	C0G	25V	62	± 5%	0.30 ± 0.03
C0603C0G1E680G	C0G	25V	68	± 2%	0.30 ± 0.03
C0603C0G1E680J	C0G	25V	68	± 5%	0.30 ± 0.03
C0603C0G1E750G	C0G	25V	75	± 2%	0.30 ± 0.03
C0603C0G1E750J	C0G	25V	75	± 5%	0.30 ± 0.03
C0603C0G1E820G	C0G	25V	82	± 2%	0.30 ± 0.03
C0603C0G1E820J	C0G	25V	82	± 5%	0.30 ± 0.03
C0603C0G1E910G	C0G	25V	91	± 2%	0.30 ± 0.03
C0603C0G1E910J	C0G	25V	91	± 5%	0.30 ± 0.03
C0603C0G1E101G	C0G	25V	100	± 2%	0.30 ± 0.03
C0603C0G1E101J	C0G	25V	100	± 5%	0.30 ± 0.03

Class 2 (Temperature Stable)

Temperature Characteristics: X7R (-55 to +125°C, ±15%)

TDK Part Number (Ordering Code)	Temperature Characteristics	Rated Voltage	Capacitance (pF)	Capacitance Tolerance	Thickness (mm)
C0603X7R1H101K	X7R	50V	100	± 10%	0.30 ± 0.03
C0603X7R1H101M	X7R	50V	100	± 20%	0.30 ± 0.03
C0603X7R1H151K	X7R	50V	150	± 10%	0.30 ± 0.03
C0603X7R1H151M	X7R	50V	150	± 20%	0.30 ± 0.03
C0603X7R1H221K	X7R	50V	220	± 10%	0.30 ± 0.03
C0603X7R1H221M	X7R	50V	220	± 20%	0.30 ± 0.03
C0603X7R1H331K	X7R	50V	330	± 10%	0.30 ± 0.03
C0603X7R1H331M	X7R	50V	330	± 20%	0.30 ± 0.03
C0603X7R1H471K	X7R	50V	470	± 10%	0.30 ± 0.03
C0603X7R1H471M	X7R	50V	470	± 20%	0.30 ± 0.03
C0603X7R1E101K	X7R	25V	100	± 10%	0.30 ± 0.03
C0603X7R1E101M	X7R	25V	100	± 20%	0.30 ± 0.03



Capacitance Range Table

C0603 [EIA CC0201]

Class 2 (Temperature Stable)

Temperature Characteristics: X7R (-55 to +125°C, ±15%)

TDK Part Number (Ordering Code)	Temperature Characteristics	Rated Voltage	Capacitance (pF)	Capacitance Tolerance	Thickness (mm)
C0603X7R1E151K	X7R	25V	150	± 10%	0.30 ± 0.03
C0603X7R1E151M	X7R	25V	150	± 20%	0.30 ± 0.03
C0603X7R1E221K	X7R	25V	220	± 10%	0.30 ± 0.03
C0603X7R1E221M	X7R	25V	220	± 20%	0.30 ± 0.03
C0603X7R1E331K	X7R	25V	330	± 10%	0.30 ± 0.03
C0603X7R1E331M	X7R	25V	330	± 20%	0.30 ± 0.03
C0603X7R1E471K	X7R	25V	470	± 10%	0.30 ± 0.03
C0603X7R1E471M	X7R	25V	470	± 20%	0.30 ± 0.03
C0603X7R1E681K	X7R	25V	680	± 10%	0.30 ± 0.03
C0603X7R1E681M	X7R	25V	680	± 20%	0.30 ± 0.03
C0603X7R1E102K	X7R	25V	1,000	± 10%	0.30 ± 0.03
C0603X7R1E102M	X7R	25V	1,000	± 20%	0.30 ± 0.03
C0603X7R1E152K	X7R	25V	1,500	± 10%	0.30 ± 0.03
C0603X7R1E152M	X7R	25V	1,500	± 20%	0.30 ± 0.03
C0603X7R1E222K	X7R	25V	2,200	± 10%	0.30 ± 0.03
C0603X7R1E222M	X7R	25V	2,200	± 20%	0.30 ± 0.03
C0603X7R1E332K	X7R	25V	3,300	± 10%	0.30 ± 0.03
C0603X7R1E332M	X7R	25V	3,300	± 20%	0.30 ± 0.03
C0603X7R1C101K	X7R	16V	100	± 10%	0.30 ± 0.03
C0603X7R1C101M	X7R	16V	100	± 20%	0.30 ± 0.03
C0603X7R1C151K	X7R	16V	150	± 10%	0.30 ± 0.03
C0603X7R1C151M	X7R	16V	150	± 20%	0.30 ± 0.03
C0603X7R1C221K	X7R	16V	220	± 10%	0.30 ± 0.03
C0603X7R1C221M	X7R	16V	220	± 20%	0.30 ± 0.03
C0603X7R1C331K	X7R	16V	330	± 10%	0.30 ± 0.03
C0603X7R1C331M	X7R	16V	330	± 20%	0.30 ± 0.03
C0603X7R1C471K	X7R	16V	470	± 10%	0.30 ± 0.03
C0603X7R1C471M	X7R	16V	470	± 20%	0.30 ± 0.03
C0603X7R1C681K	X7R	16V	680	± 10%	0.30 ± 0.03
C0603X7R1C681M	X7R	16V	680	± 20%	0.30 ± 0.03
C0603X7R1C102K	X7R	16V	1,000	± 10%	0.30 ± 0.03
C0603X7R1C102M	X7R	16V	1,000	± 20%	0.30 ± 0.03
C0603X7R1C152K	X7R	16V	1,500	± 10%	0.30 ± 0.03
C0603X7R1C152M	X7R	16V	1,500	± 20%	0.30 ± 0.03
C0603X7R1C222K	X7R	16V	2,200	± 10%	0.30 ± 0.03
C0603X7R1C222M	X7R	16V	2,200	± 20%	0.30 ± 0.03
C0603X7R1C332K	X7R	16V	3,300	± 10%	0.30 ± 0.03
C0603X7R1C332M	X7R	16V	3,300	± 20%	0.30 ± 0.03
C0603X7R1C472K	X7R	16V	4,700	± 10%	0.30 ± 0.03
C0603X7R1C472M	X7R	16V	4,700	± 20%	0.30 ± 0.03
C0603X7R1A682K	X7R	10V	6,800	± 10%	0.30 ± 0.03
C0603X7R1A682M	X7R	10V	6,800	± 20%	0.30 ± 0.03
C0603X7R1A103K	X7R	10V	10,000	± 10%	0.30 ± 0.03
C0603X7R1A103M	X7R	10V	10,000	± 20%	0.30 ± 0.03



Capacitance Range Table

C0603 [EIA CC0201]

Class 2 (Temperature Stable)

Temperature Characteristics: X7R (-55 to +125°C, ±15%), X6S(-55 to 105°C, ±22%), X5R (-55 to +85°C, ±15%)

TDK Part Number (Ordering Code)	Temperature Characteristics	Rated Voltage	Capacitance (pF)	Capacitance Tolerance	Thickness (mm)
C0603X7R0J103K	X7R	6.3V	10,000	± 10%	0.30 ± 0.03
C0603X7R0J103M	X7R	6.3V	10,000	± 20%	0.30 ± 0.03
C0603X6S0G104K	X6S	4V	100,000	± 10%	0.30 ± 0.03
C0603X6S0G104M	X6S	4V	100,000	± 20%	0.30 ± 0.03
C0603X5R1H101K	X5R	50V	100	± 10%	0.30 ± 0.03
C0603X5R1H101M	X5R	50V	100	± 20%	0.30 ± 0.03
C0603X5R1H151K	X5R	50V	150	± 10%	0.30 ± 0.03
C0603X5R1H151M	X5R	50V	150	± 20%	0.30 ± 0.03
C0603X5R1H221K	X5R	50V	220	± 10%	0.30 ± 0.03
C0603X5R1H221M	X5R	50V	220	± 20%	0.30 ± 0.03
C0603X5R1H331K	X5R	50V	330	± 10%	0.30 ± 0.03
C0603X5R1H331M	X5R	50V	330	± 20%	0.30 ± 0.03
C0603X5R1H471K	X5R	50V	470	± 10%	0.30 ± 0.03
C0603X5R1H471M	X5R	50V	470	± 20%	0.30 ± 0.03
C0603X5R1E101K	X5R	25V	100	± 10%	0.30 ± 0.03
C0603X5R1E101M	X5R	25V	100	± 20%	0.30 ± 0.03
C0603X5R1E151K	X5R	25V	150	± 10%	0.30 ± 0.03
C0603X5R1E151M	X5R	25V	150	± 20%	0.30 ± 0.03
C0603X5R1E221K	X5R	25V	220	± 10%	0.30 ± 0.03
C0603X5R1E221M	X5R	25V	220	± 20%	0.30 ± 0.03
C0603X5R1E331K	X5R	25V	330	± 10%	0.30 ± 0.03
C0603X5R1E331M	X5R	25V	330	± 20%	0.30 ± 0.03
C0603X5R1E471K	X5R	25V	470	± 10%	0.30 ± 0.03
C0603X5R1E471M	X5R	25V	470	± 20%	0.30 ± 0.03
C0603X5R1E681K	X5R	25V	680	± 10%	0.30 ± 0.03
C0603X5R1E681M	X5R	25V	680	± 20%	0.30 ± 0.03
C0603X5R1E102K	X5R	25V	1,000	± 10%	0.30 ± 0.03
C0603X5R1E102M	X5R	25V	1,000	± 20%	0.30 ± 0.03
C0603X5R1E152K	X5R	25V	1,500	± 10%	0.30 ± 0.03
C0603X5R1E152M	X5R	25V	1,500	± 20%	0.30 ± 0.03
C0603X5R1E222K	X5R	25V	2,200	± 10%	0.30 ± 0.03
C0603X5R1E222M	X5R	25V	2,200	± 20%	0.30 ± 0.03
C0603X5R1E332K	X5R	25V	3,300	± 10%	0.30 ± 0.03
C0603X5R1E332M	X5R	25V	3,300	± 20%	0.30 ± 0.03
C0603X5R1C222K	X5R	16V	2,200	± 10%	0.30 ± 0.03
C0603X5R1C222M	X5R	16V	2,200	± 20%	0.30 ± 0.03
C0603X5R1C332K	X5R	16V	3,300	± 10%	0.30 ± 0.03
C0603X5R1C332M	X5R	16V	3,300	± 20%	0.30 ± 0.03
C0603X5R1C472K	X5R	16V	4,700	± 10%	0.30 ± 0.03
C0603X5R1C472M	X5R	16V	4,700	± 20%	0.30 ± 0.03
C0603X5R1C104K	X5R	16V	100,000	± 10%	0.30 ± 0.03
C0603X5R1C154K	X5R	16V	150,000	± 10%	0.30 ± 0.03
C0603X5R1C224K	X5R	16V	220,000	± 10%	0.30 ± 0.03
C0603X5R1C224M	X5R	16V	220,000	± 20%	0.30 ± 0.03



Capacitance Range Table

C0603 [EIA CC0201]

Class 2 (Temperature Stable)

Temperature Characteristics: X5R (-55 to +85°C, ±15%), Y5V(-30 to +85°C, +22/-82%)

TDK Part Number (Ordering Code)	Temperature Characteristics	Rated Voltage	Capacitance (pF)	Capacitance Tolerance	Thickness (mm)
C0603X5R1A682K	X5R	10V	6,800	± 10%	0.30 ± 0.03
C0603X5R1A682M	X5R	10V	6,800	± 20%	0.30 ± 0.03
C0603X5R1A103K	X5R	10V	10,000	± 10%	0.30 ± 0.03
C0603X5R1A103M	X5R	10V	10,000	± 20%	0.30 ± 0.03
C0603X5R1A104K	X5R	10V	100,000	± 10%	0.30 ± 0.03
C0603X5R1A154K	X5R	10V	150,000	± 10%	0.30 ± 0.03
C0603X5R1A224K	X5R	10V	220,000	± 10%	0.30 ± 0.03
C0603X5R1A224M	X5R	10V	220,000	± 20%	0.30 ± 0.03
C0603X5R0J103K	X5R	6.3V	10,000	± 10%	0.30 ± 0.03
C0603X5R0J103M	X5R	6.3V	10,000	± 20%	0.30 ± 0.03
C0603X5R0J153K	X5R	6.3V	15,000	± 10%	0.30 ± 0.03
C0603X5R0J153M	X5R	6.3V	15,000	± 20%	0.30 ± 0.03
C0603X5R0J223K	X5R	6.3V	22,000	± 10%	0.30 ± 0.03
C0603X5R0J223M	X5R	6.3V	22,000	± 20%	0.30 ± 0.03
C0603X5R0J333K	X5R	6.3V	33,000	± 10%	0.30 ± 0.03
C0603X5R0J333M	X5R	6.3V	33,000	± 20%	0.30 ± 0.03
C0603X5R0J473K	X5R	6.3V	47,000	± 10%	0.30 ± 0.03
C0603X5R0J473M	X5R	6.3V	47,000	± 20%	0.30 ± 0.03
C0603X5R0J683K	X5R	6.3V	68,000	± 10%	0.30 ± 0.03
C0603X5R0J683M	X5R	6.3V	68,000	± 20%	0.30 ± 0.03
C0603X5R0J104K	X5R	6.3V	100,000	± 10%	0.30 ± 0.03
C0603X5R0J104M	X5R	6.3V	100,000	± 20%	0.30 ± 0.03
C0603X5R0J154K	X5R	6.3V	150,000	± 10%	0.30 ± 0.03
C0603X5R0J154M	X5R	6.3V	150,000	± 20%	0.30 ± 0.03
C0603X5R0J224K	X5R	6.3V	220,000	± 10%	0.30 ± 0.03
C0603X5R0J224M	X5R	6.3V	220,000	± 20%	0.30 ± 0.03
C0603Y5V1C103Z	Y5V	16V	10,000	+80/-20%	0.30 ± 0.03



Capacitance Range Chart

C1005 [EIA CC0402]

Capacitance Range Chart

Temperature Characteristics: C0G ($0 \pm 30\text{ppm}/^\circ\text{C}$)
 Rated Voltage: 50V (1H), 25V (1E)

Capacitance (pF)	Cap Code	Tolerance	C0G	Capacitance (pF)	Cap Code	Tolerance	C0G	
			1H (50V)				1H (50V)	1E (25V)
0.1	0R1	B: $\pm 0.10\text{pF}$ C: $\pm 0.25\text{pF}$ D: $\pm 0.50\text{pF}$		30	300	J: $\pm 5\%$		
0.5	0R5			33	330			
0.75	R75			36	360			
1	010			39	390			
1.2	1R2			43	430			
1.5	1R5			47	470			
1.8	1R8			51	510			
2.2	2R2			56	560			
2.7	2R7			62	620			
3.3	3R3			68	680			
3.9	3R9			75	750			
4.7	4R7			82	820			
5.6	5R6	C: $\pm 0.25\text{pF}$ D: $\pm 0.50\text{pF}$		91	910			
6.8	6R8			100	101			
8.2	8R2			120	121			
10	100			150	151			
11	110	J: $\pm 5\%$		180	181			
12	120			220	221			
13	130			270	271			
15	150			330	331			
16	160			390	391			
18	180			470	471			
20	200			560	561			
22	220			680	681			
24	240			820	821			
27	270			1,000	102			

• Standard capacitance is shown. Please refer to Capacitance Range Table for additional capacitance values.

Capacitance Range Chart

Temperature Characteristics: X7R ($\pm 15\%$)
 Rated Voltage: 50V (1H), 35V (1V), 25V (1E), 16V(1C), 10V (1A)

Capacitance (pF)	Cap Code	Tolerance	X7R				
			1H (50V)	1V (35V)	1E (25V)	1C (16V)	1A (10V)
220	221	K: $\pm 10\%$ M: $\pm 20\%$					
330	331						
470	471						
680	681						
1,000	102						
1,500	152						
2,200	222						
3,300	332						
4,700	472						
6,800	682						
10,000	103						
15,000	153						
22,000	223						
33,000	333						
47,000	473						
68,000	683						
100,000	104						
150,000	154						
220,000	224						

Standard Thickness

0.50 mm



Capacitance Range Chart

C1005 [EIA CC0402]

Capacitance Range Chart

Temperature Characteristics: X5R ($\pm 15\%$), X6S ($\pm 22\%$), Y5V ($+22/-82\%$)

Rated Voltage: 50V (1H), 35V (1V), 25V (1E), 16V (1C), 10V (1A), 6.3V (0J), 4V (0G)

Capacitance (pF)	Cap Code	Tolerance	X6S					
			1H (50V)	1V (35V)	1E (25V)	1C (16V)	1A (10V)	0J (6.3V)
10,000	103	K: $\pm 10\%$ M: $\pm 20\%$						
22,000	223							
47,000	473							
100,000	104							
220,000	224							
470,000	474							
1,000,000	105							
2,200,000	225							

Capacitance (pF)	Cap Code	Tolerance	X5R					
			1H (50V)	1V (35V)	1E (25V)	1C (16V)	1A (10V)	0J (6.3V)
220	221	K: $\pm 10\%$ M: $\pm 20\%$						
330	331							
470	471							
680	681							
1,000	102							
1,500	152							
2,200	222							
3,300	332							
4,700	472							
6,800	682							
10,000	103							
15,000	153							
22,000	223							
33,000	333							
47,000	473							
68,000	683							
100,000	104							
220,000	224							
330,000	334							
470,000	474							
1,000,000	105							
1,500,000	155							
2,200,000	225							
3,300,000	335							
4,700,000	475							

Capacitance (pF)	Cap Code	Tolerance	Y5V			
			1H (50V)	1E (25V)	1C (16V)	0J (6.3V)
10,000	103	Z: $+80/-20\%$				
100,000	104					
220,000	224					
470,000	474					
1,000,000	105					

Standard Thickness

0.50 mm



Capacitance Range Table

C1005 [EIA CC0402]

Class 1 (Temperature Compensating)

Temperature Characteristics: C0G (-55 to 125°C, 0±30 ppm/°C)

TDK Part Number (Ordering Code)	Temperature Characteristics	Rated Voltage	Capacitance (pF)	Capacitance Tolerance	Thickness (mm)
C1005C0G1H0R5B	C0G	50V	0.5	± 0.10pF	0.50 ± 0.05
C1005C0G1H0R5C	C0G	50V	0.5	± 0.25pF	0.50 ± 0.05
C1005C0G1HR75C	C0G	50V	0.75	± 0.25pF	0.50 ± 0.05
C1005C0G1H010B	C0G	50V	1.0	± 0.10pF	0.50 ± 0.05
C1005C0G1H010C	C0G	50V	1.0	± 0.25pF	0.50 ± 0.05
C1005C0G1H1R2B	C0G	50V	1.2	± 0.10pF	0.50 ± 0.05
C1005C0G1H1R2C	C0G	50V	1.2	± 0.25pF	0.50 ± 0.05
C1005C0G1H1R5B	C0G	50V	1.5	± 0.10pF	0.50 ± 0.05
C1005C0G1H1R5C	C0G	50V	1.5	± 0.25pF	0.50 ± 0.05
C1005C0G1H1R8B	C0G	50V	1.8	± 0.10pF	0.50 ± 0.05
C1005C0G1H1R8C	C0G	50V	1.8	± 0.25pF	0.50 ± 0.05
C1005C0G1H020B	C0G	50V	2.0	± 0.10pF	0.50 ± 0.05
C1005C0G1H020C	C0G	50V	2.0	± 0.25pF	0.50 ± 0.05
C1005C0G1H2R2B	C0G	50V	2.2	± 0.10pF	0.50 ± 0.05
C1005C0G1H2R2C	C0G	50V	2.2	± 0.25pF	0.50 ± 0.05
C1005C0G1H2R5C	C0G	50V	2.5	± 0.25pF	0.50 ± 0.05
C1005C0G1H2R7B	C0G	50V	2.7	± 0.10pF	0.50 ± 0.05
C1005C0G1H2R7C	C0G	50V	2.7	± 0.25pF	0.50 ± 0.05
C1005C0G1H030B	C0G	50V	3.0	± 0.10pF	0.50 ± 0.05
C1005C0G1H030C	C0G	50V	3.0	± 0.25pF	0.50 ± 0.05
C1005C0G1H3R3B	C0G	50V	3.3	± 0.10pF	0.50 ± 0.05
C1005C0G1H3R3C	C0G	50V	3.3	± 0.25pF	0.50 ± 0.05
C1005C0G1H3R5C	C0G	50V	3.5	± 0.25pF	0.50 ± 0.05
C1005C0G1H3R9B	C0G	50V	3.9	± 0.10pF	0.50 ± 0.05
C1005C0G1H3R9C	C0G	50V	3.9	± 0.25pF	0.50 ± 0.05
C1005C0G1H040B	C0G	50V	4.0	± 0.10pF	0.50 ± 0.05
C1005C0G1H040C	C0G	50V	4.0	± 0.25pF	0.50 ± 0.05
C1005C0G1H4R7B	C0G	50V	4.7	± 0.10pF	0.50 ± 0.05
C1005C0G1H4R7C	C0G	50V	4.7	± 0.25pF	0.50 ± 0.05
C1005C0G1H050B	C0G	50V	5.0	± 0.10pF	0.50 ± 0.05
C1005C0G1H050C	C0G	50V	5.0	± 0.25pF	0.50 ± 0.05
C1005C0G1H5R6C	C0G	50V	5.6	± 0.25pF	0.50 ± 0.05
C1005C0G1H5R6D	C0G	50V	5.6	± 0.50pF	0.50 ± 0.05
C1005C0G1H060C	C0G	50V	6.0	± 0.25pF	0.50 ± 0.05
C1005C0G1H060D	C0G	50V	6.0	± 0.50pF	0.50 ± 0.05
C1005C0G1H6R8C	C0G	50V	6.8	± 0.25pF	0.50 ± 0.05
C1005C0G1H6R8D	C0G	50V	6.8	± 0.50pF	0.50 ± 0.05
C1005C0G1H070C	C0G	50V	7.0	± 0.25pF	0.50 ± 0.05
C1005C0G1H070D	C0G	50V	7.0	± 0.50pF	0.50 ± 0.05
C1005C0G1H080C	C0G	50V	8.0	± 0.25pF	0.50 ± 0.05
C1005C0G1H080D	C0G	50V	8.0	± 0.50pF	0.50 ± 0.05
C1005C0G1H8R2C	C0G	50V	8.2	± 0.25pF	0.50 ± 0.05
C1005C0G1H8R2D	C0G	50V	8.2	± 0.50pF	0.50 ± 0.05
C1005C0G1H090C	C0G	50V	9.0	± 0.25pF	0.50 ± 0.05



Capacitance Range Table

C1005 [EIA CC0402]

Class 1 (Temperature Compensating)

Temperature Characteristics: C0G (-55 to 125°C, 0±30 ppm/°C)

TDK Part Number (Ordering Code)	Temperature Characteristics	Rated Voltage	Capacitance (pF)	Capacitance Tolerance	Thickness (mm)
C1005C0G1H090D	C0G	50V	9.0	± 0.50pF	0.50 ± 0.05
C1005C0G1H100C	C0G	50V	10	± 0.25pF	0.50 ± 0.05
C1005C0G1H100D	C0G	50V	10	± 0.50pF	0.50 ± 0.05
C1005C0G1H110J	C0G	50V	11	± 5%	0.50 ± 0.05
C1005C0G1H120J	C0G	50V	12	± 5%	0.50 ± 0.05
C1005C0G1H130J	C0G	50V	13	± 5%	0.50 ± 0.05
C1005C0G1H150J	C0G	50V	15	± 5%	0.50 ± 0.05
C1005C0G1H160J	C0G	50V	16	± 5%	0.50 ± 0.05
C1005C0G1H180J	C0G	50V	18	± 5%	0.50 ± 0.05
C1005C0G1H200J	C0G	50V	20	± 5%	0.50 ± 0.05
C1005C0G1H220J	C0G	50V	22	± 5%	0.50 ± 0.05
C1005C0G1H240J	C0G	50V	24	± 5%	0.50 ± 0.05
C1005C0G1H270J	C0G	50V	27	± 5%	0.50 ± 0.05
C1005C0G1H300J	C0G	50V	30	± 5%	0.50 ± 0.05
C1005C0G1H330J	C0G	50V	33	± 5%	0.50 ± 0.05
C1005C0G1H360J	C0G	50V	36	± 5%	0.50 ± 0.05
C1005C0G1H390J	C0G	50V	39	± 5%	0.50 ± 0.05
C1005C0G1H430J	C0G	50V	43	± 5%	0.50 ± 0.05
C1005C0G1H470J	C0G	50V	47	± 5%	0.50 ± 0.05
C1005C0G1H510J	C0G	50V	51	± 5%	0.50 ± 0.05
C1005C0G1H560J	C0G	50V	56	± 5%	0.50 ± 0.05
C1005C0G1H620J	C0G	50V	62	± 5%	0.50 ± 0.05
C1005C0G1H680J	C0G	50V	68	± 5%	0.50 ± 0.05
C1005C0G1H750J	C0G	50V	75	± 5%	0.50 ± 0.05
C1005C0G1H820J	C0G	50V	82	± 5%	0.50 ± 0.05
C1005C0G1H910J	C0G	50V	91	± 5%	0.50 ± 0.05
C1005C0G1H101J	C0G	50V	100	± 5%	0.50 ± 0.05
C1005C0G1H121J	C0G	50V	120	± 5%	0.50 ± 0.05
C1005C0G1H151J	C0G	50V	150	± 5%	0.50 ± 0.05
C1005C0G1H181J	C0G	50V	180	± 5%	0.50 ± 0.05
C1005C0G1H221J	C0G	50V	220	± 5%	0.50 ± 0.05
C1005C0G1H271J	C0G	50V	270	± 5%	0.50 ± 0.05
C1005C0G1H331J	C0G	50V	330	± 5%	0.50 ± 0.05
C1005C0G1H391J	C0G	50V	390	± 5%	0.50 ± 0.05
C1005C0G1H471J	C0G	50V	470	± 5%	0.50 ± 0.05
C1005C0G1H561J	C0G	50V	560	± 5%	0.50 ± 0.05
C1005C0G1H681J	C0G	50V	680	± 5%	0.50 ± 0.05
C1005C0G1H821J	C0G	50V	820	± 5%	0.50 ± 0.05
C1005C0G1H102J	C0G	50V	1,000	± 5%	0.50 ± 0.05
C1005C0G1E561J	C0G	25V	560	± 5%	0.50 ± 0.05
C1005C0G1E681J	C0G	25V	680	± 5%	0.50 ± 0.05
C1005C0G1E821J	C0G	25V	820	± 5%	0.50 ± 0.05
C1005C0G1E102J	C0G	25V	1,000	± 5%	0.50 ± 0.05



Capacitance Range Table

C1005 [EIA CC0402]

Class 2 (Temperature Stable)

Temperature Characteristics: X7R (-55 to +125°C, ±15%)

TDK Part Number (Ordering Code)	Temperature Characteristics	Rated Voltage	Capacitance (pF)	Capacitance Tolerance	Thickness (mm)
C1005X7R1H221K	X7R	50V	220	± 10%	0.50 ± 0.05
C1005X7R1H221M	X7R	50V	220	± 20%	0.50 ± 0.05
C1005X7R1H331K	X7R	50V	330	± 10%	0.50 ± 0.05
C1005X7R1H331M	X7R	50V	330	± 20%	0.50 ± 0.05
C1005X7R1H471K	X7R	50V	470	± 10%	0.50 ± 0.05
C1005X7R1H471M	X7R	50V	470	± 20%	0.50 ± 0.05
C1005X7R1H681K	X7R	50V	680	± 10%	0.50 ± 0.05
C1005X7R1H681M	X7R	50V	680	± 20%	0.50 ± 0.05
C1005X7R1H102K	X7R	50V	1,000	± 10%	0.50 ± 0.05
C1005X7R1H102M	X7R	50V	1,000	± 20%	0.50 ± 0.05
C1005X7R1H152K	X7R	50V	1,500	± 10%	0.50 ± 0.05
C1005X7R1H152M	X7R	50V	1,500	± 20%	0.50 ± 0.05
C1005X7R1H222K	X7R	50V	2,200	± 10%	0.50 ± 0.05
C1005X7R1H222M	X7R	50V	2,200	± 20%	0.50 ± 0.05
C1005X7R1H332K	X7R	50V	3,300	± 10%	0.50 ± 0.05
C1005X7R1H332M	X7R	50V	3,300	± 20%	0.50 ± 0.05
C1005X7R1H472K	X7R	50V	4,700	± 10%	0.50 ± 0.05
C1005X7R1H472M	X7R	50V	4,700	± 20%	0.50 ± 0.05
C1005X7R1H682K	X7R	50V	6,800	± 10%	0.50 ± 0.05
C1005X7R1H682M	X7R	50V	6,800	± 20%	0.50 ± 0.05
C1005X7R1H103K	X7R	50V	10,000	± 10%	0.50 ± 0.05
C1005X7R1H103M	X7R	50V	10,000	± 20%	0.50 ± 0.05
C1005X7R1H153K	X7R	50V	15,000	± 10%	0.50 ± 0.05
C1005X7R1H153M	X7R	50V	15,000	± 20%	0.50 ± 0.05
C1005X7R1H223K	X7R	50V	22,000	± 10%	0.50 ± 0.05
C1005X7R1H223M	X7R	50V	22,000	± 20%	0.50 ± 0.05
C1005X7R1H333K	X7R	50V	33,000	± 10%	0.50 ± 0.05
C1005X7R1H333M	X7R	50V	33,000	± 20%	0.50 ± 0.05
C1005X7R1H473K	X7R	50V	47,000	± 10%	0.50 ± 0.05
C1005X7R1H473M	X7R	50V	47,000	± 20%	0.50 ± 0.05
C1005X7R1H683K	X7R	50V	68,000	± 10%	0.50 ± 0.05
C1005X7R1H683M	X7R	50V	68,000	± 20%	0.50 ± 0.05
C1005X7R1H104K	X7R	50V	100,000	± 10%	0.50 ± 0.05
C1005X7R1H104M	X7R	50V	100,000	± 20%	0.50 ± 0.05
C1005X7R1V103K	X7R	35V	10,000	± 10%	0.50 ± 0.05
C1005X7R1V103M	X7R	35V	10,000	± 20%	0.50 ± 0.05
C1005X7R1V223K	X7R	35V	22,000	± 10%	0.50 ± 0.05
C1005X7R1V223M	X7R	35V	22,000	± 20%	0.50 ± 0.05
C1005X7R1V473K	X7R	35V	47,000	± 10%	0.50 ± 0.05
C1005X7R1V473M	X7R	35V	47,000	± 20%	0.50 ± 0.05
C1005X7R1V104K	X7R	35V	100,000	± 10%	0.50 ± 0.05
C1005X7R1V104M	X7R	35V	100,000	± 20%	0.50 ± 0.05
C1005X7R1E102K	X7R	25V	1,000	± 10%	0.50 ± 0.05
C1005X7R1E102M	X7R	25V	1,000	± 20%	0.50 ± 0.05



Capacitance Range Table

C1005 [EIA CC0402]

Class 2 (Temperature Stable)

Temperature Characteristics: X7R (-55 to +125°C, ±15%)

TDK Part Number (Ordering Code)	Temperature Characteristics	Rated Voltage	Capacitance (pF)	Capacitance Tolerance	Thickness (mm)
C1005X7R1E152K	X7R	25V	1,500	± 10%	0.50 ± 0.05
C1005X7R1E152M	X7R	25V	1,500	± 20%	0.50 ± 0.05
C1005X7R1E222K	X7R	25V	2,200	± 10%	0.50 ± 0.05
C1005X7R1E222M	X7R	25V	2,200	± 20%	0.50 ± 0.05
C1005X7R1E332K	X7R	25V	3,300	± 10%	0.50 ± 0.05
C1005X7R1E332M	X7R	25V	3,300	± 20%	0.50 ± 0.05
C1005X7R1E472K	X7R	25V	4,700	± 10%	0.50 ± 0.05
C1005X7R1E472M	X7R	25V	4,700	± 20%	0.50 ± 0.05
C1005X7R1E682K	X7R	25V	6,800	± 10%	0.50 ± 0.05
C1005X7R1E682M	X7R	25V	6,800	± 20%	0.50 ± 0.05
C1005X7R1E103J	X7R	25V	10,000	± 5%	0.50 ± 0.05
C1005X7R1E103K	X7R	25V	10,000	± 10%	0.50 ± 0.05
C1005X7R1E103M	X7R	25V	10,000	± 20%	0.50 ± 0.05
C1005X7R1E153K	X7R	25V	15,000	± 10%	0.50 ± 0.05
C1005X7R1E153M	X7R	25V	15,000	± 20%	0.50 ± 0.05
C1005X7R1E223K	X7R	25V	22,000	± 10%	0.50 ± 0.05
C1005X7R1E223M	X7R	25V	22,000	± 20%	0.50 ± 0.05
C1005X7R1E333K	X7R	25V	33,000	± 10%	0.50 ± 0.05
C1005X7R1E333M	X7R	25V	33,000	± 20%	0.50 ± 0.05
C1005X7R1E473K	X7R	25V	47,000	± 10%	0.50 ± 0.05
C1005X7R1E473M	X7R	25V	47,000	± 20%	0.50 ± 0.05
C1005X7R1E683K	X7R	25V	68,000	± 10%	0.50 ± 0.05
C1005X7R1E683M	X7R	25V	68,000	± 20%	0.50 ± 0.05
C1005X7R1E104K	X7R	25V	100,000	± 10%	0.50 ± 0.05
C1005X7R1E104M	X7R	25V	100,000	± 20%	0.50 ± 0.05
C1005X7R1C103K	X7R	16V	10,000	± 10%	0.50 ± 0.05
C1005X7R1C103M	X7R	16V	10,000	± 20%	0.50 ± 0.05
C1005X7R1C153K	X7R	16V	15,000	± 10%	0.50 ± 0.05
C1005X7R1C153M	X7R	16V	15,000	± 20%	0.50 ± 0.05
C1005X7R1C223K	X7R	16V	22,000	± 10%	0.50 ± 0.05
C1005X7R1C223M	X7R	16V	22,000	± 20%	0.50 ± 0.05
C1005X7R1C333K	X7R	16V	33,000	± 10%	0.50 ± 0.05
C1005X7R1C333M	X7R	16V	33,000	± 20%	0.50 ± 0.05
C1005X7R1C473K	X7R	16V	47,000	± 10%	0.50 ± 0.05
C1005X7R1C473M	X7R	16V	47,000	± 20%	0.50 ± 0.05
C1005X7R1C683K	X7R	16V	68,000	± 10%	0.50 ± 0.05
C1005X7R1C683M	X7R	16V	68,000	± 20%	0.50 ± 0.05
C1005X7R1C104K	X7R	16V	100,000	± 10%	0.50 ± 0.05
C1005X7R1C104M	X7R	16V	100,000	± 20%	0.50 ± 0.05
C1005X7R1C154K	X7R	16V	150,000	± 10%	0.50 ± 0.05
C1005X7R1C154M	X7R	16V	150,000	± 20%	0.50 ± 0.05
C1005X7R1C224K	X7R	16V	220,000	± 10%	0.50 ± 0.05
C1005X7R1C224M	X7R	16V	220,000	± 20%	0.50 ± 0.05
C1005X7R1A473K	X7R	10V	47,000	± 10%	0.50 ± 0.05



Capacitance Range Table

C1005 [EIA CC0402]

Class 2 (Temperature Stable)

Temperature Characteristics: X7R (-55 to +125°C, ±15%), X6S(-55 to 105°C, ±22%), X5R (-55 to +85°C, ±15%)

TDK Part Number (Ordering Code)	Temperature Characteristics	Rated Voltage	Capacitance (pF)	Capacitance Tolerance	Thickness (mm)
C1005X7R1A473M	X7R	10V	47,000	± 20%	0.50 ± 0.05
C1005X7R1A683K	X7R	10V	68,000	± 10%	0.50 ± 0.05
C1005X7R1A683M	X7R	10V	68,000	± 20%	0.50 ± 0.05
C1005X7R1A104K	X7R	10V	100,000	± 10%	0.50 ± 0.05
C1005X7R1A104M	X7R	10V	100,000	± 20%	0.50 ± 0.05
C1005X7R1A224K	X7R	10V	220,000	± 10%	0.50 ± 0.05
C1005X7R1A224M	X7R	10V	220,000	± 20%	0.50 ± 0.05
C1005X6S1H103K	X6S	50V	10,000	± 10%	0.50 ± 0.05
C1005X6S1H103M	X6S	50V	10,000	± 20%	0.50 ± 0.05
C1005X6S1H223K	X6S	50V	22,000	± 10%	0.50 ± 0.05
C1005X6S1H223M	X6S	50V	22,000	± 20%	0.50 ± 0.05
C1005X6S1H473K	X6S	50V	47,000	± 10%	0.50 ± 0.05
C1005X6S1H473M	X6S	50V	47,000	± 20%	0.50 ± 0.05
C1005X6S1H104K	X6S	50V	100,000	± 10%	0.50 ± 0.05
C1005X6S1H104M	X6S	50V	100,000	± 20%	0.50 ± 0.05
C1005X6S1V104K	X6S	35V	100,000	± 10%	0.50 ± 0.05
C1005X6S1V104M	X6S	35V	100,000	± 20%	0.50 ± 0.05
C1005X6S1E104K	X6S	25V	100,000	± 10%	0.50 ± 0.05
C1005X6S1E104M	X6S	25V	100,000	± 20%	0.50 ± 0.05
C1005X6S1E224K	X6S	25V	220,000	± 10%	0.50 ± 0.05
C1005X6S1E224M	X6S	25V	220,000	± 20%	0.50 ± 0.05
C1005X6S1C224K	X6S	16V	220,000	± 10%	0.50 ± 0.05
C1005X6S1C224M	X6S	16V	220,000	± 20%	0.50 ± 0.05
C1005X6S1A474K	X6S	10V	470,000	± 10%	0.50 ± 0.05
C1005X6S1A474M	X6S	10V	470,000	± 20%	0.50 ± 0.05
C1005X6S1A105K	X6S	10V	1,000,000	± 10%	0.50 ± 0.05
C1005X6S1A105M	X6S	10V	1,000,000	± 20%	0.50 ± 0.05
C1005X6S0J474K	X6S	6.3V	470,000	± 10%	0.50 ± 0.05
C1005X6S0J474M	X6S	6.3V	470,000	± 20%	0.50 ± 0.05
C1005X6S0J105K	X6S	6.3V	1,000,000	± 10%	0.50 ± 0.05
C1005X6S0J105M	X6S	6.3V	1,000,000	± 20%	0.50 ± 0.05
C1005X6S0G105K	X6S	4V	1,000,000	± 10%	0.50 ± 0.05
C1005X6S0G105M	X6S	4V	1,000,000	± 20%	0.50 ± 0.05
C1005X6S0G225M	X6S	4V	2,200,000	± 20%	0.50 ± 0.05
C1005X5R1H221K	X5R	50V	220	± 10%	0.50 ± 0.05
C1005X5R1H331K	X5R	50V	330	± 10%	0.50 ± 0.05
C1005X5R1H471K	X5R	50V	470	± 10%	0.50 ± 0.05
C1005X5R1H681K	X5R	50V	680	± 10%	0.50 ± 0.05
C1005X5R1H102K	X5R	50V	1,000	± 10%	0.50 ± 0.05
C1005X5R1H152K	X5R	50V	1,500	± 10%	0.50 ± 0.05
C1005X5R1H222K	X5R	50V	2,200	± 10%	0.50 ± 0.05
C1005X5R1H332K	X5R	50V	3,300	± 10%	0.50 ± 0.05
C1005X5R1H472K	X5R	50V	4,700	± 10%	0.50 ± 0.05
C1005X5R1H682K	X5R	50V	6,800	± 10%	0.50 ± 0.05



Capacitance Range Table

C1005 [EIA CC0402]

Class 2 (Temperature Stable)

Temperature Characteristics: X5R (-55 to +85°C, ±15%)

TDK Part Number (Ordering Code)	Temperature Characteristics	Rated Voltage	Capacitance (pF)	Capacitance Tolerance	Thickness (mm)
C1005X5R1H473K	X5R	50V	47,000	± 10%	0.50 ± 0.05
C1005X5R1H473M	X5R	50V	47,000	± 20%	0.50 ± 0.05
C1005X5R1H683K	X5R	50V	68,000	± 10%	0.50 ± 0.05
C1005X5R1H683M	X5R	50V	68,000	± 20%	0.50 ± 0.05
C1005X5R1H104K	X5R	50V	100,000	± 10%	0.50 ± 0.05
C1005X5R1H104M	X5R	50V	100,000	± 20%	0.50 ± 0.05
C1005X5R1V104K	X5R	35V	100,000	± 10%	0.50 ± 0.05
C1005X5R1V104M	X5R	35V	100,000	± 20%	0.50 ± 0.05
C1005X5R1E103K	X5R	25V	10,000	± 10%	0.50 ± 0.05
C1005X5R1E153K	X5R	25V	15,000	± 10%	0.50 ± 0.05
C1005X5R1E223K	X5R	25V	22,000	± 10%	0.50 ± 0.05
C1005X5R1E333K	X5R	25V	33,000	± 10%	0.50 ± 0.05
C1005X5R1E473K	X5R	25V	47,000	± 10%	0.50 ± 0.05
C1005X5R1E473M	X5R	25V	47,000	± 20%	0.50 ± 0.05
C1005X5R1E683K	X5R	25V	68,000	± 10%	0.50 ± 0.05
C1005X5R1E683M	X5R	25V	68,000	± 20%	0.50 ± 0.05
C1005X5R1E104K	X5R	25V	100,000	± 10%	0.50 ± 0.05
C1005X5R1E104M	X5R	25V	100,000	± 20%	0.50 ± 0.05
C1005X5R1E224K	X5R	25V	220,000	± 10%	0.50 ± 0.05
C1005X5R1E224M	X5R	25V	220,000	± 20%	0.50 ± 0.05
C1005X5R1C473K	X5R	16V	47,000	± 10%	0.50 ± 0.05
C1005X5R1C473M	X5R	16V	47,000	± 20%	0.50 ± 0.05
C1005X5R1C683K	X5R	16V	68,000	± 10%	0.50 ± 0.05
C1005X5R1C683M	X5R	16V	68,000	± 20%	0.50 ± 0.05
C1005X5R1C104K	X5R	16V	100,000	± 10%	0.50 ± 0.05
C1005X5R1C104M	X5R	16V	100,000	± 20%	0.50 ± 0.05
C1005X5R1C224K	X5R	16V	220,000	± 10%	0.50 ± 0.05
C1005X5R1C224M	X5R	16V	220,000	± 20%	0.50 ± 0.05
C1005X5R1C334K	X5R	16V	330,000	± 10%	0.50 ± 0.05
C1005X5R1C334M	X5R	16V	330,000	± 20%	0.50 ± 0.05
C1005X5R1C474K	X5R	16V	470,000	± 10%	0.50 ± 0.05
C1005X5R1C474M	X5R	16V	470,000	± 20%	0.50 ± 0.05
C1005X5R1C105K	X5R	16V	1,000,000	± 10%	0.50 ± 0.05
C1005X5R1C105M	X5R	16V	1,000,000	± 20%	0.50 ± 0.05
C1005X5R1A473K	X5R	10V	47,000	± 10%	0.50 ± 0.05
C1005X5R1A473M	X5R	10V	47,000	± 20%	0.50 ± 0.05
C1005X5R1A683K	X5R	10V	68,000	± 10%	0.50 ± 0.05
C1005X5R1A683M	X5R	10V	68,000	± 20%	0.50 ± 0.05
C1005X5R1A104K	X5R	10V	100,000	± 10%	0.50 ± 0.05
C1005X5R1A104M	X5R	10V	100,000	± 20%	0.50 ± 0.05
C1005X5R1A224K	X5R	10V	220,000	± 10%	0.50 ± 0.05
C1005X5R1A224M	X5R	10V	220,000	± 20%	0.50 ± 0.05
C1005X5R1A334K	X5R	10V	330,000	± 10%	0.50 ± 0.05
C1005X5R1A334M	X5R	10V	330,000	± 20%	0.50 ± 0.05



Capacitance Range Table

C1005 [EIA CC0402]

Class 2 (Temperature Stable)

Temperature Characteristics: X5R (-55 to +85°C, ±15%), Y5V(-30 to +85°C, +22/-82%)

TDK Part Number (Ordering Code)	Temperature Characteristics	Rated Voltage	Capacitance (pF)	Capacitance Tolerance	Thickness (mm)
C1005X5R1A474K	X5R	10V	470,000	± 10%	0.50 ± 0.05
C1005X5R1A474M	X5R	10V	470,000	± 20%	0.50 ± 0.05
C1005X5R1A105K	X5R	10V	1,000,000	± 10%	0.50 ± 0.05
C1005X5R1A105M	X5R	10V	1,000,000	± 20%	0.50 ± 0.05
C1005X5R1A155K	X5R	10V	1,500,000	± 10%	0.50 ± 0.05
C1005X5R1A155M	X5R	10V	1,500,000	± 20%	0.50 ± 0.05
C1005X5R1A225K	X5R	10V	2,200,000	± 10%	0.50 ± 0.05
C1005X5R1A225M	X5R	10V	2,200,000	± 20%	0.50 ± 0.05
C1005X5R0J104K	X5R	6.3V	100,000	± 10%	0.50 ± 0.05
C1005X5R0J104M	X5R	6.3V	100,000	± 20%	0.50 ± 0.05
C1005X5R0J224K	X5R	6.3V	220,000	± 10%	0.50 ± 0.05
C1005X5R0J224M	X5R	6.3V	220,000	± 20%	0.50 ± 0.05
C1005X5R0J334K	X5R	6.3V	330,000	± 10%	0.50 ± 0.05
C1005X5R0J334M	X5R	6.3V	330,000	± 20%	0.50 ± 0.05
C1005X5R0J474K	X5R	6.3V	470,000	± 10%	0.50 ± 0.05
C1005X5R0J474M	X5R	6.3V	470,000	± 20%	0.50 ± 0.05
C1005X5R0J105K	X5R	6.3V	1,000,000	± 10%	0.50 ± 0.05
C1005X5R0J105M	X5R	6.3V	1,000,000	± 20%	0.50 ± 0.05
C1005X5R0J225K	X5R	6.3V	2,200,000	± 10%	0.50 ± 0.05
C1005X5R0J225M	X5R	6.3V	2,200,000	± 20%	0.50 ± 0.05
C1005X5R0J335K	X5R	6.3V	3,300,000	± 10%	0.50 ± 0.15
C1005X5R0J335M	X5R	6.3V	3,300,000	± 20%	0.50 ± 0.15
C1005X5R0J475K	X5R	6.3V	4,700,000	± 10%	0.50 ± 0.15
C1005X5R0J475M	X5R	6.3V	4,700,000	± 20%	0.50 ± 0.15
C1005X5R0G225K	X5R	4V	2,200,000	± 10%	0.50 ± 0.05
C1005X5R0G225M	X5R	4V	2,200,000	± 20%	0.50 ± 0.05
C1005X5R0G335K	X5R	4V	3,300,000	± 10%	0.50 ± 0.15
C1005X5R0G335M	X5R	4V	3,300,000	± 20%	0.50 ± 0.15
C1005X5R0G475K	X5R	4V	4,700,000	± 10%	0.50 ± 0.15
C1005X5R0G475M	X5R	4V	4,700,000	± 20%	0.50 ± 0.15
C1005Y5V1H103Z	Y5V	50V	10,000	+80/-20%	0.50 ± 0.05
C1005Y5V1E104Z	Y5V	25V	100,000	+80/-20%	0.50 ± 0.05
C1005Y5V1E224Z	Y5V	25V	220,000	+80/-20%	0.50 ± 0.05
C1005Y5V1C104Z	Y5V	16V	100,000	+80/-20%	0.50 ± 0.05
C1005Y5V1C224Z	Y5V	16V	220,000	+80/-20%	0.50 ± 0.05
C1005Y5V1A224Z	Y5V	10V	220,000	+80/-20%	0.50 ± 0.05
C1005Y5V1A474Z	Y5V	10V	470,000	+80/-20%	0.50 ± 0.05
C1005Y5V0J105Z	Y5V	6.3V	1,000,000	+80/-20%	0.50 ± 0.05



Capacitance Range Chart

C1608 [EIA CC0603]

Capacitance Range Chart

Temperature Characteristics: C0G ($0 \pm 30\text{ppm}/^\circ\text{C}$)
 Rated Voltage: 50V (1H), 25V (1E)

Capacitance (pF)	Cap Code	Tolerance	C0G	Capacitance (pF)	Cap Code	Tolerance	C0G	
			1H (50V)				1H (50V)	1E (25V)
0.1	0R1	B: $\pm 0.10\text{pF}$ C: $\pm 0.25\text{pF}$		91	910	J: $\pm 5\%$		
0.5	0R5			100	101			
0.75	R75			110	111			
1	010			120	121			
1.2	1R2			130	131			
1.5	1R5			150	151			
1.8	1R8			160	161			
2.2	2R2			180	181			
2.7	2R7			200	201			
3.3	3R3			220	221			
3.9	3R9			240	241			
4.7	4R7			270	271			
5.6	5R6	C: $\pm 0.25\text{pF}$ D: $\pm 0.50\text{pF}$		300	301			
6.8	6R8			330	331			
8.2	8R2			360	361			
10	100			390	391			
11	110	J: $\pm 5\%$		430	431			
12	120			470	471			
13	130			510	511			
15	150			560	561			
16	160			620	621			
18	180			680	681			
20	200			750	751			
22	220			820	821			
24	240			910	911			
27	270			1,000	102			
30	300			1,200	122			
33	330			1,500	152			
36	360			1,800	182			
39	390			2,200	222			
43	430			2,700	272			
47	470			3,300	332			
51	510			3,900	392			
56	560			4,700	472			
62	620			5,600	562			
68	680			6,800	682			
75	750			8,200	822			
82	820			10,000	103			

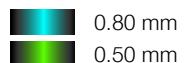
• Standard capacitance is shown. Please refer to Capacitance Range Table for additional capacitance values.

Capacitance Range Chart

Temperature Characteristics: X6S ($\pm 22\%$)
 Rated Voltage: 50V (1H), 35V (1V), 25V (1E), 16V (1C), 10V (1A), 6.3V (0J), 4V (0G)

Capacitance (pF)	Cap Code	Tolerance	X6S					
			1H (50V)	1V (35V)	1E (25V)	1C (16V)	1A (10V)	0J (6.3V)
220,000	224	K: $\pm 10\%$ M: $\pm 20\%$						
470,000	474							
1,000,000	105							
2,200,000	225							
4,700,000	475							
10,000,000	106							

Standard Thickness





Capacitance Range Chart

C1608 [EIA CC0603]

Capacitance Range Chart

Temperature Characteristics: X7R ($\pm 15\%$), X5R ($\pm 15\%$), Y5V (+22/-82%)

Rated Voltage: 50V (1H), 35V (1V), 25V (1E), 16V (1C), 10V (1A), 6.3V (0J), 4V (0G)

Capacitance (pF)	Cap Code	Tolerance	X5R						
			1H (50V)	1V (35V)	1E (25V)	1C (16V)	1A (10V)	0J (6.3V)	0G (4V)
100,000	104	K: $\pm 10\%$							
150,000	154	M: $\pm 20\%$							
220,000	224								
330,000	334								
470,000	474								
680,000	684								
1,000,000	105								
1,500,000	155								
2,200,000	225								
3,300,000	335								
4,700,000	475								
6,800,000	685								
10,000,000	106								

Capacitance (pF)	Cap Code	Tolerance	X7R					
			1H (50V)	1V (35V)	1E (25V)	1C (16V)	1A (10V)	0J (6.3V)
100	101	K: $\pm 10\%$						
220	221	M: $\pm 20\%$						
330	331							
470	471							
680	681							
1,000	102							
1,500	152							
2,200	222							
3,300	332							
4,700	472							
6,800	682							
10,000	103							
15,000	153							
22,000	223							
33,000	333							
47,000	473							
68,000	683							
100,000	104							
150,000	154							
220,000	224							
330,000	334							
470,000	474							
680,000	684							
1,000,000	105							
2,200,000	225							

Capacitance (pF)	Cap Code	Tolerance	Y5V				
			1H (50V)	1E (25V)	1C (16V)	1A (10V)	0J (6.3V)
100,000	104	Z: +80/-20%					
220,000	224						
470,000	474						
1,000,000	105						
2,200,000	225						
4,700,000	475						
10,000,000	106						

Standard Thickness

0.80 mm



Capacitance Range Table

C1608 [EIA CC0603]

Class 1 (Temperature Compensating)

Temperature Characteristics: C0G (-55 to 125°C, 0±30 ppm/°C)

TDK Part Number (Ordering Code)	Temperature Characteristics	Rated Voltage	Capacitance (pF)	Capacitance Tolerance	Thickness (mm)
C1608C0G1H0R5B	C0G	50V	0.5	± 0.10pF	0.80 ± 0.10
C1608C0G1H0R5C	C0G	50V	0.5	± 0.25pF	0.80 ± 0.10
C1608C0G1HR75C	C0G	50V	0.75	± 0.25pF	0.80 ± 0.10
C1608C0G1H010B	C0G	50V	1.0	± 0.10pF	0.80 ± 0.10
C1608C0G1H010C	C0G	50V	1.0	± 0.25pF	0.80 ± 0.10
C1608C0G1H1R2B	C0G	50V	1.2	± 0.10pF	0.80 ± 0.10
C1608C0G1H1R2C	C0G	50V	1.2	± 0.25pF	0.80 ± 0.10
C1608C0G1H1R5B	C0G	50V	1.5	± 0.10pF	0.80 ± 0.10
C1608C0G1H1R5C	C0G	50V	1.5	± 0.25pF	0.80 ± 0.10
C1608C0G1H1R8B	C0G	50V	1.8	± 0.10pF	0.80 ± 0.10
C1608C0G1H1R8C	C0G	50V	1.8	± 0.25pF	0.80 ± 0.10
C1608C0G1H020B	C0G	50V	2.0	± 0.10pF	0.80 ± 0.10
C1608C0G1H020C	C0G	50V	2.0	± 0.25pF	0.80 ± 0.10
C1608C0G1H2R2B	C0G	50V	2.2	± 0.10pF	0.80 ± 0.10
C1608C0G1H2R2C	C0G	50V	2.2	± 0.25pF	0.80 ± 0.10
C1608C0G1H2R7B	C0G	50V	2.7	± 0.10pF	0.80 ± 0.10
C1608C0G1H2R7C	C0G	50V	2.7	± 0.25pF	0.80 ± 0.10
C1608C0G1H030B	C0G	50V	3.0	± 0.10pF	0.80 ± 0.10
C1608C0G1H030C	C0G	50V	3.0	± 0.25pF	0.80 ± 0.10
C1608C0G1H3R3B	C0G	50V	3.3	± 0.10pF	0.80 ± 0.10
C1608C0G1H3R3C	C0G	50V	3.3	± 0.25pF	0.80 ± 0.10
C1608C0G1H3R9B	C0G	50V	3.9	± 0.10pF	0.80 ± 0.10
C1608C0G1H3R9C	C0G	50V	3.9	± 0.25pF	0.80 ± 0.10
C1608C0G1H040B	C0G	50V	4.0	± 0.10pF	0.80 ± 0.10
C1608C0G1H040C	C0G	50V	4.0	± 0.25pF	0.80 ± 0.10
C1608C0G1H4R7B	C0G	50V	4.7	± 0.10pF	0.80 ± 0.10
C1608C0G1H4R7C	C0G	50V	4.7	± 0.25pF	0.80 ± 0.10
C1608C0G1H050B	C0G	50V	5.0	± 0.10pF	0.80 ± 0.10
C1608C0G1H050C	C0G	50V	5.0	± 0.25pF	0.80 ± 0.10
C1608C0G1H5R6C	C0G	50V	5.6	± 0.25pF	0.80 ± 0.10
C1608C0G1H5R6D	C0G	50V	5.6	± 0.50pF	0.80 ± 0.10
C1608C0G1H060C	C0G	50V	6.0	± 0.25pF	0.80 ± 0.10
C1608C0G1H060D	C0G	50V	6.0	± 0.50pF	0.80 ± 0.10
C1608C0G1H6R8C	C0G	50V	6.8	± 0.25pF	0.80 ± 0.10
C1608C0G1H6R8D	C0G	50V	6.8	± 0.50pF	0.80 ± 0.10
C1608C0G1H070C	C0G	50V	7.0	± 0.25pF	0.80 ± 0.10
C1608C0G1H070D	C0G	50V	7.0	± 0.50pF	0.80 ± 0.10
C1608C0G1H080C	C0G	50V	8.0	± 0.25pF	0.80 ± 0.10
C1608C0G1H080D	C0G	50V	8.0	± 0.50pF	0.80 ± 0.10
C1608C0G1H8R2C	C0G	50V	8.2	± 0.25pF	0.80 ± 0.10
C1608C0G1H8R2D	C0G	50V	8.2	± 0.50pF	0.80 ± 0.10
C1608C0G1H090C	C0G	50V	9.0	± 0.25pF	0.80 ± 0.10
C1608C0G1H090D	C0G	50V	9.0	± 0.50pF	0.80 ± 0.10
C1608C0G1H100C	C0G	50V	10	± 0.25pF	0.80 ± 0.10



Capacitance Range Table

C1608 [EIA CC0603]

Class 1 (Temperature Compensating)

Temperature Characteristics: C0G (-55 to 125°C, 0±30 ppm/°C)

TDK Part Number (Ordering Code)	Temperature Characteristics	Rated Voltage	Capacitance (pF)	Capacitance Tolerance	Thickness (mm)
C1608C0G1H100D	C0G	50V	10	± 0.50pF	0.80 ± 0.10
C1608C0G1H110J	C0G	50V	11	± 5%	0.80 ± 0.10
C1608C0G1H120J	C0G	50V	12	± 5%	0.80 ± 0.10
C1608C0G1H130J	C0G	50V	13	± 5%	0.80 ± 0.10
C1608C0G1H150J	C0G	50V	15	± 5%	0.80 ± 0.10
C1608C0G1H160J	C0G	50V	16	± 5%	0.80 ± 0.10
C1608C0G1H180J	C0G	50V	18	± 5%	0.80 ± 0.10
C1608C0G1H200J	C0G	50V	20	± 5%	0.80 ± 0.10
C1608C0G1H220J	C0G	50V	22	± 5%	0.80 ± 0.10
C1608C0G1H240J	C0G	50V	24	± 5%	0.80 ± 0.10
C1608C0G1H270J	C0G	50V	27	± 5%	0.80 ± 0.10
C1608C0G1H300J	C0G	50V	30	± 5%	0.80 ± 0.10
C1608C0G1H330J	C0G	50V	33	± 5%	0.80 ± 0.10
C1608C0G1H360J	C0G	50V	36	± 5%	0.80 ± 0.10
C1608C0G1H390J	C0G	50V	39	± 5%	0.80 ± 0.10
C1608C0G1H430J	C0G	50V	43	± 5%	0.80 ± 0.10
C1608C0G1H470J	C0G	50V	47	± 5%	0.80 ± 0.10
C1608C0G1H510J	C0G	50V	51	± 5%	0.80 ± 0.10
C1608C0G1H560J	C0G	50V	56	± 5%	0.80 ± 0.10
C1608C0G1H620J	C0G	50V	62	± 5%	0.80 ± 0.10
C1608C0G1H680J	C0G	50V	68	± 5%	0.80 ± 0.10
C1608C0G1H750J	C0G	50V	75	± 5%	0.80 ± 0.10
C1608C0G1H820J	C0G	50V	82	± 5%	0.80 ± 0.10
C1608C0G1H910J	C0G	50V	91	± 5%	0.80 ± 0.10
C1608C0G1H101J	C0G	50V	100	± 5%	0.80 ± 0.10
C1608C0G1H111J	C0G	50V	110	± 5%	0.80 ± 0.10
C1608C0G1H121J	C0G	50V	120	± 5%	0.80 ± 0.10
C1608C0G1H131J	C0G	50V	130	± 5%	0.80 ± 0.10
C1608C0G1H151J	C0G	50V	150	± 5%	0.80 ± 0.10
C1608C0G1H161J	C0G	50V	160	± 5%	0.80 ± 0.10
C1608C0G1H181J	C0G	50V	180	± 5%	0.80 ± 0.10
C1608C0G1H201J	C0G	50V	200	± 5%	0.80 ± 0.10
C1608C0G1H221J	C0G	50V	220	± 5%	0.80 ± 0.10
C1608C0G1H241J	C0G	50V	240	± 5%	0.80 ± 0.10
C1608C0G1H271J	C0G	50V	270	± 5%	0.80 ± 0.10
C1608C0G1H301J	C0G	50V	300	± 5%	0.80 ± 0.10
C1608C0G1H331J	C0G	50V	330	± 5%	0.80 ± 0.10
C1608C0G1H361J	C0G	50V	360	± 5%	0.80 ± 0.10
C1608C0G1H391J	C0G	50V	390	± 5%	0.80 ± 0.10
C1608C0G1H431J	C0G	50V	430	± 5%	0.80 ± 0.10
C1608C0G1H471J	C0G	50V	470	± 5%	0.80 ± 0.10
C1608C0G1H511J	C0G	50V	510	± 5%	0.80 ± 0.10
C1608C0G1H561J	C0G	50V	560	± 5%	0.80 ± 0.10
C1608C0G1H621J	C0G	50V	620	± 5%	0.80 ± 0.10



Capacitance Range Table

C1608 [EIA CC0603]

Class 1 (Temperature Compensating)

Temperature Characteristics: C0G (-55 to 125°C, 0±30 ppm/°C)

TDK Part Number (Ordering Code)	Temperature Characteristics	Rated Voltage	Capacitance (pF)	Capacitance Tolerance	Thickness (mm)
C1608C0G1H681J	C0G	50V	680	± 5%	0.80 ± 0.10
C1608C0G1H751J	C0G	50V	750	± 5%	0.80 ± 0.10
C1608C0G1H821J	C0G	50V	820	± 5%	0.80 ± 0.10
C1608C0G1H911J	C0G	50V	910	± 5%	0.80 ± 0.10
C1608C0G1H102J	C0G	50V	1,000	± 5%	0.80 ± 0.10
C1608C0G1H122J	C0G	50V	1,200	± 5%	0.80 ± 0.10
C1608C0G1H152J	C0G	50V	1,500	± 5%	0.80 ± 0.10
C1608C0G1H182J	C0G	50V	1,800	± 5%	0.80 ± 0.10
C1608C0G1H222J	C0G	50V	2,200	± 5%	0.80 ± 0.10
C1608C0G1H272J	C0G	50V	2,700	± 5%	0.80 ± 0.10
C1608C0G1H332J	C0G	50V	3,300	± 5%	0.80 ± 0.10
C1608C0G1H392J	C0G	50V	3,900	± 5%	0.80 ± 0.10
C1608C0G1H472J	C0G	50V	4,700	± 5%	0.80 ± 0.10
C1608C0G1H562J	C0G	50V	5,600	± 5%	0.80 ± 0.10
C1608C0G1H682J	C0G	50V	6,800	± 5%	0.80 ± 0.10
C1608C0G1H822J	C0G	50V	8,200	± 5%	0.80 ± 0.10
C1608C0G1H103J	C0G	50V	10,000	± 5%	0.80 ± 0.10
C1608C0G1E392J	C0G	25V	3,900	± 5%	0.80 ± 0.10
C1608C0G1E472J	C0G	25V	4,700	± 5%	0.80 ± 0.10
C1608C0G1E562J	C0G	25V	5,600	± 5%	0.80 ± 0.10
C1608C0G1E682J	C0G	25V	6,800	± 5%	0.80 ± 0.10
C1608C0G1E822J	C0G	25V	8,200	± 5%	0.80 ± 0.10
C1608C0G1E103J	C0G	25V	10,000	± 5%	0.80 ± 0.10

Class 2 (Temperature Stable)

Temperature Characteristics: X7R (-55 to +125°C, ±15%)

TDK Part Number (Ordering Code)	Temperature Characteristics	Rated Voltage	Capacitance (pF)	Capacitance Tolerance	Thickness (mm)
C1608X7R1H101K	X7R	50V	100	± 10%	0.80 ± 0.10
C1608X7R1H101M	X7R	50V	100	± 20%	0.80 ± 0.10
C1608X7R1H221K	X7R	50V	220	± 10%	0.80 ± 0.10
C1608X7R1H221M	X7R	50V	220	± 20%	0.80 ± 0.10
C1608X7R1H331K	X7R	50V	330	± 10%	0.80 ± 0.10
C1608X7R1H331M	X7R	50V	330	± 20%	0.80 ± 0.10
C1608X7R1H471K	X7R	50V	470	± 10%	0.80 ± 0.10
C1608X7R1H471M	X7R	50V	470	± 20%	0.80 ± 0.10
C1608X7R1H681K	X7R	50V	680	± 10%	0.80 ± 0.10
C1608X7R1H681M	X7R	50V	680	± 20%	0.80 ± 0.10
C1608X7R1H102J	X7R	50V	1,000	± 5%	0.80 ± 0.10
C1608X7R1H102K	X7R	50V	1,000	± 10%	0.80 ± 0.10
C1608X7R1H102M	X7R	50V	1,000	± 20%	0.80 ± 0.10
C1608X7R1H152K	X7R	50V	1,500	± 10%	0.80 ± 0.10
C1608X7R1H152M	X7R	50V	1,500	± 20%	0.80 ± 0.10
C1608X7R1H222K	X7R	50V	2,200	± 10%	0.80 ± 0.10
C1608X7R1H222M	X7R	50V	2,200	± 20%	0.80 ± 0.10



Capacitance Range Table

C1608 [EIA CC0603]

Class 2 (Temperature Stable)

Temperature Characteristics: X7R (-55 to +125°C, ±15%)

TDK Part Number (Ordering Code)	Temperature Characteristics	Rated Voltage	Capacitance (pF)	Capacitance Tolerance	Thickness (mm)
C1608X7R1H332K	X7R	50V	3,300	± 10%	0.80 ± 0.10
C1608X7R1H332M	X7R	50V	3,300	± 20%	0.80 ± 0.10
C1608X7R1H472K	X7R	50V	4,700	± 10%	0.80 ± 0.10
C1608X7R1H472M	X7R	50V	4,700	± 20%	0.80 ± 0.10
C1608X7R1H682K	X7R	50V	6,800	± 10%	0.80 ± 0.10
C1608X7R1H682M	X7R	50V	6,800	± 20%	0.80 ± 0.10
C1608X7R1H103J	X7R	50V	10,000	± 5%	0.80 ± 0.10
C1608X7R1H103K	X7R	50V	10,000	± 10%	0.80 ± 0.10
C1608X7R1H103M	X7R	50V	10,000	± 20%	0.80 ± 0.10
C1608X7R1H153K	X7R	50V	15,000	± 10%	0.80 ± 0.10
C1608X7R1H153M	X7R	50V	15,000	± 20%	0.80 ± 0.10
C1608X7R1H223K	X7R	50V	22,000	± 10%	0.80 ± 0.10
C1608X7R1H223M	X7R	50V	22,000	± 20%	0.80 ± 0.10
C1608X7R1H333K	X7R	50V	33,000	± 10%	0.80 ± 0.10
C1608X7R1H333M	X7R	50V	33,000	± 20%	0.80 ± 0.10
C1608X7R1H473K	X7R	50V	47,000	± 10%	0.80 ± 0.10
C1608X7R1H473M	X7R	50V	47,000	± 20%	0.80 ± 0.10
C1608X7R1H683K	X7R	50V	68,000	± 10%	0.80 ± 0.10
C1608X7R1H683M	X7R	50V	68,000	± 20%	0.80 ± 0.10
C1608X7R1H104K	X7R	50V	100,000	± 10%	0.80 ± 0.10
C1608X7R1H104M	X7R	50V	100,000	± 20%	0.80 ± 0.10
C1608X7R1H154K	X7R	50V	150,000	± 10%	0.80 ± 0.10
C1608X7R1H154M	X7R	50V	150,000	± 20%	0.80 ± 0.10
C1608X7R1H224K	X7R	50V	220,000	± 10%	0.80 ± 0.10
C1608X7R1H224M	X7R	50V	220,000	± 20%	0.80 ± 0.10
C1608X7R1H334K	X7R	50V	330,000	± 10%	0.80 ± 0.10
C1608X7R1H334M	X7R	50V	330,000	± 20%	0.80 ± 0.10
C1608X7R1H474K	X7R	50V	470,000	± 10%	0.80 ± 0.10
C1608X7R1H474M	X7R	50V	470,000	± 20%	0.80 ± 0.10
C1608X7R1V334K	X7R	35V	330,000	± 10%	0.80 ± 0.10
C1608X7R1V334M	X7R	35V	330,000	± 20%	0.80 ± 0.10
C1608X7R1V474K	X7R	35V	470,000	± 10%	0.80 ± 0.10
C1608X7R1V474M	X7R	35V	470,000	± 20%	0.80 ± 0.10
C1608X7R1V105K	X7R	35V	1,000,000	± 10%	0.80 ± 0.10
C1608X7R1V105M	X7R	35V	1,000,000	± 20%	0.80 ± 0.10
C1608X7R1E103J	X7R	25V	10,000	± 5%	0.80 ± 0.10
C1608X7R1E103K	X7R	25V	10,000	± 10%	0.80 ± 0.10
C1608X7R1E103M	X7R	25V	10,000	± 20%	0.80 ± 0.10
C1608X7R1E153K	X7R	25V	15,000	± 10%	0.80 ± 0.10
C1608X7R1E153M	X7R	25V	15,000	± 20%	0.80 ± 0.10
C1608X7R1E223K	X7R	25V	22,000	± 10%	0.80 ± 0.10
C1608X7R1E223M	X7R	25V	22,000	± 20%	0.80 ± 0.10
C1608X7R1E333K	X7R	25V	33,000	± 10%	0.80 ± 0.10
C1608X7R1E333M	X7R	25V	33,000	± 20%	0.80 ± 0.10



Capacitance Range Table

C1608 [EIA CC0603]

Class 2 (Temperature Stable)

Temperature Characteristics: X7R (-55 to +125°C, ±15%)

TDK Part Number (Ordering Code)	Temperature Characteristics	Rated Voltage	Capacitance (pF)	Capacitance Tolerance	Thickness (mm)
C1608X7R1E473K	X7R	25V	47,000	± 10%	0.80 ± 0.10
C1608X7R1E473M	X7R	25V	47,000	± 20%	0.80 ± 0.10
C1608X7R1E683K	X7R	25V	68,000	± 10%	0.80 ± 0.10
C1608X7R1E683M	X7R	25V	68,000	± 20%	0.80 ± 0.10
C1608X7R1E104K	X7R	25V	100,000	± 10%	0.80 ± 0.10
C1608X7R1E104M	X7R	25V	100,000	± 20%	0.80 ± 0.10
C1608X7R1E154K	X7R	25V	150,000	± 10%	0.80 ± 0.10
C1608X7R1E154M	X7R	25V	150,000	± 20%	0.80 ± 0.10
C1608X7R1E224K	X7R	25V	220,000	± 10%	0.80 ± 0.10
C1608X7R1E224M	X7R	25V	220,000	± 20%	0.80 ± 0.10
C1608X7R1E334K	X7R	25V	330,000	± 10%	0.80 ± 0.10
C1608X7R1E334M	X7R	25V	330,000	± 20%	0.80 ± 0.10
C1608X7R1E474K	X7R	25V	470,000	± 10%	0.80 ± 0.10
C1608X7R1E474M	X7R	25V	470,000	± 20%	0.80 ± 0.10
C1608X7R1E684K	X7R	25V	680,000	± 10%	0.80 ± 0.10
C1608X7R1E684M	X7R	25V	680,000	± 20%	0.80 ± 0.10
C1608X7R1E105K	X7R	25V	1,000,000	± 10%	0.80 ± 0.10
C1608X7R1E105M	X7R	25V	1,000,000	± 20%	0.80 ± 0.10
C1608X7R1C223K	X7R	16V	22,000	± 10%	0.80 ± 0.10
C1608X7R1C223M	X7R	16V	22,000	± 20%	0.80 ± 0.10
C1608X7R1C333K	X7R	16V	33,000	± 10%	0.80 ± 0.10
C1608X7R1C333M	X7R	16V	33,000	± 20%	0.80 ± 0.10
C1608X7R1C473K	X7R	16V	47,000	± 10%	0.80 ± 0.10
C1608X7R1C473M	X7R	16V	47,000	± 20%	0.80 ± 0.10
C1608X7R1C683K	X7R	16V	68,000	± 10%	0.80 ± 0.10
C1608X7R1C683M	X7R	16V	68,000	± 20%	0.80 ± 0.10
C1608X7R1C104K	X7R	16V	100,000	± 10%	0.80 ± 0.10
C1608X7R1C104M	X7R	16V	100,000	± 20%	0.80 ± 0.10
C1608X7R1C154K	X7R	16V	150,000	± 10%	0.80 ± 0.10
C1608X7R1C154M	X7R	16V	150,000	± 20%	0.80 ± 0.10
C1608X7R1C224K	X7R	16V	220,000	± 10%	0.80 ± 0.10
C1608X7R1C224M	X7R	16V	220,000	± 20%	0.80 ± 0.10
C1608X7R1C334K	X7R	16V	330,000	± 10%	0.80 ± 0.10
C1608X7R1C334M	X7R	16V	330,000	± 20%	0.80 ± 0.10
C1608X7R1C474K	X7R	16V	470,000	± 10%	0.80 ± 0.10
C1608X7R1C474M	X7R	16V	470,000	± 20%	0.80 ± 0.10
C1608X7R1C684K	X7R	16V	680,000	± 10%	0.80 ± 0.10
C1608X7R1C684M	X7R	16V	680,000	± 20%	0.80 ± 0.10
C1608X7R1C105K	X7R	16V	1,000,000	± 10%	0.80 ± 0.10
C1608X7R1C105M	X7R	16V	1,000,000	± 20%	0.80 ± 0.10
C1608X7R1A224K	X7R	10V	220,000	± 10%	0.80 ± 0.10
C1608X7R1A224M	X7R	10V	220,000	± 20%	0.80 ± 0.10
C1608X7R1A334K	X7R	10V	330,000	± 10%	0.80 ± 0.10
C1608X7R1A334M	X7R	10V	330,000	± 20%	0.80 ± 0.10



Capacitance Range Table

C1608 [EIA CC0603]

Class 2 (Temperature Stable)

Temperature Characteristics: X7R (-55 to +125°C, ±15%), X6S (-55 to +105°C, ±22%)

TDK Part Number (Ordering Code)	Temperature Characteristics	Rated Voltage	Capacitance (pF)	Capacitance Tolerance	Thickness (mm)
C1608X7R1A474K	X7R	10V	470,000	± 10%	0.80 ± 0.10
C1608X7R1A474M	X7R	10V	470,000	± 20%	0.80 ± 0.10
C1608X7R1A105K	X7R	10V	1,000,000	± 10%	0.80 ± 0.10
C1608X7R1A105M	X7R	10V	1,000,000	± 20%	0.80 ± 0.10
C1608X7R1A225K	X7R	10V	2,200,000	± 10%	0.80 ± 0.10
C1608X7R1A225M	X7R	10V	2,200,000	± 20%	0.80 ± 0.10
C1608X7R0J225K	X7R	6.3V	2,200,000	± 10%	0.80 ± 0.10
C1608X7R0J225M	X7R	6.3V	2,200,000	± 20%	0.80 ± 0.10
C1608X6S1H224K	X6S	50V	220,000	± 10%	0.80 ± 0.10
C1608X6S1H224M	X6S	50V	220,000	± 20%	0.80 ± 0.10
C1608X6S1H474K	X6S	50V	470,000	± 10%	0.80 ± 0.10
C1608X6S1H474M	X6S	50V	470,000	± 20%	0.80 ± 0.10
C1608X6S1H105K	X6S	50V	1,000,000	± 10%	0.80 ± 0.10
C1608X6S1H105M	X6S	50V	1,000,000	± 20%	0.80 ± 0.10
C1608X6S1V224K	X6S	35V	220,000	± 10%	0.80 ± 0.10
C1608X6S1V224M	X6S	35V	220,000	± 20%	0.80 ± 0.10
C1608X6S1V474K	X6S	35V	470,000	± 10%	0.80 ± 0.10
C1608X6S1V474M	X6S	35V	470,000	± 20%	0.80 ± 0.10
C1608X6S1V105K	X6S	35V	1,000,000	± 10%	0.80 ± 0.10
C1608X6S1V105M	X6S	35V	1,000,000	± 20%	0.80 ± 0.10
C1608X6S1E474K	X6S	25V	470,000	± 10%	0.80 ± 0.10
C1608X6S1E474M	X6S	25V	470,000	± 20%	0.80 ± 0.10
C1608X6S1E105K	X6S	25V	1,000,000	± 10%	0.80 ± 0.10
C1608X6S1E105M	X6S	25V	1,000,000	± 20%	0.80 ± 0.10
C1608X6S1C105K	X6S	16V	1,000,000	± 10%	0.80 ± 0.10
C1608X6S1C105M	X6S	16V	1,000,000	± 20%	0.80 ± 0.10
C1608X6S1C225K	X6S	16V	2,200,000	± 10%	0.80 ± 0.10
C1608X6S1C225M	X6S	16V	2,200,000	± 20%	0.80 ± 0.10
C1608X6S1A225K/0.50	X6S	10V	2,200,000	± 10%	0.50 ± 0.05
C1608X6S1A225M/0.50	X6S	10V	2,200,000	± 20%	0.50 ± 0.05
C1608X6S1A475K	X6S	10V	4,700,000	± 10%	0.80 ± 0.10
C1608X6S1A475M	X6S	10V	4,700,000	± 20%	0.80 ± 0.10
C1608X6S0J225K	X6S	6.3V	2,200,000	± 10%	0.80 ± 0.10
C1608X6S0J225M	X6S	6.3V	2,200,000	± 20%	0.80 ± 0.10
C1608X6S0J475K	X6S	6.3V	4,700,000	± 10%	0.80 ± 0.10
C1608X6S0J475M	X6S	6.3V	4,700,000	± 20%	0.80 ± 0.10
C1608X6S0G225K/0.50	X6S	4V	2,200,000	± 10%	0.50 ± 0.05
C1608X6S0G225M/0.50	X6S	4V	2,200,000	± 20%	0.50 ± 0.05
C1608X6S0G475K/0.50	X6S	4V	4,700,000	± 10%	0.50 ± 0.05
C1608X6S0G475M/0.50	X6S	4V	4,700,000	± 20%	0.50 ± 0.05
C1608X6S0G475K/0.80	X6S	4V	4,700,000	± 10%	0.80 ± 0.10
C1608X6S0G475M/0.80	X6S	4V	4,700,000	± 20%	0.80 ± 0.10
C1608X6S0G106K	X6S	4V	10,000,000	± 10%	0.80 ± 0.10
C1608X6S0G106M	X6S	4V	10,000,000	± 20%	0.80 ± 0.10



Capacitance Range Table

C1608 [EIA CC0603]

Class 2 (Temperature Stable)

Temperature Characteristics: X5R (-55 to +85°C, ±15%)

TDK Part Number (Ordering Code)	Temperature Characteristics	Rated Voltage	Capacitance (pF)	Capacitance Tolerance	Thickness (mm)
C1608X5R1H104K	X5R	50V	100,000	± 10%	0.80 ± 0.10
C1608X5R1H104M	X5R	50V	100,000	± 20%	0.80 ± 0.10
C1608X5R1H154K	X5R	50V	150,000	± 10%	0.80 ± 0.10
C1608X5R1H154M	X5R	50V	150,000	± 20%	0.80 ± 0.10
C1608X5R1H224K	X5R	50V	220,000	± 10%	0.80 ± 0.10
C1608X5R1H224M	X5R	50V	220,000	± 20%	0.80 ± 0.10
C1608X5R1H334K	X5R	50V	330,000	± 10%	0.80 ± 0.10
C1608X5R1H334M	X5R	50V	330,000	± 20%	0.80 ± 0.10
C1608X5R1H474K	X5R	50V	470,000	± 10%	0.80 ± 0.10
C1608X5R1H474M	X5R	50V	470,000	± 20%	0.80 ± 0.10
C1608X5R1H684K	X5R	50V	680,000	± 10%	0.80 ± 0.10
C1608X5R1H684M	X5R	50V	680,000	± 20%	0.80 ± 0.10
C1608X5R1H105K	X5R	50V	1,000,000	± 10%	0.80 ± 0.10
C1608X5R1H105M	X5R	50V	1,000,000	± 20%	0.80 ± 0.10
C1608X5R1V105K	X5R	35V	1,000,000	± 10%	0.80 ± 0.10
C1608X5R1V105M	X5R	35V	1,000,000	± 20%	0.80 ± 0.10
C1608X5R1E154K	X5R	25V	150,000	± 10%	0.80 ± 0.10
C1608X5R1E154M	X5R	25V	150,000	± 20%	0.80 ± 0.10
C1608X5R1E224K	X5R	25V	220,000	± 10%	0.80 ± 0.10
C1608X5R1E224M	X5R	25V	220,000	± 20%	0.80 ± 0.10
C1608X5R1E334K	X5R	25V	330,000	± 10%	0.80 ± 0.10
C1608X5R1E334M	X5R	25V	330,000	± 20%	0.80 ± 0.10
C1608X5R1E474K	X5R	25V	470,000	± 10%	0.80 ± 0.10
C1608X5R1E474M	X5R	25V	470,000	± 20%	0.80 ± 0.10
C1608X5R1E105K	X5R	25V	1,000,000	± 10%	0.80 ± 0.10
C1608X5R1E105M	X5R	25V	1,000,000	± 20%	0.80 ± 0.10
C1608X5R1E155K	X5R	25V	1,500,000	± 10%	0.80 ± 0.10
C1608X5R1E155M	X5R	25V	1,500,000	± 20%	0.80 ± 0.10
C1608X5R1E225K	X5R	25V	2,200,000	± 10%	0.80 ± 0.10
C1608X5R1E225M	X5R	25V	2,200,000	± 20%	0.80 ± 0.10
C1608X5R1C224K	X5R	16V	220,000	± 10%	0.80 ± 0.10
C1608X5R1C224M	X5R	16V	220,000	± 20%	0.80 ± 0.10
C1608X5R1C334K	X5R	16V	330,000	± 10%	0.80 ± 0.10
C1608X5R1C334M	X5R	16V	330,000	± 20%	0.80 ± 0.10
C1608X5R1C474K	X5R	16V	470,000	± 10%	0.80 ± 0.10
C1608X5R1C474M	X5R	16V	470,000	± 20%	0.80 ± 0.10
C1608X5R1C684K	X5R	16V	680,000	± 10%	0.80 ± 0.10
C1608X5R1C684M	X5R	16V	680,000	± 20%	0.80 ± 0.10
C1608X5R1C105K	X5R	16V	1,000,000	± 10%	0.80 ± 0.10
C1608X5R1C105M	X5R	16V	1,000,000	± 20%	0.80 ± 0.10
C1608X5R1C225K/0.50	X5R	16V	2,200,000	± 10%	0.50 ± 0.05
C1608X5R1C225M/0.50	X5R	16V	2,200,000	± 20%	0.50 ± 0.05
C1608X5R1C225K/0.80	X5R	16V	2,200,000	± 10%	0.80 ± 0.10
C1608X5R1C225M/0.80	X5R	16V	2,200,000	± 20%	0.80 ± 0.10



Capacitance Range Table

C1608 [EIA CC0603]

Class 2 (Temperature Stable)

Temperature Characteristics: X5R (-55 to +85°C, ±15%)

TDK Part Number (Ordering Code)	Temperature Characteristics	Rated Voltage	Capacitance (pF)	Capacitance Tolerance	Thickness (mm)
C1608X5R1C335K	X5R	16V	3,300,000	± 10%	0.80 ± 0.10
C1608X5R1C335M	X5R	16V	3,300,000	± 20%	0.80 ± 0.10
C1608X5R1C475K	X5R	16V	4,700,000	± 10%	0.80 ± 0.10
C1608X5R1C475M	X5R	16V	4,700,000	± 20%	0.80 ± 0.10
C1608X5R1A224K	X5R	10V	220,000	± 10%	0.80 ± 0.10
C1608X5R1A224M	X5R	10V	220,000	± 20%	0.80 ± 0.10
C1608X5R1A334K	X5R	10V	330,000	± 10%	0.80 ± 0.10
C1608X5R1A334M	X5R	10V	330,000	± 20%	0.80 ± 0.10
C1608X5R1A474K	X5R	10V	470,000	± 10%	0.80 ± 0.10
C1608X5R1A474M	X5R	10V	470,000	± 20%	0.80 ± 0.10
C1608X5R1A684K	X5R	10V	680,000	± 10%	0.80 ± 0.10
C1608X5R1A684M	X5R	10V	680,000	± 20%	0.80 ± 0.10
C1608X5R1A105K	X5R	10V	1,000,000	± 10%	0.80 ± 0.10
C1608X5R1A105M	X5R	10V	1,000,000	± 20%	0.80 ± 0.10
C1608X5R1A225K/0.50	X5R	10V	2,200,000	± 10%	0.50 ± 0.05
C1608X5R1A225M/0.50	X5R	10V	2,200,000	± 20%	0.50 ± 0.05
C1608X5R1A225K/0.80	X5R	10V	2,200,000	± 10%	0.80 ± 0.10
C1608X5R1A225M/0.80	X5R	10V	2,200,000	± 20%	0.80 ± 0.10
C1608X5R1A335K	X5R	10V	3,300,000	± 10%	0.80 ± 0.10
C1608X5R1A335M	X5R	10V	3,300,000	± 20%	0.80 ± 0.10
C1608X5R1A475K/0.50	X5R	10V	4,700,000	± 10%	0.50 ± 0.05
C1608X5R1A475M/0.50	X5R	10V	4,700,000	± 20%	0.50 ± 0.05
C1608X5R1A475K/0.80	X5R	10V	4,700,000	± 10%	0.80 ± 0.10
C1608X5R1A475M/0.80	X5R	10V	4,700,000	± 20%	0.80 ± 0.10
C1608X5R1A685K	X5R	10V	6,800,000	± 10%	0.80 ± 0.10
C1608X5R1A685M	X5R	10V	6,800,000	± 20%	0.80 ± 0.10
C1608X5R1A106K	X5R	10V	10,000,000	± 10%	0.80 ± 0.10
C1608X5R1A106M	X5R	10V	10,000,000	± 20%	0.80 ± 0.10
C1608X5R0J105K	X5R	6.3V	1,000,000	± 10%	0.80 ± 0.10
C1608X5R0J105M	X5R	6.3V	1,000,000	± 20%	0.80 ± 0.10
C1608X5R0J155K	X5R	6.3V	1,500,000	± 10%	0.80 ± 0.10
C1608X5R0J155M	X5R	6.3V	1,500,000	± 20%	0.80 ± 0.10
C1608X5R0J225K	X5R	6.3V	2,200,000	± 10%	0.80 ± 0.10
C1608X5R0J225M	X5R	6.3V	2,200,000	± 20%	0.80 ± 0.10
C1608X5R0J335K	X5R	6.3V	3,300,000	± 10%	0.80 ± 0.15
C1608X5R0J335M	X5R	6.3V	3,300,000	± 20%	0.80 ± 0.15
C1608X5R0J475K/0.50	X5R	6.3V	4,700,000	± 10%	0.50 ± 0.05
C1608X5R0J475M/0.50	X5R	6.3V	4,700,000	± 20%	0.50 ± 0.05
C1608X5R0J475K/0.80	X5R	6.3V	4,700,000	± 10%	0.80 ± 0.15
C1608X5R0J475M/0.80	X5R	6.3V	4,700,000	± 20%	0.80 ± 0.15
C1608X5R0J685K	X5R	6.3V	6,800,000	± 10%	0.80 ± 0.15
C1608X5R0J685M	X5R	6.3V	6,800,000	± 20%	0.80 ± 0.15
C1608X5R0J106K	X5R	6.3V	10,000,000	± 10%	0.80 ± 0.10
C1608X5R0J106M	X5R	6.3V	10,000,000	± 20%	0.80 ± 0.20



Capacitance Range Table

C1608 [EIA CC0603]

Class 2 (Temperature Stable)

Temperature Characteristics: X5R (-55 to +85°C, ±15%), Y5V(-30 to +85°C, +22/-82%)

TDK Part Number (Ordering Code)	Temperature Characteristics	Rated Voltage	Capacitance (pF)	Capacitance Tolerance	Thickness (mm)
C1608X5R0G106M	X5R	4V	10,000,000	± 20%	0.80 ± 0.20
C1608Y5V1H104Z	Y5V	50V	100,000	+80/-20%	0.80 ± 0.10
C1608Y5V1H224Z	Y5V	50V	220,000	+80/-20%	0.80 ± 0.10
C1608Y5V1H474Z	Y5V	50V	470,000	+80/-20%	0.80 ± 0.10
C1608Y5V1E104Z	Y5V	25V	100,000	+80/-20%	0.80 ± 0.10
C1608Y5V1E224Z	Y5V	25V	220,000	+80/-20%	0.80 ± 0.10
C1608Y5V1E474Z	Y5V	25V	470,000	+80/-20%	0.80 ± 0.10
C1608Y5V1E105Z	Y5V	25V	1,000,000	+80/-20%	0.80 ± 0.10
C1608Y5V1C104Z	Y5V	16V	100,000	+80/-20%	0.80 ± 0.10
C1608Y5V1C105Z	Y5V	16V	1,000,000	+80/-20%	0.80 ± 0.10
C1608Y5V1C225Z	Y5V	16V	2,200,000	+80/-20%	0.80 ± 0.10
C1608Y5V1A105Z	Y5V	10V	1,000,000	+80/-20%	0.80 ± 0.10
C1608Y5V1A225Z	Y5V	10V	2,200,000	+80/-20%	0.80 ± 0.10
C1608Y5V0J475Z	Y5V	6.3V	4,700,000	+80/-20%	0.80 ± 0.10
C1608Y5V0J106Z	Y5V	6.3V	10,000,000	+80/-20%	0.80 ± 0.15



Capacitance Range Chart

C2012 [EIA CC0805]

Capacitance Range Chart

Temperature Characteristics: C0G ($0 \pm 30\text{ppm}/^\circ\text{C}$)
 Rated Voltage: 50V (1H), 25V (1E)

Capacitance (pF)	Cap Code	Tolerance	C0G	
			1H (50V)	1E (25V)
10	100	J: $\pm 5\%$		
100	101			
120	121			
150	151			
180	181			
220	221			
270	271			
330	331			
390	391			
470	471			
560	561			
680	681			
820	821			
1,000	102			
1,200	122			
1,500	152			
1,800	182			
2,200	222			
2,700	272			
3,300	332			
3,900	392			
4,700	472			
5,600	562			
6,800	682			
8,200	822			
10,000	103			
15,000	153			
22,000	223			
33,000	333			

- Standard capacitance is shown. Please refer to Capacitance Range Table for additional capacitance values.

Capacitance Range Chart

Temperature Characteristics: X6S ($\pm 22\%$)
 Rated Voltage: 50V (1H), 35V (1V), 25V (1E), 16V (1C), 10V (1A), 6.3V (0J), 4V(0G)

Capacitance (pF)	Cap Code	Tolerance	X6S					
			1H (50V)	1V (35V)	1E (25V)	1C (16V)	1A (10V)	0J (6.3V)
1,000,000	105	K: $\pm 10\%$ M: $\pm 20\%$						
2,200,000	225							
4,700,000	475							
10,000,000	106							
22,000,000	226							
47,000,000	476							

- Standard thickness is shown. Please refer to Capacitance Range Table for additional thicknesses.

Standard Thickness

	0.60 mm
	0.85 mm
	1.25 mm



Capacitance Range Chart

C2012 [EIA CC0805]

Capacitance Range Chart

Temperature Characteristics: X7R ($\pm 15\%$), X5R ($\pm 15\%$), Y5V (+22/-82%)
 Rated Voltage: 50V (1H), 35V (1V), 25V (1E), 16V (1C), 10V (1A), 6.3V (0J), 4V (0G)

Capacitance (pF)	Cap Code	Tolerance	X5R					
			1H (50V)	1E (25V)	1C (16V)	1A (10V)	0J (6.3V)	0G (4V)
1,000,000	105	K: $\pm 10\%$ M: $\pm 20\%$						
1,500,000	155							
2,200,000	225							
3,300,000	335							
4,700,000	475							
6,800,000	685							
10,000,000	106							
15,000,000	156							
22,000,000	226							
33,000,000	336							
47,000,000	476							

Capacitance (pF)	Cap Code	Tolerance	X7R					
			1H (50V)	1V (35V)	1E (25V)	1C (16V)	1A (10V)	0J (6.3V)
1,000	102	K: $\pm 10\%$ M: $\pm 20\%$						
2,200	222							
4,700	472							
10,000	103							
22,000	223							
47,000	473							
100,000	104							
150,000	154							
220,000	224							
330,000	334							
470,000	474							
680,000	684							
1,000,000	105							
1,500,000	155							
2,200,000	225							
3,300,000	335							
4,700,000	475							
10,000,000	106							

Capacitance (pF)	Cap Code	Tolerance	Y5V				
			1H (50V)	1E (25V)	1C (16V)	1A (10V)	0J (6.3V)
100,000	104	Z: +80/-20%					
470,000	474						
1,000,000	105						
2,200,000	225						
4,700,000	475						
10,000,000	106						
22,000,000	226						

Standard Thickness

	0.60 mm
	0.85 mm
	1.25 mm

• Standard thickness is shown. Please refer to Capacitance Range Table for additional thicknesses.



Capacitance Range Table

C2012 [EIA CC0805]

Class 1 (Temperature Compensating)

Temperature Characteristics: C0G (-55 to 125°C, 0±30 ppm/°C)

TDK Part Number (Ordering Code)	Temperature Characteristics	Rated Voltage	Capacitance (pF)	Capacitance Tolerance	Thickness (mm)
C2012C0G1H100D	C0G	50V	10	± 0.50pF	0.60 ± 0.10
C2012C0G1H101J	C0G	50V	100	± 5%	0.60 ± 0.10
C2012C0G1H121J	C0G	50V	120	± 5%	0.60 ± 0.10
C2012C0G1H151J	C0G	50V	150	± 5%	0.60 ± 0.10
C2012C0G1H181J	C0G	50V	180	± 5%	0.60 ± 0.10
C2012C0G1H221J	C0G	50V	220	± 5%	0.60 ± 0.10
C2012C0G1H271J	C0G	50V	270	± 5%	0.60 ± 0.10
C2012C0G1H331J	C0G	50V	330	± 5%	0.60 ± 0.10
C2012C0G1H391J	C0G	50V	390	± 5%	0.60 ± 0.10
C2012C0G1H471J	C0G	50V	470	± 5%	0.60 ± 0.10
C2012C0G1H561J	C0G	50V	560	± 5%	0.60 ± 0.10
C2012C0G1H681J	C0G	50V	680	± 5%	0.60 ± 0.10
C2012C0G1H821J	C0G	50V	820	± 5%	0.60 ± 0.10
C2012C0G1H102J	C0G	50V	1,000	± 5%	0.60 ± 0.10
C2012C0G1H122J	C0G	50V	1,200	± 5%	0.60 ± 0.10
C2012C0G1H152J	C0G	50V	1,500	± 5%	0.60 ± 0.10
C2012C0G1H182J/0.60	C0G	50V	1,800	± 5%	0.60 ± 0.10
C2012C0G1H182J/0.85	C0G	50V	1,800	± 5%	0.85 ± 0.10
C2012C0G1H222J/0.60	C0G	50V	2,200	± 5%	0.60 ± 0.10
C2012C0G1H222J/0.85	C0G	50V	2,200	± 5%	0.85 ± 0.10
C2012C0G1H272J/0.60	C0G	50V	2,700	± 5%	0.60 ± 0.10
C2012C0G1H272J/1.25	C0G	50V	2,700	± 5%	1.25 ± 0.20
C2012C0G1H332J/0.60	C0G	50V	3,300	± 5%	0.60 ± 0.10
C2012C0G1H332J/1.25	C0G	50V	3,300	± 5%	1.25 ± 0.20
C2012C0G1H392J/0.60	C0G	50V	3,900	± 5%	0.60 ± 0.10
C2012C0G1H392J/0.85	C0G	50V	3,900	± 5%	0.85 ± 0.10
C2012C0G1H472J/0.60	C0G	50V	4,700	± 5%	0.60 ± 0.10
C2012C0G1H472J/0.85	C0G	50V	4,700	± 5%	0.85 ± 0.10
C2012C0G1H562J/0.60	C0G	50V	5,600	± 5%	0.60 ± 0.10
C2012C0G1H562J/0.85	C0G	50V	5,600	± 5%	0.85 ± 0.10
C2012C0G1H682J/0.60	C0G	50V	6,800	± 5%	0.60 ± 0.10
C2012C0G1H682J/1.25	C0G	50V	6,800	± 5%	1.25 ± 0.20
C2012C0G1H822J/0.60	C0G	50V	8,200	± 5%	0.60 ± 0.10
C2012C0G1H822J/1.25	C0G	50V	8,200	± 5%	1.25 ± 0.20
C2012C0G1H103J/0.60	C0G	50V	10,000	± 5%	0.60 ± 0.10
C2012C0G1H103J/1.25	C0G	50V	10,000	± 5%	1.25 ± 0.20
C2012C0G1H153J	C0G	50V	15,000	± 5%	0.85 ± 0.10
C2012C0G1H223J	C0G	50V	22,000	± 5%	1.25 ± 0.20
C2012C0G1H333J	C0G	50V	33,000	± 5%	1.25 ± 0.20
C2012C0G1E392J	C0G	25V	3,900	± 5%	0.60 ± 0.10
C2012C0G1E472J	C0G	25V	4,700	± 5%	0.60 ± 0.10
C2012C0G1E562J	C0G	25V	5,600	± 5%	0.60 ± 0.10
C2012C0G1E682J	C0G	25V	6,800	± 5%	0.60 ± 0.10
C2012C0G1E822J	C0G	25V	8,200	± 5%	0.60 ± 0.10



Capacitance Range Table

C2012 [EIA CC0805]

Class 1 (Temperature Compensating)

Temperature Characteristics: C0G (-55 to 125°C, 0±30 ppm/°C)

TDK Part Number (Ordering Code)	Temperature Characteristics	Rated Voltage	Capacitance (pF)	Capacitance Tolerance	Thickness (mm)
C2012C0G1E103J	C0G	25V	10,000	± 5%	0.60 ± 0.10
C2012C0G1E153J	C0G	25V	15,000	± 5%	0.85 ± 0.10
C2012C0G1E223J	C0G	25V	22,000	± 5%	1.25 ± 0.20
C2012C0G1E333J	C0G	25V	33,000	± 5%	1.25 ± 0.20

Class 2 (Temperature Stable)

Temperature Characteristics: X7R (-55 to +125°C, ±15%)

TDK Part Number (Ordering Code)	Temperature Characteristics	Rated Voltage	Capacitance (pF)	Capacitance Tolerance	Thickness (mm)
C2012X7R1H102K	X7R	50V	1,000	± 10%	0.60 ± 0.10
C2012X7R1H102M	X7R	50V	1,000	± 20%	0.60 ± 0.10
C2012X7R1H222K	X7R	50V	2,200	± 10%	0.60 ± 0.10
C2012X7R1H222M	X7R	50V	2,200	± 20%	0.60 ± 0.10
C2012X7R1H472K	X7R	50V	4,700	± 10%	0.60 ± 0.10
C2012X7R1H472M	X7R	50V	4,700	± 20%	0.60 ± 0.10
C2012X7R1H103K	X7R	50V	10,000	± 10%	0.60 ± 0.10
C2012X7R1H103M	X7R	50V	10,000	± 20%	0.60 ± 0.10
C2012X7R1H223K/0.60	X7R	50V	22,000	± 10%	0.60 ± 0.10
C2012X7R1H223M/0.60	X7R	50V	22,000	± 20%	0.60 ± 0.10
C2012X7R1H473K/1.25	X7R	50V	47,000	± 10%	1.25 ± 0.20
C2012X7R1H473M/1.25	X7R	50V	47,000	± 20%	1.25 ± 0.20
C2012X7R1H104K/0.85	X7R	50V	100,000	± 10%	0.85 ± 0.10
C2012X7R1H104M/0.85	X7R	50V	100,000	± 20%	0.85 ± 0.10
C2012X7R1H104K/1.25	X7R	50V	100,000	± 10%	1.25 ± 0.20
C2012X7R1H104M/1.25	X7R	50V	100,000	± 20%	1.25 ± 0.20
C2012X7R1H154K	X7R	50V	150,000	± 10%	1.25 ± 0.20
C2012X7R1H154M	X7R	50V	150,000	± 20%	1.25 ± 0.20
C2012X7R1H224K	X7R	50V	220,000	± 10%	1.25 ± 0.20
C2012X7R1H224M	X7R	50V	220,000	± 20%	1.25 ± 0.20
C2012X7R1H334K	X7R	50V	330,000	± 10%	1.25 ± 0.20
C2012X7R1H334M	X7R	50V	330,000	± 20%	1.25 ± 0.20
C2012X7R1H474K	X7R	50V	470,000	± 10%	1.25 ± 0.20
C2012X7R1H474M	X7R	50V	470,000	± 20%	1.25 ± 0.20
C2012X7R1H684K	X7R	50V	680,000	± 10%	1.25 ± 0.20
C2012X7R1H684M	X7R	50V	680,000	± 20%	1.25 ± 0.20
C2012X7R1H105K	X7R	50V	1,000,000	± 10%	1.25 ± 0.20
C2012X7R1H105M	X7R	50V	1,000,000	± 20%	1.25 ± 0.20
C2012X7R1H155K	X7R	50V	1,500,000	± 10%	1.25 ± 0.20
C2012X7R1H155M	X7R	50V	1,500,000	± 20%	1.25 ± 0.20
C2012X7R1H225K	X7R	50V	2,200,000	± 10%	1.25 ± 0.20
C2012X7R1H225M	X7R	50V	2,200,000	± 20%	1.25 ± 0.20
C2012X7R1V105K	X7R	35V	1,000,000	± 10%	1.25 ± 0.20
C2012X7R1V105M	X7R	35V	1,000,000	± 20%	1.25 ± 0.20
C2012X7R1V225K	X7R	35V	2,200,000	± 10%	1.25 ± 0.20
C2012X7R1V225M	X7R	35V	2,200,000	± 20%	1.25 ± 0.20



Capacitance Range Table

C2012 [EIA CC0805]

Class 2 (Temperature Stable)

Temperature Characteristics: X7R (-55 to +125°C, ±15%)

TDK Part Number (Ordering Code)	Temperature Characteristics	Rated Voltage	Capacitance (pF)	Capacitance Tolerance	Thickness (mm)
C2012X7R1V335K	X7R	35V	3,300,000	± 10%	1.25 ± 0.20
C2012X7R1V335M	X7R	35V	3,300,000	± 20%	1.25 ± 0.20
C2012X7R1V475K	X7R	35V	4,700,000	± 10%	1.25 ± 0.20
C2012X7R1V475M	X7R	35V	4,700,000	± 20%	1.25 ± 0.20
C2012X7R1E104K/0.85	X7R	25V	100,000	± 10%	0.85 ± 0.10
C2012X7R1E104M/0.85	X7R	25V	100,000	± 20%	0.85 ± 0.10
C2012X7R1E104K/1.25	X7R	25V	100,000	± 10%	1.25 ± 0.20
C2012X7R1E104M/1.25	X7R	25V	100,000	± 20%	1.25 ± 0.20
C2012X7R1E224K	X7R	25V	220,000	± 10%	1.25 ± 0.20
C2012X7R1E224M	X7R	25V	220,000	± 20%	1.25 ± 0.20
C2012X7R1E334K	X7R	25V	330,000	± 10%	1.25 ± 0.20
C2012X7R1E334M	X7R	25V	330,000	± 20%	1.25 ± 0.20
C2012X7R1E474K	X7R	25V	470,000	± 10%	1.25 ± 0.20
C2012X7R1E474M	X7R	25V	470,000	± 20%	1.25 ± 0.20
C2012X7R1E684K	X7R	25V	680,000	± 10%	1.25 ± 0.20
C2012X7R1E684M	X7R	25V	680,000	± 20%	1.25 ± 0.20
C2012X7R1E105K	X7R	25V	1,000,000	± 10%	1.25 ± 0.20
C2012X7R1E105M	X7R	25V	1,000,000	± 20%	1.25 ± 0.20
C2012X7R1E155K	X7R	25V	1,500,000	± 10%	1.25 ± 0.20
C2012X7R1E155M	X7R	25V	1,500,000	± 20%	1.25 ± 0.20
C2012X7R1E225K	X7R	25V	2,200,000	± 10%	1.25 ± 0.20
C2012X7R1E225M	X7R	25V	2,200,000	± 20%	1.25 ± 0.20
C2012X7R1E335K	X7R	25V	3,300,000	± 10%	1.25 ± 0.20
C2012X7R1E335M	X7R	25V	3,300,000	± 20%	1.25 ± 0.20
C2012X7R1E475K	X7R	25V	4,700,000	± 10%	1.25 ± 0.20
C2012X7R1E475M	X7R	25V	4,700,000	± 20%	1.25 ± 0.20
C2012X7R1C224K	X7R	16V	220,000	± 10%	1.25 ± 0.20
C2012X7R1C224M	X7R	16V	220,000	± 20%	1.25 ± 0.20
C2012X7R1C334K/1.25	X7R	16V	330,000	± 10%	1.25 ± 0.20
C2012X7R1C334M/1.25	X7R	16V	330,000	± 20%	1.25 ± 0.20
C2012X7R1C474K	X7R	16V	470,000	± 10%	1.25 ± 0.20
C2012X7R1C474M	X7R	16V	470,000	± 20%	1.25 ± 0.20
C2012X7R1C684K	X7R	16V	680,000	± 10%	1.25 ± 0.20
C2012X7R1C684M	X7R	16V	680,000	± 20%	1.25 ± 0.20
C2012X7R1C105K/0.85	X7R	16V	1,000,000	± 10%	0.85 ± 0.10
C2012X7R1C105M/0.85	X7R	16V	1,000,000	± 20%	0.85 ± 0.10
C2012X7R1C105K/1.25	X7R	16V	1,000,000	± 10%	1.25 ± 0.20
C2012X7R1C105M/1.25	X7R	16V	1,000,000	± 20%	1.25 ± 0.20
C2012X7R1C155K	X7R	16V	1,500,000	± 10%	1.25 ± 0.20
C2012X7R1C155M	X7R	16V	1,500,000	± 20%	1.25 ± 0.20
C2012X7R1C225K	X7R	16V	2,200,000	± 10%	1.25 ± 0.20
C2012X7R1C225M	X7R	16V	2,200,000	± 20%	1.25 ± 0.20
C2012X7R1C335K	X7R	16V	3,300,000	± 10%	1.25 ± 0.20
C2012X7R1C335M	X7R	16V	3,300,000	± 20%	1.25 ± 0.20



Capacitance Range Table

C2012 [EIA CC0805]

Class 2 (Temperature Stable)

Temperature Characteristics: X7R (-55 to +125°C, ±15%), X6S(-55 to 105°C, ±22%)

TDK Part Number (Ordering Code)	Temperature Characteristics	Rated Voltage	Capacitance (pF)	Capacitance Tolerance	Thickness (mm)
C2012X7R1C475K	X7R	16V	4,700,000	± 10%	1.25 ± 0.20
C2012X7R1C475M	X7R	16V	4,700,000	± 20%	1.25 ± 0.20
C2012X7R1A105K	X7R	10V	1,000,000	± 10%	1.25 ± 0.20
C2012X7R1A105M	X7R	10V	1,000,000	± 20%	1.25 ± 0.20
C2012X7R1A155K	X7R	10V	1,500,000	± 10%	1.25 ± 0.20
C2012X7R1A155M	X7R	10V	1,500,000	± 20%	1.25 ± 0.20
C2012X7R1A225K	X7R	10V	2,200,000	± 10%	1.25 ± 0.20
C2012X7R1A225M	X7R	10V	2,200,000	± 20%	1.25 ± 0.20
C2012X7R1A335K	X7R	10V	3,300,000	± 10%	1.25 ± 0.20
C2012X7R1A335M	X7R	10V	3,300,000	± 20%	1.25 ± 0.20
C2012X7R1A475K	X7R	10V	4,700,000	± 10%	1.25 ± 0.20
C2012X7R1A475M	X7R	10V	4,700,000	± 20%	1.25 ± 0.20
C2012X7R1A106K	X7R	10V	10,000,000	± 10%	1.25 ± 0.20
C2012X7R1A106M	X7R	10V	10,000,000	± 20%	1.25 ± 0.20
C2012X7R0J106K	X7R	6.3V	10,000,000	± 10%	1.25 ± 0.20
C2012X7R0J106M	X7R	6.3V	10,000,000	± 20%	1.25 ± 0.20
C2012X6S1H105K	X6S	50V	1,000,000	± 10%	1.25 ± 0.20
C2012X6S1H105M	X6S	50V	1,000,000	± 20%	1.25 ± 0.20
C2012X6S1H225K	X6S	50V	2,200,000	± 10%	1.25 ± 0.20
C2012X6S1H225M	X6S	50V	2,200,000	± 20%	1.25 ± 0.20
C2012X6S1H475K	X6S	50V	4,700,000	± 10%	1.25 ± 0.20
C2012X6S1H475M	X6S	50V	4,700,000	± 20%	1.25 ± 0.20
C2012X6S1V475K	X6S	35V	4,700,000	± 10%	1.25 ± 0.20
C2012X6S1V475M	X6S	35V	4,700,000	± 20%	1.25 ± 0.20
C2012X6S1E225K	X6S	25V	2,200,000	± 10%	1.25 ± 0.20
C2012X6S1E225M	X6S	25V	2,200,000	± 20%	1.25 ± 0.20
C2012X6S1E475K	X6S	25V	4,700,000	± 10%	1.25 ± 0.20
C2012X6S1E475M	X6S	25V	4,700,000	± 20%	1.25 ± 0.20
C2012X6S1C225K	X6S	16V	2,200,000	± 10%	0.90 +0.05,-0.10
C2012X6S1C225M	X6S	16V	2,200,000	± 20%	0.90 +0.05,-0.10
C2012X6S1C475K	X6S	16V	4,700,000	± 10%	1.25 ± 0.20
C2012X6S1C475M	X6S	16V	4,700,000	± 20%	1.25 ± 0.20
C2012X6S1C106K	X6S	16V	10,000,000	± 10%	1.25 ± 0.20
C2012X6S1C106M	X6S	16V	10,000,000	± 20%	1.25 ± 0.20
C2012X6S1A106K/0.85	X6S	10V	10,000,000	± 10%	0.85 ± 0.10
C2012X6S1A106M/0.85	X6S	10V	10,000,000	± 20%	0.85 ± 0.10
C2012X6S1A226K	X6S	10V	22,000,000	± 10%	1.25 ± 0.20
C2012X6S1A226M	X6S	10V	22,000,000	± 20%	1.25 ± 0.20
C2012X6S0J106K	X6S	6.3V	10,000,000	± 10%	0.85 ± 0.10
C2012X6S0J106M	X6S	6.3V	10,000,000	± 20%	0.85 ± 0.10
C2012X6S0J226K	X6S	6.3V	22,000,000	± 10%	1.25 ± 0.20
C2012X6S0J226M	X6S	6.3V	22,000,000	± 20%	1.25 ± 0.20
C2012X6S0G226M	X6S	4V	22,000,000	± 20%	0.85 ± 0.10
C2012X6S0G476M	X6S	4V	47,000,000	± 20%	1.25 ± 0.20



Capacitance Range Table

C2012 [EIA CC0805]

Class 2 (Temperature Stable)

Temperature Characteristics: X5R (-55 to +85°C, ±15%)

TDK Part Number (Ordering Code)	Temperature Characteristics	Rated Voltage	Capacitance (pF)	Capacitance Tolerance	Thickness (mm)
C2012X5R1H105K	X5R	50V	1,000,000	± 10%	1.25 ± 0.20
C2012X5R1H105M	X5R	50V	1,000,000	± 20%	1.25 ± 0.20
C2012X5R1H155K	X5R	50V	1,500,000	± 10%	1.25 ± 0.20
C2012X5R1H155M	X5R	50V	1,500,000	± 20%	1.25 ± 0.20
C2012X5R1H225K	X5R	50V	2,200,000	± 10%	1.25 ± 0.20
C2012X5R1H225M	X5R	50V	2,200,000	± 20%	1.25 ± 0.20
C2012X5R1H335K	X5R	50V	3,300,000	± 10%	1.25 ± 0.20
C2012X5R1H335M	X5R	50V	3,300,000	± 20%	1.25 ± 0.20
C2012X5R1H475K	X5R	50V	4,700,000	± 10%	1.25 ± 0.20
C2012X5R1H475M	X5R	50V	4,700,000	± 20%	1.25 ± 0.20
C2012X5R1E105K/0.85	X5R	25V	1,000,000	± 10%	0.85 ± 0.10
C2012X5R1E105M/0.85	X5R	25V	1,000,000	± 20%	0.85 ± 0.10
C2012X5R1E105K/1.25	X5R	25V	1,000,000	± 10%	1.25 ± 0.20
C2012X5R1E105M/1.25	X5R	25V	1,000,000	± 20%	1.25 ± 0.20
C2012X5R1E155K	X5R	25V	1,500,000	± 10%	1.25 ± 0.20
C2012X5R1E155M	X5R	25V	1,500,000	± 20%	1.25 ± 0.20
C2012X5R1E225K	X5R	25V	2,200,000	± 10%	1.25 ± 0.20
C2012X5R1E225M	X5R	25V	2,200,000	± 20%	1.25 ± 0.20
C2012X5R1E475K	X5R	25V	4,700,000	± 10%	1.25 ± 0.20
C2012X5R1E475M	X5R	25V	4,700,000	± 20%	1.25 ± 0.20
C2012X5R1E685K	X5R	25V	6,800,000	± 10%	1.25 ± 0.20
C2012X5R1E685M	X5R	25V	6,800,000	± 20%	1.25 ± 0.20
C2012X5R1E106K	X5R	25V	10,000,000	± 10%	1.25 ± 0.20
C2012X5R1E106M	X5R	25V	10,000,000	± 20%	1.25 ± 0.20
C2012X5R1C105K/0.85	X5R	16V	1,000,000	± 10%	0.85 ± 0.10
C2012X5R1C105M/0.85	X5R	16V	1,000,000	± 20%	0.85 ± 0.10
C2012X5R1C105K/1.25	X5R	16V	1,000,000	± 10%	1.25 ± 0.20
C2012X5R1C105M/1.25	X5R	16V	1,000,000	± 20%	1.25 ± 0.20
C2012X5R1C225K/0.85	X5R	16V	2,200,000	± 10%	0.85 ± 0.10
C2012X5R1C225M/0.85	X5R	16V	2,200,000	± 20%	0.85 ± 0.10
C2012X5R1C225K/1.25	X5R	16V	2,200,000	± 10%	1.25 ± 0.20
C2012X5R1C225M/1.25	X5R	16V	2,200,000	± 20%	1.25 ± 0.20
C2012X5R1C475K/1.25	X5R	16V	4,700,000	± 10%	1.25 ± 0.20
C2012X5R1C475M/1.25	X5R	16V	4,700,000	± 20%	1.25 ± 0.20
C2012X5R1C685K	X5R	16V	6,800,000	± 10%	1.25 ± 0.20
C2012X5R1C685M	X5R	16V	6,800,000	± 20%	1.25 ± 0.20
C2012X5R1C106K/0.85	X5R	16V	10,000,000	± 10%	0.85 ± 0.10
C2012X5R1C106M/0.85	X5R	16V	10,000,000	± 20%	0.85 ± 0.10
C2012X5R1C106K/1.25	X5R	16V	10,000,000	± 10%	1.25 ± 0.20
C2012X5R1C106M/1.25	X5R	16V	10,000,000	± 20%	1.25 ± 0.20
C2012X5R1C226K	X5R	16V	22,000,000	± 10%	1.25 ± 0.20
C2012X5R1C226M	X5R	16V	22,000,000	± 20%	1.25 ± 0.20
C2012X5R1A105K/0.85	X5R	10V	1,000,000	± 10%	0.85 ± 0.10
C2012X5R1A105M/0.85	X5R	10V	1,000,000	± 20%	0.85 ± 0.10



Capacitance Range Table

C2012 [EIA CC0805]

Class 2 (Temperature Stable)

Temperature Characteristics: X5R (-55 to +85°C, ±15%)

TDK Part Number (Ordering Code)	Temperature Characteristics	Rated Voltage	Capacitance (pF)	Capacitance Tolerance	Thickness (mm)
C2012X5R1A105K/1.25	X5R	10V	1,000,000	± 10%	1.25 ± 0.20
C2012X5R1A105M/1.25	X5R	10V	1,000,000	± 20%	1.25 ± 0.20
C2012X5R1A225K/0.85	X5R	10V	2,200,000	± 10%	0.85 ± 0.10
C2012X5R1A225M/0.85	X5R	10V	2,200,000	± 20%	0.85 ± 0.10
C2012X5R1A225K/1.25	X5R	10V	2,200,000	± 10%	1.25 ± 0.20
C2012X5R1A225M/1.25	X5R	10V	2,200,000	± 20%	1.25 ± 0.20
C2012X5R1A335K	X5R	10V	3,300,000	± 10%	1.25 ± 0.20
C2012X5R1A335M	X5R	10V	3,300,000	± 20%	1.25 ± 0.20
C2012X5R1A475K/0.85	X5R	10V	4,700,000	± 10%	0.85 ± 0.10
C2012X5R1A475M/0.85	X5R	10V	4,700,000	± 20%	0.85 ± 0.10
C2012X5R1A475K/1.25	X5R	10V	4,700,000	± 10%	1.25 ± 0.20
C2012X5R1A475M/1.25	X5R	10V	4,700,000	± 20%	1.25 ± 0.20
C2012X5R1A106K/0.85	X5R	10V	10,000,000	± 10%	0.85 ± 0.10
C2012X5R1A106M/0.85	X5R	10V	10,000,000	± 20%	0.85 ± 0.10
C2012X5R1A106K/1.25	X5R	10V	10,000,000	± 10%	1.25 ± 0.20
C2012X5R1A106M/1.25	X5R	10V	10,000,000	± 20%	1.25 ± 0.20
C2012X5R1A156M	X5R	10V	15,000,000	± 20%	1.25 ± 0.20
C2012X5R1A226M/0.85	X5R	10V	22,000,000	± 20%	0.85 ± 0.10
C2012X5R1A226K/1.25	X5R	10V	22,000,000	± 10%	1.25 ± 0.20
C2012X5R1A226M/1.25	X5R	10V	22,000,000	± 20%	1.25 ± 0.20
C2012X5R0J225K/0.85	X5R	6.3V	2,200,000	± 10%	0.85 ± 0.10
C2012X5R0J225M/0.85	X5R	6.3V	2,200,000	± 20%	0.85 ± 0.10
C2012X5R0J225K/1.25	X5R	6.3V	2,200,000	± 10%	1.25 ± 0.20
C2012X5R0J225M/1.25	X5R	6.3V	2,200,000	± 20%	1.25 ± 0.20
C2012X5R0J335K/1.25	X5R	6.3V	3,300,000	± 10%	1.25 ± 0.20
C2012X5R0J335M/1.25	X5R	6.3V	3,300,000	± 20%	1.25 ± 0.20
C2012X5R0J475K/0.85	X5R	6.3V	4,700,000	± 10%	0.85 ± 0.10
C2012X5R0J475M/0.85	X5R	6.3V	4,700,000	± 20%	0.85 ± 0.10
C2012X5R0J475K/1.25	X5R	6.3V	4,700,000	± 10%	1.25 ± 0.20
C2012X5R0J475M/1.25	X5R	6.3V	4,700,000	± 20%	1.25 ± 0.20
C2012X5R0J685K/1.25	X5R	6.3V	6,800,000	± 10%	1.25 ± 0.20
C2012X5R0J685M/1.25	X5R	6.3V	6,800,000	± 20%	1.25 ± 0.20
C2012X5R0J106K/0.85	X5R	6.3V	10,000,000	± 10%	0.85 ± 0.10
C2012X5R0J106M/0.85	X5R	6.3V	10,000,000	± 20%	0.85 ± 0.10
C2012X5R0J106K/1.25	X5R	6.3V	10,000,000	± 10%	1.25 ± 0.20
C2012X5R0J106M/1.25	X5R	6.3V	10,000,000	± 20%	1.25 ± 0.20
C2012X5R0J156M/0.85	X5R	6.3V	15,000,000	± 20%	0.85 ± 0.10
C2012X5R0J156M/1.25	X5R	6.3V	15,000,000	± 20%	1.25 ± 0.20
C2012X5R0J226M/0.85	X5R	6.3V	22,000,000	± 20%	0.85 ± 0.10
C2012X5R0J226K/1.25	X5R	6.3V	22,000,000	± 10%	1.25 ± 0.20
C2012X5R0J226M/1.25	X5R	6.3V	22,000,000	± 20%	1.25 ± 0.20
C2012X5R0J336M	X5R	6.3V	33,000,000	± 20%	1.25 ± 0.20



Capacitance Range Table

C2012 [EIA CC0805]

Class 2 (Temperature Stable)

Temperature Characteristics: X5R (-55 to +85°C, ±15%), Y5V(-30 to +85°C, +22/-82%)

TDK Part Number (Ordering Code)	Temperature Characteristics	Rated Voltage	Capacitance (pF)	Capacitance Tolerance	Thickness (mm)
C2012X5R0J476M	X5R	6.3V	47,000,000	± 20%	1.25 ± 0.20
C2012X5R0G476M	X5R	4V	47,000,000	± 20%	1.25 ± 0.20
C2012Y5V1H104Z/0.60	Y5V	50V	100,000	+80/-20%	0.60 ± 0.10
C2012Y5V1H104Z/0.85	Y5V	50V	100,000	+80/-20%	0.85 ± 0.10
C2012Y5V1H474Z/0.85	Y5V	50V	470,000	+80/-20%	0.85 ± 0.10
C2012Y5V1H105Z/0.85	Y5V	50V	1,000,000	+80/-20%	0.85 ± 0.10
C2012Y5V1H105Z/1.25	Y5V	50V	1,000,000	+80/-20%	1.25 ± 0.20
C2012Y5V1H225Z	Y5V	50V	2,200,000	+80/-20%	1.25 ± 0.20
C2012Y5V1E105Z/0.85	Y5V	25V	1,000,000	+80/-20%	0.85 ± 0.10
C2012Y5V1E105Z/1.25	Y5V	25V	1,000,000	+80/-20%	1.25 ± 0.20
C2012Y5V1E225Z	Y5V	25V	2,200,000	+80/-20%	1.25 ± 0.20
C2012Y5V1E475Z	Y5V	25V	4,700,000	+80/-20%	1.25 ± 0.20
C2012Y5V1C105Z/0.85	Y5V	16V	1,000,000	+80/-20%	0.85 ± 0.10
C2012Y5V1C105Z/1.25	Y5V	16V	1,000,000	+80/-20%	1.25 ± 0.20
C2012Y5V1C225Z/0.85	Y5V	16V	2,200,000	+80/-20%	0.85 ± 0.10
C2012Y5V1C225Z/1.25	Y5V	16V	2,200,000	+80/-20%	1.25 ± 0.20
C2012Y5V1C475Z/0.85	Y5V	16V	4,700,000	+80/-20%	0.85 ± 0.10
C2012Y5V1C475Z/1.25	Y5V	16V	4,700,000	+80/-20%	1.25 ± 0.20
C2012Y5V1C106Z	Y5V	16V	10,000,000	+80/-20%	1.25 ± 0.20
C2012Y5V1A475Z/0.85	Y5V	10V	4,700,000	+80/-20%	0.85 ± 0.10
C2012Y5V1A475Z/1.25	Y5V	10V	4,700,000	+80/-20%	1.25 ± 0.20
C2012Y5V1A106Z	Y5V	10V	10,000,000	+80/-20%	1.25 ± 0.20
C2012Y5V0J106Z	Y5V	6.3V	10,000,000	+80/-20%	1.25 ± 0.20
C2012Y5V0J226Z	Y5V	6.3V	22,000,000	+80/-20%	1.25 ± 0.20



Capacitance Range Chart

C3216 [EIA CC1206]

Capacitance Range Chart

Temperature Characteristics: C0G ($0 \pm 30\text{ppm}/^\circ\text{C}$)
 Rated Voltage: 50V (1H), 25V (1E), 10V (1A)

Capacitance (pF)	Cap Code	Tolerance	C0G		SL
			1H (50V)	1E (25V)	1A (10V)
3,900	392	J: $\pm 5\%$			
4,700	472				
5,600	562				
6,800	682				
8,200	822				
10,000	103				
15,000	153				
22,000	223				
33,000	333				
47,000	473				
68,000	683				
100,000	104				
220,000	224				

Capacitance Range Chart

Temperature Characteristics: X7R ($\pm 15\%$), X6S ($\pm 22\%$), X5R ($\pm 15\%$), Y5V ($+22/-82$)
 Rated Voltage: 50V (1H), 35V (1V), 25V (1E), 16V (1C), 10V (1A), 6.3V (0J), 4V (0G)

Capacitance (pF)	Cap Code	Tolerance	X5R						X6S		
			1H (50V)	1E (25V)	1C (16V)	1A (10V)	0J (6.3V)	0G (4V)	1A (10V)	0J (6.3V)	0G (4V)
1,000,000	105	K: $\pm 10\%$ M: $\pm 20\%$									
2,200,000	225										
3,300,000	335										
4,700,000	475										
6,800,000	685										
10,000,000	106										
15,000,000	156										
22,000,000	226										
33,000,000	336										
47,000,000	476										
100,000,000	107										

Capacitance (pF)	Cap Code	Tolerance	X7R					Y5V				
			1H (50V)	1V (35V)	1E (25V)	1C (16V)	1A (10V)	1H (50V)	1E (25V)	1C (16V)	1A (10V)	0J (6.3V)
100,000	104	K: $\pm 10\%$ M: $\pm 20\%$ Z: $+80/-20\%$										
220,000	224											
330,000	334											
470,000	474											
680,000	684											
1,000,000	105											
1,500,000	155											
2,200,000	225											
3,300,000	335											
4,700,000	475											
6,800,000	685											
10,000,000	106											
22,000,000	226											
47,000,000	476											

Standard Thickness

0.60 mm 0.85 mm 1.15 mm 1.30 mm 1.60 mm

• Standard capacitance and thickness is shown. Please refer to Capacitance Range Table for additional capacitance values and thicknesses.



Capacitance Range Table

C3216 [EIA CC1206]

Class 1 (Temperature Compensating)

Temperature Characteristics: C0G (-55 to 125°C, 0±30 ppm/°C), SL (-25 to +85°C, +350/-1000 ppm/°C)

TDK Part Number (Ordering Code)	Temperature Characteristics	Rated Voltage	Capacitance (pF)	Capacitance Tolerance	Thickness (mm)
C3216C0G1H392J	C0G	50V	3,900	± 5%	0.60 ± 0.10
C3216C0G1H472J/0.60	C0G	50V	4,700	± 5%	0.60 ± 0.10
C3216C0G1H472J/0.85	C0G	50V	4,700	± 5%	0.85 ± 0.10
C3216C0G1H562J/0.60	C0G	50V	5,600	± 5%	0.60 ± 0.10
C3216C0G1H562J/0.85	C0G	50V	5,600	± 5%	0.85 ± 0.10
C3216C0G1H682J/0.60	C0G	50V	6,800	± 5%	0.60 ± 0.10
C3216C0G1H822J/0.60	C0G	50V	8,200	± 5%	0.60 ± 0.10
C3216C0G1H822J/0.85	C0G	50V	8,200	± 5%	0.85 ± 0.10
C3216C0G1H822J/1.15	C0G	50V	8,200	± 5%	1.15 ± 0.10
C3216C0G1H103J/0.60	C0G	50V	10,000	± 5%	0.60 ± 0.10
C3216C0G1H103J/1.15	C0G	50V	10,000	± 5%	1.15 ± 0.10
C3216C0G1H153J/0.60	C0G	50V	15,000	± 5%	0.60 ± 0.10
C3216C0G1H153J/1.15	C0G	50V	15,000	± 5%	1.15 ± 0.10
C3216C0G1H223J/0.60	C0G	50V	22,000	± 5%	0.60 ± 0.10
C3216C0G1H223J/1.15	C0G	50V	22,000	± 5%	1.15 ± 0.10
C3216C0G1H333J/0.85	C0G	50V	33,000	± 5%	0.85 ± 0.10
C3216C0G1H333J/1.60	C0G	50V	33,000	± 5%	1.60 ± 0.30
C3216C0G1H473J	C0G	50V	47,000	± 5%	1.15 ± 0.10
C3216C0G1H683J	C0G	50V	68,000	± 5%	1.60 ± 0.30
C3216C0G1H104J	C0G	50V	100,000	± 5%	1.60 ± 0.30
C3216C0G1E822J	C0G	25V	8,200	± 5%	0.60 ± 0.20
C3216C0G1E103J	C0G	25V	10,000	± 5%	0.60 ± 0.20
C3216C0G1E153J	C0G	25V	15,000	± 5%	0.60 ± 0.20
C3216C0G1E223J	C0G	25V	22,000	± 5%	0.60 ± 0.10
C3216C0G1E333J	C0G	25V	33,000	± 5%	0.85 ± 0.10
C3216C0G1E473J	C0G	25V	47,000	± 5%	1.15 ± 0.10
C3216C0G1E683J	C0G	25V	68,000	± 5%	1.60 ± 0.30
C3216C0G1E104J	C0G	25V	100,000	± 5%	1.60 ± 0.30
C3216SL1A224J	SL	10V	220,000	± 5%	1.60 ± 0.30

Class 2 (Temperature Stable)

Temperature Characteristics: X7R (-55 to +125°C, ±15%)

TDK Part Number (Ordering Code)	Temperature Characteristics	Rated Voltage	Capacitance (pF)	Capacitance Tolerance	Thickness (mm)
C3216X7R1H104K	X7R	50V	100,000	± 10%	0.85 ± 0.10
C3216X7R1H104M	X7R	50V	100,000	± 20%	0.85 ± 0.10
C3216X7R1H224K	X7R	50V	220,000	± 10%	1.15 ± 0.10
C3216X7R1H224M	X7R	50V	220,000	± 20%	1.15 ± 0.10
C3216X7R1H334K	X7R	50V	330,000	± 10%	1.60 ± 0.30
C3216X7R1H334M	X7R	50V	330,000	± 20%	1.60 ± 0.30
C3216X7R1H474K	X7R	50V	470,000	± 10%	1.60 ± 0.30
C3216X7R1H474M	X7R	50V	470,000	± 20%	1.60 ± 0.30
C3216X7R1H684K	X7R	50V	680,000	± 10%	1.60 ± 0.30
C3216X7R1H684M	X7R	50V	680,000	± 20%	1.60 ± 0.30
C3216X7R1H105K	X7R	50V	1,000,000	± 10%	1.60 ± 0.30



Capacitance Range Table

C3216 [EIA CC1206]

Class 2 (Temperature Stable)

Temperature Characteristics: X7R (-55 to +125°C, ±15%)

TDK Part Number (Ordering Code)	Temperature Characteristics	Rated Voltage	Capacitance (pF)	Capacitance Tolerance	Thickness (mm)
C3216X7R1H105M	X7R	50V	1,000,000	± 20%	1.60 ± 0.30
C3216X7R1H155K	X7R	50V	1,500,000	± 10%	1.60 ± 0.30
C3216X7R1H155M	X7R	50V	1,500,000	± 20%	1.60 ± 0.30
C3216X7R1H225K	X7R	50V	2,200,000	± 10%	1.60 ± 0.30
C3216X7R1H225M	X7R	50V	2,200,000	± 20%	1.60 ± 0.30
C3216X7R1H335K	X7R	50V	3,300,000	± 10%	1.60 ± 0.30
C3216X7R1H335M	X7R	50V	3,300,000	± 20%	1.60 ± 0.30
C3216X7R1V335K	X7R	35V	3,300,000	± 10%	1.60 ± 0.30
C3216X7R1V475K	X7R	35V	4,700,000	± 10%	1.60 ± 0.30
C3216X7R1E224K	X7R	25V	220,000	± 10%	1.15 ± 0.10
C3216X7R1E224M	X7R	25V	220,000	± 20%	1.15 ± 0.10
C3216X7R1E334K	X7R	25V	330,000	± 10%	1.15 ± 0.10
C3216X7R1E334M	X7R	25V	330,000	± 20%	1.15 ± 0.10
C3216X7R1E474K/0.85	X7R	25V	470,000	± 10%	0.85 ± 0.10
C3216X7R1E474M/0.85	X7R	25V	470,000	± 20%	0.85 ± 0.10
C3216X7R1E684K/0.85	X7R	25V	680,000	± 10%	0.85 ± 0.10
C3216X7R1E684M/0.85	X7R	25V	680,000	± 20%	0.85 ± 0.10
C3216X7R1E105K/0.85	X7R	25V	1,000,000	± 10%	0.85 ± 0.10
C3216X7R1E105M/0.85	X7R	25V	1,000,000	± 20%	0.85 ± 0.10
C3216X7R1E105K/1.60	X7R	25V	1,000,000	± 10%	1.60 ± 0.30
C3216X7R1E105M/1.60	X7R	25V	1,000,000	± 20%	1.60 ± 0.30
C3216X7R1E155K	X7R	25V	1,500,000	± 10%	1.60 ± 0.30
C3216X7R1E155M	X7R	25V	1,500,000	± 20%	1.60 ± 0.30
C3216X7R1E225K	X7R	25V	2,200,000	± 10%	1.60 ± 0.30
C3216X7R1E225M	X7R	25V	2,200,000	± 20%	1.60 ± 0.30
C3216X7R1E335K	X7R	25V	3,300,000	± 10%	1.60 ± 0.30
C3216X7R1E335M	X7R	25V	3,300,000	± 20%	1.60 ± 0.30
C3216X7R1E475K	X7R	25V	4,700,000	± 10%	1.60 ± 0.30
C3216X7R1E475M	X7R	25V	4,700,000	± 20%	1.60 ± 0.30
C3216X7R1E685K	X7R	25V	6,800,000	± 10%	1.60 ± 0.30
C3216X7R1E685M	X7R	25V	6,800,000	± 20%	1.60 ± 0.30
C3216X7R1E106K	X7R	25V	10,000,000	± 10%	1.60 ± 0.30
C3216X7R1E106M	X7R	25V	10,000,000	± 20%	1.60 ± 0.30
C3216X7R1C474K	X7R	16V	470,000	± 10%	1.15 ± 0.10
C3216X7R1C474M	X7R	16V	470,000	± 20%	1.15 ± 0.10
C3216X7R1C105K/0.85	X7R	16V	1,000,000	± 10%	0.85 ± 0.10
C3216X7R1C105M/0.85	X7R	16V	1,000,000	± 20%	0.85 ± 0.10
C3216X7R1C105K/1.15	X7R	16V	1,000,000	± 10%	1.15 ± 0.10
C3216X7R1C105K/1.30	X7R	16V	1,000,000	± 10%	1.30 ± 0.15
C3216X7R1C225K/1.60	X7R	16V	2,200,000	± 10%	1.60 ± 0.30
C3216X7R1C225M/1.60	X7R	16V	2,200,000	± 20%	1.60 ± 0.30
C3216X7R1C335K/1.60	X7R	16V	3,300,000	± 10%	1.60 ± 0.30
C3216X7R1C335M/1.60	X7R	16V	3,300,000	± 20%	1.60 ± 0.30
C3216X7R1C475K/1.60	X7R	16V	4,700,000	± 10%	1.60 ± 0.30



Capacitance Range Table

C3216 [EIA CC1206]

Class 2 (Temperature Stable)

Temperature Characteristics: X7R (-55 to +125°C, ±15%), X6S(-55 to 105°C, ±22%), X5R (-55 to +85°C, ±15%)

TDK Part Number (Ordering Code)	Temperature Characteristics	Rated Voltage	Capacitance (pF)	Capacitance Tolerance	Thickness (mm)
C3216X7R1C475M/1.60	X7R	16V	4,700,000	± 20%	1.60 ± 0.30
C3216X7R1C685K	X7R	16V	6,800,000	± 10%	1.60 ± 0.30
C3216X7R1C685M	X7R	16V	6,800,000	± 20%	1.60 ± 0.30
C3216X7R1C106K	X7R	16V	10,000,000	± 10%	1.60 ± 0.30
C3216X7R1C106M	X7R	16V	10,000,000	± 20%	1.60 ± 0.30
C3216X7R1A106K	X7R	10V	10,000,000	± 10%	1.60 ± 0.30
C3216X7R1A106M	X7R	10V	10,000,000	± 20%	1.60 ± 0.30
C3216X6S1A476M	X6S	10V	47,000,000	± 20%	1.60 ± 0.30
C3216X6S0J476M	X6S	6.3V	47,000,000	± 20%	1.60 ± 0.30
C3216X6S0G107M	X6S	4V	100,000,000	± 20%	1.60 ± 0.30
C3216X5R1H105K	X5R	50V	1,000,000	± 10%	1.60 ± 0.30
C3216X5R1H105M	X5R	50V	1,000,000	± 20%	1.60 ± 0.30
C3216X5R1H335K	X5R	50V	3,300,000	± 10%	1.60 ± 0.30
C3216X5R1H335M	X5R	50V	3,300,000	± 20%	1.60 ± 0.30
C3216X5R1H475K	X5R	50V	4,700,000	± 10%	1.60 ± 0.30
C3216X5R1H475M	X5R	50V	4,700,000	± 20%	1.60 ± 0.30
C3216X5R1H685K	X5R	50V	6,800,000	± 10%	1.60 ± 0.30
C3216X5R1H685M	X5R	50V	6,800,000	± 20%	1.60 ± 0.30
C3216X5R1H106K	X5R	50V	10,000,000	± 10%	1.60 ± 0.30
C3216X5R1H106M	X5R	50V	10,000,000	± 20%	1.60 ± 0.30
C3216X5R1E225K	X5R	25V	2,200,000	± 10%	1.60 ± 0.30
C3216X5R1E225M	X5R	25V	2,200,000	± 20%	1.60 ± 0.30
C3216X5R1E335K/1.60	X5R	25V	3,300,000	± 10%	1.60 ± 0.30
C3216X5R1E335M/1.60	X5R	25V	3,300,000	± 20%	1.60 ± 0.30
C3216X5R1E475K	X5R	25V	4,700,000	± 10%	1.60 ± 0.30
C3216X5R1E475M	X5R	25V	4,700,000	± 20%	1.60 ± 0.30
C3216X5R1E106K	X5R	25V	10,000,000	± 10%	1.60 ± 0.30
C3216X5R1E106M	X5R	25V	10,000,000	± 20%	1.60 ± 0.30
C3216X5R1E226M	X5R	25V	22,000,000	± 20%	1.60 ± 0.30
C3216X5R1C225K/1.60	X5R	16V	2,200,000	± 10%	1.60 ± 0.30
C3216X5R1C225M/1.60	X5R	16V	2,200,000	± 20%	1.60 ± 0.30
C3216X5R1C335K/1.60	X5R	16V	3,300,000	± 10%	1.60 ± 0.30
C3216X5R1C335M/1.60	X5R	16V	3,300,000	± 20%	1.60 ± 0.30
C3216X5R1C475K/1.15	X5R	16V	4,700,000	± 10%	1.15 ± 0.10
C3216X5R1C475M/1.15	X5R	16V	4,700,000	± 20%	1.15 ± 0.10
C3216X5R1C475K/1.60	X5R	16V	4,700,000	± 10%	1.60 ± 0.30
C3216X5R1C475M/1.60	X5R	16V	4,700,000	± 20%	1.60 ± 0.30
C3216X5R1C685K	X5R	16V	6,800,000	± 10%	1.60 ± 0.30
C3216X5R1C685M	X5R	16V	6,800,000	± 20%	1.60 ± 0.30
C3216X5R1C106K	X5R	16V	10,000,000	± 10%	1.60 ± 0.30
C3216X5R1C106M	X5R	16V	10,000,000	± 20%	1.60 ± 0.30
C3216X5R1C226M	X5R	16V	22,000,000	± 20%	1.60 ± 0.30
C3216X5R1C336M	X5R	16V	33,000,000	± 20%	1.60 ± 0.30
C3216X5R1C476M	X5R	16V	47,000,000	± 20%	1.60 ± 0.30



Capacitance Range Table

C3216 [EIA CC1206]

Class 2 (Temperature Stable)

Temperature Characteristics: X5R (-55 to +85°C, ±15%), Y5V (-30 to +85°C, +22/-82%)

TDK Part Number (Ordering Code)	Temperature Characteristics	Rated Voltage	Capacitance (pF)	Capacitance Tolerance	Thickness (mm)
C3216X5R1A225K/0.85	X5R	10V	2,200,000	± 10%	0.85 ± 0.10
C3216X5R1A225M/0.85	X5R	10V	2,200,000	± 20%	0.85 ± 0.10
C3216X5R1A335K/0.85	X5R	10V	3,300,000	± 10%	0.85 ± 0.10
C3216X5R1A335M/0.85	X5R	10V	3,300,000	± 20%	0.85 ± 0.10
C3216X5R1A335K/1.15	X5R	10V	3,300,000	± 10%	1.15 ± 0.10
C3216X5R1A335M/1.15	X5R	10V	3,300,000	± 20%	1.15 ± 0.10
C3216X5R1A475K	X5R	10V	4,700,000	± 10%	1.60 ± 0.30
C3216X5R1A475M	X5R	10V	4,700,000	± 20%	1.60 ± 0.30
C3216X5R1A106K	X5R	10V	10,000,000	± 10%	1.60 ± 0.30
C3216X5R1A106M	X5R	10V	10,000,000	± 20%	1.60 ± 0.30
C3216X5R1A226M	X5R	10V	22,000,000	± 20%	1.60 ± 0.30
C3216X5R1A336M	X5R	10V	33,000,000	± 20%	1.60 ± 0.30
C3216X5R1A476M	X5R	10V	47,000,000	± 20%	1.60 ± 0.30
C3216X5R1A107M	X5R	10V	100,000,000	± 20%	1.60 ± 0.30
C3216X5R0J106K/0.85	X5R	6.3V	10,000,000	± 10%	0.85 ± 0.10
C3216X5R0J106M/0.85	X5R	6.3V	10,000,000	± 20%	0.85 ± 0.10
C3216X5R0J106K/1.60	X5R	6.3V	10,000,000	± 10%	1.60 ± 0.30
C3216X5R0J106M/1.60	X5R	6.3V	10,000,000	± 20%	1.60 ± 0.30
C3216X5R0J156M	X5R	6.3V	15,000,000	± 20%	1.60 ± 0.30
C3216X5R0J226M/0.85	X5R	6.3V	22,000,000	± 20%	0.85 ± 0.10
C3216X5R0J226K/1.60	X5R	6.3V	22,000,000	± 10%	1.60 ± 0.30
C3216X5R0J226M/1.60	X5R	6.3V	22,000,000	± 20%	1.60 ± 0.30
C3216X5R0J336M	X5R	6.3V	33,000,000	± 20%	1.30 ± 0.15
C3216X5R0J476M	X5R	6.3V	47,000,000	± 20%	1.60 ± 0.30
C3216X5R0J107M	X5R	6.3V	100,000,000	± 20%	1.60 ± 0.30
C3216X5R0G107M	X5R	4V	100,000,000	± 20%	1.60 ± 0.30
C3216Y5V1H225Z/0.85	Y5V	50V	2,200,000	+80/-20%	0.85 ± 0.10
C3216Y5V1H225Z/1.15	Y5V	50V	2,200,000	+80/-20%	1.15 ± 0.10
C3216Y5V1H475Z	Y5V	50V	4,700,000	+80/-20%	1.60 ± 0.30
C3216Y5V1E475Z/0.85	Y5V	25V	4,700,000	+80/-20%	0.85 ± 0.10
C3216Y5V1E475Z/1.15	Y5V	25V	4,700,000	+80/-20%	1.15 ± 0.10
C3216Y5V1E106Z	Y5V	25V	10,000,000	+80/-20%	1.60 ± 0.30
C3216Y5V1C475Z/0.85	Y5V	16V	4,700,000	+80/-20%	0.85 ± 0.10
C3216Y5V1C475Z/1.15	Y5V	16V	4,700,000	+80/-20%	1.15 ± 0.10
C3216Y5V1C475Z/1.30	Y5V	16V	4,700,000	+80/-20%	1.30 ± 0.15
C3216Y5V1C106Z	Y5V	16V	10,000,000	+80/-20%	1.60 ± 0.30
C3216Y5V1C226Z	Y5V	16V	22,000,000	+80/-20%	1.60 ± 0.30
C3216Y5V1A106Z/0.85	Y5V	10V	10,000,000	+80/-20%	0.85 ± 0.10
C3216Y5V1A106Z/1.15	Y5V	10V	10,000,000	+80/-20%	1.15 ± 0.10
C3216Y5V1A226Z	Y5V	10V	22,000,000	+80/-20%	1.60 ± 0.30
C3216Y5V0J476Z	Y5V	6.3V	47,000,000	+80/-20%	1.60 ± 0.30



Capacitance Range Chart

C3225 [EIA CC1210]

Capacitance Range Chart

Temperature Characteristics: C0G ($0 \pm 30\text{ppm}/^\circ\text{C}$)
Rated Voltage: 50V (1H)

Capacitance (pF)	Cap Code	Tolerance	C0G 1H (50V)
22,000	223	J: $\pm 5\%$	
33,000	333		
47,000	473		
68,000	683		
100,000	104		

Capacitance Range Chart

Temperature Characteristics: X7R ($\pm 15\%$), X7S ($\pm 22\%$), X5R ($\pm 15\%$), X6S ($\pm 22\%$), Y5V ($+22/-82\%$)
Rated Voltage: 50V (1H), 25V (1E), 16V (1C), 10V (1A), 6.3V (0J), 4V (0G)

Capacitance (pF)	Cap Code	Tolerance	X5R					X6S		
			1H (50V)	1E (25V)	1C (16V)	1A (10V)	0J (6.3V)	1H (50V)	0J (6.3V)	0G (4V)
4,700,000	475	K: $\pm 10\%$								
10,000,000	106	M: $\pm 20\%$								
15,000,000	156									
22,000,000	226									
33,000,000	336									
47,000,000	476									
68,000,000	686									
100,000,000	107									

Capacitance (pF)	Cap Code	Tolerance	X7R				X7S
			1H (50V)	1E (25V)	1C (16V)	1A (10V)	1H (50V)
470,000	474	K: $\pm 10\%$					
1,000,000	105	M: $\pm 20\%$					
1,500,000	155						
2,200,000	225						
3,300,000	335						
4,700,000	475						
6,800,000	685						
10,000,000	106						
15,000,000	156						
22,000,000	226						

Capacitance (pF)	Cap Code	Tolerance	Y5V				
			1H (50V)	1E (25V)	1C (16V)	1A (10V)	0J (6.3V)
4,700,000	475	Z: $+80/-20\%$					
10,000,000	106						
22,000,000	226						
47,000,000	476						
100,000,000	107						

Standard Thickness

1.15 mm 1.25 mm 1.30 mm 1.60 mm 2.00 mm 2.50 mm 2.30 mm

• Standard capacitance and thickness is shown. Please refer to Capacitance Range Table for additional capacitance values and thicknesses.



Capacitance Range Table

C3225 [EIA CC1210]

Class 1 (Temperature Compensating)

Temperature Characteristics: C0G (-55 to 125°C, 0±30 ppm/°C)

TDK Part Number (Ordering Code)	Temperature Characteristics	Rated Voltage	Capacitance (pF)	Capacitance Tolerance	Thickness (mm)
C3225C0G1H223J	C0G	50V	22,000	± 5%	1.30 ± 0.15
C3225C0G1H333J	C0G	50V	33,000	± 5%	1.60 ± 0.30
C3225C0G1H473J	C0G	50V	47,000	± 5%	2.00 ± 0.20
C3225C0G1H683J	C0G	50V	68,000	± 5%	2.00 ± 0.20
C3225C0G1H104J	C0G	50V	100,000	± 5%	2.50 ± 0.30

Class 2 (Temperature Stable)

Temperature Characteristics: X7R (-55 to +125°C, ±15%), X7S (-55 to +125°C, ±22%), X6S (-55 to +105°C, ±22%)

TDK Part Number (Ordering Code)	Temperature Characteristics	Rated Voltage	Capacitance (pF)	Capacitance Tolerance	Thickness (mm)
C3225X7R1H474K/1.30	X7R	50V	470,000	± 10%	1.30 ± 0.15
C3225X7R1H474M/1.30	X7R	50V	470,000	± 20%	1.30 ± 0.15
C3225X7R1H105K/1.60	X7R	50V	1,000,000	± 10%	1.60 ± 0.30
C3225X7R1H105M/1.60	X7R	50V	1,000,000	± 20%	1.60 ± 0.30
C3225X7R1H105K/2.00	X7R	50V	1,000,000	± 10%	2.00 ± 0.20
C3225X7R1H105M/2.00	X7R	50V	1,000,000	± 20%	2.00 ± 0.20
C3225X7R1H155K	X7R	50V	1,500,000	± 10%	2.00 ± 0.20
C3225X7R1H155M	X7R	50V	1,500,000	± 20%	2.00 ± 0.20
C3225X7R1H225K/2.00	X7R	50V	2,200,000	± 10%	2.00 ± 0.20
C3225X7R1H225M/2.00	X7R	50V	2,200,000	± 20%	2.00 ± 0.20
C3225X7R1H225K/2.50	X7R	50V	2,200,000	± 10%	2.50 ± 0.30
C3225X7R1H225M/2.50	X7R	50V	2,200,000	± 20%	2.50 ± 0.30
C3225X7R1H335K	X7R	50V	3,300,000	± 10%	2.50 ± 0.30
C3225X7R1H335M	X7R	50V	3,300,000	± 20%	2.50 ± 0.30
C3225X7R1H475K	X7R	50V	4,700,000	± 10%	2.50 ± 0.30
C3225X7R1H475M	X7R	50V	4,700,000	± 20%	2.50 ± 0.30
C3225X6S1H475K	X6S	50V	4,700,000	± 10%	2.50 ± 0.30
C3225X6S1H475M	X6S	50V	4,700,000	± 20%	2.50 ± 0.30
C3225X7S1H685K	X7S	50V	6,800,000	± 10%	2.50 ± 0.30
C3225X7S1H685M	X7S	50V	6,800,000	± 20%	2.50 ± 0.30
C3225X7S1H106K	X7S	50V	10,000,000	± 10%	2.50 ± 0.30
C3225X7S1H106M	X7S	50V	10,000,000	± 20%	2.50 ± 0.30
C3225X7R1E225K/1.60	X7R	25V	2,200,000	± 10%	1.60 ± 0.30
C3225X7R1E225M/1.60	X7R	25V	2,200,000	± 20%	1.60 ± 0.30
C3225X7R1E335K	X7R	25V	3,300,000	± 10%	1.60 ± 0.30
C3225X7R1E335M	X7R	25V	3,300,000	± 20%	1.60 ± 0.30
C3225X7R1E475K	X7R	25V	4,700,000	± 10%	2.00 ± 0.20
C3225X7R1E475M	X7R	25V	4,700,000	± 20%	2.00 ± 0.20
C3225X7R1E685K/2.50	X7R	25V	6,800,000	± 10%	2.50 ± 0.30
C3225X7R1E685M/2.50	X7R	25V	6,800,000	± 20%	2.50 ± 0.30
C3225X7R1E106K	X7R	25V	10,000,000	± 10%	2.50 ± 0.30
C3225X7R1E106M	X7R	25V	10,000,000	± 20%	2.50 ± 0.30
C3225X7R1C106K	X7R	16V	10,000,000	± 10%	2.00 ± 0.20
C3225X7R1C106M	X7R	16V	10,000,000	± 20%	2.00 ± 0.20
C3225X7R1C156M	X7R	16V	15,000,000	± 20%	2.50 ± 0.30



Capacitance Range Table

C3225 [EIA CC1210]

Class 2 (Temperature Stable)

Temperature Characteristics: X7R (-55 to +125°C, ±15%), X6S (-55 to +105°C, ±22%), X5R (-55 to +85°C, ±15%), Y5V(-30 to +85°C, +22/-82%)

TDK Part Number (Ordering Code)	Temperature Characteristics	Rated Voltage	Capacitance (pF)	Capacitance Tolerance	Thickness (mm)
C3225X7R1C226K	X7R	16V	22,000,000	± 10%	2.50 ± 0.30
C3225X7R1C226M	X7R	16V	22,000,000	± 20%	2.50 ± 0.30
C3225X7R1A226K/2.30	X7R	10V	22,000,000	± 10%	2.30 ± 0.20
C3225X7R1A226M/2.30	X7R	10V	22,000,000	± 20%	2.30 ± 0.20
C3225X5R1H475K	X5R	50V	4,700,000	± 10%	2.50 ± 0.30
C3225X5R1H475M	X5R	50V	4,700,000	± 20%	2.50 ± 0.30
C3225X5R1E106K	X5R	25V	10,000,000	± 10%	2.50 ± 0.30
C3225X5R1E106M	X5R	25V	10,000,000	± 20%	2.50 ± 0.30
C3225X5R1C106K	X5R	16V	10,000,000	± 10%	2.00 ± 0.20
C3225X5R1C106M	X5R	16V	10,000,000	± 20%	2.00 ± 0.20
C3225X5R1C156M	X5R	16V	15,000,000	± 20%	2.50 ± 0.30
C3225X5R1C226K	X5R	16V	22,000,000	± 10%	2.50 ± 0.30
C3225X5R1C226M	X5R	16V	22,000,000	± 20%	2.50 ± 0.30
C3225X5R1A106K	X5R	10V	10,000,000	± 10%	2.00 ± 0.20
C3225X5R1A106M	X5R	10V	10,000,000	± 20%	2.00 ± 0.20
C3225X5R1A156M/2.30	X5R	10V	15,000,000	± 20%	2.30 ± 0.20
C3225X5R1A226M	X5R	10V	22,000,000	± 20%	2.30 ± 0.20
C3225X5R1A336M	X5R	10V	33,000,000	± 20%	2.00 ± 0.20
C3225X5R1A476M	X5R	10V	47,000,000	± 20%	2.50 ± 0.30
C3225X5R0J226M/1.60	X5R	6.3V	22,000,000	± 20%	1.60 ± 0.30
C3225X5R0J226K/2.00	X5R	6.3V	22,000,000	± 10%	2.00 ± 0.20
C3225X5R0J226M/2.00	X5R	6.3V	22,000,000	± 20%	2.00 ± 0.20
C3225X5R0J226K/2.50	X5R	6.3V	22,000,000	± 10%	2.50 ± 0.30
C3225X5R0J226M/2.50	X5R	6.3V	22,000,000	± 20%	2.50 ± 0.30
C3225X5R0J336M/2.00	X5R	6.3V	33,000,000	± 20%	2.00 ± 0.20
C3225X5R0J336M/2.50	X5R	6.3V	33,000,000	± 20%	2.50 ± 0.30
C3225X5R0J476M	X5R	6.3V	47,000,000	± 20%	2.50 ± 0.30
C3225X5R0J686M	X5R	6.3V	68,000,000	± 20%	2.00 ± 0.20
C3225X5R0J107M	X5R	6.3V	100,000,000	± 20%	2.50 ± 0.30
C3225X6S0J476M	X6S	6.3V	47,000,000	± 20%	2.50 ± 0.30
C3225X6S0J107M	X6S	6.3V	100,000,000	± 20%	2.50 ± 0.30
C3225X6S0G107M	X6S	4V	100,000,000	± 20%	2.50 ± 0.30
C3225Y5V1H475Z/1.15	Y5V	50V	4,700,000	+80/-20%	1.15 ± 0.10
C3225Y5V1H475Z/1.60	Y5V	50V	4,700,000	+80/-20%	1.60 ± 0.30
C3225Y5V1H106Z	Y5V	50V	10,000,000	+80/-20%	1.60 ± 0.30
C3225Y5V1E106Z/1.30	Y5V	25V	10,000,000	+80/-20%	1.30 ± 0.15
C3225Y5V1E106Z/1.60	Y5V	25V	10,000,000	+80/-20%	1.60 ± 0.30
C3225Y5V1E226Z	Y5V	25V	22,000,000	+80/-20%	2.00 ± 0.20
C3225Y5V1C106Z/1.15	Y5V	16V	10,000,000	+80/-20%	1.15 ± 0.10
C3225Y5V1C106Z/1.60	Y5V	16V	10,000,000	+80/-20%	1.60 ± 0.30
C3225Y5V1C226Z/1.30	Y5V	16V	22,000,000	+80/-20%	1.30 ± 0.15
C3225Y5V1C226Z/2.00	Y5V	16V	22,000,000	+80/-20%	2.00 ± 0.20
C3225Y5V1C476Z	Y5V	16V	47,000,000	+80/-20%	2.30 ± 0.20
C3225Y5V1A226Z/1.15	Y5V	10V	22,000,000	+80/-20%	1.15 ± 0.10



Capacitance Range Table

C3225 [EIA CC1210]

Class 2 (Temperature Stable)

Temperature Characteristics: Y5V(-30 to +85°C, +22/-82%)

TDK Part Number (Ordering Code)	Temperature Characteristics	Rated Voltage	Capacitance (pF)	Capacitance Tolerance	Thickness (mm)
C3225Y5V1A476Z	Y5V	10V	47,000,000	+80/-20%	2.00 ± 0.20
C3225Y5V0J107Z	Y5V	6.3V	100,000,000	+80/-20%	2.50 ± 0.30



Capacitance Range Chart

C4532 [EIA CC1812]

Capacitance Range Chart

Temperature Characteristics: C0G ($0 \pm 30\text{ppm}/^\circ\text{C}$)
Rated Voltage: 50V (1H)

Capacitance (pF)	Cap Code	Tolerance	C0G 1H (50V)
47,000	473	J: $\pm 5\%$	
68,000	683		
100,000	104		
150,000	154		
220,000	224		

Capacitance Range Chart

Temperature Characteristics: X7R ($\pm 15\%$), X5R ($\pm 15\%$), Y5V ($+22/-82\%$)
Rated Voltage: 50V (1H), 25V (1E), 16V (1C), 10V (1A), 6.3V (0J)

Capacitance (pF)	Cap Code	Tolerance	X7R			X5R			
			1H (50V)	1E (25V)	1C (16V)	1E (25V)	1C (16V)	1A (10V)	0J (6.3V)
1,000,000	105	K: $\pm 10\%$ M: $\pm 20\%$							
1,500,000	155								
2,200,000	225								
3,300,000	335								
4,700,000	475								
6,800,000	685								
10,000,000	106								
15,000,000	156								
22,000,000	226								
33,000,000	336								
47,000,000	476								
68,000,000	686								
100,000,000	107								

Capacitance (pF)	Cap Code	Tolerance	Y5V			
			1H (50V)	1E (25V)	1C (16V)	1A (10V)
10,000,000	106	Z: $+80/-20\%$				
22,000,000	226					
47,000,000	476					
100,000,000	107					

Standard Thickness

1.60 mm 2.00 mm 2.30 mm 2.50 mm 2.80 mm 3.20 mm

• Standard capacitance and thickness is shown. Please refer to Capacitance Range Table for additional capacitance values and thicknesses.



Capacitance Range Table

C4532 [EIA CC1812]

Class 1 (Temperature Compensating)

Temperature Characteristics: C0G (-55 to 125°C, 0±30 ppm/°C)

TDK Part Number (Ordering Code)	Temperature Characteristics	Rated Voltage	Capacitance (pF)	Capacitance Tolerance	Thickness (mm)
C4532C0G1H473J	C0G	50V	47,000	± 5%	1.60 ± 0.30
C4532C0G1H683J	C0G	50V	68,000	± 5%	1.60 ± 0.30
C4532C0G1H104J	C0G	50V	100,000	± 5%	2.00 ± 0.20
C4532C0G1H154J	C0G	50V	150,000	± 5%	2.50 ± 0.30
C4532C0G1H224J	C0G	50V	220,000	± 5%	3.20 ± 0.30

Class 2 (Temperature Stable)

Temperature Characteristics: X7R (-55 to +125°C, ±15%), X5R (-55 to +85°C, ±15%)

TDK Part Number (Ordering Code)	Temperature Characteristics	Rated Voltage	Capacitance (pF)	Capacitance Tolerance	Thickness (mm)
C4532X7R1H105K	X7R	50V	1,000,000	± 10%	1.60 ± 0.30
C4532X7R1H105M	X7R	50V	1,000,000	± 20%	1.60 ± 0.30
C4532X7R1H155K/1.60	X7R	50V	1,500,000	± 10%	1.60 ± 0.30
C4532X7R1H155M/1.60	X7R	50V	1,500,000	± 20%	1.60 ± 0.30
C4532X7R1H225K	X7R	50V	2,200,000	± 10%	1.60 ± 0.30
C4532X7R1H225M	X7R	50V	2,200,000	± 20%	1.60 ± 0.30
C4532X7R1H335K	X7R	50V	3,300,000	± 10%	2.00 ± 0.20
C4532X7R1H335M	X7R	50V	3,300,000	± 20%	2.00 ± 0.20
C4532X7R1H475K/2.00	X7R	50V	4,700,000	± 10%	2.00 ± 0.20
C4532X7R1H475M/2.00	X7R	50V	4,700,000	± 20%	2.00 ± 0.20
C4532X7R1H685K	X7R	50V	6,800,000	± 10%	2.50 ± 0.30
C4532X7R1H685M	X7R	50V	6,800,000	± 20%	2.50 ± 0.30
C4532X7R1E475M/2.00	X7R	25V	4,700,000	± 20%	2.00 ± 0.20
C4532X7R1E106K	X7R	25V	10,000,000	± 10%	2.50 ± 0.30
C4532X7R1E106M	X7R	25V	10,000,000	± 20%	2.50 ± 0.30
C4532X7R1E156M/2.80	X7R	25V	15,000,000	± 20%	2.80 ± 0.30
C4532X7R1E226M	X7R	25V	22,000,000	± 20%	2.50 ± 0.30
C4532X7R1C106K	X7R	16V	10,000,000	± 10%	2.30 ± 0.20
C4532X7R1C106M	X7R	16V	10,000,000	± 20%	2.30 ± 0.20
C4532X7R1C226M/2.00	X7R	16V	22,000,000	± 20%	2.00 ± 0.20
C4532X7R1C226M/2.30	X7R	16V	22,000,000	± 20%	2.30 ± 0.20
C4532X7R1C336M	X7R	16V	33,000,000	± 20%	2.50 ± 0.30
C4532X5R1E106K	X5R	25V	10,000,000	± 10%	2.50 ± 0.30
C4532X5R1E106M	X5R	25V	10,000,000	± 20%	2.50 ± 0.30
C4532X5R1E156M/2.80	X5R	25V	15,000,000	± 20%	2.80 ± 0.30
C4532X5R1E226M	X5R	25V	22,000,000	± 20%	2.50 ± 0.30
C4532X5R1C226M/2.00	X5R	16V	22,000,000	± 20%	2.00 ± 0.20
C4532X5R1C226M/2.30	X5R	16V	22,000,000	± 20%	2.30 ± 0.20
C4532X5R1C336M	X5R	16V	33,000,000	± 20%	2.50 ± 0.30
C4532X5R1A226M	X5R	10V	22,000,000	± 20%	2.30 ± 0.20
C4532X5R1A336M	X5R	10V	33,000,000	± 20%	2.30 ± 0.20
C4532X5R1A476M	X5R	10V	47,000,000	± 20%	2.80 ± 0.30
C4532X5R1A107M	X5R	10V	100,000,000	± 20%	2.80 ± 0.30
C4532X5R0J476M	X5R	6.3V	47,000,000	± 20%	2.50 ± 0.30
C4532X5R0J686M	X5R	6.3V	68,000,000	± 20%	2.80 ± 0.30



Capacitance Range Table

C4532 [EIA CC1812]

Class 2 (Temperature Stable)

Temperature Characteristics: X5R (-55 to +85°C, ±15%), Y5V(-30 to +85°C, +22/-82%)

TDK Part Number (Ordering Code)	Temperature Characteristics	Rated Voltage	Capacitance (pF)	Capacitance Tolerance	Thickness (mm)
C4532X5R0J107M	X5R	6.3V	100,000,000	± 20%	2.80 ± 0.30
C4532Y5V1H106Z	Y5V	50V	10,000,000	+80/-20%	2.00 ± 0.20
C4532Y5V1E226Z	Y5V	25V	22,000,000	+80/-20%	2.00 ± 0.20
C4532Y5V1C476Z	Y5V	16V	47,000,000	+80/-20%	2.50 ± 0.30
C4532Y5V1A107Z	Y5V	10V	100,000,000	+80/-20%	2.50 ± 0.30



Capacitance Range Chart

C5750 [EIA CC2220]

Capacitance Range Chart

Temperature Characteristics: X7R ($\pm 15\%$), X5R ($\pm 15\%$), Y5V (+22/-82%)
 Rated Voltage: 50V (1H), 25V (1E), 16V (1C), 10V (1A), 6.3V (0J)

Capacitance (pF)	Cap Code	Tolerance	X7R			X5R				
			1H (50V)	1E (25V)	1C (16V)	1H (50V)	1E (25V)	1C (16V)	1A (10V)	0J (6.3V)
4,700,000	475	K: $\pm 10\%$ M: $\pm 20\%$								
6,800,000	685									
10,000,000	106									
15,000,000	156									
22,000,000	226									
33,000,000	336									
47,000,000	476									
68,000,000	686									
100,000,000	107									

Capacitance (pF)	Cap Code	Tolerance	Y5V			
			1H (50V)	1E (25V)	1C (16V)	1A (10V)
10,000,000	106	Z: +80/-20%				
22,000,000	226					
47,000,000	476					
100,000,000	107					

Standard Thickness

2.00 mm
 2.30 mm
 2.50 mm
 2.80 mm



Capacitance Range Table

C5750 [EIA CC2220]

Class 2 (Temperature Stable)

Temperature Characteristics: X7R (-55 to +125°C, ±15%), X5R (-55 to +85°C, ±15%), Y5V (-30 to +85°C, +22/-82%)

TDK Part Number (Ordering Code)	Temperature Characteristics	Rated Voltage	Capacitance (pF)	Capacitance Tolerance	Thickness (mm)
C5750X7R1H475K/2.00	X7R	50V	4,700,000	± 10%	2.00 ± 0.20
C5750X7R1H475M/2.00	X7R	50V	4,700,000	± 20%	2.00 ± 0.20
C5750X7R1H475M/2.80	X7R	50V	4,700,000	± 20%	2.80 ± 0.20
C5750X7R1H685K	X7R	50V	6,800,000	± 10%	2.50 ± 0.30
C5750X7R1H685M	X7R	50V	6,800,000	± 20%	2.50 ± 0.30
C5750X7R1H106K	X7R	50V	10,000,000	± 10%	2.30 ± 0.20
C5750X7R1H106M	X7R	50V	10,000,000	± 20%	2.30 ± 0.20
C5750X7R1E106M	X7R	25V	10,000,000	± 20%	2.00 ± 0.20
C5750X7R1E156M	X7R	25V	15,000,000	± 20%	2.30 ± 0.20
C5750X7R1E226M	X7R	25V	22,000,000	± 20%	2.50 ± 0.30
C5750X7R1C226M	X7R	16V	22,000,000	± 20%	2.80 ± 0.20
C5750X7R1C476M	X7R	16V	47,000,000	± 20%	2.30 ± 0.20
C5750X5R1H106K	X5R	50V	10,000,000	± 10%	2.30 ± 0.20
C5750X5R1H106M	X5R	50V	10,000,000	± 20%	2.30 ± 0.20
C5750X5R1E226M	X5R	25V	22,000,000	± 20%	2.30 ± 0.20
C5750X5R1C336M	X5R	16V	33,000,000	± 20%	2.00 ± 0.20
C5750X5R1C476M	X5R	16V	47,000,000	± 20%	2.30 ± 0.20
C5750X5R1A686M	X5R	10V	68,000,000	± 20%	2.30 ± 0.20
C5750X5R1A107M	X5R	10V	100,000,000	± 20%	2.80 ± 0.20
C5750X5R0J107M	X5R	6.3V	100,000,000	± 20%	2.80 ± 0.20
C5750Y5V1H226Z	Y5V	50V	22,000,000	+80/-20%	2.00 ± 0.20
C5750Y5V1E476Z	Y5V	25V	47,000,000	+80/-20%	2.00 ± 0.20
C5750Y5V1C107Z	Y5V	16V	100,000,000	+80/-20%	2.50 ± 0.30
C5750Y5V1A107Z	Y5V	10V	100,000,000	+80/-20%	2.50 ± 0.30



General Specifications

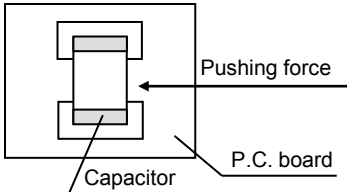
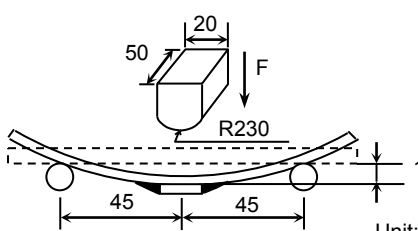
C Series – General Application

No.	Item	Performance	Test or Inspection Method			
1	External Appearance	No defects which may affect performance.	Inspect with magnifying glass (3×), in case of C0603 type, with magnifying glass (10×).			
2	Insulation Resistance	10,000MΩ or 500MΩ•μF min. (As for the capacitors of rated voltage 16, 10 and 6.3V DC, 10,000 MΩ or 100MΩ•μF min.,) whichever smaller.	Apply rated voltage for 60s. As for the rated voltage 630V DC, apply 500V DC.			
3	Voltage Proof	Withstand test voltage without insulation breakdown or other damage.	Class	Apply voltage		
			Class 1	3 × rated voltage		
			Class 2	2.5 × rated voltage		
			Above DC voltage shall be applied for 1 to 5s. Charge / discharge current shall not exceed 50mA.			
4	Capacitance	Within the specified tolerance.	Class	Rated Capacitance	Measuring Frequency	Measuring voltage
			Class 1	C ≤ 1000pF	1MHz±10%	0.5 - 5 V _{rms}
				C >1000pF	1kHz±10%	
			Class 2	C ≤ 10uF	1kHz±10%	0.5±0.2V _{rms}
				C > 10uF	120Hz±20%	1.0±0.2V _{rms} 0.5±0.2 V _{rms}
5	Q (Class 1)	Rated Capacitance	Q		See No.4 in this table for measuring condition.	
		30pF and over	1,000 min.			
		Under 30pF	400+20×C min.			
		C : Rated capacitance (pF)				
6	Dissipation Factor (Class 2)	T.C.	Rated Voltage	D.F.		See No.4 in this table for measuring condition.
		X5R X7R	-	0.03 max.		
				0.05 max.		
				0.75 max.		
				0.1 max.		
				0.125 max.		
		Y5V	50VDC	0.15 max.		
				0.05 max.		
				0.075 max.		
0.10 max.						
		10VDC	0.125 max.			
		6.3VDC	0.20 max.			

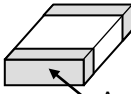


General Specifications

C Series – General Application

No.	Item	Performance	Test or Inspection Method																	
7	Temperature Characteristics of Capacitance (Class 1)	<table><tr><th>T.C.</th><th>Temperature Coefficient</th></tr><tr><td>C0G</td><td>0 ± 30 (ppm/°C)</td></tr></table> Capacitance drift Within ± 0.2% or ±0.05pF, whichever larger.	T.C.	Temperature Coefficient	C0G	0 ± 30 (ppm/°C)	Temperature coefficient shall be calculated based on values at 25°C and 85°C temperature. Measuring temperature below 20°C shall be -10°C and -25°C.													
T.C.	Temperature Coefficient																			
C0G	0 ± 30 (ppm/°C)																			
8	Temperature Characteristics of Capacitance (Class 2)	Capacitance Change (%) <table><tr><th>No Voltage Applied</th></tr><tr><td>X5R: ± 15%</td></tr><tr><td>X7R: ± 15%</td></tr><tr><td>X6S: ± 22%</td></tr><tr><td>X7S: ± 22%</td></tr><tr><td>X7T: +22/-33%</td></tr><tr><td>Y5V: + 22/-82%</td></tr></table>	No Voltage Applied	X5R: ± 15%	X7R: ± 15%	X6S: ± 22%	X7S: ± 22%	X7T: +22/-33%	Y5V: + 22/-82%	Capacitance shall be measured by the steps shown in the following table after thermal equilibrium is obtained for each step. ΔC be calculated ref. STEP 3 reading <table><tr><th>Step</th><th>Temperature (°C)</th></tr><tr><td>1</td><td>Reference temp. ± 2</td></tr><tr><td>2</td><td>Min. operating temp. ± 2</td></tr><tr><td>3</td><td>Reference temp. ± 2</td></tr><tr><td>4</td><td>Max. operating temp. ± 2</td></tr></table> Measuring voltage: 0.1, 0.2, 0.5, 1.0V _{rms} .	Step	Temperature (°C)	1	Reference temp. ± 2	2	Min. operating temp. ± 2	3	Reference temp. ± 2	4	Max. operating temp. ± 2
No Voltage Applied																				
X5R: ± 15%																				
X7R: ± 15%																				
X6S: ± 22%																				
X7S: ± 22%																				
X7T: +22/-33%																				
Y5V: + 22/-82%																				
Step	Temperature (°C)																			
1	Reference temp. ± 2																			
2	Min. operating temp. ± 2																			
3	Reference temp. ± 2																			
4	Max. operating temp. ± 2																			
9	Robustness of Terminations	No sign of termination coming off, breakage of ceramic, or other abnormal signs.	Reflow solder the capacitor on P.C. board (shown in Appendix 1a or Appendix 1b) and apply a pushing force of 2N (C0603, C1005) or 5N (C1608, C2012, C3216, C3225, C4532, C5750) for 10± 1s. 																	
10	Bending	No mechanical damage.	Reflow solder the capacitor on P.C. board (shown in Appendix 2a or Appendix 2b) and bend it for 1mm.  Unit: mm																	



No.	Item	Performance	Test or Inspection Method																														
11	Solderability	New solder to cover over 75% of termination. 25% may have pinholes or rough spots but not concentrated in one spot. Ceramic surface of A sections shall not be exposed due to melting or shifting of termination material.  A section	Completely soak both terminations in solder at $235 \pm 5^{\circ}\text{C}$ for $2 \pm 0.5\text{s}$. Solder: H63A (JIS Z 3282) Flux: Isopropyl alcohol (JIS K 8839) Rosin (JIS K 5902) 25% solid solution.																														
12	Resistance to solder heat	External appearance No cracks are allowed and terminations shall be covered at least 60% with new solder. <table><tr><td rowspan="4">Capacitance</td><td colspan="2">Characteristics</td><td>Change from the value before test</td></tr><tr><td>Class 1</td><td>C0G</td><td>Capacitance drift within $\pm 2.5\%$ or $\pm 0.25\text{pF}$, whichever larger.</td></tr><tr><td>Class 2</td><td>X5R</td><td>$\pm 7.5\%$</td></tr><tr><td></td><td>X7R</td><td>$\pm 7.5\%$</td></tr><tr><td></td><td></td><td>Y5V</td><td>$\pm 20\%$</td></tr></table> <table><tr><td rowspan="3">Q (Class 1)</td><td>Rated Capacitance</td><td>Q</td></tr><tr><td>$C \geq 30\text{pF}$</td><td>1,000 min.</td></tr><tr><td>$C < 30\text{pF}$</td><td>$400 + 20 \times C$ min.</td></tr></table> C : Rated capacitance (pF) <table><tr><td>D.F. (Class 2)</td><td>Meet the initial spec.</td></tr></table> <table><tr><td>Insulation Resistance</td><td>Meet the initial spec.</td></tr></table> <table><tr><td>Voltage Proof</td><td>No insulation breakdown or other damage.</td></tr></table>	Capacitance	Characteristics		Change from the value before test	Class 1	C0G	Capacitance drift within $\pm 2.5\%$ or $\pm 0.25\text{pF}$, whichever larger.	Class 2	X5R	$\pm 7.5\%$		X7R	$\pm 7.5\%$			Y5V	$\pm 20\%$	Q (Class 1)	Rated Capacitance	Q	$C \geq 30\text{pF}$	1,000 min.	$C < 30\text{pF}$	$400 + 20 \times C$ min.	D.F. (Class 2)	Meet the initial spec.	Insulation Resistance	Meet the initial spec.	Voltage Proof	No insulation breakdown or other damage.	Completely soak both terminations in solder at $260 \pm 5^{\circ}\text{C}$ for $5 \pm 1\text{s}$. Preheating condition Temp.: $150 \pm 10^{\circ}\text{C}$ Time: 1 to 2min. Flux: Isopropyl alcohol (JIS K 8839) Rosin (JIS K 5902) 25% solid solution. Solder: H63A (JIS Z 3282) Leave the capacitor in ambient conditions for 6 to 24h (Class 1) or $24 \pm 2\text{h}$ (Class 2) before measurement.
Capacitance	Characteristics			Change from the value before test																													
	Class 1	C0G		Capacitance drift within $\pm 2.5\%$ or $\pm 0.25\text{pF}$, whichever larger.																													
	Class 2	X5R		$\pm 7.5\%$																													
		X7R	$\pm 7.5\%$																														
		Y5V	$\pm 20\%$																														
Q (Class 1)	Rated Capacitance	Q																															
	$C \geq 30\text{pF}$	1,000 min.																															
	$C < 30\text{pF}$	$400 + 20 \times C$ min.																															
D.F. (Class 2)	Meet the initial spec.																																
Insulation Resistance	Meet the initial spec.																																
Voltage Proof	No insulation breakdown or other damage.																																



No.	Item	Performance	Test or Inspection Method													
13	Vibration															
	External appearance	No mechanical damage.	Reflow solder the capacitor on P.C. board (shown in Appendix 1a or Appendix 1b) before testing.													
	Capacitance	<table><tr><th colspan="2">Characteristics</th><th>Change from the value before test</th></tr><tr><td>Class 1</td><td>C0G</td><td>$\pm 2.5\%$ or $\pm 0.25\text{pF}$, whichever larger.</td></tr><tr><td rowspan="3">Class 2</td><td>X5R</td><td>$\pm 7.5\%$</td></tr><tr><td>X7R</td><td>$\pm 7.5\%$</td></tr><tr><td>Y5V</td><td>$\pm 20\%$</td></tr></table>	Characteristics		Change from the value before test	Class 1	C0G	$\pm 2.5\%$ or $\pm 0.25\text{pF}$, whichever larger.	Class 2	X5R	$\pm 7.5\%$	X7R	$\pm 7.5\%$	Y5V	$\pm 20\%$	Vibrate the capacitor with amplitude of 1.5mm P-P changing the frequencies from 10Hz to 55Hz and back to 10Hz after 1min. Repeat this for 2h each in 3 perpendicular directions.
	Characteristics		Change from the value before test													
	Class 1	C0G	$\pm 2.5\%$ or $\pm 0.25\text{pF}$, whichever larger.													
	Class 2	X5R	$\pm 7.5\%$													
		X7R	$\pm 7.5\%$													
		Y5V	$\pm 20\%$													
	Q (Class 1)	<table><tr><th>Rated Capacitance</th><th>Q</th></tr><tr><td>$C \geq 30\text{pF}$</td><td>1,000 min.</td></tr><tr><td>$C < 30\text{pF}$</td><td>$400+20 \times C$ min.</td></tr></table> C : Rated capacitance (pF)	Rated Capacitance	Q	$C \geq 30\text{pF}$	1,000 min.	$C < 30\text{pF}$	$400+20 \times C$ min.								
	Rated Capacitance	Q														
$C \geq 30\text{pF}$	1,000 min.															
$C < 30\text{pF}$	$400+20 \times C$ min.															
D.F. (Class 2)	Meet the initial spec.															
14	Temperature cycle															
	External appearance	No mechanical damage.	Reflow solder the capacitor on P.C. board (shown in Appendix 1a or Appendix 1b) before testing.													
	Capacitance	<table><tr><th colspan="2">Characteristics</th><th>Change from the value before test</th></tr><tr><td>Class 1</td><td>C0G</td><td>$\pm 2.5\%$ or $\pm 0.25\text{pF}$, whichever larger.</td></tr><tr><td rowspan="3">Class 2</td><td>X5R</td><td>$\pm 15\%$</td></tr><tr><td>X7R</td><td>$\pm 15\%$</td></tr><tr><td>Y5V</td><td>$\pm 20\%$</td></tr></table>	Characteristics		Change from the value before test	Class 1	C0G	$\pm 2.5\%$ or $\pm 0.25\text{pF}$, whichever larger.	Class 2	X5R	$\pm 15\%$	X7R	$\pm 15\%$	Y5V	$\pm 20\%$	Expose the capacitor in the condition step1 through step 4 and repeat 5 times consecutively.
	Characteristics		Change from the value before test													
	Class 1	C0G	$\pm 2.5\%$ or $\pm 0.25\text{pF}$, whichever larger.													
	Class 2	X5R	$\pm 15\%$													
		X7R	$\pm 15\%$													
		Y5V	$\pm 20\%$													
	Q (Class 1)	<table><tr><th>Rated Capacitance</th><th>Q</th></tr><tr><td>$C \geq 30\text{pF}$</td><td>1,000 min.</td></tr><tr><td>$C < 30\text{pF}$</td><td>$400+20 \times C$ min.</td></tr></table> C : Rated capacitance (pF)	Rated Capacitance	Q	$C \geq 30\text{pF}$	1,000 min.	$C < 30\text{pF}$	$400+20 \times C$ min.	Leave the capacitor in ambient conditions for 6 to 24h (Class 1) or $24 \pm 2\text{h}$ (Class 2) before measurement.							
	Rated Capacitance	Q														
$C \geq 30\text{pF}$	1,000 min.															
$C < 30\text{pF}$	$400+20 \times C$ min.															
D.F. (Class 2)	Meet the initial spec.															
Insulation Resistance	Meet the initial spec.															
Voltage Proof	No insulation breakdown or other damage.															

Step	Temperature (°C)	Time (min.)
1	Min. operating temp. ± 3	30 ± 3
2	Reference Temp.	2 – 5
3	Max. operating temp. ± 2	30 ± 2
4	Reference Temp.	2 - 5

Step	Temperature (°C)	Time (min.)
1	Min. operating temp. ± 3	30 ± 3
2	Reference Temp.	2 – 5
3	Max. operating temp. ± 2	30 ± 2
4	Reference Temp.	2 – 5



General Specifications

C Series – General Application

No.	Item	Performance	Test or Inspection Method	
15	Moisture Resistance (Steady State)		Reflow solder the capacitor on P.C. board (shown in Appendix 1a or Appendix 1b) before testing. Leave at temperature $40 \pm 2^{\circ}\text{C}$, 90 to 95%RH for 500 +24,0h. Leave the capacitor in ambient conditions for 6 to 24h (Class 1) or $24 \pm 2\text{h}$ (Class 2) before measurement.	
	External appearance	No mechanical damage.		
	Capacitance	Characteristics		
		Change from the value before test		
		Class 1	C0G	$\pm 5\%$ or $\pm 0.5\text{pF}$, whichever larger.
		Class 2	X5R	$\pm 25\%$
	X7R		$\pm 25\%$	
	Y5V		$\pm 30\%$	
	Q (Class 1)	Rated Capacitance		
		Q		
$C \geq 30\text{pF}$		350 min.		
$10\text{pF} \leq C < 30\text{pF}$		$275 + 5/2 \times C$ min.		
$C < 10\text{pF}$		$200 + 10 \times C$ min.		
	C : Rated capacitance (pF)			
D.F. (Class 2)	Characteristics X5R: 200% of initial spec. max. X7R: 200% of initial spec. max Y5V: 150% of initial spec. max			
Insulation Resistance	1,000M Ω or 50M $\Omega \cdot \mu\text{F}$ min. (As for the capacitors of rated voltage 16, 10 and 6.3V DC, 1,000 M Ω or 10M $\Omega \cdot \mu\text{F}$ min.,) whichever smaller.			



No.	Item	Performance	Test or Inspection Method													
16	Moisture Resistance															
	External appearance	No mechanical damage.	Reflow solder the capacitor on P.C. board (shown in Appendix 1a or Appendix 1b) before testing. Apply the rated voltage at temperature $40 \pm 2^{\circ}\text{C}$ and 90 to 95%RH for 500 +24,0h. Charge/discharge current shall not exceed 50mA.													
	Capacitance	<table><thead><tr><th colspan="2">Characteristics</th><th>Change from the value before test</th></tr></thead><tbody><tr><td>Class 1</td><td>C0G</td><td>$\pm 7.5\%$ or $\pm 0.75\text{pF}$, whichever larger.</td></tr><tr><td rowspan="3">Class 2</td><td>X5R</td><td>$\pm 25\%$</td></tr><tr><td>X7R</td><td>$\pm 25\%$</td></tr><tr><td>Y5V</td><td>$\pm 30\%$ * ($\pm 40\%$)</td></tr></tbody></table> * Inside () is applied to Y5V 6.3V product.	Characteristics		Change from the value before test	Class 1	C0G	$\pm 7.5\%$ or $\pm 0.75\text{pF}$, whichever larger.	Class 2	X5R	$\pm 25\%$	X7R	$\pm 25\%$	Y5V	$\pm 30\%$ * ($\pm 40\%$)	Leave the capacitor in ambient conditions for 6 to 24h (Class 1) or $24 \pm 2\text{h}$ (Class 2) before measurement. Voltage conditioning (only for Class 2): Voltage treat the capacitor under testing temperature and voltage for 1 hour.
	Characteristics		Change from the value before test													
	Class 1	C0G	$\pm 7.5\%$ or $\pm 0.75\text{pF}$, whichever larger.													
Class 2	X5R	$\pm 25\%$														
	X7R	$\pm 25\%$														
	Y5V	$\pm 30\%$ * ($\pm 40\%$)														
Q (Class 1)	<table><thead><tr><th>Rated Capacitance</th><th>Q</th></tr></thead><tbody><tr><td>$C \geq 30\text{pF}$</td><td>200 min.</td></tr><tr><td>$C < 30\text{pF}$</td><td>$100+10/3 \times C$ min.</td></tr></tbody></table> C : Rated capacitance (pF)	Rated Capacitance	Q	$C \geq 30\text{pF}$	200 min.	$C < 30\text{pF}$	$100+10/3 \times C$ min.	Leave the capacitor in ambient conditions for $24 \pm 2\text{h}$ before measurement. Use this measurement for initial value.								
Rated Capacitance	Q															
$C \geq 30\text{pF}$	200 min.															
$C < 30\text{pF}$	$100+10/3 \times C$ min.															
D.F. (Class 2)	Characteristics X5R: 200% of initial spec. max. X7R: 200% of initial spec. max Y5V: 150% of initial spec. max															
Insulation Resistance	500MΩor 25MΩ•μF min., whichever smaller. (As for the capacitors of rated voltage 16, 10 and 6.3V DC, 500 MΩ or 5MΩ•μF min.,)															



General Specifications

C Series – General Application

No.	Item	Performance	Test or Inspection Method														
17	Life																
	External appearance	No mechanical damage.	Reflow solder the capacitor on P.C. board (shown in Appendix 1a or Appendix 1b) before testing.														
	Capacitance	<table><tr><th colspan="2">Characteristics</th><th>Change from the value before test</th></tr><tr><td>Class 1</td><td>C0G</td><td>±3% or ±0.3pF, whichever larger.</td></tr><tr><td rowspan="3">Class 2</td><td>X5R</td><td>± 25 %</td></tr><tr><td>X7R</td><td>± 25 %</td></tr><tr><td>Y5V</td><td>± 30 % *(± 40 %)</td></tr></table>		Characteristics		Change from the value before test	Class 1	C0G	±3% or ±0.3pF, whichever larger.	Class 2	X5R	± 25 %	X7R	± 25 %	Y5V	± 30 % *(± 40 %)	Apply voltage at 125±2°C for 1,000 +48, 0h. Applied voltage is 1xRV. Some items may be tested at higher voltage (1.2x, 1.5x or 2xRV).
		Characteristics		Change from the value before test													
		Class 1	C0G	±3% or ±0.3pF, whichever larger.													
		Class 2	X5R	± 25 %													
			X7R	± 25 %													
	Y5V		± 30 % *(± 40 %)														
			Charge/discharge current shall not exceed 50mA.														
			Leave the capacitors in ambient condition for 6 to 24h (Class 1) or 24±2h (Class 2) before measurement.														
		Voltage conditioning (only for class 2) Voltage treat the capacitor under testing temperature and voltage for 1 hour.															
Q (Class 1)	<table><tr><th>Rated Capacitance</th><th>Q</th></tr><tr><td>C ≥ 30pF</td><td>350 min.</td></tr><tr><td>10pF ≤ C < 30pF</td><td>275+5/2×C min.</td></tr><tr><td>C < 10pF</td><td>200+10×C min.</td></tr></table>		Rated Capacitance	Q	C ≥ 30pF	350 min.	10pF ≤ C < 30pF	275+5/2×C min.	C < 10pF	200+10×C min.	Leave the capacitor in ambient conditions for 24±2h before measurement.						
	Rated Capacitance	Q															
	C ≥ 30pF	350 min.															
	10pF ≤ C < 30pF	275+5/2×C min.															
	C < 10pF	200+10×C min.															
		Use this measurement for initial value.															
D.F. (Class 2)	Characteristics X5R: 200% of initial spec. max. X7R: 200% of initial spec. max Y5V: 150% of initial spec. max																
Insulation Resistance	1,000MΩ or 50MΩ•μF min. , whichever smaller. (As for the capacitors of rated voltage 16, 10 and 6.3V DC, 1,000 MΩ or 10MΩ•μF min.,)																

***As for the initial measurement of capacitors (Class2) on number 8,12,13,14 and 15, leave capacitor at $150 - 10, 0^\circ\text{C}$ for 1 hour and measure the value after leaving capacitor for $24 \pm 2\text{h}$ in ambient conditions.**



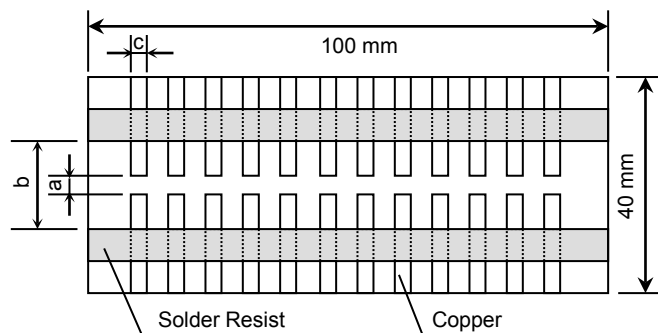
General Specifications

C Series – General Application

Appendix - 1a

P.C. Board for reliability test

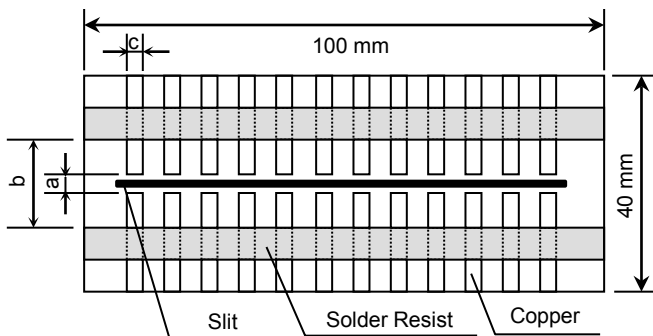
Applied for C0603, C1005, C1608, C2012, C3216



Appendix - 1b

P.C. Board for reliability test

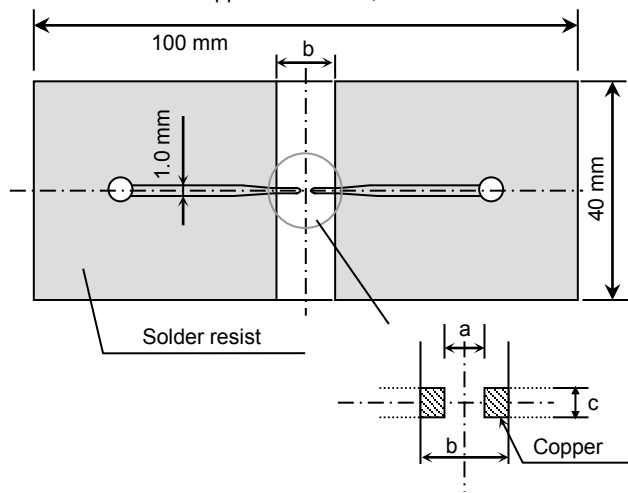
Applied for C3225, C4532, C5750



Appendix - 2a

P.C. Board for bending test

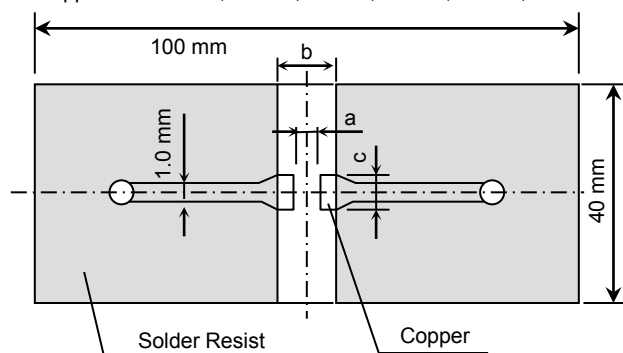
Applied for C0603, C1005



Appendix - 2b

P.C. Board for bending test

Applied for C1608, C2012, C3216, C3225, C4532, C5750



Material: Glass Epoxy (As per JIS C6484 GE4)

P.C. Board thickness: Appendix-2a 0.8mm
Appendix-1a, 1b, 2b 1.6mm



Copper (thickness 0.035mm)
Solder resist

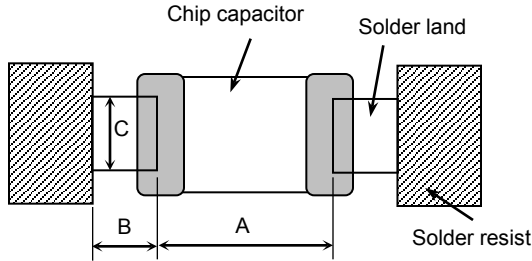
Case Code		Dimensions (mm)		
JIS	EIA	a	b	c
C0603	CC0201	0.3	0.8	0.3
C1005	CC0402	0.4	1.5	0.5
C1608	CC0603	1.0	3.0	1.2
C2012	CC0805	1.2	4.0	1.65
C3216	CC1206	2.2	5.0	2.0
C3225	CC1210	2.2	5.0	2.9
C4532	CC1812	3.5	7.0	3.7
C5750	CC2220	4.5	8.0	5.6



Soldering Information

C Series – General Application

Recommended Soldering Land Pattern



Wave Soldering

Unit: mm

Type	C1608 [CC0603]	C2012 [CC0805]	C3216 [CC1206]
Symbol			
A	0.7 - 1.0	1.0 - 1.3	2.1 - 2.5
B	0.8 - 1.0	1.0 - 1.2	1.1 - 1.3
C	0.6 - 0.8	0.8 - 1.1	1.0 - 1.3

Reflow Soldering

Unit: mm

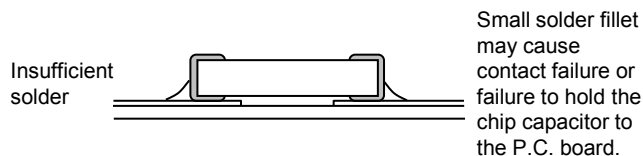
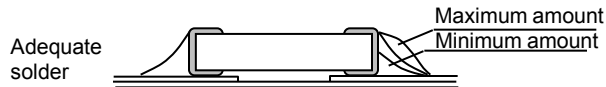
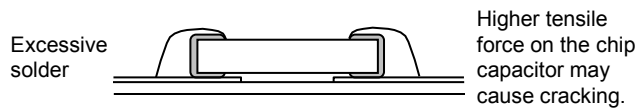
Type	C0603 [CC0201]	C1005 [CC0402]	C1608 [CC0603]	C2012 [CC0805]
Symbol				
A	0.25 - 0.35	0.3 - 0.5	0.6 - 0.8	0.9 - 1.2
B	0.2 - 0.3	0.35 - 0.45	0.6 - 0.8	0.7 - 0.9
C	0.25 - 0.35	0.4 - 0.6	0.6 - 0.8	0.9 - 1.2

Reflow Soldering

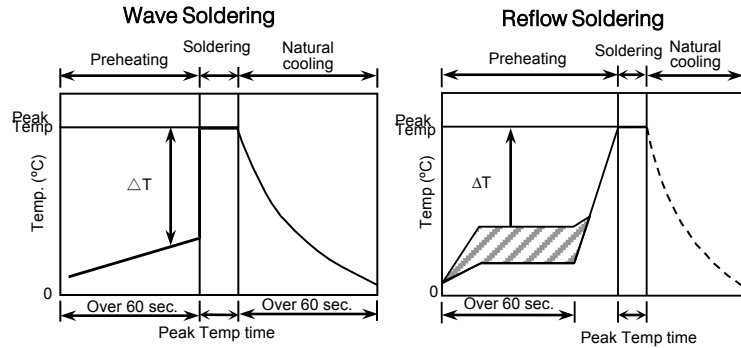
Unit: mm

Type	C3216 [CC1206]	C3225 [CC1210]	C4532 [CC1812]	C5750 [CC2220]
Symbol				
A	2.0 - 2.4	2.0 - 2.4	3.1 - 3.7	4.1 - 4.8
B	1.0 - 1.2	1.0 - 1.2	1.2 - 1.4	1.2 - 1.4
C	1.1 - 1.6	1.9 - 2.5	2.4 - 3.2	4.0 - 5.0

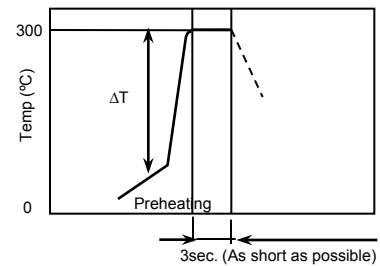
Recommended Solder Amount



Recommended Soldering Profile



Manual soldering (Solder iron)



Recommended soldering duration

Solder	Temp./ Dura.	Wave Soldering		Reflow Soldering	
		Peak temp (°C)	Duration (sec.)	Peak temp (°C)	Duration (sec.)
Sn-Pb Solder		250 max.	3 max.	230 max.	20 max.
Lead-Free Solder		260 max.	5 max.	260 max.	10 max.

Recommended solder compositions

Sn-37Pb (Sn-Pb solder)
Sn-3.0Ag-0.5Cu (Lead Free Solder)

Preheating Condition

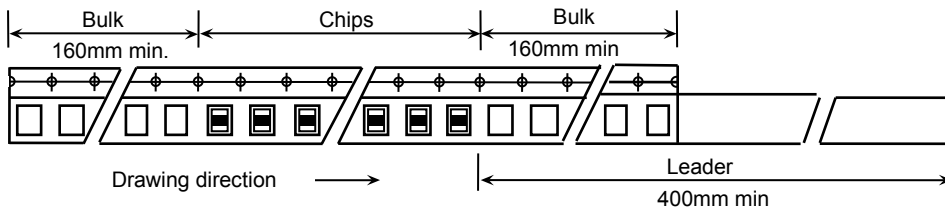
Soldering	Case Size - JIS (EIA)	Temp. (°C)
Wave soldering	C1608(CC0603), C2012(CC0805), C3216(CC1206)	$\Delta T \leq 150$
Reflow soldering	C0603(CC0201), C1005(CC0402), C1608(CC0603), C2012(CC0805), C3216(CC1206)	$\Delta T \leq 150$
	C3225(CC1210), C4532(CC1812), C5750(CC2220)	$\Delta T \leq 130$
Manual soldering	C0603(CC0201), C1005(CC0402), C1608(CC0603), C2012(CC0805), C3216(CC1206)	$\Delta T \leq 150$
	C3225(CC1210), C4532(CC1812), C5750(CC2220)	$\Delta T \leq 130$



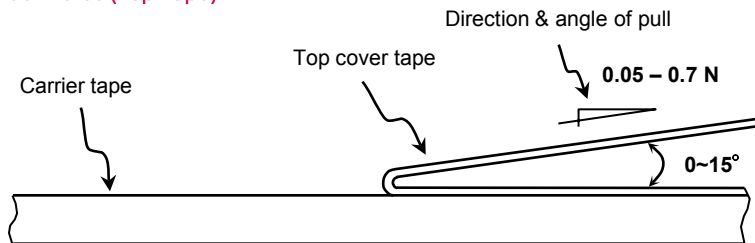
Packaging Information

C Series – General Application

Carrier Tape Configuration

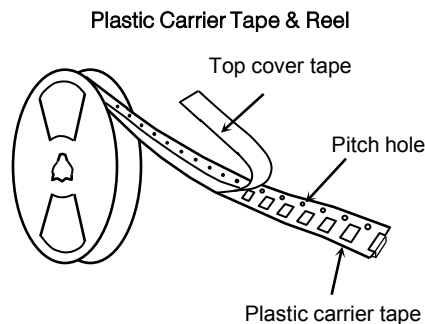
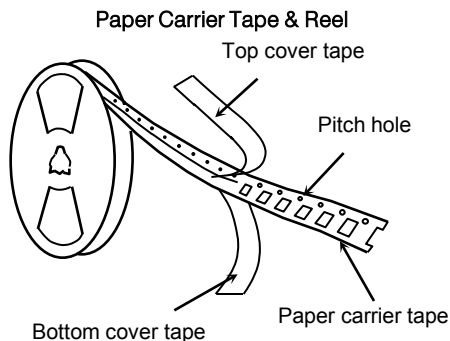


Peel Back Force (Top Tape)



- Carrier tape shall be flexible enough to be wound around a minimum radius of 30mm with components in tape.
- The missing of components shall be less than 0.1%
- Components shall not stick to the cover tape.
- The cover tape shall not protrude beyond the edges of the carrier tape not shall cover the sprocket holes.

Chip Quantity Per Reel and Structure of Reel (Paper & Plastic)



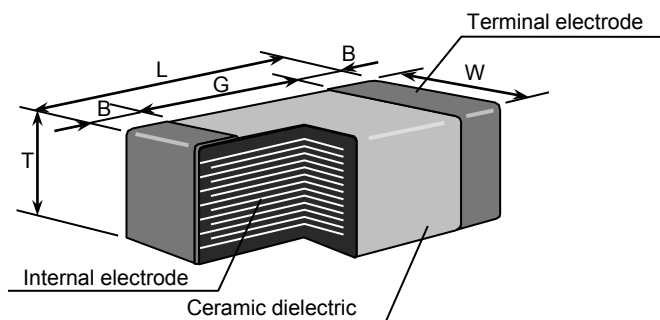
Case Code		Chip Thickness	Taping Material	Chip quantity (pcs.)	
JIS	EIA			φ178mm (7") reel	φ330mm (13") reel
C0402	CC01005	0.20 mm	Paper	20,000	-
C0603	CC0201	0.30 mm	Paper	15,000	-
C1005	CC0402	0.50 mm	Paper	10,000	50,000
C1608	CC0603	0.80 mm	Paper	4,000	10,000
C2012	CC0805	0.60 mm	Paper/Plastic	4,000	20,000
		0.85 mm			10,000
		1.25 mm	Plastic	2,000	
C3216	CC1206	0.60 mm	Paper	4,000	10,000
		0.85 mm	Paper/Plastic		
		1.15 mm	Plastic	2,000	
		1.30 mm			
		1.60 mm			
C3225	CC1210	1.15 mm	Plastic	2,000	10,000
		1.25 mm		2,000	8,000
		1.30 mm			
		1.60 mm		1,000	5,000
		2.00 mm			
		2.30 mm			
		2.50 mm			
C4532	CC1812	1.60 mm	Plastic	1,000	3,000
		2.00 mm		500	
		2.30 mm			2,000
		2.50 mm			
		2.80 mm			
3.20 mm					
C5750	CC2220	2.00 mm	Plastic	500	3,000
		2.30 mm			
		2.50 mm			2,000
		2.80 mm			2,000



Additional Information

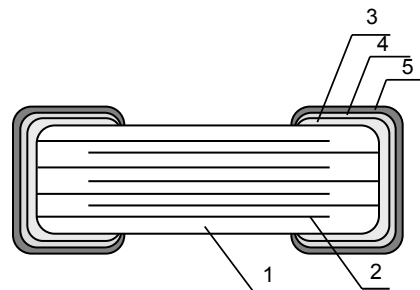
C Series – General Application

• Shape & Dimensions



Case Code		Dimensions (mm)				
JIS	EIA	L	W	T	B	G
C0402	CC01005	0.40	0.20	0.20	0.10	0.13 min.
C0603	CC0201	0.60	0.30	0.30	0.15	0.20 min.
C1005	CC0402	1.00	0.50	0.50	0.25	0.35 min.
C1608	CC0603	1.60	0.80	0.50	0.30	0.50 min.
				0.80	0.20 min.	
C2012	CC0805	2.00	1.20	0.60	0.20 min.	0.50 min.
				0.80		
				0.85		
				1.25		
C3216	CC1206	3.20	1.60	0.60	0.20 min.	1.00 min.
				0.85		
				1.15		
				1.30		
				1.60		
C3225	CC1210	3.20	2.50	1.15	0.20 min.	1.00 min
				1.25	0.30 min.	
				1.30	0.20 min.	
				1.60		
				2.00		
				2.30	0.30 min.	
2.50						
C4532	CC1812	4.50	3.20	1.30	0.30 min.	2.00 min
				1.60	0.20 min	
				2.00		
				2.30		
				2.50	0.30 min.	
				2.80		
3.20						
C5750	CC2220	5.70	5.0	1.60	0.20 min.	2.00 min.
				2.00		
				2.30		
				2.50		
				2.80		

• Inside Structure & Material System



No.	NAME	MATERIAL	
		Class 1	Class 2
(1)	Ceramic Dielectric	CaZrO ₃	BaTiO ₃
(2)	Internal Electrode	Nickel (Ni)	
(3)	Termination	Copper (Cu)	
(4)		Nickel (Ni)	
(5)		Tin (Sn)	

• Environmental Information

TDK Corporation established internal product environmental assurance standards that include the six hazardous substances banned by the EU RoHS Directive¹ enforced on July 1, 2006 along with additional substances independently banned by TDK and has successfully completed making general purpose electronic components conform to the RoHS Directive².

1. Abbreviation for Restriction on Hazardous Substances, which refers to the regulation EU Directive 2002/95/EC on hazardous substances by the European Union (EU) effective from July 1, 2006. The Directive bans the use of six specific hazardous substances in electric and electronic devices and products handled within the EU. The six substances are lead, mercury, cadmium, hexavalent chromium, PBB (polybrominated biphenyls), and PBDE (polybrominated diphenyl ethers).
2. This means that, in conformity with the EU Directive 2002/95/EC, lead, cadmium, mercury, hexavalent chromium, and specific bromine-based flame retardants, PBB and PBDE, have not been used, except for exempted applications.

For REACH (SVHC : 15 substances according to ECHA / October 2008) : All TDK MLCC do not contain these 15 substances.

For European Directive 2000/53/CE and 2005/673/CE : Cadmium, Hexavalent Chromium, Mercury, Lead are not contained in all TDK MLCC.

For European Directive 2003/11/CE : Pentabromodiphenyl-ether, Octabromodiphenyl-ether are not contained in all TDK MLCC.



MULTILAYER CERAMIC CHIP CAPACITORS



C Series Mid Voltage Application

Type:	C1005 [EIA CC0402]
	C1608 [EIA CC0603]
	C2012 [EIA CC0805]
	C3216 [EIA CC1206]
	C3225 [EIA CC1210]
	C4532 [EIA CC1812]
	C5750 [EIA CC2220]

Issue date: April 2011



**TDK MLCC
US Catalog**

Version B11

REMINDERS

Please read before using this product

SAFETY REMINDERS



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C Series Mid Voltage Application

Type: C1005, C1608, C2012,
C3216, C3225, C4532, C5750

Features



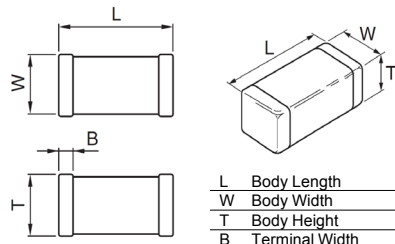
- Unique electrode design allows higher voltage application in smaller case size
- SMT package will help down sizing and lightening of the weight of the product
- A monolithic structure ensures superior mechanical strength and reliability.
- High capacitance has been achieved through precision technologies that enable the use of multiple thinner ceramic dielectric layers.
- Owing to their low ESR and excellent frequency characteristics, these products are optimally suited for high frequency and high-density type power supplies.
- High-accuracy automatic mounting is facilitated through the maintenance of very precise dimensional tolerances.
- Low residual inductance assures superior frequency characteristics.
- Low stray capacitance ensures high conformity with nominal values, thereby simplifying the circuit design process.
- Voltage rating of up to 630V
- High mechanical strength
- No polarity

Applications



- Snubber in switching power supply
- Ringer cap in telephone set and modem
- Flash light in camera
- DSU/TA in ISDN lines
- HID (High Intensity Discharge Lamp)
- Output bypass in power supply
- Driver circuit in plasma display
- Noise bypass in automotive
- Other mid voltage applications

Shape & Dimensions



Dimensions in mm

Part Number Construction

Series Name **C** **3216** **X7R** **2J** **103** **K** **T** **XXXX**

Dimensions L x W (mm)

Case Code	Length	Width
C1005	1.00 ± 0.05	0.50 ± 0.05
C1608	1.60 ± 0.10	0.80 ± 0.10
C2012	2.00 ± 0.20	1.25 ± 0.20
C3216	3.20 ± 0.20	1.60 ± 0.20
C3225	3.20 ± 0.40	2.50 ± 0.30
C4532	4.50 ± 0.40	3.20 ± 0.40
C5750	5.70 ± 0.40	5.00 ± 0.40

Temperature Characteristic

Temperature Characteristics	Capacitance Change	Temperature Range
C0G	0±30 ppm/°C	-55 to +125°C
X6S	± 22%	-55 to +105°C
X7R	± 15%	-55 to +125°C
X7S	± 22%	-55 to +125°C
X7T	+22/-33%	-55 to +125°C

Rated Voltage (DC)

Voltage Code	Voltage (DC)
2A	100V
2E	250V
2W	450V
2J	630V

Internal Codes

Packaging Style

Packaging Code	Style
T	Tape & Reel

Capacitance Tolerance

Tolerance Code	Tolerance
J	± 5%
K	± 10%
M	± 20%

Nominal Capacitance (pF)

The capacitance is expressed in three digit codes and in units of pico Farads (pF). The first and second digits identify the first and second significant figures of the capacitance. The third digit identifies the multiplier. R designates a decimal point.

Capacitance Code	Capacitance
0R5	0.5pF
010	1pF
102	1,000pF (1nF)
105	1,000,000pF (1µF)



Capacitance Range Chart

C1005 [EIA CC0402]

Capacitance Range Chart

Temperature Characteristics: X7R ($\pm 15\%$), X5R ($\pm 15\%$), Y5V (+22/-82%)
 Rated Voltage: 100V (2A)

Capacitance (pF)	Cap Code	Tolerance	X7S
			2A (100V)
1,000	102	K: $\pm 10\%$ M: $\pm 20\%$	
1,500	152		
2,200	222		
3,300	332		
4,700	472		
6,800	682		
10,000	103		

Standard Thickness

 0.50 mm



Capacitance Range Table

C1005 [EIA CC0402]

Class 2 (Temperature Stable)

Temperature Characteristics: X7S (-55 to +125°C, ±22%)

TDK Part Number (Ordering Code)	Temperature Characteristics	Rated Voltage	Capacitance (pF)	Capacitance Tolerance	Thickness (mm)
C1005X7S2A102K	X7S	100V	1,000	± 10%	0.50 ± 0.05
C1005X7S2A102M	X7S	100V	1,000	± 20%	0.50 ± 0.05
C1005X7S2A152K	X7S	100V	1,500	± 10%	0.50 ± 0.05
C1005X7S2A152M	X7S	100V	1,500	± 20%	0.50 ± 0.05
C1005X7S2A222K	X7S	100V	2,200	± 10%	0.50 ± 0.05
C1005X7S2A222M	X7S	100V	2,200	± 20%	0.50 ± 0.05
C1005X7S2A332K	X7S	100V	3,300	± 10%	0.50 ± 0.05
C1005X7S2A332M	X7S	100V	3,300	± 20%	0.50 ± 0.05
C1005X7S2A472K	X7S	100V	4,700	± 10%	0.50 ± 0.05
C1005X7S2A472M	X7S	100V	4,700	± 20%	0.50 ± 0.05
C1005X7S2A682K	X7S	100V	6,800	± 10%	0.50 ± 0.05
C1005X7S2A682M	X7S	100V	6,800	± 20%	0.50 ± 0.05
C1005X7S2A103K	X7S	100V	10,000	± 10%	0.50 ± 0.05
C1005X7S2A103M	X7S	100V	10,000	± 20%	0.50 ± 0.05



Capacitance Range Chart

C1608 [EIA CC0603]

Capacitance Range Chart

Temperature Characteristics: C0G ($0 \pm 30\text{ppm}/^\circ\text{C}$)
 Rated Voltage: 250V (2E), 100V (2A)

Capacitance (pF)	Cap Code	Tolerance	C0G	
			2E (250V)	2A (100V)
100	101	J: $\pm 5\%$		
120	121			
150	151			
180	181			
220	221			
270	271			
330	331			
390	391			
470	471			
560	561			
680	681			
820	821			
1,000	102			
1,200	122			

Capacitance Range Chart

Temperature Characteristics: X7R ($\pm 15\%$), X7S ($\pm 22\%$)
 Rated Voltage: 100V (2A)

Capacitance (pF)	Cap Code	Tolerance	X7R	X7S
			2A (100V)	2A (100V)
1,000	102	K: $\pm 10\%$ M: $\pm 20\%$		
1,500	152			
2,200	222			
3,300	332			
4,700	472			
6,800	682			
10,000	103			
15,000	153			
22,000	223			
33,000	333			
47,000	473			
68,000	683			
100,000	104			

Standard Thickness

0.80 mm



Capacitance Range Table

C1608 [EIA CC0603]

Class 1 (Temperature Compensating)

Temperature Characteristics: C0G (-55 to 125°C, 0±30 ppm/°C)

TDK Part Number (Ordering Code)	Temperature Characteristics	Rated Voltage	Capacitance (pF)	Capacitance Tolerance	Thickness (mm)
C1608C0G2A101J	C0G	100V	100	± 5%	0.80 ± 0.10
C1608C0G2A121J	C0G	100V	120	± 5%	0.80 ± 0.10
C1608C0G2A151J	C0G	100V	150	± 5%	0.80 ± 0.10
C1608C0G2A181J	C0G	100V	180	± 5%	0.80 ± 0.10
C1608C0G2A221J	C0G	100V	220	± 5%	0.80 ± 0.10
C1608C0G2A271J	C0G	100V	270	± 5%	0.80 ± 0.10
C1608C0G2A331J	C0G	100V	330	± 5%	0.80 ± 0.10
C1608C0G2A391J	C0G	100V	390	± 5%	0.80 ± 0.10
C1608C0G2A471J	C0G	100V	470	± 5%	0.80 ± 0.10
C1608C0G2A561J	C0G	100V	560	± 5%	0.80 ± 0.10
C1608C0G2A681J	C0G	100V	680	± 5%	0.80 ± 0.10
C1608C0G2A821J	C0G	100V	820	± 5%	0.80 ± 0.10
C1608C0G2A102J	C0G	100V	1,000	± 5%	0.80 ± 0.10
C1608C0G2A122J	C0G	100V	1,200	± 5%	0.80 ± 0.10
C1608C0G2E101J	C0G	250V	100	± 5%	0.80 ± 0.10
C1608C0G2E121J	C0G	250V	120	± 5%	0.80 ± 0.10
C1608C0G2E151J	C0G	250V	150	± 5%	0.80 ± 0.10
C1608C0G2E181J	C0G	250V	180	± 5%	0.80 ± 0.10
C1608C0G2E221J	C0G	250V	220	± 5%	0.80 ± 0.10
C1608C0G2E271J	C0G	250V	270	± 5%	0.80 ± 0.10
C1608C0G2E331J	C0G	250V	330	± 5%	0.80 ± 0.10
C1608C0G2E391J	C0G	250V	390	± 5%	0.80 ± 0.10
C1608C0G2E471J	C0G	250V	470	± 5%	0.80 ± 0.10
C1608C0G2E561J	C0G	250V	560	± 5%	0.80 ± 0.10
C1608C0G2E681J	C0G	250V	680	± 5%	0.80 ± 0.10

Class 2 (Temperature Stable)

Temperature Characteristics: X7R (-55 to +125°C, ±15%)

TDK Part Number (Ordering Code)	Temperature Characteristics	Rated Voltage	Capacitance (pF)	Capacitance Tolerance	Thickness (mm)
C1608X7R2A102K	X7R	100V	1,000	± 10%	0.80 ± 0.10
C1608X7R2A102M	X7R	100V	1,000	± 20%	0.80 ± 0.10
C1608X7R2A152K	X7R	100V	1,500	± 10%	0.80 ± 0.10
C1608X7R2A152M	X7R	100V	1,500	± 20%	0.80 ± 0.10
C1608X7R2A222K	X7R	100V	2,200	± 10%	0.80 ± 0.10
C1608X7R2A222M	X7R	100V	2,200	± 20%	0.80 ± 0.10
C1608X7R2A332K	X7R	100V	3,300	± 10%	0.80 ± 0.10
C1608X7R2A332M	X7R	100V	3,300	± 20%	0.80 ± 0.10
C1608X7R2A472K	X7R	100V	4,700	± 10%	0.80 ± 0.10
C1608X7R2A472M	X7R	100V	4,700	± 20%	0.80 ± 0.10
C1608X7R2A682K	X7R	100V	6,800	± 10%	0.80 ± 0.10
C1608X7R2A682M	X7R	100V	6,800	± 20%	0.80 ± 0.10
C1608X7R2A103K	X7R	100V	10,000	± 10%	0.80 ± 0.10
C1608X7R2A103M	X7R	100V	10,000	± 20%	0.80 ± 0.10
C1608X7R2A153K	X7R	100V	15,000	± 10%	0.80 ± 0.10



Capacitance Range Table

C1608 [EIA CC0603]

Class 2 (Temperature Stable)

Temperature Characteristics: X7R (-55 to +125°C, ±15%), X7S (-55 to +125°C, ±22%)

TDK Part Number (Ordering Code)	Temperature Characteristics	Rated Voltage	Capacitance (pF)	Capacitance Tolerance	Thickness (mm)
C1608X7R2A153M	X7R	100V	15,000	± 20%	0.80 ± 0.10
C1608X7R2A223K	X7R	100V	22,000	± 10%	0.80 ± 0.10
C1608X7R2A223M	X7R	100V	22,000	± 20%	0.80 ± 0.10
C1608X7S2A333K	X7S	100V	33,000	± 10%	0.80 ± 0.10
C1608X7S2A333M	X7S	100V	33,000	± 20%	0.80 ± 0.10
C1608X7S2A473K	X7S	100V	47,000	± 10%	0.80 ± 0.10
C1608X7S2A473M	X7S	100V	47,000	± 20%	0.80 ± 0.10
C1608X7S2A683K	X7S	100V	68,000	± 10%	0.80 ± 0.10
C1608X7S2A683M	X7S	100V	68,000	± 20%	0.80 ± 0.10
C1608X7S2A104K	X7S	100V	100,000	± 10%	0.80 ± 0.10
C1608X7S2A104M	X7S	100V	100,000	± 20%	0.80 ± 0.10



Capacitance Range Chart

C2012 [EIA CC0805]

Capacitance Range Chart

Temperature Characteristics: C0G ($0 \pm 30\text{ppm}/^\circ\text{C}$)
 Rated Voltage: 250V (2E), 100V (2A)

Capacitance (pF)	Cap Code	Tolerance	C0G	
			2E (250V)	2A (100V)
100	101	J: $\pm 5\%$		
220	221			
470	471			
820	821			
1,000	102			
1,200	122			
1,500	152			
1,800	182			
2,200	222			
2,700	272			
3,300	332			
3,900	392			
4,700	472			

Capacitance Range Chart

Temperature Characteristics: X7R ($\pm 15\%$), X7S ($\pm 22\%$), X7T ($+22/-33\%$)
 Rated Voltage: 450V (2W), 250V (2E), 100V (2A)

Capacitance (pF)	Cap Code	Tolerance	X7R		X7S	X7T	
			2E (250V)	2A (100V)	2A (100V)	2W (450V)	2E (250V)
1,000	102	K: $\pm 10\%$ M: $\pm 20\%$					
1,500	152						
2,200	222						
3,300	332						
4,700	472						
6,800	682						
10,000	103						
15,000	153						
22,000	223						
33,000	333						
47,000	473						
68,000	683						
100,000	104						
150,000	154						
220,000	224						
330,000	334						
470,000	474						
1,000,000	105						

Standard Thickness

	0.60 mm
	0.85 mm
	1.25 mm



Capacitance Range Table

C2012 [EIA CC0805]

Class 1 (Temperature Compensating)

Temperature Characteristics: C0G (-55 to 125°C, 0±30 ppm/°C)

TDK Part Number (Ordering Code)	Temperature Characteristics	Rated Voltage	Capacitance (pF)	Capacitance Tolerance	Thickness (mm)
C2012C0G2A101J	C0G	100V	100	± 5%	0.60 ± 0.10
C2012C0G2A221J	C0G	100V	220	± 5%	0.60 ± 0.10
C2012C0G2A471J	C0G	100V	470	± 5%	0.60 ± 0.10
C2012C0G2A102J	C0G	100V	1,000	± 5%	0.60 ± 0.10
C2012C0G2A122J	C0G	100V	1,200	± 5%	0.60 ± 0.10
C2012C0G2A152J	C0G	100V	1,500	± 5%	0.60 ± 0.10
C2012C0G2A182J	C0G	100V	1,800	± 5%	0.85 ± 0.10
C2012C0G2A222J	C0G	100V	2,200	± 5%	0.85 ± 0.10
C2012C0G2A272J	C0G	100V	2,700	± 5%	1.25 ± 0.20
C2012C0G2A332J	C0G	100V	3,300	± 5%	1.25 ± 0.20
C2012C0G2A392J	C0G	100V	3,900	± 5%	1.25 ± 0.20
C2012C0G2A472J	C0G	100V	4,700	± 5%	1.25 ± 0.20
C2012C0G2E101J	C0G	250V	100	± 5%	0.60 ± 0.10
C2012C0G2E821J	C0G	250V	820	± 5%	0.60 ± 0.10
C2012C0G2E102J	C0G	250V	1,000	± 5%	0.85 ± 0.10
C2012C0G2E122J	C0G	250V	1,200	± 5%	0.85 ± 0.10
C2012C0G2E152J	C0G	250V	1,500	± 5%	0.85 ± 0.10
C2012C0G2E182J	C0G	250V	1,800	± 5%	1.25 ± 0.20
C2012C0G2E222J	C0G	250V	2,200	± 5%	1.25 ± 0.20
C2012C0G2E272J	C0G	250V	2,700	± 5%	1.25 ± 0.20

Class 2 (Temperature Stable)

Temperature Characteristics: X7R (-55 to +125°C, ±15%)

TDK Part Number (Ordering Code)	Temperature Characteristics	Rated Voltage	Capacitance (pF)	Capacitance Tolerance	Thickness (mm)
C2012X7R2A102K	X7R	100V	1,000	± 10%	0.85 ± 0.10
C2012X7R2A102M	X7R	100V	1,000	± 20%	0.85 ± 0.10
C2012X7R2A152K	X7R	100V	1,500	± 10%	0.85 ± 0.10
C2012X7R2A152M	X7R	100V	1,500	± 20%	0.85 ± 0.10
C2012X7R2A222K	X7R	100V	2,200	± 10%	0.85 ± 0.10
C2012X7R2A222M	X7R	100V	2,200	± 20%	0.85 ± 0.10
C2012X7R2A332K	X7R	100V	3,300	± 10%	0.85 ± 0.10
C2012X7R2A332M	X7R	100V	3,300	± 20%	0.85 ± 0.10
C2012X7R2A472K	X7R	100V	4,700	± 10%	0.85 ± 0.10
C2012X7R2A472M	X7R	100V	4,700	± 20%	0.85 ± 0.10
C2012X7R2A682K	X7R	100V	6,800	± 10%	0.85 ± 0.10
C2012X7R2A682M	X7R	100V	6,800	± 20%	0.85 ± 0.10
C2012X7R2A103K	X7R	100V	10,000	± 10%	0.85 ± 0.10
C2012X7R2A103M	X7R	100V	10,000	± 20%	0.85 ± 0.10
C2012X7R2A153K	X7R	100V	15,000	± 10%	1.25 ± 0.20
C2012X7R2A153M	X7R	100V	15,000	± 20%	1.25 ± 0.20
C2012X7R2A223K	X7R	100V	22,000	± 10%	1.25 ± 0.20
C2012X7R2A223M	X7R	100V	22,000	± 20%	1.25 ± 0.20
C2012X7R2A333K	X7R	100V	33,000	± 10%	1.25 ± 0.20
C2012X7R2A333M	X7R	100V	33,000	± 20%	1.25 ± 0.20



Capacitance Range Table

C2012 [EIA CC0805]

Class 2 (Temperature Stable)

Temperature Characteristics: X7R (-55 to +125°C, ±15%), X7S (-55 to +125°C, ±22%), X7T (-55 to +125°C, +22/-33%)

TDK Part Number (Ordering Code)	Temperature Characteristics	Rated Voltage	Capacitance (pF)	Capacitance Tolerance	Thickness (mm)
C2012X7R2A473K	X7R	100V	47,000	± 10%	1.25 ± 0.20
C2012X7R2A473M	X7R	100V	47,000	± 20%	1.25 ± 0.20
C2012X7R2A683K	X7R	100V	68,000	± 10%	0.85 ± 0.10
C2012X7R2A683M	X7R	100V	68,000	± 20%	0.85 ± 0.10
C2012X7R2A104K	X7R	100V	100,000	± 10%	1.25 ± 0.20
C2012X7R2A104M	X7R	100V	100,000	± 20%	1.25 ± 0.20
C2012X7R2E102K	X7R	250V	1,000	± 10%	0.85 ± 0.10
C2012X7R2E102M	X7R	250V	1,000	± 20%	0.85 ± 0.10
C2012X7R2E152K	X7R	250V	1,500	± 10%	0.85 ± 0.10
C2012X7R2E152M	X7R	250V	1,500	± 20%	0.85 ± 0.10
C2012X7R2E222K	X7R	250V	2,200	± 10%	0.85 ± 0.10
C2012X7R2E222M	X7R	250V	2,200	± 20%	0.85 ± 0.10
C2012X7R2E332K	X7R	250V	3,300	± 10%	0.85 ± 0.10
C2012X7R2E332M	X7R	250V	3,300	± 20%	0.85 ± 0.10
C2012X7R2E472K	X7R	250V	4,700	± 10%	0.85 ± 0.10
C2012X7R2E472M	X7R	250V	4,700	± 20%	0.85 ± 0.10
C2012X7R2E682K	X7R	250V	6,800	± 10%	1.25 ± 0.20
C2012X7R2E682M	X7R	250V	6,800	± 20%	1.25 ± 0.20
C2012X7R2E103K	X7R	250V	10,000	± 10%	1.25 ± 0.20
C2012X7R2E103M	X7R	250V	10,000	± 20%	1.25 ± 0.20
C2012X7R2E153K	X7R	250V	15,000	± 10%	1.25 ± 0.20
C2012X7R2E153M	X7R	250V	15,000	± 20%	1.25 ± 0.20
C2012X7R2E223K	X7R	250V	22,000	± 10%	1.25 ± 0.20
C2012X7R2E223M	X7R	250V	22,000	± 20%	1.25 ± 0.20
C2012X7S2A154K	X7S	100V	150,000	± 10%	0.85 ± 0.10
C2012X7S2A154M	X7S	100V	150,000	± 20%	0.85 ± 0.10
C2012X7S2A224K	X7S	100V	220,000	± 10%	0.85 ± 0.10
C2012X7S2A224M	X7S	100V	220,000	± 20%	0.85 ± 0.10
C2012X7S2A334K	X7S	100V	330,000	± 10%	1.25 ± 0.20
C2012X7S2A334M	X7S	100V	330,000	± 20%	1.25 ± 0.20
C2012X7S2A474K	X7S	100V	470,000	± 10%	1.25 ± 0.20
C2012X7S2A474M	X7S	100V	470,000	± 20%	1.25 ± 0.20
C2012X7S2A105K	X7S	100V	1,000,000	± 10%	1.25 ± 0.20
C2012X7S2A105M	X7S	100V	1,000,000	± 20%	1.25 ± 0.20
C2012X7T2E333K	X7T	250V	33,000	± 10%	1.25 ± 0.20
C2012X7T2E473K	X7T	250V	47,000	± 10%	1.25 ± 0.20
C2012X7T2E683K	X7T	250V	68,000	± 10%	1.25 ± 0.20
C2012X7T2E104K	X7T	250V	100,000	± 10%	1.25 ± 0.20
C2012X7T2W103K	X7T	450V	10,000	± 10%	0.85 ± 0.10
C2012X7T2W153K	X7T	450V	15,000	± 10%	0.85 ± 0.10
C2012X7T2W223K	X7T	450V	22,000	± 10%	1.25 ± 0.20
C2012X7T2W333K	X7T	450V	33,000	± 10%	1.25 ± 0.20
C2012X7T2W473K	X7T	450V	47,000	± 10%	1.25 ± 0.20



Capacitance Range Chart

C3216 [EIA CC1206]

Capacitance Range Chart

Temperature Characteristics: C0G ($0 \pm 30\text{ppm}/^\circ\text{C}$)
 Rated Voltage: 630V (2J), 250V (2E), 100V (2A)

Capacitance (pF)	Cap Code	Tolerance	C0G		
			2J (630V)	2E (250V)	2A (100V)
100	101	J: $\pm 5\%$			
120	121				
150	151				
180	181				
220	221				
270	271				
330	331				
390	391				
470	471				
560	561				
680	681				
820	821				
1,000	102				
1,200	122				
1,500	152				
1,800	182				
2,200	222				
2,700	272				
3,300	332				
3,900	392				
4,700	472				
5,600	562				
6,800	682				
8,200	822				
10,000	103				

Capacitance Range Chart

Temperature Characteristics: X7R ($\pm 15\%$), X7S ($\pm 22\%$), X7T ($+22/-33\%$)
 Rated Voltage: 630V (2J), 450V (2W), 250V (2E), 100V (2A)

Capacitance (pF)	Cap Code	Tolerance	X7R			X7S	X7T		
			2J (630V)	2E (250V)	2A (100V)	2A (100V)	2J (630V)	2W (450V)	2E (250V)
1,000	102	K: $\pm 10\%$ M: $\pm 20\%$							
1,500	152								
2,200	222								
3,300	332								
4,700	472								
6,800	682								
10,000	103								
15,000	153								
22,000	223								
33,000	333								
47,000	473								
68,000	683								
100,000	104								
150,000	154								
220,000	224								
330,000	334								
470,000	474								
1,000,000	105								
2,200,000	225								

Standard Thickness

0.60 mm
 0.85 mm
 1.15 mm
 1.30 mm
 1.60 mm



Capacitance Range Table

C3216 [EIA CC1206]

Class 1 (Temperature Compensating)

Temperature Characteristics: C0G (-55 to 125°C, 0±30 ppm/°C)

TDK Part Number (Ordering Code)	Temperature Characteristics	Rated Voltage	Capacitance (pF)	Capacitance Tolerance	Thickness (mm)
C3216C0G2A392J	C0G	100V	3,900	± 5%	0.60 ± 0.10
C3216C0G2A472J	C0G	100V	4,700	± 5%	0.85 ± 0.10
C3216C0G2A562J	C0G	100V	5,600	± 5%	0.85 ± 0.10
C3216C0G2A682J	C0G	100V	6,800	± 5%	1.15 ± 0.10
C3216C0G2A822J	C0G	100V	8,200	± 5%	1.15 ± 0.10
C3216C0G2A103J	C0G	100V	10,000	± 5%	1.15 ± 0.10
C3216C0G2E332J	C0G	250V	3,300	± 5%	0.85 ± 0.10
C3216C0G2E392J	C0G	250V	3,900	± 5%	1.15 ± 0.10
C3216C0G2E472J	C0G	250V	4,700	± 5%	1.15 ± 0.10
C3216C0G2E562J	C0G	250V	5,600	± 5%	1.15 ± 0.10
C3216C0G2E682J	C0G	250V	6,800	± 5%	1.60 ± 0.30
C3216C0G2E822J	C0G	250V	8,200	± 5%	1.60 ± 0.30
C3216C0G2J101J	C0G	630V	100	± 5%	0.60 ± 0.10
C3216C0G2J121J	C0G	630V	120	± 5%	0.60 ± 0.10
C3216C0G2J151J	C0G	630V	150	± 5%	0.60 ± 0.10
C3216C0G2J181J	C0G	630V	180	± 5%	0.60 ± 0.10
C3216C0G2J221J	C0G	630V	220	± 5%	0.60 ± 0.10
C3216C0G2J271J	C0G	630V	270	± 5%	0.60 ± 0.10
C3216C0G2J331J	C0G	630V	330	± 5%	0.60 ± 0.10
C3216C0G2J391J	C0G	630V	390	± 5%	0.60 ± 0.10
C3216C0G2J471J	C0G	630V	470	± 5%	0.85 ± 0.10
C3216C0G2J561J	C0G	630V	560	± 5%	0.85 ± 0.10
C3216C0G2J681J	C0G	630V	680	± 5%	0.85 ± 0.10
C3216C0G2J821J	C0G	630V	820	± 5%	0.85 ± 0.10
C3216C0G2J102J	C0G	630V	1,000	± 5%	0.85 ± 0.10
C3216C0G2J122J	C0G	630V	1,200	± 5%	0.85 ± 0.10
C3216C0G2J152J	C0G	630V	1,500	± 5%	1.15 ± 0.10
C3216C0G2J182J	C0G	630V	1,800	± 5%	1.15 ± 0.10
C3216C0G2J222J	C0G	630V	2,200	± 5%	1.15 ± 0.10
C3216C0G2J272J	C0G	630V	2,700	± 5%	1.60 ± 0.30
C3216C0G2J332J	C0G	630V	3,300	± 5%	1.60 ± 0.30

Class 2 (Temperature Stable)

Temperature Characteristics: X7R (-55 to +125°C, ±15%)

TDK Part Number (Ordering Code)	Temperature Characteristics	Rated Voltage	Capacitance (pF)	Capacitance Tolerance	Thickness (mm)
C3216X7R2A333K	X7R	100V	33,000	± 10%	1.15 ± 0.10
C3216X7R2A333M	X7R	100V	33,000	± 20%	1.15 ± 0.10
C3216X7R2A473K	X7R	100V	47,000	± 10%	1.15 ± 0.10
C3216X7R2A473M	X7R	100V	47,000	± 20%	1.15 ± 0.10
C3216X7R2A683K	X7R	100V	68,000	± 10%	1.60 ± 0.30
C3216X7R2A683M	X7R	100V	68,000	± 20%	1.60 ± 0.30
C3216X7R2A104K	X7R	100V	100,000	± 10%	1.60 ± 0.30
C3216X7R2A104M	X7R	100V	100,000	± 20%	1.60 ± 0.30
C3216X7R2A154K	X7R	100V	150,000	± 10%	1.60 ± 0.30



Capacitance Range Table

C3216 [EIA CC1206]

Class 2 (Temperature Stable)

Temperature Characteristics: X7R (-55 to +125°C, ±15%), X7S (-55 to +125°C, ±22%), X7T (-55 to +125°C, +22/-33%)

TDK Part Number (Ordering Code)	Temperature Characteristics	Rated Voltage	Capacitance (pF)	Capacitance Tolerance	Thickness (mm)
C3216X7R2A154M	X7R	100V	150,000	± 20%	1.60 ± 0.30
C3216X7R2A224K	X7R	100V	220,000	± 10%	1.15 ± 0.10
C3216X7R2A224M	X7R	100V	220,000	± 20%	1.15 ± 0.10
C3216X7R2A334K	X7R	100V	330,000	± 10%	1.30 ± 0.15
C3216X7R2A334M	X7R	100V	330,000	± 20%	1.30 ± 0.15
C3216X7R2A474K	X7R	100V	470,000	± 10%	1.60 ± 0.30
C3216X7R2A474M	X7R	100V	470,000	± 20%	1.60 ± 0.30
C3216X7R2A105K	X7R	100V	1,000,000	± 10%	1.60 ± 0.30
C3216X7R2A105M	X7R	100V	1,000,000	± 20%	1.60 ± 0.30
C3216X7R2E153K	X7R	250V	15,000	± 10%	1.15 ± 0.10
C3216X7R2E153M	X7R	250V	15,000	± 20%	1.15 ± 0.10
C3216X7R2E223K	X7R	250V	22,000	± 10%	1.15 ± 0.10
C3216X7R2E223M	X7R	250V	22,000	± 20%	1.15 ± 0.10
C3216X7R2E333K	X7R	250V	33,000	± 10%	1.60 ± 0.30
C3216X7R2E333M	X7R	250V	33,000	± 20%	1.60 ± 0.30
C3216X7R2E473K	X7R	250V	47,000	± 10%	1.60 ± 0.30
C3216X7R2E473M	X7R	250V	47,000	± 20%	1.60 ± 0.30
C3216X7R2E683K	X7R	250V	68,000	± 10%	1.60 ± 0.30
C3216X7R2E683M	X7R	250V	68,000	± 20%	1.60 ± 0.30
C3216X7R2E104K	X7R	250V	100,000	± 10%	1.60 ± 0.30
C3216X7R2E104M	X7R	250V	100,000	± 20%	1.60 ± 0.30
C3216X7R2J102K	X7R	630V	1,000	± 10%	1.15 ± 0.10
C3216X7R2J102M	X7R	630V	1,000	± 20%	1.15 ± 0.10
C3216X7R2J152K	X7R	630V	1,500	± 10%	1.15 ± 0.10
C3216X7R2J152M	X7R	630V	1,500	± 20%	1.15 ± 0.10
C3216X7R2J222K	X7R	630V	2,200	± 10%	1.15 ± 0.10
C3216X7R2J222M	X7R	630V	2,200	± 20%	1.15 ± 0.10
C3216X7R2J332K	X7R	630V	3,300	± 10%	1.15 ± 0.10
C3216X7R2J332M	X7R	630V	3,300	± 20%	1.15 ± 0.10
C3216X7R2J472K	X7R	630V	4,700	± 10%	1.15 ± 0.10
C3216X7R2J472M	X7R	630V	4,700	± 20%	1.15 ± 0.10
C3216X7R2J682K	X7R	630V	6,800	± 10%	1.15 ± 0.10
C3216X7R2J682M	X7R	630V	6,800	± 20%	1.15 ± 0.10
C3216X7R2J103K	X7R	630V	10,000	± 10%	1.15 ± 0.10
C3216X7R2J103M	X7R	630V	10,000	± 20%	1.15 ± 0.10
C3216X7R2J153K	X7R	630V	15,000	± 10%	1.30 ± 0.15
C3216X7R2J153M	X7R	630V	15,000	± 20%	1.30 ± 0.15
C3216X7R2J223K	X7R	630V	22,000	± 10%	1.30 ± 0.15
C3216X7R2J223M	X7R	630V	22,000	± 20%	1.30 ± 0.15
C3216X7R2J333K	X7R	630V	33,000	± 10%	1.60 ± 0.30
C3216X7R2J333M	X7R	630V	33,000	± 20%	1.60 ± 0.30
C3216X7S2A225K	X7S	100V	2,200,000	± 10%	1.60 ± 0.30
C3216X7S2A225M	X7S	100V	2,200,000	± 20%	1.60 ± 0.30
C3216X7T2E154K	X7T	250V	150,000	± 10%	1.30 ± 0.15



Capacitance Range Table

C3216 [EIA CC1206]

Class 2 (Temperature Stable)

Temperature Characteristics: X7T (-55 to +125°C, +22/-33%)

TDK Part Number (Ordering Code)	Temperature Characteristics	Rated Voltage	Capacitance (pF)	Capacitance Tolerance	Thickness (mm)
C3216X7T2E224K	X7T	250V	220,000	± 10%	1.60 ± 0.30
C3216X7T2W683K	X7T	450V	68,000	± 10%	1.30 ± 0.15
C3216X7T2W104K	X7T	450V	100,000	± 10%	1.60 ± 0.30
C3216X7T2J103K	X7T	630V	10,000	± 10%	0.85 ± 0.10
C3216X7T2J153K	X7T	630V	15,000	± 10%	0.85 ± 0.10
C3216X7T2J223K	X7T	630V	22,000	± 10%	1.15 ± 0.10
C3216X7T2J333K	X7T	630V	33,000	± 10%	1.15 ± 0.10
C3216X7T2J473K	X7T	630V	47,000	± 10%	1.60 ± 0.30



Capacitance Range Chart

C3225 [EIA CC1210]

Capacitance Range Chart

Temperature Characteristics: C0G ($0 \pm 30\text{ppm}/^\circ\text{C}$)
 Rated Voltage: 630V (2J), 250V (2E), 100V (2A)

Capacitance (pF)	Cap Code	Tolerance	C0G		
			2J (630V)	2E (250V)	2A (100V)
3,900	392	J: $\pm 5\%$			
4,700	472				
5,600	562				
6,800	682				
10,000	103				
15,000	153				
22,000	223				
33,000	333				
47,000	473				

Capacitance Range Chart

Temperature Characteristics: X7R ($\pm 15\%$), X7S ($\pm 22\%$), X7T ($+22/-33\%$)
 Rated Voltage: 630V (2J), 450V (2W), 250V (2E), 100V (2A)

Capacitance (pF)	Cap Code	Tolerance	X7R			X7S	X7T		
			2J (630V)	2E (250V)	2A (100V)	2A (100V)	2J (630V)	2W (450V)	2E (250V)
47,000	473	K: $\pm 10\%$ M: $\pm 20\%$							
68,000	683								
100,000	104								
150,000	154								
220,000	224								
330,000	334								
470,000	474								
680,000	684								
1,000,000	105								
2,200,000	225								
3,300,000	335								
4,700,000	475								

Standard Thickness

	1.25 mm
	1.60 mm
	2.00 mm
	2.30 mm



Capacitance Range Table

C3225 [EIA CC1210]

Class 1 (Temperature Compensating)

Temperature Characteristics: C0G (-55 to 125°C, 0±30 ppm/°C)

TDK Part Number (Ordering Code)	Temperature Characteristics	Rated Voltage	Capacitance (pF)	Capacitance Tolerance	Thickness (mm)
C3225C0G2A153J	C0G	100V	15,000	± 5%	1.30 ± 0.15
C3225C0G2A223J	C0G	100V	22,000	± 5%	1.60 ± 0.30
C3225C0G2A333J	C0G	100V	33,000	± 5%	2.00 ± 0.20
C3225C0G2A473J	C0G	100V	47,000	± 5%	2.30 ± 0.20
C3225C0G2E103J	C0G	250V	10,000	± 5%	1.60 ± 0.30
C3225C0G2E153J	C0G	250V	15,000	± 5%	2.00 ± 0.20
C3225C0G2J392J	C0G	630V	3,900	± 5%	1.30 ± 0.15
C3225C0G2J472J	C0G	630V	4,700	± 5%	1.60 ± 0.30
C3225C0G2J562J	C0G	630V	5,600	± 5%	1.60 ± 0.30
C3225C0G2J682J	C0G	630V	6,800	± 5%	2.00 ± 0.20

Class 2 (Temperature Stable)

Temperature Characteristics: X7R (-55 to +125°C, ±15%), X7S (-55 to +125°C, ±22%), X7T (-55 to +125°C, +22/-33%)

TDK Part Number (Ordering Code)	Temperature Characteristics	Rated Voltage	Capacitance (pF)	Capacitance Tolerance	Thickness (mm)
C3225X7R2A334K	X7R	100V	330,000	± 10%	2.00 ± 0.20
C3225X7R2A334M	X7R	100V	330,000	± 20%	2.00 ± 0.20
C3225X7R2A474K	X7R	100V	470,000	± 10%	2.00 ± 0.20
C3225X7R2A474M	X7R	100V	470,000	± 20%	2.00 ± 0.20
C3225X7R2A684K	X7R	100V	680,000	± 10%	1.60 ± 0.30
C3225X7R2A684M	X7R	100V	680,000	± 20%	1.60 ± 0.30
C3225X7R2A105K	X7R	100V	1,000,000	± 10%	2.00 ± 0.20
C3225X7R2A105M	X7R	100V	1,000,000	± 20%	2.00 ± 0.20
C3225X7R2A225K	X7R	100V	2,200,000	± 10%	2.30 ± 0.20
C3225X7R2A225M	X7R	100V	2,200,000	± 20%	2.30 ± 0.20
C3225X7R2E104K	X7R	250V	100,000	± 10%	2.00 ± 0.20
C3225X7R2E104M	X7R	250V	100,000	± 20%	2.00 ± 0.20
C3225X7R2E154K	X7R	250V	150,000	± 10%	2.00 ± 0.20
C3225X7R2E154M	X7R	250V	150,000	± 20%	2.00 ± 0.20
C3225X7R2E224K	X7R	250V	220,000	± 10%	2.00 ± 0.20
C3225X7R2E224M	X7R	250V	220,000	± 20%	2.00 ± 0.20
C3225X7R2J473K	X7R	630V	47,000	± 10%	2.00 ± 0.20
C3225X7R2J473M	X7R	630V	47,000	± 20%	2.00 ± 0.20
C3225X7R2J683K	X7R	630V	68,000	± 10%	2.00 ± 0.20
C3225X7R2J683M	X7R	630V	68,000	± 20%	2.00 ± 0.20
C3225X7S2A335K	X7S	100V	3,300,000	± 10%	2.00 ± 0.20
C3225X7S2A335M	X7S	100V	3,300,000	± 20%	2.00 ± 0.20
C3225X7S2A475K	X7S	100V	4,700,000	± 10%	2.00 ± 0.20
C3225X7S2A475M	X7S	100V	4,700,000	± 20%	2.00 ± 0.20
C3225X7T2E334K	X7T	250V	330,000	± 10%	2.00 ± 0.20
C3225X7T2W224K	X7T	450V	220,000	± 10%	2.00 ± 0.20
C3225X7T2J104K	X7T	630V	100,000	± 10%	1.60 ± 0.30
C3225X7T2J154K	X7T	630V	150,000	± 10%	2.00 ± 0.20



Capacitance Range Chart

C4532 [EIA CC1812]

Capacitance Range Chart

Temperature Characteristics: C0G ($0 \pm 30\text{ppm}/^\circ\text{C}$)
 Rated Voltage: 630V (2J), 250V (2E), 100V (2A)

Capacitance (pF)	Cap Code	Tolerance	C0G		
			2J (630V)	2E (250V)	2A (100V)
8,200	822	J: $\pm 5\%$			
10,000	103				
15,000	153				
22,000	223				
33,000	333				
47,000	473				
68,000	683				
100,000	104				

Capacitance Range Chart

Temperature Characteristics: X7R ($\pm 15\%$), X7S ($\pm 22\%$), X7T ($+22/-33\%$)
 Rated Voltage: 630V (2J), 450V (2W), 250V (2E), 100V (2A)

Capacitance (pF)	Cap Code	Tolerance	X7R			X7S	X7T		
			2J (630V)	2E (250V)	2A (100V)	2A (100V)	2J (630V)	2W (450V)	2E (250V)
68,000	683	K: $\pm 10\%$ M: $\pm 20\%$							
100,000	104								
150,000	154								
220,000	224								
330,000	334								
470,000	474								
680,000	684								
1,000,000	105								
1,500,000	155								
2,200,000	225								
4,700,000	475								

Standard Thickness

	1.60 mm
	2.00 mm
	2.30 mm
	2.50 mm
	3.20 mm



Capacitance Range Table

C4532 [EIA CC1812]

Class 1 (Temperature Compensating)

Temperature Characteristics: C0G (-55 to 125°C, 0±30 ppm/°C)

TDK Part Number (Ordering Code)	Temperature Characteristics	Rated Voltage	Capacitance (pF)	Capacitance Tolerance	Thickness (mm)
C4532C0G2A473J	C0G	100V	47,000	± 5%	2.00 ± 0.20
C4532C0G2A683J	C0G	100V	68,000	± 5%	2.50 ± 0.30
C4532C0G2A104J	C0G	100V	100,000	± 5%	3.20 ± 0.30
C4532C0G2E223J	C0G	250V	22,000	± 5%	1.60 ± 0.30
C4532C0G2E333J	C0G	250V	33,000	± 5%	2.00 ± 0.20
C4532C0G2E473J	C0G	250V	47,000	± 5%	3.20 ± 0.30
C4532C0G2J822J	C0G	630V	8,200	± 5%	1.60 ± 0.30
C4532C0G2J103J	C0G	630V	10,000	± 5%	1.60 ± 0.30
C4532C0G2J153J	C0G	630V	15,000	± 5%	2.50 ± 0.30
C4532C0G2J223J	C0G	630V	22,000	± 5%	3.20 ± 0.30

Class 2 (Temperature Stable)

Temperature Characteristics: X7R (-55 to +125°C, ±15%), X7S (-55 to +125°C, ±22%), X7T (-55 to +125°C, +22/-33%)

TDK Part Number (Ordering Code)	Temperature Characteristics	Rated Voltage	Capacitance (pF)	Capacitance Tolerance	Thickness (mm)
C4532X7R2A684K	X7R	100V	680,000	± 10%	2.30 ± 0.20
C4532X7R2A684M	X7R	100V	680,000	± 20%	2.30 ± 0.20
C4532X7R2A105K	X7R	100V	1,000,000	± 10%	2.30 ± 0.20
C4532X7R2A105M	X7R	100V	1,000,000	± 20%	2.30 ± 0.20
C4532X7R2A155K	X7R	100V	1,500,000	± 10%	2.30 ± 0.20
C4532X7R2A155M	X7R	100V	1,500,000	± 20%	2.30 ± 0.20
C4532X7R2A225K	X7R	100V	2,200,000	± 10%	2.30 ± 0.20
C4532X7R2A225M	X7R	100V	2,200,000	± 20%	2.30 ± 0.20
C4532X7R2E154K	X7R	250V	150,000	± 10%	1.60 ± 0.30
C4532X7R2E154M	X7R	250V	150,000	± 20%	1.60 ± 0.30
C4532X7R2E224K	X7R	250V	220,000	± 10%	2.30 ± 0.20
C4532X7R2E224M	X7R	250V	220,000	± 20%	2.30 ± 0.20
C4532X7R2E334K	X7R	250V	330,000	± 10%	2.30 ± 0.20
C4532X7R2E334M	X7R	250V	330,000	± 20%	2.30 ± 0.20
C4532X7R2E474K	X7R	250V	470,000	± 10%	2.30 ± 0.20
C4532X7R2E474M	X7R	250V	470,000	± 20%	2.30 ± 0.20
C4532X7R2J683K	X7R	630V	68,000	± 10%	1.60 ± 0.30
C4532X7R2J683M	X7R	630V	68,000	± 20%	1.60 ± 0.30
C4532X7R2J104K	X7R	630V	100,000	± 10%	2.30 ± 0.20
C4532X7R2J104M	X7R	630V	100,000	± 20%	2.30 ± 0.20
C4532X7S2A475M	X7S	100V	4,700,000	± 20%	2.30 ± 0.20
C4532X7T2E684K	X7T	250V	680,000	± 10%	1.60 ± 0.30
C4532X7T2E105K	X7T	250V	1,000,000	± 10%	2.50 ± 0.30
C4532X7T2W334K	X7T	450V	330,000	± 10%	1.60 ± 0.30
C4532X7T2W474K	X7T	450V	470,000	± 10%	2.30 ± 0.20
C4532X7T2J154K	X7T	630V	150,000	± 10%	1.60 ± 0.30
C4532X7T2J224K	X7T	630V	220,000	± 10%	2.00 ± 0.20



Capacitance Range Chart

C5750 [EIA CC2220]

Capacitance Range Chart

Temperature Characteristics: X7R ($\pm 15\%$), X7S ($\pm 22\%$), X7T ($+22/-33\%$), X6S ($\pm 22\%$)

Rated Voltage: 630V (2J), 450V (2W), 250V (2E), 100V (2A)

Capacitance (pF)	Cap Code	Tolerance	X7R			X7S	X7T			X6S
			2J (630V)	2E (250V)	2A (100V)	2A (100V)	2J (630V)	2W (450V)	2E (250V)	2W (450V)
150,000	154	K: $\pm 10\%$ M: $\pm 20\%$								
220,000	224									
330,000	334									
470,000	474									
680,000	684									
1,000,000	105									
1,500,000	155									
2,200,000	225									
3,300,000	335									
4,700,000	475									
10,000,000	106									
15,000,000	156									

Standard Thickness

	1.60 mm
	2.00 mm
	2.30 mm
	2.50 mm



Capacitance Range Table

C5750 [EIA CC2220]

Class 2 (Temperature Stable)

Temperature Characteristics: X7R (-55 to +125°C, ±15%), X7S (-55 to +125°C, ±22%), X7T (-55 to +125°C, +22/-33%), X6S (-55 to +105°C, ±22%)

TDK Part Number (Ordering Code)	Temperature Characteristics	Rated Voltage	Capacitance (pF)	Capacitance Tolerance	Thickness (mm)
C5750X7R2A105K	X7R	100V	1,000,000	± 10%	2.30 ± 0.20
C5750X7R2A105M	X7R	100V	1,000,000	± 20%	2.30 ± 0.20
C5750X7R2A155K	X7R	100V	1,500,000	± 10%	2.30 ± 0.20
C5750X7R2A155M	X7R	100V	1,500,000	± 20%	2.30 ± 0.20
C5750X7R2A225K	X7R	100V	2,200,000	± 10%	2.30 ± 0.20
C5750X7R2A225M	X7R	100V	2,200,000	± 20%	2.30 ± 0.20
C5750X7R2A335K	X7R	100V	3,300,000	± 10%	2.30 ± 0.20
C5750X7R2A335M	X7R	100V	3,300,000	± 20%	2.30 ± 0.20
C5750X7R2A475K	X7R	100V	4,700,000	± 10%	2.30 ± 0.20
C5750X7R2A475M	X7R	100V	4,700,000	± 20%	2.30 ± 0.20
C5750X7R2E334K	X7R	250V	330,000	± 10%	1.60 ± 0.30
C5750X7R2E334M	X7R	250V	330,000	± 20%	1.60 ± 0.30
C5750X7R2E474K	X7R	250V	470,000	± 10%	2.30 ± 0.20
C5750X7R2E474M	X7R	250V	470,000	± 20%	2.30 ± 0.20
C5750X7R2E684K	X7R	250V	680,000	± 10%	2.30 ± 0.20
C5750X7R2E684M	X7R	250V	680,000	± 20%	2.30 ± 0.20
C5750X7R2E105K	X7R	250V	1,000,000	± 10%	2.30 ± 0.20
C5750X7R2E105M	X7R	250V	1,000,000	± 20%	2.30 ± 0.20
C5750X7R2J154K	X7R	630V	150,000	± 10%	1.60 ± 0.30
C5750X7R2J154M	X7R	630V	150,000	± 20%	1.60 ± 0.30
C5750X7R2J224K	X7R	630V	220,000	± 10%	2.30 ± 0.20
C5750X7R2J224M	X7R	630V	220,000	± 20%	2.30 ± 0.20
C5750X7S2A106M	X7S	100V	10,000,000	± 20%	2.30 ± 0.20
C5750X7S2A156M	X7S	100V	15,000,000	± 20%	2.50 ± 0.30
C5750X7T2E155K	X7T	250V	1,500,000	± 10%	2.00 ± 0.20
C5750X7T2E225K	X7T	250V	2,200,000	± 10%	2.50 ± 0.30
C5750X7T2W684K	X7T	450V	680,000	± 10%	2.00 ± 0.20
C5750X7T2W105K	X7T	450V	1,000,000	± 10%	2.50 ± 0.30
C5750X7T2J334K	X7T	630V	330,000	± 10%	2.00 ± 0.20
C5750X7T2J474K	X7T	630V	470,000	± 10%	2.50 ± 0.30
C5750X6S2W105K	X6S	450V	1,000,000	± 10%	2.50 ± 0.30
C5750X6S2W225K	X6S	450V	2,200,000	± 10%	2.50 ± 0.30



General Specifications

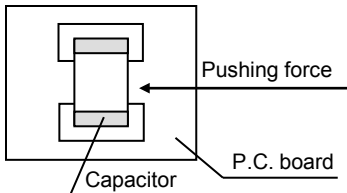
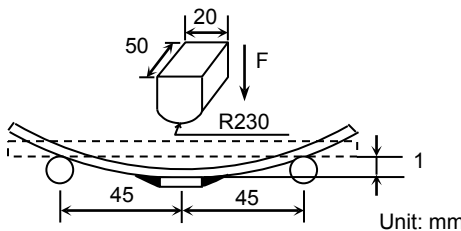
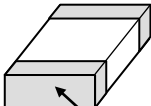
C Series – Mid Voltage Application

No.	Item	Performance	Test or Inspection Method																				
1	External Appearance	No defects which may affect performance.	Inspect with magnifying glass (3×).																				
2	Insulation Resistance	10,000MΩ or 500MΩ•μF min. whichever smaller.	Apply rated voltage for 60s. As for the rated voltage 630V DC, apply 500V DC.																				
3	Voltage Proof	Withstand test voltage without insulation breakdown or other damage.	<table><tr><th>Class</th><th>Rated Voltage</th><th>Apply voltage</th></tr><tr><td rowspan="2">Class 1</td><td>100V</td><td>3 × rated voltage</td></tr><tr><td>Over 100V</td><td>1.5 × rated voltage</td></tr><tr><td rowspan="2">Class 2</td><td>100V</td><td>2.5 × rated voltage</td></tr><tr><td>Over 100V</td><td>1.5 × rated voltage</td></tr></table> Above DC voltage shall be applied for 1 to 5s. Charge / discharge current shall not exceed 50mA.	Class	Rated Voltage	Apply voltage	Class 1	100V	3 × rated voltage	Over 100V	1.5 × rated voltage	Class 2	100V	2.5 × rated voltage	Over 100V	1.5 × rated voltage							
Class	Rated Voltage	Apply voltage																					
Class 1	100V	3 × rated voltage																					
	Over 100V	1.5 × rated voltage																					
Class 2	100V	2.5 × rated voltage																					
	Over 100V	1.5 × rated voltage																					
4	Capacitance	Within the specified tolerance.	<table><tr><th>Class</th><th>Rated Capacitance</th><th>Measuring Frequency</th><th>Measuring voltage</th></tr><tr><td rowspan="2">Class 1</td><td>1000pF and under</td><td>1MHz±10%</td><td rowspan="2">0.5 - 5 V_{rms}</td></tr><tr><td>Over 1000pF</td><td>1kHz±10%</td></tr><tr><td rowspan="3">Class 2</td><td>10uF and under</td><td>1kHz±10%</td><td>0.5±0.2V_{rms}</td></tr><tr><td></td><td></td><td>1.0±0.2V_{rms}</td></tr><tr><td>Over 10uF</td><td>120Hz±20%</td><td>0.5±0.2 V_{rms}</td></tr></table>	Class	Rated Capacitance	Measuring Frequency	Measuring voltage	Class 1	1000pF and under	1MHz±10%	0.5 - 5 V _{rms}	Over 1000pF	1kHz±10%	Class 2	10uF and under	1kHz±10%	0.5±0.2V _{rms}			1.0±0.2V _{rms}	Over 10uF	120Hz±20%	0.5±0.2 V _{rms}
Class	Rated Capacitance	Measuring Frequency	Measuring voltage																				
Class 1	1000pF and under	1MHz±10%	0.5 - 5 V _{rms}																				
	Over 1000pF	1kHz±10%																					
Class 2	10uF and under	1kHz±10%	0.5±0.2V _{rms}																				
			1.0±0.2V _{rms}																				
	Over 10uF	120Hz±20%	0.5±0.2 V _{rms}																				
5	Q (Class 1)	1,000 min.	See No.4 in this table for measuring condition.																				
6	Dissipation Factor (Class 2)	<table><tr><th>T.C.</th><th>D.F.</th></tr><tr><td>X7R</td><td>0.05 max.</td></tr><tr><td>X7S</td><td>0.05 max.</td></tr><tr><td>X7T</td><td>0.025 max.</td></tr></table>	T.C.	D.F.	X7R	0.05 max.	X7S	0.05 max.	X7T	0.025 max.	See No.4 in this table for measuring condition.												
T.C.	D.F.																						
X7R	0.05 max.																						
X7S	0.05 max.																						
X7T	0.025 max.																						
7	Temperature Characteristics of Capacitance (Class 1)	<table><tr><th>T.C.</th><th>Temperature Coefficient</th></tr><tr><td>C0G</td><td>0 ± 30 (ppm/°C)</td></tr></table> Capacitance drift within ± 0.2%	T.C.	Temperature Coefficient	C0G	0 ± 30 (ppm/°C)	Temperature coefficient shall be calculated based on values at 25°C and 85°C temperature. Measuring temperature below 20°C shall be -10°C and -25°C.																
T.C.	Temperature Coefficient																						
C0G	0 ± 30 (ppm/°C)																						



General Specifications

C Series – Mid Voltage Application

No.	Item	Performance	Test or Inspection Method										
8	Temperature Characteristics of Capacitance (Class 2)	Capacitance Change (%) No Voltage Applied X7R: ± 15% X7S: ± 22% X7T: +22/-33%	Capacitance shall be measured by the steps shown in the following table after thermal equilibrium is obtained for each step. ΔC be calculated ref. STEP 3 reading <table><tr><th>Step</th><th>Temperature (°C)</th></tr><tr><td>1</td><td>Reference temp. ± 2</td></tr><tr><td>2</td><td>Min. operating temp. ± 2</td></tr><tr><td>3</td><td>Reference temp. ± 2</td></tr><tr><td>4</td><td>Max. operating temp. ± 2</td></tr></table>	Step	Temperature (°C)	1	Reference temp. ± 2	2	Min. operating temp. ± 2	3	Reference temp. ± 2	4	Max. operating temp. ± 2
Step	Temperature (°C)												
1	Reference temp. ± 2												
2	Min. operating temp. ± 2												
3	Reference temp. ± 2												
4	Max. operating temp. ± 2												
9	Robustness of Terminations	No sign of termination coming off, breakage of ceramic, or other abnormal signs.	Reflow solder the capacitors on P.C. board (shown in Appendix 1a or Appendix 1b) and apply a pushing force of 2N (C1005) or 5N (C1608, C2012, C3216, C3225, C4532, C5750) with 10±1s. 										
10	Bending	No mechanical damage.	Reflow solder the capacitors on P.C. board (shown in Appendix 2a or Appendix 2b) and bend 1mm.  Unit: mm										
11	Solderability	New solder to cover over 75% of termination. 25% may have pin holes or rough spots but not concentrated in one spot. Ceramic surface of A sections shall not be exposed due to melting or shifting of termination material.  A section	Completely soak both terminations in solder at 235±5°C for 2±0.5s. Solder : H63A (JIS Z 3282) Flux : Isopropyl alcohol (JIS K 8839) Rosin (JIS K 5902) 25% solid solution.										



General Specifications

C Series – Mid Voltage Application

No.	Item	Performance	Test or Inspection Method
12	Resistance to solder heat		Completely soak both terminations in solder at $260 \pm 5^\circ\text{C}$ for $5 \pm 1\text{s}$.
	External appearance	No cracks are allowed and terminations shall be covered at least 60% with new solder	Preheating condition Temp. : $150 \pm 10^\circ\text{C}$ Time : 1 to 2min.
	Capacitance	Characteristics	Flux: Isopropyl alcohol (JIS K 8839) Rosin (JIS K 5902) 25% solid solution. Solder: H63A (JIS Z 3282) Leave the capacitor in ambient conditions for 6 to 24h (Class 1) or $24 \pm 2\text{h}$ (Class 2) before measurement.
		Change from the value before test	
		Class 1 C0G	
		Class 2 X7R X7S X7T	
	Q (Class 1)	1,000 min.	
	D.F. (Class 2)	Meet the initial spec.	
	Insulation Resistance	Meet the initial spec.	
	Voltage Proof	No insulation breakdown or other damage.	
13	Vibration		Reflow solder the capacitor on a P.C. board (shown in Appendix 1a or Appendix 1b) before testing.
	External appearance	No mechanical damage.	Vibrate the capacitor with amplitude of 1.5mm P-P sweeping the frequencies from 10Hz to 55Hz and back to 10Hz in about 1min.
	Capacitance	Characteristics	Repeat this for 2h each in 3 perpendicular directions.
		Change from the value before test	
		Class 1 C0G	
		Class 2 X7R X7S X7T	
	Q (Class 1)	1,000 min.	
	D.F. (Class 2)	Meet the initial spec.	



No.	Item	Performance	Test or Inspection Method														
14	Temperature cycle		Reflow solder the capacitors on a P.C. board (shown in Appendix 1a or Appendix 1b) before testing. Expose the capacitor in the condition step1 through step 4, and repeat 5 times consecutively. Leave the capacitor in ambient conditions for 6 to 24h (Class 1) or 24±2h (Class 2) before measurement.														
	External appearance	No mechanical damage.															
	Capacitance	<table><tr><th colspan="2">Characteristics</th><th>Change from the value before test</th></tr><tr><td>Class 1</td><td>C0G</td><td>±2.5 %</td></tr><tr><td rowspan="3">Class 2</td><td>X7R</td><td rowspan="3">± 7.5 %</td></tr><tr><td>X7S</td></tr><tr><td>X7T</td></tr></table>		Characteristics		Change from the value before test	Class 1	C0G	±2.5 %	Class 2	X7R	± 7.5 %	X7S	X7T			
	Characteristics			Change from the value before test													
	Class 1	C0G		±2.5 %													
	Class 2	X7R		± 7.5 %													
		X7S															
		X7T															
	Q (Class 1)	1,000 min.															
	D.F. (Class 2)	Meet the initial spec.															
Insulation Resistance	Meet the initial spec.																
Voltage Proof	No insulation breakdown or other damage.																
<table><tr><th>Step</th><th>Temperature (°C)</th><th>Time (min.)</th></tr><tr><td>1</td><td>Min. operating temp. ±3</td><td>30 ± 3</td></tr><tr><td>2</td><td>Reference Temp.</td><td>2 – 5</td></tr><tr><td>3</td><td>Max. operating temp. ± 2</td><td>30 ± 2</td></tr><tr><td>4</td><td>Reference Temp.</td><td>2 - 5</td></tr></table>			Step	Temperature (°C)	Time (min.)	1	Min. operating temp. ±3	30 ± 3	2	Reference Temp.	2 – 5	3	Max. operating temp. ± 2	30 ± 2	4	Reference Temp.	2 - 5
Step	Temperature (°C)	Time (min.)															
1	Min. operating temp. ±3	30 ± 3															
2	Reference Temp.	2 – 5															
3	Max. operating temp. ± 2	30 ± 2															
4	Reference Temp.	2 - 5															
15	Moisture Resistance (Steady State)		Reflow solder the capacitor on P.C. board (shown in Appendix 1a or Appendix 1b) before testing. Leave at temperature 40±2°C, 90 to 95%RH for 500 +24,0h. Leave the capacitor in ambient condition for 6 to 24h (Class1) or 24±2h (Class 2) before measurement.														
	External appearance	No mechanical damage.															
	Capacitance	<table><tr><th colspan="2">Characteristics</th><th>Change from the value before test</th></tr><tr><td>Class 1</td><td>C0G</td><td>± 5 %</td></tr><tr><td rowspan="3">Class 2</td><td>X7R</td><td rowspan="3">± 12.5 %</td></tr><tr><td>X7S</td></tr><tr><td>X7T</td></tr></table>		Characteristics		Change from the value before test	Class 1	C0G	± 5 %	Class 2	X7R	± 12.5 %	X7S	X7T			
	Characteristics			Change from the value before test													
	Class 1	C0G		± 5 %													
	Class 2	X7R		± 12.5 %													
		X7S															
		X7T															
	Q (Class 1)	350 min.															
	D.F. (Class 2)	Characteristics X7R: 200% of initial spec. max. X7S: 200% of initial spec. max X7T: 200% of initial spec. max															
Insulation Resistance	1,000MΩ or 50MΩ•μF min. whichever smaller.																



General Specifications

C Series – Mid Voltage Application

No.	Item	Performance	Test or Inspection Method										
16	Moisture Resistance												
	External appearance	No mechanical damage.	Reflow solder the capacitors on P.C. board (shown in Appendix 1a or Appendix 1b) before testing. Apply the rated voltage at temperature $40 \pm 2^{\circ}\text{C}$ and 90 to 95%RH for 500 +24,0h. Charge/discharge current shall not exceed 50mA.										
	Capacitance	<table><tr><th colspan="2">Characteristics</th><th>Change from the value before test</th></tr><tr><td>Class 1</td><td>C0G</td><td>$\pm 7.5 \%$</td></tr><tr><td rowspan="2">Class 2</td><td>X7R</td><td rowspan="2">$\pm 12.5 \%$</td></tr><tr><td>X7S X7T</td></tr></table>	Characteristics		Change from the value before test	Class 1	C0G	$\pm 7.5 \%$	Class 2	X7R	$\pm 12.5 \%$	X7S X7T	Leave the capacitor in ambient conditions for 6 to 24h (Class 1) or $24 \pm 2\text{h}$ (Class 2) before measurement. Voltage conditioning (only for class 2): Voltage treat the capacitors under testing temperature and voltage for 1 hour.
	Characteristics		Change from the value before test										
	Class 1	C0G	$\pm 7.5 \%$										
	Class 2	X7R	$\pm 12.5 \%$										
		X7S X7T											
Q (Class 1)	200 min.												
D.F. (Class 2)	Characteristics X7R: 200% of initial spec. max. X7S: 200% of initial spec. max X7T: 200% of initial spec. max	Leave the capacitors in ambient condition for $24 \pm 2\text{h}$ before measurement. Use this measurement for initial value.											
Insulation Resistance	500MΩ or 25MΩ•μF min. whichever smaller.												
17	Life												
	External appearance	No mechanical damage.	Reflow solder the capacitor on P.C. board (shown in Appendix 1a or Appendix 1b) before testing. Apply voltage at $125 \pm 2^{\circ}\text{C}$ for 1,000 +48, 0h. Applied voltage is 1xRV. Some items may be tested at higher voltage (1.2x, 1.5x or 2xRV).										
	Capacitance	<table><tr><th colspan="2">Characteristics</th><th>Change from the value before test</th></tr><tr><td>Class 1</td><td>C0G</td><td>$\pm 3 \%$</td></tr><tr><td rowspan="2">Class 2</td><td>X7R</td><td rowspan="2">$\pm 15 \%$</td></tr><tr><td>X7S X7T</td></tr></table>	Characteristics		Change from the value before test	Class 1	C0G	$\pm 3 \%$	Class 2	X7R	$\pm 15 \%$	X7S X7T	Charge/discharge current shall not exceed 50mA. Leave the capacitors in ambient condition for 6 to 24h (Class 1) or $24 \pm 2\text{h}$ (Class 2) before measurement. Voltage conditioning (only for class 2): Voltage treat the capacitor under testing temperature and voltage for 1 hour.
	Characteristics		Change from the value before test										
	Class 1	C0G	$\pm 3 \%$										
	Class 2	X7R	$\pm 15 \%$										
		X7S X7T											
Q (Class 1)	350 min.												
D.F. (Class 2)	Characteristics X7R: 200% of initial spec. max. X7S: 200% of initial spec. max X7T: 200% of initial spec. max	Leave the capacitor in ambient conditions for $24 \pm 2\text{h}$ before measurement. Use this measurement for initial value.											
Insulation Resistance	1,000MΩ or 50MΩ•μF min. whichever smaller.												

*As for the initial measurement of capacitors (Class 2) on number 8, 12, 13, 14 and 15, leave capacitor at $150 \pm 10, 0^\circ\text{C}$ for 1 hour and measure the value after leaving capacitor for $24 \pm 2\text{h}$ in ambient condition.



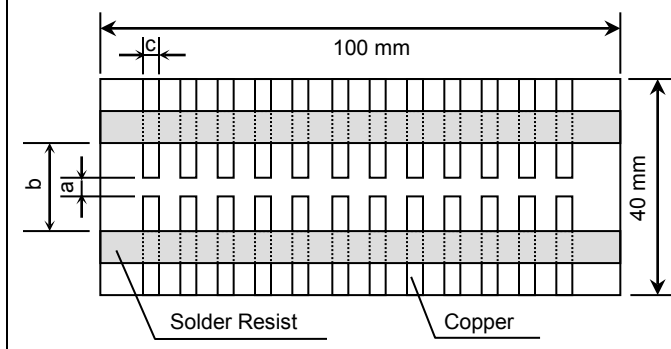
General Specifications

C Series – Mid Voltage Application

Appendix - 1a

P.C. Board for reliability test

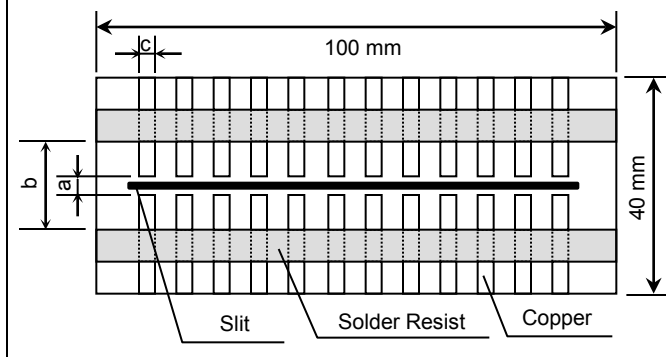
Applied for C1005, C1608, C2012, C3216



Appendix - 1b

P.C. Board for reliability test

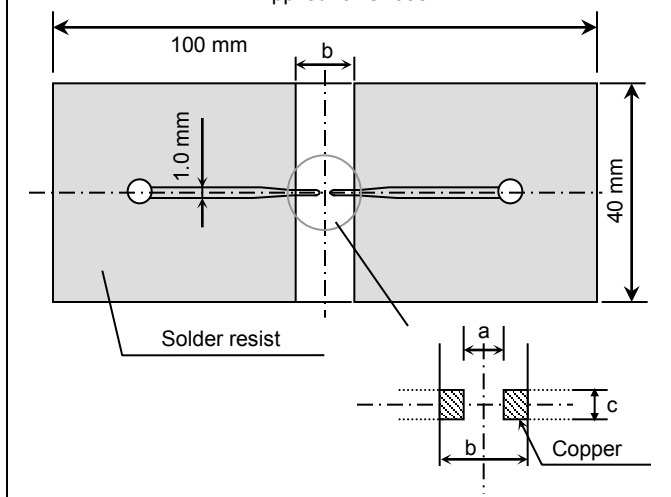
Applied for C3225, C4532, C5750



Appendix - 2a

P.C. Board for bending test

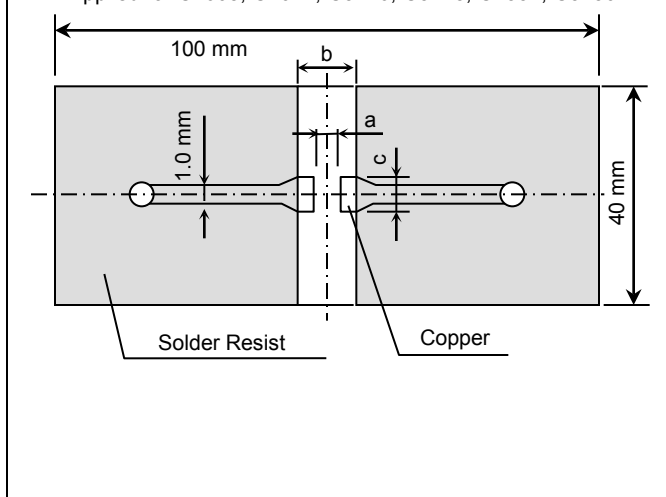
Applied for C1005



Appendix - 2b

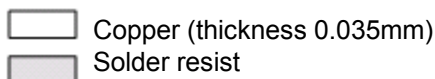
P.C. Board for bending test

Applied for C1608, C2012, C3216, C3225, C4532, C5750



Material : Glass Epoxy (As per JIS C6484 GE4)

P.C. Board thickness : Appendix-2a 0.8mm
Appendix-1a, 1b, 2b 1.6mm



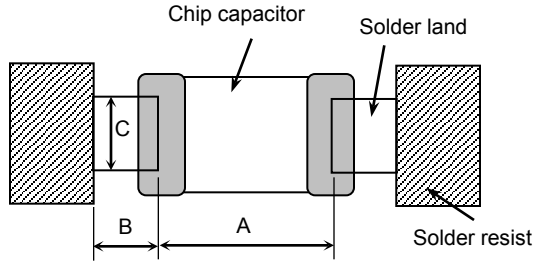
Case Code		Dimensions (mm)		
JIS	EIA	a	b	c
C1005	CC0402	0.4	1.5	0.5
C1608	CC0603	1.0	3.0	1.2
C2012	CC0805	1.2	4.0	1.65
C3216	CC1206	2.2	5.0	2.0
C3225	CC1210	2.2	5.0	2.9
C4532	CC1812	3.5	7.0	3.7
C5750	CC2220	4.5	8.0	5.6



Soldering Information

C Series – Mid Voltage Application

Recommended Soldering Land Pattern



Wave Soldering

Unit: mm

Type	C1608 [CC0603]	C2012 [CC0805]	C3216 [CC1206]
Symbol			
A	0.7 - 1.0	1.0 - 1.3	2.1 - 2.5
B	0.8 - 1.0	1.0 - 1.2	1.1 - 1.3
C	0.6 - 0.8	0.8 - 1.1	1.0 - 1.3

Reflow Soldering

Unit: mm

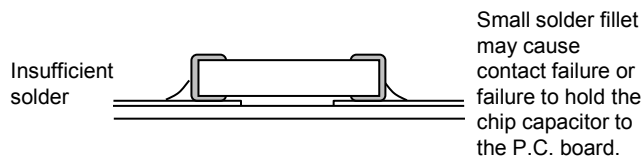
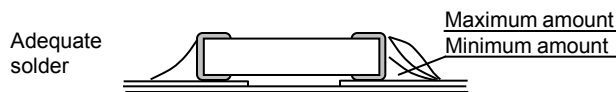
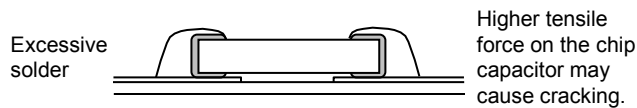
Type	C1005 [CC0402]	C1608 [CC0603]	C2012 [CC0805]
Symbol			
A	0.3 - 0.5	0.6 - 0.8	0.9 - 1.2
B	0.35 - 0.45	0.6 - 0.8	0.7 - 0.9
C	0.4 - 0.6	0.6 - 0.8	0.9 - 1.2

Reflow Soldering

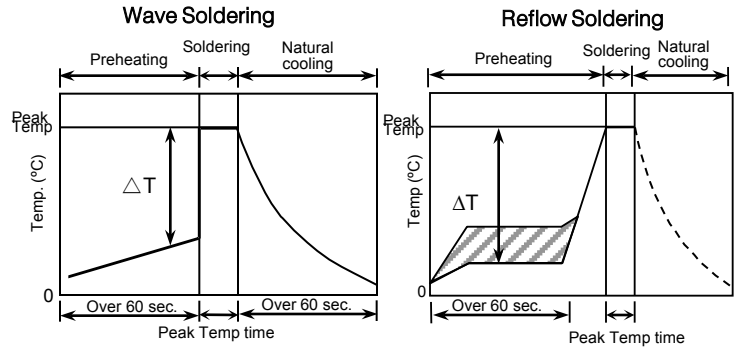
Unit: mm

Type	C3216 [CC1206]	C3225 [CC1210]	C4532 [CC1812]	C5750 [CC2220]
Symbol				
A	2.0 - 2.4	2.0 - 2.4	3.1 - 3.7	4.1 - 4.8
B	1.0 - 1.2	1.0 - 1.2	1.2 - 1.4	1.2 - 1.4
C	1.1 - 1.6	1.9 - 2.5	2.4 - 3.2	4.0 - 5.0

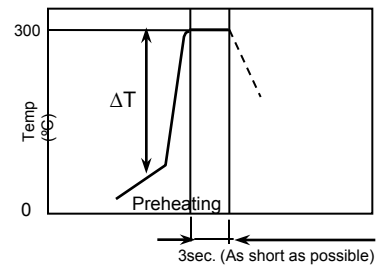
Recommended Solder Amount



Recommended Soldering Profile



Manual soldering (Solder iron)



Recommended soldering duration

Solder	Temp./Dura.	Wave Soldering		Reflow Soldering	
		Peak temp (°C)	Duration (sec.)	Peak temp (°C)	Duration (sec.)
Sn-Pb Solder		250 max.	3 max.	230 max.	20 max.
Lead-Free Solder		260 max.	5 max.	260 max.	10 max.

Recommended solder compositions

Sn-37Pb (Sn-Pb solder)

Sn-3.0Ag-0.5Cu (Lead Free Solder)

Preheating Condition

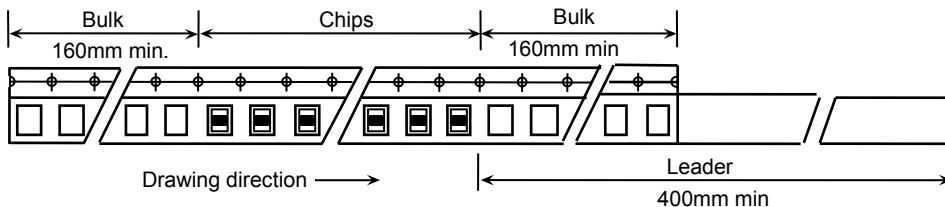
Soldering	Case Size - JIS (EIA)	Temp. (°C)
Wave soldering	C1608(CC0603), C2012(CC0805), C3216(CC1206)	$\Delta T \leq 150$
Reflow soldering	C1005(CC0402), C1608(CC0603), C2012(CC0805), C3216(CC1206)	$\Delta T \leq 150$
	C3225(CC1210), C4532(CC1812), C5750(CC2220)	$\Delta T \leq 130$
Manual soldering	C1005(CC0402), C1608(CC0603), C2012(CC0805), C3216(CC1206)	$\Delta T \leq 150$
	C3225(CC1210), C4532(CC1812), C5750(CC2220)	$\Delta T \leq 130$



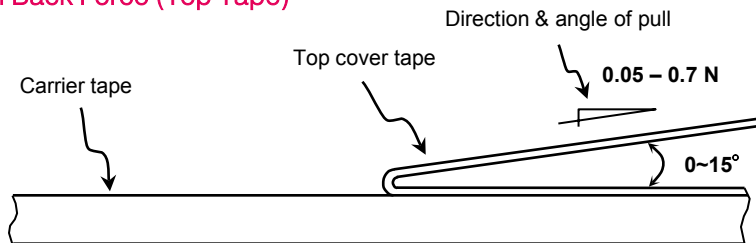
Packaging Information

C Series – Mid Voltage Application

Carrier Tape Configuration

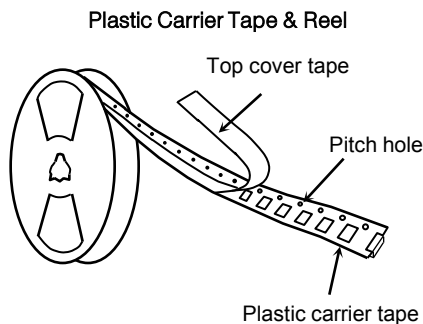
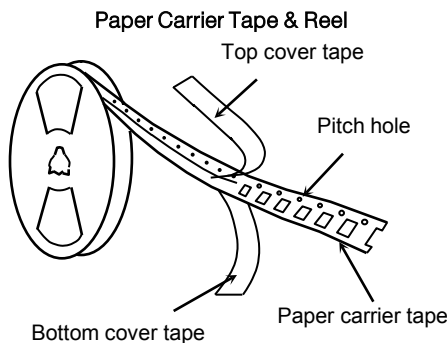


Peel Back Force (Top Tape)



- Carrier tape shall be flexible enough to be wound around a minimum radius of 30mm with components in tape.
- The missing of components shall be less than 0.1%
- Components shall not stick to the cover tape.
- The cover tape shall not protrude beyond the edges of the carrier tape not shall cover the sprocket holes.

Chip Quantity Per Reel and Structure of Reel (Paper & Plastic)



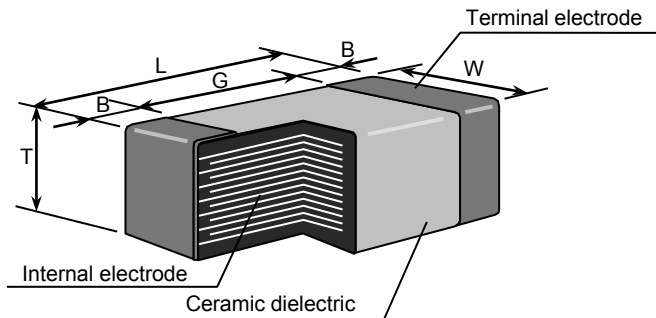
Case Code		Chip Thickness	Taping Material	Chip quantity (pcs.)		
JIS	EIA			φ178mm (7") reel	φ330mm (13") reel	
C1005	CC0402	0.50 mm	Paper	10,000	50,000	
C1608	CC0603	0.80 mm	Paper	4,000	10,000	
C2012	CC0805	0.60 mm	Paper/Plastic	4,000	20,000	
		0.85 mm			10,000	
		1.25 mm	Plastic	2,000		
C3216	CC1206	0.60 mm	Paper	4,000	10,000	
		0.85 mm	Paper/Plastic			
		1.15 mm	Plastic	2,000		8,000
		1.30 mm				
		1.60 mm				
C3225	CC1210	1.15 mm	Plastic	2,000	10,000	
		1.25 mm		2,000	8,000	
		1.30 mm				
		1.60 mm		1,000	5,000	
		2.00 mm				
		2.30 mm				
C4532	CC1812	2.50 mm	Plastic	1,000	3,000	
		1.60 mm				
		2.00 mm		500	2,000	
		2.30 mm				
		2.80 mm				
C5750	CC2220	3.20 mm	Plastic	1,000	3,000	
		1.60 mm				
		2.00 mm		500		2,000
		2.30 mm				
		2.50 mm				
	2.80 mm					



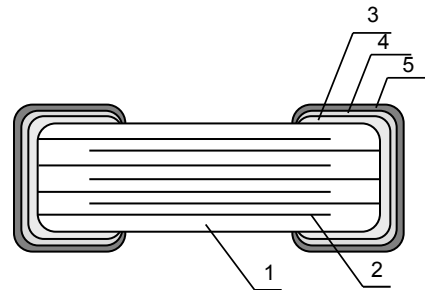
Additional Information

C Series – Mid Voltage Application

• Shape & Dimensions



• Inside Structure & Material System



Case Code		Dimensions (mm)				
JIS	EIA	L	W	T	B	G
C1005	CC0402	1.00	0.50	0.50	0.25	0.35 min.
C1608	CC0603	1.60	0.80	0.80	0.20	0.30 min.
C2012	CC0805	2.00	1.20	0.60	0.20 min.	0.50 min.
				0.85		
				1.25		
C3216	CC1206	3.20	1.60	0.60	0.20 min.	1.00 min.
				0.85		
				1.15		
				1.30		
C3225	CC1210	3.20	2.50	1.60	0.20 min.	1.00 min
				1.15		
				1.25		
				1.30		
				1.60		
				2.00		
C4532	CC1812	4.50	3.20	2.30	0.30 min.	2.00 min
				2.50		
				2.80		
				3.20		
				1.60		
C5750	CC2220	5.70	5.00	2.00	0.20 min.	2.00 min.
				2.30		
				2.50		
				2.80		
				1.60		

No.	NAME	MATERIAL	
		Class 1	Class 2
(1)	Ceramic Dielectric	CaZrO ₃	BaTiO ₃
(2)	Internal Electrode	Nickel (Ni)	
(3)	Termination	Copper (Cu)	
(4)		Nickel (Ni)	
(5)		Tin (Sn)	

• Environmental Information

TDK Corporation established internal product environmental assurance standards that include the six hazardous substances banned by the EU RoHS Directive¹ enforced on July 1, 2006 along with additional substances independently banned by TDK and has successfully completed making general purpose electronic components conform to the RoHS Directive².

1. Abbreviation for Restriction on Hazardous Substances, which refers to the regulation EU Directive 2002/95/EC on hazardous substances by the European Union (EU) effective from July 1, 2006. The Directive bans the use of six specific hazardous substances in electric and electronic devices and products handled within the EU. The six substances are lead, mercury, cadmium, hexavalent chromium, PBB (polybrominated biphenyls), and PBDE (polybrominated diphenyl ethers).
2. This means that, in conformity with the EU Directive 2002/95/EC, lead, cadmium, mercury, hexavalent chromium, and specific bromine-based flame retardants, PBB and PBDE, have not been used, except for exempted applications.

For REACH (SVHC : 15 substances according to ECHA / October 2008) : All TDK MLCC do not contain these 15 substances.

For European Directive 2000/53/CE and 2005/673/CE : Cadmium, Hexavalent Chromium, Mercury, Lead are not contained in all TDK MLCC.

For European Directive 2003/11/CE : Pentabromodiphenyl-ether, Octabromodiphenyl-ether are not contained in all TDK MLCC.



MULTILAYER CERAMIC CHIP CAPACITORS



C Series High Voltage Application

Type: C4520 [EIA CC1808]
C4532 [EIA CC1812]

Issue date: April 2011



**TDK MLCC
US Catalog**

Version B11

REMINDERS

Please read before using this product

SAFETY REMINDERS



REMINDERS

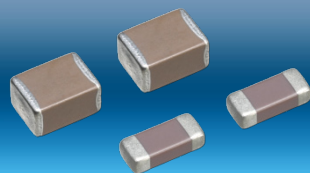
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C Series

High Voltage Application

Type: C4520, C4532



Features



- Advanced design provides improved withstand voltage characteristics.
- TDK's proprietary internal electrode structure and the use of low-dielectric-strength material result in highly reliable performance in high-voltage applications.
- Complies with ISO8802-3 for LAN applications.
- Designed exclusively for reflow soldering.

Cautions



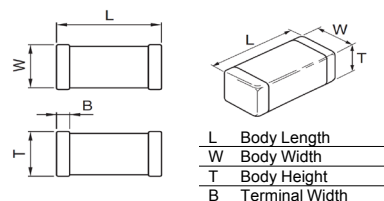
- This product intended solely for reflow soldering.
- A slit of about 1mm on the circuit board is recommended to improve removal of the flux after soldering.
- Ensure that this product is completely dried following washing.
- Because this product will be subjected to high voltages, use only low-activity rosin flux (with 0.2% max. of chlorine).
- Using this product with aluminum circuit boards must be considered a special implementation because the high heat stress levels are involved. In case of using aluminum circuit boards, please contact TDK.

Applications



- Inverter circuits with a liquid crystal backlight
- LAN card
- General high voltage circuits.
- Noise bypass for power supply
- Transceiver for LAN
- Hub, etc.

Shape & Dimensions



Dimensions in mm

Part Number Construction

Series Name	C	4532	X7R	3D	222	K	T	XXXX						
Dimensions L x W (mm)														
Case Code	Length	Width												
C4520	4.50 ± 0.40	2.00 ± 0.30												
C4532	4.50 ± 0.40	3.20 ± 0.40												
Temperature Characteristic														
Temperature Characteristics	Capacitance Change	Temperature Range												
C0G	0±30 ppm/°C	-55 to +125°C												
X7R	±15%	-55 to +125°C												
Rated Voltage (DC)														
Voltage Code	Voltage (DC)													
3A	1,000V													
3D	2,000V													
3F	3,000V													

Internal Codes

Packaging Style

Packaging Code	Style
T	Tape & Reel

Capacitance Tolerance

Tolerance Code	Tolerance
F	± 1pF
K	± 10%

Nominal Capacitance (pF)

The capacitance is expressed in three digit codes and in units of pico Farads (pF). The first and second digits identify the first and second significant figures of the capacitance. The third digit identifies the multiplier. R designates a decimal point.

Capacitance Code	Capacitance
0R5	0.5pF
010	1pF
102	1,000pF (1nF)
105	1,000,000pF (1μF)



Capacitance Range Chart

C4520 [EIA CC1808]

Capacitance Range Chart

Temperature Characteristics: C0G (0 ± 30ppm/°C), X7R (± 15%)
 Rated Voltage: 3,000 (3F), 2,000V (3D), 1,000V (3A)

Capacitance (pF)	Cap Code	Tolerance	C0G	X7R	
			3F (3000V)	3D (2000V)	3A (1000V)
10	100	F: ± 1pF K: ± 10%			
12	120				
15	150				
18	180				
22	220				
27	270				
33	330				
39	390				
47	470				
56	560				
68	680				
82	820				
100	101				
470	471				
1,000	102				

Standard Thickness

	0.85 mm
	1.10 mm
	1.30 mm
	1.60 mm
	2.00 mm



Capacitance Range Table

C4520 [EIA CC1808]

Class 1 (Temperature Compensating)

Temperature Characteristics: C0G (-55 to 125°C, 0±30 ppm/°C)

TDK Part Number (Ordering Code)	Temperature Characteristics	Rated Voltage	Capacitance (pF)	Capacitance Tolerance	Thickness (mm)
C4520C0G3F100F	C0G	3000V	10	± 1%	0.85 ± 0.10
C4520C0G3F120K	C0G	3000V	12	± 10%	0.85 ± 0.10
C4520C0G3F150K	C0G	3000V	15	± 10%	1.10 ± 0.15
C4520C0G3F180K	C0G	3000V	18	± 10%	1.10 ± 0.15
C4520C0G3F220K	C0G	3000V	22	± 10%	1.10 ± 0.15
C4520C0G3F270K	C0G	3000V	27	± 10%	1.60 ± 0.20
C4520C0G3F330K	C0G	3000V	33	± 10%	1.60 ± 0.20
C4520C0G3F390K	C0G	3000V	39	± 10%	1.60 ± 0.20
C4520C0G3F470K	C0G	3000V	47	± 10%	1.60 ± 0.20
C4520C0G3F560K	C0G	3000V	56	± 10%	2.00 ± 0.20
C4520C0G3F680K	C0G	3000V	68	± 10%	2.00 ± 0.20
C4520C0G3F820K	C0G	3000V	82	± 10%	2.00 ± 0.20
C4520C0G3F101K	C0G	3000V	100	± 10%	2.00 ± 0.20

Class 2 (Temperature Stable)

Temperature Characteristics: X7R (-55 to +125°C, ±15%)

TDK Part Number (Ordering Code)	Temperature Characteristics	Rated Voltage	Capacitance (pF)	Capacitance Tolerance	Thickness (mm)
C4520X7R3A471K	X7R	1000V	470	± 10%	1.30 ± 0.15
C4520X7R3A102K	X7R	1000V	1,000	± 10%	1.30 ± 0.15
C4520X7R3D471K	X7R	2000V	470	± 10%	1.30 ± 0.15
C4520X7R3D102K	X7R	2000V	1,000	± 10%	1.30 ± 0.15



Capacitance Range Chart

C4532 [EIA CC1812]

Capacitance Range Chart

Temperature Characteristics: C0G ($0 \pm 30\text{ppm}/^\circ\text{C}$), X7R ($\pm 15\%$)
 Rated Voltage: 3,000 (3F), 2,000V (3D), 1,000V (3A)

Capacitance (pF)	Cap Code	Tolerance	C0G	X7R	
			3F (3000V)	3D (2000V)	3A (1000V)
100	101	K: $\pm 10\%$			
120	121				
150	151				
180	181				
220	221				
270	271				
330	331				
2,200	222				
4,700	472				
10,000	103				

Standard Thickness

	1.30 mm
	1.60 mm
	2.00 mm
	2.30 mm
	2.50 mm



Capacitance Range Table

C4532 [EIA CC1812]

Class 1 (Temperature Compensating)

Temperature Characteristics: C0G (-55 to 125°C , $0 \pm 30\text{ ppm}/^\circ\text{C}$)

TDK Part Number (Ordering Code)	Temperature Characteristics	Rated Voltage	Capacitance (pF)	Capacitance Tolerance	Thickness (mm)
C4532C0G3F101K	C0G	3000V	100	$\pm 10\%$	1.60 ± 0.30
C4532C0G3F121K	C0G	3000V	120	$\pm 10\%$	1.60 ± 0.30
C4532C0G3F151K	C0G	3000V	150	$\pm 10\%$	1.60 ± 0.30
C4532C0G3F181K	C0G	3000V	180	$\pm 10\%$	1.60 ± 0.30
C4532C0G3F221K	C0G	3000V	220	$\pm 10\%$	2.00 ± 0.20
C4532C0G3F271K	C0G	3000V	270	$\pm 10\%$	2.30 ± 0.20
C4532C0G3F331K	C0G	3000V	330	$\pm 10\%$	2.50 ± 0.30

Class 2 (Temperature Stable)

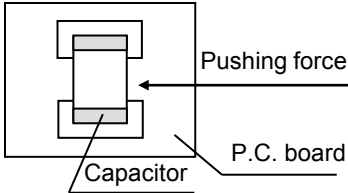
Temperature Characteristics: X7R (-55 to $+125^\circ\text{C}$, $\pm 15\%$)

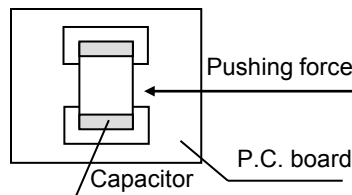
TDK Part Number (Ordering Code)	Temperature Characteristics	Rated Voltage	Capacitance (pF)	Capacitance Tolerance	Thickness (mm)
C4532X7R3A472K	X7R	1000V	4,700	$\pm 10\%$	1.60 ± 0.30
C4532X7R3A103K	X7R	1000V	10,000	$\pm 10\%$	2.00 ± 0.20
C4532X7R3D222K	X7R	2000V	2,200	$\pm 10\%$	1.30 ± 0.15



General Specifications

C Series – High Voltage Application

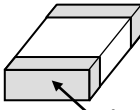
No.	Item	Performance	Test or Inspection Method												
1	External Appearance	No defects which may affect performance.	Inspect with magnifying glass (3×).												
2	Insulation Resistance	10,000MΩ min.	Apply 500V DC for 60s.												
3	Voltage Proof	Withstand test voltage without insulation breakdown or other damage.	1.2 × rated voltage (DC) shall be applied for 1 to 5s. Charge / discharge current shall not exceed 50mA.												
4	Capacitance	Within the specified tolerance.	<table><tr><th>Class</th><th>Measuring Frequency</th><th>Measuring Voltage</th></tr><tr><td>Class 1</td><td>1MHz±10%</td><td>0.5 - 5 V_{rms}</td></tr><tr><td>Class 2</td><td>1kHz±10%</td><td>1.0±0.2V_{rms}</td></tr></table>	Class	Measuring Frequency	Measuring Voltage	Class 1	1MHz±10%	0.5 - 5 V _{rms}	Class 2	1kHz±10%	1.0±0.2V _{rms}			
Class	Measuring Frequency	Measuring Voltage													
Class 1	1MHz±10%	0.5 - 5 V _{rms}													
Class 2	1kHz±10%	1.0±0.2V _{rms}													
5	Q (Class 1)	<table><tr><th>Rated Capacitance</th><th>Q</th></tr><tr><td>30pF and over</td><td>1,000 min.</td></tr><tr><td>Under 30pF</td><td>400+20×C min.</td></tr></table> C : Rated capacitance (pF)	Rated Capacitance	Q	30pF and over	1,000 min.	Under 30pF	400+20×C min.	See No.4 in this table for measuring condition.						
Rated Capacitance	Q														
30pF and over	1,000 min.														
Under 30pF	400+20×C min.														
6	Dissipation Factor (Class 2)	<table><tr><th>T.C.</th><th>D.F.</th></tr><tr><td>X7R</td><td>0.03 max.</td></tr></table>	T.C.	D.F.	X7R	0.03 max.	See No.4 in this table for measuring condition.								
T.C.	D.F.														
X7R	0.03 max.														
7	Temperature Characteristics of Capacitance (Class 1)	<table><tr><th>T.C.</th><th>Temperature Coefficient</th></tr><tr><td>C0G</td><td>0 ± 30 (ppm/°C)</td></tr></table> Capacitance drift within ± 0.2% or ± 0.05pF, whichever larger.	T.C.	Temperature Coefficient	C0G	0 ± 30 (ppm/°C)	Temperature coefficient shall be calculated based on values at 25°C and 85°C temperature. Measuring temperature below 20°C shall be -10°C and -25°C.								
T.C.	Temperature Coefficient														
C0G	0 ± 30 (ppm/°C)														
8	Temperature Characteristics of Capacitance (Class 2)	<table><tr><th>Capacitance Change (%) No Voltage Applied</th></tr><tr><td>X7R: ± 15%</td></tr></table>	Capacitance Change (%) No Voltage Applied	X7R: ± 15%	Capacitance shall be measured by the steps shown in the following table after thermal equilibrium is obtained for each step. ΔC be calculated ref. STEP3 reading <table><tr><th>Step</th><th>Temperature (°C)</th></tr><tr><td>1</td><td>Reference temp. ± 2</td></tr><tr><td>2</td><td>Min. operating temp. ± 2</td></tr><tr><td>3</td><td>Reference temp. ± 2</td></tr><tr><td>4</td><td>Max. operating temp. ± 2</td></tr></table>	Step	Temperature (°C)	1	Reference temp. ± 2	2	Min. operating temp. ± 2	3	Reference temp. ± 2	4	Max. operating temp. ± 2
Capacitance Change (%) No Voltage Applied															
X7R: ± 15%															
Step	Temperature (°C)														
1	Reference temp. ± 2														
2	Min. operating temp. ± 2														
3	Reference temp. ± 2														
4	Max. operating temp. ± 2														
9	Robustness of Terminations	No sign of termination coming off, breakage of ceramic, or other abnormal signs.	Reflow solder the capacitors on P.C. board (shown in Appendix 1) and apply a pushing force of 5N with 10±1s.  The diagram illustrates a capacitor mounted on a P.C. board. A horizontal arrow labeled 'Pushing force' points to the capacitor. The capacitor is labeled 'Capacitor' and the board is labeled 'P.C. board'.												





General Specifications

C Series – High Voltage Application

No.	Item	Performance	Test or Inspection Method																																			
10	Solderability	New solder to cover over 75% of termination. 25% may have pin holes or rough spots but not concentrated in one spot. Ceramic surface of “A sections” shall not be exposed due to melting or shifting of termination material. A section	Completely soak both terminations in solder at 235±5°C for 2±0.5s. Solder: H63A (JIS Z 3282) Flux: Isopropyl alcohol (JIS K 8839) Rosin (JIS K 5902) 25% solid solution.																																			
11	Vibration	External appearance No mechanical damage. <table><tr><td rowspan="3">Capacitance</td><td colspan="2">Characteristics</td><td>Change from the value before test</td></tr><tr><td>Class 1</td><td>C0G</td><td>± 2.5 %</td></tr><tr><td>Class 2</td><td>X7R</td><td>± 7.5 %</td></tr></table> <table><tr><td rowspan="3">Q (Class 1)</td><td colspan="2">Rated Capacitance</td><td>Q</td></tr><tr><td colspan="2">30pF and over</td><td>1,000 min.</td></tr><tr><td colspan="2">Under 30pF</td><td>400+20×C min.</td></tr></table> C : Rated capacitance (pF) D.F. (Class 2) Meet the initial spec.	Capacitance	Characteristics		Change from the value before test	Class 1	C0G	± 2.5 %	Class 2	X7R	± 7.5 %	Q (Class 1)	Rated Capacitance		Q	30pF and over		1,000 min.	Under 30pF		400+20×C min.	Completely soak both terminations in solder at 260±5°C for 5±1s. Preheating condition Temp.: 150±10°C Time: 1 to 2min. Flux: Isopropyl alcohol (JIS K 8839) Rosin (JIS K 5902) 25% solid solution. Solder: H63A (JIS Z 3282) Leave the capacitor in ambient conditions for 6 to 24h (Class 1) or 24±2h (Class 2) before measurement.															
Capacitance	Characteristics			Change from the value before test																																		
	Class 1	C0G		± 2.5 %																																		
	Class 2	X7R	± 7.5 %																																			
Q (Class 1)	Rated Capacitance		Q																																			
	30pF and over		1,000 min.																																			
	Under 30pF		400+20×C min.																																			
12	Temperature cycle	External appearance No mechanical damage. <table><tr><td rowspan="3">Capacitance</td><td colspan="2">Characteristics</td><td>Change from the value before test</td></tr><tr><td>Class 1</td><td>C0G</td><td>± 2.5 %</td></tr><tr><td>Class 2</td><td>X7R</td><td>± 7.5 %</td></tr></table> <table><tr><td rowspan="3">Q (Class 1)</td><td colspan="2">Rated Capacitance</td><td>Q</td></tr><tr><td colspan="2">30pF and over</td><td>1,000 min.</td></tr><tr><td colspan="2">Under 30pF</td><td>400+20×C min.</td></tr></table> C : Rated capacitance (pF) D.F. (Class 2) Meet the initial spec. Insulation Resistance Meet the initial spec. Voltage Proof No insulation breakdown or other damage.	Capacitance	Characteristics		Change from the value before test	Class 1	C0G	± 2.5 %	Class 2	X7R	± 7.5 %	Q (Class 1)	Rated Capacitance		Q	30pF and over		1,000 min.	Under 30pF		400+20×C min.	Reflow solder the capacitor on P.C. board (shown in Appendix 1) before testing. Expose the capacitor in the conditions step1 through step 4 and repeat 5 times consecutively. Leave the capacitor in ambient conditions for 6 to 24h (Class 1) or 24±2h (Class 2) before measurement. <table><tr><th>Step</th><th>Temperature (°C)</th><th>Time (min.)</th></tr><tr><td>1</td><td>Min. operating temp. ±3</td><td>30 ± 3</td></tr><tr><td>2</td><td>Reference Temp.</td><td>2 – 5</td></tr><tr><td>3</td><td>Max. operating temp. ± 2</td><td>30 ± 2</td></tr><tr><td>4</td><td>Reference Temp.</td><td>2 - 5</td></tr></table>	Step	Temperature (°C)	Time (min.)	1	Min. operating temp. ±3	30 ± 3	2	Reference Temp.	2 – 5	3	Max. operating temp. ± 2	30 ± 2	4	Reference Temp.	2 - 5
Capacitance	Characteristics			Change from the value before test																																		
	Class 1	C0G		± 2.5 %																																		
	Class 2	X7R	± 7.5 %																																			
Q (Class 1)	Rated Capacitance		Q																																			
	30pF and over		1,000 min.																																			
	Under 30pF		400+20×C min.																																			
Step	Temperature (°C)	Time (min.)																																				
1	Min. operating temp. ±3	30 ± 3																																				
2	Reference Temp.	2 – 5																																				
3	Max. operating temp. ± 2	30 ± 2																																				
4	Reference Temp.	2 - 5																																				



General Specifications

C Series – High Voltage Application

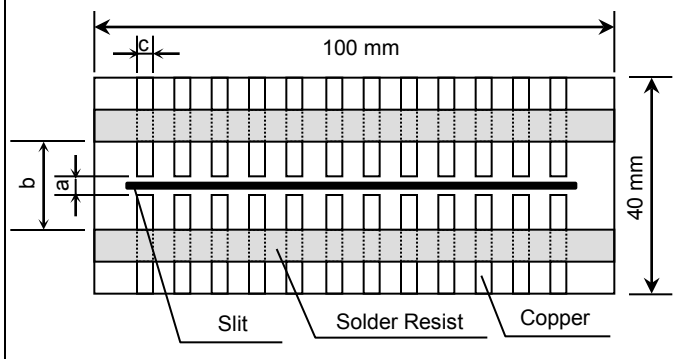
No.	Item	Performance	Test or Inspection Method									
13	Moisture Resistance (Steady State)		Reflow solder the capacitors on P.C. board (shown in Appendix 1) before testing. Leave at temperature $40 \pm 2^{\circ}\text{C}$, 90 to 95%RH for 500 +24,0h. Leave the capacitors in ambient conditions for 6 to 24h (Class 1) or $24 \pm 2\text{h}$ (Class 2) before measurement.									
	External appearance	No mechanical damage.										
	Capacitance	<table><tr><th colspan="2">Characteristics</th><th>Change from the value before test</th></tr><tr><td>Class 1</td><td>C0G</td><td>$\pm 5 \%$</td></tr><tr><td>Class 2</td><td>X7R</td><td>$\pm 12.5 \%$</td></tr></table>		Characteristics		Change from the value before test	Class 1	C0G	$\pm 5 \%$	Class 2	X7R	$\pm 12.5 \%$
		Characteristics		Change from the value before test								
		Class 1		C0G	$\pm 5 \%$							
	Class 2	X7R		$\pm 12.5 \%$								
	Q (Class 1)	<table><tr><th>Rated Capacitance</th><th>Q</th></tr><tr><td>30pF and over</td><td>350 min.</td></tr><tr><td>10pF and over to under 30pF</td><td>$275+5/2 \times \text{C min.}$</td></tr></table>		Rated Capacitance	Q	30pF and over	350 min.	10pF and over to under 30pF	$275+5/2 \times \text{C min.}$			
		Rated Capacitance		Q								
		30pF and over		350 min.								
	10pF and over to under 30pF	$275+5/2 \times \text{C min.}$										
$\text{C : Rated capacitance (pF)}$												
D.F. (Class 2)	Characteristics X7R: 200% of initial spec. max.											
Insulation Resistance	1,000MΩ min.											
14	Life		Reflow solder the capacitors on P.C. board (shown in Appendix 1) before testing. Apply rated voltage at maximum operating temperature $\pm 2^{\circ}\text{C}$ for 1,000 +48, 0h. Charge/discharge current shall not exceed 50mA. Leave the capacitor in ambient conditions for 6 to 24h (Class1) or $24 \pm 2\text{h}$ (Class2) before measurement. Voltage conditioning: Voltage treat the capacitors under testing temperature and voltage for 1 hour. Leave the capacitors in ambient conditions for $24 \pm 2\text{h}$ before measurement. Use this measurement for initial value.									
	External appearance	No mechanical damage.										
	Capacitance	<table><tr><th colspan="2">Characteristics</th><th>Change from the value before test</th></tr><tr><td>Class 1</td><td>C0G</td><td>$\pm 3 \%$</td></tr><tr><td>Class 2</td><td>X7R</td><td>$\pm 15 \%$</td></tr></table>		Characteristics		Change from the value before test	Class 1	C0G	$\pm 3 \%$	Class 2	X7R	$\pm 15 \%$
		Characteristics		Change from the value before test								
		Class 1		C0G	$\pm 3 \%$							
	Class 2	X7R		$\pm 15 \%$								
	Q (Class 1)	<table><tr><th>Rated Capacitance</th><th>Q</th></tr><tr><td>30pF and over</td><td>350 min.</td></tr><tr><td>10pF and over to under 30pF</td><td>$275+5/2 \times \text{C min.}$</td></tr></table>		Rated Capacitance	Q	30pF and over	350 min.	10pF and over to under 30pF	$275+5/2 \times \text{C min.}$			
		Rated Capacitance		Q								
		30pF and over		350 min.								
	10pF and over to under 30pF	$275+5/2 \times \text{C min.}$										
$\text{C : Rated capacitance (pF)}$												
D.F. (Class 2)	Characteristics X7R: 200% of initial spec. max.											
Insulation Resistance	1,000MΩ min.											

*As for the initial measurement of capacitors (Class 2) on number 8, 11, 12 and 13, leave capacitors at $150 -10, 0^{\circ}\text{C}$ for 1 hour and measure the value after leaving capacitor for $24 \pm 2\text{h}$ in ambient condition.



Appendix - 1

P.C. Board for reliability test



Material : Glass Epoxy (As per JIS C6484 GE4)

P.C. Board thickness : 1.6mm

 Copper (thickness 0.035mm)

 Solder resist

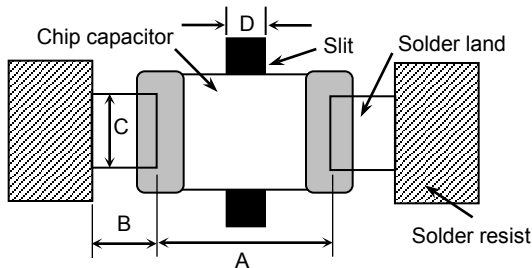
Case Code		Dimensions (mm)		
JIS	EIA	a	b	c
C4520	CC1808	3.5	7.0	2.5
C4532	CC1812	3.5	7.0	3.7



Soldering Information

C Series – High Voltage Application

Recommended Soldering Land Pattern



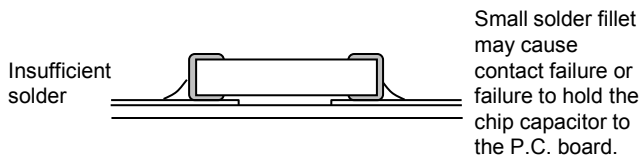
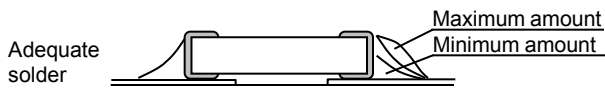
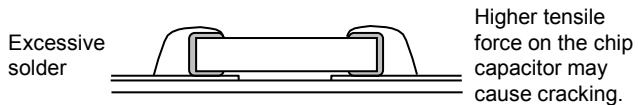
- This product intended solely for reflow soldering.
- A slit of about 1mm on the circuit board is recommended to improve removal of the flux after soldering.
- Ensure that this product is completely dried following washing.
- Because this product will be subjected to high voltages, use only low-activity rosin flux (with 0.2% max. of chlorine).
- Using this product with aluminum circuit boards must be considered a special implementation because the high heat stress levels are involved. In case of using aluminum circuit boards, please contact TDK.

Reflow Soldering

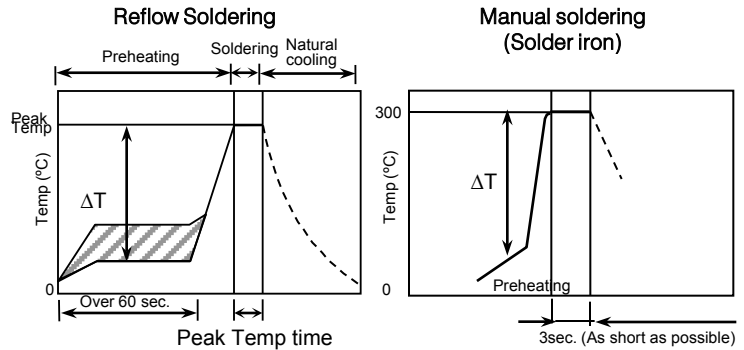
Unit: mm

Type	C4520 [CC1808]	C4532 [CC1812]
Symbol		
A	3.1 – 3.7	3.1 – 3.7
B	1.2 – 1.4	1.2 – 1.4
C	1.5 – 2.0	2.4 – 3.2
D	1.0 – 1.3	1.0 – 1.3

Recommended Solder Amount



Recommended Soldering Profile



Recommended soldering duration

Solder	Temp./Dura.	Reflow Soldering	
		Peak temp (°C)	Duration (sec.)
Sn-Pb Solder		230 max.	20 max.
Lead-Free Solder		260 max.	10 max.

Recommended solder compositions

Sn-37Pb (Sn-Pb solder)

Sn-3.0Ag-0.5Cu (Lead Free Solder)

Preheating Condition

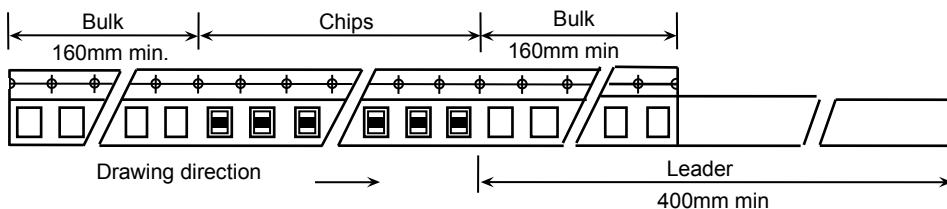
Soldering	Temp. (°C)
Reflow soldering	$\Delta T \leq 130$
Manual soldering	$\Delta T \leq 130$



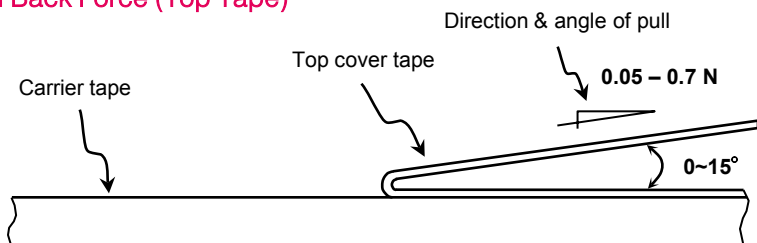
Packaging Information

C Series – High Voltage Application

Carrier Tape Configuration



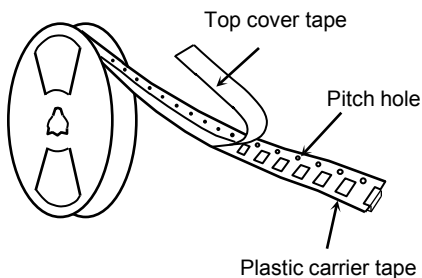
Peel Back Force (Top Tape)



- Carrier tape shall be flexible enough to be wound around a minimum radius of 30mm with components in tape.
- The missing of components shall be less than 0.1%
- Components shall not stick to the cover tape.
- The cover tape shall not protrude beyond the edges of the carrier tape not shall cover the sprocket holes.

Chip Quantity Per Reel and Structure of Reel

Plastic Carrier Tape & Reel



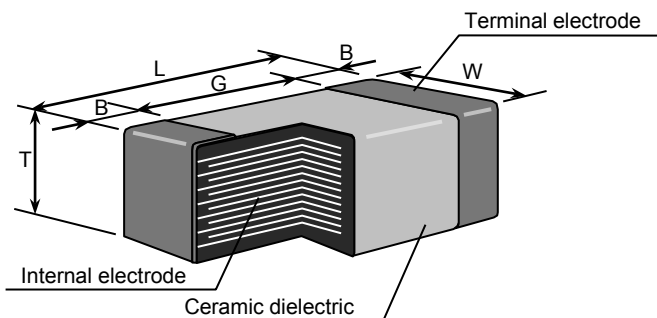
Case Code		Chip Thickness	Taping Material	Chip quantity (pcs.)	
JIS	EIA			φ178mm (7") reel	Φ330mm (13") reel
C4520	CC1808	0.85 mm	Plastic	1,000	5,000
		1.10 mm			
		1.30 mm			
		1.60 mm			3,000
		2.00 mm			
C4532	CC1812	1.30 mm	Plastic	1,000	5,000
		1.60 mm			
		2.00 mm			
		2.30 mm		500	3,000
		3.20 mm			



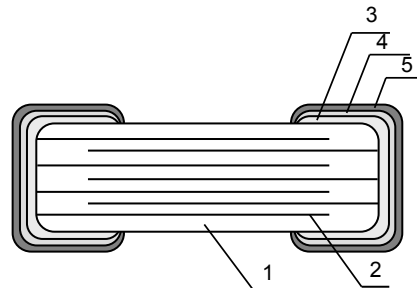
Additional Information

C Series – High Voltage Application

• Shape & Dimensions



• Inside Structure & Material System



Case Code		Dimensions (mm)				
JIS	EIA	L	W	T	B	G
C4520	CC1808	4.50	2.00	0.85 mm	0.30 min	2.00 min
				1.10 mm		
				1.30 mm	2.00 min	
				1.60 mm	0.30 min	
				2.00 mm		
C4532	CC1812	4.50	3.20	1.30 mm	0.30 min.	2.00 min
				1.60 mm		
				2.00 mm	0.20 min	
				2.30 mm		
				3.20 mm		

No.	NAME	MATERIAL	
		Class 1	Class 2
(1)	Ceramic Dielectric	CaZrO ₃	BaTiO ₃
(2)	Internal Electrode	Nickel (Ni)	
(3)	Termination	Copper (Cu)	
(4)		Nickel (Ni)	
(5)		Tin (Sn)	

• Environmental Information

TDK Corporation established internal product environmental assurance standards that include the six hazardous substances banned by the EU RoHS Directive¹ enforced on July 1, 2006 along with additional substances independently banned by TDK and has successfully completed making general purpose electronic components conform to the RoHS Directive².

1. Abbreviation for Restriction on Hazardous Substances, which refers to the regulation EU Directive 2002/95/EC on hazardous substances by the European Union (EU) effective from July 1, 2006. The Directive bans the use of six specific hazardous substances in electric and electronic devices and products handled within the EU. The six substances are lead, mercury, cadmium, hexavalent chromium, PBB (polybrominated biphenyls), and PBDE (polybrominated diphenyl ethers).
2. This means that, in conformity with the EU Directive 2002/95/EC, lead, cadmium, mercury, hexavalent chromium, and specific bromine-based flame retardants, PBB and PBDE, have not been used, except for exempted applications.

For REACH (SVHC : 15 substances according to ECHA / October 2008) : All TDK MLCC do not contain these 15 substances.

For European Directive 2000/53/CE and 2005/673/CE : Cadmium, Hexavalent Chromium, Mercury, Lead are not contained in all TDK MLCC.

For European Directive 2003/11/CE : Pentabromodiphenyl-ether, Octabromodiphenyl-ether are not contained in all TDK MLCC.



MULTILAYER CERAMIC CHIP CAPACITORS



C Series High Temperature Application

Type: C1005 [EIA CC0402]
C1608 [EIA CC0603]
C2012 [EIA CC0805]
C3216 [EIA CC1206]
C3225 [EIA CC1210]

Issue date: April 2011



**TDK MLCC
US Catalog**

Version B11

REMINDERS

Please read before using this product

SAFETY REMINDERS



REMINDERS

1. If you intend to use a product listed in this catalog for a purpose that may cause loss of life or other damage, you must contact our company's sales window.
2. We may modify products or discontinue production of a product listed in this catalog without prior notification.
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C Series

High Temperature Application

Type: C1005, C1608, C2012, C3216, C3225

Features



- These products have no polarity.
- Their electrostatic capacity temperature response is stable at 15% even in high temperature ranges (up to 150°C).

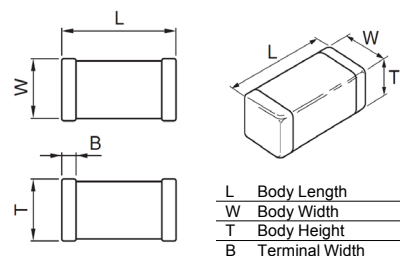
Parameters	Specifications
Temperature	-55 to +150°C
Characteristics	$\Delta C/C = \pm 15\%$
Operating Temperature	-55 to +150°C
Dissipation Factor	3% maximum
Insulation Resistance	10 GΩ or 500 MΩ • μF minimum
Voltage Proof	2.5 • rated voltage for 1 to 5 seconds
	Charge/Discharge ≤ 50 mA

Applications



- Automotive (underhood)
- Measurement instruments used at high temperature environments
- LCD display
- Sensor Module

Shape & Dimensions



Dimensions in mm

L	Body Length
W	Body Width
T	Body Height
B	Terminal Width

Part Number Construction

Series Name	C	3225	X8R	1E	335	K	T	XXXX
Dimensions L x W (mm)								
Case Code	Length	Width						
C1005	1.00 ± 0.05	0.50 ± 0.05						
C1608	1.60 ± 0.10	0.80 ± 0.10						
C2012	2.00 ± 0.20	1.25 ± 0.20						
C3216	3.20 ± 0.20	1.60 ± 0.20						
C3225	3.20 ± 0.40	2.50 ± 0.30						
Temperature Characteristic								
Temperature Characteristics	Capacitance Change	Temperature Range						
X8R	± 15%	-55 to +150°C						
Rated Voltage (DC)								
Voltage Code	Voltage (DC)							
1E	25V							
1H	50V							
2A	100V							

Internal Codes

Packaging Style

Packaging Code	Style
T	Tape & Reel

Capacitance Tolerance

Tolerance Code	Tolerance
K	± 10%

Nominal Capacitance (pF)

The capacitance is expressed in three digit codes and in units of pico Farads (pF). The first and second digits identify the first and second significant figures of the capacitance. The third digit identifies the multiplier. R designates a decimal point.

Capacitance Code	Capacitance
0R5	0.5pF
010	1pF
102	1,000pF (1nF)
105	1,000,000pF (1μF)



Capacitance Range Chart

C1005 [EIA CC0402]

Capacitance Range Chart

Temperature Characteristics: X8R ($\pm 15\%$)
Rated Voltage: 50V (1H), 25V (1E)

Capacitance (pF)	Cap Code	Tolerance	X8R	
			1H (50V)	1E (25V)
150	151	K: $\pm 10\%$		
220	221			
330	331			
470	471			
680	681			
1,000	102			
1,500	152			
2,200	222			
3,300	332			
4,700	472			
6,800	682			
10,000	103			

Standard Thickness

 0.50 mm



Capacitance Range Table

C1005 [EIA CC0402]

Class 2 (Temperature Stable)

Temperature Characteristics: X8R (-55 to $+150^{\circ}\text{C}$, $\pm 15\%$)

TDK Part Number (Ordering Code)	Temperature Characteristics	Rated Voltage	Capacitance (pF)	Capacitance Tolerance	Thickness (mm)
C1005X8R1E682K	X8R	25V	6,800	$\pm 10\%$	0.50 ± 0.05
C1005X8R1E103K	X8R	25V	10,000	$\pm 10\%$	0.50 ± 0.05
C1005X8R1H151K	X8R	50V	150	$\pm 10\%$	0.50 ± 0.05
C1005X8R1H221K	X8R	50V	220	$\pm 10\%$	0.50 ± 0.05
C1005X8R1H331K	X8R	50V	330	$\pm 10\%$	0.50 ± 0.05
C1005X8R1H471K	X8R	50V	470	$\pm 10\%$	0.50 ± 0.05
C1005X8R1H681K	X8R	50V	680	$\pm 10\%$	0.50 ± 0.05
C1005X8R1H102K	X8R	50V	1,000	$\pm 10\%$	0.50 ± 0.05
C1005X8R1H152K	X8R	50V	1,500	$\pm 10\%$	0.50 ± 0.05
C1005X8R1H222K	X8R	50V	2,200	$\pm 10\%$	0.50 ± 0.05
C1005X8R1H332K	X8R	50V	3,300	$\pm 10\%$	0.50 ± 0.05
C1005X8R1H472K	X8R	50V	4,700	$\pm 10\%$	0.50 ± 0.05



Capacitance Range Chart

C1608 [EIA CC0603]

Capacitance Range Chart

Temperature Characteristics: X8R ($\pm 15\%$)
Rated Voltage: 100V (2A), 50V (1H), 25V (1E)

Capacitance (pF)	Cap Code	Tolerance	X8R		
			2A (100V)	1H (50V)	1E (25V)
1,000	102	K: $\pm 10\%$			
1,500	152				
2,200	222				
3,300	332				
4,700	472				
6,800	682				
10,000	103				
15,000	153				
22,000	223				
33,000	333				
47,000	473				
68,000	683				
100,000	104				

Standard Thickness
0.80 mm



Capacitance Range Table

C1608 [EIA CC0603]

Class 2 (Temperature Stable)

Temperature Characteristics: X8R (-55 to $+150^{\circ}\text{C}$, $\pm 15\%$)

TDK Part Number (Ordering Code)	Temperature Characteristics	Rated Voltage	Capacitance (pF)	Capacitance Tolerance	Thickness (mm)
C1608X8R1E683K	X8R	25V	68,000	$\pm 10\%$	0.80 ± 0.10
C1608X8R1E104K	X8R	25V	100,000	$\pm 10\%$	0.80 ± 0.10
C1608X8R1H102K	X8R	50V	1,000	$\pm 10\%$	0.80 ± 0.10
C1608X8R1H152K	X8R	50V	1,500	$\pm 10\%$	0.80 ± 0.10
C1608X8R1H222K	X8R	50V	2,200	$\pm 10\%$	0.80 ± 0.10
C1608X8R1H332K	X8R	50V	3,300	$\pm 10\%$	0.80 ± 0.10
C1608X8R1H472K	X8R	50V	4,700	$\pm 10\%$	0.80 ± 0.10
C1608X8R1H682K	X8R	50V	6,800	$\pm 10\%$	0.80 ± 0.10
C1608X8R1H103K	X8R	50V	10,000	$\pm 10\%$	0.80 ± 0.10
C1608X8R1H153K	X8R	50V	15,000	$\pm 10\%$	0.80 ± 0.10
C1608X8R1H223K	X8R	50V	22,000	$\pm 10\%$	0.80 ± 0.10
C1608X8R1H333K	X8R	50V	33,000	$\pm 10\%$	0.80 ± 0.10
C1608X8R1H473K	X8R	50V	47,000	$\pm 10\%$	0.80 ± 0.10
C1608X8R2A102K	X8R	100V	1,000	$\pm 10\%$	0.80 ± 0.10
C1608X8R2A152K	X8R	100V	1,500	$\pm 10\%$	0.80 ± 0.10
C1608X8R2A222K	X8R	100V	2,200	$\pm 10\%$	0.80 ± 0.10
C1608X8R2A332K	X8R	100V	3,300	$\pm 10\%$	0.80 ± 0.10
C1608X8R2A472K	X8R	100V	4,700	$\pm 10\%$	0.80 ± 0.10
C1608X8R2A682K	X8R	100V	6,800	$\pm 10\%$	0.80 ± 0.10
C1608X8R2A103K	X8R	100V	10,000	$\pm 10\%$	0.80 ± 0.10
C1608X8R2A153K	X8R	100V	15,000	$\pm 10\%$	0.80 ± 0.10



Capacitance Range Chart

C2012 [EIA CC0805]

Capacitance Range Chart

Temperature Characteristics: X8R ($\pm 15\%$)
 Rated Voltage: 100V (2A), 50V (1H), 25V (1E)

Capacitance (pF)	Cap Code	Tolerance	X8R		
			2A (100V)	1H (50V)	1E (25V)
22,000	223	K: $\pm 10\%$			
68,000	683				
100,000	104				
150,000	154				
220,000	224				
330,000	334				

Standard Thickness

	0.85 mm
	1.25 mm



Capacitance Range Table

C2012 [EIA CC0805]

Class 2 (Temperature Stable)

Temperature Characteristics: X8R (-55 to $+150^{\circ}\text{C}$, $\pm 15\%$)

TDK Part Number (Ordering Code)	Temperature Characteristics	Rated Voltage	Capacitance (pF)	Capacitance Tolerance	Thickness (mm)
C2012X8R1E154K/0.85	X8R	25V	150,000	$\pm 10\%$	0.85 ± 0.10
C2012X8R1E224K	X8R	25V	220,000	$\pm 10\%$	1.25 ± 0.20
C2012X8R1E334K	X8R	25V	330,000	$\pm 10\%$	1.25 ± 0.20
C2012X8R1H683K	X8R	50V	68,000	$\pm 10\%$	1.25 ± 0.20
C2012X8R1H104K	X8R	50V	100,000	$\pm 10\%$	1.25 ± 0.20
C2012X8R2A223K	X8R	100V	22,000	$\pm 10\%$	1.25 ± 0.20



Capacitance Range Chart

C3216 [EIA CC1206]

Capacitance Range Chart

Temperature Characteristics: X8R ($\pm 15\%$)
Rated Voltage: 100V (2A), 50V (1H), 25V (1E)

Capacitance (pF)	Cap Code	Tolerance	X8R		
			2A (100V)	1H (50V)	1E (25V)
33,000	333	K: $\pm 10\%$			
47,000	473				
68,000	683				
100,000	104				
150,000	154				
220,000	224				
330,000	334				
470,000	474				
680,000	684				
1,000,000	105				

Standard Thickness

	0.85 mm
	1.15 mm
	1.60 mm



Capacitance Range Table

C3216 [EIA CC1206]

Class 2 (Temperature Stable)

Temperature Characteristics: X8R (-55 to $+150^{\circ}\text{C}$, $\pm 15\%$)

TDK Part Number (Ordering Code)	Temperature Characteristics	Rated Voltage	Capacitance (pF)	Capacitance Tolerance	Thickness (mm)
C3216X8R1E334K	X8R	25V	330,000	$\pm 10\%$	0.85 ± 0.10
C3216X8R1E474K	X8R	25V	470,000	$\pm 10\%$	0.85 ± 0.10
C3216X8R1E684K	X8R	25V	680,000	$\pm 10\%$	1.15 ± 0.10
C3216X8R1E105K	X8R	25V	1,000,000	$\pm 10\%$	1.60 ± 0.30
C3216X8R1H154K	X8R	50V	150,000	$\pm 10\%$	0.85 ± 0.10
C3216X8R1H224K	X8R	50V	220,000	$\pm 10\%$	1.15 ± 0.10
C3216X8R1H334K	X8R	50V	330,000	$\pm 10\%$	1.60 ± 0.30
C3216X8R1H474K	X8R	50V	470,000	$\pm 10\%$	1.60 ± 0.30
C3216X8R2A333K	X8R	100V	33,000	$\pm 10\%$	0.85 ± 0.10
C3216X8R2A473K	X8R	100V	47,000	$\pm 10\%$	0.85 ± 0.10
C3216X8R2A683K	X8R	100V	68,000	$\pm 10\%$	1.15 ± 0.10
C3216X8R2A104K	X8R	100V	100,000	$\pm 10\%$	1.15 ± 0.10
C3216X8R2A154K	X8R	100V	150,000	$\pm 10\%$	1.60 ± 0.30



Capacitance Range Chart

C3225 [EIA CC1210]

Capacitance Range Chart

Temperature Characteristics: X8R ($\pm 15\%$)

Rated Voltage: 100V (2A), 50V (1H), 25V (1E)

Capacitance (pF)	Cap Code	Tolerance	X8R		
			2A (100V)	1H (50V)	1E (25V)
1,500,000	155	K: $\pm 10\%$			
2,200,000	225				
3,300,000	335				

Standard Thickness

	1.60 mm
	2.00 mm
	2.50 mm



Capacitance Range Table

C3225 [EIA CC1210]

Class 2 (Temperature Stable)

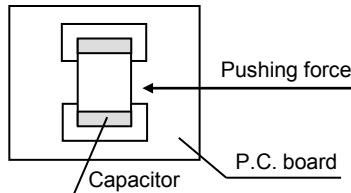
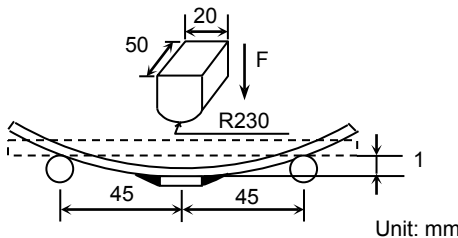
Temperature Characteristics: X8R (-55 to $+150^{\circ}\text{C}$, $\pm 15\%$)

TDK Part Number (Ordering Code)	Temperature Characteristics	Rated Voltage	Capacitance (pF)	Capacitance Tolerance	Thickness (mm)
C3225X8R1E155K	X8R	25V	1,500,000	$\pm 10\%$	1.60 ± 0.30
C3225X8R1E225K	X8R	25V	2,200,000	$\pm 10\%$	2.00 ± 0.20
C3225X8R1E335K	X8R	25V	3,300,000	$\pm 10\%$	2.50 ± 0.30



General Specifications

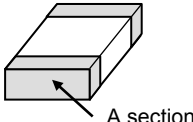
C Series – High Temperature Application

No.	Item	Performance	Test or Inspection Method												
1	External Appearance	No defects which may affect performance.	Inspect with magnifying glass (3×).												
2	Insulation Resistance	10,000MΩ or 500 MΩ・μF min.	Apply rated voltage for 60s.												
3	Voltage Proof	Withstand test voltage without insulation breakdown or other damage.	2.5 x VDC rated voltage shall be applied for 1～5s. Charge / discharge current shall not exceed 50mA.												
4	Capacitance	Within the specified tolerance.	<table><tr><th>Measuring Frequency</th><th>Measuring Voltage</th></tr><tr><td>1kHz±10%</td><td>1.0±0.2V_{rms}</td></tr></table>	Measuring Frequency	Measuring Voltage	1kHz±10%	1.0±0.2V _{rms}								
Measuring Frequency	Measuring Voltage														
1kHz±10%	1.0±0.2V _{rms}														
5	Dissipation Factor	<table><tr><th>T.C.</th><th>D.F.</th></tr><tr><td>X8R</td><td>0.03 max.</td></tr></table>	T.C.	D.F.	X8R	0.03 max.	See No.4 in this table for measuring condition.								
T.C.	D.F.														
X8R	0.03 max.														
6	Temperature Characteristics of Capacitance	Capacitance Change (%) <table><tr><th>No Voltage Applied</th></tr><tr><td>X8R: ± 15%</td></tr></table>	No Voltage Applied	X8R: ± 15%	Capacitance shall be measured by the steps shown in the following table after thermal equilibrium is obtained for each step. ΔC be calculated ref. STEP3 reading <table><tr><th>Step</th><th>Temperature (°C)</th></tr><tr><td>1</td><td>Reference temp. ± 2</td></tr><tr><td>2</td><td>Min. operating temp. ± 2</td></tr><tr><td>3</td><td>Reference temp. ± 2</td></tr><tr><td>4</td><td>Max. operating temp. ± 2</td></tr></table>	Step	Temperature (°C)	1	Reference temp. ± 2	2	Min. operating temp. ± 2	3	Reference temp. ± 2	4	Max. operating temp. ± 2
No Voltage Applied															
X8R: ± 15%															
Step	Temperature (°C)														
1	Reference temp. ± 2														
2	Min. operating temp. ± 2														
3	Reference temp. ± 2														
4	Max. operating temp. ± 2														
7	Robustness of Terminations	No sign of termination coming off, breakage of ceramic, or other abnormal signs.	Reflow solder the capacitor on a P.C. board (shown in Appendix 1) and apply a pushing force of 5N (C1608, C2012, C3216, C3225 type) and 2N (C1005 type) for 10±1s. 												
8	Bending	No mechanical damage.	Reflow solder the capacitor on a P.C. board (shown in Appendix 2) and bend 1mm as illustrated:  Unit: mm												



General Specifications

C Series – High Temperature Application

No.	Item	Performance	Test or Inspection Method																
9	Solderability	New solder to cover over 75% of termination. 25% may have pinholes or rough spots but not concentrated in one spot. Ceramic surface of "A sections" shall not be exposed due to melting or shifting of termination material. 	Completely soak both terminations in solder at 235±5°C for 2±0.5s. Solder: H63A (JIS Z 3282) Flux: Isopropyl alcohol (JIS K 8839) Rosin (JIS K 5902) 25% solid solution.																
10	Resistance to solder heat	<table><tr><td>External appearance</td><td>No cracks are allowed and terminations shall be covered at least 60% with new solder.</td></tr><tr><td>Capacitance</td><td><table><tr><th colspan="2">Characteristics</th><th>Change from the value before test</th></tr><tr><td>Class 2</td><td>X8R</td><td>± 7.5 %</td></tr></table></td></tr><tr><td>D.F. (Class 2)</td><td>Meet the initial spec.</td></tr><tr><td>Insulation Resistance</td><td>Meet the initial spec.</td></tr><tr><td>Voltage Proof</td><td>No insulation breakdown or other damage.</td></tr></table>	External appearance	No cracks are allowed and terminations shall be covered at least 60% with new solder.	Capacitance	<table><tr><th colspan="2">Characteristics</th><th>Change from the value before test</th></tr><tr><td>Class 2</td><td>X8R</td><td>± 7.5 %</td></tr></table>	Characteristics		Change from the value before test	Class 2	X8R	± 7.5 %	D.F. (Class 2)	Meet the initial spec.	Insulation Resistance	Meet the initial spec.	Voltage Proof	No insulation breakdown or other damage.	Completely soak both terminations in solder at 260±5°C for 5±1s. Preheating condition Temp. : 150±10°C Time : 1~2min. Flux: Isopropyl alcohol (JIS K 8839) Rosin (JIS K 5902) 25% solid solution. Solder: H63A(JIS Z 3282) Leave the capacitor in ambient conditions for 48±4h before measurement.
External appearance	No cracks are allowed and terminations shall be covered at least 60% with new solder.																		
Capacitance	<table><tr><th colspan="2">Characteristics</th><th>Change from the value before test</th></tr><tr><td>Class 2</td><td>X8R</td><td>± 7.5 %</td></tr></table>	Characteristics		Change from the value before test	Class 2	X8R	± 7.5 %												
Characteristics		Change from the value before test																	
Class 2	X8R	± 7.5 %																	
D.F. (Class 2)	Meet the initial spec.																		
Insulation Resistance	Meet the initial spec.																		
Voltage Proof	No insulation breakdown or other damage.																		
11	Vibration	<table><tr><td>External appearance</td><td>No mechanical damage.</td></tr><tr><td>Capacitance</td><td><table><tr><th colspan="2">Characteristics</th><th>Change from the value before test</th></tr><tr><td>Class 2</td><td>X8R</td><td>± 7.5 %</td></tr></table></td></tr><tr><td>D.F. (Class 2)</td><td>Meet the initial spec.</td></tr></table>	External appearance	No mechanical damage.	Capacitance	<table><tr><th colspan="2">Characteristics</th><th>Change from the value before test</th></tr><tr><td>Class 2</td><td>X8R</td><td>± 7.5 %</td></tr></table>	Characteristics		Change from the value before test	Class 2	X8R	± 7.5 %	D.F. (Class 2)	Meet the initial spec.	Reflow solder the capacitor on a P.C. board (shown in Appendix 1) before testing. Vibrate the capacitor with amplitude of 1.5mm P-P sweeping the frequencies from 10Hz to 55Hz and back to 10Hz in after 1min. Repeat this for 2h each in 3 perpendicular directions.				
External appearance	No mechanical damage.																		
Capacitance	<table><tr><th colspan="2">Characteristics</th><th>Change from the value before test</th></tr><tr><td>Class 2</td><td>X8R</td><td>± 7.5 %</td></tr></table>	Characteristics		Change from the value before test	Class 2	X8R	± 7.5 %												
Characteristics		Change from the value before test																	
Class 2	X8R	± 7.5 %																	
D.F. (Class 2)	Meet the initial spec.																		



General Specifications

C Series – High Temperature Application

No.	Item	Performance	Test or Inspection Method
12	Temperature cycle		Reflow solder the capacitors on P.C. board (shown in Appendix 1) before testing.
	External appearance	No mechanical damage.	Expose the capacitor in the condition step 1 through 4, and repeat 5 times consecutively.
	Capacitance	Characteristics	Leave the capacitors in ambient conditions for 48±4h before measurement.
		Change from the value before test	
		Class 2 X8R ± 7.5 %	
	D.F. (Class 2)	Meet the initial spec.	
13	Moisture Resistance (Steady State)		Reflow solder the capacitor on P.C. board (shown in Appendix 1) before testing.
	External appearance	No mechanical damage.	Leave at temperature 40±2°C, 90 to 95%RH for 500+24,0h.
	Capacitance	Characteristics	Leave the capacitor in ambient conditions for 48±4h before measurement.
		Change from the value before test	
		Class 2 X8R ± 12.5 %	
	D.F. (Class 2)	200% of initial spec max.	
14	Moisture Resistance		Reflow solder the capacitor on P.C. board (shown in Appendix 1) before testing.
	External appearance	No mechanical damage.	Apply the rated voltage at temperature 40±2°C and 90 to 95%RH for 500+24,0h.
	Capacitance	Characteristics	Charge/discharge current shall not exceed 50mA.
		Change from the value before test	
		Class 2 X8R ± 12.5 %	Leave the capacitor in ambient conditions for 48±4h before measurement.
	D.F. (Class 2)	200% of initial spec max.	Voltage conditioning: Voltage treats the capacitor under testing temperature and voltage for 1 hour.
	Insulation Resistance		Leave the capacitor in ambient condition for 48±4h before measurement.
	External appearance	No mechanical damage.	Use this measurement for initial value.
	Capacitance	Characteristics	
		Change from the value before test	
		Class 2 X8R ± 12.5 %	
	D.F. (Class 2)	200% of initial spec max.	

Step	Temperature (°C)	Time (min.)
1	Min. operating temp. ±3	30 ± 3
2	Reference Temp.	2 – 5
3	Max. operating temp. ± 2	30 ± 2
4	Reference Temp.	2 - 5



General Specifications

C Series – High Temperature Application

No.	Item	Performance	Test or Inspection Method						
15	Life								
	External appearance	No mechanical damage.	Reflow solder the capacitor on P.C. board (shown in Appendix 1) before testing. Apply 2× rated voltage at maximum operating temperature ±3°C for 1,000 +48.0h.						
	Capacitance	<table><tr><th colspan="2">Characteristics</th><th>Change from the value before test</th></tr><tr><td>Class 2</td><td>X8R</td><td>± 15 %</td></tr></table>	Characteristics		Change from the value before test	Class 2	X8R	± 15 %	Charge/discharge current shall not exceed 50mA.
	Characteristics		Change from the value before test						
	Class 2	X8R	± 15 %						
D.F. (Class 2)	Characteristics X8R: 200% of initial spec. max	Voltage conditioning : Voltage treats the capacitor under testing temperature and voltage for 1 hour.							
Insulation Resistance	1,000MΩ or 50 MΩ · μF min.	Leave the capacitor in ambient conditions for 48±4h before measurement. Use this measurement for initial value.							

***As for the initial measurement of capacitors on number 6,10,11,12 and 13, leave capacitor at 150 –10, 0°C for 1h and measure the value after leaving the capacitor for 48±4h in ambient conditions.**



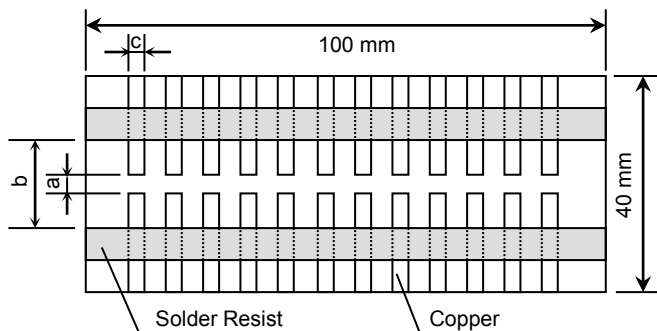
General Specifications

C Series – High Temperature Application

Appendix - 1a

P.C. Board for reliability test

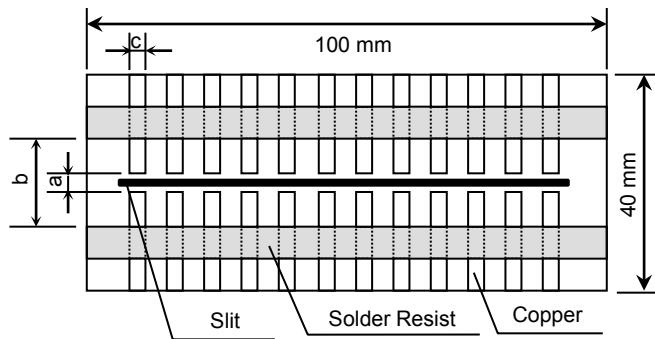
Applied for C1005, C1608, C2012, C3216



Appendix - 1b

P.C. Board for reliability test

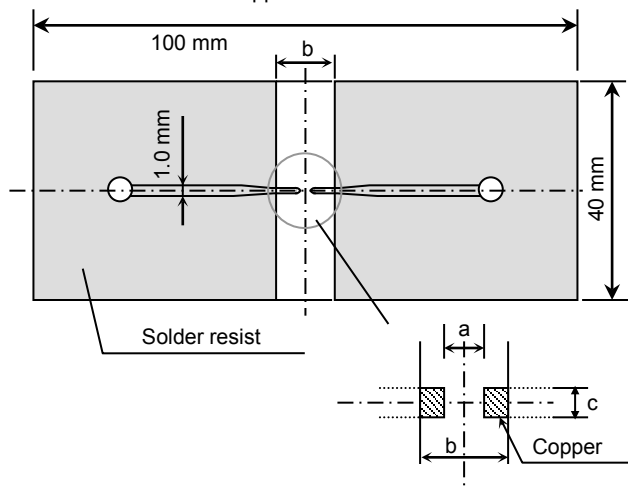
Applied for C3225



Appendix - 2a

P.C. Board for bending test

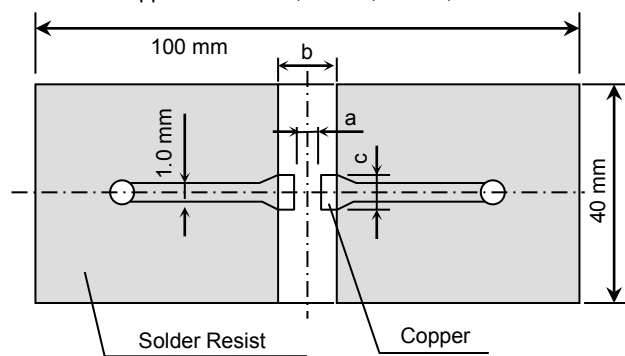
Applied for C1005



Appendix - 2b

P.C. Board for bending test

Applied for C1608, C2012, C3216, C3225



Material : Glass Epoxy (As per JIS C6484 GE4)

P.C. Board thickness : Appendix-2a 0.8mm

Appendix-1a, 1b, 2b 1.6mm



Copper (thickness 0.035mm)

Solder resist

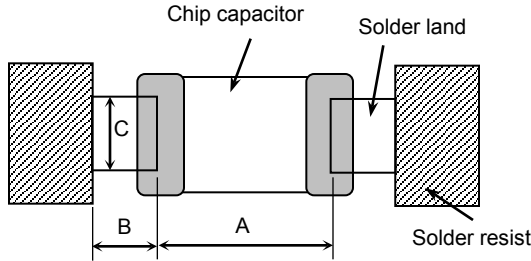
Case Code		Dimensions (mm)		
JIS	EIA	a	b	c
C1005	CC0402	0.4	1.5	0.5
C1608	CC0603	1.0	3.0	1.2
C2012	CC0805	1.2	4.0	1.65
C3216	CC1206	2.2	5.0	2.0
C3225	CC1210	2.2	5.0	2.9



Soldering Information

C Series – High Temperature Application

Recommended Soldering Land Pattern



Wave Soldering

Unit: mm

Type	C1608 [CC0603]	C2012 [CC0805]	C3216 [CC1206]
Symbol			
A	0.7 - 1.0	1.0 - 1.3	2.1 - 2.5
B	0.8 - 1.0	1.0 - 1.2	1.1 - 1.3
C	0.6 - 0.8	0.8 - 1.1	1.0 - 1.3

Reflow Soldering

Unit: mm

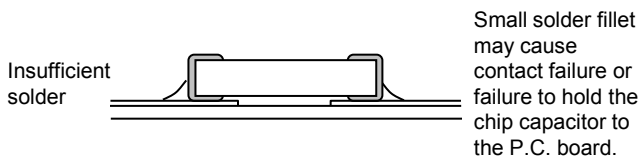
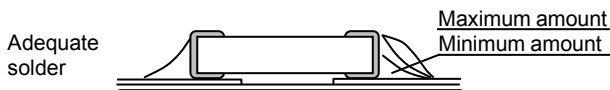
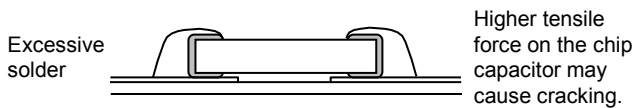
Type	C1005 [CC0402]	C1608 [CC0603]	C2012 [CC0805]
Symbol			
A	0.3 - 0.5	0.6 - 0.8	0.9 - 1.2
B	0.35 - 0.45	0.6 - 0.8	0.7 - 0.9
C	0.4 - 0.6	0.6 - 0.8	0.9 - 1.2

Reflow Soldering

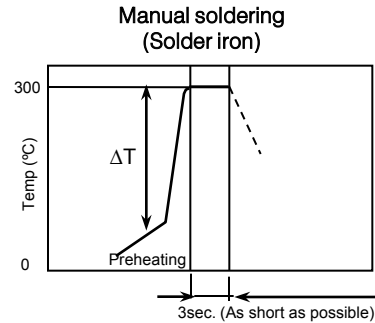
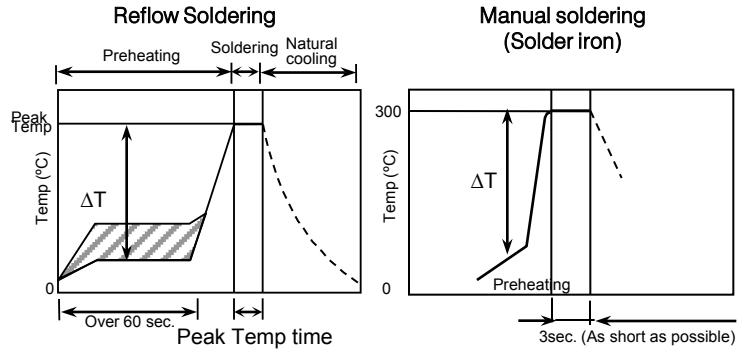
Unit: mm

Type	C3216 [CC1206]	C3225 [CC1210]
Symbol		
A	2.0 - 2.4	2.0 - 2.4
B	1.0 - 1.2	1.0 - 1.2
C	1.1 - 1.6	1.9 - 2.5

Recommended Solder Amount



Recommended Soldering Profile



Recommended soldering duration

Solder	Temp./Dura.	Wave Soldering		Reflow Soldering	
		Peak temp (°C)	Duration (sec.)	Peak temp (°C)	Duration (sec.)
Sn-Pb Solder		250 max.	3 max.	230 max.	20 max.
Lead-Free Solder		260 max.	5 max.	260 max.	10 max.

Recommended solder compositions

Sn-37Pb (Sn-Pb solder)
Sn-3.0Ag-0.5Cu (Lead Free Solder)

Preheating Condition

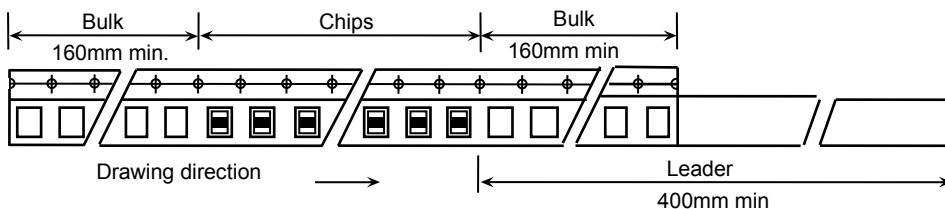
Soldering	Case Size - JIS (EIA)	Temp. (°C)
Wave soldering	C1608(CC0603), C2012(CC0805), C3216(CC1206)	$\Delta T \leq 150$
Reflow soldering	C1005(CC0402), C1608(CC0603), C2012(CC0805), C3216(CC1206)	$\Delta T \leq 150$
	C3225(CC1210)	$\Delta T \leq 130$
Manual soldering	C1005(CC0402), C1608(CC0603), C2012(CC0805), C3216(CC1206)	$\Delta T \leq 150$
	C3225(CC1210)	$\Delta T \leq 130$



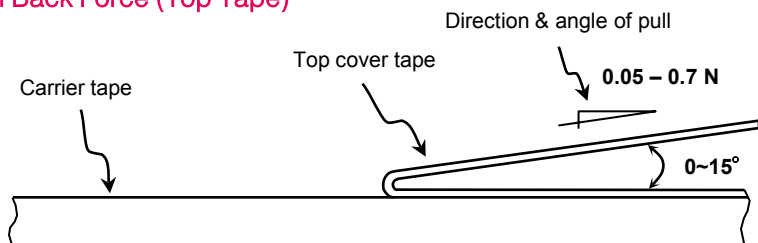
Packaging Information

C Series – High Temperature Application

Carrier Tape Configuration

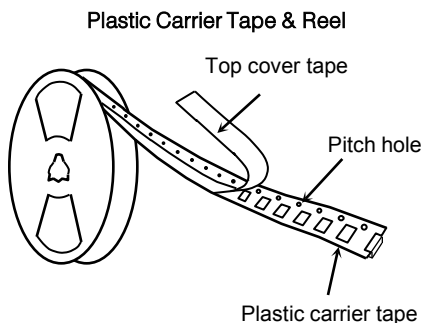
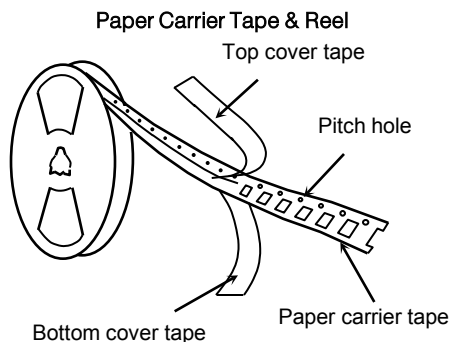


Peel Back Force (Top Tape)



- Carrier tape shall be flexible enough to be wound around a minimum radius of 30mm with components in tape.
- The missing of components shall be less than 0.1%
- Components shall not stick to the cover tape.
- The cover tape shall not protrude beyond the edges of the carrier tape not shall cover the sprocket holes.

Chip Quantity Per Reel and Structure of Reel (Paper & Plastic)



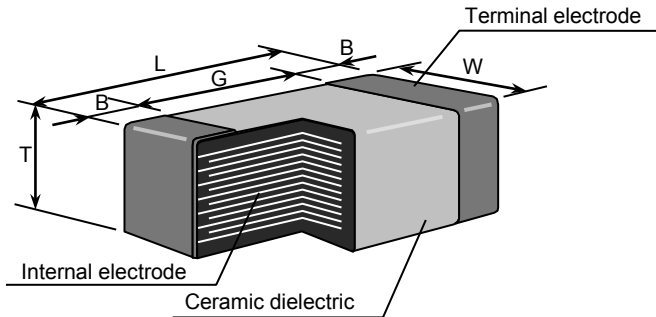
Case Code		Chip Thickness	Taping Material	Chip quantity (pcs.)	
JIS	EIA			φ178mm (7") reel	φ330mm (13") reel
C1005	CC0402	0.50 mm	Paper	10,000	50,000
C1608	CC0603	0.80 mm	Paper	4,000	10,000
C2012	CC0805	0.85 mm	Paper	4,000	10,000
		1.25 mm	Plastic	2,000	
C3216	CC1206	0.85 mm	Paper	4,000	10,000
		1.15 mm	Plastic	2,000	
		1.60 mm			8,000
C3225	CC1210	1.60 mm	Plastic	2,000	8,000
		2.00 mm		1,000	5,000
		2.50 mm			



Additional Information

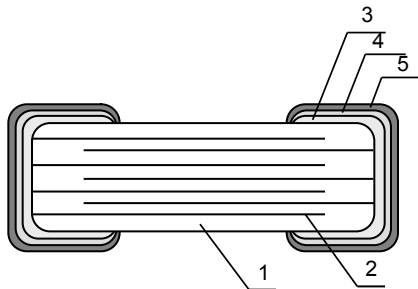
C Series – High Temperature Application

• Shape & Dimensions



Case Code		Dimensions (mm)				
JIS	EIA	L	W	T	B	G
C1005	CC0402	1.00	0.50	0.50	0.25	0.35 min.
C1608	CC0603	1.60	0.80	0.80	0.20 min.	0.30 min.
C2012	CC0805	2.00	1.20	0.85	0.20 min.	0.50 min.
				1.25		
				0.85		
C3216	CC1206	3.20	1.60	1.15	0.20 min.	1.00 min.
				1.60		
				1.60		
C3225	CC1210	3.20	2.50	2.00	0.20 min.	1.00 min.
				2.50		

• Inside Structure & Material System



No.	NAME	MATERIAL	
		Class 1	Class 2
(1)	Ceramic Dielectric	CaZrO ₃	BaTiO ₃
(2)	Internal Electrode	Nickel (Ni)	
(3)	Termination	Copper (Cu)	
(4)		Nickel (Ni)	
(5)		Tin (Sn)	

• Environmental Information

TDK Corporation established internal product environmental assurance standards that include the six hazardous substances banned by the EU RoHS Directive¹ enforced on July 1, 2006 along with additional substances independently banned by TDK and has successfully completed making general purpose electronic components conform to the RoHS Directive².

1. Abbreviation for Restriction on Hazardous Substances, which refers to the regulation EU Directive 2002/95/EC on hazardous substances by the European Union (EU) effective from July 1, 2006. The Directive bans the use of six specific hazardous substances in electric and electronic devices and products handled within the EU. The six substances are lead, mercury, cadmium, hexavalent chromium, PBB (polybrominated biphenyls), and PBDE (polybrominated diphenyl ethers).
2. This means that, in conformity with the EU Directive 2002/95/EC, lead, cadmium, mercury, hexavalent chromium, and specific bromine-based flame retardants, PBB and PBDE, have not been used, except for exempted applications.

For REACH (SVHC : 15 substances according to ECHA / October 2008) : All TDK MLCC do not contain these 15 substances.

For European Directive 2000/53/CE and 2005/673/CE : Cadmium, Hexavalent Chromium, Mercury, Lead are not contained in all TDK MLCC.

For European Directive 2003/11/CE : Pentabromodiphenyl-ether, Octabromodiphenyl-ether are not contained in all TDK MLCC.



MULTILAYER CERAMIC CHIP CAPACITORS



C Series Tight Tolerance Capacitors

Type: C1005 [EIA CC0402]
C1608 [EIA CC0603]

Issue date: April 2011



**TDK MLCC
US Catalog**

Version B11

REMINDERS

Please read before using this product

SAFETY REMINDERS



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C Series

Tight Tolerance Capacitors

Type: C1005, C1608

Available Through Distribution Only*

Features



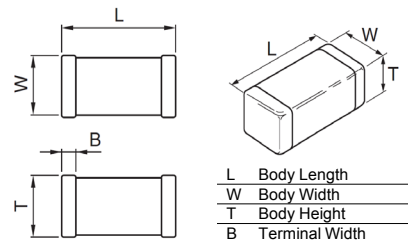
- Available in 1% and 2% capacitance tolerance
- Suitable for high frequency applications
- A monolithic structure ensures superior mechanical strength and reliability
- High-accuracy automatic mounting is facilitated through the maintenance of very precise dimensional tolerances
- Composed of only ceramics and metals, these capacitors provide extremely dependable performance, exhibiting virtually no degradation even when subjected to temperature extremes
- Low stray capacitance ensures high conformity with nominal values, thereby simplifying the circuit design process
- Low residual inductance assures superior frequency characteristics
- Owing to their low ESR and excellent frequency characteristics, these products are optimally suited for high frequency and high-density type power supplies

Applications



- Electronics equipment
- Mobile communications equipment
- LTE/WiMAX base stations
- High frequency RF modules
- Test and measurement equipment
- Matching/Coupling circuits
- Tuning circuits

Shape & Dimensions



Dimensions in mm

Part Number Construction

Series Name C 1608 C0G 2A 102 F T XXXX

Series Name

Dimensions L x W (mm)

Case Code	Length	Width
C1005	1.00 ± 0.05	0.50 ± 0.05
C1608	1.60 ± 0.10	0.80 ± 0.10

Temperature Characteristic

Temperature Characteristics	Capacitance Change	Temperature Range
C0G	0±30 ppm/°C	-55 to +125°C

Rated Voltage (DC)

Voltage Code	Voltage (DC)
1H	50V
2A	100V

Nominal Capacitance (pF)

The capacitance is expressed in three digit codes and in units of pico Farads (pF). The first and second digits identify the first and second significant figures of the capacitance. The third digit identifies the multiplier. R designates a decimal point.

Capacitance Code	Capacitance
0R5	0.5pF
010	1pF
102	1,000pF (1nF)
105	1,000,000pF (1µF)

Internal Codes

Packaging Style

Packaging Code	Style
T	Tape & Reel

Capacitance Tolerance

Tolerance Code	Tolerance
F	± 1%
G	± 2%

* This series is available through the distribution channel only. Please see www.tdk.com/distributor.php for a list of authorized distributors.



Capacitance Range Chart

C1005 [EIA CC0402]

Capacitance Range Chart

Temperature Characteristics: C0G ($0 \pm 30\text{ppm}/^\circ\text{C}$)

Rated Voltage: 50V(1H)

Capacitance (pF)	Cap Code	Temperature Characteristics	Tolerance	
			F ($\pm 1\%$)	G ($\pm 2\%$)
15	150	-55 to 125°C, 0 $\pm$ 30 ppm/°C		
22	220			
33	330			
47	470			
68	680			
100	101			
150	151			
220	221			
330	331			
470	471			
680	681			
1,000	102			

Standard Thickness

0.50 mm



Capacitance Range Table

C1005 [EIA CC0402]

Class 1 (Temperature Compensating)

Temperature Characteristics: C0G (-55 to 125°C, 0 $\pm$ 30 ppm/°C)

TDK Part Number (Ordering Code)	Temperature Characteristics	Rated Voltage	Capacitance (pF)	Capacitance Tolerance	Thickness (mm)
C1005C0G1H150F	C0G	50V	15	$\pm 1\%$	0.50 $\pm$ 0.05
C1005C0G1H150G	C0G	50V	15	$\pm 2\%$	0.50 $\pm$ 0.05
C1005C0G1H220F	C0G	50V	22	$\pm 1\%$	0.50 $\pm$ 0.05
C1005C0G1H220G	C0G	50V	22	$\pm 2\%$	0.50 $\pm$ 0.05
C1005C0G1H330F	C0G	50V	33	$\pm 1\%$	0.50 $\pm$ 0.05
C1005C0G1H330G	C0G	50V	33	$\pm 2\%$	0.50 $\pm$ 0.05
C1005C0G1H470F	C0G	50V	47	$\pm 1\%$	0.50 $\pm$ 0.05
C1005C0G1H470G	C0G	50V	47	$\pm 2\%$	0.50 $\pm$ 0.05
C1005C0G1H680F	C0G	50V	68	$\pm 1\%$	0.50 $\pm$ 0.05
C1005C0G1H680G	C0G	50V	68	$\pm 2\%$	0.50 $\pm$ 0.05
C1005C0G1H101F	C0G	50V	100	$\pm 1\%$	0.50 $\pm$ 0.05
C1005C0G1H101G	C0G	50V	100	$\pm 2\%$	0.50 $\pm$ 0.05
C1005C0G1H151F	C0G	50V	150	$\pm 1\%$	0.50 $\pm$ 0.05
C1005C0G1H151G	C0G	50V	150	$\pm 2\%$	0.50 $\pm$ 0.05
C1005C0G1H221F	C0G	50V	220	$\pm 1\%$	0.50 $\pm$ 0.05
C1005C0G1H221G	C0G	50V	220	$\pm 2\%$	0.50 $\pm$ 0.05
C1005C0G1H331F	C0G	50V	330	$\pm 1\%$	0.50 $\pm$ 0.05
C1005C0G1H331G	C0G	50V	330	$\pm 2\%$	0.50 $\pm$ 0.05
C1005C0G1H471F	C0G	50V	470	$\pm 1\%$	0.50 $\pm$ 0.05
C1005C0G1H471G	C0G	50V	470	$\pm 2\%$	0.50 $\pm$ 0.05
C1005C0G1H681F	C0G	50V	680	$\pm 1\%$	0.50 $\pm$ 0.05
C1005C0G1H681G	C0G	50V	680	$\pm 2\%$	0.50 $\pm$ 0.05
C1005C0G1H102F	C0G	50V	1,000	$\pm 1\%$	0.50 $\pm$ 0.05
C1005C0G1H102G	C0G	50V	1,000	$\pm 2\%$	0.50 $\pm$ 0.05

* This series is available through the distribution channel only. Please see www.tdk.com/distributor.php for a list of authorized distributors.



Capacitance Range Chart

C1608 [EIA CC0603]

Capacitance Range Chart

Temperature Characteristics: C0G ($0 \pm 30\text{ppm}/^\circ\text{C}$)

Rated Voltage: 100V (2A), 50V(1H)

Capacitance (pF)	Cap Code	Temperature Characteristics	100V		50V	
			F ($\pm 1\%$)	G ($\pm 2\%$)	F ($\pm 1\%$)	G ($\pm 2\%$)
15	150	-55 to 125°C, 0 $\pm$ 30 ppm/°C				
22	220					
33	330					
47	470					
68	680					
100	101					
150	151					
220	221					
330	331					
470	471					
680	681					
1,000	102					

Standard Thickness

 0.80 mm



Capacitance Range Table

C1608 [EIA CC0603]

Class 1 (Temperature Compensating)

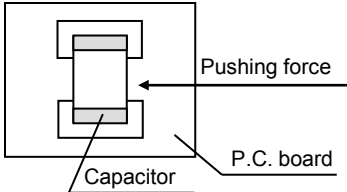
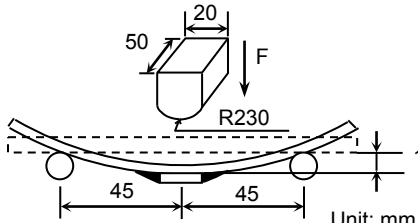
Temperature Characteristics: C0G (-55 to 125°C, 0±30 ppm/°C)

TDK Part Number (Ordering Code)	Temperature Characteristics	Rated Voltage	Capacitance (pF)	Capacitance Tolerance	Thickness (mm)
C1608C0G1H150F	C0G	50V	15	± 1%	0.80 ± 0.10
C1608C0G1H150G	C0G	50V	15	± 2%	0.80 ± 0.10
C1608C0G1H220F	C0G	50V	22	± 1%	0.80 ± 0.10
C1608C0G1H220G	C0G	50V	22	± 2%	0.80 ± 0.10
C1608C0G1H330F	C0G	50V	33	± 1%	0.80 ± 0.10
C1608C0G1H330G	C0G	50V	33	± 2%	0.80 ± 0.10
C1608C0G1H470F	C0G	50V	47	± 1%	0.80 ± 0.10
C1608C0G1H470G	C0G	50V	47	± 2%	0.80 ± 0.10
C1608C0G1H680F	C0G	50V	68	± 1%	0.80 ± 0.10
C1608C0G1H680G	C0G	50V	68	± 2%	0.80 ± 0.10
C1608C0G1H101F	C0G	50V	100	± 1%	0.80 ± 0.10
C1608C0G1H101G	C0G	50V	100	± 2%	0.80 ± 0.10
C1608C0G1H151F	C0G	50V	150	± 1%	0.80 ± 0.10
C1608C0G1H151G	C0G	50V	150	± 2%	0.80 ± 0.10
C1608C0G1H221F	C0G	50V	220	± 1%	0.80 ± 0.10
C1608C0G1H221G	C0G	50V	220	± 2%	0.80 ± 0.10
C1608C0G1H331F	C0G	50V	330	± 1%	0.80 ± 0.10
C1608C0G1H331G	C0G	50V	330	± 2%	0.80 ± 0.10
C1608C0G1H471F	C0G	50V	470	± 1%	0.80 ± 0.10
C1608C0G1H471G	C0G	50V	470	± 2%	0.80 ± 0.10
C1608C0G1H681F	C0G	50V	680	± 1%	0.80 ± 0.10
C1608C0G1H681G	C0G	50V	680	± 2%	0.80 ± 0.10
C1608C0G1H102F	C0G	50V	1,000	± 1%	0.80 ± 0.10
C1608C0G1H102G	C0G	50V	1,000	± 2%	0.80 ± 0.10
C1608C0G2A101F	C0G	100V	100	± 1%	0.80 ± 0.10
C1608C0G2A101G	C0G	100V	100	± 2%	0.80 ± 0.10
C1608C0G2A102F	C0G	100V	1,000	± 1%	0.80 ± 0.10
C1608C0G2A102G	C0G	100V	1,000	± 2%	0.80 ± 0.10



General Specifications

C Series – Tight Tolerance Capacitors

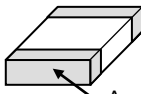
No.	Item	Performance	Test or Inspection Method										
1	External Appearance	No defects which may affect performance.	Inspect with magnifying glass (3×).										
2	Insulation Resistance	10,000MΩ min.	Apply rated voltage for 60s.										
3	Voltage Proof	Withstand test voltage without insulation breakdown or other damage.	<table><tr><th>Class</th><th>Apply voltage</th></tr><tr><td>Class 1</td><td>3 × rated voltage</td></tr></table> Above DC voltage shall be applied for 1 to 5s. Charge / discharge current shall not exceed 50mA.	Class	Apply voltage	Class 1	3 × rated voltage						
Class	Apply voltage												
Class 1	3 × rated voltage												
4	Capacitance	Within the specified tolerance.	<table><tr><th>Class</th><th>Rated Capacitance</th><th>Measuring Frequency</th><th>Measuring voltage</th></tr><tr><td rowspan="2">Class 1</td><td>1000pF and under</td><td>1MHz±10%</td><td rowspan="2">0.5 - 5 V_{rms}</td></tr><tr><td>Over 1000pF</td><td>1kHz±10%</td></tr></table>	Class	Rated Capacitance	Measuring Frequency	Measuring voltage	Class 1	1000pF and under	1MHz±10%	0.5 - 5 V _{rms}	Over 1000pF	1kHz±10%
Class	Rated Capacitance	Measuring Frequency	Measuring voltage										
Class 1	1000pF and under	1MHz±10%	0.5 - 5 V _{rms}										
	Over 1000pF	1kHz±10%											
5	Q (Class 1)	<table><tr><th>Rated Capacitance</th><th>Q</th></tr><tr><td>C ≥ 30pF</td><td>1,000 min.</td></tr><tr><td>C < 30pF</td><td>400+20×C min.</td></tr></table> C : Rated capacitance (pF)	Rated Capacitance	Q	C ≥ 30pF	1,000 min.	C < 30pF	400+20×C min.	See No.4 in this table for measuring condition.				
Rated Capacitance	Q												
C ≥ 30pF	1,000 min.												
C < 30pF	400+20×C min.												
6	Temperature Characteristics of Capacitance (Class 1)	<table><tr><th>T.C.</th><th>Temperature Coefficient</th></tr><tr><td>C0G</td><td>0 ± 30 ppm/°C</td></tr></table> Capacitance drift Within ± 0.2% or ±0.05pF, whichever larger.	T.C.	Temperature Coefficient	C0G	0 ± 30 ppm/°C	Temperature coefficient shall be calculated based on values at 25°C and 85°C temperature. Measuring temperature below 20°C shall be -10°C and -25°C.						
T.C.	Temperature Coefficient												
C0G	0 ± 30 ppm/°C												
7	Robustness of Terminations	No sign of termination coming off, breakage of ceramic, or other abnormal signs.	Reflow solder the capacitor on P.C. board (shown in Appendix 1) and apply a pushing force of 2N (C1005) or 5N (C1608) for 10±1s. 										
8	Bending	No mechanical damage.	Reflow solder the capacitor on P.C. board (shown in Appendix 2a or Appendix 2b) and bend it for 1mm.  Unit: mm										

* This series is available through the distribution channel only. Please see www.tdk.com/distributor.php for a list of authorized distributors.



General Specifications

C Series – Tight Tolerance Capacitors

No.	Item	Performance	Test or Inspection Method																
9	Solderability	New solder to cover over 75% of termination. 25% may have pinholes or rough spots but not concentrated in one spot. Ceramic surface of A sections shall not be exposed due to melting or shifting of termination material. A section	Completely soak both terminations in solder at $235\pm5^{\circ}\text{C}$ for $2\pm0.5\text{s}$. Solder: H63A (JIS Z 3282) Flux: Isopropyl alcohol (JIS K 8839) Rosin (JIS K 5902) 25% solid solution.																
10	Resistance to solder heat	External appearance No cracks are allowed and terminations shall be covered at least 60% with new solder. <table><tr><td>Capacitance</td><td><table><tr><th colspan="2">Characteristics</th><th>Change from the value before test</th></tr><tr><td>Class 1</td><td>C0G</td><td>Capacitance drift within $\pm 2.5\%$ or $\pm 0.25\text{pF}$, whichever larger.</td></tr></table></td></tr><tr><td>Q (Class 1)</td><td><table><tr><th>Rated Capacitance</th><th>Q</th></tr><tr><td>$C \geq 30\text{pF}$</td><td>1,000 min.</td></tr><tr><td>$C < 30\text{pF}$</td><td>$400 + 20 \times C$ min.</td></tr></table></td></tr></table> C : Rated capacitance (pF) Insulation Resistance Meet the initial spec. Voltage Proof No insulation breakdown or other damage.	Capacitance	<table><tr><th colspan="2">Characteristics</th><th>Change from the value before test</th></tr><tr><td>Class 1</td><td>C0G</td><td>Capacitance drift within $\pm 2.5\%$ or $\pm 0.25\text{pF}$, whichever larger.</td></tr></table>	Characteristics		Change from the value before test	Class 1	C0G	Capacitance drift within $\pm 2.5\%$ or $\pm 0.25\text{pF}$, whichever larger.	Q (Class 1)	<table><tr><th>Rated Capacitance</th><th>Q</th></tr><tr><td>$C \geq 30\text{pF}$</td><td>1,000 min.</td></tr><tr><td>$C < 30\text{pF}$</td><td>$400 + 20 \times C$ min.</td></tr></table>	Rated Capacitance	Q	$C \geq 30\text{pF}$	1,000 min.	$C < 30\text{pF}$	$400 + 20 \times C$ min.	Completely soak both terminations in solder at $260\pm5^{\circ}\text{C}$ for $5\pm1\text{s}$. Preheating condition Temp.: $150\pm10^{\circ}\text{C}$ Time : 1 to 2min. Flux: Isopropyl alcohol (JIS K 8839) Rosin (JIS K 5902) 25% solid solution. Solder: H63A (JIS Z 3282) Leave the capacitor in ambient conditions for 6 to 24h before measurement.
Capacitance	<table><tr><th colspan="2">Characteristics</th><th>Change from the value before test</th></tr><tr><td>Class 1</td><td>C0G</td><td>Capacitance drift within $\pm 2.5\%$ or $\pm 0.25\text{pF}$, whichever larger.</td></tr></table>	Characteristics		Change from the value before test	Class 1	C0G	Capacitance drift within $\pm 2.5\%$ or $\pm 0.25\text{pF}$, whichever larger.												
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$C \geq 30\text{pF}$	1,000 min.																		
$C < 30\text{pF}$	$400 + 20 \times C$ min.																		
11	Vibration	External appearance No mechanical damage. <table><tr><td>Capacitance</td><td><table><tr><th colspan="2">Characteristics</th><th>Change from the value before test</th></tr><tr><td>Class 1</td><td>C0G</td><td>Capacitance drift within $\pm 2.5\%$ or $\pm 0.25\text{pF}$, whichever larger.</td></tr></table></td></tr><tr><td>Q (Class 1)</td><td><table><tr><th>Rated Capacitance</th><th>Q</th></tr><tr><td>$C \geq 30\text{pF}$</td><td>1,000 min.</td></tr><tr><td>$C < 30\text{pF}$</td><td>$400+20 \times C$ min.</td></tr></table></td></tr></table> C : Rated capacitance (pF)	Capacitance	<table><tr><th colspan="2">Characteristics</th><th>Change from the value before test</th></tr><tr><td>Class 1</td><td>C0G</td><td>Capacitance drift within $\pm 2.5\%$ or $\pm 0.25\text{pF}$, whichever larger.</td></tr></table>	Characteristics		Change from the value before test	Class 1	C0G	Capacitance drift within $\pm 2.5\%$ or $\pm 0.25\text{pF}$, whichever larger.	Q (Class 1)	<table><tr><th>Rated Capacitance</th><th>Q</th></tr><tr><td>$C \geq 30\text{pF}$</td><td>1,000 min.</td></tr><tr><td>$C < 30\text{pF}$</td><td>$400+20 \times C$ min.</td></tr></table>	Rated Capacitance	Q	$C \geq 30\text{pF}$	1,000 min.	$C < 30\text{pF}$	$400+20 \times C$ min.	Reflow solder the capacitor on P.C. board (shown in Appendix 1) before testing. Vibrate the capacitor with amplitude of 1.5mm P-P sweeping the frequencies from 10Hz to 55Hz and back to 10Hz after 1min. Repeat this for 2h each in 3 perpendicular directions.
Capacitance	<table><tr><th colspan="2">Characteristics</th><th>Change from the value before test</th></tr><tr><td>Class 1</td><td>C0G</td><td>Capacitance drift within $\pm 2.5\%$ or $\pm 0.25\text{pF}$, whichever larger.</td></tr></table>	Characteristics		Change from the value before test	Class 1	C0G	Capacitance drift within $\pm 2.5\%$ or $\pm 0.25\text{pF}$, whichever larger.												
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Rated Capacitance	Q																		
$C \geq 30\text{pF}$	1,000 min.																		
$C < 30\text{pF}$	$400+20 \times C$ min.																		



General Specifications

C Series – Tight Tolerance Capacitors

No.	Item	Performance	Test or Inspection Method								
12	Temperature cycle		Reflow solder the capacitors on a P.C. board (shown in Appendix 1) before testing. Expose the capacitor in the conditions in step 1 through step 4, and repeat 5 times consecutively. Leave the capacitor in ambient conditions for 6 to 24h before measurement.								
	External appearance	No mechanical damage.									
	Capacitance	<table><tr><th colspan="2">Characteristics</th><th>Change from the value before test</th></tr><tr><td>Class 1</td><td>C0G</td><td>Capacitance drift within $\pm 2.5\%$ or $\pm 0.25\text{pF}$, whichever larger.</td></tr></table>		Characteristics		Change from the value before test	Class 1	C0G	Capacitance drift within $\pm 2.5\%$ or $\pm 0.25\text{pF}$, whichever larger.		
	Characteristics			Change from the value before test							
	Class 1	C0G		Capacitance drift within $\pm 2.5\%$ or $\pm 0.25\text{pF}$, whichever larger.							
	Q (Class 1)	<table><tr><th>Rated Capacitance</th><th>Q</th></tr><tr><td>$C \geq 30\text{pF}$</td><td>1,000 min.</td></tr><tr><td>$C < 30\text{pF}$</td><td>$400 + 20 \times C$ min.</td></tr></table> C : Rated capacitance (pF)		Rated Capacitance	Q	$C \geq 30\text{pF}$	1,000 min.	$C < 30\text{pF}$	$400 + 20 \times C$ min.		
	Rated Capacitance	Q									
	$C \geq 30\text{pF}$	1,000 min.									
	$C < 30\text{pF}$	$400 + 20 \times C$ min.									
	Insulation Resistance	Meet the initial spec.									
Voltage Proof	No insulation breakdown or other damage.										
13	Moisture Resistance (Steady State)		Reflow solder the capacitor on P.C. board (shown in Appendix 1) before testing. Leave at temperature $40 \pm 2^{\circ}\text{C}$, 90 to 95%RH for 500 +24,0h. Leave the capacitor in ambient condition for 6 to 24h before measurement.								
	External appearance	No mechanical damage.									
	Capacitance	<table><tr><th colspan="2">Characteristics</th><th>Change from the value before test</th></tr><tr><td>Class 1</td><td>C0G</td><td>Capacitance drift within $\pm 5\%$ or $\pm 0.5\text{pF}$, whichever larger.</td></tr></table>		Characteristics		Change from the value before test	Class 1	C0G	Capacitance drift within $\pm 5\%$ or $\pm 0.5\text{pF}$, whichever larger.		
	Characteristics			Change from the value before test							
	Class 1	C0G		Capacitance drift within $\pm 5\%$ or $\pm 0.5\text{pF}$, whichever larger.							
	Q (Class 1)	<table><tr><th>Rated Capacitance</th><th>Q</th></tr><tr><td>$C \geq 30\text{pF}$</td><td>350 min.</td></tr><tr><td>$10\text{pF} \leq C < 30\text{pF}$</td><td>$275 + 5/2 \times C$ min.</td></tr><tr><td>$C < 10\text{pF}$</td><td>$200 + 10 \times C$ min.</td></tr></table> C : Rated capacitance (pF)		Rated Capacitance	Q	$C \geq 30\text{pF}$	350 min.	$10\text{pF} \leq C < 30\text{pF}$	$275 + 5/2 \times C$ min.	$C < 10\text{pF}$	$200 + 10 \times C$ min.
	Rated Capacitance	Q									
	$C \geq 30\text{pF}$	350 min.									
	$10\text{pF} \leq C < 30\text{pF}$	$275 + 5/2 \times C$ min.									
	$C < 10\text{pF}$	$200 + 10 \times C$ min.									
Insulation Resistance	1,000MΩ min.										

Step	Temperature (°C)	Time (min.)
1	Min. operating temp. ± 3	30 ± 3
2	Reference Temp.	2 – 5
3	Max. operating temp. ± 2	30 ± 2
4	Reference Temp.	2 – 5

* This series is available through the distribution channel only. Please see www.tdk.com/distributor.php for a list of authorized distributors.



General Specifications

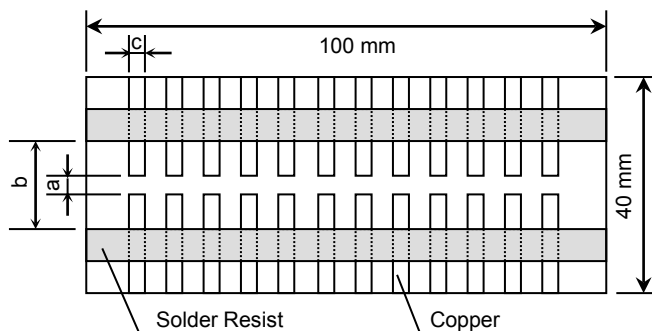
C Series – Tight Tolerance Capacitors

No.	Item	Performance	Test or Inspection Method								
14	Moisture Resistance										
	External appearance	No mechanical damage.	Reflow solder the capacitors on P.C. board (shown in Appendix 1) before testing.								
	Capacitance	<table><tr><th colspan="2">Characteristics</th><th>Change from the value before test</th></tr><tr><td>Class 1</td><td>C0G</td><td>Capacitance drift within $\pm 7.5\%$ or $\pm 0.75\text{pF}$, whichever larger.</td></tr></table>	Characteristics		Change from the value before test	Class 1	C0G	Capacitance drift within $\pm 7.5\%$ or $\pm 0.75\text{pF}$, whichever larger.	Apply the rated voltage at temperature $40\pm 2^{\circ}\text{C}$ and 90 to 95%RH for 500 +24,0h.		
	Characteristics		Change from the value before test								
	Class 1	C0G	Capacitance drift within $\pm 7.5\%$ or $\pm 0.75\text{pF}$, whichever larger.								
			Charge/discharge current shall not exceed 50mA.								
		Leave the capacitor in ambient conditions for 6 to 24h before measurement.									
		Use this measurement for initial value.									
	Q (Class 1)	<table><tr><th>Rated Capacitance</th><th>Q</th></tr><tr><td>$C \geq 30\text{pF}$</td><td>200 min.</td></tr><tr><td>$C < 30\text{pF}$</td><td>$100 + 10/3 \times C$ min.</td></tr></table> C : Rated capacitance (pF)	Rated Capacitance	Q	$C \geq 30\text{pF}$	200 min.	$C < 30\text{pF}$	$100 + 10/3 \times C$ min.			
Rated Capacitance	Q										
$C \geq 30\text{pF}$	200 min.										
$C < 30\text{pF}$	$100 + 10/3 \times C$ min.										
	Insulation Resistance	500MΩ min.									
15	Life										
	External appearance	No mechanical damage.	Reflow solder the capacitor on P.C. board (shown in Appendix 1) before testing.								
	Capacitance	<table><tr><th colspan="2">Characteristics</th><th>Change from the value before test</th></tr><tr><td>Class 1</td><td>C0G</td><td>Capacitance drift within $\pm 3\%$ or $\pm 0.3\text{pF}$, whichever larger.</td></tr></table>	Characteristics		Change from the value before test	Class 1	C0G	Capacitance drift within $\pm 3\%$ or $\pm 0.3\text{pF}$, whichever larger.	Apply 2x rated voltage at $125\pm 2^{\circ}\text{C}$ for 1,000 +48, 0h.		
	Characteristics		Change from the value before test								
	Class 1	C0G	Capacitance drift within $\pm 3\%$ or $\pm 0.3\text{pF}$, whichever larger.								
			Charge/discharge current shall not exceed 50mA.								
		Leave the capacitors in ambient condition for 6 to 24h before measurement.									
		Use this measurement for initial value.									
	Q (Class 1)	<table><tr><th>Rated Capacitance</th><th>Q</th></tr><tr><td>$C \geq 30\text{pF}$</td><td>350 min.</td></tr><tr><td>$10\text{pF} \leq C < 30\text{pF}$</td><td>$275 + 5/2 \times C$ min.</td></tr><tr><td>$C < 10\text{pF}$</td><td>$200 + 10 \times C$ min.</td></tr></table> C : Rated capacitance (pF)	Rated Capacitance	Q	$C \geq 30\text{pF}$	350 min.	$10\text{pF} \leq C < 30\text{pF}$	$275 + 5/2 \times C$ min.	$C < 10\text{pF}$	$200 + 10 \times C$ min.	
Rated Capacitance	Q										
$C \geq 30\text{pF}$	350 min.										
$10\text{pF} \leq C < 30\text{pF}$	$275 + 5/2 \times C$ min.										
$C < 10\text{pF}$	$200 + 10 \times C$ min.										
	Insulation Resistance	1,000MΩ min.									



Appendix - 1

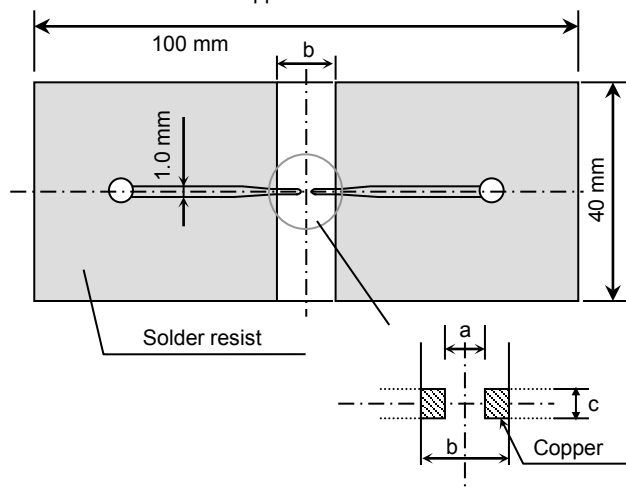
P.C. Board for reliability test



Appendix - 2a

P.C. Board for bending test

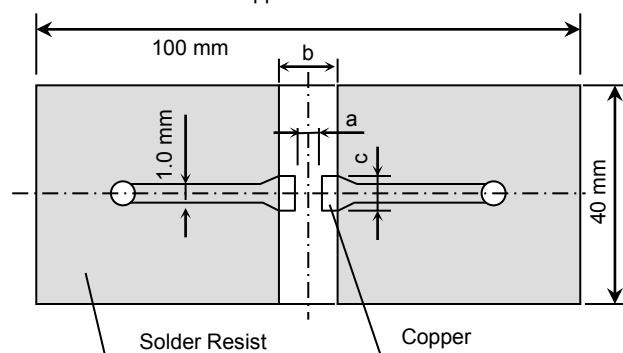
Applied for C1005



Appendix - 2b

P.C. Board for bending test

Applied for C1608



Material : Glass Epoxy (As per JIS C6484 GE4)

P.C. Board thickness : Appendix-2a 0.8mm
Appendix-1, 2b 1.6mm

Copper (thickness 0.035mm)
 Solder resist

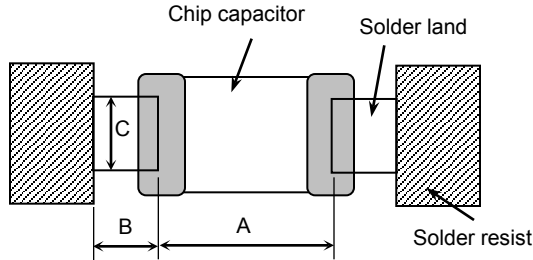
Case Code		Dimensions (mm)		
JIS	EIA	a	b	c
C1005	CC0402	0.4	1.5	0.5
C1608	CC0603	1.0	3.0	1.2



Soldering Information

C Series – Tight Tolerance Capacitors

Recommended Soldering Land Pattern



Wave Soldering

Unit: mm

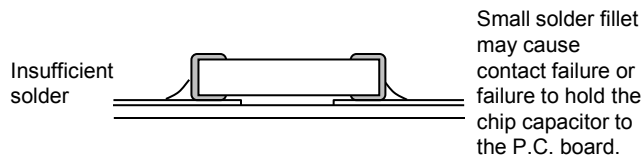
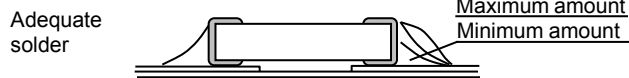
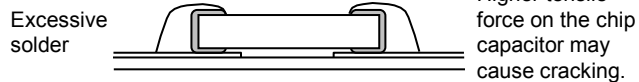
Type	C1608 [CC0603]
Symbol	
A	0.7 - 1.0
B	0.8 - 1.0
C	0.6 - 0.8

Reflow Soldering

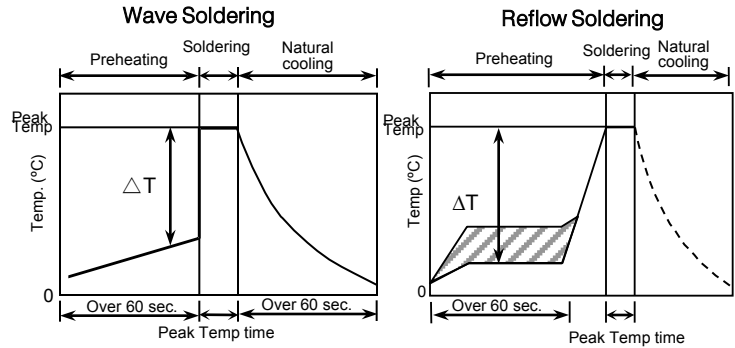
Unit: mm

Type	C1005 [CC0402]	C1608 [CC0603]
Symbol		
A	0.3 - 0.5	0.6 - 0.8
B	0.35 - 0.45	0.6 - 0.8
C	0.4 - 0.6	0.6 - 0.8

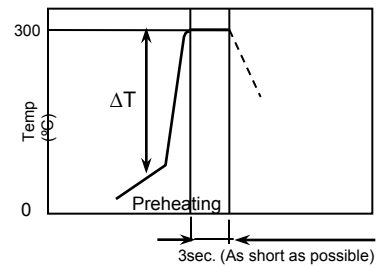
Recommended Solder Amount



Recommended Soldering Profile



Manual soldering (Solder iron)



Recommended soldering duration

Solder	Temp./ Dura.	Wave Soldering		Reflow Soldering	
		Peak temp (°C)	Duration (sec.)	Peak temp (°C)	Duration (sec.)
Sn-Pb Solder		250 max.	3 max.	230 max.	20 max.
Lead-Free Solder		260 max.	5 max.	260 max.	10 max.

Recommended solder compositions

Sn-37Pb (Sn-Pb solder)

Sn-3.0Ag-0.5Cu (Lead Free Solder)

Preheating Condition

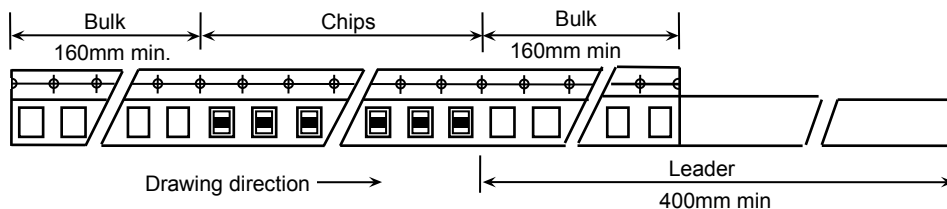
Soldering	Case Size - JIS (EIA)	Temp. (°C)
Wave soldering	C1608(CC0603)	$\Delta T \leq 150$
Reflow soldering	C1005(CC0402), C1608(CC0603)	$\Delta T \leq 150$
Manual soldering	C1005(CC0402), C1608(CC0603)	$\Delta T \leq 150$



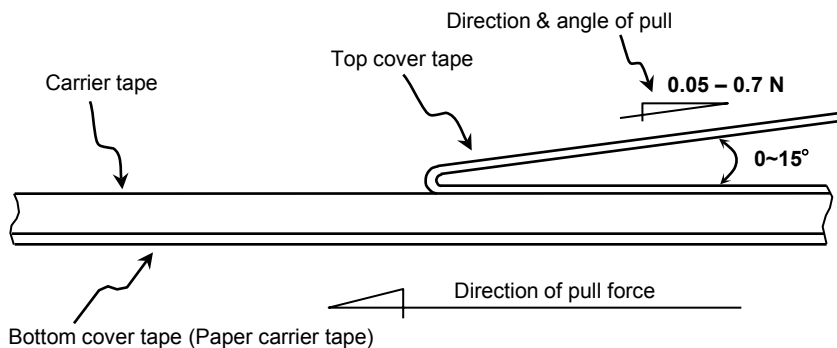
Packaging Information

C Series – Tight Tolerance Capacitors

Carrier Tape Configuration

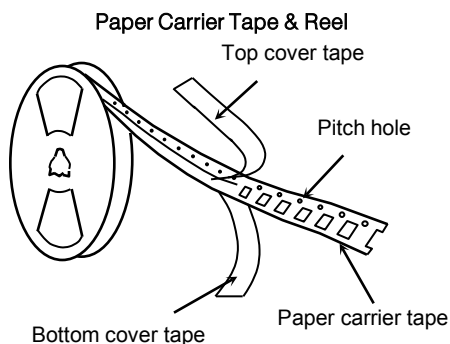


Peel Back Force (Top Tape)



- Carrier tape shall be flexible enough to be wound around a minimum radius of 30mm with components in tape.
- The missing of components shall be less than 0.1%
- Components shall not stick to the cover tape.
- The cover tape shall not protrude beyond the edges of the carrier tape and shall not cover the sprocket holes.

Chip Quantity Per Reel and Structure of Reel



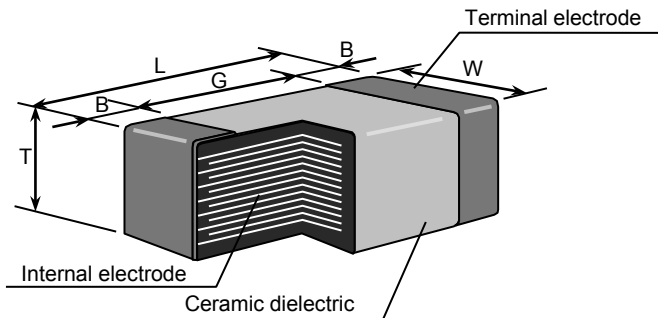
Case Code		Chip Thickness (mm)	Taping Material	Chip quantity (pcs.)	
JIS	EIA			φ178mm (7") reel	φ330mm (13") reel
C1005	CC0402	0.50	Paper	10,000	50,000
C1608	CC0603	0.80		4,000	10,000



Additional Information

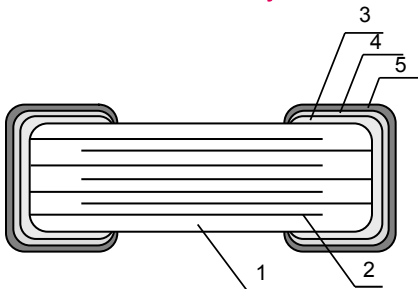
C Series – Tight Tolerance Capacitors

• Shape & Dimensions



Case Code		Dimensions (mm)				
JIS	EIA	L	W	T	B	G
C1005	CC0402	1.00	0.50	0.50	0.25	0.35 min.
C1608	CC0603	1.60	0.80	0.80	0.20 min.	0.50 min.

• Inside Structure & Material System



No.	NAME	MATERIAL
		Class 1
(1)	Ceramic Dielectric	CaZrO ₃
(2)	Internal Electrode	Nickel (Ni)
(3)	Termination	Copper (Cu)
(4)		Nickel (Ni)
(5)		Tin (Sn)

• Environmental Information

TDK Corporation established internal product environmental assurance standards that include the six hazardous substances banned by the EU RoHS Directive¹ enforced on July 1, 2006 along with additional substances independently banned by TDK and has successfully completed making general purpose electronic components conform to the RoHS Directive².

1. Abbreviation for Restriction on Hazardous Substances, which refers to the regulation EU Directive 2002/95/EC on hazardous substances by the European Union (EU) effective from July 1, 2006. The Directive bans the use of six specific hazardous substances in electric and electronic devices and products handled within the EU. The six substances are lead, mercury, cadmium, hexavalent chromium, PBB (polybrominated biphenyls), and PBDE (polybrominated diphenyl ethers).
2. This means that, in conformity with the EU Directive 2002/95/EC, lead, cadmium, mercury, hexavalent chromium, and specific bromine-based flame retardants, PBB and PBDE, have not been used, except for exempted applications.

For REACH (SVHC : 15 substances according to ECHA / October 2008) : All TDK MLCC do not contain these 15 substances.

For European Directive 2000/53/CE and 2005/673/CE : Cadmium, Hexavalent Chromium, Mercury, Lead are not contained in all TDK MLCC.

For European Directive 2003/11/CE : Pentabromodiphenyl-ether, Octabromodiphenyl-ether are not contained in all TDK MLCC.



MULTILAYER CERAMIC CHIP CAPACITORS



C Series High Q Capacitors

Type: C0603 [EIA CC0201]

Issue date: April 2011



**TDK MLCC
US Catalog**

Version B11

REMINDERS

Please read before using this product

SAFETY REMINDERS



REMINDERS

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C Series

High Q Capacitors

Type: C0603

Available Through Distribution Only*

Features



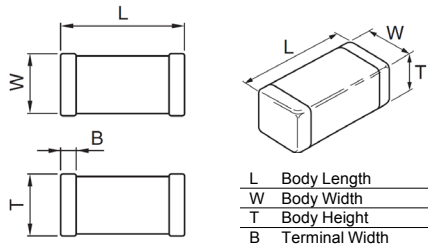
- Higher Q factor than standard capacitors
- High stability with respect to time, temperature, frequency, and voltage
- Excellent attenuation
- High self-resonant frequency
- Lower power dissipation/less energy absorption
- Capacitance range of 0.2pF to 15pF
- Available in standard and tight tolerance
- Please contact TDK for Q values

Applications



- High-frequency applications
- PA modules
- Cellular communication, Bluetooth
- Cable/satellite TV
- GPS/satellite radio
- Filter networks/matching networks
- RF amplifiers/Low noise amplifiers
- VCOs, TCXOs, etc.
- DC blocking circuits

Shape & Dimensions



Dimensions in mm

Part Number Construction

Series Name			C	0603	C0G	1E	150	J	T	XXXX
Dimensions L x W (mm)										
Case Code	Length	Width								
C0603	0.60 ± 0.03	0.30 ± 0.03								
Temperature Characteristic										
Temperature Characteristics	Capacitance Change	Temperature Range								
C0G	0±30 ppm/°C	-55 to +125°C								
Rated Voltage (DC)										
Voltage Code	Voltage (DC)									
1E	25V									

Nominal Capacitance (pF)

The capacitance is expressed in three digit codes and in units of pico Farads (pF). The first and second digits identify the first and second significant figures of the capacitance. The third digit identifies the multiplier. R designates a decimal point.

Capacitance Code	Capacitance
0R5	0.5pF
010	1pF
102	1,000pF (1nF)
105	1,000,000pF (1μF)

Internal Codes

Packaging Style

Packaging Code	Style
T	Tape & Reel

Capacitance Tolerance

Tolerance Code	Tolerance
W	± 0.05 pF
B	± 0.10 pF
C	± 0.25 pF
D	± 0.50 pF
E	± 0.20 pF
G	± 2%
J	± 5%



Capacitance Range Chart

C0603 [EIA CC0201]

Capacitance Range Chart

Temperature Characteristics: C0G ($0 \pm 30\text{ppm}/^\circ\text{C}$)

Rated Voltage: 25V(1E)

Capacitance (pF)	Cap Code	Temperature Characteristics	Tolerance					
			W (± 0.05)	B ($\pm 0.10\text{pF}$)	C ($\pm 0.25\text{pF}$)	D ($\pm 0.50\text{pF}$)	E ($\pm 0.20\text{pF}$)	J ($\pm 5\%$)
0.2	0R2	-55 to 125°C, 0 $\pm$ 30 ppm/°C						
0.3	0R3							
0.4	0R4							
0.5	0R5							
0.6	0R6							
0.7	0R7							
0.8	0R8							
0.9	0R9							
1	010							
1.1	1R1							
1.2	1R2							
1.3	1R3							
1.5	1R5							
1.6	1R6							
1.8	1R8							
2	020							
2.2	2R2							
2.4	2R4							
2.7	2R7							
3	030							
3.3	3R3							
3.6	3R6							
3.9	3R9							
4	040							
4.3	4R3							
4.7	4R7							
5	050							
5.1	5R1							
5.6	5R6							
6	060							
6.2	6R2							
6.8	6R8							
7	070							
7.5	7R5							
8	080							
8.2	8R2							
9	090							
9.1	9R1							
10	100							
11	110							
12	120							
13	130							
15	150							
16	160							
18	180							
20	200							

Standard Thickness

0.30 mm



Capacitance Range Table

C0603 [EIA CC0201]

Class 1 (Temperature Compensating)

Temperature Characteristics: C0G (-55 to 125°C, 0±30 ppm/°C)

TDK Part Number (Ordering Code)	Temperature Characteristics	Rated Voltage	Capacitance (pF)	Capacitance Tolerance	Thickness (mm)
C0603C0G1E0R2WTQ	C0G	25V	0.2	± 0.05pF	0.30 ± 0.03
C0603C0G1E0R2BTQ	C0G	25V	0.2	± 0.10pF	0.30 ± 0.03
C0603C0G1E0R3WTQ	C0G	25V	0.3	± 0.05pF	0.30 ± 0.03
C0603C0G1E0R3BTQ	C0G	25V	0.3	± 0.10pF	0.30 ± 0.03
C0603C0G1E0R4WTQ	C0G	25V	0.4	± 0.05pF	0.30 ± 0.03
C0603C0G1E0R4BTQ	C0G	25V	0.4	± 0.10pF	0.30 ± 0.03
C0603C0G1E0R5WTQ	C0G	25V	0.5	± 0.05pF	0.30 ± 0.03
C0603C0G1E0R5BTQ	C0G	25V	0.5	± 0.10pF	0.30 ± 0.03
C0603C0G1E0R6WTQ	C0G	25V	0.6	± 0.05pF	0.30 ± 0.03
C0603C0G1E0R6BTQ	C0G	25V	0.6	± 0.10pF	0.30 ± 0.03
C0603C0G1E0R7WTQ	C0G	25V	0.7	± 0.05pF	0.30 ± 0.03
C0603C0G1E0R8WTQ	C0G	25V	0.7	± 0.05pF	0.30 ± 0.03
C0603C0G1E0R7BTQ	C0G	25V	0.7	± 0.10pF	0.30 ± 0.03
C0603C0G1E0R8BTQ	C0G	25V	0.8	± 0.10pF	0.30 ± 0.03
C0603C0G1E0R9WTQ	C0G	25V	0.9	± 0.05pF	0.30 ± 0.03
C0603C0G1E0R9BTQ	C0G	25V	0.9	± 0.10pF	0.30 ± 0.03
C0603C0G1E010BTQ	C0G	25V	1.0	± 0.10pF	0.30 ± 0.03
C0603C0G1E010CTQ	C0G	25V	1.0	± 0.25pF	0.30 ± 0.03
C0603C0G1E1R1BTQ	C0G	25V	1.1	± 0.10pF	0.30 ± 0.03
C0603C0G1E1R1CTQ	C0G	25V	1.1	± 0.25pF	0.30 ± 0.03
C0603C0G1E1R2BTQ	C0G	25V	1.2	± 0.10pF	0.30 ± 0.03
C0603C0G1E1R2CTQ	C0G	25V	1.2	± 0.25pF	0.30 ± 0.03
C0603C0G1E1R3BTQ	C0G	25V	1.3	± 0.10pF	0.30 ± 0.03
C0603C0G1E1R3CTQ	C0G	25V	1.3	± 0.25pF	0.30 ± 0.03
C0603C0G1E1R5BTQ	C0G	25V	1.5	± 0.10pF	0.30 ± 0.03
C0603C0G1E1R5CTQ	C0G	25V	1.5	± 0.25pF	0.30 ± 0.03
C0603C0G1E1R6BTQ	C0G	25V	1.6	± 0.10pF	0.30 ± 0.03
C0603C0G1E1R6CTQ	C0G	25V	1.6	± 0.25pF	0.30 ± 0.03
C0603C0G1E1R8BTQ	C0G	25V	1.8	± 0.10pF	0.30 ± 0.03
C0603C0G1E1R8CTQ	C0G	25V	1.8	± 0.25pF	0.30 ± 0.03
C0603C0G1E020BTQ	C0G	25V	2.0	± 0.10pF	0.30 ± 0.03
C0603C0G1E020CTQ	C0G	25V	2.0	± 0.25pF	0.30 ± 0.03
C0603C0G1E2R2BTX	C0G	25V	2.2	± 0.10pF	0.30 ± 0.03
C0603C0G1E2R2CTX	C0G	25V	2.2	± 0.25pF	0.30 ± 0.03
C0603C0G1E2R4BTX	C0G	25V	2.4	± 0.10pF	0.30 ± 0.03
C0603C0G1E2R4CTX	C0G	25V	2.4	± 0.25pF	0.30 ± 0.03
C0603C0G1E2R7BTX	C0G	25V	2.7	± 0.10pF	0.30 ± 0.03
C0603C0G1E2R7CTX	C0G	25V	2.7	± 0.25pF	0.30 ± 0.03
C0603C0G1E030BTX	C0G	25V	3.0	± 0.10pF	0.30 ± 0.03
C0603C0G1E030CTX	C0G	25V	3.0	± 0.25pF	0.30 ± 0.03
C0603C0G1E3R3BTX	C0G	25V	3.3	± 0.10pF	0.30 ± 0.03
C0603C0G1E3R3CTX	C0G	25V	3.3	± 0.25pF	0.30 ± 0.03
C0603C0G1E3R6BTX	C0G	25V	3.6	± 0.10pF	0.30 ± 0.03
C0603C0G1E3R6CTX	C0G	25V	3.6	± 0.25pF	0.30 ± 0.03

* This series is available through the distribution channel only. Please see www.tdk.com/distributor.php for a list of authorized distributors.



Capacitance Range Table

C0603 [EIA CC0201]

Class 1 (Temperature Compensating)

Temperature Characteristics: C0G (-55 to 125°C, 0±30 ppm/°C)

TDK Part Number (Ordering Code)	Temperature Characteristics	Rated Voltage	Capacitance (pF)	Capacitance Tolerance	Thickness (mm)
C0603C0G1E3R9BTX	C0G	25V	3.9	± 0.10pF	0.30 ± 0.03
C0603C0G1E3R9CTX	C0G	25V	3.9	± 0.25pF	0.30 ± 0.03
C0603C0G1E040BTX	C0G	25V	4.0	± 0.10pF	0.30 ± 0.03
C0603C0G1E040CTX	C0G	25V	4.0	± 0.25pF	0.30 ± 0.03
C0603C0G1E4R3BTX	C0G	25V	4.3	± 0.10pF	0.30 ± 0.03
C0603C0G1E4R3CTX	C0G	25V	4.3	± 0.25pF	0.30 ± 0.03
C0603C0G1E4R7BTX	C0G	25V	4.7	± 0.10pF	0.30 ± 0.03
C0603C0G1E4R7CTX	C0G	25V	4.7	± 0.25pF	0.30 ± 0.03
C0603C0G1E050BTX	C0G	25V	5.0	± 0.10pF	0.30 ± 0.03
C0603C0G1E050CTX	C0G	25V	5.0	± 0.25pF	0.30 ± 0.03
C0603C0G1E5R1BTX	C0G	25V	5.1	± 0.10pF	0.30 ± 0.03
C0603C0G1E5R1CTX	C0G	25V	5.1	± 0.25pF	0.30 ± 0.03
C0603C0G1E5R6BTX	C0G	25V	5.6	± 0.10pF	0.30 ± 0.03
C0603C0G1E5R6CTX	C0G	25V	5.6	± 0.25pF	0.30 ± 0.03
C0603C0G1E060BTX	C0G	25V	6.0	± 0.10pF	0.30 ± 0.03
C0603C0G1E060CTX	C0G	25V	6.0	± 0.25pF	0.30 ± 0.03
C0603C0G1E6R2BTX	C0G	25V	6.2	± 0.10pF	0.30 ± 0.03
C0603C0G1E6R2CTX	C0G	25V	6.2	± 0.25pF	0.30 ± 0.03
C0603C0G1E6R8BTX	C0G	25V	6.8	± 0.10pF	0.30 ± 0.03
C0603C0G1E6R8CTX	C0G	25V	6.8	± 0.25pF	0.30 ± 0.03
C0603C0G1E070BTX	C0G	25V	7.0	± 0.10pF	0.30 ± 0.03
C0603C0G1E070CTX	C0G	25V	7.0	± 0.25pF	0.30 ± 0.03
C0603C0G1E7R5BTX	C0G	25V	7.5	± 0.10pF	0.30 ± 0.03
C0603C0G1E7R5CTX	C0G	25V	7.5	± 0.25pF	0.30 ± 0.03
C0603C0G1E080BTX	C0G	25V	8.0	± 0.10pF	0.30 ± 0.03
C0603C0G1E080CTX	C0G	25V	8.0	± 0.25pF	0.30 ± 0.03
C0603C0G1E8R2BTX	C0G	25V	8.2	± 0.10pF	0.30 ± 0.03
C0603C0G1E8R2CTX	C0G	25V	8.2	± 0.25pF	0.30 ± 0.03
C0603C0G1E090BTX	C0G	25V	9.0	± 0.10pF	0.30 ± 0.03
C0603C0G1E090CTX	C0G	25V	9.0	± 0.25pF	0.30 ± 0.03
C0603C0G1E9R1BTX	C0G	25V	9.1	± 0.10pF	0.30 ± 0.03
C0603C0G1E9R1CTX	C0G	25V	9.1	± 0.25pF	0.30 ± 0.03
C0603C0G1E100ETX	C0G	25V	10	± 0.20pF	0.30 ± 0.03
C0603C0G1E100DTX	C0G	25V	10	± 0.50pF	0.30 ± 0.03
C0603C0G1E110GTX	C0G	25V	11	± 2%	0.30 ± 0.03
C0603C0G1E110JTX	C0G	25V	11	± 5%	0.30 ± 0.03
C0603C0G1E120GTX	C0G	25V	12	± 2%	0.30 ± 0.03
C0603C0G1E120JTX	C0G	25V	12	± 5%	0.30 ± 0.03
C0603C0G1E130GTX	C0G	25V	13	± 2%	0.30 ± 0.03
C0603C0G1E130JTX	C0G	25V	13	± 5%	0.30 ± 0.03
C0603C0G1E150GTX	C0G	25V	15	± 2%	0.30 ± 0.03
C0603C0G1E150JTX	C0G	25V	15	± 5%	0.30 ± 0.03
C0603C0G1E160GTX	C0G	25V	16	± 2%	0.30 ± 0.03
C0603C0G1E160JTX	C0G	25V	16	± 5%	0.30 ± 0.03

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Capacitance Range Table

C0603 [EIA CC0201]

Class 1 (Temperature Compensating)

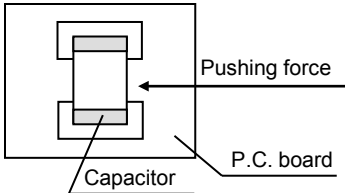
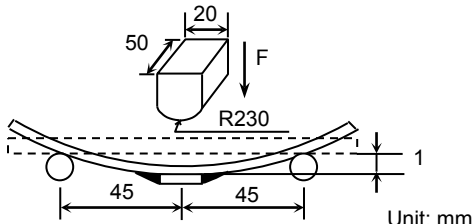
Temperature Characteristics: C0G (-55 to 125°C, 0±30 ppm/°C)

TDK Part Number (Ordering Code)	Temperature Characteristics	Rated Voltage	Capacitance (pF)	Capacitance Tolerance	Thickness (mm)
C0603C0G1E180GTX	C0G	25V	18	± 2%	0.30 ± 0.03
C0603C0G1E180JTX	C0G	25V	18	± 5%	0.30 ± 0.03
C0603C0G1E200GTX	C0G	25V	20	± 2%	0.30 ± 0.03
C0603C0G1E200JTX	C0G	25V	20	± 5%	0.30 ± 0.03

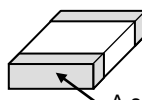


General Specifications

C0603 Series – High Q Capacitors

No.	Item	Performance	Test or Inspection Method						
1	External Appearance	No defects which may affect performance.	Inspect with magnifying glass (10×).						
2	Insulation Resistance	10,000MΩ min.	Apply rated voltage for 60s.						
3	Voltage Proof	Withstand test voltage without insulation breakdown or other damage.	<table><tr><th>Class</th><th>Apply voltage</th></tr><tr><td>Class 1</td><td>3 × rated voltage</td></tr></table> Above DC voltage shall be applied for 1 to 5s. Charge / discharge current shall not exceed 50mA.	Class	Apply voltage	Class 1	3 × rated voltage		
Class	Apply voltage								
Class 1	3 × rated voltage								
4	Capacitance	Within the specified tolerance.	<table><tr><th>Class</th><th>Measuring Frequency</th><th>Measuring voltage</th></tr><tr><td>Class 1</td><td>1MHz±10%</td><td>0.5 - 5 V_{rms}</td></tr></table>	Class	Measuring Frequency	Measuring voltage	Class 1	1MHz±10%	0.5 - 5 V _{rms}
Class	Measuring Frequency	Measuring voltage							
Class 1	1MHz±10%	0.5 - 5 V _{rms}							
5	Q (Class 1)	<table><tr><th>Rated Capacitance</th><th>Q</th></tr><tr><td>C ≥ 30pF</td><td>1,000 min.</td></tr><tr><td>C < 30pF</td><td>400 + 20 × C min.</td></tr></table> C : Rated capacitance (pF)	Rated Capacitance	Q	C ≥ 30pF	1,000 min.	C < 30pF	400 + 20 × C min.	See No.4 in this table for measuring condition.
Rated Capacitance	Q								
C ≥ 30pF	1,000 min.								
C < 30pF	400 + 20 × C min.								
6	Temperature Characteristics of Capacitance (Class 1)	<table><tr><th>T.C.</th><th>Temperature Coefficient</th></tr><tr><td>C0G</td><td>0 ± 30 ppm/°C</td></tr></table> Capacitance drift Within ± 0.2% or ±0.05pF, whichever larger.	T.C.	Temperature Coefficient	C0G	0 ± 30 ppm/°C	Temperature coefficient shall be calculated based on values at 25°C and 85°C temperature. Measuring temperature below 20°C shall be -10°C and -25°C.		
T.C.	Temperature Coefficient								
C0G	0 ± 30 ppm/°C								
7	Robustness of Terminations	No sign of termination coming off, breakage of ceramic, or other abnormal signs.	Reflow solder the capacitor on P.C. board (shown in Appendix 1) and apply a pushing force of 2N for 10 ± 1s. 						
8	Bending	No mechanical damage.	Reflow solder the capacitor on P.C. board (shown in Appendix 2) and bend it for 1mm.  Unit: mm						



No.	Item	Performance	Test or Inspection Method																	
9	Solderability	New solder to cover over 75% of termination. 25% may have pinholes or rough spots but not concentrated in one spot. Ceramic surface of A sections shall not be exposed due to melting or shifting of termination material. A section	Completely soak both terminations in solder at $235 \pm 5^{\circ}\text{C}$ for $2 \pm 0.5\text{s}$. Solder: H63A (JIS Z 3282) Flux: Isopropyl alcohol (JIS K 8839) Rosin (JIS K 5902) 25% solid solution.																	
10	Resistance to solder heat	External appearance No cracks are allowed and terminations shall be covered at least 60% with new solder. <table><tr><td rowspan="2">Capacitance</td><td colspan="2">Characteristics</td><td>Change from the value before test</td></tr><tr><td>Class 1</td><td>C0G</td><td>Capacitance drift within $\pm 2.5\%$ or $\pm 0.25\text{pF}$, whichever larger.</td></tr></table> <table><tr><td rowspan="3">Q (Class 1)</td><td colspan="2">Rated Capacitance</td><td>Q</td></tr><tr><td colspan="2">$C \geq 30\text{pF}$</td><td>1,000 min.</td></tr><tr><td colspan="2">$C < 30\text{pF}$</td><td>$400 + 20 \times C$ min.</td></tr></table> C : Rated capacitance (pF) Insulation Resistance Meet the initial spec. Voltage Proof No insulation breakdown or other damage.	Capacitance	Characteristics		Change from the value before test	Class 1	C0G	Capacitance drift within $\pm 2.5\%$ or $\pm 0.25\text{pF}$, whichever larger.	Q (Class 1)	Rated Capacitance		Q	$C \geq 30\text{pF}$		1,000 min.	$C < 30\text{pF}$		$400 + 20 \times C$ min.	Completely soak both terminations in solder at $260 \pm 5^{\circ}\text{C}$ for $5 \pm 1\text{s}$. Preheating condition Temp.: $150 \pm 10^{\circ}\text{C}$ Time : 1 to 2min. Flux: Isopropyl alcohol (JIS K 8839) Rosin (JIS K 5902) 25% solid solution. Solder: H63A (JIS Z 3282) Leave the capacitor in ambient conditions for 6 to 24h before measurement.
Capacitance	Characteristics			Change from the value before test																
	Class 1	C0G	Capacitance drift within $\pm 2.5\%$ or $\pm 0.25\text{pF}$, whichever larger.																	
Q (Class 1)	Rated Capacitance		Q																	
	$C \geq 30\text{pF}$		1,000 min.																	
	$C < 30\text{pF}$		$400 + 20 \times C$ min.																	
11	Vibration	External appearance No mechanical damage. <table><tr><td rowspan="2">Capacitance</td><td colspan="2">Characteristics</td><td>Change from the value before test</td></tr><tr><td>Class 1</td><td>C0G</td><td>Capacitance drift within $\pm 2.5\%$ or $\pm 0.25\text{pF}$, whichever larger.</td></tr></table> <table><tr><td rowspan="3">Q (Class 1)</td><td colspan="2">Rated Capacitance</td><td>Q</td></tr><tr><td colspan="2">$C \geq 30\text{pF}$</td><td>1,000 min.</td></tr><tr><td colspan="2">$C < 30\text{pF}$</td><td>$400 + 20 \times C$ min.</td></tr></table> C : Rated capacitance (pF)	Capacitance	Characteristics		Change from the value before test	Class 1	C0G	Capacitance drift within $\pm 2.5\%$ or $\pm 0.25\text{pF}$, whichever larger.	Q (Class 1)	Rated Capacitance		Q	$C \geq 30\text{pF}$		1,000 min.	$C < 30\text{pF}$		$400 + 20 \times C$ min.	Reflow solder the capacitor on P.C. board (shown in Appendix 1) before testing. Vibrate the capacitor with amplitude of 1.5mm P-P sweeping the frequencies from 10Hz to 55Hz and back to 10Hz after 1min. Repeat this for 2h each in 3 perpendicular directions.
Capacitance	Characteristics			Change from the value before test																
	Class 1	C0G	Capacitance drift within $\pm 2.5\%$ or $\pm 0.25\text{pF}$, whichever larger.																	
Q (Class 1)	Rated Capacitance		Q																	
	$C \geq 30\text{pF}$		1,000 min.																	
	$C < 30\text{pF}$		$400 + 20 \times C$ min.																	



General Specifications

C0603 Series – High Q Capacitors

No.	Item	Performance	Test or Inspection Method														
12	Temperature cycle		Reflow solder the capacitors on a P.C. board (shown in Appendix 1) before testing. Expose the capacitor in the conditions in step 1 through step 4, and repeat 5 times consecutively. Leave the capacitor in ambient conditions for 6 to 24h before measurement.														
	External appearance	No mechanical damage.															
	Capacitance	<table><tr><th colspan="2">Characteristics</th><th>Change from the value before test</th></tr><tr><td>Class 1</td><td>C0G</td><td>Capacitance drift within $\pm 2.5\%$ or $\pm 0.25\text{pF}$, whichever larger.</td></tr></table>		Characteristics		Change from the value before test	Class 1	C0G	Capacitance drift within $\pm 2.5\%$ or $\pm 0.25\text{pF}$, whichever larger.								
	Characteristics			Change from the value before test													
	Class 1	C0G		Capacitance drift within $\pm 2.5\%$ or $\pm 0.25\text{pF}$, whichever larger.													
	Q (Class 1)	<table><tr><th>Rated Capacitance</th><th>Q</th></tr><tr><td>$C \geq 30\text{pF}$</td><td>1,000 min.</td></tr><tr><td>$C < 30\text{pF}$</td><td>$400 + 20 \times C$ min.</td></tr></table> C : Rated capacitance (pF)		Rated Capacitance	Q	$C \geq 30\text{pF}$	1,000 min.	$C < 30\text{pF}$	$400 + 20 \times C$ min.								
	Rated Capacitance	Q															
	$C \geq 30\text{pF}$	1,000 min.															
	$C < 30\text{pF}$	$400 + 20 \times C$ min.															
	Insulation Resistance	Meet the initial spec.															
Voltage Proof	No insulation breakdown or other damage.																
		<table><tr><th>Step</th><th>Temperature (°C)</th><th>Time (min.)</th></tr><tr><td>1</td><td>Min. operating temp. ± 3</td><td>30 ± 3</td></tr><tr><td>2</td><td>Reference Temp.</td><td>2 – 5</td></tr><tr><td>3</td><td>Max. operating temp. ± 2</td><td>30 ± 2</td></tr><tr><td>4</td><td>Reference Temp.</td><td>2 - 5</td></tr></table>	Step	Temperature (°C)	Time (min.)	1	Min. operating temp. ± 3	30 ± 3	2	Reference Temp.	2 – 5	3	Max. operating temp. ± 2	30 ± 2	4	Reference Temp.	2 - 5
Step	Temperature (°C)	Time (min.)															
1	Min. operating temp. ± 3	30 ± 3															
2	Reference Temp.	2 – 5															
3	Max. operating temp. ± 2	30 ± 2															
4	Reference Temp.	2 - 5															
13	Moisture Resistance (Steady State)		Reflow solder the capacitor on P.C. board (shown in Appendix 1) before testing. Leave at temperature $40 \pm 2^{\circ}\text{C}$, 90 to 95%RH for 500 +24,0h. Leave the capacitor in ambient condition for 6 to 24h before measurement.														
	External appearance	No mechanical damage.															
	Capacitance	<table><tr><th colspan="2">Characteristics</th><th>Change from the value before test</th></tr><tr><td>Class 1</td><td>C0G</td><td>Capacitance drift within $\pm 5\%$ or $\pm 0.5\text{pF}$, whichever larger.</td></tr></table>		Characteristics		Change from the value before test	Class 1	C0G	Capacitance drift within $\pm 5\%$ or $\pm 0.5\text{pF}$, whichever larger.								
	Characteristics			Change from the value before test													
	Class 1	C0G		Capacitance drift within $\pm 5\%$ or $\pm 0.5\text{pF}$, whichever larger.													
	Q (Class 1)	<table><tr><th>Rated Capacitance</th><th>Q</th></tr><tr><td>$C \geq 30\text{pF}$</td><td>350 min.</td></tr><tr><td>$10\text{pF} \leq C < 30\text{pF}$</td><td>$275 + 5/2 \times C$ min.</td></tr><tr><td>$C < 10\text{pF}$</td><td>$200 + 10 \times C$ min.</td></tr></table> C : Rated capacitance (pF)		Rated Capacitance	Q	$C \geq 30\text{pF}$	350 min.	$10\text{pF} \leq C < 30\text{pF}$	$275 + 5/2 \times C$ min.	$C < 10\text{pF}$	$200 + 10 \times C$ min.						
	Rated Capacitance	Q															
	$C \geq 30\text{pF}$	350 min.															
	$10\text{pF} \leq C < 30\text{pF}$	$275 + 5/2 \times C$ min.															
	$C < 10\text{pF}$	$200 + 10 \times C$ min.															
Insulation Resistance	1,000MΩ min.																



General Specifications

C0603 Series – High Q Capacitors

No.	Item	Performance	Test or Inspection Method								
14	Moisture Resistance										
	External appearance	No mechanical damage.	Reflow solder the capacitors on P.C. board (shown in Appendix 1) before testing.								
	Capacitance	<table><tr><th colspan="2">Characteristics</th><th>Change from the value before test</th></tr><tr><td>Class 1</td><td>C0G</td><td>Capacitance drift within $\pm 7.5\%$ or $\pm 0.75\text{pF}$, whichever larger.</td></tr></table>	Characteristics		Change from the value before test	Class 1	C0G	Capacitance drift within $\pm 7.5\%$ or $\pm 0.75\text{pF}$, whichever larger.	Apply the rated voltage at temperature $40\pm 2^{\circ}\text{C}$ and 90 to 95%RH for 500 +24,0h.		
	Characteristics		Change from the value before test								
	Class 1	C0G	Capacitance drift within $\pm 7.5\%$ or $\pm 0.75\text{pF}$, whichever larger.								
			Charge/discharge current shall not exceed 50mA.								
			Leave the capacitor in ambient conditions for 6 to 24h before measurement.								
			Use this measurement for initial value.								
	Q (Class 1)	<table><tr><th>Rated Capacitance</th><th>Q</th></tr><tr><td>$C \geq 30\text{pF}$</td><td>200 min.</td></tr><tr><td>$C < 30\text{pF}$</td><td>$100 + 10/3 \times C$ min.</td></tr></table> C : Rated capacitance (pF)	Rated Capacitance	Q	$C \geq 30\text{pF}$	200 min.	$C < 30\text{pF}$	$100 + 10/3 \times C$ min.			
	Rated Capacitance	Q									
$C \geq 30\text{pF}$	200 min.										
$C < 30\text{pF}$	$100 + 10/3 \times C$ min.										
Insulation Resistance	500MΩ min.										
15	Life										
	External appearance	No mechanical damage.	Reflow solder the capacitor on P.C. board (shown in Appendix 1) before testing.								
	Capacitance	<table><tr><th colspan="2">Characteristics</th><th>Change from the value before test</th></tr><tr><td>Class 1</td><td>C0G</td><td>Capacitance drift within $\pm 3\%$ or $\pm 0.3\text{pF}$, whichever larger.</td></tr></table>	Characteristics		Change from the value before test	Class 1	C0G	Capacitance drift within $\pm 3\%$ or $\pm 0.3\text{pF}$, whichever larger.	Apply 2x rated voltage at $125\pm 2^{\circ}\text{C}$ for 1,000 +48, 0h.		
	Characteristics		Change from the value before test								
	Class 1	C0G	Capacitance drift within $\pm 3\%$ or $\pm 0.3\text{pF}$, whichever larger.								
			Charge/discharge current shall not exceed 50mA.								
			Leave the capacitors in ambient condition for 6 to 24h before measurement.								
			Use this measurement for initial value.								
	Q (Class 1)	<table><tr><th>Rated Capacitance</th><th>Q</th></tr><tr><td>$C \geq 30\text{pF}$</td><td>350 min.</td></tr><tr><td>$10\text{pF} \leq C < 30\text{pF}$</td><td>$275 + 5/2 \times C$ min.</td></tr><tr><td>$C < 10\text{pF}$</td><td>$200 + 10 \times C$ min.</td></tr></table> C : Rated capacitance (pF)	Rated Capacitance	Q	$C \geq 30\text{pF}$	350 min.	$10\text{pF} \leq C < 30\text{pF}$	$275 + 5/2 \times C$ min.	$C < 10\text{pF}$	$200 + 10 \times C$ min.	
	Rated Capacitance	Q									
$C \geq 30\text{pF}$	350 min.										
$10\text{pF} \leq C < 30\text{pF}$	$275 + 5/2 \times C$ min.										
$C < 10\text{pF}$	$200 + 10 \times C$ min.										
Insulation Resistance	1,000MΩ min.										



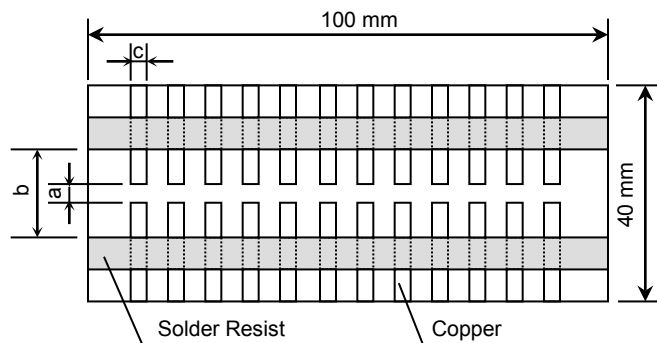
General Specifications

C0603 Series – High Q Capacitors

Appendix - 1a

P.C. Board for reliability test

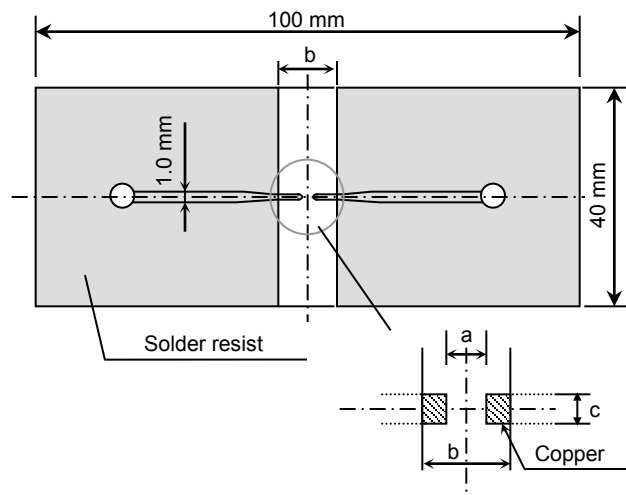
Applied for C0603, C1005, C1608, C2012, C3216



Appendix - 2a

P.C. Board for bending test

Applied for C0603, C1005



Material : Glass Epoxy (As per JIS C6484 GE4)

P.C. Board thickness : Appendix - 2 0.8mm
 Appendix - 1 1.6mm

 Copper (thickness 0.035mm)
 Solder resist

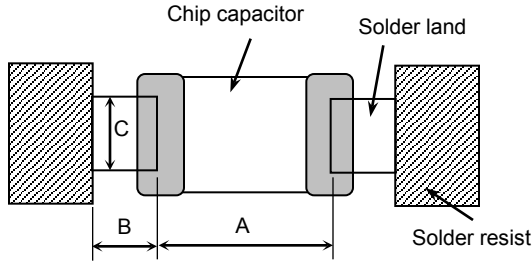
Case Code		Dimensions (mm)		
JIS	EIA	a	b	c
C0603	CC0201	0.3	0.8	0.3



Soldering Information

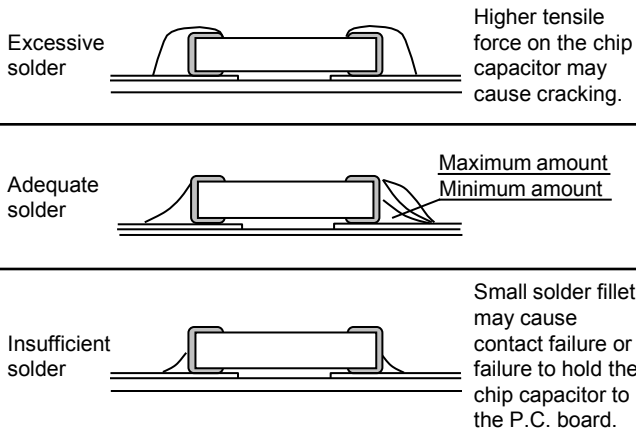
C0603 Series – High Q Capacitors

• Recommended Soldering Land Pattern

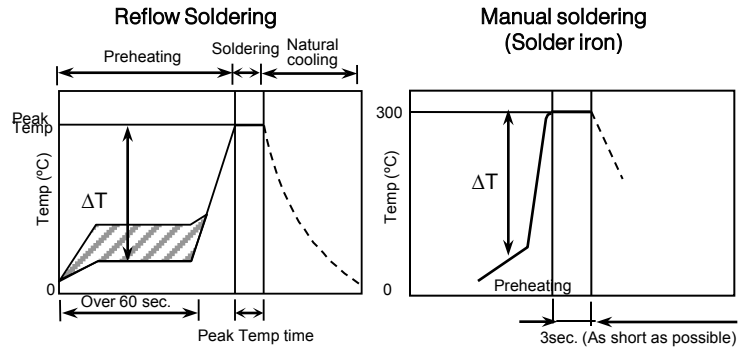


Reflow Soldering		Unit: mm
Type	C0603	
Symbol	[CC0201]	
A	0.25 ~ 0.35	
B	0.2 ~ 0.3	
C	0.25 ~ 0.35	

• Recommended Solder Amount



• Recommended Soldering Profile



Recommended soldering duration

Solder	Temp./Dura.	Reflow Soldering	
		Peak temp (°C)	Duration (sec.)
Sn-Pb Solder		230 max.	20 max.
Lead-Free Solder		260 max.	10 max.

Recommended solder compositions

Sn-37Pb (Sn-Pb solder)
Sn-3.0Ag-0.5Cu (Lead Free Solder)

Preheating Condition

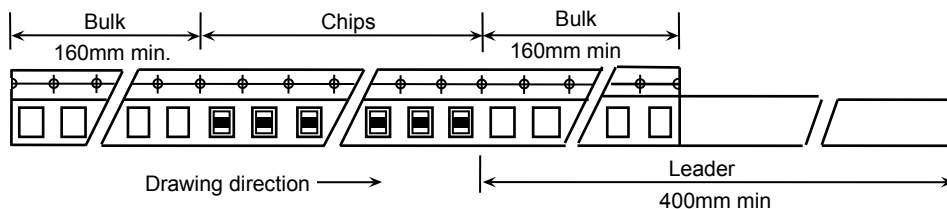
Soldering	Temp. (°C)
Reflow soldering	$\Delta T \leq 150$
Manual soldering	$\Delta T \leq 150$



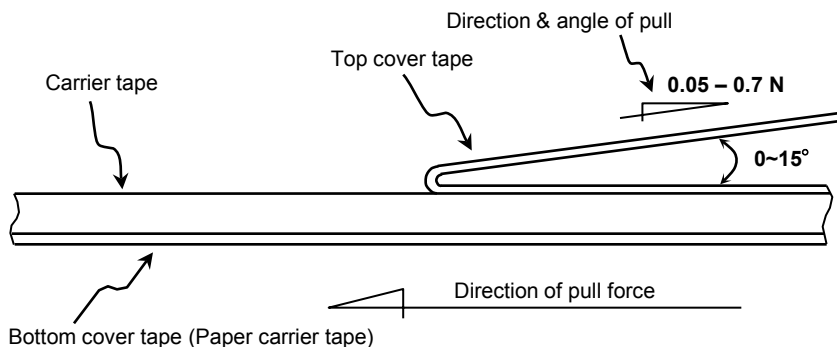
Packaging Information

C0603 Series – High Q Capacitors

Carrier Tape Configuration

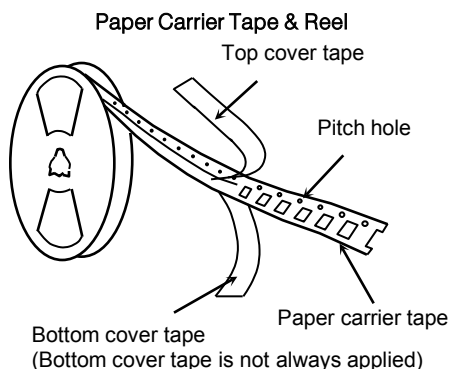


Peel Back Force (Top Tape)



- Carrier tape shall be flexible enough to be wound around a minimum radius of 30mm with components in tape.
- The missing of components shall be less than 0.1%
- Components shall not stick to the cover tape.
- The cover tape shall not protrude beyond the edges of the carrier tape and shall not cover the sprocket holes.

Chip Quantity Per Reel and Structure of Reel



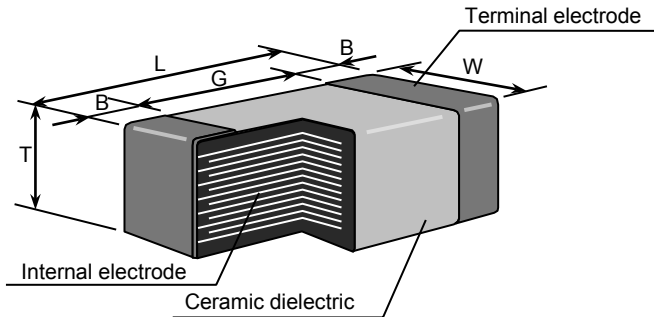
Case Code		Chip Thickness (mm)	Taping Material	Chip quantity (pcs.)
JIS	EIA			φ178mm (7") reel
C0603	CC0201	0.30	Paper	15,000



Additional Information

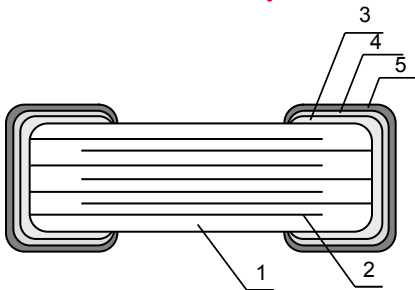
C0603 Series – High Q Capacitors

• Shape & Dimensions



Case Code		Dimensions (mm)				
JIS	EIA	L	W	T	B	G
C0603	CC0201	0.60	0.30	0.30	0.15	0.20 min.

• Inside Structure & Material System



No.	NAME	MATERIAL
		Class 1
(1)	Ceramic Dielectric	CaZrO ₃
(2)	Internal Electrode	Nickel (Ni)
(3)	Termination	Copper (Cu)
(4)		Nickel (Ni)
(5)		Tin (Sn)

• Environmental Information

TDK Corporation established internal product environmental assurance standards that include the six hazardous substances banned by the EU RoHS Directive¹ enforced on July 1, 2006 along with additional substances independently banned by TDK and has successfully completed making general purpose electronic components conform to the RoHS Directive².

1. Abbreviation for Restriction on Hazardous Substances, which refers to the regulation EU Directive 2002/95/EC on hazardous substances by the European Union (EU) effective from July 1, 2006. The Directive bans the use of six specific hazardous substances in electric and electronic devices and products handled within the EU. The six substances are lead, mercury, cadmium, hexavalent chromium, PBB (polybrominated biphenyls), and PBDE (polybrominated diphenyl ethers).
2. This means that, in conformity with the EU Directive 2002/95/EC, lead, cadmium, mercury, hexavalent chromium, and specific bromine-based flame retardants, PBB and PBDE, have not been used, except for exempted applications.

For REACH (SVHC : 15 substances according to ECHA / October 2008) : All TDK MLCC do not contain these 15 substances.

For European Directive 2000/53/CE and 2005/673/CE : Cadmium, Hexavalent Chromium, Mercury, Lead are not contained in all TDK MLCC.

For European Directive 2003/11/CE : Pentabromodiphenyl-ether, Octabromodiphenyl-ether are not contained in all TDK MLCC.



MULTILAYER CERAMIC CHIP CAPACITORS



C Series Soft Termination Type

Type: C2012 [EIA CC0805]
C3216 [EIA CC1206]
C3225 [EIA CC1210]
C4532 [EIA CC1812]
C5750 [EIA CC2220]

Issue date: April 2011



**TDK MLCC
US Catalog**

Version B11

REMINDERS

Please read before using this product

SAFETY REMINDERS



REMINDERS

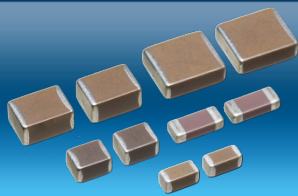
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C Series

Soft Termination Type

Type: C2012, C3216, C3225, C4532, C5750



Features



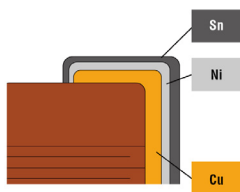
- Conductive resin layer inside the terminal electrode absorbs external stress from thermal or mechanical sources.
- Improved board bending resistance and drop resistance prevents crack occurrence within the ceramic component.
- Reduce risk of solder cracks due to thermal shock and temperature cycling as well as improved board adherences.

Applications

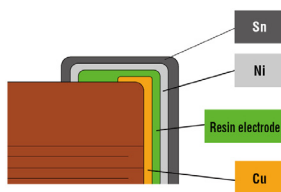


- ECU / Sensor module / ABS units / HID and other automotive electronic equipment
- Switching power supply
- Telecom base station
- Electronic circuits mounted on alumina substrate
- SMT application which requires bending robustness
- Pb-free solder application in which solder joint reliability is problematic

Standard Product

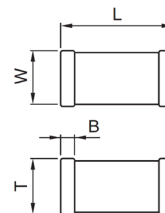


Soft Termination



- A resin electrode layer between the copper base and the nickel plating of the terminal electrode absorbs bending stress from the board and suppresses the forming of solder cracks. Conductive resin is made of epoxy mixed with a filler of conductive particles.

Shape & Dimensions



L	Body Length
W	Body Width
T	Body Height
B	Terminal Width

Dimensions in mm

Part Number Construction

Series Name C 3225 X7S 1H 106 M /SOFT

Dimensions L x W (mm)

Case Code	Length	Width
C2012	2.00 ± 0.20	1.25 ± 0.20
C3216	3.20 ± 0.20	1.60 ± 0.20
C3225	3.20 ± 0.40	2.50 ± 0.30
C4532	4.50 ± 0.40	3.20 ± 0.40
C5750	5.70 ± 0.40	5.00 ± 0.40

Temperature Characteristic

Temperature Characteristics	Capacitance Change	Temperature Range
X7R	± 15%	-55 to +125°C
X7S	± 22%	-55 to +125°C
X7T	+22/-33%	-55 to +125°C

Rated Voltage (DC)

Voltage Code	Voltage (DC)
1C	16V
1E	25V
1V	35V
1H	50V
2A	100V
2E	250V
2W	450V
2J	630V

Termination Type

Termination Code	Style
/SOFT	Epoxy Termination

Capacitance Tolerance

Tolerance Code	Tolerance
M	± 20%

Nominal Capacitance (pF)

The capacitance is expressed in three digit codes and in units of pico Farads (pF). The first and second digits identify the first and second significant figures of the capacitance. The third digit identifies the multiplier. R designates a decimal point.

Capacitance Code	Capacitance
0R5	0.5pF
010	1pF
102	1,000pF (1nF)
105	1,000,000pF (1μF)



Capacitance Range Chart

C2012 [EIA CC0805]

Capacitance Range Chart

Temperature Characteristics: X7R ($\pm 15\%$), X7S ($\pm 22\%$), X7T ($+22/-33\%$)

Rated Voltage: 450V (2W), 250V (2E), 100V (2A), 50V (1H), 35V (1V), 16V (1C)

Capacitance (pF)	Cap Code	Tolerance	X7R				X7S	X7T	
			2E (250V)	1H (50V)	1V (35V)	1C (16V)	2A (100V)	2W (450V)	2E (250V)
10,000	103	M: $\pm 20\%$							
22,000	223								
47,000	473								
100,000	104								
220,000	224								
470,000	474								
1,000,000	105								
2,200,000	225								
4,700,000	475								

Standard Thickness



0.85 mm



1.25 mm



Capacitance Range Table

C2012 [EIA CC0805]

Class 2 (Temperature Stable)

Temperature Characteristics: X7R (-55 to +125°C, $\pm 15\%$), X7S (-55 to +125°C, $\pm 22\%$), X7T (-55 to +125°C, $+22/-33\%$)

TDK Part Number (Ordering Code)	Temperature Characteristics	Rated Voltage	Capacitance (pF)	Capacitance Tolerance	Thickness (mm)
C2012X7R1C475M/SOFT	X7R	16V	4,700,000	$\pm 20\%$	1.25 $\pm$ 0.25
C2012X7R1V225M/SOFT	X7R	35V	2,200,000	$\pm 20\%$	1.25 $\pm$ 0.25
C2012X7R1H474M/SOFT	X7R	50V	470,000	$\pm 20\%$	1.25 $\pm$ 0.20
C2012X7R1H105M/SOFT	X7R	50V	1,000,000	$\pm 20\%$	1.25 $\pm$ 0.20
C2012X7S2A224M/SOFT	X7S	100V	220,000	$\pm 20\%$	0.85 $\pm$ 0.10
C2012X7S2A474M/SOFT	X7S	100V	470,000	$\pm 20\%$	1.25 $\pm$ 0.20
C2012X7S2A105M/SOFT	X7S	100V	1,000,000	$\pm 20\%$	1.25 $\pm$ 0.25
C2012X7R2E103M/SOFT	X7R	250V	10,000	$\pm 20\%$	1.25 $\pm$ 0.20
C2012X7R2E223M/SOFT	X7R	250V	22,000	$\pm 20\%$	1.25 $\pm$ 0.20
C2012X7T2E473M/SOFT	X7T	250V	47,000	$\pm 20\%$	1.25 $\pm$ 0.20
C2012X7T2E104M/SOFT	X7T	250V	100,000	$\pm 20\%$	1.25 $\pm$ 0.20
C2012X7T2W103M/SOFT	X7T	450V	10,000	$\pm 20\%$	0.85 $\pm$ 0.10
C2012X7T2W223M/SOFT	X7T	450V	22,000	$\pm 20\%$	1.25 $\pm$ 0.20
C2012X7T2W473M/SOFT	X7T	450V	47,000	$\pm 20\%$	1.25 $\pm$ 0.20



Capacitance Range Chart

C3216 [EIA CC1206]

Capacitance Range Chart

Temperature Characteristics: X7R ($\pm 15\%$), X7S ($\pm 22\%$), X7T ($+22/-33\%$)

Rated Voltage: 630V (2J), 450V (2W), 250V (2E), 100V (2A), 50V (1H), 35V (1V), 25V (1E)

Capacitance (pF)	Cap Code	Tolerance	X7R						X7S	X7T		
			2J (630V)	2E (250V)	2A (100V)	1H (50V)	1V (35V)	1E (25V)	2A (100V)	2J (630V)	2W (450V)	2E (250V)
10,000	103	M: $\pm 20\%$										
22,000	223											
47,000	473											
100,000	104											
220,000	224											
470,000	474											
1,000,000	105											
2,200,000	225											
4,700,000	475											
10,000,000	106											

Standard Thickness

1.15 mm 1.30 mm 1.60 mm



Capacitance Range Table

C3216 [EIA CC1206]

Class 2 (Temperature Stable)

Temperature Characteristics X7R (-55 to +125°C, $\pm 15\%$), X7S (-55 to +125°C, $\pm 22\%$), X7T (-55 to +125°C, $+22/-33\%$)

TDK Part Number (Ordering Code)	Temperature Characteristics	Rated Voltage	Capacitance (pF)	Capacitance Tolerance	Thickness (mm)
C3216X7R1E106M/SOFT	X7R	25V	10,000,000	$\pm 20\%$	1.60 $\pm$ 0.30
C3216X7R1V475M/SOFT	X7R	35V	4,700,000	$\pm 20\%$	1.60 $\pm$ 0.30
C3216X7R1H105M/SOFT	X7R	50V	1,000,000	$\pm 20\%$	1.60 $\pm$ 0.30
C3216X7R1H225M/SOFT	X7R	50V	2,200,000	$\pm 20\%$	1.60 $\pm$ 0.30
C3216X7R2A474M/SOFT	X7R	100V	470,000	$\pm 20\%$	1.60 $\pm$ 0.30
C3216X7R2A105M/SOFT	X7R	100V	1,000,000	$\pm 20\%$	1.60 $\pm$ 0.30
C3216X7S2A225M/SOFT	X7S	100V	2,200,000	$\pm 20\%$	1.60 $\pm$ 0.30
C3216X7R2E104M/SOFT	X7R	250V	100,000	$\pm 20\%$	1.60 $\pm$ 0.30
C3216X7T2E224M/SOFT	X7T	250V	220,000	$\pm 20\%$	1.60 $\pm$ 0.30
C3216X7T2W104M/SOFT	X7T	450V	100,000	$\pm 20\%$	1.60 $\pm$ 0.30
C3216X7R2J103M/SOFT	X7R	630V	10,000	$\pm 20\%$	1.15 $\pm$ 0.15
C3216X7R2J223M/SOFT	X7R	630V	22,000	$\pm 20\%$	1.30 $\pm$ 0.15
C3216X7T2J473M/SOFT	X7T	630V	47,000	$\pm 20\%$	1.60 $\pm$ 0.30



Capacitance Range Chart

C3225 [EIA CC1210]

Capacitance Range Chart

Temperature Characteristics: X7R ($\pm 15\%$), X7S ($\pm 22\%$), X7T ($+22/-33\%$)
 Rated Voltage: 630V (2J), 450V (2W), 250V (2E), 100V (2A), 50V (1H)

Capacitance (pF)	Cap Code	Tolerance	X7R			X7S		X7T	
			2J (630V)	2E (250V)	2A (100V)	2A (100V)	1H (50V)	2J (630V)	2W (450V)
47,000	473	M: $\pm 20\%$							
100,000	104								
220,000	224								
470,000	474								
1,000,000	105								
2,200,000	225								
4,700,000	475								
10,000,000	106								

Standard Thickness

	1.60 mm
	2.00 mm
	2.30 mm
	2.50 mm



Capacitance Range Table

C3225 [EIA CC1210]

Class 2 (Temperature Stable)

Temperature Characteristics: X7R (-55 to $+125^\circ\text{C}$, $\pm 15\%$), X7S (-55 to $+125^\circ\text{C}$, $\pm 22\%$), X7T (-55 to $+125^\circ\text{C}$, $+22/-33\%$)

TDK Part Number (Ordering Code)	Temperature Characteristics	Rated Voltage	Capacitance (pF)	Capacitance Tolerance	Thickness (mm)
C3225X7S1H475M/SOFT	X7S	50V	4,700,000	$\pm 20\%$	2.30 ± 0.20
C3225X7S1H106M/SOFT	X7S	50V	10,000,000	$\pm 20\%$	2.50 ± 0.30
C3225X7R2A225M/SOFT	X7R	100V	2,200,000	$\pm 20\%$	2.30 ± 0.20
C3225X7S2A475M/SOFT	X7S	100V	4,700,000	$\pm 20\%$	2.00 ± 0.30
C3225X7R2E104M/SOFT	X7R	250V	100,000	$\pm 20\%$	2.00 ± 0.30
C3225X7R2E224M/SOFT	X7R	250V	220,000	$\pm 20\%$	2.00 ± 0.30
C3225X7T2W224M/SOFT	X7T	450V	220,000	$\pm 20\%$	2.00 ± 0.30
C3225X7R2J473M/SOFT	X7R	630V	47,000	$\pm 20\%$	2.00 ± 0.30
C3225X7T2J104M/SOFT	X7T	630V	100,000	$\pm 20\%$	1.60 ± 0.30



Capacitance Range Chart

C4532 [EIA CC1812]

Capacitance Range Chart

Temperature Characteristics: X7R ($\pm 15\%$), X7T (+22/-33%)
 Rated Voltage: 630V (2J), 450V (2W), 250V (2E)

Capacitance (pF)	Cap Code	Tolerance	X7R	X7T		
			2E (250V)	2J (630V)	2W (450V)	2E (250V)
100,000	104	M: $\pm 20\%$				
220,000	224					
470,000	474					
1,000,000	105					
2,200,000	225					
4,700,000	475					
10,000,000	106					

Standard Thickness

	2.00 mm
	2.30 mm
	2.50 mm



Capacitance Range Table

C4532 [EIA CC1812]

Class 2 (Temperature Stable)

Temperature Characteristics: X7R (-55 to +125°C, $\pm 15\%$), X7T (-55 to +125°C, +22/-33%)

TDK Part Number (Ordering Code)	Temperature Characteristics	Rated Voltage	Capacitance (pF)	Capacitance Tolerance	Thickness (mm)
C4532X7R2E474M/SOFT	X7R	250V	470,000	$\pm 20\%$	2.30 $\pm$ 0.30
C4532X7T2E105M/SOFT	X7T	250V	1,000,000	$\pm 20\%$	2.50 $\pm$ 0.30
C4532X7T2W474M/SOFT	X7T	450V	470,000	$\pm 20\%$	2.30 $\pm$ 0.30
C4532X7T2J224M/SOFT	X7T	630V	220,000	$\pm 20\%$	2.00 $\pm$ 0.30



Capacitance Range Chart

C5750 [EIA CC2220]

Capacitance Range Chart

Temperature Characteristics: X7R ($\pm 15\%$), X7S ($\pm 22\%$), X7T ($+22/-33\%$)
 Rated Voltage: 630V (2J), 450V (2W), 250V (2E), 100V (2A)

Capacitance (pF)	Cap Code	Tolerance	X7R	X7S	X7T		
			2E (250V)	2A (100V)	2J (630V)	2W (450V)	2E (250V)
100,000	104	M: $\pm 20\%$					
220,000	224						
470,000	474						
1,000,000	105						
2,200,000	225						
4,700,000	475						
10,000,000	106						

Standard Thickness

	2.30 mm
	2.50 mm



Capacitance Range Table

C5750 [EIA CC2220]

Class 2 (Temperature Stable)

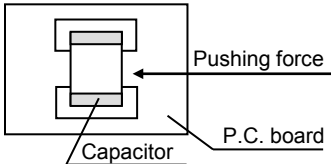
Temperature Characteristics: X7R (-55 to $+125^{\circ}\text{C}$, $\pm 15\%$), X7S (-55 to $+125^{\circ}\text{C}$, $\pm 22\%$), X7T (-55 to $+125^{\circ}\text{C}$, $+22/-33\%$)

TDK Part Number (Ordering Code)	Temperature Characteristics	Rated Voltage	Capacitance (pF)	Capacitance Tolerance	Thickness (mm)
C5750X7S2A106M/SOFT	X7S	100V	10,000,000	$\pm 20\%$	2.30 ± 0.30
C5750X7R2E105M/SOFT	X7R	250V	1,000,000	$\pm 20\%$	2.30 ± 0.30
C5750X7T2E225M/SOFT	X7T	250V	2,200,000	$\pm 20\%$	2.50 ± 0.30
C5750X7T2W105M/SOFT	X7T	450V	1,000,000	$\pm 20\%$	2.50 ± 0.30
C5750X7T2J474M/SOFT	X7T	630V	470,000	$\pm 20\%$	2.50 ± 0.30



General Specifications

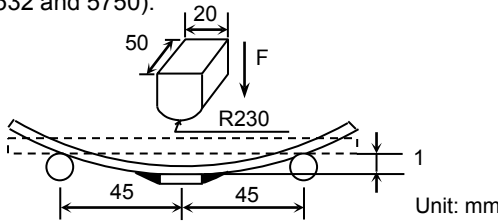
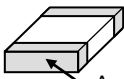
C Series – Soft Termination Type

No.	Item	Performance	Test or Inspection Method														
1	External Appearance	No defects which may affect performance.	Inspect with magnifying glass (3×).														
2	Insulation Resistance	10,000MΩ or 500MΩ•μF min., whichever smaller. (As for the capacitors of rated voltage 16V DC, 10,000 MΩ or 100MΩ•μF min.,)	Apply rated voltage for 60s. As for the rated voltage 630V DC, apply 500V DC.														
3	Voltage Proof	Withstand test voltage without insulation breakdown or other damage.	<table><tr><th>Rated Voltage</th><th>Apply voltage</th></tr><tr><td>RV ≤ 100V</td><td>2.5 × rated voltage</td></tr><tr><td>RV > 100V</td><td>1.5 × rated voltage</td></tr></table> Above DC voltage shall be applied for 1 to 5s. Charge / discharge current shall not exceed 50mA.	Rated Voltage	Apply voltage	RV ≤ 100V	2.5 × rated voltage	RV > 100V	1.5 × rated voltage								
Rated Voltage	Apply voltage																
RV ≤ 100V	2.5 × rated voltage																
RV > 100V	1.5 × rated voltage																
4	Capacitance	Within the specified tolerance.	<table><tr><th>Class</th><th>Rated Capacitance</th><th>Measuring Frequency</th><th>Measuring voltage</th></tr><tr><td rowspan="2">Class 2</td><td>C ≤ 10uF</td><td>1kHz±10%</td><td>1.0±0.2V_{rms}</td></tr><tr><td>C > 10uF</td><td>120Hz±20%</td><td>0.5±0.2 V_{rms}</td></tr></table>	Class	Rated Capacitance	Measuring Frequency	Measuring voltage	Class 2	C ≤ 10uF	1kHz±10%	1.0±0.2V _{rms}	C > 10uF	120Hz±20%	0.5±0.2 V _{rms}			
Class	Rated Capacitance	Measuring Frequency	Measuring voltage														
Class 2	C ≤ 10uF	1kHz±10%	1.0±0.2V _{rms}														
	C > 10uF	120Hz±20%	0.5±0.2 V _{rms}														
5	Dissipation Factor (Class 2)	<table><tr><th>T.C.</th><th>D.F.</th></tr><tr><td>X7R</td><td>3% max. 5% max. 7.5% max.</td></tr><tr><td>X7S</td><td>5% max.</td></tr><tr><td>X7T</td><td>2.5% max.</td></tr></table>	T.C.	D.F.	X7R	3% max. 5% max. 7.5% max.	X7S	5% max.	X7T	2.5% max.	See No.4 in this table for measuring condition.						
T.C.	D.F.																
X7R	3% max. 5% max. 7.5% max.																
X7S	5% max.																
X7T	2.5% max.																
6	Temperature Characteristics of Capacitance (Class 2)	Capacitance Change (%) <table><tr><th>No Voltage Applied</th></tr><tr><td>X7R: ± 15%</td></tr><tr><td>X7S: ± 15%</td></tr><tr><td>X7T: +22/-33%</td></tr></table>	No Voltage Applied	X7R: ± 15%	X7S: ± 15%	X7T: +22/-33%	Capacitance shall be measured by the steps shown in the following table after thermal equilibrium is obtained for each step. ΔC be calculated ref. STEP 3 reading <table><tr><th>Step</th><th>Temperature (°C)</th></tr><tr><td>1</td><td>Reference temp. ± 2</td></tr><tr><td>2</td><td>Min. operating temp. ± 2</td></tr><tr><td>3</td><td>Reference temp. ± 2</td></tr><tr><td>4</td><td>Max. operating temp. ± 2</td></tr></table>	Step	Temperature (°C)	1	Reference temp. ± 2	2	Min. operating temp. ± 2	3	Reference temp. ± 2	4	Max. operating temp. ± 2
No Voltage Applied																	
X7R: ± 15%																	
X7S: ± 15%																	
X7T: +22/-33%																	
Step	Temperature (°C)																
1	Reference temp. ± 2																
2	Min. operating temp. ± 2																
3	Reference temp. ± 2																
4	Max. operating temp. ± 2																
7	Robustness of Terminations	No sign of termination coming off, breakage of ceramic, or other abnormal signs.	Reflow solder the capacitors on P.C. board (shown in Appendix 1a or Appendix 1b) and apply a pushing force of 5N for 10±1s. 														



General Specifications

C Series – Soft Termination Type

No.	Item	Performance	Test or Inspection Method										
8	Bending	No mechanical damage.	Reflow solder the capacitor on P.C. board (shown in Appendix 2) and bend it for 5mm. (2mm is applied for C4532 and 5750).  Unit: mm										
9	Solderability	New solder to cover over 75% of termination. 25% may have pinholes or rough spots but not concentrated in one spot. Ceramic surface of “A sections” shall not be exposed due to melting or shifting of termination material.  A section	Completely soak both terminations in solder at $235 \pm 5^\circ\text{C}$ for $2 \pm 0.5\text{s}$. Solder: H63A (JIS Z 3282) Flux: Isopropyl alcohol (JIS K 8839) Rosin (JIS K 5902) 25% solid solution.										
10	Resistance to solder heat	External appearance: No cracks are allowed and terminations shall be covered at least 60% with new solder. <table border="1"> <thead> <tr> <th rowspan="2">Capacitance</th><th colspan="2">Characteristics</th><th rowspan="2">Change from the value before test</th></tr> <tr> <th>Class 2</th><th>X7R X7S X7T</th></tr> </thead> <tbody> <tr> <td></td><td></td><td></td><td>$\pm 7.5\%$</td></tr> </tbody> </table> D.F. (Class 2): Meet the initial spec. Insulation Resistance: Meet the initial spec. Voltage Proof: No insulation breakdown or other damage.	Capacitance	Characteristics		Change from the value before test	Class 2	X7R X7S X7T				$\pm 7.5\%$	Completely soak both terminations in solder at $260 \pm 5^\circ\text{C}$ for $5 \pm 1\text{s}$. Preheating condition Temp.: $150 \pm 10^\circ\text{C}$ Time : 1 to 2min. Flux: Isopropyl alcohol (JIS K 8839) Rosin (JIS K 5902) 25% solid solution. Solder: H63A (JIS Z 3282) Leave the capacitor in ambient conditions for 6 to 24h before measurement.
Capacitance	Characteristics			Change from the value before test									
	Class 2	X7R X7S X7T											
			$\pm 7.5\%$										
11	Vibration	External appearance: No mechanical damage. <table border="1"> <thead> <tr> <th rowspan="2">Capacitance</th><th colspan="2">Characteristics</th><th rowspan="2">Change from the value before test</th></tr> <tr> <th>Class 2</th><th>X7R X7S X7T</th></tr> </thead> <tbody> <tr> <td></td><td></td><td></td><td>$\pm 7.5\%$</td></tr> </tbody> </table> D.F. (Class 2): Meet the initial spec.	Capacitance	Characteristics		Change from the value before test	Class 2	X7R X7S X7T				$\pm 7.5\%$	Reflow solder the capacitor on P.C. board (shown in Appendix 1a or Appendix 1b) before testing. Vibrate the capacitor with amplitude of 1.5mm P-P sweeping the frequencies from 10Hz to 55Hz and back to 10Hz after 1min. Repeat this for 2h each in 3 perpendicular directions.
Capacitance	Characteristics			Change from the value before test									
	Class 2	X7R X7S X7T											
			$\pm 7.5\%$										



General Specifications

C Series – Soft Termination Type

No.	Item	Performance	Test or Inspection Method
12	Temperature cycle		Reflow solder the capacitors on a P.C. board (shown in Appendix 1a or Appendix 1b) before testing.
	External appearance	No mechanical damage.	Expose the capacitor in the conditions in step 1 through step 4, and repeat 5 times consecutively.
	Capacitance	Characteristics	Leave the capacitor in ambient conditions for 24 ± 2 h before measurement.
		Change from the value before test	
		Class 2	
		X7R	
		X7S	$\pm 7.5\%$
		X7T	
	D.F. (Class 2)	Meet the initial spec.	
	Insulation Resistance	Meet the initial spec.	
	Voltage Proof	No insulation breakdown or other damage.	
13	Moisture Resistance (Steady State)		Reflow solder the capacitor on P.C. board (shown in Appendix 1a or Appendix 1b) before testing.
	External appearance	No mechanical damage.	Leave at temperature $40 \pm 2^\circ\text{C}$, 90 to 95%RH for 500 +24,0h.
	Capacitance	Characteristics	Leave the capacitor in ambient condition for 24 ± 2 h before measurement.
		Change from the value before test	
		Class 2	
		X7R	
		X7S	$\pm 12.5\%$
		X7T	
	D.F. (Class 2)	Characteristics X7R: 200% of initial spec. max. X7S: 200% of initial spec. max. X7T: 200% of initial spec. max.	
	Insulation Resistance	1,000M Ω or 50M $\Omega \cdot \mu\text{F}$ min., whichever smaller. (As for the capacitors of rated voltage 16V DC, 1,000 M Ω or 10M $\Omega \cdot \mu\text{F}$ min.,)	

Step	Temperature ($^\circ\text{C}$)	Time (min.)
1	Min. operating temp. ± 3	30 ± 3
2	Reference Temp.	2 – 5
3	Max. operating temp. ± 2	30 ± 2
4	Reference Temp.	2 – 5



General Specifications

C Series – Soft Termination Type

No.	Item	Performance	Test or Inspection Method						
14	Moisture Resistance								
	External appearance	No mechanical damage.	Reflow solder the capacitors on P.C. board (shown in Appendix 1a or Appendix 1b) before testing. Apply the rated voltage at temperature 40±2°C and 90 to 95%RH for 500 +24,0h. Charge/discharge current shall not exceed 50mA. Leave the capacitor in ambient conditions for 24±2h before measurement. Voltage conditioning: Voltage treat the capacitors under testing temperature and voltage for 1 hour. Leave the capacitors in ambient condition for 24±2h before measurement.						
	Capacitance	<table><tr><th colspan="2">Characteristics</th><th>Change from the value before test</th></tr><tr><td>Class 2</td><td>X7R X7S X7T</td><td>± 12.5%</td></tr></table>	Characteristics		Change from the value before test	Class 2	X7R X7S X7T	± 12.5%	
	Characteristics		Change from the value before test						
	Class 2	X7R X7S X7T	± 12.5%						
D.F. (Class 2)	Characteristics X7R: 200% of initial spec. max. X7S: 200% of initial spec. max. X7T: 200% of initial spec. max.								
Insulation Resistance	500MΩ or 25MΩ•μF min., whichever smaller. (As for the capacitors of rated voltage 16V DC, 500 MΩ or 5MΩ•μF min.,)		Use this measurement for initial value.						
15	Life								
	External appearance	No mechanical damage.	Reflow solder the capacitors on P.C. board (shown in Appendix 1a or Appendix 1b) before testing. Apply rated voltage at maximum operating temperature ±2°C for 1,000 +48, 0h. Some items may be tested at higher voltage (1.2x, 1.5x or 2xRV). Charge/discharge current shall not exceed 50mA. Leave the capacitor in ambient conditions for 24±2h before measurement.						
	Capacitance	<table><tr><th colspan="2">Characteristics</th><th>Change from the value before test</th></tr><tr><td>Class 2</td><td>X7R X7S X7T</td><td>± 15%</td></tr></table>	Characteristics		Change from the value before test	Class 2	X7R X7S X7T	± 15%	
	Characteristics		Change from the value before test						
	Class 2	X7R X7S X7T	± 15%						
D.F. (Class 2)	Characteristics X7R: 200% of initial spec. max. X7S: 200% of initial spec. max. X7T: 200% of initial spec. max.		Voltage conditioning: Voltage treat the capacitors under testing temperature and voltage for 1 hour. Leave the capacitors in ambient condition for 24±2h before measurement.						
Insulation Resistance	1,000MΩ or 50MΩ•μF min., whichever smaller. (As for the capacitors of rated voltage 16V DC, 1,000 MΩ or 10MΩ•μF min.,)		Use this measurement for initial value.						

*As for the initial measurement of capacitors on number 8,12,13,14 and 15 leave capacitor at $150 - 10, 0^\circ\text{C}$ for 1 hour and measure the value after leaving capacitor for $24 \pm 2\text{h}$ in ambient conditions.



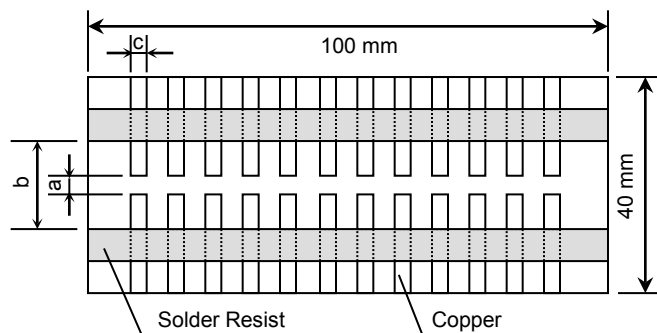
General Specifications

C Series – Soft Termination Type

Appendix - 1a

P.C. Board for reliability test

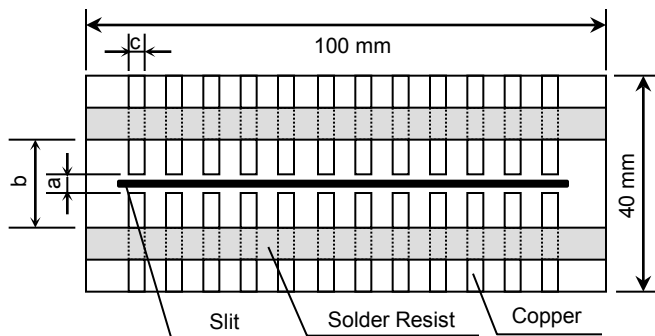
Applied for C2012, C3216



Appendix - 1b

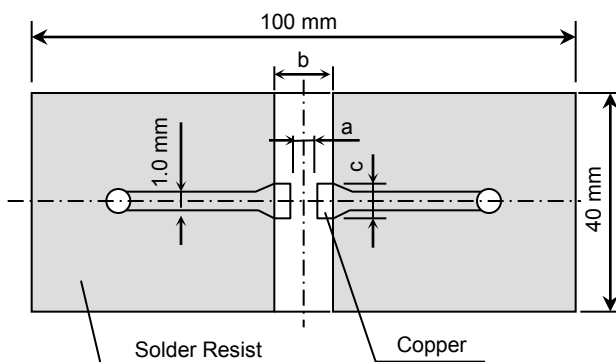
P.C. Board for reliability test

Applied for C3225, C4532, C5750



Appendix - 2

P.C. Board for bending test



Material : Glass Epoxy (As per JIS C6484 GE4)

P.C. Board thickness: 1.6mm

- Copper (thickness 0.035mm)
- Solder resist

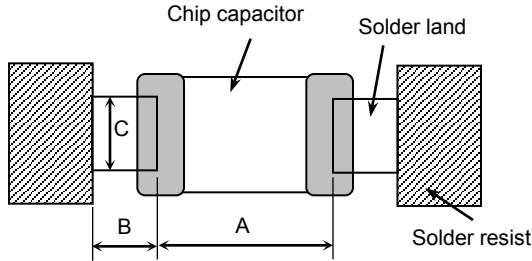
Case Code		Dimensions (mm)		
JIS	EIA	a	b	c
C2012	CC0805	1.2	4.0	1.65
C3216	CC1206	2.2	5.0	2.0
C3225	CC1210	2.2	5.0	2.9
C4532	CC1812	3.5	7.0	3.7
C5750	CC2220	4.5	8.0	5.6



Soldering Information

C Series – Soft Termination Type

Recommended Soldering Land Pattern

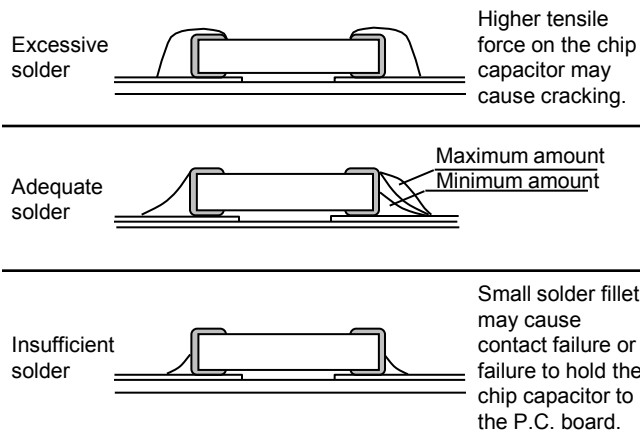


Wave Soldering		
Unit: mm		
Type	C2012 [CC0805]	C3216 [CC1206]
Symbol		
A	1.0 - 1.3	2.1 - 2.5
B	1.0 - 1.2	1.1 - 1.3
C	0.8 - 1.1	1.0 - 1.3

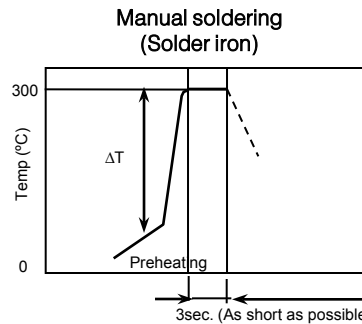
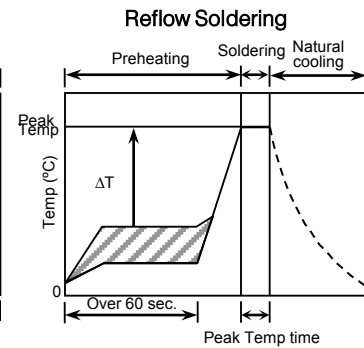
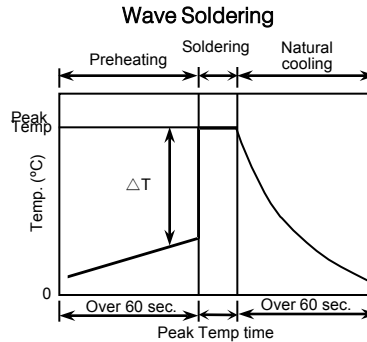
Reflow Soldering		
Unit: mm		
Type	C2012 [CC0805]	C3216 [CC1206]
Symbol		
A	0.9 - 1.2	2.0 - 2.4
B	0.7 - 0.9	1.0 - 1.2
C	0.9 - 1.2	1.1 - 1.6

Reflow Soldering			
Unit: mm			
Type	C3225 [CC1210]	C4532 [CC1812]	C5750 [CC2220]
Symbol			
A	2.0 - 2.4	3.1 - 3.7	4.1 - 4.8
B	1.0 - 1.2	1.2 - 1.4	1.2 - 1.4
C	1.9 - 2.5	2.4 - 3.2	4.0 - 5.0

Recommended Solder Amount



Recommended Soldering Profile



APPLICATION

For C2012 (CC0805) and C3216 (CC1206), applied wave soldering and reflow soldering.

For C3225 (CC1210), C4532 (CC1812), C5750 (CC2220), applied only reflow soldering.

Recommended soldering duration

Solder	Wave Soldering		Reflow Soldering	
	Temp./Dura.	Peak temp (°C)	Peak temp (°C)	Duration (sec.)
Sn-Pb Solder		250 max.	230 max.	20 max.
Lead-Free Solder		260 max.	260 max.	10 max.

Recommended solder compositions

Sn-37Pb (Sn-Pb solder)
Sn-3.0Ag-0.5Cu (Lead Free Solder)

Preheating Condition

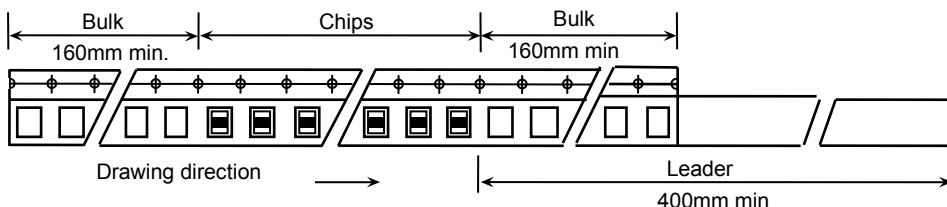
Soldering	Case Size - JIS (EIA)	Temp. (°C)
Wave soldering	C2012(CC0805), C3216(CC1206)	$\Delta T \leq 150$
Reflow soldering	C2012(CC0805), C3216(CC1206) C3225(CC1210), C4532(CC1812), C5750(CC2220)	$\Delta T \leq 150$ $\Delta T \leq 130$
Manual soldering	C2012(CC0805), C3216(CC1206) C3225(CC1210), C4532(CC1812), C5750(CC2220)	$\Delta T \leq 150$ $\Delta T \leq 130$



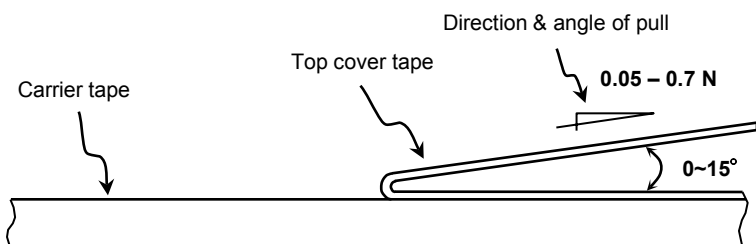
Packaging Information

C Series – Soft Termination Type

Carrier Tape Configuration

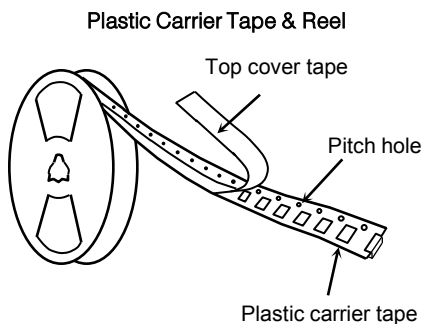
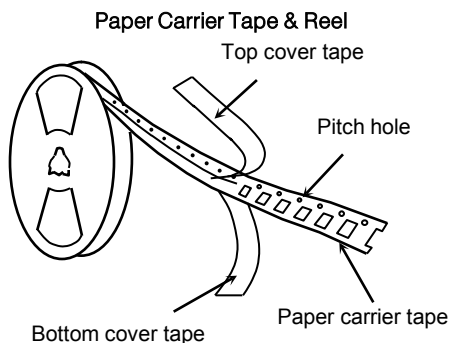


Peel Back Force (Top Tape)



- Carrier tape shall be flexible enough to be wound around a minimum radius of 30mm with components in tape.
- The missing of components shall be less than 0.1%
- Components shall not stick to the cover tape.
- The cover tape shall not protrude beyond the edges of the carrier tape and shall not cover the sprocket holes.

Chip Quantity Per Reel and Structure of Reel (Paper & Plastic)



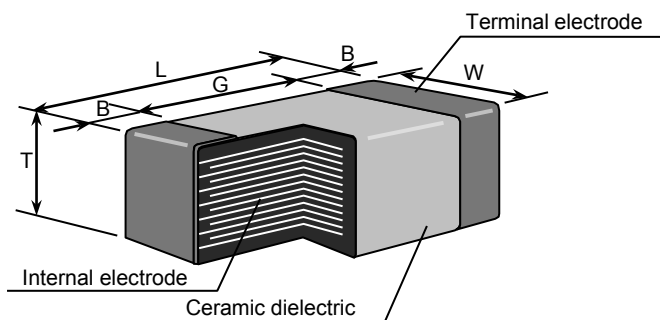
Case Code		Chip Thickness	Taping Material	Chip quantity (pcs.)	
JIS	EIA			φ178mm (7") reel	φ330mm (13") reel
C2012	CC0805	0.85 mm	Paper/Plastic	4,000	10,000
		1.25 mm	Plastic	2,000	
C3216	CC1206	1.15 mm	Plastic	2,000	10,000
		1.30 mm			8,000
		1.60 mm			
C3225	CC1210	1.60 mm	Plastic	2,000	8,000
		2.00 mm		1,000	5,000
		2.30 mm			
		2.50 mm			
C4532	CC1812	2.00 mm	Plastic	1,000	3,000
		2.30 mm		500	
		2.50 mm			
C5750	CC2220	2.30 mm	Plastic	500	3,000
		2.50 mm			



Additional Information

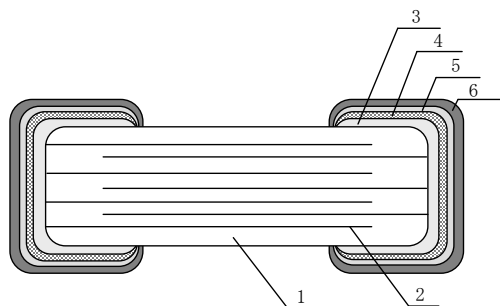
C Series – Soft Termination Type

• Shape & Dimensions



Case Code		Dimensions (mm)				
JIS	EIA	L	W	T	B	G
C2012	CC0805	2.00	1.25	0.85	0.45 min.	0.50 min.
				1.25		
C3216	CC1206	3.20	1.60	1.15	0.50 min.	1.00 min.
				1.30		
				1.60		
				1.60		
C3225	CC1210	3.20	2.50	2.00	0.50 min.	1.00 min.
				2.30		
				2.50		
				2.00		
C4532	CC1812	4.50	3.20	2.30	0.70 min.	2.00 min.
				2.50		
				2.30		
C5750	CC2220	5.70	5.00	2.30	0.70 min.	2.00 min.
				2.50		

• Inside Structure & Material System



No.	NAME	MATERIAL
		Class 2
(1)	Ceramic Dielectric	BaTiO ₃
(2)	Internal Electrode	Nickel (Ni)
(3)	Termination	Copper (Cu)
(4)		Conductive Resin (Filler: Ag)
(5)		Nickel (Ni)
(6)		Tin (Sn)

• Environmental Information

TDK Corporation established internal product environmental assurance standards that include the six hazardous substances banned by the EU RoHS Directive¹ enforced on July 1, 2006 along with additional substances independently banned by TDK and has successfully completed making general purpose electronic components conform to the RoHS Directive².

1. Abbreviation for Restriction on Hazardous Substances, which refers to the regulation EU Directive 2002/95/EC on hazardous substances by the European Union (EU) effective from July 1, 2006. The Directive bans the use of six specific hazardous substances in electric and electronic devices and products handled within the EU. The six substances are lead, mercury, cadmium, hexavalent chromium, PBB (polybrominated biphenyls), and PBDE (polybrominated diphenyl ethers).
2. This means that, in conformity with the EU Directive 2002/95/EC, lead, cadmium, mercury, hexavalent chromium, and specific bromine-based flame retardants, PBB and PBDE, have not been used, except for exempted applications.

For REACH (SVHC : 15 substances according to ECHA / October 2008) : All TDK MLCC do not contain these 15 substances.

For European Directive 2000/53/CE and 2005/673/CE : Cadmium, Hexavalent Chromium, Mercury, Lead are not contained in all TDK MLCC.

For European Directive 2003/11/CE : Pentabromodiphenyl-ether, Octabromodiphenyl-ether are not contained in all TDK MLCC.



MULTILAYER CERAMIC CHIP CAPACITORS



C Series Open Mode Design

Type: C2012 [EIA CC0805]
C3216 [EIA CC1206]
C3225 [EIA CC1210]
C4532 [EIA CC1812]
C5750 [EIA CC2220]

Issue date: April 2011



**TDK MLCC
US Catalog**

Version B11

REMINDERS

Please read before using this product

SAFETY REMINDERS



REMINDERS

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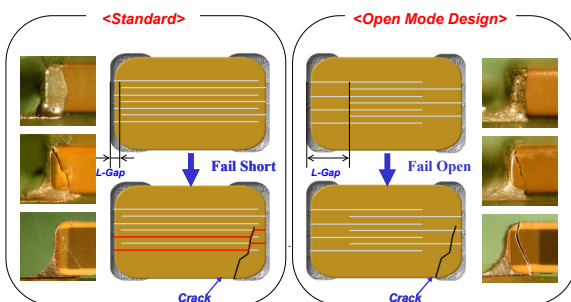
C Series Open Mode Design

Type: C2012, C3216, C3225, C4532, C5750

Features



- Increase resistance to mechanical bending, temperature cycle, vibration, and electrical stresses
- Available in X7R and X8R dielectrics
- When a chip capacitor is cracked by mechanical stress such as board bending, open mode construction helps user reduce the risk of short circuits
- The Open Mode design defines that the L-Gap length shall be wider than the terminal band width



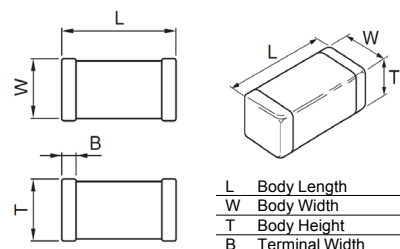
- The Open Mode concept does not guaranteed MLCC will always fail open. This design is intended to reduce the risk of the MLCC failing short. All MLCC caution guidelines apply.

Applications



- Automotive and other high stress applications
- Battery line circuits with high board flex stress

Shape & Dimensions



Dimensions in mm

L	Body Length
W	Body Width
T	Body Height
B	Terminal Width

Part Number Construction

Series Name **C** **3216** **X7R** **2A** **105** **K** **T** **5XXX**

Dimensions L x W (mm)

Case Code	Length	Width
C2012	2.00 ± 0.20	1.25 ± 0.20
C3216	3.20 ± 0.20	1.60 ± 0.20
C3225	3.20 ± 0.40	2.50 ± 0.30
C4532	4.50 ± 0.40	3.20 ± 0.40
C5750	5.70 ± 0.40	5.00 ± 0.40

Temperature Characteristic

Temperature Characteristics	Capacitance Change	Temperature Range
X7R	±15%	-55 to +125°C
X8R	±15%	-55 to +150°C

Rated Voltage (DC)

Voltage Code	Voltage (DC)
1C	16V
1E	25V
1H	50V
2A	100V
2E	250V
2J	630V

Symbol

5

Design

Open Mode

Internal Codes

Termination Code	Style
5xxx	Open Mode Design

Packaging Style

Packaging Code	Style
T	Tape & Reel

Capacitance Tolerance

Tolerance Code	Tolerance
K	± 10%
M	± 20%

Nominal Capacitance (pF)

The capacitance is expressed in three digit codes and in units of pico Farads (pF). The first and second digits identify the first and second significant figures of the capacitance. The third digit identifies the multiplier. R designates a decimal point.

Capacitance Code	Capacitance
0R5	0.5pF
010	1pF
102	1,000pF (1nF)
105	1,000,000pF (1μF)



Capacitance Range Chart

C2012 [EIA CC0805]

Capacitance Range Chart

Temperature Characteristics: X7R, ($\pm 15\%$), X8R ($\pm 15\%$)
 Rated Voltage: 250V (2E), 100V (2A), 50V (1H)

Capacitance (pF)	Cap Code	Tolerance	X7R			X8R
			2E (250V)	2A (100V)	1H (50V)	1H (50V)
1,000	102	K: $\pm 10\%$				
1,500	152					
2,200	222					
3,300	332					
4,700	472					
6,800	682					
10,000	103					
15,000	153					
22,000	223					
33,000	333					
47,000	473					
68,000	683					
100,000	104					

Standard Thickness



Capacitance Range Table

C2012 [EIA CC0805]

Class 2 (Temperature Stable)

Temperature Characteristics X7R (-55 to +125°C, $\pm 15\%$), X8R (-55 to +150°C, $\pm 15\%$)

TDK Part Number (Ordering Code)	Temperature Characteristics	Rated Voltage	Capacitance (pF)	Capacitance Tolerance	Thickness (mm)
C2012X7R1H104KT5	X7R	50V	100,000	$\pm 10\%$	1.25 $\pm$ 0.20
C2012X7R2A102KT5	X7R	100V	1,000	$\pm 10\%$	0.85 $\pm$ 0.10
C2012X7R2A152KT5	X7R	100V	1,500	$\pm 10\%$	0.85 $\pm$ 0.10
C2012X7R2A222KT5	X7R	100V	2,200	$\pm 10\%$	0.85 $\pm$ 0.10
C2012X7R2A332KT5	X7R	100V	3,300	$\pm 10\%$	0.85 $\pm$ 0.10
C2012X7R2A472KT5	X7R	100V	4,700	$\pm 10\%$	0.85 $\pm$ 0.10
C2012X7R2A682KT5	X7R	100V	6,800	$\pm 10\%$	0.85 $\pm$ 0.10
C2012X7R2A103KT5	X7R	100V	10,000	$\pm 10\%$	0.85 $\pm$ 0.10
C2012X7R2A153KT5	X7R	100V	15,000	$\pm 10\%$	1.25 $\pm$ 0.20
C2012X7R2A223KT5	X7R	100V	22,000	$\pm 10\%$	1.25 $\pm$ 0.20
C2012X7R2E102KT5	X7R	250V	1,000	$\pm 10\%$	0.85 $\pm$ 0.10
C2012X7R2E152KT5	X7R	250V	1,500	$\pm 10\%$	0.85 $\pm$ 0.10
C2012X7R2E222KT5	X7R	250V	2,200	$\pm 10\%$	0.85 $\pm$ 0.10
C2012X7R2E332KT5	X7R	250V	3,300	$\pm 10\%$	0.85 $\pm$ 0.10
C2012X7R2E472KT5	X7R	250V	4,700	$\pm 10\%$	0.85 $\pm$ 0.10
C2012X7R2E682KT5	X7R	250V	6,800	$\pm 10\%$	1.25 $\pm$ 0.20
C2012X7R2E103KT5	X7R	250V	10,000	$\pm 10\%$	1.25 $\pm$ 0.20
C2012X7R2E153KT5	X7R	250V	15,000	$\pm 10\%$	1.25 $\pm$ 0.20
C2012X8R1H223KT5	X8R	50V	22,000	$\pm 10\%$	0.85 $\pm$ 0.10
C2012X8R1H333KT5	X8R	50V	33,000	$\pm 10\%$	0.85 $\pm$ 0.10
C2012X8R1H473KT5	X8R	50V	47,000	$\pm 10\%$	1.25 $\pm$ 0.20
C2012X8R1H683KT5	X8R	50V	68,000	$\pm 10\%$	1.25 $\pm$ 0.20



Capacitance Range Chart

C3216 [EIA CC1206]

Capacitance Range Chart

Temperature Characteristics: X7R, ($\pm 15\%$)

Rated Voltage: 630V (2J), 250V (2E), 100V (2A), 16V (1C)

Capacitance (pF)	Cap Code	Tolerance	X7R			
			2J (630V)	2E (250V)	2A (100V)	1C (16V)
1,000	102	K: $\pm 10\%$				
1,500	152					
2,200	222					
3,300	332					
4,700	472					
6,800	682					
10,000	103					
15,000	153					
22,000	223					
33,000	333					
47,000	473					
68,000	683					
100,000	104					
150,000	154					
1,000,000	105					
4,700,000	475					

Standard Thickness

	1.15 mm
	1.30 mm
	1.60 mm



Capacitance Range Table

C3216 [EIA CC1206]

Class 2 (Temperature Stable)

Temperature Characteristics X7R (-55 to +125°C, $\pm 15\%$)

TDK Part Number (Ordering Code)	Temperature Characteristics	Rated Voltage	Capacitance (pF)	Capacitance Tolerance	Thickness (mm)
C3216X7R1C475MT5	X7R	16V	4,700,000	$\pm 20\%$	1.60 $\pm$ 0.30
C3216X7R2A333KT5	X7R	100V	33,000	$\pm 10\%$	1.15 $\pm$ 0.10
C3216X7R2A473KT5	X7R	100V	47,000	$\pm 10\%$	1.15 $\pm$ 0.10
C3216X7R2A683KT5	X7R	100V	68,000	$\pm 10\%$	1.60 $\pm$ 0.30
C3216X7R2A104KT5	X7R	100V	100,000	$\pm 10\%$	1.60 $\pm$ 0.30
C3216X7R2A154KT5	X7R	100V	150,000	$\pm 10\%$	1.60 $\pm$ 0.30
C3216X7R2A105KT5	X7R	100V	1,000,000	$\pm 10\%$	1.60 $\pm$ 0.30
C3216X7R2E153KT5	X7R	250V	15,000	$\pm 10\%$	1.15 $\pm$ 0.10
C3216X7R2E223KT5	X7R	250V	22,000	$\pm 10\%$	1.15 $\pm$ 0.10
C3216X7R2E333KT5	X7R	250V	33,000	$\pm 10\%$	1.60 $\pm$ 0.30
C3216X7R2E473KT5	X7R	250V	47,000	$\pm 10\%$	1.60 $\pm$ 0.30
C3216X7R2E683KT5	X7R	250V	68,000	$\pm 10\%$	1.60 $\pm$ 0.30
C3216X7R2E104KT5	X7R	250V	100,000	$\pm 10\%$	1.60 $\pm$ 0.30
C3216X7R2J102KT5	X7R	630V	1,000	$\pm 10\%$	1.15 $\pm$ 0.10
C3216X7R2J152KT5	X7R	630V	1,500	$\pm 10\%$	1.15 $\pm$ 0.10
C3216X7R2J222KT5	X7R	630V	2,200	$\pm 10\%$	1.15 $\pm$ 0.10
C3216X7R2J332KT5	X7R	630V	3,300	$\pm 10\%$	1.15 $\pm$ 0.10
C3216X7R2J472KT5	X7R	630V	4,700	$\pm 10\%$	1.15 $\pm$ 0.10
C3216X7R2J682KT5	X7R	630V	6,800	$\pm 10\%$	1.15 $\pm$ 0.10
C3216X7R2J103KT5	X7R	630V	10,000	$\pm 10\%$	1.15 $\pm$ 0.10
C3216X7R2J153KT5	X7R	630V	15,000	$\pm 10\%$	1.30 $\pm$ 0.15
C3216X7R2J223KT5	X7R	630V	22,000	$\pm 10\%$	1.30 $\pm$ 0.15
C3216X7R2J333KT5	X7R	630V	33,000	$\pm 10\%$	1.60 $\pm$ 0.30



Capacitance Range Chart

C3225 [EIA CC1210]

Capacitance Range Chart

Temperature Characteristics: X7R, ($\pm 15\%$)

Rated Voltage: 630V (2J), 250V (2E), 100V (2A), 50V (1H), 25V (1E), 16V (1C)

Capacitance (pF)	Cap Code	Tolerance	X7R					
			2J (630V)	2E (250V)	2A (100V)	1H (50V)	1E (25V)	1C (16V)
47,000	473	K: $\pm 10\%$						
68,000	683							
100,000	104							
150,000	154							
220,000	224							
330,000	334							
470,000	474							
680,000	684							
1,000,000	105							
1,500,000	155							
2,200,000	225							
3,300,000	335							
4,700,000	475							

Standard Thickness

	1.15 mm
	1.60 mm
	2.00 mm
	2.30 mm
	2.50 mm



Capacitance Range Table

C3225 [EIA CC1210]

Class 2 (Temperature Stable)

Temperature Characteristics X7R (-55 to +125°C, $\pm 15\%$)

TDK Part Number (Ordering Code)	Temperature Characteristics	Rated Voltage	Capacitance (pF)	Capacitance Tolerance	Thickness (mm)
C3225X7R1C335KT5	X7R	16V	3,300,000	$\pm 10\%$	2.00 $\pm$ 0.20
C3225X7R1C475KT5	X7R	16V	4,700,000	$\pm 10\%$	2.50 $\pm$ 0.30
C3225X7R1E105KT5	X7R	25V	1,000,000	$\pm 10\%$	1.15 $\pm$ 0.10
C3225X7R1E155KT5	X7R	25V	1,500,000	$\pm 10\%$	1.60 $\pm$ 0.30
C3225X7R1E225KT5	X7R	25V	2,200,000	$\pm 10\%$	2.00 $\pm$ 0.20
C3225X7R1H474KT5	X7R	50V	470,000	$\pm 10\%$	1.60 $\pm$ 0.30
C3225X7R1H684KT5	X7R	50V	680,000	$\pm 10\%$	2.00 $\pm$ 0.20
C3225X7R2A334KT5	X7R	100V	330,000	$\pm 10\%$	2.00 $\pm$ 0.20
C3225X7R2A105KT5	X7R	100V	1,000,000	$\pm 10\%$	2.00 $\pm$ 0.20
C3225X7R2A225KT5	X7R	100V	2,200,000	$\pm 10\%$	2.30 $\pm$ 0.20
C3225X7R2E104KT5	X7R	250V	100,000	$\pm 10\%$	2.00 $\pm$ 0.20
C3225X7R2E154KT5	X7R	250V	150,000	$\pm 10\%$	2.00 $\pm$ 0.20
C3225X7R2E224KT5	X7R	250V	220,000	$\pm 10\%$	2.00 $\pm$ 0.20
C3225X7R2J473KT5	X7R	630V	47,000	$\pm 10\%$	2.00 $\pm$ 0.20
C3225X7R2J683KT5	X7R	630V	68,000	$\pm 10\%$	2.00 $\pm$ 0.20



Capacitance Range Chart

C4532 [EIA CC1812]

Capacitance Range Chart

Temperature Characteristics: X7R, ($\pm 15\%$)

Rated Voltage: 630V (2J), 250V (2E), 100V (2A), 50V (1H), 25V (1E), 16V (1C)

Capacitance (pF)	Cap Code	Tolerance	X7R					
			2J (630V)	2E (250V)	2A (100V)	1H (50V)	1E (25V)	1C (16V)
68,000	683	K: $\pm 10\%$						
100,000	104							
150,000	154							
220,000	224							
330,000	334							
470,000	474							
680,000	684							
1,000,000	105							
1,500,000	155							
3,300,000	335							
4,700,000	475							
6,800,000	685							
10,000,000	106							

Standard Thickness

	1.60 mm
	2.00 mm
	2.30 mm



Capacitance Range Table

C4532 [EIA CC1812]

Class 2 (Temperature Stable)

Temperature Characteristics X7R (-55 to +125°C, $\pm 15\%$)

TDK Part Number (Ordering Code)	Temperature Characteristics	Rated Voltage	Capacitance (pF)	Capacitance Tolerance	Thickness (mm)
C4532X7R1C685KT5	X7R	16V	6,800,000	$\pm 10\%$	2.00 $\pm$ 0.20
C4532X7R1C106KT5	X7R	16V	10,000,000	$\pm 10\%$	2.30 $\pm$ 0.20
C4532X7R1E335KT5	X7R	25V	3,300,000	$\pm 10\%$	1.60 $\pm$ 0.30
C4532X7R1E475KT5	X7R	25V	4,700,000	$\pm 10\%$	2.00 $\pm$ 0.20
C4532X7R1H105KT5	X7R	50V	1,000,000	$\pm 10\%$	1.60 $\pm$ 0.30
C4532X7R1H155KT5	X7R	50V	1,500,000	$\pm 10\%$	2.30 $\pm$ 0.20
C4532X7R2A684KT5	X7R	100V	680,000	$\pm 10\%$	2.30 $\pm$ 0.20
C4532X7R2E154KT5	X7R	250V	150,000	$\pm 10\%$	1.60 $\pm$ 0.30
C4532X7R2E224KT5	X7R	250V	220,000	$\pm 10\%$	2.30 $\pm$ 0.20
C4532X7R2E334KT5	X7R	250V	330,000	$\pm 10\%$	2.30 $\pm$ 0.20
C4532X7R2E474KT5	X7R	250V	470,000	$\pm 10\%$	2.30 $\pm$ 0.20
C4532X7R2J683KT5	X7R	630V	68,000	$\pm 10\%$	1.60 $\pm$ 0.30
C4532X7R2J104KT5	X7R	630V	100,000	$\pm 10\%$	2.30 $\pm$ 0.20



Capacitance Range Chart

C5750 [EIA CC2220]

Capacitance Range Chart

Temperature Characteristics: X7R, ($\pm 15\%$)

Rated Voltage: 630V (2J), 250V (2E), 100V (2A), 50V (1H), 25V (1E), 16V (1C)

Capacitance (pF)	Cap Code	Tolerance	X7R					
			2J (630V)	2E (250V)	2A (100V)	1H (50V)	1E (25V)	1C (16V)
150,000	154	K: $\pm 10\%$						
220,000	224							
330,000	334							
470,000	474							
680,000	684							
1,000,000	105							
1,500,000	155							
2,200,000	225							
3,300,000	335							
4,700,000	475							
6,800,000	685							
10,000,000	106							
15,000,000	156							
22,000,000	226							

Standard Thickness

	1.60 mm
	2.00 mm
	2.30 mm
	2.80 mm



Capacitance Range Table

C5750 [EIA CC2220]

Class 2 (Temperature Stable)

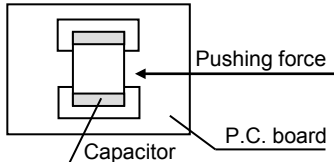
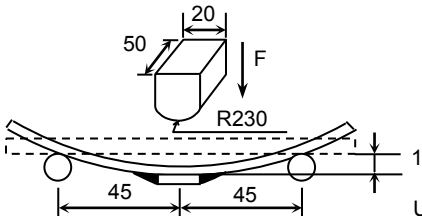
Temperature Characteristics X7R (-55 to +125°C, $\pm 15\%$)

TDK Part Number (Ordering Code)	Temperature Characteristics	Rated Voltage	Capacitance (pF)	Capacitance Tolerance	Thickness (mm)
C5750X7R1C226MT5	X7R	16V	22,000,000	$\pm 20\%$	2.80 $\pm$ 0.20
C5750X7R1E685KT5	X7R	25V	6,800,000	$\pm 10\%$	1.60 $\pm$ 0.30
C5750X7R1E106KT5	X7R	25V	10,000,000	$\pm 10\%$	2.00 $\pm$ 0.20
C5750X7R1E156MT5	X7R	25V	15,000,000	$\pm 20\%$	2.80 $\pm$ 0.20
C5750X7R1H225KT5	X7R	50V	2,200,000	$\pm 10\%$	1.60 $\pm$ 0.30
C5750X7R1H335KT5	X7R	50V	3,300,000	$\pm 10\%$	2.30 $\pm$ 0.20
C5750X7R1H475KT5	X7R	50V	4,700,000	$\pm 10\%$	2.80 $\pm$ 0.20
C5750X7R2A684KT5	X7R	100V	680,000	$\pm 10\%$	1.60 $\pm$ 0.30
C5750X7R2A105KT5	X7R	100V	1,000,000	$\pm 10\%$	2.30 $\pm$ 0.20
C5750X7R2A155KT5	X7R	100V	1,500,000	$\pm 10\%$	2.30 $\pm$ 0.20
C5750X7R2E334KT5	X7R	250V	330,000	$\pm 10\%$	1.60 $\pm$ 0.30
C5750X7R2E474KT5	X7R	250V	470,000	$\pm 10\%$	2.30 $\pm$ 0.20
C5750X7R2E684KT5	X7R	250V	680,000	$\pm 10\%$	2.30 $\pm$ 0.20
C5750X7R2E105KT5	X7R	250V	1,000,000	$\pm 10\%$	2.30 $\pm$ 0.20
C5750X7R2J154KT5	X7R	630V	150,000	$\pm 10\%$	1.60 $\pm$ 0.30
C5750X7R2J224KT5	X7R	630V	220,000	$\pm 10\%$	2.30 $\pm$ 0.20



General Specifications

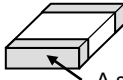
C Series – Open Mode Design

No.	Item	Performance	Test or Inspection Method																		
1	External Appearance	No defects which may affect performance.	Inspect with magnifying glass (3×).																		
2	Insulation Resistance	10,000MΩ or 500MΩ•μF min., whichever smaller. (As for the capacitors of rated voltage 16V DC, 10,000 MΩ or 100MΩ•μF min.,)	Apply rated voltage for 60s. As for the rated voltage 630V DC, apply 500V DC.																		
3	Voltage Proof	Withstand test voltage without insulation breakdown or other damage.	<table><tr><th>Rated Voltage</th><th>Apply voltage</th></tr><tr><td>RV ≤ 100V</td><td>2.5 ×rated voltage</td></tr><tr><td>RV > 100V</td><td>1.5 ×rated voltage</td></tr></table> Above DC voltage shall be applied for 1 to 5s. Charge / discharge current shall not exceed 50mA.	Rated Voltage	Apply voltage	RV ≤ 100V	2.5 ×rated voltage	RV > 100V	1.5 ×rated voltage												
Rated Voltage	Apply voltage																				
RV ≤ 100V	2.5 ×rated voltage																				
RV > 100V	1.5 ×rated voltage																				
4	Capacitance	Within the specified tolerance.	<table><tr><th>Class</th><th>Rated Capacitance</th><th>Measuring Frequency</th><th>Measuring voltage</th></tr><tr><td rowspan="2">Class 2</td><td>C ≤ 10uF</td><td>1kHz±10%</td><td>1.0±0.2V_{rms}</td></tr><tr><td>C > 10uF</td><td>120Hz±20%</td><td>0.5±0.2 V_{rms}</td></tr></table>	Class	Rated Capacitance	Measuring Frequency	Measuring voltage	Class 2	C ≤ 10uF	1kHz±10%	1.0±0.2V _{rms}	C > 10uF	120Hz±20%	0.5±0.2 V _{rms}							
Class	Rated Capacitance	Measuring Frequency	Measuring voltage																		
Class 2	C ≤ 10uF	1kHz±10%	1.0±0.2V _{rms}																		
	C > 10uF	120Hz±20%	0.5±0.2 V _{rms}																		
5	Dissipation Factor (Class 2)	<table><tr><th>T.C.</th><th>Rated Voltage (DC)</th><th>D.F.</th></tr><tr><td>X7R</td><td>RV = 25V& 50V</td><td>3% max.</td></tr><tr><td>X8R</td><td>RV ≤ 16V</td><td>5% max.</td></tr></table>	T.C.	Rated Voltage (DC)	D.F.	X7R	RV = 25V& 50V	3% max.	X8R	RV ≤ 16V	5% max.	See No.4 in this table for measuring condition.									
T.C.	Rated Voltage (DC)	D.F.																			
X7R	RV = 25V& 50V	3% max.																			
X8R	RV ≤ 16V	5% max.																			
6	Temperature Characteristics of Capacitance (Class 2)	<table><tr><th colspan="2">Capacitance Change (%)</th></tr><tr><th colspan="2">No Voltage Applied</th></tr><tr><td>X7R:</td><td>± 15%</td></tr><tr><td>X8R:</td><td>± 15%</td></tr></table>	Capacitance Change (%)		No Voltage Applied		X7R:	± 15%	X8R:	± 15%	Capacitance shall be measured by the steps shown in the following table after thermal equilibrium is obtained for each step. ΔC be calculated ref. STEP 3 reading <table><tr><th>Step</th><th>Temperature (°C)</th></tr><tr><td>1</td><td>Reference temp. ± 2</td></tr><tr><td>2</td><td>Min. operating temp. ± 2</td></tr><tr><td>3</td><td>Reference temp. ± 2</td></tr><tr><td>4</td><td>Max. operating temp. ± 2</td></tr></table>	Step	Temperature (°C)	1	Reference temp. ± 2	2	Min. operating temp. ± 2	3	Reference temp. ± 2	4	Max. operating temp. ± 2
Capacitance Change (%)																					
No Voltage Applied																					
X7R:	± 15%																				
X8R:	± 15%																				
Step	Temperature (°C)																				
1	Reference temp. ± 2																				
2	Min. operating temp. ± 2																				
3	Reference temp. ± 2																				
4	Max. operating temp. ± 2																				
7	Robustness of Terminations	No sign of termination coming off, breakage of ceramic, or other abnormal signs.	Reflow solder the capacitors on P.C. board (shown in Appendix 1a or Appendix 1b) and apply a pushing force of 5N for 10±1s. 																		
8	Bending	No mechanical damage.	Reflow solder the capacitor on P.C. board (shown in Appendix 2) and bend it for 1mm.  Unit: mm																		



General Specifications

C Series – Open Mode Design

No.	Item	Performance	Test or Inspection Method																
9	Solderability	New solder to cover over 75% of termination. 25% may have pinholes or rough spots but not concentrated in one spot. Ceramic surface of “A sections” shall not be exposed due to melting or shifting of termination material. A section	Completely soak both terminations in solder at $235 \pm 5^{\circ}\text{C}$ for $2 \pm 0.5\text{s}$. Solder: H63A (JIS Z 3282) Flux: Isopropyl alcohol (JIS K 8839) Rosin (JIS K 5902) 25% solid solution.																
10	Resistance to solder heat	<table><tr><td>External appearance</td><td>No cracks are allowed and terminations shall be covered at least 60% with new solder.</td></tr><tr><td>Capacitance</td><td><table><tr><th colspan="2">Characteristics</th><th>Change from the value before test</th></tr><tr><td>Class 2</td><td>X7R X8R</td><td>$\pm 7.5\%$</td></tr></table></td></tr><tr><td>D.F. (Class 2)</td><td>Meet the initial spec.</td></tr><tr><td>Insulation Resistance</td><td>Meet the initial spec.</td></tr><tr><td>Voltage Proof</td><td>No insulation breakdown or other damage.</td></tr></table>	External appearance	No cracks are allowed and terminations shall be covered at least 60% with new solder.	Capacitance	<table><tr><th colspan="2">Characteristics</th><th>Change from the value before test</th></tr><tr><td>Class 2</td><td>X7R X8R</td><td>$\pm 7.5\%$</td></tr></table>	Characteristics		Change from the value before test	Class 2	X7R X8R	$\pm 7.5\%$	D.F. (Class 2)	Meet the initial spec.	Insulation Resistance	Meet the initial spec.	Voltage Proof	No insulation breakdown or other damage.	Completely soak both terminations in solder at $260 \pm 5^{\circ}\text{C}$ for $5 \pm 1\text{s}$. Preheating condition Temp.: $150 \pm 10^{\circ}\text{C}$ Time : 1 to 2min. Flux: Isopropyl alcohol (JIS K 8839) Rosin (JIS K 5902) 25% solid solution. Solder: H63A (JIS Z 3282) Leave the capacitor in ambient conditions for 6 to 24h before measurement.
External appearance	No cracks are allowed and terminations shall be covered at least 60% with new solder.																		
Capacitance	<table><tr><th colspan="2">Characteristics</th><th>Change from the value before test</th></tr><tr><td>Class 2</td><td>X7R X8R</td><td>$\pm 7.5\%$</td></tr></table>	Characteristics		Change from the value before test	Class 2	X7R X8R	$\pm 7.5\%$												
Characteristics		Change from the value before test																	
Class 2	X7R X8R	$\pm 7.5\%$																	
D.F. (Class 2)	Meet the initial spec.																		
Insulation Resistance	Meet the initial spec.																		
Voltage Proof	No insulation breakdown or other damage.																		
11	Vibration	<table><tr><td>External appearance</td><td>No mechanical damage.</td></tr><tr><td>Capacitance</td><td><table><tr><th colspan="2">Characteristics</th><th>Change from the value before test</th></tr><tr><td>Class 2</td><td>X7R X8R</td><td>$\pm 7.5\%$</td></tr></table></td></tr><tr><td>D.F. (Class 2)</td><td>Meet the initial spec.</td></tr></table>	External appearance	No mechanical damage.	Capacitance	<table><tr><th colspan="2">Characteristics</th><th>Change from the value before test</th></tr><tr><td>Class 2</td><td>X7R X8R</td><td>$\pm 7.5\%$</td></tr></table>	Characteristics		Change from the value before test	Class 2	X7R X8R	$\pm 7.5\%$	D.F. (Class 2)	Meet the initial spec.	Reflow solder the capacitor on P.C. board (shown in Appendix 1a or Appendix 1b) before testing. Vibrate the capacitor with amplitude of 1.5mm P-P sweeping the frequencies from 10Hz to 55Hz and back to 10Hz after 1min. Repeat this for 2h each in 3 perpendicular directions.				
External appearance	No mechanical damage.																		
Capacitance	<table><tr><th colspan="2">Characteristics</th><th>Change from the value before test</th></tr><tr><td>Class 2</td><td>X7R X8R</td><td>$\pm 7.5\%$</td></tr></table>	Characteristics		Change from the value before test	Class 2	X7R X8R	$\pm 7.5\%$												
Characteristics		Change from the value before test																	
Class 2	X7R X8R	$\pm 7.5\%$																	
D.F. (Class 2)	Meet the initial spec.																		



No.	Item	Performance	Test or Inspection Method																
12	Temperature cycle		Reflow solder the capacitors on a P.C. board (shown in Appendix 1a or Appendix 1b) before testing.																
	External appearance	No mechanical damage.	Expose the capacitor in the conditions in step 1 through step 4, and repeat 5 times consecutively.																
	Capacitance	Characteristics	Change from the value before test	Leave the capacitor in ambient conditions for 24±2h before measurement.															
		Class 2	X7R		± 7.5%														
			X8R																
	D.F. (Class 2)	Meet the initial spec.																	
Insulation Resistance	Meet the initial spec.																		
Voltage Proof	No insulation breakdown or other damage.																		
13	Moisture Resistance (Steady State)		Reflow solder the capacitor on P.C. board (shown in Appendix 1a or Appendix 1b) before testing.																
	External appearance	No mechanical damage.	Leave at temperature 40±2°C, 90 to 95%RH for 500 +24,0h.																
	Capacitance	Characteristics	Change from the value before test	Leave the capacitor in ambient condition for 24±2h before measurement.															
		Class 2	X7R		± 12.5%														
			X8R																
	D.F. (Class 2)	Characteristics X7R: 200% of initial spec. max. X8R: 200% of initial spec. max.																	
	Insulation Resistance	1,000MΩ or 50MΩ•μF min., whichever smaller. (As for the capacitors of rated voltage 16V DC, 1,000 MΩ or 10MΩ•μF min.,)																	
				<table><tr><th>Step</th><th>Temperature (°C)</th><th>Time (min.)</th></tr><tr><td>1</td><td>Min. operating temp. ±3</td><td>30 ± 3</td></tr><tr><td>2</td><td>Reference Temp.</td><td>2 – 5</td></tr><tr><td>3</td><td>Max. operating temp. ± 2</td><td>30 ± 2</td></tr><tr><td>4</td><td>Reference Temp.</td><td>2 - 5</td></tr></table>	Step	Temperature (°C)	Time (min.)	1	Min. operating temp. ±3	30 ± 3	2	Reference Temp.	2 – 5	3	Max. operating temp. ± 2	30 ± 2	4	Reference Temp.	2 - 5
	Step	Temperature (°C)	Time (min.)																
	1	Min. operating temp. ±3	30 ± 3																
2	Reference Temp.	2 – 5																	
3	Max. operating temp. ± 2	30 ± 2																	
4	Reference Temp.	2 - 5																	



General Specifications

C Series – Open Mode Design

No.	Item	Performance	Test or Inspection Method						
14	Moisture Resistance								
	External appearance	No mechanical damage.	Reflow solder the capacitors on P.C. board (shown in Appendix 1a or Appendix 1b) before testing. Apply the rated voltage at temperature 40±2°C and 90 to 95%RH for 500 +24,0h. Charge/discharge current shall not exceed 50mA. Leave the capacitor in ambient conditions for 24±2h before measurement.						
	Capacitance	<table><tr><th colspan="2">Characteristics</th><th>Change from the value before test</th></tr><tr><td>Class 2</td><td>X7R X8R</td><td>± 12.5%</td></tr></table>	Characteristics		Change from the value before test	Class 2	X7R X8R	± 12.5%	Voltage conditioning: Voltage treat the capacitors under testing temperature and voltage for 1 hour.
	Characteristics		Change from the value before test						
	Class 2	X7R X8R	± 12.5%						
D.F. (Class 2)	Characteristics X7R: 200% of initial spec. max. X8R: 200% of initial spec. max.	Leave the capacitors in ambient condition for 24±2h before measurement.							
Insulation Resistance	500MΩ or 25MΩ•μF min., whichever smaller. (As for the capacitors of rated voltage 16V DC, 500 MΩ or 5MΩ•μF min.,)	Use this measurement for initial value.							
15	Life								
	External appearance	No mechanical damage.	Reflow solder the capacitors on P.C. board (shown in Appendix 1a or Appendix 1b) before testing. Apply rated voltage at maximum operating temperature ±2°C for 1,000 +48, 0h. Some items may be tested at higher voltage (1.2x, 1.5x or 2xRV). Charge/discharge current shall not exceed 50mA. Leave the capacitor in ambient conditions for 24±2h before measurement.						
	Capacitance	<table><tr><th colspan="2">Characteristics</th><th>Change from the value before test</th></tr><tr><td>Class 2</td><td>X7R X8R</td><td>± 15%</td></tr></table>	Characteristics		Change from the value before test	Class 2	X7R X8R	± 15%	Voltage conditioning: Voltage treat the capacitors under testing temperature and voltage for 1 hour.
	Characteristics		Change from the value before test						
	Class 2	X7R X8R	± 15%						
D.F. (Class 2)	Characteristics X7R: 200% of initial spec. max. X8R: 200% of initial spec. max.	Leave the capacitors in ambient condition for 24±2h before measurement.							
Insulation Resistance	1,000MΩ or 50MΩ•μF min., whichever smaller. (As for the capacitors of rated voltage 16V DC, 1,000 MΩ or 10MΩ•μF min.,)	Use this measurement for initial value.							

Voltage conditioning:
Voltage treat the capacitors under testing temperature and voltage for 1 hour.

Leave the capacitors in ambient condition for $24 \pm 2\text{h}$ before measurement.

Use this measurement for initial value.

Reflow solder the capacitors on P.C. board (shown in Appendix 1a or Appendix 1b) before testing.

Apply rated voltage at maximum operating temperature $\pm 2^\circ\text{C}$ for 1,000 +48, 0h. Some items may be tested at higher voltage (1.2x, 1.5x or 2xRV).

Charge/discharge current shall not exceed 50mA.

Leave the capacitor in ambient conditions for $24 \pm 2\text{h}$ before measurement.

Voltage conditioning:
Voltage treat the capacitors under testing temperature and voltage for 1 hour.

Leave the capacitors in ambient condition for $24 \pm 2\text{h}$ before measurement.

Use this measurement for initial value.

***As for the initial measurement of capacitors (Class 2) on number 6, 10, 11, 12 and 13, leave capacitor at $150 \pm 10, 0^\circ\text{C}$ for 1 hour and measure the value after leaving capacitor for $24 \pm 2\text{h}$ in ambient condition.**



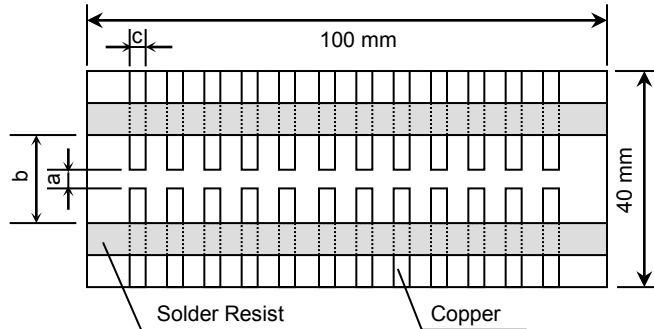
General Specifications

C Series – Open Mode Design

Appendix - 1a

P.C. Board for reliability test

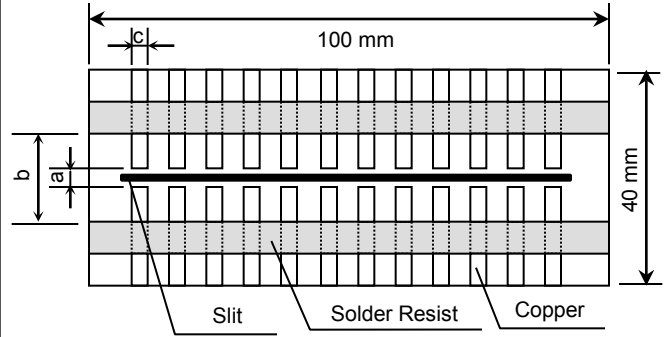
Applied for C2012, C3216



Appendix - 1b

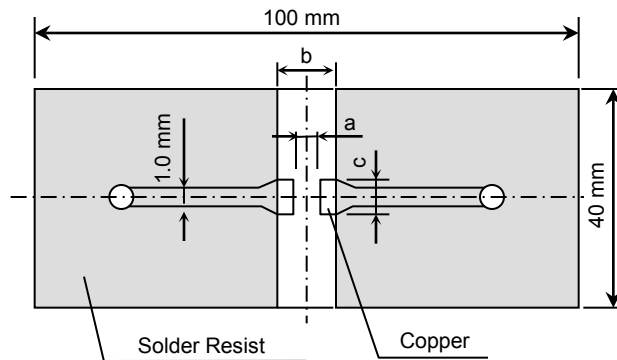
P.C. Board for reliability test

Applied for C3225, C4532, C5750



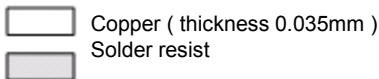
Appendix - 2

P.C. Board for bending test



Material : Glass Epoxy (As per JIS C6484 GE4)

P.C. Board thickness: 1.6mm



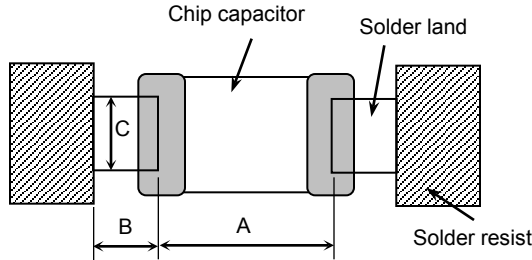
Case Code		Dimensions (mm)		
JIS	EIA	a	b	c
C2012	CC0805	1.2	4.0	1.65
C3216	CC1206	2.2	5.0	2.0
C3225	CC1210	2.2	5.0	2.9
C4532	CC1812	3.5	7.0	3.7
C5750	CC2220	4.5	8.0	5.6



Soldering Information

C Series – Open Mode Design

Recommended Soldering Land Pattern



Wave Soldering

Unit: mm

Type	C2012 [CC0805]	C3216 [CC1206]
Symbol		
A	1.0 - 1.3	2.1 - 2.5
B	1.0 - 1.2	1.1 - 1.3
C	0.8 - 1.1	1.0 - 1.3

Reflow Soldering

Unit: mm

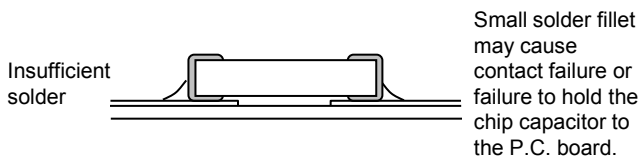
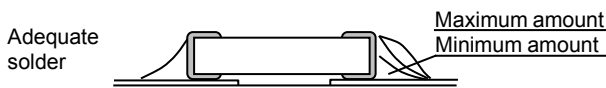
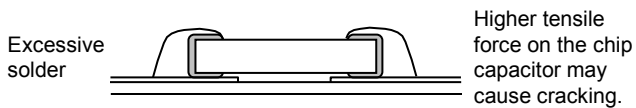
Type	C2012 [CC0805]	C3216 [CC1206]
Symbol		
A	0.9 - 1.2	2.0 - 2.4
B	0.7 - 0.9	1.0 - 1.2
C	0.9 - 1.2	1.1 - 1.6

Reflow Soldering

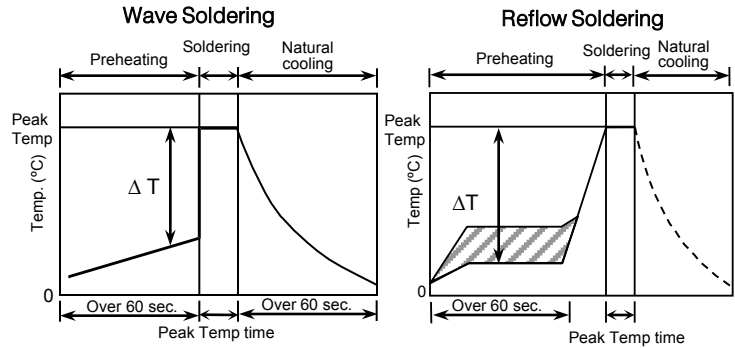
Unit: mm

Type	C3225 [CC1210]	C4532 [CC1812]	C5750 [CC2220]
Symbol			
A	2.0 - 2.4	3.1 - 3.7	4.1 - 4.8
B	1.0 - 1.2	1.2 - 1.4	1.2 - 1.4
C	1.9 - 2.5	2.4 - 3.2	4.0 - 5.0

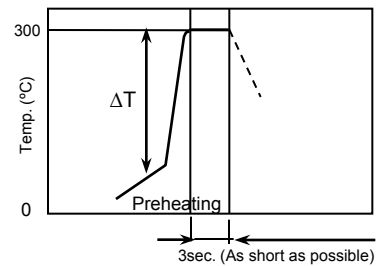
Recommended Solder Amount



Recommended Soldering Profile



Manual soldering (Solder iron)



Recommended soldering duration

Solder	Temp./ Dura.	Wave Soldering		Reflow Soldering	
		Peak temp (°C)	Duration (sec.)	Peak temp (°C)	Duration (sec.)
Sn-Pb Solder		250 max.	3 max.	230 max.	20 max.
Lead-Free Solder		260 max.	5 max.	260 max.	10 max.

Recommended solder compositions

Sn-37Pb (Sn-Pb solder)

Sn-3.0Ag-0.5Cu (Lead Free Solder)

Preheating Condition

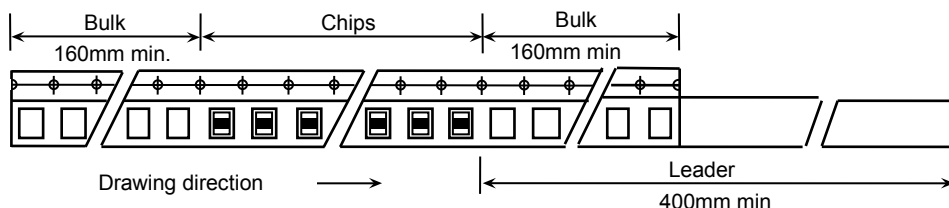
Soldering	Case Size - JIS (EIA)	Temp. (°C)
Wave soldering	C2012(CC0805), C3216(CC1206)	$\Delta T \leq 150$
Reflow soldering	C2012(CC0805), C3216(CC1206)	$\Delta T \leq 150$
	C3225(CC1210), C4532(CC1812), C5750(CC2220)	$\Delta T \leq 130$
Manual soldering	C2012(CC0805), C3216(CC1206)	$\Delta T \leq 150$
	C3225(CC1210), C4532(CC1812), C5750(CC2220)	$\Delta T \leq 130$



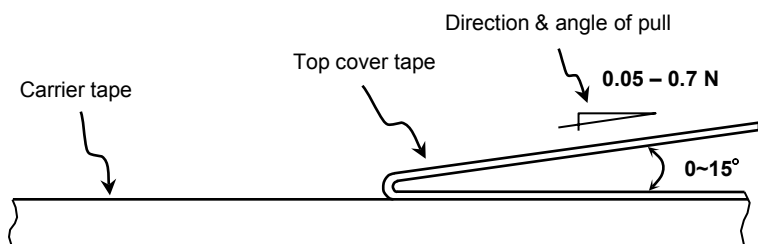
Packaging Information

C Series – Open Mode Design

Carrier Tape Configuration

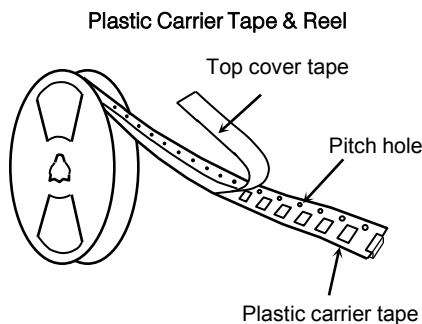
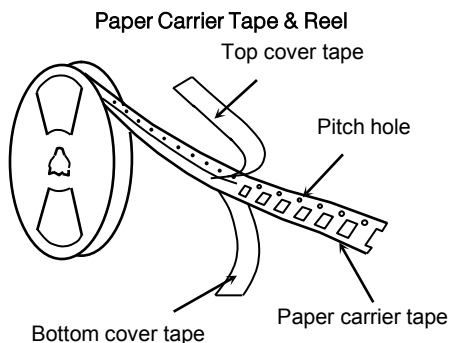


Peel Back Force (Top Tape)



- Carrier tape shall be flexible enough to be wound around a minimum radius of 30mm with components in tape.
- The missing of components shall be less than 0.1%
- Components shall not stick to the cover tape.
- The cover tape shall not protrude beyond the edges of the carrier tape and shall not cover the sprocket holes.

Chip Quantity Per Reel and Structure of Reel (Paper & Plastic)



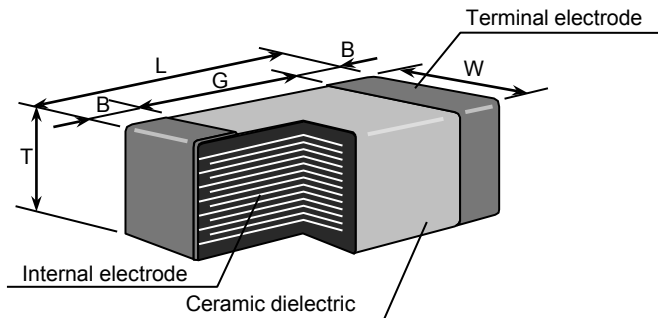
Case Code		Chip Thickness	Taping Material	Chip quantity (pcs.)	
JIS	EIA			φ178mm (7") reel	φ330mm (13") reel
C2012	CC0805	0.85 mm	Paper/Plastic	4,000	10,000
		1.25 mm	Plastic	2,000	
C3216	CC1206	1.15 mm	Plastic	2,000	10,000
		1.30 mm			8,000
		1.60 mm			10,000
		1.15 mm			8,000
C3225	CC1210	1.60 mm	Plastic	2,000	10,000
		2.00 mm			8,000
		2.30 mm			5,000
		2.50 mm			5,000
C4532	CC1812	1.60 mm	Plastic	1,000	3,000
		2.00 mm		500	
		2.30 mm		1,000	
C5750	CC2220	1.60 mm	Plastic	500	3,000
		2.00 mm			2,000
		2.30 mm			2,000
		2.80 mm			2,000



Additional Information

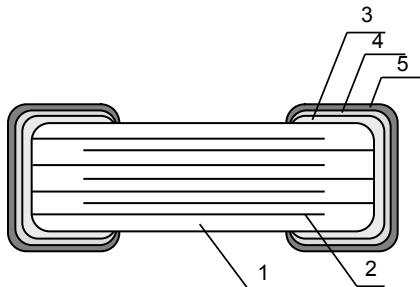
C Series – Open Mode Design

• Shape & Dimensions



Case Code		Dimensions (mm)				
JIS	EIA	L	W	T	B	G
C2012	CC0805	2.00	1.20	0.85	0.20 min.	0.50 min.
				1.25		
C3216	CC1206	3.20	1.60	1.15	0.20 min.	1.00 min.
				1.30		
				1.60		
C3225	CC1210	3.20	2.50	1.15	0.20 min.	1.00 min.
				1.60		
				2.00	0.30 min.	
				2.30		
				2.50		
C4532	CC1812	4.50	3.20	1.60	0.20 min.	2.00 min.
				2.00		
				2.30		
C5750	CC2220	5.70	5.00	1.60	0.20 min.	2.00 min.
				2.00		
				2.30		
				2.80		

• Inside Structure & Material System



No.	NAME	MATERIAL	
		Class 1	Class 2
(1)	Ceramic Dielectric	CaZrO ₃	BaTiO ₃
(2)	Internal Electrode	Nickel (Ni)	
(3)	Termination	Copper (Cu)	
(4)		Nickel (Ni)	
(5)		Tin (Sn)	

• Environmental Information

TDK Corporation established internal product environmental assurance standards that include the six hazardous substances banned by the EU RoHS Directive¹ enforced on July 1, 2006 along with additional substances independently banned by TDK and has successfully completed making general purpose electronic components conform to the RoHS Directive².

1. Abbreviation for Restriction on Hazardous Substances, which refers to the regulation EU Directive 2002/95/EC on hazardous substances by the European Union (EU) effective from July 1, 2006. The Directive bans the use of six specific hazardous substances in electric and electronic devices and products handled within the EU. The six substances are lead, mercury, cadmium, hexavalent chromium, PBB (polybrominated biphenyls), and PBDE (polybrominated diphenyl ethers).
2. This means that, in conformity with the EU Directive 2002/95/EC, lead, cadmium, mercury, hexavalent chromium, and specific bromine-based flame retardants, PBB and PBDE, have not been used, except for exempted applications.

For REACH (SVHC : 15 substances according to ECHA / October 2008) : All TDK MLCC do not contain these 15 substances.

For European Directive 2000/53/CE and 2005/673/CE : Cadmium, Hexavalent Chromium, Mercury, Lead are not contained in all TDK MLCC.

For European Directive 2003/11/CE : Pentabromodiphenyl-ether, Octabromodiphenyl-ether are not contained in all TDK MLCC.



MULTILAYER CERAMIC CHIP CAPACITORS



C Series Low ESL Flip Type

Type: C0510 [EIA CC0204]
C0816 [EIA CC0306]
C1220 [EIA CC0508]
C1632 [EIA CC0612]

Issue date: April 2011



**TDK MLCC
US Catalog**

Version B11

REMINDERS

Please read before using this product

SAFETY REMINDERS



REMINDERS

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C Series

Low ESL Flip Type

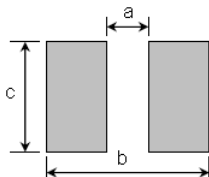
Type: C0510, C0816, C1220, C1632

Features



- Positioning the electrodes along the length of the chip device, reduces ESR and ESL components over conventional products.
- Provides high frequency noise suppression effect because the resonating frequency is high.
- Flipped geometry provides low inductance (less than 400 pH).
- Provides stabilization of power line voltage.
- Suitable for IC decoupling application.

PC Board Pattern



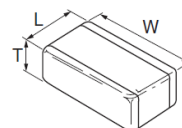
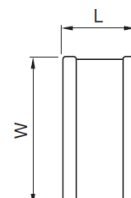
Case Size	Dimensions (mm)		
	a	b	c
C0510	0.2	0.6	1.0
C0816	0.3	1.0	1.6
C1220	0.5	1.6	2.0
C1632	0.75	2.2	3.2

Applications



- Decoupling CPU power line
- Bias line in CPU
- High speed digital IC/decoupling
- PC, cell phones, camcorders, etc.

Shape & Dimensions



L	Body Length
W	Body Width
T	Body Height
B	Terminal Width

Dimensions in mm

Part Number Construction

Series Name **C** **1632** **X5R** **0J** **106** **M** **T** **XXXX**

Series Name

Dimensions L x W (mm)

Case Code	Length	Width
C0510	0.52 ± 0.05	1.00 ± 0.05
C0816 (C<1μF)	0.80 ± 0.10	1.60 ± 0.10
C0816 (C≥1μF)	0.80 ± 0.15	1.60 ± 0.20
C1220	1.25 ± 0.20	2.00 ± 0.20
C1608	1.60 ± 0.20	3.20 ± 0.20

Temperature Characteristic

Temperature Characteristics	Capacitance Change	Temperature Range
X5R	± 15%	-55 to +85°C
X6S	± 22%	-55 to +105°C
X7R	± 15%	-55 to +125°C
X7S	± 22%	-55 to +125°C

Rated Voltage (DC)

Voltage Code	Voltage (DC)
0G	4V
0J	6.3V
1A	10V
1C	16V
1E	25V
1H	50V

Internal Codes

Packaging Style

Packaging Code	Style
T	Tape & Reel

Capacitance Tolerance

Tolerance Code	Tolerance
K	±15%
M	±20%

Nominal Capacitance (pF)

The capacitance is expressed in three digit codes and in units of pico Farads (pF). The first and second digits identify the first and second significant figures of the capacitance. The third digit identifies the multiplier. R designates a decimal point.

Capacitance Code	Capacitance
0R5	0.5pF
010	1pF
102	1,000pF (1nF)
105	1,000,000pF (1μF)



Capacitance Range Chart

C0510 [EIA CC0204]

Capacitance Range Chart

Temperature Characteristics: X6S ($\pm 22\%$)

Rated Voltage: 4V (0G)

Capacitance (pF)	Cap Code	Tolerance	X6S 0G (4V)
10,000	103	M: $\pm 20\%$	
22,000	223		
47,000	473		
100,000	104		
220,000	224		
470,000	474		
1,000,000	105		
2,200,000	225		

Standard Thickness

 0.30 mm



Capacitance Range Table

C0510 [EIA CC0204]

Class 2 (Temperature Stable)

Temperature Characteristics X6S (-55 to +105°C, $\pm 22\%$)

TDK Part Number (Ordering Code)	Temperature Characteristics	Rated Voltage	Capacitance (pF)	Capacitance Tolerance	Thickness (mm)
C0510X6S0G104M	X6S	4V	100,000	$\pm 20\%$	0.30 $\pm$ 0.05
C0510X6S0G224M	X6S	4V	220,000	$\pm 20\%$	0.30 $\pm$ 0.05
C0510X6S0G474M	X6S	4V	470,000	$\pm 20\%$	0.30 $\pm$ 0.05



Capacitance Range Chart

C0816 [EIA CC0306]

Capacitance Range Chart

Temperature Characteristics: X7R, ($\pm 15\%$), X7S ($\pm 22\%$), X5R ($\pm 15\%$), X6S ($\pm 22\%$)

Rated Voltage: 16V (1C), 10V (1A), 6.3V (0J), 4V (0G)

Capacitance (pF)	Cap Code	Tolerance	X7R		X7S	X5R		X6S
			1C (16V)	0J (6.3V)	0G (4V)	1A (10V)	0J (6.3V)	0G (4V)
10,000	103	K: $\pm 10\%$	■					
22,000	223	M: $\pm 20\%$	■					
47,000	473		■					
100,000	104		■			■		
220,000	224			■		■		
470,000	474				■		■	■
1,000,000	105				■		■	
2,200,000	225				■		■	

Standard Thickness

■ 0.50 mm



Capacitance Range Table

C0816 [EIA CC0306]

Class 2 (Temperature Stable)

Temperature Characteristics X7R (-55 to +125°C, $\pm 15\%$), X7S (-55 to +125°C, $\pm 2\%$), X5R (-55 to +85°C, $\pm 15\%$)

TDK Part Number (Ordering Code)	Temperature Characteristics	Rated Voltage	Capacitance (pF)	Capacitance Tolerance	Thickness (mm)
C0816X7R1C103K	X7R	16V	10,000	$\pm 10\%$	0.50 $\pm$ 0.10
C0816X7R1C223K	X7R	16V	22,000	$\pm 10\%$	0.50 $\pm$ 0.10
C0816X7R1C473K	X7R	16V	47,000	$\pm 10\%$	0.50 $\pm$ 0.10
C0816X7R1C104K	X7R	16V	100,000	$\pm 10\%$	0.50 $\pm$ 0.10
C0816X7R0J224K	X7R	6.3V	220,000	$\pm 10\%$	0.50 $\pm$ 0.10
C0816X7S0G474K	X7S	4V	470,000	$\pm 10\%$	0.50 $\pm$ 0.10
C0816X7S0G105M	X7S	4V	1,000,000	$\pm 20\%$	0.50 $\pm$ 0.10
C0816X7S0G225M	X7S	4V	2,200,000	$\pm 20\%$	0.50 $\pm$ 0.10
C0816X5R1A224K	X5R	10V	220,000	$\pm 10\%$	0.50 $\pm$ 0.10
C0816X5R1A474K	X5R	10V	470,000	$\pm 10\%$	0.50 $\pm$ 0.10
C0816X5R0J474K	X5R	6.3V	470,000	$\pm 10\%$	0.50 $\pm$ 0.10
C0816X5R0J105M	X5R	6.3V	1,000,000	$\pm 20\%$	0.50 $\pm$ 0.10
C0816X5R0J225M	X5R	6.3V	2,200,000	$\pm 20\%$	0.50 $\pm$ 0.10



Capacitance Range Chart

C1220 [EIA CC0508]

Capacitance Range Chart

Temperature Characteristics: X7R, ($\pm 15\%$), X5R ($\pm 15\%$)
 Rated Voltage: 50V (1H), 25V (1E), 16V (1C), 10V (1A), 6.3V (0J)

Capacitance (pF)	Cap Code	Tolerance	X7R				X5R
			1H (50V)	1E (25V)	1C (16V)	0J (6.3V)	1A (10V)
10,000	103	K: $\pm 10\%$					
22,000	223	M: $\pm 20\%$					
47,000	473						
100,000	104						
220,000	224						
470,000	474						
1,000,000	105						

Standard Thickness
 0.85 mm



Capacitance Range Table

C1220 [EIA CC0508]

Class 2 (Temperature Stable)

Temperature Characteristics X7R (-55 to +125°C, $\pm 15\%$), X5R (-55 to +85°C, $\pm 15\%$)

TDK Part Number (Ordering Code)	Temperature Characteristics	Rated Voltage	Capacitance (pF)	Capacitance Tolerance	Thickness (mm)
C1220X7R1H103K	X7R	50V	10,000	$\pm 10\%$	0.85 $\pm$ 0.10
C1220X7R1H223K	X7R	50V	22,000	$\pm 10\%$	0.85 $\pm$ 0.10
C1220X7R1H473K	X7R	50V	47,000	$\pm 10\%$	0.85 $\pm$ 0.10
C1220X7R1E104K	X7R	25V	100,000	$\pm 10\%$	0.85 $\pm$ 0.10
C1220X7R1C224K	X7R	16V	220,000	$\pm 10\%$	0.85 $\pm$ 0.10
C1220X7R0J474K	X7R	6.3V	470,000	$\pm 10\%$	0.85 $\pm$ 0.10
C1220X7R0J105M	X7R	6.3V	1,000,000	$\pm 20\%$	0.85 $\pm$ 0.10
C1220X5R1A474K	X5R	10V	470,000	$\pm 10\%$	0.85 $\pm$ 0.10
C1220X5R1A105M	X5R	10V	1,000,000	$\pm 20\%$	0.85 $\pm$ 0.10



Capacitance Range Chart

C1632 [EIA CC0612]

Capacitance Range Chart

Temperature Characteristics: X7R, ($\pm 15\%$), X7S ($\pm 22\%$), X5R ($\pm 15\%$)
 Rated Voltage: 50V (1H), 25V (1E), 16V (1C), 10V (1A), 6.3 (0J), 4V (0G)

Capacitance (pF)	Cap Code	Tolerance	X7R				X7S	X5R	
			1H (50V)	1E (25V)	1C (16V)	0J (6.3V)	0G (4V)	1A (10V)	0J (6.3V)
10,000	103	K: $\pm 10\%$ M: $\pm 20\%$	0.70 mm						
22,000	223		0.70 mm						
47,000	473		0.70 mm						
100,000	104		0.70 mm						
220,000	224		0.70 mm	0.70 mm					
470,000	474			0.70 mm	0.70 mm				
1,000,000	105				0.70 mm	0.70 mm		0.70 mm	
2,200,000	225					0.70 mm		0.70 mm	
4,700,000	475						1.30 mm		1.30 mm
10,000,000	106						1.30 mm		1.30 mm

Standard Thickness



0.70 mm



1.15 mm



1.30 mm



Capacitance Range Table

C1632 [EIA CC0612]

Class 2 (Temperature Stable)

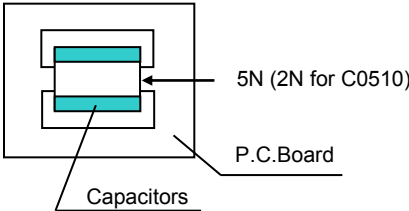
Temperature Characteristics X7R (-55 to +125°C, ±15%), X7S (-55 to +125°C, ±2%), X5R (-55 to +85°C, ±15%)

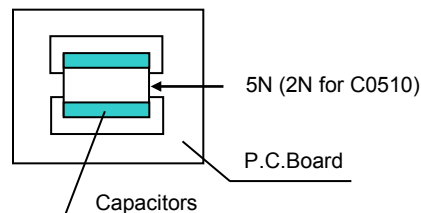
TDK Part Number (Ordering Code)	Temperature Characteristics	Rated Voltage	Capacitance (pF)	Capacitance Tolerance	Thickness (mm)
C1632X7R1H103K	X7R	50V	10,000	± 10%	0.70 ± 0.10
C1632X7R1H223K	X7R	50V	22,000	± 10%	0.70 ± 0.10
C1632X7R1H473K	X7R	50V	47,000	± 10%	0.70 ± 0.10
C1632X7R1H104K	X7R	50V	100,000	± 10%	0.70 ± 0.10
C1632X7R1H224K	X7R	50V	220,000	± 10%	1.15 ± 0.10
C1632X7R1E224K	X7R	25V	220,000	± 10%	0.70 ± 0.10
C1632X7R1E474K	X7R	25V	470,000	± 10%	1.15 ± 0.10
C1632X7R1C474K	X7R	16V	470,000	± 10%	0.70 ± 0.10
C1632X7R1C105K	X7R	16V	1,000,000	± 10%	1.15 ± 0.10
C1632X7R0J105M	X7R	6.3V	1,000,000	± 20%	0.70 ± 0.10
C1632X7R0J225M	X7R	6.3V	2,200,000	± 20%	1.15 ± 0.10
C1632X7S0G475M	X7S	4V	4,700,000	± 20%	1.30 ± 0.10
C1632X7S0G106M	X7S	4V	10,000,000	± 20%	1.30 ± 0.10
C1632X5R1A105M	X5R	10V	1,000,000	± 20%	0.70 ± 0.10
C1632X5R1A225M	X5R	10V	2,200,000	± 20%	1.15 ± 0.10
C1632X5R0J475M	X5R	6.3V	4,700,000	± 20%	1.30 ± 0.10
C1632X5R0J106M	X5R	6.3V	10,000,000	± 20%	1.30 ± 0.10



General Specifications

C Series – Low ESL Flip Type

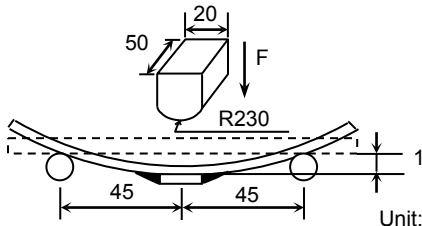
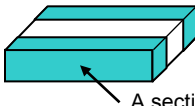
No.	Item	Performance	Test or Inspection Method																		
1	External Appearance	No defects which may affect performance.	Inspect with magnifying glass (3×).																		
2	Insulation Resistance	10,000MΩ or 500MΩ•μF min. (whichever smaller). As for the capacitor of rated voltage 16, 10, 6.3 and 4V DC, 100MΩ•μF min.	Apply rated voltage for 60s.																		
3	Voltage Proof	Withstand test voltage without insulation breakdown or other damage.	Apply 2.5 x rated voltage for 1 ~ 5s. Charge / discharge current shall not exceed 50mA.																		
4	Capacitance	Within the specified tolerance.	<table><tr><th>Measuring Frequency</th><th>Rated Voltage</th><th>Measuring Voltage</th></tr><tr><td rowspan="2">1kHz±10%</td><td>50V ~ 6.3V</td><td>1.0±0.2 V_{rms}</td></tr><tr><td>4V</td><td>0.5 - 5 V_{rms}</td></tr></table>	Measuring Frequency	Rated Voltage	Measuring Voltage	1kHz±10%	50V ~ 6.3V	1.0±0.2 V _{rms}	4V	0.5 - 5 V _{rms}										
Measuring Frequency	Rated Voltage	Measuring Voltage																			
1kHz±10%	50V ~ 6.3V	1.0±0.2 V _{rms}																			
	4V	0.5 - 5 V _{rms}																			
5	Dissipation Factor (Class 2)	<table><tr><th>T.C.</th><th>Rated Voltage</th><th>D.F.</th></tr><tr><td>X7R</td><td>50V, 25V DC</td><td>0.03 max.</td></tr><tr><td>X7R X5R</td><td>16V, 10V, 6.3V DC</td><td>0.05 max.</td></tr><tr><td>X7S X6S X5S</td><td>4V DC</td><td>0.12 max.</td></tr></table>	T.C.	Rated Voltage	D.F.	X7R	50V, 25V DC	0.03 max.	X7R X5R	16V, 10V, 6.3V DC	0.05 max.	X7S X6S X5S	4V DC	0.12 max.	See No.4 in this table for measuring condition.						
T.C.	Rated Voltage	D.F.																			
X7R	50V, 25V DC	0.03 max.																			
X7R X5R	16V, 10V, 6.3V DC	0.05 max.																			
X7S X6S X5S	4V DC	0.12 max.																			
6	Temperature Characteristics of Capacitance (Class 2)	Capacitance Change (%) <table><tr><th colspan="2">No Voltage Applied</th></tr><tr><th>T.C.</th><th>Δ C Percent</th></tr><tr><td>X5R X7R</td><td>± 15%</td></tr><tr><td>X5S X6S X7S</td><td>± 22%</td></tr></table>	No Voltage Applied		T.C.	Δ C Percent	X5R X7R	± 15%	X5S X6S X7S	± 22%	Capacitance shall be measured by the steps shown in the following table after thermal equilibrium is obtained for each step. ΔC be calculated ref. STEP3 reading <table><tr><th>Step</th><th>Temperature (°C)</th></tr><tr><td>1</td><td>Reference temp. ± 2</td></tr><tr><td>2</td><td>Min. operating temp. ± 2</td></tr><tr><td>3</td><td>Reference temp. ± 2</td></tr><tr><td>4</td><td>Max. operating temp. ± 2</td></tr></table>	Step	Temperature (°C)	1	Reference temp. ± 2	2	Min. operating temp. ± 2	3	Reference temp. ± 2	4	Max. operating temp. ± 2
No Voltage Applied																					
T.C.	Δ C Percent																				
X5R X7R	± 15%																				
X5S X6S X7S	± 22%																				
Step	Temperature (°C)																				
1	Reference temp. ± 2																				
2	Min. operating temp. ± 2																				
3	Reference temp. ± 2																				
4	Max. operating temp. ± 2																				
7	Robustness of Terminations	No sign of termination coming off, breakage of ceramic, or other abnormal signs.	Reflow solder the capacitor on P.C. board (shown in Appendix 1) and apply a pushing force of 5N (C0510: 2N) for 10 ± 1s.  5N (2N for C0510) P.C.Board Capacitors																		





General Specifications

C Series – Low ESL Flip Type

No.	Item	Performance	Test or Inspection Method									
8	Bending	No mechanical damage.	Reflow solder the capacitor on P.C. board (shown in Appendix 2) and bend it for 1mm.  Unit: mm									
9	Solderability	New solder to cover over 75% of termination. 25% may have pinholes or rough spots but not concentrated in one spot. Ceramic surface of “A sections” shall not be exposed due to melting or shifting of termination material.  A section	Completely soak both terminations in solder at 235 ± 5°C for 2 ± 0.5s. Solder: H63A (JIS Z 3282) Flux: Isopropyl alcohol (JIS K 8839) Rosin (JIS K 5902) 25% solid solution.									
10	Resistance to solder heat	External appearance No cracks are allowed and terminations shall be covered at least 60% with new solder. <table><tr><th>Capacitance</th><th>Characteristics</th><th>Change from the value before test</th></tr><tr><td rowspan="4">Class 2</td><td>X7R</td><td rowspan="4">± 7.5 %</td></tr><tr><td>X7S</td></tr><tr><td>X5R</td></tr><tr><td>X6S</td></tr></table> D.F. (Class 2) Meet the initial spec. Insulation Resistance Meet the initial spec. Voltage proof No insulation breakdown or other damage.	Capacitance	Characteristics	Change from the value before test	Class 2	X7R	± 7.5 %	X7S	X5R	X6S	Completely soak both terminations in solder at 260 ± 5°C for 5 ± 1s. Preheating condition Temp. : 150 ± 10°C Time: 1 ~ 2min. Flux: Isopropyl alcohol (JIS K 8839) Rosin (JIS K 5902) 25% solid solution. Solder : H63A (JIS Z 3282) Leave the capacitor in ambient conditions for 24 ± 2h before measurement.
Capacitance	Characteristics	Change from the value before test										
Class 2	X7R	± 7.5 %										
	X7S											
	X5R											
	X6S											



General Specifications

C Series – Low ESL Flip Type

No.	Item	Performance	Test or Inspection Method														
11	Vibration		Solder the capacitors on P.C. board (shown in Appendix 1) before testing.														
	External appearance	No mechanical damage.	Vibrate the capacitor with amplitude of 1.5mm P-P changing the frequencies from 10Hz to 55Hz and back to 10Hz in about 1min.														
	Capacitance	<table><tr><th colspan="2">Characteristics</th><th>Change from the value before test</th></tr><tr><td>Class 2</td><td>X7R X7S X5R X6S</td><td>± 7.5 %</td></tr></table>	Characteristics		Change from the value before test	Class 2	X7R X7S X5R X6S	± 7.5 %	Repeat this for 2h each in 3 perpendicular directions.								
	Characteristics		Change from the value before test														
Class 2	X7R X7S X5R X6S	± 7.5 %															
D.F. (Class 2)	Meet the initial spec.																
12	Temperature cycle		Solder the capacitors on P.C. board (shown in Appendix 1) before testing.														
	External appearance	No mechanical damage.	Expose the capacitor in the conditions step1 through 4 and repeat 5 times consecutively.														
	Capacitance	<table><tr><th colspan="2">Characteristics</th><th>Change from the value before test</th></tr><tr><td>Class 2</td><td>X7R X7S X5R X6S</td><td>± 7.5 %</td></tr></table>	Characteristics		Change from the value before test	Class 2	X7R X7S X5R X6S	± 7.5 %	Leave the capacitor in ambient conditions for 24 ± 2h before measurement.								
	Characteristics		Change from the value before test														
	Class 2	X7R X7S X5R X6S	± 7.5 %														
	D.F. (Class 2)	Meet the initial spec.															
	Insulation Resistance	1,000MΩ or 50MΩ•μF min. whichever smaller.															
Voltage Proof	No insulation breakdown or other damage.																
		<table><tr><th>Step</th><th>Temperature (°C)</th><th>Time (min.)</th></tr><tr><td>1</td><td>Min. operating temp. ±3</td><td>30 ± 3</td></tr><tr><td>2</td><td>Reference Temp.</td><td>2 – 5</td></tr><tr><td>3</td><td>Max. operating temp. ± 2</td><td>30 ± 2</td></tr><tr><td>4</td><td>Reference Temp.</td><td>2 - 5</td></tr></table>	Step	Temperature (°C)	Time (min.)	1	Min. operating temp. ±3	30 ± 3	2	Reference Temp.	2 – 5	3	Max. operating temp. ± 2	30 ± 2	4	Reference Temp.	2 - 5
Step	Temperature (°C)	Time (min.)															
1	Min. operating temp. ±3	30 ± 3															
2	Reference Temp.	2 – 5															
3	Max. operating temp. ± 2	30 ± 2															
4	Reference Temp.	2 - 5															
13	Moisture Resistance (Steady State)		Solder the capacitor on P.C. board (shown in Appendix 1) before testing.														
	External appearance	No mechanical damage.	Leave at temperature 40 ± 2°C, 90 to 95%RH for 500 +24, 0h.														
	Capacitance	<table><tr><th colspan="2">Characteristics</th><th>Change from the value before test</th></tr><tr><td>Class 2</td><td>X7R X7S X5R X6S</td><td>± 12.5 %</td></tr></table>	Characteristics		Change from the value before test	Class 2	X7R X7S X5R X6S	± 12.5 %	Leave the capacitor in ambient conditions for 24 ± 2h before measurement.								
	Characteristics		Change from the value before test														
	Class 2	X7R X7S X5R X6S	± 12.5 %														
D.F. (Class 2)	Characteristics X7R: 200% of initial spec. max. X7S: 200% of initial spec. max. X5R: 200% of initial spec. max. X6S: 200% of initial spec. max.																
Insulation Resistance	1,000MΩ or 50MΩ•μF min. (whichever smaller). As for the capacitor of rated voltage 16, 10, 6.3 and 4V DC, 10MΩ•μF min.																



General Specifications

C Series – Low ESL Flip Type

No.	Item	Performance	Test or Inspection Method						
14	Moisture Resistance								
	External appearance	No mechanical damage.	Solder the capacitors on P.C. board (shown in Appendix 1) before testing. Apply the rated voltage at temperature 40 ± 2°C and 90 to 95%RH for 500 +24, 0h. Charge/discharge current shall not exceed 50mA. Leave the capacitor in ambient conditions for 48 ± 4h before measurement. Voltage conditioning: Voltage treats the capacitor under testing temperature and voltage for 1hour. Leave the capacitor in ambient conditions for 24 ± 2h before measurement. Use this measurement for initial value.						
	Capacitance	<table><tr><th colspan="2">Characteristics</th><th>Change from the value before test</th></tr><tr><td>Class 2</td><td>X7R X7S X5R X6S</td><td>± 12.5 %</td></tr></table>	Characteristics		Change from the value before test	Class 2	X7R X7S X5R X6S	± 12.5 %	
	Characteristics		Change from the value before test						
	Class 2	X7R X7S X5R X6S	± 12.5 %						
D.F. (Class 2)	Characteristics X7R: 200% of initial spec. max. X7S: 200% of initial spec. max. X5R: 200% of initial spec. max. X6S: 200% of initial spec. max.								
Insulation Resistance	500MΩ or 25MΩ•μF min. (whichever smaller). As for the capacitor of rated voltage 16, 10, 6.3 and 4V DC, 5MΩ•μF min.								
15	Life								
	External appearance	No mechanical damage.	Reflow Solder the capacitor on P.C. board (shown in Appendix 1) before testing. Apply rated voltage at maximum operating temperature ± 2°C for 1,000 +48, 0h. Charge/discharge current shall not exceed 50mA. Leave the capacitor in ambient conditions for 24 ± 2h before measurement. Voltage conditioning: Voltage treats the capacitor under testing temperature and voltage for 1hour. Leave the capacitor in ambient conditions for 48 ± 4h before measurement. Use this measurement for initial value.						
	Capacitance	<table><tr><th colspan="2">Characteristics</th><th>Change from the value before test</th></tr><tr><td>Class 2</td><td>X7R X7S X5R X6S</td><td>± 15 %</td></tr></table>	Characteristics		Change from the value before test	Class 2	X7R X7S X5R X6S	± 15 %	
	Characteristics		Change from the value before test						
	Class 2	X7R X7S X5R X6S	± 15 %						
D.F. (Class 2)	Characteristics X7R: 200% of initial spec. max. X7S: 200% of initial spec. max. X5R: 200% of initial spec. max. X6S: 200% of initial spec. max.								
Insulation Resistance	1,000MΩ or 50MΩ•μF min. whichever smaller. As for the capacitor of rated voltage 16, 10, 6.3 and 4V DC, 10MΩ•μF min.								

*As for the initial measurement of capacitors on number 6, 10, 11, 12 and 13, leave capacitor at 150 -10, 0°C for 1h and measure the value after leaving capacitor for $24 \pm 2\text{h}$ in ambient condition.

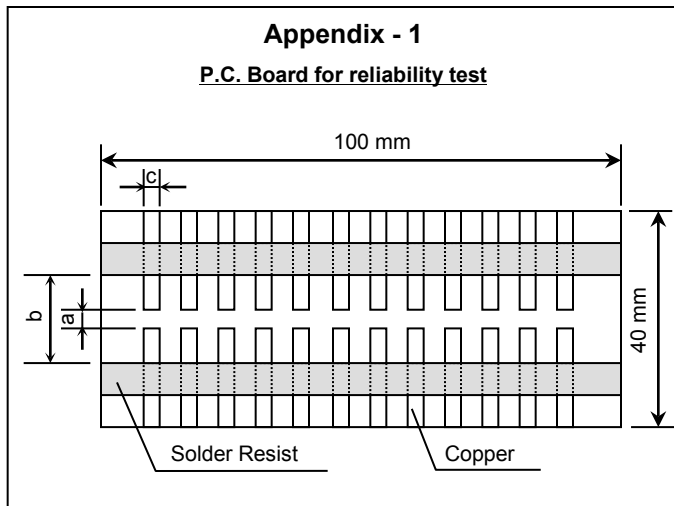


General Specifications

C Series – Low ESL Flip Type

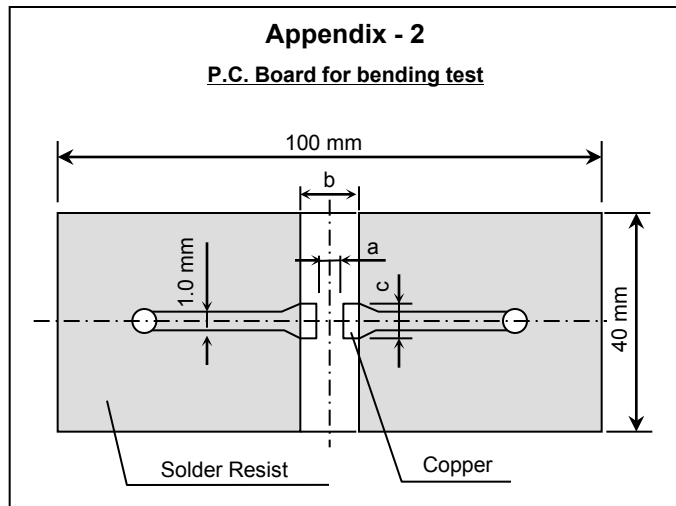
Appendix - 1

P.C. Board for reliability test



Appendix - 2

P.C. Board for bending test



Material : Glass Epoxy (As per JIS C6484 GE4)

P.C. Board thickness : Appendix 1,2 1.6mm

- Copper (thickness 0.035mm)
- Solder resist

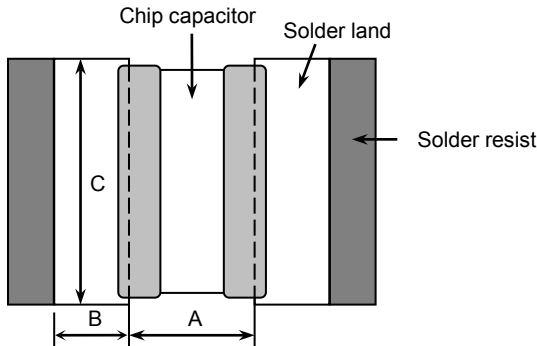
Case Code		Dimensions (mm)		
JIS	EIA	a	b	c
C0510	CC0204	0.2	0.6	1.0
C0816	CC0306	0.3	1.0	1.6
C1220	CC0508	0.5	1.6	2.0
C1632	CC0612	0.75	2.2	3.2



Soldering Information

C Series – Low ESL Flip Type

Recommended Soldering Land Pattern

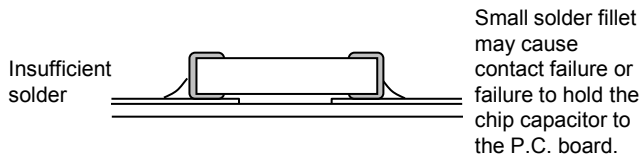
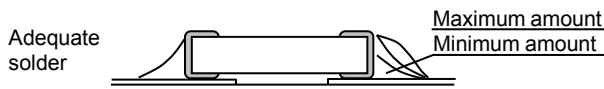
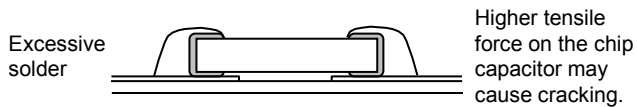


Reflow Soldering

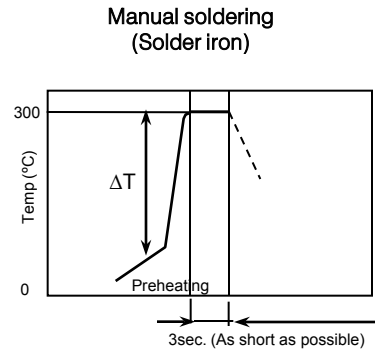
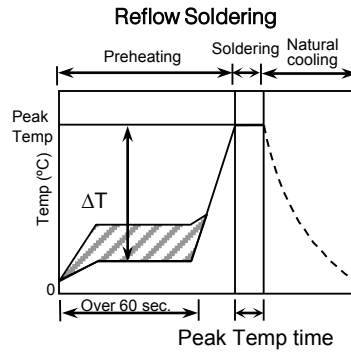
Unit: mm

Type	C0510 [CC0204]	C0816 [CC0306]	C1220 [CC0508]	C1632 [CC0612]
Symbol				
A	0.20	0.30	0.50	0.75
B	0.20	0.35	0.55	0.725
C	1.00	1.60	2.00	3.20

Recommended Solder Amount



Recommended Soldering Profile



Recommended soldering duration

Solder	Temp./Dura.	Reflow Soldering	
		Peak temp (°C)	Duration (sec.)
Sn-Pb Solder		230 max.	20 max.
Lead-Free Solder		260 max.	10 max.

Recommended solder compositions

Sn-37Pb (Sn-Pb solder)

Sn-3.0Ag-0.5Cu (Lead Free Solder)

Preheating Condition

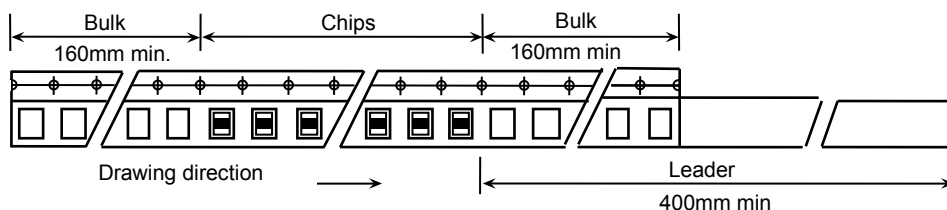
Soldering	Temp. (°C)
Reflow soldering	$\Delta T \leq 150$
Manual soldering	$\Delta T \leq 150$



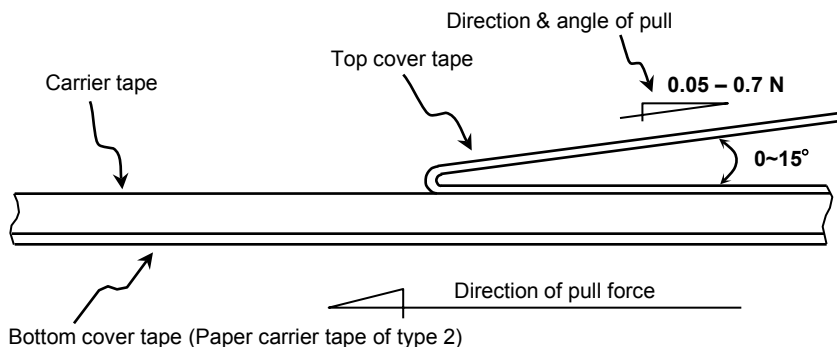
Packaging Information

C Series – Low ESL Flip Type

Carrier Tape Configuration



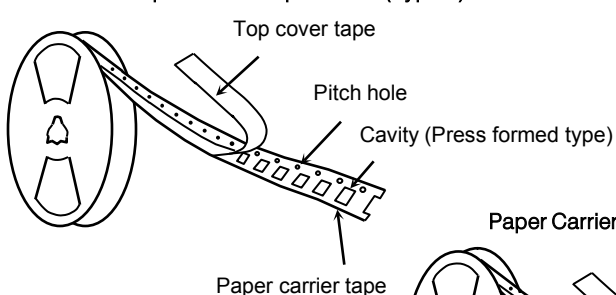
Peel Back Force (Top Tape)



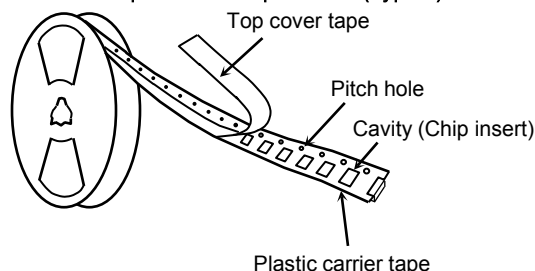
- Carrier tape shall be flexible enough to be wound around a minimum radius of 30mm with components in tape.
- The missing of components shall be less than 0.1%
- Components shall not stick to the cover tape.
- The cover tape shall not protrude beyond the edges of the carrier tape not shall cover the sprocket holes.

Chip Quantity Per Reel and Structure of Reel (Paper & Plastic)

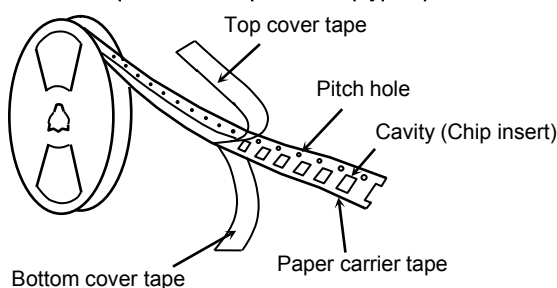
Paper Carrier Tape & Reel (Type 1)



Paper Carrier Tape & Reel (Type 2)



Paper Carrier Tape & Reel (Type 3)



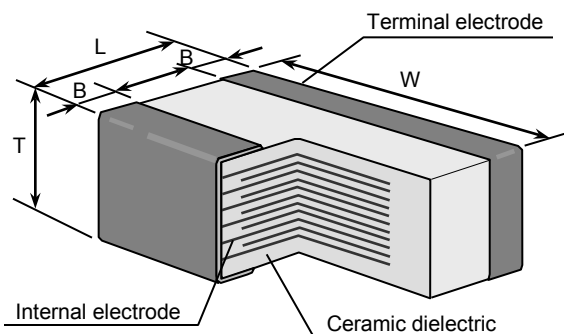
Case Code		Chip Thickness	Taping Material	Chip quantity (pcs.)	
JIS	EIA			φ178mm (7") reel	φ330mm (13") reel
C0510	CC0204	0.50 mm	Paper (Type 1)	15,000	50,000
C0816	CC0306	0.80 mm	Plastic (Type 3)	4,000	10,000
C1220	CC0508	0.85 mm	Paper (Type 2)	4,000	10,000
C1632	CC0612	0.70 mm	Plastic (Type 3)	4,000	10,000
		1.15 mm		2,000	
		1.30 mm			



Additional Information

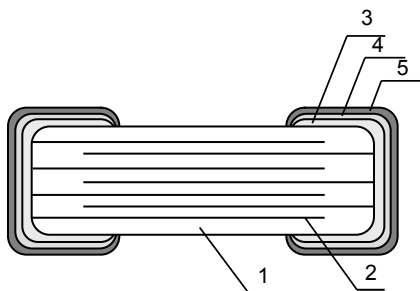
C Series – Low ESL Flip Type

• Shape & Dimensions



Case Code		Dimensions (mm)				
JIS	EIA	L	W	T	B	G
C0510	CC0204	0.52	1.00	0.50	0.10 min.	0.09 min.
C0816	CC0306	0.80	1.60	0.80	0.10 min.	-
C1220	CC0508	1.25	2.00	0.85	0.20 min.	0.40 min.
C1632	CC0612	1.60	3.20	0.70	0.20 min.	0.50 min.
				1.15		
				1.30		

• Inside Structure & Material System



No.	NAME	MATERIAL
		Class 2
(1)	Ceramic Dielectric	BaTiO ₃
(2)	Internal Electrode	Nickel (Ni)
(3)	Termination	Copper (Cu)
(4)		Nickel (Ni)
(5)		Tin (Sn)

• Environmental Information

TDK Corporation established internal product environmental assurance standards that include the six hazardous substances banned by the EU RoHS Directive¹ enforced on July 1, 2006 along with additional substances independently banned by TDK and has successfully completed making general purpose electronic components conform to the RoHS Directive².

1. Abbreviation for Restriction on Hazardous Substances, which refers to the regulation EU Directive 2002/95/EC on hazardous substances by the European Union (EU) effective from July 1, 2006. The Directive bans the use of six specific hazardous substances in electric and electronic devices and products handled within the EU. The six substances are lead, mercury, cadmium, hexavalent chromium, PBB (polybrominated biphenyls), and PBDE (polybrominated diphenyl ethers).
2. This means that, in conformity with the EU Directive 2002/95/EC, lead, cadmium, mercury, hexavalent chromium, and specific bromine-based flame retardants, PBB and PBDE, have not been used, except for exempted applications.

For REACH (SVHC : 15 substances according to ECHA / October 2008) : All TDK MLCC do not contain these 15 substances.

For European Directive 2000/53/CE and 2005/673/CE : Cadmium, Hexavalent Chromium, Mercury, Lead are not contained in all TDK MLCC.

For European Directive 2003/11/CE : Pentabromodiphenyl-ether, Octabromodiphenyl-ether are not contained in all TDK MLCC.



MULTILAYER CERAMIC CHIP CAPACITORS



CKD Series **Low ESL Feed Through Type**

Type: CKD110JB
CKD310JB
CKD510JB
CKD610JB
CKD61BJB

Issue date: April 2011

TDK MLCC
US Catalog

Version B11

REMINDERS

Please read before using this product

SAFETY REMINDERS



REMINDERS

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CKD Series

Low ESL Feed Through Type

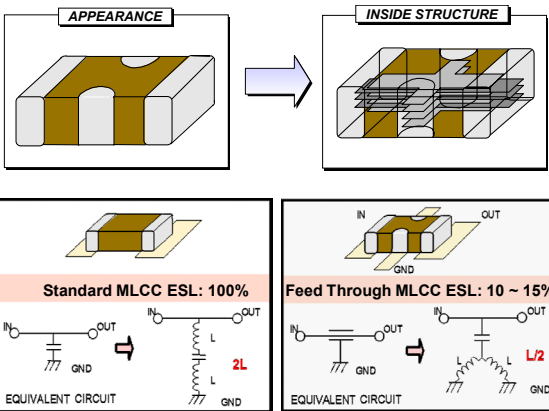
Type: CKD610JB (C1608), CKD510JB (C2012), CKD110JB (C3212), CKD310JB (C3216), CKD61BJB (C1608)

Features



- These small low-cost filters are used for meeting EMC requirements
- Can be used at higher frequencies due to low parasitic inductance
- Optimized for use as a noise bypass capacitor for signal and power source circuits

Structure

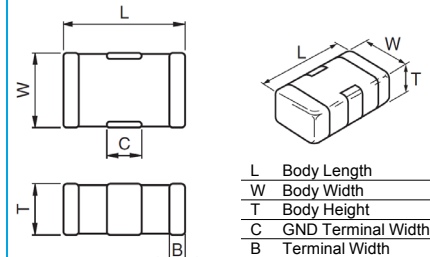


Applications



- Decoupling CPU power line
- High speed digital IC/decoupling
- High impedance/high current circuits
- DC to DC converter input/output smoothing
- Power supply

Shape & Dimensions



Dimensions in mm



Part Number Construction

CKD510JB 0J 226 S T XXXX

Series Name

Case Code	Length	Width
CKD610JB	1.60 ± 0.10	0.80 ± 0.10
CKD510JB	2.00 ± 0.20	1.25 ± 0.20
CKD110JB	3.20 ± 0.20	1.25 ± 0.20
CKD310JB	3.20 ± 0.20	1.60 ± 0.20
CKD61BJB	1.60 ± 0.10	0.80 ± 0.10

Rated Voltage (DC)

Voltage Code	Voltage (DC)
0J	6.3V
1A	10V
1C	16V
1E	25V
1H	50V

Internal Codes

Packaging Style

Packaging Code	Style
T	Tape & Reel

Capacitance Tolerance

Tolerance Code	Tolerance
S	+50/-20%

Nominal Capacitance (pF)

The capacitance is expressed in three digit codes and in units of pico Farads (pF). The first and second digits identify the first and second significant figures of the capacitance. The third digit identifies the multiplier. R designates a decimal point.

Capacitance Code	Capacitance
0R5	0.5pF
010	1pF
102	1,000pF (1nF)
105	1,000,000pF (1μF)



Capacitance Range Chart

CKD610JB [EIA CC0603]

Capacitance Range Chart

Rated Voltage: 6.3V (0J)

Capacitance (pF)	Cap Code	Tolerance	0J (6.3V)
470,000	474	S: +50/-20%	
1,000,000	105		
2,200,000	225		
4,700,000	475		
10,000,000	106		

Standard Thickness

0.80 mm



Capacitance Range Table

CKD610JB [EIA CC0603]

TDK Part Number (Ordering Code)	Rated Voltage	Capacitance (pF)	Capacitance Tolerance	Thickness (mm)	Rated Current (I _{dc} max)	DC Resistance (max)
CKD610JB0J105S	6.3V	1,000,000	+50/-20%	0.80 ± 0.10	2,000 mA	12 mΩ
CKD610JB0J225S	6.3V	2,200,000	+50/-20%	0.80 ± 0.10	2,000 mA	12 mΩ
CKD610JB0J475S	6.3V	4,700,000	+50/-20%	0.80 ± 0.10	2,000 mA	12 mΩ



Capacitance Range Chart

CKD510JB [EIA CC0805]

Capacitance Range Chart

Rated Voltage: 50V (1H), 25V (1E), 16V (1C), 10V (1A), 6.3V (0J)

Capacitance (pF)	Cap Code	Tolerance	1H (50V)	1E (25V)	1C (16V)	1A (10V)	0J (6.3V)
22	220	S: +50/-20%					
47	470						
100	101						
220	221						
470	471						
1,000	102						
2,200	222						
4,700	472						
10,000	103						
22,000	223						
47,000	473						
100,000	104						
470,000	474						
1,000,000	105						
2,200,000	225						
4,700,000	475						
10,000,000	106						
22,000,000	226						

Standard Thickness

0.85 mm



Capacitance Range Table

CKD510JB [EIA CC0805]

TDK Part Number (Ordering Code)	Rated Voltage	Capacitance (pF)	Capacitance Tolerance	Thickness (mm)	Rated Current (I _{dc} max)	DC Resistance (max)
CKD510JB1H220S	50V	22	+50/-20%	0.85 ± 0.15	400 mA	500 mΩ
CKD510JB1H470S	50V	47	+50/-20%	0.85 ± 0.15	400 mA	500 mΩ
CKD510JB1H101S	50V	100	+50/-20%	0.85 ± 0.15	400 mA	500 mΩ
CKD510JB1H221S	50V	220	+50/-20%	0.85 ± 0.15	400 mA	500 mΩ
CKD510JB1H471S	50V	470	+50/-20%	0.85 ± 0.15	400 mA	500 mΩ
CKD510JB1H102S	50V	1,000	+50/-20%	0.85 ± 0.15	400 mA	500 mΩ
CKD510JB1H222S	50V	2,200	+50/-20%	0.85 ± 0.15	400 mA	500 mΩ
CKD510JB1H472S	50V	4,700	+50/-20%	0.85 ± 0.15	400 mA	500 mΩ
CKD510JB1E103S	25V	10,000	+50/-20%	0.85 ± 0.15	1,000 mA	80 mΩ
CKD510JB1E223S	25V	22,000	+50/-20%	0.85 ± 0.15	1,000 mA	80 mΩ
CKD510JB1E473S	25V	47,000	+50/-20%	0.85 ± 0.15	1,000 mA	80 mΩ
CKD510JB1E104S	25V	100,000	+50/-20%	0.85 ± 0.15	1,000 mA	80 mΩ
CKD510JB1C474S	16V	470,000	+50/-20%	0.85 ± 0.15	2,000 mA	30 mΩ
CKD510JB1A105S	10V	1,000,000	+50/-20%	0.85 ± 0.15	2,000 mA	12 mΩ
CKD510JB1A225S	10V	2,200,000	+50/-20%	0.85 ± 0.15	2,000 mA	12 mΩ
CKD510JB1A475S	10V	4,700,000	+50/-20%	0.85 ± 0.15	3,000 mA	12 mΩ
CKD510JB0J106S	6.3V	10,000,000	+50/-20%	0.85 ± 0.15	4,000 mA	5 mΩ
CKD510JB0J226S	6.3V	22,000,000	+50/-20%	0.85 ± 0.15	4,000 mA	5 mΩ



Capacitance Range Chart

CKD110JB [EIA CC1205]

Capacitance Range Chart

Rated Voltage: 25V (1E)

Capacitance (pF)	Cap Code	Tolerance	1E (25V)
22	220	S: +50/-20%	
47	470		
100	101		
220	221		
470	471		
1,000	102		
2,200	222		
4,700	472		
10,000	103		
22,000	223		
47,000	473		
100,000	104		

Standard Thickness

 0.85 mm



Capacitance Range Table

CKD110JB [EIA CC1205]

TDK Part Number (Ordering Code)	Rated Voltage	Capacitance (pF)	Capacitance Tolerance	Thickness (mm)	Rated Current (I _{dc} max)	DC Resistance (max)
CKD110JB1E220S	25V	22	+50/-20%	0.85 ± 0.15	200 mA	600 mΩ
CKD110JB1E470S	25V	47	+50/-20%	0.85 ± 0.15	200 mA	600 mΩ
CKD110JB1E101S	25V	100	+50/-20%	0.85 ± 0.15	200 mA	600 mΩ
CKD110JB1E221S	25V	220	+50/-20%	0.85 ± 0.15	200 mA	600 mΩ
CKD110JB1E471S	25V	470	+50/-20%	0.85 ± 0.15	200 mA	600 mΩ
CKD110JB1E102S	25V	1,000	+50/-20%	0.85 ± 0.15	200 mA	600 mΩ
CKD110JB1E222S	25V	2,200	+50/-20%	0.85 ± 0.15	200 mA	600 mΩ
CKD110JB1E472S	25V	4,700	+50/-20%	0.85 ± 0.15	200 mA	600 mΩ
CKD110JB1E103S	25V	10,000	+50/-20%	0.85 ± 0.15	500 mA	300 mΩ
CKD110JB1E223S	25V	22,000	+50/-20%	0.85 ± 0.15	500 mA	300 mΩ
CKD110JB1E473S	25V	47,000	+50/-20%	0.85 ± 0.15	500 mA	300 mΩ
CKD110JB1E104S	25V	100,000	+50/-20%	0.85 ± 0.15	500 mA	300 mΩ



Capacitance Range Chart

CKD310JB [EIA CC1206]

Capacitance Range Chart

Rated Voltage: 16V (1C), 6.3V (0J)

Capacitance (pF)	Cap Code	Tolerance	1C (16V)	0J (6.3V)
100,000	104	S: +50/-20%		
220,000	224			
470,000	474			
1,000,000	105			
22,000,000	226			

Standard Thickness

1.30 mm



Capacitance Range Table

CKD310JB [EIA CC1206]

TDK Part Number (Ordering Code)	Rated Voltage	Capacitance (pF)	Capacitance Tolerance	Thickness (mm)	Rated Current (I _{dc} max)	DC Resistance (max)
CKD310JB1C104S	16V	100,000	+50/-20%	1.30 ± 0.15	2,000 mA	40 mΩ
CKD310JB1C224S	16V	220,000	+50/-20%	1.30 ± 0.15	2,000 mA	40 mΩ
CKD310JB1C474S	16V	470,000	+50/-20%	1.30 ± 0.15	2,000 mA	40 mΩ
CKD310JB1C105S	16V	1,000,000	+50/-20%	1.30 ± 0.15	2,000 mA	40 mΩ
CKD310JB0J226S	6.3V	22,000,000	+50/-20%	1.30 ± 0.15	4,000 mA	12 mΩ



Capacitance Range Chart

CKD61BJB [EIA CC0603]

Capacitance Range Chart

Rated Voltage: 6.3V (0J)

Capacitance (pF)	Cap Code	Tolerance	0J (6.3V)
100,000	104	S: +50/-20%	
470,000	474		
1,000,000	105		
4,700,000	475		
10,000,000	106		

Standard Thickness

 0.60 mm



Capacitance Range Table

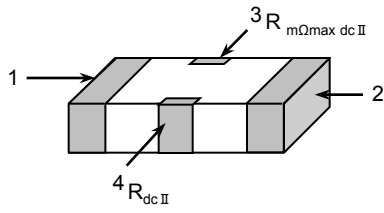
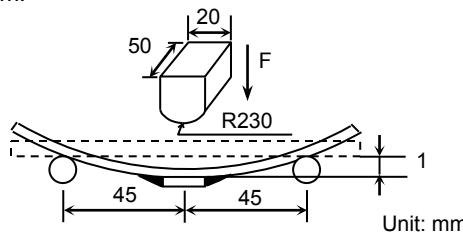
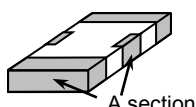
CKD61BJB [EIA CC0603]

TDK Part Number (Ordering Code)	Rated Voltage	Capacitance (pF)	Capacitance Tolerance	Thickness (mm)	Rated Current (I _{dc} max)	DC Resistance (max)
CKD61BJB0J474S	6.3V	470,000	+50/-20%	0.60 ± 0.10	2,000 mA	30 mΩ
CKD61BJB0J105S	6.3V	1,000,000	+50/-20%	0.60 ± 0.10	2,000 mA	30 mΩ
CKD61BJB0J475S	6.3V	22,000,000	+50/-20%	0.60 ± 0.10	2,000 mA	12 mΩ



General Specifications

CKD Series – Feed Through Type

No.	Item	Performance	Test or Inspection Method					
1	External Appearance	No defects which may affect performance.	Inspect with magnifying glass (3×).					
2	Insulation Resistance	10,000MΩ or 500MΩ•μF min., whichever smaller (As for the capacitors of rated voltage 16, 10, 6.3V DC, 100MΩ•μF min.).	Apply rated voltage for 60s.					
3	Direct Current Resistance R _{dc} (1-2)	R _{dc} is between 5MΩ - 600 MΩ depending on item. See the Capacitance Range Chart section to obtain item specific parameters.	Measuring current should be 100mA max. 					
4	Voltage Proof	Withstand test voltage without insulation breakdown or other damage.	2.5 x rated voltage (DC) shall be applied for 1 to 5s. Charge / discharge current shall not exceed 50mA.					
5	Capacitance	Within the specified tolerance.	<table><tr><th>Measuring Frequency</th><th>Measuring Voltage</th></tr><tr><td rowspan="2">1kHz±10%</td><td>0.5 - 5 V_{rms}</td></tr><tr><td>1.0±0.2V_{rms}</td></tr></table>	Measuring Frequency	Measuring Voltage	1kHz±10%	0.5 - 5 V _{rms}	1.0±0.2V _{rms}
Measuring Frequency	Measuring Voltage							
1kHz±10%	0.5 - 5 V _{rms}							
	1.0±0.2V _{rms}							
6	Dissipation Factor (D.F.)	10% maximum	See No.5 in this table for measuring condition.					
7	Bending	No mechanical damage.	Reflow solder the capacitor on P.C. board (shown in Appendix 2, Appendix 4 or Appendix 6) and bend 1mm. 					
8	Solderability	New solder to cover over 75% of termination. 25% may have pin holes or rough spots but not concentrated in one spot. Ceramic surface of "A sections" shall not be exposed due to melting or shifting of termination material. 	Completely soak both terminations in solder at 235±5°C for 2±0.5s. Solder: H63A (JIS Z 3282) Flux: Isopropyl alcohol (JIS K 8839) Rosin (JIS K 5902) 25% solid solution.					



General Specifications

CKD Series – Feed Through Type

No.	Item	Performance	Test or Inspection Method
9	Resistance to solder heat		Completely soak both terminations in solder at $260 \pm 5^\circ\text{C}$ for 5 ± 1 s.
	External appearance	No mechanical damage.	Preheating condition
	Capacitance	Change from the value before test	Temp.: $150 \pm 10^\circ\text{C}$
		$\pm 7.5\%$	Time: 1 to 2 min.
	D.F. (Class 2)	Meet the initial spec.	Flux: Isopropyl alcohol (JIS K 8839)
	Insulation Resistance	Meet the initial spec.	Rosin (JIS K 5902) 25% solid solution.
	Voltage Proof	No insulation breakdown or other damage.	Solder: H63A (JIS Z 3282)
10	Resistance for DC (R_{dc})	1.0Ω max.	Leave the capacitor in ambient conditions for 24 ± 2 h before measurement.
	Temperature cycle		Reflow solder the capacitor on P.C. board (shown in Appendix 1 or Appendix 3) before testing.
	External appearance	No mechanical damage.	Expose the capacitor in the conditions step1 through step 4 and repeat 5 times consecutively.
	Capacitance	Change from the value before test	Leave the capacitor in ambient conditions for 24 ± 2 h before measurement.
		$\pm 7.5\%$	
	D.F. (Class 2)	Meet the initial spec.	
	Insulation Resistance	Meet the initial spec.	
11	Resistance for DC (R_{dc})	1.0Ω max.	
	Moisture Resistance (Steady State)		Reflow solder the capacitors on P.C. board (shown in Appendix 1 or Appendix 3) before testing.
	External appearance	No mechanical damage.	Leave at temperature $40 \pm 2^\circ\text{C}$, 90 to 95%RH for 500 +24,0h.
	Capacitance	Change from the value before test	Leave the capacitor in ambient conditions for 24 ± 2 h before measurement.
		$\pm 12.5\%$	
	D.F. (Class 2)	200% of initial spec. max.	
	Insulation Resistance	1,000M Ω or 50M $\Omega \cdot \mu\text{F}$ min, whichever smaller. (As for the capacitors of rated voltage 16, 10, 6.3V DC, 10M $\Omega \cdot \mu\text{F}$ min.)	
	Resistance for DC (R_{dc})	1.0Ω max.	

Step	Temperature ($^\circ\text{C}$)	Time (min.)
1	Min. operating temp. ± 3	30 ± 3
2	20 ± 2	2 – 5
3	Max. operating temp. ± 2	30 ± 2
4	20 ± 2	2 – 5



General Specifications

CKD Series – Feed Through Type

No.	Item	Performance	Test or Inspection Method
12	Life		
	External appearance	No mechanical damage.	Reflow solder the capacitor on P.C. board (shown in Appendix 1, Appendix 3 or Appendix 5) before testing.
	Capacitance	Change from the value before test ± 15%	Voltage shall be applied at maximum operating temperature $\pm 2^{\circ}\text{C}$ for 1,000 +48, 0h. Applied voltage is 1xRV; however some items may be tested at higher voltage (1.2x, 1.5x or 2xRV). Charge/discharge current shall not exceed 50mA.
	D.F. (Class 2)	200% of initial spec. max.	Leave the capacitor in ambient conditions for $24 \pm 2\text{h}$ before measurement.
	Insulation Resistance	1,000M Ω or 50M $\Omega \cdot \mu\text{F}$ min., whichever smaller. (As for the capacitors of rated voltage 16, 10, 6.3V DC, 10M $\Omega \cdot \mu\text{F}$ min.)	Voltage conditioning: Voltage treats the capacitor under testing temperature and voltage for 1 hour.
	Resistance for DC (R_{dc})	1.0 Ω max.	Leave the capacitor in ambient conditions for $24 \pm 2\text{h}$ before measurement. Use this measurement for initial value.

***As for the initial measurement of capacitors on number 9, 10 and 11, leave capacitors at $150 \pm 10, 0^{\circ}\text{C}$ for 1 hour and measure the value after leaving capacitors for $24 \pm 2\text{h}$ in ambient condition.**

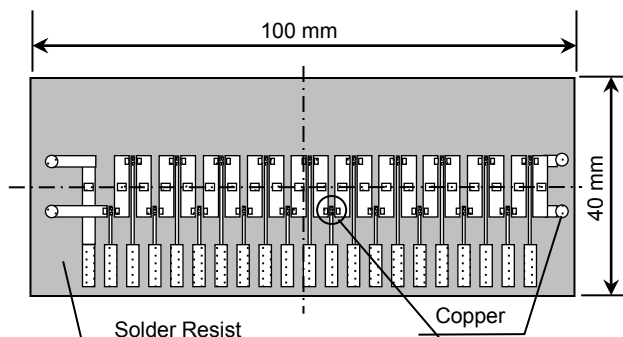


General Specifications

CKD Series – Feed Through Type

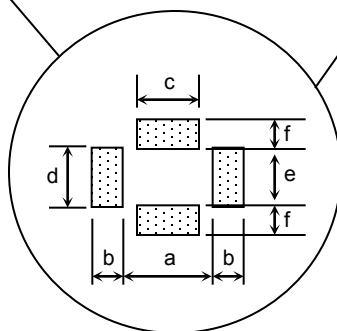
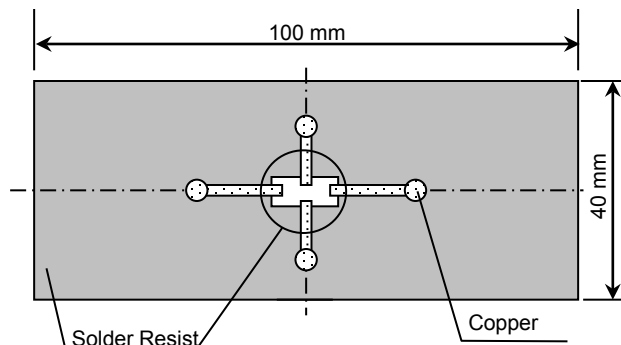
Appendix - 1

P.C. Board for reliability test



Appendix - 2

P.C. Board for bending test



Appendix – 1 & 2

Case Code			Dimensions (mm)					
Series	JIS	EIA	a	b	c	d	e	f
CKD710JB	C1005	CC0402	0.7	0.3	0.19	0.6	0.25	0.25

Material: Glass Epoxy (As per JIS C6484 GE4)

P.C. Board thickness: 1.6mm



Copper (thickness 0.035mm)



Solder resist

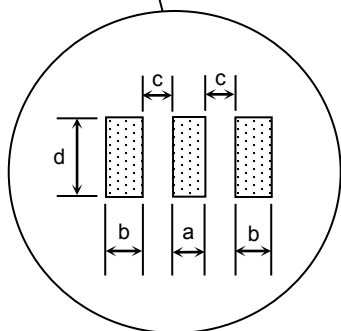
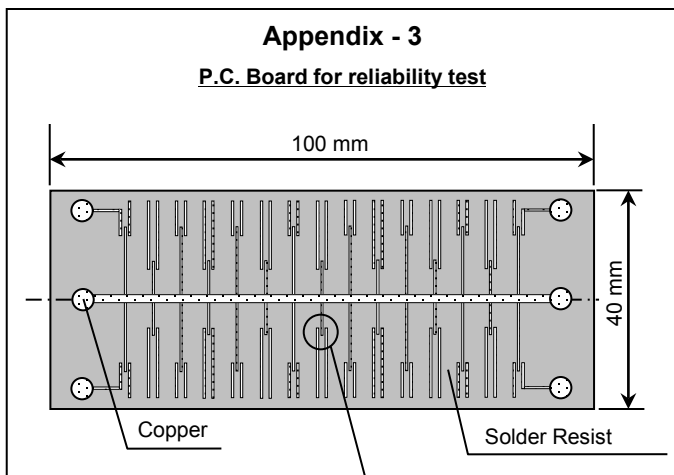


General Specifications

CKD Series – Feed Through Type

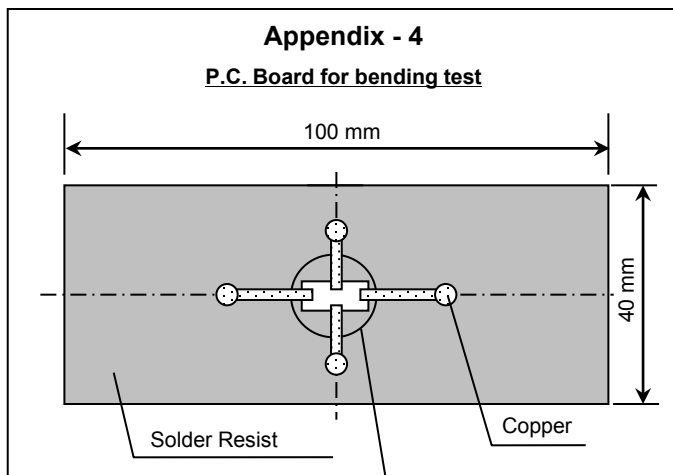
Appendix - 3

P.C. Board for reliability test

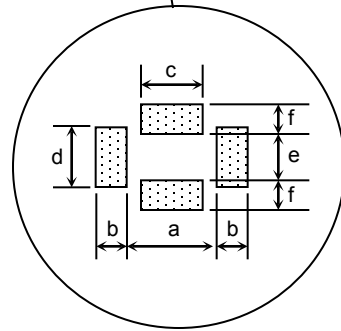


Appendix - 4

P.C. Board for bending test



(Unit: mm)



Appendix - 3

Case Code			Dimensions (mm)					
Series	JIS	EIA	a	b	c	d	e	f
CKD610JB	C1608	CC0603	1.0	0.6	0.4	0.6	0.4	0.4

Appendix - 4

Case Code			Dimensions (mm)			
Series	JIS	EIA	a	b	c	d
CKD610JB	C1608	CC0603	0.4	0.5	0.4	2.0

Material: Glass Epoxy (As per JIS C6484 GE4)

P.C. Board thickness: 1.6mm

 Copper (thickness 0.035mm)
 Solder resist

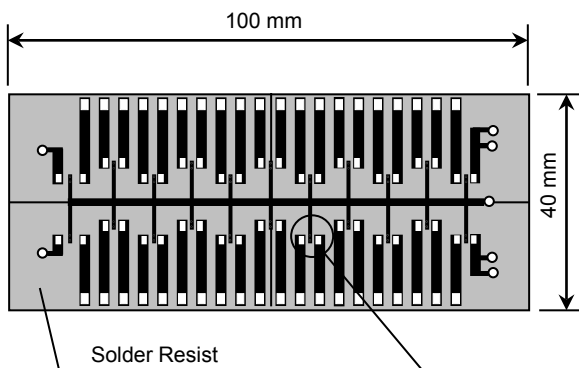


General Specifications

CKD Series – Feed Through Type

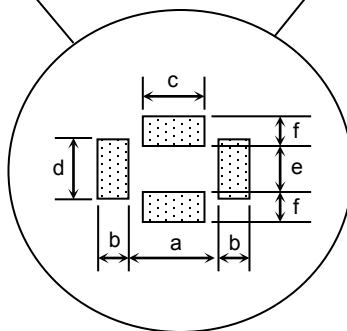
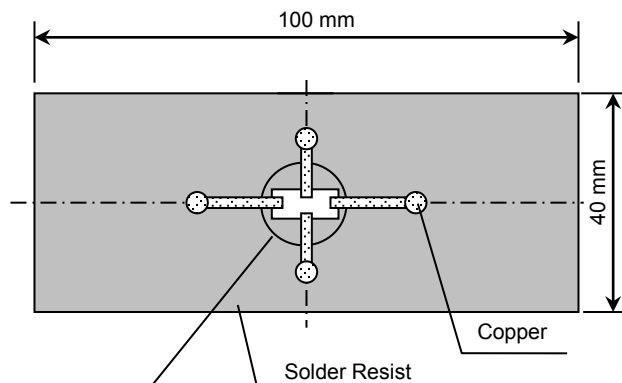
Appendix - 5

P.C. Board for reliability test



Appendix - 6

P.C. Board for bending test

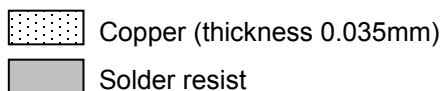


Appendix – 5 & 6

Case Code			Dimensions (mm)					
Series	JIS	EIA	a	b	c	d	e	f
CKD510JB	C2012	CC0805	1.4	0.6	0.5	0.8	0.6	0.65
CKD110JB	C3212	CC1205	2.5	0.7	1.4	1.0	0.6	0.7
CKD310JB	C3216	CC1206	2.5	1.2	1.4	1.3	0.8	0.9

Material: Glass Epoxy (As per JIS C6484 GE4)

P.C. Board thickness: 1.6mm

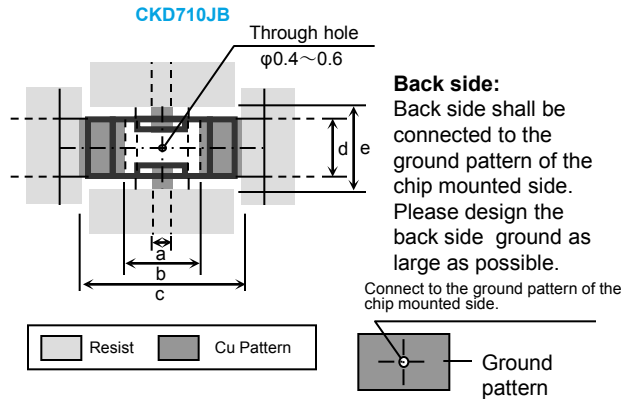




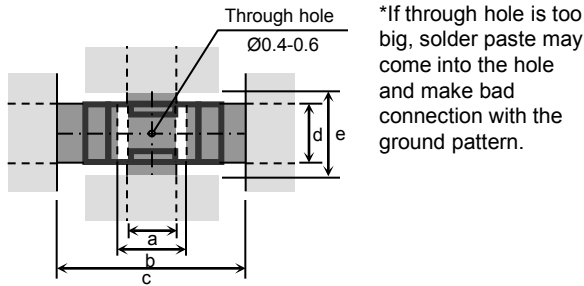
Soldering Information

CKD Series – Feed Through Type

Recommended Soldering Land Pattern

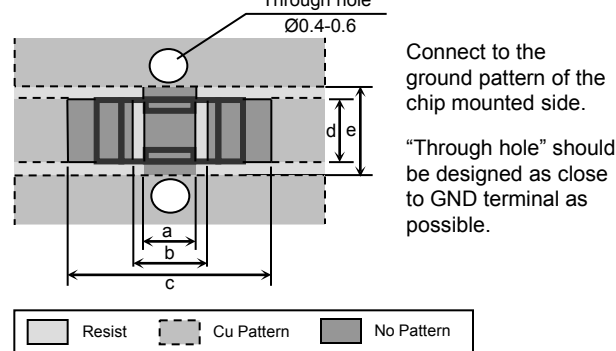


CKD510JB, CKD110JB, CKD310JB



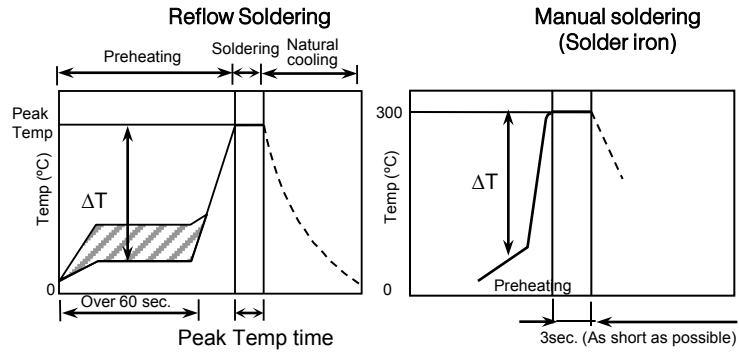
Symbol	a	b	c	d	e
Series					
CKD710JB	0.19	0.7	1.3	0.6	0.75
CKD510JB	0.5	1.5	2.6	1.0	2.0
CKD110JB	1.4	2.5	4.5	1.0	2.0
CKD310JB	1.4	2.5	4.5	1.2	2.4

CKD610JB



Symbol	a	b	c	d	e
Series					
CKD610JB	0.4	1.2	2.2	0.7	1.4

Recommended Soldering Profile



Recommended soldering duration

Solder	Temp./Dura.	Reflow Soldering	
		Peak temp (°C)	Duration (sec.)
Sn-Pb Solder		230 max.	20 max.
Lead-Free Solder		260 max.	10 max.

Recommended solder compositions

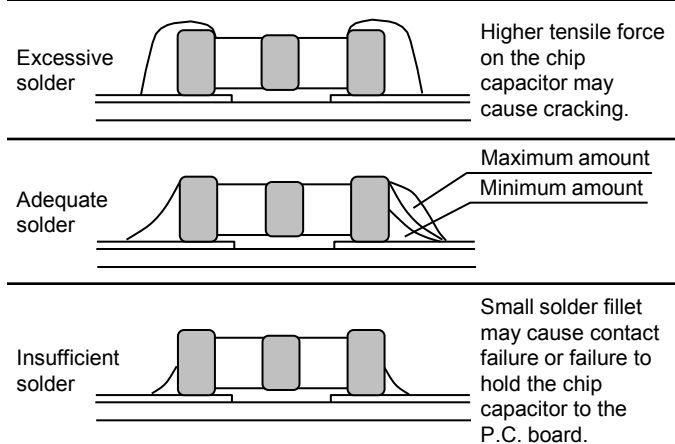
Sn-37Pb (Sn-Pb solder)

Sn-3.0Ag-0.5Cu (Lead Free Solder)

Preheating Condition

Soldering Method	Temperature (°C)
Reflow soldering	ΔT ≤ 150
Manual soldering	ΔT ≤ 150

Recommended Solder Amount

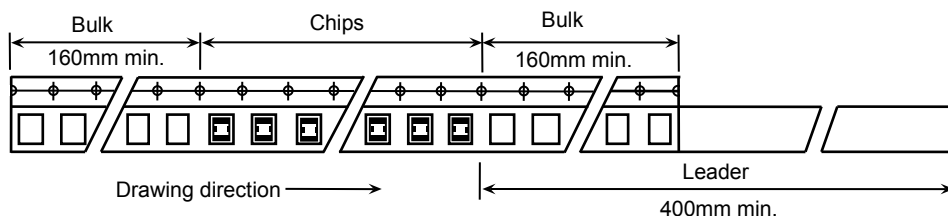




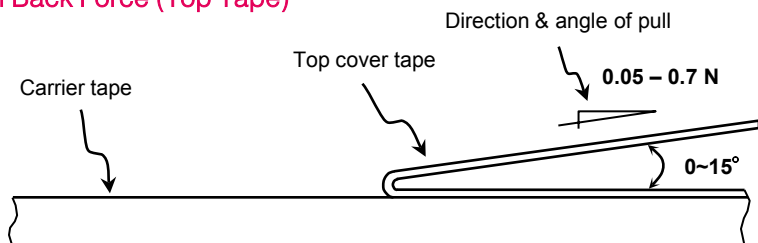
Packaging Information

CKD Series – Feed Through Type

Carrier Tape Configuration

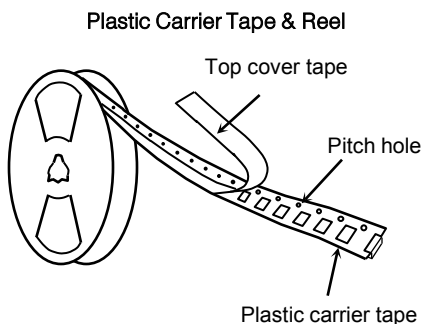
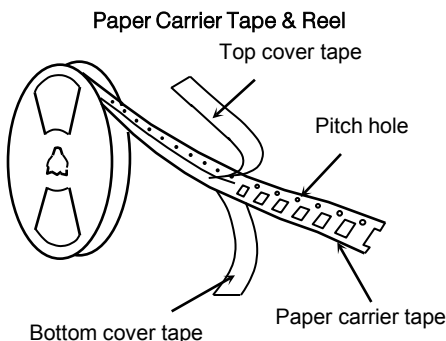


Peel Back Force (Top Tape)



- Carrier tape shall be flexible enough to be wound around a minimum radius of 30mm with components in tape.
- The missing of components shall be less than 0.1%
- Components shall not stick to the cover tape.
- The cover tape shall not protrude beyond the edges of the carrier tape not shall cover the sprocket holes.

Chip Quantity Per Reel and Structure of Reel (Paper & Plastic)



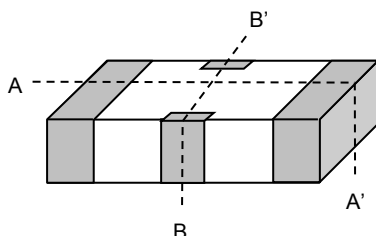
Case Code			Chip Thickness (mm)	Taping Material	Chip quantity (pcs.)	
Series	JIS	EIA			φ178mm (7") reel	φ330mm (13") reel
CKD710JB	C1005	CC0402	0.30	Paper	10,000	50,000
CKD610JB	C1608	CC0603	0.80		4,000	10,000
CKD510JB	C2012	CC0805	0.85			
CKD110JB	C3212	CC1205	0.85			
CKD310JB	C3216	CC1206	1.30	Plastic	2,000	



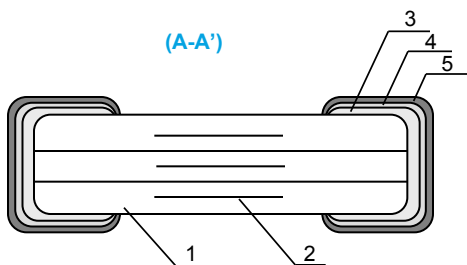
Additional Information

CKD Series – Feed Through Type

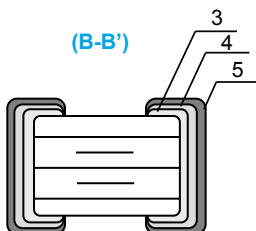
• Inside Structure & Material System



(A-A')



(B-B')



No.	NAME	MATERIAL
(1)	Ceramic Dielectric	CaZrO ₃ or BaTiO ₃
(2)	Internal Electrode	Nickel (Ni)
(3)	Termination	Copper (Cu)
(4)		Nickel (Ni)
(5)		Tin (Sn)

• Environmental Information

TDK Corporation established internal product environmental assurance standards that include the six hazardous substances banned by the EU RoHS Directive¹ enforced on July 1, 2006 along with additional substances independently banned by TDK and has successfully completed making general purpose electronic components conform to the RoHS Directive².

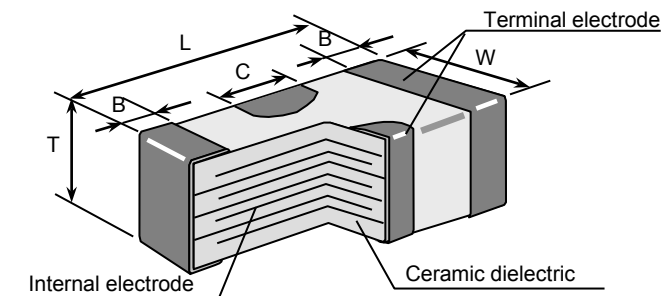
1. Abbreviation for Restriction on Hazardous Substances, which refers to the regulation EU Directive 2002/95/EC on hazardous substances by the European Union (EU) effective from July 1, 2006. The Directive bans the use of six specific hazardous substances in electric and electronic devices and products handled within the EU. The six substances are lead, mercury, cadmium, hexavalent chromium, PBB (polybrominated biphenyls), and PBDE (polybrominated diphenyl ethers).
2. This means that, in conformity with the EU Directive 2002/95/EC, lead, cadmium, mercury, hexavalent chromium, and specific bromine-based flame retardants, PBB and PBDE, have not been used, except for exempted applications.

For REACH (SVHC : 15 substances according to ECHA / October 2008) : All TDK MLCC do not contain these 15 substances.

For European Directive 2000/53/CE and 2005/673/CE : Cadmium, Hexavalent Chromium, Mercury, Lead are not contained in all TDK MLCC.

For European Directive 2003/11/CE : Pentabromodiphenyl-ether, Octabromodiphenyl-ether are not contained in all TDK MLCC.

• Shape & Dimensions



Case Code			Dimensions (mm)				
Series	JIS	EIA	L	W	T	B	C
CKD710JB	C1005	CC0402	1.00	0.55	0.30	0.17	0.30
CKD610JB	C1608	CC0603	1.60	0.80	0.80	0.10	0.40
CKD510JB	C2012	CC0805	2.00	1.25	0.85	0.30	0.40
CKD110JB	C3212	CC1205	3.20	1.25	0.85	0.40	0.95
CKD310JB	C3216	CC1206	3.20	1.60	1.30	0.40	0.95



MULTILAYER CERAMIC CHIP CAPACITORS



CLL Series Ultra Low Inductance Capacitors

Type: CLLC1A
CLLE1A

Issue date: April 2011

REMINDERS

Please read before using this product

SAFETY REMINDERS



REMINDERS

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CLL Series

Ultra Low Inductance Capacitors

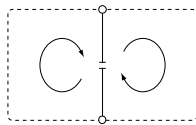
Type: CLLC1A (C1608), CLLE1A (C2012)

Features



- Features a unique internal structure that cancels magnetic fields to reduce equivalent series inductance
- Eight side terminal electrodes in one capacitor

Structure



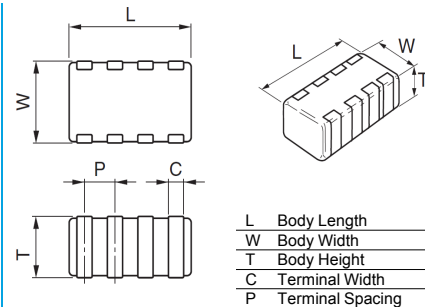
	ULI		FLIP	STD
Chip Size	C1608	C2012	C1632	C2012
Cap.	1 μ F	1 μ F	1 μ F	1 μ F
W.V.	0G (4V)	0G (4V)	1A (10V)	1A (10V)
ESL	65pH	70pH	180pH	850pH

Applications



- Decoupling CPU power line
- High speed digital IC/decoupling
- GPU/CPU

Shape & Dimensions



Dimensions in mm



Part Number Construction

CLLC1A X7R 0J 105 M T XXXX

Series Name

Case Code	Length	Width
CLLC1A	1.60 $\pm$ 0.10	0.80 $\pm$ 0.10
CLLE1A	2.00 $\pm$ 0.15	1.25 $\pm$ 0.15

Temperature Characteristic

Temperature Characteristics	Capacitance Change	Temperature Range
X7R	$\pm$ 15%	-55 to +125°C
X7S	$\pm$ 22%	-55 to +125°C

Rated Voltage (DC)

Voltage Code	Voltage (DC)
0G	4V
0J	6.3V
1A	10V

Internal Codes

Packaging Style

Packaging Code	Style
T	Tape & Reel

Capacitance Tolerance

Tolerance Code	Tolerance
M	$\pm$ 20%

Nominal Capacitance (pF)

The capacitance is expressed in three digit codes and in units of pico Farads (pF). The first and second digits identify the first and second significant figures of the capacitance. The third digit identifies the multiplier. R designates a decimal point.

Capacitance Code	Capacitance
0R5	0.5pF
010	1pF
102	1,000pF (1nF)
105	1,000,000pF (1 μ F)



Capacitance Range Chart

CLLC1A [EIA CC0603]

Capacitance Range Chart

Temperature Characteristics: X7S (± 22)

Rated Voltage: 4V (0G)

Capacitance (pF)	Cap Code	Tolerance	X7S
			0G (4V)
330,000	334	M: $\pm 20\%$	
470,000	474		
680,000	684		
1,000,000	105		

Standard Thickness

 0.50 mm



Capacitance Range Table

CLLC1A [EIA CC0603]

Class 2 (Temperature Stable)

Temperature Characteristics: X7S (-55 to $+125^{\circ}\text{C}$, $\pm 22\%$)

TDK Part Number (Ordering Code)	Temperature Characteristics	Rated Voltage	Capacitance (pF)	Capacitance Tolerance	Thickness (mm)
CLLC1AX7S0G334M	X7S	4V	330,000	$\pm 20\%$	0.50 ± 0.10
CLLC1AX7S0G474M	X7S	4V	470,000	$\pm 20\%$	0.50 ± 0.10
CLLC1AX7S0G684M	X7S	4V	680,000	$\pm 20\%$	0.50 ± 0.10
CLLC1AX7S0G105M	X7S	4V	1,000,000	$\pm 20\%$	0.50 ± 0.10



Capacitance Range Chart

CLLE1A [EIA CC0805]

Capacitance Range Chart

Temperature Characteristics: X7R ($\pm 15\%$), X7S ($\pm 22\%$)

Rated Voltage: 10V (1A), 6.3V (0J), 4V (0G)

Capacitance (pF)	Cap Code	Tolerance	X7R		X7S
			1A (10V)	0J (6.3V)	0G (4V)
100,000	104	M: $\pm 20\%$			
150,000	154				
220,000	224				
330,000	334				
470,000	474				
680,000	684				
1,000,000	105				
1,500,000	155				
2,200,000	225				
4,700,000	475				

Standard Thickness

0.50 mm
 0.85 mm



Capacitance Range Table

CLLE1A [EIA CC0805]

Class 2 (Temperature Stable)

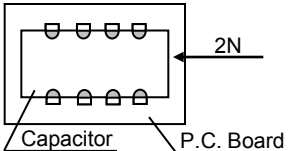
Temperature Characteristics: X7R (-55 to $+125^{\circ}\text{C}$, $\pm 15\%$), X7S (-55 to $+125^{\circ}\text{C}$, $\pm 22\%$)

TDK Part Number (Ordering Code)	Temperature Characteristics	Rated Voltage	Capacitance (pF)	Capacitance Tolerance	Thickness (mm)
CLLE1AX7R1A104M	X7R	10V	100,000	$\pm 20\%$	0.50 ± 0.10
CLLE1AX7R1A154M	X7R	10V	150,000	$\pm 20\%$	0.50 ± 0.10
CLLE1AX7R1A224M	X7R	10V	220,000	$\pm 20\%$	0.50 ± 0.10
CLLE1AX7R1A334M	X7R	10V	330,000	$\pm 20\%$	0.50 ± 0.10
CLLE1AX7R0J474M	X7R	6.3V	470,000	$\pm 20\%$	0.50 ± 0.10
CLLE1AX7R0J684M	X7R	6.3V	680,000	$\pm 20\%$	0.50 ± 0.10
CLLE1AX7R0J105M	X7R	6.3V	1,000,000	$\pm 20\%$	0.85 ± 0.10
CLLE1AX7R0J155M	X7R	6.3V	1,500,000	$\pm 20\%$	0.85 ± 0.10
CLLE1AX7S0G105M	X7S	4V	1,000,000	$\pm 20\%$	0.50 ± 0.10
CLLE1AX7S0G155M	X7S	4V	1,500,000	$\pm 20\%$	0.50 ± 0.10
CLLE1AX7S0G225M/0.50	X7S	4V	2,200,000	$\pm 20\%$	0.50 ± 0.10
CLLE1AX7S0G225M/0.85	X7S	4V	2,200,000	$\pm 20\%$	0.85 ± 0.10
CLLE1AX7S0G475M	X7S	4V	4,700,000	$\pm 20\%$	0.85 ± 0.10



General Specifications

CLL Series – ULI Capacitors

No.	Item	Performance	Test or Inspection Method													
1	External Appearance	No defects which may affect performance.	Inspect with magnifying glass (3×).													
2	Insulation Resistance	100MΩ•μF min.	Apply rated voltage for 60s. Measure 8 terminal electrodes at the same time.													
3	Voltage Proof	Withstand test voltage without insulation breakdown or other damage.	2.5 times rated voltage (DC) shall be applied for 1 to 5s. Charge / discharge current shall not exceed 50mA. Measure 8 terminal electrodes at the same time.													
4	Capacitance	Within the specified tolerance at 1000hrs age (Per IEC-384-9).	<table><tr><th>Measuring Frequency</th><th>Withstanding Voltage</th><th>Measuring voltage</th></tr><tr><td rowspan="2">1kHz±10%</td><td>10V</td><td>1.0±0.2 V_{rms}</td></tr><tr><td>≤6.3V</td><td>0.5±0.2 V_{rms}</td></tr></table> Measure 8 terminal electrodes at the same time.	Measuring Frequency	Withstanding Voltage	Measuring voltage	1kHz±10%	10V	1.0±0.2 V _{rms}	≤6.3V	0.5±0.2 V _{rms}					
Measuring Frequency	Withstanding Voltage	Measuring voltage														
1kHz±10%	10V	1.0±0.2 V _{rms}														
	≤6.3V	0.5±0.2 V _{rms}														
5	Dissipation Factor (Class 2)	<table><tr><th>T.C.</th><th>D.F.</th></tr><tr><td>X7R</td><td rowspan="2">0.10 max.</td></tr><tr><td>X7S</td></tr></table>	T.C.	D.F.	X7R	0.10 max.	X7S	See No.4 in this table for measuring condition.								
T.C.	D.F.															
X7R	0.10 max.															
X7S																
6	Temperature Characteristics of Capacitance (Class 2)	Capacitance Change (%) <table><tr><th>No DC Voltage Applied</th></tr><tr><td>X7R: ±15%</td></tr><tr><td>X7S: ±22%</td></tr></table>	No DC Voltage Applied	X7R: ±15%	X7S: ±22%	Capacitance shall be measured by the steps shown in the following table after thermal equilibrium is obtained for each step. ΔC be calculated ref. STEP 3 reading <table><tr><th>Step</th><th>Temperature (°C)</th></tr><tr><td>1</td><td>Reference temp. ±2</td></tr><tr><td>2</td><td>Min. operating temp. ±2</td></tr><tr><td>3</td><td>Reference temp. ±2</td></tr><tr><td>4</td><td>Max. operating temp. ±2</td></tr></table>	Step	Temperature (°C)	1	Reference temp. ±2	2	Min. operating temp. ±2	3	Reference temp. ±2	4	Max. operating temp. ±2
No DC Voltage Applied																
X7R: ±15%																
X7S: ±22%																
Step	Temperature (°C)															
1	Reference temp. ±2															
2	Min. operating temp. ±2															
3	Reference temp. ±2															
4	Max. operating temp. ±2															
7	Robustness of Terminations	No sign of termination coming off, breakage of ceramic, or other abnormal signs.	Reflow solder the capacitor on P.C. board (shown in Appendix 1 and 2) and apply a pushing force of 2N for 10±1s. 													
8	Solderability	All terminations shall exhibit a continuous solder coating free from defects for a minimum of 75% of the surface area of any individual termination. Anomalies other than dewetting, non-wetting, and pin holes are not cause for rejection. Ceramic surface of A sections shall not be exposed due to melting or shifting of termination material.  A section	Completely soak both terminations in solder at 235±5°C for 2±0.5s. Solder : H63A (JIS Z 3282) Flux : Isopropyl alcohol (JIS K 8839) Rosin (JIS K 5902) 25% solid solution.													



General Specifications

CLL Series – ULI Capacitors

No.	Item	Performance	Test or Inspection Method
9	Resistance to solder heat		Completely soak both terminations in solder at $260 \pm 5^\circ\text{C}$ for 5 ± 1 s.
	External appearance	No cracks are allowed and terminations shall be covered at least 60% with new solder	Preheating condition Temp. : $150 \pm 10^\circ\text{C}$ Time : 1 to 2 min.
	Capacitance	Characteristics	Flux : Isopropyl alcohol (JIS K 8839) Rosin (JIS K 5902) 25% solid solution.
		Change from the value before test	
		X7R X7S	
10	D.F. (Class 2)	Meet the initial spec.	Solder : H63A (JIS Z 3282)
	Insulation Resistance	Meet the initial spec.	Leave the capacitor in ambient conditions for 24 ± 2 h before measurement.
11	Vibration		Reflow solder the capacitor on a P.C. board (shown in Appendix 1 and 2) before testing.
	External appearance	No mechanical damage.	Vibrate the capacitor with amplitude of 1.5mm P-P sweeping the frequencies from 10Hz to 55Hz and back to 10Hz in about 1 minute.
	Capacitance	Characteristics	Repeat this for 2h each in 3 perpendicular directions (6h in total).
		Change from the value before test	
		X7R X7S	
11	D.F. (Class 2)	Meet the initial spec.	
11	Temperature cycle		Reflow solder the capacitors on a P.C. board (shown in Appendix 1 and 2) before testing.
	External appearance	No mechanical damage.	Expose the capacitor in the condition step1 through step 4, and repeat 5 times consecutively.
	Capacitance	Characteristics	Leave the capacitor in ambient conditions for 24 ± 2 h before measurement.
		Change from the value before test	
		X7R X7S	
11	D.F. (Class 2)	Meet the initial spec.	
	Insulation Resistance	Meet the initial spec.	
11	Voltage Proof	No insulation breakdown or other damage.	

Step	Temperature (°C)	Time (min.)
1	Min. operating temp. ± 3	30 ± 3
2	Reference Temp.	2 – 5
3	Max. operating temp. ± 2	30 ± 2
4	Reference Temp.	2 – 5



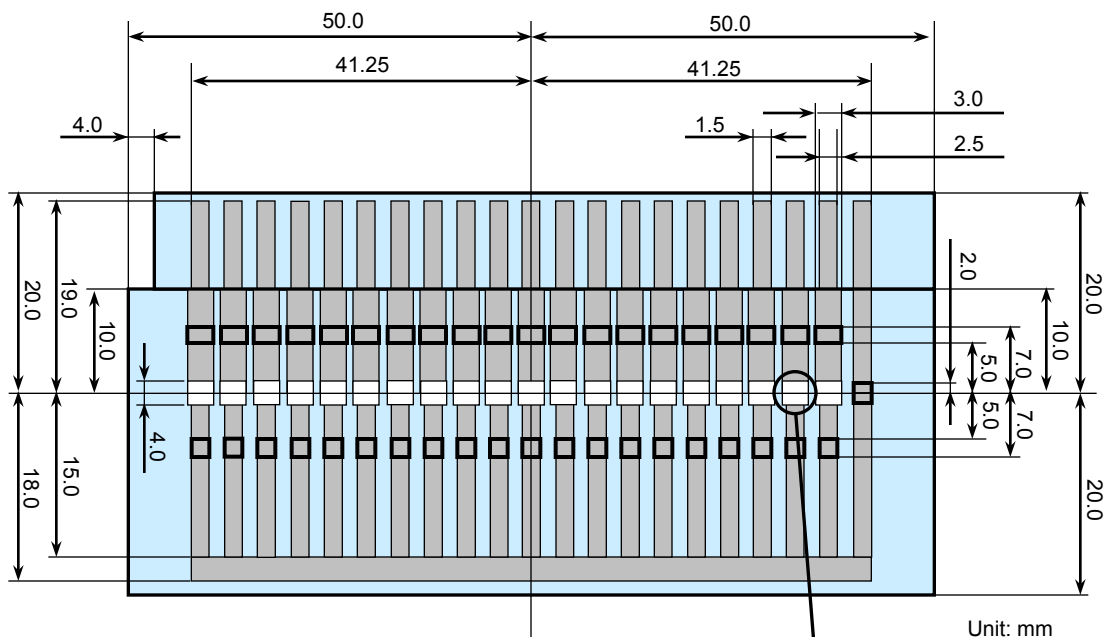
No.	Item	Performance	Test or Inspection Method				
12	Moisture Resistance (Steady State)		Reflow solder the capacitor on P.C. board (shown in Appendix 1 and 2) before testing. Leave at temperature $40 \pm 2^{\circ}\text{C}$ and 90 to 95%RH for 500 +24,0h. Leave the capacitor in ambient condition for $24 \pm 2\text{h}$ before measurement.				
	External appearance	No mechanical damage.					
	Capacitance	<table><tr><th>Characteristics</th><th>Change from the value before test</th></tr><tr><td>X7R X7S</td><td>$\pm 12.5 \%$</td></tr></table>		Characteristics	Change from the value before test	X7R X7S	$\pm 12.5 \%$
	Characteristics	Change from the value before test					
	X7R X7S	$\pm 12.5 \%$					
D.F. (Class 2)	Characteristics: X7R: 200% of initial spec. max. X7S: 200% of initial spec. max.						
Insulation Resistance	$10\text{M}\Omega \cdot \mu\text{F}$ min.						
13	Moisture Resistance		Reflow solder the capacitors on P.C. board (shown in Appendix 1 and 2) before testing. Apply the rated voltage at temperature $40 \pm 2^{\circ}\text{C}$ and 90 to 95%RH for 500 +24,0h. Charge/discharge current shall not exceed 50mA. Leave the capacitor in ambient conditions for $48 \pm 4\text{h}$ before measurement. Voltage conditioning: Voltage treat the capacitors under testing temperature and voltage for 1 hour. Leave the capacitors in ambient condition for $24 \pm 2\text{h}$ before measurement. Use this measurement for initial value.				
	External appearance	No mechanical damage.					
	Capacitance	<table><tr><th>Characteristics</th><th>Change from the value before test</th></tr><tr><td>X7R X7S</td><td>$\pm 12.5 \%$</td></tr></table>		Characteristics	Change from the value before test	X7R X7S	$\pm 12.5 \%$
	Characteristics	Change from the value before test					
	X7R X7S	$\pm 12.5 \%$					
D.F. (Class 2)	Characteristics X7R: 200% of initial spec. max. X7S: 200% of initial spec. max.						
Insulation Resistance	$5\text{M}\Omega \cdot \mu\text{F}$ min.						
14	Life		Reflow solder the capacitor on P.C. board (shown in Appendix 1 and 2) before testing. Apply 1 x rated voltage at $125 \pm 2^{\circ}\text{C}$ for 1,000 +48, 0h. Charge/discharge current shall not exceed 50mA. Leave the capacitors in ambient condition for $24 \pm 2\text{h}$ before measurement. Voltage conditioning: Voltage treat the capacitor under testing temperature and voltage for 1 hour. Leave the capacitor in ambient conditions for $48 \pm 4\text{h}$ before measurement. Use this measurement for initial value.				
	External appearance	No mechanical damage.					
	Capacitance	<table><tr><th>Characteristics</th><th>Change from the value before test</th></tr><tr><td>X7R X7S</td><td>$\pm 15 \%$</td></tr></table>		Characteristics	Change from the value before test	X7R X7S	$\pm 15 \%$
	Characteristics	Change from the value before test					
	X7R X7S	$\pm 15 \%$					
D.F. (Class 2)	Characteristics X7R: 200% of initial spec. max. X7S: 200% of initial spec. max.						
Insulation Resistance	$10\text{M}\Omega \cdot \mu\text{F}$ min.						



Appendix - 1

P.C. Board for reliability test

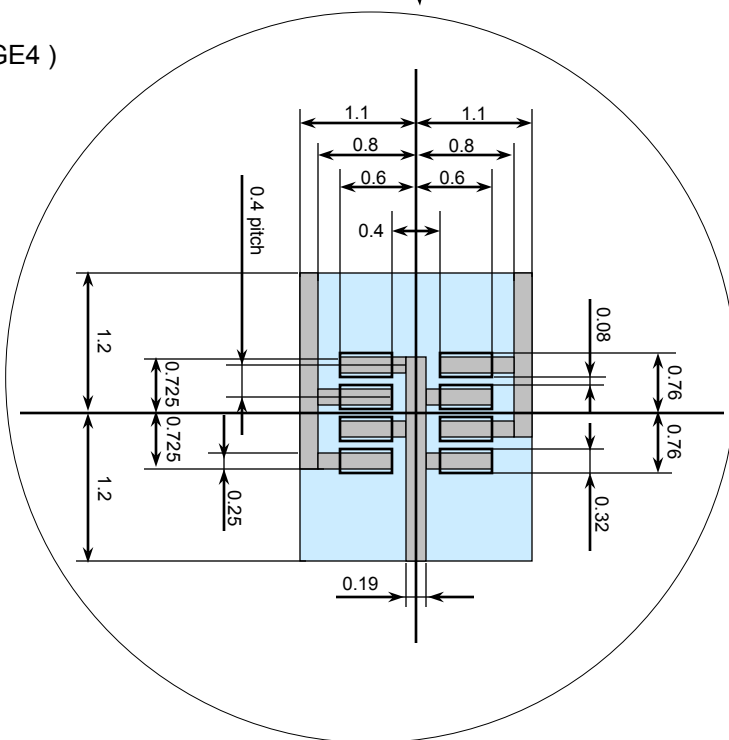
Applied for CLLC1A



Material: Glass Epoxy (As per JIS C6484 GE4)

P.C. Board thickness: 0.8mm

-  Copper (thickness 0.035mm)
-  Solder resist

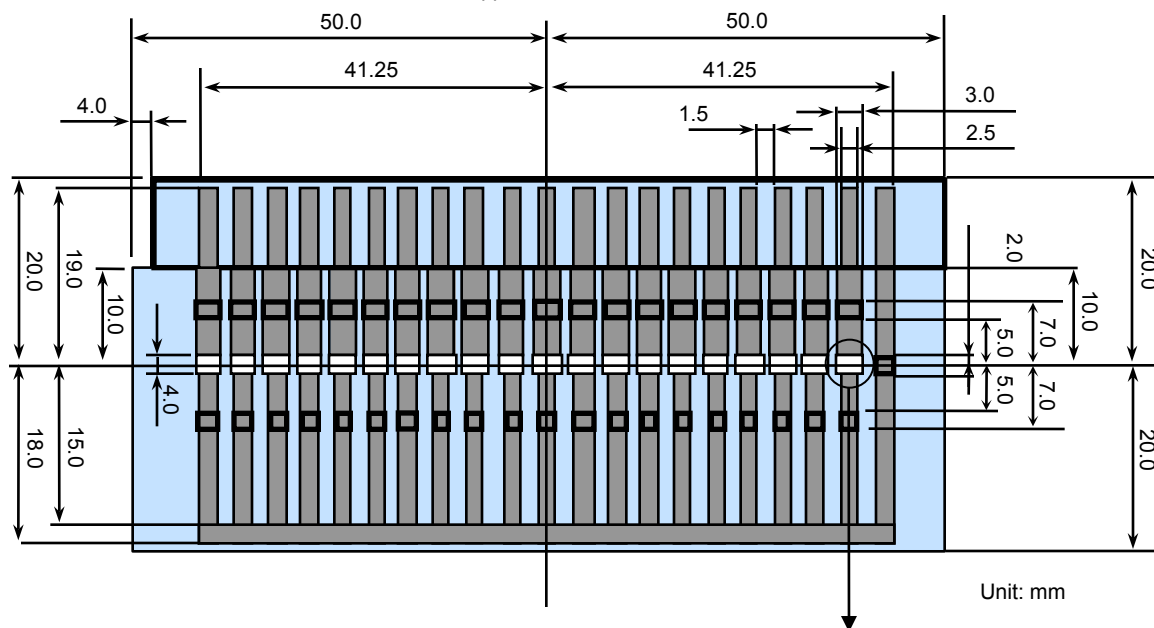




Appendix - 2

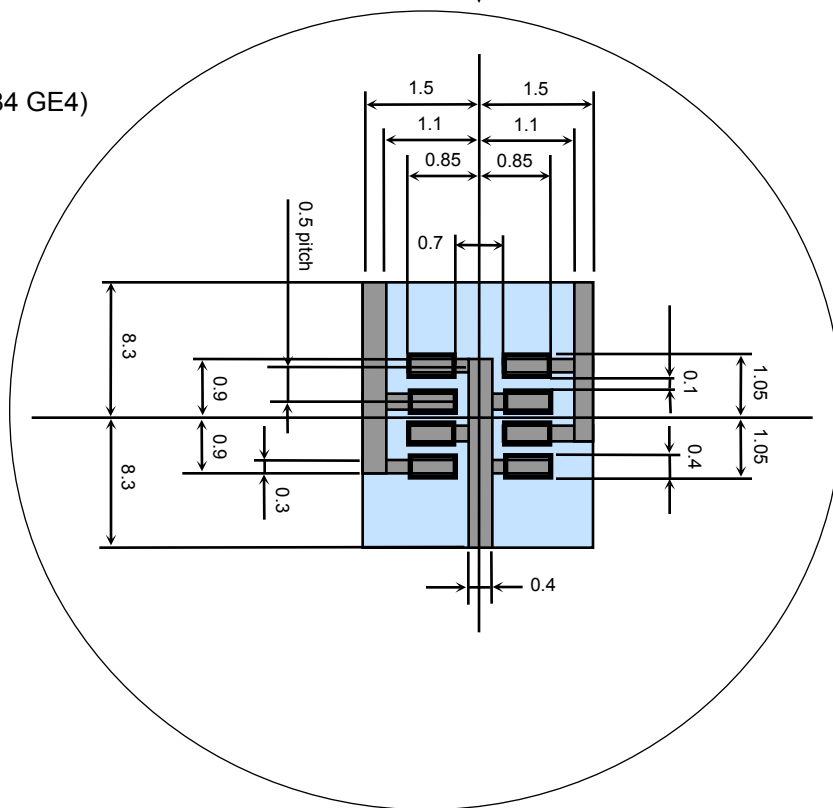
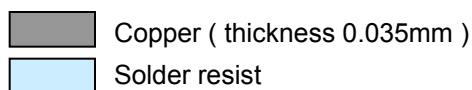
P.C. Board for reliability test

Applied for CLLE1A



Material: Glass Epoxy (As per JIS C6484 GE4)

P.C. Board thickness: 1.6mm

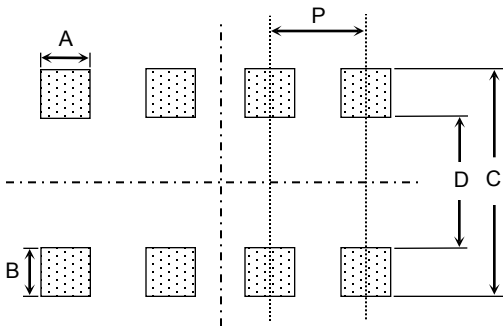




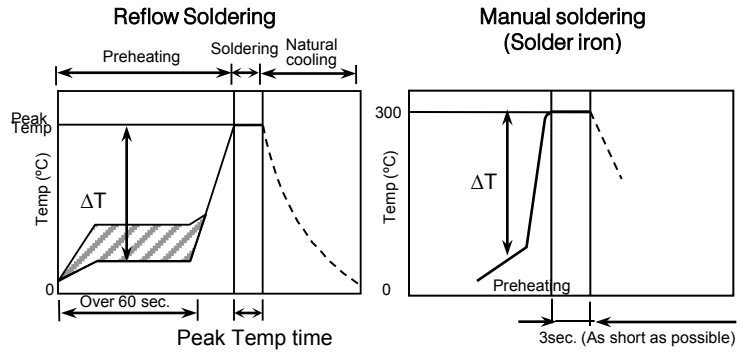
Soldering Information

CLL Series – ULI Capacitors

Recommended Soldering Land Pattern



Recommended Soldering Profile



Reflow Soldering

Unit: mm

Type	CLLC1A (C1608/CC0603)	CLLE1A (C2012/CC0805)
A	0.25	0.3
B	0.4	0.3 ~ 0.6
C	1.2	1.3 ~ 1.8
D	0.4	0.5 ~ 0.8
P	0.4	0.5

Recommended soldering duration

Solder	Temp./ Dura.	Reflow Soldering	
		Peak temp (°C)	Duration (sec.)
Sn-Pb Solder		230 max.	20 max.
Lead-Free Solder		260 max.	10 max.

Recommended solder compositions

Sn-37Pb (Sn-Pb solder)

Sn-3.0Ag-0.5Cu (Lead Free Solder)

Recommended Solder Amount

Excessive solder

Higher tensile force on the chip capacitor may cause cracking.

Adequate solder

Maximum amount
Minimum amount

Insufficient solder

Small solder fillet may cause contact failure or failure to hold the chip capacitor to the P.C. board.

Preheating Condition

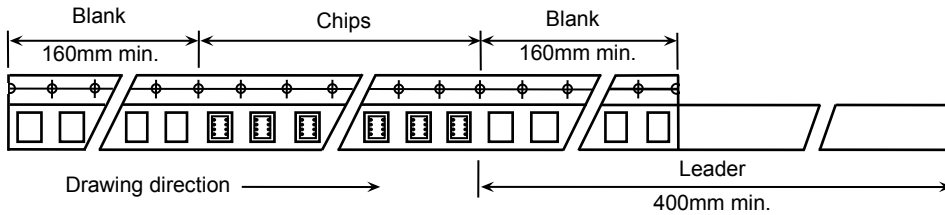
Soldering	Temp. (°C)
Reflow soldering	$\Delta T \leq 150$
Manual soldering	$\Delta T \leq 150$



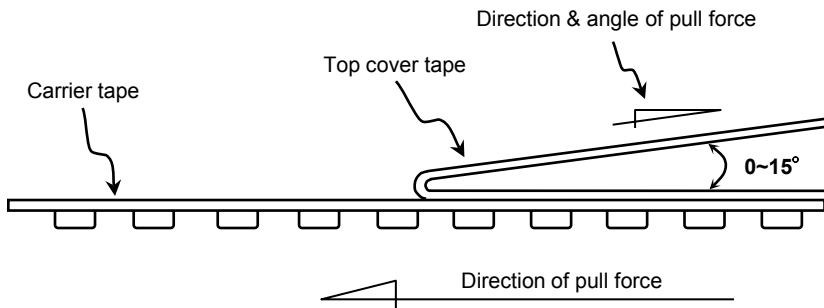
Packaging Information

CLL Series – ULI Capacitors

Carrier Tape Configuration

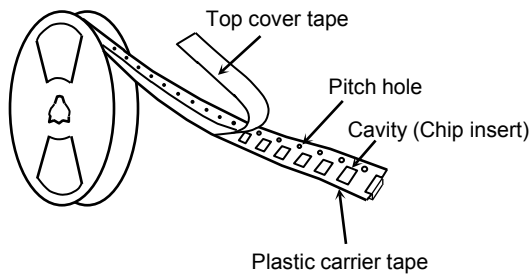


Peel Back Force (Top Tape)



- Carrier tape shall be flexible enough to be wound around a minimum radius of 30mm with components in tape.
- The missing of components shall be less than 0.1%
- Components shall not stick to the cover tape.
- The cover tape shall not protrude beyond the edges of the carrier tape and shall not cover the sprocket holes.

Chip Quantity Per Reel and Structure of Reel



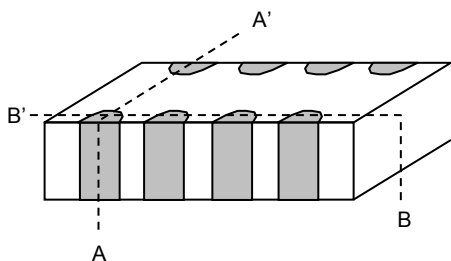
Series	Taping Material	Chip quantity (pcs.)	
		φ178mm (7") reel	φ330mm (13") reel
CLLC1A	Plastic	4,000	10,000
CLLE1A		4,000	10,000



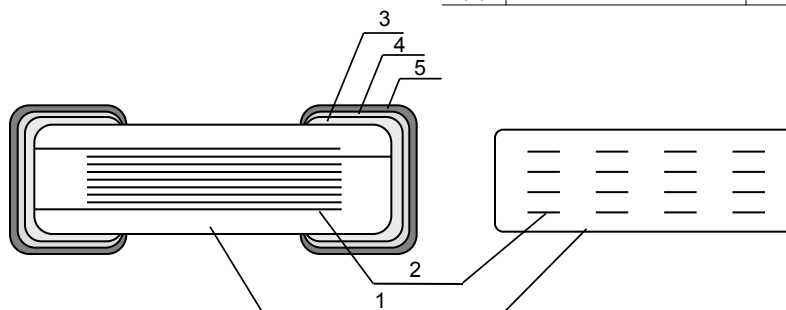
Additional Information

CLL Series – ULI Capacitors

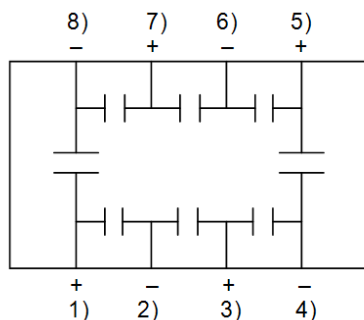
• Inside Structure & Material System



No.	NAME	MATERIAL
		Class 2
(1)	Ceramic Dielectric	BaTiO ₃
(2)	Internal Electrode	Nickel (Ni)
(3)	Termination	Copper (Cu)
(4)		Nickel (Ni)
(5)		Tin (Sn)



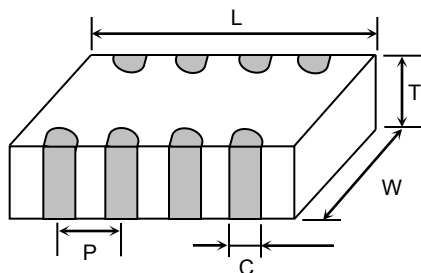
• Equivalent Circuit



+ 1) 3) 5) 7)
- 2) 4) 6) 8)

8 terminals are connected and measured at the same time.

• Shape & Dimensions



• Environmental Information

TDK Corporation established internal product environmental assurance standards that include the six hazardous substances banned by the EU RoHS Directive¹ enforced on July 1, 2006 along with additional substances independently banned by TDK and has successfully completed making general purpose electronic components conform to the RoHS Directive².

1. Abbreviation for Restriction on Hazardous Substances, which refers to the regulation EU Directive 2002/95/EC on hazardous substances by the European Union (EU) effective from July 1, 2006. The Directive bans the use of six specific hazardous substances in electric and electronic devices and products handled within the EU. The six substances are lead, mercury, cadmium, hexavalent chromium, PBB (polybrominated biphenyls), and PBDE (polybrominated diphenyl ethers).
2. This means that, in conformity with the EU Directive 2002/95/EC, lead, cadmium, mercury, hexavalent chromium, and specific bromine-based flame retardants, PBB and PBDE, have not been used, except for exempted applications.

For REACH (SVHC : 15 substances according to ECHA / October 2008) : All TDK MLCC do not contain these 15 substances.

For European Directive 2000/53/CE and 2005/673/CE : Cadmium, Hexavalent Chromium, Mercury, Lead are not contained in all TDK MLCC.

For European Directive 2003/11/CE : Pentabromodiphenyl-ether, Octabromodiphenyl-ether are not contained in all TDK MLCC.

Case Code			Dimensions (mm)				
Series	JIS	EIA	L	W	T	P	C
CLLC1A	C1608	CC0603	1.60	0.80	0.55 max.	0.40	0.25
CLLE1A	C2012	CC0805	2.00	1.25	0.95 max.	0.50	0.25



MULTILAYER CERAMIC CHIP CAPACITORS



CKC Series Array Type Capacitors

Type: CKCM25
CKCL22
CKCL44
CKCA43

Issue date: April 2011

**TDK MLCC
US Catalog**

Version B11

REMINDERS

Please read before using this product

SAFETY REMINDERS



REMINDERS

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CKC Series

2 & 4 Elements Array Capacitors

Type: CKCM25 (C1310), CKCL22 (C2012), CKCL44 (C2012), CKCA43 (C3216)

Features

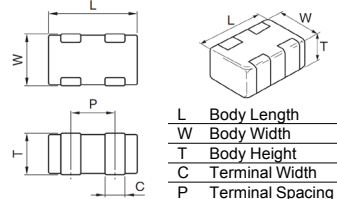


- Multiple capacitors are fitted in a single product, contributing to reduced installation costs.
- The electrostatic capacity range and shape are designed to meet the demands of the cellular phone market.
- Reduced crosstalk (signal interference) between the terminals.

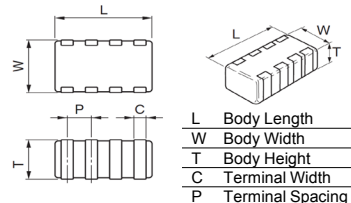
Shape & Dimensions



2 Elements Type



4 Elements Type



Applications



- Cellular telephone interface
- Interface cable circuit
- PC and peripherals
- CPU bus line
- High frequency circuit
- Noise bypass circuit



Part Number Construction

CKCM25 X7R 1E 103 M T XXXX

Series Name

Case Code	Length	Width
CKCM25	1.37 ± 0.15	1.00 ± 0.15
CKCL22	2.00 ± 0.15	1.25 ± 0.15
CKCL44	2.00 ± 0.15	1.25 ± 0.15
CKCA43	3.20 ± 0.20	1.60 ± 0.20

Temperature Characteristic

Temperature Characteristics	Capacitance Change	Temperature Range
C0G	0±30 ppm/°C	-55 to +125°C
X5R	±15%	-55 to +85°C
X7R	±15%	-55 to +125°C

Rated Voltage (DC)

Voltage Code	Voltage (DC)
0J	6.3V
1A	10V
1C	16V
1E	25V
1H	50V

Internal Codes

Packaging Style

Packaging Code	Style
T	Tape & Reel

Capacitance Tolerance

Tolerance Code	Tolerance
F	± 1%
K	± 10%
M	± 20%

Nominal Capacitance (pF)

The capacitance is expressed in three digit codes and in units of pico Farads (pF). The first and second digits identify the first and second significant figures of the capacitance. The third digit identifies the multiplier. R designates a decimal point.

Capacitance Code	Capacitance
0R5	0.5pF
010	1pF
102	1,000pF (1nF)
105	1,000,000pF (1μF)



Capacitance Range Chart

CKCM25 [EIA CC0504]

Capacitance Range Chart

Temperature Characteristics: C0G (0 ± 30 ppm/°C), X7R, (± 15%), X5R (± 15%)
 Rated Voltage: 50V (1H), 25V (1E), 16V (1C), 10V (1A), 6.3V (0J)

Capacitance (pF)	Cap Code	Tolerance	C0G	X7R		X5R		
			1H (50V)	1H (50V)	1E (25V)	1C (16V)	1A (10V)	0J (6.3V)
10	100	F: ± 1%						
15	150	K: ± 10%						
22	220							
33	330							
47	470							
68	680							
100	101	M: ± 20%						
1,000	102							
2,200	222							
4,700	472							
10,000	103							
22,000	223							
47,000	473							
100,000	104							
220,000	224							
470,000	474							
1,000,000	105							

Standard Thickness



Capacitance Range Table

CKCM25 [EIA CC0504]

Class 1 (Temperature Compensating)

Temperature Characteristics: C0G (-55 to 125°C, 0±30 ppm/°C)

TDK Part Number (Ordering Code)	Temperature Characteristics	Rated Voltage	Capacitance (pF)	Capacitance Tolerance	Thickness (mm)
CKCM25C0G1H100F	C0G	50V	10	± 1%	0.60 ± 0.06
CKCM25C0G1H150K	C0G	50V	15	± 10%	0.60 ± 0.06
CKCM25C0G1H220K	C0G	50V	22	± 10%	0.60 ± 0.06
CKCM25C0G1H330K	C0G	50V	33	± 10%	0.60 ± 0.06
CKCM25C0G1H470K	C0G	50V	47	± 10%	0.60 ± 0.06
CKCM25C0G1H680K	C0G	50V	68	± 10%	0.60 ± 0.06
CKCM25C0G1H101K	C0G	50V	100	± 10%	0.60 ± 0.06

Class 2 (Temperature Stable)

Temperature Characteristics: X7R (-55 to +125°C, ±15%), X5R (-55 to +85°C, ±15%)

TDK Part Number (Ordering Code)	Temperature Characteristics	Rated Voltage	Capacitance (pF)	Capacitance Tolerance	Thickness (mm)
CKCM25X7R1H102M	X7R	50V	1,000	± 20%	0.60 ± 0.06
CKCM25X7R1H222M	X7R	50V	2,200	± 20%	0.60 ± 0.06
CKCM25X7R1H472M	X7R	50V	4,700	± 20%	0.60 ± 0.06
CKCM25X7R1E103M	X7R	25V	10,000	± 20%	0.60 ± 0.06
CKCM25X5R1C223M	X5R	16V	22,000	± 20%	0.60 ± 0.06
CKCM25X5R1A473M	X5R	10V	47,000	± 20%	0.60 ± 0.06
CKCM25X5R0J104M	X5R	6.3V	100,000	± 20%	0.60 ± 0.06
CKCM25X5R0J224M	X5R	6.3V	220,000	± 20%	0.60 ± 0.06
CKCM25X5R0J474M	X5R	6.3V	470,000	± 20%	0.80 ± 0.10
CKCM25X5R0J105M	X5R	6.3V	1,000,000	± 20%	0.80 ± 0.10



Capacitance Range Chart

CKCL22 [EIA CC0805]

Capacitance Range Chart

Temperature Characteristics: C0G (0 ± 30 ppm/°C), X7R, (± 15%), X5R (± 15%)
 Rated Voltage: 50V (1H), 25V (1E), 16V (1C), 10V (1A), 6.3V (0J)

Capacitance (pF)	Cap Code	Tolerance	C0G	X7R		X5R		
			1H (50V)	1H (50V)	1E (25V)	1C (16V)	1A (10V)	0J (6.3V)
10	100	F: ± 1%						
15	150	K: ± 10%						
22	220							
33	330							
47	470							
68	680							
100	101							
150	151							
220	221							
330	331	M: ± 20%						
470	471							
1,000	102							
2,200	222							
4,700	472							
10,000	103							
22,000	223							
47,000	473							
100,000	104							
220,000	224							
470,000	474							
1,000,000	105							
2,200,000	225							

Standard Thickness
 0.85 ± 0.15 mm



Capacitance Range Table

CKCL22 [EIA CC0805]

Class 1 (Temperature Compensating)

Temperature Characteristics: C0G (-55 to 125°C, 0±30 ppm/°C)

TDK Part Number (Ordering Code)	Temperature Characteristics	Rated Voltage	Capacitance (pF)	Capacitance Tolerance	Thickness (mm)
CKCL22C0G1H100F	C0G	50V	10	± 1%	0.85 ± 0.10
CKCL22C0G1H150K	C0G	50V	15	± 10%	0.85 ± 0.10
CKCL22C0G1H220K	C0G	50V	22	± 10%	0.85 ± 0.10
CKCL22C0G1H330K	C0G	50V	33	± 10%	0.85 ± 0.10
CKCL22C0G1H470K	C0G	50V	47	± 10%	0.85 ± 0.10
CKCL22C0G1H680K	C0G	50V	68	± 10%	0.85 ± 0.10
CKCL22C0G1H101K	C0G	50V	100	± 10%	0.85 ± 0.10
CKCL22C0G1H151K	C0G	50V	150	± 10%	0.85 ± 0.10
CKCL22C0G1H221K	C0G	50V	220	± 10%	0.85 ± 0.10
CKCL22C0G1H331K	C0G	50V	330	± 10%	0.85 ± 0.10
CKCL22C0G1H471K	C0G	50V	470	± 10%	0.85 ± 0.10



Capacitance Range Table

CKCL22 [EIA CC0805]

Class 2 (Temperature Stable)

Temperature Characteristics: X7R (-55 to +125°C, ±15%), X5R (-55 to +85°C, ±15%)

TDK Part Number (Ordering Code)	Temperature Characteristics	Rated Voltage	Capacitance (pF)	Capacitance Tolerance	Thickness (mm)
CKCL22X7R1H102M	X7R	50V	1,000	± 20%	0.85 ± 0.10
CKCL22X7R1H222M	X7R	50V	2,200	± 20%	0.85 ± 0.10
CKCL22X7R1H472M	X7R	50V	4,700	± 20%	0.85 ± 0.10
CKCL22X7R1H103M	X7R	50V	10,000	± 20%	0.85 ± 0.10
CKCL22X7R1H223M	X7R	50V	22,000	± 20%	0.85 ± 0.10
CKCL22X7R1H473M	X7R	50V	47,000	± 20%	0.85 ± 0.10
CKCL22X7R1E104M	X7R	25V	100,000	± 20%	0.85 ± 0.10
CKCL22X5R1C224M	X5R	16V	220,000	± 20%	0.85 ± 0.10
CKCL22X5R1A474M	X5R	10V	470,000	± 20%	0.85 ± 0.10
CKCL22X5R0J105M	X5R	6.3V	1,000,000	± 20%	0.85 ± 0.10
CKCL22X5R0J225M	X5R	6.3V	2,200,000	± 20%	0.85 ± 0.10



Capacitance Range Chart

CKCL44 [EIA CC0805]

Capacitance Range Chart

Temperature Characteristics: C0G (0 ± 30 ppm/°C), X7R, (± 15%), X5R (± 15%)
 Rated Voltage: 50V (1H), 25V (1E), 16V (1C), 10V (1A), 6.3V (0J)

Capacitance (pF)	Cap Code	Tolerance	C0G	X7R			X5R	
			1H (50V)	1H (50V)	1E (25V)	1C (16V)	1A (10V)	0J (6.3V)
10	100	F: ± 1%						
15	150	K: ± 10%						
22	220							
33	330							
47	470							
68	680							
100	101							
150	151							
220	221	M: ± 20%						
470	471							
1,000	102							
2,200	222							
4,700	472							
10,000	103							
22,000	223							
47,000	473							
100,000	104							

Standard Thickness
 0.85 ± 0.15 mm



Capacitance Range Table

CKCL44 [EIA CC0805]

Class 1 (Temperature Compensating)

Temperature Characteristics: C0G (-55 to 125°C, 0±30 ppm/°C)

TDK Part Number (Ordering Code)	Temperature Characteristics	Rated Voltage	Capacitance (pF)	Capacitance Tolerance	Thickness (mm)
CKCL44C0G1H100F	C0G	50V	10	± 1%	0.85 ± 0.10
CKCL44C0G1H150K	C0G	50V	15	± 10%	0.85 ± 0.10
CKCL44C0G1H220K	C0G	50V	22	± 10%	0.85 ± 0.10
CKCL44C0G1H330K	C0G	50V	33	± 10%	0.85 ± 0.10
CKCL44C0G1H470K	C0G	50V	47	± 10%	0.85 ± 0.10
CKCL44C0G1H680K	C0G	50V	68	± 10%	0.85 ± 0.10
CKCL44C0G1H101K	C0G	50V	100	± 10%	0.85 ± 0.10
CKCL44C0G1H151K	C0G	50V	150	± 10%	0.85 ± 0.10

Class 2 (Temperature Stable)

Temperature Characteristics: X7R (-55 to +125°C, ±15%), X5R (-55 to +85°C, ±15%)

TDK Part Number (Ordering Code)	Temperature Characteristics	Rated Voltage	Capacitance (pF)	Capacitance Tolerance	Thickness (mm)
CKCL44X7R1H221M	X7R	50V	220	± 20%	0.85 ± 0.10
CKCL44X7R1H471M	X7R	50V	470	± 20%	0.85 ± 0.10
CKCL44X7R1H102M	X7R	50V	1,000	± 20%	0.85 ± 0.10
CKCL44X7R1H222M	X7R	50V	2,200	± 20%	0.85 ± 0.10
CKCL44X7R1H472M	X7R	50V	4,700	± 20%	0.85 ± 0.10
CKCL44X7R1E103M	X7R	25V	10,000	± 20%	0.85 ± 0.10
CKCL44X7R1C223M	X7R	16V	22,000	± 20%	0.85 ± 0.10
CKCL44X5R1A473M	X5R	10V	47,000	± 20%	0.85 ± 0.10
CKCL44X5R0J104M	X5R	6.3V	100,000	± 20%	0.85 ± 0.10



Capacitance Range Chart

CKCA43 [EIA CC1206]

Capacitance Range Chart

Temperature Characteristics: C0G (0 ± 30 ppm/°C), X7R, (± 15%), X5R (± 15%)
 Rated Voltage: 50V (1H), 25V (1E), 16V (1C), 10V (1A), 6.3V (0J)

Capacitance (pF)	Cap Code	Tolerance	C0G	X7R			X5R	
			1H (50V)	1H (50V)	1E (25V)	1C (16V)	1A (10V)	0J (6.3V)
10	100	F: ± 1%						
15	150	K: ± 10%						
22	220							
33	330							
47	470							
68	680							
100	101							
150	151							
220	221							
330	331							
470	471	K: ± 10%						
680	681	M: ± 20%						
1,000	102							
2,200	222	M: ± 20%						
4,700	472							
10,000	103							
22,000	223							
47,000	473							
100,000	104							
220,000	224							
470,000	474							
1,000,000	105							

Standard Thickness
 1.00 ± 0.10 mm



Capacitance Range Table

CKCA43 [EIA CC1206]

Class 1 (Temperature Compensating)

Temperature Characteristics: C0G (-55 to 125°C, 0±30 ppm/°C)

TDK Part Number (Ordering Code)	Temperature Characteristics	Rated Voltage	Capacitance (pF)	Capacitance Tolerance	Thickness (mm)
CKCA43C0G1H100F	C0G	50V	10	± 1%	1.00 ± 0.10
CKCA43C0G1H150K	C0G	50V	15	± 10%	1.00 ± 0.10
CKCA43C0G1H220K	C0G	50V	22	± 10%	1.00 ± 0.10
CKCA43C0G1H330K	C0G	50V	33	± 10%	1.00 ± 0.10
CKCA43C0G1H470K	C0G	50V	47	± 10%	1.00 ± 0.10
CKCA43C0G1H680K	C0G	50V	68	± 10%	1.00 ± 0.10
CKCA43C0G1H101K	C0G	50V	100	± 10%	1.00 ± 0.10
CKCA43C0G1H151K	C0G	50V	150	± 10%	1.00 ± 0.10
CKCA43C0G1H221K	C0G	50V	220	± 10%	1.00 ± 0.10
CKCA43C0G1H331K	C0G	50V	330	± 10%	1.00 ± 0.10
CKCA43C0G1H471K	C0G	50V	470	± 10%	1.00 ± 0.10
CKCA43C0G1H681K	C0G	50V	680	± 10%	1.00 ± 0.10
CKCA43C0G1H102K	C0G	50V	1,000	± 10%	1.00 ± 0.10



Capacitance Range Table

CKCA43 [EIA CC1206]

Class 2 (Temperature Stable)

Temperature Characteristics: X7R (-55 to +125°C, ±15%), X5R (-55 to +85°C, ±15%)

TDK Part Number (Ordering Code)	Temperature Characteristics	Rated Voltage	Capacitance (pF)	Capacitance Tolerance	Thickness (mm)
CKCA43X7R1H471M	X7R	50V	470	± 20%	1.00 ± 0.10
CKCA43X7R1H102M	X7R	50V	1,000	± 20%	1.00 ± 0.10
CKCA43X7R1H222M	X7R	50V	2,200	± 20%	1.00 ± 0.10
CKCA43X7R1H472M	X7R	50V	4,700	± 20%	1.00 ± 0.10
CKCA43X7R1H103M	X7R	50V	10,000	± 20%	1.00 ± 0.10
CKCA43X7R1H223M	X7R	50V	22,000	± 20%	1.00 ± 0.10
CKCA43X7R1E473M	X7R	25V	47,000	± 20%	1.00 ± 0.10
CKCA43X7R1C104M	X7R	16V	100,000	± 20%	1.00 ± 0.10
CKCA43X5R0J105M	X5R	6.3V	1,000,000	± 20%	1.00 ± 0.10



General Specifications

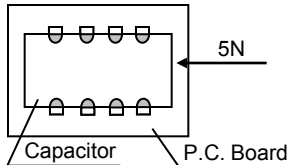
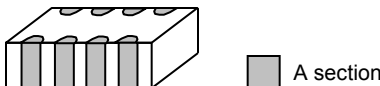
CKC Series – Array Type Capacitors

No.	Item	Performance	Test or Inspection Method													
1	External Appearance	No defects which may affect performance.	Inspect with magnifying glass (3×).													
2	Insulation Resistance	10,000MΩ min. As for the capacitors of rated voltage 16, 10, 6.3V DC, 100MΩ•μF min., whichever smaller.	To measure between each terminal. Apply rated voltage for 60s.													
3	Voltage Proof	Withstand test voltage without insulation breakdown or other damage.	<table><tr><th>Class</th><th>Apply Voltage</th></tr><tr><td>Class 1</td><td>3 x Rated Voltage</td></tr><tr><td>Class 2</td><td>2.5 x Rated Voltage</td></tr></table> Above DC voltage shall be applied across each terminal for 1 to 5s. Charge / discharge current shall not exceed 50mA.	Class	Apply Voltage	Class 1	3 x Rated Voltage	Class 2	2.5 x Rated Voltage							
Class	Apply Voltage															
Class 1	3 x Rated Voltage															
Class 2	2.5 x Rated Voltage															
4	Capacitance	Within the specified tolerance.	<table><tr><th>Class</th><th>Measuring Frequency</th><th>Measuring Voltage</th></tr><tr><td>Class 1</td><td>1MHz±10%</td><td>0.5 - 5 V_{rms}</td></tr><tr><td>Class 2</td><td>1kHz±10%</td><td>1.0±0.2V_{rms}</td></tr></table> To measure between each terminal.	Class	Measuring Frequency	Measuring Voltage	Class 1	1MHz±10%	0.5 - 5 V _{rms}	Class 2	1kHz±10%	1.0±0.2V _{rms}				
Class	Measuring Frequency	Measuring Voltage														
Class 1	1MHz±10%	0.5 - 5 V _{rms}														
Class 2	1kHz±10%	1.0±0.2V _{rms}														
5	Q (Class 1)	<table><tr><th>Rated Capacitance</th><th>Q</th></tr><tr><td>30pF and over</td><td>1,000 min.</td></tr><tr><td>Under 30pF</td><td>400+20×C min.</td></tr></table> C : Rated capacitance (pF)	Rated Capacitance	Q	30pF and over	1,000 min.	Under 30pF	400+20×C min.	See No.4 in this table for measuring condition.							
Rated Capacitance	Q															
30pF and over	1,000 min.															
Under 30pF	400+20×C min.															
6	Dissipation Factor (Class 2)	<table><tr><th>Rated Voltage (DC)</th><th>D.F.</th></tr><tr><td>25V, 50V, 100V</td><td>0.03 max.</td></tr><tr><td>6.3V, 10V, 16V</td><td>0.05 max.</td></tr></table>	Rated Voltage (DC)	D.F.	25V, 50V, 100V	0.03 max.	6.3V, 10V, 16V	0.05 max.	See No.4 in this table for measuring condition.							
Rated Voltage (DC)	D.F.															
25V, 50V, 100V	0.03 max.															
6.3V, 10V, 16V	0.05 max.															
7	Temperature Characteristics of Capacitance (Class 1)	<table><tr><th>T.C.</th><th>Temperature Coefficient</th></tr><tr><td>C0G</td><td>0 ± 30 (ppm/°C)</td></tr></table> Capacitance drift within ± 0.2% or ± 0.05pF, whichever larger.	T.C.	Temperature Coefficient	C0G	0 ± 30 (ppm/°C)	Temperature coefficient shall be calculated based on values at 25°C and 85°C temperature. Measuring temperature below 20°C shall be -10°C and -25°C.									
T.C.	Temperature Coefficient															
C0G	0 ± 30 (ppm/°C)															
8	Temperature Characteristics of Capacitance (Class 2)	Capacitance Change (%) <table><tr><th>No Voltage Applied</th></tr><tr><td>X5R: ± 15%</td></tr><tr><td>X7R: ± 15%</td></tr></table>	No Voltage Applied	X5R: ± 15%	X7R: ± 15%	Capacitance shall be measured by the steps shown in the following table after thermal equilibrium is obtained for each step. ΔC be calculated ref. STEP3 reading <table><tr><th>Step</th><th>Temperature (°C)</th></tr><tr><td>1</td><td>Reference temp. ± 2</td></tr><tr><td>2</td><td>Min. operating temp. ± 3</td></tr><tr><td>3</td><td>Reference temp. ± 2</td></tr><tr><td>4</td><td>Max. operating temp. ± 2</td></tr></table> Measuring voltage: 0.1, 0.2, 0.5, 1.0Vrms.	Step	Temperature (°C)	1	Reference temp. ± 2	2	Min. operating temp. ± 3	3	Reference temp. ± 2	4	Max. operating temp. ± 2
No Voltage Applied																
X5R: ± 15%																
X7R: ± 15%																
Step	Temperature (°C)															
1	Reference temp. ± 2															
2	Min. operating temp. ± 3															
3	Reference temp. ± 2															
4	Max. operating temp. ± 2															



General Specifications

CKC Series – Array Type Capacitors

No.	Item	Performance	Test or Inspection Method									
9	Robustness of Terminations	No sign of termination coming off, breakage of ceramic, or other abnormal signs.	Reflow solder the capacitors on P.C. board (shown in Appendix 1 to 3) and apply a pushing force of 5N with 10 ± 1s. 									
10	Solderability	New solder to cover over 75% of termination. 25% may have pin holes or rough spots but not concentrated in one spot. Ceramic surface of “A sections” shall not be exposed due to melting or shifting of termination material. 	Completely soak both terminations in solder at $235 \pm 5^{\circ}\text{C}$ for 2 ± 0.5s. Solder : H63A (JIS Z 3282) Flux : Isopropyl alcohol (JIS K 8839) Rosin (JIS K 5902) 25% solid solution.									
11	Vibration	No mechanical damage.	Reflow solder the capacitors on P.C. board (shown in Appendix 1 to 3) before testing. Vibrate the capacitor with amplitude of 1.5mm P-P sweeping the frequencies from 10Hz to 55Hz and back to 10Hz in about 1min. Repeat this for 2h each in 3 perpendicular directions.									
External appearance												
Capacitance	<table><tr><th colspan="2">Characteristics</th><th>Change from the value before test</th></tr><tr><td>Class 1</td><td>C0G</td><td>$\pm 2.5\%$</td></tr><tr><td>Class 2</td><td>X5R X7R</td><td>$\pm 7.5\%$</td></tr></table>			Characteristics		Change from the value before test	Class 1	C0G	$\pm 2.5\%$	Class 2	X5R X7R	$\pm 7.5\%$
Characteristics		Change from the value before test										
Class 1	C0G	$\pm 2.5\%$										
Class 2	X5R X7R	$\pm 7.5\%$										
Q (Class 1)	<table><tr><th>Rated Capacitance</th><th>Q</th></tr><tr><td>30pF and over</td><td>1,000 min.</td></tr><tr><td>Under 30pF</td><td>$400 + 20 \times C$ min.</td></tr></table> C : Rated capacitance (pF)			Rated Capacitance	Q	30pF and over	1,000 min.	Under 30pF	$400 + 20 \times C$ min.			
Rated Capacitance	Q											
30pF and over	1,000 min.											
Under 30pF	$400 + 20 \times C$ min.											
D.F. (Class 2)	Meet the initial spec.											



General Specifications

CKC Series – Array Type Capacitors

No.	Item	Performance	Test or Inspection Method
12	Temperature cycle		Reflow solder the capacitors on P.C. board (shown in Appendix 1 to 3) before testing.
	External appearance	No mechanical damage.	Expose the capacitors in the condition step1 through step 4 and repeat 5 times consecutively.
	Capacitance	Characteristics	Leave the capacitor in ambient conditions for 6 to 24h (Class 1) or 24±2h (Class 2) before measurement.
		Change from the value before test	
	Q (Class 1)	Class 1	± 2.5%
		Class 2	± 25 %
13	Moisture Resistance (Steady State)		Reflow solder the capacitors on P.C. board (shown in Appendix 1 to 3) before testing.
	External appearance	No mechanical damage.	Leave at temperature 40±2°C, 90 to 95%RH for 500 +24,0h.
	Capacitance	Characteristics	Leave the capacitor in ambient conditions for 6 to 24h (Class 1) or 24±2h (Class 2) before measurement.
		Change from the value before test	
	Q (Class 1)	Class 1	± 5%
		Class 2	± 25 %
	Q (Class 1)	Rated Capacitance	Q
		30pF and over	1,000 min.
		Under 30pF	400+20×C min.
	C : Rated capacitance (pF)		
	D.F. (Class 2)	Meet the initial spec.	
	Insulation Resistance	Meet the initial spec.	
	Voltage Proof	No insulation breakdown or other damage.	
	Q (Class 1)	Rated Capacitance	Q
		30pF and over	350 min.
		10pF and over under 30pF	275+5/2×C min.
	Q (Class 1)	Under 10pF	200+10×C min.
		C : Rated capacitance (pF)	
	D.F. (Class 2)	Characteristics	
		X7R: 200% of initial spec. max.	
		X5R: 200% of initial spec. max	
	Insulation Resistance	1,000MΩ min.	
		(As for the capacitors of rated voltage 16, 10, 6.3V DC, 10MΩ•μF min.)	

Step	Temperature (°C)	Time (min.)
1	Min. operating temp. ±3	30 ± 3
2	Reference Temp. ± 2	2 – 5
3	Max. operating temp. ± 2	30 ± 2
4	Reference Temp. ± 2	2 - 5



CKC Series – Array Type Capacitors

No.	Item	Performance	Test or Inspection Method									
14	Moisture Resistance		Reflow solder the capacitors on P.C. board (shown in Appendix 1 to 3) before testing. Apply the rated voltage at temperature 40±2°C and 90 to 95%RH for 500 +24,0h. Charge/discharge current shall not exceed 50mA. Leave the capacitor in ambient conditions for 6 to 24h (Class 1) or 24±2h (Class 2) before measurement. Voltage conditioning (only for class 2): Voltage treat the capacitor under testing temperature and voltage for 1 hour. Leave the capacitor in ambient conditions for 24±2h before measurement. Use this measurement for initial value.									
	External appearance	No mechanical damage.										
	Capacitance	<table><tr><th colspan="2">Characteristics</th><th>Change from the value before test</th></tr><tr><td>Class 1</td><td>C0G</td><td>± 7.5%</td></tr><tr><td>Class 2</td><td>X5R X7R</td><td>± 25 %</td></tr></table>		Characteristics		Change from the value before test	Class 1	C0G	± 7.5%	Class 2	X5R X7R	± 25 %
	Characteristics			Change from the value before test								
	Class 1	C0G		± 7.5%								
	Class 2	X5R X7R		± 25 %								
	Q (Class 1)	<table><tr><th>Rated Capacitance</th><th>Q</th></tr><tr><td>30pF and over</td><td>200 min.</td></tr><tr><td>Under 30pF</td><td>100+10/3×C min.</td></tr></table> C : Rated capacitance (pF)		Rated Capacitance	Q	30pF and over	200 min.	Under 30pF	100+10/3×C min.			
	Rated Capacitance	Q										
	30pF and over	200 min.										
	Under 30pF	100+10/3×C min.										
D.F. (Class 2)	Characteristics X7R: 200% of initial spec. max. X5R: 200% of initial spec. max.											
Insulation Resistance	500MΩ min. (As for the capacitors of rated voltage 16, 10, 6.3V DC, 5MΩ•μF min.)											
15	Life		Reflow solder the capacitors on P.C. board (shown in Appendix 1 to 3) before testing. Below the voltage shall be applied at 125±2°C for 1,000 +48, 0h. Applied voltage is 1xRV. Some items may be tested at higher voltage (1.2x, 1.5x or 2xRV). Charge/discharge current shall not exceed 50mA. Leave the capacitor in ambient conditions for 6 to 24h (Class 1) or 24±2h (Class 2) before measurement. Voltage conditioning: Voltage treat the capacitor under testing temperature and voltage for 1 hour. Leave the capacitor in ambient conditions for 24±2h before measurement. Use this measurement for initial value.									
	External appearance	No mechanical damage.										
	Capacitance	<table><tr><th colspan="2">Characteristics</th><th>Change from the value before test</th></tr><tr><td>Class 1</td><td>C0G</td><td>± 3%</td></tr><tr><td>Class 2</td><td>X5R X7R</td><td>± 25 %</td></tr></table>		Characteristics		Change from the value before test	Class 1	C0G	± 3%	Class 2	X5R X7R	± 25 %
	Characteristics			Change from the value before test								
	Class 1	C0G		± 3%								
	Class 2	X5R X7R		± 25 %								
	Q (Class 1)	<table><tr><th>Rated Capacitance</th><th>Q</th></tr><tr><td>30pF and over</td><td>350 min.</td></tr><tr><td>10pF and over under 30pF</td><td>275+5/2×C min.</td></tr><tr><td>Under 10pF</td><td>200+10×C min.</td></tr></table> C : Rated capacitance (pF)		Rated Capacitance	Q	30pF and over	350 min.	10pF and over under 30pF	275+5/2×C min.	Under 10pF	200+10×C min.	
	Rated Capacitance	Q										
	30pF and over	350 min.										
	10pF and over under 30pF	275+5/2×C min.										
Under 10pF	200+10×C min.											
D.F. (Class 2)	Characteristics X7R: 200% of initial spec. max. X5R: 200% of initial spec. max.											
Insulation Resistance	1,000MΩ min. (As for the capacitors of rated voltage 16, 10, 6.3V DC, 10MΩ•μF min.)											

*As for the initial measurement of capacitors (Class2) on number 8, 11, 12 and 13, leave capacitor at 150 –10, 0°C for 1 hour and measure the value after leaving capacitor for 24±2h in ambient condition.

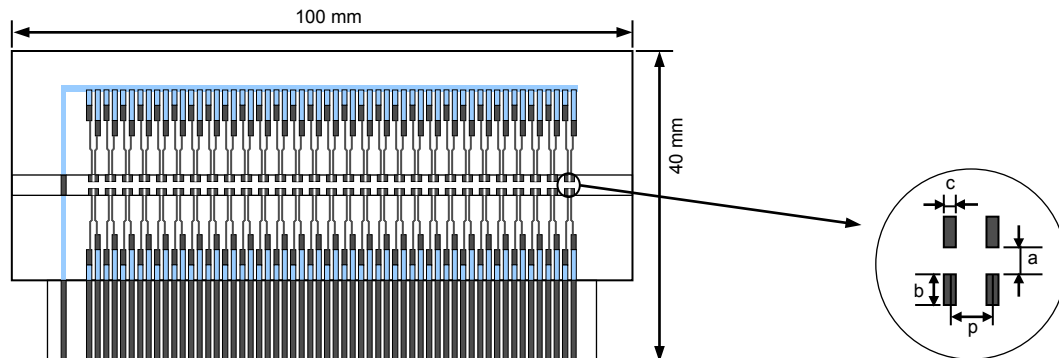


General Specifications

CKC Series – Array Type Capacitors

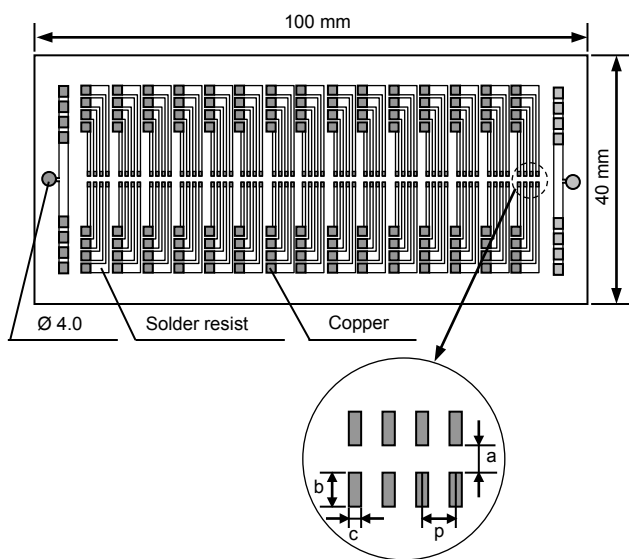
Appendix - 1

CKCM25, CKCL22



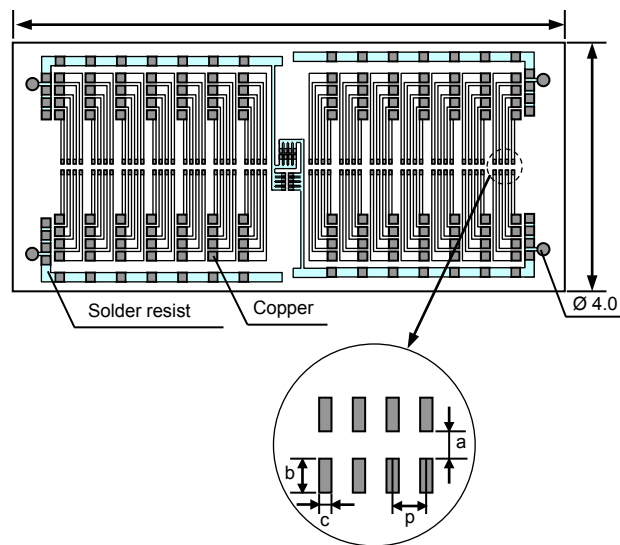
Appendix - 2

CKCL44



Appendix - 3

CKCA43



Material: Glass Epoxy (As per JIS C6484 GE4)

P.C. Board thickness: 1.6mm



Case Code			Dimensions (mm)			
Series	JIS	EIA	a	b	c	p
CKCM25	C1310	CC0504	0.5	0.5	0.36	0.64
CKCL22	C2012	CC0805	0.6	0.6	0.45	1.0
CKCL44	C2012	CC0805	0.6	0.7	0.2	0.5
CKCA43	C3216	CC1206	1.0	0.7	0.3	0.8

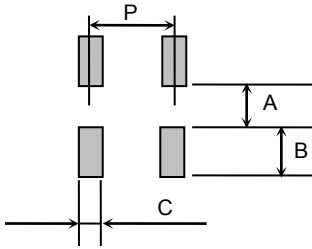


Soldering Information

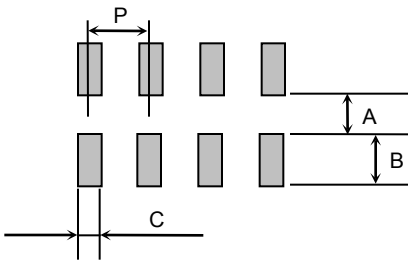
CKC Series – Array Type Capacitors

Recommended Soldering Land Pattern

CKCM25 & CKCL22



CKCL44 & CKCA43



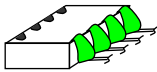
Reflow Soldering

Unit: mm

Type	CKCM25	CKCL22	CKCL44	CKCA43
Symbol				
P	0.64	1.0	0.5	0.8
A	0.3	0.4	0.55	0.6 ~ 0.7
B	0.45	0.6	0.6	0.8 ~ 1.0
C	0.3	0.5	0.25	0.4

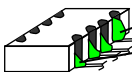
Recommended Solder Amount

Excessive solder



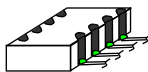
Higher tensile force on the chip capacitor may cause cracking.

Adequate solder



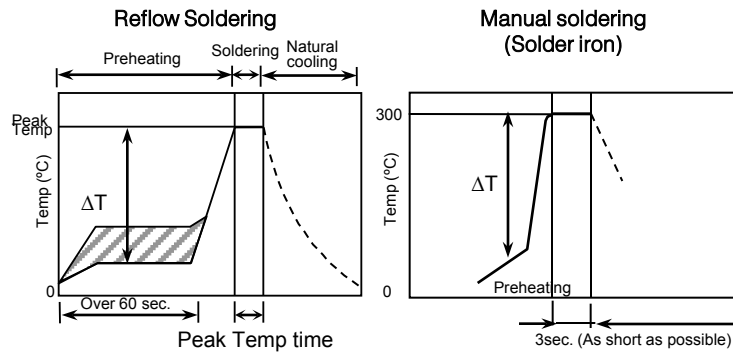
Maximum amount
Minimum amount

Insufficient solder



Small solder fillet may cause contact failure or failure to hold the chip capacitor to the P.C. board.

Recommended Soldering Profile



Recommended soldering duration

Solder	Temp./Dura.	Reflow Soldering	
		Peak temp (°C)	Duration (sec.)
Sn-Pb Solder		230 max.	20 max.
Lead-Free Solder		260 max.	10 max.

Recommended solder compositions

Sn-37Pb (Sn-Pb solder)

Sn-3.0Ag-0.5Cu (Lead Free Solder)

Preheating Condition

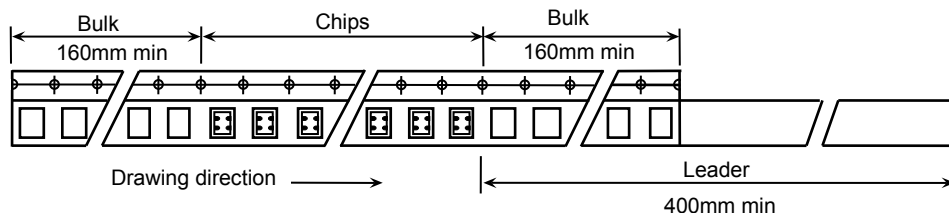
Soldering Method	Temperature (°C)	
	CKCM25, CLCL22, CKCL44	CKCA43
Reflow soldering	$\Delta T \leq 150$	$\Delta T \leq 130$
Manual soldering	$\Delta T \leq 150$	$\Delta T \leq 130$



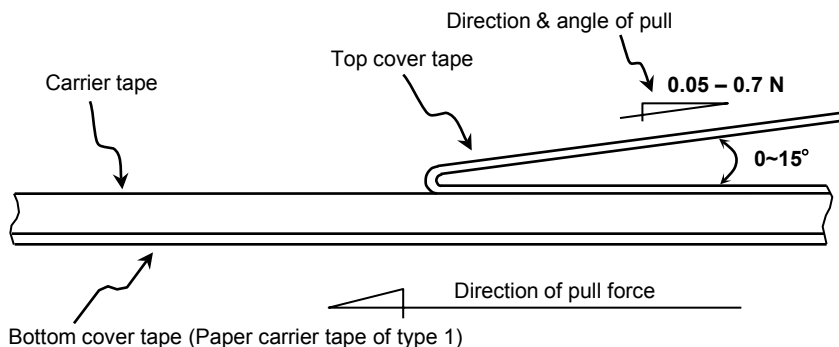
Packaging Information

CKC Series – Array Type Capacitors

Carrier Tape Configuration



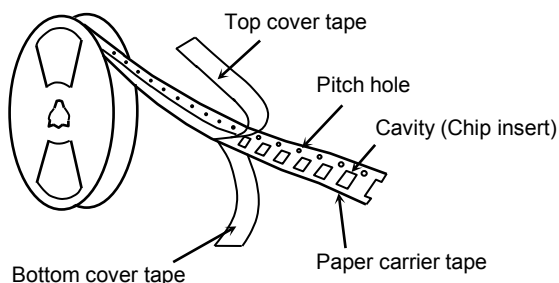
Peel Back Force (Top Tape)



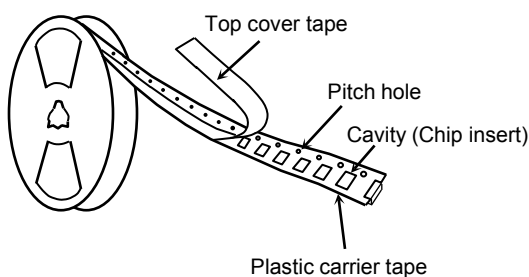
- Carrier tape shall be flexible enough to be wound around a minimum radius of 30mm with components in tape.
- The missing of components shall be less than 0.1%
- Components shall not stick to the cover tape.
- The cover tape shall not protrude beyond the edges of the carrier tape not shall cover the sprocket holes.

Chip Quantity Per Reel and Structure of Reel (Paper & Plastic)

Type 1: Paper Carrier Tape & Reel



Type 2: Plastic Carrier Tape & Reel



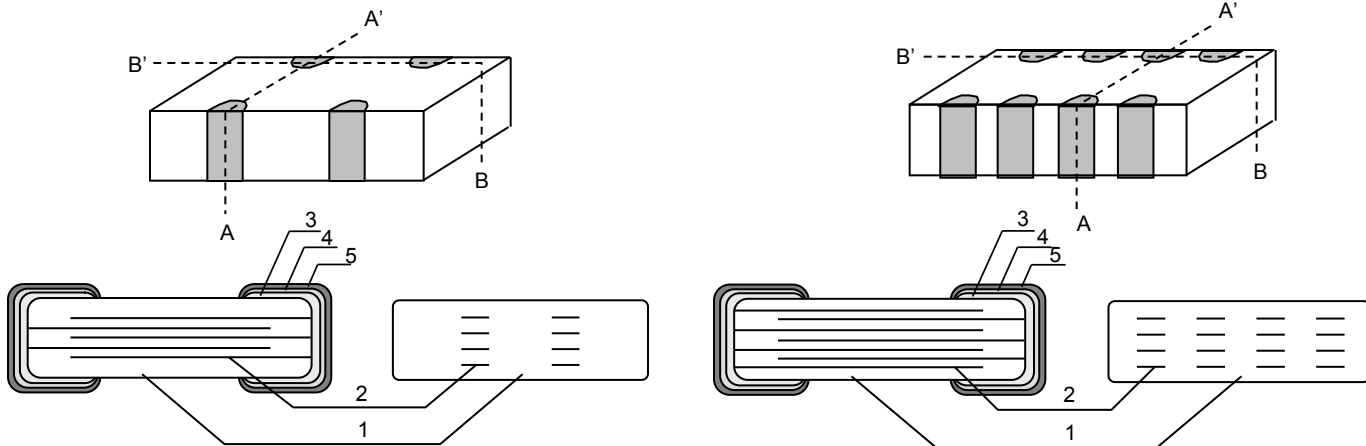
Case Code			Taping Material	Chip quantity (pcs.)	
Series	JIS	EIA		φ178mm (7") reel	φ330mm (13") reel
CKCM25	C1310	CC0504	Paper	4,000	10,000
CKCL22	C2012	CC0805	Paper		
CKCL44	C2012	CC0805	Paper		
CKCA43	C3216	CC1206	Paper	2,000	



Additional Information

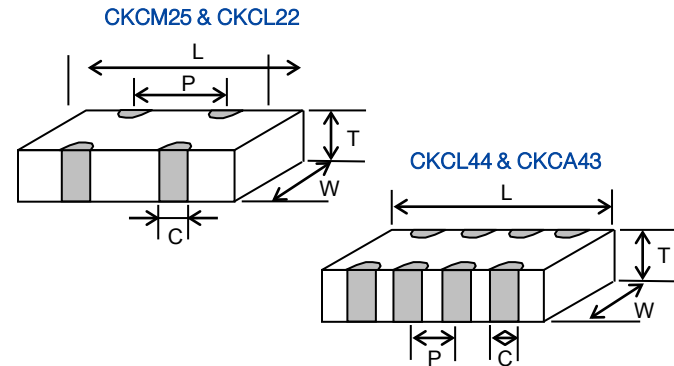
CKC Series – Array Type Capacitors

• Inside Structure & Material System



No.	NAME	MATERIAL	
		Class 1	Class 2
(1)	Ceramic Dielectric	CaZrO ₃	BaTiO ₃
(2)	Internal Electrode	Nickel (Ni)	
(3)	Termination	Copper (Cu)	
(4)		Nickel (Ni)	
(5)		Tin (Sn)	

• Shape & Dimensions



Case Code			Dimensions (mm)				
Series	JIS	EIA	L	W	T	P	C
CKCM25	C1310	CC0504	1.37	1.00	0.66 max 0.90 max	0.26 min.	0.10 min.
CKCL22	C2012	CC0805	2.00	1.25	0.85	0.35 min.	0.10 min.
CKCL44	C2012	CC0805	2.00	1.25	0.85	0.15 min.	0.10 min.
CKCA43	C3216	CC1206	3.20	1.60	1.00	0.30 min.	0.15 min.

• Environmental Information

TDK Corporation established internal product environmental assurance standards that include the six hazardous substances banned by the EU RoHS Directive¹ enforced on July 1, 2006 along with additional substances independently banned by TDK and has successfully completed making general purpose electronic components conform to the RoHS Directive².

1. Abbreviation for Restriction on Hazardous Substances, which refers to the regulation EU Directive 2002/95/EC on hazardous substances by the European Union (EU) effective from July 1, 2006. The Directive bans the use of six specific hazardous substances in electric and electronic devices and products handled within the EU. The six substances are lead, mercury, cadmium, hexavalent chromium, PBB (polybrominated biphenyls), and PBDE (polybrominated diphenyl ethers).
2. This means that, in conformity with the EU Directive 2002/95/EC, lead, cadmium, mercury, hexavalent chromium, and specific bromine-based flame retardants, PBB and PBDE, have not been used, except for exempted applications.

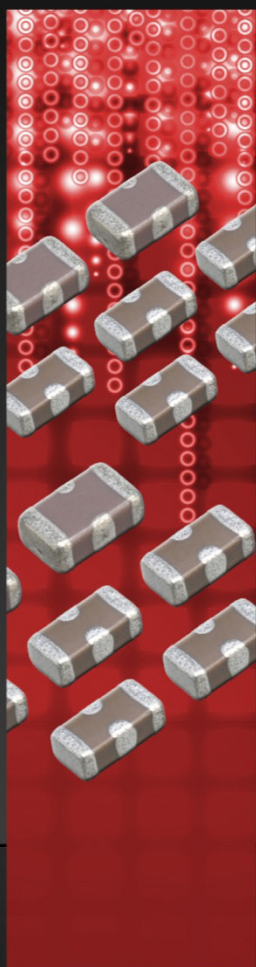
For REACH (SVHC : 15 substances according to ECHA / October 2008) : All TDK MLCC do not contain these 15 substances.

For European Directive 2000/53/CE and 2005/673/CE : Cadmium, Hexavalent Chromium, Mercury, Lead are not contained in all TDK MLCC.

For European Directive 2003/11/CE : Pentabromodiphenyl-ether, Octabromodiphenyl-ether are not contained in all TDK MLCC.



MULTILAYER CERAMIC CHIP CAPACITORS



CER Series Controlled ESR Capacitors

Type: CERB (C1608)
CERD (C2012)

Issue date: April 2011

**TDK MLCC
US Catalog**

Version B11

REMINDERS

Please read before using this product

SAFETY REMINDERS



REMINDERS

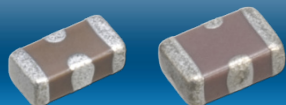
1. If you intend to use a product listed in this catalog for a purpose that may cause loss of life or other damage, you must contact our company's sales window.
2. We may modify products or discontinue production of a product listed in this catalog without prior notification.
3. We provide "Delivery Specification" that explain precautions for the specifications and safety of each product listed in this catalog. We strongly recommend that you exchange these delivery specifications with customers that use one of these products.
4. If you plan to export a product listed in this catalog, keep in mind that it may be a restricted item according to the "Foreign Exchange and Foreign Trade Control Law". In such cases, it is necessary to acquire export permission in harmony with this law.
5. Any reproduction or transferring of the contents of this catalog is prohibited without prior permission from our company.
6. We are not responsible for problems that occur related to the intellectual property rights or other rights of our company or a third party when you use a product listed in this catalog. We do not grant license of these rights.
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CER Series

Controlled ESR Capacitors

Type: CERB (C1608), CERD (C2012)



Features



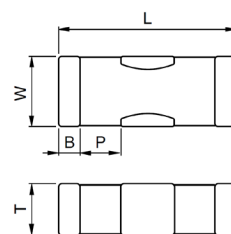
- This is a ceramic chip capacitor with the additional function of controlling (assures design of) the ESR (Equivalent Series Resistance) value as desired.
- This function enables control of voltage change, which can occur between the power source and the CPU, by controlling the impedance of capacitors located around the CPU.
- This enables a reduction in the number of parts used and contributes to cost savings, set downsizing, and upgrading quality.
- The replacement of existing products is easy because the mounting method is the same as products with two terminals.

Applications



- PC server
- Power decoupling and smoothing
- Voltage regulator
- Output filters
- Plane termination
- USB damping circuit
- Tantalum capacitor replacement

Shape & Dimensions



Dimensions in mm

Part Number Construction

Series Name			CERD	2J	X5R	0G	106	M	T	XXXX
Case Code	Length	Width								
CERB	1.60 ± 0.20	0.80 ± 0.10								
CERD	2.00 ± 0.20	1.25 ± 0.20								
ESR										
ESR Code	ESR Value									
1C	20mΩ									
1F	35mΩ									
1J	50mΩ									
2A	100mΩ									
2C	200mΩ									
2J	500mΩ									
2M	650mΩ									
3U	1,200mΩ									
Temperature Characteristic										
Temperature Characteristics	Capacitance Change	Temperature Range								
X5R	± 15%	-55 to +85°C								
Rated Voltage (DC)										
Voltage Code	Voltage (DC)									
0G	4V									

Internal Codes

Packaging Style

Packaging Code	Style
T	Tape & Reel

Capacitance Tolerance

Tolerance Code	Tolerance
M	± 20%

Nominal Capacitance (pF)

The capacitance is expressed in three digit codes and in units of pico Farads (pF). The first and second digits identify the first and second significant figures of the capacitance. The third digit identifies the multiplier. R designates a decimal point.

Capacitance Code	Capacitance
0R5	0.5pF
010	1pF
102	1,000pF (1nF)
105	1,000,000pF (1μF)



Capacitance Range Table

CERB [EIA CC0603]

Class 2 (Temperature Stable)

Temperature Characteristics: X5R (-55 to +85°C, ±15%)

TDK Part Number (Ordering Code)	ESR	Temperature Characteristics	Rated Voltage	Capacitance (pF)	Capacitance Tolerance	Thickness (mm)
CERB2CX5R0G105M	200 mΩ ± 30%	X5R	4V	1,000,000	± 20%	0.80 ± 0.10
CERB2MX5R0G105M	650 mΩ ± 30%	X5R	4V	1,000,000	± 20%	0.80 ± 0.10
CERB3UX5R0G105M	1,200 mΩ ± 30%	X5R	4V	1,000,000	± 20%	0.80 ± 0.10



Capacitance Range Table

CERD [EIA CC0805]

Class 2 (Temperature Stable)

Temperature Characteristics: X5R (-55 to +85°C, ±15%)

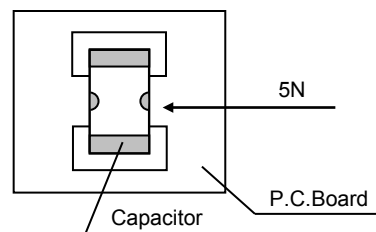
TDK Part Number (Ordering Code)	ESR	Temperature Characteristics	Rated Voltage	Capacitance (pF)	Capacitance Tolerance	Thickness (mm)
CERD1CX5R0G106M	20 mΩ ± 30%	X5R	4V	10,000,000	± 20%	0.85 ± 0.15
CERD1JX5R0G106M	50 mΩ ± 30%	X5R	4V	10,000,000	± 20%	0.85 ± 0.15
CERD2AX5R0G106M	100 mΩ ± 30%	X5R	4V	10,000,000	± 20%	0.85 ± 0.15
CERD2CX5R0G106M	200 mΩ ± 30%	X5R	4V	10,000,000	± 20%	0.85 ± 0.15
CERD2JX5R0G106M	500 mΩ ± 30%	X5R	4V	10,000,000	± 20%	0.85 ± 0.15



General Specifications

CER Series – Controlled ESR Capacitors

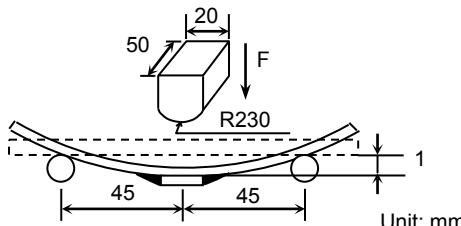
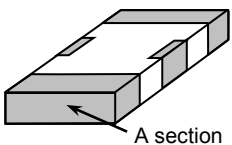
No.	Item	Performance		Test or Inspection Method											
1	External Appearance	No defects which may affect performance.		Inspect with magnifying glass (3×).											
2	Insulation Resistance	100MΩ•μF min.		Apply rated voltage for 60s.											
3	ESR	Code	ESR	Measure self resonant frequency by network analyzer.											
		1C	20 mΩ												
		1F	35 mΩ												
		1J	50 mΩ												
		2A	100 mΩ												
		2C	200 mΩ												
		2J	500 mΩ												
		2M	650 mΩ												
		3U	1,200 mΩ												
4	Voltage Proof	Withstand test voltage without insulation breakdown or other damage.		2.5 x Rated Voltage (DC) shall be applied for 1 to 5s. Charge / discharge current shall not exceed 50mA.											
5	Capacitance	Within the specified tolerance.		Measuring Frequency	Measuring Voltage										
				1kHz±10%	1.0±0.2V _{rms}										
6	Dissipation Factor	Temperature Characteristic	D.F.	See No.4 in this table for measuring condition.											
		X5R	0.10 max.												
7	Temperature Characteristics of Capacitance (Class 2)	Capacitance Change (%)		Capacitance shall be measured by the steps shown in the following table after thermal equilibrium is obtained for each step. ΔC be calculated ref. STEP3 reading <table><tr><td>Step</td><td>Temperature (°C)</td></tr><tr><td>1</td><td>Reference temp. ± 2</td></tr><tr><td>2</td><td>Min. operating temp. ± 3</td></tr><tr><td>3</td><td>Reference temp. ± 2</td></tr><tr><td>4</td><td>Max. operating temp. ± 2</td></tr></table> Measuring voltage: 0.1, 0.2, 0.5, 1.0Vrms.		Step	Temperature (°C)	1	Reference temp. ± 2	2	Min. operating temp. ± 3	3	Reference temp. ± 2	4	Max. operating temp. ± 2
		Step	Temperature (°C)												
		1	Reference temp. ± 2												
		2	Min. operating temp. ± 3												
3	Reference temp. ± 2														
4	Max. operating temp. ± 2														
No Voltage Applied															
X5R: ± 15%															
8	Robustness of Terminations	No sign of termination coming off, breakage of ceramic, or other abnormal signs.		Reflow solder the capacitors on P.C. board (shown in Appendix 2) and apply a pushing force of 5N with 10±1s.											





General Specifications

CER Series – Controlled ESR Capacitors

No.	Item	Performance	Test or Inspection Method							
9	Bending	No mechanical damage.	Glue and wave solder the capacitor on P.C. board (shown in Appendix 1) and bend it for 1mm.  Unit: mm							
10	Solderability	New solder to cover over 75% of termination. 25% may have pin holes or rough spots but not concentrated in one spot. Ceramic surface of “A sections” shall not be exposed due to melting or shifting of termination material.  A section	Completely soak both terminations in solder at $235 \pm 5^{\circ}\text{C}$ for $2 \pm 0.5\text{s}$. Solder : H63A (JIS Z 3282) Flux : Isopropyl alcohol (JIS K 8839) Rosin (JIS K 5902) 25% solid solution.							
11	Resistance to solder heat	External appearance No cracks are allowed and terminations shall be covered at least 60% with new solder. <table><tr><td rowspan="2">Capacitance</td><td colspan="2">Characteristics</td><td rowspan="2">Change from the value before test</td></tr><tr><td>Class 2</td><td>X5R</td><td>$\pm 7.5 \%$</td></tr></table> D.F. (Class 2) Meet the initial spec. Insulation Resistance Meet the initial spec. Voltage proof No insulation breakdown or other damage.	Capacitance	Characteristics		Change from the value before test	Class 2	X5R	$\pm 7.5 \%$	Completely soak both terminations in solder at $260 \pm 5^{\circ}\text{C}$ for $5 \pm 1\text{s}$. Preheating condition Temp. : $150 \pm 10^{\circ}\text{C}$ Time : 1 ~ 2min. Flux: Isopropyl alcohol (JIS K 8839) Rosin (JIS K 5902) 25% solid solution. Solder : H63A (JIS Z 3282) Leave the capacitor in ambient conditions for $48 \pm 4\text{h}$ before measurement.
Capacitance	Characteristics			Change from the value before test						
	Class 2	X5R	$\pm 7.5 \%$							
12	Vibration	External appearance No mechanical damage. <table><tr><td rowspan="2">Capacitance</td><td colspan="2">Characteristics</td><td rowspan="2">Change from the value before test</td></tr><tr><td>Class 2</td><td>X5R</td><td>$\pm 7.5 \%$</td></tr></table> D.F. (Class 2) Meet the initial spec.	Capacitance	Characteristics		Change from the value before test	Class 2	X5R	$\pm 7.5 \%$	Solder the capacitors on P.C. board (shown in Appendix 2) before testing. Vibrate the capacitor with amplitude of 1.5mm P-P changing the frequencies from 10Hz to 55Hz and back to 10Hz in about 1min. Repeat this for 2h each in 3 perpendicular directions.
Capacitance	Characteristics			Change from the value before test						
	Class 2	X5R	$\pm 7.5 \%$							



General Specifications

CER Series – Controlled ESR Capacitors

No.	Item	Performance	Test or Inspection Method						
13	Temperature cycle		Reflow solder the capacitors on a P.C. board (shown in Appendix 2) before testing. Expose the capacitor in the conditions in step 1 through step 4, and repeat 5 times consecutively. Leave the capacitor in ambient conditions for 48±4h before measurement.						
	External appearance	No mechanical damage.							
	Capacitance	<table><tr><th colspan="2">Characteristics</th><th>Change from the value before test</th></tr><tr><td>Class 2</td><td>X5R</td><td>± 12.5%</td></tr></table>		Characteristics		Change from the value before test	Class 2	X5R	± 12.5%
	Characteristics			Change from the value before test					
	Class 2	X5R		± 12.5%					
	D.F. (Class 2)	Meet the initial spec.							
Insulation Resistance	Meet the initial spec.								
Voltage Proof	No insulation breakdown or other damage.								
14	Moisture Resistance (Steady State)		Reflow solder the capacitor on P.C. board (shown in Appendix 2) before testing. Leave at temperature 40±2°C, 90 to 95%RH for 500 +24,0h. Leave the capacitor in ambient condition for 48±4h before measurement.						
	External appearance	No mechanical damage.							
	Capacitance	<table><tr><th colspan="2">Characteristics</th><th>Change from the value before test</th></tr><tr><td>Class 2</td><td>X5R</td><td>± 25%</td></tr></table>		Characteristics		Change from the value before test	Class 2	X5R	± 25%
	Characteristics			Change from the value before test					
	Class 2	X5R		± 25%					
	D.F. (Class 2)	200% of initial spec. max.							
Insulation Resistance	10MΩ•µF min.								
15	Moisture Resistance		Reflow solder the capacitors on P.C. board (shown in Appendix 2) before testing. Apply the rated voltage at temperature 40±2°C and 90 to 95%RH for 500 +24,0h. Charge/discharge current shall not exceed 50mA. Leave the capacitor in ambient conditions for 48±4h before measurement. Voltage conditioning: Voltage treat the capacitors under testing temperature and voltage for 1 hour. Leave the capacitors in ambient condition for 48±4h before measurement. Use this measurement for initial value.						
	External appearance	No mechanical damage.							
	Capacitance	<table><tr><th colspan="2">Characteristics</th><th>Change from the value before test</th></tr><tr><td>Class 2</td><td>X5R</td><td>± 25%</td></tr></table>		Characteristics		Change from the value before test	Class 2	X5R	± 25%
	Characteristics			Change from the value before test					
	Class 2	X5R		± 25%					
	D.F. (Class 2)	200% of initial spec. max.							
Insulation Resistance	5MΩ•µF min.								

Step	Temperature ($^\circ\text{C}$)	Time (min.)
1	Min. operating temp. ± 3	30 ± 3
2	Reference Temp.	2 – 5
3	Max. operating temp. ± 2	30 ± 2
4	Reference Temp.	2 – 5



General Specifications

CER Series – Controlled ESR Capacitors

No.	Item	Performance	Test or Inspection Method						
16	Life								
	External appearance	No mechanical damage.	Reflow solder the capacitors on P.C. board (shown in Appendix 2) before testing. Apply rated voltage at $85\pm2^{\circ}\text{C}$ for $1,000\pm48,0\text{h}$.						
	Capacitance	<table><tr><th colspan="2">Characteristics</th><th>Change from the value before test</th></tr><tr><td>Class 2</td><td>X5R</td><td>$\pm 25\%$</td></tr></table>	Characteristics		Change from the value before test	Class 2	X5R	$\pm 25\%$	Charge/discharge current shall not exceed 50mA. Leave the capacitor in ambient conditions for $48\pm4\text{h}$ before measurement.
	Characteristics		Change from the value before test						
	Class 2	X5R	$\pm 25\%$						
D.F. (Class 2)	200% of initial spec. max.	Voltage conditioning: Voltage treat the capacitors under testing temperature and voltage for 1 hour.							
Insulation Resistance	$10\text{M}\Omega\cdot\mu\text{F}$ min.	Leave the capacitors in ambient condition for $48\pm4\text{h}$ before measurement. Use this measurement for initial value.							

***As for the initial measurement of capacitors on number 7,11,12,13 and 14, leave capacitors at $150 \pm 10,0^\circ \text{C}$ for 1h and measure the value after leaving capacitors for $48 \pm 4\text{h}$ in ambient condition.**

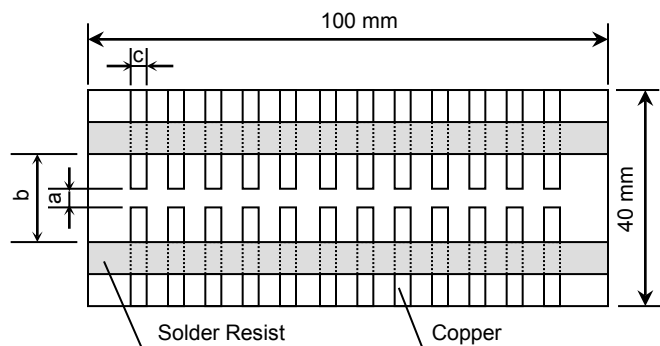


General Specifications

CER Series – Controlled ESR Capacitors

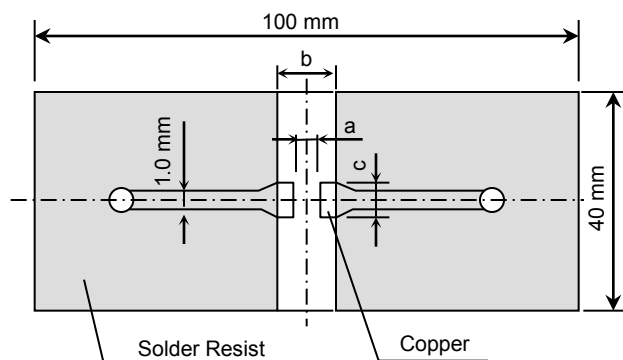
Appendix - 1

P.C. Board for reliability test



Appendix - 2

P.C. Board for bending test



Material : Glass Epoxy (As per JIS C6484 GE4)

P.C. Board thickness : Appendix-2a 0.8mm
Appendix-1a, 1b, 2b 1.6mm

- Copper (thickness 0.035mm)
- Solder resist

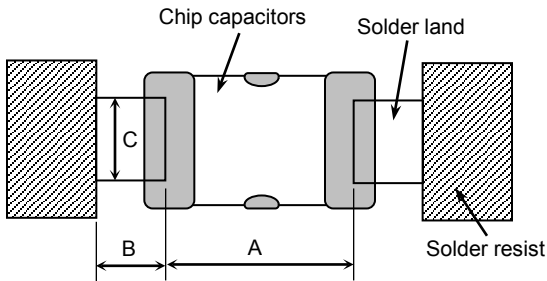
Case Code			Dimensions (mm)		
Series	JIS	EIA	a	b	c
CERA	C1005	CC0402	0.4	1.5	0.5
CERB	C1608	CC0603	1.0	3.0	1.2
CERD	C2012	CC0805	1.2	4.0	1.65
CERF	C3216	CC1206	2.2	5.0	2.9



Soldering Information

CER Series – Controlled ESR Capacitors

Recommended Soldering Land Pattern

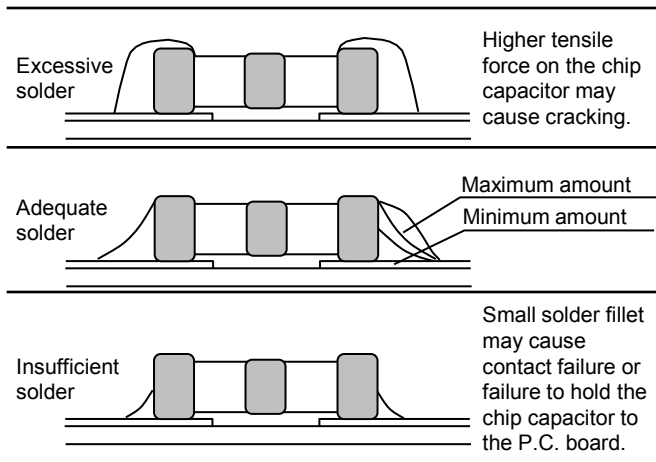


Reflow Soldering

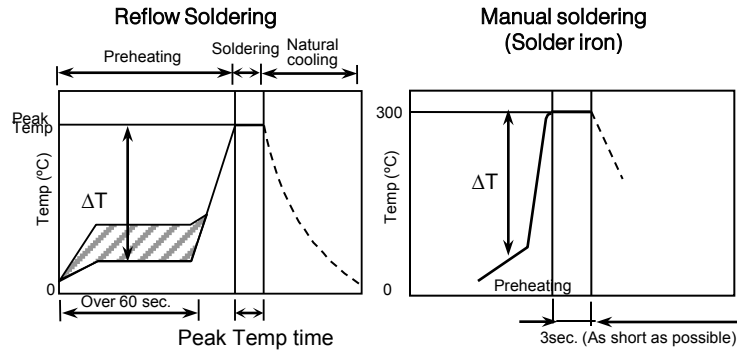
Unit: mm

Type	A	B	D	F
Symbol	[CC0402]	[CC0603]	[CC0805]	[CC1206]
A	0.3 - 0.5	0.6 - 0.8	0.9 - 1.2	2.0 - 2.4
B	0.35 - 0.45	0.6 - 0.8	0.7 - 0.9	1.0 - 1.2
C	0.4 - 0.6	0.6 - 0.8	0.9 - 1.2	1.1 - 1.6

Recommended Solder Amount



Recommended Soldering Profile



Recommended soldering duration

Solder	Temp./Dura.	Reflow Soldering	
		Peak temp (°C)	Duration (sec.)
Sn-Pb Solder		230 max.	20 max.
Lead-Free Solder		260 max.	10 max.

Recommended solder compositions

Sn-37Pb (Sn-Pb solder)

Sn-3.0Ag-0.5Cu (Lead Free Solder)

Preheating Condition

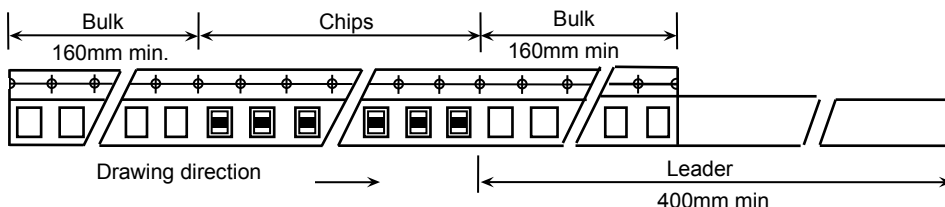
Soldering	Temp. (°C)
Reflow soldering	$\Delta T \leq 150$
Manual soldering	$\Delta T \leq 150$



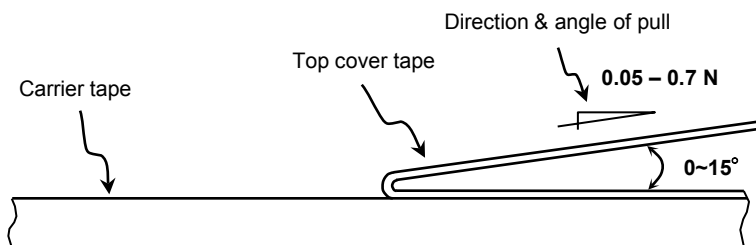
Packaging Information

CER Series – Controlled ESR Capacitors

Carrier Tape Configuration

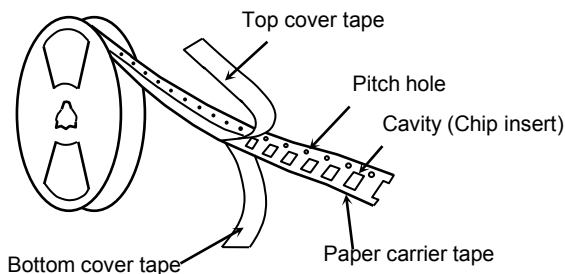


Peel Back Force (Top Tape)



- Carrier tape shall be flexible enough to be wound around a minimum radius of 30mm with components in tape.
- The missing of components shall be less than 0.1%
- Components shall not stick to the cover tape.
- The cover tape shall not protrude beyond the edges of the carrier tape not shall cover the sprocket holes.

Chip Quantity Per Reel and Structure of Reel



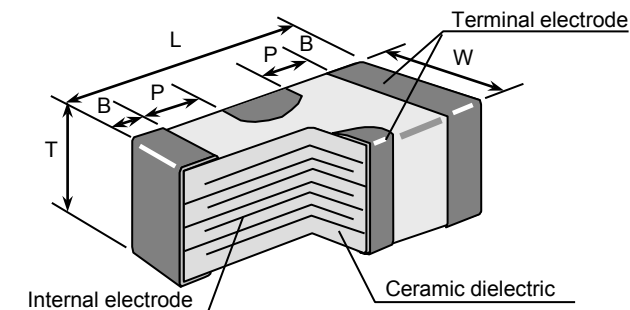
Case Code			Chip Thickness	Taping Material	Chip quantity (pcs.)	
Series	JIS	EIA			φ178mm (7") reel	φ330mm (13") reel
CERB	C1608	CC0603	0.80 mm	Paper	4,000	10,000
CERD	C2012	CC0805	085 mm	Paper	4,000	10,000



Additional Information

CER Series – Controlled ESR Capacitors

• Shape & Dimensions



Case Code			Dimensions (mm)				
Series	JIS	EIA	L	W	T	B	P
CERB	C1608	CC0603	1.60	0.80	0.80	0.25	0.25
CERD	C2012	CC0805	2.00	1.25	0.85	0.30	0.25

• Environmental Information

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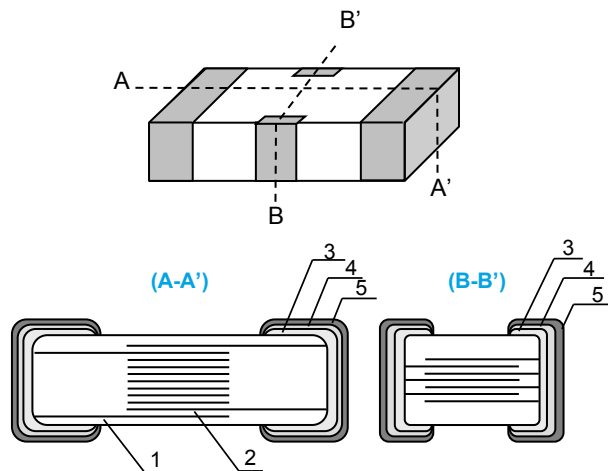
1. Abbreviation for Restriction on Hazardous Substances, which refers to the regulation EU Directive 2002/95/EC on hazardous substances by the European Union (EU) effective from July 1, 2006. The Directive bans the use of six specific hazardous substances in electric and electronic devices and products handled within the EU. The six substances are lead, mercury, cadmium, hexavalent chromium, PBB (polybrominated biphenyls), and PBDE (polybrominated diphenyl ethers).
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• Inside Structure & Material System



No.	NAME	MATERIAL	
		Class 1	Class 2
(1)	Ceramic Dielectric	CaZrO ₃	BaTiO ₃
(2)	Internal Electrode	Nickel (Ni)	
(3)	Termination	Copper (Cu)	
(4)		Nickel (Ni)	
(5)		Tin (Sn)	



MULTILAYER CERAMIC CHIP CAPACITORS



CKG Series Mega Cap Type Capacitors

Type: CKG32K
CKG45K
CKG57K
CKG45N
CKG57N

Issue date: April 2011

**TDK MLCC
US Catalog**

Version B11

REMINDERS

Please read before using this product

SAFETY REMINDERS



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3. We provide "Delivery Specification" that explain precautions for the specifications and safety of each product listed in this catalog. We strongly recommend that you exchange these delivery specifications with customers that use one of these products.
4. If you plan to export a product listed in this catalog, keep in mind that it may be a restricted item according to the "Foreign Exchange and Foreign Trade Control Law". In such cases, it is necessary to acquire export permission in harmony with this law.
5. Any reproduction or transferring of the contents of this catalog is prohibited without prior permission from our company.
6. We are not responsible for problems that occur related to the intellectual property rights or other rights of our company or a third party when you use a product listed in this catalog. We do not grant license of these rights.
7. This catalog only applies to products purchased through our company or one of our company's official agencies. This catalog does not apply to products that are purchased through other third parties.



CKG Series

Mega Cap Type Capacitors

Type: CKG32K, CKG45K, CKG57K, CKG45N, CKG57N

Features



- No polarity
- Twice the capacitance is obtainable on a single capacitor space
- Unique construction provides high reliability
- The metal caps absorb stress from thermal and mechanical shocks, ensuring excellent performance on aluminum circuit substrates
- Low ESR and ESL promise excellent characteristics for high frequency switching power supply

Structure



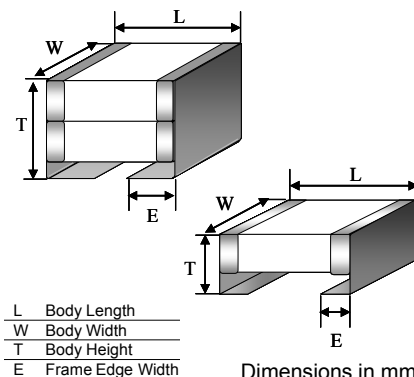
No.	Name	Material
①	Dielectric	BaTiO ₃
②	Electrode	Ni
③	Termination	Cu
④		Ni-Sn
⑤	Metal Cap Joint	High Temp Solder
⑥	Metal Cap	42 Alloy

Applications



- Smoothing circuits
- Temperature variable applications
- Maintenance free power supplies
- DC to DC converters
- Automotive applications

Shape & Dimensions



L	Body Length
W	Body Width
T	Body Height
E	Frame Edge Width

Dimensions in mm

Part Number Construction

Series Name

Case Code	Length	Width
CKG32K	3.60 ± 0.30	2.60 ± 0.30
CKG45K	5.00 ± 0.50	3.50 ± 0.50
CKG57K	6.00 ± 0.50	5.00 ± 0.50
CKG45N	5.00 ± 0.50	3.50 ± 0.50
CKG57N	6.00 ± 0.50	5.00 ± 0.50

Temperature Characteristic

Temperature Characteristics	Capacitance Change	Temperature Range
X5R	± 15%	-55 to +85°C
X7R	± 15%	-55 to +125°C
X7S	± 22%	-55 to +125°C
X7T	+22/-33%	-55 to +125°C

Rated Voltage (DC)

Voltage Code	Voltage (DC)
1C	16V
1E	25V
1H	50V
2A	100V
2E	250V
2W	450V
2J	630V

CKG32K X7R 1E 106 M T XXXX

Internal Codes

Packaging Style

Packaging Code	Style
T	Tape & Reel

Capacitance Tolerance

Tolerance Code	Tolerance
M	± 20%

Nominal Capacitance (pF)

The capacitance is expressed in three digit codes and in units of pico Farads (pF). The first and second digits identify the first and second significant figures of the capacitance. The third digit identifies the multiplier. R designates a decimal point.

Capacitance Code	Capacitance
0R5	0.5pF
010	1pF
102	1,000pF (1nF)
105	1,000,000pF (1μF)



Capacitance Range Chart

CKG32K [Single Stack]

Capacitance Range Chart

Temperature Characteristics: X7R ($\pm 15\%$), X7S (± 22), X7T ($+22/-33$)
 Rated Voltage: 630V (2J), 450 (2W), 250V (2E), 100V (2A), 50V (1H), 25V (1E)

Capacitance (pF)	Cap Code	Tolerance	X7R					X7S		X7T		
			2J (630V)	2E (250V)	2A (100V)	1H (50V)	1E (25V)	2A (100V)	1H (50V)	2J (630V)	2W (450V)	2E (250V)
47,000	473	M: $\pm 20\%$										
100,000	104											
150,000	154											
220,000	224											
330,000	334											
470,000	474											
1,000,000	105											
2,200,000	225											
4,700,000	475											
10,000,000	106											

Standard Thickness

3.35 mm



Capacitance Range Table

CKG32K [Single Stack]

Class 2 (Temperature Stable)

Temperature Characteristics: X7R (-55 to +125°C, $\pm 15\%$), X7S (-55 to +125°C, $\pm 22\%$), X7T (-55 to +125°C, $+22/-33\%$)

TDK Part Number (Ordering Code)	Temperature Characteristics	Rated Voltage	Capacitance (pF)	Capacitance Tolerance	Thickness (mm)
CKG32KX7R1E475M	X7R	25V	4,700,000	$\pm 20\%$	3.35 $\pm$ 0.15
CKG32KX7R1E106M	X7R	25V	10,000,000	$\pm 20\%$	3.35 $\pm$ 0.15
CKG32KX7R1H105M	X7R	50V	1,000,000	$\pm 20\%$	3.35 $\pm$ 0.15
CKG32KX7R2A474M	X7R	100V	470,000	$\pm 20\%$	3.35 $\pm$ 0.15
CKG32KX7R2A105M	X7R	100V	1,000,000	$\pm 20\%$	3.35 $\pm$ 0.15
CKG32KX7R2A225M	X7R	100V	2,200,000	$\pm 20\%$	3.35 $\pm$ 0.15
CKG32KX7R2E104M	X7R	250V	100,000	$\pm 20\%$	3.35 $\pm$ 0.15
CKG32KX7R2E224M	X7R	250V	220,000	$\pm 20\%$	3.35 $\pm$ 0.15
CKG32KX7R2J473M	X7R	630V	47,000	$\pm 20\%$	3.35 $\pm$ 0.15
CKG32KX7S1H475M	X7S	50V	4,700,000	$\pm 20\%$	3.35 $\pm$ 0.15
CKG32KX7S1H106M	X7S	50V	10,000,000	$\pm 20\%$	3.35 $\pm$ 0.15
CKG32KX7S2A475M	X7S	100V	4,700,000	$\pm 20\%$	3.35 $\pm$ 0.15
CKG32KX7T2E334M	X7T	250V	330,000	$\pm 20\%$	3.35 $\pm$ 0.15
CKG32KX7T2W224M	X7T	450V	220,000	$\pm 20\%$	3.35 $\pm$ 0.15
CKG32KX7T2J154M	X7T	630V	150,000	$\pm 20\%$	3.35 $\pm$ 0.15



Capacitance Range Chart

CKG45K [Single Stack]

Capacitance Range Chart

Temperature Characteristics: X7R ($\pm 15\%$), X7S ($\pm 22\%$), X7T ($+22/-33\%$)
 Rated Voltage: 630V (2J), 450 (2W), 250V (2E), 100V (2A), 50V (1H), 25V (1E), 16V (1C)

Capacitance (pF)	Cap Code	Tolerance	X7R						X7S	X7T		
			2J (630V)	2E (250V)	2A (100V)	1H (50V)	1E (25V)	1C (16V)	2A (100V)	2J (630V)	2W (450V)	2E (250V)
100,000	104	M: $\pm 20\%$										
220,000	224											
470,000	474											
1,000,000	105											
2,200,000	225											
3,300,000	335											
4,700,000	475											
10,000,000	106											
22,000,000	226											

Standard Thickness

2.90 mm



Capacitance Range Table

CKG45K [Single Stack]

Class 2 (Temperature Stable)

Temperature Characteristics: X7R (-55 to +125°C, $\pm 15\%$), X7S (-55 to +125°C, $\pm 22\%$), X7T (-55 to +125°C, $+22/-33\%$)

TDK Part Number (Ordering Code)	Temperature Characteristics	Rated Voltage	Capacitance (pF)	Capacitance Tolerance	Thickness (mm)
CKG45KX7R1C106M	X7R	16V	10,000,000	$\pm 20\%$	2.90 $\pm$ 0.10
CKG45KX7R1C226M	X7R	16V	22,000,000	$\pm 20\%$	2.90 $\pm$ 0.10
CKG45KX7R1E475M	X7R	25V	4,700,000	$\pm 20\%$	2.90 $\pm$ 0.10
CKG45KX7R1H335M	X7R	50V	3,300,000	$\pm 20\%$	2.90 $\pm$ 0.10
CKG45KX7R1H475M	X7R	50V	4,700,000	$\pm 20\%$	2.90 $\pm$ 0.10
CKG45KX7R2A105M	X7R	100V	1,000,000	$\pm 20\%$	2.90 $\pm$ 0.10
CKG45KX7R2A225M	X7R	100V	2,200,000	$\pm 20\%$	2.90 $\pm$ 0.10
CKG45KX7R2E224M	X7R	250V	220,000	$\pm 20\%$	2.90 $\pm$ 0.10
CKG45KX7R2E474M	X7R	250V	470,000	$\pm 20\%$	2.90 $\pm$ 0.10
CKG45KX7R2J104M	X7R	630V	100,000	$\pm 20\%$	2.90 $\pm$ 0.10
CKG45KX7S2A475M	X7S	100V	4,700,000	$\pm 20\%$	2.90 $\pm$ 0.10
CKG45KX7T2E105M	X7T	250V	1,000,000	$\pm 20\%$	2.90 $\pm$ 0.10
CKG45KX7T2W474M	X7T	450V	470,000	$\pm 20\%$	2.90 $\pm$ 0.10
CKG45KX7T2J224M	X7T	630V	220,000	$\pm 20\%$	2.90 $\pm$ 0.10



Capacitance Range Chart

CKG57K [Single Stack]

Capacitance Range Chart

Temperature Characteristics: X7R ($\pm 15\%$), X7S (± 22), X7T ($+22/-33$)
 Rated Voltage: 630V (2J), 450 (2W), 250V (2E), 100V (2A), 50V (1H), 25V (1E), 16V (1C)

Capacitance (pF)	Cap Code	Tolerance	X7R						X7S	X7T		
			2J (630V)	2E (250V)	2A (100V)	1H (50V)	1E (25V)	1C (16V)	2A (100V)	2J (630V)	2W (450V)	2E (250V)
220,000	224	M: $\pm 20\%$										
470,000	474											
1,000,000	105											
2,200,000	225											
3,300,000	335											
4,700,000	475											
10,000,000	106											
22,000,000	226											
47,000,000	476											

Standard Thickness

3.35 mm



Capacitance Range Table

CKG57K [Single Stack]

Class 2 (Temperature Stable)

Temperature Characteristics: X7R (-55 to +125°C, $\pm 15\%$), X7S (-55 to +125°C, $\pm 22\%$), X7T (-55 to +125°C, $+22/-33\%$)

TDK Part Number (Ordering Code)	Temperature Characteristics	Rated Voltage	Capacitance (pF)	Capacitance Tolerance	Thickness (mm)
CKG57KX7R1C476M	X7R	16V	47,000,000	$\pm 20\%$	3.35 $\pm$ 0.15
CKG57KX7R1E106M	X7R	25V	10,000,000	$\pm 20\%$	3.35 $\pm$ 0.15
CKG57KX7R1E226M	X7R	25V	22,000,000	$\pm 20\%$	3.35 $\pm$ 0.15
CKG57KX7R1H475M	X7R	50V	4,700,000	$\pm 20\%$	3.35 $\pm$ 0.15
CKG57KX7R1H106M	X7R	50V	10,000,000	$\pm 20\%$	3.35 $\pm$ 0.15
CKG57KX7R2A105M	X7R	100V	1,000,000	$\pm 20\%$	3.35 $\pm$ 0.15
CKG57KX7R2A225M	X7R	100V	2,200,000	$\pm 20\%$	3.35 $\pm$ 0.15
CKG57KX7R2A335M	X7R	100V	3,300,000	$\pm 20\%$	3.35 $\pm$ 0.15
CKG57KX7R2A475M	X7R	100V	4,700,000	$\pm 20\%$	3.35 $\pm$ 0.15
CKG57KX7R2E474M	X7R	250V	470,000	$\pm 20\%$	3.35 $\pm$ 0.15
CKG57KX7R2E105M	X7R	250V	1,000,000	$\pm 20\%$	3.35 $\pm$ 0.15
CKG57KX7R2J224M	X7R	630V	220,000	$\pm 20\%$	3.35 $\pm$ 0.15
CKG57KX7S2A106M	X7S	100V	10,000,000	$\pm 20\%$	3.35 $\pm$ 0.15
CKG57KX7T2E225M	X7T	250V	2,200,000	$\pm 20\%$	3.35 $\pm$ 0.15
CKG57KX7T2W105M	X7T	450V	1,000,000	$\pm 20\%$	3.35 $\pm$ 0.15
CKG57KX7T2J474M	X7T	630V	470,000	$\pm 20\%$	3.35 $\pm$ 0.15



Capacitance Range Chart

CKG45N [Double Stack]

Capacitance Range Chart

Temperature Characteristics: X7R ($\pm 15\%$), X7S ($\pm 22\%$), X7T ($+22/-33\%$), X5R ($\pm 15\%$)
 Rated Voltage: 630V (2J), 450 (2W), 250V (2E), 100V (2A), 50V (1H), 25V (1E), 16V (1C)

Capacitance (pF)	Cap Code	Tolerance	X7R						X7T		
			2J (630V)	2E (250V)	2A (100V)	1H (50V)	1E (25V)	1C (16V)	2J (630V)	2W (450V)	2E (250V)
220,000	224	M: $\pm 20\%$									
470,000	474										
1,000,000	105										
2,200,000	225										
3,300,000	335										
4,700,000	475										
6,800,000	685										
10,000,000	106										
22,000,000	226										
47,000,000	476										

Capacitance (pF)	Cap Code	Tolerance	X7S			X5R	
			2A (100V)	1H (50V)	1C (16V)	1H (50V)	1C (16V)
4,700,000	475	M: $\pm 20\%$					
6,800,000	685						
10,000,000	106						
22,000,000	226						
47,000,000	476						

Standard Thickness

5.00 mm



Capacitance Range Table

CKG45N [Double Stack]

Class 2 (Temperature Stable)

Temperature Characteristics: X7R (-55 to +125°C, $\pm 15\%$), X7S (-55 to +125°C, $\pm 22\%$),
 X7T (-55 to +125°C, $+22/-33\%$), X5R (-55 to +85°C, $\pm 15\%$)

TDK Part Number (Ordering Code)	Temperature Characteristics	Rated Voltage	Capacitance (pF)	Capacitance Tolerance	Thickness (mm)
CKG45NX5R1C476M	X5R	16V	47,000,000	$\pm 20\%$	5.00 $\pm$ 0.50
CKG45NX5R1H106M	X5R	50V	10,000,000	$\pm 20\%$	5.00 $\pm$ 0.50
CKG45NX7R1C226M	X7R	16V	22,000,000	$\pm 20\%$	5.00 $\pm$ 0.50
CKG45NX7R1E106M	X7R	25V	10,000,000	$\pm 20\%$	5.00 $\pm$ 0.50
CKG45NX7R1H335M	X7R	50V	3,300,000	$\pm 20\%$	5.00 $\pm$ 0.50
CKG45NX7R1H685M	X7R	50V	6,800,000	$\pm 20\%$	5.00 $\pm$ 0.50
CKG45NX7R2A225M	X7R	100V	2,200,000	$\pm 20\%$	5.00 $\pm$ 0.50
CKG45NX7R2A475M	X7R	100V	4,700,000	$\pm 20\%$	5.00 $\pm$ 0.50
CKG45NX7R2E474M	X7R	250V	470,000	$\pm 20\%$	5.00 $\pm$ 0.50
CKG45NX7R2E105M	X7R	250V	1,000,000	$\pm 20\%$	5.00 $\pm$ 0.50
CKG45NX7R2J224M	X7R	630V	220,000	$\pm 20\%$	5.00 $\pm$ 0.50
CKG45NX7S1C476M	X7S	16V	47,000,000	$\pm 20\%$	5.00 $\pm$ 0.50
CKG45NX7S1H106M	X7S	50V	10,000,000	$\pm 20\%$	5.00 $\pm$ 0.50
CKG45NX7S2A106M	X7S	100V	10,000,000	$\pm 20\%$	5.00 $\pm$ 0.50
CKG45NX7T2E225M	X7T	250V	2,200,000	$\pm 20\%$	5.00 $\pm$ 0.50
CKG45NX7T2W105M	X7T	450V	1,000,000	$\pm 20\%$	5.00 $\pm$ 0.50
CKG45NX7T2J474M	X7T	630V	470,000	$\pm 20\%$	5.00 $\pm$ 0.50



Capacitance Range Chart

CKG57N [Double Stack]

Capacitance Range Chart

Temperature Characteristics: X7R ($\pm 15\%$), X7S ($\pm 22\%$), X7T ($+22/-33\%$), X5R ($\pm 15\%$)
 Rated Voltage: 630V (2J), 450 (2W), 250V (2E), 100V (2A), 50V (1H), 25V (1E), 16V (1C)

Capacitance (pF)	Cap Code	Tolerance	X7R						X7T		
			2J (630V)	2E (250V)	2A (100V)	1H (50V)	1E (25V)	1C (16V)	2J (630V)	2W (450V)	2E (250V)
470,000	474	M: $\pm 20\%$									
1,000,000	105										
2,200,000	225										
3,300,000	335										
4,700,000	475										
10,000,000	106										
22,000,000	226										
33,000,000	336										
47,000,000	476										
100,000,000	107										

Capacitance (pF)	Cap Code	Tolerance	X7S				X5R		
			2A (100V)	1H (50V)	1E (25V)	1C (16V)	1H (50V)	1E (25V)	1C (16V)
10,000,000	106	M: $\pm 20\%$							
22,000,000	226								
33,000,000	336								
47,000,000	476								
100,000,000	107								

Standard Thickness
 5.00 mm



Capacitance Range Table

CKG57N [Double Stack]

Class 2 (Temperature Stable)

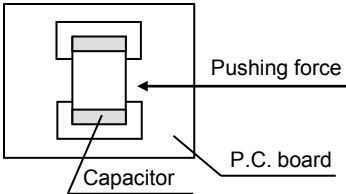
Temperature Characteristics: X7R (-55 to +125°C, $\pm 15\%$), X7S (-55 to +125°C, $\pm 22\%$), X7T (-55 to +125°C, $+22/-33\%$)

TDK Part Number (Ordering Code)	Temperature Characteristics	Rated Voltage	Capacitance (pF)	Capacitance Tolerance	Thickness (mm)
CKG57NX5R1C107M	X5R	16V	100,000,000	$\pm 20\%$	5.00 $\pm$ 0.50
CKG57NX5R1E476M	X5R	25V	47,000,000	$\pm 20\%$	5.00 $\pm$ 0.50
CKG57NX5R1H226M	X5R	50V	22,000,000	$\pm 20\%$	5.00 $\pm$ 0.50
CKG57NX7R1C336M	X7R	16V	33,000,000	$\pm 20\%$	5.00 $\pm$ 0.50
CKG57NX7R1E226M	X7R	25V	22,000,000	$\pm 20\%$	5.00 $\pm$ 0.50
CKG57NX7R1H106M	X7R	50V	10,000,000	$\pm 20\%$	5.00 $\pm$ 0.50
CKG57NX7R2A225M	X7R	100V	2,200,000	$\pm 20\%$	5.00 $\pm$ 0.50
CKG57NX7R2A475M	X7R	100V	4,700,000	$\pm 20\%$	5.00 $\pm$ 0.50
CKG57NX7R2A106M	X7R	100V	10,000,000	$\pm 20\%$	5.00 $\pm$ 0.50
CKG57NX7R2E105M	X7R	250V	1,000,000	$\pm 20\%$	5.00 $\pm$ 0.50
CKG57NX7R2E225M	X7R	250V	2,200,000	$\pm 20\%$	5.00 $\pm$ 0.50
CKG57NX7R2J474M	X7R	630V	470,000	$\pm 20\%$	5.00 $\pm$ 0.50
CKG57NX7S1C107M	X7S	16V	100,000,000	$\pm 20\%$	5.00 $\pm$ 0.50
CKG57NX7S1E476M	X7S	25V	47,000,000	$\pm 20\%$	5.00 $\pm$ 0.50
CKG57NX7S1H226M	X7S	50V	22,000,000	$\pm 20\%$	5.00 $\pm$ 0.50
CKG57NX7S2A226M	X7S	100V	22,000,000	$\pm 20\%$	5.00 $\pm$ 0.50
CKG57NX7T2E335M	X7T	250V	3,300,000	$\pm 20\%$	5.00 $\pm$ 0.50
CKG57NX7T2W225M	X7T	450V	2,200,000	$\pm 20\%$	5.00 $\pm$ 0.50
CKG57NX7T2J105M	X7T	630V	1,000,000	$\pm 20\%$	5.00 $\pm$ 0.50



General Specifications

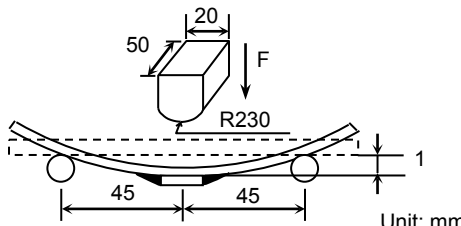
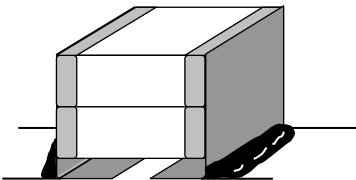
CKG Series – Mega Cap Type Capacitors

No.	Item	Performance	Test or Inspection Method																
1	External Appearance	No defects which may affect performance.	Inspect with magnifying glass (3×).																
2	Insulation Resistance	500MΩ•μF min. (As for the capacitors of rated voltage 16V DC, 100MΩ•μF min.), whichever smaller.	Apply rated voltage for 60s. As for the rated voltage 630V DC, apply 500V DC.																
3	Voltage Proof	Withstand test voltage without insulation breakdown or other damage.	<table><tr><th>Rated Voltage</th><th>Apply voltage</th></tr><tr><td>100V and under</td><td>2.5 × rated voltage</td></tr><tr><td>Over 100V</td><td>1.5 × rated voltage</td></tr></table> Above DC voltage shall be applied for 1 to 5s. Charge / discharge current shall not exceed 50mA.	Rated Voltage	Apply voltage	100V and under	2.5 × rated voltage	Over 100V	1.5 × rated voltage										
Rated Voltage	Apply voltage																		
100V and under	2.5 × rated voltage																		
Over 100V	1.5 × rated voltage																		
4	Capacitance	Within the specified tolerance.	<table><tr><th>Rated Capacitance</th><th>Measuring Frequency</th><th>Measuring voltage</th></tr><tr><td>10uF and under</td><td>1kHz±10%</td><td>1.0±0.2V_{rms}</td></tr><tr><td>Over 10uF</td><td>120Hz±20%</td><td>0.5±0.2 V_{rms}</td></tr></table>	Rated Capacitance	Measuring Frequency	Measuring voltage	10uF and under	1kHz±10%	1.0±0.2V _{rms}	Over 10uF	120Hz±20%	0.5±0.2 V _{rms}							
Rated Capacitance	Measuring Frequency	Measuring voltage																	
10uF and under	1kHz±10%	1.0±0.2V _{rms}																	
Over 10uF	120Hz±20%	0.5±0.2 V _{rms}																	
5	Dissipation Factor (Class 2)	<table><tr><th>T.C.</th><th>D.F.</th></tr><tr><td>X5R</td><td>0.045 max.</td></tr><tr><td>X7R</td><td>0.045 max.</td></tr><tr><td>X7S</td><td>0.075 max.</td></tr><tr><td>X7T</td><td>0.010 max.</td></tr></table>	T.C.	D.F.	X5R	0.045 max.	X7R	0.045 max.	X7S	0.075 max.	X7T	0.010 max.	See No.4 in this table for measuring condition.						
T.C.	D.F.																		
X5R	0.045 max.																		
X7R	0.045 max.																		
X7S	0.075 max.																		
X7T	0.010 max.																		
6	Temperature Characteristics of Capacitance	<table><tr><td>Capacitance Change (%)</td></tr><tr><td>No Voltage Applied</td></tr><tr><td>X5R: ± 15%</td></tr><tr><td>X7R: ± 15%</td></tr><tr><td>X7S: ± 22%</td></tr><tr><td>X7T: + 22/-33%</td></tr></table>	Capacitance Change (%)	No Voltage Applied	X5R: ± 15%	X7R: ± 15%	X7S: ± 22%	X7T: + 22/-33%	Capacitance shall be measured by the steps shown in the following table after thermal equilibrium is obtained for each step. ΔC be calculated ref. STEP3 reading <table><tr><th>Step</th><th>Temperature (°C)</th></tr><tr><td>1</td><td>Reference temp. ± 2</td></tr><tr><td>2</td><td>Min. operating temp. ± 2</td></tr><tr><td>3</td><td>Reference temp. ± 2</td></tr><tr><td>4</td><td>Max. operating temp. ± 2</td></tr></table>	Step	Temperature (°C)	1	Reference temp. ± 2	2	Min. operating temp. ± 2	3	Reference temp. ± 2	4	Max. operating temp. ± 2
Capacitance Change (%)																			
No Voltage Applied																			
X5R: ± 15%																			
X7R: ± 15%																			
X7S: ± 22%																			
X7T: + 22/-33%																			
Step	Temperature (°C)																		
1	Reference temp. ± 2																		
2	Min. operating temp. ± 2																		
3	Reference temp. ± 2																		
4	Max. operating temp. ± 2																		
7	Robustness of Terminations	No sign of termination coming off, breakage of ceramic, or other abnormal signs.	Reflow solder the capacitors on P.C. board (shown in Appendix 1) and apply a pushing force of 5N with 10±1s. 																



General Specifications

CKG Series – Mega Cap Type Capacitors

No.	Item	Performance	Test or Inspection Method															
8	Bending	No mechanical damage.	Reflow solder the capacitor on P.C. board (shown in Appendix 2) and bend it for 1mm.  Unit: mm															
9	Solderability	Both end faces and the contact areas shall be covered with a smooth and bright solder coating with no more than a small amount of scattered imperfections such as pinholes or un-wetted or de-wetted areas. These imperfections shall not be concentrated in one area. 	Reflow solder the capacitors on P.C board (shown in Appendix 1). Solder: H63A (JIS Z 3282) Flux: Isopropyl alcohol (JIS K 8839) Rosin (JIS K 5902) 25% solid solution.															
10	Temperature Cycle	No mechanical damage.	Reflow solder the capacitors on P.C. board (shown in Appendix 1) before testing. Expose the capacitors in the condition step1 through step 4 and repeat 100 times consecutively. Leave the capacitors in ambient condition for 24±2h before measurement. <table><thead><tr><th>Step</th><th>Temperature (°C)</th><th>Time (min.)</th></tr></thead><tbody><tr><td>1</td><td>Min. operating temp. ±3</td><td>30 ± 3</td></tr><tr><td>2</td><td>Reference Temp. ±2</td><td>2 – 5</td></tr><tr><td>3</td><td>Max. operating temp. ± 2</td><td>30 ± 2</td></tr><tr><td>4</td><td>Reference Temp. ± 2</td><td>2 - 5</td></tr></tbody></table>	Step	Temperature (°C)	Time (min.)	1	Min. operating temp. ±3	30 ± 3	2	Reference Temp. ±2	2 – 5	3	Max. operating temp. ± 2	30 ± 2	4	Reference Temp. ± 2	2 - 5
Step	Temperature (°C)	Time (min.)																
1	Min. operating temp. ±3	30 ± 3																
2	Reference Temp. ±2	2 – 5																
3	Max. operating temp. ± 2	30 ± 2																
4	Reference Temp. ± 2	2 - 5																
	External appearance	No mechanical damage.																
	Capacitance	<table><thead><tr><th>Characteristics</th><th>Change from the value before test</th></tr></thead><tbody><tr><td>X5R</td><td rowspan="4">± 7.5 %</td></tr><tr><td>X7R</td></tr><tr><td>X7S</td></tr><tr><td>X7T</td></tr></tbody></table>	Characteristics	Change from the value before test	X5R	± 7.5 %	X7R	X7S	X7T									
Characteristics	Change from the value before test																	
X5R	± 7.5 %																	
X7R																		
X7S																		
X7T																		
	D.F.	Meet the initial spec.																
	Insulation Resistance	Meet the initial spec.																
	Voltage Proof	No insulation breakdown or other damage.																



General Specifications

CKG Series – Mega Cap Type Capacitors

No.	Item	Performance	Test or Inspection Method				
14	Moisture Resistance						
	External appearance	No mechanical damage.	Reflow solder the capacitors on a P.C. board (shown in Appendix 1) before testing.				
	Capacitance	<table><tr><th>Characteristics</th><th>Change from the value before test</th></tr><tr><td>X5R X7R X7S X7T</td><td>± 12.5 %</td></tr></table>	Characteristics	Change from the value before test	X5R X7R X7S X7T	± 12.5 %	Apply the rated voltage at temperature 40±2°C and 90 to 95%RH for 500+24,0h.
	Characteristics	Change from the value before test					
	X5R X7R X7S X7T	± 12.5 %					
		Charge/discharge current shall not exceed 50mA.					
		Leave the capacitor in ambient conditions for 24±2h before measurement.					
		Voltage conditioning: Voltage treats the capacitor under testing temperature and voltage for 1 hour.					
	D.F. (Class 2)	Characteristics X5R/X7R/X7S/X7T: 200% of initial spec. max.	Leave the capacitor in ambient conditions for 24±2h before measurement.				
	Insulation Resistance	25MΩ•μF min. (As for the capacitors of rated voltage 16V DC, 5MΩ•μF min.).	Use this measurement for initial value.				
15	Life						
	External appearance	No mechanical damage.	Reflow solder the capacitors on a P.C. Board shown in Appendix 1 before testing.				
	Capacitance	<table><tr><th>Characteristics</th><th>Change from the value before test</th></tr><tr><td>X5R X7R X7S X7T</td><td>± 15 %</td></tr></table>	Characteristics	Change from the value before test	X5R X7R X7S X7T	± 15 %	Below the voltage shall be applied at Maximum operating temperature ±2°C for 1,000 +48, 0h.
	Characteristics	Change from the value before test					
	X5R X7R X7S X7T	± 15 %					
		Applied voltage is 1xRV. Some items may be tested at higher voltage (1.2x, 1.5x or 2x RV).					
		Charge/discharge current shall not exceed 50mA.					
		Leave the capacitors in ambient condition for 24±2h before measurement.					
		Voltage conditioning: Voltage treat the capacitors under testing temperature and voltage for 1 hour.					
	D.F. (Class 2)	Characteristics X5R/X7R/X7S/X7T: 200% of initial spec. max.	Leave the capacitors in ambient condition for 24±2h before measurement.				
	Insulation Resistance	50MΩ•μF min. (As for the capacitors of rated voltage 16V DC, 10MΩ•μF min.).	Use this measurement for initial value.				

***As for the initial measurement of capacitors on number 6 and 10, leave capacitors at $150 \pm 10, 0^\circ\text{C}$ for 1 hour and measure the value after leaving capacitors for $24 \pm 2\text{h}$ in ambient condition.**

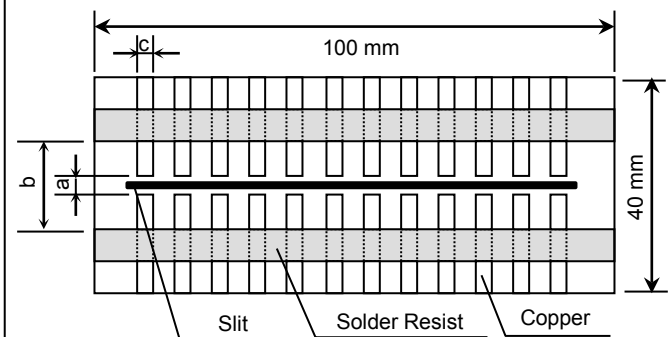


General Specifications

CKG Series – Mega Cap Type Capacitors

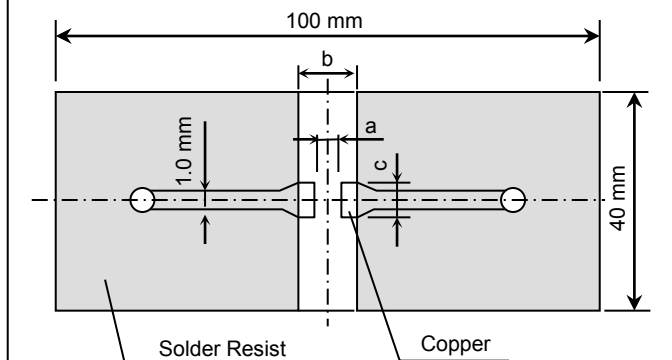
Appendix - 1

P.C. Board for reliability test



Appendix - 2

P.C. Board for bending test



Material: Glass Epoxy (As per JIS C6484 GE4)

P.C. Board thickness: 1.6mm

- Copper (thickness 0.035mm)
- Solder resist

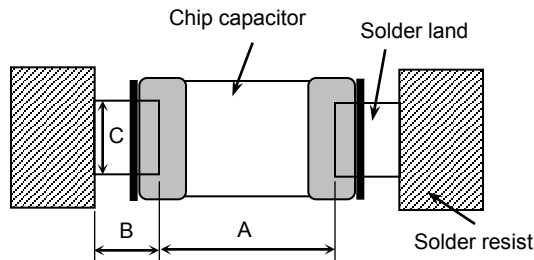
Series	Dimensions (mm)		
	a	b	c
CKG32K	2.2	5.0	2.9
CKG45K	3.5	6.1	2.9
CKG57K	4.1	7.6	4.7
CKG45N	3.5	6.1	2.9
CKG57N	4.1	7.6	4.7



Soldering Information

CKG Series – Mega Cap Type Capacitors

Recommended Soldering Land Pattern

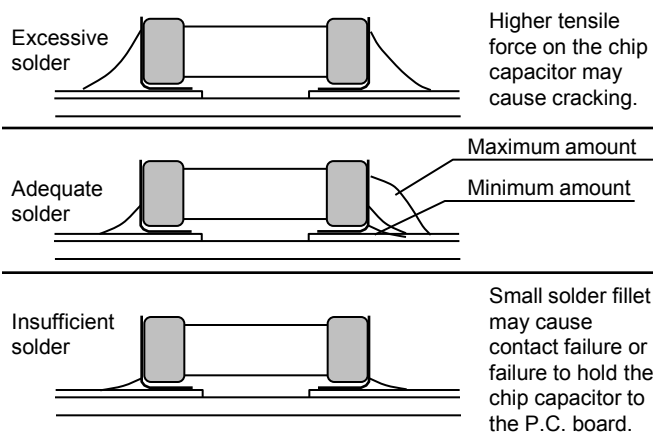


Reflow Soldering

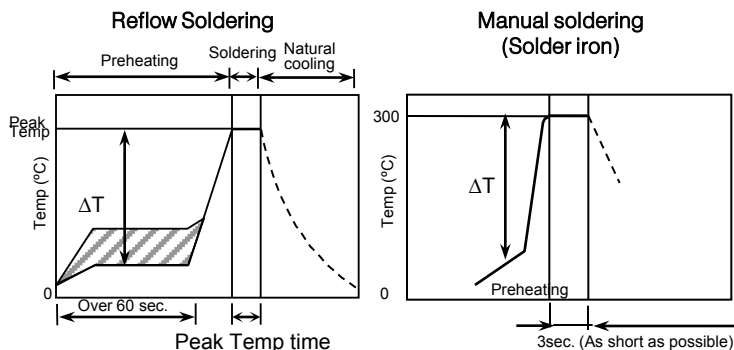
Unit: mm

Type	CKG32K	CKG45K/ CKG45N	CKG57K/ CKG57N
Symbol			
A	2.0 ~ 2.2	3.3 ~ 3.7	3.9 ~ 4.3
B	1.1 ~ 1.3	1.2 ~ 1.5	1.5 ~ 2.0
C	2.3 ~ 2.5	2.7 ~ 3.2	4.5 ~ 5.0

Recommended Solder Amount



Recommended Soldering Profile



Recommended soldering duration

Solder	Temp./ Dura.	Reflow Soldering	
		Peak temp (°C)	Duration (sec.)
Sn-Pb Solder		230 max.	20 max.
Lead-Free Solder		250 max.	10 max.

Recommended solder compositions

Sn-37Pb (Sn-Pb solder)

Sn-3.0Ag-0.5Cu (Lead Free Solder)

Preheating Condition

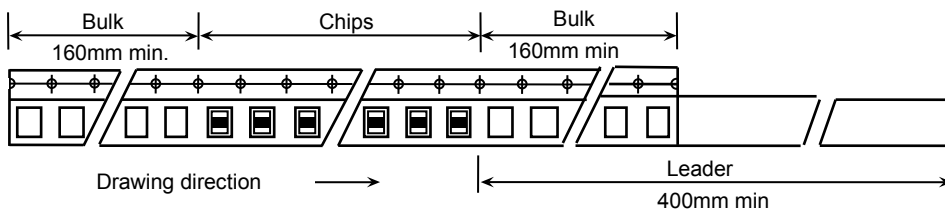
Soldering Method	Temperature (°C)
Reflow soldering	$\Delta T \leq 130$
Manual soldering	$\Delta T \leq 130$



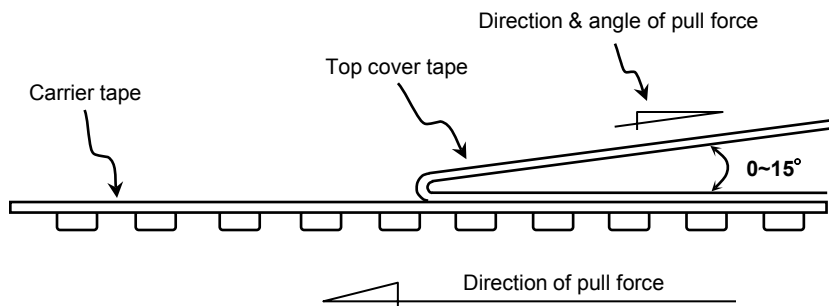
Packaging Information

CKG Series – Mega Cap Type Capacitors

Carrier Tape Configuration

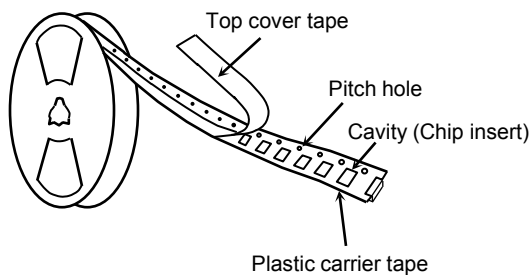


Peel Back Force (Top Tape)



- Carrier tape shall be flexible enough to be wound around a minimum radius of 30mm with components in tape.
- The missing of components shall be less than 0.1%
- Components shall not stick to the cover tape.
- The cover tape shall not protrude beyond the edges of the carrier tape and shall not cover the sprocket holes.

Chip Quantity Per Reel and Structure of Reel



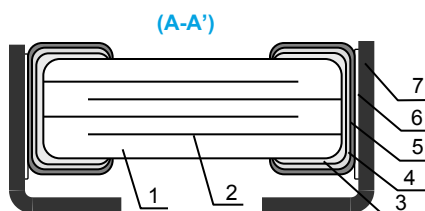
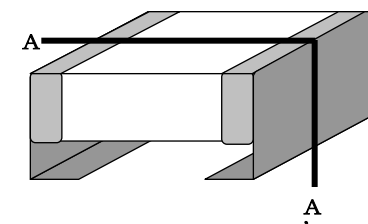
Series	Taping Material	Chip quantity (pcs.)	
		φ178mm (7") reel	φ330mm (13") reel
CKG32K	Plastic	1,000	4,000
CKG45K		-	1,000
CKG57K			
CKG45N			
CKG57N			



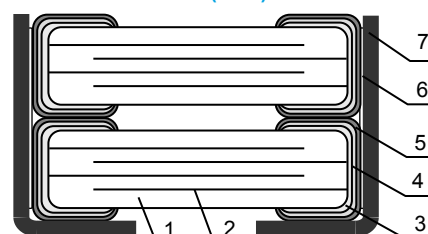
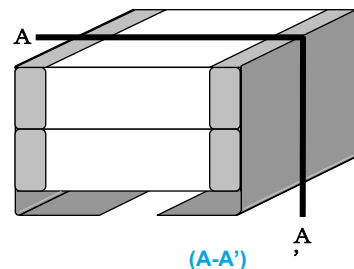
Additional Information

CKG Series – Mega Cap Type Capacitors

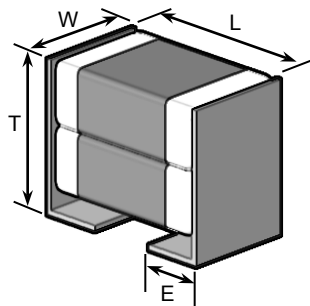
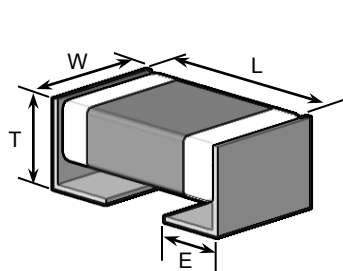
• Inside Structure & Material System



No.	NAME	MATERIAL	
		Class 1	Class 2
(1)	Ceramic Dielectric	CaZrO ₃	BaTiO ₃
(2)	Internal Electrode	Nickel (Ni)	
(3)	Termination	Copper (Cu)	
(4)		Nickel (Ni)	
(5)		Tin (Sn)	
(6)	Metal Cap Joint	High Temp Solger	
(7)	Metal Cap	42 Alloy	



• Shape & Dimensions



Case Code / Series	Dimensions (mm)			
	L	W	T	E
CKG32K	3.60 ± 0.30	2.60 ± 0.30	3.35 ± 0.10	0.80 ± 0.15
CKG45K	5.00 ± 0.50	3.50 ± 0.50	2.90 ± 0.10	1.10 ± 0.30
CKG57K	6.00 ± 0.50	5.00 ± 0.50	3.35 ± 0.15	1.60 ± 0.30
CKG45N	5.00 ± 0.50	3.50 ± 0.50	5.00 ± 0.50	1.10 ± 0.30
CKG57N	6.00 ± 0.50	5.00 ± 0.50	5.00 ± 0.50	1.60 ± 0.30

• Environmental Information

TDK Corporation established internal product environmental assurance standards that include the six hazardous substances banned by the EU RoHS Directive¹ enforced on July 1, 2006 along with additional substances independently banned by TDK and has successfully completed making general purpose electronic components conform to the RoHS Directive².

1. Abbreviation for Restriction on Hazardous Substances, which refers to the regulation EU Directive 2002/95/EC on hazardous substances by the European Union (EU) effective from July 1, 2006. The Directive bans the use of six specific hazardous substances in electric and electronic devices and products handled within the EU. The six substances are lead, mercury, cadmium, hexavalent chromium, PBB (polybrominated biphenyls), and PBDE (polybrominated diphenyl ethers).
2. This means that, in conformity with the EU Directive 2002/95/EC, lead, cadmium, mercury, hexavalent chromium, and specific bromine-based flame retardants, PBB and PBDE, have not been used, except for exempted applications.

For REACH (SVHC : 15 substances according to ECHA / October 2008) : All TDK MLCC do not contain these 15 substances.

For European Directive 2000/53/CE and 2005/673/CE : Cadmium, Hexavalent Chromium, Mercury, Lead are not contained in all TDK MLCC.

For European Directive 2003/11/CE : Pentabromodiphenyl-ether, Octabromodiphenyl-ether are not contained in all TDK MLCC.



MULTILAYER CERAMIC CHIP CAPACITORS



CGA Series Automotive Grade Capacitors

Type: CGA2 [EIA CC0402]
CGA3 [EIA CC0603]
CGA4 [EIA CC0805]
CGA5 [EIA CC1206]
CGA6 [EIA CC1210]

Issue date: April 2011

**TDK MLCC
US Catalog**

Version B11

REMINDERS

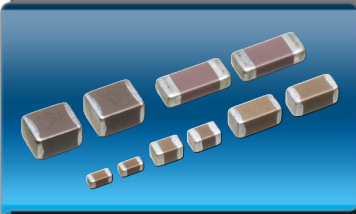
Please read before using this product

SAFETY REMINDERS



REMINDERS

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CGA Series Automotive Grade Capacitors

Type: CGA2 (C1005), CGA3 (C1608),
CGA4 (C2012), CGA5 (C3216), CGA6 (C3225)

Features



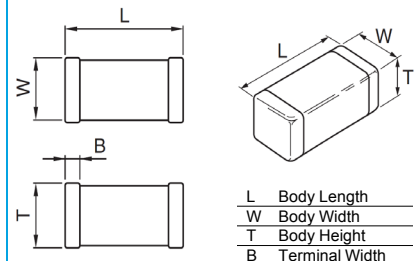
- The CGA series consists of products that can be used for the power train, safety equipment, etc. of a vehicle
- Qualified to AEC Q200 test standard
- Parts are manufactured using tested and stable manufacturing processes and are subjected to increased inspections to guarantee a higher level of reliability
- A monolithic structure ensures superior mechanical strength and reliability
- Available in X8R temperature characteristic for up to 150°C operating temperature
- High capacitance has been achieved through precision technologies that enable the use of multiple thinner ceramic dielectric layers
- High-accuracy automatic mounting is facilitated through the maintenance of very precise dimensional tolerances
- Low stray capacitance ensures high conformity with nominal values, thereby simplifying the circuit design process

Applications



- Automotive applications
- High reliability requirement applications
- Harsh environment requirement applications
- Smart meter
- Base stations
- Noise bypass in automotive

Shape & Dimensions



Dimensions in mm

L	Body Length
W	Body Width
T	Body Height
B	Terminal Width

Part Number Construction

Series Name

Dimensions L x W (mm)

Symbol	Length	Width
2	1.00 ± 0.05	0.50 ± 0.05
3	1.60 ± 0.10	0.80 ± 0.10
4	2.00 ± 0.20	1.25 ± 0.20
5	3.20 ± 0.20	1.60 ± 0.20
6	3.20 ± 0.40	2.50 ± 0.30

Thickness T (mm)

Symbol	Thickness	Symbol	Thickness
B	0.50 mm	K	1.30 mm
C	0.60 mm	L	1.60 mm
E	0.80 mm	M	2.00 mm
F	0.85 mm	N	2.30 mm
H	1.15 mm	P	2.50 mm
J	1.25 mm		

Voltage Condition for Life Test

Symbol	Condition	Symbol	Condition
1	1 × R.V.	3	1.5 × R.V.
2	2 × R.V.	4	1.2 × R.V.

Temperature Characteristic

Temperature Characteristics	Capacitance Change	Temperature Range
C0G	0±30 ppm/°C	-55 to +125°C
X5R	± 15%	-55 to +85°C
X7R	± 15%	-55 to +125°C
X7S	± 22%	-55 to +125°C
X7T	+22/-33%	-55 to +125°C
X8R	± 15%	-55 to +150°C

CGA 5 L 2 X8R 1E 105 K T XXXX

Internal Codes

Packaging Style

Packaging Code	Style
T	Tape & Reel

Capacitance Tolerance

Tolerance Code	Tolerance
C	± 0.25 pF
D	± 0.50 pF
J	± 5%
K	± 10%
M	± 20%

Nominal Capacitance (pF)

The capacitance is expressed in three digit codes and in units of pico Farads (pF). The first and second digits identify the first and second significant figures of the capacitance. The third digit identifies the multiplier. R designates a decimal point.

Capacitance Code	Capacitance
0R5	0.5pF
010	1pF
102	1,000pF (1nF)
105	1,000,000pF (1µF)

Rated Voltage (DC)

Voltage Code	Voltage (DC)	Voltage Code	Voltage (DC)
0J	6.3V	1H	50V
1A	10V	2A	100V
1C	16V	2E	250V
1E	25V	2W	450V
1V	35V	2J	630V



Capacitance Range Chart

CGA2 [EIA CC0402]

Capacitance Range Chart

Temperature Characteristics: C0G (0±30 ppm/°C)

Rated Voltage: 50V (1H)

Capacitance (pF)	Cap Code	Tolerance	C0G 1H (50V)
1	010	C: ± 0.25pF	
1.5	1R5		
2	020		
2.2	2R2		
3	030		
3.3	3R3		
4	040		
4.7	4R7		
5	050		
6	060	D: ± 0.50pF	
6.8	6R8		
7	070		
8	080		
9	090		
10	100	J: ± 5%	
12	120		
15	150		
18	180		
22	220		
27	270		
33	330		
39	390		
47	470		
56	560		
68	680		
82	820		
100	101		
120	121		
150	151		
180	181		
220	221		
270	271		
330	331		
390	391		
470	471		
560	561		
680	681		
820	821		
1,000	102		

Standard Thickness



0.50 mm



Capacitance Range Chart

CGA2 [EIA CC0402]

Capacitance Range Chart

Temperature Characteristics: X7R ($\pm 15\%$), X7S ($\pm 22\%$), X8R ($\pm 15\%$)

Rated Voltage: 100V (2A), 50V (1H), 35V (1V), 25V (1E), 16V (1C), 10V (1A)

Capacitance (pF)	Cap Code	Tolerance	X7R					X7S	X8R	
			1H (50V)	1V (35V)	1E (25V)	1C (16V)	1A (10V)	2A (100V)	1H (50V)	1E (25V)
150	151	K: $\pm 10\%$								
220	221									
330	331									
470	471									
680	681									
1,000	102									
1,500	152									
2,200	222									
3,300	332									
4,700	472									
6,800	682									
10,000	103									
15,000	153									
22,000	223									
33,000	333									
47,000	473									
68,000	683									
100,000	104									
220,000	224									

Standard Thickness

 0.50 mm



Capacitance Range Table

CGA2 [EIA CC0402]

Class 1 (Temperature Compensating)

Temperature Characteristics: C0G (-55 to 125°C, 0±30 ppm/°C)

TDK Part Number (Ordering Code)	Temperature Characteristics	Rated Voltage	Capacitance (pF)	Capacitance Tolerance	Thickness (mm)
CGA2B2C0G1H010C	C0G	50V	1.0	± 0.25pF	0.50 ± 0.05
CGA2B2C0G1H1R5C	C0G	50V	1.5	± 0.25pF	0.50 ± 0.05
CGA2B2C0G1H020C	C0G	50V	2.0	± 0.25pF	0.50 ± 0.05
CGA2B2C0G1H2R2C	C0G	50V	2.2	± 0.25pF	0.50 ± 0.05
CGA2B2C0G1H030C	C0G	50V	3.0	± 0.25pF	0.50 ± 0.05
CGA2B2C0G1H3R3C	C0G	50V	3.3	± 0.25pF	0.50 ± 0.05
CGA2B2C0G1H040C	C0G	50V	4.0	± 0.25pF	0.50 ± 0.05
CGA2B2C0G1H4R7C	C0G	50V	4.7	± 0.25pF	0.50 ± 0.05
CGA2B2C0G1H050C	C0G	50V	5.0	± 0.25pF	0.50 ± 0.05
CGA2B2C0G1H060D	C0G	50V	6.0	± 0.50pF	0.50 ± 0.05
CGA2B2C0G1H6R8D	C0G	50V	6.8	± 0.50pF	0.50 ± 0.05
CGA2B2C0G1H070D	C0G	50V	7.0	± 0.50pF	0.50 ± 0.05
CGA2B2C0G1H080D	C0G	50V	8.0	± 0.50pF	0.50 ± 0.05
CGA2B2C0G1H090D	C0G	50V	9.0	± 0.50pF	0.50 ± 0.05
CGA2B2C0G1H100D	C0G	50V	10	± 0.50pF	0.50 ± 0.05
CGA2B2C0G1H120J	C0G	50V	12	± 5%	0.50 ± 0.05
CGA2B2C0G1H150J	C0G	50V	15	± 5%	0.50 ± 0.05
CGA2B2C0G1H180J	C0G	50V	18	± 5%	0.50 ± 0.05
CGA2B2C0G1H220J	C0G	50V	22	± 5%	0.50 ± 0.05
CGA2B2C0G1H270J	C0G	50V	27	± 5%	0.50 ± 0.05
CGA2B2C0G1H330J	C0G	50V	33	± 5%	0.50 ± 0.05
CGA2B2C0G1H390J	C0G	50V	39	± 5%	0.50 ± 0.05
CGA2B2C0G1H470J	C0G	50V	47	± 5%	0.50 ± 0.05
CGA2B2C0G1H560J	C0G	50V	56	± 5%	0.50 ± 0.05
CGA2B2C0G1H680J	C0G	50V	68	± 5%	0.50 ± 0.05
CGA2B2C0G1H820J	C0G	50V	82	± 5%	0.50 ± 0.05
CGA2B2C0G1H101J	C0G	50V	100	± 5%	0.50 ± 0.05
CGA2B2C0G1H121J	C0G	50V	120	± 5%	0.50 ± 0.05
CGA2B2C0G1H151J	C0G	50V	150	± 5%	0.50 ± 0.05
CGA2B2C0G1H181J	C0G	50V	180	± 5%	0.50 ± 0.05
CGA2B2C0G1H221J	C0G	50V	220	± 5%	0.50 ± 0.05
CGA2B2C0G1H271J	C0G	50V	270	± 5%	0.50 ± 0.05
CGA2B2C0G1H331J	C0G	50V	330	± 5%	0.50 ± 0.05
CGA2B2C0G1H391J	C0G	50V	390	± 5%	0.50 ± 0.05
CGA2B2C0G1H471J	C0G	50V	470	± 5%	0.50 ± 0.05
CGA2B2C0G1H561J	C0G	50V	560	± 5%	0.50 ± 0.05
CGA2B2C0G1H681J	C0G	50V	680	± 5%	0.50 ± 0.05
CGA2B2C0G1H821J	C0G	50V	820	± 5%	0.50 ± 0.05
CGA2B2C0G1H102J	C0G	50V	1,000	± 5%	0.50 ± 0.05



Capacitance Range Table

CGA2 [EIA CC0402]

Class 2 (Temperature Stable)

Temperature Characteristics: X7R (-55 to +125°C, ±15%), X6S (-55 to +105°C, ±22%), X5R (-55 to +85°C, ±15%), Y5V (-30 to +85°C, +22/-82%)

TDK Part Number (Ordering Code)	Temperature Characteristics	Rated Voltage	Capacitance (pF)	Capacitance Tolerance	Thickness (mm)
CGA2B2X7R1H221K	X7R	50V	220	± 10%	0.50 ± 0.05
CGA2B2X7R1H331K	X7R	50V	330	± 10%	0.50 ± 0.05
CGA2B2X7R1H471K	X7R	50V	470	± 10%	0.50 ± 0.05
CGA2B2X7R1H681K	X7R	50V	680	± 10%	0.50 ± 0.05
CGA2B2X7R1H102K	X7R	50V	1,000	± 10%	0.50 ± 0.05
CGA2B2X7R1H152K	X7R	50V	1,500	± 10%	0.50 ± 0.05
CGA2B2X7R1H222K	X7R	50V	2,200	± 10%	0.50 ± 0.05
CGA2B2X7R1H332K	X7R	50V	3,300	± 10%	0.50 ± 0.05
CGA2B2X7R1H472K	X7R	50V	4,700	± 10%	0.50 ± 0.05
CGA2B2X7R1H682K	X7R	50V	6,800	± 10%	0.50 ± 0.05
CGA2B3X7R1H103K	X7R	50V	10,000	± 10%	0.50 ± 0.05
CGA2B3X7R1H153K	X7R	50V	15,000	± 10%	0.50 ± 0.05
CGA2B3X7R1H223K	X7R	50V	22,000	± 10%	0.50 ± 0.05
CGA2B3X7R1H333K	X7R	50V	33,000	± 10%	0.50 ± 0.05
CGA2B3X7R1H473K	X7R	50V	47,000	± 10%	0.50 ± 0.05
CGA2B3X7R1H683K	X7R	50V	68,000	± 10%	0.50 ± 0.05
CGA2B3X7R1H104K	X7R	50V	100,000	± 10%	0.50 ± 0.05
CGA2B3X7R1V103K	X7R	35V	10,000	± 10%	0.50 ± 0.05
CGA2B3X7R1V104K	X7R	35V	100,000	± 10%	0.50 ± 0.05
CGA2B2X7R1E103K	X7R	25V	10,000	± 10%	0.50 ± 0.05
CGA2B2X7R1E223K	X7R	25V	22,000	± 10%	0.50 ± 0.05
CGA2B1X7R1E473K	X7R	25V	47,000	± 10%	0.50 ± 0.05
CGA2B3X7R1E104K	X7R	25V	100,000	± 10%	0.50 ± 0.05
CGA2B2X7R1C473K	X7R	16V	47,000	± 10%	0.50 ± 0.05
CGA2B1X7R1C683K	X7R	16V	68,000	± 10%	0.50 ± 0.05
CGA2B1X7R1C104K	X7R	16V	100,000	± 10%	0.50 ± 0.05
CGA2B1X7R1A224K	X7R	10V	220,000	± 10%	0.50 ± 0.05
CGA2B3X7S2A102K	X7S	100V	1,000	± 10%	0.50 ± 0.05
CGA2B3X7S2A152K	X7S	100V	1,500	± 10%	0.50 ± 0.05
CGA2B3X7S2A222K	X7S	100V	2,200	± 10%	0.50 ± 0.05
CGA2B3X7S2A332K	X7S	100V	3,300	± 10%	0.50 ± 0.05
CGA2B3X7S2A472K	X7S	100V	4,700	± 10%	0.50 ± 0.05
CGA2B3X7S2A682K	X7S	100V	6,800	± 10%	0.50 ± 0.05
CGA2B3X7S2A103K	X7S	100V	10,000	± 10%	0.50 ± 0.05
CGA2B2X8R1H151K	X8R	50V	150	± 10%	0.50 ± 0.05
CGA2B2X8R1H221K	X8R	50V	220	± 10%	0.50 ± 0.05
CGA2B2X8R1H331K	X8R	50V	330	± 10%	0.50 ± 0.05
CGA2B2X8R1H471K	X8R	50V	470	± 10%	0.50 ± 0.05
CGA2B2X8R1H681K	X8R	50V	680	± 10%	0.50 ± 0.05
CGA2B2X8R1H102K	X8R	50V	1,000	± 10%	0.50 ± 0.05
CGA2B2X8R1H152K	X8R	50V	1,500	± 10%	0.50 ± 0.05
CGA2B2X8R1H222K	X8R	50V	2,200	± 10%	0.50 ± 0.05
CGA2B2X8R1H332K	X8R	50V	3,300	± 10%	0.50 ± 0.05
CGA2B2X8R1H472K	X8R	50V	4,700	± 10%	0.50 ± 0.05



Capacitance Range Table

CGA2 [EIA CC0402]

Class 2 (Temperature Stable)

Temperature Characteristics: X7R (-55 to +125°C, ±15%), X6S (-55 to +105°C, ±22%), X5R (-55 to +85°C, ±15%), Y5V(-30 to +85°C, +22/-82%)

TDK Part Number (Ordering Code)	Temperature Characteristics	Rated Voltage	Capacitance (pF)	Capacitance Tolerance	Thickness (mm)
CGA2B2X8R1E682K	X8R	25V	6,800	± 10%	0.50 ± 0.05
CGA2B2X8R1E103K	X8R	25V	10,000	± 10%	0.50 ± 0.05



Capacitance Range Chart

CGA3 [EIA CC0603]

Capacitance Range Chart

Temperature Characteristics: C0G (0±30 ppm/°C)

Rated Voltage: 250V (2E), 100V (2A), 50V (1H)

Capacitance (pF)	Cap Code	Tolerance	C0G		
			2E (250V)	2A (100V)	1H (50V)
1	010	C: ± 0.25pF			
1.5	1R5				
2	020				
2.2	2R2				
3	030				
3.3	3R3				
4	040				
4.7	4R7				
5	050				
6	060				
6.8	6R8	D: ± 0.50pF			
7	070				
8	080				
9	090				
10	100				
12	120				
15	150				
18	180				
22	220				
27	270				
33	330	J: ± 5%			
39	390				
47	470				
56	560				
68	680				
82	820				
100	101				
120	121				
150	151				
180	181				
220	221				
270	271				
330	331				
390	391				
470	471				
560	561				
680	681				
820	821				
1,000	102				
1,200	122				
1,500	152				
1,800	182				
2,200	222				
2,700	272				
3,300	332				
3,900	392				
4,700	472				
5,600	562				
6,800	682				
8,200	822				
10,000	103				

Standard Thickness



0.80 mm



Capacitance Range Chart

CGA3 [EIA CC0603]

Capacitance Range Chart

Temperature Characteristics: X7R ($\pm 15\%$), X7S ($\pm 22\%$), X8R ($\pm 15\%$), X5R ($\pm 15\%$)

Rated Voltage: 100V (2A), 50V (1H), 35V (1V), 25V (1E), 16V (1C), 6.3V (0J), 6.3V (0J)

Capacitance (pF)	Cap Code	Tolerance	X7R						X7S
			2A (100V)	1H (50V)	1V (35V)	1E (25V)	1C (16V)	0J (6.3V)	2A (100V)
220	221	K: $\pm 10\%$							
330	331								
470	471								
680	681								
1,000	102								
1,500	152								
2,200	222								
3,300	332								
4,700	472								
6,800	682								
10,000	103								
15,000	153								
22,000	223								
33,000	333								
47,000	473								
68,000	683								
100,000	104								
150,000	154								
220,000	224								
330,000	334								
470,000	474								
680,000	684								
1,000,000	105								
2,200,000	225								

Capacitance (pF)	Cap Code	Tolerance	X8R			X5R	
			2A (100V)	1H (50V)	1E (25V)	1C (16V)	0J (6.3V)
1,000	102	K: $\pm 10\%$					
1,500	152						
2,200	222						
3,300	332						
4,700	472						
6,800	682						
10,000	103						
15,000	153						
22,000	223						
33,000	333						
47,000	473						
68,000	683						
100,000	104						
2,200,000	225						
4,700,000	475						

Standard Thickness

 0.80 mm



Capacitance Range Table

CGA3 [EIA CC0603]

Class 1 (Temperature Compensating)

Temperature Characteristics: C0G (-55 to 125°C, 0±30 ppm/°C)

TDK Part Number (Ordering Code)	Temperature Characteristics	Rated Voltage	Capacitance (pF)	Capacitance Tolerance	Thickness (mm)
CGA3E2C0G1H010C	C0G	50V	1.0	± 0.25pF	0.80 ± 0.10
CGA3E2C0G1H1R5C	C0G	50V	1.5	± 0.25pF	0.80 ± 0.10
CGA3E2C0G1H020C	C0G	50V	2.0	± 0.25pF	0.80 ± 0.10
CGA3E2C0G1H2R2C	C0G	50V	2.2	± 0.25pF	0.80 ± 0.10
CGA3E2C0G1H030C	C0G	50V	3.0	± 0.25pF	0.80 ± 0.10
CGA3E2C0G1H3R3C	C0G	50V	3.3	± 0.25pF	0.80 ± 0.10
CGA3E2C0G1H040C	C0G	50V	4.0	± 0.25pF	0.80 ± 0.10
CGA3E2C0G1H4R7C	C0G	50V	4.7	± 0.25pF	0.80 ± 0.10
CGA3E2C0G1H050C	C0G	50V	5.0	± 0.25pF	0.80 ± 0.10
CGA3E2C0G1H060D	C0G	50V	6.0	± 0.50pF	0.80 ± 0.10
CGA3E2C0G1H6R8D	C0G	50V	6.8	± 0.50pF	0.80 ± 0.10
CGA3E2C0G1H070D	C0G	50V	7.0	± 0.50pF	0.80 ± 0.10
CGA3E2C0G1H080D	C0G	50V	8.0	± 0.50pF	0.80 ± 0.10
CGA3E2C0G1H090D	C0G	50V	9.0	± 0.50pF	0.80 ± 0.10
CGA3E2C0G1H100D	C0G	50V	10	± 0.50pF	0.80 ± 0.10
CGA3E2C0G1H120J	C0G	50V	12	± 5%	0.80 ± 0.10
CGA3E2C0G1H150J	C0G	50V	15	± 5%	0.80 ± 0.10
CGA3E2C0G1H180J	C0G	50V	18	± 5%	0.80 ± 0.10
CGA3E2C0G1H220J	C0G	50V	22	± 5%	0.80 ± 0.10
CGA3E2C0G1H270J	C0G	50V	27	± 5%	0.80 ± 0.10
CGA3E2C0G1H330J	C0G	50V	33	± 5%	0.80 ± 0.10
CGA3E2C0G1H390J	C0G	50V	39	± 5%	0.80 ± 0.10
CGA3E2C0G1H470J	C0G	50V	47	± 5%	0.80 ± 0.10
CGA3E2C0G1H560J	C0G	50V	56	± 5%	0.80 ± 0.10
CGA3E2C0G1H680J	C0G	50V	68	± 5%	0.80 ± 0.10
CGA3E2C0G1H820J	C0G	50V	82	± 5%	0.80 ± 0.10
CGA3E2C0G1H101J	C0G	50V	100	± 5%	0.80 ± 0.10
CGA3E2C0G1H121J	C0G	50V	120	± 5%	0.80 ± 0.10
CGA3E2C0G1H151J	C0G	50V	150	± 5%	0.80 ± 0.10
CGA3E2C0G1H181J	C0G	50V	180	± 5%	0.80 ± 0.10
CGA3E2C0G1H221J	C0G	50V	220	± 5%	0.80 ± 0.10
CGA3E2C0G1H271J	C0G	50V	270	± 5%	0.80 ± 0.10
CGA3E2C0G1H331J	C0G	50V	330	± 5%	0.80 ± 0.10
CGA3E2C0G1H391J	C0G	50V	390	± 5%	0.80 ± 0.10
CGA3E2C0G1H471J	C0G	50V	470	± 5%	0.80 ± 0.10
CGA3E2C0G1H561J	C0G	50V	560	± 5%	0.80 ± 0.10
CGA3E2C0G1H681J	C0G	50V	680	± 5%	0.80 ± 0.10
CGA3E2C0G1H821J	C0G	50V	820	± 5%	0.80 ± 0.10
CGA3E2C0G1H102J	C0G	50V	1,000	± 5%	0.80 ± 0.10
CGA3E2C0G1H122J	C0G	50V	1,200	± 5%	0.80 ± 0.10
CGA3E2C0G1H152J	C0G	50V	1,500	± 5%	0.80 ± 0.10
CGA3E2C0G1H182J	C0G	50V	1,800	± 5%	0.80 ± 0.10
CGA3E2C0G1H222J	C0G	50V	2,200	± 5%	0.80 ± 0.10
CGA3E2C0G1H272J	C0G	50V	2,700	± 5%	0.80 ± 0.10



Capacitance Range Table

CGA3 [EIA CC0603]

Class 1 (Temperature Compensating)

Temperature Characteristics: C0G (-55 to 125°C, 0±30 ppm/°C)

TDK Part Number (Ordering Code)	Temperature Characteristics	Rated Voltage	Capacitance (pF)	Capacitance Tolerance	Thickness (mm)
CGA3E2C0G1H332J	C0G	50V	3,300	± 5%	0.80 ± 0.10
CGA3E2C0G1H392J	C0G	50V	3,900	± 5%	0.80 ± 0.10
CGA3E2C0G1H472J	C0G	50V	4,700	± 5%	0.80 ± 0.10
CGA3E2C0G1H562J	C0G	50V	5,600	± 5%	0.80 ± 0.10
CGA3E2C0G1H682J	C0G	50V	6,800	± 5%	0.80 ± 0.10
CGA3E2C0G1H822J	C0G	50V	8,200	± 5%	0.80 ± 0.10
CGA3E2C0G1H103J	C0G	50V	10,000	± 5%	0.80 ± 0.10
CGA3E2C0G2A101J	C0G	100V	100	± 5%	0.80 ± 0.10
CGA3E2C0G2A121J	C0G	100V	120	± 5%	0.80 ± 0.10
CGA3E2C0G2A151J	C0G	100V	150	± 5%	0.80 ± 0.10
CGA3E2C0G2A181J	C0G	100V	180	± 5%	0.80 ± 0.10
CGA3E2C0G2A221J	C0G	100V	220	± 5%	0.80 ± 0.10
CGA3E2C0G2A271J	C0G	100V	270	± 5%	0.80 ± 0.10
CGA3E2C0G2A331J	C0G	100V	330	± 5%	0.80 ± 0.10
CGA3E2C0G2A391J	C0G	100V	390	± 5%	0.80 ± 0.10
CGA3E2C0G2A471J	C0G	100V	470	± 5%	0.80 ± 0.10
CGA3E2C0G2A561J	C0G	100V	560	± 5%	0.80 ± 0.10
CGA3E2C0G2A681J	C0G	100V	680	± 5%	0.80 ± 0.10
CGA3E2C0G2A821J	C0G	100V	820	± 5%	0.80 ± 0.10
CGA3E2C0G2A102J	C0G	100V	1,000	± 5%	0.80 ± 0.10
CGA3E2C0G2A122J	C0G	100V	1,200	± 5%	0.80 ± 0.10
CGA3E3C0G2E101J	C0G	250V	100	± 5%	0.80 ± 0.10
CGA3E3C0G2E121J	C0G	250V	120	± 5%	0.80 ± 0.10
CGA3E3C0G2E151J	C0G	250V	150	± 5%	0.80 ± 0.10
CGA3E3C0G2E181J	C0G	250V	180	± 5%	0.80 ± 0.10
CGA3E3C0G2E221J	C0G	250V	220	± 5%	0.80 ± 0.10
CGA3E3C0G2E271J	C0G	250V	270	± 5%	0.80 ± 0.10
CGA3E3C0G2E331J	C0G	250V	330	± 5%	0.80 ± 0.10
CGA3E3C0G2E391J	C0G	250V	390	± 5%	0.80 ± 0.10
CGA3E3C0G2E471J	C0G	250V	470	± 5%	0.80 ± 0.10
CGA3E3C0G2E561J	C0G	250V	560	± 5%	0.80 ± 0.10
CGA3E3C0G2E681J	C0G	250V	680	± 5%	0.80 ± 0.10

Class 2 (Temperature Stable)

Temperature Characteristics: X7R (-55 to +125°C, ±15%), X7S (-55 to +125°C, ±22%), X7T (-55 to +125°C, +22/-33%)

TDK Part Number (Ordering Code)	Temperature Characteristics	Rated Voltage	Capacitance (pF)	Capacitance Tolerance	Thickness (mm)
CGA3E2X7R1H221K	X7R	50V	220	± 10%	0.80 ± 0.10
CGA3E2X7R1H331K	X7R	50V	330	± 10%	0.80 ± 0.10
CGA3E2X7R1H471K	X7R	50V	470	± 10%	0.80 ± 0.10
CGA3E2X7R1H681K	X7R	50V	680	± 10%	0.80 ± 0.10
CGA3E2X7R1H102K	X7R	50V	1,000	± 10%	0.80 ± 0.10
CGA3E2X7R1H152K	X7R	50V	1,500	± 10%	0.80 ± 0.10
CGA3E2X7R1H222K	X7R	50V	2,200	± 10%	0.80 ± 0.10
CGA3E2X7R1H332K	X7R	50V	3,300	± 10%	0.80 ± 0.10



Capacitance Range Table

CGA3 [EIA CC0603]

Class 2 (Temperature Stable)

Temperature Characteristics: X7R (-55 to +125°C, ±15%), X6S (-55 to +105°C, ±22%), X5R (-55 to +85°C, ±15%), Y5V (-30 to +85°C, +22/-82%)

TDK Part Number (Ordering Code)	Temperature Characteristics	Rated Voltage	Capacitance (pF)	Capacitance Tolerance	Thickness (mm)
CGA3E2X7R1H472K	X7R	50V	4,700	± 10%	0.80 ± 0.10
CGA3E2X7R1H682K	X7R	50V	6,800	± 10%	0.80 ± 0.10
CGA3E2X7R1H103K	X7R	50V	10,000	± 10%	0.80 ± 0.10
CGA3E2X7R1H153K	X7R	50V	15,000	± 10%	0.80 ± 0.10
CGA3E2X7R1H223K	X7R	50V	22,000	± 10%	0.80 ± 0.10
CGA3E2X7R1H333K	X7R	50V	33,000	± 10%	0.80 ± 0.10
CGA3E2X7R1H473K	X7R	50V	47,000	± 10%	0.80 ± 0.10
CGA3E2X7R1H683K	X7R	50V	68,000	± 10%	0.80 ± 0.10
CGA3E2X7R1H104K	X7R	50V	100,000	± 10%	0.80 ± 0.10
CGA3E3X7R1H154K	X7R	50V	150,000	± 10%	0.80 ± 0.10
CGA3E3X7R1H224K	X7R	50V	220,000	± 10%	0.80 ± 0.10
CGA3E1X7R1V334K	X7R	35V	330,000	± 10%	0.80 ± 0.10
CGA3E1X7R1V474K	X7R	35V	470,000	± 10%	0.80 ± 0.10
CGA3E2X7R1E104K	X7R	25V	100,000	± 10%	0.80 ± 0.10
CGA3E2X7R1E154K	X7R	25V	150,000	± 10%	0.80 ± 0.10
CGA3E1X7R1E224K	X7R	25V	220,000	± 10%	0.80 ± 0.10
CGA3E3X7R1E474K	X7R	25V	470,000	± 10%	0.80 ± 0.10
CGA3E1X7R1E684K	X7R	25V	680,000	± 10%	0.80 ± 0.10
CGA3E1X7R1E105K	X7R	25V	1,000,000	± 10%	0.80 ± 0.10
CGA3E2X7R1C224K	X7R	16V	220,000	± 10%	0.80 ± 0.10
CGA3E1X7R1C334K	X7R	16V	330,000	± 10%	0.80 ± 0.10
CGA3E1X7R1C474K	X7R	16V	470,000	± 10%	0.80 ± 0.10
CGA3E1X7R1C684K	X7R	16V	680,000	± 10%	0.80 ± 0.10
CGA3E1X5R1C225K	X5R	16V	2,200,000	± 10%	0.80 ± 0.10
CGA3E1X7R0J225K	X7R	6.3V	2,200,000	± 10%	0.80 ± 0.10
CGA3E1X5R0J475K	X5R	6.3V	4,700,000	± 10%	0.80 ± 0.10
CGA3E2X7R2A102K	X7R	100V	1,000	± 10%	0.80 ± 0.10
CGA3E2X7R2A152K	X7R	100V	1,500	± 10%	0.80 ± 0.10
CGA3E2X7R2A222K	X7R	100V	2,200	± 10%	0.80 ± 0.10
CGA3E2X7R2A332K	X7R	100V	3,300	± 10%	0.80 ± 0.10
CGA3E2X7R2A472K	X7R	100V	4,700	± 10%	0.80 ± 0.10
CGA3E2X7R2A682K	X7R	100V	6,800	± 10%	0.80 ± 0.10
CGA3E2X7R2A103K	X7R	100V	10,000	± 10%	0.80 ± 0.10
CGA3E2X7R2A153K	X7R	100V	15,000	± 10%	0.80 ± 0.10
CGA3E2X7R2A223K	X7R	100V	22,000	± 10%	0.80 ± 0.10
CGA3E3X7S2A333K	X7S	100V	33,000	± 10%	0.80 ± 0.10
CGA3E3X7S2A473K	X7S	100V	47,000	± 10%	0.80 ± 0.10
CGA3E3X7S2A683K	X7S	100V	68,000	± 10%	0.80 ± 0.10
CGA3E3X7S2A104K	X7S	100V	100,000	± 10%	0.80 ± 0.10
CGA3E2X8R1E683K	X8R	25V	68,000	± 10%	0.80 ± 0.10
CGA3E2X8R1E104K	X8R	25V	100,000	± 10%	0.80 ± 0.10
CGA3E2X8R1H102K	X8R	50V	1,000	± 10%	0.80 ± 0.10
CGA3E2X8R1H152K	X8R	50V	1,500	± 10%	0.80 ± 0.10
CGA3E2X8R1H222K	X8R	50V	2,200	± 10%	0.80 ± 0.10



Capacitance Range Table

CGA3 [EIA CC0603]

Class 2 (Temperature Stable)

Temperature Characteristics: X7R (-55 to +125°C, ±15%), X6S (-55 to +105°C, ±22%), X5R (-55 to +85°C, ±15%), Y5V(-30 to +85°C, +22/-82%)

TDK Part Number (Ordering Code)	Temperature Characteristics	Rated Voltage	Capacitance (pF)	Capacitance Tolerance	Thickness (mm)
CGA3E2X8R1H332K	X8R	50V	3,300	± 10%	0.80 ± 0.10
CGA3E2X8R1H472K	X8R	50V	4,700	± 10%	0.80 ± 0.10
CGA3E2X8R1H682K	X8R	50V	6,800	± 10%	0.80 ± 0.10
CGA3E2X8R1H103K	X8R	50V	10,000	± 10%	0.80 ± 0.10
CGA3E2X8R1H153K	X8R	50V	15,000	± 10%	0.80 ± 0.10
CGA3E2X8R1H223K	X8R	50V	22,000	± 10%	0.80 ± 0.10
CGA3E2X8R1H333K	X8R	50V	33,000	± 10%	0.80 ± 0.10
CGA3E2X8R1H473K	X8R	50V	47,000	± 10%	0.80 ± 0.10
CGA3E2X8R2A102K	X8R	100V	1,000	± 10%	0.80 ± 0.10
CGA3E2X8R2A152K	X8R	100V	1,500	± 10%	0.80 ± 0.10
CGA3E2X8R2A222K	X8R	100V	2,200	± 10%	0.80 ± 0.10
CGA3E2X8R2A332K	X8R	100V	3,300	± 10%	0.80 ± 0.10
CGA3E2X8R2A472K	X8R	100V	4,700	± 10%	0.80 ± 0.10
CGA3E2X8R2A682K	X8R	100V	6,800	± 10%	0.80 ± 0.10
CGA3E2X8R2A103K	X8R	100V	10,000	± 10%	0.80 ± 0.10
CGA3E2X8R2A153K	X8R	100V	15,000	± 10%	0.80 ± 0.10



Capacitance Range Chart

CGA4 [EIA CC0805]

Capacitance Range Chart

Temperature Characteristics: C0G (0±30 ppm/°C)

Rated Voltage: 250V (2E), 100V (2A), 50V (1H)

Capacitance (pF)	Cap Code	Tolerance	C0G		
			2E (250V)	2A (100V)	1H (50V)
100	101	J: ± 5%			
220	221				
470	471				
820	821				
1,000	102				
1,200	122				
1,500	152				
1,800	182				
2,200	222				
2,700	272				
3,300	332				
3,900	392				
4,700	472				
5,600	562				
6,800	682				
8,200	822				
10,000	103				
15,000	153				
22,000	223				
33,000	333				

Standard Thickness

	0.60 mm
	0.85 mm
	1.25 mm



Capacitance Range Chart

CGA4 [EIA CC0805]

Capacitance Range Chart

Temperature Characteristics: X7R ($\pm 15\%$), X7S ($\pm 22\%$), X8R ($\pm 15\%$), X5R ($\pm 15\%$)

Rated Voltage: 450V (2W), 250V (2E), 100V (2A), 50V (1H), 35V (1V), 25V (1E), 16V (1C), 6.3V (0J)

Capacitance (pF)	Cap Code	Tolerance	X7R						
			2E (250V)	2A (100V)	1H (50V)	1V (35V)	1E (25V)	1C (16V)	0J (6.3V)
1,000	102	K: $\pm 10\%$							
1,500	152								
2,200	222								
3,300	332								
4,700	472								
6,800	682								
10,000	103								
15,000	153								
22,000	223								
33,000	333								
47,000	473								
68,000	683								
100,000	104								
150,000	154								
220,000	224								
330,000	334								
470,000	474								
680,000	684								
1,000,000	105								
1,500,000	155								
2,200,000	225								
3,300,000	335								
4,700,000	475								
10,000,000	106								

Capacitance (pF)	Cap Code	Tolerance	X8R			X7S	X7T		X5R
			2A (100V)	1H (50V)	1E (25V)	2A (100V)	2W (450V)	2E (250V)	0J (6.3V)
10,000	103	K: $\pm 10\%$							
15,000	153								
22,000	223								
33,000	333								
47,000	473								
68,000	683								
100,000	104								
150,000	154								
220,000	224								
330,000	334								
470,000	474								
680,000	684								
1,000,000	105								
10,000,000	106								

Standard Thickness

	0.60 mm
	0.85 mm
	1.25 mm



Capacitance Range Table

CGA4 [EIA CC0805]

Class 1 (Temperature Compensating)

Temperature Characteristics: C0G (-55 to 125°C, 0±30 ppm/°C)

TDK Part Number (Ordering Code)	Temperature Characteristics	Rated Voltage	Capacitance (pF)	Capacitance Tolerance	Thickness (mm)
CGA4C2C0G1H101J	C0G	50V	100	± 5%	0.60 ± 0.10
CGA4C2C0G1H102J	C0G	50V	1,000	± 5%	0.60 ± 0.10
CGA4C2C0G1H222J	C0G	50V	2,200	± 5%	0.60 ± 0.10
CGA4C2C0G1H272J	C0G	50V	2,700	± 5%	0.60 ± 0.10
CGA4C2C0G1H332J	C0G	50V	3,300	± 5%	0.60 ± 0.10
CGA4C2C0G1H392J	C0G	50V	3,900	± 5%	0.60 ± 0.10
CGA4F2C0G1H392J	C0G	50V	3,900	± 5%	0.85 ± 0.10
CGA4C2C0G1H472J	C0G	50V	4,700	± 5%	0.60 ± 0.10
CGA4F2C0G1H472J	C0G	50V	4,700	± 5%	0.85 ± 0.10
CGA4C2C0G1H562J	C0G	50V	5,600	± 5%	0.60 ± 0.10
CGA4F2C0G1H562J	C0G	50V	5,600	± 5%	0.85 ± 0.10
CGA4C2C0G1H682J	C0G	50V	6,800	± 5%	0.60 ± 0.10
CGA4J2C0G1H682J	C0G	50V	6,800	± 5%	1.25 ± 0.20
CGA4C2C0G1H822J	C0G	50V	8,200	± 5%	0.60 ± 0.10
CGA4J2C0G1H822J	C0G	50V	8,200	± 5%	1.25 ± 0.20
CGA4C2C0G1H103J	C0G	50V	10,000	± 5%	0.60 ± 0.10
CGA4J2C0G1H103J	C0G	50V	10,000	± 5%	1.25 ± 0.20
CGA4F2C0G1H153J	C0G	50V	15,000	± 5%	0.85 ± 0.10
CGA4J2C0G1H223J	C0G	50V	22,000	± 5%	1.25 ± 0.20
CGA4J2C0G1H333J	C0G	50V	33,000	± 5%	1.25 ± 0.20
CGA4C2C0G2A101J	C0G	100V	100	± 5%	0.60 ± 0.10
CGA4C2C0G2A221J	C0G	100V	220	± 5%	0.60 ± 0.10
CGA4C2C0G2A471J	C0G	100V	470	± 5%	0.60 ± 0.10
CGA4C2C0G2A102J	C0G	100V	1,000	± 5%	0.60 ± 0.10
CGA4C2C0G2A122J	C0G	100V	1,200	± 5%	0.60 ± 0.10
CGA4C2C0G2A152J	C0G	100V	1,500	± 5%	0.60 ± 0.10
CGA4F2C0G2A182J	C0G	100V	1,800	± 5%	0.85 ± 0.10
CGA4F2C0G2A222J	C0G	100V	2,200	± 5%	0.85 ± 0.10
CGA4J2C0G2A272J	C0G	100V	2,700	± 5%	1.25 ± 0.20
CGA4J2C0G2A332J	C0G	100V	3,300	± 5%	1.25 ± 0.20
CGA4J2C0G2A392J	C0G	100V	3,900	± 5%	1.25 ± 0.20
CGA4J2C0G2A472J	C0G	100V	4,700	± 5%	1.25 ± 0.20
CGA4C3C0G2E821J	C0G	250V	820	± 5%	0.60 ± 0.10
CGA4F3C0G2E102J	C0G	250V	1,000	± 5%	0.85 ± 0.10
CGA4F3C0G2E122J	C0G	250V	1,200	± 5%	0.85 ± 0.10
CGA4F3C0G2E152J	C0G	250V	1,500	± 5%	0.85 ± 0.10
CGA4J3C0G2E182J	C0G	250V	1,800	± 5%	1.25 ± 0.20
CGA4J3C0G2E222J	C0G	250V	2,200	± 5%	1.25 ± 0.20
CGA4J3C0G2E272J	C0G	250V	2,700	± 5%	1.25 ± 0.20



Capacitance Range Table

CGA4 [EIA CC0805]

Class 2 (Temperature Stable)

Temperature Characteristics: X7R (-55 to +125°C, ±15%), X6S (-55 to +105°C, ±22%), X5R (-55 to +85°C, ±15%), Y5V(-30 to +85°C, +22/-82%)

TDK Part Number (Ordering Code)	Temperature Characteristics	Rated Voltage	Capacitance (pF)	Capacitance Tolerance	Thickness (mm)
CGA4C2X7R1H102K	X7R	50V	1,000	± 10%	0.60 ± 0.10
CGA4C2X7R1H103K	X7R	50V	10,000	± 10%	0.60 ± 0.10
CGA4F2X7R1H104K	X7R	50V	100,000	± 10%	0.85 ± 0.10
CGA4J2X7R1H104K	X7R	50V	100,000	± 10%	1.25 ± 0.20
CGA4J2X7R1H104KT5	X7R	50V	100,000	± 10%	1.25 ± 0.20
CGA4J2X7R1H154K	X7R	50V	150,000	± 10%	1.25 ± 0.20
CGA4J2X7R1H224K	X7R	50V	220,000	± 10%	1.25 ± 0.20
CGA4J2X7R1H334K	X7R	50V	330,000	± 10%	1.25 ± 0.20
CGA4J3X7R1H474K	X7R	50V	470,000	± 10%	1.25 ± 0.20
CGA4J3X7R1H684K	X7R	50V	680,000	± 10%	1.25 ± 0.20
CGA4J3X7R1H105K	X7R	50V	1,000,000	± 10%	1.25 ± 0.20
CGA4J3X7R1V105K	X7R	35V	1,000,000	± 10%	1.25 ± 0.20
CGA4J1X7R1V225K	X7R	35V	2,200,000	± 10%	1.25 ± 0.20
CGA4J2X7R1E224K	X7R	25V	220,000	± 10%	1.25 ± 0.20
CGA4J2X7R1E474K	X7R	25V	470,000	± 10%	1.25 ± 0.20
CGA4J3X7R1E684K	X7R	25V	680,000	± 10%	1.25 ± 0.20
CGA4J3X7R1E105K	X7R	25V	1,000,000	± 10%	1.25 ± 0.20
CGA4J3X7R1E225K	X7R	25V	2,200,000	± 10%	1.25 ± 0.20
CGA4J1X7R1E335K	X7R	25V	3,300,000	± 10%	1.25 ± 0.20
CGA4J1X7R1E475K	X7R	25V	4,700,000	± 10%	1.25 ± 0.20
CGA4J2X7R1C474K	X7R	16V	470,000	± 10%	1.25 ± 0.20
CGA4J2X7R1C684K	X7R	16V	680,000	± 10%	1.25 ± 0.20
CGA4J2X7R1C105K	X7R	16V	1,000,000	± 10%	1.25 ± 0.20
CGA4J3X7R1C155K	X7R	16V	1,500,000	± 10%	1.25 ± 0.20
CGA4J3X7R1C225K	X7R	16V	2,200,000	± 10%	1.25 ± 0.20
CGA4J3X7R1C475K	X7R	16V	4,700,000	± 10%	1.25 ± 0.20
CGA4J3X5R1A106K	X5R	10V	10,000,000	± 10%	1.25 ± 0.20
CGA4J1X7R0J106K	X7R	6.3V	10,000,000	± 10%	1.25 ± 0.20
CGA4F2X7R2A102K	X7R	100V	1,000	± 10%	0.85 ± 0.10
CGA4F2X7R2A152K	X7R	100V	1,500	± 10%	0.85 ± 0.10
CGA4F2X7R2A222K	X7R	100V	2,200	± 10%	0.85 ± 0.10
CGA4F2X7R2A332K	X7R	100V	3,300	± 10%	0.85 ± 0.10
CGA4F2X7R2A472K	X7R	100V	4,700	± 10%	0.85 ± 0.10
CGA4F2X7R2A682K	X7R	100V	6,800	± 10%	0.85 ± 0.10
CGA4F2X7R2A103K	X7R	100V	10,000	± 10%	0.85 ± 0.10
CGA4J2X7R2A153K	X7R	100V	15,000	± 10%	1.25 ± 0.20
CGA4J2X7R2A223K	X7R	100V	22,000	± 10%	1.25 ± 0.20
CGA4J2X7R2A333K	X7R	100V	33,000	± 10%	1.25 ± 0.20
CGA4J2X7R2A473K	X7R	100V	47,000	± 10%	1.25 ± 0.20
CGA4F2X7R2A683K	X7R	100V	68,000	± 10%	0.85 ± 0.10
CGA4J2X7R2A104K	X7R	100V	100,000	± 10%	1.25 ± 0.20
CGA4F3X7R2E102K	X7R	250V	1,000	± 10%	0.85 ± 0.10
CGA4F3X7R2E152K	X7R	250V	1,500	± 10%	0.85 ± 0.10
CGA4F3X7R2E222K	X7R	250V	2,200	± 10%	0.85 ± 0.10



Capacitance Range Table

CGA4 [EIA CC0805]

Class 2 (Temperature Stable)

Temperature Characteristics: X7R (-55 to +125°C, ±15%), X6S (-55 to +105°C, ±22%), X5R (-55 to +85°C, ±15%), Y5V(-30 to +85°C, +22/-82%)

TDK Part Number (Ordering Code)	Temperature Characteristics	Rated Voltage	Capacitance (pF)	Capacitance Tolerance	Thickness (mm)
CGA4F3X7R2E332K	X7R	250V	3,300	± 10%	0.85 ± 0.10
CGA4F3X7R2E472K	X7R	250V	4,700	± 10%	0.85 ± 0.10
CGA4J3X7R2E682K	X7R	250V	6,800	± 10%	1.25 ± 0.20
CGA4J3X7R2E103K	X7R	250V	10,000	± 10%	1.25 ± 0.20
CGA4J3X7R2E153K	X7R	250V	15,000	± 10%	1.25 ± 0.20
CGA4J3X7R2E223K	X7R	250V	22,000	± 10%	1.25 ± 0.20
CGA4F3X7S2A224K	X7S	100V	220,000	± 10%	0.85 ± 0.10
CGA4J3X7S2A474K	X7S	100V	470,000	± 10%	1.25 ± 0.20
CGA4J3X7S2A105K	X7S	100V	1,000,000	± 10%	1.25 ± 0.20
CGA4J3X7T2E473K	X7T	250V	47,000	± 10%	1.25 ± 0.20
CGA4J3X7T2E104K	X7T	250V	100,000	± 10%	1.25 ± 0.20
CGA4F4X7T2W103K	X7T	450V	10,000	± 10%	0.85 ± 0.10
CGA4J4X7T2W223K	X7T	450V	22,000	± 10%	1.25 ± 0.20
CGA4J4X7T2W473K	X7T	450V	47,000	± 10%	1.25 ± 0.20
CGA4J2X8R1H683K	X8R	50V	68,000	± 10%	1.25 ± 0.20
CGA4J2X8R1H104K	X8R	50V	100,000	± 10%	1.25 ± 0.20
CGA4F2X8R1E154K	X8R	25V	150,000	± 10%	0.85 ± 0.10
CGA4J2X8R1E224K	X8R	25V	220,000	± 10%	1.25 ± 0.20
CGA4J2X8R1E334K	X8R	25V	330,000	± 10%	1.25 ± 0.20
CGA4J2X8R2A223K	X8R	100V	22,000	± 10%	1.25 ± 0.20



Capacitance Range Chart

CGA5 [EIA CC1206]

Capacitance Range Chart

Temperature Characteristics: C0G (0±30 ppm/°C)

Rated Voltage: 630V (2J), 250V (2E), 100V (2A), 50V (1H)

Capacitance (pF)	Cap Code	Tolerance	C0G			
			2J (630V)	2E (250V)	2A (100V)	1H (50V)
100	101	J: ± 5%				
120	121					
150	151					
180	181					
220	221					
270	271					
330	331					
390	391					
470	471					
560	561					
680	681					
820	821					
1,000	102					
1,200	122					
1,500	152					
1,800	182					
2,200	222					
2,700	272					
3,300	332					
3,900	392					
4,700	472					
5,600	562					
6,800	682					
8,200	822					
10,000	103					
15,000	153					
22,000	223					
33,000	333					
47,000	473					
68,000	683					
100,000	104					

Standard Thickness

	0.60 mm
	0.85 mm
	1.15 mm
	1.60 mm



Capacitance Range Chart

CGA5 [EIA CC1206]

Capacitance Range Chart

Temperature Characteristics: X7R ($\pm 15\%$), X7S ($\pm 22\%$), X8R ($\pm 15\%$), X5R ($\pm 15\%$)

Rated Voltage: 630V (2J), 450V (2W), 250V (2E), 100V (2A), 50V (1H), 35V (1V), 25V (1E), 16V (1C)

Capacitance (pF)	Cap Code	Tolerance	X7R						
			2J (630V)	2E (250V)	2A (100V)	1H (50V)	1V (35V)	1E (25V)	1C (16V)
1,000	102	K: $\pm 10\%$							
1,500	152								
2,200	222								
3,300	332								
4,700	472								
6,800	682								
10,000	103								
15,000	153								
22,000	223								
33,000	333								
47,000	473								
68,000	683								
100,000	104								
150,000	154								
220,000	224								
330,000	334								
470,000	474								
680,000	684								
1,000,000	105								
1,500,000	155								
2,200,000	225								
3,300,000	335								
4,700,000	475								
6,800,000	685								
10,000,000	106								

Capacitance (pF)	Cap Code	Tolerance	X7S	X7T			X8R		
			2A (100V)	2J (630V)	2W (450V)	2E (250V)	2A (100V)	1H (50V)	1E (25V)
10,000	103	K: ± 10%							
15,000	153								
22,000	223								
33,000	333								
47,000	473								
68,000	683								
100,000	104								
150,000	154								
220,000	224								
330,000	334								
470,000	474								
680,000	684								
1,000,000	105								
1,500,000	155								
2 200,000	225								

Standard Thickness

	0.85 mm
	1.15 mm
	1.30 mm
	1.60 mm



Capacitance Range Table

CGA5 [EIA CC1206]

Class 1 (Temperature Compensating)

Temperature Characteristics: C0G (-55 to 125°C, 0±30 ppm/°C)

TDK Part Number (Ordering Code)	Temperature Characteristics	Rated Voltage	Capacitance (pF)	Capacitance Tolerance	Thickness (mm)
CGA5C2C0G1H472J	C0G	50V	4,700	± 5%	0.60 ± 0.10
CGA5C2C0G1H562J	C0G	50V	5,600	± 5%	0.60 ± 0.10
CGA5C2C0G1H682J	C0G	50V	6,800	± 5%	0.60 ± 0.10
CGA5C2C0G1H822J	C0G	50V	8,200	± 5%	0.60 ± 0.10
CGA5F2C0G1H822J	C0G	50V	8,200	± 5%	0.85 ± 0.10
CGA5C2C0G1H103J	C0G	50V	10,000	± 5%	0.60 ± 0.10
CGA5F2C0G1H103J	C0G	50V	10,000	± 5%	0.85 ± 0.10
CGA5C2C0G1H153J	C0G	50V	15,000	± 5%	0.60 ± 0.10
CGA5H2C0G1H153J	C0G	50V	15,000	± 5%	1.15 ± 0.10
CGA5C2C0G1H223J	C0G	50V	22,000	± 5%	0.60 ± 0.10
CGA5H2C0G1H223J	C0G	50V	22,000	± 5%	1.15 ± 0.10
CGA5F2C0G1H333J	C0G	50V	33,000	± 5%	0.85 ± 0.10
CGA5L2C0G1H333J	C0G	50V	33,000	± 5%	1.60 ± 0.30
CGA5H2C0G1H473J	C0G	50V	47,000	± 5%	1.15 ± 0.10
CGA5L2C0G1H683J	C0G	50V	68,000	± 5%	1.60 ± 0.30
CGA5L2C0G1H104J	C0G	50V	100,000	± 5%	1.60 ± 0.30
CGA5C2C0G2A392J	C0G	100V	3,900	± 5%	0.60 ± 0.10
CGA5F2C0G2A472J	C0G	100V	4,700	± 5%	0.85 ± 0.10
CGA5F2C0G2A562J	C0G	100V	5,600	± 5%	0.85 ± 0.10
CGA5H2C0G2A682J	C0G	100V	6,800	± 5%	1.15 ± 0.10
CGA5H2C0G2A822J	C0G	100V	8,200	± 5%	1.15 ± 0.10
CGA5H2C0G2A103J	C0G	100V	10,000	± 5%	1.15 ± 0.10
CGA5F3C0G2E332J	C0G	250V	3,300	± 5%	0.85 ± 0.10
CGA5H3C0G2E392J	C0G	250V	3,900	± 5%	1.15 ± 0.10
CGA5H3C0G2E472J	C0G	250V	4,700	± 5%	1.15 ± 0.10
CGA5H3C0G2E562J	C0G	250V	5,600	± 5%	1.15 ± 0.10
CGA5L3C0G2E682J	C0G	250V	6,800	± 5%	1.60 ± 0.30
CGA5L3C0G2E822J	C0G	250V	8,200	± 5%	1.60 ± 0.30
CGA5C4C0G2J101J	C0G	630V	100	± 5%	0.60 ± 0.10
CGA5C4C0G2J121J	C0G	630V	120	± 5%	0.60 ± 0.10
CGA5C4C0G2J151J	C0G	630V	150	± 5%	0.60 ± 0.10
CGA5C4C0G2J181J	C0G	630V	180	± 5%	0.60 ± 0.10
CGA5C4C0G2J221J	C0G	630V	220	± 5%	0.60 ± 0.10
CGA5C4C0G2J271J	C0G	630V	270	± 5%	0.60 ± 0.10
CGA5C4C0G2J331J	C0G	630V	330	± 5%	0.60 ± 0.10
CGA5C4C0G2J391J	C0G	630V	390	± 5%	0.60 ± 0.10
CGA5F4C0G2J471J	C0G	630V	470	± 5%	0.85 ± 0.10
CGA5F4C0G2J561J	C0G	630V	560	± 5%	0.85 ± 0.10
CGA5F4C0G2J681J	C0G	630V	680	± 5%	0.85 ± 0.10
CGA5F4C0G2J821J	C0G	630V	820	± 5%	0.85 ± 0.10
CGA5F4C0G2J102J	C0G	630V	1,000	± 5%	0.85 ± 0.10
CGA5F4C0G2J122J	C0G	630V	1,200	± 5%	0.85 ± 0.10
CGA5H4C0G2J152J	C0G	630V	1,500	± 5%	1.15 ± 0.10
CGA5H4C0G2J182J	C0G	630V	1,800	± 5%	1.15 ± 0.10



Capacitance Range Table

CGA5 [EIA CC1206]

Class 1 (Temperature Compensating)

Temperature Characteristics: C0G (-55 to 125°C, 0±30 ppm/°C)

TDK Part Number (Ordering Code)	Temperature Characteristics	Rated Voltage	Capacitance (pF)	Capacitance Tolerance	Thickness (mm)
CGA5H4C0G2J222J	C0G	630V	2,200	± 5%	1.15 ± 0.10
CGA5L4C0G2J272J	C0G	630V	2,700	± 5%	1.60 ± 0.30
CGA5L4C0G2J332J	C0G	630V	3,300	± 5%	1.60 ± 0.30

Class 2 (Temperature Stable)

Temperature Characteristics: X7R (-55 to +125°C, ±15%), X6S (-55 to +105°C, ±22%), X5R (-55 to +85°C, ±15%), Y5V(-30 to +85°C, +22/-82%)

TDK Part Number (Ordering Code)	Temperature Characteristics	Rated Voltage	Capacitance (pF)	Capacitance Tolerance	Thickness (mm)
CGA5L2X7R1H474K	X7R	50V	470,000	± 10%	1.60 ± 0.30
CGA5L2X7R1H684K	X7R	50V	680,000	± 10%	1.60 ± 0.30
CGA5L3X7R1H105K	X7R	50V	1,000,000	± 10%	1.60 ± 0.30
CGA5L3X7R1H155K	X7R	50V	1,500,000	± 10%	1.60 ± 0.30
CGA5L3X7R1H225K	X7R	50V	2,200,000	± 10%	1.60 ± 0.30
CGA5L1X7R1V335K	X7R	35V	3,300,000	± 10%	1.60 ± 0.30
CGA5L1X7R1V475K	X7R	35V	4,700,000	± 10%	1.60 ± 0.30
CGA5L2X7R1E105K	X7R	25V	1,000,000	± 10%	1.60 ± 0.30
CGA5L2X7R1E155K	X7R	25V	1,500,000	± 10%	1.60 ± 0.30
CGA5L2X7R1E225K	X7R	25V	2,200,000	± 10%	1.60 ± 0.30
CGA5L1X7R1E335K	X7R	25V	3,300,000	± 10%	1.60 ± 0.30
CGA5L1X7R1E475K	X7R	25V	4,700,000	± 10%	1.60 ± 0.30
CGA5L1X7R1E106K	X7R	25V	10,000,000	± 10%	1.60 ± 0.30
CGA5H2X7R1C105K	X7R	16V	1,000,000	± 10%	1.15 ± 0.10
CGA5L2X7R1C225K	X7R	16V	2,200,000	± 10%	1.60 ± 0.30
CGA5L3X7R1C475K	X7R	16V	4,700,000	± 10%	1.60 ± 0.30
CGA5L1X7R1C685K	X7R	16V	6,800,000	± 10%	1.60 ± 0.30
CGA5H2X7R2A333K	X7R	100V	33,000	± 10%	1.15 ± 0.10
CGA5H2X7R2A473K	X7R	100V	47,000	± 10%	1.15 ± 0.10
CGA5L2X7R2A683K	X7R	100V	68,000	± 10%	1.60 ± 0.30
CGA5L2X7R2A104K	X7R	100V	100,000	± 10%	1.60 ± 0.30
CGA5L2X7R2A154K	X7R	100V	150,000	± 10%	1.60 ± 0.30
CGA5H2X7R2A224K	X7R	100V	220,000	± 10%	1.15 ± 0.10
CGA5K2X7R2A334K	X7R	100V	330,000	± 10%	1.30 ± 0.15
CGA5L2X7R2A474K	X7R	100V	470,000	± 10%	1.60 ± 0.30
CGA5L2X7R2A105K	X7R	100V	1,000,000	± 10%	1.60 ± 0.30
CGA5H3X7R2E153K	X7R	250V	15,000	± 10%	1.15 ± 0.10
CGA5H3X7R2E223K	X7R	250V	22,000	± 10%	1.15 ± 0.10
CGA5L3X7R2E333K	X7R	250V	33,000	± 10%	1.60 ± 0.30
CGA5L3X7R2E473K	X7R	250V	47,000	± 10%	1.60 ± 0.30
CGA5L3X7R2E683K	X7R	250V	68,000	± 10%	1.60 ± 0.30
CGA5L3X7R2E104K	X7R	250V	100,000	± 10%	1.60 ± 0.30
CGA5H4X7R2J102K	X7R	630V	1,000	± 10%	1.15 ± 0.10
CGA5H4X7R2J152K	X7R	630V	1,500	± 10%	1.15 ± 0.10
CGA5H4X7R2J222K	X7R	630V	2,200	± 10%	1.15 ± 0.10
CGA5H4X7R2J332K	X7R	630V	3,300	± 10%	1.15 ± 0.10
CGA5H4X7R2J472K	X7R	630V	4,700	± 10%	1.15 ± 0.10



Capacitance Range Table

CGA5 [EIA CC1206]

Class 2 (Temperature Stable)

Temperature Characteristics: X7R (-55 to +125°C, ±15%), X6S (-55 to +105°C, ±22%), X5R (-55 to +85°C, ±15%), Y5V(-30 to +85°C, +22/-82%)

TDK Part Number (Ordering Code)	Temperature Characteristics	Rated Voltage	Capacitance (pF)	Capacitance Tolerance	Thickness (mm)
CGA5H4X7R2J682K	X7R	630V	6,800	± 10%	1.15 ± 0.10
CGA5H4X7R2J103K	X7R	630V	10,000	± 10%	1.15 ± 0.10
CGA5K4X7R2J153K	X7R	630V	15,000	± 10%	1.30 ± 0.15
CGA5K4X7R2J223K	X7R	630V	22,000	± 10%	1.30 ± 0.15
CGA5L4X7R2J333K	X7R	630V	33,000	± 10%	1.60 ± 0.30
CGA5L3X7S2A225K	X7S	100V	2,200,000	± 10%	1.60 ± 0.30
CGA5L3X7T2E224K	X7T	250V	220,000	± 10%	1.60 ± 0.30
CGA5L4X7T2W104K	X7T	450V	100,000	± 10%	1.60 ± 0.30
CGA5F1X7T2J103K	X7T	630V	10,000	± 10%	0.85 ± 0.10
CGA5H1X7T2J223K	X7T	630V	22,000	± 10%	1.15 ± 0.10
CGA5L1X7T2J473K	X7T	630V	47,000	± 10%	1.60 ± 0.30
CGA5F2X8R1H154K	X8R	50V	150,000	± 10%	0.85 ± 0.10
CGA5H2X8R1H224K	X8R	50V	220,000	± 10%	1.15 ± 0.10
CGA5L2X8R1H334K	X8R	50V	330,000	± 10%	1.60 ± 0.30
CGA5L2X8R1H474K	X8R	50V	470,000	± 10%	1.60 ± 0.30
CGA5F2X8R1E334K	X8R	25V	330,000	± 10%	0.85 ± 0.10
CGA5F2X8R1E474K	X8R	25V	470,000	± 10%	0.85 ± 0.10
CGA5H2X8R1E684K	X8R	25V	680,000	± 10%	1.15 ± 0.10
CGA5L2X8R1E105K	X8R	25V	1,000,000	± 10%	1.60 ± 0.30
CGA5F2X8R2A333K	X8R	100V	33,000	± 10%	0.85 ± 0.10
CGA5F2X8R2A473K	X8R	100V	47,000	± 10%	0.85 ± 0.10
CGA5H2X8R2A683K	X8R	100V	68,000	± 10%	1.15 ± 0.10
CGA5H2X8R2A104K	X8R	100V	100,000	± 10%	1.15 ± 0.10
CGA5L2X8R2A154K	X8R	100V	150,000	± 10%	1.60 ± 0.30



Capacitance Range Chart

CGA6 [EIA CC1210]

Capacitance Range Chart

Temperature Characteristics: C0G (0±30 ppm/°C)

Rated Voltage: 630V (2J), 250V (2E), 100V (2A), 50V (1H)

Capacitance (pF)	Cap Code	Tolerance	C0G			
			2J (630V)	2E (250V)	2A (100V)	1H (50V)
3,900	392	J: ± 5%				
4,700	472					
5,600	562					
6,800	682					
10,000	103					
15,000	153					
22,000	223					
33,000	333					
47,000	473					
68,000	683					
100,000	104					

Standard Thickness

	1.30 mm
	1.60 mm
	2.00 mm
	2.30 mm
	2.50 mm

Capacitance Range Chart

Temperature Characteristics: X7R (± 15%), X7S (± 22%), X8R (±15%), X5R (±15%)

Rated Voltage: 630V (2J), 450V (2W), 250V (2E), 100V (2A), 50V (1H), 25V (1E), 16V (1C)

Capacitance (pF)	Cap Code	Tolerance	X7R					
			2J (630V)	2E (250V)	2A (100V)	1H (50V)	1E (25V)	1C (16V)
47,000	473	K: ± 10%						
68,000	683							
100,000	104							
150,000	154							
220,000	224							
330,000	334							
470,000	474							
680,000	684							
1,000,000	105							
1,500,000	155							
2,200,000	225							
3,300,000	335							
4,700,000	475							
6,800,000	685							
10,000,000	106							
15,000,000	156							
22,000,000	226							

Capacitance (pF)	Cap Code	Tolerance	X7S		X7T		X8R
			2A (100V)	1H (50V)	2J (630V)	2W (450V)	1E (25V)
100,000	104	K: ± 10%					
150,000	154						
220,000	224						
330,000	334						
470,000	474						
680,000	684						
1,000,000	105						
1,500,000	155						
2,200,000	225						
3,300,000	335						
4,700,000	475						
6,800,000	685						
10,000,000	106						

Standard Thickness

	1.30 mm
	1.60 mm
	2.00 mm
	2.30 mm
	2.50 mm



Capacitance Range Table

CGA6 [EIA CC1210]

Class 1 (Temperature Compensating)

Temperature Characteristics: C0G (-55 to 125°C, 0±30 ppm/°C)

TDK Part Number (Ordering Code)	Temperature Characteristics	Rated Voltage	Capacitance (pF)	Capacitance Tolerance	Thickness (mm)
CGA6J2C0G1H223J	C0G	50V	22,000	± 5%	1.30 ± 0.15
CGA6L2C0G1H333J	C0G	50V	33,000	± 5%	1.60 ± 0.30
CGA6M2C0G1H473J	C0G	50V	47,000	± 5%	2.00 ± 0.20
CGA6M2C0G1H683J	C0G	50V	68,000	± 5%	2.00 ± 0.20
CGA6P2C0G1H104J	C0G	50V	100,000	± 5%	2.50 ± 0.30
CGA6J2C0G2A153J	C0G	100V	15,000	± 5%	1.30 ± 0.15
CGA6L2C0G2A223J	C0G	100V	22,000	± 5%	1.60 ± 0.30
CGA6M2C0G2A333J	C0G	100V	33,000	± 5%	2.00 ± 0.20
CGA6N2C0G2A473J	C0G	100V	47,000	± 5%	2.30 ± 0.20
CGA6L3C0G2E103J	C0G	250V	10,000	± 5%	1.60 ± 0.30
CGA6M3C0G2E153J	C0G	250V	15,000	± 5%	2.00 ± 0.20
CGA6J4C0G2J392J	C0G	630V	3,900	± 5%	1.30 ± 0.15
CGA6L4C0G2J472J	C0G	630V	4,700	± 5%	1.60 ± 0.30
CGA6L4C0G2J562J	C0G	630V	5,600	± 5%	1.60 ± 0.30
CGA6M4C0G2J682J	C0G	630V	6,800	± 5%	2.00 ± 0.20

Class 2 (Temperature Stable)

Temperature Characteristics: X7R (-55 to +125°C, ±15%), X7S (-55 to +125°C, ±22%), X7T (-55 to +125°C, +22/-33%)

TDK Part Number (Ordering Code)	Temperature Characteristics	Rated Voltage	Capacitance (pF)	Capacitance Tolerance	Thickness (mm)
CGA6L2X7R1H105K	X7R	50V	1,000,000	± 10%	1.60 ± 0.30
CGA6M2X7R1H155K	X7R	50V	1,500,000	± 10%	2.00 ± 0.20
CGA6M3X7R1H225K	X7R	50V	2,200,000	± 10%	2.00 ± 0.20
CGA6P3X7R1H335K	X7R	50V	3,300,000	± 10%	2.50 ± 0.30
CGA6P3X7R1H475K	X7R	50V	4,700,000	± 10%	2.50 ± 0.30
CGA6L2X7R1E335K	X7R	25V	3,300,000	± 10%	1.60 ± 0.30
CGA6M2X7R1E475K	X7R	25V	4,700,000	± 10%	2.00 ± 0.20
CGA6P3X7R1E685K	X7R	25V	6,800,000	± 10%	2.50 ± 0.30
CGA6P1X7R1E106K	X7R	25V	10,000,000	± 10%	2.50 ± 0.30
CGA6P1X7R1E106M	X7R	25V	10,000,000	± 20%	2.50 ± 0.30
CGA6M3X7R1C106K	X7R	16V	10,000,000	± 10%	2.00 ± 0.20
CGA6M3X7R1C106M	X7R	16V	10,000,000	± 20%	2.00 ± 0.20
CGA6P3X7R1C156M	X7R	16V	15,000,000	± 20%	2.50 ± 0.30
CGA6P1X7R1C226M	X7R	16V	22,000,000	± 20%	2.50 ± 0.30
CGA6M2X7R2A334K	X7R	100V	330,000	± 10%	2.00 ± 0.20
CGA6M2X7R2A474K	X7R	100V	470,000	± 10%	2.00 ± 0.20
CGA6L2X7R2A684K	X7R	100V	680,000	± 10%	1.60 ± 0.30
CGA6M2X7R2A105K	X7R	100V	1,000,000	± 10%	2.00 ± 0.20
CGA6N3X7R2A225K	X7R	100V	2,200,000	± 10%	2.30 ± 0.20
CGA6M3X7R2E104K	X7R	250V	100,000	± 10%	2.00 ± 0.20
CGA6M3X7R2E154K	X7R	250V	150,000	± 10%	2.00 ± 0.20
CGA6M3X7R2E224K	X7R	250V	220,000	± 10%	2.00 ± 0.20
CGA6M4X7R2J473K	X7R	630V	47,000	± 10%	2.00 ± 0.20
CGA6M4X7R2J683K	X7R	630V	68,000	± 10%	2.00 ± 0.20
CGA6N3X7S1H475K	X7S	50V	4,700,000	± 10%	2.30 ± 0.20



Capacitance Range Table

CGA6 [EIA CC1210]

Class 2 (Temperature Stable)

Temperature Characteristics: X7R (-55 to +125°C, ±15%), X6S (-55 to +105°C, ±22%), X5R (-55 to +85°C, ±15%), Y5V(-30 to +85°C, +22/-82%)

TDK Part Number (Ordering Code)	Temperature Characteristics	Rated Voltage	Capacitance (pF)	Capacitance Tolerance	Thickness (mm)
CGA6P3X7S1H685K	X7S	50V	6,800,000	± 10%	2.50 ± 0.30
CGA6P3X7S1H106K	X7S	50V	10,000,000	± 10%	2.50 ± 0.30
CGA6M3X7S2A475K	X7S	100V	4,700,000	± 10%	2.00 ± 0.20
CGA6M4X7T2W224K	X7T	450V	220,000	± 10%	2.00 ± 0.20
CGA6L1X7T2J104K	X7T	630V	100,000	± 10%	1.60 ± 0.30
CGA6L2X8R1E155K	X8R	25V	1,500,000	± 10%	1.60 ± 0.30
CGA6M2X8R1E225K	X8R	25V	2,200,000	± 10%	2.00 ± 0.20
CGA6P2X8R1E335K	X8R	25V	3,300,000	± 10%	2.50 ± 0.30



General Specifications

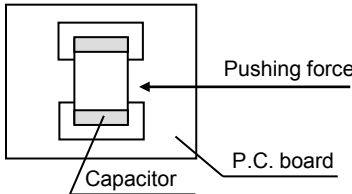
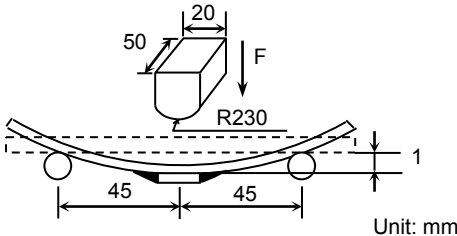
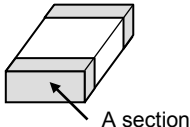
CGA Series – Automotive Grade Capacitors

No.	Item	Performance	Test or Inspection Method																	
1	External Appearance	No defects which may affect performance.	Inspect with magnifying glass (3×).																	
2	Insulation Resistance	10,000MΩ or 500MΩ•μF min. (As for the capacitors of rated voltage 16V DC and the item below, 10,000 MΩ or 100MΩ•μF min.), whichever is smaller.	Apply rated voltage for 60s. As for the rated voltage 630V DC, apply 500V DC.																	
3	Voltage Proof	Withstand test voltage without insulation breakdown or other damage.	<table><tr><th>Class</th><th>Rated Voltage</th><th>Apply voltage</th></tr><tr><td rowspan="2">Class 1</td><td>100V and under</td><td>3 × rated voltage</td></tr><tr><td>Over 100V</td><td>1.5 × rated voltage</td></tr><tr><td rowspan="2">Class 2</td><td>100V and under</td><td>2.5 × rated voltage</td></tr><tr><td>Over 100V</td><td>1.5 × rated voltage</td></tr></table> Above DC voltage shall be applied for 1 to 5s. Charge / discharge current shall not exceed 50mA.	Class	Rated Voltage	Apply voltage	Class 1	100V and under	3 × rated voltage	Over 100V	1.5 × rated voltage	Class 2	100V and under	2.5 × rated voltage	Over 100V	1.5 × rated voltage				
Class	Rated Voltage	Apply voltage																		
Class 1	100V and under	3 × rated voltage																		
	Over 100V	1.5 × rated voltage																		
Class 2	100V and under	2.5 × rated voltage																		
	Over 100V	1.5 × rated voltage																		
4	Capacitance	Within the specified tolerance.	<table><tr><th>Class</th><th>Rated Capacitance</th><th>Measuring Frequency</th><th>Measuring voltage</th></tr><tr><td rowspan="2">Class 1</td><td>≤ 1000pF</td><td>1MHz±10%</td><td rowspan="2">0.5 - 5 V_{rms}</td></tr><tr><td>> 1000pF</td><td>1kHz±10%</td></tr><tr><td rowspan="2">Class 2</td><td>≤ 10uF</td><td>1kHz±10%</td><td>1.0±0.2 V_{rms}</td></tr><tr><td>> 10uF</td><td>120Hz±20%</td><td>0.5±0.2 V_{rms}</td></tr></table>	Class	Rated Capacitance	Measuring Frequency	Measuring voltage	Class 1	≤ 1000pF	1MHz±10%	0.5 - 5 V _{rms}	> 1000pF	1kHz±10%	Class 2	≤ 10uF	1kHz±10%	1.0±0.2 V _{rms}	> 10uF	120Hz±20%	0.5±0.2 V _{rms}
Class	Rated Capacitance	Measuring Frequency	Measuring voltage																	
Class 1	≤ 1000pF	1MHz±10%	0.5 - 5 V _{rms}																	
	> 1000pF	1kHz±10%																		
Class 2	≤ 10uF	1kHz±10%	1.0±0.2 V _{rms}																	
	> 10uF	120Hz±20%	0.5±0.2 V _{rms}																	
5	Q (Class 1)	<table><tr><th>Rated Capacitance</th><th>Q</th></tr><tr><td>C ≥ 30pF</td><td>1,000 min.</td></tr><tr><td>C < 30pF</td><td>400+20×C min.</td></tr></table> C : Rated capacitance (pF)	Rated Capacitance	Q	C ≥ 30pF	1,000 min.	C < 30pF	400+20×C min.	See No.4 in this table for measuring condition.											
Rated Capacitance	Q																			
C ≥ 30pF	1,000 min.																			
C < 30pF	400+20×C min.																			
6	Dissipation Factor (Class 2)	<table><tr><th>T.C.</th><th>D.F.</th></tr><tr><td>X8R</td><td>0.03 max.</td></tr><tr><td>X7R</td><td>0.05 max.</td></tr><tr><td>C0G</td><td>0.075 max.</td></tr><tr><td></td><td>0.1 max.</td></tr></table>	T.C.	D.F.	X8R	0.03 max.	X7R	0.05 max.	C0G	0.075 max.		0.1 max.	See No.4 in this table for measuring condition.							
T.C.	D.F.																			
X8R	0.03 max.																			
X7R	0.05 max.																			
C0G	0.075 max.																			
	0.1 max.																			
7	Temperature Characteristics of Capacitance (Class1)	<table><tr><th>T.C.</th><th>Temperature Coefficient</th></tr><tr><td>C0G</td><td>0 ± 30 ppm/°C</td></tr></table> Capacitance drift within ± 0.2% or ± 0.05pF, whichever larger.	T.C.	Temperature Coefficient	C0G	0 ± 30 ppm/°C														
T.C.	Temperature Coefficient																			
C0G	0 ± 30 ppm/°C																			



General Specifications

CGA Series – Automotive Grade Capacitors

No.	Item	Performance	Test or Inspection Method													
8	Temperature Characteristics of Capacitance (Class 2)	Capacitance Change (%) <table><tr><td>No Voltage Applied</td></tr><tr><td>X7R: ± 15%</td></tr><tr><td>X8R: ± 15%</td></tr></table>	No Voltage Applied	X7R: ± 15%	X8R: ± 15%	Capacitance shall be measured by the steps shown in the following table after thermal equilibrium is obtained for each step. ΔC be calculated ref. STEP 3 reading <table><tr><th>Step</th><th>Temperature (°C)</th></tr><tr><td>1</td><td>Reference temp. ± 2</td></tr><tr><td>2</td><td>Min. operating temp. ± 3</td></tr><tr><td>3</td><td>Reference temp. ± 2</td></tr><tr><td>4</td><td>Max. operating temp. ± 2</td></tr></table> Measuring voltage: 0.1, 0.2, 0.5, 1.0V _{rms} .	Step	Temperature (°C)	1	Reference temp. ± 2	2	Min. operating temp. ± 3	3	Reference temp. ± 2	4	Max. operating temp. ± 2
No Voltage Applied																
X7R: ± 15%																
X8R: ± 15%																
Step	Temperature (°C)															
1	Reference temp. ± 2															
2	Min. operating temp. ± 3															
3	Reference temp. ± 2															
4	Max. operating temp. ± 2															
9	Robustness of Terminations	No sign of termination coming off, breakage of ceramic, or other abnormal signs.	Reflow solder the capacitor on P.C. board (shown in Appendix 1a or Appendix 1b) and apply a pushing force of 2N (CGA2) or 17.7N (CGA3, CGA4, CGA5, CGA6) with 10±1s. 													
10	Bending	No mechanical damage.	Reflow solder the capacitors on P.C. board (shown in Appendix 2a or Appendix 2b) and bend it for 1mm. 													
11	Solderability	New solder to cover over 75% of termination. 25% may have pinholes or rough spots but not concentrated in one spot. Ceramic surface of A sections shall not be exposed due to melting or shifting of termination material. 	Completely soak both terminations in solder at 235±5°C for 2±0.5s. Solder: H63A (JIS Z 3282) Flux: Isopropyl alcohol (JIS K 8839) Rosin (JIS K 5902) 25% solid solution.													



General Specifications

CGA Series – Automotive Grade Capacitors

No.	Item	Performance	Test or Inspection Method
12	Resistance to solder heat		Completely soak both terminations in solder at $260 \pm 5^\circ\text{C}$ for $5 \pm 1\text{s}$.
	External appearance	No cracks are allowed and terminations shall be covered at least 60% with new solder	Preheating condition Temp. : $150 \pm 10^\circ\text{C}$ Time : 1 to 2min.
	Capacitance	Characteristics	Flux : Isopropyl alcohol (JIS K 8839) Rosin (JIS K 5902) 25% solid solution. Solder : H63A (JIS Z 3282)
		Change from the value before test	
		Class 1 C0G	
		Class 2 X7R X8R	
			Capacitance drift within $\pm 2.5\%$ or $\pm 0.25\text{pF}$, whichever larger. $\pm 7.5\%$
Q (Class 1)	Rated Capacitance		Q
	30pF and over		1,000 min.
	Under 30pF		$400 + 20 \times C$ min.
	C : Rated capacitance (pF)		
D.F. (Class 2)	Meet the initial spec.		
Insulation Resistance	Meet the initial spec.		
Voltage Proof	No insulation breakdown or other damage.		
13	Vibration		Reflow solder the capacitor on a P.C. board (shown in Appendix 1a or Appendix 1b) before testing.
	External appearance	No mechanical damage.	Vibrate the capacitor with following conditions:
	Capacitance	Characteristics	Applied force: 5G max. Frequency: 10-2000Hz Duration: 20 min. Cycle : 12 cycles
		Change from the value before test	
		Class 1 C0G	
		Class 2 X7R X8R	
			Capacitance drift within $\pm 2.5\%$ or $\pm 0.25\text{pF}$, whichever larger. $\pm 7.5\%$
Q (Class 1)	Rated Capacitance		Q
	30pF and over		1,000 min.
	Under 30pF		$400 + 20 \times C$ min.
	C : Rated capacitance (pF)		
D.F. (Class 2)	Meet the initial spec.		



General Specifications

CGA Series – Automotive Grade Capacitors

No.	Item	Performance	Test or Inspection Method															
14	Temperature cycle		Reflow solder the capacitors on a P.C. board (shown in Appendix 1a or Appendix 1b) before testing. Expose the capacitor in the conditions step1 through step 4, and repeat 5 times consecutively. Leave the capacitor in ambient conditions for 6 to 24h (Class 1) or 24±2h (Class 2) before measurement. <table><tr><th>Step</th><th>Temperature (°C)</th><th>Time (min.)</th></tr><tr><td>1</td><td>Min. operating temp. ±3</td><td>30 ± 3</td></tr><tr><td>2</td><td>Reference Temp. ±2</td><td>2 – 5</td></tr><tr><td>3</td><td>Max. operating temp. ± 2</td><td>30 ± 2</td></tr><tr><td>4</td><td>Reference Temp. ± 2</td><td>2 - 5</td></tr></table>	Step	Temperature (°C)	Time (min.)	1	Min. operating temp. ±3	30 ± 3	2	Reference Temp. ±2	2 – 5	3	Max. operating temp. ± 2	30 ± 2	4	Reference Temp. ± 2	2 - 5
	Step	Temperature (°C)		Time (min.)														
	1	Min. operating temp. ±3		30 ± 3														
	2	Reference Temp. ±2		2 – 5														
	3	Max. operating temp. ± 2		30 ± 2														
	4	Reference Temp. ± 2		2 - 5														
	External appearance	No mechanical damage.																
	Capacitance	<table><tr><th colspan="2">Characteristics</th><th>Change from the value before test</th></tr><tr><td>Class 1</td><td>C0G</td><td>Capacitance drift within ±2.5% or ±0.25pF, whichever larger.</td></tr><tr><td>Class 2</td><td>X7R X8R</td><td>± 7.5 %</td></tr></table>		Characteristics		Change from the value before test	Class 1	C0G	Capacitance drift within ±2.5% or ±0.25pF, whichever larger.	Class 2	X7R X8R	± 7.5 %						
	Characteristics			Change from the value before test														
	Class 1	C0G		Capacitance drift within ±2.5% or ±0.25pF, whichever larger.														
Class 2	X7R X8R	± 7.5 %																
Q (Class 1)	<table><tr><th>Rated Capacitance</th><th>Q</th></tr><tr><td>30pF and over</td><td>1,000 min.</td></tr><tr><td>Under 30pF</td><td>400+20×C min.</td></tr></table> C : Rated capacitance (pF)	Rated Capacitance	Q	30pF and over	1,000 min.	Under 30pF	400+20×C min.											
Rated Capacitance	Q																	
30pF and over	1,000 min.																	
Under 30pF	400+20×C min.																	
D.F. (Class 2)	Meet the initial spec.																	
Insulation Resistance	Meet the initial spec.																	
Voltage proof	No insulation breakdown or other damage.																	
15	Moisture Resistance		Reflow solder the capacitor on P.C. board (shown in Appendix 1a or Appendix 1b) before testing. Apply the rated voltage at temperature 85°C and 85%RH for 1000 +24,0h. Charge/discharge current shall not exceed 50mA. Leave the capacitor in ambient conditions for 6 to 24h (Class 1) or 24±2h (Class 2) before measurement. Voltage conditioning (only for Class 2): Voltage treat the capacitor under testing temperature and voltage for 1 hour. Leave the capacitor in ambient conditions for 24±2h before measurement. Use this measurement for initial value.															
	External appearance	No mechanical damage.																
	Capacitance	<table><tr><th colspan="2">Characteristics</th><th>Change from the value before test</th></tr><tr><td>Class 1</td><td>C0G</td><td>Capacitance drift within ±7.5% or ±0.75pF, whichever larger.</td></tr><tr><td>Class 2</td><td>X7R X8R</td><td>± 12.5 %</td></tr></table>		Characteristics		Change from the value before test	Class 1	C0G	Capacitance drift within ±7.5% or ±0.75pF, whichever larger.	Class 2	X7R X8R	± 12.5 %						
	Characteristics			Change from the value before test														
	Class 1	C0G		Capacitance drift within ±7.5% or ±0.75pF, whichever larger.														
	Class 2	X7R X8R		± 12.5 %														
	Q (Class 1)	<table><tr><th>Rated Capacitance</th><th>Q</th></tr><tr><td>30pF and over</td><td>1,000 min.</td></tr><tr><td>Under 30pF</td><td>100+10/3×C min.</td></tr></table> C : Rated capacitance (pF)		Rated Capacitance	Q	30pF and over	1,000 min.	Under 30pF	100+10/3×C min.									
	Rated Capacitance	Q																
	30pF and over	1,000 min.																
	Under 30pF	100+10/3×C min.																
D.F. (Class 2)	Characteristics X7R: 200% of initial spec. max. X8R: 200% of initial spec. max																	
Insulation Resistance	500MΩ or 25MΩ•μF min. (As for the capacitors of rated voltage 16V DC and item below, 500MΩ or 5MΩ•μF min.,) whichever smaller.																	



General Specifications

CGA Series – Automotive Grade Capacitors

No.	Item	Performance	Test or Inspection Method									
16	Life											
	External appearance	No mechanical damage.	Reflow solder the capacitor on P.C. board (shown in Appendix 1a or Appendix 1b) before testing. Test condition : maximum operating temperature $\pm 2^{\circ}\text{C}$ for 1,000 +48,0h.									
	Capacitance	<table><tr><th colspan="2">Characteristics</th><th>Change from the value before test</th></tr><tr><td>Class 1</td><td>C0G</td><td>Capacitance drift within $\pm 7.5\%$ or $\pm 0.75\text{pF}$, whichever larger.</td></tr><tr><td>Class 2</td><td>X7R X8R</td><td>$\pm 15\%$</td></tr></table>	Characteristics		Change from the value before test	Class 1	C0G	Capacitance drift within $\pm 7.5\%$ or $\pm 0.75\text{pF}$, whichever larger.	Class 2	X7R X8R	$\pm 15\%$	Please refer to each part number for test voltage. Charge/discharge current shall not exceed 50mA. Leave the capacitor in ambient conditions for 6 to 24h (Class 1) or $24 \pm 2\text{h}$ (Class 2) before measurement.
	Characteristics		Change from the value before test									
	Class 1	C0G	Capacitance drift within $\pm 7.5\%$ or $\pm 0.75\text{pF}$, whichever larger.									
	Class 2	X7R X8R	$\pm 15\%$									
	Q	<table><tr><th>Rated Capacitance</th><th>Q</th></tr><tr><td>$C \geq 30\text{pF}$</td><td>350 min.</td></tr><tr><td>$10\text{pF} \leq C < 30\text{pF}$</td><td>$275 + 5/2 \times C$ min.</td></tr><tr><td>$C < 10\text{pF}$</td><td>$200 + 10 \times C$ min.</td></tr></table>	Rated Capacitance	Q	$C \geq 30\text{pF}$	350 min.	$10\text{pF} \leq C < 30\text{pF}$	$275 + 5/2 \times C$ min.	$C < 10\text{pF}$	$200 + 10 \times C$ min.	Voltage conditioning: Voltage treat the capacitors under testing temperature and voltage for 1 hour.	
	Rated Capacitance	Q										
	$C \geq 30\text{pF}$	350 min.										
	$10\text{pF} \leq C < 30\text{pF}$	$275 + 5/2 \times C$ min.										
$C < 10\text{pF}$	$200 + 10 \times C$ min.											
(Class 1)		Leave the capacitor in ambient conditions on for $24 \pm 2\text{h}$ before measurement.										
		Use this measurement for initial value.										

***As for the initial measurement of capacitors (Class 2) on number 8, 12, 13 and 14, leave capacitors at $150 \pm 10, 0^{\circ}\text{C}$ for 1 hour and measure the value after leaving capacitor for $24 \pm 2\text{h}$ in ambient conditions.**



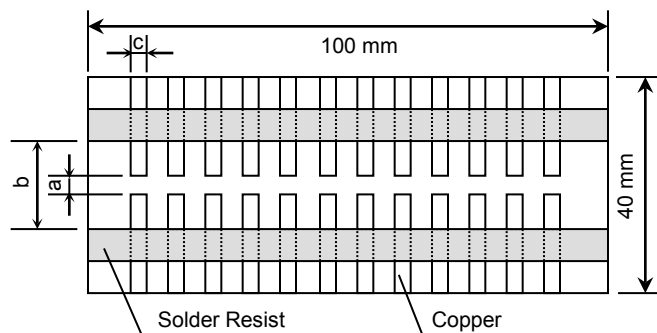
General Specifications

CGA Series – Automotive Grade Capacitors

Appendix - 1a

P.C. Board for reliability test

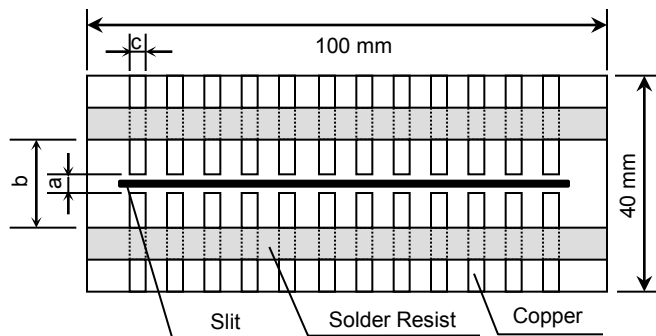
Applied for CGA2, CGA3, CGA4, CGA5



Appendix - 1b

P.C. Board for reliability test

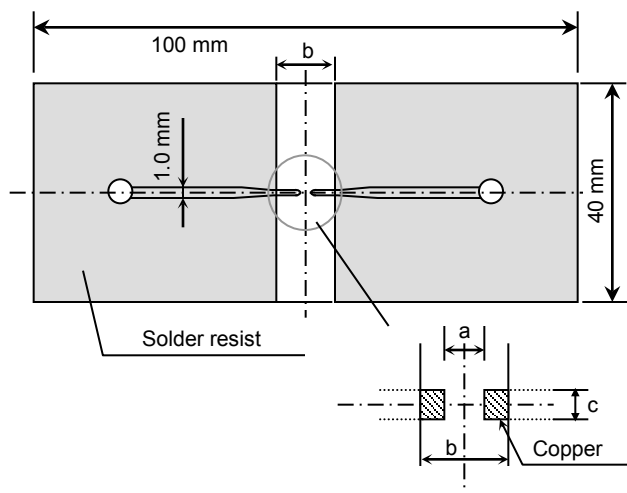
Applied for CGA6



Appendix - 2a

P.C. Board for bending test

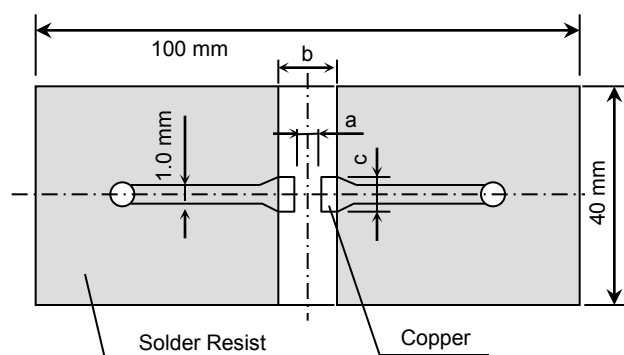
Applied for CGA2



Appendix - 2b

P.C. Board for bending test

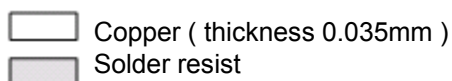
Applied for CGA3, CGA4, CGA5, CGA6



Material : Glass Epoxy (As per JIS C6484 GE4)

P.C. Board thickness : Appendix-2a 0.8mm

Appendix-1a, 1b, 2b 1.6mm



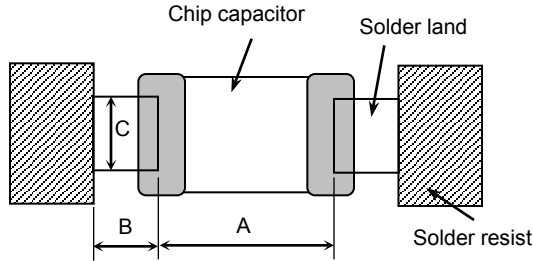
Case Code			Dimensions (mm)		
Series	JIS	EIA	a	b	c
CGA2	C1005	CC0402	0.4	1.5	0.5
CGA3	C1608	CC0603	1.0	3.0	1.2
CGA4	C2012	CC0805	1.2	4.0	1.65
CGA5	C3216	CC1206	2.2	5.0	2.0
CGA6	C3225	CC1210	2.2	5.0	2.9



Soldering Information

CGA Series – Automotive Grade Capacitors

Recommended Soldering Land Pattern



Wave Soldering

Unit: mm

Type	CGA3 [CC0603]	CGA4 [CC0805]	CGA5 [CC1206]
Symbol			
A	0.7 - 1.0	1.0 - 1.3	2.1 - 2.5
B	0.8 - 1.0	1.0 - 1.2	1.1 - 1.3
C	0.6 - 0.8	0.8 - 1.1	1.0 - 1.3

Reflow Soldering

Unit: mm

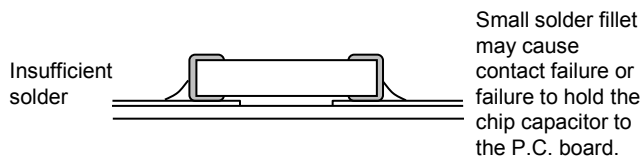
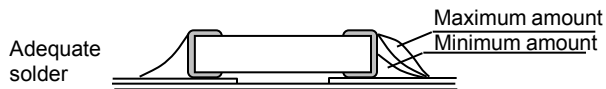
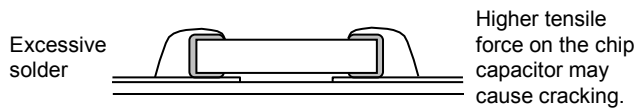
Type	CGA2 [CC0402]	CGA3 [CC0603]	CGA4 [CC0805]
Symbol			
A	0.3 - 0.5	0.6 - 0.8	0.9 - 1.2
B	0.35 - 0.45	0.6 - 0.8	0.7 - 0.9
C	0.4 - 0.6	0.6 - 0.8	0.9 - 1.2

Reflow Soldering

Unit: mm

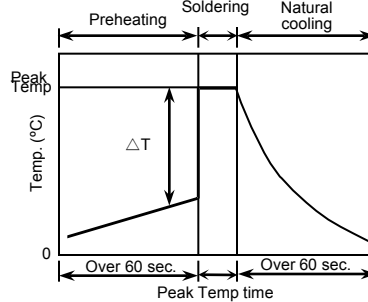
Type	CGA5 [CC1206]	CGA6 [CC1210]
Symbol		
A	2.0 - 2.4	2.0 - 2.4
B	1.0 - 1.2	1.0 - 1.2
C	1.1 - 1.6	1.9 - 2.5

Recommended Solder Amount

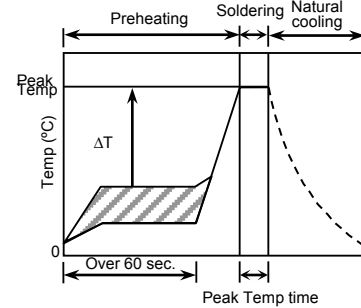


Recommended Soldering Profile

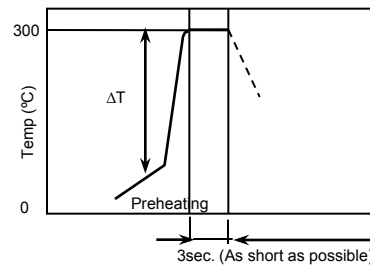
Wave Soldering



Reflow Soldering



Manual soldering (Solder iron)



Recommended soldering duration

Solder	Temp./ Dura.	Wave Soldering		Reflow Soldering	
		Peak temp (°C)	Duration (sec.)	Peak temp (°C)	Duration (sec.)
Sn-Pb Solder		250 max.	3 max.	230 max.	20 max.
Lead-Free Solder		260 max.	5 max.	260 max.	10 max.

Recommended solder compositions

Sn-37Pb (Sn-Pb solder)

Sn-3.0Ag-0.5Cu (Lead Free Solder)

Preheating Condition

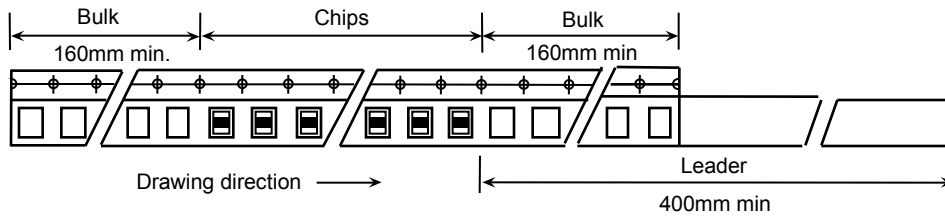
Soldering	Case Size - JIS (EIA)	Temp. (°C)
Wave soldering	CGA3(CC0603), CGA4(CC0805), CGA5(CC1206)	$\Delta T \leq 150$
Reflow soldering	CGA2(CC0402), CGA3(CC0603), CGA4(CC0805), CGA5(CC1206) CGA6(CC1210)	$\Delta T \leq 150$ $\Delta T \leq 130$
Manual soldering	CGA2(CC0402), CGA3(CC0603), CGA4(CC0805), CGA5(CC1206) CGA6(CC1210)	$\Delta T \leq 150$ $\Delta T \leq 130$



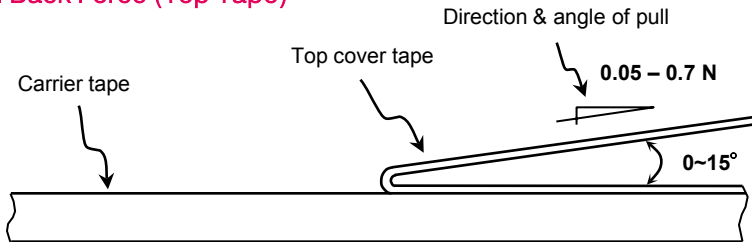
Packaging Information

CGA Series – Automotive Grade Capacitors

Carrier Tape Configuration

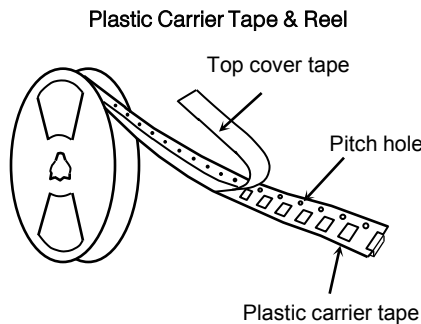
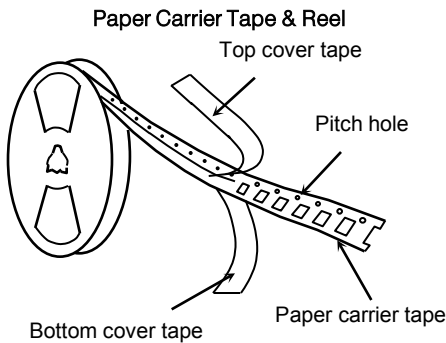


Peel Back Force (Top Tape)



- Carrier tape shall be flexible enough to be wound around a minimum radius of 30mm with components in tape.
- The missing of components shall be less than 0.1%
- Components shall not stick to the cover tape.
- The cover tape shall not protrude beyond the edges of the carrier tape and shall not cover the sprocket holes.

Chip Quantity Per Reel and Structure of Reel (Paper & Plastic)



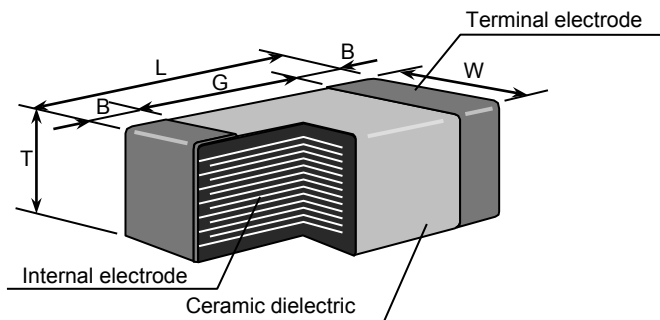
Case Code			Chip Thickness (mm)	Taping Material	Chip quantity (pcs.)	
Series	JIS	EIA			φ178mm (7") reel	φ330mm (13") reel
CGA2	C1005	CC0402	0.50	Paper	10,000	50,000
CGA3	C1608	CC0603	0.80		4,000	10,000
CGA4	C2012	CC0805	0.60			20,000
			0.85		10,000	
			1.25	Plastic		2,000
CGA5	C3216	CC1206	0.60	Paper		4,000
			0.85			
			1.15	Plastic		2,000
			1.60			
1.25						
CGA6	C3225	CC1210	1.60		1,000	5,000
			2.00			
			2.30			
			2.50			



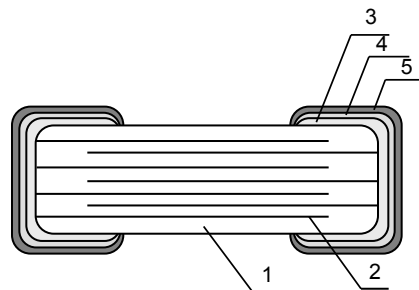
Additional Information

CGA Series – Automotive Grade Capacitors

• Shape & Dimensions



• Inside Structure & Material System



Case Code			Dimensions (mm)				
Series	JIS	EIA	L	W	T	B	G
CGA2	C1005	CC0402	1.00	0.50	0.50	0.25	0.30 min.
CGA3	C1608	CC0603	1.60	0.80	0.80	0.30	0.50 min.
CGA4	C2012	CC0805	2.00	1.25	0.60	0.20 min.	0.50 min.
					0.85		
CGA5	C3216	CC1206	3.20	1.60	0.60	0.30 min.	1.00 min.
					0.85		
					1.15		
CGA6	C3225	CC1210	3.20	2.50	1.60	0.20 min.	1.00 min.
					2.00		
					2.30		
					2.50		

No.	NAME	MATERIAL	
		Class 1	Class 2
(1)	Ceramic Dielectric	CaZrO ₃	BaTiO ₃
(2)	Internal Electrode	Nickel (Ni)	
(3)	Termination	Copper (Cu)	
(4)		Nickel (Ni)	
(5)		Tin (Sn)	

• Environmental Information

TDK Corporation established internal product environmental assurance standards that include the six hazardous substances banned by the EU RoHS Directive¹ enforced on July 1, 2006 along with additional substances independently banned by TDK and has successfully completed making general purpose electronic components conform to the RoHS Directive².

1. Abbreviation for Restriction on Hazardous Substances, which refers to the regulation EU Directive 2002/95/EC on hazardous substances by the European Union (EU) effective from July 1, 2006. The Directive bans the use of six specific hazardous substances in electric and electronic devices and products handled within the EU. The six substances are lead, mercury, cadmium, hexavalent chromium, PBB (polybrominated biphenyls), and PBDE (polybrominated diphenyl ethers).
2. This means that, in conformity with the EU Directive 2002/95/EC, lead, cadmium, mercury, hexavalent chromium, and specific bromine-based flame retardants, PBB and PBDE, have not been used, except for exempted applications.

For REACH (SVHC : 15 substances according to ECHA / October 2008) : All TDK MLCC do not contain these 15 substances.

For European Directive 2000/53/CE and 2005/673/CE : Cadmium, Hexavalent Chromium, Mercury, Lead are not contained in all TDK MLCC.

For European Directive 2003/11/CE : Pentabromodiphenyl-ether, Octabromodiphenyl-ether are not contained in all TDK MLCC.



TDK Sales Representatives Contact Information

South Bridge, LLC
South Carolina, USA
Email: crystal@southbridge.net
Website: www.southbridge.net

South Bridge, LLC
Alabama, USA
Email: sherrill@southbridge.net
Website: www.southbridge.net

South Bridge, LLC
Mississippi, USA
Email: sherrill@southbridge.net
Website: www.southbridge.net

South Bridge, LLC
North Carolina, USA
Email: crystal@southbridge.net
Website: www.southbridge.net

South Bridge, LLC
Western Tennessee, USA
Email: sherrill@southbridge.net
Website: www.southbridge.net

South Bridge, LLC
Georgia, USA
Email: bobbi@southbridge.net
Website: www.southbridge.net

South Bridge, LLC
Eastern Tennessee, USA
Email: bobbi@southbridge.net
Website: www.southbridge.net

South Bridge, LLC
Florida, USA
Email: kim@southbridge.net
Website: www.southbridge.net

Seltec Sales Corporation
Missouri, USA
Email: christy.meyer@seltec-sales.com
Website: www.seltecsales.com

Seltec Sales Corporation
Kansas, USA
Email: brian.young@seltec-sales.com
Website: www.seltecsales.com

Seltec Sales Corporation
Southern Illinois, USA
Email: christy.meyer@seltec-sales.com
Website: www.seltecsales.com

Seltec Sales Corporation
Nebraska, USA
Email: brian.young@seltec-sales.com
Website: www.seltecsales.com

Quad State Sales and Marketing
Texas, USA
Email: kbrayman@quadstatesales.com
Website: www.quadstatesales.com

Quad State Sales and Marketing
Oklahoma, USA
Email: kbrayman@quadstatesales.com
Website: www.quadstatesales.com

Quad State Sales and Marketing
Arkansas, USA
Email: kbrayman@quadstatesales.com
Website: www.quadstatesales.com

Quad State Sales and Marketing
Louisiana, USA
Email: kbrayman@quadstatesales.com
Website: www.quadstatesales.com

Procyon Technical Sales
Southern Nevada, USA
Email: ifisher@procyonsales.com
Website: www.procyonsales.com

Procyon Technical Sales
New Mexico, USA
Email: ifisher@procyonsales.com
Website: www.procyonsales.com

Procyon Technical Sales
New Mexico, USA
Email: ifisher@procyonsales.com
Website: www.procyonsales.com

Procyon Technical Sales
Arizona, USA
Email: ifisher@procyonsales.com
Website: www.procyonsales.com

Procyon Technical Sales
Southern California, USA
Email: ifisher@procyonsales.com
Website: www.procyonsales.com

Paragon Electronic Systems
Vermont, USA
Email: sales@paragonelect.com
Website: www.paragonelect.com

Paragon Electronic Systems
Rhode Island, USA
Email: sales@paragonelect.com
Website: www.paragonelect.com

Paragon Electronic Systems
New Hampshire, USA
Email: sales@paragonelect.com
Website: www.paragonelect.com

Paragon Electronic Systems
Maine, USA
Email: sales@paragonelect.com
Website: www.paragonelect.com

Paragon Electronic Systems
Massachusetts, USA
Email: sales@paragonelect.com
Website: www.paragonelect.com

Paragon Electronic Systems
Connecticut, USA
Email: sales@paragonelect.com
Website: www.paragonelect.com

Omega Electronic Sales, Inc.
Southern New Jersey, USA
Email: office@omegasales.com
Website: www.omegasales.com

Omega Electronic Sales, Inc.
Delaware, USA
Email: office@omegasales.com
Website: www.omegasales.com

Omega Electronic Sales, Inc.
Eastern Pennsylvania, USA
Email: office@omegasales.com
Website: www.omegasales.com

Mel Foster Company
Iowa, USA
Email: sonja@melfoster.com
Website: www.melfoster.com

Mel Foster Company
North Dakota, USA
Email: kristine@melfoster.com
Website: www.melfoster.com

Mel Foster Company
South Dakota, USA
Email: kristine@melfoster.com
Website: www.melfoster.com

Mel Foster Company
Minnesota, USA
Email: kristine@melfoster.com
Website: www.melfoster.com

Mel Foster Company
Northwest Wisconsin, USA
Email: kristine@melfoster.com
Website: www.melfoster.com

Luscombe Engineering Company
Northern California, USA
Email: dbrown@lecsf.com
Website: www.lecsf.com

Luscombe Engineering Company
Northern Nevada, All products, USA
Email: dbrown@lecsf.com
Website: www.lecsf.com

Innovatech Rocky Mountains
Colorado, USA
Email: qgoodenow@innovatechrm.com
Website: www.innovatechrm.com

Innovatech Rocky Mountains
Utah, USA
Email: qgoodenow@innovatechrm.com
Website: www.innovatechrm.com

Innovatech Rocky Mountains
Montana, USA
Email: qgoodenow@innovatechrm.com
Website: www.innovatechrm.com

Innovatech Rocky Mountains
Wyoming, USA
Email: qgoodenow@innovatechrm.com
Website: www.innovatechrm.com

HLC Ltd
Northern Illinois, USA
Email: djohnson@hlcltd.com
Website: www.hlcltd.com

HLC Ltd
Southeast Wisconsin, USA
Email: djohnson@hlcltd.com
Website: www.hlcltd.com

Fusion Sourcing Group
New York, USA
Email: TDKsales@fusionsourcing.com
Website: www.fusionsourcing.com

Fusion Sourcing Group
Northern New Jersey, USA
Email: TDKsales@fusionsourcing.com
Website: www.fusionsourcing.com

Enco Marketing
Michigan, USA
Email: Brett.kauffman@encomarketing.com
Website: www.encomarketing.com

Electro Repts Inc
Kentucky, USA
Email: eri@electro-reps.com
Website: www.electro-reps.com

Electro Repts Inc
Ohio, USA
Email: eri@electro-reps.com
Website: www.electro-reps.com

Electro Repts Inc
Indiana, USA
Email: eri@electro-reps.com
Website: www.electro-reps.com

Electro Repts Inc
Western Pennsylvania, USA
Email: eri@electro-reps.com
Website: www.electro-reps.com

Earl & Brown Co., Inc.
Washington, USA
Email: dpoulos@earlbrownrep.com
Website: www.earlbrownrep.com

Earl & Brown Co., Inc.
Idaho, USA
Email: dpoulos@earlbrownrep.com
Website: www.earlbrownrep.com

Earl & Brown Co., Inc.
Oregon, USA
Email: ichinn@earlbrownrep.com
Website: www.earlbrownrep.com



TDK Corporation of America

475 Half Day Road
Lincolnshire, IL 60069-2934

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