

# Type CS (Capstick®) Metallized Polymer Network

## Radial Multi-pin Metallized Polymer Network for DC to DC Converters



The Type CS multi-pin metallized polymer network is ideal for the low ESR/ESL requirements in DC to DC converters and switching power supply applications. This unique, robust, capacitor design offers high ripple current capability and high capacitance in a small package. It is available with straight pins on 0.10" centers for through-hole mounting or with gull wing leads for surface mount assembly. Type CS (Capstick®) is encapsulated in a rugged conformal coating and is packaged in anti-static tubes for easy handling.

### Highlights

- ♦ Rugged conformal coated case meets UL94V-0
- ♦ Low ESR/ESL
- ♦ High ripple current
- ♦ High capacitance in a small package
- ♦ Non-inductive design
- ♦ Non-polar
- ♦ Surface mount or through hole assembly
- ♦ Multi-pin leads on 0.10" centers

### Specifications

RoHS Compliant

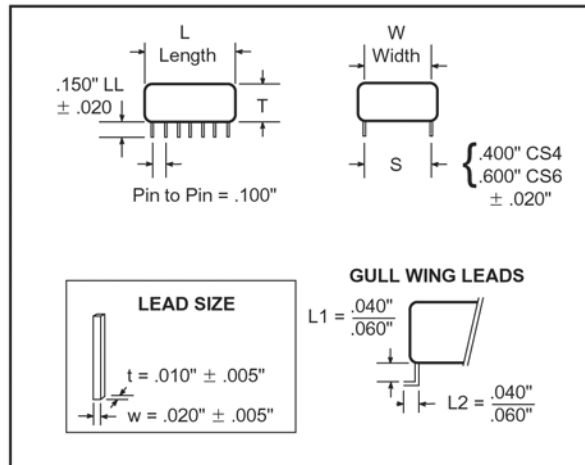
|                                                             |                                                                                                                    |
|-------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------|
| <b>Capacitance Range:</b>                                   | <b>0.33 <math>\mu</math>F to 20.0 <math>\mu</math>F</b>                                                            |
| <b>Voltage Range:</b>                                       | <b>50 Vdc, 100 Vdc, 250 Vdc, 400 Vdc, 500 Vdc</b>                                                                  |
| <b>Capacitance Tolerance:</b>                               | <b><math>\pm 10\%</math></b>                                                                                       |
| <b>Operating Temperature Range for 50, 100 and 250 Vdc:</b> | <b>-55 °C to +125 °C (with 50% Vdc derating &gt;85 °C)</b>                                                         |
| <b>Operating Temperature Range for 400 and 500 Vdc:</b>     | <b>-55 °C to +125 °C with no derating</b>                                                                          |
| <b>Construction:</b>                                        | <b>Multilayer metallized polymer dielectric</b>                                                                    |
| <b>Temperature Coefficient:</b>                             | <b>+6% from -55 °C to +85 °C</b>                                                                                   |
| <b>Dielectric Withstand Voltage:</b>                        | <b>1.3 x rated voltage: 50/100/250/500 Vdc<br/>1.6 x rated voltage: 400 Vdc</b>                                    |
| <b>Dissipation Factor (DF):</b>                             | <b><math>\leq 1.0\%</math> @ 1 kHz</b>                                                                             |
| <b>Total Self Inductance (L):</b>                           | <b>&lt;6 nH typical (CS6)<br/>&lt; 4 nH typical (CS4)</b>                                                          |
| <b>Lead Material:</b>                                       | <b>Tinned copper alloy frame</b>                                                                                   |
| <b>Insulation Resistance:</b>                               | <b><math>\geq 1000 \text{ M}\Omega \cdot \mu\text{F}</math> - need not exceed 1000 <math>\text{M}\Omega</math></b> |

### Part Numbering System

|                    |                |               |        |                    |                       |   |                  |
|--------------------|----------------|---------------|--------|--------------------|-----------------------|---|------------------|
| 405                | K              | 100           | CS     | 4                  | G                     | - | FA               |
| Cap                |                |               |        | Pin                | "Optional"            |   |                  |
| ( $\mu$ F)         | Tolerance      | Voltage       | Series | Spacing            | (*)                   |   |                  |
| 334 = 0.33 $\mu$ F | K = $\pm 10\%$ | 050 = 50 Vdc  | CS     | 4 = 0.4" (10.0 mm) | Blank = Straight Pins |   | Blank = 5/6 RoHS |
| 405 = 4.0 $\mu$ F  |                | 100 = 100 Vdc |        | 6 = 0.6" (15.0 mm) | G = Gull Wing         |   | FA = 6/6 RoHS    |
| 206 = 20.0 $\mu$ F |                | 400 = 400 Vdc |        |                    |                       |   |                  |

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## Capacitor Outline Drawing



## Test Method and Performance

| Accelerated Dry Life            |                                                                                                                                  |
|---------------------------------|----------------------------------------------------------------------------------------------------------------------------------|
| <b>Test Conditions</b>          | Temperature: +85 °C ±5 °C<br>Applied Voltage: 1.25 x rated voltage<br>Test Duration: 1000 hours performance                      |
| <b>Requirements</b>             | Capacitance : Change of ≤5.0%<br>Dissipation Factor: ≤1.0% @ 1 kHz<br>Insulation Resistance: ≥1K MΩ • μF, need not exceed 1 K MΩ |
| Humidity                        |                                                                                                                                  |
| <b>Test Conditions</b>          | Temperature: +85 °C ±2.0 °C<br>Applied Voltage: Zero voltage<br>Humidity: 85% ±2% RH<br>Test Duration: 21 days                   |
| <b>Performance Requirements</b> | Capacitance Change of ≤7.0%<br>Dissipation Factor ≤1.0% @ 1 kHz<br>Insulation Resistance ≥ 30% of limit value                    |
| Soldering                       |                                                                                                                                  |
| <b>Test Conditions</b>          | Thru Hole Soldering Temperature: 260 °C, 5 sec.<br>SMD Reflow Soldering Temperature: 220 °C, 30 sec.                             |
| <b>Performance Requirements</b> | Capacitance: Change of ≤ 2%                                                                                                      |
| <b>Capacitance Drift:</b>       | ≤2.0% over 2 years between 0 °C and 35 °C and a RH of between 35% and 65%                                                        |
| <b>Vibration</b>                | Conforms to MIL-STD-202 Method 204D                                                                                              |

Note: The 400 Vdc rating can handle a 450 Vdc surge and is built to a 640 Vdc high potential.

## Ratings

## RoHS Compliant

| Catalog Part Number | Cap (μF) | DC Voltage | ESR Ω @ 500 kHz | RMS Current @ 500 kHz | W Max. Inches (mm) | T Max. Inches (mm) | L Max. Inches (mm) | Nom. L.S. Inches (mm) | Leads Per Side | Tube Quantity |
|---------------------|----------|------------|-----------------|-----------------------|--------------------|--------------------|--------------------|-----------------------|----------------|---------------|
| <b>50 Vdc</b>       |          |            |                 |                       |                    |                    |                    |                       |                |               |
| 106K050CS4*         | 10.00    | 50         | 0.0030          | 15.3                  | 0.5 (12.7)         | 0.32 (8.1)         | 0.620 (15.7)       | 0.4 (10)              | 5              | 32            |
| 206K050CS4*         | 20.00    | 50         | 0.0025          | 17.8                  | 0.5 (12.7)         | 0.32 (8.1)         | 1.150 (29.2)       | 0.4 (10)              | 9              | 16            |
| <b>100 Vdc</b>      |          |            |                 |                       |                    |                    |                    |                       |                |               |
| 205K100CS4*         | 2.00     | 100        | 0.009           | 8.3                   | 0.5 (12.7)         | 0.25 (6.4)         | 0.450 (11.4)       | 0.4 (10)              | 3              | 44            |
| 405K100CS4*         | 4.00     | 100        | 0.007           | 11.5                  | 0.5 (12.7)         | 0.25 (6.4)         | 0.450 (11.4)       | 0.4 (10)              | 3              | 44            |
| 475K100CS4*         | 4.70     | 100        | 0.006           | 12.2                  | 0.5 (12.7)         | 0.25 (6.4)         | 0.525 (13.3)       | 0.4 (10)              | 3              | 38            |
| 685K100CS4*         | 6.80     | 100        | 0.005           | 13.7                  | 0.5 (12.7)         | 0.25 (6.4)         | 0.700 (17.8)       | 0.4 (10)              | 5              | 35            |
| 106K100CS4*         | 10.00    | 100        | 0.003           | 15.3                  | 0.5 (12.7)         | 0.25 (6.4)         | 0.995 (25.3)       | 0.4 (10)              | 7              | 20            |
| <b>250 Vdc</b>      |          |            |                 |                       |                    |                    |                    |                       |                |               |
| 105K250CS6*         | 1.00     | 250        | 0.012           | 5.2                   | 0.7 (17.8)         | 0.30 (7.6)         | 0.440 (11.2)       | 0.6 (15)              | 3              | 44            |
| <b>400 Vdc</b>      |          |            |                 |                       |                    |                    |                    |                       |                |               |
| 334K400CS6*         | 0.33     | 400        | 0.012           | 6.0                   | 0.7 (17.8)         | 0.32 (8.1)         | 0.435 (11.0)       | 0.6 (15)              | 3              | 44            |
| 474K400CS6*         | 0.47     | 400        | 0.011           | 6.2                   | 0.7 (17.8)         | 0.32 (8.1)         | 0.460 (11.7)       | 0.6 (15)              | 3              | 42            |
| 105K400CS6*         | 1.00     | 400        | 0.008           | 9.5                   | 0.7 (17.8)         | 0.32 (8.1)         | 0.880 (22.4)       | 0.6 (15)              | 7              | 22            |
| <b>500 Vdc</b>      |          |            |                 |                       |                    |                    |                    |                       |                |               |
| 474K500CS6*         | 0.47     | 500        | 0.011           | 6.2                   | 0.7 (17.8)         | 0.32 (8.1)         | 0.625 (15.9)       | 0.6 (15)              | 4              | 32            |
| 105K500CS6*         | 1.00     | 500        | 0.008           | 9.5                   | 0.7 (17.8)         | 0.32 (8.1)         | 1.135 (28.8)       | 0.6 (15)              | 8              | 16            |

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