

Surface Mount Multilayer Ceramic Chip Capacitors Prohibit Surface Arc-Over in High-Voltage Applications



HV Arc Guard Capacitor with no Surface Arc-over



Standard Capacitor with Surface Arc-over

FEATURES

For this Worldwide Patented Technology

- Specialty: high-voltage applications
- MLCC that protects against surface arc-over
- Excellent high-voltage performance
- Higher capacitances and smaller case sizes that save board space, as compared to standard high-voltage MLCCs
- Voltage breakdowns as much as twice that of competitors' products
- X7R dielectric available with polymer termination for increase resistance to board flex cracking
- Wet build process
- Reliable Noble Metal Electrode (NME) system
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912



RoHS
COMPLIANT
HALOGEN
FREE
GREEN
[5-2008]
Available

APPLICATIONS

- Power supplies
- DC/DC converters (buck and boost)
- Voltage multipliers for flyback converters
- For lighting and other AC applications please contact: mlcc@vishay.com

ELECTRICAL SPECIFICATIONS

| COG (NP0) | | | | |
|--|------------------------------|------------------------|---|------------------------|
| <p>GENERAL SPECIFICATION</p> <p>Note Electrical characteristics at +25 °C unless otherwise specified</p> <p>Operating Temperature: -55 °C to +125 °C</p> <p>Capacitance Range: 10 pF to 8.2 nF</p> <p>Voltage Range: 1000 V_{DC} to 2500 V_{DC}</p> <p>Temperature Coefficient of Capacitance (TCC): 0 ppm/°C ± 30 ppm/°C from -55 °C to +125 °C</p> <p>Dissipation Factor (DF): 0.1 % maximum at 1.0 V_{RMS} and 1 MHz for values ≤ 1000 pF 0.1 % maximum at 1.0 V_{RMS} and 1 kHz for values > 1000 pF</p> <p>Insulating Resistance: at +25 °C 100 000 MΩ min. or 1000 ΩF whichever is less at +125 °C 10 000 MΩ min. or 100 ΩF whichever is less</p> <p>Aging Rate: 0 % maximum per decade</p> <p>Dielectric Strength Test: performed per method 103 of EIA 198-2-E. Applied test voltages</p> <table> <tr> <td>1000 V_{DC}-rated:</td> <td>150 % of rated voltage</td> </tr> <tr> <td>1500 V_{DC}, 2500 V_{DC}-rated:</td> <td>120 % of rated voltage</td> </tr> </table> | 1000 V _{DC} -rated: | 150 % of rated voltage | 1500 V _{DC} , 2500 V _{DC} -rated: | 120 % of rated voltage |
| 1000 V _{DC} -rated: | 150 % of rated voltage | | | |
| 1500 V _{DC} , 2500 V _{DC} -rated: | 120 % of rated voltage | | | |

| X7R | | | | | | |
|---|-------------------------------|------------------------|-----------------------------|-----------------------------|--|-----------------------------|
| <p>GENERAL SPECIFICATION</p> <p>Note Electrical characteristics at +25 °C unless otherwise specified</p> <p>Operating Temperature: -55 °C to +125 °C</p> <p>Capacitance Range: 220 pF to 270 nF</p> <p>Voltage Range: 250 V_{DC} to 1000 V_{DC}</p> <p>Temperature Coefficient of Capacitance (TCC): ± 15 % from -55 °C to +125 °C, with 0 V_{DC} applied</p> <p>Dissipation Factor (DF): 2.5 % maximum at 1.0 V_{RMS} and 1 kHz</p> <p>Insulating Resistance: at +25 °C 100 000 MΩ min. or 1000 ΩF whichever is less at +125 °C 10 000 MΩ min. or 100 ΩF whichever is less</p> <p>Aging Rate: 1 % maximum per decade</p> <p>Dielectric Strength Test: performed per method 103 of EIA 198-2-E. Applied test voltages</p> <table> <tr> <td>≤ 250 V_{DC}-rated:</td> <td>200 % of rated voltage</td> </tr> <tr> <td>500 V_{DC}-rated:</td> <td>min. 150 % of rated voltage</td> </tr> <tr> <td>630 V_{DC}, 1000 V_{DC}-rated:</td> <td>min. 120 % of rated voltage</td> </tr> </table> | ≤ 250 V _{DC} -rated: | 200 % of rated voltage | 500 V _{DC} -rated: | min. 150 % of rated voltage | 630 V _{DC} , 1000 V _{DC} -rated: | min. 120 % of rated voltage |
| ≤ 250 V _{DC} -rated: | 200 % of rated voltage | | | | | |
| 500 V _{DC} -rated: | min. 150 % of rated voltage | | | | | |
| 630 V _{DC} , 1000 V _{DC} -rated: | min. 120 % of rated voltage | | | | | |



| QUICK REFERENCE DATA | | | | |
|----------------------|------|---------------------|-------------|---------|
| DIELECTRIC | CASE | MAXIMUM VOLTAGE (V) | CAPACITANCE | |
| | | | MINIMUM | MAXIMUM |
| C0G (NP0) | 0805 | 1500 | 10 pF | 390 pF |
| | 1206 | 1500 | 10 pF | 1.5 nF |
| | 1210 | 1500 | 10 pF | 2.7 nF |
| | 2220 | 1500 | 470 pF | 5.6 nF |
| | 2225 | 2500 | 470 pF | 8.2 nF |
| X7R | 0805 | 1000 | 470 pF | 3.3 nF |
| | 1206 | 1000 | 220 pF | 47 nF |
| | 1210 | 1000 | 220 pF | 82 nF |
| | 1808 | 1000 | 220 pF | 100 nF |
| | 1812 | 1000 | 220 pF | 270 nF |

Note

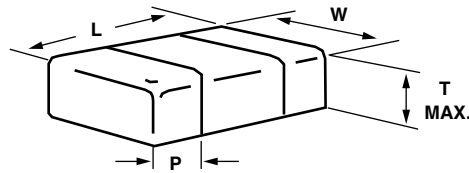
- Detail ratings see “Selection Chart”

| ORDERING INFORMATION (4) | | | | | | | | |
|--|--------------------------|---|---------------------------------------|--|---|--------------|---|-------------------|
| VJ0805 | A | 101 | J | X | G | A | T | 5Z (2) |
| CASE CODE | DIELECTRIC | CAPACITANCE NOMINAL CODE | CAPACITANCE TOLERANCE | TERMINATION (5) | DC VOLTAGE RATING (1) | MARKING | PACKAGING | PROCESS CODE |
| 0805 1206 1210 1808 1812 2220 2225 | A = C0G (NP0) Y = X7R | Expressed in picofarads (pF). The first two digits are significant, the third is a multiplier. Examples 102 = 1000 pF 223 = 22 000 pF | J = ± 5 % K = ± 10 % M = ± 20 % | X = Ni barrier 100 % matte tin plate finish F, E = AgPd (3) B = polymer 100 % matte tin plate finish (4) | P = 250 V E = 500 V L = 630 V G = 1000 V R = 1500 V O = 2500 V | A = unmarked | T = 7" reel / plastic tape R = 11 1/4" / 13" reel / plastic tape | 5Z = HVArc Guard® |

Notes

- (1) DC voltage rating should not be exceeded in application. Other application factors may affect the MLCC performance. Consult for questions: mlcc@vishay.com
- (2) Process code has to be added
- (3) Termination code “E” is for conductive epoxy assembly, contact mlcc@vishay.com for availability
- (4) Polymer termination is available for X7R dielectric only
- (5) Other termination options contact mlcc@vishay.com for availability

| ENVIRONMENTAL STATUS | | | |
|----------------------|--|----------------|--------------|
| TERMINATION CODE | TERMINATION DESCRIPTION | RoHS COMPLIANT | VISHAY GREEN |
| X | Ni barrier 100 % tin plated matte finish | Yes | Yes |
| E | AgPd | Yes | Yes |
| B | Polymer layer, 100 % tin plated matte finish | Yes | No |
| F | AgPd | Yes | No |

DIMENSIONS in inches (millimeters)


| CASE CODE | STYLE | LENGTH (L) | WIDTH (W) | MAXIMUM THICKNESS (T) | TERMINATION PAD (P) | |
|-----------|--------|--------------------------------|--------------------------------|-----------------------|---------------------|--------------|
| | | | | | MINIMUM | MAXIMUM |
| 0805 | VJ0805 | 0.079 ± 0.008 (2.00 ± 0.20) | 0.049 ± 0.008 (1.25 ± 0.20) | 0.057 (1.45) | 0.010 (0.25) | 0.030 (0.76) |
| 1206 | VJ1206 | 0.126 ± 0.008 (3.20 ± 0.20) | 0.063 ± 0.008 (1.60 ± 0.20) | 0.067 (1.70) | 0.010 (0.25) | 0.030 (0.76) |
| 1210 | VJ1210 | 0.126 ± 0.008 (3.20 ± 0.20) | 0.098 ± 0.008 (2.50 ± 0.20) | 0.067 (1.70) | 0.010 (0.25) | 0.030 (0.76) |
| 1808 | VJ1808 | 0.180 ± 0.012 (4.57 ± 0.30) | 0.080 ± 0.010 (2.03 ± 0.25) | 0.086 (2.18) | 0.010 (0.25) | 0.035 (0.90) |
| 1812 | VJ1812 | 0.177 ± 0.012 (4.50 ± 0.30) | 0.126 ± 0.008 (3.20 ± 0.20) | 0.086 (2.18) | 0.010 (0.25) | 0.035 (0.90) |
| 2220 | VJ2220 | 0.220 ± 0.010 (5.59 ± 0.25) | 0.200 ± 0.010 (5.08 ± 0.25) | 0.086 (2.18) | 0.010 (0.25) | 0.037 (0.95) |
| 2225 | VJ2225 | 0.220 ± 0.010 (5.59 ± 0.25) | 0.250 ± 0.010 (6.35 ± 0.25) | 0.090 (2.30) | 0.010 (0.25) | 0.037 (0.95) |

Note

- Polymer (B-termination) have increased dimensions: part length increased by 0.006" (0.15 mm)



| SELECTION CHART COG (NP0) | | | | | | | | | | | | |
|----------------------------|--------|-----------|------|-----------------------|------|-----------------------|------|-----------------------|------|-----------------------|------|------|
| DIELECTRIC | | COG (NP0) | | | | | | | | | | |
| STYLE | | VJ0805 | | VJ1206 ⁽¹⁾ | | VJ1210 ⁽¹⁾ | | VJ2220 ⁽¹⁾ | | VJ2225 ⁽¹⁾ | | |
| CASE CODE | | 0805 | | 1206 | | 1210 | | 2220 | | 2225 | | |
| VOLTAGE (V _{DC}) | | 1000 | 1500 | 1000 | 1500 | 1000 | 1500 | 1000 | 1500 | 1000 | 1500 | 2500 |
| VOLTAGE CODE | | G | R | G | R | G | R | G | R | G | R | O |
| CAP. CODE | CAP. | | | | | | | | | | | |
| 100 | 10 pF | • | • | • | • | • | • | | | | | |
| 120 | 12 pF | • | • | • | • | • | • | | | | | |
| 150 | 15 pF | • | • | • | • | • | • | | | | | |
| 180 | 18 pF | • | • | • | • | • | • | | | | | |
| 220 | 22 pF | • | • | • | • | • | • | | | | | |
| 270 | 27 pF | • | • | • | • | • | • | | | | | |
| 330 | 33 pF | • | • | • | • | • | • | | | | | |
| 390 | 39 pF | • | • | • | • | • | • | | | | | |
| 470 | 47 pF | • | • | • | • | • | • | | | | | |
| 560 | 56 pF | • | • | • | • | • | • | | | | | |
| 680 | 68 pF | • | • | • | • | • | • | | | | | |
| 820 | 82 pF | • | • | • | • | • | • | | | | | |
| 101 | 100 pF | • | • | • | • | • | • | | | | | |
| 121 | 120 pF | • | • | • | • | • | • | | | | | |
| 151 | 150 pF | • | • | • | • | • | • | | | | | |
| 181 | 180 pF | • | • | • | • | • | • | | | | | |
| 221 | 220 pF | • | • | • | • | • | • | | | | | |
| 271 | 270 pF | • | • | • | • | • | • | | | | | |
| 331 | 330 pF | • | • | • | • | • | • | | | | | |
| 391 | 390 pF | • | • | • | • | • | • | | | | | |
| 471 | 470 pF | | | • | • | • | • | • | • | • | • | • |
| 561 | 560 pF | | | • | • | • | • | • | • | • | • | • |
| 681 | 680 pF | | | • | • | • | • | • | • | • | • | • |
| 821 | 820 pF | | | • | • | • | • | • | • | • | • | • |
| 102 | 1.0 nF | | | • | • | • | • | • | • | • | • | • |
| 122 | 1.2 nF | | | • | • | • | • | • | • | • | • | • |
| 152 | 1.5 nF | | | • | • | • | • | • | • | • | • | • |
| 182 | 1.8 nF | | | | | • | • | • | • | • | • | • |
| 222 | 2.2 nF | | | | | • | • | • | • | • | • | • |
| 272 | 2.7 nF | | | | | • | • | • | • | • | • | • |
| 332 | 3.3 nF | | | | | | | • | • | • | • | • |
| 392 | 3.9 nF | | | | | | | • | • | • | • | • |
| 472 | 4.7 nF | | | | | | | • | • | • | • | • |
| 562 | 5.6 nF | | | | | | | • | • | • | • | • |
| 682 | 6.8 nF | | | | | | | | | • | • | • |
| 822 | 8.2 nF | | | | | | | | | • | • | • |

Notes

⁽¹⁾ See soldering recommendations within this data book, or visit www.vishay.com/doc?45034

- Available in plastic carrier tape only

■ RoHS-compliant



| SELECTION CHART X7R | | | | | | | | | | | | | | | | | | | |
|----------------------------|--------|--------|------|-----------------------|-----|-----|------|-----------------------|-----|-----|------|-----------------------|-----|-----|------|-----------------------|-----|-----|------|
| DIELECTRIC | | X7R | | | | | | | | | | | | | | | | | |
| STYLE | | VJ0805 | | VJ1206 ⁽¹⁾ | | | | VJ1210 ⁽¹⁾ | | | | VJ1808 ⁽¹⁾ | | | | VJ1812 ⁽¹⁾ | | | |
| CASE CODE | | 0805 | | 1206 | | | | 1210 | | | | 1808 | | | | 1812 | | | |
| VOLTAGE (V _{DC}) | | 630 | 1000 | 250 | 500 | 630 | 1000 | 250 | 500 | 630 | 1000 | 250 | 500 | 630 | 1000 | 250 | 500 | 630 | 1000 |
| VOLTAGE CODE | | L | G | P | E | L | G | P | E | L | G | P | E | L | G | P | E | L | G |
| CAP. CODE | CAP. | | | | | | | | | | | | | | | | | | |
| 101 | 100 pF | | | | | | | | | | | | | | | | | | |
| 121 | 120 pF | | | | | | | | | | | | | | | | | | |
| 151 | 150 pF | | | | | | | | | | | | | | | | | | |
| 181 | 180 pF | | | | | | | | | | | | | | | | | | |
| 221 | 220 pF | | | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • |
| 271 | 270 pF | | | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • |
| 331 | 330 pF | | | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • |
| 391 | 390 pF | | | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • |
| 471 | 470 pF | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • |
| 561 | 560 pF | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • |
| 681 | 680 pF | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • |
| 821 | 820 pF | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • |
| 102 | 1.0 nF | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • |
| 122 | 1.2 nF | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • |
| 152 | 1.5 nF | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • |
| 182 | 1.8 nF | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • |
| 222 | 2.2 nF | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • |
| 272 | 2.7 nF | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • |
| 332 | 3.3 nF | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • |
| 392 | 3.9 nF | | | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • |
| 472 | 4.7 nF | | | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • |
| 562 | 5.6 nF | | | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • |
| 682 | 6.8 nF | | | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • |
| 822 | 8.2 nF | | | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • |
| 103 | 10 nF | | | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • |
| 123 | 12 nF | | | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • |
| 153 | 15 nF | | | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • |
| 183 | 18 nF | | | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • |
| 223 | 22 nF | | | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • |
| 273 | 27 nF | | | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • |
| 333 | 33 nF | | | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • |
| 393 | 39 nF | | | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • |
| 473 | 47 nF | | | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • |
| 563 | 56 nF | | | | | | | • | • | | | | | | | • | • | | |
| 683 | 68 nF | | | | | | | • | • | | | | | | | • | • | | |
| 823 | 82 nF | | | | | | | • | • | | | | | | | • | • | | |
| 104 | 100 nF | | | | | | | | | | | | | • | | | • | • | |
| 124 | 120 nF | | | | | | | | | | | | | | | | • | | |
| 154 | 150 nF | | | | | | | | | | | | | | | | • | | |
| 184 | 180 nF | | | | | | | | | | | | | | | | • | | |
| 224 | 220 nF | | | | | | | | | | | | | | | | • | | |
| 274 | 270 nF | | | | | | | | | | | | | | | | • | | |
| 334 | 330 nF | | | | | | | | | | | | | | | | | | |

Notes

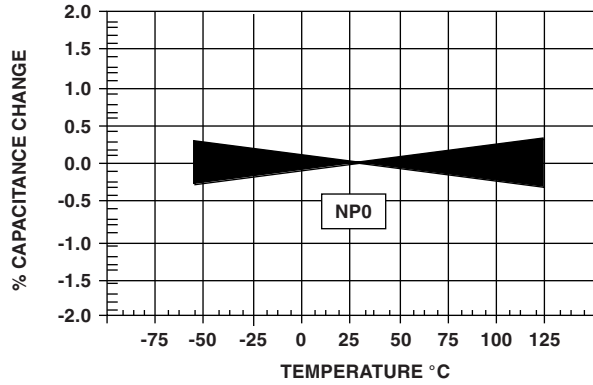
(1) See soldering recommendations within this data book, or visit www.vishay.com/doc?45034

• Available in plastic carrier tape only

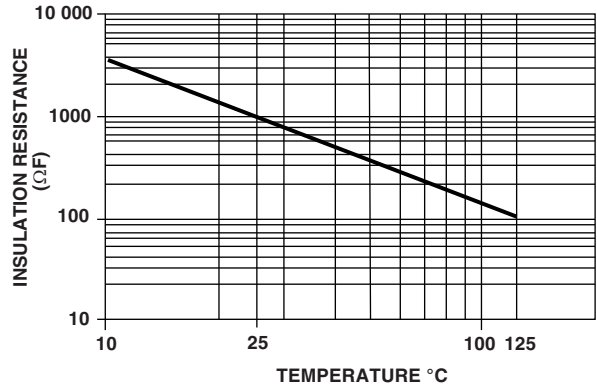
■ RoHS-compliant

HVArc Guard® C0G (NP0) DIELECTRIC - TYPICAL PARAMETERS

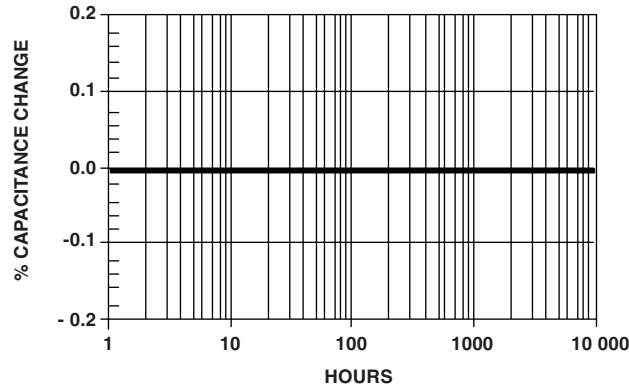
TEMPERATURE COEFFICIENT OF CAPACITANCE



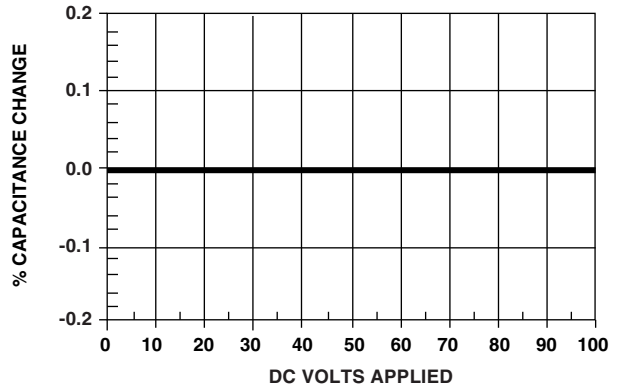
MINIMUM INSULATION RESISTANCE VS. TEMPERATURE



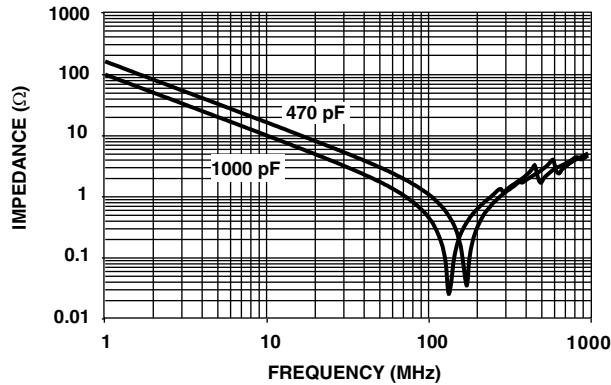
AGING RATE



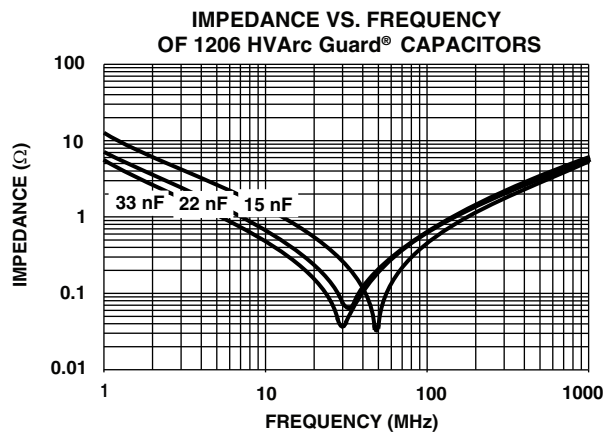
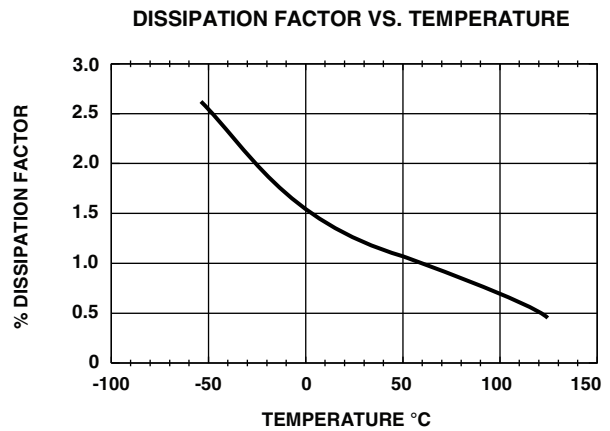
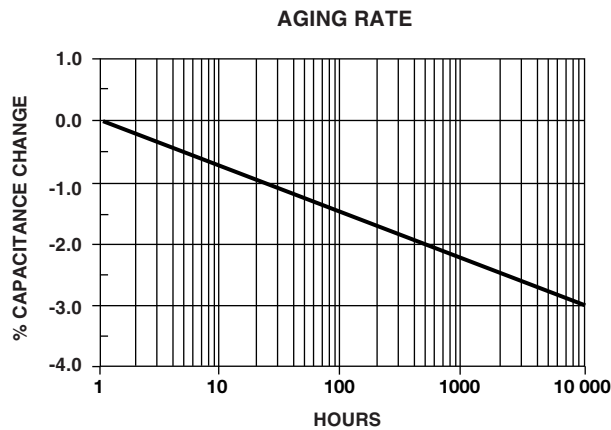
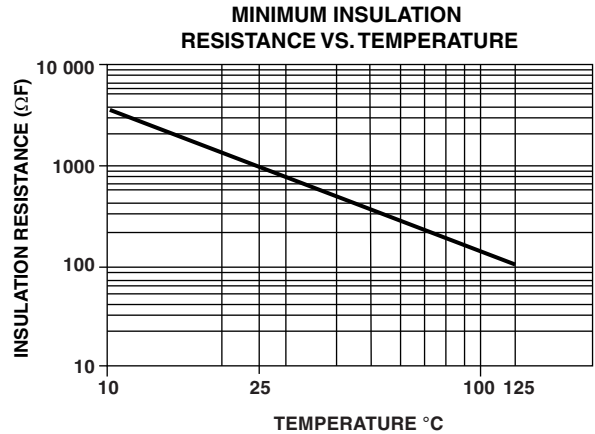
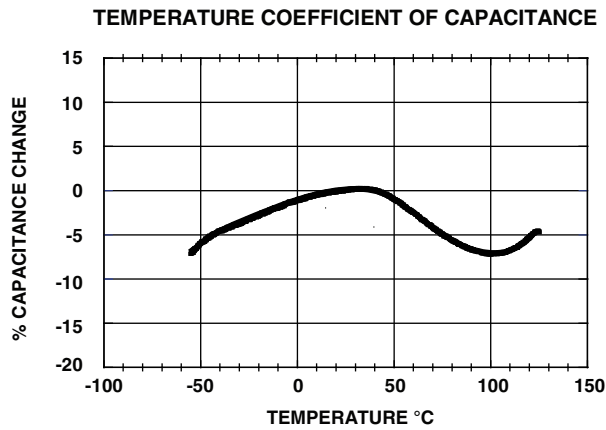
VOLTAGE COEFFICIENT OF CAPACITANCE

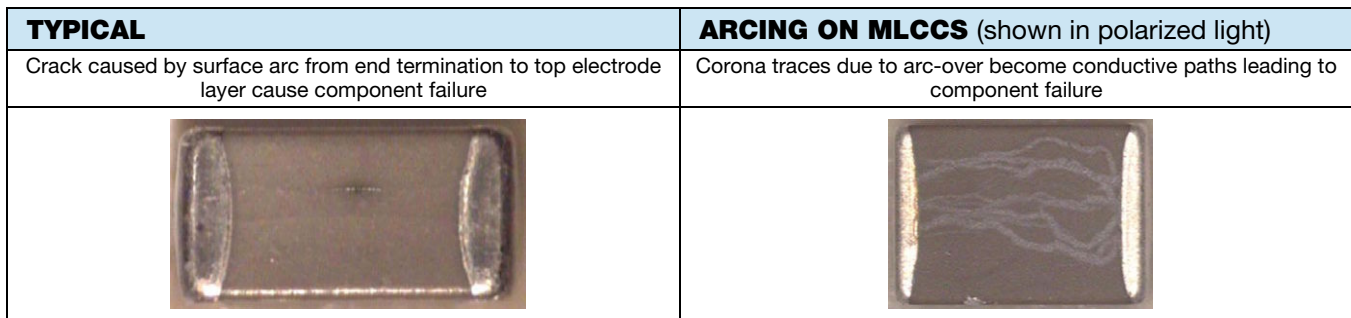
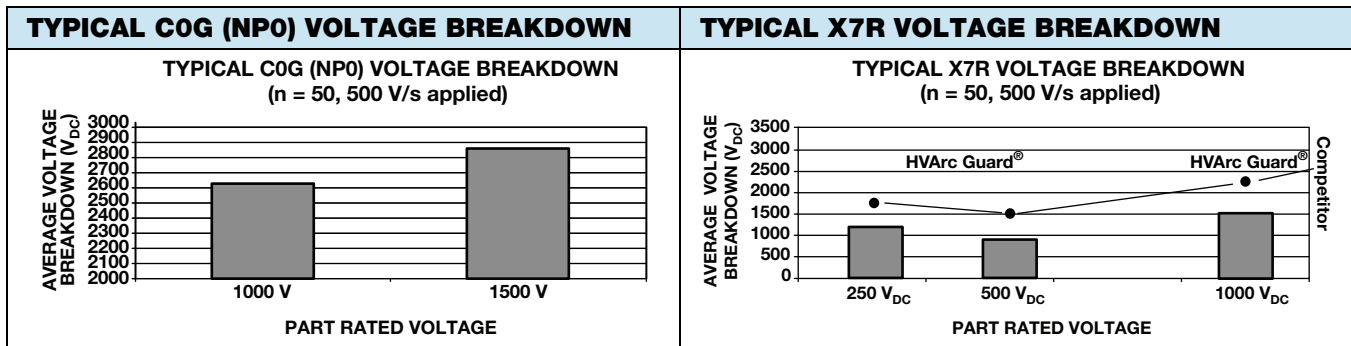


IMPEDANCE VS. FREQUENCY OF 1206 NP0 HVArc Guard®



HVArc Guard® X7R DIELECTRIC - TYPICAL PARAMETERS





APPLICATION NOTE

- Suitable only for transient voltage and not for periodical pulse(s) chain
- 1000 V rated parts are not suitable for AC / lighting applications above 220 V_{AC}
- 500 V and 630 V are not suitable for AC / lighting applications above 110 V_{AC}
- If further questions, please contact: mlcc@vishay.com

| STANDARD PACKAGING QUANTITIES (1)(2)(3) | | | |
|---|-----------|---------------------------------|---------------------------------|
| CASE CODE | TAPE SIZE | 7" REEL QUANTITIES | 11 1/4" AND 13" REEL QUANTITIES |
| | | PLASTIC TAPE PACKAGING CODE "T" | PLASTIC TAPE PACKAGING CODE "R" |
| 0805 | 8 mm | 3000 | 10 000 |
| 1206 ⁽⁴⁾ | 8 mm | 2500 / 3000 | 10 000 |
| 1210 ⁽⁴⁾ | 8 mm | 2500 / 3000 | 10 000 |
| 1808 | 12 mm | 2000 | 10 000 |
| 1812 | 12 mm | 1000 | 4000 |
| 2220 | 12 mm | 1000 | n/a |
| 2225 | 12 mm | 500 | n/a |

Notes

- (1) Vishay Vitramon uses embossed plastic carrier tape
- (2) 11 1/4" reel is standard for large quantities. 13" is maybe used for large "T" dimension parts
- (3) Reference: EIA standard RS 481 - "Taping of Surface Mount Components for Automatic Placement"
- (4) Packaging quantity can vary with product thickness
Contact mlcc@vishay.com with respect to specific part number requirements

STORAGE AND HANDLING CONDITIONS

- (1) Store the components at 5 °C to 40 °C ambient temperature and ≤ 70 % relative humidity conditions.
- (2) The product is recommended to be used within a time-frame of 2 years after shipment.
Check solderability in case extended shelf life beyond the expiry date is needed.

Precautions:

- a. Do not store products in an environment containing corrosive elements, especially where chloride gas, sulfide gas, acid, alkali, salt or the like are present. This may cause corrosion or oxidization of the terminations, which can easily lead to poor soldering.
- b. Store products on the shelf and avoid exposure to moisture or dust.
- c. Do not expose products to excessive shock, vibration, direct sunlight and so on.



Disclaimer

ALL PRODUCT, PRODUCT SPECIFICATIONS AND DATA ARE SUBJECT TO CHANGE WITHOUT NOTICE TO IMPROVE RELIABILITY, FUNCTION OR DESIGN OR OTHERWISE.

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