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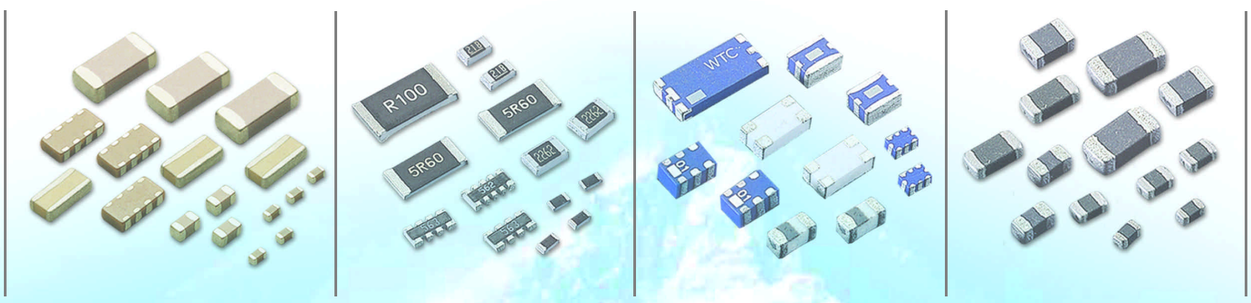
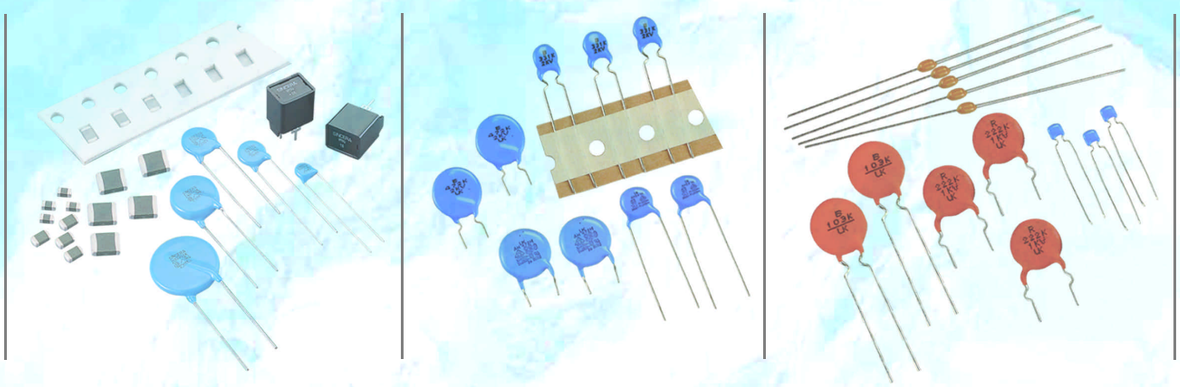
Walsin Technology Corporation

Multilayer Ceramic Capacitors





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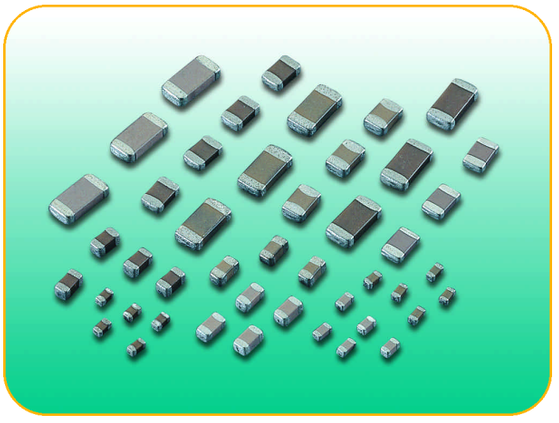
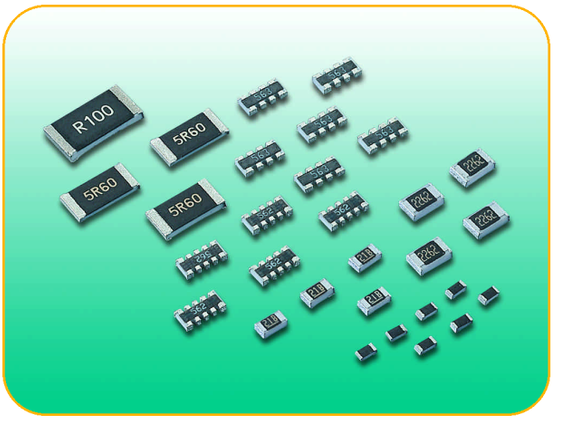
Walsin Full Product Range

MULTILAYER CERAMIC CAPACITORS (MLCC)

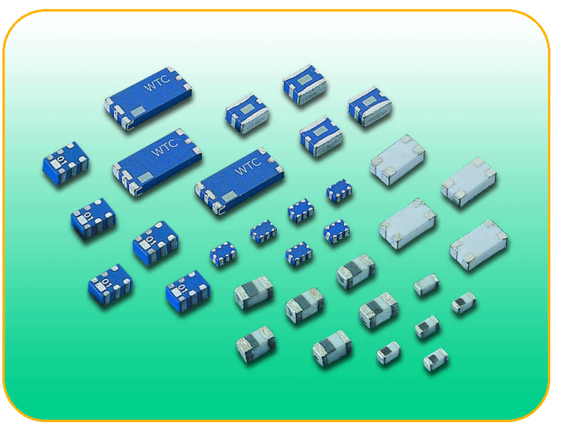


CHIP RESISTORS

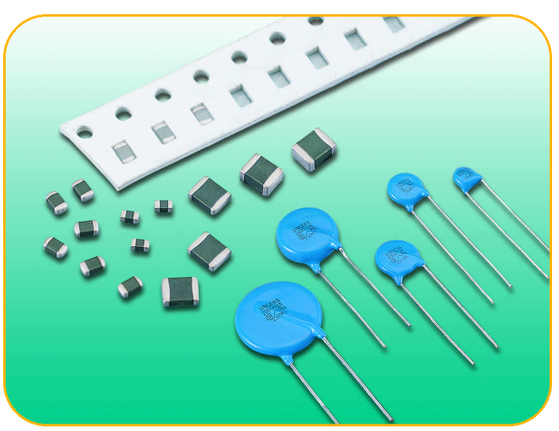


FERRITE CHIP BEADS & INDUCTORS

HIGH FREQUENCY INDUCTORS & RF DEVICES



VARISTORS & SMD-VARISTORS



POSITIVE TEMPERATURE COEFFICIENT RESISTOR (PTCR)

Table of Contents

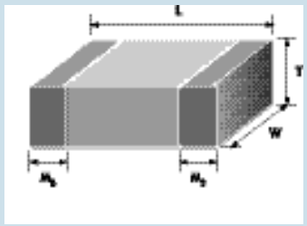
Quick Product Information

■ Quick Product Information

Series	Dielectric	Size	Capacitance	Rated voltage	Page
General Purpose Caps	NP0	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	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, 1210, 1812	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~4.7μF	6.3V, 10V	9
	Y5V	0805, 1206, 1210	2.2μF~10μF	10V, 16V	9
Ultra-small Caps	NP0	0201	0.5pF~100pF	16V, 25V	10
	X7R	0201	100pF~4700pF	16V	10
	X5R	0201	1000pF~0.022μF	6.3V, 10V, 16V	10
	Y5V	0201	0.022μF~0.1μF	4V, 6.3V	10
Middle & High Voltage Caps	NP0	0603, 0805, 1206, 1210, 1808, 1812	0.5pF~6800pF	200V, 250V, 500V, 630V, 1kV, 2kV, 3kV	12
	X7R	0805, 1206, 1210, 1808, 1812	150pF~0.47μF	200V, 250V, 500V, 630V, 1kV, 1.5kV, 2kV, 3kV	14
	Y5V	0805, 1206, 1210, 1812	0.01μF~0.68μF	200V, 250V	15
Safety Certificated Caps (X1/Y2)	NP0	1808, 1812	10pF~470pF	250Vac	16
Safety Certificated Caps (X2/Y3)	NP0	1808, 1812	10pF~1000pF	250Vac	18
	X7R	1808, 1812	150pF~4700pF	250Vac	18
High Q & Low ESR Caps	NP0	0402, 0603	0.5pF~3300pF	16V, 25V, 50V, 100V	20
Microwave Caps	NP0	0402, 0603	0.1pF~22pF	50V	22
Open-mode Design Caps	X7R	0805, 1206, 1210, 1812	100pF~0.22μF	100V, 200V, 250V, 500V	24
Capacitor Arrays	NP0	0612 (4x0603)	10pF~470pF	50V	25
	X7R	0612 (4x0603)	180pF~0.1μF	16V, 50V	25
	Y5V	0612 (4x0603)	0.01μF~0.1μF	50V	25
Low Inductance Caps	X7R	0612	0.01μF~0.15μF	50V	26

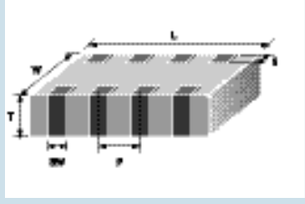
The Outlines and External Dimensions of Capacitor

■ 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	#	
	1206 (3216)	3.20±0.15	1.60±0.15	0.80±0.10	B		0.60±0.20
				0.95±0.10	C		
				1.15±0.15	J	#	
				1.25±0.10	D	#	
			1.60±0.20	1.60±0.20	G	#	
		3.20+0.30/-0.10	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	#	

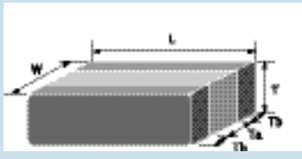
Reflow soldering only is recommended.
* For safety certificated products, please refer to individual data sheet for detail.

■ 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.

General Purpose Capacitors

■ 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%	Two significant digits followed by no. of zeros. And R is in place of decimal point. 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

General Purpose Capacitors

■ CAPACITANCE RANGE

NP0 Dielectric

Dielectric		NP0																		
Size		0402				0603			0805				1206			1210			1812	
Rated Voltage (VDC)		16	25	50	100	16	50	100	16	25	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	N			S	S			A	A		B	B		C	C		D
	220pF (221)		N	N			S	S			A	A		B	B		C	C		D
	270pF (271)	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					C	C		C	C	D	D
	0.010µF (103)								D					D			C	C	D	D
	0.012µF (123)								D				D	P		C	D	D	D	D
	0.015µF (153)												D	P		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.
2. For more information about products with special capacitance or other data, please contact WTC local representative.

General Purpose Capacitors

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					S	S				B	B			B	B		C	C		D	D
	6,800pF (682)			N					S	S				B	B			B	B		C	C		D	D
	8,200pF (822)			N					S	S				B	B			B	B		C	C		D	D
	0.010µF (103)			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							S					B	D			B	B		C	C		D	D
	0.033µF (333)	N						S	X					B	D			B	B		C	C		D	D
	0.039µF (393)	N						S	X					B	D			B	B		C	C		D	D
	0.047µF (473)	N						S	X					B	D			B	B		C	C		D	D
	0.056µF (563)	N						S	X					B				B	B		C	C		D	D
	0.068µF (683)	N						S	X					B				B	B		C	C		D	D
	0.082µF (823)	N					S	S	X				B	B				B	D		C	C		D	D
	0.10µF (104)	N					S	S	X				B	B				B	D		C	C		D	D
	0.12µF (124)					S	S						B	D				B	D		C	C		D	D
	0.15µF (154)					S	S						D	D				C	G		C	D		D	D
	0.18µF (184)					S	S						D					C	G		C	D		D	D
	0.22µF (224)					S	S						D					C	G		C	D		D	D
	0.27µF (274)					X							D				C	D			C	G		D	D
	0.33µF (334)					X							D				C	D		C	D	G		D	D
	0.39µF (394)					X						D	D			C	J	P		C	D	M		D	D
	0.47µF (474)					X						D	D			J	J	P		C	D	M		D	K
	0.56µF (564)											D	D			J	J	P		D	D			D	K
	0.68µF (684)										D	D	D			J	J	P		D	D		D	K	K
	0.82µF (824)										D	D	D			J	J	P		D	D		D	K	K
	1.0µF (105)										D	D	D			J	J	P		D	D		D	K	K

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.

General Purpose Capacitors

■ CAPACITANCE RANGE

Y5V Dielectric (0402,0603,0805,Sizes)

Dielectric		Y5V											
Size		0402				0603				0805			
Rated Voltage (VDC)		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	B
	0.22μF (224)	N						S				A	
	0.33μF (334)							S				B	
	0.47μF (474)						S				B	B	
	0.68μF (684)					S	X			B	D		
	1.0μF (105)					S	X			B	D		

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.

Y5V Dielectric (1206,1210,1812 Sizes)

Dielectric		Y5V								
Size		1206			1210			1812		
Rated Voltage (VDC)		25	50	100	25	50	100	25	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	C	D	D	D
	0.15μF (154)	B	B	C	C	C	C	D	D	D
	0.22μF (224)	B	B	C	C	C	C	D	D	D
	0.33μF (334)	B	B		C	C	C	D	D	D
	0.47μF (474)	B	B		C	C		D	D	D
	0.68μF (684)	B	B		C	C		D	D	D
	1.0μF (105)	C	C		C	C		D	D	D

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.

High Capacitance Capacitors

HOW TO ORDER

1206	F	106	Z	100	C	T
Size	**Dielectric**	**Capacitance**	**Tolerance**	**Rated voltage**	**Termination**	**Packaging**
Inch (mm) 0402 (1005) 0603 (1608) 0805 (2012) 1206 (3216) 1210 (3225) 1812 (4532)	B=X7R X=X5R S=X6S F=Y5V	Two significant digits followed by no. of zeros. And R is in place of decimal point. eg.: 106=10x10^6 =10μF	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 250=25 VDC 500=50 VDC	C=Cu/Ni/Sn	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	-
1812 (4532)	1.25±0.10	D	-	-	1k	-
	2.00±0.20	K	-	-	1k	-

Unit: pieces

High Capacitance Capacitors

■ CAPACITANCE RANGE

X7R Dielectric

Dielectric		X7R																	
Size		0402	0603				0805			1206				1210				1812	
Rated Voltage (VDC)		10	10	16	25	50	10	16	25	10	16	25	50	10	16	25	50	25	50
Capacitance	0.10μF (104)	N	S	S	S	X													
	0.15μF (154)		S	S															
	0.22μF (224)		S	S															
	0.33μF (334)		X	X															
	0.47μF (474)		X	X															
	0.68μF (684)																		
	1.0μF (105)		X				D	D	D		J	J	P			D	D	D	K
	1.5μF (155)																		
	2.2μF (225)									J	P	P		K	K	G			
	3.3μF (335)									P									
	4.7μF (475)									P									

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.

X5R Dielectric

Dielectric		X5R									
Size		0402			0603			0805	1206		
Rated Voltage (VDC)		6.3	10	16	6.3	10	16	6.3	6.3	10	
Capacitance	0.027μF (273)			N							
	0.033μF (333)			N							
	0.039μF (393)			N							
	0.047μF (473)			N							
	0.056μF (563)		N								
	0.068μF (683)		N								
	0.082μF (823)		N								
	0.10μF (104)		N								
	0.15μF (154)										
	0.22μF (224)	N*									
	0.33μF (334)					X	X				
	0.47μF (474)					X	X				
	0.68μF (684)				X						
	1.0μF (105)				X	X					
	1.5μF (155)										
	2.2μF (225)							I		J	
	3.3μF (335)									P	
	4.7μF (475)							I		P	
	6.8μF (685)								P	P	
	10μF (106)							I*	P	P	

1. The letter in cell is expressed the symbol of product thickness.
2. The letter in cell with "*" mark is expressed product also available for X6S dielectric.
3. The shadow cell is expressed that product is under development, please contact WTC local representative to inquire more information.

Y5V Dielectric

Dielectric		Y5V																	
Size		0402		0603		0805			1206				1210					1812	
Rated Voltage (VDC)		6.3	10	10	16	10	16	25	10	16	25	50	10	16	25	35	50	25	50
Capacitance	0.15μF (154)		N																
	0.22μF (224)		N																
	0.33μF (334)	N																	
	0.47μF (474)	N																	
	0.68μF (684)	N																	
	1.0μF (105)	N		S	X	B	B	D		C	C	C					C		D
	1.5μF (155)			S		D	D			C	C				C				D
	2.2μF (225)			S		D	D			C	C				C				D
	3.3μF (335)					D	D		J	J	J				C				D
	4.7μF (475)					D	D		J	J	J			C	D				D
	6.8μF (685)					I			J	J				C	G				D
	10μF (106)					I			J	J				D	G	K	D		
	22μF (226)								P				K						
	47μF (476)												K						

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.

Low Profile Capacitors

■ HOW TO ORDER

TT	31	X	225	M	100	C	T
Series	**Size**	**Dielectric**	**Capacitance**	**Tolerance**	**Rated voltage**	**Termination**	**Packaging**
TT=Low profile	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 Max (mm)/Symbol		7" reel	
			Paper tape	Plastic tape
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	0805	1.0μF	±10%, ±20%	10	0.95	TT21X105□100CT
		4.7μF	±10%, ±20%	6.3	0.95	TT21X475□6R3CT
	1206	2.2μF	±10%, ±20%	10	0.95	TT31X225□100CT
	1210	3.3μF	±10%, ±20%	10	0.95	TT32X335□100CT
		4.7μF	±10%, ±20%	10	0.95	TT32X475□100CT
Y5V	0805	2.2μF	-20/+80%	16	0.95	TT21F225Z160CT
		3.3μF	-20/+80%	10	0.95	TT21F335Z100CT
		4.7μF	-20/+80%	10	0.95	TT21F475Z100CT
	1206	4.7μF	-20/+80%	16	0.95	TT31F475Z160CT
		10μF	-20/+80%	10	0.95	TT31F106Z100CT
		10μF	-20/+80%	16	1.25	TT31F106Z160CT
	1210	10μF	-20/+80%	10	0.95	TT32F106Z100CT

□ Please specify the capacitance tolerance code.

1. This series product is suited to reflow soldering process only.
2. For more information about products with special capacitance or other data, please contact WTC local representative.

Ultra-small 0201 Capacitors

■ HOW TO ORDER

0201	N	100	J	250	L	T
Size	**Dielectric**	**Capacitance**	**Tolerance**	**Rated voltage**	**Termination**	**Packaging**
Inch (mm) 0201 (0603)	N=NP0 (C0G) B=X7R X=X5R S=X6S 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	C=±0.25pF D=±0.5pF G=±2% 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. 4R0=4 VDC 6R3=6.3 VDC 100=10 VDC 160=16 VDC 250=25 VDC	L=Ag/Ni/Sn (for NP0 dielectric) C=Cu/Ni/Sn (for X7R, X5R, Y5V dielectric)	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		NP0	
Rated Voltage (VDC)		16	25
Capacitance	0.5pF (0R5)		L
	1.0pF (1R0)		L
	1.2pF (1R2)		L
	1.5pF (1R5)		L
	1.8pF (1R8)		L
	2.2pF (2R2)		L
	2.7pF (2R7)		L
	3.3pF (3R3)		L
	3.9pF (3R9)		L
	4.7pF (4R7)		L
	5.6pF (5R6)		L
	6.8pF (6R8)		L
	8.2pF (8R2)		L
	10pF (100)		L
	12pF (120)		L
	15pF (150)		L
	18pF (180)		L
	22pF (220)		L
	27pF (270)		L
	33pF (330)		L
	39pF (390)		L
	47pF (470)		L
	56pF (560)	L	L
	68pF (680)	L	L
	82pF (820)	L	L
	100pF (101)	L	L

Size		0201					
Dielectric		X7R	X5R			Y5V	
Rated Voltage (VDC)		16	16	10	6.3	4	6.3
Capacitance	100pF (101)	L					
	120pF (121)	L					
	150pF (151)	L					
	180pF (181)	L					
	220pF (221)	L					
	270pF (271)	L					
	330pF (331)	L					
	390pF (391)	L					
	470pF (471)	L					
	560pF (561)	L					
	680pF (681)	L					
	820pF (821)	L					
	1,000pF (102)	L					
	1,500pF (152)	L			L		
	2,200pF (222)	L			L		
	3,300pF (332)	L			L		
	4,700pF (472)	L			L		
	6,800pF (682)			L			
	0.010µF (103)			L			
	0.015µF (153)		L*				
	0.022µF (223)		L*				L
	0.033µF (333)						
	0.047µF (473)						L
	0.068µF (683)						
	0.10µF (104)					L	

1. The letter in cell is expressed the symbol of product thickness.
2. The letter in cell with “*” mark is expressed product also available for X6S dielectric.
3. The shadow cell is expressed that product is under development, please contact WTC local representative to inquire more information.

Middle and High Voltage Capacitors

■ HOW TO ORDER

1808	N	100	G	202	L	T
Size	**Dielectric**	**Capacitance**	**Tolerance**	**Rated voltage**	**Termination**	**Packaging**
Inch (mm) 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 G=±2% 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. 201=200 VDC 251=250 VDC 501=500 VDC 631=630 VDC 102=1000 VDC 152=1500 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/Ni/Sn terminations, please ref to below product range of X7R dielectric for detail.

■ PACKAGING DIMENSION AND QUANTITY

Size	Thickness (mm)/Symbol		Paper tape		Plastic tape	
			7” reel	13” reel	7” reel	13” reel
0805	0.60±0.10	A	4k	15k	-	-
	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	-
1808	1.25±0.10	D	-	-	2k	-
	2.00±0.20	K	-	-	1k	-
1812	1.25±0.10	D	-	-	1k	-
	2.00±0.20	K	-	-	1k	-

Unit: pieces

Middle and High Voltage Capacitors

■ 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	A	B	B	B	B	B	B	C	C	C	C	D	D	D	D
	120pF (121)			A	A	D	D	B	B	B	B	C	C	C	C	D	D	D	D
	150pF (151)			B	B	D	D	B	B	B	B	C	C	C	C	D	D	D	D
	180pF (181)			B	B	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	B	C	C	C	C	C	C	D	D	D	D
	330pF (331)			D	D	D	D	B	B	C	C	C	C	C	C	D	D	D	D
	390pF (391)			D	D	D	D	B	B	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	C	C	C	C	C	C	C	D	D	D	D
	680pF (681)			D				C	C	C	C	C	C	C	C	D	D	D	D
	820pF (821)			D				C	D	D	D	C	C	C	C	D	D	D	D
	1,000pF (102)							C	G	G	G	C	C	C	C	D	D	D	D
	1,200pF (122)							C				D	D	D	D	D	D	D	D
	1,500pF (152)							C				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.
2. For more information about products with special capacitance or other data, please contact WTC local representative.

Middle and High Voltage Capacitors

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								
	2.7pF (2R7)	B	B								
	3.3pF (3R3)	B	B								
	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		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.
2. For more information about products with special capacitance or other data, please contact WTC local representative.

Middle and High Voltage Capacitors

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^	B	B	B^	B^								
	180pF (181)	B	B	B^	B^	B	B	B^	B^								
	220pF (221)	B	B	B^	B^	B	B	B^	B^								
	270pF (271)	B	B	B^	B^	B	B	B^	B^								
	330pF (331)	B	B	B^	B^	B	B	B^	B^								
	390pF (391)	B	B	B^	B^	B	B	B^	B^								
	470pF (471)	B	B	B^	B^	B	B	B^	B^								
	560pF (561)	B	B	B^	B^	B	B	B^	B^								
	680pF (681)	B	B	B^	B^	B	B	B^	B^								
	820pF (821)	B	B	B^	B^	B	B	B^	B^								
	1,000pF (102)	B	B	B^	B^	B	B	B^	B^	C	C	C^	C^	D	D	D^	D^
	1,200pF (122)	B	B	B^	B^	B	B	B^	B^	C	C	C^	C^	D	D	D^	D^
	1,500pF (152)	B	B	B^	B^	B	B	B^	B^	C	C	C^	C^	D	D	D^	D^
	1,800pF (182)	B	B	B^	B^	B	B	B^	B^	C	C	C^	C^	D	D	D^	D^
	2,200pF (222)	B	B	B^	B^	B	B	B^	B^	C	C	C^	C^	D	D	D^	D^
	2,700pF (272)	B	B	B^	B^	B	B	B^	B^	C	C	C^	C^	D	D	D^	D^
	3,300pF (332)	B	B			B	B	B^	B^	C	C	C^	C^	D	D	D^	D^
	3,900pF (392)	B	B			B	B	B^	B^	C	C	C^	C^	D	D	D^	D^
	4,700pF (472)	B	B			B	B	B^	B^	C	C	C^	C^	D	D	D^	D^
	5,600pF (562)	D	D			B	B	B^	B^	C	C	C^	C^	D	D	D^	D^
	6,800pF (682)	D	D			B	B	B^	B^	C	C	C^	C^	D	D	D^	D^
	8,200pF (822)	D	D			B	B	C^	C^	C	C	C^	C^	D	D	D^	D^
	0.010µF (103)	D	D			B	B	C^	C^	C	C	C^	C^	D	D	D^	D^
	0.012µF (123)	D	D			B	B	D^	D^	C	C	C^	C^	D	D	D^	D^
	0.015µF (153)	D	D			C	C	D^	D^	C	C	C^	C^	D	D	D^	D^
	0.018µF (183)	D	D			C	C	D^	D^	C	C	C^	C^	D	D	D^	D^
	0.022µF (223)	D	D			C	C	G^	G^	C	C	D^	D^	D	D	D^	D^
	0.027µF (273)					C	C	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)													K	K		
	0.33µF (334)													K	K		
	0.39µF (394)													K	K		
	0.47µF (474)													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.
3. For more information about products with special capacitance or other data, please contact WTC local representative.

Middle and High Voltage Capacitors

X7R Dielectric 1kV to 3kV

Dielectric		X7R										
Size		1206			1210	1808				1812		
Rated Voltage (VDC)		1000	1500	2000	1000	1000	1500	2000	3000	1000	2000	3000
Capacitance	150pF (151)	B^	B^	B^		D^	D^	D^				
	180pF (181)	B^	B^	B^		D^	D^	D^				
	220pF (221)	B^	B^	B^		D^	D^	D^				
	270pF (271)	B^	B^	B^		D^	D^	D^		D^	D^	
	330pF (331)	B^	B^	B^		D^	D^	D^		D^	D^	
	390pF (391)	B^	B^	C^		D^	D^	D^		D^	D^	
	470pF (471)	B^	B^	C^		D^	D^	D^	K^	D^	D^	
	560pF (561)	B^	C^	C^		D^	D^	D^	K^	D^	D^	
	680pF (681)	B^	C^	C^		D^	D^	D^	K^	D^	D^	K^
	820pF (821)	B^	G^	G^		D^	D^	D^	K^	D^	D^	K^
	1,000pF (102)	B^	G^	G^	C^	D^	D^	K^	K^	D^	D^	K^
	1,200pF (122)	B^	G^		C^	D^	D^	K^		D^	D^	
	1,500pF (152)	C^	G^		C^	D^	D^	K^		D^	D^	
	1,800pF (182)	C^	G^		C^	D^	D^	K^		D^	D^	
	2,200pF (222)	D^	G^		C^	D^	D^	K^		D^	D^	
	2,700pF (272)	G^			C^	D^	D^			D^	D^	
	3,300pF (332)	G^			D^	D^	K^			D^	K^	
	3,900pF (392)	G^				D^				D^	K^	
	4,700pF (472)					D^				D^	K^	
	5,600pF (562)					K^				D^		
	6,800pF (682)					K^				D^		
	8,200pF (822)					K^				D^		
	0.010μF (103)					K^				D^		
	0.012μF (123)									K^		
	0.015μF (153)									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.
3. For more information about products with special capacitance or other data, please contact WTC local representative.

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.
2. For more information about products with special capacitance or other data, please contact WTC local representative.

Safety Certificated Capacitors X1/Y2

■ 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)	N=NP0 (C0G)	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 / Plastic 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

Dielectric		NP0	
Rated voltage (VAC)		250	
Rated Voltage (VDC)		3000	
Size		1808	1812
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
	120pF (121)	D	D
	150pF (151)	D	D
	180pF (181)	K	D
	220pF (221)	K	D
	270pF (271)	K	K
	330pF (331)		K
	390pF (391)		K
	470pF (471)		K

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.

Safety Certificated Capacitors X2/Y3

■ 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=4.7pF 0R5=0.5pF 1R0=1.0pF 100=10x10^0 =10pF	J=±5% K=±10%	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 / Plastic 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

Safety Certificated Capacitors X2/Y3

■ CAPACITANCE RANGE

NP0 Dielectric

Dielectric		NP0			
Size		1808		1812	
Rated voltage (VAC)		250		250	
Rated Voltage (VDC)		2000	3000	2000	3000
Capacitance	10pF (100)	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	

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.

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		D	
	390pF (391)	D		D	
	470pF (471)	D		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	

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.

High Q and Low ESR Capacitors

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)	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	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
0402	0.50±0.05	N	10K	20K
0603	0.80±0.07	S	4K	10K

Unit: pieces

ELECTRICAL CHARACTERISTICS

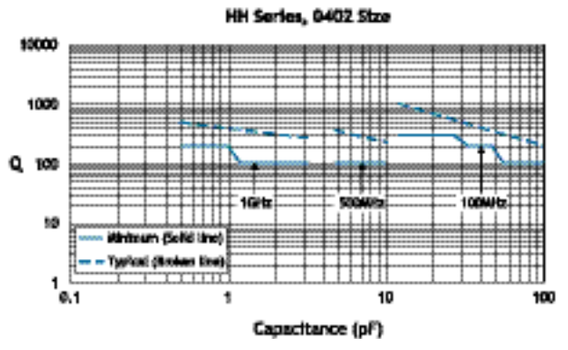


Fig. 2 Q factor specification vs. Specific frequency for 0402

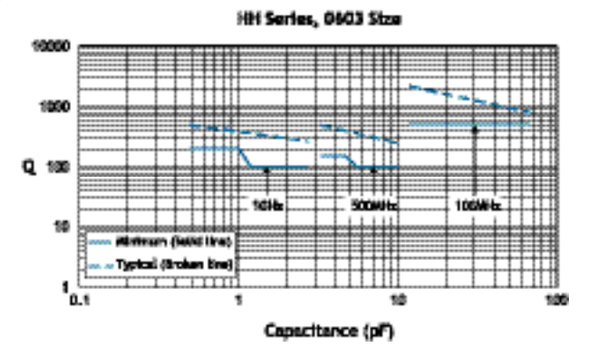


Fig. 3 Q factor specification vs. Specific frequency for 0603

High Q and Low ESR Capacitors

■ CAPACITANCE RANGE

Dielectric		NP0					
Size		0402			0603		
Rated Voltage (VDC)		16	25	50	16	50	100
Capacitance	0.5pF (0R5)			N		S	S
	0.6pF (0R6)			N		S	S
	0.7pF (0R7)			N		S	S
	0.8pF (0R8)			N		S	S
	0.9pF (0R9)			N		S	S
	1.0pF (1R0)			N		S	S
	1.2pF (1R2)			N		S	S
	1.5pF (1R5)			N		S	S
	1.8pF (1R8)			N		S	S
	2.2pF (2R2)			N		S	S
	2.7pF (2R7)			N		S	S
	3.3pF (3R3)			N		S	S
	3.9pF (3R9)			N		S	S
	4.7pF (4R7)			N		S	S
	5.6pF (5R6)			N		S	S
	6.8pF (6R8)			N		S	S
	8.2pF (8R2)			N		S	S
	10pF (100)			N		S	S
	12pF (120)			N		S	S
	15pF (150)			N		S	S
	18pF (180)			N		S	S
	22pF (220)			N		S	S
	27pF (270)			N		S	S
	33pF (330)			N		S	S
	39pF (390)			N		S	S
	47pF (470)			N		S	S
	56pF (560)			N		S	S
	68pF (680)			N		S	S
	82pF (820)			N		S	S
	100pF (101)			N		S	S
	120pF (121)			N		S	S
	150pF (151)			N		S	S
	180pF (181)		N	N		S	S
	220pF (221)		N	N		S	S
	270pF (271)	N				S	S
	330pF (331)	N				S	S
	390pF (391)	N				S	S
	470pF (471)	N				S	S
	560pF (561)					S	
	680pF (681)					S	
	820pF (821)					S	
	1,000pF (102)					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.
2. For more information about products with special capacitance or other data, please contact WTC local representative.

Microwave Capacitors

■ HOW TO ORDER

MW	15	N	100	G	500	L	T
Series	**Size**	**Dielectric**	**Capacitance**	**Tolerance**	**Rated voltage**	**Termination**	**Packaging**
MW=Microwave	15=0402 (1005) 18=0603 (1608)	N=NP0 (C0J)	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%	Two significant digits followed by no. of zeros. And R is in place of decimal point. 500=50 VDC	L=Ag/Ni/Sn	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
0402	0.50±0.05	N	10K	20K
0603	0.80±0.07	S	4K	10K

Unit: pieces

■ ELECTRICAL CHARACTERISTICS

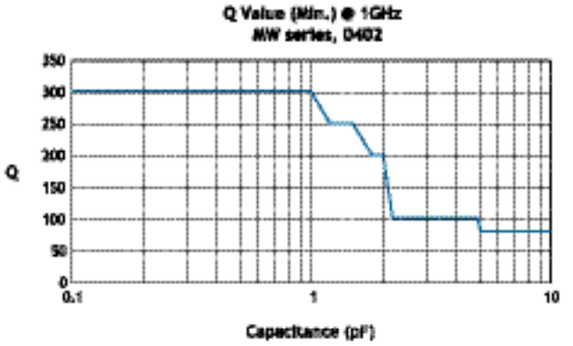


Fig. 2 Q value criteria vs. capacitance for 0402

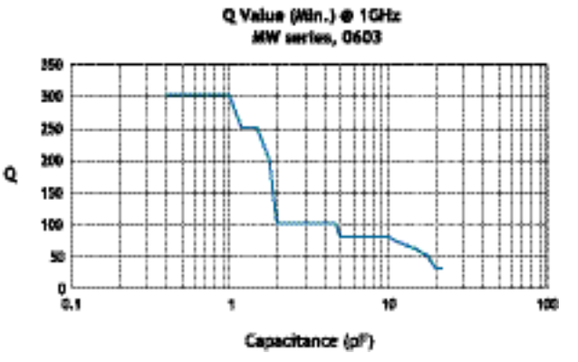


Fig. 3 Q value criteria vs. capacitance for 0603

Microwave Capacitors

■ CAPACITANCE RANGE

Dielectric		NP0	
Size		0402	0603
Rated Voltage (VDC)		50	50
Capacitance	0.1pF (0R1)	N	
	0.2pF (0R2)	N	
	0.3pF (0R3)	N	
	0.4pF (0R4)	N	S
	0.5pF (0R5)	N	S
	0.6pF (0R6)	N	S
	0.7pF (0R7)	N	S
	0.8pF (0R8)	N	S
	0.9pF (0R9)	N	S
	1.0pF (1R0)	N	S
	1.2pF (1R2)	N	S
	1.5pF (1R5)	N	S
	1.8pF (1R8)	N	S
	2.0pF (2R0)	N	S
	2.2pF (2R2)	N	S
	2.7pF (2R7)	N	S
	3.0pF (3R0)	N	S
	3.3pF (3R3)	N	S
	3.9pF (3R9)	N	S
	4.0pF (4R0)	N	S
	4.7pF (4R7)	N	S
	5.0pF (5R0)	N	S
	5.6pF (5R6)	N	S
	6.0pF (6R0)	N	S
	6.8pF (6R8)	N	S
	7.0pF (7R0)	N	S
	8.0pF (8R0)	N	S
	8.2pF (8R2)	N	S
	9.0pF (9R0)	N	S
	10pF (100)	N	S
	12pF (120)		S
	15pF (150)		S
	18pF (180)		S
	22pF (220)		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.

Open-mode Design Capacitors

■ 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.: $102=10x10^2$ $=1000pF$	K=±10% M=±20%	Two significant digits followed by no. 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 range table to find right termination 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	-
1812	1.25±0.10	D	-	-	1k	-
	2.00±0.20	K	-	-	1k	-

Unit: pieces

■ INNER CONSTRUCTION OF OPEN-MODE DESIGN

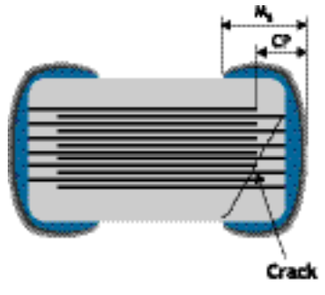


Fig. 2 Normal design ($CP<M_B$) – circuit leakage during cracking.

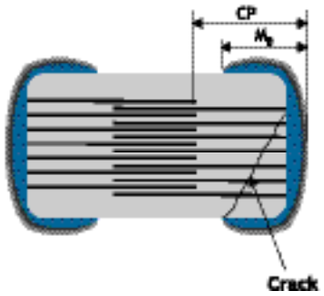


Fig. 3 Open-mode design ($CP>M_B$) – circuit open during cracking.

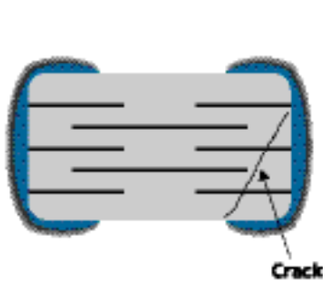


Fig. 4 Floating design (one kind of open-mode design)– circuit open during cracking.

Open-mode Design Capacitors

■ CAPACITANCE RANGE

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

Capacitor Arrays

■ 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		NP0	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	
	680pF (681)			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		
	0.022μF (223)		B		B
	0.033μF (333)		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.
2. For more information about products with special capacitance or other data, please contact WTC local representative.

Low Inductance Capacitors

■ 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=50VDC	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

Dielectric		X7R
Size		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.
2. For more information about products with special capacitance or other data, please contact WTC local representative.

Appendix I : Reliability Test Conditions and Requirements

<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≤10μF, 1.0±0.2Vrms, 1KHz±10%
Cap>10μF, 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
X7R, X5R:
<table>
<tr><th>Rated vol.</th><th>D.F.</th><th colspan="2">Exception of D.F.</th></tr>
<tr><td>≥50V</td><td>≤2.5%</td><td>≤3%</td><td>0603≥0.047μF; 0805≥0.18μF;
1206≥0.47μF</td></tr>
<tr><td rowspan="2">25V</td><td rowspan="2">≤3.5%</td><td>≤5%</td><td>0805≥1μF, 1210≥10μF</td></tr>
<tr><td>≤7%</td><td>0603≥0.33μF</td></tr>
<tr><td>16V</td><td>≤3.5%</td><td>≤5%</td><td>0201≥0.0047μF; 0402≥0.033μF;
0603≥0.15μF; 0805≥0.68μF;
1206≥2.2μF</td></tr>
<tr><td>10V</td><td>≤5.0%</td><td>---</td><td>---</td></tr>
<tr><td>6.3V</td><td>≤10%</td><td>≤15%</td><td>0805≥10μF</td></tr>
</table>
Y5V:
<table>
<tr><th>Rated vol.</th><th>D.F.</th><th colspan="2">Exception of D.F.</th></tr>
<tr><td>≥50V</td><td>≤5.0%</td><td>---</td><td>---</td></tr>
<tr><td rowspan="2">25V</td><td rowspan="2">≤5.0%</td><td>≤7%</td><td>0603≥0.1μF; 0805≥0.33μF;
1206≥1μF; 1210≥4.7μF</td></tr>
<tr><td>≤9%</td><td>0402≥0.068μF</td></tr>
<tr><td>16V (C<1.0μF)</td><td>≤7.0%</td><td>≤9%</td><td>0402≥0.068μF; 0603≥0.68μF</td></tr>
<tr><td>16V (C≥1.0μF)</td><td>≤9.0%</td><td>---</td><td>---</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 ≥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: 1 to 5 sec.</td><td>* No evidence of damage or flash over during test.</td></tr>
<tr><td rowspan="3">5.</td><td rowspan="3">Insulation Resistance</td><td colspan="2">To apply rated voltage for max. 120 sec.</td><td>≥10GΩ or RxC≥500Ω-F whichever is smaller.</td></tr>
<tr><td>Rated voltage:
100 ~ 500V</td><td>To apply rated voltage for 60 sec.</td><td>≥10GΩ</td></tr>
<tr><td>Rated voltage:
> 500V</td><td>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>NP0 (C0G)</td><td>-55~125°C at 25°C</td></tr>
<tr><td>NP0 (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>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>NP0 (C0G)</td><td>Within ±30ppm/°C</td></tr>
<tr><td>NP0 (C0J)</td><td>Within ±120ppm/°C</td></tr>
<tr><td>X7R</td><td>Within ±15%</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:
0201: 2N
0402 & 0603: 5N
>0603: 10N
* Test time: 10±1 sec.</td><td>* No remarkable damage or removal of the terminations.</td></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>
</table>

Appendix I : Reliability Test Conditions and Requirements

<table>
<tr><th>NO.</th><th>Item</th><th>Test Condition</th><th>Requirements</th></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%
Y5V: within ±30%
* 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 of D.F.</th></tr>
<tr><td>≥50V</td><td>≤3.0%</td><td>≤6.0%</td><td>0603≥0.047μF; 0805≥0.18μF; 1206≥0.47μF</td></tr>
<tr><td rowspan="2">25V</td><td rowspan="2">≤5.0%</td><td>≤10%</td><td>0805≥1μF, 1210≥10μF</td></tr>
<tr><td>≤14%</td><td>0603≥0.33μF</td></tr>
<tr><td>16V</td><td>≤5.0%</td><td>≤10%</td><td>0402≥0.033μF; 0603≥0.15μF; 0805≥0.68μF; 1206≥2.2μF</td></tr>
<tr><td>10V</td><td>≤7.5%</td><td>≤15%</td><td>0402≥0.056μF; 0603≥0.33μF; 0805≥2.2μF; 1206≥2.2μF</td></tr>
<tr><td>6.3V</td><td>≤15.0%</td><td>≤30%</td><td>0805≥10μF</td></tr>
</table>
Y5V:
<table>
<tr><th>Rated vol.</th><th>D.F.</th><th colspan="2">Exception of D.F.</th></tr>
<tr><td>≥50V</td><td>≤7.5%</td><td>---</td><td>---</td></tr>
<tr><td rowspan="2">25V</td><td rowspan="2">≤7.5%</td><td>≤10.0%</td><td>0603≥0.1μF; 0805≥0.33μF; 1206≥1μF; 1210≥4.7μF</td></tr>
<tr><td>≤12.5%</td><td>0402≥0.068μF</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>---</td><td>---</td></tr>
<tr><td>10V</td><td>≤15%</td><td>---</td><td>---</td></tr>
<tr><td>≤6.3V</td><td>≤30%</td><td>---</td><td>---</td></tr>
</table>
* I.R.: ≥1GΩ or RxC≥50Ω-F whichever is smaller.</td></tr>
</table>

Appendix I : Reliability Test Conditions and Requirements

<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, with ±25%
Y5V: ≥10V, within ±30%
6.3V, within +30 to -40%
* Q/D.F. value:
NP0: Cap≥30pF, Q≥200; Cap<30pF, Q≥100+10/3C
X7R, X5R:
<table>
<tr><th>Rated vol.</th><th>D.F.</th><th colspan="2">Exception of D.F.</th></tr>
<tr><td>≥50V</td><td>≤3.0%</td><td>≤6.0%</td><td>0603≥0.047μF; 0805≥0.18μF;
1206≥0.47μF</td></tr>
<tr><td rowspan="2">25V</td><td rowspan="2">≤5.0%</td><td>≤10%</td><td>0805≥1μF; 1210≥10μF</td></tr>
<tr><td>≤14%</td><td>0603≥0.33μF</td></tr>
<tr><td>16V</td><td>≤5.0%</td><td>≤10%</td><td>0402≥0.033μF; 0603≥0.15μF;
0805≥0.68μF; 1206≥2.2μF</td></tr>
<tr><td>10V</td><td>≤7.5%</td><td>≤15%</td><td>0402≥0.056μF; 0603≥0.33μF;
0805≥2.2μF; 1206≥2.2μF</td></tr>
<tr><td>6.3V</td><td>≤15%</td><td>≤30%</td><td>0805≥10μF</td></tr>
</table>
Y5V:
<table>
<tr><th>Rated vol.</th><th>D.F.</th><th colspan="2">Exception of D.F.</th></tr>
<tr><td>≥50V</td><td>≤7.5%</td><td>---</td><td>---</td></tr>
<tr><td>25V</td><td>≤5.0%</td><td>10%</td><td>0603≥0.1μF; 0805≥0.33μF;
1206≥1μF; 1210≥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>
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<tr><td>10V</td><td>≤15%</td><td>---</td><td>---</td></tr>
<tr><td>6.3V</td><td>≤30%</td><td>---</td><td>---</td></tr>
</table>
* I.R.: ≥500MΩ or RxC≥25Ω-F whichever is smaller.</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. (Max. 3600V)
* 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, with ±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 of D.F.</th></tr>
<tr><td>≥50V</td><td>≤3.0%</td><td>≤6.0%</td><td>0603≥0.047μF; 0805≥0.18μF;
1206≥0.47μF</td></tr>
<tr><td rowspan="2">25V</td><td rowspan="2">≤5.0%</td><td>≤10%</td><td>0805≥1μF; 1210≥10μF</td></tr>
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0805≥2.2μF; 1206≥2.2μF</td></tr>
<tr><td>6.3V</td><td>≤15.0%</td><td>≤30%</td><td>0805≥10μF</td></tr>
</table>
Y5V:
<table>
<tr><th>Rated vol.</th><th>D.F.</th><th colspan="2">Exception of D.F.</th></tr>
<tr><td>≥50V</td><td>≤7.5%</td><td>---</td><td>---</td></tr>
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</table>
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</table>

Appendix II : General Information

◙ Constructions

No.	Name		NP0/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)	

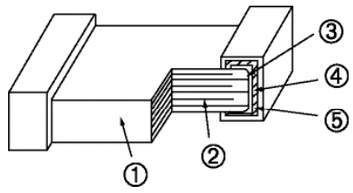

Fig.1 The construction of MLCC

◙ 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 N_2 within oven are recommended.

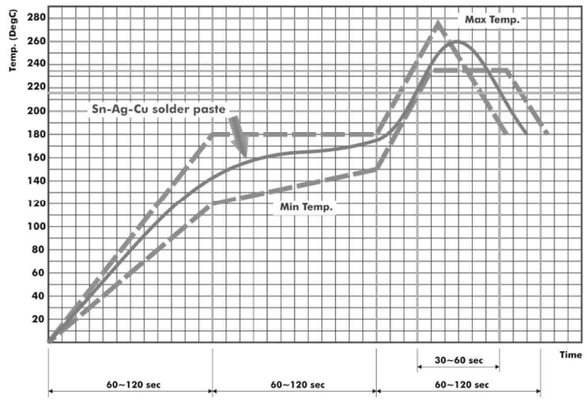

Fig. 2 IR reflow soldering profile for SMT process with SnAgCu series solder paste.

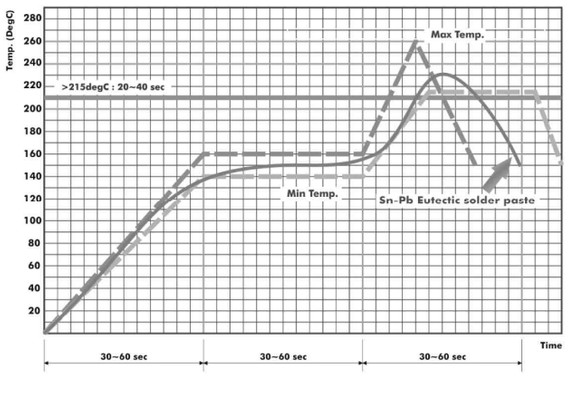

Fig. 3 IR reflow soldering profile for SMT process with eutectic SnPb solder paste.

PLAN & MEMO

PSA PASSIVE SYSTEM ALLIANCE

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