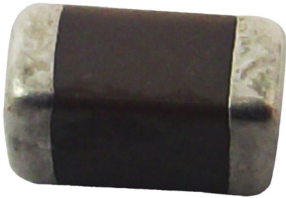


# Ultra-small Multilayer SMD Ceramic Capacitor 0201 Size, NP0, X7R, X5R Dielectrics (6.3V to 50V)



**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. 0201 MLCC is performed by high precision technology achieve high capacitance in unit size and ensure the stability and reliability of products.

## Features:

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

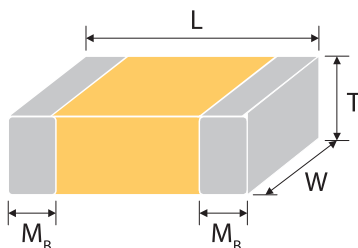
## Applications:

- Miniature microwave module.
- Portable equipments (ex. Mobile phone, PDA).
- High frequency circuits.

## How To Order:

MC	31	X	225	K	100	C	T
	Size	Dielectric	Capacitance	Tolerance	Rated Voltage	Termination	Packaging style
Multicomp	Inch (mm) 0201 (0603)	N=NP0 (COG) B=X7R X=X5R	Two significant digits followed by no. of zeros. And R is in place of decimal point.  Eg.: 0R5 = 0.5pF 1R0 = 1.0pF 102 = $10 \times 10^2$ = 1,000pF	A=±0.05pF B=±0.1pF C=±0.25pF D=±0.5pF F=±1% G=±2% J=±5% K=±10% M=±20% Z=-20/+80%	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	C=Cu/Ni/Sn	T = 7" reeled

## External Dimensions:



The outline of MLCC

Size Inch (mm)	L (mm)	W (mm)	T max (mm)/Symbol	M <sub>B</sub> (mm)
0201 (0603)	0.6 ±0.03	0.30±0.03	0.3 ±0.03	L 0.15 ±0.05
	0.6 ±0.05#1	0.3±0.05#1	0.3 ±0.05#1	

\* Reflow soldering only.  
#1 For 0201/Cap≥0.68uF



# Ultra-small Multilayer SMD Ceramic Capacitor 0201 Size, NP0, X7R, X5R Dielectrics (6.3V to 50V)



## General Electrical Data:

Size	0201		
Dielectric	NP0	X7R	X5R
Capacitance*	0.1pF to 120pF	100pF to 10nF	100pF to 1μF
Capacitance tolerance**	Cap≤5pF <sup>#1</sup> : A (±0.05pF), B (±0.1pF), C (±0.25pF) 5pF<Cap<10pF: B (±0.1pF), C (±0.25pF), D(±0.5pF) Cap≥10pF: F (±1%), G (±2%), J (±5%), K (±10%)	J (±5%), K (±10%), M (±20%)	J (±5%), K (±10%), M (±20%)
Rated voltage (WVDC)	16V, 25V, 50V	6.3V, 10V, 16V, 25V, 50V	6.3V, 10V, 16V, 25V, 50V
Tan δ / Q*	Cap<30pF, Q≥400+20C Cap≥30pF, Q≥1000	Note 1	
Insulation resistance at Ur	≥10GΩ	≥10GΩ or RxC≥500ΩxF whichever is less	
Operating temperature	-55 to +125°C		-55 to +85°C
Capacitance change	±30ppm	±15%	
Termination	Ni/Sn (lead-free termination)		

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

\* Measured at 30~70% related humidity.

NP0: Apply 1.0±0.2Vrms, 1.0MHz±10% at the condition of 25°C ambient temperature.

X7R, X5R: Apply 1.0±0.2Vrms, 1.0kHz±10%(0201/6.3V, Cap≥224 : 0.5±0.2Vrms, 1.0kHz±10%) at the condition of 25°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.

### Note 1:

X7R/X5R

Rated vol.	D.F.	Exception of D.F.	
≥50V	≤3%	-	
25V	≤3.5%	≤5%	0201≥0.01μF
16V	≤3.5%	≤5%	0201≥0.01μF
10V	≤5%	≤10%	0201≥0.012μF
		≤15%	0201≥0.1μF
6.3V	≤10%	≤15%	0201≥0.1μF

**Ultra-small Multilayer SMD Ceramic Capacitor  
0201 Size, NP0, X7R, X5R Dielectrics (6.3V to 50V)**



**Packaging Dimension And Quantity:**

Size	Thickness (mm)/Symbol		Paper tape	
			7" reel	13" reel
0201 (0603)	0.3 ±0.03	L	15,000	70,000
	0.3 ±0.05 <sup>#1</sup>		15,000	-

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.																										
2	Capacitance		Shall not exceed the limits given in the detailed spec. NP0: Cap≥30pF, Q≥1000; Cap<30pF, Q≥400+20C X7R, X5R:																										
3	Q/ D.F. (Dissipation Factor)	Class I: NP0 Cap≤1000pF, 1.0±0.2Vrms, 1MHz±10% Cap>1000pF, 1.0±0.2Vrms, 1kHz±10% Class II: X7R, X5R 1.0±0.2Vrms, 1kHz±10%** **0.5±0.2Vrms, 1.0kHz±10% : 0201 ≥0.22 uF(6.3V)	<table border="1"> <thead> <tr> <th>Rated vol.</th> <th>D.F</th> <th colspan="2">Exception of D.F.</th> </tr> </thead> <tbody> <tr> <td>≥50V</td> <td>≤3%</td> <td>-</td> <td></td> </tr> <tr> <td>25V</td> <td>≤3.5%</td> <td>≤5%</td> <td>0201≥0.01μF</td> </tr> <tr> <td>16V</td> <td>≤3.5%</td> <td>≤5%</td> <td>0201≥0.01μF</td> </tr> <tr> <td rowspan="2">10V</td> <td rowspan="2">≤5%</td> <td>≤10%</td> <td>0201≥0.012μF</td> </tr> <tr> <td>≤15%</td> <td>0201≥0.1μF</td> </tr> <tr> <td>6.3V</td> <td>≤10%</td> <td>≤15%</td> <td>0201≥0.1μF</td> </tr> </tbody> </table>	Rated vol.	D.F	Exception of D.F.		≥50V	≤3%	-		25V	≤3.5%	≤5%	0201≥0.01μF	16V	≤3.5%	≤5%	0201≥0.01μF	10V	≤5%	≤10%	0201≥0.012μF	≤15%	0201≥0.1μF	6.3V	≤10%	≤15%	0201≥0.1μF
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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. 120sec.	≥10GΩ or RxC≥500Ω-F whichever is smaller. Class II (X5R, X6S, X7R, Y5V) <table border="1"> <thead> <tr> <th>Rated voltage</th> <th>Insulation resistance</th> </tr> </thead> <tbody> <tr> <td>6.3V; 10V:0201≥47nF</td> <td>≥100 Ω-F</td> </tr> </tbody> </table>	Rated voltage	Insulation resistance	6.3V; 10V:0201≥47nF	≥100 Ω-F																						
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6	Temperature Coefficient	With no electrical load. <table border="1"> <thead> <tr> <th>T.C.</th> <th>Operating Temp</th> </tr> </thead> <tbody> <tr> <td>NP0 (C0G)</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>25~85°C at 20°C</td> </tr> </tbody> </table>	T.C.	Operating Temp	NP0 (C0G)	55~125°C at 25°C	X7R	55~125°C at 25°C	X5R	25~85°C at 20°C	<table border="1"> <thead> <tr> <th>T.C.</th> <th>Capacitance Change</th> </tr> </thead> <tbody> <tr> <td>NP0 (C0G)</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> </tbody> </table>	T.C.	Capacitance Change	NP0 (C0G)	Within ±30ppm/°C	X7R	Within ±15%	X5R	Within ±15%										
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7.	Adhesive Strength of Termination	Pressurizing force : 2N Test time: 10±1 sec.	No remarkable damage or removal of the terminations.																										



**Ultra-small Multilayer SMD Ceramic Capacitor  
0201 Size, NP0, X7R, X5R Dielectrics (6.3V to 50V)**



No	Item	Test Condition	Requirements															
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: NP0: within ±5.0% or ±0.5pF whichever is larger. 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.)															
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: NP0: within ±2.5% or ±0.25pF whichever is larger. 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.															
12	Temperature Cycle	Conduct the five cycles according to the temperatures and time. <table border="1" data-bbox="359 1344 790 1556"> <thead> <tr> <th>Step</th> <th>Temp. (°C)</th> <th>Time (min.)</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>Min. operating temp. +0/-3</td> <td>30±3</td> </tr> <tr> <td>2</td> <td>Room temp.</td> <td>2~3</td> </tr> <tr> <td>3</td> <td>Max. operating temp. +3/-0</td> <td>30±3</td> </tr> <tr> <td>4</td> <td>Room temp.</td> <td>2~3</td> </tr> </tbody> </table> 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.	Step	Temp. (°C)	Time (min.)	1	Min. operating temp. +0/-3	30±3	2	Room temp.	2~3	3	Max. operating temp. +3/-0	30±3	4	Room temp.	2~3	No remarkable damage. Cap change: NP0: within ±2.5% or ±0.25pF whichever is larger. X7R, X5R: within ±7.5% Y5V: within ±20% Q/D.F., I.R. and dielectric strength: To meet initial requirements.
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0201 Size, NP0, X7R, X5R Dielectrics (6.3V to 50V)**



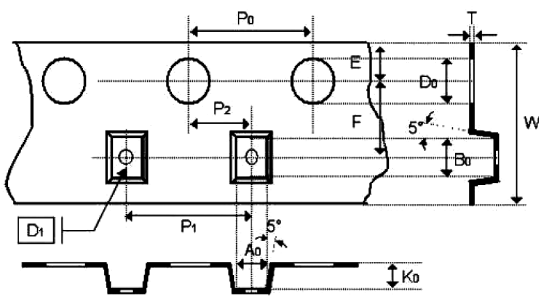
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13	Humidity (Damp Heat) Steady State	<p>Test temp.: 40±2°C Humidity: 90~95% RH Test time: 500+24/-0hrs. Before initial measurement (Class II only): Perform 150+0/-10°C for 1 hr and then set for 24±2 hrs at room temp Measurement to be made after keeping at room temp. for 24±2 hrs.</p>	<p>No remarkable damage. Cap change : NP0: within ±5.0% or ±0.5pF whichever is larger. X7R, X5R: ≥10V, within ±12.5%, 10V ≧ 0.1μF, within ±25%; 6.3V, within ±25% Y5V: ≥10V, within ±30% 6.3V, within +30/-40%</p> <p>Q/D.F. value: NP0: Cap≥30pF, Q≥350; 10pF≤Cap&lt;30pF, Q≥275+2.5C Cap&lt;10pF; Q≥200+10C X7R, X5R:</p> <table border="1"> <thead> <tr> <th>Rated vol.</th> <th>D.F</th> <th colspan="2">Exception of D.F.</th> </tr> </thead> <tbody> <tr> <td>≥50V</td> <td>≤6%</td> <td>-</td> <td></td> </tr> <tr> <td>25V</td> <td>≤5%</td> <td>≤10%</td> <td>0201≥0.01μF</td> </tr> <tr> <td>16V</td> <td>≤5%</td> <td>≤15%</td> <td>0201≥0.01μF</td> </tr> <tr> <td rowspan="2">10V</td> <td rowspan="2">≤7.5%</td> <td>≤15%</td> <td>0201≥0.012μF</td> </tr> <tr> <td>≤20%</td> <td>0201≥0.1μF</td> </tr> <tr> <td>6.3V</td> <td>≤15%</td> <td>≤30%</td> <td>0201≥0.1μF</td> </tr> </tbody> </table> <p>I.R.: ≥10V, ≥1GΩ or RxC≥50Ω-F whichever is smaller. 6.3V; 10V:0201≥47nF, RxC≥10Ω-F</p>	Rated vol.	D.F	Exception of D.F.		≥50V	≤6%	-		25V	≤5%	≤10%	0201≥0.01μF	16V	≤5%	≤15%	0201≥0.01μF	10V	≤7.5%	≤15%	0201≥0.012μF	≤20%	0201≥0.1μF	6.3V	≤15%	≤30%	0201≥0.1μF
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14	Humidity (Damp Heat) Load	<p>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.</p>	<p>No remarkable damage. Cap change: NP0: within ±7.5% or ±0.75pF whichever is larger. X7R, X5R: ≥10V, within ±12.5%, 10V ≧ 0.1μF, within ±25%; 6.3V, within ±25% Y5V: ≥10V, within ±30% 6.3V, within +30/-40%</p> <p>Q/D.F. value: NP0: Cap≥30pF, Q≥200; Cap&lt;30pF, Q≥100+10/3C X7R/X5R:</p> <table border="1"> <thead> <tr> <th>Rated vol.</th> <th>D.F</th> <th colspan="2">Exception of D.F.</th> </tr> </thead> <tbody> <tr> <td>≥50V</td> <td>≤6%</td> <td>-</td> <td></td> </tr> <tr> <td>25V</td> <td>≤5%</td> <td>≤10%</td> <td>0201≥0.01μF</td> </tr> <tr> <td>16V</td> <td>≤5%</td> <td>≤15%</td> <td>0201≥0.01μF</td> </tr> <tr> <td rowspan="2">10V</td> <td rowspan="2">≤7.5%</td> <td>≤15%</td> <td>0201≥0.012μF</td> </tr> <tr> <td>≤20%</td> <td>0201≥0.1μF</td> </tr> <tr> <td>6.3V</td> <td>≤15%</td> <td>≤30%</td> <td>0201≥0.1μF</td> </tr> </tbody> </table> <p>I.R.: ≥10V,500MΩ or RxC≥25Ω-F whichever is smaller. 6.3V; 10V:0201≥47nF, RxC≥5Ω-F</p>	Rated vol.	D.F	Exception of D.F.		≥50V	≤6%	-		25V	≤5%	≤10%	0201≥0.01μF	16V	≤5%	≤15%	0201≥0.01μF	10V	≤7.5%	≤15%	0201≥0.012μF	≤20%	0201≥0.1μF	6.3V	≤15%	≤30%	0201≥0.1μF
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15	High Temperature Load (Endurance)	Test temp.: NP0, X7R: 125±3°C X5R, Y5V: 85±3°C To apply voltage: 1) Cap. ≥ 0.1µF : 100% of rated voltage 2) 6.3V: 150% of rated voltage. 3) >6.3V: 200% of rated voltage. Test time: 1,000+24/-0 hrs. 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	No remarkable damage. Cap change: NP0: within ±3.0% or ±0.3pF whichever is larger. X7R, X5R: ≥10V, within ±12.5%, 10V ≧ 0.1µF, within ±25%; 6.3V, within ±25% Y5V: ≥10V, within ±30% 6.3V, within +30/-40% Q/D.F. value: NP0: Cap ≥ 30pF, Q ≥ 350; 10pF ≤ Cap < 30pF, Q ≥ 275+2.5C Cap < 10pF; Q ≥ 200+10C X7R/X5R: <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th>Rated vol.</th> <th>D.F</th> <th colspan="2">Exception of D.F.</th> </tr> </thead> <tbody> <tr> <td>≥50V</td> <td>≤6%</td> <td>-</td> <td></td> </tr> <tr> <td>25V</td> <td>≤5%</td> <td>≤10%</td> <td>0201 ≥ 0.01µF</td> </tr> <tr> <td>16V</td> <td>≤5%</td> <td>≤15%</td> <td>0201 ≥ 0.01µF</td> </tr> <tr> <td rowspan="2">10V</td> <td rowspan="2">≤7.5%</td> <td>≤15%</td> <td>0201 ≥ 0.012µF</td> </tr> <tr> <td>≤20%</td> <td>0201 ≥ 0.1µF</td> </tr> <tr> <td>6.3V</td> <td>≤15%</td> <td>≤30%</td> <td>0201 ≥ 0.1µF</td> </tr> </tbody> </table> I.R.: ≥10V, ≥1GΩ or Rx C ≥ 50Ω-F whichever is smaller. 6.3V; 10V: 0201 ≥ 47nF, Rx C ≥ 10Ω-F	Rated vol.	D.F	Exception of D.F.		≥50V	≤6%	-		25V	≤5%	≤10%	0201 ≥ 0.01µF	16V	≤5%	≤15%	0201 ≥ 0.01µF	10V	≤7.5%	≤15%	0201 ≥ 0.012µF	≤20%	0201 ≥ 0.1µF	6.3V	≤15%	≤30%	0201 ≥ 0.1µF
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**Appendixes**

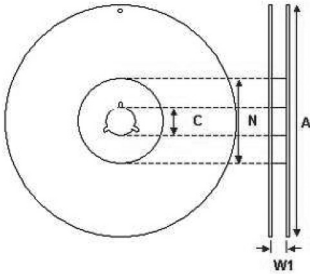
**Tape & Reel Dimensions**



The dimension of plastic tape

Size	0201
<b>Thickness</b>	<b>L</b>
A <sub>0</sub>	0.38±0.05
B <sub>0</sub>	0.68±0.05
T	0.42±0.05
K <sub>0</sub>	-
W	8.00±0.10
P <sub>0</sub>	4.00±0.10
10xP <sub>0</sub>	40.0±0.10
P <sub>1</sub>	2.00±0.05
P <sub>2</sub>	2.00±0.05
D <sub>0</sub>	1.55±0.05
D <sub>1</sub>	-
E	1.75±0.05
F	3.50±0.05

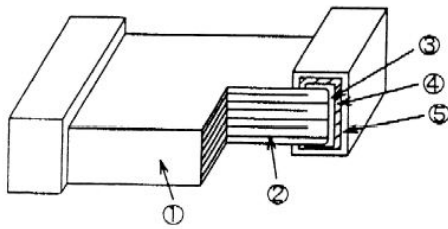
**Ultra-small Multilayer SMD Ceramic Capacitor  
0201 Size, NPO, X7R, X5R Dielectrics (6.3V to 50V)**



Size	0201	
Reel size	7"	13"
C	13 +0.5/-0.2	13 +0.5/-0.2
W1	8.4 +1.5/-0	8.4 +1.5/-0
A	178 ±0.10	330 ±1
N	60 +1/-0	100 ±1

The dimension of reel

**Constructions:**



No.	Name	NPO, X7R, Y5V
1	Ceramic material	BaTiO <sub>3</sub> based
2	Inner electrode	Ni
3	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.

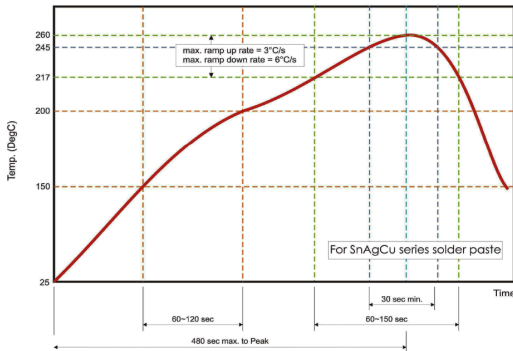
**Cautions:**

- 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.

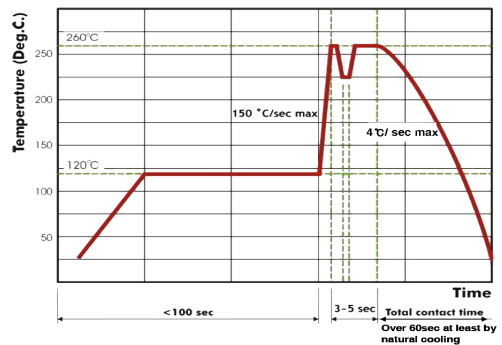


**Recommended Soldering Conditions:**

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<sub>2</sub> 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.

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