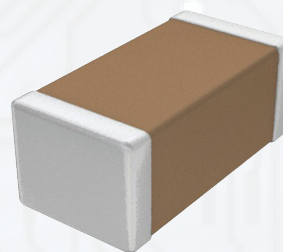


# AUTOMOTIVE MULTILAYER CERAMIC CHIP CAPACITORS

## - GMT SERIES -

### SCOPE

- Consists of conducting material and electrodes - to achieve chip-type SMT and small size, high density and high efficiency ceramic condensers are used
- Provide product dielectrics provides product with high electrical precision, stability and reliability
- Assured quality performance in automotive applications qualified to AEC-Q200



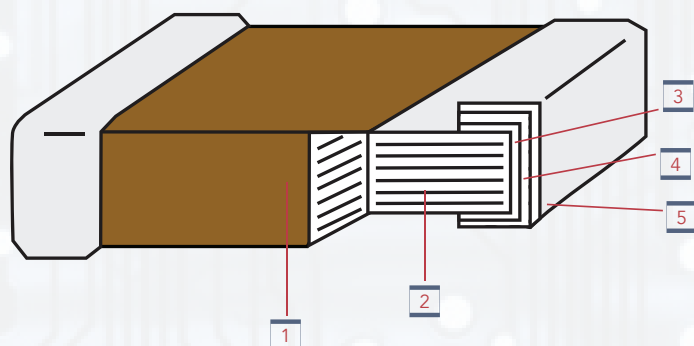
### APPLICATIONS

- For navigation and information equipment
- For entertainment equipment
- For comfortable equipment
- For automotive electronic equipment

### FEATURES

- Wide selection of sizes available
- High capacitance in given case size
- MLCC with lead free termination (pure Tin)
- Meets AEC-Q200 requirement

### CONSTRUCTION AND DIMENSIONS



NO.	NAME	CLASS I DIELECTRIC	CLASS II DIELECTRIC
1	Ceramic Material	CaZrO3	BaTiO3
2	Inner Electrode	Ni	Ni
3	Inner Layer	Cu	Cu
4	Middle Layer	Ni	Ni
5	Outer Layer	Sn	Sn

### PART NUMBER

GMT	04	CG	102	J	50	NT	4
PRODUCT TYPE	DIMENSIONS	DIELECTRIC	CAPACITANCE	TOLERANCE	RATED VOLTAGE	PACKAGING CODE	REEL SIZE
AECQ200 Qualified	02 - 0201 04 - 0402 10 - 0603 21 - 0805 31 - 1206 32 - 1210	CG - NPO / COG X8G - X8G X7R - X7R X5R - X5R	0R5: 0.5pF 5R0: 5pF 100: 10pF 101: 100pF 102: 1000pF 103: .01uF 104: 1uF 105: 1.0uF 106: 10uF	A: ± 0.05pF B: ± 0.1pF C: ± 0.25pF D: ± 0.5pF F: ± 1% G: ± 2% J: ± 5% K: ± 10% M: ± 20%	6R3: 6.3 VDC 10: 10 VDC 16: 16 VDC 25: 25 VDC 50: 50 VDC 100: 100 VDC 200: 200 VDC 250: 250 VDC 630: 630 VDC 1K0: 1000 VDC	NT: Tape & Reel	1: 1K reel 3: 3K reel 4: 4K reel 6: 6K reel 8: 8K reel 10: 10K reel 15: 15K reel

\*\*See packaging quantity on page 2 for more info

### STANDARD ELECTRICAL SPECIFICATIONS

DIELECTRIC	NPO	X7R	X5R
SIZE	0201, 0402, 0603, 0805, 1206, 1210	0201, 0402, 0603, 0805, 1206, 1210	0402, 0603, 0805, 1206
CAPACITANCE RANGE*	0.1pF to 0.047µF	100PF to 10µF	100pF to 10µF
CAPACITANCE TOLERANCE**	Cap≤5pF: A (±0.5pF), B (±0.1pF), C (±0.25pF) 5pF<Cap<10pF: B (±0.1pF), C (±0.25pF), D (±0.25pF) Cap≥10pF: F (±1%), G (±2%), J (±5%)	J (±5%), K (±10%), M (±20%)	J (+/-5%), K (+/-10%), M (+/-20%)
RATED VOLTAGE (WVDC)	10, 16V, 25V, 35V, 50V, 100V, 250V, 500V, 630V, 1000V		10V, 16V, 25V, 35V 50V
OPERATING TEMPERATURE	-55 TO +125°C		-55-85C
CAPACITANCE CHARACTERISTIC	±30ppm/ °C	±15%	±15%
TERMINATION			







# RELIABILITY TEST CONDITIONS AND DIMENSIONS

NO.	TEST ITEM	TEST CONDITION	REQUIREMENTS																																																																				
1.	Pre-and Post-Stress Electrical Test	---																																																																					
2.	High Temperature Exposure (Storage) MIL-STD-202 Method 108	- Test temp.: 125±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"> <thead> <tr> <th>RATED VOL.</th> <th>D.F.≤</th> <th>EXCEPTION OF D.F. ≤</th> </tr> </thead> <tbody> <tr> <td rowspan="3">≥100V</td> <td>≤6%</td> <td>1206 ≥ 0.47μF</td> </tr> <tr> <td>≤7.5%</td> <td>0603 ≥ 0.068μF; 0805 ≥ 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>≤6%</td> <td>0201(50V); 0603 ≥ 0.047μF; 0805 ≥ 0.18μF; 1206 ≥ 0.47μF</td> </tr> <tr> <td>≤3%</td> <td>≤10% 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 rowspan="3">35V</td> <td>≤5%</td> <td>≤20% 0603 ≥ 1μF; 0805 ≥ 2.2μF; 1206 ≥ 2.2μF; 1210 ≥ 10μF</td> </tr> <tr> <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 rowspan="3">25V</td> <td>≤5%</td> <td>≤15% 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 ≥ 0.33μF</td> </tr> <tr> <td>≤10%</td> <td>0603 ≥ 0.15μF; 0805 ≥ 0.68μF; 120 ≥ 2.2μF; 1210 ≥ 4.7μF</td> </tr> <tr> <td rowspan="3">16V</td> <td>≤5%</td> <td>≤15% 0201 ≥ 0.022μF; 0402 ≥ 0.033μF; 0603 &gt; 0.47μF; 0805 ≥ 2.2μF; 1206 ≥ 4.7μF; 1210 ≥ 22μF</td> </tr> <tr> <td>≤7.5%</td> <td>≤15% 0201 ≥ 0.012μF; 0402 ≥ 0.15μF; 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 rowspan="2">10V</td> <td>≤15%</td> <td>0201 ≥ 0.1μF; 0402 ≥ 1μF</td> </tr> <tr> <td>≤30%</td> <td>0201 ≥ 0.1μF; 0402 ≥ 1μF; 0603 ≥ 10μF; 0805 ≥ 4.7μF; 1206 ≥ 47μF; 1210 ≥ 100μF</td> </tr> <tr> <td>6.3V</td> <td>≤15%</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> </tr> </tbody> </table> <p>* I.R.: ≥10GΩ or RxC≥500Ω-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="7">1GΩ or RxC ≥ 10 Ω-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: 0201 ≥ 0.1μF; 0402 ≥ 0.22μF; 0603 ≥ 2.2μF; 0805 ≥ 2.2μF; 1206 ≥ 10μF; 1210 ≥ 10μF</td> </tr> <tr> <td>16V: 0201 ≥ 0.1μF; 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, Size ≥ 1812</td> </tr> </tbody> </table>	RATED VOL.	D.F.≤	EXCEPTION OF D.F. ≤	≥100V	≤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	≤6%	0201(50V); 0603 ≥ 0.047μF; 0805 ≥ 0.18μF; 1206 ≥ 0.47μF	≤3%	≤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	≤10%	0201 ≥ 0.01μF; 0805 ≥ 1μF; 1210 ≥ 10μF	≤14%	0603 ≥ 0.33μF	25V	≤5%	≤15% 0201 ≥ 0.1μF; 0402 ≥ 0.056μF; 0603 ≥ 0.47μF; 0805 ≥ 2.2μF; 1206 ≥ 4.7μF; 1210 ≥ 22μF	≤20%	0402 ≥ 0.33μF	≤10%	0603 ≥ 0.15μF; 0805 ≥ 0.68μF; 120 ≥ 2.2μF; 1210 ≥ 4.7μF	16V	≤5%	≤15% 0201 ≥ 0.022μF; 0402 ≥ 0.033μF; 0603 > 0.47μF; 0805 ≥ 2.2μF; 1206 ≥ 4.7μF; 1210 ≥ 22μF	≤7.5%	≤15% 0201 ≥ 0.012μF; 0402 ≥ 0.15μF; 0603 ≥ 0.33μF; 0805 ≥ 2.2μF; 1206 ≥ 2.2μF; 1210 ≥ 22μF	≤20%	0201 ≥ 0.1μF; 0402 ≥ 1μF	10V	≤15%	0201 ≥ 0.1μF; 0402 ≥ 1μF	≤30%	0201 ≥ 0.1μF; 0402 ≥ 1μF; 0603 ≥ 10μF; 0805 ≥ 4.7μF; 1206 ≥ 47μF; 1210 ≥ 100μF	6.3V	≤15%	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 RxC ≥ 10 Ω-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: 0201 ≥ 0.1μF; 0402 ≥ 0.22μF; 0603 ≥ 2.2μF; 0805 ≥ 2.2μF; 1206 ≥ 10μF; 1210 ≥ 10μF	16V: 0201 ≥ 0.1μF; 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, Size ≥ 1812									
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2	+125°C ±3/-0	5 ±1																																																																					
RATED VOL.	D.F.≤	EXCEPTION OF D.F. ≤																																																																					
≥100V	≤6%	1206 ≥ 0.47μF																																																																					
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	≤20%	0402 ≥ 0.012μF; 0603 > 0.1μF; 0805/X7R> 0.47μF; 1206 ≥ 2.2μF; 1210 ≥ 10μF																																																																					
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# RELIABILITY TEST CONDITIONS AND DIMENSIONS

NO.	TEST ITEM	TEST CONDITION	REQUIREMENTS																																																																								
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.	- 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: <table border="1"> <thead> <tr> <th>RATED VOL.</th> <th>D.F.≤</th> <th>EXCEPTION OF D.F. ≤</th> </tr> </thead> <tbody> <tr> <td rowspan="3">≥100V</td> <td>≤6%</td> <td>1206 ≥ 0.47μF</td> </tr> <tr> <td>≤7.5%</td> <td>0603 ≥ 0.068μF; 0805 ≥ 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>≤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 rowspan="3">35V</td> <td>≤20%</td> <td>0603 ≥ 1μF; 0805 ≥ 2.2μF; 1206 ≥ 2.2μF; 1210 ≥ 10μF</td> </tr> <tr> <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 rowspan="3">25V</td> <td>≤5%</td> <td>0201 ≥ 0.1μF; 0402 ≥ 0.056μF; 0603 ≥ 0.47μF; 0805 ≥ 2.2μF; 1206 ≥ 4.7μF; 1210 ≥ 22μF</td> </tr> <tr> <td>≤15%</td> <td>0201 ≥ 0.1μF; 0402 ≥ 0.33μF</td> </tr> <tr> <td>≤20%</td> <td>0402 ≥ 0.33μF</td> </tr> <tr> <td rowspan="3">16V</td> <td>≤10%</td> <td>0603 ≥ 0.15μF; 0805 ≥ 0.68μF; 120 ≥ 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>≤15%</td> <td>0201 ≥ 0.012μF; 0402 ≥ 0.15μF; 0603 ≥ 0.33μF; 0805 ≥ 2.2μF; 1206 ≥ 2.2μF; 1210 ≥ 22μF</td> </tr> <tr> <td rowspan="3">10V</td> <td>≤7.5%</td> <td>0201 ≥ 0.1μF; 0402 ≥ 1μF</td> </tr> <tr> <td>≤20%</td> <td>0201 ≥ 0.1μF; 0402 ≥ 1μF</td> </tr> <tr> <td>≤15%</td> <td>0201 ≥ 0.1μF; 0402 ≥ 1μF; 0603 ≥ 10μF; 0805 ≥ 4.7μF; 1206 ≥ 4.7μF; 1210 ≥ 100μF</td> </tr> <tr> <td>6.3V</td> <td>≤15%</td> <td>0201 ≥ 0.1μF; 0402 ≥ 1μF; 0603 ≥ 10μF; 0805 ≥ 4.7μF; 1206 ≥ 4.7μF; 1210 ≥ 100μF</td> </tr> <tr> <td>4V</td> <td>≤20%</td> <td>---</td> </tr> </tbody> </table> <p>*I.R.: ≥10GΩ OR RxC≥500Ω-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="10">1GΩ or RxC ≥ 10 Ω-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: 0201 ≥ 0.1μF; 0402 ≥ 0.22μF; 0603 ≥ 2.2μF; 0805 ≥ 2.2μF; 1206 ≥ 10μF; 1210 ≥ 10μF</td> </tr> <tr> <td>16V: 0201 ≥ 0.1μF; 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; Size ≥ 1812</td> </tr> </tbody> </table>	RATED VOL.	D.F.≤	EXCEPTION OF D.F. ≤	≥100V	≤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	≤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	≤20%	0603 ≥ 1μF; 0805 ≥ 2.2μF; 1206 ≥ 2.2μF; 1210 ≥ 10μF	≤10%	0201 ≥ 0.01μF; 0805 ≥ 1μF; 1210 ≥ 10μF	≤14%	0603 ≥ 0.33μF	25V	≤5%	0201 ≥ 0.1μF; 0402 ≥ 0.056μF; 0603 ≥ 0.47μF; 0805 ≥ 2.2μF; 1206 ≥ 4.7μF; 1210 ≥ 22μF	≤15%	0201 ≥ 0.1μF; 0402 ≥ 0.33μF	≤20%	0402 ≥ 0.33μF	16V	≤10%	0603 ≥ 0.15μF; 0805 ≥ 0.68μF; 120 ≥ 2.2μF; 1210 ≥ 4.7μF	≤15%	0201 ≥ 0.022μF; 0402 ≥ 0.033μF; 0603 > 0.47μF; 0805 ≥ 2.2μF; 1206 ≥ 4.7μF; 1210 ≥ 22μF	≤15%	0201 ≥ 0.012μF; 0402 ≥ 0.15μF; 0603 ≥ 0.33μF; 0805 ≥ 2.2μF; 1206 ≥ 2.2μF; 1210 ≥ 22μF	10V	≤7.5%	0201 ≥ 0.1μF; 0402 ≥ 1μF	≤20%	0201 ≥ 0.1μF; 0402 ≥ 1μF	≤15%	0201 ≥ 0.1μF; 0402 ≥ 1μF; 0603 ≥ 10μF; 0805 ≥ 4.7μF; 1206 ≥ 4.7μF; 1210 ≥ 100μF	6.3V	≤15%	0201 ≥ 0.1μF; 0402 ≥ 1μF; 0603 ≥ 10μF; 0805 ≥ 4.7μF; 1206 ≥ 4.7μF; 1210 ≥ 100μF	4V	≤20%	---	RATED VOLTAGE	INSULATION RESISTANCE	100V: All X7R; 1210 ≥ 3.3μF	1GΩ or RxC ≥ 10 Ω-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: 0201 ≥ 0.1μF; 0402 ≥ 0.22μF; 0603 ≥ 2.2μF; 0805 ≥ 2.2μF; 1206 ≥ 10μF; 1210 ≥ 10μF	16V: 0201 ≥ 0.1μF; 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; Size ≥ 1812											
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6.		Biased Humidity MIL-STD-202 Method 103	- 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 24±2 hrs at room temp. - Measurement to be made after keeping at room temp. for 24±2hrs.	- No remarkable damage. - Cap Change: NPO: within ±3.0% or ±0.30pF whichever is larger X7R: within ±12.5% -Q/D.F. value: NPO: C≥30pF, Q≥200; Cap<30pF, Q≥100+10/3C X7R: <table border="1"> <thead> <tr> <th>RATED VOL.</th> <th>D.F.≤</th> <th>EXCEPTION OF D.F. ≤</th> </tr> </thead> <tbody> <tr> <td rowspan="3">≥100V</td> <td>≤6%</td> <td>1206 ≥ 0.47μF</td> </tr> <tr> <td>≤7.5%</td> <td>0603 ≥ 0.068μF; 0805 ≥ 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>≤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 rowspan="3">35V</td> <td>≤20%</td> <td>0603 ≥ 1μF; 0805 ≥ 2.2μF; 1206 ≥ 2.2μF; 1210 ≥ 10μF</td> </tr> <tr> <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 rowspan="3">25V</td> <td>≤5%</td> <td>0201 ≥ 0.1μF; 0402 ≥ 0.056μF; 0603 ≥ 0.47μF; 0805 ≥ 2.2μF; 1206 ≥ 4.7μF; 1210 ≥ 22μF</td> </tr> <tr> <td>≤15%</td> <td>0201 ≥ 0.1μF; 0402 ≥ 0.33μF</td> </tr> <tr> <td>≤20%</td> <td>0402 ≥ 0.33μF</td> </tr> <tr> <td rowspan="3">16V</td> <td>≤10%</td> <td>0603 ≥ 0.15μF; 0805 ≥ 0.68μF; 120 ≥ 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>≤15%</td> <td>0201 ≥ 0.012μF; 0402 ≥ 0.15μF; 0603 ≥ 0.33μF; 0805 ≥ 2.2μF; 1206 ≥ 2.2μF; 1210 ≥ 22μF</td> </tr> <tr> <td rowspan="3">10V</td> <td>≤7.5%</td> <td>0201 ≥ 0.1μF; 0402 ≥ 1μF</td> </tr> <tr> <td>≤20%</td> <td>0201 ≥ 0.1μF; 0402 ≥ 1μF</td> </tr> <tr> <td>≤15%</td> <td>0201 ≥ 0.1μF; 0402 ≥ 1μF; 0603 ≥ 10μF; 0805 ≥ 4.7μF; 1206 ≥ 4.7μF; 1210 ≥ 100μF</td> </tr> <tr> <td>6.3V</td> <td>≤15%</td> <td>0201 ≥ 0.1μF; 0402 ≥ 1μF; 0603 ≥ 10μF; 0805 ≥ 4.7μF; 1206 ≥ 4.7μF; 1210 ≥ 100μF</td> </tr> <tr> <td>4V</td> <td>≤20%</td> <td>---</td> </tr> </tbody> </table> <p>*I.R.: ≥1GΩ OR RxC≥50Ω-F whichever is smaller.</p> <p>Class II (X7R) for rated voltage test:</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="10">500MΩ or RxC ≥ 5 Ω-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: 0201 ≥ 0.1μF; 0402 ≥ 0.22μF; 0603 ≥ 2.2μF; 0805 ≥ 2.2μF; 1206 ≥ 10μF; 1210 ≥ 10μF</td> </tr> <tr> <td>16V: 0201 ≥ 0.1μF; 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; Size ≥ 1812</td> </tr> </tbody> </table> <p>Class II (X7R) for 1.3~1.5Vdc</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="10">1GΩ or RxC ≥ 10 Ω-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: 0201 ≥ 0.1μF; 0402 ≥ 0.22μF; 0603 ≥ 2.2μF; 0805 ≥ 2.2μF; 1206 ≥ 10μF; 1210 ≥ 10μF</td> </tr> <tr> <td>16V: 0201 ≥ 0.1μF; 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; Size ≥ 1812</td> </tr> </tbody> </table>	RATED VOL.	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\* "Room condition" Temperature: 15 to 35°C, Relative humidity: 25 to 75%, Atmospheric pressure: 86 to 106kPa.



NO.	TEST ITEM	TEST CONDITION	REQUIREMENTS																																																						
7.	Operational Life MIL-STD-202 Method 108	- Test temp.: Maximum Operating Temperature $\pm 3^{\circ}\text{C}$ - To apply voltage: (1) $10\text{V} \leq U_r \leq 250\text{V}$ : 200% of rated voltage. (2) 150% of rated voltage: a) 500V b) $\leq 6.3\text{V}$ or $C \geq 10\mu\text{F}$ c) 0603/X7R/50V/Cap. $>0.1\mu\text{F}$ 0603/X7R/ $\leq 25\text{V}$ /Cap. $\geq 1.0\mu\text{F}$ d) 0805/X7R/50V/Cap. $\geq 0.68\mu\text{F}$ e) 1206/X7R/100V/Cap. $\geq 1.0\mu\text{F}$ f) 1210/X7R/50V&100V/Cap. $\geq 2.2\mu\text{F}$ (3) $630\text{V} \leq U_r \leq 1000\text{V}$ : 120% of rated voltage. - Test time: 1000+24/-0 hrs. - Before initial measurement (X7R only): Apply test voltage for 1 hr at $125^{\circ}\text{C}$ . Remove and let set for 24 $\pm$ 2 hrs at room temp. - Measurement to be made after keeping at room temp. for 24 $\pm$ 2 hrs.	- No remarkable damage. - Cap Change: NPO: within $\pm 3.0\%$ or $\pm 0.30\text{pF}$ whichever is larger X7R: within $\pm 12.5\%$ -Q/D.F. value: NPO: More than 30pF, $Q \geq 350$ ; 10pF $\leq C \leq 30\text{pF}$ , $Q \geq 275+2.5\text{C}$ less than 10pF $Q \geq 200+10\text{C}$ X7R: <table border="1"> <thead> <tr> <th>RATED VOL.</th> <th>D.F. <math>\leq</math></th> <th>EXCEPTION OF D.F. <math>\leq</math></th> </tr> </thead> <tbody> <tr> <td rowspan="2"><math>\geq 100\text{V}</math></td> <td><math>\leq 6\%</math></td> <td>1206 <math>\geq 0.47\mu\text{F}</math></td> </tr> <tr> <td><math>\leq 7.5\%</math></td> <td>0603 <math>\geq 0.068\mu\text{F}</math>; 0805 <math>\geq 0.1\mu\text{F}</math>; 1206 <math>\geq 1\mu\text{F}</math>; 1210 <math>\geq 2.2\mu\text{F}</math></td> </tr> <tr> <td rowspan="2"><math>\geq 50\text{V}</math></td> <td><math>\leq 20\%</math></td> <td>0805 <math>&gt; 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D.F. $\leq$	EXCEPTION OF D.F. $\leq$	$\geq 100\text{V}$	$\leq 6\%$	1206 $\geq 0.47\mu\text{F}$	$\leq 7.5\%$	0603 $\geq 0.068\mu\text{F}$ ; 0805 $\geq 0.1\mu\text{F}$ ; 1206 $\geq 1\mu\text{F}$ ; 1210 $\geq 2.2\mu\text{F}$	$\geq 50\text{V}$	$\leq 20\%$	0805 $> 0.22\mu\text{F}$ ; 1210 $\geq 3.3\mu\text{F}$	$\leq 6\%$	0201(50V); 0603 $\geq 0.047\mu\text{F}$ ; 0805 $\geq 0.18\mu\text{F}$ ; 1206 $\geq 0.47\mu\text{F}$	35V	$\leq 10\%$	0201 $\geq 0.01\mu\text{F}$ ; 1210 $\geq 3.3\mu\text{F}$	$\leq 20\%$	0402 $\geq 0.012\mu\text{F}$ ; 0603 $> 0.1\mu\text{F}$ ; 0805/X7R $> 0.47\mu\text{F}$ ; 1206 $\geq 2.2\mu\text{F}$ ; 1210 $\geq 10\mu\text{F}$	25V	$\leq 5\%$	0603 $\geq 1\mu\text{F}$ ; 0805 $\geq 2.2\mu\text{F}$ ; 1206 $\geq 2.2\mu\text{F}$ ; 1210 $\geq 10\mu\text{F}$	$\leq 10\%$	0201 $\geq 0.01\mu\text{F}$ ; 0805 $\geq 1\mu\text{F}$ ; 1210 $\geq 10\mu\text{F}$	16V	$\leq 14\%$	0603 $\geq 0.33\mu\text{F}$	$\leq 15\%$	0201 $\geq 0.1\mu\text{F}$ ; 0402 $\geq 0.056\mu\text{F}$ ; 0603 $\geq 0.47\mu\text{F}$ ; 0805 $\geq 2.2\mu\text{F}$ ; 1206 $\geq 4.7\mu\text{F}$ ; 1210 $\geq 22\mu\text{F}$	10V	$\leq 20\%$	0402 $\geq 0.33\mu\text{F}$	$\leq 10\%$	0603 $\geq 0.15\mu\text{F}$ ; 0805 $\geq 0.68\mu\text{F}$ ; 120 $\geq 2.2\mu\text{F}$ ; 1210 $\geq 4.7\mu\text{F}$	6.3V	$\leq 15\%$	0201 $\geq 0.012\mu\text{F}$ ; 0402 $\geq 0.15\mu\text{F}$ ; 0603 $\geq 0.33\mu\text{F}$ ; 0805 $\geq 2.2\mu\text{F}$ ; 1206 $\geq 2.2\mu\text{F}$ ; 1210 $\geq 22\mu\text{F}$	$\leq 20\%$	0201 $\geq 0.1\mu\text{F}$ ; 0402 $\geq 1\mu\text{F}$	4V	$\leq 20\%$	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 $\geq 100\mu\text{F}$	RATED VOLTAGE	INSULATION RESISTANCE	100V: All X7R; 1210 $\geq 3.3\mu\text{F}$	1G $\Omega$ or $\text{RxC} \geq 10\Omega\text{-F}$ whichever is smaller.	50V: 0402 $> 0.01\mu\text{F}$ ; 0603 $\geq 1\mu\text{F}$ ; 0805 $\geq 1\mu\text{F}$ ; 1206 $\geq 4.7\mu\text{F}$ ; 1210 $\geq 4.7\mu\text{F}$	35V: 0603 $\geq 1\mu\text{F}$ ; 0805 $\geq 2.2\mu\text{F}$ ; 1206 $\geq 2.2\mu\text{F}$ ; 1210 $\geq 10\mu\text{F}$	25V: 0201 $\geq 0.1\mu\text{F}$ ; 0402 $\geq 0.22\mu\text{F}$ ; 0603 $\geq 2.2\mu\text{F}$ ; 0805 $\geq 2.2\mu\text{F}$ ; 1206 $\geq 10\mu\text{F}$ ; 1210 $\geq 10\mu\text{F}$	16V: 0201 $\geq 0.1\mu\text{F}$ ; 0402 $\geq 0.22\mu\text{F}$ ; 0603 $\geq 1\mu\text{F}$ ; 0805 $\geq 2.2\mu\text{F}$ ; 1206 $\geq 10\mu\text{F}$ ; 1210 $\geq 47\mu\text{F}$	10V: 0201 $\geq 47\text{nF}$ ; 0402 $\geq 0.47\mu\text{F}$ ; 0603 $\geq 0.47\mu\text{F}$ ; 0805 $\geq 2.2\mu\text{F}$ ; 1206 $\geq 4.7\mu\text{F}$ ; 1210 $\geq 47\mu\text{F}$	6.3V, 4V; Size $\geq 1812$			
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8.	External Visual MIL-STD-883 Method 2009	- Visual inspection	- No remarkable defect.																																																						
9.	Physical Dimension JESD22 Method JB-100	- By using calipers	- Within the specified dimensions																																																						
10.	Resistance to Solvents MIL-STD-202 Method 215	- Temperature $25 \pm 5^{\circ}\text{C}$ - Time: 3+0.5/-0 min - Solvent: Iso-propyl alcohol.	- No remarkable damage. - Cap: within the specified tolerance. -Q/D.F. value: NPO: Cap $\geq 30\text{pF}$ ; $Q \geq 1000$ ; Cap $< 30\text{pF}$ , $Q \geq 400+20\text{C}$ . 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	$\leq 5\%$	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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	$\leq 10\%$	0201 $\geq 0.012\mu\text{F}$ ; 0402 $\geq 0.15\mu\text{F}$ ; 0603 $\geq 0.33\mu\text{F}$ ; 0805 $\geq 2.2\mu\text{F}$ ; 1206 $\geq 2.2\mu\text{F}$ ; 1210 $\geq 22\mu\text{F}$																																																							
4V	$\leq 15\%$	0201 $\geq 0.1\mu\text{F}$ ; 0402 $\geq 1\mu\text{F}$																																																							
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\* "Room condition" Temperature: 15 to  $35^{\circ}\text{C}$ , Relative humidity: 25 to 75%, Atmospheric pressure: 86 to 106kPa.



# RELIABILITY TEST CONDITIONS AND DIMENSIONS

NO.	TEST ITEM	TEST CONDITION	REQUIREMENTS																																																																				
11.	Mechanical Shock MIL-STD-202 Method 213	<ul style="list-style-type: none"> <li>- Peak value: 1500g's</li> <li>- Wave: 1/2 sine.</li> <li>- Velocity: 15.4ft/sec</li> <li>- Three shocks in each direction should be applied along 3 mutually perpendicular axes of the test specimen (18 shocks)</li> </ul>	<ul style="list-style-type: none"> <li>- No remarkable damage.</li> <li>- Cap: within the specified tolerance</li> <li>-Q/D.F. value: NPO: Cap30pF, Q≥1000; Cap&lt;30pF, Q≥400+20C</li> </ul> <p>X7R:</p> <table border="1"> <thead> <tr> <th>RATED VOL.</th> <th>D.F.≤</th> <th>EXCEPTION OF D.F. ≤</th> </tr> </thead> <tbody> <tr> <td rowspan="3">≥100V</td> <td>≤2.5%</td> <td>≤3% 1206 ≥ 0.47μF ≤5% 0603 ≥ 0.068μF; 0805 ≥ 0.1μF; 1206 ≥ 1μF; 1210 ≥ 2.2μF</td> </tr> <tr> <td>≤5%</td> <td>≤10% 0805 &gt; 0.22μF; 1210 ≥ 3.3μF</td> </tr> <tr> <td>≤10%</td> <td>≤3% 0201(50V); 0603 ≥ 0.047μF; 0805 ≥ 0.18μF; 1206 ≥ 0.47μF</td> </tr> <tr> <td rowspan="3">50V</td> <td>≤2.5%</td> <td>≤5% 0201 ≥ 0.01μF; 1210 ≥ 3.3μF</td> </tr> <tr> <td>≤5%</td> <td>≤10% 0402 ≥ 0.012μF; 0603 &gt; 0.1μF; 0805 &gt; 0.47μF; 1206 ≥ 2.2μF; 1210 ≥ 10μF</td> </tr> <tr> <td>≤10%</td> <td>0603 ≥ 1μF; 0805 ≥ 2.2μF; 1206 ≥ 2.2μF; 1210 ≥ 10μF</td> </tr> <tr> <td rowspan="3">35V</td> <td>≤3.5%</td> <td>≤10% 0603 ≥ 1μF; 0805 ≥ 1μF; 1210 ≥ 10μF</td> </tr> <tr> <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 rowspan="3">25V</td> <td>≤3.5%</td> <td>≤10% 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 ≥ 0.33μF</td> </tr> <tr> <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 rowspan="3">16V</td> <td>≤3.5%</td> <td>≤10% 0201 ≥ 0.022μF; 0402 ≥ 0.15μF; 0603 &gt; 0.47μF; 0805 ≥ 2.2μF; 1206 ≥ 4.7μF; 1210 ≥ 22μF</td> </tr> <tr> <td>≤10%</td> <td>0201 ≥ 0.012μF; 0402 ≥ 0.15μF; 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="3">10V</td> <td>≤5%</td> <td>15% 0201 ≥ 0.1μF; 0402 ≥ 1μF</td> </tr> <tr> <td>≤10%</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> </tr> </tbody> </table> <p>*I.R.: ≥10GΩ OR RxC≥500Ω-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</td> <td rowspan="10">10GΩ or RxC ≥ 100 Ω-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: 0805 ≥ 2.2μF; 1206 ≥ 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 ≥ 0.1μF; 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; Size ≥ 1812</td> </tr> <tr> <td>RATED VOLTAGE</td> <td rowspan="8">RxC ≥ 50 Ω-F</td> </tr> <tr> <td>100V: 1210 ≥ 3.3μF</td> </tr> <tr> <td>50V: 0402 ≥ 0.1μF; 0603 ≥ 2.2μF; 0805 ≥ 10μF; 1206 ≥ 10μF</td> </tr> <tr> <td>35V: 0603 ≥ 1μF</td> </tr> <tr> <td>25V: 0201 ≥ 0.1μF; 0402 ≥ 2.2μF; 0603 ≥ 10μF; 0805 ≥ 10μF; 1206 ≥ 22μF</td> </tr> <tr> <td>16V: 0603 ≥ 10μF; 0402 ≥ 1μF; 0201 ≥ 0.22μF</td> </tr> <tr> <td>10V: 0201 &gt; 0.1μF; 0402 ≥ 1μF; 0603 ≥ 10μF; 0805 ≥ 47μF</td> </tr> <tr> <td>6.3V: 0201 ≥ 0.1μF; 0402 ≥ 1μF; 0603 &gt; 4.7μF; 0805 ≥ 47μF; 1206 ≥ 10μF</td> </tr> <tr> <td>4V: 0603 ≥ 22μF; 0805 ≥ 47μF; 1206 ≥ 100μF</td> </tr> </tbody> </table>	RATED VOL.	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12.	Vibration MIL-STD-202 Method 204	<ul style="list-style-type: none"> <li>- Vibration frequency: 10~2000 Hz/min. (5g's for 20 min)</li> <li>- Total Amplitude: 1.5mm</li> <li>- 12 cycles each of 3 orientations (36 times)</li> </ul>	<ul style="list-style-type: none"> <li>- No remarkable damage.</li> <li>- Cap Change: within the specified tolerance</li> <li>-Q/D.F. value: NPO: C≥30pF, Q≥1000; Cap&lt;30pF, Q≥400+20C</li> </ul> <p>X7R:</p> <table border="1"> <thead> <tr> <th>RATED VOL.</th> <th>D.F.≤</th> <th>EXCEPTION OF D.F. ≤</th> </tr> </thead> <tbody> <tr> <td rowspan="3">≥100V</td> <td>≤2.5%</td> <td>≤3% 1206 ≥ 0.47μF ≤5% 0603≥0.068μF; 0805&gt;0.1μF; 1206≥1μF; 1210≥2.2μF</td> </tr> <tr> <td>≤5%</td> <td>≤10% 0805 &gt; 0.22μF; 1210 ≥ 3.3μF</td> </tr> <tr> <td>≤10%</td> <td>≤3% 0201(50V); 0603 ≥ 0.047μF; 0805 ≥ 0.18μF; 1206 ≥ 0.47μF</td> </tr> <tr> <td rowspan="3">50V</td> <td>≤2.5%</td> <td>≤5% 0201 ≥ 0.01μF; 1210 ≥ 3.3μF</td> </tr> <tr> <td>≤5%</td> <td>≤10% 0402 ≥ 0.012μF; 0603 &gt; 0.1μF; 0805 &gt; 0.47μF; 1206 ≥ 2.2μF; 1210 ≥ 10μF</td> </tr> <tr> <td>≤10%</td> <td>0603 ≥ 1μF; 0805 ≥ 2.2μF; 1206 ≥ 2.2μF; 1210 ≥ 10μF</td> </tr> <tr> <td rowspan="3">35V</td> <td>≤3.5%</td> <td>≤10% 0603 ≥ 1μF; 0805 ≥ 1μF; 1210 ≥ 10μF</td> </tr> <tr> <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 rowspan="3">25V</td> <td>≤3.5%</td> <td>≤10% 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 ≥ 0.33μF</td> </tr> <tr> <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 rowspan="3">16V</td> <td>≤3.5%</td> <td>≤10% 0201 ≥ 0.022μF; 0402 ≥ 0.15μF; 0603 &gt; 0.47μF; 0805 ≥ 2.2μF; 1206 ≥ 4.7μF; 1210 ≥ 22μF</td> </tr> <tr> <td>≤10%</td> <td>0201 ≥ 0.012μF; 0402 ≥ 0.15μF; 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="3">10V</td> <td>≤5%</td> <td>15% 0201 ≥ 0.1μF; 0402 ≥ 1μF</td> </tr> <tr> <td>≤10%</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> </tr> </tbody> </table> <p>*I.R.: ≥1GΩ OR RxC≥50Ω-F whichever is smaller.</p> <p>Class II (X7R) for rated voltage test:</p> <table border="1"> <thead> <tr> <th>RATED VOLTAGE</th> <th>INSULATION RESISTANCE</th> </tr> </thead> <tbody> <tr> <td>100V: All X7R</td> <td rowspan="10">10GΩ or RxC ≥ 100 Ω-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: 0805 ≥ 2.2μF; 1206 ≥ 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 ≥ 0.1μF; 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; Size ≥ 1812</td> </tr> <tr> <td>RATED VOLTAGE</td> <td rowspan="8">RxC ≥ 50 Ω-F</td> </tr> <tr> <td>100V: 1210 ≥ 3.3μF</td> </tr> <tr> <td>50V: 0402 ≥ 0.1μF; 0603 ≥ 2.2μF; 0805 ≥ 10μF; 1206 ≥ 10μF</td> </tr> <tr> <td>35V: 0603 ≥ 1μF</td> </tr> <tr> <td>25V: 0201 ≥ 0.1μF; 0402 ≥ 2.2μF; 0603 ≥ 10μF; 0805 ≥ 10μF; 1206 ≥ 22μF</td> </tr> <tr> <td>16V: 0603 ≥ 10μF; 0402 ≥ 1μF; 0201 ≥ 0.22μF</td> </tr> <tr> <td>10V: 0201 &gt; 0.1μF; 0402 ≥ 1μF; 0603 ≥ 10μF; 0805 ≥ 47μF</td> </tr> <tr> <td>6.3V: 0201 ≥ 0.1μF; 0402 ≥ 1μF; 0603 &gt; 4.7μF; 0805 ≥ 47μF; 1206 ≥ 10μF</td> </tr> <tr> <td>4V: 0603 ≥ 22μF; 0805 ≥ 47μF; 1206 ≥ 100μF</td> </tr> </tbody> </table>	RATED VOL.	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\* "Room condition" Temperature: 15 to 35°C, Relative humidity: 25 to 75%, Atmospheric pressure: 86 to 106kPa.





NO.	TEST ITEM	TEST CONDITION	REQUIREMENTS																																																																										
13.	Resistance to Soldering Heat MIL-STD-202 Method 210	- Solder temperature: 260±5°C - Dipping time: 10±1 sec - Before initial measurement (X7R only): perform 150+0/-10°C for 1 hr and then set 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 ±2.5% or 0.25pF whichever is larger X7R: within 7.5% -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>EXCEPTION OF D.F. ≤</th> </tr> </thead> <tbody> <tr> <td rowspan="3">≥100V</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>≤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 &gt; 0.47μF; 1206 ≥ 2.2μF; 1210 ≥ 10μF</td> </tr> <tr> <td rowspan="3">35V</td> <td>≤3.5%</td> <td>0603 ≥ 1μF; 0805 ≥ 2.2μF; 1206 ≥ 2.2μF; 1210 ≥ 10μF</td> </tr> <tr> <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 rowspan="3">25V</td> <td>≤3.5%</td> <td>0201 ≥ 0.1μF; 0402 ≥ 0.056μF; 0603 ≥ 0.47μF; 0805 ≥ 2.2μF; 1206 ≥ 4.7μF; 1210 ≥ 22μF</td> </tr> <tr> <td>≤10%</td> <td>0402 ≥ 0.33μF</td> </tr> <tr> <td>≤12.5%</td> <td>0402 ≥ 0.33μF</td> </tr> <tr> <td rowspan="3">16V</td> <td>≤3.5%</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 ≥ 0.022μF; 0402 ≥ 0.15μF; 0603 &gt; 0.47μF; 0805 ≥ 2.2μF; 1206 ≥ 4.7μF; 1210 ≥ 22μF</td> </tr> <tr> <td>≤10%</td> <td>0201 ≥ 0.012μF; 0402 ≥ 0.15μF; 0603 ≥ 0.33μF; 0805 ≥ 2.2μF; 1206 ≥ 2.2μF; 1210 ≥ 22μF</td> </tr> <tr> <td rowspan="2">10V</td> <td>≤5%</td> <td>0201 ≥ 0.1μF; 0402 ≥ 1μF</td> </tr> <tr> <td>≤15%</td> <td>0201 ≥ 0.1μF; 0402 ≥ 1μF</td> </tr> <tr> <td rowspan="2">6.3V</td> <td>≤10%</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> </tr> </tbody> </table> <p>*I.R.: ≥10GΩ OR RxC≥500Ω-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</td> <td rowspan="6">10GΩ or RxC ≥ 100 Ω-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: 0805 ≥ 2.2μF; 1206 ≥ 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 ≥ 0.1μF; 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; Size ≥ 1812</td> <td></td> </tr> <tr> <td colspan="2"><b>RATED VOLTAGE</b></td> <td><b>INSULATION RESISTANCE</b></td> </tr> <tr> <td>100V: 1210 ≥ 3.3μF</td> <td rowspan="6">RxC ≥ 50 Ω-F</td> </tr> <tr> <td>50V: 0402 ≥ 0.1μF; 0603 ≥ 2.2μF; 0805 ≥ 10μF; 1206 ≥ 10μF</td> </tr> <tr> <td>35V: 0603 ≥ 1μF</td> </tr> <tr> <td>25V: 0201 ≥ 0.1μF; 0402 ≥ 2.2μF; 0603 ≥ 10μF; 0805 ≥ 10μF; 1206 ≥ 22μF</td> </tr> <tr> <td>16V: 0603 ≥ 10μF; 0402 ≥ 1μF; 0201 ≥ 0.22μF</td> </tr> <tr> <td>10V: 0201 &gt; 0.1μF; 0402 ≥ 1μF; 0603 ≥ 10μF; 0805 ≥ 47μF</td> </tr> <tr> <td>6.3V: 0201 ≥ 0.1μF; 0402 ≥ 1μF; 0603 &gt; 4.7μF; 0805 ≥ 47μF; 1206 ≥ 10μF</td> </tr> <tr> <td>4V: 0603 ≥ 22μF; 0805 ≥ 47μF; 1206 ≥ 100μF</td> </tr> </tbody> </table>	RATED VOL.	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	≤20%	0402 ≥ 0.012μF; 0603 > 0.1μF; 0805 /X7R > 0.47μF; 1206 ≥ 2.2μF; 1210 ≥ 10μF																																																																											
35V	≤5%	0603 ≥ 1μF; 0805 ≥ 2.2μF; 1206 ≥ 2.2μF; 1210 ≥ 10μF																																																																											
	≤10%	0201 ≥ 0.01μF; 0805 ≥ 1μF; 1210 ≥ 10μF																																																																											
	≤14%	0603 ≥ 0.33μF																																																																											
25V	≤5%	0201 ≥ 0.1μF; 0402 ≥ 0.056μF; 0603 ≥ 0.47μF; 0805 ≥ 2.2μF; 1206 ≥ 4.7μF; 1210 ≥ 22μF																																																																											
	≤20%	0402 ≥ 0.33μF																																																																											
	≤10%	0201 ≥ 0.01μF; 0402 ≥ 0.033μF; 0603 ≥ 0.15μF; 0805 ≥ 0.68μF; 1206 ≥ 2.2μF; 1210 ≥ 4.7μF																																																																											
16V	≤5%	0201 ≥ 0.022μF; 0402 ≥ 0.15μF; 0603 > 0.47μF; 0805 ≥ 2.2μF; 1206 ≥ 4.7μF; 1210 ≥ 22μF																																																																											
	≤15%	0201 ≥ 0.012μF; 0402 ≥ 0.15μF; 0603 ≥ 0.33μF; 0805 ≥ 2.2μF; 1206 ≥ 2.2μF; 1210 ≥ 22μF																																																																											
	≤20%	0201 ≥ 0.1μF; 0402 ≥ 1μF																																																																											
10V	≤7.5%	0201 ≥ 0.1μF; 0402 ≥ 1μF																																																																											
	≤30%	0201 ≥ 0.1μF; 0402 ≥ 1μF; 0603 ≥ 10μF; 0805 ≥ 4.7μF; 1206 ≥ 47μF; 1210 ≥ 100μF																																																																											
6.3V	≤15%	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 RxC ≥ 10 Ω-F whichever is smaller.																																																																												
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16V: 0201 ≥ 0.1μF; 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; Size ≥ 1812																																																																													

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



## RELIABILITY TEST CONDITIONS AND DIMENSIONS

NO.	TEST ITEM	TEST CONDITION	REQUIREMENTS																																																	
15.	ESD AEC-Q200-002	- Per AEC-Q200-002	<p>- No remarkable damage.</p> <p>- Cap change: within the specified tolerance.</p> <p>- Q/D.F. value: NPO: Cap<math>\geq</math>30pF, Q<math>\geq</math>1000; Cap<math>&lt;</math>30pF, Q<math>\geq</math>400+20C</p> <p>X7R:</p> <table border="1"> <thead> <tr> <th>RATED VOL.</th> <th>D.F.<math>\leq</math></th> <th>EXCEPTION OF D.F. <math>\leq</math></th> </tr> </thead> <tbody> <tr> <td></td> <td><math>\leq</math>3%</td> <td>1206 <math>\geq</math> 0.47<math>\mu</math>F</td> </tr> <tr> <td><math>\geq</math>100V</td> <td><math>\leq</math>2.5%</td> <td><math>\leq</math>5% 0603 <math>\geq</math> 0.068<math>\mu</math>F; 0805 <math>&gt;</math> 0.1<math>\mu</math>F; 1206 <math>\geq</math> 1<math>\mu</math>F; 1210 <math>\geq</math> 2.2<math>\mu</math>F <math>\leq</math>10% 0805 <math>&gt;</math> 0.22<math>\mu</math>F; 1210 <math>\geq</math> 3.3<math>\mu</math>F</td> </tr> <tr> <td>50V</td> <td><math>\leq</math>2.5%</td> <td><math>\leq</math>3% 0201(50V); 0603 <math>\geq</math> 0.047<math>\mu</math>F; 0805 <math>\geq</math> 0.18<math>\mu</math>F; 1206 <math>\geq</math> 0.47<math>\mu</math>F <math>\leq</math>5% 0201 <math>\geq</math> 0.01<math>\mu</math>F; 1210 <math>\geq</math> 3.3<math>\mu</math>F</td> </tr> <tr> <td>35V</td> <td><math>\leq</math>3.5%</td> <td><math>\leq</math>10% 0402 <math>\geq</math> 0.012<math>\mu</math>F; 0603 <math>&gt;</math> 0.1<math>\mu</math>F; 0805 <math>&gt;</math> 0.47<math>\mu</math>F; 1206 <math>\geq</math> 2.2<math>\mu</math>F; 1210 <math>\geq</math> 10<math>\mu</math>F <math>\leq</math>5% 0603 <math>\geq</math> 1<math>\mu</math>F; 0805 <math>\geq</math> 2.2<math>\mu</math>F; 1206 <math>\geq</math> 2.2<math>\mu</math>F; 1210 <math>\geq</math> 10<math>\mu</math>F</td> </tr> <tr> <td>25V</td> <td><math>\leq</math>3.5%</td> <td><math>\leq</math>5% 0201 <math>\geq</math> 0.01<math>\mu</math>F; 0805 <math>\geq</math> 1<math>\mu</math>F; 1210 <math>\geq</math> 10<math>\mu</math>F <math>\leq</math>7% 0603 <math>\geq</math> 0.33<math>\mu</math>F <math>\leq</math>10% 0201 <math>\geq</math> 0.1<math>\mu</math>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<math>\pm</math>0.5 sec in solder bath at 245<math>\pm</math>5°C.</p> <p>- Condition B Un-mounted chips steam 8 hrs then completely immersed for 10<math>\pm</math>1 sec in solder bath at 215+5/-0°C</p> <p>- Condition C Un-mounted chips steam 8 hrs then completely immersed for 10<math>\pm</math>1 sec in solder bath at 260+0/-5°C.</p>	<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.</p>																																																	

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



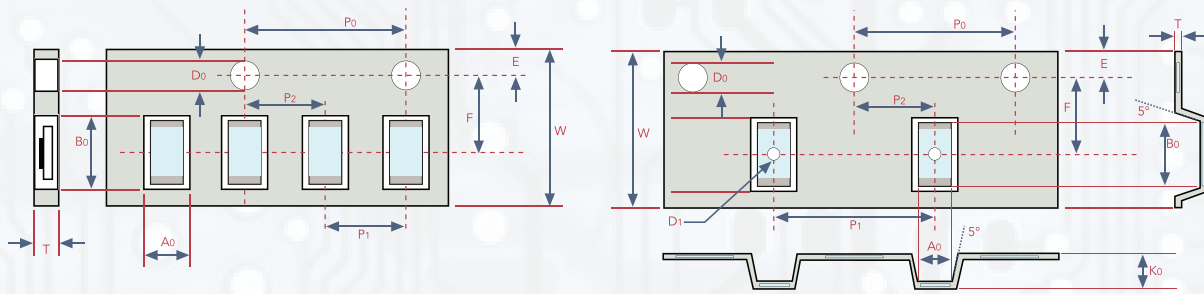


## RELIABILITY TEST CONDITIONS AND DIMENSIONS

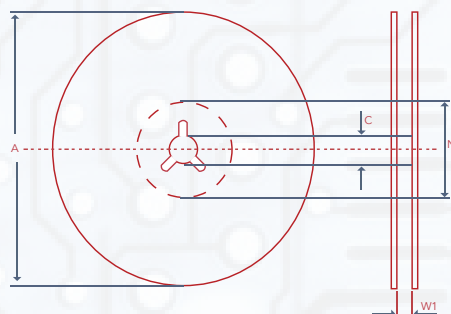
NO.	TEST ITEM	TEST CONDITION	REQUIREMENTS																																															
19.	Terminal Strength AEC-Q200-006	- Pressurizing force: 2N (0201 & 0402), 10N (0603), 10N(0603), 18N(≥0805). - Test time: 60±1 sec.	- No remarkable damage or removal of the terminations - Capacitance within the specified tolerance. - Q/D.F. value: NPO: Cap≥30pF, Q≥1000; Cap<30pF, Q≥400+20C  X7R:																																															
			<table border="1"> <thead> <tr> <th>RATED VOL.</th> <th>D.F.≤</th> <th>EXCEPTION OF D.F. ≤</th> </tr> </thead> <tbody> <tr> <td rowspan="3">≥100V</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="2">50V</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 rowspan="2">35V</td> <td>≤3.5%</td> <td>0402 ≥ 0.012μF; 0603 &gt; 0.1μF; 0805 &gt; 0.47μF; 1206 ≥ 2.2μF; 1210 ≥ 10μF</td> </tr> <tr> <td>≤10%</td> <td>0603 ≥ 1μF; 0805 ≥ 2.2μF; 1206 ≥ 2.2μF; 1210 ≥ 10μF</td> </tr> <tr> <td rowspan="3">25V</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 rowspan="3">16V</td> <td>≤12.5%</td> <td>0402 ≥ 0.33μF</td> </tr> <tr> <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 ≥ 0.022μF; 0402 ≥ 0.15μF; 0603 &gt; 0.47μF; 0805 ≥ 2.2μF; 1206 ≥ 4.7μF; 1210 ≥ 22μF</td> </tr> <tr> <td rowspan="2">10V</td> <td>≤10%</td> <td>0201 ≥ 0.012μF; 0402 ≥ 0.15μF; 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>≤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> </tr> </tbody> </table>	RATED VOL.	D.F.≤	EXCEPTION OF D.F. ≤	≥100V	≤3%	1206 ≥ 0.47μF	≤5%	0603 ≥ 0.068μF; 0805 > 0.1μF; 1206 ≥ 1μF; 1210 ≥ 2.2μF	≤10%	0805 > 0.22μF; 1210 ≥ 3.3μF	50V	≤3%	0201(50V); 0603 ≥ 0.047μF; 0805 ≥ 0.18μF; 1206 ≥ 0.47μF	≤5%	0201 ≥ 0.01μF; 1210 ≥ 3.3μF	35V	≤3.5%	0402 ≥ 0.012μF; 0603 > 0.1μF; 0805 > 0.47μF; 1206 ≥ 2.2μF; 1210 ≥ 10μF	≤10%	0603 ≥ 1μF; 0805 ≥ 2.2μF; 1206 ≥ 2.2μF; 1210 ≥ 10μF	25V	≤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	16V	≤12.5%	0402 ≥ 0.33μF	≤5%	0201 ≥ 0.01μF; 0402 ≥ 0.033μF; 0603 ≥ 0.15μF; 0805 ≥ 0.68μF; 1206 ≥ 2.2μF; 1210 ≥ 4.7μF	≤10%	0201 ≥ 0.022μF; 0402 ≥ 0.15μF; 0603 > 0.47μF; 0805 ≥ 2.2μF; 1206 ≥ 4.7μF; 1210 ≥ 22μF	10V	≤10%	0201 ≥ 0.012μF; 0402 ≥ 0.15μF; 0603 ≥ 0.33μF; 0805 ≥ 2.2μF; 1206 ≥ 2.2μF; 1210 ≥ 22μF	≤15%	0201 ≥ 0.1μF; 0402 ≥ 1μF	6.3V	≤15%	0201 ≥ 0.1μF; 0402 ≥ 1μF; 0603 ≥ 10μF; 0805 ≥ 4.7μF; 1206 ≥ 4.7μF; 1210 ≥ 100μF	≤20%	0402 ≥ 2.2μF	4V	≤15%	---
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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, Relative humidity: 25 to 75%, Atmospheric pressure: 86 to 106kPa.

## TAPE & REEL DIMENSIONS



SIZE	0201		0402		0603		0805		1206			1210	
THICKNESS	L	N, E	S, H, X	A, H	B, T	D, I	B, T	C, J, D	G, P	T	C, D, G, K	M	
A <sub>0</sub>	0.40±0.10	0.70±0.20	1.05±0.30	1.50±0.20	1.50±0.20	< 1.80	1.90±0.50	< 2.00	< 2.30	< 3.05	< 3.05	< 3.20	
B <sub>0</sub>	0.70±0.10	1.20±0.20	1.80±0.30	2.30±0.20	2.30±0.20	< 2.70	3.50±0.50	< 3.70	< 4.00	< 3.80	< 3.80	< 4.00	
T	≤0.55	≤0.80	≤1.20	≤1.15	≤1.20	0.23±0.1	≤1.20	0.23±0.1	0.23±0.1	0.23±0.1	0.23±0.1	0.23±0.1	
K <sub>0</sub>	-	-	-	-	-	< 2.50	-	< 2.50	< 2.50	< 1.50	< 2.50	< 3.20	
W	8.00±0.30	8.00±0.30	8.00±0.30	8.00±0.30	8.00±0.30	8.00±0.30	8.00±0.30	8.00±0.30	8.00±0.30	8.00±0.30	8.00±0.30	8.00±0.30	
P <sub>0</sub>	4.00±0.10	4.00±0.10	4.00±0.10	4.00±0.10	4.00±0.10	4.00±0.10	4.00±0.10	4.00±0.10	4.00±0.10	4.00±0.10	4.00±0.10	4.00±0.10	
10 X P <sub>0</sub>	40.00±0.10	40.00±0.10	40.00±0.20	40.00±0.20	40.00±0.20	40.00±0.20	40.00±0.20	40.00±0.20	40.00±0.20	40.00±0.20	40.00±0.20	40.00±0.20	
P <sub>1</sub>	2.00±0.05	2.00±0.05	4.00±0.10	4.00±0.10	4.00±0.10	4.00±0.10	4.00±0.10	4.00±0.10	4.00±0.10	4.00±0.10	4.00±0.10	4.00±0.10	
P <sub>2</sub>	2.00±0.05	2.00±0.05	2.00±0.05	2.00±0.05	2.00±0.05	2.00±0.05	2.00±0.05	2.00±0.05	2.00±0.05	2.00±0.05	2.00±0.05	2.00±0.05	
D <sub>0</sub>	1.50±0.1/-0	1.50±0.1/-0	1.50±0.1/-0	1.50±0.1/-0	1.50±0.1/-0	1.50±0.1/-0	1.50±0.1/-0	1.50±0.1/-0	1.50±0.1/-0	1.50±0.1/-0	1.50±0.1/-0	1.50±0.1/-0	
D <sub>1</sub>	-	-	-	-	-	1.00±0.10	-	1.00±0.10	1.00±0.10	1.00±0.10	1.00±0.10	1.00±0.10	
E	1.75±0.10	1.75±0.10	1.75±0.10	1.75±0.10	1.75±0.10	1.75±0.10	1.75±0.10	1.75±0.10	1.75±0.10	1.75±0.10	1.75±0.10	1.75±0.10	
F	3.50±0.05	3.50±0.05	3.50±0.05	3.50±0.05	3.50±0.05	3.50±0.05	3.50±0.05	3.50±0.05	3.50±0.05	3.50±0.05	3.50±0.05	3.50±0.05	



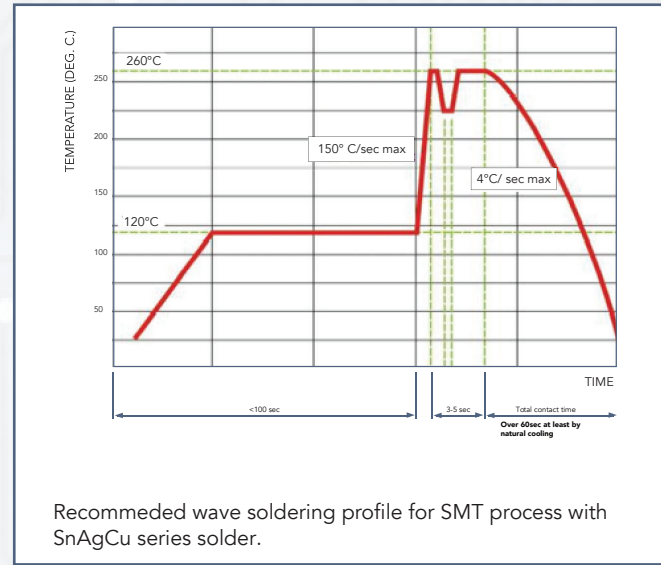
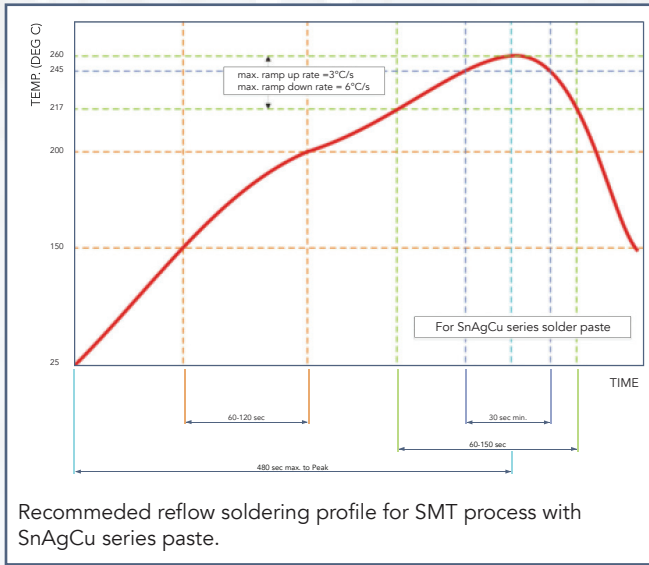
SIZE	0201, 0402, 0603, 0805, 1206, 1210		
REEL SIZE	7"	10"	13"
C	13.0±0.5	13.0±0.5	13.0±0.5
W <sub>1</sub>	10.0±1.5	10.0±1.5	10.0±1.5
A	178.0±0.20	250.0±2.0	330.0±2.0
N	60.0±1.0/-0	50 min	50 min





## 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.



**WARRANTY:** All passive components supplied by CalChip Electronics, 59 Steamwhistle Drive, Ivyland, PA 18974, are under warranty for a period of 2 years from the date of manufacture. Product will meet or exceed all reliability and test specifications expressed by CalChip for the above mentioned time period provided storage conditions (stated below) are met.

### PRODUCT STORAGE INSTRUCTIONS:

- 1) Product must be kept away from direct sunlight.
- 2) Product must be stored in the following conditions  
 Temperature; 5 to 35°C / 30 to 90°F  
 Humidity; 45 to 85%
- 3) Product to be kept free of moisture, dirt and debris.

\*\*\*\*\*WHEN THESE CONDITIONS ARE NOT MET, PRODUCT LIFE COULD BE SHORTENED\*\*\*\*\*

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