CSRF Series

Foil on Ceramic Current Sensing Chip Resistor

Features:

- High power rating – up to 2W
- Low inductance – typically less than 0.2nH
- Wide resistance range (0.003Ω – 0.100Ω)
- Current handling up to 26 amps
- TCR down to ±50 ppm/°C
- Non-standard resistance values available
- RoHS compliant / lead-free

Electrical Specifications

Type / Code	Power Rating (Watts) @ 70ºC	Resistance Temperature Coefficient	Ohmic Range (Ω) and Tolerance	
			1%	5%
CSRF0402	0.125W	±200 ppm/ºC	0.01 - 0.015	0.01 - 0.015
CSRF0603	0.25W	±75 ppm/ºC	0.005 - 0.01	0.005 - 0.01
CSRF0805	0.5W	±100 ppm/ºC ±50 ppm/ºC	0.01 0.011 - 0.03	0.01 0.011 - 0.03
CSRF1206	0.5W	±100 ppm/ºC ±50 ppm/ºC	0.005 - 0.01 0.011 - 0.04	0.005 - 0.01 0.011 - 0.04
CSRF2010(*)	1W	±100 ppm/ºC	0.005, 0.006, 0.007, 0.008, 0.009, 0.01	0.005, 0.006, 0.007, 0.008, 0.009, 0.01
CSRF2512	2W	±100 ppm/ºC ±50 ppm/ºC	0.003 - 0.01 0.011 - 0.1	0.003 - 0.01 0.011 - 0.1

(*) For 2010 size, MOQ of 20Kpcs per value is required.

Please refer to the High Power Resistor Application Note (page 3) for more information on designing and implementing high power resistor types.

Fig. 1

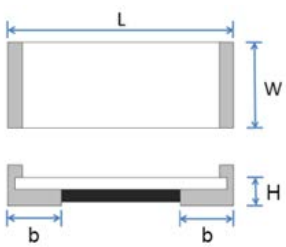


Fig. 2

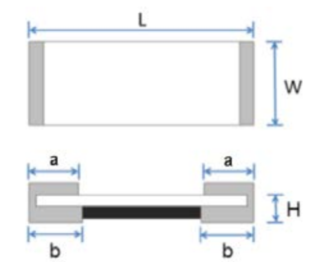
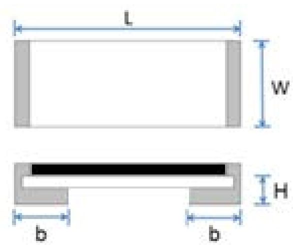


Fig. 3



Mechanical Specifications

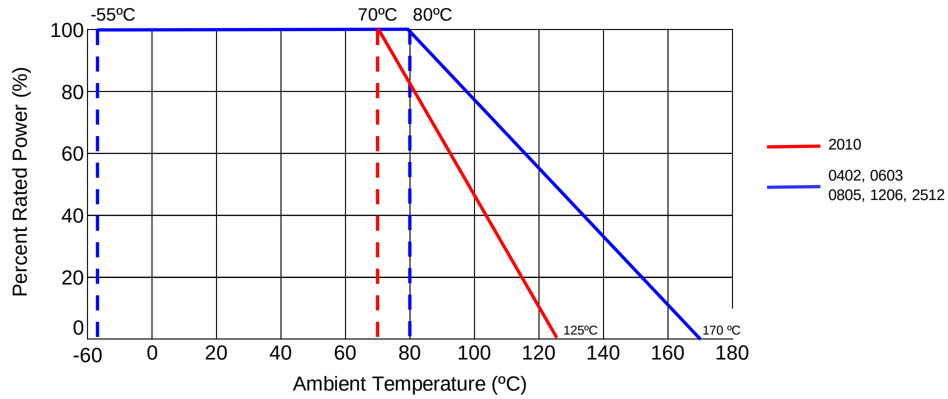
Type / Code	L Body Length	W Body Width	H Body Height	a Top Termination	b Bottom Termination	Unit
CSRF0402 (Fig. 1)	0.039 ± 0.004 1.00 ± 0.10	0.022 ± 0.004 0.55 ± 0.10	0.018 ± 0.004 0.45 ± 0.10	N/A	0.010 ± 0.004 0.25 ± 0.10	inches mm
CSRF0603 (Fig. 1)	0.063 ± 0.004 1.60 ± 0.10	0.031 ± 0.004 0.80 ± 0.10	0.022 ± 0.006 0.55 ± 0.15	N/A	0.012 ± 0.008 0.30 ± 0.20	inches mm
CSRF0805 (Fig. 2)	0.083 ± 0.008 2.10 ± 0.20	0.051 ± 0.006 1.30 ± 0.15	0.028 ± 0.006 0.70 ± 0.15	0.016 ± 0.008 0.40 ± 0.20	0.018 ± 0.008 0.45 ± 0.20	inches mm
CSRF1206 (Fig. 2)	0.122 ± 0.008 3.10 ± 0.20	0.061 ± 0.008 1.55 ± 0.20	0.028 ± 0.006 0.70 ± 0.15	0.020 ± 0.008 0.50 ± 0.20	0.022 ± 0.008 0.55 ± 0.20	inches mm
CSRF2010 (=5mΩ) (Fig. 3)	0.197 ± 0.008 5.00 ± 0.20	0.098 ± 0.008 2.50 ± 0.20	0.041 ± 0.006 1.05 ± 0.15	N/A	0.039 ± 0.006 1.00 ± 0.15	inches mm
CSRF2010 (>5mΩ) (Fig. 3)	0.197 ± 0.008 5.00 ± 0.20	0.098 ± 0.008 2.50 ± 0.20	0.031 ± 0.006 0.80 ± 0.15	N/A	0.039 ± 0.006 1.00 ± 0.15	inches mm
CSRF2512 (Fig. 2)	0.254 ± 0.008 6.45 ± 0.20	0.128 ± 0.008 3.25 ± 0.20	0.031 ± 0.006 0.80 ± 0.15	0.035 ± 0.008 0.90 ± 0.20	0.043 ± 0.010 1.10 ± 0.25	inches mm

Performance Characteristics

Test	Test Method	Test Specification	Typical
Load Life	MIL-STD-202F-Method 108A RCWV at 70°C; 1.5hrs ON; 0.5hrs OFF Total 1024 ± 24hrs	± 1%	≤ 0.5%
Resistance to Soldering Heat	MIL-STD-202F-Method 210E 260 ± 5°C for 10 ± 1sec	± 1%	≤ 0.3%
Solderability	MIL-STD-202F-Method 208H 245 ± 5°C for 2 ± 0.5sec	minimum 95% coverage	> 95%
Thermal Shock	MIL-STD-202F-Method 107G -55°C to 150°C, 100 cycles	± 1%	≤ 0.3%
Short Time Overload	JIS-C-5202-5.5 5x rated power for 5 sec	± 1%	≤ 0.3%
High Temperature Exposure	125ºC: 1000 hous	± 1%	≤ 0.2%
Moisture Resistance	MIL- STD-202F-Method 106G	± 1%	≤ 0.5%
Insulation Resistance	MIL-STD-202F-Method 302 Apply 100Vdc for 1 minute	1MΩ minimum	≥ 1MΩ

Operating Temperature Range: -55°C to +170°C

Power Derating Curve:



How to Order

1	2	3	4	5	6	7	8	9	10	11	12	13	14
C	S	R	F	1	2	0	6	F	T	1	0	L	0

Product Series	
CSRF	Foil / Ceramic

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

Tolerance	
Code	Tol
F	1%
J	5%

Packaging			
Code	Description	Size	Quantity
T	7" Reel - Paper Tape	0402	10,000
		0603, 0805	5,000
		1206	4,000
		2010, 2512	2,000

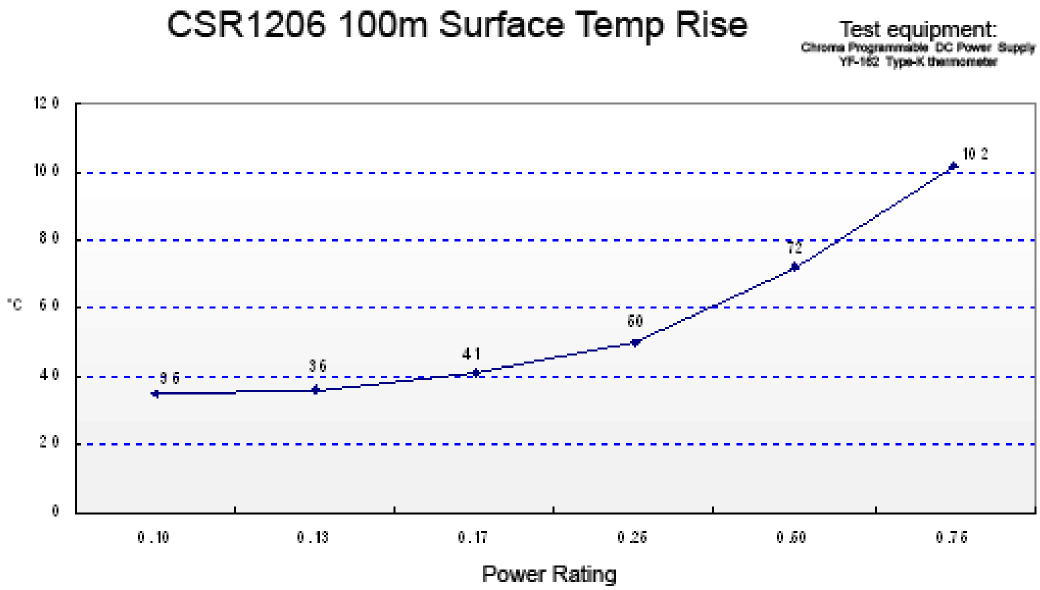
Resistance Value
Four characters with "L" used as multiplier of 10^{-3} for any value under 0.1 ohm..
0.005 ohm = 5L00 0.01 ohm = 10L0 0.1 ohm = R100

This specification may be changed at any time without prior notice
Please confirm technical specifications before you order and/or use.

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 100ºC for the CSS / CSSH series and 70ºC 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 105ºC . At first glance this wouldn't seem too difficult, however the graph below shows typical heat rise for the CSR1206 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 102ºC heat rise shown here would indicate there will be additional thermal reduction techniques needed to keep this part under 105ºC 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 72ºC. 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.