

# RESETTABLE OVERCURRENT PROTECTION WORKSHEET

A-11-17

**KEY PARAMETERS:**

$I_c$  Carry Current of \_\_\_\_\_ mA for \_\_\_\_\_ min. @ 25°C  
and \_\_\_\_\_ mA for \_\_\_\_\_ min. @ \_\_\_\_\_ °C.  
(high ambient)

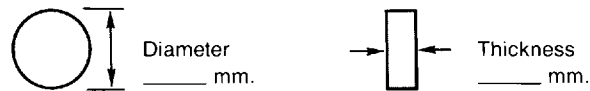
$R_0$  Desired Resistance of \_\_\_\_\_ ± \_\_\_\_\_ ohms.  
(if not critical, give range)

- $I_o$  Operating Current of:
- ① \_\_\_\_\_ mA within \_\_\_\_\_ sec. max. @ 25°C.
  - ② \_\_\_\_\_ mA within \_\_\_\_\_ sec. max. @ 25°C.
  - ③ \_\_\_\_\_ mA within \_\_\_\_\_ sec. max. @ 25°C.
  - ④ \_\_\_\_\_ mA within \_\_\_\_\_ sec. max. @ 25°C.

$V_{MAX}$  Maximum Operating Voltage of \_\_\_\_\_ VACrms.

$I_{MAX}$  Maximum Short-Time Overcurrent of \_\_\_\_\_ A.  
(typically 10 to 15 ×  $I_c$ )

$V_{TRAN}$  Surge Voltage \_\_\_\_\_ (typically 1KV, 10 × 1,000μsec.)



**CIRCUIT DIAGRAM & OTHER CUSTOMER REQUIREMENTS:**

## SHORT CIRCUIT CAPABILITY AND INTERRUPTING CAPACITY

The PTCR current limiters are intended for service on telephone systems, automobiles or the secondary of control transformers or in similar applications where energy available is limited by source impedance. They are not intended for application on AC line voltages where source energy may be high and source impedance low.

However, in some applications, the lines that are being protected may be subjected to high surge currents as might occur from lightning effects or accidental crossing with power lines or transformer primaries.

Cera-Mite has conducted extensive testing to show the capability of the PTCR pellets at high surge currents and at higher than rated voltages. Figure T-23 shows the trip time curves for higher currents. The maximum interrupting capability data expressed in "I²t Let Through" shown in Table VI is based on test data conducted in accordance with UL 497A and CSA 22.2 No. 0.7-M1985. The test circuit is shown in Figure T-24. The data shown is for reference. Specific short circuit data or interrupting capability is partially determined by the mounting means and circuit applications. The testing equipment and techniques are made available on request.

**TIME VS. CURRENT CURVES FOR HIGH CURRENT SURGES (25°C)**

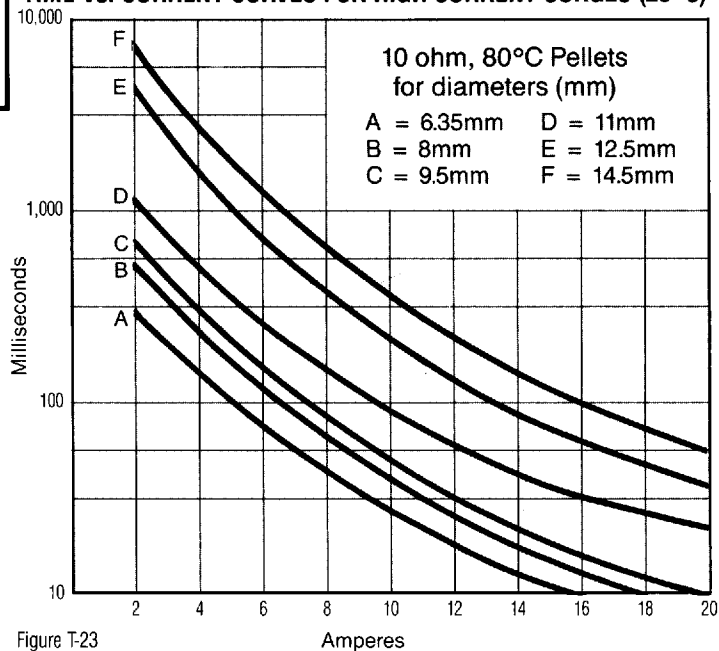


Figure T-23

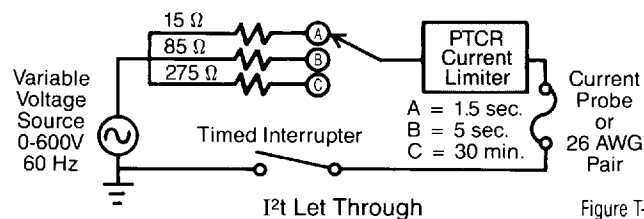


Figure T-24

## OTHER ENVIRONMENTAL CONSIDERATIONS

### TRANSIENT VOLTAGE AND CURRENTS

Because of the thermal storage capability of the ceramic PTCR, transient surges do not cause tripping. The PTCR is considered to be transparent to these low energy transients. Figure T-25 shows a typical test circuit for such transients.

### ATMOSPHERE

Cera-Mite PTCR pellets, in suitable enclosures, have been exposed to the severe conditions in UL 497A including H<sub>2</sub>S, SO<sub>2</sub> and humidity conditioning and meet operating requirements after exposure.

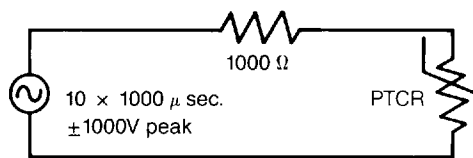


Figure T-25

Pass-Thru Pulse

A-11-17

## OTHER APPLICATIONS

The unique resistance versus temperature characteristics of the PTCR allow it to be used in a variety of applications. Cera-Mite has the application engineering expertise and ceramic manufacturing capability to provide a wide array of positive temperature coefficient thermistors to meet your needs.

### TIME DELAY CURRENT RELAY

The PTCR's self-heating ability (due to internal  $I^2R$  loss) allows it to function as a solid state timing device for the control of relatively large electrical currents. The operating current line of a PTCR is determined by its resistance, physical mass, and curie temperature. These properties can be varied to provide a specific time delay for a given current value between the range of  $I_{MAX}$  to  $I_{MIN}$ .

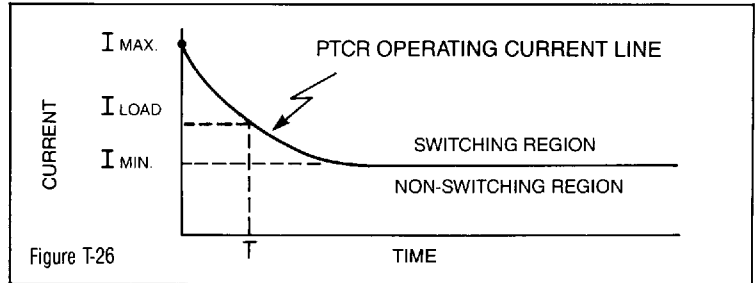


Figure T-26

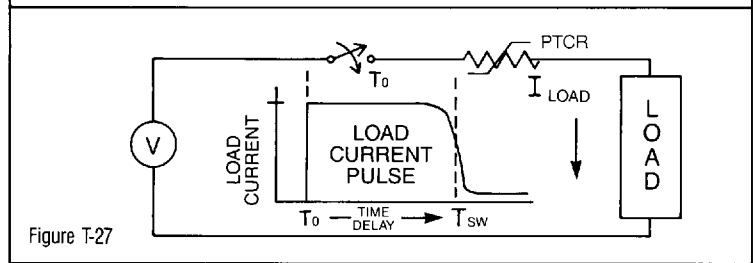


Figure T-27

### CONSTANT TEMPERATURE HEATER

When a voltage is applied to a PTCR, it draws a current proportional to its low initial resistance. This current causes the unit to self-heat to its curie temperature. The subsequent rise in resistance limits the current to a value sufficient to maintain a constant PTCR temperature. The power input required to maintain the stable curie temperature is proportional to the PTCR's ability to dissipate heat. Heat dissipation is affected by the ambient temperature, air flow, surface area of the part, and the heat sink to which it is attached. If the temperature of the PTCR is lowered by an external influence (thermal load), the resulting drop in resistance causes it to draw additional current until it again reaches the equilibrium temperature. This allows the PTCR to function as a fixed temperature self regulating heater with no thermostat.

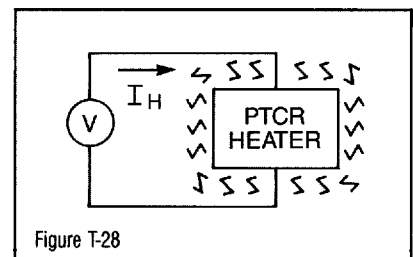


Figure T-28

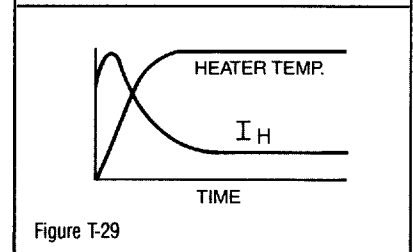


Figure T-29

## RELIABILITY

### SPC AT CERA-MITE

On line Statistical Process Control (SPC) has been used for years at Cera-Mite to dynamically measure and adjust controllable parameters to insure the highest possible quality. Cera-Mite's workforce has been trained in the use of SPC and chart their progress on a regular basis.

### THERMAL CYCLING

PTCRs switch large currents at voltages up to 600Vrms. These applications generate internal heating rates up to 60,000 degrees Centigrade per minute. With reliability as a key consideration, Cera-Mite has continually refined its ceramic technology to meet customer needs to control high power electrical loads with life cycle requirements in excess of several hundred thousand operations.

### THIRD PARTY CERTIFICATION

Cera-Mite PTCR Motor Start devices are recognized by Underwriters Labora-

tories. Production parts are 100% tested and receive a voltage pulse burn-in simulating actual motor starts.

### QUALITY

The use of SPC techniques, precision kiln firing profiles, structured quality control procedures, and constant engineering overview have resulted in outstanding quality levels — quality that has enabled customers to experience near perfect field reliability.

### CUSTOMER SATISFACTION

On November 28, 1990, United Technologies - Carrier Corporation presented its first J.A. Porter Quality Award. Out of hundreds of possible suppliers, it named Cera-Mite Corporation as their Supplier of the Year for 1990 - "For Outstanding Quality, Delivery, and Commitment to Continuous Improvement and Customer Satisfaction".

# CERAMIC DISC CAPACITORS 1.0 PICOFARAD TO 0.1 MICROFARAD

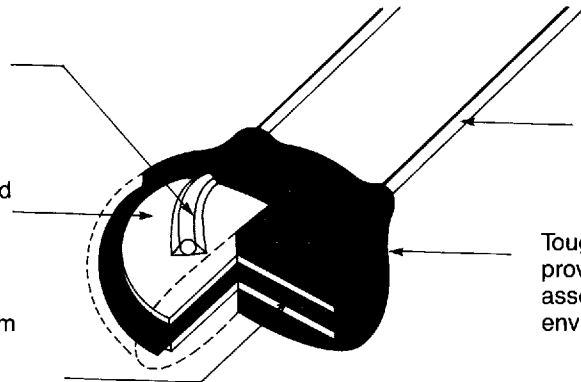
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Reliable Solutions in EMI/RFI, Decoupling, dv/dt & di/dt, Snubbers, By-Pass, ESR & ESL.  
Excellent for Power Supplies: Switcher & High Voltage.

Metallurgically bonded lead attachment for reliability under severe thermal cycling.

Silver electrodes minimize aging and are time proven for stability.

Solid ceramic discs provide maximum resistance to failure from voltage transients and current surges, good power dissipation, and heat sinking.



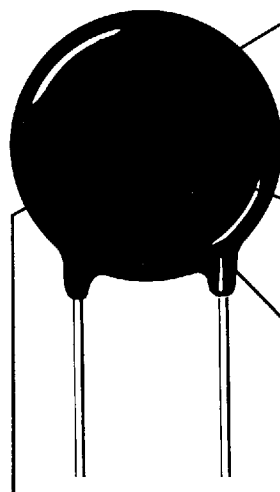
Tinned copper leads for optimum soldering.

Tough polymer insulating coating provides mechanical strength for assembly and extended-life environment protection.

## MARKING INFORMATION

Leaded type, DC rated, disc capacitors are marked with a code that identifies the manufacturer, capacitance, tolerance, voltage, and type of ceramic.

Specialty types such as AC rated are marked as described in those sections.



**MANUFACTURER IDENTIFICATION**  
"Cera-Mite®" or the identification "CM."  
"O" designates Oconto plant.

**TEMPERATURE COEFFICIENT**  
(See chart at right)

**CAPACITANCE TOLERANCE**  
C = ± .25pF    M = ± 20%  
D = ± .5pF    P = +100 - 0%  
J = ± 5%        Y = -20 + 50%  
K = ± 10%      Z = -20 + 80%

**VOLTAGE**  
Rating normally DC volts. AC voltage rating marked AC or  $\sim$ . If no voltage is marked, part is 500VDC.

### CAPACITANCE

Expressed in picofarads or microfarads.  
Examples: 680 = 680 picofarads.  
0047 = .0047 microfarads.

### OPTIONAL MARKINGS

A Lot Date Code and/or a Customer Part Number may also be imprinted on the capacitor, at extra cost.

## TYPE OF CERAMIC (Temperature Coefficient)

| Capacitance Change Over Temp. Range PPM per Degree C | Marking Code for Temp. Range -55° to +125°C | Alternate Marking Code | Dielectric Class  |                    |   |            |
|--|---|------------------------|-------------------|--------------------|---|------------|
| 0 ± 30 (NPO)   | COG   | A                      | I                 |                    |   |            |
| -750 ± 120 (N750)                                    | U2J   | U                      | I                 |                    |   |            |
| -1000 ± 250 (N1000)                                  | M3K   | V                      | I                 |                    |   |            |
| -1500 ± 250 (N1500)                                  | P3K   | W                      | I                 |                    |   |            |
| -2200 ± 500 (N2200)                                  | R3L   | X                      | I                 |                    |   |            |
| -3300 ± 500 (N3300)                                  | S3L   | Y                      | I                 |                    |   |            |
| -4700 ± 1000 (N4700)                                 | T3M   | Z                      | I & II*           |                    |   |            |
| <b>Max. % Change</b>                                 | <b>+10° +85°C</b>                           | <b>-30° +85°C</b>      | <b>-55° +85°C</b> | <b>-55° +125°C</b> | — | —          |
| ± 7.5%   | —   | —                      | X5F               | X7F                | B | II         |
| ± 10%  | —   | Y5P                    | —                 | —                  | C | II         |
| ± 15%  | —   | Y5R                    | X5R               | X7R                | C | II or IV** |
| ± 22%  | —   | Y5S                    | X5S               | —                  | D | II or IV   |
| +22 - 56%  | Z5U   | Y5U                    | —                 | —                  | E | III        |
| +22 - 82%  | Z5V   | Y5V                    | —                 | —                  | F | III        |

\*N4700 is a transition material between Class I and II, and has characteristics of both. It is used for larger cap values; capacitance and DF measured at 1 kHz.

\*\*Class IV uses same material as Class II, but is processed differently.

**PACKAGING INFORMATION**

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**BULK**

Bulk packaging is cardboard boxes. The inner box size will be either 6"x6"x2" or 6"x6"x3.5".

The boxes are labeled with the following:

|                       |                            |      |
|-----------------------|----------------------------|------|
| Customer Name         | Cera-Mite Mfg. Code Number | Qty. |
| Customer P.O. Number  |                            |      |
| Cera-Mite P/N         | Cera-Mite Lot Number       |      |
| Customer P/N          |                            |      |
| Customer P/N Revision | Cera-Mite Order Number     |      |
| Cera-Mite Corp.       | Grafton, WI 53024          |      |

The outer carton standard packaging is corrugated cardboard, ranging in size from 6.5"x7"x8" to 12.5"x15"x7".

The cartons are labeled with the following:

|   |              |          |                  |
|---|--------------|----------|------------------|
| Cera-Mite Corporation<br>1327 6th Avenue<br>Grafton, WI 53024 |              |          |                  |
| Customer P.O. Number  | Customer P/N | Quantity | Box ____ of ____ |
| Customer Name<br>Customer Address                             |              |          |                  |

**TAPE AND REEL (EIA-468-A)**

| ITEM  | CODE           | STANDARD                             | EIA OPTIONS**                    |                      |                                  |
|---|----------------|--------------------------------------|----------------------------------|----------------------|----------------------------------|
|   |                | Fig. a<br>5mm<br>LS                  | Fig. b<br>7.5mm LS<br>15mm Pitch | Fig. c<br>10mm<br>LS | Fig. d<br>7.5mm LS<br>30mm Pitch |
| Pitch of component                                | P              | 12.7                                 | 15.0                             | 25.4                 | 30.0                             |
| Pitch of sprocket hole                            | P <sub>0</sub> | 12.7 ± 0.3                           | 15.0 ± 0.3                       | 12.7 ± 0.3           | 15.0 ± 0.3                       |
| Lead spacing                                      | F              | 5.0 + 0.8<br>- 0.2                   | 7.5 ± 1.0                        | 10.0 ± 1.0           | 7.5 ± 1.0                        |
| Length from hole center to component center       | P <sub>2</sub> | 6.35 ± 1.3                           | 7.5 ± 1.5                        | —                    | 7.5 ± 1.5                        |
| Length from hole center to lead                   | P <sub>1</sub> | 3.85 ± 0.7                           | 3.75 ± 1.0                       | 7.7 ± 1.5            | 3.75 ± 1.0                       |
| Body diameter                                     | D              | See individual product specification |                                  |                      |                                  |
| Deviation along tape, left or right               | ΔS             | 0 ± 1.3                              | 0 ± 2.0                          |                      |                                  |
| Carrier tape width                                | W              | 18.0 ± 0.5                           |                                  |                      |                                  |
| Position of sprocket hole                         | W <sub>1</sub> | 9.0 ± 0.5                            |                                  |                      |                                  |
| Lead distance between reference and bottom planes | H              | 20.0 + 1.5<br>- 1.0                  | 20.0 + 1.5<br>- 1.0              | 18.0 + 2.0<br>- 0    | 20.0 + 1.5<br>- 1.0              |
| Protusion length                                  | I              | + 3.0 / - 1.0                        |                                  |                      |                                  |
| Diameter of sprocket hole                         | D <sub>0</sub> | 4.0 ± 0.2                            |                                  |                      |                                  |
| Total tape thickness                              | t <sub>1</sub> | 0.6 ± 0.3                            |                                  |                      |                                  |
| Total thickness, tape and lead wire               | t <sub>2</sub> | 1.5 max.                             |                                  |                      |                                  |
| Portion to cut in case of defect                  | L              | 11 max.                              |                                  |                      |                                  |
| Hold down tape width                              | W <sub>0</sub> | 11.5 min.                            |                                  |                      |                                  |
| Hold down tape position                           | W <sub>2</sub> | 1.5 ± 1.5                            |                                  |                      |                                  |

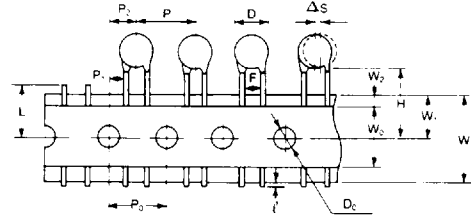
\*\* Options are shown for reference. Cera-Mite has factory capability for 5mm only. Other options are furnished on subcontract basis.

The EIA lead spacings for tape and reel are based on multiples of .100" (2.5mm) to coordinate with standard automatic insertion machinery and boards using the .100" grid convention.

Many North American assemblers use .250" and .375" lead spacing for boards laid out for hand insertion or semi-automatic insertion such as Ragen machines. If capacitors are to be tape and reel with .250" or .375" LS, we recommend the style shown in Figure b or c.

For capacitors up to 3 KVDC, ≤12.4mm dia.  
12.7mm pitch/lead spacing 5mm

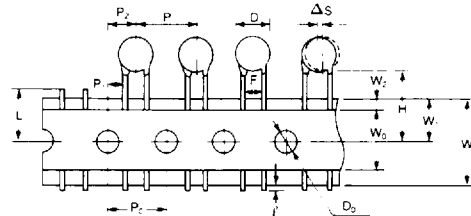
Figure a



\*For standard Tape and Reel packaging of crimped leaded parts, "H" is measured to the bottom of the built-in standoff on the component leads. This dimension is 16mm ± 0.5.

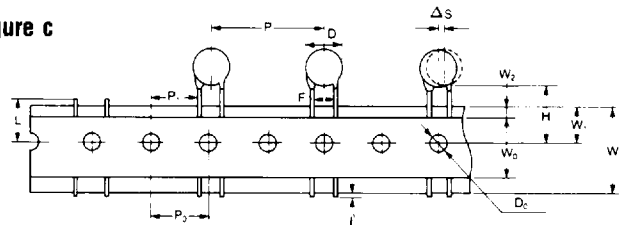
For capacitors up to 12.4mm dia.  
15mm pitch/lead spacing 7.5mm

Figure b



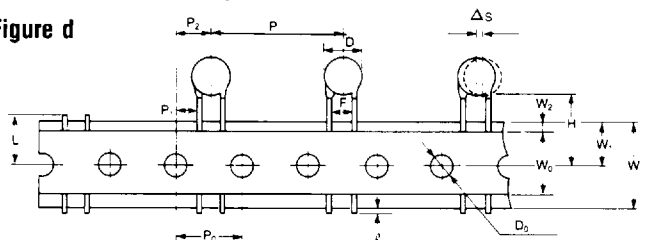
For capacitors ≥ 2 KVDC & AC rated, ≤18mm  
25.4mm pitch/lead spacing 10.0mm

Figure c



For capacitors ≥ 2 KVDC & AC rated, ≤18mm dia.  
30mm pitch/lead spacing 7.5mm

Figure d



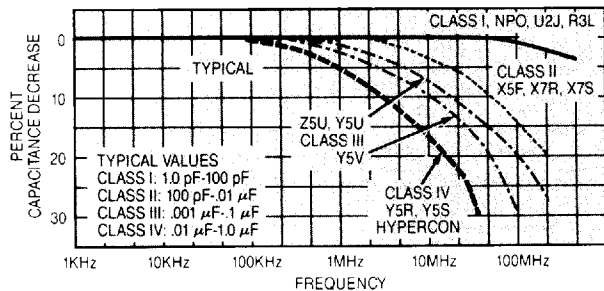
# CERAMIC DISC CAPACITOR APPLICATION NOTES

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- **HIGH K:** For small size and higher values of capacitance. EIA 198D Class III, Z5U, Y5U, Y5V. This type is usually broad tolerance: ± 20% or + 80 - 20%.
- **MODERATELY HIGH K:** Here the materials are blended to provide better capacitance stability against change in temperature or voltage; but may be larger in size than the HIGH K types, especially in the higher capacitance values. EIA 198D Class II, X5F, X7R, X7S. Usually tighter tolerance. ± 10% at 25°C. Higher dV/dt rating.
- **LOW K FORMULATIONS FOR PRECISION CAPACITORS:** This class provides ultra stable capacitance over the broadest temperature, frequency ranges and voltage variation. EIA Class I, NPO, U2J, R3L and S3L. Usually ± 5% or better. Highest dV/dt rating.

- **HYPERCON** construction gives the highest capacitance density for larger values. This type is made by forming a dielectric barrier layer at each electrode surface and connecting these layers through the titanate substrate. The thin dielectric layer produces very high capacitance and good temperature stability. Improvements have extended the range of application to 100 VDC rating. Industry standard EIA 198D Class IV, Y5R and Y5S.
- **CAPACITANCE MEASUREMENTS:** Class IV dielectric are conducted at 50 to 100 millivolts, 1000 hz. All others are measured at 1.0 volts; Class II & III at 1 khz; Class I at 1 mhz.

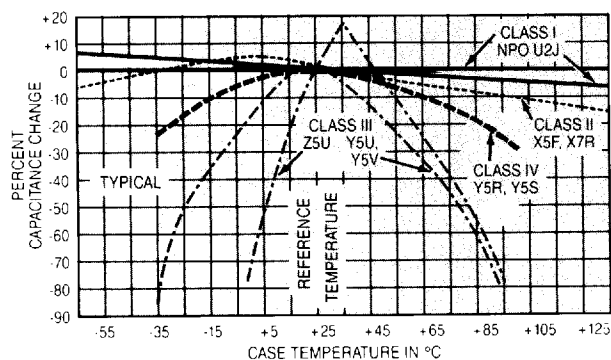
## EFFECTIVE CAP CHANGE vs. FREQUENCY



## FREQUENCY:

- Operating frequency range is determined primarily by capacitor value and self resonance due to lead inductance. This typically occurs at 500 megahertz for 100 picofarads, decreasing to 50 megahertz at .01 microfarads and 10 MHz at 0.1 μF.
- Class III and IV, typical applications are power and logic bus coupling and decoupling, and broad band bypass filtering. Class I and II are chosen for frequency discriminating filters, d-c blocking, reference circuits, and similar circuits requiring close tolerance and stability.

## CAPACITANCE CHANGE vs. TEMPERATURE



## TEMPERATURE:

- Capacitors are designed for service temperatures of -55°C to +105°C. The limiting factor is the life of the polymer coating. Ceramic discs are not injured by short time exposure up to 125°C.
- In applications where there is continuous heat dissipation in the capacitor, such as in snubber networks for power semiconductors, the case temperature rise should be limited to 30°C. Class I, II and III are well suited for snubber service. See chart below for wattage ratings.

## VOLTAGE:

- The extensive range of d-c voltage ratings available allows selection of the appropriate device to minimize d-c voltage effects in the circuit.
- A-C voltage ratings for capacitors up to 1000 volts applies to applications where energy and current are limited by circuit impedance. 1000 ohms impedance at the maximum a-c voltage rating is adequate.
- Ratings apply up to 50 khz. Above 50 khz reduce a-c voltage rating by:  $\left(\frac{\text{frequency}}{50 \text{ khz}}\right)^2$

## CURRENT:

- For sinusoidal applied voltages:  $I_{rms} = 7 \sqrt{VFC}$  where V = rms Voltage; F = frequency; C = farads  
 Power dissipation may be approximated by: Watts =  $(I_{rms})^2 \times \text{Effective series resistance (ESR)}$

Approximate ESR Values: Class I,  $ESR = \frac{100}{C(pF)f(mHz)}$  Ex.: 10 pf ESR = 10 Ohms at 1 megahertz

Class II or III,  $ESR = \frac{1}{C(\mu F)f(kHz)}$  Ex.: .001 μf ESR = 100 Ohms at 10kHz

Example:

$100 \text{ V}$   $0.001 \mu\text{f}$   $50 \text{ khz}$   $IRMS = 7 \times 100 \times (50 \times 10^3) \times (.001 \times 10^{-6}) = 35 \text{ ma}$   
 Power Dissipation =  $(35 \times 10^{-3})^2 \times 20 = .024 \text{ watts}$

- For nonsinusoidal applied voltage (repetitive transient pulses) limit on peak current is:

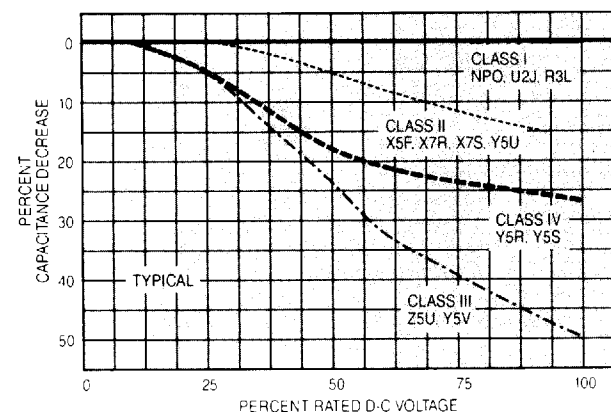
$I_p = \frac{dv}{dt} \times C$  where V = volts; T = seconds; C = farads

- Approximate  $\frac{dv}{dt}$  limits:
- ≤ 100pF = 10,000V/microsecond, Class I
  - > 100pF = 5,000V/microsecond, Class I
  - < 100pF = 5,000V/microsecond, Class II
  - 100pF - 1000pF = 2,000V/microsecond, Class II & III
  - 1000pF - 10,000pF = 1,000V/microsecond, Class II & III
  - > 10,000pF = 500V/microsecond, Class II & III
  - > 10,000pF = 100V/microsecond, Class IV

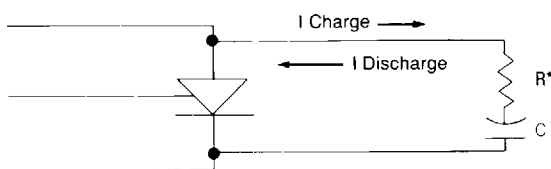
Example: .001 μf, Class II;  $I_p = \frac{1000}{10^{-6}} \times (.001 \times 10^{-6}) = 1 \text{ ampere peak}$

Note: Above calculations are typical. Actual circuit conditions may allow more or less current and voltage. Actual circuit test is recommended.

## CAPACITANCE DECREASE vs. D-C VOLTAGE BIAS



## CERAMIC DISC CAPACITORS AS SNUBBERS



\*Select R to limit dv/dt and di/dt to capacitor and semiconductor ratings.

See page 19 & 24 for parts selection from 10TS, new "lossless" 10TCU type, and new "lossless" 2KV DFO types.

### ALLOWABLE POWER DISSIPATION (Watts) 30°C RISE

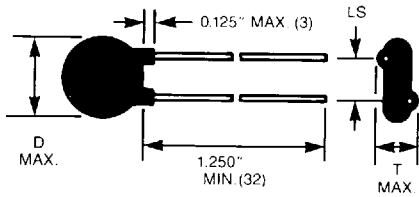
| Cap. Size Code | Capacitor Voltage Rating |        |        |        |
|----------------|--------------------------|--------|--------|--------|
|                | 500 V                    | 1000 V | 3000 V | 6000 V |
| C-E            | .25 W                    | .50 W  | 1 W    | —      |
| F-H            | .50 W                    | .75 W  | 1.5 W  | 1.7 W  |
| J-K            | 1 W                      | 1.5 W  | 3 W    | 3.3 W  |
| L-Q            | 2 W                      | 3 W    | 5 W    | 5.5 W  |

**LOW VOLTAGE 12V to 1KV CAPACITORS**

A-05-0501

Capacitors on pages 18 and 19 are stocked at the factory and are in distribution. See pages 20 and 21 for other electrical and mechanical options.

**Figure 1**



**STANDARD WIRE SIZE**

C and E Sizes  
24 Gauge (.020")  
Tin Coated Copperweld

F thru Q Sizes  
22 Gauge (.025")  
Tin Coated Copper

**Figure 3**

**TAPE AND REEL STANDARDS**

Cataloged product 12 thru 1000 volts with size code C to H are available tape and reeled to EIA RS468 on a special order basis. 10,000 piece minimum, three lead styles are available.

To order tape and reel, add to catalog number the lead style type:

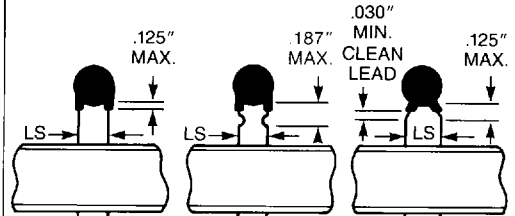
Example: TGS10 QA (Style)

LS is 5 mm (.197) for tape and reel.

TYPE QA/QR

TYPE RE/RR

TYPE TK/TR  
Figure 1a only



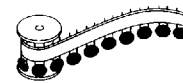
Use if leads are to be formed. Will furnish if nothing else specified.

Most stable seating plane for auto insertion. Keeps rounded out of holes.

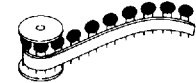
Controls coating run-down with low seated height.

QA RE TK

QR RR TR

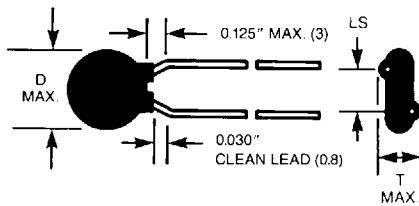


Cera-Mite Standard

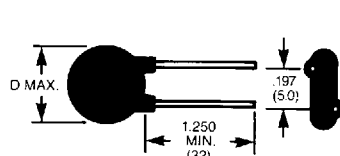


EIA RS-468A Std

**Figure 1a** Dimensions are inch (cm.)



**Figure 2**



| Size Code      | Maximum Diameter |      | Maximum Thickness |     | Fig. 1 & 1a Lead Spacing |     |
|----------------|------------------|------|-------------------|-----|--------------------------|-----|
|                | IN               | MM   | IN                | MM  | IN                       | MM  |
| C              | .250"            | 6.3  | .156"             | 4.0 | .250                     | 6.3 |
| E              | .290"            | 7.4  | .156"             | 4.0 | .250                     | 6.3 |
| F              | .370"            | 9.4  | .156"             | 4.0 | .250                     | 6.3 |
| G              | .440"            | 11.2 | .156"             | 4.0 | .250                     | 6.3 |
| H              | .490"            | 12.4 | .156"             | 4.0 | .250                     | 6.3 |
| H <sup>3</sup> | .490"            | 12.4 | .156"             | 4.0 | .375                     | 9.4 |
| J              | .560"            | 14.2 | .156"             | 4.0 | .375                     | 9.4 |
| K              | .630"            | 16.0 | .156"             | 4.0 | .375                     | 9.4 |
| L              | .680"            | 17.0 | .156"             | 4.0 | .375                     | 9.4 |

| Size Code | Maximum Diameter |      | Maximum Thickness |     | Fig. 1 & 1a Lead Spacing |     |
|-----------|------------------|------|-------------------|-----|--------------------------|-----|
|           | IN               | MM   | IN                | MM  | IN                       | MM  |
| M         | .760"            | 19.3 | .156"             | 4.0 | .375                     | 9.4 |
| P         | .890"            | 22.4 | .156"             | 4.0 | .375                     | 9.4 |
| R         | .510"            | 13.0 | .200"             | 5.1 | .250                     | 6.3 |
| U         | .640"            | 16.3 | .200"             | 5.1 | .375                     | 9.4 |
| W         | .700"            | 17.8 | .200"             | 5.1 | .375                     | 9.4 |
| X         | .770"            | 19.6 | .200"             | 5.1 | .375                     | 9.4 |
| Y         | .900"            | 22.5 | .200"             | 5.1 | .375                     | 9.4 |
| Q         | .950"            | 24.1 | .200"             | 5.1 | .375                     | 9.4 |

**100 VOLT GENERAL PURPOSE**

**562C SERIES**

• Application range:  
Up to 250 VDC, 75 VAC RMS\*\*

• Insulation Resistance: 10,000 MΩ minimum; 500 ΩF  
• Dissipation Factor: 3.0% max

• Dielectric Strength:  
750 VDC, 250 VAC RMS

| pF  | Tol. Code | Catalog Number | Size   |      | Temp. Coef. |
|-----|-----------|----------------|--------|------|-------------|
|     |           |                | Figure | Code |             |
| 10  | J         | TSQ10          | 2      | C    | NPO         |
| 22  | J         | TCQ22          | 2      | C    | NPO         |
| 33  | K         | TCQ33          | 2      | C    | U2J         |
| 47  | K         | TSQ47          | 2      | C    | U2J         |
| 100 | K         | TST10          | 2      | C    | X7R         |
| 220 | K         | TST22          | 2      | C    | X7R         |
| 330 | K         | TST33          | 2      | C    | X7R         |

| μF    | Tol. Code | Catalog Number | Size   |      | Temp. Coef. |
|-------|-----------|----------------|--------|------|-------------|
|       |           |                | Figure | Code |             |
| 470pF | K         | TST47          | 2      | C    | X7R         |
| .001  | K         | TSD10          | 2      | C    | X7R         |
| .0022 | K         | TSD22          | 2      | E    | X7R         |
| .0033 | K         | TSD33          | 2      | F    | X7R         |
| .0047 | K         | TSD47          | 2      | G    | X7S         |
| .0068 | K         | TSD68          | 2      | G    | X7S         |
| .01   | K         | TSS10          | 2      | H    | X7S         |

| μF   | Tol. Code | Catalog Number | Size   |      | Temp. Coef. |
|------|-----------|----------------|--------|------|-------------|
|      |           |                | Figure | Code |             |
| .005 | M         | TSD50          | 1      | E    | Z5U         |
| .01  | M         | TGS10          | 1      | F    | Z5U         |
| .02  | M         | TGS20          | 1      | G    | Z5U         |
| .022 | M         | TSS22          | 1      | R    | X7S         |
| .047 | M         | TSS47          | 1      | W    | X7S         |
| .050 | M         | TGS50          | 1      | R    | Z5U         |
| .10  | M         | TGP10          | 1      | W    | Z5U         |

**500 VOLT GENERAL PURPOSE**

**562C SERIES**

• Application range:  
Up to 600 VDC, 100 VAC RMS\*\*

• Insulation Resistance: 15,000 MΩ minimum; 750 ΩF  
• Dissipation Factor: 3.0% max

• Dielectric Strength:  
1500 VDC, 300 VAC RMS

| μF    | Tol. Code | Catalog Number | Size   |      | Temp. Coef. |
|-------|-----------|----------------|--------|------|-------------|
|       |           |                | Figure | Code |             |
| .001  | K         | 5TSD10         | 1a     | E    | X7R         |
| .001  | M         | 5TSSD10        | 1a     | C    | Y5U         |
| .0022 | K         | 5TSD22         | 1a     | F    | X7R         |
| .0033 | K         | 5TSD33         | 1      | G    | X7R         |
| .0047 | K         | 5TSD47         | 1      | H    | X7R         |
| .005  | Z         | 5TSD50         | 1      | F    | Z5U         |
| .0068 | K         | 5TSD68         | 1      | H    | X7R         |

| μF   | Tol. Code | Catalog Number | Size   |      | Temp. Coef. |
|------|-----------|----------------|--------|------|-------------|
|      |           |                | Figure | Code |             |
| .01  | K         | 5TSS10         | 1      | J    | X7R         |
| .01  | M         | 5GASS10        | 1      | G    | Z5U         |
| .01  | Z         | 5HKSS10        | 1      | G    | Z5U         |
| .02  | M         | 5GASS20        | 1      | J    | Z5U         |
| .022 | M         | 5TSS22         | 1      | K    | X7S         |
| .033 | M         | 5TSS33         | 1      | X    | X7S         |
| .05  | M         | 5GAS50         | 1      | P    | Z5U         |

| μF  | Tol. Code | Catalog Number | Size   |      | Temp. Coef. |
|-----|-----------|----------------|--------|------|-------------|
|     |           |                | Figure | Code |             |
| .05 | Z         | 5HKS50         | 1      | U    | Z5U         |
| .10 | M         | 5GAP10         | 1      | X    | Z5U         |
| .10 | Y         | 5HKSP10        | 1      | Q    | Y5V         |
| .10 | Z         | 5HKP10         | 1      | X    | Z5U         |
| .15 | Y         | 5GAP15         | 1      | Y    | Z5U         |
| .20 | M         | 5GAP20         | 1      | Q    | Z5U         |

\*\*See page 17 for application limits on AC voltage

**LOW VOLTAGE**

**CERA-MITE**

A-05-05-01

**1000 VOLT GENERAL PURPOSE**

**562C SERIES**

- Application range:  
Up to 1000 VDC, 150 VAC RMS\*\*

- Insulation Resistance: 20,000 MΩ minimum; 1000 ΩF
- Dissipation Factor: 2.5%

- Dielectric Strength:  
2500 VDC, 500 VAC RMS

| pF  | Tol. Code | Catalog Number | Size   |      | Temp. Coef. | μF    | Tol. Code | Catalog Number | Size   |      | Temp. Coef. | μF    | Tol. Code | Catalog Number | Size   |                | Temp. Coef. |
|-----|-----------|----------------|--------|------|-------------|-------|-----------|----------------|--------|------|-------------|-------|-----------|----------------|--------|----------------|-------------|
|     |           |                | Figure | Code |             |       |           |                | Figure | Code |             |       |           |                | Figure | Code           |             |
| 10  | M         | 5GAQ10         | 1a     | C    | NPO         | .001  | M         | 5GAD10         | 1a     | E    | X5S         | .0050 | M         | 5GAD50         | 1      | F              | Z5U         |
| 20  | M         | 5GAQ20         | 1a     | C    | NPO         | .001  | P         | 5HKD10         | 1a     | E    | Y5U         | .0068 | M         | 5GAD68         | 1      | G              | Z5U         |
| 33  | M         | 5GAQ33         | 1a     | E    | U2J         | .0012 | M         | 5GAD12         | 1a     | E    | Z5U         | .0082 | M         | 5GAD82         | 1      | H              | Z5U         |
| 47  | M         | 5GAQ47         | 1a     | E    | U2J         | .0015 | M         | 5GAD15         | 1a     | E    | Z5U         | .01   | M         | 5GAS10         | 1      | H <sup>3</sup> | Z5U         |
| 100 | M         | 5GAT10         | 1a     | C    | X5F         | .0020 | M         | 5GAD20         | 1      | E    | Z5U         | .01   | M         | 5HKMS10        | 1      | H              | Z5U         |
| 150 | M         | 5GAT15         | 1a     | C    | X5F         | .0022 | M         | 5GAD22         | 1      | E    | Z5U         | .01   | P         | 5HKS10         | 1      | H <sup>3</sup> | Z5U         |
| 200 | M         | 5GAT20         | 1a     | C    | X5F         | .0025 | M         | 5GAD25         | 1      | E    | Z5U         | .015  | M         | 5GAS15         | 1      | J              | Z5U         |
| 220 | M         | 5GAT22         | 1a     | C    | X5F         | .0027 | M         | 5GAD27         | 1      | E    | Z5U         | .020  | M         | 5GAS20         | 1      | L              | Z5U         |
| 330 | M         | 5GAT33         | 1a     | C    | X5F         | .0030 | M         | 5GAD30         | 1      | E    | Z5U         | .050  | M         | 10HKS50        | 1      | X              | Z5U         |
| 470 | M         | 5GAT47         | 1a     | C    | X5F         | .0033 | M         | 5GAD33         | 1      | E    | Z5U         | .10   | M         | 10GAP10        | 1      | Q              | Z5U         |
| 500 | M         | 5GAT50         | 1a     | C    | X5F         | .0047 | M         | 5GAD47         | 1      | F    | Z5U         | .15   | M         | 10GAP15        | 1      | Q              | Y5V         |

**1 KV TEMP. AND VOLTAGE STABILIZED, 10% TOL.**

**562C SERIES**

- Application range:  
Up to 1250 VDC, 200 VAC RMS\*\*

- Insulation Resistance: 50,000 MΩ minimum; 1000 ΩF
- Dissipation Factor: 2.0%

- Dielectric Strength:  
2500 VDC, 750 VAC RMS

| pF | Catalog Number | Size   |      | Temp. Coef. | pF  | Catalog Number | Size   |      | Temp. Coef. | pF  | Catalog Number | Size   |      | Temp. Coef. | pF     | Catalog Number | Size   |                | Temp. Coef. |
|----|----------------|--------|------|-------------|-----|----------------|--------|------|-------------|-----|----------------|--------|------|-------------|--------|----------------|--------|----------------|-------------|
|    |                | Figure | Code |             |     |                | Figure | Code |             |     |                | Figure | Code |             |        |                | Figure | Code           |             |
| 10 | 10TSQ10        | 1a     | C    | NPO         | 75  | 10TSQ75        | 1a     | C    | X5F         | 270 | 10TST27        | 1a     | C    | X5F         | 820    | 10TST82        | 1a     | E              | X5F         |
| 25 | 10TSQ25        | 1a     | E    | NPO         | 82  | 10TSQ82        | 1a     | C    | X5F         | 300 | 10TST30        | 1a     | C    | X5F         | .001μF | 10TSD10        | 1a     | E              | X5F         |
| 27 | 10TSQ27        | 1a     | C    | U2J         | 100 | 10TST10        | 1a     | C    | X5F         | 330 | 10TST33        | 1a     | C    | X5F         | .0015  | 10TSD15        | 1      | G              | X5F         |
| 30 | 10TSQ30        | 1a     | C    | U2J         | 120 | 10TST12        | 1a     | C    | X5F         | 390 | 10TST39        | 1a     | C    | X5F         | .0020  | 10TSD20        | 1      | H <sup>3</sup> | X5F         |
| 33 | 10TSQ33        | 1a     | E    | U2J         | 150 | 10TST15        | 1a     | C    | X5F         | 470 | 10TST47        | 1a     | C    | X5F         | .0022  | 10TSD22        | 1      | H <sup>3</sup> | X5F         |
| 39 | 10TSQ39        | 1a     | E    | U2J         | 180 | 10TST18        | 1a     | C    | X5F         | 500 | 10TST50        | 1a     | C    | X5F         | .0027  | 10TSD27        | 1      | J              | X5F         |
| 47 | 10TSQ47        | 1a     | E    | U2J         | 200 | 10TST20        | 1a     | C    | X5F         | 560 | 10TST56        | 1a     | E    | X5F         | .0033  | 10TSD33        | 1      | J              | X5F         |
| 50 | 10TSQ50        | 1a     | E    | U2J         | 220 | 10TST22        | 1a     | C    | X5F         | 680 | 10TST68        | 1a     | E    | X5F         | .0047  | 10TSD47        | 1      | L              | X5F         |
| 56 | 10TSQ56        | 1a     | C    | X5F         | 250 | 10TST25        | 1a     | C    | X5F         | 750 | 10TST75        | 1a     | E    | X5F         | .01    | 10TSS10        | 1      | K              | X5S         |
| 68 | 10TSQ68        | 1a     | C    | X5F         |     |                |        |      |             |     |                |        |      |             |        |                |        |                |             |

**1 KV NPO/N750 PRECISION DISC CAPACITORS, 5% TOL.**

**561C SERIES**  
Temperature/Frequency/Voltage Stable

- Application range:  
Up to 1500 VDC, 300 VAC RMS\*\*
- dV/dT up to 10,000 V/usec

- Insulation Resistance: 100,000 MΩ minimum; 1000 ΩF
- Dielectric Strength: 2500 VDC, 750 VAC RMS
- High Q: 1000; Dissipation Factor 0.1%

- Application: NPO capacitors are used when the ultimate in stability is required.
- N750/S3L are smaller and ideal for "lossless snubbers."

| pF  | Catalog Number | Size   |      | pF | Catalog Number | Size   |      | pF  | Catalog Number | Size   |                | pF                       | Catalog Number | Size   |      | Temp. Coef. |
|-----|----------------|--------|------|----|----------------|--------|------|-----|----------------|--------|----------------|--------------------------|----------------|--------|------|-------------|
|     |                | Figure | Code |    |                | Figure | Code |     |                | Figure | Code           |                          |                | Figure | Code |             |
| 1.0 | 10TCCV10       | 1a     | C    | 10 | 10TCCQ10       | 1a     | C    | 47  | 10TCCQ47       | 1      | G              | N750/S3L DISC CAPACITORS |                |        |      |             |
| 2.2 | 10TCCV22       | 1a     | C    | 12 | 10TCCQ12       | 1a     | C    | 50  | 10TCCQ50       | 1      | G              | 33                       | 10TCUQ33       | 1a     | C    | U           |
| 2.7 | 10TCCV27       | 1a     | C    | 15 | 10TCCQ15       | 1a     | C    | 56  | 10TCCQ56       | 1      | G              | 47                       | 10TCUQ47       | 1a     | C    | U           |
| 3.0 | 10TCCV30       | 1a     | C    | 18 | 10TCCQ18       | 1a     | E    | 68  | 10TCCQ68       | 1      | H              | 68                       | 10TCUQ68       | 1a     | F    | U           |
| 3.3 | 10TCCV33       | 1a     | C    | 20 | 10TCCQ20       | 1a     | E    | 82  | 10TCCQ82       | 1      | H <sup>3</sup> | 100                      | 10TCUT10       | 1a     | F    | U           |
| 3.9 | 10TCCV39       | 1a     | C    | 22 | 10TCCQ22       | 1a     | E    | 100 | 10TCCQ100      | 1      | J              | 220                      | 10TCUT22       | 1      | G    | V           |
| 4.7 | 10TCCV47       | 1a     | C    | 25 | 10TCCQ25       | 1a     | E    | 120 | 10TCCQ120      | 1      | J              | 330                      | 10TCUT33       | 1      | H    | V           |
| 5.0 | 10TCCV50       | 1a     | C    | 27 | 10TCCQ27       | 1a     | F    | 150 | 10TCCQ150      | 1      | K              | 470                      | 10TCUT47       | 1      | J    | V           |
| 5.6 | 10TCCV56       | 1a     | C    | 30 | 10TCCQ30       | 1a     | F    | 180 | 10TCCQ180      | 1      | L              | 560                      | 10TCUT56       | 1      | J    | V           |
| 6.8 | 10TCCV68       | 1a     | C    | 33 | 10TCCQ33       | 1a     | F    | 220 | 10TCCQ220      | 1      | M              | 680                      | 10TCUT68       | 1      | K    | W           |
| 8.2 | 10TCCV82       | 1a     | C    | 39 | 10TCCQ39       | 1a     | F    | 270 | 10TCCQ270      | 1      | P              | 1000                     | 10TCUD10       | 1      | L    | W           |

- Application:  
Low Voltage Bulk Filter

**12/25/50/100V HYPERCON HIGH-CAPACITANCE DISCS**

**563C SERIES CLASS IV DIELECTRIC**

| 12VDC, Y5R, 2.5ΩF, 5% DF |           |                |        |      | 25VDC, Y5R, 5ΩF, 5% DF |           |                |        |      | 50VDC, Y5R, 25ΩF, 4% DF |           |                |        |      | 100VDC, Y5S, 100ΩF, 3% DF |           |                |        |      |
|--------------------------|-----------|----------------|--------|------|------------------------|-----------|----------------|--------|------|-------------------------|-----------|----------------|--------|------|---------------------------|-----------|----------------|--------|------|
| μF                       | Tol. Code | Catalog Number | Size   |      | μF                     | Tol. Code | Catalog Number | Size   |      | μF                      | Tol. Code | Catalog Number | Size   |      | μF                        | Tol. Code | Catalog Number | Size   |      |
|                          |           |                | Figure | Code |                        |           |                | Figure | Code |                         |           |                | Figure | Code |                           |           |                | Figure | Code |
| .05                      | Y         | HY105          | 1a     | E    | .01                    | M         | HY820          | 1a     | C    | .01                     | M         | HY920          | 1a     | C    | .0022                     | M         | HMMD22         | 2      | C    |
| .10                      | M         | HY110          | 1      | G    | .022                   | M         | HY825          | 1a     | E    | .022                    | M         | HY925          | 1a     | F    | .0047                     | M         | HMMD47         | 2      | C    |
| .22                      | M         | HY122          | 1      | J    | .033                   | M         | HY530          | 1a     | E    | .047                    | M         | HY935          | 1      | G    | .01                       | M         | HMMS10         | 1a     | E    |
| .47                      | M         | HY147          | 1      | P    | .047                   | M         | HY835          | 1      | F    | .10                     | M         | HY950          | 1      | H    | .1                        | M         | HMMP10         | 1      | L    |
|                          |           |                |        |      | .10                    | M         | HY850          | 1      | G    |                         |           |                |        |      |                           |           |                |        |      |

\*\*See page 17 for application limits on AC voltage

**ELECTRICAL AND MECHANICAL OPTIONS**

A-05-03-01

The most popular values and constructions are shown on pages 18 and 19 for 12 volt to 1KV ratings and on page 24 for 2 to 6KV ratings. Other values and other lead styles are available. The tables following show the complete range of product. Other lead styles are shown on page 21 and an 18 character alpha-numeric designator is shown. The Cera-Mite appli-

cation engineer will provide a certified outline drawing and a correct part number for the options specified. Customer approval of the outline is usually requested to guarantee satisfaction.

All of the performance characteristics shown in the catalog apply to the options unless otherwise stated on the outlines.

**562 and 564 Class II & III Series Electrical Options (General Purpose)**

| Ceramic Type | Range of Values (picofarads) |                        |                        |                        |                        | Tolerances |       |          |
|--------------|------------------------------|------------------------|------------------------|------------------------|------------------------|------------|-------|----------|
|              | 500V<br>Size C thru Q        | 1000V<br>Size C thru Q | 2000V<br>Size E thru Q | 3000V<br>Size E thru Q | 6000V<br>Size F thru P | 500        | 1000V | 2 to 6KV |
| X5F          | 200 - 22,000                 | 100 - 20,000           | 68 - 12,000            | 47 - 10,000            | 47 - 2,200             | K,M        | K,M   | K,M      |
| X5S          | 400 - 25,000                 | 300 - 25,000           | 470 - 15,000           | 390 - 10,000           | 220 - 2,700            | M          | K,M   | K,M      |
| X7R          | 500 - 33,000                 | 390 - 33,000           | 680 - 22,000           | 470 - 15,000           | 560 - 4,700            | K,M        | K,M   | K,M      |
| Y5U          | 1000 - 50,000                | 750 - 50,000           | 560 - 33,000           | 390 - 22,000           | 470 - 5,600            | M          | M     | M,Y      |
| Z5U          | 1,500 - 100,000              | 1,000 - 100,000        | 1,000 - 47,000         | 680 - 33,000           | 820 - 10,000           | M,Z        | M,Z   | M,Z      |
| Y5V          | 2,000 - 200,000              | 1,500 - 150,000        | 15,000 - 100,000       | 1,000 - 50,000         | N/A                    | Y,Z        | M,Z   | M,Z      |

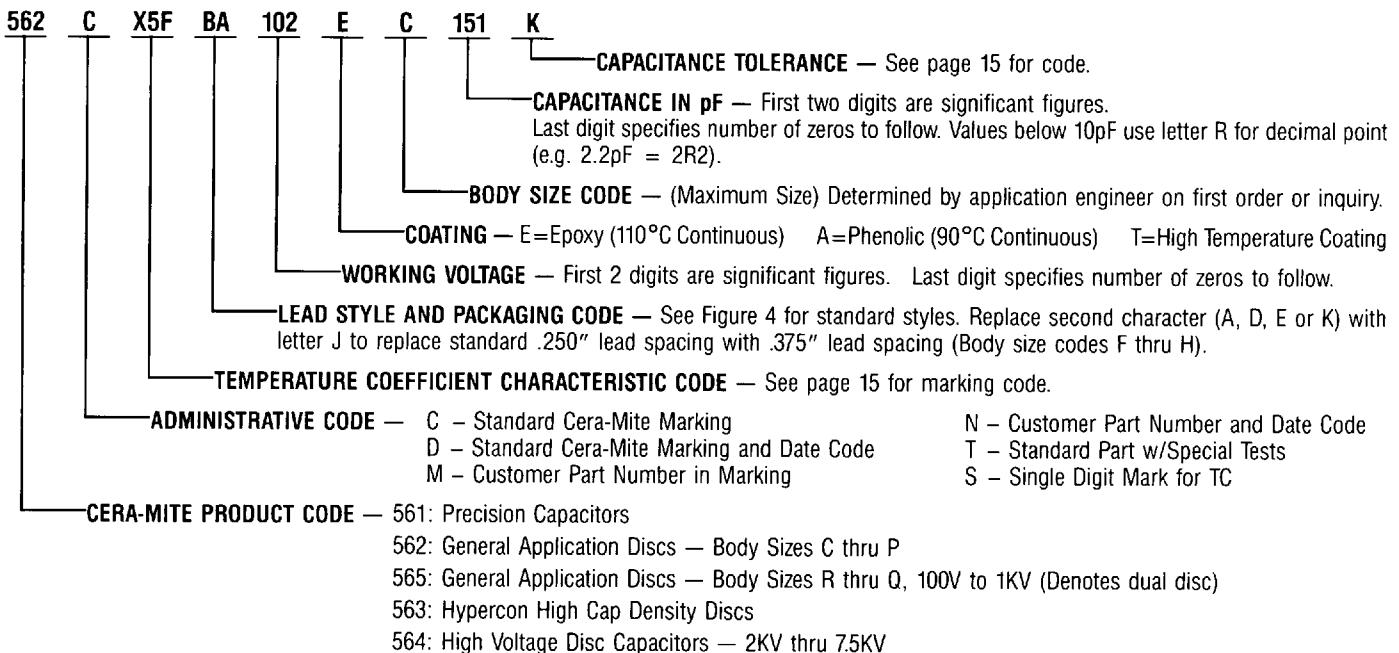
Note: 100V ratings are available in same ranges as 500V.

**561 and 564 Class I Series Electrical Options (Precision and over 50 kHz)**

| Ceramic Type | Range of Values (picofarads) |                        |                        |                        | Tolerances |
|--------------|------------------------------|------------------------|------------------------|------------------------|------------|
|              | 500V<br>Size C thru L        | 1000V<br>Size C thru M | 2000V<br>Size E thru P | 3000V<br>Size E thru P |            |
| NPO          | 10 - 390                     | 1 - 330                | 1 - 270                | 1 - 180                | C,D,J,K    |
| N750         | 47 - 680                     | 22 - 470               | 10 - 330               | 10 - 270               | J,K        |
| N1000        | 56 - 820                     | 33 - 560               | 15 - 390               | 10 - 330               | J,K        |
| N2200        | 68 - 750                     | 56 - 680               | 33 - 560               | 22 - 470               | J,K        |
| N3300        | 100 - 1,000                  | 75 - 820               | 47 - 750               | 33 - 560               | J,K        |
| N4700        | N/A                          | 330 - 5,600            | 220 - 4,700            | 100 - 3,300            | K,M        |

Note: Cera-Mite also offers capacitors in N030, N080, N150, N220, N330 and N470 characteristics to serve those older radio and tuning applications requiring TC matching. Values are available in the same range as NPO.

**DESCRIPTIVE DESIGNATOR USED FOR PARTS NOT LISTED IN CATALOG BUT SELECTED FROM RANGE CHARTS**





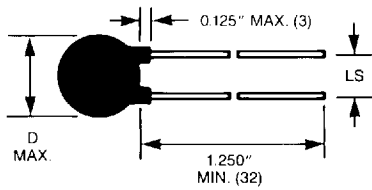
**DISC CAPABILITY**

**CERA-MITE**

A-050501

**STANDARD LEAD OPTIONS**

Figure 4a:



- 2KV to 7.5KV AA:** #20 Ga; .250", .375" and .500" LS; Bulk Pack
- 12V to 1KV BA:** #22 Ga; .250" and .375" LS; Bulk Pack
- 12V to 1KV MA:** #22 Ga; 5mm LS Bulk Pack
- 12V to 3KV QA:** #22 Ga; 5mm LS Tape and Reel
- 12V to 1KV UA:** #24 Ga; .250" and .375" LS; Bulk Pack

Figure 4a2

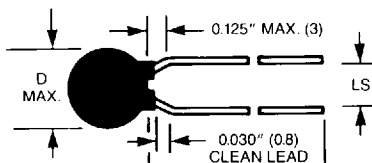
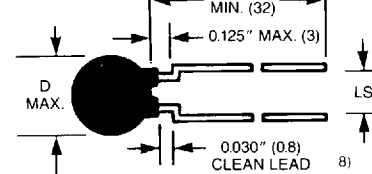


Figure 4a3

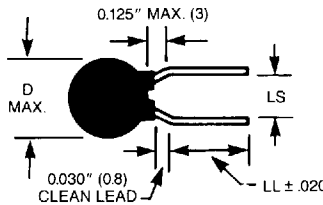


- 12V to 1KV CK:** #22 Ga; .250" LS; Bulk Pack; "C" and "E" Sizes Only
- 12V to 1KV DK:** #22 Ga; 5mm LS; Bulk Pack; "C" and "E" Sizes Only
- 12V to 1KV TK:** #22 Ga; 5mm LS; Tape and Reel; "C" and "E" Sizes Only
- 12V to 1KV WK:** #24 Ga; .250" LS; Bulk Pack; "C" and "E" Sizes Only

Figure 4a2 and 4a3 are functionally the same and are interchangeable.

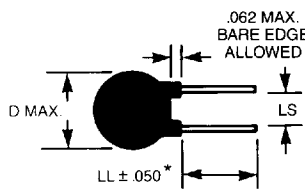
**CUT LEAD OPTIONS**

Figure 4b1



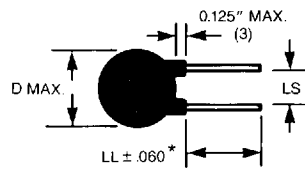
- 12V to 1KV NK:** #22 Ga; .250" and 5mm LS; Bulk Pack; Minimum LL of .140"; "C" and "E" Sizes Only
- 12V to 1KV PK:** #24 Ga; .250" and 5mm LS; Bulk Pack; Minimum LL of .140"; "C" and "E" Sizes Only

Figure 4b2



- 12V to 1KV FD:** #22 Ga; .250", .375" and 5mm LS; Bulk Pack; Minimum LL of .110"; Phenolic Coating Only
- 12V to 1KV PD:** #24 Ga; .250" and 5mm LS; Bulk Pack; Minimum LL of .110"; Phenolic Coating Only

Figure 4b3

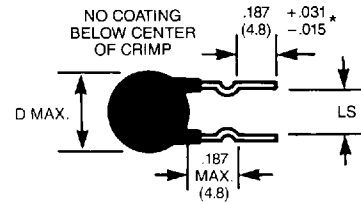


- 12V to 3KV FA:** #22 Ga; .250", .375" and 5mm LS; Bulk Pack; Minimum LL of .110"; Epoxy Coating Only
- 12V to 3KV PA:** #24 Ga; .250" and 5mm LS; Bulk Pack; Minimum LL of .110"; Epoxy Coating Only

\*The minimum LL is shown. The EIA standard LL is .187". User to specify length required. If not specified, .187" is furnished.

**CRIMPED LEAD OPTIONS**

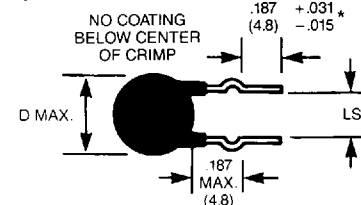
Figure 4c1



- 12V to 3KV JE:** #22 Ga; .250" and .375" Lead Spacing; Bulk Pack
- 12V to 3KV SE:** #22 Ga; 5mm Lead Spacing; Bulk Pack
- 12V to 3KV RE:** #22 Ga; 5mm Lead Spacing; Tape and Reel

\*Other LL are available (.120" min.)

Figure 4c2



- 12V to 3KV KE:** #22 Ga; .250" and .375" Lead Spacing; Bulk Pack

\*Other LL are available (.120" min.)

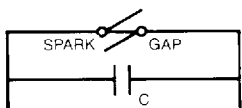
Consult factory for lead styles not shown on this page.

Note: Other lead styles specified on customer drawings can be furnished on reasonable demand.

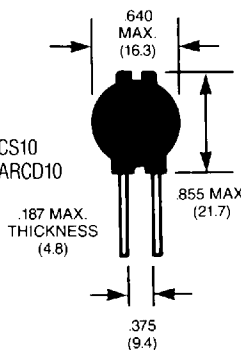
**SPECIALTY ITEMS**

**ARC-CAP**

Working Voltage:  
100 to 1500VDC  
High Energy Air GAP Discharge  
at 2-3KVDC  
Capacitance:  
.01µF Z Tolerance Std. 564C10ARCS10  
1000pF Z Tolerance Std. 564C10ARCD10



Equivalent to Centralab GAP series and Mallory AT series.

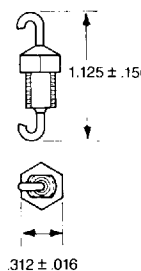


**DISCOIDAL FEED-THRU CAPACITORS (Old Style — Pre 1975 Systems)**

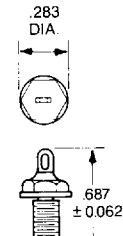
Capacitance Range:  
33pF to .02µF  
Application Range:  
Up to 500 VDC  
Operating Temperature Range:  
-55°C to +85°C (X5F);  
+10°C to +85°C (Z5U)  
Dielectric Strength:  
250% rated voltage  
Dissipation Factor:  
2.0% (X5F); 3.0% (Z5U)  
Capacitance Tolerance:  
± 10%=K; ± 20%=M;  
+100-0%=P; +80-20%=Z

Insulation Resistance: 200 megohm-microfarads minimum.

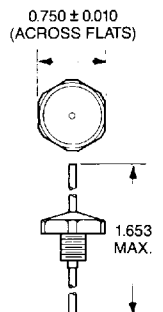
**Type 514C**



**Type 507C**



**Type 533C**



**A.C. LINE RATED DISC CAPACITORS  
X & Y EMI/RFI Filter Types  
Across The Line, Line By-Pass & Antenna Coupling Types**

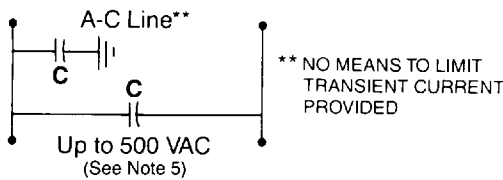
A-05-0501

| PERFORMANCE DATA   |  | SERIES                     |       |         |         |                |
|--|--|----------------------------|-------|---------|---------|----------------|
|  |  | 125L                       | 20VL  | 25Y     | 30LV    | 440L           |
| Continuous Voltage Rating AC   | See Note 5   | 250                        | 250   | 250/400 | 250/400 | 250/500        |
| DC   |  | 2KV                        | 1.4KV | 2.5KV   | 2KV     | 4KV            |
| Dielectric Strength  | AC RMS 2 sec., 60 Hz                                 | 2000                       | 1250  | 2500    | 2500    | 3500/4000      |
|  | DC 1 Minute Withstand (50 ma. max. charging current) | 4KV                        | 2.8KV | 4.5KV   | 4KV     | 7KV            |
| Transient Energy Class (See Note 1 and 2)                                  |  | B & C                      | C     | B & C   | B & C   | A, B & C       |
| Dissipation Factor (at 25°C)   |  | 1.5%                       | 1.5%  | 1.5%    | 1.5%    | 1.0%           |
| Case Breakdown/Flammability/Max. Service Temperature                       |  | 2500 V.A.C.; UL94V0; 105°C |       |         |         |                |
| Filter Application (VDE 0565) See Figure c below (IEC 384-14) (See Note 6) |  | X                          | X     | Y       | Y       | X or Y         |
| Environmental VDE & IEC Rating (See Note 3 and 5)                          |  | HPF                        | JPF   | HPF     | HPF/JPF | HPF            |
| Temperature Characteristic (Note 4 and Figure d; Note 7, page 19)          |  | Z5U/Y5V                    | Y5V   | X7R     | Y5U/Z5U | X5F<br>Y5U/Z5U |
| Insulation Resistance (Minimum)  |  | 1000 ΩF                    |       |         |         |                |

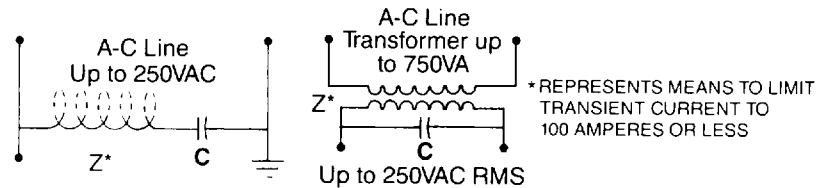
- NOTES:**
1. Transient Energy Requirements (Discharge Test or Dump Tests). The discharge test requirement often is the determining factor in selection of the right capacitor. These tests vary in severity and require different thickness and diameter parts to absorb the transient energy. The following classification states the requirements in order of severity:  
 Class A: UL 1414 para. 9 and CSA 22.2, No. 1, Figure 11 and ANSI/IEEE 62.41 Category B  
 Class B: UL 1414 para. 14 and CSA 22.2, No. 8 (IEC) and ANSI/IEEE 62.41 Category A  
 Class C: VDE 0565 para. 4.5 & 4.7 and CSA 22.2, No. 1, Figure 9
  2. Safety considerations and line filter performance are established by national agencies. Transient current and voltage withstandability and A.C. leakage currents to ground and many other parameters are controlled and tested.
  3. HPF is -25°C to 85°C; 21 days humidity JPF is -10°C to 85°C; 21 days humidity.
  4. Permissible change with temperature: Y Type: +20%, -55% (reference 20°C) X Type: +20%, -80%
  5. All ratings are manufacturers' rating. Part markings are governed by agency rules and customer requirements.
  6. If parts are shown as "Y" type, they also meet "X" type requirements.

5. Parts are marked 250 VAC unless otherwise requested

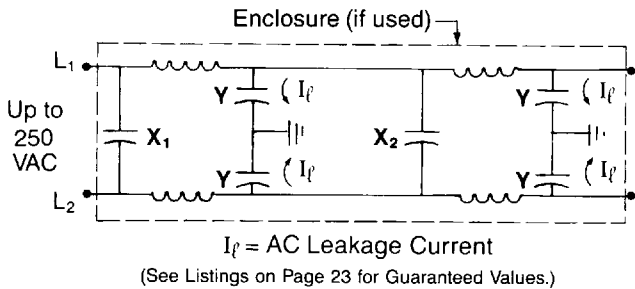
**Figure a**  
Across-the-Line and Coupling Type  
440L Series UL1414 & VDE 0560-2



**Figure b**  
Line By-Pass Type — 125L Series (Per UL and CSA)

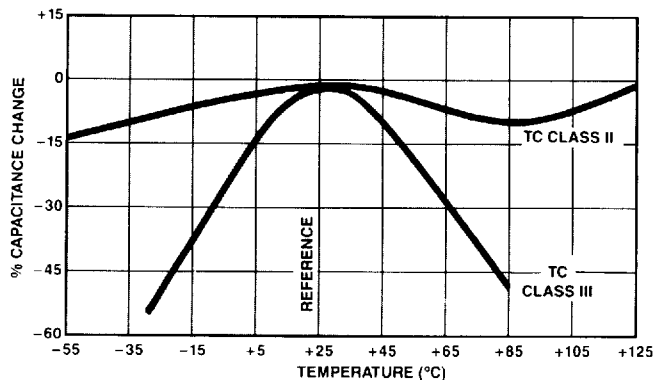


**Figure c**  
Y Type 30LV, 25Y, 440L Series  
X Type 20VL, 125L, 440L Series  
Ref: IEC 384-14 & VDE 0565



Typical Filter Showing Application of X & Y Types

**Figure d**  
Typical Characteristics  
Capacitance Change vs. Temperature (See Note 7, Pg. 23)



Class II is used when greater stability of capacitance is needed over a wide range of temperature and/or applied voltage. Class II is especially effective for snubber applications and on wide swings in ambient such as experienced in outdoor or military environments.