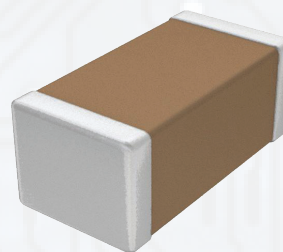


# AUTOMOTIVE MULTILAYER CERAMIC CHIP CAPACITORS

## - 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



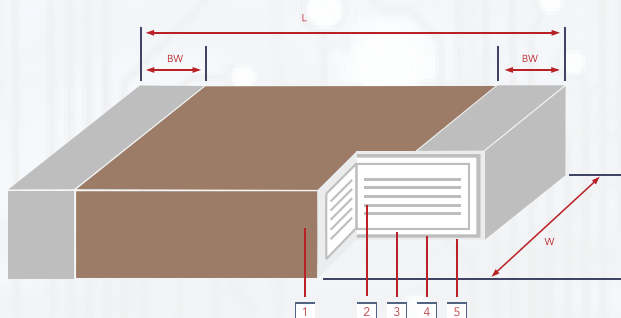
### APPLICATIONS

- 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             | BatTiO3             |
| 2   | Inner Electrode  | Ni                 | Ni                  |
| 3   | Inner Layer      | Cu                 | Cu                  |
| 4   | Middle Layer     | Ni                 | Ni                  |
| 5   | Outer Layer      | Sn                 | Sn                  |

| SIZE INCH (MM) | L (MM)      | W (MM)           | T (MM) / SYMBOL      | MA (MM)         |
|----------------|-------------|------------------|----------------------|-----------------|
| 0201 (0603)    | 0.60±0.03   | 0.30±0.03        | SEE FOLLOWING CHARTS | 0.15+/-0.05     |
| 0402 (1005)    | 1.00±0.10   | 0.50±0.10        |                      | 0.25+0.05/-0.10 |
| 0603 (1608)    | 1.60±0.15   | 0.80±0.15        |                      | 0.40±0.15       |
| 0805 (2012)    | 2.00±0.20   | 1.25±0.20        |                      | 0.50±0.20       |
| 1206 (3216)    | 3.20±0.20   | 1.60±0.20        |                      | 0.60 ±0.2       |
|                | 3.30 ± 0.30 | 1.60 +0.3 / -0.1 |                      |                 |
| 1210 (3225)    | 3.20±0.30   | 2.50 ± 0.30      |                      | 0.75±0.35       |
|                | 3.30±0.40   |                  |                      |                 |

### 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<br>04 - 0402<br>10 - 0603<br>21 - 0805<br>31 - 1206<br>32 - 1210 | CG - NPO / COG<br>X8G - X8G<br>X7R - X7R<br>X7S - X7S<br>X7T - X7T<br>X5R - X5R | 0R5: 0.5pF<br>5R0: 5pF<br>100: 10pF<br>101: 100pF<br>102: 1000pF<br>103: .01uF<br>104: 1uF<br>105: 1.0uF<br>106: 10uF | A: ± 0.05pF<br>B: ± 0.1pF<br>C: ± 0.25pF<br>D: ± 0.5pF<br>F: ± 1%<br>G: ± 2%<br>J: ± 5%<br>K: ± 10%<br>M: ± 20% | 6R3: 6.3 VDC<br>10: 10 VDC<br>16: 16 VDC<br>25: 25 VDC<br>50: 50 VDC<br>100: 100 VDC<br>200: 200 VDC<br>250: 250 VDC<br>630: 630 VDC<br>1K0: 1000 VDC | NT: Tape & Reel | 1: 1K reel<br>3: 3K reel<br>4: 4K reel<br>6: 6K reel<br>8: 8K reel<br>10: 10K reel<br>15: 15K reel<br><br>**See packaging quantity on page 2 for more info |

### STANDARD ELECTRICAL SPECIFICATIONS

| DIELECTRIC                 | NPO   | X7R                                | X7S                                | X7T                                | X5R                               |
|----------------------------|---|------------------------------------|------------------------------------|------------------------------------|-----------------------------------|
| SIZE                       | 0201, 0402, 0603, 0805, 1206, 1210  | 0201, 0402, 0603, 0805, 1206, 1210 | 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 22µF                      | 100pF to 100µF                     | 100pF TO 100µF                     | 220pF to 100µF                    |
| CAPACITANCE TOLERANCE**    | Cap≤5pF: A (±0.5pF), B (±0.1pF), C (±0.25pF)<br>5pF<Cap<10pF: B (±0.1pF), C (±0.25pF), D (±0.25pF)<br>Cap≥10pF: F (±1%), G (±2%), J (±5%) | J (±5%), K (±10%), M (±20%)        | J (+/-5%),K (+/-10%), M (+/-20%)   | J (+/-5%),K (+/-10%), M (+/-20%)   | J (+/-5%), K (+/-10%), M (+/-20%) |
| RATED VOLTAGE (VVDC)       | 10, 16V, 25V, 35V, 50V, 100V, 250V, 500V, 630V, 1000V   |                                    | 6.3v, 10v, 16v, 25v,35v 50v, 100v  | 6.3v, 10v, 16v, 25v,35v 50v, 100v  | 10V, 16V, 25V, 35V 50V            |
| OPERATING TEMPERATURE      |   |                                    | -55 TO +125°C                      |                                    | -55-85C                           |
| CAPACITANCE CHARACTERISTIC | ±30ppm/°C   | ±15%                               | ±22%                               | +22% / -33%                        | ±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)<br>MIL-STD-202 Method 108 | - Test temp.: 125±3°C<br>- Un-powered<br>- Test Time: 1000+24/-0 hrs<br>- Measurement to be made after keeping at room temp. for 24±2 hrs.   | - No remarkable damage.<br>- Cap Change:<br>NPO: within ±2.5% or ±0.25pF whichever is larger<br>X7R: within ±10.00%<br>-Q/D.F. value:<br>NPO: Cap≥30pF, Q≥1000; Cap<30pF, Q≥400+20C<br>X7R: <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th>RATED VOL.</th> <th>D.F.≤</th> <th>EXCEPTION OF D.F. ≤</th> </tr> </thead> <tbody> <tr> <td rowspan="2">≥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 rowspan="2">≥50V</td> <td>≤20%</td> <td>0805 &gt; 0.22μF; 1210 ≥ 3.3μF</td> </tr> <tr> <td>≤6%</td> <td>0201(50V); 0603 ≥ 0.047μF; 0805 ≥ 0.18μF; 1206 ≥ 0.47μF</td> </tr> <tr> <td rowspan="2">35V</td> <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="2">25V</td> <td>≤5%</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 rowspan="2">16V</td> <td>≤14%</td> <td>0603 ≥ 0.33μF</td> </tr> <tr> <td>≤15%</td> <td>0201 ≥ 0.1μF; 0402 ≥ 0.056μF; 0603 ≥ 0.47μF; 0805 ≥ 2.2μF; 1206 ≥ 4.7μF; 1210 ≥ 22μF</td> </tr> <tr> <td rowspan="2">10V</td> <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="2">6.3V</td> <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>≤7.5%</td> <td>0201 ≥ 0.012μF; 0402 ≥ 0.15μF; 0603 ≥ 0.33μF; 0805 ≥ 2.2μF; 1206 ≥ 2.2μF; 1210 ≥ 22μF</td> </tr> <tr> <td>4V</td> <td>≤20%</td> <td>0201 ≥ 0.1μF; 0402 ≥ 1μF</td> </tr> </tbody> </table> <p>* I.R.: ≥10GΩ or RxC≥500Ω·F whichever is smaller.</p> | 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 | ≥50V  | ≤20%       | 0805 > 0.22μF; 1210 ≥ 3.3μF | ≤6%                 | 0201(50V); 0603 ≥ 0.047μF; 0805 ≥ 0.18μF; 1206 ≥ 0.47μF | 35V | ≤10%          | 0201 ≥ 0.01μF; 1210 ≥ 3.3μF | ≤20%   | 0402 ≥ 0.012μF; 0603 > 0.1μF; 0805/X7R> 0.47μF; 1206 ≥ 2.2μF; 1210 ≥ 10μF | 25V  | ≤5%                         | 0603 ≥ 1μF; 0805 ≥ 2.2μF; 1206 ≥ 2.2μF; 1210 ≥ 10μF | ≤10%  | 0201 ≥ 0.01μF; 0805 ≥ 1μF; 1210 ≥ 10μF | 16V  | ≤14%                        | 0603 ≥ 0.33μF | ≤15%  | 0201 ≥ 0.1μF; 0402 ≥ 0.056μF; 0603 ≥ 0.47μF; 0805 ≥ 2.2μF; 1206 ≥ 4.7μF; 1210 ≥ 22μF | 10V | ≤20%  | 0402 ≥ 0.33μF | ≤10%                                   | 0603 ≥ 0.15μF; 0805 ≥ 0.68μF; 120 ≥ 2.2μF; 1210 ≥ 4.7μF | 6.3V | ≤15%          | 0201 ≥ 0.022μF; 0402 ≥ 0.033μF; 0603 > 0.47μF; 0805 ≥ 2.2μF; 1206 ≥ 4.7μF; 1210 ≥ 22μF | ≤7.5%  | 0201 ≥ 0.012μF; 0402 ≥ 0.15μF; 0603 ≥ 0.33μF; 0805 ≥ 2.2μF; 1206 ≥ 2.2μF; 1210 ≥ 22μF | 4V   | ≤20%          | 0201 ≥ 0.1μF; 0402 ≥ 1μF |   |      |      |  |       |   |    |      |                          |
| 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   |  |            |             |                     |             |      |               |              |  |   |            |                             |                     |   |     |               |                             |  |   |      |                             |   |   |  |      |                             |               |   |  |     |   |               |  |   |      |               |  |  |   |      |               |                          |   |      |      |  |       |   |    |      |                          |
| ≥50V       | ≤20%  | 0805 > 0.22μF; 1210 ≥ 3.3μF  |  |            |             |                     |             |      |               |              |  |   |            |                             |                     |   |     |               |                             |  |   |      |                             |   |   |  |      |                             |               |   |  |     |   |               |  |   |      |               |  |  |   |      |               |                          |   |      |      |  |       |   |    |      |                          |
|            | ≤6%   | 0201(50V); 0603 ≥ 0.047μF; 0805 ≥ 0.18μF; 1206 ≥ 0.47μF  |  |            |             |                     |             |      |               |              |  |   |            |                             |                     |   |     |               |                             |  |   |      |                             |   |   |  |      |                             |               |   |  |     |   |               |  |   |      |               |  |  |   |      |               |                          |   |      |      |  |       |   |    |      |                          |
| 35V        | ≤10%  | 0201 ≥ 0.01μF; 1210 ≥ 3.3μF  |  |            |             |                     |             |      |               |              |  |   |            |                             |                     |   |     |               |                             |  |   |      |                             |   |   |  |      |                             |               |   |  |     |   |               |  |   |      |               |  |  |   |      |               |                          |   |      |      |  |       |   |    |      |                          |
|            | ≤20%  | 0402 ≥ 0.012μF; 0603 > 0.1μF; 0805/X7R> 0.47μF; 1206 ≥ 2.2μF; 1210 ≥ 10μF  |  |            |             |                     |             |      |               |              |  |   |            |                             |                     |   |     |               |                             |  |   |      |                             |   |   |  |      |                             |               |   |  |     |   |               |  |   |      |               |  |  |   |      |               |                          |   |      |      |  |       |   |    |      |                          |
| 25V        | ≤5%   | 0603 ≥ 1μF; 0805 ≥ 2.2μF; 1206 ≥ 2.2μF; 1210 ≥ 10μF  |  |            |             |                     |             |      |               |              |  |   |            |                             |                     |   |     |               |                             |  |   |      |                             |   |   |  |      |                             |               |   |  |     |   |               |  |   |      |               |  |  |   |      |               |                          |   |      |      |  |       |   |    |      |                          |
|            | ≤10%  | 0201 ≥ 0.01μF; 0805 ≥ 1μF; 1210 ≥ 10μF   |  |            |             |                     |             |      |               |              |  |   |            |                             |                     |   |     |               |                             |  |   |      |                             |   |   |  |      |                             |               |   |  |     |   |               |  |   |      |               |  |  |   |      |               |                          |   |      |      |  |       |   |    |      |                          |
| 16V        | ≤14%  | 0603 ≥ 0.33μF  |  |            |             |                     |             |      |               |              |  |   |            |                             |                     |   |     |               |                             |  |   |      |                             |   |   |  |      |                             |               |   |  |     |   |               |  |   |      |               |  |  |   |      |               |                          |   |      |      |  |       |   |    |      |                          |
|            | ≤15%  | 0201 ≥ 0.1μF; 0402 ≥ 0.056μF; 0603 ≥ 0.47μF; 0805 ≥ 2.2μF; 1206 ≥ 4.7μF; 1210 ≥ 22μF   |  |            |             |                     |             |      |               |              |  |   |            |                             |                     |   |     |               |                             |  |   |      |                             |   |   |  |      |                             |               |   |  |     |   |               |  |   |      |               |  |  |   |      |               |                          |   |      |      |  |       |   |    |      |                          |
| 10V        | ≤20%  | 0402 ≥ 0.33μF  |  |            |             |                     |             |      |               |              |  |   |            |                             |                     |   |     |               |                             |  |   |      |                             |   |   |  |      |                             |               |   |  |     |   |               |  |   |      |               |  |  |   |      |               |                          |   |      |      |  |       |   |    |      |                          |
|            | ≤10%  | 0603 ≥ 0.15μF; 0805 ≥ 0.68μF; 120 ≥ 2.2μF; 1210 ≥ 4.7μF  |  |            |             |                     |             |      |               |              |  |   |            |                             |                     |   |     |               |                             |  |   |      |                             |   |   |  |      |                             |               |   |  |     |   |               |  |   |      |               |  |  |   |      |               |                          |   |      |      |  |       |   |    |      |                          |
| 6.3V       | ≤15%  | 0201 ≥ 0.022μF; 0402 ≥ 0.033μF; 0603 > 0.47μF; 0805 ≥ 2.2μF; 1206 ≥ 4.7μF; 1210 ≥ 22μF   |  |            |             |                     |             |      |               |              |  |   |            |                             |                     |   |     |               |                             |  |   |      |                             |   |   |  |      |                             |               |   |  |     |   |               |  |   |      |               |  |  |   |      |               |                          |   |      |      |  |       |   |    |      |                          |
|            | ≤7.5%   | 0201 ≥ 0.012μF; 0402 ≥ 0.15μF; 0603 ≥ 0.33μF; 0805 ≥ 2.2μF; 1206 ≥ 2.2μF; 1210 ≥ 22μF  |  |            |             |                     |             |      |               |              |  |   |            |                             |                     |   |     |               |                             |  |   |      |                             |   |   |  |      |                             |               |   |  |     |   |               |  |   |      |               |  |  |   |      |               |                          |   |      |      |  |       |   |    |      |                          |
| 4V         | ≤20%  | 0201 ≥ 0.1μF; 0402 ≥ 1μF   |  |            |             |                     |             |      |               |              |  |   |            |                             |                     |   |     |               |                             |  |   |      |                             |   |   |  |      |                             |               |   |  |     |   |               |  |   |      |               |  |  |   |      |               |                          |   |      |      |  |       |   |    |      |                          |
| 3.         | Destructive Physical Analysis<br>EIA-469                      | -Per EIA-469   | -No defects or abnormalities   |            |             |                     |             |      |               |              |  |   |            |                             |                     |   |     |               |                             |  |   |      |                             |   |   |  |      |                             |               |   |  |     |   |               |  |   |      |               |  |  |   |      |               |                          |   |      |      |  |       |   |    |      |                          |
| 4.         | Temperature Cycling JESD22 Method JA-104                      | - Conduct 1000 cycles according to the temperatures and time. <table border="1" style="width: 100%; border-collapse: collapse; margin: 10px 0;"> <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> - Before initial measurement (X7R only):<br>Perform 150+0/-10* for 1 hr and then set for 24±2 hrs at room temp.<br>- Measurement to be made after keeping at room temp for 24±2hrs. | STEP   | TEMP. (°C) | TIME (MIN.) | 1                   | -55°C +0/-3 | 5 ±1 | 2             | +125°C +3/-0 | 5 ±1   | - No remarkable damage.<br>- Cap Change:<br>NPO: within ±2.5% or ±0.25pF whichever is larger<br>X7R: within ±10.0%<br>-Q/D.F. value:<br>NPO: Cap≥30pF, Q≥1000; Cap<30pF, Q≥400+20C<br>X7R: <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th>RATED VOL.</th> <th>D.F.≤</th> <th>EXCEPTION OF D.F. ≤</th> </tr> </thead> <tbody> <tr> <td rowspan="2">≥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 rowspan="2">≥50V</td> <td>≤20%</td> <td>0805 &gt; 0.22μF; 1210 ≥ 3.3μF</td> </tr> <tr> <td>≤6%</td> <td>0201(50V); 0603 ≥ 0.047μF; 0805 ≥ 0.18μF; 1206 ≥ 0.47μF</td> </tr> <tr> <td rowspan="2">35V</td> <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="2">25V</td> <td>≤5%</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 rowspan="2">16V</td> <td>≤14%</td> <td>0603 ≥ 0.33μF</td> </tr> <tr> <td>≤15%</td> <td>0201 ≥ 0.1μF; 0402 ≥ 0.056μF; 0603 ≥ 0.47μF; 0805 ≥ 2.2μF; 1206 ≥ 4.7μF; 1210 ≥ 22μF</td> </tr> <tr> <td rowspan="2">10V</td> <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="2">6.3V</td> <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>≤7.5%</td> <td>0201 ≥ 0.012μF; 0402 ≥ 0.15μF; 0603 ≥ 0.33μF; 0805 ≥ 2.2μF; 1206 ≥ 2.2μF; 1210 ≥ 22μF</td> </tr> <tr> <td>4V</td> <td>≤20%</td> <td>0201 ≥ 0.1μF; 0402 ≥ 1μF</td> </tr> </tbody> </table> <p>* I.R.: ≥10GΩ or RxC≥500Ω·F whichever is smaller.</p> | 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 | ≥50V  | ≤20% | 0805 > 0.22μF; 1210 ≥ 3.3μF | ≤6%   | 0201(50V); 0603 ≥ 0.047μF; 0805 ≥ 0.18μF; 1206 ≥ 0.47μF | 35V                                    | ≤10% | 0201 ≥ 0.01μF; 1210 ≥ 3.3μF | ≤20%          | 0402 ≥ 0.012μF; 0603 > 0.1μF; 0805/X7R> 0.47μF; 1206 ≥ 2.2μF; 1210 ≥ 10μF | 25V  | ≤5% | 0603 ≥ 1μF; 0805 ≥ 2.2μF; 1206 ≥ 2.2μF; 1210 ≥ 10μF | ≤10%          | 0201 ≥ 0.01μF; 0805 ≥ 1μF; 1210 ≥ 10μF | 16V   | ≤14% | 0603 ≥ 0.33μF | ≤15%   | 0201 ≥ 0.1μF; 0402 ≥ 0.056μF; 0603 ≥ 0.47μF; 0805 ≥ 2.2μF; 1206 ≥ 4.7μF; 1210 ≥ 22μF | 10V   | ≤20% | 0402 ≥ 0.33μF | ≤10%                     | 0603 ≥ 0.15μF; 0805 ≥ 0.68μF; 120 ≥ 2.2μF; 1210 ≥ 4.7μF | 6.3V | ≤15% | 0201 ≥ 0.022μF; 0402 ≥ 0.033μF; 0603 > 0.47μF; 0805 ≥ 2.2μF; 1206 ≥ 4.7μF; 1210 ≥ 22μF | ≤7.5% | 0201 ≥ 0.012μF; 0402 ≥ 0.15μF; 0603 ≥ 0.33μF; 0805 ≥ 2.2μF; 1206 ≥ 2.2μF; 1210 ≥ 22μF | 4V | ≤20% | 0201 ≥ 0.1μF; 0402 ≥ 1μF |
| STEP       | TEMP. (°C)  | TIME (MIN.)  |  |            |             |                     |             |      |               |              |  |   |            |                             |                     |   |     |               |                             |  |   |      |                             |   |   |  |      |                             |               |   |  |     |   |               |  |   |      |               |  |  |   |      |               |                          |   |      |      |  |       |   |    |      |                          |
| 1          | -55°C +0/-3   | 5 ±1   |  |            |             |                     |             |      |               |              |  |   |            |                             |                     |   |     |               |                             |  |   |      |                             |   |   |  |      |                             |               |   |  |     |   |               |  |   |      |               |  |  |   |      |               |                          |   |      |      |  |       |   |    |      |                          |
| 2          | +125°C +3/-0  | 5 ±1   |  |            |             |                     |             |      |               |              |  |   |            |                             |                     |   |     |               |                             |  |   |      |                             |   |   |  |      |                             |               |   |  |     |   |               |  |   |      |               |  |  |   |      |               |                          |   |      |      |  |       |   |    |      |                          |
| 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   |  |            |             |                     |             |      |               |              |  |   |            |                             |                     |   |     |               |                             |  |   |      |                             |   |   |  |      |                             |               |   |  |     |   |               |  |   |      |               |  |  |   |      |               |                          |   |      |      |  |       |   |    |      |                          |
| ≥50V       | ≤20%  | 0805 > 0.22μF; 1210 ≥ 3.3μF  |  |            |             |                     |             |      |               |              |  |   |            |                             |                     |   |     |               |                             |  |   |      |                             |   |   |  |      |                             |               |   |  |     |   |               |  |   |      |               |  |  |   |      |               |                          |   |      |      |  |       |   |    |      |                          |
|            | ≤6%   | 0201(50V); 0603 ≥ 0.047μF; 0805 ≥ 0.18μF; 1206 ≥ 0.47μF  |  |            |             |                     |             |      |               |              |  |   |            |                             |                     |   |     |               |                             |  |   |      |                             |   |   |  |      |                             |               |   |  |     |   |               |  |   |      |               |  |  |   |      |               |                          |   |      |      |  |       |   |    |      |                          |
| 35V        | ≤10%  | 0201 ≥ 0.01μF; 1210 ≥ 3.3μF  |  |            |             |                     |             |      |               |              |  |   |            |                             |                     |   |     |               |                             |  |   |      |                             |   |   |  |      |                             |               |   |  |     |   |               |  |   |      |               |  |  |   |      |               |                          |   |      |      |  |       |   |    |      |                          |
|            | ≤20%  | 0402 ≥ 0.012μF; 0603 > 0.1μF; 0805/X7R> 0.47μF; 1206 ≥ 2.2μF; 1210 ≥ 10μF  |  |            |             |                     |             |      |               |              |  |   |            |                             |                     |   |     |               |                             |  |   |      |                             |   |   |  |      |                             |               |   |  |     |   |               |  |   |      |               |  |  |   |      |               |                          |   |      |      |  |       |   |    |      |                          |
| 25V        | ≤5%   | 0603 ≥ 1μF; 0805 ≥ 2.2μF; 1206 ≥ 2.2μF; 1210 ≥ 10μF  |  |            |             |                     |             |      |               |              |  |   |            |                             |                     |   |     |               |                             |  |   |      |                             |   |   |  |      |                             |               |   |  |     |   |               |  |   |      |               |  |  |   |      |               |                          |   |      |      |  |       |   |    |      |                          |
|            | ≤10%  | 0201 ≥ 0.01μF; 0805 ≥ 1μF; 1210 ≥ 10μF   |  |            |             |                     |             |      |               |              |  |   |            |                             |                     |   |     |               |                             |  |   |      |                             |   |   |  |      |                             |               |   |  |     |   |               |  |   |      |               |  |  |   |      |               |                          |   |      |      |  |       |   |    |      |                          |
| 16V        | ≤14%  | 0603 ≥ 0.33μF  |  |            |             |                     |             |      |               |              |  |   |            |                             |                     |   |     |               |                             |  |   |      |                             |   |   |  |      |                             |               |   |  |     |   |               |  |   |      |               |  |  |   |      |               |                          |   |      |      |  |       |   |    |      |                          |
|            | ≤15%  | 0201 ≥ 0.1μF; 0402 ≥ 0.056μF; 0603 ≥ 0.47μF; 0805 ≥ 2.2μF; 1206 ≥ 4.7μF; 1210 ≥ 22μF   |  |            |             |                     |             |      |               |              |  |   |            |                             |                     |   |     |               |                             |  |   |      |                             |   |   |  |      |                             |               |   |  |     |   |               |  |   |      |               |  |  |   |      |               |                          |   |      |      |  |       |   |    |      |                          |
| 10V        | ≤20%  | 0402 ≥ 0.33μF  |  |            |             |                     |             |      |               |              |  |   |            |                             |                     |   |     |               |                             |  |   |      |                             |   |   |  |      |                             |               |   |  |     |   |               |  |   |      |               |  |  |   |      |               |                          |   |      |      |  |       |   |    |      |                          |
|            | ≤10%  | 0603 ≥ 0.15μF; 0805 ≥ 0.68μF; 120 ≥ 2.2μF; 1210 ≥ 4.7μF  |  |            |             |                     |             |      |               |              |  |   |            |                             |                     |   |     |               |                             |  |   |      |                             |   |   |  |      |                             |               |   |  |     |   |               |  |   |      |               |  |  |   |      |               |                          |   |      |      |  |       |   |    |      |                          |
| 6.3V       | ≤15%  | 0201 ≥ 0.022μF; 0402 ≥ 0.033μF; 0603 > 0.47μF; 0805 ≥ 2.2μF; 1206 ≥ 4.7μF; 1210 ≥ 22μF   |  |            |             |                     |             |      |               |              |  |   |            |                             |                     |   |     |               |                             |  |   |      |                             |   |   |  |      |                             |               |   |  |     |   |               |  |   |      |               |  |  |   |      |               |                          |   |      |      |  |       |   |    |      |                          |
|            | ≤7.5%   | 0201 ≥ 0.012μF; 0402 ≥ 0.15μF; 0603 ≥ 0.33μF; 0805 ≥ 2.2μF; 1206 ≥ 2.2μF; 1210 ≥ 22μF  |  |            |             |                     |             |      |               |              |  |   |            |                             |                     |   |     |               |                             |  |   |      |                             |   |   |  |      |                             |               |   |  |     |   |               |  |   |      |               |  |  |   |      |               |                          |   |      |      |  |       |   |    |      |                          |
| 4V         | ≤20%  | 0201 ≥ 0.1μF; 0402 ≥ 1μF   |  |            |             |                     |             |      |               |              |  |   |            |                             |                     |   |     |               |                             |  |   |      |                             |   |   |  |      |                             |               |   |  |     |   |               |  |   |      |               |  |  |   |      |               |                          |   |      |      |  |       |   |    |      |                          |



| NO.   | TEST ITEM  | TEST CONDITION   | REQUIREMENTS   |   |            |                     |                     |       |                   |  |  |                                  |      |   |   |  |  |     |  |  |   |                    |     |   |   |  |  |     |   |   |  |                               |       |                               |                               |   |   |      |   |   |               |                       |                             |   |  |  |  |  |   |   |                       |               |                       |                             |   |  |  |  |  |   |                       |
|---|--|--|--|---|------------|---------------------|---------------------|-------|-------------------|--|--|----------------------------------|------|---|---|--|--|-----|--|--|---|--------------------|-----|---|---|--|--|-----|---|---|--|-------------------------------|-------|-------------------------------|-------------------------------|---|---|------|---|---|---------------|-----------------------|-----------------------------|---|--|--|--|--|---|---|-----------------------|---------------|-----------------------|-----------------------------|---|--|--|--|--|---|-----------------------|
| 5.  | Moisture Resistance<br>MIL-STD-202<br>Method 106             | - Test temp.: 25~65°C<br>- Humidity: 80~100% RH<br>- Test Time: 10 cycles, t=24hrs/cycle<br>- Measurement to be made after keeping at room temp. for 24±2 hrs. | - No remarkable damage.<br>- Cap Change:<br>NPO: within ±3.0% or ±0.30pF whichever is larger<br>X7R: within ±12.5%<br>-Q/D.F. value:<br>NPO: More than 30pF, Q≥350; 10pF≤C≤30pF, Q≥275+2.5C<br>Less than 10pf Q≥200+10C<br>X7R:<br><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 rowspan="3">≤3%</td> <td>≤6% 1206 ≥ 0.47μF</td> </tr> <tr> <td>≤7.5% 0603 ≥ 0.068μF; 0805 ≥ 0.1μF; 1206 ≥ 1μF; 1210 ≥ 2.2μF</td> </tr> <tr> <td>≤20% 0805 &gt; 0.22μF; 1210 ≥ 3.3μF</td> </tr> <tr> <td rowspan="3">≥50V</td> <td rowspan="3">≤3%</td> <td>≤6% 0201(50V); 0603 ≥ 0.047μF; 0805 ≥ 0.18μF; 1206 ≥ 0.47μF</td> </tr> <tr> <td>≤10% 0201 ≥ 0.01μF; 1210 ≥ 3.3μF</td> </tr> <tr> <td>≤20% 0402 ≥ 0.012μF; 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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               | ≤3%   | ≤6% 1206 ≥ 0.47μF | ≤7.5% 0603 ≥ 0.068μF; 0805 ≥ 0.1μF; 1206 ≥ 1μF; 1210 ≥ 2.2μF | ≤20% 0805 > 0.22μF; 1210 ≥ 3.3μF                             | ≥50V                             | ≤3%  | ≤6% 0201(50V); 0603 ≥ 0.047μF; 0805 ≥ 0.18μF; 1206 ≥ 0.47μF | ≤10% 0201 ≥ 0.01μF; 1210 ≥ 3.3μF                            | ≤20% 0402 ≥ 0.012μF; 0603 > 0.1μF; 0805(X7R) 0.47μF; 1206 ≥ 2.2μF; 1210 ≥ 10μF | 35V  | ≤5% | ≤20% 0603 ≥ 1μF; 0805 ≥ 2.2μF; 1206 ≥ 2.2μF; 1210 ≥ 10μF | ≤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; 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1206 ≥ 4.7μF; 1210 ≥ 47μF | 6.3V; 4V; Size ≥ 1812   |                       |               |                       |                             |   |  |  |  |  |   |                       |
| RATED VOL.  | D.F.≤  | EXCEPTION OF D.F. ≤  |  |   |            |                     |                     |       |                   |  |  |                                  |      |   |   |  |  |     |  |  |   |                    |     |   |   |  |  |     |   |   |  |                               |       |                               |                               |   |   |      |   |   |               |                       |                             |   |  |  |  |  |   |   |                       |               |                       |                             |   |  |  |  |  |   |                       |
| ≥100V   | ≤3%  | ≤6% 1206 ≥ 0.47μF  |  |   |            |                     |                     |       |                   |  |  |                                  |      |   |   |  |  |     |  |  |   |                    |     |   |   |  |  |     |   |   |  |                               |       |                               |                               |   |   |      |   |   |               |                       |                             |   |  |  |  |  |   |   |                       |               |                       |                             |   |  |  |  |  |   |                       |
|   |  | ≤7.5% 0603 ≥ 0.068μF; 0805 ≥ 0.1μF; 1206 ≥ 1μF; 1210 ≥ 2.2μF   |  |   |            |                     |                     |       |                   |  |  |                                  |      |   |   |  |  |     |  |  |   |                    |     |   |   |  |  |     |   |   |  |                               |       |                               |                               |   |   |      |   |   |               |                       |                             |   |  |  |  |  |   |   |                       |               |                       |                             |   |  |  |  |  |   |                       |
|   |  | ≤20% 0805 > 0.22μF; 1210 ≥ 3.3μF   |  |   |            |                     |                     |       |                   |  |  |                                  |      |   |   |  |  |     |  |  |   |                    |     |   |   |  |  |     |   |   |  |                               |       |                               |                               |   |   |      |   |   |               |                       |                             |   |  |  |  |  |   |   |                       |               |                       |                             |   |  |  |  |  |   |                       |
| ≥50V  | ≤3%  | ≤6% 0201(50V); 0603 ≥ 0.047μF; 0805 ≥ 0.18μF; 1206 ≥ 0.47μF  |  |   |            |                     |                     |       |                   |  |  |                                  |      |   |   |  |  |     |  |  |   |                    |     |   |   |  |  |     |   |   |  |                               |       |                               |                               |   |   |      |   |   |               |                       |                             |   |  |  |  |  |   |   |                       |               |                       |                             |   |  |  |  |  |   |                       |
|   |  | ≤10% 0201 ≥ 0.01μF; 1210 ≥ 3.3μF   |  |   |            |                     |                     |       |                   |  |  |                                  |      |   |   |  |  |     |  |  |   |                    |     |   |   |  |  |     |   |   |  |                               |       |                               |                               |   |   |      |   |   |               |                       |                             |   |  |  |  |  |   |   |                       |               |                       |                             |   |  |  |  |  |   |                       |
|   |  | ≤20% 0402 ≥ 0.012μF; 0603 > 0.1μF; 0805(X7R) 0.47μF; 1206 ≥ 2.2μF; 1210 ≥ 10μF   |  |   |            |                     |                     |       |                   |  |  |                                  |      |   |   |  |  |     |  |  |   |                    |     |   |   |  |  |     |   |   |  |                               |       |                               |                               |   |   |      |   |   |               |                       |                             |   |  |  |  |  |   |   |                       |               |                       |                             |   |  |  |  |  |   |                       |
| 35V   | ≤5%  | ≤20% 0603 ≥ 1μF; 0805 ≥ 2.2μF; 1206 ≥ 2.2μF; 1210 ≥ 10μF   |  |   |            |                     |                     |       |                   |  |  |                                  |      |   |   |  |  |     |  |  |   |                    |     |   |   |  |  |     |   |   |  |                               |       |                               |                               |   |   |      |   |   |               |                       |                             |   |  |  |  |  |   |   |                       |               |                       |                             |   |  |  |  |  |   |                       |
|   |  | ≤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  |  |   |            |                     |                     |       |                   |  |  |                                  |      |   |   |  |  |     |  |  |   |                    |     |   |   |  |  |     |   |   |  |                               |       |                               |                               |   |   |      |   |   |               |                       |                             |   |  |  |  |  |   |   |                       |               |                       |                             |   |  |  |  |  |   |                       |
|   |  | ≤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%  | ≤15% 0201 ≥ 0.1μF; 0402 ≥ 1μF  |  |   |            |                     |                     |       |                   |  |  |                                  |      |   |   |  |  |     |  |  |   |                    |     |   |   |  |  |     |   |   |  |                               |       |                               |                               |   |   |      |   |   |               |                       |                             |   |  |  |  |  |   |   |                       |               |                       |                             |   |  |  |  |  |   |                       |
|   |  | ≤20% 0201 ≥ 0.1μF; 0402 ≥ 1μF  |  |   |            |                     |                     |       |                   |  |  |                                  |      |   |   |  |  |     |  |  |   |                    |     |   |   |  |  |     |   |   |  |                               |       |                               |                               |   |   |      |   |   |               |                       |                             |   |  |  |  |  |   |   |                       |               |                       |                             |   |  |  |  |  |   |                       |
|   |  | ≤30% 0201 ≥ 0.1μF; 0402 ≥ 1μF; 0603 ≥ 10μF; 0805 ≥ 4.7μF; 1206 ≥ 47μF; 1210 ≥ 100μF  |  |   |            |                     |                     |       |                   |  |  |                                  |      |   |   |  |  |     |  |  |   |                    |     |   |   |  |  |     |   |   |  |                               |       |                               |                               |   |   |      |   |   |               |                       |                             |   |  |  |  |  |   |   |                       |               |                       |                             |   |  |  |  |  |   |                       |
| 6.3V  | ≤15%   | ≤30% 0201 ≥ 0.1μF; 0402 ≥ 1μF; 0603 ≥ 10μF; 0805 ≥ 4.7μF; 1206 ≥ 47μF; 1210 ≥ 100μF  |  |   |            |                     |                     |       |                   |  |  |                                  |      |   |   |  |  |     |  |  |   |                    |     |   |   |  |  |     |   |   |  |                               |       |                               |                               |   |   |      |   |   |               |                       |                             |   |  |  |  |  |   |   |                       |               |                       |                             |   |  |  |  |  |   |                       |
|   |  | ≤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   |  |  |  |   |            |                     |                     |       |                   |  |  |                                  |      |   |   |  |  |     |  |  |   |                    |     |   |   |  |  |     |   |   |  |                               |       |                               |                               |   |   |      |   |   |               |                       |                             |   |  |  |  |  |   |   |                       |               |                       |                             |   |  |  |  |  |   |                       |
| 6.  |  | Biased Humidity<br>MIL-STD-202<br>Method 103   | - Test Temp.: 85±3°C<br>- Humidity: 85%RH<br>- Test Time: 1000+24/-0 hrs<br>- To apply voltage: rated voltage (Max.500V) and 1.3~1.5Vdc (add 100k ohm resistor)<br>- Before initial measurement (Class II only): To apply test voltage for 1hr at test temp. and then set 24±2 hrs at room temp.<br>- Measurement to be made after keeping at room temp. for 24±2hrs.  | - No remarkable damage.<br>- Cap Change:<br>NPO: within ±3.0% or ±0.30pF whichever is larger<br>X7R: within ±12.5%<br>-Q/D.F. value:<br>NPO: C≥30pF, Q≥200; Cap<30pF, Q≥100+10/3C<br>X7R:<br><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 rowspan="3">≤3%</td> <td>≤6% 1206 ≥ 0.47μF</td> </tr> <tr> <td>≤7.5% 0603 ≥ 0.068μF; 0805 ≥ 0.1μF; 1206 ≥ 1μF; 1210 ≥ 2.2μF</td> </tr> <tr> <td>≤20% 0805 &gt; 0.22μF; 1210 ≥ 3.3μF</td> </tr> <tr> <td rowspan="3">≥50V</td> <td rowspan="3">≤3%</td> <td>≤6% 0201(50V); 0603 ≥ 0.047μF; 0805 ≥ 0.18μF; 1206 ≥ 0.47μF</td> </tr> <tr> <td>≤10% 0201 ≥ 0.01μF; 1210 ≥ 3.3μF</td> </tr> <tr> <td>≤20% 0402 ≥ 0.012μF; 0603 &gt; 0.1μF; 0805(X7R) 0.47μF; 1206 ≥ 2.2μF; 1210 ≥ 10μF</td> </tr> <tr> <td rowspan="3">35V</td> <td rowspan="3">≤5%</td> <td>≤20% 0603 ≥ 1μF; 0805 ≥ 2.2μF; 1206 ≥ 2.2μF; 1210 ≥ 10μF</td> </tr> <tr> <td>≤10% 0201 ≥ 0.01μF; 0805 ≥ 1μF; 1210 ≥ 10μF</td> </tr> <tr> <td>≤14% 0603 ≥ 0.33μF</td> </tr> <tr> <td rowspan="3">25V</td> <td rowspan="3">≤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% 0402 ≥ 0.33μF</td> </tr> <tr> <td>≤10% 0603 ≥ 0.15μF; 0805 ≥ 0.68μF; 120 ≥ 2.2μF; 1210 ≥ 4.7μF</td> </tr> <tr> <td rowspan="3">16V</td> <td rowspan="3">≤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>≤15% 0201 ≥ 0.012μF; 0402 ≥ 0.15μF; 0603 ≥ 0.33μF; 0805 ≥ 2.2μF; 1206 ≥ 2.2μF; 1210 ≥ 22μF</td> </tr> <tr> <td>≤20% 0201 ≥ 0.1μF; 0402 ≥ 1μF</td> </tr> <tr> <td rowspan="3">10V</td> <td rowspan="3">≤7.5%</td> <td>≤15% 0201 ≥ 0.1μF; 0402 ≥ 1μF</td> </tr> <tr> <td>≤20% 0201 ≥ 0.1μF; 0402 ≥ 1μF</td> </tr> <tr> <td>≤30% 0201 ≥ 0.1μF; 0402 ≥ 1μF; 0603 ≥ 10μF; 0805 ≥ 4.7μF; 1206 ≥ 47μF; 1210 ≥ 100μF</td> </tr> <tr> <td rowspan="2">6.3V</td> <td rowspan="2">≤15%</td> <td>≤30% 0201 ≥ 0.1μF; 0402 ≥ 1μF; 0603 ≥ 10μF; 0805 ≥ 4.7μF; 1206 ≥ 47μF; 1210 ≥ 100μF</td> </tr> <tr> <td>≤20% --- ---</td> </tr> </tbody> </table> <p>*1.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; 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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 | ≤3%               | ≤6% 1206 ≥ 0.47μF  | ≤7.5% 0603 ≥ 0.068μF; 0805 ≥ 0.1μF; 1206 ≥ 1μF; 1210 ≥ 2.2μF | ≤20% 0805 > 0.22μF; 1210 ≥ 3.3μF | ≥50V | ≤3%   | ≤6% 0201(50V); 0603 ≥ 0.047μF; 0805 ≥ 0.18μF; 1206 ≥ 0.47μF | ≤10% 0201 ≥ 0.01μF; 1210 ≥ 3.3μF   | ≤20% 0402 ≥ 0.012μF; 0603 > 0.1μF; 0805(X7R) 0.47μF; 1206 ≥ 2.2μF; 1210 ≥ 10μF | 35V | ≤5%  | ≤20% 0603 ≥ 1μF; 0805 ≥ 2.2μF; 1206 ≥ 2.2μF; 1210 ≥ 10μF | ≤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 | ≤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%                         | ≤15% 0201 ≥ 0.1μF; 0402 ≥ 1μF | ≤20% 0201 ≥ 0.1μF; 0402 ≥ 1μF   | ≤30% 0201 ≥ 0.1μF; 0402 ≥ 1μF; 0603 ≥ 10μF; 0805 ≥ 4.7μF; 1206 ≥ 47μF; 1210 ≥ 100μF | 6.3V | ≤15%  | ≤30% 0201 ≥ 0.1μF; 0402 ≥ 1μF; 0603 ≥ 10μF; 0805 ≥ 4.7μF; 1206 ≥ 47μF; 1210 ≥ 100μF | ≤20% --- ---  | RATED VOLTAGE         | INSULATION RESISTANCE       | 100V: All X7R; 1210 ≥ 3.3μF               | 500MΩ or RxC ≥ 5 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 | 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 |
| RATED VOL.  |  | D.F.≤  | EXCEPTION OF D.F. ≤  |   |            |                     |                     |       |                   |  |  |                                  |      |   |   |  |  |     |  |  |   |                    |     |   |   |  |  |     |   |   |  |                               |       |                               |                               |   |   |      |   |   |               |                       |                             |   |  |  |  |  |   |   |                       |               |                       |                             |   |  |  |  |  |   |                       |
| ≥100V   |  | ≤3%  | ≤6% 1206 ≥ 0.47μF  |   |            |                     |                     |       |                   |  |  |                                  |      |   |   |  |  |     |  |  |   |                    |     |   |   |  |  |     |   |   |  |                               |       |                               |                               |   |   |      |   |   |               |                       |                             |   |  |  |  |  |   |   |                       |               |                       |                             |   |  |  |  |  |   |                       |
|   | ≤7.5% 0603 ≥ 0.068μF; 0805 ≥ 0.1μF; 1206 ≥ 1μF; 1210 ≥ 2.2μF |  |  |   |            |                     |                     |       |                   |  |  |                                  |      |   |   |  |  |     |  |  |   |                    |     |   |   |  |  |     |   |   |  |                               |       |                               |                               |   |   |      |   |   |               |                       |                             |   |  |  |  |  |   |   |                       |               |                       |                             |   |  |  |  |  |   |                       |
|   | ≤20% 0805 > 0.22μF; 1210 ≥ 3.3μF                             |  |  |   |            |                     |                     |       |                   |  |  |                                  |      |   |   |  |  |     |  |  |   |                    |     |   |   |  |  |     |   |   |  |                               |       |                               |                               |   |   |      |   |   |               |                       |                             |   |  |  |  |  |   |   |                       |               |                       |                             |   |  |  |  |  |   |                       |
| ≥50V  | ≤3%  | ≤6% 0201(50V); 0603 ≥ 0.047μF; 0805 ≥ 0.18μF; 1206 ≥ 0.47μF  |  |   |            |                     |                     |       |                   |  |  |                                  |      |   |   |  |  |     |  |  |   |                    |     |   |   |  |  |     |   |   |  |                               |       |                               |                               |   |   |      |   |   |               |                       |                             |   |  |  |  |  |   |   |                       |               |                       |                             |   |  |  |  |  |   |                       |
|   |  | ≤10% 0201 ≥ 0.01μF; 1210 ≥ 3.3μF   |  |   |            |                     |                     |       |                   |  |  |                                  |      |   |   |  |  |     |  |  |   |                    |     |   |   |  |  |     |   |   |  |                               |       |                               |                               |   |   |      |   |   |               |                       |                             |   |  |  |  |  |   |   |                       |               |                       |                             |   |  |  |  |  |   |                       |
|   |  | ≤20% 0402 ≥ 0.012μF; 0603 > 0.1μF; 0805(X7R) 0.47μF; 1206 ≥ 2.2μF; 1210 ≥ 10μF   |  |   |            |                     |                     |       |                   |  |  |                                  |      |   |   |  |  |     |  |  |   |                    |     |   |   |  |  |     |   |   |  |                               |       |                               |                               |   |   |      |   |   |               |                       |                             |   |  |  |  |  |   |   |                       |               |                       |                             |   |  |  |  |  |   |                       |
| 35V   | ≤5%  | ≤20% 0603 ≥ 1μF; 0805 ≥ 2.2μF; 1206 ≥ 2.2μF; 1210 ≥ 10μF   |  |   |            |                     |                     |       |                   |  |  |                                  |      |   |   |  |  |     |  |  |   |                    |     |   |   |  |  |     |   |   |  |                               |       |                               |                               |   |   |      |   |   |               |                       |                             |   |  |  |  |  |   |   |                       |               |                       |                             |   |  |  |  |  |   |                       |
|   |  | ≤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  |  |   |            |                     |                     |       |                   |  |  |                                  |      |   |   |  |  |     |  |  |   |                    |     |   |   |  |  |     |   |   |  |                               |       |                               |                               |   |   |      |   |   |               |                       |                             |   |  |  |  |  |   |   |                       |               |                       |                             |   |  |  |  |  |   |                       |
|   |  | ≤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%  | ≤15% 0201 ≥ 0.1μF; 0402 ≥ 1μF  |  |   |            |                     |                     |       |                   |  |  |                                  |      |   |   |  |  |     |  |  |   |                    |     |   |   |  |  |     |   |   |  |                               |       |                               |                               |   |   |      |   |   |               |                       |                             |   |  |  |  |  |   |   |                       |               |                       |                             |   |  |  |  |  |   |                       |
|   |  | ≤20% 0201 ≥ 0.1μF; 0402 ≥ 1μF  |  |   |            |                     |                     |       |                   |  |  |                                  |      |   |   |  |  |     |  |  |   |                    |     |   |   |  |  |     |   |   |  |                               |       |                               |                               |   |   |      |   |   |               |                       |                             |   |  |  |  |  |   |   |                       |               |                       |                             |   |  |  |  |  |   |                       |
|   |  | ≤30% 0201 ≥ 0.1μF; 0402 ≥ 1μF; 0603 ≥ 10μF; 0805 ≥ 4.7μF; 1206 ≥ 47μF; 1210 ≥ 100μF  |  |   |            |                     |                     |       |                   |  |  |                                  |      |   |   |  |  |     |  |  |   |                    |     |   |   |  |  |     |   |   |  |                               |       |                               |                               |   |   |      |   |   |               |                       |                             |   |  |  |  |  |   |   |                       |               |                       |                             |   |  |  |  |  |   |                       |
| 6.3V  | ≤15%   | ≤30% 0201 ≥ 0.1μF; 0402 ≥ 1μF; 0603 ≥ 10μF; 0805 ≥ 4.7μF; 1206 ≥ 47μF; 1210 ≥ 100μF  |  |   |            |                     |                     |       |                   |  |  |                                  |      |   |   |  |  |     |  |  |   |                    |     |   |   |  |  |     |   |   |  |                               |       |                               |                               |   |   |      |   |   |               |                       |                             |   |  |  |  |  |   |   |                       |               |                       |                             |   |  |  |  |  |   |                       |
|   |  | ≤20% --- ---   |  |   |            |                     |                     |       |                   |  |  |                                  |      |   |   |  |  |     |  |  |   |                    |     |   |   |  |  |     |   |   |  |                               |       |                               |                               |   |   |      |   |   |               |                       |                             |   |  |  |  |  |   |   |                       |               |                       |                             |   |  |  |  |  |   |                       |
| RATED VOLTAGE   | INSULATION RESISTANCE  |  |  |   |            |                     |                     |       |                   |  |  |                                  |      |   |   |  |  |     |  |  |   |                    |     |   |   |  |  |     |   |   |  |                               |       |                               |                               |   |   |      |   |   |               |                       |                             |   |  |  |  |  |   |   |                       |               |                       |                             |   |  |  |  |  |   |                       |
| 100V: All X7R; 1210 ≥ 3.3μF   | 500MΩ or RxC ≥ 5 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   |  |  |  |   |            |                     |                     |       |                   |  |  |                                  |      |   |   |  |  |     |  |  |   |                    |     |   |   |  |  |     |   |   |  |                               |       |                               |                               |   |   |      |   |   |               |                       |                             |   |  |  |  |  |   |   |                       |               |                       |                             |   |  |  |  |  |   |                       |
| 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   |  |  |  |   |            |                     |                     |       |                   |  |  |                                  |      |   |   |  |  |     |  |  |   |                    |     |   |   |  |  |     |   |   |  |                               |       |                               |                               |   |   |      |   |   |               |                       |                             |   |  |  |  |  |   |   |                       |               |                       |                             |   |  |  |  |  |   |                       |

\* "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  |            |             |                          |                    |              |   |                   |  |     |  |     |              |  |     |   |     |              |   |      |   |    |                 |     |               |                       |   |  |   |   |   |   |  |                            |     |  |     |  |     |  |
|---|--|---|---|------------|-------------|--------------------------|--------------------|--------------|---|-------------------|--|-----|--|-----|--------------|--|-----|---|-----|--------------|---|------|---|----|-----------------|-----|---------------|-----------------------|---|--|---|---|---|---|--|----------------------------|-----|--|-----|--|-----|--|
| 7.  | Operational Life<br>MIL-STD-202<br>Method 108                                    | <ul style="list-style-type: none"> <li>- Test temp.:<br/>Maximum Operating Temperature <math>\pm 3^{\circ}\text{C}</math></li> <li>- To apply voltage:<br/>(1) <math>10\text{V} \leq \text{Ur} \leq 250\text{V}</math>: 200% of rated voltage.<br/>(2) 150% of rated voltage:<br/>a) 500V<br/>b) <math>\leq 6.3\text{V}</math> or <math>\text{C} \geq 10\mu\text{F}</math><br/>c) <math>0603/\text{X7R}/50\text{V}/\text{Cap.} &gt; 0.1\mu\text{F}</math><br/><math>0603/\text{X7R}/\leq 25\text{V}/\text{Cap.} \geq 1.0\mu\text{F}</math><br/>d) <math>0805/\text{X7R}/50\text{V}/\text{Cap.} \geq 0.68\mu\text{F}</math><br/>e) <math>1206/\text{X7R}/100\text{V}/\text{Cap.} \geq 1.0\mu\text{F}</math><br/>f) <math>1210/\text{X7R}/50\text{V}\&amp;100\text{V}/\text{Cap.} \geq 2.2\mu\text{F}</math><br/>(3) <math>630\text{V} \leq \text{Ur} \leq 1000\text{V}</math>: 120% of rated voltage.</li> <li>- Test time: <math>1000+24/-0</math> hrs.</li> <li>- Before initial measurement (X7R only):<br/>Apply test voltage for 1 hr at <math>125^{\circ}\text{C}</math>.<br/>Remove and let set for <math>24 \pm 2</math> hrs at room temp.</li> <li>- Measurement to be made after keeping at room temp. for <math>24 \pm 2</math> hrs.</li> </ul> | <ul style="list-style-type: none"> <li>- No remarkable damage.</li> <li>- Cap Change:<br/>NPO: within <math>\pm 3.0\%</math> or <math>\pm 0.30\text{pF}</math> whichever is larger<br/>X7R: within <math>\pm 12.5\%</math></li> <li>-Q/D.F. value:<br/>NPO: More than 30pF, <math>\text{Q} \geq 350</math>; <math>10\text{pF} \leq \text{C} \leq 30\text{pF}</math>, <math>\text{Q} \geq 275+2.5\text{C}</math><br/>less than 10pF <math>\text{Q} \geq 200+10\text{C}</math></li> </ul> <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 rowspan="3"><math>\geq 100\text{V}</math></td> <td><math>\leq 3\%</math></td> <td><math>\leq 6\%</math> 1206 <math>\geq 0.47\mu\text{F}</math><br/><math>\leq 7.5\%</math> 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><br/><math>\leq 20\%</math> 0805 <math>&gt; 0.22\mu\text{F}</math>; 1210 <math>\geq 3.3\mu\text{F}</math></td> </tr> <tr> <td><math>\leq 5\text{V}</math></td> <td><math>\leq 6\%</math> 0201(50V); 0603 <math>\geq 0.047\mu\text{F}</math>; 0805 <math>\geq 0.18\mu\text{F}</math>; 1206 <math>\geq 0.47\mu\text{F}</math><br/><math>\leq 10\%</math> 0201 <math>\geq 0.01\mu\text{F}</math>; 1210 <math>\geq 3.3\mu\text{F}</math><br/><math>\leq 20\%</math> 0402 <math>\geq 0.012\mu\text{F}</math>; 0603 <math>&gt; 0.1\mu\text{F}</math>; 0805/X7R <math>&gt; 0.47\mu\text{F}</math>; 1206 <math>\geq 2.2\mu\text{F}</math>; 1210 <math>\geq 10\mu\text{F}</math></td> </tr> <tr> <td>35V</td> <td><math>\leq 20\%</math> 0603 <math>\geq 1\mu\text{F}</math>; 0805 <math>\geq 2.2\mu\text{F}</math>; 1206 <math>\geq 2.2\mu\text{F}</math>; 1210 <math>\geq 10\mu\text{F}</math><br/><math>\leq 10\%</math> 0201 <math>\geq 0.01\mu\text{F}</math>; 0805 <math>\geq 1\mu\text{F}</math>; 1210 <math>\geq 10\mu\text{F}</math></td> </tr> <tr> <td rowspan="2">25V</td> <td><math>\leq 5\%</math></td> <td><math>\leq 14\%</math> 0603 <math>\geq 0.33\mu\text{F}</math><br/><math>\leq 15\%</math> 0201 <math>\geq 0.1\mu\text{F}</math>; 0402 <math>\geq 0.056\mu\text{F}</math>; 0603 <math>\geq 0.47\mu\text{F}</math>; 0805 <math>\geq 2.2\mu\text{F}</math>; 1206 <math>\geq 4.7\mu\text{F}</math>; 1210 <math>\geq 22\mu\text{F}</math><br/><math>\leq 20\%</math> 0402 <math>\geq 0.33\mu\text{F}</math></td> </tr> <tr> <td>16V</td> <td><math>\leq 10\%</math> 0603 <math>\geq 0.15\mu\text{F}</math>; 0805 <math>\geq 0.68\mu\text{F}</math>; 1206 <math>\geq 2.2\mu\text{F}</math>; 1210 <math>\geq 4.7\mu\text{F}</math><br/><math>\leq 15\%</math> 0201 <math>\geq 0.022\mu\text{F}</math>; 0402 <math>\geq 0.033\mu\text{F}</math>; 0603 <math>&gt; 0.47\mu\text{F}</math>; 0805 <math>\geq 2.2\mu\text{F}</math>; 1206 <math>\geq 4.7\mu\text{F}</math>; 1210 <math>\geq 22\mu\text{F}</math></td> </tr> <tr> <td rowspan="2">10V</td> <td><math>\leq 7.5\%</math></td> <td><math>\leq 15\%</math> 0201 <math>\geq 0.012\mu\text{F}</math>; 0402 <math>\geq 0.15\mu\text{F}</math>; 0603 <math>\geq 0.33\mu\text{F}</math>; 0805 <math>\geq 2.2\mu\text{F}</math>; 1206 <math>\geq 2.2\mu\text{F}</math>; 1210 <math>\geq 22\mu\text{F}</math><br/><math>\leq 20\%</math> 0201 <math>\geq 0.1\mu\text{F}</math>; 0402 <math>\geq 1\mu\text{F}</math></td> </tr> <tr> <td>6.3V</td> <td><math>\leq 15\%</math> 0201 <math>\geq 0.1\mu\text{F}</math>; 0402 <math>\geq 1\mu\text{F}</math>; 0603 <math>\geq 10\mu\text{F}</math>; 0805 <math>\geq 4.7\mu\text{F}</math>; 1206 <math>\geq 47\mu\text{F}</math>; 1210 <math>\geq 100\mu\text{F}</math></td> </tr> <tr> <td>4V</td> <td><math>\leq 20\%</math> ---</td> <td>---</td> </tr> </tbody> </table> <p>I.R.: <math>\geq 1\text{G}\Omega</math> OR <math>\text{RxC} \geq 50\Omega\text{-F}</math> whichever is smaller<br/>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 <math>\geq 3.3\mu\text{F}</math></td> <td rowspan="10"><math>1\text{G}\Omega</math> or <math>\text{RxC} \geq 10\Omega\text{-F}</math> whichever is smaller.</td> </tr> <tr> <td>50V: 0402 <math>&gt; 0.01\mu\text{F}</math>; 0603 <math>\geq 1\mu\text{F}</math>; 0805 <math>\geq 1\mu\text{F}</math>; 1206 <math>\geq 4.7\mu\text{F}</math>; 1210 <math>\geq 4.7\mu\text{F}</math></td> </tr> <tr> <td>35V: 0603 <math>\geq 1\mu\text{F}</math>; 0805 <math>\geq 2.2\mu\text{F}</math>; 1206 <math>\geq 2.2\mu\text{F}</math>; 1210 <math>\geq 10\mu\text{F}</math></td> </tr> <tr> <td>25V: 0201 <math>\geq 0.1\mu\text{F}</math>; 0402 <math>\geq 0.22\mu\text{F}</math>; 0603 <math>\geq 2.2\mu\text{F}</math>; 0805 <math>\geq 2.2\mu\text{F}</math>; 1206 <math>\geq 10\mu\text{F}</math>; 1210 <math>\geq 10\mu\text{F}</math></td> </tr> <tr> <td>16V: 0201 <math>\geq 0.1\mu\text{F}</math>; 0402 <math>\geq 0.22\mu\text{F}</math>; 0603 <math>\geq 1\mu\text{F}</math>; 0805 <math>\geq 2.2\mu\text{F}</math>; 1206 <math>\geq 10\mu\text{F}</math>; 1210 <math>\geq 47\mu\text{F}</math></td> </tr> <tr> <td>10V: 0201 <math>\geq 47\text{nF}</math>; 0402 <math>\geq 0.47\mu\text{F}</math>; 0603 <math>\geq 0.47\mu\text{F}</math>; 0805 <math>\geq 2.2\mu\text{F}</math>; 1206 <math>\geq 4.7\mu\text{F}</math>; 1210 <math>\geq 47\mu\text{F}</math></td> </tr> <tr> <td>6.3V; 4V; Size <math>\geq 1812</math></td> </tr> <tr> <td colspan="2">---</td> </tr> <tr> <td colspan="2">---</td> </tr> <tr> <td colspan="2">---</td> </tr> </tbody> </table> | RATED VOL. | D.F. $\leq$ | EXCEPTION OF D.F. $\leq$ | $\geq 100\text{V}$ | $\leq 3\%$   | $\leq 6\%$ 1206 $\geq 0.47\mu\text{F}$<br>$\leq 7.5\%$ 0603 $\geq 0.068\mu\text{F}$ ; 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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 $\geq 1812$ | --- |  | --- |  | --- |  |
| RATED VOL.  | D.F. $\leq$  | EXCEPTION OF D.F. $\leq$  |   |            |             |                          |                    |              |   |                   |  |     |  |     |              |  |     |   |     |              |   |      |   |    |                 |     |               |                       |   |  |   |   |   |   |  |                            |     |  |     |  |     |  |
| $\geq 100\text{V}$  | $\leq 3\%$   | $\leq 6\%$ 1206 $\geq 0.47\mu\text{F}$<br>$\leq 7.5\%$ 0603 $\geq 0.068\mu\text{F}$ ; 0805 $\geq 0.1\mu\text{F}$ ; 1206 $\geq 1\mu\text{F}$ ; 1210 $\geq 2.2\mu\text{F}$<br>$\leq 20\%$ 0805 $> 0.22\mu\text{F}$ ; 1210 $\geq 3.3\mu\text{F}$   |   |            |             |                          |                    |              |   |                   |  |     |  |     |              |  |     |   |     |              |   |      |   |    |                 |     |               |                       |   |  |   |   |   |   |  |                            |     |  |     |  |     |  |
|   | $\leq 5\text{V}$   | $\leq 6\%$ 0201(50V); 0603 $\geq 0.047\mu\text{F}$ ; 0805 $\geq 0.18\mu\text{F}$ ; 1206 $\geq 0.47\mu\text{F}$<br>$\leq 10\%$ 0201 $\geq 0.01\mu\text{F}$ ; 1210 $\geq 3.3\mu\text{F}$<br>$\leq 20\%$ 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 $\geq 10\mu\text{F}$  |   |            |             |                          |                    |              |   |                   |  |     |  |     |              |  |     |   |     |              |   |      |   |    |                 |     |               |                       |   |  |   |   |   |   |  |                            |     |  |     |  |     |  |
|   | 35V  | $\leq 20\%$ 0603 $\geq 1\mu\text{F}$ ; 0805 $\geq 2.2\mu\text{F}$ ; 1206 $\geq 2.2\mu\text{F}$ ; 1210 $\geq 10\mu\text{F}$<br>$\leq 10\%$ 0201 $\geq 0.01\mu\text{F}$ ; 0805 $\geq 1\mu\text{F}$ ; 1210 $\geq 10\mu\text{F}$  |   |            |             |                          |                    |              |   |                   |  |     |  |     |              |  |     |   |     |              |   |      |   |    |                 |     |               |                       |   |  |   |   |   |   |  |                            |     |  |     |  |     |  |
| 25V   | $\leq 5\%$   | $\leq 14\%$ 0603 $\geq 0.33\mu\text{F}$<br>$\leq 15\%$ 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 $\geq 22\mu\text{F}$<br>$\leq 20\%$ 0402 $\geq 0.33\mu\text{F}$   |   |            |             |                          |                    |              |   |                   |  |     |  |     |              |  |     |   |     |              |   |      |   |    |                 |     |               |                       |   |  |   |   |   |   |  |                            |     |  |     |  |     |  |
|   | 16V  | $\leq 10\%$ 0603 $\geq 0.15\mu\text{F}$ ; 0805 $\geq 0.68\mu\text{F}$ ; 1206 $\geq 2.2\mu\text{F}$ ; 1210 $\geq 4.7\mu\text{F}$<br>$\leq 15\%$ 0201 $\geq 0.022\mu\text{F}$ ; 0402 $\geq 0.033\mu\text{F}$ ; 0603 $> 0.47\mu\text{F}$ ; 0805 $\geq 2.2\mu\text{F}$ ; 1206 $\geq 4.7\mu\text{F}$ ; 1210 $\geq 22\mu\text{F}$   |   |            |             |                          |                    |              |   |                   |  |     |  |     |              |  |     |   |     |              |   |      |   |    |                 |     |               |                       |   |  |   |   |   |   |  |                            |     |  |     |  |     |  |
| 10V   | $\leq 7.5\%$   | $\leq 15\%$ 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 $\geq 22\mu\text{F}$<br>$\leq 20\%$ 0201 $\geq 0.1\mu\text{F}$ ; 0402 $\geq 1\mu\text{F}$   |   |            |             |                          |                    |              |   |                   |  |     |  |     |              |  |     |   |     |              |   |      |   |    |                 |     |               |                       |   |  |   |   |   |   |  |                            |     |  |     |  |     |  |
|   | 6.3V   | $\leq 15\%$ 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 $\geq 100\mu\text{F}$   |   |            |             |                          |                    |              |   |                   |  |     |  |     |              |  |     |   |     |              |   |      |   |    |                 |     |               |                       |   |  |   |   |   |   |  |                            |     |  |     |  |     |  |
| 4V  | $\leq 20\%$ ---  | ---   |   |            |             |                          |                    |              |   |                   |  |     |  |     |              |  |     |   |     |              |   |      |   |    |                 |     |               |                       |   |  |   |   |   |   |  |                            |     |  |     |  |     |  |
| RATED VOLTAGE   | INSULATION RESISTANCE  |   |   |            |             |                          |                    |              |   |                   |  |     |  |     |              |  |     |   |     |              |   |      |   |    |                 |     |               |                       |   |  |   |   |   |   |  |                            |     |  |     |  |     |  |
| 100V: All X7R; 1210 $\geq 3.3\mu\text{F}$   | $1\text{G}\Omega$ 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 $\geq 1812$  |  |   |   |            |             |                          |                    |              |   |                   |  |     |  |     |              |  |     |   |     |              |   |      |   |    |                 |     |               |                       |   |  |   |   |   |   |  |                            |     |  |     |  |     |  |
| ---   |  |   |   |            |             |                          |                    |              |   |                   |  |     |  |     |              |  |     |   |     |              |   |      |   |    |                 |     |               |                       |   |  |   |   |   |   |  |                            |     |  |     |  |     |  |
| ---   |  |   |   |            |             |                          |                    |              |   |                   |  |     |  |     |              |  |     |   |     |              |   |      |   |    |                 |     |               |                       |   |  |   |   |   |   |  |                            |     |  |     |  |     |  |
| ---   |  |   |   |            |             |                          |                    |              |   |                   |  |     |  |     |              |  |     |   |     |              |   |      |   |    |                 |     |               |                       |   |  |   |   |   |   |  |                            |     |  |     |  |     |  |
| 8.  | External Visual<br>MIL-STD-883<br>Method 2009                                    | - Visual inspection   | - No remarkable defect.   |            |             |                          |                    |              |   |                   |  |     |  |     |              |  |     |   |     |              |   |      |   |    |                 |     |               |                       |   |  |   |   |   |   |  |                            |     |  |     |  |     |  |
| 9.  | Physical Dimension<br>JESD22<br>Method JB-100                                    | - By using calipers   | - Within the specified dimensions   |            |             |                          |                    |              |   |                   |  |     |  |     |              |  |     |   |     |              |   |      |   |    |                 |     |               |                       |   |  |   |   |   |   |  |                            |     |  |     |  |     |  |
| 10.   | Resistance to Solvents<br>MIL-STD-202<br>Method 215                              | <ul style="list-style-type: none"> <li>- Temperature <math>25 \pm 5^{\circ}\text{C}</math></li> <li>- Time: <math>3+0.5/-0</math> min</li> <li>- Solvent: Iso-propyl alcohol.</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:<br/>NPO: <math>\text{Cap} \geq 30\text{pF}</math>; <math>\text{Q} \geq 1000</math>; <math>\text{Cap} &lt; 30\text{pF}</math>, <math>\text{Q} \geq 400+20\text{C}</math>.</li> </ul> <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 rowspan="3"><math>\geq 100\text{V}</math></td> <td><math>\leq 2.5\%</math></td> <td><math>\leq 3\%</math> 1206 <math>\geq 0.47\mu\text{F}</math><br/><math>\leq 5\%</math> 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><br/><math>\leq 10\%</math> 0805 <math>&gt; 0.22\mu\text{F}</math>; 1210 <math>\geq 3.3\mu\text{F}</math></td> </tr> <tr> <td><math>\geq 50\text{V}</math></td> <td><math>\leq 3\%</math> 0201(50V); 0603 <math>\geq 0.047\mu\text{F}</math>; 0805 <math>\geq 0.18\mu\text{F}</math>; 1206 <math>\geq 0.47\mu\text{F}</math><br/><math>\leq 5\%</math> 0201 <math>\geq 0.01\mu\text{F}</math>; 1210 <math>\geq 3.3\mu\text{F}</math><br/><math>\leq 10\%</math> 0402 <math>\geq 0.012\mu\text{F}</math>; 0603 <math>&gt; 0.1\mu\text{F}</math>; 0805/X7R <math>&gt; 0.47\mu\text{F}</math>; 1206 <math>\geq 2.2\mu\text{F}</math>; 1210 <math>\geq 10\mu\text{F}</math></td> </tr> <tr> <td>35V</td> <td><math>\leq 3.5\%</math> <math>\leq 10\%</math> 0603 <math>\geq 1\mu\text{F}</math>; 0805 <math>\geq 2.2\mu\text{F}</math>; 1206 <math>\geq 2.2\mu\text{F}</math>; 1210 <math>\geq 10\mu\text{F}</math><br/><math>\leq 5\%</math> 0201 <math>\geq 0.01\mu\text{F}</math>; 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1210 <math>\geq 47\mu\text{F}</math></td> </tr> <tr> <td>6.3V; 4V; Size <math>\geq 1812</math></td> </tr> <tr> <td colspan="2">---</td> </tr> <tr> <td colspan="2">---</td> </tr> <tr> <td colspan="2">---</td> </tr> </tbody> </table>   | RATED VOL. | D.F. $\leq$ | EXCEPTION OF D.F. $\leq$ | $\geq 100\text{V}$ | $\leq 2.5\%$ | $\leq 3\%$ 1206 $\geq 0.47\mu\text{F}$<br>$\leq 5\%$ 0603 $\geq 0.068\mu\text{F}$ ; 0805 $\geq 0.1\mu\text{F}$ ; 1206 $\geq 1\mu\text{F}$ ; 1210 $\geq 2.2\mu\text{F}$<br>$\leq 10\%$ 0805 $> 0.22\mu\text{F}$ ; 1210 $\geq 3.3\mu\text{F}$   | $\geq 50\text{V}$ | $\leq 3\%$ 0201(50V); 0603 $\geq 0.047\mu\text{F}$ ; 0805 $\geq 0.18\mu\text{F}$ ; 1206 $\geq 0.47\mu\text{F}$<br>$\leq 5\%$ 0201 $\geq 0.01\mu\text{F}$ ; 1210 $\geq 3.3\mu\text{F}$<br>$\leq 10\%$ 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 $\geq 10\mu\text{F}$  | 35V | $\leq 3.5\%$ $\leq 10\%$ 0603 $\geq 1\mu\text{F}$ ; 0805 $\geq 2.2\mu\text{F}$ ; 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1210 $\geq 22\mu\text{F}$<br>$\leq 15\%$ 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 $\geq 100\mu\text{F}$<br>$\leq 20\%$ 0402 $\geq 2.2\mu\text{F}$ | 4V | $\leq 15\%$ --- | --- | RATED VOLTAGE | INSULATION RESISTANCE | 100V: All X7R                             | $10\text{G}\Omega$ or $\text{RxC} \geq 100\Omega\text{-F}$ 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: 0805 $\geq 2.2\mu\text{F}$ ; 1206 $\geq 2.2\mu\text{F}$ ; 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 $\geq 10\mu\text{F}$                                 | 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 $\geq 1812$ | --- |  | --- |  | --- |  |
| RATED VOL.  | D.F. $\leq$  | EXCEPTION OF D.F. $\leq$  |   |            |             |                          |                    |              |   |                   |  |     |  |     |              |  |     |   |     |              |   |      |   |    |                 |     |               |                       |   |  |   |   |   |   |  |                            |     |  |     |  |     |  |
| $\geq 100\text{V}$  | $\leq 2.5\%$   | $\leq 3\%$ 1206 $\geq 0.47\mu\text{F}$<br>$\leq 5\%$ 0603 $\geq 0.068\mu\text{F}$ ; 0805 $\geq 0.1\mu\text{F}$ ; 1206 $\geq 1\mu\text{F}$ ; 1210 $\geq 2.2\mu\text{F}$<br>$\leq 10\%$ 0805 $> 0.22\mu\text{F}$ ; 1210 $\geq 3.3\mu\text{F}$   |   |            |             |                          |                    |              |   |                   |  |     |  |     |              |  |     |   |     |              |   |      |   |    |                 |     |               |                       |   |  |   |   |   |   |  |                            |     |  |     |  |     |  |
|   | $\geq 50\text{V}$  | $\leq 3\%$ 0201(50V); 0603 $\geq 0.047\mu\text{F}$ ; 0805 $\geq 0.18\mu\text{F}$ ; 1206 $\geq 0.47\mu\text{F}$<br>$\leq 5\%$ 0201 $\geq 0.01\mu\text{F}$ ; 1210 $\geq 3.3\mu\text{F}$<br>$\leq 10\%$ 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 $\geq 10\mu\text{F}$   |   |            |             |                          |                    |              |   |                   |  |     |  |     |              |  |     |   |     |              |   |      |   |    |                 |     |               |                       |   |  |   |   |   |   |  |                            |     |  |     |  |     |  |
|   | 35V  | $\leq 3.5\%$ $\leq 10\%$ 0603 $\geq 1\mu\text{F}$ ; 0805 $\geq 2.2\mu\text{F}$ ; 1206 $\geq 2.2\mu\text{F}$ ; 1210 $\geq 10\mu\text{F}$<br>$\leq 5\%$ 0201 $\geq 0.01\mu\text{F}$ ; 0805 $\geq 1\mu\text{F}$ ; 1210 $\geq 10\mu\text{F}$  |   |            |             |                          |                    |              |   |                   |  |     |  |     |              |  |     |   |     |              |   |      |   |    |                 |     |               |                       |   |  |   |   |   |   |  |                            |     |  |     |  |     |  |
| 25V   | $\leq 3.5\%$   | $\leq 7\%$ 0603 $\geq 0.33\mu\text{F}$<br>$\leq 10\%$ 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 $\geq 22\mu\text{F}$<br>$\leq 12.5\%$ 0402 $\geq 0.33\mu\text{F}$  |   |            |             |                          |                    |              |   |                   |  |     |  |     |              |  |     |   |     |              |   |      |   |    |                 |     |               |                       |   |  |   |   |   |   |  |                            |     |  |     |  |     |  |
|   | 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 $\geq 4.7\mu\text{F}$<br>$\leq 10\%$ 0201 $\geq 0.022\mu\text{F}$ ; 0402 $\geq 0.15\mu\text{F}$ ; 0603 $> 0.47\mu\text{F}$ ; 0805 $\geq 2.2\mu\text{F}$ ; 1206 $\geq 4.7\mu\text{F}$ ; 1210 $\geq 22\mu\text{F}$   |   |            |             |                          |                    |              |   |                   |  |     |  |     |              |  |     |   |     |              |   |      |   |    |                 |     |               |                       |   |  |   |   |   |   |  |                            |     |  |     |  |     |  |
| 10V   | $\leq 5\%$   | $\leq 10\%$ 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 $\geq 22\mu\text{F}$<br>$\leq 15\%$ 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 $\geq 100\mu\text{F}$<br>$\leq 20\%$ 0402 $\geq 2.2\mu\text{F}$   |   |            |             |                          |                    |              |   |                   |  |     |  |     |              |  |     |   |     |              |   |      |   |    |                 |     |               |                       |   |  |   |   |   |   |  |                            |     |  |     |  |     |  |
| 4V  | $\leq 15\%$ ---  | ---   |   |            |             |                          |                    |              |   |                   |  |     |  |     |              |  |     |   |     |              |   |      |   |    |                 |     |               |                       |   |  |   |   |   |   |  |                            |     |  |     |  |     |  |
| RATED VOLTAGE   | INSULATION RESISTANCE  |   |   |            |             |                          |                    |              |   |                   |  |     |  |     |              |  |     |   |     |              |   |      |   |    |                 |     |               |                       |   |  |   |   |   |   |  |                            |     |  |     |  |     |  |
| 100V: All X7R   | $10\text{G}\Omega$ or $\text{RxC} \geq 100\Omega\text{-F}$ 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: 0805 $\geq 2.2\mu\text{F}$ ; 1206 $\geq 2.2\mu\text{F}$ ; 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 $\geq 10\mu\text{F}$                                 |  |   |   |            |             |                          |                    |              |   |                   |  |     |  |     |              |  |     |   |     |              |   |      |   |    |                 |     |               |                       |   |  |   |   |   |   |  |                            |     |  |     |  |     |  |
| 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 $\geq 1812$  |  |   |   |            |             |                          |                    |              |   |                   |  |     |  |     |              |  |     |   |     |              |   |      |   |    |                 |     |               |                       |   |  |   |   |   |   |  |                            |     |  |     |  |     |  |
| ---   |  |   |   |            |             |                          |                    |              |   |                   |  |     |  |     |              |  |     |   |     |              |   |      |   |    |                 |     |               |                       |   |  |   |   |   |   |  |                            |     |  |     |  |     |  |
| ---   |  |   |   |            |             |                          |                    |              |   |                   |  |     |  |     |              |  |     |   |     |              |   |      |   |    |                 |     |               |                       |   |  |   |   |   |   |  |                            |     |  |     |  |     |  |
| ---   |  |   |   |            |             |                          |                    |              |   |                   |  |     |  |     |              |  |     |   |     |              |   |      |   |    |                 |     |               |                       |   |  |   |   |   |   |  |                            |     |  |     |  |     |  |

\* "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<br>MIL-STD-202<br>Method 213 | - Peak value: 1500g's<br>- Wave: 1/2 sine.<br>- Velocity: 15.4ft/sec<br>- Three shocks in each direction should be applied along 3 mutually perpendicular axes of the test specimen (18 shocks) | - No remarkable damage.<br>- Cap: within the specified tolerance<br>-Q/D.F. value:<br>NPO: Cap30pF, Q≥1000; Cap<30pF, Q≥400+20C<br>X7R:<br><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 rowspan="3">≤2.5%</td> <td>≤3% 1206 ≥ 0.47μF</td> </tr> <tr> <td>≤5% 0603 ≥ 0.068μF; 0805 ≥ 0.1μF; 1206 ≥ 1μF; 1210 ≥ 2.2μF</td> </tr> <tr> <td>≤10% 0805 &gt; 0.22μF; 1210 ≥ 3.3μF</td> </tr> <tr> <td rowspan="3">50V</td> <td rowspan="3">≤2.5%</td> <td>≤3% 0201(50V); 0603 ≥ 0.047μF; 0805 ≥ 0.18μF; 1206 ≥ 0.47μF</td> </tr> <tr> <td>≤5% 0201 ≥ 0.01μF; 1210 ≥ 3.3μF</td> </tr> <tr> <td>≤10% 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 rowspan="3">≤3.5%</td> <td>≤10% 0603 ≥ 1μF; 0805 ≥ 2.2μF; 1206 ≥ 2.2μF; 1210 ≥ 10μF</td> </tr> <tr> <td>≤5% 0201 ≥ 0.01μF; 0805 ≥ 1μF; 1210 ≥ 10μF</td> </tr> <tr> <td>≤7% 0603 ≥ 0.33μF</td> </tr> <tr> <td rowspan="3">25V</td> <td rowspan="3">≤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% 0402 ≥ 0.33μF</td> </tr> <tr> <td>≤5% 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 rowspan="3">≤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% 0201 ≥ 0.012μF; 0402 ≥ 0.15μF; 0603 ≥ 0.33μF; 0805 ≥ 2.2μF; 1206 ≥ 2.2μF; 1210 ≥ 22μF</td> </tr> <tr> <td>≤15% 0201 ≥ 0.1μF; 0402 ≥ 1μF</td> </tr> <tr> <td rowspan="2">10V</td> <td rowspan="2">≤5%</td> <td>15% 0201 ≥ 0.1μF; 0402 ≥ 1μF</td> </tr> <tr> <td>15% 0201 ≥ 0.1μF; 0402 ≥ 1μF; 0603 ≥ 10μF; 0805 ≥ 4.7μF; 1206 ≥ 47μF; 1210 ≥ 100μF</td> </tr> <tr> <td rowspan="2">6.3V</td> <td rowspan="2">≤10%</td> <td>15% 0201 ≥ 0.1μF; 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> <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>4V: 0603 ≥ 22μF; 0805 ≥ 47μF; 1206 ≥ 100μF</td> </tr> </tbody> </table><br><table border="1"> <thead> <tr> <th>RATED VOLTAGE</th> <th>INSULATION RESISTANCE</th> </tr> </thead> <tbody> <tr> <td>100V: 1210 ≥ 3.3μF</td> <td rowspan="10">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.  | D.F.≤      | EXCEPTION OF D.F. ≤ | ≥100V               | ≤2.5% | ≤3% 1206 ≥ 0.47μF | ≤5% 0603 ≥ 0.068μF; 0805 ≥ 0.1μF; 1206 ≥ 1μF; 1210 ≥ 2.2μF | ≤10% 0805 > 0.22μF; 1210 ≥ 3.3μF                   | 50V                              | ≤2.5% | ≤3% 0201(50V); 0603 ≥ 0.047μF; 0805 ≥ 0.18μF; 1206 ≥ 0.47μF | ≤5% 0201 ≥ 0.01μF; 1210 ≥ 3.3μF                             | ≤10% 0402 ≥ 0.012μF; 0603 > 0.1μF; 0805 > 0.47μF; 1206 ≥ 2.2μF; 1210 ≥ 10μF | 35V   | ≤3.5% | ≤10% 0603 ≥ 1μF; 0805 ≥ 2.2μF; 1206 ≥ 2.2μF; 1210 ≥ 10μF | ≤5% 0201 ≥ 0.01μF; 0805 ≥ 1μF; 1210 ≥ 10μF               | ≤7% 0603 ≥ 0.33μF                          | 25V               | ≤3.5% | ≤10% 0201 ≥ 0.1μF; 0402 ≥ 0.056μF; 0603 ≥ 0.47μF; 0805 ≥ 2.2μF; 1206 ≥ 4.7μF; 1210 ≥ 22μF | ≤12.5% 0402 ≥ 0.33μF  | ≤5% 0201 ≥ 0.01μF; 0402 ≥ 0.033μF; 0603 ≥ 0.15μF; 0805 ≥ 0.68μF; 1206 ≥ 2.2μF; 1210 ≥ 4.7μF | 16V   | ≤3.5% | ≤10% 0201 ≥ 0.022μF; 0402 ≥ 0.15μF; 0603 > 0.47μF; 0805 ≥ 2.2μF; 1206 ≥ 4.7μF; 1210 ≥ 22μF | ≤10% 0201 ≥ 0.012μF; 0402 ≥ 0.15μF; 0603 ≥ 0.33μF; 0805 ≥ 2.2μF; 1206 ≥ 2.2μF; 1210 ≥ 22μF | ≤15% 0201 ≥ 0.1μF; 0402 ≥ 1μF  | 10V                           | ≤5% | 15% 0201 ≥ 0.1μF; 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0402 ≥ 2.2μF; 0603 ≥ 10μF; 0805 ≥ 10μF; 1206 ≥ 22μF | 16V: 0603 ≥ 10μF; 0402 ≥ 1μF; 0201 ≥ 0.22μF                            | 10V: 0201 > 0.1μF; 0402 ≥ 1μF; 0603 ≥ 10μF; 0805 ≥ 47μF | 6.3V: 0201 ≥ 0.1μF; 0402 ≥ 1μF; 0603 > 4.7μF; 0805 ≥ 47μF; 1206 ≥ 10μF | 4V: 0603 ≥ 22μF; 0805 ≥ 47μF; 1206 ≥ 100μF                             |  |
| RATED VOL.  | D.F.≤   | EXCEPTION OF D.F. ≤   |   |   |            |                     |                     |       |                   |  |  |                                  |       |   |   |   |   |       |  |  |  |                   |       |   |   |   |   |       |  |  |  |                               |     |                              |  |  |      |  |  |                   |      |      |               |                       |                       |   |  |  |   |  |   |   |  |  |                       |                       |                    |   |   |  |  |   |  |  |  |
| ≥100V   | ≤2.5%   | ≤3% 1206 ≥ 0.47μF   |   |   |            |                     |                     |       |                   |  |  |                                  |       |   |   |   |   |       |  |  |  |                   |       |   |   |   |   |       |  |  |  |                               |     |                              |  |  |      |  |  |                   |      |      |               |                       |                       |   |  |  |   |  |   |   |  |  |                       |                       |                    |   |   |  |  |   |  |  |  |
|   |   | ≤5% 0603 ≥ 0.068μF; 0805 ≥ 0.1μF; 1206 ≥ 1μF; 1210 ≥ 2.2μF  |   |   |            |                     |                     |       |                   |  |  |                                  |       |   |   |   |   |       |  |  |  |                   |       |   |   |   |   |       |  |  |  |                               |     |                              |  |  |      |  |  |                   |      |      |               |                       |                       |   |  |  |   |  |   |   |  |  |                       |                       |                    |   |   |  |  |   |  |  |  |
|   |   | ≤10% 0805 > 0.22μF; 1210 ≥ 3.3μF  |   |   |            |                     |                     |       |                   |  |  |                                  |       |   |   |   |   |       |  |  |  |                   |       |   |   |   |   |       |  |  |  |                               |     |                              |  |  |      |  |  |                   |      |      |               |                       |                       |   |  |  |   |  |   |   |  |  |                       |                       |                    |   |   |  |  |   |  |  |  |
| 50V   | ≤2.5%   | ≤3% 0201(50V); 0603 ≥ 0.047μF; 0805 ≥ 0.18μF; 1206 ≥ 0.47μF   |   |   |            |                     |                     |       |                   |  |  |                                  |       |   |   |   |   |       |  |  |  |                   |       |   |   |   |   |       |  |  |  |                               |     |                              |  |  |      |  |  |                   |      |      |               |                       |                       |   |  |  |   |  |   |   |  |  |                       |                       |                    |   |   |  |  |   |  |  |  |
|   |   | ≤5% 0201 ≥ 0.01μF; 1210 ≥ 3.3μF   |   |   |            |                     |                     |       |                   |  |  |                                  |       |   |   |   |   |       |  |  |  |                   |       |   |   |   |   |       |  |  |  |                               |     |                              |  |  |      |  |  |                   |      |      |               |                       |                       |   |  |  |   |  |   |   |  |  |                       |                       |                    |   |   |  |  |   |  |  |  |
|   |   | ≤10% 0402 ≥ 0.012μF; 0603 > 0.1μF; 0805 > 0.47μF; 1206 ≥ 2.2μF; 1210 ≥ 10μF   |   |   |            |                     |                     |       |                   |  |  |                                  |       |   |   |   |   |       |  |  |  |                   |       |   |   |   |   |       |  |  |  |                               |     |                              |  |  |      |  |  |                   |      |      |               |                       |                       |   |  |  |   |  |   |   |  |  |                       |                       |                    |   |   |  |  |   |  |  |  |
| 35V   | ≤3.5%   | ≤10% 0603 ≥ 1μF; 0805 ≥ 2.2μF; 1206 ≥ 2.2μF; 1210 ≥ 10μF  |   |   |            |                     |                     |       |                   |  |  |                                  |       |   |   |   |   |       |  |  |  |                   |       |   |   |   |   |       |  |  |  |                               |     |                              |  |  |      |  |  |                   |      |      |               |                       |                       |   |  |  |   |  |   |   |  |  |                       |                       |                    |   |   |  |  |   |  |  |  |
|   |   | ≤5% 0201 ≥ 0.01μF; 0805 ≥ 1μF; 1210 ≥ 10μF  |   |   |            |                     |                     |       |                   |  |  |                                  |       |   |   |   |   |       |  |  |  |                   |       |   |   |   |   |       |  |  |  |                               |     |                              |  |  |      |  |  |                   |      |      |               |                       |                       |   |  |  |   |  |   |   |  |  |                       |                       |                    |   |   |  |  |   |  |  |  |
|   |   | ≤7% 0603 ≥ 0.33μF   |   |   |            |                     |                     |       |                   |  |  |                                  |       |   |   |   |   |       |  |  |  |                   |       |   |   |   |   |       |  |  |  |                               |     |                              |  |  |      |  |  |                   |      |      |               |                       |                       |   |  |  |   |  |   |   |  |  |                       |                       |                    |   |   |  |  |   |  |  |  |
| 25V   | ≤3.5%   | ≤10% 0201 ≥ 0.1μF; 0402 ≥ 0.056μF; 0603 ≥ 0.47μF; 0805 ≥ 2.2μF; 1206 ≥ 4.7μF; 1210 ≥ 22μF   |   |   |            |                     |                     |       |                   |  |  |                                  |       |   |   |   |   |       |  |  |  |                   |       |   |   |   |   |       |  |  |  |                               |     |                              |  |  |      |  |  |                   |      |      |               |                       |                       |   |  |  |   |  |   |   |  |  |                       |                       |                    |   |   |  |  |   |  |  |  |
|   |   | ≤12.5% 0402 ≥ 0.33μF  |   |   |            |                     |                     |       |                   |  |  |                                  |       |   |   |   |   |       |  |  |  |                   |       |   |   |   |   |       |  |  |  |                               |     |                              |  |  |      |  |  |                   |      |      |               |                       |                       |   |  |  |   |  |   |   |  |  |                       |                       |                    |   |   |  |  |   |  |  |  |
|   |   | ≤5% 0201 ≥ 0.01μF; 0402 ≥ 0.033μF; 0603 ≥ 0.15μF; 0805 ≥ 0.68μF; 1206 ≥ 2.2μF; 1210 ≥ 4.7μF   |   |   |            |                     |                     |       |                   |  |  |                                  |       |   |   |   |   |       |  |  |  |                   |       |   |   |   |   |       |  |  |  |                               |     |                              |  |  |      |  |  |                   |      |      |               |                       |                       |   |  |  |   |  |   |   |  |  |                       |                       |                    |   |   |  |  |   |  |  |  |
| 16V   | ≤3.5%   | ≤10% 0201 ≥ 0.022μF; 0402 ≥ 0.15μF; 0603 > 0.47μF; 0805 ≥ 2.2μF; 1206 ≥ 4.7μF; 1210 ≥ 22μF  |   |   |            |                     |                     |       |                   |  |  |                                  |       |   |   |   |   |       |  |  |  |                   |       |   |   |   |   |       |  |  |  |                               |     |                              |  |  |      |  |  |                   |      |      |               |                       |                       |   |  |  |   |  |   |   |  |  |                       |                       |                    |   |   |  |  |   |  |  |  |
|   |   | ≤10% 0201 ≥ 0.012μF; 0402 ≥ 0.15μF; 0603 ≥ 0.33μF; 0805 ≥ 2.2μF; 1206 ≥ 2.2μF; 1210 ≥ 22μF  |   |   |            |                     |                     |       |                   |  |  |                                  |       |   |   |   |   |       |  |  |  |                   |       |   |   |   |   |       |  |  |  |                               |     |                              |  |  |      |  |  |                   |      |      |               |                       |                       |   |  |  |   |  |   |   |  |  |                       |                       |                    |   |   |  |  |   |  |  |  |
|   |   | ≤15% 0201 ≥ 0.1μF; 0402 ≥ 1μF   |   |   |            |                     |                     |       |                   |  |  |                                  |       |   |   |   |   |       |  |  |  |                   |       |   |   |   |   |       |  |  |  |                               |     |                              |  |  |      |  |  |                   |      |      |               |                       |                       |   |  |  |   |  |   |   |  |  |                       |                       |                    |   |   |  |  |   |  |  |  |
| 10V   | ≤5%   | 15% 0201 ≥ 0.1μF; 0402 ≥ 1μF  |   |   |            |                     |                     |       |                   |  |  |                                  |       |   |   |   |   |       |  |  |  |                   |       |   |   |   |   |       |  |  |  |                               |     |                              |  |  |      |  |  |                   |      |      |               |                       |                       |   |  |  |   |  |   |   |  |  |                       |                       |                    |   |   |  |  |   |  |  |  |
|   |   | 15% 0201 ≥ 0.1μF; 0402 ≥ 1μF; 0603 ≥ 10μF; 0805 ≥ 4.7μF; 1206 ≥ 47μF; 1210 ≥ 100μF  |   |   |            |                     |                     |       |                   |  |  |                                  |       |   |   |   |   |       |  |  |  |                   |       |   |   |   |   |       |  |  |  |                               |     |                              |  |  |      |  |  |                   |      |      |               |                       |                       |   |  |  |   |  |   |   |  |  |                       |                       |                    |   |   |  |  |   |  |  |  |
| 6.3V  | ≤10%  | 15% 0201 ≥ 0.1μF; 0402 ≥ 1μF; 0603 ≥ 10μF; 0805 ≥ 4.7μF; 1206 ≥ 47μF; 1210 ≥ 100μF  |   |   |            |                     |                     |       |                   |  |  |                                  |       |   |   |   |   |       |  |  |  |                   |       |   |   |   |   |       |  |  |  |                               |     |                              |  |  |      |  |  |                   |      |      |               |                       |                       |   |  |  |   |  |   |   |  |  |                       |                       |                    |   |   |  |  |   |  |  |  |
|   |   | ≤20% 0402 ≥ 2.2μF   |   |   |            |                     |                     |       |                   |  |  |                                  |       |   |   |   |   |       |  |  |  |                   |       |   |   |   |   |       |  |  |  |                               |     |                              |  |  |      |  |  |                   |      |      |               |                       |                       |   |  |  |   |  |   |   |  |  |                       |                       |                    |   |   |  |  |   |  |  |  |
| 4V  | ≤15%  | ---   |   |   |            |                     |                     |       |                   |  |  |                                  |       |   |   |   |   |       |  |  |  |                   |       |   |   |   |   |       |  |  |  |                               |     |                              |  |  |      |  |  |                   |      |      |               |                       |                       |   |  |  |   |  |   |   |  |  |                       |                       |                    |   |   |  |  |   |  |  |  |
| RATED VOLTAGE   | INSULATION RESISTANCE                         |   |   |   |            |                     |                     |       |                   |  |  |                                  |       |   |   |   |   |       |  |  |  |                   |       |   |   |   |   |       |  |  |  |                               |     |                              |  |  |      |  |  |                   |      |      |               |                       |                       |   |  |  |   |  |   |   |  |  |                       |                       |                    |   |   |  |  |   |  |  |  |
| 100V: All X7R   | 10GΩ or RxC ≥ 100 Ω-F whichever is smaller.   |   |   |   |            |                     |                     |       |                   |  |  |                                  |       |   |   |   |   |       |  |  |  |                   |       |   |   |   |   |       |  |  |  |                               |     |                              |  |  |      |  |  |                   |      |      |               |                       |                       |   |  |  |   |  |   |   |  |  |                       |                       |                    |   |   |  |  |   |  |  |  |
| 50V: 0402 > 0.01μF; 0603 ≥ 1μF; 0805 ≥ 1μF; 1206 ≥ 4.7μF; 1210 ≥ 4.7μF                  |   |   |   |   |            |                     |                     |       |                   |  |  |                                  |       |   |   |   |   |       |  |  |  |                   |       |   |   |   |   |       |  |  |  |                               |     |                              |  |  |      |  |  |                   |      |      |               |                       |                       |   |  |  |   |  |   |   |  |  |                       |                       |                    |   |   |  |  |   |  |  |  |
| 35V: 0805 ≥ 2.2μF; 1206 ≥ 2.2μF; 1210 ≥ 10μF  |   |   |   |   |            |                     |                     |       |                   |  |  |                                  |       |   |   |   |   |       |  |  |  |                   |       |   |   |   |   |       |  |  |  |                               |     |                              |  |  |      |  |  |                   |      |      |               |                       |                       |   |  |  |   |  |   |   |  |  |                       |                       |                    |   |   |  |  |   |  |  |  |
| 25V: 0402 ≥ 1μF; 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   |   |   |   |   |            |                     |                     |       |                   |  |  |                                  |       |   |   |   |   |       |  |  |  |                   |       |   |   |   |   |       |  |  |  |                               |     |                              |  |  |      |  |  |                   |      |      |               |                       |                       |   |  |  |   |  |   |   |  |  |                       |                       |                    |   |   |  |  |   |  |  |  |
| 4V: 0603 ≥ 22μF; 0805 ≥ 47μF; 1206 ≥ 100μF  |   |   |   |   |            |                     |                     |       |                   |  |  |                                  |       |   |   |   |   |       |  |  |  |                   |       |   |   |   |   |       |  |  |  |                               |     |                              |  |  |      |  |  |                   |      |      |               |                       |                       |   |  |  |   |  |   |   |  |  |                       |                       |                    |   |   |  |  |   |  |  |  |
| RATED VOLTAGE   |   | INSULATION RESISTANCE   |   |   |            |                     |                     |       |                   |  |  |                                  |       |   |   |   |   |       |  |  |  |                   |       |   |   |   |   |       |  |  |  |                               |     |                              |  |  |      |  |  |                   |      |      |               |                       |                       |   |  |  |   |  |   |   |  |  |                       |                       |                    |   |   |  |  |   |  |  |  |
| 100V: 1210 ≥ 3.3μF  |   | RxC ≥ 50 Ω-F  |   |   |            |                     |                     |       |                   |  |  |                                  |       |   |   |   |   |       |  |  |  |                   |       |   |   |   |   |       |  |  |  |                               |     |                              |  |  |      |  |  |                   |      |      |               |                       |                       |   |  |  |   |  |   |   |  |  |                       |                       |                    |   |   |  |  |   |  |  |  |
| 50V: 0402 ≥ 0.1μF; 0603 ≥ 2.2μF; 0805 ≥ 10μF; 1206 ≥ 10μF                               |   |   |   |   |            |                     |                     |       |                   |  |  |                                  |       |   |   |   |   |       |  |  |  |                   |       |   |   |   |   |       |  |  |  |                               |     |                              |  |  |      |  |  |                   |      |      |               |                       |                       |   |  |  |   |  |   |   |  |  |                       |                       |                    |   |   |  |  |   |  |  |  |
| 35V: 0603 ≥ 1μF   |   |   |   |   |            |                     |                     |       |                   |  |  |                                  |       |   |   |   |   |       |  |  |  |                   |       |   |   |   |   |       |  |  |  |                               |     |                              |  |  |      |  |  |                   |      |      |               |                       |                       |   |  |  |   |  |   |   |  |  |                       |                       |                    |   |   |  |  |   |  |  |  |
| 25V: 0201 ≥ 0.1μF; 0402 ≥ 2.2μF; 0603 ≥ 10μF; 0805 ≥ 10μF; 1206 ≥ 22μF                  |   |   |   |   |            |                     |                     |       |                   |  |  |                                  |       |   |   |   |   |       |  |  |  |                   |       |   |   |   |   |       |  |  |  |                               |     |                              |  |  |      |  |  |                   |      |      |               |                       |                       |   |  |  |   |  |   |   |  |  |                       |                       |                    |   |   |  |  |   |  |  |  |
| 16V: 0603 ≥ 10μF; 0402 ≥ 1μF; 0201 ≥ 0.22μF   |   |   |   |   |            |                     |                     |       |                   |  |  |                                  |       |   |   |   |   |       |  |  |  |                   |       |   |   |   |   |       |  |  |  |                               |     |                              |  |  |      |  |  |                   |      |      |               |                       |                       |   |  |  |   |  |   |   |  |  |                       |                       |                    |   |   |  |  |   |  |  |  |
| 10V: 0201 > 0.1μF; 0402 ≥ 1μF; 0603 ≥ 10μF; 0805 ≥ 47μF                                 |   |   |   |   |            |                     |                     |       |                   |  |  |                                  |       |   |   |   |   |       |  |  |  |                   |       |   |   |   |   |       |  |  |  |                               |     |                              |  |  |      |  |  |                   |      |      |               |                       |                       |   |  |  |   |  |   |   |  |  |                       |                       |                    |   |   |  |  |   |  |  |  |
| 6.3V: 0201 ≥ 0.1μF; 0402 ≥ 1μF; 0603 > 4.7μF; 0805 ≥ 47μF; 1206 ≥ 10μF                  |   |   |   |   |            |                     |                     |       |                   |  |  |                                  |       |   |   |   |   |       |  |  |  |                   |       |   |   |   |   |       |  |  |  |                               |     |                              |  |  |      |  |  |                   |      |      |               |                       |                       |   |  |  |   |  |   |   |  |  |                       |                       |                    |   |   |  |  |   |  |  |  |
| 4V: 0603 ≥ 22μF; 0805 ≥ 47μF; 1206 ≥ 100μF  |   |   |   |   |            |                     |                     |       |                   |  |  |                                  |       |   |   |   |   |       |  |  |  |                   |       |   |   |   |   |       |  |  |  |                               |     |                              |  |  |      |  |  |                   |      |      |               |                       |                       |   |  |  |   |  |   |   |  |  |                       |                       |                    |   |   |  |  |   |  |  |  |
| 12.   | Vibration<br>MIL-STD-202<br>Method 204        |   | - Vibration frequency: 10~2000 Hz/min. (5g's for 20 min)<br>- Total Amplitude: 1.5mm<br>- 12 cycles each of 3 orientations (36 times)   | - No remarkable damage.<br>- Cap Change: within the specified tolerance<br>-Q/D.F. value:<br>NPO: C≥30pF, Q≥1000; Cap<30pF, Q≥400+20C<br>X7R:<br><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 rowspan="3">≤2.5%</td> <td>≤3% 1206 ≥ 0.47μF</td> </tr> <tr> <td>≤5% 0603≥0.068μF; 0805&gt;0.1μF; 1206≥1μF; 1210≥2.2μF</td> </tr> <tr> <td>≤10% 0805 &gt; 0.22μF; 1210 ≥ 3.3μF</td> </tr> <tr> <td rowspan="3">50V</td> <td rowspan="3">≤2.5%</td> <td>≤3% 0201(50V); 0603 ≥ 0.047μF; 0805 ≥ 0.18μF; 1206 ≥ 0.47μF</td> </tr> <tr> <td>≤5% 0201 ≥ 0.01μF; 1210 ≥ 3.3μF</td> </tr> <tr> <td>≤10% 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 rowspan="3">≤3.5%</td> <td>≤10% 0603 ≥ 1μF; 0805 ≥ 2.2μF; 1206 ≥ 2.2μF; 1210 ≥ 10μF</td> </tr> <tr> <td>≤5% 0201 ≥ 0.01μF; 0805 ≥ 1μF; 1210 ≥ 10μF</td> </tr> <tr> <td>≤7% 0603 ≥ 0.33μF</td> </tr> <tr> <td rowspan="3">25V</td> <td rowspan="3">≤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% 0402 ≥ 0.33μF</td> </tr> <tr> <td>≤5% 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 rowspan="3">≤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% 0201 ≥ 0.012μF; 0402 ≥ 0.15μF; 0603 ≥ 0.33μF; 0805 ≥ 2.2μF; 1206 ≥ 2.2μF; 1210 ≥ 22μF</td> </tr> <tr> <td>≤15% 0201 ≥ 0.1μF; 0402 ≥ 1μF</td> </tr> <tr> <td rowspan="2">10V</td> <td rowspan="2">≤5%</td> <td>15% 0201 ≥ 0.1μF; 0402 ≥ 1μF</td> </tr> <tr> <td>15% 0201 ≥ 0.1μF; 0402 ≥ 1μF; 0603 ≥ 10μF; 0805 ≥ 4.7μF; 1206 ≥ 47μF; 1210 ≥ 100μF</td> </tr> <tr> <td rowspan="2">6.3V</td> <td rowspan="2">≤10%</td> <td>15% 0201 ≥ 0.1μF; 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> <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>4V: 0603 ≥ 22μF; 0805 ≥ 47μF; 1206 ≥ 100μF</td> </tr> </tbody> </table><br><table border="1"> <thead> <tr> <th>RATED VOLTAGE</th> <th>INSULATION RESISTANCE</th> </tr> </thead> <tbody> <tr> <td>100V: 1210 ≥ 3.3μF</td> <td rowspan="10">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. | D.F.≤               | EXCEPTION OF D.F. ≤ | ≥100V | ≤2.5%             | ≤3% 1206 ≥ 0.47μF  | ≤5% 0603≥0.068μF; 0805>0.1μF; 1206≥1μF; 1210≥2.2μF | ≤10% 0805 > 0.22μF; 1210 ≥ 3.3μF | 50V   | ≤2.5%   | ≤3% 0201(50V); 0603 ≥ 0.047μF; 0805 ≥ 0.18μF; 1206 ≥ 0.47μF | ≤5% 0201 ≥ 0.01μF; 1210 ≥ 3.3μF   | ≤10% 0402 ≥ 0.012μF; 0603 > 0.1μF; 0805 > 0.47μF; 1206 ≥ 2.2μF; 1210 ≥ 10μF | 35V   | ≤3.5%  | ≤10% 0603 ≥ 1μF; 0805 ≥ 2.2μF; 1206 ≥ 2.2μF; 1210 ≥ 10μF | ≤5% 0201 ≥ 0.01μF; 0805 ≥ 1μF; 1210 ≥ 10μF | ≤7% 0603 ≥ 0.33μF | 25V   | ≤3.5%   | ≤10% 0201 ≥ 0.1μF; 0402 ≥ 0.056μF; 0603 ≥ 0.47μF; 0805 ≥ 2.2μF; 1206 ≥ 4.7μF; 1210 ≥ 22μF | ≤12.5% 0402 ≥ 0.33μF  | ≤5% 0201 ≥ 0.01μF; 0402 ≥ 0.033μF; 0603 ≥ 0.15μF; 0805 ≥ 0.68μF; 1206 ≥ 2.2μF; 1210 ≥ 4.7μF | 16V   | ≤3.5%  | ≤10% 0201 ≥ 0.022μF; 0402 ≥ 0.15μF; 0603 > 0.47μF; 0805 ≥ 2.2μF; 1206 ≥ 4.7μF; 1210 ≥ 22μF | ≤10% 0201 ≥ 0.012μF; 0402 ≥ 0.15μF; 0603 ≥ 0.33μF; 0805 ≥ 2.2μF; 1206 ≥ 2.2μF; 1210 ≥ 22μF | ≤15% 0201 ≥ 0.1μF; 0402 ≥ 1μF | 10V | ≤5%                          | 15% 0201 ≥ 0.1μF; 0402 ≥ 1μF   | 15% 0201 ≥ 0.1μF; 0402 ≥ 1μF; 0603 ≥ 10μF; 0805 ≥ 4.7μF; 1206 ≥ 47μF; 1210 ≥ 100μF | 6.3V | ≤10%   | 15% 0201 ≥ 0.1μF; 0402 ≥ 1μF; 0603 ≥ 10μF; 0805 ≥ 4.7μF; 1206 ≥ 47μF; 1210 ≥ 100μF | ≤20% 0402 ≥ 2.2μF | 4V   | ≤15% | ---           | RATED VOLTAGE         | INSULATION RESISTANCE | 100V: All X7R                               | 10GΩ or RxC ≥ 100 Ω-F whichever is smaller.                            | 50V: 0402 > 0.01μF; 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| RATED VOL.  | D.F.≤   |   | EXCEPTION OF D.F. ≤   |   |            |                     |                     |       |                   |  |  |                                  |       |   |   |   |   |       |  |  |  |                   |       |   |   |   |   |       |  |  |  |                               |     |                              |  |  |      |  |  |                   |      |      |               |                       |                       |   |  |  |   |  |   |   |  |  |                       |                       |                    |   |   |  |  |   |  |  |  |
| ≥100V   | ≤2.5%   | ≤3% 1206 ≥ 0.47μF   |   |   |            |                     |                     |       |                   |  |  |                                  |       |   |   |   |   |       |  |  |  |                   |       |   |   |   |   |       |  |  |  |                               |     |                              |  |  |      |  |  |                   |      |      |               |                       |                       |   |  |  |   |  |   |   |  |  |                       |                       |                    |   |   |  |  |   |  |  |  |
|   |   | ≤5% 0603≥0.068μF; 0805>0.1μF; 1206≥1μF; 1210≥2.2μF  |   |   |            |                     |                     |       |                   |  |  |                                  |       |   |   |   |   |       |  |  |  |                   |       |   |   |   |   |       |  |  |  |                               |     |                              |  |  |      |  |  |                   |      |      |               |                       |                       |   |  |  |   |  |   |   |  |  |                       |                       |                    |   |   |  |  |   |  |  |  |
|   |   | ≤10% 0805 > 0.22μF; 1210 ≥ 3.3μF  |   |   |            |                     |                     |       |                   |  |  |                                  |       |   |   |   |   |       |  |  |  |                   |       |   |   |   |   |       |  |  |  |                               |     |                              |  |  |      |  |  |                   |      |      |               |                       |                       |   |  |  |   |  |   |   |  |  |                       |                       |                    |   |   |  |  |   |  |  |  |
| 50V   | ≤2.5%   | ≤3% 0201(50V); 0603 ≥ 0.047μF; 0805 ≥ 0.18μF; 1206 ≥ 0.47μF   |   |   |            |                     |                     |       |                   |  |  |                                  |       |   |   |   |   |       |  |  |  |                   |       |   |   |   |   |       |  |  |  |                               |     |                              |  |  |      |  |  |                   |      |      |               |                       |                       |   |  |  |   |  |   |   |  |  |                       |                       |                    |   |   |  |  |   |  |  |  |
|   |   | ≤5% 0201 ≥ 0.01μF; 1210 ≥ 3.3μF   |   |   |            |                     |                     |       |                   |  |  |                                  |       |   |   |   |   |       |  |  |  |                   |       |   |   |   |   |       |  |  |  |                               |     |                              |  |  |      |  |  |                   |      |      |               |                       |                       |   |  |  |   |  |   |   |  |  |                       |                       |                    |   |   |  |  |   |  |  |  |
|   |   | ≤10% 0402 ≥ 0.012μF; 0603 > 0.1μF; 0805 > 0.47μF; 1206 ≥ 2.2μF; 1210 ≥ 10μF   |   |   |            |                     |                     |       |                   |  |  |                                  |       |   |   |   |   |       |  |  |  |                   |       |   |   |   |   |       |  |  |  |                               |     |                              |  |  |      |  |  |                   |      |      |               |                       |                       |   |  |  |   |  |   |   |  |  |                       |                       |                    |   |   |  |  |   |  |  |  |
| 35V   | ≤3.5%   | ≤10% 0603 ≥ 1μF; 0805 ≥ 2.2μF; 1206 ≥ 2.2μF; 1210 ≥ 10μF  |   |   |            |                     |                     |       |                   |  |  |                                  |       |   |   |   |   |       |  |  |  |                   |       |   |   |   |   |       |  |  |  |                               |     |                              |  |  |      |  |  |                   |      |      |               |                       |                       |   |  |  |   |  |   |   |  |  |                       |                       |                    |   |   |  |  |   |  |  |  |
|   |   | ≤5% 0201 ≥ 0.01μF; 0805 ≥ 1μF; 1210 ≥ 10μF  |   |   |            |                     |                     |       |                   |  |  |                                  |       |   |   |   |   |       |  |  |  |                   |       |   |   |   |   |       |  |  |  |                               |     |                              |  |  |      |  |  |                   |      |      |               |                       |                       |   |  |  |   |  |   |   |  |  |                       |                       |                    |   |   |  |  |   |  |  |  |
|   |   | ≤7% 0603 ≥ 0.33μF   |   |   |            |                     |                     |       |                   |  |  |                                  |       |   |   |   |   |       |  |  |  |                   |       |   |   |   |   |       |  |  |  |                               |     |                              |  |  |      |  |  |                   |      |      |               |                       |                       |   |  |  |   |  |   |   |  |  |                       |                       |                    |   |   |  |  |   |  |  |  |
| 25V   | ≤3.5%   | ≤10% 0201 ≥ 0.1μF; 0402 ≥ 0.056μF; 0603 ≥ 0.47μF; 0805 ≥ 2.2μF; 1206 ≥ 4.7μF; 1210 ≥ 22μF   |   |   |            |                     |                     |       |                   |  |  |                                  |       |   |   |   |   |       |  |  |  |                   |       |   |   |   |   |       |  |  |  |                               |     |                              |  |  |      |  |  |                   |      |      |               |                       |                       |   |  |  |   |  |   |   |  |  |                       |                       |                    |   |   |  |  |   |  |  |  |
|   |   | ≤12.5% 0402 ≥ 0.33μF  |   |   |            |                     |                     |       |                   |  |  |                                  |       |   |   |   |   |       |  |  |  |                   |       |   |   |   |   |       |  |  |  |                               |     |                              |  |  |      |  |  |                   |      |      |               |                       |                       |   |  |  |   |  |   |   |  |  |                       |                       |                    |   |   |  |  |   |  |  |  |
|   |   | ≤5% 0201 ≥ 0.01μF; 0402 ≥ 0.033μF; 0603 ≥ 0.15μF; 0805 ≥ 0.68μF; 1206 ≥ 2.2μF; 1210 ≥ 4.7μF   |   |   |            |                     |                     |       |                   |  |  |                                  |       |   |   |   |   |       |  |  |  |                   |       |   |   |   |   |       |  |  |  |                               |     |                              |  |  |      |  |  |                   |      |      |               |                       |                       |   |  |  |   |  |   |   |  |  |                       |                       |                    |   |   |  |  |   |  |  |  |
| 16V   | ≤3.5%   | ≤10% 0201 ≥ 0.022μF; 0402 ≥ 0.15μF; 0603 > 0.47μF; 0805 ≥ 2.2μF; 1206 ≥ 4.7μF; 1210 ≥ 22μF  |   |   |            |                     |                     |       |                   |  |  |                                  |       |   |   |   |   |       |  |  |  |                   |       |   |   |   |   |       |  |  |  |                               |     |                              |  |  |      |  |  |                   |      |      |               |                       |                       |   |  |  |   |  |   |   |  |  |                       |                       |                    |   |   |  |  |   |  |  |  |
|   |   | ≤10% 0201 ≥ 0.012μF; 0402 ≥ 0.15μF; 0603 ≥ 0.33μF; 0805 ≥ 2.2μF; 1206 ≥ 2.2μF; 1210 ≥ 22μF  |   |   |            |                     |                     |       |                   |  |  |                                  |       |   |   |   |   |       |  |  |  |                   |       |   |   |   |   |       |  |  |  |                               |     |                              |  |  |      |  |  |                   |      |      |               |                       |                       |   |  |  |   |  |   |   |  |  |                       |                       |                    |   |   |  |  |   |  |  |  |
|   |   | ≤15% 0201 ≥ 0.1μF; 0402 ≥ 1μF   |   |   |            |                     |                     |       |                   |  |  |                                  |       |   |   |   |   |       |  |  |  |                   |       |   |   |   |   |       |  |  |  |                               |     |                              |  |  |      |  |  |                   |      |      |               |                       |                       |   |  |  |   |  |   |   |  |  |                       |                       |                    |   |   |  |  |   |  |  |  |
| 10V   | ≤5%   | 15% 0201 ≥ 0.1μF; 0402 ≥ 1μF  |   |   |            |                     |                     |       |                   |  |  |                                  |       |   |   |   |   |       |  |  |  |                   |       |   |   |   |   |       |  |  |  |                               |     |                              |  |  |      |  |  |                   |      |      |               |                       |                       |   |  |  |   |  |   |   |  |  |                       |                       |                    |   |   |  |  |   |  |  |  |
|   |   | 15% 0201 ≥ 0.1μF; 0402 ≥ 1μF; 0603 ≥ 10μF; 0805 ≥ 4.7μF; 1206 ≥ 47μF; 1210 ≥ 100μF  |   |   |            |                     |                     |       |                   |  |  |                                  |       |   |   |   |   |       |  |  |  |                   |       |   |   |   |   |       |  |  |  |                               |     |                              |  |  |      |  |  |                   |      |      |               |                       |                       |   |  |  |   |  |   |   |  |  |                       |                       |                    |   |   |  |  |   |  |  |  |
| 6.3V  | ≤10%  | 15% 0201 ≥ 0.1μF; 0402 ≥ 1μF; 0603 ≥ 10μF; 0805 ≥ 4.7μF; 1206 ≥ 47μF; 1210 ≥ 100μF  |   |   |            |                     |                     |       |                   |  |  |                                  |       |   |   |   |   |       |  |  |  |                   |       |   |   |   |   |       |  |  |  |                               |     |                              |  |  |      |  |  |                   |      |      |               |                       |                       |   |  |  |   |  |   |   |  |  |                       |                       |                    |   |   |  |  |   |  |  |  |
|   |   | ≤20% 0402 ≥ 2.2μF   |   |   |            |                     |                     |       |                   |  |  |                                  |       |   |   |   |   |       |  |  |  |                   |       |   |   |   |   |       |  |  |  |                               |     |                              |  |  |      |  |  |                   |      |      |               |                       |                       |   |  |  |   |  |   |   |  |  |                       |                       |                    |   |   |  |  |   |  |  |  |
| 4V  | ≤15%  | ---   |   |   |            |                     |                     |       |                   |  |  |                                  |       |   |   |   |   |       |  |  |  |                   |       |   |   |   |   |       |  |  |  |                               |     |                              |  |  |      |  |  |                   |      |      |               |                       |                       |   |  |  |   |  |   |   |  |  |                       |                       |                    |   |   |  |  |   |  |  |  |
| RATED VOLTAGE   | INSULATION RESISTANCE                         |   |   |   |            |                     |                     |       |                   |  |  |                                  |       |   |   |   |   |       |  |  |  |                   |       |   |   |   |   |       |  |  |  |                               |     |                              |  |  |      |  |  |                   |      |      |               |                       |                       |   |  |  |   |  |   |   |  |  |                       |                       |                    |   |   |  |  |   |  |  |  |
| 100V: All X7R   | 10GΩ or RxC ≥ 100 Ω-F whichever is smaller.   |   |   |   |            |                     |                     |       |                   |  |  |                                  |       |   |   |   |   |       |  |  |  |                   |       |   |   |   |   |       |  |  |  |                               |     |                              |  |  |      |  |  |                   |      |      |               |                       |                       |   |  |  |   |  |   |   |  |  |                       |                       |                    |   |   |  |  |   |  |  |  |
| 50V: 0402 > 0.01μF; 0603 ≥ 1μF; 0805 ≥ 1μF; 1206 ≥ 4.7μF; 1210 ≥ 4.7μF                  |   |   |   |   |            |                     |                     |       |                   |  |  |                                  |       |   |   |   |   |       |  |  |  |                   |       |   |   |   |   |       |  |  |  |                               |     |                              |  |  |      |  |  |                   |      |      |               |                       |                       |   |  |  |   |  |   |   |  |  |                       |                       |                    |   |   |  |  |   |  |  |  |
| 35V: 0805 ≥ 2.2μF; 1206 ≥ 2.2μF; 1210 ≥ 10μF  |   |   |   |   |            |                     |                     |       |                   |  |  |                                  |       |   |   |   |   |       |  |  |  |                   |       |   |   |   |   |       |  |  |  |                               |     |                              |  |  |      |  |  |                   |      |      |               |                       |                       |   |  |  |   |  |   |   |  |  |                       |                       |                    |   |   |  |  |   |  |  |  |
| 25V: 0402 ≥ 1μF; 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   |   |   |   |   |            |                     |                     |       |                   |  |  |                                  |       |   |   |   |   |       |  |  |  |                   |       |   |   |   |   |       |  |  |  |                               |     |                              |  |  |      |  |  |                   |      |      |               |                       |                       |   |  |  |   |  |   |   |  |  |                       |                       |                    |   |   |  |  |   |  |  |  |
| 4V: 0603 ≥ 22μF; 0805 ≥ 47μF; 1206 ≥ 100μF  |   |   |   |   |            |                     |                     |       |                   |  |  |                                  |       |   |   |   |   |       |  |  |  |                   |       |   |   |   |   |       |  |  |  |                               |     |                              |  |  |      |  |  |                   |      |      |               |                       |                       |   |  |  |   |  |   |   |  |  |                       |                       |                    |   |   |  |  |   |  |  |  |
| RATED VOLTAGE   |   | INSULATION RESISTANCE   |   |   |            |                     |                     |       |                   |  |  |                                  |       |   |   |   |   |       |  |  |  |                   |       |   |   |   |   |       |  |  |  |                               |     |                              |  |  |      |  |  |                   |      |      |               |                       |                       |   |  |  |   |  |   |   |  |  |                       |                       |                    |   |   |  |  |   |  |  |  |
| 100V: 1210 ≥ 3.3μF  |   | RxC ≥ 50 Ω-F  |   |   |            |                     |                     |       |                   |  |  |                                  |       |   |   |   |   |       |  |  |  |                   |       |   |   |   |   |       |  |  |  |                               |     |                              |  |  |      |  |  |                   |      |      |               |                       |                       |   |  |  |   |  |   |   |  |  |                       |                       |                    |   |   |  |  |   |  |  |  |
| 50V: 0402 ≥ 0.1μF; 0603 ≥ 2.2μF; 0805 ≥ 10μF; 1206 ≥ 10μF                               |   |   |   |   |            |                     |                     |       |                   |  |  |                                  |       |   |   |   |   |       |  |  |  |                   |       |   |   |   |   |       |  |  |  |                               |     |                              |  |  |      |  |  |                   |      |      |               |                       |                       |   |  |  |   |  |   |   |  |  |                       |                       |                    |   |   |  |  |   |  |  |  |
| 35V: 0603 ≥ 1μF   |   |   |   |   |            |                     |                     |       |                   |  |  |                                  |       |   |   |   |   |       |  |  |  |                   |       |   |   |   |   |       |  |  |  |                               |     |                              |  |  |      |  |  |                   |      |      |               |                       |                       |   |  |  |   |  |   |   |  |  |                       |                       |                    |   |   |  |  |   |  |  |  |
| 25V: 0201 ≥ 0.1μF; 0402 ≥ 2.2μF; 0603 ≥ 10μF; 0805 ≥ 10μF; 1206 ≥ 22μF                  |   |   |   |   |            |                     |                     |       |                   |  |  |                                  |       |   |   |   |   |       |  |  |  |                   |       |   |   |   |   |       |  |  |  |                               |     |                              |  |  |      |  |  |                   |      |      |               |                       |                       |   |  |  |   |  |   |   |  |  |                       |                       |                    |   |   |  |  |   |  |  |  |
| 16V: 0603 ≥ 10μF; 0402 ≥ 1μF; 0201 ≥ 0.22μF   |   |   |   |   |            |                     |                     |       |                   |  |  |                                  |       |   |   |   |   |       |  |  |  |                   |       |   |   |   |   |       |  |  |  |                               |     |                              |  |  |      |  |  |                   |      |      |               |                       |                       |   |  |  |   |  |   |   |  |  |                       |                       |                    |   |   |  |  |   |  |  |  |
| 10V: 0201 > 0.1μF; 0402 ≥ 1μF; 0603 ≥ 10μF; 0805 ≥ 47μF                                 |   |   |   |   |            |                     |                     |       |                   |  |  |                                  |       |   |   |   |   |       |  |  |  |                   |       |   |   |   |   |       |  |  |  |                               |     |                              |  |  |      |  |  |                   |      |      |               |                       |                       |   |  |  |   |  |   |   |  |  |                       |                       |                    |   |   |  |  |   |  |  |  |
| 6.3V: 0201 ≥ 0.1μF; 0402 ≥ 1μF; 0603 > 4.7μF; 0805 ≥ 47μF; 1206 ≥ 10μF                  |   |   |   |   |            |                     |                     |       |                   |  |  |                                  |       |   |   |   |   |       |  |  |  |                   |       |   |   |   |   |       |  |  |  |                               |     |                              |  |  |      |  |  |                   |      |      |               |                       |                       |   |  |  |   |  |   |   |  |  |                       |                       |                    |   |   |  |  |   |  |  |  |
| 4V: 0603 ≥ 22μF; 0805 ≥ 47μF; 1206 ≥ 100μF  |   |   |   |   |            |                     |                     |       |                   |  |  |                                  |       |   |   |   |   |       |  |  |  |                   |       |   |   |   |   |       |  |  |  |                               |     |                              |  |  |      |  |  |                   |      |      |               |                       |                       |   |  |  |   |  |   |   |  |  |                       |                       |                    |   |   |  |  |   |  |  |  |

\* "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  |            |             |                     |             |       |   |               |  |  |  |       |                     |  |       |   |     |   |   |   |       |  |   |       |  |     |     |   |       |   |     |     |      |       |               |                       |               |   |  |  |   |  |   |                       |                    |              |   |                 |  |   |   |  |  |      |     |               |                       |                             |   |  |  |   |  |   |                       |
|---|---|--|---|------------|-------------|---------------------|-------------|-------|---|---------------|--|--|--|-------|---------------------|--|-------|---|-----|---|---|---|-------|--|---|-------|--|-----|-----|---|-------|---|-----|-----|------|-------|---------------|-----------------------|---------------|---|--|--|---|--|---|-----------------------|--------------------|--------------|---|-----------------|--|---|---|--|--|------|-----|---------------|-----------------------|-----------------------------|---|--|--|---|--|---|-----------------------|
| 13.   | Resistance to Soldering Heat<br>MIL-STD-202<br>Method 210 | <ul style="list-style-type: none"> <li>Solder temperature: 260±5°C</li> <li>Dipping time: 10±1 sec</li> <li>Before initial measurement (X7R only): perform 150+0/-10°C for 1 hr and then set 24±2 hrs at room temp.</li> <li>Measurement to be made after keeping at room temp. for 24±2 hrs.</li> </ul>   | <ul style="list-style-type: none"> <li>No remarkable damage.</li> <li>Cap change:<br/>NPO: within ±2.5% or 0.25pF whichever is larger<br/>X7R: within 7.5%</li> <li>-Q/D.F. value:<br/>NPO: Cap≥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<br/>≤5% 0603 ≥ 0.068μF; 0805 &gt; 0.1μF; 1206 ≥ 1μF; 1210 ≥ 2.2μF<br/>≤10% 0805 &gt; 0.22μF; 1210 ≥ 3.3μF</td> </tr> <tr> <td rowspan="2">≤5%</td> <td>≤3% 0201(50V); 0603 ≥ 0.047μF; 0805 ≥ 0.18μF; 1206 ≥ 0.47μF<br/>≤10% 0402 ≥ 0.012μF; 0603 &gt; 0.1μF; 0805 &gt; 0.47μF; 1206 ≥ 2.2μF; 1210 ≥ 10μF</td> </tr> <tr> <td>≤3.5%</td> <td>≤10% 0603 ≥ 1μF; 0805 ≥ 2.2μF; 1206 ≥ 2.2μF; 1210 ≥ 10μF<br/>≤5% 0201 ≥ 0.01μF; 0805 ≥ 1μF; 1210 ≥ 10μF</td> </tr> <tr> <td rowspan="2">50V</td> <td>≤2.5%</td> <td>≤7% 0603 ≥ 0.33μF<br/>≤10% 0201 ≥ 0.1μF; 0402 ≥ 0.056μF; 0603 ≥ 0.47μF; 0805 ≥ 2.2μF; 1206 ≥ 4.7μF; 1210 ≥ 22μF<br/>≤12.5% 0402 ≥ 0.33μF</td> </tr> <tr> <td rowspan="2">≤3.5%</td> <td>≤5% 0201 ≥ 0.01μF; 0402 ≥ 0.033μF; 0603 ≥ 0.15μF; 0805 ≥ 0.68μF; 1206 ≥ 2.2μF; 1210 ≥ 4.7μF<br/>≤10% 0201 ≥ 0.022μF; 0402 ≥ 0.15μF; 0603 &gt; 0.47μF; 0805 ≥ 2.2μF; 1206 ≥ 4.7μF; 1210 ≥ 22μF</td> </tr> <tr> <td rowspan="2">35V</td> <td>≤10%</td> <td>≤10% 0201 ≥ 0.012μF; 0402 ≥ 0.15μF; 0603 ≥ 0.33μF; 0805 ≥ 2.2μF; 1206 ≥ 2.2μF; 1210 ≥ 22μF<br/>≤15% 0201 ≥ 0.1μF; 0402 ≥ 1μF</td> </tr> <tr> <td rowspan="2">25V</td> <td>≤3.5%</td> <td>≤15% 0201 ≥ 0.1μF; 0402 ≥ 1μF; 0603 ≥ 10μF; 0805 ≥ 4.7μF; 1206 ≥ 47μF; 1210 ≥ 100μF<br/>≤20% 0402 ≥ 2.2μF</td> </tr> <tr> <td rowspan="2">16V</td> <td>≤3.5%</td> <td>≤15% ---</td> </tr> <tr> <td rowspan="2">10V</td> <td>≤5%</td> <td>---</td> </tr> <tr> <td rowspan="2">6.3V</td> <td>≤10%</td> <td>---</td> </tr> <tr> <td rowspan="2">4V</td> <td>≤15%</td> <td>---</td> </tr> </tbody> </table> <p>*1.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>100V: 1210 ≥ 3.3μF</td> <td rowspan="5">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. | D.F.≤       | EXCEPTION OF D.F. ≤ | ≥100V       | ≤2.5% | ≤3% 1206 ≥ 0.47μF<br>≤5% 0603 ≥ 0.068μF; 0805 > 0.1μF; 1206 ≥ 1μF; 1210 ≥ 2.2μF<br>≤10% 0805 > 0.22μF; 1210 ≥ 3.3μF | ≤5%           | ≤3% 0201(50V); 0603 ≥ 0.047μF; 0805 ≥ 0.18μF; 1206 ≥ 0.47μF<br>≤10% 0402 ≥ 0.012μF; 0603 > 0.1μF; 0805 > 0.47μF; 1206 ≥ 2.2μF; 1210 ≥ 10μF | ≤3.5%  | ≤10% 0603 ≥ 1μF; 0805 ≥ 2.2μF; 1206 ≥ 2.2μF; 1210 ≥ 10μF<br>≤5% 0201 ≥ 0.01μF; 0805 ≥ 1μF; 1210 ≥ 10μF | 50V   | ≤2.5%               | ≤7% 0603 ≥ 0.33μF<br>≤10% 0201 ≥ 0.1μF; 0402 ≥ 0.056μF; 0603 ≥ 0.47μF; 0805 ≥ 2.2μF; 1206 ≥ 4.7μF; 1210 ≥ 22μF<br>≤12.5% 0402 ≥ 0.33μF | ≤3.5% | ≤5% 0201 ≥ 0.01μF; 0402 ≥ 0.033μF; 0603 ≥ 0.15μF; 0805 ≥ 0.68μF; 1206 ≥ 2.2μF; 1210 ≥ 4.7μF<br>≤10% 0201 ≥ 0.022μF; 0402 ≥ 0.15μF; 0603 > 0.47μF; 0805 ≥ 2.2μF; 1206 ≥ 4.7μF; 1210 ≥ 22μF | 35V | ≤10%  | ≤10% 0201 ≥ 0.012μF; 0402 ≥ 0.15μF; 0603 ≥ 0.33μF; 0805 ≥ 2.2μF; 1206 ≥ 2.2μF; 1210 ≥ 22μF<br>≤15% 0201 ≥ 0.1μF; 0402 ≥ 1μF | 25V   | ≤3.5% | ≤15% 0201 ≥ 0.1μF; 0402 ≥ 1μF; 0603 ≥ 10μF; 0805 ≥ 4.7μF; 1206 ≥ 47μF; 1210 ≥ 100μF<br>≤20% 0402 ≥ 2.2μF | 16V   | ≤3.5% | ≤15% ---   | 10V | ≤5% | ---   | 6.3V  | ≤10%  | --- | 4V  | ≤15% | ---   | RATED VOLTAGE | INSULATION RESISTANCE | 100V: All X7R | 10GΩ or RxC ≥ 100 Ω-F whichever is smaller. | 50V: 0402 > 0.01μF; 0603 ≥ 1μF; 0805 ≥ 1μF; 1206 ≥ 4.7μF; 1210 ≥ 4.7μF | 35V: 0805 ≥ 2.2μF; 1206 ≥ 2.2μF; 1210 ≥ 10μF | 25V: 0402 ≥ 1μF; 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 | 100V: 1210 ≥ 3.3μF | RxC ≥ 50 Ω-F | 50V: 0402 ≥ 0.1μF; 0603 ≥ 2.2μF; 0805 ≥ 10μF; 1206 ≥ 10μF | 35V: 0603 ≥ 1μF | 25V: 0201 ≥ 0.1μF; 0402 ≥ 2.2μF; 0603 ≥ 10μF; 0805 ≥ 10μF; 1206 ≥ 22μF | 16V: 0603 ≥ 10μF; 0402 ≥ 1μF; 0201 ≥ 0.22μF | 10V: 0201 > 0.1μF; 0402 ≥ 1μF; 0603 ≥ 10μF; 0805 ≥ 47μF | 6.3V: 0201 ≥ 0.1μF; 0402 ≥ 1μF; 0603 > 4.7μF; 0805 ≥ 47μF; 1206 ≥ 10μF | 4V: 0603 ≥ 22μF; 0805 ≥ 47μF; 1206 ≥ 100μF |      |     |               |                       |                             |   |  |  |   |  |   |                       |
| RATED VOL.  | D.F.≤   | EXCEPTION OF D.F. ≤  |   |            |             |                     |             |       |   |               |  |  |  |       |                     |  |       |   |     |   |   |   |       |  |   |       |  |     |     |   |       |   |     |     |      |       |               |                       |               |   |  |  |   |  |   |                       |                    |              |   |                 |  |   |   |  |  |      |     |               |                       |                             |   |  |  |   |  |   |                       |
| ≥100V   | ≤2.5%   | ≤3% 1206 ≥ 0.47μF<br>≤5% 0603 ≥ 0.068μF; 0805 > 0.1μF; 1206 ≥ 1μF; 1210 ≥ 2.2μF<br>≤10% 0805 > 0.22μF; 1210 ≥ 3.3μF  |   |            |             |                     |             |       |   |               |  |  |  |       |                     |  |       |   |     |   |   |   |       |  |   |       |  |     |     |   |       |   |     |     |      |       |               |                       |               |   |  |  |   |  |   |                       |                    |              |   |                 |  |   |   |  |  |      |     |               |                       |                             |   |  |  |   |  |   |                       |
|   | ≤5%   | ≤3% 0201(50V); 0603 ≥ 0.047μF; 0805 ≥ 0.18μF; 1206 ≥ 0.47μF<br>≤10% 0402 ≥ 0.012μF; 0603 > 0.1μF; 0805 > 0.47μF; 1206 ≥ 2.2μF; 1210 ≥ 10μF   |   |            |             |                     |             |       |   |               |  |  |  |       |                     |  |       |   |     |   |   |   |       |  |   |       |  |     |     |   |       |   |     |     |      |       |               |                       |               |   |  |  |   |  |   |                       |                    |              |   |                 |  |   |   |  |  |      |     |               |                       |                             |   |  |  |   |  |   |                       |
|   |   | ≤3.5%  | ≤10% 0603 ≥ 1μF; 0805 ≥ 2.2μF; 1206 ≥ 2.2μF; 1210 ≥ 10μF<br>≤5% 0201 ≥ 0.01μF; 0805 ≥ 1μF; 1210 ≥ 10μF  |            |             |                     |             |       |   |               |  |  |  |       |                     |  |       |   |     |   |   |   |       |  |   |       |  |     |     |   |       |   |     |     |      |       |               |                       |               |   |  |  |   |  |   |                       |                    |              |   |                 |  |   |   |  |  |      |     |               |                       |                             |   |  |  |   |  |   |                       |
| 50V   | ≤2.5%   | ≤7% 0603 ≥ 0.33μF<br>≤10% 0201 ≥ 0.1μF; 0402 ≥ 0.056μF; 0603 ≥ 0.47μF; 0805 ≥ 2.2μF; 1206 ≥ 4.7μF; 1210 ≥ 22μF<br>≤12.5% 0402 ≥ 0.33μF   |   |            |             |                     |             |       |   |               |  |  |  |       |                     |  |       |   |     |   |   |   |       |  |   |       |  |     |     |   |       |   |     |     |      |       |               |                       |               |   |  |  |   |  |   |                       |                    |              |   |                 |  |   |   |  |  |      |     |               |                       |                             |   |  |  |   |  |   |                       |
|   | ≤3.5%   | ≤5% 0201 ≥ 0.01μF; 0402 ≥ 0.033μF; 0603 ≥ 0.15μF; 0805 ≥ 0.68μF; 1206 ≥ 2.2μF; 1210 ≥ 4.7μF<br>≤10% 0201 ≥ 0.022μF; 0402 ≥ 0.15μF; 0603 > 0.47μF; 0805 ≥ 2.2μF; 1206 ≥ 4.7μF; 1210 ≥ 22μF  |   |            |             |                     |             |       |   |               |  |  |  |       |                     |  |       |   |     |   |   |   |       |  |   |       |  |     |     |   |       |   |     |     |      |       |               |                       |               |   |  |  |   |  |   |                       |                    |              |   |                 |  |   |   |  |  |      |     |               |                       |                             |   |  |  |   |  |   |                       |
| 35V   |   | ≤10%   | ≤10% 0201 ≥ 0.012μF; 0402 ≥ 0.15μF; 0603 ≥ 0.33μF; 0805 ≥ 2.2μF; 1206 ≥ 2.2μF; 1210 ≥ 22μF<br>≤15% 0201 ≥ 0.1μF; 0402 ≥ 1μF   |            |             |                     |             |       |   |               |  |  |  |       |                     |  |       |   |     |   |   |   |       |  |   |       |  |     |     |   |       |   |     |     |      |       |               |                       |               |   |  |  |   |  |   |                       |                    |              |   |                 |  |   |   |  |  |      |     |               |                       |                             |   |  |  |   |  |   |                       |
|   | 25V   | ≤3.5%  | ≤15% 0201 ≥ 0.1μF; 0402 ≥ 1μF; 0603 ≥ 10μF; 0805 ≥ 4.7μF; 1206 ≥ 47μF; 1210 ≥ 100μF<br>≤20% 0402 ≥ 2.2μF  |            |             |                     |             |       |   |               |  |  |  |       |                     |  |       |   |     |   |   |   |       |  |   |       |  |     |     |   |       |   |     |     |      |       |               |                       |               |   |  |  |   |  |   |                       |                    |              |   |                 |  |   |   |  |  |      |     |               |                       |                             |   |  |  |   |  |   |                       |
| 16V   |   | ≤3.5%  | ≤15% ---  |            |             |                     |             |       |   |               |  |  |  |       |                     |  |       |   |     |   |   |   |       |  |   |       |  |     |     |   |       |   |     |     |      |       |               |                       |               |   |  |  |   |  |   |                       |                    |              |   |                 |  |   |   |  |  |      |     |               |                       |                             |   |  |  |   |  |   |                       |
|   | 10V   | ≤5%  | ---   |            |             |                     |             |       |   |               |  |  |  |       |                     |  |       |   |     |   |   |   |       |  |   |       |  |     |     |   |       |   |     |     |      |       |               |                       |               |   |  |  |   |  |   |                       |                    |              |   |                 |  |   |   |  |  |      |     |               |                       |                             |   |  |  |   |  |   |                       |
| 6.3V  |   | ≤10%   | ---   |            |             |                     |             |       |   |               |  |  |  |       |                     |  |       |   |     |   |   |   |       |  |   |       |  |     |     |   |       |   |     |     |      |       |               |                       |               |   |  |  |   |  |   |                       |                    |              |   |                 |  |   |   |  |  |      |     |               |                       |                             |   |  |  |   |  |   |                       |
|   | 4V  | ≤15%   | ---   |            |             |                     |             |       |   |               |  |  |  |       |                     |  |       |   |     |   |   |   |       |  |   |       |  |     |     |   |       |   |     |     |      |       |               |                       |               |   |  |  |   |  |   |                       |                    |              |   |                 |  |   |   |  |  |      |     |               |                       |                             |   |  |  |   |  |   |                       |
| RATED VOLTAGE   |   | INSULATION RESISTANCE  |   |            |             |                     |             |       |   |               |  |  |  |       |                     |  |       |   |     |   |   |   |       |  |   |       |  |     |     |   |       |   |     |     |      |       |               |                       |               |   |  |  |   |  |   |                       |                    |              |   |                 |  |   |   |  |  |      |     |               |                       |                             |   |  |  |   |  |   |                       |
| 100V: All X7R   | 10GΩ or RxC ≥ 100 Ω-F whichever is smaller.               |  |   |            |             |                     |             |       |   |               |  |  |  |       |                     |  |       |   |     |   |   |   |       |  |   |       |  |     |     |   |       |   |     |     |      |       |               |                       |               |   |  |  |   |  |   |                       |                    |              |   |                 |  |   |   |  |  |      |     |               |                       |                             |   |  |  |   |  |   |                       |
| 50V: 0402 > 0.01μF; 0603 ≥ 1μF; 0805 ≥ 1μF; 1206 ≥ 4.7μF; 1210 ≥ 4.7μF                  |   |  |   |            |             |                     |             |       |   |               |  |  |  |       |                     |  |       |   |     |   |   |   |       |  |   |       |  |     |     |   |       |   |     |     |      |       |               |                       |               |   |  |  |   |  |   |                       |                    |              |   |                 |  |   |   |  |  |      |     |               |                       |                             |   |  |  |   |  |   |                       |
| 35V: 0805 ≥ 2.2μF; 1206 ≥ 2.2μF; 1210 ≥ 10μF  |   |  |   |            |             |                     |             |       |   |               |  |  |  |       |                     |  |       |   |     |   |   |   |       |  |   |       |  |     |     |   |       |   |     |     |      |       |               |                       |               |   |  |  |   |  |   |                       |                    |              |   |                 |  |   |   |  |  |      |     |               |                       |                             |   |  |  |   |  |   |                       |
| 25V: 0402 ≥ 1μF; 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   |   |  |   |            |             |                     |             |       |   |               |  |  |  |       |                     |  |       |   |     |   |   |   |       |  |   |       |  |     |     |   |       |   |     |     |      |       |               |                       |               |   |  |  |   |  |   |                       |                    |              |   |                 |  |   |   |  |  |      |     |               |                       |                             |   |  |  |   |  |   |                       |
| 100V: 1210 ≥ 3.3μF  |   | RxC ≥ 50 Ω-F   |   |            |             |                     |             |       |   |               |  |  |  |       |                     |  |       |   |     |   |   |   |       |  |   |       |  |     |     |   |       |   |     |     |      |       |               |                       |               |   |  |  |   |  |   |                       |                    |              |   |                 |  |   |   |  |  |      |     |               |                       |                             |   |  |  |   |  |   |                       |
| 50V: 0402 ≥ 0.1μF; 0603 ≥ 2.2μF; 0805 ≥ 10μF; 1206 ≥ 10μF                               |   |  |   |            |             |                     |             |       |   |               |  |  |  |       |                     |  |       |   |     |   |   |   |       |  |   |       |  |     |     |   |       |   |     |     |      |       |               |                       |               |   |  |  |   |  |   |                       |                    |              |   |                 |  |   |   |  |  |      |     |               |                       |                             |   |  |  |   |  |   |                       |
| 35V: 0603 ≥ 1μF   |   |  |   |            |             |                     |             |       |   |               |  |  |  |       |                     |  |       |   |     |   |   |   |       |  |   |       |  |     |     |   |       |   |     |     |      |       |               |                       |               |   |  |  |   |  |   |                       |                    |              |   |                 |  |   |   |  |  |      |     |               |                       |                             |   |  |  |   |  |   |                       |
| 25V: 0201 ≥ 0.1μF; 0402 ≥ 2.2μF; 0603 ≥ 10μF; 0805 ≥ 10μF; 1206 ≥ 22μF                  |   |  |   |            |             |                     |             |       |   |               |  |  |  |       |                     |  |       |   |     |   |   |   |       |  |   |       |  |     |     |   |       |   |     |     |      |       |               |                       |               |   |  |  |   |  |   |                       |                    |              |   |                 |  |   |   |  |  |      |     |               |                       |                             |   |  |  |   |  |   |                       |
| 16V: 0603 ≥ 10μF; 0402 ≥ 1μF; 0201 ≥ 0.22μF   |   |  |   |            |             |                     |             |       |   |               |  |  |  |       |                     |  |       |   |     |   |   |   |       |  |   |       |  |     |     |   |       |   |     |     |      |       |               |                       |               |   |  |  |   |  |   |                       |                    |              |   |                 |  |   |   |  |  |      |     |               |                       |                             |   |  |  |   |  |   |                       |
| 10V: 0201 > 0.1μF; 0402 ≥ 1μF; 0603 ≥ 10μF; 0805 ≥ 47μF                                 |   |  |   |            |             |                     |             |       |   |               |  |  |  |       |                     |  |       |   |     |   |   |   |       |  |   |       |  |     |     |   |       |   |     |     |      |       |               |                       |               |   |  |  |   |  |   |                       |                    |              |   |                 |  |   |   |  |  |      |     |               |                       |                             |   |  |  |   |  |   |                       |
| 6.3V: 0201 ≥ 0.1μF; 0402 ≥ 1μF; 0603 > 4.7μF; 0805 ≥ 47μF; 1206 ≥ 10μF                  |   |  |   |            |             |                     |             |       |   |               |  |  |  |       |                     |  |       |   |     |   |   |   |       |  |   |       |  |     |     |   |       |   |     |     |      |       |               |                       |               |   |  |  |   |  |   |                       |                    |              |   |                 |  |   |   |  |  |      |     |               |                       |                             |   |  |  |   |  |   |                       |
| 4V: 0603 ≥ 22μF; 0805 ≥ 47μF; 1206 ≥ 100μF  |   |  |   |            |             |                     |             |       |   |               |  |  |  |       |                     |  |       |   |     |   |   |   |       |  |   |       |  |     |     |   |       |   |     |     |      |       |               |                       |               |   |  |  |   |  |   |                       |                    |              |   |                 |  |   |   |  |  |      |     |               |                       |                             |   |  |  |   |  |   |                       |
| 14.   | Thermal Shock<br>MIL-STD-202<br>Method 107                | <ul style="list-style-type: none"> <li>Conduct 300 cycles according to the temperatures and time.</li> </ul> <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 ± 3</td> </tr> <tr> <td>2</td> <td>+125°C + 3/-0</td> <td>5 ± 3</td> </tr> </tbody> </table> <ul style="list-style-type: none"> <li>Max. transfer time: 20 sec.</li> <li>Before initial measurement (X7R only): perform 150+0/-10°C for 1 hr and then set for 24±2 hrs at room temp.</li> <li>Measurement to be made after keeping at room temp for 24±2 hrs.</li> </ul> | STEP  | TEMP. (°C) | TIME (MIN.) | 1                   | -55°C +0/-3 | 5 ± 3 | 2   | +125°C + 3/-0 | 5 ± 3  | <ul style="list-style-type: none"> <li>No remarkable damage.</li> <li>Cap change:<br/>NPO: within ±2.5% or 0.25pF whichever is larger<br/>X7R: within 10.0%</li> <li>-Q/D.F. value:<br/>NPO: Cap≥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>≤3%</td> <td>≤6% 1206 ≥ 0.47μF<br/>≤7.5% 0603 ≥ 0.068μF; 0805 &gt; 0.1μF; 1206 ≥ 1μF; 1210 ≥ 2.2μF<br/>≤20% 0805 &gt; 0.22μF; 1210 ≥ 3.3μF</td> </tr> <tr> <td rowspan="2">≤5%</td> <td>≤6% 0201(50V); 0603 ≥ 0.047μF; 0805 ≥ 0.18μF; 1206 ≥ 0.47μF<br/>≤10% 0201 ≥ 0.01μF; 1210 ≥ 3.3μF<br/>≤20% 0402 ≥ 0.012μF; 0603 &gt; 0.1μF; 0805 /X7R &gt; 0.47μF; 1206 ≥ 2.2μF; 1210 ≥ 10μF</td> </tr> <tr> <td>≤3.5%</td> <td>≤20% 0603 ≥ 1μF; 0805 ≥ 2.2μF; 1206 ≥ 2.2μF; 1210 ≥ 10μF<br/>≤10% 0201 ≥ 0.01μF; 0805 ≥ 1μF; 1210 ≥ 10μF</td> </tr> <tr> <td rowspan="2">50V</td> <td>≤3%</td> <td>≤14% 0603 ≥ 0.33μF<br/>≤15% 0201 ≥ 0.1μF; 0402 ≥ 0.056μF; 0603 ≥ 0.47μF; 0805 ≥ 2.2μF; 1206 ≥ 4.7μF; 1210 ≥ 22μF<br/>≤20% 0402 ≥ 0.33μF</td> </tr> <tr> <td>≤5%</td> <td>≤10% 0201 ≥ 0.01μF; 0402 ≥ 0.033μF; 0603 ≥ 0.15μF; 0805 ≥ 0.68μF; 1206 ≥ 2.2μF; 1210 ≥ 4.7μF<br/>≤15% 0201 ≥ 0.022μF; 0402 ≥ 0.15μF; 0603 &gt; 0.47μF; 0805 ≥ 2.2μF; 1206 ≥ 4.7μF; 1210 ≥ 22μF</td> </tr> <tr> <td rowspan="2">35V</td> <td>≤5%</td> <td>≤15% 0201 ≥ 0.012μF; 0402 ≥ 0.15μF; 0603 ≥ 0.33μF; 0805 ≥ 2.2μF; 1206 ≥ 2.2μF; 1210 ≥ 22μF<br/>≤20% 0201 ≥ 0.1μF; 0402 ≥ 1μF</td> </tr> <tr> <td>≤3.5%</td> <td>≤30% 0201 ≥ 0.1μF; 0402 ≥ 1μF; 0603 ≥ 10μF; 0805 ≥ 4.7μF; 1206 ≥ 47μF; 1210 ≥ 100μF<br/>≤20% ---</td> </tr> <tr> <td rowspan="2">25V</td> <td>≤5%</td> <td>---</td> </tr> <tr> <td>≤3.5%</td> <td>---</td> </tr> <tr> <td rowspan="2">16V</td> <td>≤5%</td> <td>---</td> </tr> <tr> <td>≤3.5%</td> <td>---</td> </tr> <tr> <td rowspan="2">10V</td> <td>≤5%</td> <td>---</td> </tr> <tr> <td>≤3.5%</td> <td>---</td> </tr> <tr> <td rowspan="2">6.3V</td> <td>≤15%</td> <td>---</td> </tr> <tr> <td>≤20%</td> <td>---</td> </tr> <tr> <td rowspan="2">4V</td> <td>≤15%</td> <td>---</td> </tr> <tr> <td>≤20%</td> <td>---</td> </tr> </tbody> </table> <p>*1.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">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 ≥ 2.2μF; 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  | ≤3%   | ≤6% 1206 ≥ 0.47μF<br>≤7.5% 0603 ≥ 0.068μF; 0805 > 0.1μF; 1206 ≥ 1μF; 1210 ≥ 2.2μF<br>≤20% 0805 > 0.22μF; 1210 ≥ 3.3μF   | ≤5% | ≤6% 0201(50V); 0603 ≥ 0.047μF; 0805 ≥ 0.18μF; 1206 ≥ 0.47μF<br>≤10% 0201 ≥ 0.01μF; 1210 ≥ 3.3μF<br>≤20% 0402 ≥ 0.012μF; 0603 > 0.1μF; 0805 /X7R > 0.47μF; 1206 ≥ 2.2μF; 1210 ≥ 10μF | ≤3.5%   | ≤20% 0603 ≥ 1μF; 0805 ≥ 2.2μF; 1206 ≥ 2.2μF; 1210 ≥ 10μF<br>≤10% 0201 ≥ 0.01μF; 0805 ≥ 1μF; 1210 ≥ 10μF | 50V   | ≤3%  | ≤14% 0603 ≥ 0.33μF<br>≤15% 0201 ≥ 0.1μF; 0402 ≥ 0.056μF; 0603 ≥ 0.47μF; 0805 ≥ 2.2μF; 1206 ≥ 4.7μF; 1210 ≥ 22μF<br>≤20% 0402 ≥ 0.33μF | ≤5%   | ≤10% 0201 ≥ 0.01μF; 0402 ≥ 0.033μF; 0603 ≥ 0.15μF; 0805 ≥ 0.68μF; 1206 ≥ 2.2μF; 1210 ≥ 4.7μF<br>≤15% 0201 ≥ 0.022μF; 0402 ≥ 0.15μF; 0603 > 0.47μF; 0805 ≥ 2.2μF; 1206 ≥ 4.7μF; 1210 ≥ 22μF | 35V | ≤5% | ≤15% 0201 ≥ 0.012μF; 0402 ≥ 0.15μF; 0603 ≥ 0.33μF; 0805 ≥ 2.2μF; 1206 ≥ 2.2μF; 1210 ≥ 22μF<br>≤20% 0201 ≥ 0.1μF; 0402 ≥ 1μF | ≤3.5% | ≤30% 0201 ≥ 0.1μF; 0402 ≥ 1μF; 0603 ≥ 10μF; 0805 ≥ 4.7μF; 1206 ≥ 47μF; 1210 ≥ 100μF<br>≤20% --- | 25V | ≤5% | ---  | ≤3.5% | ---           | 16V                   | ≤5%           | ---   | ≤3.5%  | ---  | 10V   | ≤5%  | ---   | ≤3.5%                 | ---                | 6.3V         | ≤15%  | ---             | ≤20%   | ---   | 4V  | ≤15%   | ---  | ≤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 ≥ 2.2μF; 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 |
| STEP  | TEMP. (°C)  | TIME (MIN.)  |   |            |             |                     |             |       |   |               |  |  |  |       |                     |  |       |   |     |   |   |   |       |  |   |       |  |     |     |   |       |   |     |     |      |       |               |                       |               |   |  |  |   |  |   |                       |                    |              |   |                 |  |   |   |  |  |      |     |               |                       |                             |   |  |  |   |  |   |                       |
| 1   | -55°C +0/-3   | 5 ± 3  |   |            |             |                     |             |       |   |               |  |  |  |       |                     |  |       |   |     |   |   |   |       |  |   |       |  |     |     |   |       |   |     |     |      |       |               |                       |               |   |  |  |   |  |   |                       |                    |              |   |                 |  |   |   |  |  |      |     |               |                       |                             |   |  |  |   |  |   |                       |
| 2   | +125°C + 3/-0   | 5 ± 3  |   |            |             |                     |             |       |   |               |  |  |  |       |                     |  |       |   |     |   |   |   |       |  |   |       |  |     |     |   |       |   |     |     |      |       |               |                       |               |   |  |  |   |  |   |                       |                    |              |   |                 |  |   |   |  |  |      |     |               |                       |                             |   |  |  |   |  |   |                       |
| RATED VOL.  | D.F.≤   | EXCEPTION OF D.F. ≤  |   |            |             |                     |             |       |   |               |  |  |  |       |                     |  |       |   |     |   |   |   |       |  |   |       |  |     |     |   |       |   |     |     |      |       |               |                       |               |   |  |  |   |  |   |                       |                    |              |   |                 |  |   |   |  |  |      |     |               |                       |                             |   |  |  |   |  |   |                       |
| ≥100V   | ≤3%   | ≤6% 1206 ≥ 0.47μF<br>≤7.5% 0603 ≥ 0.068μF; 0805 > 0.1μF; 1206 ≥ 1μF; 1210 ≥ 2.2μF<br>≤20% 0805 > 0.22μF; 1210 ≥ 3.3μF  |   |            |             |                     |             |       |   |               |  |  |  |       |                     |  |       |   |     |   |   |   |       |  |   |       |  |     |     |   |       |   |     |     |      |       |               |                       |               |   |  |  |   |  |   |                       |                    |              |   |                 |  |   |   |  |  |      |     |               |                       |                             |   |  |  |   |  |   |                       |
|   | ≤5%   | ≤6% 0201(50V); 0603 ≥ 0.047μF; 0805 ≥ 0.18μF; 1206 ≥ 0.47μF<br>≤10% 0201 ≥ 0.01μF; 1210 ≥ 3.3μF<br>≤20% 0402 ≥ 0.012μF; 0603 > 0.1μF; 0805 /X7R > 0.47μF; 1206 ≥ 2.2μF; 1210 ≥ 10μF  |   |            |             |                     |             |       |   |               |  |  |  |       |                     |  |       |   |     |   |   |   |       |  |   |       |  |     |     |   |       |   |     |     |      |       |               |                       |               |   |  |  |   |  |   |                       |                    |              |   |                 |  |   |   |  |  |      |     |               |                       |                             |   |  |  |   |  |   |                       |
|   |   | ≤3.5%  | ≤20% 0603 ≥ 1μF; 0805 ≥ 2.2μF; 1206 ≥ 2.2μF; 1210 ≥ 10μF<br>≤10% 0201 ≥ 0.01μF; 0805 ≥ 1μF; 1210 ≥ 10μF   |            |             |                     |             |       |   |               |  |  |  |       |                     |  |       |   |     |   |   |   |       |  |   |       |  |     |     |   |       |   |     |     |      |       |               |                       |               |   |  |  |   |  |   |                       |                    |              |   |                 |  |   |   |  |  |      |     |               |                       |                             |   |  |  |   |  |   |                       |
| 50V   | ≤3%   | ≤14% 0603 ≥ 0.33μF<br>≤15% 0201 ≥ 0.1μF; 0402 ≥ 0.056μF; 0603 ≥ 0.47μF; 0805 ≥ 2.2μF; 1206 ≥ 4.7μF; 1210 ≥ 22μF<br>≤20% 0402 ≥ 0.33μF  |   |            |             |                     |             |       |   |               |  |  |  |       |                     |  |       |   |     |   |   |   |       |  |   |       |  |     |     |   |       |   |     |     |      |       |               |                       |               |   |  |  |   |  |   |                       |                    |              |   |                 |  |   |   |  |  |      |     |               |                       |                             |   |  |  |   |  |   |                       |
|   | ≤5%   | ≤10% 0201 ≥ 0.01μF; 0402 ≥ 0.033μF; 0603 ≥ 0.15μF; 0805 ≥ 0.68μF; 1206 ≥ 2.2μF; 1210 ≥ 4.7μF<br>≤15% 0201 ≥ 0.022μF; 0402 ≥ 0.15μF; 0603 > 0.47μF; 0805 ≥ 2.2μF; 1206 ≥ 4.7μF; 1210 ≥ 22μF   |   |            |             |                     |             |       |   |               |  |  |  |       |                     |  |       |   |     |   |   |   |       |  |   |       |  |     |     |   |       |   |     |     |      |       |               |                       |               |   |  |  |   |  |   |                       |                    |              |   |                 |  |   |   |  |  |      |     |               |                       |                             |   |  |  |   |  |   |                       |
| 35V   | ≤5%   | ≤15% 0201 ≥ 0.012μF; 0402 ≥ 0.15μF; 0603 ≥ 0.33μF; 0805 ≥ 2.2μF; 1206 ≥ 2.2μF; 1210 ≥ 22μF<br>≤20% 0201 ≥ 0.1μF; 0402 ≥ 1μF  |   |            |             |                     |             |       |   |               |  |  |  |       |                     |  |       |   |     |   |   |   |       |  |   |       |  |     |     |   |       |   |     |     |      |       |               |                       |               |   |  |  |   |  |   |                       |                    |              |   |                 |  |   |   |  |  |      |     |               |                       |                             |   |  |  |   |  |   |                       |
|   | ≤3.5%   | ≤30% 0201 ≥ 0.1μF; 0402 ≥ 1μF; 0603 ≥ 10μF; 0805 ≥ 4.7μF; 1206 ≥ 47μF; 1210 ≥ 100μF<br>≤20% ---  |   |            |             |                     |             |       |   |               |  |  |  |       |                     |  |       |   |     |   |   |   |       |  |   |       |  |     |     |   |       |   |     |     |      |       |               |                       |               |   |  |  |   |  |   |                       |                    |              |   |                 |  |   |   |  |  |      |     |               |                       |                             |   |  |  |   |  |   |                       |
| 25V   | ≤5%   | ---  |   |            |             |                     |             |       |   |               |  |  |  |       |                     |  |       |   |     |   |   |   |       |  |   |       |  |     |     |   |       |   |     |     |      |       |               |                       |               |   |  |  |   |  |   |                       |                    |              |   |                 |  |   |   |  |  |      |     |               |                       |                             |   |  |  |   |  |   |                       |
|   | ≤3.5%   | ---  |   |            |             |                     |             |       |   |               |  |  |  |       |                     |  |       |   |     |   |   |   |       |  |   |       |  |     |     |   |       |   |     |     |      |       |               |                       |               |   |  |  |   |  |   |                       |                    |              |   |                 |  |   |   |  |  |      |     |               |                       |                             |   |  |  |   |  |   |                       |
| 16V   | ≤5%   | ---  |   |            |             |                     |             |       |   |               |  |  |  |       |                     |  |       |   |     |   |   |   |       |  |   |       |  |     |     |   |       |   |     |     |      |       |               |                       |               |   |  |  |   |  |   |                       |                    |              |   |                 |  |   |   |  |  |      |     |               |                       |                             |   |  |  |   |  |   |                       |
|   | ≤3.5%   | ---  |   |            |             |                     |             |       |   |               |  |  |  |       |                     |  |       |   |     |   |   |   |       |  |   |       |  |     |     |   |       |   |     |     |      |       |               |                       |               |   |  |  |   |  |   |                       |                    |              |   |                 |  |   |   |  |  |      |     |               |                       |                             |   |  |  |   |  |   |                       |
| 10V   | ≤5%   | ---  |   |            |             |                     |             |       |   |               |  |  |  |       |                     |  |       |   |     |   |   |   |       |  |   |       |  |     |     |   |       |   |     |     |      |       |               |                       |               |   |  |  |   |  |   |                       |                    |              |   |                 |  |   |   |  |  |      |     |               |                       |                             |   |  |  |   |  |   |                       |
|   | ≤3.5%   | ---  |   |            |             |                     |             |       |   |               |  |  |  |       |                     |  |       |   |     |   |   |   |       |  |   |       |  |     |     |   |       |   |     |     |      |       |               |                       |               |   |  |  |   |  |   |                       |                    |              |   |                 |  |   |   |  |  |      |     |               |                       |                             |   |  |  |   |  |   |                       |
| 6.3V  | ≤15%  | ---  |   |            |             |                     |             |       |   |               |  |  |  |       |                     |  |       |   |     |   |   |   |       |  |   |       |  |     |     |   |       |   |     |     |      |       |               |                       |               |   |  |  |   |  |   |                       |                    |              |   |                 |  |   |   |  |  |      |     |               |                       |                             |   |  |  |   |  |   |                       |
|   | ≤20%  | ---  |   |            |             |                     |             |       |   |               |  |  |  |       |                     |  |       |   |     |   |   |   |       |  |   |       |  |     |     |   |       |   |     |     |      |       |               |                       |               |   |  |  |   |  |   |                       |                    |              |   |                 |  |   |   |  |  |      |     |               |                       |                             |   |  |  |   |  |   |                       |
| 4V  | ≤15%  | ---  |   |            |             |                     |             |       |   |               |  |  |  |       |                     |  |       |   |     |   |   |   |       |  |   |       |  |     |     |   |       |   |     |     |      |       |               |                       |               |   |  |  |   |  |   |                       |                    |              |   |                 |  |   |   |  |  |      |     |               |                       |                             |   |  |  |   |  |   |                       |
|   | ≤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 ≥ 2.2μF; 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   |   |  |   |            |             |                     |             |       |   |               |  |  |  |       |                     |  |       |   |     |   |   |   |       |  |   |       |  |     |     |   |       |   |     |     |      |       |               |                       |               |   |  |  |   |  |   |                       |                    |              |   |                 |  |   |   |  |  |      |     |               |                       |                             |   |  |  |   |  |   |                       |

\* "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<br>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:<br/>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 rowspan="2"><math>\geq</math>100V</td> <td rowspan="2"><math>\leq</math>2.5%</td> <td><math>\leq</math>3% 1206 <math>\geq</math> 0.47<math>\mu</math>F</td> </tr> <tr> <td><math>\leq</math>5% 0603 <math>\geq</math> 0.048<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</td> </tr> <tr> <td rowspan="2">50V</td> <td rowspan="2"><math>\leq</math>2.5%</td> <td><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><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</td> </tr> <tr> <td rowspan="2">35V</td> <td rowspan="2"><math>\leq</math>3.5%</td> <td><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><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</td> </tr> <tr> <td rowspan="2">25V</td> <td rowspan="2"><math>\leq</math>3.5%</td> <td><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><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</td> </tr> <tr> <td rowspan="2">16V</td> <td rowspan="2"><math>\leq</math>3.5%</td> <td><math>\leq</math>7% 0603 <math>\geq</math> 0.33<math>\mu</math>F</td> </tr> <tr> <td><math>\leq</math>10% 0201 <math>\geq</math> 0.1<math>\mu</math>F; 0402 <math>\geq</math> 0.056<math>\mu</math>F; 0603 <math>\geq</math> 0.47<math>\mu</math>F; 0805 <math>\geq</math> 2.2<math>\mu</math>F; 1206 <math>\geq</math> 4.7<math>\mu</math>F; 1210 <math>\geq</math> 22<math>\mu</math>F</td> </tr> <tr> <td rowspan="2">10V</td> <td rowspan="2"><math>\leq</math>5%</td> <td><math>\leq</math>12.5% 0402 <math>\geq</math> 0.33<math>\mu</math>F</td> </tr> <tr> <td><math>\leq</math>5% 0201 <math>\geq</math> 0.01<math>\mu</math>F; 0402 <math>\geq</math> 0.033<math>\mu</math>F; 0603 <math>\geq</math> 0.15<math>\mu</math>F; 0805 <math>\geq</math> 0.68<math>\mu</math>F; 1206 <math>\geq</math> 2.2<math>\mu</math>F; 1210 <math>\geq</math> 4.7<math>\mu</math>F</td> </tr> <tr> <td rowspan="2">6.3V</td> <td rowspan="2"><math>\leq</math>10%</td> <td><math>\leq</math>10% 0201 <math>\geq</math> 0.012<math>\mu</math>F; 0402 <math>\geq</math> 0.15<math>\mu</math>F; 0603 <math>&gt;</math> 0.47<math>\mu</math>F; 0805 <math>\geq</math> 2.2<math>\mu</math>F; 1206 <math>\geq</math> 4.7<math>\mu</math>F; 1210 <math>\geq</math> 22<math>\mu</math>F</td> </tr> <tr> <td><math>\leq</math>15% 0201 <math>\geq</math> 0.1<math>\mu</math>F; 0402 <math>\geq</math> 1<math>\mu</math>F</td> </tr> <tr> <td>4V</td> <td><math>\leq</math>15%</td> <td><math>\leq</math>15% 0201 <math>\geq</math> 0.1<math>\mu</math>F; 0402 <math>\geq</math> 1<math>\mu</math>F; 0603 <math>\geq</math> 10<math>\mu</math>F; 0805 <math>\geq</math> 4.7<math>\mu</math>F; 1206 <math>\geq</math> 47<math>\mu</math>F; 1210 <math>\geq</math> 100<math>\mu</math>F</td> </tr> </tbody> </table> <p>*I.R.: <math>\geq</math>10G<math>\Omega</math> OR RxC<math>\geq</math>500<math>\Omega</math>-F whichever is smaller.</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">10G<math>\Omega</math> or RxC<math>\geq</math>100 <math>\Omega</math>-F whichever is smaller</td> </tr> <tr> <td>50V: 0402 <math>&gt;</math> 0.01<math>\mu</math>F; 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0603 $\geq$ 0.047 $\mu$ F; 0805 $\geq$ 0.18 $\mu$ F; 1206 $\geq$ 0.47 $\mu$ F | 35V | $\leq$ 3.5% | $\leq$ 5% 0201 $\geq$ 0.01 $\mu$ F; 1210 $\geq$ 3.3 $\mu$ F | $\leq$ 10% 0402 $\geq$ 0.012 $\mu$ F; 0603 $>$ 0.1 $\mu$ F; 0805 $>$ 0.47 $\mu$ F; 1206 $\geq$ 2.2 $\mu$ F; 1210 $\geq$ 10 $\mu$ F | 25V | $\leq$ 3.5% | $\leq$ 5% 0603 $\geq$ 1 $\mu$ F; 0805 $\geq$ 2.2 $\mu$ F; 1206 $\geq$ 2.2 $\mu$ F; 1210 $\geq$ 10 $\mu$ F | $\leq$ 5% 0201 $\geq$ 0.01 $\mu$ F; 0805 $\geq$ 1 $\mu$ F; 1210 $\geq$ 10 $\mu$ F | 16V | $\leq$ 3.5% | $\leq$ 7% 0603 $\geq$ 0.33 $\mu$ F | $\leq$ 10% 0201 $\geq$ 0.1 $\mu$ F; 0402 $\geq$ 0.056 $\mu$ F; 0603 $\geq$ 0.47 $\mu$ F; 0805 $\geq$ 2.2 $\mu$ F; 1206 $\geq$ 4.7 $\mu$ F; 1210 $\geq$ 22 $\mu$ F | 10V | $\leq$ 5% | $\leq$ 12.5% 0402 $\geq$ 0.33 $\mu$ F | $\leq$ 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 | 6.3V | $\leq$ 10% | $\leq$ 10% 0201 $\geq$ 0.012 $\mu$ F; 0402 $\geq$ 0.15 $\mu$ F; 0603 $>$ 0.47 $\mu$ F; 0805 $\geq$ 2.2 $\mu$ F; 1206 $\geq$ 4.7 $\mu$ F; 1210 $\geq$ 22 $\mu$ F | $\leq$ 15% 0201 $\geq$ 0.1 $\mu$ F; 0402 $\geq$ 1 $\mu$ F | 4V | $\leq$ 15% | $\leq$ 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 | RATED VOLTAGE | INSULATION RESISTANCE | 100V: All X7R | 10G $\Omega$ or RxC $\geq$ 100 $\Omega$ -F whichever is smaller | 50V: 0402 $>$ 0.01 $\mu$ F; 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; 1206 $\geq$ 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 $\geq$ 0.22 $\mu$ 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; Size $\geq$ 1812 |  | RATED VOLTAGE | INSULATION RESISTANCE | 100V: 1210 $\geq$ 3.3 $\mu$ F | RxC $\geq$ 50 $\Omega$ -F | 50V: 0402 $\geq$ 0.1 $\mu$ F; 0603 $\geq$ 2.2 $\mu$ F; 0805 $\geq$ 10 $\mu$ F; 1206 $\geq$ 10 $\mu$ F | 35V: 0603 $\geq$ 1 $\mu$ F; | 25V: 0201 $\geq$ 0.1 $\mu$ F; 0402 $\geq$ 2.2 $\mu$ F; 0603 $\geq$ 10 $\mu$ F; 0805 $\geq$ 10 $\mu$ F; 1206 $\geq$ 22 $\mu$ F | 16V: 0603 $\geq$ 10 $\mu$ F; 0402 $\geq$ 1 $\mu$ F; 0201 $\geq$ 0.22 $\mu$ F | 10V: 0201 $>$ 0.1 $\mu$ F; 0402 $\geq$ 1 $\mu$ F; 0603 $\geq$ 10 $\mu$ F; 0805 $\geq$ 47 $\mu$ F | 6.3V; 0201 $\geq$ 0.1 $\mu$ F; 0402 $\geq$ 1 $\mu$ F; 0603 $>$ 4.7 $\mu$ F; 0805 $\geq$ 47 $\mu$ F; 1206 $\geq$ 10 $\mu$ F | 4V: 0603 $\geq$ 22 $\mu$ F; 0805 $\geq$ 47 $\mu$ F; 1206 $\geq$ 100 $\mu$ F |
| RATED VOL.   | D.F. $\leq$   | EXCEPTION OF D.F. $\leq$  |  |            |             |                          |             |             |                                    |   |     |             |   |  |     |             |   |  |     |             |   |   |     |             |                                    |   |     |           |                                       |   |      |            |   |   |    |            |   |               |                       |               |   |  |   |  |  |   |                            |  |               |                       |                               |                           |   |                             |   |  |  |  |   |
| $\geq$ 100V  | $\leq$ 2.5%   | $\leq$ 3% 1206 $\geq$ 0.47 $\mu$ F  |  |            |             |                          |             |             |                                    |   |     |             |   |  |     |             |   |  |     |             |   |   |     |             |                                    |   |     |           |                                       |   |      |            |   |   |    |            |   |               |                       |               |   |  |   |  |  |   |                            |  |               |                       |                               |                           |   |                             |   |  |  |  |   |
|  |   | $\leq$ 5% 0603 $\geq$ 0.048 $\mu$ F; 0805 $>$ 0.1 $\mu$ F; 1206 $\geq$ 1 $\mu$ F; 1210 $\geq$ 2.2 $\mu$ F   |  |            |             |                          |             |             |                                    |   |     |             |   |  |     |             |   |  |     |             |   |   |     |             |                                    |   |     |           |                                       |   |      |            |   |   |    |            |   |               |                       |               |   |  |   |  |  |   |                            |  |               |                       |                               |                           |   |                             |   |  |  |  |   |
| 50V  | $\leq$ 2.5%   | $\leq$ 10% 0805 $>$ 0.22 $\mu$ F; 1210 $\geq$ 3.3 $\mu$ F   |  |            |             |                          |             |             |                                    |   |     |             |   |  |     |             |   |  |     |             |   |   |     |             |                                    |   |     |           |                                       |   |      |            |   |   |    |            |   |               |                       |               |   |  |   |  |  |   |                            |  |               |                       |                               |                           |   |                             |   |  |  |  |   |
|  |   | $\leq$ 3% 0201(50V); 0603 $\geq$ 0.047 $\mu$ F; 0805 $\geq$ 0.18 $\mu$ F; 1206 $\geq$ 0.47 $\mu$ F  |  |            |             |                          |             |             |                                    |   |     |             |   |  |     |             |   |  |     |             |   |   |     |             |                                    |   |     |           |                                       |   |      |            |   |   |    |            |   |               |                       |               |   |  |   |  |  |   |                            |  |               |                       |                               |                           |   |                             |   |  |  |  |   |
| 35V  | $\leq$ 3.5%   | $\leq$ 5% 0201 $\geq$ 0.01 $\mu$ F; 1210 $\geq$ 3.3 $\mu$ F   |  |            |             |                          |             |             |                                    |   |     |             |   |  |     |             |   |  |     |             |   |   |     |             |                                    |   |     |           |                                       |   |      |            |   |   |    |            |   |               |                       |               |   |  |   |  |  |   |                            |  |               |                       |                               |                           |   |                             |   |  |  |  |   |
|  |   | $\leq$ 10% 0402 $\geq$ 0.012 $\mu$ F; 0603 $>$ 0.1 $\mu$ F; 0805 $>$ 0.47 $\mu$ F; 1206 $\geq$ 2.2 $\mu$ F; 1210 $\geq$ 10 $\mu$ F  |  |            |             |                          |             |             |                                    |   |     |             |   |  |     |             |   |  |     |             |   |   |     |             |                                    |   |     |           |                                       |   |      |            |   |   |    |            |   |               |                       |               |   |  |   |  |  |   |                            |  |               |                       |                               |                           |   |                             |   |  |  |  |   |
| 25V  | $\leq$ 3.5%   | $\leq$ 5% 0603 $\geq$ 1 $\mu$ F; 0805 $\geq$ 2.2 $\mu$ F; 1206 $\geq$ 2.2 $\mu$ F; 1210 $\geq$ 10 $\mu$ F   |  |            |             |                          |             |             |                                    |   |     |             |   |  |     |             |   |  |     |             |   |   |     |             |                                    |   |     |           |                                       |   |      |            |   |   |    |            |   |               |                       |               |   |  |   |  |  |   |                            |  |               |                       |                               |                           |   |                             |   |  |  |  |   |
|  |   | $\leq$ 5% 0201 $\geq$ 0.01 $\mu$ F; 0805 $\geq$ 1 $\mu$ F; 1210 $\geq$ 10 $\mu$ F   |  |            |             |                          |             |             |                                    |   |     |             |   |  |     |             |   |  |     |             |   |   |     |             |                                    |   |     |           |                                       |   |      |            |   |   |    |            |   |               |                       |               |   |  |   |  |  |   |                            |  |               |                       |                               |                           |   |                             |   |  |  |  |   |
| 16V  | $\leq$ 3.5%   | $\leq$ 7% 0603 $\geq$ 0.33 $\mu$ F  |  |            |             |                          |             |             |                                    |   |     |             |   |  |     |             |   |  |     |             |   |   |     |             |                                    |   |     |           |                                       |   |      |            |   |   |    |            |   |               |                       |               |   |  |   |  |  |   |                            |  |               |                       |                               |                           |   |                             |   |  |  |  |   |
|  |   | $\leq$ 10% 0201 $\geq$ 0.1 $\mu$ F; 0402 $\geq$ 0.056 $\mu$ F; 0603 $\geq$ 0.47 $\mu$ F; 0805 $\geq$ 2.2 $\mu$ F; 1206 $\geq$ 4.7 $\mu$ F; 1210 $\geq$ 22 $\mu$ F   |  |            |             |                          |             |             |                                    |   |     |             |   |  |     |             |   |  |     |             |   |   |     |             |                                    |   |     |           |                                       |   |      |            |   |   |    |            |   |               |                       |               |   |  |   |  |  |   |                            |  |               |                       |                               |                           |   |                             |   |  |  |  |   |
| 10V  | $\leq$ 5%   | $\leq$ 12.5% 0402 $\geq$ 0.33 $\mu$ F   |  |            |             |                          |             |             |                                    |   |     |             |   |  |     |             |   |  |     |             |   |   |     |             |                                    |   |     |           |                                       |   |      |            |   |   |    |            |   |               |                       |               |   |  |   |  |  |   |                            |  |               |                       |                               |                           |   |                             |   |  |  |  |   |
|  |   | $\leq$ 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   |  |            |             |                          |             |             |                                    |   |     |             |   |  |     |             |   |  |     |             |   |   |     |             |                                    |   |     |           |                                       |   |      |            |   |   |    |            |   |               |                       |               |   |  |   |  |  |   |                            |  |               |                       |                               |                           |   |                             |   |  |  |  |   |
| 6.3V   | $\leq$ 10%  | $\leq$ 10% 0201 $\geq$ 0.012 $\mu$ F; 0402 $\geq$ 0.15 $\mu$ F; 0603 $>$ 0.47 $\mu$ F; 0805 $\geq$ 2.2 $\mu$ F; 1206 $\geq$ 4.7 $\mu$ F; 1210 $\geq$ 22 $\mu$ F   |  |            |             |                          |             |             |                                    |   |     |             |   |  |     |             |   |  |     |             |   |   |     |             |                                    |   |     |           |                                       |   |      |            |   |   |    |            |   |               |                       |               |   |  |   |  |  |   |                            |  |               |                       |                               |                           |   |                             |   |  |  |  |   |
|  |   | $\leq$ 15% 0201 $\geq$ 0.1 $\mu$ F; 0402 $\geq$ 1 $\mu$ F   |  |            |             |                          |             |             |                                    |   |     |             |   |  |     |             |   |  |     |             |   |   |     |             |                                    |   |     |           |                                       |   |      |            |   |   |    |            |   |               |                       |               |   |  |   |  |  |   |                            |  |               |                       |                               |                           |   |                             |   |  |  |  |   |
| 4V   | $\leq$ 15%  | $\leq$ 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   |  |            |             |                          |             |             |                                    |   |     |             |   |  |     |             |   |  |     |             |   |   |     |             |                                    |   |     |           |                                       |   |      |            |   |   |    |            |   |               |                       |               |   |  |   |  |  |   |                            |  |               |                       |                               |                           |   |                             |   |  |  |  |   |
| RATED VOLTAGE  | INSULATION RESISTANCE   |   |  |            |             |                          |             |             |                                    |   |     |             |   |  |     |             |   |  |     |             |   |   |     |             |                                    |   |     |           |                                       |   |      |            |   |   |    |            |   |               |                       |               |   |  |   |  |  |   |                            |  |               |                       |                               |                           |   |                             |   |  |  |  |   |
| 100V: All X7R  | 10G $\Omega$ or RxC $\geq$ 100 $\Omega$ -F whichever is smaller |   |  |            |             |                          |             |             |                                    |   |     |             |   |  |     |             |   |  |     |             |   |   |     |             |                                    |   |     |           |                                       |   |      |            |   |   |    |            |   |               |                       |               |   |  |   |  |  |   |                            |  |               |                       |                               |                           |   |                             |   |  |  |  |   |
| 50V: 0402 $>$ 0.01 $\mu$ F; 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; 1206 $\geq$ 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 $\geq$ 0.22 $\mu$ 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; Size $\geq$ 1812   |   |   |  |            |             |                          |             |             |                                    |   |     |             |   |  |     |             |   |  |     |             |   |   |     |             |                                    |   |     |           |                                       |   |      |            |   |   |    |            |   |               |                       |               |   |  |   |  |  |   |                            |  |               |                       |                               |                           |   |                             |   |  |  |  |   |
| RATED VOLTAGE  | INSULATION RESISTANCE   |   |  |            |             |                          |             |             |                                    |   |     |             |   |  |     |             |   |  |     |             |   |   |     |             |                                    |   |     |           |                                       |   |      |            |   |   |    |            |   |               |                       |               |   |  |   |  |  |   |                            |  |               |                       |                               |                           |   |                             |   |  |  |  |   |
| 100V: 1210 $\geq$ 3.3 $\mu$ F  | RxC $\geq$ 50 $\Omega$ -F                                       |   |  |            |             |                          |             |             |                                    |   |     |             |   |  |     |             |   |  |     |             |   |   |     |             |                                    |   |     |           |                                       |   |      |            |   |   |    |            |   |               |                       |               |   |  |   |  |  |   |                            |  |               |                       |                               |                           |   |                             |   |  |  |  |   |
| 50V: 0402 $\geq$ 0.1 $\mu$ F; 0603 $\geq$ 2.2 $\mu$ F; 0805 $\geq$ 10 $\mu$ F; 1206 $\geq$ 10 $\mu$ F  |   |   |  |            |             |                          |             |             |                                    |   |     |             |   |  |     |             |   |  |     |             |   |   |     |             |                                    |   |     |           |                                       |   |      |            |   |   |    |            |   |               |                       |               |   |  |   |  |  |   |                            |  |               |                       |                               |                           |   |                             |   |  |  |  |   |
| 35V: 0603 $\geq$ 1 $\mu$ F;  |   |   |  |            |             |                          |             |             |                                    |   |     |             |   |  |     |             |   |  |     |             |   |   |     |             |                                    |   |     |           |                                       |   |      |            |   |   |    |            |   |               |                       |               |   |  |   |  |  |   |                            |  |               |                       |                               |                           |   |                             |   |  |  |  |   |
| 25V: 0201 $\geq$ 0.1 $\mu$ F; 0402 $\geq$ 2.2 $\mu$ F; 0603 $\geq$ 10 $\mu$ F; 0805 $\geq$ 10 $\mu$ F; 1206 $\geq$ 22 $\mu$ F                          |   |   |  |            |             |                          |             |             |                                    |   |     |             |   |  |     |             |   |  |     |             |   |   |     |             |                                    |   |     |           |                                       |   |      |            |   |   |    |            |   |               |                       |               |   |  |   |  |  |   |                            |  |               |                       |                               |                           |   |                             |   |  |  |  |   |
| 16V: 0603 $\geq$ 10 $\mu$ F; 0402 $\geq$ 1 $\mu$ F; 0201 $\geq$ 0.22 $\mu$ F   |   |   |  |            |             |                          |             |             |                                    |   |     |             |   |  |     |             |   |  |     |             |   |   |     |             |                                    |   |     |           |                                       |   |      |            |   |   |    |            |   |               |                       |               |   |  |   |  |  |   |                            |  |               |                       |                               |                           |   |                             |   |  |  |  |   |
| 10V: 0201 $>$ 0.1 $\mu$ F; 0402 $\geq$ 1 $\mu$ F; 0603 $\geq$ 10 $\mu$ F; 0805 $\geq$ 47 $\mu$ F   |   |   |  |            |             |                          |             |             |                                    |   |     |             |   |  |     |             |   |  |     |             |   |   |     |             |                                    |   |     |           |                                       |   |      |            |   |   |    |            |   |               |                       |               |   |  |   |  |  |   |                            |  |               |                       |                               |                           |   |                             |   |  |  |  |   |
| 6.3V; 0201 $\geq$ 0.1 $\mu$ F; 0402 $\geq$ 1 $\mu$ F; 0603 $>$ 4.7 $\mu$ F; 0805 $\geq$ 47 $\mu$ F; 1206 $\geq$ 10 $\mu$ F                             |   |   |  |            |             |                          |             |             |                                    |   |     |             |   |  |     |             |   |  |     |             |   |   |     |             |                                    |   |     |           |                                       |   |      |            |   |   |    |            |   |               |                       |               |   |  |   |  |  |   |                            |  |               |                       |                               |                           |   |                             |   |  |  |  |   |
| 4V: 0603 $\geq$ 22 $\mu$ F; 0805 $\geq$ 47 $\mu$ F; 1206 $\geq$ 100 $\mu$ F  |   |   |  |            |             |                          |             |             |                                    |   |     |             |   |  |     |             |   |  |     |             |   |   |     |             |                                    |   |     |           |                                       |   |      |            |   |   |    |            |   |               |                       |               |   |  |   |  |  |   |                            |  |               |                       |                               |                           |   |                             |   |  |  |  |   |
| 16.  | Solderability<br>J-STD-002<br>JESD22-B102E                      | <p>- Condition A<br/>Un-mounted chips 4hrs / 155°C<br/>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<br/>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<br/>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> | - 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.   |            |             |                          |             |             |                                    |   |     |             |   |  |     |             |   |  |     |             |   |   |     |             |                                    |   |     |           |                                       |   |      |            |   |   |    |            |   |               |                       |               |   |  |   |  |  |   |                            |  |               |                       |                               |                           |   |                             |   |  |  |  |   |

\* "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   |            |       |                     |  |       |       |     |               |     |     |  |      |                             |     |       |     |   |     |                             |      |  |     |       |      |   |     |  |     |               |     |       |      |  |        |               |     |   |     |       |      |   |      |   |      |                          |     |     |      |                          |      |  |      |              |      |      |      |              |     |     |    |      |     |     |               |                       |               |  |   |  |   |  |   |                       |                    |            |   |                  |  |   |   |  |  |
|---|--|--|--|------------|-------|---------------------|--|-------|-------|-----|---------------|-----|-----|--|------|-----------------------------|-----|-------|-----|---|-----|-----------------------------|------|--|-----|-------|------|---|-----|--|-----|---------------|-----|-------|------|--|--------|---------------|-----|---|-----|-------|------|---|------|---|------|--------------------------|-----|-----|------|--------------------------|------|--|------|--------------|------|------|------|--------------|-----|-----|----|------|-----|-----|---------------|-----------------------|---------------|--|---|--|---|--|---|-----------------------|--------------------|------------|---|------------------|--|---|---|--|--|
| 17.   | Electrical Characterization              | <ul style="list-style-type: none"> <li>- Capacitance</li> <li>- Q/ D.F. (Dissipation Factor)</li> <li>- Test temp: Room Temperature.</li> <li>- Class I: (NPO)                             <ul style="list-style-type: none"> <li>Cap≤1000pF 1.0±0.2Vrms, 1MHz±10%</li> <li>Cap&gt;1000pF 1.0±0.2Vrms, 1KHz±10%</li> </ul> </li> <li>- Class II: (X7R)                             <ul style="list-style-type: none"> <li>Cap ≤10μF, 1.0±0.2Vrms, 1KHz±10%</li> <li>Cap&gt;10μF, 0.5±0.2Vrms, 120Hz±20%</li> </ul> </li> <li>- Insulation Resistance</li> <li>- Test temp: Room Temperature.</li> <li>- Test voltage:                             <ul style="list-style-type: none"> <li>≤100V: To apply rated voltage for max. 120 sec.</li> <li>≥200V: To apply rated voltage (Max.500V) for 60 sec.</li> </ul> </li> <li>- Dielectric Strength                             <ul style="list-style-type: none"> <li>To apply voltage:                                     <ul style="list-style-type: none"> <li>≤100 ≥2.5 times VDC</li> <li>200V~300V ≥2 times VDC</li> <li>400V~450V ≥1.2 times VDC</li> <li>500V~999V ≥1.5 times VDC</li> <li>1000V~3000V ≥1.2 times VDC</li> </ul> </li> <li>duration 1~5 sec, charge and discharge current less than 50mA.</li> </ul> </li> <li>- Temperature Coefficient (with no electrical load)</li> <li>- Operation temperature: Min. operating temp. to Max. operating temp. at 25°C</li> </ul> | <ul style="list-style-type: none"> <li>- Capacitance within the specified tolerance.</li> <li>- Q/D.F. value:                             <ul style="list-style-type: none"> <li>NPO: Cap≥30pF, Q≥1000; Cap&lt;30pF, Q≥400+20C</li> </ul> </li> </ul> <p>X7R:</p> <table border="1"> <thead> <tr> <th>RATED VOL.</th> <th>D.F.≤</th> <th colspan="2">EXCEPTION OF D.F. ≤</th> </tr> </thead> <tbody> <tr> <td rowspan="3">≥100V</td> <td>≤2.5%</td> <td>≤3%</td> <td>1206 ≥ 0.47μF</td> </tr> <tr> <td rowspan="2">≤5%</td> <td>≤5%</td> <td>0603 ≥ 0.068μF; 0805 &gt; 0.1μF; 1206 ≥ 1μF; 1210 ≥ 2.2μF</td> </tr> <tr> <td>≤10%</td> <td>0805 &gt; 0.22μF; 1210 ≥ 3.3μF</td> </tr> <tr> <td rowspan="3">50V</td> <td rowspan="3">≤2.5%</td> <td>≤3%</td> <td>0201(50V); 0603 ≥ 0.047μF; 0805 ≥ 0.18μF; 1206 ≥ 0.47μF</td> </tr> <tr> <td>≤5%</td> <td>0201 ≥ 0.01μF; 1210 ≥ 3.3μF</td> </tr> <tr> <td>≤10%</td> <td>0402 ≥ 0.012μF; 0603 &gt; 0.1μF; 0805 &gt; 0.47μF; 1206 ≥ 2.2μF; 1210 ≥ 10μF</td> </tr> <tr> <td rowspan="3">35V</td> <td rowspan="3">≤3.5%</td> <td>≤10%</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 rowspan="3">≤3.5%</td> <td>≤10%</td> <td>0201 ≥ 0.1μF; 0402 ≥ 0.056μF; 0603 ≥ 0.47μF; 0805 ≥ 2.2μF; 1206 ≥ 4.7μF; 1210 ≥ 22μF</td> </tr> <tr> <td>≤12.5%</td> <td>0402 ≥ 0.33μF</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 rowspan="3">≤3.5%</td> <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>≤15%</td> <td>0201 ≥ 0.1μF; 0402 ≥ 1μF</td> </tr> <tr> <td rowspan="3">10V</td> <td rowspan="3">≤5%</td> <td>≤15%</td> <td>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 rowspan="2">6.3V</td> <td rowspan="2">≤10%</td> <td>≤15%</td> <td>0402 ≥ 2.2μF</td> </tr> <tr> <td>---</td> <td>---</td> </tr> <tr> <td rowspan="2">4V</td> <td rowspan="2">≤15%</td> <td>---</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 ≥ 0.01μF; 0603 ≥ 1μF; 0805 ≥ 1μF; 1206 ≥ 4.7μF; 1210 ≥ 10μF</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>100V: 1210 ≥ 3.3μF</td> <td rowspan="7">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. | D.F.≤ | EXCEPTION OF D.F. ≤ |  | ≥100V | ≤2.5% | ≤3% | 1206 ≥ 0.47μF | ≤5% | ≤5% | 0603 ≥ 0.068μF; 0805 > 0.1μF; 1206 ≥ 1μF; 1210 ≥ 2.2μF | ≤10% | 0805 > 0.22μF; 1210 ≥ 3.3μF | 50V | ≤2.5% | ≤3% | 0201(50V); 0603 ≥ 0.047μF; 0805 ≥ 0.18μF; 1206 ≥ 0.47μF | ≤5% | 0201 ≥ 0.01μF; 1210 ≥ 3.3μF | ≤10% | 0402 ≥ 0.012μF; 0603 > 0.1μF; 0805 > 0.47μF; 1206 ≥ 2.2μF; 1210 ≥ 10μF | 35V | ≤3.5% | ≤10% | 0603 ≥ 1μF; 0805 ≥ 2.2μF; 1206 ≥ 2.2μF; 1210 ≥ 10μF | ≤5% | 0201 ≥ 0.01μF; 0805 ≥ 1μF; 1210 ≥ 10μF | ≤7% | 0603 ≥ 0.33μF | 25V | ≤3.5% | ≤10% | 0201 ≥ 0.1μF; 0402 ≥ 0.056μF; 0603 ≥ 0.47μF; 0805 ≥ 2.2μF; 1206 ≥ 4.7μF; 1210 ≥ 22μF | ≤12.5% | 0402 ≥ 0.33μF | ≤5% | 0201 ≥ 0.01μF; 0402 ≥ 0.033μF; 0603 ≥ 0.15μF; 0805 ≥ 0.68μF; 1206 ≥ 2.2μF; 1210 ≥ 4.7μF | 16V | ≤3.5% | ≤10% | 0201 ≥ 0.022μF; 0402 ≥ 0.15μF; 0603 > 0.47μF; 0805 ≥ 2.2μF; 1206 ≥ 4.7μF; 1210 ≥ 22μF | ≤10% | 0201 ≥ 0.012μF; 0402 ≥ 0.15μF; 0603 ≥ 0.33μF; 0805 ≥ 2.2μF; 1206 ≥ 2.2μF; 1210 ≥ 22μF | ≤15% | 0201 ≥ 0.1μF; 0402 ≥ 1μF | 10V | ≤5% | ≤15% | 0201 ≥ 0.1μF; 0402 ≥ 1μF | ≤10% | 0201 ≥ 0.1μF; 0402 ≥ 1μF; 0603 ≥ 10μF; 0805 ≥ 4.7μF; 1206 ≥ 47μF; 1210 ≥ 100μF | ≤20% | 0402 ≥ 2.2μF | 6.3V | ≤10% | ≤15% | 0402 ≥ 2.2μF | --- | --- | 4V | ≤15% | --- | --- | RATED VOLTAGE | INSULATION RESISTANCE | 100V: All X7R | 10GΩ or RxC≥100 Ω·F whichever is smaller | 50V: 0402 ≥ 0.01μF; 0603 ≥ 1μF; 0805 ≥ 1μF; 1206 ≥ 4.7μF; 1210 ≥ 10μF | 35V: 0805 ≥ 2.2μF; 1206 ≥ 2.2μF; 1210 ≥ 10μF | 25V: 0402 ≥ 1μF; 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 | 100V: 1210 ≥ 3.3μF | RxC≥50 Ω·F | 50V: 0402 ≥ 0.1μF; 0603 ≥ 2.2μF; 0805 ≥ 10μF; 1206 ≥ 10μF | 35V: 0603 ≥ 1μF; | 25V: 0201 ≥ 0.1μF; 0402 ≥ 2.2μF; 0603 ≥ 10μF; 0805 ≥ 10μF; 1206 ≥ 22μF | 16V: 0603 ≥ 10μF; 0402 ≥ 1μF; 0201 ≥ 0.22μF | 10V: 0201 > 0.1μF; 0402 ≥ 1μF; 0603 ≥ 10μF; 0805 ≥ 47μF | 6.3V, 0201 ≥ 0.1μF; 0402 ≥ 1μF; 0603 > 4.7μF; 0805 ≥ 47μF; 1206 ≥ 10μF | 4V: 0603 ≥ 22μF; 0805 ≥ 47μF; 1206 ≥ 100μF |
| RATED VOL.  | D.F.≤                                    | EXCEPTION OF D.F. ≤  |  |            |       |                     |  |       |       |     |               |     |     |  |      |                             |     |       |     |   |     |                             |      |  |     |       |      |   |     |  |     |               |     |       |      |  |        |               |     |   |     |       |      |   |      |   |      |                          |     |     |      |                          |      |  |      |              |      |      |      |              |     |     |    |      |     |     |               |                       |               |  |   |  |   |  |   |                       |                    |            |   |                  |  |   |   |  |  |
| ≥100V   | ≤2.5%                                    | ≤3%  | 1206 ≥ 0.47μF  |            |       |                     |  |       |       |     |               |     |     |  |      |                             |     |       |     |   |     |                             |      |  |     |       |      |   |     |  |     |               |     |       |      |  |        |               |     |   |     |       |      |   |      |   |      |                          |     |     |      |                          |      |  |      |              |      |      |      |              |     |     |    |      |     |     |               |                       |               |  |   |  |   |  |   |                       |                    |            |   |                  |  |   |   |  |  |
|   | ≤5%                                      | ≤5%  | 0603 ≥ 0.068μF; 0805 > 0.1μF; 1206 ≥ 1μF; 1210 ≥ 2.2μF   |            |       |                     |  |       |       |     |               |     |     |  |      |                             |     |       |     |   |     |                             |      |  |     |       |      |   |     |  |     |               |     |       |      |  |        |               |     |   |     |       |      |   |      |   |      |                          |     |     |      |                          |      |  |      |              |      |      |      |              |     |     |    |      |     |     |               |                       |               |  |   |  |   |  |   |                       |                    |            |   |                  |  |   |   |  |  |
|   |  | ≤10%   | 0805 > 0.22μF; 1210 ≥ 3.3μF  |            |       |                     |  |       |       |     |               |     |     |  |      |                             |     |       |     |   |     |                             |      |  |     |       |      |   |     |  |     |               |     |       |      |  |        |               |     |   |     |       |      |   |      |   |      |                          |     |     |      |                          |      |  |      |              |      |      |      |              |     |     |    |      |     |     |               |                       |               |  |   |  |   |  |   |                       |                    |            |   |                  |  |   |   |  |  |
| 50V   | ≤2.5%                                    | ≤3%  | 0201(50V); 0603 ≥ 0.047μF; 0805 ≥ 0.18μF; 1206 ≥ 0.47μF  |            |       |                     |  |       |       |     |               |     |     |  |      |                             |     |       |     |   |     |                             |      |  |     |       |      |   |     |  |     |               |     |       |      |  |        |               |     |   |     |       |      |   |      |   |      |                          |     |     |      |                          |      |  |      |              |      |      |      |              |     |     |    |      |     |     |               |                       |               |  |   |  |   |  |   |                       |                    |            |   |                  |  |   |   |  |  |
|   |  | ≤5%  | 0201 ≥ 0.01μF; 1210 ≥ 3.3μF  |            |       |                     |  |       |       |     |               |     |     |  |      |                             |     |       |     |   |     |                             |      |  |     |       |      |   |     |  |     |               |     |       |      |  |        |               |     |   |     |       |      |   |      |   |      |                          |     |     |      |                          |      |  |      |              |      |      |      |              |     |     |    |      |     |     |               |                       |               |  |   |  |   |  |   |                       |                    |            |   |                  |  |   |   |  |  |
|   |  | ≤10%   | 0402 ≥ 0.012μF; 0603 > 0.1μF; 0805 > 0.47μF; 1206 ≥ 2.2μF; 1210 ≥ 10μF   |            |       |                     |  |       |       |     |               |     |     |  |      |                             |     |       |     |   |     |                             |      |  |     |       |      |   |     |  |     |               |     |       |      |  |        |               |     |   |     |       |      |   |      |   |      |                          |     |     |      |                          |      |  |      |              |      |      |      |              |     |     |    |      |     |     |               |                       |               |  |   |  |   |  |   |                       |                    |            |   |                  |  |   |   |  |  |
| 35V   | ≤3.5%                                    | ≤10%   | 0603 ≥ 1μF; 0805 ≥ 2.2μF; 1206 ≥ 2.2μF; 1210 ≥ 10μF  |            |       |                     |  |       |       |     |               |     |     |  |      |                             |     |       |     |   |     |                             |      |  |     |       |      |   |     |  |     |               |     |       |      |  |        |               |     |   |     |       |      |   |      |   |      |                          |     |     |      |                          |      |  |      |              |      |      |      |              |     |     |    |      |     |     |               |                       |               |  |   |  |   |  |   |                       |                    |            |   |                  |  |   |   |  |  |
|   |  | ≤5%  | 0201 ≥ 0.01μF; 0805 ≥ 1μF; 1210 ≥ 10μF   |            |       |                     |  |       |       |     |               |     |     |  |      |                             |     |       |     |   |     |                             |      |  |     |       |      |   |     |  |     |               |     |       |      |  |        |               |     |   |     |       |      |   |      |   |      |                          |     |     |      |                          |      |  |      |              |      |      |      |              |     |     |    |      |     |     |               |                       |               |  |   |  |   |  |   |                       |                    |            |   |                  |  |   |   |  |  |
|   |  | ≤7%  | 0603 ≥ 0.33μF  |            |       |                     |  |       |       |     |               |     |     |  |      |                             |     |       |     |   |     |                             |      |  |     |       |      |   |     |  |     |               |     |       |      |  |        |               |     |   |     |       |      |   |      |   |      |                          |     |     |      |                          |      |  |      |              |      |      |      |              |     |     |    |      |     |     |               |                       |               |  |   |  |   |  |   |                       |                    |            |   |                  |  |   |   |  |  |
| 25V   | ≤3.5%                                    | ≤10%   | 0201 ≥ 0.1μF; 0402 ≥ 0.056μF; 0603 ≥ 0.47μF; 0805 ≥ 2.2μF; 1206 ≥ 4.7μF; 1210 ≥ 22μF   |            |       |                     |  |       |       |     |               |     |     |  |      |                             |     |       |     |   |     |                             |      |  |     |       |      |   |     |  |     |               |     |       |      |  |        |               |     |   |     |       |      |   |      |   |      |                          |     |     |      |                          |      |  |      |              |      |      |      |              |     |     |    |      |     |     |               |                       |               |  |   |  |   |  |   |                       |                    |            |   |                  |  |   |   |  |  |
|   |  | ≤12.5%   | 0402 ≥ 0.33μF  |            |       |                     |  |       |       |     |               |     |     |  |      |                             |     |       |     |   |     |                             |      |  |     |       |      |   |     |  |     |               |     |       |      |  |        |               |     |   |     |       |      |   |      |   |      |                          |     |     |      |                          |      |  |      |              |      |      |      |              |     |     |    |      |     |     |               |                       |               |  |   |  |   |  |   |                       |                    |            |   |                  |  |   |   |  |  |
|   |  | ≤5%  | 0201 ≥ 0.01μF; 0402 ≥ 0.033μF; 0603 ≥ 0.15μF; 0805 ≥ 0.68μF; 1206 ≥ 2.2μF; 1210 ≥ 4.7μF  |            |       |                     |  |       |       |     |               |     |     |  |      |                             |     |       |     |   |     |                             |      |  |     |       |      |   |     |  |     |               |     |       |      |  |        |               |     |   |     |       |      |   |      |   |      |                          |     |     |      |                          |      |  |      |              |      |      |      |              |     |     |    |      |     |     |               |                       |               |  |   |  |   |  |   |                       |                    |            |   |                  |  |   |   |  |  |
| 16V   | ≤3.5%                                    | ≤10%   | 0201 ≥ 0.022μF; 0402 ≥ 0.15μF; 0603 > 0.47μF; 0805 ≥ 2.2μF; 1206 ≥ 4.7μF; 1210 ≥ 22μF  |            |       |                     |  |       |       |     |               |     |     |  |      |                             |     |       |     |   |     |                             |      |  |     |       |      |   |     |  |     |               |     |       |      |  |        |               |     |   |     |       |      |   |      |   |      |                          |     |     |      |                          |      |  |      |              |      |      |      |              |     |     |    |      |     |     |               |                       |               |  |   |  |   |  |   |                       |                    |            |   |                  |  |   |   |  |  |
|   |  | ≤10%   | 0201 ≥ 0.012μF; 0402 ≥ 0.15μF; 0603 ≥ 0.33μF; 0805 ≥ 2.2μF; 1206 ≥ 2.2μF; 1210 ≥ 22μF  |            |       |                     |  |       |       |     |               |     |     |  |      |                             |     |       |     |   |     |                             |      |  |     |       |      |   |     |  |     |               |     |       |      |  |        |               |     |   |     |       |      |   |      |   |      |                          |     |     |      |                          |      |  |      |              |      |      |      |              |     |     |    |      |     |     |               |                       |               |  |   |  |   |  |   |                       |                    |            |   |                  |  |   |   |  |  |
|   |  | ≤15%   | 0201 ≥ 0.1μF; 0402 ≥ 1μF   |            |       |                     |  |       |       |     |               |     |     |  |      |                             |     |       |     |   |     |                             |      |  |     |       |      |   |     |  |     |               |     |       |      |  |        |               |     |   |     |       |      |   |      |   |      |                          |     |     |      |                          |      |  |      |              |      |      |      |              |     |     |    |      |     |     |               |                       |               |  |   |  |   |  |   |                       |                    |            |   |                  |  |   |   |  |  |
| 10V   | ≤5%                                      | ≤15%   | 0201 ≥ 0.1μF; 0402 ≥ 1μF   |            |       |                     |  |       |       |     |               |     |     |  |      |                             |     |       |     |   |     |                             |      |  |     |       |      |   |     |  |     |               |     |       |      |  |        |               |     |   |     |       |      |   |      |   |      |                          |     |     |      |                          |      |  |      |              |      |      |      |              |     |     |    |      |     |     |               |                       |               |  |   |  |   |  |   |                       |                    |            |   |                  |  |   |   |  |  |
|   |  | ≤10%   | 0201 ≥ 0.1μF; 0402 ≥ 1μF; 0603 ≥ 10μF; 0805 ≥ 4.7μF; 1206 ≥ 47μF; 1210 ≥ 100μF   |            |       |                     |  |       |       |     |               |     |     |  |      |                             |     |       |     |   |     |                             |      |  |     |       |      |   |     |  |     |               |     |       |      |  |        |               |     |   |     |       |      |   |      |   |      |                          |     |     |      |                          |      |  |      |              |      |      |      |              |     |     |    |      |     |     |               |                       |               |  |   |  |   |  |   |                       |                    |            |   |                  |  |   |   |  |  |
|   |  | ≤20%   | 0402 ≥ 2.2μF   |            |       |                     |  |       |       |     |               |     |     |  |      |                             |     |       |     |   |     |                             |      |  |     |       |      |   |     |  |     |               |     |       |      |  |        |               |     |   |     |       |      |   |      |   |      |                          |     |     |      |                          |      |  |      |              |      |      |      |              |     |     |    |      |     |     |               |                       |               |  |   |  |   |  |   |                       |                    |            |   |                  |  |   |   |  |  |
| 6.3V  | ≤10%                                     | ≤15%   | 0402 ≥ 2.2μF   |            |       |                     |  |       |       |     |               |     |     |  |      |                             |     |       |     |   |     |                             |      |  |     |       |      |   |     |  |     |               |     |       |      |  |        |               |     |   |     |       |      |   |      |   |      |                          |     |     |      |                          |      |  |      |              |      |      |      |              |     |     |    |      |     |     |               |                       |               |  |   |  |   |  |   |                       |                    |            |   |                  |  |   |   |  |  |
|   |  | ---  | ---  |            |       |                     |  |       |       |     |               |     |     |  |      |                             |     |       |     |   |     |                             |      |  |     |       |      |   |     |  |     |               |     |       |      |  |        |               |     |   |     |       |      |   |      |   |      |                          |     |     |      |                          |      |  |      |              |      |      |      |              |     |     |    |      |     |     |               |                       |               |  |   |  |   |  |   |                       |                    |            |   |                  |  |   |   |  |  |
| 4V  | ≤15%                                     | ---  | ---  |            |       |                     |  |       |       |     |               |     |     |  |      |                             |     |       |     |   |     |                             |      |  |     |       |      |   |     |  |     |               |     |       |      |  |        |               |     |   |     |       |      |   |      |   |      |                          |     |     |      |                          |      |  |      |              |      |      |      |              |     |     |    |      |     |     |               |                       |               |  |   |  |   |  |   |                       |                    |            |   |                  |  |   |   |  |  |
|   |  | RATED VOLTAGE  | INSULATION RESISTANCE  |            |       |                     |  |       |       |     |               |     |     |  |      |                             |     |       |     |   |     |                             |      |  |     |       |      |   |     |  |     |               |     |       |      |  |        |               |     |   |     |       |      |   |      |   |      |                          |     |     |      |                          |      |  |      |              |      |      |      |              |     |     |    |      |     |     |               |                       |               |  |   |  |   |  |   |                       |                    |            |   |                  |  |   |   |  |  |
| 100V: All X7R   | 10GΩ or RxC≥100 Ω·F whichever is smaller |  |  |            |       |                     |  |       |       |     |               |     |     |  |      |                             |     |       |     |   |     |                             |      |  |     |       |      |   |     |  |     |               |     |       |      |  |        |               |     |   |     |       |      |   |      |   |      |                          |     |     |      |                          |      |  |      |              |      |      |      |              |     |     |    |      |     |     |               |                       |               |  |   |  |   |  |   |                       |                    |            |   |                  |  |   |   |  |  |
| 50V: 0402 ≥ 0.01μF; 0603 ≥ 1μF; 0805 ≥ 1μF; 1206 ≥ 4.7μF; 1210 ≥ 10μF                   |  |  |  |            |       |                     |  |       |       |     |               |     |     |  |      |                             |     |       |     |   |     |                             |      |  |     |       |      |   |     |  |     |               |     |       |      |  |        |               |     |   |     |       |      |   |      |   |      |                          |     |     |      |                          |      |  |      |              |      |      |      |              |     |     |    |      |     |     |               |                       |               |  |   |  |   |  |   |                       |                    |            |   |                  |  |   |   |  |  |
| 35V: 0805 ≥ 2.2μF; 1206 ≥ 2.2μF; 1210 ≥ 10μF  |  |  |  |            |       |                     |  |       |       |     |               |     |     |  |      |                             |     |       |     |   |     |                             |      |  |     |       |      |   |     |  |     |               |     |       |      |  |        |               |     |   |     |       |      |   |      |   |      |                          |     |     |      |                          |      |  |      |              |      |      |      |              |     |     |    |      |     |     |               |                       |               |  |   |  |   |  |   |                       |                    |            |   |                  |  |   |   |  |  |
| 25V: 0402 ≥ 1μF; 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   |  |  |  |            |       |                     |  |       |       |     |               |     |     |  |      |                             |     |       |     |   |     |                             |      |  |     |       |      |   |     |  |     |               |     |       |      |  |        |               |     |   |     |       |      |   |      |   |      |                          |     |     |      |                          |      |  |      |              |      |      |      |              |     |     |    |      |     |     |               |                       |               |  |   |  |   |  |   |                       |                    |            |   |                  |  |   |   |  |  |
| 100V: 1210 ≥ 3.3μF  |  | RxC≥50 Ω·F   |  |            |       |                     |  |       |       |     |               |     |     |  |      |                             |     |       |     |   |     |                             |      |  |     |       |      |   |     |  |     |               |     |       |      |  |        |               |     |   |     |       |      |   |      |   |      |                          |     |     |      |                          |      |  |      |              |      |      |      |              |     |     |    |      |     |     |               |                       |               |  |   |  |   |  |   |                       |                    |            |   |                  |  |   |   |  |  |
| 50V: 0402 ≥ 0.1μF; 0603 ≥ 2.2μF; 0805 ≥ 10μF; 1206 ≥ 10μF                               |  |  |  |            |       |                     |  |       |       |     |               |     |     |  |      |                             |     |       |     |   |     |                             |      |  |     |       |      |   |     |  |     |               |     |       |      |  |        |               |     |   |     |       |      |   |      |   |      |                          |     |     |      |                          |      |  |      |              |      |      |      |              |     |     |    |      |     |     |               |                       |               |  |   |  |   |  |   |                       |                    |            |   |                  |  |   |   |  |  |
| 35V: 0603 ≥ 1μF;  |  |  |  |            |       |                     |  |       |       |     |               |     |     |  |      |                             |     |       |     |   |     |                             |      |  |     |       |      |   |     |  |     |               |     |       |      |  |        |               |     |   |     |       |      |   |      |   |      |                          |     |     |      |                          |      |  |      |              |      |      |      |              |     |     |    |      |     |     |               |                       |               |  |   |  |   |  |   |                       |                    |            |   |                  |  |   |   |  |  |
| 25V: 0201 ≥ 0.1μF; 0402 ≥ 2.2μF; 0603 ≥ 10μF; 0805 ≥ 10μF; 1206 ≥ 22μF                  |  |  |  |            |       |                     |  |       |       |     |               |     |     |  |      |                             |     |       |     |   |     |                             |      |  |     |       |      |   |     |  |     |               |     |       |      |  |        |               |     |   |     |       |      |   |      |   |      |                          |     |     |      |                          |      |  |      |              |      |      |      |              |     |     |    |      |     |     |               |                       |               |  |   |  |   |  |   |                       |                    |            |   |                  |  |   |   |  |  |
| 16V: 0603 ≥ 10μF; 0402 ≥ 1μF; 0201 ≥ 0.22μF   |  |  |  |            |       |                     |  |       |       |     |               |     |     |  |      |                             |     |       |     |   |     |                             |      |  |     |       |      |   |     |  |     |               |     |       |      |  |        |               |     |   |     |       |      |   |      |   |      |                          |     |     |      |                          |      |  |      |              |      |      |      |              |     |     |    |      |     |     |               |                       |               |  |   |  |   |  |   |                       |                    |            |   |                  |  |   |   |  |  |
| 10V: 0201 > 0.1μF; 0402 ≥ 1μF; 0603 ≥ 10μF; 0805 ≥ 47μF                                 |  |  |  |            |       |                     |  |       |       |     |               |     |     |  |      |                             |     |       |     |   |     |                             |      |  |     |       |      |   |     |  |     |               |     |       |      |  |        |               |     |   |     |       |      |   |      |   |      |                          |     |     |      |                          |      |  |      |              |      |      |      |              |     |     |    |      |     |     |               |                       |               |  |   |  |   |  |   |                       |                    |            |   |                  |  |   |   |  |  |
| 6.3V, 0201 ≥ 0.1μF; 0402 ≥ 1μF; 0603 > 4.7μF; 0805 ≥ 47μF; 1206 ≥ 10μF                  |  |  |  |            |       |                     |  |       |       |     |               |     |     |  |      |                             |     |       |     |   |     |                             |      |  |     |       |      |   |     |  |     |               |     |       |      |  |        |               |     |   |     |       |      |   |      |   |      |                          |     |     |      |                          |      |  |      |              |      |      |      |              |     |     |    |      |     |     |               |                       |               |  |   |  |   |  |   |                       |                    |            |   |                  |  |   |   |  |  |
| 4V: 0603 ≥ 22μF; 0805 ≥ 47μF; 1206 ≥ 100μF  |  |  |  |            |       |                     |  |       |       |     |               |     |     |  |      |                             |     |       |     |   |     |                             |      |  |     |       |      |   |     |  |     |               |     |       |      |  |        |               |     |   |     |       |      |   |      |   |      |                          |     |     |      |                          |      |  |      |              |      |      |      |              |     |     |    |      |     |     |               |                       |               |  |   |  |   |  |   |                       |                    |            |   |                  |  |   |   |  |  |
| 18.   | Board Flex AEC-Q200-005                  | <ul style="list-style-type: none"> <li>- The middle part of substrate shall be pressurized by means of the pressurizing rod at a rate of about 1 mm per second until the deflection becomes 3mm (2mm for X7R) and then the pressure shall be maintained for 60±1 sec.</li> <li>- Measurement to be made after keeping at room temp. for 24±2 hrs.</li> </ul>   | <ul style="list-style-type: none"> <li>- No remarkable damage.</li> <li>- Cap change:                             <ul style="list-style-type: none"> <li>NPO: within ±5% or 0.5pF whichever is larger</li> <li>X7R: within ±12.5%</li> </ul> </li> </ul> <p>(This capacitance change means the change of capacitance under specified flexure of substrate from the capacitance measured before the test.)</p>  |            |       |                     |  |       |       |     |               |     |     |  |      |                             |     |       |     |   |     |                             |      |  |     |       |      |   |     |  |     |               |     |       |      |  |        |               |     |   |     |       |      |   |      |   |      |                          |     |     |      |                          |      |  |      |              |      |      |      |              |     |     |    |      |     |     |               |                       |               |  |   |  |   |  |   |                       |                    |            |   |                  |  |   |   |  |  |

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

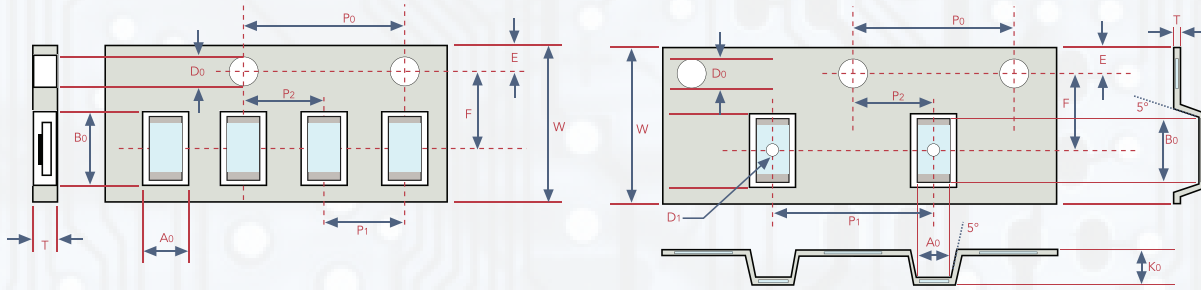


## RELIABILITY TEST CONDITIONS AND DIMENSIONS

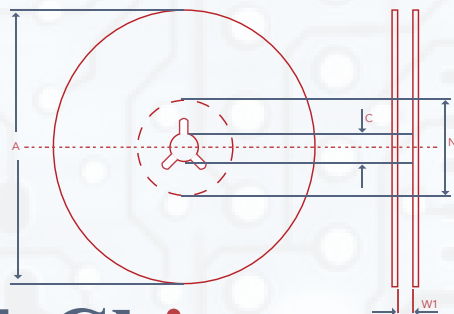
| NO.        | TEST ITEM                         | TEST CONDITION   | REQUIREMENTS  |  |  |                     |       |       |                   |  |                                  |     |       |   |                                 |   |     |       |  |  |                   |     |       |   |                      |   |     |       |  |  |                               |     |     |  |                               |                   |      |      |  |                   |    |      |     |
|------------|-----------------------------------|--|---|--|--|---------------------|-------|-------|-------------------|--|----------------------------------|-----|-------|---|---------------------------------|---|-----|-------|--|--|-------------------|-----|-------|---|----------------------|---|-----|-------|--|--|-------------------------------|-----|-----|--|-------------------------------|-------------------|------|------|--|-------------------|----|------|-----|
| 19.        | Terminal Strength<br>AEC-Q200-006 | - Pressurizing force: 2N (0201 & 0402), 10N (0603), 10N(0603), 18N(≥0805).<br>- Test time: 60±1 sec. | - No remarkable damage or removal of the terminations<br>- Capacitance within the specified tolerance.<br>- Q/D.F. value:<br>NPO: Cap≥30pF, Q≥1000; Cap<30pF, Q≥400+20C<br><br>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 rowspan="3">≤2.5%</td> <td>≤3% 1206 ≥ 0.47μF</td> </tr> <tr> <td>≤5% 0603 ≥ 0.068μF; 0805 &gt; 0.1μF; 1206 ≥ 1μF; 1210 ≥ 2.2μF</td> </tr> <tr> <td>≤10% 0805 &gt; 0.22μF; 1210 ≥ 3.3μF</td> </tr> <tr> <td rowspan="3">50V</td> <td rowspan="3">≤2.5%</td> <td>≤3% 0201(50V); 0603 ≥ 0.047μF; 0805 &gt; 0.18μF; 1206 ≥ 0.47μF</td> </tr> <tr> <td>≤5% 0201 ≥ 0.01μF; 1210 ≥ 3.3μF</td> </tr> <tr> <td>≤10% 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 rowspan="3">≤3.5%</td> <td>≤10% 0603 ≥ 1μF; 0805 ≥ 2.2μF; 1206 ≥ 2.2μF; 1210 ≥ 10μF</td> </tr> <tr> <td>≤5% 0201 ≥ 0.01μF; 0805 ≥ 1μF; 1210 ≥ 10μF</td> </tr> <tr> <td>≤7% 0603 ≥ 0.33μF</td> </tr> <tr> <td rowspan="3">25V</td> <td rowspan="3">≤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% 0402 ≥ 0.33μF</td> </tr> <tr> <td>≤5% 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 rowspan="3">≤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% 0201 ≥ 0.012μF; 0402 ≥ 0.15μF; 0603 ≥ 0.33μF; 0805 ≥ 2.2μF; 1206 ≥ 2.2μF; 1210 ≥ 22μF</td> </tr> <tr> <td>≤15% 0201 ≥ 0.1μF; 0402 ≥ 1μF</td> </tr> <tr> <td rowspan="3">10V</td> <td rowspan="3">≤5%</td> <td>≤10% 0201 ≥ 0.012μF; 0402 ≥ 0.15μF; 0603 ≥ 0.33μF; 0805 ≥ 2.2μF; 1206 ≥ 2.2μF; 1210 ≥ 22μF</td> </tr> <tr> <td>≤15% 0201 ≥ 0.1μF; 0402 ≥ 1μF</td> </tr> <tr> <td>≤20% 0402 ≥ 2.2μF</td> </tr> <tr> <td rowspan="2">6.3V</td> <td rowspan="2">≤10%</td> <td>≤15% 0201 ≥ 0.1μF; 0402 ≥ 1μF; 0603 ≥ 10μF; 0805 ≥ 4.7μF; 1206 ≥ 4.7μF; 1210 ≥ 100μF</td> </tr> <tr> <td>≤20% 0402 ≥ 2.2μF</td> </tr> <tr> <td rowspan="2">4V</td> <td rowspan="2">≤15%</td> <td>---</td> </tr> </tbody> </table> | RATED VOL.   | D.F.≤  | EXCEPTION OF D.F. ≤ | ≥100V | ≤2.5% | ≤3% 1206 ≥ 0.47μF | ≤5% 0603 ≥ 0.068μF; 0805 > 0.1μF; 1206 ≥ 1μF; 1210 ≥ 2.2μF | ≤10% 0805 > 0.22μF; 1210 ≥ 3.3μF | 50V | ≤2.5% | ≤3% 0201(50V); 0603 ≥ 0.047μF; 0805 > 0.18μF; 1206 ≥ 0.47μF | ≤5% 0201 ≥ 0.01μF; 1210 ≥ 3.3μF | ≤10% 0402 ≥ 0.012μF; 0603 > 0.1μF; 0805 > 0.47μF; 1206 ≥ 2.2μF; 1210 ≥ 10μF | 35V | ≤3.5% | ≤10% 0603 ≥ 1μF; 0805 ≥ 2.2μF; 1206 ≥ 2.2μF; 1210 ≥ 10μF | ≤5% 0201 ≥ 0.01μF; 0805 ≥ 1μF; 1210 ≥ 10μF | ≤7% 0603 ≥ 0.33μF | 25V | ≤3.5% | ≤10% 0201 ≥ 0.1μF; 0402 ≥ 0.056μF; 0603 ≥ 0.47μF; 0805 ≥ 2.2μF; 1206 ≥ 4.7μF; 1210 ≥ 22μF | ≤12.5% 0402 ≥ 0.33μF | ≤5% 0201 ≥ 0.01μF; 0402 ≥ 0.033μF; 0603 ≥ 0.15μF; 0805 ≥ 0.68μF; 1206 ≥ 2.2μF; 1210 ≥ 4.7μF | 16V | ≤3.5% | ≤10% 0201 ≥ 0.022μF; 0402 ≥ 0.15μF; 0603 > 0.47μF; 0805 ≥ 2.2μF; 1206 ≥ 4.7μF; 1210 ≥ 22μF | ≤10% 0201 ≥ 0.012μF; 0402 ≥ 0.15μF; 0603 ≥ 0.33μF; 0805 ≥ 2.2μF; 1206 ≥ 2.2μF; 1210 ≥ 22μF | ≤15% 0201 ≥ 0.1μF; 0402 ≥ 1μF | 10V | ≤5% | ≤10% 0201 ≥ 0.012μF; 0402 ≥ 0.15μF; 0603 ≥ 0.33μF; 0805 ≥ 2.2μF; 1206 ≥ 2.2μF; 1210 ≥ 22μF | ≤15% 0201 ≥ 0.1μF; 0402 ≥ 1μF | ≤20% 0402 ≥ 2.2μF | 6.3V | ≤10% | ≤15% 0201 ≥ 0.1μF; 0402 ≥ 1μF; 0603 ≥ 10μF; 0805 ≥ 4.7μF; 1206 ≥ 4.7μF; 1210 ≥ 100μF | ≤20% 0402 ≥ 2.2μF | 4V | ≤15% | --- |
| RATED VOL. | D.F.≤                             | EXCEPTION OF D.F. ≤  |   |  |  |                     |       |       |                   |  |                                  |     |       |   |                                 |   |     |       |  |  |                   |     |       |   |                      |   |     |       |  |  |                               |     |     |  |                               |                   |      |      |  |                   |    |      |     |
| ≥100V      | ≤2.5%                             | ≤3% 1206 ≥ 0.47μF  |   |  |  |                     |       |       |                   |  |                                  |     |       |   |                                 |   |     |       |  |  |                   |     |       |   |                      |   |     |       |  |  |                               |     |     |  |                               |                   |      |      |  |                   |    |      |     |
|            |                                   | ≤5% 0603 ≥ 0.068μF; 0805 > 0.1μF; 1206 ≥ 1μF; 1210 ≥ 2.2μF   |   |  |  |                     |       |       |                   |  |                                  |     |       |   |                                 |   |     |       |  |  |                   |     |       |   |                      |   |     |       |  |  |                               |     |     |  |                               |                   |      |      |  |                   |    |      |     |
|            |                                   | ≤10% 0805 > 0.22μF; 1210 ≥ 3.3μF   |   |  |  |                     |       |       |                   |  |                                  |     |       |   |                                 |   |     |       |  |  |                   |     |       |   |                      |   |     |       |  |  |                               |     |     |  |                               |                   |      |      |  |                   |    |      |     |
| 50V        | ≤2.5%                             | ≤3% 0201(50V); 0603 ≥ 0.047μF; 0805 > 0.18μF; 1206 ≥ 0.47μF  |   |  |  |                     |       |       |                   |  |                                  |     |       |   |                                 |   |     |       |  |  |                   |     |       |   |                      |   |     |       |  |  |                               |     |     |  |                               |                   |      |      |  |                   |    |      |     |
|            |                                   | ≤5% 0201 ≥ 0.01μF; 1210 ≥ 3.3μF  |   |  |  |                     |       |       |                   |  |                                  |     |       |   |                                 |   |     |       |  |  |                   |     |       |   |                      |   |     |       |  |  |                               |     |     |  |                               |                   |      |      |  |                   |    |      |     |
|            |                                   | ≤10% 0402 ≥ 0.012μF; 0603 > 0.1μF; 0805 > 0.47μF; 1206 ≥ 2.2μF; 1210 ≥ 10μF                          |   |  |  |                     |       |       |                   |  |                                  |     |       |   |                                 |   |     |       |  |  |                   |     |       |   |                      |   |     |       |  |  |                               |     |     |  |                               |                   |      |      |  |                   |    |      |     |
| 35V        | ≤3.5%                             | ≤10% 0603 ≥ 1μF; 0805 ≥ 2.2μF; 1206 ≥ 2.2μF; 1210 ≥ 10μF   |   |  |  |                     |       |       |                   |  |                                  |     |       |   |                                 |   |     |       |  |  |                   |     |       |   |                      |   |     |       |  |  |                               |     |     |  |                               |                   |      |      |  |                   |    |      |     |
|            |                                   | ≤5% 0201 ≥ 0.01μF; 0805 ≥ 1μF; 1210 ≥ 10μF   |   |  |  |                     |       |       |                   |  |                                  |     |       |   |                                 |   |     |       |  |  |                   |     |       |   |                      |   |     |       |  |  |                               |     |     |  |                               |                   |      |      |  |                   |    |      |     |
|            |                                   | ≤7% 0603 ≥ 0.33μF  |   |  |  |                     |       |       |                   |  |                                  |     |       |   |                                 |   |     |       |  |  |                   |     |       |   |                      |   |     |       |  |  |                               |     |     |  |                               |                   |      |      |  |                   |    |      |     |
| 25V        | ≤3.5%                             | ≤10% 0201 ≥ 0.1μF; 0402 ≥ 0.056μF; 0603 ≥ 0.47μF; 0805 ≥ 2.2μF; 1206 ≥ 4.7μF; 1210 ≥ 22μF            |   |  |  |                     |       |       |                   |  |                                  |     |       |   |                                 |   |     |       |  |  |                   |     |       |   |                      |   |     |       |  |  |                               |     |     |  |                               |                   |      |      |  |                   |    |      |     |
|            |                                   | ≤12.5% 0402 ≥ 0.33μF   |   |  |  |                     |       |       |                   |  |                                  |     |       |   |                                 |   |     |       |  |  |                   |     |       |   |                      |   |     |       |  |  |                               |     |     |  |                               |                   |      |      |  |                   |    |      |     |
|            |                                   | ≤5% 0201 ≥ 0.01μF; 0402 ≥ 0.033μF; 0603 ≥ 0.15μF; 0805 ≥ 0.68μF; 1206 ≥ 2.2μF; 1210 ≥ 4.7μF          |   |  |  |                     |       |       |                   |  |                                  |     |       |   |                                 |   |     |       |  |  |                   |     |       |   |                      |   |     |       |  |  |                               |     |     |  |                               |                   |      |      |  |                   |    |      |     |
| 16V        | ≤3.5%                             | ≤10% 0201 ≥ 0.022μF; 0402 ≥ 0.15μF; 0603 > 0.47μF; 0805 ≥ 2.2μF; 1206 ≥ 4.7μF; 1210 ≥ 22μF           |   |  |  |                     |       |       |                   |  |                                  |     |       |   |                                 |   |     |       |  |  |                   |     |       |   |                      |   |     |       |  |  |                               |     |     |  |                               |                   |      |      |  |                   |    |      |     |
|            |                                   | ≤10% 0201 ≥ 0.012μF; 0402 ≥ 0.15μF; 0603 ≥ 0.33μF; 0805 ≥ 2.2μF; 1206 ≥ 2.2μF; 1210 ≥ 22μF           |   |  |  |                     |       |       |                   |  |                                  |     |       |   |                                 |   |     |       |  |  |                   |     |       |   |                      |   |     |       |  |  |                               |     |     |  |                               |                   |      |      |  |                   |    |      |     |
|            |                                   | ≤15% 0201 ≥ 0.1μF; 0402 ≥ 1μF  |   |  |  |                     |       |       |                   |  |                                  |     |       |   |                                 |   |     |       |  |  |                   |     |       |   |                      |   |     |       |  |  |                               |     |     |  |                               |                   |      |      |  |                   |    |      |     |
| 10V        | ≤5%                               | ≤10% 0201 ≥ 0.012μF; 0402 ≥ 0.15μF; 0603 ≥ 0.33μF; 0805 ≥ 2.2μF; 1206 ≥ 2.2μF; 1210 ≥ 22μF           |   |  |  |                     |       |       |                   |  |                                  |     |       |   |                                 |   |     |       |  |  |                   |     |       |   |                      |   |     |       |  |  |                               |     |     |  |                               |                   |      |      |  |                   |    |      |     |
|            |                                   | ≤15% 0201 ≥ 0.1μF; 0402 ≥ 1μF  |   |  |  |                     |       |       |                   |  |                                  |     |       |   |                                 |   |     |       |  |  |                   |     |       |   |                      |   |     |       |  |  |                               |     |     |  |                               |                   |      |      |  |                   |    |      |     |
|            |                                   | ≤20% 0402 ≥ 2.2μF  |   |  |  |                     |       |       |                   |  |                                  |     |       |   |                                 |   |     |       |  |  |                   |     |       |   |                      |   |     |       |  |  |                               |     |     |  |                               |                   |      |      |  |                   |    |      |     |
| 6.3V       | ≤10%                              | ≤15% 0201 ≥ 0.1μF; 0402 ≥ 1μF; 0603 ≥ 10μF; 0805 ≥ 4.7μF; 1206 ≥ 4.7μF; 1210 ≥ 100μF                 |   |  |  |                     |       |       |                   |  |                                  |     |       |   |                                 |   |     |       |  |  |                   |     |       |   |                      |   |     |       |  |  |                               |     |     |  |                               |                   |      |      |  |                   |    |      |     |
|            |                                   | ≤20% 0402 ≥ 2.2μF  |   |  |  |                     |       |       |                   |  |                                  |     |       |   |                                 |   |     |       |  |  |                   |     |       |   |                      |   |     |       |  |  |                               |     |     |  |                               |                   |      |      |  |                   |    |      |     |
| 4V         | ≤15%                              | ---  |   |  |  |                     |       |       |                   |  |                                  |     |       |   |                                 |   |     |       |  |  |                   |     |       |   |                      |   |     |       |  |  |                               |     |     |  |                               |                   |      |      |  |                   |    |      |     |
|            |                                   | 20.  | Beam Load Test<br>AEC-Q200-003  | - Break strength test<br>- Beam speed: 2.5±0.25 mm/sec | The chip endure following force<br>- Chip length ≤2.5mm: Thickness >0.5mm (20N), ≤0.5mm (8N)<br>- 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



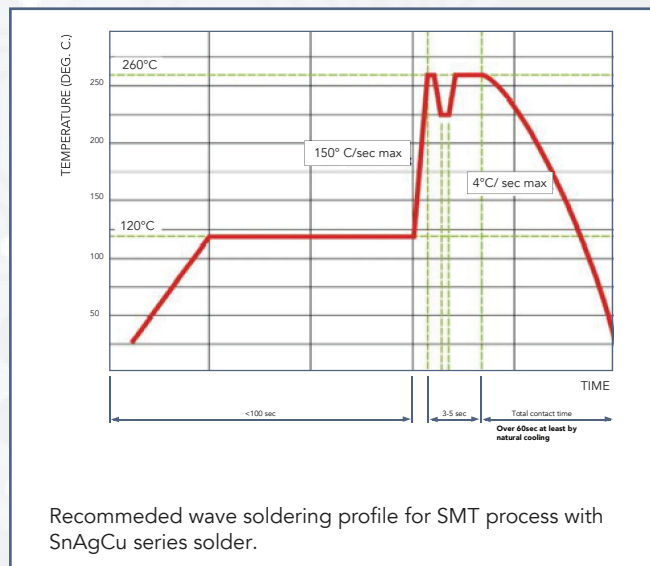
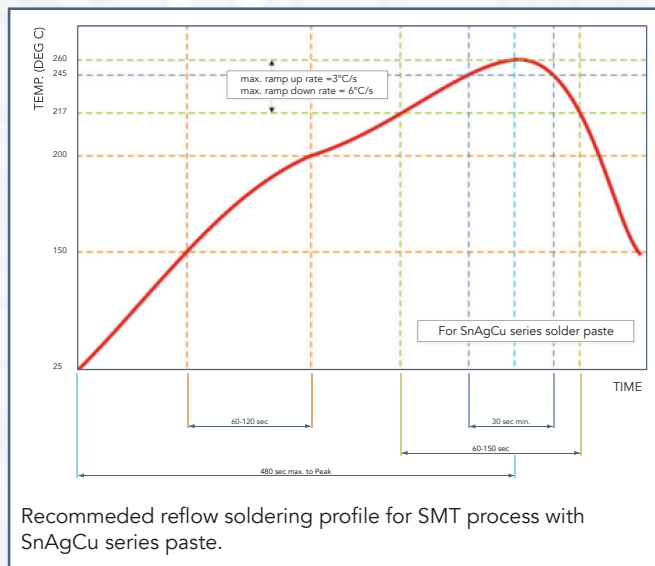
| SIZE                | 0201        | 0402        | 0603        | 0805        |             |             | 1206        |             |             |             | 1210        |             |
|---------------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|
| 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±2.0                          | 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, Inc., 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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