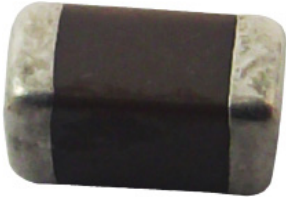


**RoHS
Compliant**



Description:

WTC 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.

Features:

- MLCC's termination are with a soft & flexible polymer layer to withstand high bending stress in SMT line.
- Available for any item in standard series range.

Applications:

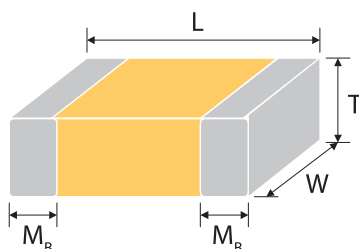
- Automotive industry.
- Power supply and related industries.
- Lighting industry.
- The other mechanical stress concerned products.

How To Order:

MCSH	31	B	104	K	500	C	T
Series	Size	Dielectric	Capacitance	Tolerance	Rated Voltage	Termination	Packaging
Multicomp SH=Soft termination	15=0402 (1005) 18=0603 (1608) 21=0805 (2012) 31=1206 (3216) 32=1210 (3225) 43=1812 (4532)	N= NP0 (C0G) B=X7R X=X5R F=Y5V	Two significant digits followed by no. of zeros. And R is in place of decimal point. Eg. 104 =10x104 =100nF	B=±0.1pF C=±0.25pF D=±0.5pF F=±1% G=±2% J=±5% K=±10% M=±20% Z=-20/+80%	Two significant digits followed by no. of zeros. And R is in place of decimal point. 6R3=6.3V DC 100=10V DC 160=16V DC 250=25V DC 500=50V DC 101=100V DC	C=Cu/ Polymer/Ni/ Sn	T=7" reeled G=13" reeled

Note 1: Please see below product range to find right termination code.

External Dimensions:



The outline of MLCC

Size Inch (mm)	L (mm)	W (mm)	T (mm)/Symbol	Remark	M _B (mm)
0402 (1005)	1±0.2	0.5±0.2	0.5±0.2	E	0.25 +0.05/-0.1
0603 (1608)	1.6±0.2	0.8±0.1	0.80±0.07	S	0.40±0.15
	1.6 +0.2/-0.1	0.8 +0.15/-0.1	0.8 +0.15/-0.1	X	

Reflow soldering only is recommended.

Size Inch (mm)	L (mm)	W (mm)	T (mm)/Symbol		Remark	M _B (mm)
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+0.25/-0.2	1.25±0.2	1.25±0.2	I	#	
1206 (3216)	3.2+0.4/-0.1	1.6±0.15	0.8±0.1	B		0.6±0.2
			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+0.4/-0.1	1.6+0.3/0.1	1.6+0.3/-0.1	P	#		
1210 (3225)	3.2±0.4	2.5±0.2	0.95±0.1	C	#	0.75±0.25
			1.25±0.1	D	#	
	3.2±0.5	2.5±0.3	1.6±0.2	G	#	
			2±0.2	K	#	
			2.5±0.3	M	#	
1812 (4532)	4.5+0.6/-0.4	3.2±0.3	1.25±0.1	D	#	0.75±0.25

Reflow soldering only is recommended.

General Electrical Data:

Dielectric	NPO	X7R	X5R	Y5V
Size	0402, 0603, 0805, 1206, 1210, 1812			
Capacitance range*	0.1pF to 0.015µF	100pF to 10µF	0.027µF to 10µF	0.01µF to 4.7µF
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%), K (±10%)	K (±10%), M (±20%)		Z (-20/+80%)
Rated voltage (WVDC)	6.3V, 10V, 16V, 25V, 50V, 100V			
Operating temperature	-55 to +125°C	-55 to +125°C	-55 to +85°C	-25 to +85°C
Capacitance characteristic	±30ppm	±15%	±15%	+30/-80%
Termination	Ni/Sn (lead-free termination)			

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

NPO: Apply 1±0.2Vrms, 1MHz±10% for Cap≤1,000pF and 1±0.2Vrms, 1kHz±10% for Cap>1,000pF, 25°C at ambient temperature

X7R, X5R: Apply 1±0.2Vrms, 1kHz±10%, at 25°C ambient temperature.

Y5V: Apply 1±0.2Vrms, 1kHz±10%, at 20°C ambient 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.

Packaging Style and Quantity:

Size	Thickness (mm)/Symbol		Paper tape		Plastic tape	
			7" reel	13" reel	7" reel	13" reel
0402 (1005)	0.5±0.2	E	10k	-	-	-
0603 (1608)	0.8±0.07	S	4k	15k	-	-
	0.8+0.15/-0.1	X	4k	15k	-	-
0805 (2012)	0.6±0.1	A	4k	15k	-	-
	0.8±0.1	B	4k	15k	-	-
	1.25±0.1	D	-	-	3k	10k
	1.25±0.2	I	-	-	3k	10k
1206 (3216)	0.8±0.1	B	4k	15k	-	-
	0.95±0.1	C	-	-	3k	10k
	1.15±0.15	J	-	-	3k	10k
	1.25±0.1	D	-	-	3k	10k
	1.6±0.2	G	-	-	2k	10k
	1.6+0.3/-0.1	P	-	-	2k	9k
1210 (3225)	0.95±0.1	C	-	-	3k	10k
	1.25±0.1	D	-	-	3k	10k
	1.6±0.2	G	-	-	2k	-
	2±0.2	K	-	-	1k	6k
	2.5±0.3	M	-	-	1k	6k
1812 (4532)	1.25±0.1	D	-	-	1k	5k
	2±0.2	K	-	-	1k	-

Unit: pieces

Reliability Test Conditions and Requirements:

No	Item	Test Condition	Requirements
1	Visual and Mechanical	-	*No remarkable defect. *Dimensions to conform to individual specification sheet.

No	Item	Test Condition	Requirements																																																						
2	Capacitance	<p>Class I: NPO Cap≤1,000pF 1±0.2Vrms, 1MHz±10% Cap>1,000pF 1±0.2Vrms, 1KHz±10% Class II: X7R, X5R, X6S, Y5V Cap≤10μF, 1±0.2Vrms, 1kHz±10% ** Cap>10μF, 0.5±0.2Vrms, 120Hz±20%</p> <p>** Test condition: 0.5±0.2Vrms, 1KHz±10% X7R: 0603≥225(10V), 0805=106(6.3V&10V) X5R: 01R5≥103, 0201≥224 (6.3V,10V), 0402≥475 (6.3V), 0402≥225(10V), 0603=106 (6.3V,10V), TT18X 475(≥10V) , TT15X series X6S:0201≥224 (6.3V),0402≥225 (6.3V),</p>	<p>NP0: Cap≥30pF, Q≥1000; Cap<30pF,Q≥400+20C</p> <p>X7R,X5R,X6S:</p> <table border="1"> <thead> <tr> <th>Rated vo</th> <th>DI..F. ≙</th> <th colspan="2">Exception of D.F. ≙</th> </tr> </thead> <tbody> <tr> <td rowspan="2">≥100V</td> <td rowspan="2">≤2.5%</td> <td>≤3%</td> <td>1206≥0.47μF</td> </tr> <tr> <td>≤5%</td> <td>0805≥0.1μF, 0603≥0.068μF</td> </tr> <tr> <td rowspan="3">50V</td> <td rowspan="3">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>1210≥4.7μF</td> </tr> <tr> <td>≤10%</td> <td>0402≥0.1μF; 0603≥1μF; 0805≥1μF; 1206≥2.2μF; 1210≥10μF; TT series</td> </tr> <tr> <td>35V</td> <td>≤3.5%</td> <td>≤10%</td> <td>0603≥1μF;0805≥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;0805≥1μF; 1210≥10μF</td> </tr> <tr> <td>≤7%</td> <td>0603≥0.33μF; 1206≥4.7μF</td> </tr> <tr> <td>≤10%</td> <td>0402≥0.1μF;0603≥0.47μF; 0805≥2.2μF; 1206≥6.8μF; 1210≥22μF; TT series</td> </tr> <tr> <td>≤12.5%</td> <td>0402≥1μF</td> </tr> <tr> <td rowspan="2">16V</td> <td rowspan="2">≤3.5%</td> <td>≤5%</td> <td>0201≥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≥0.1μF; 0402≥0.22μF; 0603≥0.68μF; 0805≥2.2μF; 1206≥4.7μF; 1210≥22μF; TT series</td> </tr> <tr> <td rowspan="2">10V</td> <td rowspan="2">≤5%</td> <td>≤10%</td> <td>0201≥0.012μF; 0402≥0.33μF; 0603≥0.33μF; 0805≥2.2μF; 1206≥2.2μF; 1210≥22μF; TT series</td> </tr> <tr> <td>≤15%</td> <td>0201≥0.1μF; 0402≥1μF</td> </tr> <tr> <td rowspan="2">6.3V</td> <td rowspan="2">≤10%</td> <td>≤15%</td> <td>0201≥0.1μF; 0402≥1μF; 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> </tbody> </table>	Rated vo	DI..F. ≙	Exception of D.F. ≙		≥100V	≤2.5%	≤3%	1206≥0.47μF	≤5%	0805≥0.1μF, 0603≥0.068μF	50V	2.5%	≤3%	0201(50V); 0603≥0.047μF; 0805≥0.18μF;1206≥0.47μF	≤5%	1210≥4.7μF	≤10%	0402≥0.1μF; 0603≥1μF; 0805≥1μF; 1206≥2.2μF; 1210≥10μF; TT series	35V	≤3.5%	≤10%	0603≥1μF;0805≥2.2μF; 1210≥10μF	25V	≤3.5%	≤5%	0201≥0.01μF;0805≥1μF; 1210≥10μF	≤7%	0603≥0.33μF; 1206≥4.7μF	≤10%	0402≥0.1μF;0603≥0.47μF; 0805≥2.2μF; 1206≥6.8μF; 1210≥22μF; TT series	≤12.5%	0402≥1μF	16V	≤3.5%	≤5%	0201≥0.01μF; 0402≥0.033μF; 0603≥0.15μF; 0805≥0.68μF 1206≥2.2μF; 1210≥4.7μF	≤10%	0201≥0.1μF; 0402≥0.22μF; 0603≥0.68μF; 0805≥2.2μF; 1206≥4.7μF; 1210≥22μF; TT series	10V	≤5%	≤10%	0201≥0.012μF; 0402≥0.33μF; 0603≥0.33μF; 0805≥2.2μF; 1206≥2.2μF; 1210≥22μF; TT series	≤15%	0201≥0.1μF; 0402≥1μF	6.3V	≤10%	≤15%	0201≥0.1μF; 0402≥1μF; 0603≥10μF; 0805≥4.7μF; 1206≥47μF :1210≥100μF; TT series	≤20%	0402≥2.2μF	4V	≤15%	-	-
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No	Item	Test Condition	Requirements			
3	Q/ D.F. (Dissipation Factor)		Y5V:			
			Rated vo	DI..F. ≙	Exception of D.F.≙	
			≥50V	5%	7%	0603≥0.1μF; 0805≥0.47μF; 1206≥4.7μF
			35V	7%	-	-
			25V	5%	7%	0402≥0.047μF; 0603≥0.1μF; 0805≥0.33μF; 1206≥1μF; 1210≥4.7μF
					9%	0402≥0.068μF; 0603≥0.47μF; 1206≥4.7μF; 1210≥22μF
			16V (C<1μF)	7%	9%	0402≥0.068μF; 0603≥0.68μF
					12.5%	0402≥0.22μF
			16V (C≥1μF)	9%	12.5%	0603≥2.2μF; 0805≥3.3μF; 1206≥10μF; 1210≥22μF;1812≥47μF
			10V	12.5%	20%	0402≥0.47μF
6.3V	20%	-	-			
4	Dielectric Strength	To apply voltage (≤100V) 250%. Duration: 1 to 5 sec. Charge and discharge current less than 50mA	No evidence of damage or flash over during test.			
5	Insulation Resistance	To apply rated voltage for max. 120 sec.	10GΩ or RxC≥500Ω-F whichever is smaller. Class II (X7R, X5R, X6S, Y5V)			
			Rated voltage	Insulation Resistance		
			100V: X7R	10GΩ or RxC≥100Ω-F whichever is smaller.		
			50V:0603≥1μF; 0805≥1μF; 1206≥4.7μF; 1210≥4.7μF			
			35V:0805≥2.2μF; 1210≥10μF			
			25V:0402≥1μF; 0603≥2.2μF; 0805≥2.2μF; 1206≥10μF;1210≥10μF			
			16V: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			
			50V: 0402≥0.1μF	10GΩ or RxC≥50Ω-F whichever is smaller.		
			35V:0603≥1μF			
			10V:0603≥10μF			
			4V:0603≥22μF; 0805≥47μF			

No	Item	Test Condition	Requirements																								
6	Temperature Coefficient	With no electrical load.																									
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7	Adhesive Strength of Termination	Pressurizing force: 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.) Measurement to be made after keeping at room temp. for 24±2 hrs.	No remarkable damage. Cap change and Q/D.F.: To meet initial spec.																								
9	Solderability	Solder temperature: 235±5°C Dipping time: 2±0.5 sec.	95% 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 1mm per second until the deflection becomes: 5mm and then the pressure shall be maintained for 5±1 sec. Measurement to be made after keeping at room temp. for 24±2 hrs.	No remarkable damage. Cap change: NPO: within ±5% or 0.5pF whichever is larger X7R, X5R, X6S: 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.)																								
11	Resistance to Soldering Heat	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): Perform 150+0/-10°C for 1 hr and 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: NPO: within ±2.5% or 0.25pF whichever is larger X7R, X5R, X6S: within ±7.5% Y5V: within ±20% Q/D.F., I.R. and dielectric strength: To meet initial requirements. 25% max. leaching on each edge.																								
12	Temperature Cycle	* Conduct the five cycles according to the temperatures and time.	No remarkable damage. Cap change: NPO: within ±2.5% or 0.25pF whichever is larger X7R, X5R, X6S: within ±7.5% Y5V: within ±20% Q/D.F., I.R. and dielectric strength: To meet initial requirements.																								
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4	Room temp.	2~3																									

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13	Humidity (Damp Heat) Steady State	<p>Test temp.: 40±2°C Humidity: 90~95% RH Test time: 500+24/-0hrs.</p> <p>Before initial measurement (Class II only): Perform 150+0/-10°C for 1 hr and then set for 24±2 hrs at room temp. Measurement to be made after keeping at room temp. for 24±2 hrs.</p>	<p>No remarkable damage. Cap change: NPO: within ±5% or 0.5pF whichever is larger X7R, X5R, X6S: ≥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%; Y5V: ≥10V, within ±30%; ≤6.3V, within +30/-40% Q/D.F. value: NPO: More than 30pF Q ≥ 350, 10pF ≤ C ≤ 30pF, Q ≥ 275+2.5C Less than 10pF Q ≥ 200+10C X7R, X5R, X6S:</p> <table border="1"> <thead> <tr> <th>Rated</th> <th>D.F. ≤</th> <th colspan="2">Exception of D.F. ≤</th> </tr> </thead> <tbody> <tr> <td rowspan="2">≥100V</td> <td rowspan="2">≤3%</td> <td>≤6%</td> <td>1206 ≥ 0.47μF</td> </tr> <tr> <td>≤7.5%</td> <td>0805 ≥ 0.1μF, 0603 ≥ 0.068μF</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>1210 ≥ 4.7μF</td> </tr> <tr> <td>≤20%</td> <td>0402 ≥ 0.1μF; 0603 ≥ 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; 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>0402 ≥ 0.10μF; 0603 ≥ 0.47μF; 0805 ≥ 2.2μF; 1206 ≥ 6.8μF; 1210 ≥ 22μF; TT series</td> </tr> <tr> <td>≤20%</td> <td>0402 ≥ 1μF</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; 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; 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</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>	Rated	D.F. ≤	Exception of D.F. ≤		≥100V	≤3%	≤6%	1206 ≥ 0.47μF	≤7.5%	0805 ≥ 0.1μF, 0603 ≥ 0.068μF	≥50V	≤3%	≤6%	0201(50V); 0603 ≥ 0.047μF; 0805 ≥ 0.18μF; 1206 ≥ 0.47μF	≤10%	1210 ≥ 4.7μF	≤20%	0402 ≥ 0.1μF; 0603 ≥ 1μF; 0805 ≥ 1μF; 1206 ≥ 2.2μF; 1210 ≥ 10μF; TT series	35V	≤5%	≤20%	0603 ≥ 1μF; 0805 ≥ 2.2μF; 1210 ≥ 10μF	25V	≤5%	≤10%	0201 ≥ 0.01μF; 0805 ≥ 1μF; 1210 ≥ 10μF	≤14%	0603 ≥ 0.33μF; 1206 ≥ 4.7μF	≤15%	0402 ≥ 0.10μF; 0603 ≥ 0.47μF; 0805 ≥ 2.2μF; 1206 ≥ 6.8μF; 1210 ≥ 22μF; TT series	≤20%	0402 ≥ 1μF	16V	≤5%	≤10%	0603 ≥ 0.15μF; 0805 ≥ 0.68μF; 1206 ≥ 2.2μF; 1210 ≥ 4.7μF	≤15%	0201 ≥ 0.01μF; 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; 0603 ≥ 0.33μF; 0805 ≥ 2.2μF; 1206 ≥ 2.2μF; 1210 ≥ 22μF	≤20%	0201 ≥ 0.1μF; 0402 ≥ 1μF; TT series	6.3V	≤15%	≤30%	0201 ≥ 0.1μF; 0402 ≥ 1μF; 0603 ≥ 10μF; 0805 ≥ 4.7μF; 1206 ≥ 47μF; 1210 ≥ 100μF; TT series	4V	≤20%	-	-
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			Y5V:			
			Rated vo	DI..F. ≤	Exception of D.F.≤	
			≥50V	5%	7%	0603≥0.1μF; 0805≥0.47μF; 1206≥4.7μF
			35V	7%	-	-
			25V	5%	7%	0402≥0.047μF; 0603≥0.1μF; 0805≥0.33μF; 1206≥1μF; 1210≥4.7μF
					9%	0402≥0.068μF; 0603≥0.47μF; 1206≥4.7μF; 1210≥22μF
			16V (C<1μF)	7%	9%	0402≥0.068μF; 0603≥0.68μF
					12.5%	0402≥0.22μF
			16V (C≥1μF)	9%	12.5%	0603≥2.2μF; 0805≥3.3μF; 1206≥10μF; 1210≥22μF;1812≥47μF
			10V	12.5%	20%	0402≥0.47μF
			6.3V	20%	-	-
			*I.R.: ≥10V, 1GΩ or 50 Ω-F whichever is smaller.			
			Class II (X7R, X5R, X6S, Y5V)			
			Rated voltage		Insulation Resistance	
			100V: X7R		1GΩ or RxC≥10 Ω-F whichever is smaller.	
			50V: 0402≥0.1μF;0603≥1μF;0805≥1μF; 1206≥4.7μF;1210≥4.7μF			
			35V: 0603≥1μF; 0805≥2.2μF;1210≥10μF			
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			6.3V; 4V			

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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. Before initial measurement (Class II only): To apply test voltage for 1hr at 40°C and 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: NPO: ±7.5% or 0.75pF whichever is larger. X7R, X5R, X6S: ≥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%; Y5V: ≥10V, within ±30%; ≤6.3V, within +30/-40% Q/D.F. value: NPO: C≥30pF,Q≥200;C<30pF, Q≥100+10/3C X7R, X5R, X6S:																																																				
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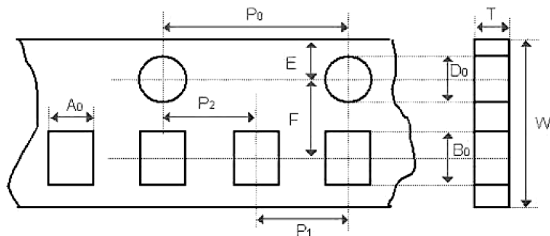
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No	Item	Test Condition	Requirements																																																																																																																																											
15	High Temperature Load (Endurance)	<p>Test temp.: NP0, X7R/X7E: 125±3°C X6S: 105±3°C; X5R, Y5V: 85±3°C Test time: 1000+24/-0 hrs. To apply voltage: (1) ≤6.3V or C≥10μF : 150% of rated voltage. (2) 10V≤Ur<500V: 200% of rated voltage. (3) 500V: 150% of rated voltage. (4) Ur≥630V: 120% of rated voltage. (5) 100% of rated voltage for below range.</p> <table border="1"> <thead> <tr> <th>Size</th> <th>Dielectric</th> <th>Rated</th> <th>Capacitance</th> </tr> </thead> <tbody> <tr> <td>0201</td> <td>X5R/X7R/ X6S</td> <td>6.3V, 10V</td> <td>C≥0.1μF</td> </tr> <tr> <td>0402</td> <td>X5R/X7R/ X6S</td> <td>6.3V, 10V</td> <td>C≥1μF</td> </tr> <tr> <td rowspan="3">0603</td> <td rowspan="3">X5R/X7R/ X6S</td> <td>4V</td> <td>C≥22μF</td> </tr> <tr> <td>6.3V, 10V</td> <td>C≥4.7μF</td> </tr> <tr> <td>35V</td> <td>C≥1μF</td> </tr> <tr> <td rowspan="2">0805</td> <td rowspan="2">X5R/X7R/ X6S</td> <td>4V</td> <td>C≥47μF</td> </tr> <tr> <td>6.3V</td> <td>C≥22μF</td> </tr> <tr> <td rowspan="2">1206</td> <td>X5R/X7R/</td> <td>6.3V</td> <td>C≥47μF</td> </tr> <tr> <td>NP0</td> <td>3000V</td> <td>Cv1.5pF</td> </tr> <tr> <td>TT18</td> <td>Y5V</td> <td>6.3V,10</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>TT31</td> <td>Y5V</td> <td>6.3V</td> <td>C≥22μF</td> </tr> </tbody> </table> <p>(6)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 range</th> </tr> </thead> <tbody> <tr> <td>0201</td> <td>X5R/X7R/ X6S</td> <td>16V</td> <td>C≥0.1μF</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>10V~25V</td> <td>C≥0.22μF</td> </tr> <tr> <td></td> <td>Y5V</td> <td>16V</td> <td>C≥0.47μF</td> </tr> <tr> <td rowspan="2">0603</td> <td rowspan="2">X5R/X7R/ X6S</td> <td>10V,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</td> <td>10~50V</td> <td>C≥4.7μF</td> </tr> <tr> <td rowspan="2">X7R</td> <td>50V</td> <td>C≥2.2μF</td> </tr> <tr> <td>100V</td> <td>C≥0.47μF</td> </tr> <tr> <td></td> <td>Y5V</td> <td>16V</td> <td>C≥4.7μF</td> </tr> <tr> <td>2220</td> <td>X7R</td> <td>100V</td> <td>C≥6.8μF</td> </tr> </tbody> </table>	Size	Dielectric	Rated	Capacitance	0201	X5R/X7R/ X6S	6.3V, 10V	C≥0.1μF	0402	X5R/X7R/ X6S	6.3V, 10V	C≥1μF	0603	X5R/X7R/ X6S	4V	C≥22μF	6.3V, 10V	C≥4.7μF	35V	C≥1μF	0805	X5R/X7R/ X6S	4V	C≥47μF	6.3V	C≥22μF	1206	X5R/X7R/	6.3V	C≥47μF	NP0	3000V	Cv1.5pF	TT18	Y5V	6.3V,10	C≥2.2μF	TT21	Y5V	6.3V	C≥10μF	TT31	Y5V	6.3V	C≥22μF	Size	Dielectric	Rated voltage	Capacitance range	0201	X5R/X7R/ X6S	16V	C≥0.1μF	0402	X5R/X7R/ X6S	50V	C≥0.1μF	10V~25V	C≥0.22μF		Y5V	16V	C≥0.47μF	0603	X5R/X7R/ X6S	10V,50V	C≥1.0μF	Y5V	16V	C≥2.2μF	0805	X5R/X7R/ X6S	10~50V	C≥4.7μF	X7R	50V	C≥2.2μF	100V	C≥0.47μF		Y5V	16V	C≥4.7μF	2220	X7R	100V	C≥6.8μF	<p>No remarkable damage. Cap change: NP0: ±3.0% or ±0.3pF whichever is larger X7R, X5R, X6S: ≥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%; Y5V: ≥10V, within ±30%; ≤6.3V, within +30/-40% Q/D.F. value: NP0: More than 30pF, Q≥350 10pF≤C<30pF, Q≥275+2.5C Less than 10pF, Q≥200+10C X7R, X5R, X6S:</p> <table border="1"> <thead> <tr> <th>Rated</th> <th>D.F.≤</th> <th colspan="2">Exception of D.F.≤</th> </tr> </thead> <tbody> <tr> <td rowspan="2">≥100V</td> <td rowspan="2">≤3%</td> <td>≤6%</td> <td>1206≥0.47μF</td> </tr> <tr> <td>≤7.5%</td> <td>0805≥0.1μF, 0603≥0.068μF</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>1210≥4.7μF</td> </tr> <tr> <td>≤20%</td> <td>0402≥0.1μF;0603≥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;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>0402≥0.10μF;0603≥0.47μF;0805≥2.2μF; 1206≥6.8μF; 1210≥22μF; TT series</td> </tr> <tr> <td>≤20%</td> <td>0402≥1μF</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;0402≥0.033μF;0603≥0.68μ F;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; 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</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>	Rated	D.F.≤	Exception of D.F.≤		≥100V	≤3%	≤6%	1206≥0.47μF	≤7.5%	0805≥0.1μF, 0603≥0.068μF	≥50V	≤3%	≤6%	0201(50V);0603≥0.047μF; 0805≥0.18μF; 1206≥0.47μF	≤10%	1210≥4.7μF	≤20%	0402≥0.1μF;0603≥1μF; 0805≥1μF; 1206≥2.2μF; 1210≥10μF; TT series	35V	≤5%	≤20%	0603≥1μF; 0805≥2.2μF;1210≥10μF	25V	≤5%	≤10%	0201≥0.01μF;0805≥1μF; 1210≥10μF	≤14%	0603≥0.33μF;1206≥4.7μF	≤15%	0402≥0.10μF;0603≥0.47μF;0805≥2.2μF; 1206≥6.8μF; 1210≥22μF; TT series	≤20%	0402≥1μF	16V	≤5%	≤10%	0603≥0.15μF;0805≥0.68μF;1206≥2.2μF; 1210≥4.7μF	≤15%	0201≥0.01μF;0402≥0.033μF;0603≥0.68μ F;0805≥2.2μF; 1206≥4.7μF; 1210≥22μF; TT series	10V	≤7.5%	≤15%	0201≥0.012μF; 0402≥0.33μF; 0603≥0.33μF;0805≥2.2μF; 1206≥2.2μF; 1210≥22μF	≤20%	0201≥0.1μF ;0402≥1μF; TT series	6.3V	≤15%	≤30%	0201≥0.1μF;0402≥1μF;0603≥10μF; 0805≥4.7μF;1206≥47μF;1210≥100μF; TT series	4V	≤20%	-	-
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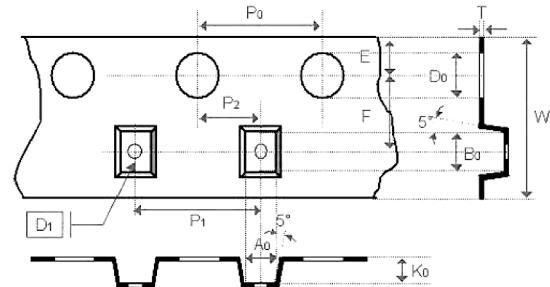
No	Item	Test Condition	Requirements			
	High Temperature Load (Endurance)		Y5V:			
			Rated vol.	D.F.≤	Exception of D.F.≤	
			≥50V	7.5%	10%	0603≥0.1μF; 0805≥0.47μF;1206≥4.7μF
			35V	10%	-	-
			25V	7.5%	10%	0402≥0.047μF;0603≥0.1μF; 0805≥0.33μF;1206≥1μF; 1210≥4.7μF
					15%	0402≥0.068μF;0603≥0.47μF; 1206≥4.7μF; 1210≥22μF
			16V (C<1μF)	10%	12.5%	0402≥0.068μF; 0603≥0.68μF
					20%	0402≥0.22μF
			16V (C≥1μF)	12.5%	20%	0603≥2.2μF; 0805≥3.3μF; 1206≥10μF;1210≥22μF; 1812≥47μF;
			10V	20%	30%	0402≥0.47μF
		6.3V	30%	-	-	
			*I.R.: ≥10V, 1GΩ or 50 Ω-F whichever is smaller. Class II (X7R, X5R, X6S, Y5V)			
			Rated voltage		Insulation Resistance	
			100V: X7R		1GΩ or R×C≥10Ω-F whichever is smaller.	
			50V: 0402≥0.1μF;0603≥1μF;0805≥1μF;1206≥4.7μF;1210≥4.7μF			
			35V: 0603≥1μF; 0805≥2.2μF;1210≥10μF			
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			6.3V; 4V			

Appendixes:

Tape & Reel Dimensions

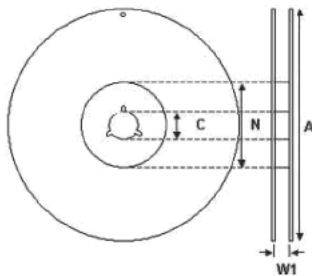


The dimension of paper tape



The dimension of plastic tape

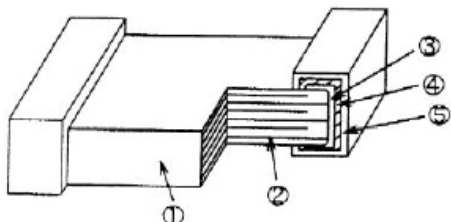
Size	0402	0603	0805			1206			1210		1812
Thickness	N	S, X	A	B	C, D, I	B	C, J, D	G	C, D, G	M	D, K
A0	0.7±0.1	1.02 ±0.05	1.5 ±0.1	1.5 ±0.1	<1.57	2 ±0.1	<1.85	<1.95	<2.97	<2.97	<3.81
B0	1.12±0.05	1.8 ±0.05	2.3 ±0.1	2.3 ±0.1	<2.4	3.5 ±0.1	<3.46	<3.67	<3.73	<3.73	<5.3
T	0.6±0.05	0.95 ±0.05	0.75 ±0.05	0.95 ±0.05	0.23 ±0.05	0.95 ±0.05	0.23±0.05	0.23 ±0.05	0.23 ±0.05	0.23 ±0.05	0.25±0.05
K0	-	-	-	-	<2.5	-	<2.5	<2.5	<2.5	<3	<2.5
W	8 ±0.1	8 ±0.1	8 ±0.1	8 ±0.1	8 ±0.1	8 ±0.1	8 ±0.1	8 ±0.1	8 ±0.1	8 ±0.1	12 ±0.2
P0	4 ±0.1	4 ±0.1	4 ±0.1	4 ±0.1	4 ±0.1	4 ±0.1	4 ±0.1	4 ±0.1	4 ±0.1	4 ±0.1	4 ±0.1
10xP0	40 ±0.1	40 ±0.1	40 ±0.1	40 ±0.1	40 ±0.1	40 ±0.1	40 ±0.1	40 ±0.1	40 ±0.1	40 ±0.1	40 ±0.1
P1	2 ±0.05	4 ±0.1	4 ±0.1	4 ±0.1	4 ±0.1	4 ±0.1	4 ±0.1	4 ±0.1	4 ±0.1	4 ±0.1	8 ±0.1
P2	2 ±0.05	2 ±0.05	2 ±0.05	2 ±0.05	2 ±0.05	2 ±0.05	2 ±0.05	2 ±0.05	2 ±0.05	2 ±0.05	2 ±0.05
D0	1.55±0.05	1.55 ±0.05	1.55 ±0.05	1.55±0.05	1.5 ±0.05	1.5 ±0.05	1.5 ±0.05	1.5 ±0.05	1.5 ±0.05	1.5 ±0.05	1.5 ±0.05
D1	-	-	-	-	1 ±0.1	-	1 ±0.1	1 ±0.1	1 ±0.1	1 ±0.1	1.5 ±0.1
E	1.75±0.05	1.75 ±0.05	1.75 ±0.05	1.75 ±0.05	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	3.5 ±0.05	3.5 ±0.05	3.5 ±0.05	5.5 ±0.05



The dimension of reel

Size	0402, 0603, 0805, 1206, 1210			1812
Reel size	7"	10"	13"	7"
C	13 +0.5/-0.2	13 +0.5/-0.2	13 +0.5/-0.2	13 +0.5/-0.2
W1	8.4 +1.5/-0	8.4 +1.5/-0	8.4 +1.5/-0	12.4 +2/-0
A	178 ±0.1	250 ±1	330 ±1	178 ±0.1
N	60 +1/-0	100 ±1	100 ±1	60 +1/-0

Constructions:



No.	Name	NPO, X7R, X5R, Y5V	
1	Ceramic material	BaTiO ₃ based	
2	Inner electrode	Ni	
3	Inner layer	Cu	
4	Termination	Middle layer	Ni
5		Outer layer	Sn

Storage and handling conditions

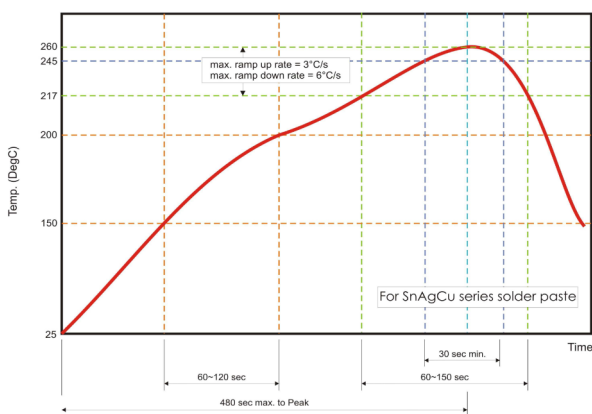
- (1) To store products at 5°C to 40°C ambient temperature and 20 to 70% related humidity conditions.
- (2) The product is recommended to be used within one year after shipment. Check solderability in case of shelf life extension is needed.

Cautions:

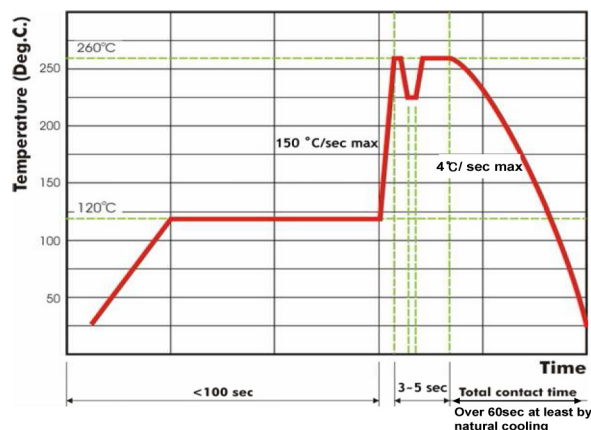
- a. The corrosive gas reacts on the terminal electrodes of capacitors, and results in the poor solderability. Do not store the capacitors in the ambience of corrosive gas (e.g., hydrogen sulfide, sulfur dioxide, chlorine, ammonia gas etc.)
- b. In corrosive atmosphere, solderability might be degraded, 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 N₂ within oven are recommended.



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



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

Certificate of compliance

The parts, materials and the products are compliant with all requirement and exemption set by the European RoHS Directive 2011/65/EU. The statements in this letter are true and accurate.

Composition List of Products & Parts (MLCC)

Product	P/N	Composition of Parts		Composition of Materials					Ex-emption	Typical weight		
		Material Name	Typical wt% in product	Sub-stance Name	Typical wt% in material	Substance Name	Typical wt% in product	CAS No.		Sub-stance weight (mg)	Material weight (mg)	Product weight (mg)
MLCC	MCSH21B 0805 series	Dielectric ceramic body	86.05	Barium Titanate	98	Barium Titanate(IV)	84.3290	12047-27-7		14.977	15.283	17.76
				Yttrium Oxide	2	Yttrium Oxide	1.7210	1314-36-9		0.306		
				Nickel	80	Nickel	2.2800	7440-02-0		0.405		
		Inner electrode	2.85	Barium Titanate	20	Barium Titanate(IV)	0.5700	12047-27-7		0.101		
				Copper	88	Copper	1.6720	7440-50-8		0.297		
		Terminal electrode	1.9	Lead Free Glass	12	Lead Free Glass Frit	0.2280	65997-18-4		0.04		
				Silver	85	Silver	2.8050	7440-22-4		0.498		
		Soft terminal	3.3	Phenolic epoxy resin	10	Phenolic epoxy resin	0.3300	9003-36-5		0.059		
				Phenolic resin	5	Phenolic resin	0.1650	9003-35-4		0.029		
		Under plating	3.54	Ni	100	Ni	3.5400	7440-02-0		0.629	0.629	
		Surface plating	2.36	Matte Sn	100	Matte Sn	2.3600	7440-31-5		0.419	0.419	

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