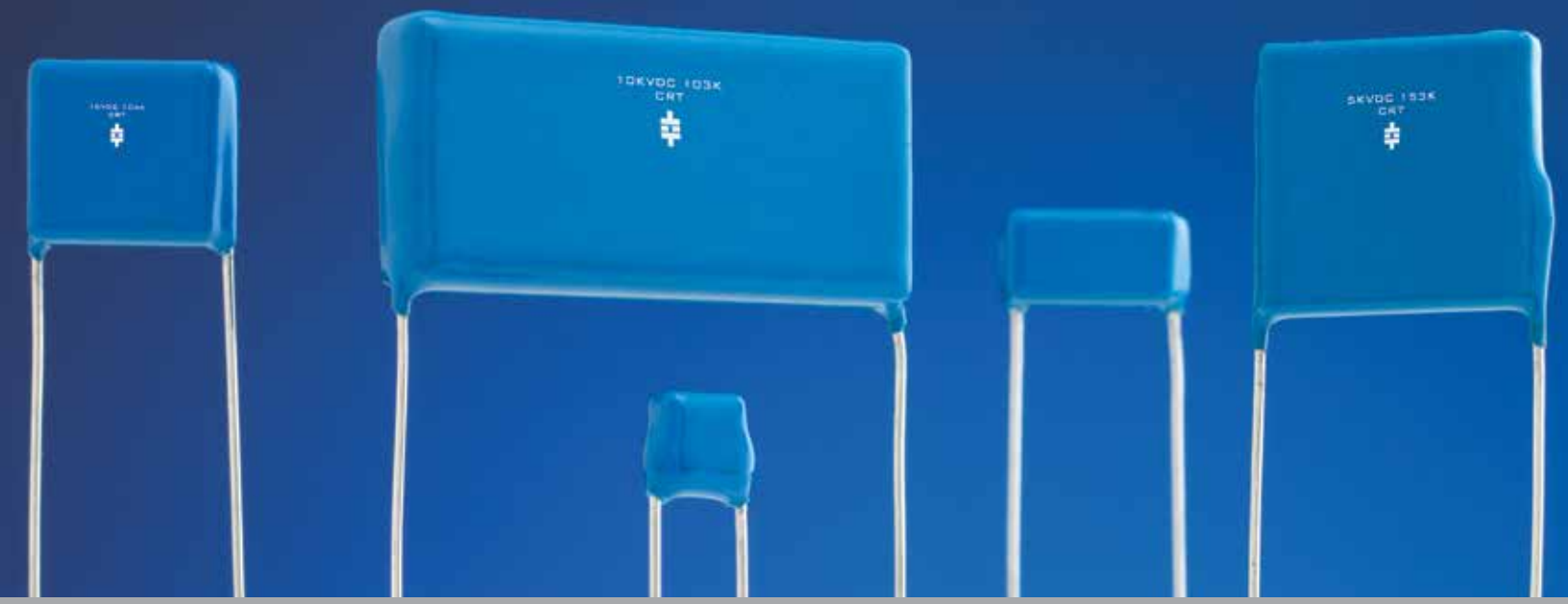
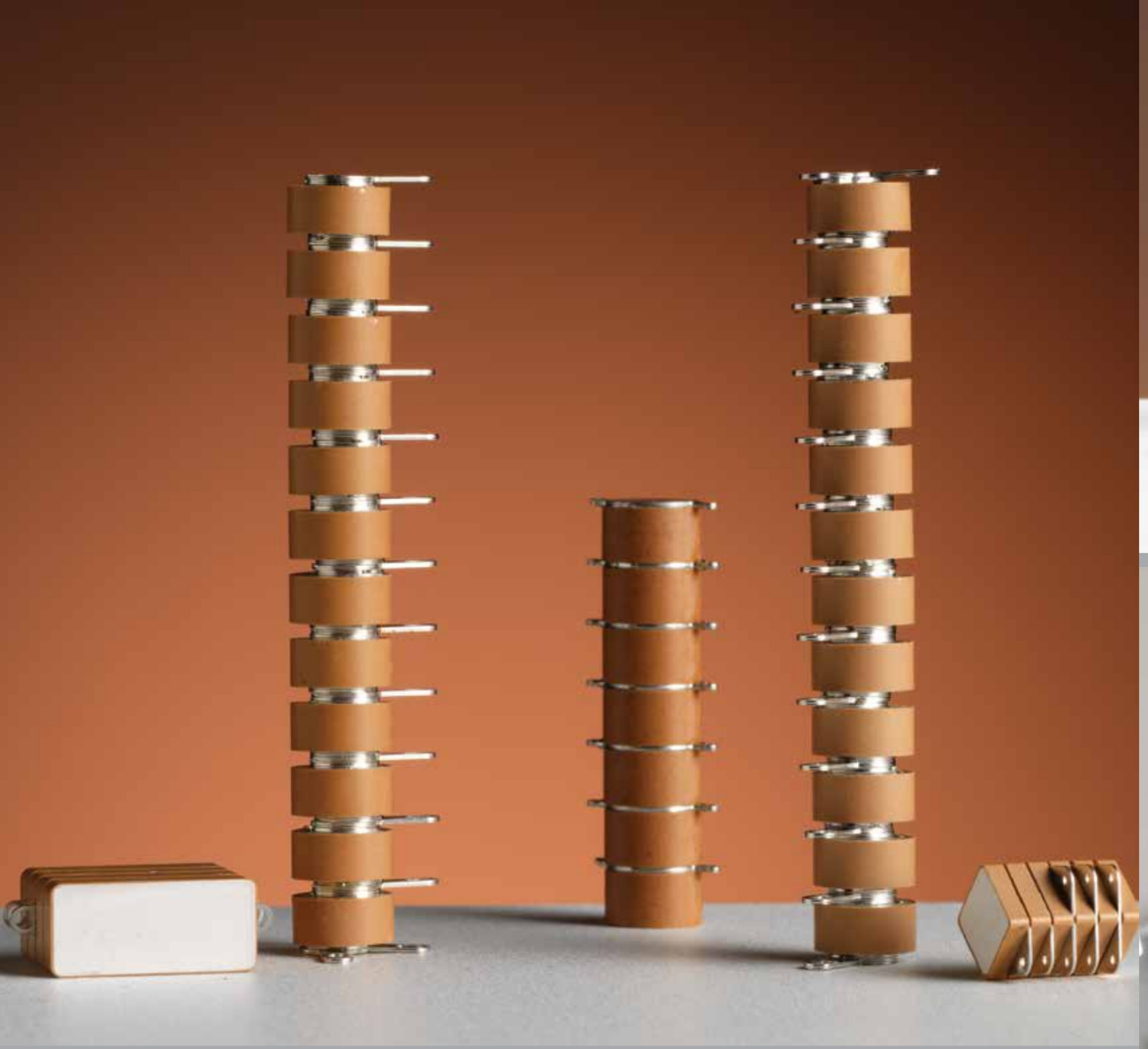
High Voltage Ceramic Capacitors
500 V to 20 KV



CalRamic Technologies LLC

- Space Level
- Military Aircraft and Ground Based Systems
- Commercial Aerospace
- Commercial and Industrial Applications
- Medical Imaging
- Pulse Discharge and High Repetition Rate Applications
- Geophysical and Geothermal 200° C High Temp



Partnering with our clients for combined success.

CalRamic Technologies LLC manufactures High Voltage Ceramic Capacitors. Applications of our products are Space Level, Military Aircraft and Ground Based Systems, Commercial Aerospace, 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 Multi-layer 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.

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.

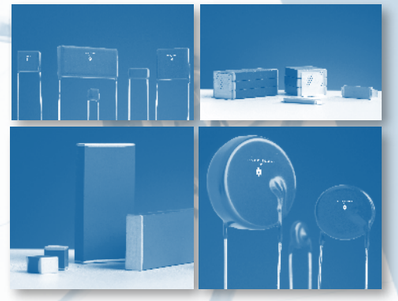
Decoupling of Circuit Components
Capacitors are often used in integrated circuits (IC's) to minimize noise in the logic signal by providing an additional current source.

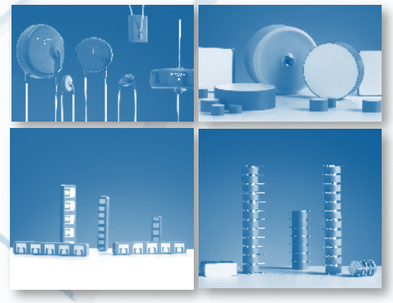
Filter Capacitors
The reactance of a capacitor is inversely proportional to the frequency thereby offering decreased resistance to current flow at higher frequency levels. This ability to decrease or increase the impedance of the circuit allows the capacitor to discriminate and filter out undesired frequencies.

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.

PRODUCTS





A

B

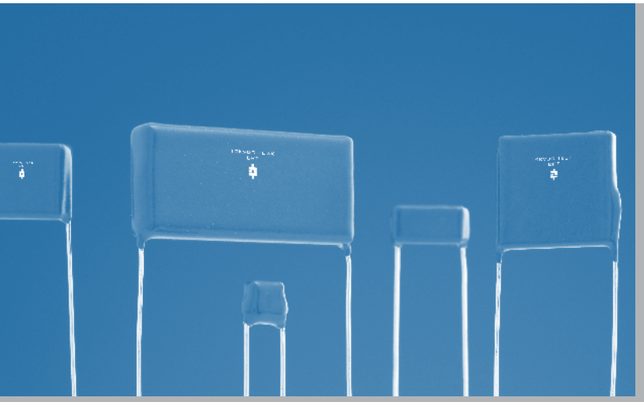
C

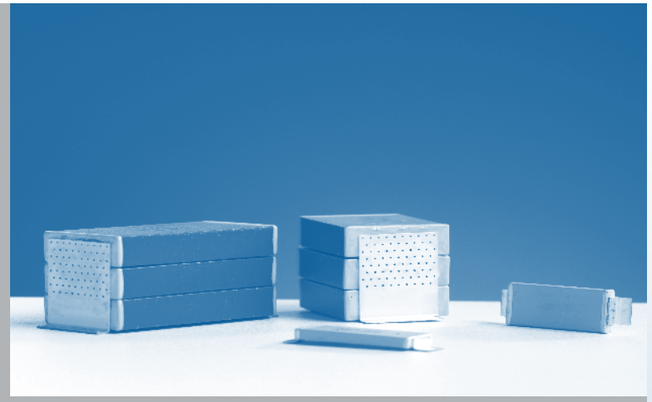
D

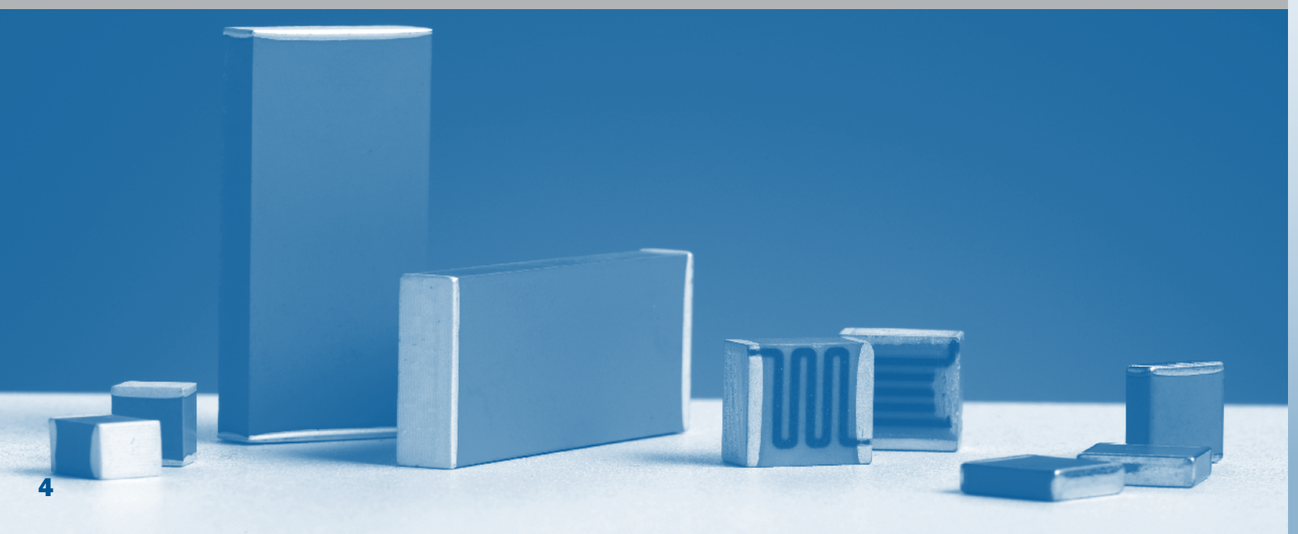
Military & Commercial

CalRamic Technologies LLC

(775) 851-3580 / calramic.com / 5462 Louie Lane / Reno, NV 89511 USA

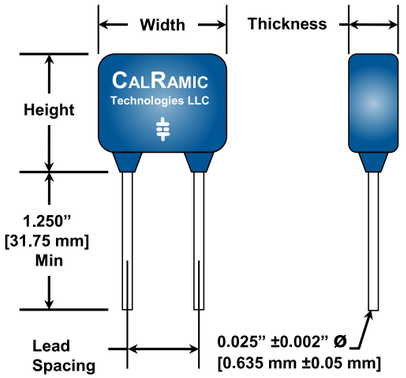






High Voltage Radial Leaded Capacitors

Military & Commercial Grade – 500 Vdc to 10 KVdc



Lead Type: #22 AWG, CCFE

Lead Finish: Standard – Solder plate / RoHS – 100% Tin plate

CalRamic Technologies LLC manufactures a series of highly reliable, military / commercial grade high voltage, radial leaded ceramic capacitors that are designed specifically for those conditions where the assembly may be exposed to high levels of thermal and / or mechanical shock. In addition, these assemblies are packaged in a high resistance conformal coating that provides enhanced electrical isolation and added environmental protection.

Intended for continuous operation at full rated voltage and across the entire operating temperature range, these capacitors utilize a special internal design specifically intended to reduce electric field stresses, thereby providing a device that exhibits very low ESR characteristics and no reduction in insulation resistance with life.

Available with ultra stable Class I, NPO and stable Class II, X7R dielectric materials, these capacitors are ideally suited for timing / precision circuitry, energy storage, DC blocking, snubbers, transient suppression, decoupling, resonators and EMI filtering applications.

A

Performance Characteristics

Specification	Dielectric Type (EIA Designation)	
	NPO (COG)	X7R
Material Classification	Type I, Ultra Stable, K90	Type II, Stable, K2500
Coefficient of Thermal Expansion	9 x 10^{-6} / °C	11 x 10^{-6} / °C
Density	67 g / in^3	
Operating Temperature Range	-55 to +125°C	
Aging Rate	0	-2% Max per decade hour
Temperature Coefficient	±30 PPM / °C	±15%
Voltage Coefficient	Negligible	Range -35% to -55% Max @ WVDC
Capacitance Range	10 pF to 0.33 µF	150 pF to 5.6 µF
Voltage Range	500 Vdc to 10KVdc	
Insulation Resistance @ +25°C	100,000 MΩ or 1000 MΩ - µF, W/E is less	
Insulation Resistance @ +125°C	10,000 MΩ or 100 MΩ - µF, W/E is less	
Dissipation Factor	0.1% Max	2.5% Max
DWV	1.5 x WVDC @ WVDC = 500 Vdc / 1.2 x WVDC @ WVDC > 500 Vdc	

Mechanical Dimensions

Dimensions inches [mm]	Product Style												
	HV01	HV02	HV03	HV10	HV04	HV11	HV05	HV06	HV07	HV13	HV14	HV15	HV16
Width - Max	0.250 [6.35]	0.320 [8.13]	0.370 [9.40]	0.450 [11.43]	0.470 [11.94]	0.550 [13.97]	0.570 [14.48]	0.670 [17.02]	0.770 [19.56]	0.850 [21.59]	1.050 [26.67]	1.250 [31.75]	1.450 [36.83]
Height - Max	0.220 [5.59]	0.280 [7.11]	0.300 [7.62]	0.220 [5.59]	0.400 [10.16]	0.280 [7.11]	0.500 [12.70]	0.600 [15.24]	0.720 [18.29]	0.400 [10.16]	0.500 [12.70]	0.600 [15.24]	0.720 [18.29]
Thickness - Max	0.200 [5.08]	0.250 [6.35]	0.250 [6.35]	0.200 [5.08]	0.270 [6.86]	0.270 [6.86]	0.270 [6.86]	0.270 [6.86]	0.270 [6.86]	0.270 [6.86]	0.270 [6.86]	0.270 [6.86]	0.270 [6.86]
Lead Spacing ±0.030 [0.762]	0.170 [4.32]	0.220 [5.59]	0.275 [6.99]	0.300 [7.62]	0.375 [9.53]	0.400 [10.16]	0.475 [12.07]	0.575 [14.61]	0.675 [17.15]	0.700 [17.78]	0.975 [24.77]	1.175 [29.85]	1.300 [33.02]

High Voltage Radial Leaded Capacitors

Military & Commercial Grade – 500 Vdc to 10 KVdc

Electrical Characteristics

NPO Capacitance Range														
Style		HV01	HV02	HV03	HV04	HV05	HV06	HV07	HV10	HV11	HV13	HV14	HV15	HV16
Min Cap		120	220	270	270	180	270	470	100	100	120	180	330	560
WVDC	500	472	822	103	223	563	823	104	103	183	823	104	224	334
	1000	152	392	682	183	333	473	683	472	123	393	563	104	154
	2000	271	821	102	222	472	682	103	102	152	562	103	223	253
	3000	151	561	681	152	392	562	822	471	821	472	562	153	183
	4000	•	•	•	681	152	272	392	221	561	152	332	562	822
	5000	•	•	•	•	102	222	272	•	391	122	182	392	562
	7000	•	•	•	•	•	•	•	•	•	471	102	182	272
	10000	•	•	•	•	•	•	•	•	•	•	821	122	222

X7R Capacitance Value														
Style		HV01	HV02	HV03	HV04	HV05	HV06	HV07	HV10	HV11	HV13	HV14	HV15	HV16
Min Cap		271	561	681	271	471	681	821	151	271	221	471	821	122
WVDC	500	823	184	224	564	125	185	255	224	394	155	225	395	565
	1000	183	683	823	274	474	684	105	563	154	684	105	155	225
	2000	332	123	183	333	683	104	184	822	223	823	154	254	334
	3000	•	392	562	153	333	393	823	222	822	273	563	823	124
	4000	•	•	•	682	103	153	273	122	472	123	273	473	683
	5000	•	•	•	•	682	103	153	•	272	822	223	273	393
	7000	•	•	•	•	•	•	•	•	•	332	472	103	183
	10000	•	•	•	•	•	•	•	•	•	•	392	562	103

Notes

1. Product designed and manufactured to be drop in replacements for DSCC HV designs.
2. Group A screening available to MIL-PRF-49467.
3. Special testing including SLAM / CSAM and Partial Discharge (Corona) is available. See Space Level HS catalog CRT-0009 for more information.
4. Custom voltages, package sizes and capacitance values available. Contact factory
5. X7R dielectrics are not intended for AC line filtering applications.
6. Large ceramic capacitors, even leaded devices are susceptible to damage when exposed to thermal and / or mechanical shock. Refer to Technical Bulletin AN103 for handling and installation recommendations.
7. High voltage products may require additional conformal coating to prevent possible arc over.

Part Number / Ordering Information

20	HV03	B	562	K	M	R

Voltage
05 = 500 Vdc
20 = 2000 Vdc
100 = 10 kVdc

Style
HV03
- Reference table

Dielectric
B = X7R
N = NPO

Capacitance
Value in pF
- Two significant figures, plus number of zeros
562 = 5600 pF
104 = 100,000 pF

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

Screening
M = Group A
- Excludes corona

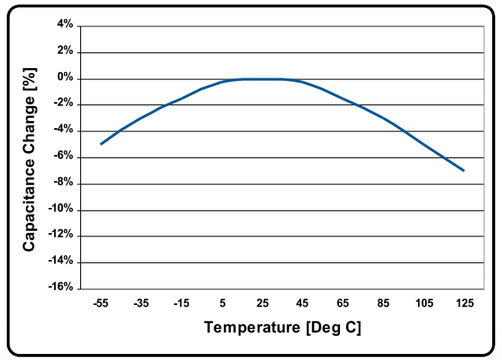
RoHS
R = RoHS

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

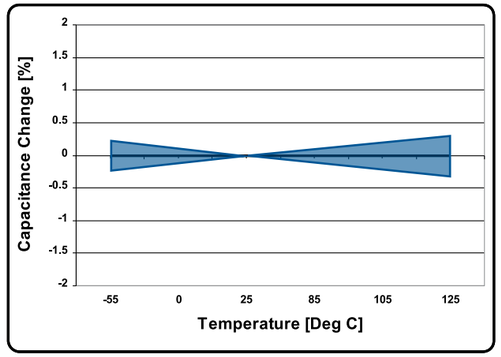
High Voltage Radial Leaded Capacitors

Military & Commercial Grade – 500 Vdc to 10 KVdc

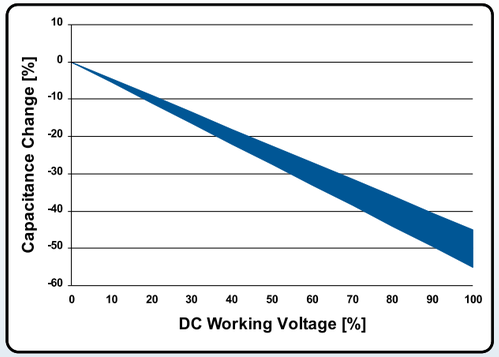
Performance Charts (Typical)



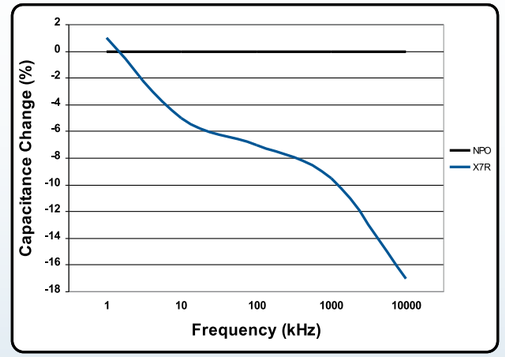
X7R Temperature Coefficient



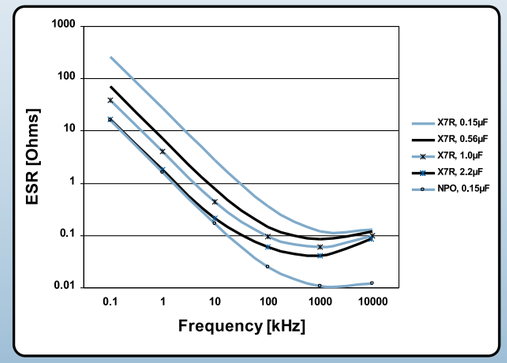
NPO Temperature Coefficient



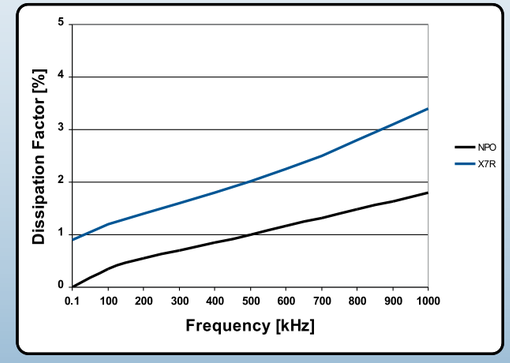
Voltage Coefficient



Capacitance Vs Frequency



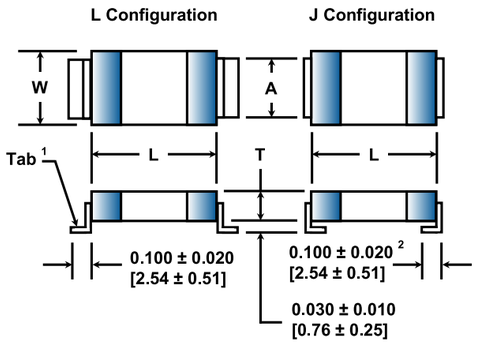
ESR Vs Frequency



DF Vs Frequency

High Voltage Surface Mount Capacitors

Military & Commercial Grade – 500 Vdc to 10 KVdc



1. Tab thickness 0.009 ± 0.001 [0.25 ± 0.05]
2. SM01, SM02, SM03 @ 0.040 ± 0.010 [1.02 ± 0.26]

CalRamic Technologies LLC manufactures a series of highly reliable, military / commercial grade high voltage, surface mount, ceramic chip capacitors, that are intended for those applications where the assembly may be exposed to high levels of thermal and / or mechanical shock. Conservatively designed, they are ideal for use in demanding high voltage, high current environments.

Intended for continuous operation at full rated voltage and across the entire operating temperature range, these capacitors utilize a special internal design specifically intended to reduce electric field stresses, thereby providing a device that exhibits very low ESR characteristics and no reduction in insulation resistance with life.

Available with ultra stable Class I, NPO and stable Class II, X7R dielectric materials, these capacitors are ideally suited for timing / precision circuitry, energy storage, DC blocking, snubbers, transient suppression, decoupling, resonators and EMI filtering applications.

Performance Characteristics

Specification	Dielectric Type (EIA Designation)	
	NPO (COG)	X7R
Material Classification	Type I, Ultra Stable, K90	Type II, Stable, K2500
Coefficient of Thermal Expansion	9 x 10^{-6} / °C	11 x 10^{-6} / °C
Density	67 g / in^3	
Operating Temperature Range	-55 to +125°C	
Aging Rate	0	-2% Max per decade hour
Temperature Coefficient	±30 PPM / °C	±15%
Voltage Coefficient	Negligible	Range -35% to -55% Max @ WVDC
Capacitance Range	10 pF to 0.33 µF	150 pF to 5.6 µF
Voltage Range	500 Vdc to 10KVdc	
Insulation Resistance @ +25°C	100,000 MΩ or 1000 MΩ - µF, W/E is less	
Insulation Resistance @ +125°C	10,000 MΩ or 100 MΩ - µF, W/E is less	
Dissipation Factor	0.1% Max	2.5% Max
DWV	1.5 x WVDC @ WVDC = 500 Vdc / 1.2 x WVDC @ WVDC > 500 Vdc	

Mechanical Dimensions

Dimensions Inches [mm]	Product Style												
	S M01	S M02	S M03	S M04	S M05	S M06	S M07	S M10	S M11	S M13	S M14	S M15	S M16
Length [L]	0.150 ± 0.015 [3.81 ± 0.38]	0.200 ± 0.020 [5.08 ± 0.51]	0.250 ± 0.025 [6.35 ± 0.64]	0.350 ± 0.030 [8.89 ± 0.76]	0.450 ± 0.030 [11.43 ± 0.76]	0.550 ± 0.030 [14.00 ± 0.76]	0.650 ± 0.030 [16.50 ± 0.76]	0.300 ± 0.030 [7.62 ± 0.76]	0.400 ± 0.030 [10.20 ± 0.76]	0.700 ± 0.030 [17.80 ± 0.76]	0.900 ± 0.030 [22.90 ± 0.76]	1.150 ± 0.030 [27.90 ± 0.76]	1.300 ± 0.030 [33.02 ± 0.76]
Width [W]	0.150 ± 0.015 [3.81 ± 0.38]	0.200 ± .020 [5.08 ± 0.51]	0.200 ± 0.020 [5.08 ± 0.51]	0.300 ± 0.030 [7.62 ± 0.76]	0.400 ± 0.030 [10.16 ± 0.76]	0.500 ± 0.030 [12.70 ± 0.76]	0.600 ± 0.030 [10.20 ± 0.76]	0.150 ± 0.015 [3.81 ± 0.38]	0.200 ± 0.020 [5.08 ± 0.51]	0.300 ± 0.030 [7.62 ± 0.76]	0.400 ± 0.030 [10.16 ± 0.76]	0.500 ± 0.030 [12.70 ± 0.76]	0.600 ± 0.030 [10.20 ± 0.76]
Thickness [T] [Max]	0.130 [3.30]	0.180 [4.57]	0.180 [4.57]	0.220 [5.59]	0.220 [5.59]	0.220 [5.59]	0.220 [5.59]	0.140 [3.55]	0.130 [3.30]	.180 [4.57]	0.220 [5.59]	0.220 [5.59]	0.220 [5.59]
Tab [A]	0.100 [2.54]	0.100 [2.54]	0.100 [2.54]	0.200 5.08]	0.300 [7.62]	0.400 [10.2]	0.500 [12.7]	0.100 [2.54]	0.100 [2.54]	0.200 5.08]	0.300 [7.62]	0.400 [10.2]	0.500 [12.7]

High Voltage Surface Mount Capacitors

Military & Commercial Grade – 500 Vdc to 10 KVdc

A

Electrical Characteristics

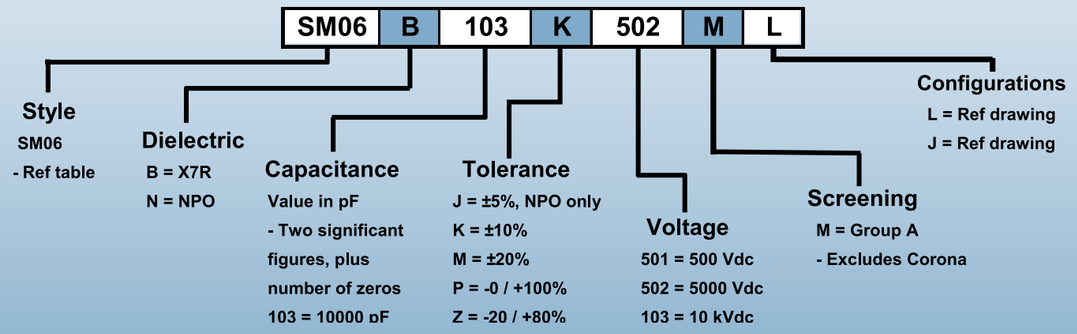
NPO Capacitance Range														
Style		S M01	S M02	S M03	S M04	S M05	S M06	S M07	S M10	S M11	S M13	S M14	S M15	S M16
Min Cap		120	220	270	270	180	270	470	100	100	120	180	330	560
WVDC	500	472	822	103	223	563	823	104	103	183	823	104	224	334
	1000	152	392	682	183	333	473	683	472	123	393	563	104	154
	2000	271	821	102	222	472	682	103	102	152	562	103	223	253
	3000	151	561	681	152	392	562	822	471	821	472	562	153	183
	4000	•	•	•	681	152	272	392	221	561	152	332	562	822
	5000	•	•	•	•	102	222	272	•	391	122	182	392	562
	7000	•	•	•	•	•	•	•	•	•	471	102	182	272
	10000	•	•	•	•	•	•	•	•	•	•	821	122	222

X7R Capacitance Value														
Style		S M01	S M02	S M03	S M04	S M05	S M06	S M07	S M10	S M11	S M13	S M14	S M15	S M16
Min Cap		271	561	681	271	471	681	821	151	271	221	471	821	122
WVDC	500	823	184	224	564	125	185	255	224	394	155	225	395	565
	1000	183	683	823	274	474	684	105	563	154	684	105	155	225
	2000	332	123	183	333	683	104	184	822	223	823	154	254	334
	3000	•	392	562	153	333	393	823	222	822	273	563	823	124
	4000	•	•	•	682	103	153	273	122	472	123	273	473	683
	5000	•	•	•	•	682	103	153	•	272	822	223	273	393
	7000	•	•	•	•	•	•	•	•	•	332	472	103	183
	10000	•	•	•	•	•	•	•	•	•	•	392	562	103

Notes

1. Group A screening available to MIL-PRF-49467.
2. Special testing including Ultrasound (SLAM / CSAM) and Partial Discharge (Corona) is available. See Space Level Surface Mount catalog page CRT-0022 for more information or contact factory.
3. Custom voltages, package sizes and capacitance values available. Contact factory.
4. X7R dielectrics are not intended for AC line filtering applications.
5. Large ceramic capacitors, even leaded devices are susceptible to damage when exposed to thermal and /or mechanical shock. Refer to Technical Bulletin AN101 for handling and installation recommendations.
6. High voltage products may require conformal coating to prevent possible arc over.

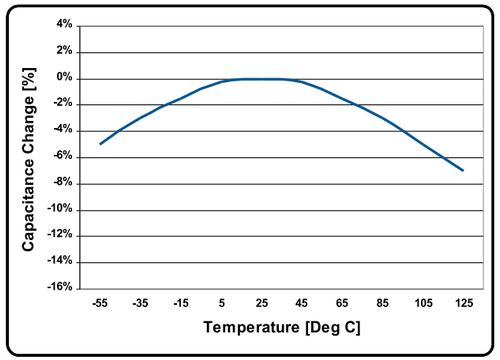
Part Number / Ordering Information



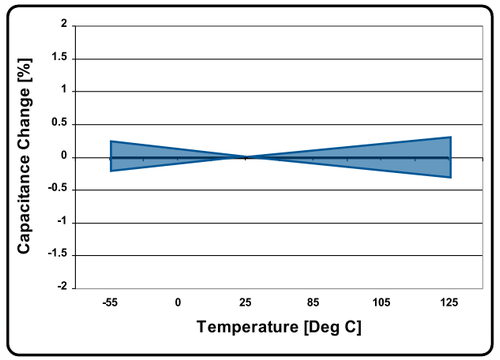
High Voltage Surface Mount Capacitors

Military & Commercial Grade – 500 Vdc to 10 KVdc

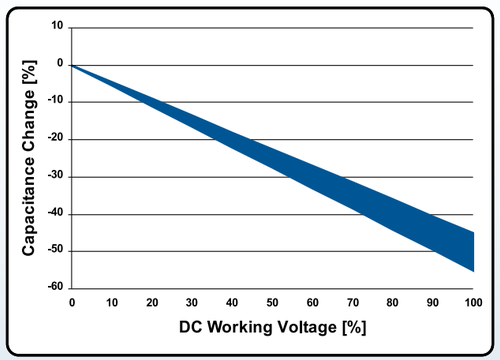
Performance Charts (Typical)



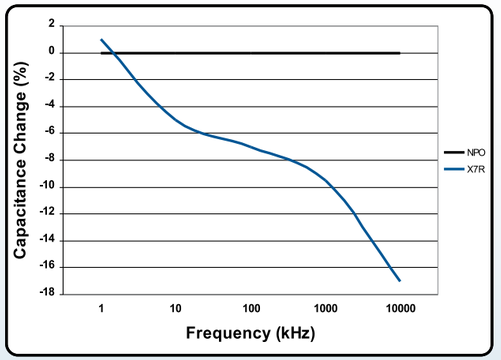
X7R Temperature Coefficient



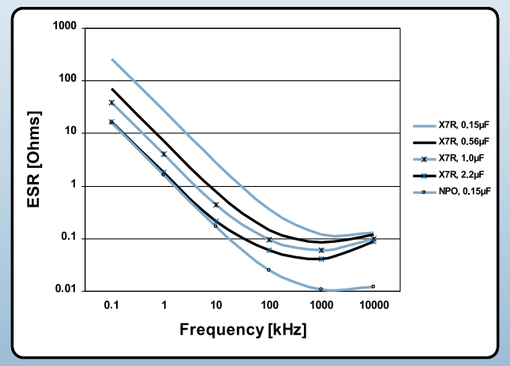
NPO Temperature Coefficient



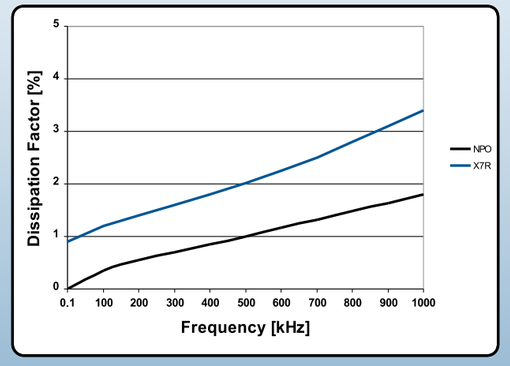
Voltage Coefficient



Capacitance Vs Frequency



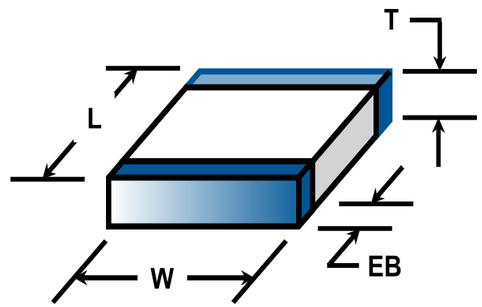
ESR Vs Frequency



DF Vs Frequency

High Voltage Multi-Layer Chip Capacitors

Military & Commercial Grade – 500 Vdc to 10 KVdc



CalRamic Technologies LLC manufactures a series of highly reliable, military / commercial grade high voltage, multilayer ceramic chip capacitors that are conservatively designed and intended specifically for use in demanding high voltage,high current environments.

Intended for continuous operation at full rated voltage and across the entire operating temperature range, these capacitors utilize a special internal design specifically intended to reduce electric field stresses, thereby providing a device that exhibits very low ESR characteristics and no reduction in insulation resistance with life.

Available with ultra stable Class I, NPO and stable Class II, X7R dielectric materials, these capacitors are ideally suited for timing / precision circuitry, energy storage, DC blocking, snubbers, transient suppression, decoupling, resonators and EMI filtering applications.

Performance Characteristics

Specification	Dielectric Type (EIA Designation)	
	NPO (COG)	X7R
Material Classification	Type I, Ultra Stable, K90	Type II, Stable, K2500
Coefficient of Thermal Expansion	9 x 10^{-6} / °C	11 x 10^{-6} / °C
Density	67 g / in^3	
Operating Temperature Range	-55 to +125°C	
Aging Rate	0	-2% Max per decade hour
Temperature Coefficient	±30 PPM / °C	±15%
Voltage Coefficient	Negligible	Range -35% to -55% Max @ WVDC
Capacitance Range	10 pF to 0.33 µF	150 pF to 5.6 µF
Voltage Range	500 Vdc to 10KVdc	
Insulation Resistance @ +25°C	100,000 MΩ or 1000 MΩ - µF, W/E is less	
Insulation Resistance @ +125°C	10,000 MΩ or 100 MΩ - µF, W/E is less	
Dissipation Factor	0.1% Max	2.5% Max
DWV	1.5 x WVDC @ WVDC = 500 Vdc / 1.2 x WVDC @ WVDC > 500 Vdc	

Mechanical Dimensions

Dimensions in [mm]	Product Style																	
	HV1515	HV1812	HV1825	HV2020	HV2225	HV2520	HV3333	HV3530	HV4040	HV4540	HV5440	HV5550	HV6560	HV7030	HV9040	HV11050	HV13060
Length [L] Tol ±	0.150 [3.81] 0.015 [0.38]	0.180 [4.57] 0.020 [0.51]	0.180 [4.57] 0.020 [0.51]	0.200 [5.08] 0.020 [0.51]	0.220 [5.59] 0.020 [0.51]	0.250 [6.35] 0.020 [0.51]	0.330 [8.38] 0.030 [0.76]	0.350 [8.89] 0.030 [0.76]	0.400 [10.2] 0.030 [0.76]	0.450 [11.43] 0.030 [0.76]	0.540 [13.7] 0.030 [0.76]	0.550 [14.0] 0.030 [0.76]	0.650 [16.5] 0.030 [0.76]	0.700 [17.8] 0.030 [0.76]	0.900 [22.9] 0.030 [0.76]	1.100 [27.9] 0.030 [0.76]	1.300 [33.0] 0.030 [0.76]
Width [W] Tol ±	0.150 [3.81] 0.015 [0.38]	0.120 [4.57] 0.015 [0.38]	0.250 [6.35] 0.020 [0.51]	0.200 [5.08] 0.020 [0.51]	0.250 [6.35] 0.020 [0.51]	0.200 [5.08] 0.020 [0.51]	0.330 [8.38] 0.030 [0.76]	0.300 [7.62] 0.030 [0.76]	0.400 [10.2] 0.030 [0.76]	0.400 [10.2] 0.030 [0.76]	0.400 [10.2] 0.030 [0.76]	0.500 [12.7] 0.030 [0.76]	0.600 [15.2] 0.030 [0.76]	0.300 [7.62] 0.030 [0.76]	0.400 [10.2] 0.030 [0.76]	0.500 [12.7] 0.030 [0.76]	0.600 [15.2] 0.030 [0.76]
Thickness [T] Max	0.140 [3.55]	0.100 [2.54]	0.160 [4.07]	0.180 [4.57]	0.200 [5.08]	0.180 [4.57]	0.220 [5.59]	0.220 [5.59]	0.220 [5.59]	0.220 [5.59]	0.220 [5.59]	0.220 [5.59]	0.220 [5.59]	0.220 [5.59]	0.220 [5.59]	0.220 [5.59]	0.220 [5.59]
EB Min - Max	0.010 - 0.030 [0.254 - 0.762]	0.010 - 0.040 [0.254 - 1.02]	0.010 - 0.040 [0.254 - 1.02]	0.010 - 0.040 [0.254 - 1.02]	0.010 - 0.040 [0.254 - 1.02]	0.020 - 0.060 [0.51 - 1.52]	0.020 - 0.060 [0.51 - 1.52]	0.020 - 0.060 [0.51 - 1.52]	0.020 - 0.060 [0.51 - 1.52]	0.020 - 0.060 [0.51 - 1.52]	0.020 - 0.060 [0.51 - 1.52]	0.020 - 0.060 [0.51 - 1.52]	0.020 - 0.060 [0.51 - 1.52]	0.020 - 0.060 [0.51 - 1.52]	0.020 - 0.060 [0.51 - 1.52]	0.020 - 0.060 [0.51 - 1.52]	0.020 - 0.060 [0.51 - 1.52]

High Voltage Multi-Layer Chip Capacitors

Military & Commercial Grade – 500 Vdc to 10 KVdc

Electrical Characteristics

NPO Capacitance Range																		
HV Style		1515	1812	1825	2020	2225	2520	3333	3530	4040	4540	5440	5550	6560	7030	9040	11050	13060
Min Cap		120	120	220	220	270	270	270	270	180	180	270	270	470	120	180	330	560
WVDC	500	472	272	822	822	123	103	153	223	393	563	823	823	104	823	104	224	334
	1000	152	122	392	392	822	682	123	183	223	333	333	473	683	393	563	104	154
	2000	271	271	821	821	102	102	222	222	392	472	562	682	103	562	103	223	253
	3000	151	121	561	561	681	681	122	152	222	392	472	562	822	472	562	153	183
	4000	•	•	•	•	•	•	681	681	122	152	222	272	392	152	332	562	822
	5000	•	•	•	•	•	•	•	•	•	122	•	222	272	122	182	392	562
	7000	•	•	•	•	•	•	•	•	•	•	•	•	•	471	102	182	272
	10000	•	•	•	•	•	•	•	•	•	•	•	•	•	•	821	122	222

X7R Capacitance Range																		
HV Style		1515	1812	1825	2020	2225	2520	3333	3530	4040	4540	5440	5550	6560	7030	9040	11050	13060
Min Cap		271	271	561	561	681	681	471	271	471	471	681	681	821	221	471	821	122
WVDC	500	823	563	184	184	224	224	474	564	824	125	155	185	255	155	225	395	565
	1000	183	183	473	683	823	823	254	274	394	474	684	684	105	684	105	155	225
	2000	332	252	822	123	153	183	333	333	473	683	563	104	184	823	154	254	334
	3000	•	•	272	392	472	562	123	153	183	333	333	393	823	273	563	823	124
	4000	•	•	•	•	•	•	•	682	•	103	103	153	273	123	273	473	683
	5000	•	•	•	•	•	•	•	•	•	682	-	103	153	822	223	273	393
	7000	•	•	•	•	•	•	•	•	•	•	•	•	•	332	472	103	273
	10000	•	•	•	•	•	•	•	•	•	•	•	•	•	•	392	562	103

Notes

1. Group A screening available to MIL-PRF-49467.
2. Special testing including Ultrasound (SLAM / CSAM) and Partial Discharge (Corona) is available. Reference CRT-0021, Space Level, HV MLCC catalog, or contact factory for more information.
3. Custom voltages, package sizes and capacitance values available. Contact factory.
4. X7R dielectrics are not intended for AC line filtering applications.
5. Large ceramic capacitors are susceptible to damage when exposed to thermal and / or mechanical shock. Refer to technical bulletin AN101 for handling and installation recommendations or consider selecting radial leaded or surface mount alternatives as detailed in catalogs CRT-0010 and CRT-0017.
6. High voltage products may require conformal coating to prevent possible arc over.

Part Number / Ordering Information

HV2520	B	183	K	202	N	M	R

Style
HV2520
- Ref table

Dielectric
B = X7R
N = NPO

Capacitance
Value in pF
- Two significant figures, plus number of zeros
183 = 18000 pF
104 = 100,000 pF

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

Voltage
501 = 500 Vdc
502 = 5000 Vdc
103 = 10 kVdc

Termination
P = Pd/Ag
S = Ag
N = Ni barrier / 100% Sn plate (7030 Pkg)
Y = Ni barrier / Sn-Pb plate (7030 Pkg)

Screening
M = Group A
- Excludes corona

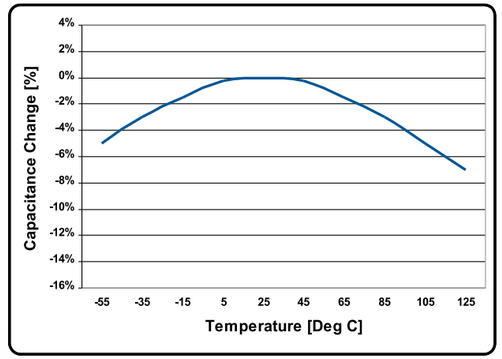
RoHS
R = Compliant

High Voltage Multi-Layer Chip Capacitors

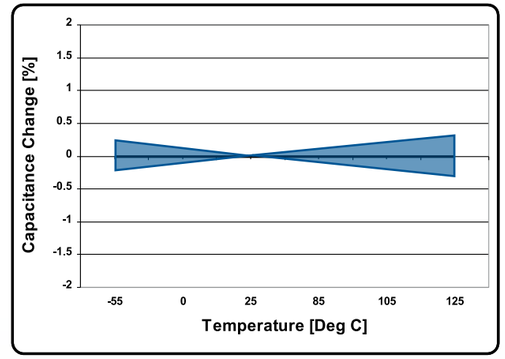
Military & Commercial Grade – 500 Vdc to 10 KVdc

A

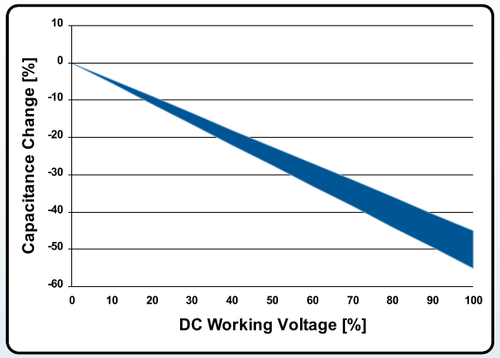
Performance Charts (Typical)



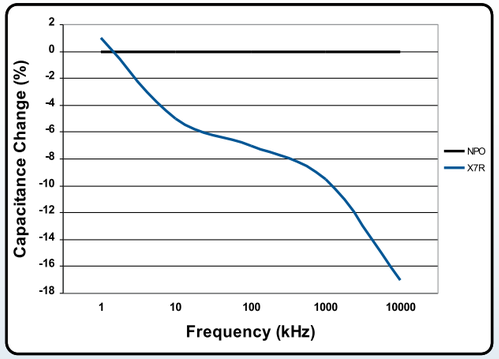
X7R Temperature Coefficient



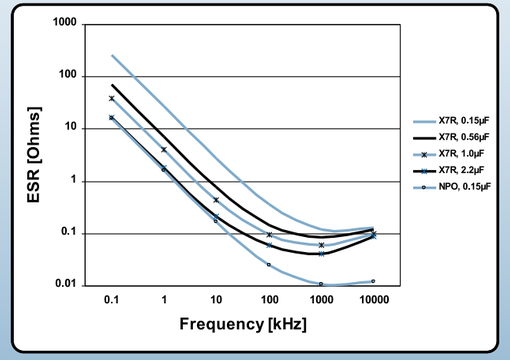
NPO Temperature Coefficient



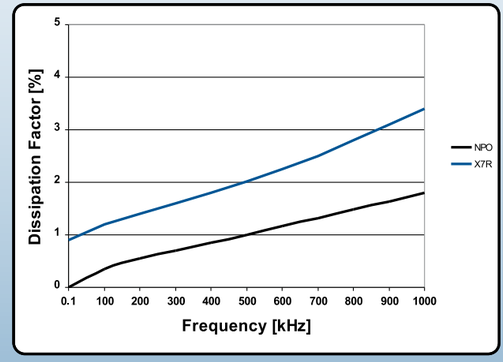
Voltage Coefficient



Capacitance Vs Frequency



ESR Vs Frequency

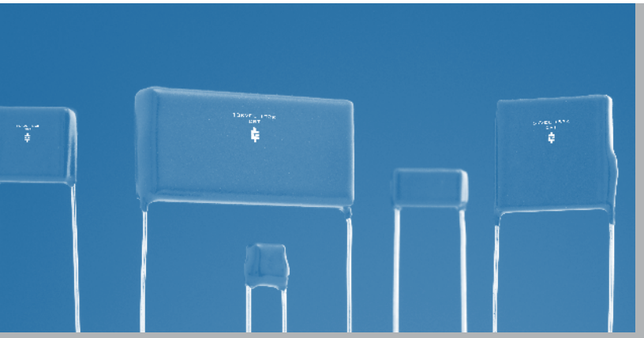


DF Vs Frequency

Space Level

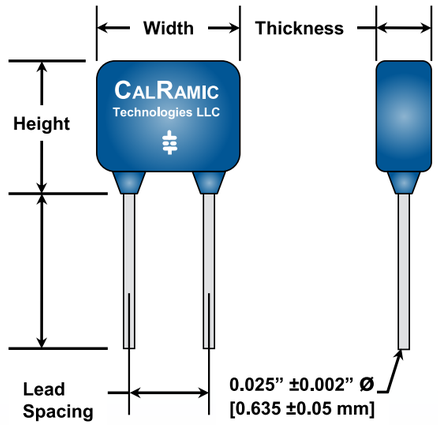
CalRamic Technologies LLC

(775) 851-3580 / calramic.com / 5462 Louie Lane / Reno, NV 89511 USA



High Voltage Radial Leaded Capacitors

Space Level – 500 Vdc to 10 KVdc



Lead Type: #22 AWG, CCFE / Solder plate

CalRamic Technologies LLC manufactures a series of highly reliable, mission critical, high voltage, radial leaded ceramic capacitors that are designed specifically for those non-repairable, space applications where the assembly may be exposed to high levels of thermal and / or mechanical shock.

In addition, these assemblies are packaged in a high resistance conformal coating that provides enhanced electrical isolation and added environmental protection.

Intended for continuous operation at full rated voltage and across the entire operating temperature range, these capacitors utilize a special internal design specifically intended to reduce electric field stresses, thereby providing a device that exhibits very low ESR characteristics and no reduction in insulation resistance with life.

Available with ultra stable Class I, NPO and stable Class II, X7R / BR dielectric materials, these capacitors are ideally suited for timing / precision circuitry, energy storage, DC blocking, snubbers, transient suppression, decoupling, resonators and EMI filtering applications.

Performance Characteristics

Specification	Dielectric Type (EIA Designation)	
	NPO (COG)	X7R [BR]
Material Classification	Type I, Ultra Stable, K90	Type II, Stable, K2500
Coefficient of Thermal Expansion	9 x 10^{-6} / °C	11 x 10^{-6} / °C
Density	67 g / in^3	
Operating Temperature Range	-55 to +125°C	
Aging Rate	0	-2% Max per decade hour
Temperature Coefficient	±30 PPM / °C	±15%
Voltage Coefficient	Negligible	Range -40% Max @ WVDC
Capacitance Range	12 pF to 0.22 µF	270 pF to 2.2 µF
Voltage Range	500 Vdc to 10KVdc	
Insulation Resistance @ +25°C	100,000 MΩ or 1000 MΩ - µF, W/E is less	
Insulation Resistance @ +125°C	10,000 MΩ or 100 MΩ - µF, W/E is less	
Dissipation Factor	0.1% Max	2.5% Max
DWV	1.5 x WVDC @ WVDC = 500 Vdc / 1.2 x WVDC @ WVDC > 500 Vdc	

Mechanical Dimensions

Dimensions inches [mm]	Product Style												
	HS01	HS02	HS03	HS10	HS04	HS11	HS05	HS06	HS07	HS13	HS14	HS15	HS16
Width - Max	0.250 [6.35]	0.320 [8.13]	0.370 [9.40]	0.450 [11.43]	0.470 [11.94]	0.550 [13.97]	0.570 [14.48]	0.670 [17.02]	0.770 [19.56]	0.850 [21.59]	1.050 [26.67]	1.250 [31.75]	1.450 [36.83]
Height - Max	0.220 [5.59]	0.280 [7.11]	0.300 [7.62]	0.220 [5.59]	0.400 [10.16]	0.280 [7.11]	0.500 [12.70]	0.600 [15.24]	0.720 [18.29]	0.400 [10.16]	0.500 [12.70]	0.600 [15.24]	0.720 [18.29]
Thickness - Max	0.200 [5.08]	0.250 [6.35]	0.250 [6.35]	0.200 [5.08]	0.270 [6.86]	0.270 [6.86]	0.270 [6.86]	0.270 [6.86]	0.270 [6.86]	0.270 [6.86]	0.270 [6.86]	0.270 [6.86]	0.270 [6.86]
Lead Spacing ±0.030 [0.762]	0.170 [4.32]	0.220 [5.59]	0.275 [6.99]	0.300 [7.62]	0.375 [9.53]	0.400 [10.16]	0.475 [12.07]	0.575 [14.61]	0.675 [17.15]	0.700 [17.78]	0.975 [24.77]	1.175 [29.85]	1.300 [33.02]

High Voltage Radial Leaded Capacitors

Space Level – 500 Vdc to 10 KVdc

Electrical Characteristics

NPO Capacitance Range														
Style		HS01	HS02	HS03	HS04	HS05	HS06	HS07	HS10	HS11	HS13	HS14	HS15	HS16
Min Cap		120	220	270	270	180	270	470	100	100	120	180	330	560
WVDC	500	392	682	822	183	473	683	823	123	223	104	124	184	224
	1000	122	272	472	153	253	393	473	332	682	473	563	823	124
	2000	561	681	821	252	562	822	183	681	182	822	123	183	223
	3000	•	•	471	122	272	472	562	271	681	392	472	123	153
	4000	•	•	•	•	102	182	272	•	561	152	332	472	822
	5000	•	•	•	•	561	152	222	•	251	122	222	392	392
	7000	•	•	•	•	•	•	•	•	•	102	821	122	222
	10000	•	•	•	•	•	•	•	•	•	•	•	102	152

X7R Capacitance Range														
Style		HS01	HS02	HS03	HS04	HS05	HS06	HS07	HS10	HS11	HS13	HS14	HS15	HS16
Min Cap		271	561	681	271	471	681	122	151	271	221	471	821	122
WVDC	500	273	823	104	274	474	684	105	823	154	684	105	155	225
	1000	682	223	273	823	154	224	334	183	473	224	274	474	684
	2000	122	472	682	153	273	473	683	332	103	333	683	104	154
	3000	•	•	•	562	123	223	333	122	392	153	273	473	683
	4000	•	•	•	•	472	822	123	•	222	682	154	223	333
	5000	•	•	•	•	392	472	522	•	152	392	822	123	223
	7000	•	•	•	•	•	•	•	•	•	472	332	472	822
	10000	•	•	•	•	•	•	•	•	•	•	•	332	562

Notes

1. Product receives 100% Group A Inspection in accordance with MIL-PRF-49467 including Corona.
2. Special testing including 100% SLAM / CSAM is available upon request.
3. Custom voltages, package sizes and capacitance values available. Contact factory.
4. X7R dielectrics are not intended for AC line filtering applications.
5. Space level products are capable of meeting a minimum of 4000 hours life at full rated conditions with no degradation in insulation resistance.
6. Large ceramic capacitors, even leaded devices are susceptible to damage when exposed to thermal and / or mechanical shock. Refer to Technical Bulletin AN103 for handling and installation recommendations.
7. High voltage products may require additional conformal coating to prevent possible arc over.

Part Number / Ordering Information

30	HS03	B	392	K	S

Voltage
05 = 500 Vdc
20 = 2000 Vdc
100 = 10 kVdc

Style
HS03
- Reference table

Dielectric
B = BR / X7R
N = NPO

Capacitance
Value in pF
- Two significant figures, plus number of zeros
392 = 3900 pF
104 = 100,000 pF

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

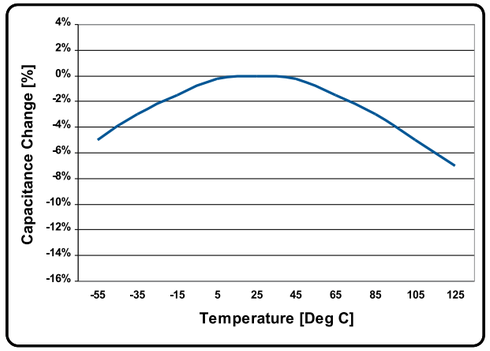
Ultrasound
S = SLAM
C = C-SAM

Note: Ultrasound (SLAM / C-SAM) is not included unless designated in part number.

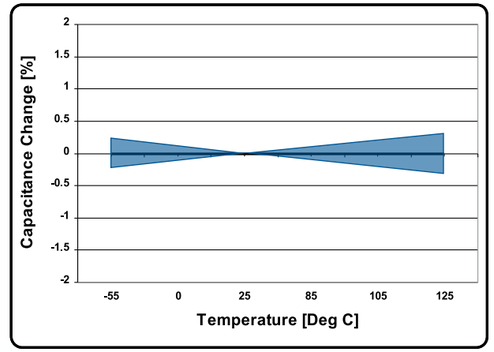
High Voltage Radial Leaded Capacitors

Space Level – 500 Vdc to 10 KVdc

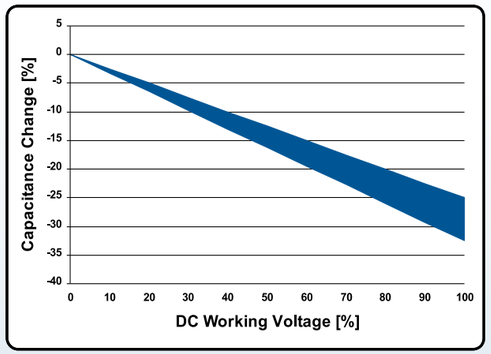
Performance Charts (Typical)



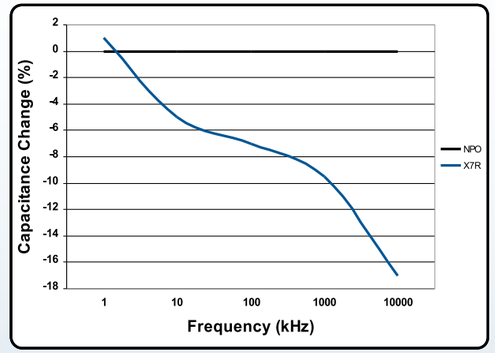
X7R Temperature Coefficient



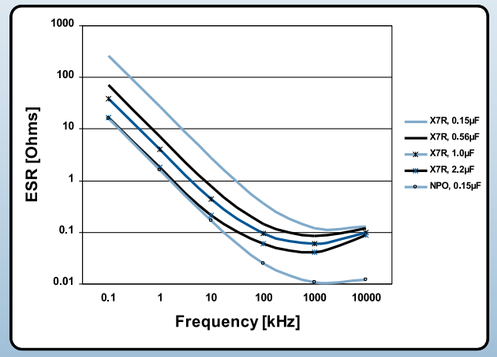
NPO Temperature Coefficient



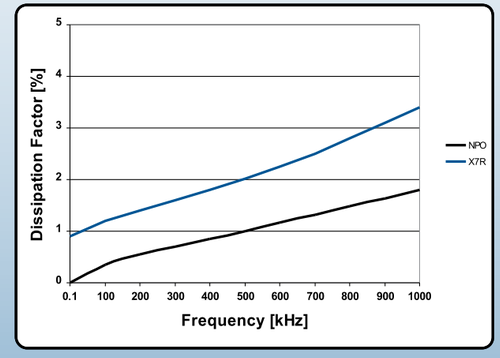
Voltage Coefficient [BR]



Capacitance Vs Frequency



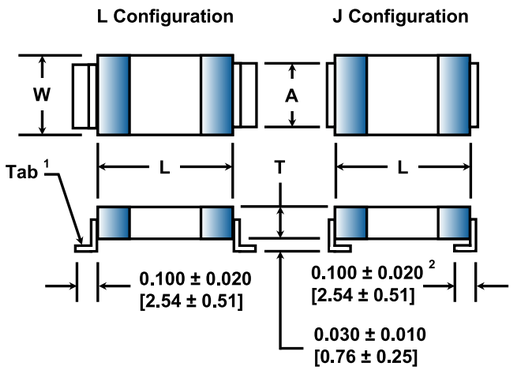
ESR Vs Frequency



DF Vs Frequency

High Voltage Surface Mount Capacitors

Space Level – 500 Vdc to 10 KVdc



1. Tab thickness 0.009 ± 0.001 [0.25 ± 0.05]
2. SM01, SM02, SM03 @ 0.040 ± 0.010 [1.02 ± 0.26]

CalRamic Technologies LLC manufactures a series of highly reliable, mission critical, high voltage, surface mount tab leaded ceramic capacitors that are designed specifically for those non-repairable, space applications, where the assembly may be exposed to high levels of thermal and / or mechanical shock. Conservatively designed, they are ideal for use in demanding high voltage, high current environments.

Intended for continuous operation at full rated voltage and across the entire operating temperature range, these capacitors utilize a special internal design specifically intended to reduce electric field stresses, thereby providing a device that exhibits very low ESR characteristics and no reduction in insulation resistance with life.

Available with ultra stable Class I, NPO and stable Class II, X7R / BR dielectric materials, these capacitors are ideally suited for timing / precision circuitry, energy storage, DC blocking, snubbers, transient suppression, decoupling, resonators and EMI filtering applications.

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Specification	Dielectric Type (EIA Designation)	
	NPO (COG)	X7R [BR]
Material Classification	Type I, Ultra Stable, K90	Type II, Stable, K2500
Coefficient of Thermal Expansion	9 x 10^{-6} / °C	11 x 10^{-6} / °C
Density	67 g / in^3	
Operating Temperature Range	-55 to +125°C	
Aging Rate	0	-2% Max per decade hour
Temperature Coefficient	±30 PPM / °C	±15%
Voltage Coefficient	Negligible	Range -40% Max @ WVDC
Capacitance Range	12 pF to 0.22 µF	270 pF to 2.2 µF
Voltage Range	500 Vdc to 10KVdc	
Insulation Resistance @ +25°C	100,000 MΩ or 1000 MΩ - µF, W/E is less	
Insulation Resistance @ +125°C	10,000 MΩ or 100 MΩ - µF, W/E is less	
Dissipation Factor	0.1% Max	2.5% Max
DWV	1.5 x WVDC @ WVDC = 500 Vdc / 1.2 x WVDC @ WVDC > 500 Vdc	

Mechanical Dimensions

Dimensions Inches [mm]	Product Style												
	SM01	SM02	SM03	SM04	SM05	SM06	SM07	SM10	SM11	SM13	SM14	SM15	SM16
Length [L]	0.150 ± 0.015 [3.81 ± 0.38]	0.200 ± 0.020 [5.08 ± 0.51]	0.250 ± 0.025 [6.35 ± 0.64]	0.350 ± 0.030 [8.89 ± 0.76]	0.450 ± 0.030 [11.43 ± 0.76]	0.550 ± 0.030 [14.00 ± 0.76]	0.650 ± 0.030 [16.50 ± 0.76]	0.300 ± 0.030 [7.62 ± 0.76]	0.400 ± 0.030 [10.20 ± 0.76]	0.700 ± 0.030 [17.80 ± 0.76]	0.900 ± 0.030 [22.90 ± 0.76]	1.150 ± 0.030 [27.90 ± 0.76]	1.300 ± 0.030 [33.02 ± 0.76]
Width [W]	0.150 ± 0.015 [3.81 ± 0.38]	0.200 ± .020 [5.08 ± 0.51]	0.200 ± 0.020 [5.08 ± 0.51]	0.300 ± 0.030 [7.62 ± 0.76]	0.400 ± 0.030 [10.16 ± 0.76]	0.500 ± 0.030 [12.70 ± 0.76]	0.600 ± 0.030 [10.20 ± 0.76]	0.150 ± 0.015 [3.81 ± 0.38]	0.200 ± 0.020 [5.08 ± 0.51]	0.300 ± 0.030 [7.62 ± 0.76]	0.400 ± 0.030 [10.16 ± 0.76]	0.500 ± 0.030 [12.70 ± 0.76]	0.600 ± 0.030 [10.20 ± 0.76]
Thickness [T] [Max]	0.130 [3.30]	0.180 [4.57]	0.180 [4.57]	0.220 [5.59]	0.220 [5.59]	0.220 [5.59]	0.220 [5.59]	0.140 [3.55]	0.130 [3.30]	.180 [4.57]	0.220 [5.59]	0.220 [5.59]	0.220 [5.59]
Tab [A]	0.100 [2.54]	0.100 [2.54]	0.100 [2.54]	0.200 5.08]	0.300 [7.62]	0.400 [10.2]	0.500 [12.7]	0.100 [2.54]	0.100 [2.54]	0.200 5.08]	0.300 [7.62]	0.400 [10.2]	0.500 [12.7]

High Voltage Surface Mount Capacitors

Space Level – 500 Vdc to 10 KVdc

Electrical Characteristics

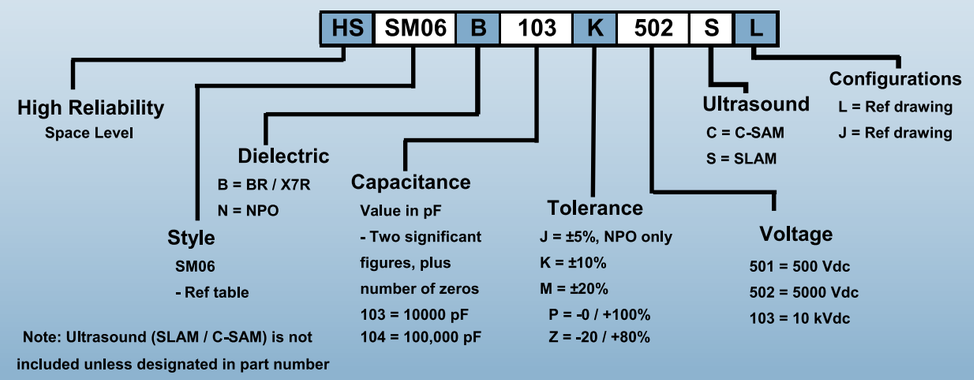
NPO Capacitance Range														
HS Style		SM01	SM02	SM03	SM04	SM05	SM06	SM07	SM10	SM11	SM13	SM14	SM15	SM16
Min Cap		120	220	270	270	180	270	470	100	100	120	180	330	560
WVDC	500	392	682	822	183	473	683	823	123	223	104	124	184	224
	1000	122	272	472	153	253	393	473	332	682	473	563	823	124
	2000	561	681	821	252	562	822	183	681	182	822	123	183	223
	3000	.	.	471	122	272	472	562	271	681	392	472	123	153
	4000	.	.	.	.	102	182	272	.	561	152	332	472	822
	5000	.	.	.	.	561	152	222	.	251	122	222	392	392
	7000	.	.	.	.	.	.	.	.	.	102	821	122	222
	10000	.	.	.	.	.	.	.	.	.	.	.	102	152

X7R Capacitance Range														
HS Style		SM01	SM02	SM03	SM04	SM05	SM06	SM07	SM10	SM11	SM13	SM14	SM15	SM16
Min Cap		271	561	681	271	471	681	122	151	271	221	471	821	122
WVDC	500	273	823	104	274	474	684	105	823	154	684	105	155	225
	1000	682	223	273	823	154	224	334	183	473	224	274	474	684
	2000	122	472	682	153	273	473	683	332	103	333	683	104	154
	3000	.	.	.	562	123	223	333	122	392	153	273	473	683
	4000	.	.	.	.	472	822	123	.	222	682	154	223	333
	5000	.	.	.	.	392	472	522	.	152	392	822	123	223
	7000	.	.	.	.	.	.	.	.	.	472	332	472	822
	10000	.	.	.	.	.	.	.	.	.	.	.	332	562

Notes

1. Product receives 100% Group A Inspection in accordance with MIL-PRF-49467 including Corona.
2. Special testing including 100% SLAM / CSAM is available upon request.
3. Custom voltages, package sizes and capacitance values available. Contact factory.
4. X7R dielectrics are not intended for AC line filtering applications.
5. Space level products are capable of meeting a minimum of 4000 hours life at full rated conditions with no degradation in insulation resistance.
6. Large ceramic capacitors, even leaded devices are susceptible to damage when exposed to thermal and / or mechanical shock. Refer to Technical Bulletin AN101 for handling and installation recommendations.
7. High voltage products may require conformal coating to prevent possibility of arc over.

Part Number / Ordering Information

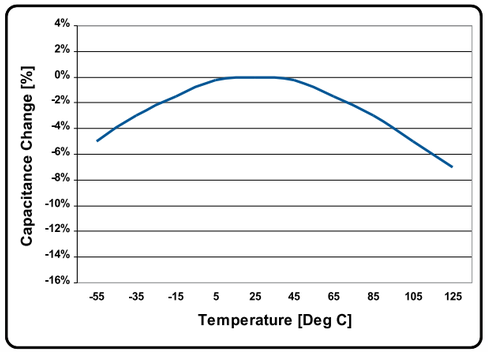


Note: Ultrasound (SLAM / C-SAM) is not included unless designated in part number

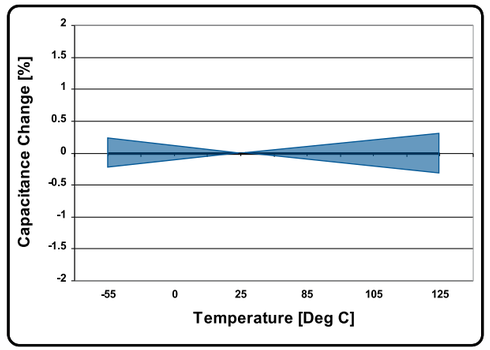
High Voltage Surface Mount Capacitors

Space Level – 500 Vdc to 10 KVdc

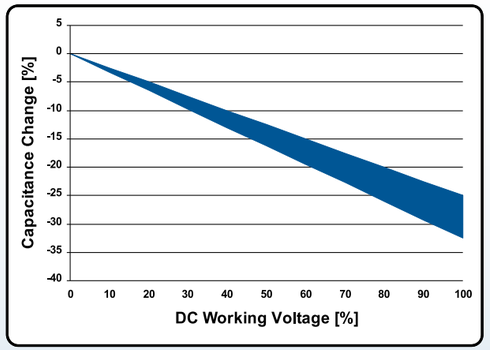
Performance Charts (Typical)



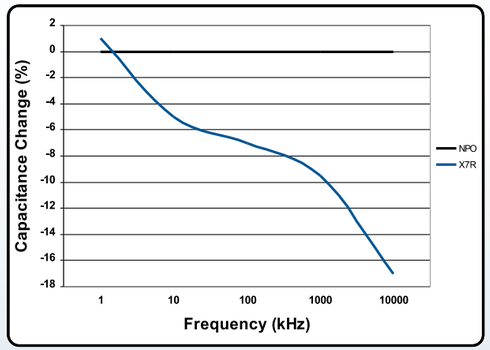
X7R Temperature Coefficient



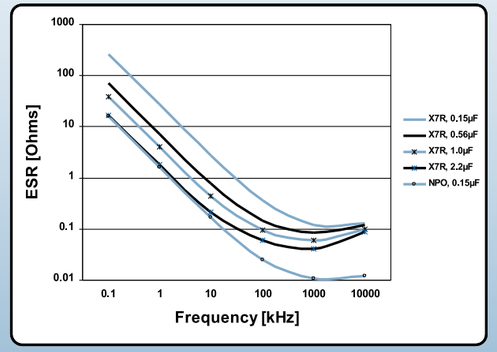
NPO Temperature Coefficient



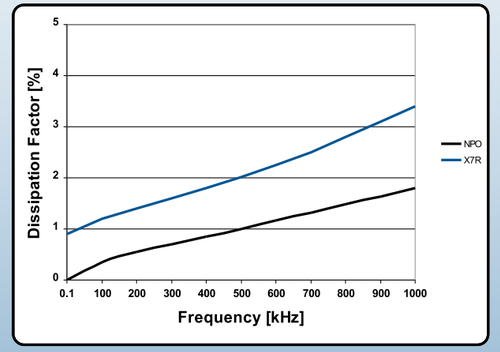
Voltage Coefficient [BR}



Capacitance Vs Frequency



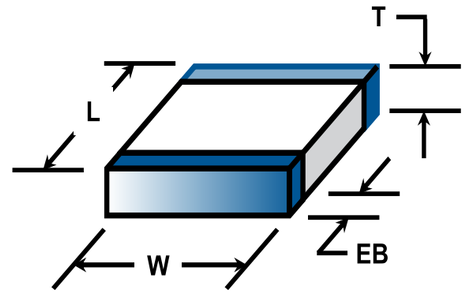
ESR Vs Frequency



DF Vs Frequency

High Voltage Multi-Layer Chip Capacitors

Space Level Grade – 500 Vdc to 10 KVdc



CalRamic Technologies LLC manufactures a series of highly reliable, mission critical, high voltage, multi-layer ceramic chip capacitors that are intended specifically for nonrepairable, space applications. Conservatively designed they are ideal for use in demanding high voltage, high current environments.

Intended for continuous operation at full rated voltage and across the entire operating temperature range, these capacitors utilize a special internal design specifically intended to reduce electric field stresses, thereby providing a device that exhibits very low ESR characteristics and no reduction in insulation resistance with life.

Available with ultra stable Class I, NPO and stable Class II, X7R dielectric materials, these capacitors are ideally suited for timing / precision circuitry, energy storage, DC blocking, snubbers, transient suppression, decoupling, resonators and EMI filtering applications.

Performance Characteristics

Specification	Dielectric Type (EIA Designation)	
	NPO (COG)	X7R [BR]
Material Classification	Type I, Ultra Stable, K90	Type II, Stable, K2500
Coefficient of Thermal Expansion	9 x 10^{-6} / °C	11 x 10^{-6} / °C
Density	67 g / in^3	
Operating Temperature Range	-55 to +125°C	
Aging Rate	0	-2% Max per decade hour
Temperature Coefficient	±30 PPM / °C	±15%
Voltage Coefficient	Negligible	Range -40% Max @ WVDC
Capacitance Range	12 pF to 0.22 µF	270 pF to 2.2 µF
Voltage Range	500 Vdc to 10KVdc	
Insulation Resistance @ +25°C	100,000 MΩ or 1000 MΩ - µF, W/E is less	
Insulation Resistance @ +125°C	10,000 MΩ or 100 MΩ - µF, W/E is less	
Dissipation Factor	0.1% Max	2.5% Max
DWV	1.5 x WVDC @ WVDC = 500 Vdc / 1.2 x WVDC @ WVDC > 500 Vdc	

Mechanical Dimensions

Dimensions in [mm]	Product Style											
	HS 1515	HS 2020	HV2520	HS 3530	HS 4040	HS 4540	HS 5550	HS 6560	HS 7030	HS 9040	HS 11050	HS 13060
Length [L] Tol ±	0.150 [3.81] 0.015 [0.38]	0.200 [5.08] 0.020 [0.51]	0.250 [6.35] 0.020 [0.51]	0.350 [8.89] 0.030 [0.76]	0.400 [10.2] 0.030 [0.76]	0.450 [11.43] 0.030 [0.76]	0.550 [14.0] 0.030 [0.76]	0.650 [16.5] 0.030 [0.76]	0.700 [17.8] 0.030 [0.76]	0.900 [22.9] 0.030 [0.76]	1.100 [27.9] 0.030 [0.76]	1.300 [33.0] 0.030 [0.76]
Width [W] Tol ±	0.150 [3.81] 0.015 [0.38]	0.200 [5.08] 0.020 [0.51]	0.200 [5.08] 0.020 [0.51]	0.300 [7.62] 0.030 [0.76]	0.400 [10.2] 0.030 [0.76]	0.400 [10.2] 0.030 [0.76]	0.500 [12.7] 0.030 [0.76]	0.600 [15.2] 0.030 [0.76]	0.300 [7.62] 0.030 [0.76]	0.400 [10.2] 0.030 [0.76]	0.500 [12.7] 0.030 [0.76]	0.600 [15.2] 0.030 [0.76]
Thickness [T] Max	0.140 [3.55]	0.180 [4.57]	0.180 [4.57]	0.220 [5.59]	0.220 [5.59]	0.220 [5.59]	0.220 [5.59]	0.220 [5.59]	0.220 [5.59]	0.220 [5.59]	0.220 [5.59]	0.220 [5.59]
EB Min - Max	0.010 - 0.030 [0.254 - 0.762]	0.010 - 0.040 [0.254 - 1.02]	0.020 - 0.060 [0.51 - 1.52]	0.020 - 0.060 [0.51 - 1.52]	0.020 - 0.060 [0.51 - 1.52]	0.020 - 0.060 [0.51 - 1.52]	0.020 - 0.060 [0.51 - 1.52]	0.020 - 0.060 [0.51 - 1.52]	0.020 - 0.060 [0.51 - 1.52]	0.020 - 0.060 [0.51 - 1.52]	0.020 - 0.060 [0.51 - 1.52]	0.020 - 0.060 [0.51 - 1.52]

High Voltage Multi-Layer Chip Capacitors

Space Level Grade – 500 Vdc to 10 KVdc

Electrical Characteristics

NPO Capacitance Range												
HS Style		1515	2020	2520	3530	4540	5550	6560	4040	7030	9040	11050	13060
Min Cap		120	220	270	270	180	270	470	100	120	180	330	560
WVDC	500	392	682	822	183	473	683	823	223	104	124	184	224
	1000	122	272	472	153	253	393	473	682	473	563	823	124
	2000	561	681	821	252	562	822	183	182	822	123	183	223
	3000	•	•	471	122	272	472	562	681	392	472	123	153
	4000	•	•	•	•	102	182	272	561	152	332	472	822
	5000	•	•	•	•	561	152	222	251	122	222	392	392
	7000	•	•	•	•	•	•	•	•	102	821	122	222
	10000	•	•	•	•	•	•	•	•	•	•	102	152

X7R Capacitance Range												
HS Style		1515	2020	2520	3530	4540	5550	6560	4040	7030	9040	11050	13060
Min Cap		271	561	681	271	471	681	122	271	221	471	821	122
WVDC	500	273	823	104	274	474	684	105	154	684	105	155	225
	1000	682	223	273	823	154	224	334	473	224	274	474	684
	2000	122	472	682	153	273	473	683	103	333	683	104	154
	3000	•	•	•	562	123	223	333	392	153	273	473	683
	4000	•	•	•	•	472	822	123	222	682	154	223	333
	5000	•	•	•	•	392	472	522	152	392	822	123	223
	7000	•	•	•	•	•	•	•	•	472	332	472	822
	10000	•	•	•	•	•	•	•	•	•	•	332	562

Notes

1. Product receives 100% Group A Inspection in accordance with MIL-PRF-49467 including Corona.
2. Special testing including 100% SLAM / CSAM is available upon request.
3. Custom voltages, package sizes and capacitance values available. Contact factory.
4. X7R dielectrics are not intended for AC line filtering applications.
5. Space level products are capable of meeting a minimum of 4000 hours life at full rated conditions with no degradation in insulation resistance.
6. Large ceramic capacitors are susceptible to damage when exposed to thermal and / or mechanical shock. Refer to technical bulletin AN101 for handling and installation recommendations or consider selecting radial leaded or surface mount alternatives as detailed in catalogs CRT-0009 and CRT-0022.
7. High voltage capacitors may require conformal coating to prevent arc over.

Part Number / Ordering Information

HS2520 | B | 183 | K | 202 | N | C | R

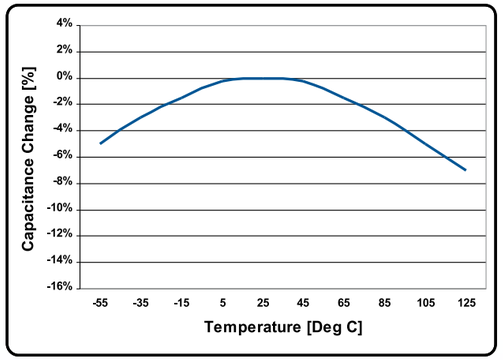
- **Style**: HV2520 - Ref table
- **Dielectric**: B = BR / X7R; N = NPO
- **Capacitance**: Value in pF - Two significant figures, plus number of zeros; 183 = 18000 pF; 104 = 100,000 pF
- **Tolerance**: J = ±5%, NPO only; K = ±10%; M = ±20%; P = -0 / +100%; Z = -20 / +80%
- **Voltage**: 501 = 500 Vdc; 502 = 5000 Vdc; 103 = 10 kVdc
- **Termination**: P = Pd/Ag; S = Ag; N = Ni barrier / 100% Sn plate (7030 Pkg); Y = Ni barrier / Sn-Pb plate (7030 Pkg)
- **Ultrasound**: C = C-SAM; S = SLAM
- **RoHS**: R = Compliant

Note: Ultrasound (SLAM / C-SAM) is not included unless designated in part number.

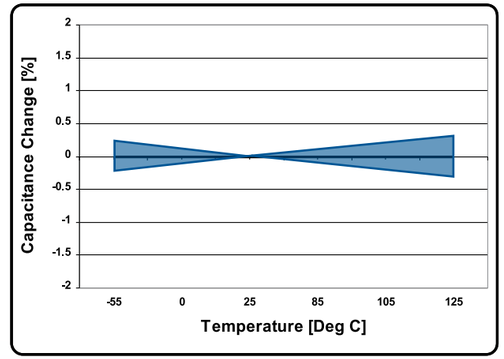
High Voltage Multi-Layer Chip Capacitors

Space Level Grade – 500 Vdc to 10 KVdc

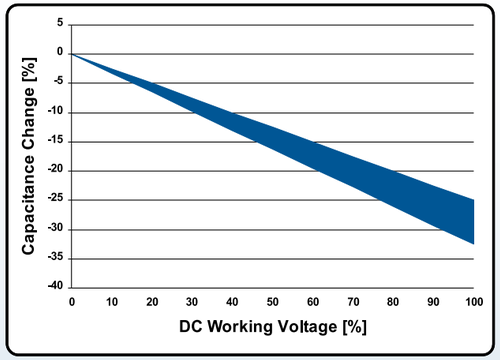
Performance Charts (Typical)



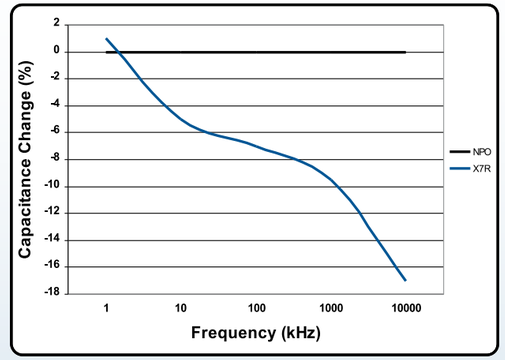
X7R Temperature Coefficient



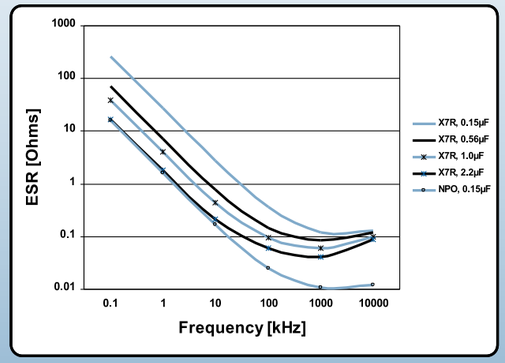
NPO Temperature Coefficient



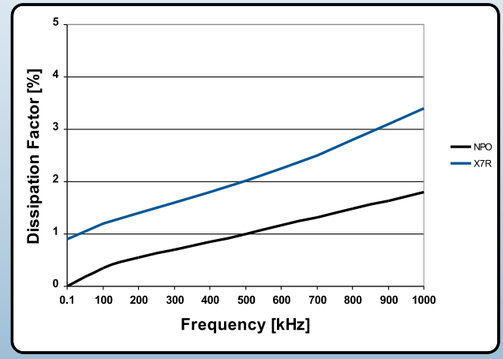
Voltage Coefficient [BR]



Capacitance Vs Frequency



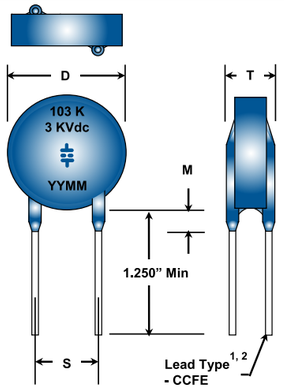
ESR Vs Frequency



DF Vs Frequency

High Voltage Radial Leaded Disc Capacitors

Space Level - 3 kVDC to 20 kVDC



1. **Lead Size: D30, D40 @ 0.025" ø (#22 AWG) [0.64 mm] D50 & larger @ 0.32" ø (#20 AWG) [0.81 mm]**
2. **Lead Finish: Solder Plate - Standard / RoHS – 100% Tin Plate**
3. **Order of marking may vary depending on size of capacitor**

CalRamic Technologies LLC manufactures a series of highly reliable, mission critical, single layer, conformally coated, leaded ceramic disc capacitors that are designed and manufactured under strict quality control guidelines to ensure unparalleled performance in high voltage space level 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, X5U and Z5U 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.

Performance Characteristics

Specification	Dielectric Type (EIA Designation)				
	NPO (COG)	X7R	X5R	X5U	Z5U
Material Classification	Type I, Ultra Stable, K76	Type II, Stable, K2350	Type II, Stable, K2500	Type II, Stable, K5000	Type II, Stable, K10000
Coefficient of Thermal Expansion	9 x 10^{-6} / °C	11 x 10^{-6} / °C	11 x 10^{-6} / °C	11 x 10^{-6} / °C	11 x 10^{-6} / °C
Density	72 g / in^3				
Operating Temperature Range	-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	±30 PPM / °C	±15%		+22 / -56%	
Voltage Coefficient	Negligible	-20% Max @ WVDC		-35% Max @ WVDC	
Capacitance Range	1.4 pF to 350 pF	42 pF to 0.012 µF	44 pF to 0.012 µF	80 pF to 0.022 µF	150 pF to 0.045 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. Capacitors receive 100% Group A Inspection including Partial Discharge (Corona).
2. Ultrasonic examination (SLAM / CSAM) is available. Contact factory.
3. Group A testing and Group B Inspection when required, is performed in accordance with applicable requirements of MIL-PRF-49467, DSCC 87125, DSCC 89087 and NASA GSFC S-311-15C.
4. Custom voltages, package sizes and capacitance values available. Contact factory.
5. Higher voltage parts may require further encapsulation to prevent surface arc over and breakdown. When required, parts should first be cleaned and oven dried at +85ºC. Care should be taken to select a suitable epoxy that will not apply mechanical stress to the part and de-airing of encapsulates is recommended.
6. Testing of higher voltage parts before installation and / or supplemental encapsulation, may be done in a suitable, non-contaminating dielectric fluid like FC-40.
7. Large ceramic capacitors, even leaded devices are susceptible to damage when exposed to thermal and / or mechanical shock. Refer to Technical Bulletin AN103 for handling and installation recommendations.

High Voltage Radial Leaded Disc Capacitors

Space Level - 3 kVDC to 20 kVDC

Electrical / Mechanical Characteristics

Working Voltage	Disc Style	Dimensions [in]				Capacitance Range [pF]									
		D Max	S ± 0.030	T Max	M Max	NPO		X5R		X7R		X5U		Z5U	
						Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
3 kVDC	D30	0.300	0.250	0.210	0.125	8.4	12	270	370	260	350	500	670	1000	1300
	D40	0.400	0.250	0.210	0.125	12	24	410	780	380	730	730	1400	1500	2900
	D50	0.500	0.375	0.210	0.125	28	46	920	1500	870	1400	1700	2700	3400	5600
	D60	0.600	0.375	0.210	0.125	38	61	1300	2000	1200	1900	2200	3600	6000	7300
	D70	0.700	0.500	0.210	0.125	63	95	2100	3100	2000	2900	3700	5600	7500	11000
	D80	0.800	0.500	0.210	0.125	94	110	3100	3800	2900	3500	5500	6800	11000	13000
	D90	0.900	0.500	0.210	0.125	110	160	3700	5300	3500	5000	6600	9500	13000	19000
	D100	1.000	0.500	0.210	0.125	150	200	5000	6500	4700	6200	9000	12000	18000	13000
	D120	1.200	0.500	0.210	0.125	200	310	6600	10000	6200	9500	12000	18000	24000	36000
	D140	1.400	0.625	0.210	0.125	310	350	10000	12000	9600	12000	19000	22000	37000	45000
5 kVDC	D30	0.300	0.250	0.250	0.125	5.1	6.9	160	220	150	210	300	400	600	820
	D40	0.400	0.250	0.250	0.125	7.3	15	250	473	230	440	440	850	900	1700
	D50	0.500	0.375	0.250	0.125	17	28	560	920	520	860	1000	1600	2100	3300
	D60	0.600	0.375	0.250	0.125	23	37	760	1200	700	1100	1400	2200	3600	4300
	D70	0.700	0.500	0.250	0.125	38	57	1300	1800	1200	1800	2300	3400	4500	6700
	D80	0.800	0.500	0.250	0.125	57	69	1900	2300	1800	2100	3400	4000	6800	8200
	D90	0.900	0.500	0.250	0.125	69	97	2200	3100	2100	3000	4000	5700	8100	11000
	D100	1.000	0.500	0.250	0.125	92	120	3000	3900	2900	3700	5500	7100	11000	14000
	D120	1.200	0.500	0.250	0.125	120	180	3900	6100	3800	5700	7200	11000	14000	22000
	D140	1.400	0.625	0.250	0.125	190	230	6200	7500	5800	7000	11000	13000	22000	27000
7.5 kVDC	D30	0.300	0.250	0.310	0.150	3.4	4.6	110	150	100	150	200	270	400	540
	D40	0.400	0.250	0.310	0.150	5	9.6	170	310	150	300	300	570	600	1100
	D50	0.500	0.375	0.310	0.150	12	19	370	610	350	580	670	1100	1400	2200
	D60	0.600	0.375	0.310	0.150	15	25	510	800	470	750	900	1450	2400	2900
	D70	0.700	0.500	0.310	0.150	25	38	830	1200	780	1200	1500	2200	3000	4500
	D80	0.800	0.500	0.310	0.150	37	46	1300	1500	1200	1400	2200	2700	4500	5400
	D90	0.900	0.500	0.310	0.150	45	65	1500	2100	1400	2000	2700	3800	5400	7600
	D100	1.000	0.500	0.310	0.150	60	80	2000	2600	1900	2500	3700	4700	7300	9500
	D120	1.200	0.500	0.310	0.150	80	120	2600	3300	2500	3800	4800	7400	9500	14000
	D140	1.400	0.625	0.310	0.150	120	150	4100	5000	3800	4700	7400	9000	15000	18000
10 kVDC	D30	0.300	0.250	0.440	0.170	2.5	3.5	84	110	78	110	150	200	300	410
	D40	0.400	0.250	0.440	0.170	3.8	7.2	120	230	110	220	220	420	450	850
	D50	0.500	0.375	0.440	0.170	8.5	14	280	480	260	430	500	820	1000	1600
	D60	0.600	0.375	0.440	0.170	12	18	380	600	350	560	680	1000	1800	2100
	D70	0.700	0.500	0.440	0.170	19	28	620	940	580	880	1100	1700	2300	3400
	D80	0.800	0.500	0.440	0.170	28	34	930	1100	870	1100	1700	2000	3400	4100
	D90	0.900	0.500	0.440	0.170	34	48	1100	1600	1000	1500	2000	2900	4000	5700
	D100	1.000	0.500	0.440	0.170	46	60	1500	2000	1400	1800	2700	3500	5500	7100
	D120	1.200	0.500	0.440	0.170	60	93	2000	3000	1900	2800	3600	5500	7200	11000
	D140	1.400	0.625	0.440	0.170	94	110	3100	3700	2900	3500	5600	6800	11000	13000
15 kVDC	D30	0.300	0.250	0.545	0.175	1.6	2.3	55	76	52	71	100	130	200	270
	D40	0.400	0.250	0.545	0.175	2.4	4.8	52	160	76	150	150	280	300	570
	D50	0.500	0.375	0.545	0.175	5.7	9.4	180	300	180	290	330	550	700	1100
	D60	0.600	0.375	0.545	0.175	7.7	12	250	400	230	370	450	720	1200	1400
	D70	0.700	0.500	0.545	0.175	12	20	410	620	390	590	750	1100	1500	2200
	D80	0.800	0.500	0.545	0.175	19	23	620	760	580	710	1100	1360	2300	2700
	D90	0.900	0.500	0.545	0.175	23	32	740	1000	690	1000	1300	1900	2700	3800
	D100	1.000	0.500	0.545	0.175	30	40	1000	1300	950	1200	1800	2400	3700	4700
	D120	1.200	0.500	0.545	0.175	40	60	1300	2000	1300	1900	2400	3600	4800	7300
	D140	1.400	0.625	0.545	0.175	60	77	2100	2500	1900	2300	3700	4500	7500	9000
20 kVDC	D50	0.500	0.375	0.650	0.175	4.6	6.8	150	220	140	210	270	400	500	830
	D60	0.600	0.375	0.650	0.175	6.2	8.9	200	290	190	270	360	520	890	1000
	D70	0.700	0.500	0.650	0.175	10	14	330	450	310	430	600	820	1200	1700
	D80	0.800	0.500	0.650	0.175	15	17	500	550	470	520	900	1000	1700	2000
	D90	0.900	0.500	0.650	0.175	18	23	600	770	560	720	1100	1400	2000	2800
	D100	1.000	0.500	0.650	0.175	24	30	800	960	760	900	1500	1700	2800	300
	D120	1.200	0.500	0.650	0.175	32	45	1000	1500	1000	1400	1900	2600	3600	5500
	D140	1.400	0.625	0.650	0.175	50	56	1700	1800	1600	1700	3000	3300	5600	6800

B

High Voltage Radial Leaded Disc Capacitors

Space Level - 3 kVDC to 20 kVDC

Part Number / Ordering Information

HS	D30	D50	W	921	K	R

Series
HS = Space Level

Voltage
D30 = 3 kVDC
D100 = 10 kVDC
D150 = 15 kVDC

Style
D50
- Reference table

Dielectric
N = NPO
W = X5R
X = X7R
Y = X5U
Z = Z5U

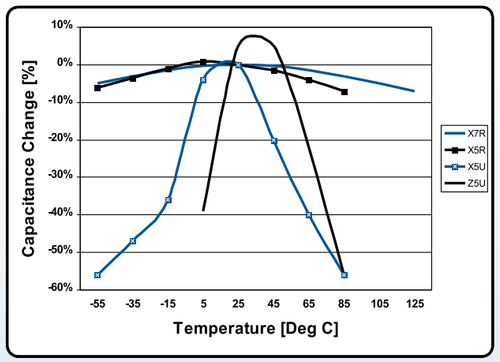
Capacitance
Value in pF
- Two significant figures, plus number of zeros
8R4 = 8.4 pF
921 = 920 pF
223 = 22,000 pF

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

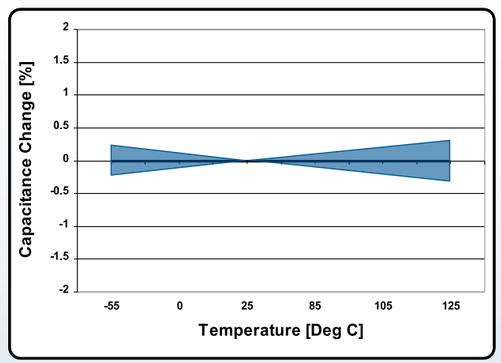
RoHS
Compliant

Note: RoHS compliance is not included unless designated in part number

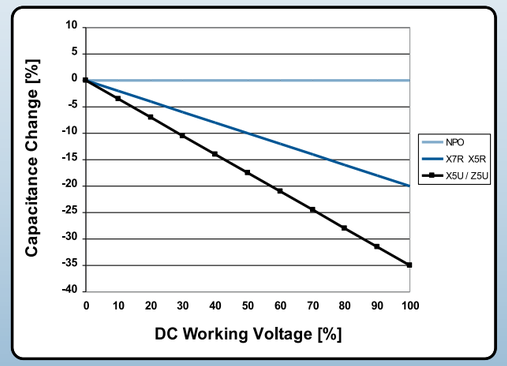
Performance Charts (Typical)



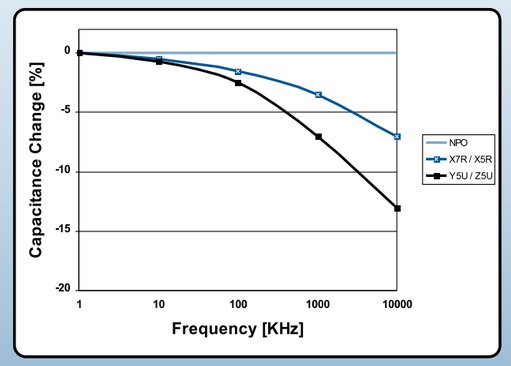
Class II Temperature Coefficient



NPO Temperature Coefficient



Voltage Coefficient



Capacitance Vs Frequency

Notes

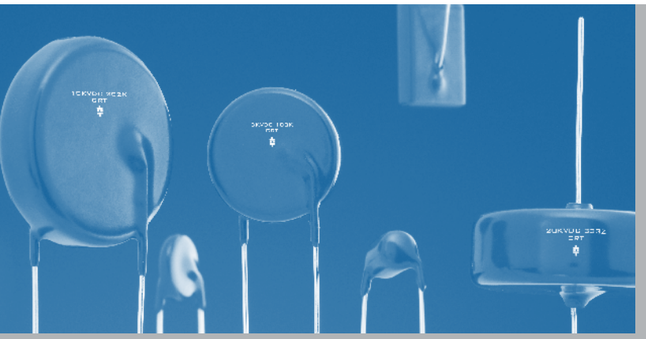
CalRamic Technologies LLC

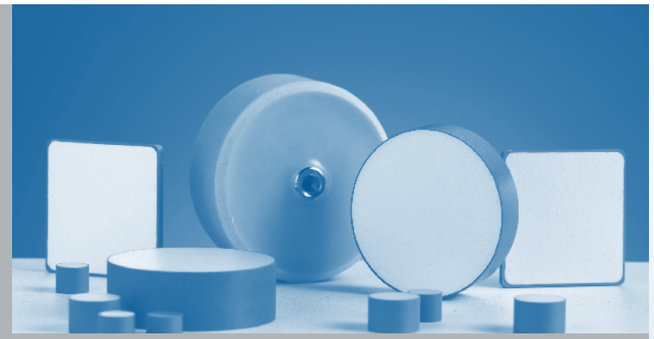
(775) 851-3580 / calramic.com / 5462 Louie Lane / Reno, NV 89511 USA

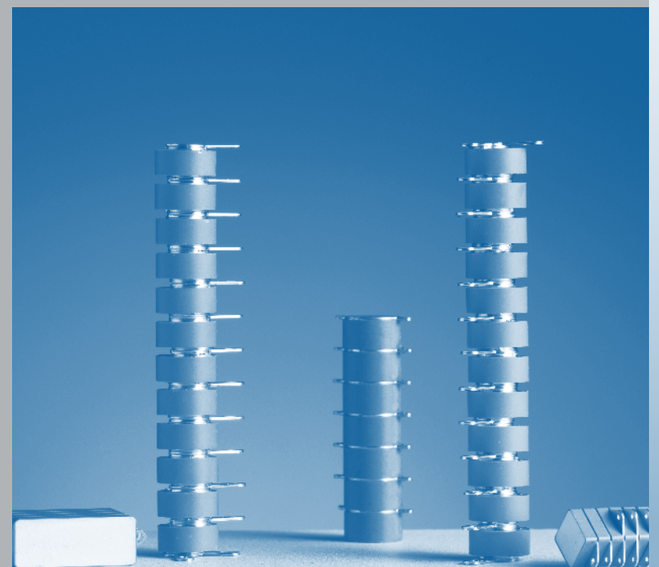
Military & Commercial

CalRamic Technologies LLC

(775) 851-3580 / calramic.com / 5462 Louie Lane / Reno, NV 89511 USA

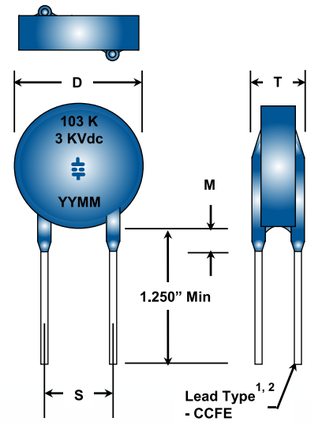






High Voltage Radial Leaded Disc Capacitors

Military & Commercial Grade - 3 kVDC to 20 kVDC



1. **Lead Size: D30, D40 @ 0.025" ø (#22 AWG) [0.64 mm] D50 & larger @ 0.32" ø (#20 AWG) [0.81 mm]**
2. **Lead Finish: Solder Plate - Standard / RoHS – 100% Tin Plate**
3. **Order of marking may vary depending on size of capacitor**

CalRamic Technologies LLC manufactures a series of highly reliable, single layer, conformally coated, ceramic disc capacitors, designed with leaded terminals and intended for those applications where the capacitor may be exposed to higher levels of thermal and mechanical shock.

These capacitors are 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, X5U and Z5U 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.

Performance Characteristics

Specification	Dielectric Type (EIA Designation)				
	NPO (COG)	X7R	X5R	X5U	Z5U
Material Classification	Type I, Ultra Stable, K76	Type II, Stable, K2350	Type II, Stable, K2500	Type II, Stable, K5000	Type II, Stable, K10000
Coefficient of Thermal Expansion	9 x 10^{-6} / °C	11 x 10^{-6} / °C	11 x 10^{-6} / °C	11 x 10^{-6} / °C	11 x 10^{-6} / °C
Density	72 g / in^3				
Operating Temperature Range	-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	±30 PPM / °C	±15%		+22 / -56%	
Voltage Coefficient	Negligible	-20% Max @ WVDC		-35% Max @ WVDC	
Capacitance Range	1.4 pF to 350 pF	42 pF to 0.012 µF	44 pF to 0.012 µF	80 pF to 0.022 µF	150 pF to 0.045 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. Contact factory.
3. Custom voltages, package sizes and capacitance values available. Contact factory.
4. Higher voltage parts may require further encapsulation to prevent surface arc over and breakdown. When required, parts should first be cleaned and oven dried at +85ºC. 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 supplemental encapsulation, may be done in a suitable, non-contaminating dielectric fluid like FC-40.
6. Large ceramic capacitors, even leaded devices are susceptible to damage when exposed to thermal and / or mechanical shock. Refer to Technical Bulletin AN103 for handling and installation recommendations.

CRT-0006
Rev 1410

High Voltage Radial Leaded Disc Capacitors

Military & Commercial Grade - 3 kVDC to 20 kVDC

Electrical / Mechanical Characteristics

Working Voltage	Disc Style	Dimensions [in]				Capacitance Range [pF]									
		D Max	S ± 0.030	T Max	M Max	NPO		X5R		X7R		X5U		Z5U	
						Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
3 kVDC	D30	0.300	0.250	0.210	0.125	8.4	12	270	370	260	350	500	670	1000	1300
	D40	0.400	0.250	0.210	0.125	12	24	410	780	380	730	730	1400	1500	2900
	D50	0.500	0.375	0.210	0.125	28	46	920	1500	870	1400	1700	2700	3400	5600
	D60	0.600	0.375	0.210	0.125	38	61	1300	2000	1200	1900	2200	3600	6000	7300
	D70	0.700	0.500	0.210	0.125	63	95	2100	3100	2000	2900	3700	5600	7500	11000
	D80	0.800	0.500	0.210	0.125	94	110	3100	3800	2900	3500	5500	6800	11000	13000
	D90	0.900	0.500	0.210	0.125	110	160	3700	5300	3500	5000	6600	9500	13000	19000
	D100	1.000	0.500	0.210	0.125	150	200	5000	6500	4700	6200	9000	12000	18000	23000
	D120	1.200	0.500	0.210	0.125	200	310	6600	10000	6200	9500	12000	18000	24000	36000
	D140	1.400	0.625	0.210	0.125	310	350	10000	12000	9600	12000	19000	22000	37000	45000
5 kVDC	D30	0.300	0.250	0.250	0.125	5.1	6.9	160	220	150	210	300	400	600	820
	D40	0.400	0.250	0.250	0.125	7.3	15	250	473	230	440	440	850	900	1700
	D50	0.500	0.375	0.250	0.125	17	28	560	920	520	860	1000	1600	2100	3300
	D60	0.600	0.375	0.250	0.125	23	37	760	1200	700	1100	1400	2200	3600	4300
	D70	0.700	0.500	0.250	0.125	38	57	1300	1800	1200	1800	2300	3400	4500	6700
	D80	0.800	0.500	0.250	0.125	57	69	1900	2300	1800	2100	3400	4000	6800	8200
	D90	0.900	0.500	0.250	0.125	69	97	2200	3100	2100	3000	4000	5700	8100	11000
	D100	1.000	0.500	0.250	0.125	92	120	3000	3900	2900	3700	5500	7100	11000	14000
	D120	1.200	0.500	0.250	0.125	120	180	3900	6100	3800	5700	7200	11000	14000	22000
	D140	1.400	0.625	0.250	0.125	190	230	6200	7500	5800	7000	11000	13000	22000	27000
7.5 kVDC	D30	0.300	0.250	0.310	0.150	3.4	4.6	110	150	100	150	200	270	400	540
	D40	0.400	0.250	0.310	0.150	5	9.6	170	310	150	300	300	570	600	1100
	D50	0.500	0.375	0.310	0.150	12	19	370	610	350	580	670	1100	1400	2200
	D60	0.600	0.375	0.310	0.150	15	25	510	800	470	750	900	1450	2400	2900
	D70	0.700	0.500	0.310	0.150	25	38	830	1200	780	1200	1500	2200	3000	4500
	D80	0.800	0.500	0.310	0.150	37	46	1300	1500	1200	1400	2200	2700	4500	5400
	D90	0.900	0.500	0.310	0.150	45	65	1500	2100	1400	2000	2700	3800	5400	7600
	D100	1.000	0.500	0.310	0.150	60	80	2000	2600	1900	2500	3700	4700	7300	9500
	D120	1.200	0.500	0.310	0.150	80	120	2600	3300	2500	3800	4800	7400	9500	14000
	D140	1.400	0.625	0.310	0.150	120	150	4100	5000	3800	4700	7400	9000	15000	18000
10 kVDC	D30	0.300	0.250	0.440	0.170	2.5	3.5	84	110	78	110	150	200	300	410
	D40	0.400	0.250	0.440	0.170	3.8	7.2	120	230	110	220	220	420	450	850
	D50	0.500	0.375	0.440	0.170	8.5	14	280	480	260	430	500	820	1000	1600
	D60	0.600	0.375	0.440	0.170	12	18	380	600	350	560	680	1000	1800	2100
	D70	0.700	0.500	0.440	0.170	19	28	620	940	580	880	1100	1700	2300	3400
	D80	0.800	0.500	0.440	0.170	28	34	930	1100	870	1100	1700	2000	3400	4100
	D90	0.900	0.500	0.440	0.170	34	48	1100	1600	1000	1500	2000	2900	4000	5700
	D100	1.000	0.500	0.440	0.170	46	60	1500	2000	1400	1800	2700	3500	5500	7100
	D120	1.200	0.500	0.440	0.170	60	93	2000	3000	1900	2800	3600	5500	7200	11000
	D140	1.400	0.625	0.440	0.170	94	110	3100	3700	2900	3500	5600	6800	11000	13000
15 kVDC	D30	0.300	0.250	0.545	0.175	1.6	2.3	55	76	52	71	100	130	200	270
	D40	0.400	0.250	0.545	0.175	2.4	4.8	52	160	76	150	150	280	300	570
	D50	0.500	0.375	0.545	0.175	5.7	9.4	180	300	180	290	330	550	700	1100
	D60	0.600	0.375	0.545	0.175	7.7	12	250	400	230	370	450	720	1200	1400
	D70	0.700	0.500	0.545	0.175	12	20	410	620	390	590	750	1100	1500	2200
	D80	0.800	0.500	0.545	0.175	19	23	620	760	580	710	1100	1360	2300	2700
	D90	0.900	0.500	0.545	0.175	23	32	740	1000	690	1000	1300	1900	2700	3800
	D100	1.000	0.500	0.545	0.175	30	40	1000	1300	950	1200	1800	2400	3700	4700
	D120	1.200	0.500	0.545	0.175	40	60	1300	2000	1300	1900	2400	3600	4800	7300
	D140	1.400	0.625	0.545	0.175	60	77	2100	2500	1900	2300	3700	4500	7500	9000
20 kVDC	D50	0.500	0.375	0.650	0.175	4.6	6.8	150	220	140	210	270	400	500	830
	D60	0.600	0.375	0.650	0.175	6.2	8.9	200	290	190	270	360	520	890	1000
	D70	0.700	0.500	0.650	0.175	10	14	330	450	310	430	600	820	1200	1700
	D80	0.800	0.500	0.650	0.175	15	17	500	550	470	520	900	1000	1700	2000
	D90	0.900	0.500	0.650	0.175	18	23	600	770	560	720	1100	1400	2000	2800
	D100	1.000	0.500	0.650	0.175	24	30	800	960	760	900	1500	1700	2800	300
	D120	1.200	0.500	0.650	0.175	32	45	1000	1500	1000	1400	1900	2600	3600	5500
	D140	1.400	0.625	0.650	0.175	50	56	1700	1800	1600	1700	3000	3300	5600	6800

High Voltage Radial Leaded Disc Capacitors

Military & Commercial Grade - 3 kVDC to 20 kVDC

Part Number / Ordering Information

D30	D50	W	921	M	M	R

Voltage
D30 = 3 kVDC
D100 = 10 kVDC
D150 = 15 kVDC

Style
D50
- Reference table

Dielectric
N = NPO
W = X5R
X = X7R
Y = X5U
Z = Z5U

Capacitance
Value in pF
- Two significant figures, plus number of zeros
8R4 = 8.4 pF
921 = 920 pF
223 = 22,000 pF

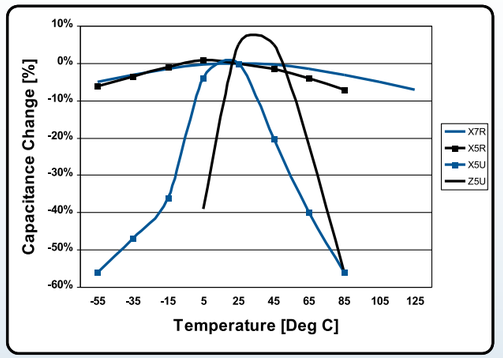
Tolerance
J = ±5%, NPO only
K = ±10%
M = ±20%
P = -0 / +100%
Z = -20 / +80%

Screening
M = Group A
- Excludes corona

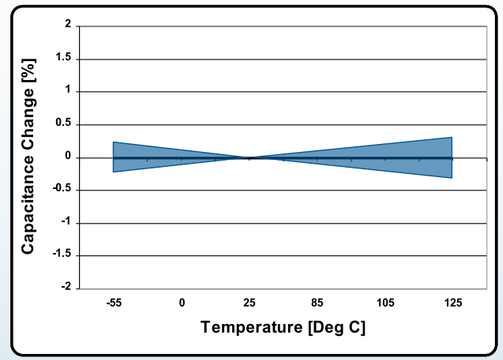
RoHS
R = RoHS

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

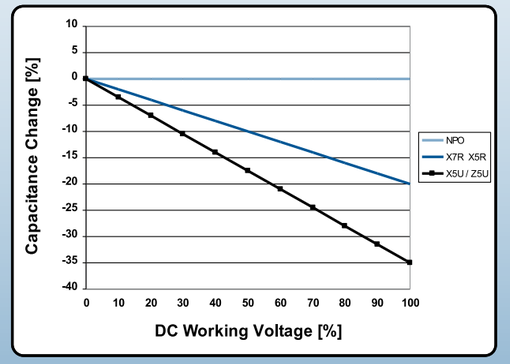
Performance Charts (Typical)



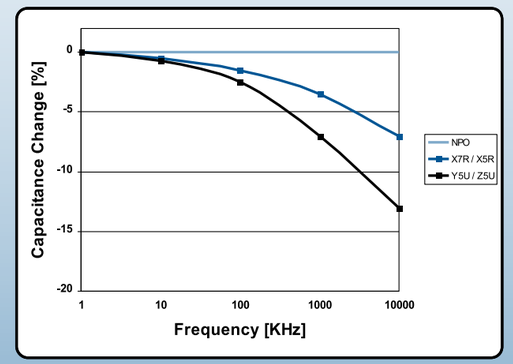
Class II Temperature Coefficient



NPO Temperature Coefficient



Voltage Coefficient

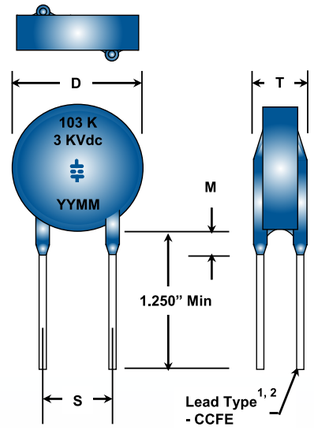


Capacitance Vs Frequency

CRT-0006
Rev 1410

High Voltage Radial Leaded Disc Capacitors

Negative TC Low Loss - 3 kVDC to 20 kVDC



1. **Lead Size: D30, D40 @ 0.025" Dia (#22 AWG) [0.64 mm] D50 & larger @ 0.32" Dia (#20 AWG) [0.81 mm]**
2. **Lead Finish: Sn60 / Pb40 Solder**
3. **Order of marking may vary depending on size of capacitor**

CalRamic Technologies LLC manufactures a series of highly reliable, single layer, conformally coated, negative temperature compensating, leaded ceramic disc capacitors that deliver both very stable and predictable performance characteristics typically associated with low loss dielectrics.

These capacitors, which draw on thirty plus years of proven design and process experience, are manufactured under strict quality control guidelines and utilize a double action press to minimize gradients within the dielectric powder, producing a finished capacitor with a uniform fired ceramic density and unparalleled performance in high voltage applications. Leaded construction limits risk for damage due to exposure to mechanical and thermal stress.

Essential where low losses and tight capacitance tolerances are critical, 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.

Performance Characteristics

Specification	Dielectric Type				
	CR01	CR03	CR09	CR17	CR22
Material Classification	N750 (U2J)	N1500 (P3K)	N2200 (R3L)	N4700 (T3M)	N5600 (U3N)
Coefficient of Thermal Expansion	11 x 10^{-6} / °C	11 x 10^{-6} / °C	11 x 10^{-6} / °C	11 x 10^{-6} / °C	11 x 10^{-6} / °C
Density	72 g / in^3				
Operating Temperature Range	-55 to +125°C				
Aging Rate	0				
Temperature Coefficient	-750 PPM / °C ±10% Max	-1500 PPM / °C ±17% Max	-2200 PPM / °C ±24% Max	-4700 PPM / °C ±52% Max	-5600 PPM / °C ±59% Max
Voltage Coefficient	-4% Max @ WVDC		-7% Max @ WVDC		
Capacitance Range	2.0 pF to 600 pF	5.5 pF to 1699 pF	15 pF to 4500 pF	29 pF to 8500 pF	34 pF to 0.010 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 @ +125°C	10,000 MΩ or 100 MΩ - µF, W/E is less				
Dissipation Factor	0.2% Max				
DWV	1.5 x WVDC				

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. Group B Inspection is available upon request.
3. Special testing including 100% Partial Discharge (Corona) is available upon request. Contact factory.
4. Custom voltages, package sizes and capacitance values available. Contact factory.
5. Higher voltage parts may require further encapsulation to prevent surface arc over and breakdown. When required, parts should first be cleaned and oven dried at +85ºC. Silicone rubbers or a suitable epoxy may be used and de-airing of encapsulates is recommended.
6. Testing of higher voltage parts before installation and / or supplemental encapsulation, may be done in a suitable, non-contaminating dielectric fluid like FC-40.
7. Large ceramic capacitors, even leaded devices are susceptible to damage when exposed to thermal and / or mechanical shock. Refer to Technical Bulletin AN103 for handling and installation recommendations.

High Voltage Radial Leaded Disc Capacitors

Negative TC Low Loss - 3 kVDC to 20 kVDC

Electrical / Mechanical Characteristics

Working Voltage	Disc Style	Dimensions [in]				Capacitance Range [pF]									
		D Max	S ± 0.030	T Max	M Max	CR01		CR03		CR09		CR17		CR22	
						Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
3 kVDC	D30	0.3	0.25	0.210	0.125	14	18	37	50	100	130	190	250	230	300
	D40	0.4	0.25	0.210	0.125	20	37	55	100	150	280	280	530	330	630
	D50	0.5	0.375	0.210	0.125	45	73	130	200	340	550	640	1000	750	1200
	D60	0.6	0.375	0.210	0.125	80	96	220	260	600	720	1200	1300	1400	1600
	D70	0.7	0.5	0.210	0.125	100	150	280	410	750	1100	1500	2100	1700	2500
	D80	0.8	0.5	0.210	0.125	150	180	420	500	1200	1300	2200	2500	2500	3000
	D90	0.9	0.5	0.210	0.125	180	250	500	700	1400	1900	2600	3600	3000	4200
	D100	1	0.5	0.210	0.125	250	310	670	870	1900	2300	3500	4400	4100	5200
	D120	1.2	0.5	0.210	0.125	320	480	880	1300	2400	3600	4500	6900	5300	8100
	D140	1.4	0.625	0.210	0.125	500	600	1400	1600	3800	4500	7100	8500	8300	10000
5 kVDC	D30	0.3	0.25	0.250	0.125	8	10	22	30	60	82	120	150	140	180
	D40	0.4	0.25	0.250	0.125	12	22	33	62	89	170	170	320	200	370
	D50	0.5	0.375	0.250	0.125	27	44	74	120	210	330	390	620	450	730
	D60	0.6	0.375	0.250	0.125	48	57	140	150	360	430	680	820	800	960
	D70	0.7	0.5	0.250	0.125	60	90	170	240	450	670	850	1200	1000	1500
	D80	0.8	0.5	0.250	0.125	90	100	250	300	680	820	1300	1500	1500	1800
	D90	0.9	0.5	0.250	0.125	110	150	300	420	810	1100	1600	2100	1800	2500
	D100	1	0.5	0.250	0.125	150	190	410	520	1100	1400	2100	2600	2500	3100
	D120	1.2	0.5	0.250	0.125	190	290	530	800	1500	2200	2700	4100	3200	4800
	D140	1.4	0.625	0.250	0.125	300	360	820	990	2300	2700	4300	5100	5000	6000
7.5 kVDC	D30	0.3	0.25	0.310	0.150	5.5	7	15	20	40	54	76	100	89	120
	D40	0.4	0.25	0.310	0.150	8	15	22	41	60	110	120	210	140	250
	D50	0.5	0.375	0.310	0.150	18	29	50	81	140	220	260	410	300	490
	D60	0.6	0.375	0.310	0.150	32	38	87	100	240	280	450	540	530	640
	D70	0.7	0.5	0.310	0.150	40	60	110	160	300	450	570	850	670	1000
	D80	0.8	0.5	0.310	0.150	60	72	170	200	450	540	850	1000	1000	1200
	D90	0.9	0.5	0.310	0.150	72	100	200	280	540	760	1100	1400	1200	1700
	D100	1	0.5	0.310	0.150	98	120	270	340	730	950	1400	1700	1700	2100
	D120	1.2	0.5	0.310	0.150	130	190	350	530	950	1400	1800	2700	2200	3200
	D140	1.4	0.625	0.310	0.150	200	240	550	660	1500	1800	2900	3400	3300	4000
10 kVDC	D30	0.3	0.25	0.440	0.170	4	5	11	15	30	41	57	77	67	91
	D40	0.4	0.25	0.440	0.170	6	11	17	31	45	85	84	160	99	180
	D50	0.5	0.375	0.440	0.170	14	22	37	60	110	160	200	310	230	360
	D60	0.6	0.375	0.440	0.170	24	28	66	79	180	210	340	410	400	480
	D70	0.7	0.5	0.440	0.170	30	45	83	120	230	330	430	640	500	750
	D80	0.8	0.5	0.440	0.170	45	54	130	150	340	410	640	770	750	910
	D90	0.9	0.5	0.440	0.170	54	76	150	210	410	570	760	1000	900	1200
	D100	1	0.5	0.440	0.170	73	95	210	260	550	710	1100	1300	1300	1500
	D120	1.2	0.5	0.440	0.170	95	140	270	400	720	1100	1400	2000	1600	2400
	D140	1.4	0.625	0.440	0.170	150	180	410	490	1200	1300	2200	2500	2500	3000
15 kVDC	D30	0.3	0.25	0.545	0.175	3	3.5	7.5	10	20	27	38	51	45	60
	D40	0.4	0.25	0.545	0.175	4	7.5	11	20	30	56	56	100	66	120
	D50	0.5	0.375	0.545	0.175	9	14	25	40	68	110	130	200	150	240
	D60	0.6	0.375	0.545	0.175	16	19	44	53	120	140	230	270	270	320
	D70	0.7	0.5	0.545	0.175	20	30	55	82	150	220	290	420	340	500
	D80	0.8	0.5	0.545	0.175	30	36	83	100	230	270	430	510	500	600
	D90	0.9	0.5	0.545	0.175	36	51	99	140	270	380	510	720	600	850
	D100	1	0.5	0.545	0.175	49	63	140	170	370	470	690	890	810	1000
	D120	1.2	0.5	0.545	0.175	64	97	180	260	480	730	900	1300	1100	1600
	D140	1.4	0.625	0.545	0.175	99	120	280	330	750	900	1500	1700	1700	2000
20 kVDC	D50	0.5	0.375	0.650	0.175	7	11	19	30	51	83	96	150	120	180
	D60	0.6	0.375	0.650	0.175	12	14	33	39	89	100	170	200	200	240
	D70	0.7	0.5	0.650	0.175	15	22	42	62	120	160	220	320	250	370
	D80	0.8	0.5	0.650	0.175	23	27	62	75	170	200	320	380	380	450
	D90	0.9	0.5	0.650	0.175	27	38	74	100	210	280	380	540	450	630
	D100	1	0.5	0.650	0.175	37	47	110	130	280	350	520	670	610	790
	D120	1.2	0.5	0.650	0.175	48	73	140	200	360	550	680	1000	800	1200
	D140	1.4	0.625	0.650	0.175	75	90	210	240	560	670	1100	1200	1300	1500

C

High Voltage Radial Leaded Disc Capacitors

Negative TC Low Loss - 3 kVDC to 20 kVDC

Part Number / Ordering Information

D30	D50	CR22	102	K	M

Voltage
D30 = 3 kVDC
D100 = 10 kVDC
D150 = 15 kVDC

Style
D50
- Reference table

Dielectric
CR01 = N750
CR03 = N1500
CR09 = N2200
CR17 = N4700
CR22 = N5600

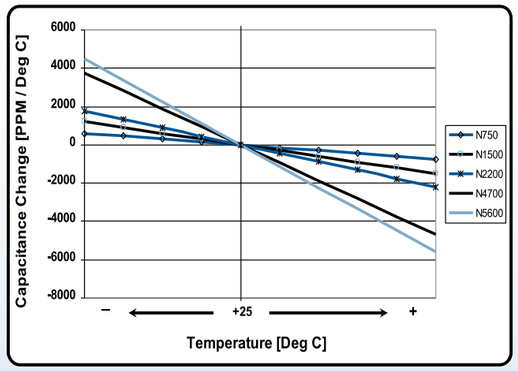
Capacitance
Value in pF
- Two significant figures, plus number of zeros
5R5 = 5.5 pF
102 = 1000 pF
103 = 10,000 pF

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

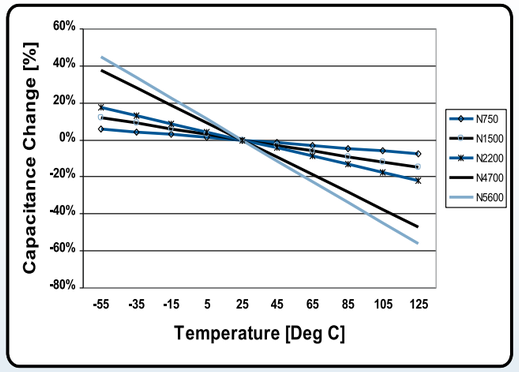
Screening
M = Group A
- Excludes corona

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

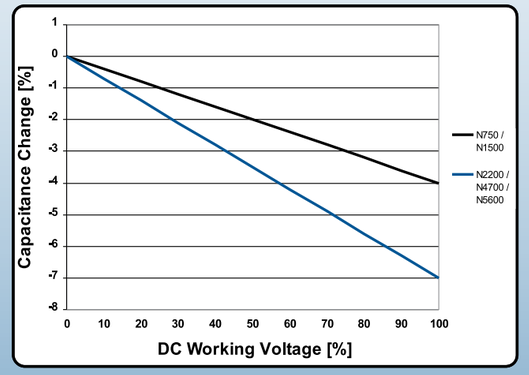
Performance Charts (Typical)



Temperature Coefficient [PPM / °C]



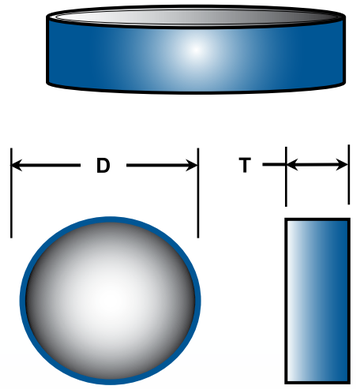
Temperature Coefficient [% Vs Temp]



Voltage Coefficient

High Voltage Single Layer Bare Disc Capacitors

Military & Commercial Grade - 3 kVDC to 10 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.

Performance Characteristics

Specification	Dielectric Type (EIA Designation)			
	NPO (COG)	X7R	X5R	X5U
Material Classification	Type I, Ultra Stable, K76	Type II, Stable, K2350	Type II, Stable, K2500	Type II, Stable, K5000
Coefficient of Thermal Expansion	9 x 10^{-6} / °C	11 x 10^{-6} / °C	11 x 10^{-6} / °C	11 x 10^{-6} / °C
Density	72 g / in^3			
Operating Temperature Range	-55 to +125°C		-55 to +85°C	
Aging Rate	0	-2% Max per decade hour		-3% Max per decade hour
Temperature Coefficient	±30 PPM / °C	±15%		+22 / -56%
Voltage Coefficient	Negligible	-20% Max @ WVDC		-35% Max @ WVDC
Capacitance Range	1.6 pF to 310 pF	52 pF to 9500 pF	55 pF to 0.010 µF	100 pF to 0.018 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			

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 +85ºC. 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.

High Voltage Single Layer Bare Disc Capacitors

Military & Commercial Grade - 3 kVDC to 10 kVDC

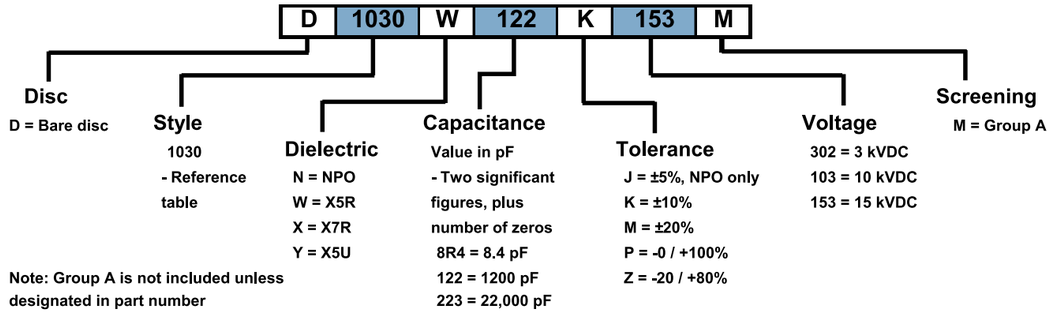
Electrical / Mechanical Characteristics

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

High Voltage Single Layer Bare Disc Capacitors

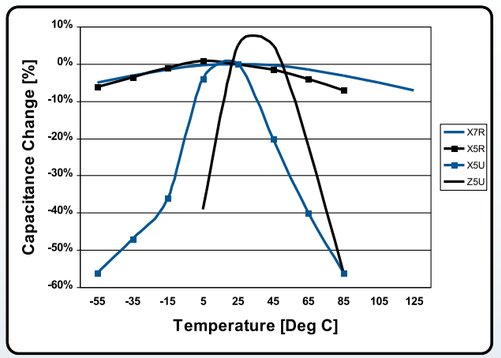
Military & Commercial Grade - 3 kVDC to 10 kVDC

Part Number / Ordering Information

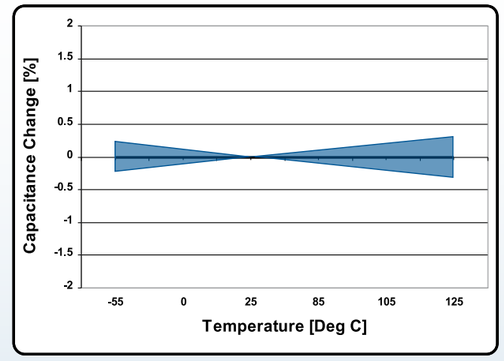


Note: Group A is not included unless designated in part number

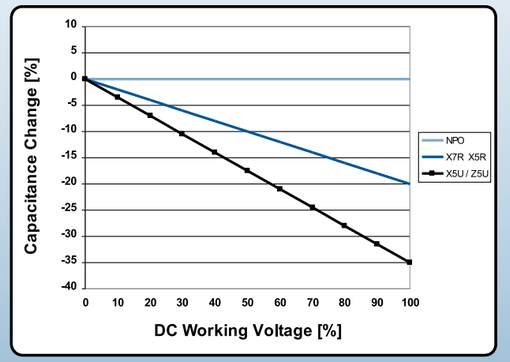
Performance Charts (Typical)



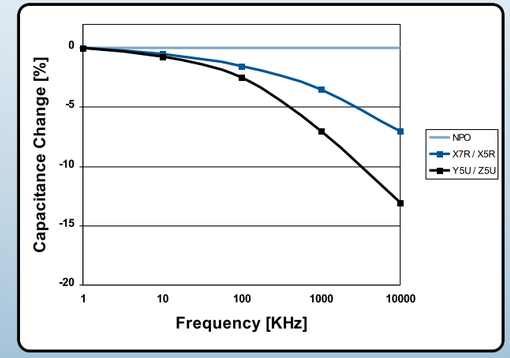
Class II Temperature Coefficient



NPO Temperature Coefficient



Voltage Coefficient

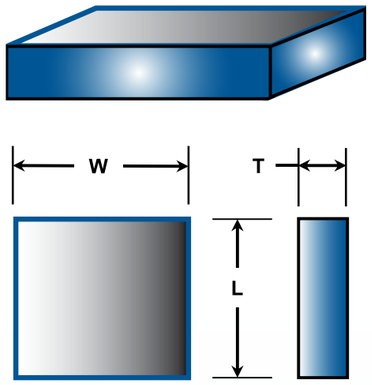


Capacitance Vs Frequency

CRT-0001
Rev 1410

High Voltage Single Layer Bare Rectangular Capacitors

Military & Commercial Grade - 3 kVDC to 10 kVDC



CalRamic Technologies LLC manufactures a series of highly reliable, single layer, rectangular ceramic 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 higher 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.

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

Performance Characteristics

Specification	Dielectric Type (EIA Designation)			
	NPO (COG)	X7R	X5R	X5U
Material Classification	Type I, Ultra Stable, K76	Type II, Stable, K2350	Type II, Stable, K2500	Type II, Stable, K5000
Coefficient of Thermal Expansion	9 x 10^{-6} / °C	11 x 10^{-6} / °C	11 x 10^{-6} / °C	11 x 10^{-6} / °C
Density	72 g / in^3			
Operating Temperature Range	-55 to +125°C		-55 to +85°C	
Aging Rate	0	-2% Max per decade hour		-3% Max per decade hour
Temperature Coefficient	±30 PPM / °C	±15%		+22 / -56%
Voltage Coefficient	Negligible	-20% Max @ WVDC		-35% Max @ WVDC
Capacitance Range	5.2 pF to 300 pF	120 pF to 9000 pF	140 pF to 10,200 pF	270 pF to 0.020 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			

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 +85ºC. 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 a leaded alternative.

High Voltage Single Layer Bare Rectangular Capacitors

Military & Commercial Grade - 3 kVDC to 10 kVDC

Electrical / Mechanical Characteristics

Working Voltage	Style	Dimensions [in]				Capacitance Range [pF]							
		L ± 0.010	W ± 0.010	T Max	T Nom	NPO		X5R		X7R		X5U	
						Min	Max	Min	Max	Min	Max	Min	Max
3 kVDC	3408	0.340	0.080	0.075	0.060	6.8	8.1	230	275	200	240	460	550
	5625	0.560	0.250	0.075	0.060	35	42	1200	1400	1000	1200	2400	2900
	5439	0.540	0.390	0.075	0.060	53	64	1800	2200	1600	1900	3600	4300
	7050	0.700	0.500	0.075	0.060	88	106	3000	3600	2600	3100	6000	7100
	100100	1.000	1.000	0.075	0.060	250	300	8500	10200	7500	9000	17000	20000
5 kVDC	3408	0.340	0.080	0.125	0.100	4	5	140	170	120	150	270	340
	5625	0.560	0.250	0.125	0.100	21	26	700	870	620	7700	1400	1700
	5439	0.540	0.390	0.125	0.100	32	39	1100	1300	940	1200	2100	2600
	7050	0.700	0.500	0.125	0.100	52	65	1800	2200	1500	1900	3500	4400
	100100	1.000	1.000	0.125	0.100	150	184	5000	6200	4400	5500	10000	12400
7.5 kVDC	3408	0.340	0.080	0.180	0.150	•	•	•	•	•	•	•	•
	5625	0.560	0.250	0.180	0.180	14	17	470	580	410	500	940	1200
	5439	0.540	0.390	0.180	0.180	21	26	700	870	620	760	1400	1700
	7050	0.700	0.500	0.180	0.180	35	43	1200	1400	100	1300	2300	2900
	100100	1.000	1.000	0.180	0.180	100	120	3400	4100	2900	3600	6700	8200
10 kVDC	3408	0.340	0.080	0.235	0.200	•	•	•	•	•	•	•	•
	5625	0.560	0.250	0.235	0.200	11	13	350	430	310	380	710	870
	5439	0.540	0.390	0.235	0.200	16	19	530	650	470	570	1100	1300
	7050	0.700	0.500	0.235	0.200	26	32	880	1100	780	950	1800	2200
	100100	1.000	1.000	0.235	0.200	75	92	2500	3100	2200	2700	5000	6200
15 kVDC	3408	0.340	0.080	0.350	0.300	•	•	•	•	•	•	•	•
	5625	0.560	0.250	0.350	0.300	7	8.5	240	290	210	250	470	580
	5439	0.540	0.390	0.350	0.300	11	13	350	430	310	380	710	870
	7050	0.700	0.500	0.350	0.300	17	21	590	720	520	630	1200	1400
	100100	1.000	1.000	0.350	0.300	50	60	1700	2100	1500	1800	3400	4100
20 kVDC	3408	0.340	0.080	0.460	0.400	•	•	•	•	•	•	•	•
	5625	0.560	0.250	0.460	0.400	5.2	6.4	180	220	160	190	350	430
	5439	0.540	0.390	0.460	0.400	7.9	9.6	270	330	230	290	530	650
	7050	0.700	0.500	0.460	0.400	13	16	440	540	390	470	880	1100
	100100	1.000	1.000	0.460	0.400	37	46	1300	1500	1100	1400	2500	3100

Part Number / Ordering Information

SL	7050	W	122	K	752	M

Disc
SL = Single layer

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

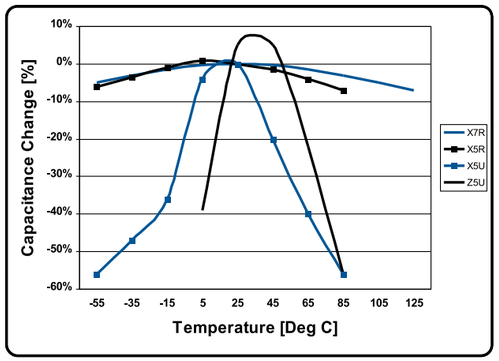
Screening
M = Group A

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

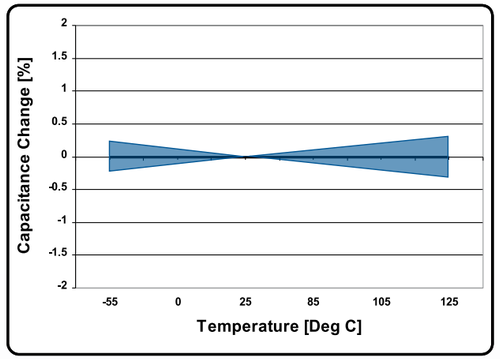
High Voltage Single Layer Bare Rectangular Capacitors

Military & Commercial Grade - 3 kVDC to 10 kVDC

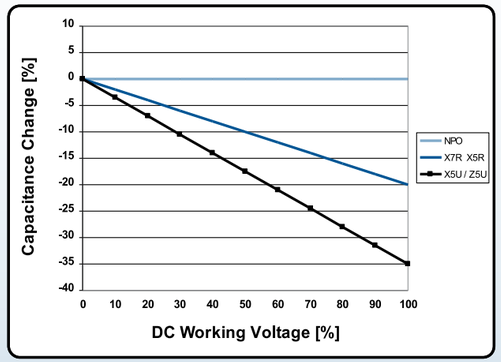
Performance Charts (Typical)



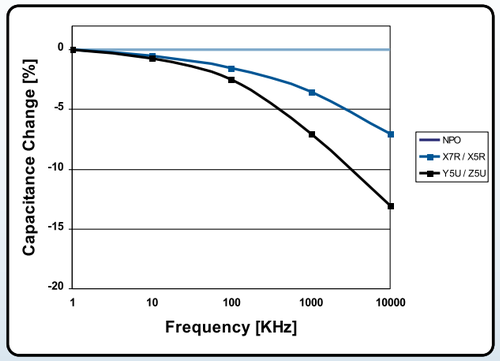
Class II Temperature Coefficient



NPO Temperature Coefficient



Voltage Coefficient



Capacitance Vs Frequency

CRT-0007
Rev 1410

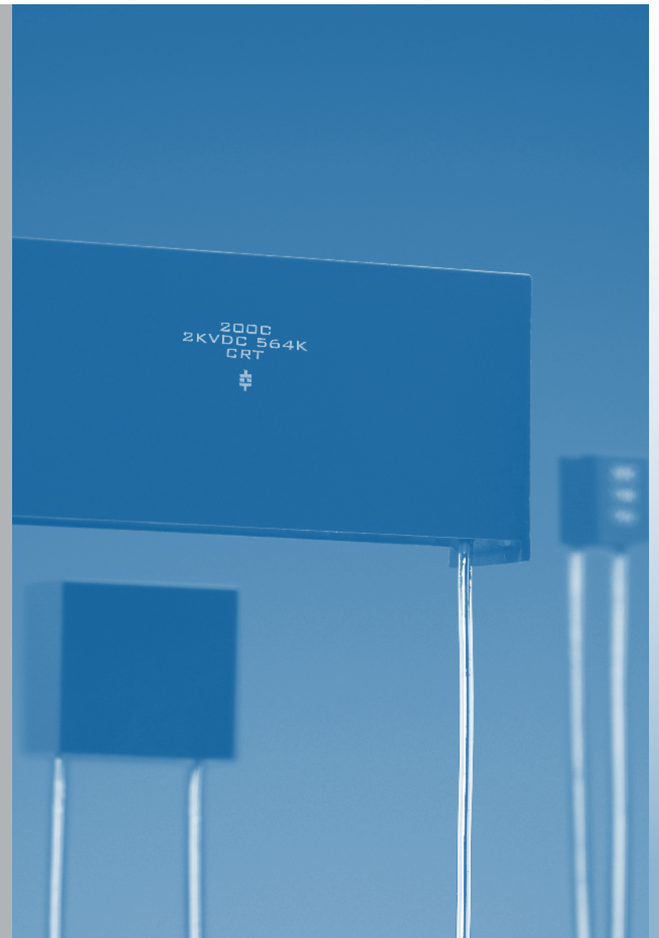
Notes

CalRamic Technologies LLC
(775) 851-3580 / calramic.com / 5462 Louie Lane / Reno, NV 89511 USA

High Temp, 200°C

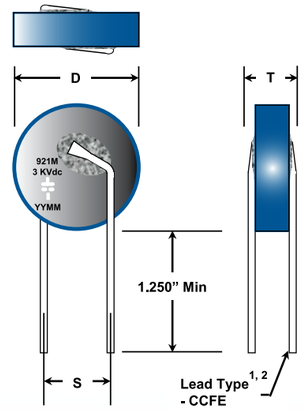
CalRamic Technologies LLC

(775) 851-3580 / calramic.com / 5462 Louie Lane / Reno, NV 89511 USA



High Voltage Radial Leaded Disc Capacitors

High Temperature +200°C Rated - 3 kVDC to 20 kVDC



1. **Lead Size: D30, D40 @ 0.025" Dia (#22 AWG) [0.64 mm] D50 & larger @ 0.32" Dia (#20 AWG) [0.81 mm]**
2. **Lead Finish: Solder**
3. **Order of marking may vary depending on size of capacitor**

CalRamic Technologies LLC manufactures a series of highly reliable, single layer, leaded ceramic disc capacitors that are designed and manufactured under strict quality control guidelines to ensure unparalleled performance in high temperature, 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, X7R type dielectric materials, which are intended for those applications where higher 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 intended for the high temperature down-hole, automotive and industrial markets.

Performance Characteristics

Specification	Dielectric Type (EIA Designation)	
	HTNPO (COG)	HTX7R
Material Classification	Type I, Ultra Stable, K76	Type II, Stable, K2350
Coefficient of Thermal Expansion	9 x 10^{-6} / °C	11 x 10^{-6} / °C
Density	76 g / in^3	
Operating Temperature Range	-55 to +200°C	
Aging Rate	0	-2% Max per decade hour
Temperature Coefficient	±30 PPM / °C	+15 / -70%
Capacitance Range	1.4 pF to 350 pF	42 pF to 0.012 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 @ +200°C	1000 MΩ or 10 MΩ - µF, W/E is less	
Dissipation Factor	0.1% Max	2.5% Max
DWV	1.5 x WVDC	

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, lead configurations 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 +85ºC. A suitable encapsulant, capable of withstanding the extreme conditions associated with these applications, may be used and de-airing of coatings is recommended.
5. Testing of higher voltage parts before installation and / or supplemental encapsulation, may be done in a suitable, non-contaminating dielectric fluid like FC-40.
6. Large ceramic capacitors, even leaded devices are susceptible to damage when exposed to thermal and / or mechanical shock. Refer to Technical Bulletin AN103 for handling and installation recommendations.

High Voltage Radial Leaded Disc Capacitors

High Temperature +200º C Rated - 3 kVDC to 20 kVDC

Electrical / Mechanical Characteristics

Working Voltage	Disc Style	Dimensions [in]			Capacitance Range [pF]			
					HTNPO		HTX7R	
		D Max	S ± 0.030	T Max	Min	Max	Min	Max
3 kVDC	D30	0.300	0.250	0.210	8.4	12	260	350
	D40	0.400	0.250	0.210	12	24	380	730
	D50	0.500	0.375	0.210	28	46	870	1400
	D60	0.600	0.375	0.210	38	61	1200	1900
	D70	0.700	0.500	0.210	63	95	2000	2900
	D80	0.800	0.500	0.210	94	110	2900	3500
	D90	0.900	0.500	0.210	110	160	3500	5000
	D100	1.000	0.500	0.210	150	200	4700	6200
	D120	1.200	0.500	0.210	200	310	6200	9500
	D140	1.400	0.625	0.210	310	350	9600	12000
5 kVDC	D30	0.300	0.250	0.250	5.1	6.9	150	210
	D40	0.400	0.250	0.250	7.3	15	230	440
	D50	0.500	0.375	0.250	17	28	520	860
	D60	0.600	0.375	0.250	23	37	700	1100
	D70	0.700	0.500	0.250	38	57	1200	1800
	D80	0.800	0.500	0.250	57	69	1800	2100
	D90	0.900	0.500	0.250	69	97	2100	3000
	D100	1.000	0.500	0.250	92	120	2900	3700
	D120	1.200	0.500	0.250	120	180	3800	5700
	D140	1.400	0.625	0.250	190	230	5800	7000
7.5 kVDC	D30	0.300	0.250	0.310	3.4	4.6	100	150
	D40	0.400	0.250	0.310	5	9.6	150	300
	D50	0.500	0.375	0.310	12	19	350	580
	D60	0.600	0.375	0.310	15	25	470	750
	D70	0.700	0.500	0.310	25	38	780	1200
	D80	0.800	0.500	0.310	37	46	1200	1400
	D90	0.900	0.500	0.310	45	65	1400	2000
	D100	1.000	0.500	0.310	60	80	1900	2500
	D120	1.200	0.500	0.310	80	120	2500	3800
	D140	1.400	0.625	0.310	120	150	3800	4700
10 kVDC	D30	0.300	0.250	0.365	2.5	3.5	78	110
	D40	0.400	0.250	0.365	3.8	7.2	110	220
	D50	0.500	0.375	0.365	8.5	14	260	430
	D60	0.600	0.375	0.365	12	18	350	560
	D70	0.700	0.500	0.365	19	28	580	880
	D80	0.800	0.500	0.365	28	34	870	1100
	D90	0.900	0.500	0.365	34	48	1000	1500
	D100	1.000	0.500	0.365	46	60	1400	1800
	D120	1.200	0.500	0.365	60	93	1900	2800
	D140	1.400	0.625	0.365	94	110	2900	3500
15 kVDC	D30	0.300	0.250	0.474	1.6	2.3	52	71
	D40	0.400	0.250	0.475	2.4	4.8	76	150
	D50	0.500	0.375	0.475	5.7	9.4	180	290
	D60	0.600	0.375	0.475	7.7	12	230	370
	D70	0.700	0.500	0.475	12	20	390	590
	D80	0.800	0.500	0.475	19	23	580	710
	D90	0.900	0.500	0.475	23	32	690	1000
	D100	1.000	0.500	0.475	30	40	950	1200
	D120	1.200	0.500	0.475	40	60	1300	1900
	D140	1.400	0.625	0.475	60	77	1900	2300
20 kVDC	D50	0.500	0.375	0.575	4.6	6.8	140	210
	D60	0.600	0.375	0.575	6.2	8.9	190	270
	D70	0.700	0.500	0.575	10	14	310	430
	D80	0.800	0.500	0.575	15	17	470	520
	D90	0.900	0.500	0.575	18	23	560	720
	D100	1.000	0.500	0.575	24	30	760	900
	D120	1.200	0.500	0.575	32	45	1000	1400
	D140	1.400	0.625	0.575	50	56	1600	1700

High Voltage Radial Leaded Disc Capacitors

High Temperature +200º C Rated - 3 kVDC to 20 kVDC

Part Number / Ordering Information

HT	D30	D50	X	1R4	J

Series
HT = High Temp
+200 ºC

Voltage
D30 = 3 kVDC
D100 = 10 kVDC
D150 = 15 kVDC

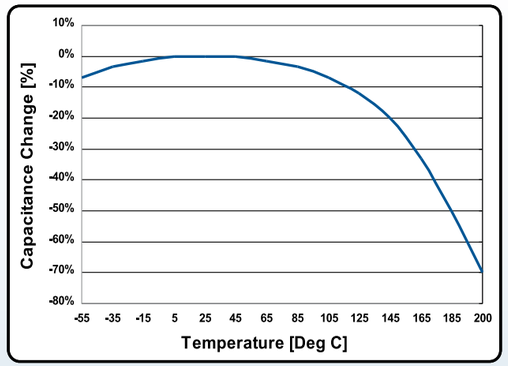
Style
D50
- Reference table

Dielectric
N = HTNPO
X = HTX7R

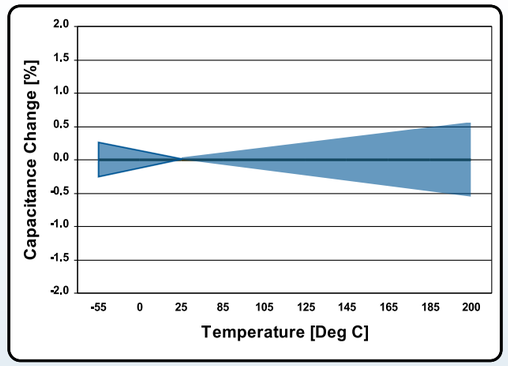
Capacitance
Value in pF
- Two significant figures, plus number of zeros
1R4 = 1.4 pF
120 = 12 pF
192 = 1900 pF

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

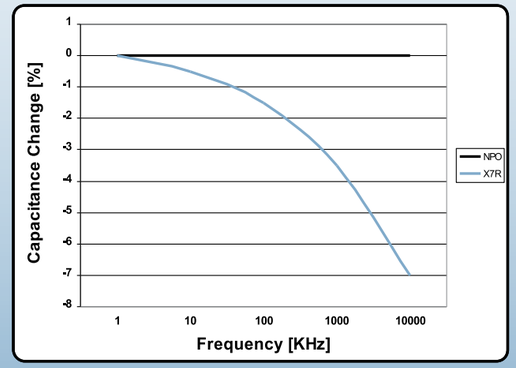
Performance Charts (Typical)



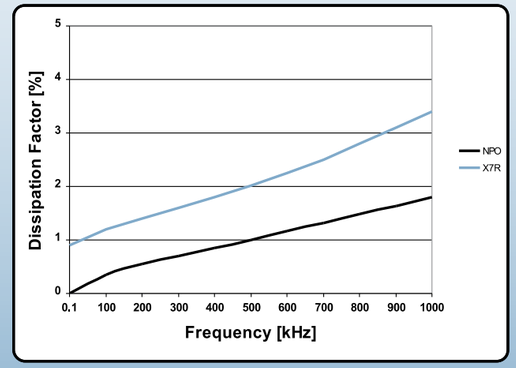
HTX7R Temperature Coefficient



HTNPO Temperature Coefficient



Capacitance Vs Frequency



Dissipation Factor Vs Frequency

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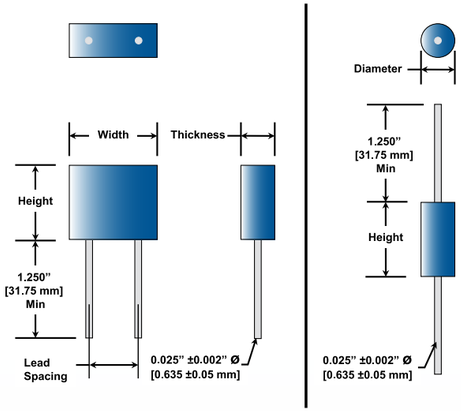
High Temperature - High Voltage Leaded Capacitors

200°C Rated NPO / HTX7R – 50 Vdc to 10 KVdc



Lead Type: #22 AWG, silver plated, CCFE or solid nickel

CalRamic Technologies LLC manufactures a series of highly reliable, encapsulated radial / axial leaded ceramic capacitors that are designed specifically for those severe conditions where the capacitor may be exposed to elevated levels of mechanical stress and high temperature conditions. These assemblies are packaged in a high resistance, high temperature rated case and backfilled with a high temperature epoxy that provides enhanced electrical isolation and added environmental protection.

Intended for continuous operation at full rated voltage and across the entire operating temperature range of -55 to +200ºC, these capacitors utilize a special internal design specifically intended to reduce electric field stresses, thereby providing a device that exhibits very low ESR characteristics and no reduction in insulation resistance with life.

Available with ultra stable Class I, NPO and stable Class II, X7R dielectric materials, these capacitors are ideally suited for a variety of extreme applications associated with the high temperature aerospace, down-hole mining and automotive industries.

Performance Characteristics

Specification	Dielectric Type (EIA Designation)		
	NPO (COG)	HTX7R	HTX7R [Extended Range]
Material Classification	Type I, Ultra Stable, K90	Type II, Stable, K2100	Type II, Stable, K2500
Coefficient of Thermal Expansion	9 x 10^{-6} / °C	11 x 10^{-6} / °C	
Density	72 g / in^3		
Operating Temperature Range	-55 to +200°C		
Aging Rate	0	-2% Max per decade hour	
Temperature Coefficient	±60 PPM / °C	+15 / -40%	+15 / -60%
Voltage Coefficient	Negligible	-20% Max @ WVDC	-35% Max @ WVDC
Maximum Capacitance	0.10 µF HTR / 0.010 µF HTA	1.8 µF HTR / 0.68 µF HTA	2.7 µF HTR / 1.0 µF HTA
Voltage Range	50 VDC to 10 kVDC		
Insulation Resistance @ +25°C	100,000 MΩ or 1000 MΩ - µF, W/E is less		
Insulation Resistance @ 200°C	100 MΩ or 1 MΩ - µF, W/E is less		
Dissipation Factor	0.1% Max	2.0% Max	
DWV	2 x WVDC @ WVDC < 200 VDC / 1.5 x WVDC @ 200 VDC WVDC < 1 kVDC / 1.2 x WVDC @ WVDC 1 kVDC		

Mechanical Dimensions

Dimensions inches [mm]	Product Style											
	HTR01	HTR02	HTR03	HTR04	HTR05	HTR06	HTR07	HTA10	HTA11	HTA12	HTA13	HTA14
Width - Max	0.200 [5.08]	0.200 [5.08]	0.200 [5.08]	0.300 [7.60]	0.500 [12.70]	0.700 [17.80]	1.500 [38.10]	•	•	•	•	•
Height - Max	0.200 [5.08]	0.200 [5.08]	0.200 [5.08]	0.300 [7.60]	0.500 [12.70]	0.400 [10.16]	0.750 [19.05]	0.170 [4.32]	0.270 [6.86]	0.400 [10.16]	0.500 [12.70]	0.750 [19.10]
Thickness - Max	0.100 [2.54]	0.100 [2.54]	0.150 [3.81]	0.150 [3.81]	0.250 [6.35]	0.250 [6.35]	0.300 [7.62]	•	•	•	•	•
Diameter - Max	•	•	•	•	•	•	•	0.100 [2.54]	0.135 [3.43]	0.155 [3.94]	0.200 [5.08]	0.375 [9.53]
Lead Spacing ±0.030 [0.762]	0.100 [2.54]	0.200 [5.08]	0.100 [2.54]	0.200 [5.08]	0.400 [10.16]	0.500 [12.70]	1.375 [34.93]	•	•	•	•	•

High Temperature - High Voltage Leaded Capacitors

200°C Rated NPO / HTX7R – 50 Vdc to 10 KVdc

Electrical Characteristics

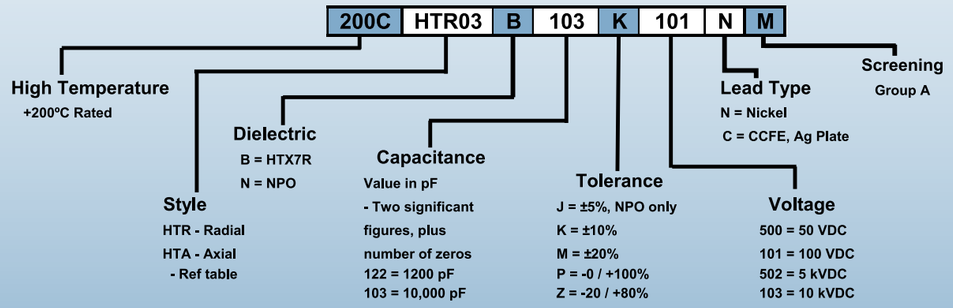
HT NPO Capacitance Range [Max]													
Style		HTR01	HTR02	HTR03	HTR04	HTR05	HTR06	HTR07	HTA10	HTA11	HTA12	HTA13	HTA14
WVDC	50	562	562	562	253	683	104	•	142	332	103	•	•
	100	472	472	472	223	563	823	•	122	272	822	•	•
	200	392	392	392	183	473	683	•	102	252	682	•	•
	500	182	182	272	103	333	473	•	681	182	472	•	•
	1000	561	561	102	332	183	163	104	181	471	222	•	•
	2000	•	•	•	561	392	562	223	•	•	221	•	•
	3000	•	•	•	•	272	392	153	•	•	221	•	•
	4000	•	•	•	•	681	222	472	•	•	•	•	•
	5000	•	•	•	•	•	102	372	•	•	•	•	•
	10000	•	•	•	•	•	•	122	•	•	•	•	•

HTX7R Capacitance Range																									
Style		HTR01		HTR02		HTR03		HTR04		HTR05		HTR06		HTR07		HTA10		HTA11		HTA12		HTA13		HTA14	
Cap Range		STD	EXT	STD	EXT	STD	EXT	STD	EXT	STD	EXT	STD	EXT	STD	EXT	STD	EXT	STD	EXT	STD	EXT	STD	EXT	STD	EXT
WVDC	50	823	124	823	124	823	124	474	824	125	185	185	275	•	•	273	393	683	104	184	274	274	394	684	105
	100	683	104	683	104	683	104	394	684	105	155	155	225	•	•	223	333	563	823	154	224	224	334	564	824
	200	273	393	273	393	393	563	154	224	564	824	824	125	•	•	822	123	333	473	823	124	124	184	334	474
	500	392	562	392	562	682	103	223	333	224	334	334	474	•	•	102	152	332	47	153	223	273	393	124	184
	1000	102	152	102	152	182	272	562	822	563	823	823	124	394	564	271	391	681	102	272	392	562	822	333	473
	2000	•	•	•	•	•	•	102	152	153	223	183	273	863	124	•	•	•	•	561	102	152	222	682	103
	3000	•	•	•	•	•	•	•	•	562	822	822	103	333	473	•	•	•	•	391	561	102	122	332	472
	4000	•	•	•	•	•	•	•	•	252	392	392	562	153	183	•	•	•	•	•	•	271	391	122	182
	5000	•	•	•	•	•	•	•	•	•	•	222	332	103	123	•	•	•	•	•	•	•	•	821	122
	10000	•	•	•	•	•	•	•	•	•	•	•	•	222	332	•	•	•	•	•	•	•	•	•	•

Notes

1. Group A screening available to MIL-PRF-49467 at +200ºC. [Voltage conditioning performed at 1.5 x WVDC for product rated at ≤ 200 VDC].
2. Special testing including Partial Discharge (Corona) is available for product rated at ≥500 VDC. Contact factory for more information.
3. Custom voltages, package sizes and capacitance values available. Contact factory
4. X7R dielectrics are not intended for AC line filtering applications.
5. Large ceramic capacitors, even leaded devices are susceptible to damage when exposed to thermal and / or mechanical shock. Refer to Technical Bulletin AN103 for handling and installation recommendations.

Part Number / Ordering Information



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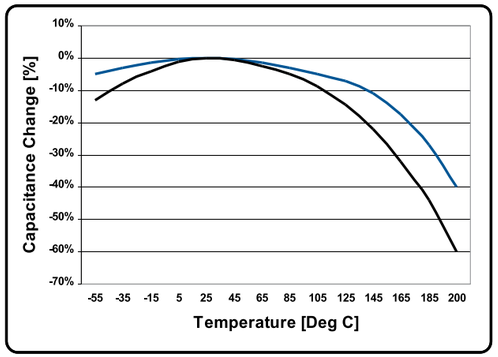
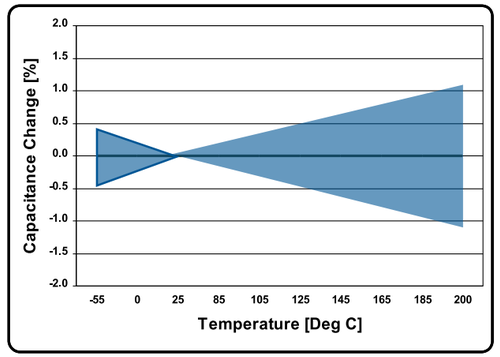
High Temperature - High Voltage Leaded Capacitors

200º C Rated NPO / HTX7R – 50 Vdc to 10 KVdc

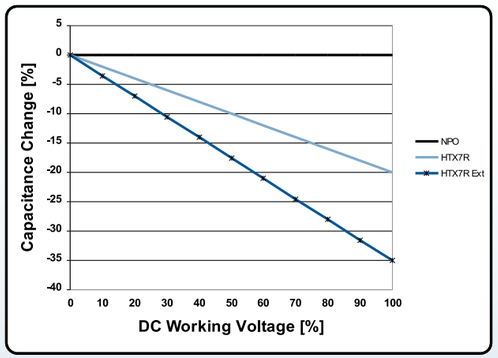
Performance Charts (Typical)



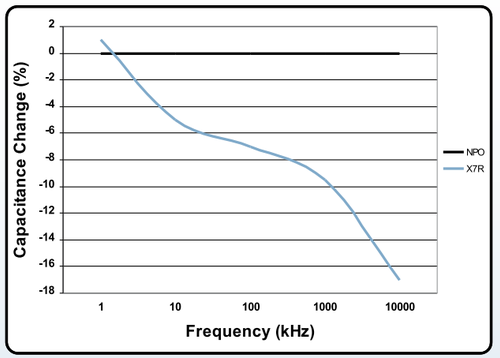
HTX7R Temperature Coefficient



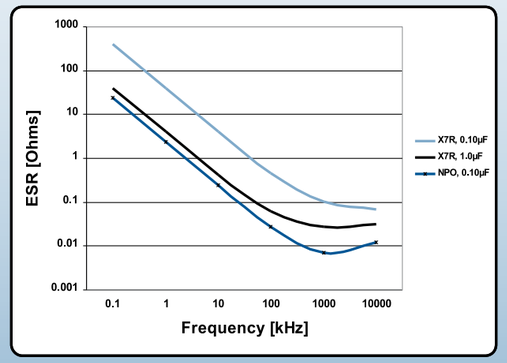
HTNPO Temperature Coefficient



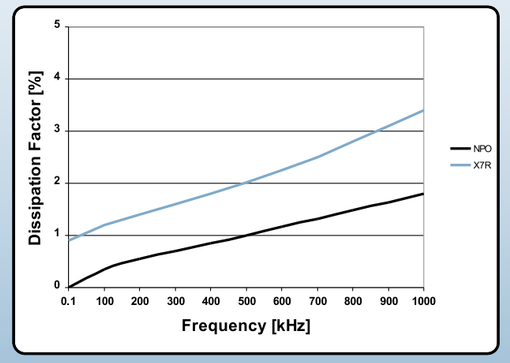
Voltage Coefficient



Capacitance Vs Frequency



ESR Vs Frequency



DF Vs Frequency

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Notes

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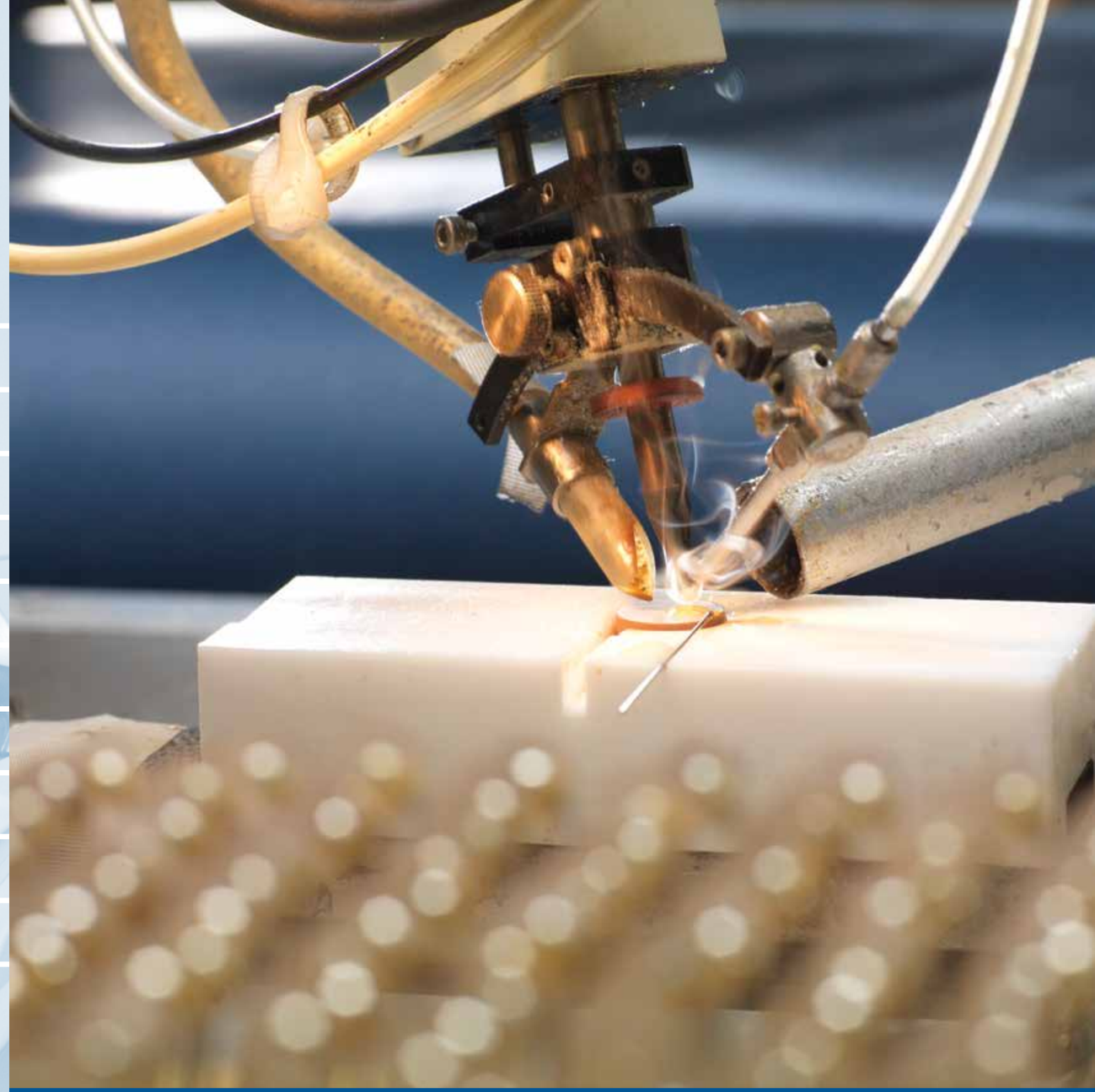

CalRamic Technologies LLC is an ISO9001-2008 Certified facility. Our commitment to Quality is our primary objective and we pride ourselves on our satisfaction to our client base. Our Goal is to provide the upmost Quality from the initial contact in introducing our company, to quoting the same day if 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.

MORE ABOUT US

CalRamic Technologies LLC is a US based manufacturing plant in Reno, Nevada. It was started in 2001 by Jeff Day who is the current President and CEO.

Jeff obtained his degree in Materials Science Engineering in 1984 from the University of Washington and has focused his entire career in the field of High Voltage Ceramic Capacitors. Over the years of service, he has acquired standard design and manufacturing practices to insure the upmost quality of the components.

CalRamic Technologies LLC focuses primarily on the High Voltage Ceramic Capacitor market that has the range of 500 volts to 20,000 volts. We pride ourselves on Lean Manufacturing practices which correspond with short deliveries, low cost, high quality components, combined with low overhead to compete on a World-Wide basis.

CalRamic Technologies LLC is privately owned with Jeff Day as the majority share-holder. CalRamic's partner company and shareholder is Voltage Multipliers Inc.,Visalia, CA. Voltage Multipliers manufactures diodes and power supplies.

Whatever your Market or application that may require a catalog part, or a part that needs to be custom made, CalRamic can assist you in your design.

Jeff Day

CalRamic Technologies LLC

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5462 Louie Lane, Reno, Nevada 89511

www.voltagemultipliers.com ~ HV Diodes and Power Supplies

Partner company of CalRamic Technologies LLC