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	Package Type	Power Rating (Watts) @ 70ºC	Dielectric Withstanding Voltage	Resistance Temperature Coefficient	Ohmic Range (Ω) and Tolerance	
					1%	2%, 5%
CSR 1/8S	0402	0.125W	200V	±200 ppm/ºC	0.051 - 1	0.051 - 1
CSR 1/8	0603	0.125W	200V	±300 ppm/ºC	0.02 - 1	0.02 - 1
CSR 1/4	0805	0.25W	200V	±200 ppm/ºC	0.02 - 1	0.02 - 1
CSR 1/2	1206	0.5W	200V	±100 ppm/ºC (1)	0.01 - 1	0.01 - 1
CSRN 1S	0815	1W	200V	±300 ppm/ºC ±150 ppm/ºC	0.01 - 0.019 0.02 - 0.5	0.01 - 0.019 0.02 - 0.5
CSRN 1	2010	1W	200V	±250 ppm/ºC	0.01 - 1	0.01 - 1
CSRN 2	2512	2W	200V	±200 ppm/ºC	0.01 - 1	0.01 - 1
CSR 3	1225	3W	200V	±200 ppm/ºC ±100 ppm/ºC	0.003 - 0.02 0.021 - 10	0.003 - 0.02 0.021 - 10

(1) Contact Factory for TCR below 50mOhm

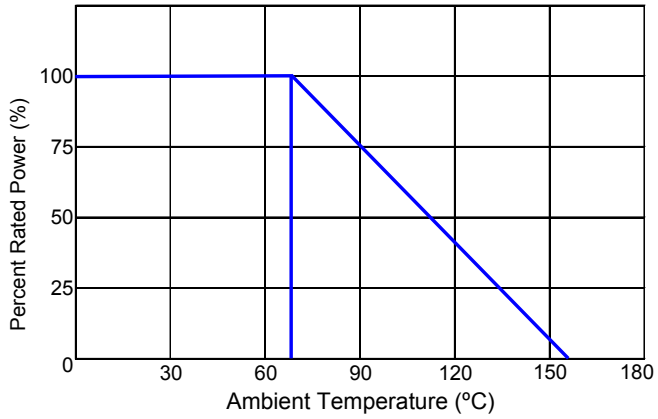
Please refer to the High Power Resistor Application Note (page 4) for more information on designing and implementing high power resistor types.

Performance Characteristics

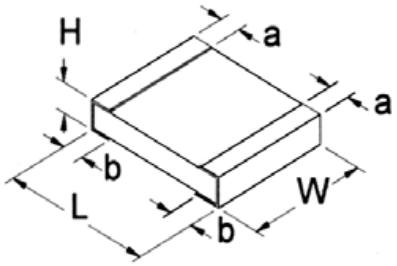
Test	Test Specification	Typical
Moisture Resistance	± 0.5%	≤ 0.5%
Load Life	± 0.5%	≤ 0.5%
Leach Resistance	90 seconds minimum	> 90 seconds
Resistance to Soldering Heat	± 0.5%	≤ 0.25%
Solderability	minimum 95% coverage	≥ 95%
Temperature Cycling	± 0.5%	≤ 0.5%
Thermal Shock	± 0.5%	≤ 0.5%
Short Time Overload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

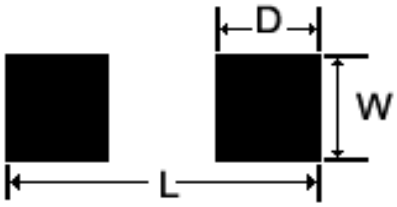
Operating Temperature Range: -55ºC to +155ºC

Power Derating Curve:

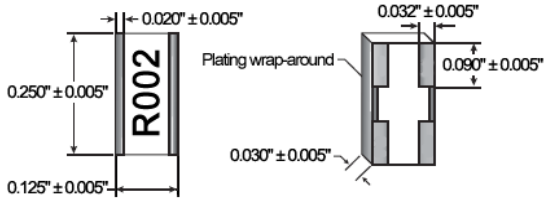


Mechanical Specifications						
Type / Code	L Body Length	W Body Width	H Body Height	a Top Termination	b Bottom Termination	Units
CSR 1/8 S	0.039 ± 0.002 1.000 ± 0.050	0.020 ± 0.002 0.500 ± 0.050	0.013 ± 0.004 0.320 ± 0.100	0.010 ± 0.004 0.250 ± 0.100	0.008 ± 0.004 0.200 ± 0.100	inches mm
CSR 1/8	0.063 ± 0.004 1.600 ± 0.100	0.032 ± 0.004 0.800 ± 0.100	0.018 ± 0.004 0.450 ± 0.100	0.012 ± 0.008 0.300 ± 0.200	0.012 ± 0.008 0.300 ± 0.200	inches mm
CSR 1/4	0.079 ± 0.006 2.000 ± 0.150	0.049 ± 0.006 1.250 ± 0.150	0.022 ± 0.004 0.550 ± 0.100	0.012 ± 0.008 0.300 ± 0.200	0.016 ± 0.010 0.400 ± 0.250	inches mm
CSR 1/2	0.120 ± 0.006 3.050 ± 0.150	0.061 ± 0.006 1.550 ± 0.150	0.022 ± 0.004 0.550 ± 0.100	0.020 ± 0.012 0.500 ± 0.300	0.016 ± 0.010 0.400 ± 0.250	inches mm
CSRN 1S	0.079 ± 0.008 2.000 ± 0.200	0.148 ± 0.008 3.750 ± 0.200	0.024 ± 0.004 0.600 ± 0.100	0.016 ± 0.008 0.400 ± 0.200	0.016 ± 0.008 0.400 ± 0.200	inches mm
CSRN 1	0.197 ± 0.008 5.000 ± 0.200	0.097 ± 0.006 2.450 ± 0.150	0.024 ± 0.006 0.600 ± 0.150	0.024 ± 0.012 0.600 ± 0.300	0.020 ± 0.010 0.508 ± 0.250	inches mm
CSRN 2	0.250 ± 0.008 6.350 ± 0.200	0.124 ± 0.006 3.150 ± 0.150	0.024 ± 0.004 0.600 ± 0.100	0.024 ± 0.012 0.600 ± 0.300	0.022 ± 0.010 0.550 ± 0.250	inches mm
CSR 3	0.122 ± 0.006 3.100 ± 0.150	0.248 ± 0.006 6.300 ± 0.150	0.035 ± 0.006 0.900 ± 0.150	0.024 ± 0.012 0.600 ± 0.300	0.022 ± 0.010 0.550 ± 0.250	inches mm





Solder Pad Dimensions						
Type / Code	L Total Length	W Total Width	D Pad Depth	Units	CSR3 (1225)	4 Terminal Bottom
CSR 1/8 S	0.05 1.30	0.03 0.80	0.02 0.40	inches mm		
CSR 1/8	0.08 2.10	0.04 1.10	0.03 0.70	inches mm		
CSR 1/4	0.11 2.70	0.06 1.40	0.04 1.00	inches mm		
CSR 1/2	0.16 4.00	0.07 1.80	0.06 1.40	inches mm		
CSRN 1S	0.15 3.80	0.18 4.50	0.06 1.50	inches mm		
CSRN 1	0.25 6.40	0.14 3.60	0.06 1.40	inches mm		
CSRN 2	0.31 8.00	0.15 3.75	0.10 2.50	inches mm		
CSR 3	0.20 5.08	0.30 7.60	0.08 2.00	inches mm		



How to Order

SEI Type	Code	Nominal Resistance	Tolerance	Packaging
CSR	1/2	0.01	1%	R

Type	Description
CSR	Standard
CSRN	Narrow Terminations

Code	Wattage	Size
1/8S	0.125W	0402
1/8	0.125W	0603
1/4	0.25W	0805
1/2	0.5W	1206
1S	1W	0815
1	1W	2010
2	2W	2512
3	3W	1225

Tolerance
1%
2%
5%

SEI Types	Pkg Qty	Description	Code
1/8S	10,000	7" reel paper tape	R
1/8, 1/4, 1/2	5,000		
1, 2	4,000	7" reel plastic tape	
1S, 3	2,000		
1/8S	1,000	7" reel paper tape	I
1/8, 1/4, 1/2			
1, 2		7" reel plastic tape	
1S, 3			

New part number format starting January 3rd, 2011:

How to Order

1	2	3	4	5	6	7	8	9	10	11	12	13
C	S	R	1	2	0	6	F	T	1	0	L	0

Product Series	
CSR	Standard
CSRN	Narrow Terminations

Size	Power
0402	0.125W
0603	0.125W
0805	0.25W
1206	0.5W
0815	1W
2010	1W
2512	2W
1225	3W

Tolerance	
Code	Tol
F	1%
G	2%
J	5%

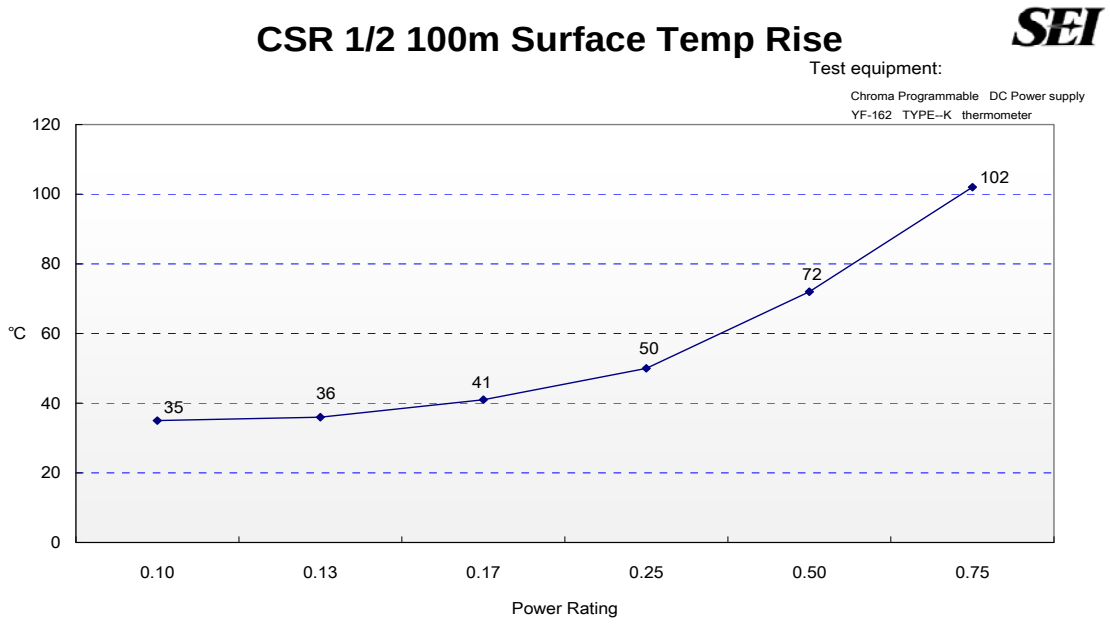
Packaging			
Code	Description	Size	Quantity
T	7" reel paper tape	0402	10,000
		0603, 0805, 1206	5,000
	7" reel plastic tape	2010, 2512	4,000
		0815, 1225	2,000
K	7" reel paper tape	0402	1,000
		0603, 0805, 1206	
	7" reel plastic tape	2010, 2512	
		0815, 1225	

Resistance Value
Four characters with the multiplier used as the decimal holder. "L" used as multiplier of 10^{-3} for any value under 0.1 ohm.
0.01 ohm = 10L0
0.1 ohm = R100
1 ohm = 1R00

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 mΩ. This should be taken into account when designing.