



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

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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).

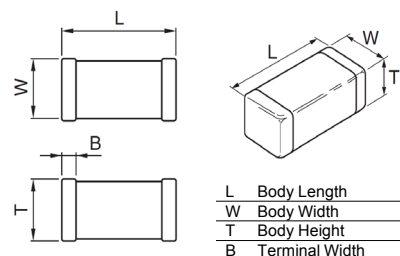
Parameters	Specifications
Temperature	-55 to +150°C
Characteristics	$\Delta C/C = \pm 15\%$
Operating Temperature	-55 to +150°C
Dissipation Factor	3% maximum
Insulation Resistance	10 GΩ or 500 MΩ • μF minimum
Voltage Proof	2.5 • rated voltage for 1 to 5 seconds
	Charge/Discharge ≤ 50 mA

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°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 $\pm$ 0.10
C1608X8R1E104K	X8R	25V	100,000	$\pm 10\%$	0.80 $\pm$ 0.10
C1608X8R1H102K	X8R	50V	1,000	$\pm 10\%$	0.80 $\pm$ 0.10
C1608X8R1H152K	X8R	50V	1,500	$\pm 10\%$	0.80 $\pm$ 0.10
C1608X8R1H222K	X8R	50V	2,200	$\pm 10\%$	0.80 $\pm$ 0.10
C1608X8R1H332K	X8R	50V	3,300	$\pm 10\%$	0.80 $\pm$ 0.10
C1608X8R1H472K	X8R	50V	4,700	$\pm 10\%$	0.80 $\pm$ 0.10
C1608X8R1H682K	X8R	50V	6,800	$\pm 10\%$	0.80 $\pm$ 0.10
C1608X8R1H103K	X8R	50V	10,000	$\pm 10\%$	0.80 $\pm$ 0.10
C1608X8R1H153K	X8R	50V	15,000	$\pm 10\%$	0.80 $\pm$ 0.10
C1608X8R1H223K	X8R	50V	22,000	$\pm 10\%$	0.80 $\pm$ 0.10
C1608X8R1H333K	X8R	50V	33,000	$\pm 10\%$	0.80 $\pm$ 0.10
C1608X8R1H473K	X8R	50V	47,000	$\pm 10\%$	0.80 $\pm$ 0.10
C1608X8R2A102K	X8R	100V	1,000	$\pm 10\%$	0.80 $\pm$ 0.10
C1608X8R2A152K	X8R	100V	1,500	$\pm 10\%$	0.80 $\pm$ 0.10
C1608X8R2A222K	X8R	100V	2,200	$\pm 10\%$	0.80 $\pm$ 0.10
C1608X8R2A332K	X8R	100V	3,300	$\pm 10\%$	0.80 $\pm$ 0.10
C1608X8R2A472K	X8R	100V	4,700	$\pm 10\%$	0.80 $\pm$ 0.10
C1608X8R2A682K	X8R	100V	6,800	$\pm 10\%$	0.80 $\pm$ 0.10
C1608X8R2A103K	X8R	100V	10,000	$\pm 10\%$	0.80 $\pm$ 0.10
C1608X8R2A153K	X8R	100V	15,000	$\pm 10\%$	0.80 $\pm$ 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)

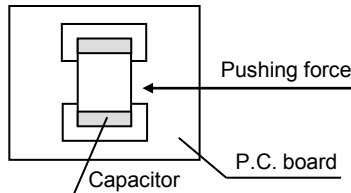
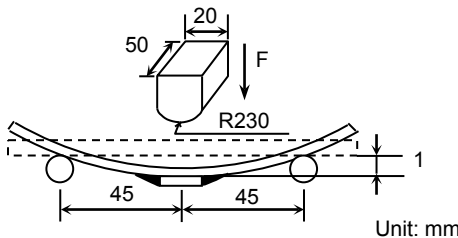
Temperature Characteristics: X8R (-55 to $+150^{\circ}\text{C}$, $\pm 15\%$)

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

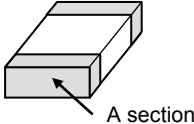
C Series – High Temperature Application

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. Expose the capacitor in the condition step 1 through 4, and repeat 5 times consecutively. Leave the capacitors in ambient conditions for 48±4h 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
	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														
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.																	
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±2°C, 90 to 95%RH for 500 +24,0h. 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>X8R</td><td>± 12.5 %</td></tr></table>		Characteristics		Change from the value before test	Class 2	X8R	± 12.5 %									
	Characteristics			Change from the value before test														
	Class 2	X8R		± 12.5 %														
	D.F. (Class 2)	200% of initial spec max.																
Insulation Resistance	1,000MΩ or 50 MΩ · μF min.																	
14	Moisture Resistance		Reflow solder the capacitor 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 1 hour. Leave the capacitor 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>X8R</td><td>± 12.5 %</td></tr></table>		Characteristics		Change from the value before test	Class 2	X8R	± 12.5 %									
	Characteristics			Change from the value before test														
	Class 2	X8R		± 12.5 %														
	D.F. (Class 2)	200% of initial spec max.																
Insulation Resistance	500MΩ or 25 MΩ · μF min.																	



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.**



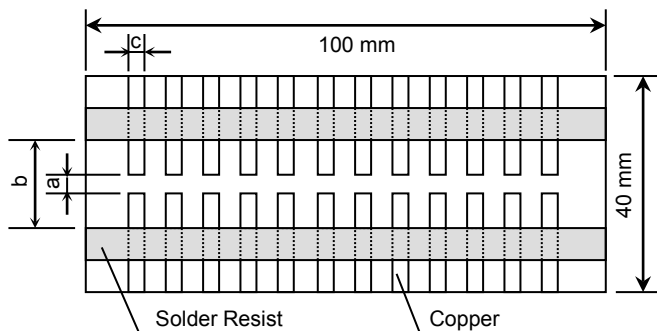
General Specifications

C Series – High Temperature Application

Appendix - 1a

P.C. Board for reliability test

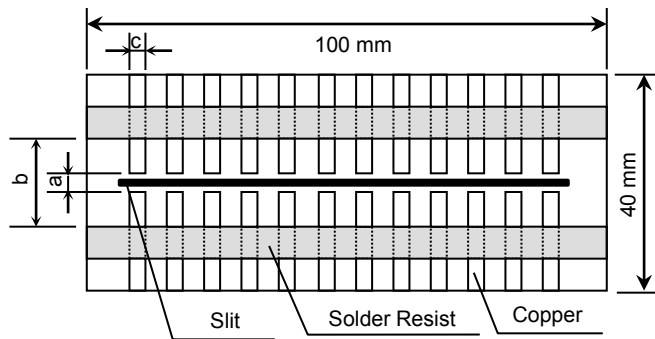
Applied for C1005, C1608, C2012, C3216



Appendix - 1b

P.C. Board for reliability test

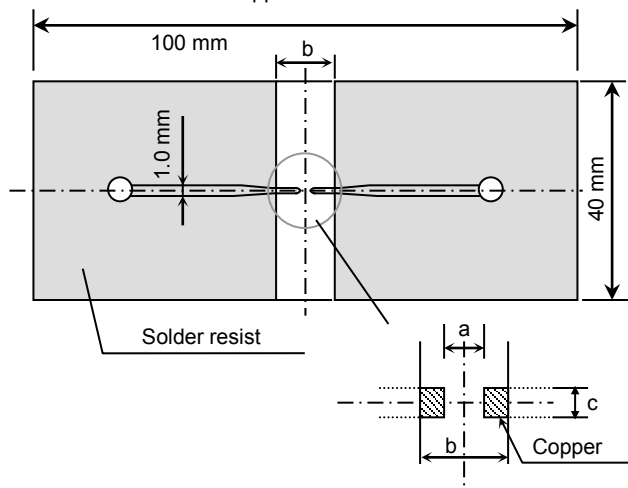
Applied for C3225



Appendix - 2a

P.C. Board for bending test

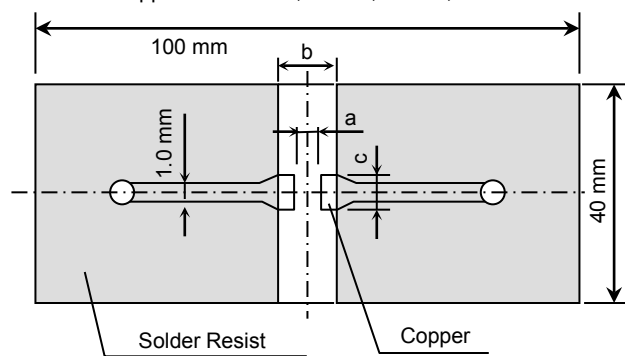
Applied for C1005



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

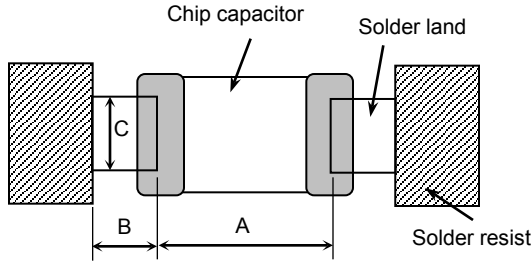
Case Code		Dimensions (mm)		
JIS	EIA	a	b	c
C1005	CC0402	0.4	1.5	0.5
C1608	CC0603	1.0	3.0	1.2
C2012	CC0805	1.2	4.0	1.65
C3216	CC1206	2.2	5.0	2.0
C3225	CC1210	2.2	5.0	2.9



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

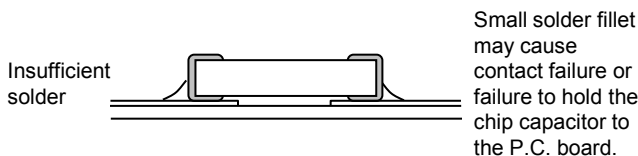
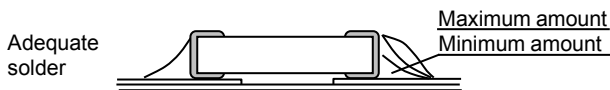
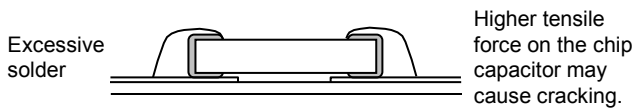
Type	C1005 [CC0402]	C1608 [CC0603]	C2012 [CC0805]
Symbol			
A	0.3 - 0.5	0.6 - 0.8	0.9 - 1.2
B	0.35 - 0.45	0.6 - 0.8	0.7 - 0.9
C	0.4 - 0.6	0.6 - 0.8	0.9 - 1.2

Reflow Soldering

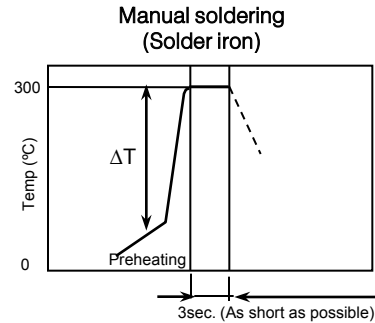
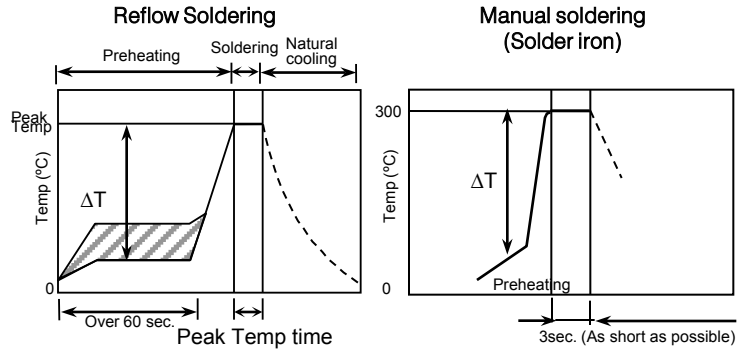
Unit: mm

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

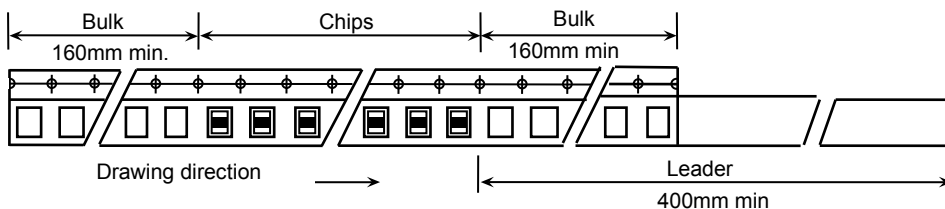
Soldering	Case Size - JIS (EIA)	Temp. (°C)
Wave soldering	C1608(CC0603), C2012(CC0805), C3216(CC1206)	$\Delta T \leq 150$
Reflow soldering	C1005(CC0402), C1608(CC0603), C2012(CC0805), C3216(CC1206)	$\Delta T \leq 150$
	C3225(CC1210)	$\Delta T \leq 130$
Manual soldering	C1005(CC0402), C1608(CC0603), C2012(CC0805),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



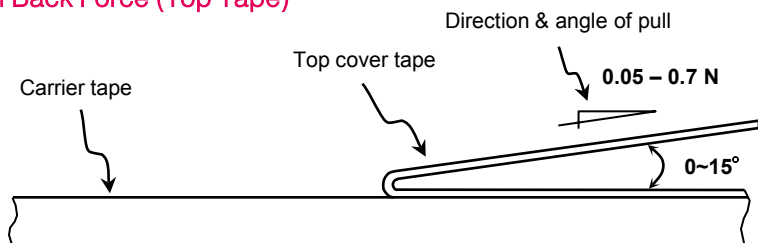
Packaging Information

C Series – High Temperature Application

Carrier Tape Configuration

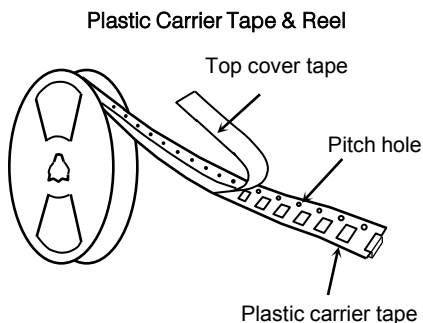
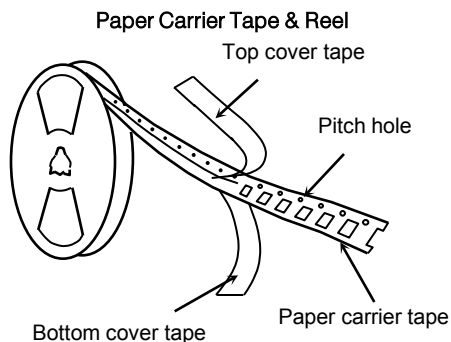


Peel Back Force (Top Tape)



- 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)



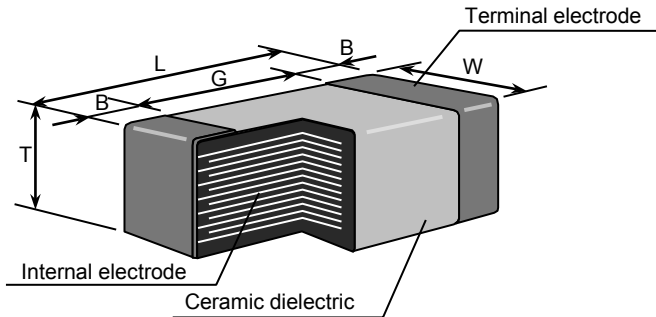
Case Code		Chip Thickness	Taping Material	Chip quantity (pcs.)	
JIS	EIA			φ178mm (7") reel	φ330mm (13") reel
C1005	CC0402	0.50 mm	Paper	10,000	50,000
C1608	CC0603	0.80 mm	Paper	4,000	10,000
C2012	CC0805	0.85 mm	Paper	4,000	10,000
		1.25 mm	Plastic	2,000	
C3216	CC1206	0.85 mm	Paper	4,000	10,000
		1.15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

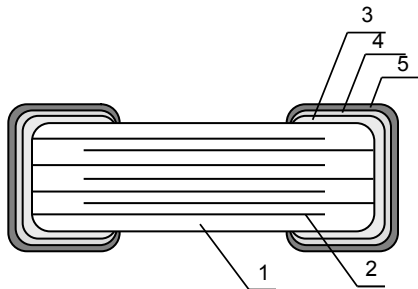
C Series – High Temperature Application

• 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.