Features:

- High power rating – up to 6W
- Wide resistance range (0.001Ω – 0.6Ω)
- Current handling up to 26 amps
- TCR down to ±50 ppm/°C
- Other resistance values may be available
- RoHS compliant, lead-free and halogen-free

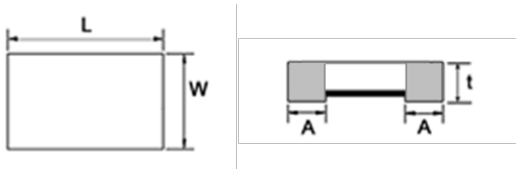
Electrical Specifications

Type/Code	Power Rating (Watts)	Resistance Temperature Coefficient	Ohmic Range (Ω) and Tolerance
			1% and 5%
CSRF0201	0.1W	±350 ppm/ºC	0.01
CSRF0201…-HP	0.25W	±350 ppm/ºC	0.01
CSRF0402 (2)	0.125W	±300 ppm/ºC	0.003 - 0.007
		±200 ppm/ºC	0.008 - 0.02
CSRF0402…-HP (2)	0.25W	±300 ppm/ºC	0.003 - 0.007
		±200 ppm/ºC	0.008 - 0.02
CSRF0603 (2)	0.25W	±400 ppm/ºC	0.0025 - 0.004
		±150 ppm/ºC	0.005 - 0.009
		±75 ppm/ºC	0.01 - 0.03
CSRF0603…-HP (2)	0.5W	±400 ppm/ºC	0.0025 - 0.004
		±150 ppm/ºC	0.005 - 0.009
		±75 ppm/ºC	0.01 - 0.03
CSRF0805 (2)	0.5W	±100 ppm/ºC	0.003 - 0.01
		±50 ppm/ºC	0.011 - 0.03
CSRF1206 (2)	1W	±100 ppm/ºC	0.003 - 0.01
		±50 ppm/ºC	0.011 - 0.05
CSRF0612	1.5W	±100 ppm/ºC	0.002
	1W	±100 ppm/ºC	0.003 - 0.004
		±75 ppm/ºC	0.005 - 0.03
CSRF2010 (1)	1W	±100 ppm/ºC	0.003 - 0.009
		±50 ppm/ºC	0.01 - 0.1
CSRF2512 (2)	2W	±100 ppm/ºC	0.003 - 0.01
		±50 ppm/ºC	0.011 - 0.6
CSRF4320	5W	±50 ppm/ºC	0.01 - 0.033

(1) For 2010 size, MOQ of 20Kpcs per value is required.
(2) Qualified to AEC-Q200

Please refer to the High Power Resistor Application Note (page 7) for more information on designing and implementing high power resistor types.

Mechanical Specifications – CSRF0201

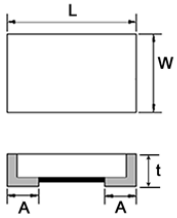


Type/Code	L Body Length	W Body Width	t Body Height	A Bottom Termination	Unit
CSRF0201	0.024 ± 0.001 0.60 ± 0.03	0.012 ± 0.002 0.31 ± 0.04	0.012 max. 0.30 max.	0.006 ± 0.004 0.14 ± 0.10	inches mm

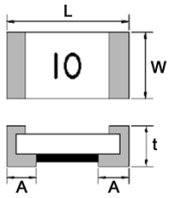
Note: No marking.

Mechanical Specifications – CSRF0402

0.0025Ω – 0.004Ω



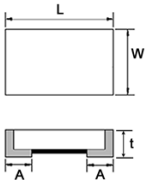
0.005Ω – 0.02Ω



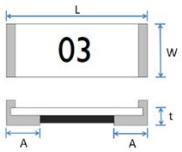
Type/Code	L Body Length	W Body Width	t Body Height	A Bottom Termination	Unit
CSRF0402 0.003Ω - 0.004Ω	0.039 ± 0.004 1.00 ± 0.10	0.022 ± 0.004 0.55 ± 0.10	0.018 ± 0.004 0.45 ± 0.10	0.018 ± 0.004 0.45 ± 0.10	inches mm
CSRF0402 0.005Ω - 0.007Ω	0.039 ± 0.004 1.00 ± 0.10	0.022 ± 0.004 0.55 ± 0.10	0.018 ± 0.004 0.45 ± 0.10	0.014 ± 0.004 0.35 ± 0.10	inches mm
CSRF0402 0.008Ω - 0.02Ω	0.039 ± 0.004 1.00 ± 0.10	0.022 ± 0.004 0.55 ± 0.10	0.018 ± 0.004 0.45 ± 0.10	0.010 ± 0.004 0.25 ± 0.10	inches mm

Mechanical Specifications – CSRF0603

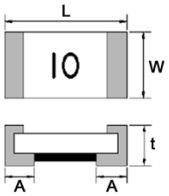
0.0025Ω



0.003Ω – 0.004Ω

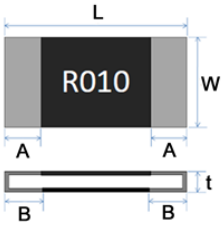


0.005Ω – 0.03Ω



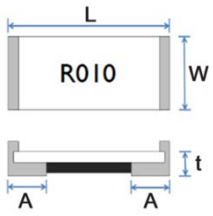
Type/Code	L Body Length	W Body Width	t Body Height	A Bottom Termination	Unit
CSRF0603 0.0025	0.063 ± 0.004 1.60 ± 0.10	0.031 ± 0.004 0.80 ± 0.10	0.024 ± 0.006 0.60 ± 0.15	0.022 ± 0.006 0.55 ± 0.15	inches mm
CSRF0603 0.003 - 0.004	0.063 ± 0.004 1.60 ± 0.10	0.031 ± 0.004 0.80 ± 0.10	0.022 ± 0.006 0.55 ± 0.15	0.022 ± 0.008 0.55 ± 0.20	inches mm
CSRF0603 0.005 - 0.03	0.063 ± 0.004 1.60 ± 0.10	0.031 ± 0.004 0.80 ± 0.10	0.022 ± 0.006 0.55 ± 0.15	0.012 ± 0.008 0.30 ± 0.20	inches mm

Mechanical Specifications – CSRF0805, 1206, 2512



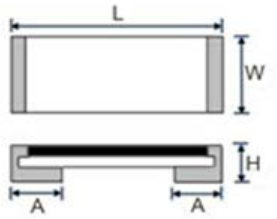
Type/Code	L Body Length	W Body Width	t Body Height	A Top Termination	B Bottom Termination	Unit
CSRF0805	0.083 ± 0.008 2.10 ± 0.20	0.051 ± 0.006 1.30 ± 0.15	0.028 ± 0.006 0.70 ± 0.15	0.016 ± 0.008 0.40 ± 0.20	0.018 ± 0.008 0.45 ± 0.20	inches mm
CSRF1206	0.122 ± 0.008 3.10 ± 0.20	0.061 ± 0.008 1.55 ± 0.20	0.031 ± 0.006 0.80 ± 0.15	0.020 ± 0.008 0.50 ± 0.20	0.022 ± 0.008 0.55 ± 0.20	inches mm
CSRF2512	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 ± 0.010 0.90 ± 0.25	0.043 ± 0.010 1.10 ± 0.25	inches mm

Mechanical Specifications – CSRF4320



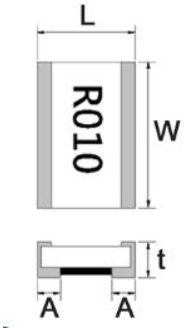
Type/Code	L Body Length	W Body Width	t Body Height	A Bottom Termination	Unit
CSRF4320	0.433 ± 0.008 11.00 ± 0.20	0.197 ± 0.008 5.00 ± 0.20	0.026 ± 0.008 0.65 ± 0.20	0.093 ± 0.012 2.36 ± 0.30	inches mm

Mechanical Specifications – CSRF2010



Type/Code	L Body Length	W Body Width	H Body Height	A Bottom Termination	Unit
CSRF2010 <0.005Ω	0.197 ± 0.008 5.00 ± 0.20	0.098 ± 0.008 2.50 ± 0.20	0.030 ± 0.008 0.75 ± 0.20	0.063 ± 0.008 1.60 ± 0.20	inches mm
CSRF2010 ≥0.005Ω	0.197 ± 0.008 5.00 ± 0.20	0.098 ± 0.008 2.50 ± 0.20	0.030 ± 0.008 0.75 ± 0.20	0.024 ± 0.008 0.60 ± 0.20	inches mm

Mechanical Specifications – CSRF0612

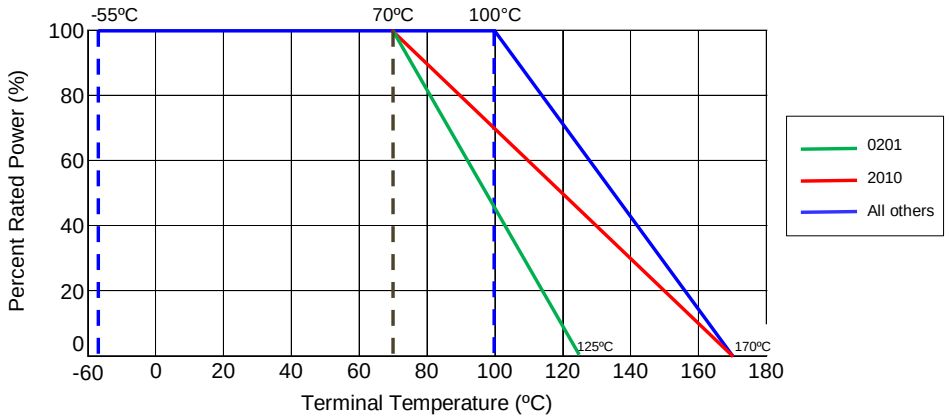


Type/Code	L Body Length	W Body Width	t Body Height	A Bottom Termination	Unit
CSRF0612	0.063 ± 0.008 1.60 ± 0.20	0.126 ± 0.008 3.20 ± 0.20	0.024 ± 0.008 0.60 ± 0.20	0.012 ± 0.008 0.30 ± 0.20	inches mm

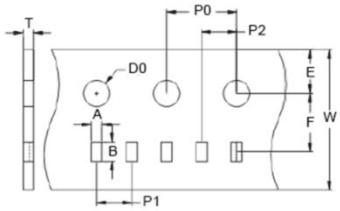
Performance Characteristics				
Test	Test Method	Test Specification	Typical	Test Condition
Load Life	MIL-STD-202F-Method 108A	±1%	≤ 0.5%	RCWV at 70°C; 1.5 hour ON; 0.5 hour. OFF Total 1024 ± 24 hours
Resistance to Soldering Heat	MIL-STD-202F-Method 210E	±1%	≤ 0.3%	260 ± 5°C for 10 ± 1 seconds
Solderability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

Storage Conditions:
Temperature: 5~35°C. Humidity: 40~75%

Power Derating Curve:



Taping Specifications – Paper Tape

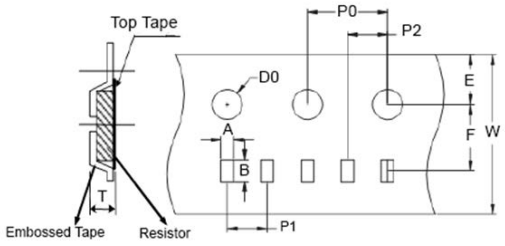


Type/Code	A	B	E	F	W	Unit
CSRF0201	0.017 ± 0.002 0.42 ± 0.05	0.028 ± 0.002 0.72 ± 0.05	0.069 ± 0.004 1.75 ± 0.10	0.138 ± 0.002 3.50 ± 0.05	0.315 ± 0.012 8.00 ± 0.30	Inches mm
CSRF0402	0.028 ± 0.002 0.70 ± 0.05	0.047 ± 0.002 1.20 ± 0.05	0.069 ± 0.004 1.75 ± 0.10	0.138 ± 0.002 3.50 ± 0.05	0.315 ± 0.008 8.00 ± 0.20	Inches mm
CSRF0603	0.043 ± 0.004 1.10 ± 0.10	0.075 ± 0.004 1.90 ± 0.10	0.069 ± 0.004 1.75 ± 0.10	0.138 ± 0.002 3.50 ± 0.05	0.315 ± 0.008 8.00 ± 0.20	Inches mm
CSRF0805	0.063 ± 0.004 1.60 ± 0.10	0.094 ± 0.004 2.40 ± 0.10	0.069 ± 0.004 1.75 ± 0.10	0.138 ± 0.002 3.50 ± 0.05	0.315 ± 0.008 8.00 ± 0.20	Inches mm
CSRF1206	0.079 ± 0.004 2.00 ± 0.10	0.142 ± 0.004 3.60 ± 0.10	0.069 ± 0.004 1.75 ± 0.10	0.138 ± 0.002 3.50 ± 0.05	0.315 ± 0.008 8.00 ± 0.20	Inches mm
CSRF0612	0.079 ± 0.004 2.00 ± 0.10	0.142 ± 0.004 3.60 ± 0.10	0.069 ± 0.004 1.75 ± 0.10	0.138 ± 0.002 3.50 ± 0.05	0.315 ± 0.008 8.00 ± 0.20	Inches mm

Taping Specifications – Paper Tape (cont.)

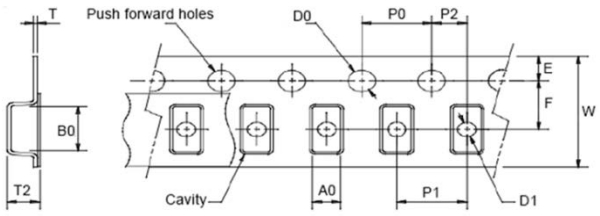
Type/Code	P0	P1	P2	D0	T	Unit
CSRF0201	0.157 ± 0.004 4.00 ± 0.10	0.079 ± 0.004 2.00 ± 0.10	0.079 ± 0.002 2.00 ± 0.05	0.061 ± 0.002 1.55 ± 0.05	0.016 ± 0.004 0.40 ± 0.10	Inches mm
CSRF0402	0.157 ± 0.004 4.00 ± 0.10	0.079 ± 0.004 2.00 ± 0.10	0.079 ± 0.002 2.00 ± 0.05	0.061 ± 0.002 1.55 ± 0.05	0.024 ± 0.004 0.60 ± 0.10	Inches mm
CSRF0603	0.157 ± 0.004 4.00 ± 0.10	0.157 ± 0.004 4.00 ± 0.10	0.079 ± 0.002 2.00 ± 0.05	0.061 ± 0.002 1.55 ± 0.05	0.028 ± 0.004 0.70 ± 0.10	Inches mm
CSRF0805	0.157 ± 0.004 4.00 ± 0.10	0.157 ± 0.004 4.00 ± 0.10	0.079 ± 0.002 2.00 ± 0.05	0.061 ± 0.002 1.55 ± 0.05	0.038 ± 0.004 0.97 ± 0.10	Inches mm
CSRF1206	0.157 ± 0.004 4.00 ± 0.10	0.157 ± 0.004 4.00 ± 0.10	0.079 ± 0.002 2.00 ± 0.05	0.061 ± 0.002 1.55 ± 0.05	0.038 ± 0.004 0.97 ± 0.10	Inches mm
CSRF0612	0.157 ± 0.004 4.00 ± 0.10	0.157 ± 0.004 4.00 ± 0.10	0.079 ± 0.002 2.00 ± 0.05	0.061 ± 0.002 1.55 ± 0.05	0.038 ± 0.004 0.97 ± 0.10	Inches mm

Taping Specifications – Embossed Plastic Tape



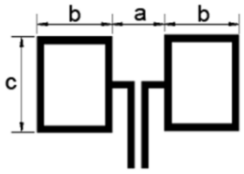
Type/Code	A	B	E	F	W	Unit
CSRF2010	0.110 ± 0.006 2.80 ± 0.15	0.217 ± 0.006 5.50 ± 0.15	0.069 ± 0.004 1.75 ± 0.10	0.217 ± 0.002 5.50 ± 0.05	0.472 ± 0.012 12.00 ± 0.30	Inches mm
CSRF2512	0.138 ± 0.004 3.50 ± 0.10	0.268 ± 0.004 6.80 ± 0.10	0.069 ± 0.004 1.75 ± 0.10	0.217 ± 0.002 5.50 ± 0.05	0.472 ± 0.008 12.00 ± 0.20	Inches mm
Type/Code	P0	P1	P2	D0	T	Unit
CSRF2010	0.157 ± 0.004 4.00 ± 0.10	0.157 ± 0.004 4.00 ± 0.10	0.079 ± 0.002 2.00 ± 0.05	0.059 ± 0.004 1.50 ± 0.10	0.033 ± 0.008 0.84 ± 0.20	Inches mm
CSRF2512	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 1.50 ± 0.10	0.039 ± 0.008 1.00 ± 0.20	Inches mm

Taping Specifications – Embossed Plastic Tape



Type/Code	A	B	E	F	W	P0	Unit
CSRF4320	0.211 ± 0.004 5.36 ± 0.10	0.462 ± 0.004 11.74 ± 0.10	0.069 ± 0.004 1.75 ± 0.10	0.453 ± 0.004 11.50 ± 0.10	0.945 ± 0.012 24.00 ± 0.30	0.157 ± 0.004 4.00 ± 0.10	Inches mm
Type/Code	P1	P2	D0	D1	T1	T2	Unit
CSRF4320	0.315 ± 0.004 8.00 ± 0.10	0.079 ± 0.004 2.00 ± 0.10	0.059 ± 0.004 1.50 ± 0.10	0.059 ± 0.010 1.50 ± 0.25	0.013 ± 0.004 0.33 ± 0.10	0.077 ± 0.004 1.96 ± 0.10	Inches mm

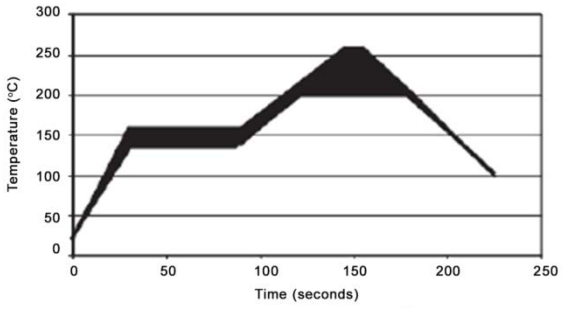
Recommended Pad Layouts



Size	a	b	c	Unit
CSRF0201	0.012 0.30	0.014 0.35	0.016 0.40	inches mm
CSRF0402 0.0025 - 0.004Ω	0.008 0.20	0.031 0.80	0.024 0.60	inches mm
CSRF0402 0.005Ω - 0.007Ω	0.012 0.30	0.024 0.60	0.024 0.60	inches mm
CSRF0402 0.008Ω - 0.02Ω	0.020 0.50	0.020 0.50	0.024 0.60	inches mm
CSRF0603 0.0025	0.014 0.35	0.031 0.80	0.039 1.00	inches mm
CSRF0603 0.003 - 0.004	0.014 0.35	0.043 1.10	0.039 1.00	inches mm
CSRF0603 0.005 - 0.009	0.024 0.60	0.035 0.90	0.039 1.00	inches mm
CSRF0603 0.01 - 0.03	0.035 0.90	0.028 0.70	0.039 1.00	inches mm
CSRF0805	0.047 1.20	0.047 1.20	0.055 1.40	inches mm
CSRF1206	0.087 2.20	0.051 1.30	0.071 1.80	inches mm
CSRF0612	0.024 0.60	0.051 1.30	0.142 3.60	inches mm
CSRF2010 0.003Ω - 0.009Ω	0.063 1.60	0.093 2.35	0.114 2.90	inches mm
CSRF2010 0.01Ω - 0.1Ω	0.106 2.70	0.071 1.80	0.114 2.90	inches mm
CSRF2512	0.150 3.80	0.083 2.10	0.134 3.40	inches mm
CSRF4320	0.157 4.00	0.197 5.00	0.276 7.00	inches mm

Soldering Recommendations:

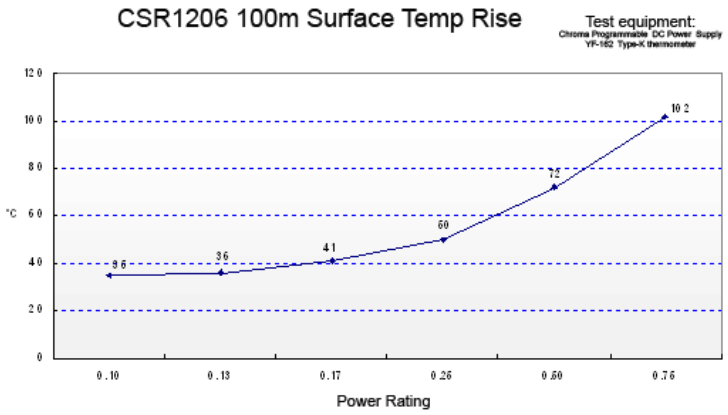
- Peak reflow temperatures and durations:
  - IR Reflow Peak = 260°C max for 10 seconds
  - Wave Solder = 260°C max for 10 seconds
- Compatible with lead and lead-free solder reflow process
- Recommended IR Reflow Profile:



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 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 ≤ 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 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)
CSRF	Foil on Ceramic Current Sensing Surface Mount Chip Resistor	SMD	YES	100% Matte Sn over Ni	Jul-04	04/27

"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	17
C	S	R	F	0	4	0	2	F	T	8	L	0	0	-	H	P

Product Series

Code	Description
CSRF	Foil / Ceramic

Size

Code	Power
0201	0.1W
0201(HP)	0.25W
0402	0.125W
0402(HP)	0.25W
0603	0.25W
0603(HP)	0.5W
0805	0.5W
1206	1W
0612	1.5W
2010	1W
2512	2W
4320	5W

Tolerance

Code	Tol
F	1%
J	5%

Packaging

Code	Description	Size	Quantity
T	7" Reel Paper Tape	0201	15,000
		0402	10,000
		0603, 0805 0612, 1206	5,000
	Embossed Plastic Tape	2010	4,000
		2512	2,000
		4320	1,000

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
0.01 ohm = 10L0
0.1 ohm = R100

Special

Code	Description
-HP	High Power