Features:

- 0402 to 1225 sizes available
- Power ratings to 3W
- Low inductance – less than 0.2nH typically
- RoHS compliant and halogen free
- Non-standard resistance values available
- 0815, 2010 and 2512 sizes available with narrow terminations (CSRN)

Electrical Specifications

Type / Code	Power Rating (Watts) @ 70ºC	Dielectric Withstanding Voltage	Resistance Temperature Coefficient	Ohmic Range (Ω) and Tolerance	
				1%	2%, 5%
CSR0402	0.125W	200V	±200 ppm/ºC	0.05 - 1	
CSR0603	0.125W	200V	±300 ppm/ºC	0.02 - 1	
CSR0805	0.25W	200V	±200 ppm/ºC	0.02 - 1	
CSR1206	0.5W	200V	±100 ppm/ºC (1)	0.01 - 1	
CSR1210	0.5W	200V	±600 ppm/ºC	0.01 - 0.02	
			±400 ppm/ºC	0.021 - 0.05	
			±300 ppm/ºC	0.051 - 0.099	
			±200 ppm/ºC	0.1 - 1	
CSRN0815	1W	200V	±300 ppm/ºC	0.01 - 0.019	
			±150 ppm/ºC	0.02 - 0.5	
CSR0830	2W	200V	±300 ppm/ºC	-	0.001 - 0.004
			±200 ppm/ºC	0.005 - 0.01	
			±150 ppm/ºC	0.011 - 0.35	
CSR2010	1W	200V	±100 ppm/ºC (1)	0.01 - 1	
CSRN2010	1W	200V	±250 ppm/ºC	0.01 - 1	
CSR2512	2W	200V	±200 ppm/ºC	0.01 - 1	
CSRN2512(*)	2W	200V	±200 ppm/ºC	0.01 - 1	
CSR1225	3W	200V	±300 ppm/ºC	0.003 - 0.005	
			±200 ppm/ºC	0.006 - 0.02	
			±150 ppm/ºC	0.021 - 0.03	
			±100 ppm/ºC	0.033 - 8	

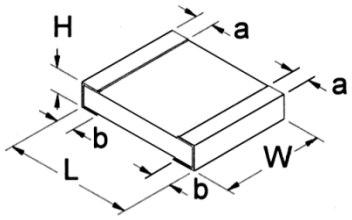
(*) AEC-Q200 Qualified
(1) Contact Factory for TCR below 50mOhm

Electrical Specifications – High Power

Type / Code	Power Rating (Watts) @ 70ºC	Dielectric Withstanding Voltage	Resistance Temperature Coefficient	Ohmic Range (Ω) and Tolerance
				1%, 2%, 5%
CSR0603…-HP	0.2W	200V	±400 ppm/ºC	0.051 - 0.1
			±300 ppm/ºC	0.102 - 0.5
			±200 ppm/ºC	0.51 - 1
CSR1210…-HP	0.75W	200V	±600 ppm/ºC	0.01 - 0.02
			±400 ppm/ºC	0.021 - 0.05
			±300 ppm/ºC	0.051 - 0.091
			±200 ppm/ºC	0.1 - 1

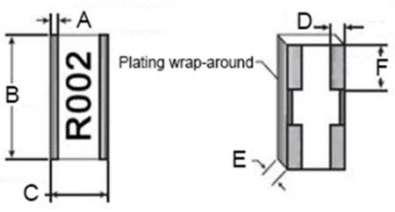
Please refer to the High Power Resistor Application Note (page 5) for more information on designing and implementing high power resistor types.

Mechanical Specifications



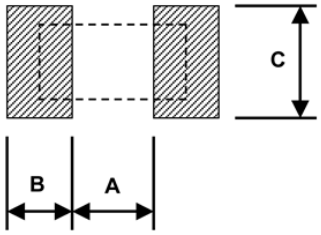
Type / Code	L Body Length	W Body Width	H Body Height	a Top Termination	b Bottom Termination	Unit
CSR0402	0.039 ± 0.002 1.00 ± 0.05	0.020 ± 0.002 0.50 ± 0.05	0.013 ± 0.004 0.32 ± 0.10	0.010 ± 0.004 0.25 ± 0.10	0.008 ± 0.004 0.20 ± 0.10	inches mm
CSR0603	0.063 ± 0.004 1.60 ± 0.10	0.031 ± 0.004 0.80 ± 0.10	0.018 ± 0.004 0.45 ± 0.10	0.012 ± 0.008 0.30 ± 0.20	0.012 ± 0.008 0.30 ± 0.20	inches mm
CSR0805	0.079 ± 0.006 2.00 ± 0.15	0.049 ± 0.006 1.25 ± 0.15	0.022 ± 0.004 0.55 ± 0.10	0.012 ± 0.008 0.30 ± 0.20	0.016 ± 0.010 0.40 ± 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 ± 0.10	0.020 ± 0.012 0.50 ± 0.30	0.016 ± 0.010 0.40 ± 0.25	inches mm
CSR1210	0.122 ± 0.004 3.10 ± 0.10	0.102 ± 0.006 2.60 ± 0.15	0.022 ± 0.004 0.55 ± 0.10	0.020 ± 0.012 0.50 ± 0.30	0.020 ± 0.010 0.50 ± 0.25	inches mm
CSRN0815	0.079 ± 0.008 2.00 ± 0.20	0.148 ± 0.008 3.75 ± 0.20	0.024 ± 0.004 0.60 ± 0.10	0.016 ± 0.008 0.40 ± 0.20	0.016 ± 0.008 0.40 ± 0.20	inches mm
CSR0830	0.079 ± 0.008 2.00 ± 0.20	0.295 ± 0.012 7.50 ± 0.30	0.024 ± 0.004 0.60 ± 0.10	0.016 ± 0.008 0.40 ± 0.20	0.016 ± 0.008 0.40 ± 0.20	inches mm
CSR2010	0.197 ± 0.008 5.00 ± 0.20	0.100 ± 0.008 2.54 ± 0.20	0.020 ± 0.006 0.50 ± 0.15	0.068 ± 0.006 1.72 ± 0.15	0.067 ± 0.006 1.70 ± 0.15	inches mm
CSRN2010	0.197 ± 0.008 5.00 ± 0.20	0.096 ± 0.006 2.45 ± 0.15	0.024 ± 0.006 0.60 ± 0.15	0.024 ± 0.012 0.60 ± 0.30	0.020 ± 0.010 0.50 ± 0.25	inches mm
CSR2512	0.252 ± 0.008 6.40 ± 0.20	0.126 ± 0.008 3.20 ± 0.20	0.020 ± 0.006 0.50 ± 0.15	0.075 ± 0.006 1.90 ± 0.15	0.075 ± 0.006 1.90 ± 0.15	inches mm
CSRN2512	0.250 ± 0.008 6.35 ± 0.20	0.124 ± 0.006 3.15 ± 0.15	0.024 ± 0.004 0.60 ± 0.10	0.024 ± 0.012 0.60 ± 0.30	0.022 ± 0.010 0.55 ± 0.25	inches mm

CSR1225 Mechanical Specifications



Type / Code	A	B	C	D	E	F	Unit
CSR1225	0.020 ± 0.005 0.51 ± 0.13	0.250 ± 0.005 6.35 ± 0.13	0.125 ± 0.005 3.18 ± 0.13	0.032 ± 0.005 0.81 ± 0.13	0.030 ± 0.005 0.76 ± 0.13	0.090 ± 0.005 2.29 ± 0.13	inches mm

Recommended Pad Layout



Type / Code	A	B	C	Unit
CSR0402	0.020 0.50	0.020 0.50	0.024 ± 0.008 0.60 ± 0.20	inches mm
CSR0603	0.031 0.80	0.039 1.00	0.035 ± 0.008 0.90 ± 0.20	inches mm
CSR0805	0.039 1.00	0.039 1.00	0.053 ± 0.008 1.35 ± 0.20	inches mm
CSR1206	0.079 2.00	0.045 1.15	0.067 ± 0.008 1.70 ± 0.20	inches mm
CSR1210	0.079 2.00	0.045 1.15	0.098 ± 0.008 2.50 ± 0.20	inches mm
CSRN0815	0.039 1.00	0.071 1.80	0.154 ± 0.008 3.90 ± 0.20	inches mm
CSR0830	0.039 1.00	0.071 1.80	0.299 ± 0.008 7.60 ± 0.20	inches mm
CSR2010	0.142 3.60	0.055 1.40	0.098 ± 0.008 2.50 ± 0.20	inches mm
CSRN2010	0.142 3.60	0.055 1.40	0.098 ± 0.008 2.50 ± 0.20	inches mm
CSR2512	0.193 4.90	0.063 1.60	0.122 ± 0.008 3.10 ± 0.20	inches mm
CSRN2512	0.193 4.90	0.063 1.60	0.122 ± 0.008 3.10 ± 0.20	inches mm
CSR1225	0.047 1.20	0.079 2.00	0.276 ± 0.008 7.00 ± 0.20	inches mm

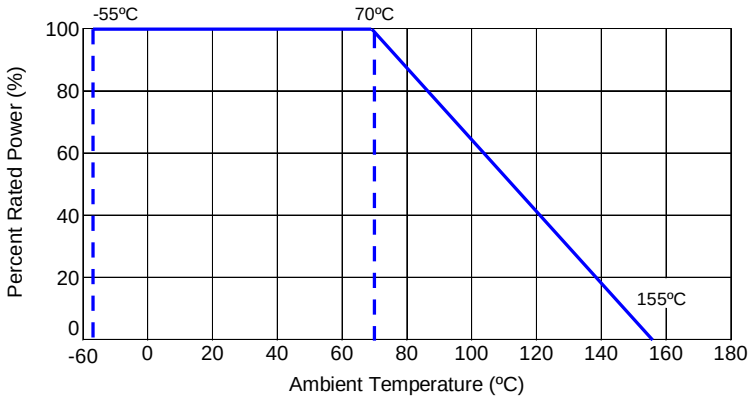
Performance Characteristics

Test	Test Method	Test Specifications	Typical	Test Conditions
High Temperature Exposure	MIL-STD-202 Method 108	1% Tol: (±1.0% +0.05Ω) 2%, 5% Tol:(±1.5% +0.10Ω)	≤ 0.5%	1000 hrs. @ T=155°C. Unpowered. Measurement at 24 ± 4 hours after test conclusion.
Short Time Overload	JIS-C-5201-1 4.13 IEC 60115-1 4.13	±(0.5% +0.05Ω)	≤ 0.25%	RCSV*2.5 or Max. Overload voltage whichever is lower for 5 seconds
		±(1.0% +0.05Ω) For high power rating	≤ 0.5%	
Temperature Cycling	JESD22 Method JA-104	1% Tol: (±0.5% +0.05Ω) 2%, 5% Tol:(±1.5% +0.10Ω)	≤ 0.5%	1000 Cycles (-55°C to +125°C) Measurement at 24 ± 4 hours after test conclusion. 30 min maximum dwell time at each temperature extreme. 1 min. maximum transition time.
Biased Humidity	MIL-STD-202 Method 103	1% Tol: (±1.00% +0.10Ω) 2%, 5% Tol:(±2.00% +0.10Ω)	≤ 0.5%	1000 hours 85°C/85% RH. Note: Specified conditions: 10% of operating power. Measurement at 24 ± 4 hours after test conclusion.
Operational Life	MIL-STD-202 Method 108	1% Tol: (±1.00% +0.10Ω) 2%, 5% Tol:(±2.00% +0.10Ω)	≤ 0.5%	Condition D Steady State T_A=125°C at rated power. Measurement at 24 ± 4 hours after test conclusion.
External Visual	MIL-STD 883 Method 2009	--	Pass	Electrical test not required. Inspect device construction, marking and workmanship

Performance Characteristics (cont.)				
Test	Test Method	Test Specifications	Typical	Test Conditions
Physical Dimensions	JESD22 Method JB-100	--	Pass	Verify physical dimensions to the applicable device detail specification. Note: User(s) and Suppliers spec. Electrical test not required.
Resistance to Solvents	MIL-STD 202 Method 215	Marking unsmeared	Pass	Note: Aqueous wash chemical - OKEM Clean or equivalent. Do not use banned solvents.
Mechanical Shock	MIL-STD 202 Method 213	1% Tol: (±0.25% +0.05Ω) 2%, 5% Tol:(±1.00% +0.05Ω)	≤ 0.5%	Figure 1 of Method 213. Condition C.
Vibration	MIL-STD 202 Method 204	1% Tol: (±0.50% +0.05Ω) 2%, 5% Tol:(±1.00% +0.05Ω)	≤ 0.5%	5 g's for 20 min., 12 cycles each of 3 orientations. Note: Use 8"X5" PCB 0.031" thick 7 secure points on one long side and 2 secure points at corners of opposite sides. Parts mounted within 2" from any secure point. Test from 10 - 2000 Hz.
Resistance to Soldering Heat	MIL-STD 202 Method 210	1% Tol: (±0.50% +0.05Ω) 2%, 5% Tol:(±1.00% +0.05Ω)	≤ 0.5%	Condition B no pre-heat of samples. Note: Single wave solder - Procedure 2 for SMD.
ESD	AEC-Q200-002	--	Pass	With the electrometer in direct contact with the discharge tip, verify the voltage setting at levels of ±500 V, ±1kV, ±2kV, ±4kV, ±8kV. The electrometer reading shall be within ±10% for voltages from 500 V to ≤ 8 kV.
Solderability	J-STD-002	> 95% Coverage	Pass	Electrical test not required. Magnification 50X. Conditions: SMD: a) Method B, 4 hrs @ 155°C dry heat @ 235°C. b) Method B @ 215°C category 3. c) Method D category 3 @ 260°C.
Electrical Characterization	User Spec	--	Pass	Parametrically test per lot and sample size requirements, summary to show Min, Max, Mean and Standard Deviation at room as well as Min and Max operating temperatures.
Flammability	UL-94	No ignition of tissue or scorching of pine board.	Pass	V-0 or V-1 are acceptable. Electrical test not required.
Board Flex	AEC-Q200-005	1% Tol: (±1.00% +0.05Ω) 2%, 5% Tol:(±1.00% +0.05Ω)	≤ 0.5%	60 second minimum holding time.
Terminal Strength (SMD)	AEC-Q200-006	None broken	Pass	
Flame Retardance	AEC-Q200-001	No flame	Pass	

Operating Temperature Range: -55ºC to +155ºC

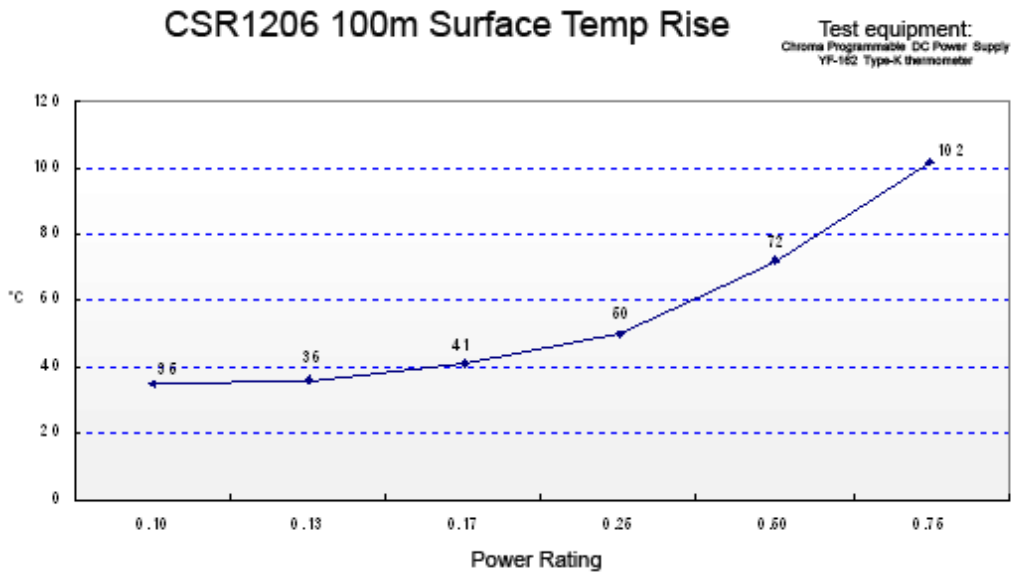
Power Derating Curve:



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 ≤ 50mΩ. 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 2). 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.

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)
CSR	Thick Film Current Sensing Surface Mount Chip Resistor	SMD	YES by means of exemption 7c-I	100% Matte Sn over Ni	May-04	04/18
CSRN	Thick Film Current Sensing Surface Mount Chip Resistor, Narrow	SMD	YES by means of exemption 7c-I	100% Matte Sn over Ni	May-04	04/18

"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 Easter 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	10	11	12	13		14	15
C	S	R	1	2	0	6	F	T	1	0	L	0	-	H	P

Product Series	
CSR	Standard
CSRN	Narrow Terminations

Size	Power
0402	0.125W
0603	0.125W
0805	0.25W
1206	0.5W
1210	0.5W
0815	1W
0830	2W
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, 1210	5,000
	7" Reel Plastic Tape	2010, 2512	4,000
		0815, 0830, 1225	2,000
K	7" Reel Paper Tape	0402	1,000
		0603, 0805, 1206, 1210	
	7" Reel Plastic Tape	2010, 2512	
		0815, 0830, 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
0.051 ohm = 51L0 0.35 ohm = R350 1 ohm = 1R00

Special	
Code	Description
HP	High Power

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MCR03EZPFX3162 MCR004YZPJ332 201007J022KT4E 201007F1653T4E 201007F6652T4E 0603WAF137KT5E RTT204702FTE RTT203000FTE RTT2056R0FTE CR2010F470KE04Z RTT018451FTH RTT021802DTH 0402WGF510LTCE 0201WMJ0200TEE TR0603B26K7P0550Z 0201WMF5102TEE 1210W2J047KT5E YLR12-2-4F-W YLR12-2-30F-W HOT(0.25x1.3)-3.2-0R-I HOT(0.4x1.5)-5.2-0R-I HoT(0.45x1.5)-8.2-0R-I 0201WMF1103TEE 0201WMF7152TEE 1210W2J0124T5E 201007J010LT4E 201007J0360T4E 201007J0430T4E 1206W4F5231T5E 1210W2J0620T5E 201007J0822T4E 0201WMF1005TCE 0201WMF1212TCE 0201WMF1373TCE 0201WMF1400TCE 0201WMF2000TEE 0201WMF2001TCE 0201WMF226JTCE 0201WMF2672TCE 0201WMF2803TCE 0201WMF357JTCE 0201WMF3743TCE 0201WMF430JTCE 0201WMF4990TCE 0201WMF5104TCE 0201WMF510JTEE 0201WMF5110TCE 0201WMF6652TEE 0201WMF6812TCE 0201WMF8200TCE