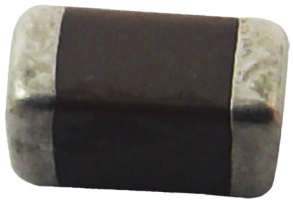
Low Profile Multilayer SMD Ceramic Capacitor
0402 to 1210 Sizes, X7R, X5R & Y5V Dielectrics (MCTT Series)

multicomp PRO

RoHS Compliant



Description

MLCC consists of a conducting material and electrodes. To manufacture a chip-type SMT and achieve miniaturization, high density and high efficiency, ceramic condensers are used.

MCTT series MLCC is used in product having thickness concerned generally have high capacitance and thinner product thickness. The high dielectric constant material X7R, X5R and Y5V are used for this series product.

Features

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

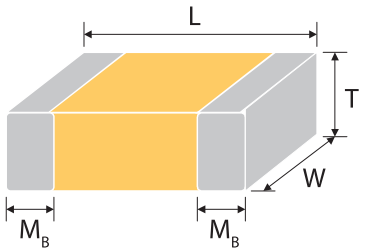
Applications

- For LCD panels.
- For PCMCA cards.
- For IC packaging and modules.
- Any thickness concerned products.

How To Order

MCTT	31	X	225	K	100	C	T
Series	**Size**	**Dielectric**	**Capacitance**	**Tolerance**	**Rated Voltage**	**Termination**	**Packaging style**
TT = Low profile	15=0402 (1005) 18=0603 (1608) 21=0805 (2012) 31=1206 (3216) 32=1210 (3225)	B=X7R X=X5R F=Y5V	Two significant digits followed by no. of zeros. And R is in place of decimal point. Eg.: 475 = 47×10^5 =4,700,000pF =4.7µF	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/Ni/Sn	T=7″ reeled G=13″ reeled

External Dimensions



The outline of MLCC

Size Inch (mm)	L (mm)	W (mm)	T max (mm)/Symbol		M_B (mm)
0402 (1005)	1 ±0.2	0.5 ±0.2	0.3 ±0.03	L	0.25 ±0.1
0603 (1608)	1.6+0.15/-0.1	0.8+0.15/-0.1	0.5 ±0.1	H	0.4 ±0.15
0805 (2012)	2 ±0.2	1.25 ±0.2	0.85 ±0.1	T	0.5 ±0.2
1206 (3216)	3.2 ±0.2	1.6 ±0.2	0.85 ±0.1	T	0.6 ±0.2
			1.15 ±0.15	J	
1210 (3225)	3.2 ±0.3	2.5 ±0.2	0.85 ±0.1	T	0.75 ±0.25
			2 ±0.2	K	

Reflow soldering process only is recommended

General Electrical Data

Dielectric	X7R	X5R	Y5V
Size	0402, 0603, 0805, 1206, 1210		
Capacitance range*	1µF to 10µF	0.22µF to 22µF	1µF to 10µF
Capacitance tolerance**	K (±10%), M (±20%)		Z (-20/+80%)
Rated voltage (WVDC)	10V, 16V, 25V, 50V, 100V	6.3V, 10V, 16V, 25V	10V, 16V, 25V, 50V
Operating temperature	-55 to +125°C	-55 to +85°C	-25 to +85°C
Capacitance characteristic	±15%		+30/-80%
Termination	Ni/Sn (lead-free termination)		

* Measured at 1 ±0.2Vrms, 1kHz±10%, 30~70% related humidity, 25°C ambient temperature for X7R, X5R and at 20°C for Y5V.

** 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		X7R										
Size		0805				1206				1210		
Rated voltage (V DC)		10	16	25	50	10	16	25	50	10	16	100
Capacitance	1µF (105)							T				
	1.5µF (155)											
	2.2µF (225)		T	T					T			K
	3.3µF (335)											
	4.7µF (475)	T						T				
	6.8µF (685)											
	10µF (106)					T						
	22µF (226)											

X5R dielectric

Dielectric		X5R															
Size		0402			0603		0805				1206					1210		
Rated voltage (V DC)		6.3	10	25	10	16	6.3	10	16	25	6.3	10	16	25	50	10	16	25
Capacitance	0.22µF (224)			L	H	H												
	0.47µF (474)	L		L														
	1µF (105)	L			H	H		T	T	T		T	T	T				
	1.5µF (155)							T	T			T	T	T				
	2.2µF (225)	L					T	T	T	T		T	T	T	T			
	3.3µF (335)											T	T	T		T		

Dielectric		X5R																
Size		0402			0603		0805				1206					1210		
Rated voltage (V DC)		6.3	10	25	10	16	6.3	10	16	25	6.3	10	16	25	50	10	16	25
Capacitance	4.7µF (475)	L			H		T	T	T	T		T	T	T		T		
	6.8µF (685)																	
	10µF (106)						T	T	T		J	J/T		T		T		T
	22uF (226)						T	T			T		T				T	
	47uF (476)										T							

Y5V dielectric

Dielectric		Y5V									
Size		0805				1206				1210	
Rated voltage (V DC)		10	16	25	50	10	16	25	50	10	16
Capacitance	1µF (105)				T						
	1.5µF (155)										
	2.2µF (225)		T			T	T	T	T		
	3.3µF (335)	T									
	4.7µF (475)	T	T			T	T				
	6.8µF (685)					T					
	10µF (106)	T				T				T	
	22µF (226)										

Packaging Dimension And Quantity

Size	Thickness Max (mm)/Symbol		7" reel	
			Paper tape	Plastic tape
0402 (1005)	0.33	L	15k	-
0603 (1608)	0.6	H	4k	-
0805 (2012)	0.95	T	4k	-
1206 (3216)	0.95	T	4k	-
	1.3	J	-	3k
1210 (3225)	0.95	T	-	3k
	2	K	-	1k

Unit : pieces

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">Cap≤10μF, 1.0±0.2Vrms, 1kHz±10%
Cap>10μF, 0.5±0.2Vrms, 120Hz±20%**
** Test condition: 0.5±0.2Vrms, 1KHz±10%
TT18X≧475(10V) , TT15X series</td><td>Shall not exceed the limits given in the detailed spec.</td></tr>
<tr><td>3</td><td>Q/ D.F. (Dissipation Factor)</td><td>X7R/X5R:
<table>
<tr><td>Rated vol.</td><td>D.F.</td></tr>
<tr><td>100V</td><td>5%</td></tr>
<tr><td>50V, 25V, 16V, 10V</td><td>≤10%</td></tr>
<tr><td>6.3V</td><td>≤15%</td></tr>
</table>
Y5V:
<table>
<tr><td>Rated vol.</td><td>D.F.</td></tr>
<tr><td>50V</td><td>≤7%</td></tr>
<tr><td>25V</td><td>≤9%</td></tr>
<tr><td>16V/10V</td><td>≤12.5%</td></tr>
</table></td></tr>
<tr><td>4</td><td>Dielectric Strength</td><td>To apply voltage: 250% rated voltage.
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. 120sec.</td><td>≥10GΩ or RxC≥100Ω-F whichever is smaller.</td></tr>
<tr><td>6</td><td>Temperature Coefficient</td><td>With no electrical load.
<table>
<tr><td>T.C.</td><td>Operating Temp</td></tr>
<tr><td>NP0</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>Y5V</td><td>25~85°C at 20°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.
<table>
<tr><th>01005</th><th>0201</th></tr>
<tr><td>Cap0.01μF: 0.5V</td><td>Cap<0.1μF:1V</td></tr>
<tr><td>Cap>0.01μF: 0.2V</td><td>0.1μF*Cap<1μF: 0.2V</td></tr>
<tr><td></td><td>Cap1μF: 0.1V</td></tr>
<tr><td></td><td>*0201X104/16V: 0.5V</td></tr>
<tr><th>0402</th><th>0603</th></tr>
<tr><td>Cap<1μF: 1V</td><td>Cap1μF: 1V</td></tr>
<tr><td>Cap=1μF: 0.5V</td><td>1μF<Cap4.7μF: 0.5V</td></tr>
<tr><td>1μF<Cap<10μF: 0.2V</td><td>Cap>4.7μF: 0.2V</td></tr>
<tr><td>Cap10μF: 0.1V</td><td></td></tr>
<tr><th>0805</th><th>1206/1210</th></tr>
<tr><td>Cap<10μF: 1V</td><td>Cap10μF: 1V</td></tr>
<tr><td>Cap=10μF: 0.5V</td><td>10μF<Cap100μF: 0.5V</td></tr>
<tr><td>Cap>10μF: 0.2V</td><td>Cap>100μF: 0.2V</td></tr>
</table></td><td>
<table>
<tr><td>T.C.</td><td>Capacitance Change</td></tr>
<tr><td>X7R</td><td>Within ±15%</td></tr>
<tr><td>X5R</td><td>Within ±15%</td></tr>
<tr><td>Y5V</td><td>Within +30%/-80%</td></tr>
</table></td></tr>
</table>

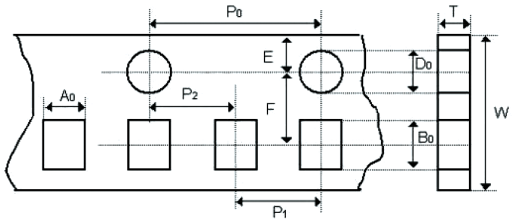
<table>
<tr><th>No</th><th>Item</th><th>Test Condition</th><th>Requirements</th></tr>
<tr><td>7.</td><td>Adhesive Strength of Termination</td><td>Pressurizing force:
5N (≤0603) and 10N (>0603)
Test time: 10±1 sec.</td><td>No remarkable damage or removal of the terminations.</td></tr>
<tr><td>8</td><td>Vibration 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.)
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</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:
X7R/X5R: within ±12.5%
Y5V: within ±30%
(This capacitance change means the change of capacitance under specified flexure of substrate from the capacitance measured before the test.)</td></tr>
<tr><td>11</td><td>Resistance to Soldering Heat</td><td>Solder temperature: 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:
X7R/X5R: within ±7.5%
Y5V: within ±20%
Q/D.F., I.R. and dielectric strength: To meet initial requirements.
25% max. leaching on each edge.</td></tr>
<tr><td>12</td><td>Temperature Cycle</td><td>Conduct the five cycles according to the temperatures and time.
<table>
<tr><th>Step</th><th>Temp. (°C)</th><th>Time (min.)</th></tr>
<tr><td>1</td><td>Min. operating temp. +0/-3</td><td>30±3</td></tr>
<tr><td>2</td><td>Room temp.</td><td>2~3</td></tr>
<tr><td>3</td><td>Max. operating temp. +3/-0</td><td>30±3</td></tr>
<tr><td>4</td><td>Room temp.</td><td>2~3</td></tr>
</table>
Before initial measurement (Class II only): Perform 150+0/-10°C for 1 hr and then set for 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:
X7R/X5R: 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>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.
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: X7R/X5R: within ±25%
Y5V: within ±30%; 6.3V, within +30/-40%
Q/D.F. value:
X7R/X5R:
<table>
<tr><th>Rated vol.</th><th>D.F.</th></tr>
<tr><td>100V</td><td>≤7.5%</td></tr>
<tr><td>25V, 16V</td><td>≤15%</td></tr>
<tr><td>10V</td><td>≤20%</td></tr>
<tr><td>50V, 6.3V</td><td>≤30%</td></tr>
</table>
Y5V:
<table>
<tr><th>Rated vol.</th><th>D.F.</th></tr>
<tr><td>50V</td><td>≤10%</td></tr>
<tr><td>25V</td><td>≤15%</td></tr>
<tr><td>16V, 10V</td><td>≤20%</td></tr>
</table>
I.R.: 1GΩ or RxC≧10 Ω-F whichever is smaller.</td></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.
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: X7R/X5R: within ±25%
Y5V: within ±30%; 6.3V, within +30/-40%
Q/D.F. value:
X7R/X5R:
<table>
<tr><th>Rated vol.</th><th>D.F.</th></tr>
<tr><td>100V</td><td>≤7.5%</td></tr>
<tr><td>25V, 16V</td><td>≤15%</td></tr>
<tr><td>50V, 10V</td><td>≤20%</td></tr>
<tr><td>6.3V</td><td>≤30%</td></tr>
</table>
Y5V:
<table>
<tr><th>Rated vol.</th><th>D.F.</th></tr>
<tr><td>50V</td><td>≤10%</td></tr>
<tr><td>25V</td><td>≤15%</td></tr>
<tr><td>16V, 10V</td><td>≤20%</td></tr>
</table>
I.R.: 500MΩ or RxC≧5 Ω-F whichever is smaller.</td></tr>
</table>

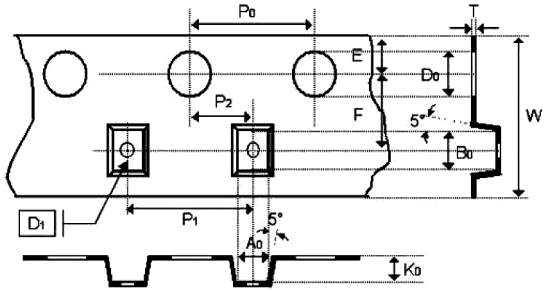
<table>
<tr><th>No</th><th>Item</th><th>Test Condition</th><th>Requirements</th></tr>
<tr><td>15</td><td>High Temperature Load (Endurance)</td><td>Test temp.:
NP0, X7R/X7E: 125±3°C
X5R, Y5V: 85±3°C
Test time: 1000+24/-0 hrs.
To apply voltage: 150% of rated voltage.
100% of rated voltage for below range.
<table>
<tr><th>Size</th><th>Dielectric</th><th>Rated voltage</th><th>Capacitance</th></tr>
<tr><td>TT15</td><td>X5R</td><td>6.3V</td><td>C≧1μF</td></tr>
<tr><td>TT18</td><td>Y5V</td><td>6.3V,10V</td><td>C≧2.2μF</td></tr>
<tr><td>TT21</td><td>Y5V</td><td>6.3V</td><td>C≧10μF</td></tr>
<tr><td>TT31</td><td>Y5V</td><td>6.3V</td><td>C≧22μF</td></tr>
</table>
Before initial measurement (Class II only): To apply test voltage for 1hr at test temp. 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: X7R/X5R: within ±25%
Y5V: within ±30%; 6.3V, within +30/-40%
Q/D.F. value:
X7R/X5R:
<table>
<tr><th>Rated vol.</th><th>D.F.</th></tr>
<tr><td>100V</td><td>≤7.5%</td></tr>
<tr><td>25V, 16V</td><td>≤15%</td></tr>
<tr><td>50V, 10V</td><td>≤20%</td></tr>
<tr><td>6.3V</td><td>≤30%</td></tr>
</table>
Y5V:
<table>
<tr><th>Rated vol.</th><th>D.F.</th></tr>
<tr><td>50V</td><td>≤10%</td></tr>
<tr><td>25V</td><td>≤15%</td></tr>
<tr><td>16V, 10V</td><td>≤20%</td></tr>
</table>
I.R.: 1GΩ or RxC≧5 Ω-F whichever is smaller.</td></tr>
</table>

Appendixes

Tape & Reel Dimensions



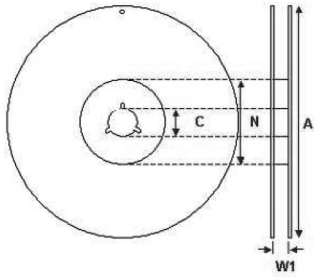
The dimension of paper tape



The dimension of plastic tape

Size	0402	0603	0805	1206		1210	
Thickness	L	H	T	T	J	T	K
A_0	0.7 ±0.2	1.05 ±0.3	1.5 ±0.2	1.9 ±0.5	<2	< 3.05	1.05 ±0.3
B_0	1.2 ±0.2	1.8 ±0.3	2.3 ±0.2	3.5 ±0.5	< 3.7	< 3.8	1.05 ±0.3
T	≦0.8	≦1.2	≦1.2	≦1.2	0.23 ±0.1	0.23 ±0.1	≦1.2
K_0	-	-	-	-	<2.5	<1.5	-
W	8 ±0.3	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	2 ±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

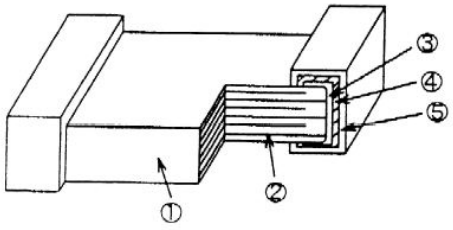
Size	0402	0603	0805	1206		1210	
Thickness	L	H	T	T	J	T	K
D_1	-		-	-	1 ±0.1	1 ±0.1	-
E	1.75 ±0.1	1.75 ±0.1	1.75 ±0.1	1.75 ±0.1	1.75 ±0.1	1.75 ±0.1	1.75 ±0.1
F	3.5 ±0.05	3.5 ±0.05	3.5 ±0.05	3.5 ±0.05	3.5 ±0.05	3.5 ±0.05	3.5 ±0.05



The dimension of reel

Size	0402, 0603, 0805, 1206, 1210		
Reel size	7″	10″	13″
C	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
A	178 ±0.1	250 ±1	330 ±1
N	60 +1/-0	100 ±1	100 ±1

Constructions:



No.	Name		NP0*	NPO, X7R, Y5V
1	Ceramic material		$BaTiO_3$ based	
2	Inner electrode		Ni	
3	Termination	Inner layer	Cu	
4		Middle layer	Ni	
5		Outer layer	Sn (Matt)	

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:

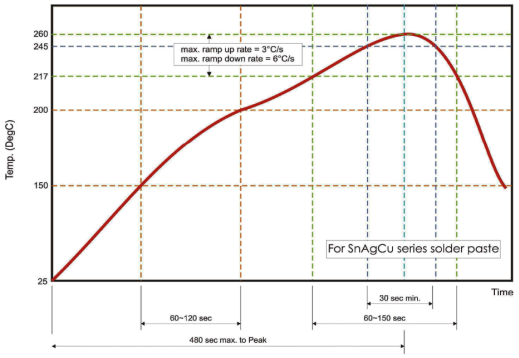
a. The corrosive gas reacts on the terminal electrodes of capacitors, and results in the poor solderability. Do not store the capacitors in the ambience of corrosive gas (e.g., hydrogen sulfide, sulfur dioxide, chlorine, ammonia gas etc.)

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

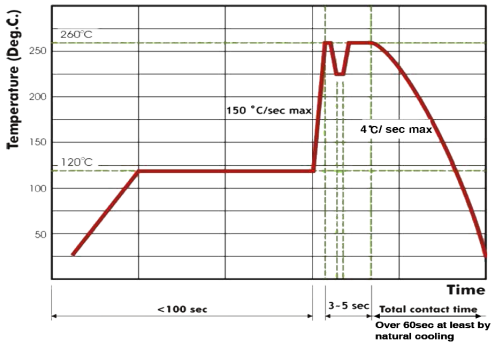
c. Due to the dewing by rapid humidity change, or the photochemical change of the terminal electrode by direct sunlight,the solderability and electrical performance may deteriorate. Do not store capacitors under direct sunlight or dewing condition. To store products on the shelf and avoid exposure to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