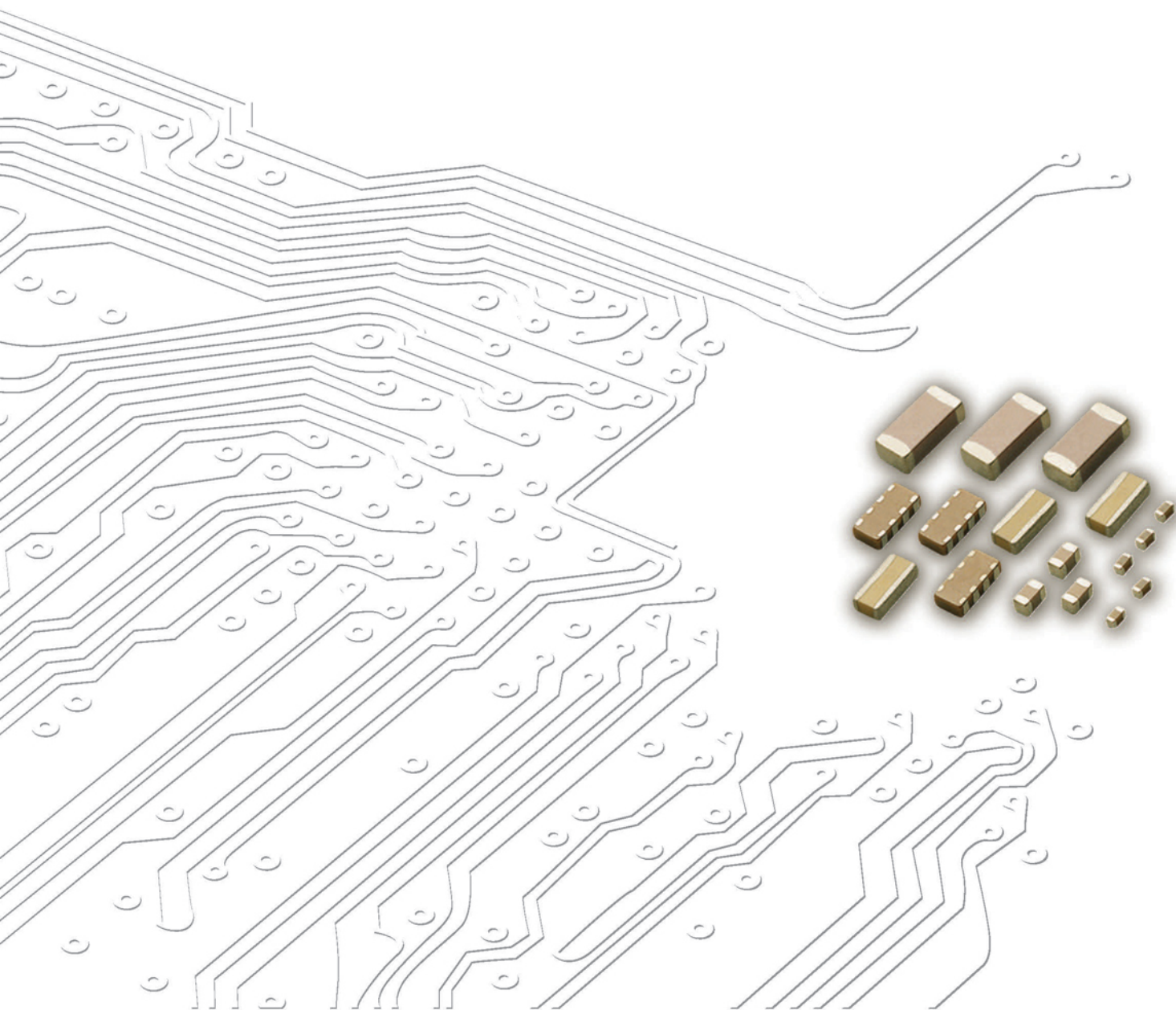


# Multilayer Ceramic Capacitors

## Product catalog

[www.passivecomponent.com](http://www.passivecomponent.com)



## Product Portfolio



**Multilayer Ceramic Capacitors (MLCC)**



**Chip-Resistor**



**Disc Capacitors**



**RF Device and High Frequency Inductors**



**Antenna**



**Inductors**



**Varistors and SMD-Varistors**

## IEC-63 Nominal Resistance / Capacitance

<b>E1</b>	100																							
<b>E3</b>	100				220					470														
<b>E6</b>	100	150	220	330	470	680																		
<b>E12</b>	100	120	150	180	220	270	330	390	470	560	680	820												
<b>E24</b>	100	110	120	130	150	160	180	200	220	240	270	300	330	360	390	430	470	510	560	620	680	750	820	910
<b>E96</b>	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:  $\sqrt[6]{10} \approx 1.46$  E12:  $\sqrt[12]{10} \approx 1.21$

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

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\*The specifications are subject to change or our products in it may be discontinued without advance notice. Please check with our sales representatives or product engineers before ordering.

\*This catalog has only typical specifications because there is no space for detailed specifications. Therefore, please approve our product specifications or transact the approval sheet for product specifications before ordering.

## ■ QUICK PRODUCT INFORMATION

Series	Dielectric	Size	Capacitance	Rated voltage	Page
General Purpose Caps (6.3V~100V)	NPO	0201, 0402, 0603, 0805, 1206, 1210, 1812,1825,2220,2225	0.1pF~0.27μF	10V, 16V, 25V, 50V, 100V	4
	X7R	0201, 0402, 0603, 0805, 1206, 1210, 1812,1825,2220,2225	100pF~47μF	6.3V, 10V, 16V, 25V, 50V, 100V	
	X6S	0402, 0603, 0805, 1206,1210	0.1μF~100μF	6.3V, 10V, 16V, 25V	
	X7S	0402, 0603, 0805, 1206,1210	1.0μF~100μF	6.3V, 10V, 16V, 25V, 50V, 100V	
	X5R	0201, 0402, 0603, 0805, 1206,1210	100pF~220μF	6.3V, 10V, 16V, 25V, 50V	
	Y5V	0402, 0603, 0805, 1206, 1210, 1812	0.01μF~100μF	6.3V, 10V, 16V, 25V, 50V, 100V	
Ultra-small Caps (01R5 series)	NPO	01005	0.2pF~100pF	16V	9
	X7R	01005	100pF~1000pF	10V	
	X5R	01005	1000pF~0.1μF	6.3V,10V	
Middle & High Voltage Caps (200V~4kV)	NPO	0603, 0805, 1206, 1210, 1808, 1812,1825,2220,2225	0.5pF~0.12μF	200V, 250V, 500V, 630V, 1kV, 2kV, 3kV, 4kV	10
	X7R	0603, 0805, 1206, 1210, 1808, 1812,1825,2220,2225	100pF~2.2μF	200V, 250V, 400V, 450V, 500V, 630V, 1kV, 2kV, 3kV, 4kV	
	Y5V	0805, 1206, 1210,1812	0.01μF~0.68μF	200V, 250V	
High Q & Low ESR Caps (HH series)	NPO	0201,0402, 0603,0805	0.3pF to 3300pF	10V,16V, 25V, 50V, 100V, 200V, 250V, 500V, 630V	13
Microwave Caps (RF series)	NPO	01005, 0201,0402,0603, 0805,0505,1111	0.1pF~1000pF	6.3V, 10V, 25V, 50V,100V,250V,500V,1500V	15
Soft Termination Capacitors (SH series)	NPO	0402,0603, 0805,1206, 1210, 1808, 1812,1825,2220,2225	0.5pF~0.22μF	10V,16V,25V,50V,100V,200V,250V,50 0V,630V,1kV, 3kV	17
	X7R	0402,0603, 0805,1206, 1210, 1808, 1812,1825,2220,2225	100pF~22μF	10V,16V,25V,50V,100V,200V,250V,50 0V,630V, 1kV,2kV, 3kV	
High Temperature Caps (HT series)	X8G	0402,0603, 0805,1206, 1210	0.2pF~0.01μF	10V,16V,25V,50V,100V	23
	X8R	0603, 0805,1206,	100pF~0.1μF	10V,16V,25V,50V	
Open-mode Design Caps (OP series)	X7R	0805, 1206, 1210, 1812	100pF~1μF	100V, 200V, 250V, 500V	25
Capacitor Arrays (Y4C2/Y4C3 series)	NPO	0508 (4x0402), 0612 (4x0603)	10pF~470pF	25V, 50V,100V	27
	X7R	0508 (4x0402), 0612 (4x0603)	180pF~0.1μF	10V, 16V, 25V, 50V	
	Y5V	0612 (4x0603)	0.01μF~0.1μF	16V, 50V	
Low Profile Caps (TT series)	X7R	0805, 1206	0.22μF~4.7μF	10V, 16V, 25V, 50V	28
	X5R	0603, 0805, 1206, 1210	0.22μF~22μF	6.3V, 10V, 16V, 25V, 50V	
	Y5V	0805, 1206, 1210	1μF~10μF	10V, 16V, 25V, 50V	
Low Inductance Caps (0612 series)	X7R	0612	0.01μF~0.15μF	50V	29
Safety Certificated Caps X1/Y2 (S2 series)	NPO	1808, 1812, 2211	4pF~680pF	250Vac	30
	X7R	1808, 1812, 2220, 2211	100pF~4700pF	250Vac	
Safety Certificated Caps X2 (S3 series)	NPO	1808, 1812	3.9pF~1000pF	250Vrms	31
	X7R	1808, 1812	150pF~5600pF	250Vrms	
Automotive Capacitor Qualified to AEC-Q200 (MT series)	NPO	0201, 0402, 0603, 0805, 1206, 1210	0.5pF~0.39μF	10V,16V,25V,50V,100V, 250V, 500V, 630V	32
	X7R	0402, 0603, 0805, 1206, 1210	100pF~1μF	10V,16V,25V,50V,100V, 250V, 500V, 630V,1kV	
Automotive Caps Without AEC-Q200 Certification (MG series)	NPO	0402, 0603, 0805, 1206, 1210, 1812	0.5pF~0.033μF	10V,16V,25V,50V,100V,200V,250V	33
	X7R	0402, 0603, 0805, 1206, 1210, 1812	100pF~2.2μF	10V,16V,25V,50V,100V,200V,250V	
	X5R	0402, 0603, 0805, 1206, 1210	0.056μF~10μF	6.3V,10V,16V,25V	
Automotive Capacitor Arrays Qualified AEC-Q200 (MY Series)	NPO	0612(4x0603), 0508(4x0402)	10pF~220pF	16V, 25V, 50V, 100V	36
	X7R	0612(4x0603), 0508(4x0402)	470pF~0.1μF	10V, 16V, 25V, 50V	

## HOW TO ORDER



Type of MLCC	0805	B	104	K	500	C	T
General Purpose MLCC Middle & High Voltage MLCC Ultra-small MLCC	<b>Size</b> Inch (mm) : 01R5 (0402), 0402 (1005), 0603 (1608), 0805 (2012), 1206 (3216), 1210 (3225), 1808 (4520), 1812 (4532), 1825 (4563), 2225 (5763)	<b>Dielectric</b> N=NP0 G=X8G R=X8R B=X7R A=X7S S=X6S X=X5R F=Y5V	<b>Capacitance</b> Two significant digits followed by no. of zeros. And R is in place of decimal point. R47=0.47pF 0R5=0.5pF 1R0=1pF 100=10pF 101=100pF 102=1000pF 103=0.01uF 104=0.1uF 105=1uF 106=10uF 107=100uF	<b>Tolerance</b> A= ±0.05pF B= ±0.1pF C= ±0.25pF D= ±0.5pF F= ±1% G= ±2% J= ±5% K= ±10% M= ±20% Z=-20/+80%	<b>Rated voltage</b> 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 350=35 Vdc 500=50 Vdc 101=100 Vdc 201=200 Vdc 251=250 Vdc 401=400 Vdc 451=450 Vdc 501=500 Vdc 631=630 Vdc 102=1k Vdc 152=1.5k Vdc 202=2k Vdc 252=2.5k Vdc 302=3k Vdc 402=4k Vdc 502=5k Vdc 602=6k Vdc	<b>Termination</b> L=Ag/Ni/Sn C=Cu/Ni/Sn P=Cu/Polymer/Ni/Sn  SH:C=Ag polymer/Ni/Sn  C=Cu/Ni/Sn	<b>TAIWAN Packaging EXCELLENCE 2013</b> 國家發明獎 National Invention Award  T=7" reeled Q=10" reeled G=13" reeled
Low Inductance MLCC	0612 (1632)						
High Q / Low ESR MLCC Microwave MLCC Low Profile MLCC Open Mode MLCC Safety Certificated LCC Automotive MLCC	<b>RF</b> Series HH=High Q/ Low ESR RF=Microwave TT=Low profile OP=Open-mode design S2=X1/Y2 safety class S3=X2 safety class MG=Automotive Cap. without AEC-Q200 MT=Automotive Cap. with AEC-Q200 MY=Automotive Array with AEC-Q200	<b>03</b> Inch : 02=01005 03=0201 15=0402 11=0505 18=0603 21=0805 22=1111 31=1206 32=1210 42=1808 43=1812 52=2211 55=2220 56=2225					
Soft Termination MLCC	SH=With Ag polymer						
Cap Arrays MLCC	<b>Y</b> Type Y=Capacitor array	<b>4 C</b> Cap. Nr. 4C=4xCap	<b>3</b> Termination pitch 3=0.03 inch 2=0.02 inch				

\* The packaging code per each size of reel, please refer to following table "packaging style and quantity".

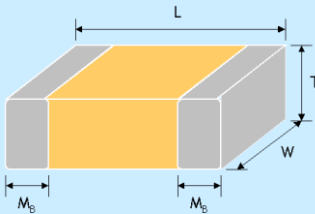
## PACKAGING STYLE AND QUANTITY

Size	Thickness (mm)/Symbol		Paper tape		Plastic tape	
			7" reel	13" reel	7" reel	13" reel
01005 (0402)	0.20±0.02	V	20,000	-	40,000(W4P1)-	-
0201 (0603)	0.30±0.03	L	15,000	70,000	-	-
0402 (1005)	0.50±0.05	N	10,000	50,000	-	-
	0.50+0.02/-0.05	Q	10,000	50,000	-	-
	0.50±0.20	E	10,000	-	-	-
0603 (1608)	0.50±0.10	H	4,000	-	-	-
	0.80±0.07	S	4,000	15,000	-	-
	0.80+0.15/-0.10	X	4,000	15,000	-	-
0805 (2012)	0.50±0.10	H	4,000	15,000	-	-
	0.60±0.10	A	4,000	15,000	-	-
	0.80±0.10	B	4,000	15,000	-	-
	0.85±0.10	T	4,000	15,000	-	-
	1.25±0.10	D	-	-	3,000	10,000
1206 (3216)	1.25±0.20	I	-	-	3,000	10,000
	0.80±0.10	B	4,000	15,000	-	-
	0.85±0.10	T	4,000	15,000	-	-
	0.95±0.10	C	-	-	3,000	10,000
	1.15±0.15	J	-	-	3,000	10,000
	1.25±0.10	D	-	-	3,000	10,000
1210 (3225)	1.60±0.20	G	-	-	2,000	10,000
	1.60+0.30/-0.10	P	-	-	2,000	9,000
	0.85±0.10	T	-	-	3,000	10,000
	0.95±0.10	C	-	-	3,000	10,000
	1.25±0.10	D	-	-	3,000	10,000
	1.60±0.20	G	-	-	2,000	-
1808 (4520)	2.00±0.20	K	-	-	1,000	6,000
	2.50±0.30	M	-	-	1,000	6,000
	2.80±0.30	U	-	-	500	-
	1.25±0.10	D	-	-	1,000	5,000
	1.60±0.20	G	-	-	1,000	-
1812 (4532)	2.00±0.20	K	-	-	1,000	-
	2.50±0.30	M	-	-	500	3,000
	2.80±0.30	U	-	-	500	-
	1.25±0.10	D	-	-	1,000	-
	1.60±0.20	G	-	-	1,000	-
1825 (4563) 2220 (5750) 2225 (5763)	2.00±0.20	K	-	-	1,000	-
	2.50±0.30	M	-	-	500	-
	2.80±0.30	U	-	-	500	-

Unit: pieces

# The Outlines and External Dimensions of Capacitors

## ■ SINGLE CHIP CAPACITORS

Outline	Size Inch (mm)	L (mm)	W (mm)	T (mm)/Symbol	Soldering Method *	M <sub>B</sub> (mm)	
	01R5 (0402)	0.4±0.02	0.2±0.02	0.2±0.02	V	R	0.10±0.03
	0201 (0603)	0.6±0.03	0.3±0.03	0.3±0.03	L	R	0.15±0.05
		0.6±0.05 <sup>#2</sup>	0.3±0.05 <sup>#2</sup>	0.3±0.05 <sup>#2</sup>			0.15±0.1/-0.05
		0.6±0.09 <sup>#3</sup>	0.3±0.09 <sup>#3</sup>	0.3±0.09 <sup>#3</sup>			
	0402 (1005)	1.00±0.05	0.50±0.05	0.50±0.05	N	R	0.25 +0.05/-0.10
		1.00±0.20	0.50±0.20	0.50±0.02/-0.05	Q	R	
		1.60±0.10	0.80±0.10	0.5±0.20	E	R	
	0603 (1608)	1.60±0.10	0.80±0.10	0.80±0.07	S	R / W	0.40±0.15
		1.60±0.15/-0.10	0.80±0.15/-0.10	0.50±0.10	H	R / W	
		1.60±0.20 <sup>#1</sup>	0.80±0.20 <sup>#1</sup>	0.80±0.15/-0.10	X	R / W	
	0805 (2012)	2.00±0.15	1.25±0.10	0.50±0.10	H	R / W	0.50±0.20
				0.60±0.10	A	R / W	
				0.80±0.10	B	R / W	
				1.25±0.10	D	R	
				0.85±0.10	T	R / W	
	2.00±0.20	1.25±0.20	1.25±0.20	I	R		
	1206 (3216)	3.20±0.15	1.60±0.15	0.80±0.10	B	R / W	0.60±0.20 (0.5±0.25) <sup>***</sup>
				0.95±0.10	C	R	
				1.25±0.10	D	R	
		3.20±0.20	1.60±0.20	1.15±0.15	J	R	
1.60±0.20		G	R				
3.20+0.30/-0.10		1.60+0.30/-0.10	0.85±0.10	T	R / W		
1210 (3225)	3.20±0.30	2.50±0.20	0.80±0.10	C	R	0.75±0.25	
			0.85±0.10	T	R		
			1.25±0.10	D	R		
	3.20±0.40	2.50±0.30	1.60±0.20	G	R		
	2.00±0.20	K	R				
	3.20±0.60 <sup>#4</sup>	2.50±0.50 <sup>#4</sup>	2.50±0.30	M	R		
1808 (4520)	4.50±0.40 (4.5+0.5/-0.3) <sup>**</sup>	2.03±0.25	1.25±0.10	D	R	0.75±0.25 (0.5±0.25) <sup>***</sup>	
			1.40±0.15	F	R		
			1.60±0.20	G	R		
			2.00±0.20	K	R		
1812 (4532)	4.50±0.40 (4.5+0.5/-0.3) <sup>**</sup>	3.20±0.30	1.25±0.10	D	R	0.75±0.25 (0.5±0.25) <sup>***</sup>	
			1.60±0.20	G	R		
			2.00±0.20	K	R		
		3.20±0.40	2.50±0.30	M	R		
		2.80±0.30	U	R			
1825 (4563)	4.60±0.50	6.30±0.40	1.60±0.20 (G)	2.00±0.20	R	≥ 0.26	
2211 (5728)	5.70±0.50	2.80±0.30	(K)	R	≥ 0.30		
2220 (5750)	5.70±0.50	5.00±0.40	2.50±0.30 (M)	R	≥ 0.30		
2225 (5763)	5.70±0.50	6.30±0.40	2.80±0.30 (U)	R	≥ 0.30		

\* R = Reflow soldering process ; W = Wave soldering process.

\*\* For 1808\_200V ~3kV, 1812\_200V~3kV and safety certificated products.

\*\*\* For 1206\_1000V ~3kV,1808\_200V ~3kV, 1812\_200V~3kV and safety certificated products.

#1 : For 0603/Cap ≥ 10μF or 0603(≤ 6.3V)/Cap ≥ 4.7μF or 0603(>10V)/Cap > 1μF products.

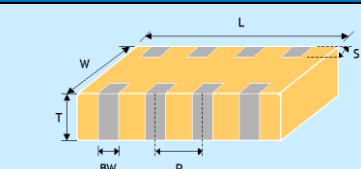
#2 : For 0201/Cap ≥ 0.68μF products.

#3 : For 0201/Cap ≥ 1μF products.

#4 : For 1210(100V)/Cap > 1μF or 1210(250V)/Cap > 0.47μF or 1210(400V~630V)/Cap > 0.22μF.

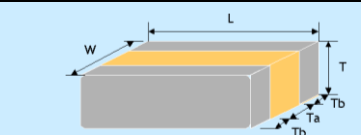
The table only for General Purpose Series, Soft termination and others please refer to individual sheet for details.

## ■ Capacitor Arrays

Outline	Size Inch (mm)	L (mm)	W (mm)	T (mm)/Symbol	S (mm)	BW (mm)	P (mm)	
	0603 x 4 (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
	0402 x 4 (0508 (1220))	2.00±0.15	1.25±0.15	0.85±0.10	T	0.20±0.10	0.25±0.10	0.50±0.10

Reflow soldering process only.

## ■ Low Inductance Capacitors

Outline	Size Inch (mm)	L (mm)	W (mm)	T (mm)/Symbol	T <sub>a</sub> min. (mm)	T <sub>b</sub> min. (mm)	
	0612 (1632)	3.20±0.15	1.60±0.15	0.80±0.10	B	0.5	0.13

Reflow soldering process only.

### ■ FEATURES

- \* A wide selection of sizes is available (0201 to 2225).
- \* High capacitance in given case size.
- \* Capacitor with lead-free termination (pure Tin).

### ■ GENERAL ELECTRICAL DATA

Dielectric	NP0	X7R	X7S	X6S	X5R	Y5V
Size	0201, 0402, 0603, 0805, 1206, 1210, 1812, 1825, 2220, 2225					
Capacitance range	0.1pF to 0.27μF	100pF to 47μF	1μF to 100μF	0.1μF to 100μF	100pF to 220μF	0.01μF to 100μF
Capacitance tolerance	Caps≤5pF <sup>#1</sup> : A (±0.05pF), B (±0.1pF), C (±0.25pF) 5pF<Cap<10pF: C (±0.25pF), D (±0.5pF) Cap≥10pF: F (±1%), G (±2%), J (±5%), K (±10%)	J (±5%), K (±10%), M (±20%)	K (±10%), M (±20%)	K (±10%), M (±20%)	K (±10%), M (±20%)	M (±20%), Z (-20/+80%)
Rated voltage (WVDC)	10V, 16V, 25V, 50V, 100V	4V, 6.3V, 10V, 16V, 25V, 50V, 100V				
Operating temperature	-55 to +125°C			-55 to +105°C	-55 to +85°C	-25 to +85°C
Capacitance characteristic	±30ppm	±15%	±22%		±15%	+30/-80%
Termination	Ni/Sn (lead-free termination)					

#1: NP0, 0.1pF product only provide B tolerance

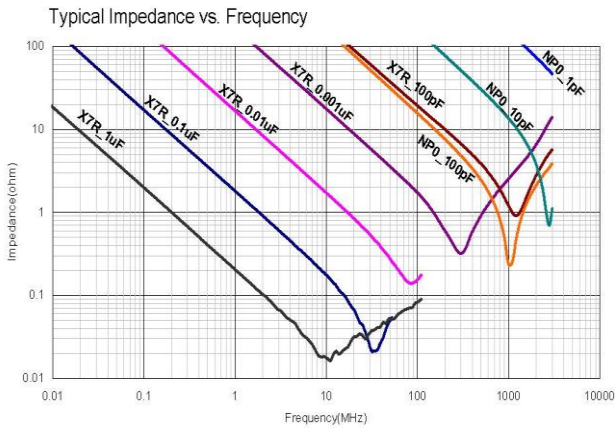
### ■ EXPLANATION OF PART NUMBERS

1206	F	104	Z	500	C	I
<u>Size (Inch (mm))</u>	<u>Dielectric</u>	<u>Capacitance</u>	<u>Tolerance</u>	<u>Rated voltage</u>	<u>Termination</u>	<u>Packaging style</u>
1206 (3216)	F=Y5V	104=10x10 <sup>4</sup> =100nF	Z=-20/+80%	500=50 VDC	C=Cu/Ni/Sn	T=7" reeled

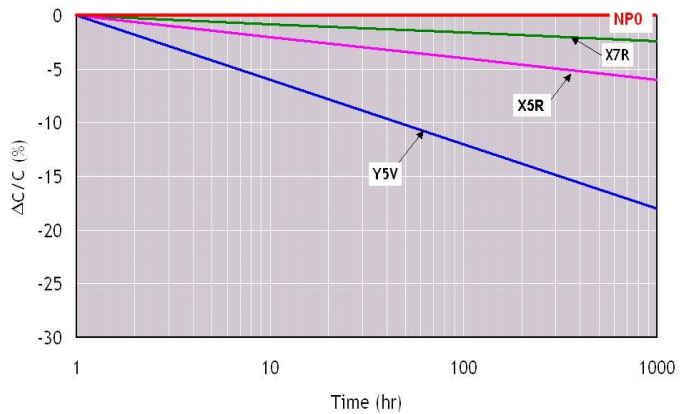
Please refer to page 2 "How to order" for more information.

### ■ ELECTRICAL CHARACTERISTICS

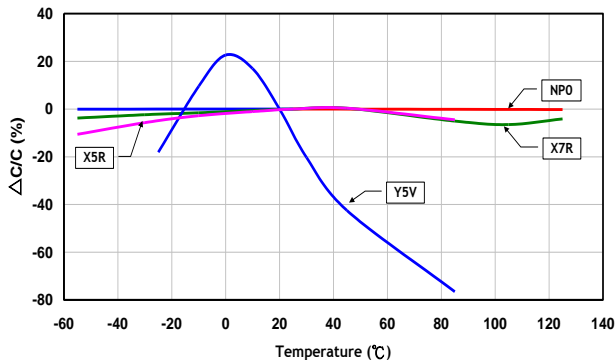
#### 1) Frequency characteristics



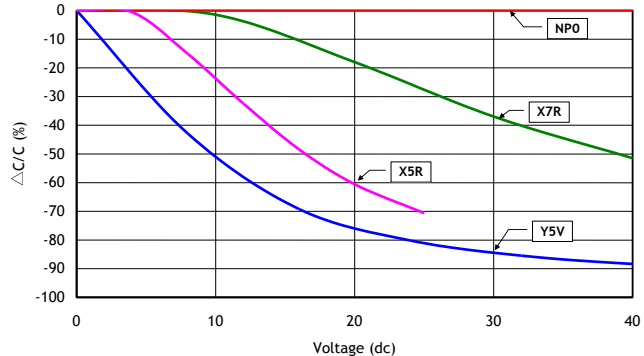
#### 2) Capacitance Change - Typical aging rate



#### 3) Temperature characteristics of capacitance (TCC)



#### 4) DC Bias characteristics



All above typical electronic characteristics are for reference only.  
Please contact with Walsin representative for detail information of any specific item.







# General Purpose Capacitors

## 4V~100V

### Y5V Dielectric (0402, 0603, 0805 Size)

Dielectric		Y5V															
Size		0402					0603					0805					
Rated Voltage (VDC)		6.3	10	16	25	50	6.3	10	16	25	50	6.3	10	16	25	50	100
Capacitance	0.010uF (103)		N	N	N	N		S	S	S	S		A	A	A	A	B
	0.015uF (153)		N	N	N	N		S	S	S	S		A	A	A	A	B
	0.022uF (223)		N	N	N	N		S	S	S	S		A	A	A	A	B
	0.033uF (333)		N	N	N	N		S	S	S	S		A	A	A	A	B
	0.047uF (473)		N	N	N	N		S	S	S	S		A	A	A	A	B
	0.068uF (683)		N	N	N	N		S	S	S	S		A	A	A	A	B
	0.10uF (104)		N	N	N	N		S	S	S	S		A	A	A	A	B
	0.15uF (154)		N	N	N	N		S	S	S	S		A	A	A	A	
	0.22uF (224)	N	N	N	N	N		S	S	S	S		A	A	A	A	
	0.33uF (334)	N	N	N	N	N		S	S	S	X		B	B	B	B	
	0.47uF (474)	N	N	N	N	N		S	S	X	X		B	B	B	B/D	
	0.68uF (684)	N	N	N	N	N		S	X	X			B	B	D	D	
	1.0uF (105)	N	N	N	N	N		S	X	X			B	B	D	D	
	1.5uF (155)							S					D	D			
	2.2uF (225)							S	S	X			D	D	I		
	3.3uF (335)												D	D			
	4.7uF (475)							X	X				D	D	I		
	6.8uF (685)												I				
10uF (106)												I	I	I			
22uF (226)												I	I				

### Y5V Dielectric (1206, 1210, 1812 Size)

Dielectric		Y5V																		
Size		1206						1210						1812						
Rated Voltage (VDC)		6.3	10	16	25	35	50	100	6.3	10	16	25	35	50	100	10	16	25	50	100
Capacitance	0.010uF (103)		B	B	B		B	B							C					D
	0.015uF (153)		B	B	B		B	B							C					D
	0.022uF (223)		B	B	B		B	B							C					D
	0.033uF (333)		B	B	B		B	B							C					D
	0.047uF (473)		B	B	B		B	B							C					D
	0.068uF (683)		B	B	B		B	B							C					D
	0.10uF (104)		B	B	B		B	B		C	C	C		C	C	D	D	D	D	D
	0.15uF (154)		B	B	B		B	C		C	C	C		C	C	D	D	D	D	D
	0.22uF (224)		B	B	B		B	C		C	C	C		C	C	D	D	D	D	D
	0.33uF (334)		B	B	B		B	C		C	C	C		C	C	D	D	D	D	D
	0.47uF (474)		B	B	B		B	C		C	C	C		C		D	D	D	D	D
	0.68uF (684)		B	B	B		B	C		C	C	C		C		D	D	D	D	D
	1.0uF (105)		C	C	C		C/D	C		C	C	C		C		D	D	D	D	D
	1.5uF (155)		C	C	C			C		C	C	C				D	D	D	D	D
	2.2uF (225)		C	C	C		J	C		C	C	C		G		D	D	D	D	D
	3.3uF (335)		J	J	J			C		C	C	C				D	D	D	D	D
	4.7uF (475)		J	J	J	J	P	C		C	C	D		G		D	D	D	D	D
	6.8uF (685)		J	J				C		C	C	D		K		D	D	D	D	D
10uF (106)		J	J	P			D		D	D	G	K	K		D	D	D	K		
22uF (226)		P	P	P					K	K	K									
47uF (476)									K	K						M				
100uF (107)									M											

### X7S Dielectric

Dielectric		X7S																						
Size		0402				0603				0805				1206				1210						
Rated Voltage (VDC)		6.3	10	16	25	6.3	10	16	25	10	16	25	50	100	6.3	10	16	25	50	6.3	10	16	25	50
Capacitance	1.0uF (105)		E											I										
	1.5uF (155)																							
	2.2uF (225)	E	E					X	X															
	3.3uF (335)																							
	4.7uF (475)					X	X					I												
	6.8uF (685)																							
	10uF (106)									I	I													
	22uF (226)																	P*						
47uF (476)																	P*							
100uF (107)																						M*		

- The letter in cell is expressed the symbol of product thickness.
- The letter in cell with "\*" mark is expressed: "M tolerance"(20%) only
- For more information about products with special capacitance or other data, please contact WTC local representative.

**X5R Dielectric**

Dielectric		X5R																																			
Size		0201					0402					0603					0805					1206					1210										
Rated Voltage (VDC)		6.3	10	16	25	50	6.3	10	16	25	50	6.3	10	16	25	50	6.3	10	16	25	50	6.3	10	16	25	50	6.3	10	16	25	50	4	6.3	10	16	25	50
Capacitance	100pF (101)	L	L	L	L	L																															
	220pF (221)	L	L	L	L	L																															
	470pF (471)	L	L	L	L	L																															
	1000pF (102)	L	L	L	L	L																															
	2200pF (222)	L	L	L	L	L																															
	4700pF (472)	L	L	L	L	L																															
	0.010µF (103)	L	L	L	L	L																															
	0.027µF (273)	L	L																																		
	0.033µF (333)	L	L																																		
	0.039µF (393)	L	L																																		
	0.047µF (473)	L	L																																		
	0.056µF (563)	L	L																																		
	0.068µF (683)	L	L																																		
	0.082µF (823)	L	L																																		
	0.10µF (104)	L	L	L	L	L																															
	0.15µF (154)																																				
	0.22µF (224)	L	L	L*																																	
	0.27µF (274)																																				
	0.33µF (334)	L*	L*																																		
	0.39µF (394)																																				
	0.47µF (474)	L																																			
	0.68µF (684)																																				
	0.82µF (824)																																				
1.0µF (105)	L*	L*	L*																																		
1.5µF (155)																																					
2.2µF (225)	L*	L*																																			
3.3µF (335)																																					
4.7µF (475)																																					
6.8µF (685)																																					
10µF (106)																																					
22µF (226)																																					
47µF (476)																																					
100µF (107)																																					
220µF (227)																																					

- The letter in cell is expressed the symbol of product thickness.
- The letter in cell with "\*" mark is expressed: "M tolerance"(20%) only
- For more information about products with special capacitance or other data, please contact WTC local representative.

**X6S Dielectric**

Dielectric		X6S																																		
Size		0201				0402				0603				0805				1206				1210														
Rated Voltage (VDC)		6.3	10	16	25	6.3	10	16	25	4	6.3	10	16	25	4	6.3	10	16	25	50	6.3	10	16	25	50	6.3	10	16	25	50	4	6.3	10	16	25	50
Capacitance	0.10µF (104)	L	L	L	L																															
	0.15µF (154)																																			
	0.22µF (224)	L	L*																																	
	0.33µF (334)																																			
	0.47µF (474)																																			
	0.68µF (684)																																			
	1.0µF (105)	L*																																		
	1.5µF (155)																																			
	2.2µF (225)																																			
	3.3µF (335)																																			
	4.7µF (475)																																			
6.8µF (685)																																				
10µF (106)																																				
22µF (226)																																				
47µF (476)																																				
100µF (107)																																				

- The letter in cell is expressed the symbol of product thickness.
- The letter in cell with "\*" mark is expressed: "M tolerance"(20%) only
- For more information about products with special capacitance or other data, please contact WTC local representative.

# Ultra-small Capacitors

## 01R5 series

### ■ FEATURES

- \* High capacitance in unit size.
- \* High precision dimensional tolerances.
- \* Suitable used in high-accuracy automatic mounting machine.

### ■ GENERAL ELECTRICAL DATA

Size	01R5		
Dielectric	NP0	X7R	X5R
Capacitance*	0.2pF to 100pF	100pF & 1000pF	1000pF to 0.1μF
Capacitance tolerance**	K (±10%), M (±20%)		
Rated voltage (WVDC)	16V, 25V	10V	6.3V, 10V
Operating temperature	-55 to +125°C	-55 to +125°C	-55 to +85°C
Capacitance change	±30ppm	±15%	
Termination	Ni/Sn (lead-free termination)		

### ■ EXPLANATION OF PART NUMBERS

01R5	N	100	J	160	C	I
Size (Inch (mm))	Dielectric	Capacitance	Tolerance	Rated voltage	Termination	Packaging
01R5 = 01005 (0402)	N=NP0(C0G)	100=10x10 <sup>0</sup> =10pF	J=±5%	160=16 VDC	C=Cu/Ni/Sn	T=7" reeled

Please refer to page 2 "How to order" for more information.

### ■ CAPACITANCE RANGE

SIZE	01R5		
	NP0		
	16	25	50
0.2pF (0R2)	V	V	V
0.3pF (0R3)	V	V	V
0.4pF (0R4)	V	V	V
0.5pF (0R5)	V	V	V
1.0pF (1R0)	V	V	V
1.5pF (1R5)	V	V	V
2.0pF (2R0)	V	V	V
3.0pF (3R0)	V	V	V
4.0pF (4R0)	V	V	V
5.0pF (5R0)	V	V	V
6.0pF (6R0)	V	V	V
7.0pF (7R0)	V	V	V
8.0pF (8R0)	V	V	V
9.0pF (9R0)	V	V	V
10pF (100)	V	V	V
12pF (120)	V	V	V
15pF (150)	V	V	V
18pF (180)	V	V	V
22pF (220)	V	V	V
27pF (270)	V	V	V
33pF (330)	V	V	V
39pF (390)	V	V	V
47pF (470)	V	V	V
56pF (560)	V	V	V
68pF (680)	V	V	V
82pF (820)	V	V	V
100pF (101)	V	V	V

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

SIZE	01R5	
	X7R	
	10	
100pF (101)	V	
120pF (121)	V	
150pF (151)	V	
180pF (181)	V	
220pF (221)	V	
270pF (271)	V	
330pF (331)	V	
390pF (391)	V	
470pF (471)	V	
560pF (561)	V	
680pF (681)	V	
820pF (821)	V	
1,000pF (102)	V	

SIZE	01R5	
	X5R	
	6.3	10
1,000pF (102)	V	V
1,500pF (152)		V
2,200pF (222)		V
3,300pF (332)		V
4,700pF (472)		V
6,800pF (682)		V
0.010μF (103)	V	V
0.015μF (153)		
0.022μF (223)	V	
0.033μF (333)	V	
0.047μF (473)	V	
0.068μF (683)		
0.10μF (104)	V	

### ■ FEATURES

- \* High voltage in a given case size.
- \* High stability and reliability.

### ■ GENERAL ELECTRICAL DATA

Dielectric	NP0	X7R	Y5V
Size	0603, 0805, 1206, 1210, 1808, 1812, 1825, 2220, 2225		0805, 1206, 1210, 1812
Capacitance	0.5pF to 0.12μF	100pF to 2.2μF	0.01μF to 0.68μF
Capacitance tolerance	Cap≤5pF: C (±0.25pF) 5pF<Cap<10pF: D (±0.5pF) Cap≥10pF: J (±5%), K (±10%)	K (±10%), M (±20%)	Z (-20/+80%)
Rated voltage (WVDC)	200V to 4000V		200V, 250V
DF/ Q	Cap<30pF: Q≥400+20C Cap≥30pF: Q≥1000	≤2.5%	≤5%
Insulation resistance at Ur	Ur=200~630V: ≥10GΩ or RxC≥100Ω·F whichever is smaller Ur=1000~3000V: ≥10GΩ		
Dielectric strength	200~300V: ≥2 x WVDC 400V~450V: ≥1.2 x WVDC 500~999V: ≥1.5 x WVDC 1000~3000V: ≥1.2 x WVDC 4000: ≥1.1 x WVDC		
Operating temperature	-55 to +125°C		-25 to +85°C
Capacitance characteristic	±30ppm	±15%	+30/-80%
Termination	Ni/Sn (lead-free termination)		

### ■ EXPLANATION OF PART NUMBERS

<u>1808</u>	<u>N</u>	<u>100</u>	<u>J</u>	<u>202</u>	<u>C</u>	<u>I</u>
<u>Size (Inch (mm))</u>	<u>Dielectric</u>	<u>Capacitance</u>	<u>Tolerance</u>	<u>Rated voltage</u>	<u>Termination</u>	<u>Packaging style</u>
1808 (4520)	N=NP0(C0G)	100=10x10 <sup>0</sup> =10pF	J=±5%	202=2000 VDC	C=Cu/Ni/Sn	T=7" reeled

Please refer to page 2 "How to order" for more information.

### ■ CAPACITANCE RANGE

#### 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. 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 / Low ESR Capacitors

## HH series

### ■ FEATURES

- \* High Q and low ESR performance at high frequency.
- \* Quality improvement of telephone calls for low power loss and better performance.

### ■ GENERAL ELECTRICAL DATA

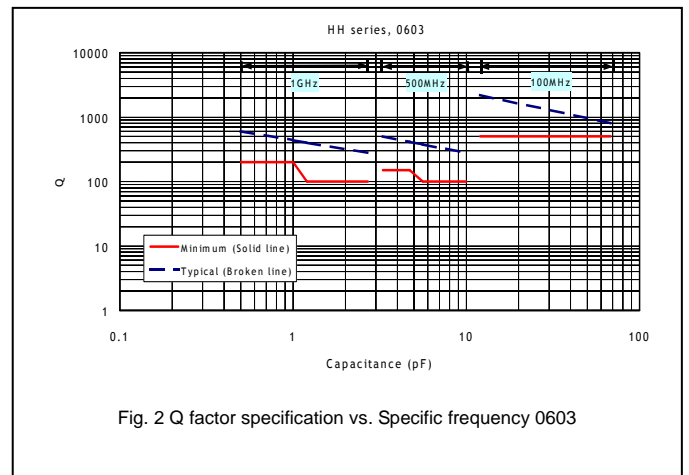
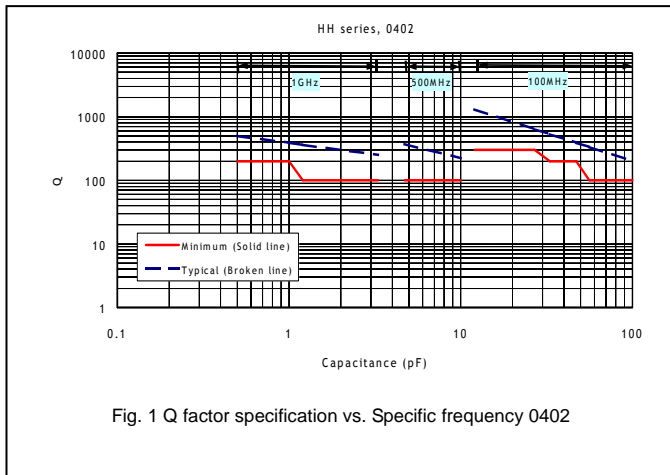
Dielectric	NP0
Size	0201, 0402, 0603, 0805
Capacitance	0.3pF to 3300pF
Capacitance tolerance	Cap≤5pF: B (±0.1pF), C (±0.25pF) 5pF<Cap<10pF: C (±0.25pF), D (±0.5pF) Cap≥10pF: F (±1%), G (±2%), J (±5%)
Rated voltage (WVDC)	10V, 16V, 25V, 50V, 100V, 200V, 250V, 500V, 630V
Q	Cap<30pF: Q≥400+20C Cap≥30pF: Q≥1000
Insulation resistance at Ur	≥10GΩ
Operating temperature	-55 to +125°C
Capacitance change	±30ppm
Termination	Ni/Sn (lead-free termination)

### ■ EXPLANATION OF PART NUMBERS

HH	15	N	100	G	500	C	I
<b>Series</b> HH=High Q/ Low ESR	<b>Size (Inch (mm))</b> 15=0402 (1005)	<b>Dielectric</b> N=NP0 (COG)	<b>Capacitance</b> 100=10x10 <sup>0</sup> =10pF	<b>Tolerance</b> G=±2%	<b>Rated voltage</b> 500=50 VDC	<b>Termination</b> C=Cu/Ni/Sn	<b>Packaging</b> T=7" reeled

\* Please refer to page 2 "How to order" for more information.

### ■ ELECTRICAL CHARACTERISTICS





### ■ CAPACITANCE RANGE

DIELECTRIC		NPO													
SIZE		0201		0402				0603				0805			
Rated Voltage (VAC)		10,16	25,50	16	25	50	100	16	25	50	100	50	100	200, 250	500, 630
Capacitance	0.3pF (0R3)	L	L	N^	N^	N^	N^								
	0.4pF (0R4)	L	L	N^	N^	N^	N^								
	0.5pF (0R5)	L	L	N^	N^	N^	N^	S^	S^	S^	S^	B	B		
	0.6pF (0R6)	L	L	N^	N^	N^	N^	S^	S^	S^	S^	B	B		
	0.7pF (0R7)	L	L	N^	N^	N^	N^	S^	S^	S^	S^	B	B		
	0.8pF (0R8)	L	L	N^	N^	N^	N^	S^	S^	S^	S^	B	B		
	0.9pF (0R9)	L	L	N^	N^	N^	N^	S^	S^	S^	S^	B	B		
	1.0pF (1R0)	L	L	N^	N^	N^	N^	S^	S^	S^	S^	B	B	B	B
	1.2pF (1R2)	L	L	N^	N^	N^	N^	S^	S^	S^	S^	B	B	B	B
	1.5pF (1R5)	L	L	N^	N^	N^	N^	S^	S^	S^	S^	B	B	B	B
	1.8pF (1R8)	L	L	N^	N^	N^	N^	S^	S^	S^	S^	B	B	B	B
	2.0pF (2R0)	L	L	N^	N^	N^	N^	S^	S^	S^	S^	B	B	B	B
	2.2pF (2R2)	L	L	N^	N^	N^	N^	S^	S^	S^	S^	B	B	B	B
	2.7pF (2R7)	L	L	N^	N^	N^	N^	S^	S^	S^	S^	B	B	B	B
	3.0pF (3R0)	L	L	N^	N^	N^	N^	S^	S^	S^	S^	B	B	B	B
	3.3pF (3R3)	L	L	N^	N^	N^	N^	S^	S^	S^	S^	B	B	B	B
	3.9pF (3R9)	L	L	N^	N^	N^	N^	S^	S^	S^	S^	B	B	B	B
	4.0pF (4R0)	L	L	N^	N^	N^	N^	S^	S^	S^	S^	B	B	B	B
	4.7pF (4R7)	L	L	N^	N^	N^	N^	S^	S^	S^	S^	B	B	B	B
	5.0pF (5R0)	L	L	N^	N^	N^	N^	S^	S^	S^	S^	B	B	B	B
	5.6pF (5R6)	L	L	N^	N^	N^	N^	S^	S^	S^	S^	B	B	B	B
	6.0pF (6R0)	L	L	N^	N^	N^	N^	S^	S^	S^	S^	B	B	B	B
	6.8pF (6R8)	L	L	N^	N^	N^	N^	S^	S^	S^	S^	B	B	B	B
	7.0pF (7R0)	L	L	N^	N^	N^	N^	S^	S^	S^	S^	B	B	B	B
	8.0pF (8R0)	L	L	N^	N^	N^	N^	S^	S^	S^	S^	B	B	B	B
	8.2pF (8R2)	L	L	N^	N^	N^	N^	S^	S^	S^	S^	B	B	B	B
	9.0pF (9R0)	L	L	N^	N^	N^	N^	S^	S^	S^	S^	B	B	B	B
	10pF (100)	L	L	N	N	N	N	S	S	S	S	B	B	B	B
	12pF (120)	L	L	N	N	N	N	S	S	S	S	B	B	B	B
	15pF (150)	L	L	N	N	N	N	S	S	S	S	B	B	B	B
	18pF (180)	L	L	N	N	N	N	S	S	S	S	B	B	B	B
	22pF (220)	L	L	N	N	N	N	S	S	S	S	B	B	B	B
	27pF (270)	L	L	N	N	N	N	S	S	S	S	B	B	B	B
33pF (330)	L	L	N	N	N	N	S	S	S	S	B	B	B	B	
39pF (390)			N	N	N	N	S	S	S	S	B	B	B	B	
47pF (470)			N	N	N	N	S	S	S	S	B	B	B	B	
56pF (560)			N	N	N	N	S	S	S	S	B	B	B	B	
68pF (680)			N	N	N	N	S	S	S	S	B	B	B	B	
82pF (820)			N	N	N	N	S	S	S	S	B	B	B	B	
100pF (101)			N	N	N	N	S	S	S	S	B	B	B	B	
120pF (121)			N	N	N	N	S	S	S	S	D	D	D	D	
150pF (151)			N	N	N	N	S	S	S	S	D	D	D	D	
180pF (181)			N	N	N	N	S	S	S	S			D	D	
220pF (221)			N	N	N	N	S	S	S	S			D	D	
270pF (271)			N	N	N	N	S	S	S	S			D	D	
330pF (331)			N	N	N	N	S	S	S	S			D	D	
390pF (391)			N	N	N	N	S	S	S	S			D	D	
470pF (471)			N	N	N	N	S	S	S	S					
560pF (561)							S	S	S	S					
680pF (681)							S	S	S	S					
820pF (821)							S	S	S	S					
1,000pF (102)							S	S	S	S					
1,200pF (122)							X	X	X						
1,500pF (152)							X	X	X						
1,800pF (182)							X	X	X						
2,200pF (222)							X	X	X						
2,700pF (272)							X	X	X						
3,300pF (332)							X	X	X						

1. The letter in cell is expressed the symbol of product thickness.
2. The letter in cell with "A" 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.

### ■ FEATURES

- \* Ultra high Q and low ESR performance at high frequency.
- \* Quality improvement of telephone calls for low power loss and better performance.



### ■ GENERAL ELECTRICAL DATA

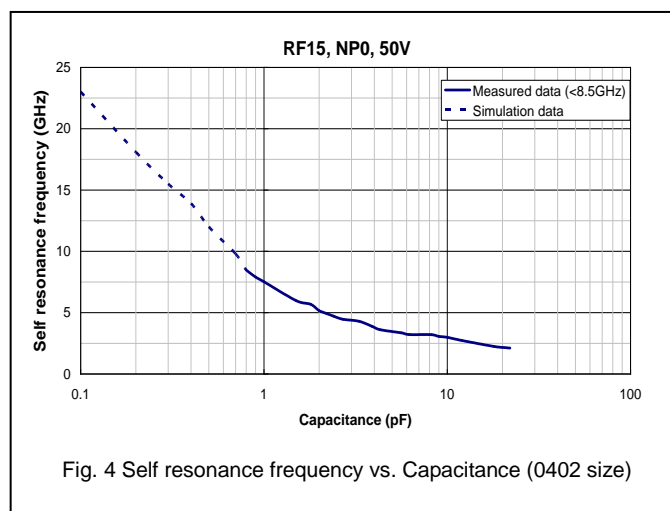
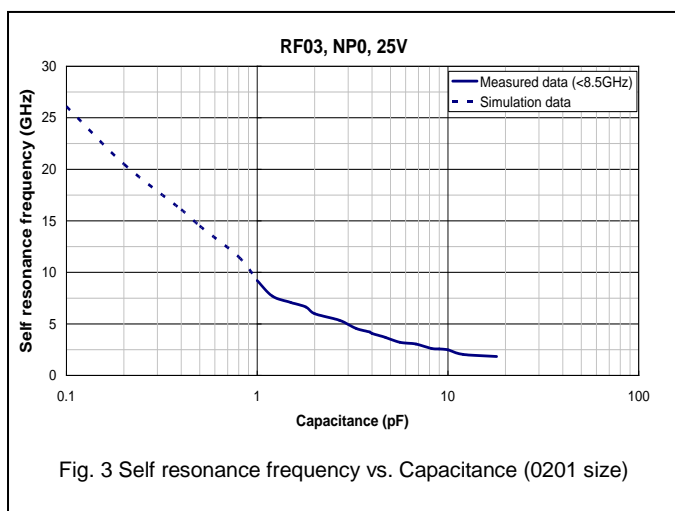
Dielectric	NP0
Size	01005, 0201, 0402, 0603, 0805, 0505, 1111
Capacitance	0.1pF to 1000pF
Capacitance tolerance	Cap≤5pF: A (±0.05pF), B (±0.1pF), C (±0.25pF) 5pF<Cap<10pF: B (±0.1pF), C (±0.25pF), D (±0.5pF) Cap≥10pF: F (±1%), G (±2%), J (±5%)
Rated voltage (WVDC)	6.3V, 10V, 25V, 50V, 100V, 250V, 500V, 1500V
Q	Cap≥30pF, Q≥1000 Cap<30pF, Q≥400+20C
Insulation resistance at Ur	≥10GΩ
Operating temperature	-55 to +125°C
Capacitance change	±30ppm/°C; 0201Cap≥22pF, ±60ppm/°C
Termination	Ni/Sn (lead-free termination)

### ■ EXPLANATION OF PART NUMBERS

<u>RF</u>	<u>15</u>	<u>N</u>	<u>100</u>	<u>G</u>	<u>500</u>	<u>C</u>	<u>I</u>
<b>Series</b> RF=Microwave	<b>Size (Inch (mm))</b> 15=0402 (1005)	<b>Dielectric</b> N=NP0	<b>Capacitance</b> 100=10x10 <sup>0</sup> =10pF	<b>Tolerance</b> G=±2%	<b>Rated voltage</b> 500=50 VDC	<b>Termination</b> C=Cu/Ni/Sn	<b>Packaging</b> T=7" reeled

\* Please refer to page 2 "How to order" for more information.

### ■ ELECTRICAL CHARACTERISTICS



■ CAPACITANCE RANGE

DIELECTRIC		NP0																			
		01005		0201			0402				0603			0805				0505		1111	
SIZE		16	25	6.3 10 25	50	100	25	50	100	200	50	100	250	50	100	250	500	50 100 250	50 100 200 250 500	1500	
RATED VOLTAGE (VDC)																					
Capacitance	0.1pF (0R1)			L	L	L	N	N	N	N	H	H	H								
	0.2pF (0R2)	V	V	L	L	L	N	N	N	N	H	H	H	A	A	A	A				
	0.3pF (0R3)	V	V	L	L	L	N	N	N	N	S	S	S	T	T	T	T				
	0.4pF (0R4)	V	V	L	L	L	N	N	N	N	S	S	S	T	T	T	T	J			
	0.5pF (0R5)	V	V	L	L	L	N	N	N	N	S	S	S	T	T	T	T	J			
	0.6pF (0R6)	V	V	L	L	L	N	N	N	N	S	S	S	T	T	T	T	J			
	0.7pF (0R7)	V	V	L	L	L	N	N	N	N	S	S	S	T	T	T	T	J			
	0.8pF (0R8)	V	V	L	L	L	N	N	N	N	S	S	S	T	T	T	T	J			
	0.9pF (0R9)	V	V	L	L	L	N	N	N	N	S	S	S	T	T	T	T	J			
	1.0pF (1R0)	V	V	L	L	L	N	N	N	N	S	S	S	T	T	T	T	J	G	G	
	1.2pF (1R2)	V	V	L	L	L	N	N	N	N	S	S	S	T	T	T	T	J	G	G	
	1.5pF (1R5)	V	V	L	L	L	N	N	N	N	S	S	S	T	T	T	T	J	G	G	
	1.8pF (1R8)	V	V	L	L	L	N	N	N	N	S	S	S	T	T	T	T	J	G	G	
	2.0pF (2R0)	V	V	L	L	L	N	N	N	N	S	S	S	T	T	T	T	J	G	G	
	2.2pF (2R2)	V	V	L	L	L	N	N	N	N	S	S	S	T	T	T	T	J	G	G	
	2.7pF (2R7)	V	V	L	L	L	N	N	N	N	S	S	S	T	T	T	T	J	G	G	
	3.0pF (3R0)	V	V	L	L	L	N	N	N	N	S	S	S	T	T	T	T	J	G	G	
	3.3pF (3R3)	V	V	L	L	L	N	N	N	N	S	S	S	T	T	T	T	J	G	G	
	3.9pF (3R9)	V	V	L	L	L	N	N	N	N	S	S	S	T	T	T	T	J	G	G	
	4.0pF (4R0)	V	V	L	L	L	N	N	N	N	S	S	S	T	T	T	T	J	G	G	
	4.7pF (4R7)	V	V	L	L	L	N	N	N	N	S	S	S	T	T	T	T	J	G	G	
	5.0pF (5R0)	V	V	L	L	L	N	N	N	N	S	S	S	T	T	T	T	J	G	G	
	5.6pF (5R6)	V	V	L	L	L	N	N	N	N	S	S	S	T	T	T	T	J	G	G	
	6.0pF (6R0)	V	V	L	L	L	N	N	N	N	S	S	S	T	T	T	T	J	G	G	
	6.8pF (6R8)	V		L	L	L	N	N	N	N	S	S	S	T	T	T	T	J	G	G	
	7.0pF (7R0)	V		L	L	L	N	N	N	N	S	S	S	T	T	T	T	J	G	G	
	8.0pF (8R0)	V		L	L	L	N	N	N	N	S	S	S	T	T	T	T	J	G	G	
	8.2pF (8R2)	V		L	L	L	N	N	N	N	S	S	S	T	T	T	T	J	G	G	
	9.0pF (9R0)	V		L	L	L	N	N	N	N	S	S	S	T	T	T	T	J	G	G	
	10pF (100)	V	V	L	L	L	N	N	N	N	S	S	S	T	T	T	T	J	G	G	
	11pF (110)	V	V	L	L		N	N	N	N	S	S	S	T	T	T	T	J	G	G	
	12pF (120)	V	V	L	L		N	N	N	N	S	S	S	T	T	T	T	J	G	G	
	13pF (130)	V	V	L	L		N	N	N	N	S	S	S	T	T	T	T	J	G	G	
	15pF (150)	V	V	L	L		N	N	N	N	S	S	S	T	T	T	T	J	G	G	
	16pF (160)	V	V	L	L		N	N	N	N	S	S	S	T	T	T	T	J	G	G	
	18pF (180)	V	V	L	L		N	N	N	N	S	S	S	T	T	T	T	J	G	G	
	20pF (200)	V	V	L	L		N	N	N	N	S	S	S	T	T	T	T	J	G	G	
	22pF (220)	V	V	L			N	N	N	N	S	S	S	T	T	T	T	J	G	G	
	24pF (240)			L			N	N	N	N	S	S	S	T	T	T	T	J	G	G	
	27pF (270)			L			N	N	N	N	S	S	S	T	T	T	T	J	G	G	
	30pF (300)			L			N	N	N	N	S	S	S	T	T	T	T	J	G	G	
	33pF (330)			L			N	N	N	N	S	S	S	T	T	T	T	J	G	G	
36pF (360)						N	N	N	N	S	S	S	T	T	T	T	J	G	G		
39pF (390)						N	N	N	N	S	S	S	T	T	T	T	J	G	G		
43pF (430)						N	N	N	N	S	S	S	T	T	T	T	J	G	G		
47pF (470)						N	N	N	N	S	S	S	T	T	T	T	J	G	G		
56pF (560)						N	N	N	N	S	S	S	T	T	T	T	J	G	G		
68pF (680)						N	N	N	N	S	S	S	T	T	T	T	J	G	G		
82pF (820)						N	N	N	N	S	S	S	T	T	T	T	J	G	G		
100pF (101)						N	N			S	S	S	T	T	T		J	G	G		
120pF (121)													T	T	T			G	G		
150pF (151)													T	T	T			G	G		
180pF (181)													T	T	T			G	G		
220pF (221)													T	T	T			G	G		
270pF (271)																		G	G		
330pF (331)																		G	G		
390pF (391)																		G	G		
470pF (471)																		G	G		
560pF (561)																		G			
680pF (681)																		G			
820pF (821)																		G			
1,000pF (102)																		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.

# Soft Termination Capacitors

## SH series

### ■ FEATURES

\* MLCC's terminations build a soft & flexible polymer layer to withstand high bending stress in SMT line.

\* Available for any item in standard series range.

### ■ GENERAL ELECTRICAL DATA

Dielectric	NP0	X7R
Size	0603, 0805, 1206, 1210, 1808, 1812, 1825, 2220, 2225	
Capacitance range	0.5pF to 0.22 $\mu$ F	100pF to 22 $\mu$ F
Capacitance tolerance	Cap $\leq$ 5pF: B ( $\pm$ 0.1pF), C ( $\pm$ 0.25pF) 5pF<Cap<10pF: C ( $\pm$ 0.25pF), D ( $\pm$ 0.5pF) Cap $\geq$ 10pF: F ( $\pm$ 1%), G ( $\pm$ 2%), J ( $\pm$ 5%), K ( $\pm$ 10%)	J ( $\pm$ 5%), K ( $\pm$ 10%), M ( $\pm$ 20%)
Rated voltage (WVDC)	10V, 16V, 25V, 50V, 100V, 200V, 250V, 500V, 630V, 1000V, 2000V, 3000V	
Operating temperature	-55 to +125°C	
Capacitance characteristic	$\pm$ 30ppm	$\pm$ 15%
Termination	Ni/Sn (lead-free termination)	

### ■ EXPLANATION OF PART NUMBERS

SH	31	N	100	D	501	C	I
<b>Series</b>	<b>Size (Inch (mm))</b>	<b>Dielectric</b>	<b>Capacitance</b>	<b>Tolerance</b>	<b>Rated voltage</b>	<b>Termination</b>	<b>Packaging</b>
SH=With Ag polymer	31=1206 (3216)	N=NP0(C0G)	100=10x10 <sup>0</sup> =10pF	D= $\pm$ 0.5pF	501=500 VDC	C=Cu/Ni/Sn	T=7" reeled

\* Please refer to page 2 "How to order" for more information.

### ■ PACKAGING DIMENSION AND QUANTITY

Size	L(mm)	W(mm)	Thickness (mm)/Symbol		Paper tape		Plastic tape	
					7" reel	13" reel	7" reel	13" reel
0402 (1005)	1.00 $\pm$ 0.20	0.50 $\pm$ 0.20	0.50 $\pm$ 0.20	E	1,000	-	-	-
0603 (1608)	1.60 $\pm$ 0.20	0.80 $\pm$ 0.10	0.80 $\pm$ 0.07	S	4,000	15,000	-	-
	1.60 $\pm$ 0.30	0.80 $\pm$ 0.30	0.80 $\pm$ 0.30	X	4,000	15,000	-	-
0805 (2012)	2.00 $\pm$ 0.20	1.25 $\pm$ 0.10	0.60 $\pm$ 0.10	A	4,000	15,000	-	-
			0.80 $\pm$ 0.10	B	4,000	15,000	-	-
	2.00 $\pm$ 0.30	1.25 $\pm$ 0.30	1.25 $\pm$ 0.10	D	-	-	3,000	10,000
			1.25 $\pm$ 0.30	I	-	-	3,000	10,000
1206 (3216)	3.20+0.4/-0.1	1.60 $\pm$ 0.15	0.80 $\pm$ 0.10	B	4,000	15,000	-	-
			0.95 $\pm$ 0.10	C	-	-	3,000	10,000
			1.15 $\pm$ 0.15	J	-	-	3,000	10,000
			1.25 $\pm$ 0.10	D	-	-	3,000	10,000
	3.20+0.4/-0.1	1.60 $\pm$ 0.20	1.60 $\pm$ 0.20	G	-	-	2,000	10,000
3.20 $\pm$ 0.50	1.60 $\pm$ 0.50	1.60 $\pm$ 0.50	P	-	-	2,000	9,000	
1210 (3225)	3.20 $\pm$ 0.40	2.50 $\pm$ 0.20	0.95 $\pm$ 0.10	C	-	-	3,000	10,000
			1.25 $\pm$ 0.10	D	-	-	3,000	10,000
			1.60 $\pm$ 0.20	G	-	-	2,000	10,000
	3.20 $\pm$ 0.60	2.50 $\pm$ 0.50	2.00 $\pm$ 0.20	K	-	-	1,000	6,000
			2.50 $\pm$ 0.50	M	-	-	1,000	6,000
1808 (4520)	4.50+0.60/-0.4	2.03 $\pm$ 0.25	1.25 $\pm$ 0.10	D	-	-	2,000	-
			2.00 $\pm$ 0.20	K	-	-	1,000	-
1812 (4532)	4.50+0.60/-0.4	3.20 $\pm$ 0.30	1.25 $\pm$ 0.10	D	-	-	1,000	-
			2.00 $\pm$ 0.20	K	-	-	1,000	-
		3.20 $\pm$ 0.40	2.50 $\pm$ 0.50	M	-	-	500	3,000
1825 (4563)	4.50+0.6/-0.4	6.30 $\pm$ 0.40	1.60 $\pm$ 0.20	G	-	-	1000	-
2220 (5750)	5.70 $\pm$ 0.50	5.00 $\pm$ 0.40	2.00 $\pm$ 0.20	K	-	-	1000	-
			2.50 $\pm$ 0.30	M	-	-	500	-
2225 (5763)	5.70 $\pm$ 0.50	6.30 $\pm$ 0.40	2.80 $\pm$ 0.30	U	-	-	500	-

Unit: pieces



# Soft Termination Capacitors

## SH series

### ■ CAPACITANCE RANGE (SH Series)

#### X7R Dielectric (0402 to 1812 Size, 10V~250V)

DIELECTRIC	X7R																												
	0402				0603					0805				1206					1210					1812					
RATED VOLTAGE (VDC)	10 16	25	50	100	10 16	25	50	100	200 250	10, 16, 25	50	100, 200	250	10, 16	25	50	100	200 250	10, 16	25	50	100	200 250	10, 16, 25	50	100	200 250		
100pF (101)	E	E	E	E	S	S	S	S	X	D	D	D	D																
120pF (121)	E	E	E	E	S	S	S	S	X	D	D	D	D																
150pF (151)	E	E	E	E	S	S	S	S	X	D	D	D	D	D	D	D	D	D											
180pF (181)	E	E	E	E	S	S	S	S	X	D	D	D	D	D	D	D	D	D											
220pF (221)	E	E	E	E	S	S	S	S	X	D	D	D	D	D	D	D	D	D											
270pF (271)	E	E	E	E	S	S	S	S	X	D	D	D	D	D	D	D	D	D											
330pF (331)	E	E	E	E	S	S	S	S	X	D	D	D	D	D	D	D	D	D											
390pF (391)	E	E	E	E	S	S	S	S	X	D	D	D	D	D	D	D	D	D											
470pF (471)	E	E	E	E	S	S	S	S	X	D	D	D	D	D	D	D	D	D											
560pF (561)	E	E	E	E	S	S	S	S	X	D	D	D	D	D	D	D	D	D											
680pF (681)	E	E	E	E	S	S	S	S	X	D	D	D	D	D	D	D	D	D											
820pF (821)	E	E	E	E	S	S	S	S	X	D	D	D	D	D	D	D	D	D											
1,000pF (102)	E	E	E	E	S	S	S	S	X	D	D	D	D	D	D	D	D	D	C	C	C	C	C	C	D	D	D	D	
1,200pF (122)	E	E	E	E	S	S	S	S	X	D	D	D	D	D	D	D	D	D	C	C	C	C	C	C	D	D	D	D	
1,500pF (152)	E	E	E	E	S	S	S	S	X	D	D	D	D	D	D	D	D	D	C	C	C	C	C	C	D	D	D	D	
1,800pF (182)	E	E	E	E	S	S	S	S	X	D	D	D	D	D	D	D	D	D	C	C	C	C	C	C	D	D	D	D	
2,200pF (222)	E	E	E	E	S	S	S	S	X	D	D	D	D	D	D	D	D	D	C	C	C	C	C	C	D	D	D	D	
2,700pF (272)	E	E	E	E	S	S	S	S	X	D	D	D	D	D	D	D	D	D	C	C	C	C	C	C	D	D	D	D	
3,300pF (332)	E	E	E	E	S	S	S	S	X	D	D	D	D	D	D	D	D	D	C	C	C	C	C	C	D	D	D	D	
3,900pF (392)	E	E	E	E	S	S	S	S	X	D	D	D	D	D	D	D	D	D	C	C	C	C	C	C	D	D	D	D	
4,700pF (472)	E	E	E	E	S	S	S	S	X	D	D	D	D	D	D	D	D	D	C	C	C	C	C	C	D	D	D	D	
5,600pF (562)	E	E	E		S	S	S	S	X	D	D	D	D	D	D	D	D	D	C	C	C	C	C	C	D	D	D	D	
6,800pF (682)	E	E	E		S	S	S	S	X	D	D	D	D	D	D	D	D	D	C	C	C	C	C	C	D	D	D	D	
8,200pF (822)	E	E	E		S	S	S	S	X	D	D	D	D	D	D	D	D	D	C	C	C	C	C	C	D	D	D	D	
0.010µF (103)	E	E	E		S	S	S	S	X	D	D	D	D	D	D	D	D	D	C	C	C	C	C	C	D	D	D	D	
0.012µF (123)	E	E			S	S	S	X		D	D	D	D	D	D	D	D	D	C	C	C	C	C	C	D	D	D	D	
0.015µF (153)	E	E			S	S	S	X		D	D	D	D	D	D	D	D	D	C	C	C	C	C	C	D	D	D	D	
0.018µF (183)	E	E			S	S	S	X		D	D	D	D	D	D	D	D	D	C	C	C	C	C	C	D	D	D	D	
0.022µF (223)	E	E			S	S	S	X		D	D	D	D	D	D	D	D	D	C	C	C	C	C	C	D	D	D	D	
0.027µF (273)	E	E			S	S	S	X		D	D	D	D	D	D	D	D	D	C	C	C	C	C	C	D	D	D	D	
0.033µF (333)	E	E			S	S	X	X		D	D	D	D	D	D	D	D	G	C	C	C	C	C	C	D	D	D	D	
0.039µF (393)	E	E			S	S	X	X		D	D	D	D	D	D	D	D	G	C	C	C	C	C	C	D	D	D	D	
0.047µF (473)	E	E			S	S	X	X		D	D	D	D	D	D	D	D	G	C	C	C	C	C	D	D	D	D	D	
0.056µF (563)	E				S	S	X	X		D	D	D	D	D	D	D	D	G	C	C	C	C	C	D	D	D	D	D	
0.068µF (683)	E				S	S	X	X		D	D	D	D	D	D	D	D	G	C	C	C	C	C	G	D	D	D	D	
0.082µF (823)	E				S	S	X	X		D	D	D		D	D	D	D	G	C	C	C	C	C	G	D	D	D	D	
0.10µF (104)	E				S	S	X	X		D	D	D		D	D	D	D	G	C	C	C	C	C	G	D	D	D	D	
0.12µF (124)					S	X				D	D			D	D	D	D		C	C	C	C	C	G	D	D	D	D	
0.15µF (154)					S	X				D	D			C	C	C	G		C	C	C	D	M	D	D	D	K		
0.18µF (184)					S	X				D	D			C	C	C	G		C	C	C	D	M	D	D	D	K		
0.22µF (224)					S	X	X			D	D	I		C	C	C	G		C	C	C	D	M	D	D	D	K		
0.27µF (274)					X	X				I	I			C	C	D	G		C	C	C	G	M	D	D	D	K		
0.33µF (334)					X	X				I	I			C	C	D	G		C	C	C	G	M	D	D	D	K		
0.39µF (394)					X	X				I	I			J	J	P	G		C	C	C	M	M	D	D	D	K		
0.47µF (474)					X	X				I	I			J	J	P	G		C	C	C	M	M	D	D	K	K		
0.56µF (564)					X					I				J	J	P	P		D	D	D	M	M	D	D	K	M		
0.68µF (684)					X					I				J	J	P	P		D	D	D	K	M	D	K	K	M		
0.82µF (824)					X					I				J	J	P	P		D	D	D	K		D	K	K	M		
1.0µF (105)					X					I	I			J	J	P	P		D	D	D	K		D	K	K	M		
1.5µF (155)										I				J	P				K	G	M	M					K		
2.2µF (225)										I				J	P	P			K	G	M	M			M	M			
3.3µF (335)														P	P				K	G	M								
4.7µF (475)										I				P	P				K	K	M								
10µF (106)														P	P				K	M	M								
22µF (226)														P					M										
47µF (476)																													

- The letter in cell is expressed the symbol of product thickness.
- 0805 size, Cap. 4.7µF\_16V only, 0805 size, Cap. 0.22µF\_100V only, 1210 size, Cap. 0.22µF\_10V only.
- For more information about products with special capacitance or other data, please contact WTC local representative.

■ CAPACITANCE RANGE (SH Series)

X7R Dielectric (0805 to 1812 Size, 500V~3000V)

DIELECTRIC		X7R																				
SIZE		0805			1206					1210				1808				1812				
RATED VOLTAGE (VDC)		500	630	1000	500	630	1000	1500	2000	500	630	1000	1500, 2000	500, 630	1000	1500 2000	2500 3000	500 630	1000	1500 2000	3000	
Capacitance	100pF (101)	D	D	D																		
	120pF (121)	D	D	D																		
	150pF (151)	D	D	D	D	D	D	D	D					D	D	D	D					
	180pF (181)	D	D	D	D	D	D	D	D					D	D	D	D					
	220pF (221)	D	D	D	D	D	D	D	D					D	D	D	D					
	270pF (271)	D	D	D	D	D	D	D	D					D	D	D	D		D	D	K	
	330pF (331)	D	D	D	D	D	D	D	D					D	D	D	K		D	D	K	
	390pF (391)	D	D	D	D	D	D	D	D					D	D	D	K		D	D	K	
	470pF (471)	D	D	D	D	D	D	D	D					D	D	D	K		D	D	K	
	560pF (561)	D	D	D	D	D	D	D	D					D	D	D	K		D	D	K	
	680pF (681)	D	D	D	D	D	D	D	D					D	D	D	K		D	D	K	
	820pF (821)	D	D	D	D	D	D	D	G	G				D	D	D	K		D	D	K	
	1,000pF (102)	D	D	D	D	D	D	D	G	G	D	D	D	M	D	D	K	K	D	D	D	K
	1,200pF (122)	D	D	D	D	D	D	D	G	G	D	D	D	M	D	D	K	K	D	D	D	K
	1,500pF (152)	D	D	D	D	D	D	D	G	G	D	D	D	M	D	D	K	K	D	D	D	K
	1,800pF (182)	D	D	D	D	D	D	D	G	G	D	D	D	M	D	D	K	K	D	D	D	M
	2,200pF (222)	D	D	D	D	D	D	D	G	G	D	D	D	M	D	D	K		D	D	D	M
	2,700pF (272)	D	D	D	D	D	D	D	G	G	D	D	D	M	D	D	K		D	D	D	M
	3,300pF (332)	D	D	D	D	D	D	D	G	G	D	D	D	M	D	D	K		D	D	K	M
	3,900pF (392)	D	D	D	D	D	D	D	G		D	D	G	M	D	D	K		D	D	K	
	4,700pF (472)	D	D	D	D	D	D	D	G		D	D	G	M	D	D	K		D	D	K	
	5,600pF (562)	D	D	D	D	D	D	D	G		D	D	G	M	K	K	K		D	D	M	
	6,800pF (682)	D	D	D	D	D	D	D	G		D	D	G	M	K	K	K		D	D	M	
	8,200pF (822)	D	D	D	D	D	D	D			D	D	G	M	K	K			D	D	M	
	0.010μF (103)	D	D		D	D	D				D	D	G		K	K			D	D	M	
	0.012μF (123)	D	D		D	D	G				D	D	G		K	K			D	K		
	0.015μF (153)	D	D		D	D	G				D	D	G		K	K			D	K		
	0.018μF (183)	D	D		D	D					D	D	G		K	K			D	M		
	0.022μF (223)	D	D		G	G					D	D	G		K	K			D	M		
	0.027μF (273)				G	G					G	G	G		K	K			D	M		
	0.033μF (333)				G	G					G	G	G		K	K			D	M		
	0.039μF (393)				G	G					G	G	K		K	K			D	M		
	0.047μF (473)				G	G					G	G	M		K	K			D	M		
	0.056μF (563)				G	G					G	G	M		K	K			K	M		
	0.068μF (683)										K	K	M		K				K	M		
0.082μF (823)										K	K			K				K	M			
0.10μF (104)										K	K							K	M			
0.12μF (124)										M	M							M				
0.15μF (154)										M	M							M				
0.18μF (184)																		M				
0.22μF (224)																		M				
0.27μF (274)																		M				
0.33μF (334)																		M				
0.39μF (394)																		M				
0.47μF (474)																		M				
0.56μF (564)																						
0.68μF (684)																						
0.82μF (824)																						
1.00μF (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.

# Soft Termination Capacitors

## SH series

### ■ CAPACITANCE RANGE (SH Series)

#### NP0 Dielectric 1825 to 2225 Sizes

DIELECTRIC		NP0																	
SIZE		1825						2220						2225					
RATED VOLTAGE (VDC)		100	200 250	500 630	1000	2000	3000	100	200 250	500 630	1000	2000	3000	100	200 250	500 630	1000	2000	3000
Capacitance	10pF (100)	G	G	G	K	K	K	G	G	G	K	K	K	G	G	G	K	K	K
	12pF (120)	G	G	G	K	K	K	G	G	G	K	K	K	G	G	G	K	K	K
	15pF (150)	G	G	G	K	K	K	G	G	G	K	K	K	G	G	G	K	K	K
	18pF (180)	G	G	G	K	K	K	G	G	G	K	K	K	G	G	G	K	K	K
	22pF (220)	G	G	G	K	K	K	G	G	G	K	K	K	G	G	G	K	K	K
	27pF (270)	G	G	G	K	K	K	G	G	G	K	K	K	G	G	G	K	K	K
	33pF (330)	G	G	G	K	K	K	G	G	G	K	K	K	G	G	G	K	K	K
	39pF (390)	G	G	G	K	K	K	G	G	G	K	K	K	G	G	G	K	K	K
	47pF (470)	G	G	G	K	K	K	G	G	G	K	K	K	G	G	G	K	K	K
	56pF (560)	G	G	G	K	K	K	G	G	G	K	K	K	G	G	G	K	K	K
	68pF (680)	G	G	G	K	K	K	G	G	G	K	K	K	G	G	G	K	K	K
	82pF (820)	G	G	G	K	K	K	G	G	G	K	K	K	G	G	G	K	K	K
	100pF (101)	G	G	G	K	K	K	G	G	G	K	K	K	G	G	G	K	K	K
	120pF (121)	G	G	G	K	K	K	G	G	G	K	K	K	G	G	G	K	K	K
	150pF (151)	G	G	G	K	K	K	G	G	G	K	K	K	G	G	G	K	K	K
	180pF (181)	G	G	G	K	K	K	G	G	G	K	K	K	G	G	G	K	K	K
	220pF (221)	G	G	G	K	K	K	G	G	G	K	K	K	G	G	G	K	K	K
	270pF (271)	G	G	G	K	K	K	G	G	G	K	K	K	G	G	G	K	K	K
	330pF (331)	G	G	G	K	K	K	G	G	G	K	K	M	G	G	G	K	K	K
	390pF (391)	G	G	G	K	K	K	G	G	G	K	K	M	G	G	G	K	K	K
	470pF (471)	G	G	G	K	K	K	G	G	G	K	K	M	G	G	G	K	K	K
	560pF (561)	G	G	G	K	K	K	G	G	G	K	K	M	G	G	G	K	K	K
	680pF (681)	G	G	G	K	K	M	G	G	G	K	K	M	G	G	G	K	K	K
	820pF (821)	G	G	G	K	K	M	G	G	G	K	K	M	G	G	G	K	M	M
	1,000pF (102)	G	G	G	K	K	M	G	G	G	K	K	M	G	G	G	K	M	M
	1,200pF (122)	G	G	G	K	K	M	G	G	G	M	M	M	G	G	G	K	M	M
	1,500pF (152)	G	G	G	K	M	M	G	G	G	M	M	M	G	G	G	K	M	M
	1,800pF (182)	G	G	G	K	M	M	G	G	G	M	M	M	G	G	G	K	M	M
	2,200pF (222)	G	G	G	K	M	M	G	G	G	M	M	M	G	G	G	K	M	M
	2,700pF (272)	G	G	G	K	M	M	G	G	G	M	M	M	G	G	G	K	M	M
	3,300pF (332)	G	G	G	K	M		G	G	G	M	M		G	G	G	K	M	M
	3,900pF (392)	G	G	G	M	M		G	G	G	M	M		G	G	G	K	M	
	4,700pF (472)	G	G	G	M	M		G	G	G	M	M		G	G	G	K	M	
	5,600pF (562)	G	G	G	M	M		G	G	G	M	M		G	G	G	M	M	
	6,800pF (682)	G	G	G	M	M		G	G	G	M	M		G	G	G	M	M	
	8,200pF (822)	G	G	G	M	M		G	G	G	M	M		G	G	G	M	M	
0.010uF (103)	G	G	G	M			G	G	G	M			G	G	G	M	M		
0.012uF (123)	G	G	G	M			G	G	G	M			G	G	G	M			
0.015uF (153)	G	G	G				G	G	G				G	G	G				
0.018uF (183)	G	G	G				G	G	G				G	G	G				
0.022uF (223)	G	G	G				G	G	G				G	G	G				
0.027uF (273)	G	G	K				G	G	K				G	G	G				
0.033uF (333)	G	G	K				G	K	K				G	G	G				
0.039uF (393)	G	K	M				G	K	M				G	K	K				
0.047uF (473)	G	K	M				G	M	M				G	K	K				
0.056uF (563)	K	M	M				K	M	M				G	M	M				
0.068uF (683)	K	M	M				K	M					K	M	M				
0.082uF (823)	M	M					M	M					K	M	M				
0.1uF (104)	M	M					M	M					M	M					
0.12uF (124)	M						M						M	M					
0.18uF (184)							M						M						
0.22uF (224)													M						

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.



■ CAPACITANCE RANGE (SH Series)

X7R Dielectric 1825 to 2225 Sizes

DIELECTRIC		X7R																	
SIZE		1825						2220						2225					
RATED VOLTAGE (VDC)		250	500	630	1000	2000	3000	25 50	100	250	500 630 1000	1500	2000	3000	500	630	1000	1500 2000	3000
Capacitance	1,000pF (102)	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K
	1,200pF (122)	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K
	1,500pF (152)	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K
	1,800pF (182)	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K
	2,200pF (222)	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K
	2,700pF (272)	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K
	3,300pF (332)	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K
	3,900pF (392)	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K
	4,700pF (472)	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K
	5,600pF (562)	K	K	K	K	K	M	K	K	K	K	K	K	K	K	K	K	K	M
	6,800pF (682)	K	K	K	K	K	M	K	K	K	K	K	K	K	K	K	K	K	M
	8,200pF (822)	K	K	K	K	K	M	K	K	K	K	K	M	M	K	K	K	K	M
	0.010μF (103)	K	K	K	K	K	M	K	K	K	K	K	M	M	K	K	K	K	M
	0.012μF (123)	K	K	K	K	M	U	K	K	K	K	K	M	U	K	K	K	M	M
	0.015μF (153)	K	K	K	K	M	U	K	K	K	K	K	M	U	K	K	K	M	M
	0.018μF (183)	K	K	K	K	M	U	K	K	K	K	K	U	U	K	K	K	M	U
	0.022μF (223)	K	K	K	K	M		K	K	K	K	K	U		K	K	K	M	
	0.027μF (273)	K	K	K	K	U		K	K	K	K	K	U		K	K	K	M	
	0.033μF (333)	K	K	K	K	U		K	K	K	K	K	U		K	K	K	M	
	0.039μF (393)	K	K	K	K	U		K	K	K	K	K	U		K	K	K	U	
	0.047μF (473)	K	K	K	K	U		K	K	K	K	K	U		K	K	K	U	
	0.056μF (563)	K	K	K	K	U		K	K	K	K	K	U		K	K	K	U	
	0.068μF (683)	K	K	K	K			K	K	K	K	M			K	K	K		
	0.082μF (823)	K	K	K	M			K	K	K	K	M			K	K	K		
	0.10μF (104)	K	K	K	M			K	K	K	K	M			K	K	M		
	0.12μF (124)	K	K	K	U			K	K	K	K	M			K	K	U		
	0.15μF (154)	K	K	K	U			K	K	K	K	U			K	K	U		
	0.18μF (184)	K	K	K	U			K	K	K	K	U			K	K	U		
	0.22μF (224)	K	K	K	U			K	K	K	K	U			K	K	U		
	0.27μF (274)	K	K	K	U			K	K	K	K	U			K	K	U		
	0.33μF (334)	K	K	K	U			K	K	K	K	U			K	K	U		
	0.39μF (394)	K	K	K				K	K	K	K	U			K	K	U		
	0.47μF (474)	K	K	K				K	K	K	K				K	K			
0.56μF (564)	K	M	M				K	K	K	M				K	K				
0.68μF (684)	K	M	M				K	K	K	M				K	K				
0.82μF (824)	K	U	U				K	K	K	U				M	M				
1.0μF (105)	K						K	K	K	U				M	M				
1.5μF (155)	M						K	K	M					U	U				
2.2μF (225)	M						K	K	M										
3.3μF (335)							K	K											
4.7μF (475)							K	M											
6.8μF (685)							M	U											
10μF (106)							U	U											

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 Temperature Capacitors

## HT series

### ■ FEATURES

- \* These products have no polarity.
- \* Their electrostatic capacity temperature response is stable at 15% even in high temperature ranges (up to 150°C).
- \* Larger capacity and smaller size (0402 size) with X8G/X8R characteristics

### ■ GENERAL ELECTRICAL DATA

Dielectric	X8G	X8R
Size	0402, 0603, 0805, 1206, 1210	
Capacitance	0.2pF to 0.015μF	100pF to 0.1μF
Capacitance tolerance*	Cap≤5pF: A (±0.05pF), B (±0.1pF), C (±0.25pF) 5pF<Cap<10pF: C (±0.25pF), D (±0.5pF) Cap≥10pF: F (±1%), G (±2%), J (±5%), K (±10%)	K (±10%), M (±20%)
Rated voltage (WVDC)	10V, 16V, 25V, 50V, 100V	
Q/DF*	Cap<30pF: Q≥400+20C Cap≥30pF: Q≥1000	DF≤5%
Insulation resistance at Ur**	10GΩ or RxC≥500Ω·F whichever is smaller	
Operating temperature	-55 to +150°C	
Capacitance characteristic	±30ppm/°C	±15%
Termination	Ni/Sn (lead-free termination)	

### ■ EXPLANATION OF PART NUMBERS

HT	31	R	103	K	500	C	I
<b>Series</b> HT=High Temperature	<b>Size (Inch (mm))</b> 31=1206 (3216)	<b>Dielectric</b> R=X8R	<b>Capacitance</b> 103=10x10 <sup>3</sup> =10nF	<b>Tolerance</b> K=±10%	<b>Rated voltage</b> 500=50 VDC	<b>Termination</b> C=Cu/Ni/Sn	<b>Packaging</b> T=7" reeled

\* Please refer to page 2 "How to order" for more information.

### ■ CAPACITANCE RANGE

#### X8R Dielectric 0603, 0805, 1206 Sizes

DIELECTRIC	X8R												
	SIZE	0603				0805				1206			
RATED VOLTAGE (VDC)	10	16	25	50	10	16	25	50	10	16	25	50	
Capacitance	100pF (101)	S	S	S	S	D	D	D	D				
	120pF (121)	S	S	S	S	D	D	D	D				
	150pF (151)	S	S	S	S	D	D	D	D	D	D	D	D
	180pF (181)	S	S	S	S	D	D	D	D	D	D	D	D
	220pF (221)	S	S	S	S	D	D	D	D	D	D	D	D
	270pF (271)	S	S	S	S	D	D	D	D	D	D	D	D
	330pF (331)	S	S	S	S	D	D	D	D	D	D	D	D
	390pF (391)	S	S	S	S	D	D	D	D	D	D	D	D
	470pF (471)	S	S	S	S	D	D	D	D	D	D	D	D
	560pF (561)	S	S	S	S	D	D	D	D	D	D	D	D
	680pF (681)	S	S	S	S	D	D	D	D	D	D	D	D
	820pF (821)	S	S	S	S	D	D	D	D	D	D	D	D
	1,000pF (102)	S	S	S	S	D	D	D	D	D	D	D	D
	1,200pF (122)	S	S	S	S	D	D	D	D	D	D	D	D
	1,500pF (152)	S	S	S	S	D	D	D	D	D	D	D	D
	1,800pF (182)	S	S	S	S	D	D	D	D	D	D	D	D
	2,200pF (222)	S	S	S	S	D	D	D	D	D	D	D	D
	2,700pF (272)	S	S	S	S	D	D	D	D	D	D	D	D
	3,300pF (332)	S	S	S	S	D	D	D	D	D	D	D	D
	3,900pF (392)	S	S	S	S	D	D	D	D	D	D	D	D
	4,700pF (472)	S	S	S	S	D	D	D	D	D	D	D	D
	5,600pF (562)	S	S	S	S	D	D	D	D	D	D	D	D
	6,800pF (682)	S	S	S	S	D	D	D	D	D	D	D	D
	8,200pF (822)	S	S	S	S	D	D	D	D	D	D	D	D
	0.010μF (103)	S	S	S	S	D	D	D	D	D	D	D	D
	0.012μF (123)					D	D	D	D	D	D	D	D
	0.015μF (153)					D	D	D	D	D	D	D	D
	0.018μF (183)					D	D	D	D	D	D	D	D
	0.022μF (223)					D	D	D	D	D	D	D	D
	0.027μF (273)					D	D	D	D	D	D	D	D
0.033μF (333)					D	D	D	D	D	D	D	D	
0.039μF (393)					D	D	D	D	D	D	D	D	
0.047μF (473)					D	D	D	D	D	D	D	D	
0.056μF (563)									D	D	D	D	
0.068μF (683)									D	D	D	D	
0.082μF (823)									D	D	D	D	
0.10μF (104)									D	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.

### ■ CAPACITANCE RANGE

#### X8G Dielectric

DIELECTRIC		X8G																		
SIZE		0402				0603					0805					1206		1210		
RATED VOLTAGE (VDC)		10	16	25	50	10	16	25	50	100	10	16	25	50	100	10 16 25	50 100	10 16 25	50 100	
Capacitance	0.1pF (0R1)																			
	0.2pF (0R2)	N	N	N	N															
	0.3pF (0R3)	N	N	N	N															
	0.4pF (0R4)	N	N	N	N															
	0.5pF (0R5)	N	N	N	N	S	S	S	S	S	A	A	A	A	A					
	1.0pF (1R0)	N	N	N	N	S	S	S	S	S	S	A	A	A	A	A				
	1.2pF (1R2)	N	N	N	N	S	S	S	S	S	S	A	A	A	A	A	B	B		
	1.5pF (1R5)	N	N	N	N	S	S	S	S	S	S	A	A	A	A	A	B	B		
	1.8pF (1R8)	N	N	N	N	S	S	S	S	S	S	A	A	A	A	A	B	B		
	2.0pF (2R0)	N	N	N	N	S	S	S	S	S	S	A	A	A	A	A	B	B		
	2.2pF (2R2)	N	N	N	N	S	S	S	S	S	S	A	A	A	A	A	B	B		
	2.7pF (2R7)	N	N	N	N	S	S	S	S	S	S	A	A	A	A	A	B	B		
	3.0pF (3R0)	N	N	N	N	S	S	S	S	S	S	A	A	A	A	A	B	B		
	3.3pF (3R3)	N	N	N	N	S	S	S	S	S	S	A	A	A	A	A	B	B		
	3.9pF (3R9)	N	N	N	N	S	S	S	S	S	S	A	A	A	A	A	B	B		
	4.0pF (4R0)	N	N	N	N	S	S	S	S	S	S	A	A	A	A	A	B	B		
	4.7pF (4R7)	N	N	N	N	S	S	S	S	S	S	A	A	A	A	A	B	B		
	5.0pF (5R0)	N	N	N	N	S	S	S	S	S	S	A	A	A	A	A	B	B		
	5.6pF (5R6)	N	N	N	N	S	S	S	S	S	S	A	A	A	A	A	B	B		
	6.0pF (6R0)	N	N	N	N	S	S	S	S	S	S	A	A	A	A	A	B	B		
	6.8pF (6R8)	N	N	N	N	S	S	S	S	S	S	A	A	A	A	A	B	B		
	7.0pF (7R0)	N	N	N	N	S	S	S	S	S	S	A	A	A	A	A	B	B		
	8.0pF (8R0)	N	N	N	N	S	S	S	S	S	S	A	A	A	A	A	B	B		
	8.2pF (8R2)	N	N	N	N	S	S	S	S	S	S	A	A	A	A	A	B	B		
	9.0pF (9R0)	N	N	N	N	S	S	S	S	S	S	A	A	A	A	A	B	B		
	10pF (100)	N	N	N	N	S	S	S	S	S	S	A	A	A	A	A	B	B	C	C
	12pF (120)	N	N	N	N	S	S	S	S	S	S	A	A	A	A	A	B	B	C	C
	15pF (150)	N	N	N	N	S	S	S	S	S	S	A	A	A	A	A	B	B	C	C
	18pF (180)	N	N	N	N	S	S	S	S	S	S	A	A	A	A	A	B	B	C	C
	22pF (220)	N	N	N	N	S	S	S	S	S	S	A	A	A	A	A	B	B	C	C
	27pF (270)	N	N	N	N	S	S	S	S	S	S	A	A	A	A	A	B	B	C	C
	33pF (330)	N	N	N	N	S	S	S	S	S	S	A	A	A	A	A	B	B	C	C
	39pF (390)	N	N	N	N	S	S	S	S	S	S	A	A	A	A	A	B	B	C	C
	47pF (470)	N	N	N	N	S	S	S	S	S	S	A	A	A	A	A	B	B	C	C
	56pF (560)	N	N	N	N	S	S	S	S	S	S	A	A	A	A	A	B	B	C	C
	68pF (680)	N	N	N	N	S	S	S	S	S	S	A	A	A	A	A	B	B	C	C
	82pF (820)	N	N	N	N	S	S	S	S	S	S	A	A	A	A	A	B	B	C	C
	100pF (101)	N	N	N	N	S	S	S	S	S	S	A	A	A	A	A	B	B	C	C
	120pF (121)	N	N	N	N	S	S	S	S	S	S	A	A	A	A	A	B	B	C	C
	150pF (151)	N	N	N	N	S	S	S	S	S	S	A	A	A	A	A	B	B	C	C
	180pF (181)	N	N	N	N	S	S	S	S	S	S	A	A	A	A	A	B	B	C	C
	220pF (221)	N	N	N	N	S	S	S	S	S	S	A	A	A	A	A	B	B	C	C
	270pF (271)	N	N	N	N	S	S	S	S	S	S	A	A	A	A	A	B	B	C	C
	330pF (331)	N	N	N	N	S	S	S	S	S	S	A	A	A	A	A	B	B	C	C
	390pF (391)	N	N	N	N	S	S	S	S	S	S	B	B	B	B	B	B	B	C	C
	470pF (471)	N	N	N	N	S	S	S	S	S	S	B	B	B	B	B	B	B	C	C
	560pF (561)					S	S	S	S	S	S	B	B	B	B	B	B	B	C	C
680pF (681)					S	S	S	S	S	S	B	B	B	B	B	B	B	C	C	
820pF (821)					S	S	S	S	S	S	B	B	B	B	B	B	B	C	C	
1,000pF (102)					S	S	S	S	S	S	B	B	B	B	B	B	B	C	C	
1,200pF (122)					X	X	X	X			B	B	B	B	B	B	B	C	C	
1,500pF (152)					X	X	X	X			B	B	B	B	B	B	B	C	C	
1,800pF (182)					X	X	X	X			B	B	B	B	B	B	B	C	C	
2,200pF (222)					X	X	X	X			B	B	B	B	B	B	B	C	C	
2,700pF (272)					X	X	X	X			D	D	D	D	D	B	B	C	C	
3,300pF (332)					X	X	X	X			D	D	D	D	D	B	B	C	C	
3,900pF (392)											D	D	D	D	D	B	B	C	C	
4,700pF (472)											D	D	D	D	D	B	B	C	C	
5,600pF (562)											D	D	D	D		B	B	C	C	
6,800pF (682)											D	D	D	D		C	C	C	C	
8,200pF (822)											D	D	D	D		D	D	C	C	
0.010uF (103)											D	D	D	D		D	D	C	C	

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.

### ■ FEATURES

- \* High voltage in a given case size.
- \* Circuit open during product cracking.
- \* High stability and reliability.

### ■ GENERAL ELECTRICAL DATA

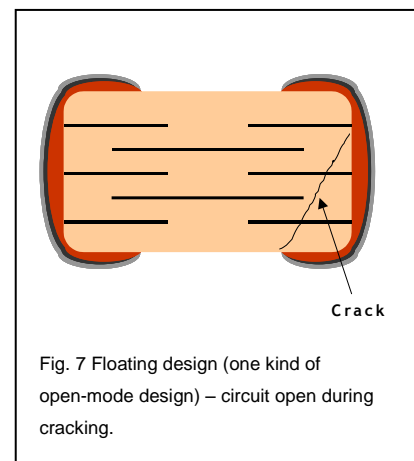
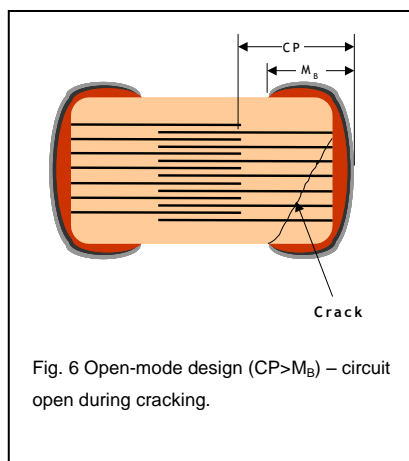
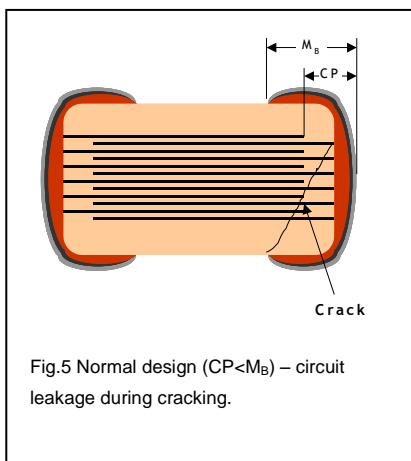
Dielectric	X7R
Size	0805, 1206, 1210, 1812
Capacitance	100pF to 1μF
Capacitance tolerance	K (±10%), M (±20%)
Rated voltage (WVDC)	50V, 100V, 200V, 250V, 500V
DF(Tan δ)	≤2.5%
Insulation resistance at Ur	≥10GΩ or RxC≥500Ω·F whichever is smaller
Dielectric strength	100V: ≥2.5 x WVDC 200V and 250V: ≥2 x WVDC 500V: ≥1.5 x WVDC
Operating temperature	-55 to +125°C
Capacitance characteristic	±15%
Termination	Ni/Sn (lead-free termination)

### ■ EXPLANATION OF PART NUMBERS

OP	32	B	103	K	201	C	I
<b>Series</b> OP=Open-mode	<b>Size (Inch (mm))</b> 32=1210 (3225)	<b>Dielectric</b> B=X7R	<b>Capacitance</b> 103=10x103=10nF	<b>Tolerance</b> K=±10%	<b>Rated voltage</b> 201=200 VDC	<b>Termination</b> C=Cu/Ni/Sn	<b>Packaging</b> T=7" reeled

\* Please refer to page 2 "How to order" for more information.

### ■ INNER CONSTRUCTION OF OPEN-MODE DESIGN



### ■ CAPACITANCE RANGE

DIELECTRIC		X7R																
SIZE		0805				1206					1210				1812			
RATED VOLTAGE (VDC)		100	200	250	500 630	50	100	200	250	500 630	100	200	250	500 630	100	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	D	D	D								
	180pF (181)	B	B	B	B	B	B	D	D	D								
	220pF (221)	B	B	B	B	B	B	D	D	D								
	270pF (271)	B	B	B	B	B	B	D	D	D								
	330pF (331)	B	B	B	B	B	B	D	D	D								
	390pF (391)	B	B	B	B	B	B	D	D	D								
	470pF (471)	B	B	B	B	B	B	D	D	D								
	560pF (561)	B	B	B	B	B	B	D	D	D								
	680pF (681)	B	B	B	B	B	B	D	D	D								
	820pF (821)	B	B	B	B	B	B	D	D	D								
	1,000pF (102)	B	B	B	B	B	B	D	D	D	C	C	C	D	D	D	D	D
	1,200pF (122)	B	B	B	B	B	B	D	D	D	C	C	C	D	D	D	D	D
	1,500pF (152)	B	B	B	B	B	B	D	D	D	C	C	C	D	D	D	D	D
	1,800pF (182)	B	B	B	B	B	B	D	D	D	C	C	C	D	D	D	D	D
	2,200pF (222)	B	B	B	B	B	B	D	D	D	C	C	C	D	D	D	D	D
	2,700pF (272)	B	B	B	B	B	B	D	D	D	C	C	C	D	D	D	D	D
	3,300pF (332)	B	B	B	B	B	B	D	D	D	C	C	C	D	D	D	D	D
	3,900pF (392)	B	B	B	B	B	B	D	D	D	C	C	C	D	D	D	D	D
	4,700pF (472)	B	B	B	D	B	B	D	D	D	C	C	C	D	D	D	D	D
	5,600pF (562)	B	D	D	D	B	B	D	D	D	C	C	C	D	D	D	D	D
	6,800pF (682)	B	D	D	D	B	B	D	D	D	C	C	C	D	D	D	D	D
	8,200pF (822)	B	D	D	D	B	B	D	D	D	C	C	C	D	D	D	D	D
	0.010μF (103)	B	D	D	D	B	B	D	D	D	C	C	C	D	D	D	D	D
	0.012μF (123)	B	D	D		B	B	D	D	D	C	C	C	D	D	D	D	D
	0.015μF (153)	B	D	D		B	B	D	D	D	C	C	C	D	D	D	D	D
	0.018μF (183)	B	D	D		B	B	D	D	D	C	C	C	D	D	D	D	D
	0.022μF (223)	B	D	D		B	B	D	D	G	C	C	C	D	D	D	D	D
	0.027μF (273)	D				B	B	D	D	G	C	C	C	D	D	D	D	D
	0.033μF (333)	D				B	B	G	G	G	C	C	C	G	D	D	D	D
	0.039μF (393)	D				B	B	G	G		C	C	C	G	D	D	D	D
	0.047μF (473)	D				B	B	G	G		C	D	D	G	D	D	D	D
	0.056μF (563)					B	B	G	G		C	D	D	G	D	D	D	K
	0.068μF (683)					B	B	G	G		C	G	G	G	D	D	D	K
	0.082μF (823)					D	D	G	G		C	G	G		D	D	D	K
	0.10μF (104)					D	D	G	G		C	G	G		D	D	D	K
	0.12μF (124)					D	D				C	G	G		D	D	D	
	0.15μF (154)					D	G				D	M	M		D	K	K	
	0.18μF (184)					D	G				D	M	M		D	K	K	
0.22μF (224)					D	G				D	M	M		D	K	K		
0.27μF (274)					D					G				D	K	K		
0.33μF (334)					D					G				D	K	K		
0.39μF (394)					D					M				D	K	K		
0.47μF (474)					D					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. For more information about products with special capacitance or other data, please contact WTC local representative.

# Capacitor Arrays Capacitors

## Y4C2/Y4C3 series

### ■ FEATURES

- \* High density mounting due to mounting space saving.
- \* Mounting cost saving.
- \* Increased throughput.

### ■ GENERAL ELECTRICAL DATA

Dielectric	NP0		X7R		Y5V
Size	4x0402	4x0603	4x0402	4x0603	4x0603
Capacitance*	10pF to 270pF	10pF to 470pF	1000pF to 100nF	180pF to 100nF	10nF to 100nF
Capacitance tolerance**	J (±5%), K (±10%)		K (±10%), M (±20%)		Z (-20/+80%)
Rated voltage (WVDC)	25,50V,100V	25, 50V,100V	10V, 16V, 25V, 50V	16V, 25V, 50V	16V, 50V
Q/DF(Tan δ)*	Cap<30pF: Q≥400+20C Cap≥30pF: Q≥1000		Ur=50V, ≤2.5% Ur=25V&16V, ≤3.5% Ur=10V, ≤5.0%		Ur=50V, ≤5% Ur=16V, ≤7%
Insulation resistance at Ur	≥10GΩ		≥10GΩ or RxC≥500ΩxF whichever is less		
Operating temperature	-55 to +125°C				-25 to +85°C
Capacitance characteristic	±30ppm		±15%		+30/-80%
Termination	Ni/Sn (lead-free termination)				

### ■ EXPLANATION OF PART NUMBERS

Y	4C	3	B	103	K	500	C	I
<b>Series</b> Y=Capacitor array	<b>Cap. Nr.</b> 4C=4xCap	<b>Termination pitch</b> 3=0.03" pitch 2=0.02" pitch	<b>Dielectric</b> B=X7R	<b>Capacitance</b> 103=10x10 <sup>3</sup> =10nF	<b>Tolerance</b> K=±10%	<b>Rated voltage</b> 500=50 VDC	<b>Termination</b> C=Cu/Ni/Sn	<b>Packaging</b> T=7" reeled

\* Please refer to page 2 "How to order" for more information.

### ■ CAPACITANCE RANGE

SIZE	4 x 0402					4 x 0603					
	DIELECTRIC	NP0	X7R			NP0	X7R			Y5V	
RATED VOLTAGE (VDC)	25 50 100	10	16	25	50	25 50 100	16	25	50	16	50
Capacitance	10pF (100)	T				B					
	15pF (150)	T				B					
	22pF (220)	T				B					
	33pF (330)	T				B					
	47pF (470)	T				B					
	68pF (680)	T				B					
	100pF (101)	T				B					
	150pF (151)	T				B		B	B		
	180pF (181)	T				B		B	B		
	220pF (221)	T				B		B	B		
	270pF (271)	T				B		B	B		
	330pF (331)					B		B	B		
	470pF (471)					B		B	B		
	6,80pF (681)							B	B		
	1,000pF (102)		T	T	T	T		B	B		
	1,500pF (152)		T	T	T	T		B	B		
	2,200pF (222)		T	T	T	T		B	B		
	3,300pF (332)		T	T	T	T		B	B		
	4,700pF (472)		T	T	T	T		B	B		
	6,800pF (682)		T	T	T	T		B	B		
0.010μF (103)		T	T	T	T		B	B		B	
0.015μF (153)		T	T	T			B	B	B	B	
0.022μF (223)		T	T	T			B	B	B	B	
0.033μF (333)		T	T	T			B			B	
0.047μF (473)		T	T	T			B			B	
0.068μF (683)		T	T	T			B			B	
0.10μF (104)		T	T	T			B		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.

### ■ FEATURES

- \* Standard size with thin thickness.
- \* Small size with high capacitance.
- \* Capacitor with lead-free termination (pure Tin).

### ■ GENERAL ELECTRICAL DATA

Dielectric	X7R	X5R	Y5V
Size	0402, 0603, 0805, 1206, 1210		
Capacitance range	0.22μF to 4.7μF	0.22μF to 22μF	1μF to 10μF
Capacitance tolerance	K (±10%), M (±20%)		Z (-20/+80%)
Rated voltage (WVDC)	6.3V, 10V, 16V, 25V	6.3V, 10V, 16V, 25V, 50V	10V, 16V, 25V, 50V
DF(Tan δ)*	16V, 10V: ≤10.0% 6.3V: ≤15.0%		50V: ≤7% 25V: ≤9% 16V, 10V: ≤12.5%
Insulation resistance at Ur	RxC≥100ΩxF		
Operating temperature	-55 to +125°C	-55 to +85°C	-25 to +85°C
Capacitance characteristic	±15%		+30/-80%
Termination	Ni/Sn (lead-free termination)		

### ■ EXPLANATION OF PART NUMBERS

TT	31	X	225	K	100	C	I
<b>Series</b> TT=Low profile	<b>Size (Inch (mm))</b> 31=1206 (3216)	<b>Dielectric</b> X=X5R	<b>Capacitance</b> 225=22x10 <sup>5</sup> =2.2μF	<b>Tolerance</b> K=±10%	<b>Rated voltage</b> 100=10 VDC	<b>Termination</b> C=Cu/Ni/Sn	<b>Packaging</b> T=7" reeled

\* Please refer to page 2 "How to order" for more information.

### ■ CAPACITANCE RANGE

Dielectric		X5R																
Size		0402		0603		0805				1206				1210				
Rated voltage (VDC)		6.3	25	10	16	6.3	10	16	25	6.3	10	16	25	50	10	16	25	
Capacitance	0.22μF (224)		L	H	H													
	0.47μF (474)	L	L															
	1.0μF (105)	L		H	H		T	T	T		T	T	T					
	1.5μF (155)						T	T			T	T	T					
	2.2μF (225)	L				T	T	T	T		T	T	T	T				
	3.3μF (335)										T	T	T		T			
	4.7μF (475)	L		H		T	T	T	T		T	T	T		T			
	6.8μF (685)																	
	10μF (106)					T	T	T		J	T		T		T		T	
	22μF (226)					T	T			T		T				T		
47μF (476)									T									

Dielectric		X7R							Y5V							
Size		0805			1206		1210	0805				1206			1210	
Rated voltage (VDC)		10	16, 25	10	25	50	100	10	16	25	50	10	16	25	50	10
Capacitance	1.0μF (105)				T						T					
	1.5μF (155)															
	2.2μF (225)		T			T	K		T			T	T	T	T	
	3.3μF (335)							T	T							
	4.7μF (475)	T			T			T	T			T	T			
	6.8μF (685)											T				
	10μF (106)			T				T				T				T
22μF (226)																

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

## 0612 series

### ■ FEATURES

- \* Standard size with thin thickness.
- \* Small size with high capacitance.
- \* Capacitor with lead-free termination (pure Tin).
- \* MLCC with low ESL performance.

### ■ GENERAL ELECTRICAL DATA

Dielectric	X7R
Size	0612
Capacitance range	10nF to 150nF
Capacitance tolerance	K (±10%), M (±20%)
Rated voltage (WVDC)	50V
DF(Tan δ)*	≤2.5%
Insulation resistance at Ur	≥10GΩ or RxC≥500ΩxF whichever is less
Operating temperature	-55 to +125°C
Capacitance characteristic	±15%
Termination	Ni/Sn (lead-free termination)
ESL	500pH

### ■ EXPLANATION OF PART NUMBERS

0612	B	103	K	500	C	I
<u>Size (Inch (mm))</u> 0612 (1632)	<u>Dielectric</u> B=X7R	<u>Capacitance</u> 103=10x10 <sup>3</sup> =10nF	<u>Tolerance</u> K=±10%	<u>Rated voltage</u> 500=50VDC	<u>Termination</u> C=Cu/Ni/Sn	<u>Packaging</u> T=7" reeled

\* Please refer to page 2 "How to order" for more information.

### ■ 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.



### ■ FEATURES

- \* High voltage in a given case size.
- \* High stability and reliability.
- \* RoHS compliant.



### ■ GENERAL ELECTRICAL DATA

Dielectric	NPO	X7R
Size	1808, 1812, 2211	1808, 1812, 2220, 2211
Capacitance	4pF to 680pF	100pF to 4700pF
Capacitance tolerance	J (±5%), K (±10%)	
Rated voltage (WVAC)	250Vrms	
Q/ DF(Tan δ)	Cap<30pF: Q≥400+20C Cap≥30pF: Q≥1000	DF≤2.5%
Insulation resistance at Ur	≥10GΩ	
Dielectric withstanding strength	1500VAC	
Peak impulse voltage	5000V	
Operating temperature	-55 to +125°C	
Capacitance characteristic	±30ppm	±15%
Termination	Ni/Sn (lead-free termination)	
Certified number	TUV: R50195920, UL: E250427, E182369	
Test standard	EN 60384-14, UL 60950:2000, UL 60384-14	

### ■ EXPLANATION OF PART NUMBERS

S2	42	N	100	J	302	L	I
<b>Series</b> S2=X1/Y2	<b>Size (Inch (mm))</b> 42=1808 (4520)	<b>Dielectric</b> N=NPO	<b>Capacitance</b> 100=10x10 <sup>0</sup> =10pF	<b>Tolerance</b> J=±5%	<b>Rated voltage</b> 302=3000 VDC 602=6000 Impulse Voltage	<b>Termination</b> L=Ag/Ni/Sn C=Cu/Ni/Sn	<b>Packaging</b> T=7" reeled

\* Please refer to page 2 "How to order" for more information.

### ■ CAPACITANCE RANGE

DIELECTRIC	NPO				
	SIZE	1808	1812	2211	
	RATED VOLTAGE (VDC)	3000	3000	3000	
PEAK IMPULSE VOLTAGE	5000	5000	5000	6000	
Capacitance	4pF (4R0)	F*		K*	K
	5pF (5R0)	F*		K*	K
	10pF (100)	F*	D	K*	K
	12pF (120)	F*	D	K*	K
	15pF (150)	F*	D	K*	K
	18pF (180)	F*	D	K*	K
	22pF (220)	F*	D	K*	K
	27pF (270)	F*	D	K*	K
	33pF (330)	F*	D	K*	K
	39pF (390)	G*	D	K*	K
	47pF (470)	G*	D	K*	K
	56pF (560)	G*	D	K*	K
	68pF (680)	G*	D	K*	K
	82pF (820)	G*	D	K*	K
	100pF (101)	K	D	K*	K
	120pF (121)	K	D	M	
	150pF (151)	K	D	M	
	180pF (181)		D	M	
	220pF (221)		K	M	
	270pF (271)		K	M	
330pF (331)		K	M		
390pF (391)		K	M		
470pF (471)		K	M		
560pF (561)			M		
680pF (681)			M		

DIELECTRIC	X7R				
	SIZE	1808	1812	2211	2220
	RATED VOLTAGE (VDC)	3000			
PEAK IMPULSE VOLTAGE	5000				
Capacitance	56pF (560)				
	68pF (680)				
	82pF (820)				
	100pF (101)	G			
	120pF (121)	G			
	150pF (151)	G	G	G*	
	180pF (181)	G	G	G*	K
	220pF (221)	G	G	G*	K
	270pF (271)	K	G	G*	K
	330pF (331)	K	G	G*	K
	390pF (391)	K	G	G*	K
	470pF (471)	K	G	K*	K
	560pF (561)	K	G	K*	K
	680pF (681)	K	K	K*	K
	820pF (821)	K	K	K*	K
	1,000pF (102)	K	M	M*	K
	1,200pF (122)				M
	1,500pF (152)				M
	1,800pF (182)				M
	2,200pF (222)			M	M
3,300pF (332)				M	
4,700pF (472)				M	

- The letter in cell is expressed the symbol of product thickness.
- The letter in cell with "\*" mark is expressed product with Cu/Ni/Sn terminations.
- For more information about products with special capacitance or other data, please contact WTC local representative.

### ■ PACKAGING DIMENSION AND QUANTITY (X1/Y2 & X2 Series)

Unit: pieces

Size Inch (mm)	L (mm)	W (mm)	M <sub>B</sub> min(mm)	T (mm)/Symbol		7" Plastic tape
1808 (4520)	4.50±0.5/-0.3	2.03±0.25	0.26	1.40±0.15	F	2,000
				1.60±0.20	G	1,000
				2.00±0.20	K	1,000
1812 (4532)	4.50±0.5/-0.3	3.20±0.30	0.26	1.60±0.20	G	1,000
				2.00±0.20	K	1,000
				2.50±0.30	M	500
2220 (5750)	5.70±0.40	5.00±0.40	0.30	2.00±0.20	K	1,000
				2.50±0.30	M	500
				1.60±0.20	G	1,000
2211 (5728)	5.70±0.40	2.80±0.30	0.30	2.00±0.20	K	1,000
				2.50±0.30	M	500
				2.50±0.30	M	500

# Safety Certificated Capacitors X2

## S3 series

### ■ FEATURES

- \* High voltage in a given case size.
- \* High stability and reliability.
- \* RoHS compliant.



### ■ GENERAL ELECTRICAL DATA

Dielectric	NP0	X7R
Size	1808, 1812	
Capacitance*	3.9pF to 1000pF	150pF to 5600pF
Capacitance tolerance	J (±5%), K (±10%)	K (±10%), M (±20%)
Rated voltage (WVDC)	2000V, 3000V	
Rated voltage (WVAC)	250Vrms	
Q/ DF(Tan δ)	Cap<30pF: Q≥400+20C Cap≥30pF: Q≥1000	Tan δ≤2.5%
Insulation resistance at Ur	≥10GΩ	
Dielectric withstanding strength	1500VAC	
Peak impulse voltage (X2)	2500V	
Operating temperature	-55 to +125°C	
Capacitance characteristic	±30ppm	±15%
Termination	Ni/Sn (lead-free termination)	
Certified number	TUV: R50195920, UL: E250427, E182369	
Test standard	EN 60384-14, UL 60950:2000, UL 60384-14	

### ■ EXPLANATION OF PART NUMBERS

S3	42	N	100	J	202	L	I
<b>Series</b> S3=X2	<b>Size (Inch (mm))</b> 42=1808 (4520)	<b>Dielectric</b> N=NP0	<b>Capacitance</b> 100=10x10 <sup>0</sup> =10pF	<b>Tolerance</b> J=±5%	<b>Rated voltage</b> 202=2000 VDC	<b>Termination</b> L=Ag/Ni/Sn	<b>Packaging</b> T=7" reeled

\* Please refer to page 2 "How to order" for more information.

### ■ CAPACITANCE RANGE

DIELECTRIC	NP0			
	1808		1812	
	2000	3000	3000	
SIZE				
RATED VOLTAGE (VDC)				
Capacitance	3.9pF (3R9)	F*	F*	
	4.7pF (4R7)	F*	F*	
	5.0pF (5R0)	F*	F*	
	5.6pF (5R6)	F*	F*	
	6.8pF (6R8)	F*	F*	
	8.2pF (8R2)	F*	F*	
	10pF (100)	F*	F*	D
	12pF (120)	F*	F*	D
	15pF (150)	F*	F*	D
	18pF (180)	F*	F*	D
	22pF (220)	F*	F*	D
	27pF (270)	F*	F*	D
	33pF (330)	F*	F*	D
	39pF (390)	G*	G*	D
	47pF (470)	G*	G*	D
	56pF (560)	G*	G*	D
	68pF (680)	G*	G*	D
	82pF (820)	G*	G*	D
	100pF (101)	K*	K*	D
	120pF (121)	K*	K*	D
	150pF (151)	K*	K*	D
	180pF (181)	K*	K*	D
	220pF (221)	K*	K*	D
	270pF (271)	K*	K*	D
330pF (331)	K*	K*	D	
390pF (391)	K*	K*	D	
470pF (471)	K*	K*	D	
560pF (561)	K*	K*	D	
680pF (681)	K*	K*	K	
820pF (821)	K*	K*	K	
1,000pF (102)	K*	K*	K	

DIELECTRIC	X7R				
	1808		1812		
	2000	3000	2000	3000	
SIZE					
RATED VOLTAGE (VDC)					
Capacitance	150pF (151)	G			
	180pF (181)	G*	G*		
	220pF (221)	G*	G*		
	270pF (271)	G*	G*	G	
	330pF (331)	G*	G*	G*	G*
	390pF (391)	G*	G*	G*	G*
	470pF (471)	G*	G*	G*	G*
	560pF (561)	G*	G*	G*	G*
	680pF (681)	G*	G*	G*	G*
	820pF (821)	G*	G*	G*	G*
	1,000pF (102)	K*	K*	G*	G*
	1,200pF (122)	K*	K*	G*	G*
	1,500pF (152)	K*	K*	K*	K*
	1,800pF (182)	K*	K*	K*	K*
	2,200pF (222)	K		M	M
	2,700pF (272)			M	M
	3,300pF (332)			M	
3,900pF (392)			M		
4,700pF (472)			M		
5,600pF (562)			M		

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 ELECTRICAL DATA

Table with 3 columns: Dielectric, NP0, X7R. Rows include Size, Capacitance range, Capacitance tolerance, Rated voltage (WVDC), Operating temperature, Capacitance characteristic, Termination.

EXPLANATION OF PART NUMBERS

Table with 8 columns: MT, 31, B, 104, K, 500, C, T. Rows include Series, Size (Inch (mm)), Dielectric, Capacitance, Tolerance, Rated voltage, Termination, Packaging.

CAPACITANCE RANGE

NP0 Dielectric

Large table for NP0 Dielectric showing Capacitance vs. Size (0201, 0402, 0603, 0805, 1206, 1210) and Rated Voltage (VDC).

X7R Dielectric

Large table for X7R Dielectric showing Capacitance vs. Size (0402, 0603, 0805, 1206, 1210) and Rated Voltage (VDC).

- 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.
3. X7R/0805/1uF\_10V & 16V only.

### ■ FEATURES

- \* A wide selection of sizes is available (0402 to 1812).
- \* High capacitance in given case size.
- \* Capacitor with lead-free termination (pure Tin).
- \* High reliability design with severe quality controls.

### ■ GENERAL ELECTRICAL DATA

Dielectric	NP0	X7R	X5R
Size	0402, 0603, 0805, 1206, 1210, 1812		
Capacitance range*	0.5pF to 0.033μF	100pF to 2.2μF	0.056μF to 10μF
Capacitance tolerance**	J (±5%), K (±10%), M (±20%) Cap≤5pF: B (±0.1pF), C (±0.25pF) 5pF<Cap<10pF: C (±0.25pF), D (±0.5pF) Cap≥10pF: F (±1%), G (±2%), J (±5%)		
Rated voltage (WVDC)	16V, 25V, 50V, 100V	10V, 16V, 25V, 50V, 100V, 200V, 250V	6.3V, 10V, 16V, 25V
Operating temperature	-55 to +125°C		-55 to +85°C
Capacitance characteristic	±30ppm/°C	±15%	
Termination	Ni/Sn (lead-free termination)		

### ■ EXPLANATION OF PART NUMBERS

MG	31	B	104	K	500	C	I
<b>Series</b> MG= Automotive (without AEC-Q200 certification)	<b>Size (Inch (mm))</b> 31=1206 (3216)	<b>Dielectric</b> B=X7R	<b>Capacitance</b> 104=10x10 <sup>4</sup> =0.1uF	<b>Tolerance</b> K=±10%	<b>Rated voltage</b> 500=50 VDC	<b>Termination</b> C=Cu/Ni/Sn	<b>Packaging</b> T=7" reeled

\* Please refer to page 2 "How to order" for more information.

### ■ CAPACITANCE RANGE

#### 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	0.056μF (563)		N															
	0.068μF (683)		N															
	0.082μF (823)		N															
	0.10μF (104)		N	N														
	0.15μF (154)		N	N														
	0.22μF (224)	N	N	N				X										
	0.27μF (274)	N	N			X	X	X										
	0.33μF (334)	N	N			X	X	X										
	0.39μF (394)	N				X	X	X										
	0.47μF (474)	N				X	X	X										
	0.68μF (684)	N				X	X	X										
	0.82μF (824)	N				X	X	X										
	1.0μF (105)					X	X	X										
	1.5μF (155)								I	I				J	J	P	K	K
	2.2μF (225)								I	I	I	I		J	J	P	K	K
	3.3μF (335)										I	I	P	P	P	P	K	K
4.7μF (475)										I	I	P	P	P	P	K	K	
6.8μF (685)												P	P					
10μF (106)												P	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.

### NP0 Dielectric

Dielectric		NP0													
Size		0402	0603	0805				1206		1210			1812		
Rated Voltage (VDC)		10,16,25,50,100	10,16,25,50,100	10,16,25,50	100	200	250	500,630	10,16,25,50	100	10,16	25,50	100	10,16,25,50	100
0.1pF (0R1)															
0.2pF (0R2)															
0.3pF (0R3)															
0.4pF (0R4)															
0.5pF (0R5)	N	S	A	A	A	A	A	A							
0.6pF (0R6)	N	S	A	A	A	A	A	A							
0.7pF (0R7)	N	S	A	A	A	A	A	A							
0.8pF (0R8)	N	S	A	A	A	A	A	A							
0.9pF (0R9)	N	S	A	A	A	A	A	A							
1.0pF (1R0)	N	S	A	A	A	A	A	A							
1.2pF (1R2)	N	S	A	A	A	A	A	A							
1.5pF (1R5)	N	S	A	A	A	A	A	A	B	B					
1.8pF (1R8)	N	S	A	A	A	A	A	A	B	B					
2.2pF (2R2)	N	S	A	A	A	A	A	A	B	B					
2.7pF (2R7)	N	S	A	A	A	A	A	A	B	B					
3.3pF (3R3)	N	S	A	A	A	A	A	A	B	B					
3.9pF (3R9)	N	S	A	A	A	A	A	A	B	B					
4.7pF (4R7)	N	S	A	A	A	A	A	A	B	B					
5.6pF (5R6)	N	S	A	A	A	A	A	A	B	B					
6.8pF (6R8)	N	S	A	A	A	A	A	A	B	B					
8.2pF (8R2)	N	S	A	A	A	A	A	A	B	B					
10pF (100)	N	S	A	A	A	A	A	A	B	B	C	C	C	D	D
12pF (120)	N	S	A	A	A	A	A	A	B	B	C	C	C	D	D
15pF (150)	N	S	A	A	A	A	A	A	B	B	C	C	C	D	D
18pF (180)	N	S	A	A	A	A	A	A	B	B	C	C	C	D	D
22pF (220)	N	S	A	A	A	A	A	A	B	B	C	C	C	D	D
27pF (270)	N	S	A	A	A	A	A	A	B	B	C	C	C	D	D
33pF (330)	N	S	A	A	A	A	A	A	B	B	C	C	C	D	D
39pF (390)	N	S	A	A	A	A	A	A	B	B	C	C	C	D	D
47pF (470)	N	S	A	A	A	A	A	A	B	B	C	C	C	D	D
56pF (560)	N	S	A	A	A	A	A	A	B	B	C	C	C	D	D
68pF (680)	N	S	A	A	A	A	A	A	B	B	C	C	C	D	D
82pF (820)	N	S	A	A	A	A	A	B	B	B	C	C	C	D	D
100pF (101)	N	S	A	A	A	B	B	B	B	B	C	C	C	D	D
120pF (121)	N	S	A	A	A	B	D	D	B	B	C	C	C	D	D
150pF (151)	N	S	A	A	B	D	D	D	B	B	C	C	C	D	D
180pF (181)	N	S	A	A	B	D	D	D	B	B	C	C	C	D	D
220pF (221)	N	S	A	A	D	D	D	D	B	B	C	C	C	D	D
270pF (271)		S	A	A	D	D	D	D	B	B	C	C	C	D	D
330pF (331)		S	A	A	D	D	D	D	B	B	C	C	C	D	D
390pF (391)		S	B	B	D	D	D	D	B	B	C	C	C	D	D
470pF (471)		S	B	B	D	D	D	D	B	B	C	C	C	D	D
560pF (561)		S	B	B	D	D	D	D	B	B	C	C	C	D	D
680pF (681)		S	B	B	D	D	D	D	B	B	C	C	C	D	D
820pF (821)		S	B	B	D	D	D	D	B	B	C	C	C	D	D
1,000pF (102)		S	B	B	D	D	D	D	B	B	C	C	C	D	D
1,200pF (122)			B	B	D	D	D	D	B	B	C	C	C	D	D
1,500pF (152)			B	B	D	D	D	D	B	B	C	C	C	D	D
1,800pF (182)			B	B	D	D	D	D	B	B	C	C	C	D	D
2,200pF (222)			B	B	D	D	D	D	B	B	C	C	C	D	D
2,700pF (272)			D	D					B	B	C	C	C	D	D
3,300pF (332)			D						B	B	C	C	C	D	D
3,900pF (392)			D						B	B	C	C	C	D	D
4,700pF (472)			D						B	B	C	C	C	D	D
5,600pF (562)			D						B	B	C	C	C	D	D
6,800pF (682)			D						C		C	C	C	D	D
8,200pF (822)			D						D		C	C	C	D	D
0.010uF (103)			D						D		C	C	C	D	D
0.012uF (123)											C	D	D	D	D
0.015uF (153)											C		D	D	D
0.018uF (183)														D	D
0.022uF (223)														D	D
0.027uF (273)														D	D
0.033uF (333)														D	D

1. The letter in cell is expressed the symbol of product thickness.
2. The letter in cell with "A" 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.

### X7R Dielectric

Dielectric		X7R																										
Size		0402			0603				0805					1206					1210					1812				
Rated Voltage (VDC)		10, 16	25	50	6.3, 10, 16	25	50	100	10, 16	25	50	100	200, 250	10, 16	25	50	100	200, 250	10, 16	25	50	100	200, 250	10, 16, 25	50	100	200, 250	
Capacitance	100pF (101)	N	N	N	S	S	S	S	B	B	B	B	B															
	120pF (121)	N	N	N	S	S	S	S	B	B	B	B	B															
	150pF (151)	N	N	N	S	S	S	S	B	B	B	B	B	B	B	B	B	B										
	180pF (181)	N	N	N	S	S	S	S	B	B	B	B	B	B	B	B	B	B										
	220pF (221)	N	N	N	S	S	S	S	B	B	B	B	B	B	B	B	B	B										
	270pF (271)	N	N	N	S	S	S	S	B	B	B	B	B	B	B	B	B	B										
	330pF (331)	N	N	N	S	S	S	S	B	B	B	B	B	B	B	B	B	B										
	390pF (391)	N	N	N	S	S	S	S	B	B	B	B	B	B	B	B	B	B										
	470pF (471)	N	N	N	S	S	S	S	B	B	B	B	B	B	B	B	B	B										
	560pF (561)	N	N	N	S	S	S	S	B	B	B	B	B	B	B	B	B	B										
	680pF (681)	N	N	N	S	S	S	S	B	B	B	B	B	B	B	B	B	B										
	820pF (821)	N	N	N	S	S	S	S	B	B	B	B	B	B	B	B	B	B										
	1,000pF (102)	N	N	N	S	S	S	S	B	B	B	B	B	B	B	B	B	B	C	C	C	C	C	C	D	D	D	D
	1,200pF (122)	N	N	N	S	S	S	S	B	B	B	B	B	B	B	B	B	B	C	C	C	C	C	C	D	D	D	D
	1,500pF (152)	N	N	N	S	S	S	S	B	B	B	B	B	B	B	B	B	B	C	C	C	C	C	C	D	D	D	D
	1,800pF (182)	N	N	N	S	S	S	S	B	B	B	B	B	B	B	B	B	B	C	C	C	C	C	C	D	D	D	D
	2,200pF (222)	N	N	N	S	S	S	S	B	B	B	B	B	B	B	B	B	B	C	C	C	C	C	C	D	D	D	D
	2,700pF (272)	N	N	N	S	S	S	S	B	B	B	B	B	B	B	B	B	B	C	C	C	C	C	C	D	D	D	D
	3,300pF (332)	N	N	N	S	S	S	S	B	B	B	B	B	B	B	B	B	B	C	C	C	C	C	C	D	D	D	D
	3,900pF (392)	N	N	N	S	S	S	S	B	B	B	B	B	B	B	B	B	B	C	C	C	C	C	C	D	D	D	D
	4,700pF (472)	N	N	N	S	S	S	S	B	B	B	B	B	B	B	B	B	B	C	C	C	C	C	C	D	D	D	D
	5,600pF (562)	N	N	N	S	S	S	S	B	B	B	B	D	B	B	B	B	B	C	C	C	C	C	C	D	D	D	D
	6,800pF (682)	N	N	N	S	S	S	S	B	B	B	B	D	B	B	B	B	B	C	C	C	C	C	C	D	D	D	D
	8,200pF (822)	N	N	N	S	S	S	S	B	B	B	B	D	B	B	B	B	B	C	C	C	C	C	C	D	D	D	D
	0.010uF (103)	N	N	N	S	S	S	S	B	B	B	B	D	B	B	B	B	B	C	C	C	C	C	C	D	D	D	D
	0.012uF (123)	N	N		S	S	S		B	B	B	B	D	B	B	B	B	B	C	C	C	C	C	C	D	D	D	D
	0.015uF (153)	N	N		S	S	S		B	B	B	B	D	B	B	B	B	B	C	C	C	C	C	C	D	D	D	D
	0.018uF (183)	N	N		S	S	S		B	B	B	B	D	B	B	B	B	C	C	C	C	C	C	C	D	D	D	D
	0.022uF (223)	N	N		S	S	S		B	B	B	B	D	B	B	B	B	C	C	C	C	C	C	C	D	D	D	D
	0.027uF (273)	N	N		S	S	S		B	B	B	D		B	B	B	B	C	C	C	C	C	C	C	D	D	D	D
	0.033uF (333)	N	N		S	S	X		B	B	B	D		B	B	B	B	G	C	C	C	C	C	C	D	D	D	D
	0.039uF (393)	N	N		S	S	X		B	B	B	D		B	B	B	B	G	C	C	C	C	C	C	D	D	D	D
0.047uF (473)	N	N		S	S	X		B	B	B	D		B	B	B	B	G	C	C	C	C	C	D	D	D	D	D	
0.056uF (563)	N			S	S	X		B	B	B	D		B	B	B	B	G	C	C	C	C	C	D	D	D	D	D	
0.068uF (683)	N			S	S	X		B	B	B	D		B	B	B	B	G	C	C	C	C	C	G	D	D	D	D	
0.082uF (823)	N			S	S	X		B	B	B	D		B	B	B	D	G	C	C	C	C	C	G	D	D	D	D	
0.10uF (104)	N	N		S	S	X		B	B	B	D		B	B	B	D	G	C	C	C	C	C	G	D	D	D	D	
0.12uF (124)				S	X			D	D	D				B	B	B	D	C	C	C	C	C	G	D	D	D	D	
0.15uF (154)				S	X			D	D	D				C	C	C	G	C	C	C	D	M	D	D	D	K		
0.18uF (184)				S	X			D	D	D				C	C	C	G	C	C	C	D	M	D	D	D	K		
0.22uF (224)				S	X			D	D	D				C	C	C	G	C	C	C	D	M	D	D	D	K		
0.27uF (274)				X				D	D					C	C	D		C	C	C	G	M	D	D	D	K		
0.33uF (334)				X				D	D					C	C	D		C	C	D	G	M	D	D	D	K		
0.39uF (394)				X				D	D					C	J	P		C	C	D	M	M	D	D	D	K		
0.47uF (474)				X				D	D					J	J	P		C	C	D	M	M	D	D	K	K		
0.56uF (564)								D	D					J	J	P		D	D	D	M		D	D	K			
0.68uF (684)								D	D					J	J	P		D	D	D	K		D	K	K			
0.82uF (824)								D	D					J	J	P		D	D	D	K		D	K	K			
1.0uF (105)								D	D					J	J	P		D	D	D	K		D	K	K			
1.5uF (155)														J	P			K	G							K		
2.2uF (225)														J	P			K	G							M		

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.

### ■ FEATURES

- \* High density mounting due to mounting space saving.
- \* Mounting cost saving.
- \* Increased throughput

### ■ GENERAL ELECTRICAL DATA

Dielectric	NP0	X7R
Size	4x0402, 4x0603	
Capacitance*	10pF to 470pF	180pF to 0.1μF
Capacitance tolerance**	J (±5%), K (±10%)	K (±10%), M (±20%)
Rated voltage (WVDC)	25V, 50V, 100V	10V, 16V, 25V, 50V
Insulation resistance at Ur	≥10GΩ or RxC≥500ΩxF whichever is less	
Operating temperature	-55 to +125°C	
Capacitance characteristic	±30ppm	±15%
Termination	Ni/Sn (lead-free termination)	

### ■ EXPLANATION OF PART NUMBERS

MY	24	N	102	J	500	C	I
<b>Series</b> MY= Automotive Capacitor array (with AEC-Q200 qualification)	<b>Size</b> 24=4x0402 34=4x0603	<b>Dielectric</b> N=NP0 (COG) B=X7R	<b>Capacitance</b> 102=10x10 <sup>2</sup> =1000pF	<b>Tolerance</b> J=±5%	<b>Rated voltage</b> 500=50 VDC	<b>Termination</b> C=Cu/Ni/Sn	<b>Packaging style</b> T=7" reeled G=13" reeled

\* Please refer to page 2 " How to order" for more information.

### ■ CAPACITANCE RANGE

SIZE Inch (mm)	4 x 0402				4x0603						
	DIELECTRIC	X7R			NP0			X7R			
	RATED VOLTAGE (VDC)	50	10	16	25	25	50	100	16	25	50
Capacitance	10pF (100)	T				B	B	B			
	15pF (150)	T				B	B	B			
	22pF (220)	T				B	B	B			
	33pF (330)	T				B	B	B			
	47pF (470)	T				B	B	B			
	68pF (680)	T				B	B	B			
	100pF (101)	T				B	B	B			
	120pF (121)	T				B	B	B			
	150pF (151)	T				B	B	B			
	180pF (181)	T				B	B	B		B	B
	220pF (221)	T				B	B	B		B	B
	270pF (271)					B	B	B		B	B
	330pF (331)					B	B	B		B	B
	470pF (471)					B	B	B		B	B
	6,80pF (681)									B	B
	1,000pF (102)		T	T	T					B	B
	1,500pF (152)		T	T	T					B	B
	2,200pF (222)		T	T	T					B	B
	3,300pF (332)		T	T	T					B	B
	4,700pF (472)		T	T	T					B	B
	6,800pF (682)		T	T	T					B	B
	0.010μF (103)		T	T	T					B	B
	0.015μF (153)		T	T	T				B	B	B
	0.022μF (223)		T	T	T				B	B	B
0.033μF (333)		T	T	T				B			
0.047μF (473)		T	T	T				B			
0.068μF (683)		T	T	T				B			
0.10μF (104)		T	T	T				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

No.	Item	Test Condition	Requirements																																																																			
1.	Visual and Mechanical	---	* No remarkable defect. * Dimensions to conform to individual specification sheet.																																																																			
2.	Capacitance	Class I: (NP0,X8G) $\leq 1000\text{pF}$ , $1.0\pm 0.2\text{Vrms}$ · $1\text{MHz}\pm 10\%$ $> 1000\text{pF}$ , $1.0\pm 0.2\text{Vrms}$ · $1\text{KHz}\pm 10\%$	* Shall not exceed the limits given in the detailed spec.																																																																			
3.	Q/ D.F. (Dissipation Factor)	Class II: (X7R, X7E, X6S, X5R,X7S,Y5V, X8R)  $C \leq 10\mu\text{F}$ , $1.0\pm 0.2\text{Vrms}$ · $1\text{KHz}\pm 10\%$ ** $C > 10\mu\text{F}$ , $0.5\pm 0.2\text{Vrms}$ · $120\text{Hz}\pm 20\%$  ** Test condition: $0.5\pm 0.2\text{Vrms}$ · $1\text{KHz}\pm 10\%$  X7R: 0805=106(6.3V), 0603/475(6.3V) X5R: 01R5 $\geq 103$ , 0201 $\geq 224$ (6.3V,10V,16V) <sup>#1</sup> , 0402 $\geq 475$ (6.3V,16V), 0402 $\geq 225$ (10V), 0603=106 (6.3V,10V), TT18X $\geq 475$ (10V), TT15X series X6S: 0201 $\geq 104$ (6.3V,10V), 0402 $\geq 225$ (6.3V), 0402/475 (10V), 0603/106 (6.3V), X7S: 0402/225(6.3V)  #1 Excluding X5R/0201/105(6.3V); 225(10V) , (1.0±0.2Vrms · 1KHz±10%)  * Before initial measurement (Class II only): To apply de-aging at 150°C for 1hr then set for 24±2 hrs at room temp.	NP0, X8G: $\text{Cap} \geq 30\text{pF}$ , $Q \geq 1000$ ; $\text{Cap} < 30\text{pF}$ , $Q \geq 400+20C$ <sup>#2</sup> #2.RF15( $\geq 100\text{V}$ ), RF18, RF21, RF11,RF22: $\text{Cap} < 30\text{pF}$ ; $Q \geq 800+20C$ ; $\text{Cap} \geq 30\text{pF}$ ; $Q \geq 1400$  X8R: D.F. $\leq 5\%$  X7R, X6S, X5R, X7S: <table border="1"> <thead> <tr> <th>Rated vol.</th> <th>D.F. <math>\leq</math></th> <th>Exception of D.F. <math>\leq</math></th> </tr> </thead> <tbody> <tr> <td rowspan="3"><math>\geq 100\text{V}</math></td> <td rowspan="3"><math>\leq 2.5\%</math></td> <td><math>\leq 3\%</math> 1206 <math>\geq 0.47\mu\text{F}</math></td> </tr> <tr> <td><math>\leq 5\%</math> 0805 <math>&gt; 0.1\mu\text{F}</math>; 0603 <math>\geq 0.068\mu\text{F}</math>; 1206 <math>&gt; 1\mu\text{F}</math>; 1210 <math>\geq 2.2\mu\text{F}</math>; TT series</td> </tr> <tr> <td><math>\leq 10\%</math> 0805 <math>&gt; 0.22\mu\text{F}</math>; 1210 <math>\geq 3.3\mu\text{F}</math></td> </tr> <tr> <td rowspan="3">50V</td> <td rowspan="3"><math>\leq 2.5\%</math></td> <td><math>\leq 3\%</math> 0201(50V); 0603 <math>\geq 0.047\mu\text{F}</math>; 0805 <math>\geq 0.18\mu\text{F}</math>; 1206 <math>\geq 0.47\mu\text{F}</math></td> </tr> <tr> <td><math>\leq 5\%</math> 0201 <math>\geq 0.01\mu\text{F}</math>; 1210 <math>\geq 4.7\mu\text{F}</math></td> </tr> <tr> <td><math>\leq 10\%</math> 0402 <math>\geq 0.012\mu\text{F}</math>; 0603 <math>\geq 0.1\mu\text{F}</math>; 0805 <math>\geq 1\mu\text{F}</math>; 1206 <math>\geq 2.2\mu\text{F}</math>; 1210 <math>\geq 10\mu\text{F}</math>; TT series</td> </tr> <tr> <td rowspan="3">35V</td> <td rowspan="3"><math>\leq 3.5\%</math></td> <td><math>\leq 10\%</math> 0603 <math>\geq 1\mu\text{F}</math>; 0805 <math>\geq 2.2\mu\text{F}</math>; 1206 <math>\geq 2.2\mu\text{F}</math>; 1210 <math>\geq 10\mu\text{F}</math></td> </tr> <tr> <td><math>\leq 5\%</math> 0201 <math>\geq 0.01\mu\text{F}</math>; 0805 <math>\geq 1\mu\text{F}</math>; 1210 <math>\geq 10\mu\text{F}</math></td> </tr> <tr> <td><math>\leq 7\%</math> 0603 <math>\geq 0.33\mu\text{F}</math>; 1206 <math>\geq 4.7\mu\text{F}</math></td> </tr> <tr> <td rowspan="3">25V</td> <td rowspan="3"><math>\leq 3.5\%</math></td> <td><math>\leq 10\%</math> 0201 <math>\geq 0.1\mu\text{F}</math>; 0402 <math>\geq 0.10\mu\text{F}</math> &amp; (0402/X7R <math>\geq 0.056\mu\text{F}</math>); TT series</td> </tr> <tr> <td><math>\leq 10\%</math> 0603 <math>\geq 0.47\mu\text{F}</math>; 0805 <math>\geq 2.2\mu\text{F}</math>; 1206 <math>\geq 6.8\mu\text{F}</math>; 1210 <math>\geq 22\mu\text{F}</math></td> </tr> <tr> <td><math>\leq 12.5\%</math> 0402 <math>\geq 0.47\mu\text{F}</math></td> </tr> <tr> <td rowspan="3">16V</td> <td rowspan="3"><math>\leq 3.5\%</math></td> <td><math>\leq 5\%</math> 0201 <math>\geq 0.01\mu\text{F}</math>; 0402 <math>\geq 0.033\mu\text{F}</math>; 0603 <math>\geq 0.15\mu\text{F}</math>; 0805 <math>\geq 0.68\mu\text{F}</math>; 1206 <math>\geq 2.2\mu\text{F}</math>; 1210 <math>\geq 4.7\mu\text{F}</math></td> </tr> <tr> <td><math>\leq 10\%</math> 0201 <math>\geq 0.1\mu\text{F}</math> (0201/X7R <math>\geq 0.022\mu\text{F}</math>); 0402 <math>\geq 0.22\mu\text{F}</math>; 0603 <math>\geq 0.68\mu\text{F}</math>; 0805 <math>\geq 2.2\mu\text{F}</math>; 1206 <math>\geq 4.7\mu\text{F}</math>; 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4a.	Dielectric Strength	*To apply voltage: $\leq 100\text{V}$ : 250% of rated voltage. 200V ~ 300V : 200% of rated voltage. 400V ~ 450V : 120% of rated voltage. 500V ~ 999V : 150% of rated voltage. 1000V ~ 3000V : 120% of rated voltage. 4000V : 110% of rated voltage. *Duration: 1 to 5 sec. *Charge & discharge current less than 50mA.	* No evidence of damage or flash over during test.																																																																			
4b.	Dielectric Strength (for X1/Y2 & X2)	* To apply 1500 VAC voltage. * Duration: 60 sec.	* No evidence of damage or flash over during test.																																																																			
5.	Insulation Resistance	To apply rated voltage for max. 120 sec. *Before initial measurement (Class II only): To apply de-aging at 150°C for 1hr then set for 24±2 hrs at room temp.	10GΩ or $\text{RxC} \geq 500\Omega\text{-F}$ whichever is smaller. Class II (X7R, X6S, X5R, X7S, Y5V) <table border="1"> <thead> <tr> <th>Rated voltage</th> <th>Insulation Resistance</th> </tr> </thead> <tbody> <tr> <td>100V: X7R</td> <td rowspan="6">10GΩ or <math>\text{RxC} \geq 100\Omega\text{-F}</math> whichever is smaller.</td> </tr> <tr> <td>50V: .0402 <math>&gt; 0.01\mu\text{F}</math>; 0603 <math>\geq 1\mu\text{F}</math>; 0805 <math>\geq 1\mu\text{F}</math>; 1206 <math>\geq 4.7\mu\text{F}</math>; 1210 <math>\geq 4.7\mu\text{F}</math></td> </tr> <tr> <td>35V: 0805 <math>\geq 2.2\mu\text{F}</math>; 1206 <math>\geq 2.2\mu\text{F}</math>; 1210 <math>\geq 10\mu\text{F}</math></td> </tr> <tr> <td>25V: 0402 <math>\geq 1\mu\text{F}</math>; 0603 <math>\geq 2.2\mu\text{F}</math>; 0805 <math>\geq 2.2\mu\text{F}</math>; 1206 <math>\geq 10\mu\text{F}</math>; 1210 <math>\geq 10\mu\text{F}</math></td> </tr> <tr> <td>16V: 0201 <math>\geq 0.1\mu\text{F}</math>; 0402 <math>\geq 0.22\mu\text{F}</math>; 0603 <math>\geq 1\mu\text{F}</math>; 0805 <math>\geq 2.2\mu\text{F}</math>; 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0402 <math>\geq 1\mu\text{F}</math>; 0201 <math>\geq 0.22\mu\text{F}</math> / 10V: 0201 <math>&gt; 0.1\mu\text{F}</math>, 0402 <math>\geq 1\mu\text{F}</math>; 0603 <math>\geq 10\mu\text{F}</math>; 0805 <math>\geq 47\mu\text{F}</math>; TT21 <math>&gt; 4.7\mu\text{F}</math> / 6.3V: 0201 <math>\geq 0.1\mu\text{F}</math>; 0603 <math>&gt; 4.7\mu\text{F}</math>; 0805 <math>\geq 47\mu\text{F}</math>; 1206 <math>\geq 10\mu\text{F}</math>; TT15 <math>&gt; 1.0\mu\text{F}</math> / 4V: 0603 <math>\geq 22\mu\text{F}</math>; 0805 <math>\geq 47\mu\text{F}</math>; 1206 <math>\geq 100\mu\text{F}</math></td> </tr> <tr> <td></td> </tr> </tbody> </table> <table border="1"> <tbody> <tr> <td>Rated Voltage: 200V ~ 630V</td> <td>To apply rated voltage (500V max.) for 60 sec.</td> <td><math>&gt; 10\text{G}\Omega</math> or <math>100\Omega\text{-F}</math> whichever is smaller.</td> </tr> <tr> <td>Rated Voltage: <math>&gt; 630\text{V}</math></td> <td>To apply 500V for 60sec.</td> <td><math>&gt; 10\text{G}\Omega</math> or <math>100\Omega\text{-F}</math> whichever is smaller.</td> </tr> </tbody> </table>	Rated voltage	Insulation Resistance	100V: X7R	10GΩ or $\text{RxC} \geq 100\Omega\text{-F}$ whichever is smaller.	50V: .0402 $> 0.01\mu\text{F}$ ; 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Rated Voltage: $> 630\text{V}$	To apply 500V for 60sec.	$> 10\text{G}\Omega$ or $100\Omega\text{-F}$ whichever is smaller.																																																																				

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No.	Item	Test Condition	Requirements																																																																						
6.	Temperature Coefficient	<p>With no electrical load.</p> <table border="1"> <thead> <tr> <th>T.C.</th> <th>Operating Temp</th> </tr> </thead> <tbody> <tr><td>NPO (C0G)</td><td>-55~125°C at 25°C</td></tr> <tr><td>NPO (C0H)</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>X8G</td><td>-55~125°C at 25°C</td></tr> <tr><td>X8R</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>X7S</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> </tbody> </table> <p>*Measurement voltage for Class II:</p> <table border="1"> <thead> <tr> <th>01005</th> <th>0201</th> </tr> </thead> <tbody> <tr><td>Cap≤0.01μF: 0.5V</td><td>Cap&lt;0.1μF: 1V</td></tr> <tr><td>Cap&gt;0.01μF: 0.2V</td><td>0.1μF≤Cap&lt;1μF: 0.2V</td></tr> <tr><td></td><td>Cap≥1μF: 0.1V</td></tr> <tr> <th>0402</th> <th>0603</th> </tr> <tr><td>Cap&lt;1μF: 1V</td><td>Cap≤1μF: 1V</td></tr> <tr><td>Cap=1μF: 0.5V</td><td>1μF&lt;Cap≤4.7μF: 0.5V</td></tr> <tr><td>1μF&lt;Cap&lt;10μF: 0.2V</td><td>Cap&gt;4.7μF: 0.2V</td></tr> <tr><td>Cap≥10μF: 0.1V</td><td></td></tr> <tr> <th>0805</th> <th>1206/1210</th> </tr> <tr><td>Cap&lt;10μF: 1V</td><td>Cap≤10μF: 1V</td></tr> <tr><td>Cap=10μF: 0.5V</td><td>10μF&lt;Cap≤100μF: 0.5V</td></tr> <tr><td>Cap&gt;10μF: 0.2V</td><td>Cap&gt;100μF: 0.2V</td></tr> </tbody> </table> <p>*Before initial measurement (Class II only): To apply de-aging at 150°C for 1hr then set for 24±2 hrs at room temp.</p>	T.C.	Operating Temp	NPO (C0G)	-55~125°C at 25°C	NPO (C0H)	-55~125°C at 25°C	NPO (C0J)	-55~125°C at 25°C	X8G	-55~125°C at 25°C	X8R	-55~125°C at 25°C	X7R	-55~125°C at 25°C	X7S	-55~125°C at 25°C	X6S	-55~105°C at 25°C	X5R	-55~ 85°C at 25°C	Y5V	-25~ 85°C at 20°C	01005	0201	Cap≤0.01μF: 0.5V	Cap<0.1μF: 1V	Cap>0.01μF: 0.2V	0.1μF≤Cap<1μF: 0.2V		Cap≥1μF: 0.1V	0402	0603	Cap<1μF: 1V	Cap≤1μF: 1V	Cap=1μF: 0.5V	1μF<Cap≤4.7μF: 0.5V	1μF<Cap<10μF: 0.2V	Cap>4.7μF: 0.2V	Cap≥10μF: 0.1V		0805	1206/1210	Cap<10μF: 1V	Cap≤10μF: 1V	Cap=10μF: 0.5V	10μF<Cap≤100μF: 0.5V	Cap>10μF: 0.2V	Cap>100μF: 0.2V	<table border="1"> <thead> <tr> <th>T.C.</th> <th>Capacitance Change</th> </tr> </thead> <tbody> <tr><td>NPO (C0G)</td><td>Within ±30ppm/°C</td></tr> <tr><td>NPO (C0H)</td><td>Within ±60ppm/°C</td></tr> <tr><td>NPO (C0J)</td><td>Within ±120ppm/°C</td></tr> <tr><td>X8G</td><td>Within ±30ppm/°C</td></tr> <tr><td>X8R</td><td>Within ±15%</td></tr> <tr><td>X7R</td><td>Within ±15%</td></tr> <tr><td>X7S</td><td>Within ±22%</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> </tbody> </table>	T.C.	Capacitance Change	NPO (C0G)	Within ±30ppm/°C	NPO (C0H)	Within ±60ppm/°C	NPO (C0J)	Within ±120ppm/°C	X8G	Within ±30ppm/°C	X8R	Within ±15%	X7R	Within ±15%	X7S	Within ±22%	X6S	Within ±22%	X5R	Within ±15%	Y5V	Within +30%/-80%
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7.	Adhesive Strength of Termination	<p>*Pressurizing force: 01005:1N, 0201:2N, 0402 &amp; 0603:5N, &gt;0603: 10N</p> <p>*Test time : 10 ±1 sec</p>	* No remarkable damage or removal of the terminations.																																																																						
8.	Vibration Resistance	<p>*Vibration frequency: 10~55 Hz/min. *Total amplitude: 1.5mm *Test time: 6 hrs.(Two hrs each in three mutually perpendicular directions.) *Before initial measurement (Class II only): To apply de-aging at 150°C for 1hr then set for 24±2 hrs at room temp. *Cap./DF(Q) Measurement to be made after de-aging at 150°C for 1hr then set for 24±2 hrs at room temp.</p>	<p>* No remarkable damage. * Cap change and Q/D.F.: To meet initial spec.</p>																																																																						
9.	Solderability	<p>* Solder temperature: 235±5°C * Dipping time: 2±0.5 sec.</p>	<p>95% MIN. coverage of all metalized area.** **SH series: 75% MIN. coverage of all metalized area.</p>																																																																						
10.	Bending Test	<p>*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 / SH series: 5 mm<sup>3</sup> and then the pressure shall be maintained for 5±1 sec.</p> <p>* Before initial measurement (Class II only): To apply de-aging at 150°C for 1hr then set for 24±2 hrs at room temp.</p> <p>#3.SH21B224_101/SH31B226_100/SH31B106_160/SH31B106_250/SH31B225_500/SH31B474_101/SH31B105_101/SH32B476_6R3/SH32B226_160/SH32B106_250/SH32B225_500/SH32B475_500/SH32B106_500/SH32B225_101/SH21B105_500/SH21B225_250/SH21B475_160</p>	<p>* No remarkable damage. * Cap change: NP0,X8G: within ±5% or 0.5pF whichever is larger X7R, X7S, X6S, X5R,X8R: 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.)</p>																																																																						
11.	Resistance to Soldering Heat	<p>* Solder temperature: 260±5°C * Dipping time: 10±1 sec * Preheating: 120 to 150°C for 1 minute before immerse the capacitor in a eutectic solder. * Before initial measurement (Class II only): To apply de-aging at 150°C for 1hr then set for 24±2 hrs at room temp. * Cap. / DF(Q) / I.R. Measurement to be made after de-aging at 150°C for 1hr then set for 24±2 hrs at room temp.</p>	<p>* No remarkable damage. * Cap change: NP0,X8G: within ±2.5% or 0.25pF whichever is larger X7R, X7S, X6S, X5R,X8R: within ±7.5% Y5V: within ±20% * Q/D.F., I.R. and dielectric strength: To meet initial requirements. * 25% max. leaching on each edge.</p>																																																																						
12.	Temperature Cycle	<p>* Conduct the five cycles according to the temperatures and time.</p> <table border="1"> <thead> <tr> <th>Step</th> <th>Temp. (°C)</th> <th>Time (min.)</th> </tr> </thead> <tbody> <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> </tbody> </table> <p>* Before initial measurement (Class II only): To apply de-aging at 150°C for 1hr then set for 24±2 hrs at room temp. * Cap. / DF(Q) / I.R. Measurement to be made after de-aging at 150°C for 1hr then set for 24±2 hrs at room temp.</p>	Step	Temp. (°C)	Time (min.)	1	MIN. Operating Temp. +0/-3	30±3	2	Room Temp.	2~3	3	MAX. Operating Temp. +3/-0	30±3	4	Room Temp.	2~3	<p>* No remarkable damage. * Cap change: NP0,X8G: within ±2.5% or 0.25pF whichever is larger X7R, X7S, X6S, X5R,X8R: within ±7.5% Y5V: within ±20% * Q/D.F., I.R. and dielectric strength: To meet initial requirements.</p>																																																							
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# Appendix I

## Reliability Test Conditions and Requirements

No.	Item	Test Condition	Requirements																																																																																																																
13.	Humidity (Damp Heat) Steady State	<ul style="list-style-type: none"> <li>* Test temp.: 40±2°C</li> <li>* Humidity: 90~95%RH</li> <li>* Test time: 500+24/-0hrs.</li> <li>* Before initial measurement (Class II only): To apply de-aging at 150°C for 1hr then set for 24±2 hrs at room temp.</li> <li>* Cap. / DF(Q) / I.R. Measurement to be made after de-aging at 150°C for 1hr then set for 24±2 hrs at room temp.</li> </ul>	<ul style="list-style-type: none"> <li>* No remarkable damage.</li> <li>* Cap change: NP0, X8G: within ±5% or 0.5pF whichever is larger</li> <li>X7R, X7S, X6S, X5R, X8R: ≥10V**, within ±12.5%; 6.3V within ±25%; TT series, within ±25%</li> <li>**10V:0603 ≥ 4.7μF; 0402 ≥ 1μF; 0201 ≥ 0.1μF, within ±25%;</li> <li>Y5V: ≥10V, within ±30%; 6.3V, within +30/-40%</li> <li>* Q/D.F. value: NP0, X8R: More than 30pF Q≥350, 10pF≤C≤30pF, Q≥275+2.5C, Less than 10pF Q≥200+10C</li> <li>X8R: ≤7.5%</li> <li>X7R, X6S, X5R, X7S:</li> </ul> <table border="1"> <thead> <tr> <th>Rated vol.</th> <th>D.F. ≤</th> <th colspan="2">Exception of D.F. ≤</th> </tr> </thead> <tbody> <tr> <td rowspan="3">≥ 100V</td> <td rowspan="3">≤ 3%</td> <td>≤ 6%</td> <td>1206 ≥ 0.47μF</td> </tr> <tr> <td>≤ 7.5%</td> <td>0805 &gt; 0.1μF; 0603 ≥ 0.068μF; 1206 &gt; 1μF; 1210 ≥ 2.2μF; TT series</td> </tr> <tr> <td>≤ 20%</td> <td>0805 &gt; 0.22μF; 1210 ≥ 3.3μF</td> </tr> <tr> <td rowspan="3">≥ 50V</td> <td rowspan="3">≤ 3%</td> <td>≤ 6%</td> <td>0201(50V); 0603 ≥ 0.047μF; 0805 ≥ 0.18μF; 1206 ≥ 0.47μF</td> </tr> <tr> <td>≤ 10%</td> <td>0201 ≥ 0.01μF; 1210 ≥ 4.7μF</td> </tr> <tr> <td>≤ 20%</td> <td>0402 ≥ 0.012μF; 0603 &gt; 0.1μF; 0805 ≥ 1μF; 1206 ≥ 2.2μF; 1210 ≥ 10μF; TT series</td> </tr> <tr> <td>35V</td> <td>≤ 5%</td> <td>≤ 20%</td> <td>0603 ≥ 1μF; 0805 ≥ 2.2μF; 1206 ≥ 2.2μF; 1210 ≥ 10μF</td> </tr> <tr> <td rowspan="4">25V</td> <td rowspan="4">≤ 5%</td> <td>≤ 10%</td> <td>0201 ≥ 0.01μF; 0805 ≥ 1μF; 1210 ≥ 10μF</td> </tr> <tr> <td>≤ 14%</td> <td>0603 ≥ 0.33μF; 1206 ≥ 4.7μF</td> </tr> <tr> <td>≤ 15%</td> <td>0201 ≥ 0.1μF; 0402 ≥ 0.10μF &amp; (0402/X7R ≥ 0.056μF); TT series</td> </tr> <tr> <td>≤ 20%</td> <td>0603 ≥ 0.47μF; 0805 ≥ 2.2μF; 1206 ≥ 6.8μF; 1210 ≥ 22μF</td> </tr> <tr> <td rowspan="3">16V</td> <td rowspan="3">≤ 5%</td> <td>≤ 10%</td> <td>0603 ≥ 0.15μF; 0805 ≥ 0.68μF; 1206 ≥ 2.2μF; 1210 ≥ 4.7μF</td> </tr> <tr> <td>≤ 15%</td> <td>0201 ≥ 0.01μF (0201/X7R ≥ 0.022μF); 0402 ≥ 0.033μF; 0603 ≥ 0.68μF; 0805 ≥ 2.2μF; 1206 ≥ 4.7μF; 1210 ≥ 22μF; TT series</td> </tr> <tr> <td>≤ 20%</td> <td>0201 ≥ 0.012μF; 0402 ≥ 0.33μF (0402/X7R ≥ 0.22μF); 0603 ≥ 0.33μF; 0805 ≥ 2.2μF; 1206 ≥ 2.2μF; 1210 ≥ 22μF</td> </tr> <tr> <td rowspan="3">10V</td> <td rowspan="3">≤ 7.5%</td> <td>≤ 15%</td> <td>0201 ≥ 0.1μF; 0402 ≥ 1μF; TT series; 01R5</td> </tr> <tr> <td>≤ 20%</td> <td>0201 ≥ 0.1μF; 0402 ≥ 1μF; 0603 ≥ 10μF;</td> </tr> <tr> <td>---</td> <td>0805 ≥ 4.7μF; 1206 ≥ 47μF; 1210 ≥ 100μF; TT series</td> </tr> <tr> <td>6.3V</td> <td>≤ 15%</td> <td>≤ 30%</td> <td>---</td> </tr> <tr> <td>4V</td> <td>≤ 20%</td> <td>---</td> <td>---</td> </tr> </tbody> </table> <p>Y5V:</p> <table border="1"> <thead> <tr> <th>Rated vol.</th> <th>D.F. ≤</th> <th colspan="2">Exception of D.F. ≤</th> </tr> </thead> <tbody> <tr> <td rowspan="3">≥ 50V</td> <td rowspan="3">≤ 7.5%</td> <td>≤ 10%</td> <td>0603 ≥ 0.1μF; 0805 ≥ 0.47μF; 1206 ≥ 4.7μF; TT series &amp; Cap ≥ 1μF</td> </tr> <tr> <td>≤ 20%</td> <td>1210 ≥ 6.8μF</td> </tr> <tr> <td>---</td> <td>---</td> </tr> <tr> <td>35V</td> <td>≤ 10%</td> <td>---</td> <td>---</td> </tr> <tr> <td rowspan="3">25V</td> <td rowspan="3">≤ 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; 1210 ≥ 22μF; TT series &amp; Cap ≥ 1μF</td> </tr> <tr> <td>---</td> <td>---</td> </tr> <tr> <td>16V (C&lt;1.0μF)</td> <td>≤ 10%</td> <td>≤ 12.5%</td> <td>0402 ≥ 0.068μF; 0603 ≥ 0.68μF</td> </tr> <tr> <td></td> <td></td> <td>≤ 20%</td> <td>0402 ≥ 0.22μF</td> </tr> <tr> <td>16V (C ≥ 1.0μF)</td> <td>≤ 12.5%</td> <td>≤ 20%</td> <td>0603 ≥ 2.2μF; 0805 ≥ 3.3μF; 1206 ≥ 10μF; 1210 ≥ 22μF; 1812 ≥ 47μF; TT series &amp; Cap ≥ 1μF</td> </tr> <tr> <td>10V</td> <td>≤ 20%</td> <td>≤ 30%</td> <td>0402 ≥ 0.47μF</td> </tr> <tr> <td>6.3V</td> <td>≤ 30%</td> <td>---</td> <td>---</td> </tr> </tbody> </table> <p>* I.R.: ≥10V, 1GΩ or 50 Ω-F whichever is smaller.</p> <p>Class II (X7R, X7E, X6S, X5R, X7S, Y5V)</p> <table border="1"> <thead> <tr> <th>Rated voltage</th> <th>Insulation Resistance</th> </tr> </thead> <tbody> <tr> <td>100V: All X7R; 1210 ≥ 3.3μF</td> <td rowspan="7">1GΩ or RxC ≥ 10 Ω-F whichever is smaller.</td> </tr> <tr> <td>50V: 0402 &gt; 0.01μF; 0603 ≥ 1μF; 0805 ≥ 1μF; 1206 ≥ 4.7μF; 1210 ≥ 4.7μF</td> </tr> <tr> <td>35V: 0603 ≥ 1μF; 0805 ≥ 2.2μF; 1206 ≥ 2.2μF; 1210 ≥ 10μF</td> </tr> <tr> <td>25V: 0201 ≥ 0.1μF; 0402 ≥ 0.22μF; 0603 ≥ 2.2μF; 0805 ≥ 2.2μF; 1206 ≥ 10μF; 1210 ≥ 10μF</td> </tr> <tr> <td>16V: 0201 ≥ 0.1μF; 0402 ≥ 0.22μF; 0603 ≥ 1μF; 0805 ≥ 2.2μF; 1206 ≥ 10μF; 1210 ≥ 47μF</td> </tr> <tr> <td>10V: 0201 ≥ 47nF; 0402 ≥ 0.47μF; 0603 ≥ 0.47μF; 0805 ≥ 2.2μF; 1206 ≥ 4.7μF; 1210 ≥ 47μF</td> </tr> <tr> <td>6.3V; 4V; TT series; All X6S/X7S items; Size ≥ 1812</td> </tr> </tbody> </table>	Rated vol.	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\* This Reliability Test Conditions and Requirements only for General Purpose series, please refer to individual sheet for other products information.

No.	Item	Test Condition	Requirements																																																																																																									
14	Humidity (Damp Heat) Load	*Test temp. : 40±2°C *Humidity : 90~95%RH *Test time : 500+24/-0 hrs. *To apply voltage : rated voltage (MAX. 500V) *Before initial measurement (Class II only): To apply de-aging at 150°C for 1hr then set for 24±2 hrs at room temp. * Cap. / DF(Q) / I.R. Measurement to be made after de-aging at 150°C for 1hr then set for 24±2 hrs at room temp.	* No remarkable damage. Cap change: NP0,X8G: ±7.5% or 0.75pF whichever is larger. X7R, X7S, X6S, X5R,X8R: ≥10V**, within ±12.5%;6.3V within ±25%;TT series,within ±25% **10V:0603≥4.7μF;0402≥1μF;0201≥0.1μF, within ±25%; Y5V: ≥10V, within ±30%; 6.3V, within +30/-40% Q/D.F. value: NP0,X8G: C≥30pF,Q≥200;C<30pF, Q≥100+10/3C X8R: ≤7.5% X7R, X6S, X5R, X7S: <table border="1"> <thead> <tr> <th>Rated vol.</th> <th>D.F. ≤</th> <th colspan="2">Exception of D.F. ≤</th> </tr> </thead> <tbody> <tr> <td rowspan="3">≥100V</td> <td rowspan="3">≤3%</td> <td>≤6%</td> <td>1206 ≥ 0.47μF</td> </tr> <tr> <td>≤7.5%</td> <td>0805 &gt; 0.1μF, 0603 ≥ 0.068μF, 1206 &gt; 1μF; 1210 ≥ 2.2μF; TT series</td> </tr> <tr> <td>≤20%</td> <td>0805 &gt; 0.22μF; 1210 ≥ 3.3μF</td> </tr> <tr> <td rowspan="3">≥50V</td> <td rowspan="3">≤3%</td> <td>≤6%</td> <td>0201(50V); 0603 ≥ 0.047μF; 0805 ≥ 0.18μF; 1206 ≥ 0.47μF</td> </tr> <tr> <td>≤10%</td> <td>0201 ≥ 0.01μF; 1210 ≥ 4.7μF</td> </tr> <tr> <td>≤20%</td> <td>0402 ≥ 0.012μF; 0603 &gt; 0.1μF; 0805 ≥ 1μF; 1206 ≥ 2.2μF; 1210 ≥ 10μF; TT series</td> </tr> <tr> <td>35V</td> <td>≤5%</td> <td>≤20%</td> <td>0603 ≥ 1μF; 0805 ≥ 2.2μF; 1206 ≥ 2.2μF; 1210 ≥ 10μF</td> </tr> <tr> <td rowspan="3">25V</td> <td rowspan="3">≤5%</td> <td>≤10%</td> <td>0201 ≥ 0.01μF; 0805 ≥ 1μF; 1210 ≥ 10μF</td> </tr> <tr> <td>≤14%</td> <td>0603 ≥ 0.33μF; 1206 ≥ 4.7μF</td> </tr> <tr> <td>≤15%</td> <td>0201 ≥ 0.1μF; 0402 ≥ 0.10μF &amp; (0402/X7R ≥ 0.056μF); TT series 0603 ≥ 0.47μF; 0805 ≥ 2.2μF; 1206 ≥ 6.8μF; 1210 ≥ 22μF</td> </tr> <tr> <td></td> <td></td> <td>≤20%</td> <td>0402 ≥ 0.47μF</td> </tr> <tr> <td rowspan="2">16V</td> <td rowspan="2">≤5%</td> <td>≤10%</td> <td>0603 ≥ 0.15μF; 0805 ≥ 0.68μF; 1206 ≥ 2.2μF; 1210 ≥ 4.7μF</td> </tr> <tr> <td>≤15%</td> <td>0201 ≥ 0.01μF (0201/X7R ≥ 0.022μF); 0402 ≥ 0.033μF; 0603 ≥ 0.68μF; 0805 ≥ 2.2μF; 1206 ≥ 4.7μF; 1210 ≥ 22μF; TT series</td> </tr> <tr> <td rowspan="2">10V</td> <td rowspan="2">≤7.5%</td> <td>≤15%</td> <td>0201 ≥ 0.012μF; 0402 ≥ 0.33μF (0402/X7R ≥ 0.22μF); 0603 ≥ 0.33μF; 0805 ≥ 2.2μF; 1206 ≥ 2.2μF; 1210 ≥ 22μF</td> </tr> <tr> <td>≤20%</td> <td>0201 ≥ 0.1μF; 0402 ≥ 1μF; TT series; 01R5</td> </tr> <tr> <td>6.3V</td> <td>≤15%</td> <td>≤30%</td> <td>0201 ≥ 0.1μF; 0402 ≥ 1μF; 0603 ≥ 10μF; 0805 ≥ 4.7μF; 1206 ≥ 47μF; 1210 ≥ 100μF; TT series</td> </tr> <tr> <td>4V</td> <td>≤20%</td> <td>---</td> <td>---</td> </tr> </tbody> </table> Y5V: <table border="1"> <thead> <tr> <th>Rated vol.</th> <th>D.F. ≤</th> <th colspan="2">Exception of D.F. ≤</th> </tr> </thead> <tbody> <tr> <td rowspan="2">≥50V</td> <td rowspan="2">≤7.5%</td> <td>≤10%</td> <td>0603 ≥ 0.1μF; 0805 ≥ 0.47μF; 1206 ≥ 4.7μF; TT series &amp; Cap ≥ 1μF</td> </tr> <tr> <td>≤20%</td> <td>1210 ≥ 6.8μF</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; 1210 ≥ 22μF; TT series &amp; Cap ≥ 1μF</td> </tr> <tr> <td rowspan="2">16V (C&lt;1.0μF)</td> <td rowspan="2">≤10%</td> <td>≤12.5%</td> <td>0402 ≥ 0.068μF; 0603 ≥ 0.68μF</td> </tr> <tr> <td>≤20%</td> <td>0402 ≥ 0.22μF</td> </tr> <tr> <td>16V (C≥1.0μF)</td> <td>≤12.5%</td> <td>≤20%</td> <td>0603 ≥ 2.2μF; 0805 ≥ 3.3μF; 1206 ≥ 10μF; 1210 ≥ 22μF; 1812 ≥ 47μF; TT series &amp; Cap ≥ 1μF</td> </tr> <tr> <td>10V</td> <td>≤20%</td> <td>≤30%</td> <td>0402 ≥ 0.47μF</td> </tr> <tr> <td>6.3V</td> <td>≤30%</td> <td>---</td> <td>---</td> </tr> </tbody> </table> *I.R.: ≥10V, 500MΩ or 25 Ω-F whichever is smaller. Class II (X7R, X7S, X6S, X5R, Y5V) <table border="1"> <thead> <tr> <th>Rated voltage</th> <th>Insulation Resistance</th> </tr> </thead> <tbody> <tr> <td>100V: All X7R; 1210 ≥ 3.3μF</td> <td rowspan="6">500MΩ or RxC ≥ 5 Ω-F whichever is smaller.</td> </tr> <tr> <td>50V: 0402 &gt; 0.01μF; 0603 ≥ 1μF; 0805 ≥ 1μF; 1206 ≥ 4.7μF; 1210 ≥ 4.7μF</td> </tr> <tr> <td>35V: 0603 ≥ 1μF; 0805 ≥ 2.2μF; 1206 ≥ 2.2μF; 1210 ≥ 10μF</td> </tr> <tr> <td>25V: 0201 ≥ 0.1μF; 0402 ≥ 0.22μF; 0603 ≥ 2.2μF; 0805 ≥ 2.2μF; 1206 ≥ 10μF; 1210 ≥ 10μF</td> </tr> <tr> <td>16V: 0201 ≥ 0.1μF; 0402 ≥ 0.22μF; 0603 ≥ 1μF; 0805 ≥ 2.2μF; 1206 ≥ 10μF; 1210 ≥ 47μF</td> </tr> <tr> <td>10V: 0201 ≥ 47nF; 0402 ≥ 0.47μF; 0603 ≥ 0.47μF; 0805 ≥ 2.2μF; 1206 ≥ 4.7μF; 1210 ≥ 47μF</td> </tr> <tr> <td>6.3V; 4V; TT series; All X6S/X7S items; Size ≥ 1812</td> <td></td> </tr> </tbody> </table>	Rated vol.	D.F. ≤	Exception of D.F. ≤		≥100V	≤3%	≤6%	1206 ≥ 0.47μF	≤7.5%	0805 > 0.1μF, 0603 ≥ 0.068μF, 1206 > 1μF; 1210 ≥ 2.2μF; TT series	≤20%	0805 > 0.22μF; 1210 ≥ 3.3μF	≥50V	≤3%	≤6%	0201(50V); 0603 ≥ 0.047μF; 0805 ≥ 0.18μF; 1206 ≥ 0.47μF	≤10%	0201 ≥ 0.01μF; 1210 ≥ 4.7μF	≤20%	0402 ≥ 0.012μF; 0603 > 0.1μF; 0805 ≥ 1μF; 1206 ≥ 2.2μF; 1210 ≥ 10μF; TT series	35V	≤5%	≤20%	0603 ≥ 1μF; 0805 ≥ 2.2μF; 1206 ≥ 2.2μF; 1210 ≥ 10μF	25V	≤5%	≤10%	0201 ≥ 0.01μF; 0805 ≥ 1μF; 1210 ≥ 10μF	≤14%	0603 ≥ 0.33μF; 1206 ≥ 4.7μF	≤15%	0201 ≥ 0.1μF; 0402 ≥ 0.10μF & (0402/X7R ≥ 0.056μF); TT series 0603 ≥ 0.47μF; 0805 ≥ 2.2μF; 1206 ≥ 6.8μF; 1210 ≥ 22μF			≤20%	0402 ≥ 0.47μF	16V	≤5%	≤10%	0603 ≥ 0.15μF; 0805 ≥ 0.68μF; 1206 ≥ 2.2μF; 1210 ≥ 4.7μF	≤15%	0201 ≥ 0.01μF (0201/X7R ≥ 0.022μF); 0402 ≥ 0.033μF; 0603 ≥ 0.68μF; 0805 ≥ 2.2μF; 1206 ≥ 4.7μF; 1210 ≥ 22μF; TT series	10V	≤7.5%	≤15%	0201 ≥ 0.012μF; 0402 ≥ 0.33μF (0402/X7R ≥ 0.22μF); 0603 ≥ 0.33μF; 0805 ≥ 2.2μF; 1206 ≥ 2.2μF; 1210 ≥ 22μF	≤20%	0201 ≥ 0.1μF; 0402 ≥ 1μF; TT series; 01R5	6.3V	≤15%	≤30%	0201 ≥ 0.1μF; 0402 ≥ 1μF; 0603 ≥ 10μF; 0805 ≥ 4.7μF; 1206 ≥ 47μF; 1210 ≥ 100μF; TT series	4V	≤20%	---	---	Rated vol.	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\* This Reliability Test Conditions and Requirements only for General Purpose series, please refer to individual sheet for other products information.

# Appendix I

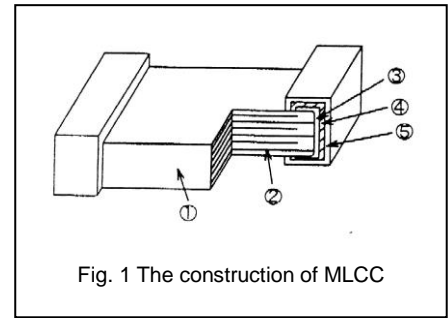
## Reliability Test Conditions and Requirements

No.	Item	Test Condition	Requirements																																																																																																																																																																																									
15.	High Temperature Load (Endurance)	<p>*Test temp. : X8G, X8R: 150±3°C NP0, X7R/ X7S: 125±3°C X6S: 105±3°C X5R, Y5V: 85±3°C *Test time: 1000+24/-0 hrs.</p> <p>*To apply voltage: (1) 100% of rated voltage for below range.</p> <table border="1"> <thead> <tr> <th>Size</th> <th>Dielectric</th> <th>Rated voltage</th> <th>Capacitance</th> </tr> </thead> <tbody> <tr> <td rowspan="2">0201</td> <td rowspan="2">X5R/X7R/X6S</td> <td>≤ 10V</td> <td>C ≥ 0.1μF</td> </tr> <tr> <td>≤ 16V</td> <td>C &gt; 0.1μF</td> </tr> <tr> <td>0402</td> <td>X5R/X7R/ X6S/X7S/Y5V</td> <td>6.3V, 10V, 16V, 25V</td> <td>C ≥ 1.0μF</td> </tr> <tr> <td rowspan="3">0603</td> <td rowspan="3">X5R/X7R/ X6S/X7S</td> <td>4V</td> <td>C ≥ 22μF</td> </tr> <tr> <td>6.3V, 10V</td> <td>C ≥ 4.7μF</td> </tr> <tr> <td>25V, 35V</td> <td>C ≥ 1.0μF</td> </tr> <tr> <td rowspan="3">0805</td> <td rowspan="3">X5R/X7R/ X6S/X7S</td> <td>4V</td> <td>C ≥ 47μF</td> </tr> <tr> <td>6.3V</td> <td>C ≥ 22μF</td> </tr> <tr> <td>10V~50V</td> <td>C ≥ 10μF</td> </tr> <tr> <td rowspan="2">1206</td> <td>X5R/X7R/X6S</td> <td>≤ 6.3V</td> <td>C ≥ 47μF</td> </tr> <tr> <td>NP0</td> <td>3000V</td> <td>C ≥ 1.5pF</td> </tr> <tr> <td rowspan="2">1210</td> <td>X5R/X7R/X6S</td> <td>16V</td> <td>C ≥ 47μF</td> </tr> <tr> <td>X7R</td> <td>100V</td> <td>C ≥ 3.3μF</td> </tr> <tr> <td>TT15</td> <td>X5R</td> <td>6.3V</td> <td>C &gt; 1.0μF</td> </tr> <tr> <td>TT18</td> <td>Y5V</td> <td>6.3V, 10V</td> <td>C ≥ 2.2μF</td> </tr> <tr> <td>TT21</td> <td>Y5V</td> <td>6.3V</td> <td>C ≥ 10μF</td> </tr> <tr> <td rowspan="2">TT31</td> <td>X5R/X7R/X6S</td> <td>≤ 10V</td> <td>C ≥ 10μF</td> </tr> <tr> <td>Y5V</td> <td>6.3V</td> <td>C ≥ 22μF</td> </tr> </tbody> </table> <p>*1WV items must follow de-rating conditions (2) 150% of rated voltage for below range.</p> <table border="1"> <thead> <tr> <th>Size</th> <th>Dielectric</th> <th>Rated voltage</th> <th>Capacitance</th> </tr> </thead> <tbody> <tr> <td rowspan="2">0201</td> <td>X5R/X6S</td> <td>16V/25V</td> <td>C=0.1μF</td> </tr> <tr> <td>X7R</td> <td>16V</td> <td>C ≥ 0.022μF</td> </tr> <tr> <td rowspan="2">0402</td> <td rowspan="2">X5R/X7R/X6S</td> <td>50V</td> <td>C ≥ 0.1μF</td> </tr> <tr> <td>10~25V</td> <td>C ≥ 0.22μF</td> </tr> <tr> <td rowspan="2"></td> <td rowspan="2">Y5V</td> <td>16V</td> <td>C ≥ 0.47μF</td> </tr> <tr> <td>50V</td> <td>C &gt; 0.1μF</td> </tr> <tr> <td rowspan="2">0603</td> <td rowspan="2">X5R/X7R/ X6S/X7S</td> <td>10V, 16V, 50V</td> <td>C ≥ 1.0μF</td> </tr> <tr> <td>Y5V</td> <td>16V</td> <td>C ≥ 2.2μF</td> </tr> <tr> <td rowspan="3">0805</td> <td rowspan="3">X5R/X7R/ X6S/X7S</td> <td>10~50V</td> <td>C ≥ 4.7μF</td> </tr> <tr> <td>50V</td> <td>C ≥ 2.2μF</td> </tr> <tr> <td>100V</td> <td>C ≥ 0.47μF</td> </tr> <tr> <td rowspan="2">1206</td> <td>X5R/X7R/X6S</td> <td>100V</td> <td>C &gt; 1.0μF</td> </tr> <tr> <td>X5R/X7R/X6S</td> <td>50V~100V</td> <td>C ≥ 2.2μF</td> </tr> <tr> <td>1825 2220 2225</td> <td>X7R</td> <td>100V~250V</td> <td>C ≥ 1.0μF</td> </tr> </tbody> </table> <p>(3) ≤ 6.3V or C ≥ 10μF or TT series: 150% of rated voltage. (4) 10V~250V: 200% of rated voltage. (5) 400V~450V: 120% of rated voltage. (6) 500V: 150% of rated voltage. (7) 630~3000V: 120% of rated voltage. (8) Ur=4000V: 110% of rated voltage.</p> <p>*Before initial measurement (Class II only): To apply de-aging at 150°C for 1hr then set for 24±2 hrs at room temp.</p> <p>*Cap. / DF(Q) / I.R. Measurement to be made after de-aging at 150°C for 1hr then set for 24±2 hrs at room temp.</p>	Size	Dielectric	Rated voltage	Capacitance	0201	X5R/X7R/X6S	≤ 10V	C ≥ 0.1μF	≤ 16V	C > 0.1μF	0402	X5R/X7R/ X6S/X7S/Y5V	6.3V, 10V, 16V, 25V	C ≥ 1.0μF	0603	X5R/X7R/ X6S/X7S	4V	C ≥ 22μF	6.3V, 10V	C ≥ 4.7μF	25V, 35V	C ≥ 1.0μF	0805	X5R/X7R/ X6S/X7S	4V	C ≥ 47μF	6.3V	C ≥ 22μF	10V~50V	C ≥ 10μF	1206	X5R/X7R/X6S	≤ 6.3V	C ≥ 47μF	NP0	3000V	C ≥ 1.5pF	1210	X5R/X7R/X6S	16V	C ≥ 47μF	X7R	100V	C ≥ 3.3μF	TT15	X5R	6.3V	C > 1.0μF	TT18	Y5V	6.3V, 10V	C ≥ 2.2μF	TT21	Y5V	6.3V	C ≥ 10μF	TT31	X5R/X7R/X6S	≤ 10V	C ≥ 10μF	Y5V	6.3V	C ≥ 22μF	Size	Dielectric	Rated voltage	Capacitance	0201	X5R/X6S	16V/25V	C=0.1μF	X7R	16V	C ≥ 0.022μF	0402	X5R/X7R/X6S	50V	C ≥ 0.1μF	10~25V	C ≥ 0.22μF		Y5V	16V	C ≥ 0.47μF	50V	C > 0.1μF	0603	X5R/X7R/ X6S/X7S	10V, 16V, 50V	C ≥ 1.0μF	Y5V	16V	C ≥ 2.2μF	0805	X5R/X7R/ X6S/X7S	10~50V	C ≥ 4.7μF	50V	C ≥ 2.2μF	100V	C ≥ 0.47μF	1206	X5R/X7R/X6S	100V	C > 1.0μF	X5R/X7R/X6S	50V~100V	C ≥ 2.2μF	1825 2220 2225	X7R	100V~250V	C ≥ 1.0μF	<p>* No remarkable damage. Cap change: NP0, X8G: ±3.0% or ±0.3pF whichever is larger X7R, X7S, X6S, X5R, X8R: ≥10V**, within ±12.5%; 6.3V within ±25%; TT series, within ±25% **10V: 0603 ≥ 4.7μF; 0402 ≥ 1μF; 0201 ≥ 0.1μF, within ±25%; Y5V: ≥10V, within ±30%; 6.3V, within +30/-40% Q/D.F. value: NP0, X8G: More than 30pF, Q ≥ 350; 10pF ≤ C &lt; 30pF, Q ≥ 275+2.5C; Less than 10pF, Q ≥ 200+10C X8R: ≤ 7.5% X7R, X6S, X5R, X7S:</p> <table border="1"> <thead> <tr> <th>Rated vol.</th> <th>D.F. ≤</th> <th>Exception of D.F. ≤</th> </tr> </thead> <tbody> <tr> <td rowspan="3">≥ 100V</td> <td rowspan="3">≤ 3%</td> <td>≤ 6% 1206 ≥ 0.47μF</td> </tr> <tr> <td>≤ 7.5% 0805 &gt; 0.1μF, 0603 ≥ 0.068μF, 1206 &gt; 1μF; 1210 ≥ 2.2μF; TT series</td> </tr> <tr> <td>≤ 20% 0805 &gt; 0.22μF; 1210 ≥ 3.3μF</td> </tr> <tr> <td rowspan="3">≥ 50V</td> <td rowspan="3">≤ 3%</td> <td>≤ 6% 0201(50V); 0603 ≥ 0.047μF; 0805 ≥ 0.18μF; 1206 ≥ 0.47μF</td> </tr> <tr> <td>≤ 10% 0201 ≥ 0.01μF; 1210 ≥ 4.7μF</td> </tr> <tr> <td>≤ 20% 0402 ≥ 0.012μF; 0603 &gt; 0.1μF; 0805 ≥ 1μF; 1206 ≥ 2.2μF; 1210 ≥ 10μF; TT series</td> </tr> <tr> <td>35V</td> <td>≤ 5%</td> <td>≤ 20% 0603 ≥ 1μF; 0805 ≥ 2.2μF; 1206 ≥ 2.2μF; 1210 ≥ 10μF</td> </tr> <tr> <td rowspan="4">25V</td> <td rowspan="4">≤ 5%</td> <td>≤ 10% 0201 ≥ 0.01μF; 0805 ≥ 1μF; 1210 ≥ 10μF</td> </tr> <tr> <td>≤ 14% 0603 ≥ 0.33μF; 1206 ≥ 4.7μF</td> </tr> <tr> <td>≤ 15% 0201 ≥ 0.1μF; 0402 ≥ 0.10μF &amp; (0402/X7R ≥ 0.056μF); TT series ; 0603 ≥ 0.47μF; 0805 ≥ 2.2μF; 1206 ≥ 6.8μF; 1210 ≥ 22μF</td> </tr> <tr> <td>≤ 20% 0402 ≥ 0.47μF</td> </tr> <tr> <td rowspan="2">16V</td> <td rowspan="2">≤ 5%</td> <td>≤ 10% 0603 ≥ 0.15μF; 0805 ≥ 0.68μF; 1206 ≥ 2.2μF; 1210 ≥ 4.7μF</td> </tr> <tr> <td>≤ 15% 0201 ≥ 0.01μF; 0201/X7R ≥ 0.022μF; 0402 ≥ 0.033μF; 0603 ≥ 0.68μF; 0805 ≥ 2.2μF; 1206 ≥ 4.7μF; 1210 ≥ 22μF; TT series</td> </tr> <tr> <td rowspan="2">10V</td> <td rowspan="2">≤ 7.5%</td> <td>≤ 15% 0201 ≥ 0.012μF; 0402 ≥ 0.33μF (0402/X7R ≥ 0.22μF); 0603 ≥ 0.33μF; 0805 ≥ 2.2μF; 1206 ≥ 2.2μF; 1210 ≥ 22μF</td> </tr> <tr> <td>≤ 20% 0201 ≥ 0.1μF; 0402 ≥ 1μF; TT series; 01R5</td> </tr> <tr> <td>6.3V</td> <td>≤ 15%</td> <td>≤ 30% 0201 ≥ 0.1μF; 0402 ≥ 1μF; 0603 ≥ 10μF; 0805 ≥ 4.7μF; 1206 ≥ 47μF; 1210 ≥ 100μF; TT series</td> </tr> <tr> <td>4V</td> <td>≤ 20%</td> <td>---</td> </tr> </tbody> </table> <p>Y5V:</p> <table border="1"> <thead> <tr> <th>Rated vol.</th> <th>D.F. ≤</th> <th>Exception of D.F. ≤</th> </tr> </thead> <tbody> <tr> <td rowspan="2">≥ 50V</td> <td rowspan="2">≤ 7.5%</td> <td>≤ 10% 0603 ≥ 0.1μF; 0805 ≥ 0.47μF; 1206 ≥ 4.7μF; TT series</td> </tr> <tr> <td>≤ 20% 1210 ≥ 6.8μF</td> </tr> <tr> <td>35V</td> <td>≤ 10%</td> <td>---</td> </tr> <tr> <td rowspan="2">25V</td> <td rowspan="2">≤ 7.5%</td> <td>≤ 10% 0402 ≥ 0.047μF; 0603 ≥ 0.1μF; 0805 ≥ 0.33μF; 1206 ≥ 1μF; 1210 ≥ 4.7μF</td> </tr> <tr> <td>≤ 15% 0402 ≥ 0.068μF; 0603 ≥ 0.47μF; 1206 ≥ 4.7μF; 1210 ≥ 22μF; TT series</td> </tr> <tr> <td>16V (C &lt; 1.0μF)</td> <td>≤ 10%</td> <td>≤ 12.5% 0402 ≥ 0.068μF; 0603 ≥ 0.68μF</td> </tr> <tr> <td rowspan="2">16V (C ≥ 1.0μF)</td> <td rowspan="2">≤ 10%</td> <td>≤ 20% 0402 ≥ 0.22μF</td> </tr> <tr> <td>≤ 12.5% 0603 ≥ 2.2μF; 0805 ≥ 3.3μF; 1206 ≥ 10μF; 1210 ≥ 22μF; 1812 ≥ 47μF; TT series</td> </tr> <tr> <td>10V</td> <td>≤ 20%</td> <td>≤ 30% 0402 ≥ 0.47μF</td> </tr> <tr> <td>6.3V</td> <td>≤ 30%</td> <td>---</td> </tr> </tbody> </table> <p>*I.R.: ≥ 10V, 1GΩ or 50 Q-F whichever is smaller. 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35V	≤ 5%	≤ 20% 0603 ≥ 1μF; 0805 ≥ 2.2μF; 1206 ≥ 2.2μF; 1210 ≥ 10μF																																																																																																																																																																																										
25V	≤ 5%	≤ 10% 0201 ≥ 0.01μF; 0805 ≥ 1μF; 1210 ≥ 10μF																																																																																																																																																																																										
		≤ 14% 0603 ≥ 0.33μF; 1206 ≥ 4.7μF																																																																																																																																																																																										
		≤ 15% 0201 ≥ 0.1μF; 0402 ≥ 0.10μF & (0402/X7R ≥ 0.056μF); TT series ; 0603 ≥ 0.47μF; 0805 ≥ 2.2μF; 1206 ≥ 6.8μF; 1210 ≥ 22μF																																																																																																																																																																																										
		≤ 20% 0402 ≥ 0.47μF																																																																																																																																																																																										
16V	≤ 5%	≤ 10% 0603 ≥ 0.15μF; 0805 ≥ 0.68μF; 1206 ≥ 2.2μF; 1210 ≥ 4.7μF																																																																																																																																																																																										
		≤ 15% 0201 ≥ 0.01μF; 0201/X7R ≥ 0.022μF; 0402 ≥ 0.033μF; 0603 ≥ 0.68μF; 0805 ≥ 2.2μF; 1206 ≥ 4.7μF; 1210 ≥ 22μF; TT series																																																																																																																																																																																										
10V	≤ 7.5%	≤ 15% 0201 ≥ 0.012μF; 0402 ≥ 0.33μF (0402/X7R ≥ 0.22μF); 0603 ≥ 0.33μF; 0805 ≥ 2.2μF; 1206 ≥ 2.2μF; 1210 ≥ 22μF																																																																																																																																																																																										
		≤ 20% 0201 ≥ 0.1μF; 0402 ≥ 1μF; TT series; 01R5																																																																																																																																																																																										
6.3V	≤ 15%	≤ 30% 0201 ≥ 0.1μF; 0402 ≥ 1μF; 0603 ≥ 10μF; 0805 ≥ 4.7μF; 1206 ≥ 47μF; 1210 ≥ 100μF; TT series																																																																																																																																																																																										
4V	≤ 20%	---																																																																																																																																																																																										
Rated vol.	D.F. ≤	Exception of D.F. ≤																																																																																																																																																																																										
≥ 50V	≤ 7.5%	≤ 10% 0603 ≥ 0.1μF; 0805 ≥ 0.47μF; 1206 ≥ 4.7μF; TT series																																																																																																																																																																																										
		≤ 20% 1210 ≥ 6.8μF																																																																																																																																																																																										
35V	≤ 10%	---																																																																																																																																																																																										
25V	≤ 7.5%	≤ 10% 0402 ≥ 0.047μF; 0603 ≥ 0.1μF; 0805 ≥ 0.33μF; 1206 ≥ 1μF; 1210 ≥ 4.7μF																																																																																																																																																																																										
		≤ 15% 0402 ≥ 0.068μF; 0603 ≥ 0.47μF; 1206 ≥ 4.7μF; 1210 ≥ 22μF; TT series																																																																																																																																																																																										
16V (C < 1.0μF)	≤ 10%	≤ 12.5% 0402 ≥ 0.068μF; 0603 ≥ 0.68μF																																																																																																																																																																																										
16V (C ≥ 1.0μF)	≤ 10%	≤ 20% 0402 ≥ 0.22μF																																																																																																																																																																																										
		≤ 12.5% 0603 ≥ 2.2μF; 0805 ≥ 3.3μF; 1206 ≥ 10μF; 1210 ≥ 22μF; 1812 ≥ 47μF; TT series																																																																																																																																																																																										
10V	≤ 20%	≤ 30% 0402 ≥ 0.47μF																																																																																																																																																																																										
6.3V	≤ 30%	---																																																																																																																																																																																										
Rated voltage	Insulation Resistance																																																																																																																																																																																											
100V: All X7R; 1210 ≥ 3.3μF	1GΩ or RxC ≥ 10 Q-F whichever is smaller.																																																																																																																																																																																											
50V: 0402 > 0.01μF; 0603 ≥ 1μF; 0805 ≥ 1μF; 1206 ≥ 4.7μF; 1210 ≥ 4.7μF																																																																																																																																																																																												
35V: 0603 ≥ 1μF; 0805 ≥ 2.2μF; 1206 ≥ 2.2μF; 1210 ≥ 10μF																																																																																																																																																																																												
25V: 0201 ≥ 0.1μF; 0402 ≥ 0.22μF; 0603 ≥ 2.2μF; 0805 ≥ 2.2μF; 1206 ≥ 10μF; 1210 ≥ 10μF																																																																																																																																																																																												
16V: 0201 ≥ 0.1μF; 0402 ≥ 0.22μF; 0603 ≥ 1μF; 0805 ≥ 2.2μF; 1206 ≥ 10μF; 1210 ≥ 47μF																																																																																																																																																																																												
10V: 0201 ≥ 47nF; 0402 ≥ 0.47μF; 0603 ≥ 0.47μF; 0805 ≥ 2.2μF; 1206 ≥ 4.7μF; 1210 ≥ 47μF																																																																																																																																																																																												
6.3V ; 4V ; TT series ; All X6S/X7S items; Size ≥ 1812																																																																																																																																																																																												
16.	ESR	For RF Series only, refer to data sheet.	----																																																																																																																																																																																									

\* This Reliability Test Conditions and Requirements only for General Purpose series, please refer to individual sheet for other products information.

### ■ Constructions

No.	Name	NP0	NPO/X7R/X7S/X6S/X5R/Y5V
①	Ceramic material	BaTiO <sub>3</sub> based	
②	Inner electrode	AgPd alloy	Ni
③	Termination	Inner layer	Ag
④		Middle layer	Ni
⑤		Outer layer	Sn



### ■ Storage and handling conditions

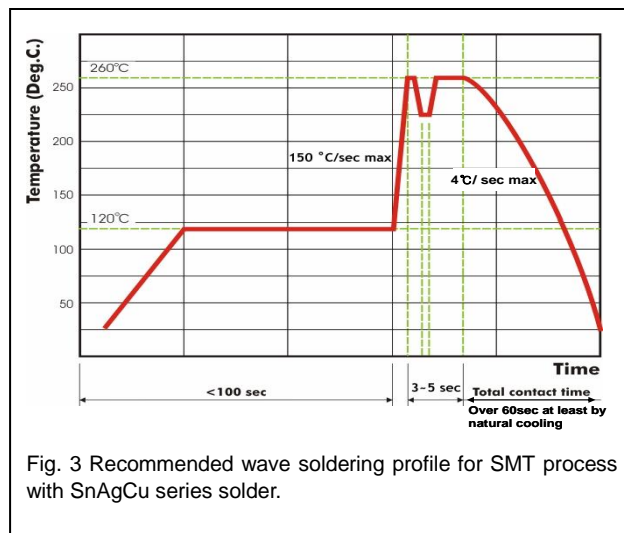
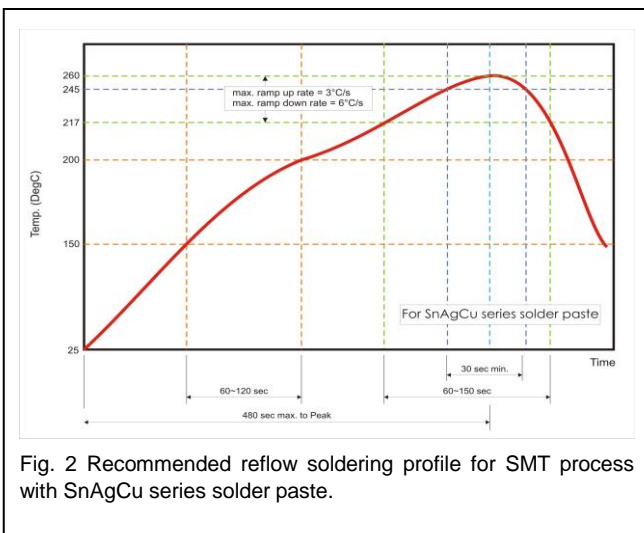
- (1) To store products at 5 to 40°C ambient temperature and 20 to 70% related humidity conditions.
- (2) The product is recommended to be used within one year after shipment. Check solderability in case of shelf life extension is needed.

### Cautions:

- a. The corrosive gas reacts on the terminal electrodes of capacitors, and results in the poor solderability. Do not store the capacitors in the ambience of corrosive gas (e.g., hydrogen sulfide, sulfur dioxide, chlorine, ammonia gas etc.)
- b. In corrosive atmosphere, solderability might be degraded, and silver migration might occur to cause low reliability.
- c. Due to the dewing by rapid humidity change, or the photochemical change of the terminal electrode by direct sunlight, the solderability and electrical performance may deteriorate. Do not store capacitors under direct sunlight or dewing condition. To store products on the shelf and avoid exposure to moisture.

### ■ 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<sub>2</sub> within oven are recommended.



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