國家品質獎

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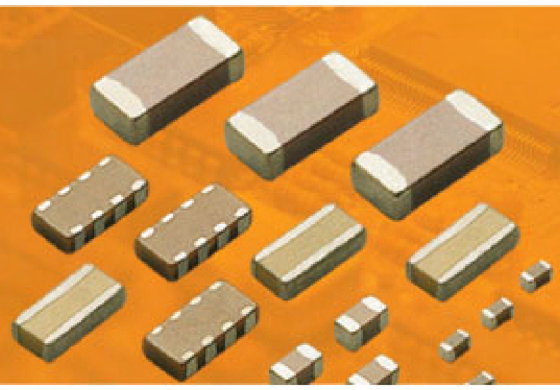

# Multilayer Ceramic Capacitors

2013

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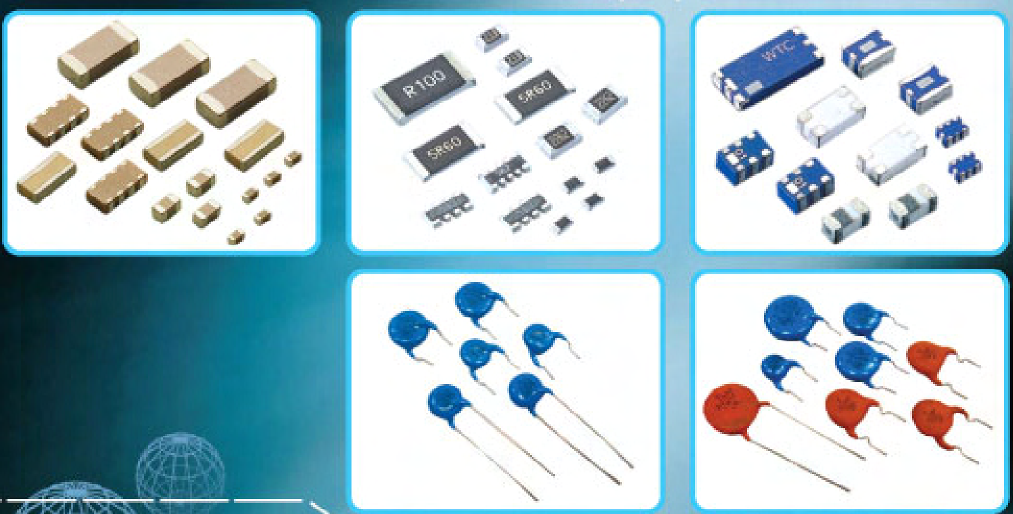

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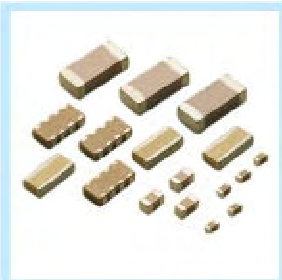
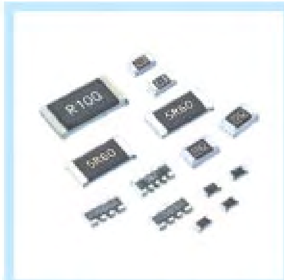
# Product Portfolio



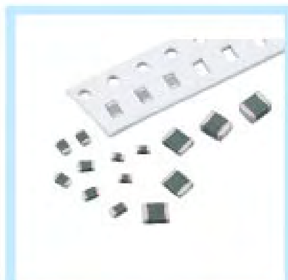
Multilayer Ceramic Capacitors (MLCC)



Chip-Resistor

Disc Capacitors

RF Device and High Frequency Inductors



Varistors and SMD-Varistors

# IEC-63 Nominal Resistance / Capacitance

| | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| E1 | 100 | | | | | | | | | | | | | | | | | | | | | | | |
| E3 | 100 | | | | | | | | 220 | | | | | | | | 470 | | | | | | | |
| E6 | 100 | | | | 150 | | | | 220 | | | | 330 | | | | 470 | | | | 680 | | | |
| E12 | 100 | | 120 | | 150 | | 180 | | 220 | | 270 | | 330 | | 390 | | 470 | | 560 | | 680 | | 820 | |
| E24 | 100 | 110 | 120 | 130 | 150 | 160 | 180 | 200 | 220 | 240 | 270 | 300 | 330 | 360 | 390 | 430 | 470 | 510 | 560 | 620 | 680 | 750 | 820 | 910 |
| E96 | 100 | 102 | 121 | 124 | 147 | 150 | 178 | 182 | 215 | 221 | 261 | 267 | 316 | 324 | 383 | 392 | 464 | 475 | 562 | 576 | 681 | 698 | 825 | 845 |
| | 105 | 107 | 127 | 130 | 154 | 158 | 187 | 191 | 226 | 232 | 274 | 280 | 332 | 340 | 402 | 412 | 487 | 499 | 590 | 604 | 715 | 732 | 866 | 887 |
| | 110 | 113 | 133 | 137 | 162 | 165 | 196 | 200 | 237 | 243 | 287 | 294 | 348 | 357 | 422 | 432 | 511 | 523 | 619 | 634 | 750 | 768 | 909 | 931 |
| | 115 | 118 | 140 | 143 | 169 | 174 | 205 | 210 | 249 | 255 | 301 | 309 | 365 | 374 | 442 | 453 | 536 | 549 | 649 | 665 | 787 | 806 | 953 | 976 |

E6: $\sqrt[6]{10} \fallingdotseq 1.46$ E12: $\sqrt[12]{10} \fallingdotseq 1.21$
E1 series resistance: 1Ω, 10Ω, 100Ω, 1000Ω, 10000Ω, 100000Ω

# INDEX



*The specifications are subject to change or our products in it may be discontinued without advance notice. Please check with our sales representatives or product engineers before ordering.
*This catalog has only typical specifications because there is no space for detailed specifications. Therefore, please approve our product specifications or transact the approval sheet for product specifications before ordering.

## QUICK PRODUCT INFORMATION

| Series | Dielectric | Size | Capacitance | Rated voltage | Page |
|---|---|---|---|---|---|
| General Purpose Caps (6.3V~100V) | NPO | 0402, 0603, 0805, 1206, 1210, 1812 | 0.5pF~0.039μF | 10V, 16V, 25V, 50V, 100V | 5 |
| | X7R | 0402, 0603, 0805, 1206, 1210, 1812 | 100pF~47μF | 6.3V, 10V, 16V, 25V, 50V, 100V | |
| | X5R | 0402, 0603, 0805, 1206,1210 | 0.027μF~100μF | 6.3V, 10V, 16V, 25V | |
| | Y5V | 0402, 0603, 0805, 1206, 1210, 1812 | 0.01μF~100μF | 6.3V, 10V, 16V, 25V, 50V, 100V | |
| 0201 Size Caps (0201 series) | NPO | 0201 | 0.3pF~100pF | 16V, 25V, 50V | 9 |
| | X7R | 0201 | 100pF~0.01μF | 6.3V, 10V, 16V, 25V, 50V | |
| | X5R | 0201 | 1000pF~0.47μF | 6.3V, 10V, 16V, 25V, 50V | |
| Middle & High Voltage Caps (200V~3kV) | NPO | 0603, 0805, 1206, 1210, 1808, 1812 | 0.5pF~6800pF | 200V, 250V, 500V, 630V, 1kV, 2kV, 3kV | 11 |
| | X7R | 0805, 1206, 1210, 1808, 1812 | 100pF~1μF | 200V, 250V, 500V, 630V, 1kV, 2kV, 3kV | |
| | Y5V | 0805, 1206, 1210,1812 | 0.01μF~0.68μF | 200V, 250V | |
| High Q & Low ESR Caps (HH series) | NPO | 0402, 0603,0805 | 0.5pF~3300pF | 16V, 25V, 50V, 100V, 200V, 250V, 500V, 630V | 14 |
| Microwave Caps (RF series) | NPO | 0201, 0402,0603,0805 | 0.1pF~100pF | 6.3V, 10V, 25V, 50V,100V,250V | 16 |
| Soft Termination Capacitors (SH series) | NPO | 1206,1808 | 1.5pF~220pF | 100V,200V,250V,500V,630V,1KV | 18 |
| | X7R | 0603, 0805, 1206, 1210, 1808, 1812 | 100pF~1μF | 10V,16V,25V,50V,100V,200V,250V,500V, 630V, 1KV,2KV, 3kV | |
| Open-mode Design Caps (OP series) | X7R | 0805, 1206, 1210, 1812 | 100pF~1μF | 100V, 200V, 250V, 500V | 22 |
| Capacitor Arrays (0612/ 0508 series) | NPO | 0508 (4x0402), 0612 (4x0603) | 10pF~470pF | 25V, 50V | 23 |
| | X7R | 0508 (4x0402), 0612 (4x0603) | 180pF~0.1μF | 10V, 16V, 25V, 50V | |
| | Y5V | 0612 (4x0603) | 0.01μF~0.1μF | 16V, 50V | |
| Low Profile Caps (TT series) | X5R | 0603, 0805, 1206, 1210 | 0.22μF~22μF | 6.3V, 10V, 16V, 25V | 24 |
| | Y5V | 0805, 1206, 1210 | 1μF~10μF | 10V, 16V, 25V, 50V | |
| Low Inductance Caps (0612 series) | X7R | 0612 | 0.01μF~0.15μF | 50V | 25 |
| Safety Certificated Caps X1/Y2 (S2 series) | NPO | 1808 | 10pF~150pF | 250Vac | 26 |
| | X7R | 1808, 1812, 2211 | 100pF~2200pF | 250Vac | |
| Safety Certificated Caps X2/Y3 (S3 series) | NPO | 1808 | 3.9pF~680pF | 250Vac | 27 |
| | X7R | 1808, 1812 | 180pF~2700pF | 250Vac | |
| Low Distortion Caps (LD series) | X7R / X7E | 1206 | 150pF~0.1μF | 100V, 200V, 250V, 350V, 500V, 630V | 28 |
| Automotive Caps Without AEC-Q200 Certification (MG series) | NPO | 0402, 0603, 0805, 1206, 1210, 1812 | 0.5pF~0.033μF | 10V,16V,25V,50V,100V,200V,250V | 29 |
| | X7R | 0402, 0603, 0805, 1206, 1210, 1812 | 100pF~2.2μF | 10V,16V,25V,50V,100V,200V,250V | |
| | X5R | 0402, 0603, 0805, 1206, 1210 | 0.056μF~10μF | 63V,10V,16V,25V | |

## HOW TO ORDER

| Type of MLCC | 0805 | B | 104 | K | 500 | C | T |
|---|---|---|---|---|---|---|---|
| General Purpose MLCC<br>Middle & High Voltage MLCC<br>0201 size MLCC | **Size**<br>Inch (mm) :<br>0201 (0603), 0402 (1005),<br>0603 (1608), 0805 (2012),<br>1206 (3216), 1210 (3225),<br>1808 (4520), 1812 (4532) | **Dielectric**<br>N=NP0<br>B=X7R<br>D=X7E<br>X=X5R<br>F=Y5V | **Capacitance**<br>Two significant digits followed by no. of zeros. And R is in place of decimal point.<br>R47=0.47pF<br>0R5=0.5pF<br>1R0=1pF<br>100=10pF<br>101=100pF<br>102=1000pF<br>103=0.01uF<br>104=0.1uF<br>105=1uF<br>106=10uF<br>107=100uF | **Tolerance**<br>A= ±0.05pF<br>B= ±0.1pF<br>C= ±0.25pF<br>D= ±0.5pF<br>F= ±1%<br>G= ±2%<br>J= ±5%<br>K= ±10%<br>M= ±20%<br>Z=-20/+80% | **Rated voltage**<br>Two significant digits followed by no. of zeros. And R is in place of decimal point.<br>4R0=4 Vdc<br>6R3=6.3 Vdc<br>100=10 Vdc<br>160=16 Vdc<br>250=25 Vdc<br>500=50 Vdc<br>101=100 Vdc<br>201=200 Vdc<br>251=250 Vdc<br>501=500 Vdc<br>631=630 Vdc<br>102=1k Vdc<br>202=2k Vdc<br>302=3k Vdc<br>502=5k Vdc | **Termination**<br>L=Ag/Ni/Sn<br>C=Cu/Ni/Sn<br>Termination | **Packaging**<br>B=Bulk<br>C=Bulk cassette<br>T=7" reeled<br>Q=10" reeled<br>G=13" reeled |
| Low Inductance MLCC | 0612 (1632) | | | | | | |
| High Q / Low ESR MLCC<br>Microwave MLCC<br>Low Profile MLCC<br>Open Mode MLCC<br>Safety Certificated MLCC<br>Low Distortion MLCC<br>Automotive MLCC | **RF** — **Series**<br>HH=High Q/ Low ESR<br>RF=Microwave<br>TT=Low profile<br>OP=Open-mode design<br>S2=X1/Y2 safety class<br>S3=X2/Y3 safety class<br>LD= Low distortion<br>MG=Automotive Cap. without AEC-Q200<br>**03** — **Size**<br>Inch :<br>03=0201<br>15=0402<br>18=0603<br>21=0805<br>12=0508<br>31=1206<br>32=1210<br>42=1808<br>43=1812<br>52=2211 | | | | | L=Ag/Ni/Sn<br>C=Cu/Ni/Sn<br>P=Cu/Polymer Ag/Ni/Sn | |
| Soft Termination MLCC | SH=Soft termination | | | | | C=Cu/Polymer Ag/Ni/Sn | |
| Cap Arrays MLCC | **Y** — **Type**<br>Y=Capacitor array<br>**4 C** — **Cap. Nr.**<br>4C=4xCap<br>**3** — **Termination pitch**<br>3=0.03 inch<br>2=0.02 inch | | | | | C=Cu/Ni/Sn | |

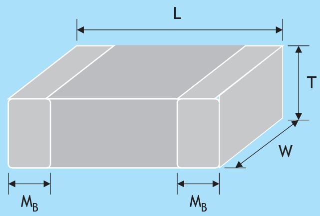
* The packaging code per each size of reel, please refer to following table "packaging style and quantity".

## PACKAGING STYLE AND QUANTITY

| Size | Thickness (mm)/Symbol | | Paper tape | | Plastic tape | |
|---|---|---|---|---|---|---|
| | | | 7" reel | 13" reel | 7" reel | 13" reel |
| 0201 (0603) | 0.30±0.03 | L | 15,000 | 70,000 | - | - |
| 0402 (1005) | 0.50±0.05 | N | 10,000 | 50,000 | - | - |
| | 0.50+0.02/-0.05 | Q | 10,000 | 50,000 | - | - |
| | 0.50±0.20 | E | 10,000 | - | - | - |
| 0603 (1608) | 0.50±0.10 | H | 4,000 | - | - | - |
| | 0.80±0.07 | S | 4,000 | 15,000 | - | - |
| | 0.80+0.15/-0.10 | X | 4,000 | 15,000 | - | - |
| 0805 (2012) | 0.50±0.10 | H | 4,000 | 15,000 | - | - |
| | 0.60±0.10 | A | 4,000 | 15,000 | - | - |
| | 0.80±0.10 | B | 4,000 | 15,000 | - | - |
| | 0.85±0.10 | T | 4,000 | 15,000 | - | - |
| | 1.25±0.10 | D | - | - | 3,000 | 10,000 |
| | 1.25±0.20 | I | - | - | 3,000 | 10,000 |
| 1206 (3216) | 0.80±0.10 | B | 4,000 | 15,000 | - | - |
| | 0.85±0.10 | T | 4,000 | 15,000 | - | - |
| | 0.95±0.10 | C | - | - | 3,000 | 10,000 |
| | 1.15±0.15 | J | - | - | 3,000 | 10,000 |
| | 1.25±0.10 | D | - | - | 3,000 | 10,000 |
| | 1.60±0.20 | G | - | - | 2,000 | 10,000 |
| | 1.60+0.30/-0.10 | P | - | - | 2,000 | 9,000 |
| 1210 (3225) | 0.85±0.10 | T | - | - | 4,000 | 10,000 |
| | 0.95±0.10 | C | - | - | 3,000 | 10,000 |
| | 1.25±0.10 | D | - | - | 3,000 | 10,000 |
| | 1.60±0.20 | G | - | - | 2,000 | - |
| | 2.00±0.20 | K | - | - | 1,000 | 6,000 |
| | 2.50±0.30 | M | - | - | 1,000 | 6,000 |
| 1808 (4520) | 1.25±0.10 | D | - | - | 2,000 | 10,000 |
| | 1.10±0.15 | F | - | - | 2,000 | 10,000 |
| | 1.60±0.20 | G | - | - | 2,000 | 8,000 |
| | 2.00±0.20 | K | - | - | 1,000 | 6,000 |
| 1812 (4532) | 1.25±0.10 | D | - | - | 1,000 | 5,000 |
| | 1.60±0.20 | G | - | - | 1,000 | - |
| | 2.00±0.20 | K | - | - | 1,000 | - |
| | 2.50±0.30 | M | - | - | 500 | 3,000 |
| | 2.80±0.30 | U | - | - | 500 | - |

Unit: pieces

## SINGLE CHIP CAPACITORS

| Outline | Size Inch (mm) | L (mm) | W (mm) | T (mm)/Symbol | | SolderingMethod * | MB (mm) |
|---|---|---|---|---|---|---|---|
|  | 0201 (0603) | 0.6±0.03 | 0.3±0.03 | 0.3±0.03 | L | R | 0.15±0.05 |
| | 0402 (1005) | 1.00±0.05 | 0.50±0.05 | 0.50±0.05 | N | R | 0.25+0.05/-0.10 |
| | | | | 0.50+0.02/-0.05 | Q | R | |
| | | 1.00+0.2/-0.05 | 0.50+0.2/-0.05 | 0.50±0.20 | E | R | |
| | 0603 (1608) | 1.60±0.10 | 0.80±0.10 | 0.80±0.07 | S | R / W | 0.40±0.15 |
| | | 1.60+0.15/-0.10 | 0.80+0.15/-0.10 | 0.50±0.10 | H | R / W | |
| | | | | 0.80+0.15/-0.10 | X | R / W | |
| | 0805 (2012) | 2.00±0.15 | 1.25±0.10 | 0.50±0.10 | H | R / W | 0.50±0.20 |
| | | | | 0.60±0.10 | A | R / W | |
| | | | | 0.80±0.10 | B | R / W | |
| | | | | 1.25±0.10 | D | R | |
| | | 2.00±0.20 | 1.25±0.20 | 0.85±0.10 | T | R / W | |
| | | | | 1.25±0.20 | I | R | |
| | 1206 (3216) | 3.20±0.15 | 1.60±0.15 | 0.80±0.10 | B | R / W | 0.60±0.20<br>(0.5±0.25)*** |
| | | | | 0.95±0.10 | C | R | |
| | | | | 1.25±0.10 | D | R | |
| | | 3.20±0.30 | | 1.15±0.10 | J | R | |
| | | | 1.60±0.20 | 1.60±0.20 | G | R | |
| | | | | 0.85±0.10 | T | R / W | |
| | | 3.20 +0.30/-0.10 | 1.60 +0.30/0.10 | 1.60+0.30/-0.10 | P | R | |
| | 1210 (3225) | 3.20±0.30 | 2.50±0.20 | 0.95±0.10 | C | R | 0.75±0.25 |
| | | | | 0.85±0.10 | T | R | |
| | | | | 1.25±0.10 | D | R | |
| | | 3.20±0.40 | 2.50±0.30 | 1.60±0.20 | G | R | |
| | | | | 2.00±0.20 | K | R | |
| | | | | 2.50±0.30 | M | R | |
| | 1808 (4520) | 4.50±0.40<br>(4.5+0.5/-0.3)** | 2.03±0.25 | 1.25±0.10 | D | R | 0.75±0.25<br>(0.5±0.25)*** |
| | | | | 1.40±0.15 | F | R | |
| | | | | 1.60±0.20 | G | R | |
| | | | | 2.00±0.20 | K | R | |
| | 1812 (4532) | 4.50±0.40<br>(4.5+0.5/-0.3)** | 3.20±0.30 | 1.25±0.10 | D | R | 0.75±0.25<br>(0.5±0.25)*** |
| | | | | 1.60±0.20 | G | R | |
| | | | | 2.00±0.20 | K | R | |
| | | | 3.20±0.40 | 2.50±0.30 | M | R | |
| | | | | 2.80±0.30 | U | R | |

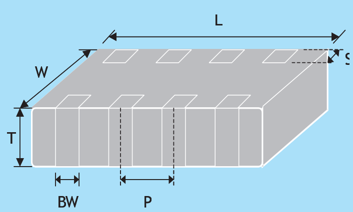
* R = Reflow soldering process ; W = Wave soldering process.

** For 1808_200~3kV, 1812_200V~3kV and safety certificated products.

*** For 1206_1000V ~3kV, 1808_200~3kV, 1812_1~3kV and safety certificated products.

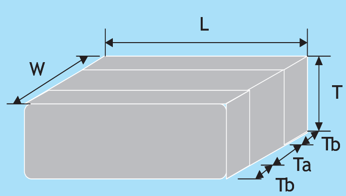
Soft termination product please refer to individual sheet for detail.

## Capacitor Arrays

| Outline | Size Inch (mm) | L (mm) | W (mm) | T (mm)/ Symbol | | S (mm) | BW (mm) | P (mm) |
|---|---|---|---|---|---|---|---|---|
|  | 0603 x 4<br>(0612 (1632) | 3.20±0.15 | 1.60±0.15 | 0.80±0.10 | B | 0.30±0.20 | 0.40±0.15 | 0.80±0.15 |
| | 0402 x 4<br>(0508 (1220) | 2.00±0.15 | 1.25±0.15 | 0.85±0.10 | T | 0.20±0.10 | 0.25±0.10 | 0.50±0.10 |

Reflow soldering process only.

## Low Inductance Capacitors / RF series

| Outline | Size Inch (mm) | L (mm) | W (mm) | T (mm)/Symbol | | Ta min. (mm) | Tb min. (mm) |
|---|---|---|---|---|---|---|---|
|  | 0612 (1632) | 3.20±0.15 | 1.60±0.15 | 0.80±0.10 | B | 0.5 | 0.13 |
| | 0508 (1220) | 2.00±0.15 | 1.25±0.15 | 0.85±0.10 | T | 0.38 | 0.13 |

Reflow soldering process only.

## FEATURES

* A wide selection of sizes is available (0402 to 1812).
* High capacitance in given case size.
* Capacitor with lead-free termination (pure Tin).

## GENERAL ELECTRICAL DATA

| Dielectric | NP0 | X7R | X5R | Y5V |
|---|---|---|---|---|
| Size | 0402, 0603, 0805, 1206, 1210, 1812 | | | |
| Capacitance range | 0.5pF to 0.039μF | 100pF to 47μF | 0.027μF to 100μF | 0.01μF to 100μF |
| Capacitance tolerance | Cap≤5pF: B (±0.1pF), C (±0.25pF)<br>5pF<Cap<10pF: C (±0.25pF), D (±0.5pF)<br>Cap≥10pF: F (±1%), G (±2%), J (±5%),K (±10%) | J (±5%),<br>K (±10%),<br>M (±20%) | K (±10%),<br>M (±20%) | M (±20%),<br>Z (-20/+80%) |
| Rated voltage (WVDC) | 10V, 16V, 25V, 50V, 100V | 6.3V, 10V, 16V, 25V, 50V, 100V | | |
| Insulation resistance at Ur | ≥10GΩ or RxC≥500Ω-F whichever is less | | | |
| Operating temperature | -55 to +125°C | | -55 to +85°C | -25 to +85°C |
| Capacitance characteristic | ±30ppm | ±15% | ±15% | +30/-80% |
| Termination | Ni/Sn (lead-free termination) | | | |

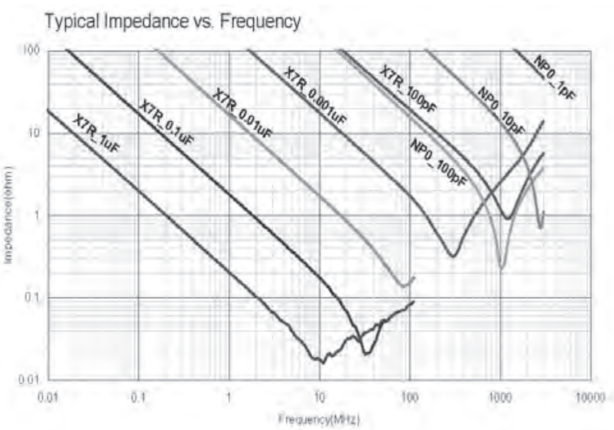
## EXPLANATION OF PART NUMBERS

| 1206 | F | 104 | Z | 500 | C | T |
|---|---|---|---|---|---|---|
| **Size (Inch (mm))**<br>1206 (3216) | **Dielectric**<br>F=Y5V | **Capacitance**<br>104=10x10$^4$=100nF | **Tolerance**<br>Z=-20/+80% | **Rated voltage**<br>500=50 VDC | **Termination**<br>C=Cu/Ni/Sn | **Packaging style**<br>T=7" reeled |

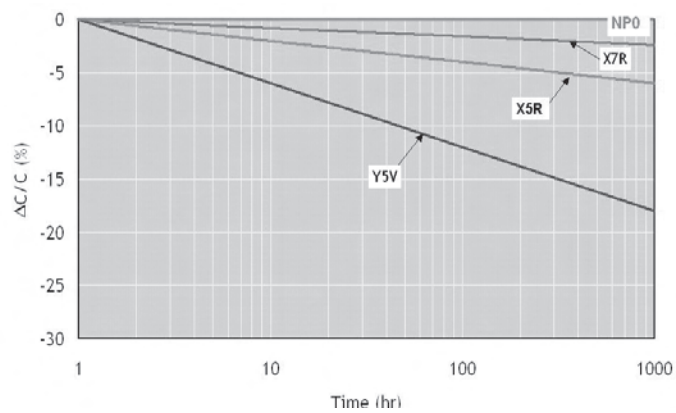
Please refer to page 2 " How to order" for more information.

## ELECTRICAL CHARACTERISTICS

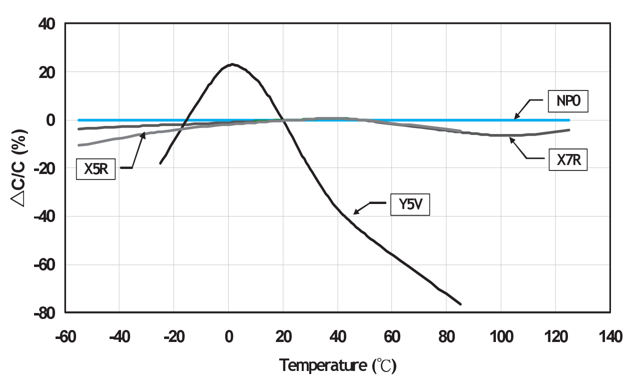
1) Frequency characteristics



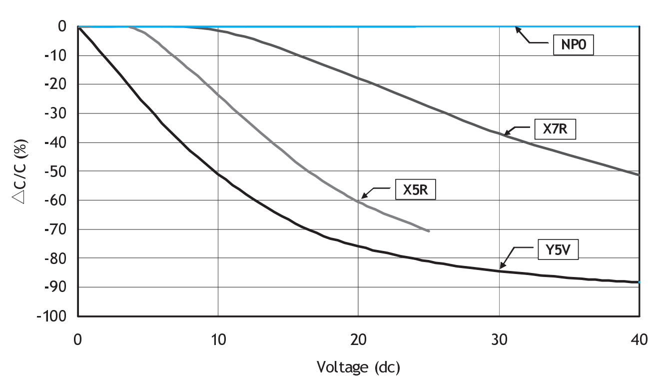

2) Capacitance Change - Typical aging rate




3) Temperature characteristics of capacitance (TCC)




4) DC Bias characteristics



## CAPACITANCE RANGE

### NP0 Dielectric

| Dielectric | NP0 | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Size | 0402 | | 0603 | | 0805 | | | 1206 | | | 1210 | | | 1812 | |
| Rated Voltage (VDC) | 10 16 25 50 | 100 | 10 16 25 50 | 100 | 10 16 | 25 50 | 100 | 10 16 | 25 50 | 100 | 10 16 | 25 50 | 100 | 16 50 | 100 |
| capacitance 0.5pF (0R5) | N | N | S | S | A | A | A | | | | | | | | |
| 0.6pF (0R6) | N | N | S | S | A | A | A | | | | | | | | |
| 0.7pF (0R7) | N | N | S | S | A | A | A | | | | | | | | |
| 0.8pF (0R8) | N | N | S | S | A | A | A | | | | | | | | |
| 0.9pF (0R9) | N | N | S | S | A | A | A | | | | | | | | |
| 1.0pF (1R0) | N | N | S | S | A | A | A | | | | | | | | |
| 1.2pF (1R2) | N | N | S | S | A | A | A | B | B | B | | | | | |
| 1.5pF (1R5) | N | N | S | S | A | A | A | B | B | B | | | | | |
| 1.8pF (1R8) | N | N | S | S | A | A | A | B | B | B | | | | | |
| 2.2pF (2R2) | N | N | S | S | A | A | A | B | B | B | | | | | |
| 2.7pF (2R7) | N | N | S | S | A | A | A | B | B | B | | | | | |
| 3.3pF (3R3) | N | N | S | S | A | A | A | B | B | B | | | | | |
| 3.9pF (3R9) | N | N | S | S | A | A | A | B | B | B | | | | | |
| 4.7pF (4R7) | N | N | S | S | A | A | A | B | B | B | | | | | |
| 5.6pF (5R6) | N | N | S | S | A | A | A | B | B | B | | | | | |
| 6.8pF (6R8) | N | N | S | S | A | A | A | B | B | B | | | | | |
| 8.2pF (8R2) | N | N | S | S | A | A | A | B | B | B | | | | | |
| 10pF (100) | N | N | S | S | A | A | A | B | B | B | C | C | C | D | D |
| 12pF (120) | N | N | S | S | A | A | A | B | B | B | C | C | C | D | D |
| 15pF (150) | N | N | S | S | A | A | A | B | B | B | C | C | C | D | D |
| 18pF (180 | N | N | S | S | A | A | A | B | B | B | C | C | C | D | D |
| 22pF (220) | N | N | S | S | A | A | A | B | B | B | C | C | C | D | D |
| 27pF (270) | N | N | S | S | A | A | A | B | B | B | C | C | C | D | D |
| 33pF (330) | N | N | S | S | A | A | A | B | B | B | C | C | C | D | D |
| 39pF (390) | N | N | S | S | A | A | A | B | B | B | C | C | C | D | D |
| 47pF (470) | N | N | S | S | A | A | A | B | B | B | C | C | C | D | D |
| 56pF (560) | N | N | S | S | A | A | A | B | B | B | C | C | C | D | D |
| 68pF (680) | N | N | S | S | A | A | A | B | B | B | C | C | C | D | D |
| 82pF (820) | N | N | S | S | A | A | A | B | B | B | C | C | C | D | D |
| 100pF (101) | N | N | S | S | A | A | A | B | B | B | C | C | C | D | D |
| 120pF (121) | N | N | S | S | A | A | A | B | B | B | C | C | C | D | D |
| 150pF (151) | N | N | S | S | A | A | A | B | B | B | C | C | C | D | D |
| 180pF (181) | N | N | S | S | A | A | A | B | B | B | C | C | C | D | D |
| 220pF (221) | N | N | S | S | A | A | A | B | B | B | C | C | C | D | D |
| 270pF (271) | N | | S | S | A | A | A | B | B | B | C | C | C | D | D |
| 330pF (331) | N | | S | S | A | A | A | B | B | B | C | C | C | D | D |
| 390pF (391) | N | | S | S | B | B | B | B | B | B | C | C | C | D | D |
| 470pF (471) | N | | S | S | B | B | B | B | B | B | C | C | C | D | D |
| 560pF (561) | N | | S | S | B | B | B | B | B | B | C | C | C | D | D |
| 680pF (681) | N | | S | S | B | B | B | B | B | B | C | C | C | D | D |
| 820pF (821) | N | | S | S | B | B | B | B | B | B | C | C | C | D | D |
| 1,000pF (102) | N | | S | S | B | B | B | B | B | B | C | C | C | D | D |
| 1,200pF (122) | | | X | | B | B | B | B | B | B | C | C | C | D | D |
| 1,500pF (152) | | | X | | B | B | B | B | B | B | C | C | C | D | D |
| 1,800pF (182) | | | X | | B | B | B | B | B | B | C | C | C | D | D |
| 2,200pF (222) | | | X | | B | B | B | B | B | B | C | C | C | D | D |
| 2,700pF (272) | | | X | | D | D | D | B | B | B | C | C | C | D | D |
| 3,300pF (332) | | | X | | D | D | D | B | B | B | C | C | C | D | D |
| 3,900pF (392) | | | | | D | D | D | B | B | B | C | C | C | D | D |
| 4,700pF (472) | | | | | D | D | D | B | B | B | C | C | C | D | D |
| 5,600pF (562) | | | | | D | D | | B | B | B | C | C | C | D | D |
| 6,800pF (682) | | | | | D | D | | C | C | C | C | C | C | D | D |
| 8,200pF (822) | | | | | D | D | | D | D | D | C | C | C | D | D |
| 0.010uF (103) | | | | | D | D | | D | D | D | C | C | C | D | D |
| 0.012uF (123) | | | | | | | | D^ | | | C | D | D | D | D |
| 0.015uF (153) | | | | | | | | D^ | | | C | D | D | D | D |
| 0.018uF (183) | | | | | | | | D^ | | | | | | D | D |
| 0.022uF (223) | | | | | | | | D^ | | | | | | D | D |
| 0.027uF (273) | | | | | | | | D^ | | | | | | D | D |
| 0.033uF (333) | | | | | | | | D^ | | | | | | D | D |
| 0.039uF (393) | | | | | | | | G^ | | | | | | | |

1. The letter in cell is expressed the symbol of product thickness.
2. The letter in cell with "^" mark is expressed product with Ag/Ni/Sn terminations.
3. For more information about products with special capacitance or other data, please contact WTC local representative.

## X7R Dielectric

| | Dielectric | X7R | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Size | 0402 | | | 0603 | | | | | | 0805 | | | | | | 1206 | | | | | | 1210 | | | | | 1812 | | | | |
| | Rated Voltage (VDC) | 10 16 | 25 | 50 | 6.3 | 10 | 16 | 25 | 50 | 100 | 6.3 | 10 | 16 | 25 | 50 | 100 | 6.3 | 10 | 16 | 25 | 50 | 100 | 10 | 16 | 25 | 50 | 100 | 10 | 16 | 25 | 50 | 100 |
| capacitance | 100pF (101) | N | N | N | | S | S | S | S | S | | B | B | B | B | B | | | | | | | | | | | | | | | | |
| | 120pF (121) | N | N | N | | S | S | S | S | S | | B | B | B | B | B | | | | | | | | | | | | | | | | |
| | 150pF (151) | N | N | N | | S | S | S | S | S | | B | B | B | B | B | | B | B | B | B | B | | | | | | | | | | |
| | 180pF (181) | N | N | N | | S | S | S | S | S | | B | B | B | B | B | | B | B | B | B | B | | | | | | | | | | |
| | 220pF (221) | N | N | N | | S | S | S | S | S | | B | B | B | B | B | | B | B | B | B | B | | | | | | | | | | |
| | 270pF (271) | N | N | N | | S | S | S | S | S | | B | B | B | B | B | | B | B | B | B | B | | | | | | | | | | |
| | 330pF (331) | N | N | N | | S | S | S | S | S | | B | B | B | B | B | | B | B | B | B | B | | | | | | | | | | |
| | 390pF (391) | N | N | N | | S | S | S | S | S | | B | B | B | B | B | | B | B | B | B | B | | | | | | | | | | |
| | 470pF (471) | N | N | N | | S | S | S | S | S | | B | B | B | B | B | | B | B | B | B | B | | | | | | | | | | |
| | 560pF (561) | N | N | N | | S | S | S | S | S | | B | B | B | B | B | | B | B | B | B | B | | | | | | | | | | |
| | 680pF (681) | N | N | N | | S | S | S | S | S | | B | B | B | B | B | | B | B | B | B | B | | | | | | | | | | |
| | 820pF (821) | N | N | N | | S | S | S | S | S | | B | B | B | B | B | | B | B | B | B | B | | | | | | | | | | |
| | 1,000pF (102) | N | N | N | | S | S | S | S | S | | B | B | B | B | B | | B | B | B | B | B | C | C | C | C | C | D | D | D | D | D |
| | 1,200pF (122) | N | N | N | | S | S | S | S | S | | B | B | B | B | B | | B | B | B | B | B | C | C | C | C | C | D | D | D | D | D |
| | 1,500pF (152) | N | N | N | | S | S | S | S | S | | B | B | B | B | B | | B | B | B | B | B | C | C | C | C | C | D | D | D | D | D |
| | 1,800pF (182) | N | N | N | | S | S | S | S | S | | B | B | B | B | B | | B | B | B | B | B | C | C | C | C | C | D | D | D | D | D |
| | 2,200pF (222) | N | N | N | | S | S | S | S | S | | B | B | B | B | B | | B | B | B | B | B | C | C | C | C | C | D | D | D | D | D |
| | 2,700pF (272) | N | N | N | | S | S | S | S | S | | B | B | B | B | B | | B | B | B | B | B | C | C | C | C | C | D | D | D | D | D |
| | 3,300pF (332) | N | N | N | | S | S | S | S | S | | B | B | B | B | B | | B | B | B | B | B | C | C | C | C | C | D | D | D | D | D |
| | 3,900pF (392) | N | N | N | | S | S | S | S | S | | B | B | B | B | B | | B | B | B | B | B | C | C | C | C | C | D | D | D | D | D |
| | 4,700pF (472) | N | N | N | | S | S | S | S | S | | B | B | B | B | B | | B | B | B | B | B | C | C | C | C | C | D | D | D | D | D |
| | 5,600pF (562) | N | N | N | | S | S | S | S | S | | B | B | B | B | B | | B | B | B | B | B | C | C | C | C | C | D | D | D | D | D |
| | 6,800pF (682) | N | N | N | | S | S | S | S | S | | B | B | B | B | B | | B | B | B | B | B | C | C | C | C | C | D | D | D | D | D |
| | 8,200pF (822) | N | N | N | | S | S | S | S | S | | B | B | B | B | B | | B | B | B | B | B | C | C | C | C | C | D | D | D | D | D |
| | 0.010uF (103) | N | N | N | | S | S | S | S | S | | B | B | B | B | B | | B | B | B | B | B | C | C | C | C | C | D | D | D | D | D |
| | 0.012uF (123) | N | N | | | S | S | S | S | | | B | B | B | B | B | | B | B | B | B | B | C | C | C | C | C | D | D | D | D | D |
| | 0.015uF (153) | N | N | | | S | S | S | S | | | B | B | B | B | B | | B | B | B | B | B | C | C | C | C | C | D | D | D | D | D |
| | 0.018uF (183) | N | N | | | S | S | S | S | | | B | B | B | B | B | | B | B | B | B | B | C | C | C | C | C | D | D | D | D | D |
| | 0.022uF (223) | N | N | | | S | S | S | S | | | B | B | B | B | B | | B | B | B | B | B | C | C | C | C | C | D | D | D | D | D |
| | 0.027uF (273) | N | N | | | S | S | S | S | | | B | B | B | B | D | | B | B | B | B | B | C | C | C | C | C | D | D | D | D | D |
| | 0.033uF (333) | N | N | | | S | S | S | X | | | B | B | B | B | D | | B | B | B | B | B | C | C | C | C | C | D | D | D | D | D |
| | 0.039uF (393) | N | N | | | S | S | S | X | | | B | B | B | B | D | | B | B | B | B | B | C | C | C | C | C | D | D | D | D | D |
| | 0.047uF (473) | N | N | | | S | S | S | X | | | B | B | B | B | D | | B | B | B | B | B | C | C | C | C | C | D | D | D | D | D |
| | 0.056uF (563) | N | | | | S | S | S | X | | | B | B | B | B | D | | B | B | B | B | B | C | C | C | C | C | D | D | D | D | D |
| | 0.068uF (683) | N | | | | S | S | S | X | | | B | B | B | B | D | | B | B | B | B | B | C | C | C | C | C | D | D | D | D | D |
| | 0.082uF (823) | N | | | | S | S | S | X | | | B | B | B | B | D | | B | B | B | B | D | C | C | C | C | C | D | D | D | D | D |
| | 0.10uF (104) | N | N | | | S | S | S | X | | | B | B | B | B | D | | B | B | B | B | D | C | C | C | C | C | D | D | D | D | D |
| | 0.12uF (124) | | | | | S | S | X | | | | D | D | D | D | | | B | B | B | B | D | C | C | C | C | C | D | D | D | D | D |
| | 0.15uF (154) | | | | | S | S | X | | | | D | D | D | D | | | C | C | C | C | G | C | C | C | C | D | D | D | D | D | D |
| | 0.18uF (184) | | | | | S | S | X | | | | D | D | D | D | | | C | C | C | C | G | C | C | C | C | D | D | D | D | D | D |
| | 0.22uF (224) | N | | | | S | S | X | | | | D | D | D | D | | | C | C | C | C | G | C | C | C | C | D | D | D | D | D | D |
| | 0.27uF (274) | | | | X | X | X | X | | | | D | D | D | I | | | C | C | C | D | G | C | C | C | C | G | D | D | D | D | D |
| | 0.33uF (334) | | | | X | X | X | X | | | | D | D | D | I | | | C | C | C | D | G | C | C | C | D | G | D | D | D | D | D |
| | 0.39uF (394) | | | | X | X | X | X | | | | D | D | D | I | | | C | C | J | P | G | C | C | C | D | M | D | D | D | D | D |
| | 0.47uF (474) | | | | X | X | X | X | | | | D | D | D | I | | | J | J | J | P | G | C | C | C | D | M | D | D | D | D | K |
| | 0.56uF (564) | | | | X | X | X | | | | | D | D | D | | | | J | J | J | P | P | D | D | D | D | M | D | D | D | D | K |
| | 0.68uF (684) | | | | X | X | X | | | | | D | D | D | | | | J | J | J | P | P | D | D | D | D | K | D | D | D | K | K |
| | 0.82uF (824) | | | | X | X | X | | | | | D | D | D | | | | J | J | J | P | P | D | D | D | D | K | D | D | D | K | K |
| | 1.0uF (105) | | | | X | X | X | X | | | | D | D | D | I | | | J | J | J | P | P | D | D | D | D | K | D | D | D | K | K |
| | 1.5uF (155) | | | | | | | | | | | I | I | I | | | J | J | J | P | | | | | | | M | | | | | K |
| | 2.2uF (225) | | | | | X | | | | | I | I | I | I | | | J | J | J | P | P | | | K | G | | M | | | | M | M |
| | 3.3uF (335) | | | | | | | | | | | | | | | | P | P | P | P | | | | | G | | | | | | | |
| | 4.7uF (475) | | | | | | | | | | I | I | I | | | | P | P | P | P | P | | K | K | K | M | | | | | | |
| | 6.8uF (685) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 10uF (106) | | | | | | | | | | I | I | | | | | P | P | P | P | | | K | K | K | M | | | | | | |
| | 22uF (226) | | | | | | | | | | | | | | | | | P | | | | | | M | M | | | | | | | |
| | 47uF (476) | | | | | | | | | | | | | | | | | | | | | | M | | | | | | | | | |

1. The letter in cell is expressed the symbol of product thickness.
2. For more information about products with special capacitance or other data, please contact WTC local representative.

## Y5V Dielectric (0402, 0603, 0805 Size)

| Dielectric | | Y5V | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Size | | 0402 | | | | | 0603 | | | | | 0805 | | | | |
| Rated Voltage (VDC) | | 6.3 | 10 | 16 | 25 | 50 | 6.3 | 10 | 16 | 25 | 50 | 6.3 | 10 | 16 | 25 | 50 | 100 |
| capacitance | 0.010uF (103) | | N | N | N | N | | S | S | S | S | | A | A | A | A | B |
| | 0.015uF (153) | | N | N | N | N | | S | S | S | S | | A | A | A | A | B |
| | 0.022uF (223) | | N | N | N | N | | S | S | S | S | | A | A | A | A | B |
| | 0.033uF (333) | | N | N | N | N | | S | S | S | S | | A | A | A | A | B |
| | 0.047uF (473) | | N | N | N | | | S | S | S | S | | A | A | A | A | B |
| | 0.068uF (683) | | N | N | N | | | S | S | S | S | | A | A | A | A | B |
| | 0.10uF (104) | | N | N | N | | | S | S | S | S | | A | A | A | A | B |
| | 0.15uF (154) | | N | N | | | | S | S | S | S | | A | A | A | A | |
| | 0.22uF (224) | N | N | N | | | S | S | S | S | S | | A | A | A | A | |
| | 0.33uF (334) | N | N | N | | | | S | S | S | | | B | B | B | B | |
| | 0.47uF (474) | N | N | N | | | | S | S | X | S | | B | B | B | B/D | |
| | 0.68uF (684) | N | | | | | | S | X | | | | B | B | D | D | |
| | 1.0uF (105) | N | N | | | | | S | X | X | | | B | B | D | D | |
| | 1.5uF (155) | | | | | | | S | | | | | D | D | | | |
| | 2.2uF (225) | | | | | | S | S | X | | | | D | D | I | | |
| | 3.3uF (335) | | | | | | | | | | | | D | D | | | |
| | 4.7uF (475) | | | | | | X | X | | | | | D | D | I | | |
| | 6.8uF (685) | | | | | | | | | | | | I | | | | |
| | 10uF (106) | | | | | | | | | | | I | I | I | | | |
| | 22uF (226) | | | | | | | | | | | I | | | | | |

## Y5V Dielectric (1206, 1210, 1812 Size)

| Dielectric | | Y5V | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Size | | 1206 | | | | | | | 1210 | | | | | | | 1812 | | | | |
| Rated Voltage (VDC) | | 6.3 | 10 | 16 | 25 | 35 | 50 | 100 | 6.3 | 10 | 16 | 25 | 35 | 50 | 100 | 10 | 16 | 25 | 50 | 100 |
| capacitance | 0.010uF (103) | | B | B | B | | B | B | | | | | | | C | | | | | D |
| | 0.015uF (153) | | B | B | B | | B | B | | | | | | | C | | | | | D |
| | 0.022uF (223) | | B | B | B | | B | B | | | | | | | C | | | | | D |
| | 0.033uF (333) | | B | B | B | | B | B | | | | | | | C | | | | | D |
| | 0.047uF (473) | | B | B | B | | B | B | | | | | | | C | | | | | D |
| | 0.068uF (683) | | B | B | B | | B | B | | | | | | | C | | | | | D |
| | 0.10uF (104) | | B | B | B | | B | B | | C | C | C | | C | C | D | D | D | D | D |
| | 0.15uF (154) | | B | B | B | | B | C | | C | C | C | | C | C | D | D | D | D | D |
| | 0.22uF (224) | | B | B | B | | B | C | | C | C | C | | C | C | D | D | D | D | D |
| | 0.33uF (334) | | B | B | B | | B | | | C | C | C | | C | C | D | D | D | D | D |
| | 0.47uF (474) | | B | B | B | | B | | | C | C | C | | C | | D | D | D | D | D |
| | 0.68uF (684) | | B | B | B | | B | | | C | C | C | | C | | D | D | D | D | D |
| | 1.0uF (105) | | C | C | C | | C/D | | | C | C | C | | C | | D | D | D | D | D |
| | 1.5uF (155) | | C | C | C | | | | | C | C | C | | | | D | D | D | D | |
| | 2.2uF (225) | | C | C | C | | J | | | C | C | C | | G | | D | D | D | D | |
| | 3.3uF (335) | | J | J | J | | | | | C | C | C | | | | D | D | D | D | |
| | 4.7uF (475) | | J | J | J | J | P | | | C | C | D | | G | | D | D | D | D | |
| | 6.8uF (685) | | J | J | | | | | | C | C | D | | | | D | D | D | D | |
| | 10uF (106) | | J | J | P | | | | | D | D | G | K | | | D | D | D | K | |
| | 22uF (226) | | P | | | | | | | K | K | | | | | | | | | |
| | 47uF (476) | P | | | | | | | K | K | | | | | | | M | | | |
| | 100uF (107) | | | | | | | | M | | | | | | | | | | | |

1. The letter in cell is expressed the symbol of product thickness.
2. For more information about products with special capacitance or other data, please contact WTC local representative.

## X5R Dielectric

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

1. The letter in cell is expressed the symbol of product thickness.
2. For more information about products with special capacitance or other data, please contact WTC local representative.

## FEATURES

* High capacitance in unit size.
* High precision dimensional tolerances.
* Suitable used in high-accuracy automatic mounting machine.

## GENERAL ELECTRICAL DATA

| Size | 0201 | | |
|---|---|---|---|
| Dielectric | NP0 | X7R | X5R |
| Capacitance | 0.3pF to 100pF | 100pF to 10nF | 100pF to 0.47µF |
| Capacitance tolerance | Cap≤5pF: B (±0.1pF), C (±0.25pF)<br>5pF<Cap<10pF: C (±0.25pF),D(±0.5pF)<br>Cap≥10pF:F (±1%),G (±2%),J (±5%),K(±10%) | J (±5%), K (±10%), M (±20%) | J (±5%),K (±10%), M (±20%) |
| Rated voltage (WVDC) | 16V, 25V, 50V | 6.3V, 10V, 16V, 25V, 50V | 6.3V, 10V, 16V, 25V, 50V |
| Tan δ / Q | Cap<30pF, Q≥400+20C<br>Cap≥30pF, Q≥1000 | Ur=50V: ≤3.0%<br>Ur=16V, 25V: ≤3.5%<br>Ur=10V: ≤5.0%<br>Ur=6.3V: ≤10% | Ur=50V: ≤3.0%<br>Ur=16V, 25V: ≤3.5%<br>Ur=10V: ≤5.0%<br>Ur=6.3V: ≤10% |
| Insulation resistance at Ur | ≥10GΩ | ≥10GΩ or RxC≥500ΩxF whichever is less | |
| Operating temperature | -55 to +125°C | | -55 to +85°C |
| Capacitance change | ±30ppm | ±15% | |
| Termination | Ni/Sn (lead-free termination) | | |

## EXPLANATION OF PART NUMBERS

| 0201 | N | 100 | J | 250 | L | T |
|---|---|---|---|---|---|---|
| **Size (Inch (mm))** | **Dielectric** | **Capacitance** | **Tolerance** | **Rated voltage** | **Termination** | **Packaging style** |
| 0201 (0603) | N=NP0(C0G) | 100=10x10$^0$=10pF | J=±5% | 250=25 VDC | L=Ag/Ni/Sn | T=7" reeled |

Please refer to page 2 " How to order" for more information.

## CAPACITANCE RANGE

| SIZE | | 0201 | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| DIELECTRIC | | X7R | | | | | X5R | | | | |
| RATED VOLTAGE (VDC) | | 6.3 | 10 | 16 | 25 | 50 | 6.3 | 10 | 16 | 25 | 50 |
| Capacitance | 100pF (101) | | | L | L | L | | | L | L | L |
| | 120pF (121) | | | L | L | L | | | L | L | L |
| | 150pF (151) | | | L | L | L | | | L | L | L |
| | 180pF (181) | | | L | L | L | | | L | L | L |
| | 220pF (221) | | | L | L | L | | | L | L | L |
| | 270pF (271) | | | L | L | L | | | L | L | L |
| | 330pF (331) | | | L | L | L | | | L | L | L |
| | 390pF (391) | | | L | L | L | | | L | L | L |
| | 470pF (471) | | | L | L | L | | | L | L | L |
| | 560pF (561) | | | L | L | L | | | L | L | L |
| | 680pF (681) | | | L | L | L | | | L | L | L |
| | 820pF (821) | | | L | L | L | | | L | L | L |
| | 1,000pF (102) | L | L | L | L | L | | | L | L | L |
| | 1,500pF (152) | L | L | L | | | | L | L | | |
| | 2,200pF (222) | L | L | L | | | | L | L | | |
| | 3,300pF (332) | L | L | L | | | | L | L | | |
| | 4,700pF (472) | L | L | L | | | | L | L | | |
| | 6,800pF (682) | L | L | | | | | L | | | |
| | 0.010µF (103) | L | L | L | | | L | L | | | |
| | 0.015µF (153) | | | | | | L | L | | | |
| | 0.022µF (223) | | | | | | L | L | | | |
| | 0.033µF (333) | | | | | | L | L | | | |
| | 0.047µF (473) | | | | | | L | L | | | |
| | 0.068µF (683) | | | | | | L | L | | | |
| | 0.10µF (104) | | | | | | L | L | | | |
| | 0.22µF (224) | | | | | | L | | | | |
| | 0.47µF (474) | | | | | | L | | | | |

| SIZE | | 0201 | | |
|---|---|---|---|---|
| DIELECTRIC | | NPO | | |
| RATED VOLTAGE (VDC) | | 16 | 25 | 50 |
| Capacitance | 0.3pF (0R3) | | L^ | L^ |
| | 0.4pF (0R4) | | L^ | L^ |
| | 0.5pF (0R5) | | L^ | L^ |
| | 1.0pF (1R0) | | L^ | L^ |
| | 1.2pF (1R2) | | L^ | L^ |
| | 1.5pF (1R5) | | L^ | L^ |
| | 1.8pF (1R8) | | L^ | L^ |
| | 2.2pF (2R2) | | L^ | L^ |
| | 2.7pF (2R7) | | L^ | L^ |
| | 3.0pF (3R0) | | L^ | L^ |
| | 3.3pF (3R3) | | L^ | L^ |
| | 3.9pF (3R9) | | L^ | L^ |
| | 4.0pF(4R0) | | L^ | L^ |
| | 4.7pF (4R7) | | L^ | L^ |
| | 5.6pF (5R6) | | L^ | L^ |
| | 6.8pF (6R8) | | L^ | L^ |
| | 8.2pF (8R2) | | L^ | L^ |
| | 10pF (100) | | L^ | L^ |
| | 12pF (120) | | L^ | L^ |
| | 15pF (150) | | L^ | L^ |
| | 18pF (180) | | L^ | L^ |
| | 22pF (220) | | L^ | L^ |
| | 27pF (270) | | L^ | L^ |
| | 33pF (330) | | L^ | L^ |
| | 39pF (390) | | L^ | L^ |
| | 47pF (470) | | L^ | L^ |
| | 56pF (560) | L^ | L^ | |
| | 68pF (680) | L^ | L^ | |
| | 82pF (820) | L^ | L^ | |
| | 100pF (101) | L^ | L^ | |

1. The letter in cell is expressed the symbol of product thickness.
2. The letter in cell with "^" mark is expressed product with Ag/Ni/Sn terminations.
3. For more information about products with special capacitance or other data, please contact WTC local representative.

## FEATURES

* High voltage in a given case size.
* High stability and reliability.

## GENERAL ELECTRICAL DATA

| Dielectric | NP0 | X7R | Y5V |
|---|---|---|---|
| Size | 0603, 0805, 1206, 1210, 1808, 1812 | | 0805, 1206, 1210, 1812 |
| Capacitance | 0.5pF to 6800pF | 100pF to 1.0μF | 0.01μF to 0.68μF |
| Capacitance tolerance | Cap≤5pF: C (±0.25pF)<br>5pF<Cap<10pF: D (±0.5pF)<br>Cap≥10pF: J (±5%), K (±10%) | K (±10%), M (±20%) | Z (-20/+80%) |
| Rated voltage (WVDC) | 200V to 3kV | | 200V, 250V |
| Q | Cap<30pF: Q≥400+20C<br>Cap≥30pF: Q≥1000 | ≤2.5% | ≤5% |
| Insulation resistance at Ur | Ur=200~630V: ≥10GΩ or RxC≥100Ω-F whichever is smaller<br>Ur=1000~3000V: ≥10GΩ | | |
| Dielectric strength | 200~300V: ≥2 x WVDC<br>500~999V: ≥1.5 x WVDC<br>1000~3000V: ≥1.2 x WVDC | | |
| Operating temperature | -55 to +125°C | | -25 to +85°C |
| Capacitance characteristic | ±30ppm | ±15% | +30/-80% |
| Termination | Ni/Sn (lead-free termination) | | |

## EXPLANATION OF PART NUMBERS

| 1808 | N | 100 | J | 202 | C | T |
|---|---|---|---|---|---|---|
| **Size (Inch (mm))** | **Dielectric** | **Capacitance** | **Tolerance** | **Rated voltage** | **Termination** | **Packaging style** |
| 1808 (4520) | N=NP0(C0G) | 100=$10\times10^{0}$=10pF | J=±5% | 202=2000 VDC | C=Cu/Ni/Sn | T=7" reeled |

Please refer to page 2 " How to order" for more information.

## CAPACITANCE RANGE

### Y5V Dielectric 200V to 250V

| DIELECTRIC | Y5V | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| SIZE | 0805 | | 1206 | | 1210 | | 1812 | |
| RATED VOLTAGE (VDC) | 200 | 250 | 200 | 250 | 200 | 250 | 200 | 250 |
| Capacitance 0.010μF (103) | B | B | B | B | C | C | D | D |
| 0.015μF (153) | B | B | B | B | C | C | D | D |
| 0.022μF (223) | B | B | B | B | C | C | D | D |
| 0.033μF (333) | B | B | B | B | C | C | D | D |
| 0.047μF (473) | B | B | B | B | C | C | D | D |
| 0.068μF (683) | B | B | B | B | C | C | D | D |
| 0.10μF (104) | | | B | B | C | C | D | D |
| 0.15μF (154) | | | C | C | C | C | D | D |
| 0.22μF (224) | | | | | | | D | D |
| 0.33μF (334) | | | | | | | D | D |
| 0.47μF (474) | | | | | | | D | D |
| 0.68μF (684) | | | | | | | D | D |

1. The letter in cell is expressed the symbol of product thickness.
2. For more information about products with special capacitance or other data, please contact WTC local representative.

## NP0 Dielectric 200V to 3kV

| DIELECTRIC | NP0 | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SIZE | 0603 | 0805 | | | 1206 | | | | | 1210 | | | | | 1808 | | | 1812 | | | | | |
| RATED VOLTAGE (VDC) | 200 / 250 | 200 | 250 | 500 / 630 | 200 | 250 | 500 / 630 | 1000 | 2000 | 200 | 250 | 500 / 630 | 1000 | 2000 | 500 / 630 / 1000 | 2000 | 3000 | 200 | 250 | 500 / 630 | 1000 | 2000 | 3000 |
| Capacitance 0.5pF (0R5) | S | A | A | A | | | | | | | | | | | | | | | | | | | |
| 1.0pF (1R0) | S | A | A | A | | | | | | | | | | | | | | | | | | | |
| 1.2pF (1R2) | S | A | A | A | | | | | | | | | | | | | | | | | | | |
| 1.5pF (1R5) | S | A | A | A | B | B | B | B | B | | | | | | | | | | | | | | |
| 1.8pF (1R8) | S | A | A | A | B | B | B | B | B | | | | | | | | | | | | | | |
| 2.2pF (2R2) | S | A | A | A | B | B | B | B | B | | | | | | D | D | D | | | | | | |
| 2.7pF (2R7) | S | A | A | A | B | B | B | B | B | | | | | | D | D | D | | | | | | |
| 3.3pF (3R3) | S | A | A | A | B | B | B | B | B | | | | | | D | D | D | | | | | | |
| 3.9pF (3R9) | S | A | A | A | B | B | B | B | B | | | | | | D | D | D | | | | | | |
| 4.7pF (4R7) | S | A | A | A | B | B | B | B | B | | | | | | D | D | D | | | | | | |
| 5.6pF (5R6) | S | A | A | A | B | B | B | B | B | | | | | | D | D | D | | | | | | |
| 6.8pF (6R8) | S | A | A | A | B | B | B | B | B | | | | | | D | D | D | | | | | | |
| 8.2pF (8R2) | S | A | A | A | B | B | B | B | B | | | | | | D | D | D | | | | | | |
| 10pF (100) | S | A | A | A | B | B | B | B | B | C | C | C | C | C | D | D | D | D | D | D | D | D | D |
| 12pF (120) | S | A | A | A | B | B | B | B | B | C | C | C | C | C | D | D | D | D | D | D | D | D | D |
| 15pF (150) | S | A | A | A | B | B | B | B | B | C | C | C | C | C | D | D | D | D | D | D | D | D | D |
| 18pF (180) | S | A | A | A | B | B | B | B | B | C | C | C | C | C | D | D | D | D | D | D | D | D | D |
| 22pF (220) | S | A | A | A | B | B | B | B | B | C | C | C | C | C | D | D | D | D | D | D | D | D | D |
| 27pF (270) | S | A | A | A | B | B | B | B | B | C | C | C | C | C | D | D | D | D | D | D | D | D | D |
| 33pF (330) | S | A | A | A | B | B | B | B | C | C | C | C | C | C | D | D | D | D | D | D | D | D | D |
| 39pF (390) | S | A | A | A | B | B | B | B | C | C | C | C | C | C | D | D | D | D | D | D | D | D | D |
| 47pF (470) | S | A | A | A | B | B | B | C | C | C | C | C | C | C | D | D | D | D | D | D | D | D | D |
| 56pF (560) | S | A | A | A | B | B | B | C | D | C | C | C | C | D | D | D | D | D | D | D | D | D | D |
| 68pF (680) | S | A | A | A | B | B | B | C | D | C | C | C | C | D | D | D | D | D | D | D | D | D | D |
| 82pF (820) | S | A | A | B | B | B | B | D | D | C | C | C | C | D | D | D | D | D | D | D | D | D | D |
| 100pF (101) | S | A | B | B | B | B | B | D | D | C | C | C | D | D | D | D | K | D | D | D | D | D | D |
| 120pF (121) | S | A | B | D | B | B | B | D | G | C | C | C | D | D | D | D | K | D | D | D | D | D | D |
| 150pF (151) | S | B | D | D | B | B | B | D | G | C | C | C | D | G | D | K | K | D | D | D | D | D | D |
| 180pF (181) | S | B | D | D | B | B | B | G | G | C | C | C | D | G | D | K | K | D | D | D | D | D | K |
| 220pF (221) | S | D | D | D | B | B | B | G | G | C | C | C | G | G | D | K | K | D | D | D | D | D | K |
| 270pF (271) | X | D | D | D | B | C | C | G | | C | C | C | G | | K | K | K | D | D | D | D | K | K |
| 330pF (331) | X | D | D | D | B | C | C | G | | C | C | C | G | | K | K | K | D | D | D | D | K | K |
| 390pF (391) | X | D | D | D | B | C | C | G | | C | C | C | G | | K | K | | D | D | D | D | K | K |
| 470pF (471) | X | D | D | | C | C | C | G | | C | C | C | G | | K | K | | D | D | D | K | K | K |
| 560pF (561) | | D | D | | C | D | D | | | C | C | C | | | K | K | | D | D | D | K | K | |
| 680pF (681) | | D | D | | C | D | D | | | C | C | C | | | K | K | | D | D | D | K | K | |
| 820pF (821) | | D | D | | C | G | G | | | C | C | C | | | K | | | D | D | D | K | K | |
| 1,000pF (102) | | D | | | C | G | G | | | D | D | D | | | K | | | D | D | D | K | K | |
| 1,200pF (122) | | | | | C | G | G | | | D | D | D | | | | | | D | D | D | K | | |
| 1,500pF (152) | | | | | D | G | G | | | D | D | D | | | | | | D | D | D | K | | |
| 1,800pF (182) | | | | | D | G | G | | | D | D | D | | | | | | D | D | D | | | |
| 2,200pF (222) | | | | | D | G | G | | | D | D | | | | | | | D | D | D | | | |
| 2,700pF (272) | | | | | | | | | | D | D | | | | | | | D | D | D | | | |
| 3,300pF (332) | | | | | | | | | | D | D | | | | | | | D | D | D | | | |
| 3,900pF (392) | | | | | | | | | | D | D | | | | | | | D | | | | | |
| 4,700pF (472) | | | | | | | | | | | | | | | | | | D | | | | | |
| 5,600pF (562) | | | | | | | | | | | | | | | | | | D | | | | | |
| 6,800pF (682) | | | | | | | | | | | | | | | | | | D | | | | | |

1. The letter in cell is expressed the symbol of product thickness.
2. The letter in cell with “^” mark is expressed product with Ag/Ni/Sn terminations.
3. For more information about products with special capacitance or other data, please contact WTC local representative.

## X7R Dielectric 200V to 3kV

| DIELECTRIC | X7R | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SIZE | 0805 | | 1206 | | | | 1210 | | | 1808 | | | 1812 | | | | |
| RATED VOLTAGE (VDC) | 200/250 | 500/630 | 200/250 | 500/630 | 1000 | 2000 | 200/250 | 500/630 | 1000 | 500/630/1000 | 2000 | 3000 | 200/250 | 500/630 | 1000 | 2000 | 3000 |
| **Capacitance** | | | | | | | | | | | | | | | | | |
| 100pF (101) | B | B | | | | | | | | | | | | | | | |
| 120pF (121) | B | B | | | | | | | | | | | | | | | |
| 150pF (151) | B | B | D | D | D | D | | | | D | D | D | | | | | |
| 180pF (181) | B | B | D | D | D | D | | | | D | D | D | | | | | |
| 220pF (221) | B | B | D | D | D | D | | | | D | D | D | | | | | |
| 270pF (271) | B | B | D | D | D | D | | | | D | D | D | | | D | D | |
| 330pF (331) | B | B | D | D | D | D | | | | D | D | K | | | D | D | |
| 390pF (391) | B | B | D | D | D | D | | | | D | D | K | | | D | D | |
| 470pF (471) | B | B | D | D | D | D | | | | D | D | K | | | D | D | |
| 560pF (561) | B | B | D | D | D | D | | | | D | D | K | | | D | D | |
| 680pF (681) | B | B | D | D | D | D | | | | D | D | K | | | D | D | K |
| 820pF (821) | B | B | D | D | D | G | | | | D | D | K | | | D | D | K |
| 1,000pF (102) | B | B | D | D | D | G | C | D | D | D | D | K | D | D | D | D | K |
| 1,200pF (122) | B | B | D | D | D | G | C | D | D | D | K | | D | D | D | D | |
| 1,500pF (152) | B | B | D | D | D | G | C | D | D | D | K | | D | D | D | D | |
| 1,800pF (182) | B | B | D | D | D | G | C | D | D | D | K | | D | D | D | D | |
| 2,200pF (222) | B | B | D | D | D | | C | D | D | D | K | | D | D | D | D | |
| 2,700pF (272) | B | B | D | D | D | | C | D | D | D | | | D | D | D | D | |
| 3,300pF (332) | B | B | D | D | D | | C | D | D | D | | | D | D | D | K | |
| 3,900pF (392) | B | B | D | D | D | | C | D | G | D | | | D | D | D | K | |
| 4,700pF (472) | B | D | D | D | D | | C | D | G | D | | | D | D | D | K | |
| 5,600pF (562) | D | D | D | D | D | | C | D | G | K | | | D | D | D | | |
| 6,800pF (682) | D | D | D | D | D | | C | D | G | K | | | D | D | D | | |
| 8,200pF (822) | D | D | D | D | D | | C | D | G | K | | | D | D | D | | |
| 0.010μF (103) | D | D | D | D | D | | C | D | G | K | | | D | D | D | | |
| 0.012μF (123) | D | | D | D | | | C | D | | | | | D | D | K | | |
| 0.015μF (153) | D | | D | D | | | C | D | | | | | D | D | K | | |
| 0.018μF (183) | D | | D | D | | | C | D | | | | | D | D | | | |
| 0.022μF (223) | D | | D | G | | | C | D | | | | | D | D | | | |
| 0.027μF (273) | | | D | G | | | C | G | | | | | D | D | | | |
| 0.033μF (333) | | | G | G | | | C | G | | | | | D | D | | | |
| 0.039μF (393) | | | G | | | | C | G | | | | | D | D | | | |
| 0.047μF (473) | | | G | | | | D | G | | | | | D | D | | | |
| 0.056μF (563) | | | G | | | | D | G | | | | | D | K | | | |
| 0.068μF (683) | | | G | | | | G | | | | | | D | K | | | |
| 0.082μF (823) | | | G | | | | G | | | | | | D | K | | | |
| 0.10μF (104) | | | G | | | | G | | | | | | D | K | | | |
| 0.12μF (124) | | | | | | | G | | | | | | D | | | | |
| 0.15μF (154) | | | | | | | M | | | | | | K | | | | |
| 0.18μF (184) | | | | | | | M | | | | | | K | | | | |
| 0.22μF (224) | | | | | | | M | | | | | | K | | | | |
| 0.27μF (274) | | | | | | | M | | | | | | K | | | | |
| 0.33μF (334) | | | | | | | M | | | | | | K | | | | |
| 0.39μF (394) | | | | | | | M | | | | | | K | | | | |
| 0.47μF (474) | | | | | | | M | | | | | | K | | | | |
| 0.56μF (564) | | | | | | | | | | | | | M | | | | |
| 0.68μF (684) | | | | | | | | | | | | | M | | | | |
| 0.82μF (824) | | | | | | | | | | | | | M | | | | |
| 1.00μF (105) | | | | | | | | | | | | | M | | | | |

**1. The letter in cell is expressed the symbol of product thickness.**

**2. The letter in cell with “^” mark is expressed product with Ag/Ni/Sn terminations.**

**3. For more information about products with special capacitance or other data, please contact WTC local representative.**

## FEATURES

* High Q and low ESR performance at high frequency.
* Quality improvement of telephone calls for low power loss and better performance.

## GENERAL ELECTRICAL DATA

| Dielectric | NP0 |
|---|---|
| Size | 0402, 0603,0805 |
| Capacitance | 0402: 0.5pF to 470pF(<0.5pF: on requested)<br>0603: 0.5pF to 3300pF<br>0805: 0.5pF to 150pF |
| Capacitance tolerance | Cap≤5pF: B (±0.1pF), C (±0.25pF)<br>5pF<Cap<10pF: C (±0.25pF), D (±0.5pF)<br>Cap≥10pF: F (±1%), G (±2%), J (±5%) |
| Rated voltage (WVDC) | 16V, 25V, 50V, 100V, 200V, 250V, 500V, 630V |
| Q | Cap<30pF: Q≥400+20C<br>Cap≥30pF: Q≥1000 |
| Insulation resistance at Ur | ≥10GΩ |
| Operating temperature | -55 to +125°C |
| Capacitance change | ±30ppm |
| Termination | Ni/Sn (lead-free termination) |

## EXPLANATION OF PART NUMBERS

| HH | 15 | N | 100 | G | 500 | C | T |
|---|---|---|---|---|---|---|---|
| **Series**<br>HH=High Q/ Low ESR | **Size (Inch (mm))**<br>15=0402 (1005) | **Dielectric**<br>N=NP0(C0G) | **Capacitance**<br>100=10x10$^0$=10pF | **Tolerance**<br>G=±2% | **Rated voltage**<br>500=50 VDC | **Termination**<br>C=Cu/Ni/Sn | **Packaging**<br>T=7" reeled |

* Please refer to page 2 " How to order" for more information.

## ELECTRICAL CHARACTERISTICS

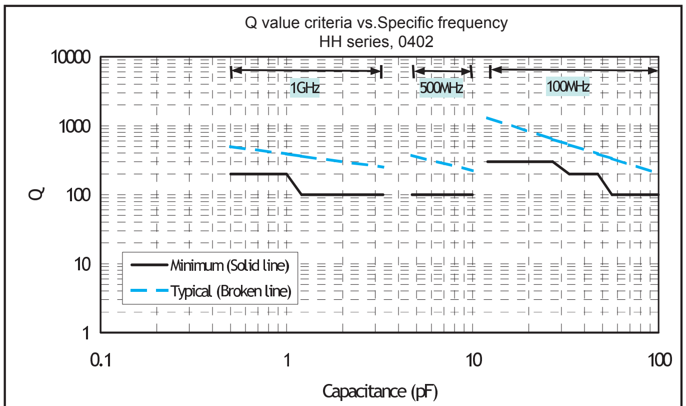



Fig. 1 Q factor specification vs. Specific frequency 0402

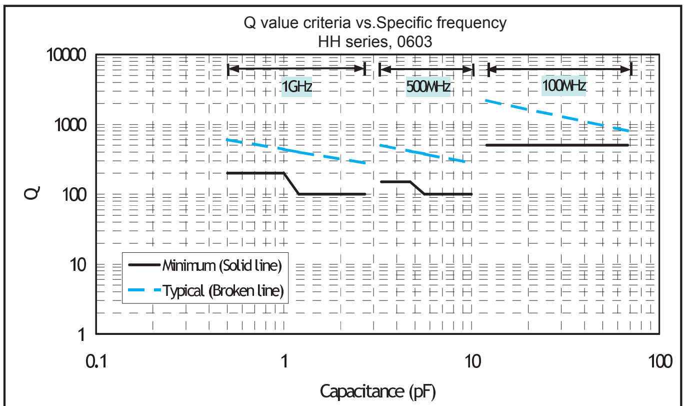



Fig. 2 Q factor specification vs. Specific frequency 0603

## CAPACITANCE RANGE

| DIELECTRIC | | NP0 | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SIZE | | 0402 | | | 0603 | | | | 0805 | | | |
| RATED VOLTAGE (VDC) | | 16 | 25 | 50 | 16 | 25 | 50 | 100 | 50 | 100 | 200,250 | 500,630 |
| Capacitance | 0.5pF (0R5) | N^ | N^ | N^ | S^ | S^ | S^ | S^ | B | B | | |
| | 0.6pF (0R6) | N^ | N^ | N^ | S^ | S^ | S^ | S^ | B | B | | |
| | 0.7pF (0R7) | N^ | N^ | N^ | S^ | S^ | S^ | S^ | B | B | | |
| | 0.8pF (0R8) | N^ | N^ | N^ | S^ | S^ | S^ | S^ | B | B | | |
| | 0.9pF (0R9) | N^ | N^ | N^ | S^ | S^ | S^ | S^ | B | B | | |
| | 1.0pF (1R0) | N^ | N^ | N^ | S^ | S^ | S^ | S^ | B | B | B | B |
| | 1.2pF (1R2) | N^ | N^ | N^ | S^ | S^ | S^ | S^ | B | B | B | B |
| | 1.5pF (1R5) | N^ | N^ | N^ | S^ | S^ | S^ | S^ | B | B | B | B |
| | 1.8pF (1R8) | N^ | N^ | N^ | S^ | S^ | S^ | S^ | B | B | B | B |
| | 2.2pF (2R2) | N^ | N^ | N^ | S^ | S^ | S^ | S^ | B | B | B | B |
| | 2.7pF (2R7) | N^ | N^ | N^ | S^ | S^ | S^ | S^ | B | B | B | B |
| | 3.3pF (3R3) | N^ | N^ | N^ | S^ | S^ | S^ | S^ | B | B | B | B |
| | 3.9pF (3R9) | N^ | N^ | N^ | S^ | S^ | S^ | S^ | B | B | B | B |
| | 4.7pF (4R7) | N^ | N^ | N^ | S^ | S^ | S^ | S^ | B | B | B | B |
| | 5.6pF (5R6) | N^ | N^ | N^ | S^ | S^ | S^ | S^ | B | B | B | B |
| | 6.8pF (6R8) | N^ | N^ | N^ | S^ | S^ | S^ | S^ | B | B | B | B |
| | 8.2pF (8R2) | N^ | N^ | N^ | S^ | S^ | S^ | S^ | B | B | B | B |
| | 10pF (100) | N | N | N | S | S | S | S | B | B | B | B |
| | 12pF (120) | N | N | N | S | S | S | S | B | B | B | B |
| | 15pF (150) | N | N | N | S | S | S | S | B | B | B | B |
| | 18pF (180) | N | N | N | S | S | S | S | B | B | B | B |
| | 22pF (220) | N | N | N | S | S | S | S | B | B | B | B |
| | 27pF (270) | N | N | N | S | S | S | S | B | B | B | B |
| | 33pF (330) | N | N | N | S | S | S | S | B | B | B | B |
| | 39pF (390) | N | N | N | S | S | S | S | B | B | B | B |
| | 47pF (470) | N | N | N | S | S | S | S | B | B | B | B |
| | 56pF (560) | N | N | N | S | S | S | S | B | B | B | B |
| | 68pF (680) | N | N | N | S | S | S | S | B | B | B | B |
| | 82pF (820) | N | N | N | S | S | S | S | B | B | B | B |
| | 100pF (101) | N | N | N | S | S | S | S | B | B | B | B |
| | 120pF (121) | N | N | N | S | S | S | S | D | D | D | D |
| | 150pF (151) | N | N | N | S | S | S | S | D | D | D | D |
| | 180pF (181) | N | N | N | S | S | S | S | | | D | D |
| | 220pF (221) | N | N | N | S | S | S | S | | | D | D |
| | 270pF (271) | N | N | N | S | S | S | S | | | D | D |
| | 330pF (331) | N | N | N | S | S | S | S | | | D | D |
| | 390pF (391) | N | N | N | S | S | S | S | | | D | D |
| | 470pF (471) | N | N | N | S | S | S | S | | | | |
| | 560pF (561) | | | | S | S | S | S | | | | |
| | 680pF (681) | | | | S | S | S | S | | | | |
| | 820pF (821) | | | | S | S | S | S | | | | |
| | 1,000pF (102) | | | | S | S | S | S | | | | |
| | 1,200pF (122) | | | | X | X | X | | | | | |
| | 1,500pF (152) | | | | X | X | X | | | | | |
| | 1,800pF (182) | | | | X | X | X | | | | | |
| | 2,200pF (222) | | | | X | X | X | | | | | |
| | 2,700pF (272) | | | | X | X | X | | | | | |
| | 3,300pF (332) | | | | X | X | X | | | | | |

1. The letter in cell is expressed the symbol of product thickness.
2. The letter in cell with “^” mark is expressed product with Ag/Ni/Sn terminations.
3. 0402, Capacitance <0.5pF: On request.
4. For more information about products with special capacitance or other data, please contact WTC local representative.

## FEATURES

* Ultra high Q and low ESR performance at high frequency.
* Quality improvement of telephone calls for low power loss and better performance.

## GENERAL ELECTRICAL DATA

| Dielectric | NP0 |
|---|---|
| Size | 0201, 0402, 0603, 0805 |
| Capacitance | 0201: 0.1pF to 33pF;<br>0402: 0.1pF to 22pF;<br>0603: 0.3pF to 47pF;<br>0805: 0.3pF to 100pF |
| Capacitance tolerance | Cap≤5pF: A (±0.05pF ), B (±0.1pF), C (±0.25pF)<br>5pF<Cap<10pF: B (±0.1pF), C (±0.25pF), D (±0.5pF)<br>Cap≥10pF: F (±1%), G (±2%), J (±5%) |
| Rated voltage (WVDC) | 6.3V, 10V, 25V, 50V, 100V, 250V |
| Q | Cap≥30pF, Q≥1000<br>Cap<30pF,Q≥400+20C |
| Insulation resistance at Ur | ≥10GΩ |
| Operating temperature | -55 to +125°C |
| Capacitance change | ±30ppm/°C; 0201Cap≥22pF, ±60ppm/°C |
| Termination | Ni/Sn (lead-free termination) |

## EXPLANATION OF PART NUMBERS

| RF | 15 | N | 100 | G | 500 | C | T |
|---|---|---|---|---|---|---|---|
| **Series**<br>RF=Microwave | **Size (Inch (mm))**<br>15=0402 (1005) | **Dielectric**<br>N=NP0 | **Capacitance**<br>100=10x10$^0$=10pF | **Tolerance**<br>G=±2% | **Rated voltage**<br>500=50 VDC | **Termination**<br>C=Cu/Ni/Sn | **Packaging**<br>T=7" reeled |

* Please refer to page 2 " How to order" for more information.

## ELECTRICAL CHARACTERISTICS

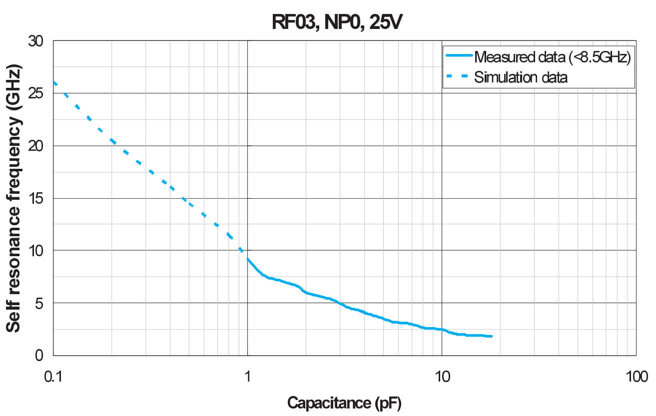



Fig. 3 Self resonance frequency vs. Capacitance (0201 size)

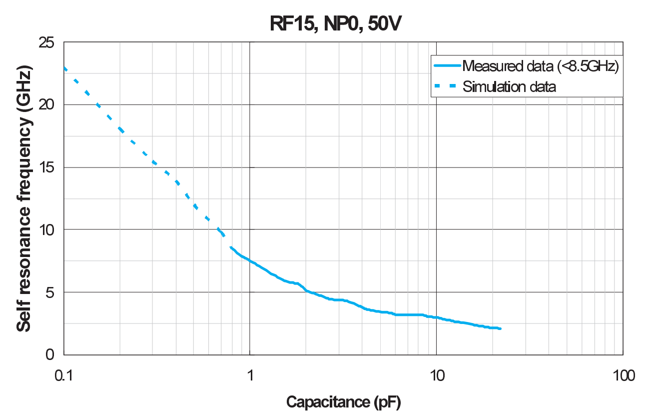



Fig. 4 Self resonance frequency vs. Capacitance (0402 size)

## ■ CAPACITANCE RANGE

| DIELECTRIC | NP0 | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| SIZE | 0201 | | | 0402 | | 0603 | | | 0805 | | |
| RATED VOLTAGE (VDC) | 6.3 | 10 | 25 | 50 | 100 | 50 | 100 | 250 | 50 | 100 | 250 |
| Capacitance 0.1pF (0R1) | L | L | L | N | N | | | | | | |
| 0.2pF (0R2) | L | L | L | N | N | | | | | | |
| 0.3pF (0R3) | L | L | L | N | N | S | S | S | T | T | T |
| 0.4pF (0R4) | L | L | L | N | N | S | S | S | T | T | T |
| 0.5pF (0R5) | L | L | L | N | N | S | S | S | T | T | T |
| 0.6pF (0R6) | L | L | L | N | N | S | S | S | T | T | T |
| 0.7pF (0R7) | L | L | L | N | N | S | S | S | T | T | T |
| 0.8pF (0R8) | L | L | L | N | N | S | S | S | T | T | T |
| 0.9pF (0R9) | L | L | L | N | N | S | S | S | T | T | T |
| 1.0pF (1R0) | L | L | L | N | N | S | S | S | T | T | T |
| 1.2pF (1R2) | L | L | L | N | N | S | S | S | T | T | T |
| 1.5pF (1R5) | L | L | L | N | N | S | S | S | T | T | T |
| 1.8pF (1R8) | L | L | L | N | N | S | S | S | T | T | T |
| 2.2pF (2R2) | L | L | L | N | N | S | S | S | T | T | T |
| 2.7pF (2R7) | L | L | L | N | N | S | S | S | T | T | T |
| 3.3pF (3R3) | L | L | L | N | N | S | S | S | T | T | T |
| 3.9pF (3R9) | L | L | L | N | N | S | S | S | T | T | T |
| 4.7pF (4R7) | L | L | L | N | N | S | S | S | T | T | T |
| 5.6pF (5R6) | L | L | L | N | N | S | S | S | T | T | T |
| 6.8pF (6R8) | L | L | L | N | N | S | S | S | T | T | T |
| 8.2pF (8R2) | L | L | L | N | N | S | S | S | T | T | T |
| 10pF (100) | L | L | L | N | N | S | S | S | T | T | T |
| 11pF (110) | L | L | L | N | | S | S | S | T | T | T |
| 12pF (120) | L | L | L | N | | S | S | S | T | T | T |
| 13pF (130) | L | L | L | N | | S | S | S | T | T | T |
| 15pF (150) | L | L | L | N | | S | S | S | T | T | T |
| 16pF (160) | L | L | L | N | | S | S | S | T | T | T |
| 18pF (180) | L | L | L | N | | S | S | S | T | T | T |
| 20pF (200) | L | L | L | N | | S | S | S | T | T | T |
| 22pF (220) | L | L | | N | | S | S | S | T | T | T |
| 24pF (240) | L | L | | | | S | S | S | T | T | T |
| 27pF (270) | L | L | | | | S | S | S | T | T | T |
| 30pF (300) | L | L | | | | S | S | S | T | T | T |
| 33pF (330) | L | L | | | | S | S | S | T | T | T |
| 36pF (360) | | | | | | S | S | S | T | T | T |
| 39pF (390) | | | | | | S | S | S | T | T | T |
| 43pF (430) | | | | | | S | S | S | T | T | T |
| 47pF (470) | | | | | | S | S | S | T | T | T |
| 56pF (560) | | | | | | | | | T | T | T |
| 68pF (680) | | | | | | | | | T | T | T |
| 82pF (820) | | | | | | | | | T | T | T |
| 100pF (101) | | | | | | | | | T | T | T |

1. The letter in cell is expressed the symbol of product thickness.
2. For more information about products with special capacitance or other data, please contact WTC local representative.

## FEATURES

* MLCC's terminations build a soft & flexible polymer layer to withstand high bending stress in SMT line.
* Available for any item in standard series range.

## GENERAL ELECTRICAL DATA

| Dielectric | NP0 | X7R |
|---|---|---|
| Size | 0603, 0805, 1206, 1210, 1808, 1812 | |
| Capacitance range | 1.5pF to 220pF | 100pF to 1μF |
| Capacitance tolerance | Cap≤5pF: B (±0.1pF), C (±0.25pF)<br>5pF<Cap<10pF: C (±0.25pF), D (±0.5pF)<br>Cap≥10pF: F (±1%), G (±2%), J (±5%), K (±10%) | J (±5%), K (±10%), M (±20%) |
| Rated voltage (WVDC) | 100V, 200V, 250V, 500V, 630V, 1kV, 3kV | 10V, 16V, 25V, 50V, 100V, 200V, 250V, 500V, 630V, 1000V, 2000V, 3000V |
| Insulation resistance at Ur | ≥10GΩ or RxC≥500Ω-F whichever is less | |
| Operating temperature | -55 to +125°C | |
| Capacitance characteristic | ±30ppm | ±15% |
| Termination | Ni/Sn (lead-free termination) | |

## EXPLANATION OF PART NUMBERS

| SH | 31 | N | 100 | D | 501 | C | T |
|---|---|---|---|---|---|---|---|
| **Series** | **Size (Inch (mm))** | **Dielectric** | **Capacitance** | **Tolerance** | **Rated voltage** | **Termination** | **Packaging** |
| SH=Soft termination | 31=1206 (3216) | N=NP0(C0G) | 100=10x10$^0$=10pF | D=±0.5pF | 501=50 VDC | C=Cu/Ni/Sn | T=7" reeled |

* Please refer to page 2 " How to order" for more information.

## PACKAGING DIMENSION AND QUANTITY

| Size | L(mm) | W(mm) | Thickness (mm)/Symbol | | Paper tape | | Plastic tape | |
|---|---|---|---|---|---|---|---|---|
| | | | | | 7" reel | 13" reel | 7" reel | 13" reel |
| 0603 (1608) | 1.60±0.20 | 0.80±0.10 | 0.80±0.07 | S | 4,000 | 15,000 | - | - |
| | 1.60+0.20/-0.10 | 0.80+0.15/-0.10 | 0.80+0.15/-0.10 | X | 4,000 | 15,000 | - | - |
| 0805 (2012) | 2.00±0.20 | 1.25±0.10 | 0.60±0.10 | A | 4,000 | 15,000 | - | - |
| | | | 0.80±0.10 | B | 4,000 | 15,000 | - | - |
| | | | 1.25±0.10 | D | - | - | 3,000 | 10,000 |
| | 2.00+0.25/-0.2 | 1.25±0.20 | 1.25±0.20 | I | - | - | 3,000 | 10,000 |
| 1206 (3216) | 3.20+0.4/-0.1 | 1.60±0.15 | 0.80±0.10 | B | 4,000 | 15,000 | - | - |
| | | | 0.95±0.10 | C | - | - | 3,000 | 10,000 |
| | | | 1.15±0.15 | J | - | - | 3,000 | 10,000 |
| | | | 1.25±0.10 | D | - | - | 3,000 | 10,000 |
| | 3.20+0.4/-0.1 | 1.60±0.20 | 1.60±0.20 | G | - | - | 2,000 | 10,000 |
| | 3.20+0.4/-0.1 | 1.60+0.30/-0.10 | 1.60+0.30/-0.10 | P | - | - | 2,000 | 9,000 |
| 1210 (3225) | 3.20±0.40 | 2.50±0.20 | 0.95±0.10 | C | - | - | 3,000 | 10,000 |
| | | | 1.25±0.10 | D | - | - | 3,000 | 10,000 |
| | 3.20±0.50 | 2.50±0.30 | 1.60±0.20 | G | - | - | 2,000 | 10,000 |
| | | | 2.00±0.20 | K | - | - | 1,000 | 6,000 |
| | | | 2.50±0.30 | M | - | - | 1,000 | 6,000 |
| 1808 (4520) | 4.50+0.60/-0.4 | 2.03±0.25 | 1.25±0.10 | D | - | - | 2,000 | - |
| | | | 2.00±0.20 | K | - | - | 1,000 | - |
| 1812 (4532) | 4.50+0.60/-0.4 | 3.20±0.30 | 1.25±0.10 | D | - | - | 1,000 | - |
| | | | 2.00±0.20 | K | - | - | 1,000 | - |
| | | 3.20±0.40 | 2.50±0.30 | M | - | - | 500 | 3,000 |

Unit: pieces

## CAPACITANCE RANGE

| DIELECTRIC | | NP0 | | | | | | |
|---|---|---|---|---|---|---|---|---|
| SIZE | | 1206 | | | | | | 1808 |
| RATED VOLTAGE (VDC) | | 100 | 200 | 250 | 500 | 630 | 1000 | 3000 |
| Capacitance | 0.5pF (0R5) | | | | | | | |
| | 1.0pF (1R0) | | | | | | | |
| | 1.2pF (1R2) | | | | | | | |
| | 1.5pF (1R5) | B | B | B | B | B | B | |
| | 1.8pF (1R8) | B | B | B | B | B | B | |
| | 2.2pF (2R2) | B | B | B | B | B | B | D |
| | 2.7pF (2R7) | B | B | B | B | B | B | D |
| | 3.3pF (3R3) | B | B | B | B | B | B | D |
| | 3.9pF (3R9) | B | B | B | B | B | B | D |
| | 4.7pF (4R7) | B | B | B | B | B | B | D |
| | 5.6pF (5R6) | B | B | B | B | B | B | D |
| | 6.8pF (6R8) | B | B | B | B | B | B | D |
| | 8.2pF (8R2) | B | B | B | B | B | B | D |
| | 10pF (100) | B | B | B | B | B | B | D |
| | 12pF (120) | B | B | B | B | B | B | D |
| | 15pF (150) | B | B | B | B | B | B | D |
| | 18pF (180) | B | B | B | B | B | B | D |
| | 22pF (220) | B | B | B | B | B | B | D |
| | 27pF (270) | B | B | B | B | B | B | D |
| | 33pF (330) | B | B | B | B | B | B | D |
| | 39pF (390) | B | B | B | B | B | B | D |
| | 47pF (470) | B | B | B | B | B | C | D |
| | 56pF (560) | B | B | B | B | B | C | D |
| | 68pF (680) | B | B | B | B | B | C | D |
| | 82pF (820) | B | B | B | B | B | D | D |
| | 100pF (101) | B | B | B | B | B | D | K |
| | 120pF (121) | B | B | B | B | B | D | |
| | 150pF (151) | B | B | B | B | B | D | |
| | 180pF (181) | B | B | B | B | B | G | |
| | 220pF (221) | B | B | B | B | B | G | |
| | 270pF (271) | | | | | | | |
| | 330pF (331) | | | | | | | |
| | 390pF (391) | | | | | | | |
| | 470pF (471) | | | | | | | |
| | 560pF (561) | | | | | | | |
| | 680pF (681) | | | | | | | |
| | 820pF (821) | | | | | | | |
| | 1,000pF (102) | | | | | | | |
| | 1,200pF (122) | | | | | | | |
| | 1,500pF (152) | | | | | | | |
| | 1,800pF (182) | | | | | | | |
| | 2,200pF (222) | | | | | | | |
| | 2,700pF (272) | | | | | | | |
| | 3,300pF (332) | | | | | | | |
| | 3,900pF (392) | | | | | | | |
| | 4,700pF (472) | | | | | | | |
| | 5,600pF (562) | | | | | | | |
| | 6,800pF (682) | | | | | | | |
| | 8,200pF (822) | | | | | | | |

1. The letter in cell is expressed the symbol of product thickness.
2. For more information about products with special capacitance or other data, please contact WTC local representative.

## X7R Dielectric 10V To 250V

| DIELECTRIC | X7R | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SIZE | 0603 | | | | 0805 | | | | | 1206 | | | | | 1210 | | 1812 | | | |
| RATED VOLTAGE (VDC) | 10 16 | 25 | 50 | 100 | 10 16 25 | 50 | 100 | 200 | 250 | 10 16 25 | 50 | 100 | 200 | 250 | 10 16 25 | 50 | 10 16 25 | 50 | 100 | 200 250 |
| Capacitance | | | | | | | | | | | | | | | | | | | | |
| 100pF (101) | S | S | S | S | D | D | D | D | D | | | | | | | | | | | |
| 120pF (121) | S | S | S | S | D | D | D | D | D | | | | | | | | | | | |
| 150pF (151) | S | S | S | S | D | D | D | D | D | D | D | D | D | D | | | | | | |
| 180pF (181) | S | S | S | S | D | D | D | D | D | D | D | D | D | D | | | | | | |
| 220pF (221) | S | S | S | S | D | D | D | D | D | D | D | D | D | D | | | | | | |
| 270pF (271) | S | S | S | S | D | D | D | D | D | D | D | D | D | D | | | | | | |
| 330pF (331) | S | S | S | S | D | D | D | D | D | D | D | D | D | D | | | | | | |
| 390pF (391) | S | S | S | S | D | D | D | D | D | D | D | D | D | D | | | | | | |
| 470pF (471) | S | S | S | S | D | D | D | D | D | D | D | D | D | D | | | | | | |
| 560pF (561) | S | S | S | S | D | D | D | D | D | D | D | D | D | D | | | | | | |
| 680pF (681) | S | S | S | S | D | D | D | D | D | D | D | D | D | D | | | | | | |
| 820pF (821) | S | S | S | S | D | D | D | D | D | D | D | D | D | D | | | | | | |
| 1,000pF (102) | S | S | S | S | D | D | D | D | D | D | D | D | D | D | C | C | D | D | D | D |
| 1,200pF (122) | S | S | S | S | D | D | D | D | D | D | D | D | D | D | C | C | D | D | D | D |
| 1,500pF (152) | S | S | S | S | D | D | D | D | D | D | D | D | D | D | C | C | D | D | D | D |
| 1,800pF (182) | S | S | S | S | D | D | D | D | D | D | D | D | D | D | C | C | D | D | D | D |
| 2,200pF (222) | S | S | S | S | D | D | D | D | D | D | D | D | D | D | C | C | D | D | D | D |
| 2,700pF (272) | S | S | S | S | D | D | D | D | D | D | D | D | D | D | C | C | D | D | D | D |
| 3,300pF (332) | S | S | S | S | D | D | D | D | D | D | D | D | D | D | C | C | D | D | D | D |
| 3,900pF (392) | S | S | S | S | D | D | D | D | D | D | D | D | D | D | C | C | D | D | D | D |
| 4,700pF (472) | S | S | S | S | D | D | D | D | D | D | D | D | D | D | C | C | D | D | D | D |
| 5,600pF (562) | S | S | S | S | D | D | D | D | D | D | D | D | D | D | C | C | D | D | D | D |
| 6,800pF (682) | S | S | S | S | D | D | D | D | D | D | D | D | D | D | C | C | D | D | D | D |
| 8,200pF (822) | S | S | S | S | D | D | D | D | D | D | D | D | D | D | C | C | D | D | D | D |
| 0.010µF (103) | S | S | S | S | D | D | D | D | D | D | D | D | D | D | C | C | D | D | D | D |
| 0.012µF (123) | S | S | S | | D | D | D | D | D | D | D | D | D | D | C | C | D | D | D | D |
| 0.015µF (153) | S | S | S | | D | D | D | D | D | D | D | D | D | D | C | C | D | D | D | D |
| 0.018µF (183) | S | S | S | | D | D | D | D | D | D | D | D | D | D | C | C | D | D | D | D |
| 0.022µF (223) | S | S | S | | D | D | D | D | D | D | D | D | D | D | C | C | D | D | D | D |
| 0.027µF (273) | S | S | S | | D | D | D | | | D | D | D | D | D | C | C | D | D | D | D |
| 0.033µF (333) | S | S | X | | D | D | D | | | D | D | D | G | G | C | C | D | D | D | D |
| 0.039µF (393) | S | S | X | | D | D | D | | | D | D | D | G | G | C | C | D | D | D | D |
| 0.047µF (473) | S | S | X | | D | D | D | | | D | D | D | G | G | C | C | D | D | D | D |
| 0.056µF (563) | S | S | X | | D | D | D | | | D | D | D | G | G | C | C | D | D | D | D |
| 0.068µF (683) | S | S | X | | D | D | D | | | D | D | D | G | G | C | C | D | D | D | D |
| 0.082µF (823) | S | S | X | | D | D | D | | | D | D | D | G | G | C | C | D | D | D | D |
| 0.10µF (104) | S | S | X | | D | D | D | | | D | D | D | G | G | C | C | D | D | D | D |
| 0.12µF (124) | S | X | | | D | D | | | | D | D | D | | | C | C | D | D | D | D |
| 0.15µF (154) | S | X | | | D | D | | | | C | C | G | | | C | C | D | D | D | K |
| 0.18µF (184) | S | X | | | D | D | | | | C | C | G | | | C | C | D | D | D | K |
| 0.22µF (224) | S | X | | | D | D | | | | C | C | G | | | C | C | D | D | D | K |
| 0.27µF (274) | X | X | | | I | | | | | C | D | | | | C | C | D | D | D | K |
| 0.33µF (334) | X | X | | | I | | | | | C | D | | | | C | D | D | D | D | K |
| 0.39µF (394) | X | X | | | I | | | | | J | P | | | | C | D | D | D | D | K |
| 0.47µF (474) | X | X | | | I | | | | | J | P | | | | C | D | D | D | K | K |
| 0.56µF (564) | X | | | | I | | | | | J | P | | | | D | D | D | D | K | |
| 0.68µF (684) | X | | | | I | | | | | J | P | | | | D | D | D | K | K | |
| 0.82µF (824) | | | | | I | | | | | J | P | | | | D | D | D | K | K | |
| 1.0µF (105) | | | | | I | | | | | J | P | | | | D | D | D | K | K | |
| 1.5µF (155) | | | | | | | | | | | | | | | | | | | | |
| 2.2µF (225) | | | | | | | | | | | | | | | | | | | | |

1. The letter in cell is expressed the symbol of product thickness.
2. For more information about products with special capacitance or other data, please contact WTC local representative

## X7R Dielectric 500V To 3kV

| DIELECTRIC | X7R | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SIZE | 0805 | | 1206 | | | | 1210 | | | 1808 | | | 1812 | | | | |
| RATED VOLTAGE (VDC) | 200 250 | 500 630 | 200 250 | 500 630 | 1000 | 2000 | 200 250 | 500 630 | 1000 | 500 630 1000 | 2000 | 3000 | 200 250 | 500 630 | 1000 | 2000 | 3000 |
| Capacitance 100pF (101) | B | B | | | | | | | | | | | | | | | |
| 120pF (121) | B | B | | | | | | | | | | | | | | | |
| 150pF (151) | B | B | D | D | D | D | | | | D | D | D | | | | | |
| 180pF (181) | B | B | D | D | D | D | | | | D | D | D | | | | | |
| 220pF (221) | B | B | D | D | D | D | | | | D | D | D | | | | | |
| 270pF (271) | B | B | D | D | D | D | | | | D | D | D | | | D | D | |
| 330pF (331) | B | B | D | D | D | D | | | | D | D | K | | | D | D | |
| 390pF (391) | B | B | D | D | D | D | | | | D | D | K | | | D | D | |
| 470pF (471) | B | B | D | D | D | D | | | | D | D | K | | | D | D | |
| 560pF (561) | B | B | D | D | D | D | | | | D | D | K | | | D | D | |
| 680pF (681) | B | B | D | D | D | D | | | | D | D | K | | | D | D | K |
| 820pF (821) | B | B | D | D | D | G | | | | D | D | K | | | D | D | K |
| 1,000pF (102) | B | B | D | D | D | G | C | D | D | D | D | K | D | D | D | D | K |
| 1,200pF (122) | B | B | D | D | D | | C | D | D | D | K | | D | D | D | D | |
| 1,500pF (152) | B | B | D | D | D | | C | D | D | D | K | | D | D | D | D | |
| 1,800pF (182) | B | B | D | D | D | | C | D | D | D | K | | D | D | D | D | |
| 2,200pF (222) | B | B | D | D | D | | C | D | D | D | K | | D | D | D | D | |
| 2,700pF (272) | B | B | D | D | D | | C | D | D | D | | | D | D | D | D | |
| 3,300pF (332) | B | B | D | D | D | | C | D | D | D | | | D | D | D | K | |
| 3,900pF (392) | B | B | D | D | D | | C | D | G | D | | | D | D | D | K | |
| 4,700pF (472) | B | D | D | D | D | | C | D | G | D | | | D | D | D | K | |
| 5,600pF (562) | D | D | D | D | D | | C | D | G | K | | | D | D | D | | |
| 6,800pF (682) | D | D | D | D | D | | C | D | G | K | | | D | D | D | | |
| 8,200pF (822) | D | D | D | D | D | | C | D | G | K | | | D | D | D | | |
| 0.010μF (103) | D | D | D | D | D | | C | D | G | K | | | D | D | D | | |
| 0.012μF (123) | D | | D | D | | | C | D | | | | | D | D | K | | |
| 0.015μF (153) | D | | D | D | | | C | D | | | | | D | D | K | | |
| 0.018μF (183) | D | | D | D | | | C | D | | | | | D | D | | | |
| 0.022μF (223) | D | | D | G | | | C | D | | | | | D | D | | | |
| 0.027μF (273) | | | D | G | | | C | G | | | | | D | D | | | |
| 0.033μF (333) | | | G | G | | | C | G | | | | | D | D | | | |
| 0.039μF (393) | | | G | | | | C | G | | | | | D | D | | | |
| 0.047μF (473) | | | G | | | | D | G | | | | | D | D | | | |
| 0.056μF (563) | | | G | | | | D | G | | | | | D | K | | | |
| 0.068μF (683) | | | G | | | | G | | | | | | D | K | | | |
| 0.082μF (823) | | | G | | | | G | | | | | | D | K | | | |
| 0.10μF (104) | | | G | | | | G | | | | | | D | K | | | |
| 0.12μF (124) | | | | | | | G | | | | | | D | | | | |
| 0.15μF (154) | | | | | | | M | | | | | | K | | | | |
| 0.18μF (184) | | | | | | | M | | | | | | K | | | | |
| 0.22μF (224) | | | | | | | M | | | | | | K | | | | |
| 0.27μF (274) | | | | | | | M | | | | | | K | | | | |
| 0.33μF (334) | | | | | | | M | | | | | | K | | | | |
| 0.39μF (394) | | | | | | | M | | | | | | K | | | | |
| 0.47μF (474) | | | | | | | M | | | | | | K | | | | |
| 0.56μF (564) | | | | | | | | | | | | | | | | | |
| 0.68μF (684) | | | | | | | | | | | | | | | | | |
| 0.82μF (824) | | | | | | | | | | | | | | | | | |
| 1.00μF (105) | | | | | | | | | | | | | | | | | |

1. The letter in cell is expressed the symbol of product thickness.
2. For more information about products with special capacitance or other data, please contact WTC local representative

## FEATURES

* High voltage in a given case size.
* Circuit open during product cracking.
* High stability and reliability.

## GENERAL ELECTRICAL DATA

| Dielectric | X7R |
|---|---|
| Size | 0805, 1206, 1210, 1812 |
| Capacitance | 100pF to 1μF |
| Capacitance tolerance | K (±10%), M (±20%) |
| Rated voltage (WVDC) | 100V, 200V, 250V, 500V |
| Tan δ | ≤2.5% |
| Insulation resistance at Ur | ≥10GΩ or RxC≥500Ω-F whichever is smaller |
| Dielectric strength | 100V: ≥2.5 x WVDC<br>200V and 250V: ≥2 x WVDC<br>500V: ≥1.5 x WVDC |
| Operating temperature | -55 to +125°C |
| Capacitance characteristic | ±15% |
| Termination | Ni/Sn (lead-free termination) |

## EXPLANATION OF PART NUMBERS

| OP | 32 | B | 103 | K | 201 | C | T |
|---|---|---|---|---|---|---|---|
| **Series**<br>OP=Open-mode | **Size (Inch (mm))**<br>32=1210 (3225) | **Dielectric**<br>B=X7R | **Capacitance**<br>103=10x10$^3$=10nF | **Tolerance**<br>K=±10% | **Rated voltage**<br>201=200 VDC | **Termination**<br>C=Cu/Ni/Sn | **Packaging**<br>T=7" reeled |

* Please refer to page 2 " How to order" for more information.

## INNER CONSTRUCTION OF OPEN-MODE DESIGN

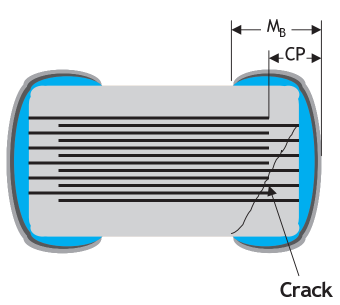



Fig.5 Normal design (CP<$M_B$) – circuit leakage during cracking.

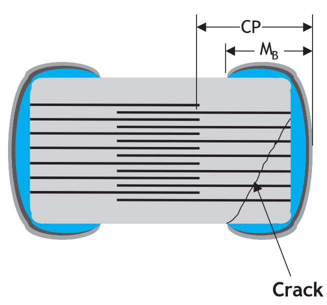



Fig. 6 Open-mode design (CP>$M_B$) – circuit open during cracking.

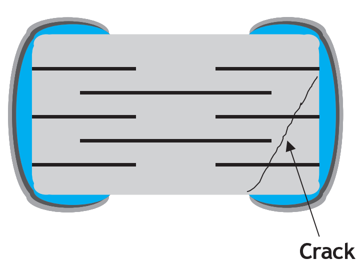



Fig. 7 Floating design (one kind of open-mode design) – circuit open during cracking.

## CAPACITANCE RANGE

| DIELECTRIC | X7R | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SIZE | 0805 | | | | 1206 | | | | 1210 | | | | 1812 | | | |
| RATED VOLTAGE (VDC) | 100 | 200 | 250 | 500 | 100 | 200 | 250 | 500 | 100 | 200 | 250 | 500 | 100 | 200 | 250 | 500 |
| Capacitance 100pF (101) | B | B | B | B | | | | | | | | | | | | |
| 120pF (121) | B | B | B | B | | | | | | | | | | | | |
| 150pF (151) | B | B | B | B | B | D | D | D | | | | | | | | |
| 180pF (181) | B | B | B | B | B | D | D | D | | | | | | | | |
| 220pF (221) | B | B | B | B | B | D | D | D | | | | | | | | |
| 270pF (271) | B | B | B | B | B | D | D | D | | | | | | | | |
| 330pF (331) | B | B | B | B | B | D | D | D | | | | | | | | |
| 390pF (391) | B | B | B | B | B | D | D | D | | | | | | | | |
| 470pF (471) | B | B | B | B | B | D | D | D | | | | | | | | |
| 560pF (561) | B | B | B | B | B | D | D | D | | | | | | | | |
| 680pF (681) | B | B | B | B | B | D | D | D | | | | | | | | |
| 820pF (821) | B | B | B | B | B | D | D | D | | | | | | | | |
| 1,000pF (102) | B | B | B | B | B | D | D | D | C | C | C | D | D | D | D | D |
| 1,200pF (122) | B | B | B | B | B | D | D | D | C | C | C | D | D | D | D | D |
| 1,500pF (152) | B | B | B | B | B | D | D | D | C | C | C | D | D | D | D | D |
| 1,800pF (182) | B | B | B | B | B | D | D | D | C | C | C | D | D | D | D | D |
| 2,200pF (222) | B | B | B | B | B | D | D | D | C | C | C | D | D | D | D | D |
| 2,700pF (272) | B | B | B | B | B | D | D | D | C | C | C | D | D | D | D | D |
| 3,300pF (332) | B | B | B | B | B | D | D | D | C | C | C | D | D | D | D | D |
| 3,900pF (392) | B | B | B | | B | D | D | D | C | C | C | D | D | D | D | D |
| 4,700pF (472) | B | B | B | | B | D | D | D | C | C | C | D | D | D | D | D |
| 5,600pF (562) | B | D | D | | B | D | D | D | C | C | C | D | D | D | D | D |
| 6,800pF (682) | B | D | D | | B | D | D | D | C | C | C | D | D | D | D | D |
| 8,200pF (822) | B | D | D | | B | D | D | D | C | C | C | D | D | D | D | D |
| 0.010µF (103) | B | D | D | | B | D | D | D | C | C | C | D | D | D | D | D |
| 0.012µF (123) | B | D | D | | B | D | D | D | C | C | C | D | D | D | D | D |
| 0.015µF (153) | B | D | D | | B | D | D | D | C | C | C | D | D | D | D | D |
| 0.018µF (183) | B | D | D | | B | D | D | D | C | C | C | D | D | D | D | D |
| 0.022µF (223) | B | D | D | | B | D | D | G | C | C | C | D | D | D | D | D |
| 0.027µF (273) | D | | | | B | D | D | G | C | C | C | D | D | D | D | D |
| 0.033µF (333) | D | | | | B | G | G | G | C | C | C | G | D | D | D | D |
| 0.039µF (393) | D | | | | B | G | G | | C | C | C | G | D | D | D | D |
| 0.047µF (473) | D | | | | B | G | G | | C | D | D | G | D | D | D | D |
| 0.056µF (563) | | | | | B | G | G | | C | D | D | G | D | D | D | K |
| 0.068µF (683) | | | | | B | G | G | | C | G | G | G | D | D | D | K |
| 0.082µF (823) | | | | | D | G | G | | C | G | G | | D | D | D | K |
| 0.10µF (104) | | | | | D | G | G | | C | G | G | | D | D | D | K |
| 0.12µF (124) | | | | | D | | | | C | G | G | | D | D | D | |
| 0.15µF (154) | | | | | G | | | | D | M | M | | D | K | K | |
| 0.18µF (184) | | | | | G | | | | D | M | M | | D | K | K | |
| 0.22µF (224) | | | | | G | | | | D | M | M | | D | K | K | |
| 0.27µF (274) | | | | | | | | | G | | | | D | K | K | |
| 0.33µF (334) | | | | | | | | | G | | | | D | K | K | |
| 0.39µF (394) | | | | | | | | | M | | | | D | K | K | |
| 0.47µF (474) | | | | | | | | | M | | | | K | K | K | |
| 0.56µF (564) | | | | | | | | | M | | | | K | | | |
| 0.68µF (684) | | | | | | | | | | | | | K | | | |
| 0.82µF (824) | | | | | | | | | | | | | K | | | |
| 1.0µF (105) | | | | | | | | | | | | | K | | | |

1. The letter in cell is expressed the symbol of product thickness.
2. The letter in cell with "^" mark is expressed product with Ag/Ni/Sn terminations.
3. For more information about products with special capacitance or other data, please contact WTC local representative.

# Capacitor Array Capacitors
# Y4C3/Y4C2 Series

## FEATURES

* High density mounting due to mounting space saving.
* Mounting cost saving.
* Increased throughput.

## GENERAL ELECTRICAL DATA

| Dielectric | NP0 | | X7R | | Y5V |
|---|---|---|---|---|---|
| Size | 4x0402 | 4x0603 | 4x0402 | 4x0603 | 4x0603 |
| Capacitance* | 10pF to 270pF | 10pF to 470pF | 1000pF to 100nF | 180pF to 100nF | 10nF to 100nF |
| Capacitance tolerance** | J (±5%), K (±10%) | | K (±10%), M (±20%) | | Z (-20/+80%) |
| Rated voltage (WVDC) | 50V | 25, 50V | 10V, 16V, 25V, 50V | 16V, 25V, 50V | 16V, 50V |
| Q/Tan δ* | Cap<30pF: Q≥400+20C<br>Cap≥30pF: Q≥1000 | | Ur=50V, ≤2.5%<br>Ur=25V&16V, ≤3.5%<br>Ur=10V, ≤5.0% | | Ur=50V, ≤5%<br>Ur=16V, ≤7% |
| Insulation resistance at Ur | ≥10GΩ | | ≥10GΩ or RxC≥500ΩxF whichever is less | | |
| Operating temperature | -55 to +125°C | | | | -25 to +85°C |
| Capacitance characteristic | ±30ppm | | ±15% | | +30/-80% |
| Termination | Ni/Sn (lead-free termination) | | | | |

## EXPLANATION OF PART NUMBERS

| Y | 4C | 3 | B | 103 | K | 500 | C | T |
|---|---|---|---|---|---|---|---|---|
| **Series** | **Cap. Nr.** | **Termination pitch** | **Dielectric** | **Capacitance** | **Tolerance** | **Rated voltage** | **Termination** | **Packaging** |
| Y=Capacitor array | 4C=4xCap | 3=0.03" pitch<br>2=0.02" pitch | B=X7R | 103=10x10$^3$=10nF | K=±10% | 500=50 VDC | C=Cu/Ni/Sn | T=7" reeled |

* Please refer to page 2 " How to order" for more information.

## CAPACITANCE RANGE

| SIZE | | 4 x 0402 | | | | | 4 x 0603 | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DIELECTRIC | | NP0 | X7R | | | | NP0 | | X7R | | | Y5V | |
| RATED VOLTAGE (VDC) | | 50 | 10 | 16 | 25 | 50 | 25 | 50 | 16 | 25 | 50 | 16 | 50 |
| Capacitance | 10pF (100) | T | | | | | B | B | | | | | |
| | 15pF (150) | T | | | | | B | B | | | | | |
| | 22pF (220) | T | | | | | B | B | | | | | |
| | 33pF (330) | T | | | | | B | B | | | | | |
| | 47pF (470) | T | | | | | B | B | | | | | |
| | 68pF (680) | T | | | | | B | B | | | | | |
| | 100pF (101) | T | | | | | B | B | | | | | |
| | 150pF (151) | T | | | | | B | B | | | | | |
| | 180pF (181) | T | | | | | B | B | | B | B | | |
| | 220pF (221) | T | | | | | B | B | | B | B | | |
| | 270pF (271) | T | | | | | B | B | | B | B | | |
| | 330pF (331) | | | | | | B | B | | B | B | | |
| | 470pF (471) | | | | | | B | B | | B | B | | |
| | 6,80pF (681) | | | | | | | | | B | B | | |
| | 1,000pF (102) | | T | T | T | T | | | | B | B | | |
| | 1,500pF (152) | | T | T | T | T | | | | B | B | | |
| | 2,200pF (222) | | T | T | T | T | | | | B | B | | |
| | 3,300pF (332) | | T | T | T | T | | | | B | B | | |
| | 4,700pF (472) | | T | T | T | T | | | | B | B | | |
| | 6,800pF (682) | | T | T | T | T | | | | B | B | | |
| | 0.010µF (103) | | T | T | T | T | | | | B | B | | B |
| | 0.015µF (153) | | T | T | T | | | | B | B | B | | B |
| | 0.022µF (223) | | T | T | T | | | | B | B | B | | B |
| | 0.033µF (333) | | T | T | T | | | | B | | | | B |
| | 0.047µF (473) | | T | T | T | | | | B | | | | B |
| | 0.068µF (683) | | T | T | T | | | | B | | | | B |
| | 0.10µF (104) | | T | T | T | | | | B | | | B | B |

1. The letter in cell is expressed the symbol of product thickness.
2. For more information about products with special capacitance or other data, please contact WTC local representative.

## FEATURES

* Standard size with thin thickness.
* Small size with high capacitance.
* Capacitor with lead-free termination (pure Tin).

## GENERAL ELECTRICAL DATA

| Dielectric | X5R | Y5V |
|---|---|---|
| Size | 0603, 0805, 1206, 1210 | |
| Capacitance range | 0.22μF to 22μF | 1μF to 10μF |
| Capacitance tolerance | K (±10%), M (±20%) | Z (-20/+80%) |
| Rated voltage (WVDC) | 6.3V, 10V, 16V, 25V | 10V, 16V, 25V, 50V |
| Tan δ* | 16V, 10V: ≤10.0%<br>6.3V: ≤15.0% | 50V: ≤7%<br>25V: ≤9%<br>16V, 10V: ≤12.5% |
| Insulation resistance at Ur | RxC≥500ΩxF | |
| Operating temperature | -55 to +85°C | -25 to +85°C |
| Capacitance characteristic | ±15% | +30/-80% |
| Termination | Ni/Sn (lead-free termination) | |

## EXPLANATION OF PART NUMBERS

| TT | 31 | X | 225 | K | 100 | C | T |
|---|---|---|---|---|---|---|---|
| **Series** | **Size (Inch (mm))** | **Dielectric** | **Capacitance** | **Tolerance** | **Rated voltage** | **Termination** | **Packaging** |
| TT=Low profile | 31=1206 (3216) | X=X5R | 225=22x10$^5$=2.2μF | K=±10% | 100=10 VDC | C=Cu/Ni/Sn | T=7” reeled |

* Please refer to page 2 “ How to order” for more information.

## CAPACITANCE RANGE

| Dielectric | | X5R | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Size | | 0603 | | 0805 | | | | 1206 | | | | | 1210 | |
| Rated voltage (VDC) | | 10 | 16 | 6.3 | 10 | 16 | 25 | 6.3 | 10 | 16 | 25 | 50 | 10 | 25 |
| Capacitance | 0.22uF (224) | H | H | | | | | | | | | | | |
| | 1.0μF (105) | H | H | | T | T | T | | T | T | T | | | |
| | 1.5μF (155) | | | | T | T | | | T | T | T | | | |
| | 2.2μF (225) | | | T | T | T | T | | T | T | T | T | | |
| | 3.3μF (335) | | | | | | | | T | T | T | | T | |
| | 4.7μF (475) | | | T | T | T | | | T | T | T | | T | |
| | 6.8μF (685) | | | | | | | | | | | | | |
| | 10μF (106) | | | T | T | | | J | T | | T | | | T |
| | 22μF (226) | | | T | | | | T | | | | | | |

| Dielectric | | Y5V | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Size | | 0805 | | | | 1206 | | | | 1210 | |
| Rated voltage (VDC) | | 10 | 16 | 25 | 50 | 10 | 16 | 25 | 50 | 10 | 16 |
| Capacitance | 1.0μF (105) | | | | T | | | | | | |
| | 1.5μF (155) | | | | | | | | | | |
| | 2.2μF (225) | | T | T | | T | T | T | T | | |
| | 3.3μF (335) | T | | | | | | | | | |
| | 4.7μF (475) | T | T | | | T | T | T | | | |
| | 6.8μF (685) | | | | | T | | | | | |
| | 10μF (106) | T | | | | T | | | | T | |
| | 22μF (226) | | | | | | | | | | |

1. The letter in cell is expressed the symbol of product thickness.
2. For more information about products with special capacitance or other data, please contact WTC local representative.

## FEATURES

* Standard size with thin thickness.
* Small size with high capacitance.
* Capacitor with lead-free termination (pure Tin).
* MLCC with low ESL performance.

## GENERAL ELECTRICAL DATA

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

## EXPLANATION OF PART NUMBERS

| 0612 | B | 103 | K | 500 | C | T |
|---|---|---|---|---|---|---|
| **Size (Inch (mm))** | **Dielectric** | **Capacitance** | **Tolerance** | **Rated voltage** | **Termination** | **Packaging** |
| 0612(1632) | B=X7R | 103=10x10$^3$=10nF | K=±10% | 500=50 VDC | C=Cu/Ni/Sn | T=7" reeled |

* Please refer to page 2 " How to order" for more information.

## CAPACITANCE RANGE

| DIELECTRIC | | X7R |
|---|---|---|
| SIZE | | 0612 |
| RATED VOLTAGE (VDC) | | 50 |
| Capacitance | 10nF (103) | B |
| | 12nF (123) | B |
| | 15nF (153) | B |
| | 18nF (183) | B |
| | 22nF (223) | B |
| | 27nF (273) | B |
| | 33nF (333) | B |
| | 39nF (393) | B |
| | 47nF (473) | B |
| | 56nF (563) | B |
| | 68nF (683) | B |
| | 82nF (823) | B |
| | 100nF (104) | B |
| | 120nF (124) | B |
| | 150nF (154) | B |

1. The letter in cell is expressed the symbol of product thickness.
2. For more information about products with special capacitance or other data, please contact WTC local representative.

# FEATURES

* High voltage in a given case size.
* High stability and reliability.
* RoHS compliant.

TÜV Rheinland Product Safety
BAUART GEPRÜFT
TYPE APPROVED

# GENERAL ELECTRICAL DATA

| Dielectric | NP0 | X7R |
|---|---|---|
| Size | 1808 | 1808, 1812,2211 |
| Capacitance | 10pF to 150pF | 100pF to 2200pF |
| Capacitance tolerance | J (±5%), K (±10%) | |
| Rated voltage (WVAC) | 250Vrms | |
| Q | Cap<30pF: Q≥400+20C | Tan δ≤2.5% |
| Insulation resistance at Ur | ≥10GΩ | |
| Dielectric withstanding strength | 1500VAC | |
| Peak impulse voltage | 5000V | |
| Operating temperature | -55 to +125°C | |
| Capacitance characteristic | ±60ppm | ±15% |
| Termination | Ni/Sn (lead-free termination) | |
| TUV certified number | TUV: R50118359 | |
| Test standard | EN 132400, 1994+A2+A3+A4; IEC 60384-14, 1993+A1, Class X1Y2 | |

# EXPLANATION OF PART NUMBERS

| S2 | 42 | N | 100 | J | 302 | L | T |
|---|---|---|---|---|---|---|---|
| **Series**<br>S2=X1/Y2 | **Size (Inch (mm))**<br>42=1808 (4520) | **Dielectric**<br>N=NP0(C0H) | **Capacitance**<br>100=10x$10^0$=10pF | **Tolerance**<br>J=±5% | **Rated voltage**<br>302=3000 VDC<br>502=5000 Impulse Voltage | **Termination**<br>L=Ag/Ni/Sn | **Packaging**<br>T=7" reeled |

* Please refer to page 2 " How to order" for more information.

# CAPACITANCE RANGE

| DIELECTRIC | | NP0 |
|---|---|---|
| SIZE | | 1808 |
| RATED VOLTAGE (VDC) | | 3000 |
| PEAK IMPULSE VOLTAGE | | 5000 |
| Capacitance | 10pF (100) | F |
| | 12pF (120) | F |
| | 15pF (150) | F |
| | 18pF (180) | F |
| | 22pF (220) | F |
| | 27pF (270) | F |
| | 33pF (330) | F |
| | 39pF (390) | G |
| | 47pF (470) | G |
| | 56pF (560) | G |
| | 68pF (680) | G |
| | 82pF (820) | G |
| | 100pF (101) | K |
| | 120pF (121) | K |
| | 150pF (151) | K |
| | 180pF (181) | |
| | 220pF (221) | |
| | 270pF (271) | |
| | 330pF (331) | |
| | 390pF (391) | |
| | 470pF (471) | |

| DIELECTRIC | | X7R | | |
|---|---|---|---|---|
| SIZE | | 1808 | 1812 | 2211 |
| RATED VOLTAGE (VDC) | | 3000 | 3000 | 3000 |
| PEAK IMPULSE VOLTAGE | | 5000 | 5000 | 5000 |
| Capacitance | 56pF (560) | | | |
| | 68pF (680) | | | |
| | 82pF (820) | | | |
| | 100pF (101) | G | | |
| | 120pF (121) | G | | |
| | 150pF (151) | G | G | G |
| | 180pF (181) | G | G | G |
| | 220pF (221) | G | G | G |
| | 270pF (271) | K | G | G |
| | 330pF (331) | K | G | G |
| | 390pF (391) | K | G | G |
| | 470pF (471) | K | G | K |
| | 560pF (561) | K | G | K |
| | 680pF (681) | K | K | K |
| | 820pF (821) | K | K | K |
| | 1,000pF (102) | K | M | M |
| | 1,200pF (122) | | | M |
| | 1,500pF (152) | | | M |
| | 1,800pF (182) | | | M |
| | 2,200pF (222) | | | M |

1. The letter in cell is expressed the symbol of product thickness.
2. For more information about products with special capacitance or other data, please contact WTC local representative.

# PACKAGING DIMENSION AND QUANTITY ( X1/Y2 & X2/Y3 Series)

| Size Inch (mm) | L (mm) | W (mm) | MB (mm) | T (mm)/Symbol | | 7" Plastic tape |
|---|---|---|---|---|---|---|
| 1808 (4520) | 4.50+0.5/-0.3 | 2.03±0.25 | 0.50±0.25 | 1.25±0.10 | D | 2,000 |
| | | | | 1.40±0.15 | F | 2,000 |
| | | | | 1.60±0.20 | G | 1,000 |
| | | | | 2.00±0.20 | K | 1,000 |
| 1812 (4532) | 4.50+0.5/-0.3 | 3.20±0.30 | 0.50±0.25 | 1.25±0.10 | D | 1,000 |
| | | | | 1.60±0.20 | G | 1,000 |
| | | | | 2.00±0.20 | K | 1,000 |
| | | | | 2.50±0.30 | M | 500 |
| 2211 (5728) | 5.70±0.40 | 2.80±0.30 | 0.85±0.55 | 1.60±0.20 | G | 1,000 |
| | | | | 2.00±0.20 | K | 1,000 |
| | | | | 2.50±0.30 | M | 500 |

# Safety Certificated Capacitors X2/Y3
# S3 Series

## FEATURES

* High voltage in a given case size.
* High stability and reliability.
* RoHS compliant.

## GENERAL ELECTRICAL DATA

| Dielectric | NP0 | X7R |
|---|---|---|
| Size | 1808, 1812 | |
| Capacitance* | 3.9pF to 680pF | 180pF to 2700pF |
| Capacitance tolerance | J (±5%), K (±10%) | K (±10%), M (±20%) |
| Rated voltage (WVDC) | 2000V, 3000V | |
| Rated voltage (WVAC) | 250Vrms | |
| Q/Tan δ | Cap<30pF: Q≥400+20C<br>Cap≥30pF: Q≥1000 | Tan δ≤2.5% |
| Insulation resistance at Ur | ≥10GΩ | |
| Dielectric withstanding strength | 1500VAC | |
| Peak impulse voltage (X2) | 2500V | |
| Operating temperature | -55 to +125°C | |
| Capacitance characteristic | ±60ppm | ±15% |
| Termination | Ni/Sn (lead-free termination) | |
| Certified number | TUV: R50118359, UL: E250427, UL: 60950 | |
| Test standard | EN 132400, 1994+A2+A3+A4; IEC 60384-14, 1993+A1, Class X2Y3<br>EN 60950, Third Edition (2000) | |

## EXPLANATION OF PART NUMBERS

| S3 | 42 | N | 100 | J | 202 | L | T |
|---|---|---|---|---|---|---|---|
| **Series** | **Size (Inch (mm))** | **Dielectric** | **Capacitance** | **Tolerance** | **Rated voltage** | **Termination** | **Packaging** |
| S3=X2/Y3 | 42=1808 (4520) | N=NP0(C0H) | 100=10x$10^0$ =10pF | J=±5% | 202=2000 VDC | L=Ag/Ni/Sn | T=7” reeled |

* Please refer to page 2 “ How to order” for more information.

## CAPACITANCE RANGE

| DIELECTRIC | NP0 | |
|---|---|---|
| SIZE | 1808 | |
| RATED VOLTAGE (VDC) | 2000 | 3000 |
| Capacitance 3.9pF (3R9) | | F |
| 4.7pF (4R7) | | F |
| 5.0pF (5R0) | | F |
| 5.6pF (5R6) | | F |
| 6.8pF (6R8) | | F |
| 8.2pF (8R2) | | F |
| 10pF (100) | F | F |
| 12pF (120) | F | F |
| 15pF (150) | F | F |
| 18pF (180) | F | F |
| 22pF (220) | F | F |
| 27pF (270) | F | F |
| 33pF (330) | F | F |
| 39pF (390) | G | G |
| 47pF (470) | G | G |
| 56pF (560) | G | G |
| 68pF (680) | G | G |
| 82pF (820) | G | G |
| 100pF (101) | K | K |
| 120pF (121) | K | K |
| 150pF (151) | K | K |
| 180pF (181) | K | K |
| 220pF (221) | K | K |
| 270pF (271) | K | K |
| 330pF (331) | K | |
| 390pF (391) | K | |
| 470pF (471) | K | |
| 560pF (561) | K | |
| 680pF (681) | K | |
| 820pF (821) | | |
| 1,000pF (102) | | |

| DIELECTRIC | X7R | | | |
|---|---|---|---|---|
| SIZE | 1808 | | 1812 | |
| RATED VOLTAGE (VDC) | 2000 | 3000 | 2000 | 3000 |
| Capacitance 150pF (151) | | | | |
| 180pF (181) | G | | | |
| 220pF (221) | G | | | |
| 270pF (271) | G | | | |
| 330pF (331) | G | G | G | |
| 390pF (391) | G | G | G | |
| 470pF (471) | G | G | G | |
| 560pF (561) | G | G | G | |
| 680pF (681) | G | G | G | G |
| 820pF (821) | G | G | G | G |
| 1,000pF (102) | K | K | G | G |
| 1,200pF (122) | K | | G | |
| 1,500pF (152) | K | | K | |
| 1,800pF (182) | K | | K | |
| 2,200pF (222) | | | M | |
| 2,700pF (272) | | | M | |
| 3,300pF (332) | | | | |
| 3,900pF (392) | | | | |
| 4,700pF (472) | | | | |

1. The letter in cell is expressed the symbol of product thickness.
2. For more information about products with special capacitance or other data, please contact WTC local representative.

## FEATURES

* High voltage in a given case size.
* Low DF value.
* Low power consumption in AC voltage application.

## GENERAL ELECTRICAL DATA

| Dielectric | X7R/ X7E |
|---|---|
| Size | 1206 |
| Capacitance | 150pF to 0.1µF |
| Capacitance tolerance | K (±10%), M (±20%) |
| Rated voltage (WVDC) | 100V, 200V, 250V, 350V, 500V, 630V |
| Tan δ* | 100V : ≤1.4%<br>≥200V : ≤1.0% |
| Insulation resistance at Ur | ≥10GΩ or RxC≥500Ω-F whichever is smaller |
| Dielectric strength | 100 to 350V: ≥2 x WVDC<br>500V & 630V: ≥1.5 x WVDC |
| Operating temperature | -55 to +125°C |
| Capacitance characteristic | X7R: ±15% ; X7E: ±4.7% |
| Termination | Ni/Sn (lead-free termination) |

## EXPLANATION OF PART NUMBERS

| LD | 31 | B | 102 | K | 201 | L | T |
|---|---|---|---|---|---|---|---|
| **Series** | **Size (Inch (mm))** | **Dielectric** | **Capacitance** | **Tolerance** | **Rated voltage** | **Termination** | **Packaging** |
| LD=Low distortion | 31=1206 (3216) | B=X7R D=X7E | $102=10x10^{2}$ =1000pF | K=±10% | 201=200 VDC | L=Cu/Ni/Sn | T=7" reeled |

* Please refer to page 2 " How to order" for more information.
* All LD series products with Ag/Ni/Sn terminations.

## CAPACITANCE RANGE

| DIELECTRIC | | X7R / X7E | | | | | |
|---|---|---|---|---|---|---|---|
| SIZE | | 1206 | | | | | |
| RATED VOLTAGE (VDC) | | 100 | 200 | 250 | 350 | 500 | 630 |
| Capacitance | 100pF (101) | | | | | | |
| | 120pF (121) | | | | | | |
| | 150pF (151) | D | D | D | D | D | D |
| | 180pF (181) | D | D | D | D | D | D |
| | 220pF (221) | D | D | D | D | D | D |
| | 270pF (271) | D | D | D | D | D | D |
| | 330pF (331) | D | D | D | D | D | D |
| | 390pF (391) | D | D | D | D | D | D |
| | 470pF (471) | D | D | D | D | D | D |
| | 560pF (561) | D | D | D | D | D | D |
| | 680pF (681) | D | D | D | D | D | D |
| | 820pF (821) | D | D | D | D | D | D |
| | 1,000pF (102) | D | D | D | D | D | D |
| | 1,200pF (122) | D | D | D | D | D | D |
| | 1,500pF (152) | D | D | D | D | D | D |
| | 1,800pF (182) | D | D | D | D | D | D |
| | 2,200pF (222) | D | D | D | D | D | D |
| | 2,700pF (272) | D | D | D | D | D | D |
| | 3,300pF (332) | D | D | D | D | D | D |
| | 3,900pF (392) | D | D | D | D | D | D |
| | 4,700pF (472) | D | D | D | D | D | D |
| | 5,600pF (562) | D | D | D | D | D | D |
| | 6,800pF (682) | D | D | D | D | D | D |
| | 8,200pF (822) | D | D | D | D | D | D |
| | 0.010µF (103) | D | D | D | D | D | D |
| | 0.012µF (123) | D | D | D | D | D | D |
| | 0.015µF (153) | D | D | D | D | D | D |
| | 0.018µF (183) | D | D | D | D | G | G |
| | 0.022µF (223) | D | D | D | D | G | G |
| | 0.027µF (273) | D | D | D | D | G | G |
| | 0.033µF (333) | D | D | D | D | G | G |
| | 0.039µF (393) | D | D | D | D | | |
| | 0.047µF (473) | D | D | D | D | | |
| | 0.056µF (563) | D | | | | | |
| | 0.068µF (683) | D | | | | | |
| | 0.082µF (823) | D | | | | | |
| | 0.1.µF (104) | D | | | | | |

1. The letter in cell is expressed the symbol of product thickness.
2. For more information about products with special capacitance or other data, please contact WTC local representative.

## FEATURES

* A wide selection of sizes is available (0402 to 1812).
* High capacitance in given case size.
* Capacitor with lead-free termination (pure Tin).
* High reliability design with severe quality controls.

## GENERAL ELECTRICAL DATA

| Dielectric | NP0 | X7R | X5R |
|---|---|---|---|
| Size | 0402, 0603, 0805, 1206, 1210, 1812 | | |
| Capacitance range* | 0.5pF to 0.033μF | 100pF to 2.2μF | 0.056μF to 10μF |
| Capacitance tolerance** | Cap≤5pF: B (±0.1pF), C (±0.25pF)<br>5pF<Cap<10pF: C (±0.25pF), D (±0.5pF)<br>Cap≥10pF: F (±1%), G (±2%), J (±5%) | J (±5%), K (±10%), M (±20%) | |
| Rated voltage (WVDC) | 16V, 25V, 50V, 100V | 10V, 16V, 25V, 50V, 100V, 200V, 250V | 6.3V, 10V, 16V, 25V |
| Insulation resistance at Ur | ≥10GΩ or RxC≥500Ω-F whichever is less | | |
| Operating temperature | -55 to +125°C | | -55 to +85°C |
| Capacitance characteristic | ±30ppm/°C | | ±15% |
| Termination | Ni/Sn (lead-free termination) | | |

## EXPLANATION OF PART NUMBERS

| MG | 31 | B | 104 | K | 500 | C | T |
|---|---|---|---|---|---|---|---|
| **Series**<br>MG= Automotive (without AEC-Q200 certification) | **Size (Inch (mm))**<br>31=1206 (3216) | **Dielectric**<br>B=X7R | **Capacitance**<br>102=10x$10^4$ =0.1uF | **Tolerance**<br>K=±10% | **Rated voltage**<br>500=50 VDC | **Termination**<br>C=Cu/Ni/Sn | **Packaging**<br>T=7” reeled |

* Please refer to page 2 “ How to order” for more information.

## CAPACITANCE RANGE

### X5R Dielectric

| Dielectric | X5R | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Size | 0402 | | | 0603 | | | | 0805 | | | | 1206 | | | | 1210 | |
| Rated Voltage(VDC) | 6.3 | 10 | 16 | 6.3 | 10 | 16 | 25 | 6.3 | 10 | 16 | 25 | 6.3 | 10 | 16 | 25 | 10 | 16 |
| Capacitance 0.056μF (563) | | N | | | | | | | | | | | | | | | |
| 0.068μF (683) | | N | | | | | | | | | | | | | | | |
| 0.082μF (823) | | N | | | | | | | | | | | | | | | |
| 0.10μF (104) | | N | N | | | | | | | | | | | | | | |
| 0.15μF (154) | | | | | | | | | | | | | | | | | |
| 0.22μF (224) | N | | | | | | X | | | | | | | | | | |
| 0.27uF (274) | N | | | | X | X | X | | | | | | | | | | |
| 0.33μF (334) | N | | | | X | X | X | | | | | | | | | | |
| 0.39μF (394) | N | | | | X | X | X | | | | | | | | | | |
| 0.47μF (474) | N | | | | X | X | X | | | | | | | | | | |
| 0.68μF (684) | N | | | | X | X | X | | | | | | | | | | |
| 0.82uF (824) | N | | | X | X | X | X | | | | | | | | | | |
| 1.0μF (105) | | | | X | X | X | X | | | | | | | | | | |
| 1.5μF (155) | | | | | | | | I | I | | | | J | J | P | K | K |
| 2.2μF (225) | | | | | | | | I | I | I | I | | J | J | P | K | K |
| 3.3μF (335) | | | | | | | | | | I | I | P | P | P | P | K | K |
| 4.7μF (475) | | | | | | | | | | I | I | P | P | P | P | K | K |
| 6.8uF (685) | | | | | | | | | | | | P | P | P | P | | |
| 10μF (106) | | | | | | | | | | | | P | P | P | P | | |

1. The letter in cell is expressed the symbol of product thickness.
2. For more information about products with special capacitance or other data, please contact WTC local representative.

## NP0 Dielectric

| Dielectric | NP0 | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Size | 0402 | 0603 | 0805 | | | | 1206 | | 1210 | | | 1812 | |
| Rated Voltage (VDC) | 10,16, 25,50, 100 | 10,16, 25,50, 100 | 10,16, 25,50, 100 | 200 | 250 | 500, 630 | 10,16, 25,50, | 100 | 10,16 | 25,50 | 100 | 10,16, 25,50 | 100 |
| Capacitance | | | | | | | | | | | | | |
| 0.1pF (0R1) | | | | | | | | | | | | | |
| 0.2pF (0R2) | | | | | | | | | | | | | |
| 0.3pF (0R3) | | | | | | | | | | | | | |
| 0.4pF (0R4) | | | | | | | | | | | | | |
| 0.5pF (0R5) | N | S | A | A | A | A | | | | | | | |
| 0.6pF (0R6) | N | S | A | A | A | A | | | | | | | |
| 0.7pF (0R7) | N | S | A | A | A | A | | | | | | | |
| 0.8pF (0R8) | N | S | A | A | A | A | | | | | | | |
| 0.9pF (0R9) | N | S | A | A | A | A | | | | | | | |
| 1.0pF (1R0) | N | S | A | A | A | A | | | | | | | |
| 1.2pF (1R2) | N | S | A | A | A | A | | | | | | | |
| 1.5pF (1R5) | N | S | A | A | A | A | B | B | | | | | |
| 1.8pF (1R8) | N | S | A | A | A | A | B | B | | | | | |
| 2.2pF (2R2) | N | S | A | A | A | A | B | B | | | | | |
| 2.7pF (2R7) | N | S | A | A | A | A | B | B | | | | | |
| 3.3pF (3R3) | N | S | A | A | A | A | B | B | | | | | |
| 3.9pF (3R9) | N | S | A | A | A | A | B | B | | | | | |
| 4.7pF (4R7) | N | S | A | A | A | A | B | B | | | | | |
| 5.6pF (5R6) | N | S | A | A | A | A | B | B | | | | | |
| 6.8pF (6R8) | N | S | A | A | A | A | B | B | | | | | |
| 8.2pF (8R2) | N | S | A | A | A | A | B | B | | | | | |
| 10pF (100) | N | S | A | A | A | A | B | B | C | C | C | D | D |
| 12pF (120) | N | S | A | A | A | A | B | B | C | C | C | D | D |
| 15pF (150) | N | S | A | A | A | A | B | B | C | C | C | D | D |
| 18pF (180) | N | S | A | A | A | A | B | B | C | C | C | D | D |
| 22pF (220) | N | S | A | A | A | A | B | B | C | C | C | D | D |
| 27pF (270) | N | S | A | A | A | A | B | B | C | C | C | D | D |
| 33pF (330) | N | S | A | A | A | A | B | B | C | C | C | D | D |
| 39pF (390) | N | S | A | A | A | A | B | B | C | C | C | D | D |
| 47pF (470) | N | S | A | A | A | A | B | B | C | C | C | D | D |
| 56pF (560) | N | S | A | A | A | A | B | B | C | C | C | D | D |
| 68pF (680) | N | S | A | A | A | A | B | B | C | C | C | D | D |
| 82pF (820) | N | S | A | A | A | B | B | B | C | C | C | D | D |
| 100pF (101) | N | S | A | A | B | B | B | B | C | C | C | D | D |
| 120pF (121) | N | S | A | A | B | D | B | B | C | C | C | D | D |
| 150pF (151) | N | S | A | B | D | D | B | B | C | C | C | D | D |
| 180pF (181) | N | S | A | B | D | D | B | B | C | C | C | D | D |
| 220pF (221) | N | S | A | D | D | D | B | B | C | C | C | D | D |
| 270pF (271) | | S | A | D | D | D | B | B | C | C | C | D | D |
| 330pF (331) | | S | A | D | D | D | B | B | C | C | C | D | D |
| 390pF (391) | | S | B | D | D | D | B | B | C | C | C | D | D |
| 470pF (471) | | S | B | D | | | B | B | C | C | C | D | D |
| 560pF (561) | | S | B | D | | | B | B | C | C | C | D | D |
| 680pF (681) | | S | B | D | | | B | B | C | C | C | D | D |
| 820pF (821) | | S | B | D | | | B | B | C | C | C | D | D |
| 1,000pF (102) | | S | B | | | | B | B | C | C | C | D | D |
| 1,200pF (122) | | | B | | | | B | B | C | C | C | D | D |
| 1,500pF (152) | | | B | | | | B | B | C | C | C | D | D |
| 1,800pF (182) | | | B | | | | B | B | C | C | C | D | D |
| 2,200pF (222) | | | B | | | | B | B | C | C | C | D | D |
| 2,700pF (272) | | | D | | | | B | B | C | C | C | D | D |
| 3,300pF (332) | | | | | | | B | B | C | C | C | D | D |
| 3,900pF (392) | | | | | | | B | B | C | C | C | D | D |
| 4,700pF (472) | | | | | | | B | B | C | C | C | D | D |
| 5,600pF (562) | | | | | | | B | B | C | C | C | D | D |
| 6,800pF (682) | | | | | | | C | | C | C | C | D | D |
| 8,200pF (822) | | | | | | | D | | C | C | C | D | D |
| 0.010uF (103) | | | | | | | D | | C | C | C | D | D |
| 0.012uF (123) | | | | | | | | | C | D | D | D | D |
| 0.015uF (153) | | | | | | | | | C | D | D | D | D |
| 0.018uF (183) | | | | | | | | | | | | D | D |
| 0.022uF (223) | | | | | | | | | | | | D | D |
| 0.027uF (273) | | | | | | | | | | | | D | D |
| 0.033uF (333) | | | | | | | | | | | | D | D |

1. The letter in cell is expressed the symbol of product thickness.
2. The letter in cell with “^” mark is expressed product with Ag/Ni/Sn terminations.
3. For more information about products with special capacitance or other data, please contact WTC local representative.

## X7R Dielectric

| Dielectric | | X7R | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Size | | 0402 | | | 0603 | | | | 0805 | | | | | 1206 | | | | | 1210 | | | | | 1812 | | | |
| Rated Voltage (VDC) | | 10, 16 | 25 | 50 | 6.3, 10, 16 | 25 | 50 | 100 | 6.3 | 10, 16, 25 | 50 | 100 | 200, 250 | 10, 16 | 25 | 50 | 100 | 200, 250 | 10, 16 | 25 | 50 | 100 | 200, 250 | 10, 16, 25 | 50 | 100 | 200, 250 |
| Capacitance | 100pF (101) | N | N | N | S | S | S | S | B | B | B | B | B | | | | | | | | | | | | | | |
| | 120pF (121) | N | N | N | S | S | S | S | B | B | B | B | B | | | | | | | | | | | | | | |
| | 150pF (151) | N | N | N | S | S | S | S | B | B | B | B | B | B | B | B | B | B | | | | | | | | | |
| | 180pF (181) | N | N | N | S | S | S | S | B | B | B | B | B | B | B | B | B | B | | | | | | | | | |
| | 220pF (221) | N | N | N | S | S | S | S | B | B | B | B | B | B | B | B | B | B | | | | | | | | | |
| | 270pF (271) | N | N | N | S | S | S | S | B | B | B | B | B | B | B | B | B | B | | | | | | | | | |
| | 330pF (331) | N | N | N | S | S | S | S | B | B | B | B | B | B | B | B | B | B | | | | | | | | | |
| | 390pF (391) | N | N | N | S | S | S | S | B | B | B | B | B | B | B | B | B | B | | | | | | | | | |
| | 470pF (471) | N | N | N | S | S | S | S | B | B | B | B | B | B | B | B | B | B | | | | | | | | | |
| | 560pF (561) | N | N | N | S | S | S | S | B | B | B | B | B | B | B | B | B | B | | | | | | | | | |
| | 680pF (681) | N | N | N | S | S | S | S | B | B | B | B | B | B | B | B | B | B | | | | | | | | | |
| | 820pF (821) | N | N | N | S | S | S | S | B | B | B | B | B | B | B | B | B | B | | | | | | | | | |
| | 1,000pF (102) | N | N | N | S | S | S | S | B | B | B | B | B | B | B | B | B | B | C | C | C | C | C | D | D | D | D |
| | 1,200pF (122) | N | N | N | S | S | S | S | B | B | B | B | B | B | B | B | B | B | C | C | C | C | C | D | D | D | D |
| | 1,500pF (152) | N | N | N | S | S | S | S | B | B | B | B | B | B | B | B | B | B | C | C | C | C | C | D | D | D | D |
| | 1,800pF (182) | N | N | N | S | S | S | S | B | B | B | B | B | B | B | B | B | B | C | C | C | C | C | D | D | D | D |
| | 2,200pF (222) | N | N | N | S | S | S | S | B | B | B | B | B | B | B | B | B | B | C | C | C | C | C | D | D | D | D |
| | 2,700pF (272) | N | N | N | S | S | S | S | B | B | B | B | B | B | B | B | B | B | C | C | C | C | C | D | D | D | D |
| | 3,300pF (332) | N | N | N | S | S | S | S | B | B | B | B | B | B | B | B | B | B | C | C | C | C | C | D | D | D | D |
| | 3,900pF (392) | N | N | N | S | S | S | S | B | B | B | B | B | B | B | B | B | B | C | C | C | C | C | D | D | D | D |
| | 4,700pF (472) | N | N | N | S | S | S | S | B | B | B | B | B | B | B | B | B | B | C | C | C | C | C | D | D | D | D |
| | 5,600pF (562) | N | N | N | S | S | S | S | B | B | B | B | D | B | B | B | B | B | C | C | C | C | C | D | D | D | D |
| | 6,800pF (682) | N | N | N | S | S | S | S | B | B | B | B | D | B | B | B | B | B | C | C | C | C | C | D | D | D | D |
| | 8,200pF (822) | N | N | N | S | S | S | S | B | B | B | B | D | B | B | B | B | B | C | C | C | C | C | D | D | D | D |
| | 0.010uF (103) | N | N | N | S | S | S | S | B | B | B | B | D | B | B | B | B | B | C | C | C | C | C | D | D | D | D |
| | 0.012uF (123) | N | N | | S | S | S | | B | B | B | B | D | B | B | B | B | B | C | C | C | C | C | D | D | D | D |
| | 0.015uF (153) | N | N | | S | S | S | | B | B | B | B | D | B | B | B | B | C | C | C | C | C | C | D | D | D | D |
| | 0.018uF (183) | N | N | | S | S | S | | B | B | B | B | D | B | B | B | B | C | C | C | C | C | C | D | D | D | D |
| | 0.022uF (223) | N | N | | S | S | S | | B | B | B | B | D | B | B | B | B | C | C | C | C | C | C | D | D | D | D |
| | 0.027uF (273) | N | N | | S | S | S | | | B | B | D | | B | B | B | B | C | C | C | C | C | C | D | D | D | D |
| | 0.033uF (333) | N | N | | S | S | X | | | B | B | D | | B | B | B | B | G | C | C | C | C | C | D | D | D | D |
| | 0.039uF (393) | N | N | | S | S | X | | | B | B | D | | B | B | B | B | G | C | C | C | C | C | D | D | D | D |
| | 0.047uF (473) | N | N | | S | S | X | | | B | B | D | | B | B | B | B | G | C | C | C | C | D | D | D | D | D |
| | 0.056uF (563) | N | | | S | S | X | | | B | B | D | | B | B | B | B | G | C | C | C | C | D | D | D | D | D |
| | 0.068uF (683) | N | | | S | S | X | | | B | B | D | | B | B | B | B | G | C | C | C | C | G | D | D | D | D |
| | 0.082uF (823) | N | | | S | S | X | | | B | B | D | | B | B | B | J | G | C | C | C | C | G | D | D | D | D |
| | 0.10uF (104) | N | | | S | S | X | | | B | B | D | | B | B | B | J | G | C | C | C | C | G | D | D | D | D |
| | 0.12uF (124) | | | | S | X | | | | D | D | | | B | B | B | J | | C | C | C | C | G | D | D | D | D |
| | 0.15uF (154) | | | | S | X | | | | D | D | | | C | C | C | G | | C | C | C | D | M | D | D | D | K |
| | 0.18uF (184) | | | | S | X | | | | D | D | | | C | C | C | G | | C | C | C | D | M | D | D | D | K |
| | 0.22uF (224) | | | | S | X | | | | D | D | | | C | C | C | G | | C | C | C | D | M | D | D | D | K |
| | 0.27uF (274) | | | | X | | | | | D | | | | C | C | D | | | C | C | C | G | M | D | D | D | K |
| | 0.33uF (334) | | | | X | | | | | D | | | | C | C | D | | | C | C | D | G | M | D | D | D | K |
| | 0.39uF (394) | | | | X | | | | | D | | | | C | J | P | | | C | C | D | M | M | D | D | D | K |
| | 0.47uF (474) | | | | X | | | | | D | | | | J | J | P | | | C | C | D | M | M | D | D | K | K |
| | 0.56uF (564) | | | | | | | | | D | | | | J | J | P | | | D | D | D | M | | D | D | K | M |
| | 0.68uF (684) | | | | | | | | | D | | | | J | J | P | | | D | D | D | K | | D | K | K | M |
| | 0.82uF (824) | | | | | | | | | D | | | | J | J | P | | | D | D | D | K | | D | K | K | M |
| | 1.0uF (105) | | | | | | | | | D | | | | J | J | P | | | D | D | D | K | | D | K | K | M |
| | 1.5uF (155) | | | | | | | | | | | | | J | P | | | | K | G | | | | | | K | |
| | 2.2uF (225) | | | | | | | | | | | | | J | P | | | | K | G | | | | | | M | |

1. The letter in cell is expressed the symbol of product thickness.
2. 0805 size, Cap.1.0uF_10V only.
3. For more information about products with special capacitance or other data, please contact WTC local representative.

WALSIN

* About Reliability Test Conditions and Requirements, please refer to Walsin MLCC approval sheet for more detail.

<table>
<tr><th>No</th><th>Item</th><th colspan="2">Test Condition</th><th>Requirements</th></tr>
<tr><td>1.</td><td>Visual and Mechanical</td><td colspan="2">---</td><td>* No remarkable defect.<br>* Dimensions to conform to individual specification sheet.</td></tr>
<tr><td>2.</td><td>Capacitance</td><td colspan="2" rowspan="2">Class I: NP0<br>Cap≤1000pF 1.0±0.2Vrms, 1MHz±10%<br>Cap>1000pF 1.0±0.2Vrms, 1KHz±10%<br><br>Class II: X7R,X7E, X5R,Y5V<br>Cap≤10μF, 1.0±0.2Vrms, 1kHz±10% **<br>Cap>10μF, 0.5±0.2Vrms, 120Hz±20%<br><br>** Test condition: 0.5±0.2Vrms, 1KHz±10%<br>X7R: 0603≥225(10V),<br>0805=106(6.3V&10V)<br>X5R: 01R5≥103, 0201≥224 (6.3V),<br>0402≥475 (6.3V), 0402≥225(10V),<br>0603=106 (6.3V)</td><td>* Shall not exceed the limits given in the detailed spec.</td></tr>
<tr><td>3.</td><td>Q/ D.F. (Dissipation Factor)</td><td>NP0: Cap≥30pF, Q≥1000; Cap<30pF,Q≥400+20C<br>X7R, X5R:
<table>
<tr><th>Rated vol.</th><th>D.F.≤</th><th colspan="2">Exception of D.F. ≤</th></tr>
<tr><td rowspan="3">≥50V</td><td rowspan="3">≤2.5%</td><td>≤3%</td><td>0201(50V); 0603≥0.047μF; 0805≥0.18μF;1206≥0.47μF</td></tr>
<tr><td>≤5%</td><td>1210≥4.7μF</td></tr>
<tr><td>≤10%</td><td>0603≥1μF; 0805≥1μF;1206≥4.7μF; 1210≥10μF</td></tr>
<tr><td>35V</td><td>≤3.5%</td><td>≤10%</td><td>0805≥2.2μF; 1210≥10μF</td></tr>
<tr><td rowspan="3">25V</td><td rowspan="3">≤3.5%</td><td>≤5%</td><td>0201≥0.01μF;0805≥1μF; 1210≥10μF</td></tr>
<tr><td>≤7%</td><td>0603≥0.33μF; 1206≥4.7μF</td></tr>
<tr><td>≤10%</td><td>0402≥0.10μF;0603≥0.47μF; 0805≥2.2μF; 1206≥6.8μF; 1210≥22μF ; TT series</td></tr>
<tr><td rowspan="2">16V</td><td rowspan="2">≤3.5%</td><td>≤5%</td><td>0201≥0.01μF;0402≥0.033μF; 0805≥0.68μF;1206≥2.2μF;1210≥4.7μF</td></tr>
<tr><td>≤10%</td><td>0402≥0.47uF; 0603≥0.68μF;0805≥2.2μF; 1206≥4.7μF; 1210≥22μF; TT series</td></tr>
<tr><td rowspan="2">10V</td><td rowspan="2">≤5%</td><td>≤10%</td><td>0402≥0.33μF;0603≥0.33μF; 0805≥2.2μF; 1206≥2.2μF;1210≥22μF; TT series</td></tr>
<tr><td>≤15%</td><td>0201≥0.1μF; 0402≥1μF</td></tr>
<tr><td rowspan="2">6.3V</td><td rowspan="2">≤10%</td><td>≤15%</td><td>0201≥0.1μF;0402≥1μF;0603≥10μF; 0805≥4.7μF; 1206≥47μF :1210≥100μF; TT series</td></tr>
<tr><td>≤20%</td><td>0402≥2.2μF</td></tr>
<tr><td>4V</td><td>≤15%</td><td>---</td><td>---</td></tr>
</table>
X7R/X7E, LD series : 100V: DF≤1.4%; ≤200V:DF≤1.0%<br>Y5V:
<table>
<tr><th>Rated vol.</th><th>D.F. ≤</th><th colspan="2">Exception of D.F.≤</th></tr>
<tr><td>≥50V</td><td>≤5%</td><td>≤7%</td><td>0603≥0.1μF; 0805≥0.47μF; 1206≥4.7μF; TT series & Cap≥1μF</td></tr>
<tr><td>35V</td><td>≤7%</td><td>---</td><td>---</td></tr>
<tr><td rowspan="2">25V</td><td rowspan="2">≤5%</td><td>≤7%</td><td>0402≥0.047μF;0603≥0.1μF; 0805≥0.33μF;1206≥1μF; 1210≥4.7μF</td></tr>
<tr><td>≤9%</td><td>0402≥0.068μF;0603≥0.47μF; 1206≥4.7μF; 1210≥22μF; TT series & Cap≥1μF</td></tr>
<tr><td rowspan="2">16V (C<1.0μF)</td><td rowspan="2">≤7%</td><td>≤9%</td><td>0402≥0.068μF; 0603≥0.68μF</td></tr>
<tr><td>≤12.5%</td><td>0402≥0.22μF</td></tr>
<tr><td>16V (C≥1.0μF)</td><td>≤9%</td><td>≤12.5%</td><td>0603≥2.2μF; 0805≥3.3μF;1206≥10μF; 1210≥22μF; 1812≥47μF; TT series & Cap≥1μF</td></tr>
<tr><td>10V</td><td>≤12.5%</td><td>≤20%</td><td>0402≥0.47μF</td></tr>
<tr><td>6.3V</td><td>≤20%</td><td>---</td><td>---</td></tr>
</table></td></tr>
<tr><td rowspan="2">4a.</td><td rowspan="2">Dielectric Strength</td><td colspan="2">*To apply voltage(≤100V) 250%.<br>*Duration: 1 to 5 sec.<br>*Charge & discharge current less than 50mA.</td><td rowspan="2">*No evidence of damage or flash over during test.</td></tr>
<tr><td colspan="2">*To apply voltage:<br>200V ~300V & LD series ≥2 times V DC<br>500V ~ 999V ≥1.5 times V DC<br>1000V ~ 3000V ≥1.2 times V DC<br>*Cut-off, set at 10mA<br>*TEST= 15 sec. *RAMP=0</td></tr>
<tr><td>4b.</td><td>Dielectric Strength (for X1/Y2 & X2/Y3)</td><td colspan="2">* To apply 1500 VAC voltage.<br>* Duration: 60 sec.</td><td>* No evidence of damage or flash over during test.</td></tr>
<tr><td rowspan="3">5.</td><td rowspan="3">Insulation Resistance</td><td colspan="2">To apply rated voltage for max. 120 sec.</td><td>10GΩ or RxC≥500Ω-F whichever is smaller.<br>Class II (X7R, X7E, X5R, Y5V)
<table>
<tr><th>Rated voltage</th><th>Insulation Resistance</th></tr>
<tr><td>100V: X7R</td><td rowspan="7">10GΩ or RxC≥100 Ω-F whichever is smaller.</td></tr>
<tr><td>50V:0603≥1μF;0805≥1μF;1206≥4.7μF;1210≥4.7μF</td></tr>
<tr><td>35V:0805≥2.2μF;1210≥10μF</td></tr>
<tr><td>25V:0402≥1μF;0603≥2.2μF;0805≥2.2μF;1206≥10μF;1210≥10μF</td></tr>
<tr><td>16V:0402≥0.22μF;0603≥1μF;0805≥2.2μF;1206≥10μF;1210≥47μF</td></tr>
<tr><td>10V:0201≥47nF;0402≥0.47μF;0603≥0.47μF; 0805≥2.2μF; 1206≥4.7μF;1210≥47μF</td></tr>
<tr><td>6.3V ; 4V ; TT series</td></tr>
</table></td></tr>
<tr><td>Rated Voltage:<br>200V ~ 630V</td><td>To apply rated voltage (500V max.) for 60 sec.</td><td>>10GΩ or 100Ω-F whichever is smaller.</td></tr>
<tr><td>Rated Voltage: >630V</td><td>To apply 500V for 60sec.</td><td>>10GΩ</td></tr>
<tr><td>6.</td><td>Temperature Coefficient</td><td colspan="2">With no electrical load.
<table>
<tr><th>T.C.</th><th>Operating Temp</th></tr>
<tr><td>NPO (C0G)</td><td>-55~125°C at 25°C</td></tr>
<tr><td>NPO (C0H)</td><td>-55~125°C at 25°C</td></tr>
<tr><td>NPO (C0J)</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>X7E</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></td><td>
<table>
<tr><th>T.C.</th><th>Capacitance Change</th></tr>
<tr><td>NPO (C0G)</td><td>Within ±30ppm/°C</td></tr>
<tr><td>NPO (C0H)</td><td>Within ±60ppm/°C</td></tr>
<tr><td>NPO (C0J)</td><td>Within ±120ppm/°C</td></tr>
<tr><td>X7R</td><td>Within ±15%</td></tr>
<tr><td>X7E</td><td>Within ±4.7%</td></tr>
<tr><td>X5R</td><td>Within ±15%</td></tr>
<tr><td>Y5V</td><td>Within +30%/-80%</td></tr>
</table></td></tr>
<tr><td>7.</td><td>Adhesive Strength of Termination</td><td colspan="2">*Pressurizing force:<br>0201: 2N<br>0402 & 0603: 5N<br>>0603: 10N<br>*Test time:10 ±1 sec</td><td>* No remarkable damage or removal of the terminations.</td></tr>
</table>

<table>
<tr><th>No</th><th>Item</th><th>Test Condition</th><th>Requirements</th></tr>
<tr><td>8.</td><td>Vibration Resistance</td><td>* Vibration frequency: 10~55 Hz/min.<br>* Total amplitude: 1.5mm<br>* Test time: 6 hrs.<br>(Two hrs each in three mutually perpendicular directions.)</td><td>* No remarkable defect.<br>* Dimensions to conform to individual specification sheet.</td></tr>
<tr><td>9.</td><td>Solderability</td><td>* Solder temperature: 235±5°C<br>* Dipping time: 2±0.5 sec.</td><td>95% min. coverage of all metalized area.</td></tr>
<tr><td>10.</td><td>Bending Test</td><td>*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 / SH series: 5 mm** & 3 mm*** and then the pressure shall be maintained for 5±1 sec.<br>*Measurement to be made after keeping at room temp. for 24±2 hrs. (Class I) or 48±4 hrs. (Class II).<br>(** Thickness >1.0mm; *** Thickness≤1.0mm)</td><td>* No remarkable damage.<br>* Cap change:<br>NP0: within ±5% or 0.5pF whichever is larger<br>X7R, X7E, X5R: within ±12.5% , Y5V: within ±30%<br>(This capacitance change means the change of capacitance under specified flexure of substrate from the capacitance measured before the test.)</td></tr>
<tr><td>11.</td><td>Resistance to Soldering Heat</td><td>* Solder temperature: 260±5°C<br>* Dipping time: 10±1 sec<br>* Preheating: 120 to 150°C for 1 minute before immerse the capacitor in a eutectic solder.<br>* Before initial measurement (Class II only): Perform 150+0/-10°C for 1 hr and then set for 48±4 hrs at room temp.<br>* Measurement to be made after keeping at room temp. for 24±2 hrs. (Class I) or 48±4 hrs. (Class II).</td><td>* No remarkable damage.<br>* Cap change:<br>NP0: within ±2.5% or 0.25pF whichever is larger<br>X7R, X7E, X5R: within ±7.5%<br>Y5V: within ±20%<br>* Q/D.F., I.R. and dielectric strength: To meet initial requirements.<br>* 25% max. leaching on each edge.</td></tr>
<tr><td>12.</td><td>Temperature Cycle</td><td>* Conduct the five cycles according to the temperatures and time.
<table>
<tr><th>Step</th><th>Temp. (°C)</th><th>Time (min.)</th></tr>
<tr><td>1</td><td>Min. operating temp. +0/-3</td><td>30±3</td></tr>
<tr><td>2</td><td>Room temp.</td><td>2~3</td></tr>
<tr><td>3</td><td>Max. operating temp. +3/-0</td><td>30±3</td></tr>
<tr><td>4</td><td>Room temp.</td><td>2~3</td></tr>
</table>
* Before initial measurement (Class II only): Perform 150+0/-10°C for 1 hr and then set for 48±4 hrs at room temp.<br>* Measurement to be made after keeping at room temp. for 24±2 hrs. (Class I) or 48±4 hrs. (Class II).</td><td>* No remarkable damage.<br>* Cap change:<br>NP0: within ±2.5% or 0.25pF whichever is larger<br>X7R, X7E, X5R: within ±7.5%<br>Y5V: within ±20%<br>* Q/D.F., I.R. and dielectric strength: To meet initial requirements.</td></tr>
<tr><td>13.</td><td>Humidity (Damp Heat) Steady State</td><td>* Test temp.: 40±2°C<br>* Humidity: 90~95% RH<br>* Test time: 500+24/-0hrs.<br>* Measurement to be made after keeping at room temp. for 24±2 hrs. (Class I) or 48±4 hrs. (Class II).</td><td>* No remarkable damage.<br>* Cap change: NP0: within ±5% or 0.5pF whichever is larger<br>X7R, X7E, X5R: ≥10V**,within ±12.5%;6.3V within ±25%;TT series & C≥ 1uF,within ±25%<br>**10V:0603≥4.7μF;0402≥1μF;0201≥0.1μF, within ±25%;<br>Y5V: ≥10V, within ±30%; 6.3V, within +30/-40%<br>* Q/D.F. value:<br>NP0: More than 30pF Q≥350, 10pF≤C≤30pF, Q≥275+2.5C,Less than 10pF Q≥200+10C<br>X7R, X5R:
<table>
<tr><th>Rated vol.</th><th>D.F.≤</th><th colspan="2">Exception of D.F. ≤</th></tr>
<tr><td rowspan="3">≥50V</td><td rowspan="3">≤3%</td><td>≤6%</td><td>0201(50V);0603≥0.047μF; 0805≥0.18μF; 1206≥0.47μF</td></tr>
<tr><td>≤10%</td><td>1210≥4.7μF</td></tr>
<tr><td>≤20%</td><td>0603≥1μF; 0805≥1μF;1206≥4.7μF; 1210≥10μF</td></tr>
<tr><td>35V</td><td>≤5%</td><td>≤20%</td><td>0805≥2.2μF;1210≥10μF</td></tr>
<tr><td rowspan="3">25V</td><td rowspan="3">≤5%</td><td>≤10%</td><td>0201≥0.01μF;0805≥1μF; 1210≥10μF</td></tr>
<tr><td>≤14%</td><td>0603≥0.33μF;1206≥4.7μF</td></tr>
<tr><td>≤15%</td><td>0402≥0.10μF;0603≥0.47μF;0805≥2.2μF;1206≥6.8μF; 1210≥22μF; TT series</td></tr>
<tr><td rowspan="2">16V</td><td rowspan="2">≤5%</td><td>≤10%</td><td>0603≥0.15μF;0805≥0.68μF;1206≥2.2μF;1210≥4.7μF</td></tr>
<tr><td>≤15%</td><td>0201≥0.01μF;0402≥0.033μF;0603≥0.68μF;0805≥2.2μF; 1206≥4.7μF; 1210≥22μF; TT series</td></tr>
<tr><td rowspan="2">10V</td><td rowspan="2">≤7.5%</td><td>≤15%</td><td>0402≥0.33μF; 0603≥0.33μF;0805≥2.2μF 1206≥2.2μF; 1210≥22μF</td></tr>
<tr><td>≤20%</td><td>0201≥0.1μF ;0402≥1μF; TT series</td></tr>
<tr><td>6.3V</td><td>≤15%</td><td>≤30%</td><td>0201≥0.1μF;0402≥1μF;0603≥10μF; 0805≥4.7μF;1206≥47μF;1210≥100μF;TT series</td></tr>
<tr><td>4V</td><td>≤20%</td><td>---</td><td>---</td></tr>
</table>
X7R/X7E, LD series : DF≤3%<br>Y5V:
<table>
<tr><th>Rated vol.</th><th>D.F.≤</th><th colspan="2">Exception of D.F.≤</th></tr>
<tr><td>≥50V</td><td>≤7.5%</td><td>≥10%</td><td>0603≥0.1μF;0805≥0.47μF;1206≥4.7μF</td></tr>
<tr><td>35V</td><td>≤10%</td><td>---</td><td>---</td></tr>
<tr><td rowspan="2">25V</td><td rowspan="2">≤7.5%</td><td>≥10%</td><td>0402≥0.047μF;0603≥0.1μF;0805≥0.33μF ;1206≥1μF; 1210≥4.7μF</td></tr>
<tr><td>≥15%</td><td>0402≥0.068μF;0603≥0.47μF;1206≥4.7 μF; 1210≥22μF; TT series & Cap≥1μF</td></tr>
<tr><td rowspan="2">16V(C<1.0μF)</td><td rowspan="2">≤10%</td><td>≥12.5%</td><td>0402≥0.068μF; 0603≥0.68μF</td></tr>
<tr><td>≥20%</td><td>0402≥0.22μF</td></tr>
<tr><td>16V(C≥1.0μF)</td><td>≤12.5%</td><td>≥20%</td><td>0603≥2.2μF;0805≥3.3μF;1206≥10μF ;1210≥22μF;1812≥47μF; TT series & Cap≥1μF</td></tr>
<tr><td>10V</td><td>≤20%</td><td>≥30%</td><td>0402≥0.47μF</td></tr>
<tr><td>6.3V</td><td>≤30%</td><td>---</td><td>---</td></tr>
</table>
*I.R.: ≥10V, 1GΩ or 50 Ω-F whichever is smaller.<br>Class II (X7R, X7E, X5R, Y5V)
<table>
<tr><th>Rated voltage</th><th>Insulation Resistance</th></tr>
<tr><td>100V: X7R</td><td rowspan="7">1GΩ or RxC≥10 Ω-F whichever is smaller.</td></tr>
<tr><td>50V:0603≥1μF;0805≥1μF;1206≥4.7μF;1210≥4.7μF</td></tr>
<tr><td>35V:0805≥2.2μF;1210≥10μF</td></tr>
<tr><td>25V:0402≥1μF;0603≥2.2μF;0805≥2.2μF;1206≥10μF;1210≥10μF</td></tr>
<tr><td>16V:0402≥0.22μF;0603≥1μF;0805≥2.2μF;1206≥10μF;1210≥47μF</td></tr>
<tr><td>10V:0201≥47nF;0402≥0.47μF;0603≥0.47μF; 0805≥2.2μF;1206≥4.7μF;1210≥47μF</td></tr>
<tr><td>6.3V ; 4V ; TT series</td></tr>
</table>
</td></tr>
</table>

<table>
<tr><th>No</th><th>Item</th><th>Test Condition</th><th>Requirements</th></tr>
<tr>
<td>14.</td>
<td>Humidity (Damp Heat) Load</td>
<td>* Test temp.: 40±2°C<br>* Humidity: 90~95%RH<br>* Test time: 500+24/-0 hrs.<br>* To apply voltage:<br>Rated voltage.(Max.500V)<br>* Measurement to be made after keeping at room temp. for 24±2 hrs. (Class I) or 48±4 hrs. (Class II).</td>
<td>* No remarkable damage.<br>Cap change: NP0: ±7.5% or 0.75pF whichever is larger.<br>X7R, X7E, X5R: ≥10V**,within ±12.5%;6.3V within ±25%;TT series & C≥ 1uF,within ±25%<br>**10V:0603≥4.7μF;0402≥1μF;0201≥0.1μF, within ±25%;<br>Y5V: ≥10V, within ±30%; 6.3V, within +30/-40%<br>Q/D.F. value: NP0: C≥30pF,Q≥200;C<30pF, Q≥100+10/3C<br>X7R, X5R:
<table>
<tr><th>Rated vol.</th><th>D.F.≤</th><th colspan="2">Exception of D.F. ≤</th></tr>
<tr><td rowspan="3">≥50V</td><td rowspan="3">≤3%</td><td>≤6%</td><td>0201(50V);0603≥0.047μF; 0805≥0.18μF; 1206≥0.47μF</td></tr>
<tr><td>≤10%</td><td>1210≥4.7μF</td></tr>
<tr><td>≤20%</td><td>0603≥1μF; 0805≥1μF;1206≥4.7μF; 1210≥10μF</td></tr>
<tr><td>35V</td><td>≤5%</td><td>≤20%</td><td>0805≥2.2μF;1210≥10μF</td></tr>
<tr><td rowspan="3">25V</td><td rowspan="3">≤5%</td><td>≤10%</td><td>0201≥0.01μF;0805≥1μF; 1210≥10μF</td></tr>
<tr><td>≤14%</td><td>0603≥0.33μF;1206≥4.7μF</td></tr>
<tr><td>≤15%</td><td>0402≥0.10μF;0603≥0.47μF;0805≥2.2μF;1206≥6.8μF;1210≥22μF; TT series</td></tr>
<tr><td rowspan="2">16V</td><td rowspan="2">≤5%</td><td>≤10%</td><td>0603≥0.15μF;0805≥0.68μF;1206≥2.2μF;1210≥4.7μF</td></tr>
<tr><td>≤15%</td><td>0201≥0.01μF;0402≥0.033μF;0603≥0.68μF;0805≥2.2μF; 1206≥4.7μF; 1210≥22μF; TT series</td></tr>
<tr><td rowspan="2">10V</td><td rowspan="2">≤7.5%</td><td>≤15%</td><td>0402≥0.33μF; 0603≥0.33μF;0805≥2.2μF;1206≥2.2μF; 1210≥22μF</td></tr>
<tr><td>≤20%</td><td>0201≥0.1μF ;0402≥1μF; TT series</td></tr>
<tr><td>6.3V</td><td>≤15%</td><td>≤30%</td><td>0201≥0.1μF;0402≥1μF;0603≥10μF; 0805≥4.7μF;1206≥47μF;1210≥100μF;TT series</td></tr>
<tr><td>4V</td><td>≤20%</td><td>---</td><td>---</td></tr>
</table>
X7R/X7E, LD series : DF≤3%<br>Y5V:
<table>
<tr><th>Rated vol.</th><th>D.F.≤</th><th colspan="2">Exception of D.F.≤</th></tr>
<tr><td>≥50V</td><td>≤7.5%</td><td>≤10%</td><td>0603≥0.1μF; 0805≥0.47μF;1206≥4.7μF; TT series & Cap≥1μF</td></tr>
<tr><td>35V</td><td>≤10%</td><td>---</td><td>---</td></tr>
<tr><td rowspan="2">25V</td><td rowspan="2">≤7.5%</td><td>≤10%</td><td>0402≥0.047μF;0603≥0.1μF;0805≥0.33μF;1206≥1μF; 1210≥4.7μF</td></tr>
<tr><td>≤15%</td><td>0402≥0.068μF;0603≥0.47μF;1206≥4.7μF;1210≥22μF; TT series & Cap≥1μF</td></tr>
<tr><td rowspan="2">16V<br>(C<1.0μF)</td><td rowspan="2">≤10%</td><td>≤12.5%</td><td>0402≥0.068μF; 0603≥0.68μF</td></tr>
<tr><td>≤20%</td><td>0402≥0.22μF</td></tr>
<tr><td>16V<br>(C≥1.0μF)</td><td>≤12.5%</td><td>≤20%</td><td>0603≥2.2μF;0805≥3.3μF;1206≥10μF;1210≥22μF;1812≥47μF; TT series & Cap≥1μF</td></tr>
<tr><td>10V</td><td>≤20%</td><td>≤30%</td><td>0402≥0.47μF</td></tr>
<tr><td>6.3V</td><td>≤30%</td><td>---</td><td>---</td></tr>
</table>
*I.R.: ≥10V, 500MΩ or 25 Ω-F whichever is smaller.Class II (X7R, X7E, X5R, Y5V)
<table>
<tr><th>Rated voltage</th><th>Insulation Resistance</th></tr>
<tr><td>100V: X7R</td><td rowspan="7">500MΩ or RxC≥5 Ω-F whichever is smaller.</td></tr>
<tr><td>50V:0603≥1μF;0805≥1μF;1206≥4.7μF;1210≥4.7μF</td></tr>
<tr><td>35V:0805≥2.2μF;1210≥10μF</td></tr>
<tr><td>25V:0402≥1μF;0603≥2.2μF;0805≥2.2μF;1206≥10μF;1210≥10μF</td></tr>
<tr><td>16V:0402≥0.22μF;0603≥1μF;0805≥2.2μF;1206≥10μF;1210≥47μF</td></tr>
<tr><td>10V:0201≥47nF;0402≥0.47μF;0603≥0.47μF ;0805≥2.2μF;1206≥4.7μF;1210≥47μF</td></tr>
<tr><td>6.3V ; 4V ; TT series</td></tr>
</table>
</td>
</tr>
<tr>
<td>15.</td>
<td>High Temperature Load (Endurance)</td>
<td>*Test temp.:<br>NP0, X7R/X7E: 125±3°C<br>X5R, Y5V: 85±3°C<br>*Test time: 1000+24/-0 hrs.<br>*To apply voltage:<br>(1) 6.3V or C≥10μF or TT series:<br>150% of rated voltage.<br>(2) 10V≥Ur<500V:<br>200% of rated voltage.<br>(3) 500V: 150% of rated voltage.<br>(4) Ur≥630V:<br>120% of rated voltage.<br>(5) 100% of rated voltage for below range.
<table>
<tr><th>Size</th><th>Dielectric</th><th>Rated voltage</th><th>Capacitance range</th></tr>
<tr><td>0201</td><td>X5R</td><td>6.3V,10V</td><td>C≥0.1μF</td></tr>
<tr><td>0402</td><td>X5R,</td><td>6.3V,10V</td><td>C≥1.0μF</td></tr>
<tr><td>0603</td><td>X5R</td><td>6.3V,10V</td><td>C≥4.7μF</td></tr>
<tr><td>0805</td><td>X5R</td><td>6.3V</td><td>C≥22μF</td></tr>
<tr><td rowspan="2">1206</td><td>X5R</td><td>6.3V</td><td>C≥47μF</td></tr>
<tr><td>NP0</td><td>3000V</td><td>C≥1.5pF</td></tr>
<tr><td>TT18</td><td>Y5V</td><td>6.3V,10V</td><td>C≥2.2μF</td></tr>
<tr><td>TT21</td><td>Y5V</td><td>6.3V</td><td>C≥10μF</td></tr>
<tr><td>TT31</td><td>Y5V</td><td>6.3V</td><td>C≥22μF</td></tr>
</table>
(6)150% of rated voltage for below range.
<table>
<tr><th>Size</th><th>Dielectric</th><th colspan="2">Rated voltage<br>Capacitance range</th></tr>
<tr><td rowspan="2">0402</td><td>X5R</td><td>10V,16V,25V</td><td>C≥0.22μF</td></tr>
<tr><td>Y5V</td><td>16V</td><td>C≥0.47μF</td></tr>
<tr><td rowspan="2">0603</td><td>X5R</td><td>10V,16V</td><td>C≥1.0μF</td></tr>
<tr><td>Y5V</td><td>16V</td><td>C≥2.2μF</td></tr>
<tr><td rowspan="2">0805</td><td>X5R</td><td>10V</td><td>C≥4.7μF</td></tr>
<tr><td>Y5V</td><td>16V</td><td>C≥4.7μF</td></tr>
</table>
* Measurement to be made after keeping at room temp. for 24±2 hrs. (Class I) or 48±4 hrs. (Class II).</td>
<td>* No remarkable damage. Cap change: NP0: ±3.0% or ±0.3pF whichever is larger<br>X7R, X7E, X5R: ≥10V**,within ±12.5%;6.3V within ±25%;TT series & C≥ 1uF,within ±25%<br>**10V:0603≥4.7μF;0402≥1μF;0201≥0.1μF, within ±25%;<br>Y5V: ≥10V, within ±30%; 6.3V, within +30/-40%<br>Q/D.F. value: NP0: More than 30pF, Q≥350; 10pF≤C<30pF, Q≥275+2.5C; Less than 10pF, Q≥200+10C<br>X7R, X5R:
<table>
<tr><th>Rated vol.</th><th>D.F.≤</th><th colspan="2">Exception of D.F. ≤</th></tr>
<tr><td rowspan="3">≥50V</td><td rowspan="3">≤3%</td><td>≤6%</td><td>0201(50V);0603≥0.047μF; 0805≥0.18μF; 1206≥0.47μF</td></tr>
<tr><td>≤10%</td><td>1210≥4.7μF</td></tr>
<tr><td>≤20%</td><td>0603≥1μF; 0805≥1μF;1206≥4.7μF; 1210≥10μF</td></tr>
<tr><td>35V</td><td>≤5%</td><td>≤20%</td><td>0805≥2.2μF;1210≥10μF</td></tr>
<tr><td rowspan="3">25V</td><td rowspan="3">≤5%</td><td>≤10%</td><td>0201≥0.01μF;0805≥1μF; 1210≥10μF</td></tr>
<tr><td>≤14%</td><td>0603≥0.33μF;1206≥4.7μF</td></tr>
<tr><td>≤15%</td><td>0402≥0.10μF;0603≥0.47μF;0805≥2.2μF;1206≥6.8μF;1210≥22μF; TT series</td></tr>
<tr><td rowspan="2">16V</td><td rowspan="2">≤5%</td><td>≤10%</td><td>0603≥0.15μF;0805≥0.68μF;1206≥2.2μF;1210≥4.7μF</td></tr>
<tr><td>≤15%</td><td>0201≥0.01μF;0402≥0.033μF;0603≥0.68μF;0805≥2.2μF; 1206≥4.7μF; 1210≥22μF; TT series</td></tr>
<tr><td rowspan="2">10V</td><td rowspan="2">≤7.5%</td><td>≤15%</td><td>0402≥0.33μF; 0603≥0.33μF;0805≥2.2μF;1206≥2.2μF; 1210≥22μF</td></tr>
<tr><td>≤20%</td><td>0201≥0.1μF ;0402≥1μF; TT series</td></tr>
<tr><td>6.3V</td><td>≤15%</td><td>≤30%</td><td>0201≥0.1μF;0402≥1μF;0603≥10μF; 0805≥4.7μF;1206≥47μF;1210≥100μF;TT series</td></tr>
<tr><td>4V</td><td>≤20%</td><td>---</td><td>---</td></tr>
</table>
X7R/X7E, LD series : DF≤3%<br>Y5V:
<table>
<tr><th>Rated vol.</th><th>D.F.≤</th><th colspan="2">Exception of D.F.≤</th></tr>
<tr><td>≥50V</td><td>≤7.5%</td><td>≤10%</td><td>0603≥0.1μF; 0805≥0.47μF;1206≥4.7μF; TT series & Cap≥1μF</td></tr>
<tr><td>35V</td><td>≤10%</td><td>---</td><td>---</td></tr>
<tr><td rowspan="2">25V</td><td rowspan="2">≤7.5%</td><td>≤10%</td><td>0402≥0.047μF;0603≥0.1μF;0805≥0.33μF;1206≥1μF; 1210≥4.7μF</td></tr>
<tr><td>≤15%</td><td>0402≥0.068μF;0603≥0.47μF;1206≥4.7μF;1210≥22μF; TT series & Cap≥1μF</td></tr>
<tr><td rowspan="2">16V(C<1.0μF)</td><td rowspan="2">≤10%</td><td>≤12.5%</td><td>0402≥0.068μF; 0603≥0.68μF</td></tr>
<tr><td>≤20%</td><td>0402≥0.22μF</td></tr>
<tr><td>16V(C≥1.0μF)</td><td>≤12.5%</td><td>≤20%</td><td>0603≥2.2μF;0805≥3.3μF;1206≥10μF;1210≥22μF;1812≥47μF;TT series & Cap≥1μF</td></tr>
<tr><td>10V</td><td>≤20%</td><td>≤30%</td><td>0402≥0.47μF</td></tr>
<tr><td>6.3V</td><td>≤30%</td><td>---</td><td>---</td></tr>
</table>
*I.R.: ≥10V, 1GΩ or 50 Ω-F whichever is smaller.Class II (X7R, X7E, X5R, Y5V)
<table>
<tr><th>Rated voltage</th><th>Insulation Resistance</th></tr>
<tr><td>100V: X7R</td><td rowspan="7">1GΩ or RxC≥10 Ω-F whichever is smaller.</td></tr>
<tr><td>50V:0603≥1μF;0805≥1μF;1206≥4.7μF;1210≥4.7μF</td></tr>
<tr><td>35V:0805≥2.2μF;1210≥10μF</td></tr>
<tr><td>25V:0402≥1μF;0603≥2.2μF;0805≥2.2μF;1206≥10μF;1210≥10μF</td></tr>
<tr><td>16V:0402≥0.22μF;0603≥1μF;0805≥2.2μF;1206≥10μF;1210≥47μF</td></tr>
<tr><td>10V:0201≥47nF;0402≥0.47μF;0603≥0.47μF;0805≥2.2μF; 1206≥4.7μF;1210≥47μF</td></tr>
<tr><td>6.3V ; 4V ; TT series</td></tr>
</table>
</td>
</tr>
<tr>
<td>16.</td>
<td>ESR</td>
<td>For RF Series only, refer to data sheet.</td>
<td>---</td>
</tr>
</table>

## ■ Constructions

| No. | Name | | NP0/X7R/X7E | NPO/X7R/X5R/Y5V |
|---|---|---|---|---|
| ① | Ceramic material | | BaTiO3 based | |
| ② | Inner electrode | | AgPd alloy | Ni |
| ③ | Termination | Inner layer | Ag | Cu |
| ④ | | Middle layer | Ni | |
| ⑤ | | Outer layer | Sn | |

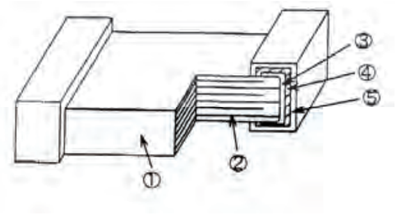



Fig. 1 The construction of MLCC

## ■ Storage and handling conditions

(1)To store products at 5 to 40°C ambient temperature and 20 to 70%. related humidity conditions.

(2)The product is recommended to be used within one year after shipment. Check solderability in case of shelf life extension is needed.

### Cautions:

a. The corrosive gas reacts on the terminal electrodes of capacitors, and results in the poor solderability. Do not store the capacitors in the ambience of corrosive gas (e.g., hydrogen sulfide, sulfur dioxide, chlorine, ammonia gas etc.)

b. In corrosive atmosphere, solderability might be degraded, and silver migration might occur to cause low reliability.

c. Due to the dewing by rapid humidity change, or the photochemical change of the terminal electrode by direct sunlight,the solderability and electrical performance may deteriorate. Do not store capacitors under direct sunlight or dewing condition. To store products on the shelf and avoid exposure to moisture.

## ■ Recommended soldering conditions

The lead-free termination MLCCs are not only to be used on SMT against lead-free solder paste, but also suitable against lead-containing solder paste. If the optimized solder joint is requested, increasing soldering time, temperature and concentration of N2 within oven are recommended.

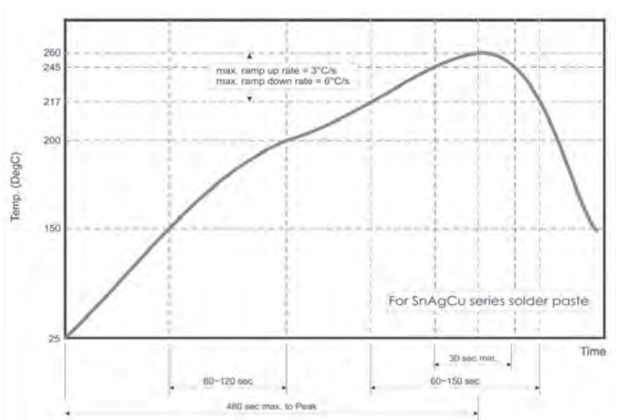



Fig. 2 Recommended reflow soldering profile for SMT process with SnAgCu series solder paste.

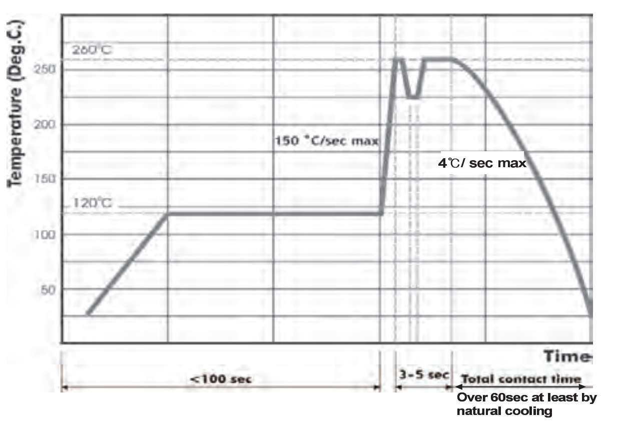



Fig. 3 Recommended wave soldering profile for SMT process with SnAgCu series solder.

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