



Selecting Precision Resistors

Short and Long-Term Implications

A Technical Program with Discussions and Demonstrations

Whether your application requires the best available combination of all important resistor characteristics, or just one or two of the best available specific and unique characteristics, exact knowledge of all resistor technologies is essential. This technical program will clarify the differences among various precision resistor technologies beyond the simple assertions of their publicized datasheets.

These educational technical programs are intended for managers, design and test engineers, technicians, teachers and students, sales representatives, and other persons involved in analog circuits or in hardware development and manufacturing.

Typical Program

- 45 min Presentation by a Field Design Engineer on the electrical properties and stress factors of thick film, thin film and foil resistors, emphasizing the theoretical and actual resistor performance characteristics of Bulk Metal® Foil resistors, including: TCR (Temperature Coefficient of Resistance), PCR (Power TCR), ESD, short time overload, Thermal EMF, and stability
- 10 min Break
- 45 min Demonstration of electrical properties of thick film, thin film, and Bulk Metal® Foil resistors
- As required Q & A Session

Request for Visit

Name: _____
Title: _____
Company: _____
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Target Audience

- Managers
- Design or Test Engineers
- Component Engineers
- Project Managers
- Technicians
- Teachers
- Engineering Students
- Sales Representatives and Component Distributors
- Others, please specify: _____

Target Application: _____

Preferred Date(s): _____ Time: _____

Additional Remarks: _____

Complete the form and click the Submit button to the right



What You'll Learn

Resistors built on different technologies may seem alike on the surface, and may even have similar specifications such as initial TCR (Temperature Coefficient of Resistance) and tolerance; however, the differences among them remain quite significant. Inherent in each type of resistive material are certain design and processing variations that strongly influence device electrical performance in ways that may become apparent only after a period of use in the end product.

In this tutorial we discuss the primary factors that influence resistor stability in real-world environments and how these can depart from the specifications published in datasheets. Parameters such as temperature (known and unknown), pulse, SNR, CTE (Coefficient of Thermal Expansion) of the PCB, ESD, surface tension, Thermal EMF, and more will be covered. We will conclude with a demonstration that illustrates in real-time the differences among Bulk Metal[®] Foil, thin film, and thick film resistor technologies.

Bulk Metal[®] Foil Technology

Bulk Metal[®] Foil technology, first introduced in 1962, still outperforms all other resistor technologies available for applications that require precision, stability, and reliability. Bulk Metal[®] Foil resistor products provide extremely low temperature coefficient of resistance—the lowest in the industry by an order of magnitude—and exceptional long-term stability regardless of temperature extremes. Fifty years of progress have brought about features and benefits of Vishay Foil resistors that include:

- **Temperature Coefficient of Resistance (TCR)**
 - Absolute TCR: ± 0.05 ppm/ $^{\circ}$ C (0 $^{\circ}$ C to +60 $^{\circ}$ C) typical; 0.2 ppm/ $^{\circ}$ C (-55 $^{\circ}$ C to 125 $^{\circ}$ C with 25 $^{\circ}$ C reference)
 - Tracking TCR: 0.1 ppm/ $^{\circ}$ C typical
- **Power Coefficient of Resistance (PCR)**
“ ΔR due to self heating” — 5 ppm typical at rated power
- **Resistance Tolerance**
Absolute: $\pm 0.005\%$; match: 0.005% (50 ppm)
- **Load Life Stability**
0.0025% at 70 $^{\circ}$ C, 2000 hrs at rated power;
0.005% at +70 $^{\circ}$ C, 10,000 hrs at rated power
- **Electrostatic Discharge (ESD)**
At least to 25 kV

Vishay Precision Group

Vishay Precision Group (VPG) produces sensors based on resistive foil technology, and sensor-based systems. VPG provides vertically integrated products and solutions for multiple growing markets in the areas of stress measurement, industrial weighing, and manufacturing process control. As a spin-off from Vishay Intertechnology, the company has a decades-long track record of innovation: in foil precision resistors, which VPG invented, current sensors, and strain gages, which have served as a foundation for more recent expansion into strain gage instrumentation, load cells and transducers, load cell modules, and complete systems for process control and on-board weighing. Vishay Precision Group may be found on the Internet at www.vishaypg.com.

