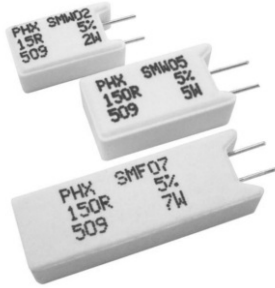


Wirewound/Metal Film Resistors, Commercial Power, Vertical Mount



FEATURES

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



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 $P_{70^{\circ}\text{C}}$ 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

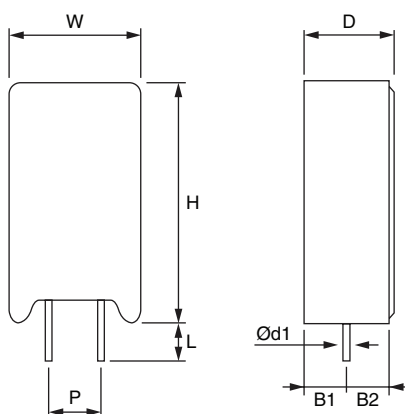
⁽²⁾ Other tolerances available upon request

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:

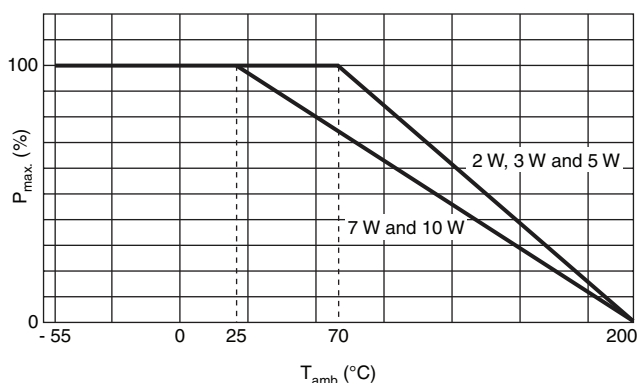
⁽³⁾ Temperature Coefficient of $\pm 20, 30, 50$ or 90 ppm/°C available on request

**DIMENSIONS** in millimeters (inches)

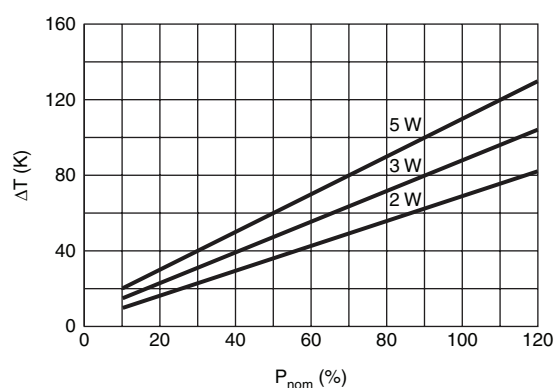
| TYPE | W ± 0.1 (0.04) | D ± 0.1 (0.04) | H ± 1.5 (0.06) | B1 - B2 | L | P | Ød |
|----------------|-------------------|-------------------|-------------------|--------------------------------|----------------------------|----------------------------|-------------------------------|
| SMW02 SMF02 | 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 $k\Omega$ 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 | $\pm 5 \%$ | 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 | | | |
| SMF07 | | 2306 348 03xxx | | | 340 |
| 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 $k\Omega$ | 2 |
| 10 - 91 $k\Omega$ | 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 , $\pm 5 \%$, 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

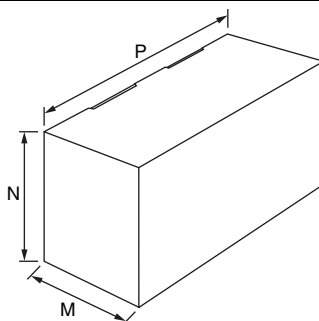
| Value | 5 DIGITS |
|-------|----------|
| 1 Ω | 1R000 |
| 10 Ω | 10R00 |
| 100 Ω | 100R0 |
| 1 kΩ | 1K000 |
| 10 kΩ | 10K00 |

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 P _n ; 5 s (voltage not more than 1000 V/25 mm) | $\Delta R/R_{\max.} \pm 2 \% + 0.1 \Omega$ |
| 4.15 | - | Robustness of resistor body | Load 200 ± 10 N | No damage $\Delta R/R_{\max.} \pm 0.5 \% + 0.05 \Omega$ |
| 4.16 | 21(U) | Robustness of terminations: | | No damage |
| 4.16.2 | 21(Ua1) | Tensile all samples | Load 10 N; 10 s | |
| 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 | $\Delta R/R_{\max.} \pm 0.5 \% + 0.05 \Omega$ |
| 4.19 | 14(Na) | Rapid change of temperature | 30 min at - 40 °C and 30 min + 200 °C; 5 cycles | No damage $\Delta R/R_{\max.} \pm 1 \% + 0.05 \Omega$ |
| 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 $\Delta R/R_{\max.} \pm 0.5 \% + 0.05 \Omega$ |
| 4.23 | 2(Ba) 30(Db) 1(Aa) 30 (Db) | Climatic sequence: | | $\Delta R/R_{\max.} \pm 3 \% + 0.05 \Omega$ |
| 4.23.2 | | Dry heat | 16 h, + 200 °C | |
| 4.23.3 | | Damp heat (accelerated) 1st cycle | 24 h, 25 °C to 55 °C; 90 to 100 % RH | |
| 4.23.4 | | Cold | 2 h, - 40 °C | |
| 4.23.6 | | Damp heat (accelerated) remaining cycles | 5 days; 25 °C to 55 °C; 90 to 100 % RH | |
| 4.24 | 3 (Ca) | Damp heat (steady state) | 56 days; 40 °C; 90 to 95 % RH; loaded with 0.01 P _n | $\Delta R/R_{\max.} \pm 3 \% + 0.1 \Omega$ |
| 4.25.1 | - | Endurance (at 70 °C) | 1000 h load with 0.9 P _n ; 1.5 h ON and 0.5 h OFF | No visual damage $\Delta R/R_{\max.} \pm 5 \% + 0.1 \Omega$ |



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