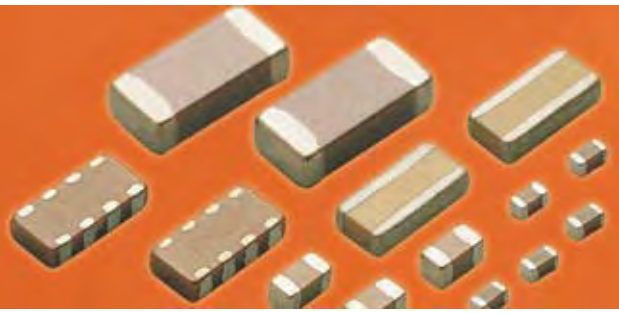
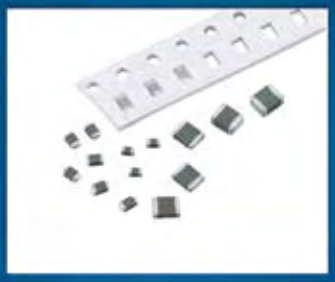
WALSIN

PSA 華新科技股份有限公司

Walsin Technology Corporation



Multilayer Ceramic Capacitors



2009

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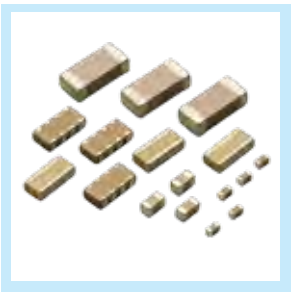
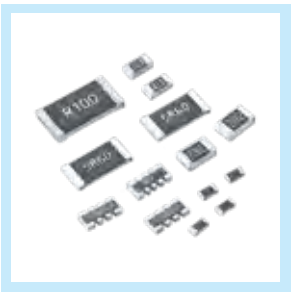
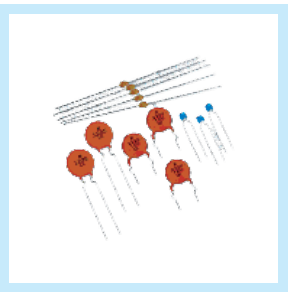
Product Portfolio



Multilayer Ceramic Capacitors (MLCC)



Chip-Resistor



Disc Capacitors

RF Device and High Frequency Inductors

Varistors and SMD-Varistors

IEC-63 Nominal Resistance / Capacitance

E1	100																							
E3	100							220									470							
E6	100				150				220				330				470				680			
E12	100		120		150		180		220		270		330		390		470		560		680		820	
E24	100	110	120	130	150	160	180	200	220	240	270	300	330	360	390	430	470	510	560	620	680	750	820	910
E96	100	102	121	124	147	150	178	182	215	221	261	267	316	324	383	392	464	475	562	576	681	698	825	845
	105	107	127	130	154	158	187	191	226	232	274	280	332	340	402	412	487	499	590	604	715	732	866	887
	110	113	133	137	162	165	196	200	237	243	287	294	348	357	422	432	511	523	619	634	750	768	909	931
	115	118	140	143	169	174	205	210	249	255	301	309	365	374	442	453	536	549	649	665	787	806	953	976

E6: $\sqrt[6]{10} \fallingdotseq 1.46$ E12: $\sqrt[12]{10} \fallingdotseq 1.21$

E1 series resistance: 1Ω, 10Ω, 100Ω, 1000Ω, 10000Ω, 100000Ω

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■ Quick Product Information

Series	Dielectric	Size	Capacitance	Rated voltage	Page
General Purpose Caps	NPO	0402, 0603, 0805, 1206, 1210, 1812	0.5pF~0.039μF	16V, 25V, 50V, 100V	4
	X7R	0402, 0603, 0805, 1206, 1210, 1812	100pF~1μF	10V, 16V, 25V, 50V, 100V	5
	Y5V	0402, 0603, 0805, 1206, 1210, 1812	0.01μF~1μF	6.3V, 10V, 16V, 25V, 50V, 100V	6
High Capacitance Caps	X7R	0402, 0603, 0805, 1206, 1210, 1812	0.1μF~4.7μF	10V, 16V, 25V, 50V	8
	X5R	0402, 0603, 0805, 1206	0.027μF~10μF	6.3V, 10V, 16V	8
	Y5V	0402, 0603, 0805, 1206, 1210, 1812	0.15μF~47μF	6.3V, 10V, 16V, 25V, 35V, 50V	8
Low Profile Caps	X5R	0805, 1206, 1210	1μF~10μF	6.3V, 10V	9
	Y5V	0805, 1206, 1210	2.2μF~10μF	10V, 16V	9
Ultra-small Caps	NPO	0201	0.5pF~100pF	16V, 25V	10
	X7R	0201	100pF~4700pF	16V, 25V, 50V	10
	X5R	0201	1000pF~0.1μF	6.3V, 10V, 16V	10
Middle & High Voltage Caps	NPO	0603, 0805, 1206, 1210, 1808, 1812	0.5pF~6800pF	200V, 250V, 500V, 630V, 1kV, 2kV, 3kV	12
	X7R	0805, 1206, 1210, 1808, 1812	100pF~0.47μF	200V, 250V, 500V, 630V, 1kV, 2kV, 3kV	14
	Y5V	0805, 1206, 1210,1812	0.01μF~0.68μF	200V, 250V	15
Safety Certificated Caps (X1/Y2)	NPO	1808, 1812	10pF~470pF	250Vac	16
Safety Certificated Caps (X2/Y3)	NPO	1808, 1812	3.9pF~1000pF	250Vac	18
	X7R	1808, 1812	150pF~4700pF	250Vac	18
High Q & Low ESR Caps	NPO	0402, 0603	0.5pF~3300pF	16V, 50V, 100V	20
Ultra High Q&Low ESR Caps	NPO	0201, 0402	0.1pF~22pF	25V, 50V	22
Open-mode Design Caps	X7R	0805, 1206, 1210, 1812	100pF~1μF	100V, 200V, 250V, 500V	24
Low Distortion Caps	X7R	1206	150pF~0.1μF	100V, 200V, 250V	25
Capacitor Arrays	NPO	0612 (4x0603)	10pF~470pF	50V	27
	X7R	0612 (4x0603)	180pF~0.1μF	16V, 50V	27
	Y5V	0612 (4x0603)	0.01μF~0.1μF	50V	27
Low Inductance Caps	X7R	0612	0.01μF~0.15μF	50V	28

The Outlines and External Dimensions of Capacitor

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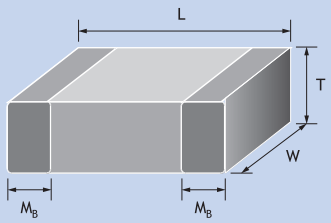
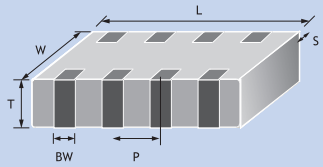
■ Single Chip Capacitors

Outline	Size Inch (mm)	L (mm)	W (mm)	T (mm)/Symbol		Remark	M_B (mm)
	0201 (0603)	0.6±0.03	0.3±0.03	0.3±0.03	L	#	0.15±0.05
	0402 (1005)	1.00±0.05	0.50±0.05	0.50±0.05	N	#	0.25 +0.05/-0.10
	0603 (1608)	1.60±0.10	0.80±0.10	0.80±0.07	S		0.40±0.15
		1.60 +0.15/-0.10	0.80+0.15/-0.10	0.80+0.15/-0.10	X		
	0805 (2012)	2.00±0.15	1.25±0.10	0.60±0.10	A		0.50±0.20
				0.80±0.10	B		
				1.25±0.10	D	#	
		2.00±0.20	1.25±0.20	1.25±0.20	I	#	
	1206 (3216)	3.20±0.15	1.60±0.15	0.80±0.10	B		0.60±0.20
				0.95±0.10	C		
				1.25±0.10	D	#	
		3.20±0.20	1.60±0.15	1.15±0.15	J	#	
			1.60±0.20	1.60±0.20	G	#	
			1.60+0.30/-0.10	1.60+0.30/-0.10	P	#	
	1210 (3225)	3.20±0.30	2.50±0.20	0.95±0.10	C	#	0.75±0.25
				1.25±0.10	D	#	
		3.20±0.40	2.50±0.30	1.60±0.20	G	#	
				2.00±0.20	K	#	
				2.50±0.30	M	#	
	1808 (4520)	4.50±0.40	2.03±0.25	1.25±0.10	D	#	0.75±0.25*
				2.00±0.20	K	#	
	1812 (4532)	4.50±0.40	3.20±0.30	1.25±0.10	D	#	0.75±0.25*
				2.00±0.20	K	#	
				2.50±0.30	M	#	

Reflow soldering only is recommended.

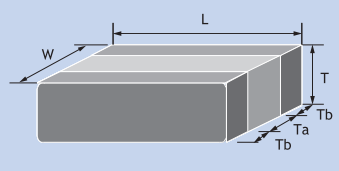
* For safety certiflcated products please refer to individual sheet for detail.

■ Capacitor Arrays

Outline	Size Inch (mm)	L (mm)	W (mm)	T (mm)/Symbol		S (mm)	BW (mm)	P (mm)
	0612 (1632)	3.20±0.15	1.60±0.15	0.80±0.10	B	0.30±0.20	0.40±0.15	0.80±0.15

Reflow soldering only.

■ Low Inductance Capacitors

Outline	Size Inch (mm)	L (mm)	W (mm)	T (mm)/Symbol		T_a min. (mm)	T_b min. (mm)
	0612 (1632)	3.20±0.15	1.60±0.15	0.80±0.10	B	0.5	0.13

Reflow soldering only.

■ HOW TO ORDER

1206	F	104	Z	500	C	T
Size	**Dielectric**	**Capacitance**	**Tolerance**	**Rated voltage**	**Termination**	**Packaging**
Inch (mm) 0402 (1005) 0603 (1608) 0805 (2012) 1206 (3216) 1210 (3225) 1812 (4532)	N=NP0 (C0G) B=X7R F=Y5V	Two significant digits followed by no. of zeros. And R is in place of decimal point. eg.: R47=0.47pF 0R5=0.5pF 1R0=1.0pF 104=10x10⁴ =100nF	B=±0.1pF C=±0.25pF D=±0.5pF F=±1% G=±2% J=±5% K=±10% M=±20% Z=-20/+80% (B,C,D for Cap<10pF; F,G,J,K,M,Z for Cap≥ 10pF)	Two significant digits followed by no. of zeros. And R is in place of decimal point. 6R3=6.3 VDC 100=10 VDC 160=16 VDC 250=25 VDC 500=50 VDC 101=100 VDC	L=Ag/Ni/Sn (for NP0 dielectric) C=Cu/Ni/Sn (for X7R, Y5V dielectric)	B=Bulk C=Bulk cassette T=7" reeled G=13" reeled

■ PACKAGING DIMENSION AND QUANTITY

Size	Thickness (mm)/Symbol		Paper tape		Plastic tape	
			7" reel	13" reel	7" reel	13" reel
0402 (1005)	0.50 ± 0.05	N	10k	50k	-	-
0603 (1608)	0.80 ± 0.07	S	4k	15k	-	-
	0.80 + 0.15 / -0.10	X	4k	15k	-	-
0805 (2012)	0.60 ± 0.10	A	4k	15k	-	-
	0.80 ± 0.10	B	4k	15k	-	-
	1.25 ± 0.10	D	-	-	3k	10k
1206 (3216)	0.80 ± 0.10	B	4k	15k	-	-
	0.95 ± 0.10	C	-	-	3k	10k
	1.15 ± 0.15	J	-	-	3k	10k
	1.25 ± 0.10	D	-	-	3k	10k
	1.60 ± 0.20	G	-	-	2k	-
	1.60 + 0.30 / -0.10	P	-	-	2k	-
1210 (3225)	0.95 ± 0.10	C	-	-	3k	10k
	1.25 ± 0.10	D	-	-	3k	10k
	1.60 ± 0.20	G	-	-	2k	-
	2.50 ± 0.30	M	-	-	1k	-
1812 (4532)	1.25 ± 0.10	D	-	-	1k	-
	2.00 ± 0.20	K	-	-	1k	-

Unit: pieces

■ CAPACITANCE RANGE

NP0 Dielectric

Dielectric		NPO																	
Size		0402				0603			0805			1206			1210			1812	
Rated Voltage (VDC)		16	25	50	100	16	50	100	16	50	100	16	50	100	16	50	100	50	100
capacitance	0.5pF (0R5)			N	N		S	S		A	A								
	0.6pF (0R6)			N	N		S	S		A	A								
	0.7pF (0R7)			N	N		S	S		A	A								
	0.8pF (0R8)			N	N		S	S		A	A								
	0.9pF (0R9)			N	N		S	S		A	A								
	1.0pF (1R0)			N	N		S	S		A	A								
	1.2pF (1R2)			N	N		S	S		A	A								
	1.5pF (1R5)			N	N		S	S		A	A		B	B					
	1.8pF (1R8)			N	N		S	S		A	A		B	B					
	2.2pF (2R2)			N	N		S	S		A	A		B	B					
	2.7pF (2R7)			N	N		S	S		A	A		B	B					
	3.3pF (3R3)			N	N		S	S		A	A		B	B					
	3.9pF (3R9)			N	N		S	S		A	A		B	B					
	4.7pF (4R7)			N	N		S	S		A	A		B	B					
	5.6pF (5R6)			N	N		S	S		A	A		B	B					
	6.8pF (6R8)			N	N		S	S		A	A		B	B					
	8.2pF (8R2)			N	N		S	S		A	A		B	B					
	10pF (100)			N	N		S	S		A	A		B	B			C		D
	12pF (120)			N	N		S	S		A	A		B	B			C		D
	15pF (150)			N	N		S	S		A	A		B	B			C		D
	18pF (180)			N	N		S	S		A	A		B	B			C		D
	22pF (220)			N	N		S	S		A	A		B	B		C	C		D
	27pF (270)			N	N		S	S		A	A		B	B		C	C		D
	33pF (330)			N	N		S	S		A	A		B	B		C	C		D
	39pF (390)			N	N		S	S		A	A		B	B		C	C		D
	47pF (470)			N	N		S	S		A	A		B	B		C	C		D
	56pF (560)			N	N		S	S		A	A		B	B		C	C		D
	68pF (680)			N	N		S	S		A	A		B	B		C	C		D
	82pF (820)			N	N		S	S		A	A		B	B		C	C		D
	100pF (101)			N	N		S	S		A	A		B	B		C	C		D
	120pF (121)			N	N		S	S		A	A		B	B		C	C		D
	150pF (151)			N	N		S	S		A	A		B	B		C	C		D
	180pF (181)			N			S	S		A	A		B	B		C	C		D
	220pF (221)			N			S	S		A	A		B	B		C	C		D
	270pF (271)	N	N				S	S		A	A		B	B		C	C		D
	330pF (331)	N					S	S		A	A		B	B		C	C		D
	390pF (391)	N					S	S		B	B		B	B		C	C		D
	470pF (471)	N					S	S		B	B		B	B		C	C		D
	560pF (561)						S	S		B	B		B	B		C	C		D
	680pF (681)						S			B	B		B	B		C	C		D
	820pF (821)						S			B	B		B	B		C	C		D
	1,000pF (102)						S			B	B		B	B		C	C	D	D
	1,200pF (122)					S				B	B		B	B		C	C	D	D
	1,500pF (152)					S				B	B		B	B		C	C	D	D
	1,800pF (182)					S				B	B		B	B		C	C	D	D
	2,200pF (222)					S				B	B		B	B		C	C	D	D
	2,700pF (272)					S				D	D		B	B		C	C	D	D
	3,300pF (332)					S				D	D		B	B		C	C	D	D
	3,900pF (392)									D	D		B	B		C	C	D	D
	4,700pF (472)									D			B	B		C	C	D	D
	5,600pF (562)								D				B	B		C	C	D	D
	6,800pF (682)								D				C	C		C	C	D	D
	8,200pF (822)								D				D	D		C	C	D	D
	0.010μF (103)								D				D			C	C	D	D
	0.012μF (123)								D			D			C	D	D	D	D
	0.015μF (153)											D			C	D	D	D	D
	0.018μF (183)											D						D	D
	0.022μF (223)											D						D	D
	0.027μF (273)											D						D	D
	0.033μF (333)											D						D	D
	0.039μF (393)											G							

1. The letter in cell is expressed the symbol of product thickness.

X7R Dielectric

Dielectric		X7R																							
Size		0402				0603					0805					1206				1210			1812		
Rated Voltage (VDC)		10	16	25	50	10	16	25	50	100	10	16	25	50	100	16	25	50	100	25	50	100	25	50	100
capacitance	100pF (101)				N				S	S				B	B										
	120pF (121)				N				S	S				B	B										
	150pF (151)				N				S	S				B	B			B	B						
	180pF (181)				N				S	S				B	B			B	B						
	220pF (221)				N				S	S				B	B			B	B						
	270pF (271)				N				S	S				B	B			B	B						
	330pF (331)				N				S	S				B	B			B	B						
	390pF (391)				N				S	S				B	B			B	B						
	470pF (471)				N				S	S				B	B			B	B						
	560pF (561)				N				S	S				B	B			B	B						
	680pF (681)				N				S	S				B	B			B	B						
	820pF (821)				N				S	S				B	B			B	B						
	1,000pF (102)				N				S	S				B	B			B	B		C	C		D	D
	1,200pF (122)				N				S	S				B	B			B	B		C	C		D	D
	1,500pF (152)				N				S	S				B	B			B	B		C	C		D	D
	1,800pF (182)				N				S	S				B	B			B	B		C	C		D	D
	2,200pF (222)				N				S	S				B	B			B	B		C	C		D	D
	2,700pF (272)				N				S	S				B	B			B	B		C	C		D	D
	3,300pF (332)				N				S	S				B	B			B	B		C	C		D	D
	3,900pF (392)				N				S	S				B	B			B	B		C	C		D	D
	4,700pF (472)				N				S	S				B	B			B	B		C	C		D	D
	5,600pF (562)			N	N				S	S				B	B			B	B		C	C		D	D
	6,800pF (682)			N	N				S	S				B	B			B	B		C	C		D	D
	8,200pF (822)			N	N				S	S				B	B			B	B		C	C		D	D
	0.010μF (103)			N	N				S	S				B	B			B	B		C	C		D	D
	0.012μF (123)		N	N					S					B	B			B	B		C	C		D	D
	0.015μF (153)		N	N					S					B	B			B	B		C	C		D	D
	0.018μF (183)		N	N					S					B	B			B	B		C	C		D	D
	0.022μF (223)		N	N					S					B	B			B	B		C	C		D	D
	0.027μF (273)	N	N						S					B	D			B	B		C	C		D	D
	0.033μF (333)	N	N					S	X					B	D			B	B		C	C		D	D
	0.039μF (393)	N	N					S	X					B	D			B	B		C	C		D	D
	0.047μF (473)	N	N					S	X					B	D			B	B		C	C		D	D
	0.056μF (563)	N	N					S	X					B	D			B	B		C	C		D	D
	0.068μF (683)	N	N					S	X					B	D			B	B		C	C		D	D
	0.082μF (823)	N	N			S	S	S	X				B	B	D			B	D		C	C		D	D
	0.10μF (104)	N	N			S	S	S	X				B	B	D			B	D		C	C		D	D
	0.12μF (124)					S	S	X					B	D				B	D		C	C		D	D
	0.15μF (154)					S	S	X					D	D				C	G		C	D		D	D
	0.18μF (184)					S	S	X					D	D				C	G		C	D		D	D
	0.22μF (224)					S	S	X					D	D				C	G		C	D		D	D
	0.27μF (274)					X	X	X					D				C	D			C	G		D	D
	0.33μF (334)					X	X	X					D	I			C	D		C	D	G		D	D
	0.39μF (394)					X	X	X				D	D			C	J	P		C	D	M		D	D
	0.47μF (474)					X	X	X				D	D	I		J	J	P		C	D	M		D	K
	0.56μF (564)					X						D	D			J	J	P		D	D	M		D	K
	0.68μF (684)					X					D	D	D			J	J	P		D	D	K	D	K	K
	0.82μF (824)					X					D	D	D			J	J	P		D	D	K	D	K	K
	1.0μF (105)					X					D	D	D			J	J	P		D	D	K	D	K	K

1. The letter in cell is expressed the symbol of product thickness.

■ CAPACITANCE RANGE

Y5V Dielectric (0402,0603,0805,Sizes)

Dielectric		Y5V												
Size		0402					0603				0805			
Rated Voltage (VDC)		6.3	10	16	25	50	10	16	25	50	16	25	50	100
capacitance	0.010μF (103)					N				S			A	B
	0.015μF (153)					N				S			A	B
	0.022μF (223)					N				S			A	B
	0.033μF (333)					N				S			A	B
	0.047μF (473)				N					S			A	B
	0.068μF (683)			N	N					S			A	B
	0.10μF (104)			N	N					S			A	B
	0.15μF (154)		N							S			A	
	0.22μF (224)		N						S	S			A	
	0.33μF (334)	N	N						S				B	
	0.47μF (474)	N	N					S				B	B	
	0.68μF (684)	N					S	X			B	D	D	
	1.0μF (105)	N					S	X	X		B	D	D	

1. The letter in cell is expressed the symbol of product thickness.

Y5V Dielectric (1206,1210,1812 Sizes)

Dielectric		Y5V						
Size		1206			1210		1812	
Rated Voltage (VDC)		25	50	100	50	100	50	100
capacitance	0.010μF (103)	B	B	B		C		D
	0.015μF (153)	B	B	B		C		D
	0.022μF (223)	B	B	B		C		D
	0.033μF (333)	B	B	B		C		D
	0.047μF (473)	B	B	B		C		D
	0.068μF (683)	B	B	B		C		D
	0.10μF (104)	B	B	B	C	C	D	D
	0.15μF (154)	B	B	C	C	C	D	D
	0.22μF (224)	B	B	C	C	C	D	D
	0.33μF (334)	B	B		C	C	D	D
	0.47μF (474)	B	B		C		D	D
	0.68μF (684)	B	B		C		D	D
	1.0μF (105)	C	C		C		D	D

1. The letter in cell is expressed the symbol of product thickness.

■ HOW TO ORDER

1206	F	106	Z	100	C	T
Size Inch (mm) 0402 (1005) 0603 (1608) 0805 (2012) 1206 (3216) 1210 (3225) 1812 (4532)	**Dielectric** B=X7R X=X5R S=X6S F=Y5V	**Capacitance** Two significant digits followed by no. of zeros. And R is in place of decimal point. eg.: 106=10x10^6 =10μF	**Tolerance** K=±10% M=±20% Z=-20/+80%	**Rated voltage** Two significant digits followed by no. of zeros. And R is in place of decimal point. 6R3=6.3 VDC 100=10 VDC 160=16 VDC 250=25 VDC 500=50 VDC	**Termination** C=Cu/Ni/Sn	**Packaging** B=Bulk C=Bulk cassette T=7”reeled G=13”reeled

■ PACKAGING DIMENSION AND QUANTITY

Size	Thickness (mm)/Symbol		Paper tape		Plastic tape	
			7” reel	13” reel	7” reel	13” reel
0402 (1005)	0.50 ± 0.05	N	10k	50k	-	-
0603 (1608)	0.80 ± 0.07	S	4k	15k	-	-
	0.80 + 0.15 / -0.10	X	4k	15k	-	-
0805 (2012)	0.80 ± 0.10	B	4k	15k	-	-
	1.25 ± 0.10	D	-	-	3k	10k
	1..25 ± 0.20	I	-	-	3k	10k
1206 (3216)	0.95 ± 0.10	C	-	-	3k	10k
	1.15 ± 0.15	J	-	-	3k	10k
	1.60 ± 0.20	G	-	-	2k	-
	1.60 + 0.30 / -0.10	P	-	-	2k	-
1210 (3225)	0.95 ± 0.10	C	-	-	3k	10k
	1.25 ± 0.10	D	-	-	3k	10k
	1.60 ± 0.20	G	-	-	2k	-
	2.00 ± 0.20	K	-	-	1k	-
	2.50 ± 0.30	M	-	-	1k	-
1812 (4532)	1.25 ± 0.10	D	-	-	1k	-
	2.00 ± 0.20	K	-	-	1k	-
	2.50 ± 0.30	M	-	-	0.5k	-

Unit: pieces

■ CAPACITANCE RANGE

X7R Dielectric

Dielectric																		
Size		0603				0805			1206				1210			1812		
Rated Voltage (VDC)		10	16	25	50	10	16	25	10	16	25	50	25	50	100	25	50	100
capacitance	1.0μF (105)	X				D	D	D	J	J	J	P	D	D	K	D	K	K
	1.5μF (155)					I			J	J								K
	2.2μF (225)					I	I	I	J	J	P		G					M
	3.3μF (335)								P	P	P							
	4.7μF (475)								P	P	P							

The letter in cell is expressed the symbol of product thickness.

X5R Dielectric

Dielectric		X5R																
Size		0402			0603				0805				1206				1210	
Rated Voltage (VDC)		6.3	10	16	6.3	10	16	25	6.3	10	16	25	6.3	10	16	25	10	16
capacitance	0.027μF (273)			N														
	0.033μF (333)			N														
	0.039μF (393)			N														
	0.047μF (473)			N														
	0.056μF (563)		N	N														
	0.068μF (683)		N	N														
	0.082μF (823)	N	N	N														
	0.10μF (104)	N	N	N														
	0.22μF (224)	N					X	X										
	0.33μF (334)	N				X	X	X										
	0.47μF (474)	N				X	X	X										
	0.68μF (684)	N			X	X	X	X										
	1.0μF (105)	N			X	X	X	X										
	1.5μF (155)				X				I	I				J	J		K	K
	2.2μF (225)				X				I	I	I	I		J	J	J	K	K
	3.3μF (335)								I	I	I	I		P	P	P		
	4.7μF (475)								I	I	I	I	P	P	P		K	K
	6.8μF (685)												P	P				
	10μF (106)								I				P	P	P	P	K	K
	22μF (226)												P					

1. The letter in cell is expressed the symbol of product thickness.

Y5V Dielectric

Dielectric		Y5V																			
Size		0603		0805				1206					1210						1812		
Rated Voltage (VDC)		10	16	10	16	25	50	10	16	25	35	50	6.3	10	16	25	35	50	16	25	50
capacitance	1.0μF (105)	S	X	B	B	D	D	C	C	C		C		C	C	C		C	D	D	D
	1.5μF (155)	S		D	D			C	C	C				C	C	C			D	D	D
	2.2μF (225)	S		D	D	I		C	C	C				C	C	C		G	D	D	D
	3.3μF (335)			D	D			J	J	J				C	C	C			D	D	D
	4.7μF (475)			D	D	I		J	J	J	J			C	C	D		G	D	D	D
	6.8μF (685)			I				J	J					C	C	D			D	D	D
	10μF (106)			I				J	J	P				D	D	G	K		D	D	
	22μF (226)							P						K	K						
	47μF (476)												K	K					M		
	100μF (107)												M								

1. The letter in cell is expressed the symbol of product thickness.
2. For more information about products with special capactitance or other date, please contact WTC local representative.

■ HOW TO ORDER

TT	31	X	225	M	100	C	T
Series	**Size**	**Dielectric**	**Capacitance**	**Tolerance**	**Rated voltage**	**Termination**	**Packaging**
TT=Low profile	18=0603 (1608) 21=0805 (2012) 31=1206 (3216) 32=1210 (3225)	X=X5R F=Y5V	Two significant digits followed by no. of zeros. And R is in place of decimal point. eg.: 225=22x10^5 =2,200,000pF =2.2μF	K=±10% M=±20% Z=-20/+80%	Two significant digits followed by no. of zeros. And R is in place of decimal point. 6R3=6.3 VDC 100=10 VDC 160=16 VDC	C=Cu/Ni/Sn	B=Bulk T=7"reeled

■ PACKAGING DIMENSION AND QUANTITY

Size	Thickness (mm)/Symbol		7" reel	
			Paper tape	Plastic tape
0603 (1608)	0.60	H	4k	-
0805 (2012)	0.95	T	4k	-
1206 (3216)	0.95	T	4k	-
	1.25	J	-	3k
1210 (3225)	0.95	T	-	3k

Unit: pieces

■ CAPACITANCE RANGE

Dielectric	Size	Capacitance	Tolerance	Rated Voltage (VDC)	Thickness Max (mm)	Part Number
X5R	0603	0.22μF	±10%, ±20%	10	0.60	TT 18X224□100CT
	0805	4.7μF	±10%, ±20%	6.3	0.95	TT 21X475□6R3CT
		10μF	±10%, ±20%	10	0.95	TT 21X105□100CT
		2.2μF	±10%, ±20%	10	0.95	TT 21X225□100CT
		2.2μF	±10%, ±20%	16	0.95	TT 21X225□160CT
	1206	2.2μF	±10%, ±20%	10	0.95	TT 31X225□100CT
		4.7μF	±10%, ±20%	10	0.95	TT 31X475□100CT
		10μF	±10%, ±20%	10	0.95	TT 31X106□100CT
	1210	3.3μF	±10%, ±20%	10	0.95	TT 32X335□100CT
		4.7μF	±10%, ±20%	10	0.95	TT 32X475□100CT
Y5V	0805	2.2μF	-20/ +80%	16	0.95	TT 21F225Z160CT
		3.3μF	-20/ +80%	10	0.95	TT 21F335Z100CT
		4.7μF	-20/ +80%	10	0.95	TT 21F475Z100CT
	1206	4.7μF	-20/ +80%	16	0.95	TT 31F475Z160CT
		6.8μF	-20/ +80%	10	0.95	TT 31F685Z100CT
		10μF	-20/ +80%	10	0.95	TT 31F106Z100CT
		4.7μF	-20/ +80%	16	0.95	TT 31F475Z160CT
		10μF	-20/ +80%	16	1.25	TT 31F106Z160CT
	1210	10μF	-20/ +80%	10	0.95	TT 32F106Z100CT

□ Please specify the capacitance tolerance code.

1. This series product is suited to reflow soldering process only.

■ HOW TO ORDER

0201	N	100	J	250	L	T
Size Inch (mm) 0201 (0603)	**Dielectric** N=NP0 (C0G) B=X7R X=X5R	**Capacitance** Two significant digits followed by no. of zeros. And R is in place of decimal point. eg.: R47=0.47pF 0R5=0.5pF 1R0=1.0pF 100=10x10⁰ =10pF	**Tolerance** B=±0.1pF C=±0.25pF D=±0.5pF G=±2% J=±5% K=±10% M=±20% (B,C,D for Cap<10pF; G,J,K,M for Cap≥10pF)	**Rated voltage** Two significant digits followed by no. of zeros. And R is in place of decimal point. 6R3=6.3 VDC 100=10 VDC 160=16 VDC 250=25 VDC 500=50 VDC	**Termination** L=Ag/Ni/Sn (for NP0 dielectric) C=Cu/Ni/Sn (for X7R, X5R, dielectric)	**Packaging** T=7”reeled

■ PACKAGING DIMENSION AND QUANTITY

Size	Thickness (mm)/Symbol		Paper tape	
			7” reel	13” reel
0201 (0603)	0.30±0.03	L	15k	-

Unit: pieces

■ CAPACITANCE RANGE

Size		0201		
Dielectric		NPO		
Rated Voltage (VDC)		16	25	50
capacitance	0.3pF (0R3)		L	L
	0.4pF (0R4)		L	L
	0.5pF (0R5)		L	L
	1.0pF (1R0)		L	L
	1.2pF (1R2)		L	L
	1.5pF (1R5)		L	L
	1.8pF (1R8)		L	L
	2.2pF (2R2)		L	L
	2.7pF (2R7)		L	L
	3.3pF (3R3)		L	L
	3.9pF (3R9)		L	L
	4.7pF (4R7)		L	L
	5.6pF (5R6)		L	L
	6.8pF (6R8)		L	L
	8.2pF (8R2)		L	L
	10pF (100)		L	L
	12pF (120)		L	L
	15pF (150)		L	L
	18pF (180)		L	L
	22pF (220)		L	L
	27pF (270)		L	L
	33pF (330)		L	L
	39pF (390)		L	L
	47pF (470)		L	L
	56pF (560)	L	L	
	68pF (680)	L	L	
	82pF (820)	L	L	
	100pF (101)	L	L	

Size		0201							
Dielectric		X7R				X5R			
Rated Voltage (VDC)		10V	16V	25V	50V	6.3V	10V	16V	50V
capacitance	100pF (101)		L	L	L				L
	120pF (121)		L	L	L				L
	150pF (151)		L	L	L				L
	180pF (181)		L	L	L				L
	220pF (221)		L	L	L				L
	270pF (271)		L	L	L				L
	330pF (331)		L	L	L				L
	390pF (391)		L	L	L				L
	470pF (471)		L	L	L				L
	560pF (561)		L	L	L				L
	680pF (681)		L	L	L				L
	820pF (821)		L	L	L				L
	1,000pF (102)		L	L	L				L
	1,500pF (152)	L	L					L	
	2,200pF (222)	L	L					L	
	3,300pF (332)	L	L					L	
	4,700pF (472)	L	L					L	
	6,800pF (682)	L					L		
	0.010μF (103)	L				L	L		
	0.015μF (153)					L			
	0.022μF (223)					L			
	0.033μF (333)					L			
	0.047μF (473)					L			
	0.068μF (683)					L			
	0.10μF (104)					L			

1. The letter in cell is expressed the symbol of product thickness.
2. For more information about products with special capacitance or other data, please contact WTC local sales representative.

■ HOW TO ORDER

1808	N	100	G	202	L	T
Size	**Dielectric**	**Capacitance**	**Tolerance**	**Rated voltage**	**Termination**	**Packaging**
Inch (mm) 0603 (1608) 0805 (2012) 1206 (3216) 1210 (3225) 1808 (4520) 1812 (4532)	N=NP0 (C0G) B=X7R F=Y5V	Two significant digits followed by no. of zeros. And R is in place of decimal point. eg.: R47=0.47pF 0R5=0.5pF 1R0=1.0pF 100=10x10^0 =10pF	B=±0.1pF C=±0.25pF D=±0.5pF F=±1% G=±2% J=±5% K=±10% M=±20% Z=-20/+80% (B,C,D for Cap<10pF; G,J,K,M,Z for Cap≥10pF)	Two significant digits followed by no. of zeros. And R is in place of decimal point. 201=200 VDC 251=250 VDC 501=500 VDC 631=630 VDC 102=1000 VDC 202=2000 VDC 302=3000 VDC	L=Ag/Ni/Sn (for NP0 dielectric) C=Cu/Ni/Sn (for X7R*, Y5V dielectric)	B=Bulk T=7”reeled G=13”reeled

* Partial X7R Items are with Ag/Nl/Sn terminations please please ref to below product range of X7R dlelectric for detall.

■ PACKAGING DIMENSION AND QUANTITY

Size	Thickness (mm)/Symbol		Paper tape		Plastic tape	
			7” reel	13” reel	7” reel	13” reel
0603 (1608)	0.80 ± 0.07	S	4k	15k	-	-
0805 (2012)	0.60 ± 0.10	A	4k	15k	-	-
	0.80 ± 0.10	B	4k	15k	-	-
	1.25 ± 0.10	D	-	-	3k	10k
1206 (3216)	0.80 ± 0.10	B	4k	15k	-	-
	0.95 ± 0.10	C	-	-	3k	10k
	1.25 ± 0.10	D	-	-	3k	10k
	1.60 ± 0.20	G	-	-	2k	-
1210 (3225)	0.95 ± 0.10	C	-	-	3k	10k
	1.25 ± 0.10	D	-	-	3k	10k
	1.60 ± 0.20	G	-	-	2k	-
	2.50 ± 0.30	M	-	-	1k	-
1808 (4520)	1.25 ± 0.10	D	-	-	2k	-
	2.00 ± 0.20	K	-	-	1k	-
1812 (4532)	1.25 ± 0.10	D	-	-	1k	-
	2.00 ± 0.20	K	-	-	1k	-

Unit: pieces

■ CAPACITANCE RANGE

NP0 Dielectric 200V to 630V

Dielectric		NP0																	
Size		0603		0805				1206				1210				1812			
Rated Voltage (VDC)		200	250	200	250	500	630	200	250	500	630	200	250	500	630	200	250	500	630
capacitance	0.5pF (0R5)			A	A	A	A												
	1.0pF (1R0)			A	A	A	A												
	1.2pF (1R2)			A	A	A	A												
	1.5pF (1R5)			A	A	A	A	B	B	B	B								
	1.8pF (1R8)			A	A	A	A	B	B	B	B								
	2.2pF (2R2)			A	A	A	A	B	B	B	B								
	2.7pF (2R7)			A	A	A	A	B	B	B	B								
	3.3pF (3R3)			A	A	A	A	B	B	B	B								
	3.9pF (3R9)			A	A	A	A	B	B	B	B								
	4.7pF (4R7)			A	A	A	A	B	B	B	B								
	5.6pF (5R6)			A	A	A	A	B	B	B	B								
	6.8pF (6R8)			A	A	A	A	B	B	B	B								
	8.2pF (8R2)			A	A	A	A	B	B	B	B								
	10pF (100)			A	A	A	A	B	B	B	B	C	C	C	C	D	D	D	D
	12pF (120)			A	A	A	A	B	B	B	B	C	C	C	C	D	D	D	D
	15pF (150)			A	A	A	A	B	B	B	B	C	C	C	C	D	D	D	D
	18pF (180)			A	A	A	A	B	B	B	B	C	C	C	C	D	D	D	D
	22pF (220)	S	S	A	A	A	A	B	B	B	B	C	C	C	C	D	D	D	D
	27pF (270)	S	S	A	A	A	A	B	B	B	B	C	C	C	C	D	D	D	D
	33pF (330)	S	S	A	A	A	A	B	B	B	B	C	C	C	C	D	D	D	D
	39pF (390)	S	S	A	A	A	A	B	B	B	B	C	C	C	C	D	D	D	D
	47pF (470)	S	S	A	A	A	A	B	B	B	B	C	C	C	C	D	D	D	D
	56pF (560)	S	S	A	A	A	A	B	B	B	B	C	C	C	C	D	D	D	D
	68pF (680)	S	S	A	A	A	A	B	B	B	B	C	C	C	C	D	D	D	D
	82pF (820)	S	S	A	A	B	B	B	B	B	B	C	C	C	C	D	D	D	D
	100pF (101)	S	S	A	B	B	B	B	B	B	B	C	C	C	C	D	D	D	D
	120pF (121)			A	B	D	D	B	B	B	B	C	C	C	C	D	D	D	D
	150pF (151)			B	D	D	D	B	B	B	B	C	C	C	C	D	D	D	D
	180pF (181)			B	D	D	D	B	B	B	B	C	C	C	C	D	D	D	D
	220pF (221)			D	D	D	D	B	B	B	B	C	C	C	C	D	D	D	D
	270pF (271)			D	D	D	D	B	C	C	C	C	C	C	C	D	D	D	D
	330pF (331)			D	D	D	D	B	C	C	C	C	C	C	C	D	D	D	D
	390pF (391)			D	D	D	D	B	C	C	C	C	C	C	C	D	D	D	D
	470pF (471)			D				C	C	C	C	C	C	C	C	D	D	D	D
	560pF (561)			D				C	D	D	D	C	C	C	C	D	D	D	D
	680pF (681)			D				C	D	D	D	C	C	C	C	D	D	D	D
	820pF (821)			D				C	G	G	G	C	C	C	C	D	D	D	D
	1,000pF (102)			D				C	G	G	G	D	D	D	D	D	D	D	D
	1,200pF (122)							C				D	D	D	D	D	D	D	D
	1,500pF (152)							D				D	D	D	D	D	D	D	D
	1,800pF (182)							D				D	D	D	D	D	D	D	D
	2,200pF (222)							D				D	D			D	D	D	D
	2,700pF (272)											D	D			D	D	D	D
	3,300pF (332)											D				D	D	D	D
	3,900pF (392)											D				D			
	4,700pF (472)															D			
	5,600pF (562)															D			
	6,800pF (682)															D			

1. The letter in cell is expressed the symbol of product thickness.

NP0 Dielectric 1kV to 3kV

Dielectric		NP0								
Size		1206		1210		1808			1812		
Rated Voltage (VDC)		1000	2000	1000	2000	1000	2000	3000	1000	2000	3000
capacitance	1.5pF (1R5)	B	B								
	1.8pF (1R8)	B	B								
	2.2pF (2R2)	B	B			D	D	D			
	2.7pF (2R7)	B	B			D	D	D			
	3.3pF (3R3)	B	B			D	D	D			
	3.9pF (3R9)	B	B			D	D	D			
	4.7pF (4R7)	B	B			D	D	D			
	5.6pF (5R6)	B	B			D	D	D			
	6.8pF (6R8)	B	B			D	D	D			
	8.2pF (8R2)	B	B			D	D	D			
	10pF (100)	B	B	C	C	D	D	D	D	D	D
	12pF (120)	B	B	C	C	D	D	D	D	D	D
	15pF (150)	B	B	C	C	D	D	D	D	D	D
	18pF (180)	B	B	C	C	D	D	D	D	D	D
	22pF (220)	B	B	C	C	D	D	D	D	D	D
	27pF (270)	B	B	C	C	D	D	D	D	D	D
	33pF (330)	B	B	C	C	D	D	D	D	D	D
	39pF (390)	B	B	C	C	D	D	D	D	D	D
	47pF (470)	B	B	C	C	D	D	D	D	D	D
	56pF (560)	B	B	C	D	D	D	D	D	D	D
	68pF (680)	B	C	C	D	D	D	D	D	D	D
	82pF (820)	B	C	C	D	D	D	D	D	D	D
	100pF (101)	B	C	C	D	D	D	D	D	D	D
	120pF (121)	B	D	C	D	D	D	D	D	D	D
	150pF (151)	C	D	C	D	D	D	D	D	D	D
	180pF (181)	C	G	C	D	D	D	K	D	D	D
	220pF (221)	D	G	C	D	D	D	K	D	D	D
	270pF (271)	D		C		D	D	K	D	D	K
	330pF (331)	G		D		D	D	K	D	D	K
	390pF (391)	G		D		D	K		D	D	K
	470pF (471)	G		D		D	K		D	D	K
	560pF (561)					K	K		D	D	
	680pF (681)					K	K		D	K	
	820pF (821)					K			D	K	
	1,000pF (102)					K			K	K	
	1,200pF (122)								K		
	1,500pF (152)								K		

1. The letter in cell is expressed the symbol of product thickness.

X7R Dielectric 200V to 630V

Dielectric		X7R															
Size		0805				1206				1210				1812			
Rated Voltage (VDC)		200	250	500	630	200	250	500	630	200	250	500	630	200	250	500	630
capacitance	100pF (101)	B	B	B^	B^												
	120pF (121)	B	B	B^	B^												
	150pF (151)	B	B	B^	B^	D	D	D^	D^								
	180pF (181)	B	B	B^	B^	D	D	D^	D^								
	220pF (221)	B	B	B^	B^	D	D	D^	D^								
	270pF (271)	B	B	B^	B^	D	D	D^	D^								
	330pF (331)	B	B	B^	B^	D	D	D^	D^								
	390pF (391)	B	B	B^	B^	D	D	D^	D^								
	470pF (471)	B	B	B^	B^	D	D	D^	D^								
	560pF (561)	B	B	B^	B^	D	D	D^	D^								
	680pF (681)	B	B	B^	B^	D	D	D^	D^								
	820pF (821)	B	B	B^	B^	D	D	D^	D^								
	1,000pF (102)	B	B	B^	B^	D	D	D^	D^	C	C	C^	C^	D	D	D^	D^
	1,200pF (122)	B	B	B^	B^	D	D	D^	D^	C	C	C^	C^	D	D	D^	D^
	1,500pF (152)	B	B	B^	B^	D	D	D^	D^	C	C	C^	C^	D	D	D^	D^
	1,800pF (182)	B	B	B^	B^	D	D	D^	D^	C	C	C^	C^	D	D	D^	D^
	2,200pF (222)	B	B	B^	B^	D	D	D^	D^	C	C	C^	C^	D	D	D^	D^
	2,700pF (272)	B	B	B^	B^	D	D	D^	D^	C	C	C^	C^	D	D	D^	D^
	3,300pF (332)	B	B	B^	B^	D	D	D^	D^	C	C	C^	C^	D	D	D^	D^
	3,900pF (392)	B	B			D	D	D^	D^	C	C	C^	C^	D	D	D^	D^
	4,700pF (472)	B	B			D	D	D^	D^	C	C	C^	C^	D	D	D^	D^
	5,600pF (562)	D	D			D	D	D^	D^	C	C	C^	C^	D	D	D^	D^
	6,800pF (682)	D	D			D	D	D^	D^	C	C	C^	C^	D	D	D^	D^
	8,200pF (822)	D	D			D	D	D^	D^	C	C	C^	C^	D	D	D^	D^
	0.010μF (103)	D	D			D	D	D^	D^	C	C	C^	C^	D	D	D^	D^
	0.012μF (123)	D	D			D	D	D^	D^	C	C	C^	C^	D	D	D^	D^
	0.015μF (153)	D	D			D	D	D^	D^	C	C	C^	C^	D	D	D^	D^
	0.018μF (183)	D	D			D	D	D^	D^	C	C	C^	C^	D	D	D^	D^
	0.022μF (223)	D	D			D	D	G^	G^	C	C	D^	D^	D	D	D^	D^
	0.027μF (273)					D	D	G^	G^	C	C	G^	G^	D	D	D^	D^
	0.033μF (333)					G	G	G^	G^	C	C	G^	G^	D	D	D^	D^
	0.039μF (393)					G	G			C	C	G^	G^	D	D	D^	D^
	0.047μF (473)					G	G			D	D	G^	G^	D	D	D^	D^
	0.056μF (563)					G	G			D	D	G^	G^	D	D	K^	K^
	0.068μF (683)					G	G			G	G			D	D	K^	K^
	0.082μF (823)					G	G			G	G			D	D	K^	K^
	0.10μF (104)					G	G			G	G			D	D	K^	K^
	0.12μF (124)									G	G			D	D		
	0.15μF (154)									M	M			K	K		
	0.18μF (184)									M	M			K	K		
	0.22μF (224)									M	M			K	K		
	0.27μF (274)									M	M			K	K		
	0.33μF (334)									M	M			K	K		
	0.39μF (394)									M	M			K	K		
	0.47μF (474)									M	M			K	K		

1. The letter in cell is expressed the symbol of product thickness.
2. The letter in cell with 〝^〞 mark is expressed product with Ag/Ni/Sn terminations.

X7R Dielectric 1kV to 3kV

Dielectric		X7R								
Size		1206		1210	1808			1812		
Rated Voltage (VDC)		1000	2000	1000	1000	2000	3000	1000	2000	3000
capacitance	150pF (151)	B^	B^		D^	D^	D^			
	180pF (181)	B^	B^		D^	D^	D^			
	220pF (221)	B^	B^		D^	D^	D^			
	270pF (271)	B^	B^		D^	D^	D^	D^	D^	
	330pF (331)	B^	B^		D^	D^	K^	D^	D^	
	390pF (391)	B^	C^		D^	D^	K^	D^	D^	
	470pF (471)	B^	C^		D^	D^	K^	D^	D^	
	560pF (561)	B^	C^		D^	D^	K^	D^	D^	
	680pF (681)	B^	C^		D^	D^	K^	D^	D^	K^
	820pF (821)	B^	G^		D^	D^	K^	D^	D^	K^
	1,000pF (102)	B^	G^	C^	D^	K^	K^	D^	D^	K^
	1,200pF (122)	B^	G^	C^	D^	K^		D^	D^	
	1,500pF (152)	C^	G^	C^	D^	K^		D^	D^	
	1,800pF (182)	C^		C^	D^	K^		D^	D^	
	2,200pF (222)	D^		C^	D^	K^		D^	D^	
	2,700pF (272)	G^		C^	D^			D^	D^	
	3,300pF (332)	G^		D^	D^			D^	K^	
	3,900pF (392)	G^		G^	D^			D^	K^	
	4,700pF (472)	G^		G^	D^			D^	K^	
	5,600pF (562)			G^	K^			D^		
	6,800pF (682)			M^	K^			D^		
	8,200pF (822)			M^	K^			D^		
	0.010μF (103)			M^	K^			D^		
	0.012μF (123)							K^		
	0.015μF (153)							K^		

1. The letter in cell is expressed the symbol of product thickness.

Y5V Dielectric 200V to 250V

Dielectric		Y5V							
Size		0805		1206		1210		1812	
Rated Voltage (VDC)		200	250	200	250	200	250	200	250
capacitance	0.010μF (103)	B	B	B	B	C	C	D	D
	0.015μF (153)	B	B	B	B	C	C	D	D
	0.022μF (223)	B	B	B	B	C	C	D	D
	0.033μF (333)	B	B	B	B	C	C	D	D
	0.047μF (473)	B	B	B	B	C	C	D	D
	0.068μF (683)	B	B	B	B	C	C	D	D
	0.10μF (104)			B	B	C	C	D	D
	0.15μF (154)			C	C	C	C	D	D
	0.22μF (224)							D	D
	0.33μF (334)							D	D
	0.47μF (474)							D	D
	0.68μF (684)							D	D
	1.0μF (105)								

1. The letter in cell is expressed the symbol of product thickness.

■ HOW TO ORDER

S2	42	N	100	J	302	L	T
Series	**Size**	**Dielectric**	**Capacitance**	**Tolerance**	**Rated voltage**	**Termination**	**Packaging**
S2=X1/Y2	42=1808 (4520) 43=1812 (4532) 52=2211 (5728)	N=NP0 (C0G) B=X7R	Two significant digits followed by no. of zeros. And R is in place of decimal point. eg.: 100=10x10^0 =10pF	J=±5% K=±10%	Two significant digits followed by no. of zeros. And R is in place of decimal point. 302=3000 VDC	L=Ag/Ni/Sn	B=Bulk T=7"reeled

■ PACKAGING DIMENSION AND QUANTITY

Size	Thickness (mm)/Symbol		7" reel / Paper tape
1808 (4520)	1.25±0.10	D	2k
	2.00±0.20	K	1k
1812 (4532)	1.25±0.10	D	1k
	2.00±0.20	K	1k
2211 (5728)	1.60±0.20	G	1k
	2.00±0.20	K	1k
	2.50±0.30	M	0.5k

Unit: pieces

■ CAPACITANCE RANGE

Dielectric		NPO		X7R		
Rated Voltage (VAC)		250		250		
Rated Voltage (VDC)		3000		3000		
Size		1808	1812	1808	1812	2211
capacitance	10pF (100)	D				
	12pF (120)	D	D			
	15pF (150)	D	D			
	18pF (180)	D	D			
	22pF (220)	D	D			
	27pF (270)	D	D			
	33pF (330)	D	D			
	39pF (390)	D	D			
	47pF (470)	D	D			
	56pF (560)	D	D			
	68pF (680)	D	D			
	82pF (820)	D	D			
	100pF (101)	D	D	G		
	120pF (121)	D	D	G		
	150pF (151)	D	D	G	G	G
	180pF (181)	K	D	G	G	G
	220pF (221)	K	D	G	G	G
	270pF (271)	K	K	K	G	G
	330pF (331)		K	K	G	G
	390pF (391)		K	K	G	G
	470pF (471)		K	K	G	K
	560pF (561)			K	G	K
	680pF (681)			K	K	K
	820pF (821)			K	K	K
	1000pF (102)			K	M	M
	1200pF (122)					M
	1500pF (152)					M
	1800pF (182)					M
	2200pF (222)					M

1. The letter in cell is expressed the symbol of product thickness.

■ HOW TO ORDER

S3	42	N	100	J	202	L	T
Series	**Size**	**Dielectric**	**Capacitance**	**Tolerance**	**Rated voltage**	**Termination**	**Packaging**
S3=X2/Y3	42=1808 (4520) 43=1812 (4532)	N=NP0 (C0G) B=X7R	Two significant digits followed by no. of zeros. And R is in place of decimal point. Eg.: R47=0.47pF 0R5=0.5pF 1R0=1.0pF 100=10x10^0 =10pF	C=±0.25pF D=±0.5pF J=±5% K=±10% (C,D for Cap<10pF; J,K for Cap≥ 10pF)	Two significant digits followed by no. of zeros. And R is in place of decimal point. 202=2000 VDC 302=3000 VDC	L=Ag/Ni/Sn	B=Bulk T=7”reeled

■ PACKAGING DIMENSION AND QUANTITY

Size	Thickness (mm)/Symbol		7” reel / Paper tape
1808 (4520)	1.25±0.10	D	2k
	2.00±0.20	K	1k
1812 (4532)	1.25±0.10	D	1k
	2.00±0.20	K	1k

Unit: pieces

■ CAPACITANCE RANGE

NP0 Dielectric

Dielectric		NPO			
Size		1808		1812	
Rated Voltage (VAC)		250		250	
Rated Voltage (VDC)		2000	3000	2000	3000
capacitance	3.9pF (3R9)		D*		
	4.7pF (4R7)		D*		
	5.0pF (5R0)		D*		
	5.6pF (5R6)		D*		
	6.8pF (6R8)		D*		
	8.2pF (8R2)		D*		
	10pF (100)	D	D	D*	D*
	12pF (120)	D	D	D	D
	15pF (150)	D	D	D	D
	18pF (180)	D	D	D	D
	22pF (220)	D	D	D	D
	27pF (270)	D	D	D	D
	33pF (330)	D	D	D	D
	39pF (390)	D	D	D	D
	47pF (470)	D	D	D	D
	56pF (560)	D	D	D	D
	68pF (680)	D	D	D	D
	82pF (820)	D	D	D	D
	100pF (101)	D	D	D	D
	120pF (121)	D	D	D	D
	150pF (151)	D	D	D	D
	180pF (181)	D	K	D	D
	220pF (221)	D	K	D	D
	270pF (271)	D	K	D	K
	330pF (331)	D		D	K
	390pF (391)	K		D	K
	470pF (471)	K		D	K
	560pF (561)	K		D	
	680pF (681)	K		K	
	820pF (821)			K	
	1,000pF (102)			K	

"*"means it is only available for UL safety certificated.
1. The letter in cell is expressed the symbol of product thickness.

X7R Dielectric

Dielectric		X7R			
Size		1808		1812	
Rated Voltage (VAC)		250		250	
Rated Voltage (VDC)		2000	3000	2000	3000
capacitance	150pF (151)	D			
	180pF (181)	D			
	220pF (221)	D			
	270pF (271)	D		D	
	330pF (331)	D	K*	D	
	390pF (391)	D	K*	D	
	470pF (471)	D	K*	D	
	560pF (561)	D	K	D	
	680pF (681)	D	K	D	K
	820pF (821)	D	K	D	K
	1,000pF (102)	K	K	D	K
	1,200pF (122)	K		D	
	1,500pF (152)	K		D	
	1,800pF (182)	K		D	
	2,200pF (222)	K		D	
	2,700pF (272)			D	
	3,300pF (332)			K	
	3,900pF (392)			K	
	4,700pF (472)			K	

"*"means it is only available for UL safety certificated.
1. The letter in cell is expressed the symbol of product thickness.

■ HOW TO ORDER

HH	15	N	100	G	500	L	T
Series	**Size**	**Dielectric**	**Capacitance**	**Tolerance**	**Rated voltage**	**Termination**	**Packaging**
HH= High Q/Low ESR	15=0402 (1005) 18=0603 (1608) 21=0805 (2012)	N=NP0 (C0G)	Two significant digits followed by no. of zeros. And R is in place of decimal point. eg.: R47=0.47pF 0R5=0.5pF 1R0=1.0pF 100=10x10^0 =10pF	B=±0.1pF C=±0.25pF D=±0.5pF F=±1% G=±2% J=±5%	Two significant digits followed by no. of zeros. And R is in place of decimal point. 160=16 VDC 250=25 VDC 500=50 VDC 101=100 VDC	L=Ag/Ni/Sn	T=7"reeled G=13"reeled

■ PACKAGING DIMENSION AND QUANTITY

Size	Thickness (mm)/Symbol		Paper tape	
			7" reel	13" reel
0402	0.50±0.05	N	10k	20k
0603	0.80±0.07	S	4k	15k
0805	0.60±0.10	A	4k	15k

Unit: pieces

■ ELECTRICAL CHARACTERISTICS

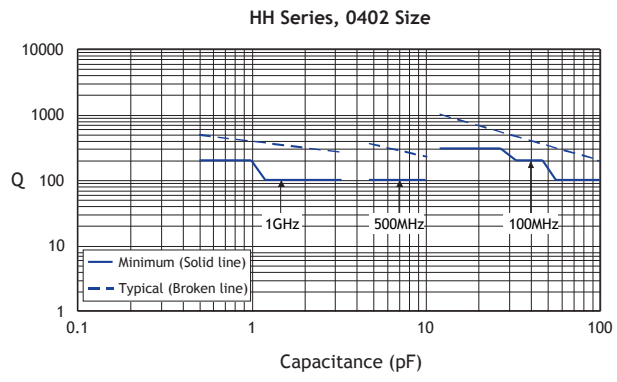


Fig. 2 Q factor specification vs. Specific frequency for 0402

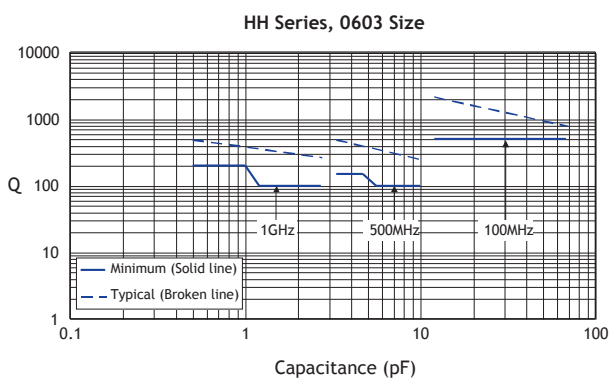


Fig. 3 Q factor specification vs. Specific frequency for 0603

■ CAPACITANCE RANGE

Dielectric		NPO								
Size		0402			0603				0805	
Rated Voltage (VDC)		16	25	50	16	25	50	100	50	100
capacitance	0.5pF (0R5)		N	N		S	S	S	A	A
	0.6pF (0R6)		N	N		S	S	S	A	A
	0.7pF (0R7)		N	N		S	S	S	A	A
	0.8pF (0R8)		N	N		S	S	S	A	A
	0.9pF (0R9)		N	N		S	S	S	A	A
	1.0pF (1R0)		N	N		S	S	S	A	A
	1.2pF (1R2)		N	N		S	S	S	A	A
	1.5pF (1R5)		N	N		S	S	S	A	A
	1.8pF (1R8)		N	N		S	S	S	A	A
	2.2pF (2R2)		N	N		S	S	S	A	A
	2.7pF (2R7)		N	N		S	S	S	A	A
	3.3pF (3R3)		N	N		S	S	S	A	A
	3.9pF (3R9)		N	N		S	S	S	A	A
	4.7pF (4R7)		N	N		S	S	S	A	A
	5.6pF (5R6)		N	N		S	S	S	A	A
	6.8pF (6R8)		N	N		S	S	S	A	A
	8.2pF (8R2)		N	N		S	S	S	A	A
	10pF (100)		N	N		S	S	S	A	A
	12pF (120)		N	N		S	S	S	A	A
	15pF (150)		N	N		S	S	S	A	A
	18pF (180)		N	N		S	S	S	A	A
	22pF (220)		N	N		S	S	S	A	A
	27pF (270)		N	N		S	S	S	A	A
	33pF (330)		N	N		S	S	S	A	A
	39pF (390)		N	N		S	S	S	A	A
	47pF (470)		N	N		S	S	S	A	A
	56pF (560)		N	N		S	S	S	A	A
	68pF (680)		N	N		S	S	S	A	A
	82pF (820)		N	N		S	S	S	A	A
	100pF (101)		N	N		S	S	S	A	A
	120pF (121)		N	N		S	S	S	A	A
	150pF (151)		N	N		S	S	S	A	A
	180pF (181)		N	N		S	S	S		
	220pF (221)		N	N		S	S	S		
	270pF (271)	N				S	S	S		
	330pF (331)	N				S	S	S		
	390pF (391)	N				S	S	S		
	470pF (471)	N				S	S	S		
	560pF (561)					S	S			
	680pF (681)					S	S			
	820pF (821)					S	S			
	1,000pF (102)					S	S			
	1,200pF (122)				S					
	1,500pF (152)				S					
	1,800pF (182)				S					
	2,200pF (222)				S					
	2,700pF (272)				S					
	3,300pF (332)				S					

1. The letter in cell is expressed the symbol of product thickness.

■ HOW TO ORDER

RF	15	N	100	G	500	C	T
Series	**Size**	**Dielectric**	**Capacitance**	**Tolerance**	**Rated voltage**	**Termination**	**Packaging**
RF=Ultra Hight Q and Low ESR	03=0201 (0603) 15=0402 (1005)	N=NP0 (C0G)	Two significant digits followed by no. of zeros. And R is in place of decimal point. Eg.: R47=0.47pF 0R5=0.5pF 1R0=1.0pF 100=10x10^0 =10pF	A=±0.05pF B=±0.1pF C=±0.25pF F=±1% G=±2% J=±5% A for Cap<5pF; B,C,D for Cap<10pF; F,G,J for Cap≥10pF)	Two significant digits followed byno. of zeros. And R is in place of decimal point. 250=25 VDC 500=50 VDC	C=Cu/Ni/Su	B=Bulk C=Bulk cassette T=7”reeled G=13”reeled

■ PACKAGING DIMENSION AND QUANTITY

Size	Thickness (mm)/Symbol		Paper tape	
			7” reel	13” reel
0201	0.30±0.03	L	15k	-
0402	0.50±0.05	N	10k	20k

Unit: pieces

■ CAPACITANCE RANGE

Dielectric		NPO		
Size		0201	0402	0603
Rated Voltage (VDC)		25	50	50
capacitance	0.1pF (0R1)	L	N	
	0.2pF (0R2)	L	N	
	0.3pF (0R3)	L	N	
	0.4pF (0R4)	L	N	S
	0.5pF (0R5)	L	N	S
	0.6pF (0R6)	L	N	S
	0.7pF (0R7)	L	N	S
	0.8pF (0R8)	L	N	S
	0.9pF (0R9)	L	N	S
	1.0pF (1R0)	L	N	S
	1.2pF (1R2)	L	N	S
	1.5pF (1R5)	L	N	S
	1.8pF (1R8)	L	N	S
	2.0pF (2R0)	L	N	S
	2.2pF (2R2)	L	N	S
	2.7pF (2R7)	L	N	S
	3.0pF (3R0)	L	N	S
	3.3pF (3R3)	L	N	S
	3.9pF (3R9)	L	N	S
	4.0pF (4R0)	L	N	S
	4.7pF (4R7)	L	N	S
	5.0pF (5R0)	L	N	S
	5.6pF (5R6)	L	N	S
	6.0pF (6R0)	L	N	S
	6.8pF (6R8)	L	N	S
	7.0pF (7R0)	L	N	S
	8.0pF (8R0)	L	N	S
	8.2pF (8R2)	L	N	S
	9.0pF (9R0)	L	N	S
	10pF (100)	L	N	S
	12pF (120)	L	N	S
	15pF (150)	L	N	S
	18pF (180)	L	N	S
	22pF (220)		N	S
	27pF (270)			S
	33pF (330)			S
	39pF (390)			S
	47pF (470)			S

1. The letter in cell is expressed the symbol of product thickness.
2. For more information about products with special capacitance or other data, please contact WTC local representative.

■ HOW TO ORDER

OP	32	B	103	K	201	C	T
Series	**Size**	**Dielectric**	**Capacitance**	**Tolerance**	**Rated voltage**	**Termination**	**Packaging**
OP=Open-mode	21=0805 (2012) 31=1206 (3216) 32=1210 (3225) 43=1812 (4532)	B=X7R	Two significant digits followed by no. of zeros. And R is in place of decimal point. eg.: 102=10x10² =1000pF	K=±10% M=±20%	Two significant digits followed byno. of zeros. And R is in place of decimal point. 101=100 VDC 201=200 VDC 251=250 VDC 501=500 VDC	L=Ag/Ni/Sn C=Cu/Ni/Sn (Note 1)	B=Bulk T=7”reeled G=13”reeled

Note 1: Please see below product rang table to find right temination code.

■ PACKAGING DIMENSION AND QUANTITY

Size	Thickness (mm)/Symbol		Paper tape		Plastic tape	
			7” reel	13” reel	7” reel	13” reel
0805	0.80 ± 0.10	B	4k	15k	-	-
	1.25 ± 0.10	D	-	-	3k	10k
1206	0.80 ± 0.10	B	4k	15k	-	-
	0.95 ± 0.10	C	-	-	3k	10k
	1.25 ± 0.10	D	-	-	3k	10k
	1.60 ± 0.20	G	-	-	2k	-
1210	0.95 ± 0.10	C	-	-	3k	10k
	1.25 ± 0.10	D	-	-	3k	10k
	1.60 ± 0.20	G	-	-	2k	-
	2.50 ± 0.30	M	-	-	1k	-
1812	1.25 ± 0.10	D	-	-	1k	-
	2.00 ± 0.20	K	-	-	1k	-

Unit: pieces

■ INNER CONSTRUCTION OF OPEN-MODE DESIGN

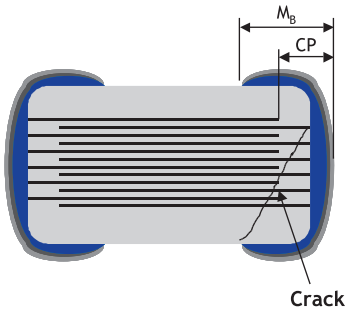


Fig. 2 Normal design (CP<M_B)–circuit leakage during cracking.

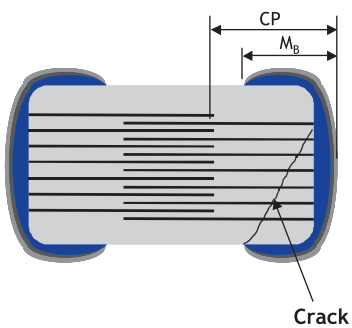


Fig. 3 Open-mode design (CP>M_B)–circuit open during cracking.

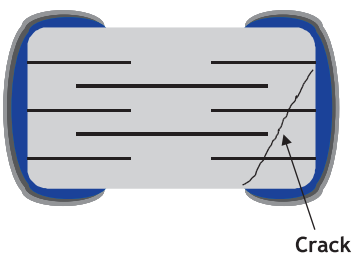


Fig. 4 Floating design (one kind of open-mode design)–circuit open during cracking.

■ CAPACITANCE RANGE

Dielectric		X7R															
Size		0805				1206				1210				1812			
Rated Voltage (VDC)		100	200	250	500	100	200	250	500	100	200	250	500	100	200	250	500
capacitance	100pF (101)	B	B	B	B^												
	120pF (121)	B	B	B	B^												
	150pF (151)	B	B	B	B^	B	D	D	D^								
	180pF (181)	B	B	B	B^	B	D	D	D^								
	220pF (221)	B	B	B	B^	B	D	D	D^								
	270pF (271)	B	B	B	B^	B	D	D	D^								
	330pF (331)	B	B	B	B^	B	D	D	D^								
	390pF (391)	B	B	B	B^	B	D	D	D^								
	470pF (471)	B	B	B	B^	B	D	D	D^								
	560pF (561)	B	B	B	B^	B	D	D	D^								
	680pF (681)	B	B	B	B^	B	D	D	D^								
	820pF (821)	B	B	B	B^	B	D	D	D^								
	1,000pF (102)	B	B	B	B^	B	D	D	D^	C	C	C	C^	D	D	D	D^
	1,200pF (122)	B	B	B	B^	B	D	D	D^	C	C	C	C^	D	D	D	D^
	1,500pF (152)	B	B	B	B^	B	D	D	D^	C	C	C	C^	D	D	D	D^
	1,800pF (182)	B	B	B	B^	B	D	D	D^	C	C	C	C^	D	D	D	D^
	2,200pF (222)	B	B	B	B^	B	D	D	D^	C	C	C	C^	D	D	D	D^
	2,700pF (272)	B	B	B	B^	B	D	D	D^	C	C	C	C^	D	D	D	D^
	3,300pF (332)	B	B	B	B^	B	D	D	D^	C	C	C	C^	D	D	D	D^
	3,900pF (392)	B	B	B		B	D	D	D^	C	C	C	C^	D	D	D	D^
	4,700pF (472)	B	B	B		B	D	D	D^	C	C	C	C^	D	D	D	D^
	5,600pF (562)	B	D	D		B	D	D	D^	C	C	C	C^	D	D	D	D^
	6,800pF (682)	B	D	D		B	D	D	D^	C	C	C	C^	D	D	D	D^
	8,200pF (822)	B	D	D		B	D	D	D^	C	C	C	C^	D	D	D	D^
	0.010μF (103)	B	D	D		B	D	D	D^	C	C	C	C^	D	D	D	D^
	0.012μF (123)	B	D	D		B	D	D	D^	C	C	C	C^	D	D	D	D^
	0.015μF (153)	B	D	D		B	D	D	D^	C	C	C	C^	D	D	D	D^
	0.018μF (183)	B	D	D		B	D	D	D^	C	C	C	C^	D	D	D	D^
	0.022μF (223)	B	D	D		B	D	D	G^	C	C	C	D^	D	D	D	D^
	0.027μF (273)	D				B	D	D	G^	C	C	C	G^	D	D	D	D^
	0.033μF (333)	D				B	G	G	G^	C	C	C	G^	D	D	D	D^
	0.039μF (393)	D				B	G	G		C	C	C	G^	D	D	D	D^
	0.047μF (473)	D				B	G	G		C	D	D	G^	D	D	D	D^
	0.056μF (563)					B	G	G		C	D	D	G^	D	D	D	K^
	0.068μF (683)					B	G	G		C	G	G		D	D	D	K^
	0.082μF (823)					B	G	G		C	G	G		D	D	D	K^
	0.10μF (104)					D	G	G		C	G	G		D	D	D	K^
	0.12μF (124)					D				C	G	G		D	D	D	
	0.15μF (154)					G				D	M	M		D	K	K	
	0.18μF (184)					G				D	M	M		D	K	K	
	0.22μF (224)					G				D	M	M		D	K	K	
	0.27μF (274)									G				D	K	K	
	0.33μF (334)									G				D	K	K	
	0.39μF (394)									M				D	K	K	
	0.47μF (474)									M				K	K	K	
	0.56μF (564)									M				K			
	0.68μF (684)													K			
	0.82μF (824)													K			
	1.0μF (105)													K			

1. The letter in cell is expressed the symbol of product thickness.
2. The letter in cell with 〝^〞 mark is expressed product with Ag/Ni/Sn terminations.

■ HOW TO ORDER

LD	31	B	102	K	201	L	T
Series	**Size**	**Dielectric**	**Capacitance**	**Tolerance**	**Rated voltage**	**Termination**	**Packaging**
LD=Low Distortion	31=1206 (3216)	B=X7R D=X7E	Two significant digits followed by no. of zeros. And R is in place of decimal point. Eg.: 102=10x10^2 =1000pF	K=±10% M=±20%	Two significant digits followed byno. of zeros. And R is in place of decimal point. 101=100 VDC 201=200 VDC 251=250 VDC 351=350 VDC 501=500 VDC 631=630 VDC	L=Ag/Ni/Sn	B=Bulk T=7”reeled G=13”reeled

■ PACKAGING DIMENSION AND QUANTITY

Size	Thickness (mm)/Symbol		Paper tape		Paper tape	
			7” reel	13” reel	7” reel	13” reel
1206	1.25±0.10	D	-	-	3k	10k

Unit: pieces

■ CAPACITANCE RANGE

Dielectric		X7R / X7E					
Size		1206					
Rated Voltage (VDC)		100	200	250	350	500	630
capacitance	100pF (101)						
	120pF (121)						
	150pF (151)	D	D	D	D	D	D
	180pF (181)	D	D	D	D	D	D
	220pF (221)	D	D	D	D	D	D
	270pF (271)	D	D	D	D	D	D
	330pF (331)	D	D	D	D	D	D
	390pF (391)	D	D	D	D	D	D
	470pF (471)	D	D	D	D	D	D
	560pF (561)	D	D	D	D	D	D
	680pF (681)	D	D	D	D	D	D
	820pF (821)	D	D	D	D	D	D
	1000pF (102)	D	D	D	D	D	D
	1200pF (122)	D	D	D	D	D	D
	1500pF (152)	D	D	D	D	D	D
	1800pF (182)	D	D	D	D	D	D
	2200pF (222)	D	D	D	D	D	D
	2700pF (272)	D	D	D	D	D	D
	3300pF (332)	D	D	D	D	D	D
	3900pF (392)	D	D	D	D	D	D
	4700pF (472)	D	D	D	D	D	D
	5600pF (562)	D	D	D	D	D	D
	6800pF (682)	D	D	D	D	D	D
	8200pF (822)	D	D	D	D	D	D
	0.010μF (103)	D	D	D	D	D	D
	0.012μF (123)	D	D	D	D	D	D
	0.015μF (153)	D	D	D	D	D	D
	0.018μF (183)	D	D	D	D	G	G
	0.022μF (223)	D	D	D	D	G	G
	0.027μF (273)	D	D	D	D	G	G
	0.033μF (333)	D	D	D	D	G	G
	0.039μF (393)	D	D	D	D		
	0.047μF (473)	D	D	D	D		
	0.056μF (563)	D					
	0.068μF (683)	D					
	0.082μF (823)	D					
	0.1μF (104)	D					

1. The letter in cell is expressed the symbol of product thickness.

■ HOW TO ORDER

Y	4C	3	B	103	K	500	C	T
Series	**Cap. Nr.**	**Termination pitch**	**Dielectric**	**Capacitance**	**Tolerance**	**Rated voltage**	**Termination**	**Packaging**
Y=Capacitor Array	4C=4xCap	3=0.03" pitch	N=NP0 (C0G) B=X7R F=Y5V	Two significant digits followed by no. of zeros. And R is in place of decimal point. eg.: 103=10x10^3 =10,000pF =10nF	J=±5% K=±10% M=±20% Z=-20%~+80%	Two significant digits followed by no. of zeros. And R is in place of decimal point. 160=16 VDC 250=25 VDC 500=50 VDC	L=Ag/Ni/Sn (for NP0 dielectric) C=Cu/Ni/Sn (for X7R, Y5V, dielectric)	T=7"reeled

■ PACKAGING DIMENSION AND QUANTITY

Size	Thickness (mm)/Symbol		Paper tape	
			7" reel	13" reel
4 x 0603	0.80±0.10	B	4k	-

Unit: pieces

■ CAPACITANCE RANGE

Size		4 x 0603			
Dielectric		NPO	X7R		Y5V
Rated Voltage (VDC)		50	16	50	50
capacitance	10pF (100)	B			
	15pF (150)	B			
	22pF (220)	B			
	33pF (330)	B			
	47pF (470)	B			
	68pF (680)	B			
	100pF (101)	B			
	150pF (151)	B			
	180pF (181)	B		B	
	220pF (221)	B		B	
	330pF (331)	B		B	
	470pF (471)	B		B	
	1,000pF (102)			B	
	1,500pF (152)			B	
	2,200pF (222)			B	
	3,300pF (332)			B	
	4,700pF (472)			B	
	6,800pF (682)			B	
	0.010μF (103)			B	B
	0.015μF (153)		B	B	B
	0.022μF (223)		B	B	B
	0.033μF (333)		B		B
	0.047μF (473)		B		B
	0.068μF (683)		B		
	0.10μF (104)		B		B

1. The letter in cell is expressed the symbol of product thickness.

■ HOW TO ORDER

0612	B	103	K	500	C	T
Size	**Dielectric**	**Capacitance**	**Tolerance**	**Rated voltage**	**Termination**	**Packaging**
Inch (mm) 0612 (1632)	B=X7R	Two significant digits followed by no. of zeros. And R is in place of decimal point. eg.: 103=10x10^3 =10nF	K=±10% M=±20%	Two significant digits followed by no. of zeros. And R is in place of decimal point. eg.: 500=50 VDC	C=Cu/Ni/Sn	T=7”reeled

■ PACKAGING DIMENSION AND QUANTITY

Size	Thickness (mm)/Symbol		7” reel / Paper tape
0612 (1632)	0.80±0.10	B	4k

Unit: pieces

■ CAPACITANCE RANGE

Size		X7R
Dielectric		0612
Rated Voltage (VDC)		50
capacitance	10nF (103)	B
	12nF (123)	B
	15nF (153)	B
	18nF (183)	B
	22nF (223)	B
	27nF (273)	B
	33nF (333)	B
	39nF (393)	B
	47nF (473)	B
	56nF (563)	B
	68nF (683)	B
	82nF (823)	B
	100nF (104)	B
	120nF (124)	B
	150nF (154)	B

1. The letter in cell is expressed the symbol of product thickness.

<table>
<tr><th>NO.</th><th>Item</th><th>Test Condition</th><th>Requirements</th></tr>
<tr><td>1.</td><td>Visual and Mechanical</td><td>---</td><td>* No remarkable defect.
* Dimensions to confirm to individual specification sheet.</td></tr>
<tr><td>2.</td><td>Capacitance</td><td rowspan="2">Class I : NP0
Cap≤1000pF 1.0±0.2Vrms, 1MHz±10%
Cap>1000pF 1.0±0.2Vrms, 1KHz±10%

Class II : X7R, X5R, Y5V
Cap≤10±F, 1.0±0.2Vrms, 1KHz±10%
Cap>10±F, 0.5±0.2Vrms, 120Hz±20%</td><td>* Shall not exceed the limits given in the detailed spec.</td></tr>
<tr><td>3.</td><td>Q/ D.F.
(Dissipation Factor)</td><td>NP0: Cap≥30pF, Q≥1000; Cap<30pF, Q≥400+20C,RF series:Q>2500
X7R / X5R:
<table>
<tr><th>Rated vol.</th><th>D.F.≤</th><th colspan="2">Exception D.F.≤</th></tr>
<tr><td>≥50V</td><td>≤2.5%</td><td>≤3%</td><td>0201(50V);0603≥0.047μF;0805≥0.18μF;
1206≥0.47μF</td></tr>
<tr><td>35V</td><td>≤3.5%</td><td></td><td></td></tr>
<tr><td rowspan="3">25V</td><td rowspan="3">≤3.5%</td><td>≤5%</td><td>0805≥1μF, 1210≥10μF</td></tr>
<tr><td>≤7%</td><td>0603≥0.33μF;TT series & Cap≥1μF;
0402≥0.1μF;1206≥4.7μF</td></tr>
<tr><td>≤10%</td><td>0603≥0.47μF, 0805≥2.2uF; 1206≥6.8μF</td></tr>
<tr><td rowspan="2">16V</td><td rowspan="2">≤3.5%</td><td>≤5%</td><td>0402≥0.033μF; 0603≥0.15μF;0805≥0.68μF;
1206≥2.2μF;1210≥4.7μF</td></tr>
<tr><td>≤10%</td><td>0603≥0.68μF;0805≥2.2μF; 1206≥4.7nF;
1210≥22μF;TT series & Cap≥1μF</td></tr>
<tr><td>10V</td><td>≤5.0%</td><td>≤10%</td><td>TT series & Cap≥1μF;0603≥0.33μF;
0805≥2.2μF;1206≥2.2μF;1210≥22μF</td></tr>
<tr><td rowspan="2">6.3V</td><td rowspan="2">≤10%</td><td>≤15%</td><td>0603≥10μF; 0805≥4.7nF;1210≥100μF;
TT series & Cap≥1μF</td></tr>
<tr><td>≤20%</td><td>0402≥2.2μF</td></tr>
</table>
X7R, LD series; 100V: DF ≤ 1.4%; 200V & 250V: DF ≤ 1.0%
Y5V
<table>
<tr><th>Rated vol.</th><th>D.F.≤</th><th colspan="2">Exception D.F.≤</th></tr>
<tr><td>≥50V</td><td>≤5%</td><td>≤7%</td><td>0603≥0.1μF;0805≥0.47μF</td></tr>
<tr><td>35V</td><td>≤7%</td><td>---</td><td>---</td></tr>
<tr><td rowspan="2">25V</td><td rowspan="2">≤5%</td><td>≤7%</td><td>0402≥0.047μF;0603≥0.1μF;0805≥0.33μF;
1206≥1μF;1210≥4.7μF</td></tr>
<tr><td>≤9%</td><td>0402≥0.068μF;0603≥0.47μF;1206≥4.7μF</td></tr>
<tr><td>16V(C<1μF)</td><td>≤7%</td><td>≤9%</td><td>0402≥0.068μF;0603≥0.68μF</td></tr>
<tr><td>16V(C≥1μF)</td><td>≤9%</td><td>≤12.5%</td><td>0805≥4.7μF;1206≥10μF;1210≥22μF;
1812≥47μF;TT series & Cap≥1μF</td></tr>
<tr><td>10V</td><td>≤12.5%</td><td>---</td><td>---</td></tr>
<tr><td>6.3V</td><td>≤20%</td><td>---</td><td>---</td></tr>
</table></td></tr>
<tr><td>4a.</td><td>Dielectric Strength</td><td>* To apply voltage (≤50V) 250%.
* Duration : 1 to 5 sec.
* Charge & discharge current less than 50mA.

* To apply voltage :
100V ≥3 times V DC
200V ~ 300V&LD series ≥2 times V DC
500V ~ 999V ≥1.5 times V DC
1000V ~ 3000V ≥1.2 times V DC
* Cut-off, set at 10mA
* TEST= 15 sec. * RAMP=0</td><td>* No evidence of damage or flash over during test.</td></tr>
<tr><td>4b.</td><td>Dielectric Strength
(for X1/Y2 & X2/Y3)</td><td>* To apply 1500 VAC voltage.
* Duration: 60 sec.</td><td>* No evidence of damage or flash over during test.</td></tr>
<tr><td>5.</td><td>Insulation Resistance</td><td>To apply rated voltage for max. 120 sec.</td><td>10GΩ or RxC≥500Ω-F whichever is smaller.
Class II (X5R, X6S, X7R, Y5V)
<table>
<tr><th>Rated voltage</th><th>Insulation Resistance</th></tr>
<tr><td>10V:0603>0.47μF;0805>2.2μF;
1206>4.7μF</td><td rowspan="2">≥100 Ω-F</td></tr>
<tr><td>6.3V</td></tr>
</table></td></tr>
<tr><td></td><td></td><td>Rated voltage:
200 ~ 630V
To apply rated voltage (500V max) for 60 sec</td><td>≥10GΩ or 100Ω-F whichever is smaller.</td></tr>
<tr><td></td><td></td><td>Rated voltage:
> 630V
To apply 500V for 60 sec</td><td>≥10GΩ</td></tr>
<tr><td>6.</td><td>Temperature Coefficient</td><td>With no electrical load.
<table>
<tr><th>T.C.</th><th>Operating Temp</th></tr>
<tr><td>NPO (C0G)</td><td>-55~125°C at 25°C</td></tr>
<tr><td>NPO (C0J)</td><td>-55~125°C at 25°C</td></tr>
<tr><td>X7R</td><td>-55~125°C at 25°C</td></tr>
<tr><td>X6S</td><td>-55~105°C at 25°C</td></tr>
<tr><td>X5R</td><td>-55~85°C at 25°C</td></tr>
<tr><td>Y5V</td><td>-25~85°C at 20°C</td></tr>
</table></td><td>
<table>
<tr><th>T.C.</th><th>Capacitance Change</th></tr>
<tr><td>NPO (C0G)</td><td>Within ±30ppm / °C</td></tr>
<tr><td>NPO (C0J)</td><td>Within ±120ppm / °C</td></tr>
<tr><td>X7R</td><td>Within ±15%</td></tr>
<tr><td>X6S</td><td>Within ±22%</td></tr>
<tr><td>X5R</td><td>Within ±15%</td></tr>
<tr><td>Y5V</td><td>Within ±30%/-80%</td></tr>
</table></td></tr>
<tr><td>7.</td><td>Adhesive Strength of Termination</td><td>* Pressurizing force: * Test time: 10±1 sec.
0201: 2N
0402 & 0603: 5N
>0603: 10N</td><td>* No remarkable damage or removal of the terminations.</td></tr>
</table>

<table>
<tr><th>NO.</th><th>Item</th><th>Test Condition</th><th>Requirements</th></tr>
<tr><td>8.</td><td>Vibration Resistance</td><td>* Vibration frequency: 10~55 Hz/min.
* Total amplitude: 1.5mm
* Test time: 6 hrs. (Two hrs each in three mutually perpendicular directions.)</td><td>* No remarkable damage.
* Cap change and Q/D.F.: To meet initial spec.</td></tr>
<tr><td>9.</td><td>Solderability</td><td>* Solder temperature: 235±5 °C
* Dipping time: 2±0.5 sec.</td><td>95% min. coverage of all metalized area.</td></tr>
<tr><td>10.</td><td>Bending Test</td><td>* The middle part of substrate shall be pressurized by means of the pressurizing rod at a rate of about 1 mm per second until the deflection becomes 1 mm and then the pressure shall be maintained for 5±1 sec.
* Measurement to be made after keeping at room temp. for 24±2 hrs.</td><td>* No remarkable damage.
* Cap change:
NP0: within ±5.0% or ±0.5pF whichever is larger.
X7R, X5R: within ±12.5%
Y5V: within ±30%
(This capacitance change means the change of capacitance under specified flexure of substrate from the capacitance measured before the test.)</td></tr>
<tr><td>11.</td><td>Resistance to Soldering Heat</td><td>* Solder temperature: 270±5°C
* Dipping time: 10±1 sec
* Preheating: 120 to 150°C for 1 minute before immerse the capacitor in an eutectic solder.
* Before initial measurement (Class II only): Perform 150+0/-10°C for 1 hr and then set for 48±4 hrs at room temp.
* Measurement to be made after keeping at room temp. for 24±2 hrs. (Class I) or 48±4 hrs. (Class II).</td><td>* No remarkable damage.
* Cap change:
NP0: within ±2.5% or ±0.25pF whichever is larger.
X7R, X5R: within ±7.5%
Y5V: within ±20%
* Q/D.F., I.R. and dielectric strength: To meet initial requirements.
* 25% max. leaching on each edge.</td></tr>
<tr><td>12.</td><td>Temperature Cycle</td><td>* Conduct the five cycles according to the temperatures and time.
<table>
<tr><th>Step</th><th>Temp.(°C)</th><th>Time.(min.)</th></tr>
<tr><td>1</td><td>Min. operating temp. +0/-3</td><td>30±3</td></tr>
<tr><td>2</td><td>Room temp.</td><td>2~3</td></tr>
<tr><td>3</td><td>Max. operating temp. +3/-0</td><td>30±3</td></tr>
<tr><td>4</td><td>Room temp.</td><td>2~3</td></tr>
</table>
* Before initial measurement (Class II only): Perform 150+0/-10°C for 1 hr and then set for 48±4 hrs at room temp.
* Measurement to be made after keeping at room temp. for 24±2 hrs. (Class I) or 48±4 hrs. (Class II).</td><td>* No remarkable damage.
* Cap change:
NP0: within ±2.5% or ±0.25pF whichever is larger.
X7R, X5R: within ±7.5%
Y5V: within ±20%
* Q/D.F., I.R. and dielectric strength: To meet initial requirements.</td></tr>
<tr><td>13.</td><td>Humidity (Steady State)</td><td>* Test temp.: 40±2°C
* Humidity: 90~95% RH
* Test time: 500+24/-0hrs.
* Measurement to be made after keeping at room temp. for 24±2 hrs. (Class I) or 48±4 hrs. (Class II).</td><td>* No remarkable damage.
* Cap change: NP0: within ±5.0% or ±0.5pF whichever is larger.
X7R/X5R: ≥10V, within ±12.5%, 6.3V, within ±25%
TT series & Cap≥1μF, within ±25%
Y5V: ≥10V, within ±30%, 6.3V, within +30/-40%
* Q/D.F. value:
NP0: More then 30pF Q≥350, 10pF≤C<30pF, Q≥275+2.5C
Less than 10pF Q≥200+10C
X7R/X5R:
<table>
<tr><th>Rated vol.</th><th>D.F.≤</th><th colspan="2">Exception D.F.≤</th></tr>
<tr><td>≥50V</td><td>≤3%</td><td>≤6%</td><td>0201(50V);0603≥0.047μF;0805≥0.18μF;
1206≥0.47μF</td></tr>
<tr><td>35V</td><td>≤5%</td><td></td><td></td></tr>
<tr><td rowspan="3">25V</td><td rowspan="3">≤5%</td><td>≤10%</td><td>0805≥1μF;1210≥10μF</td></tr>
<tr><td>≤14%</td><td>0402≥0.10μF;0603≥0.33μF;0805≥2.2μF;
1206≥4.7μF;TT series & Cap≥1μF</td></tr>
<tr><td>≤15%</td><td>0603≥0.68μF;0805≥4.7μF;1206≥6.8μF;</td></tr>
<tr><td rowspan="2">16V</td><td rowspan="2">≤5%</td><td>≤10%</td><td>0402≥0.033μF;0603≥0.15μF;
0805≥0.68μF;1206≥2.2μF;1210≥4.7μF</td></tr>
<tr><td>≤15%</td><td>TT series & Cap≥1μF;0603≥0.68μF;0805≥2.2μF;
1206≥6.8μF;1210≥22μF</td></tr>
<tr><td>10V</td><td>≤7.5%</td><td>≤15%</td><td>TT series & Cap≥1μF;0603≥0.33μF;0805≥2.2μF;
1206≥2.2μF;1210≥22μF</td></tr>
<tr><td>6.3V</td><td>≤15%</td><td>≤30%</td><td>0402≥2.2μF;0603≥10μF; 0805≥10μF;
1210≥100μF;TT series & Cap≥1μF</td></tr>
</table>
Y5V:
<table>
<tr><th>Rated vol.</th><th>D.F.≤</th><th colspan="2">Exception D.F.≤</th></tr>
<tr><td>≥50V</td><td>≤7.5%</td><td>≤10%</td><td>0603≥0.1μF;0805≥0.47μF</td></tr>
<tr><td>35V</td><td>≤10%</td><td>---</td><td>---</td></tr>
<tr><td rowspan="2">25V</td><td rowspan="2">≤7.5%</td><td>≤10%</td><td>0402≥0.047μF;0603≥0.1μF;0805≥0.33μF;
1206≥1μF;1210≥4.7μF</td></tr>
<tr><td>≤15%</td><td>0402≥0.068μF;0603≥0.47μF;1206≥4.7μF</td></tr>
<tr><td>16V(C<1.0μF)</td><td>≤10%</td><td>≤12.5%</td><td>0402≥0.068μF;0603≥0.68μF</td></tr>
<tr><td>16V(C≥1.0μF)</td><td>≤12.5%</td><td>≤20%</td><td>0805≥4.7μF;1206≥10μF;1210≥22μF;
1812≥47μF;TT series & Cap≥1μF</td></tr>
<tr><td>10V</td><td>≤20%</td><td>---</td><td>---</td></tr>
<tr><td>6.3V</td><td>≤30%</td><td>---</td><td>---</td></tr>
</table>
* I.R.: ≥10V 1GΩ or 50Ω-F whichever is smaller.
6.3V 1GΩ-F</td></tr>
</table>

<table>
<tr><th>NO.</th><th>Item</th><th>Test Condition</th><th>Requirements</th></tr>
<tr><td>14.</td><td>Humidity Load
(Damp Heat)</td><td>* Test temp.: 40±2°C
* Humidity: 90~95%RH
* Test time: 500+24/-0 hrs.
* To apply voltage: rated voltage (Max. 500V)
* Measurement to be made after keeping at room temp. for 24±2 hrs. (Class I) or 48±4 hrs. (Class II).</td><td>* No remarkable damage.
* Cap change: NP0: within ±7.5% or ±0.75pF whichever is larger.
X7R/X5R: ≥10V, within ±12.5%, 6.3V, within ±25%
TT series & Cap≥1μF, within ±25%
Y5V: ≥10V, within ±30%, 6.3V, within +30 / -40%
* Q/D.F. value:
NP0: C≥30pF, Q≥200; C<30pF, Q≥100+10/3C
X7R / X5R:
<table>
<tr><th>Rated vol.</th><th>D.F.≤</th><th colspan="2">Exception D.F.≤</th></tr>
<tr><td>≥50V</td><td>≤3%</td><td>≤6%</td><td>0201(50V), 0603≥0.047μF;0805≥0.18μF;
1206≥0.47μF</td></tr>
<tr><td>35V</td><td>≤5%</td><td></td><td></td></tr>
<tr><td rowspan="3">25V</td><td rowspan="3">≤5%</td><td>≤10%</td><td>0805≥1μF, 1210≥10μF</td></tr>
<tr><td>≤14%</td><td>0402≥0.10μF;0603≥0.33μF;0805≥2.2μF;1206≥4.7μF;
TT series & Cap≥1μF</td></tr>
<tr><td>≤15%</td><td>0603≥0.68μF;0805≥4.7μF;1206≥6.8μF</td></tr>
<tr><td rowspan="2">16V</td><td rowspan="2">≤5%</td><td>≤10%</td><td>0402≥0.033μF;0603≥0.15μF;0805≥0.68μF;
1206≥2.2μF;1210≥4.7μF</td></tr>
<tr><td>≤15%</td><td>TT series & Cap≥1μF;0603≥0.68μF;0805≥2.2μF;
1206≥6.8μF;1210≥22μF</td></tr>
<tr><td>10V</td><td>≤7.5%</td><td>≤15%</td><td>TT series & Cap≥1μF;0603≥0.33μF;0805≥2.2μF;
1206≥2.2μF;1210≥22μF;</td></tr>
<tr><td>6.3V</td><td>≤15%</td><td>≤30%</td><td>0603≥10μF;0805≥10μF;1210≥100μF;
0402≥2.2μF;TT series & Cap≥1μF</td></tr>
</table>
X7R
<table>
<tr><th>Rated vol.</th><th>D.F.≤</th><th colspan="2">Exception D.F.≤</th></tr>
<tr><td>≥50V</td><td>≤7.5%</td><td>≤10%</td><td>0603≥0.1μF;0805≥0.47μF;</td></tr>
<tr><td>35V</td><td>≤10%</td><td>---</td><td>---</td></tr>
<tr><td rowspan="2">25V</td><td rowspan="2">≤7.5%</td><td>≤10%</td><td>0402≥0.047μF;0603≥0.1μF;0805≥0.33μF;
1206≥1μF;1210≥4.7μF</td></tr>
<tr><td>≤15%</td><td>0402≥0.068μF;0603≥0.47μF;1206≥4.7μF</td></tr>
<tr><td>16V(C<1.0μF)</td><td>≤10%</td><td>≤12.5%</td><td>0402≥0.068μF;0603≥0.68μF</td></tr>
<tr><td>16V(C≥1.0μF)</td><td>≤12.5%</td><td>≤20%</td><td>0805≥3.3μF;1206≥10μF;1210≥22μF;
1812≥47μF;TT series & Cap≥1μF</td></tr>
<tr><td>10V</td><td>≤20%</td><td>---</td><td>---</td></tr>
<tr><td>6.3V</td><td>≤30%</td><td>---</td><td>---</td></tr>
</table>
* I.R.: ≥10V, 500MΩ-F or 25Ω-F whichever is smaller. 6.3V, 5Ω-F</td></tr>
<tr><td>15.</td><td>High
Temperature
Load
(Endurance)</td><td>* Test temp.:
NP0, X7R: 125±3°C
X5R, Y5V: 85±3°C
* To apply voltage:
(1) 6.3V or C≥10μF (for X7R, X5R): 150% of rated voltage.
(2) 6.3V<V<500V and C<10μF (for X7R, X5R):
200% of rated voltage.
(3) 500V: 150% of rated voltage.
(4) V≥630V: 120% of rated voltage.
* Test time: 1000+24/-0 hrs.
* Measurement to be made after keeping at room temp. for 24±2 hrs. (Class I) or 48±4 hrs. (Class II).</td><td>* No remarkable damage.
* Cap change: NP0: within ±3.0% or ±0.3pF whichever is larger.
X7R/X5R: ≥10V, within ±12.5%, 6.3V, within ±25%
TT series & Cap≥1μF, within ±25%
Y5V: ≥10V, within ±30%
6.3V, within +30 to -40%
* Q/D.F. value:
NP0: Cap≥30pF, Q≥350
10pF≤Cap<30pF, Q≥275+2.5C
Cap<10pF, Q≥200+10C
X7R / X5R:
<table>
<tr><th>Rated vol.</th><th>D.F.≤</th><th colspan="2">Exception D.F.≤</th></tr>
<tr><td>≥50V</td><td>≤3%</td><td>≤6%</td><td>0201(50V); 0603≥0.047μF;0805≥0.18μF;
1206≥0.47μF</td></tr>
<tr><td>35V</td><td>≤5%</td><td>---</td><td>---</td></tr>
<tr><td rowspan="3">25V</td><td rowspan="3">≤5%</td><td>≤10%</td><td>0805≥1μF, 1206≥1μF, 1210≥10μF</td></tr>
<tr><td>≤14%</td><td>0402≥0.10μF;0603≥0.33μF; 0805≥2.2μF;
1206≥4.7μF;TT series & Cap≥1μF</td></tr>
<tr><td>≤15%</td><td>0603≥0.68μF; 080≥4.7μF;1206≥6.8μF;</td></tr>
<tr><td rowspan="2">16V</td><td rowspan="2">≤5%</td><td>≤10%</td><td>0402≥0.033μF;0603≥0.15μF;0805≥0.68μF;
1206≥2.2μF; 1210≥4.7μF;TT series & Cap≥1μF</td></tr>
<tr><td>≤15%</td><td>TT series & Cap≥1μF;0603≥0.68μF;0805≥2.2μF;
1206≥6.8μF;1210≥22μF</td></tr>
<tr><td>10V</td><td>≤7.5%</td><td>≤15%</td><td>TT series & Cap≥1μF;0603≥0.33μF;0805≥2.2μF;
1206≥2.2μF;1210≥22μF;</td></tr>
<tr><td>6.3V</td><td>≤15%</td><td>≤30%</td><td>0402≥2.2μF; 0603≥10μF;0805≥10μF;1210≥100μF;
TT series & Cap≥1μF</td></tr>
</table>
Y5V:
<table>
<tr><th>Rated vol.</th><th>D.F.≤</th><th colspan="2">Exception D.F.≤</th></tr>
<tr><td rowspan="2">25V</td><td rowspan="2">≤7.5%</td><td>≤10%</td><td>0402≥0.047μF;0603≥0.1μF;0805≥0.33μF;
1206≥1μF;1210≥4.7μF</td></tr>
<tr><td>≤15%</td><td>0402≥0.068μF;0603≥0.47μF;1206≥4.7μF</td></tr>
<tr><td>16V(C<1μF)</td><td>≤10%</td><td>≤12.5%</td><td>0402≥0.068μF;0603≥0.68μF</td></tr>
<tr><td>16V(C≥1μF)</td><td>≤12.5%</td><td>≤20%</td><td>0805≥3.3μF;1206≥10μF;1210≥22μF;
1812≥47μF;TT series & Cap≥1μF</td></tr>
<tr><td>10V</td><td>≤20%</td><td>---</td><td>---</td></tr>
<tr><td>6.3V</td><td>≤30%</td><td>---</td><td>---</td></tr>
</table>
* I.R.: ≥10V 1GΩ or 50Ω-F whichever is smaller.
6.3V, 10Ω-F</td></tr>
</table>

Constructions

NO.	Name		NPO/X7R	X7R/X5R/Y5V
①	Ceramic material		$BaTiO_3$ based	
②	Inner electrode		AgPd alloy	Ni
③	Termination	Inner layer	Ag	Cu
④		Middle layer	Ni	
⑤		Outer layer	Sn (Matt)	

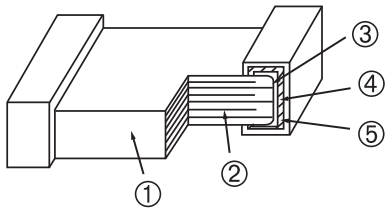


Fig.1 The construction of MLCC

Storage and handling conditions

(1) To store products at 5 to 40°C ambient temperature and 20 to 70%. related humidity conditions.

(2) The product is recommended to be used within one year after shipment. Check solderability in case of shelf life extension is needed.

Cautions:

a. Don't store products in a corrosive environment such as sulfide, chloride gas, or acid. It may cause oxidization of electrode, which easily be resulted in poor soldering.

b. To store products on the shelf and avoid exposure to moisture.

c. Don't expose products to excessive shock, vibration, direct sunlight and so on.

Recommended soldering conditions

The lead-free termination MLCCs are not only to be used on SMT against lead-free solder paste, but also suitable against lead-containing solder paste. If the optimized solder joint is requested, increasing soldering time, temperature and concentration of N2 within oven are recommended.

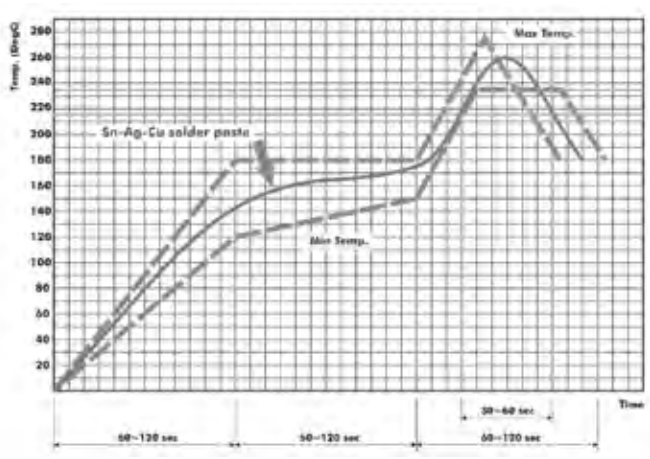


Fig. 2 IR reflow soldering profile for SMT process with SnAgCu series solder paste.

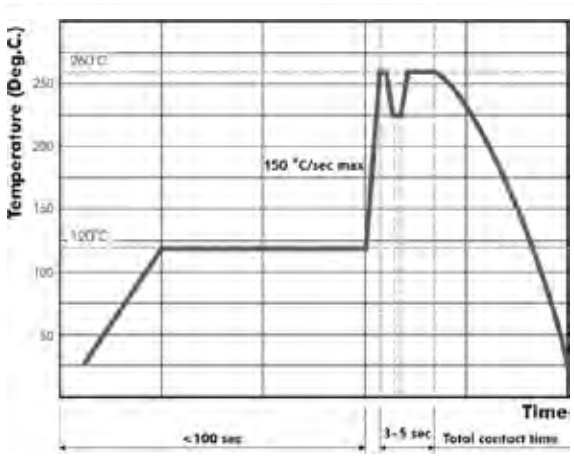


Fig. 3 Recommended wave soldering profile for SMT process with SnAgCu series solder.

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