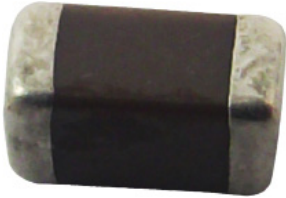


**RoHS
Compliant**



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. WTC's MT series 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.

Features:

- A 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.

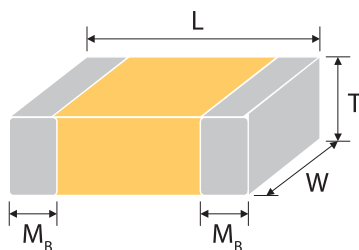
Applications:

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

How To Order:

MCMT	18	N	102	J	500	C	T
Series	Size	Dielectric	Capacitance	Tolerance	Rated Voltage	Termination	Packaging
Multicomp MT= Automotive safe concern (with AEC- Q200 qualification) Multicomp	15=0402 (1005) 18=0603 (1608) 21=0805 (2012) 31=1206 (3216) 32=1210 (3225)	N= NPO (C0G) B=X7R	Two significant digits followed by no. of zeros. And R is in place of decimal point. Eg. 0R5=0.5pF 1R0=1.0pF 102=10x10 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%	Two significant digits followed by no. of zeros. And R is in place of decimal point. 100=10V DC 160=16V DC 250=25V DC 500=50V DC 101=100V DC 201=200V DC 251=250V DC 501=500V DC 631=630V DC	C=Cu/Ni/Sn	T=7" reeled R=7" reeled (2mm pitch for 0603 size; paper tape) G=13" reeled

External Dimensions:



The outline of MLCC

Size Inch (mm)	L (mm)	W (mm)	T (mm)/Symbol	Remark	M _B (mm)
0402 (1005)	1±0.05	0.5±0.05	0.5±0.05	N #	0.25 +0.05/-0.1
0603 (1608)	1.6±0.1	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	0.8 +0.15/-0.1	X	

Reflow soldering only is recommended.

Size Inch (mm)	L (mm)	W (mm)	T (mm)/Symbol		Remark	M _b (mm)
0805 (2012)	2±0.15	1.25±0.1	0.6±0.1	A		0.5±0.2
			0.8±0.1	B		
			1.25±0.1	D	#	
1206 (3216)	3.2±0.15	1.6±0.15	0.8±0.1	B		0.6±0.2
			0.95±0.1	C		
			1.25±0.1	D	#	
	3.2±0.2	1.6±0.2	1.15±0.15	J	#	
			1.6±0.2	G	#	
3.2+0.3/-0.1	1.6+0.3/ 0.1	1.6+0.3/ 0.1	P	#		
1210 (3225)	3.2±0.4	2.5±0.2	0.95±0.1	C	#	0.75±0.25
			1.25±0.1	D	#	

Reflow soldering only is recommended.

General Electrical Data:

Dielectric	NPO	X7R
Size	0402, 0603, 0805, 1206, 1210	0402, 0603, 0805, 1206
Capacitance range*	0.5pF to 0.01uF	
Capacitance tolerance**	Cap≤5pF: 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	
Insulation resistance at U _r	≥10GΩ or R _x C≥500ΩxF whichever is less	
Operating temperature	-55 to +125°C	
Capacitance characteristic	±30ppm/°C	±15%
Termination	Ni/Sn (lead-free termination)	

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

NPO: Apply 1±0.2Vrms, 1MHz±10% for Cap≤1,000pF and 1±0.2Vrms, 1kHz±10% for Cap>1,000pF, 25°C at ambient temperature Measured at 1±0.2Vrms, 1kHz±10% for C≤10μF; 0.5±0.2Vrms, 120Hz±20% for C>10μF, 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.

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
1206 (3216)	0.80±0.1	B	4k	15k	-	-
	0.95±0.1	C	-	-	3k	10k
	1.15±0.15	J	-	-	3k	10k
	1.25±0.1	D	-	-	3k	10k
	1.6±0.2	G	-	-	2k	10k
	1.6+0.3/-0.1	P	-	-	2k	9k
1210 (3225)	0.95±0.1	C	-	-	3k	10k
	1.25±0.1	D	-	-	3k	10k

Unit: pieces

Reliability Test Conditions and Requirements:

No	Item	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: 1,000+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%. Q/D.F. value: NPO: Cap≥30pF, Q≥1,000 ; Cap<30pF, Q≥400+20C.

No	Item	Test Condition	Requirements			
			X7R:			
			Rated vol.	D.F. \leq	Exception of D.F. \leq	
			$\geq 50V$	$\leq 3\%$	$\leq 6\%$	0201(50V);0603 $\geq 0.047\mu F$; 0805 $\geq 0.18\mu F$; 1206 $\geq 0.47\mu F$
					$\leq 10\%$	1210 $\geq 4.7\mu F$
					$\leq 20\%$	0402 $\geq 0.1\mu F$;0603 $\geq 1\mu F$; 0805 $\geq 1\mu F$;1206 $\geq 2.2\mu F$; 1210 $\geq 10\mu F$; TT series
			35V	$\leq 5\%$	$\leq 20\%$	0603 $\geq 1\mu F$;0805 $\geq 2.2\mu F$; 1210 $\geq 10\mu F$
			25V	$\leq 5\%$	$\leq 10\%$	0201 $\geq 0.01\mu F$;0805 $\geq 1\mu F$; 1210 $\geq 10\mu F$
					$\leq 14\%$	0603 $\geq 0.33\mu F$;1206 $\geq 4.7\mu F$
					$\leq 15\%$	0402 $\geq 0.1\mu F$;0603 $\geq 0.47\mu F$; ;0805 $\geq 2.2\mu F$;1206 $\geq 6.8\mu F$; 1210 $\geq 22\mu F$; TT series
			16V	$\leq 5\%$	$\leq 10\%$	0603 $\geq 0.15\mu F$;0805 $\geq 0.68\mu F$; 1206 $\geq 2.2\mu F$; 1210 $\geq 4.7\mu F$
					$\leq 15\%$	0201 $\geq 0.01\mu F$;0402 $\geq 0.033\mu F$; ;0603 $\geq 0.68\mu F$; 0805 $\geq 2.2\mu F$; 1206 $\geq 4.7\mu F$; 1210 $\geq 22\mu F$; TT series
			10V	$\leq 7.5\%$	$\leq 15\%$	0201 $\geq 0.012\mu F$; 0402 $\geq 0.33\mu F$; 0603 $\geq 0.33\mu F$;0805 $\geq 2.2\mu F$; 1206 $\geq 2.2\mu F$; 1210 $\geq 22\mu F$
					$\leq 20\%$	0201 $\geq 0.1\mu F$;0402 $\geq 1\mu F$; TT series
			6.3V	$\leq 15\%$	$\leq 30\%$	0201 $\geq 0.1\mu F$;0402 $\geq 1\mu F$; 0603 $\geq 10\mu F$; 0805 $\geq 4.7\mu F$; 1206 $\geq 47\mu F$;1210 $\geq 100\mu F$; TT series
			4V	$\leq 20\%$	-	-
			I.R.: $\geq 10G\Omega$ or $RxC \geq 500\Omega \cdot F$ whichever is smaller.			

No	Item	Test Condition	Requirements																																	
			<p>Class II (X7R)</p> <table border="1"> <thead> <tr> <th>Rated voltage</th> <th>Insulation Resistance</th> </tr> </thead> <tbody> <tr> <td>100V: X7R</td> <td rowspan="6">1GΩ or $RxC \geq 10 \Omega \cdot F$ whichever is smaller.</td> </tr> <tr> <td>50V:0603$\geq 1\mu F$;0805$\geq 1\mu F$;1206$\geq 4.7\mu F$;1210$\geq 4.7\mu F$</td> </tr> <tr> <td>35V:0805$\geq 2.2\mu F$;1210$\geq 10\mu F$</td> </tr> <tr> <td>25V:0402$\geq 1\mu F$;0603$\geq 2.2\mu F$;0805$\geq 2.2\mu F$;1206$\geq 10\mu F$;1210$\geq 10\mu F$</td> </tr> <tr> <td>16V: 0201$\geq 0.1\mu F$;0402$\geq 0.2\mu F$;0603$\geq 1\mu F$;0805$\geq 2.2\mu F$;1206$\geq 10\mu F$;1210$\geq 47\mu F$</td> </tr> <tr> <td>10V:0201$\geq 47nF$;0402$\geq 0.47\mu F$;0603$\geq 0.47\mu F$;0805$\geq 2.2\mu F$;1206$\geq 4.7\mu F$;1210$\geq 47\mu F$</td> </tr> <tr> <td>6.3V; 4V; TT series</td> <td></td> </tr> </tbody> </table>	Rated voltage	Insulation Resistance	100V: X7R	1GΩ or $RxC \geq 10 \Omega \cdot F$ whichever is smaller.	50V:0603 $\geq 1\mu F$;0805 $\geq 1\mu F$;1206 $\geq 4.7\mu F$;1210 $\geq 4.7\mu F$	35V:0805 $\geq 2.2\mu F$;1210 $\geq 10\mu F$	25V:0402 $\geq 1\mu F$;0603 $\geq 2.2\mu F$;0805 $\geq 2.2\mu F$;1206 $\geq 10\mu F$;1210 $\geq 10\mu F$	16V: 0201 $\geq 0.1\mu F$;0402 $\geq 0.2\mu F$;0603 $\geq 1\mu F$;0805 $\geq 2.2\mu F$;1206 $\geq 10\mu F$;1210 $\geq 47\mu F$	10V:0201 $\geq 47nF$;0402 $\geq 0.47\mu F$;0603 $\geq 0.47\mu F$;0805 $\geq 2.2\mu F$;1206 $\geq 4.7\mu F$;1210 $\geq 47\mu F$	6.3V; 4V; TT series																							
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3	<p>Temperature Cycling JESD22 Method JA-104</p>	<p>Conduct 1000 cycles according to the temperatures and time.</p> <table border="1"> <thead> <tr> <th>Step</th> <th>Temp. (°C)</th> <th>Time (min.)</th> </tr> </thead> <tbody> <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> </tbody> </table> <p>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.</p>	Step	Temp. (°C)	Time (min.)	1	-55°C +0/-3	5±1	2	+125°C +3/-0	5±1	<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$\geq 30pF$, Q$\geq 1,000$; Cap$< 30pF$, Q$\geq 400+20C$. X7R:</p> <table border="1"> <thead> <tr> <th>Rated vol.</th> <th>D.F. \leq</th> <th colspan="2">Exception of D.F. \leq</th> </tr> </thead> <tbody> <tr> <td rowspan="3">$\geq 50V$</td> <td rowspan="3">$\leq 3\%$</td> <td>$\leq 6\%$</td> <td>0201(50V);0603$\geq 0.047\mu F$; 0805$\geq 0.18\mu F$; 1206$\geq 0.47\mu F$</td> </tr> <tr> <td>$\leq 10\%$</td> <td>1210$\geq 4.7\mu F$</td> </tr> <tr> <td>$\leq 20\%$</td> <td>0402$\geq 0.1\mu F$;0603$\geq 1\mu F$; 0805$\geq 1\mu F$;1206$\geq 2.2\mu F$; 1210$\geq 10\mu F$; TT series</td> </tr> <tr> <td>35V</td> <td>$\leq 5\%$</td> <td>$\leq 20\%$</td> <td>0603$\geq 1\mu F$;0805$\geq 2.2\mu F$; 1210$\geq 10\mu F$</td> </tr> <tr> <td rowspan="3">25V</td> <td rowspan="3">$\leq 5\%$</td> <td>$\leq 10\%$</td> <td>0201$\geq 0.01\mu F$;0805$\geq 1\mu F$; 1210$\geq 10\mu F$</td> </tr> <tr> <td>$\leq 14\%$</td> <td>0603$\geq 0.33\mu F$;1206$\geq 4.7\mu F$</td> </tr> <tr> <td>$\leq 15\%$</td> <td>0402$\geq 0.10\mu F$;0603$\geq 0.47\mu F$; 0805$\geq 2.2\mu F$;1206$\geq 6.8\mu F$; 1210$\geq 22\mu F$; TT series</td> </tr> </tbody> </table>	Rated vol.	D.F. \leq	Exception of D.F. \leq		$\geq 50V$	$\leq 3\%$	$\leq 6\%$	0201(50V);0603 $\geq 0.047\mu F$; 0805 $\geq 0.18\mu F$; 1206 $\geq 0.47\mu F$	$\leq 10\%$	1210 $\geq 4.7\mu F$	$\leq 20\%$	0402 $\geq 0.1\mu F$;0603 $\geq 1\mu F$; 0805 $\geq 1\mu F$;1206 $\geq 2.2\mu F$; 1210 $\geq 10\mu F$; TT series	35V	$\leq 5\%$	$\leq 20\%$	0603 $\geq 1\mu F$;0805 $\geq 2.2\mu F$; 1210 $\geq 10\mu F$	25V	$\leq 5\%$	$\leq 10\%$	0201 $\geq 0.01\mu F$;0805 $\geq 1\mu F$; 1210 $\geq 10\mu F$	$\leq 14\%$	0603 $\geq 0.33\mu F$;1206 $\geq 4.7\mu F$	$\leq 15\%$	0402 $\geq 0.10\mu F$;0603 $\geq 0.47\mu F$; 0805 $\geq 2.2\mu F$;1206 $\geq 6.8\mu F$; 1210 $\geq 22\mu F$; TT series
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4	Destructive Physical Analysis EIA-469	Per EIA-469	No defects or abnormalities																														

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5	Moisture Resistance MIL-STD-202 Method 106	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.	<p>No remarkable damage. Cap change : NPO: within ±3.0% or 0.30pF whichever is larger X7R: within ±12.5%. Q/D.F. value: NPO: More than 30pF Q≥350 ; 10pF≤C≤30pF, Q≥275+2.5C Less than 10pF Q≥200+10C 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">≥50V</td> <td rowspan="3">≤3%</td> <td>≤6%</td> <td>0201(50V);0603≥0.047μF; 0805≥0.18μF; 1206≥0.47μF</td> </tr> <tr> <td>≤10%</td> <td>1210≥4.7μF</td> </tr> <tr> <td>≤20%</td> <td>0402≥0.1μF;0603≥1μF; 0805≥1μF;1206≥2.2μF; 1210≥10μF; TT series</td> </tr> <tr> <td>35V</td> <td>≤5%</td> <td>≤20%</td> <td>0603≥1μF;0805≥2.2μF; 1210≥10μF</td> </tr> <tr> <td rowspan="3">25V</td> <td rowspan="3">≤5%</td> <td>≤10%</td> <td>0201≥0.01μF;0805≥1μF; 1210≥10μF</td> </tr> <tr> <td>≤14%</td> <td>0603≥0.33μF;1206≥4.7μF</td> </tr> <tr> <td>≤15%</td> <td>0402≥0.10μF;0603≥0.47μF ;0805≥2.2μF;1206≥6.8μF; 1210≥22μF; TT series</td> </tr> <tr> <td rowspan="2">16V</td> <td rowspan="2">≤5%</td> <td>≤10%</td> <td>0603≥0.15μF;0805≥0.68μF ;1206≥2.2μF; 1210≥4.7μF</td> </tr> <tr> <td>≤15%</td> <td>0201≥0.01μF;0402≥0.033μF;0603≥0.68μF;0805≥2.2μF; 1206≥4.7μF; 1210≥22μF; TT series</td> </tr> <tr> <td rowspan="2">10V</td> <td rowspan="2">≤7.5%</td> <td>≤15%</td> <td>0201≥0.012μF; 0402≥0.33μF; 0603≥0.33μF;0805≥2.2μF 1206≥2.2μF; 1210≥22μF</td> </tr> <tr> <td>≤20%</td> <td>0201≥0.1μF ;0402≥1μF; TT series</td> </tr> <tr> <td>6.3V</td> <td>≤15%</td> <td>≤30%</td> <td>0201≥0.1μF;0402≥1μF; 0603≥10μF; 0805≥4.7μF; 1206≥47μF;1210≥100μF; TT series</td> </tr> <tr> <td>4V</td> <td>≤20%</td> <td>-</td> <td>-</td> </tr> </tbody> </table>	Rated vol.	D.F. ≤	Exception of D.F. ≤		≥50V	≤3%	≤6%	0201(50V);0603≥0.047μF; 0805≥0.18μF; 1206≥0.47μF	≤10%	1210≥4.7μF	≤20%	0402≥0.1μF;0603≥1μF; 0805≥1μF;1206≥2.2μF; 1210≥10μF; TT series	35V	≤5%	≤20%	0603≥1μF;0805≥2.2μF; 1210≥10μF	25V	≤5%	≤10%	0201≥0.01μF;0805≥1μF; 1210≥10μF	≤14%	0603≥0.33μF;1206≥4.7μF	≤15%	0402≥0.10μF;0603≥0.47μF ;0805≥2.2μF;1206≥6.8μF; 1210≥22μF; TT series	16V	≤5%	≤10%	0603≥0.15μF;0805≥0.68μF ;1206≥2.2μF; 1210≥4.7μF	≤15%	0201≥0.01μF;0402≥0.033μF;0603≥0.68μF;0805≥2.2μF; 1206≥4.7μF; 1210≥22μF; TT series	10V	≤7.5%	≤15%	0201≥0.012μF; 0402≥0.33μF; 0603≥0.33μF;0805≥2.2μF 1206≥2.2μF; 1210≥22μF	≤20%	0201≥0.1μF ;0402≥1μF; TT series	6.3V	≤15%	≤30%	0201≥0.1μF;0402≥1μF; 0603≥10μF; 0805≥4.7μF; 1206≥47μF;1210≥100μF; TT series	4V	≤20%	-	-
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6	Biased Humidity MIL-STD-202 Method 103	Test temp.: $85 \pm 3^\circ C$ 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.	No remarkable damage. Cap change: NPO: within $\pm 3.0\%$ or 0.30pF whichever is larger. X7R: within $\pm 12.5\%$ Q/D.F. value: NPO: $C \geq 30pF$, $Q \geq 200$; $C < 30pF$, $Q \geq 100 + 10/3C$ X7R: <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th>Rated vol.</th> <th>D.F. \leq</th> <th colspan="2">Exception of D.F. \leq</th> </tr> </thead> <tbody> <tr> <td rowspan="3">$\geq 50V$</td> <td rowspan="3">$\leq 3\%$</td> <td>$\leq 6\%$</td> <td>0201(50V); 0603 $\geq 0.047\mu F$; 0805 $\geq 0.18\mu F$; 1206 $\geq 0.47\mu F$</td> </tr> <tr> <td>$\leq 10\%$</td> <td>1210 $\geq 4.7\mu F$</td> </tr> <tr> <td>$\leq 20\%$</td> <td>0402 $\geq 0.1\mu F$; 0603 $\geq 1\mu F$; 0805 $\geq 1\mu F$; 1206 $\geq 2.2\mu F$; 1210 $\geq 10\mu F$; TT series</td> </tr> <tr> <td>35V</td> <td>$\leq 5\%$</td> <td>$\leq 20\%$</td> <td>0603 $\geq 1\mu F$; 0805 $\geq 2.2\mu F$; 1210 $\geq 10\mu F$</td> </tr> <tr> <td rowspan="3">25V</td> <td rowspan="3">$\leq 5\%$</td> <td>$\leq 10\%$</td> <td>0201 $\geq 0.01\mu F$; 0805 $\geq 1\mu F$; 1210 $\geq 10\mu F$</td> </tr> <tr> <td>$\leq 14\%$</td> <td>0603 $\geq 0.33\mu F$; 1206 $\geq 4.7\mu F$</td> </tr> <tr> <td>$\leq 15\%$</td> <td>0402 $\geq 0.10\mu F$; 0603 $\geq 0.47\mu F$; 0805 $\geq 2.2\mu F$; 1206 $\geq 6.8\mu F$; 1210 $\geq 22\mu F$; TT series</td> </tr> </tbody> </table>	Rated vol.	D.F. \leq	Exception of D.F. \leq		$\geq 50V$	$\leq 3\%$	$\leq 6\%$	0201(50V); 0603 $\geq 0.047\mu F$; 0805 $\geq 0.18\mu F$; 1206 $\geq 0.47\mu F$	$\leq 10\%$	1210 $\geq 4.7\mu F$	$\leq 20\%$	0402 $\geq 0.1\mu F$; 0603 $\geq 1\mu F$; 0805 $\geq 1\mu F$; 1206 $\geq 2.2\mu F$; 1210 $\geq 10\mu F$; TT series	35V	$\leq 5\%$	$\leq 20\%$	0603 $\geq 1\mu F$; 0805 $\geq 2.2\mu F$; 1210 $\geq 10\mu F$	25V	$\leq 5\%$	$\leq 10\%$	0201 $\geq 0.01\mu F$; 0805 $\geq 1\mu F$; 1210 $\geq 10\mu F$	$\leq 14\%$	0603 $\geq 0.33\mu F$; 1206 $\geq 4.7\mu F$	$\leq 15\%$	0402 $\geq 0.10\mu F$; 0603 $\geq 0.47\mu F$; 0805 $\geq 2.2\mu F$; 1206 $\geq 6.8\mu F$; 1210 $\geq 22\mu F$; TT series
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7	Operational Life MIL-STD-202 Method 108	<p>Test temp.: 125±3°C To apply voltage: full rated voltage. Test time: 1000+24/-0 hrs. Before initial measurement (X7R only): Apply rated 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.</p>	<p>No remarkable damage. Cap change: NPO: within ±3.0% or ±0.3pF whichever is larger X7R: within ±12.5%. Q/D.F. value: NPO: More than 30pF, Q≥350 ; 10pF≤C<30pF, Q≥275+2.5C Less than 10pF, Q≥200+10C X7R:</p> <table border="1" data-bbox="815 1245 1453 1816"> <thead> <tr> <th data-bbox="815 1245 911 1312">Rated vol.</th> <th data-bbox="911 1245 1007 1312">D.F.≤</th> <th colspan="2" data-bbox="1007 1245 1453 1312">Exception of D.F. ≤</th> </tr> </thead> <tbody> <tr> <td data-bbox="815 1312 911 1547" rowspan="3">≥50V</td> <td data-bbox="911 1312 1007 1547" rowspan="3">≤3%</td> <td data-bbox="1007 1312 1142 1413">≤6%</td> <td data-bbox="1142 1312 1453 1413">0201(50V);0603≥0.047μF; 0805≥0.18μF; 1206≥0.47μF</td> </tr> <tr> <td data-bbox="1007 1413 1142 1447">≤10%</td> <td data-bbox="1142 1413 1453 1447">1210≥4.7μF</td> </tr> <tr> <td data-bbox="1007 1447 1142 1547">≤20%</td> <td data-bbox="1142 1447 1453 1547">0402≥0.1μF;0603≥1μF; 0805≥1μF;1206≥2.2μF; 1210≥10μF; TT series</td> </tr> <tr> <td data-bbox="815 1547 911 1615">35V</td> <td data-bbox="911 1547 1007 1615">≤5%</td> <td data-bbox="1007 1547 1142 1615">≤20%</td> <td data-bbox="1142 1547 1453 1615">0603≥1μF;0805≥2.2μF; 1210≥10μF</td> </tr> <tr> <td data-bbox="815 1615 911 1816" rowspan="3">25V</td> <td data-bbox="911 1615 1007 1816" rowspan="3">≤5%</td> <td data-bbox="1007 1615 1142 1682">≤10%</td> <td data-bbox="1142 1615 1453 1682">0201≥0.01μF;0805≥1μF; 1210≥10μF</td> </tr> <tr> <td data-bbox="1007 1682 1142 1727">≤14%</td> <td data-bbox="1142 1682 1453 1727">0603≥0.33μF;1206≥4.7μF</td> </tr> <tr> <td data-bbox="1007 1727 1142 1816">≤15%</td> <td data-bbox="1142 1727 1453 1816">0402≥0.10μF;0603≥0.47μF ;0805≥2.2μF;1206≥6.8μF; 1210≥22μF; TT series</td> </tr> </tbody> </table>	Rated vol.	D.F.≤	Exception of D.F. ≤		≥50V	≤3%	≤6%	0201(50V);0603≥0.047μF; 0805≥0.18μF; 1206≥0.47μF	≤10%	1210≥4.7μF	≤20%	0402≥0.1μF;0603≥1μF; 0805≥1μF;1206≥2.2μF; 1210≥10μF; TT series	35V	≤5%	≤20%	0603≥1μF;0805≥2.2μF; 1210≥10μF	25V	≤5%	≤10%	0201≥0.01μF;0805≥1μF; 1210≥10μF	≤14%	0603≥0.33μF;1206≥4.7μF	≤15%	0402≥0.10μF;0603≥0.47μF ;0805≥2.2μF;1206≥6.8μF; 1210≥22μF; TT series
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No	Item	Test Condition	Requirements			
			16V	≅5%	≅10%	0603≅0.15μF;0805≅0.68μ; 1206≅2.2μF; 1210≅4.7μF
			10V	≅7.5%	≅15%	0201≅0.01μF;0402≅0.033μF;0603≅0.68μF;0805≅2.2μF; 1206≅4.7μF; 1210≅22μF; TT series
			6.3V	≅15%	≅30%	0201≅0.012μF; 0402≅0.33μF; 0603≅0.33μF;0805≅2.2μF 1206≅2.2μF; 1210≅22μF
			4V	≅20%	-	0201≅0.1μF ;0402≅1μF; TT series
			I.R.: ≥1GΩ or RxC≥50Ω-F whichever is smaller. Class II (X7R)			
			Rated voltage		Insulation Resistance	
			100V: X7R		1GΩ or RxC≥10 Ω-F whichever is smaller.	
			50V:0603≥1μF;0805≥1μF;1206≥4.7μF;1210≥4.7μF			
			35V:0805≥2.2μF;1210≥10μF			
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8	External Visual MIL-STD-883 Method 2009	Visual inspection	No remarkable defect.			

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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.	<p>No remarkable damage. Cap.: within the specified tolerance. Q/D.F. value: NPO: Cap≥30pF, Q≥1000 ; Cap<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">≥50V</td> <td rowspan="3">≤2.5%</td> <td>≤3%</td> <td>0201(50V); 0603≥0.047μF; 0805≥0.18μF;1206≥0.47μF</td> </tr> <tr> <td>≤5%</td> <td>1210≥4.7μF</td> </tr> <tr> <td>≤10%</td> <td>0402≥0.1μF;0603≥1μF; 0805≥1μF;1206≥2.2μF; 1210≥10μF; TT series</td> </tr> <tr> <td>35V</td> <td>≤3.5%</td> <td>≤10%</td> <td>0603≥1μF;0805≥2.2μF; 1210≥10μF</td> </tr> <tr> <td rowspan="3">25V</td> <td rowspan="3">≤3.5%</td> <td>≤5%</td> <td>0201≥0.01μF;0805≥1μF; 1210≥10μF</td> </tr> <tr> <td>≤7%</td> <td>0603≥0.33μF; 1206≥4.7μF</td> </tr> <tr> <td>≤10%</td> <td>0402≥0.10μF;0603≥ 0.47μF; 0805≥2.2μF; 1206≥6.8μF ; 1210≥22μF; TT series</td> </tr> <tr> <td rowspan="2">16V</td> <td rowspan="2">≤3.5%</td> <td>≤5%</td> <td>0201≥0.01μF;0402≥0.033μ F;0603≥0.15μF; 0805≥0.68μF;1206≥2.2μF; 1210≥4.7μF</td> </tr> <tr> <td>≤10%</td> <td>0201≥0.1μF; 0402≥0.22μF; 0603≥0.68μF;0805≥2.2μF; 1206≥4.7μF; 1210≥22μF; TT series</td> </tr> <tr> <td rowspan="2">10V</td> <td rowspan="2">≤5%</td> <td>≤10%</td> <td>0201≥0.012μF;0402≥0.33μF ;0603≥0.33μF; 0805≥2.2μF; 1206≥2.2μF;1210≥22μF; TT series</td> </tr> <tr> <td>≤15%</td> <td>0201≥0.1μF; 0402≥1μF</td> </tr> <tr> <td rowspan="2">6.3V</td> <td rowspan="2">≤10%</td> <td>≤15%</td> <td>0201≥0.1μF;0402≥1μF; 0603≥10μF; 0805≥4.7μF; 1206≥47μF ;1210≥100μF; TT series</td> </tr> <tr> <td>≤20%</td> <td>0402≥2.2μF</td> </tr> <tr> <td>4V</td> <td>≤15%</td> <td>-</td> <td>-</td> </tr> </tbody> </table>	Rated vol.	D.F.≤	Exception of D.F. ≤		≥50V	≤2.5%	≤3%	0201(50V); 0603≥0.047μF; 0805≥0.18μF;1206≥0.47μF	≤5%	1210≥4.7μF	≤10%	0402≥0.1μF;0603≥1μF; 0805≥1μF;1206≥2.2μF; 1210≥10μF; TT series	35V	≤3.5%	≤10%	0603≥1μF;0805≥2.2μF; 1210≥10μF	25V	≤3.5%	≤5%	0201≥0.01μF;0805≥1μF; 1210≥10μF	≤7%	0603≥0.33μF; 1206≥4.7μF	≤10%	0402≥0.10μF;0603≥ 0.47μF; 0805≥2.2μF; 1206≥6.8μF ; 1210≥22μF; TT series	16V	≤3.5%	≤5%	0201≥0.01μF;0402≥0.033μ F;0603≥0.15μF; 0805≥0.68μF;1206≥2.2μF; 1210≥4.7μF	≤10%	0201≥0.1μF; 0402≥0.22μF; 0603≥0.68μF;0805≥2.2μF; 1206≥4.7μF; 1210≥22μF; TT series	10V	≤5%	≤10%	0201≥0.012μF;0402≥0.33μF ;0603≥0.33μF; 0805≥2.2μF; 1206≥2.2μF;1210≥22μF; TT series	≤15%	0201≥0.1μF; 0402≥1μF	6.3V	≤10%	≤15%	0201≥0.1μF;0402≥1μF; 0603≥10μF; 0805≥4.7μF; 1206≥47μF ;1210≥100μF; TT series	≤20%	0402≥2.2μF	4V	≤15%	-	-
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11	Mechanical Shock MIL-STD-202 Method 213	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)	<p>No remarkable damage. Cap.: within the specified tolerance. Q/D.F. value: NPO: Cap $\geq 30pF$, $Q \geq 1000$; Cap $< 30pF$, $Q \geq 400 + 20C$. X7R:</p> <table border="1"> <thead> <tr> <th>Rated vol.</th> <th>D.F. \leq</th> <th colspan="2">Exception of D.F. \leq</th> </tr> </thead> <tbody> <tr> <td rowspan="3">$\geq 50V$</td> <td rowspan="3">$\leq 2.5\%$</td> <td>$\leq 3\%$</td> <td>0201(50V); 0603 $\geq 0.047\mu F$; 0805 $\geq 0.18\mu F$; 1206 $\geq 0.47\mu F$</td> </tr> <tr> <td>$\leq 5\%$</td> <td>1210 $\geq 4.7\mu F$</td> </tr> <tr> <td>$\leq 10\%$</td> <td>0402 $\geq 0.1\mu F$; 0603 $\geq 1\mu F$; 0805 $\geq 1\mu F$; 1206 $\geq 2.2\mu F$; 1210 $\geq 10\mu F$; TT series</td> </tr> <tr> <td>35V</td> <td>$\leq 3.5\%$</td> <td>$\leq 10\%$</td> <td>0603 $\geq 1\mu F$; 0805 $\geq 2.2\mu F$; 1210 $\geq 10\mu F$</td> </tr> <tr> <td rowspan="3">25V</td> <td rowspan="3">$\leq 3.5\%$</td> <td>$\leq 5\%$</td> <td>0201 $\geq 0.01\mu F$; 0805 $\geq 1\mu F$; 1210 $\geq 10\mu F$</td> </tr> <tr> <td>$\leq 7\%$</td> <td>0603 $\geq 0.33\mu F$; 1206 $\geq 4.7\mu F$</td> </tr> <tr> <td>$\leq 10\%$</td> <td>0402 $\geq 0.10\mu F$; 0603 $\geq 0.47\mu F$; 0805 $\geq 2.2\mu F$; 1206 $\geq 6.8\mu F$; 1210 $\geq 22\mu F$; TT series</td> </tr> </tbody> </table>	Rated vol.	D.F. \leq	Exception of D.F. \leq		$\geq 50V$	$\leq 2.5\%$	$\leq 3\%$	0201(50V); 0603 $\geq 0.047\mu F$; 0805 $\geq 0.18\mu F$; 1206 $\geq 0.47\mu F$	$\leq 5\%$	1210 $\geq 4.7\mu F$	$\leq 10\%$	0402 $\geq 0.1\mu F$; 0603 $\geq 1\mu F$; 0805 $\geq 1\mu F$; 1206 $\geq 2.2\mu F$; 1210 $\geq 10\mu F$; TT series	35V	$\leq 3.5\%$	$\leq 10\%$	0603 $\geq 1\mu F$; 0805 $\geq 2.2\mu F$; 1210 $\geq 10\mu F$	25V	$\leq 3.5\%$	$\leq 5\%$	0201 $\geq 0.01\mu F$; 0805 $\geq 1\mu F$; 1210 $\geq 10\mu F$	$\leq 7\%$	0603 $\geq 0.33\mu F$; 1206 $\geq 4.7\mu F$	$\leq 10\%$	0402 $\geq 0.10\mu F$; 0603 $\geq 0.47\mu F$; 0805 $\geq 2.2\mu F$; 1206 $\geq 6.8\mu F$; 1210 $\geq 22\mu F$; TT series
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No	Item	Test Condition	Requirements				
12	Vibration MIL-STD-202 Method 204	Vibration frequency: 10~2000 Hz/min. (5g's for 20 min) Total amplitude: 1.5mm 12 cycles each of 3 orientations (36 times)	No remarkable damage. Cap.: within the specified tolerance. Q/D.F. value: NPO: Cap \geq 30pF, Q \geq 1,000 ; Cap $<$ 30pF, Q \geq 400+20C. X7R:				
			Rated vol.	D.F. \leq	Exception of D.F. \leq		
			\geq 50V	\leq 2.5%	\leq 3%	0201(50V); 0603 \geq 0.047 μ F; 0805 \geq 0.18 μ F; 1206 \geq 0.47 μ F	
					\leq 5%	1210 \geq 4.7 μ F	
					\leq 10%	0402 \geq 0.1 μ F; 0603 \geq 1 μ F; 0805 \geq 1 μ F; 1206 \geq 2.2 μ F; 1210 \geq 10 μ F; TT series	
			35V	\leq 3.5%	\leq 10%	0603 \geq 1 μ F; 0805 \geq 2.2 μ F; 1210 \geq 10 μ F	
			25V	\leq 3.5%	\leq 5%	0201 \geq 0.01 μ F; 0805 \geq 1 μ F; 1210 \geq 10 μ F	
					\leq 7%	0603 \geq 0.33 μ F; 1206 \geq 4.7 μ F	
					\leq 10%	0402 \geq 0.10 μ F; 0603 \geq 0.47 μ F; 0805 \geq 2.2 μ F; 1206 \geq 6.8 μ F; 1210 \geq 22 μ F; TT series	
			16V	\leq 3.5%	\leq 5%	0201 \geq 0.01 μ F; 0402 \geq 0.033 μ F; 0603 \geq 0.15 μ F; 0805 \geq 0.68 μ F; 1206 \geq 2.2 μ F; 1210 \geq 4.7 μ F	
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			10V	\leq 5%	\leq 10%	0201 \geq 0.012 μ F; 0402 \geq 0.33 μ F; 0603 \geq 0.33 μ F; 0805 \geq 2.2 μ F; 1206 \geq 2.2 μ F; 1210 \geq 22 μ F; TT series	
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		\leq 20%	0402 \geq 2.2 μ F				
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13	Resistance to Soldering Heat MIL-STD-202 Method 210	Solder temperature: $270 \pm 5^\circ C$ Dipping time: 10 ± 1 sec Before initial measurement (X7R only): Perform $150 + 0 / - 10^\circ C$ 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>No remarkable damage. Cap change: NPO: within $\pm 2.5\%$ or $0.25pF$ whichever is larger X7R: within $\pm 7.5\%$ Q/D.F. value: NPO: $Cap \geq 30pF$, $Q \geq 1000$; $Cap < 30pF$, $Q \geq 400 + 20C$. X7R:</p> <table border="1"> <thead> <tr> <th>Rated vol.</th> <th>D.F. \leq</th> <th colspan="2">Exception of D.F. \leq</th> </tr> </thead> <tbody> <tr> <td rowspan="3">$\geq 50V$</td> <td rowspan="3">$\leq 2.5\%$</td> <td>$\leq 3\%$</td> <td>0201(50V); 0603 $\geq 0.047\mu F$; 0805 $\geq 0.18\mu F$; 1206 $\geq 0.47\mu F$</td> </tr> <tr> <td>$\leq 5\%$</td> <td>1210 $\geq 4.7\mu F$</td> </tr> <tr> <td>$\leq 10\%$</td> <td>0402 $\geq 0.1\mu F$; 0603 $\geq 1\mu F$; 0805 $\geq 1\mu F$; 1206 $\geq 2.2\mu F$; 1210 $\geq 10\mu F$; TT series</td> </tr> <tr> <td>35V</td> <td>$\leq 3.5\%$</td> <td>$\leq 10\%$</td> <td>0603 $\geq 1\mu F$; 0805 $\geq 2.2\mu F$; 1210 $\geq 10\mu F$</td> </tr> <tr> <td rowspan="3">25V</td> <td rowspan="3">$\leq 3.5\%$</td> <td>$\leq 5\%$</td> <td>0201 $\geq 0.01\mu F$; 0805 $\geq 1\mu F$; 1210 $\geq 10\mu F$</td> </tr> <tr> <td>$\leq 7\%$</td> <td>0603 $\geq 0.33\mu F$; 1206 $\geq 4.7\mu F$</td> </tr> <tr> <td>$\leq 10\%$</td> <td>0402 $\geq 0.10\mu F$; 0603 $\geq 0.47\mu F$; 0805 $\geq 2.2\mu F$; 1206 $\geq 6.8\mu F$; 1210 $\geq 22\mu F$; TT series</td> </tr> </tbody> </table>	Rated vol.	D.F. \leq	Exception of D.F. \leq		$\geq 50V$	$\leq 2.5\%$	$\leq 3\%$	0201(50V); 0603 $\geq 0.047\mu F$; 0805 $\geq 0.18\mu F$; 1206 $\geq 0.47\mu F$	$\leq 5\%$	1210 $\geq 4.7\mu F$	$\leq 10\%$	0402 $\geq 0.1\mu F$; 0603 $\geq 1\mu F$; 0805 $\geq 1\mu F$; 1206 $\geq 2.2\mu F$; 1210 $\geq 10\mu F$; TT series	35V	$\leq 3.5\%$	$\leq 10\%$	0603 $\geq 1\mu F$; 0805 $\geq 2.2\mu F$; 1210 $\geq 10\mu F$	25V	$\leq 3.5\%$	$\leq 5\%$	0201 $\geq 0.01\mu F$; 0805 $\geq 1\mu F$; 1210 $\geq 10\mu F$	$\leq 7\%$	0603 $\geq 0.33\mu F$; 1206 $\geq 4.7\mu F$	$\leq 10\%$	0402 $\geq 0.10\mu F$; 0603 $\geq 0.47\mu F$; 0805 $\geq 2.2\mu F$; 1206 $\geq 6.8\mu F$; 1210 $\geq 22\mu F$; TT series
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14	Thermal Shock MIL-STD-202 Method 107	Conduct 300 cycles according to the temperatures and time. <table border="1" data-bbox="376 483 783 600"> <thead> <tr> <th>Step</th> <th>Temp. (°C)</th> <th>Time (min.)</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>-55°C +0/-3</td> <td>15±3</td> </tr> <tr> <td>2</td> <td>+125°C +3/-0</td> <td>15±3</td> </tr> </tbody> </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.	Step	Temp. (°C)	Time (min.)	1	-55°C +0/-3	15±3	2	+125°C +3/-0	15±3	No remarkable damage. Cap change:NPO: within ±2.5% or 0.25pF whichever is larger X7R: within ±10.0% Q/D.F. value: NPO: Cap≥30pF, Q≥1,000 ; Cap<30pF, Q≥400+20C. X7R: <table border="1" data-bbox="815 629 1452 1749"> <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">≥50V</td> <td rowspan="3">≤3%</td> <td>≤6%</td> <td>0201(50V);0603≥0.047μF; 0805≥0.18μF; 1206≥0.47μF</td> </tr> <tr> <td>≤10%</td> <td>1210≥4.7μF</td> </tr> <tr> <td>≤20%</td> <td>0402≥0.1μF;0603≥1μF; 0805≥1μF;1206≥2.2μF; 1210≥10μF; TT series</td> </tr> <tr> <td>35V</td> <td>≤5%</td> <td>≤20%</td> <td>0603≥1μF;0805≥2.2μF; 1210≥10μF</td> </tr> <tr> <td rowspan="3">25V</td> <td rowspan="3">≤5%</td> <td>≤10%</td> <td>0201≥0.01μF;0805≥1μF; 1210≥10μF</td> </tr> <tr> <td>≤14%</td> <td>0603≥0.33μF;1206≥4.7μF</td> </tr> <tr> <td>≤15%</td> <td>0402≥0.10μF;0603≥0.47μF ;0805≥2.2μF;1206≥6.8μF; 1210≥22μF; TT series</td> </tr> <tr> <td rowspan="2">16V</td> <td rowspan="2">≤5%</td> <td>≤10%</td> <td>0603≥0.15μF;0805≥0.68μF ;1206≥2.2μF; 1210≥4.7μF</td> </tr> <tr> <td>≤15%</td> <td>0201≥0.01μF;0402≥0.0 33μF;0603≥0.68μF;080 5≥2.2μF; 1206≥4.7μF; 1210≥22μF; TT series</td> </tr> <tr> <td rowspan="2">10V</td> <td rowspan="2">≤7.5%</td> <td>≤15%</td> <td>0201≥0.012μF; 0402≥0.33μF; 0603≥0.33μF;0805≥2.2μF 1206≥2.2μF; 1210≥22μF</td> </tr> <tr> <td>≤20%</td> <td>0201≥0.1μF ;0402≥1μF; TT series</td> </tr> <tr> <td>6.3V</td> <td>≤15%</td> <td>≤30%</td> <td>0201≥0.1μF;0402≥1μF; 0603≥10μF; 0805≥4.7μF; 1206≥47μF;1210≥100μF; TT series</td> </tr> <tr> <td>4V</td> <td>≤20%</td> <td>-</td> <td>-</td> </tr> </tbody> </table>				Rated vol.	D.F.≤	Exception of D.F. ≤		≥50V	≤3%	≤6%	0201(50V);0603≥0.047μF; 0805≥0.18μF; 1206≥0.47μF	≤10%	1210≥4.7μF	≤20%	0402≥0.1μF;0603≥1μF; 0805≥1μF;1206≥2.2μF; 1210≥10μF; TT series	35V	≤5%	≤20%	0603≥1μF;0805≥2.2μF; 1210≥10μF	25V	≤5%	≤10%	0201≥0.01μF;0805≥1μF; 1210≥10μF	≤14%	0603≥0.33μF;1206≥4.7μF	≤15%	0402≥0.10μF;0603≥0.47μF ;0805≥2.2μF;1206≥6.8μF; 1210≥22μF; TT series	16V	≤5%	≤10%	0603≥0.15μF;0805≥0.68μF ;1206≥2.2μF; 1210≥4.7μF	≤15%	0201≥0.01μF;0402≥0.0 33μF;0603≥0.68μF;080 5≥2.2μF; 1206≥4.7μF; 1210≥22μF; TT series	10V	≤7.5%	≤15%	0201≥0.012μF; 0402≥0.33μF; 0603≥0.33μF;0805≥2.2μF 1206≥2.2μF; 1210≥22μF	≤20%	0201≥0.1μF ;0402≥1μF; TT series	6.3V	≤15%	≤30%	0201≥0.1μF;0402≥1μF; 0603≥10μF; 0805≥4.7μF; 1206≥47μF;1210≥100μF; TT series	4V	≤20%	-	-
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			16V	$\leq 3.5\%$	$\leq 5\%$	0201 $\geq 0.01\mu\text{F}$; 0402 $\geq 0.033\mu\text{F}$; 0603 $\geq 0.15\mu\text{F}$; 0805 $\geq 0.68\mu\text{F}$; 1206 $\geq 2.2\mu\text{F}$; 1210 $\geq 4.7\mu\text{F}$
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			10V	$\leq 5\%$	$\leq 10\%$	0201 $\geq 0.012\mu\text{F}$; 0402 $\geq 0.33\mu\text{F}$; 0603 $\geq 0.33\mu\text{F}$; 0805 $\geq 2.2\mu\text{F}$; 1206 $\geq 2.2\mu\text{F}$; 1210 $\geq 22\mu\text{F}$; TT series
					$\leq 15\%$	0201 $\geq 0.1\mu\text{F}$; 0402 $\geq 1\mu\text{F}$
			6.3V	$\leq 10\%$	$\leq 15\%$	0201 $\geq 0.1\mu\text{F}$; 0402 $\geq 1\mu\text{F}$; 0603 $\geq 10\mu\text{F}$; 0805 $\geq 4.7\mu\text{F}$; 1206 $\geq 47\mu\text{F}$; 1210 $\geq 100\mu\text{F}$; TT series
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			Rated voltage		Insulation Resistance	
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			35V: 0805 $\geq 2.2\mu\text{F}$; 1210 $\geq 10\mu\text{F}$			
			25V: 0402 $\geq 1\mu\text{F}$; 0603 $\geq 2.2\mu\text{F}$; 0805 $\geq 2.2\mu\text{F}$; 1206 $\geq 10\mu\text{F}$; 1210 $\geq 10\mu\text{F}$			
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16	Solderability J-STD-002 JESD22-B102E	<p>Condition A Un-mounted chips 4hrs / 155°C*dry then completely immersed for 5±0.5 sec in solder bath at 245±5°C.</p> <p>Condition B Un-mounted chips steam 8 hrs then completely immersed for 10±1sec in solder bath at 220+5/-0°C.</p> <p>Condition C Un-mounted chips steam 8 hrs then completely immersed for 10±1 sec. in solder bath at 260+0/-5°C.</p>	All terminations shall exhibit a continuous solder coating free from defects from a minimum of 95% of the critical surface area of any individual termination.																																				
17	Electrical Characterization	<p>Capacitance Q/ D.F. (Dissipation Factor) Cap≤1,000pF 1±0.2Vrms, 1MHz±10% Cap>1,000pF 1±0.2Vrms, 1KHz±10%</p>	<p>Capacitance within the specified tolerance. Q/D.F. value: NPO: Cap≥30pF, Q≥1,000 ; Cap<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">≥50V</td> <td rowspan="3">≤2.5%</td> <td>≤3%</td> <td>0201(50V); 0603≥0.047μF; 0805≥0.18μF; 1206≥0.47μF</td> </tr> <tr> <td>≤5%</td> <td>1210≥4.7μF</td> </tr> <tr> <td>≤10%</td> <td>0402≥0.1μF; 0603≥1μF; 0805≥1μF; 1206≥2.2μF; 1210≥10μF; TT series</td> </tr> <tr> <td>35V</td> <td>≤3.5%</td> <td>≤10%</td> <td>0603≥1μF; 0805≥2.2μF; 1210≥10μF</td> </tr> <tr> <td rowspan="3">25V</td> <td rowspan="3">≤3.5%</td> <td>≤5%</td> <td>0201≥0.01μF; 0805≥1μF; 1210≥10μF</td> </tr> <tr> <td>≤7%</td> <td>0603≥0.33μF; 1206≥4.7μF</td> </tr> <tr> <td>≤10%</td> <td>0402≥0.10μF; 0603≥0.47μF; 0805≥2.2μF; 1206≥6.8μF; 1210≥22μF; TT series</td> </tr> <tr> <td rowspan="2">16V</td> <td rowspan="2">≤3.5%</td> <td>≤5%</td> <td>0201≥0.01μF; 0402≥0.033μF; 0603≥0.15μF; 0805≥0.68μF; 1206≥2.2μF; 1210≥4.7μF</td> </tr> <tr> <td>≤10%</td> <td>0201≥0.1μF; 0402≥0.22μF; 0603≥0.68μF; 0805≥2.2μF; 1206≥4.7μF; 1210≥22μF; TT series</td> </tr> <tr> <td rowspan="2">10V</td> <td rowspan="2">≤5%</td> <td>≤10%</td> <td>0201≥0.012μF; 0402≥0.33μF; 0603≥0.33μF; 0805≥2.2μF; 1206≥2.2μF; 1210≥22μF; TT series</td> </tr> <tr> <td>≤15%</td> <td>0201≥0.1μF; 0402≥1μF</td> </tr> </tbody> </table>	Rated vol.	D.F. ≤	Exception of D.F. ≤		≥50V	≤2.5%	≤3%	0201(50V); 0603≥0.047μF; 0805≥0.18μF; 1206≥0.47μF	≤5%	1210≥4.7μF	≤10%	0402≥0.1μF; 0603≥1μF; 0805≥1μF; 1206≥2.2μF; 1210≥10μF; TT series	35V	≤3.5%	≤10%	0603≥1μF; 0805≥2.2μF; 1210≥10μF	25V	≤3.5%	≤5%	0201≥0.01μF; 0805≥1μF; 1210≥10μF	≤7%	0603≥0.33μF; 1206≥4.7μF	≤10%	0402≥0.10μF; 0603≥0.47μF; 0805≥2.2μF; 1206≥6.8μF; 1210≥22μF; TT series	16V	≤3.5%	≤5%	0201≥0.01μF; 0402≥0.033μF; 0603≥0.15μF; 0805≥0.68μF; 1206≥2.2μF; 1210≥4.7μF	≤10%	0201≥0.1μF; 0402≥0.22μF; 0603≥0.68μF; 0805≥2.2μF; 1206≥4.7μF; 1210≥22μF; TT series	10V	≤5%	≤10%	0201≥0.012μF; 0402≥0.33μF; 0603≥0.33μF; 0805≥2.2μF; 1206≥2.2μF; 1210≥22μF; TT series	≤15%	0201≥0.1μF; 0402≥1μF
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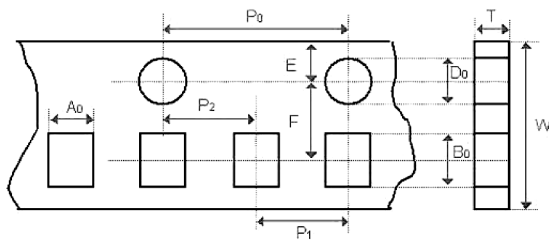
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		<p>Insulation Resistance To apply rated voltage for max. 120 sec.</p> <p>Dielectric Strength To apply 250% of rated voltage, duration 1~5 sec, charge and discharge current less than 50mA.</p> <p>Temperature Coefficient (with no electrical load) Operation temperature: -55~125°C at 25°C</p>	<table border="1"> <tr> <td>6.3V</td> <td>≤10%</td> <td>≤15%</td> <td>0201≥0.1μF;0402≥1μF; 0603≥10μF; 0805≥4.7μF; 1206≥47μF :1210≥100μF; TT series</td> </tr> <tr> <td></td> <td></td> <td>≤20%</td> <td>0402≥2.2μF</td> </tr> <tr> <td>4V</td> <td>≤15%</td> <td>-</td> <td>-</td> </tr> </table> <p>IR. ≥10GΩ or RxC≥500Ω-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: X7R</td> <td rowspan="7">10GΩ or RxC≥100 Ω-F whichever is smaller.</td> </tr> <tr> <td>50V:0603≥1μF;0805≥1μF;1206≥4.7μF;1210≥4.7μF</td> </tr> <tr> <td>35V:0805≥2.2μF;1210≥10μF</td> </tr> <tr> <td>25V:0402≥1μF;0603≥2.2μF;0805≥2.2μF;1206≥10μF;1210≥10μF</td> </tr> <tr> <td>16V: 0201≥0.1uF;0402≥0.22μF;0603≥1μF;0805≥2.2μF;1206≥10μF;1210≥47μF</td> </tr> <tr> <td>10V:0201≥47nF;0402≥0.47μF;0603≥0.47μF;0805≥2.2μF;1206≥4.7μF;1210≥47μF</td> </tr> <tr> <td>6.3V; 4V; TT series</td> </tr> </tbody> </table> <p>Dielectric strength No evidence of damage or flash over during test.</p> <p>Temperature Coefficient Capacitance Change: NPO: Within ±30ppm/°C X7R: Within ±15%</p>	6.3V	≤10%	≤15%	0201≥0.1μF;0402≥1μF; 0603≥10μF; 0805≥4.7μF; 1206≥47μF :1210≥100μF; TT series			≤20%	0402≥2.2μF	4V	≤15%	-	-	Rated voltage	Insulation Resistance	100V: X7R	10GΩ or RxC≥100 Ω-F whichever is smaller.	50V:0603≥1μF;0805≥1μF;1206≥4.7μF;1210≥4.7μF	35V:0805≥2.2μF;1210≥10μF	25V:0402≥1μF;0603≥2.2μF;0805≥2.2μF;1206≥10μF;1210≥10μF	16V: 0201≥0.1uF;0402≥0.22μF;0603≥1μF;0805≥2.2μF;1206≥10μF;1210≥47μF	10V:0201≥47nF;0402≥0.47μF;0603≥0.47μF;0805≥2.2μF;1206≥4.7μF;1210≥47μF	6.3V; 4V; TT series
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6.3V; 4V; TT series																									
18	Board Flex AEC-Q200-005	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 5±1 sec. Measurement to be made after keeping at room temp. for 24±2 hrs.	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.)																						
19	Terminal Strength	Pressurizing force:2N (0402), 10N(0603), 18N(0805). Test time: 60±1 sec.	No remarkable damage or removal of the terminations. Capacitance within the specified tolerance. Q/D.F. value: NPO: Cap≥30pF, Q≥1,000 ; Cap<30pF, Q≥400+20C.																						

No	Item	Test Condition	Requirements			
			X7R:			
			Rated vol.	D.F. \leq	Exception of D.F. \leq	
			$\geq 50V$	$\leq 2.5\%$	$\leq 3\%$	0201(50V); 0603 $\geq 0.047\mu F$; 0805 $\geq 0.18\mu F$; 1206 $\geq 0.47\mu F$
					$\leq 5\%$	1210 $\geq 4.7\mu F$
					$\leq 10\%$	0402 $\geq 0.1\mu F$; 0603 $\geq 1\mu F$; 0805 $\geq 1\mu F$; 1206 $\geq 2.2\mu F$; 1210 $\geq 10\mu F$; TT series
			35V	$\leq 3.5\%$	$\leq 10\%$	0603 $\geq 1\mu F$; 0805 $\geq 2.2\mu F$; 1210 $\geq 10\mu F$
			25V	$\leq 3.5\%$	$\leq 5\%$	0201 $\geq 0.01\mu F$; 0805 $\geq 1\mu F$; 1210 $\geq 10\mu F$
					$\leq 7\%$	0603 $\geq 0.33\mu F$; 1206 $\geq 4.7\mu F$
					$\leq 10\%$	0402 $\geq 0.10\mu F$; 0603 $\geq 0.47\mu F$; 0805 $\geq 2.2\mu F$; 1206 $\geq 6.8\mu F$; 1210 $\geq 22\mu F$; TT series
			16V	$\leq 3.5\%$	$\leq 5\%$	0201 $\geq 0.01\mu F$; 0402 $\geq 0.033\mu F$; 0603 $\geq 0.15\mu F$; 0805 $\geq 0.68\mu F$; 1206 $\geq 2.2\mu F$; 1210 $\geq 4.7\mu F$
					$\leq 10\%$	0201 $\geq 0.1\mu F$; 0402 $\geq 0.22\mu F$; 0603 $\geq 0.68\mu F$; 0805 $\geq 2.2\mu F$; 1206 $\geq 4.7\mu F$; 1210 $\geq 22\mu F$; TT series
			10V	$\leq 5\%$	$\leq 10\%$	0201 $\geq 0.012\mu F$; 0402 $\geq 0.33\mu F$; 0603 $\geq 0.33\mu F$; 0805 $\geq 2.2\mu F$; 1206 $\geq 2.2\mu F$; 1210 $\geq 22\mu F$; TT series
					$\leq 15\%$	0201 $\geq 0.1\mu F$; 0402 $\geq 1\mu F$
			6.3V	$\leq 10\%$	$\leq 15\%$	0201 $\geq 0.1\mu F$; 0402 $\geq 1\mu F$; 0603 $\geq 10\mu F$; 0805 $\geq 4.7\mu F$; 1206 $\geq 47\mu F$; 1210 $\geq 100\mu F$; TT series
					$\leq 20\%$	0402 $\geq 2.2\mu F$
			4V	$\leq 15\%$	-	-

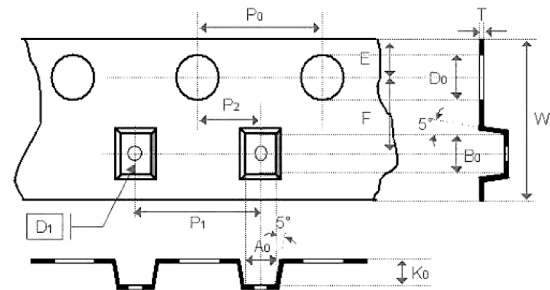
No	Item	Test Condition	Requirements
20	Beam Load Test AEC-Q200-003	Break strength test Beam speed: 2.5±0.25 mm/sec	The chip endure following force Chip length ≤2.5mm: Thickness >0.5mm (20N), ≤0.5mm (8N) Chip length ≥3.2mm: Thickness ≥1.25mm (54.5N), <1.25mm (15N)

Appendixes:

Tape & Reel Dimensions

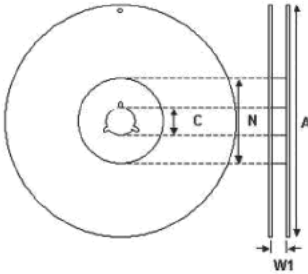


The dimension of paper tape



The dimension of plastic tape

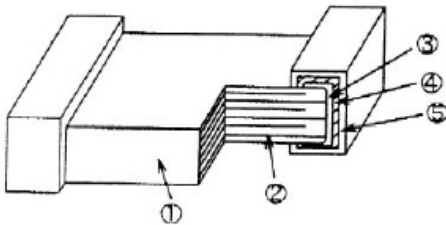
Size	0402	0603	0805			1206			1210
Thickness	N	S, X	A	B	C, D, I	B	C, J, D	G	C, D
A ₀	0.62±0.05	1.02±0.05	1.5±0.1	1.5±0.1	<1.57	2±0.1	<1.85	<1.95	<2.97
B ₀	1.12±0.05	1.8±0.05	2.3±0.1	2.3±0.1	<2.4	3.5±0.1	<3.46	<3.67	<3.73
T	0.6±0.05	0.95±0.05	0.75±0.05	0.95±0.05	0.23±0.05	0.95±0.05	0.23±0.05	0.23±0.05	0.23±0.05
K ₀	-	-	-	-	<2.5	-	<2.5	<2.5	<2.5
W	8±0.1	8±0.1	8±0.1	8±0.1	8±0.1	8±0.1	8±0.1	8±0.1	8±0.1
P ₀	4±0.1	4±0.1	4±0.1	4±0.1	4±0.1	4±0.1	4±0.1	4±0.1	4±0.1
10×P ₀	40±0.1	40±0.1	40±0.1	40±0.1	40±0.1	40±0.1	40±0.1	40±0.1	40±0.1
P ₁	2±0.05	4±0.1	4±0.1	4±0.1	4±0.1	4±0.1	4±0.1	4±0.1	4±0.1
P ₂	2±0.05	2±0.05	2±0.05	2±0.05	2±0.05	2±0.05	2±0.05	2±0.05	2±0.05
D ₀	1.55±0.05	1.55±0.05	1.55±0.05	1.55±0.05	1.5±0.05	1.5±0.05	1.5±0.05	1.5±0.05	1.5±0.05
D ₁	-	-	-	-	1±0.1	-	1±0.1	1±0.1	1±0.1
E	1.75±0.05	1.75±0.05	1.75±0.05	1.75±0.05	1.75±0.1	1.75±0.1	1.75±0.1	1.75±0.1	1.75±0.1
F	3.5±0.05	3.5±0.05	3.5±0.05	3.5±0.05	3.5±0.05	3.5±0.05	3.5±0.05	3.5±0.05	3.5±0.05



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	NPO, X7R
1	Ceramic material	BaTiO ₃ based
2	Inner electrode	Ni
3	Termination	Inner layer
4		Middle layer
5		Outer layer
		Sn (Matt)

Storage and handling conditions

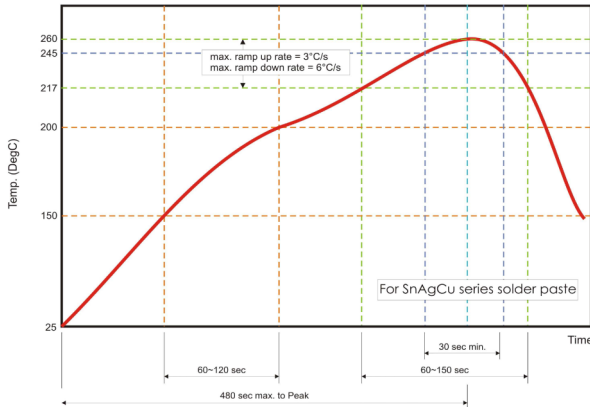
- (1) To store products at 5 to 40°C ambient temperature and 20 to 70% related humidity conditions.
- (2) The product is recommended to be used within one year after shipment. Check solderability in case of shelf life extension is needed.

Cautions:

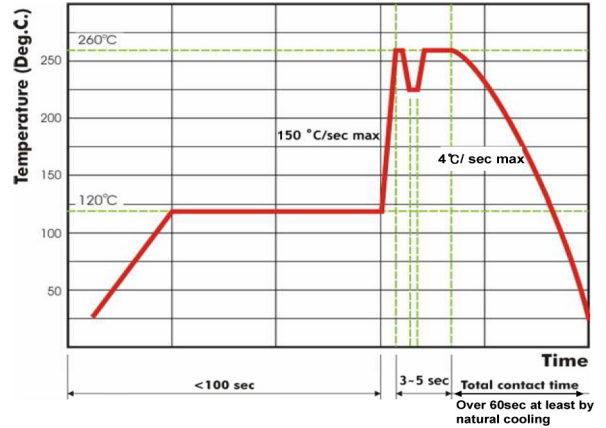
- a. The corrosive gas reacts on the terminal electrodes of capacitors, and results in the poor solderability. Do not store the capacitors in the ambience of corrosive gas (e.g., hydrogen sulfide, sulfur dioxide, chlorine, ammonia gas etc.)
- b. In corrosive atmosphere, solderability might be degraded, 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 N2 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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