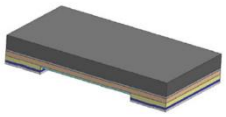
Features:

- High temperature performance up to 225°C (for operation up to 275ºC, contact Stackpole)
- Low thermal EMF (< 1µ V/C) typically
- RoHS compliant, REACH compliant, lead free, and halogen free
- AEC-Q200 compliant



Electrical Specifications

Type/Code	Maximum Power Rating (W)	TCR (ppm/ºC)	Ohmic Range (Ω) and Tolerance		
			0.5%	1%	5%
CSS0201	0.2	± 200	-	0.01, 0.02	-
CSS0402	0.33	± 150	-	0.0025	-
		± 100	-	0.005, 0.006, 0.008, 0.01, 0.015, 0.02	-
CSS0603	0.33	± 150	-	0.002	-
		± 100	-	0.0025, 0.003, 0.004, 0.005	-
		± 75	-	0.01, 0.015, 0.02	-
CSS0508	1	± 150	-	0.001, 0.0015	-
		± 100		0.002, 0.003, 0.004, 0.005	
CSS0805	0.5	± 100	-	0.0015	-
		± 75	-	0.002, 0.003, 0.004, 0.005	-
		± 50	-	0.006, 0.007, 0.01, 0.015, 0.02	-
CSSH0805	1	± 100	-	0.0005	
		± 75	-	0.001 - 0.002	
		± 50	0.007 - 0.013	0.0025 - 0.013	
CSS1206	1	± 175	-	0.0005 - 0.0006	
		± 75	0.005 - 0.006	-	
		± 50	-	0.001 - 0.004	
		± 25	0.007 - 0.015	0.005 - 0.015	
		± 15	0.016 - 0.05	0.016 - 0.05	
CSSH1206	2	± 75	0.005	0.001 - 0.005	
CSS2010	1	± 100	-	0.0005 - 0.0009	
		± 50	-	0.001 - 0.003	
		± 25	0.007 - 0.015	0.004 - 0.006	
		± 15	0.016 - 0.049	0.007 - 0.1	
CSSH2010	2	± 100	-	0.0005 - 0.0009	
		± 75	-	0.001 - 0.0019	
		± 50	-	0.002 - 0.0069	
		± 25	0.007 - 0.012	0.007 - 0.012	
CSS2512	2	± 150	-	0.0003	
		± 75	0.001	-	
		± 50	0.0011 - 0.003	0.0005 - 0.003	
		± 25	0.0031 - 0.0069	0.004 - 0.006 0.08 - 0.5	
		± 15	0.007 - 0.05	0.007 - 0.075	
CSSH2512	3	± 150	-	0.0003	
		± 75	0.001	-	
		± 50	0.0011 - 0.0025	0.0005 - 0.0025	
			0.011 - 0.05	0.011 - 0.1	
		± 25	0.003 - 0.01	0.003 - 0.01	

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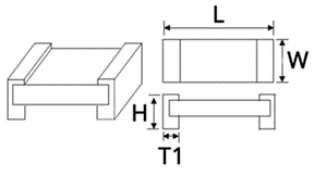
Electrical Specifications (cont.)

Type/Code	Maximum Power Rating (W)	TCR (ppm/ºC)	Ohmic Range (Ω) and Tolerance		
			0.5%	1%	5%
CSS2725	4	± 100	-	0.0002	
		± 50	-	0.00025 - 0.003	
CSS2728	3	± 25	0.004 - 0.007	0.004 - 0.007 0.101 - 0.2	
		± 15	0.008 - 0.019	0.008 - 0.1	
CSSH2728	4	± 25	0.004 - 0.007	0.004 - 0.007	
		± 15	0.008 - 0.019	0.008 - 0.05	
CSSH3637	7	± 100	-	0.0003	
CSS4527	5	± 50	0.007 - 0.12	0.0005 - 0.2	

$V = \sqrt{(P*R)}$

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

Mechanical Specifications



Type/Code	Maximum Power Rating (W)	Resistance Range (Ω)	L	W	H	T1	Unit
CSS0201	0.2	0.01, 0.02	0.024 ± 0.006 0.60 ± 0.15	0.012 ± 0.006 0.30 ± 0.15	0.010 ± 0.004 0.25 ± 0.10	0.006 ± 0.004 0.15 ± 0.10	inches mm
CSS0402	0.33	0.0025	0.039 ± 0.006 1.00 ± 0.15	0.022 ± 0.006 0.55 ± 0.15	0.012 ± 0.004 0.30 ± 0.10	0.012 ± 0.004 0.30 ± 0.10	inches mm
		0.005 - 0.02				0.009 ± 0.004 0.23 ± 0.10	inches mm
CSS0603	0.33	0.002	0.063 ± 0.010 1.60 ± 0.25	0.031 ± 0.010 0.80 ± 0.25	0.016 ± 0.010 0.40 ± 0.25	0.018 ± 0.008 0.45 ± 0.20	inches mm
		0.0025, 0.003				0.014 ± 0.008 0.35 ± 0.20	inches mm
		0.004 - 0.02				0.012 ± 0.008 0.30 ± 0.20	inches mm
CSS0508	1	0.001	0.049 ± 0.010 1.25 ± 0.25	0.079 ± 0.010 2.00 ± 0.25	0.017 ± 0.006 0.42 ± 0.15	0.015 ± 0.010 0.38 ± 0.25	inches mm
		0.0015				0.015 ± 0.010 0.37 ± 0.25	inches mm
		0.002				0.014 ± 0.010 0.36 ± 0.25	inches mm
		0.003 - 0.005				0.013 ± 0.010 0.32 ± 0.25	inches mm
CSS0805	0.5	0.0015	0.079 ± 0.010 2.00 ± 0.25	0.049 ± 0.010 1.25 ± 0.25	0.016 ± 0.010 0.40 ± 0.25	0.028 ± 0.008 0.70 ± 0.20	inches mm
		0.002				0.024 ± 0.008 0.60 ± 0.20	inches mm
		0.003 - 0.02				0.016 ± 0.008 0.40 ± 0.20	inches mm

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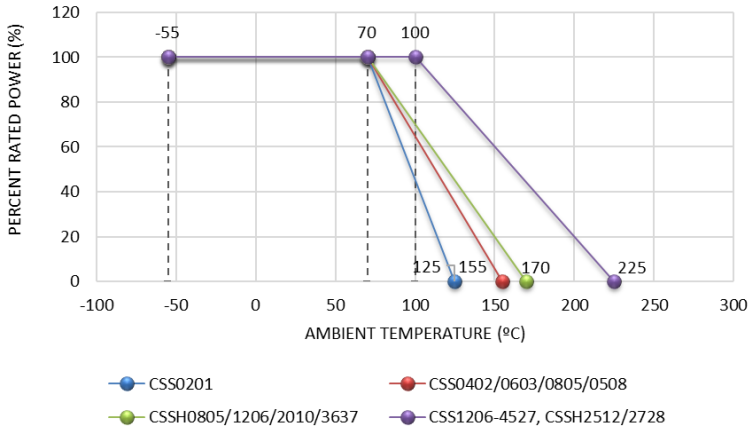
Mechanical Specifications (cont.)							
Type/Code	Maximum Power Rating (W)	Resistance Range (Ω)	L	W	H	T1	Unit
CSSH0805	1	0.0005	0.081 ± 0.010 2.05 ± 0.25	0.051 ± 0.012 1.30 ± 0.30	0.024 ± 0.008 0.60 ± 0.20	0.030 ± 0.008 0.75 ± 0.20	inches mm
		0.001			0.022 ± 0.008 0.55 ± 0.20	0.016 ± 0.008 0.40 ± 0.20	inches mm
		0.0015			0.018 ± 0.008 0.45 ± 0.20		inches mm
		0.002			0.014 ± 0.008 0.35 ± 0.20		inches mm
		0.0025			0.018 ± 0.008 0.45 ± 0.20		inches mm
		0.003 - 0.008			0.014 ± 0.008 0.35 ± 0.20		inches mm
		0.009 - 0.013			0.015 ± 0.008 0.37 ± 0.20		inches mm
CSS1206	1	0.0005 - 0.0006	0.126 ± 0.010 3.20 ± 0.25	0.063 ± 0.010 1.60 ± 0.25	0.039 ± 0.010 1.00 ± 0.25	0.029 ± 0.010 0.73 ± 0.25	inches mm
		0.001 - 0.0015			0.025 ± 0.010 0.65 ± 0.25	0.020 ± 0.010 0.51 ± 0.25	inches mm
		0.002 - 0.004			0.022 ± 0.010 0.55 ± 0.25	0.020 ± 0.010 0.51 ± 0.25	inches mm
		0.005			0.022 ± 0.010 0.55 ± 0.25	0.024 ± 0.010 0.60 ± 0.25	inches mm
		0.006 - 0.05			0.022 ± 0.010 0.55 ± 0.25	0.020 ± 0.010 0.51 ± 0.25	inches mm
CSSH1206	2	0.001	0.126 ± 0.010 3.20 ± 0.25	0.063 ± 0.010 1.60 ± 0.25	0.025 ± 0.010 0.65 ± 0.25	0.020 ± 0.010 0.51 ± 0.25	inches mm
		0.002 - 0.004			0.021 ± 0.010 0.55 ± 0.25	0.020 ± 0.010 0.51 ± 0.25	inches mm
		0.005			0.021 ± 0.010 0.55 ± 0.25	0.024 ± 0.010 0.60 ± 0.25	inches mm
CSS2010	1	0.0005 - 0.0009	0.200 ± 0.010 5.08 ± 0.25	0.100 ± 0.010 2.54 ± 0.25	0.031 ± 0.010 0.79 ± 0.25	0.057 ± 0.010 1.44 ± 0.25	inches mm
		0.001 - 0.003			0.031 ± 0.010 0.79 ± 0.25	0.051 ± 0.010 1.30 ± 0.25	inches mm
		0.0031 - 0.1			0.025 ± 0.010 0.65 ± 0.25	0.031 ± 0.010 0.79 ± 0.25	inches mm
CSSH2010	2	0.0005 - 0.0009	0.200 ± 0.010 5.08 ± 0.25	0.100 ± 0.010 2.54 ± 0.25	0.031 ± 0.010 0.79 ± 0.25	0.057 ± 0.010 1.44 ± 0.25	inches mm
		0.001 - 0.003			0.031 ± 0.010 0.79 ± 0.25	0.051 ± 0.010 1.30 ± 0.25	inches mm
		0.0031 - 0.004			0.025 ± 0.010 0.65 ± 0.25	0.031 ± 0.010 0.79 ± 0.25	inches mm
		0.0041 - 0.012			0.025 ± 0.010 0.65 ± 0.25	0.031 ± 0.010 0.79 ± 0.25	inches mm
CSS2512	2	0.0003	0.246 ± 0.010 6.25 ± 0.25	0.126 ± 0.010 3.20 ± 0.25	0.039 ± 0.010 1.00 ± 0.25	0.080 ± 0.010 2.02 ± 0.25	inches mm
		0.0005 - 0.0007			0.031 ± 0.010 0.79 ± 0.25	0.080 ± 0.010 2.02 ± 0.25	inches mm
		0.00075			0.031 ± 0.010 0.79 ± 0.25	0.054 ± 0.010 1.37 ± 0.25	inches mm
		0.0008 - 0.004			0.031 ± 0.010 0.79 ± 0.25	0.074 ± 0.010 1.88 ± 0.25	inches mm
		0.0041 - 0.075			0.026 ± 0.010 0.65 ± 0.25	0.044 ± 0.010 1.12 ± 0.25	inches mm
		0.08 - 0.1			0.026 ± 0.010 0.65 ± 0.25	0.025 ± 0.010 0.62 ± 0.25	inches mm
		0.3 - 0.5			0.028 ± 0.010 0.72 ± 0.25	0.034 ± 0.010 0.87 ± 0.25	inches mm

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Mechanical Specifications (cont.)							
Type/Code	Maximum Power Rating (W)	Resistance Range (Ω)	L	W	H	T1	Unit
CSSH2512	3	0.0003	0.246 ± 0.010 6.25 ± 0.25	0.126 ± 0.010 3.20 ± 0.25	0.039 ± 0.010 1.00 ± 0.25	0.080 ± 0.010 2.02 ± 0.25	inches mm
		0.0005			0.031 ± 0.010 0.79 ± 0.25	0.080 ± 0.010 2.02 ± 0.25	inches mm
		0.0006 - 0.0007				0.074 ± 0.010 1.88 ± 0.25	inches mm
		0.00075				0.054 ± 0.010 1.37 ± 0.25	inches mm
		0.0008 - 0.0029				0.044 ± 0.010 1.12 ± 0.25	inches mm
		0.003 - 0.0035				0.074 ± 0.010 1.88 ± 0.25	inches mm
		0.0036 - 0.004				0.066 ± 0.010 1.68 ± 0.25	inches mm
		0.0041 - 0.01			0.026 ± 0.010 0.65 ± 0.25	0.044 ± 0.010 1.12 ± 0.25	inches mm
CSS2725	4	0.0002 - 0.0003	0.268 ± 0.010 6.81 ± 0.25	0.254 ± 0.010 6.45 ± 0.25	0.039 ± 0.010 0.99 ± 0.25	0.085 ± 0.010 2.16 ± 0.25	inches mm
		0.00035				0.075 ± 0.010 1.90 ± 0.25	inches mm
		0.0004 - 0.00045				0.051 ± 0.010 1.30 ± 0.25	inches mm
		0.0005				0.085 ± 0.010 2.16 ± 0.25	inches mm
		0.0006				0.071 ± 0.010 1.80 ± 0.25	inches mm
		0.00075				0.059 ± 0.010 1.50 ± 0.25	inches mm
		0.001			0.043 ± 0.010 1.09 ± 0.25	0.085 ± 0.010 2.16 ± 0.25	inches mm
		0.0015			0.039 ± 0.010 0.99 ± 0.25	0.085 ± 0.010 2.16 ± 0.25	inches mm
		0.002			0.035 ± 0.010 0.89 ± 0.25	0.071 ± 0.010 1.80 ± 0.25	inches mm
		0.00225 - 0.0025				0.065 ± 0.010 1.65 ± 0.25	inches mm
		0.003				0.051 ± 0.010 1.30 ± 0.25	inches mm
CSS2728	3	0.004 - 0.2	0.264 ± 0.010 6.71 ± 0.25	0.283 ± 0.010 7.19 ± 0.25	0.039 ± 0.010 0.99 ± 0.25	0.045 ± 0.010 1.14 ± 0.25	inches mm
CSSH2728	4	0.004 - 0.05	0.264 ± 0.010 6.71 ± 0.25	0.283 ± 0.010 7.19 ± 0.25	0.039 ± 0.010 0.99 ± 0.25	0.045 ± 0.010 1.14 ± 0.25	inches mm
CSSH3637	7	0.0003	0.360 ± 0.010 9.14 ± 0.25	0.378 ± 0.010 9.60 ± 0.25	0.029 ± 0.010 0.73 ± 0.25	0.091 ± 0.010 2.30 ± 0.25	inches mm
CSS4527	5	0.0005	0.450 ± 0.010 11.43 ± 0.25	0.270 ± 0.010 6.85 ± 0.25	0.059 ± 0.010 1.50 ± 0.25	0.137 ± 0.010 3.47 ± 0.25	inches mm
		0.0006 - 0.003				0.127 ± 0.010 3.22 ± 0.25	inches mm
		0.004 - 0.005				0.127 ± 0.010 3.22 ± 0.25	inches mm
		0.0051 - 0.2				0.072 ± 0.010 1.82 ± 0.25	inches mm

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Power Derating Curve:



Performance Characteristics

Test	Test Method	Test Specification	Test Condition
Temperature Coefficient of Resistance (TCR)	JIS-C-5201-1 4.8	Per specification (refer to Electrical Specification table)	TCR (ppm/ºC) $= \frac{(R2 - R1)}{R1\ (T2 - T1)} \times 10^6$ R1: resistance of room temperature (T1) R2: resistance of 125ºC (T2)
Short Time Overload	JIS C 5201-1 4.13	See table below	The number of rated power are as follows: (see table below) Rating power duration: 5 seconds.

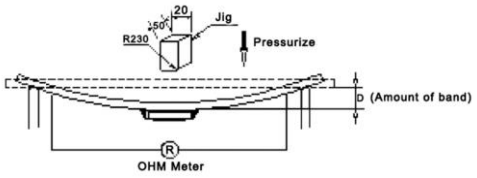
Size	Power (W)	Max. R Change
CSS0201	0.2	≤ ± 0.5%
CSS0402	0.33	± 1% + 0.5mΩ
CSS0603	0.33	± 1% + 0.5mΩ
CSS0508	1	± 1% + 0.5mΩ
CSS0805	0.5	± 1% + 0.5mΩ
CSSH0805	1	≤ ± 1%
CSS1206	1	≤ ± 0.5%
CSSH1206	2	≤ ± 0.5%
CSS2010	1	≤ ± 0.5%
CSSH2010	2	≤ ± 0.5%
CSS2512	2	≤ ± 0.5%
CSSH2512	3	≤ ± 0.5%
CSS2725	4	≤ ± 0.5%
CSS2728	3	≤ ± 0.5%
CSSH2728	4	≤ ± 0.5%
CSSH3637	7	≤ 0.5% + 0.5mΩ
CSS4527	5	≤ ± 2%

Size	Power (W)	Rated Power
CSS0201	0.2	2.5 times
CSS0402	0.33	2.5 times
CSS0603	0.33	2.5 times
CSS0508	1	2.5 times
CSS0805	0.5	2.5 times
CSSH0805	1	4 times
CSS1206	1	5 times
CSSH1206	2	5 times
CSS2010	1	5 times
CSSH2010	2	5 times
CSS2512	2	5 times
CSSH2512	3	5 times
CSS2725	4	5 times
CSS2728	3	5 times
CSSH2728	4	5 times
CSSH3637	7	5 times
CSS4527	5	5 times

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Performance Characteristics (cont.)			
Test	Test Method	Test Specification	Test Condition
Insulation Resistance	JIS-C-5201-1 4.6	≥ 10^9 Ω	Put the resistor in the fixture, add 100 VDC in terminal for 60 seconds, then measure the insulation resistance between electrodes and insulating enclosure or between electrodes and base material
Dielectric Withstanding Voltage	JIS-C-5201-1 4.7	No short or burned in the appearance.	Applied 500 VAC for 1 minute and limit surge current 50 mA (max)

Operating Temperature Range for size CSS0201 is -55°C to +125°C.
Operating Temperature Range for sizes CSS0402, CSS0603, CSS0805, and CSS0508 is -55°C to +155°C.
Operating Temperature Range for size CSSH0805, CSSH1206, CSSH2010, and CSSH3637 is -55°C to +170°C.
Operating Temperature Range for sizes CSS1206 - CSS4527, CSSH 2512 and CSSH 2728 is -55°C to +225°C.

Mechanical Performance			
Test Item	Test Method	Test Specifications	Test Condition
Resistance to Solder Heat	JIS C 5201-1 4.18	0201 - 0805 ≤ ± 1% + 0.5mΩ CSSH0805 and above 1206 ≤ ± 0.5% + 0.5mΩ CSSH3637 ≤ ± 0.5% + 0.5mΩ Jumper < Rmax	260 ± 5°C for 10 ± 1 seconds
Solderability	JIS C 5201-1 4.17	> 95 % coverage	245 ± 5°C for 3 ± 0.5 seconds
Substrate Bending	JIS C 5201-1 4.33	± 1% + 0.5mΩ CSSH3637 ≤ ± 0.5% + 0.5mΩ	Span between fulcrums: 90 mm Bend width: 2 mm 
Resistance to Solvent	JIS C 5201-1 4.29	≤ ± 0.5% No evidence of mechanical damage	The tested resistor is immersed into isopropyl alcohol of 20 ~ 25°C for 60 seconds, then the resistor is left in the room for 48 hours.
Vibration	JIS C 5201-1 4.22	≤ ± 0.5% No evidence of mechanical damage	The resistor shall be mounted by its terminal leads to the supporting terminals on the solid table. The entire frequency range from 10 Hz to 55 Hz and return to 10 Hz, shall be transferred in 1 minute. Amplitude: 1.5 mm - This motion shall be applied for a period of 4 hours in each 3 mutually perpendicular directions (a total of 12 hours)
Mechanical Shock	JIS C 5202 6.7	± 1% + 0.5mΩ	a = 50 G, t = 11 ms, 5 times shock

Environmental Performance			
Test Item	Test Method	Test Specifications	Test Condition
Low Temperature Exposure (Storage)	JIS C 5201-1 4.23.4	0201 - 0805 ≤ ± 1% + 0.5mΩ ≥ 1206 = ± 0.5%	1000 hours at -55°C ± 2°C
High Temperature Exposure (Storage)	JIS C 5201-1 4.23.2	0201 - 0805 ≤ ± 1% + 0.5mΩ	1000 hours at + 155°C ± 2°C
		CSSH0805 = ± 1% CSSH3637 ≤ ± 1% + 0.5mΩ ≥ 1206 = ± 1%	1000 hours at +170°C ± 5°C
		0201 Jumper < Rmax	1000 hours at + 125°C ± 2°C

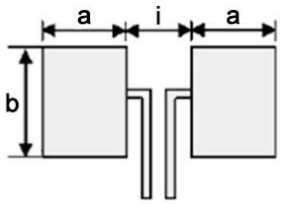
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Environmental Performance (cont.)

Test Item	Test Method	Test Specifications	Test Condition
Temperature Cycling	JIS C 5201-1 4.19	0201 - 0805 ≤ ± 1% + 0.5mΩ	0201 = -55°C to +125°C, 100 cycles 0402 - 0805 = -55°C +155°C, 100 cycles
		CSSH0805 = ± 0.5% CSSH3637 ≤ ± 0.5% + 0.5mΩ	-55°C to +150°C, 100 cycles
		≥ 1206 = ± 0.5%	Lowest temperature: -55 +0/-10°C Highest temperature: 150 + 10/-0°C
Biased Humidity	JIS C 5201-1 4.24	0201 - 0805 ≤ ± 2% + 0.5mΩ 0201 Jumper < R max	T = 40 ± 2°C , RH = 90~95%, Load with Rated Current 1.5 hours "ON", 0.5 hours "OFF", 1000 hours
		CSSH0805 = ± 0.5% CSSH3637 ≤ ± 0.5% + 0.5mΩ ≥ 1206 = ± 0.5%	1000 hours at +85°C / 85% R.H., 10% of operating power 1.5 hours "ON" and 0.5 hours "OFF
Load Life	JIS C 5201-1 4.25	0201 - 0805 ≤ ± 2% + 0.5mΩ 0201 Jumper = R max CSSH0805 = ± 1% CSSH3637 ≤ ± 1% + 0.5mΩ 1206 - 2728 = ± 1% 4527 = ± 2%	T = 70 ± 2°C, load with Rated Current 1.5 hours "ON", 0.5 hours "OFF", 1000 hours
Whisker Test	JESD Standard No.22A121 class 2	Max 50 μm	Test item (Thermal Shock Test): Testing Condition Minimum Storage Temperature: -55 +0 / -10°C Maximum Storage Temperature: 85 + 10 / -0°C Temperature-Retaining Time: 10 minutes Number of Temperature Cycles: 1500 Inspection: Inspect for whisker formation on specimens that underwent the acceleration test, with a magnifier (stereo microscope) of about 40 or higher magnification. If judgement is difficult with this method, use a scanning electron microscope (SEM) of about 1000 or higher magnification.

Recommended storage temperature: 25 ± 5°C. Humidity: 60 ± 20%.

Recommended Pad Layouts



Type/Code	Maximum Power Rating (W)	Resistance Range (Ω)	a	b	i	Unit
CSS0201	0.2	0.01, 0.02	0.008 0.20	0.013 0.33	0.010 0.25	inches mm
CSS0402	0.33	0.0025	0.024 0.60	0.024 0.60	0.014 0.35	inches mm
		0.005 - 0.02			0.016 0.40	inches mm
CSS0603	0.33	0.002	0.056 1.41	0.036 0.92	0.015 0.38	inches mm
		0.0025, 0.003	0.053 1.35	0.036 0.92	0.020 0.50	inches mm
		0.004 - 0.02	0.051 1.30		0.024 0.60	inches mm

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Recommended Pad Layouts (cont.)						
Type/Code	Maximum Power Rating (W)	Resistance Range (Ω)	a	b	i	Unit
CSS0508	1	0.001, 0.0015, 0.002	0.035 0.90	0.091 2.30	0.016 0.40	inches mm
		0.003 - 0.005	0.033 0.85		0.020 0.50	inches mm
CSS0805	0.5	0.0015, 0.002	0.061 1.55	0.057 1.44	0.020 0.50	inches mm
		0.003 - 0.02	0.055 1.40		0.031 0.80	inches mm
CSSH0805	1	0.0005	0.053 1.35	0.071 1.80	0.012 0.30	inches mm
		0.001 - 0.013	0.039 1.00		0.039 1.00	inches mm
CSS1206	1	0.0005 - 0.0006	0.065 1.65	0.086 2.18	0.035 0.90	inches mm
		0.001 - 0.05	0.063 1.60	0.086 2.18	0.039 1.00	inches mm
CSSH1206	2	0.001 - 0.005	0.063 1.60	0.086 2.18	0.039 1.00	inches mm
CSS2010	1	0.0005 - 0.003	0.114 2.89	0.115 2.92	0.048 1.22	inches mm
		0.0031 - 0.1	0.090 2.29		0.095 2.41	inches mm
CSSH2010	2	0.0005 - 0.003	0.114 2.89	0.115 2.92	0.048 1.22	inches mm
		0.0031 - 0.012	0.090 2.29		0.095 2.41	inches mm
CSS2512	2	0.0003 - 0.0007	0.120 3.05	0.145 3.68	0.050 1.27	inches mm
		0.00075	0.086 2.19	0.145 3.68	0.118 3.00	inches mm
		0.0008 - 0.004	0.120 3.05	0.145 3.68	0.050 1.27	inches mm
		0.00041 - 0.075	0.083 2.11	0.145 3.68	0.125 3.18	inches mm
		0.08 - 0.1	0.083 2.11	0.145 3.68	0.125 3.18	inches mm
		0.3 - 0.5	0.083 2.11	0.145 3.68	0.125 3.18	inches mm
CSSH2512	3	0.0003 - 0.0005	0.120 3.05	0.145 3.68	0.050 1.27	inches mm
		0.0006 - 0.0029	0.086 2.19		0.118 3.00	inches mm
		0.003 - 0.004	0.110 2.79		0.071 1.80	inches mm
		0.0101 - 0.1	0.086 2.19		0.118 3.00	inches mm
CSS2725	4	0.0002 - 0.003	0.125 3.18	0.270 6.86	0.052 1.32	inches mm
CSS2728	3	0.004 - 0.2	0.108 2.75	0.308 7.82	0.138 3.51	inches mm

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Please confirm technical specifications before use.

Recommended Pad Layouts (cont.)						
Type/Code	Maximum Power Rating (W)	Resistance Range (Ω)	a	b	i	Unit
CSSH2728	4	0.004 - 0.1	0.108 2.75	0.308 7.82	0.138 3.51	inches mm
CSSH3637	7	0.0003	0.152 3.85	0.413 10.50	0.114 2.90	inches mm
CSS4527	5	0.0005 - 0.005	0.228 5.80	0.344 8.74	0.138 3.51	inches mm
		0.0051 - 0.2	0.163 4.15		0.268 6.81	inches mm

Recommended Solder Profiles

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 "*".

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

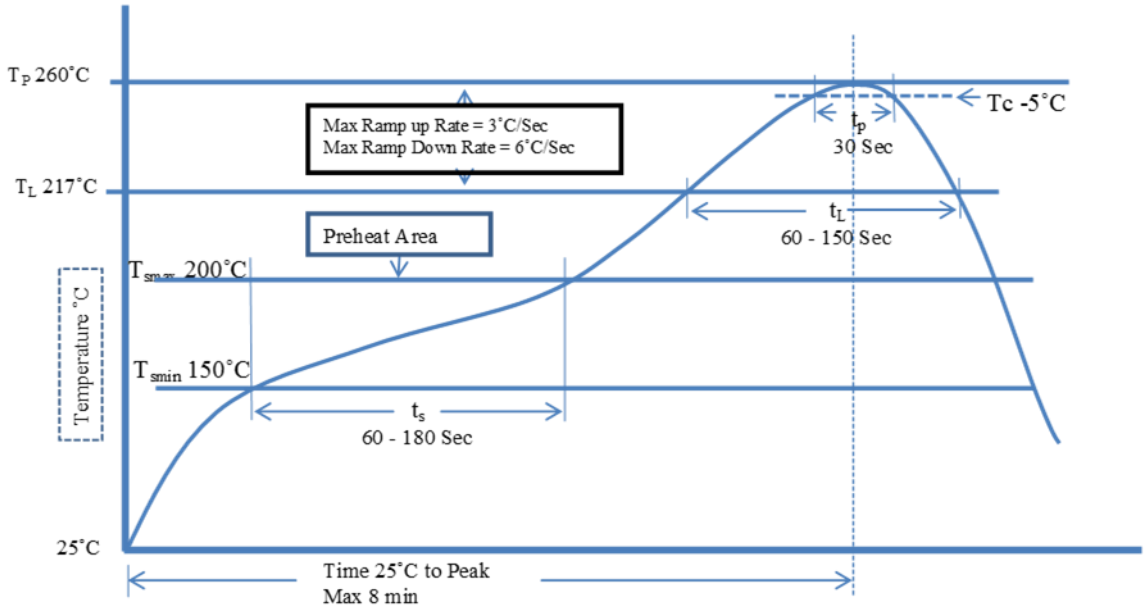
Wave Soldering			
Description	Maximum	Recommended	Minimum
Preheat Time	80 seconds	70 seconds	60 seconds
Temperature Diff.	140°C	120°C	100°C
Solder Temp.	260°C	250°C	240°C
Dwell Time at Max.	10 seconds	5 seconds	*
Ramp DN (°C/sec)	N/A	N/A	N/A

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

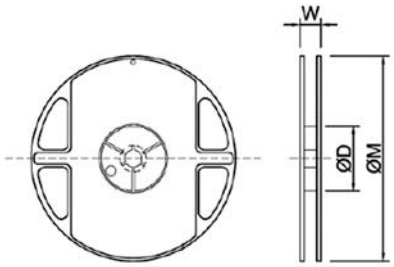
Convection IR Reflow			
Description	Maximum	Recommended	Minimum
Ramp Up (°C/sec)	3°C/sec	2°C/sec	*
Dwell Time > 217°C	150 seconds	90 seconds	60 seconds
Solder Temp.	260°C	245°C	*
Dwell Time at Max.	30 seconds	15 seconds	10 seconds
Ramp DN (°C/sec)	6°C/sec	3°C/sec	*

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Recommended Lead Free Resistor Reflow Profile



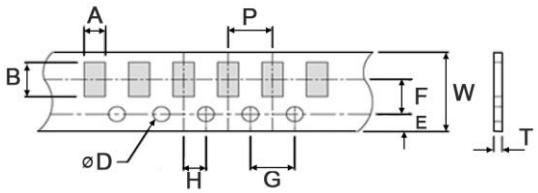
Reel Specifications



Type/Code	Tape Width	W	ØD	ØM	Unit
0201, 0402, 0603 0508, 0805,1206	8 mm	0.354 ± 0.020 9.00 ± 0.50	2.362 ± 0.079 60.00 ± 2.00	7.008 ± 0.197 178.00 ± 5.00	inches mm
CSSH0805	8 mm	0.472 ± 0.020 12.00 ± 0.50	2.362 ± 0.079 60.00 ± 2.00	7.008 ± 0.197 178.00 ± 5.00	inches mm
CSSH3637	16 mm	0.685 ± 0.039 17.40 ± 1.00	2.362 ± 0.039 60.00 ± 1.00	7.008 ± 0.079 178.00 ± 2.00	inches mm
2010, 2512, 2725, 2728	12 mm	0.543 ± 0.020 13.80 ± 0.50	3.150 ± 0.039 80.00 ± 1.00	7.008 ± 0.197 178.00 ± 5.00	inches mm
4527	24 mm	0.984 ± 0.039 25.00 ± 1.00	2.362 ± 0.039 60.00 ± 1.00	7.008 ± 0.197 178.00 ± 5.00	inches mm

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Paper Tape Specifications

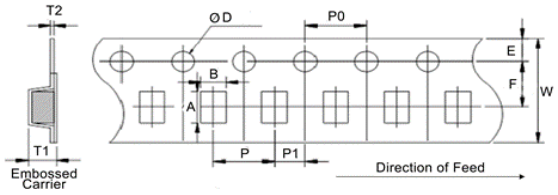


Type/Code	W	P	E	F	ØD	Unit
CSS0201	0.315 ± 0.012 8.00 ± 0.30	0.079 ± 0.004 2.00 ± 0.10	0.069 ± 0.004 1.75 ± 0.10	0.138 ± 0.004 3.50 ± 0.10	0.059 +0.004 / -0 1.50 +0.1 / -0	inches mm
CSS0402						inches mm
CSS0603		0.157 ± 0.004 4.00 ± 0.10				inches mm
CSS0508						inches mm
CSS0805						inches mm

Type/Code	G	H	A	B	T	Unit
CSS0201	0.157 ± 0.004 4.00 ± 0.10	0.079 ± 0.004 2.00 ± 0.10	0.016 ± 0.008 0.40 ± 0.20	0.028 ± 0.008 0.70 ± 0.20	0.018 ± 0.002 0.45 ± 0.05	inches mm
CSS0402			0.026 ± 0.008 0.65 ± 0.20	0.043 ± 0.008 1.10 ± 0.20	0.017 ± 0.002 0.42 ± 0.05	inches mm
CSS0603			0.039 ± 0.008 0.98 ± 0.20	0.073 ± 0.008 1.85 ± 0.20	0.024 ± 0.004 0.60 ± 0.10	inches mm
CSS0508			0.061 ± 0.008 1.55 ± 0.20	0.091 ± 0.008 2.30 ± 0.20	0.028 ± 0.008 0.70 ± 0.20	inches mm
CSS0805					0.030 ± 0.008 0.75 ± 0.20	inches mm

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Plastic Tape Specifications



Type/Code	A	B	W	E	F	T1	Unit
CSS1206/CSSH1206 (0.0005Ω - 0.0006Ω)	0.138 ± 0.004 3.50 ± 0.10	0.075 ± 0.004 1.90 ± 0.10	0.315 ± 0.006 8.00 ± 0.15	0.069 ± 0.004 1.75 ± 0.10	0.138 ± 0.004 3.50 ± 0.10	0.050 ± 0.004 1.27 ± 0.10	inches mm
CSS1206/CSSH1206 (≥ 0.001Ω)	0.137 ± 0.004 3.48 ± 0.10	0.072 ± 0.004 1.83 ± 0.10	0.315 ± 0.006 8.00 ± 0.15	0.069 ± 0.004 1.75 ± 0.10	0.138 ± 0.004 3.50 ± 0.10	0.043 ± 0.004 1.10 ± 0.10	inches mm
CSS2010/CSSH2010	0.215 ± 0.004 5.45 ± 0.10	0.114 ± 0.004 2.90 ± 0.10	0.472 ± 0.006 12.00 ± 0.15	0.069 ± 0.004 1.75 ± 0.10	0.217 ± 0.004 5.50 ± 0.10	0.052 ± 0.004 1.33 ± 0.10	inches mm
CSS2512/CSSH2512 (0.0003Ω)	0.265 ± 0.004 6.74 ± 0.10	0.138 ± 0.004 3.50 ± 0.10	0.472 ± 0.006 12.00 ± 0.15	0.069 ± 0.004 1.75 ± 0.10	0.217 ± 0.004 5.50 ± 0.10	0.063 ± 0.004 1.60 ± 0.10	inches mm
CSS2512/CSSH2512	0.266 ± 0.004 6.75 ± 0.10	0.138 ± 0.004 3.50 ± 0.10	0.472 ± 0.006 12.00 ± 0.15	0.069 ± 0.004 1.75 ± 0.10	0.217 ± 0.004 5.50 ± 0.10	0.051 ± 0.004 1.30 ± 0.10	inches mm
CSS2725	0.281 ± 0.004 7.15 ± 0.10	0.266 ± 0.004 6.75 ± 0.10	0.472 ± 0.006 12.00 ± 0.15	0.069 ± 0.004 1.75 ± 0.10	0.217 ± 0.004 5.50 ± 0.10	0.077 ± 0.004 1.95 ± 0.10	inches mm
CSS2728	0.281 ± 0.004 7.15 ± 0.10	0.303 ± 0.004 7.70 ± 0.10	0.472 ± 0.006 12.00 ± 0.15	0.069 ± 0.004 1.75 ± 0.10	0.217 ± 0.004 5.50 ± 0.10	0.057 ± 0.004 1.45 ± 0.10	inches mm
CSSH0805 0.0005Ω - 0.001Ω	0.096 ± 0.004 2.45 ± 0.10	0.067 ± 0.004 1.70 ± 0.10	0.315 ± 0.012 8.00 ± 0.30	0.069 ± 0.004 1.75 ± 0.10	0.138 ± 0.004 3.50 ± 0.10	0.035 ± 0.010 0.90 ± 0.25	inches mm
CSSH0805 0.0015Ω - 0.013Ω	0.096 ± 0.004 2.45 ± 0.10	0.067 ± 0.004 1.70 ± 0.10	0.315 ± 0.012 8.00 ± 0.30	0.069 ± 0.004 1.75 ± 0.10	0.138 ± 0.004 3.50 ± 0.10	0.022 ± 0.010 0.55 ± 0.25	inches mm
CSSH3637	0.394 ± 0.004 10.00 ± 0.10	0.378 ± 0.004 9.60 ± 0.10	0.630 ± 0.008 16.00 ± 0.20	0.069 ± 0.004 1.75 ± 0.10	0.295 ± 0.004 7.50 ± 0.10	0.051 ± 0.004 1.30 ± 0.10	inches mm
CSS4527	0.465 ± 0.004 11.80 ± 0.10	0.283 ± 0.004 7.20 ± 0.10	0.945 ± 0.006 24.00 ± 0.15	0.069 ± 0.004 1.75 ± 0.10	0.453 ± 0.004 11.50 ± 0.10	0.079 ± 0.004 2.00 ± 0.10	inches mm

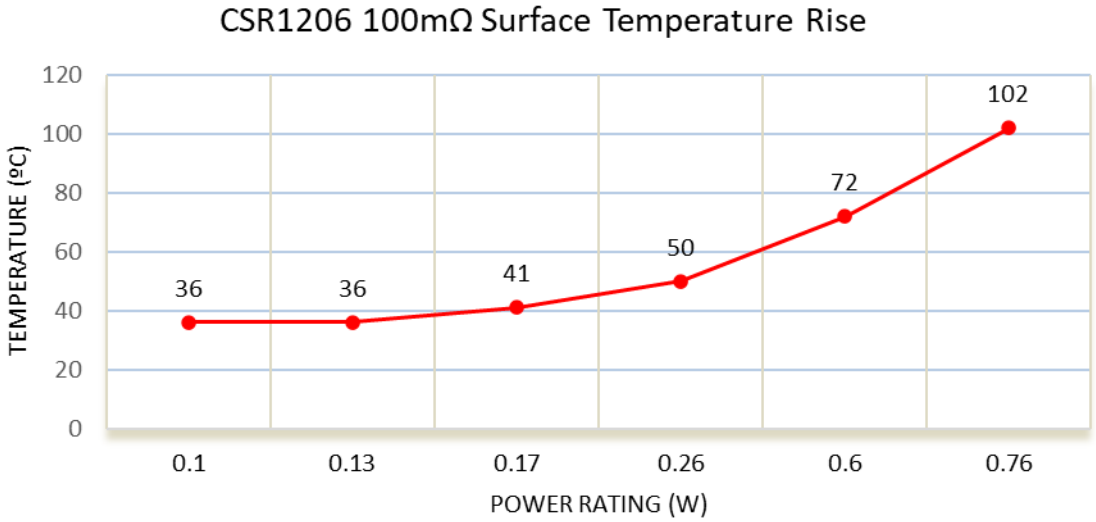
Type/Code	T2	P	P0	P1	ΦD	Unit
CSS1206/CSSH1206 (0.0005Ω - 0.0006Ω)	0.009 ± 0.004 0.23 ± 0.10	0.157 ± 0.004 4.00 ± 0.10	0.157 ± 0.004 4.00 ± 0.10	0.079 ± 0.004 2.00 ± 0.10	0.059 +0.004/-0 1.50 +0.10/-0	inches mm
CSS1206/CSSH1206 (≥ 0.001Ω)	0.008 ± 0.002 0.20 ± 0.05	0.157 ± 0.004 4.00 ± 0.10	0.157 ± 0.004 4.00 ± 0.10	0.079 ± 0.004 2.00 ± 0.10	0.059 +0.004/-0 1.50 +0.10/-0	inches mm
CSS2010/CSSH2010	0.009 ± 0.002 0.23 ± 0.05	0.157 ± 0.004 4.00 ± 0.10	0.157 ± 0.004 4.00 ± 0.10	0.079 ± 0.004 2.00 ± 0.10	0.059 +0.004/-0 1.50 +0.10/-0	inches mm
CSS2512/CSSH2512 (0.0003Ω)	0.009 ± 0.002 0.24 ± 0.05	0.315 ± 0.004 8.00 ± 0.10	0.157 ± 0.004 4.00 ± 0.10	0.079 ± 0.004 2.00 ± 0.10	0.059 +0.004/-0 1.50 +0.10/-0	inches mm
CSS2512/CSSH2512	0.008 ± 0.002 0.20 ± 0.05	0.157 ± 0.004 4.00 ± 0.10	0.157 ± 0.004 4.00 ± 0.10	0.079 ± 0.004 2.00 ± 0.10	0.059 +0.004/-0 1.50 +0.10/-0	inches mm
CSS2725	0.010 ± 0.002 0.25 ± 0.05	0.315 ± 0.004 8.00 ± 0.10	0.157 ± 0.004 4.00 ± 0.10	0.079 ± 0.004 2.00 ± 0.10	0.059 +0.004/-0 1.50 +0.10/-0	inches mm
CSS2728	0.010 ± 0.002 0.25 ± 0.05	0.472 ± 0.004 12.00 ± 0.10	0.157 ± 0.004 4.00 ± 0.10	0.079 ± 0.004 2.00 ± 0.10	0.059 +0.004/-0 1.50 +0.10/-0	inches mm
CSSH0805 0.0005Ω - 0.001Ω	0.008 ± 0.002 0.20 ± 0.05	0.157 ± 0.004 4.00 ± 0.10	0.157 ± 0.004 4.00 ± 0.10	0.079 ± 0.004 2.00 ± 0.10	0.059 +0.004/-0 1.50 +0.10/-0	inches mm
CSSH0805 0.0015Ω - 0.013Ω	0.008 ± 0.002 0.20 ± 0.05	0.157 ± 0.004 4.00 ± 0.10	0.157 ± 0.004 4.00 ± 0.10	0.079 ± 0.004 2.00 ± 0.10	0.059 +0.004/-0 1.50 +0.10/-0	inches mm
CSSH3637	0.010 ± 0.002 0.25 ± 0.05	0.472 ± 0.004 12.00 ± 0.10	0.157 ± 0.004 4.00 ± 0.10	0.079 ± 0.004 2.00 ± 0.10	0.059 +0.004/-0 1.50 +0.10/-0	inches mm
CSS4527	0.012 ± 0.004 0.30 ± 0.10	0.472 ± 0.004 12.00 ± 0.10	0.157 ± 0.004 4.00 ± 0.10	0.079 ± 0.004 2.00 ± 0.10	0.059 +0.004/-0 1.50 +0.10/-0	inches mm

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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.



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.

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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)
CSS	Ultra-Precision Current Sensing Chip Resistor	SMD	YES	100% Matte Sn over Ni	Always	Always
CSSH	Ultra-Precision Current Sensing Chip Resistor (High Power)	SMD	YES	100% Matte Sn over Ni	Always	Always

"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.

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How to Order

C	S	S	2	7	2	5	F	T	3	L	0	0

Product Series	
Code	Description
CSS	Metal Alloy
CSSH	High Power

Size
Size
0201
0402
0603
0805
0508
1206
2010
2512
2728
2725
3637
4527

Tolerance	
Code	Tol
D	0.5%
F	1%
G	2%
J	5%

Packaging			
Code	Description	Size	Quantity
T	7" Reel Paper Tape	0201, 0402	10000
		0603, 0508	5000
		0805	
	7" Reel Plastic Tape	1206 (≥0.001Ω)	4000
		1206 (0.0003 - 0.0006Ω) 2010, 2512 (>0.0003Ω)	2000
		2512 (0.0003Ω) 2725, 2728, 3637	1000
		4527	500

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.
0.00025 ohm = L250 0.004 ohm = 4L00 0.05 ohm = 50L0 0.12 ohm = R120

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