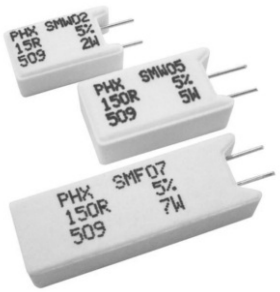
Wirewound/Metal Film Resistors, Commercial Power, Vertical Mount



FEATURES

- High power dissipation in small volume
- Ideal for pulsing applications
- Stand-up mounting saves space on PCB
- High heat and moisture resistance

Pb-free

e3

RoHS COMPLIANT

Please reference the Vishay Dale closest equivalents: CPCx or CPCC, CPCF High Volume (for CPCx datasheet please visit our website: http://www.vishay.com/doc?30218 and for CPCC, CPCF High Volume datasheet: http://www.vishay.com/doc?30116).

Note:

• There may be slight differences between the Vishay Phoenix and the Vishay Dale crosses

TECHNOLOGY

SMW: The resistor element is a resistive wire, which is wound in a single layer on a ceramic rod. Metal caps are pressed over the rod. The ends of the resistive wire and the leads are connected to the caps by welding.

SMF: The resistor element is a metal film resistor consisting of a metal layer deposited over a high-grade ceramic rod. Metal caps are pressed over the rod. The leads are connected to the caps by welding.

For both SMW and SMF, the resistor body and lead ends are housed within a rectangular ceramic case which is non-flammable, will not melt even at high overloads and is resistant to most commonly used cleaning solvents, in accordance with MIL-STD-202, method 215 and IEC 60 068-2-45. A special version with a thermal fuse for surge and inrush current protection is available upon request.

STANDARD ELECTRICAL SPECIFICATIONS

MODEL	POWER RATING $P_{70\,°C}$ W	RESISTANCE RANGE (1) Ω	TOLERANCE (2) %	E-SERIES Decade Values
SMW02	2	0.1 - 200	± 5	24
SMF02		220 - 47K		
SMW03	3	0.1 - 560		
SMF03		620 - 47K		
SMW05	5	0.1 - 560		
SMF05		620 - 47K		
SMW07	7 at 25 °C	0.1 - 1.5K		
SMF07		100 - 51K		
SMF10	10 at 25 °C	0.47 - 1.5K		

Notes:

(1) Special resistance values available upon request

(2) Other tolerances available upon request

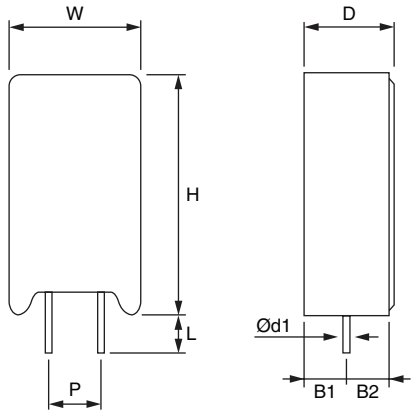
TECHNICAL SPECIFICATIONS

PARAMETER	UNIT	SMW	SMF02/ SMF03	SMF05	SMF07
Limiting Voltage	V	$\sqrt{P \times R}$	500	750	1000
Insulation Voltage	V	> 2000			
Temperature Coefficient (3)	ppm/°C	R < 10 Ω: 0 to + 600; R ≥ 10 Ω: - 80 to + 140	± 250		
Operating Temperature	°C	- 40 to + 200			
Short Time Overload	-	10 x rated power for 5 s			

Note:

(3) Temperature Coefficient of ± 20, 30, 50 or 90 ppm/°C available on request

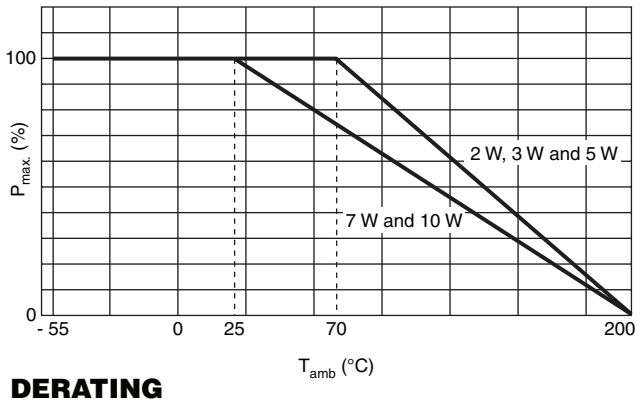
DIMENSIONS in millimeters (inches)



TYPE	W ± 0.1 (0.04)	D ± 0.1 (0.04)	H ± 1.5 (0.06)	B1 - B2	L	P	Ød
SMW02 SMF02	11.0 (0.43)	7.0 (0.28)	20.5 (0.81)	+ 0.9/- 0.3 (+ 0.04/- 0.02)	4.5 ± 1.5 (0.18 ± 0.06)	5.0 ± 1.0 (0.20 ± 0.04)	0.8 ± 0.03 (0.031 ± 0.002)
SMW03 SMF03	13.0 (0.51)	9.0 (0.36)	25.5 (1.01)	+ 2.3/- 0.3 (+ 0.09/- 0.02)	4.5 ± 1.5 (0.18 ± 0.06)	5.0 ± 1.0 (0.20 ± 0.04)	0.8 ± 0.03 (0.031 ± 0.002)
SMW05 SMF05	13.0 (0.51)	9.0 (0.36)	25.5 (1.01)	+ 2.3/- 0.3 (+ 0.09/- 0.02)	4.5 ± 1.5 (0.18 ± 0.06)	5.0 ± 1.0 (0.20 ± 0.04)	0.8 ± 0.03 (0.031 ± 0.002)
SMW07 SMF07	13.0 (0.51)	9.0 (0.36)	38.0 (1.49)	+ 2.3/- 0.3 (+ 0.09/- 0.02)	4.5 ± 1.0 (0.18 ± 0.04)	5.0 ± 1.0 (0.20 ± 0.04)	0.8 ± 0.03 (0.031 ± 0.002)
SMW10	16.0 (0.63)	10.0 (0.47)	35.0 (1.38)	+ 2.3/- 0.3 (+ 0.09/- 0.02)	4.5 ± 1.0 (0.18 ± 0.04)	7.5 ± 1.0 (0.30 ± 0.04)	0.8 ± 0.03 (0.031 ± 0.002)

ELECTRICAL CHARACTERISTICS

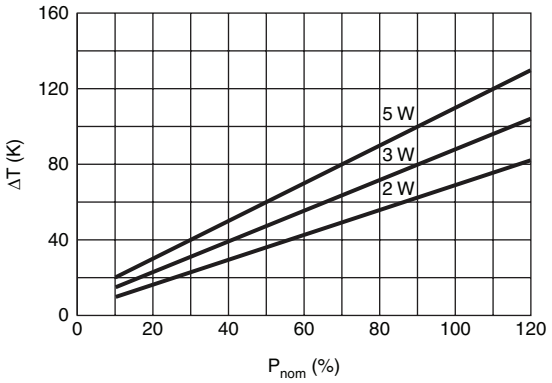
The power that the resistor can dissipate depends on the operating temperature.



DERATING

Maximum dissipation ($P_{max.}$) in percentage of rated power as a function of ambient temperature (T_{amb})

APPLICATION INFORMATION



The temperature rise at the solder spot as a function of dissipated power

Notes:

Application information available on request:

- Temperature rise of resistor body (hot spot) as a function of dissipation
- Pulse load behavior
- High frequency behavior (self inductance)

MARKING

The resistor is marked with the resistor type, the rated power, the nominal resistance value (R for values Ω and K for values kΩ is used as decimal point), the resistance tolerance and the production date (week and year), are printed in black on the resistor body.

Example:

PHX	SMW02
27R	5 %
204	2 W

ORDERING INFORMATION

PRODUCT	TOLERANCE	ORDERING CODE	LEAD Ø in millimeters (inches)	PACKAGING	QUANTITY (pieces)
SMW02	± 5 %	2306 340 03xxx	0.80 (0.031)	BOX	500
SMF02		2306 345 03xxx			
SMW03		2306 341 03xxx			
SMF03		2306 346 03xxx			
SMW05		2306 342 03xxx			
SMF05		2306 347 03xxx			
SMW07		2306 343 03xxx			340
SMF07		2306 348 03xxx			
SMW10		2306 344 03xxx			210

Last Digit of Ordering Code

RESISTANCE DECADE	LAST DIGIT
0.1 - 0.91 Ω	7
1 - 9.1 Ω	8
10 - 91 Ω	9
100 - 910 Ω	1
1 - 9.1 kΩ	2
10 - 91 kΩ	3

The resistors have 12 digit ordering code starting with 2306. The next 5 digits indicate the resistor type and packaging, see table ORDERING INFORMATION.

The last 3 digits indicate the resistance value:
- The first 2 digits of these last 3 indicate the actual resistance value
- The last digit indicates the resistance decade in accordance with table “Last Digit of Ordering Code“

Example:
SMW02, 47 Ω, ± 5 %, box of 500 pieces is **2306 340 03479**

NAFTA ORDERING INFORMATION

PRODUCT	TOLERANCE	NAFTA ORDERING CODE	LEAD Ø in millimeters (inches)	PACKAGING	QUANTITY (pieces)
SMW02	± 5 %	SMW02WxxxxxJ	0.80 (0.031)	BOX	500
SMF02		SMF02WxxxxxJ			
SMW03		SMW03WxxxxxJ			
SMF03		SMF03WxxxxxJ			
SMW05		SMW05WxxxxxJ			
SMF05		SMF05WxxxxxJ			
SMW07		SMW07WxxxxxJ			340
SMF07		SMF07WxxxxxJ			
SMW10		SMW10WxxxxxJ			210

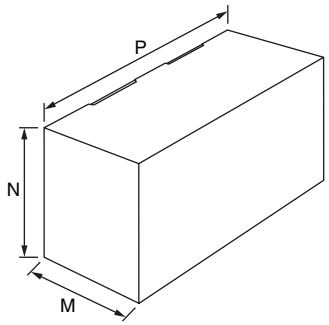
Examples of the Ohmic Value

Value	5 DIGITS
1 Ω	1R000
10 Ω	10R00
100 Ω	100R0
1 kΩ	1K000
10 kΩ	10K00

The ohmic value in the NAFTA ordering code (see table NAFTA ORDERING INFORMATION) is represented by the "xxxxx" in the middle of the above ordering code. The table "Examples of the Ohmic Value" gives some examples on how to use these 5 digits.

Example:
SMW02, 47 Ω, ± 5 %, box of 500 pieces is **SMW02W47R00J**

PACKAGING in millimeters (inches)



PRODUCT	P	N	N	QUANTITY (pieces)
SMW02 SMF02	262 (10.3)	84 (3.3)	128 (5.1)	500
SMW03 SMF03				
SMW05 SMF05				
SMW07 SMF07				340
SMW10				210

TESTS AND REQUIREMENTS

Essentially all tests are carried out in accordance to the schedule of IEC publications 60115-1, category 40/200/56 (rated temperature range - 40 to + 200 °C; damp heat, long term, 56 days and along the lines of IEC publications 60068-2); "Recommended basic climatic and mechanical robustness testing procedure for electronic components" and under standard atmosphere conditions according to IEC 60068-1 subclause 5.3, unless otherwise specified.
In some instances deviations from IEC applications were necessary for our method specified.

PERFORMANCE				
IEC 60115-1 CLAUSE	**IEC 60068-2 TEST METHOD**	**TEST**	**PROCEDURE**	**REQUIREMENTS**
4.8		Temperature coefficient	Between - 40 °C and + 200 °C: SMW R < 10 Ω: R ≥ 10 Ω: SMF	 0 to 600 ppm/°C - 80 to + 140 ppm/°C ± 250 ppm/°C
4.13		Short time overload	Room temperature; P = 10 x Pn; 5 s (voltage not more than 1000 V/25 mm)	$\Delta R/R_{max.}$ ± 2 % + 0.1 Ω
4.15	-	Robustness of resistor body	Load 200 ± 10 N	No damage $\Delta R/R_{max.}$ ± 0.5 % + 0.05 Ω
4.16 4.16.2	21(U) 21(Ua1)	Robustness of terminations: Tensile all samples	 Load 10 N; 10 s	No damage
4.17	20(Ta)	Solderability (after ageing)	16 h at 155 °C; leads immersed in flux 600 for 2 ± 0.5 s in a solder bath at 235 ± 5 °C	Good tinning, (≥ 95 % covered) no damage
4.18	20(Tb)	Resistance to soldering heat	Thermal shock: 3 s, 350 ± 10 °C; 2.5 mm from body	$\Delta R/R_{max.}$ ± 0.5 % + 0.05 Ω
4.19	14(Na)	Rapid change of temperature	30 min at - 40 °C and 30 min + 200 °C; 5 cycles	No damage $\Delta R/R_{max.}$ ± 1 % + 0.05 Ω
4.22	6(Fc)	Vibration	Frequency 10 to 55 Hz, displacement 0.75 mm or acceleration 10 g, three directions; total 6 h (3 x 2 h)	No damage $\Delta R/R_{max.}$ ± 0.5 % + 0.05 Ω
4.23 4.23.2 4.23.3 4.23.4 4.23.6	 2(Ba) 30(Db) 1(Aa) 30 (Db)	Climatic sequence: Dry heat Damp heat (accelerated) 1st cycle Cold Damp heat (accelerated) remaining cycles	 16 h, + 200 °C 24 h, 25 °C to 55 °C; 90 to 100 % RH 2 h, - 40 °C 5 days; 25 °C to 55 °C; 90 to 100% RH	 $\Delta R/R_{max.}$ ± 3 % + 0.05 Ω
4.24	3 (Ca)	Damp heat (steady state)	56 days; 40 °C; 90 to 95 % RH; loaded with 0.01 Pn	$\Delta R/R_{max.}$ ± 3 % + 0.1 Ω
4.25.1	-	Endurance (at 70 °C)	1000 h load with 0.9 Pn; 1.5 h ON and 0.5 h OFF	No visual damage $\Delta R/R_{max.}$ ± 5 % + 0.1 Ω

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