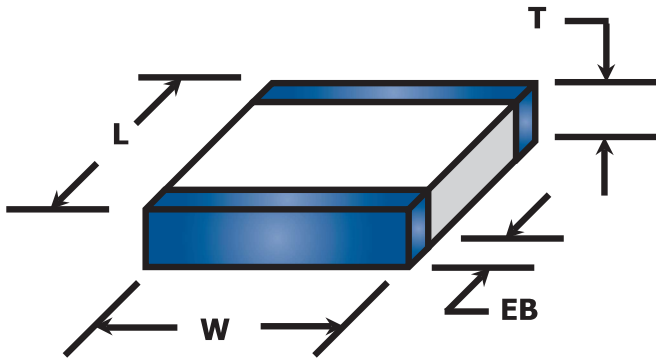


# High Voltage Multi-Layer Chip Capacitors

High Rel. Space Level NPO & X7R – 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 non-repairable, 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.

**B**

## 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	$9 \times 10^{-6} / ^\circ\text{C}$	$11 \times 10^{-6} / ^\circ\text{C}$
Density	67 g / in <sup>3</sup>	
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 10 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	0.1% Max	2.5% Max
DWV	1.5 X WVDC ≤ 1250 Vdc or 1.2 X WVDC > 1250 Vdc	

## Mechanical Dimensions

Dimensions in [mm]	Product Style											
	HS1515	HV2020	HV2520*	HS3530*	HS4040*	HS4540*	HS5550*	HS6560*	HS7030*	HS9040*	HS11050*	HS13060*
Length [L] To ±	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] To ±	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]

\* Surface Mount Tabs Recommended - See Page 18

# High Voltage Multi-Layer Chip Capacitors

High Rel. Space Level NPO & X7R – 500 Vdc to 10 kVdc

## Electrical Characteristics

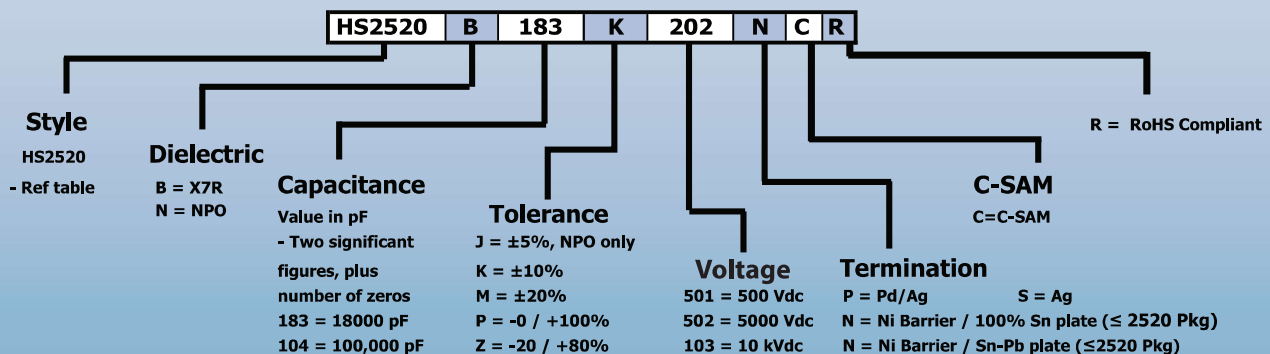
NPO Capacitance Range													
HS Style	1515	2020	2520	3530	4540	5550	6560	4040	7030	9040	11050	13060	
Min Cap	120	220	270	270	180	270	470	100	120	180	330	560	
WVDC	500	392	682	822	183	473	683	823	223	104	124	184	224
	1000	122	272	472	153	253	393	473	682	473	563	823	124
	2000	561	681	821	252	562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

NPO 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	225	
	1000	682	223	273	823	154	224	334	473	224	274	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	•	•	•	•	•	•	•	•	272	472	682	822
	10000	•	•	•	•	•	•	•	•	•	•	332	562

## Notes

- Product receives 100% Group A Inspection in accordance with MIL-PRF-49467, including Partial Discharge (Corona).
- Special testing including 100% Ultrasound (C-SAM) is available upon request.
- Custom voltages, package sizes and capacitance values available. Contact factory.
- X7R dielectrics are not intended for AC line filtering applications.
- Space level products are capable of meeting a minimum of 4000 hours life at full rated conditions with no degradation in insulation resistance.
- Large ceramic capacitors are susceptible to damage when exposed to thermal and / or mechanical shock. Refer to Technical Bulletin AN101/AN112 for handling and installation recommendations or consider selecting radial leaded or surface mount alternatives as detailed in CRT-0009 and CRT-0022.
- High voltage products may require conformal coating to prevent possible arc over.

## Part Number / Ordering Information



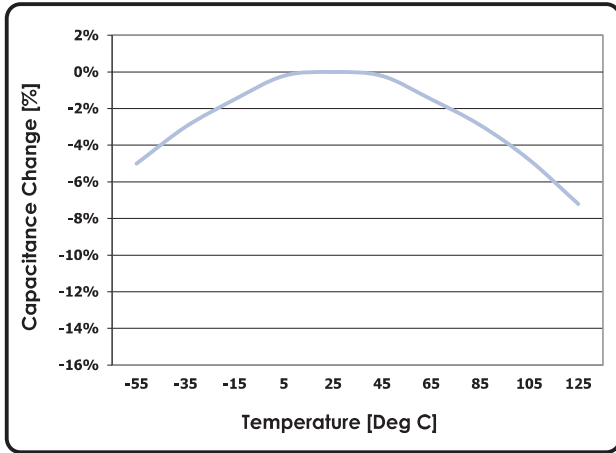
Note: Ultrasonic (C-SAM) is not included unless designated in part number.

# High Voltage Multi-Layer Chip Capacitors

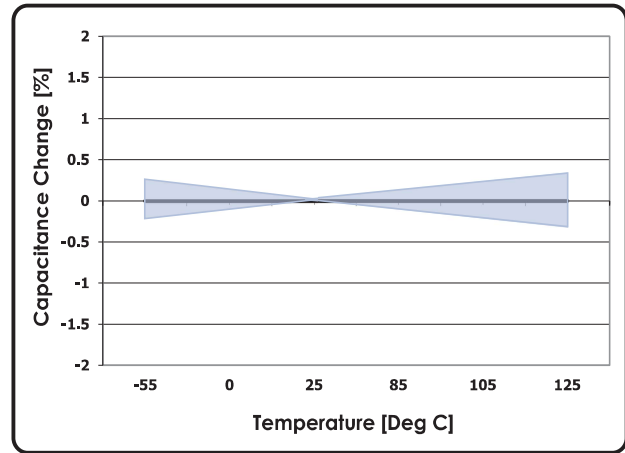
High Rel. Space Level NPO & X7R – 500 Vdc to 10 kVdc



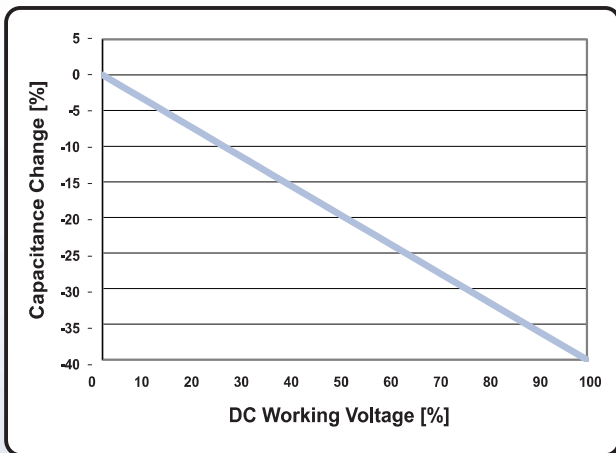
## Performance Charts (Typical)



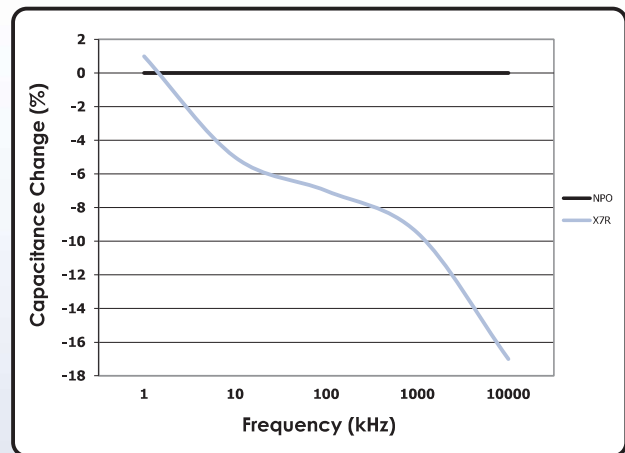
**X7R Temperature Coefficient**



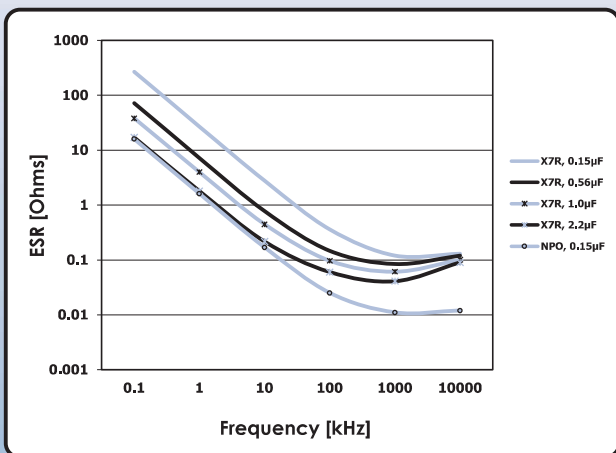
**NPO Temperature Coefficient**



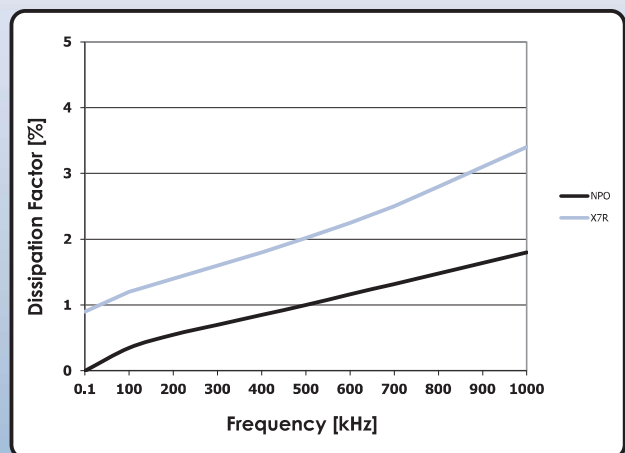
**Voltage Coefficient [BR]**



**Capacitance Vs Frequency**



**ESR Vs Frequency**



**DF Vs Frequency**

B