

- Features:
- 0402 to 2512 & 1225 sizes available
 - Power ratings to 3W
 - Low inductance – less than 0.2nH typically
 - RoHS compliant
 - Non-standard resistance values available
 - 2010 and 2512 sizes available with narrow terminations (CSRN)

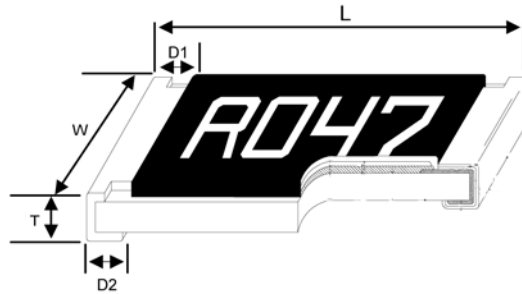


| Electrical Specifications | | | | | | |
|---------------------------|--------------|-----------------------------|---------------------------------|------------------------------------|-------------------------------|----------------------------|
| Type / Code | Old Pkg Code | Power Rating (Watts) @ 70°C | Dielectric Withstanding Voltage | Resistance Temperature Coefficient | Ohmic Range (Ω) and Tolerance | |
| | | | | | 1% | 2%, 5% |
| CSR0402 | 1/8S | 0.125W | 200V | ±200 ppm/°C | 0.051 - 1 | 0.051 - 1 |
| CSR0603 | 1/8 | 0.125W | 200V | ±300 ppm/°C | 0.02 - 1 | 0.02 - 1 |
| CSR0805 | 1/4 | 0.25W | 200V | ±200 ppm/°C | 0.02 - 1 | 0.02 - 1 |
| CSR1206 | 1/2 | 0.5W | 200V | ±100 ppm/°C (1) | 0.01 - 1 | 0.01 - 1 |
| CSR1210 | - | 0.5W | 200V | ±600 ppm/°C | 0.01 - 0.02 | 0.01 - 0.02 |
| | | | | ±400 ppm/°C | 0.021 - 0.05 | 0.021 - 0.05 |
| | | | | ±300 ppm/°C | 0.051 - 0.099 | 0.051 - 0.099 |
| | | | | ±200 ppm/°C | 0.1 - 1 | 0.1 - 1 |
| CSRN0815 | 1S | 1W | 200V | ±300 ppm/°C ±150 ppm/°C | 0.01 - 0.019 0.02 - 0.5 | 0.01 - 0.019 0.02 - 0.5 |
| CSR0830 | - | 2W | 200V | ±300 ppm/°C | - | 0.001 - 0.004 |
| | | | | ±200 ppm/°C | 0.005 - 0.01 | 0.005 - 0.01 |
| | | | | ±150 ppm/°C | 0.011 - 0.35 | 0.011 - 0.35 |
| CSR2010 | 1 | 1W | 200V | ±100 ppm/°C (1) | 0.01 - 1 | 0.01 - 1 |
| CSRN2010 | 1 | 1W | 200V | ±250 ppm/°C | 0.01 - 1 | 0.01 - 1 |
| CSR2512 | 2 | 2W | 200V | ±200 ppm/°C | 0.01 - 1 | 0.01 - 1 |
| CSRN2512 | 2 | 2W | 200V | ±200 ppm/°C | 0.01 - 1 | 0.01 - 1 |
| CSR1225 | 3 | 3W | 200V | ±200 ppm/°C | 0.003 - 0.02 | 0.003 - 0.02 |
| | | | | ±100 ppm/°C | 0.021 - 10 | 0.021 - 10 |

(1) Contact Factory for TCR below 50mOhm

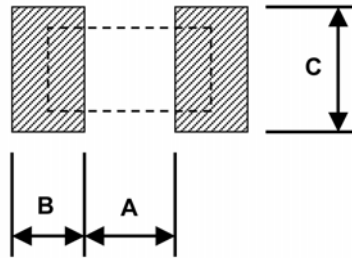
Please refer to the High Power Resistor Application Note (page 5) for more information on designing and implementing high power resistor types.

| Performance Characteristics | | |
|------------------------------|----------------------|--------------|
| Test | Test Specification | Typical |
| Moisture Resistance | ± 0.5% | ≤ 0.5% |
| Load Life | ± 0.5% | ≤ 0.5% |
| Leach Resistance | 90 seconds minimum | > 90 seconds |
| Resistance to Soldering Heat | ± 0.5% | ≤ 0.25% |
| Solderability | minimum 95% coverage | ≥ 95% |
| Temperature Cycling | ± 0.5% | ≤ 0.5% |
| Thermal Shock | ± 0.5% | ≤ 0.5% |
| Short Time Overload | ± 0.5% | ≤ 0.5% |
| Insulation Resistance | 1MΩ minimum | ≥ 1MΩ |



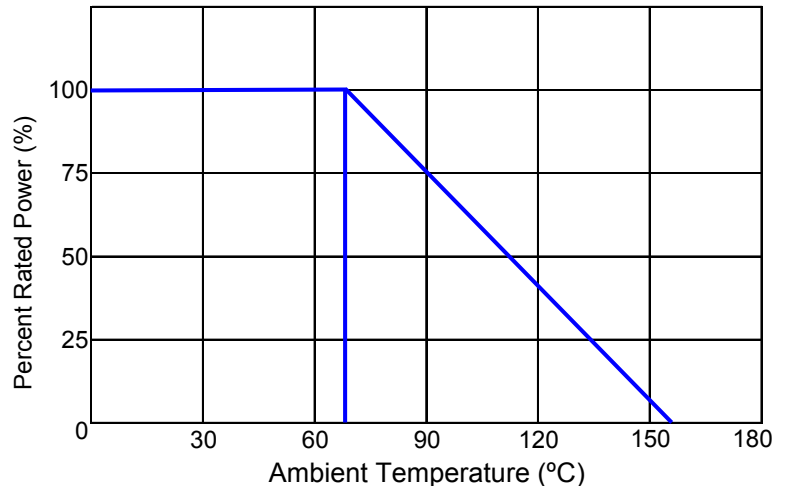
Mechanical Specifications

| Type / Code | L Body Length | W Body Width | H Body Height | a Top Termination | b Bottom Termination | Unit |
|-------------|------------------------------|------------------------------|-----------------------------|------------------------------|------------------------------|--------------|
| CSR0402 | 0.039 ± 0.002 1 ± 0.05 | 0.020 ± 0.002 0.5 ± 0.05 | 0.013 ± 0.004 0.32 ± 0.1 | 0.010 ± 0.004 0.25 ± 0.1 | 0.008 ± 0.004 0.2 ± 0.1 | inches mm |
| CSR0603 | 0.063 ± 0.004 1.6 ± 0.1 | 0.032 ± 0.004 0.8 ± 0.1 | 0.018 ± 0.004 0.45 ± 0.1 | 0.012 ± 0.008 0.3 ± 0.2 | 0.012 ± 0.008 0.3 ± 0.2 | inches mm |
| CSR0805 | 0.079 ± 0.006 2 ± 0.15 | 0.049 ± 0.006 1.25 ± 0.15 | 0.022 ± 0.004 0.55 ± 0.1 | 0.012 ± 0.008 0.3 ± 0.2 | 0.016 ± 0.010 0.4 ± 0.25 | inches mm |
| CSR1206 | 0.120 ± 0.006 3.05 ± 0.15 | 0.061 ± 0.006 1.55 ± 0.15 | 0.022 ± 0.004 0.55 ± 0.1 | 0.020 ± 0.012 0.5 ± 0.3 | 0.016 ± 0.010 0.4 ± 0.25 | inches mm |
| CSR1210 | 0.122 ± 0.004 3.1 ± 0.1 | 0.102 ± 0.006 2.6 ± 0.15 | 0.022 ± 0.004 0.55 ± 0.1 | 0.020 ± 0.012 0.5 ± 0.3 | 0.016 ± 0.010 0.5 ± 0.25 | inches mm |
| CSRN0815 | 0.079 ± 0.008 2 ± 0.2 | 0.148 ± 0.008 3.75 ± 0.2 | 0.024 ± 0.004 0.6 ± 0.1 | 0.016 ± 0.008 0.4 ± 0.2 | 0.016 ± 0.008 0.4 ± 0.2 | inches mm |
| CSR0830 | 0.079 ± 0.008 2 ± 0.2 | 0.295 ± 0.012 7.5 ± 0.3 | 0.024 ± 0.004 0.6 ± 0.1 | 0.016 ± 0.008 0.4 ± 0.2 | 0.016 ± 0.008 0.4 ± 0.2 | inches mm |
| CSR2010 | 0.197 ± 0.008 5 ± 0.2 | 0.100 ± 0.008 2.54 ± 0.2 | 0.020 ± 0.006 0.5 ± 0.15 | 0.068 ± 0.006 1.72 ± 0.15 | 0.067 ± 0.006 1.7 ± 0.15 | inches mm |
| CSRN2010 | 0.197 ± 0.008 5 ± 0.2 | 0.097 ± 0.006 2.45 ± 0.15 | 0.024 ± 0.006 0.6 ± 0.15 | 0.024 ± 0.012 0.6 ± 0.3 | 0.020 ± 0.010 0.5 ± 0.25 | inches mm |
| CSR2512 | 0.252 ± 0.008 6.4 ± 0.2 | 0.126 ± 0.008 3.2 ± 0.2 | 0.020 ± 0.006 0.5 ± 0.15 | 0.075 ± 0.006 1.9 ± 0.15 | 0.075 ± 0.006 1.9 ± 0.15 | inches mm |
| CSRN2512 | 0.250 ± 0.008 6.35 ± 0.2 | 0.124 ± 0.006 3.15 ± 0.15 | 0.024 ± 0.004 0.6 ± 0.1 | 0.024 ± 0.012 0.6 ± 0.3 | 0.022 ± 0.010 0.55 ± 0.25 | inches mm |
| CSR1225 | 0.122 ± 0.006 3.1 ± 0.15 | 0.248 ± 0.006 6.3 ± 0.15 | 0.035 ± 0.006 0.9 ± 0.15 | 0.024 ± 0.012 0.6 ± 0.3 | 0.022 ± 0.010 0.55 ± 0.25 | inches mm |

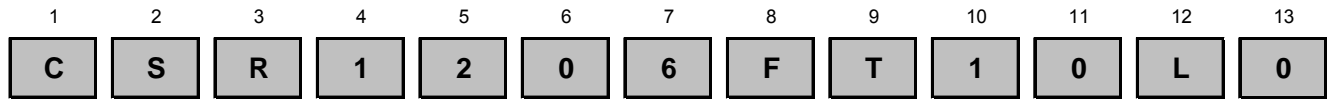


| Solder Pad Dimensions | | | | |
|-----------------------|-------|-------|---------------|--------|
| Type / Code | A | B | C | Unit |
| CSR0402 | 0.02 | 0.02 | 0.024 ± 0.008 | inches |
| | 0.5 | 0.5 | 0.6 ± 0.2 | mm |
| CSR0603 | 0.031 | 0.039 | 0.035 ± 0.008 | inches |
| | 0.8 | 1.0 | 0.9 ± 0.2 | mm |
| CSR0805 | 0.039 | 0.039 | 0.053 ± 0.008 | inches |
| | 1.0 | 1.0 | 1.35 ± 0.2 | mm |
| CSR1206 | 0.079 | 0.045 | 0.067 ± 0.008 | inches |
| | 2.0 | 1.15 | 1.7 ± 0.2 | mm |
| CSR1210 | 0.079 | 0.045 | 0.098 ± 0.008 | inches |
| | 2.0 | 1.15 | 2.5 ± 0.2 | mm |
| CSRN0815 | 0.039 | 0.071 | 0.154 ± 0.008 | inches |
| | 1.0 | 1.8 | 3.9 ± 0.2 | mm |
| CSR0830 | 0.039 | 0.071 | 0.299 ± 0.008 | inches |
| | 1.0 | 1.8 | 7.6 ± 0.2 | mm |
| CSR2010 | 0.142 | 0.055 | 0.098 ± 0.008 | inches |
| | 3.6 | 1.4 | 2.5 ± 0.2 | mm |
| CSRN2010 | 0.142 | 0.055 | 0.098 ± 0.008 | inches |
| | 3.6 | 1.4 | 2.5 ± 0.2 | mm |
| CSR2512 | 0.193 | 0.063 | 0.122 ± 0.008 | inches |
| | 4.9 | 1.6 | 3.1 ± 0.2 | mm |
| CSRN2512 | 0.193 | 0.063 | 0.122 ± 0.008 | inches |
| | 4.9 | 1.6 | 3.1 ± 0.2 | mm |
| CSR1225 | 0.079 | 0.079 | 0.252 ± 0.008 | inches |
| | 2.0 | 2.0 | 6.4 ± 0.2 | mm |

Power Derating Curve:



How to Order



| Product Series | | Size | Power | Tolerance | | Packaging | | | | Resistance Value |
|----------------|---------------------|------|--------|-----------|-----|-----------|--------------|------------------------|----------|---|
| Code | Description | | | Code | Tol | Code | Description | Size | Quantity | |
| CSR | Standard | 0402 | 0.125W | F | 1% | T | 7" Reel | 0402 | 10,000 | Four characters with the multiplier used as the decimal holder. "L" used as multiplier of 10 ⁻³ for any value under 0.1 ohm |
| CSRN | Narrow Terminations | 0603 | 0.125W | G | 2% | T | Paper Tape | 0603, 0805, 1206, 1210 | 5,000 | |
| | | 0805 | 0.25W | J | 5% | T | 7" Reel | 2010, 2512 | 4,000 | 0.051 ohm = 51L0 0.35 ohm = R350 1 ohm = 1R00 |
| | | 1206 | 0.5W | | | T | Plastic Tape | 0815, 0830, 1225 | 2,000 | |
| | | 1210 | 0.5W | | | K | 7" Reel | 0402 | 1,000 | |
| | | 0815 | 1W | | | K | Paper Tape | 0603, 0805, 1206, 1210 | | |
| | | 0830 | 2W | | | K | 7" Reel | 2010, 2512 | | |
| | | 2010 | 1W | | | K | Plastic Tape | 0815, 0830, 1225 | | |
| | | 2512 | 2W | | | | | | | |
| | | 1225 | 3W | | | | | | | |

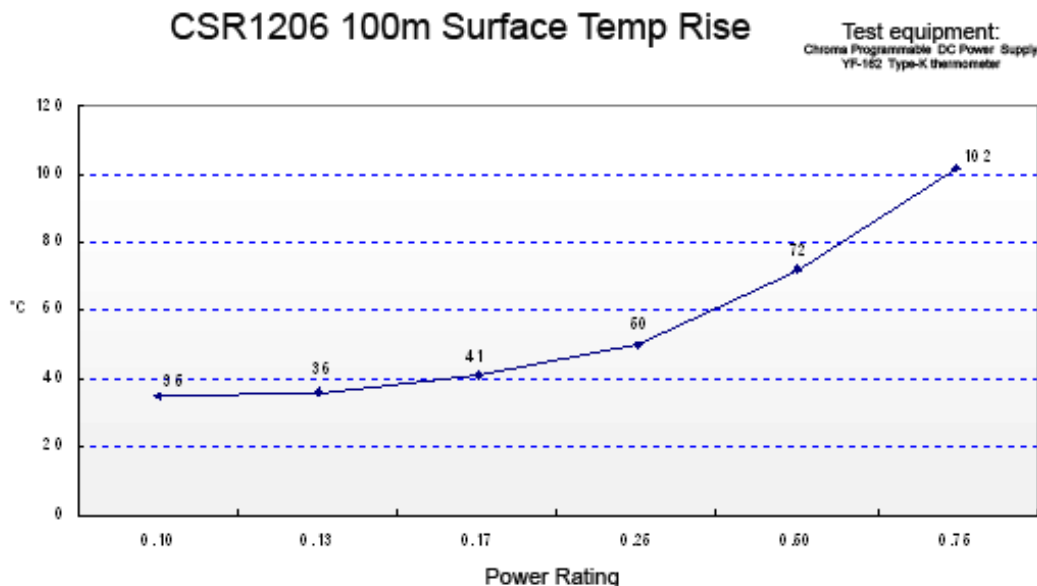
Legacy Part Number (before January 3, 2011):

| SEI Type | | Code | | | Nominal Resistance | Tolerance | Packaging | | | |
|----------|---------------------|------|---------|------|--------------------|-----------|------------------|---------|--------------|------|
| CSR | | 1/2 | | | 0.01 | 1% | R | | | |
| Type | Description | Code | Wattage | Size | | Tolerance | SEI Types | Pkg Qty | Description | Code |
| CSR | Standard | 1/8S | 0.125W | 0402 | | 1% | 0402 | 10,000 | 7" reel | R |
| CSRN | Narrow Terminations | 1/8 | 0.125W | 0603 | | 2% | 0603, 0805, 1206 | 5,000 | paper tape | |
| | | 1/4 | 0.25W | 0805 | | 5% | 2010, 2512 | 4,000 | 7" reel | |
| | | 1/2 | 0.5W | 1206 | | | 0815, 1225 | 2,000 | plastic tape | I |
| | | 1S | 1W | 0815 | | | 0402 | 1,000 | 7" reel | |
| | | 1 | 1W | 2010 | | | 0603, 0805, 1206 | | paper tape | |
| | | 2 | 2W | 2512 | | | 2010, 2512 | | 7" reel | |
| | | 3 | 3W | 1225 | | | 0815, 1225 | | plastic tape | |

High Power Chip Resistors and Thermal Management

Stackpole has developed several surface mount resistor series in addition to our current sense resistors, which have had higher power ratings than standard resistor chips. This has caused some uncertainty and even confusion by users as to how to reliably use these resistors at the higher power ratings in their designs.

The data sheets for the RHC, RMCP, RNCP, CSR, CSRN, CSRF, CSS, and CSSH state that the rated power assumes an ambient temperature of no more than 100 degrees C for the CSS / CSSH series and 70 degrees C for all other high power resistor series. In addition, IPC and UL best practices dictate that the combined temperature on any resistor due to power dissipated and ambient air shall be no more than 105C. At first glance this wouldn't seem too difficult, however the graph below shows typical heat rise for the CSR ½ 100 milliohm at full rated power. The heat rise for the RMCP and RNCP would be similar. The RHC with its unique materials, design, and processes would have less heat rise and therefore would be easier to implement for any given customer.



The 102 degrees C heat rise shown here would indicate there will be additional thermal reduction techniques needed to keep this part under 105C total hot spot temperature if this part is to be used at 0.75 watts of power. However, this same part at the usual power rating for this size would have a heat rise of around 72 degrees C. This additional heat rise may be dealt with using wider conductor traces, larger solder pads and land patterns under the solder mask, heavier copper in the conductors, vias through PCB, air movement, and heat sinks, among many other techniques. Because of the variety of methods customers can use to lower the effective heat rise of the circuit, resistor manufacturers simply specify power ratings with the limitations on ambient air temperature and total hot spot temperatures and leave the details of how to best accomplish this to the design engineers. Design guidelines for products in various market segments can vary widely so it would be unnecessarily constraining for a resistor manufacturer to recommend the use of any of these methods over another.

Note: The final resistance value can be affected by the board layout and assembly process, especially the size of the mounting pads and the amount of solder used. This is especially notable for resistance values ≤ 50 m Ω . This should be taken into account when designing.