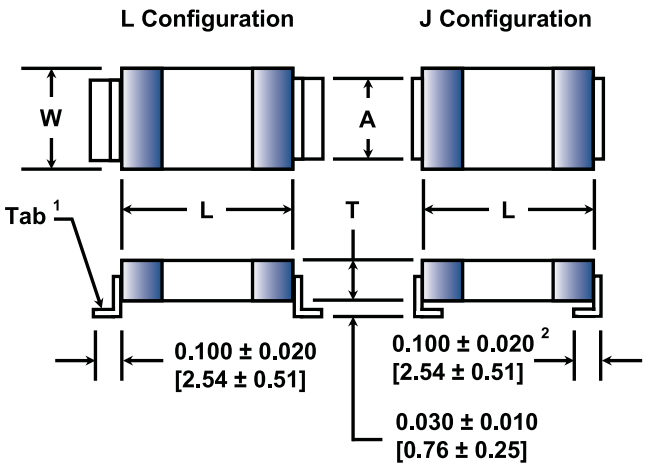
# High Voltage Surface Mount Capacitors

## 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.

## 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 -25% to -33% 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 | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | S M01 | S M02 | S M03 | S M10 | S M04 | S M11 | S M05 | S M06 | S M07 | 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] | 0.300 ± 0.030 [7.62 ± 0.76] | 0.350 ± 0.030 [8.89 ± 0.76] | 0.400 ± 0.030 [10.20 ± 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] | 0.700 ± 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] | 0.150 ± 0.015 [3.81 ± 0.38] | 0.300 ± 0.030 [7.62 ± 0.76] | 0.200 ± 0.020 [5.08 ± 0.51] | 0.400 ± 0.030 [10.16 ± 0.76] | 0.500 ± 0.030 [12.70 ± 0.76] | 0.600 ± 0.030 [10.20 ± 0.76] | 0.300 ± 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] | 0.140 [3.55] | 0.220 [5.59] | 0.130 [3.30] | 0.220 [5.59] | 0.220 [5.59] | 0.220 [5.59] | .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] | 0.100 [2.54] | 0.200 5.08] | 0.100 [2.54] | 0.300 [7.62] | 0.400 [10.2] | 0.500 [12.7] | 0.200 5.08] | 0.300 [7.62] | 0.400 [10.2] | 0.500 [12.7] |

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### 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 |

B

### 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

| HS | SM06 | B | 103 | K | 502 | S | L |
|---|---|---|---|---|---|---|---|

**High Reliability**
Space Level

**Style**
SM06
- Ref table

**Dielectric**
B = BR / X7R
N = NPO

**Capacitance**
Value in pF
- Two significant figures, plus number of zeros
103 = 10000 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

**Ultrasound**
C = C-SAM
S = SLAM

**Configurations**
L = Ref drawing
J = Ref drawing

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

# High Voltage Surface Mount Capacitors

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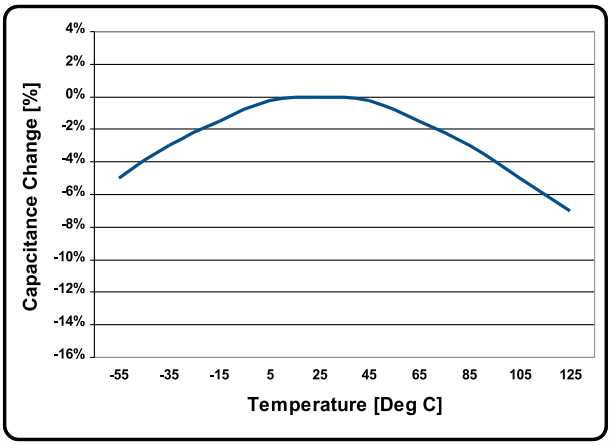
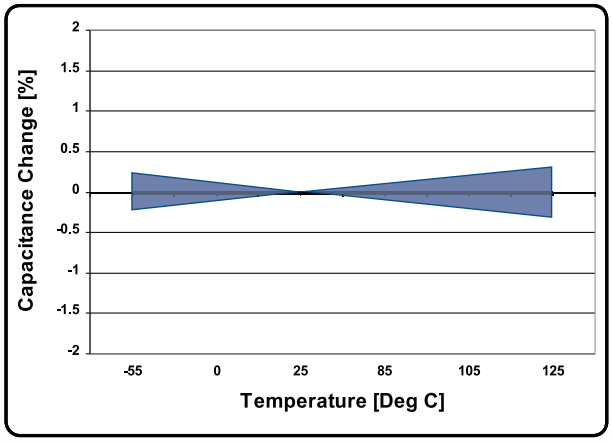
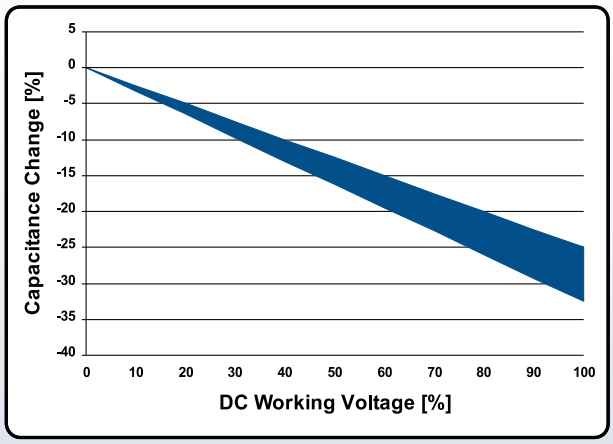
### Performance Charts (Typical)



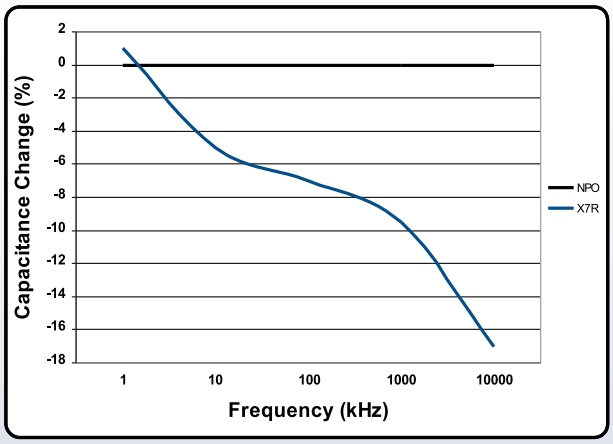

X7R Temperature Coefficient



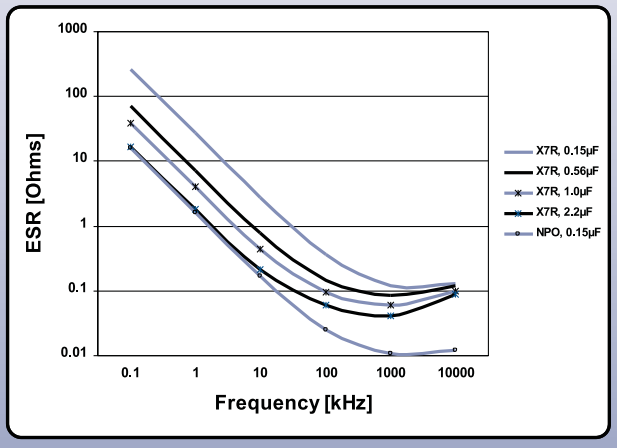

NPO Temperature Coefficient



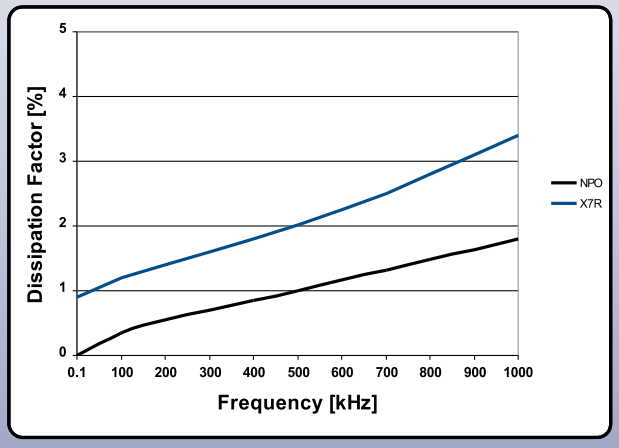

Voltage Coefficient [BR}




Capacitance Vs Frequency




ESR Vs Frequency




DF Vs Frequency