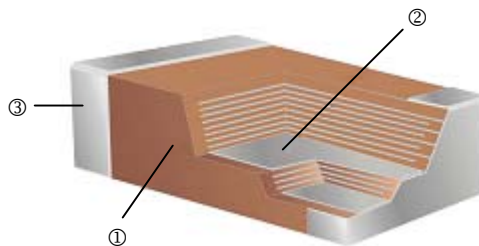


Multilayer Ceramic Capacitor – MC Series

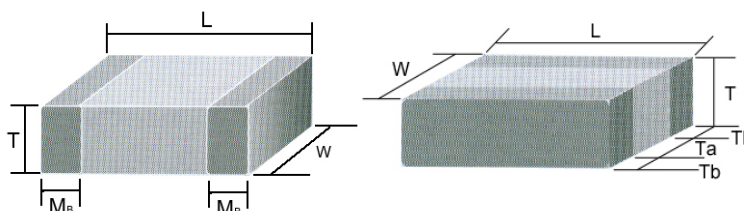
Construction



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

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



Dimensions

MC / MCHL / MCRF Type

Unit: mm

| Type | Size (Inch) | L | W | T / Symbol | | Mb | 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 | - |
| 02 | 0402 | 1.00±0.05 | 0.50±0.05 | 0.50±0.05 | N | 0.25 +0.05 / -0.10 | 10K | - |
| 03 | 0603 | 1.60±0.10 | 0.80±0.10 | 0.80±0.07 | S | 0.40±0.15 | 4K | - |
| | | 1.60 +0.15 / -0.10 | 0.80 +0.15 / -0.10 | 0.80 +0.05 / -0.10 | X | | 4K | |
| 05 | 0805 | 2.00±0.15 | 1.25±0.10 | 0.60±0.10 | A | 0.50±0.20 | 4K | - |
| | | | | 0.80±0.10 | B | | 4K | - |
| | | | | 1.25±0.10 | D | | - | 3K |
| | | 2.00±0.20 | 1.25±0.20 | 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 | 4K | - |
| | | | | 0.95±0.10 | C | | - | 3K |
| | | | | 1.25±0.10 | D | | - | 3K |
| | | | | 1.15±0.15 | J | | - | 3K |
| | | | | 1.60±0.20 | G | | - | 2K |
| | | 3.20+0.3 / -0.1 | 1.60+0.3 / -0.1 | 1.60+0.3 / -0.1 | P | | - | 2K |
| 10 | 1210 | 3.20±0.30 | 2.50±0.20 | 0.95±0.10 | C | 0.75±0.25 | - | 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 |
| 08 | 1808 | 4.50+0.5 / -0.3 | 2.03±0.25 | 1.25±0.10 | D | 0.50±0.25 | - | 2K |
| | | | | 2.00±0.20 | K | | - | 1K |
| 12 | 1812 | 4.50±0.40 | 3.20±0.30 | 1.25±0.10 | D | 0.75±0.25 | - | 1K |
| | | | | 2.00±0.20 | K | | - | 1K |
| | | | 3.20±0.40 | 2.50±0.30 | M | | - | 0.5K |
| 12* | 1812 | 4.5+0.5 / -0.3 | 3.20±0.30 | 1.25±0.10 | D | 0.50±0.25 | - | 1K |
| | | | | 1.60±0.20 | G | | - | 1K |
| | | | | 2.00±0.20 | K | | - | 1K |

■ 12* for Middle and High Voltage

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 (LxW) | Capacitance Tolerance | Packaging | Dielectric | Voltage (VDCW) | Capacitance |
| MC : General; Ultra-small Middle and High Voltage MCHL: High Q and Low ESR MCRF: Ultra High Q and Low ESR (RF) MCLI: Low Inductance | 01: 0201 02: 0402 03: 0603 05: 0805 06: 1206 10: 1210 08: 1808 12: 1812 43: 0612 | A: $\pm 0.05\text{pF}$ ($\text{Cap} \leq 5\text{pF}$) B: $\pm 0.1\text{pF}$ ($\text{Cap} \leq 5\text{pF}$) C: $\pm 0.25\text{pF}$ ($\text{Cap} \leq 5\text{pF}$) D: $\pm 0.5\text{pF}$ ($5\text{pF} < \text{Cap} < 10\text{pF}$) F: $\pm 1\%$ G: $\pm 2\%$ J: $\pm 5\%$ K: $\pm 10\%$ M: $\pm 20\%$ Z: $+80/-20\%$ | T: Taping Reel | N: NPO (COG) B: X7R F: Y5V X: X5R | 6V3: 6.3V 250: 25V 350: 35V 500: 50V 101: 100V 102: 1000V 202: 2000V 302: 3000V | 3R9: 3.9pF 150: 15pF 181: 180pF 225: 2.2 μF 476: 47 μF 107: 100 μF |

■ Middle and High Voltage

Capacitance & Voltage (NPO 200V~3KV) E6 / E12 Series

| Dielectric | | NPO | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------------|--------|------|-----|------|-----|-----|-----|------|-----|-----|-----|------|------|----------------|----------------|----------------|----------------|------|------|------|------|------|----------------|----------------|----------------|----------------|----------------|------|------|---|---|
| EIA | Size | 0603 | | 0805 | | | | 1206 | | | | | 1210 | | | | | 1808 | | | 1812 | | | | | | | | | | |
| Code | VDCW | 200 | 250 | 200 | 250 | 500 | 630 | 200 | 250 | 500 | 630 | 1000 | 2000 | 200 | 250 | 500 | 630 | 1000 | 2000 | 1000 | 2000 | 3000 | 200 | 250 | 500 | 630 | 1000 | 2000 | 3000 | | |
| 0R5 | 0.5pF | S | S | A | A | A | A | | | | | | | | | | | | | | | | | | | | | | | | |
| 1R0 | 1 | S | S | A | A | A | A | | | | | | | | | | | | | | | | | | | | | | | | |
| 1R2 | 1.2 | S | S | A | A | A | A | | | | | | | | | | | | | | | | | | | | | | | | |
| 1R5 | 1.5 | S | S | A | A | A | A | B | B | B | B | B | B | | | | | | | | | | | | | | | | | | |
| 1R8 | 1.8 | S | S | A | A | A | A | B | B | B | B | B | B | | | | | | | | | | | | | | | | | | |
| 2R2 | 2.2 | S | S | A | A | A | A | B | B | B | B | B | B | | | | | | | | D | D | D | | | | | | | | |
| 2R7 | 2.7 | S | S | A | A | A | A | B | B | B | B | B | B | | | | | | | | D | D | D | | | | | | | | |
| 3R3 | 3.3 | S | S | A | A | A | A | B | B | B | B | B | B | | | | | | | | D | D | D | | | | | | | | |
| 3R9 | 3.9 | S | S | A | A | A | A | B | B | B | B | B | B | | | | | | | | D | D | D | | | | | | | | |
| 4R7 | 4.7 | S | S | A | A | A | A | B | B | B | B | B | B | | | | | | | | D | D | D | | | | | | | | |
| 5R6 | 5.6 | S | S | A | A | A | A | B | B | B | B | B | B | | | | | | | | D | D | D | | | | | | | | |
| 6R8 | 6.8 | S | S | A | A | A | A | B | B | B | B | B | B | | | | | | | | D | D | D | | | | | | | | |
| 8R2 | 8.2 | S | S | A | A | A | A | B | B | B | B | B | B | | | | | | | | D | D | D | | | | | | | | |
| 100 | 10pF | S | S | A | A | A | A | B | B | B | B | B | B | C ^A | C ^A | C ^A | C ^A | C | C | D | D | D | D ^A | D ^A | D ^A | D ^A | D | D | D | D | |
| 120 | 12 | S | S | A | A | A | A | B | B | B | B | B | B | C ^A | C ^A | C ^A | C ^A | C | C | D | D | D | D ^A | D ^A | D ^A | D ^A | D | D | D | D | |
| 150 | 15 | S | S | A | A | A | A | B | B | B | B | B | B | C ^A | C ^A | C ^A | C ^A | C | C | D | D | D | D ^A | D ^A | D ^A | D ^A | D | D | D | D | |
| 180 | 18 | S | S | A | A | A | A | B | B | B | B | B | B | C ^A | C ^A | C ^A | C ^A | C | C | D | D | D | D ^A | D ^A | D ^A | D ^A | D | D | D | D | |
| 220 | 22 | S | S | A | A | A | A | B | B | B | B | B | B | C ^A | C ^A | C ^A | C ^A | C | C | D | D | D | D ^A | D ^A | D ^A | D ^A | D | D | D | D | |
| 270 | 27 | S | S | A | A | A | A | B | B | B | B | B | B | C ^A | C ^A | C ^A | C ^A | C | C | D | D | D | D ^A | D ^A | D ^A | D ^A | D | D | D | D | |
| 330 | 33 | S | S | A | A | A | A | B | B | B | B | B | C | C ^A | C ^A | C ^A | C ^A | C | C | D | D | D | D ^A | D ^A | D ^A | D ^A | D | D | D | D | |
| 390 | 39 | S | S | A | A | A | A | B | B | B | B | B | C | C ^A | C ^A | C ^A | C ^A | C | C | D | D | D | D ^A | D ^A | D ^A | D ^A | D | D | D | D | |
| 470 | 47 | S | S | A | A | A | A | B | B | B | B | C | C | C ^A | C ^A | C ^A | C ^A | C | C | D | D | D | D ^A | D ^A | D ^A | D ^A | D | D | D | D | |
| 560 | 56 | S | S | A | A | A | A | B | B | B | B | C | D | C ^A | C ^A | C ^A | C ^A | C | D | D | D | D | D ^A | D ^A | D ^A | D ^A | D | D | D | D | |
| 680 | 68 | S | S | A | A | A | A | B | B | B | B | C | D | C ^A | C ^A | C ^A | C ^A | C | D | D | D | D | D ^A | D ^A | D ^A | D ^A | D | D | D | D | |
| 820 | 82 | S | S | A | A | B | B | B | B | B | B | D | D | C ^A | C ^A | C ^A | C ^A | C | D | D | D | D | D ^A | D ^A | D ^A | D ^A | D | D | D | D | |
| 101 | 100pF | S | S | A | B | B | B | B | B | B | B | D | D | C ^A | C ^A | C ^A | C ^A | C | D | D | D | D | K | D ^A | D ^A | D ^A | D ^A | D | D | D | D |
| 121 | 120 | S | S | A | B | D | D | B | B | B | B | D | G | C ^A | C ^A | C ^A | C ^A | C | D | D | D | D | K | D ^A | D ^A | D ^A | D ^A | D | D | D | D |
| 151 | 150 | S | S | B | D | D | D | B | B | B | B | D | G | C ^A | C ^A | C ^A | C ^A | D | G | D | K | K | D ^A | D ^A | D ^A | D ^A | D | D | D | D | |
| 181 | 180 | S | S | B | D | D | D | B | B | B | B | G | G | C ^A | C ^A | C ^A | C ^A | D | G | D | K | K | D ^A | D ^A | D ^A | D ^A | D | D | D | K | |
| 221 | 220 | S | S | D | D | D | D | B | B | B | B | G | G | C ^A | C ^A | C ^A | C ^A | G | G | D | K | K | D ^A | D ^A | D ^A | D ^A | D | D | D | K | |
| 271 | 270 | | | D | D | D | D | B | C | C | C | G | | C ^A | C ^A | C ^A | C ^A | G | | K | K | K | D ^A | D ^A | D ^A | D ^A | D | K | K | K | |
| 331 | 330 | | | D | D | D | D | B | C | C | C | G | | C ^A | C ^A | C ^A | C ^A | G | | K | K | K | D ^A | D ^A | D ^A | D ^A | D | K | K | K | |
| 391 | 390 | | | D | D | D | D | B | C | C | C | G | | C ^A | C ^A | C ^A | C ^A | G | | K | K | | D ^A | D ^A | D ^A | D ^A | D | K | K | K | |
| 471 | 470 | | | D | | | | C | C | C | C | G | | C ^A | C ^A | C ^A | C ^A | G | | K | K | | D ^A | D ^A | D ^A | D ^A | K | K | K | K | |
| 561 | 560 | | | D | | | | C | D | D | D | | | C ^A | C ^A | C ^A | C ^A | | | K | K | | D ^A | D ^A | D ^A | D ^A | K | K | | | |
| 681 | 680 | | | D | | | | C | D | D | D | | | C ^A | C ^A | C ^A | C ^A | | | K | K | | D ^A | D ^A | D ^A | D ^A | K | K | | | |
| 821 | 820 | | | D | | | | C | G | G | G | | | C ^A | C ^A | C ^A | C ^A | | | K | K | | D ^A | D ^A | D ^A | D ^A | K | K | | | |
| 102 | 1000pF | | | D | | | | C | G | G | G | | | D ^A | D ^A | D ^A | D ^A | | | K | K | | D ^A | D ^A | D ^A | D ^A | K | K | | | |
| 122 | 1200 | | | | | | | C | | | | | | D ^A | D ^A | D ^A | D ^A | | | | | | D ^A | D ^A | D ^A | D ^A | K | | | | |
| 152 | 1500 | | | | | | | D | | | | | | D ^A | D ^A | D ^A | D ^A | | | | | | D ^A | D ^A | D ^A | D ^A | K | | | | |
| 182 | 1800 | | | | | | | D | | | | | | D ^A | D ^A | D ^A | D ^A | | | | | | D ^A | D ^A | D ^A | D ^A | K | | | | |
| 222 | 2200 | | | | | | | D | | | | | | D ^A | D ^A | | | | | | | | D ^A | D ^A | D ^A | D ^A | | | | | |
| 272 | 2700 | | | | | | | | | | | | | D ^A | D ^A | | | | | | | | D ^A | D ^A | D ^A | D ^A | | | | | |
| 332 | 3300 | | | | | | | | | | | | | D ^A | | | | | | | | | D ^A | D ^A | D ^A | D ^A | | | | | |
| 392 | 3900 | | | | | | | | | | | | | D ^A | | | | | | | | | D ^A | | | | | | | | |
| 472 | 4700 | | | | | | | | | | | | | | | | | | | | | | D ^A | | | | | | | | |
| 562 | 5600 | | | | | | | | | | | | | | | | | | | | | | D ^A | | | | | | | | |
| 682 | 6800 | | | | | | | | | | | | | | | | | | | | | | D ^A | | | | | | | | |

- The letter in cell is expressed the symbol of product thickness
- The "A" mark is expressed product with Ag/Ni/Sn

Capacitance & Voltage (X7R 200V~3KV) E6 / E12 Series

| Dielectric | | X7R | | | | | | | | | | | | | | | | | | | | | | | | |
|------------|---------|------|------|------|------|------|------|------|------|-------|-------|------|------|------|------|-------|-------|-------|-------|------|------|------|------|-------|-------|-------|
| EIA | Size | 0805 | | | | 1206 | | | | | 1210 | | | | | 1808 | | | 1812 | | | | | | | |
| Code | VDCW | 200V | 250V | 500V | 630V | 200V | 250V | 500V | 630V | 1000V | 2000V | 200V | 250V | 500V | 630V | 1000V | 1000V | 2000V | 3000V | 200V | 250V | 500V | 630V | 1000V | 2000V | 3000V |
| 101 | 100pF | B | B | B^A | B^A | | | | | | | | | | | | | | | | | | | | | |
| 121 | 120 | B | B | B^A | B^A | | | | | | | | | | | | | | | | | | | | | |
| 151 | 150 | B | B | B^A | B^A | D | D | D | D | D | D | | | | | | D | D | D | | | | | | | |
| 181 | 180 | B | B | B^A | B^A | D | D | D | D | D | D | | | | | | D | D | D | | | | | | | |
| 221 | 220 | B | B | B^A | B^A | D | D | D | D | D | D | | | | | | D | D | D | | | | | | | |
| 271 | 270 | B | B | B^A | B^A | D | D | D | D | D | D | | | | | | D | D | D | | | | | D | D | |
| 331 | 330 | B | B | B^A | B^A | D | D | D | D | D | D | | | | | | D | D | K | | | | | D | D | |
| 391 | 390 | B | B | B^A | B^A | D | D | D | D | D | D | | | | | | D | D | K | | | | | D | D | |
| 471 | 470 | B | B | B^A | B^A | D | D | D | D | D | D | | | | | | D | D | K | | | | | D | D | |
| 561 | 560 | B | B | B^A | B^A | D | D | D | D | D | D | | | | | | D | D | K | | | | | D | D | |
| 681 | 680 | B | B | B^A | B^A | D | D | D | D | D | D | | | | | | D | D | K | | | | | D | D | K |
| 821 | 820 | B | B | B^A | B^A | D | D | D | D | D | G | | | | | | D | D | K | | | | | D | D | K |
| 102 | 1000pF | B | B | B^A | B^A | D | D | D | D | D | G | C | C | D | D | D | D | K | K | D | D | D | D | D | D | K |
| 122 | 1200 | B | B | B^A | B^A | D | D | D | D | D | G^A | C | C | D | D | D | D | K | | D | D | D | D | D | D | |
| 152 | 1500 | B | B | B^A | B^A | D | D | D | D | D | G^A | C | C | D | D | D | D | K | | D | D | D | D | D | D | |
| 182 | 1800 | B | B | B^A | B^A | D | D | D | D | D | | C | C | D | D | D | D | K | | D | D | D | D | D | D | G |
| 222 | 2200 | B | B | B^A | B^A | D | D | D | D | D | | C | C | D | D | D | D | K^A | | D | D | D | D | D | D | G |
| 272 | 2700 | B | B | B^A | B^A | D | D | D | D | D | | C | C | D | D | D | D | | | D | D | D | D | D | D | G |
| 332 | 3300 | B | B | B^A | B^A | D | D | D | D | D | | C | C | D | D | D | D | | | D | D | D | D | D | D | K |
| 392 | 3900 | B | B | | | D | D | D | D | D | | C | C | D | D | G | D | | | D | D | D | D | D | D | K |
| 472 | 4700 | B | B | | | D | D | D | D | D | | C | C | D | D | G | D | | | D | D | D | D | D | D | K |
| 562 | 5600 | D | D | | | D | D | D | D | D | | C | C | D | D | G | K | | | D | D | D | D | D | D | |
| 682 | 6800 | D | D | | | D | D | D | D | D | | C | C | D | D | G | K | | | D | D | D | D | D | D | |
| 822 | 8200 | D | D | | | D | D | D | D | D | | C | C | D | D | G | K | | | D | D | D | D | D | D | |
| 103 | 0.010μF | D | D | | | D | D | D | D | D | | C | C | D | D | G | K | | | D | D | D | D | D | D | |
| 123 | 0.012 | D | D | | | D | D | D | D | | | C | C | D | D | | | | | D | D | D | D | K | | |
| 153 | 0.015 | D | D | | | D | D | D | D | | | C | C | D | D | | | | | D | D | D | D | K | | |
| 183 | 0.018 | D | D | | | D | D | D | D | | | C | C | D | D | | | | | D | D | D | D | | | |
| 223 | 0.022 | D | D | | | D | D | G | G | | | C | C | D | D | | | | | D | D | D | D | | | |
| 273 | 0.027 | | | | | D | D | G | G | | | C | C | G | G | | | | | D | D | D | D | | | |
| 333 | 0.033 | | | | | G | G | G | G | | | C | C | G | G | | | | | D | D | D | D | | | |
| 393 | 0.039 | | | | | G | G | | | | | C | C | G | G | | | | | D | D | D | D | | | |
| 473 | 0.047 | | | | | G | G | | | | | D | D | G | G | | | | | D | D | D | D | | | |
| 563 | 0.056 | | | | | G | G | | | | | D | D | G | G | | | | | D | D | K | K | | | |
| 683 | 0.068 | | | | | G | G | | | | | G | G | | | | | | | D | D | K | K | | | |
| 823 | 0.082 | | | | | G | G | | | | | G | G | | | | | | | D | D | K | K | | | |
| 104 | 0.10μF | | | | | G | G | | | | | G | G | | | | | | | D | D | K | K | | | |
| 124 | 0.12 | | | | | | | | | | | G | G | | | | | | | D | D | | | | | |
| 154 | 0.15 | | | | | | | | | | | M | M | | | | | | | K | K | | | | | |
| 184 | 0.18 | | | | | | | | | | | M | M | | | | | | | K | K | | | | | |
| 224 | 0.22 | | | | | | | | | | | M | M | | | | | | | K | K | | | | | |
| 274 | 0.27 | | | | | | | | | | | M | M | | | | | | | K | K | | | | | |
| 334 | 0.33 | | | | | | | | | | | M | M | | | | | | | K | K | | | | | |
| 394 | 0.39 | | | | | | | | | | | M | M | | | | | | | K | K | | | | | |
| 474 | 0.47 | | | | | | | | | | | M | M | | | | | | | K | K | | | | | |

- The letter in cell is expressed the symbol of product thickness
- The “^” mark is expressed product with Ag/Ni/Sn

Capacitance & Voltage (Y5V 200V~250V) E6 / E12 Series

| Dielectric | | Y5V | | | | | | | |
|------------|---------------|------|-----|------|-----|------|-----|------|-----|
| EIA | Size | 0805 | | 1206 | | 1210 | | 1812 | |
| Code | VDCW | 200 | 250 | 200 | 250 | 200 | 250 | 200 | 250 |
| 103 | 0.010 μ F | B | B | B | B | C | C | D | D |
| 153 | 0.015 | B | B | B | B | C | C | D | D |
| 223 | 0.022 | B | B | B | B | C | C | D | D |
| 333 | 0.033 | B | B | B | B | C | C | D | D |
| 473 | 0.047 | B | B | B | B | C | C | D | D |
| 683 | 0.068 | B | B | B | B | C | C | D | D |
| 104 | 0.10 μ F | B | B | B | B | C | C | D | D |
| 154 | 0.15 | | | C | C | C | C | D | D |
| 224 | 0.22 | | | | | | | D | D |
| 334 | 0.33 | | | | | | | D | D |
| 474 | 0.47 | | | | | | | D | D |
| 684 | 0.68 | | | | | | | D | D |

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

Electrical data

| Dielectric | NP0 | X7R | Y5V |
|-------------------------------|---|----------------------------------|---------------------------|
| Size | 0603,0805,1206,1210,1808,1812 | 0805,1206,1210,1808,1812 | 0805,1206,1210,1812 |
| Capacitance* | 0.5pF~6800pF | 100pF~0.47 μ F | 0.01 μ F~0.68 μ F |
| Capacitance tolerance | Cap \leq 5pF: C (\pm 0.25pF) 5pF<Cap<10pF: D (\pm 0.50pF) Cap \geq 10pF: J (\pm 5%), K (\pm 10%) | K (\pm 10%) M (\pm 20%) | Z (-20 / +80%) |
| Rated voltage (VDCW) | 200V to 3KV | | 200V, 250V |
| Q* | Cap<30pF: Q \geq 400 +20C Cap \geq 30pF: Q \geq 1000 | \leq 2.5% | \leq 5% |
| Insulation resistance at Ur** | Ur=200~630V: \geq 10G Ω or RxC \geq 100 Ω -F Whichever is smaller Ur=1000~3000V: \geq 10G Ω | | |
| Dielectric Strength | 200~300V: \geq 2 \times VDCW 500~999V: \geq 1.5 \times VDCW 1000~3000V: \geq 1.2 \times VDCW | | |
| Operating temperature | -55 to +125 $^{\circ}$ C | | -25 to +85 $^{\circ}$ C |
| Capacitance change | \pm 30 ppm | \pm 15% | +30/-80% |
| Termination | Ni/Sn (lead-free termination) | | |

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

■ NP0: Apply 1.0 \pm 0.2Vrms, 1.0MHz \pm 10% for Cap \leq 1000pF and 1.0 \pm 0.2Vrms, 1.0KHz \pm 10% for Cap>1000pF, 25 $^{\circ}$ C ambient temperature

■ X7R, X5R: Apply 1.0 \pm 0.2Vrms, 1.0KHz \pm 10% at the condition of 20 $^{\circ}$ C ambient temperature

■ ***Measured at 500V_{DC} for 60 sec. for Ur > 500V_{DC}

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) Cap \leq 1000pF 1.0 \pm 0.2Vrms, 1MHz \pm 10% Cap \leq 1000pF 1.0 \pm 0.2Vrms, 1KHz \pm 10% | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Dissipation Factor (D.F.) or Quality factor (Q=1/D.F.) | <p>NPO: Cap\geq30pF, Q\geq1000; Cap$<$30pF, Q\geq400+20C MCRF Series: Q\geq2500 X7R, X5R:</p> <table border="1"> <thead> <tr> <th>Rated vol.</th> <th>D.F.\leq</th> <th colspan="2">Exception of D.F. \leq</th> </tr> </thead> <tbody> <tr> <td>\geq50V</td> <td>2.5%</td> <td>3%</td> <td>0201(50V); 0603\geq0.047μF 0805\geq0.18μF; 1206\geq0.47μF</td> </tr> <tr> <td rowspan="3">25V</td> <td rowspan="3">3.5%</td> <td>5%</td> <td>0805\geq1μF; 1210\geq10μF</td> </tr> <tr> <td>7%</td> <td>0603\geq0.33μF; 1206\geq4.7μF</td> </tr> <tr> <td>10%</td> <td>0402\geq0.10μF; 0603\geq0.47μF 0805\geq2.2μF; 1206\geq6.8μF</td> </tr> <tr> <td rowspan="2">16V</td> <td rowspan="2">3.5%</td> <td>5%</td> <td>0402\geq0.033μF; 0603\geq0.15μF 0805\geq0.68μF; 1206\geq2.2μF 1210\geq4.7μF</td> </tr> <tr> <td>10%</td> <td>0603\geq0.68μF; 0805\geq2.2μF 1206\geq4.7μF; 1210\geq22μF</td> </tr> <tr> <td rowspan="2">10V</td> <td rowspan="2">5%</td> <td>10%</td> <td>0402\geq0.33μF; 0603\geq0.33μF 0805\geq2.2μF; 1206\geq2.2μF 1210\geq22μF</td> </tr> <tr> <td>15%</td> <td>0201\geq0.1μF; 0402\geq1μF</td> </tr> <tr> <td rowspan="2">6.3V</td> <td rowspan="2">10%</td> <td>15%</td> <td>0603\geq10μF; 0805\geq4.7μF 1210\geq100μF</td> </tr> <tr> <td>20%</td> <td>0402\geq2.2μF</td> </tr> </tbody> </table> <p>Y5V:</p> <table border="1"> <thead> <tr> <th>Rated vol.</th> <th>D.F.\leq</th> <th colspan="2">Exception of D.F. \leq</th> </tr> </thead> <tbody> <tr> <td>\geq50V</td> <td>5%</td> <td>7%</td> <td>0603\geq0.1μF; 0805\geq0.47μF 1206\geq4.7μF</td> </tr> <tr> <td>35V</td> <td>7%</td> <td>—</td> <td>—</td> </tr> <tr> <td rowspan="2">25V</td> <td rowspan="2">5%</td> <td>7%</td> <td>0402\geq0.047μF; 0603\geq0.1μF 0805\geq0.33μF; 1206\geq1μF 1210\geq0.47μF</td> </tr> <tr> <td>9%</td> <td>0402\geq0.068μF; 0603\geq0.47μF 1206\geq4.7μF; 1210\geq22μF</td> </tr> <tr> <td rowspan="2">16V (C$<$1.0μF)</td> <td rowspan="2">7%</td> <td>9%</td> <td>0402\geq0.068μF; 0603\geq0.68μF</td> </tr> <tr> <td>12.5%</td> <td>0402\geq0.22μF</td> </tr> <tr> <td>16V (C\geq1.0μF)</td> <td>9%</td> <td>12.5%</td> <td>0603\geq2.2μF; 0805\geq3.3μF 1206\geq10μF; 1210\geq22μF 1812\geq47μF</td> </tr> <tr> <td>10V</td> <td>12.5%</td> <td>20%</td> <td>0402\geq0.47μF</td> </tr> <tr> <td>6.3V</td> <td>20%</td> <td>-</td> <td>-</td> </tr> </tbody> </table> | Rated vol. | D.F. \leq | Exception of D.F. \leq | | \geq 50V | 2.5% | 3% | 0201(50V); 0603 \geq 0.047 μ F 0805 \geq 0.18 μ F; 1206 \geq 0.47 μ F | 25V | 3.5% | 5% | 0805 \geq 1 μ F; 1210 \geq 10 μ F | 7% | 0603 \geq 0.33 μ F; 1206 \geq 4.7 μ F | 10% | 0402 \geq 0.10 μ F; 0603 \geq 0.47 μ F 0805 \geq 2.2 μ F; 1206 \geq 6.8 μ F | 16V | 3.5% | 5% | 0402 \geq 0.033 μ F; 0603 \geq 0.15 μ F 0805 \geq 0.68 μ F; 1206 \geq 2.2 μ F 1210 \geq 4.7 μ F | 10% | 0603 \geq 0.68 μ F; 0805 \geq 2.2 μ F 1206 \geq 4.7 μ F; 1210 \geq 22 μ F | 10V | 5% | 10% | 0402 \geq 0.33 μ F; 0603 \geq 0.33 μ F 0805 \geq 2.2 μ F; 1206 \geq 2.2 μ F 1210 \geq 22 μ F | 15% | 0201 \geq 0.1 μ F; 0402 \geq 1 μ F | 6.3V | 10% | 15% | 0603 \geq 10 μ F; 0805 \geq 4.7 μ F 1210 \geq 100 μ F | 20% | 0402 \geq 2.2 μ F | Rated vol. | D.F. \leq | Exception of D.F. \leq | | \geq 50V | 5% | 7% | 0603 \geq 0.1 μ F; 0805 \geq 0.47 μ F 1206 \geq 4.7 μ F | 35V | 7% | — | — | 25V | 5% | 7% | 0402 \geq 0.047 μ F; 0603 \geq 0.1 μ F 0805 \geq 0.33 μ F; 1206 \geq 1 μ F 1210 \geq 0.47 μ F | 9% | 0402 \geq 0.068 μ F; 0603 \geq 0.47 μ F 1206 \geq 4.7 μ F; 1210 \geq 22 μ F | 16V (C $<$ 1.0 μ F) | 7% | 9% | 0402 \geq 0.068 μ F; 0603 \geq 0.68 μ F | 12.5% | 0402 \geq 0.22 μ F | 16V (C \geq 1.0 μ F) | 9% | 12.5% | 0603 \geq 2.2 μ F; 0805 \geq 3.3 μ F 1206 \geq 10 μ F; 1210 \geq 22 μ F 1812 \geq 47 μ F | 10V | 12.5% | 20% | 0402 \geq 0.47 μ F | 6.3V | 20% | - | - | <p>X7R, X5R, Y5V: (Class II) Cap\leq10μF 1.0\pm0.2Vrms, 1KHz\pm10% Cap$>$10μF 0.5\pm0.2Vrms, 120Hz\pm10%</p> |
| Rated vol. | D.F. \leq | Exception of D.F. \leq | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| \geq 50V | 2.5% | 3% | 0201(50V); 0603 \geq 0.047 μ F 0805 \geq 0.18 μ F; 1206 \geq 0.47 μ F | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 25V | 3.5% | 5% | 0805 \geq 1 μ F; 1210 \geq 10 μ F | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | 7% | 0603 \geq 0.33 μ F; 1206 \geq 4.7 μ F | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | 10% | 0402 \geq 0.10 μ F; 0603 \geq 0.47 μ F 0805 \geq 2.2 μ F; 1206 \geq 6.8 μ F | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 16V | 3.5% | 5% | 0402 \geq 0.033 μ F; 0603 \geq 0.15 μ F 0805 \geq 0.68 μ F; 1206 \geq 2.2 μ F 1210 \geq 4.7 μ F | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | 10% | 0603 \geq 0.68 μ F; 0805 \geq 2.2 μ F 1206 \geq 4.7 μ F; 1210 \geq 22 μ F | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 10V | 5% | 10% | 0402 \geq 0.33 μ F; 0603 \geq 0.33 μ F 0805 \geq 2.2 μ F; 1206 \geq 2.2 μ F 1210 \geq 22 μ F | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | 15% | 0201 \geq 0.1 μ F; 0402 \geq 1 μ F | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 6.3V | 10% | 15% | 0603 \geq 10 μ F; 0805 \geq 4.7 μ F 1210 \geq 100 μ F | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | 20% | 0402 \geq 2.2 μ F | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Rated vol. | D.F. \leq | Exception of D.F. \leq | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| \geq 50V | 5% | 7% | 0603 \geq 0.1 μ F; 0805 \geq 0.47 μ F 1206 \geq 4.7 μ F | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 35V | 7% | — | — | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 25V | 5% | 7% | 0402 \geq 0.047 μ F; 0603 \geq 0.1 μ F 0805 \geq 0.33 μ F; 1206 \geq 1 μ F 1210 \geq 0.47 μ F | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | 9% | 0402 \geq 0.068 μ F; 0603 \geq 0.47 μ F 1206 \geq 4.7 μ F; 1210 \geq 22 μ F | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 16V (C $<$ 1.0 μ F) | 7% | 9% | 0402 \geq 0.068 μ F; 0603 \geq 0.68 μ F | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | 12.5% | 0402 \geq 0.22 μ F | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 16V (C \geq 1.0 μ F) | 9% | 12.5% | 0603 \geq 2.2 μ F; 0805 \geq 3.3 μ F 1206 \geq 10 μ F; 1210 \geq 22 μ F 1812 \geq 47 μ F | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 10V | 12.5% | 20% | 0402 \geq 0.47 μ F | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 6.3V | 20% | - | - | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Dielectric Strength | No evidence of damage or flash over during test | <p>To apply voltage(\leq100V) 250% Duration: 1 to 5sec Charge and discharge current less than 50mA</p> <p>To apply voltage: 200V~300V \geq 2 time VDC 500V~999V \geq 1.5 time VDC 1000V~3000V \geq 1.2 time VDC Cut-off, set at 10mA RAMP=0</p> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Item | Requirement | Test Method | | | | | | | | | | | | | | | | | | | | |
|---|--|---|-----------------------|-----------|---------------|------------------|---|------|--|-----------|-----------|--|---------------------------|----------------|-----|---------------------|-----|---------------------|-----|--------------------|-----|--------------------|
| Insulation Resistance | 10GΩ or RxC≥500Ω-F Whichever is smaller X7R, X5R, Y5V: <table border="1"> <tr> <td>Rated Voltage</td> <td>Insulation Resistance</td> </tr> <tr> <td>100V: X7R</td> <td rowspan="4">RxC ≥ 100Ω-F</td> </tr> <tr> <td>16V: 0402≥0.22uF</td> </tr> <tr> <td>10V: 0201≥47nF;0402≥0.47uF;0603≥0.47uF 0805≥2.2uF;1206≥4.7uF;1210≥47uF</td> </tr> <tr> <td>6.3V</td> </tr> </table> | Rated Voltage | Insulation Resistance | 100V: X7R | RxC ≥ 100Ω-F | 16V: 0402≥0.22uF | 10V: 0201≥47nF;0402≥0.47uF;0603≥0.47uF 0805≥2.2uF;1206≥4.7uF;1210≥47uF | 6.3V | To apply rated voltage for max. 120sec | | | | | | | | | | | | | |
| | Rated Voltage | Insulation Resistance | | | | | | | | | | | | | | | | | | | | |
| | 100V: X7R | RxC ≥ 100Ω-F | | | | | | | | | | | | | | | | | | | | |
| 16V: 0402≥0.22uF | | | | | | | | | | | | | | | | | | | | | | |
| 10V: 0201≥47nF;0402≥0.47uF;0603≥0.47uF 0805≥2.2uF;1206≥4.7uF;1210≥47uF | | | | | | | | | | | | | | | | | | | | | | |
| 6.3V | | | | | | | | | | | | | | | | | | | | | | |
| ≥10GΩ or RxC≥100Ω-F whichever is smaller Rated voltage: 200V~630V | To apply rated voltage(500V max.) for 60sec. | | | | | | | | | | | | | | | | | | | | | |
| ≥10GΩ Rated voltage: ≥630V | To apply 500V for 60sec. | | | | | | | | | | | | | | | | | | | | | |
| Temperature Characteristic of Capacitance | <table border="1"> <tr> <td>T.C.</td> <td>Capacitance Change</td> </tr> <tr> <td>NPO</td> <td>0±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 | 0±30 (ppm/°C) | X7R | ±15% | X5R | ±15% | Y5V | +30%~-80% | <table border="1"> <tr> <td>T.C.</td> <td>Operating Temp</td> </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> | 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 |
| T.C. | Capacitance Change | | | | | | | | | | | | | | | | | | | | | |
| NPO | 0±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 | | | | | | | | | | | | | | | | | | | | | |
| Adhesive Strength of Termination | No remarkable damage or removal of the terminations | Pressurizing force: 5N(≤0603) and 10N(>0603) Test time: 10±1 sec | | | | | | | | | | | | | | | | | | | | |
| Vibration Resistance | No remarkable damage Cap change and Q/D.F.: To meet initial spec | Vibration frequency: 10~55Hz/min Total amplitude: 1.5mm Test time: 6hrs.(tow hrs each in three mutually Perpendicular directions.) | | | | | | | | | | | | | | | | | | | | |
| Solderability | 95% min. coverage of all metalized area. | Solder temperature: 235±5°C Dipping time: 2±0.5 sec. | | | | | | | | | | | | | | | | | | | | |
| Bending Test | No remarkable damage Cap change: NPO: within±5% or 0.5pF whichever is larger X7R, X5R: within±12.5% Y5V: within±30% (This capacitance change means the change of capacitance under specified flexure of substrate from the capacitance measured before the test.) | The middle part of substrate shall be pressurized by means of the pressurizing rod at a rate of about 1mm per second until the deflection becomes 1mm and then the pressure shall be maintained for 5±1sec. Measurement to be made after keeping at room temp. for 24±2hrs(Class I) or 48±4hrs(Class II) | | | | | | | | | | | | | | | | | | | | |
| Resistance to Soldering Heat | No remarkable damage Cap change: NPO: within±2.5% or 0.25pF whichever is larger X7R, X5R: within±7.5% Y5V: within±20% Q/D.F., I.R. and dielectric strength: To meet initial requirements. 25%max. leaching on each edge. | Solder temperature: 270±5°C Dipping time: 10±1sec Preheating: 120 to 150°C for 1minute before immerse the capacitor in a eutectic solder. Before initial measurement(Class II only): Perform 150+0/-10°C for 1hr and then set for 48±4hrs at room temp. Measurement to be made after keep at room temp. for 24±2 hrs.(Class I) or 48±4 hrs.(Class II). | | | | | | | | | | | | | | | | | | | | |
| Temperature Cycle | No remarkable damage. Cap change: NPO: within±2.5% or 0.25pF whichever is larger X7R, X5R: within±7.5% Y5V: within±20% Q/D.F., I.R. and dielectric strength: To meet initial requirements. | Conduct the five cycles according to the temperature and time. <table border="1"> <tr> <th>Step</th> <th>Temp.(°C)</th> <th>Time(min)</th> </tr> <tr> <td>1</td> <td>Min. operating temp.+0/-3</td> <td>30±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±3</td> </tr> <tr> <td>4</td> <td>Room temp.</td> <td>2-3</td> </tr> </table> Before initial measurement(Cass II only): Perform 150+0/-10°C for 1hr and then set for 48±4 hrs at room temp. Measurement to be made after keeping at room temp. for 24±2 hrs.(Class I) or 48±4 hrs.(Class II). | Step | Temp.(°C) | Time(min) | 1 | Min. operating temp.+0/-3 | 30±3 | 2 | Room temp | 2-3 | 3 | Max. operating temp.+3/-0 | 30±3 | 4 | Room temp. | 2-3 | | | | | |
| Step | Temp.(°C) | Time(min) | | | | | | | | | | | | | | | | | | | | |
| 1 | Min. operating temp.+0/-3 | 30±3 | | | | | | | | | | | | | | | | | | | | |
| 2 | Room temp | 2-3 | | | | | | | | | | | | | | | | | | | | |
| 3 | Max. operating temp.+3/-0 | 30±3 | | | | | | | | | | | | | | | | | | | | |
| 4 | Room temp. | 2-3 | | | | | | | | | | | | | | | | | | | | |

| Item | Requirement | Test Method | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|--|--|---------------------|--|---------------------|--|-------|------|----|--|-----|------|-----|-------------------------|-----|-----------------------------|-----|---|-----|----|-----|--|-----|--|-----|------|-----|---|-----|--------------------------|------|-----|-----|---|------------|--------|---------------------|--|--------|------|-----|---|-----|-----|---|---|-----|------|-----|---|-----|--|------------------|-----|-------|-------------------------------|-----|---------------|-------------------|-------|-----|---|-----|-----|-----|---------------|------|-----|---|---|---------------|-----------------------|----------|-------------|-------------------|--|------|--|
| Humidity (steady state) | <p>No remarkable damage. Cap change: NPO: within±5% or 0.5pF whichever is large X7R, X5R:≥10V, within±12.5%;6.3V, within±25% Y5V:≥10V, within±30%;6.3V, within+30/-40% Q/D.F. value: NPO: More than 30pF Q≥350, 10pF≤C≤30pF, Q≥275+2.5C Less than 10pF Q≥200+10C X7R, X5R:</p> <table border="1" data-bbox="363 528 995 1059"> <thead> <tr> <th>Rated vol.</th> <th>D.F. ≤</th> <th colspan="2">Exception of D.F. ≤</th> </tr> </thead> <tbody> <tr> <td>≥ 50V</td> <td>3.0%</td> <td>6%</td> <td>0603 ≥ 0.047μF; 0805 ≥ 0.18μF 1206 ≥ 0.47μF</td> </tr> <tr> <td rowspan="3">25V</td> <td rowspan="3">5.0%</td> <td>10%</td> <td>0805 ≥ 1μF; 1210 ≥ 10μF</td> </tr> <tr> <td>14%</td> <td>0603 ≥ 0.33μF; 1206 ≥ 4.7μF</td> </tr> <tr> <td>15%</td> <td>0402 ≥ 0.1μF; 0603 ≥ 0.47μF 0805 ≥ 2.2μF; 1206 ≥ 6.8μF</td> </tr> <tr> <td rowspan="2">16V</td> <td rowspan="2">5%</td> <td>10%</td> <td>0603 ≥ 0.15μF; 0603 ≥ 0.68μF 1206 ≥ 2.2μF; 1210 ≥ 4.7μF</td> </tr> <tr> <td>15%</td> <td>0402 ≥ 0.033μF; 0603 ≥ 0.68μF 0805 ≥ 2.2μF; 1206 ≥ 4.7μF 1210 ≥ 22μF</td> </tr> <tr> <td rowspan="2">10V</td> <td rowspan="2">7.5%</td> <td>15%</td> <td>0402 ≥ 0.33μF; 0603 ≥ 0.33μF 0805 ≥ 2.2μF; 1206 ≥ 2.2μF 1210 ≥ 22μF</td> </tr> <tr> <td>20%</td> <td>0201 ≥ 0.1μF; 0402 ≥ 1μF</td> </tr> <tr> <td>6.3V</td> <td>15%</td> <td>30%</td> <td>0402 ≥ 2.2μF; 0603 ≥ 10μF 0805 ≥ 4.7μF; 1210 ≥ 100μF</td> </tr> </tbody> </table> <p>Y5V:</p> <table border="1" data-bbox="363 1095 989 1592"> <thead> <tr> <th>Rated vol.</th> <th>D.F. ≤</th> <th colspan="2">Exception of D.F. ≤</th> </tr> </thead> <tbody> <tr> <td>≥ 50 V</td> <td>7.5%</td> <td>10%</td> <td>0603 ≥ 0.1μF; 0805 ≥ 0.47μF 1206 ≥ 4.7μF</td> </tr> <tr> <td>35V</td> <td>10%</td> <td>—</td> <td>—</td> </tr> <tr> <td rowspan="2">25V</td> <td rowspan="2">7.5%</td> <td>10%</td> <td>0402 ≥ 0.047μF; 0603 ≥ 0.1μF 0805 ≥ 0.33μF; 1206 ≥ 1μF 1210 ≥ 4.7μF</td> </tr> <tr> <td>15%</td> <td>0402 ≥ 0.068μF; 0603 ≥ 0.47μF 1206 ≥ 4.7μF; 1210 ≥ 22μF</td> </tr> <tr> <td rowspan="2">16V (C<1.0μF)</td> <td rowspan="2">10%</td> <td>12.5%</td> <td>0402 ≥ 0.068μF; 0603 ≥ 0.68μF</td> </tr> <tr> <td>20%</td> <td>0402 ≥ 0.22μF</td> </tr> <tr> <td>16V (C ≥ .0μF)</td> <td>12.5%</td> <td>20%</td> <td>0603 ≥ 2.2μF; 0805 ≥ 3.3μF 1206 ≥ 10μF; 1210 ≥ 22μF 1812 ≥ 47μF</td> </tr> <tr> <td>10V</td> <td>20%</td> <td>30%</td> <td>0402 ≥ 0.47μF</td> </tr> <tr> <td>6.3V</td> <td>30%</td> <td>-</td> <td>-</td> </tr> </tbody> </table> <p>I.R.: ≥10V 1GΩ or 50Ω-F whichever is smaller. Class II (X7R, X5R, Y5V)</p> <table border="1" data-bbox="363 1693 1002 1939"> <thead> <tr> <th>Rated voltage</th> <th>Insulation Resistance</th> </tr> </thead> <tbody> <tr> <td>100V:X7R</td> <td rowspan="5">RxC ≥ 10Ω-F</td> </tr> <tr> <td>16V:0402 ≥ 0.22uF</td> </tr> <tr> <td>10V:0201 ≥ 47nF; 0402 ≥ 47uF 0603 ≥ 0.47uF; 0805 ≥ 2.2uF 1206 ≥ 2.2uF; 1210 ≥ 47uF</td> </tr> <tr> <td>6.3V</td> </tr> </tbody> </table> | Rated vol. | D.F. ≤ | Exception of D.F. ≤ | | ≥ 50V | 3.0% | 6% | 0603 ≥ 0.047μF; 0805 ≥ 0.18μF 1206 ≥ 0.47μF | 25V | 5.0% | 10% | 0805 ≥ 1μF; 1210 ≥ 10μF | 14% | 0603 ≥ 0.33μF; 1206 ≥ 4.7μF | 15% | 0402 ≥ 0.1μF; 0603 ≥ 0.47μF 0805 ≥ 2.2μF; 1206 ≥ 6.8μF | 16V | 5% | 10% | 0603 ≥ 0.15μF; 0603 ≥ 0.68μF 1206 ≥ 2.2μF; 1210 ≥ 4.7μF | 15% | 0402 ≥ 0.033μF; 0603 ≥ 0.68μF 0805 ≥ 2.2μF; 1206 ≥ 4.7μF 1210 ≥ 22μF | 10V | 7.5% | 15% | 0402 ≥ 0.33μF; 0603 ≥ 0.33μF 0805 ≥ 2.2μF; 1206 ≥ 2.2μF 1210 ≥ 22μF | 20% | 0201 ≥ 0.1μF; 0402 ≥ 1μF | 6.3V | 15% | 30% | 0402 ≥ 2.2μF; 0603 ≥ 10μF 0805 ≥ 4.7μF; 1210 ≥ 100μF | Rated vol. | D.F. ≤ | Exception of D.F. ≤ | | ≥ 50 V | 7.5% | 10% | 0603 ≥ 0.1μF; 0805 ≥ 0.47μF 1206 ≥ 4.7μF | 35V | 10% | — | — | 25V | 7.5% | 10% | 0402 ≥ 0.047μF; 0603 ≥ 0.1μF 0805 ≥ 0.33μF; 1206 ≥ 1μF 1210 ≥ 4.7μF | 15% | 0402 ≥ 0.068μF; 0603 ≥ 0.47μF 1206 ≥ 4.7μF; 1210 ≥ 22μF | 16V (C<1.0μF) | 10% | 12.5% | 0402 ≥ 0.068μF; 0603 ≥ 0.68μF | 20% | 0402 ≥ 0.22μF | 16V (C ≥ .0μF) | 12.5% | 20% | 0603 ≥ 2.2μF; 0805 ≥ 3.3μF 1206 ≥ 10μF; 1210 ≥ 22μF 1812 ≥ 47μF | 10V | 20% | 30% | 0402 ≥ 0.47μF | 6.3V | 30% | - | - | Rated voltage | Insulation Resistance | 100V:X7R | RxC ≥ 10Ω-F | 16V:0402 ≥ 0.22uF | 10V:0201 ≥ 47nF; 0402 ≥ 47uF 0603 ≥ 0.47uF; 0805 ≥ 2.2uF 1206 ≥ 2.2uF; 1210 ≥ 47uF | 6.3V | <p>Test temp: 40±2°C Humidity: 90~95% RH Test time: 500+24/-0hrs Measurement to be made after keeping at room temp. for 24±2hrs.(Class I) or 48±4 hrs. (Class II).</p> |
| Rated vol. | D.F. ≤ | Exception of D.F. ≤ | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| ≥ 50V | 3.0% | 6% | 0603 ≥ 0.047μF; 0805 ≥ 0.18μF 1206 ≥ 0.47μF | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 25V | 5.0% | 10% | 0805 ≥ 1μF; 1210 ≥ 10μF | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | 14% | 0603 ≥ 0.33μF; 1206 ≥ 4.7μF | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | 15% | 0402 ≥ 0.1μF; 0603 ≥ 0.47μF 0805 ≥ 2.2μF; 1206 ≥ 6.8μF | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 16V | 5% | 10% | 0603 ≥ 0.15μF; 0603 ≥ 0.68μF 1206 ≥ 2.2μF; 1210 ≥ 4.7μF | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | 15% | 0402 ≥ 0.033μF; 0603 ≥ 0.68μF 0805 ≥ 2.2μF; 1206 ≥ 4.7μF 1210 ≥ 22μF | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 10V | 7.5% | 15% | 0402 ≥ 0.33μF; 0603 ≥ 0.33μF 0805 ≥ 2.2μF; 1206 ≥ 2.2μF 1210 ≥ 22μF | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | 20% | 0201 ≥ 0.1μF; 0402 ≥ 1μF | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 6.3V | 15% | 30% | 0402 ≥ 2.2μF; 0603 ≥ 10μF 0805 ≥ 4.7μF; 1210 ≥ 100μF | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Rated vol. | D.F. ≤ | Exception of D.F. ≤ | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| ≥ 50 V | 7.5% | 10% | 0603 ≥ 0.1μF; 0805 ≥ 0.47μF 1206 ≥ 4.7μF | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 35V | 10% | — | — | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 25V | 7.5% | 10% | 0402 ≥ 0.047μF; 0603 ≥ 0.1μF 0805 ≥ 0.33μF; 1206 ≥ 1μF 1210 ≥ 4.7μF | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | 15% | 0402 ≥ 0.068μF; 0603 ≥ 0.47μF 1206 ≥ 4.7μF; 1210 ≥ 22μF | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 16V (C<1.0μF) | 10% | 12.5% | 0402 ≥ 0.068μF; 0603 ≥ 0.68μF | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | 20% | 0402 ≥ 0.22μF | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 16V (C ≥ .0μF) | 12.5% | 20% | 0603 ≥ 2.2μF; 0805 ≥ 3.3μF 1206 ≥ 10μF; 1210 ≥ 22μF 1812 ≥ 47μF | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 10V | 20% | 30% | 0402 ≥ 0.47μF | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 6.3V | 30% | - | - | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Rated voltage | Insulation Resistance | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 100V:X7R | RxC ≥ 10Ω-F | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 16V:0402 ≥ 0.22uF | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 10V:0201 ≥ 47nF; 0402 ≥ 47uF 0603 ≥ 0.47uF; 0805 ≥ 2.2uF 1206 ≥ 2.2uF; 1210 ≥ 47uF | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 6.3V | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Item | Requirement | Test Method | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|--|---|--------------------------|--|--------------------------|--|-------------------|------|----|---|-----|------|-----|--|-----|--|-----|--|-----|----|-----|--|-----|--|-----|------|-----|---|-----|---|------|-----|-----|---|------------|-------------|--------------------------|--|-------------------|------|-----|--|-----|-----|---|---|-----|------|-----|--|-----|---|---------------------------------|-----|-------|--|-----|-----------------------------|------------------------------------|-------|-----|---|-----|-----|-----|-----------------------------|------|-----|---|---|---------------|-----------------------|-----------|-----------------------------|----------------------------------|--|------|--|---|
| Humidity load | <p>No remarkable damage. Cap change: NPO: $\pm 7.5\%$ or 0.75pF whichever is larger X5R, X5R: $\geq 10\text{V}$, within $\pm 12.5\%$; 6.3V, within $\pm 25\%$ Y5V: $\geq 10\text{V}$, within $\pm 30\%$; 6.3V, within $+30/-40\%$ Q/D.F. value: NPO: $C \geq 30\text{pF}, Q \geq 200$; $C < 30\text{pF}, Q \geq 100+10/3C$</p> <p>X7R, X5R:</p> <table border="1"> <thead> <tr> <th>Rated vol.</th> <th>D.F. \leq</th> <th colspan="2">Exception of D.F. \leq</th> </tr> </thead> <tbody> <tr> <td>$\geq 50\text{V}$</td> <td>3.0%</td> <td>6%</td> <td>0603 $\geq 0.047\mu\text{F}$; 0805 $\geq 0.18\mu\text{F}$ 1206 $\geq 0.47\mu\text{F}$</td> </tr> <tr> <td rowspan="3">25V</td> <td rowspan="3">5.0%</td> <td>10%</td> <td>0805 $\geq 1\mu\text{F}$; 1210 $\geq 10\mu\text{F}$</td> </tr> <tr> <td>14%</td> <td>0603 $\geq 0.33\mu\text{F}$; 1206 $\geq 4.7\mu\text{F}$</td> </tr> <tr> <td>15%</td> <td>0402 $\geq 0.10\mu\text{F}$; 0603 $\geq 0.47\mu\text{F}$ 0805 $\geq 2.2\mu\text{F}$; 1206 $\geq 6.8\mu\text{F}$</td> </tr> <tr> <td rowspan="2">16V</td> <td rowspan="2">5%</td> <td>10%</td> <td>0603 $\geq 0.15\mu\text{F}$; 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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% | 0402 $\geq 2.2\mu\text{F}$; 0603 $\geq 10\mu\text{F}$ 0805 $\geq 4.7\mu\text{F}$; 1210 $\geq 100\mu\text{F}$ | 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 $\geq 4.7\mu\text{F}$ | 35V | 10% | — | — | 25V | 7.5% | 10% | 0402 $\geq 0.047\mu\text{F}$; 0603 $\geq 0.1\mu\text{F}$ 0805 $\geq 0.033\mu\text{F}$; 1206 $\geq 1\mu\text{F}$ 1210 $\geq 4.7\mu\text{F}$ | 15% | 0402 $\geq 0.068\mu\text{F}$; 0603 $\geq 0.1\mu\text{F}$ 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% | - | - | Rated voltage | Insulation Resistance | 100V: X7R | RxC $\geq 5\Omega\text{-F}$ | 16V: 0402 $\geq 0.22\mu\text{F}$ | 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 | | <p>Test temp: $40 \pm 2^\circ\text{C}$ Humidity: 90~95%RH Test time: 500+24/-0 hrs To apply voltage: Rated voltage Measurement to be made after keeping at room temp for $24 \pm 2\text{hrs}$. (Class I) or $48 \pm 4\text{hrs}$. (Class II)</p> |
| Rated vol. | D.F. \leq | Exception of D.F. \leq | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
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| 25V | 5.0% | 10% | 0805 $\geq 1\mu\text{F}$; 1210 $\geq 10\mu\text{F}$ | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | 14% | 0603 $\geq 0.33\mu\text{F}$; 1206 $\geq 4.7\mu\text{F}$ | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
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| 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% | 0402 $\geq 0.033\mu\text{F}$; 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% | 0402 $\geq 0.22\mu\text{F}$; 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% | 0402 $\geq 2.2\mu\text{F}$; 0603 $\geq 10\mu\text{F}$ 0805 $\geq 4.7\mu\text{F}$; 1210 $\geq 100\mu\text{F}$ | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
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| $\geq 50\text{V}$ | 7.5% | 10% | 0603 $\geq 0.1\mu\text{F}$; 0805 $\geq 0.47\mu\text{F}$ 1206 $\geq 4.7\mu\text{F}$ | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 35V | 10% | — | — | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 25V | 7.5% | 10% | 0402 $\geq 0.047\mu\text{F}$; 0603 $\geq 0.1\mu\text{F}$ 0805 $\geq 0.033\mu\text{F}$; 1206 $\geq 1\mu\text{F}$ 1210 $\geq 4.7\mu\text{F}$ | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | 15% | 0402 $\geq 0.068\mu\text{F}$; 0603 $\geq 0.1\mu\text{F}$ 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% | - | - | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Rated voltage | Insulation Resistance | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 100V: X7R | RxC $\geq 5\Omega\text{-F}$ | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 16V: 0402 $\geq 0.22\mu\text{F}$ | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 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) | <p>No remarkable damage Cap change: NPO: $\pm 3\%$ or $\pm 0.3F$ whichever is larger X7R, X5R: $\geq 10V$, within $\pm 12.5\%$; 6.3V, within $+30/-40\%$ Q/D.F. value: NPO: more than 30pF, $Q \geq 350$ $10pF \leq C < 30pF$, $Q \geq 275 + 2.5C$ Less than 10pF, $Q \geq 200 + 10C$ X7R, X5R:</p> <table border="1" data-bbox="335 454 954 987"> <thead> <tr> <th>Rated vol.</th> <th>D.F. \leq</th> <th colspan="2">Exception of D.F. \leq</th> </tr> </thead> <tbody> <tr> <td>$\geq 50V$</td> <td>3.0%</td> <td>6%</td> <td>0603 $\geq 0.047\mu F$; 0805 $\geq 0.18\mu F$ 1206 $\geq 0.47\mu F$</td> </tr> <tr> <td rowspan="3">25V</td> <td rowspan="3">5.0%</td> <td>10%</td> <td>0805 $\geq 1\mu F$; 1210 $\geq 10\mu F$</td> </tr> <tr> <td>14%</td> <td>0603 $\geq 0.33\mu F$</td> </tr> <tr> <td>15%</td> <td>0402 $\geq 0.10\mu F$; 0603 $\geq 0.47\mu F$ 0805 $\geq 2.2\mu F$; 1206 $\geq 6.8\mu F$</td> </tr> <tr> <td rowspan="2">16V</td> <td rowspan="2">5%</td> <td>10%</td> <td>0603 $\geq 0.15\mu F$; 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0603 $\geq 0.1\mu F$ 0805 $\geq 0.33\mu F$; 1206 $\geq 1\mu F$ 1210 $\geq 4.7\mu F$</td> </tr> <tr> <td rowspan="2">16V (C < 1.0μF)</td> <td rowspan="2">10%</td> <td>12.5%</td> <td>0402 $\geq 0.068\mu F$; 0603 $\geq 0.68\mu F$</td> </tr> <tr> <td>20%</td> <td>0402 $\geq 0.22\mu F$</td> </tr> <tr> <td>16V (C $\geq 1.0\mu F$)</td> <td>12.5%</td> <td>20%</td> <td>0603 $\geq 2.2\mu F$; 0805 $\geq 3.3\mu F$ 1206 $\geq 10\mu F$; 1210 $\geq 22\mu F$ 1812 $\geq 47\mu F$</td> </tr> <tr> <td>10V</td> <td>15%</td> <td>30%</td> <td>0402 $\geq 0.47\mu F$</td> </tr> <tr> <td>6.3V</td> <td>30%</td> <td>-</td> <td>-</td> </tr> </tbody> </table> <p>I.R.: $\geq 10V$ 1GΩ or 50Ω-F whichever is smaller Class II (X7R, X5R, Y5V)</p> <table border="1" data-bbox="335 1592 954 1816"> <thead> <tr> <th>Rated voltage</th> <th>Insulation Resistance</th> </tr> </thead> <tbody> <tr> <td>100V: X7R</td> <td rowspan="5">RxC $\geq 10\Omega$-F</td> </tr> <tr> <td>16V: 0402 $\geq 0.22\mu F$</td> </tr> <tr> <td>10V: 0201 $\geq 47nF$; 0402 $\geq 0.47\mu F$ 0603 $\geq 0.47\mu F$; 0805 $\geq 2.2\mu F$ 1206 $\geq 4.7\mu F$; 1210 $\geq 47\mu F$</td> </tr> <tr> <td>6.3V</td> </tr> </tbody> </table> | Rated vol. | D.F. \leq | Exception of D.F. \leq | | $\geq 50V$ | 3.0% | 6% | 0603 $\geq 0.047\mu F$; 0805 $\geq 0.18\mu F$ 1206 $\geq 0.47\mu F$ | 25V | 5.0% | 10% | 0805 $\geq 1\mu F$; 1210 $\geq 10\mu F$ | 14% | 0603 $\geq 0.33\mu F$ | 15% | 0402 $\geq 0.10\mu F$; 0603 $\geq 0.47\mu F$ 0805 $\geq 2.2\mu F$; 1206 $\geq 6.8\mu F$ | 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% | 0402 $\geq 0.033\mu F$; 0603 $\geq 0.68\mu F$ 0805 $\geq 2.2\mu F$; 1206 $\geq 4.7\mu F$ 1210 $\geq 22\mu F$ | 10V | 7.5% | 15% | 0402 $\geq 0.33\mu F$; 0603 $\geq 0.33\mu F$ 0805 $\geq 2.2\mu F$; 1206 $\geq 2.2\mu F$ 1210 $\geq 22\mu F$ | 20% | 0201 $\geq 0.1\mu F$; 0402 $\geq 1\mu F$ | 6.3V | 15% | 30% | 0402 $\geq 2.2\mu F$; 0603 $\geq 10\mu F$ 0805 $\geq 4.7\mu F$; 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 $\geq 4.7\mu F$ | 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 $\geq 4.7\mu F$ | 16V (C < 1.0 μF) | 10% | 12.5% | 0402 $\geq 0.068\mu F$; 0603 $\geq 0.68\mu F$ | 20% | 0402 $\geq 0.22\mu F$ | 16V (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 | 15% | 30% | 0402 $\geq 0.47\mu F$ | 6.3V | 30% | - | - | Rated voltage | Insulation Resistance | 100V: X7R | RxC $\geq 10\Omega$ -F | 16V: 0402 $\geq 0.22\mu F$ | 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: NPO, X7R: $125 \pm 3^\circ C$ X5R, Y5V: $85 \pm 3^\circ C$ To apply voltage: (1.1) 100% of rated voltage for below range</p> <table border="1" data-bbox="986 365 1485 562"> <thead> <tr> <th>Size</th> <th>Dielectric</th> <th>Rated voltage</th> <th>Capacitance range</th> </tr> </thead> <tbody> <tr> <td>0201</td> <td>X5R</td> <td>6.3V, 10V</td> <td>C $\geq 0.1\mu F$</td> </tr> <tr> <td>0402</td> <td>X5R, Y5V</td> <td>6.3V, 10V</td> <td>C $\geq 1.0\mu F$</td> </tr> <tr> <td>0603</td> <td>X5R</td> <td>6.3V, 10V</td> <td>C $\geq 4.7\mu F$</td> </tr> <tr> <td>0805</td> <td>X5R</td> <td>6.3V</td> <td>C $\geq 22\mu F$</td> </tr> </tbody> </table> <p>(1.2) 6.3V or C $\geq 10\mu F$: 150% of rated voltage (2) $10V \leq U_r < 500V$: 200% of rated voltage 150% of rated voltage for below range</p> <table border="1" data-bbox="986 656 1485 913"> <thead> <tr> <th>Size</th> <th>Dielectric</th> <th>Rated voltage</th> <th>Capacitance range</th> </tr> </thead> <tbody> <tr> <td>0603</td> <td>X5R</td> <td>10V, 16V</td> <td>C $\geq 1.0\mu F$</td> </tr> <tr> <td rowspan="2">0805</td> <td rowspan="2">X5R</td> <td rowspan="2">10V</td> <td>C $\geq 4.7\mu F$</td> </tr> <tr> <td>C $\geq 2.2\mu F$ & T = $0.85 \pm 0.1mm$</td> </tr> <tr> <td>1206</td> <td>X5R</td> <td>10V</td> <td>C $\geq 4.7\mu F$ & T = $0.85 \pm 0.1mm$</td> </tr> </tbody> </table> <p>(3) 500V: 150% of rated voltage (4) $U_r \geq 630V$: 120% of rated voltage</p> <p>Test time: 1000+24/-0hrs Measurement to be made after keeping at room temp. for 24\pm2hrs.(Class I) or 48\pm4hrs.(Class II).</p> | Size | Dielectric | Rated voltage | Capacitance range | 0201 | X5R | 6.3V, 10V | C $\geq 0.1\mu F$ | 0402 | X5R, Y5V | 6.3V, 10V | C $\geq 1.0\mu F$ | 0603 | X5R | 6.3V, 10V | C $\geq 4.7\mu F$ | 0805 | X5R | 6.3V | C $\geq 22\mu F$ | Size | Dielectric | Rated voltage | Capacitance range | 0603 | X5R | 10V, 16V | C $\geq 1.0\mu F$ | 0805 | X5R | 10V | C $\geq 4.7\mu F$ | C $\geq 2.2\mu F$ & T = $0.85 \pm 0.1mm$ | 1206 | X5R | 10V | C $\geq 4.7\mu F$ & T = $0.85 \pm 0.1mm$ |
| Rated vol. | D.F. \leq | Exception of D.F. \leq | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| $\geq 50V$ | 3.0% | 6% | 0603 $\geq 0.047\mu F$; 0805 $\geq 0.18\mu F$ 1206 $\geq 0.47\mu F$ | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 25V | 5.0% | 10% | 0805 $\geq 1\mu F$; 1210 $\geq 10\mu F$ | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | 14% | 0603 $\geq 0.33\mu F$ | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | 15% | 0402 $\geq 0.10\mu F$; 0603 $\geq 0.47\mu F$ 0805 $\geq 2.2\mu F$; 1206 $\geq 6.8\mu F$ | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 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% | 0402 $\geq 0.033\mu F$; 0603 $\geq 0.68\mu F$ 0805 $\geq 2.2\mu F$; 1206 $\geq 4.7\mu F$ 1210 $\geq 22\mu F$ | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 10V | 7.5% | 15% | 0402 $\geq 0.33\mu F$; 0603 $\geq 0.33\mu F$ 0805 $\geq 2.2\mu F$; 1206 $\geq 2.2\mu F$ 1210 $\geq 22\mu F$ | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | 20% | 0201 $\geq 0.1\mu F$; 0402 $\geq 1\mu F$ | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 6.3V | 15% | 30% | 0402 $\geq 2.2\mu F$; 0603 $\geq 10\mu F$ 0805 $\geq 4.7\mu F$; 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 $\geq 4.7\mu F$ | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 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 $\geq 4.7\mu F$ | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 16V (C < 1.0 μF) | 10% | 12.5% | 0402 $\geq 0.068\mu F$; 0603 $\geq 0.68\mu F$ | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | 20% | 0402 $\geq 0.22\mu F$ | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 16V (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 | 15% | 30% | 0402 $\geq 0.47\mu F$ | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 6.3V | 30% | - | - | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Rated voltage | Insulation Resistance | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 100V: X7R | RxC $\geq 10\Omega$ -F | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 16V: 0402 $\geq 0.22\mu F$ | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 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 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Size | | Dielectric | Rated voltage | Capacitance range | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 0201 | X5R | 6.3V, 10V | C $\geq 0.1\mu F$ | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 0402 | X5R, Y5V | 6.3V, 10V | C $\geq 1.0\mu F$ | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 0603 | X5R | 6.3V, 10V | C $\geq 4.7\mu F$ | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 0805 | X5R | 6.3V | C $\geq 22\mu F$ | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Size | Dielectric | Rated voltage | Capacitance range | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 0603 | X5R | 10V, 16V | C $\geq 1.0\mu F$ | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 0805 | X5R | 10V | C $\geq 4.7\mu F$ | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | C $\geq 2.2\mu F$ & T = $0.85 \pm 0.1mm$ | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1206 | X5R | 10V | C $\geq 4.7\mu F$ & T = $0.85 \pm 0.1mm$ | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

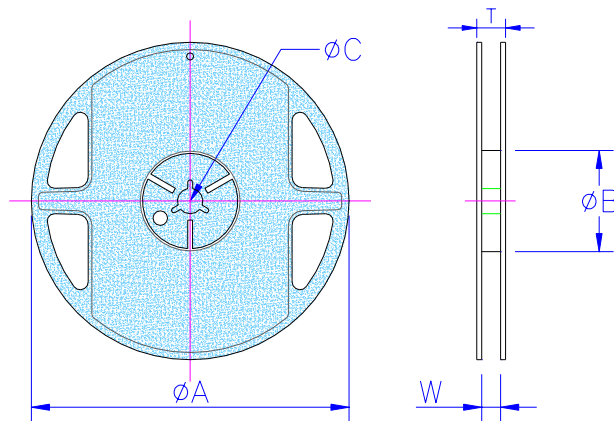
■ Packaging

Packaging Quantity

Unit: mm

| Type | Thickness / Symbol | | Packaging (7" Reel) | |
|------|--------------------|---|---------------------|--------------|
| | | | Paper tape | Plastic tape |
| 0201 | 0.30±0.03 | L | 15K | - |
| 0402 | 0.50±0.05 | N | 10K | - |
| 0603 | 0.80±0.07 | S | 4K | - |
| | 0.80 +0.05 / -0.10 | X | 4K | - |
| 0805 | 0.60±0.10 | A | 4K | - |
| | 0.80±0.10 | B | 4K | - |
| | 1.25±0.10 | D | - | 3K |
| | 1.25±0.20 | I | - | 3K |
| 1206 | 0.80±0.10 | B | 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 | 0.95±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 |
| | 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 |
| 0612 | 0.80±0.10 | B | 4K | - |

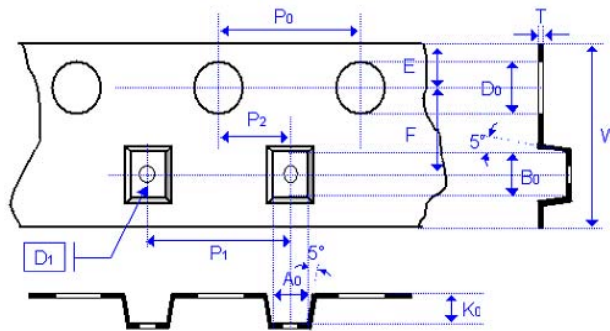
Tape and Reel



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") |

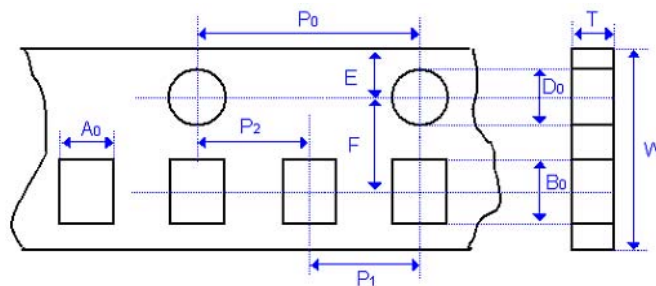
Plastic Tape Size Specification



Unit: mm

| Type | 0805 | | 1206 | | | | | 1210 | | | | | 1808 | | 1812 | | |
|----------------|-----------|---|-----------|---|-----------|---|-----------|------|-----------|---|-----------|-------|-----------|---|-------|---|---|
| | D | I | C | J | M | G | P | C | D | G | K | M | D | K | D | K | M |
| A ₀ | <1.57 | | <1.85 | | <1.95 | | <2.97 | | <2.97 | | <2.35 | | <3.81 | | | | |
| B ₀ | <2.40 | | <3.46 | | <3.67 | | <3.73 | | <3.73 | | <4.98 | <5.00 | <5.30 | | | | |
| T | 0.23±0.05 | | 0.23±0.05 | | 0.23±0.05 | | 0.23±0.05 | | 0.23±0.05 | | 0.25±0.05 | | 0.25±0.05 | | | | |
| K ₀ | <2.50 | | <2.50 | | <2.50 | | <2.50 | | <3.00 | | <2.50 | | <2.50 | | <3.00 | | |
| W | 8.00±0.10 | | 8.00±0.10 | | 8.00±0.10 | | 8.00±0.10 | | 8.00±0.10 | | 12.0±0.20 | | 12.0±0.20 | | | | |
| P ₀ | 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 ₁ | 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 ₂ | 2.00±0.05 | | 2.00±0.05 | | 2.00±0.05 | | 2.00±0.05 | | 2.00±0.05 | | 2.00±0.05 | | 2.00±0.05 | | | | |
| D ₀ | 1.50±0.05 | | 1.50±0.05 | | 1.50±0.05 | | 1.50±0.05 | | 1.50±0.05 | | 1.50±0.05 | | 1.50±0.05 | | | | |
| D ₁ | 1.00±0.10 | | 1.00±0.10 | | 1.00±0.10 | | 1.00±0.10 | | 1.00±0.10 | | 1.00±0.10 | | 1.00±0.10 | | | | |
| E | 1.75±0.10 | | 1.75±0.10 | | 1.75±0.10 | | 1.75±0.10 | | 1.75±0.10 | | 1.75±0.10 | | 1.75±0.10 | | | | |
| 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±0.05 | | | | |

Paper Tape Size Specification



Unit: mm

| Type | 0201 | 0402 | 0603 | | 0805 | | 1206/0612 |
|----------------|-----------|-----------|-----------|---|-----------|-----------|-----------|
| | L | N | S | X | A | B | B |
| A ₀ | 0.45±0.05 | 0.62±0.05 | 1.02±0.05 | | 1.50±0.10 | 1.50±0.10 | 2.00±0.10 |
| B ₀ | 0.75±0.05 | 1.12±0.05 | 1.82±0.05 | | 2.30±0.10 | 2.30±0.10 | 3.50±0.10 |
| T | 0.60±0.05 | 0.60±0.05 | 0.95±0.05 | | 0.75±0.05 | 0.95±0.05 | 0.95±0.05 |
| 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 ₀ | 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 ₁ | 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 ₂ | 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 ₀ | 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 |