

Features:

- WWS offers miniature size at higher power rating
- High performance for low cost
- High power to size ratio
- MWW – completely molded construction with welded terminations
- Complete welded terminations
- Tinned copper leads
- Available in non-inductive styles
- High temperature silicone coating
- RoHS compliant
- Higher operating temperatures may be available. Contact factory.



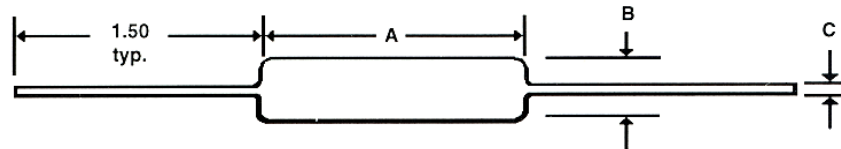
Electrical Specifications						
Type / Code	MIL-R-26 Ref.	Dielectric Strength (V)	Power Rating (Watts) @ 25°C	Resistance Temperature Coefficient	Ohmic Range(Ω) and Tolerance(1) 0.1%, 0.5%, 1% & 5%	
					Standard	Non-Inductive
WW12 / NWW12	-	500V	0.4W	< 1Ω = ±90ppm/°C	0.1 - 2K	0.1 - 1K
WW1 / NWW1	-	500V	1W		0.1 - 3K	0.1 - 1.5K
WW1A / NWW1A	RW-70	500V	1W		0.1 - 7K	0.1 - 3.5K
WW2 / NWW2	RW-69	1,000V	1.5W		0.1 - 10K	0.1 - 5K
WWS2 / NWS2	-	500V	2.5W		0.1 - 3K	0.1 - 1.5K
WW2A / NWW2A	-	1,000V	2.5W	1Ω to 10Ω = ±50ppm°C	0.1 - 15K	0.1 - 7.5K
WW3 / NWW3	RW-79	1,000V	3W		0.1 - 22K	0.1 - 11K
WWS3 / NWS3	RW-69	1,000V	3W		0.1 - 10K	0.1 - 5K
WW3A / NWW3A	-	1,000V	3W		0.1 - 30K	0.1 - 15K
WW4 / NWW4	-	1,000V	4W		0.1 - 40K	0.1 - 20K
WWS4 / NWS4	RW-79	1,000V	4W		0.1 - 22K	0.1 - 11K
WW5 / NWW5	RW-67, RW-74	1,000V	5W		0.1 - 50K	0.1 - 25K
WWS5 / NWS5	-	1,000V	5W		0.1 - 40K	0.1 - 20K
WW7 / NWW7	-	1,000V	6.5W		0.1 - 70K	0.1 - 35K
WWS7 / NWS7	RW-67, RW-74	1,000V	6.5W		0.1 - 50K	0.1 - 25K
WW7B / NWW7B	-	1,000V	7W	>10Ω = ±20ppm/°C	0.1 - 100K	0.1 - 50K
WW10 / NWW10	RW-78	1,000V	10W		0.1 - 150K	0.1 - 75K
WWS10 / NWS10	-	1,000V	10W		0.1 - 100K	0.1 - 50K
MWW1 / NMWW1	RW-70	1,000V	1W		0.1 - 2K	-
MWW3 / NMWW3	RW-79	1,000V	3W		0.1 - 20K	-
MWW5 / NMWW5	RW-67, RW-74	1,000V	5W		0.1 - 40K	-
MWW10 / NMWW10	RW-68, RW-74	1,000V	10W		0.1 - 150K	-

(1) Lesser of √PR or maximum working voltage

Please refer to the High Power Resistor Application Note (page 4) for more information on designing and implementing high power resistor types.

Performance Characteristics		
Test	Test Condition	Result
Moisture Resistance	1000 hours, 95% R.H., 40°C	1% max
Load Life	1000 hours, cycled power 1.5 hours ON, 0.5 hours OFF, 25°C	1%
Temperature Cycling	5 cycles, -55°C to 200°C	0.5%
Short Time Overload	5 times rated power for 5 seconds	1%

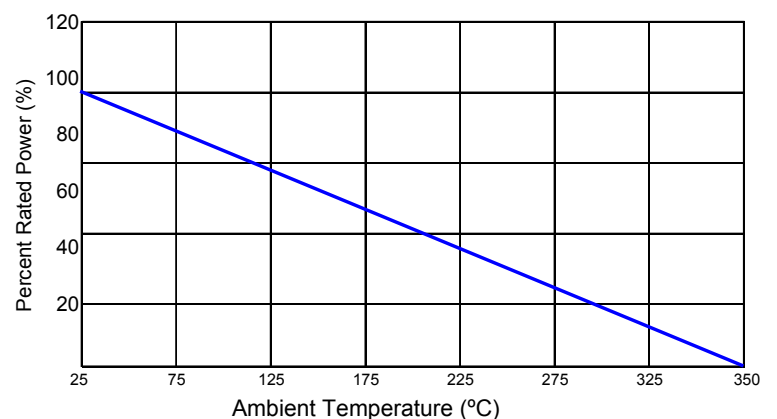
Operating Temperature Range: -55°C to +350°C



Mechanical Specifications				
Type / Code	A	B	C	Unit
WW12 / NWW12	0.312 ± 0.062	0.110 ± 0.031	0.025 ± 0.002	inches
	7.92 ± 1.57	2.79 ± 0.79	0.64 ± 0.05	mm
WW1, WWS2 / NWW1, NWWS2	0.375 ± 0.062	0.110 ± 0.031	0.025 ± 0.002	inches
	9.53 ± 1.57	2.79 ± 0.79	0.64 ± 0.05	mm
WW1A / NWW1A	0.420 ± 0.062	0.110 ± 0.031	0.025 ± 0.002	inches
	10.67 ± 1.57	2.79 ± 0.79	0.64 ± 0.05	mm
WW2, WWS3 / NWW2, NWWS3	0.370 ± 0.062	0.156 ± 0.031	0.032 ± 0.002	inches
	9.40 ± 1.57	3.96 ± 0.79	0.81 ± 0.05	mm
WW2A / NWW2A	0.550 ± 0.062	0.156 ± 0.031	0.032 ± 0.002	inches
	13.97 ± 1.57	3.96 ± 0.79	0.81 ± 0.05	mm
WW3, WWS4 / NWW3, NWWS4	0.560 ± 0.062	0.187 ± 0.031	0.032 ± 0.002	inches
	14.22 ± 1.57	4.75 ± 0.79	0.81 ± 0.05	mm
WW3A / NWW3A	0.500 ± 0.062	0.218 ± 0.031	0.032 ± 0.002	inches
	12.70 ± 1.57	5.54 ± 0.79	0.81 ± 0.05	mm
WW4, WWS5 / NWW4, NWWS5	0.700 ± 0.062	0.270 ± 0.031	0.036 ± 0.002	inches
	17.78 ± 1.57	6.86 ± 0.79	0.91 ± 0.05	mm
WW5, WWS7 / NWW5, NWWS7	0.875 ± 0.062	0.312 ± 0.031	0.036 ± 0.002	inches
	22.23 ± 1.57	7.92 ± 0.79	0.91 ± 0.05	mm
WW7 / NWW7	1.000 ± 0.062	0.312 ± 0.031	0.036 ± 0.002	inches
	25.40 ± 1.57	7.92 ± 0.79	0.91 ± 0.05	mm
WW7B, WWS10 / NWW7B, NWWS10	1.200 ± 0.062	0.312 ± 0.031	0.036 ± 0.002	inches
	30.48 ± 1.57	7.92 ± 0.79	0.91 ± 0.05	mm
WW10 / NWW10	1.780 ± 0.062	0.375 ± 0.031	0.040 ± 0.002 (1)	inches
	45.21 ± 1.57	9.53 ± 0.79	1.02 ± 0.05 (1)	mm
MWW1 / NMWW1	0.385 ± 0.062	0.135 ± 0.031	0.032 ± 0.002	inches
	9.78 ± 1.57	3.43 ± 0.79	0.81 ± 0.05	mm
MWW3 / NMWW3	0.560 ± 0.062	0.205 ± 0.031	0.032 ± 0.002	inches
	14.22 ± 1.57	5.21 ± 0.79	0.81 ± 0.05	mm
MWW5 / NMWW5	0.925 ± 0.062	0.330 ± 0.031	0.036 ± 0.002	inches
	23.50 ± 1.57	8.38 ± 0.79	0.91 ± 0.05	mm
MWW10 / NMWW10	1.965 ± 0.062	0.480 ± 0.031	0.040 ± 0.002	inches
	49.91 ± 1.57	12.19 ± 0.79	1.02 ± 0.05	mm

(1) Available in 0.036" / 0.91mm

Power Derating Curve:



How to Order

1		2		3		4		5		6		7		8		9	
W		W		1		F		T		1		K		0		0	
Product Series		Type/Code		Power Rating @ 25°C		Tolerance		Packaging				Resistance Value					
WW	Standard					Code	Tol	Code	Description	Size	Quantity	Four characters with the multiplier used as the decimal holder. 0.1 ohm = R100 2 Kohm = 2K00					
WWS	Mini	WW12 / NWW12		0.4W		B	0.1%	T	11" Tape and Reel	WW12 / NWW12 WW1 / NWW1 WWS2 / NWSWS2 WW1A / NWW1A MWW1 / NMWW1	2,500						
MWW	Molded	WW1 / NWW1		1W		D	0.5%			WW2 / NWW2 WWS3 / NWSWS3 WW2A / NWW2A WW3 / NWW3 WWS4 / NWSWS4 MWW3 / NMWW3	2,000						
NWW	Non-Inductive	WW1A / NWW1A		1W		F	1%			WW3A / NWW3A WW4 / NWW4 WWS5 / NWSWS5 WW5 / NWW5 WWS7 / NWSWS7 WW7 / NWW7 WW7B / NWW7B WWS10 / NWSWS10 MWW5 / NMWW5	500						
NWWS	Mini	WW2 / NWW2		1.5W		J	5%			WW10 / NWW10 MWW10 / NMWW10	250						
NWWS	Non-Inductive	WWS2 / NWWS2		2.5W													
		WW2A / NWWS2A		2.5W													
		WW3 / NWW3		3W													
		WWS3 / NWWS3		3W													
		WW3A / NWW3A		3W													
		WW4 / NWW4		4W													
		WWS4 / NWWS4		4W													
		WW5 / NWW5		5W													
		WWS5 / NWWS5		5W													
		WW7 / NWW7		6.5W													
		WWS7 / NWWS7		6.5W													
		WW7B / NWW7B		7W													
		WW10 / NWW10		10W													
		WWS10 / NWWS10		10W													
		MWW1 / NMWW1		1W													
		MWW3 / NMWW3		3W													
		MWW5 / NMWW5		5W													
		MWW10 / NMWW10		10W													

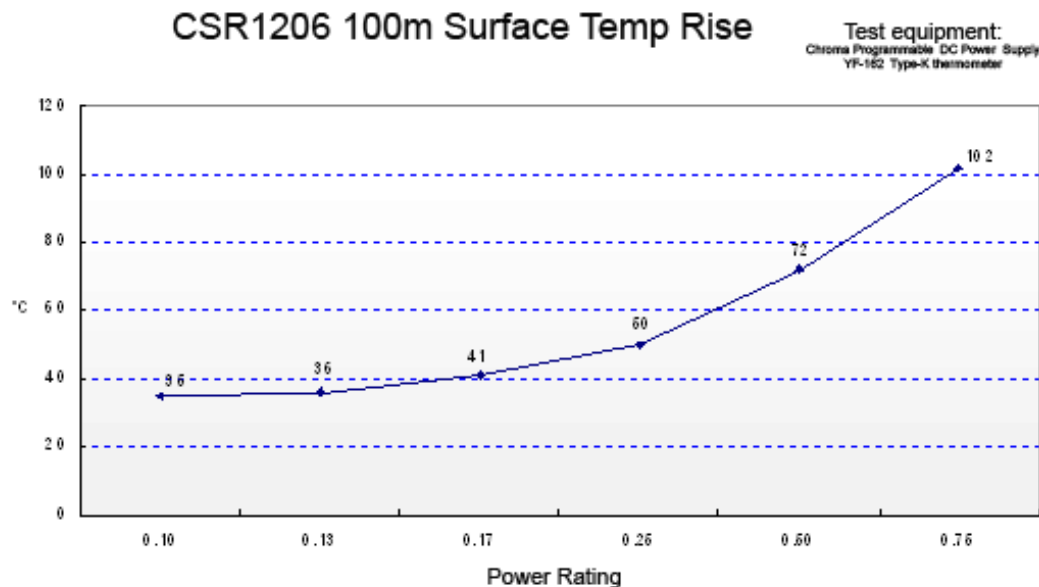
Legacy Part Number (before January 3, 2011):

SEI Type	Code	Nominal Resistance	Tolerance	Packaging			
WW	1	10K	1%	R			
Type	Description		Tolerance	Types	Qty	Description	Code
WW	Standard		0.1%	WW12, NWW12, WW1, NWW1, WWS2, NWWS2	2,500	11" reel tape	R
WWS	Mini		0.5%	WW1A, NWW1A, MWW1, NMWW1			
MWW	Molded		1%	WW2, NWW2, WWS3, NWWS3, WW2A, NWW2A	2,000		
NWW	Non-Inductive		5%	WW3, NWW3, WWS4, NWWS4, MWW3, NMWW3			
NWWS	Mini			WW3A, NWW3A, WW4, NWW4, WWS5, NWWS5	500		
	Non-Inductive			WW5, NWW5, WWS7, NWWS7, WW7, NWW7			
				WW7B, NWW7B, WWS10, NWWS10			
				MWW5, NMWW5			
				WW10, NWW10, MWW10, NMWW10	250		

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 degrees C for the CSS / CSSH series and 70 degrees 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 105C. 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 degrees C heat rise shown here would indicate there will be additional thermal reduction techniques needed to keep this part under 105C 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 degrees 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.