

FMT series

AUTOMOTIVE Multilayer Ceramic Chip Capacitors series

◆ Features

- » A wide selection of sizes is available (0402 to 1210).
- » High capacitance in given case size
- » Capacitor with lead-free termination (pure Tin)
- » The FMT series meet AEC-Q200 requirement.
- » RoHS compliant

◆ Applications

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

◆ Part Number

FMT Series	0402 Size	N Dielectric (C0G)	100 Capacitance	J Tolerance	500 Rated voltage
	Inch:	N: NPO (C0G)	Two significant Digits followed by no. of zeros and P is in place of decimal point	B=±0.1pF C=±0.25pF D=±0.5pF	Two significant Digits followed by no. of zeros and V is in place of decimal point
	0402		Eg.: 0P47 = 0.47pF	F=±1%	6V3 = 6.3 VDC
	0603	X: X7R	0P5 = 0.5pF	G=±2%	100 = 10 VDC
	0805		1P0 = 1.0pF	J=±5%	160 = 16 VDC
	1206		100 = 10x10 ⁰ = 10pF	K=±10%	250 = 25 VDC
	1210			M=±20%	500 = 50 VDC

◆ General Electrical Data

Dielectric	NPO (C0G)	X7R
Size	0402, 0603, 0805, 1206, 1210,	0402, 0603, 0805, 1206
Capacitance range*	0.5pF to 0.01uF	100pF to 1uF
Capacitance tolerance	Cap≤5pF: B (±0.1pF), C (±0.25pF) 5pF<Cap<10pF: 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, 250V, 500V, 630V	
Insulation resistance at U _R	≥10G or RxC≥500xΩ whichever is less	
Operating temperature	-55°C ~ 125°C	
Temperature coefficient	±30ppm	±15%
Termination	Cu (or Ag)/Ni/Sn (lead-free termination)	

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

NPO (C0G) : Apply 1.0±0.2Vrms, 1.0MHz±10% for Cap≤1000PF and 1.0±0.2Vrms, 1.0KHz±10% for Cap> 1000PF, 25°C at ambient temperature. Measured at 1.0±0.2Vrms, 1.0kHz±10% for C≤10F; 0.5±0.2Vrms, 120Hz±20% for C>10μF, 30~70% related humidity, 25°C ambient temperature for 7R

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.

◆ **RELIABILITY TEST CONDITIONS AND REQUIREMENTS**

No.	AEC-Q200 Test Item	AEC-Q200 Test Condition	Requirements																																							
1.	Pre-and Post-Stress Electrical Test	---																																								
2.	High Temperature Exposure (Storage) MIL-STD-202 Method 108	<ul style="list-style-type: none"> * Test temp.: 150±3°C * Unpowered. * Test time: 1000+24/-0 hrs. * Measurement to be made after keeping at room temp. for 24±2 hrs. 	<ul style="list-style-type: none"> * 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">≥ 50V</td> <td rowspan="3">≤ 3%</td> <td>≤ 6% 0603 ≥ 0.047μF; 0805 ≥ 0.18μF; 1206 ≥ 0.47μF</td> </tr> <tr> <td>≤ 10% 1210 ≥ 4.7μF</td> </tr> <tr> <td>≤ 20% 0603 ≥ 1μF; 0805 ≥ 1μF; 1206 ≥ 4.7μF; 1210 ≥ 10μF</td> </tr> <tr> <td>35V</td> <td>≤ 5%</td> <td>≤ 20% 0805 ≥ 2.2μF; 1210 ≥ 10μF</td> </tr> <tr> <td rowspan="3">25V</td> <td rowspan="3">≤ 5%</td> <td>≤ 10% 0805 ≥ 1μF; 1210 ≥ 10μF</td> </tr> <tr> <td>≤ 14% 0603 ≥ 0.33μF; 1206 ≥ 4.7μF</td> </tr> <tr> <td>≤ 15% 0402 ≥ 0.10μF; 0603 ≥ 0.47μF; 0805 ≥ 2.2μF; 1206 ≥ 6.8μF; 1210 ≥ 22μF</td> </tr> <tr> <td>16V</td> <td>≤ 5%</td> <td>≤ 10% 0603 ≥ 0.15μF; 0805 ≥ 0.68μF; 1206 ≥ 2.2μF; 1210 ≥ 4.7μF</td> </tr> <tr> <td rowspan="2">10V</td> <td rowspan="2">≤ 7.5%</td> <td>≤ 15% 0402 ≥ 0.33μF; 0603 ≥ 0.33μF; 0805 ≥ 2.2μF; 1206 ≥ 2.2μF; 1210 ≥ 22μF</td> </tr> <tr> <td>≤ 20% 0402 ≥ 1μF</td> </tr> <tr> <td>6.3V</td> <td>≤ 15%</td> <td>≤ 30% 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. 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">1GΩ or RxC ≥ 10 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: 0402 ≥ 0.22μF; 0603 ≥ 1μF; 0805 ≥ 2.2μF; 1206 ≥ 10μF; 1210 ≥ 47μF</td> </tr> <tr> <td>10V: 0402 ≥ 0.47μF; 0603 ≥ 0.47μF; 0805 ≥ 2.2μF; 1206 ≥ 4.7μF; 1210 ≥ 47μF</td> </tr> <tr> <td>6.3V ; 4V ;</td> </tr> </tbody> </table>	Rated vol.	D.F.	Exception of D.F.	≥ 50V	≤ 3%	≤ 6% 0603 ≥ 0.047μF; 0805 ≥ 0.18μF; 1206 ≥ 0.47μF	≤ 10% 1210 ≥ 4.7μF	≤ 20% 0603 ≥ 1μF; 0805 ≥ 1μF; 1206 ≥ 4.7μF; 1210 ≥ 10μF	35V	≤ 5%	≤ 20% 0805 ≥ 2.2μF; 1210 ≥ 10μF	25V	≤ 5%	≤ 10% 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	16V	≤ 5%	≤ 10% 0603 ≥ 0.15μF; 0805 ≥ 0.68μF; 1206 ≥ 2.2μF; 1210 ≥ 4.7μF	10V	≤ 7.5%	≤ 15% 0402 ≥ 0.33μF; 0603 ≥ 0.33μF; 0805 ≥ 2.2μF; 1206 ≥ 2.2μF; 1210 ≥ 22μF	≤ 20% 0402 ≥ 1μF	6.3V	≤ 15%	≤ 30% 0402 ≥ 1μF; 0603 ≥ 10μF; 0805 ≥ 4.7μF; 1206 ≥ 47μF; 1210 ≥ 100μF	4V	≤ 20%	---	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	25V: 0402 ≥ 1μF; 0603 ≥ 2.2μF; 0805 ≥ 2.2μF; 1206 ≥ 10μF; 1210 ≥ 10μF	16V: 0402 ≥ 0.22μF; 0603 ≥ 1μF; 0805 ≥ 2.2μF; 1206 ≥ 10μF; 1210 ≥ 47μF	10V: 0402 ≥ 0.47μF; 0603 ≥ 0.47μF; 0805 ≥ 2.2μF; 1206 ≥ 4.7μF; 1210 ≥ 47μF	6.3V ; 4V ;
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3.	Destructive Physical Analysis EIA-469	Per EIA-469	No defects or abnormalities																																							

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4	Temperature Cycling JESD22 Method JA-104	<p>* Conduct 1000 cycles according to the temperatures and time.</p> <table border="1" data-bbox="383 481 726 627"> <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 ±10.0%. * Q/D.F. value: NPO: Cap≥30pF, Q≥1000 ; Cap<30pF, Q≥400+20C. X7R:</p> <table border="1" data-bbox="758 593 1476 1310"> <thead> <tr> <th>Rated vol.</th> <th>D.F. ≤</th> <th>Exception of D.F. ≤</th> </tr> </thead> <tbody> <tr> <td rowspan="3">≥50V</td> <td rowspan="3">≤3%</td> <td>≤6% 0603 ≥ 0.047μF; 0805 ≥ 0.18μF; 1206 ≥ 0.47μF</td> </tr> <tr> <td>≤10% 1210 ≥ 4.7μF</td> </tr> <tr> <td>≤20% 0603 ≥ 1μF; 0805 ≥ 1μF; 1206 ≥ 4.7μF; 1210 ≥ 10μF</td> </tr> <tr> <td>35V</td> <td>≤5%</td> <td>≤20% 0805 ≥ 2.2μF; 1210 ≥ 10μF</td> </tr> <tr> <td rowspan="3">25V</td> <td rowspan="3">≤5%</td> <td>≤10% 0805 ≥ 1μF; 1210 ≥ 10μF</td> </tr> <tr> <td>≤14% 0603 ≥ 0.33μF; 1206 ≥ 4.7μF</td> </tr> <tr> <td>≤15% 0402 ≥ 0.10μF; 0603 ≥ 0.47μF; 0805 ≥ 2.2μF; 1206 ≥ 6.8μF; 1210 ≥ 22μF</td> </tr> <tr> <td rowspan="2">16V</td> <td rowspan="2">≤5%</td> <td>≤10% 0603 ≥ 0.15μF; 0805 ≥ 0.68μF; 1206 ≥ 2.2μF; 1210 ≥ 4.7μF</td> </tr> <tr> <td>≤15% 0402 ≥ 0.033μF; 0603 ≥ 0.68μF; 0805 ≥ 2.2μF; 1206 ≥ 4.7μF; 1210 ≥ 22μF</td> </tr> <tr> <td rowspan="2">10V</td> <td rowspan="2">≤7.5%</td> <td>≤15% 0402 ≥ 0.33μF; 0603 ≥ 0.33μF; 0805 ≥ 2.2μF; 1206 ≥ 2.2μF; 1210 ≥ 22μF</td> </tr> <tr> <td>≤20% 0402 ≥ 1μF</td> </tr> <tr> <td>6.3V</td> <td>≤15%</td> <td>≤30% 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" data-bbox="758 1422 1476 1792"> <thead> <tr> <th>Rated voltage</th> <th>Insulation Resistance</th> </tr> </thead> <tbody> <tr> <td>100V: X7R</td> <td rowspan="7">1GΩ or RxC ≥ 10 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: 0402 ≥ 0.22μF; 0603 ≥ 1μF; 0805 ≥ 2.2μF; 1206 ≥ 10μF; 1210 ≥ 47μF</td> </tr> <tr> <td>10V: 0402 ≥ 0.47μF; 0603 ≥ 0.47μF; 0805 ≥ 2.2μF; 1206 ≥ 4.7μF; 1210 ≥ 47μF</td> </tr> <tr> <td>6.3V ; 4V</td> </tr> </tbody> </table>	Rated vol.	D.F. ≤	Exception of D.F. ≤	≥50V	≤3%	≤6% 0603 ≥ 0.047μF; 0805 ≥ 0.18μF; 1206 ≥ 0.47μF	≤10% 1210 ≥ 4.7μF	≤20% 0603 ≥ 1μF; 0805 ≥ 1μF; 1206 ≥ 4.7μF; 1210 ≥ 10μF	35V	≤5%	≤20% 0805 ≥ 2.2μF; 1210 ≥ 10μF	25V	≤5%	≤10% 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	16V	≤5%	≤10% 0603 ≥ 0.15μF; 0805 ≥ 0.68μF; 1206 ≥ 2.2μF; 1210 ≥ 4.7μF	≤15% 0402 ≥ 0.033μF; 0603 ≥ 0.68μF; 0805 ≥ 2.2μF; 1206 ≥ 4.7μF; 1210 ≥ 22μF	10V	≤7.5%	≤15% 0402 ≥ 0.33μF; 0603 ≥ 0.33μF; 0805 ≥ 2.2μF; 1206 ≥ 2.2μF; 1210 ≥ 22μF	≤20% 0402 ≥ 1μF	6.3V	≤15%	≤30% 0402 ≥ 1μF; 0603 ≥ 10μF; 0805 ≥ 4.7μF; 1206 ≥ 47μF; 1210 ≥ 100μF	4V	≤20%	---	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	25V: 0402 ≥ 1μF; 0603 ≥ 2.2μF; 0805 ≥ 2.2μF; 1206 ≥ 10μF; 1210 ≥ 10μF	16V: 0402 ≥ 0.22μF; 0603 ≥ 1μF; 0805 ≥ 2.2μF; 1206 ≥ 10μF; 1210 ≥ 47μF	10V: 0402 ≥ 0.47μF; 0603 ≥ 0.47μF; 0805 ≥ 2.2μF; 1206 ≥ 4.7μF; 1210 ≥ 47μF	6.3V ; 4V
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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.	* 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:										
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No.	AEC-Q200 Test Item	AEC-Q200 Test Condition	Requirements																																				
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 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 ±3.0% or 0.30pF whichever is larger. X7R: within ±12.5% * Q/D.F. value: NPO: C≥30pF, Q≥200; C<30pF, Q≥100+10/3C X7R:																																				
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No.	AEC-Q200 Test Item	AEC-Q200 Test Condition	Requirements																																								
7.	Operational Life MIL-STD-202 Method 108	<ul style="list-style-type: none"> * 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. 	<ul style="list-style-type: none"> * 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: <table border="1" data-bbox="753 600 1444 1153"> <thead> <tr> <th>Rated vol.</th> <th>D.F. ≤</th> <th>Exception of D.F. ≤</th> </tr> </thead> <tbody> <tr> <td rowspan="3">≥ 50V</td> <td rowspan="3">≤ 3%</td> <td>≤ 6% 0603 ≥ 0.047μF; 0805 ≥ 0.18μF; 1206 ≥ 0.47μF</td> </tr> <tr> <td>≤ 10% 1210 ≥ 4.7μF</td> </tr> <tr> <td>≤ 20% 0603 ≥ 1μF; 0805 ≥ 1μF; 1206 ≥ 4.7μF; 1210 ≥ 10μF</td> </tr> <tr> <td>35V</td> <td>≤ 5%</td> <td>≤ 20% 0805 ≥ 2.2μF; 1210 ≥ 10μF</td> </tr> <tr> <td rowspan="3">25V</td> <td rowspan="3">≤ 5%</td> <td>≤ 10% 0805 ≥ 1μF; 1210 ≥ 10μF</td> </tr> <tr> <td>≤ 14% 0603 ≥ 0.33μF; 1206 ≥ 4.7μF</td> </tr> <tr> <td>≤ 15% 0402 ≥ 0.10μF; 0603 ≥ 0.47μF; 0805 ≥ 2.2μF; 1206 ≥ 6.8μF; 1210 ≥ 22μF</td> </tr> <tr> <td rowspan="2">16V</td> <td rowspan="2">≤ 5%</td> <td>≤ 10% 0603 ≥ 0.15μF; 0805 ≥ 0.68μF; 1206 ≥ 2.2μF; 1210 ≥ 4.7μF</td> </tr> <tr> <td>≤ 15% 0402 ≥ 0.033μF; 0603 ≥ 0.68μF; 0805 ≥ 2.2μF; 1206 ≥ 4.7μF; 1210 ≥ 22μF</td> </tr> <tr> <td rowspan="2">10V</td> <td rowspan="2">≤ 7.5%</td> <td>≤ 15% 0402 ≥ 0.33μF; 0603 ≥ 0.33μF; 0805 ≥ 2.2μF; 1206 ≥ 2.2μF; 1210 ≥ 22μF</td> </tr> <tr> <td>≤ 20% 0402 ≥ 1μF</td> </tr> <tr> <td>6.3V</td> <td>≤ 15%</td> <td>≤ 30% 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> <ul style="list-style-type: none"> * I.R.: ≥1GΩ or RxC≥50Ω-F whichever is smaller. Class II (X7R) <table border="1" data-bbox="753 1249 1444 1541"> <thead> <tr> <th>Rated voltage</th> <th>Insulation Resistance</th> </tr> </thead> <tbody> <tr> <td>100V; X7R</td> <td rowspan="7">1GΩ or RxC ≥ 10 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; 0402≥0.22μF; 0603≥1μF; 0805≥2.2μF; 1206≥10μF; 1210≥47μF</td> </tr> <tr> <td>10V; 0402≥0.47μF; 0603≥0.47μF; 0805≥2.2μF; 1206≥4.7μF; 1210≥47μF</td> </tr> <tr> <td>6.3V ; 4V</td> </tr> </tbody> </table>	Rated vol.	D.F. ≤	Exception of D.F. ≤	≥ 50V	≤ 3%	≤ 6% 0603 ≥ 0.047μF; 0805 ≥ 0.18μF; 1206 ≥ 0.47μF	≤ 10% 1210 ≥ 4.7μF	≤ 20% 0603 ≥ 1μF; 0805 ≥ 1μF; 1206 ≥ 4.7μF; 1210 ≥ 10μF	35V	≤ 5%	≤ 20% 0805 ≥ 2.2μF; 1210 ≥ 10μF	25V	≤ 5%	≤ 10% 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	16V	≤ 5%	≤ 10% 0603 ≥ 0.15μF; 0805 ≥ 0.68μF; 1206 ≥ 2.2μF; 1210 ≥ 4.7μF	≤ 15% 0402 ≥ 0.033μF; 0603 ≥ 0.68μF; 0805 ≥ 2.2μF; 1206 ≥ 4.7μF; 1210 ≥ 22μF	10V	≤ 7.5%	≤ 15% 0402 ≥ 0.33μF; 0603 ≥ 0.33μF; 0805 ≥ 2.2μF; 1206 ≥ 2.2μF; 1210 ≥ 22μF	≤ 20% 0402 ≥ 1μF	6.3V	≤ 15%	≤ 30% 0402 ≥ 1μF; 0603 ≥ 10μF; 0805 ≥ 4.7μF; 1206 ≥ 47μF; 1210 ≥ 100μF	4V	≤ 20%	---	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	25V; 0402≥1μF; 0603≥2.2μF; 0805≥2.2μF; 1206≥10μF; 1210≥10μF	16V; 0402≥0.22μF; 0603≥1μF; 0805≥2.2μF; 1206≥10μF; 1210≥47μF	10V; 0402≥0.47μF; 0603≥0.47μF; 0805≥2.2μF; 1206≥4.7μF; 1210≥47μF	6.3V ; 4V
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8.	External Visual MIL-STD-883 Method 2009	Visual inspection	No remarkable defect.																																								
9.	Physical Dimension JESD22 Method JB-100	Using by calipers	Within the specified dimensions																																								

No.	AEC-Q200 Test Item	AEC-Q200 Test Condition	Requirements																																																								
10.	Resistance to Solvents MIL-STD-202 Method 215	* Temperature: 25±5°C * Time: 3+0.5/-0 min. * Solvent: Iso-propyl alcohol.	* No remarkable damage. * Cap.: within the specified tolerance. * Q/D.F. value: NPO: Cap≥30pF, Q≥1000 ; Cap<30pF, Q≥400+20C. X7R: <table border="1" data-bbox="756 555 1485 1189"> <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>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>0603 ≥ 1μF; 0805 ≥ 1μF; 1206 ≥ 4.7μF; 1210 ≥ 10μF</td> </tr> <tr> <td>35V</td> <td>≤ 3.5%</td> <td>≤ 10%</td> <td>0805 ≥ 2.2μF; 1210 ≥ 10μF</td> </tr> <tr> <td rowspan="3">25V</td> <td rowspan="3">≤ 3.5%</td> <td>≤ 5%</td> <td>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</td> </tr> <tr> <td rowspan="2">16V</td> <td rowspan="2">≤ 3.5%</td> <td>≤ 5%</td> <td>0402 ≥ 0.033μF; 0603 ≥ 0.15μF; 0805 ≥ 0.68μF; 1206 ≥ 2.2μF; 1210 ≥ 4.7μF</td> </tr> <tr> <td>≤ 10%</td> <td>0402 ≥ 0.22μF; 0603 ≥ 0.68μF; 0805 ≥ 2.2μF; 1206 ≥ 4.7μF; 1210 ≥ 22μF</td> </tr> <tr> <td rowspan="2">10V</td> <td rowspan="2">≤ 5%</td> <td>≤ 10%</td> <td>0402 ≥ 0.33μF; 0603 ≥ 0.33μF; 0805 ≥ 2.2μF; 1206 ≥ 2.2μF; 1210 ≥ 22μF</td> </tr> <tr> <td>≤ 15%</td> <td>0402 ≥ 1μF</td> </tr> <tr> <td rowspan="2">6.3V</td> <td rowspan="2">≤ 10%</td> <td>≤ 15%</td> <td>0402 ≥ 1μF; 0603 ≥ 10μF; 0805 ≥ 4.7μF; 1206 ≥ 47μF ; 1210 ≥ 100μF</td> </tr> <tr> <td>≤ 20%</td> <td>0402 ≥ 2.2μF</td> </tr> <tr> <td>4V</td> <td>≤ 15%</td> <td>---</td> <td>---</td> </tr> </tbody> </table> * I.R.: ≥10GΩ or RxC≥500Ω-F whichever is smaller. Class II (X7R) <table border="1" data-bbox="756 1263 1485 1570"> <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: 0402 ≥ 0.22μF; 0603 ≥ 1μF; 0805 ≥ 2.2μF; 1206 ≥ 10μF; 1210 ≥ 47μF</td> </tr> <tr> <td>10V: 0402 ≥ 0.47μF; 0603 ≥ 0.47μF; 0805 ≥ 2.2μF; 1206 ≥ 4.7μF; 1210 ≥ 47μF</td> </tr> <tr> <td>6.3V ; 4V</td> </tr> </tbody> </table>	Rated vol.	D.F. ≤	Exception of D.F. ≤		≥ 50V	≤ 2.5%	≤ 3%	0603 ≥ 0.047μF; 0805 ≥ 0.18μF; 1206 ≥ 0.47μF	≤ 5%	1210 ≥ 4.7μF	≤ 10%	0603 ≥ 1μF; 0805 ≥ 1μF; 1206 ≥ 4.7μF; 1210 ≥ 10μF	35V	≤ 3.5%	≤ 10%	0805 ≥ 2.2μF; 1210 ≥ 10μF	25V	≤ 3.5%	≤ 5%	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	16V	≤ 3.5%	≤ 5%	0402 ≥ 0.033μF; 0603 ≥ 0.15μF; 0805 ≥ 0.68μF; 1206 ≥ 2.2μF; 1210 ≥ 4.7μF	≤ 10%	0402 ≥ 0.22μF; 0603 ≥ 0.68μF; 0805 ≥ 2.2μF; 1206 ≥ 4.7μF; 1210 ≥ 22μF	10V	≤ 5%	≤ 10%	0402 ≥ 0.33μF; 0603 ≥ 0.33μF; 0805 ≥ 2.2μF; 1206 ≥ 2.2μF; 1210 ≥ 22μF	≤ 15%	0402 ≥ 1μF	6.3V	≤ 10%	≤ 15%	0402 ≥ 1μF; 0603 ≥ 10μF; 0805 ≥ 4.7μF; 1206 ≥ 47μF ; 1210 ≥ 100μF	≤ 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: 0402 ≥ 0.22μF; 0603 ≥ 1μF; 0805 ≥ 2.2μF; 1206 ≥ 10μF; 1210 ≥ 47μF	10V: 0402 ≥ 0.47μF; 0603 ≥ 0.47μF; 0805 ≥ 2.2μF; 1206 ≥ 4.7μF; 1210 ≥ 47μF	6.3V ; 4V
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No.	AEC-Q200 Test Item	AEC-Q200 Test Condition	Requirements			
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)	* 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:			
			Rated vol.	D.F. \geq	Exception of D.F. \leq	
			\geq 50V	\leq 2.5%	\leq 3%	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%	0603 \geq 1 μ F; 0805 \geq 1 μ F; 1206 \geq 4.7 μ F; 1210 \geq 10 μ F
			35V	\leq 3.5%	\leq 10%	0805 \geq 2.2 μ F; 1210 \geq 10 μ F
					\leq 5%	0805 \geq 1 μ F; 1210 \geq 10 μ F
			25V	\leq 3.5%	\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
16V	\leq 3.5%	\leq 5%	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			
		\leq 10%	0402 \geq 0.22 μ F; 0603 \geq 0.68 μ F; 0805 \geq 2.2 μ F; 1206 \geq 4.7 μ F; 1210 \geq 22 μ F			
10V	\leq 5%	\leq 10%	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			
		\leq 15%	0402 \geq 1 μ F			
6.3V	\leq 10%	\leq 15%	0402 \geq 1 μ F; 0603 \geq 10 μ F; 0805 \geq 4.7 μ F; 1206 \geq 47 μ F ; 1210 \geq 100 μ F			
		\leq 20%	0402 \geq 2.2 μ F			
4V	\leq 15%	--	--			
* I.R.: \geq 10G Ω or RxC \geq 500 Ω -F whichever is smaller.						
Class II (X7R)						
Rated voltage	Insulation Resistance					
100V: X7R	10G Ω or RxC \geq 100 Ω -F whichever is smaller.					
50V: 0603 \geq 1 μ F; 0805 \geq 1 μ F; 1206 \geq 4.7 μ F; 1210 \geq 4.7 μ F						
35V: 0805 \geq 2.2 μ F; 1210 \geq 10 μ F						
25V: 0402 \geq 1 μ F; 0603 \geq 2.2 μ F; 0805 \geq 2.2 μ F; 1206 \geq 10 μ F; 1210 \geq 10 μ F						
16V: 0402 \geq 0.22 μ F; 0603 \geq 1 μ F; 0805 \geq 2.2 μ F; 1206 \geq 10 μ F; 1210 \geq 47 μ F						
10V: 0402 \geq 0.47 μ F; 0603 \geq 0.47 μ F; 0805 \geq 2.2 μ F; 1206 \geq 4.7 μ F; 1210 \geq 47 μ F						
6.3V ; 4V						

No.	AEC-Q200 Test Item	AEC-Q200 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 1000 ; Cap $<$ 30pF, Q \geq 400+20C. X7R: <table border="1" data-bbox="762 645 1508 1272"> <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>0603 \geq 0.047μF; 0805 \geq 0.18μF; 1206 \geq 0.47μF</td> </tr> <tr> <td>\leq 5%</td> <td>1210 \geq 4.7μF</td> </tr> <tr> <td>\leq 10%</td> <td>0603 \geq 1μF; 0805 \geq 1μF; 1206 \geq 4.7μF; 1210 \geq 10μF</td> </tr> <tr> <td>35V</td> <td>\leq 3.5%</td> <td>\leq 10%</td> <td>0805\geq2.2μF; 1210 \geq 10μF</td> </tr> <tr> <td rowspan="3">25V</td> <td rowspan="3">\leq 3.5%</td> <td>\leq 5%</td> <td>0805 \geq 1μF; 1210 \geq 10μF</td> </tr> <tr> <td>\leq 7%</td> <td>0603 \geq 0.33μF; 1206 \geq 4.7μF</td> </tr> <tr> <td>\leq 10%</td> <td>0402 \geq 0.10μF; 0603 \geq 0.47μF; 0805 \geq 2.2μF; 1206 \geq 6.8μF ; 1210 \geq 22μF</td> </tr> <tr> <td rowspan="2">16V</td> <td rowspan="2">\leq 3.5%</td> <td>\leq 5%</td> <td>0402 \geq 0.033μF; 0603 \geq 0.15μF; 0805 \geq 0.68μF; 1206 \geq 2.2μF; 1210 \geq 4.7μF</td> </tr> <tr> <td>\leq 10%</td> <td>0402 \geq 0.22μF; 0603 \geq 0.68μF; 0805 \geq 2.2μF; 1206 \geq 4.7μF; 1210 \geq 22μF</td> </tr> <tr> <td>10V</td> <td>\leq 5%</td> <td>\leq 10%</td> <td>0402 \geq 0.33μF; 0603 \geq 0.33μF; 0805 \geq 2.2μF; 1206 \geq 2.2μF; 1210 \geq 22μF</td> </tr> <tr> <td rowspan="2">6.3V</td> <td rowspan="2">\leq 10%</td> <td>\leq 15%</td> <td>0402 \geq 1μF; 0603 \geq 10μF; 0805 \geq 4.7μF; 1206 \geq 47μF ; 1210 \geq 100μF</td> </tr> <tr> <td>\leq 20%</td> <td>0402 \geq 2.2μF</td> </tr> <tr> <td>4V</td> <td>\leq 15%</td> <td>--</td> <td>--</td> </tr> </tbody> </table> <p>* I.R.: \geq10GΩ or RxC\geq500Ω-F whichever is smaller. Class II (X7R)</p> <table border="1" data-bbox="762 1384 1508 1684"> <thead> <tr> <th>Rated voltage</th> <th>Insulation Resistance</th> </tr> </thead> <tbody> <tr> <td>100V: X7R</td> <td rowspan="7">10GΩ or RxC \geq 100 Ω-F whichever is smaller.</td> </tr> <tr> <td>50V: 0603\geq1 μF; 0805\geq1μF; 1206\geq4.7μF; 1210\geq4.7μF</td> </tr> <tr> <td>35V: 0805\geq2.2 μF; 1210 \geq 10μF</td> </tr> <tr> <td>25V: 0402\geq1 μF; 0603\geq2.2μF; 0805\geq2.2μF; 1206\geq10μF; 1210\geq10μF</td> </tr> <tr> <td>16V: 0402\geq0.22μF; 0603\geq1μF; 0805\geq2.2μF; 1206\geq10μF; 1210\geq47μF</td> </tr> <tr> <td>10V: 0402\geq0.47μF; 0603\geq0.47μF; 0805\geq2.2μF; 1206\geq4.7μF; 1210\geq47μF</td> </tr> <tr> <td>6.3V ; 4V</td> </tr> </tbody> </table>		Rated vol.	D.F. \leq	Exception of D.F. \leq		\geq 50V	\leq 2.5%	\leq 3%	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%	0603 \geq 1 μ F; 0805 \geq 1 μ F; 1206 \geq 4.7 μ F; 1210 \geq 10 μ F	35V	\leq 3.5%	\leq 10%	0805 \geq 2.2 μ F; 1210 \geq 10 μ F	25V	\leq 3.5%	\leq 5%	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	16V	\leq 3.5%	\leq 5%	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	\leq 10%	0402 \geq 0.22 μ F; 0603 \geq 0.68 μ F; 0805 \geq 2.2 μ F; 1206 \geq 4.7 μ F; 1210 \geq 22 μ F	10V	\leq 5%	\leq 10%	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	6.3V	\leq 10%	\leq 15%	0402 \geq 1 μ F; 0603 \geq 10 μ F; 0805 \geq 4.7 μ F; 1206 \geq 47 μ F ; 1210 \geq 100 μ F	\leq 20%	0402 \geq 2.2 μ F	4V	\leq 15%	--	--	Rated voltage	Insulation Resistance	100V: X7R	10G Ω or RxC \geq 100 Ω -F whichever is smaller.	50V: 0603 \geq 1 μ F; 0805 \geq 1 μ F; 1206 \geq 4.7 μ F; 1210 \geq 4.7 μ F	35V: 0805 \geq 2.2 μ F; 1210 \geq 10 μ F	25V: 0402 \geq 1 μ F; 0603 \geq 2.2 μ F; 0805 \geq 2.2 μ F; 1206 \geq 10 μ F; 1210 \geq 10 μ F	16V: 0402 \geq 0.22 μ F; 0603 \geq 1 μ F; 0805 \geq 2.2 μ F; 1206 \geq 10 μ F; 1210 \geq 47 μ F	10V: 0402 \geq 0.47 μ F; 0603 \geq 0.47 μ F; 0805 \geq 2.2 μ F; 1206 \geq 4.7 μ F; 1210 \geq 47 μ F	6.3V ; 4V
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13.	Resistance to Soldering Heat MIL-STD-202 Method 210	<ul style="list-style-type: none"> * Solder temperature: 270±5°C * Dipping time: 10±1 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. 	<ul style="list-style-type: none"> * 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" data-bbox="735 645 1485 1216"> <thead> <tr> <th>Rated vol.</th> <th>D.F. ≤</th> <th>Exception of D.F. ≤</th> </tr> </thead> <tbody> <tr> <td rowspan="3">≥ 50V</td> <td rowspan="3">≤ 2.5%</td> <td>≤ 3% 0603 ≥ 0.047μF; 0805 ≥ 0.18μF; 1206 ≥ 0.47μF</td> </tr> <tr> <td>≤ 5% 1210 ≥ 4.7μF</td> </tr> <tr> <td>≤ 10% 0603 ≥ 1μF; 0805 ≥ 1μF; 1206 ≥ 4.7μF; 1210 ≥ 10μF</td> </tr> <tr> <td>35V</td> <td>≤ 3.5%</td> <td>≤ 10% 0805 ≥ 2.2μF; 1210 ≥ 10μF</td> </tr> <tr> <td rowspan="2">25V</td> <td rowspan="2">≤ 3.5%</td> <td>≤ 5% 0805 ≥ 1μF; 1210 ≥ 10μF</td> </tr> <tr> <td>≤ 7% 0603 ≥ 0.33μF; 1206 ≥ 4.7μF</td> </tr> <tr> <td rowspan="2">16V</td> <td rowspan="2">≤ 3.5%</td> <td>≤ 10% 0402 ≥ 0.10μF; 0603 ≥ 0.47μF; 0805 ≥ 2.2μF; 1206 ≥ 6.8μF ; 1210 ≥ 22μF</td> </tr> <tr> <td>≤ 5% 0402 ≥ 0.033μF; 0603 ≥ 0.15μF; 0805 ≥ 0.68μF; 1206 ≥ 2.2μF; 1210 ≥ 4.7μF</td> </tr> <tr> <td rowspan="2">10V</td> <td rowspan="2">≤ 5%</td> <td>≤ 10% 0402 ≥ 0.22μF; 0603 ≥ 0.68μF; 0805 ≥ 2.2μF; 1206 ≥ 4.7μF; 1210 ≥ 22μF</td> </tr> <tr> <td>≤ 15% 0402 ≥ 1μF</td> </tr> <tr> <td rowspan="2">6.3V</td> <td rowspan="2">≤ 10%</td> <td>≤ 15% 0402 ≥ 1μF; 0603 ≥ 10μF; 0805 ≥ 4.7μF; 1206 ≥ 47μF ; 1210 ≥ 100μF</td> </tr> <tr> <td>≤ 20% 0402 ≥ 2.2μF</td> </tr> <tr> <td>4V</td> <td>≤ 15%</td> <td>---</td> </tr> </tbody> </table> <ul style="list-style-type: none"> * I.R.: ≥10GΩ or RxC≥500Ω-F whichever is smaller. Class II (X7R) <table border="1" data-bbox="735 1285 1485 1568"> <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: 0402 ≥ 0.22μF; 0603 ≥ 1μF; 0805 ≥ 2.2μF; 1206 ≥ 10μF; 1210 ≥ 47μF</td> </tr> <tr> <td>10V: 0402 ≥ 0.47μF; 0603 ≥ 0.47μF; 0805 ≥ 2.2μF; 1206 ≥ 4.7μF; 1210 ≥ 47μF</td> </tr> <tr> <td>6.3V ; 4V</td> </tr> </tbody> </table>	Rated vol.	D.F. ≤	Exception of D.F. ≤	≥ 50V	≤ 2.5%	≤ 3% 0603 ≥ 0.047μF; 0805 ≥ 0.18μF; 1206 ≥ 0.47μF	≤ 5% 1210 ≥ 4.7μF	≤ 10% 0603 ≥ 1μF; 0805 ≥ 1μF; 1206 ≥ 4.7μF; 1210 ≥ 10μF	35V	≤ 3.5%	≤ 10% 0805 ≥ 2.2μF; 1210 ≥ 10μF	25V	≤ 3.5%	≤ 5% 0805 ≥ 1μF; 1210 ≥ 10μF	≤ 7% 0603 ≥ 0.33μF; 1206 ≥ 4.7μF	16V	≤ 3.5%	≤ 10% 0402 ≥ 0.10μF; 0603 ≥ 0.47μF; 0805 ≥ 2.2μF; 1206 ≥ 6.8μF ; 1210 ≥ 22μF	≤ 5% 0402 ≥ 0.033μF; 0603 ≥ 0.15μF; 0805 ≥ 0.68μF; 1206 ≥ 2.2μF; 1210 ≥ 4.7μF	10V	≤ 5%	≤ 10% 0402 ≥ 0.22μF; 0603 ≥ 0.68μF; 0805 ≥ 2.2μF; 1206 ≥ 4.7μF; 1210 ≥ 22μF	≤ 15% 0402 ≥ 1μF	6.3V	≤ 10%	≤ 15% 0402 ≥ 1μF; 0603 ≥ 10μF; 0805 ≥ 4.7μF; 1206 ≥ 47μF ; 1210 ≥ 100μF	≤ 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: 0402 ≥ 0.22μF; 0603 ≥ 1μF; 0805 ≥ 2.2μF; 1206 ≥ 10μF; 1210 ≥ 47μF	10V: 0402 ≥ 0.47μF; 0603 ≥ 0.47μF; 0805 ≥ 2.2μF; 1206 ≥ 4.7μF; 1210 ≥ 47μF	6.3V ; 4V
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14	Thermal Shock MIL-STD-202 Method 107	<p>* Conduct 300 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>15±3</td> </tr> <tr> <td>2</td> <td>+125°C +3/-0</td> <td>15±3</td> </tr> </tbody> </table> <p>* Max. transfer time: 20 sec.</p> <p>* Before initial measurement (X7R only): Perform 150+0/-10°C for 1 hr and then set for 24±2 hrs at room temp.</p> <p>* Measurement to be made after keeping at room temp. for 24±2 hrs.</p>	Step	Temp. (°C)	Time (min.)	1	-55°C +0/-3	15±3	2	+125°C +3/-0	15±3	<p>* No remarkable damage.</p> <p>* Cap change : NPO: within ±2.5% or 0.25pF whichever is larger X7R: within 10.0%</p> <p>* 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>Exception of D.F. ≤</th> </tr> </thead> <tbody> <tr> <td rowspan="3">≥ 50V</td> <td rowspan="3">≤ 3%</td> <td>≤ 6% 0603 ≥ 0.047μF; 0805 ≥ 0.18μF; 1206 ≥ 0.47μF</td> </tr> <tr> <td>≤ 10% 1210 ≥ 4.7μF</td> </tr> <tr> <td>≤ 20% 0603 ≥ 1μF; 0805 ≥ 1μF; 1206 ≥ 4.7μF; 1210 ≥ 10μF</td> </tr> <tr> <td rowspan="2">35V</td> <td rowspan="2">≤ 5%</td> <td>≤ 20% 0805 ≥ 2.2μF; 1210 ≥ 10μF</td> </tr> <tr> <td>≤ 10% 0805 ≥ 1μF; 1210 ≥ 10μF</td> </tr> <tr> <td rowspan="3">25V</td> <td rowspan="3">≤ 5%</td> <td>≤ 14% 0603 ≥ 0.33μF; 1206 ≥ 4.7μF</td> </tr> <tr> <td>≤ 15% 0402 ≥ 0.10μF; 0603 ≥ 0.47μF; 0805 ≥ 2.2μF; 1206 ≥ 6.8μF; 1210 ≥ 22μF</td> </tr> <tr> <td>≤ 10% 0603 ≥ 0.15μF; 0805 ≥ 0.68μF; 1206 ≥ 2.2μF; 1210 ≥ 4.7μF</td> </tr> <tr> <td rowspan="2">16V</td> <td rowspan="2">≤ 5%</td> <td>≤ 15% 0402 ≥ 0.33μF; 0603 ≥ 0.68μF; 0805 ≥ 2.2μF; 1206 ≥ 4.7μF; 1210 ≥ 22μF</td> </tr> <tr> <td>≤ 15% 0402 ≥ 0.33μF; 0603 ≥ 0.33μF; 0805 ≥ 2.2μF; 1206 ≥ 2.2μF; 1210 ≥ 22μF</td> </tr> <tr> <td rowspan="2">10V</td> <td rowspan="2">≤ 7.5%</td> <td>≤ 20% 0402 ≥ 1μF</td> </tr> <tr> <td>≤ 15% 0402 ≥ 1μF; 0603 ≥ 10μF; 0805 ≥ 4.7μF; 1206 ≥ 47μF; 1210 ≥ 100μF</td> </tr> <tr> <td>6.3V</td> <td>≤ 15%</td> <td>---</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: X7R</td> <td rowspan="8">1GΩ or RxC ≥ 10 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: 0402 ≥ 0.22μF; 0603 ≥ 1μF; 0805 ≥ 2.2μF; 1206 ≥ 10μF; 1210 ≥ 47μF</td> </tr> <tr> <td>10V: 0402 ≥ 0.47μF; 0603 ≥ 0.47μF; 0805 ≥ 2.2μF; 1206 ≥ 4.7μF; 1210 ≥ 47μF</td> </tr> <tr> <td>6.3V; 4V</td> </tr> </tbody> </table>	Rated vol.	D.F. ≤	Exception of D.F. ≤	≥ 50V	≤ 3%	≤ 6% 0603 ≥ 0.047μF; 0805 ≥ 0.18μF; 1206 ≥ 0.47μF	≤ 10% 1210 ≥ 4.7μF	≤ 20% 0603 ≥ 1μF; 0805 ≥ 1μF; 1206 ≥ 4.7μF; 1210 ≥ 10μF	35V	≤ 5%	≤ 20% 0805 ≥ 2.2μF; 1210 ≥ 10μF	≤ 10% 0805 ≥ 1μF; 1210 ≥ 10μF	25V	≤ 5%	≤ 14% 0603 ≥ 0.33μF; 1206 ≥ 4.7μF	≤ 15% 0402 ≥ 0.10μF; 0603 ≥ 0.47μF; 0805 ≥ 2.2μF; 1206 ≥ 6.8μF; 1210 ≥ 22μF	≤ 10% 0603 ≥ 0.15μF; 0805 ≥ 0.68μF; 1206 ≥ 2.2μF; 1210 ≥ 4.7μF	16V	≤ 5%	≤ 15% 0402 ≥ 0.33μF; 0603 ≥ 0.68μF; 0805 ≥ 2.2μF; 1206 ≥ 4.7μF; 1210 ≥ 22μF	≤ 15% 0402 ≥ 0.33μF; 0603 ≥ 0.33μF; 0805 ≥ 2.2μF; 1206 ≥ 2.2μF; 1210 ≥ 22μF	10V	≤ 7.5%	≤ 20% 0402 ≥ 1μF	≤ 15% 0402 ≥ 1μF; 0603 ≥ 10μF; 0805 ≥ 4.7μF; 1206 ≥ 47μF; 1210 ≥ 100μF	6.3V	≤ 15%	---	4V	≤ 20%	---	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	25V: 0402 ≥ 1μF; 0603 ≥ 2.2μF; 0805 ≥ 2.2μF; 1206 ≥ 10μF; 1210 ≥ 10μF	16V: 0402 ≥ 0.22μF; 0603 ≥ 1μF; 0805 ≥ 2.2μF; 1206 ≥ 10μF; 1210 ≥ 47μF	10V: 0402 ≥ 0.47μF; 0603 ≥ 0.47μF; 0805 ≥ 2.2μF; 1206 ≥ 4.7μF; 1210 ≥ 47μF	6.3V; 4V
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		Un-mounted chips 4hrs / 155 $^{\circ}$ C* dry then completely immersed for 5 \pm 0.5 sec in solder bath at 245 \pm 5 $^{\circ}$ C.																																
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17.	Electrical Characterization	* Capacitance	* Capacitance within the specified tolerance.																															
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18.	Board Flex AEC-Q200-005	<ul style="list-style-type: none"> * 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. 	<ul style="list-style-type: none"> * 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 AEC-Q200-006	<ul style="list-style-type: none"> * Pressurizing force : 2N (0402), 10N(0603), 18N(0805). * Test time: 60±1 sec. 	<ul style="list-style-type: none"> * 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">≥50V</td> <td rowspan="3">≤2.5%</td> <td>≤3% 0603 ≥ 0.047μF; 0805 ≥ 0.18μF; 1206 ≥ 0.47μF</td> </tr> <tr> <td>≤5% 1210 ≥ 4.7μF</td> </tr> <tr> <td>≤10% 0603 ≥ 1μF, 0805 ≥ 1μF, 1206 ≥ 4.7μF, 1210 ≥ 10μF</td> </tr> <tr> <td>35V</td> <td>≤3.5%</td> <td>≤10% 0805 ≥ 2.2μF; 1210 ≥ 10μF</td> </tr> <tr> <td rowspan="3">25V</td> <td rowspan="3">≤3.5%</td> <td>≤5% 0805 ≥ 1μF; 1210 ≥ 10μF</td> </tr> <tr> <td>≤7% 0603 ≥ 0.33μF; 1206 ≥ 4.7μF</td> </tr> <tr> <td>≤10% 0402 ≥ 0.10μF; 0603 ≥ 0.47μF; 0805 ≥ 2.2μF; 1206 ≥ 6.8μF; 1210 ≥ 22μF</td> </tr> <tr> <td rowspan="2">16V</td> <td rowspan="2">≤3.5%</td> <td>≤5% 0402 ≥ 0.033μF; 0603 ≥ 0.15μF; 0805 ≥ 0.68μF; 1206 ≥ 2.2μF; 1210 ≥ 4.7μF</td> </tr> <tr> <td>≤10% 0402 ≥ 0.22μF; 0603 ≥ 0.68μF; 0805 ≥ 2.2μF; 1206 ≥ 4.7μF; 1210 ≥ 22μF</td> </tr> <tr> <td rowspan="2">10V</td> <td rowspan="2">≤5%</td> <td>≤10% 0402 ≥ 0.33μF; 0603 ≥ 0.33μF; 0805 ≥ 2.2μF; 1206 ≥ 2.2μF; 1210 ≥ 22μF</td> </tr> <tr> <td>≤15% 0402 ≥ 1μF</td> </tr> <tr> <td rowspan="2">6.3V</td> <td rowspan="2">≤10%</td> <td>≤15% 0402 ≥ 1μF; 0603 ≥ 10μF; 0805 ≥ 4.7μF; 1206 ≥ 47μF; 1210 ≥ 100μF</td> </tr> <tr> <td>≤20% 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. ≤	≥50V	≤2.5%	≤3% 0603 ≥ 0.047μF; 0805 ≥ 0.18μF; 1206 ≥ 0.47μF	≤5% 1210 ≥ 4.7μF	≤10% 0603 ≥ 1μF, 0805 ≥ 1μF, 1206 ≥ 4.7μF, 1210 ≥ 10μF	35V	≤3.5%	≤10% 0805 ≥ 2.2μF; 1210 ≥ 10μF	25V	≤3.5%	≤5% 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	16V	≤3.5%	≤5% 0402 ≥ 0.033μF; 0603 ≥ 0.15μF; 0805 ≥ 0.68μF; 1206 ≥ 2.2μF; 1210 ≥ 4.7μF	≤10% 0402 ≥ 0.22μF; 0603 ≥ 0.68μF; 0805 ≥ 2.2μF; 1206 ≥ 4.7μF; 1210 ≥ 22μF	10V	≤5%	≤10% 0402 ≥ 0.33μF; 0603 ≥ 0.33μF; 0805 ≥ 2.2μF; 1206 ≥ 2.2μF; 1210 ≥ 22μF	≤15% 0402 ≥ 1μF	6.3V	≤10%	≤15% 0402 ≥ 1μF; 0603 ≥ 10μF; 0805 ≥ 4.7μF; 1206 ≥ 47μF; 1210 ≥ 100μF	≤20% 0402 ≥ 2.2μF	4V	≤15%	--
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20	Beam Load Test AEC-Q200-003	<ul style="list-style-type: none"> * Break strength test * Beam speed: 2.5±0.25 mm/sec 	<ul style="list-style-type: none"> 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) 																															