Features:

- 1, 3 and 5 watts
- ± 1%, ± 2% or ± 5% tolerance
- ± 20 ppm/ºC element wire
- ± 200 ppm/ºC at lead stops
- All welded construction
- Flameproof
- Non-inductive (10 nH max)
- High current handling to 31 amps
- RoHS compliant, lead free and halogen free
- REACH compliant

Applications:

- Current sensing
- Feedback
- Low inductance
- Surge and pulse

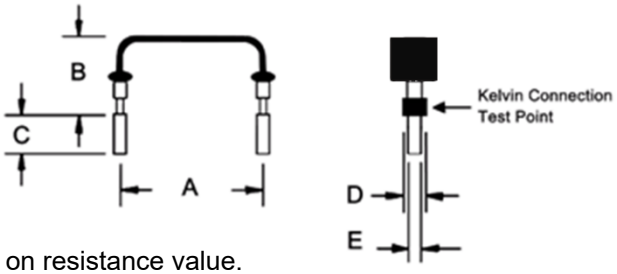
Electrical Specifications

Type/Code	Power Rating (W) at 85ºC	Ohmic Range (Ω) and Tolerance[1] 1%, 2%, 5%
BR1	1 W	0.005 - 0.1
BR3	3 W	0.005 - 0.1
BR5	5 W	0.005 - 0.05

(1) Contact factory for resistance values below 0.005 Ω.
Product photo shown above is typical. Actual components may vary depending on element wire size and amount of trim adjusting required to meet desired resistance value.

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

Mechanical Specifications



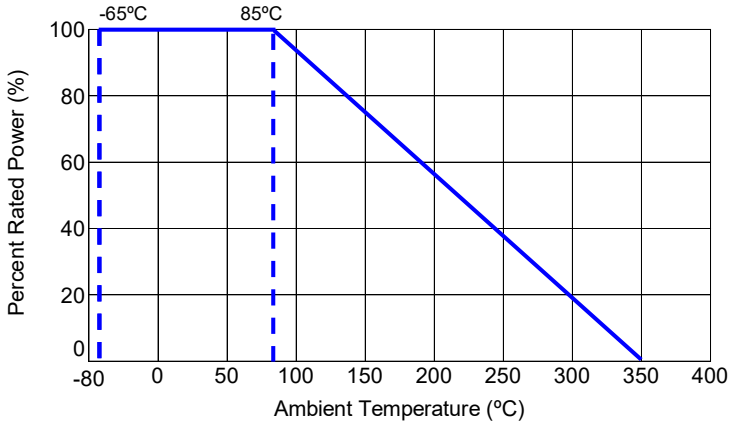
Element width varies depending on resistance value.

Type/Code	A	B	C	D	E	Unit
BR1	0.450 ± 0.040 11.43 ± 1.02	0.200 ± 0.100 5.08 ± 2.54	0.125 ± 0.030 3.18 ± 0.76	0.065 ± 0.010 1.65 ± 0.25	0.04 ± 0.002 1.02 ± 0.05	inches mm
BR3	0.602 ± 0.040 15.30 ± 1.02	0.602 Typ - 1.000 Max 15.30 Typ - 25.40 Max	0.125 ± 0.030 3.18 ± 0.76	0.065 ± 0.010 1.65 ± 0.25	0.04 ± 0.002 1.02 ± 0.05	inches mm
BR5	0.800 ± 0.040 20.32 ± 1.02	0.602 Typ - 1.000 Max 15.30 Typ - 25.40 Max	0.125 ± 0.030 3.18 ± 0.76	0.065 ± 0.010 1.65 ± 0.25	0.04 ± 0.002 1.02 ± 0.05	inches mm

Performance Characteristics	
Test	Test Specification
Moisture Resistance	± 1%
Load Life @ 25ºC - 1000 hours	± 2%, + 0.0005 Ω
Temperature Cycle @ -40ºC & +125ºC (1000 cycles)	± 1%

Operating temperature range is -65ºC to +350ºC

Power Derating Curve:



Note: Maximum recommended solder joint/lead stop temperature = +105ºC

Recommended Solder Profile

This information is intended as a reference for solder profiles for Stackpole resistive components. These profiles should be compatible with most soldering processes. These are only recommendations. Actual numbers will depend on board density, geometry, packages used, etc., especially those cells labeled with "*".

100% Matte Tin / RoHS Compliant Terminations

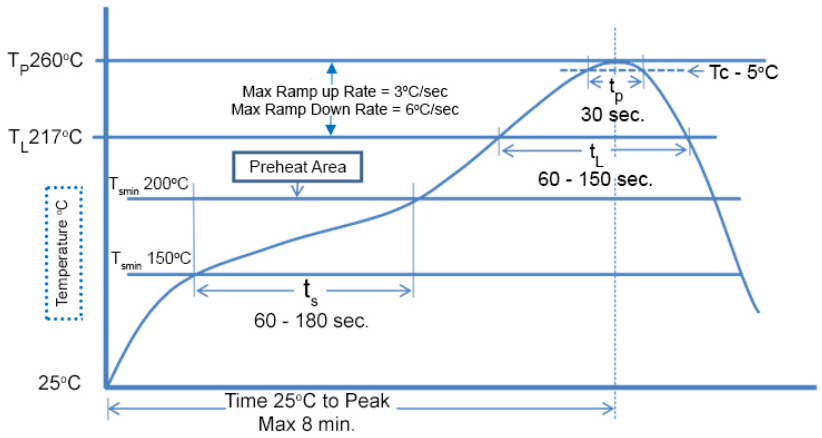
Soldering iron recommended temperatures: 330°C to 350°C with minimum duration.
Maximum number of reflow cycles: 3.

Wave Soldering			
Description	Maximum	Recommended	Minimum
Preheat Time	80 seconds	70 seconds	60 seconds
Temperature Diff.	140°C	120°C	100°C
Solder Temp.	260°C	250°C	240°C
Dwell Time at Max.	10 seconds	5 seconds	*
Ramp DN (°C/sec)	N/A	N/A	N/A

Temperature Diff. = Defference between final preheat stage and soldering stage.

Convection IR Reflow			
Description	Maximum	Recommended	Minimum
Ramp Up (°C/sec)	3°C/sec	2°C/sec	*
Dwell Time > 217°C	150 seconds	90 seconds	60 seconds
Solder Temp.	260°C	245°C	*
Dwell Time at Max.	30 seconds	15 seconds	10 seconds
Ramp DN (°C/sec)	6°C/sec	3°C/sec	*

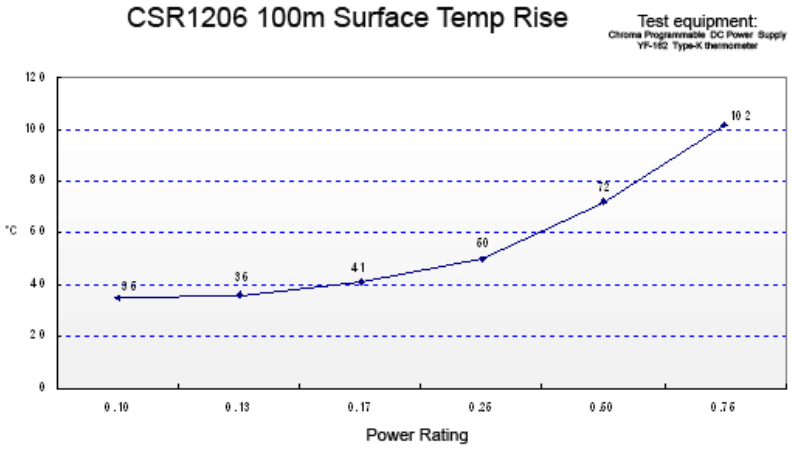
Recommended Lead Free Resistor Reflow Profile



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°C for the CSS / CSSH series and 70°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 105°C. 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°C heat rise shown here would indicate there will be additional thermal reduction techniques needed to keep this part under 105°C 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°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, via 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.

RoHS Compliance

Stackpole Electronics has joined the worldwide effort to reduce the amount of lead in electronic components and to meet the various regulatory requirements now prevalent, such as the European Union's directive regarding "Restrictions on Hazardous Substances" (RoHS 3). As part of this ongoing program, we periodically update this document with the status regarding the availability of our compliant components. All our standard part numbers are compliant to EU Directive 2011/65/EU of the European Parliament as amended by Directive (EU) 2015/863/EU as regards the list of restricted substances.

RoHS Compliance Status						
Standard Product Series	Description	Package / Termination Type	Standard Series RoHS Compliant	Lead-Free Termination Composition	Lead-Free Mfg. Effective Date (Std Product Series)	Lead-Free Effective Date Code (YY/WW)
BR	Open Air Bare Element Current Sense Resistor	Special	YES	100% Matte Sn	Jan-06	06/01

"Conflict Metals" Commitment

We at Stackpole Electronics, Inc. are joined with our industry in opposing the use of metals mined in the "conflict region" of the eastern Democratic Republic of the Congo (DRC) in our products. Recognizing that the supply chain for metals used in the electronics industry is very complex, we work closely with our own suppliers to verify to the extent possible that the materials and products we supply do not contain metals sourced from this conflict region. As such, we are in compliance with the requirements of Dodd-Frank Act regarding Conflict Minerals.

Compliance to "REACH"

We certify that all passive components supplied by Stackpole Electronics, Inc. are SVHC (Substances of Very High Concern) free and compliant with the requirements of EU Directive 1907/2006/EC, "The Registration, Evaluation, Authorization and Restriction of Chemicals", otherwise referred to as REACH. Contact us for complete list of REACH Substance Candidate List.

Environmental Policy

It is the policy of Stackpole Electronics, Inc. (SEI) to protect the environment in all localities in which we operate. We continually strive to improve our effect on the environment. We observe all applicable laws and regulations regarding the protection of our environment and all requests related to the environment to which we have agreed. We are committed to the prevention of all forms of pollution.

How to Order

1	2	3	4	5	6	7	8	9
B	**R**	**1**	**F**	**B**	**1**	**0**	**L**	**0**

Product Series	
Code	Description
BR	Bare Element Current Sensing

Power Rating	
Size	W
1	1
3	3
5	5

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

Packaging			
Code	Description	Size	Quantity
B	Bulk	All Sizes	1000

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.
0.005 ohm = 5L00 0.05 ohm = 50L0 0.1 ohm = R100