

“Panic Button” - Small-Quantity Prototype Service Delivers Any Type or Value to You in 5 Working Days or Less

PROTOTYPE

When you need precision resistors for your prototype, you want them in a hurry ... and now Vishay Foil resistors guarantees a 5 working day delivery on any value from 0R002 to 1M ... Any tolerance to 0.005 %. This is available through our new “Panic Button” service.

For the prototype quantities you need, the very moderate “Panic Button” surcharge is insignificant. What’s really important is that you can put your prototype system together faster than ever before ... check it out ... get it into production ... with full assurance that your resistor solutions are completely verified.

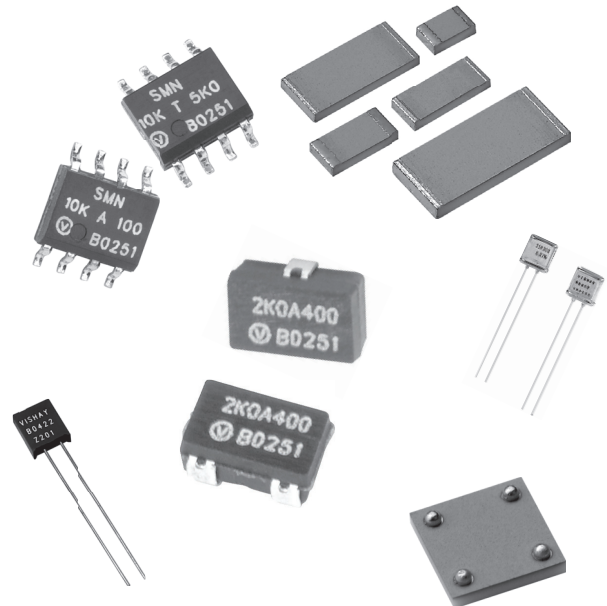
This is a Vishay spec package that eliminates resistor “trade-off” worries ... the only one of its kind:

- Temperature coefficient of resistance (TCR) for Z-foil technology
 - ± 0.05 ppm/°C typical (0 °C to + 60 °C)
 - ± 0.2 ppm/°C typical (- 55 °C to + 125 °C, + 25 °C ref.)
- Power coefficient of resistance for Z-foil technology
 - “ ΔR due to self heating”: ± 5 ppm at rated power
- Load life stability: to ± 0.005 % at + 70 °C, 2000 h at rated power
- Resistance tolerance: to ± 0.001 % (10 ppm) when hermetically sealed and ± 0.005 % (5 ppm) when encapsulated
- Resistance range: 2 m Ω to 3.3 M Ω
- Electrostatic discharge (ESD) up to 25 000 V
- Non-inductive, non-capacitance design
- Rise time: 1 ns effectively no ringing
- Thermal stabilization time < 1 s
- Current noise ≤ -40 dB
- Thermal EMF: 0.05 μ V/°C
- Voltage coefficient: < 0.1 ppm/V
- Lead (Pb)-free and tin/lead terminations are available

With “Panic Button” service - you can get Vishay resistors in prototype quantities in just 5 working days or sooner!

We will send it directly from the main facility or via one of our precision centers or “FOIL RESISTOR QUICK DELIVERY SOURCES” which are spread around the world.

Preserve your R&D cash in these hard economic times. There is no need to stock a wide array of R&D precision resistors at minimum order prices when you can buy only what you need and get them within days. And, because this resistor is the most precise resistor available, it will satisfy all your R&D requirements. For lesser precision applications on your board, use foil resistors for quick delivery in the prototype stage and convert back to lesser precision resistors at the production phase when your purchasing dollars can buy the larger quantities at a more economical net cost.



Today, designers of analog circuits are demanding discrete resistors and networks that approach the ideal in performance ... stable, high speed, high accuracy components that will operate with assured, predictable reliability for years in a variety of environments. Vishay is meeting those demands with discretely and networks of unequalled performance.

Vishay Foil also adds the dimensions of convenience and economy to resistors needs. Our long experience relieves the circuit designer of the complicated, costly and wasteful procedure of calculating the value of individual network components, ordering and then stabilizing, aging or matching these units, and literally assembling and testing his own resistor arrays.

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Instead, Vishay offers complete facilities and assistance in the:

1. Design of the discrete resistor and network solutions
2. Selection, measurement and matching of individual resistors, using the most accurate measuring equipment available
3. Complete testing to verify discrete resistor and network performance
4. **And, all with no NRE (non-recurring engineering charge)**

The Vishay Foil approach to discretized and networks is simple and straight forward, our solution consists of any combination of resistors, and the end result is what matters. As a consequence, the only data Vishay requires is the overall electrical performance specifications, the operational environment, and the desired physical requirements. Vishay will then select and package the resistor or resistors in the most suitable combination to meet performance requirements. A part number is assigned and a layout is provided to the user for approval.

RESISTOR SELECTION FACTORS

These four fundamental factors determine how “ideal” a precision resistor will be:

1. Initial resistance value or how closely the absolute resistance value can be achieved
2. How precisely the value of individual resistors can be controlled
3. How precisely the end of life tolerance is maintained under a wide range of operating conditions and stress factors (temperature, humidity, load, etc.)
4. Fast response without ringing and fast thermal stabilization - and the ability of the resistor to react to rapid switching without adversely affecting the circuit function.

Until the development of Vishay Foil resistors, precise control of all four factors was virtually impossible.

THE VISHAY FOIL RESISTOR

Vishay Foil resistors are designed and manufactured to eliminate the inter-parameter compromise inherent in all other types of resistors. All important characteristics: tolerance, long term stability, temperature coefficient, power coefficient, ESD, noise, capacitance and inductance - are optimized, approaching the theoretical ideal in total performance.

Resistor technologies before the development of Vishay Bulk Metal® Foil resistors all compromised the theoretical ideal performance in one or more ways. For example, the winding of wire and the evaporation or the sputtering of extremely thin metal each produce metallurgical changes in the resistance materials and these noticeably deteriorate the electrical

characteristics. Such changes are not predictable, and thus randomly alter performance parameters. The form factor of other units also introduces losses in high frequency performance, limits power dissipation and prohibits size reduction.

Vishay Foil has developed a new resistor concept, through the use of a proprietary Bulk Metal® Foil and new nanometer-level photo-etching techniques created by the company so that the conductor can closely approximate a flat wire. Because the metals used are not drawn, wound or mistreated in any way during the manufacturing process, Vishay Foil resistors maintain all their design, physical and electrical characteristics. These characteristics are both measurable and predictable before, during and after manufacturing.

Through the entire process, every step is carefully controlled not only to keep the metal in its virgin state, but also to eliminate the effects of any stress that might be imposed either during manufacture or use. The sub-assembly is guarded from external stress by a flexible shock absorbing insulation that is available with the leaded resistors and the molded SMD chips. In addition, differential linear coefficients of expansion for all the materials in the resistor are actually designed to control the temperature coefficient or resistance to less than 1 ppm/°C.

Vishay Foil resistors including the latest version of Z-foil achieve maximum stability and near zero temperature coefficient. This superior performance is built-in for every unit and does not rely on culling or other artificial means for uniform excellence.

All Vishay Foil resistors (and networks) are produced from the same proprietary Bulk Metal Foil alloy, of known and controllable characteristics. The alloy, which is not deposited by conventional techniques, is approximately 100 times thicker than conventional evaporated or sputtered films. Vishay Foil is then photo-etched into a variety of resistive patterns in such a way that the resistance is adjustable to a standard initial tolerance down to 0.001 % and with service life variation of less than 0.05 %.

For more detailed information about Vishay “state-of-the-art” resistors, send an e-mail to our sales engineering department: foil@vishaypg.com

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PRECISION CENTERS

Precision centers are scattered around the world to provide local, short run, quick delivery, of Vishay Bulk Metal Foil resistors. Unique to Vishay Foil is the ability to provide any value to any tolerance in large or small quantities and the precision center makes the small quantities available in five days or less.

Why do we have authorized local manufacturing or precision centers? Because we have no standard values and each resistor is trimmed to the precise value ordered. Why was the

concept of standard values developed in the first place? Historically, it was impractical to stock all values and tolerances, so a pattern of standard values was born. But what if your calculation calls for a more precise value that falls between two “standard” values? Then you must wait as much as 26 weeks or ... use a Vishay Foil resistor which can be obtained from the precision center in 5 working days.

For further information contact: foil@vishaypg.com

RESISTOR PERFORMANCE COMPARISON

(When tested against MIL-PRF-55342/MIL-PRF-55182/MIL-PRF-39009/MIL-PRF-49465 etc., standard Vishay resistors show much smaller resistance changes than the specification limit)

TECHNOLOGY	Z-FOIL	CLASSIC FOIL	PRECISION THIN FILM	THICK FILM
Typical Temperature Coefficient of Resistance (TCR)	0.05 ppm/°C (0 °C to + 60 °C) 0.2 ppm/°C (- 55 °C to + 125 °C, + 25 °C ref.)	< 2 ppm/°C	10 ppm/°C to 25 ppm/°C (5 ppm available but very expensive and requires special screening)	100 ppm/°C to 300 ppm/°C
Load Life Stability (2000 h, + 70 °C at Rated Power)	0.005 %	0.005 %	0.1 %	1 % to 3 %
Power Coefficient of Resistance (PCR) at Rated Power	5 ppm	20 ppm	> 200 ppm	> 1000 ppm
Electronic Discharge (ESD) Withstanding	up to 25 000 V	up to 25 000 V	3000 V	< 2000 V
Absolute Tolerance	0.001 %	0.001 %	0.05 % to 1 %	1 % to 5 %
Resistance to Soldering Heat	0.01 %	0.01 %	0.1 %	0.25 % to 3 %
Moisture Resistance	0.015 %	0.015 %	0.1 % to 0.2 %	0.25 % to 3 %
High Temperature Exposure	0.02 %	0.02 %	0.15 %	1 % to 1.5 %
Shelf Life Stability	25 ppm 2 ppm in hermetic package for at least 10 years	25 ppm 2 ppm in hermetic package for at least 10 years	100 ppm	20 000 ppm
Noise	< - 40 dB	< - 40 dB	- 30 dB	- 18 dB to - 10 dB

POST MANUFACTURING OPERATIONS OR PMO FOR IMPROVED EOL

Many analog applications can include requirements for performance under conditions of stress beyond the norm and over extended periods of time. This calls for more than just selecting a standard device and applying it to a circuit. The standard device may turn out to be all that is needed but an analysis of the projected service conditions should be made and it may well dictate a routine of stabilization known as post manufacturing operations or PMO. The PMO operations that will be discussed are only applicable to Foil resistors. They stabilize Foil resistors while they may be harmful to other types.

Short time overload, accelerated load life, and temperature cycling are the three PMO methods that do the most to remove the anomalies down the road. Foil resistors are inherently stable as manufactured. These PMO methods are only of value on Foil resistors and they improve the performance by small but significant amounts. Users are encouraged to contact Vishay Foil applications engineering for assistance in choosing the PMO operations that are right for their application.