VISHAY PRECISION GROUP

Vishay Foil Resistors

Superior High-Precision Foil Resistors for Avionics, Military, and Space Applications





Bulk Metal® Foil technology, first introduced by Vishay Foil Resistors (VFR) in 1962, still out-performs all resistor technologies available for applications that require precision, stability, and reliability. VFR's unique, ultra precision Bulk Metal® Foil resistor products provide extremely low temperature coefficient of resistance (TCR) and exceptional long-term stability through temperature extremes. VFR continues to develop, manufacture, and market new types of foil resistor products, including military established reliability components (EEE-INST-002, DSCC, CECC, ESA, ER, QPL, etc). The Vishay Foil Resistors portfolio is comprised of discrete resistors and resistor networks in surface mount and through-hole (leaded) configurations, precision trimming potentiometers, and discrete chips for use in hybrid circuits. Customized chip resistor networks and resistor arrays can also be manufactured.

Scan the QR code on the back of this page to access our website and VFR's Design and Selector Guide, which provides complete information on how to chose the best Bulk Metal® Foil resistor for your application. The selector guide is divided into sections providing the resistance range, tolerance, TCR, rated power, power coefficient of resistance (PCR), and load life stability of Bulk Metal® Foil products in eight categories: Surface-Mount; Through-Hole; Power Current-Sensing; Voltage Dividers and Resistor Networks; Hermetically-Sealed; Trimming Potentiometers; Hybrid Chips and Custom Designed Hermetically-Sealed Networks (PRND); Avionics, Military, and Space (AMS).

Key Features

- Temperature coefficient of resistance (TCR) for Z-Foil technology
  - ±0.05 ppm/°C typical (0°C to +60°C, +25°C ref.)
  - ±0.2 ppm/°C typical (–55°C to +125°C, +25°C ref.)
- Power coefficient of resistance for Z-Foil technology (Power PCR)
  - "ΔR due to self heating": ±5 ppm at rated power
- Load life stability: to ±0.005% (50 ppm) at +70°C, 10,000 hours at rated power
- Resistance tolerance: to ±0.001% (10 ppm)
- Electrostatic discharge (ESD) at least to 25 kV
- Thermal stabilization time <1 sec (nominal value achieved within 10 ppm of steady state value)
- Thermal EMF: 0.05 µV/°C
- Not restricted to standard values; specific "as required" values can be supplied at no extra cost or delivery (e.g., 1K2345 vs. 1K)

Characteristics of Different Types of Resistors

Technology	Temperature Coefficient of Resistance (TCR) –55°C to +125°C, +25°C ref.	Initial Tolerance	End of Life Tolerance	Load Life Stability at +70°C, Rated Power 2000 Hours and 10,000 Hours	ESD (V)	Thermal Stabilization	Noise (dB)
Bulk Metal® Foil	**±0.2 ppm/°C**	**From 0.001%**	**<0.05%**	**0.005% (50 ppm) 0.01% (100 ppm)**	**25,000**	**<1 second**	**–42**
High-Precision Thin Film	±5 ppm/°C	From 0.05%	<0.4%	0.05% (500 ppm) 0.15% (1500 ppm)	2500	>few minutes	–20
Precision Thick Film	±50 ppm/°C	From 0.5%	<5%	0.5% (5000 ppm) 2% (20,000 ppm)	2000	>few minutes	+20
Wirewound	±3 ppm/°C	From 0.005%	<0.5%	0.05% (500 ppm) 0.15% (1500 ppm)	25,000	>few minutes	–35

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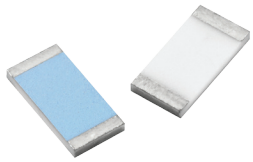
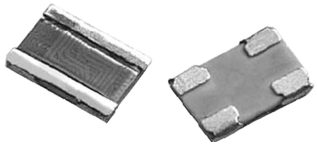
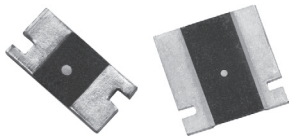
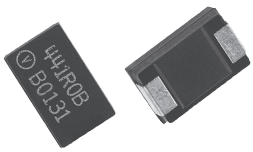
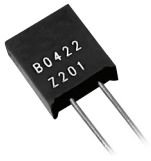
for Avionics, Military, and Space Applications

Best Available, Long Life Stability, Precision, and Accuracy

Avionics, Military, and Space (AMS) applications have reliability requirements that exceed what can be achieved using standard processes of electronic component manufacturing. Military (MIL) style testing consists of electrical and environmental stresses that may be applied to each resistor, or to a sample of parts from each production lot. By reviewing the behavior of the parts when they are subjected to the specified tests, lot-to lot uniformity is guaranteed and a higher level of reliability is achieved. Different qualification conformance inspection plans are applicable depending on the application, ranging from a DSCC specification, up to a MIL spec qualified component with an established reliability level. Additionally, custom screening plans, such as those modeled after NASA EEE-INST-002 guidelines, or plans intended to qualify products for use in higher temperatures may be considered. Contact VFR application engineers for the appropriate conformance inspection for your project.

Selected Vishay Foil Resistors Bulk Metal® Foil Resistors

Product	Type	Construction	Performance and Screening Specifications	Typical TCR –55°C to +125°C, +25°C ref. (ppm/°C)	Load Life Stability 2000 Hours, +70°C Under Power, Typical
	**VSMP Series 0805 – 2512**	Wrap-around surface mount	DSCC, EEE-INST-002 MIL-PRF-55342	0.2	0.005%
	**VCS1625Z**	Current-sense with Kelvin connections for high accuracy	DSCC, EEE-INST-002 MIL-PRF-55342	0.2	0.005%
	**CSM2512 / CSM3637**		DSCC, EEE-INST-002 MIL-PRF-49465	Max 15	0.005%
	**SMR1DZ / SMR3DZ**	Molded, flexible terminations with robust construction	DSCC, EEE-INST-002 MIL-PRF-55182	0.2	0.005%
	**Z201**	Through-hole	EEE-INST-002 MIL-PRF-55182	0.2	0.005%

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VFR-MS0178-1308

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