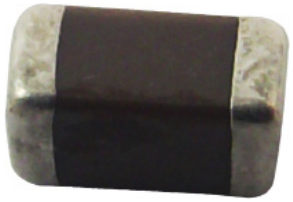
Soft Termination Standard voltage Soft Termination Multilayer SMD Ceramic Capacitor
NP0, X7R, X5R & Y5V Dielectrics, 0402 to 1812 Sizes, 6.3V to 100V, (MCSHSeries)

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:

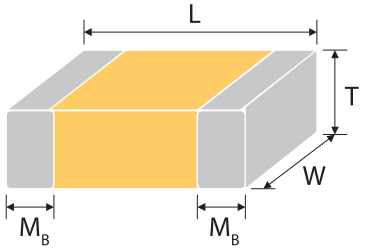
- Automotive industry.
- Power supply and related industries.
- Lighting industry.
- The other mechanical stress concerned products.

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	NP0	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.

NP0: 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.

<table>
<tr><th>No</th><th>Item</th><th>Test Condition</th><th>Requirements</th></tr>
<tr><td>2</td><td>Capacitance</td><td>Class I: NP0
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%

** 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),</td><td>NP0: Cap≥30pF, Q≥1000; Cap<30pF,Q≥400+20C

X7R,X5R,X6S:
<table>
<tr><th>Rated vo</th><th>Dl..F. ≦</th><th colspan="2">Exception of D.F.≦</th></tr>
<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≧0.22uF;
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>
</table></td></tr>
</table>

<table>
<tr><th>No</th><th>Item</th><th>Test Condition</th><th>Requirements</th></tr>
<tr><td>3</td><td>Q/ D.F. (Dissipation Factor)</td><td></td><td>Y5V:
<table>
<tr><th>Rated vo</th><th>DI..F. ≦</th><th colspan="2">Exception of D.F.≦</th></tr>
<tr><td>≧50V</td><td>5%</td><td>7%</td><td>0603≧0.1μF; 0805≧0.47μF; 1206≧4.7μF</td></tr>
<tr><td>35V</td><td>7%</td><td>-</td><td>-</td></tr>
<tr><td rowspan="2">25V</td><td rowspan="2">5%</td><td>7%</td><td>0402≧0.047μF; 0603≧0.1μF; 0805≧0.33μF; 1206≧1μF; 1210≧4.7μF</td></tr>
<tr><td>9%</td><td>0402≧0.068μF; 0603≧0.47μF; 1206≧4.7μF; 1210≧22μF</td></tr>
<tr><td rowspan="2">16V (C<1μF)</td><td rowspan="2">7%</td><td>9%</td><td>0402≧0.068μF; 0603≧0.68μF</td></tr>
<tr><td>12.5%</td><td>0402≧0.22μF</td></tr>
<tr><td>16V (C≧1μF)</td><td>9%</td><td>12.5%</td><td>0603≧2.2μF; 0805≧3.3μF; 1206≧10μF; 1210≧22μF;1812≧47μF</td></tr>
<tr><td>10V</td><td>12.5%</td><td>20%</td><td>0402≧0.47μF</td></tr>
<tr><td>6.3V</td><td>20%</td><td>-</td><td>-</td></tr>
</table></td></tr>
<tr><td>4</td><td>Dielectric Strength</td><td>To apply voltage (≤100V) 250%.
Duration: 1 to 5 sec.
Charge and 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>To apply rated voltage for max. 120 sec.</td><td>10GΩ or RxC≧500Ω-F whichever is smaller.
Class II (X7R, X5R, X6S, Y5V)
<table>
<tr><th>Rated voltage</th><th>Insulation Resistance</th></tr>
<tr><td>100V: X7R</td><td rowspan="8">10GΩ or RxC≧100Ω-F whichever is smaller.</td></tr>
<tr><td>50V:0603≥1μF; 0805≥1μF; 1206≥4.7μF; 1210≥4.7μF</td></tr>
<tr><td>35V:0805≥2.2μF; 1210≧10μF</td></tr>
<tr><td>25V:0402≥1μF; 0603≥2.2μF; 0805≥2.2μF; 1206≥10μF;1210≥10μF</td></tr>
<tr><td>16V: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</td></tr>
<tr><td>50V: 0402≥0.1μF</td><td rowspan="4">10GΩ or RxC≧50Ω-F whichever is smaller.</td></tr>
<tr><td>35V:0603≥1μF</td></tr>
<tr><td>10V:0603≥10μF</td></tr>
<tr><td>4V:0603≥22μF; 0805≥47μF</td></tr>
</table></td></tr>
</table>

<table>
<tr><th>No</th><th>Item</th><th>Test Condition</th><th>Requirements</th></tr>
<tr><td>6</td><td>Temperature Coefficient</td><td>With no electrical load.
<table><tr><th>T.C.</th><th>Operating Temp</th></tr><tr><td>NPO</td><td>-55~125°C at 25°C</td></tr><tr><td>X7R</td><td>-55~125°C at 25°C</td></tr><tr><td>X5R</td><td>-55~ 85°C at 25°C</td></tr><tr><td>X6S</td><td>-55~105°C at 25°C</td></tr><tr><td>Y5V</td><td>-25~ 85°C at 20°C</td></tr></table></td><td><table><tr><th>T.C.</th><th>Capacitance Change</th></tr><tr><td>NPO</td><td>Within ±30ppm/°C</td></tr><tr><td>X7R</td><td>Within ±15%</td></tr><tr><td>X5R</td><td>Within ±15%</td></tr><tr><td>X6S</td><td>Within ±22%</td></tr><tr><td>Y5V</td><td>Within +30%/-80%</td></tr></table></td></tr>
<tr><td>7</td><td>Adhesive Strength of Termination</td><td>Pressurizing force:
5N (≤0603) and 10N (>0603)
Test time: 10±1 sec.</td><td>No remarkable damage or removal of the terminations.</td></tr>
<tr><td>8</td><td>Vibration Resistance</td><td>Vibration frequency: 10~55 Hz/min.
Total amplitude: 1.5mm
Test time: 6 hrs. (Two hrs each in three mutually perpendicular directions.)
Measurement to be made after keeping at room temp. for 24±2 hrs.</td><td>No remarkable damage.
Cap change and Q/D.F.: To meet initial spec.</td></tr>
<tr><td>9</td><td>Solderability</td><td>Solder temperature: 235±5°C
Dipping time: 2±0.5 sec.</td><td>95% min. coverage of all metalized area.</td></tr>
<tr><td>10</td><td>Bending Test</td><td>The middle part of substrate shall be pressurized by means of the pressurizing rod at a rate of about 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.</td><td>No remarkable damage.
Cap change:
NP0: 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.)</td></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 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.</td><td>No remarkable damage.
Cap change:
NP0: 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.</td></tr>
<tr><td>12</td><td>Temperature Cycle</td><td>* Conduct the five cycles according to the temperatures and time.
<table><tr><th>Step</th><th>Temp. (°C)</th><th>Time (min.)</th></tr><tr><td>1</td><td>Min. operating temp. +0/-3</td><td>30±3</td></tr><tr><td>2</td><td>Room temp.</td><td>2~3</td></tr><tr><td>3</td><td>Max. operating temp. +3/-0</td><td>30±3</td></tr><tr><td>4</td><td>Room temp.</td><td>2~3</td></tr></table></td><td>No remarkable damage.
Cap change:
NP0: 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.</td></tr>
</table>

<table>
<tr><th>No</th><th>Item</th><th>Test Condition</th><th>Requirements</th></tr>
<tr><td></td><td>Temperature Cycle</td><td>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.</td><td></td></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): 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.</td><td>No remarkable damage.
Cap change:
NP0: 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:
NP0: More than 30pF Q≥350, 10pF≤C≤30pF, Q≥275+2.5C
Less than 10pF Q≥200+10C
X7R, X5R, X6S:
<table>
<tr><th>Rated</th><th>D.F.≦</th><th colspan="2">Exception of D.F.≦</th></tr>
<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>
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<table>
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<tr><td></td><td></td><td></td><td>
Y5V:
<table>
<tr><th>Rated vo</th><th>DI..F. ≦</th><th colspan="2">Exception of D.F.≦</th></tr>
<tr><td>≧50V</td><td>5%</td><td>7%</td><td>0603≧0.1μF; 0805≧0.47μF; 1206≧4.7μF</td></tr>
<tr><td>35V</td><td>7%</td><td>-</td><td>-</td></tr>
<tr><td rowspan="2">25V</td><td rowspan="2">5%</td><td>7%</td><td>0402≧0.047μF; 0603≧0.1μF; 0805≧0.33μF; 1206≧1μF; 1210≧4.7μF</td></tr>
<tr><td>9%</td><td>0402≧0.068μF; 0603≧0.47μF; 1206≧4.7μF; 1210≧22μF</td></tr>
<tr><td rowspan="2">16V (C<1μF)</td><td rowspan="2">7%</td><td>9%</td><td>0402≧0.068μF; 0603≧0.68μF</td></tr>
<tr><td>12.5%</td><td>0402≧0.22μF</td></tr>
<tr><td>16V (C≧1μF)</td><td>9%</td><td>12.5%</td><td>0603≧2.2μF; 0805≧3.3μF; 1206≧10μF; 1210≧22μF;1812≧47μF</td></tr>
<tr><td>10V</td><td>12.5%</td><td>20%</td><td>0402≧0.47μF</td></tr>
<tr><td>6.3V</td><td>20%</td><td>-</td><td>-</td></tr>
</table>
*I.R.: ≥10V, 1GΩ or 50 Ω-F whichever is smaller.
Class II (X7R, X5R, X6S, Y5V)
<table>
<tr><th>Rated voltage</th><th>Insulation Resistance</th></tr>
<tr><td>100V: X7R</td><td rowspan="7">1GΩ or RxC≧10 Ω-F whichever is smaller.</td></tr>
<tr><td>50V: 0402≥0.1μF;0603≥1μF;0805≥1μF; 1206≥4.7μF;1210≥4.7μF</td></tr>
<tr><td>35V: 0603≥1μF; 0805≥2.2μF;1210≧10μF</td></tr>
<tr><td>25V:0402≥1μF;0603≥2.2μF;0805≥2.2 μF; 1206≥10μF;1210≥10μF</td></tr>
<tr><td>16V:0402≥0.22μF;0603≥1μF;0805≥2.2 μF; 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</td></tr>
</table>
</td></tr>
</table>

<table>
<tr><th>No</th><th>Item</th><th>Test Condition</th><th>Requirements</th></tr>
<tr><td>14</td><td>Humidity (Damp Heat) Load</td><td>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.</td><td>No remarkable damage.
Cap change:
NP0: ±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:
NP0: C≥30pF,Q≥200;C<30pF, Q≥100+10/3C
X7R, X5R, X6S:
<table>
<tr><th>Rated</th><th>D.F.≦</th><th colspan="2">Exception of D.F.≦</th></tr>
<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>
</table></td></tr>
</table>

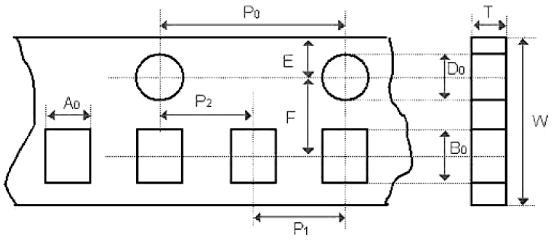
<table>
<tr><th>No</th><th>Item</th><th>Test Condition</th><th>Requirements</th></tr>
<tr><td></td><td></td><td></td><td>
Y5V:
<table>
<tr><th>Rated vol.</th><th>D.F.≦</th><th colspan="2">Exception of D.F.≦</th></tr>
<tr><td>≧50V</td><td>7.5%</td><td>10%</td><td>0603≧0.1μF;
0805≧0.47μF;1206≧4.7μF</td></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</td></tr>
<tr><td rowspan="2">16V
(C<1μF)</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≧1μF)</td><td>12.5%</td><td>20%</td><td>0603≧2.2μF; 0805≧3.3μF;
1206≧10μF;1210≧22μF;
1812≧47μF;</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>
</table>
I.R.: ≥10V, 500MΩ or 25 Ω-F whichever is smaller.
Class II (X7R, X5R, X6S, Y5V)
<table>
<tr><th>Rated voltage</th><th>Insulation Resistance</th></tr>
<tr><td>100V: X7R</td><td rowspan="8">500MΩ or R×C≧5Ω-F whichever is smaller.</td></tr>
<tr><td>50V:0603≥1μF; 0805≥1μF; 1206≥4.7μF;
1210≥4.7μF</td></tr>
<tr><td>35V:0805≥2.2μF; 1210≧10μF</td></tr>
<tr><td>25V:0402≥1μF; 0603≥2.2μF; 0805≥2.2μF;
1206≥10μF;1210≥10μF</td></tr>
<tr><td>16V: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 colspan="2">6.3V ; 4V</td></tr>
</table>
</td></tr>
</table>

<table>
<tr><th>No</th><th>Item</th><th>Test Condition</th><th>Requirements</th></tr>
<tr><td>15</td><td>High Temperature Load (Endurance)</td><td>
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.
<table>
<tr><th>Size</th><th>Dielectric</th><th>Rated</th><th>Capacitance</th></tr>
<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>
</table>
(6)150% of rated voltage for below range.
<table>
<tr><th>Size</th><th>Dielectric</th><th>Rated voltage</th><th>Capacitance range</th></tr>
<tr><td>0201</td><td>X5R/X7R/ X6S</td><td>16V</td><td>C≧0.1μF</td></tr>
<tr><td rowspan="3">0402</td><td rowspan="3">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>Y5V</td><td>16V</td><td>C≧0.47μF</td></tr>
<tr><td rowspan="2">0603</td><td>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="4">0805</td><td>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>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>
</table>
</td><td>
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:
<table>
<tr><th>Rated</th><th>D.F.≦</th><th colspan="2">Exception of D.F.≦</th></tr>
<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>
</table>
</td></tr>
</table>

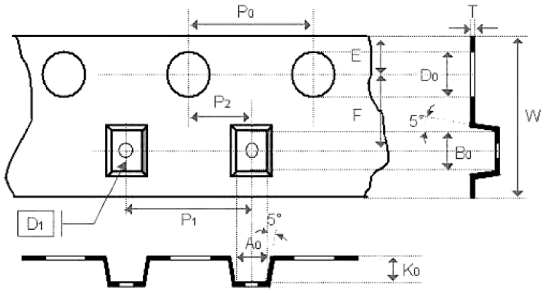
<table>
<tr><th>No</th><th>Item</th><th>Test Condition</th><th>Requirements</th></tr>
<tr><td></td><td>High Temperature Load (Endurance)</td><td></td><td>
Y5V:
<table>
<tr><th>Rated vol.</th><th>D.F.≦</th><th colspan="2">Exception of D.F.≦</th></tr>
<tr><td>≧50V</td><td>7.5%</td><td>10%</td><td>0603≧0.1μF; 0805≧0.47μF;1206≧4.7μF</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</td></tr>
<tr><td rowspan="2">16V (C<1μF)</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≧1μF)</td><td>12.5%</td><td>20%</td><td>0603≧2.2μF; 0805≧3.3μF; 1206≧10μF;1210≧22μF; 1812≧47μF;</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>
</table>
*I.R.: ≥10V, 1GΩ or 50 Ω-F whichever is smaller.
Class II (X7R, X5R, X6S, Y5V)
<table>
<tr><th>Rated voltage</th><th>Insulation Resistance</th></tr>
<tr><td>100V: X7R</td><td rowspan="8">1GΩ or R×C≧10Ω-F whichever is smaller.</td></tr>
<tr><td>50V: 0402≥0.1μF;0603≥1μF;0805≥1μF;1206≥4.7μF;1210≥4.7μF</td></tr>
<tr><td>35V: 0603≥1μF; 0805≥2.2μF;1210≧10μF</td></tr>
<tr><td>25V:0402≥1μF;0603≥2.2μF;0805≥2.2μF;1206≥10μF;1210≥10μF</td></tr>
<tr><td>16V: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 colspan="2">6.3V; 4V</td></tr>
</table>
</td></tr>
</table>

Appendixes:

Tape & Reel Dimensions

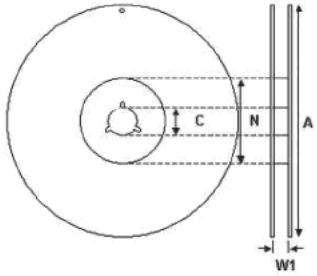


The dimension of paper tape



The dimension of plastic tape

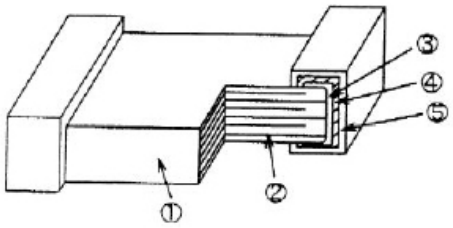
Size	0402	0603	0805			1206			1210		1812
Thickness	N	S, X	A	B	C, D, I	B	C, J, D	G	C, D, G	M	D, K
A_0	0.7±0.1	1.02 ±0.05	1.5 ±0.1	1.5 ±0.1	<1.57	2 ±0.1	<1.85	<1.95	<2.97	<2.97	<3.81
B_0	1.12±0.05	1.8 ±0.05	2.3 ±0.1	2.3 ±0.1	<2.4	3.5 ±0.1	<3.46	<3.67	<3.73	<3.73	<5.3
T	0.6±0.05	0.95 ±0.05	0.75 ±0.05	0.95 ±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
K_0	-	-	-	-	<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
P_0	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
$10xP_0$	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
P_1	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
P_2	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
D_0	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
D_1	-	-	-	-	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
W_1	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	Termination	Inner layer	Cu
4		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:

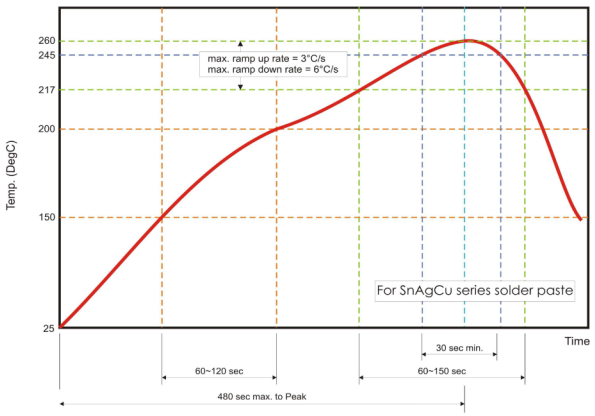
a. The corrosive gas reacts on the terminal electrodes of capacitors, and results in the poor solderability. Do not store the capacitors in the ambience of corrosive gas (e.g., hydrogen sulfide, sulfur dioxide, chlorine, ammonia gas etc.)

b. In corrosive atmosphere, solderability might be degraded, and silver migration might occur to cause low reliability.

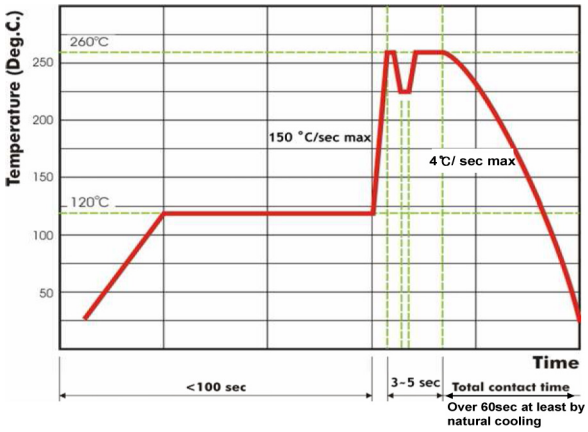
c. Due to the dewing by rapid humidity change, or the photochemical change of the terminal electrode by direct sunlight,the solderability and electrical performance may deteriorate. Do not store capacitors under direct sunlight or dewing condition. To store products on the shelf and avoid exposure to 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 N_2 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.