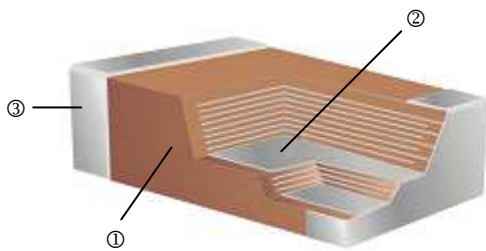


## Multilayer Ceramic Chip Capacitor

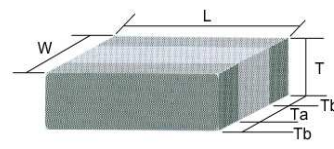
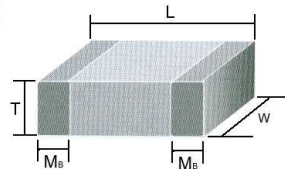
### Features

- Wide capacitance range, extremely compact size
- Low inductance of capacitor for high frequency application
- Excellent solderability and resistance to soldering heat, suitable for flow and reflow soldering
- Adaptable to high-speed surface mount assembly
- Conform to EIAJ-RC3402, and also compatible with EIA-RS198 and IEC PUB. 384-10

### Construction



|   |                  |   |  |
|---|------------------|---|--|
| ① | Ceramic Material | ③ | Termination:   |
| ② | Inner Electrodes |   | NPO: Ag/Ni/Sn dielectric<br>X7R, Y5V, X5R: Cu/Ni/Sn dielectric |



Unit: mm

### Dimensions

MC / MCHL / MCRF Type

| Type | Size<br>(Inch) | L   | W                       | T / Symbol             |   | M <sub>B</sub>                          | Packaging (7" Reel) |              |
|------|----------------|---|-------------------------|------------------------|---|---|---------------------|--------------|
|      |                |   |                         |                        |   |   | Paper tape          | Plastic tape |
| 01   | 0201           | 0.6±0.03                                  | 0.3±0.03                | 0.3±0.03               | L | 0.15±0.05                               | 15K                 | -            |
|      |                | 0.6±0.05 <sup>#2</sup>                    | 0.3±0.05 <sup>#2</sup>  | 0.3±0.05 <sup>#2</sup> |   |   |                     |              |
|      |                | 0.6±0.09 <sup>#3</sup>                    | 0.3±0.09 <sup>#3</sup>  | 0.3±0.09 <sup>#3</sup> |   |   |                     |              |
| 02   | 0402           | 1.00±0.05                                 | 0.50±0.05               | 0.50±0.05              | N | 0.25<br>+0.05 / -0.10                   | 10K                 | -            |
|      |                |   |                         | 0.50+0.02/-0.05        | Q |   |                     |              |
|      |                | 1.00±0.20                                 | 0.50±0.20               | 0.50±0.20              | E |   |                     |              |
| 03   | 0603           | 1.60±0.10                                 | 0.80±0.10               | 0.80±0.10              | S | 0.40±0.15                               | 4K                  | -            |
|      |                | 1.60+0.15/-0.10                           | 0.80+0.15/-0.10         | 0.50±0.10              | H |   |                     |              |
|      |                | 1.60±0.20 <sup>#1</sup>                   | 0.80±0.20 <sup>#1</sup> | 0.80+0.15 / -0.10      | X |   |                     |              |
| 05   | 0805           | 2.00±0.15                                 | 1.25±0.10               | 0.50±0.10              | H | 0.50±0.20                               | 4K                  | -            |
|      |                |   |                         | 0.60±0.15              | A |   |                     | -            |
|      |                |   |                         | 0.80±0.10              | B |   |                     | -            |
|      |                |   |                         | 1.25±0.10              | D |   |                     | 3K           |
|      |                | 2.00±0.20                                 | 1.25±0.20               | 0.85±0.10              | T |   | 4K                  | -            |
|      |                |   |                         | 1.25±0.20              | I |   | -                   | 3K           |
| 06   | 1206           | 3.20±0.15                                 | 1.60±0.15               | 0.80±0.10              | B | 0.60±0.20<br>(0.50±0.25) <sup>***</sup> | 4K                  | -            |
|      |                |   |                         | 0.95±0.10              | C |   | -                   | 3K           |
|      |                |   |                         | 1.25±0.10              | D |   | -                   | 3K           |
|      |                |   |                         | 1.15±0.15              | J |   | -                   | 3K           |
|      |                | 3.20±0.20                                 | 1.60±0.20               | 1.60±0.20              | G |   | -                   | 2K           |
|      |                |   |                         | 0.85±0.10              | T |   | 4K                  | -            |
|      |                | 3.20+0.3 / -0.1                           | 1.60+0.3 / -0.1         | 1.60+0.3 / -0.1        | P |   | -                   | 2K           |
|      |                |   |                         |                        |   |   | -                   | 2K           |
| 10   | 1210           | 3.20±0.30                                 | 2.50±0.20               | 0.95±0.10              | C | 0.75±0.25                               | -                   | 3K           |
|      |                |   |                         | 0.85±0.10              | T |   | -                   | 3K           |
|      |                |   |                         | 1.25±0.10              | D |   | -                   | 3K           |
|      |                | 3.20±0.40                                 | 2.50±0.30               | 1.60±0.20              | G |   | -                   | 2K           |
|      |                |   |                         | 2.00±0.20              | K |   | -                   | 1K           |
|      |                |   |                         | 2.50±0.30              | M |   | -                   | 1K           |
|      |                |   |                         | 1.25±0.10              | D |   | -                   | 2K           |
| 08   | 1808           | 4.50±0.40<br>(4.5+0.5/-0.3) <sup>**</sup> | 2.03±0.25               | 1.40±0.15              | F | 0.75±0.25<br>(0.50±0.25) <sup>***</sup> | -                   | 2K           |
|      |                |   |                         | 1.60±0.20              | G |   | -                   | 2K           |
|      |                |   |                         | 2.00±0.20              | K |   | -                   | 1K           |
|      |                |   |                         |                        |   |   |                     |              |

| Type | Size (Inch) | L                             | W         | T / Symbol |   | M <sub>B</sub>              | Packaging (7" Reel) |              |
|------|-------------|-------------------------------|-----------|------------|---|-----------------------------|---------------------|--------------|
|      |             |                               |           |            |   |                             | Paper tape          | Plastic tape |
| 12   | 1812        | 4.50±0.40<br>(4.5+0.5/-0.3)** | 3.20±0.30 | 1.25±0.10  | D | 0.75±0.25<br>(0.50±0.25)*** | -                   | 1K           |
|      |             |                               |           | 1.60±0.20  | G |                             | -                   | 1K           |
|      |             |                               |           | 2.00±0.20  | K |                             | -                   | 1K           |
|      |             |                               | 3.20±0.40 | 2.50±0.30  | M |                             | -                   | 0.5K         |
|      |             |                               |           | 2.80±0.30  | U |                             | -                   | 0.5K         |

\*\* For 1808/1812: 200~3KV, \*\*\*For 1206:1KV~3KV; 1808/1812: 200~3KV

#1: For 0603 Cap ≥ 10uF or 0603 Cap ≥ 4.7uF (≤ 6.3V) or 0603 Cap > 1uF (> 10V) products ;

#2: For 0201/Cap ≥ 0.68uF products ;

#3: For 0201/Cap ≥ 1uF products

Low Inductance Capacitors for MCLI Type

Unit: mm

| Type   | Size (Inch) | L         | W         | T / Symbol |   | Ta min. | Tb min. | Packaging (7" Reel) |              |
|--------|-------------|-----------|-----------|------------|---|---------|---------|---------------------|--------------|
|        |             |           |           |            |   |         |         | Paper tape          | Plastic tape |
| MCLI43 | 0612        | 3.20±0.15 | 1.60±0.15 | 0.80±0.10  | B | 0.5     | 0.13    | 4K                  | -            |

## Part Numbering

| MC  | 03   | J  | T                 | N  | 250  | 3R9  |
|---|--|--|-------------------|--|--|--|
| Product Type  | Dimensions (L×W)   | Capacitance Tolerance  | Packaging         | Dielectric                                 | Voltage (VDCW)   | Capacitance  |
| MC : General; Ultra-small<br>Middle and High Voltage<br>MCHL: High Q and Low ESR<br>MCRF: Ultra High Q and Low ESR (RF)<br>MCLI: Low Inductance | 01: 0201<br>02: 0402<br>03: 0603<br>05: 0805<br>06: 1206<br>10: 1210<br>08: 1808<br>12: 1812<br>43: 0612 | B: ±0.1pF (Cap ≤ 5pF)<br>C: ±0.25pF (Cap ≤ 5pF)<br>D: ±0.5pF (5pF < Cap < 10pF)<br>F: ±1%<br>G: ±2%<br>J: ±5%<br>K: ±10%<br>M: ±20%<br>Z: +80/-20% | T: Taping<br>Reel | N: NPO (COG)<br>B: X7R<br>F: Y5V<br>X: X5R | 6V3: 6.3V<br>250: 25V<br>500: 50V<br>101: 100V<br>102: 1000V<br>202: 2000V<br>302: 3000V | 3R9: 3.9pF<br>150: 15pF<br>181: 180pF<br>225: 2.2μF<br>476: 47μF<br>107: 100μF |

■ Ultra High Q & Low ESR Capacitors for MCRF Series

Capacitance & Voltage

| Dielectric |       | NPO  |     |     |     |      |     |      |      |      |      |      |      |      |      |      |
|------------|-------|------|-----|-----|-----|------|-----|------|------|------|------|------|------|------|------|------|
| EIA        | Size  | 0201 |     |     |     | 0402 |     |      |      | 0603 |      |      | 0805 |      |      |      |
| Code       | VDCW  | 6.3V | 10V | 25V | 50V | 25V  | 50V | 100V | 200V | 50V  | 100V | 250V | 50V  | 100V | 250V | 500V |
| 0R1        | 0.1pF | L    | L   | L   | L   | N    | N   | N    | N    |      |      |      |      |      |      |      |
| 0R2        | 0.2   | L    | L   | L   | L   | N    | N   | N    | N    |      |      |      |      |      |      |      |
| 0R3        | 0.3   | L    | L   | L   | L   | N    | N   | N    | N    | S    | S    | S    | T    | T    | T    | T    |
| 0R4        | 0.4   | L    | L   | L   | L   | N    | N   | N    | N    | S    | S    | S    | T    | T    | T    | T    |
| 0R5        | 0.5   | L    | L   | L   | L   | N    | N   | N    | N    | S    | S    | S    | T    | T    | T    | T    |
| 0R6        | 0.6   | L    | L   | L   | L   | N    | N   | N    | N    | S    | S    | S    | T    | T    | T    | T    |
| 0R7        | 0.7   | L    | L   | L   | L   | N    | N   | N    | N    | S    | S    | S    | T    | T    | T    | T    |
| 0R8        | 0.8   | L    | L   | L   | L   | N    | N   | N    | N    | S    | S    | S    | T    | T    | T    | T    |
| 0R9        | 0.9   | L    | L   | L   | L   | N    | N   | N    | N    | S    | S    | S    | T    | T    | T    | T    |
| 1R0        | 1.0   | L    | L   | L   | L   | N    | N   | N    | N    | S    | S    | S    | T    | T    | T    | T    |
| 1R2        | 1.2   | L    | L   | L   | L   | N    | N   | N    | N    | S    | S    | S    | T    | T    | T    | T    |
| 1R5        | 1.5   | L    | L   | L   | L   | N    | N   | N    | N    | S    | S    | S    | T    | T    | T    | T    |
| 1R8        | 1.8   | L    | L   | L   | L   | N    | N   | N    | N    | S    | S    | S    | T    | T    | T    | T    |
| 2R0        | 2.0   | L    | L   | L   | L   | N    | N   | N    | N    | S    | S    | S    | T    | T    | T    | T    |
| 2R2        | 2.2   | L    | L   | L   | L   | N    | N   | N    | N    | S    | S    | S    | T    | T    | T    | T    |
| 2R7        | 2.7   | L    | L   | L   | L   | N    | N   | N    | N    | S    | S    | S    | T    | T    | T    | T    |
| 3R0        | 3.0   | L    | L   | L   | L   | N    | N   | N    | N    | S    | S    | S    | T    | T    | T    | T    |
| 3R3        | 3.3   | L    | L   | L   | L   | N    | N   | N    | N    | S    | S    | S    | T    | T    | T    | T    |
| 3R9        | 3.9   | L    | L   | L   | L   | N    | N   | N    | N    | S    | S    | S    | T    | T    | T    | T    |
| 4R0        | 4.0   | L    | L   | L   | L   | N    | N   | N    | N    | S    | S    | S    | T    | T    | T    | T    |
| 4R7        | 4.7   | L    | L   | L   | L   | N    | N   | N    | N    | S    | S    | S    | T    | T    | T    | T    |
| 5R0        | 5.0   | L    | L   | L   | L   | N    | N   | N    | N    | S    | S    | S    | T    | T    | T    | T    |
| 5R6        | 5.6   | L    | L   | L   | L   | N    | N   | N    | N    | S    | S    | S    | T    | T    | T    | T    |
| 6R0        | 6.0   | L    | L   | L   | L   | N    | N   | N    | N    | S    | S    | S    | T    | T    | T    | T    |
| 6R8        | 6.8   | L    | L   | L   | L   | N    | N   | N    | N    | S    | S    | S    | T    | T    | T    | T    |
| 7R0        | 7.0   | L    | L   | L   | L   | N    | N   | N    | N    | S    | S    | S    | T    | T    | T    | T    |
| 8R2        | 8.2   | L    | L   | L   | L   | N    | N   | N    | N    | S    | S    | S    | T    | T    | T    | T    |
| 9R0        | 9.0   | L    | L   | L   | L   | N    | N   | N    | N    | S    | S    | S    | T    | T    | T    | T    |
| 100        | 10    | L    | L   | L   | L   | N    | N   | N    | N    | S    | S    | S    | T    | T    | T    | T    |
| 110        | 11    | L    | L   | L   | L   | N    | N   | N    | N    | S    | S    | S    | T    | T    | T    | T    |
| 120        | 12    | L    | L   | L   | L   | N    | N   | N    | N    | S    | S    | S    | T    | T    | T    | T    |
| 130        | 13    | L    | L   | L   | L   | N    | N   | N    | N    | S    | S    | S    | T    | T    | T    | T    |
| 150        | 15    | L    | L   | L   | L   | N    | N   | N    | N    | S    | S    | S    | T    | T    | T    | T    |
| 160        | 16    | L    | L   | L   | L   | N    | N   | N    | N    | S    | S    | S    | T    | T    | T    | T    |
| 180        | 18    | L    | L   | L   | L   | N    | N   | N    | N    | S    | S    | S    | T    | T    | T    | T    |
| 200        | 20    | L    | L   | L   | L   | N    | N   | N    | N    | S    | S    | S    | T    | T    | T    | T    |
| 220        | 22    | L    | L   | L   |     | N    | N   | N    | N    | S    | S    | S    | T    | T    | T    | T    |
| 240        | 24    | L    | L   | L   |     | N    | N   | N    | N    | S    | S    | S    | T    | T    | T    | T    |
| 270        | 27    | L    | L   | L   |     | N    | N   | N    | N    | S    | S    | S    | T    | T    | T    | T    |
| 300        | 30    | L    | L   | L   |     | N    | N   | N    | N    | S    | S    | S    | T    | T    | T    | T    |
| 330        | 33    | L    | L   | L   |     | N    | N   | N    |      | S    | S    | S    | T    | T    | T    | T    |
| 360        | 36    |      |     |     |     | N    | N   | N    |      | S    | S    | S    | T    | T    | T    | T    |
| 390        | 39    |      |     |     |     | N    | N   | N    |      | S    | S    | S    | T    | T    | T    | T    |
| 430        | 43    |      |     |     |     | N    | N   | N    |      | S    | S    | S    | T    | T    | T    | T    |
| 470        | 47    |      |     |     |     | N    | N   | N    |      | S    | S    | S    | T    | T    | T    | T    |
| 560        | 56    |      |     |     |     | N    |     |      |      | S    | S    | S    | T    | T    | T    | T    |
| 680        | 68    |      |     |     |     | N    |     |      |      | S    | S    | S    | T    | T    | T    | T    |
| 820        | 82    |      |     |     |     | N    |     |      |      | S    | S    | S    | T    | T    | T    |      |
| 101        | 100   |      |     |     |     | N    |     |      |      | S    | S    | S    | T    | T    | T    |      |

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

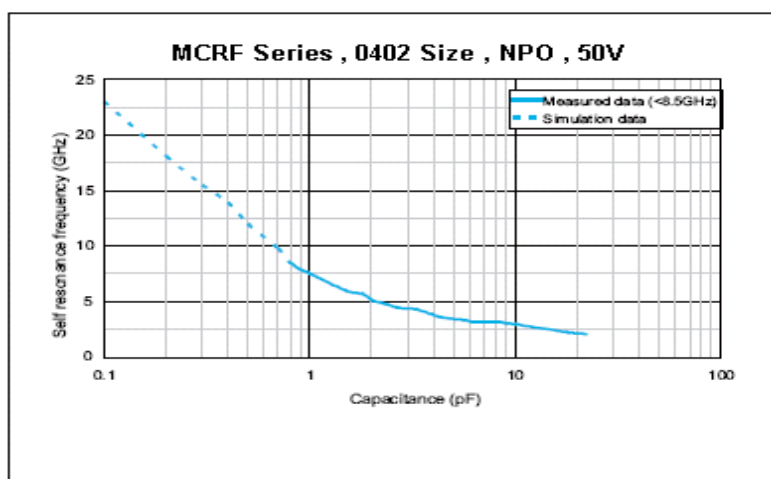
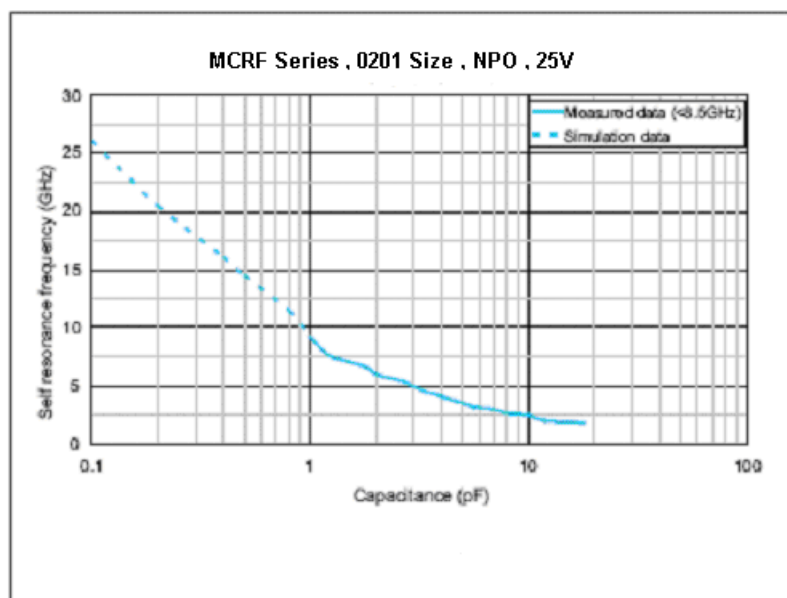
Electrical Data

| Dielectric                  | NPO  |
|-----------------------------|--|
| Size                        | 0201, 0402, 0603, 0805   |
| Capacitance*                | 0201: 0.1pF ~ 33pF, 0402: 0.1pF ~ 100pF<br>0603: 0.3pF ~ 100pF, 0805: 0.3pF ~ 100pF  |
| Capacitance tolerance**     | Cap ≤ 5pF: A(±0.05pF), B(±0.1pF), C(±0.25pF)<br>5pF < Cap < 10pF: B(±0.1pF), C(±0.25pF), D(±0.5pF)<br>Cap ≥ 10pF: F(±1%), G(±2%), J(±5%) |
| Rated voltage (VDCW)        | 6.3V, 10V, 25V, 50V, 100V, 250V, 500V  |
| Q *                         | Cap ≥ 30pF: Q ≥ 1000, Cap < 30pF: Q ≥ 400+20C;   |
| Insulation resistance at Ur | ≥ 10GΩ   |
| Operating temperature       | -55 to +125°C  |
| Capacitance                 | ±30 ppm; 0201 Cap ≥ 22pF, ±60 ppm  |
| Termination                 | Ni/Sn (lead-free termination)  |

■ \*\*Measured at the conditions of 25°C ambient temperature and 30~70% related humidity

■ Apply 1.0±0.2Vrms, 1.0MHz±10% for Cap ≤ 1000pF; 1.0KHz±10% for Cap > 1000pF

Electrical characteristics



## Multilayer Ceramic Chip Capacitor

### Environmental Characteristics

| Item   | Requirement  | Test Method   |        |                     |        |      |                   |   |                                 |     |      |  |                                |  |     |      |   |     |      |   |                                |   |                     |     |      |   |  |     |    |  |                              |      |     |  |                  |            |        |                     |       |    |  |                    |     |    |   |     |    |  |   |                    |    |                                  |                     |                    |    |   |     |       |                   |      |     |   |   |
|--|--|---|--------|---------------------|--------|------|-------------------|---|---------------------------------|-----|------|--|--------------------------------|--|-----|------|---|-----|------|---|--------------------------------|---|---------------------|-----|------|---|--|-----|----|--|------------------------------|------|-----|--|------------------|------------|--------|---------------------|-------|----|--|--------------------|-----|----|---|-----|----|--|---|--------------------|----|----------------------------------|---------------------|--------------------|----|---|-----|-------|-------------------|------|-----|---|---|
| External Appearance                                    | No defects which may affect performance  | Visual inspection & Dimension measurement   |        |                     |        |      |                   |   |                                 |     |      |  |                                |  |     |      |   |     |      |   |                                |   |                     |     |      |   |  |     |    |  |                              |      |     |  |                  |            |        |                     |       |    |  |                    |     |    |   |     |    |  |   |                    |    |                                  |                     |                    |    |   |     |       |                   |      |     |   |   |
| Capacitance(Cap.)                                      | Within the specified tolerance that refers on page2  | NPO: (Class I)<br>Cap≤ 1000pF 1.0±0.2Vrms, 1MHz±10%<br>Cap>1000pF 1.0±0.2Vrms, 1KHz±10%   |        |                     |        |      |                   |   |                                 |     |      |  |                                |  |     |      |   |     |      |   |                                |   |                     |     |      |   |  |     |    |  |                              |      |     |  |                  |            |        |                     |       |    |  |                    |     |    |   |     |    |  |   |                    |    |                                  |                     |                    |    |   |     |       |                   |      |     |   |   |
| Dissipation Factor (D.F.) or Quality factor (Q=1/D.F.) | <p>NPO: Cap≥ 30pF, Q≥ 1000; Cap&lt;30pF, Q≥ 400+20C<br/>X7R, X5R:</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 rowspan="3">2.5%</td><td>3% 1206 ≥ 0.047μF</td></tr> <tr> <td>5% 0603 ≥ 0.068μF; 0805 ≥ 0.1μF<br/>1206 &gt; 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<br/>0805 ≥ 0.18μF; 1206 ≥ 0.47μF</td></tr> <tr> <td>5% 0201 ≥ 0.01μF; 1210 ≥ 4.7μF</td></tr> <tr> <td>10% 0402 ≥ 0.1μF; 0603 &gt; 0.1μF;<br/>0805 ≥ 1μF; 1206 ≥ 2.2μF; 1210 ≥ 10μF</td></tr> <tr> <td>35V</td><td>3.5%</td><td>10% 0603 ≥ 1μF; 0805 ≥ 2.2μF; 1206 ≥ 2.2μF; 1210 ≥ 10μF</td></tr> <tr> <td rowspan="4">25V</td><td rowspan="4">3.5%</td><td>5% 0201 ≥ 0.01μF; 0805 ≥ 1μF; 1210 ≥ 10μF</td></tr> <tr> <td>7% 0603 ≥ 0.33μF; 1206 ≥ 4.7μF</td></tr> <tr> <td>10% 0201 ≥ 0.1μF; 0402 ≥ 0.10μF; 0603 ≥ 0.47μF<br/>0805 ≥ 2.2μF; 1206 ≥ 6.8μF; 1210 ≥ 22μF</td></tr> <tr> <td>12.5% 0402 ≥ 0.47μF</td></tr> <tr> <td rowspan="2">16V</td><td rowspan="2">3.5%</td><td>5% 0201 ≥ 0.01μF; 0402 ≥ 0.033μF; 0603 ≥ 0.15μF;<br/>0805 ≥ 0.68μF; 1206 ≥ 2.2μF; 1210 ≥ 4.7μF</td></tr> <tr> <td>10% 0201 ≥ 0.1μF(0201/X7R ≥ 0.022μF);<br/>0402 ≥ 0.22μF; 0603 ≥ 0.68μF; 0805 ≥ 2.2μF; 1206 ≥ 4.7μF; 1210 ≥ 22μF</td></tr> <tr> <td rowspan="2">10V</td><td rowspan="2">5%</td><td>10% 0201 ≥ 0.012μF; 0402 ≥ 0.33μF(0402/X7R ≥ 0.22μF)<br/>0603 ≥ 0.33μF; 0805 ≥ 2.2μF<br/>1206 ≥ 2.2μF; 1210 ≥ 22μF</td></tr> <tr> <td>15% 0201 ≥ 0.1μF; 0402 ≥ 1μF</td></tr> <tr> <td rowspan="2">6.3V</td><td rowspan="2">10%</td><td>15% 0201 ≥ 0.1μF; 0402 ≥ 1μF<br/>0603 ≥ 10μF; 0805 ≥ 4.7μF<br/>1206 ≥ 47μF; 1210 ≥ 100μF</td></tr> <tr> <td>20% 0402 ≥ 2.2μF</td></tr> </tbody> </table> <p>Y5V:</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="2">≥ 50V</td><td rowspan="2">5%</td><td>7% 0603 ≥ 0.1μF; 0805 ≥ 0.47μF; 1206 ≥ 4.7μF</td></tr> <tr> <td>12.5% 1210 ≥ 6.8μF</td></tr> <tr> <td>35V</td><td>7%</td><td>—</td></tr> <tr> <td rowspan="2">25V</td><td rowspan="2">5%</td><td>7% 0402 ≥ 0.047μF; 0603 ≥ 0.1μF<br/>0805 ≥ 0.33μF; 1206 ≥ 1μF<br/>1210 ≥ 4.7μF</td></tr> <tr> <td>9% 0402 ≥ 0.068μF; 0603 ≥ 0.47μF<br/>1206 ≥ 4.7μF; 1210 ≥ 22μF</td></tr> <tr> <td rowspan="2">16V<br/>(C &lt; 1.0μF)</td><td rowspan="2">7%</td><td>9% 0402 ≥ 0.068μF; 0603 ≥ 0.68μF</td></tr> <tr> <td>12.5% 0402 ≥ 0.22μF</td></tr> <tr> <td>16V<br/>(C ≥ 1.0μF)</td><td>9%</td><td>12.5% 0603 ≥ 2.2μF; 0805 ≥ 3.3μF<br/>1206 ≥ 10μF; 1210 ≥ 22μF<br/>1812 ≥ 47μF</td></tr> <tr> <td>10V</td><td>12.5%</td><td>20% 0402 ≥ 0.47μF</td></tr> <tr> <td>6.3V</td><td>20%</td><td>-</td></tr> </tbody> </table> | Rated vol.  | D.F. ≤ | Exception of D.F. ≤ | ≥ 100V | 2.5% | 3% 1206 ≥ 0.047μF | 5% 0603 ≥ 0.068μF; 0805 ≥ 0.1μF<br>1206 > 1μF; 1210 ≥ 2.2μF | 10% 0805 > 0.22μF; 1210 ≥ 3.3μF | 50V | 2.5% | 3% 0201(50V); 0603 ≥ 0.047μF<br>0805 ≥ 0.18μF; 1206 ≥ 0.47μF | 5% 0201 ≥ 0.01μF; 1210 ≥ 4.7μF | 10% 0402 ≥ 0.1μF; 0603 > 0.1μF;<br>0805 ≥ 1μF; 1206 ≥ 2.2μF; 1210 ≥ 10μF | 35V | 3.5% | 10% 0603 ≥ 1μF; 0805 ≥ 2.2μF; 1206 ≥ 2.2μF; 1210 ≥ 10μF | 25V | 3.5% | 5% 0201 ≥ 0.01μF; 0805 ≥ 1μF; 1210 ≥ 10μF | 7% 0603 ≥ 0.33μF; 1206 ≥ 4.7μF | 10% 0201 ≥ 0.1μF; 0402 ≥ 0.10μF; 0603 ≥ 0.47μF<br>0805 ≥ 2.2μF; 1206 ≥ 6.8μF; 1210 ≥ 22μF | 12.5% 0402 ≥ 0.47μF | 16V | 3.5% | 5% 0201 ≥ 0.01μF; 0402 ≥ 0.033μF; 0603 ≥ 0.15μF;<br>0805 ≥ 0.68μF; 1206 ≥ 2.2μF; 1210 ≥ 4.7μF | 10% 0201 ≥ 0.1μF(0201/X7R ≥ 0.022μF);<br>0402 ≥ 0.22μF; 0603 ≥ 0.68μF; 0805 ≥ 2.2μF; 1206 ≥ 4.7μF; 1210 ≥ 22μF | 10V | 5% | 10% 0201 ≥ 0.012μF; 0402 ≥ 0.33μF(0402/X7R ≥ 0.22μF)<br>0603 ≥ 0.33μF; 0805 ≥ 2.2μF<br>1206 ≥ 2.2μF; 1210 ≥ 22μF | 15% 0201 ≥ 0.1μF; 0402 ≥ 1μF | 6.3V | 10% | 15% 0201 ≥ 0.1μF; 0402 ≥ 1μF<br>0603 ≥ 10μF; 0805 ≥ 4.7μF<br>1206 ≥ 47μF; 1210 ≥ 100μF | 20% 0402 ≥ 2.2μF | Rated vol. | D.F. ≤ | Exception of D.F. ≤ | ≥ 50V | 5% | 7% 0603 ≥ 0.1μF; 0805 ≥ 0.47μF; 1206 ≥ 4.7μF | 12.5% 1210 ≥ 6.8μF | 35V | 7% | — | 25V | 5% | 7% 0402 ≥ 0.047μF; 0603 ≥ 0.1μF<br>0805 ≥ 0.33μF; 1206 ≥ 1μF<br>1210 ≥ 4.7μF | 9% 0402 ≥ 0.068μF; 0603 ≥ 0.47μF<br>1206 ≥ 4.7μF; 1210 ≥ 22μF | 16V<br>(C < 1.0μF) | 7% | 9% 0402 ≥ 0.068μF; 0603 ≥ 0.68μF | 12.5% 0402 ≥ 0.22μF | 16V<br>(C ≥ 1.0μF) | 9% | 12.5% 0603 ≥ 2.2μF; 0805 ≥ 3.3μF<br>1206 ≥ 10μF; 1210 ≥ 22μF<br>1812 ≥ 47μF | 10V | 12.5% | 20% 0402 ≥ 0.47μF | 6.3V | 20% | - | <p>X7R, X5R, Y5V: (Class II)<br/>Cap≤10uF 1.0±0.2Vrms, 1KHz±10%**<br/>Cap&gt;10uF 0.5±0.2Vrms, 120Hz±10%</p> <p>** Test condition: 0.5±0.2Vrms ,<br/>1KHz±10%</p> <p>X7R:<br/>0805=106(6.3V,10V), 0603/475(6.3V)<br/>X5R:<br/>0201 ≥ 224 (6.3V,10V,16V)#1<br/>0402 ≥ 475 (6.3V,16V), 0402 ≥ 225(10V)<br/>0603=106 (6.3V,10V),<br/>#1 Excluding<br/>X5R/0201/105(6.3V);225(10V),<br/>(1.0±0.2Vrms , 1KHz±10%)</p> <p>*Before initial measurement (Class II only):<br/>To apply de-aging at 150°C for 1hr then set<br/>for 24±2 hrs at room temp.</p> |
| Rated vol.   | D.F. ≤   | Exception of D.F. ≤   |        |                     |        |      |                   |   |                                 |     |      |  |                                |  |     |      |   |     |      |   |                                |   |                     |     |      |   |  |     |    |  |                              |      |     |  |                  |            |        |                     |       |    |  |                    |     |    |   |     |    |  |   |                    |    |                                  |                     |                    |    |   |     |       |                   |      |     |   |   |
| ≥ 100V   | 2.5%   | 3% 1206 ≥ 0.047μF   |        |                     |        |      |                   |   |                                 |     |      |  |                                |  |     |      |   |     |      |   |                                |   |                     |     |      |   |  |     |    |  |                              |      |     |  |                  |            |        |                     |       |    |  |                    |     |    |   |     |    |  |   |                    |    |                                  |                     |                    |    |   |     |       |                   |      |     |   |   |
|  |  | 5% 0603 ≥ 0.068μF; 0805 ≥ 0.1μF<br>1206 > 1μF; 1210 ≥ 2.2μF   |        |                     |        |      |                   |   |                                 |     |      |  |                                |  |     |      |   |     |      |   |                                |   |                     |     |      |   |  |     |    |  |                              |      |     |  |                  |            |        |                     |       |    |  |                    |     |    |   |     |    |  |   |                    |    |                                  |                     |                    |    |   |     |       |                   |      |     |   |   |
|  |  | 10% 0805 > 0.22μF; 1210 ≥ 3.3μF   |        |                     |        |      |                   |   |                                 |     |      |  |                                |  |     |      |   |     |      |   |                                |   |                     |     |      |   |  |     |    |  |                              |      |     |  |                  |            |        |                     |       |    |  |                    |     |    |   |     |    |  |   |                    |    |                                  |                     |                    |    |   |     |       |                   |      |     |   |   |
| 50V  | 2.5%   | 3% 0201(50V); 0603 ≥ 0.047μF<br>0805 ≥ 0.18μF; 1206 ≥ 0.47μF  |        |                     |        |      |                   |   |                                 |     |      |  |                                |  |     |      |   |     |      |   |                                |   |                     |     |      |   |  |     |    |  |                              |      |     |  |                  |            |        |                     |       |    |  |                    |     |    |   |     |    |  |   |                    |    |                                  |                     |                    |    |   |     |       |                   |      |     |   |   |
|  |  | 5% 0201 ≥ 0.01μF; 1210 ≥ 4.7μF  |        |                     |        |      |                   |   |                                 |     |      |  |                                |  |     |      |   |     |      |   |                                |   |                     |     |      |   |  |     |    |  |                              |      |     |  |                  |            |        |                     |       |    |  |                    |     |    |   |     |    |  |   |                    |    |                                  |                     |                    |    |   |     |       |                   |      |     |   |   |
|  |  | 10% 0402 ≥ 0.1μF; 0603 > 0.1μF;<br>0805 ≥ 1μF; 1206 ≥ 2.2μF; 1210 ≥ 10μF  |        |                     |        |      |                   |   |                                 |     |      |  |                                |  |     |      |   |     |      |   |                                |   |                     |     |      |   |  |     |    |  |                              |      |     |  |                  |            |        |                     |       |    |  |                    |     |    |   |     |    |  |   |                    |    |                                  |                     |                    |    |   |     |       |                   |      |     |   |   |
| 35V  | 3.5%   | 10% 0603 ≥ 1μF; 0805 ≥ 2.2μF; 1206 ≥ 2.2μF; 1210 ≥ 10μF   |        |                     |        |      |                   |   |                                 |     |      |  |                                |  |     |      |   |     |      |   |                                |   |                     |     |      |   |  |     |    |  |                              |      |     |  |                  |            |        |                     |       |    |  |                    |     |    |   |     |    |  |   |                    |    |                                  |                     |                    |    |   |     |       |                   |      |     |   |   |
| 25V  | 3.5%   | 5% 0201 ≥ 0.01μF; 0805 ≥ 1μF; 1210 ≥ 10μF   |        |                     |        |      |                   |   |                                 |     |      |  |                                |  |     |      |   |     |      |   |                                |   |                     |     |      |   |  |     |    |  |                              |      |     |  |                  |            |        |                     |       |    |  |                    |     |    |   |     |    |  |   |                    |    |                                  |                     |                    |    |   |     |       |                   |      |     |   |   |
|  |  | 7% 0603 ≥ 0.33μF; 1206 ≥ 4.7μF  |        |                     |        |      |                   |   |                                 |     |      |  |                                |  |     |      |   |     |      |   |                                |   |                     |     |      |   |  |     |    |  |                              |      |     |  |                  |            |        |                     |       |    |  |                    |     |    |   |     |    |  |   |                    |    |                                  |                     |                    |    |   |     |       |                   |      |     |   |   |
|  |  | 10% 0201 ≥ 0.1μF; 0402 ≥ 0.10μF; 0603 ≥ 0.47μF<br>0805 ≥ 2.2μF; 1206 ≥ 6.8μF; 1210 ≥ 22μF   |        |                     |        |      |                   |   |                                 |     |      |  |                                |  |     |      |   |     |      |   |                                |   |                     |     |      |   |  |     |    |  |                              |      |     |  |                  |            |        |                     |       |    |  |                    |     |    |   |     |    |  |   |                    |    |                                  |                     |                    |    |   |     |       |                   |      |     |   |   |
|  |  | 12.5% 0402 ≥ 0.47μF   |        |                     |        |      |                   |   |                                 |     |      |  |                                |  |     |      |   |     |      |   |                                |   |                     |     |      |   |  |     |    |  |                              |      |     |  |                  |            |        |                     |       |    |  |                    |     |    |   |     |    |  |   |                    |    |                                  |                     |                    |    |   |     |       |                   |      |     |   |   |
| 16V  | 3.5%   | 5% 0201 ≥ 0.01μF; 0402 ≥ 0.033μF; 0603 ≥ 0.15μF;<br>0805 ≥ 0.68μF; 1206 ≥ 2.2μF; 1210 ≥ 4.7μF   |        |                     |        |      |                   |   |                                 |     |      |  |                                |  |     |      |   |     |      |   |                                |   |                     |     |      |   |  |     |    |  |                              |      |     |  |                  |            |        |                     |       |    |  |                    |     |    |   |     |    |  |   |                    |    |                                  |                     |                    |    |   |     |       |                   |      |     |   |   |
|  |  | 10% 0201 ≥ 0.1μF(0201/X7R ≥ 0.022μF);<br>0402 ≥ 0.22μF; 0603 ≥ 0.68μF; 0805 ≥ 2.2μF; 1206 ≥ 4.7μF; 1210 ≥ 22μF  |        |                     |        |      |                   |   |                                 |     |      |  |                                |  |     |      |   |     |      |   |                                |   |                     |     |      |   |  |     |    |  |                              |      |     |  |                  |            |        |                     |       |    |  |                    |     |    |   |     |    |  |   |                    |    |                                  |                     |                    |    |   |     |       |                   |      |     |   |   |
| 10V  | 5%   | 10% 0201 ≥ 0.012μF; 0402 ≥ 0.33μF(0402/X7R ≥ 0.22μF)<br>0603 ≥ 0.33μF; 0805 ≥ 2.2μF<br>1206 ≥ 2.2μF; 1210 ≥ 22μF  |        |                     |        |      |                   |   |                                 |     |      |  |                                |  |     |      |   |     |      |   |                                |   |                     |     |      |   |  |     |    |  |                              |      |     |  |                  |            |        |                     |       |    |  |                    |     |    |   |     |    |  |   |                    |    |                                  |                     |                    |    |   |     |       |                   |      |     |   |   |
|  |  | 15% 0201 ≥ 0.1μF; 0402 ≥ 1μF  |        |                     |        |      |                   |   |                                 |     |      |  |                                |  |     |      |   |     |      |   |                                |   |                     |     |      |   |  |     |    |  |                              |      |     |  |                  |            |        |                     |       |    |  |                    |     |    |   |     |    |  |   |                    |    |                                  |                     |                    |    |   |     |       |                   |      |     |   |   |
| 6.3V   | 10%  | 15% 0201 ≥ 0.1μF; 0402 ≥ 1μF<br>0603 ≥ 10μF; 0805 ≥ 4.7μF<br>1206 ≥ 47μF; 1210 ≥ 100μF  |        |                     |        |      |                   |   |                                 |     |      |  |                                |  |     |      |   |     |      |   |                                |   |                     |     |      |   |  |     |    |  |                              |      |     |  |                  |            |        |                     |       |    |  |                    |     |    |   |     |    |  |   |                    |    |                                  |                     |                    |    |   |     |       |                   |      |     |   |   |
|  |  | 20% 0402 ≥ 2.2μF  |        |                     |        |      |                   |   |                                 |     |      |  |                                |  |     |      |   |     |      |   |                                |   |                     |     |      |   |  |     |    |  |                              |      |     |  |                  |            |        |                     |       |    |  |                    |     |    |   |     |    |  |   |                    |    |                                  |                     |                    |    |   |     |       |                   |      |     |   |   |
| Rated vol.   | D.F. ≤   | Exception of D.F. ≤   |        |                     |        |      |                   |   |                                 |     |      |  |                                |  |     |      |   |     |      |   |                                |   |                     |     |      |   |  |     |    |  |                              |      |     |  |                  |            |        |                     |       |    |  |                    |     |    |   |     |    |  |   |                    |    |                                  |                     |                    |    |   |     |       |                   |      |     |   |   |
| ≥ 50V  | 5%   | 7% 0603 ≥ 0.1μF; 0805 ≥ 0.47μF; 1206 ≥ 4.7μF  |        |                     |        |      |                   |   |                                 |     |      |  |                                |  |     |      |   |     |      |   |                                |   |                     |     |      |   |  |     |    |  |                              |      |     |  |                  |            |        |                     |       |    |  |                    |     |    |   |     |    |  |   |                    |    |                                  |                     |                    |    |   |     |       |                   |      |     |   |   |
|  |  | 12.5% 1210 ≥ 6.8μF  |        |                     |        |      |                   |   |                                 |     |      |  |                                |  |     |      |   |     |      |   |                                |   |                     |     |      |   |  |     |    |  |                              |      |     |  |                  |            |        |                     |       |    |  |                    |     |    |   |     |    |  |   |                    |    |                                  |                     |                    |    |   |     |       |                   |      |     |   |   |
| 35V  | 7%   | —   |        |                     |        |      |                   |   |                                 |     |      |  |                                |  |     |      |   |     |      |   |                                |   |                     |     |      |   |  |     |    |  |                              |      |     |  |                  |            |        |                     |       |    |  |                    |     |    |   |     |    |  |   |                    |    |                                  |                     |                    |    |   |     |       |                   |      |     |   |   |
| 25V  | 5%   | 7% 0402 ≥ 0.047μF; 0603 ≥ 0.1μF<br>0805 ≥ 0.33μF; 1206 ≥ 1μF<br>1210 ≥ 4.7μF  |        |                     |        |      |                   |   |                                 |     |      |  |                                |  |     |      |   |     |      |   |                                |   |                     |     |      |   |  |     |    |  |                              |      |     |  |                  |            |        |                     |       |    |  |                    |     |    |   |     |    |  |   |                    |    |                                  |                     |                    |    |   |     |       |                   |      |     |   |   |
|  |  | 9% 0402 ≥ 0.068μF; 0603 ≥ 0.47μF<br>1206 ≥ 4.7μF; 1210 ≥ 22μF   |        |                     |        |      |                   |   |                                 |     |      |  |                                |  |     |      |   |     |      |   |                                |   |                     |     |      |   |  |     |    |  |                              |      |     |  |                  |            |        |                     |       |    |  |                    |     |    |   |     |    |  |   |                    |    |                                  |                     |                    |    |   |     |       |                   |      |     |   |   |
| 16V<br>(C < 1.0μF)                                     | 7%   | 9% 0402 ≥ 0.068μF; 0603 ≥ 0.68μF  |        |                     |        |      |                   |   |                                 |     |      |  |                                |  |     |      |   |     |      |   |                                |   |                     |     |      |   |  |     |    |  |                              |      |     |  |                  |            |        |                     |       |    |  |                    |     |    |   |     |    |  |   |                    |    |                                  |                     |                    |    |   |     |       |                   |      |     |   |   |
|  |  | 12.5% 0402 ≥ 0.22μF   |        |                     |        |      |                   |   |                                 |     |      |  |                                |  |     |      |   |     |      |   |                                |   |                     |     |      |   |  |     |    |  |                              |      |     |  |                  |            |        |                     |       |    |  |                    |     |    |   |     |    |  |   |                    |    |                                  |                     |                    |    |   |     |       |                   |      |     |   |   |
| 16V<br>(C ≥ 1.0μF)                                     | 9%   | 12.5% 0603 ≥ 2.2μF; 0805 ≥ 3.3μF<br>1206 ≥ 10μF; 1210 ≥ 22μF<br>1812 ≥ 47μF   |        |                     |        |      |                   |   |                                 |     |      |  |                                |  |     |      |   |     |      |   |                                |   |                     |     |      |   |  |     |    |  |                              |      |     |  |                  |            |        |                     |       |    |  |                    |     |    |   |     |    |  |   |                    |    |                                  |                     |                    |    |   |     |       |                   |      |     |   |   |
| 10V  | 12.5%  | 20% 0402 ≥ 0.47μF   |        |                     |        |      |                   |   |                                 |     |      |  |                                |  |     |      |   |     |      |   |                                |   |                     |     |      |   |  |     |    |  |                              |      |     |  |                  |            |        |                     |       |    |  |                    |     |    |   |     |    |  |   |                    |    |                                  |                     |                    |    |   |     |       |                   |      |     |   |   |
| 6.3V   | 20%  | -   |        |                     |        |      |                   |   |                                 |     |      |  |                                |  |     |      |   |     |      |   |                                |   |                     |     |      |   |  |     |    |  |                              |      |     |  |                  |            |        |                     |       |    |  |                    |     |    |   |     |    |  |   |                    |    |                                  |                     |                    |    |   |     |       |                   |      |     |   |   |
| Dielectric Strength                                    | No evidence of damage or flash over during test  | <p>To apply voltage(≤ 100V) 250%<br/>Duration: 1 to 5sec<br/>Charge and discharge current less than 50mA</p> <p>To apply voltage:<br/>200V~300V ≥ 2 time VDC<br/>500V~999V ≥ 1.5 time VDC<br/>1000V~3000V ≥ 1.2 time VDC<br/>Cut-off, set at 10mA<br/>TEST=15 sec. RAMP=0</p> |        |                     |        |      |                   |   |                                 |     |      |  |                                |  |     |      |   |     |      |   |                                |   |                     |     |      |   |  |     |    |  |                              |      |     |  |                  |            |        |                     |       |    |  |                    |     |    |   |     |    |  |   |                    |    |                                  |                     |                    |    |   |     |       |                   |      |     |   |   |

| Item  | Requirement   | Test Method  |   |                       |              |   |  |  |  |   |   |   |      |                |     |                     |     |                     |     |                    |     |                    |      |      |              |             |                     |               |               |                    |  |                |      |      |             |              |                     |                |                 |                |      |      |              |              |                      |                      |                 |                 |
|---|---|--|---|-----------------------|--------------|---|--|--|--|---|---|---|------|----------------|-----|---------------------|-----|---------------------|-----|--------------------|-----|--------------------|------|------|--------------|-------------|---------------------|---------------|---------------|--------------------|--|----------------|------|------|-------------|--------------|---------------------|----------------|-----------------|----------------|------|------|--------------|--------------|----------------------|----------------------|-----------------|-----------------|
| Insulation Resistance   | 10GΩ or R×C≥ 500Ω·F Whichever is smaller<br>X7R, X5R, Y5V:  | To apply rated voltage for max. 120sec<br><br>*Before initial measurement (Class II only):<br>To apply de-aging at 150°C for 1hr then set for 24±2 hrs at room temp.   |   |                       |              |   |  |  |  |   |   |   |      |                |     |                     |     |                     |     |                    |     |                    |      |      |              |             |                     |               |               |                    |  |                |      |      |             |              |                     |                |                 |                |      |      |              |              |                      |                      |                 |                 |
|   | <table><tr><th>Rated Voltage</th><th>Insulation Resistance</th></tr><tr><td>100V: X7R</td><td rowspan="6">10GΩ or RxC ≥ 100Ω·F Whichever is smaller</td></tr><tr><td>50V: 0402≥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≥1uF;0603≥2.2uF;0805≥2.2uF1206≥10uF;1210≥10uF</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≥0.47uF;0603≥0.47uF0805≥2.2uF;1206≥4.7uF;1210≥47uF</td></tr><tr><td>6.3V</td></tr></table> |  | Rated Voltage                             | Insulation Resistance | 100V: X7R    | 10GΩ or RxC ≥ 100Ω·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≥1uF;0603≥2.2uF;0805≥2.2uF1206≥10uF;1210≥10uF | 16V: 0201≥0.1μF;0402≥0.22μF;0603≥1μF;0805≥2.2μF;1206≥10μF;1210≥47μF | 10V: 0201≥47nF;0402≥0.47uF;0603≥0.47uF0805≥2.2uF;1206≥4.7uF;1210≥47uF | 6.3V  |      |                |     |                     |     |                     |     |                    |     |                    |      |      |              |             |                     |               |               |                    |  |                |      |      |             |              |                     |                |                 |                |      |      |              |              |                      |                      |                 |                 |
|   | Rated Voltage   |  | Insulation Resistance                     |                       |              |   |  |  |  |   |   |   |      |                |     |                     |     |                     |     |                    |     |                    |      |      |              |             |                     |               |               |                    |  |                |      |      |             |              |                     |                |                 |                |      |      |              |              |                      |                      |                 |                 |
|   | 100V: X7R   |  | 10GΩ or RxC ≥ 100Ω·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≥1uF;0603≥2.2uF;0805≥2.2uF1206≥10uF;1210≥10uF                |   |  |   |                       |              |   |  |  |  |   |   |   |      |                |     |                     |     |                     |     |                    |     |                    |      |      |              |             |                     |               |               |                    |  |                |      |      |             |              |                     |                |                 |                |      |      |              |              |                      |                      |                 |                 |
| 16V: 0201≥0.1μF;0402≥0.22μF;0603≥1μF;0805≥2.2μF;1206≥10μF;1210≥47μF   |   |  |   |                       |              |   |  |  |  |   |   |   |      |                |     |                     |     |                     |     |                    |     |                    |      |      |              |             |                     |               |               |                    |  |                |      |      |             |              |                     |                |                 |                |      |      |              |              |                      |                      |                 |                 |
| 10V: 0201≥47nF;0402≥0.47uF;0603≥0.47uF0805≥2.2uF;1206≥4.7uF;1210≥47uF |   |  |   |                       |              |   |  |  |  |   |   |   |      |                |     |                     |     |                     |     |                    |     |                    |      |      |              |             |                     |               |               |                    |  |                |      |      |             |              |                     |                |                 |                |      |      |              |              |                      |                      |                 |                 |
| 6.3V  |   |  |   |                       |              |   |  |  |  |   |   |   |      |                |     |                     |     |                     |     |                    |     |                    |      |      |              |             |                     |               |               |                    |  |                |      |      |             |              |                     |                |                 |                |      |      |              |              |                      |                      |                 |                 |
| ≥ 10GΩ or 100Ω ·F whichever is smaller<br>Rated voltage: 200V~630V    | To apply rated voltage(500V max.) for 60sec.  |  |   |                       |              |   |  |  |  |   |   |   |      |                |     |                     |     |                     |     |                    |     |                    |      |      |              |             |                     |               |               |                    |  |                |      |      |             |              |                     |                |                 |                |      |      |              |              |                      |                      |                 |                 |
| ≥ 10GΩ<br>Rated voltage: >630V  | To apply 500V for 60sec.  |  |   |                       |              |   |  |  |  |   |   |   |      |                |     |                     |     |                     |     |                    |     |                    |      |      |              |             |                     |               |               |                    |  |                |      |      |             |              |                     |                |                 |                |      |      |              |              |                      |                      |                 |                 |
| Temperature Characteristic of Capacitance                             | <table><tr><th>T.C.</th><th>Capacitance Change</th></tr><tr><td>NPO</td><td>±30 (ppm/°C)</td></tr><tr><td>X7R</td><td>±15%</td></tr><tr><td>X5R</td><td>±15%</td></tr><tr><td>Y5V</td><td>+30%~-80%</td></tr></table>   | T.C.   | Capacitance Change                        | NPO                   | ±30 (ppm/°C) | X7R                                       | ±15%   | X5R                                    | ±15%   | Y5V   | +30%~-80%   | With no electrical load.<br><br><table><tr><th>T.C.</th><th>Operating Temp</th></tr><tr><td>NPO</td><td>-55 ~ 125°C at 25°C</td></tr><tr><td>X7R</td><td>-55 ~ 125°C at 25°C</td></tr><tr><td>X5R</td><td>-55 ~ 85°C at 25°C</td></tr><tr><td>Y5V</td><td>-25 ~ 85°C at 20°C</td></tr></table><br><br>*Before initial measurement (Class II only):<br>To apply de-aging at 150°C for 1hr then set for 24±2 hrs at room temp.<br>* Measurement voltage for Class II:<br><br><table><tr><td>0201</td><td>0402</td></tr><tr><td>Cap&lt;0.1μF:1V</td><td>Cap&lt;1μF: 1V</td></tr><tr><td>0.1μF≤Cap&lt;1μF: 0.2V</td><td>Cap=1μF: 0.5V</td></tr><tr><td>Cap≥1μF: 0.1V</td><td>1μF&lt;Cap&lt;10μF: 0.2V</td></tr><tr><td></td><td>Cap≥10μF: 0.1V</td></tr><tr><td>0603</td><td>0805</td></tr><tr><td>Cap≤1μF: 1V</td><td>Cap&lt;10μF: 1V</td></tr><tr><td>1μF&lt;Cap≤4.7μF: 0.5V</td><td>Cap=10μF: 0.5V</td></tr><tr><td>Cap&gt;4.7μF: 0.2V</td><td>Cap&gt;10μF: 0.2V</td></tr><tr><td>1206</td><td>1210</td></tr><tr><td>Cap≤10μF: 1V</td><td>Cap≤10μF: 1V</td></tr><tr><td>10μF&lt;Cap≤100μF: 0.5V</td><td>10μF&lt;Cap≤100μF: 0.5V</td></tr><tr><td>Cap&gt;100μF: 0.2V</td><td>Cap&gt;100μF: 0.2V</td></tr></table> | T.C. | Operating Temp | NPO | -55 ~ 125°C at 25°C | X7R | -55 ~ 125°C at 25°C | X5R | -55 ~ 85°C at 25°C | Y5V | -25 ~ 85°C at 20°C | 0201 | 0402 | Cap<0.1μF:1V | Cap<1μF: 1V | 0.1μF≤Cap<1μF: 0.2V | Cap=1μF: 0.5V | Cap≥1μF: 0.1V | 1μF<Cap<10μF: 0.2V |  | Cap≥10μF: 0.1V | 0603 | 0805 | Cap≤1μF: 1V | Cap<10μF: 1V | 1μF<Cap≤4.7μF: 0.5V | Cap=10μF: 0.5V | Cap>4.7μF: 0.2V | Cap>10μF: 0.2V | 1206 | 1210 | Cap≤10μF: 1V | Cap≤10μF: 1V | 10μF<Cap≤100μF: 0.5V | 10μF<Cap≤100μF: 0.5V | Cap>100μF: 0.2V | Cap>100μF: 0.2V |
|   | T.C.  | Capacitance Change   |   |                       |              |   |  |  |  |   |   |   |      |                |     |                     |     |                     |     |                    |     |                    |      |      |              |             |                     |               |               |                    |  |                |      |      |             |              |                     |                |                 |                |      |      |              |              |                      |                      |                 |                 |
| NPO   | ±30 (ppm/°C)  |  |   |                       |              |   |  |  |  |   |   |   |      |                |     |                     |     |                     |     |                    |     |                    |      |      |              |             |                     |               |               |                    |  |                |      |      |             |              |                     |                |                 |                |      |      |              |              |                      |                      |                 |                 |
| X7R   | ±15%  |  |   |                       |              |   |  |  |  |   |   |   |      |                |     |                     |     |                     |     |                    |     |                    |      |      |              |             |                     |               |               |                    |  |                |      |      |             |              |                     |                |                 |                |      |      |              |              |                      |                      |                 |                 |
| X5R   | ±15%  |  |   |                       |              |   |  |  |  |   |   |   |      |                |     |                     |     |                     |     |                    |     |                    |      |      |              |             |                     |               |               |                    |  |                |      |      |             |              |                     |                |                 |                |      |      |              |              |                      |                      |                 |                 |
| Y5V   | +30%~-80%   |  |   |                       |              |   |  |  |  |   |   |   |      |                |     |                     |     |                     |     |                    |     |                    |      |      |              |             |                     |               |               |                    |  |                |      |      |             |              |                     |                |                 |                |      |      |              |              |                      |                      |                 |                 |
| T.C.  | Operating Temp  |  |   |                       |              |   |  |  |  |   |   |   |      |                |     |                     |     |                     |     |                    |     |                    |      |      |              |             |                     |               |               |                    |  |                |      |      |             |              |                     |                |                 |                |      |      |              |              |                      |                      |                 |                 |
| NPO   | -55 ~ 125°C at 25°C   |  |   |                       |              |   |  |  |  |   |   |   |      |                |     |                     |     |                     |     |                    |     |                    |      |      |              |             |                     |               |               |                    |  |                |      |      |             |              |                     |                |                 |                |      |      |              |              |                      |                      |                 |                 |
| X7R   | -55 ~ 125°C at 25°C   |  |   |                       |              |   |  |  |  |   |   |   |      |                |     |                     |     |                     |     |                    |     |                    |      |      |              |             |                     |               |               |                    |  |                |      |      |             |              |                     |                |                 |                |      |      |              |              |                      |                      |                 |                 |
| X5R   | -55 ~ 85°C at 25°C  |  |   |                       |              |   |  |  |  |   |   |   |      |                |     |                     |     |                     |     |                    |     |                    |      |      |              |             |                     |               |               |                    |  |                |      |      |             |              |                     |                |                 |                |      |      |              |              |                      |                      |                 |                 |
| Y5V   | -25 ~ 85°C at 20°C  |  |   |                       |              |   |  |  |  |   |   |   |      |                |     |                     |     |                     |     |                    |     |                    |      |      |              |             |                     |               |               |                    |  |                |      |      |             |              |                     |                |                 |                |      |      |              |              |                      |                      |                 |                 |
| 0201  | 0402  |  |   |                       |              |   |  |  |  |   |   |   |      |                |     |                     |     |                     |     |                    |     |                    |      |      |              |             |                     |               |               |                    |  |                |      |      |             |              |                     |                |                 |                |      |      |              |              |                      |                      |                 |                 |
| Cap<0.1μF:1V  | Cap<1μF: 1V   |  |   |                       |              |   |  |  |  |   |   |   |      |                |     |                     |     |                     |     |                    |     |                    |      |      |              |             |                     |               |               |                    |  |                |      |      |             |              |                     |                |                 |                |      |      |              |              |                      |                      |                 |                 |
| 0.1μF≤Cap<1μF: 0.2V   | Cap=1μF: 0.5V   |  |   |                       |              |   |  |  |  |   |   |   |      |                |     |                     |     |                     |     |                    |     |                    |      |      |              |             |                     |               |               |                    |  |                |      |      |             |              |                     |                |                 |                |      |      |              |              |                      |                      |                 |                 |
| Cap≥1μF: 0.1V   | 1μF<Cap<10μF: 0.2V  |  |   |                       |              |   |  |  |  |   |   |   |      |                |     |                     |     |                     |     |                    |     |                    |      |      |              |             |                     |               |               |                    |  |                |      |      |             |              |                     |                |                 |                |      |      |              |              |                      |                      |                 |                 |
|   | Cap≥10μF: 0.1V  |  |   |                       |              |   |  |  |  |   |   |   |      |                |     |                     |     |                     |     |                    |     |                    |      |      |              |             |                     |               |               |                    |  |                |      |      |             |              |                     |                |                 |                |      |      |              |              |                      |                      |                 |                 |
| 0603  | 0805  |  |   |                       |              |   |  |  |  |   |   |   |      |                |     |                     |     |                     |     |                    |     |                    |      |      |              |             |                     |               |               |                    |  |                |      |      |             |              |                     |                |                 |                |      |      |              |              |                      |                      |                 |                 |
| Cap≤1μF: 1V   | Cap<10μF: 1V  |  |   |                       |              |   |  |  |  |   |   |   |      |                |     |                     |     |                     |     |                    |     |                    |      |      |              |             |                     |               |               |                    |  |                |      |      |             |              |                     |                |                 |                |      |      |              |              |                      |                      |                 |                 |
| 1μF<Cap≤4.7μF: 0.5V   | Cap=10μF: 0.5V  |  |   |                       |              |   |  |  |  |   |   |   |      |                |     |                     |     |                     |     |                    |     |                    |      |      |              |             |                     |               |               |                    |  |                |      |      |             |              |                     |                |                 |                |      |      |              |              |                      |                      |                 |                 |
| Cap>4.7μF: 0.2V   | Cap>10μF: 0.2V  |  |   |                       |              |   |  |  |  |   |   |   |      |                |     |                     |     |                     |     |                    |     |                    |      |      |              |             |                     |               |               |                    |  |                |      |      |             |              |                     |                |                 |                |      |      |              |              |                      |                      |                 |                 |
| 1206  | 1210  |  |   |                       |              |   |  |  |  |   |   |   |      |                |     |                     |     |                     |     |                    |     |                    |      |      |              |             |                     |               |               |                    |  |                |      |      |             |              |                     |                |                 |                |      |      |              |              |                      |                      |                 |                 |
| Cap≤10μF: 1V  | Cap≤10μF: 1V  |  |   |                       |              |   |  |  |  |   |   |   |      |                |     |                     |     |                     |     |                    |     |                    |      |      |              |             |                     |               |               |                    |  |                |      |      |             |              |                     |                |                 |                |      |      |              |              |                      |                      |                 |                 |
| 10μF<Cap≤100μF: 0.5V  | 10μF<Cap≤100μF: 0.5V  |  |   |                       |              |   |  |  |  |   |   |   |      |                |     |                     |     |                     |     |                    |     |                    |      |      |              |             |                     |               |               |                    |  |                |      |      |             |              |                     |                |                 |                |      |      |              |              |                      |                      |                 |                 |
| Cap>100μF: 0.2V   | Cap>100μF: 0.2V   |  |   |                       |              |   |  |  |  |   |   |   |      |                |     |                     |     |                     |     |                    |     |                    |      |      |              |             |                     |               |               |                    |  |                |      |      |             |              |                     |                |                 |                |      |      |              |              |                      |                      |                 |                 |
| Adhesive Strength of Termination                                      | No remarkable damage or removal of the terminations   | Pressurizing force:<br>0201:2N<br>0402&0603:5N>0603:10N<br>Test time: 10±1 sec   |   |                       |              |   |  |  |  |   |   |   |      |                |     |                     |     |                     |     |                    |     |                    |      |      |              |             |                     |               |               |                    |  |                |      |      |             |              |                     |                |                 |                |      |      |              |              |                      |                      |                 |                 |
| Vibration Resistance  | No remarkable damage<br>Cap change and Q/D.F.: To meet initial spec   | Vibration frequency: 10~55Hz/min<br>Total amplitude: 1.5mm<br>Test time: 6hrs.(two hrs each in three mutually Perpendicular directions.)<br>*Before initial measurement (Class II only):<br>To apply de-aging at 150°C for 1hr then set for 24±2 hrs at room temp.<br>*Cap./DF(Q) Measurement to be made after de-aging at 150°C for 1hr then set for 24±2 hrs at room temp. |   |                       |              |   |  |  |  |   |   |   |      |                |     |                     |     |                     |     |                    |     |                    |      |      |              |             |                     |               |               |                    |  |                |      |      |             |              |                     |                |                 |                |      |      |              |              |                      |                      |                 |                 |
| Solderability   | 95% min. coverage of all metalized area.  | Solder temperature: 235±5°C<br>Dipping time: 2±0.5 sec.  |   |                       |              |   |  |  |  |   |   |   |      |                |     |                     |     |                     |     |                    |     |                    |      |      |              |             |                     |               |               |                    |  |                |      |      |             |              |                     |                |                 |                |      |      |              |              |                      |                      |                 |                 |

## Multilayer Ceramic Chip Capacitor

| Item                         | Requirement   | Test Method  |      |           |           |   |                           |            |   |           |     |   |                           |            |   |            |     |
|------------------------------|---|--|------|-----------|-----------|---|---------------------------|------------|---|-----------|-----|---|---------------------------|------------|---|------------|-----|
| Bending Test                 | <p>No remarkable damage.</p> <p>Cap change :</p> <p>NP0: within <math>\pm 5\%</math> or 0.5pF whichever is larger</p> <p>X7R, X5R, X6S, X7S: within <math>\pm 12.5\%</math></p> <p>Y5V: within <math>\pm 30\%</math></p> <p>(This capacitance change means the change of capacitance under specified flexure of substrate from the capacitance measured before the test.)</p> | <p>The middle part of substrate shall be pressurized by means of the pressurizing rod at a rate of about 1 mm per second until the deflection becomes 1 mm and then the pressure shall be maintained for <math>5 \pm 1</math> sec.</p> <p>*Before initial measurement (Class II only):</p> <p>To apply de-aging at 150°C for 1hr then set for 24<math>\pm</math>2 hrs at room temp.</p> <p>Measurement to be made after keeping at room temp. for 24<math>\pm</math>2 hrs.</p>   |      |           |           |   |                           |            |   |           |     |   |                           |            |   |            |     |
| Resistance to Soldering Heat | <p>No remarkable damage.</p> <p>Cap change:</p> <p>NP0: within <math>\pm 2.5\%</math> or 0.25pF whichever is larger</p> <p>X7R, X5R, X6S, X7S: within <math>\pm 7.5\%</math></p> <p>Y5V: within <math>\pm 20\%</math></p> <p>Q/D.F., I.R. and dielectric strength: To meet initial requirements.</p> <p>25% max. leaching on each edge</p>                                    | <p>Solder temperature: 260<math>\pm</math>5°C</p> <p>Dipping time: 10<math>\pm</math>1 sec</p> <p>Preheating: 120 to 150°C for 1 minute before immerse the capacitor in a eutectic solder.</p> <p>*Before initial measurement (Class II only): To apply de-aging at 150°C for 1hr then set for 24<math>\pm</math>2 hrs at room temp.</p> <p>Cap. / DF(Q) / I.R. Measurement to be made after de-aging at 150°C for 1hr then set for 24<math>\pm</math>2 hrs at room temp</p>   |      |           |           |   |                           |            |   |           |     |   |                           |            |   |            |     |
| Temperature Cycle            | <p>No remarkable damage.</p> <p>* Cap change :</p> <p>NP0: within <math>\pm 2.5\%</math> or 0.25pF whichever is larger</p> <p>X7R, X5R, X6S, X7S: within <math>\pm 7.5\%</math></p> <p>Y5V: within <math>\pm 20\%</math></p> <p>* Q/D.F., I.R. and dielectric strength: To meet initial requirements</p>  | <p>Conduct the five cycles according to the temperature and time.</p> <table border="1"> <thead> <tr> <th>Step</th><th>Temp.(°C)</th><th>Time(min)</th></tr> </thead> <tbody> <tr> <td>1</td><td>Min. operating temp.+0/-3</td><td>30<math>\pm</math>3</td></tr> <tr> <td>2</td><td>Room temp</td><td>2-3</td></tr> <tr> <td>3</td><td>Max. operating temp.+3/-0</td><td>30<math>\pm</math>3</td></tr> <tr> <td>4</td><td>Room temp.</td><td>2-3</td></tr> </tbody> </table> <p>Before initial measurement (Class II only): To apply de-aging at 150°C for 1hr then set for 24<math>\pm</math>2 hrs at room temp.</p> <p>Cap. / DF(Q) / I.R. Measurement to be made after de-aging at 150°C for 1hr then set for 24<math>\pm</math>2 hrs at room temp.</p> | Step | Temp.(°C) | Time(min) | 1 | Min. operating temp.+0/-3 | 30 $\pm$ 3 | 2 | Room temp | 2-3 | 3 | Max. operating temp.+3/-0 | 30 $\pm$ 3 | 4 | Room temp. | 2-3 |
| Step                         | Temp.(°C)   | Time(min)  |      |           |           |   |                           |            |   |           |     |   |                           |            |   |            |     |
| 1                            | Min. operating temp.+0/-3   | 30 $\pm$ 3   |      |           |           |   |                           |            |   |           |     |   |                           |            |   |            |     |
| 2                            | Room temp   | 2-3  |      |           |           |   |                           |            |   |           |     |   |                           |            |   |            |     |
| 3                            | Max. operating temp.+3/-0   | 30 $\pm$ 3   |      |           |           |   |                           |            |   |           |     |   |                           |            |   |            |     |
| 4                            | Room temp.  | 2-3  |      |           |           |   |                           |            |   |           |     |   |                           |            |   |            |     |

| Item  | Requirement  | Test Method              |  |                          |  |             |    |    |                       |      |   |     |   |            |    |    |   |     |  |     |  |     |    |     |  |     |    |     |  |     |  |     |  |     |                       |     |    |     |   |     |  |     |      |     |   |     |   |      |     |     |   |            |             |                          |  |            |      |     |   |     |                      |     |     |   |   |     |      |     |   |     |   |                           |     |       |  |     |                       |                              |       |     |   |     |     |     |                       |      |     |   |   |               |                       |           |  |   |   |   |   |   |      |  |
|---|--|--------------------------|--|--------------------------|--|-------------|----|----|-----------------------|------|---|-----|---|------------|----|----|---|-----|--|-----|--|-----|----|-----|--|-----|----|-----|--|-----|--|-----|--|-----|-----------------------|-----|----|-----|---|-----|--|-----|------|-----|---|-----|---|------|-----|-----|---|------------|-------------|--------------------------|--|------------|------|-----|---|-----|----------------------|-----|-----|---|---|-----|------|-----|---|-----|---|---------------------------|-----|-------|--|-----|-----------------------|------------------------------|-------|-----|---|-----|-----|-----|-----------------------|------|-----|---|---|---------------|-----------------------|-----------|--|---|---|---|---|---|------|--|
| Humidity<br>(steady state)  | <p>No remarkable damage.</p> <p>Cap change:</p> <p>NP0: within <math>\pm 5\%</math> or 0.5pF whichever is larger</p> <p>X7R, X5R: <math>\geq 10V^{**}</math>, within <math>\pm 12.5\%</math>; <math>\leq 6.3V</math> within <math>\pm 25\%</math>; <math>C \geq 1\mu F</math>, within <math>\pm 25\%</math></p> <p><math>**10V</math>: 0603<math>\geq 4.7\mu F</math>; 0402<math>\geq 1\mu F</math>; 0201<math>\geq 0.1\mu F</math>, within <math>\pm 25\%</math>;</p> <p>Y5V: <math>\geq 10V</math>, within <math>\pm 30\%</math>; <math>\leq 6.3V</math>, within <math>+30/-40\%</math></p> <p>Q/D.F. value:</p> <p>NP0: More than 30pF <math>Q \geq 350</math>, <math>10pF \leq C \leq 30pF</math>, <math>Q \geq 275+2.5C</math> Less than 10pF <math>Q \geq 200+10C</math></p> <p>X7R, X5R:</p> <table><tr><th>Rated vol.</th><th>D.F. <math>\leq</math></th><th colspan="2">Exception of D.F. <math>\leq</math></th></tr><tr><td rowspan="3"><math>\geq 100V</math></td><td rowspan="3">3%</td><td>6%</td><td>1206 <math>\geq 0.47\mu F</math></td></tr><tr><td>7.5%</td><td>0603 <math>\geq 0.068\mu F</math>; 0805 <math>&gt; 0.1\mu F</math>; 1206 <math>&gt; 1\mu F</math>; 1210 <math>\geq 2.2\mu F</math></td></tr><tr><td>20%</td><td>0805 <math>&gt; 0.22\mu F</math>; 1210 <math>\geq 3.3\mu F</math></td></tr><tr><td rowspan="3"><math>\geq 50V</math></td><td rowspan="3">3%</td><td>6%</td><td>0201(50V); 0603 <math>\geq 0.047\mu F</math>; 0805 <math>\geq 0.18\mu F</math>; 1206 <math>\geq 0.47\mu F</math></td></tr><tr><td>10%</td><td>0201 <math>\geq 0.01\mu F</math>; 1210 <math>\geq 4.7\mu F</math></td></tr><tr><td>20%</td><td>0402 <math>\geq 0.1\mu F</math>; 0603 <math>&gt; 0.1\mu F</math>; 0805 <math>\geq 1\mu F</math>; 1206 <math>\geq 2.2\mu F</math>; 1210 <math>\geq 10\mu F</math></td></tr><tr><td>35V</td><td>5%</td><td>20%</td><td>0603 <math>\geq 1\mu F</math>; 0805 <math>\geq 2.2\mu F</math>; 1206 <math>\geq 2.2\mu F</math>; 1210 <math>\geq 10\mu F</math></td></tr><tr><td rowspan="4">25V</td><td rowspan="4">5%</td><td>10%</td><td>0201 <math>\geq 0.01\mu F</math>; 0805 <math>\geq 1\mu F</math>; 1210 <math>\geq 10\mu F</math></td></tr><tr><td>14%</td><td>0603 <math>\geq 0.33\mu F</math>; 1206 <math>\geq 4.7\mu F</math></td></tr><tr><td>15%</td><td>0201 <math>\geq 0.1\mu F</math>; 0402 <math>\geq 0.10\mu F</math>; 0603 <math>\geq 0.47\mu F</math> 0805 <math>\geq 2.2\mu F</math>; 1206 <math>\geq 6.8\mu F</math>; 1210 <math>\geq 22\mu F</math></td></tr><tr><td>20%</td><td>0402 <math>\geq 0.47\mu F</math></td></tr><tr><td rowspan="2">16V</td><td rowspan="2">5%</td><td>10%</td><td>0603 <math>\geq 0.15\mu F</math>; 0805 <math>\geq 0.68\mu F</math>; 1206 <math>\geq 2.2\mu F</math>; 1210 <math>\geq 4.7\mu F</math></td></tr><tr><td>15%</td><td>0201 <math>\geq 0.01\mu F</math> (0201/X7R <math>\geq 0.022\mu F</math>); 0402 <math>\geq 0.33\mu F</math>; 0603 <math>\geq 0.68\mu F</math>; 0805 <math>\geq 2.2\mu F</math>; 1206 <math>\geq 4.7\mu F</math>; 1210 <math>\geq 22\mu F</math></td></tr><tr><td rowspan="2">10V</td><td rowspan="2">7.5%</td><td>15%</td><td>0201 <math>\geq 0.012\mu F</math>; 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0805 $> 0.1\mu F$ ; 1206 $> 1\mu F$ ; 1210 $\geq 2.2\mu F$ | 20% | 0805 $> 0.22\mu F$ ; 1210 $\geq 3.3\mu F$ | $\geq 50V$ | 3% | 6% | 0201(50V); 0603 $\geq 0.047\mu F$ ; 0805 $\geq 0.18\mu F$ ; 1206 $\geq 0.47\mu F$ | 10% | 0201 $\geq 0.01\mu F$ ; 1210 $\geq 4.7\mu F$ | 20% | 0402 $\geq 0.1\mu F$ ; 0603 $> 0.1\mu F$ ; 0805 $\geq 1\mu F$ ; 1206 $\geq 2.2\mu F$ ; 1210 $\geq 10\mu F$ | 35V | 5% | 20% | 0603 $\geq 1\mu F$ ; 0805 $\geq 2.2\mu F$ ; 1206 $\geq 2.2\mu F$ ; 1210 $\geq 10\mu F$ | 25V | 5% | 10% | 0201 $\geq 0.01\mu F$ ; 0805 $\geq 1\mu F$ ; 1210 $\geq 10\mu F$ | 14% | 0603 $\geq 0.33\mu F$ ; 1206 $\geq 4.7\mu F$ | 15% | 0201 $\geq 0.1\mu F$ ; 0402 $\geq 0.10\mu F$ ; 0603 $\geq 0.47\mu F$ 0805 $\geq 2.2\mu F$ ; 1206 $\geq 6.8\mu F$ ; 1210 $\geq 22\mu F$ | 20% | 0402 $\geq 0.47\mu F$ | 16V | 5% | 10% | 0603 $\geq 0.15\mu F$ ; 0805 $\geq 0.68\mu F$ ; 1206 $\geq 2.2\mu F$ ; 1210 $\geq 4.7\mu F$ | 15% | 0201 $\geq 0.01\mu F$ (0201/X7R $\geq 0.022\mu F$ ); 0402 $\geq 0.33\mu F$ ; 0603 $\geq 0.68\mu F$ ; 0805 $\geq 2.2\mu F$ ; 1206 $\geq 4.7\mu F$ ; 1210 $\geq 22\mu F$ | 10V | 7.5% | 15% | 0201 $\geq 0.012\mu F$ ; 0402 $\geq 0.33\mu F$ (0402/X7R $\geq 0.22\mu F$ ) 0603 $\geq 0.33\mu F$ ; 0805 $\geq 2.2\mu F$ ; 1206 $\geq 2.2\mu F$ ; 1210 $\geq 22\mu F$ | 20% | 0201 $\geq 0.1\mu F$ ; 0402 $\geq 1\mu F$ | 6.3V | 15% | 30% | 0201 $\geq 0.1\mu F$ ; 0402 $\geq 1\mu F$ ; 0603 $\geq 10\mu F$ ; 0805 $\geq 4.7\mu F$ 1206 $\geq 47\mu F$ ; 1210 $\geq 100\mu F$ | Rated vol. | D.F. $\leq$ | Exception of D.F. $\leq$ |  | $\geq 50V$ | 7.5% | 10% | 0603 $\geq 0.1\mu F$ ; 0805 $\geq 0.47\mu F$ ; 1206 $\geq 4.7\mu F$ | 20% | 1210 $\geq 6.8\mu F$ | 35V | 10% | — | — | 25V | 7.5% | 10% | 0402 $\geq 0.047\mu F$ ; 0603 $\geq 0.1\mu F$ ; 0805 $\geq 0.33\mu F$ ; 1206 $\geq 1\mu F$ ; 1210 $\geq 4.7\mu F$ | 15% | 0402 $\geq 0.068\mu F$ ; 0603 $\geq 0.47\mu F$ ; 1206 $\geq 4.7\mu F$ ; 1210 $\geq 22\mu F$ | 16V<br>( $C < 1.0\mu F$ ) | 10% | 12.5% | 0402 $\geq 0.068\mu F$ ; 0603 $\geq 0.68\mu F$ | 20% | 0402 $\geq 0.22\mu F$ | 16V<br>( $C \geq 1.0\mu F$ ) | 12.5% | 20% | 0603 $\geq 2.2\mu F$ ; 0805 $\geq 3.3\mu F$ ; 1206 $\geq 10\mu F$ ; 1210 $\geq 22\mu F$ ; 1812 $\geq 47\mu F$ | 10V | 20% | 30% | 0402 $\geq 0.47\mu F$ | 6.3V | 30% | - | - | Rated Voltage | Insulation Resistance | 100V: X7R | 10G $\Omega$ or<br>RxC $\geq 10\Omega \cdot F$<br>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: 0603 $\geq 1\mu F$ ; 0805 $\geq 2.2\mu F$ ; 1206 $\geq 2.2\mu F$ ; 1210 $\geq 10\mu F$ | 25V: 0201 $\geq 0.1\mu F$ ; 0402 $\geq 0.22\mu F$ ; 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 | <p>Test temp.: <math>40 \pm 2^\circ C</math></p> <p>Humidity: 90~95%RH</p> <p>Test time: 500+24/-0hrs.</p> <p>Before initial measurement (Class II only): To apply de-aging at <math>150^\circ C</math> for 1hr then set for 24<math>\pm</math>2 hrs at room temp.</p> <p>Cap. / DF(Q) / I.R. Measurement to be made after de-aging at <math>150^\circ C</math> for 1hr then set for 24<math>\pm</math>2 hrs at room temp.</p> |
| Rated vol.  | D.F. $\leq$  | Exception of D.F. $\leq$ |  |                          |  |             |    |    |                       |      |   |     |   |            |    |    |   |     |  |     |  |     |    |     |  |     |    |     |  |     |  |     |  |     |                       |     |    |     |   |     |  |     |      |     |   |     |   |      |     |     |   |            |             |                          |  |            |      |     |   |     |                      |     |     |   |   |     |      |     |   |     |   |                           |     |       |  |     |                       |                              |       |     |   |     |     |     |                       |      |     |   |   |               |                       |           |  |   |   |   |   |   |      |  |
| $\geq 100V$   | 3%   | 6%                       | 1206 $\geq 0.47\mu F$  |                          |  |             |    |    |                       |      |   |     |   |            |    |    |   |     |  |     |  |     |    |     |  |     |    |     |  |     |  |     |  |     |                       |     |    |     |   |     |  |     |      |     |   |     |   |      |     |     |   |            |             |                          |  |            |      |     |   |     |                      |     |     |   |   |     |      |     |   |     |   |                           |     |       |  |     |                       |                              |       |     |   |     |     |     |                       |      |     |   |   |               |                       |           |  |   |   |   |   |   |      |  |
|   |  | 7.5%                     | 0603 $\geq 0.068\mu F$ ; 0805 $> 0.1\mu F$ ; 1206 $> 1\mu F$ ; 1210 $\geq 2.2\mu F$  |                          |  |             |    |    |                       |      |   |     |   |            |    |    |   |     |  |     |  |     |    |     |  |     |    |     |  |     |  |     |  |     |                       |     |    |     |   |     |  |     |      |     |   |     |   |      |     |     |   |            |             |                          |  |            |      |     |   |     |                      |     |     |   |   |     |      |     |   |     |   |                           |     |       |  |     |                       |                              |       |     |   |     |     |     |                       |      |     |   |   |               |                       |           |  |   |   |   |   |   |      |  |
|   |  | 20%                      | 0805 $> 0.22\mu F$ ; 1210 $\geq 3.3\mu F$  |                          |  |             |    |    |                       |      |   |     |   |            |    |    |   |     |  |     |  |     |    |     |  |     |    |     |  |     |  |     |  |     |                       |     |    |     |   |     |  |     |      |     |   |     |   |      |     |     |   |            |             |                          |  |            |      |     |   |     |                      |     |     |   |   |     |      |     |   |     |   |                           |     |       |  |     |                       |                              |       |     |   |     |     |     |                       |      |     |   |   |               |                       |           |  |   |   |   |   |   |      |  |
| $\geq 50V$  | 3%   | 6%                       | 0201(50V); 0603 $\geq 0.047\mu F$ ; 0805 $\geq 0.18\mu F$ ; 1206 $\geq 0.47\mu F$  |                          |  |             |    |    |                       |      |   |     |   |            |    |    |   |     |  |     |  |     |    |     |  |     |    |     |  |     |  |     |  |     |                       |     |    |     |   |     |  |     |      |     |   |     |   |      |     |     |   |            |             |                          |  |            |      |     |   |     |                      |     |     |   |   |     |      |     |   |     |   |                           |     |       |  |     |                       |                              |       |     |   |     |     |     |                       |      |     |   |   |               |                       |           |  |   |   |   |   |   |      |  |
|   |  | 10%                      | 0201 $\geq 0.01\mu F$ ; 1210 $\geq 4.7\mu F$   |                          |  |             |    |    |                       |      |   |     |   |            |    |    |   |     |  |     |  |     |    |     |  |     |    |     |  |     |  |     |  |     |                       |     |    |     |   |     |  |     |      |     |   |     |   |      |     |     |   |            |             |                          |  |            |      |     |   |     |                      |     |     |   |   |     |      |     |   |     |   |                           |     |       |  |     |                       |                              |       |     |   |     |     |     |                       |      |     |   |   |               |                       |           |  |   |   |   |   |   |      |  |
|   |  | 20%                      | 0402 $\geq 0.1\mu F$ ; 0603 $> 0.1\mu F$ ; 0805 $\geq 1\mu F$ ; 1206 $\geq 2.2\mu F$ ; 1210 $\geq 10\mu F$   |                          |  |             |    |    |                       |      |   |     |   |            |    |    |   |     |  |     |  |     |    |     |  |     |    |     |  |     |  |     |  |     |                       |     |    |     |   |     |  |     |      |     |   |     |   |      |     |     |   |            |             |                          |  |            |      |     |   |     |                      |     |     |   |   |     |      |     |   |     |   |                           |     |       |  |     |                       |                              |       |     |   |     |     |     |                       |      |     |   |   |               |                       |           |  |   |   |   |   |   |      |  |
| 35V   | 5%   | 20%                      | 0603 $\geq 1\mu F$ ; 0805 $\geq 2.2\mu F$ ; 1206 $\geq 2.2\mu F$ ; 1210 $\geq 10\mu F$   |                          |  |             |    |    |                       |      |   |     |   |            |    |    |   |     |  |     |  |     |    |     |  |     |    |     |  |     |  |     |  |     |                       |     |    |     |   |     |  |     |      |     |   |     |   |      |     |     |   |            |             |                          |  |            |      |     |   |     |                      |     |     |   |   |     |      |     |   |     |   |                           |     |       |  |     |                       |                              |       |     |   |     |     |     |                       |      |     |   |   |               |                       |           |  |   |   |   |   |   |      |  |
| 25V   | 5%   | 10%                      | 0201 $\geq 0.01\mu F$ ; 0805 $\geq 1\mu F$ ; 1210 $\geq 10\mu F$   |                          |  |             |    |    |                       |      |   |     |   |            |    |    |   |     |  |     |  |     |    |     |  |     |    |     |  |     |  |     |  |     |                       |     |    |     |   |     |  |     |      |     |   |     |   |      |     |     |   |            |             |                          |  |            |      |     |   |     |                      |     |     |   |   |     |      |     |   |     |   |                           |     |       |  |     |                       |                              |       |     |   |     |     |     |                       |      |     |   |   |               |                       |           |  |   |   |   |   |   |      |  |
|   |  | 14%                      | 0603 $\geq 0.33\mu F$ ; 1206 $\geq 4.7\mu F$   |                          |  |             |    |    |                       |      |   |     |   |            |    |    |   |     |  |     |  |     |    |     |  |     |    |     |  |     |  |     |  |     |                       |     |    |     |   |     |  |     |      |     |   |     |   |      |     |     |   |            |             |                          |  |            |      |     |   |     |                      |     |     |   |   |     |      |     |   |     |   |                           |     |       |  |     |                       |                              |       |     |   |     |     |     |                       |      |     |   |   |               |                       |           |  |   |   |   |   |   |      |  |
|   |  | 15%                      | 0201 $\geq 0.1\mu F$ ; 0402 $\geq 0.10\mu F$ ; 0603 $\geq 0.47\mu F$ 0805 $\geq 2.2\mu F$ ; 1206 $\geq 6.8\mu F$ ; 1210 $\geq 22\mu F$                                 |                          |  |             |    |    |                       |      |   |     |   |            |    |    |   |     |  |     |  |     |    |     |  |     |    |     |  |     |  |     |  |     |                       |     |    |     |   |     |  |     |      |     |   |     |   |      |     |     |   |            |             |                          |  |            |      |     |   |     |                      |     |     |   |   |     |      |     |   |     |   |                           |     |       |  |     |                       |                              |       |     |   |     |     |     |                       |      |     |   |   |               |                       |           |  |   |   |   |   |   |      |  |
|   |  | 20%                      | 0402 $\geq 0.47\mu F$  |                          |  |             |    |    |                       |      |   |     |   |            |    |    |   |     |  |     |  |     |    |     |  |     |    |     |  |     |  |     |  |     |                       |     |    |     |   |     |  |     |      |     |   |     |   |      |     |     |   |            |             |                          |  |            |      |     |   |     |                      |     |     |   |   |     |      |     |   |     |   |                           |     |       |  |     |                       |                              |       |     |   |     |     |     |                       |      |     |   |   |               |                       |           |  |   |   |   |   |   |      |  |
| 16V   | 5%   | 10%                      | 0603 $\geq 0.15\mu F$ ; 0805 $\geq 0.68\mu F$ ; 1206 $\geq 2.2\mu F$ ; 1210 $\geq 4.7\mu F$  |                          |  |             |    |    |                       |      |   |     |   |            |    |    |   |     |  |     |  |     |    |     |  |     |    |     |  |     |  |     |  |     |                       |     |    |     |   |     |  |     |      |     |   |     |   |      |     |     |   |            |             |                          |  |            |      |     |   |     |                      |     |     |   |   |     |      |     |   |     |   |                           |     |       |  |     |                       |                              |       |     |   |     |     |     |                       |      |     |   |   |               |                       |           |  |   |   |   |   |   |      |  |
|   |  | 15%                      | 0201 $\geq 0.01\mu F$ (0201/X7R $\geq 0.022\mu F$ ); 0402 $\geq 0.33\mu F$ ; 0603 $\geq 0.68\mu F$ ; 0805 $\geq 2.2\mu F$ ; 1206 $\geq 4.7\mu F$ ; 1210 $\geq 22\mu F$ |                          |  |             |    |    |                       |      |   |     |   |            |    |    |   |     |  |     |  |     |    |     |  |     |    |     |  |     |  |     |  |     |                       |     |    |     |   |     |  |     |      |     |   |     |   |      |     |     |   |            |             |                          |  |            |      |     |   |     |                      |     |     |   |   |     |      |     |   |     |   |                           |     |       |  |     |                       |                              |       |     |   |     |     |     |                       |      |     |   |   |               |                       |           |  |   |   |   |   |   |      |  |
| 10V   | 7.5%   | 15%                      | 0201 $\geq 0.012\mu F$ ; 0402 $\geq 0.33\mu F$ (0402/X7R $\geq 0.22\mu F$ ) 0603 $\geq 0.33\mu F$ ; 0805 $\geq 2.2\mu F$ ; 1206 $\geq 2.2\mu F$ ; 1210 $\geq 22\mu F$  |                          |  |             |    |    |                       |      |   |     |   |            |    |    |   |     |  |     |  |     |    |     |  |     |    |     |  |     |  |     |  |     |                       |     |    |     |   |     |  |     |      |     |   |     |   |      |     |     |   |            |             |                          |  |            |      |     |   |     |                      |     |     |   |   |     |      |     |   |     |   |                           |     |       |  |     |                       |                              |       |     |   |     |     |     |                       |      |     |   |   |               |                       |           |  |   |   |   |   |   |      |  |
|   |  | 20%                      | 0201 $\geq 0.1\mu F$ ; 0402 $\geq 1\mu F$  |                          |  |             |    |    |                       |      |   |     |   |            |    |    |   |     |  |     |  |     |    |     |  |     |    |     |  |     |  |     |  |     |                       |     |    |     |   |     |  |     |      |     |   |     |   |      |     |     |   |            |             |                          |  |            |      |     |   |     |                      |     |     |   |   |     |      |     |   |     |   |                           |     |       |  |     |                       |                              |       |     |   |     |     |     |                       |      |     |   |   |               |                       |           |  |   |   |   |   |   |      |  |
| 6.3V  | 15%  | 30%                      | 0201 $\geq 0.1\mu F$ ; 0402 $\geq 1\mu F$ ; 0603 $\geq 10\mu F$ ; 0805 $\geq 4.7\mu F$ 1206 $\geq 47\mu F$ ; 1210 $\geq 100\mu F$                                      |                          |  |             |    |    |                       |      |   |     |   |            |    |    |   |     |  |     |  |     |    |     |  |     |    |     |  |     |  |     |  |     |                       |     |    |     |   |     |  |     |      |     |   |     |   |      |     |     |   |            |             |                          |  |            |      |     |   |     |                      |     |     |   |   |     |      |     |   |     |   |                           |     |       |  |     |                       |                              |       |     |   |     |     |     |                       |      |     |   |   |               |                       |           |  |   |   |   |   |   |      |  |
| Rated vol.  | D.F. $\leq$  | Exception of D.F. $\leq$ |  |                          |  |             |    |    |                       |      |   |     |   |            |    |    |   |     |  |     |  |     |    |     |  |     |    |     |  |     |  |     |  |     |                       |     |    |     |   |     |  |     |      |     |   |     |   |      |     |     |   |            |             |                          |  |            |      |     |   |     |                      |     |     |   |   |     |      |     |   |     |   |                           |     |       |  |     |                       |                              |       |     |   |     |     |     |                       |      |     |   |   |               |                       |           |  |   |   |   |   |   |      |  |
| $\geq 50V$  | 7.5%   | 10%                      | 0603 $\geq 0.1\mu F$ ; 0805 $\geq 0.47\mu F$ ; 1206 $\geq 4.7\mu F$  |                          |  |             |    |    |                       |      |   |     |   |            |    |    |   |     |  |     |  |     |    |     |  |     |    |     |  |     |  |     |  |     |                       |     |    |     |   |     |  |     |      |     |   |     |   |      |     |     |   |            |             |                          |  |            |      |     |   |     |                      |     |     |   |   |     |      |     |   |     |   |                           |     |       |  |     |                       |                              |       |     |   |     |     |     |                       |      |     |   |   |               |                       |           |  |   |   |   |   |   |      |  |
|   |  | 20%                      | 1210 $\geq 6.8\mu F$   |                          |  |             |    |    |                       |      |   |     |   |            |    |    |   |     |  |     |  |     |    |     |  |     |    |     |  |     |  |     |  |     |                       |     |    |     |   |     |  |     |      |     |   |     |   |      |     |     |   |            |             |                          |  |            |      |     |   |     |                      |     |     |   |   |     |      |     |   |     |   |                           |     |       |  |     |                       |                              |       |     |   |     |     |     |                       |      |     |   |   |               |                       |           |  |   |   |   |   |   |      |  |
| 35V   | 10%  | —                        | —  |                          |  |             |    |    |                       |      |   |     |   |            |    |    |   |     |  |     |  |     |    |     |  |     |    |     |  |     |  |     |  |     |                       |     |    |     |   |     |  |     |      |     |   |     |   |      |     |     |   |            |             |                          |  |            |      |     |   |     |                      |     |     |   |   |     |      |     |   |     |   |                           |     |       |  |     |                       |                              |       |     |   |     |     |     |                       |      |     |   |   |               |                       |           |  |   |   |   |   |   |      |  |
| 25V   | 7.5%   | 10%                      | 0402 $\geq 0.047\mu F$ ; 0603 $\geq 0.1\mu F$ ; 0805 $\geq 0.33\mu F$ ; 1206 $\geq 1\mu F$ ; 1210 $\geq 4.7\mu F$  |                          |  |             |    |    |                       |      |   |     |   |            |    |    |   |     |  |     |  |     |    |     |  |     |    |     |  |     |  |     |  |     |                       |     |    |     |   |     |  |     |      |     |   |     |   |      |     |     |   |            |             |                          |  |            |      |     |   |     |                      |     |     |   |   |     |      |     |   |     |   |                           |     |       |  |     |                       |                              |       |     |   |     |     |     |                       |      |     |   |   |               |                       |           |  |   |   |   |   |   |      |  |
|   |  | 15%                      | 0402 $\geq 0.068\mu F$ ; 0603 $\geq 0.47\mu F$ ; 1206 $\geq 4.7\mu F$ ; 1210 $\geq 22\mu F$  |                          |  |             |    |    |                       |      |   |     |   |            |    |    |   |     |  |     |  |     |    |     |  |     |    |     |  |     |  |     |  |     |                       |     |    |     |   |     |  |     |      |     |   |     |   |      |     |     |   |            |             |                          |  |            |      |     |   |     |                      |     |     |   |   |     |      |     |   |     |   |                           |     |       |  |     |                       |                              |       |     |   |     |     |     |                       |      |     |   |   |               |                       |           |  |   |   |   |   |   |      |  |
| 16V<br>( $C < 1.0\mu F$ )   | 10%  | 12.5%                    | 0402 $\geq 0.068\mu F$ ; 0603 $\geq 0.68\mu F$   |                          |  |             |    |    |                       |      |   |     |   |            |    |    |   |     |  |     |  |     |    |     |  |     |    |     |  |     |  |     |  |     |                       |     |    |     |   |     |  |     |      |     |   |     |   |      |     |     |   |            |             |                          |  |            |      |     |   |     |                      |     |     |   |   |     |      |     |   |     |   |                           |     |       |  |     |                       |                              |       |     |   |     |     |     |                       |      |     |   |   |               |                       |           |  |   |   |   |   |   |      |  |
|   |  | 20%                      | 0402 $\geq 0.22\mu F$  |                          |  |             |    |    |                       |      |   |     |   |            |    |    |   |     |  |     |  |     |    |     |  |     |    |     |  |     |  |     |  |     |                       |     |    |     |   |     |  |     |      |     |   |     |   |      |     |     |   |            |             |                          |  |            |      |     |   |     |                      |     |     |   |   |     |      |     |   |     |   |                           |     |       |  |     |                       |                              |       |     |   |     |     |     |                       |      |     |   |   |               |                       |           |  |   |   |   |   |   |      |  |
| 16V<br>( $C \geq 1.0\mu F$ )  | 12.5%  | 20%                      | 0603 $\geq 2.2\mu F$ ; 0805 $\geq 3.3\mu F$ ; 1206 $\geq 10\mu F$ ; 1210 $\geq 22\mu F$ ; 1812 $\geq 47\mu F$  |                          |  |             |    |    |                       |      |   |     |   |            |    |    |   |     |  |     |  |     |    |     |  |     |    |     |  |     |  |     |  |     |                       |     |    |     |   |     |  |     |      |     |   |     |   |      |     |     |   |            |             |                          |  |            |      |     |   |     |                      |     |     |   |   |     |      |     |   |     |   |                           |     |       |  |     |                       |                              |       |     |   |     |     |     |                       |      |     |   |   |               |                       |           |  |   |   |   |   |   |      |  |
| 10V   | 20%  | 30%                      | 0402 $\geq 0.47\mu F$  |                          |  |             |    |    |                       |      |   |     |   |            |    |    |   |     |  |     |  |     |    |     |  |     |    |     |  |     |  |     |  |     |                       |     |    |     |   |     |  |     |      |     |   |     |   |      |     |     |   |            |             |                          |  |            |      |     |   |     |                      |     |     |   |   |     |      |     |   |     |   |                           |     |       |  |     |                       |                              |       |     |   |     |     |     |                       |      |     |   |   |               |                       |           |  |   |   |   |   |   |      |  |
| 6.3V  | 30%  | -                        | -  |                          |  |             |    |    |                       |      |   |     |   |            |    |    |   |     |  |     |  |     |    |     |  |     |    |     |  |     |  |     |  |     |                       |     |    |     |   |     |  |     |      |     |   |     |   |      |     |     |   |            |             |                          |  |            |      |     |   |     |                      |     |     |   |   |     |      |     |   |     |   |                           |     |       |  |     |                       |                              |       |     |   |     |     |     |                       |      |     |   |   |               |                       |           |  |   |   |   |   |   |      |  |
| Rated Voltage   | Insulation Resistance  |                          |  |                          |  |             |    |    |                       |      |   |     |   |            |    |    |   |     |  |     |  |     |    |     |  |     |    |     |  |     |  |     |  |     |                       |     |    |     |   |     |  |     |      |     |   |     |   |      |     |     |   |            |             |                          |  |            |      |     |   |     |                      |     |     |   |   |     |      |     |   |     |   |                           |     |       |  |     |                       |                              |       |     |   |     |     |     |                       |      |     |   |   |               |                       |           |  |   |   |   |   |   |      |  |
| 100V: X7R   | 10G $\Omega$ or<br>RxC $\geq 10\Omega \cdot F$<br>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: 0603 $\geq 1\mu F$ ; 0805 $\geq 2.2\mu F$ ; 1206 $\geq 2.2\mu F$ ; 1210 $\geq 10\mu F$   |  |                          |  |                          |  |             |    |    |                       |      |   |     |   |            |    |    |   |     |  |     |  |     |    |     |  |     |    |     |  |     |  |     |  |     |                       |     |    |     |   |     |  |     |      |     |   |     |   |      |     |     |   |            |             |                          |  |            |      |     |   |     |                      |     |     |   |   |     |      |     |   |     |   |                           |     |       |  |     |                       |                              |       |     |   |     |     |     |                       |      |     |   |   |               |                       |           |  |   |   |   |   |   |      |  |
| 25V: 0201 $\geq 0.1\mu F$ ; 0402 $\geq 0.22\mu F$ ; 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  |  |                          |  |                          |  |             |    |    |                       |      |   |     |   |            |    |    |   |     |  |     |  |     |    |     |  |     |    |     |  |     |  |     |  |     |                       |     |    |     |   |     |  |     |      |     |   |     |   |      |     |     |   |            |             |                          |  |            |      |     |   |     |                      |     |     |   |   |     |      |     |   |     |   |                           |     |       |  |     |                       |                              |       |     |   |     |     |     |                       |      |     |   |   |               |                       |           |  |   |   |   |   |   |      |  |



## Multilayer Ceramic Chip Capacitor

| Item  | Requirement  | Test Method  |  |  |  |   |   |   |   |  |   |     |   |                   |    |     |   |     |   |     |  |                             |     |       |  |     |                             |                                |  |     |   |     |  |     |                             |      |     |     |   |     |  |     |      |     |   |     |   |      |     |     |   |  |
|---|--|--|--|--|--|---|---|---|---|--|---|-----|---|-------------------|----|-----|---|-----|---|-----|--|-----------------------------|-----|-------|--|-----|-----------------------------|--------------------------------|--|-----|---|-----|--|-----|-----------------------------|------|-----|-----|---|-----|--|-----|------|-----|---|-----|---|------|-----|-----|---|--|
| Humidity load   | No remarkable damage.<br>Cap change:<br>NP0: $\pm 7.5\%$ or $0.75\mu\text{F}$ whichever is larger.<br>X7R, X5R, X6S, X7S: $\geq 10\text{V}^{**}$ , within $\pm 12.5\%$ ; $\leq 6.3\text{V}$ within $\pm 25\%$ ;<br>TT series & C $\geq 1\mu\text{F}$ , within $\pm 25\%$<br>**10V: 0603 $4.7\mu\text{F}$ ; 0402 $1\mu\text{F}$ ; 0201 $\geq 0.1\mu\text{F}$ , within $\pm 25\%$ ;<br>Y5V: $\geq 10\text{V}$ , within $\pm 30\%$ ; $\leq 6.3\text{V}$ , within $+30/-40\%$<br>Q/D.F. value:<br>NP0: C $\geq 30\text{pF}$ , Q $\geq 200$ ; C $< 30\text{pF}$ , Q $\geq 100+10/3\text{C}$<br>X7R, X5R:  | Test temp. : $40\pm 2^\circ\text{C}$<br>Humidity : 90~95%RH<br>Test time : 500+24/-0 hrs.<br>To apply voltage :<br>Rated voltage (MAX. 500V)<br>Before initial measurement (Class II only): To apply de-aging at $150^\circ\text{C}$ for 1hr then set for $24\pm 2$ hrs at room temp.<br>Cap. / DF(Q) / I.R. Measurement to be made after de-aging at $150^\circ\text{C}$ for 1hr then set for $24\pm 2$ hrs at room temp. |  |  |  |   |   |   |   |  |   |     |   |                   |    |     |   |     |   |     |  |                             |     |       |  |     |                             |                                |  |     |   |     |  |     |                             |      |     |     |   |     |  |     |      |     |   |     |   |      |     |     |   |  |
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0402 $\geq 1\mu\text{F}$ ; 0603 $\geq 10\mu\text{F}$ ; 0805 $\geq 4.7\mu\text{F}$ 1206 $\geq 47\mu\text{F}$ ; 1210 $\geq 100\mu\text{F}$ |  |
|   | Rated vol.   | D.F. $\leq$  | Exception of D.F. $\leq$   |  |  |   |   |   |   |  |   |     |   |                   |    |     |   |     |   |     |  |                             |     |       |  |     |                             |                                |  |     |   |     |  |     |                             |      |     |     |   |     |  |     |      |     |   |     |   |      |     |     |   |  |
|   | $\geq 100\text{V}$   | 3%   | 6%   | 1206 $\geq 0.47\mu\text{F}$  |  |   |   |   |   |  |   |     |   |                   |    |     |   |     |   |     |  |                             |     |       |  |     |                             |                                |  |     |   |     |  |     |                             |      |     |     |   |     |  |     |      |     |   |     |   |      |     |     |   |  |
|   |  |  | 7.5%   | 0603 $\geq 0.068\mu\text{F}$ ; 0805 $> 0.1\mu\text{F}$ ; 1206 $> 1\mu\text{F}$ ; 1210 $\geq 2.2\mu\text{F}$                              |  |   |   |   |   |  |   |     |   |                   |    |     |   |     |   |     |  |                             |     |       |  |     |                             |                                |  |     |   |     |  |     |                             |      |     |     |   |     |  |     |      |     |   |     |   |      |     |     |   |  |
|   |  |  | 20%  | 0805 $> 0.22\mu\text{F}$ ; 1210 $\geq 3.3\mu\text{F}$  |  |   |   |   |   |  |   |     |   |                   |    |     |   |     |   |     |  |                             |     |       |  |     |                             |                                |  |     |   |     |  |     |                             |      |     |     |   |     |  |     |      |     |   |     |   |      |     |     |   |  |
|   | $\geq 50\text{V}$  | 3%   | 6%   | 0201(50V); 0603 $\geq 0.047\mu\text{F}$ ; 0805 $\geq 0.18\mu\text{F}$ ; 1206 $\geq 0.47\mu\text{F}$                                      |  |   |   |   |   |  |   |     |   |                   |    |     |   |     |   |     |  |                             |     |       |  |     |                             |                                |  |     |   |     |  |     |                             |      |     |     |   |     |  |     |      |     |   |     |   |      |     |     |   |  |
|   |  |  | 10%  | 0201 $\geq 0.01\mu\text{F}$ ; 1210 $\geq 4.7\mu\text{F}$   |  |   |   |   |   |  |   |     |   |                   |    |     |   |     |   |     |  |                             |     |       |  |     |                             |                                |  |     |   |     |  |     |                             |      |     |     |   |     |  |     |      |     |   |     |   |      |     |     |   |  |
|   |  |  | 20%  | 0402 $\geq 0.1\mu\text{F}$ ; 0603 $> 0.1\mu\text{F}$ ; 0805 $\geq 1\mu\text{F}$ ; 1206 $\geq 2.2\mu\text{F}$ ; 1210 $\geq 10\mu\text{F}$ |  |   |   |   |   |  |   |     |   |                   |    |     |   |     |   |     |  |                             |     |       |  |     |                             |                                |  |     |   |     |  |     |                             |      |     |     |   |     |  |     |      |     |   |     |   |      |     |     |   |  |
|   | 35V  | 5%   | 20%  | 0603 $\geq 1\mu\text{F}$ ; 0805 $\geq 2.2\mu\text{F}$ ; 1206 $\geq 2.2\mu\text{F}$ ; 1210 $\geq 10\mu\text{F}$                           |  |   |   |   |   |  |   |     |   |                   |    |     |   |     |   |     |  |                             |     |       |  |     |                             |                                |  |     |   |     |  |     |                             |      |     |     |   |     |  |     |      |     |   |     |   |      |     |     |   |  |
| 25V   | 5%   | 10%  | 0201 $\geq 0.01\mu\text{F}$ ; 0805 $\geq 1\mu\text{F}$ ; 1210 $\geq 10\mu\text{F}$   |  |  |   |   |   |   |  |   |     |   |                   |    |     |   |     |   |     |  |                             |     |       |  |     |                             |                                |  |     |   |     |  |     |                             |      |     |     |   |     |  |     |      |     |   |     |   |      |     |     |   |  |
|   |  | 14%  | 0603 $\geq 0.33\mu\text{F}$ ; 1206 $\geq 4.7\mu\text{F}$   |  |  |   |   |   |   |  |   |     |   |                   |    |     |   |     |   |     |  |                             |     |       |  |     |                             |                                |  |     |   |     |  |     |                             |      |     |     |   |     |  |     |      |     |   |     |   |      |     |     |   |  |
|   |  | 15%  | 0201 $\geq 0.1\mu\text{F}$ ; 0402 $\geq 0.10\mu\text{F}$ ; 0603 $\geq 0.47\mu\text{F}$ 0805 $\geq 2.2\mu\text{F}$ ; 1206 $\geq 6.8\mu\text{F}$ ; 1210 $\geq 22\mu\text{F}$                                       |  |  |   |   |   |   |  |   |     |   |                   |    |     |   |     |   |     |  |                             |     |       |  |     |                             |                                |  |     |   |     |  |     |                             |      |     |     |   |     |  |     |      |     |   |     |   |      |     |     |   |  |
|   |  | 20%  | 0402 $\geq 0.47\mu\text{F}$  |  |  |   |   |   |   |  |   |     |   |                   |    |     |   |     |   |     |  |                             |     |       |  |     |                             |                                |  |     |   |     |  |     |                             |      |     |     |   |     |  |     |      |     |   |     |   |      |     |     |   |  |
| 16V   | 5%   | 10%  | 0603 $\geq 0.15\mu\text{F}$ ; 0805 $\geq 0.68\mu\text{F}$ ; 1206 $\geq 2.2\mu\text{F}$ ; 1210 $\geq 4.7\mu\text{F}$  |  |  |   |   |   |   |  |   |     |   |                   |    |     |   |     |   |     |  |                             |     |       |  |     |                             |                                |  |     |   |     |  |     |                             |      |     |     |   |     |  |     |      |     |   |     |   |      |     |     |   |  |
|   |  | 15%  | 0201 $\geq 0.01\mu\text{F}$ (0201/X7R $\geq 0.022\mu\text{F}$ ); 0402 $\geq 0.33\mu\text{F}$ ; 0603 $\geq 0.68\mu\text{F}$ ; 0805 $\geq 2.2\mu\text{F}$ ; 1206 $\geq 4.7\mu\text{F}$ ; 1210 $\geq 22\mu\text{F}$ |  |  |   |   |   |   |  |   |     |   |                   |    |     |   |     |   |     |  |                             |     |       |  |     |                             |                                |  |     |   |     |  |     |                             |      |     |     |   |     |  |     |      |     |   |     |   |      |     |     |   |  |
| 10V   | 7.5%   | 15%  | 0201 $\geq 0.012\mu\text{F}$ ; 0402 $\geq 0.33\mu\text{F}$ (0402/X7R $\geq 0.22\mu\text{F}$ ) 0603 $\geq 0.33\mu\text{F}$ ; 0805 $\geq 2.2\mu\text{F}$ ; 1206 $\geq 2.2\mu\text{F}$ ; 1210 $\geq 22\mu\text{F}$  |  |  |   |   |   |   |  |   |     |   |                   |    |     |   |     |   |     |  |                             |     |       |  |     |                             |                                |  |     |   |     |  |     |                             |      |     |     |   |     |  |     |      |     |   |     |   |      |     |     |   |  |
|   |  | 20%  | 0201 $\geq 0.1\mu\text{F}$ ; 0402 $\geq 1\mu\text{F}$  |  |  |   |   |   |   |  |   |     |   |                   |    |     |   |     |   |     |  |                             |     |       |  |     |                             |                                |  |     |   |     |  |     |                             |      |     |     |   |     |  |     |      |     |   |     |   |      |     |     |   |  |
| 6.3V  | 15%  | 30%  | 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 $\geq 100\mu\text{F}$  |  |  |   |   |   |   |  |   |     |   |                   |    |     |   |     |   |     |  |                             |     |       |  |     |                             |                                |  |     |   |     |  |     |                             |      |     |     |   |     |  |     |      |     |   |     |   |      |     |     |   |  |
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| Rated vol.  | D.F. $\leq$  | Exception of D.F. $\leq$   |  |  |  |   |   |   |   |  |   |     |   |                   |    |     |   |     |   |     |  |                             |     |       |  |     |                             |                                |  |     |   |     |  |     |                             |      |     |     |   |     |  |     |      |     |   |     |   |      |     |     |   |  |
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|   |  | 20%  | 1210 $\geq 6.8\mu\text{F}$   |  |  |   |   |   |   |  |   |     |   |                   |    |     |   |     |   |     |  |                             |     |       |  |     |                             |                                |  |     |   |     |  |     |                             |      |     |     |   |     |  |     |      |     |   |     |   |      |     |     |   |  |
| 35V   | 10%  | —  | —  |  |  |   |   |   |   |  |   |     |   |                   |    |     |   |     |   |     |  |                             |     |       |  |     |                             |                                |  |     |   |     |  |     |                             |      |     |     |   |     |  |     |      |     |   |     |   |      |     |     |   |  |
| 25V   | 7.5%   | 10%  | 0402 $\geq 0.047\mu\text{F}$ ; 0603 $\geq 0.1\mu\text{F}$ ; 0805 $\geq 0.33\mu\text{F}$ ; 1206 $\geq 1\mu\text{F}$ ; 1210 $\geq 4.7\mu\text{F}$  |  |  |   |   |   |   |  |   |     |   |                   |    |     |   |     |   |     |  |                             |     |       |  |     |                             |                                |  |     |   |     |  |     |                             |      |     |     |   |     |  |     |      |     |   |     |   |      |     |     |   |  |
|   |  | 15%  | 0402 $\geq 0.068\mu\text{F}$ ; 0603 $\geq 0.47\mu\text{F}$ ; 1206 $\geq 4.7\mu\text{F}$ ; 1210 $\geq 22\mu\text{F}$  |  |  |   |   |   |   |  |   |     |   |                   |    |     |   |     |   |     |  |                             |     |       |  |     |                             |                                |  |     |   |     |  |     |                             |      |     |     |   |     |  |     |      |     |   |     |   |      |     |     |   |  |
| 16V (C $< 1.0\mu\text{F}$ )   | 10%  | 12.5%  | 0402 $\geq 0.068\mu\text{F}$ ; 0603 $\geq 0.68\mu\text{F}$   |  |  |   |   |   |   |  |   |     |   |                   |    |     |   |     |   |     |  |                             |     |       |  |     |                             |                                |  |     |   |     |  |     |                             |      |     |     |   |     |  |     |      |     |   |     |   |      |     |     |   |  |
|   |  | 20%  | 0402 $\geq 0.22\mu\text{F}$  |  |  |   |   |   |   |  |   |     |   |                   |    |     |   |     |   |     |  |                             |     |       |  |     |                             |                                |  |     |   |     |  |     |                             |      |     |     |   |     |  |     |      |     |   |     |   |      |     |     |   |  |
| 16V (C $\geq 1.0\mu\text{F}$ )  | 12.5%  | 20%  | 0603 $\geq 2.2\mu\text{F}$ ; 0805 $\geq 3.3\mu\text{F}$ ; 1206 $\geq 10\mu\text{F}$ ; 1210 $\geq 22\mu\text{F}$ ; 1812 $\geq 47\mu\text{F}$  |  |  |   |   |   |   |  |   |     |   |                   |    |     |   |     |   |     |  |                             |     |       |  |     |                             |                                |  |     |   |     |  |     |                             |      |     |     |   |     |  |     |      |     |   |     |   |      |     |     |   |  |
| 10V   | 20%  | 30%  | 0402 $\geq 0.47\mu\text{F}$  |  |  |   |   |   |   |  |   |     |   |                   |    |     |   |     |   |     |  |                             |     |       |  |     |                             |                                |  |     |   |     |  |     |                             |      |     |     |   |     |  |     |      |     |   |     |   |      |     |     |   |  |
| 6.3V  | 30%  | -  | -  |  |  |   |   |   |   |  |   |     |   |                   |    |     |   |     |   |     |  |                             |     |       |  |     |                             |                                |  |     |   |     |  |     |                             |      |     |     |   |     |  |     |      |     |   |     |   |      |     |     |   |  |
| I.R.: $\geq 10\text{V}$ , 500M $\Omega$ or 25 $\Omega\cdot\text{F}$ whichever is smaller.<br>Class II (X7R, X5R, Y5V)   | <table><tr><th>Rated Voltage</th><th>Insulation Resistance</th></tr><tr><td>100V: X7R</td><td rowspan="7">500M<math>\Omega</math> or Rx C <math>\geq 5\Omega\cdot\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</td></tr></table>   | Rated Voltage  | Insulation Resistance  | 100V: X7R  | 500M $\Omega$ or Rx C $\geq 5\Omega\cdot\text{F}$ 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  |     |   |                   |    |     |   |     |   |     |  |                             |     |       |  |     |                             |                                |  |     |   |     |  |     |                             |      |     |     |   |     |  |     |      |     |   |     |   |      |     |     |   |  |
| Rated Voltage   | Insulation Resistance  |  |  |  |  |   |   |   |   |  |   |     |   |                   |    |     |   |     |   |     |  |                             |     |       |  |     |                             |                                |  |     |   |     |  |     |                             |      |     |     |   |     |  |     |      |     |   |     |   |      |     |     |   |  |
| 100V: X7R   | 500M $\Omega$ or Rx C $\geq 5\Omega\cdot\text{F}$ 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  |  |  |  |  |  |   |   |   |   |  |   |     |   |                   |    |     |   |     |   |     |  |                             |     |       |  |     |                             |                                |  |     |   |     |  |     |                             |      |     |     |   |     |  |     |      |     |   |     |   |      |     |     |   |  |

| Item  | Requirement  |                          |   | Test Method  |  |  |
|---|--|--------------------------|---|--|--|--|
| High Temperature Load (Endurance)   | No remarkable damage.<br>Cap change:<br>NP0: $\pm 3.0\%$ or $\pm 0.3\text{pF}$ whichever is larger<br>X7R, X5R, X6S, X7S: $\geq 10\text{V}^{**}$ , within $\pm 12.5\%$ ; $\leq 6.3\text{V}$ within $\pm 25\%$ ;<br>TT series & C $\geq 1\mu\text{F}$ , within $\pm 25\%$<br>$^{**}10\text{V}$ : 0603 $\geq 4.7\mu\text{F}$ ; 0402 $\geq 1\mu\text{F}$ ; 0201 $\geq 0.1\mu\text{F}$ , within $\pm 25\%$ ;<br>Y5V: $\geq 10\text{V}$ , within $\pm 30\%$ ; $\leq 6.3\text{V}$ , within $+30/-40\%$<br>Q/D.F. value:<br>NP0: More than 30pF, Q $\geq 350$<br>10pF $\leq$ C $<$ 30pF, Q $\geq 275+2.5\text{C}$<br>Less than 10pF, Q $\geq 200+10\text{C}$<br>X7R, X5R: |                          |   |  |  |  |
|   | Rated vol.   | D.F. $\leq$              | Exception of D.F. $\leq$  |  |  |  |
|   | $\geq 100\text{V}$   | 3%                       | 6%  | 1206 $\geq 0.47\mu\text{F}$  |  |  |
|   |  |                          | 7.5%  | 0603 $\geq 0.068\mu\text{F}$ ; 0805 $> 0.1\mu\text{F}$ ; 1206 $> 1\mu\text{F}$ ; 1210 $\geq 2.2\mu\text{F}$  |  |  |
|   |  |                          | 20%   | 0805 $> 0.22\mu\text{F}$ ; 1210 $\geq 3.3\mu\text{F}$  |  |  |
|   | $\geq 50\text{V}$  | 3%                       | 6%  | 0201(50V); 0603 $\geq 0.047\mu\text{F}$ ; 0805 $\geq 0.18\mu\text{F}$ ; 1206 $\geq 0.47\mu\text{F}$  |  |  |
|   |  |                          | 10%   | 0201 $\geq 0.01\mu\text{F}$ ; 1210 $\geq 4.7\mu\text{F}$   |  |  |
|   |  |                          | 20%   | 0402 $\geq 0.1\mu\text{F}$ ; 0603 $> 0.1\mu\text{F}$ ; 0805 $\geq 1\mu\text{F}$ ; 1206 $\geq 2.2\mu\text{F}$ ; 1210 $\geq 10\mu\text{F}$   |  |  |
|   | 35V  | 5%                       | 20%   | 0603 $\geq 1\mu\text{F}$ ; 0805 $\geq 2.2\mu\text{F}$ ; 1206 $\geq 2.2\mu\text{F}$ ; 1210 $\geq 10\mu\text{F}$   |  |  |
|   | 25V  | 5%                       | 10%   | 0201 $\geq 0.01\mu\text{F}$ ; 0805 $\geq 1\mu\text{F}$ ; 1210 $\geq 10\mu\text{F}$   |  |  |
|   |  |                          | 14%   | 0603 $\geq 0.33\mu\text{F}$ ; 1206 $\geq 4.7\mu\text{F}$   |  |  |
|   |  |                          | 15%   | 0201 $\geq 0.1\mu\text{F}$ ; 0402 $\geq 0.10\mu\text{F}$ ; 0603 $\geq 0.47\mu\text{F}$ 0805 $\geq 2.2\mu\text{F}$ ; 1206 $\geq 6.8\mu\text{F}$ ; 1210 $\geq 22\mu\text{F}$                                       |  |  |
|   |  |                          | 20%   | 0402 $\geq 0.47\mu\text{F}$  |  |  |
|   | 16V  | 5%                       | 10%   | 0603 $\geq 0.15\mu\text{F}$ ; 0805 $\geq 0.68\mu\text{F}$ ; 1206 $\geq 2.2\mu\text{F}$ ; 1210 $\geq 4.7\mu\text{F}$  |  |  |
|   |  |                          | 15%   | 0201 $\geq 0.01\mu\text{F}$ (0201/X7R $\geq 0.022\mu\text{F}$ ); 0402 $\geq 0.33\mu\text{F}$ ; 0603 $\geq 0.68\mu\text{F}$ ; 0805 $\geq 2.2\mu\text{F}$ ; 1206 $\geq 4.7\mu\text{F}$ ; 1210 $\geq 22\mu\text{F}$ |  |  |
|   | 10V  | 7.5%                     | 15%   | 0201 $\geq 0.012\mu\text{F}$ ; 0402 $\geq 0.33\mu\text{F}$ (0402/X7R $\geq 0.22\mu\text{F}$ ); 0603 $\geq 0.33\mu\text{F}$ ; 0805 $\geq 2.2\mu\text{F}$ ; 1206 $\geq 2.2\mu\text{F}$ ; 1210 $\geq 22\mu\text{F}$ |  |  |
|   |  |                          | 20%   | 0201 $\geq 0.1\mu\text{F}$ ; 0402 $\geq 1\mu\text{F}$  |  |  |
|   | 6.3V   | 15%                      | 30%   | 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 $\geq 100\mu\text{F}$  |  |  |
| Y5V:  |  |                          |   |  |  |  |
| Rated vol.  | D.F. $\leq$  | Exception of D.F. $\leq$ |   |  |  |  |
| $\geq 50\text{V}$   | 7.5%   | 10%                      | 0603 $\geq 0.1\mu\text{F}$ ; 0805 $\geq 0.47\mu\text{F}$ ; 1206 $\geq 4.7\mu\text{F}$   |  |  |  |
|   |  | 20%                      | 1210 $\geq 6.8\mu\text{F}$  |  |  |  |
| 35V   | 10%  | —                        | —   |  |  |  |
| 25V   | 7.5%   | 10%                      | 0402 $\geq 0.047\mu\text{F}$ ; 0603 $\geq 0.1\mu\text{F}$ ; 0805 $\geq 0.33\mu\text{F}$ ; 1206 $\geq 1\mu\text{F}$ ; 1210 $\geq 4.7\mu\text{F}$ |  |  |  |
|   |  | 15%                      | 0402 $\geq 0.068\mu\text{F}$ ; 0603 $\geq 0.47\mu\text{F}$ ; 1206 $\geq 4.7\mu\text{F}$ ; 1210 $\geq 22\mu\text{F}$                             |  |  |  |
| 16V (C $< 1.0\mu\text{F}$ )   | 10%  | 12.5%                    | 0402 $\geq 0.068\mu\text{F}$ ; 0603 $\geq 0.68\mu\text{F}$  |  |  |  |
| 16V (C $\geq 1.0\mu\text{F}$ )  | 12.5%  | 20%                      | 0402 $\geq 0.22\mu\text{F}$   |  |  |  |
|   |  | 20%                      | 0603 $\geq 2.2\mu\text{F}$ ; 0805 $\geq 3.3\mu\text{F}$ ; 1206 $\geq 10\mu\text{F}$ ; 1210 $\geq 22\mu\text{F}$ ; 1812 $\geq 47\mu\text{F}$     |  |  |  |
| 10V   | 20%  | 30%                      | 0402 $\geq 0.47\mu\text{F}$   |  |  |  |
| 6.3V  | 30%  | -                        | -   |  |  |  |
| I.R.: $\geq 10\text{V}$ , 1G $\Omega$ or 50 $\Omega\cdot\text{F}$ whichever is smaller.   |  |                          |   |  |  |  |
| Class II (X7R, X5R, Y5V)  |  |                          |   |  |  |  |
| Rated Voltage   |  |                          | Insulation Resistance   |  |  |  |
| 100V: X7R   |  |                          | 500M $\Omega$ or RxC $\geq 5\Omega\cdot\text{F}$ 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  |  |                          |   |  |  |  |
| Test temp. :<br>NP0, X7R: 125 $\pm$ 3 $^{\circ}\text{C}$<br>X5R, Y5V: 85 $\pm$ 3 $^{\circ}\text{C}$<br>To apply voltage:<br>(1) $\leq 6.3\text{V}$ or C $\geq 10\mu\text{F}$ : 150% of rated voltage.<br>(2) 10V $\leq$ Ur $<$ 500V: 200% of rated voltage.<br>(3) 500V: 150% of rated voltage.<br>(4) Ur $\geq$ 630V: 120% of rated voltage.<br>(5) 100% of rated voltage for below range. |  |                          |   |  |  |  |
| Size  | Dielectric   | Rated voltage            | Capacitance range   |  |  |  |
| 0201  | X5R, X7R   | $\leq 10\text{V}$        | C $\geq 0.1\mu\text{F}$   |  |  |  |
|   |  | $\geq 16\text{V}$        | C $> 0.1\mu\text{F}$  |  |  |  |
| 0402  | X5R, X7R, Y5V  | 6.3V, 10V, 16V, 25V      | C $\geq 1.0\mu\text{F}$   |  |  |  |
| 0603  | X5R, X7R   | 6.3V, 10V, 25V, 35V      | C $\geq 4.7\mu\text{F}$   |  |  |  |
|   |  |                          | C $\geq 1.0\mu\text{F}$   |  |  |  |
| 0805  | X5R, X7R   | 6.3V                     | C $\geq 22\mu\text{F}$  |  |  |  |
|   |  | 10V~50V                  | C $\geq 10\mu\text{F}$  |  |  |  |
| 1206  | X5R, X7R   | 6.3V                     | C $\geq 47\mu\text{F}$  |  |  |  |
|   |  | NPO                      | 3000V   |  |  |  |
| 1210  | X5R, X7R   | 16V                      | C $\geq 47\mu\text{F}$  |  |  |  |
|   |  | X7R                      | 100V  |  |  |  |
| (6) 150% of rated voltage for below range   |  |                          |   |  |  |  |
| Size  | Dielectric   | Rated voltage            | Capacitance range   |  |  |  |
| 0201  | X5R, X7R   | 16V, 25V                 | C $\geq 0.1\mu\text{F}$   |  |  |  |
|   |  | X7R                      | 16V   |  |  |  |
| 0402  | X5R, X7R,  | 50V                      | C $\geq 1.0\mu\text{F}$   |  |  |  |
|   |  | Y5V                      | 10~25V  |  |  |  |
| 0603  | X7R  | 16V                      | C $\geq 0.47\mu\text{F}$  |  |  |  |
|   |  | X5R, X7R,                | 50V   |  |  |  |
|   |  | Y5V                      | 10V, 16V, 50V   |  |  |  |
| 0805  | X5R, X7R   | 10V, 16V, 50V            | C $\geq 1.0\mu\text{F}$   |  |  |  |
|   |  | Y5V                      | 16V   |  |  |  |
|   |  |                          | C $\geq 2.2\mu\text{F}$   |  |  |  |
| 1206  | X5R, X7R   | 10V~50V                  | C $\geq 4.7\mu\text{F}$   |  |  |  |
|   |  |                          | 50V   |  |  |  |
|   |  |                          | C $\geq 2.2\mu\text{F}$   |  |  |  |
| 1210  | X5R, X7R   | 100V                     | C $\geq 0.47\mu\text{F}$  |  |  |  |
|   |  |                          | 16V   |  |  |  |
|   |  |                          | C $\geq 4.7\mu\text{F}$   |  |  |  |
| 1206  | X5R, X7R   | 100V                     | C $\geq 1.0\mu\text{F}$   |  |  |  |
|   |  |                          | 50V~100V  |  |  |  |
| 1210  | X5R, X7R   | 50V~100V                 | C $\geq 2.2\mu\text{F}$   |  |  |  |
|   |  |                          |   |  |  |  |

# Multilayer Ceramic Chip Capacitor

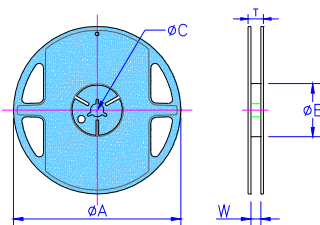
## ■Packaging

Packaging Quantity

Unit: mm

| Type | Thickness / Symbol |   | Packaging (7" Reel) |              |
|------|--------------------|---|---------------------|--------------|
|      |                    |   | Paper tape          | Plastic tape |
| 0201 | 0.30±0.03          | L | 15K                 | -            |
|      | 0.30±0.05          | L | 15K                 | -            |
|      | 0.30±0.09          | L | 15K                 | -            |
| 0402 | 0.50±0.05          | N | 10K                 | -            |
|      | 0.5+0.02/-0.05     | Q | 10K                 | -            |
|      | 0.50±0.20          | E | 10K                 | -            |
| 0603 | 0.50±0.10          | H | 4K                  | -            |
|      | 0.80±0.10          | S | 4K                  | -            |
|      | 0.80 +0.15 / -0.10 | X | 4K                  | -            |
| 0805 | 0.50±0.10          | H | 4K                  | -            |
|      | 0.60±0.10          | A | 4K                  | -            |
|      | 0.80±0.10          | B | 4K                  | -            |
|      | 0.85±0.10          | T | 4K                  | -            |
|      | 1.25±0.10          | D | -                   | 3K           |
|      | 1.25±0.20          | I | -                   | 3K           |
| 1206 | 0.80±0.10          | B | 4K                  | -            |
|      | 0.85±0.10          | T | 4K                  | -            |
|      | 0.95±0.10          | C | -                   | 3K           |
|      | 1.15±0.15          | J | -                   | 3K           |
|      | 1.25±0.10          | D | -                   | 3K           |
|      | 1.60±0.20          | G | -                   | 2K           |
|      | 1.60 +0.30 / -0.10 | P | -                   | 2K           |
| 1210 | 0.85±0.10          | T | -                   | 3K           |
|      | 0.95±0.10          | C | -                   | 3K           |
|      | 1.25±0.10          | D | -                   | 3K           |
|      | 1.60±0.20          | G | -                   | 2K           |
|      | 2.00±0.20          | K | -                   | 1K           |
|      | 2.50±0.30          | M | -                   | 1K           |
| 1808 | 1.25±0.10          | D | -                   | 2K           |
|      | 1.10±0.15          | F | -                   | 2K           |
|      | 1.60±0.20          | G | -                   | 2K           |
|      | 2.00±0.20          | K | -                   | 1K           |
| 1812 | 1.25±0.10          | D | -                   | 1K           |
|      | 1.60±0.20          | G | -                   | 1K           |
|      | 2.00±0.20          | K | -                   | 1K           |
|      | 2.50±0.30          | M | -                   | 0.5K         |
|      | 2.80±0.30          | U | -                   | 0.5K         |
| 0612 | 0.80±0.10          | B | 4K                  | -            |

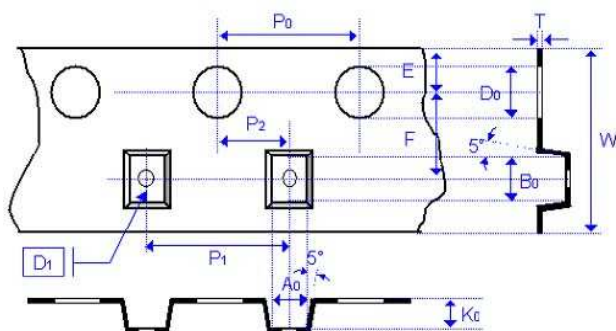
Tape and Reel



Unit: mm

| Type | Chip Size    |              |              |              |              |              |              |              |
|------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|
|      | 0201         | 0402         | 0603         | 0805         | 1206/0612    | 1210         | 1808         | 1812         |
| ΦC   | 13.0±1.0     | 13.0±1.0     | 13.0±1.0     | 13.0±1.0     | 13.0±1.0     | 13.0±1.0     | 13.0±1.0     | 13.0±1.0     |
| W    | 9.0±1.0      | 9.0±1.0      | 9.0±1.0      | 9.0±1.0      | 9.0±1.0      | 9.0±1.0      | 13.5±1.0     | 13.5±1.0     |
| ΦA   | 178±1.0(7")  | 178±1.0(7")  | 178±1.0(7")  | 178±1.0(7")  | 178±1.0(7")  | 178±1.0(7")  | 178±1.0(7")  | 178±1.0(7")  |
| ΦB   | 60.5±1.0(7") | 60.5±1.0(7") | 60.5±1.0(7") | 60.5±1.0(7") | 60.5±1.0(7") | 60.5±1.0(7") | 80.0±1.0(7") | 80.0±1.0(7") |

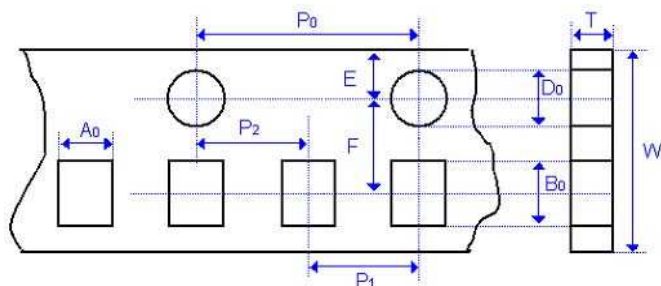
Plastic Tape Size Specification



Unit: mm

| Type           | 0805        |   | 1206      |   |   |             |   | 1210        |  |             |   |   |             | 1808 |  |             |   | 1812        |   |   |       |   |   |   |   |
|----------------|-------------|---|-----------|---|---|-------------|---|-------------|--|-------------|---|---|-------------|------|--|-------------|---|-------------|---|---|-------|---|---|---|---|
| Thickness      | D           | I | C         | J | D | G           | P | T           |  | C           | D | G | K           | M    |  | D           | F | G           | K | D | F     | G | K | M | U |
| A <sub>0</sub> | <1.80       |   | <200      |   |   | <2.30       |   | <3.05       |  | <3.05       |   |   | <3.20       |      |  | <2.50       |   | <3.90       |   |   |       |   |   |   |   |
| B <sub>0</sub> | <2.70       |   | <3.70     |   |   | <4.00       |   | <3.80       |  | <3.80       |   |   | <3.95       |      |  | <5.30       |   | <5.30       |   |   |       |   |   |   |   |
| T              | 0.23±0.10   |   | 0.23±0.10 |   |   | 0.23±0.10   |   | 0.23±0.10   |  | 0.23±0.10   |   |   | 0.23±0.10   |      |  | 0.25±0.10   |   | 0.25±0.10   |   |   |       |   |   |   |   |
| K <sub>0</sub> | <2.50       |   | <2.50     |   |   | <2.50       |   | <1.50       |  | <2.50       |   |   | <3.00       |      |  | <2.50       |   | <2.50       |   |   | <3.50 |   |   |   |   |
| W              | 8.00±0.20   |   | 8.00±0.20 |   |   | 8.00±0.20   |   | 8.00±0.20   |  | 8.00±0.20   |   |   | 8.00±0.20   |      |  | 12.0±0.20   |   | 12.0±0.20   |   |   |       |   |   |   |   |
| 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   |   |   |       |   |   |   |   |
| P <sub>1</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   |   | 8.00±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±0.10   |   | 2.00±0.05   |   |   |       |   |   |   |   |
| D <sub>0</sub> | 1.50+0.1/-0 |   | 1.50±0.05 |   |   | 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   |      |  | 1.50±0.10   |   | 1.50±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   |   |   |       |   |   |   |   |
| 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   |      |  | 5.50±0.10   |   | 5.50±0.10   |   |   |       |   |   |   |   |

Paper Tape Size Specification



Unit: mm

| Type           | 0201      | 0402      |   | 0603      |   |   | 0805      |   |           |   | 1206/0612 |   |
|----------------|-----------|-----------|---|-----------|---|---|-----------|---|-----------|---|-----------|---|
| Thickness      | L         | N         | E | S         | H | X | A         | H | B         | T | B         | T |
| A <sub>0</sub> | 0.39±0.07 | 0.70±0.20 |   | 1.05±0.30 |   |   | 1.50±0.20 |   | 1.50±0.20 |   | 1.90±0.50 |   |
| B <sub>0</sub> | 0.69±0.07 | 1.20±0.20 |   | 1.80±0.30 |   |   | 2.30±0.20 |   | 2.30±0.20 |   | 3.50±0.50 |   |
| T              | ≤ 0.50    | ≤ 0.80    |   | ≤ 1.20    |   |   | ≤ 1.15    |   | ≤ 1.30    |   | ≤ 1.30    |   |
| W              | 8.00±0.10 | 8.00±0.10 |   | 8.00±0.10 |   |   | 8.00±0.10 |   | 8.00±0.10 |   | 8.00±0.10 |   |
| 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 |   |
| 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 |   |
| 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 |   |
| D <sub>0</sub> | 1.55±0.05 | 1.55±0.05 |   | 1.55±0.05 |   |   | 1.55±0.05 |   | 1.55±0.05 |   | 1.50±0.05 |   |
| E              | 1.75±0.05 | 1.75±0.05 |   | 1.75±0.05 |   |   | 1.75±0.05 |   | 1.75±0.05 |   | 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 |   |