

- Features:
- High power rating – up to 5W
 - 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



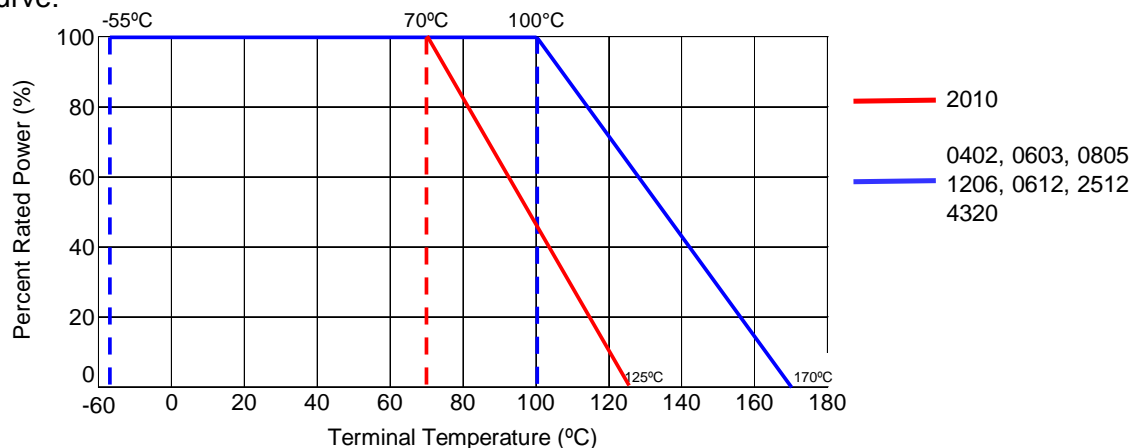
Electrical Specifications			
Type / Code	Power Rating (Watts)	Resistance Temperature Coefficient	Ohmic Range (Ω) and Tolerance
			1% and 5%
CSRF0402 ⁽²⁾	0.125W	±300 ppm/°C	0.003 - 0.007
		±200 ppm/°C	0.008 - 0.02
		±100 ppm/°C	0.05
CSRF0402...-HP ⁽²⁾	0.25W	±300 ppm/°C	0.003 - 0.007
		±200 ppm/°C	0.008 - 0.02
		±100 ppm/°C	0.05
CSRF0603 ⁽²⁾	0.25W	±150 ppm/°C	0.0025 - 0.009
		±75 ppm/°C	0.01 - 0.02
CSRF0603...-HP ⁽²⁾	0.5W	±200 ppm/°C	0.0025 - 0.009
		±75 ppm/°C	0.01 - 0.03
CSRF0805 ⁽²⁾	0.5W	±100 ppm/°C	0.005 - 0.01
		±50 ppm/°C	0.011 - 0.03
CSRF1206 ⁽²⁾	1W	±100 ppm/°C	0.005 - 0.01
		±50 ppm/°C	0.011 - 0.05
CSRF0612	1.5W	±100 ppm/°C	0.003 - 0.004
		±75 ppm/°C	0.005 - 0.029
CSRF2010 ⁽¹⁾	1W	±100 ppm/°C	0.005, 0.006, 0.007, 0.008, 0.009, 0.01
CSRF2512 ⁽²⁾	2W	±100 ppm/°C	0.001 - 0.01
		±50 ppm/°C	0.011 - 0.6
CSRF4320	5W	±50 ppm/°C	0.01 - 0.02

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

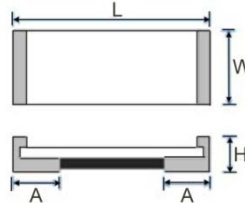
(2) Qualified to AEC-Q200

Please refer to the High Power Resistor Application Note (page 6) for more information on designing and implementing high power resistor types.

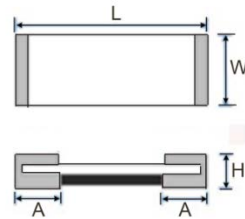
Power Derating Curve:



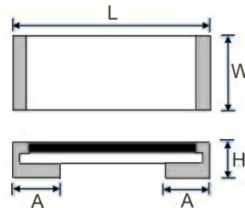
Mechanical Specifications



Type / Code	L Body Length	W Body Width	H 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 - 0.05Ω	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
CSRF0603	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
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

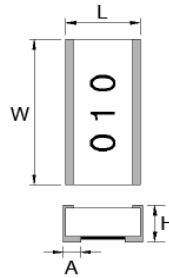


Type / Code	L Body Length	W Body Width	H Body Height	A Bottom Termination	Unit
CSRF0805	0.083 ± 0.008 2.10 ± 0.20	0.051 ± 0.006 1.30 ± 0.15	0.028 ± 0.006 0.70 ± 0.15	0.018 ± 0.008 0.45 ± 0.20	inches mm
CSRF1206	0.122 ± 0.008 3.10 ± 0.20	0.061 ± 0.008 1.55 ± 0.20	0.028 ± 0.006 0.70 ± 0.15	0.022 ± 0.008 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	0.043 ± 0.010 1.10 ± 0.25	inches mm



Type / Code	L Body Length	W Body Width	H Body Height	A Bottom Termination	Unit
CSRF2010 0.0005Ω	0.197 ± 0.008 5.00 ± 0.20	0.098 ± 0.008 2.50 ± 0.20	0.041 ± 0.006 1.05 ± 0.15	0.039 ± 0.006 1.00 ± 0.15	inches mm
CSRF2010 >0.0005Ω	0.197 ± 0.008 5.00 ± 0.20	0.098 ± 0.008 2.50 ± 0.20	0.031 ± 0.006 0.80 ± 0.15	0.039 ± 0.006 1.00 ± 0.15	inches mm

Mechanical Specifications



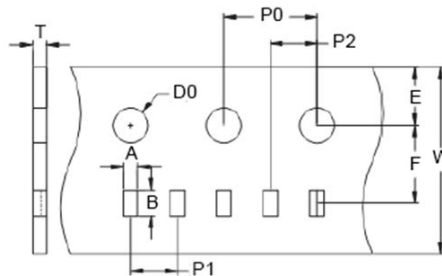
Type / Code	L Body Length	W Body Width	H Body Height	A Bottom Termination	Unit
CSRF0612	0.063 ± 0.008	0.126 ± 0.008	0.024 ± 0.008	0.012 ± 0.008	inches
	1.60 ± 0.20	3.20 ± 0.20	0.60 ± 0.20	0.30 ± 0.20	mm

Performance Characteristics

Test	Test Method	Test Specification	Typical
Load Life	MIL-STD-202F-Method 108A RCWV at 70°C; 1.5 h. ON; 0.5 h. OFF Total 1024 ± 24 hours	±1%	≤ 0.5%
Resistance to Soldering Heat	MIL-STD-202F-Method 210E 260 ± 5°C for 10 ± 1 seconds	±1%	≤ 0.3%
Solderability	MIL-STD-202F-Method 208H 245 ± 5°C for 2 ± 0.5 seconds	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 seconds	±1%	≤ 0.3%
High Temperature Exposure	125°C: 1000 hours	±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

Packaging Specifications

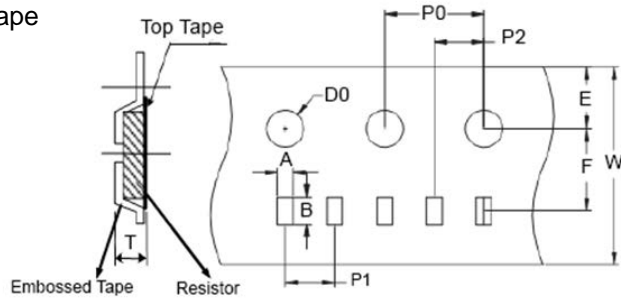
Paper Tape:



Type / Code	A	B	E	F	W	P0	P1	P2	D0	T	Unit
CSRF0402	0.028 ± 0.002	0.047 ± 0.002	0.069 ± 0.004	0.138 ± 0.002	0.315 ± 0.008	0.157 ± 0.004	0.079 ± 0.004	0.079 ± 0.002	0.061 ± 0.002	0.024 ± 0.004	Inches
	0.70 ± 0.05	1.20 ± 0.05	1.75 ± 0.10	3.50 ± 0.05	8.00 ± 0.20	4.00 ± 0.10	2.00 ± 0.10	2.00 ± 0.05	1.55 ± 0.05	0.60 ± 0.10	mm
CSRF0603	0.043 ± 0.004	0.075 ± 0.004	0.069 ± 0.004	0.138 ± 0.002	0.315 ± 0.008	0.157 ± 0.004	0.157 ± 0.004	0.079 ± 0.002	0.061 ± 0.002	0.028 ± 0.004	Inches
	1.10 ± 0.10	1.90 ± 0.10	1.75 ± 0.10	3.50 ± 0.05	8.00 ± 0.20	4.00 ± 0.10	4.00 ± 0.10	2.00 ± 0.05	1.55 ± 0.05	0.70 ± 0.10	mm
CSRF0805	0.063 ± 0.004	0.094 ± 0.004	0.069 ± 0.004	0.138 ± 0.002	0.315 ± 0.008	0.157 ± 0.004	0.157 ± 0.004	0.079 ± 0.002	0.061 ± 0.002	0.038 ± 0.004	Inches
	1.60 ± 0.10	2.40 ± 0.10	1.75 ± 0.10	3.50 ± 0.05	8.00 ± 0.20	4.00 ± 0.10	4.00 ± 0.10	2.00 ± 0.05	1.55 ± 0.05	0.97 ± 0.10	mm
CSRF1206	0.079 ± 0.004	0.142 ± 0.004	0.069 ± 0.004	0.138 ± 0.002	0.315 ± 0.008	0.157 ± 0.004	0.157 ± 0.004	0.079 ± 0.002	0.061 ± 0.002	0.038 ± 0.004	Inches
	2.00 ± 0.10	3.60 ± 0.10	1.75 ± 0.10	3.50 ± 0.05	8.00 ± 0.20	4.00 ± 0.10	4.00 ± 0.10	2.00 ± 0.05	1.55 ± 0.05	0.97 ± 0.10	mm

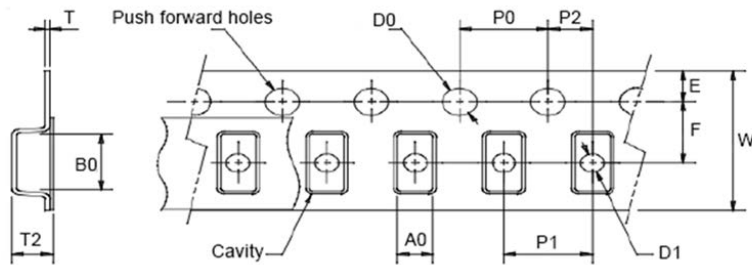
Packaging Specifications

Embossed Plastic Tape



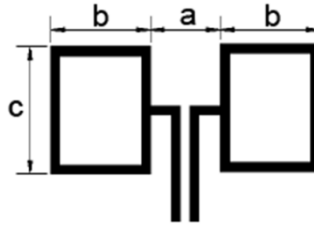
Type / Code	A	B	E	F	W	P0	P1	P2	D0	T	Unit
CSRF2512	0.138 ± 0.004	0.268 ± 0.004	0.069 ± 0.004	0.217 ± 0.002	0.472 ± 0.008	0.157 ± 0.002	0.157 ± 0.004	0.079 ± 0.002	0.059 ± 0.004	0.039 ± 0.008	Inches
	3.50 ± 0.10	6.80 ± 0.10	1.75 ± 0.10	5.50 ± 0.05	12.00 ± 0.20	4.00 ± 0.05	4.00 ± 0.10	2.00 ± 0.05	1.50 ± 0.10	1.00 ± 0.20	mm
CSRF2010	0.110 ± 0.004	0.211 ± 0.004	0.069 ± 0.004	0.217 ± 0.002	0.472 ± 0.012	0.157 ± 0.004	0.157 ± 0.004	0.079 ± 0.002	0.059 ± 0.004	0.039 ± 0.008	Inches
	2.80 ± 0.10	5.35 ± 0.10	1.75 ± 0.10	5.50 ± 0.05	12.00 ± 0.30	4.00 ± 0.10	4.00 ± 0.10	2.00 ± 0.05	1.50 ± 0.10	1.00 ± 0.20	mm

Embossed Plastic Tape



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

Solder Land Pattern



SIZE	a	b	c	Unit
0402 0.003Ω - 0.004Ω	0.008	0.031	0.024	inches
	0.20	0.80	0.60	mm
0402 0.005Ω - 0.007Ω	0.012	0.024	0.024	inches
	0.30	0.60	0.60	mm
0402 0.008Ω - 0.05Ω	0.020	0.020	0.024	inches
	0.50	0.50	0.60	mm
0603	0.035	0.028	0.039	inches
	0.90	0.70	1.00	mm
0805	0.047	0.047	0.055	inches
	1.20	1.20	1.40	mm
1206	0.087	0.051	0.071	inches
	2.20	1.30	1.80	mm
0612	0.024	0.051	0.142	inches
	0.60	1.30	3.60	mm
2010	0.118	0.061	0.120	inches
	3.00	1.56	3.05	mm
2512	0.150	0.083	0.134	inches
	3.80	2.10	3.40	mm
4320	0.157	0.197	0.276	inches
	4.00	5.00	7.00	mm

How to Order

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
C	S	R	F	0	4	0	2	F	T	8	L	0	0	-	H P

<table border="1"> <tr><th colspan="2">Product Series</th></tr> <tr><td>CSRF</td><td>Foil / Ceramic</td></tr> </table>	Product Series		CSRF	Foil / Ceramic	<table border="1"> <tr><th>Size</th><th>Power</th></tr> <tr><td>0402</td><td>0.125W</td></tr> <tr><td>0402 HP</td><td>0.25W</td></tr> <tr><td>0603</td><td>0.25W</td></tr> <tr><td>0603 HP</td><td>0.5W</td></tr> <tr><td>0805</td><td>0.5W</td></tr> <tr><td>1206</td><td>1W</td></tr> <tr><td>0612</td><td>1.5W</td></tr> <tr><td>2010</td><td>1W</td></tr> <tr><td>2512</td><td>2W</td></tr> <tr><td>4320</td><td>5W</td></tr> </table>	Size	Power	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	<table border="1"> <tr><th colspan="2">Tolerance</th></tr> <tr><th>Code</th><th>Tol</th></tr> <tr><td>F</td><td>1%</td></tr> <tr><td>J</td><td>5%</td></tr> </table>	Tolerance		Code	Tol	F	1%	J	5%	<table border="1"> <tr><th colspan="4">Packaging</th></tr> <tr><th>Code</th><th>Description</th><th>Size</th><th>Quantity</th></tr> <tr><td rowspan="5">T</td><td rowspan="3">7" Reel Paper Tape</td><td>0402</td><td>10,000</td></tr> <tr><td>0603, 0805</td><td rowspan="2">5,000</td></tr> <tr><td>0612</td></tr> <tr><td rowspan="2">Embossed Plastic Tape</td><td>1206</td><td>5,000</td></tr> <tr><td>2010, 2512</td><td>2,000</td></tr> <tr><td>4320</td><td>1,000</td></tr> </table>	Packaging				Code	Description	Size	Quantity	T	7" Reel Paper Tape	0402	10,000	0603, 0805	5,000	0612	Embossed Plastic Tape	1206	5,000	2010, 2512	2,000	4320	1,000	<table border="1"> <tr><th colspan="2">Resistance Value</th></tr> <tr><td colspan="2">Four characters with the multiplier used as the decimal holder. "L" used as multiplier of 10⁻³ for any value under 0.1 ohm..</td></tr> <tr><td>0.005 ohm = 5L00</td><td></td></tr> <tr><td>0.01 ohm = 10L0</td><td></td></tr> <tr><td>0.1 ohm = R100</td><td></td></tr> </table>	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		<table border="1"> <tr><th colspan="2">Special</th></tr> <tr><th>Code</th><th>Description</th></tr> <tr><td>HP</td><td>High Power</td></tr> </table>	Special		Code	Description	HP	High Power
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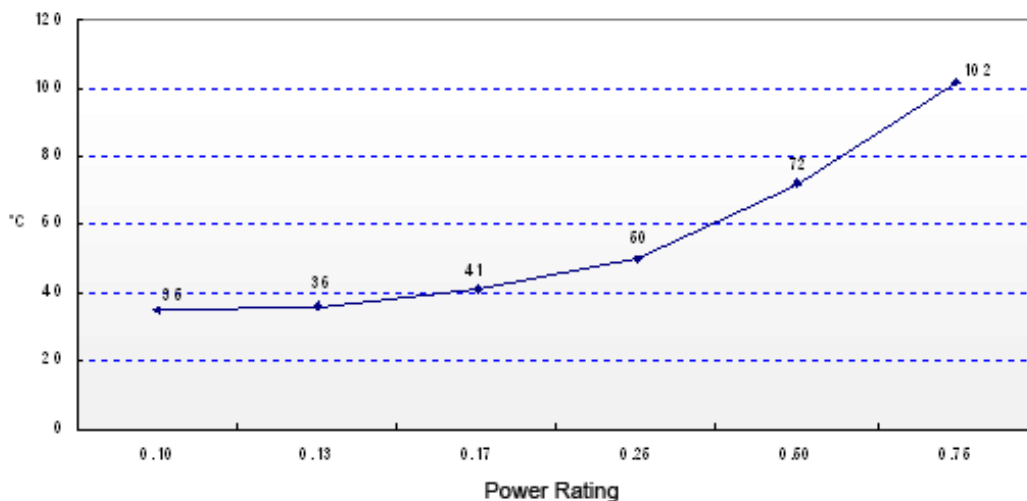
High Power Chip Resistors and Thermal Management

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 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.

CSR1206 100m Surface Temp Rise

Test equipment:
Chroma Programmable DC Power Supply
YF-162 Type-K thermometer



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, 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 m Ω . This should be taken into account when designing.