

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.



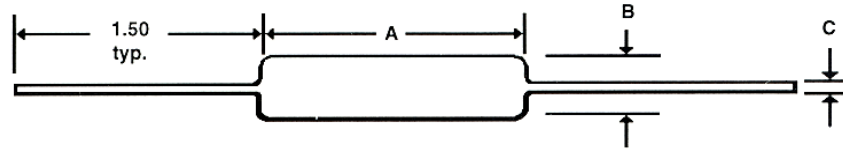
Electrical Specifications							
Type / Code	MIL-R-26 Ref.	Dielectric Strength (V)	Power Rating (Watts) @ 25°C	Resistance Temperature Coefficient	Ohmic Range(Ω) and Tolerance(1) 0.1%, 0.5%, 1% & 5%		
					Standard	Non-Inductive	
WW12 / NWW12	-	500V	0.4W	< 1Ω = ±90ppm/°C	0.1 - 2K	0.1 - 1K	
WW1 / NWW1	-	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		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	1Ω to 10Ω = ±50ppm°C	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		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		>10Ω = ±20ppm/°C	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%

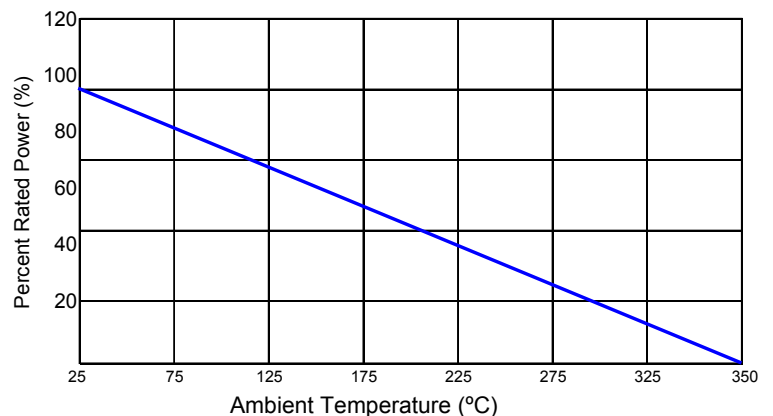
Operating Temperature Range: -55°C to +350°C



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 WW10 / NWW10 WWS10 / NWSWS10 MWW1 / NMWW1	500		
NWWS	Mini	WW2 / NWW2		1.5W	J	5%			WW4 / NWW4 WWS6 / NWSWS6 WW5A / NWW5A WW6 / NWW6 WWS8 / NWSWS8 WW8 / NWW8 WW8B / NWW8B WW11 / NWW11 WWS11 / NWSWS11 MWW2 / NMWW2	250		
	Non-Inductive	WWS2 / NWWS2		2.5W							WW10 / NWW10 MWW10 / NMWW10	
		WW2A / NW2A		2.5W								
		WW3 / NWW3		3W								
		WWS3 / NWSWS3		3W								
		WW3A / NWW3A		3W								
		WW4 / NWW4		4W								
		WWS4 / NWSWS4		4W								
		WW5 / NWW5		5W								
		WWS5 / NWSWS5		5W								
		WW7 / NWW7		6.5W								
		WWS7 / NWSWS7		6.5W								
		WW7B / NWW7B		7W								
		WW10 / NWW10		10W								
		WWS10 / NWSWS10		10W								
		MWW1 / NMWW1		1W								
		MWW3 / NMWW3		3W								
		MWW5 / NMWW5		5W								
		MWW10 / NMWW10		10W								

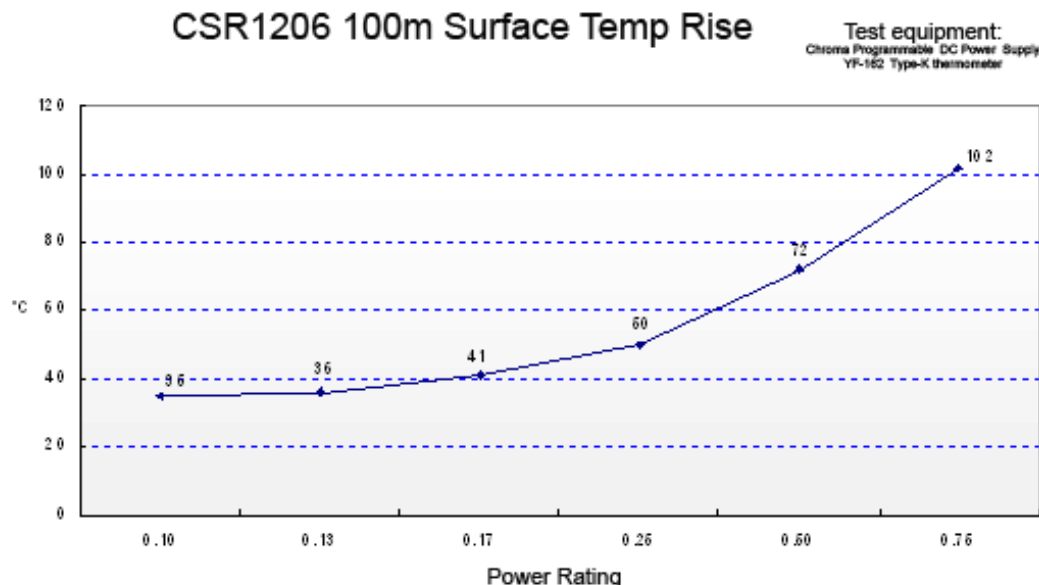
Legacy Part Number (before January 3, 2011):

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, NWWWS2	2,500	11" reel tape	R
WWS	Mini				0.5%	WW1A, NWW1A, MWW1, NMWW1			
MWW	Molded				1%	WW2, NWW2, WWS3, NWWWS3, WW2A, NWW2A	2,000		
NWW	Non-Inductive				5%	WW3, NWW3, WWS4, NWWWS4, MWW3, NMWW3			
NWWWS	Mini Non-Inductive					WW3A, NWW3A, WW4, NWW4, WWS5, NWWWS5	500		
						WW5, NWW5, WWS7, NWWWS7, WW7, NWW7		250	
						WW7B, NWW7B, WWS10, NWWWS10			
						MWW5, NMWW5			
						WW10, NWW10, MWW10, NMWW10			

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.