SMD Multilayer Ceramic Capacitors
Automotive

RoHS Compliant

Description:

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

Features:

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

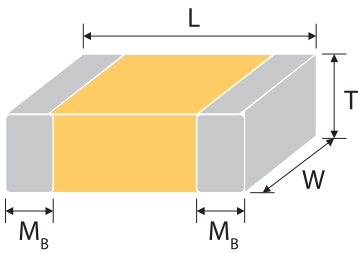
Applications:

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

External Dimensions:

Size Inch (mm)	L (mm)	W (mm)	T (mm)/Symbol		Remark	M_B min (mm)
0603 (1608)	1.6 ±0.2	0.8 ±0.1	0.8 ±0.07	S	-	0.4 ±0.15
	1.6 ±0.3	0.8 ±0.3	0.8 ±0.3	X	-	
1210 (3225)	3.2 ±0.6	2.5 ±0.5	2.5 ±0.5	M	#	0.75 ±0.25

Reflow soldering only is recommended.



The outline of MLCC

General Electrical Data:

Dielectric	X7R
Size	0603, 1210
Capacitance range*	270pF to 10μF
Capacitance tolerance**	J (±5%), K (±10%), M (±20%)
Rated voltage (WVDC)	50V
Operating temperature	-55 to +125°C
Capacitance characteristic	±15%
Termination	Ni/Sn (lead-free termination)

* Measured at the condition of 30~70% related humidity.
Measured at 1.0±0.2Vrms, 30~70% related humidity, 25°C ambient temperature for X7R.
** 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		0603			1210	
Rated Voltage		16	25	50	50	100
Capacitance	270pF (271)					
	330pF (331)					
	390pF (391)					
	470pF (471)					
	560pF (561)					
	680pF (681)					
	820pF (821)					
	1,000pF (102)	D	D	D		
	1,200pF (122)	D	D	D		
	1,500pF (152)	D	D	D		
	1,800pF (182)	D	D	D		
	2,200pF (222)	D	D	D		
	2,700pF (272)	D	D	D		
	3,300pF (332)	D	D	D		
	3,900pF (392)	D	D	D		
	4,700pF (472)	D	D	D		
	5,600pF (562)	D	D	D		
	6,800pF (682)	D	D	D		
	8,200pF (822)	D	D	D		
	0.010µF (103)	D	D	D		
	0.012µF (123)	D	D	D		
	0.015µF (153)	D	D	D		
	0.018µF (183)	D	D	D		
	0.022µF (223)	D	D	D		
	0.027µF (273)	D	D	D		
	0.033µF (333)	D	D	D		
	0.039µF (393)	D	D	D		
	0.047µF (473)	D	D	D		

Dielectric		X7R				
Size		0603			1210	
Rated Voltage		16	25	50	50	100
Capacitance	0.056µF (563)	D	D	D		
	0.068µF (683)	D	D	D		
	0.082µF (823)	D	D	D		
	0.10µF (104)	D	D	D		
	0.12µF (124)	D	D	D		
	0.15µF (154)	D	D	D		
	0.18µF (184)	D	D	D		
	0.22µF (224)	D	D	D		
	0.27µF (274)	I	I	I		
	0.33µF (334)	I	I	I		
	0.39µF (394)	I	I	I		
	0.47µF (474)	I	I	I		
	0.56µF (564)	I	I			
	0.68µF (684)	I	I	I		
	0.82µF (824)	I	I			
	1.0µF (105)	I	I	I		
	1.2µF (125)					
	1.5µF (155)					
	1.8µF (185)					
	2.2µF (225)					M
	2.7µF (275)					
	3.3µF (335)					
	3.9µF (395)					
	4.7µF (475)				M	M
	5.6µF (565)					
	6.8µF (685)					
	8.2µF (825)					
	10µF (106)				M	

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

Reliability Test Conditions And Requirements

<table>
<tr><th>No</th><th>AEC-Q200
Test Item</th><th>AEC-Q200 Test Condition</th><th>Requirements</th></tr>
<tr><td>1.</td><td>Pre-and
Post-Stress
Electrical Test</td><td>-</td><td>* No remarkable defect.
* Dimensions to conform to individual specification sheet.</td></tr>
<tr><td>2.</td><td rowspan="2">High Temperature
Exposure (Storage)
MIL-STD-202
Method 108</td><td rowspan="2">* Test temp.: 150±3°C
* Unpowered.
* Test time: 1000+24/-0 hrs.
* Measurement to be made after keeping at room temp. for 24±2 hrs.</td><td>* Shall not exceed the limits given in the detailed spec.</td></tr>
<tr><td>* No remarkable damage.
* Cap change: X7R: within ±10%.
* Q/D.F. value:.
X7R:
1. 1812/10V~16V: D.F.≤7%; 1812≥1KV: D.F.≤5%
2.
<table>
<tr><th>Rated vol.</th><th>D.F.≤</th><th colspan="2">Exception of D.F.≤</th></tr>
<tr><td rowspan="3">50V</td><td rowspan="3">≤3%</td><td>≤6%</td><td>0201(50V);0603≥0.047μF;0805≥0.18μF;1206≥0.47μF</td></tr>
<tr><td>≤10%</td><td>0201≥0.01uF;1210≥3.3μF</td></tr>
<tr><td>≤20%</td><td>0402≥0.012μF;0603>0.1μF; 0805/X7R>0.47μF;
1206≥2.2μF;1210≥10μF</td></tr>
</table>
* I.R.: .≥10GΩ or RxC.≥500Ω-F whichever is smaller.
Class II (X7R)
<table>
<tr><th>Rated voltage</th><th>Insulation Resistance</th></tr>
<tr><td>50V: 0402>0.01μF;0603≥1μF;0805≥1μF;1206≥4.7μF;1210≥4.7μF</td><td>1GΩ or R × C ≥10Ω-F whichever is smaller.</td></tr>
</table></td></tr>
<tr><td>3.</td><td>Temperature
Cycling JESD22
Method JA-104</td><td>* Conduct 1000 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>-55°C +0/-3</td><td>5±1</td></tr>
<tr><td>2</td><td>+125°C +3/-0</td><td>5±1</td></tr>
</table>
* Before initial measurement (X7R 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: within ±10%.
* Q/D.F. value:.
X7R:
1. 1812/10V~16V: D.F.≤7%; 1812≥1KV: D.F.≤5%
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</table>

* "Room condition" Temperature: 15 to 35°C, Relativ e humidity: 25 to 75%, Atmospheric pressure: 86 to 106kPa.

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Test Item</th><th>AEC-Q200 Test Condition</th><th>Requirements</th></tr>
<tr><td>4</td><td>Destructive Physical Analysis EIA-469</td><td>Per EIA-469</td><td>No defects or abnormalities</td></tr>
<tr><td>5</td><td>Moisture Resistance MIL-STD-202 Method 106</td><td>* Test temp.: 25~65°C
* Humidity: 80~100% RH
* Test time: 10 cycles, t=24hrs/cycle.
* Measurement to be made after keeping at room temp. for 24±2 hrs.</td><td>* No remarkable damage.
* Cap change: X7R: within ±12.5%.
* Q/D.F. value:.
X7R:
1. 1812/10V~16V: D.F.≤7%; 1812≥1KV: D.F.≤5%
2.
<table>
<tr><th>Rated vol.</th><th>D.F.≤</th><th colspan="2">Exception of D.F.≤</th></tr>
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<tr><td>≤20%</td><td>0402≥0.012μF;0603>0.1μF; 0805/X7R>0.47μF; 1206≥2.2μF;1210≥10μF</td></tr>
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* I.R.: ≥10GΩ or RxC≥500Ω-F whichever is smaller.
Class II (X7R)
<table>
<tr><th>Rated voltage</th><th>Insulation Resistance</th></tr>
<tr><td>50V: 0402>0.01μF;0603≥1μF;0805≥1μF;1206≥4.7μF;1210≥4.7μF</td><td>1GΩ or R × C ≥10Ω-F whichever is smaller.</td></tr>
</table></td></tr>
<tr><td>6.</td><td>Biased Humidity MIL-STD-202 Method 103</td><td>* Test temp.: 85±3°C
* Humidity: 85%RH
* Test time: 1000+24/-0 hrs.
* To apply voltage: rated voltage(Max.500V) and 1.3~1.5Vdc. (add 100k ohm resistor)
* 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: within ±12.5%.
* Q/D.F. value:. X7R:
1. 1812/10V~16V: D.F.≤7%; 1812≥1KV: D.F.≤5%
<table>
<tr><th>Rated vol.</th><th>D.F.≤</th><th colspan="2">Exception of D.F.≤</th></tr>
<tr><td rowspan="3">50V</td><td rowspan="3">≤3%</td><td>≤6%</td><td>0201(50V);0603≥0.047μF;0805≥0.18μF;1206≥0.47μF</td></tr>
<tr><td>≤10%</td><td>0201≥0.01uF;1210≥3.3μF</td></tr>
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</table>
* I.R.: ≥1GΩ or RxC≥50Ω-F whichever is smaller.
Class II (X7R)
<table>
<tr><th>Rated voltage</th><th>Insulation Resistance</th></tr>
<tr><td>50V: 0402>0.01μF;0603≥1μF;0805≥1μF;1206≥4.7μF;1210≥4.7μF</td><td>500MΩ or R × C ≥5Ω-F whichever is smaller.</td></tr>
</table>
Class II (X7R) for 1.3~1.5Vdc
<table>
<tr><th>Rated voltage</th><th>Insulation Resistance</th></tr>
<tr><td>50V: 0402>0.01μF;0603≥1μF;0805≥1μF;1206≥4.7μF;1210≥4.7μF</td><td>1GΩ or R × C ≥10Ω-F whichever is smaller.</td></tr>
</table></td></tr>
</table>

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<tr><th>No</th><th>AEC-Q200
Test Item</th><th>AEC-Q200 Test Condition</th><th>Requirements</th></tr>
<tr><td>7.</td><td>Operational Life
MIL-STD-202
Method 108</td><td>* Test temp.: Maximum Operating Temperature ±3°C
* To apply voltage:
(1) 10VUr250V:200% of rated voltage.
(2) 150% of rated voltage:
a) 500V
b) 0603/X7R/50V/ Cap.>0.1μF
c) 0805/X7R/50V/ Cap.0.68μF
d) 1206/X7R/100V/ Cap.1.0μF
e) 1210/X7R/50V&100V/ Cap.2.2μF
(3) 630VUr1000V:120% of rated voltage.
* Test time: 1000+24/-0 hrs.
* Before initial measurement (X7R only):
Apply test voltage for 1 hr at 125°C. Remove and let 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: within ±12.5%.
* Q/D.F. value:.
X7R:
1. 1812/10V~16V: D.F.≤7%; 1812≥1KV: D.F.≤5%
2.
<table>
<tr><th>Rated vol.</th><th>D.F.≤</th><th colspan="2">Exception of D.F.≤</th></tr>
<tr><td rowspan="3">50V</td><td rowspan="3">≤3%</td><td>≤6%</td><td>0201(50V);0603≥0.047μF;0805≥0.18μF;1206≥0.47μF</td></tr>
<tr><td>≤10%</td><td>0201≥0.01uF;1210≥3.3μF</td></tr>
<tr><td>≤20%</td><td>0402≥0.012μF;0603>0.1μF; 0805/X7R>0.47μF; 1206≥2.2μF;1210≥10μF</td></tr>
</table>
* I.R.: ≥1GΩ or RxC≥50Ω-F whichever is smaller.
Class II (X7R)
<table>
<tr><th>Rated voltage</th><th>Insulation Resistance</th></tr>
<tr><td>50V: 0402>0.01μF;0603≥1μF;0805≥1μF;1206≥4.7μF;1210≥4.7μF</td><td>1GΩ or R × C ≥10Ω-F whichever is smaller.</td></tr>
</table></td></tr>
<tr><td>8.</td><td>External Visual
MIL-STD-883
Method 2009</td><td>Visual inspection</td><td>No remarkable defect.</td></tr>
<tr><td>9.</td><td>Physical Dimension
JESD22
Method JB-100</td><td>Using by calipers</td><td>Within the specified dimensions</td></tr>
</table>

<table>
<tr><th>No</th><th>AEC-Q200
Test Item</th><th>AEC-Q200 Test Condition</th><th>Requirements</th></tr>
<tr><td>10.</td><td>Resistance to Solvents
MIL-STD-202
Method 215</td><td>* Temperature: 25±5°C
* Time: 3+0.5/-0 min.
* Solvent: Iso-propyl alcohol.</td><td>* No remarkable damage.
* Cap: within the specified tolerance..
* Q/D.F. value:.
X7R
<table>
<tr><th>Rated vol.</th><th>D.F.≤</th><th colspan="2">Exception of D.F.≤</th></tr>
<tr><td rowspan="3">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>0201≥0.01uF;1210≥3.3μF</td></tr>
<tr><td>≤10%</td><td>0402≥0.012μF;0603>0.1μF; 0805/X7R>0.47μF; 1206≥2.2μF;1210≥10μF</td></tr>
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* I.R.: ≥10GΩ or RxC≥500Ω-F whichever is smaller.
Class II (X7R)
<table>
<tr><th>Rated voltage</th><th>Insulation Resistance</th></tr>
<tr><td>50V: 0402>0.01μF;0603≥1μF;0805≥1μF;1206≥4.7μF;1210≥4.7μF</td><td>10GΩ or R × C ≥100Ω-F whichever is smaller.</td></tr>
</table>
<table>
<tr><th>Rated voltage</th><th>Insulation Resistance</th></tr>
<tr><td>50V: 0402>0.1μF;0603≥2.2μF;0805≥1μF;1206≥10μF</td><td>R × C ≥50Ω-F</td></tr>
</table></td></tr>
<tr><td>11</td><td>Mechanical Shock
MIL-STD-202
Method 213</td><td>* Peak value: 1500g's.
* Wave: 1/2 sine.
* Velocity: 15.4 ft/sec
* Three shocks in each direction should be applied along 3 mutually perpendicular axes of the test specimen (18 shocks)</td><td>* No remarkable damage.
* Cap: within the specified tolerance..
* Q/D.F. value:.
X7R
<table>
<tr><th>Rated vol.</th><th>D.F.≤</th><th colspan="2">Exception of D.F.≤</th></tr>
<tr><td rowspan="3">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>
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Class II (X7R)
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<tr><th>Rated voltage</th><th>Insulation Resistance</th></tr>
<tr><td>50V: 0402>0.01μF;0603≥1μF;0805≥1μF;1206≥4.7μF;1210≥4.7μF</td><td>10GΩ or R × C ≥100Ω-F whichever is smaller.</td></tr>
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<tr><th>Rated voltage</th><th>Insulation Resistance</th></tr>
<tr><td>50V: 0402≥0.1μF;0603≥2.2μF;0805≥1μF;1206≥10μF</td><td>R × C ≥50Ω-F</td></tr>
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<tr><th>No</th><th>AEC-Q200
Test Item</th><th>AEC-Q200 Test Condition</th><th>Requirements</th></tr>
<tr><td>12.</td><td>Vibration
MIL-STD-202
Method 204</td><td>* Vibration frequency:
10~2000 Hz/min.
(5g's for 20 min)
* Total amplitude: 1.5mm
* 12 cycles each of 3
orientations (36 times)</td><td>* No remarkable damage.
* Cap: within the specified tolerance..
* Q/D.F. value:.
X7R
<table>
<tr><th>Rated vol.</th><th>D.F.≤</th><th colspan="2">Exception of D.F.≤</th></tr>
<tr><td rowspan="3">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>
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Class II (X7R)
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<tr><th>Rated voltage</th><th>Insulation Resistance</th></tr>
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<tr><th>Rated voltage</th><th>Insulation Resistance</th></tr>
<tr><td>50V: 0402≥0.1μF;0603≥2.2μF;0805≥10μF;1206≥10μF</td><td>R × C ≥50 Ω-F</td></tr>
</table></td></tr>
<tr><td>13</td><td>Resistance to
Soldering Heat
MIL-STD-202
Method 210</td><td>* Solder temperature:
260±5°C
* Dipping time: 10±1 sec
* Before initial measure-
ment (X7R 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: within ±7.5%.
* Q/D.F. value:.
X7R:
<table>
<tr><th>Rated vol.</th><th>D.F.≤</th><th colspan="2">Exception of D.F.≤</th></tr>
<tr><td rowspan="3">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>
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<tr><td>50V: 0402>0.1μF;0603≥2.2μF;0805≥10μF;1206≥10μF</td><td>RxC≥50 Ω-F.</td></tr>
</table></td></tr>
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Test Item</th><th>AEC-Q200 Test Condition</th><th>Requirements</th></tr>
<tr><td>14</td><td>Thermal Shock
MIL-STD-202
Method 107</td><td>* Conduct 300 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>-55°C +0/-3</td><td>5±3</td></tr>
<tr><td>2</td><td>+125°C +3/-0</td><td>5±3</td></tr>
</table>
* Max. transfer time: 20 sec.
* Before initial measurement (X7R 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: within ±10%.
* Q/D.F. value:.
X7R: 1812/10V~16V: D.F.≤7%; 1812≥1KV: D.F.≤5%
<table>
<tr><th>Rated vol.</th><th>D.F.≤</th><th colspan="2">Exception of D.F.≤</th></tr>
<tr><td rowspan="3">50V</td><td rowspan="3">≤2.5%</td><td>≤6%</td><td>0201(50V);0603≥0.047μF;0805≥0.18μF;1206≥0.47μF</td></tr>
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Class II (X7R)
<table>
<tr><th>Rated voltage</th><th>Insulation Resistance</th></tr>
<tr><td>50V: 0402>0.01μF;0603≥1μF;0805≥1μF;1206≥4.7μF;1210≥4.7μF</td><td>1GΩ or R × C ≥10Ω-F whichever is smaller.</td></tr>
</table></td></tr>
<tr><td>15</td><td>ESD
AEC-Q200-002</td><td>Per AEC-Q200-002v</td><td>* No remarkable damage.
* Cap.: within the specified tolerance.
* Q/D.F. value:.
X7R
<table>
<tr><th>Rated vol.</th><th>D.F.≤</th><th colspan="2">Exception of D.F.≤</th></tr>
<tr><td rowspan="3">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>
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<tr><td>50V: 0402>0.01μF;0603≥2.2μF;0805≥10μF;1206≥10μF</td><td>RxC≥50 Ω-F.</td></tr>
</table></td></tr>
</table>

<table>
<tr><th>No</th><th>AEC-Q200
Test Item</th><th>AEC-Q200 Test Condition</th><th>Requirements</th></tr>
<tr><td>16</td><td>Solderability
J-STD-002
JESD22-B102E</td><td>* Condition A Un-mounted chips 4hrs / 155°C*dry then completely immersed for 5±0.5 sec in solder bath at 235±5°C.
* Condition B Un-mounted chips steam 8 hrs then completely immersed for 10±1sec in solder bath at 215+5/-0°C.
* Condition C Un-mounted chips steam 8 hrs then completely immersed for 10±1 sec. in solder bath at 260+0/-5°C.</td><td>All terminations shall exhibit a continuous solder coating free from defects from a minimum of 75% of the critical surface area of any individual termination.</td></tr>
<tr><td>17</td><td>Electrical Characterization</td><td>* Capacitance
* Q/ D.F. (Dissipation Factor)
*Test temp.: Room Temperature.
Class II: (X7R) Cap 10µF, 1 ±0.2Vrms, 1KHz±10%
Cap, 10µF, 0.5±0.2Vrms, 120Hz±20%

* Insulation Resistance
* Test temp.: Room Temperature.
* Test voltage:
100V:To apply rated voltage for max.
120 sec.
200V:To apply rated voltage (Max.500V)
for 60 sec.
* Dielectric Strength
To apply voltage:
≤100 ≥2.5 times VDC
200V~300V ≥2 times VDC
400V~450V ≥1.2 times VDC
500V~999V ≥1.5 times VDC
1000V~3000V ≥1.2 times VDC
duration 1~5 sec,
charge and discharge current less than 50mA.
* Temperature Coefficient (with no electrical load)
Operation temperature:
-55~125°C at 25°C</td><td>* Capacitance within the specified tolerance.
* Q/D.F. value:
X7R
<table>
<tr><th>Rated vol.</th><th>D.F.≤</th><th colspan="2">Exception of D.F.≤</th></tr>
<tr><td rowspan="3">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>
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<tr><th>Rated voltage</th><th>Insulation Resistance</th></tr>
<tr><td>50V: 0402>0.1µF;0603≥2.2µF;0805≥10µF;1206≥10µF</td><td>RxC≥50 Ω-F.</td></tr>
</table>
* Dielectric strength
No evidence of damage or flash over during test.
* Temperature Coefficient
Capacitance Change: X7R: Within ±15%</td></tr>
</table>

<table>
<tr><th>No</th><th>AEC-Q200
Test Item</th><th>AEC-Q200 Test Condition</th><th>Requirements</th></tr>
<tr><td>18.</td><td>Board Flex
AEC-Q200-005</td><td>* The middle part of substrate shall be
pressurized by means of the pressurizing
rod at a rate of about 1 mm per second until
the deflection becomes 5 mm and then the
pressure shall be maintained for 60±1 sec.
* Measurement to be made after keeping at
room temp. for 24±2 hrs.</td><td>* No remarkable damage.
* Cap change: X7R: within ±12.5%
(This capacitance change means the change of capacitance under specified flexure of substrate from the capacitance measured before the test.)</td></tr>
<tr><td>19</td><td>Terminal Strength
AEC-Q200-006</td><td>* Pressurizing force:2N (0201 & 0402),
10N(0603), 18N(0805).
* Test time: 60±1 sec.</td><td>* No remarkable damage or removal of the terminations.
* Capacitance within the specified tolerance.
* Q/D.F. value:.
X7R:
<table>
<tr><th>Rated vol.</th><th>D.F.≤</th><th colspan="2">Exception of D.F.≤</th></tr>
<tr><td rowspan="3">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>
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<tr><td>≤10%</td><td>0402≥0.012μF;0603>0.1μF; 0805>0.47μF;
1206≥2.2μF;1210≥10μF</td></tr>
</table></td></tr>
<tr><td>20.</td><td>Beam Load Test
AEC-Q200-003</td><td>* Break strength test
* Beam speed: 2.5±0.25 mm/sec</td><td>The chip endure following force
* Chip length ≤2.5mm: Thickness >0.5mm (20N), ≤0.5mm (8N)
* Chip length ≥3.2mm: Thickness ≥1.25mm (54.5N), <1.25mm (15N)</td></tr>
</table>

APPENDIXES

Tape & reel dimensions

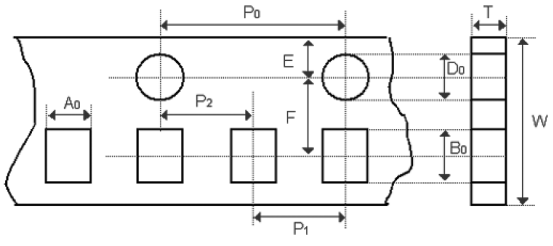


Fig. 2 The dimension of paper tape

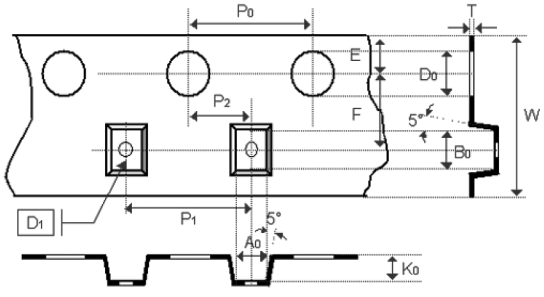


Fig. 3 The dimension of plastic tape

Size	0603	1210		
Thickness	S,H,X	T	C,D,G,K	M
A_0	1.05 +/-0.30	< 3.05	< 3.05	< 3.2
B_0	1.8 +/-0.3	< 3.8	< 3.8	<4
T	≤1.2	0.23 +/-0.1	0.23 +/-0.1	0.23 +/-0.1
K_0	--	< 1.5	< 2.5	< 3.5
W	8 +/-0.30	8 +/-0.3	8 +/-0.3	8 +/-0.3
P_0	4 +/-0.10	4 +/-0.1	4 +/-0.1	4 +/-0.1
$10xP_0$	40 +/-0.20	40 +/-0.2	40 +/-0.2	40 +/-0.2
P_1	4 +/-0.10	4 +/-0.1	4 +/-0.1	4 +/-0.1
P_2	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
D_1	--	1 +/-0.1	1 +/-0.1	1 +/-0.1
E	1.75 +/-0.10	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

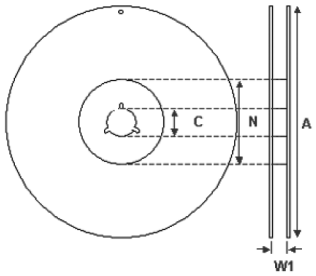
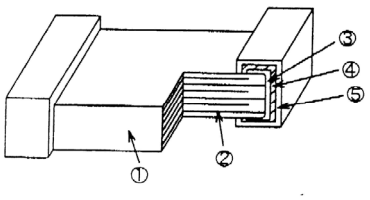


Fig. 4 The dimension of reel

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

Appendixes

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



The construction of MLCC

Storage and handling conditions

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

(2) The product is recommended to be used within one year after shipment. Check solderability in case of shelf life extension is needed.

Cautions:

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

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

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

Recommended soldering conditions

The lead-free termination MLCCs are not only to be used on SMT against lead-free solder paste, but also suitable against lead-containing solder paste. If the optimized solder joint is requested, increasing soldering time, temperature and concentration of N2 within oven are recommended.

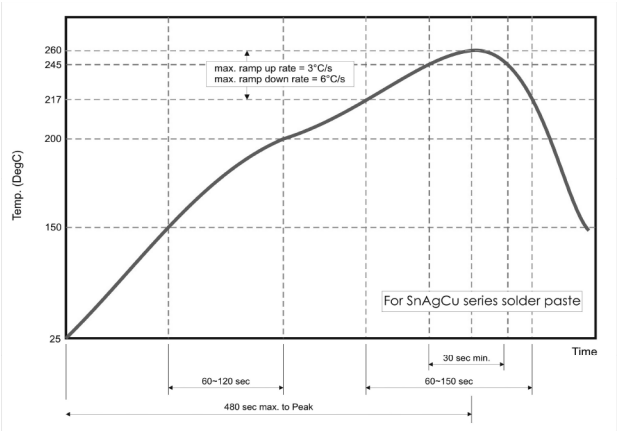


Fig. 6 Recommended reflow soldering profile for SMT process with SnAgCu series solder paste.

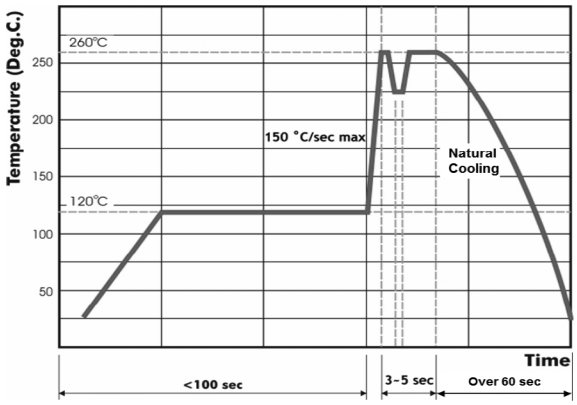


Fig. 7 Recommended wave soldering profile for SMT process with SnAgCu series solder.

Part Number Table

Description	Part Number
SMD Multilayer Ceramic Capacitors, Soft Termination, Automotive, 0603, X7R, 100nF, 10%, 50V	MCST18B104K500CT
SMD Multilayer Ceramic Capacitors, Soft Termination, Automotive, 1210, X7R, 4.7uF, 10%, 50V	MCST32B475K500CT

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