CSR / CSRN Series

Thick Film Current Sensing Resistor

Stackpole Electronics, Inc.

Resistive Product Solutions

Features:

- 0201 to 1225 sizes available
- Power ratings to 3W
- Low inductance - < 2nH typically
- Non-standard resistance values available
- 0815, 2010 and 2512 sizes available with narrow terminations (CSRN)
- 100% RoHS compliant and lead free without exemption
- Halogen free
- REACH compliant

Electrical Specifications - CSR

Type/Code	Power Rating (W) @ 70°C	Dielectric Withstanding Voltage (V)	TCR (ppm/ºC)	Ohmic Range (Ω) and Tolerance	
				1%	2%, 5%
CSR0201	0.05	200	± 1000	0.1 - 0.147	
			± 600	0.15 - 0.499	
			± 300	0.511 - 1	
CSR0402	0.125	200	± 200	0.0511 - 1	
CSR0603	0.125	200	± 300	0.02 - 1	
CSR0805	0.25	200	± 200	0.02 - 1	
CSR1206	0.5	200	± 100 (1)	0.01 - 1	
CSR1210	0.5	200	± 600	0.01 - 0.02	
			± 400	0.0205 - 0.0511	
			± 300	0.0523 - 0.0976	
			± 200	0.1 - 1	
CSR2010	1	200	± 100 (1)	0.01 - 1	
CSR2512	2	200	± 200	0.01 - 1	
CSR0830	2	200	± 300	-	0.001 - 0.004
			± 200	0.0051 - 0.01	
			± 150	0.0102 - 0.348	
CSR1225	3	200	± 300	0.003 - 0.0049	
			± 200	0.0051 - 0.02	
			± 150	0.0205 - 0.0301	
			± 100	0.0332 - 7.87	

(1) Contact Stackpole for TCR below 50 mohm

Electrical Specifications – CSRN (Narrow Termination)

Type/Code	Power Rating (W) @ 70°C	Dielectric Withstanding Voltage (V)	TCR (ppm/ºC)	Ohmic Range (Ω) and Tolerance
				1%, 2%, 5%
CSRN2010	1	200	± 250	0.01 - 1
CSRN0815	1	200	± 300	0.01 - 0.0196
			± 150	0.02 - 0.499
CSRN2512(*)	2	200	± 200	0.01 - 1

(*) AEC-Q200 Qualified

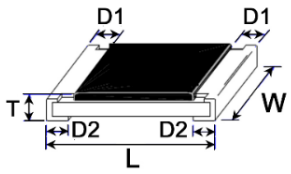
Electrical Specifications – CSR-HP

Type/Code	Power Rating (W) @ 70°C	Dielectric Withstanding Voltage (V)	TCR (ppm/ºC)	Ohmic Range (Ω) and Tolerance
				1%, 2%, 5%
CSR0603…-HP	0.2	200	± 400	0.051 - 0.1
			± 300	0.102 - 0.499
			± 200	0.51 - 1

Electrical Specifications – CSR-HP (cont.)				
Type/Code	Power Rating (W) @ 70°C	Dielectric Withstanding Voltage (V)	TCR (ppm/ºC)	Ohmic Range (Ω) and Tolerance
				1%, 2%, 5%
CSR1210…-HP	0.75	200	± 600	0.01 - 0.02
			± 400	0.0205 - 0.0499
			± 300	0.051 - 0.091
			± 200	0.1 - 1

Please refer to the High-Power Resistor Application Note (page 8) for more information on designing and implementing high power resistor types.

Mechanical Specifications - CSR

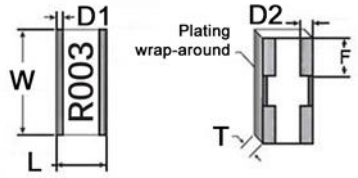


Type/Code	Weight (g) (1000 pieces)	L Body Length	W Body Width	T Body Height	D1 Top Termination	D2 Bottom Termination	Unit
CSR0201	0.18	0.024 ± 0.001 0.60 ± 0.03	0.012 ± 0.001 0.30 ± 0.03	0.009 ± 0.002 0.23 ± 0.05	0.005 ± 0.002 0.12 ± 0.05	0.006 ± 0.002 0.15 ± 0.05	inches mm
CSR0402	0.7	0.039 ± 0.002 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	1.99	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	5.3	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	8.82	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	15.5	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
CSR2010	27.03	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
CSR2512	53.08	0.252 ± 0.008 6.40 ± 0.20	0.126 ± 0.008 3.20 ± 0.20	0.020 ± 0.006 0.50 ± 0.15	0.024 ± 0.012 0.60 ± 0.30	0.079 ± 0.010 2.00 ± 0.25	inches mm
CSR0830	35.71	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

Mechanical Specifications – CSRN (Narrow Termination)

Type/Code	Weight (g) (1000 pieces)	L Body Length	W Body Width	T Body Height	D1 Top Termination	D2 Bottom Termination	Unit
CSRN0815	19.96	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
CSRN2010	27.03	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
CSRN2512	53.08	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

Mechanical Specifications – CSR1225



Type/Code	Weight (g) (1000 pieces)	L	W	T	D1	D2	F	Unit
CSR1225	64.88	0.126 ± 0.006 3.20 ± 0.15	0.254 ± 0.006 6.45 ± 0.15	0.035 ± 0.006 0.90 ± 0.15	0.024 ± 0.012 0.60 ± 0.30	0.031 ± 0.010 0.80 ± 0.25	0.090 ± 0.005 2.29 ± 0.13	inches mm

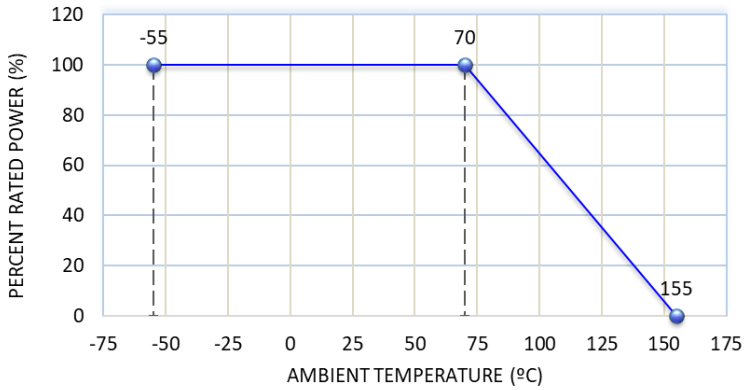
Performance Characteristics

Test	Test Method	Test Specification	Typical	Test Condition
High Temperature Exposure	MIL-STD-202 Method 108	1% Tol: (± 1% + 0.05Ω) 2%, 5% Tol: (± 1.5% + 0.1Ω)	≤ 0.5%	1000 hours at 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%	RCV (rated current) * 2.5 for 5 seconds.
		± (1% + 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% + 0.1Ω)	≤ 0.5%	1000 Cycles (-55°C to +125°C) Measurement at 24 ± 4 hours after test conclusion. 30 minuntes maximum dwell time at each temperature extreme. 1 minute maximum transition time.
Biased Humidity	MIL-STD-202 Method 103	1% Tol: (± 1% + 0.1Ω) 2%, 5% Tol: (± 2% + 0.1Ω)	≤ 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% + 0.1Ω) 2%, 5% Tol: (±2% + 0.1Ω)	≤ 0.5%	Condition D Steady State TA = 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.
Physical Dimensions	JESD22 Method JB-100	-	Pass	Verify physical dimensions to the applicable device detail specification. Note: User(s) and supplier specification, 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% + 0.05Ω)	≤ 0.5%	Figure 1 of Method 213. Condition C.
Vibration	MIL-STD 202 Method 204	1% Tol: (± 0.5% + 0.05Ω) 2%, 5% Tol: (±1% + 0.05Ω)	≤ 0.5%	5g's for 20 minuntes, 12 cycles each of 3 orientations. Note: Use 8" X 5" 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 - 2000Hz.
Resistance to Soldering Heat	MIL-STD 202 Method 210	1% Tol: (± 0.5% +0.05Ω) 2%, 5% Tol: (± 1% + 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 ± 500V, ± 1kV, ± 2kV, ± 4kV, ± 8kV. The electrometer reading shall be within ± 10% for voltages from 500V to ≤ 8kV.
Solderability	J-STD-002	> 95% Coverage	Pass	Electrical test not required. Magnification 50 times. Conditions: SMD: a) Method B, 4 hours @ 155°C dry heat @ 235°C. b) Method B @ 215°C category 3. c) Method D category 3 at 260°C.

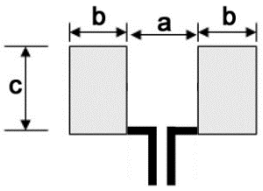
Performance Characteristics (cont.)				
Test	Test Method	Test Specification	Typical	Test Condition
Electrical Characterization	User Spec	--	Pass	Parametrically test per lot and sample size requirements, summary to show Min, Max, Mean and Standard Deviation at room as well as Min and Max operating temperatures.
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% + 0.05Ω) 2%, 5% Tol: (± 1% + 0.05Ω)	≤ 0.5%	60 second minimum holding time.
Terminal Strength (SMD)	AEC-Q200-006	No breakage	Pass	
Flame Retardance	AEC-Q200-001	No flame	Pass	
Voltage Proof	JIS-C-5201-1 4.7 IEC-60115-1 4.7	No breakdown or flashover	Pass	1.42 times Max. Operating Voltage for 1 minute. 0201: 50V; 0402: 100V; 0603: 150V; 0805: 300V 1206, 1210, 2010, 2512, 0830, 1225, 0815: 400V

Operating temperature range is -55ºC to +155ºC

Power Derating Curve:



Recommended Pad Layouts - CSR



Type/Code	a	b	c	Unit
CSR0201	0.010 0.25	0.012 0.30	0.016 ± 0.008 0.40 ± 0.20	inches mm
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

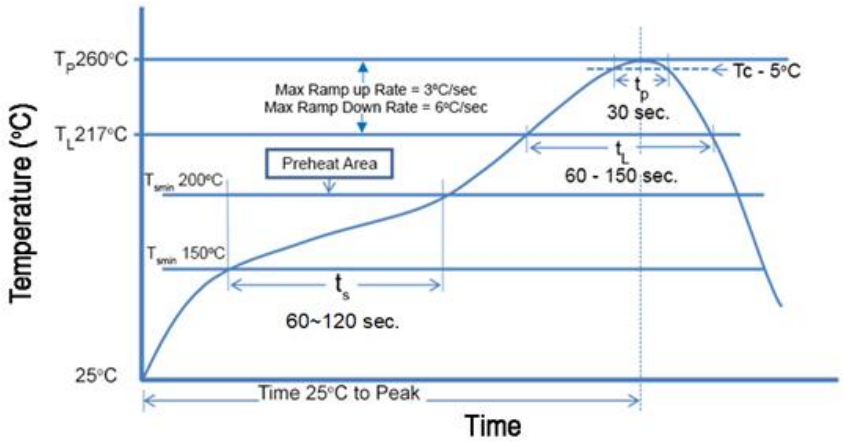
Recommended Pad Layouts – CSR (cont.)

Type/Code	a	b	c	Unit
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
CSR2512	0.193 4.90	0.063 1.60	0.126 ± 0.008 3.20 ± 0.20	inches mm
CSR1225	0.047 1.20	0.079 2.00	0.276 ± 0.008 7.00 ± 0.20	inches mm

Recommended Pad Layouts - CSRN

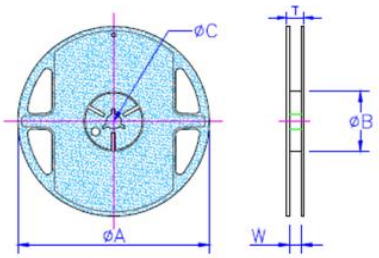
Type/Code	a	b	c	Unit
CSRN0815	0.039 1.00	0.071 1.80	0.154 ± 0.008 3.90 ± 0.20	inches mm
CSRN2010	0.142 3.60	0.055 1.40	0.098 ± 0.008 2.50 ± 0.20	inches mm
CSRN2512	0.193 4.90	0.063 1.60	0.126 ± 0.008 3.20 ± 0.20	inches mm

Soldering Conditions



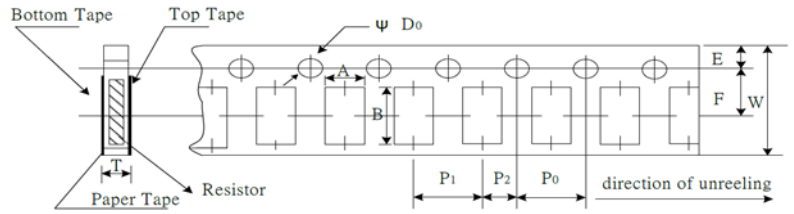
Profile Feature	Pb-Free Assembly
Preheat Min. Temperature (Tsmin) Max. Temperture (Tsmax) Prehating time (ts) from (Tsmin to Tsmax)	 150°C 200°C 60-120 seconds
Ramp-up Rate (T_L to T_P)	3°C/second max.
Liquidous Temperature (T_L)	217°C
Time (t_L) maintained above T_L	60-150 seconds
Min. Peak Temperature (Tp min)	235°C
Max. Peak Temperature (Tp max)	260°C
Time (tp) within 5°C of the specified classification temperature (Tc)	30 seconds max.
Ramp-down rate (T_P to T_L)	6°C/second max.
Time 25°C to peak temperature	8 minutes max.

Reel Specifications



Size	A	B	C	W	T	Unit
0201	7.008 ± 0.039 178.00 ± 1.00	2.362 ± 0.039 60.00 ± 1.00	0.531 ± 0.028 13.50 ± 0.70	0.374 ± 0.004 9.50 ± 0.10	0.453 ± 0.039 11.50 ± 1.00	inches mm
0402						inches mm
0603						inches mm
0805						inches mm
1206						inches mm
1210						inches mm
2010				0.531 ± 0.039 13.50 ± 1.00	0.610 ± 0.039 15.50 ± 1.00	inches mm
2512						inches mm
1225						inches mm
0815						inches mm
0830				0.689 ± 0.039 17.50 ± 1.00	0.768 ± 0.039 19.50 ± 1.00	inches mm

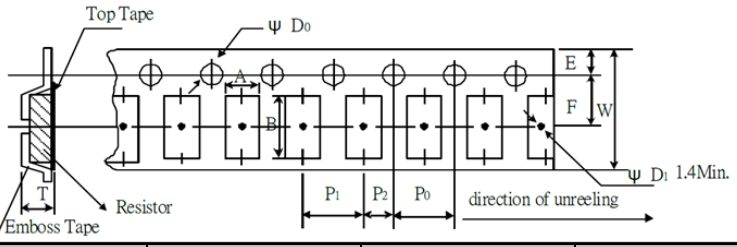
Packaging Specifications – Paper Tape



Size	A	B	W	E	F	Unit
0201	0.015 ± 0.002 0.38 ± 0.05	0.027 ± 0.002 0.68 ± 0.05	0.315 ± 0.004 8.00 ± 0.10	0.069 ± 0.002 1.75 ± 0.05		inches mm
0402	0.026 ± 0.004 0.65 ± 0.10	0.045 ± 0.004 1.15 ± 0.10				inches mm
0603	0.043 ± 0.004 1.10 ± 0.10	0.075 ± 0.004 1.90 ± 0.10				inches mm
0805	0.063 ± 0.004 1.60 ± 0.10	0.094 ± 0.008 2.40 ± 0.20	0.315 ± 0.008 8.00 ± 0.20	0.069 ± 0.004 1.75 ± 0.10	0.138 ± 0.002 3.50 ± 0.05	inches mm
1206	0.075 ± 0.004 1.90 ± 0.10	0.138 ± 0.008 3.50 ± 0.20				inches mm
1210	0.114 ± 0.004 2.90 ± 0.10	0.138 ± 0.008 3.50 ± 0.20				inches mm

Size	P0	P1	P2	D0	T	Unit
0201		0.079 ± 0.002 2.00 ± 0.05	0.079 ± 0.004 2.00 ± 0.10		0.017 ± 0.008 0.42 ± 0.20	inches mm
0402					0.018 ± 0.004 0.45 ± 0.10	inches mm
0603					0.028 ± 0.004 0.70 ± 0.10	inches mm
0805	0.157 ± 0.004 4.00 ± 0.10	0.157 ± 0.002 4.00 ± 0.05	0.079 ± 0.002 2.00 ± 0.05	0.059 + 0.004/-0 1.50 + 0.10/-0		inches mm
1206					0.033 ± 0.004 0.85 ± 0.10	inches mm
1210						inches mm

Packaging Specifications – Embossed Plastic Tape



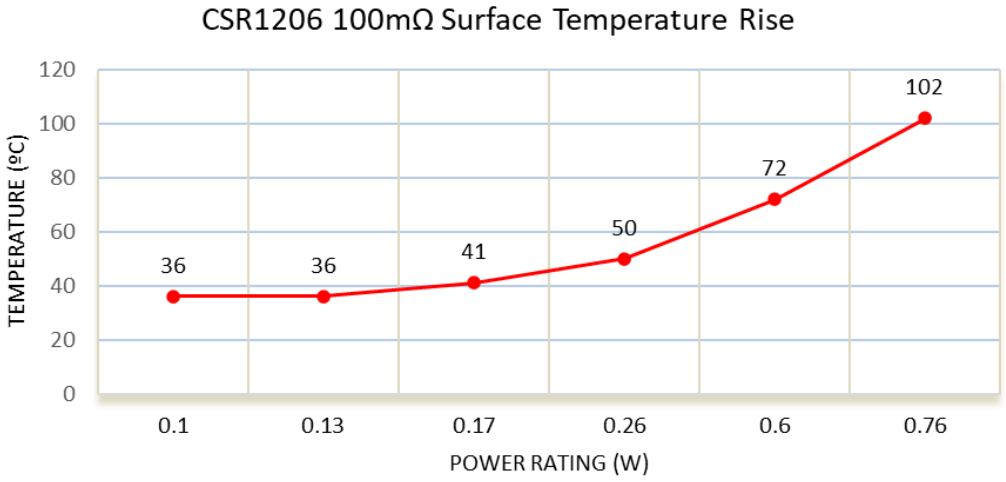
Size	A	B	W	E	F	Unit
2010	0.110 ± 0.004 2.80 ± 0.10	0.217 ± 0.004 5.50 ± 0.10			0.217 ± 0.002 5.50 ± 0.05	inches mm
2512	0.133 ± 0.004 3.38 ± 0.10	0.263 ± 0.004 6.68 ± 0.10			0.217 ± 0.004 5.50 ± 0.10	inches mm
1225	0.133 ± 0.004 3.38 ± 0.10	0.263 ± 0.004 6.68 ± 0.10	0.472 ± 0.012 12.00 ± 0.30	0.069 ± 0.004 1.75 ± 0.10	0.217 ± 0.004 5.50 ± 0.10	inches mm
0815	0.098 ± 0.008 2.50 ± 0.20	0.175 ± 0.008 4.45 ± 0.20			0.217 ± 0.002 5.50 ± 0.05	inches mm
0830	0.098 ± 0.008 2.50 ± 0.20	0.327 ± 0.008 8.30 ± 0.20	0.630 ± 0.012 16.00 ± 0.30		0.307 ± 0.002 7.80 ± 0.05	inches mm

Packaging Specifications – Embossed Plastic Tape (cont.)						
Size	P0	P1	P2	D0	T	Unit
2010	0.157 ± 0.002 4.00 ± 0.05	0.157 ± 0.004 4.00 ± 0.10	0.079 ± 0.002 2.00 ± 0.05	0.059 + 0.004/-0 1.50 + 0.10, -0	0.039 ± 0.008 1.00 ± 0.20	inches mm
2512	0.157 ± 0.004 4.00 ± 0.10			0.061 + 0.002/-0 1.55 + 0.05, -0	0.057 ± 0.008 1.45 ± 0.20	inches mm
1225						inches mm
0815	0.157 ± 0.002 4.00 ± 0.05			0.061 + 0.004/-0 1.55 + 0.10, -0	0.047 ± 0.008 1.20 ± 0.20	inches mm
0830						inches mm

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 CSR1206 100 milliohms 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)
CSR	Thick Film Current Sensing Surface Mount Chip Resistor	SMD	YES	100% Matte Sn over Ni	May-04	04/18
CSRN	Thick Film Current Sensing Surface Mount Chip Resistor, Narrow	SMD	YES	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 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	10	11	12	13	14	15	16
C	S	R	1	2	0	6	F	T	1	0	L	0	-	H	P

Product Series

Code	Description
CSR	Standard
CSRN	Narrow Terminations

Size

Code	W
0201	0.05
0402	0.13
0603	0.13
0805	0.25
1206	0.5
1210	0.5
2010	1
2512	2
0815	1
0830	2
1225	3

Tolerance

Code	Tol
F	1%
G	2%
J	5%

Packaging

Code	Description	Size	Quantity
T	7" Reel	0201, 0402	10000
	Paper Tape	0603, 0805, 1206, 1210	5000
	7" Reel	2010, 2512	4000
	Plastic Tape	0815, 0830, 1225	2000
K	7" Reel	0402	1000
	Paper Tape	0603, 0805, 1206, 1210	
	7" Reel	2010, 2512	
	Plastic Tape	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
blank	Standard
-HP	High Power

(*) Only available for 0603 and 1210 sizes