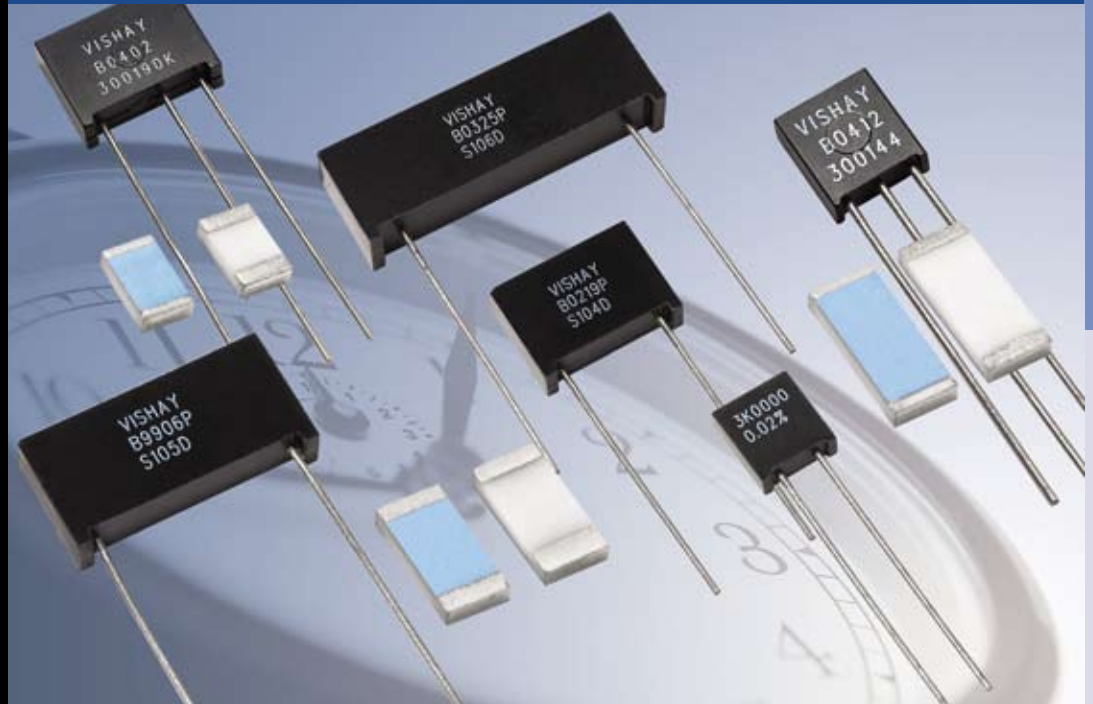




VISHAY INTERTECHNOLOGY, INC.



VISHAY APPROVED PROTOTYPE CENTERS FOR BULK METAL[®] FOIL RESISTORS

Fast Delivery for Small-Quantity Prototypes of Vishay Ultra-High-Precision Bulk Metal[®] Foil Resistors









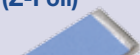

- Small quantity delivery: less than 72 hours
- No minimum order requirements
- Standard Vishay-approved manufacturing procedures
- Vishay high reliability and performance
- Any value at any tolerance available



Vishay Bulk Metal® Foil Technology

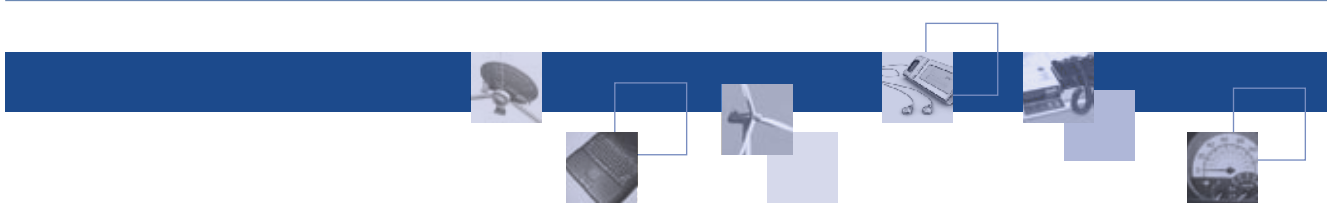


Ultra-High-Precision Surface-Mount Resistors










Model	Product Description	Resistance Range (Ω)*, **	Tolerance (%)	TCR (ppm/°C) Temp. Range: (-55 °C to +125 °C) Ref. +25 °C	Power at 70 °C (W)	PCR — Power Coefficient (ppm at Rated Power)	Long-Term Stability: 2000 Hours, +70 °C Under Power
VSMP0805 (Z-Foil) 	Bulk Metal® foil technology Ultra-high-precision chip resistor	10 Ω to 12 K Ω	± 0.01 %	± 0.2 ppm/°C	0.200 W	5 ppm typical	± 0.01 % ± 0.005 % (reduced power)
VSM0805 	Bulk Metal foil technology	10 Ω to 12 K Ω	± 0.01 %	± 2 ppm/°C	0.100 W		± 0.01 %
VSMP1206 (Z-Foil) 	Bulk Metal foil technology Ultra-high-precision chip resistor	10 Ω to 30 K Ω	± 0.01 %	± 0.2 ppm/°C	0.300 W	5 ppm typical	± 0.01 % ± 0.005 % (reduced power)
VSM1206 	Bulk Metal foil technology	10 Ω to 30 K Ω	± 0.01 %	± 2 ppm/°C	0.150 W		± 0.01 %
VSMP1506 (Z-Foil) 	Bulk Metal foil technology Ultra-high-precision chip resistor	10 Ω to 40 K Ω	± 0.01 %	± 0.2 ppm/°C	0.300 W	5 ppm typical	± 0.01 % ± 0.005 % (reduced power)
VSM1506 	Bulk Metal foil technology	10 Ω to 40 K Ω	± 0.01 %	± 2 ppm/°C	0.200 W		± 0.01 %
VSMP2010 (Z-Foil) 	Bulk Metal foil technology Ultra-high-precision chip resistor	10 Ω to 100 K Ω	± 0.01 %	± 0.2 ppm/°C	0.500 W	5 ppm typical	± 0.01 % ± 0.005 % (reduced power)
VSM2010 	Bulk Metal foil technology	10 Ω to 100 K Ω	± 0.01 %	± 2 ppm/°C	0.300 W		± 0.01 %
VSMP2512 (Z-Foil) 	Bulk Metal foil technology Ultra-high-precision chip resistor	10 Ω to 150 K Ω	± 0.01 %	± 0.2 ppm/°C	0.750 W	5 ppm typical	± 0.01 % ± 0.005 % (reduced power)
VSM2512 	Bulk Metal foil technology	10 Ω to 150 K Ω	± 0.01 %	± 2 ppm/°C	0.400 W		± 0.01 %

* Tighter performances and higher or lower value resistances are available for all models.

** Any value at any tolerance available within resistance range.



High-Precision Through-Hole Resistors

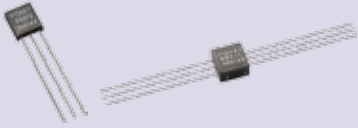

Model	Product Description	Resistance Range (Ω) *, **	Tolerance (%)	TCR (ppm/ $^{\circ}$ C) Temp. Range: (-55 $^{\circ}$ C to +125 $^{\circ}$ C) Ref. +25 $^{\circ}$ C	Rated Power (W)	Long-Term Stability: 2000 Hours, +125 $^{\circ}$ C Under Power
 Z201	Bulk Metal Z-Foil Technology	10 Ω to 100 K Ω		± 0.2 ppm/ $^{\circ}$ C	0.6 W at +70 $^{\circ}$ C 0.3 W at +125 $^{\circ}$ C	
 S102C	Bulk Metal foil technology S series: high-performance, aerospace and instrumentation resistors	1 Ω to 150 K Ω	± 0.005 %	± 2 ppm/ $^{\circ}$ C	Up to 100 K: 0.6 W at +70 $^{\circ}$ C 0.3 W at +125 $^{\circ}$ C Over 100 K: 0.4 W at +70 $^{\circ}$ C 0.2 W at +125 $^{\circ}$ C	0.005 %
 S104D		1 Ω to 500 K Ω		± 2 ppm/ $^{\circ}$ C	Up to 200 K: 1 W at +70 $^{\circ}$ C 0.5 W at +125 $^{\circ}$ C Over 200 K: 0.6 W at +70 $^{\circ}$ C 0.3 W at +125 $^{\circ}$ C	
 S105D		1 Ω to 750 K Ω		± 2 ppm/ $^{\circ}$ C	Up to 300 K: 1.5 W at +70 $^{\circ}$ C 0.75 W at +125 $^{\circ}$ C Over 300 K: 0.8 W at +70 $^{\circ}$ C 0.4 W at +125 $^{\circ}$ C	
 S106D		0.5 Ω to 1 M Ω		± 2 ppm/ $^{\circ}$ C	Up to 400 K: 2 W at +70 $^{\circ}$ C 1 W at +125 $^{\circ}$ C Over 400 K: 1 W at +70 $^{\circ}$ C 0.5 W at +125 $^{\circ}$ C	
 S102K		1 Ω to 100 K Ω		± 1 ppm/ $^{\circ}$ C	Up to 100 K: 0.6 W at +70 $^{\circ}$ C 0.3 W at +125 $^{\circ}$ C Over 100 K: 0.4 W at +70 $^{\circ}$ C 0.2 W at +125 $^{\circ}$ C	
 S104K		1 Ω to 300 K Ω		± 1 ppm/ $^{\circ}$ C	Up to 200 K: 1 W at +70 $^{\circ}$ C 0.5 W at +125 $^{\circ}$ C Over 200 K: 0.6 W at +70 $^{\circ}$ C 0.3 W at +125 $^{\circ}$ C	
 S105K		1 Ω to 500 K Ω		± 1 ppm/ $^{\circ}$ C	Up to 300 K: 1.5 W at +70 $^{\circ}$ C 0.75 W at +125 $^{\circ}$ C Over 300 K: 0.8 W at +70 $^{\circ}$ C 0.4 W at +125 $^{\circ}$ C	
 S106K		0.5 Ω to 600 K Ω		± 1 ppm/ $^{\circ}$ C	Up to 400 K: 2 W at +70 $^{\circ}$ C 1 W at +125 $^{\circ}$ C Over 400 K: 1 W at +70 $^{\circ}$ C 0.5 W at +125 $^{\circ}$ C	

* Tighter performances and higher or lower values are available for all models.

** Any value at any tolerance available within resistance range.



Ultra-High-Precision Voltage Dividers and Networks

Model and Product Description	Resistance Range (Ω)*, **	Resistance Tolerance		TCR (ppm/°C) Temp. Range: (-55 °C to +125 °C) Ref. +25 °C	Rated Power (W)
		Absolute	Ratio Match		
300144Z, 300145Z (with Z foil) (Pair of voltage dividers)  Bulk Metal foil technology Small-package, molded voltage dividers	Any value from 100 Ω to 20 K Ω per side Large variety of resistance ratios	± 0.005 %	0.005 %	Absolute ± 0.2 ppm/°C Tracking 0.1 ppm/°C	0.2 W at +85 °C (per voltage divider)
2R, 3R, 4R with Z-Foil Series (2 to 4 resistors in single package) 	Any value from 1 Ω to 150 K Ω per side Large variety of resistance ratios	± 0.005 %	0.005 %	Absolute ± 0.2 ppm/°C Tracking 0.1 ppm/°C	0.2 W at +125 °C (per resistor)

Ultra-High-Precision Hermetically-Sealed Resistors

Model	Product Description	Resistance Range (Ω)*, **	Tolerance (%)	TCR (ppm/°C) Temp. Range: (-55 °C to +125 °C) Ref. +25 °C	Rated Power at +70 °C
VHS102 (Available with Z-Foil) 	Bulk Metal foil technology Hermetically-sealed resistor	1 Ω to < 150 K Ω	± 0.005 %	± 2 ppm/°C	0.6 W
VH102K (Available with Z-Foil) 	Bulk Metal foil technology Hermetically-sealed resistor	1 Ω to < 100 K Ω	± 0.005 %	± 1 ppm/°C	0.6 W

Hybrid Chips and Hermetically-Sealed Networks

Model	Product Description	Resistance Range (Ω)*, **	Tolerance (%)	TCR (ppm/°C)	Temp. Range	Rated Power at +70 °C
V5X5 (0.050" x 0.050")	Bulk Metal foil technology Hybrid chips (gold-plated pads)	5 Ω to 10 K Ω	± 0.005 %	± 2 ppm/°C	-55 °C to +125 °C, Ref +25 °C	0.05 W
V15X5 (0.150" x 0.050")		5 Ω to 33 K Ω				0.1 W
V15X10 (0.150" x 0.100")		33 K Ω to 80 K Ω				0.15 W

* Tighter performances and higher or lower values are available for all models.

** Any value at any tolerance available within resistance range.



Vishay Bulk Metal[®] Foil Technology



Vishay Ultra-High-Precision Bulk Metal[®] Foil Technology

Bulk Metal foil technology outperforms all other resistor technologies available today for applications that require high precision and stability. The new Z-Foil technology provides a significant reduction of the resistive element's sensitivity to changes of temperature due to ambient temperature variations (TCR) and to self-heating when power is applied (Power Coefficient or PCR).

Applications

The Precision Centers manufacture high-reliability precision resistors based on the Bulk Metal foil technology pioneered and developed by Vishay. Products based on this technology are the most suitable for a wide range of high-precision and high-stability applications in:

- Military and aerospace systems
(www.vishay.com/doc?49386)
- Automatic test equipment (ATE)
- Current sensing
(www.vishay.com/doc?49460)
- Down-hole equipment (high-temperature)
- Precision scales
- Laboratories
- High-precision amplifiers
- High-precision instrumentation
- Audio (high-end stereo equipment)
(www.vishay.com/doc?49414)
- Medical
(www.vishay.com/doc?49466)

Key Features

- “Zero TCR”: ± 0.05 ppm/ $^{\circ}\text{C}$ (Industrial range) and ± 0.2 ppm/ $^{\circ}\text{C}$ (Mil range) with Z-Foil technology
- Power coefficient of resistance (PCR): 5 ppm at rated power for Z-Foil resistors
- Load life stability: 0.005 % (50 ppm) under applied power (2000 hours at $+70$ $^{\circ}\text{C}$)
- Tolerance to ± 0.005 %
- Electrostatic Discharge (ESD) above 25,000 Volts
- Current noise: -40 dB
- Non-Inductive, Non-Capacitive design
- Rise time: 1 ns without ringing
- Thermal EMF: 0.05 $\mu\text{V}/^{\circ}\text{C}$
- Lead (Pb)–free and RoHS-compliant parts available upon request

For more information about technical specifications, please view the *Seven Technical Reasons to Specify Bulk Metal Foil Resistors* brochure at www.vishay.com/doc?49422

Vishay's Applications Engineering department is available to advise customers and to make recommendations regarding non-standard technical requirements and special applications. Contact foil@vishay.com.

Vishay's family of Vishay-owned and independent Precision Centers has the capability to produce small-quantity orders of select Vishay ultra-high-precision Bulk Metal[®] foil resistors with quick turnaround times. By maintaining a stock of foil resistor chips, the Precision Centers will precisely calibrate your order and deliver the product in as little as 72 hours. The Precision Centers utilize Vishay-approved procedures to produce resistors with the high quality and performance for which Vishay has long been known.



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