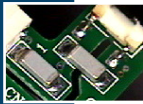
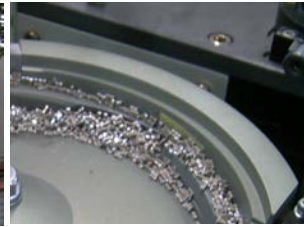


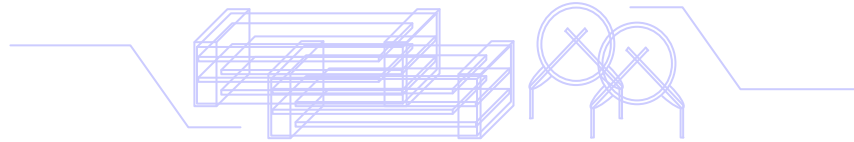


Holy Stone
Enterprise Co., Ltd.

CERAMIC CAPACITOR CATALOG



www.holystone.com.tw
www.holystonecaps.com



▪ Introduction

▪The Company



Holy Stone Enterprise Company Ltd. (Holy Stone) was established in June of 1981 as an agent and distributor of electronic components. In 1994, with technology

and cooperation from a Japanese partner, Holy Stone began manufacturing Multi-layer Ceramic Capacitors. Today, Holy Stone is recognized as an industry leader in application specific ceramic capacitors.

Holy Stone integrates active and passive component distribution with significant manufacturing capabilities. Holy Stone's unique business model combines the service and inventory management strengths of a broad line distributor with the technical knowledge and world class pricing of a manufacturer.

Holy Stone was founded by five engineers in 1981. Since this point Holy Stone has maintained a focus and commitment to providing customers with innovative products and exceptional service. The result of that unwavering commitment is evident in Holy Stone's phenomenal growth. Holy Stone also maintains a high profile on the Taiwan Stock Exchange, ranked in the top 100 companies and the leader among its peers.

▪Manufacturing Facilities

Holy Stone capacitors are produced in two modern factories located in Lungtan and Yilan, Taiwan.



In addition to these factories, the advanced materials research laboratory is located in Japan. The factory operating systems are certified to ISO-9001 and ISO-14001.

▪Sales and Support Locations

Holy Stone administrative Headquarters are located in Taipei, Taiwan. Holy Stone maintains sales and support offices in Kaohsiung, Taiwan, Shenzhen, Suzhou and Shanghai, China.



Holy Stone Enterprise Company Ltd has subsidiary companies in North America and in Europe. "HolyStone International", located in Murrieta, California, U.S.A. is responsible for sales and technical support in the Americas. "HolyStone (Europe) Ltd.", located in Norwich, England is responsible for sales and technical service for Europe. Holy Stone opened its Singapore office to service Southeast Asia. Holy Stone also has a network of independent representatives, Distributors and Agents throughout the world.

▪The Environment

Holy Stone is committed to the cause of achieving and maintaining a healthy environment. Holy Stone is also among the first suppliers of halogen free epoxy coated capacitors. The factory is Certified to ISO-14000 and all standard products are designed and produced conforming to full RoHS compliance.



▪Our Employees

Holy Stone's success is measured by the satisfaction of our customers and share holders. Achieving that satisfaction is the result of the sum contribution of our employees. Those contributions come from all of our employees, whether they are engaged in administrative functions, manufacturing our goods or servicing our customers. Holy Stone strives to maintain a work environment that stimulates creativity, encourages enthusiasm and rewards results.

You should know Holy Stone.

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|  | LCC Series -- Large Size MLCC (1515 to 7565) | For Voltage Multipliers, Power Circuit (DC-DC, Ballast, Snubbe), Surge protection, Industrial Control, ... | 32-33 |
|  | RDC Series -- Radial Dipped Ceramic Capacitors | For Car Electronic, Inverter and Converter, Power Supplier | 34-35 |
|  | HDC Series -- High Voltage Ceramic Disc Capacitors | For xDSL, Power Circuits (Backlight Inverter, Power Supplier, ...) | 36-37 |
|  | HDC Series -- Low Loss/Low DF Ceramic Capacitors | For 1KV to 3KV Application (Power Supplier, Adaptor, ...) | 38-39 |
|  | HDC Series -- Ultra High Voltage Ceramic Capacitors | For 10KV to 20KV Application (Pump, Hybrid Engine, Power Supplier, ...) | 40-43 |
|  | SDC Series -- Safety Ceramic Disc Capacitors | For xDSL, Set Top Box, VOIP, Power Supplier (UL, CSA, EN132400 Class X1/Y2, X1/Y1) | 44-47 |

| Vdc | | 0201 | 0402 | 0603 | 0805 | 1206 | 1210 | 1808 | 1812 | 1825 | 2220 | 2225 |
|------|-----|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| 6.3V | NPO | | | | | | | | | | | |
| | X7R | 100nF | | 2.2uF | 10uF | 22uF | | | | | | |
| | X5R | 470nF | 10uF | 22uF | 47uF | 100uF | 100uF | | | | | |
| 10V | NPO | | | | | | | | | | | |
| | X7R | | 100nF | 2.2uF | 10uF | 22uF | 22uF | | | | | |
| | X5R | | 4.7uF | 10uF | 22uF | 47uF | 47uF | | | | | |
| 16V | NPO | 100pF | | 3.3nF | 10nF | 27nF | 47nF | | 120nF | | | |
| | X7R | 3.9nF | 100nF | 1uF | 10uF | 10uF | 22uF | | | | | |
| | X5R | | 1uF | 4.7uF | 22uF | 22uF | 47uF | | | | | |
| 25V | NPO | 100pF | 470pF | 3.3nF | 10nF | 10nF | 22nF | | 120nF | | | |
| | X7R | 2.2nF | 47nF | 1uF | 4.7uF | 10uF | 22uF | | 10uF | | | |
| | X5R | | 1uF | 2.2uF | 22uF | 22uF | 22uF | | | | | |
| 35V | NPO | | | | | | | | | | | |
| | X7R | | | | 2.2uF | 4.7uF | 10uF | | 4.7uF | | | |
| | X5R | | | | | | | | | | | |
| 50V | NPO | | 470pF | 3.3nF | 10nF | 33nF | 47nF | | 100nF | | | 82nF |
| | X7R | | | 100nF | 2.2uF | 4.7uF | 10uF | | 4.7uF | 4.7uF | 10uF | 10uF |
| | X5R | | | 1uF | 2.2uF | 4.7uF | 10uF | | | | | |
| 100V | NPO | | | 680pF | 3.9nF | 12nF | 10nF | | 100nF | 56nF | 56nF | 68nF |
| | X7R | | | 22nF | 100nF | 1uF | 2.2uF | | 2.2uF | 2.2uF | 4.7uF | 4.7uF |
| | X5R | | | | | | | | | | | |
| 200V | NPO | | | 680pF | 1.2nF | 5.6nF | 10nF | | 18nF | 47nF | 47nF | 56nF |
| | X7R | | | | 47nF | 100nF | 470nF | | 1uF | 1uF | 2.2uF | 2.2uF |
| | X5R | | | | | | | | | | | |
| 250V | NPO | | | 680pF | 1.2nF | 5.6nF | 10nF | | 18nF | 47nF | 47nF | 56nF |
| | X7R | | | | 47nF | 100nF | 470nF | | 1uF | 1uF | 2.2uF | 2.2uF |
| | X5R | | | | | | | | | | | |
| 500V | NPO | | | | 680pF | 5.6nF | 6.8nF | 2.2nF | 8.2nF | 47nF | 39nF | 47nF |
| | X7R | | | | 22nF | 68nF | 100nF | 47nF | 220nF | 270nF | 470nF | 470nF |
| | X5R | | | | | | | | | | | |
| 630V | NPO | | | | | 2.2nF | 6.8nF | 1.8nF | 8.2nF | 27nF | 27nF | 33nF |
| | X7R | | | | | 33nF | | | | | | |
| | X5R | | | | | | | | | | | |
| 1KV | NPO | | | | | 1nF | 2.2nF | 1.2nF | 6.8nF | 12nF | 12nF | 15nF |
| | X7R | | | | 1nF | 10nF | 27nF | 15nF | 68nF | 100nF | 100nF | 100nF |
| | X5R | | | | | | | | | | | |
| 2KV | NPO | | | | | 390pF | | 1nF | 1.5nF | | | |
| | X7R | | | | | 1.8nF | 2.7nF | 3.3nF | 10nF | 18nF | 18nF | 18nF |
| | X5R | | | | | | | | | | | |
| 3KV | NPO | | | | | 39pF | | 1nF | 1.2nF | | | |
| | X7R | | | | | | | 1.8nF | 2.7nF | | | |
| | X5R | | | | | | | | | | | |
| 4KV | NPO | | | | | | | | | | | |
| | X7R | | | | | | | 1nF | | | | |
| | X5R | | | | | | | | | | | |
| 5KV | NPO | | | | | | | 27pF | | | 120pF | |
| | X7R | | | | | | | | | | | |
| | X5R | | | | | | | | | | | |

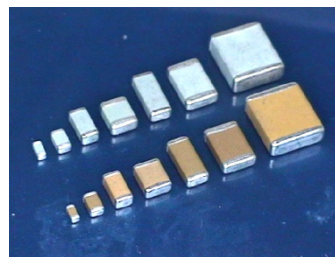
| SMD Capacitors | | | | | | | | |
|----------------|---------|-----|-------------|-------------|-------------|------------|--------------|-----------|
| Vac | | | 1808 | 1812 | 2208 | 2211 | 2220 | 2825 |
| X2/Y3 | 250Vrms | NPO | 2.0pF–1nF | N/A | N/A | N/A | N/A | N/A |
| | 250Vrms | SL | 220pF-1nF | N/A | N/A | N/A | N/A | N/A |
| | 250Vrms | X7R | 150pF–2.2nF | 330pF–4.7nF | N/A | N/A | N/A | N/A |
| X1/Y2 | 250Vrms | NPO | 2.0pF–330pF | 2.0pF-680pF | 2.0pF-330pF | 2.0pF-1nF | 2.0pF-1.2nF | N/A |
| | 250Vrms | X7R | 150pF-1nF | 130pF-1nF | 36pF-1nF | 68pF-2.7nF | 101pF-4.7nF | N/A |
| X2 | 250Vrms | NPO | N/A | N/A | N/A | N/A | N/A | N/A |
| | 250Vrms | X7R | N/A | N/A | N/A | N/A | 150pF – 33nF | 47nF-56nF |
| | 305Vrms | X7R | N/A | N/A | N/A | N/A | 150pF – 33nF | N/A |



◆ All ranges are Lead (Pb) free

Multilayer Ceramic Chip Capacitors

[High Voltage NP0 and X7R Capacitors]



HVC Series

Holy Stone high voltage products are designed and manufactured to meet the general requirements of international standards. The product offering is well suitable for commercial and industrial applications and includes NP0 (C0G), SL, and X7R characteristics in sizes 0603 to 2225 and with working voltages up to 5KV.

◆ Features

- ❑ Special internal electrode design offers the highest voltage rating
- ❑ Surface mount suitable for wave and reflow soldering
- ❑ High reliability
- ❑ RoHS compliant

◆ Applications

- ❑ Suitable for LAN/WLAN interface, Back-Lighting Inverter, DC-DC Converters, Ballast, Modems and Power Supplies.

◆ Summary of Specifications

| | |
|-------------------------|---|
| Operation Temperature | -55 °C ~ +125 °C |
| Rated Voltage | 100Vdc to 5000Vdc |
| Temperature Coefficient | NP0 : $\leq \pm 30$ ppm/ °C , -55 °C ~ +125 °C (EIA Class I) |
| | X7R : $\leq \pm 15\%$, -55 °C ~ +125 °C (EIA Class II) |
| | SL : $\leq +350/-1000$ ppm/ °C , -25 °C ~ +85 °C (EIA Class I) |
| Dissipation Factor | NP0/SL : $Q \geq 1000$, X7R : D.F. $\leq 2.5\%$ |
| Insulation Resistance | 10G Ω or 500/C Ω whichever is smaller |
| Aging | NP0/SL : 0% , X7R : Typically 1.0% per decade of time |
| Dielectric Strength | 100V \leq V < 500V : 200% Rated Voltage |
| | 500V \leq V < 1000V : 150% Rated Voltage |
| | 1000V \leq V : 120% Rated Voltage |

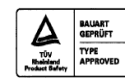
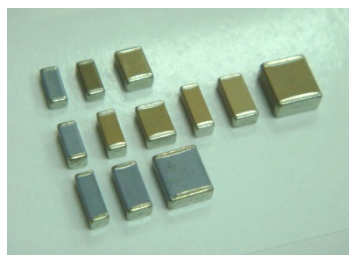
◆ How To Order

C
1206
X
102
K
202
T
E
X

| Product Code | Chip Size | Dielectric | Capacitance Unit : pF | Tolerance | Rated Voltage | Packaging | Thickness (mm) | Special Requirement |
|--|--|--------------------------|--|---|--|------------------------------------|---|--|
| C: MLCC (Multilayer Ceramic Chip of Capacitor) | Ex.: 0603 0805 1206 1210 1808 1812 1825 2220 2225 | Ex.: N: NP0 X: X7R | Ex.: 2R0:2.0pF 100:10 \times 10 ⁰ 471:47 \times 10 ¹ 102:10 \times 10 ² | Ex.: C: +/-0.25pF D: +/-0.50pF J : +/- 5% K : +/-10% M: +/-20% | Ex.: 101: 100Vdc 251: 250Vdc 501: 500Vdc 631: 630Vdc 102: 1000Vdc 202: 2000Vdc 302: 3000Vdc 402: 4000Vdc 502: 5000Vdc | T: T/R 7" R: T/R 13" B: Bulk | Ex: B:0.85 \pm 0.10 E:1.60 \pm 0.20 | Ex.: O: Arc Prevention Coating X: Polymer Termination (Super Term) |

Multilayer Ceramic Chip Capacitors [Safety Capacitors – X2, X2Y3 & X1Y2]

SCC Series Rated up to 305Vac



The SCC series X2, X2/Y3 & X1/Y2 rated at 250Vrms and X2 rated at 305Vrms safety capacitors are designed specifically for use in modem, facsimile, telephone and other electronic equipment. These parts are compliant to EN132400-14, IEC60384-14 and UL60950-1 standards. These capacitors are available in NP0 (C0G) and X7R dielectrics.

◆ Features

- Small size & high capacitance
- Suitable for reflow soldering
- Surface mount
- Safety standard approval by EN 132400-14 and UL 60950-1
- Certified to:
TUV R50005234, R50103496 & UL E229738
TUV R50162550 & UL E229738 for Lead(Pb) free
- RoHS compliant and Lead(Pb) free option

◆ Applications

- The X2, X2/Y3 & X1/Y2 (250Vrms) and X2- (305Vrms) are specially designed for use in Modem, Facsimile, Telephone and other telecommunication equipment, electronic equipment for lighting and surge protection, EMI filtering and Isolation.

◆ Safety Detail of Specifications

| | |
|---|--|
| EN 60384-1 : 2001 EN 60384-14 : 2005 | Meets the electrical requirements and certification for equipment requiring Class X1/Y2 and X2/Y3 devices. |
| IEC 60950-1 : 2005 | Component certified for equipment requiring IEC 60950 compliance |
| IEC 60384: 1999 IEC 60384-14 : 2005 | Component certified for equipment requiring IEC-384 compliance |
| UL 60950-1 : 2007 2nd Edition | TNV/SELV isolation capacitors certified To UL 60950 |

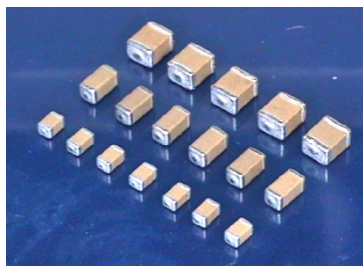
◆ How To Order

SCC 1808 X 102 K 502 T S

| Product Code | Chip Size | Dielectric | Capacitance Unit : pF | Tolerance | Class | Packaging | Special Requirement |
|--|--|-----------------------------------|---|--|--|------------------------------------|--|
| SCC: Safety Approved of MLCC Product | Ex.: 1808 1812 2208 2211 2220 2825 | Ex.: N: NP0 X: X7R S: SL | Ex.: 2R0:2.0pF 100:10×10 ⁰ 471:47×10 ¹ 182:18×10 ² | Ex.: J :+/-5% K :+/-10% M :+/-20% | Ex.: 202: X2 252 :X2 (305Vrms) 302: X2/Y3 502: X1/Y2 602: X1/Y2 for SCC2208N, SCC2211N, SCC2220N | T: T/R 7" R: T/R 13" B: Bulk | Ex.: S: Arc Prevention Coating X: Polymer Termination (Super Term) Z: Arc Prevention Coating & Super Term G: Lead(Pb) Free |

Multilayer Ceramic Chip Capacitors [Trigger Capacitors for Strobe]

TCX Series



The TCX series is specifically designed with a proprietary material for discharge applications such as strobe circuit applications. The unique properties of the X7E material, and the design of the TCX series, make them suitable for any discharge application which requires the capacitor to have a good damping characteristic.

The TCX series is also suitable for applications in which a minimum change in capacitance over temperature (T/C) is desired. The TCX series is offered in sizes 0805, 1206 and 1210 and at 350Vdc and 630Vdc.

◆ Features

- Excellent trigger characteristics
- Low ESR & Low Tan δ
- Excellent DC Bias
- Provide good damping characteristics results in more light
- RoHS compliant

◆ Applications

- Suitable for strobe trigger circuit in digital and electric cameras.

◆ Summary of Specifications

| | |
|-------------------------|---|
| Operation Temperature | -55 °C ~ +125 °C |
| Rated Voltage | 350Vdc and 630Vdc |
| Temperature Coefficient | X7E : $\leq \pm 4.7\%$, -55 °C ~ +125 °C (EIA Class II) |
| Capacitance Range | 1.0nF to 100nF |
| Dissipation Factor | 1.0% max. at 1KHz 25 °C |
| Insulation Resistance | 10G Ω or 500/C Ω whichever is smaller (C in Farads) |
| Dielectric Strength | 350Vdc : 200% Rated Voltage |
| | 630Vdc : 150% Rated Voltage |
| Capacitance Tolerance | $\pm 5\%$, $\pm 10\%$, $\pm 20\%$ |
| Aging | 1.0% per decade hr., typical |

◆ How To Order

TCX

1206

C

223

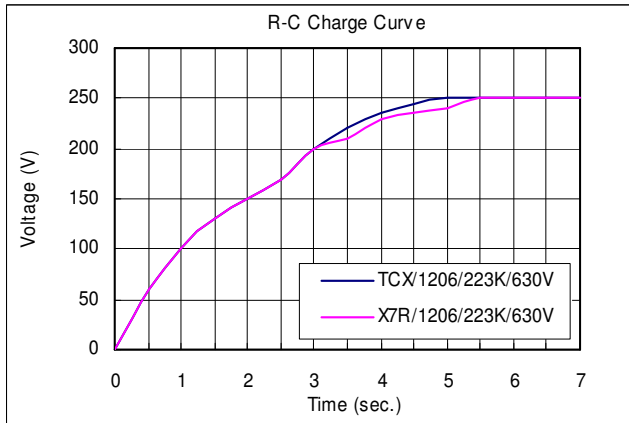
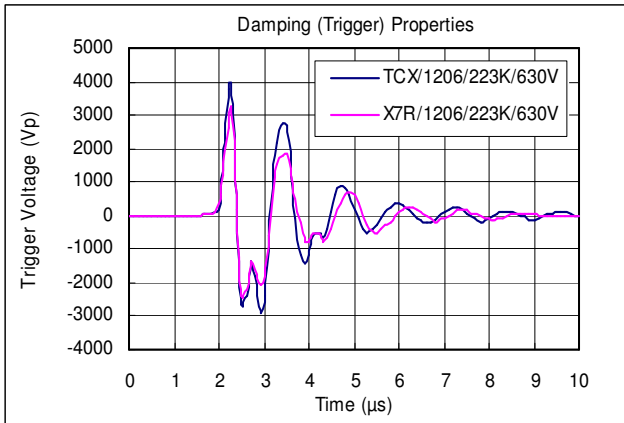
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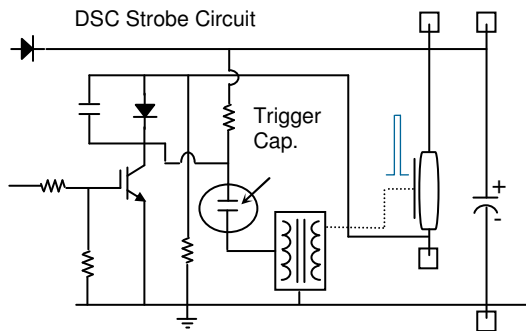
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| Product Code | Chip Size | Dielectric | Capacitance Unit : pF | Tolerance | Rated Voltage | Packaging |
|------------------------------|------------------------------|------------|--|--|--------------------------------------|------------------------------------|
| TCX: Trigger Capacitor | Ex.: 0805 1206 1210 | C: X7E | Ex.: 102 : 10 \times 10 ² 473 : 47 \times 10 ³ | Ex.: J : +/- 5% K : +/- 10% M : +/- 20% | Ex.: 351 : 350Vdc 631 : 630Vdc | T: T&R 7" R: T&R 13" B: Bulk |

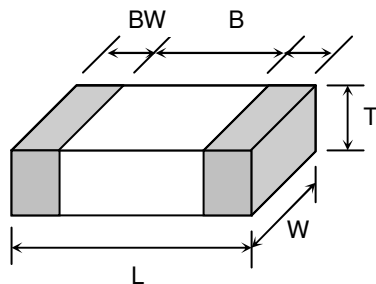
◆ Characteristics



◆ Application Example of Circuit



◆ Dimensions



Unit : mm [inches]

| TYPE | L | W | T (max) | B (min) | BW (min) |
|------|--------------------------|--------------------------|----------------|----------------|----------------|
| 0805 | 2.00±0.20 [.079±.012] | 1.25±0.20 [.049±.008] | 1.45 [.057] | 0.70 [.028] | 0.20 [.008] |
| 1206 | 3.20±0.30 [.126±.012] | 1.60±0.20 [.063±.008] | 1.80 [.071] | 1.50 [.059] | 0.30 [.012] |
| 1210 | 3.20±0.30 [.126±.012] | 2.50±0.20 [.098±.008] | 1.80 [.071] | 1.60 [.063] | 0.30 [.012] |

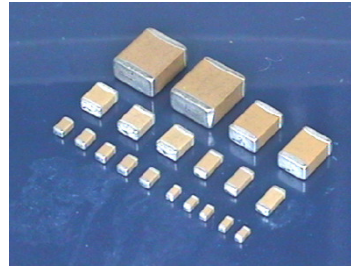
◆ Capacitance Range

| Dielectric Characteristic | Size | Voltage | Capacitance Range | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---------------------------|----------|----------|-------------------|----------|---------|-----------|---------|---------|---------|---------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|--|
| | | | 102 | 122 | 152 | 182 | 222 | 272 | 332 | 392 | 472 | 562 | 682 | 822 | 103 | 123 | 153 | 183 | 223 | 273 | 333 | 393 | 473 | 563 | 683 | 823 | 104 | 154 | 224 | |
| X7E | 0805 | 350V | C | C | C | C | C | C | C | C | C | C | C | C | C | C | C | C | C | D | D | D | D | | | | | | | |
| | | 630V | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 1206 | 350V | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | 630V | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1210 | 350V | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 630V | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Symbol Code | S | O | A | B | C | D | E | F | G | H | | | | | | | | | | | | | | | | | | | | |
| Thickness(mm) | 0.3±0.03 | 0.5±0.05 | 0.6±0.1 | 0.85±0.1 | 1.0±0.1 | 1.25±0.20 | 1.6±0.2 | 2.0±0.2 | 2.4±0.2 | 2.8±0.2 | | | | | | | | | | | | | | | | | | | | |

■ Other dimensions, capacitance values and voltages rating are available. Please contact Holy Stone.

Multilayer Ceramic Chip Capacitors [Low Distortion Capacitors]

LDC Series



Low Distortion Capacitors (NP0/X7R Hybrid)

◆ Features

- Small size & high capacitance
- Ultra stable T/C for a Class II
- Excellent Bias, high temperature stability & low Tan δ
- High breakdown voltage
- Replacement for Film Capacitors
- RoHS compliant

◆ Applications

- Suitable for telecommunication (ADSL, Modem, ...), power (inverter for oscillation circuit) and audio circuit

◆ Summary of Specifications

| | |
|-------------------------|---|
| Operation Temperature | -55 °C ~ +125 °C |
| Rated Voltage | 25Vdc and 50Vdc |
| Temperature Coefficient | X7E : $\leq \pm 4.7\%$, -55 °C ~ +125 °C (EIA Class II) |
| Capacitance Range | 1nF ~ 270nF |
| Dissipation Factor | For 50V : 1.2% max. at 1KHz 25 °C |
| | For 25V : 2.0% max. at 1KHz 25 °C |
| Insulation Resistance | 10G Ω or 500/C Ω whichever is smaller (C in Farads) |
| Dielectric Strength | 250% Rated Voltage for 5 second @ 50mA max. current |
| Capacitance Tolerance | $\pm 5\%$, $\pm 10\%$, $\pm 20\%$ |
| Aging | 1.0% per decade hr., typical |

◆ How To Order

LDC

1206

C

103

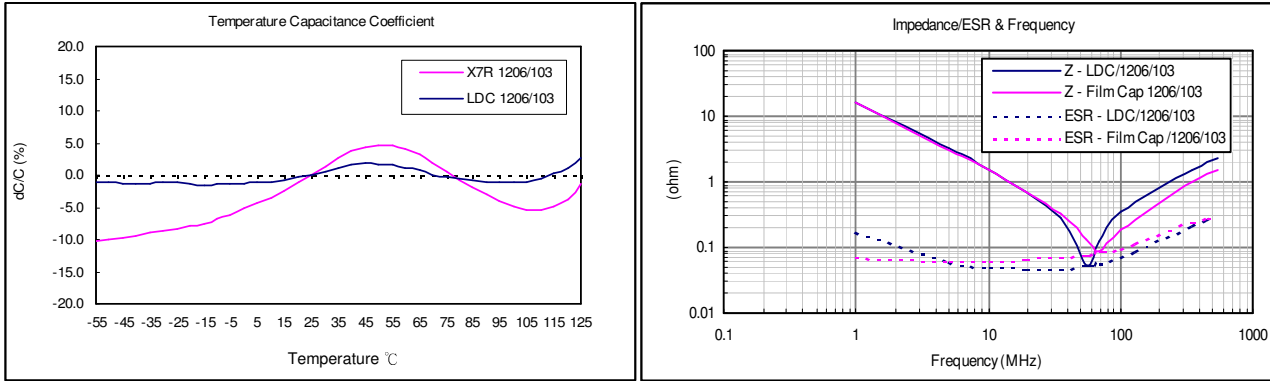
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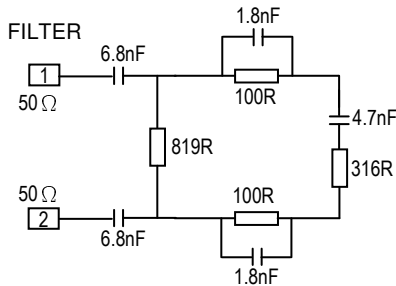
| Product Code | Chip Size | Dielectric | Capacitance Unit : pF | Tolerance | Rated Voltage | Packaging |
|--|--|------------|--|--|------------------------------------|---------------------------------------|
| LDC: Low Distortion Capacitor | Ex.: 0603 0805 1206 1210 1812 2220 | C: X7E | Ex.: 102 : 10 \times 10 ² 224 : 22 \times 10 ⁴ | Ex.: J : +/- 5% K : +/- 10% M : +/- 20% | Ex.: 025 : 25Vdc 050 : 50Vdc | T : T&R 7" R : T&R 13" B : Bulk |

◆ Characteristics

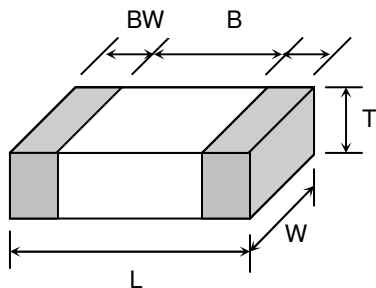


◆ Application

Example of Circuit



◆ Dimensions



Unit : mm [inches]

| TYPE | L | W | T (max) | B (min) | BW (min) |
|------|--------------------------|--------------------------|----------------|----------------|----------------|
| 0603 | 1.60±0.10 [.063±.004] | 0.80±0.10 [.031±.004] | 0.95 [.037] | 0.40 [.016] | 0.15 [.006] |
| 0805 | 2.00±0.20 [.079±.012] | 1.25±0.20 [.049±.008] | 1.45 [.057] | 0.70 [.028] | 0.20 [.008] |
| 1206 | 3.20±0.30 [.126±.012] | 1.60±0.20 [.063±.008] | 1.80 [.071] | 1.50 [.059] | 0.30 [.012] |
| 1210 | 3.20±0.30 [.126±.012] | 2.50±0.20 [.098±.008] | 1.80 [.071] | 1.60 [.063] | 0.30 [.012] |
| 1812 | 4.60±0.30 [.181±.012] | 3.20±0.30 [.126±.012] | 2.20 [.087] | 2.50 [.098] | 0.30 [.012] |
| 2220 | 5.70±0.40 [.220±.016] | 5.00±0.40 [.197±.016] | 2.20 [.087] | 3.50 [.137] | 0.30 [.012] |

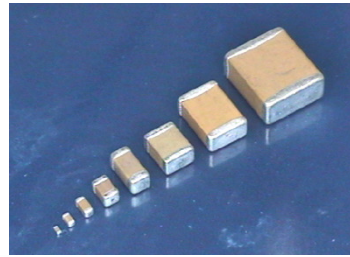
◆ Capacitance Range

| Dielectric Characteristic | Size | Rated Voltage | Capacitance Range | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---------------------------|------|---------------|-------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|--|--|
| | | | 102 | 122 | 152 | 182 | 222 | 272 | 332 | 392 | 472 | 562 | 682 | 822 | 103 | 123 | 153 | 183 | 223 | 273 | 333 | 393 | 473 | 563 | 683 | 823 | 104 | 154 | 224 | 274 | | |
| X7E | 0603 | 50V | B | B | B | B | B | B | B | B | B | B | B | B | B | B | B | B | B | B | | | | | | | | | | | | |
| | 0805 | 50V | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 1206 | 25V | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | 50V | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 1210 | 50V | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 1812 | 50V | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 2220 | 50V | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Symbol Code | S | O | A | B | C | D | E | F | G | H |
|---------------|----------|----------|---------|----------|---------|-----------|---------|---------|---------|---------|
| Thickness(mm) | 0.3±0.03 | 0.5±0.05 | 0.6±0.1 | 0.85±0.1 | 1.0±0.1 | 1.25±0.20 | 1.6±0.2 | 2.0±0.2 | 2.4±0.2 | 2.8±0.2 |

■ Other dimensions, capacitance values and voltages rating are available. Please contact Holy Stone.

Multilayer Ceramic Chip Capacitors [Normal Chip Capacitors – NP0,X7R,X5R,Y5V] NCC Series



Standard Multilayer Ceramic Chip Capacitors are available in a full range of sizes and temperature coefficients, with voltage ratings from 6.3V to 50V.

◆ Features

- Surface mount suitable for wave and reflow soldering
- Small size and high reliability
- Excellent in high frequency characteristics
- RoHS compliant

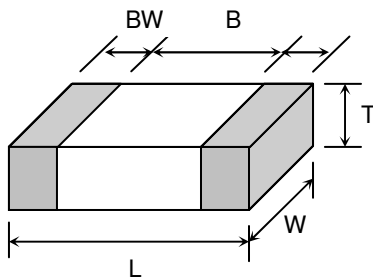
◆ Applications

- Suitable for general electronics circuit, telecommunication, personal computers and peripheral, power circuit, mobile application & etc

◆ Summary of Specifications

| | |
|-------------------------|--|
| Operation Temperature | NP0 & X7R : -55 °C ~ +125 °C , X5R : -55 °C ~ +85 °C , Y5V : -30 °C ~ +85 °C |
| Rated Voltage | 6.3Vdc to 50Vdc |
| Temperature Coefficient | NP0 : $\leq \pm 30\text{ppm}/^\circ\text{C}$, -55 °C ~ +125 °C (EIA Class I) |
| | X7R : $\leq \pm 15\%$, -55 °C ~ +125 °C (EIA Class II) |
| | X5R : $\leq \pm 15\%$, -55 °C ~ +85 °C (EIA Class II) |
| | Y5V: +22%/-82% , -30 °C ~ +85 °C (EIA Class II) |
| Dissipation Factor | NP0 : More than 30pF: $Q \geq 1000$ (0.001) , 30pF and below : $Q \geq 400+20C$ (C=pF) |
| | X7R, X5R and Y5V: Please see HEC specification data sheet |
| Insulation Resistance | 10G Ω or 500/C Ω whichever is smaller (C in Farads) |
| Aging | NP0 : 0% , X7R/X5R : typically 1.0% , Y5V $\leq 7\%$ per decade of time |
| Dielectric Strength | 250% Rated Voltage |

◆ Dimensions



| TYPE | L | W | T (max) | B (min) | BW (min) |
|------|--------------------------|---------------------------|----------------|----------------|----------------|
| 0201 | 0.60±0.03 [.024±.001] | 0.30±0.03 [.011 ±.001] | 0.33 [.013] | 0.20 [.008] | 0.10 [.004] |
| 0402 | 1.00±0.05 [.039±.002] | 0.50±0.05 [.020 ±.002] | 0.55 [.022] | 0.30 [.012] | 0.15 [.006] |
| 0603 | 1.60±0.10 [.063±.004] | 0.80±0.10 [.031 ±.004] | 0.95 [.037] | 0.40 [.016] | 0.15 [.006] |
| 0805 | 2.00±0.20 [.079±.012] | 1.25±0.20 [.049 ±.008] | 1.45 [.057] | 0.70 [.028] | 0.20 [.008] |
| 1206 | 3.20±0.30 [.126±.012] | 1.60±0.20 [.063±.008] | 1.80 [.071] | 1.50 [.059] | 0.30 [.012] |

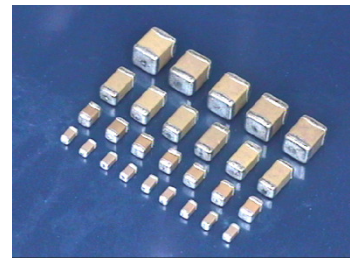
◆ How To Order



| Product Code | Chip Size | Dielectric | Capacitance Unit : pF | Tolerance | Rated Voltage | Packaging |
|--|--|--|--|--|--|------------------------------------|
| C: MLCC (Multilayer Ceramic Chip of Capacitor) | Ex.: 0201 0402 0603 0805 1206 | Ex.: N: NP0 X: X7R B:X5R Y:Y5V | Ex.: 102 : 10×10 ² 473 : 47×10 ³ 104 : 10×10 ⁴ | Ex.: C : +/- 0.25pF D : +/- 0.50pF F : +/- 1% G : +/- 2% J : +/- 5% K : +/- 10% M : +/- 20% Z : +80/-20% | Ex.: 007 : 6.3Vdc 010 : 10Vdc 016 : 16Vdc 025 : 25Vdc 050 : 50Vdc | T: T&R 7" R: T&R 13" B: Bulk |

Multilayer Ceramic Chip Capacitors [High Capacitance MLCC – 1.0uF and above]

HCC Series



◆ Features

- ❑ Surface mount suitable for wave and reflow soldering
- ❑ High reliability
- ❑ Small size and high capacitance value
- ❑ Excellent high frequency characteristics
- ❑ RoHS compliant

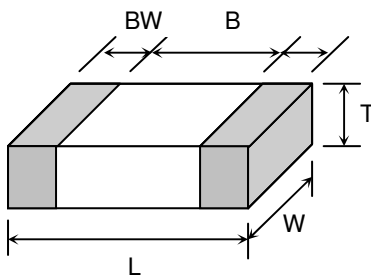
◆ Applications

- ❑ Ideal for smoothing and decoupling circuits
- ❑ Suitable for DC-DC converter, personal computer and peripherals, telecommunication and general electronic equipment

◆ Summary of Specifications

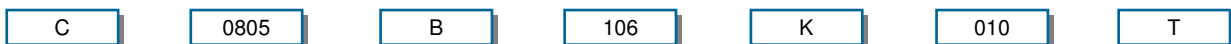
| | |
|-------------------------|--|
| Operation Temperature | NP0 & X7R : -55 °C ~ +125 °C , X6S : -55 °C ~ +105 °C ; X5R : -55 °C ~ +85 °C , Y5V : -30 °C ~ +85 °C |
| Rated Voltage | 4.0Vdc to 50Vdc |
| Temperature Coefficient | X7R : ≤ ± 15% , -55 °C ~ +125 °C (EIA Class II) X6S : ≤ ± 22% , -55 °C ~ +105 °C (EIA Class II) X5R : ≤ ± 15% , -55 °C ~ +85 °C (EIA Class II) Y5V : +22%/-82% , -30 °C ~ +85 °C (EIA Class II) |
| Dissipation Factor | X7R, X5R and Y5V : Please see HEC specification data sheet |
| Insulation Resistance | 10GΩ or 500/CΩ whichever is smaller (C in Farads) |
| Aging | X7R/X6S/X5R : typically 1.0% and Y5V ≤ 7% per decade of time |
| Dielectric Strength | 250% Rated Voltage |

◆ Dimensions



| TYPE | L | W | T (max) | B (min) | BW (min) |
|------|--------------------------|--------------------------|----------------|----------------|----------------|
| 0402 | 1.00±0.05 [.039±.002] | 0.50±0.05 [.020±.002] | 0.55 [.022] | 0.30 [.012] | 0.15 [.006] |
| 0603 | 1.60±0.10 [.063±.004] | 0.80±0.10 [.031±.004] | 0.95 [.037] | 0.40 [.016] | 0.15 [.006] |
| 0805 | 2.00±0.20 [.079±.012] | 1.25±0.20 [.049±.008] | 1.45 [.057] | 0.70 [.028] | 0.20 [.008] |
| 1206 | 3.20±0.30 [.126±.012] | 1.60±0.20 [.126±.012] | 1.80 [.071] | 1.50 [.059] | 0.30 [.012] |
| 1210 | 3.20±0.30 [.126±.012] | 2.50±0.20 [.098±.008] | 2.70 [.105] | 1.60 [.063] | 0.30 [.012] |
| 1812 | 4.60±0.3 [.181±.012] | 3.20±0.3 [.126±.012] | 3.00 [.118] | 2.50 [.098] | 0.30 [.012] |
| 2220 | 5.7±0.40 [.220±.016] | 5.00±0.40 [.197±.016] | 3.00 [.118] | 3.50 [.137] | 0.30 [.012] |

◆ How To Order



| Product Code | Chip Size | Dielectric | Capacitance Unit : pF | Tolerance | Rated Voltage | Packaging |
|--|---|--|--|--|--|------------------------------------|
| C: MLCC (Multilayer Ceramic Chip of Capacitor) | Ex. 0402 0603 0805 1206 1210 1812 2220 | Ex.: X:X7R S:X6S B:X5R Y:Y5V | Ex.: 105:10×10 ⁵ 106:10×10 ⁶ 226:22×10 ⁶ | Ex.: J : +/- 5% K : +/- 10% M : +/- 20% Z : +80/-20% | Ex.: 004: 4Vdc 007: 6.3Vdc 010: 10Vdc 016: 16Vdc 025: 25Vdc 035: 35Vdc 050: 50Vdc | T: T&R 7" R: T&R 13" B: Bulk |

◆ Capacitance Range

| X7R (X) Series | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------------|------|-----|-----|-----|------|-----|-----|-----|-----|------|------|-----|-----|-----|------|-----|-----|-----|------|------|-----|-----|-----|-----|---|
| Size | 0603 | | | | 0805 | | | | | 1206 | | | | | 1210 | | | | 1812 | 2220 | | | | | |
| Code | 6.3V | 10V | 16V | 25V | 6.3V | 10V | 16V | 25V | 35V | 50V | 6.3V | 10V | 16V | 25V | 35V | 50V | 10V | 16V | 25V | 35V | 50V | 25V | 50V | 50V | |
| 105 | B | B | B | B | D | D | D | D | D | D | D | D | D/E | D/E | D/E | D/E | D | D | D | D | D | E | F | F | F |
| 155 | | | | | D | D | D | | | | | | | | | | | | | | | | F | F | F |
| 225 | B | B | | | D | D | D | D | D | D | E | E | E | E | E | E | F | F | F | F | F | F | F | F | |
| 335 | | | | | D | D | | | | | E | E | E | E | | | | | | | | F | F | F | |
| 475 | | | | | D | D | D | D | | | E | E | E | E | E | E | F | F | F | F | F | F | F | F | |
| 106 | | | | | D | D | D | | | | E | E | E | E | | | F | F | F | F | G | G | | G | |
| 226 | | | | | | | | | | | E | E | | | | | G | G | G | | | | | | |

| X6S (S) Series | | | | | | | | | | | | | | | | | | | | | | |
|----------------|------|------|------|-----|-----|------|-----|-----|-----|------|-----|-----|-----|-----|------|-----|-----|-----|-----|-----|---|---|
| Size | 0402 | | 0603 | | | 0805 | | | | 1206 | | | | | 1210 | | | | | | | |
| Code | 6.3V | 6.3V | 10V | 16V | 25V | 6.3V | 10V | 16V | 25V | 6.3V | 10V | 16V | 25V | 35V | 50V | 10V | 16V | 25V | 35V | 50V | | |
| 105 | O | B | B | B | B | | | D | D | | | | | E | E | | | | | E | | |
| 225 | | B | B | | | | D | D | D | | | | | E | E | E | | | | F | F | F |
| 475 | | B | | | | D | D | D | D | E | E | E | E | E | E | | | F | F | F | F | |
| 106 | | | | | | D | D | D | | E | E | E | E | | | F | F | F | F | G | | |
| 226 | | | | | | D | | | | E | E | | | | | G | G | G | | | | |

| X7R (X) Series | | | | | | | | | | | | | | | | | | | | | |
|----------------|------|-----|-----|------|-----|-----|-----|-----|------|-----|-----|-----|-----|------|-----|-----|-----|------|------|--|--|
| Size | 0603 | | | 0805 | | | | | 1206 | | | | | 1210 | | | | 1812 | 2220 | | |
| Code | 6.3V | 10V | 16V | 6.3V | 10V | 16V | 25V | 10V | 16V | 25V | 35V | 50V | 10V | 16V | 25V | 35V | 35V | 35V | | | |
| 105 | B | B | B | D | D | D | | E | E | E | E | | E | E | E | F | F | | | | |
| 155 | | | | | | | | | | | | | | | | F | F | | | | |
| 225 | B | B | B | D | D | D | | E | E | E | | | E | E/F | F | F | F | | | | |
| 335 | | | | D | D | | | E | E | | | | | | | F | F | | | | |
| 475 | | | | D | D | D | | E | E | E | | | E | F | F | | F | | | | |
| 106 | | | | D | | | | E | E | | | | E | E | F | | G | | | | |
| 226 | | | | | | | | | | | | | G | | | | | | | | |

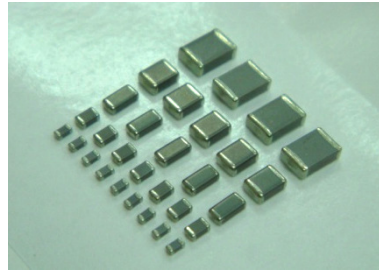
| Y5V (Y) Series | | | | | | | | | | | | | | | | | | | |
|----------------|------|-----|------|-----|-----|------|------|-----|-----|-----|------|-----|-----|------|-----|-----|-----|-----|--|
| Size | 0402 | | 0603 | | | 0805 | | | | | 1206 | | | 1210 | | | | | |
| Code | 6.3V | 10V | 6.3 | 10V | 16V | 25V | 6.3V | 10V | 16V | 25V | 50V | 10V | 16V | 25V | 10V | 16V | 25V | 35V | |
| 105 | O | O | | B | B | B | | | B | B | D | | | | | | | | |
| 225 | | | B | B | B | | D | D | D | | | | | | | | | | |
| 475 | | | B | B | | D | D | D | | | | | | | | | | | |
| 106 | | | | | | D | D | D | | | | D | D/E | E | F | F | F | F | |
| 226 | | | | | | D | D | | | | | D/E | D/E | | F | F | | | |

■ Other dimensions, capacitance values and voltages rating are available. Please contact Holy Stone.

| Symbol Code | S | O | A | B | C | D | E | F | G |
|---------------|----------|----------|---------|----------|---------|-----------|---------|---------|---------|
| Thickness(mm) | 0.3±0.03 | 0.5±0.05 | 0.6±0.1 | 0.85±0.1 | 1.0±0.1 | 1.25±0.20 | 1.6±0.2 | 2.0±0.2 | 2.5±0.2 |

Multilayer Ceramic Chip Capacitors [High Cap. NP0]

HCN Series



Replacement for Film Capacitor

◆ Features

- Small size & high Capacitance
- Suitable for wave and reflow soldering
- Excellent characteristics and tight tolerances
- Excellent Bias, high temperature stability & low Tan δ
- Replace Film Capacitors
- RoHS compliant

◆ Applications

- Suitable for ADSL filter circuits, cable Modem and coupling circuits, general Telecommunication use, power (Inverter for oscillation circuit) and audio circuit

◆ Summary of Specifications

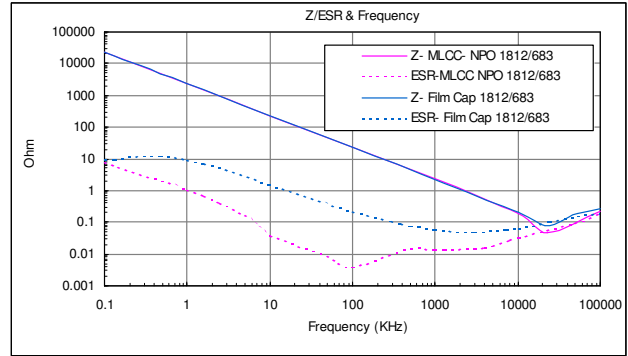
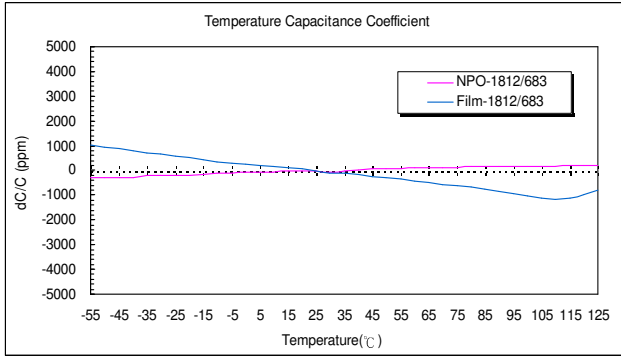
| | |
|-------------------------|--|
| Operation Temperature | -55 °C ~ +125 °C |
| Rated Voltage | 16Vdc to 50Vdc |
| Temperature Coefficient | NP0 : $\leq 30\text{ppm}/^\circ\text{C}$, -55 °C ~ +125 °C (EIA Class I) |
| Capacitance Range | 1nF ~ 120nF |
| Dissipation Factor | $Q \geq 1000$ at 1KHz 20 °C |
| Insulation Resistance | 10G Ω or 500/C Ω whichever is smaller (C in Farad) |
| Dielectric Strength | 250% Rated Voltage for 5 second @ 50mA max. current |
| Aging | 0% per decade hr. |

◆ How To Order

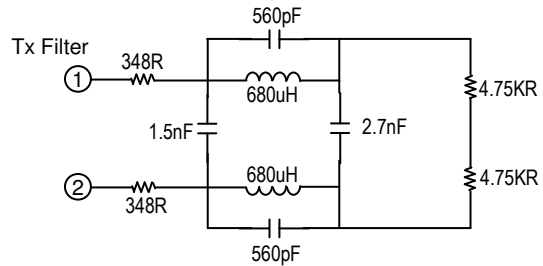
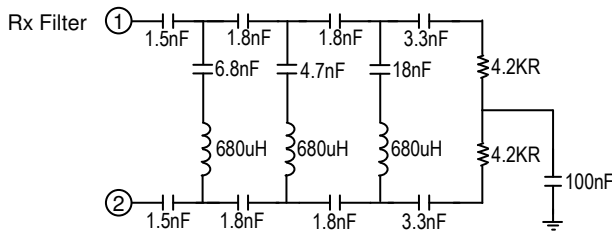
C
1206
N
103
J
025
T

| Product Code | Chip Size | Dielectric | Capacitance Unit : pF | Tolerance | Rated Voltage | Packaging |
|--|--|------------|--|--|---|------------------------------------|
| C: MLCC (Multilayer Ceramic Chip of Capacitor) | Ex.: 0603 0805 1206 1210 1812 | N: NP0 | Ex.: 102 : 10×10^2 103 : 10×10^3 124 : 12×10^4 | Ex.: F : +/- 1% G : +/- 2% J : +/- 5% | Ex.: 016:16Vdc 025:25Vdc 050:50Vdc | T: T&R 7" R: T&R 13" B: Bulk |

◆ Characteristics

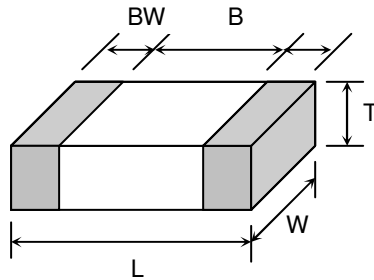


◆ Application Example Circuits



◆ Dimensions

Unit : mm [inches]



| TYPE | L | W | T (max) | B (min) | BW (min) |
|------|--------------------------|---------------------------|----------------|----------------|----------------|
| 0603 | 1.60±0.10 [.063±.004] | 0.80±0.10 [.031±.004] | 0.95 [.037] | 0.40 [.016] | 0.15 [.006] |
| 0805 | 2.00±0.20 [.079±.008] | 1.25±0.20 [.049 ±.008] | 1.45 [.057] | 0.70 [.028] | 0.20 [.008] |
| 1206 | 3.20±0.30 [.126±.012] | 1.60±0.20 [.126±.008] | 1.80 [.071] | 1.50 [.059] | 0.30 [.012] |
| 1210 | 3.20±0.30 [.126±.012] | 2.50±0.20 [.098±.008] | 2.20 [.087] | 1.60 [.063] | 0.30 [.012] |
| 1812 | 4.60±0.30 [.181±.012] | 3.20±0.30 [.126±.012] | 2.20 [.087] | 4.00 [.157] | 0.30 [.012] |

◆ Capacitance Range

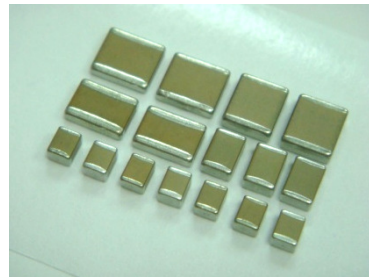
| Dielectric Characteristic | Size | Voltage | Capacitance Range | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---------------------------|------|---------|-------------------|----|----|----|----|----|----|----|----|----|----|----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|---|---|
| | | | 10 | 12 | 15 | 18 | 22 | 27 | 33 | 39 | 47 | 56 | 68 | 82 | 100 | 120 | 150 | 180 | 220 | 270 | 330 | 390 | 470 | 560 | 680 | 820 | 1000 | 1200 | 1500 | 2200 | | |
| NPO | 0603 | 16V | B | B | B | B | B | B | B | | | | | | | | | | | | | | | | | | | | | | | |
| | | 25V | B | B | B | B | B | B | B | | | | | | | | | | | | | | | | | | | | | | | |
| | | 50V | B | B | B | B | B | B | B | | | | | | | | | | | | | | | | | | | | | | | |
| | 0805 | 16V | B | B | B | B | B | B | B | D | D | D | D | D | D | D | D | D | | | | | | | | | | | | | | |
| | | 25V | B | B | B | B | B | B | B | D | D | D | D | D | D | D | D | D | | | | | | | | | | | | | | |
| | | 50V | B | B | B | B | B | B | B | D | D | D | D | D | D | D | D | D | | | | | | | | | | | | | | |
| | 1206 | 16V | B | B | B | B | B | B | B | B | B | B | B | B | B | B | B | B | D | D | D | D | D | D | D | D | D | D | D | D | D | D |
| | | 25V | B | B | B | B | B | B | B | B | B | B | B | B | B | B | B | B | D | D | D | D | D | D | D | D | D | D | D | D | D | D |
| | | 50V | B | B | B | B | B | B | B | B | B | B | B | B | B | B | B | B | D | D | D | D | D | D | D | D | D | D | D | D | D | D |
| | 1210 | 16V | C | C | C | C | C | C | C | C | C | C | C | C | C | C | C | C | C | D | D | D | D | D | D | D | D | D | D | D | D | D |
| | | 25V | C | C | C | C | C | C | C | C | C | C | C | C | C | C | C | C | C | D | D | D | D | D | D | D | D | D | D | D | D | D |
| | | 50V | C | C | C | C | C | C | C | C | C | C | C | C | C | C | C | C | C | D | D | D | D | D | D | D | D | D | D | D | D | D |
| 1812 | 16V | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | |
| | 25V | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | |
| | 50V | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | |

| Symbol Code | S | O | A | B | C | D | E | F |
|---------------|----------|----------|---------|----------|---------|----------|---------|---------|
| Thickness(mm) | 0.3±0.03 | 0.5±0.05 | 0.6±0.1 | 0.85±0.1 | 1.0±0.1 | 1.25±0.2 | 1.6±0.2 | 2.0±0.2 |

■ Other dimensions, capacitance values and voltages rating are available. Please contact Holy Stone.

Multilayer Ceramic Chip Capacitors [High Cap. X7R]

HCX Series



◆ Features

- Rated working voltage of 50Vdc and 100Vdc
- Small size & high capacitance
- Excellent Bias, high temperature stability & low Tan δ
- Low ESR and excellent ripple current characteristics
- RoHS compliant

◆ Applications

- DC-DC Converters (filter)
- Industrial controls
- Power supplies
- Surge protection

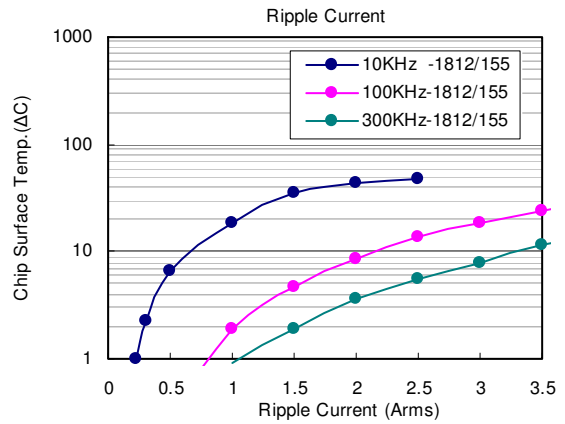
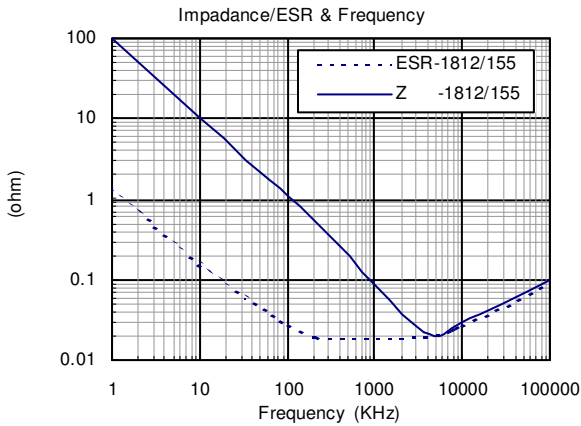
◆ Summary of Specifications

| | |
|-------------------------|--|
| Operation Temperature | -55 °C ~ +125 °C |
| Rated Voltage | 50Vdc to 100Vdc |
| Temperature Coefficient | X7R : $\leq \pm 15\%$ at -55 °C ~ +125 °C (EIA Class II) |
| Capacitance Range | 100nF ~ 10uF |
| Dissipation Factor | 2.5% max. at 1KHz 25 °C |
| Insulation Resistance | 10G Ω or 500/C Ω whichever is smaller (C in Farad) |
| Dielectric Strength | 50V : 250% Rated Voltage for 5 second @ 50mA max. current |
| | 100V : 200% Rated Voltage for 5 second @ 50mA max. current |
| Capacitance Tolerance | $\pm 10\%$, $\pm 20\%$ |
| Aging | 1.0% per decade hr., typical |

◆ How To Order

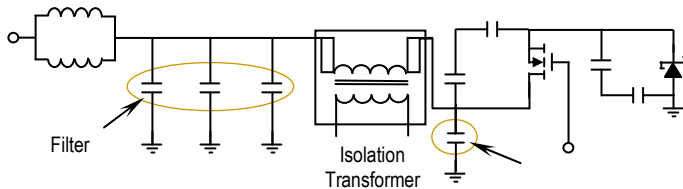
| C | 1210 | X | 225 | K | 101 | T | X |
|--|---|------------|---|------------------------------------|-------------------------------------|------------------------------------|--|
| Product Code | Chip Size | Dielectric | Capacitance Unit : pF | Tolerance | Rated Voltage | Packaging | Special Requirement |
| C: MLCC (Multilayer Ceramic Chip of Capacitor) | Ex.: 1210 1812 1825 2220 2225 | X: X7R | Ex.: 102 : 10×10^2 224 : 22×10^4 105 : 10×10^5 | Ex.: K : +/- 10% M : +/- 20% | Ex.: 050 : 50Vdc 101 : 100Vdc | T: T&R 7" R: T&R 13" B: Bulk | Ex.: O: Arc Prevention Coating X: Cushion Termination (Super Term) |

◆ Characteristics

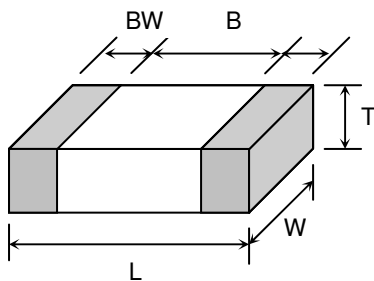


◆ Application Example Circuit

DC-DC Converter



◆ Dimensions



Unit : mm [inches]

| TYPE | L | W | T (max) | B (min) | BW (min) |
|------|--------------------------|--------------------------|----------------|----------------|----------------|
| 1210 | 3.20±0.30 [.126±.012] | 2.50±0.20 [.098±.008] | 2.60 [.102] | 1.60 [.063] | 0.30 [.012] |
| 1812 | 4.60±0.30 [.181±.012] | 3.20±0.30 [.126±.012] | 3.00 [.118] | 2.50 [.098] | 0.30 [.012] |
| 1825 | 4.60±0.30 [.181±.012] | 6.35±0.40 [.250±.016] | 3.00 [.118] | 2.50 [.098] | 0.30 [.012] |
| 2220 | 5.70±0.40 [.220±.016] | 5.00±0.40 [.197±.016] | 3.00 [.118] | 3.50 [.137] | 0.30 [.012] |
| 2225 | 5.70±0.40 [.220±.016] | 6.35±0.40 [.250±.016] | 3.00 [.118] | 3.50 [.137] | 0.30 [.012] |

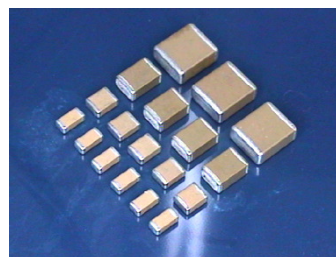
◆ Capacitance Range

| Size | | 1210 | | 1812 | | 1825 | | 2220 | | 2225 | |
|------|-------|------|------|------|------|------|------|------|------|------|------|
| Code | WVDC | 50V | 100V | 50V | 100V | 50V | 100V | 50V | 100V | 50V | 100V |
| 104 | 100nF | ■ | ■ | ■ | ■ | ■ | ■ | | | | |
| 154 | 150nF | ■ | ■ | ■ | ■ | ■ | ■ | | | | |
| 224 | 220nF | ■ | ■ | ■ | ■ | ■ | ■ | | | | |
| 334 | 330nF | ■ | ■ | ■ | ■ | ■ | ■ | | | | |
| 474 | 470nF | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| 564 | 560nF | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| 684 | 680nF | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| 105 | 1uF | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| 155 | 1.5uF | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| 225 | 2.2uF | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| 335 | 3.3uF | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| 475 | 4.7uF | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| 685 | 6.8uF | | | | | | | ■ | ■ | ■ | ■ |
| 106 | 10uF | | | | | | | ■ | ■ | ■ | ■ |

■ Other dimensions, capacitance values and voltages rating are available. Please contact Holy Stone.

Multilayer Ceramic Chip Capacitors [Tip & Ring Capacitors]

SAC Series



Telephone lines use a DC voltage of 48 volts and pass the subscriber's AC signal pulse of 15 to 25Hz, at 70 to 90Vrms.

These MLCC Tip & Ring capacitors replace bulky leaded film capacitors and offer excellent frequency response, low ESR, and improved temperature characteristics. Ideal for telecommunication and modem applications.

◆ Features

- Small size & high capacitance
- Suitable for wave and reflow soldering
- Surface mount
- Low ESR characteristics & improved temperature performance
- RoHS compliant

◆ Summary of Specifications

| | |
|-------------------------|---|
| Operation temperature | X7R : -55 °C ~ +125 °C , Y5U : -30 °C ~ +85 °C |
| Rated Voltage | 250Vdc |
| Temperature Coefficient | Y5U : ≤ +22 / -56 % , -30 °C ~ +85 °C (EIA Class II) |
| | X7R : ≤ ± 15% , -55 °C ~ +125 °C (EIA Class II) |
| Capacitance Range | Y5U : 10nF ~ 1.0uF |
| | X7R : 180pF ~ 2.2uF |
| Dissipation Factor | Y5U : D.F. ≤ 4.0% , X7R : D.F. ≤ 2.5% |
| Insulation Resistance | 10GΩ or 500/CΩ whichever is smaller (C in Farads) |
| Dielectric Strength | 200% Rated Voltage for 5 second @ 50mA max. current |
| Aging | Y5U : 4.0 % , X7R: 1.0 % per decade hr., typical |

◆ How To Order

| C | 1812 | X | 474 | M | 251 | T |
|--|---|-------------------------|---|---------------------------------|-------------------|------------------------------------|
| Product Code | Chip Size | Dielectric | Capacitance Unit : pF | Tolerance | Rated Voltage | Packaging |
| C: MLCC (Multilayer Ceramic Chip of Capacitor) | Ex.: 0805 1206 1210 1812 2220 | Ex.: X : X7R E : Y5U | Ex.: 103 : 10×10 ³ 474 : 47×10 ⁴ | Ex.: K : +/- 10% M : +/- 20% | Ex.: 251 : 250Vdc | T: T&R 7" R: T&R 13" B: Bulk |

Multilayer Ceramic Chip Capacitors [Low-Loss, High Frequency Capacitors]

HBC Series



◆ Features

- Low stable ESR at high frequency
- Ultra stable NP0 performance
- Suitable for solder wave and reflow soldering
- RoHS compliant
- High peak to peak voltage capability

◆ Applications

- High frequency pulse circuits
- Lighting ballast snubber circuits
- DC-DC converters
- High dv/dt rating

◆ Summary of Specifications

| | |
|-------------------------|-------------------------------|
| Operation Temperature | -55 °C ~ +125 °C |
| Rated Voltage | 500Vdc and 630Vdc |
| Temperature Coefficient | ≤ ± 30ppm at -55 °C ~ +125 °C |
| Capacitance Range | 10pF ~ 2700pF |
| Dissipation Factor | 0.1% max. at 1MHz 25°C |
| Insulation Resistance | 10GΩ |
| Dielectric Withstanding | 1.5 × WVDC for 5 sec |
| Capacitance Tolerance | F, G, J, K |
| Ageing | None |
| Piezo Effects | None |
| dv/dt Rating | >6KV/μ second |

◆ How To Order

HBC
1206
N
100
J
501
T

| Product Code | Chip Size | Dielectric | Capacitance Unit : pF | Tolerance | Rated Voltage | Packaging |
|--|----------------------|------------|--|---|--------------------------------------|------------------------------------|
| HBC: Low-Loss High Frequency Capacitor | Ex.: 1206 1210 | N : NP0 | Ex.: 100 : 10×10 ⁰ 101 : 10×10 ¹ 102 : 10×10 ² | Ex.: F : ± 1% G : ± 2% J : ± 5% K : ± 10% | Ex.: 501 : 500Vdc 631 : 630Vdc | T: T&R 7" R: T&R 13" B: Bulk |

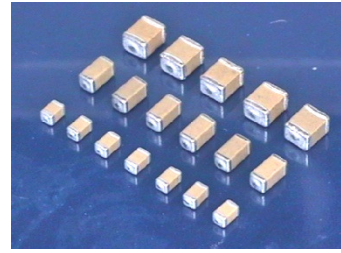
HTC Series - High Temperature Capacitors



Multilayer Ceramic Chip Capacitors
High Temperature Capacitors

HTC Series

[X8R rated to +150°C]



◆ Features

- ❑ Rated voltages from 25Vdc to 250Vdc
- ❑ Stable temperature coefficient of $\pm 15\%$ at high temperature (up to 150 °C)
- ❑ Fully RoHS compliant
- ❑ Available with flexible termination (Super Term) to minimize mechanical / thermal stress effects

◆ Applications

- ❑ Suitable for automotive, oil exploration and other demanding high temperature environments and applications
- ❑ Instrumentation and other equipment circuit operating at high temperatures

◆ Summary of Specifications

| | |
|-------------------------|--|
| Operation Temperature | -55 °C ~ +150 °C |
| Rated Voltage | 25Vdc ~ 250Vdc |
| Temperature Coefficient | $\leq \pm 15\%$, -55 °C ~ +150 °C (EIA Class II) |
| Capacitance Range | 180pF ~ 390pF |
| Dissipation Factor | 2.5 % max. at 1KHz 25 °C |
| Insulation Resistance | 100G Ω or 1000/C Ω whichever is smaller at 25 °C (C in Farads) |
| Dielectric Strength | < 200V : 250% Rated Voltage for 5 second @ 50mA max. current 201~500V : 150% Rated Voltage for 5 second @ 50mA max. current |
| Capacitance Tolerance | $\pm 5\%$, $\pm 10\%$, $\pm 20\%$ |
| Aging | 2.0% per decade hr., typical |

◆ How To Order

HTC
1206
H
103
K
025
T

| Product Code | Chip Size | Dielectric | Capacitance Unit : pF | Tolerance | Rated Voltage | Packaging |
|---|--------------------------------------|------------|--|--|------------------------------------|------------------------------------|
| HTC: Middle High Temperature Capacitor | Ex.: 0603 0805 1206 1210 | H: X8R | Ex.: 102 : 10 \times 10 ² 224 : 22 \times 10 ⁴ | Ex.: J : +/- 5% K : +/- 10% M : +/- 20% | Ex.: 025 : 25Vdc 050 : 50Vdc | T: T&R 7" R: T&R 13" B: Bulk |

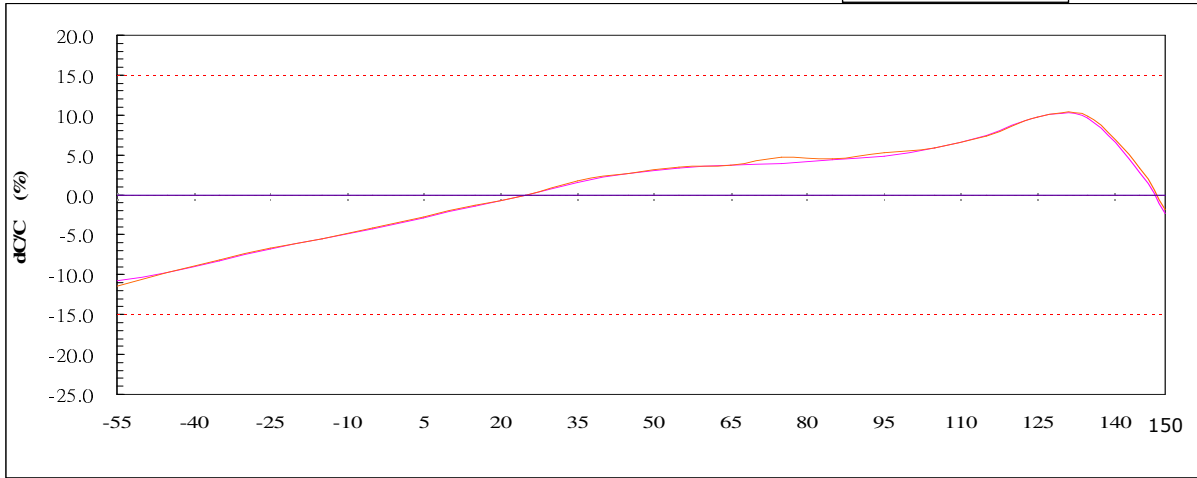


HTC Series - High Temperature Capacitors



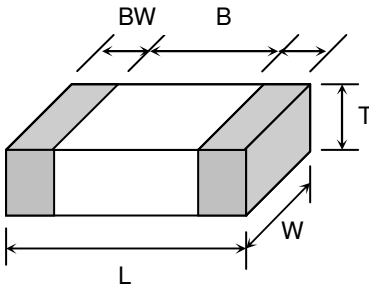
◆ Characteristics

X8R-1206 / 100nF



◆ Dimensions

Unit : mm [inches]



| TYPE | L | W | T (max) | B (min) | BW (min) |
|------|--------------------------|---------------------------|----------------|----------------|----------------|
| 0603 | 1.60±0.10 [.063±.004] | 0.80±0.10 [.031 ±.004] | 0.95 [.037] | 0.40 [.016] | 0.15 [.006] |
| 0805 | 2.00±0.20 [.079±.008] | 1.25±0.20 [.049 ±.008] | 1.45 [.057] | 0.70 [.028] | 0.20 [.008] |
| 1206 | 3.20±0.30 [.126±.012] | 1.60±0.20 [.063±.008] | 1.80 [.071] | 1.50 [.059] | 0.30 [.012] |
| 1210 | 3.20±0.30 [.126±.012] | 2.50±0.20 [.098±.008] | 1.80 [.071] | 1.60 [.063] | 0.30 [.012] |

◆ Capacitance Range

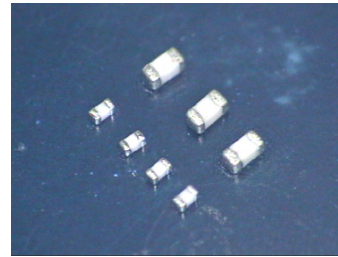
| Temperature Characteristic | Size | Rated Voltage | Capacitance Range | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------------------------|------|---------------|-------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| | | | 181 | 221 | 271 | 331 | 391 | 471 | 561 | 681 | 102 | 122 | 152 | 182 | 222 | 272 | 332 | 392 | 472 | 562 | 682 | 103 | 123 | 153 | 183 | 223 | 273 | 333 | 393 | 473 | 563 | 683 | 104 | 124 | 154 | 184 | 224 | 274 | 334 | 394 | 474 | 564 | 684 | 105 | 155 | 225 |
| X8R | 0603 | 25V | 181 | 221 | 271 | 331 | 391 | 471 | 561 | 681 | 102 | 122 | 152 | 182 | 222 | 272 | 332 | 392 | 472 | 562 | 682 | 103 | 123 | 153 | 183 | 223 | 273 | 333 | 393 | 473 | 563 | 683 | 104 | 124 | 154 | 184 | 224 | 274 | 334 | 394 | 474 | 564 | 684 | 105 | 155 | 225 |
| | | 50V | 181 | 221 | 271 | 331 | 391 | 471 | 561 | 681 | 102 | 122 | 152 | 182 | 222 | 272 | 332 | 392 | 472 | 562 | 682 | 103 | 123 | 153 | 183 | 223 | 273 | 333 | 393 | 473 | 563 | 683 | 104 | 124 | 154 | 184 | 224 | 274 | 334 | 394 | 474 | 564 | 684 | 105 | 155 | 225 |
| | 0805 | 25V | 181 | 221 | 271 | 331 | 391 | 471 | 561 | 681 | 102 | 122 | 152 | 182 | 222 | 272 | 332 | 392 | 472 | 562 | 682 | 103 | 123 | 153 | 183 | 223 | 273 | 333 | 393 | 473 | 563 | 683 | 104 | 124 | 154 | 184 | 224 | 274 | 334 | 394 | 474 | 564 | 684 | 105 | 155 | 225 |
| | | 50V | 181 | 221 | 271 | 331 | 391 | 471 | 561 | 681 | 102 | 122 | 152 | 182 | 222 | 272 | 332 | 392 | 472 | 562 | 682 | 103 | 123 | 153 | 183 | 223 | 273 | 333 | 393 | 473 | 563 | 683 | 104 | 124 | 154 | 184 | 224 | 274 | 334 | 394 | 474 | 564 | 684 | 105 | 155 | 225 |
| | | 100V | 181 | 221 | 271 | 331 | 391 | 471 | 561 | 681 | 102 | 122 | 152 | 182 | 222 | 272 | 332 | 392 | 472 | 562 | 682 | 103 | 123 | 153 | 183 | 223 | 273 | 333 | 393 | 473 | 563 | 683 | 104 | 124 | 154 | 184 | 224 | 274 | 334 | 394 | 474 | 564 | 684 | 105 | 155 | 225 |
| | | 250V | 181 | 221 | 271 | 331 | 391 | 471 | 561 | 681 | 102 | 122 | 152 | 182 | 222 | 272 | 332 | 392 | 472 | 562 | 682 | 103 | 123 | 153 | 183 | 223 | 273 | 333 | 393 | 473 | 563 | 683 | 104 | 124 | 154 | 184 | 224 | 274 | 334 | 394 | 474 | 564 | 684 | 105 | 155 | 225 |
| | 1206 | 25V | 181 | 221 | 271 | 331 | 391 | 471 | 561 | 681 | 102 | 122 | 152 | 182 | 222 | 272 | 332 | 392 | 472 | 562 | 682 | 103 | 123 | 153 | 183 | 223 | 273 | 333 | 393 | 473 | 563 | 683 | 104 | 124 | 154 | 184 | 224 | 274 | 334 | 394 | 474 | 564 | 684 | 105 | 155 | 225 |
| | | 50V | 181 | 221 | 271 | 331 | 391 | 471 | 561 | 681 | 102 | 122 | 152 | 182 | 222 | 272 | 332 | 392 | 472 | 562 | 682 | 103 | 123 | 153 | 183 | 223 | 273 | 333 | 393 | 473 | 563 | 683 | 104 | 124 | 154 | 184 | 224 | 274 | 334 | 394 | 474 | 564 | 684 | 105 | 155 | 225 |
| | | 100V | 181 | 221 | 271 | 331 | 391 | 471 | 561 | 681 | 102 | 122 | 152 | 182 | 222 | 272 | 332 | 392 | 472 | 562 | 682 | 103 | 123 | 153 | 183 | 223 | 273 | 333 | 393 | 473 | 563 | 683 | 104 | 124 | 154 | 184 | 224 | 274 | 334 | 394 | 474 | 564 | 684 | 105 | 155 | 225 |
| | | 250V | 181 | 221 | 271 | 331 | 391 | 471 | 561 | 681 | 102 | 122 | 152 | 182 | 222 | 272 | 332 | 392 | 472 | 562 | 682 | 103 | 123 | 153 | 183 | 223 | 273 | 333 | 393 | 473 | 563 | 683 | 104 | 124 | 154 | 184 | 224 | 274 | 334 | 394 | 474 | 564 | 684 | 105 | 155 | 225 |
| | 1210 | 25V | 181 | 221 | 271 | 331 | 391 | 471 | 561 | 681 | 102 | 122 | 152 | 182 | 222 | 272 | 332 | 392 | 472 | 562 | 682 | 103 | 123 | 153 | 183 | 223 | 273 | 333 | 393 | 473 | 563 | 683 | 104 | 124 | 154 | 184 | 224 | 274 | 334 | 394 | 474 | 564 | 684 | 105 | 155 | 225 |
| | | 50V | 181 | 221 | 271 | 331 | 391 | 471 | 561 | 681 | 102 | 122 | 152 | 182 | 222 | 272 | 332 | 392 | 472 | 562 | 682 | 103 | 123 | 153 | 183 | 223 | 273 | 333 | 393 | 473 | 563 | 683 | 104 | 124 | 154 | 184 | 224 | 274 | 334 | 394 | 474 | 564 | 684 | 105 | 155 | 225 |
| | | 100V | 181 | 221 | 271 | 331 | 391 | 471 | 561 | 681 | 102 | 122 | 152 | 182 | 222 | 272 | 332 | 392 | 472 | 562 | 682 | 103 | 123 | 153 | 183 | 223 | 273 | 333 | 393 | 473 | 563 | 683 | 104 | 124 | 154 | 184 | 224 | 274 | 334 | 394 | 474 | 564 | 684 | 105 | 155 | 225 |
| | | 250V | 181 | 221 | 271 | 331 | 391 | 471 | 561 | 681 | 102 | 122 | 152 | 182 | 222 | 272 | 332 | 392 | 472 | 562 | 682 | 103 | 123 | 153 | 183 | 223 | 273 | 333 | 393 | 473 | 563 | 683 | 104 | 124 | 154 | 184 | 224 | 274 | 334 | 394 | 474 | 564 | 684 | 105 | 155 | 225 |

■ Other dimensions, capacitance values and voltages rating are available. Please contact Holy Stone.



Multilayer Ceramic Chip Capacitors [Radio Frequency Capacitors]

RFC Series



◆ Features

- High Q value & Low ESR at high frequency
- Ultra stable NP0 performance
- Ultra miniature size 0603 to 1111
- Low capacitance with tight tolerance
- RoHS compliant

◆ Applications

- Radio frequency
 - Impedance matching circuit
 - Resonant circuit
 - Coupling circuit
 - ◆ RF Modules, VCO, BPF, DUP, PA, etc.
 - ◆ Cellular Phone, Bluetooth, Wireless LAN, etc.

◆ Summary of Specifications

| | |
|-------------------------|---|
| Operation Temperature | -55 °C ~ +125 °C |
| Rated Voltage | 25Vdc to 500Vdc |
| Temperature Coefficient | ≤ ± 30ppm/ °C , -55~+125 °C (EIA Class I) |
| Capacitance Range | 0.1pF ~ 1000pF |
| Q Value | ≥ 1000 at 1MHz & ≥ 500. at 1GHz / 1pF |
| Insulation Resistance | 10GΩ |
| Dielectric Withstanding | V ≤ 50V : 300% Rated Voltage for 5 second @50mA max. current |
| | 100 ≤ V < 500V : 200% Rated Voltage for 5 second @50mA max. current |
| | V ≥ 500V : 150% Rated Voltage for 5 second @50mA max. current |
| Aging | 0% per decade of time, typical |

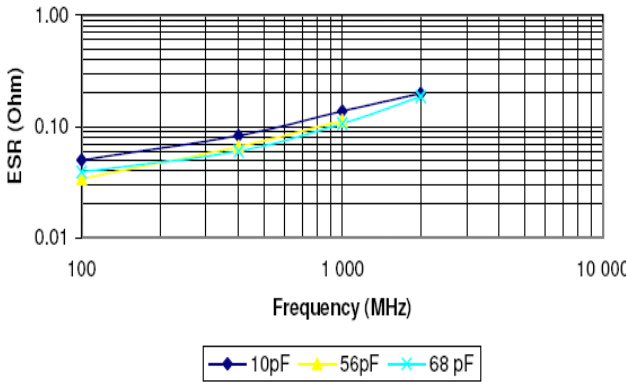
◆ How To Order

RFC
0505
G
100
J
101
T

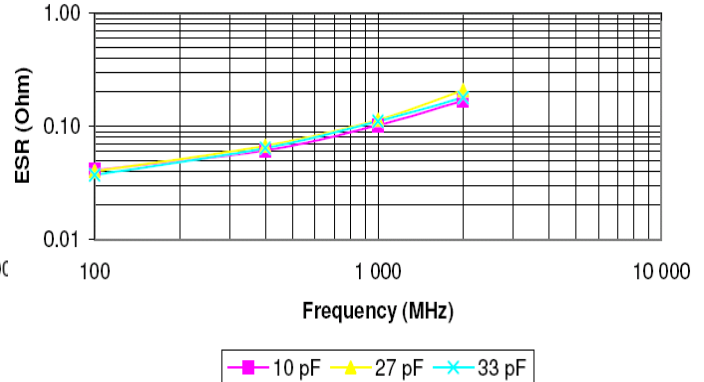
| Product Code | Chip Size | Dielectric | Capacitance Unit : pF | Tolerance | Rated Voltage | Packaging |
|---------------------------------------|--|------------|--|---|--------------------------------------|------------------------------------|
| RFC: Radio Frequency of MLCC | Ex.: 0603 0505 0805 1206 1210 1111 | G: C0G | Ex.: R10 : 0.1pF 5R0 : 5.0pF 120 : 12×10 ⁰ 102 : 10×10 ² | Ex.: L : ±0.050pF A : ±0.075pF B : ±0.10pF C : ±0.25pF J : ±5.0% | Ex.: 251 : 250Vdc 501 : 500Vdc | T: T&R 7" R: T&R 13" B: Bulk |

◆ Characteristics

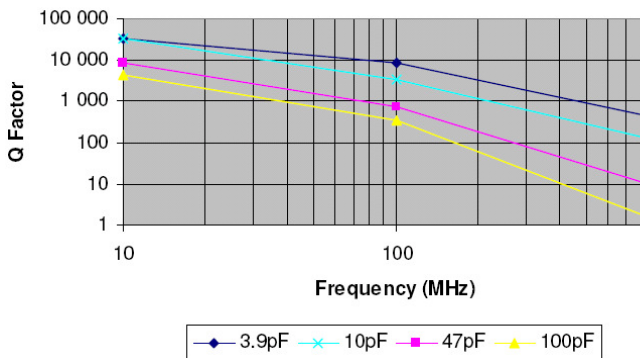
0505-ESR vs Frequency



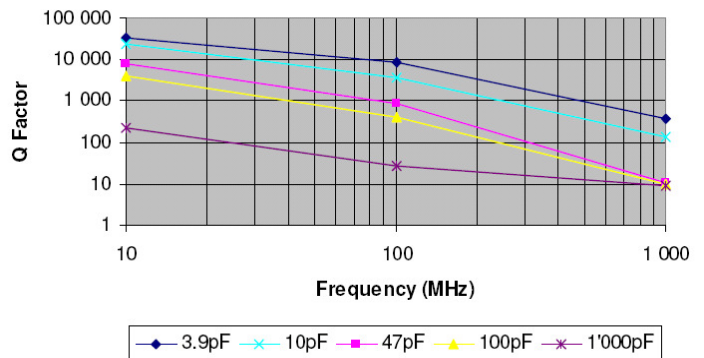
1111-ESR vs Frequency



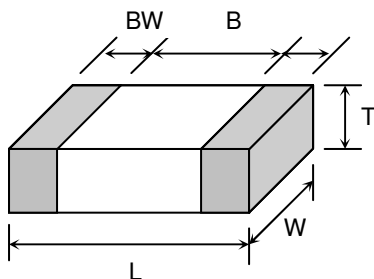
0505-Q Factor vs Frequency



1111-Q Factor vs Frequency



◆ Dimensions



Unit : mm [inches]

| TYPE | L | W | T (max) | B (min) | BW (min) |
|------|--------------------------|---------------------------|----------------|----------------|----------------|
| 0603 | 1.60±0.10 [.063±.004] | 0.80±0.10 [.031 ±.004] | 0.95 [.037] | 0.40 [.016] | 0.15 [.006] |
| 0505 | 1.40±0.25 [.055±.010] | 1.40±0.25 [.055±.010] | 1.40 [.055] | 0.35 [.014] | 0.20 [.008] |
| 0805 | 2.00±0.20 [.079±.008] | 1.25±0.20 [.049 ±.008] | 1.45 [.057] | 0.70 [.028] | 0.20 [.008] |
| 1206 | 3.20±0.30 [.126±.012] | 1.60±0.20 [.063 ±.008] | 1.80 [.071] | 1.50 [.059] | 0.30 [.012] |
| 1210 | 3.20±0.30 [.126±.012] | 2.50±0.20 [.098 ±.008] | 2.60 [.102] | 1.60 [.063] | 0.30 [.012] |
| 1111 | 2.80±0.40 [.110±.016] | 2.80±0.40 [.110±.016] | 2.60 [.102] | 1.40 [.055] | 0.30 [.012] |

Multilayer Ceramic Chip Capacitors [Large Size Ceramic Chip Capacitors] LCC Series



◆ Features

- Optimized internal designs offers the highest voltage rating (up to 8KVdc)
- Capacitance range from 470pF to 33uF and sizes from 1515 to 7565
- Available with proprietary surface coating for arc prevention
- Available with flexible termination (Super Term) to minimize the effects of mechanical stress
- High reliability screening is available
- Pd/Ag, 100% Sn and optional 90/10 Sn/Pb termination
- RoHS compliant

◆ Applications

- Voltage Multipliers
- Power Supplies
- DC-DC Converters
- Surge protection
- Industrial control circuits
- Isolation
- Ballast
- Snubber
- Custom applications

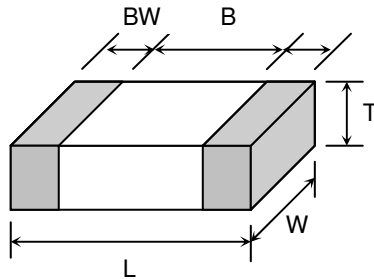
◆ Summary of Specifications

| | |
|-------------------------|---|
| Operation Temperature | -55 °C ~ +125 °C |
| Rated Voltage | 50Vdc to 8KVdc |
| Temperature Coefficient | NP0 : $\leq \pm 30\text{ppm}/^\circ\text{C}$, -55~+125 °C (EIA Class I) |
| | X7R : $\leq \pm 15\%$, -55~+125 °C (EIA Class II) |
| Capacitance Range | NP0 : 100pF to 820nF , X7R : 1000pF to 33uF |
| Dissipation Factor | NP0 : $Q \geq 1000$, X7R : D.F. $\leq 2.5\%$ |
| Insulation Resistance | 10GΩ or 500/CΩ whichever is smaller (C in Farad) |
| Aging | NP0 : 0% , X7R : 2.5 % per decade of time |
| Dielectric Strength | $V \leq 500\text{V}$: 200% Rated Voltage |
| | $500\text{V} \leq V < 1000\text{V}$: 150% Rated Voltage |
| | $V \geq 1000\text{V}$: 120% Rated Voltage |

◆ How To Order

| C | 2520 | X | 103 | K | 102 | T | N | S | X |
|--|--|----------------------------|--|--|--|---|--|---|---|
| Product Code | Chip Size | Dielectric | Capacitance Unit : pF | Tolerance | Rated Voltage | Packaging | Termination | Testing Requirement | Special Requirement |
| C: MLCC (Multilayer Ceramic Chip of Capacitor) | EX.: 1515 2520 3530 3640 4540 5550 6560 7565 | Ex.: N : NP0 X : X7R | Ex.: 100 : 10×10 ⁰ 471 : 47×10 ¹ 102 : 10×10 ² | Ex.: C : +/-0.25pF D : +/-0.50pF J : +/- 5% K : +/-10% M : +/-20% | Ex.: 050:50Vdc 251:250Vdc 631:630Vdc 102:1000Vdc | Ex.: T : T&R W : Waffle B : Bulk | Ex.: S:Solderable Ag P:Pd/Ag N:100% Sn Plated W:90/10 Sn/Pb Plated | Ex.: S: Standard Electrical H: Hi-Reliability | Ex.: Blank: Standard O: Arc Prevention Coating X: Cushion Termination (Super Term) |

◆ Dimensions



Unit : mm [inches]

| TYPE | L | W | T (max) | B (min) | BW (min) |
|------|-------------------------|-------------------------|----------------|-----------------|----------------|
| 1515 | 3.80±0.50 [.15±.020] | 3.80±0.50 [.15±.020] | 3.20 [.126] | 1.60 [.059] | 0.30 [.012] |
| 2520 | 6.35±0.50 [.25±.020] | 5.00±0.50 [.20±.020] | 3.20 [.126] | 4.00 [.157] | 0.30 [.012] |
| 3530 | 8.90±0.50 [.35±.020] | 7.60±0.50 [.30±.020] | 5.00 [.200] | 5.50 [.217] | 0.30 [.012] |
| 3640 | 9.20±0.50 [.36±.020] | 10.2±0.50 [.40±.020] | 5.00 [.200] | 6.00 [.236] | 0.30 [.012] |
| 4540 | 11.5±0.50 [.45±.020] | 10.2±0.50 [.40±.020] | 5.00 [.200] | 7.50 [.295] | 0.30 [.012] |
| 5550 | 14.0±0.50 [.55±.020] | 12.7±0.50 [.50±.020] | 5.00 [.200] | 9.00 [.354] | 0.30 [.012] |
| 6560 | 16.5±0.50 [.65±.020] | 15.3±0.50 [.60±.020] | 5.00 [.200] | 11.50 [.453] | 0.30 [.012] |
| 7565 | 19.0±0.50 [.75±.020] | 16.5±0.50 [.65±.020] | 5.00 [.200] | 14.00 [.551] | 0.30 [.012] |

◆ Capacitance Range

| Size | Dielectric | Capacitance (pF) maximum | | | | | | | | | |
|------|------------|--------------------------|------|------|------|-----|-----|-----|-----|-----|-----|
| | | 50V | 100V | 200V | 500V | 1KV | 2KV | 3KV | 4KV | 5KV | 8KV |
| 1515 | NPO | 473 | 393 | 363 | 103 | 222 | 821 | -- | -- | -- | -- |
| | X7R | 225 | 105 | 474 | 124 | 473 | 682 | -- | -- | -- | -- |
| 1825 | NPO | 563 | 473 | 393 | 393 | 103 | 222 | 222 | -- | -- | -- |
| | X7R | -- | -- | -- | 124 | 104 | 103 | 682 | -- | -- | -- |
| 2220 | NPO | 563 | 473 | 393 | 363 | 103 | 392 | 222 | 102 | 471 | -- |
| | X7R | -- | -- | -- | 474 | 104 | 103 | 472 | 222 | 182 | -- |
| 2225 | NPO | 104 | 823 | 563 | 473 | 153 | 472 | 332 | 222 | 561 | -- |
| | X7R | -- | -- | -- | 334 | 104 | 103 | 103 | 222 | 222 | -- |
| 2520 | NPO | 823 | 683 | 563 | 473 | 103 | 392 | 222 | 102 | 471 | -- |
| | X7R | 475 | 225 | 474 | 224 | 473 | 153 | 472 | 222 | 102 | -- |
| 3530 | NPO | 224 | 184 | 104 | 823 | 473 | 103 | 472 | 332 | 102 | 251 |
| | X7R | 106 | 475 | 225 | 474 | 224 | 473 | 153 | 562 | 222 | 102 |
| 3640 | NPO | 224 | 184 | 104 | 823 | 473 | 123 | 562 | 362 | 122 | 561 |
| | X7R | 126 | 565 | 225 | 564 | 274 | 683 | 223 | 153 | 103 | 122 |
| 4540 | NPO | 274 | 224 | 124 | 823 | 563 | 223 | 103 | 472 | 152 | 621 |
| | X7R | 156 | 685 | 225 | 105 | 334 | 104 | 683 | 273 | 223 | 152 |
| 5550 | NPO | 334 | 274 | 154 | 104 | 683 | 333 | 223 | 562 | 182 | 681 |
| | X7R | 186 | 825 | 275 | 125 | 364 | 124 | 823 | 333 | 273 | 182 |
| 6560 | NPO | 684 | 564 | 474 | 334 | 333 | 273 | 103 | 682 | 332 | 821 |
| | X7R | 226 | 186 | 106 | 475 | 105 | 334 | 224 | 104 | 473 | 222 |
| 7565 | NPO | 824 | 684 | 564 | 474 | 473 | 333 | 223 | 103 | 472 | 102 |
| | X7R | 336 | 226 | 186 | 106 | 225 | 364 | 274 | 124 | 563 | 272 |

- All values are capacitance EIA codes.
- Other dimensions, capacitance values and voltages rating are available. Please contact Holy Stone.

*Soldering And Handling Precautions:

Large ceramic capacitors are more prone to thermal and mechanical cracks. To minimize mechanical cracks, capacitors have to be handled carefully in the original waffle pack container, carrier tape or other suitable container. Care must be taken that these capacitors do not come into contact with each other which can cause chip outs, cracks or other mechanical damage.

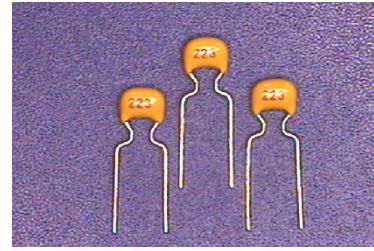
The recommended method for soldering large chips is reflow soldering. Wave soldering and manual soldering with Iron is not recommended. Ceramic capacitors must be preheated with less than 2°C/second rate to about 50°C below the reflow temperature. Any sudden increase or decrease in temperature more than the recommended rate, during soldering, may cause internal thermal cracks.

Options:

- HEC offers polymer termination (Super Term) for very large chips to minimize mechanical cracks due to board flexing.
- To minimize the potential for surface arcing in higher voltage applications, HEC offers the option of a proprietary surface coating.
- Pure Tin terminated / RoHS compliant products are offered as a standard, however, lead (Pb) content plated termination may be provided if required.
- Pd/Ag termination is also offered as an option for Hybrid circuits and other applications.

Radial Dipped Ceramic Capacitors [General Used Capacitors – 6.3V-1KV]

RDC Series



◆ Features

- Advanced process technology produces thinner layers of ceramic dielectric and offers higher voltage rating and capacitance values
- Provides good frequency response
- High reliability
- RoHS compliant
- Halogen free

◆ Applications

- Suitable for Automotive Electronics, Power supplies
- Inverter and Converter
- Fuel pump, Water pump, Hybrid engine, Door lock, and Wiper

◆ Summary of Specifications

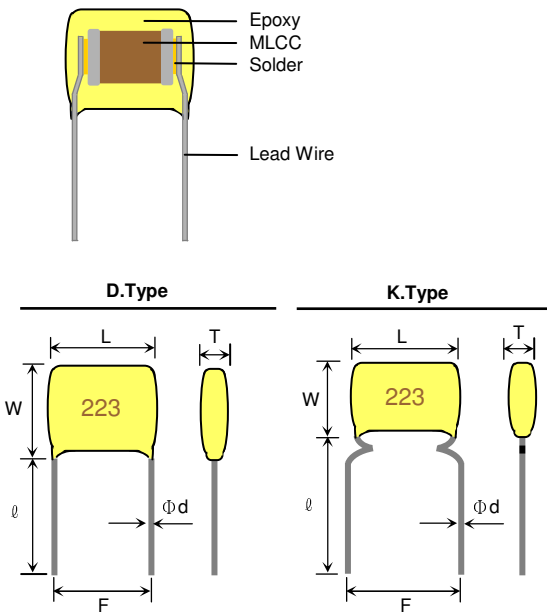
| | |
|-------------------------|---|
| Operation Temperature | NP0, X7R : -55 °C ~ +125 °C , X5R : -55 °C ~ +85 °C , Y5V : -30 °C ~ +85 °C |
| Rated Voltage | 6.3Vdc to 1KVdc |
| Temperature Coefficient | NP0 : $\leq \pm 30$ ppm/ °C , -55 °C ~ +125 °C (EIA Class I) |
| | X7R : $\leq \pm 15\%$, -55 °C ~ +125 °C (EIA Class II) |
| | X5R : $\leq \pm 15\%$, -55 °C ~ +85 °C (EIA Class II) |
| | Y5V : $\leq +22\sim -82\%$, -30 °C ~ +85 °C (EIA Class II) |
| Capacitance Range | NP0 : 2pF to 220nF |
| | X7R : 150pF to 22uF |
| | X5R : 0.1uF to 100uF |
| | Y5V : 0.1uF to 100uF |
| Dissipation Factor | Please see RDC specification data sheet |
| Insulation Resistance | 10GΩ or 500/CΩ whichever is smaller (C in Farads) |
| Aging | NP0 : 0% , X7R, X5R : 2.5 % , Y5V: 6% per decade of time |
| Dielectric Strength | V ≤ 50 : 250% Rated Voltage |
| | V < 500V : 200% Rated Voltage |
| | 500V ≤ V < 1000V : 150% Rated Voltage |
| | 1000 ≤ V : 120% Rated Voltage |

◆ How To Order

| | | | | | | | |
|-----|---|-----|---|-----|----|---|---|
| RDC | X | 471 | K | 631 | EK | A | N |
|-----|---|-----|---|-----|----|---|---|

| Product Code | Dielectric | Capacitance Unit : pF | Tolerance | Rated Voltage | Leader Style & Dimension | Lead Length & Packaging | Optional Suffix & Special requirement |
|--|--|---|--|--|---|---|---|
| RDC: Radial Ceramic Chip Capacitor | Ex.: N : NP0 X : X7R B : X5R Y : Y5V | Ex.: 2R0 : 2.0pF 100 : 10×10 ⁰ 471 : 47×10 ¹ 102 : 10×10 ² | Ex.: C : +/-0.25pF D : +/-0.50pF J : +/- 5% K : +/-10% M : +/-20% Z : +80/-20% | Ex.: 007:6.3Vdc 010:10Vdc 025:25Vdc 050:50Vdc 101:100Vdc 251:250Vdc 631:630Vdc 102:1000Vdc | Ex: D Type CD:4.5x5.5mm DD:4.5x5.5mm ED:5.5x7.0mm FD:7.5x8.0mm K Type CK:4.5x5.5mm DK:4.5x5.5mm EK:5.5x7.0mm FK:7.5x8.0mm | Ex.: S: 5.0mm M: 10.0mm L: 25mm min. O: 30mm A: Ammo Box | Ex.: Blank: No special requirement N: Halogen Free C: F= 5.0±1.0 mm (special lead space) D: Special thickness 4.0mm |

◆ Structure & Standard Dimensions



| TYPE | L (max) | W (max) | T (max) | F | l (min) | Φd |
|------|----------------|-----------------|-----------------|-------------------------|-----------------|--------------------------|
| CD | 4.5 [0.177] | 5.5 [0.217] | 2.5 [0.098] | 2.5±0.5 [.098 ±.020] | 25.0 [0.984] | 0.5±0.1 [0.020 ±.004] |
| CK | 4.5 [0.177] | 5.5 [0.217] | 2.5 [0.098] | 5.0±1.0 [.197 ±.039] | 25.0 [0.984] | 0.5±0.1 [0.020 ±.004] |
| DD | 4.5 [0.177] | 5.5 [0.217] | 2.5 [0.098] | 2.5±0.5 [.098 ±.020] | 25.0 [0.984] | 0.5±0.1 [0.020 ±.004] |
| DK | 4.5 [0.177] | 5.5 [0.217] | 2.5 [0.098] | 5.0±1.0 [.197 ±.039] | 25.0 [0.984] | 0.5±0.1 [0.020 ±.004] |
| ED | 5.5 [0.217] | 7.0 [0.276] | 4.0 [0.157] | 5.0±1.0 [.197 ±.039] | 25.0 [0.984] | 0.5±0.1 [0.020 ±.004] |
| EK | 5.5 [0.217] | 7.0 [0.276] | 4.0 [0.157] | 5.0±1.0 [.197 ±.039] | 25.0 [0.984] | 0.5±0.1 [0.020 ±.004] |
| FD | 7.5 [0.295] | 8.0 [0.315] | 4.0 [0.157] | 5.0±1.0 [.197 ±.039] | 25.0 [0.984] | 0.6±0.1 [0.024 ±.004] |
| FK | 7.5 [0.295] | 8.0 [0.315] | 4.0 [0.157] | 6.0±1.0 [.236 ±.039] | 25.0 [0.984] | 0.6±0.1 [0.024 ±.004] |
| GD | 7.6 [0.299] | 9.4 [0.370] | 6.9 [0.272] | 6.0±1.0 [.236 ±.039] | 25.0 [0.984] | 0.6±0.1 [0.024 ±.004] |
| GK | 7.6 [0.299] | 9.4 [0.370] | 6.9 [0.272] | 9.5±1.0 [.374 ±.039] | 25.0 [0.984] | 0.6±0.1 [0.024 ±.004] |
| WD | 7.5 [0.295] | 7.0 [0.276] | 4.0 [0.157] | 5.0±1.0 [.197 ±.039] | 25.0 [0.984] | 0.6±0.1 [0.024 ±.004] |
| WK | 7.5 [0.295] | 7.0 [0.276] | 4.0 [0.157] | 5.0±1.0 [.197 ±.039] | 25.0 [0.984] | 0.6±0.1 [0.024 ±.004] |
| UD | 7.0 [0.276] | 10.7 [0.421] | 6.90 [0.272] | 5.0±1.0 [.197 ±.039] | 25.0 [0.984] | 0.6±0.1 [0.024 ±.004] |

◆ Capacitance Range

NP0(N) Series

| Type | C□ | | | D□ | | | | E□ | | | | | F□ | | | | | GD | | |
|----------|-----|------|------|-----|------|------|------|-----|------|------|------|------|-----|-----|------|------|------|------|-----|--|
| WVDC | 50V | 100V | 250V | 50V | 100V | 250V | 500V | 50V | 100V | 250V | 500V | 630V | 1KV | 50V | 100V | 250V | 500V | 630V | 1KV | |
| Cap Min. | 5R0 | 5R0 | 2R0 | 100 | 101 | 101 | 100 | 153 | 392 | 332 | 101 | 101 | 100 | 104 | 473 | 223 | 822 | 822 | 101 | |
| Cap Max. | 332 | 471 | 151 | 103 | 472 | 272 | 681 | 104 | 333 | 153 | 682 | 682 | 102 | 224 | 104 | 473 | 223 | 223 | 183 | |

X7R(X) Series

| Type | C□ | | | | D□ | | | | | E□ | | | | | | | | | |
|----------|-----|-----|-----|------|-----|-----|-----|------|------|------|-----|-----|-----|------|------|------|------|-----|--|
| WVDC | 16V | 25V | 50V | 100V | 16V | 25V | 50V | 100V | 250V | 500V | 16V | 25V | 50V | 100V | 250V | 500V | 630V | 1KV | |
| Cap Min. | 151 | 151 | 151 | 151 | 224 | 154 | 102 | 102 | 102 | 102 | 335 | 684 | 474 | 333 | 153 | 102 | 102 | 102 | |
| Cap Max. | 474 | 224 | 104 | 183 | 225 | 155 | 334 | 103 | 223 | 223 | 156 | 475 | 225 | 105 | 224 | 683 | 683 | 103 | |

| Type | F□ | | | | | GD | | | | | | | | |
|----------|-----|-----|-----|------|------|------|------|-----|-----|------|------|------|------|-----|
| WVDC | 16V | 25V | 50V | 100V | 250V | 500V | 630V | 1KV | 50V | 100V | 250V | 500V | 630V | 1KV |
| Cap Min. | 226 | 475 | 104 | 104 | 104 | 683 | 683 | 103 | 474 | 474 | 105 | 224 | 224 | 393 |
| Cap Max. | 226 | 156 | 475 | 225 | 105 | 224 | 104 | 683 | 106 | 475 | 225 | 474 | 474 | 224 |

X5R(B) Series

| Type | C□ | | | | D□ | | | | E□ | | | | F□ | |
|----------|------|-----|-----|-----|------|-----|-----|-----|------|-----|-----|-----|------|-----|
| WVDC | 6.3V | 10V | 16V | 25V | 6.3V | 10V | 16V | 25V | 6.3V | 10V | 16V | 25V | 6.3V | 10V |
| Cap Min. | 225 | 474 | 154 | 104 | 475 | 334 | 225 | 105 | 685 | 685 | 155 | 155 | 686 | 226 |
| Cap Max. | 106 | 475 | 225 | 105 | 106 | 475 | 475 | 475 | 226 | 156 | 106 | 106 | 107 | 476 |

Y5V(Y) Series

| Type | C□ | | | | D□ | | | | | E□ | | | | | F□ | | | |
|----------|------|-----|-----|-----|------|-----|-----|-----|-----|------|-----|-----|-----|-----|-----|-----|-----|-----|
| WVDC | 6.3V | 10V | 16V | 25V | 6.3V | 10V | 16V | 25V | 50V | 6.3V | 10V | 16V | 25V | 50V | 10V | 16V | 25V | 50V |
| Cap Min. | 474 | 224 | 104 | 104 | 475 | 225 | 105 | 474 | 104 | 476 | 226 | 106 | 475 | 225 | 476 | 226 | 106 | 475 |
| Cap Max. | 475 | 475 | 225 | 105 | 226 | 106 | 475 | 225 | 105 | 107 | 476 | 226 | 106 | 475 | 107 | 476 | 226 | 106 |

■ Other dimensions, capacitance values and voltages rating are available. Please contact Holy Stone.

Ceramic Disc Capacitors [High Voltage Disc Capacitors]

HDC Series – 1KVdc to 6KVdc



HDC Series (ceramic disc capacitors) are ideal for use in general electronic products with voltage ratings from 1KV to 6KV.

◆ Features

- Wide operating temperature range
- Low Loss at wide range of frequency
- High reliability
- RoHS compliant
- Halogen Free available

◆ Applications

- Suitable for LAN/WLAN interface
- Ballast circuit of back-lighting inverter
- DC-DC converters
- Snubber circuit of switching power supplies
- Modems and communication

◆ Summary of Specifications

| | |
|-------------------------|---|
| Operation Temperature | NP0/SL/X7R : -55 °C ~ +125 °C |
| | Y5P/Y5S : -25 °C ~ +85 °C |
| | Y5U/Y5V : -25 °C ~ +85 °C |
| Capacitance Range | 2pF to 100nF |
| Rated Voltage | 1KVdc to 6KVdc |
| Temperature Coefficient | NP0 : $\leq \pm 30\text{ppm}/^\circ\text{C}$, -55 °C ~ +125 °C (EIA Class I) |
| | SL : $+350 \sim -1000\text{ppm}/^\circ\text{C}$, -25 °C ~ +85 °C (EIA Class I) |
| | Y5S : $\leq \pm 22\%$, -25 °C ~ +85 °C |
| | X7R : $\leq \pm 15\%$, -55 °C ~ +125 °C (EIA Class II) |
| | Y5P : $\leq \pm 10\%$, Y5U : $+22\%/-56\%$, Y5V : $+22\%/-82\%$, -25 °C ~ +85°C (EIA Class II) |
| Dissipation Factor | Please see HDC specification data sheet |
| Insulation Resistance | 10GΩ or 500/CΩ whichever is smaller (C in Farads) |
| Aging | NP0 : 0% , SL : 1.5% per decade of time |
| | X7R, Y5P, Y5S : 3.5 % per decade of time |
| | Y5U : 5.0 % , Y5V : 7.5% per decade of time |
| Dielectric Strength | V \leq 2KV : 200% Rated Voltage |
| | 3KV : 175% Rated Voltage |
| | 6KV : 150% Rated Voltage |

◆ How To Order

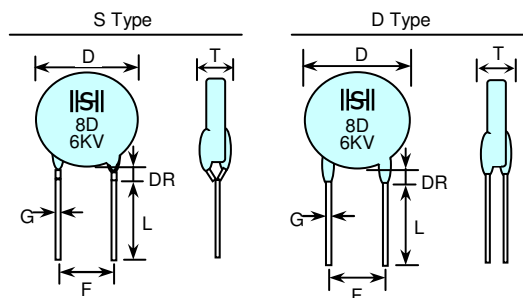
HDC
S
3R0
C
602
7
A
A
N

| Product Code | Dielectric | Capacitance Unit : pF | Tolerance | Rated Voltage | Lead Space | Lead Length & Packaging | Lead Shape Style | Optional Suffix |
|--------------------------------|--|---|---|--|--|--|--|--------------------------|
| HDC: Ceramic Disc Capacitor | Ex.: N : NP0 S : SL L : Y5S X : X7R P : Y5P Y : Y5V E : Y5U | Ex.: 2R0 : 2pF 100 : 10x10 ⁰ 151 : 15x10 ¹ | Ex.: C : $\pm 0.25\text{pF}$ D : $\pm 0.5\text{pF}$ H : $\pm 3\%$ J : $\pm 5\%$ K : $\pm 10\%$ M : $\pm 20\%$ | Ex.: 102:1000Vdc 202:2000Vdc 302:3000Vdc 602:6000Vdc | Ex.: 5 : 5.00mm 6 : 6.35mm 7 : 7.50mm A : 10.0mm B : 12.5mm | Ex.: H: 3.1mm C: 3.5mm S: 5.0mm M: 10.0mm L: 25mm min. T: T & R A: Ammo Box | Ex.: S Type 1: $\phi = 0.50\text{mm}$ 2: $\phi = 0.60\text{mm}$ 3: $\phi = 0.65\text{mm}$ 4: $\phi = 0.80\text{mm}$ D Type 9: $\phi = 0.50\text{mm}$ A: $\phi = 0.60\text{mm}$ B: $\phi = 0.65\text{mm}$ C: $\phi = 0.80\text{mm}$ | Ex.: N : Halogen Free |

HDC Series - High Voltage Ceramic Disc Capacitors

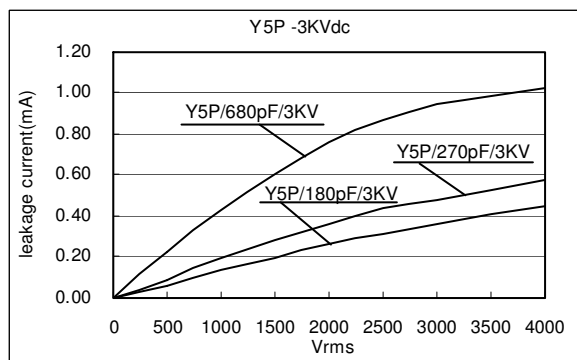
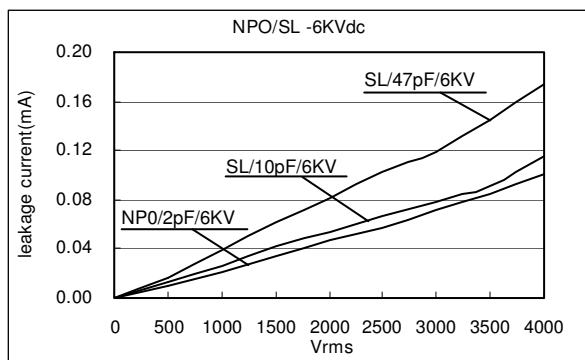


◆ Dimensions



| Code | Dimension | | | |
|------|-----------------------------------|-------------|-------------|-------------|
| D | Φ20.5mm max. | | | |
| F | 5.0±1.0 mm | 7.50±1.5 mm | 10.0±2.0 mm | 12.5±2.0 mm |
| G | 0.5±0.1mm / 0.6±0.1mm / 0.8±0.1mm | | | |
| T | 8.0mm max. | | | |
| DR | 4.0mm max. | | | |

◆ Leakage Current Characteristics (Typical Reference)



◆ Capacitance Range

| Dielectric Characteristic | Voltage | Capacitance Range | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---------------------------|---------|-------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| | | 2R0 | 3R0 | 5R0 | 6R0 | 7R0 | 8R0 | 9R0 | 100 | 120 | 150 | 180 | 220 | 270 | 330 | 390 | 470 | 560 | 680 | 820 | 101 | 121 | 151 | 181 | 221 | 271 | 331 | 391 | 471 | 561 | 681 | 821 | 102 |
| NPO | 3KV | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | | | | | | | | | | | | | | | | | | | | | |
| | 6KV | ■ | ■ | ■ | ■ | ■ | ■ | ■ | | | | | | | | | | | | | | | | | | | | | | | | | |
| SL | 1KV | | | | | | | | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | |
| | 2KV | | | | | | | | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | |
| | 3KV | | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | |
| | 6KV | | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | |
| Y5S | 3KV | | | | | | | | | | | | | | | | | | | | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | | |

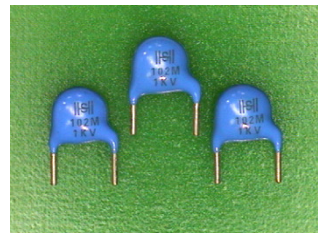
| Dielectric Characteristic | Voltage | Capacitance Range | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---------------------------|---------|-------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| | | 101 | 121 | 151 | 181 | 221 | 271 | 331 | 391 | 471 | 561 | 681 | 821 | 102 | 122 | 152 | 182 | 222 | 272 | 332 | 392 | 472 | 562 | 682 | 822 | 103 | 153 | 223 | 273 | 333 | 393 | 473 |
| X7R | 2KV | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| | 3KV | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| Y5P | 1KV | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| | 2KV | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| | 3KV | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| Y5U | 1KV | | | | | | | | | ■ | | | | ■ | | | | | | | | | | | | | | | | | | |
| | 2KV | | | | | | | | | ■ | | | | ■ | | | | | | | | | | | | | | | | | | |
| | 3KV | | | | | | | | | ■ | | | | ■ | | | | | | | | | | | | | | | | | | |
| Y5V | 1KV | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 2KV | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

■ Other capacitance and voltage rating are available. Please contact Holy Stone.



Ceramic Disc Capacitors [High Voltage Disc Capacitors]

HDC Series – Low Loss / Low Dissipation



The series (R type) used in electronic product and with voltage ratings from 1KV to 3KV. Ideal for use on high frequency pulse circuits such as horizontal resonance circuits for CTV and snubber circuits for switching power supplies.

◆ Features

- Wide operating temperature range up to +125°C
- Ultra low dissipation factor
- Small size a special design
- High reliability
- RoHS compliant
- Halogen Free available

◆ Applications

- Suitable for LAN/WLAN interface
- Ballast circuit of back-lighting inverter
- DC-DC converters
- Snubber circuit of switching power supplies
- Modems and communication

◆ Summary of Specifications

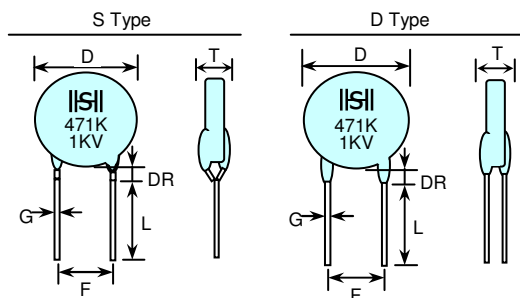
| | |
|-------------------------|---|
| Operation Temperature | -25 °C ~ +125 °C |
| Capacitance Range | 100pF to 47nF |
| Rated Voltage | 1KVdc to 3KVdc |
| Temperature Coefficient | ≤ +15/-30%, -25 °C ~ +125 °C |
| Dissipation Factor | ≤ 0.3% |
| Insulation Resistance | 10GΩ or 500/CΩ whichever is smaller (C in Farads) |
| Aging | 3.5% per decade of time |
| Dielectric Strength | V ≤ 2KV : 200% Rated Voltage |
| | 3KV : 175% Rated Voltage |

◆ How To Order

HDC
R
471
K
102
5
A
9
L

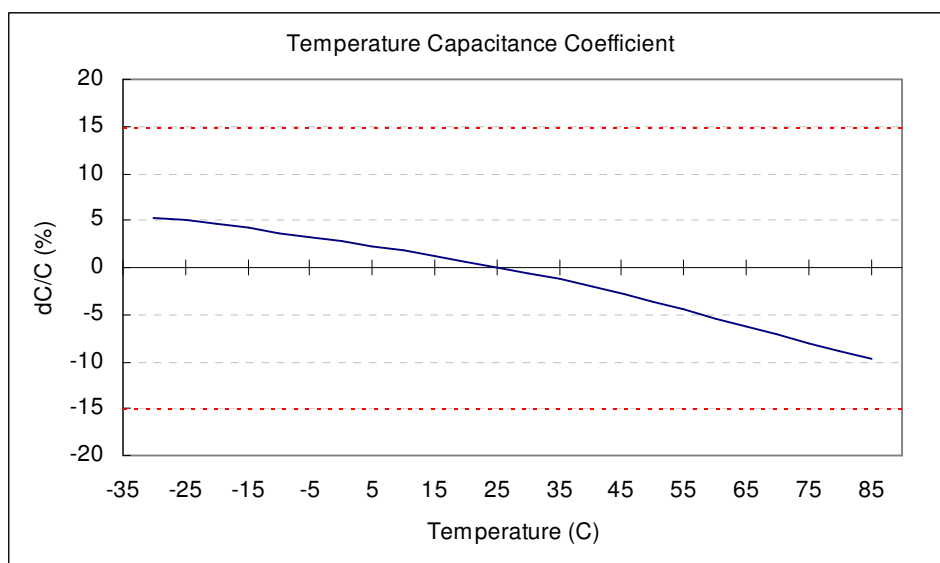
| Product Code | Dielectric | Capacitance Unit : pF | Tolerance | Rated Voltage | Lead Space | Lead Length & Packaging | Lead Shape Style | Optional Suffix |
|--------------------------------|-----------------|--|------------------------------|---|--|--|--|--|
| HDC: Ceramic Disc Capacitor | Ex.: R : Y5R | Ex.: 101 : 10x10 ¹ 472 : 47x10 ² | Ex.: K : ±10% M : ±20% | Ex.: 102:1000Vdc 202:2000Vdc 302:3000Vdc | Ex.: 5 : 5.00mm 6 : 6.35mm 7 : 7.50mm A : 10.0mm B : 12.5mm | Ex.: H: 3.1mm C: 3.5mm S: 5.0mm M: 10.0mm L: 25mm min. T: Tape Reel A: Ammo Box | Ex.: S Type 1: φ=0.50mm 2: φ=0.60mm 3: φ=0.65mm 4: φ=0.80mm D Type 9: φ=0.50mm A: φ=0.60mm B: φ=0.65mm C: φ=0.80mm | Ex.: L: Low Loss / Low Dissipation R: Halogen Free |

◆ Dimensions



| Code | Dimension | | | |
|------|-----------------------------------|-------------|-------------|-------------|
| D | Φ20.5mm max. | | | |
| F | 5.0±1.0 mm | 7.50±1.5 mm | 10.0±2.0 mm | 12.5±2.0 mm |
| G | 0.5±0.1mm / 0.6±0.1mm / 0.8±0.1mm | | | |
| T | 8.0mm max. | | | |
| DR | 4.0mm max. | | | |

◆ Temperature Capacitance Coefficient (Typical Reference)



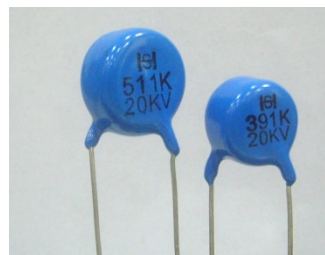
◆ Capacitance Range

| Dielectric Characteristic | Voltage | Capacitance Range | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---------------------------|---------|-------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|--|--|--|
| | | 101 | 121 | 151 | 181 | 221 | 271 | 331 | 391 | 471 | 561 | 681 | 821 | 102 | 122 | 152 | 182 | 222 | 272 | 332 | 392 | 472 | 562 | 682 | 822 | 103 | 153 | 223 | 273 | 333 | 393 | 473 | 104 | | | |
| Y5R | 1KV | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | | | | | | | | | | | |
| | 2KV | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | | | | | | | | | | | |
| | 3KV | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | | | | | | | | | | | |

■ Other capacitance and voltage rating are available. Please contact Holy Stone.

Ceramic Disc Capacitors [Ultra High Voltage Disc Capacitors]

HDC Series – over 10KVdc



HDC Series (ceramic disc capacitors) are ideal for use in general electronic products with voltage ratings over 10KVdc.

◆ Features

- Wide operating temperature range
- Low Loss at wide range of frequency
- High reliability
- RoHS compliant
- Halogen Free available

◆ Applications

- Suitable for LAN/WLAN interface
- Ballast circuit of back-lighting inverter
- DC-DC converters
- Snubber circuit of switching power supplies
- Modems and communication
- High voltage power supply

◆ Summary of Specifications

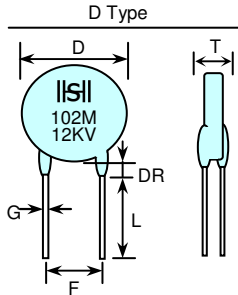
| | |
|-------------------------|--|
| Operation Temperature | NP0/SL/X7R : -55 °C ~ +125 °C |
| | Y5P/Y5S : -25 °C ~ +85 °C |
| | Y5U/Y5V : -25 °C ~ +85 °C |
| Capacitance Range | 10pF to 10nF |
| Capacitance | 1MHz/1KHz ± 20% /osc : 1 to 5Vrms, and 20 °C |
| Rated Voltage | Over 10KVdc |
| Temperature Coefficient | NP0 : ≤ ± 30ppm/ °C , -55 °C ~ +125 °C (EIA Class I) |
| | SL : +350 ~ -1000ppm/ °C , -25 °C ~ +85 °C (EIA Class I) |
| | Y5S (N3300) ± 22% , -25 °C ~ +85 °C |
| | X7R : ≤ ± 15% , -55 °C ~ +125 °C (EIA Class II) |
| | Y5P : ≤ ± 10% , Y5U : +22%/-56% , Y5V : +22%/-82% , -25 °C ~ +85 °C (EIA Class II) |
| Dissipation Factor | Please see HDC specification data sheet |
| Insulation Resistance | 10GΩ at 500Vdc 1 minute |
| Aging | NP0 : 0% , SL : 1.5% per decade of time |
| | X7R, Y5P, Y5S : 3.5 % per decade of time |
| | Y5U : 5.0 % , Y5V : 7.5% per decade of time |
| Dielectric Strength | 150% Rated Voltage |

◆ How To Order

HDC
L
102
M
153
A
L
C
N

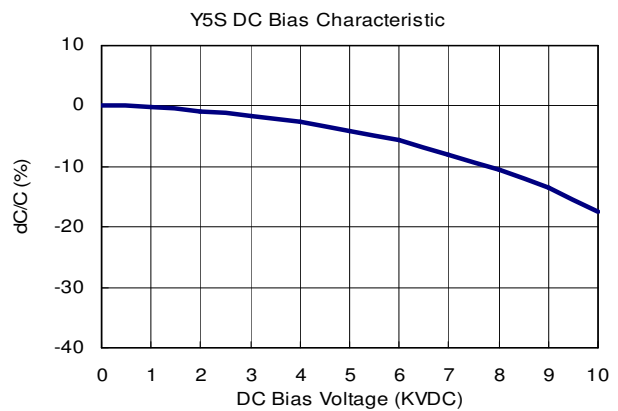
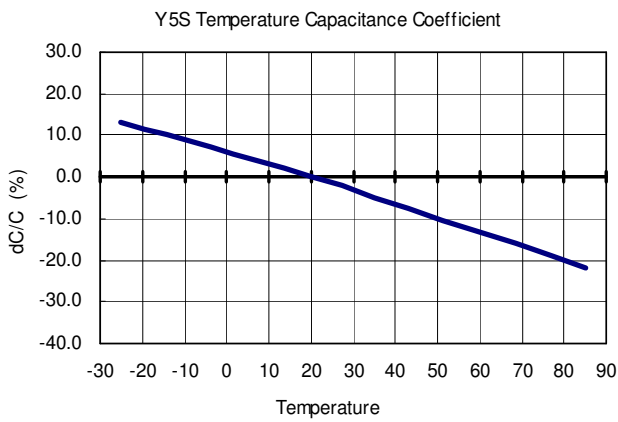
| Product Code | Dielectric | Capacitance Unit : pF | Tolerance | Rated Voltage | Lead Space | Lead Length & Packaging | Lead Shape Style | Optional Suffix |
|--------------------------------|--|--|---|--|----------------------------------|-------------------------|-------------------------------|-------------------------|
| HDC: Ceramic Disc Capacitor | Ex.: N : NP0 S : SL L : Y5S X : X7R P : Y5P E : Y5U Y : Y5V | Ex.: 102 : 10x10 ² 103 : 10x10 ³ | Ex.: J : ±5% K : ±10% M : ±20% | Ex.: 103:10KVdc 123:12KVdc 153:15KVdc 203:20KVdc | Ex.: A : 10.0mm B : 12.5mm | Ex.: L : 25mm min. | Ex.: D Type C: φ=0.80mm | Ex.: N :Halogen Free |

◆ **Dimensions**



| Code | Dimension | |
|------|---------------------------|-----------|
| | D Type | |
| D | Please contact Holy Stone | |
| F | 10.0±2 mm | 12.5±2 mm |
| G | 0.8±0.1mm max. | |
| T | Please contact Holy Stone | |
| DR | 5.0mm max. | |

◆ **Temperature Capacitance Coefficient & DC Bias** (Typical Reference)



◆ **Capacitance Range**

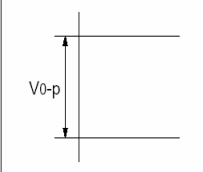
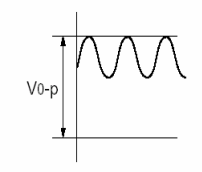
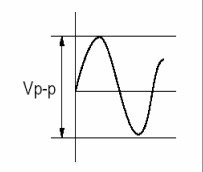
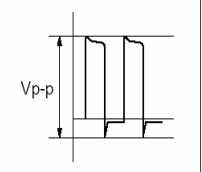
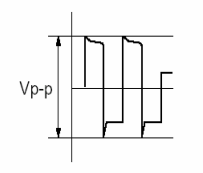
| Dielectric Characteristic | Voltage | Capacitance Range | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---------------------------|---------|-------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| | | 100 | 120 | 150 | 180 | 220 | 270 | 330 | 390 | 470 | 560 | 680 | 820 | 101 | 121 | 151 | 181 | 221 | 271 | 331 | 391 | 471 | 561 | 681 | 821 | 102 | 152 | 222 | 332 | 472 | 682 | 103 | 123 | | | | |
| NPO | 10KV | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | | |
| | 15KV | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | | |
| | 20KV | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | | |
| SL | 10KV | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | | |
| | 15KV | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | | |
| | 20KV | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | |
| X7R | 10KV | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | |
| | 12KV | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | |
| | 15KV | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] |
| Y5S | 10KV | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | |
| | 12KV | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] |
| | 15KV | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] |
| Y5P | 10KV | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] |
| | 12KV | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] |
| | 15KV | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] |
| Y5U | 10KV | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] |
| | 12KV | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] |
| | 15KV | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] |
| Y5V | 10KV | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] |
| | 12KV | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] |
| | 15KV | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] | [X] |

■ Other capacitance and voltage rating are available. Please contact Holy Stone.

◆ **Caution**

(1) **Operating Voltage:**

When DC-rated capacitors are to be used in AC or ripple current circuits, be sure to maintain the V_{p-p} value of the applied voltage or the V_{0-p} which contains a DC bias within the rated voltage range. When the voltage is applied to the circuit, starting or stopping may generate an irregular voltage for a transit period because of resonance or switching. Be sure to use a capacitor with a rated voltage range that includes these irregular voltages.

| Voltage | DC Voltage | DC+AC Voltage | AC Voltage | Pulse Voltage (1) | Pulse Voltage (2) |
|------------------------|---|---|--|---|---|
| Positional measurement |  |  |  |  |  |

(2) **Operating Temperature and Self-generated Heat**

Keep the surface temperature of a capacitor below the upper limit of its rated operating temperature range. Be sure to take into account the heat generated by the capacitor itself. When the capacitor is used in a high frequency current, pulse current or similar current, it may self-generate heat due to dielectric loss. The frequency of the applied sine wave voltage should be less than 100kHz. The applied voltage load should be such that the capacitor's self-generated heat is within 20°C at an atmosphere temperature of 25°C. When measuring, use a thermocouple of small thermal capacity-K of $\varnothing 0.1\text{mm}$ in conditions where the capacitor is not affected by radiant heat from other components or surrounding ambient fluctuations. Excessive heat may lead to deterioration of the capacitor's characteristics and reliability. (Never attempt to perform measurement with the cooling fan running. Otherwise, accurate measurement cannot be ensured.)

(3) **Fail-Safe**

It should be assumed that if the capacitor fails, it will fail in short circuit mode. Be sure to provide an appropriate fail-safe function, like a fuse in your circuit, if failure would cause an electric shock, fire or fumes.

(4) **Operating and storage environment**

The insulating coating of capacitors does not form a perfect seal; therefore, do not use or store capacitors in a corrosive atmosphere, especially where chloride gas, sulfide gas, acid, alkali, salt or the like are present, and avoid exposure to moisture. Before cleaning, bonding or molding this product, verify that these processes do not affect product quality by testing the performance of a cleaned, bonded or molded product in the intended equipment. Store the capacitors where the temperature and relative humidity do not exceed -10 to 40 degrees centigrade and 15 to 85 %. Use capacitors within 6 months.

(5) **Vibration and impact**

Do not expose a capacitor or its leads to excessive shock or vibration during use.

(6) Soldering

When soldering this product to a PCB/PWB, do not exceed the solder heat resistance specification of the capacitor.

Subjecting this product to excessive heating could melt the internal solder joint and may result in thermal shock that can crack the ceramic element. When soldering capacitors with a soldering iron, it should be performed in following conditions.

Temperature of iron-tip: 400 degrees C. max.

Soldering iron wattage : 50W max.

Soldering time : 3.5 sec. max.

Failure to follow the above cautions may result, in worst case, in short circuit and cause fuming or partial dispersion when the product is used.

(7) Cleaning (ultrasonic cleaning)

To perform ultrasonic cleaning, observe the following conditions.

Rinse bath capacity : Output of 20 watts per liter or less.

Rinsing time : 5 min. maximum.

Do not vibrate the PCB/PWB directly.

Excessive ultrasonic cleaning may lead to fatigue failure of the lead wires.

(8) Rating

Capacitance change of capacitor

(a). Class 1 series (Temp. Char. SL · NP0)

Capacitance might change a little depending on the surrounding temperature or an applied voltage.

Please contact us if you intend to use this product in a strict time constant circuit.

(b). CLASS 2 Series (Temp. Char. X7R, Y5S, Y5P, Y5U and Y5V)

Capacitors have an aging characteristic, whereby the capacitor continually decreases its capacitance slightly if the capacitor is left on for a long time. Moreover, capacitance might change greatly depending on the surrounding temperature or an applied voltage. Therefore, it is not likely to be suitable for use in a time constant circuit.

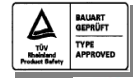
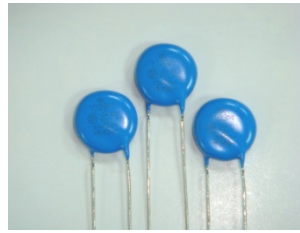
Please contact us if you need detailed information.

SDC Series - Safety Disc Capacitors



Ceramic Disc Capacitors [Safety Disc Capacitors – X1Y1& X1Y2]

SDC Series



This specification applies to the following Safety Standards that are recognized for Ceramic Capacitors used in Electronic Appliances.

◆ Features

- ❑ Operating temperature range guaranteed up to 125°C (UL/CSA:85°C)
- ❑ Safety capacitors specially designed for use in Modem, Facsimile, Telephone and other electronic equipment for lighting and surge protection, EMI filter and isolation.
- ❑ The series is recognized by U/L, CSA, TUV, CCC
- ❑ Coated with Flame-retardant epoxy resin (conforming to UL 94-0 standards)
- ❑ Suitable for automatic insertion
- ❑ RoHS compliant
- ❑ Halogen Free available

◆ Applications

- ❑ Safety capacitors specially designed for use in Modem, Facsimile, Telephone and other electronic equipment for lighting and surge protection, EMI filter and isolation.
- ❑ Interference suppressor for AC line of electronic equipment

◆ Related Standards and Certificate Numbers

| Certificated Body | Relation Standard | Number | Rated Voltage |
|-------------------|--|-----------------|--------------------------|
| TUV | IEC 60384-14 : 2005 (3 rd Edition) EN 60384-14 : 2005 EN 132400 : 1994+A2:1998+A3:1998+A4:2001 | R50152938 | X1:400 VAC Y2:250 VAC |
| | | | X1:440 VAC Y1:250 VAC |
| | | | X1:440 VAC Y2:400 VAC |
| UL | UL 1414 Edition 5 | E300818 | SDC-Y2 250 VAC |
| | | | SDC-Y1L 250 VAC |
| | | | SDC-Y1H 250 VAC |
| CUL/CSA | CSA :C22.2 No.1 | E300818/1686156 | 250 VAC |
| ENEC Report | EN 60384-14 : 2005(3 rd Edition) | 2792364 | |
| CB Report | EN 60384-14 : 2005(3 rd Edition) | HU-455/A1 | |

◆ How To Order

| | | | | | | | | |
|-----|---|-----|---|----|---|---|---|---|
| SDC | P | 101 | K | 50 | 2 | 7 | A | 2 |
|-----|---|-----|---|----|---|---|---|---|

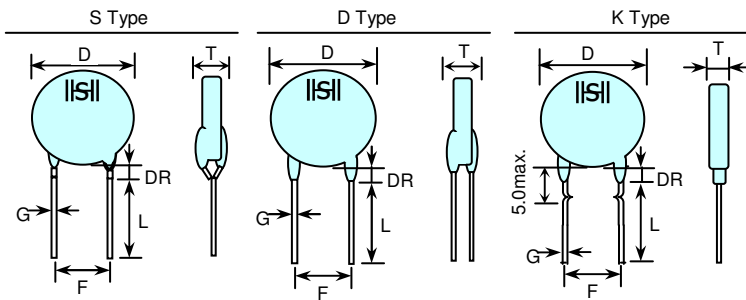
| Product Code | Dielectric | Capacitance Unit : pF | Tolerance | Class | Rated Voltage | Lead Space | Lead Length | Lead Shape |
|---|---|--|---|----------------------------------|---|--|---|---|
| SDC: Safety Disc Ceramic Capacitor | Ex.: N : NP0 S : SL X : X7R P : Y5P Y : Y5V E : Y5U | Ex.: 100 : 10x10 ⁰ 151 : 15x10 ¹ | Ex.: J : ±5.0% K : ±10% M : ±20% | Ex.: 10 : X1/Y1 50 : X1/Y2 | Ex.: 2: Y Cap:250V X Cap:400V 3: Y Cap:250V X Cap:440V 4: Y Cap:400V X Cap:440V | Ex.: 5 : 5.00mm 6 : 6.35mm 7 : 7.50mm A : 10.0mm B : 12.5mm | Ex.: H: 3.1mm C: 3.5mm S: 5.0mm M: 10mm L : 25mm min T : T&R A: Ammo Box | S Type 1: φ=0.50mm 2: φ=0.60mm 3: φ=0.65mm 4: φ=0.80mm K Type 5: φ=0.50mm 6: φ=0.60mm 7: φ=0.65mm 8: φ=0.80mm D Type 9: φ=0.50mm A: φ=0.60mm B: φ=0.65mm C: φ=0.80mm |



Summary of Specifications

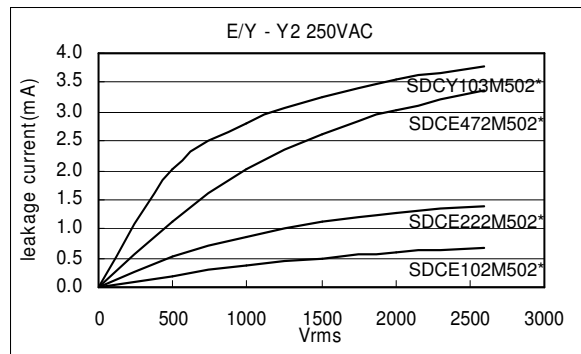
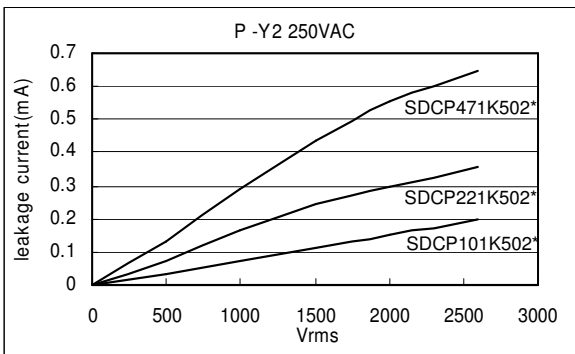
| | |
|-----------------------|--|
| Operation Temperature | -25 °C ~ +125 °C |
| Dielectric Strength | X1:440 VAC / Y1:250 VAC : 4000VAC for 1 minute |
| | X1:440 VAC / Y1:400 VAC : 4000VAC for 1 minute |
| | X1:400 VAC / Y2:250 VAC : 2600VAC for 1 minute |
| Capacitance Range | X1:440 VAC / Y1:250 VAC : 2pF to 4700pF |
| | X1:440 VAC / Y1:400 VAC : 2pF to 4700pF |
| | X1:400 VAC / Y2:250 VAC : 2pF to 10,000pF |
| Dissipation Factor | Class I , NP0/SL : Q ≥ 300 at 1MHz/1Vrms |
| Insulation Resistance | Class II , Y5P : DF ≤ 2.5% , Y5U/Y5V : DF ≤ 5.0% at 1KHz/1Vrms |
| | 10,000MΩ min. at 500Vdc |

Dimensions



| Code | Dimension | | | |
|------|-----------------------------------|-------------|-------------|-------------|
| D | Φ16.0mm max. | | | |
| F | 5.0±1.0 mm | 7.50±1.5 mm | 10.0±2.0 mm | 12.5±2.0 mm |
| G | 0.5±0.1mm / 0.6±0.1mm / 0.8±0.1mm | | | |
| T | 8.0mm max. | | | |
| DR | 4.0mm max. | | | |

Leakage Current Characteristics (Typical Reference)



Capacitance Range

| Class | TC | Capacitance Range | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|--------------------------|-----|-------------------|------|------|------|-------|------|------|------|------|------|------|------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|-----|------|------|------|------|------|------|------|------|------|------|------|--|--|
| | | 2R0 | 3R0 | 5R0 | 8R0 | 100 | 150 | 220 | 330 | 390 | 470 | 680 | 101 | 121 | 151 | 181 | 221 | 271 | 331 | 391 | 471 | 561 | 681 | 102 | 152 | 182 | 202 | 222 | 332 | 392 | 472 | 682 | 822 | 103 | | | | |
| X1: 400VAC Y2: 250VAC | NPO | 0.75 | 0.75 | 0.75 | 0.75 | 10.75 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | SL | | | | 0.75 | 0.75 | 0.75 | 0.75 | 0.75 | 0.75 | 0.75 | 0.75 | 0.75 | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Y5P | | | | 0.75 | 0.75 | 0.75 | 0.75 | 0.75 | 0.75 | 0.75 | 0.75 | 0.75 | 8.7 | 8.7 | 8.7 | 8.7 | 8.7 | 8.7 | 8.7 | 8.7 | 8.7 | 8.7 | 9.7 | 9.7 | 10.7 | | | | | | | | | | | | |
| | Y5U | | | | | | | | | | | | | | | | | | | | | | | | | 8.7 | 9.7 | 10.7 | 10.7 | 10.7 | 10.7 | 12.7 | 13.7 | 13.7 | | | | |
| | Y5V | | | | | | | | | | | | | | | | | | | | | | | | | 8.7 | 8.7 | | | | 9.7 | 10.7 | | 12.7 | 13.7 | 13.7 | | |
| X1: 440VAC Y1: 250VAC | NPO | 0.75 | 0.75 | 0.75 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | SL | | | | 0.75 | 0.75 | 0.75 | 0.75 | 0.75 | 0.75 | 0.75 | 0.75 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Y5P | | | | | | | | | | | | 8.8 | 8.8 | 8.8 | 8.8 | 9.8 | 9.8 | 9.8 | 9.8 | 9.8 | 9.8 | 10.8 | 12.8 | | | | | | | | | | | | | | |
| | Y5U | | | | | | | | | | | | | | | | | | | | | | | | 8.8 | 9.8 | 10.8 | 10.8 | 10.8 | 10.8 | 12.8 | 13.8 | 13.8 | | | | | |
| X1: 440VAC Y1: 400VAC | NPO | 0.75 | 0.75 | 0.75 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | SL | | | | 0.75 | 0.75 | 0.75 | 0.75 | 0.75 | 0.75 | 0.75 | 0.75 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Y5P | | | | | | | | | | | | 8.8 | 8.8 | 8.8 | 8.8 | 9.8 | 9.8 | 9.8 | 9.8 | 9.8 | 9.8 | 10.8 | 12.8 | | | | | | | | | | | | | | |
| | Y5U | | | | | | | | | | | | | | | | | | | | | | | | 8.8 | 9.8 | 10.8 | 10.8 | 10.8 | 10.8 | 12.8 | 13.8 | 13.8 | | | | | |

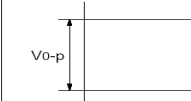
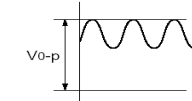
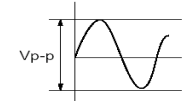
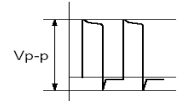
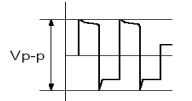
Body Diameter (max.) / Body Thickness (max.)

◆ Caution (Rating)

(1) Operating Voltage

Be sure to maintain the V_{p-p} value of the applied voltage or the V_{o-p} which contains a DC bias within the rated voltage range.

When the voltage is started to apply to the circuit or it is stopped applying, the irregular voltage may be generated for a transit period because of resonance or switching. Be sure to use a capacitor within rated voltage containing this irregular voltage.

| Voltage | DC Voltage | DC+AC Voltage | AC Voltage | Pulse Voltage (1) | Pulse Voltage (2) |
|------------------------|---|---|---|---|---|
| Positional Measurement |  |  |  |  |  |

(2) Operating Temperature and Self-generated Heat

Keep the surface temperature of a capacitor below the upper limit of its rated operating temperature range. Be sure to take into account the heat generated by the capacitor itself. When the capacitor is used in a high-frequency current, pulse current or the like, it may have the self-generated heat due to dielectric-loss.

Applied voltage should be the load such as self-generated heat is within 20°C on the condition of atmosphere temperature 25°C . When measuring, use a thermocouple of small thermal capacity-K of $\phi 0.1\text{mm}$ and be in the condition where capacitor is not affected by radiant heat of other components and wind of surroundings. Excessive heat may lead to deterioration of the capacitor's characteristics and reliability.

(3) Test condition for withstanding Voltage

I. Test Equipment

Test equipment for AC withstanding voltage shall be used with the performance of the wave similar to 50/60 Hz sine waves.

If a distorted sine wave or over load exceeding the specified voltage value is applied, a failure may be caused.

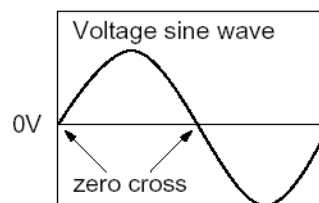
II. Voltage Applied Method

When the withstand voltage is applied, the capacitor's leads or terminals shall be firmly connected to the output of the withstand voltage test equipment, and then the voltage shall be raised from near zero to the test voltage.

If the test voltage is applied directly to capacitor, the test voltage should be applied at the *zero cross point. At the end of the test time, the test voltage shall be reduced to near zero, and then capacitor's lead or terminal shall be taken off the output of the withstand voltage test equipment.

If the test voltage is not applied from the near zero voltage point and applied directly to capacitor, a surge voltage may arise, and cause the capacitor to fail.

* ZERO CROSS is the point where voltage sine wave pass 0V.- See the right figure.



(4) Fail-Safe

It should be assumed that if the capacitor fails, it will fail in short circuit mode. Be sure to provide an appropriate fail-safe function, like a fuse in your circuit, if failure would cause an electric shock, fire or fumes.

◆ Caution (Storage and operating condition)

The insulating coating of capacitors does not form a perfect seal; therefore, do not use or store capacitors in a corrosive atmosphere, especially where chloride gas, sulfide gas, acid, alkali, salt are likely to be present. And avoid exposure to moisture. Before cleaning, bonding, or molding this product, verify that these processes do not affect product quality by testing the performance of a cleaned, bonded or molded product in the intended equipment. Store the capacitors where the temperature and relative humidity do not exceed -10 to 40 degrees centigrade and 15 to 85 % R.H. Use capacitors within 6 months.

◆ Caution (Soldering and Mounting)

1. Vibration and impact:

Do not expose a capacitor or its leads to excessive shock or vibration during use.

2. Soldering:

When soldering this product to a PCB/PWB, do not exceed the solder heat resistance specification of the capacitor. Subjecting this product to excessive heating could melt the internal junction solder and may result in thermal shocks that can crack the ceramic element.

When soldering these capacitor with a soldering iron, it should be performed in following conditions.

Temperature of iron-tip: 400 degrees C. max.

Soldering iron wattage: 50W max.

Soldering time: 3.5 sec. max.

3. Cleaning (ultrasonic cleaning):

To perform ultrasonic cleaning, observe the following conditions.

Rinse bath capacity: Output of 20 watts per liter or less.

Rinsing time: 5 min maximum.

Do not vibrate the PCB/PWB directly.

Excessive ultrasonic cleaning may lead to fatigue destruction of the lead wires.

◆ Caution (Handling)

Vibration and impact

Do not expose a capacitor or its leads to excessive shock or vibration during use.

Failure to follow the above cautions may result, in worst case, in a short circuit and cause fuming or partial dispersion where the product is used.

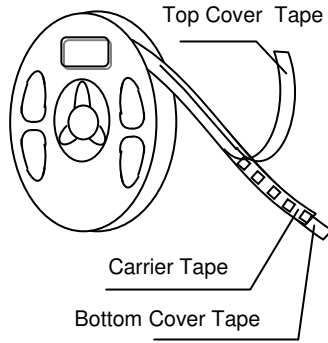
◆ Multilayer Ceramic Chip Capacitor

● Bulk Packing

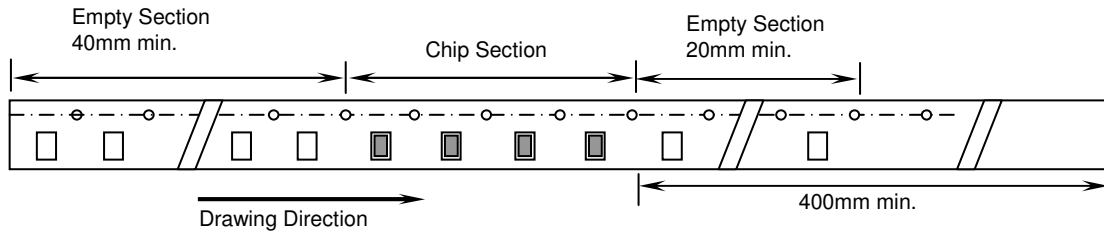
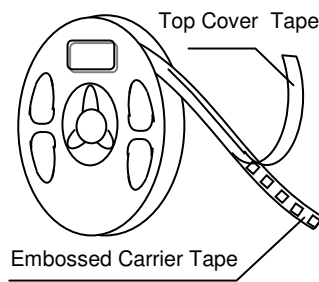
Standard packing 10Kpcs/pack, others according to customers' request.

● Tape Packing

Paper Tape



Embossed Tape



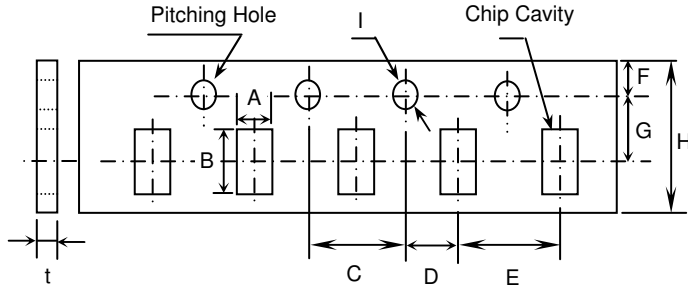
Material And Quantity (ϕ180mm)

| Chip Size (EIA Code) | Dimension (mm) | | | ϕ180mm reel | |
|-------------------------|----------------|------|---------------------|-----------------|----------------|
| | L | W | T | Paper Tape | Plastic Tape |
| 0201 | 0.6 | 0.3 | $T \leq 0.33$ | 15,000 pcs/reel | N/A |
| 0402 | 1.0 | 0.5 | $T \leq 0.55$ | 10,000 pcs/reel | N/A |
| 0603 | 1.6 | 0.8 | $T \leq 0.90$ | 4,000 pcs/reel | N/A |
| 0805 | 2.0 | 1.25 | $T \leq 0.90$ | 4,000 pcs/reel | N/A |
| 1206 | 3.2 | 1.6 | $0.9 < T \leq 1.25$ | N/A | 3,000 pcs/reel |
| | | | $T \leq 0.90$ | 4,000 pcs/reel | N/A |
| | | | $T > 1.25$ | N/A | 2,000 pcs/reel |
| 1210 | 3.2 | 2.5 | $T \leq 1.25$ | N/A | 3,000 pcs/reel |
| | | | $T > 1.25$ | N/A | 2,000 pcs/reel |
| 1808 | 4.6 | 2.0 | $T \leq 1.25$ | N/A | 3,000 pcs/reel |
| | | | $T > 1.25$ | N/A | 2,000 pcs/reel |
| 1812 | 4.6 | 3.2 | $T \leq 2.20$ | N/A | 1,000 pcs/reel |
| | | | $T > 2.20$ | N/A | 700 pcs/reel |
| 1825 | 4.6 | 6.35 | $T \leq 2.20$ | N/A | 700 pcs/reel |
| | | | $T > 2.20$ | N/A | 400 pcs/reel |
| 2208 | 5.7 | 2.0 | $T \leq 2.20$ | N/A | 1,000 pcs/reel |
| 2211 | 5.7 | 2.8 | $T \leq 2.20$ | N/A | 1,000 pcs/reel |
| | | | $T > 2.20$ | N/A | 700 pcs/reel |
| 2220 | 5.7 | 5.0 | $T \leq 2.20$ | N/A | 1,000 pcs/reel |
| | | | $T > 2.20$ | N/A | 700 pcs/reel |
| 2225 | 5.7 | 6.35 | $T \leq 2.20$ | N/A | 700 pcs/reel |
| | | | $T > 2.20$ | N/A | 400 pcs/reel |

NA : Not Available

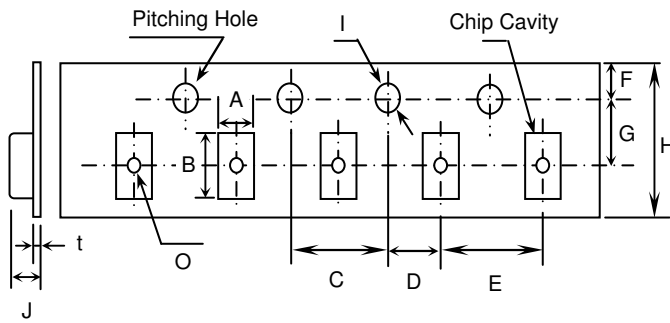
● Tape Dimensions and Specifications

Paper Tape



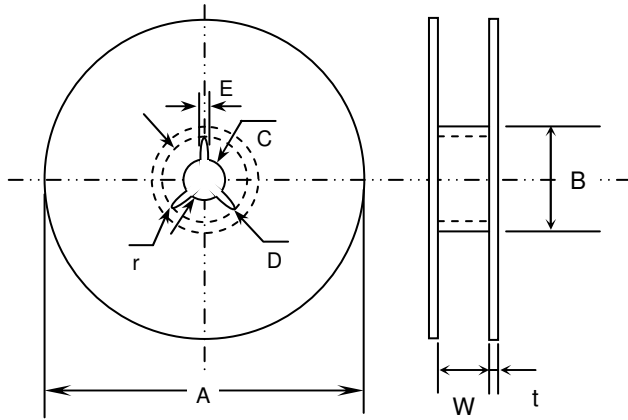
| | 0201 | 0402 | 0603 | 0805 | 1206 | 1210 |
|---|-------------|----------|----------|----------|----------|----------|
| A | 0.37±0.1 | 0.61±0.1 | 1.10±0.2 | 1.50±0.2 | 1.90±0.2 | 2.90±0.2 |
| B | 0.67±0.1 | 1.20±0.1 | 1.90±0.2 | 2.30±0.2 | 3.50±0.2 | 3.60±0.2 |
| C | 4.00±0.1 | --- | | | | |
| D | 2.0±0.05 | --- | | | | |
| E | 2.00±0.1 | --- | 4.00±0.1 | --- | | |
| F | 1.75±0.1 | --- | | | | |
| G | 3.5±0.05 | --- | | | | |
| H | 8.00±0.3 | --- | | | | |
| I | ∅1.5+0.1/-0 | --- | | | | |
| t | 1.1 max. | --- | | | | |

Embossed Tape



| | 0805 | 1206 | 1210 | 1808 | 2208 | 1812 | 1825 | 2211 | 2220 | 2225 |
|---|-------------|---------|---------|------------|---------|---------|---------|---------|---------|---------|
| A | 1.5±0.1 | 1.9±0.2 | 2.9±0.2 | 2.5±0.2 | 2.5±0.2 | 3.6±0.2 | 6.9±0.2 | 3.2±0.2 | 5.4±0.2 | 6.9±0.2 |
| B | 2.3±0.2 | 3.5±0.2 | 3.6±0.2 | 4.9±0.2 | 6.1±0.2 | 4.9±0.2 | 4.9±0.2 | 6.1±0.2 | 6.1±0.2 | 6.1±0.2 |
| C | 4.0±0.1 | → | | | | | | | | |
| D | 2.0±0.05 | → | | | | | | | | |
| E | 4.0±0.1 | → | | | | 8.0±0.1 | → | | | |
| F | 1.75±0.1 | → | | | | | | | | |
| G | 3.5±0.05 | → | | 5.5±0.05 | → | | | | | |
| H | 8.0±0.3 | → | | 12.0 +3/-0 | → | | | | | |
| I | ∅1.5+0.1/-0 | → | | | | | | | | |
| J | 3.0 max. | → | | 4.0 max. | → | | | | | |
| t | 0.3 max. | → | | | | | | | | |
| O | 0.15 min. | → | | | | | | | | |

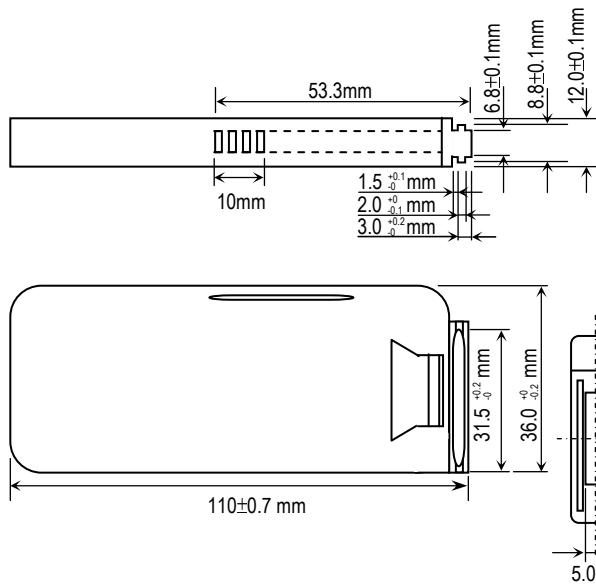
Reel Dimensions



Unit : mm

| | 0402 to 1210 | 1808 to 2220 |
|---|--------------|--------------|
| A | ϕ 382 max. | ϕ 178±0.2 |
| B | ϕ 50 min. | ϕ 60±0.2 |
| C | ϕ 13±0.5 | ϕ 13±0.5 |
| D | ϕ 21±0.8 | ϕ 21±0.8 |
| E | ϕ 2.0±0.5 | ϕ 2.0±0.5 |
| W | 10±0.15 | 13±0.3 |
| t | 2.0±0.5 | 17±1.4 |
| r | 1.0 | 1.0 |

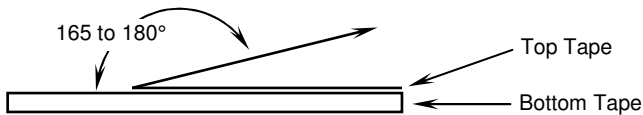
Bulk Cassette Packing



Unit : mm

| Cassette Packing | 0402 | 0603 | 2012 |
|------------------|-----------|-----------|-----------|
| Chip Size | 0402 | 0603 | 2012 |
| Length | 1.00±0.05 | 1.60±0.10 | 2.00±0.20 |
| Width | 0.50±0.05 | 0.80±0.10 | 1.25±0.20 |
| Thickness | 0.50±0.05 | 0.80±0.10 | 0.60±0.10 |
| Quantity | 50,000pcs | 15,000pcs | 10,000pcs |

● Cover Tape Peel Force



The peel force of cover tape is 5 to 70 grams in the direction of arrow.

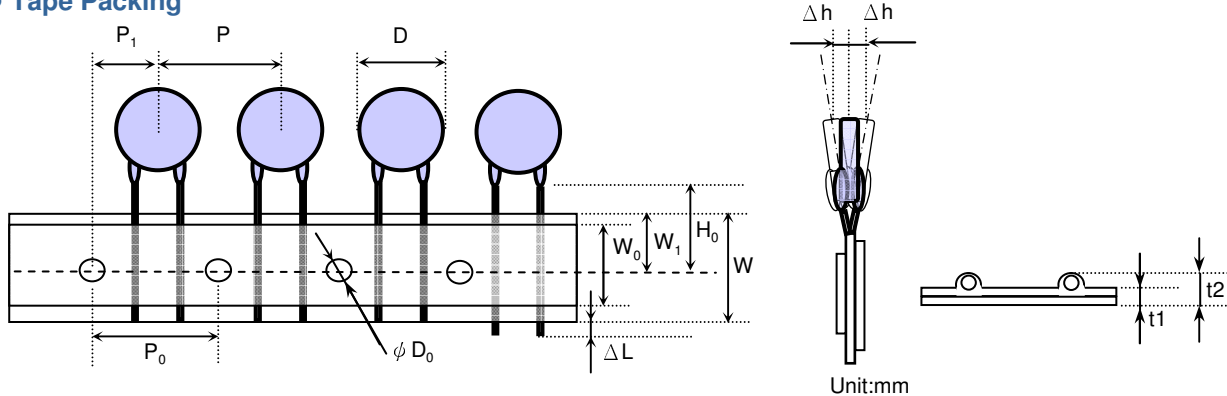
◆ Ceramic Disc Capacitors Packing Information (SDC,HDC Series)

● Bulk Packing

Standard packing 300pcs,500pcs&1,000pcs/pack, others according to customers' request.

| Bulk Package | Lead Code | Qt'y/One Pack |
|--------------|-------------|-----------------|
| HDC Series | H,C,S,M / L | 1,000 / 500 pcs |
| SDC Series | H,C,S,M / L | 500 / 250 pcs |

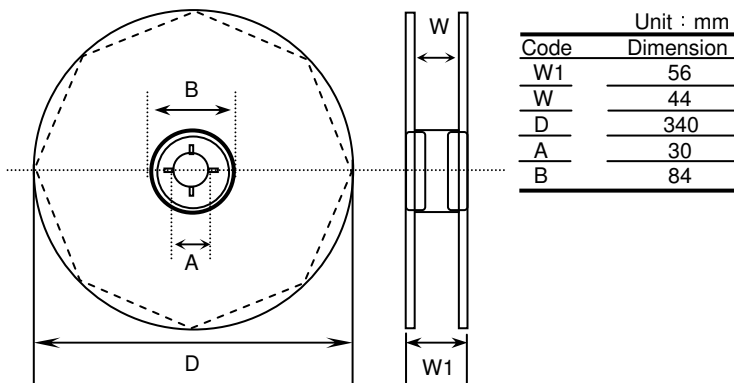
● Tape Packing



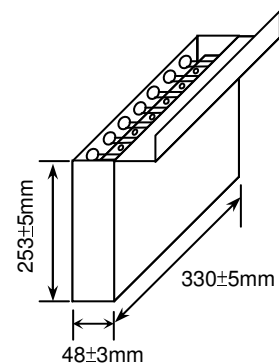
| | Symbol | Lead Space | | |
|----------------------------------|-----------------|------------|--------|--------|
| | | 5.00mm | 6.35mm | 7.50mm |
| Pitch of component | P | 12.7±1.0 | | |
| Feed Hole Pitch | P ₀ | 12.7±0.3 | | |
| Hole center to component center | P ₁ | 6.35±1.3 | | |
| Body diameter | D | 11.0 max | | |
| Hold position | W ₁ | 8+1.0-0.5 | | |
| Hold tape width | W ₀ | 10 min | | |
| Hold position | W ₁ | 9±0.5 | | |
| Lead wire clinch | H ₀ | 16+1.5-0.5 | | |
| Total tape thickness | t ₁ | 0.6±0.3 | | |
| Total thickness, tape& lead wire | t ₂ | 1.5 max | | |
| Feed hold diameter | φD ₀ | 4.0±0.2 | | |
| Deviation across tape | Δh | 2.0 max | | |
| Protrusion Length | ΔL | 1.0 max | | |

● Packing Dimensions

Reel Dimensions :



Ammo Dimensions :



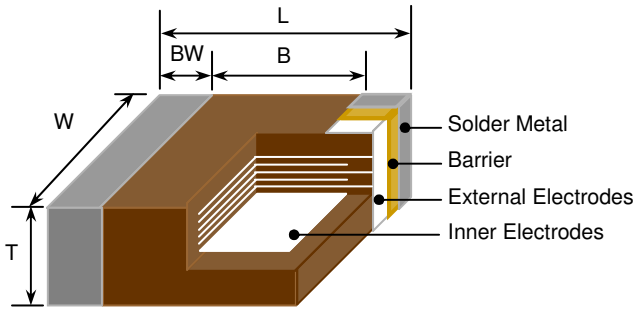
● Packing Quantity

| Package | Unit:mm | |
|------------------|--------------------|---------------------|
| | One Box / One Reel | Carton Box |
| Taping Reel Pack | 1,500 / 2,000 pcs | 15,000 / 20,000 pcs |
| Ammo Box Pack | 1,000 / 1,500 pcs | 10,000 / 15,000 pcs |

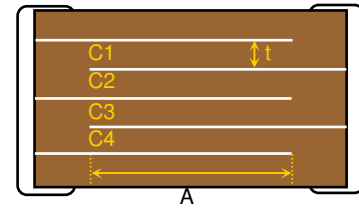
The Multilayer Ceramic Chip of Capacitors supplied in bulk, cassette or taped & reel package are ideally suitable for thick-film Hybrid circuits and automatic surface mounting on printed circuit boards.

Mainly use in electric circuit for by-pass, filtering and smoothing circuit.

◆ Shapes and Dimensions



Cross Section



Dimensions(mm) [inches]

| EIA style | L | W | Tmax. | BWmin | Bmin. |
|-----------|--------------------------|--------------------------|----------------|----------------|----------------|
| 0201 | 0.60±0.03 [.024±.002] | 0.30±0.03 [.011±.002] | 0.33 [.013] | 0.10 [.004] | 0.20 [.008] |
| 0402 | 1.00±0.05 [.039±.002] | 0.50±0.05 [.020±.002] | 0.55 [.022] | 0.15 [.006] | 0.30 [.012] |
| 0603 | 1.60±0.10 [.063±.004] | 0.80±0.10 [.031±.004] | 0.95 [.037] | 0.15 [.006] | 0.40 [.016] |
| 0805 | 2.00±0.20 [.079±.008] | 1.25±0.20 [.049±.008] | 1.45 [.057] | 0.20 [.008] | 0.70 [.028] |
| 1206 | 3.20±0.30 [.126±.012] | 1.60±0.20 [.063±.008] | 1.80 [.071] | 0.30 [.012] | 1.50 [.059] |
| 1210 | 3.20±0.30 [.126±.012] | 2.50±0.20 [.098±.008] | 2.60 [.102] | 0.30 [.012] | 1.60 [.063] |
| 1808 | 4.60±0.30 [.181±.012] | 2.00±0.20 [.079±.008] | 2.20 [.087] | 0.30 [.012] | 2.50 [.098] |
| 1812 | 4.60±0.30 [.181±.012] | 3.20±0.30 [.126±.012] | 3.00 [.118] | 0.30 [.012] | 2.50 [.098] |
| 1825 | 4.60±0.30 [.181±.012] | 6.35±0.40 [.250±.016] | 2.60 [.102] | 0.30 [.012] | 2.50 [.098] |
| 2208 | 5.70±0.40 [.220±.016] | 2.00±0.20 [.197±.008] | 2.20 [.087] | 0.30 [.012] | 3.50 [.137] |
| 2211 | 5.70±0.40 [.220±.016] | 2.80±0.40 [.110±.016] | 3.00 [.118] | 0.30 [.012] | 3.50 [.137] |
| 2220 | 5.70±0.40 [.220±.016] | 5.00±0.40 [.197±.016] | 3.00 [.118] | 0.30 [.012] | 3.50 [.137] |
| 2225 | 5.70±0.40 [.220±.016] | 6.35±0.40 [.250±.016] | 3.00 [.118] | 0.30 [.012] | 3.50 [.137] |

$$C = \epsilon_0 \cdot \epsilon \frac{A \cdot N}{t}$$

- C : Capacitance
- ϵ_0 : Dielectric constant in the air
- ϵ : Proportional dielectric constant
- A : Overlap Area
- t : Dielectric Thickness
- N : Layers

◆ Nominal Capacitance and Tolerance

| Class | EIA Symbol | Tolerance | Nominal Capacitor |
|-------|------------|----------------------|-------------------|
| I | NP0 | J (±5%),K (±10%) | E-12 ,E-24 Series |
| II | X7R | K(±10%), M(±20%) | E-3,E-6 Series |
| | X7E | K(±10%), M(±20%) | E-3,E-6 Series |
| | X5R | K(±10%), M(±20%) | E-3,E-6 Series |
| | Y5U | M(±20%),Z(+80/-20 %) | E-3 Series |
| | Y5V | M(±20%),Z(+80/-20 %) | E-3 Series |
| | Z5U | M(±20%),Z(+80/-20 %) | E-3 Series |

| 2. E Series (Standard Number) | Application Capacitance | | | | | | | | | | | |
|-------------------------------|-------------------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|
| E-Series | | | | | | | | | | | | |
| E-3 | <u>1.0</u> | | | <u>2.2</u> | | | <u>4.7</u> | | | | | |
| E-6 | <u>1.0</u> | <u>1.5</u> | <u>2.2</u> | <u>3.3</u> | <u>4.7</u> | <u>6.8</u> | | | | | | |
| E12 | <u>1.0</u> | <u>1.2</u> | <u>1.5</u> | <u>1.8</u> | <u>2.2</u> | <u>2.7</u> | <u>3.3</u> | <u>3.9</u> | <u>4.7</u> | <u>5.6</u> | <u>6.8</u> | <u>8.2</u> |
| E24 | <u>1.0</u> | <u>1.2</u> | <u>1.5</u> | <u>1.8</u> | <u>2.2</u> | <u>2.7</u> | <u>3.3</u> | <u>3.9</u> | <u>4.7</u> | <u>5.6</u> | <u>6.8</u> | <u>8.2</u> |
| | <u>1.1</u> | <u>1.3</u> | <u>1.6</u> | <u>2.0</u> | <u>2.4</u> | <u>3.0</u> | <u>3.6</u> | <u>4.3</u> | <u>5.1</u> | <u>6.2</u> | <u>7.5</u> | <u>9.1</u> |

◆ EIA Designations

For Class I Dielectrics

| Coefficient of capacitance (ppm/ °C) | | Multiplier applicable to column | | Tolerance of temp. coeff.(ppm/ °C) | |
|--------------------------------------|---|---------------------------------|---|------------------------------------|---|
| 0.0 | C | -1.0 | 0 | 30 | G |
| 1.0 | M | -10 | 1 | 60 | H |
| 1.5 | P | -100 | 2 | 120 | J |
| 2.2 | R | -1000 | 3 | 250 | K |
| 3.3 | S | -10000 | 4 | 500 | L |
| 4.7 | T | +1 | 5 | 1000 | M |
| 7.5 | U | +10 | 6 | 2500 | N |
| | | +100 | 7 | | |
| | | +1000 | 8 | | |
| | | +10000 | 9 | | |

Ex.: C0G Negative 0±30ppm/ °C
 U2J Negative 750±120ppm/ °C

For Class II Dielectrics

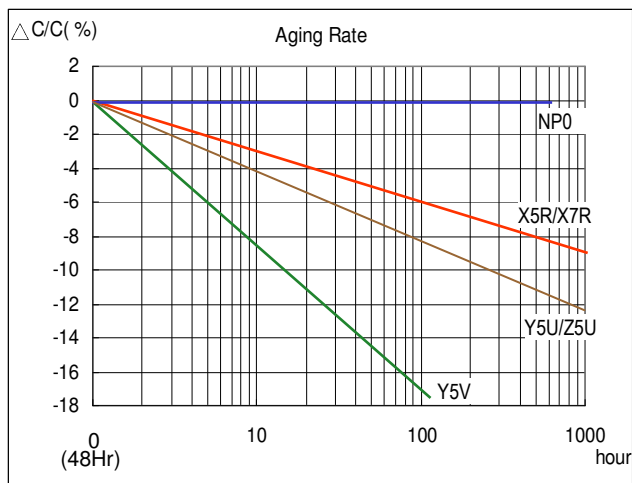
| Low Temp. Symbol | | High Temp. Symbol | | Max. %ΔC Symbol | |
|------------------|---|-------------------|---|-----------------|---|
| -55°C | X | +45°C | 3 | ±1.0% | A |
| -30°C | Y | +65°C | 4 | ±1.2% | B |
| +10°C | Z | +85°C | 5 | ±2.2% | C |
| | | +105°C | 6 | ±3.3% | D |
| | | +125°C | 7 | ±4.7% | E |
| | | +150 °C | 8 | ±7.5% | F |
| | | +200 °C | 9 | ±10.0% | P |
| | | | | ±15.0% | R |
| | | | | ±22.0% | S |
| | | | | +22% /-33% | T |
| | | | | +22% /-56% | U |
| | | | | +22% /-82% | V |

Ex.: X7R -55 ~ +125 °C ±15%
 Y5V -30 ~ +85 °C +22%/-82%

◆ Operating Temperature Range

| Class | EIA Symbol | Dielectric Code | Temperature Range(°C) | Capacitance Change | Reference Temperature |
|-------|------------|-----------------|-----------------------|--------------------|-----------------------|
| I | NP0 | N | -55°C ~ +125 °C | 0±30 ppm/°C | 25°C |
| | SL | L | -25°C ~ +85 °C | +350/-1000 ppm/°C | 25°C |
| II | X7R | X | -55°C ~ +125°C | ±15% | 25°C |
| | X7E | C | -55°C ~ +125°C | ±4.7% | 25°C |
| | X5R | B | -55°C ~ +85°C | ±15% | 25°C |
| | Y5V | Y | -30°C ~ +85°C | +22/-82 % | 25°C |
| | Y5U | E | -30°C ~ +85°C | +22/-56 % | 25°C |
| | Z5U | Z | +10°C ~ +85°C | +22/-56 % | 25°C |

◆ Dielectric Material – Aging Rate



Aging Rate

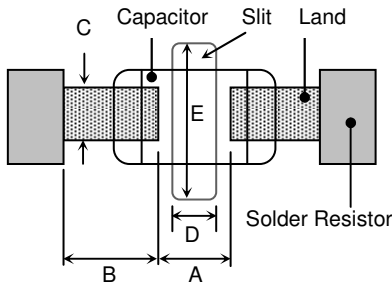
- NP0: 0
- X7R/X5R : 1 ~ 4 % /decade
- Y5U/Z5U : 4~6% / decate
- Y5V : 6~10 % /decade

After performing De-Aging at 150±5 °C for 30 minutes and placement at room temperature for 48 hours.

◆ Construction of Board Pattern

Improper circuit layout and pad/land size may cause poor solder joints between the component and the PC board. Insufficient solder may create a weak joint, and excessive solder may increase the potential for mechanical or thermal cracks in the ceramic capacitor. Therefore we recommend the solder pad/land size to be as shown in the following table:

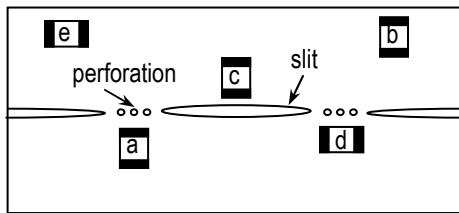
1. Size and recommend land dimensions for reflow soldering



| EIA Code | Chip (mm) | | Land (mm) | | | | |
|----------|-----------|------|-----------|---------|---------|---------|---------|
| | L | W | A | B | C | D | E |
| 0201 | 0.60 | 0.30 | 0.2~0.3 | 0.2~0.4 | 0.2~0.4 | -- | -- |
| 0402 | 1.00 | 0.50 | 0.3~0.5 | 0.3~0.5 | 0.4~0.6 | -- | -- |
| 0603 | 1.60 | 0.80 | 0.4~0.6 | 0.6~0.7 | 0.6~0.8 | -- | -- |
| 0805 | 2.00 | 1.25 | 0.7~0.9 | 0.6~0.8 | 0.8~1.1 | -- | -- |
| 1206 | 3.20 | 1.60 | 2.2~2.4 | 0.8~0.9 | 1.0~1.4 | 1.0~2.0 | 3.2~3.7 |
| 1210 | 3.20 | 2.50 | 2.2~2.4 | 1.0~1.2 | 1.8~2.3 | 1.0~2.0 | 4.1~4.6 |
| 1808 | 4.60 | 2.00 | 2.8~3.4 | 1.8~2.0 | 1.5~1.8 | 1.0~2.8 | 3.6~4.1 |
| 1812 | 4.60 | 3.20 | 2.8~3.4 | 1.8~2.0 | 2.3~3.0 | 1.0~2.8 | 4.8~5.3 |
| 1825 | 4.60 | 6.35 | 2.8~3.4 | 1.8~2.0 | 5.1~5.8 | 1.0~4.0 | 7.1~8.3 |
| 2208 | 5.70 | 2.00 | 4.0~4.6 | 2.0~2.2 | 1.5~1.8 | 1.0~4.0 | 3.6~4.1 |
| 2211 | 5.70 | 2.80 | 4.0~4.6 | 2.0~2.2 | 2.0~2.6 | 1.0~4.0 | 4.4~4.9 |
| 2220 | 5.70 | 5.00 | 4.0~4.6 | 2.0~2.2 | 3.5~4.8 | 1.0~4.0 | 6.6~7.1 |
| 2225 | 5.70 | 6.35 | 4.0~4.6 | 2.0~2.2 | 5.1~5.8 | 1.0~4.0 | 7.1~8.3 |

2. Mechanical strength varies according to location of chip capacitors on the P.C. board.

Design the layout of components on the PC board in such a way to minimize the stress imposed on the components, upon flexure of the boards in depanelization or other processes.

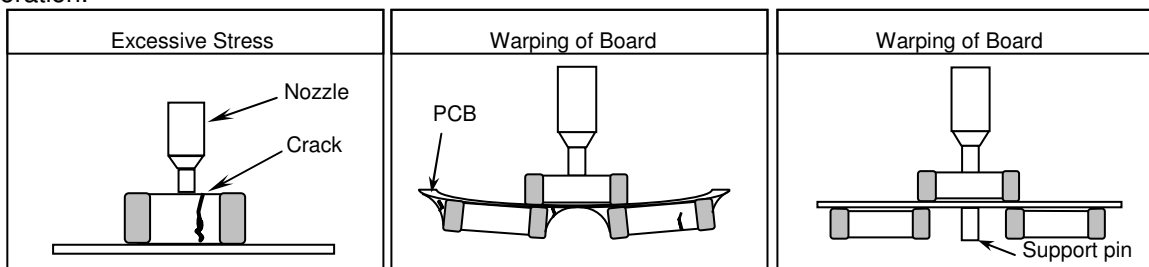


Component layout close to the edge of the board or the “depanelization line” is not recommended. Susceptibility to stress is in the order of: a>b>c and d>e

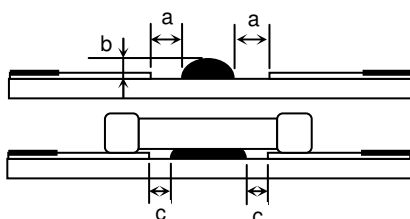
◆ Mounting

1. Sometimes cracking can be caused by the impact load of the pick and place nozzle.

In the pick and place operation, if the low dead point is too low, excessive stress is applied to component. This may cause cracks in the ceramic capacitor, therefore it is required to move the low dead point of the nozzle to the higher level to minimize the board warpage and stress on the components. Nozzle pressure should be adjusted to N to 3N (static load) during the pick and place operation.



2. Amount of Adhesive

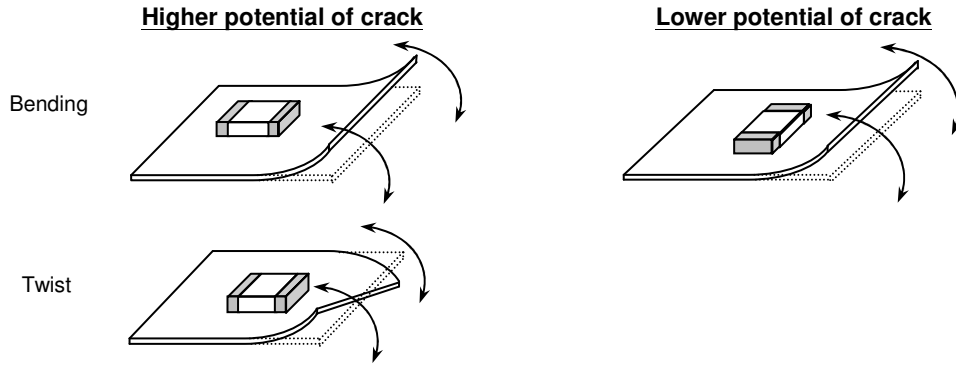


Example : 0805 & 1206

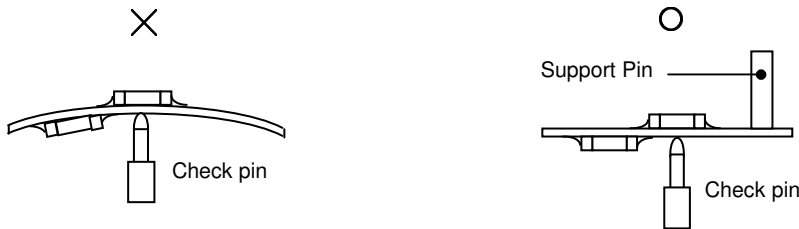
| | |
|---|------------------------------|
| a | 0.2mm min. |
| b | 70 ~ 100 μm |
| c | Do not touch the solder land |

◆ Handling after chip mounted

1. Proper handling of the PCB is recommended since excessive bending and twisting of the PC board may induce mechanical stress and cause internal cracking of the capacitor.

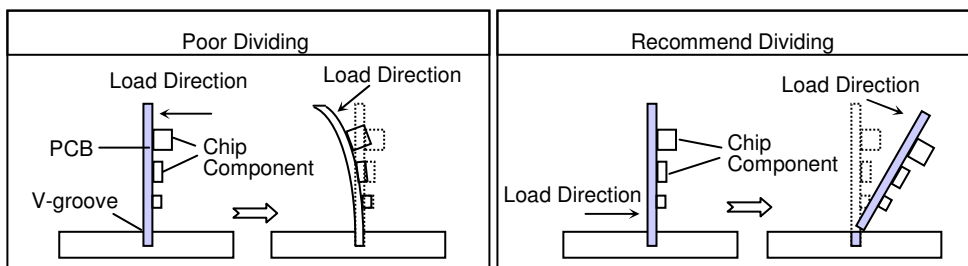
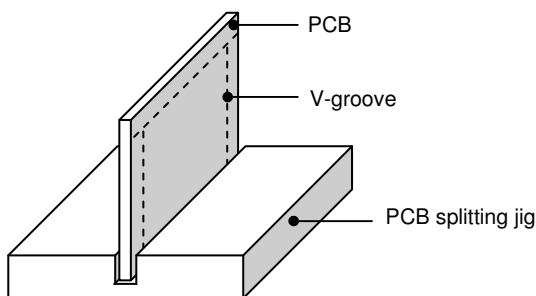


2. There is a potential of cracking if board is warped due to excessive load from the check pin



3. Examples of PCB de-panelization jigs:

The outline of PCB breaking jig is shown below. It is recommended when dividing or breaking PCB that they are held near the jig where no bending will occur, this way there will be no compressive stress is applied to the capacitors on the PCB. Do not hold the PCB at a position which is far away from the jig, tensile stress to the capacitors may cause them to crack.

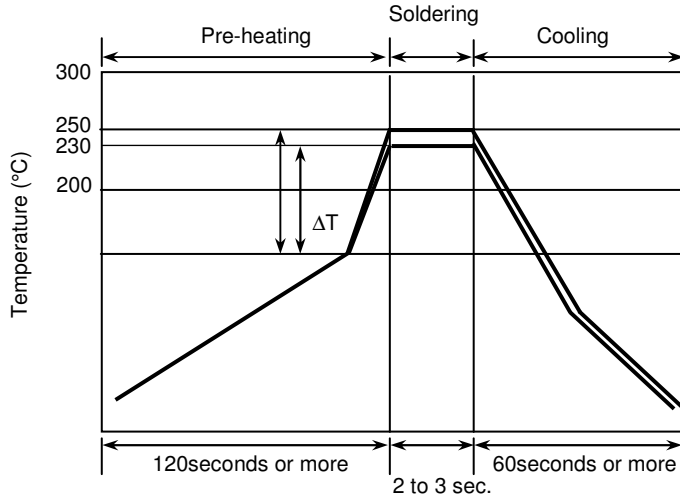


◆Soldering

1. Wave Soldering

Most components are wave soldered with solder at 230 to 250°C. Adequate care must be taken to prevent the potential of thermal cracks in the ceramic capacitors. Refer to the soldering methods below for optimum soldering benefits.

Recommend flow soldering temperature Profile



| Soldering Method | Change in Temp.(°C) |
|------------------|---------------------|
| 1206 and Under | ΔT ≤100~130°C max. |

To optimize the result of soldering, proper preheating is essential:

- 1) Preheat temperature is too low
 - a. Flux flows to easily
 - b. Possibility of thermal cracks
- 2) Preheat temperature is too high
 - a. Flux deteriorates even when oxide film is removed
 - b. Causes warping of circuit board
 - c. Loss of reliability in chip and other components

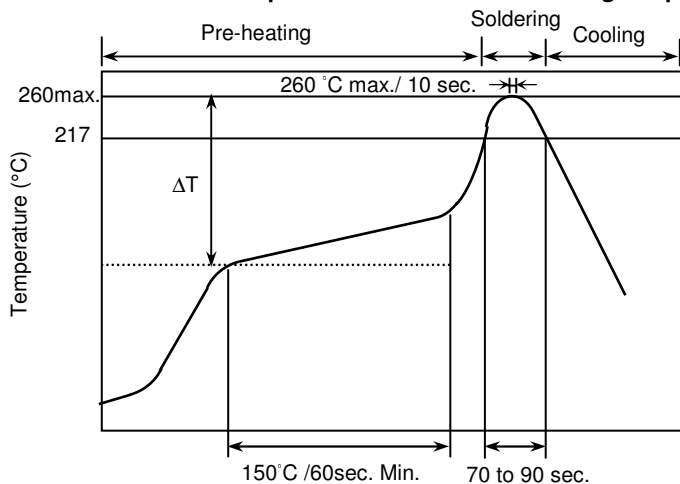
Cooling Condition:

Natural cooling in air is recommended. Forced cooling should be avoided, however if the chips are dipped into a solvent for cleaning, the temperature difference (ΔT) between the solvent and the chips must be less than 100°C.

2. Reflow Soldering

Preheat to the reflow temperature is recommended to decrease the potential of thermal cracking in the components. The recommended heating rate depends on the size of component, however it should not exceed 3°C/Sec.

Recommend reflow profile for Lead-Free soldering temperature Profile (MIL-STD-202G #210F)

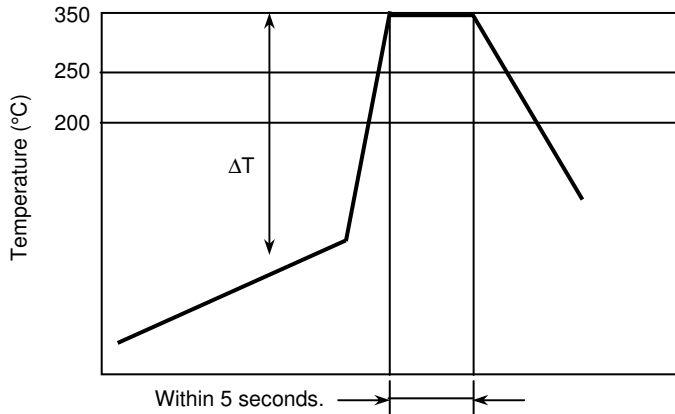


| Soldering Method | Change in Temp.(°C) |
|------------------|---------------------|
| 1206 and Under | ΔT ≤190°C |
| 1210 and Over | ΔT ≤130°C |

※ The cycles of soldering : Twice (Max.)

3. Hand Soldering

Sudden temperature changes in ceramic capacitors will result in a temperature gradient within the component and therefore may cause internal thermal cracking. In general a hand soldering method is not recommended unless proper preheating and handling practices have been taken. Care must also be taken not to touch the ceramic body of the capacitor with the tip of solder Iron. The soldering iron tip should always be placed on to the solder pad.



| Soldering Method | Change in Temp.(°C) |
|------------------|-------------------------------------|
| 1206 and Under | $\Delta T \leq 150^{\circ}\text{C}$ |
| 1210 and Over | $\Delta T \leq 130^{\circ}\text{C}$ |

How to Solder Repair by Solder Iron

1) Selection of the soldering iron tip

The required temperature of soldering iron for any type of repair depends on the type of the tip, the substrate material, and the solder land size.

2) recommended solder iron condition

- a.) Preheat the substrate to (60°C to 120°C) on a hot plate. Note that due to the heat loss, the actual setting of the hot plate may have to be higher. (For example 100°C to 150°C)
- b.) Soldering iron power shall not exceed 30 W.
- c.) Soldering iron tip diameter shall not exceed 3mm.
- d.) Temperature of the iron tip shall not exceed 350°C, and the process should be finished within 5 seconds. **(refer to MIL-STD-202G)**
- e.) Do not touch the ceramic body with the tip of solder iron. Direct contact of the soldering iron tip to ceramic body may cause thermal cracks.
- f.) After soldering operation, let the products should be allowed to cool down naturally in air.

◆Storage

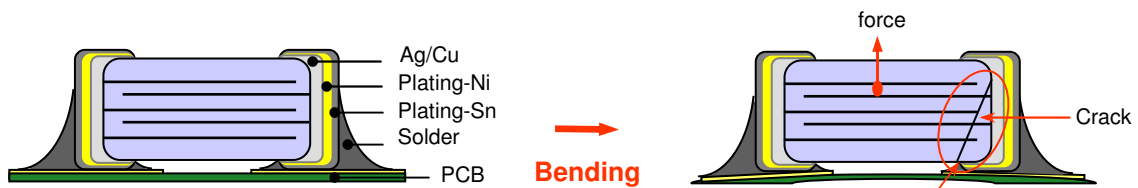
Store the capacitors where the temperature and relative humidity do not exceed 40°C and 70%RH. We recommend that the capacitors be used within 12 months from the date of manufacturing. Store the products in the original package and do not open the outer polyethylene bag until just before usage. If it is open, seal it as soon as possible or keep it in a desiccant with a desiccation agent.

Internal MLCC cracking can result in serious failure modes. If ceramic capacitors are subjected to severe mechanical stress, a bending crack may occur. This crack can run through two or more electrodes of opposing polarity and result in a short circuit. Typical bending cracks are shown below. In the worst case scenario, these short circuits may lead to the MLCC overheating and catastrophic failure.

Super Term Advantages

- “Flexible” Termination Layer incorporated
- Reduce Cracking due to Mechanical Stress

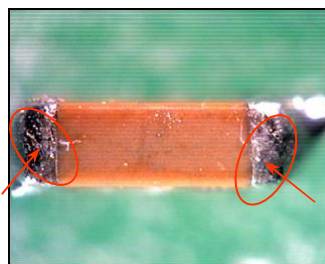
Typical Applications are power circuit input and output filtering, smoothing...



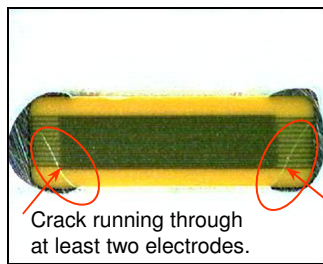
Standard termination construction may result in cracking during PCB bending, vibration, Depanelizing, etc.

Actual Examples:

Failure Mode Type 1



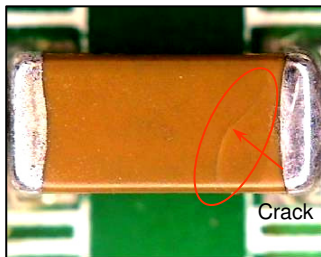
Surface View



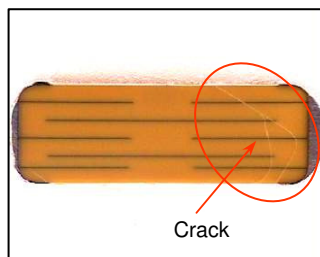
Cross Section View

The failure mode results from PCB bending forces. These cracks may not be visible on the MLCC surface. Cross sectional analysis is required to determine these internal cracks.

Failure Mode Type 2 (wetting greater than 2/3 of thickness)



Top View

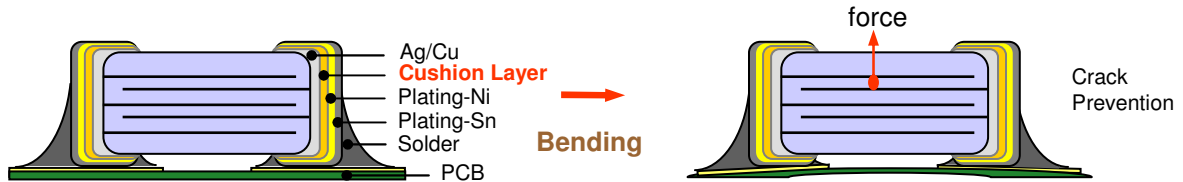


Cross Section View

MLCC cracking frequently occurs during the circuit board depanelizing process. The root cause is knife (blade) vibration during the process.

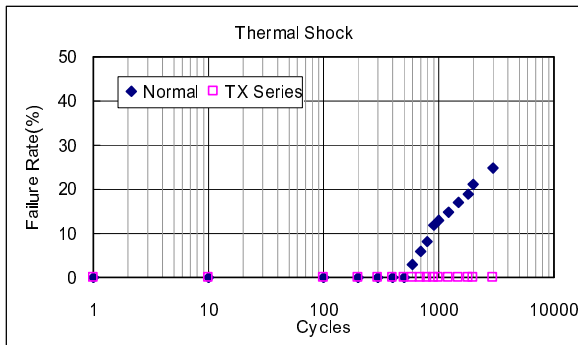
Holy Stone has developed the “**Super Term**” Series (TX suffix in the part number), which incorporates a “cushion layer” in the termination structure. This construction effectively absorbs external forces, reduces the incidence of cracking and improves overall product reliability. Super Term product applications include: high temperature automotive, power circuits and other critical end products with extreme processing conditions.

TX Product



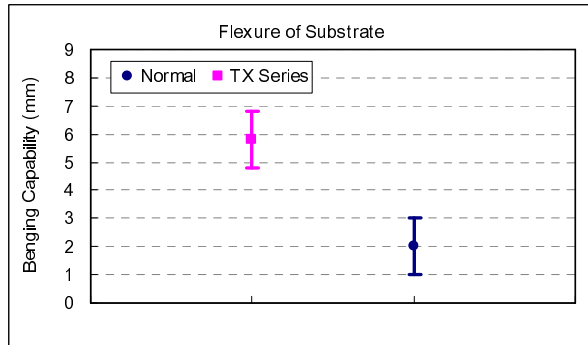
Reliability/Durability Comparison

(a) Thermal Shock Comparison (0805/X7R)

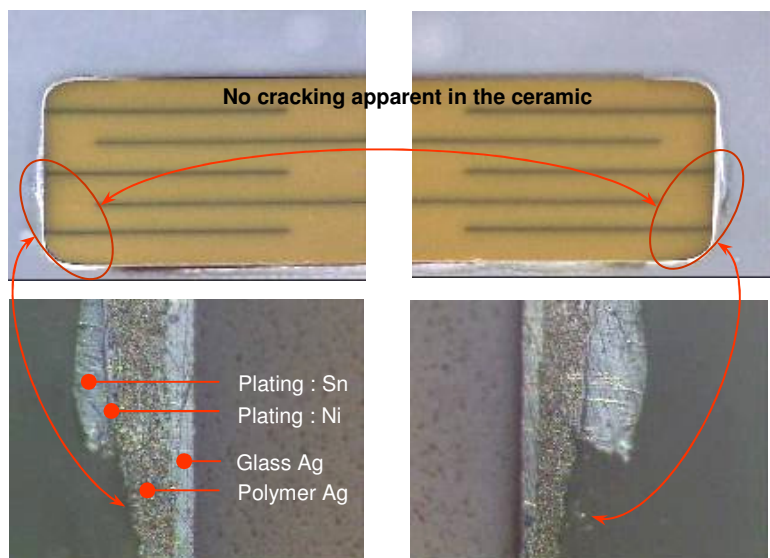
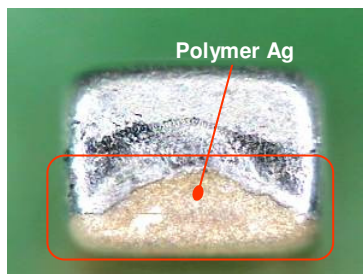


Thermal shock test on standard termination results in inception of failure at 500 cycles. Super Term TX Series reliability improves to over 3000 cycles.

(b) Substrate Flexure Comparison (0805/X7R)



Bending test on Super Term shows an improvement of about 5.0 mm bend vs. an average of about 2.0 mm. for standard termination.

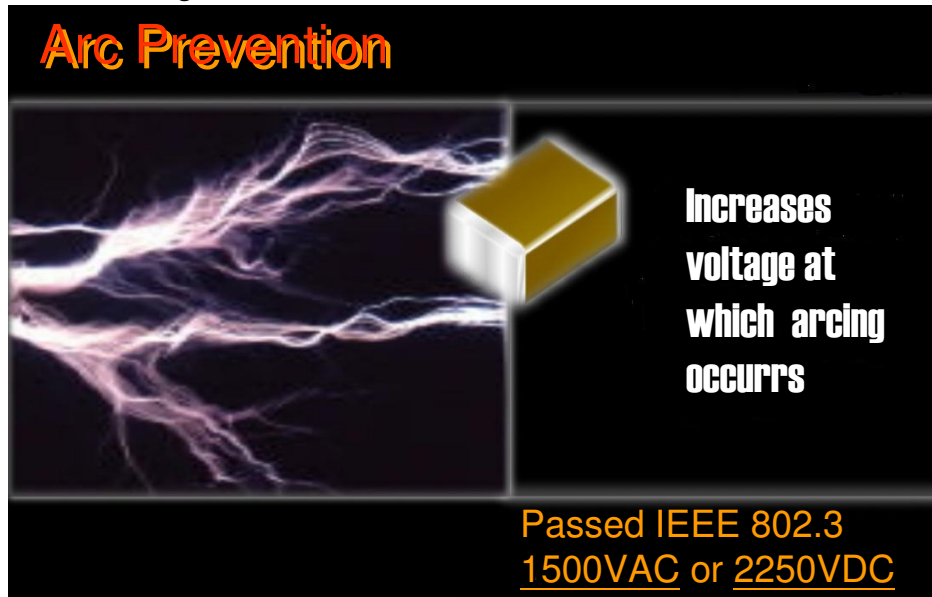


During destructive bending test, the PCB is subjected to bending until capacitor failure. With Super Term there is no cracking damage in the ceramic. Super Term effectively prevents ceramic body cracking during extreme mechanical stress as simulated by this test.

Super Term failures resulting from destructive bending test tend to occur in the OPEN mode and not short circuit mode typical of standard termination failures. The Super Term cushion layer material is a “polymer silver” material and can be seen in the above photo.

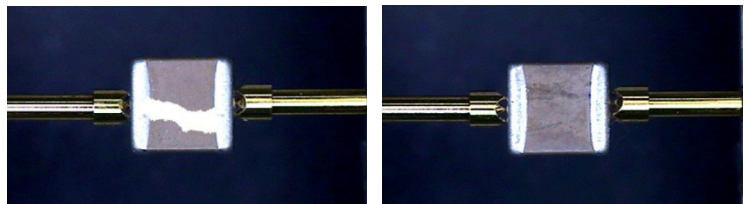
MLCC Arc Prevention – for Hi-Pot Testing

Due to the open and porous nature of the surface of the X7R dielectric, moisture and/or dirt which will have a lower resistance than the dielectric grains, can become entrapped in the surface. Dirt can also include any flux residues as a result of the soldering process. This dirt/flux as well as becoming entrapped into the surface will, in itself, attract additional moisture onto the surface thus reducing the surface resistance and the voltage at which arcing occurs. Surface arcing or flashover at worst can cause equipment failure during isolation testing and, in addition, will leave a carbon track on the surface which can lead to eventual failure of the capacitor.



Typical Applications for telecommunication devices(IEEE802.3) in LAN interface, Ballast...

Holy Stone has developed an Arc Prevention coating process that coats the surface of the dielectric without encroaching onto the termination material. This coating makes the surface of the dielectric non porous and prevents moisture and dirt becoming trapped thus reducing the surface resistance and the arcing voltage of the capacitor. It has been shown that the arcing voltage can be increased by up to 65% on soldered parts by using the Holy Stone Arc Prevention Coating.



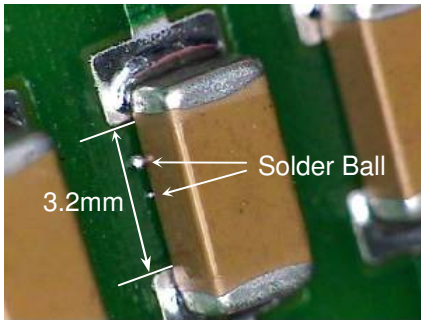
Typical surface arcing on X7R MLCC is from termination-to-termination (shown in polarized light)

NP0 & X7R Material Characteristic Comparison

| Item | NP0 | X7R |
|---------------------|-------------------|-------------------|
| Dielectric Constant | 30 ~ 100 | 2000 ~ 4000 |
| I. Resistance | $>10^{13} \Omega$ | $>10^{11} \Omega$ |
| B.D. Voltage | 70~80 Vdc/um | 40~50 Vdc/um |
| Grain Size | < 500nm | 900nm ~ 1500nm |
| Grain Size (x8000) | | |
| Porosity (x1000) | | |

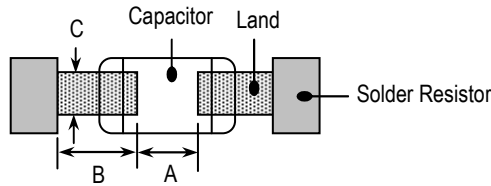
- The different grain shape and size will lead to different grain density after sintering.
- The grain size of NP0 dielectric is smaller than that of X7R resulting a denser and less porous structure.
- Surface porosity will trap dirt, flux and moisture causing the surface resistance to dramatically decrease.
- Low surface resistance will cause the arcing voltage to reduce, possibly leading to failure of the capacitor or equipment during isolation testing.
- Using the Holy Stone Arc Prevention coating effectively makes the surface of X7R dielectric similar to that of NP0.

Creepage distance v.s. Arcing Voltage



Solder balls reduce the creepage distance between terminations and thus reduce the arcing voltage

Recommended Solder Pad Design



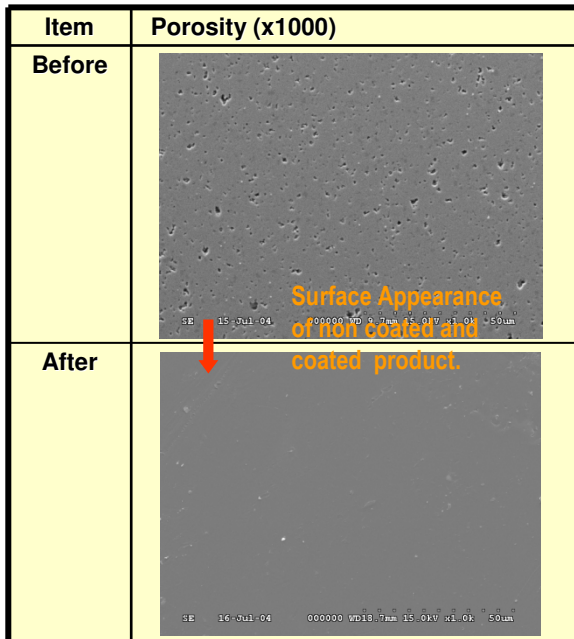
| EIA Code | Chip (mm) | | Land (mm) | | |
|----------|-----------|---------|-----------|---------|---------|
| | L | W | A | B | C |
| 1808 | 4.6±0.3 | 2.0±0.2 | 3.2~3.6 | 1.2~2.4 | 1.5~1.8 |
| 1812 | 4.6±0.3 | 3.2±0.2 | 3.2~3.6 | 1.2~2.4 | 2.3~3.0 |
| 2208 | 5.7±0.4 | 2.0±0.2 | 4.0~4.6 | 1.2~2.4 | 1.5~1.8 |
| 2211 | 5.7±0.4 | 2.0±0.3 | 4.0~4.6 | 1.2~2.4 | 2.0~2.6 |
| 2220 | 5.7±0.4 | 5.0±0.4 | 4.0~4.6 | 1.2~2.4 | 3.5~4.8 |

The distance between terminations also has a direct effect on the arcing voltage. The greater the distance (chip size) the higher this voltage will be. Solder pad design will have a significant effect on the arcing of high voltage capacitors. Above is our recommended solder pad land design for each chip size.

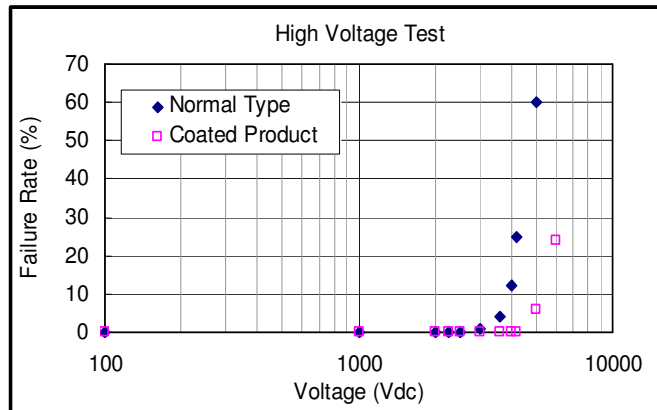
Arc Prevention Coating.

The application of the Arc Prevention coating, which is a high insulation resistance material, coats the surface of the dielectric with a smooth and non porous layer that prevents moisture entering the surface pores and also aids cleaning post soldering. The following diagrams show the difference between coated and non coated X7R components.

Surface Comparison



High Voltage Test Comparison



- The coating reduces the porosity of the X7R surface and provides a smooth surface which help prevent surface arcing.
- The maximum Hi-pot test level will be increased by >1000Vdc after coating with both unsoldered and soldered components.

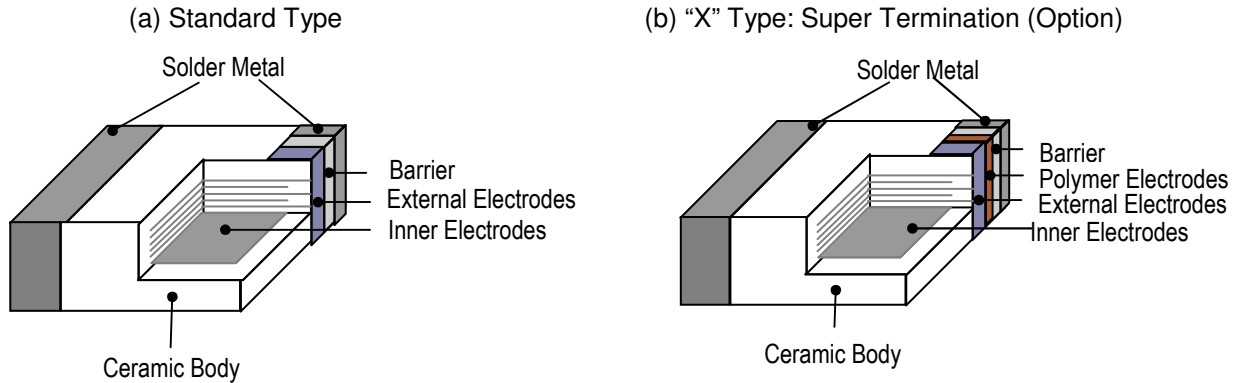
Using the Holy Stone Arc Prevention coating increases the surface arcing voltage of X7R capacitors to almost that of an equivalent NP0 part. However the higher dielectric constant of X7R allows for higher capacitance values to be achieved in any given case size.

The Holy Stone Arc Prevention coating provides a total solution to the harmful effects of surface arcing.

Description:

MLCC , Ceramic Disc Capacitors: NP0, SL, X7R, X5R, X6S, X7E, Y5V and Y5U dielectrics.

Basic Construction/Homogenous Material :



- Multi-layer Ceramic Chip capacitors are Homogenous devices manufactured from materials that cannot be mechanically disjoined into different materials.
- Multi-layer Ceramic Chip products : Standard sizes are fully RoHS Compliant.

| Group | Series | RoHS Status | Cadmium | Hexavalent Chromium | Lead * | Mercury | PBBs | PBDE |
|-----------------------------------|--------------------------------|-------------|-----------|---------------------|---------|---------|--------|-------|
| | | Limit | <0.01% | <0.01% | <0.1% | <0.01% | <0.01% | 0.01% |
| MLC Family Surface mount Products | NCC,HCC,VAC,RFC, HCX, SMC, LCC | Available | √ | √ | √ | √ | √ | √ |
| | TCX,LDC, HTC | Available | √ | √ | √ | √ | √ | √ |
| | HCN,SAC SCC, | Available | √ | √ | √ / √ * | √ | √ | √ |
| | HVC | NP0 | Available | √ | √ | √ / √ * | √ | √ |
| | | X7R | Available | √ | √ | √ / √ * | √ | √ |

* Pb in internal ceramic insert – exempt from RoHS annex 7 to Article 4.1

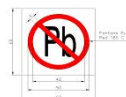
| RoHS Status | Lead-Free Status / MSL level |
|---|---|
| ※ External plating : 100% Matte Sn as Standard. | ※ Pb-free Reflow & Wave Solder compliant, MSL=1 • Reflow : 260°C max recommended. • Wave : 260°C max recommended, Wave & Reflow profile refer to HEC recommended solder profile. |

Part Number Designation:
(Generally no change to P/N, but available as P/N prefix at customer request)

RoHS Compliant : No Change to P/N
Pb-Free : No Change to P/N

Product Marking :
(available at customer request, highlighted or marked on reel and container)

Pb free : Pb free



refer to JEDEC&IPC Std.

ISO Certification

| Plant | Certificated | Date | Organization | Registration No. |
|----------------------------|----------------|--------------|--------------|------------------|
| Taipei HQ/Lung Tan Factory | ISO 9001:2008 | 20,Mar.,2002 | BVQI | TW08098Q |
| Taipei HQ/Lung Tan Factory | ISO 14001:2004 | 29,May,2003 | BVQI | 131145 |

ISO 9001:2008



ISO 14001:2004





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