



**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.

MLCC is made by NPO,X7R dielectrics and which provides product with high electrical precision, stability and reliability. Besides, MT series MLCC is tighten controlling in quality in line to assure quality performance in automotive applications.

**RoHS**  
**Compliant**

**Features:**

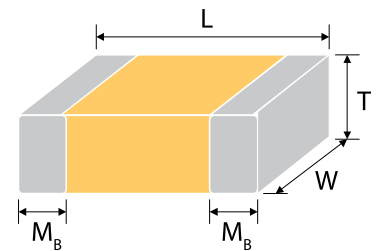
- Wide selection of sizes is available (0402 to 0805).
- High capacitance in given case size.
- Capacitor with lead-free termination (pure Tin).
- The MT series meet AEC-Q200 requirement.

**Applications:**

- For Navigation & Information equipments.
- For entertainment equipments
- For comfortable equipments.
- For Automotive electronic equipment.

**External Dimensions:**

Size Inch (mm)	L (mm)	W (mm)	T (mm)/Symbol	Remark	M <sub>B</sub> min (mm)	
0402 (1005)	1.00±0.05	0.5 ±0.05	0.5 ±0.05	N	#	0.25 +0.05/-0.1
0603 (1608)	1.60±0.10	0.8 ±0.1	0.8 ±0.07	S	-	0.4 ±0.15
	1.6 +0.15/-0.1	0.8 +0.15/-0.1	0.80 +0.15/-0.1	X	-	
0805 (2012)	2 ±0.15	1.25 ±0.1	0.60±0.10	A	-	0.50±0.20
			0.80±0.10	B	-	
			1.25±0.10	D	#	
	2 ±0.2	1.25 ±0.2	1.25±0.20	I	#	



The outline of MLCC

# Reflow soldering only is recommended.

**General Electrical Data:**

Dielectric	NPO	X7R
Size	0805	0402, 0603, 0805
Capacitance range*	0.1pF to 0.047uF	100pF to 2.2µF
Capacitance tolerance**	Cap≤5pF#1: 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%)	J (±5%), K (±10%), M (±20%)
Rated voltage (WVDC)	10V, 16V, 25V, 50V, 100V, 200V, 250, 500, 630, 1000	
Operating temperature	-55°C to +125°C	
Capacitance characteristic	±30ppm/°C	±15%
Termination	Ni/Sn (lead-free termination)	

#1: NPO, 0.1pF product only provide B tolerance.

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

NPO: Apply 1.0±0.2Vrms, 1.0MHz±10% for Cap1000pF and 1.0±0.2Vrms, 1.0kHz±10% for Cap>1000pF, 25°C at 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**

Dielectric		NP0								
Size		0805								
Rated Voltage		10	16	25	50	100	200	250	500	630
Capacitance	0.5pF (0R5)	A	A	A	A	A	A	A	A	A
	0.6pF (0R6)	A	A	A	A	A	A	A	A	A
	0.7pF (0R7)	A	A	A	A	A	A	A	A	A
	0.8pF (0R8)	A	A	A	A	A	A	A	A	A
	0.9pF (0R9)	A	A	A	A	A	A	A	A	A
	1.0pF (1R0)	A	A	A	A	A	A	A	A	A
	1.2pF (1R2)	A	A	A	A	A	A	A	A	A
	1.5pF (1R5)	A	A	A	A	A	A	A	A	A
	1.8pF (1R8)	A	A	A	A	A	A	A	A	A
	2.2pF (2R2)	A	A	A	A	A	A	A	A	A
	2.7pF (2R7)	A	A	A	A	A	A	A	A	A
	3.3pF (3R3)	A	A	A	A	A	A	A	A	A
	3.9pF (3R9)	A	A	A	A	A	A	A	A	A
	4.7pF (4R7)	A	A	A	A	A	A	A	A	A
	5.6pF (5R6)	A	A	A	A	A	A	A	A	A
	6.8pF (6R8)	A	A	A	A	A	A	A	A	A
	8.2pF (8R2)	A	A	A	A	A	A	A	A	A
	10pF (100)	A	A	A	A	A	A	A	A	A
	12pF (120)	A	A	A	A	A	A	A	A	A
	15pF (150)	A	A	A	A	A	A	A	A	A
	18pF (180)	A	A	A	A	A	A	A	A	A
	22pF (220)	A	A	A	A	A	A	A	A	A
	27pF (270)	A	A	A	A	A	A	A	A	A
	33pF (330)	A	A	A	A	A	A	A	A	A
	39pF (390)	A	A	A	A	A	A	A	A	A
	47pF (470)	A	A	A	A	A	A	A	A	A
	56pF (560)	A	A	A	A	A	A	A	A	A
	68pF (680)	A	A	A	A	A	A	A	A	A
82pF (820)	A	A	A	A	A	A	A	A	B	
100pF (101)	A	A	A	A	A	A	B	B	B	
120pF (121)	A	A	A	A	A	A	B	B	D	
150pF (151)	A	A	A	A	A	A	D	D	D	
180pF (181)	A	A	A	A	A	A	D	D	D	
220pF (221)	A	A	A	A	A	A	D	D	D	

# Automotive Multilayer Ceramic Capacitors 10 to 100V (NP0, X7R Dielectrics)

# multicomp PRO

Dielectric		NP0								
Size		0805								
Rated Voltage		10	16	25	50	100	200	250	500	630
Capacitance	270pF (271)	A	A	A	A	A	D	D	D	D
	330pF (331)	A	A	A	A	A	D	D	D	D
	390pF (391)	B	B	B	B	B	D	D	D	D
	470pF (471)	B	B	B	B	B	D	D	I	I
	560pF (561)	B	B	B	B	B	D	D	I	I
	680pF (681)	B	B	B	B	B	D	D	I	I
	820pF (821)	B	B	B	B	B	D	D	I	I
	1,000pF (102)	B	B	B	B	B	D	D	I	I
	1,200pF (122)	B	B	B	B	B	D	D		
	1,500pF (152)	B	B	B	B	B	D	D		
	1,800pF (182)	B	B	B	B	B	D	D		
	2,200pF (222)	B	B	B	B	B	D	D		
	2,700pF (272)	D	D	D	D	D				
	3,300pF (332)	D	D	D	D	D				
	3,900pF (392)	D	D	D	D	D				
	4,700pF (472)	D	D	D	D	D				
	5,600pF (562)	D	D	D	D	D				
	6,800pF (682)	D	D	D	D	D				
8,200pF (822)	D	D	D	D						
0.01μF (103)	D	D	D	D						

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

## X7R Dielectric

Dielectric		X7R								
Size		0402				0603				
Rated Voltage		10	16	25	50	10	16	25	50	100
Capacitance	100pF (101)	N	N	N	N	S	S	S	S	S
	120pF (121)	N	N	N	N	S	S	S	S	S
	150pF (151)	N	N	N	N	S	S	S	S	S
	180pF (181)	N	N	N	N	S	S	S	S	S
	220pF (221)	N	N	N	N	S	S	S	S	S
	270pF (271)	N	N	N	N	S	S	S	S	S

Newark.com/multicomp-pro  
Farnell.com/multicomp-pro  
sg.element14.com/b/multicomp-pro

# multicomp PRO

**Automotive Multilayer Ceramic Capacitors  
10 to 100V (NPO, X7R Dielectrics)**



Dielectric		X7R								
Size		0402				0603				
Capacitance	330pF (331)	N	N	N	N	S	S	S	S	S
	390pF (391)	N	N	N	N	S	S	S	S	S
	470pF (471)	N	N	N	N	S	S	S	S	S
	560pF (561)	N	N	N	N	S	S	S	S	S
	680pF (681)	N	N	N	N	S	S	S	S	S
	820pF (821)	N	N	N	N	S	S	S	S	S
	1,000pF (102)	N	N	N	N	S	S	S	S	S
	1,200pF (122)	N	N	N	N	S	S	S	S	S
	1,500pF (152)	N	N	N	N	S	S	S	S	S
	1,800pF (182)	N	N	N	N	S	S	S	S	S
	2,200pF (222)	N	N	N	N	S	S	S	S	S
	2,700pF (272)	N	N	N	N	S	S	S	S	S
	3,300pF (332)	N	N	N	N	S	S	S	S	S
	3,900pF (392)	N	N	N	N	S	S	S	S	S
	4,700pF (472)	N	N	N	N	S	S	S	S	S
	5,600pF (562)	N	N	N	N	S	S	S	S	S
	6,800pF (682)	N	N	N	N	S	S	S	S	S
	8,200pF (822)	N	N	N	N	S	S	S	S	S
	0.010μF (103)	N	N	N	N	S	S	S	S	S
	0.012μF (123)	N	N	N		S	S	S	S	X
	0.015μF (153)	N	N	N		S	S	S	S	X
	0.018μF (183)	N	N	N		S	S	S	S	X
	0.022μF (223)	N	N	N		S	S	S	S	X
	0.027μF (273)	N	N	N		S	S	S	S	X
	0.033μF (333)	N	N	N		S	S	S	X	X
	0.039μF (393)	N	N	N		S	S	S	X	X
	0.047μF (473)	N	N	N		S	S	S	X	X
	0.056μF (563)	N	N	N		S	S	S	X	
	0.068μF (683)	N	N	N		S	S	S	X	
	0.082μF (823)	N	N	N		S	S	S	X	
	0.10μF (104)	N	N	N		S	S	S	X	
	0.12μF (124)					X	X	X		
	0.15μF (154)					X	X	X	X	
	0.18μF (184)					X	X	X		
0.22μF (224)					X	X	X	X		
0.33μF (334)					X	X	X	X		

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



**X7R Dielectric**

Dielectric		X7R								
Size		0805								
Rated Voltage (V DC)		10	16	25	50	100	200	250	500	630
Capacitance	100pF (101)	B	B	B	B	B	B	B	B	B
	120pF (121)	B	B	B	B	B	B	B	B	B
	150pF (151)	B	B	B	B	B	B	B	B	B
	180pF (181)	B	B	B	B	B	B	B	B	B
	220pF (221)	B	B	B	B	B	B	B	B	B
	270pF (271)	B	B	B	B	B	B	B	B	B
	330pF (331)	B	B	B	B	B	B	B	B	B
	390pF (391)	B	B	B	B	B	B	B	B	B
	470pF (471)	B	B	B	B	B	B	B	B	B
	560pF (561)	B	B	B	B	B	B	B	B	B
	680pF (681)	B	B	B	B	B	B	B	B	B
	820pF (821)	B	B	B	B	B	B	B	B	B
	1,000pF (102)	B	B	B	B	B	B	B	B	B
	1,200pF (122)	B	B	B	B	B	B	B	B	B
	1,500pF (152)	B	B	B	B	B	B	B	B	B
	1,800pF (182)	B	B	B	B	B	B	B	B	B
	2,200pF (222)	B	B	B	B	B	B	B	B	B
	2,700pF (272)	B	B	B	B	B	B	B	B	B
	3,300pF (332)	B	B	B	B	B	B	B	B	B
	3,900pF (392)	B	B	B	B	B	B	B	B	B
	4,700pF (472)	B	B	B	B	B	B	B	D	D
	5,600pF (562)	B	B	B	B	B	B	B	D	D
	6,800pF (682)	B	B	B	B	B	B	B	D	D
	8,200pF (822)	B	B	B	B	B	B	B	D	D
	0.010μF (103)	B	B	B	B	B	D	D	D	D
	0.012μF (123)	B	B	B	B	B	D	D		
	0.015μF (153)	B	B	B	B	B	D	D		
	0.018μF (183)	B	B	B	B	B	D	D		
	0.022μF (223)	B	B	B	B	B	D	D		
	0.027μF (273)	B	B	B	B	D				
0.033μF (333)	B	B	B	B	D					
0.039μF (393)	B	B	B	B	D					
0.047μF (473)	B	B	B	B	D					
0.056μF (563)	B	B	B	B	D					
0.068μF (683)	B	B	B	B	D					

Dielectric		X7R								
Size		0805								
Rated Voltage (V DC)		10	16	25	50	100	200	250	500	630
Capacitance	0.082μF (823)	B	B	B	B	D				
	0.10μF (104)	B	B	B	B	D				
	0.12μF (124)	B	B	B	D					
	0.15μF (154)	D	D	D	D					
	0.18μF (184)	D	D	D	D					
	0.22μF (224)	D	D	D	D					
	0.27μF (274)	D	D	D	I					
	0.33μF (334)	D	D	D	I					
	0.39μF (394)	D	D	D	I					
	0.47μF (474)	D	D	D	I					
	0.56μF (564)	D	D	D						
	0.68μF (684)	D	D	D	I					
	0.82μF (824)	D	D	D						
	1.0μF (105)	D	D	D	I					
	2.2μF (225)									
	4.7μF (475)									
10μF (106)										

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

**Packaging Style And Quantity**

Size	Thickness (mm)/Symbol		Paper tape		Plastic tape	
			7" reel	13" reel	7" reel	13" reel
0402 (1005)	0.5 ±0.05	N	10k	50k	-	-
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

**Reliability Test Conditions And Requirements**

No	AEC-Q200 Test Item	AEC-Q200 Test Condition	Requirements																																																						
1	Pre-and Post-Stress Electrical Test	-																																																							
2	High Temperature Exposure (Storage) MIL-STD-202 Method 108	* 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.	* No remarkable damage. * Cap change : NPO: within ±2.5% or ±0.25pF whichever is larger. X7R: within ±10.00%. * Q/D.F. value: NPO: Cap≥30pF, Q≥1000 ; Cap<30pF, Q≥400+20C. X7R: <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 rowspan="3">≥ 100V</td> <td rowspan="3">≤3%</td> <td>≤6%</td> <td>1206≥0.47μF</td> </tr> <tr> <td>≤7.5%</td> <td>0603≥0.068μF;0805&gt;0.1μF;1206≥1μF;1210≥2.2μF</td> </tr> <tr> <td>≤20%</td> <td>0805&gt;0.22μF;1210≥3.3μF</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>0201≥0.01uF;1210≥3.3μF</td> </tr> <tr> <td>≤20%</td> <td>0402≥0.012μF;0603&gt;0.1μF; 0805/X7R&gt;0.47μF; 1206≥2.2μF;1210≥10μF</td> </tr> <tr> <td>35V</td> <td>≤5%</td> <td>≤20%</td> <td>0603≥1μF;0805≥2.2μF;1206≥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</td> </tr> <tr> <td>≤15%</td> <td>0201≥0.1μF; 0402≥0.056μF;0603≥0.47μF; 0805≥2.2μF;1206≥4.7μF;1210≥22μF</td> </tr> <tr> <td>≤20%</td> <td>0402≥0.47μF</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≥0.022μF;0402≥0.033μF; 0603&gt;0.47μF;0805≥2.2μF;1206≥4.7μF;1210≥22μF</td> </tr> <tr> <td rowspan="2">10V</td> <td rowspan="2">≤7.5%</td> <td>≤15%</td> <td>0201≥0.012μF;0402≥0.22μF; 0603≥0.33μF;0805≥2.2μF;1206≥2.2μF;1210≥22μF</td> </tr> <tr> <td>≤20%</td> <td>0201≥0.1μF;0402≥1μF</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</td> </tr> <tr> <td>4V</td> <td>≤20%</td> <td>---</td> <td>---</td> </tr> </tbody> </table> * I.R.: 10GΩ or Rx500Ω-F whichever is smaller. Class II (X7R)	Rated vol.	D.F.≤	Exception of D.F.≤		≥ 100V	≤3%	≤6%	1206≥0.47μF	≤7.5%	0603≥0.068μF;0805>0.1μF;1206≥1μF;1210≥2.2μF	≤20%	0805>0.22μF;1210≥3.3μF	50V	≤3%	≤6%	0201(50V);0603≥0.047μF;0805≥0.18μF;1206≥0.47μF	≤10%	0201≥0.01uF;1210≥3.3μF	≤20%	0402≥0.012μF;0603>0.1μF; 0805/X7R>0.47μF; 1206≥2.2μF;1210≥10μF	35V	≤5%	≤20%	0603≥1μF;0805≥2.2μF;1206≥2.2μF;1210≥10μF	25V	≤5%	≤10%	0201≥0.01μF;0805≥1μF;1210≥10μF	≤14%	0603≥0.33μF	≤15%	0201≥0.1μF; 0402≥0.056μF;0603≥0.47μF; 0805≥2.2μF;1206≥4.7μF;1210≥22μF	≤20%	0402≥0.47μF	16V	≤5%	≤10%	0603≥0.15μF;0805≥0.68μF;1206≥2.2μF;1210≥4.7μF	≤15%	0201≥0.022μF;0402≥0.033μF; 0603>0.47μF;0805≥2.2μF;1206≥4.7μF;1210≥22μF	10V	≤7.5%	≤15%	0201≥0.012μF;0402≥0.22μF; 0603≥0.33μF;0805≥2.2μF;1206≥2.2μF;1210≥22μF	≤20%	0201≥0.1μF;0402≥1μF	6.3V	≤15%	≤30%	0201≥0.1μF;0402≥1μF;0603≥10μF; 0805≥4.7μF;1206≥47μF;1210≥100μF	4V	≤20%	---	---
Rated vol.	D.F.≤	Exception of D.F.≤																																																							
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16V	≤5%	≤10%	0603≥0.15μF;0805≥0.68μF;1206≥2.2μF;1210≥4.7μF																																																						
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6	Biased Humidity MIL-STD-202 Method 103	<p>* Test temp.: 85±3°C                      * Humidity: 85%RH                      * Test time: 1000+24/-0 hrs.                      * To apply voltage: rated voltage 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.</p>	<p>* No remarkable damage.                      * Cap change : NPO: within ±2.5% or ±0.25pF whichever is larger.                      X7R: within ±10%.                      * Q/D.F. value:                      NPO: Cap≥30pF, Q≥1000 ; Cap&lt;30pF, Q≥400+20C.                      X7R:</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 rowspan="3">≥ 100V</td> <td rowspan="3">≤3%</td> <td>≤6%</td> <td>1206≥0.47μF</td> </tr> <tr> <td>≤7.5%</td> <td>0603≥0.068μF;0805&gt;0.1μF;1206≥1μF;1210≥2.2μF</td> </tr> <tr> <td>≤20%</td> <td>0805&gt;0.22μF;1210≥3.3μF</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>0201≥0.01uF;1210≥3.3μF</td> </tr> <tr> <td>≤20%</td> <td>0402≥0.012μF;0603&gt;0.1μF; 0805/X7R&gt;0.47μF; 1206≥2.2μF;1210≥10μF</td> </tr> <tr> <td>35V</td> <td>≤5%</td> <td>≤20%</td> <td>0603≥1μF;0805≥2.2μF;1206≥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</td> </tr> <tr> <td>≤15%</td> <td>0201≥0.1μF; 0402≥0.056μF;0603≥0.47μF; 0805≥2.2μF;1206≥4.7μF;1210≥22μF</td> </tr> <tr> <td>≤20%</td> <td>0402≥0.47μF</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≥0.022μF;0402≥0.033μF; 0603&gt;0.47μF;0805≥2.2μF;1206≥4.7μF;1210≥22μF</td> </tr> <tr> <td rowspan="2">10V</td> <td rowspan="2">≤7.5%</td> <td>≤15%</td> <td>0201≥0.012μF;0402≥0.22μF; 0603≥0.33μF;0805≥2.2μF;1206≥2.2μF;1210≥22μF</td> </tr> <tr> <td>≤20%</td> <td>0201≥0.1μF;0402≥1μF</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</td> </tr> <tr> <td>4V</td> <td>≤20%</td> <td>---</td> <td>---</td> </tr> </tbody> </table> <p>* I.R.: 10GΩ or RxC50Ω-F whichever is smaller.                      Class II (X7R)</p>	Rated vol.	D.F.≤	Exception of D.F.≤		≥ 100V	≤3%	≤6%	1206≥0.47μF	≤7.5%	0603≥0.068μF;0805>0.1μF;1206≥1μF;1210≥2.2μF	≤20%	0805>0.22μF;1210≥3.3μF	50V	≤3%	≤6%	0201(50V);0603≥0.047μF;0805≥0.18μF;1206≥0.47μF	≤10%	0201≥0.01uF;1210≥3.3μF	≤20%	0402≥0.012μF;0603>0.1μF; 0805/X7R>0.47μF; 1206≥2.2μF;1210≥10μF	35V	≤5%	≤20%	0603≥1μF;0805≥2.2μF;1206≥2.2μF;1210≥10μF	25V	≤5%	≤10%	0201≥0.01μF;0805≥1μF;1210≥10μF	≤14%	0603≥0.33μF	≤15%	0201≥0.1μF; 0402≥0.056μF;0603≥0.47μF; 0805≥2.2μF;1206≥4.7μF;1210≥22μF	≤20%	0402≥0.47μF	16V	≤5%	≤10%	0603≥0.15μF;0805≥0.68μF;1206≥2.2μF;1210≥4.7μF	≤15%	0201≥0.022μF;0402≥0.033μF; 0603>0.47μF;0805≥2.2μF;1206≥4.7μF;1210≥22μF	10V	≤7.5%	≤15%	0201≥0.012μF;0402≥0.22μF; 0603≥0.33μF;0805≥2.2μF;1206≥2.2μF;1210≥22μF	≤20%	0201≥0.1μF;0402≥1μF	6.3V	≤15%	≤30%	0201≥0.1μF;0402≥1μF;0603≥10μF; 0805≥4.7μF;1206≥47μF;1210≥100μF	4V	≤20%	---	---
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**Automotive Multilayer Ceramic Capacitors**  
**10 to 100V (NPO, X7R Dielectrics)**



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7	Operational Life MIL-STD-202 Method 108	<p>* Test temp.: 125±3°C</p> <p>* To apply voltage:</p> <p>(1) 10VUr250V:200% of rated voltage.</p> <p>(2) 150% of rated voltage:</p> <p>a) 500V</p> <p>b) 0603/X7R/50V/ Cap.&gt;0.1µF</p> <p>c) 0805/X7R/50V/ Cap.0.68µF</p> <p>(3) 630VUr1000V:120% of rated voltage.</p> <p>* Test time: 1000+24/-0 hrs.</p> <p>* Before initial measurement (X7R only):</p> <p>Apply test voltage for 1 hr at 125°C.</p> <p>Remove and let set for 24±2 hrs at room temp.</p> <p>* Measurement to be made after keeping at room temp. for 24±2 hrs.</p>	<p>* No remarkable damage.</p> <p>* Cap change : NPO: within ±2.5% or ±0.25pF whichever is larger. X7R: within ±10%.</p> <p>* Q/D.F. value:</p> <p>NPO: Cap≥30pF, Q≥1000 ; Cap&lt;30pF, Q≥400+20C.</p> <p>X7R:</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 rowspan="3">≥ 100V</td> <td rowspan="3">≤3%</td> <td>≤6%</td> <td>1206≥0.47µF</td> </tr> <tr> <td>≤7.5%</td> <td>0603≥0.068µF;0805&gt;0.1µF;1206≥1µF;1210≥2.2µF</td> </tr> <tr> <td>≤20%</td> <td>0805&gt;0.22µF;1210≥3.3µF</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>0201≥0.01µF;1210≥3.3µF</td> </tr> <tr> <td>≤20%</td> <td>0402≥0.012µF;0603&gt;0.1µF; 0805/X7R&gt;0.47µF; 1206≥2.2µF;1210≥10µF</td> </tr> <tr> <td>35V</td> <td>≤5%</td> <td>≤20%</td> <td>0603≥1µF;0805≥2.2µF;1206≥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</td> </tr> <tr> <td>≤15%</td> <td>0201≥0.1µF; 0402≥0.056µF;0603≥0.47µF; 0805≥2.2µF;1206≥4.7µF;1210≥22µF</td> </tr> <tr> <td>≤20%</td> <td>0402≥0.47µF</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≥0.022µF;0402≥0.033µF; 0603&gt;0.47µF;0805≥2.2µF;1206≥4.7µF;1210≥22µF</td> </tr> <tr> <td rowspan="2">10V</td> <td rowspan="2">≤7.5%</td> <td>≤15%</td> <td>0201≥0.012µF;0402≥0.22µF; 0603≥0.33µF;0805≥2.2µF;1206≥2.2µF;1210≥22µF</td> </tr> <tr> <td>≤20%</td> <td>0201≥0.1µF;0402≥1µF</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</td> </tr> <tr> <td>4V</td> <td>≤20%</td> <td>---</td> <td>---</td> </tr> </tbody> </table> <p>* I.R.: 10GΩ or RxC50Ω-F whichever is smaller.</p> <p>Class II (X7R)</p> <table border="1"> <thead> <tr> <th>Rated voltage</th> <th>Insulation Resistance</th> </tr> </thead> <tbody> <tr> <td>100V: All X7R;1210≥3.3µF</td> <td rowspan="6">1GΩ or R × C ≥10Ω-F whichever is smaller.</td> </tr> <tr> <td>50V: 0402&gt;0.01µF;0603≥1µF;0805≥1µF;1206≥4.7µF;1210≥4.7µF</td> </tr> <tr> <td>35V: 0603≥1µF;0805≥2.2µF;1206≥2.2µF;1210≥10µF</td> </tr> <tr> <td>25V: 02010≥1µF;04020≥22µF;06032≥2µF;0805≥2.2µF; 1206≥10µF;1210≥10µF</td> </tr> <tr> <td>16V: 02010≥1µF;04020≥22µF;0603≥1µF;0805≥2.2µF; 1206≥10µF;1210≥47µF</td> </tr> <tr> <td>10V: 0201≥47nF;0402≥0.47µF;06030≥47µF;0805≥2.2µF; 1206≥4.7µF;1210≥47µF</td> </tr> <tr> <td>6.3V; 4V; Size≥1812</td> <td></td> </tr> </tbody> </table>	Rated vol.	D.F.≤	Exception of D.F.≤		≥ 100V	≤3%	≤6%	1206≥0.47µF	≤7.5%	0603≥0.068µF;0805>0.1µF;1206≥1µF;1210≥2.2µF	≤20%	0805>0.22µF;1210≥3.3µF	50V	≤3%	≤6%	0201(50V);0603≥0.047µF;0805≥0.18µF;1206≥0.47µF	≤10%	0201≥0.01µF;1210≥3.3µF	≤20%	0402≥0.012µF;0603>0.1µF; 0805/X7R>0.47µF; 1206≥2.2µF;1210≥10µF	35V	≤5%	≤20%	0603≥1µF;0805≥2.2µF;1206≥2.2µF;1210≥10µF	25V	≤5%	≤10%	0201≥0.01µF;0805≥1µF;1210≥10µF	≤14%	0603≥0.33µF	≤15%	0201≥0.1µF; 0402≥0.056µF;0603≥0.47µF; 0805≥2.2µF;1206≥4.7µF;1210≥22µF	≤20%	0402≥0.47µF	16V	≤5%	≤10%	0603≥0.15µF;0805≥0.68µF;1206≥2.2µF;1210≥4.7µF	≤15%	0201≥0.022µF;0402≥0.033µF; 0603>0.47µF;0805≥2.2µF;1206≥4.7µF;1210≥22µF	10V	≤7.5%	≤15%	0201≥0.012µF;0402≥0.22µF; 0603≥0.33µF;0805≥2.2µF;1206≥2.2µF;1210≥22µF	≤20%	0201≥0.1µF;0402≥1µF	6.3V	≤15%	≤30%	0201≥0.1µF;0402≥1µF;0603≥10µF; 0805≥4.7µF;1206≥47µF;1210≥100µF	4V	≤20%	---	---	Rated voltage	Insulation Resistance	100V: All X7R;1210≥3.3µF	1GΩ or R × C ≥10Ω-F whichever is smaller.	50V: 0402>0.01µF;0603≥1µF;0805≥1µF;1206≥4.7µF;1210≥4.7µF	35V: 0603≥1µF;0805≥2.2µF;1206≥2.2µF;1210≥10µF	25V: 02010≥1µF;04020≥22µF;06032≥2µF;0805≥2.2µF; 1206≥10µF;1210≥10µF	16V: 02010≥1µF;04020≥22µF;0603≥1µF;0805≥2.2µF; 1206≥10µF;1210≥47µF	10V: 0201≥47nF;0402≥0.47µF;06030≥47µF;0805≥2.2µF; 1206≥4.7µF;1210≥47µF	6.3V; 4V; Size≥1812	
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# Automotive Multilayer Ceramic Capacitors 10 to 100V (NPO, X7R Dielectrics)



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8	External Visual MIL-STD-883 Method 2009	Visual inspection	No remarkable defect.																																																								
9	Physical Dimension JESD22 Method JB-100	Using by calipers	Within the specified dimensions																																																								
10	Resistance to Solvents MIL-STD-202 Method 215	* Temperature: 25±5°C * Time: 3+0.5/-0 min. * Solvent: Iso-propyl alcohol.	* No remarkable damage. * Cap.: within the specified tolerance. * Q/D.F. value: NPO: Cap≥30pF, Q≥1000 ; Cap<30pF, Q≥400+20C. X7R: <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 rowspan="3">≥ 100V</td> <td rowspan="3">≤2.5%</td> <td>≤3%</td> <td>1206≥0.47μF</td> </tr> <tr> <td>≤5%</td> <td>0603≥0.068μF;0805&gt;0.1μF;1206≥1μF;1210≥2.2μF</td> </tr> <tr> <td>≤10%</td> <td>0805&gt;0.22μF;1210≥3.3μF</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>0201≥0.01μF;1210≥3.3μF</td> </tr> <tr> <td>≤10%</td> <td>0402≥0.012μF;0603&gt;0.1μF; 0805/X7R&gt;0.47μF; 1206≥2.2μF;1210≥10μF</td> </tr> <tr> <td>35V</td> <td>≤3.5%</td> <td>≤10%</td> <td>0603≥1μF;0805≥2.2μF;1206≥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</td> </tr> <tr> <td>≤10%</td> <td>0201≥0.1μF; 0402≥0.056μF;0603≥0.47μF; 0805≥2.2μF;1206≥4.7μF;1210≥22μF</td> </tr> <tr> <td>≤12.5%</td> <td>0402≥0.47μF</td> </tr> <tr> <td rowspan="2">16V</td> <td rowspan="2">≤3.5%</td> <td>≤5%</td> <td>0603≥0.15μF;0805≥0.68μF;1206≥2.2μF;1210≥4.7μF</td> </tr> <tr> <td>≤10%</td> <td>0201≥0.022μF;0402≥0.033μF; 0603&gt;0.47μF;0805≥2.2μF;1206≥4.7μF;1210≥22μF</td> </tr> <tr> <td rowspan="2">10V</td> <td rowspan="2">≤5%</td> <td>≤10%</td> <td>0201≥0.012μF;0402≥0.22μF; 0603≥0.33μF;0805≥2.2μF;1206≥2.2μF;1210≥22μF</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</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 vol.	D.F.≤	Exception of D.F.≤		≥ 100V	≤2.5%	≤3%	1206≥0.47μF	≤5%	0603≥0.068μF;0805>0.1μF;1206≥1μF;1210≥2.2μF	≤10%	0805>0.22μF;1210≥3.3μF	50V	≤2.5%	≤3%	0201(50V);0603≥0.047μF;0805≥0.18μF;1206≥0.47μF	≤5%	0201≥0.01μF;1210≥3.3μF	≤10%	0402≥0.012μF;0603>0.1μF; 0805/X7R>0.47μF; 1206≥2.2μF;1210≥10μF	35V	≤3.5%	≤10%	0603≥1μF;0805≥2.2μF;1206≥2.2μF;1210≥10μF	25V	≤3.5%	≤5%	0201≥0.01μF;0805≥1μF;1210≥10μF	≤7%	0603≥0.33μF	≤10%	0201≥0.1μF; 0402≥0.056μF;0603≥0.47μF; 0805≥2.2μF;1206≥4.7μF;1210≥22μF	≤12.5%	0402≥0.47μF	16V	≤3.5%	≤5%	0603≥0.15μF;0805≥0.68μF;1206≥2.2μF;1210≥4.7μF	≤10%	0201≥0.022μF;0402≥0.033μF; 0603>0.47μF;0805≥2.2μF;1206≥4.7μF;1210≥22μF	10V	≤5%	≤10%	0201≥0.012μF;0402≥0.22μF; 0603≥0.33μF;0805≥2.2μF;1206≥2.2μF;1210≥22μF	≤15%	0201≥0.1μF;0402≥1μF	6.3V	≤10%	≤15%	0201≥0.1μF;0402≥1μF;0603≥10μF; 0805≥4.7μF;1206≥47μF;1210≥100μF	≤20%	0402≥2.2μF	4V	≤15%	---	---
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# Automotive Multilayer Ceramic Capacitors 10 to 100V (NPO, X7R Dielectrics)



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13.	Resistance to Soldering Heat MIL-STD-202 Method 210	<p>* Solder temperature: 260±5°C</p> <p>* Dipping time: 10±1 sec</p> <p>* Before initial measurement (X7R only): Perform 150+0/-10°C for 1 hr and then set for 24±2 hrs at room temp.</p> <p>* Measurement to be made after keeping at room temp. for 24±2 hrs.</p>	<p>* No remarkable damage.</p> <p>* Cap change: NPO: within ±2.5% or 0.25pF whichever is larger X7R: within ±7.5%</p> <p>* Q/D.F. value: NPO: Cap≥30pF, Q≥1000 ; Cap&lt;30pF, Q≥400+20C. X7R:</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 rowspan="3">≥ 100V</td> <td rowspan="3">≤2.5%</td> <td>≤3%</td> <td>1206≥0.47μF</td> </tr> <tr> <td>≤5%</td> <td>0603≥0.068μF;0805&gt;0.1μF;1206≥1μF;1210≥2.2μF</td> </tr> <tr> <td>≤10%</td> <td>0805&gt;0.22μF;1210≥3.3μF</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>0201≥0.01μF;1210≥3.3μF</td> </tr> <tr> <td>≤10%</td> <td>0402≥0.012μF;0603&gt;0.1μF; 0805/X7R&gt;0.47μF; 1206≥2.2μF;1210≥10μF</td> </tr> <tr> <td>35V</td> <td>≤3.5%</td> <td>≤10%</td> <td>0603≥1μF;0805≥2.2μF;1206≥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</td> </tr> <tr> <td>≤10%</td> <td>0201≥0.1μF; 0402≥0.056μF;0603≥0.47μF; 0805≥2.2μF;1206≥4.7μF;1210≥22μF</td> </tr> <tr> <td>≤12.5%</td> <td>0402≥0.47μF</td> </tr> <tr> <td rowspan="2">16V</td> <td rowspan="2">≤3.5%</td> <td>≤5%</td> <td>0603≥0.15μF;0805≥0.68μF;1206≥2.2μF;1210≥4.7μF</td> </tr> <tr> <td>≤10%</td> <td>0201≥0.022μF;0402≥0.033μF; 0603&gt;0.47μF;0805≥2.2μF;1206≥4.7μF;1210≥22μF</td> </tr> <tr> <td rowspan="2">10V</td> <td rowspan="2">≤5%</td> <td>≤10%</td> <td>0201≥0.012μF;0402≥0.22μF; 0603≥0.33μF;0805≥2.2μF;1206≥2.2μF;1210≥22μF</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≥4.7μF;1210≥100μF</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> <p>* I.R.: 10GΩ or RxC500Ω-F whichever is smaller. Class II (X7R)</p> <table border="1"> <thead> <tr> <th>Rated voltage</th> <th>Insulation Resistance</th> </tr> </thead> <tbody> <tr> <td>100V: All X7R;1210≥3.3μF</td> <td rowspan="7">10GΩ or R × C ≥100Ω-F whichever is smaller.</td> </tr> <tr> <td>50V: 0402&gt;0.01μF;0603≥1μF;0805≥1μF;1206≥4.7μF;1210≥4.7μF</td> </tr> <tr> <td>35V: 0603≥1μF;0805≥2.2μF;1206≥2.2μF;1210≥10μF</td> </tr> <tr> <td>25V: 02010≥1μF;04020≥22μF;06032≥2μF;0805≥2.2μF; 1206≥10μF;1210≥10μF</td> </tr> <tr> <td>16V: 02010≥1μF;04020≥22μF;0603≥1μF;0805≥2.2μF; 1206≥10μF;1210≥4.7μF</td> </tr> <tr> <td>10V: 0201≥47nF;0402≥0.47μF;06030≥47μF;0805≥2.2μF; 1206≥4.7μF;1210≥4.7μF</td> </tr> <tr> <td>6.3V; 4V; Size≥1812</td> </tr> </tbody> </table>	Rated vol.	D.F.≤	Exception of D.F.≤		≥ 100V	≤2.5%	≤3%	1206≥0.47μF	≤5%	0603≥0.068μF;0805>0.1μF;1206≥1μF;1210≥2.2μF	≤10%	0805>0.22μF;1210≥3.3μF	50V	≤2.5%	≤3%	0201(50V);0603≥0.047μF;0805≥0.18μF;1206≥0.47μF	≤5%	0201≥0.01μF;1210≥3.3μF	≤10%	0402≥0.012μF;0603>0.1μF; 0805/X7R>0.47μF; 1206≥2.2μF;1210≥10μF	35V	≤3.5%	≤10%	0603≥1μF;0805≥2.2μF;1206≥2.2μF;1210≥10μF	25V	≤3.5%	≤5%	0201≥0.01μF;0805≥1μF;1210≥10μF	≤7%	0603≥0.33μF	≤10%	0201≥0.1μF; 0402≥0.056μF;0603≥0.47μF; 0805≥2.2μF;1206≥4.7μF;1210≥22μF	≤12.5%	0402≥0.47μF	16V	≤3.5%	≤5%	0603≥0.15μF;0805≥0.68μF;1206≥2.2μF;1210≥4.7μF	≤10%	0201≥0.022μF;0402≥0.033μF; 0603>0.47μF;0805≥2.2μF;1206≥4.7μF;1210≥22μF	10V	≤5%	≤10%	0201≥0.012μF;0402≥0.22μF; 0603≥0.33μF;0805≥2.2μF;1206≥2.2μF;1210≥22μF	≤15%	0201≥0.1μF;0402≥1μF	6.3V	≤10%	≤15%	0201≥0.1μF;0402≥1μF;0603≥10μF; 0805≥4.7μF;1206≥4.7μF;1210≥100μF	≤20%	0402≥2.2μF	4V	≤15%	---	---	Rated voltage	Insulation Resistance	100V: All X7R;1210≥3.3μF	10GΩ or R × C ≥100Ω-F whichever is smaller.	50V: 0402>0.01μF;0603≥1μF;0805≥1μF;1206≥4.7μF;1210≥4.7μF	35V: 0603≥1μF;0805≥2.2μF;1206≥2.2μF;1210≥10μF	25V: 02010≥1μF;04020≥22μF;06032≥2μF;0805≥2.2μF; 1206≥10μF;1210≥10μF	16V: 02010≥1μF;04020≥22μF;0603≥1μF;0805≥2.2μF; 1206≥10μF;1210≥4.7μF	10V: 0201≥47nF;0402≥0.47μF;06030≥47μF;0805≥2.2μF; 1206≥4.7μF;1210≥4.7μF	6.3V; 4V; Size≥1812
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**Automotive Multilayer Ceramic Capacitors**  
**10 to 100V (NPO, X7R Dielectrics)**



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		<p>* 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</p>	<table border="1"> <thead> <tr> <th data-bbox="708 412 1289 470">Rated voltage</th> <th data-bbox="1289 412 1461 470">Insulation Resistance</th> </tr> </thead> <tbody> <tr> <td data-bbox="708 470 1289 504">100V: 1210≥3.3μF</td> <td data-bbox="1289 470 1461 728" rowspan="5">RxC≥50Ω·F.</td> </tr> <tr> <td data-bbox="708 504 1289 537">50V: 0402≥0.1μF;0603≥2.2μF;0805≥10μF;1206≥10μF</td> </tr> <tr> <td data-bbox="708 537 1289 571">35V: 0603≥1μF;</td> </tr> <tr> <td data-bbox="708 571 1289 604">25V: 0201≥0.1μF;0402≥2.2μF;0603≥10μF;0805≥10μF;1206≥22μF</td> </tr> <tr> <td data-bbox="708 604 1289 638">16V: 0603≥10μF;0402≥1μF;0201≥0.22μF</td> </tr> <tr> <td data-bbox="708 638 1289 672">6.3V: 0201≥0.1μF;0402≥1μF;0603&gt;4.7μF;0805≥47μF;1206≥10μF</td> <td data-bbox="1289 638 1461 672"></td> </tr> <tr> <td data-bbox="708 672 1289 728">4V: 0603≥22μF;0805≥47μF;1206≥100μF</td> <td data-bbox="1289 672 1461 728"></td> </tr> </tbody> </table>	Rated voltage	Insulation Resistance	100V: 1210≥3.3μF	RxC≥50Ω·F.	50V: 0402≥0.1μF;0603≥2.2μF;0805≥10μF;1206≥10μF	35V: 0603≥1μF;	25V: 0201≥0.1μF;0402≥2.2μF;0603≥10μF;0805≥10μF;1206≥22μF	16V: 0603≥10μF;0402≥1μF;0201≥0.22μF	6.3V: 0201≥0.1μF;0402≥1μF;0603>4.7μF;0805≥47μF;1206≥10μF		4V: 0603≥22μF;0805≥47μF;1206≥100μF		
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18.	Board Flex AEC-Q200-005	<p>* 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 3mm (2mm for X7R) and then the pressure shall be maintained for 60±1 sec.                      * 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: within ±12.5%                      (This capacitance change means the change of capacitance under specified flexure of substrate from the capacitance measured before the test.)</p>													

No	AEC-Q200 Test Item	AEC-Q200 Test Condition	Requirements			
19.	Terminal Strength AEC-Q200-006	* Pressurizing force: 2N (0201 & 0402), 10N(0603), 18N(≥0805). * Test time: 60±1 sec.	* No remarkable damage. * Cap.: within the specified tolerance. * Q/D.F. value: NPO: Cap≥30pF, Q≥1000 ; Cap<30pF, Q≥400+20C. X7R:			
			<b>Rated vol.</b>	<b>D.F.≤</b>	<b>Exception of D.F.≤</b>	
			≥ 100V	≤2.5%	≤3%	1206≥0.47μF
					≤5%	0603≥0.068μF;0805>0.1μF;1206≥1μF;1210≥2.2μF
					≤10%	0805>0.22μF;1210≥3.3μF
			50V	≤2.5%	≤3%	0201(50V);0603≥0.047μF;0805≥0.18μF;1206≥0.47μF
					≤5%	0201≥0.01uF;1210≥3.3μF
					≤10%	0402≥0.012μF;0603>0.1μF; 0805/X7R>0.47μF; 1206≥2.2μF;1210≥10μF
			35V	≤3.5%	≤10%	0603≥1μF;0805≥2.2μF;1206≥2.2μF;1210≥10μF
			25V	≤3.5%	≤5%	0201≥0.01μF;0805≥1μF;1210≥10μF
					≤7%	0603≥0.33μF
					≤10%	0201≥0.1μF; 0402≥0.056μF;0603≥0.47μF; 0805≥2.2μF;1206≥4.7μF;1210≥22μF
≤12.5%	0402≥0.47μF					
16V	≤3.5%	≤5%	0603≥0.15μF;0805≥0.68μF;1206≥2.2μF;1210≥4.7μF			
		≤10%	0201≥0.022μF;0402≥0.033μF; 0603>0.47μF;0805≥2.2μF;1206≥4.7μF;1210≥22μF			
10V	≤5%	≤10%	0201≥0.012μF;0402≥0.22μF; 0603≥0.33μF;0805≥2.2μF;1206≥2.2μF;1210≥22μF			
		≤15%	0201≥0.1μF;0402≥1μF			
6.3V	≤10%	≤15%	0201≥0.1μF;0402≥1μF;0603≥10μF; 0805≥4.7μF;1206≥47μF;1210≥100μF			
		≤20%	0402≥2.2μF			
4V	≤15%	---	---			
20.	Beam Load Test AEC-Q200-003	* Break strength test * Beam speed: 2.5±0.25 mm/sec	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)			

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



**APPENDIXES**

**Tape & reel dimensions**

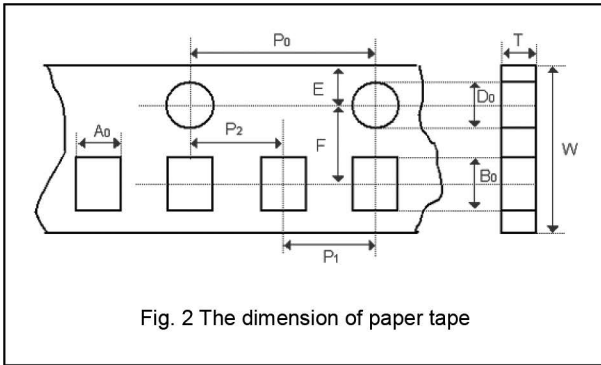


Fig. 2 The dimension of paper tape

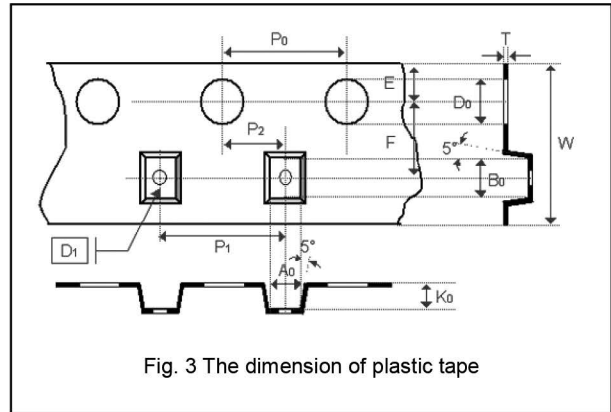


Fig. 3 The dimension of plastic tape

Size	0402	0603	0805		
Thickness	N,E	S,H,X	A,H	B,T	D,I
A <sub>0</sub>	0.7 +/-0.2	1.05 +/-0.3	1.5 +/-0.2	1.5 +/-0.2	< 1.8
B <sub>0</sub>	1.2 +/-0.2	1.8 +/-0.3	2.3 +/-0.2	2.3 +/-0.2	< 2.7
T	≤0.8	≤1.2	≤1.15	≤1.2	0.23 +/-0.1
K <sub>0</sub>	--	--	--	--	< 2.5
W	8 +/-0.3	8 +/-0.3	8 +/-0.3	8 +/-0.3	8 +/-0.3
P <sub>0</sub>	4 +/-0.1	4 +/-0.1	4 +/-0.1	4 +/-0.1	4 +/-0.1
10xP <sub>0</sub>	40 +/-0.1	40 +/-0.2	40 +/-0.2	40 +/-0.2	40 +/-0.2
P <sub>1</sub>	2 +/-0.05	4 +/-0.1	4 +/-0.1	4 +/-0.1	4 +/-0.1
P <sub>2</sub>	2 +/-0.05	2 +/-0.05	2 +/-0.05	2 +/-0.05	2 +/-0.05
D <sub>0</sub>	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
D <sub>1</sub>	--	--	--	--	1 +/-0.1
E	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

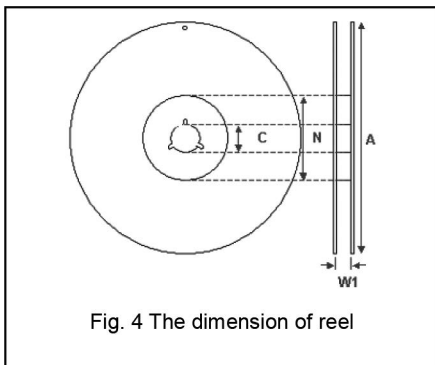
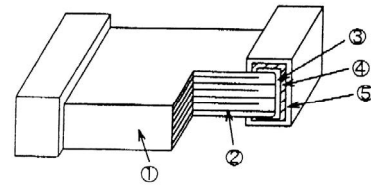


Fig. 4 The dimension of reel

Size	0402, 0603, 0805		
Reel size	7"	10"	13"
C	13 ±0.5	13 ±0.5	13 ±0.5
W <sub>1</sub>	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	NPO	X7R
1	Ceramic material	CaZrO3 based	BaTiO <sub>3</sub> based
2	Inner electrode	Ni	
3	Termination	Inner layer	Cu
4		Middle layer	Ni
5		Outer layer	Sn (Matt)



The construction of MLCC

**Application Notes**

**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 N<sub>2</sub> within oven are recommended.

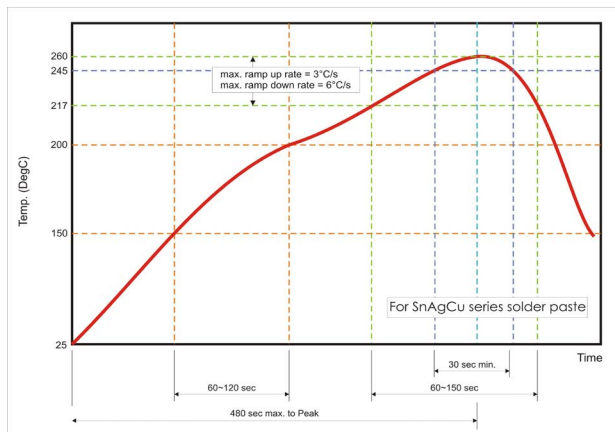


Fig. 5 Recommended reflow soldering profile for SMT process with SnAgCu series solder paste.

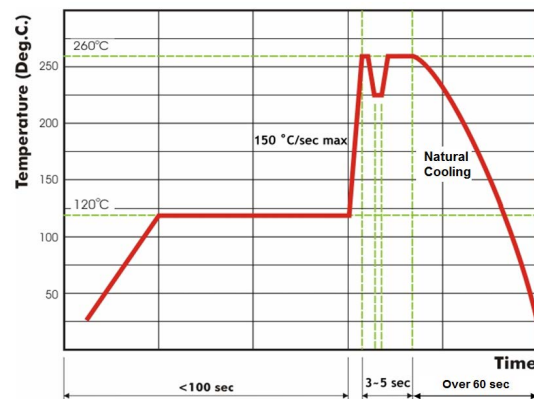


Fig. 6 Recommended wave soldering profile for SMT process with SnAgCu series solder.

**Part Number Table**

Description	Part Number
Capacitor, 0402, 6800pF, X7R, 25V	MPMT15B682K250CT
Capacitor, 0603, 10nF, X7R, 50V	MPMT18B103K500CT
Capacitor, 0603, 100nF, X7R, 16V	MPMT18B104K160CT
Capacitor, 0603, 0.1uF, X7R, 25V	MPMT18B104K250CT
Capacitor, 0805, 0.1uF, X7R, 25V	MPMT21B104K250CT
Capacitor, 0805, 6800pF, NPO, 50V	MPMT21N682J500CT

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