SMD Multilayer Ceramic Capacitors

Description:

This soft termination series MLCC is designed and with a polymer layer within end terminations of product, which can absorb mechanical stress caused by PCB handling in SMT line and reduce the mechanical impact for product. It will offer more robust and reliable performance in applications.

RoHS Compliant

Features:

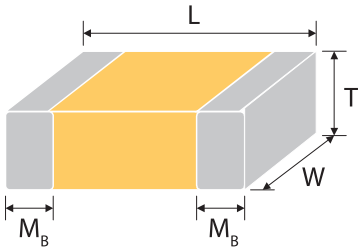
- MLCC's termination are with a soft & flexible polymer layer to withstand high bending stress in SMT line.

Applications:

- Power supply and related industries.
- Lighting industry.
- The other mechanical stress concerned products.

External Dimensions:

Size Inch (mm)	L (mm)	W (mm)	T (mm)/Symbol		Remark	M_B min (mm)
0603 (1608)	1.6 ±0.2	0.8 ±0.1	0.8 ±0.07	S	-	0.4 ±0.15
	1.6 ±0.3	0.8 ±0.3	0.8 ±0.3	X	-	
0805 (2012)	2 ±0.2	1.25 ±0.1	0.6 ±0.1	A	-	0.5 ±0.2
			0.8 ±0.1	B	-	
			1.25 ±0.1	D	#	
	2 ±0.3	1.25 ±0.3	1.25 ±0.3	I		
1206 (3216)	3.2+0.4/-0.1	1.60±0.15	0.8 ±0.1	B		0.6 ±0.2 (0.5 ±0.25)*
			0.95 ±0.1	C		
			1.15±0.15	J		
			1.25 ±0.1	D		
	3.2+0.4/-0.1	1.6 ±0.2	1.6 ±0.2	G		
	3.2 ±0.5	1.6 ±0.5	1.6 ±0.5	P		



The outline of MLCC

Reflow soldering only is recommended.

* For 1206_≥1000V products.

General Electrical Data:

Dielectric	X7R
Size	0603, 0805, 1206
Capacitance range*	100pF to 10μF
Capacitance tolerance**	J (±5%), K (±10%), M (±20%)
Rated voltage (WVDC)	6.3V to 2000V
Operating temperature	-55 to +125°C
Capacitance characteristic	±15%
Termination	Ni/Sn (lead-free termination)

* Measured at the condition of 30~70% related humidity.

X7R: Apply 1.0±0.2Vrms, 1.0kHz±10%, at 25°C am bient temperature.

** Preconditioning for Class II MLCC: Perform a heat treatment at 150±10°C for 1 hour, then leave in ambient condition for 24±2 hours before measurement.

Capacitance Range

X7R Dielectric

Dielectric								
Size		0603						
Rated Voltage		10	16	25	50	100	200	250
Capacitance	100pF (101)	S	S	S	S	S	X	X
	120pF (121)	S	S	S	S	S	X	X
	150pF (151)	S	S	S	S	S	X	X
	180pF (181)	S	S	S	S	S	X	X
	220pF (221)	S	S	S	S	S	X	X
	270pF (271)	S	S	S	S	S	X	X
	330pF (331)	S	S	S	S	S	X	X
	390pF (391)	S	S	S	S	S	X	X
	470pF (471)	S	S	S	S	S	X	X
	560pF (561)	S	S	S	S	S	X	X
	680pF (681)	S	S	S	S	S	X	X
	820pF (821)	S	S	S	S	S	X	X
	1,000pF (102)	S	S	S	S	S	X	X
	1,200pF (122)	S	S	S	S	S	X	X
	1,500pF (152)	S	S	S	S	S	X	X
	1,800pF (182)	S	S	S	S	S	X	X
	2,200pF (222)	S	S	S	S	S	X	X
	2,700pF (272)	S	S	S	S	S	X	X
	3,300pF (332)	S	S	S	S	S	X	X
	3,900pF (392)	S	S	S	S	S	X	X
	4,700pF (472)	S	S	S	S	S	X	X
	5,600pF (562)	S	S	S	S	S	X	X
	6,800pF (682)	S	S	S	S	S	X	X
	8,200pF (822)	S	S	S	S	S	X	X
	0.010µF (103)	S	S	S	S	S	X	X
	0.012µF (123)	S	S	S	S	X		
	0.015µF (153)	S	S	S	S	X		
	0.018µF (183)	S	S	S	S	X		
	0.022µF (223)	S	S	S	S	X		
	0.027µF (273)	S	S	S	S	X		
	0.033µF (333)	S	S	S	X	X		
	0.039µF (393)	S	S	S	X	X		
	0.047µF (473)	S	S	S	X	X		
	0.056µF (563)	S	S	S	X	X		

Dielectric								
Size		0603						
Rated Voltage		10	16	25	50	100	200	250
Capacitance	0.068µF (683)	S	S	S	X	X		
	0.082µF (823)	S	S	S	X	X		
	0.10µF (104)	S	S	S	X	X		
	0.12µF (124)	S	S	X	X			
	0.15µF (154)	S	S	X				
	0.18µF (184)	S	S	X				
	0.22µF (224)	S	S	X	X			
	0.27µF (274)	X	X	X				
	0.33µF (334)	X	X	X				
	0.39µF (394)	X	X	X				
	0.47µF (474)	X	X	X				
	0.56µF (564)	X	X					
	0.68µF (684)	X	X					
	0.82µF (824)	X	X					
	1.0µF (105)	X	X	X				
	1.5µF (155)							
	2.2µF (225)							
	4.7µF (475)							

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

X7R Dielectric

Dielectric		X7R									
Size		0805									
Rated Voltage (V DC)		10	16	25	50	100	200	250	500	630	1000
Capacitance	100pF (101)	D	D	D	D	D	D	D	B	B	B
	120pF (121)	D	D	D	D	D	D	D	B	B	B
	150pF (151)	D	D	D	D	D	D	D	B	B	B
	180pF (181)	D	D	D	D	D	D	D	B	B	B
	220pF (221)	D	D	D	D	D	D	D	B	B	B
	270pF (271)	D	D	D	D	D	D	D	B	B	B
	330pF (331)	D	D	D	D	D	D	D	B	B	B
	390pF (391)	D	D	D	D	D	D	D	B	B	B
	470pF (471)	D	D	D	D	D	D	D	B	B	B
	560pF (561)	D	D	D	D	D	D	D	B	B	B
	680pF (681)	D	D	D	D	D	D	D	B	B	B
	820pF (821)	D	D	D	D	D	D	D	B	B	B

Dielectric		X7R									
Size		0805									
Rated Voltage (V DC)		10	16	25	50	100	200	250	500	630	1000
Capacitance	1,000pF (102)	D	D	D	D	D	D	D	B	B	B
	1,200pF (122)	D	D	D	D	D	D	D	B	B	B
	1,500pF (152)	D	D	D	D	D	D	D	B	B	D
	1,800pF (182)	D	D	D	D	D	D	D	B	B	D
	2,200pF (222)	D	D	D	D	D	D	D	B	B	D
	2,700pF (272)	D	D	D	D	D	D	D	B	B	
	3,300pF (332)	D	D	D	D	D	D	D	B	B	
	3,900pF (392)	D	D	D	D	D	D	D	B	B	
	4,700pF (472)	D	D	D	D	D	D	D	D	D	
	5,600pF (562)	D	D	D	D	D	D	D	D	D	
	6,800pF (682)	D	D	D	D	D	D	D	D	D	
	8,200pF (822)	D	D	D	D	D	D	D	D	D	
	0.010µF (103)	D	D	D	D	D	D	D	D	D	
	0.012µF (123)	D	D	D	D	D	D	D	D	D	
	0.015µF (153)	D	D	D	D	D	D	D	D	D	
	0.018µF (183)	D	D	D	D	D	D	D	D	D	
	0.022µF (223)	D	D	D	D	D	D	D	D	D	
	0.027µF (273)	D	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			
	0.047µF (473)	D	D	D	D	D	D	D			
	0.056µF (563)	D	D	D	D	D	D	D			
	0.068µF (683)	D	D	D	D	D	D	D			
	0.082µF (823)	D	D	D	D	D	D				
	0.10µF (104)	D	D	D	D	D	D				
	0.12µF (124)	D	D	D	D	I					
	0.15µF (154)	D	D	D	D	I					
	0.18µF (184)	D	D	D	D	I					
	0.22µF (224)	D	D	D	D	I					
	0.27µF (274)	I	I	I	I						
	0.33µF (334)	I	I	I	I						
	0.39µF (394)	I	I	I	I						
	0.47µF (474)	I	I	I	I						
	0.56µF (564)	I	I	I							
	0.68µF (684)	I	I	I							
	0.82µF (824)	I	I	I							
	1.0µF (105)	I	I	I	I						

Dielectric		X7R									
Size		0805									
Rated Voltage (V DC)		10	16	25	50	100	200	250	500	630	1000
Capacitance	1.5µF (155)	I	I	I							
	2.2µF (225)	I	I	I							
	3.3µF (335)										
	4.7µF (475)										
	10µF (106)										
	22µF (226)										
	47µF (476)										

X7R Dielectric 1206 Size

Dielectric		X7R													
Size		1206													
Rated Voltage (VDC)		10	16	25	50	100	200	250	400	450	500	630	1000	1500	2000
Capacitance	100pF (101)						D	D			D	D	D	D	D
	120pF (121)						D	D			D	D	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
	330pF (331)	D	D	D	D	D	D	D			D	D	D	D	D
	390pF (391)	D	D	D	D	D	D	D			D	D	D	D	D
	470pF (471)	D	D	D	D	D	D	D			D	D	D	D	D
	560pF (561)	D	D	D	D	D	D	D			D	D	D	D	D
	680pF (681)	D	D	D	D	D	D	D			D	D	D	D	D
	820pF (821)	D	D	D	D	D	D	D			D	D	D	G	G
	1,000pF (102)	D	D	D	D	D	D	D			D	D	D	G	G
	1,200pF (122)	D	D	D	D	D	D	D			D	D	D	G	G
	1,500pF (152)	D	D	D	D	D	D	D			D	D	D	G	G
	1,800pF (182)	D	D	D	D	D	D	D			D	D	D	G	G
	2,200pF (222)	D	D	D	D	D	D	D			D	D	D	G	G
	2,700pF (272)	D	D	D	D	D	D	D			D	D	D	G	G
	3,300pF (332)	D	D	D	D	D	D	D			D	D	D	G	G
	3,900pF (392)	D	D	D	D	D	D	D			D	D	D	G	
	4,700pF (472)	D	D	D	D	D	D	D			D	D	D	G	
	5,600pF (562)	D	D	D	D	D	D	D			D	D	D	G	
	6,800pF (682)	D	D	D	D	D	D	D			D	D	D	G	
	8,200pF (822)	D	D	D	D	D	D	D			D	D	D	G	

Dielectric		X7R													
Size		1206													
Rated Voltage (VDC)		10	16	25	50	100	200	250	400	450	500	630	1000	1500	2000
	0.010µF (103)	D	D	D	D	D	D	D			D	D	D	G	
	0.012µF (123)	D	D	D	D	D	D	D			D	D	G		
Capacitance	0.015µF (153)	D	D	D	D	D	D	D			D	D	G		
	0.018µF (183)	D	D	D	D	D	D	D			D	D			
	0.022µF (223)	D	D	D	D	D	D	D			G	G			
	0.027µF (273)	D	D	D	D	D	D	D			G	G			
	0.033µF (333)	D	D	D	D	D	G	G			G	G			
	0.039µF (393)	D	D	D	D	D	G	G			G	G			
	0.047µF (473)	D	D	D	D	D	G	G			G	G			
	0.056µF (563)	D	D	D	D	D	G	G			G	G			
	0.068µF (683)	D	D	D	D	D	G	G	G	G					
	0.082µF (823)	D	D	D	D	D	G	G	G	G					
	0.10µF (104)	D	D	D	D	D	G	G	G	G					
	0.12µF (124)	D	D	D	D	D									
	0.15µF (154)	C	C	C	C	G									
	0.18µF (184)	C	C	C	C	G									
	0.22µF (224)	C	C	C	C	G									
	0.27µF (274)	C	C	C	D	G									
	0.33µF (334)	C	C	C	D	G									
	0.39µF (394)	C	C	J	P	G									
	0.47µF (474)	J	J	J	P	G									
	0.56µF (564)	J	J	J	P	P									
	0.68µF (684)	J	J	J	P	P									
	0.82µF (824)	J	J	J	P	P									
	1.0µF (105)	J	J	J	P										
	1.5µF (155)	J	J	P											
	2.2µF (225)	J	J	P											
	3.3µF (335)	P	P	P											
	4.7µF (475)	P	P	P											
	10µF (106)	P													
	22µF (226)														
	47µF (476)														

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

Reliability Test Conditions And Requirements

<table>
<tr><th>No</th><th>Item</th><th>Test Condition</th><th>Requirements</th></tr>
<tr><td>1</td><td>Visual and Mechanical</td><td>-</td><td>* No remarkable defect.
* Dimensions to conform to individual specification sheet.</td></tr>
<tr><td>2</td><td>Capacitance</td><td rowspan="2">*Test temp.: Room Temperature.
*Class I: (NP0)
≤1000pF, 1.0±0.2Vrms, 1MHz±10%
>1000pF, 1.0±0.2Vrms, 1KHz±10%
Class II: (X7R) C≤10μF, 1.0±0.2Vrms, 1KHz±10% **
C>10μF, 0.5±0.2Vrms, 120Hz±20%
** Test condition:
0.5±0.2Vrms, 1KHz±10%
X7R: 0603/475(6.3V)

*Before initial measurement (Class II only):
To apply de-aging at 150°C for 1hr then set for 24±2 hrs at room temp.</td><td>* Shall not exceed the limits given in the detailed spec.</td></tr>
<tr><td>3</td><td>High Temperature Exposure (Storage)
MIL-STD-202
Method 108</td><td>* No remarkable damage.
* Cap change : NPO: within ±2.5% or ±0.25pF whichever is larger.
X7R: within ±10.00%.
* Q/D.F. value:
NPO: Cap≥30pF, Q≥1000 ; Cap<30pF, Q≥400+20C.
X7R:
<table>
<tr><th>Rated vol.</th><th>D.F.≤</th><th colspan="2">Exception of D.F.≤</th></tr>
<tr><td rowspan="3">≥ 100V</td><td rowspan="3">≤2.5%</td><td>≤3%</td><td>1206≥0.47μF</td></tr>
<tr><td>≤5%</td><td>0603≥0.068μF;0805>0.1μF;1206≥1μF;1210≥2.2μF; TT series</td></tr>
<tr><td>≤10%</td><td>0805>0.22μF;1210≥3.3μF</td></tr>
<tr><td rowspan="4">50V</td><td rowspan="4">≤2.5%</td><td>≤3%</td><td>0201(50V);0603≥0.047μF;0805≥0.18μF;1206≥0.47μF</td></tr>
<tr><td>≤5%</td><td>0201≥0.01uF;1210≥3.3μF</td></tr>
<tr><td>≤10%</td><td>0402≥0.012μF;0603>0.1μF; 0805/X7R>0.47μF; 1206≥2.2μF;1210≥10μF</td></tr>
<tr><td>≤12.5%</td><td>1206/X5R=10μF</td></tr>
<tr><td>35V</td><td>≤3.5%</td><td>≤10%</td><td>0603≥1μF;0805≥2.2μF;1206≥2.2μF;1210≥10μF</td></tr>
<tr><td rowspan="4">25V</td><td rowspan="4">≤3.5%</td><td>≤5%</td><td>0201≥0.01μF(0201/ X5R=0.01μF);0805≥1μF;1210≥10μF*</td></tr>
<tr><td>≤7%</td><td>0603≥0.33μF</td></tr>
<tr><td>≤10%</td><td>0201≥0.1μF(0201/X5R>0.01μF);0603≥0.47μF;TT series;
0402≥0.10μF(0402/X7R≥0.056μF);0805≥2.2μF;
1206≥4.7μF;1210≥22μF(1210/X5R≥10μF)*</td></tr>
<tr><td>≤12.5%</td><td>402≥0.47μF;0805/X5R/X6S=10μF</td></tr>
<tr><td rowspan="3">16V</td><td rowspan="3">≤3.5%</td><td>≤5%</td><td>0201≥0.01μF(0201/X5R=0.01μF);0402≥0.033μF;
0603≥0.15μF;0805≥0.68μF;1206≥2.2μF;1210≥4.7μF</td></tr>
<tr><td>≤10%</td><td>0201≥0.1μ(0201/X5R>0.01μF;0201/ X7R≥0.022μF);0402≥0.22uF;
0603>0.47μF;0805≥2.2μF;1206≥4.7μF;1210≥22μF;
TT series</td></tr>
<tr><td>≤12.5%</td><td>0402/X5R≥1μF;0402/X6S=1μF;0805/X5R/X6S=10μF</td></tr>
<tr><td rowspan="3">10V</td><td rowspan="3">≤5%</td><td>≤10%</td><td>0201≥0.012μF;0402≥0.22μF;0603≥0.33μF;TT series;
0805≥2.2μF;1206≥2.2μF;1210≥22μF:01R5/X5R</td></tr>
<tr><td>≤12.5%</td><td>0805/X5R/X6S=10μF</td></tr>
<tr><td>≤15%</td><td>0201≥0.1μF(0201/X5R>0.1μF);0402≥1μF;0603/ X5R≥10μF</td></tr>
<tr><td rowspan="2">6.3V</td><td rowspan="2">≤10%</td><td>≤15%</td><td>0201≥0.1μF(0201/X5R>0.1μF);0402≥1μF(0402/ X6SC0.47μF); 0603≥10μF;0805≥4.7μF;1206≥47μF;1210≥100μF;TT series</td></tr>
<tr><td>≤20%</td><td>0402≥2.2μF</td></tr>
<tr><td>4V</td><td>≤15%</td><td>---</td><td>---</td></tr>
</table>
</td></tr>
</table>

<table>
<tr><th>No</th><th>Item</th><th>Test Condition</th><th>Requirements</th></tr>
<tr><td>4</td><td>Dielectric Strength</td><td>*To apply voltage:
≥100V: 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.</td><td> No evidence of damage or flash over during test.</td></tr>
<tr><td>5</td><td>Insulation Resistance</td><td>*Test temp.: Room Temperature.
*To apply rated voltage for MAX. 120sec.</td><td>10G or RxCV 500-F whichever is smaller.
Class II (X7R, X7E, X5R,X6S,X7S)
<table>
<tr><th>Rated voltage</th><th>Insulation Resistance</th></tr>
<tr><td>100V: All X7R</td><td rowspan="7">10GΩ or R × C ≥100Ω-F whichever is smaller.</td></tr>
<tr><td>50V:0402>0.01μF;06031μF;08051μF;12064.7μF;12104.7μF</td></tr>
<tr><td>35V:08052.2μF;1206≥2.2μF;1210≥10μF</td></tr>
<tr><td>25V:04021μF;06032.2μF;08052.2μF;120610μF;121010μF</td></tr>
<tr><td>16V: 02010.1μF,04020.22μF;06031μF; 08052.2μF;120610μF;121047μF</td></tr>
<tr><td>10V:020147nF;04020.47μF;06030.47μF;08052.2μF; 12064.7μF;121047μF</td></tr>
<tr><td>6.3V ; 4V ; TT series; Size1812</td></tr>
<tr><td>Rated voltage</td><td>Insulation Resistance</td></tr>
<tr><td>All X6S items, All X7S items</td><td></td></tr>
<tr><td>100V: 1210≥3.3μF</td><td></td></tr>
<tr><td>50V: 0402≥0.1μF; 0603≥2.2μF; 0805≥10μF;1206≥10μF</td><td></td></tr>
<tr><td>35V: 0603≥1μF;</td><td></td></tr>
<tr><td>25V: 0201≥0.1μF; 0402≥2.2μF; 0603≥10μF; 0805≥10μF;120622μF</td><td></td></tr>
<tr><td>16V: 0603≥10μF; 0402≥1μF; 0201≥0.22μF</td><td></td></tr>
<tr><td>10V: 0201>0.1μF; 0402≥1μF; 0603≥10μF; 0805≥47μF; TT21>4.7μF</td><td></td></tr>
<tr><td>6.3V: 0201≥0.1μF; 0402≥1μF;0603>4.7μF;0805≥47μF;1206≥10μF;</td><td></td></tr>
<tr><td>4V: 0603≥22μF; 0805≥47μF; 1206100μF</td><td></td></tr>
</table></td></tr>
</table>

<table>
<tr><th>No</th><th>Item</th><th colspan="2">Test Condition</th><th>Requirements</th></tr>
<tr><td></td><td></td><td>Rated voltage: 200~630V</td><td>To apply rated voltage (500V max.) for 60 sec</td><td rowspan="2">≥10GΩ or RxC≥100Ω-F whichever is smaller</td></tr>
<tr><td></td><td></td><td>Rated voltage: >630V</td><td>To apply 500V for 60 sec.</td></tr>
<tr><td>6</td><td>Temperature Coefficient</td><td colspan="2">With no electrical load
<table>
<tr><th>T.C</th><th>Operating Temp</th></tr>
<tr><td>X7R</td><td>-55~125°C at 25°C</td></tr>
</table>
*Before initial measurement (Class II only): To apply de-aging at 150°C for 1hr then set for 24±2 hrs at room temp.
* Measurement voltage for Class II:
<table>
<tr><th>0603</th></tr>
<tr><td>Cap<1μF: 1V</td></tr>
<tr><td>1μFCap4.7μF: 0.5V
0603X106-10V: 0.5V</td></tr>
<tr><td>Cap>4.7μF: 0.2V</td></tr>
</table>
<table>
<tr><th>0805</th></tr>
<tr><td>Cap<10μF: 1V</td></tr>
<tr><td>Cap=10μF: 0.5V
0805B475/6.3V~25V: 0.5V</td></tr>
<tr><td>Cap>10μF: 0.2V</td></tr>
</table>
<table>
<tr><th>1206</th></tr>
<tr><td>Cap10μF: 1V</td></tr>
<tr><td>10μF<Cap100μF: 0.5V</td></tr>
<tr><td>Cap>100μF: 0.2V
1206X107-6.3V: 0.2V</td></tr>
</table></td><td>* No remarkable damage.
* Cap change : NPO: within ±2.5% or ±0.25pF whichever is larger.
X7R: within ±10%.
* Q/D.F. value:
NPO: Cap≥30pF, Q≥1000 ; Cap<30pF, Q≥400+20C.
X7R:

* I.R.: 10GΩ or RxC500Ω-F whichever is smaller.
Class II (X7R)</td></tr>
</table>

No	Item	Test Condition	Requirements
7	Adhesive Strength of Termination	* Pressurizing force:q 2N (0201) and 5N (0603) and 10N (>0603) * Test time: 10±1 sec.	* No remarkable damage or removal of the terminations.
8	Vibration Resistance	* 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.	* No remarkable damage. * Cap change and Q/D.F.: To meet initial spec.
9	Solderability	* Solder temperature: 235±5°C	* 75% min. coverage of all metalized area.
10	Bending Test	* 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 5 mm and then the pressure shall be maintained for 5±1 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. * Measurement to be made after keeping at room temp. for 24±2 hrs.	* No remarkable damage. * Cap change: NP0: within ±5% or 0.5pF whichever is larger X7R, X5R, X6S, X7S: within ±12.5% (This capacitance change means the change of capacitance under specified flexure of substrate from the capacitance measured before the test.)

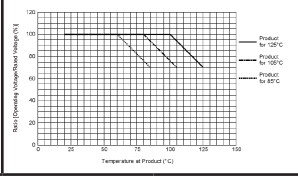
<table>
<tr><th>No</th><th>Item</th><th>Test Condition</th><th>Requirements</th></tr>
<tr><td>11</td><td>Resistance to Soldering Heat</td><td>* Solder temperature: 260±5°C
* Dipping time: 10±1 sec
* Preheating: 120 to 150°C for 1 minute before imme rse
the capacitor in a eutectic solder.
*Before initial measure-ment (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. Meas-urement to be made after de-aging at 150°C for 1hr then set for 24±2 hrs at room
temp.</td><td>* No remarkable damage.
* Cap change:
NP0: within ±2.5% or 0.25pF whichever is larger
X7R, X5R, X6S, X7S: within ±7.5%
* Q/D.F., I.R. and dielectric strength: To meet initial requirements.
* 25% max. leaching on each edge.</td></tr>
<tr><td>12</td><td>Temperature Cycle</td><td>* Conduct the five cycles according to the tempera-tures
and time.
<table><tr><th>Step</th><th>Temp. (°C)</th><th>Time (min.)</th></tr><tr><td>1</td><td>Min. operating temp. +0/-3</td><td>30±3</td></tr><tr><td>2</td><td>Room temp.</td><td>2~3</td></tr><tr><td>3</td><td>Max. operating temp. +3/-0</td><td>30±3</td></tr><tr><td>4</td><td>Room temp.</td><td>2~3</td></tr></table>*Before initial measure-ment (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.</td><td>* No remarkable damage.
* Cap change:
NP0: within ±2.5% or 0.25pF whichever is larger
X7R, X5R, X6S, X7S: within ±7.5%
* Q/D.F., I.R. and dielectric strength: To meet initial requirements</td></tr>
</table>

<table>
<tr><th>No</th><th>Item</th><th>Test Condition</th><th>Requirements</th></tr>
<tr><td>13</td><td>Humidity (Damp Heat) Steady State</td><td>*Test temp.: 40±2°C
*Humidity: 90~95%RH
*Test time: 500+24/-0hrs.
*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.</td><td>* No remarkable damage.
* Cap change:
NP0: within ±5% or 0.5pF whichever is larger
X7R, within ±12.5%; ≤6.3V within ±25%;
TT series & C 1uF,within ±25%
**10V: 0603≥4.7μF;0402≥1μF;0201≥0.1μF, within ±25%;
* Q/D.F. value: X7R:
<table>
<tr><th>Rated vol.</th><th>D.F.≤</th><th colspan="2">Exception of D.F.≤</th></tr>
<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>0603≥0.068μF;0805>0.1μF;1206≥1μF;1210≥2.2μF; TT series</td></tr>
<tr><td>≤20%</td><td>0805>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≥0.01uF;1210≥3.3μF</td></tr>
<tr><td>≤20%</td><td>0402≥0.012μF;0603>0.1μF; 0805/X7R>0.47μF; 1206≥2.2μF;1210≥10μF</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</td></tr>
<tr><td>≤15%</td><td>0201≥0.1μF(0201/X5R>0.01μF); 0603≥0.47μF;TTseries 0402≥0.10μF(0402/X7R≥0.056μF);0805v2.2μF; 1206≥4.7μF;1210≥22μF</td></tr>
<tr><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>0.47μF;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≥0.22μF; 0603≥0.33μF;0805≥2.2μF;1206≥2.2μF;1210≥22μF</td></tr>
<tr><td>≤20%</td><td>0201≥0.1μF;0402≥1μF;0603/X5R≥10μF;TT series;01R5/X5R</td></tr>
<tr><td>6.3V</td><td>≤15%</td><td>≤30%</td><td>0201≥0.1μF;0402≥1μF(0402/X6S≥0.47μF); 0603v10μF;0805≥4.7μF;1206≥47μF;1210≥100μF;TT series</td></tr>
<tr><td>4V</td><td>≤20%</td><td>---</td><td>---</td></tr>
</table>
* I.R.: 10GΩ or RxC500Ω-F whichever is smaller.
Class II (X7R)</td></tr>
</table>

<table>
<tr><th>No</th><th>Item</th><th>Test Condition</th><th>Requirements</th></tr>
<tr><td></td><td></td><td></td><td>
<table>
<tr><th>Rated voltage</th><th>Insulation Resistance</th></tr>
<tr><td>100V: All X7R;1210≥3.3μF</td><td rowspan="7">1GΩ or R × C ≥10Ω-F whichever is smaller.</td></tr>
<tr><td>50V: 0402>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≥0.1uF;0402≥0.22μF;0603≥2.2μF;0805≥2.2μF; 1206≥10μF;1210≥10μF</td></tr>
<tr><td>16V: 0201≥0.1uF;0402≥0.22μF;0603≥1μF;0805≥2.2μF; 1206≥10μF;1210≥47μF</td></tr>
<tr><td>10V: 0201≥47nF;0402≥0.47μF;06030≥47μF;0805≥2.2μF; 1206≥4.7μF;1210≥47μF</td></tr>
<tr><td>6.3V; 4V; Size≥1812</td></tr>
</table>
</td></tr>
<tr><td>14</td><td>Biased Humidity
MIL-STD-202
Method 103</td><td>*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.</td><td>
* No remarkable damage.
* Cap change : NPO: within ±2.5% or ±0.25pF whichever is larger.
X7R: within ±10%.
* Q/D.F. value:
NPO: Cap≥30pF, Q≥1000 ; Cap<30pF, Q≥400+20C. X7R:
* I.R.: 10GΩ or RxC50Ω-F whichever is smaller.
Class II (X7R)
<table>
<tr><th>Rated vol.</th><th>D.F.≤</th><th colspan="2">Exception of D.F.≤</th></tr>
<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>0603≥0.068μF;0805>0.1μF;1206≥1μF;1210≥2.2μF; TT series</td></tr>
<tr><td>≤20%</td><td>0805>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≥0.01uF;1210≥3.3μF</td></tr>
<tr><td>≤20%</td><td>0402≥0.012μF;0603>0.1μF;0805≥1μF(0805/X7R>0.47μF); 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(0201/X5R=0.01μF);0805≥1μF;1210≥10μF*</td></tr>
<tr><td>≤14%</td><td>0603≥0.33μF</td></tr>
<tr><td>≤15%</td><td>0201≥0.1μF(0201/X5R>0.01μF); 0603≥0.47μF;TTseries 0402≥0.10μF(0402/X7R≥0.056μF);0805≥2.2μF; 1206≥4.7μF;1210≥22μF(1210/X5R≥10μF)*;</td></tr>
<tr><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>0.47μF;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≥0.22μF; 0603≥0.33μF;0805≥2.2μF;1206≥2.2μF;1210≥22μF</td></tr>
<tr><td>≤20%</td><td>0201≥0.1μF;0402≥1μF;0603/X5R≥10μF;TT series;01R5/X5R</td></tr>
<tr><td>6.3V</td><td>≤15%</td><td>≤30%</td><td>0201≥0.1μF;0402≥1μF(0402/X6S≥0.47μF); 0603v10μF;0805≥4.7μF;1206≥47μF;1210≥100μF;TT series</td></tr>
<tr><td>4V</td><td>≤20%</td><td>---</td><td>---</td></tr>
</table>
</td></tr>
</table>

<table>
<tr><th>No</th><th>Item</th><th>Test Condition</th><th>Requirements</th></tr>
<tr><td></td><td></td><td></td><td>
<table>
<tr><th>Rated voltage</th><th>Insulation Resistance</th></tr>
<tr><td>100V: All X7R;1210≥3.3μF</td><td rowspan="6">500GΩ or R × C≥5Ω-F whichever is smaller.</td></tr>
<tr><td>50V: 0402>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≥0.1uF;0402≥0.22μF;0603≥2.2μF;0805≥2.2μF;
1206≥10μF;1210≥10μF</td></tr>
<tr><td>16V: 0201≥0.1uF;0402≥0.22μF;0603≥1μF;0805≥2.2μF;
1206≥10μF;1210≥47μF</td></tr>
<tr><td>10V: 0201≥47nF;0402≥0.47μF;06030≥47μF;0805≥2.2μF;
1206≥4.7μF;1210≥47μF</td></tr>
<tr><td>6.3V; 4V; Size≥1812</td></tr>
</table>
Class II (X7R) for 1.3~1.5Vdc
<table>
<tr><th>Rated voltage</th><th>Insulation Resistance</th></tr>
<tr><td>100V: All X7R;1210≥3.3μF</td><td rowspan="6">1GΩ or R × C ≥10Ω-F whichever is smaller.</td></tr>
<tr><td>50V: 0402>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: 02010≥1uF;04020≥22μF;06032≥2μF;0805≥2.2μF;
1206≥10μF;1210≥10μF</td></tr>
<tr><td>16V: 02010≥1uF;04020≥22μF;0603≥1μF;0805≥2.2μF;
1206≥10μF;1210≥47μF</td></tr>
<tr><td>10V: 0201≥47nF;0402≥0.47μF;06030≥47μF;0805≥2.2μF;
1206≥4.7μF;1210≥47μF</td></tr>
<tr><td>6.3V; 4V; Size≥1812</td></tr>
</table>
</td></tr>
<tr><td>15</td><td>High Temperature Load (Endurance)</td><td>* Test temp: X7R : 125±3°C
*Test time: 1000+24/-0 hrs.
*To apply voltage:
(1) 100% of rated voltage for below range.
<table>
<tr><th>Size</th><th>Dielectric</th><th>Rated voltage</th><th>Capacitance</th></tr>
<tr><td rowspan="3">0603</td><td rowspan="2">X5R/X7R/ X6S/X7S</td><td>4V</td><td>C≥22μF</td></tr>
<tr><td>6.3V,10V</td><td>C≥4.7μF#1</td></tr>
<tr><td>X5R/X6S/ X7S</td><td>25V</td><td>C≥1.0μF</td></tr>
<tr><td>X7R</td><td>35V</td><td>C≥1.0μF</td></tr>
<tr><td rowspan="6">0805</td><td rowspan="3">X5R/X7R/ X6S/X7S</td><td>4V</td><td>Cv47μF</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">X6S</td><td>16V</td><td>C >10μF</td></tr>
<tr><td>25V</td><td>C≥10μF</td></tr>
<tr><td>X7R/X7S</td><td rowspan="2">16V,25V</td><td>C≥10μF</td></tr>
<tr><td>X5R</td><td>C≥22μF</td></tr>
<tr><td>1206</td><td>X5R/X7R/ X6S</td><td>≤6.3V</td><td>C≥47μF</td></tr>
</table>
</td><td>* No remarkable damage.
Cap change:
NP0: ±3.0% or ±0.3pF whichever is larger
X7R, X5R, X6S, X7S: 10V**,within ±12.5%; ≤6.3V within ±25%;
TT series & C 1uF,within ±25%
**10V: 0603≥4.7μF;0402≥1μF;0201≥0.1μF, within ±25%;
Q/D.F. value:
NP0: More than 30pF, Q350 10pF≤C<30pF, Q≥275+2.5C Less than 10pF, Q≥200+10C X7R</td></tr>
</table>

<table>
<tr><th>No</th><th>Item</th><th>Test Condition</th><th>Requirements</th></tr>
<tr><td></td><td></td><td>
**1WV items must follow de-rating conditions.
#1. 0603X106(10V)&0603S106(4V&6.3V):150% of rated voltage
(2) 150% of rated voltage for below range.
<table>
<tr><th>Size</th><th>Dielectric</th><th>Rated voltage</th><th>Capacitance</th></tr>
<tr><td rowspan="5">0603</td><td>X7S</td><td>50V~100V</td><td>C>0.22μF</td></tr>
<tr><td rowspan="2">X7R</td><td>50V</td><td>C>0.1μF</td></tr>
<tr><td>25V</td><td>C=1.0μF</td></tr>
<tr><td>X5R</td><td>50V</td><td>C≥1.0μF</td></tr>
<tr><td>X5R/X7R/X6S/X7S</td><td>10V,16V</td><td>C≥1.0μF</td></tr>
<tr><td rowspan="4">0805</td><td rowspan="4">X5R/X7R/X6S/X7S</td><td>100V</td><td>C≥47μF</td></tr>
<tr><td>50V</td><td>C≥68μF</td></tr>
<tr><td>35V</td><td>C≥2.2μF</td></tr>
<tr><td>10~25V</td><td>C >4.7μF</td></tr>
<tr><td rowspan="4">1206</td><td rowspan="2">X7R</td><td>100V</td><td>C≥1.0μF</td></tr>
<tr><td>50V</td><td>C=4.7μF</td></tr>
<tr><td rowspan="2">X5R/X6S/X7S</td><td>100V</td><td>C≥2.2μF</td></tr>
<tr><td>50V</td><td>C≥1.0μF</td></tr>
</table>
(3)≤6.3V or C≥10μF: 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) 630V~3000V:120% of rated voltage, Excluding 1210/X7R/103/2KV(110% of rated voltage)
(8) 4000V: 110% of rated voltage
* 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.
** De-rating conditions:
</td><td>
<table>
<tr><th>Rated vol.</th><th>D.F.≤</th><th colspan="2">Exception of D.F.≤</th></tr>
<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>0603≥0.068μF;0805>0.1μF;1206≥1μF;1210≥2.2μF; TT series</td></tr>
<tr><td>≤20%</td><td>0805>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≥0.01uF;1210≥3.3μF</td></tr>
<tr><td>≤20%</td><td>0402≥0.012μF;0603>0.1μF; 0805/X7R>0.47μF; 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;0201/ X5R=0.01μF);0805≥1μF;1210≥10μF*</td></tr>
<tr><td>≤14%</td><td>0603≥0.33μF</td></tr>
<tr><td>≤15%</td><td>0201≥0.1μF(0201/X5R>0.01μF); 0603≥0.47μF;TTseries 0402≥0.10μF(0402/X7R≥0.056μF);0805v2.2μF; 1206≥4.7μF;1210≥22μF (1210/X5R≥10μF)*;</td></tr>
<tr><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>0.47μF;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≥0.22μF; 0603≥0.33μF;0805≥2.2μF;1206≥2.2μF;1210≥22μF</td></tr>
<tr><td>≤20%</td><td>0201≥0.1μF;0402≥1μF;0603/X5R≥10μF;TT series;01R5/X5R</td></tr>
<tr><td>6.3V</td><td>≤15%</td><td>≤30%</td><td>0201≥0.1μF;0402≥1μF(0402/X6S≥0.47μF); 0603v10μF;0805≥4.7μF;1206≥47μF;1210≥100μF;TT series</td></tr>
<tr><td>4V</td><td>≤20%</td><td>---</td><td>---</td></tr>
</table>
*I.R.: 10V, 1G or 50 -F whichever is smaller.
Class II (X7R)
<table>
<tr><th>Rated voltage</th><th>Insulation Resistance</th></tr>
<tr><td>100V: All X7R;1210≥3.3μF</td><td rowspan="6">1G or RxC≥ 10 -F whichever is smaller.</td></tr>
<tr><td>50V: 0402>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≥0.1uF;0402≥0.22μF;0603≥2.2μF;0805≥2.2μF; 1206≥10μF;1210≥10μF</td></tr>
<tr><td>16V: 0201≥0.1uF;0402≥0.22μF;0603≥1μF;0805≥2.2μF; 1206≥10μF;1210≥47μF</td></tr>
<tr><td>10V: 0201≥47nF;0402≥0.47μF;06030≥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>
</table>
</td></tr>
</table>

No	Item	Test Condition	Requirements
			

APPENDIXES

Tape & reel dimensions

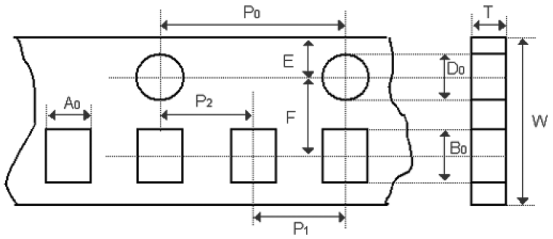


Fig. 2 The dimension of paper tape

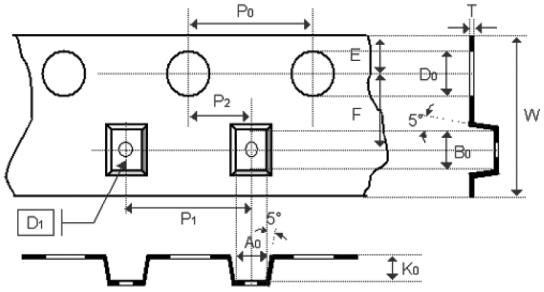


Fig. 3 The dimension of plastic tape

Size	0603	0805			1206		
Thickness	S,X	A,H	B,T	D,I	B,T	C,J, D	G,P
A_0	1.05 +/-0.3	1.5 +/-0.2	1.5 +/-0.2	< 1.8	1.9 +/-0.5	< 2	<2.3
B_0	1.80 +/-0.3	2.3 +/-0.2	2.3 +/-0.2	< 2.7	3.5 +/-0.5	< 3.7	< 4
T	≤1.2	≤1.15	≤1.2	0.23 +/-0.1	≤1.2	0.23 +/-0.1	0.23 +/-0.1
K_0	--	--	--	< 2.5	--	< 2.5	< 2.5
W	8 +/-0.30	8 +/-0.3	8 +/-0.3	8 +/-0.3	8 +/-0.3	8 +/-0.3	8 +/-0.3
P_0	4 +/-0.1	4 +/-0.1	4 +/-0.1	4 +/-0.1	4 +/-0.1	4 +/-0.1	4 +/-0.1
$10xP_0$	40 +/-0.2	40 +/-0.2	40 +/-0.2	40 +/-0.2	40 +/-0.2	40 +/-0.2	40 +/-0.2
P_1	4 +/-0.1	4 +/-0.1	4 +/-0.1	4 +/-0.1	4 +/-0.1	4 +/-0.1	4 +/-0.1
P_2	2 +/-0.05	2 +/-0.05	2 +/-0.05	2 +/-0.05	2 +/-0.05	2 +/-0.05	2 +/-0.05
D_0	1.5 +0.1/-0	1.5 +0.1/-0	1.5 +0.1/-0	1.5 +0.1/-0	1.5 +0.1/-0	1.5 +0.1/-0	1.5 +0.1/-0
D_1	--	--	--	1 +/-0.1	--	1 +/-0.1	1 +/-0.1
E	1.75 +/-0.1	1.75 +/-0.1	1.75 +/-0.1	1.75 +/-0.1	1.75 +/-0.1	1.75 +/-0.1	1.75 +/-0.1
F	3.5 +/-0.05	3.5 +/-0.05	3.5 +/-0.05	3.5 +/-0.05	3.5 +/-0.05	3.5 +/-0.05	3.5 +/-0.05

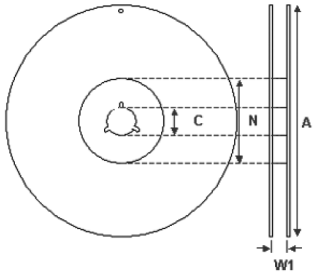
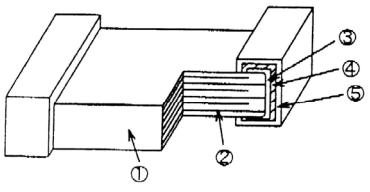


Fig. 4 The dimension of reel

Size	0603, 0805, 1206		
Reel size	7”	10”	13”
C	13 ±0.5	13 ±0.5	13 ±0.5
W_1	10 ±1.5	10 ±1.5	10 ±1.5
A	178 ±2	250 ±2	330 ±2
N	60 +1.0/-0	50 min	50 min

Appendixes

No.	Name		X7R
1	Ceramic material		$BaTiO_3$ based
2	Inner electrode		Ni
3	Termination	Inner layer	Cu + Cu Polymer
4		Middle layer	Ni
5		Outer layer	Sn



The construction of MLCC

Storage and handling conditions

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

(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_2 within oven are recommended.

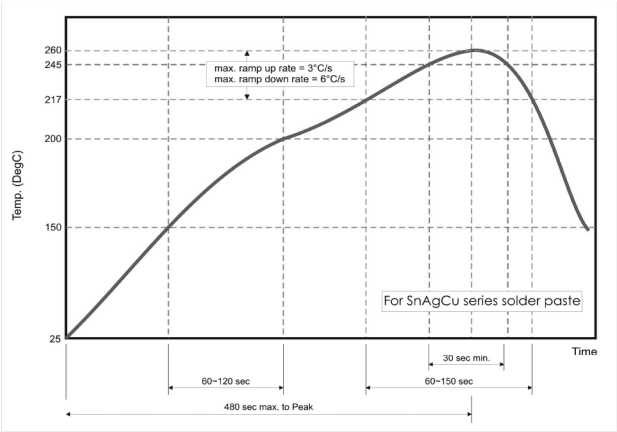


Fig. 6 Recommended reflow soldering profile for SMT process with SnAgCu series solder paste.

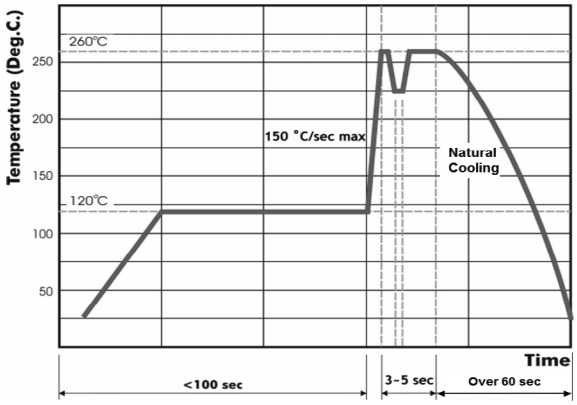


Fig. 7 Recommended wave soldering profile for SMT process with SnAgCu series solder.

Part Number Table

Description	Part Number
SMD Multilayer Ceramic Capacitors, Soft Termination, 0603, X7R, 10nF, 10%, 50V	MCSG18B103K500CT
SMD Multilayer Ceramic Capacitors, Soft Termination, 0805, X7R, 1nF, 10%, 1KV	MCSG21B102K102CT
SMD Multilayer Ceramic Capacitors, Soft Termination, 0805, X7R, 100nF, 10%, 50V	MCSG21B104K500CT
SMD Multilayer Ceramic Capacitors, Soft Termination, 0805, X7R, 220nF, 10%, 50V	MCSG21B224K500CT
SMD Multilayer Ceramic Capacitors, Soft Termination, 1206, X7R, 100nF, 10%, 50V	MCSG31B104K500CT