

Data Sheet

Customer:

Product: Multilayer Ceramic Chip Capacitor – MC Series

Sizes.: 0201/0402/0603/0805/1206/1210/1808/1812/0612

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|---------------------|------------------|---------------------|------------------------|---------------------------|
| 19-Jan-18 | 19-Jan-18 | 19-Jan-18 | 19-Jan-18 | |
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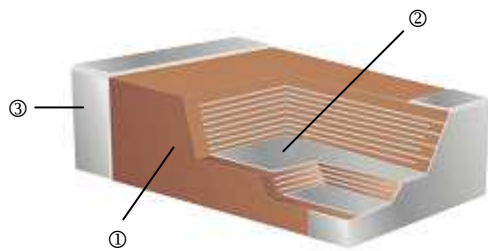
Multilayer Ceramic Chip Capacitor

■ Features

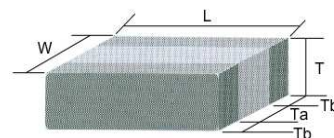
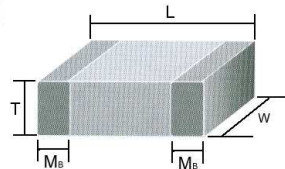
- Wide capacitance range, extremely compact size
- Low inductance of capacitor for high frequency application
- Excellent solderability and resistance to soldering heat, suitable for flow and reflow soldering
- Adaptable to high-speed surface mount assembly
- Conform to EIAJ-RC3402, and also compatible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



■ Construction



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



Unit: mm

■ Dimensions

MC / MCRF Type

| Type | Size (Inch) | L | W | T / Symbol | | M _B | 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 ^{#2} | 0.3±0.05 ^{#2} | 0.3±0.05 ^{#2} | | | | | | |
| | | 0.6±0.09 ^{#3} | 0.3±0.09 ^{#3} | 0.3±0.09 ^{#3} | | | | | | |
| 02 | 0402 | 1.00±0.05 | 0.50±0.05 | 0.50±0.05 | N Q E | 0.25 +0.05 / -0.10 | 10K | - | | |
| | | 1.00±0.20 | 0.50±0.20 | 0.50±0.20 | | | | | | |
| | | 1.60±0.10 | 0.80±0.10 | 0.80±0.10 | | | | | | |
| 03 | 0603 | 1.60+0.15/-0.10 | 0.80+0.15/-0.10 | 0.50±0.10 | H X | 0.40±0.15 | 4K | - | | |
| | | 1.60±0.20 ^{#1} | 0.80±0.20 ^{#1} | 0.80+0.15 / -0.10 | | | | | | |
| | | | | 0.80±0.20 ^{#1} | | | | | | |
| 05 | 0805 | 2.00±0.15 | 1.25±0.10 | 0.50±0.10 | H A B D | 0.50±0.20 | 4K | - | | |
| | | | | 0.60±0.15 | | | | | | |
| | | | | 0.80±0.10 | | | | | | |
| | | 2.00±0.20 | 1.25±0.20 | 0.85±0.10 | T I | | | | - | 3K |
| | | 1.25±0.20 | | 4K | | | | | - | |
| | | 1.25±0.20 | | - | | | | | 3K | |
| 06 | 1206 | 3.20±0.15 | 1.60±0.15 | 0.80±0.10 | B C D J | 0.60±0.20 (0.50±0.25) ^{***} | 4K | - | | |
| | | | | 0.95±0.10 | | | | | | |
| | | | | 1.25±0.10 | | | | | | |
| | | 3.20±0.20 | 1.60±0.20 | 1.15±0.15 | G T | | | | - | 3K |
| | | 1.60±0.20 | | - | | | | | 2K | |
| | | 0.85±0.10 | | 4K | | | | | - | |
| 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 T D | 0.75±0.25 | - | 3K | | |
| | | | | 0.85±0.10 | | | | | | |
| | | | | 1.25±0.10 | | | | | | |
| | | 3.20±0.40 | 2.50±0.30 | 1.60±0.20 | G K M | | | | - | 3K |
| | | 2.00±0.20 | | - | | | | | 2K | |
| | | 2.50±0.30 | | - | | | | | 1K | |
| 08 | 1808 | 4.50±0.40 (4.5+0.5/-0.3) ^{**} | 2.03±0.25 | 1.25±0.10 | D F G K | 0.75±0.25 (0.50±0.25) ^{***} | - | 2K | | |
| | | | | 1.40±0.15 | | | | | | |
| | | | | 1.60±0.20 | | | | | | |
| | | | | 2.00±0.20 | | | | | | |

| Type | Size (Inch) | L | W | T / Symbol | | M _B | Packaging (7" Reel) | |
|------|-------------|-------------------------------|-----------|------------|---|-----------------------------|---------------------|--------------|
| | | | | | | | Paper tape | Plastic tape |
| 12 | 1812 | 4.50±0.40 (4.5+0.5/-0.3)** | 3.20±0.30 | 1.25±0.10 | D | 0.75±0.25 (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 Middle and High Voltage 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 | B: ±0.1pF (Cap ≤ 5pF) C: ±0.25pF (Cap ≤ 5pF) D: ±0.5pF (5pF < Cap < 10pF) F: ±1% G: ±2% J: ±5% K: ±10% M: ±20% Z: +80/-20% | T: Taping Reel | N: NPO (COG) B: X7R F: Y5V X: X5R | 6V3: 6.3V 250: 25V 500: 50V 101: 100V 102: 1000V 202: 2000V 302: 3000V | 3R9: 3.9pF 150: 15pF 181: 180pF 225: 2.2μF 476: 47μF 107: 100μF |

Multilayer Ceramic Chip Capacitor

General Capacitance & Voltage

Capacitance & Voltage (NPO)

| Dielectric | | NPO | | | | | | | | | | | | | | |
|------------|--------|------|-----|-----|-----|------|------|-----|-----|-----|------|------|-----|-----|-----|------|
| EIA | Size | 0402 | | | | | 0603 | | | | | 0805 | | | | |
| Code | VDCW | 10V | 16V | 25V | 50V | 100V | 10V | 16V | 25V | 50V | 100V | 10V | 16V | 25V | 50V | 100V |
| 0R1 | 0.1pF | N | N | N | N | | | | | | | | | | | |
| 0R2 | 0.2 | N | N | N | N | | | | | | | | | | | |
| 0R3 | 0.3 | N | N | N | N | | S | S | S | S | | | | | | |
| 0R4 | 0.4 | N | N | N | N | | S | S | S | S | | | | | | |
| 0R5 | 0.5 | N | N | N | N | N | S | S | S | S | S | A | A | A | A | A |
| 0R6 | 0.6 | N | N | N | N | N | S | S | S | S | S | A | A | A | A | A |
| 0R7 | 0.7 | N | N | N | N | N | S | S | S | S | S | A | A | A | A | A |
| 0R8 | 0.8 | N | N | N | N | N | S | S | S | S | S | A | A | A | A | A |
| 0R9 | 0.9 | N | N | N | N | N | S | S | S | S | S | A | A | A | A | A |
| 1R0 | 1.0 | N | N | N | N | N | S | S | S | S | S | A | A | A | A | A |
| 1R2 | 1.2 | N | N | N | N | N | S | S | S | S | S | A | A | A | A | A |
| 1R5 | 1.5 | N | N | N | N | N | S | S | S | S | S | A | A | A | A | A |
| 1R8 | 1.8 | N | N | N | N | N | S | S | S | S | S | A | A | A | A | A |
| 2R0 | 2.0 | N | N | N | N | N | S | S | S | S | S | A | A | A | A | A |
| 2R2 | 2.2 | N | N | N | N | N | S | S | S | S | S | A | A | A | A | A |
| 2R7 | 2.7 | N | N | N | N | N | S | S | S | S | S | A | A | A | A | A |
| 3R0 | 3.0 | N | N | N | N | N | S | S | S | S | S | A | A | A | A | A |
| 3R3 | 3.3 | N | N | N | N | N | S | S | S | S | S | A | A | A | A | A |
| 3R9 | 3.9 | N | N | N | N | N | S | S | S | S | S | A | A | A | A | A |
| 4R0 | 4.0 | N | N | N | N | N | S | S | S | S | S | A | A | A | A | A |
| 4R7 | 4.7 | N | N | N | N | N | S | S | S | S | S | A | A | A | A | A |
| 5R0 | 5.0 | N | N | N | N | N | S | S | S | S | S | A | A | A | A | A |
| 5R6 | 5.6 | N | N | N | N | N | S | S | S | S | S | A | A | A | A | A |
| 6R0 | 6.0 | N | N | N | N | N | S | S | S | S | S | A | A | A | A | A |
| 6R8 | 6.8 | N | N | N | N | N | S | S | S | S | S | A | A | A | A | A |
| 7R0 | 7.0 | N | N | N | N | N | S | S | S | S | S | A | A | A | A | A |
| 8R0 | 8.0 | N | N | N | N | N | S | S | S | S | S | A | A | A | A | A |
| 8R2 | 8.2 | N | N | N | N | N | S | S | S | S | S | A | A | A | A | A |
| 9R0 | 9.0 | N | N | N | N | N | S | S | S | S | S | A | A | A | A | A |
| 100 | 10pF | N | N | N | N | N | S | S | S | S | S | A | A | A | A | A |
| 120 | 12 | N | N | N | N | N | S | S | S | S | S | A | A | A | A | A |
| 150 | 15 | N | N | N | N | N | S | S | S | S | S | A | A | A | A | A |
| 180 | 18 | N | N | N | N | N | S | S | S | S | S | A | A | A | A | A |
| 220 | 22 | N | N | N | N | N | S | S | S | S | S | A | A | A | A | A |
| 270 | 27 | N | N | N | N | N | S | S | S | S | S | A | A | A | A | A |
| 330 | 33 | N | N | N | N | N | S | S | S | S | S | A | A | A | A | A |
| 390 | 39 | N | N | N | N | N | S | S | S | S | S | A | A | A | A | A |
| 470 | 47 | N | N | N | N | N | S | S | S | S | S | A | A | A | A | A |
| 560 | 56 | N | N | N | N | N | S | S | S | S | S | A | A | A | A | A |
| 680 | 68 | N | N | N | N | N | S | S | S | S | S | A | A | A | A | A |
| 820 | 82 | N | N | N | N | N | S | S | S | S | S | A | A | A | A | A |
| 101 | 100pF | N | N | N | N | N | S | S | S | S | S | A | A | A | A | A |
| 121 | 120 | N | N | N | N | N | S | S | S | S | S | A | A | A | A | A |
| 151 | 150 | N | N | N | N | N | S | S | S | S | S | A | A | A | A | A |
| 181 | 180 | N | N | N | N | N | S | S | S | S | S | A | A | A | A | A |
| 221 | 220 | N | N | N | N | N | S | S | S | S | S | A | A | A | A | A |
| 271 | 270 | N | N | N | N | N | S | S | S | S | S | A | A | A | A | A |
| 331 | 330 | N | N | N | N | N | S | S | S | S | S | A | A | A | A | A |
| 391 | 390 | N | N | N | N | N | S | S | S | S | S | B | B | B | B | B |
| 471 | 470 | N | N | N | N | N | S | S | S | S | S | B | B | B | B | B |
| 561 | 560 | N | N | N | N | N | S | S | S | S | S | B | B | B | B | B |
| 681 | 680 | N | N | N | N | N | S | S | S | S | S | B | B | B | B | B |
| 821 | 820 | N | N | N | N | N | S | S | S | S | S | B | B | B | B | B |
| 102 | 1000pF | N | N | N | N | | S | S | S | S | S | B | B | B | B | B |
| 122 | 1200 | | | | | | X | X | X | X | X* | B | B | B | B | B |
| 152 | 1500 | | | | | | X | X | X | X | X* | B | B | B | B | B |
| 182 | 1800 | | | | | | X | X | X | X | | B | B | B | B | B |
| 222 | 2200 | | | | | | X | X | X | X | | B | B | B | B | B |
| 272 | 2700 | | | | | | X | X | X | X | | D | D | D | D | D |
| 332 | 3300 | | | | | | X | X | X | X | | D | D | D | D | D |
| 392 | 3900 | | | | | | X* | X* | X* | X* | | D | D | D | D | D |
| 472 | 4700 | | | | | | X* | X* | X* | X* | | D | D | D | D | D |
| 562 | 5600 | | | | | | X* | X* | X* | X* | | D | D | D | D | D |
| 682 | 6800 | | | | | | X* | X* | X* | X* | | D | D | D | D | D |
| 822 | 8200 | | | | | | X* | X* | X* | X* | | D | D | D | D | D |
| 103 | 0.01uF | | | | | | X* | X* | X* | X* | | D | D | D | D | D |
| 123 | 0.012 | | | | | | | | | | | T* | T* | T* | T* | |
| 153 | 0.015 | | | | | | | | | | | T* | T* | T* | T* | |
| 183 | 0.018 | | | | | | | | | | | D* | D* | D* | D* | |
| 223 | 0.022 | | | | | | | | | | | D* | D* | D* | D* | |

■The letter in cell is expressed the symbol of product thickness
 ■The letter in cell with "*" mark is expressed capacitance tolerance "J"(±5%) only

Multilayer Ceramic Chip Capacitor

Capacitance & Voltage (NPO)

| Dielectric | | NPO | | | | | | | | | | | | | |
|------------|--------|------|-----|-----|-----|------|------|-----|-----|-----|------|------|-----|-----|------|
| EIA | Size | 1206 | | | | | 1210 | | | | | 1812 | | | |
| Code | VDCW | 10V | 16V | 25V | 50V | 100V | 10V | 16V | 25V | 50V | 100V | 16V | 25V | 50V | 100V |
| 1R2 | 1.2 pF | B | B | B | B | B | | | | | | | | | |
| 1R5 | 1.5 | B | B | B | B | B | | | | | | | | | |
| 1R8 | 1.8 | B | B | B | B | B | | | | | | | | | |
| 2R2 | 2.2 | B | B | B | B | B | | | | | | | | | |
| 2R7 | 2.7 | B | B | B | B | B | | | | | | | | | |
| 3R3 | 3.3 | B | B | B | B | B | | | | | | | | | |
| 3R9 | 3.9 | B | B | B | B | B | | | | | | | | | |
| 4R7 | 4.7 | B | B | B | B | B | | | | | | | | | |
| 5R6 | 5.6 | B | B | B | B | B | | | | | | | | | |
| 6R8 | 6.8 | B | B | B | B | B | | | | | | | | | |
| 8R2 | 8.2 | B | B | B | B | B | | | | | | | | | |
| 100 | 10pF | B | B | B | B | B | C | C | C | C | C | D | D | D | D |
| 120 | 12 | B | B | B | B | B | C | C | C | C | C | D | D | D | D |
| 150 | 15 | B | B | B | B | B | C | C | C | C | C | D | D | D | D |
| 180 | 18 | B | B | B | B | B | C | C | C | C | C | D | D | D | D |
| 220 | 22 | B | B | B | B | B | C | C | C | C | C | D | D | D | D |
| 270 | 27 | B | B | B | B | B | C | C | C | C | C | D | D | D | D |
| 330 | 33 | B | B | B | B | B | C | C | C | C | C | D | D | D | D |
| 390 | 39 | B | B | B | B | B | C | C | C | C | C | D | D | D | D |
| 470 | 47 | B | B | B | B | B | C | C | C | C | C | D | D | D | D |
| 560 | 56 | B | B | B | B | B | C | C | C | C | C | D | D | D | D |
| 680 | 68 | B | B | B | B | B | C | C | C | C | C | D | D | D | D |
| 820 | 82 | B | B | B | B | B | C | C | C | C | C | D | D | D | D |
| 101 | 100pF | B | B | B | B | B | C | C | C | C | C | D | D | D | D |
| 121 | 120 | B | B | B | B | B | C | C | C | C | C | D | D | D | D |
| 151 | 150 | B | B | B | B | B | C | C | C | C | C | D | D | D | D |
| 181 | 180 | B | B | B | B | B | C | C | C | C | C | D | D | D | D |
| 221 | 220 | B | B | B | B | B | C | C | C | C | C | D | D | D | D |
| 271 | 270 | B | B | B | B | B | C | C | C | C | C | D | D | D | D |
| 331 | 330 | B | B | B | B | B | C | C | C | C | C | D | D | D | D |
| 391 | 390 | B | B | B | B | B | C | C | C | C | C | D | D | D | D |
| 471 | 470 | B | B | B | B | B | C | C | C | C | C | D | D | D | D |
| 561 | 560 | B | B | B | B | B | C | C | C | C | C | D | D | D | D |
| 681 | 680 | B | B | B | B | B | C | C | C | C | C | D | D | D | D |
| 821 | 820 | B | B | B | B | B | C | C | C | C | C | D | D | D | D |
| 102 | 1000pF | B | B | B | B | B | C | C | C | C | C | D | D | D | D |
| 122 | 1200 | B | B | B | B | B | C | C | C | C | C | D | D | D | D |
| 152 | 1500 | B | B | B | B | B | C | C | C | C | C | D | D | D | D |
| 182 | 1800 | B | B | B | B | B | C | C | C | C | C | D | D | D | D |
| 222 | 2200 | B | B | B | B | B | C | C | C | C | C | D | D | D | D |
| 272 | 2700 | B | B | B | B | B | C | C | C | C | C | D | D | D | D |
| 332 | 3300 | B | B | B | B | B | C | C | C | C | C | D | D | D | D |
| 392 | 3900 | B | B | B | B | B | C | C | C | C | C | D | D | D | D |
| 472 | 4700 | B | B | B | B | B | C | C | C | C | C | D | D | D | D |
| 562 | 5600 | B | B | B | B | B | C | C | C | C | C | D | D | D | D |
| 682 | 6800 | C | C | C | C | C | C | C | C | C | C | D | D | D | D |
| 822 | 8200 | D | D | D | D | D | C | C | C | C | C | D | D | D | D |
| 103 | 0.01uF | D | D | D | D | D | C | C | C | C | C | D | D | D | D |
| 123 | 0.012 | P | P | P | P | P | D | D | D | D | D | D | D | D | D |
| 153 | 0.015 | P | P | P | P | P | D | D | D | D | D | D | D | D | D |
| 183 | 0.018 | P | P | P | P | P | K | K | K | K | K | D | D | D | D |
| 223 | 0.022 | P | P | P | P | P | K | K | K | K | K | D | D | D | D |
| 273 | 0.027 | P | P | P | P | P | K | K | K | K | K | D | D | D | D |
| 333 | 0.033 | P | P | P | P | P | K | K | K | K | K | D | D | D | D |
| 393 | 0.039 | P | P | P | P | P | | | | | | M | M | M | M |
| 473 | 0.047 | J* | J* | J* | J* | J* | | | | | | M | M | M | M |
| 563 | 0.056 | J* | J* | J* | J* | J* | | | | | | M | M | M | M |
| 683 | 0.068 | G* | G* | G* | G* | G* | | | | | | M | M | M | M |
| 823 | 0.082 | G* | G* | G* | G* | G* | | | | | | M | M | M | M |
| 104 | 0.10uF | G* | G* | G* | G* | G* | | | | | | M | M | M | M |

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

■The letter in cell with "*" mark is expressed capacitance tolerance "J"(±5%) only

Multilayer Ceramic Chip Capacitor

Capacitance & Voltage (X7R)

| Dielectric | | X7R | | | | | | | | | | | | | | | | | |
|------------|--------|------|-----|-----|-----|-----|------|------|-----|-----|-----|-----|------|------|-----|-----|-----|-----|------|
| EIA | Size | 0402 | | | | | | 0603 | | | | | | 0805 | | | | | |
| Code | VDCW | 6.3V | 10V | 16V | 25V | 50V | 100V | 6.3V | 10V | 16V | 25V | 50V | 100V | 6.3V | 10V | 16V | 25V | 50V | 100V |
| 101 | 100pF | | N | N | N | N | N | | S | S | S | S | S | | B | B | B | B | B |
| 121 | 120 | | N | N | N | N | N | | S | S | S | S | S | | B | B | B | B | B |
| 151 | 150 | | N | N | N | N | N | | S | S | S | S | S | | B | B | B | B | B |
| 181 | 180 | | N | N | N | N | N | | S | S | S | S | S | | B | B | B | B | B |
| 221 | 220 | | N | N | N | N | N | | S | S | S | S | S | | B | B | B | B | B |
| 271 | 270 | | N | N | N | N | N | | S | S | S | S | S | | B | B | B | B | B |
| 331 | 330 | | N | N | N | N | N | | S | S | S | S | S | | B | B | B | B | B |
| 391 | 390 | | N | N | N | N | N | | S | S | S | S | S | | B | B | B | B | B |
| 471 | 470 | | N | N | N | N | N | | S | S | S | S | S | | B | B | B | B | B |
| 561 | 560 | | N | N | N | N | N | | S | S | S | S | S | | B | B | B | B | B |
| 681 | 680 | | N | N | N | N | N | | S | S | S | S | S | | B | B | B | B | B |
| 821 | 820 | | N | N | N | N | N | | S | S | S | S | S | | B | B | B | B | B |
| 102 | 1000pF | | N | N | N | N | N | | S | S | S | S | S | | B | B | B | B | B |
| 122 | 1200 | | N | N | N | N | N | | S | S | S | S | S | | B | B | B | B | B |
| 152 | 1500 | | N | N | N | N | N | | S | S | S | S | S | | B | B | B | B | B |
| 182 | 1800 | | N | N | N | N | N | | S | S | S | S | S | | B | B | B | B | B |
| 222 | 2200 | | N | N | N | N | N | | S | S | S | S | S | | B | B | B | B | B |
| 272 | 2700 | | N | N | N | N | N | | S | S | S | S | S | | B | B | B | B | B |
| 332 | 3300 | | N | N | N | N | N | | S | S | S | S | S | | B | B | B | B | B |
| 392 | 3900 | | N | N | N | N | N | | S | S | S | S | S | | B | B | B | B | B |
| 472 | 4700 | | N | N | N | N | N | | S | S | S | S | S | | B | B | B | B | B |
| 562 | 5600 | | N | N | N | N | | | S | S | S | S | S | | B | B | B | B | B |
| 682 | 6800 | | N | N | N | N | | | S | S | S | S | S | | B | B | B | B | B |
| 822 | 8200 | | N | N | N | N | | | S | S | S | S | S | | B | B | B | B | B |
| 103 | 0.01μF | | N | N | N | N | | | S | S | S | S | S | | B | B | B | B | B |
| 123 | 0.012 | | N | N | N | | | | S | S | S | S | X | | B | B | B | B | B |
| 153 | 0.015 | | N | N | N | | | | S | S | S | S | X | | B | B | B | B | B |
| 183 | 0.018 | | N | N | N | | | | S | S | S | S | X | | B | B | B | B | B |
| 223 | 0.022 | | N | N | N | | | | S | S | S | S | X | | B | B | B | B | B |
| 273 | 0.027 | | N | N | N | | | | S | S | S | S | X | | B | B | B | B | D |
| 333 | 0.033 | | N | N | N | | | | S | S | S | X | X | | B | B | B | B | D |
| 393 | 0.039 | | N | N | N | | | | S | S | S | X | X | | B | B | B | B | D |
| 473 | 0.047 | | N | N | N | N | | | S | S | S | X | X | | B | B | B | B | D |
| 563 | 0.056 | | N | N | | | | | S | S | S | X | X | | B | B | B | B | D |
| 683 | 0.068 | | N | N | | | | | S | S | S | X | X | | B | B | B | B | D |
| 823 | 0.082 | | N | N | | | | | S | S | S | X | X | | B | B | B | B | D |
| 104 | 0.10μF | N | N | N | N | N | | | S | S | S | X | X | | B | B | B | B | D |
| 124 | 0.12 | | | | | | | | S | S | X | | | | B | B | B | D | I |
| 154 | 0.15 | | | | | | | | S | S | X | | | | D | D | D | D | I |
| 184 | 0.18 | | | | | | | | S | S | X | | | | D | D | D | D | I |
| 224 | 0.22 | N | N | N | N | | | | S | S | X | X | | | D | D | D | D | I |
| 274 | 0.27 | | | | | | | X | X | X | X | | | | D | D | D | D | I |
| 334 | 0.33 | | | | | | | X | X | X | X | | | | D | D | D | D | I |
| 394 | 0.39 | | | | | | | X | X | X | X | | | | D | D | D | D | I |
| 474 | 0.47 | N | N | | | | | X | X | X | X | X | | | D | D | D | D | I |
| 564 | 0.56 | | | | | | | X | X | X | | | | | D | D | D | | |
| 684 | 0.68 | | | | | | | X | X | X | | | | | D | D | D | | |
| 824 | 0.82 | | | | | | | X | X | X | | | | | D | D | D | | |
| 105 | 1.0μF | N | | | | | | X | X | X | X | X | | | D | D | D | I | |
| 155 | 1.5 | | | | | | | | | | | | | | I | I | I | I | |
| 225 | 2.2 | | | | | | | X | X | X | | | | | I | I | I | I | |
| 335 | 3.3 | | | | | | | | | | | | | | | | | | |
| 475 | 4.7 | | | | | | | X | | | | | | | I | I | I | I | |
| 106 | 10 | | | | | | | | | | | | | | I | I | I* | | |

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

■The letter in cell with "*" mark is expressed capacitance tolerance "J"(±5%) only

Capacitance & Voltage (X7R)

| Dielectric | | X7R | | | | | | | | | | | | | | | | | |
|------------|--------|------|-----|-----|-----|-----|-----|------|------|-----|-----|-----|-----|------|------|-----|-----|-----|------|
| EIA | Size | 1206 | | | | | | | 1210 | | | | | | 1812 | | | | |
| Code | VDCW | 6.3V | 10V | 16V | 25V | 35V | 50V | 100V | 6.3V | 10V | 16V | 25V | 50V | 100V | 10V | 16V | 25V | 50V | 100V |
| 151 | 150 pF | | B | B | B | | B | B | | | | | | | | | | | |
| 181 | 180 | | B | B | B | | B | B | | | | | | | | | | | |
| 221 | 220 | | B | B | B | | B | B | | | | | | | | | | | |
| 271 | 270 | | B | B | B | | B | B | | | | | | | | | | | |
| 331 | 330 | | B | B | B | | B | B | | | | | | | | | | | |
| 391 | 390 | | B | B | B | | B | B | | | | | | | | | | | |
| 471 | 470 | | B | B | B | | B | B | | | | | | | | | | | |
| 561 | 560 | | B | B | B | | B | B | | | | | | | | | | | |
| 681 | 680 | | B | B | B | | B | B | | | | | | | | | | | |
| 821 | 820 | | B | B | B | | B | B | | | | | | | | | | | |
| 102 | 1000pF | | B | B | B | | B | B | | C | C | C | C | C | D | D | D | D | D |
| 122 | 1200 | | B | B | B | | B | B | | C | C | C | C | C | D | D | D | D | D |
| 152 | 1500 | | B | B | B | | B | B | | C | C | C | C | C | D | D | D | D | D |
| 182 | 1800 | | B | B | B | | B | B | | C | C | C | C | C | D | D | D | D | D |
| 222 | 2200 | | B | B | B | | B | B | | C | C | C | C | C | D | D | D | D | D |
| 272 | 2700 | | B | B | B | | B | B | | C | C | C | C | C | D | D | D | D | D |
| 332 | 3300 | | B | B | B | | B | B | | C | C | C | C | C | D | D | D | D | D |
| 392 | 3900 | | B | B | B | | B | B | | C | C | C | C | C | D | D | D | D | D |
| 472 | 4700 | | B | B | B | | B | B | | C | C | C | C | C | D | D | D | D | D |
| 562 | 5600 | | B | B | B | | B | B | | C | C | C | C | C | D | D | D | D | D |
| 682 | 6800 | | B | B | B | | B | B | | C | C | C | C | C | D | D | D | D | D |
| 822 | 8200 | | B | B | B | | B | B | | C | C | C | C | C | D | D | D | D | D |
| 103 | 0.01μF | | B | B | B | | B | B | | C | C | C | C | C | D | D | D | D | D |
| 123 | 0.012 | | B | B | B | | B | B | | C | C | C | C | C | D | D | D | D | D |
| 153 | 0.015 | | B | B | B | | B | B | | C | C | C | C | C | D | D | D | D | D |
| 183 | 0.018 | | B | B | B | | B | B | | C | C | C | C | C | D | D | D | D | D |
| 223 | 0.022 | | B | B | B | | B | B | | C | C | C | C | C | D | D | D | D | D |
| 273 | 0.027 | | B | B | B | | B | B | | C | C | C | C | C | D | D | D | D | D |
| 333 | 0.033 | | B | B | B | | B | B | | C | C | C | C | C | D | D | D | D | D |
| 393 | 0.039 | | B | B | B | | B | B | | C | C | C | C | C | D | D | D | D | D |
| 473 | 0.047 | | B | B | B | | B | B | | C | C | C | C | C | D | D | D | D | D |
| 563 | 0.056 | | B | B | B | | B | B | | C | C | C | C | C | D | D | D | D | D |
| 683 | 0.068 | | B | B | B | | B | B | | C | C | C | C | C | D | D | D | D | D |
| 823 | 0.082 | | B | B | B | | B | D | | C | C | C | C | C | D | D | D | D | D |
| 104 | 0.10μF | | B | B | B | | B | D | | C | C | C | C | C | D | D | D | D | D |
| 124 | 0.12 | | B | B | B | | B | D | | C | C | C | C | C | D | D | D | D | D |
| 154 | 0.15 | | C | C | C | | C | G | | C | C | C | C | D | D | D | D | D | D |
| 184 | 0.18 | | C | C | C | | C | G | | C | C | C | C | D | D | D | D | D | D |
| 224 | 0.22 | | C | C | C | | C | G | | C | C | C | C | D | D | D | D | D | D |
| 274 | 0.27 | | C | C | C | | D | G | | C | C | C | C | G | D | D | D | D | D |
| 334 | 0.33 | | C | C | C | | D | G | | C | C | C | D | G | D | D | D | D | D |
| 394 | 0.39 | | C | C | J | | P | G | | C | C | C | D | M | D | D | D | D | D |
| 474 | 0.47 | | J | J | J | | P | G | | C | C | C | D | M | D | D | D | D | K |
| 564 | 0.56 | | J | J | J | | P | P | | D | D | D | D | M | D | D | D | D | K |
| 684 | 0.68 | | J | J | J | | P | P | | D | D | D | D | K | D | D | D | K | K |
| 824 | 0.82 | | J | J | J | | P | P | | D | D | D | D | K | D | D | D | K | K |
| 105 | 1.0μF | | J | J | J | | P | P | | D | D | D | D | K | D | D | D | K | K |
| 155 | 1.5 | J | J | J | P | | | | | | K | G | M | M | | | | | K |
| 225 | 2.2 | J | J | J | P | | P | P | | | K | G | M | M | | | | M | M |
| 335 | 3.3 | | P | P | P | | | | | | K | G | | | | | | | |
| 475 | 4.7 | P | P | P | P | | P | | | K | K | K | M | M | | | | | |
| 106 | 10 | P | P | P | P | P | | | | K | K | K | M | | | | | | |
| 226 | 22 | P | P | P* | | | | | | M | M | M | | | | | | | |
| 476 | 47 | | | | | | | | M | M | | | | | | | | | |

■The letter in cell is expressed the symbol of product thickness
 ■The letter in cell with "*" mark is expressed capacitance tolerance "J"(±5%) only

Capacitance & Voltage (X5R)

| Dielectric | | X5R | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------------|---------|------|-----|-----|-----|-----|------|-----|-----|-----|-----|------|-----|-----|-----|-----|------|-----|-----|-----|-----|------|-----|-----|-----|-----|------|-----|-----|-----|-----|
| EIA | Size | 0402 | | | | | 0603 | | | | | 0805 | | | | | 1206 | | | | | 1210 | | | | | | | | | |
| Code | VDCW | 6.3V | 10V | 16V | 25V | 50V | 6.3V | 10V | 16V | 25V | 50V | 6.3V | 10V | 16V | 25V | 50V | 6.3V | 10V | 16V | 25V | 50V | 6.3V | 10V | 16V | 25V | 50V | 6.3V | 10V | 16V | 25V | 50V |
| 273 | 0.027μF | | | N | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 333 | 0.033 | | | N | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 393 | 0.039 | | | N | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 473 | 0.047 | N | N | N | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 563 | 0.056 | N | N | N | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 683 | 0.068 | N | N | N | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 823 | 0.082 | N | N | N | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 104 | 0.10μF | N | N | N | N | N | | | | | | | | | | | | | | | | | | | | | | | | | |
| 154 | 0.15 | N | N | N | N | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 224 | 0.22 | N | N | N | N | N | | | | | | | | | | | | | | | | | | | | | | | | | |
| 274 | 0.27 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 334 | 0.33 | N | N | | | | X | X | X | X | | | | | | | | | | | | | | | | | | | | | |
| 394 | 0.39 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 474 | 0.47 | N | N | E | E | E | X | X | X | X | X | | | | | | | | | | | | | | | | | | | | |
| 684 | 0.68 | N | N | | | | X | X | X | X | | | | | | | | | | | | | | | | | | | | | |
| 824 | 0.82 | | | | | | X | X | X | | | | | | | | | | | | | | | | | | | | | | |
| 105 | 1.0μF | N | N | N | N | E | X | X | X | X | X | | D | D | D | I | | | | | | | | | | | | | | | |
| 155 | 1.5 | | | | | | X | | | | | | I | I | I | I | | | | | | J | J | | | | K | K | | | |
| 225 | 2.2 | N | N | E | E | | X | X | X | X | X | I | I | I | I | I | | | | | | J | J | P | P | | K | K | | | |
| 335 | 3.3 | | | | | | X | X | | | | I | I | I | I | | | | | | | P | P | P | | | | | | | |
| 475 | 4.7 | E* | E* | E* | | | X | X | X | X | | I | I | I | I | I | | | | | | P | P | P | P | | K | K | K | | |
| 685 | 6.8 | | | | | | | | | | | | | | | | | | | | | P | P | | | | | | | | |
| 106 | 10μF | E* | E* | | | | X | X | X | X* | | I | I | I | I | I | | | | | | P | P | P | P | P | K | K | K | K | M |
| 226 | 22 | | | | | | X* | X* | | | | I | I* | I* | I* | | | | | | | P | P | P | P | | M | M | M | M | |
| 476 | 47 | | | | | | X* | | | | | I* | I* | | | | | | | | | P | P | P* | | | M | M | M | M* | |
| 107 | 100 | | | | | | | | | | | I* | | | | | | | | | | P | | | | | M | M | | | |

- The letter in cell is expressed the symbol of product thickness
- The letter in cell with "*" mark is expressed capacitance tolerance "K"(±10%) only

Capacitance & Voltage (Y5V)

| Dielectric | | Y5V | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------------|---------|------|----|----|----|----|------|----|----|----|----|------|----|----|----|----|------|-----|----|----|----|------|-----|-----|----|----|------|----|----|-----|----|----|----|----|-----|
| EIA | Size | 0402 | | | | | 0603 | | | | | 0805 | | | | | 1206 | | | | | 1210 | | | | | 1812 | | | | | | | | |
| Code | VDCW | 6.3 | 10 | 16 | 25 | 50 | 6.3 | 10 | 16 | 25 | 50 | 6.3 | 10 | 16 | 25 | 50 | 100 | 6.3 | 10 | 16 | 25 | 50 | 100 | 6.3 | 10 | 16 | 25 | 35 | 50 | 100 | 10 | 16 | 25 | 50 | 100 |
| 103 | 0.010μF | | N | N | N | N | | S | S | S | S | | A | A | A | A | B | | B | B | B | B | B | | | | | | | C | | | | D | |
| 153 | 0.015 | | N | N | N | N | | S | S | S | S | | A | A | A | A | B | | B | B | B | B | B | | | | | | | C | | | | D | |
| 223 | 0.022 | | N | N | N | N | | S | S | S | S | | A | A | A | A | B | | B | B | B | B | B | | | | | | | C | | | | D | |
| 333 | 0.033 | | N | N | N | N | | S | S | S | S | | A | A | A | A | B | | B | B | B | B | B | | | | | | | C | | | | D | |
| 473 | 0.047 | | N | N | N | | | S | S | S | S | | A | A | A | A | B | | B | B | B | B | B | | | | | | | C | | | | D | |
| 683 | 0.068 | | N | N | N | | | S | S | S | S | | A | A | A | A | B | | B | B | B | B | B | | | | | | | C | | | | D | |
| 104 | 0.10μF | | N | N | N | | | S | S | S | S | | A | A | A | A | B | | B | B | B | B | B | | C | C | C | | C | C | D | D | D | D | |
| 154 | 0.15 | | N | N | | | | S | S | S | S | | A | A | A | A | | | B | B | B | B | C | | C | C | C | | C | C | D | D | D | D | |
| 224 | 0.22 | N | N | N | | | | S | S | S | S | | A | A | A | A | | | B | B | B | B | C | | C | C | C | | C | C | D | D | D | D | |
| 334 | 0.33 | N | N | N | | | | S | S | S | X | | B | B | B | B | | | B | B | B | B | | | C | C | C | | C | C | D | D | D | D | |
| 474 | 0.47 | N | N | N | | | | S | S | X | X | | B | B | B | B | | | B | B | B | B | | | C | C | C | | C | | D | D | D | D | |
| 684 | 0.68 | N | | | | | | S | X | X | | | B | B | D | D | | | B | B | B | B | | | C | C | C | | C | | D | D | D | D | |
| 105 | 1.0μF | N | N | | | | | S | X | X | | | B | B | D | D | | | C | C | C | C | | | C | C | C | | C | | D | D | D | D | |
| 155 | 1.5 | | | | | | | S | | | | | D | D | | | | | C | C | C | | | | C | C | C | | | D | D | D | D | | |
| 225 | 2.2 | | | | | | S | S | X | | | | D | D | I | | | | C | C | C | J | | | C | C | C | | G | | D | D | D | D | |
| 335 | 3.3 | | | | | | | | | | | | D | D | | | | | J | J | J | | | | C | C | C | | | D | D | D | D | | |
| 475 | 4.7 | | | | | | X | X | | | | | D | D | I | | | | J | J | J | P | | | C | C | D | | G | | D | D | D | D | |
| 685 | 6.8 | | | | | | | | | | | | I | | | | | | J | J | | | | | C | C | D | | K | | D | D | D | D | |
| 106 | 10μF | | | | | | | | | | | I | I | I | | | | | J | J | P | | | | D | D | G | K | K | | D | D | D | K | |
| 226 | 22μF | | | | | | | | | | | I | I | | | | | | P | P | | | | | | K | K | | | | | | | | |
| 476 | 47μF | | | | | | | | | | | | | | | | | | P | | | | | | K | K | | | | | | | | M | |
| 107 | 100μF | | | | | | | | | | | | | | | | | | | | | | | | | M | | | | | | | | | |

Multilayer Ceramic Chip Capacitor

Environmental Characteristics

| Size | 0402, 0603, 0805, 1206, 1210, 1812 | | | |
|-------------------------------|---|-------------------------------------|-------------|----------------------------|
| Dielectric | NP0 | X7R | X5R | Y5V |
| Capacitance* | 0.1pF~0.1μF | 100pF~47μF | 27nF~100μF | 10nF~100μF |
| Capacitance tolerance | Cap ≤ 5pF: B (±0.1pF), C (±0.25pF) 5pF < Cap < 10pF: C (±0.25pF), D (±0.50pF) Cap ≥ 10pF: J (±5%) | J (± 5%) K (±10%) | | M (±20%) Z (-20 / +80%) |
| Rated voltage (VDCW) | 10V,16V, 25V, 50V, 100V | 6.3V, 10V, 16V, 25V, 35V, 50V, 100V | | |
| Q* | Cap < 30pF: Q ≥ 400 +20C Cap ≥ 30pF: Q ≥ 1000 | Note 1 | | |
| Insulation resistance at Ur** | ≥ 10GΩ or R×C ≥ 500Ω×F Whichever is less | | | |
| Operating temperature | -55 to +125°C | | -55 to 85°C | -25 to +85°C |
| Capacitance change | ±30 ppm | ±15% | | +30/-80% |
| Termination | Ni/Sn (lead-free termination) | | | |

- **Measured at the condition of 30~70% related humidity
- NP0: Apply 1.0±0.2Vrms, 1.0MHz±10% for Cap ≤ 1000pF and 1.0±0.2Vrms, 1.0 KHz±10% for Cap > 1000pF, 25°C ambient temperature
- X7R: Apply 1.0±0.2Vrms, 1.0KHz±10% at the condition of 25°C ambient temperature
- Y5V: Apply 1.0±0.2Vrms, 1.0 KHz±10% at the condition of 20°C ambient temperature

Note 1:

X7R / X5R

| Rated Vol. | D.F. | Exception of D.F. | |
|------------|--------|-------------------|--|
| ≥ 100V | ≤ 2.5% | ≤ 3% | 1206 ≥ 0.47μF |
| | | ≤ 5% | 0805 > 0.1μF; 0603 0.068μF 1206 > 1μF; 1210 ≥ 2.2μF |
| | | ≤ 10% | 0805 > 0.22μF; 1210 ≥ 3.3μF |
| 50V | ≤ 2.5% | ≤ 3% | 0201(50V); 0603 ≥ 0.047μF; 0805 ≥ 0.18μF; 1206 ≥ 0.47μF |
| | | ≤ 5% | 0201 ≥ 0.01uF; 1210 ≥ 4.7μF |
| | | ≤ 10% | 0402 ≥ 0.1μF; 0603 > 0.1μF; 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; 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; 0805 ≥ 0.68μF; 1206 ≥ 2.2μF; 1210 ≥ 4.7μF |
| | | ≤ 10% | 0201 ≥ 0.1uF(0201/X7R ≥ 0.022μF); 0402 ≥ 0.22uF; 0603 ≥ ; 1206 ≥ 4.7μF; 1210 ≥ 22μF |
| 10V | ≤ 5.0% | ≤ 10% | 0201 ≥ 0.012μF; 0402 ≥ 0.33μF(0402/X7R ≥ 0.22μF); 0603 ≥ 0.33μF; 0805 ≥ 2.2μF; 1206 ≥ 2.2μF; 1210 ≥ 22μF |
| | | ≤ 15% | 0201 ≥ 0.1μF |
| 6.3V | ≤ 10% | ≤ 15% | 0201 ≥ 0.1μF; 0402 ≥ 1μF; 0603 ≥ 10μF; 0805 ≥ 4.7μF; 1206 ≥ 47μF ; 1210 ≥ 100μF |
| | | ≤ 20% | 0402 ≥ 2.2μF |

Y5V

| 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; 0805 ≥ 0.33μF; 1206 ≥ 1μF; 1210 ≥ 4.7μF |
| | | ≤ 9% | 0402 ≥ 0.068μF; 0603 ≥ 0.47μF; 1206 ≥ 4.7μF; 1210 ≥ 22μF |
| 16V (C < 1.0μF) | ≤ 7% | ≤ 9% | 0402 ≥ 0.068μF; 0603 ≥ 0.68μF |
| | | ≤ 12.5% | 0402 ≥ 0.22μF |
| 16V (C ≥ 1.0μF) | ≤ 9% | ≤ 12.5% | 0603 ≥ 2.2μF; 0805 ≥ 3.3μF; 1206 ≥ 10μF; 1210 ≥ 22μF; 1812 ≥ 47μF |
| 10V | ≤ 12.5% | ≤ 20% | 0402 ≥ 0.47μF |
| 6.3V | ≤ 20% | --- | --- |

Multilayer Ceramic Chip Capacitor

■ Middle and High Voltage

Capacitance & Voltage (NPO 200V~3KV)

| Dielectric | | NPO | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------------|--------|------|-----|------|-----|-----|------|------|-----|-----|-----|------|------|------|-----|-----|-----|------|------|------|------|-----|------|------|------|------|------|-----|-----|-----|------|------|------|------|---|---|---|
| EIA | Size | 0603 | | 0805 | | | | 1206 | | | | | 1210 | | | | | 1808 | | | | | 1812 | | | | | | | | | | | | | | |
| Code | VDCW | 200 | 250 | 200 | 250 | 500 | 1000 | 200 | 250 | 500 | 630 | 1000 | 1500 | 2000 | 200 | 250 | 500 | 630 | 1000 | 1500 | 2000 | 500 | 630 | 1000 | 1500 | 2000 | 3000 | 200 | 250 | 500 | 1000 | 1500 | 2000 | 3000 | | | |
| 0R5 | 0.5pF | S | S | A | A | A | D | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1R0 | 1.0 | S | S | A | A | A | D | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1R2 | 1.2 | S | S | A | A | A | D | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1R5 | 1.5 | S | S | A | A | A | D | B | B | B | B | B | B | | | | | | | | | | | | | | | | | | | | | | | | |
| 1R8 | 1.8 | S | S | A | A | A | D | B | B | B | B | B | B | | | | | | | | | D | | | | | | | | | | | | | | | |
| 2R2 | 2.2 | S | S | A | A | A | D | B | B | B | B | B | B | | | | | | | | | D | D | D | D | D | | | | | | | | | | | |
| 2R7 | 2.7 | S | S | A | A | A | D | B | B | B | B | B | B | | | | | | | | | D | D | D | D | D | | | | | | | | | | | |
| 3R3 | 3.3 | S | S | A | A | A | D | B | B | B | B | B | B | | | | | | | | | D | D | D | D | D | | | | | | | | | | | |
| 3R9 | 3.9 | S | S | A | A | A | D | B | B | B | B | B | B | | | | | | | | | D | D | D | D | D | | | | | | | | | | | |
| 4R7 | 4.7 | S | S | A | A | A | D | B | B | B | B | B | B | | | | | | | | | D | D | D | D | D | | | | | | | | | | | |
| 5R6 | 5.6 | S | S | A | A | A | D | B | B | B | B | B | B | | | | | | | | | D | D | D | D | D | | | | | | | | | | | |
| 6R8 | 6.8 | S | S | A | A | A | D | B | B | B | B | B | B | | | | | | | | | D | D | D | D | D | | | | | | | | | | | |
| 8R2 | 8.2 | S | S | A | A | A | D | B | B | B | B | B | B | | | | | | | | | D | D | D | D | D | | | | | | | | | | | |
| 100 | 10pF | S | S | A | A | A | D | B | B | B | B | B | B | C | C | C | C | C | C | C | C | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | |
| 120 | 12 | S | S | A | A | A | D | B | B | B | B | B | B | C | C | C | C | C | C | C | C | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | |
| 150 | 15 | S | S | A | A | A | D | B | B | B | B | B | B | C | C | C | C | C | C | C | C | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | |
| 180 | 18 | S | S | A | A | A | D | B | B | B | B | B | B | C | C | C | C | C | C | C | C | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | |
| 220 | 22 | S | S | A | A | A | D | B | B | B | B | B | B | C | C | C | C | C | C | C | C | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | |
| 270 | 27 | S | S | A | A | A | D | B | B | B | B | B | B | C | C | C | C | C | C | C | C | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | |
| 330 | 33 | S | S | A | A | A | D | B | B | B | B | B | B | C | C | C | C | C | C | C | C | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | |
| 390 | 39 | S | S | A | A | A | D | B | B | B | B | B | B | C | C | C | C | C | C | C | C | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | |
| 470 | 47 | S | S | A | A | A | D | B | B | B | B | C | C | C | C | C | C | C | C | C | C | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | |
| 560 | 56 | S | S | A | A | A | D | B | B | B | B | C | D | C | C | C | C | C | C | C | C | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | |
| 680 | 68 | S | S | A | A | A | D | B | B | B | B | C | D | C | C | C | C | C | C | C | C | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | |
| 820 | 82 | S | S | A | A | B | D | B | B | B | B | D | D | C | C | C | C | C | C | C | C | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | |
| 101 | 100pF | S | S | A | B | B | D | B | B | B | B | D | D | C | C | C | C | C | C | C | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | |
| 121 | 120 | S | S | A | B | D | D | B | B | B | B | D | G | C | C | C | C | C | C | C | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | |
| 151 | 150 | S | S | B | D | D | D | B | B | B | B | D | G | C | C | C | C | C | C | C | D | G | D | D | D | D | D | D | D | D | D | D | D | D | D | D | |
| 181 | 180 | S | S | B | D | D | D | B | B | B | B | G | G | C | C | C | C | C | C | C | D | G | D | D | D | D | D | D | D | D | D | D | D | D | D | K | K |
| 221 | 220 | S | S | D | D | D | D | B | B | B | B | G | G | C | C | C | C | C | C | C | G | G | D | D | D | D | D | D | D | D | D | D | D | D | D | K | K |
| 271 | 270 | X | X | D | D | D | D | B | C | C | C | G | P | C | C | C | C | C | C | G | K | D | D | D | D | D | D | D | D | D | D | D | D | D | K | K | |
| 331 | 330 | X | X | D | D | D | D | B | C | C | C | G | P | C | C | C | C | C | C | G | K | K | K | K | K | K | K | D | D | D | D | D | D | D | K | K | |
| 391 | 390 | X | X | D | D | D | D | B | C | C | C | G | P | C | C | C | C | C | C | G | M | K | K | K | K | | | D | D | D | D | D | D | D | K | K | |
| 471 | 470 | X | X | D | D | I | | C | C | C | C | G | | C | C | C | C | C | C | G | M | K | K | K | K | | | D | D | D | D | D | D | D | K | K | |
| 561 | 560 | | | D | D | I | | C | D | D | D | G | | C | C | C | C | C | C | G | | K | K | K | K | | | D | D | D | D | D | D | D | K | K | |
| 681 | 680 | | | D | D | I | | C | D | D | D | G | | C | C | C | C | C | C | G | | K | K | K | K | | | D | D | D | D | D | D | D | K | K | |
| 821 | 820 | | | D | D | I | | C | G | G | G | G | | C | C | C | C | C | C | G | | K | K | | | | | D | D | D | D | D | D | D | K | K | |
| 102 | 1000pF | | | D | D | I | | C | G | G | G | G | | D | D | D | D | D | D | G | | K | K | | | | | D | D | D | D | D | D | D | K | K | |
| 122 | 1200 | | | D | D | | | C | G | G | G | | | D | D | D | D | D | D | | | K | | | | | | D | D | D | D | D | D | D | K | | |
| 152 | 1500 | | | D | D | | | D | G | G | G | | | D | D | D | D | D | D | | | K | | | | | | D | D | D | D | D | D | D | K | | |
| 182 | 1800 | | | D | D | | | D | G | G | G | | | D | D | D | D | D | D | | | K | | | | | | D | D | D | D | D | D | D | D | | |
| 222 | 2200 | | | D | D | | | D | G | G | G | | | D | D | D | D | D | D | | | K | | | | | | D | D | D | D | D | D | D | D | | |
| 272 | 2700 | | | | | | | D | G | | | | | D | D | D | D | D | D | | | | | | | | | D | D | D | D | D | D | D | D | | |
| 332 | 3300 | | | | | | | D | G | | | | | D | D | D | D | D | D | | | | | | | | | D | D | D | D | D | D | D | D | | |
| 392 | 3900 | | | | | | | D | G | | | | | D | D | D | D | D | D | | | | | | | | | D | D | D | D | D | D | D | D | | |
| 472 | 4700 | | | | | | | D | G | | | | | G | G | | | | | | | | | | | | | D | D | D | D | D | D | D | D | | |
| 562 | 5600 | | | | | | | | | | | | | G | G | | | | | | | | | | | | | D | D | D | D | D | D | D | D | | |
| 682 | 6800 | | | | | | | | | | | | | G | G | | | | | | | | | | | | | D | D | D | D | D | D | D | D | | |
| 822 | 8200 | | | | | | | | | | | | | G | G | | | | | | | | | | | | | | | | | | | | | | |
| 103 | 0.01uF | | | | | | | | | | | | | G | G | | | | | | | | | | | | | | | | | | | | | | |

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

Multilayer Ceramic Chip Capacitor

Capacitance & Voltage (X7R 200V~3KV)

| Dielectric | | X7R | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------------|---------|--------------|------|------|--------------|-------|--------------|--------------|-------|-------|-------|--------------|--------------|-------|-------|-------|--------------|-------|----------------|-------|--------------|--------------|-------|----------------|-------|--|--|--|--|
| EIA | Size | 0603 | | | | | 0805 | | | | | 1206 | | | | | 1210 | | | | 1808 | | | | 1812 | | | | |
| Code | VDCW | 200V 250V | 200V | 250V | 500V 630V | 1000V | 200V 250V | 500V 630V | 1000V | 1500V | 2000V | 200V 250V | 500V 630V | 1000V | 1500V | 2000V | 500V 630V | 1000V | 1500V 2000V | 3000V | 200V 250V | 500V 630V | 1000V | 1500V 2000V | 3000V | | | | |
| 101 | 100pF | X | B | B | B | B | D | D | D | D | D | D | D | D | D | D | D | D | D | D | | | | | | | | | |
| 121 | 120 | X | B | B | B | B | D | D | D | D | D | D | D | D | D | D | D | D | D | D | | | | | | | | | |
| 151 | 150 | X | B | B | B | B | D | D | D | D | D | D | D | D | D | D | D | D | D | D | | | | | | | | | |
| 181 | 180 | X | B | B | B | B | D | D | D | D | D | D | D | D | D | D | D | D | D | D | | | | | | | | | |
| 221 | 220 | X | B | B | B | B | D | D | D | D | D | D | D | D | D | D | D | D | D | D | | | | | | | | | |
| 271 | 270 | X | B | B | B | B | D | D | D | D | D | D | D | D | D | D | D | D | D | D | | | D | D | K | | | | |
| 331 | 330 | X | B | B | B | B | D | D | D | D | D | D | D | D | D | D | D | D | D | K | | | D | D | K | | | | |
| 391 | 390 | X | B | B | B | B | D | D | D | D | D | D | D | D | D | D | D | D | D | K | | | D | D | K | | | | |
| 471 | 470 | X | B | B | B | B | D | D | D | D | D | D | D | D | D | D | D | D | D | K | | | D | D | K | | | | |
| 561 | 560 | X | B | B | B | B | D | D | D | D | D | D | D | D | D | D | D | D | D | K | | | D | D | K | | | | |
| 681 | 680 | X | B | B | B | B | D | D | D | D | D | C | D | D | D | D | D | D | D | K | | | D | D | K | | | | |
| 821 | 820 | X | B | B | B | B | D | D | D | D | D | C | D | D | D | D | D | D | D | K | | | D | D | K | | | | |
| 102 | 1000pF | X | B | B | B | B | D | D | D | D | D | C | D | D | D | D | D | D | K | K | D | D | D | D | K | | | | |
| 122 | 1200 | X | B | B | B | B | D | D | D | G | G | C | D | D | M | D | D | K | K | D | D | D | D | D | K | | | | |
| 152 | 1500 | X | B | B | B | D | D | D | D | G | G | C | D | D | M | D | D | K | K | D | D | D | D | D | K | | | | |
| 182 | 1800 | X | B | B | B | D | D | D | D | G | G | C | D | D | M | D | D | K | K | D | D | D | D | G | M | | | | |
| 222 | 2200 | X | B | B | B | D | D | D | D | G | G | C | D | D | M | D | D | K | | D | D | D | D | G | M | | | | |
| 272 | 2700 | X | B | B | B | | D | D | D | G | G | C | D | D | M | D | D | K | | D | D | D | D | G | M | | | | |
| 332 | 3300 | X | B | B | B | | D | D | D | G | G | C | D | D | M | D | D | K | | D | D | D | D | K | M | | | | |
| 392 | 3900 | X | B | B | B | | D | D | D | G | | C | D | D | M | D | D | K | | D | D | D | D | K | | | | | |
| 472 | 4700 | X | B | B | D | | D | D | D | G | | C | D | D | M | D | D | K | | D | D | D | D | K | | | | | |
| 562 | 5600 | X | D | D | D | | D | D | D | G | | C | D | D | | K | K | K | | D | D | D | D | M | | | | | |
| 682 | 6800 | X | D | D | D | | D | D | D | G | | C | D | D | | K | K | | | D | D | D | D | M | | | | | |
| 822 | 8200 | X | D | D | D | | D | D | D | | | C | D | D | | K | K | | | D | D | D | D | M | | | | | |
| 103 | 0.010μF | X | D | D | D | | D | D | D | | | C | D | D | | K | K | | | D | D | D | D | M | | | | | |
| 123 | 0.012 | | D | D | D | | D | D | G | | | C | D | D | | K | K | | | D | D | D | D | K | | | | | |
| 153 | 0.015 | | D | D | D | | D | D | G | | | C | D | D | | K | K | | | D | D | D | D | K | | | | | |
| 183 | 0.018 | | D | D | D | | D | D | | | | C | D | D | | K | K | | | D | D | D | D | M | | | | | |
| 223 | 0.022 | | D | D | D | | D | G | | | | C | D | D | | K | K | | | D | D | D | D | M | | | | | |
| 273 | 0.027 | | D | D | | | D | G | | | | C | G | | | K | K | | | D | D | D | D | M | | | | | |
| 333 | 0.033 | | D | D | | | G | G | | | | C | G | | | K | K | | | D | D | D | D | M | | | | | |
| 393 | 0.039 | | D | D | | | G | G | | | | C | G | | | K | K | | | D | D | D | D | M | | | | | |
| 473 | 0.047 | | D | D | | | G | G | | | | D | G | | | K | K | | | D | D | D | D | M | | | | | |
| 563 | 0.056 | | D | D | | | G | G | | | | D | G | | | K | | | | D | D | D | D | M | | | | | |
| 683 | 0.068 | | D | | | | G | | | | | G | K | | | K | | | | D | D | D | D | M | | | | | |
| 823 | 0.082 | | D | | | | G | | | | | G | K | | | | | | | D | D | D | D | M | | | | | |
| 104 | 0.10μF | | D | | | | G | | | | | G | K | | | | | | | D | D | D | D | M | | | | | |
| 124 | 0.12 | | | | | | | | | | | G | | | | | | | | D | D | D | D | M | | | | | |
| 154 | 0.15 | | | | | | | | | | | M | | | | | | | | K | D | D | D | M | | | | | |
| 184 | 0.18 | | | | | | | | | | | M | | | | | | | | K | D | D | D | M | | | | | |
| 224 | 0.22 | | | | | | | | | | | M | | | | | | | | K | D | D | D | M | | | | | |
| 274 | 0.27 | | | | | | | | | | | M | | | | | | | | K | D | D | D | M | | | | | |
| 334 | 0.33 | | | | | | | | | | | M | | | | | | | | K | D | D | D | M | | | | | |
| 394 | 0.39 | | | | | | | | | | | M | | | | | | | | K | D | D | D | M | | | | | |
| 474 | 0.47 | | | | | | | | | | | M | | | | | | | | K | D | D | D | M | | | | | |
| 564 | 0.56 | | | | | | | | | | | | | | | | | | | | D | D | D | D | M | | | | |
| 684 | 0.68 | | | | | | | | | | | | | | | | | | | | D | D | D | D | M | | | | |
| 824 | 0.82 | | | | | | | | | | | | | | | | | | | | D | D | D | D | M | | | | |
| 105 | 1μF | | | | | | | | | | | | | | | | | | | | D | D | D | D | M | | | | |

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

Multilayer Ceramic Chip Capacitor

Capacitance & Voltage (Y5V 200V~250V)

| Dielectric | | Y5V | | | | | | | |
|------------|---------|------|-----|------|-----|------|-----|------|-----|
| EIA | Size | 0805 | | 1206 | | 1210 | | 1812 | |
| Code | VDCW | 200 | 250 | 200 | 250 | 200 | 250 | 200 | 250 |
| 103 | 0.010μF | 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 | 0.10μF | | | 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 | | 0805,1206,1210,1812 |
| Capacitance* | 0.5pF~0.01μF | | 0.01μF~0.68μF |
| Capacitance tolerance | Cap ≤ 5pF: C (±0.25pF) 5pF < Cap < 10pF: D (±0.50pF) Cap ≥ 10pF: J (±5%), K (±10%) | | K (±10%) M (±20%) Z (-20 / +80%) |
| Rated voltage (VDCW) | 200V to 3KV | | 200V, 250V |
| DF/Q | Cap < 30pF: Q ≥ 400 +20C Cap ≥ 30pF: Q ≥ 1000 | | DF ≤ 5% |
| Insulation resistance at Ur | Ur=200~630V: ≥ 10GΩ or R×C ≥ 100Ω·F Whichever is smaller Ur=1000~3000V: ≥ 10GΩ | | |
| Dielectric Strength | 200~300V: ≥ 2×VDCW 500~999V: ≥ 1.5×VDCW 1000~3000V: ≥ 1.2×VDCW | | |
| Operating temperature | -55 to +125°C | | -25 to +85°C |
| Capacitance change | ±30 ppm | | ±15% +30/-80% |
| Termination | Ni/Sn (lead-free termination) | | |

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

■ NP0: Apply 1.0±0.2Vrms, 1.0MHz±10% for Cap ≤ 1000pF and 1.0±0.2Vrms, 1.0KHz±10% for Cap > 1000pF, 25°C ambient temperature

■ X7R, X5R: Apply 1.0±0.2Vrms, 1.0KHz±10% at the condition of 25°C ambient temperature

■ Y5V: Apply 1.0±0.2Vrms, 1.0KHz±10% at the condition of 20°C ambient temperature

Multilayer Ceramic Chip Capacitor

Ultra-small 0201 Capacitors

Capacitance & Voltage

| EIA | Size | 0201 | | |
|------|-------|------|-----|-----|
| | | NPO | | |
| Code | VDCW | 16V | 25V | 50V |
| 0R1 | 0.1pF | L | L | L |
| 0R2 | 0.2 | L | L | L |
| 0R3 | 0.3 | L | L | L |
| 0R4 | 0.4 | L | L | L |
| 0R5 | 0.5 | L | L | L |
| 0R6 | 0.6 | L | L | L |
| 0R7 | 0.7 | L | L | L |
| 0R8 | 0.8 | L | L | L |
| 0R9 | 0.9 | L | L | L |
| 1R0 | 1.0 | L | L | L |
| 1R2 | 1.2 | L | L | L |
| 1R5 | 1.5 | L | L | L |
| 1R8 | 1.8 | L | L | L |
| 2R2 | 2.2 | L | L | L |
| 2R7 | 2.7 | L | L | L |
| 3R0 | 3.0 | L | L | L |
| 3R3 | 3.3 | L | L | L |
| 3R9 | 3.9 | L | L | L |
| 4R0 | 4.0 | L | L | L |
| 4R7 | 4.7 | L | L | L |
| 5R0 | 5.0 | L | L | L |
| 5R6 | 5.6 | L | L | L |
| 6R0 | 6.0 | L | L | L |
| 6R8 | 6.8 | L | L | L |
| 7R0 | 7.0 | L | L | L |
| 8R2 | 8.2 | L | L | L |
| 9R0 | 9.0 | L | L | L |
| 100 | 10 | L | L | L |
| 120 | 12 | L | L | L |
| 150 | 15 | L | L | L |
| 180 | 18 | L | L | L |
| 220 | 22 | L | L | L |
| 270 | 27 | L | L | L |
| 330 | 33 | L | L | L |
| 390 | 39 | L | L | L |
| 470 | 47 | L | L | L |
| 560 | 56 | L | L | L |
| 680 | 68 | L | L | L |
| 820 | 82 | L | L | L |
| 101 | 100 | L | L | L |
| 121 | 120 | L | L | L |
| 151 | 150 | L | L | L |
| 271 | 270 | L | L | L |
| 331 | 330 | L | L | L |
| 391 | 390 | L | L | L |
| 471 | 470 | L | L | L |
| 561 | 560 | L | L | L |

| EIA | Size | 0201 | | | | | | | | | |
|------|---------|------|-----|-----|-----|-----|------|-----|-----|-----|-----|
| | | X7R | | | | | X5R | | | | |
| Code | VDCW | 6.3V | 10V | 16V | 25V | 50V | 6.3V | 10V | 16V | 25V | 50V |
| 101 | 100pF | | | L | L | L | | | L | L | L |
| 121 | 120 | | | L | L | L | | | L | L | L |
| 151 | 150 | | | L | L | L | | | L | L | L |
| 181 | 180 | | | L | L | L | | | L | L | L |
| 221 | 220 | | | L | L | L | | | L | L | L |
| 271 | 270 | | | L | L | L | | | L | L | L |
| 331 | 330 | | | L | L | L | | | L | L | L |
| 391 | 390 | | | L | L | L | | | L | L | L |
| 471 | 470 | | | L | L | L | | | L | L | L |
| 561 | 560 | | | L | L | L | | | L | L | L |
| 681 | 680 | | | L | L | L | | | L | L | L |
| 821 | 820 | | | L | L | L | | | L | L | L |
| 102 | 1000 | L | L | L | L | L | | L | L | L | L |
| 122 | 1200 | L | L | L | L | L | | | | | |
| 152 | 1500 | L | L | L | L | L | | L | L | | |
| 182 | 1800 | L | L | L | L | L | | | | | |
| 222 | 2200 | L | L | L | L | L | | L | L | | |
| 272 | 2700 | L | L | L | L | L | | L | L | | |
| 332 | 3300 | L | L | L | L | L | | L | L | | |
| 392 | 3900 | L | L | L | L | L | | | | | |
| 472 | 4700 | L | L | L | L | L | | L | L | | |
| 562 | 5600 | L | L | L | L | L | | | | | |
| 682 | 6800 | L | L | L | L | L | | L | | | |
| 822 | 8200 | L | L | L | L | L | | | | | |
| 103 | 0.010μF | L | L | L | L | L | L | L | L | L | L |
| 153 | 0.015 | | | | | | L | L | | | |
| 223 | 0.022 | | L | | | | L | L | | | |
| 273 | 0.027 | | | | | | L | L | | | |
| 333 | 0.033 | | | | | | L | L | | | |
| 393 | 0.039 | | | | | | L | L | | | |
| 473 | 0.047 | | | | | | L | L | | | |
| 563 | 0.056 | | | | | | L | L | | | |
| 683 | 0.068 | | | | | | L | L | | | |
| 823 | 0.082 | | | | | | L | L | | | |
| 104 | 0.100 | | | | | | L | L | L | L | |
| 224 | 0.220 | | | | | | L | L | L* | | |
| 474 | 0.470 | | | | | | L | | | | |
| 105 | 1μF | | | | | | L | L* | | | |
| 225 | 2.2 | | | | | | L* | L* | | | |

- The letter in cell is expressed the symbol of product thickness
- The letter in cell with "*" mark is expressed capacitance tolerance "K"(±10%) only

Electrical Data

| Size | 0201 | | | |
|-----------------------|------------|--|--------------------------|--------------------------|
| | Dielectric | NPO | X7R | X5R |
| Capacitance* | | 0.1pF~560pF | 100pF~22nF | 100pF~2.2μF |
| Capacitance tolerance | | Cap ≤ 5pF: C (±0.25pF) 5pF < Cap < 10pF: D (±0.50pF) Cap ≥ 10pF: J (±5%) | J (±5%) K (±10%) | K (±10%) M (±20%) |
| Rated voltage (VDCW) | | 16V, 25V, 50V | 6.3V, 10V, 16V, 25V, 50V | 6.3V, 10V, 16V, 25V, 50V |
| Operating temperature | | -55 to +125°C | | -55 to +85°C |
| Capacitance change | | ±30 ppm | ±15% | |
| Termination | | Ni/Sn (lead-free termination) | | |

- *Measured at 30~70% related humidity
- NPO: Apply 1.0±0.2Vrms, 1.0MHz±10% at the condition of 25°C ambient temperature
- X7R, X5R: Apply 1.0±0.2Vrms, 1.0KHz±10% at the condition of 25°C ambient temperature

Multilayer Ceramic Chip Capacitor

■ 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 | L | N | N | N | N | S | S | S | T | T | T | T |
| 240 | 24 | L | L | L | L | N | N | N | N | S | S | S | T | T | T | T |
| 270 | 27 | L | L | L | L | N | N | N | N | S | S | S | T | T | T | T |
| 300 | 30 | L | L | L | L | N | N | N | N | S | S | S | T | T | T | T |
| 330 | 33 | L | L | L | L | N | N | N | N | S | S | S | T | T | T | T |
| 360 | 36 | | | | | N | N | N | N | S | S | S | T | T | T | T |
| 390 | 39 | | | | | N | N | N | N | S | S | S | T | T | T | T |
| 430 | 43 | | | | | N | N | N | N | S | S | S | T | T | T | T |
| 470 | 47 | | | | | N | 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 | T |
| 101 | 100 | | | | | N | | | | S | S | S | T | T | T | T |

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

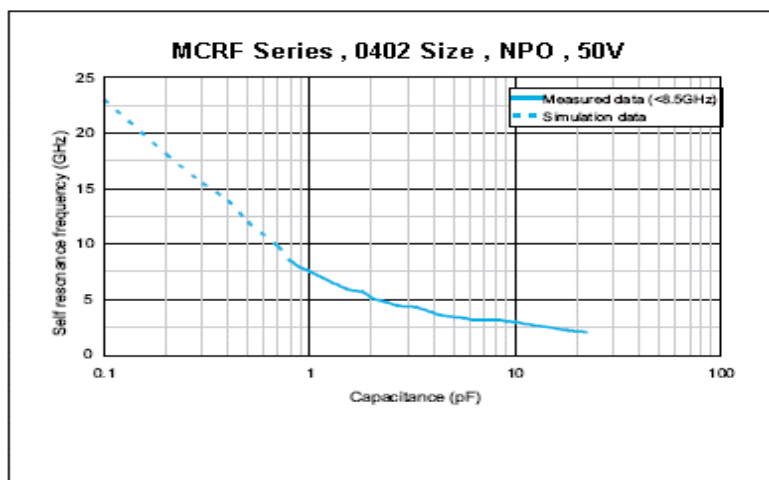
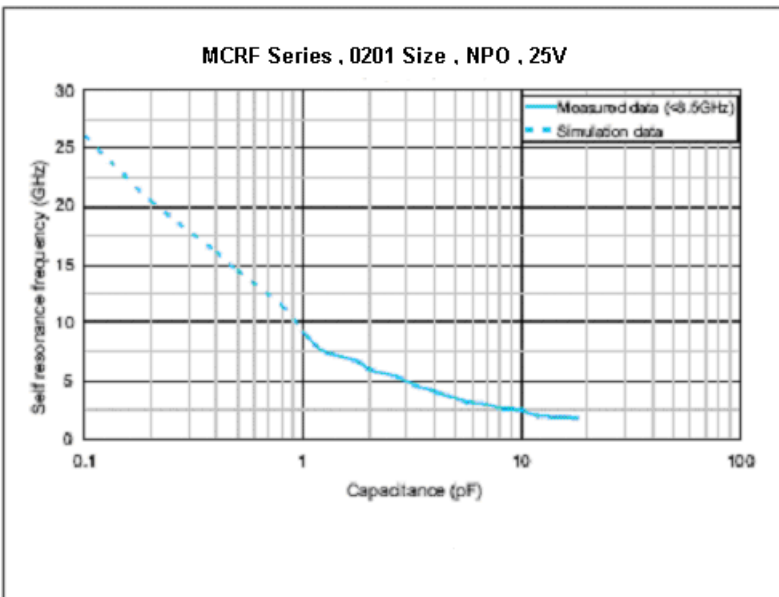
Multilayer Ceramic Chip Capacitor

Electrical Data

| Dielectric | NPO |
|-----------------------------|--|
| Size | 0201, 0402, 0603, 0805 |
| Capacitance* | 0201: 0.1pF ~ 33pF, 0402: 0.1pF ~ 100pF 0603: 0.3pF ~ 100pF, 0805: 0.3pF ~ 100pF |
| Capacitance tolerance** | Cap ≤ 5pF: A(±0.05pF), B(±0.1pF), C(±0.25pF) 5pF < Cap < 10pF: B(±0.1pF), C(±0.25pF), D(±0.5pF) 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

Low Inductance Capacitors for MCLI Series

Capacitance & Voltage

| Dielectric | | X7R |
|------------|------|------|
| EIA | Size | 0612 |
| Code | VDCW | 50V |
| 103 | 10nF | B |
| 123 | 12 | B |
| 153 | 15 | B |
| 183 | 18 | B |
| 223 | 22 | B |
| 273 | 27 | B |
| 333 | 33 | B |
| 393 | 39 | B |
| 473 | 47 | B |
| 563 | 56 | B |
| 683 | 68 | B |
| 823 | 82 | B |
| 104 | 100 | B |
| 124 | 120 | B |
| 154 | 150 | B |

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

General Electrical data

| Size | 0612 |
|-----------------------------|---|
| Dielectric | X7R |
| Capacitance* | 10nF~150nF |
| Capacitance tolerance | K (±10%) M (±20%) |
| Rated voltage (WVDC) | 50V |
| Tan δ * | ≤2.5% |
| Insulation resistance at Ur | ≥ 10GΩ or R×C≥ 500Ω×F Whichever is less |
| Operating temperature | -55 to +125°C |
| Capacitance change | ±15% |
| Termination | Ni/Sn (lead-free termination) |
| ESL | 500pH |

■ **Measured at 1.0±0.2Vrms, 1.0KHz±10%, 30~70% related humidity, 25°C ambient temperature

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

| Item | Requirement | Test Method | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|--|--|-----------------------|-----------------------|---|---|--|--|---|---|-----------|--|------|----------------|-----|---------------------|-----|---------------------|-----|--------------------|-----|--------------------|------|------|--------------|-------------|---------------------|---------------|---------------|--------------------|--|----------------|------|------|-------------|--------------|---------------------|----------------|-----------------|----------------|------|------|--------------|--------------|----------------------|----------------------|-----------------|-----------------|
| Insulation Resistance | 10GΩ or R×C≥ 500Ω·F Whichever is smaller X7R, X5R, Y5V: | To apply rated voltage for max. 120sec *Before initial measurement (Class II only): To apply de-aging at 150°C for 1hr then set for 24±2 hrs at room temp. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
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| | Rated Voltage | | Insulation Resistance | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 100V: X7R 50V: 0402>0.01μF;0603≥1μF;0805≥1μF; 1206≥4.7μF;1210≥4.7μF | 10GΩ or R×C ≥ 100Ω·F Whichever is smaller | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 35V: 0805≥2.2μF;1206≥ 2.2μF;1210≥ 10μF | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 25V: 0402≥1uF;0603≥2.2uF;0805≥2.2uF 1206≥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≥0.47uF 0805≥2.2uF;1206≥4.7uF;1210≥47uF | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 6.3V | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| ≥ 10GΩ or 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> <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% | <p>With no electrical load.</p> <table border="1"> <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> <p>*Before initial measurement (Class II only): To apply de-aging at 150°C for 1hr then set for 24±2 hrs at room temp. * Measurement voltage for Class II:</p> <table border="1"> <tr> <td>0201</td> <td>0402</td> </tr> <tr> <td>Cap<0.1μF:1V</td> <td>Cap<1μF: 1V</td> </tr> <tr> <td>0.1μF≤Cap<1μF: 0.2V</td> <td>Cap=1μF: 0.5V</td> </tr> <tr> <td>Cap≥1μF: 0.1V</td> <td>1μF<Cap<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<10μF: 1V</td> </tr> <tr> <td>1μF<Cap≤4.7μF: 0.5V</td> <td>Cap=10μF: 0.5V</td> </tr> <tr> <td>Cap>4.7μF: 0.2V</td> <td>Cap>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<Cap≤100μF: 0.5V</td> <td>10μF<Cap≤100μF: 0.5V</td> </tr> <tr> <td>Cap>100μF: 0.2V</td> <td>Cap>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: 0201:2N 0402&0603:5N>0603:10N 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.(two hrs each in three mutually Perpendicular directions.) *Before initial measurement (Class II only): To apply de-aging at 150°C for 1hr then set for 24±2 hrs at room temp. *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 Dipping time: 2±0.5 sec. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

Multilayer Ceramic Chip Capacitor

| Item | Requirement | Test Method | | | | | | | | | | | | | | | |
|------------------------------|---|--|------|-----------|-----------|---|---------------------------|------------|---|-----------|-----|---|---------------------------|------------|---|------------|-----|
| Bending Test | No remarkable damage. Cap change : NP0: within $\pm 5\%$ or 0.5pF whichever is larger X7R, X5R, X6S, X7S: within $\pm 12.5\%$ Y5V: within $\pm 30\%$ (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 1 mm per second until the deflection becomes 1 mm and then the pressure shall be maintained for 5 ± 1 sec. *Before initial measurement (Class II only): To apply de-aging at 150°C for 1hr then set for 24 \pm 2 hrs at room temp. Measurement to be made after keeping at room temp. for 24 \pm 2 hrs. | | | | | | | | | | | | | | | |
| Resistance to Soldering Heat | No remarkable damage. Cap change: NP0: within $\pm 2.5\%$ or 0.25pF whichever is larger X7R, X5R, X6S, X7S: within $\pm 7.5\%$ Y5V: within $\pm 20\%$ Q/D.F., I.R. and dielectric strength: To meet initial requirements. 25% max. leaching on each edge | Solder temperature: 260 \pm 5°C Dipping time: 10 \pm 1 sec Preheating: 120 to 150°C for 1 minute before immerse the capacitor in a eutectic solder. *Before initial measurement (Class II only): To apply de-aging at 150°C for 1hr then set for 24 \pm 2 hrs at room temp. Cap. / DF(Q) / I.R. Measurement to be made after de-aging at 150°C for 1hr then set for 24 \pm 2 hrs at room temp | | | | | | | | | | | | | | | |
| Temperature Cycle | No remarkable damage. * Cap change : NP0: within $\pm 2.5\%$ or 0.25pF whichever is larger X7R, X5R, X6S, X7S: within $\pm 7.5\%$ Y5V: within $\pm 20\%$ * 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" data-bbox="986 757 1474 922"> <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\pm3</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\pm3</td> </tr> <tr> <td>4</td> <td>Room temp.</td> <td>2-3</td> </tr> </tbody> </table> Before initial measurement (Class II only): To apply de-aging at 150°C for 1hr then set for 24 \pm 2 hrs at room temp. Cap. / DF(Q) / I.R. Measurement to be made after de-aging at 150°C for 1hr then set for 24 \pm 2 hrs at room temp. | 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 | | | | | | | | | | | | | | | |

Multilayer Ceramic Chip Capacitor

| Item | Requirement | Test Method | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|--------------------------|--|--------------------------|--|-------------|----|----|-----------------------|------|---|-----|---|------------|----|----|---|-----|--|-----|--|-----|----|-----|--|-----|----|-----|--|-----|--|-----|--|-----|-----------------------|-----|----|-----|---|-----|--|-----|------|-----|--|-----|---|------|-----|-----|---|------------|-------------|--------------------------|--|------------|------|-----|---|-----|----------------------|-----|-----|---|---|-----|------|-----|---|-----|---|---------------------------|-----|-------|--|-----|-----------------------|-----------------------------|-------|-----|---|-----|-----|-----|-----------------------|------|-----|---|---|---------------|-----------------------|-----------|---|---|---|---|---|---|------|--|
| Humidity (steady state) | <p>No remarkable damage. Cap change: NP0: within $\pm 5\%$ or 0.5pF whichever is larger X7R, X5R: $\geq 10V^{**}$, within $\pm 12.5\%$; $\leq 6.3V$ within $\pm 25\%$; $C \geq 1\mu F$, within $\pm 25\%$ **10V: 0603 $\geq 4.7\mu F$; 0402 $\geq 1\mu F$; 0201 $\geq 0.1\mu F$, within $\pm 25\%$; Y5V: $\geq 10V$, within $\pm 30\%$; $\leq 6.3V$, within $+30/-40\%$ Q/D.F. value: NP0: More than 30pF $Q \geq 350$, $10pF \leq C \leq 30pF$, $Q \geq 275 + 2.5C$ Less than 10pF $Q \geq 200 + 10C$ 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 rowspan="3">$\geq 100V$</td> <td rowspan="3">3%</td> <td>6%</td> <td>1206 $\geq 0.47\mu F$</td> </tr> <tr> <td>7.5%</td> <td>0603 $\geq 0.068\mu F$; 0805 $> 0.1\mu F$; 1206 $> 1\mu F$; 1210 $\geq 2.2\mu F$</td> </tr> <tr> <td>20%</td> <td>0805 $> 0.22\mu F$; 1210 $\geq 3.3\mu F$</td> </tr> <tr> <td rowspan="3">$\geq 50V$</td> <td rowspan="3">3%</td> <td>6%</td> <td>0201(50V); 0603 $\geq 0.047\mu F$; 0805 $\geq 0.18\mu F$; 1206 $\geq 0.47\mu F$</td> </tr> <tr> <td>10%</td> <td>0201 $\geq 0.01\mu F$; 1210 $\geq 4.7\mu F$</td> </tr> <tr> <td>20%</td> <td>0402 $\geq 0.1\mu F$; 0603 $> 0.1\mu F$; 0805 $\geq 1\mu F$; 1206 $\geq 2.2\mu F$; 1210 $\geq 10\mu F$</td> </tr> <tr> <td>35V</td> <td>5%</td> <td>20%</td> <td>0603 $\geq 1\mu F$; 0805 $\geq 2.2\mu F$; 1206 $\geq 2.2\mu F$; 1210 $\geq 10\mu F$</td> </tr> <tr> <td rowspan="4">25V</td> <td rowspan="4">5%</td> <td>10%</td> <td>0201 $\geq 0.01\mu F$; 0805 $\geq 1\mu F$; 1210 $\geq 10\mu F$</td> </tr> <tr> <td>14%</td> <td>0603 $\geq 0.33\mu F$; 1206 $\geq 4.7\mu F$</td> </tr> <tr> <td>15%</td> <td>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 $\geq 22\mu F$</td> </tr> <tr> <td>20%</td> <td>0402 $\geq 0.47\mu F$</td> </tr> <tr> <td rowspan="2">16V</td> <td rowspan="2">5%</td> <td>10%</td> <td>0603 $\geq 0.15\mu F$; 0805 $\geq 0.68\mu F$; 1206 $\geq 2.2\mu F$; 1210 $\geq 4.7\mu F$</td> </tr> <tr> <td>15%</td> <td>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 $\geq 22\mu F$</td> </tr> <tr> <td rowspan="2">10V</td> <td rowspan="2">7.5%</td> <td>15%</td> <td>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 $\geq 22\mu F$</td> </tr> <tr> <td>20%</td> <td>0201 $\geq 0.1\mu F$; 0402 $\geq 1\mu F$</td> </tr> <tr> <td>6.3V</td> <td>15%</td> <td>30%</td> <td>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 $\geq 100\mu F$</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 rowspan="2">$\geq 50V$</td> <td rowspan="2">7.5%</td> <td>10%</td> <td>0603 $\geq 0.1\mu F$; 0805 $\geq 0.47\mu F$; 1206 $\geq 4.7\mu F$</td> </tr> <tr> <td>20%</td> <td>1210 $\geq 6.8\mu F$</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 $\geq 0.047\mu F$; 0603 $\geq 0.1\mu F$; 0805 $\geq 0.33\mu F$; 1206 $\geq 1\mu F$; 1210 $\geq 4.7\mu F$</td> </tr> <tr> <td>15%</td> <td>0402 $\geq 0.068\mu F$; 0603 $\geq 0.47\mu F$; 1206 $\geq 4.7\mu F$; 1210 $\geq 22\mu F$</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>20%</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 50 Ω-F whichever is smaller. Class II (X7R, X5R, Y5V)</p> <table border="1"> <thead> <tr> <th>Rated Voltage</th> <th>Insulation Resistance</th> </tr> </thead> <tbody> <tr> <td>100V: X7R</td> <td rowspan="7">10GΩ or RxC $\geq 10\Omega$-F Whichever is smaller</td> </tr> <tr> <td>50V: 0402 $> 0.01\mu F$; 0603 $\geq 1\mu F$; 0805 $\geq 1\mu F$; 1206 $\geq 4.7\mu F$; 1210 $\geq 4.7\mu F$</td> </tr> <tr> <td>35V: 0603 $\geq 1\mu F$; 0805 $\geq 2.2\mu F$; 1206 $\geq 2.2\mu F$; 1210 $\geq 10\mu F$</td> </tr> <tr> <td>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 $\geq 10\mu F$</td> </tr> <tr> <td>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 $\geq 47\mu F$</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 | | $\geq 100V$ | 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 (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 | 20% | 30% | 0402 $\geq 0.47\mu F$ | 6.3V | 30% | - | - | Rated Voltage | Insulation Resistance | 100V: X7R | 10G Ω or RxC $\geq 10\Omega$ -F Whichever is smaller | 50V: 0402 $> 0.01\mu F$; 0603 $\geq 1\mu F$; 0805 $\geq 1\mu F$; 1206 $\geq 4.7\mu F$; 1210 $\geq 4.7\mu F$ | 35V: 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.: $40 \pm 2^\circ C$ Humidity: 90~95%RH Test time: 500+24/-0hrs. Before initial measurement (Class II only): To apply de-aging at $150^\circ C$ for 1hr then set for 24 ± 2 hrs at room temp. Cap. / DF(Q) / I.R. Measurement to be made after de-aging at $150^\circ C$ for 1hr then set for 24 ± 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 (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 | 20% | 30% | 0402 $\geq 0.47\mu F$ | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 6.3V | 30% | - | - | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Rated Voltage | Insulation Resistance | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 100V: X7R | 10G Ω or RxC $\geq 10\Omega$ -F Whichever is smaller | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 50V: 0402 $> 0.01\mu F$; 0603 $\geq 1\mu F$; 0805 $\geq 1\mu F$; 1206 $\geq 4.7\mu F$; 1210 $\geq 4.7\mu F$ | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 35V: 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 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Item | Requirement | Test Method | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|--|--------------------------|--|--------------------------|--|--------------------|----|----|-----------------------------|------|---|-----|---|-------------------|----|----|---|-----|--|-----|--|-----|----|-----|--|-----|----|-----|--|-----|--|-----|--|-----|-----------------------------|-----|----|-----|---|-----|--|-----|------|-----|--|-----|---|------|-----|-----|---|------------|-------------|--------------------------|--|-------------------|------|-----|---|-----|----------------------------|-----|-----|---|---|-----|------|-----|---|-----|---|------------------------------|-----|-------|--|-----|-----------------------------|--------------------------------|-------|-----|---|-----|-----|-----|-----------------------------|------|-----|---|---|---------------|-----------------------|-----------|--|---|---|---|---|--|------|---|
| Humidity load | <p>No remarkable damage. Cap change: NP0: $\pm 7.5\%$ or 0.75pF whichever is larger. X7R, X5R, X6S, X7S: $\geq 10\text{V}^{**}$, within $\pm 12.5\%$; $\leq 6.3\text{V}$ within $\pm 25\%$; TT series & C$\geq 1\mu\text{F}$, within $\pm 25\%$ **10V: 0603 $4.7\mu\text{F}$; 0402 $1\mu\text{F}$; 0201 $\geq 0.1\mu\text{F}$, within $\pm 25\%$; Y5V: $\geq 10\text{V}$, within $\pm 30\%$; $\leq 6.3\text{V}$, within $+30/-40\%$ Q/D.F. value: NP0: $C \geq 30\text{pF}$, $Q \geq 200$; $C < 30\text{pF}$, $Q \geq 100 + 10/3C$ X7R, X5R:</p> <table border="1" data-bbox="284 454 1059 1088"> <thead> <tr> <th>Rated vol.</th> <th>D.F. \leq</th> <th colspan="2">Exception of D.F. \leq</th> </tr> </thead> <tbody> <tr> <td rowspan="3">$\geq 100\text{V}$</td> <td rowspan="3">3%</td> <td>6%</td> <td>1206 $\geq 0.47\mu\text{F}$</td> </tr> <tr> <td>7.5%</td> <td>0603 $\geq 0.068\mu\text{F}$; 0805 $> 0.1\mu\text{F}$; 1206 $> 1\mu\text{F}$; 1210 $\geq 2.2\mu\text{F}$</td> </tr> <tr> <td>20%</td> <td>0805 $> 0.22\mu\text{F}$; 1210 $\geq 3.3\mu\text{F}$</td> </tr> <tr> <td rowspan="3">$\geq 50\text{V}$</td> <td rowspan="3">3%</td> <td>6%</td> <td>0201(50V); 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>10%</td> <td>0201 $\geq 0.01\mu\text{F}$; 1210 $\geq 4.7\mu\text{F}$</td> </tr> <tr> <td>20%</td> <td>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 $\geq 10\mu\text{F}$</td> </tr> <tr> <td>35V</td> <td>5%</td> <td>20%</td> <td>0603 $\geq 1\mu\text{F}$; 0805 $\geq 2.2\mu\text{F}$; 1206 $\geq 2.2\mu\text{F}$; 1210 $\geq 10\mu\text{F}$</td> </tr> <tr> <td rowspan="4">25V</td> <td rowspan="4">5%</td> <td>10%</td> <td>0201 $\geq 0.01\mu\text{F}$; 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>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 $\geq 22\mu\text{F}$</td> </tr> <tr> <td>20%</td> <td>0402 $\geq 0.47\mu\text{F}$</td> </tr> <tr> <td rowspan="2">16V</td> <td rowspan="2">5%</td> <td>10%</td> <td>0603 $\geq 0.15\mu\text{F}$; 0805 $\geq 0.68\mu\text{F}$; 1206 $\geq 2.2\mu\text{F}$; 1210 $\geq 4.7\mu\text{F}$</td> </tr> <tr> <td>15%</td> <td>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 $\geq 22\mu\text{F}$</td> </tr> <tr> <td rowspan="2">10V</td> <td rowspan="2">7.5%</td> <td>15%</td> <td>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 $\geq 22\mu\text{F}$</td> </tr> <tr> <td>20%</td> <td>0201 $\geq 0.1\mu\text{F}$; 0402 $\geq 1\mu\text{F}$</td> </tr> <tr> <td>6.3V</td> <td>15%</td> <td>30%</td> <td>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 $\geq 100\mu\text{F}$</td> </tr> </tbody> </table> <p>Y5V:</p> <table border="1" data-bbox="284 1122 1059 1547"> <thead> <tr> <th>Rated vol.</th> <th>D.F. \leq</th> <th colspan="2">Exception of D.F. \leq</th> </tr> </thead> <tbody> <tr> <td rowspan="2">$\geq 50\text{V}$</td> <td rowspan="2">7.5%</td> <td>10%</td> <td>0603 $\geq 0.1\mu\text{F}$; 0805 $\geq 0.47\mu\text{F}$; 1206 $\geq 4.7\mu\text{F}$</td> </tr> <tr> <td>20%</td> <td>1210 $\geq 6.8\mu\text{F}$</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 $\geq 0.047\mu\text{F}$; 0603 $\geq 0.1\mu\text{F}$; 0805 $\geq 0.33\mu\text{F}$; 1206 $\geq 1\mu\text{F}$; 1210 $\geq 4.7\mu\text{F}$</td> </tr> <tr> <td>15%</td> <td>0402 $\geq 0.068\mu\text{F}$; 0603 $\geq 0.47\mu\text{F}$; 1206 $\geq 4.7\mu\text{F}$; 1210 $\geq 22\mu\text{F}$</td> </tr> <tr> <td rowspan="2">16V (C < 1.0μF)</td> <td rowspan="2">10%</td> <td>12.5%</td> <td>0402 $\geq 0.068\mu\text{F}$; 0603 $\geq 0.68\mu\text{F}$</td> </tr> <tr> <td>20%</td> <td>0402 $\geq 0.22\mu\text{F}$</td> </tr> <tr> <td>16V (C $\geq 1.0\mu\text{F}$)</td> <td>12.5%</td> <td>20%</td> <td>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 $\geq 47\mu\text{F}$</td> </tr> <tr> <td>10V</td> <td>20%</td> <td>30%</td> <td>0402 $\geq 0.47\mu\text{F}$</td> </tr> <tr> <td>6.3V</td> <td>30%</td> <td>-</td> <td>-</td> </tr> </tbody> </table> <p>I.R.: $\geq 10\text{V}$, 500MΩ or 25 $\Omega\text{-F}$ whichever is smaller. Class II (X7R, X5R, Y5V)</p> <table border="1" data-bbox="284 1637 1059 1939"> <thead> <tr> <th>Rated Voltage</th> <th>Insulation Resistance</th> </tr> </thead> <tbody> <tr> <td>100V: X7R</td> <td rowspan="7">500MΩ or $R \times C \geq 5\Omega\text{-F}$ Whichever is smaller</td> </tr> <tr> <td>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 $\geq 4.7\mu\text{F}$</td> </tr> <tr> <td>35V: 0603 $\geq 1\mu\text{F}$; 0805 $\geq 2.2\mu\text{F}$; 1206 $\geq 2.2\mu\text{F}$; 1210 $\geq 10\mu\text{F}$</td> </tr> <tr> <td>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 $\geq 10\mu\text{F}$</td> </tr> <tr> <td>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 $\geq 47\mu\text{F}$</td> </tr> <tr> <td>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 $\geq 47\mu\text{F}$</td> </tr> <tr> <td>6.3V</td> </tr> </tbody> </table> | 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 $\geq 47\mu\text{F}$; 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To apply voltage : Rated voltage (MAX. 500V) Before initial measurement (Class II only): To apply de-aging at 150°C for 1hr then set for 24 ± 2 hrs at room temp. Cap. / DF(Q) / I.R. Measurement to be made after de-aging at 150°C for 1hr then set for 24 ± 2 hrs at room temp.</p> |
| 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 $\geq 100\mu\text{F}$ | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 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 μF) | 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 | 500M Ω or $R \times C \geq 5\Omega\text{-F}$ Whichever is smaller | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 50V: 0402 $> 0.01\mu\text{F}$; 0603 $\geq 1\mu\text{F}$; 0805 $\geq 1\mu\text{F}$; 1206 $\geq 4.7\mu\text{F}$; 1210 $\geq 4.7\mu\text{F}$ | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 35V: 0603 $\geq 1\mu\text{F}$; 0805 $\geq 2.2\mu\text{F}$; 1206 $\geq 2.2\mu\text{F}$; 1210 $\geq 10\mu\text{F}$ | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 25V: 0201 $\geq 0.1\mu\text{F}$; 0402 $\geq 0.22\mu\text{F}$; 0603 $\geq 2.2\mu\text{F}$; 0805 $\geq 2.2\mu\text{F}$; 1206 $\geq 10\mu\text{F}$; 1210 $\geq 10\mu\text{F}$ | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 16V: 0201 $\geq 0.1\mu\text{F}$; 0402 $\geq 0.22\mu\text{F}$; 0603 $\geq 1\mu\text{F}$; 0805 $\geq 2.2\mu\text{F}$; 1206 $\geq 10\mu\text{F}$; 1210 $\geq 47\mu\text{F}$ | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 10V: 0201 $\geq 47\text{nF}$; 0402 $\geq 0.47\mu\text{F}$; 0603 $\geq 0.47\mu\text{F}$; 0805 $\geq 2.2\mu\text{F}$; 1206 $\geq 4.7\mu\text{F}$; 1210 $\geq 47\mu\text{F}$ | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 6.3V | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Item | Requirement | Test Method |
|--|--|--|
| High Temperature Load (Endurance) | No remarkable damage. Cap change: NP0: $\pm 3.0\%$ or $\pm 0.3\text{pF}$ whichever is larger X7R, X5R, X6S, X7S: $\geq 10\text{V}^{**}$, within $\pm 12.5\%$; $\leq 6.3\text{V}$ within $\pm 25\%$; TT series & $C \geq 1\mu\text{F}$, within $\pm 25\%$ $**10\text{V}$: 0603 $\geq 4.7\mu\text{F}$; 0402 $\geq 1\mu\text{F}$; 0201 $\geq 0.1\mu\text{F}$, within $\pm 25\%$; Y5V: $\geq 10\text{V}$, within $\pm 30\%$; $\leq 6.3\text{V}$, within $+30/-40\%$ Q/D.F. value: NP0: More than 30pF, $Q \geq 350$ $10\text{pF} \leq C < 30\text{pF}$, $Q \geq 275 + 2.5C$ Less than 10pF, $Q \geq 200 + 10C$ X7R, X5R: | Test temp. : NP0, X7R: $125 \pm 3^\circ\text{C}$ X5R, Y5V: $85 \pm 3^\circ\text{C}$ To apply voltage: (1) $\leq 6.3\text{V}$ or $C \geq 10\mu\text{F}$: 150% of rated voltage. (2) $10\text{V} \leq U_r < 500\text{V}$: 200% of rated voltage. (3) 500V: 150% of rated voltage. (4) $U_r \geq 630\text{V}$: 120% of rated voltage. (5) 100% of rated voltage for below range. |
| | Rated vol. D.F. \leq Exception of D.F. \leq | Size Dielectric Rated voltage Capacitance range |
| | $\geq 100\text{V}$ 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 $\geq 3.3\mu\text{F}$ | 0201 X5R, X7R $\leq 10\text{V}$ $C \geq 0.1\mu\text{F}$ $\geq 16\text{V}$ $C > 0.1\mu\text{F}$ |
| | $\geq 50\text{V}$ 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 $\geq 10\mu\text{F}$ | 0402 X5R, X7R, Y5V 6.3V, 10V, 16V, 25V $C \geq 1.0\mu\text{F}$ 0603 X5R, X7R 6.3V, 10V, 25V, 35V $C \geq 1.0\mu\text{F}$ |
| | 35V 5% 20% 0603 $\geq 1\mu\text{F}$; 0805 $\geq 2.2\mu\text{F}$; 1206 $\geq 2.2\mu\text{F}$; 1210 $\geq 10\mu\text{F}$ | 0805 X5R, X7R 6.3V $C \geq 22\mu\text{F}$ 10V~50V $C \geq 10\mu\text{F}$ |
| | 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 $\geq 0.47\mu\text{F}$ | 1206 X5R, X7R 6.3V $C \geq 47\mu\text{F}$ NPO 3000V $C \geq 1.5\text{pF}$ |
| | 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 $\geq 22\mu\text{F}$ | 1210 X5R, X7R 16V $C \geq 47\mu\text{F}$ X7R 100V $C \geq 3.3\mu\text{F}$ |
| | 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) 150% of rated voltage for below range |
| | 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 $\geq 100\mu\text{F}$ | Size Dielectric Rated voltage Capacitance range |
| | Y5V: | 0201 X5R, X7R 16V, 25V $C \geq 0.1\mu\text{F}$ X7R 16V $C > 0.022\mu\text{F}$ |
| | Rated vol. D.F. \leq Exception of D.F. \leq | 0402 X5R, X7R, Y5V 50V $C \geq 1.0\mu\text{F}$ 10~25V $C \geq 0.022\mu\text{F}$ |
| | $\geq 50\text{V}$ 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 $\geq 6.8\mu\text{F}$ | 0402 Y5V 16V $C \geq 0.47\mu\text{F}$ |
| | 35V 10% — — | 0603 X7R 50V $C \geq 0.1\mu\text{F}$ X5R, X7R, Y5V 10V, 16V, 50V $C \geq 1.0\mu\text{F}$ Y5V 16V $C \geq 2.2\mu\text{F}$ |
| | 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 $\geq 22\mu\text{F}$ | 0805 X5R, X7R 10V~50V $C \geq 4.7\mu\text{F}$ 50V $C \geq 2.2\mu\text{F}$ 100V $C \geq 0.47\mu\text{F}$ Y5V 16V $C \geq 4.7\mu\text{F}$ |
| | 16V (C < 1.0 μF) 10% 12.5% 0402 $\geq 0.068\mu\text{F}$; 0603 $\geq 0.68\mu\text{F}$ 20% 0402 $\geq 0.22\mu\text{F}$ | 1206 X5R, X7R 100V $C \geq 1.0\mu\text{F}$ 1210 X5R, X7R 50V~100V $C \geq 2.2\mu\text{F}$ |
| 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.: $\geq 10\text{V}$, 1G Ω or 50 Ω -F whichever is smaller. | | |
| Class II (X7R, X5R, Y5V) | | |
| Rated Voltage | Insulation Resistance | |
| 100V: X7R | 500M Ω or RxC $\geq 5\Omega$ -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 | | |

Multilayer Ceramic Chip Capacitor

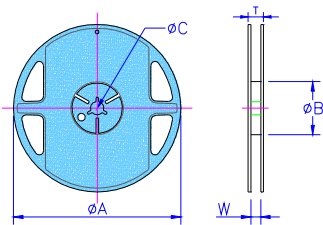
■Packaging

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 |
| 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

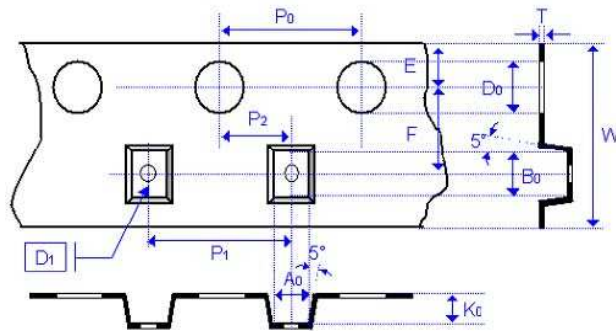


Unit: mm

| 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") |

Multilayer Ceramic Chip Capacitor

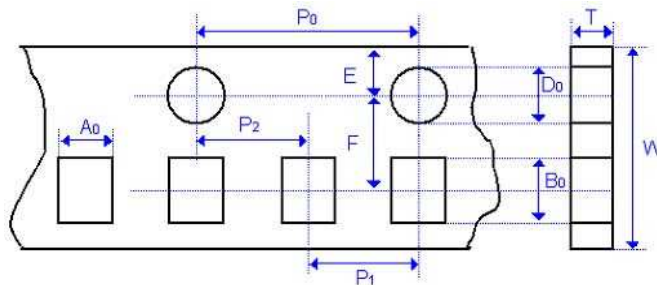
Plastic Tape Size Specification



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 ₀ | <1.80 | | <200 | | | <2.30 | | <3.05 | | | | | <3.20 | | | | | <3.90 | | | | | |
| B ₀ | <2.70 | | <3.70 | | | <4.00 | | <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 | | | | | 0.25±0.10 | | | | | 0.25±0.10 |
| K ₀ | <2.50 | | <2.50 | | | <2.50 | | <1.50 | | | | | <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 | | | | | 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±0.10 | | | | | 2.00±0.05 |
| D ₀ | 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 |
| D ₁ | 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 |
| F | 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 ₀ | 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 ₀ | 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 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 | |