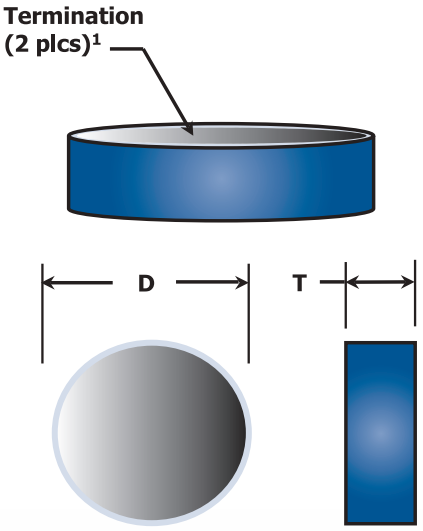
# High Voltage Single Layer Bare Disc Capacitors

## Military & Commercial Level Class 1 & Class 2 Dielectric – 3 kVdc to 20 kVdc




1. **Termination Type: 100% fired-on silver**

**CalRamic Technologies LLC** manufactures a series of highly reliable, single layer, ceramic disc capacitors that are designed and manufactured under strict quality control guidelines to ensure unparalleled performance in high voltage applications.

These capacitors, which draw on thirty plus years of proven design and process experience, utilize double action pressing to minimize gradients within the dielectric powder and produce a finished capacitor with a uniform fired ceramic density.

Capacitors are available with ultra stable Class I, NPO dielectrics, essential where low losses and tight capacitance tolerances are critical and stable Class II, X5R, X7R and X5U dielectric materials, which are intended for those applications where added dielectric losses and less precision can be tolerated.

These capacitors are ideally suited as snubbers for switching power supplies, coupling and decoupling capacitors, inverter circuitry, lighting ballasts, and other high voltage pulse applications.

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## Performance Characteristics

| Specification | Dielectric Type (EIA Designation) | | | | | |
|---|---|---|---|---|---|---|
| | NPO (COG) (N) | Y5P (P) | X7R (X) | X5R (W) | X5U (Y) | Z5U (Z) |
| Material Classification | Type I, Ultra Stable, K76 | Type II, Stable, K2450 | Type II, Stable, K2350 | Type II, Stable, K2500 | Type II, Stable, K5000 | Type II, Stable, K10000 |
| Coef of Thermal Expansion | 9 x $10^{-6}$ / °C | 11 x $10^{-6}$ / °C | | | | |
| Density | 72 g / $in^3$ | | | | | |
| Operating Temperature Range | -55 to +125°C | -30 to +85°C | -55 to +125°C | -55 to +85°C | | +10 to +85°C |
| Aging Rate | 0 | -2% Max per decade hour | | | -3% Max per decade hour | |
| Temperature Coefficient | ±90 PPM / °C | ±10% | ±15% | | +22 / -56% | |
| Voltage Coefficient | Negligible | -40% Max @ WVDC | | | -65% Max @ WVDC | -65% Max @ WVDC |
| Capacitance Range | 1.6 pF to 600 pF | 52 pF to 0.020 µF | 52 pF to 0.020 µF | 52 pF to 0.020 µF | 100 pF to 0.037 µF | 200 pF to 0.077 µF |
| Voltage Range | 3 kVdc to 20 kVdc | | | | | |
| Insulation Resistance @ +25°C | 100,000 MΩ or 1000 MΩ - µF, W/E is less | | | | | |
| Insulation Resistance @ T Max | 10,000 MΩ or 100 MΩ - µF, W/E is less | | | | | |
| Dissipation Factor | 0.1% Max | 2.5% Max | | | | |
| DWV | 1.5 x WVDC | | | | | |

## General Information

1. Standard inspection and Group A testing, when required, is performed in accordance with applicable requirements of MIL-PRF-49467, DSCC 87125, DSCC 89087 and NASA GSFC S-311-15C.
2. Special testing including 100% Partial Discharge (Corona) is available upon request.
3. Custom voltages, package sizes and capacitance values available. Contact factory.
4. Higher voltage parts may require encapsulation to prevent surface arc over and breakdown. When required, parts should first be cleaned, and oven dried at +85°C. Silicone rubbers or a suitable epoxy may be used and de-airing of encapsulates is recommended.
5. Testing of higher voltage parts before installation and / or application of supplemental encapsulation, may be done in a suitable, non-contaminating dielectric fluid like FC-40.
6. Large ceramic capacitors are susceptible to damage when exposed to thermal and / or mechanical shock. Ensure care is taken while handling and during installation or consider selecting leaded alternatives as detailed in catalog page CRT-0006.
7. All parts are RoHS compliant.

# High Voltage Single Layer Bare Disc Capacitors

## Military & Commercial Level Class 1 & Class 2 Dielectric – 3 kVdc to 20

### Electrical / Mechanical Characteristics

| Working Voltage | Disc Style | Dimensions [in] | | | Capacitance Range [pF] | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | NPO | | X5R | | X7R | | X5U | |
| | | D Max | T Nom | T Max | Min | Max | Min | Max | Min | Max | Min | Max |
| 3 kVDC | D0606 | 0.220 | 0.060 | 0.075 | 8.4 | 10 | 270 | 340 | 260 | 320 | 500 | 600 |
| | D0706 | 0.245 | 0.060 | 0.075 | 9.7 | 12 | 320 | 370 | 300 | 350 | 570 | 670 |
| | D0806 | 0.275 | 0.060 | 0.075 | 12 | 15 | 410 | 500 | 380 | 470 | 730 | 900 |
| | D1006 | 0.330 | 0.060 | 0.075 | 20 | 24 | 640 | 780 | 600 | 730 | 1200 | 1400 |
| | D1206 | 0.400 | 0.060 | 0.075 | 28 | 34 | 920 | 1100 | 870 | 1100 | 1700 | 2000 |
| | D1406 | 0.460 | 0.060 | 0.075 | 38 | 46 | 1300 | 1500 | 1200 | 1400 | 2200 | 2700 |
| | D1606 | 0.525 | 0.060 | 0.075 | 50 | 61 | 1600 | 2000 | 1500 | 1900 | 3000 | 3600 |
| | D1806 | 0.590 | 0.060 | 0.075 | 63 | 77 | 2100 | 2500 | 2000 | 2400 | 3700 | 4600 |
| | D2006 | 0.650 | 0.060 | 0.075 | 78 | 95 | 2600 | 3100 | 2400 | 2900 | 4600 | 5600 |
| | D2206 | 0.710 | 0.060 | 0.075 | 94 | 110 | 3100 | 3800 | 2900 | 3500 | 5600 | 6800 |
| | D2406 | 0.775 | 0.060 | 0.075 | 110 | 140 | 3700 | 4500 | 3500 | 4200 | 6600 | 8100 |
| | D2606 | 0.840 | 0.060 | 0.075 | 130 | 160 | 4300 | 5300 | 4100 | 5000 | 7800 | 9500 |
| | D2906 | 0.930 | 0.060 | 0.075 | 150 | 200 | 5000 | 6500 | 4700 | 6200 | 9000 | 12000 |
| | D3206 | 1.030 | 0.060 | 0.075 | 200 | 240 | 6600 | 8000 | 6200 | 7500 | 12000 | 14000 |
| | D3606 | 1.150 | 0.060 | 0.075 | 230 | 310 | 7400 | 10000 | 7000 | 9500 | 13000 | 18000 |
| 5 kVDC | D0610 | 0.220 | 0.125 | 0.100 | 5.1 | 6.2 | 160 | 200 | 150 | 190 | 300 | 370 |
| | D0710 | 0.245 | 0.125 | 0.100 | 5.8 | 6.9 | 190 | 220 | 180 | 210 | 350 | 400 |
| | D0810 | 0.275 | 0.125 | 0.100 | 7.3 | 9.2 | 250 | 300 | 230 | 280 | 410 | 540 |
| | D1010 | 0.330 | 0.125 | 0.100 | 12 | 15 | 390 | 473 | 370 | 440 | 700 | 850 |
| | D1210 | 0.400 | 0.125 | 0.100 | 17 | 21 | 560 | 680 | 520 | 640 | 1000 | 1200 |
| | D1410 | 0.460 | 0.125 | 0.100 | 23 | 28 | 760 | 920 | 700 | 860 | 1400 | 1600 |
| | D1610 | 0.525 | 0.125 | 0.100 | 30 | 37 | 990 | 1200 | 930 | 1100 | 1800 | 2200 |
| | D1810 | 0.590 | 0.125 | 0.100 | 38 | 47 | 1300 | 1500 | 1200 | 1400 | 2300 | 2800 |
| | D2010 | 0.650 | 0.125 | 0.100 | 47 | 57 | 1500 | 1800 | 1500 | 1800 | 2800 | 3400 |
| | D2210 | 0.710 | 0.125 | 0.100 | 57 | 69 | 1900 | 2300 | 1800 | 2100 | 3400 | 4000 |
| | D2410 | 0.775 | 0.125 | 0.100 | 69 | 83 | 2200 | 2700 | 2100 | 2600 | 4000 | 4900 |
| | D2610 | 0.840 | 0.125 | 0.100 | 79 | 97 | 2600 | 3100 | 2500 | 3000 | 4700 | 5700 |
| | D2910 | 0.930 | 0.125 | 0.100 | 92 | 120 | 3000 | 3900 | 2900 | 3700 | 5500 | 7100 |
| | D3210 | 1.030 | 0.125 | 0.100 | 120 | 150 | 3900 | 4800 | 3800 | 4500 | 7200 | 8700 |
| | D3610 | 1.150 | 0.125 | 0.100 | 140 | 180 | 4500 | 6100 | 4200 | 5700 | 8000 | 11000 |
| | D4010 | 1.280 | 0.125 | 0.100 | 190 | 230 | 6200 | 7500 | 5800 | 7000 | 11000 | 13000 |
| 7.5 kVDC | D0615 | 0.220 | 0.180 | 0.150 | 3.4 | 4.1 | 110 | 140 | 110 | 130 | 200 | 240 |
| | D0715 | 0.245 | 0.180 | 0.150 | 3.9 | 4.6 | 130 | 150 | 120 | 150 | 230 | 270 |
| | D0815 | 0.275 | 0.180 | 0.150 | 5 | 6.1 | 170 | 200 | 150 | 190 | 300 | 360 |
| | D1015 | 0.330 | 0.180 | 0.150 | 7.8 | 9.6 | 260 | 310 | 240 | 300 | 460 | 570 |
| | D1215 | 0.400 | 0.180 | 0.150 | 12 | 14 | 370 | 460 | 350 | 430 | 670 | 820 |
| | D1415 | 0.460 | 0.180 | 0.150 | 15 | 19 | 510 | 610 | 470 | 580 | 900 | 1100 |
| | D1615 | 0.525 | 0.180 | 0.150 | 20 | 25 | 660 | 800 | 620 | 750 | 1200 | 1450 |
| | D1815 | 0.590 | 0.180 | 0.150 | 25 | 31 | 830 | 1000 | 780 | 960 | 1500 | 1800 |
| | D2015 | 0.650 | 0.180 | 0.150 | 31 | 38 | 1000 | 1200 | 970 | 1200 | 1900 | 2200 |
| | D2215 | 0.710 | 0.180 | 0.150 | 37 | 46 | 1300 | 1500 | 1200 | 1400 | 2200 | 2700 |
| | D2415 | 0.775 | 0.180 | 0.150 | 45 | 55 | 1500 | 1800 | 1400 | 1700 | 2700 | 3300 |
| | D2615 | 0.840 | 0.180 | 0.150 | 53 | 65 | 1700 | 2100 | 1600 | 2000 | 3100 | 3800 |
| | D2915 | 0.930 | 0.180 | 0.150 | 60 | 80 | 2000 | 2600 | 1900 | 2500 | 3700 | 4700 |
| | D3215 | 1.030 | 0.180 | 0.150 | 80 | 98 | 2600 | 3200 | 2500 | 3000 | 4800 | 5800 |
| | D3615 | 1.150 | 0.180 | 0.150 | 90 | 120 | 3000 | 4000 | 2800 | 3800 | 5300 | 7400 |
| | D4015 | 1.280 | 0.180 | 0.150 | 120 | 150 | 4100 | 5000 | 3800 | 4700 | 7400 | 9000 |
| 10 kVDC | D0620 | 0.220 | 0.235 | 0.200 | 2.5 | 3.1 | 84 | 100 | 78 | 95 | 150 | 180 |
| | D0720 | 0.245 | 0.235 | 0.200 | 2.9 | 3.5 | 96 | 110 | 90 | 110 | 170 | 200 |
| | D0820 | 0.275 | 0.235 | 0.200 | 3.8 | 4.6 | 120 | 150 | 110 | 140 | 220 | 270 |
| | D1020 | 0.330 | 0.235 | 0.200 | 5.9 | 7.2 | 190 | 230 | 180 | 220 | 350 | 420 |
| | D1220 | 0.400 | 0.235 | 0.200 | 8.5 | 10 | 280 | 340 | 260 | 320 | 500 | 610 |
| | D1420 | 0.460 | 0.235 | 0.200 | 12 | 14 | 380 | 480 | 350 | 430 | 680 | 820 |
| | D1620 | 0.525 | 0.235 | 0.200 | 15 | 18 | 500 | 600 | 470 | 560 | 890 | 1000 |
| | D1820 | 0.590 | 0.235 | 0.200 | 19 | 23 | 620 | 770 | 580 | 720 | 1100 | 1400 |
| | D2020 | 0.650 | 0.235 | 0.200 | 24 | 28 | 770 | 940 | 730 | 880 | 1400 | 1700 |
| | D2220 | 0.710 | 0.235 | 0.200 | 28 | 34 | 930 | 1100 | 870 | 1100 | 1700 | 2000 |
| | D2420 | 0.775 | 0.235 | 0.200 | 34 | 41 | 1100 | 1400 | 1000 | 1300 | 2000 | 2400 |
| | D2620 | 0.840 | 0.235 | 0.200 | 40 | 48 | 1300 | 1600 | 1200 | 1500 | 2400 | 2900 |
| | D2920 | 0.930 | 0.235 | 0.200 | 46 | 60 | 1500 | 2000 | 1400 | 1800 | 2700 | 3500 |
| | D3220 | 1.030 | 0.235 | 0.200 | 60 | 73 | 2000 | 2400 | 1900 | 2300 | 3600 | 4300 |
| | D3620 | 1.150 | 0.235 | 0.200 | 68 | 93 | 2200 | 3000 | 2100 | 2800 | 4000 | 5500 |
| | D4020 | 1.280 | 0.235 | 0.200 | 94 | 110 | 3100 | 3700 | 2900 | 3500 | 5600 | 6800 |
| 15 kVDC | D0630 | 0.220 | 0.350 | 0.300 | 1.6 | 2.1 | 55 | 68 | 52 | 64 | 100 | 120 |
| | D0730 | 0.245 | 0.350 | 0.300 | 1.9 | 2.3 | 64 | 76 | 60 | 71 | 120 | 130 |
| | D0830 | 0.275 | 0.350 | 0.300 | 2.4 | 3.1 | 52 | 100 | 76 | 94 | 150 | 180 |
| | D1030 | 0.330 | 0.350 | 0.300 | 3.9 | 4.8 | 130 | 160 | 120 | 150 | 230 | 280 |
| | D1230 | 0.400 | 0.350 | 0.300 | 5.7 | 6.9 | 180 | 230 | 180 | 210 | 340 | 410 |
| | D1430 | 0.460 | 0.350 | 0.300 | 7.7 | 9.4 | 250 | 300 | 230 | 290 | 450 | 550 |
| | D1630 | 0.525 | 0.350 | 0.300 | 10 | 12 | 330 | 400 | 310 | 370 | 600 | 720 |
| | D1830 | 0.590 | 0.350 | 0.300 | 12 | 16 | 410 | 510 | 390 | 480 | 750 | 920 |
| | D2030 | 0.650 | 0.350 | 0.300 | 16 | 20 | 520 | 620 | 490 | 590 | 930 | 1100 |
| | D2230 | 0.710 | 0.350 | 0.300 | 19 | 23 | 620 | 760 | 580 | 710 | 1100 | 1360 |
| | D2430 | 0.775 | 0.350 | 0.300 | 23 | 28 | 740 | 910 | 690 | 850 | 1300 | 1600 |
| | D2630 | 0.840 | 0.350 | 0.300 | 26 | 32 | 870 | 1000 | 820 | 1000 | 1600 | 1900 |
| | D2930 | 0.930 | 0.350 | 0.300 | 30 | 40 | 1000 | 1300 | 950 | 1200 | 1800 | 2400 |
| | D3230 | 1.030 | 0.350 | 0.300 | 40 | 49 | 1300 | 1600 | 1300 | 1500 | 2400 | 2900 |
| | D3630 | 1.150 | 0.350 | 0.300 | 45 | 60 | 1500 | 2000 | 1400 | 1900 | 2700 | 3600 |
| | D4030 | 1.280 | 0.350 | 0.300 | 60 | 77 | 2100 | 2500 | 1900 | 2300 | 3700 | 4500 |
| 20 kVDC | D1040 | 0.330 | 0.460 | 0.400 | 3.2 | 3.5 | 100 | 110 | 98 | 100 | 190 | 200 |
| | D1240 | 0.400 | 0.460 | 0.400 | 4.6 | 5 | 150 | 170 | 140 | 160 | 270 | 300 |
| | D1440 | 0.460 | 0.460 | 0.400 | 6.2 | 6.8 | 200 | 220 | 190 | 210 | 360 | 400 |
| | D1640 | 0.525 | 0.460 | 0.400 | 8.1 | 8.9 | 270 | 290 | 250 | 270 | 480 | 520 |
| | D1840 | 0.245 | 0.460 | 0.400 | 10 | 11 | 330 | 370 | 310 | 350 | 600 | 670 |
| | D2040 | 0.650 | 0.460 | 0.400 | 13 | 14 | 410 | 450 | 390 | 430 | 750 | 820 |
| | D2240 | 0.710 | 0.460 | 0.400 | 15 | 17 | 500 | 550 | 470 | 520 | 900 | 1000 |
| | D2440 | 0.775 | 0.460 | 0.400 | 18 | 20 | 600 | 660 | 560 | 620 | 1100 | 1200 |
| | D2640 | 0.812 | 0.460 | 0.400 | 21 | 23 | 700 | 770 | 660 | 720 | 1300 | 1400 |
| | D2940 | 0.930 | 0.460 | 0.400 | 24 | 30 | 810 | 960 | 760 | 900 | 1500 | 1700 |
| | D3240 | 1.030 | 0.460 | 0.400 | 32 | 36 | 1000 | 1200 | 1000 | 1100 | 1900 | 2100 |
| | D3640 | 0.840 | 0.460 | 0.400 | 36 | 45 | 1200 | 1500 | 1100 | 1400 | 2200 | 2600 |
| | D4040 | 1.280 | 0.460 | 0.400 | 50 | 56 | 1700 | 1800 | 1600 | 1700 | 3000 | 3300 |

# High Voltage Single Layer Bare Disc Capacitors

## Military & Commercial Level Class 1 & Class 2 Dielectric – 3 kVdc to 20

MADE IN USA

C

### Part Number / Ordering Information

| D | 1030 | W | 122 | K | 752 | M | C |
|---|---|---|---|---|---|---|---|

**Disc**
D = Bare Disc

**Style**
7050
- Reference table

**Dielectric**
N = NPO
W = X5R
X = X7R
Y = X5U

**Capacitance**
Value in pF
- Two significant figures, plus number of zeros
6R8 = 6.8 pF
122 = 1200 pF
203 = 20,000 pF

**Tolerance**
J = ±5%, NPO only
K = ±10%
M = ±20%
P = -0 / +100%
Z = -20 / +80%

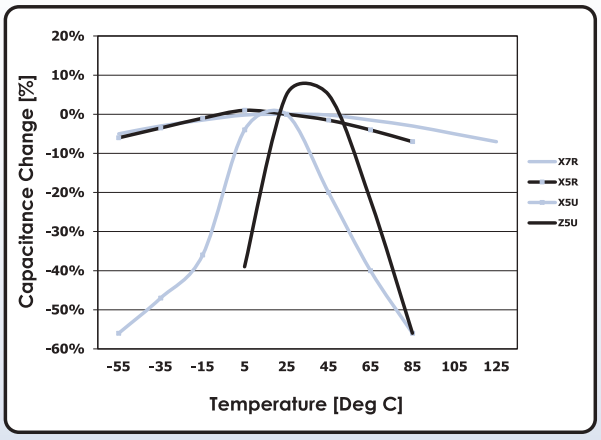
**Voltage**
752 = 7.5 kVDC
103 = 10 kVDC
153 = 15 kVDC

**Screening**
M = Group A
- Excluding Partial Discharge (Corona)

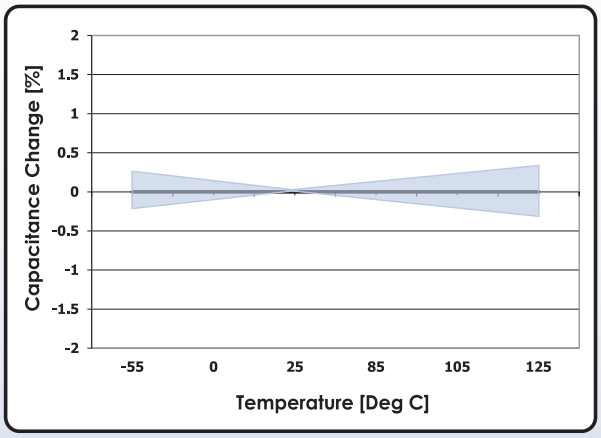
**Partial Discharge (Corona)**
C = Partial Discharge (Corona)

Note: Group A is not included unless designated in part number

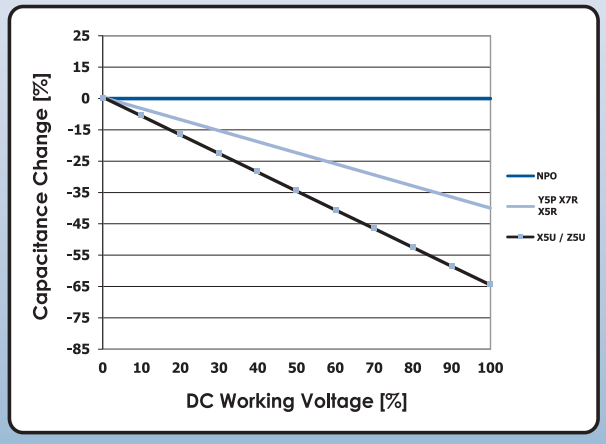
### Performance Charts (Typical)



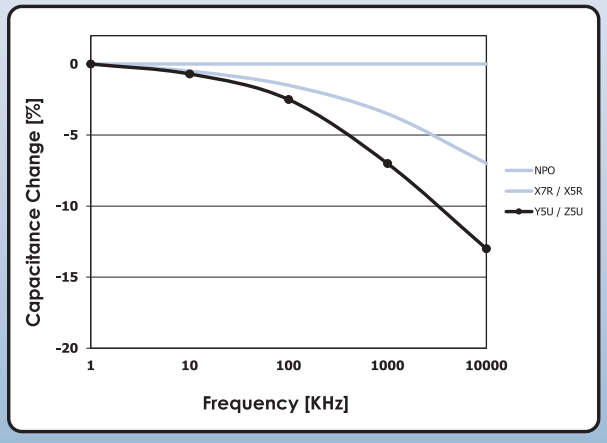

**Class II Temperature Coefficient**




**NPO Temperature Coefficient**




**Voltage Coefficient**




**Capacitance Vs Frequency**

Partnering with our clients for combined success.

ISO 9001:2015 CERTIFIED QUALITY MANAGEMENT SYSTEM

MADE IN USA

CalRamic Technologies LLC manufactures High Voltage Ceramic Capacitors. All of our products are manufactured in the United States. Applications of our products are Space Level, Military Aircraft and Ground Based Systems, Commercial Aerospace, SMPS, Medical Imaging, High Temperature (Geophysical and Geothermal), Pulse Discharge and High Repetition Rate, and a variety of commercial and industrial applications.

Our products range from Radial Leaded Multilayer and Disc to Surface Mount Chip capacitors in a variety of dielectrics to suit your application. We can produce large or small production quantities. Our lean manufacturing process and discipline offer the shortest lead times in the industry with out-of-stock same day delivery.

We also offer our “Fast Track” delivery for those special delivery needs. Custom designs and variations are welcome.

MADE IN USA

## BASIC APPLICATIONS

It is the basic ability of a capacitor to store energy for controlled release that makes it an extremely valuable tool for use in a wide range of applications in the electronics industry. Typical applications would include:

### Energy / Pulse Discharge

The energy stored in the capacitor can be discharged for use in an ignition, firing or triggering circuit or as a power source.

### Direct Current Blockage

A fully charged capacitor acts as a high impedance device and can block the passage of DC current while still allowing AC current to pass to a specified portion of the circuit.

### Coupling of Circuit Components

With the ability to pass AC signals, a capacitor is able to couple one section of an AC circuit to another circuit.

### Decoupling of Circuit Components

Capacitors are often used in integrated circuits (IC's) to minimize noise in the logic signal by providing an additional current source.

### Filter Capacitors

The reactance of a capacitor is inversely proportional to the frequency thereby offering decreased resistance to current flow at higher frequency levels. This ability to decrease or increase the impedance of the circuit allows the capacitor to discriminate and filter out undesired frequencies.

### By-Pass Capacitor

The ability to block DC current and allow the passage of AC current permits the capacitor to be placed in parallel with other components to by-pass the AC at a certain frequency without allowing the DC component of the signal to pass.

### Snubber Capacitors

Capacitors can be used to protect sensitive components in a circuit by limiting the energy associated with high voltage transients generated by the opening of relays or silicon controlled rectifiers (SCR) used to drive high inductance loads.

### Switch Mode Power Supply

For applications including input and output filters for switch mode power supplies, DC to DC converters, decoupling, snubbers, energy storage and high capacitance discharge circuits.
See pages 27 & 49 for more information.

**CalRamic Technologies LLC** is an ISO9001-2015 Certified facility. Our commitment to Quality is our primary objective and we pride ourselves on our satisfaction to our client base. Our Goal is to provide the upmost Quality from the initial contact in introducing our company, to quoting the same day if possible, followed by offering short deliveries coupled with “on time deliveries” of our products. And of course, what we consider the most important element, the reliability of the components in the application once delivered. In addition, we remain dynamic and open to our customer’s inputs so we may continue to improve in all aspects related to our chosen field. We continue to grow at a substantial rate and believe that is in direct response to maintaining the Quality Objectives stated above.

42 °C
NEW ELEMENTS 10/9

## MORE ABOUT US

**CalRamic Technologies LLC** is a U.S.-based High Voltage Ceramic Capacitor manufacturer with over 20 years' experience. Our team focuses on producing exceptional quality capacitors by using superior quality materials with a highly trained team.

CalRamic produces a variety of components in a multitude of configurations ranging from 500VDC to 80KVDC. Our Lean Manufacturing principles provide shorter lead times, rapid prototype turnaround deliveries, multiple design derivations for your custom application, and a variety of dielectric types depending on your specific application.

Our quality control system conforms to and exceeds ISO 9001-2015 requirements. We manufacture capacitors suitable for a wide range of applications like: Geothermal, Commercial/Industrial, Medical, Commercial Aerospace, Ground Based Military, Military Aerospace and even Hi-Reliability Space Satellite Systems. Our manufacturing design guidelines, material choices, and precision controls result in performance-based High Voltage Capacitors for your specific application.

The CalRamic Technologies Leadership has created a culture that encourages personal growth and success for each team member, while building a We Succeed as a Team environment. In addition, we look for opportunities to support our local community through non-profit involvement and CalRamic Team events throughout the year.

We are committed to the best approaches and practices that limit environmental impact, and an extensive safety and awareness training program that limits hazardous exposures to our Team Members.

CalRamic Technologies LLC is fully committed to our clients' success. On our website we offer a full ceramic capacitor educational library with Application Notes and Product Training Modules that help our clients understand the technical nature of High Voltage Ceramic Capacitors.

We are fully committed to your application's success.

*Jeff Day*

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