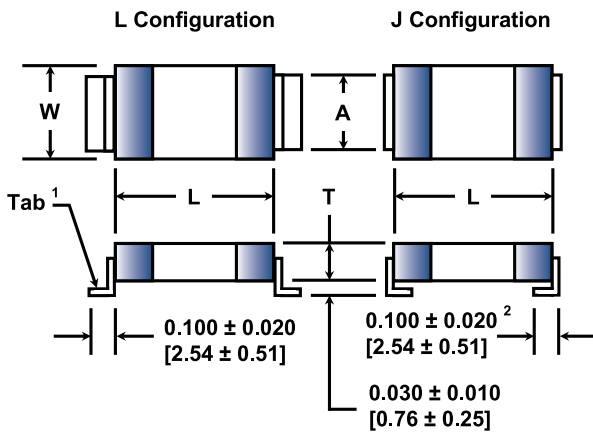


# High Voltage Surface Mount Capacitors

## Military & Commercial Grade – 500 Vdc to 10 KVdc



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 | $9 \times 10^{-6} / ^\circ\text{C}$                       | $11 \times 10^{-6} / ^\circ\text{C}$ |
| 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 -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                  |                                |                                |                                |                                |                                 |                                 |                                 |                                 |                                 |                                 |                                 |                                 |
|------------------------|--------------------------------|--------------------------------|--------------------------------|--------------------------------|--------------------------------|---------------------------------|---------------------------------|---------------------------------|---------------------------------|---------------------------------|---------------------------------|---------------------------------|---------------------------------|
|                        | SM01                           | SM02                           | SM03                           | SM10                           | SM04                           | SM11                            | SM05                            | SM06                            | SM07                            | SM13                            | SM14                            | SM15                            | SM16                            |
| Length [L]             | 0.150 ± 0.015<br>[3.81 ± 0.38] | 0.200 ± 0.020<br>[5.08 ± 0.51] | 0.250 ± 0.025<br>[6.35 ± 0.64] | 0.300 ± 0.030<br>[7.62 ± 0.76] | 0.350 ± 0.030<br>[8.89 ± 0.76] | 0.400 ± 0.030<br>[10.20 ± 0.76] | 0.450 ± 0.030<br>[11.43 ± 0.76] | 0.550 ± 0.030<br>[14.00 ± 0.76] | 0.650 ± 0.030<br>[16.50 ± 0.76] | 0.700 ± 0.030<br>[17.80 ± 0.76] | 0.900 ± 0.030<br>[22.90 ± 0.76] | 1.150 ± 0.030<br>[29.20 ± 0.76] | 1.300 ± 0.030<br>[33.02 ± 0.76] |
| Width [W]              | 0.150 ± 0.015<br>[3.81 ± 0.38] | 0.200 ± .020<br>[5.08 ± 0.51]  | 0.200 ± 0.020<br>[5.08 ± 0.51] | 0.150 ± 0.015<br>[3.81 ± 0.38] | 0.300 ± 0.030<br>[7.62 ± 0.76] | 0.200 ± 0.020<br>[5.08 ± 0.51]  | 0.400 ± 0.030<br>[10.16 ± 0.76] | 0.500 ± 0.030<br>[12.70 ± 0.76] | 0.600 ± 0.030<br>[15.20 ± 0.76] | 0.300 ± 0.030<br>[7.62 ± 0.76]  | 0.400 ± 0.030<br>[10.16 ± 0.76] | 0.500 ± 0.030<br>[12.70 ± 0.76] | 0.600 ± 0.030<br>[15.20 ± 0.76] |
| Thickness [T]<br>[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

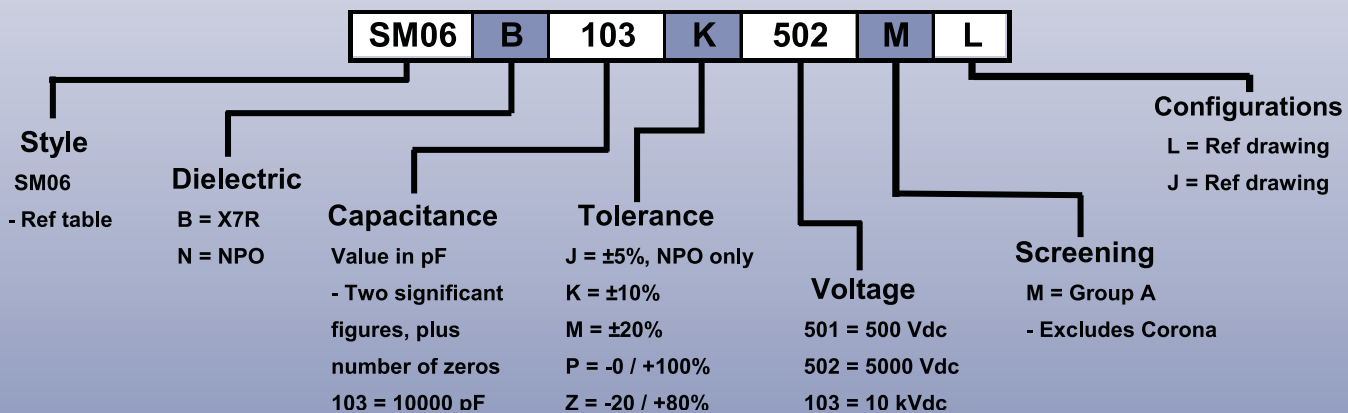
| NPO Capacitance Range |       |       |       |       |       |       |       |       |       |       |       |       |       |     |
|-----------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-----|
| Style                 | S M01 | 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  | 223   | 683   | 823   | 274   | 474   | 684   | 105   | 563   | 154   | 684   | 105   | 155   | 225 |
|                       | 2000  | 392   | 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   | 682   | 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.

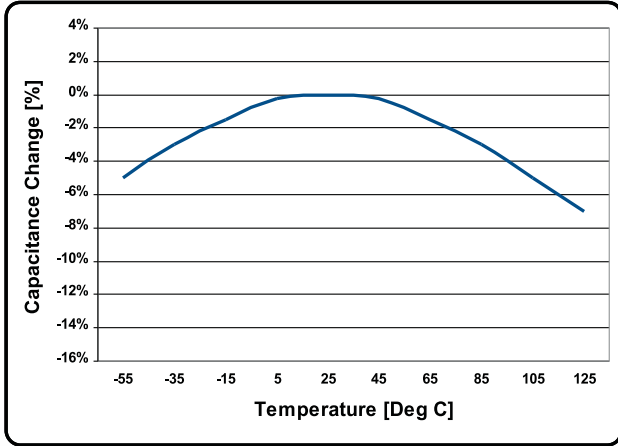
### Part Number / Ordering Information



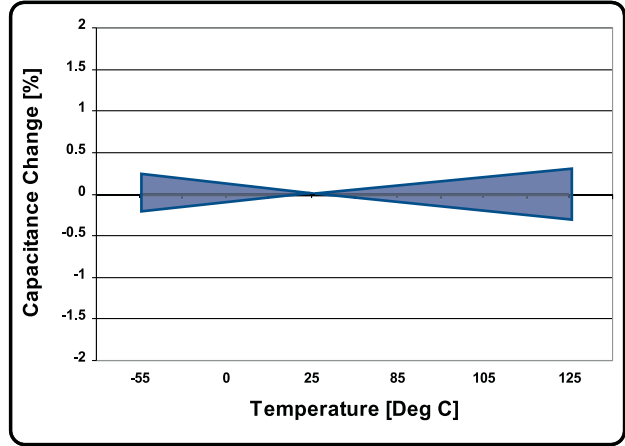
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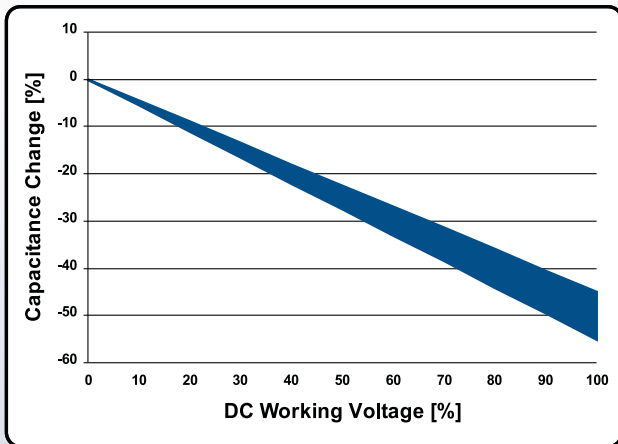
## Performance Charts (Typical)



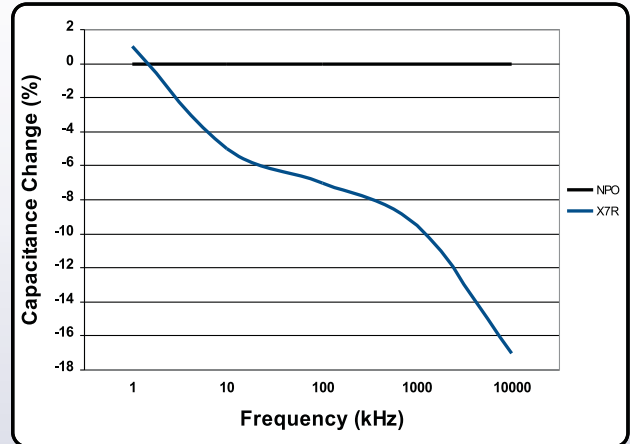
X7R Temperature Coefficient



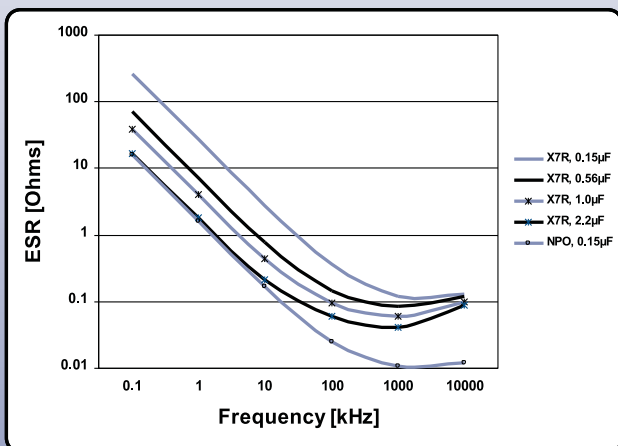
NPO Temperature Coefficient



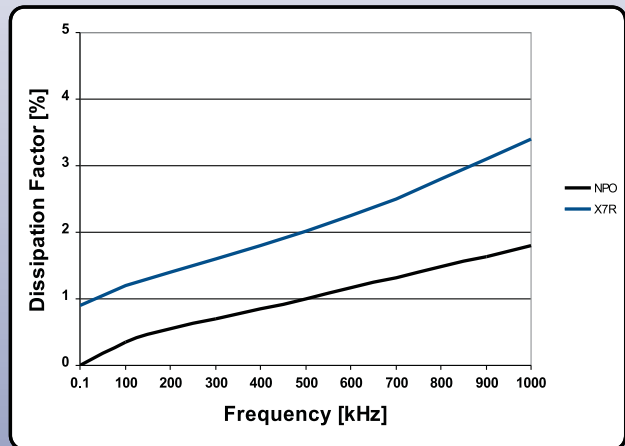
Voltage Coefficient [BR]



Capacitance Vs Frequency



ESR Vs Frequency



DF Vs Frequency