AEROSPACE MARKET SOLUTIONS

Solutions... think Vishay

www.vishay.com
# SEMICONDUCTORS

## RECTIFIERS
- Schottky (single, dual)
- Standard, Fast, and Ultra-Fast Recovery (single, dual)
- Bridge
- Supereectifier®
- Sinterglass Avalanche Diodes

## SMALL-SIGNAL DIODES
- Schottky and Switching (single, dual)
- Tuner/Capacitance (single, dual)
- Bandswitching
- PIN

## ZENER AND SUPPRESSOR DIODES
- Zener (single, dual)
- TVS (TRANSZORB®, Automotive, ESD, Arrays)

## MOSFETs
- Power MOSFETs
- JFETs

## RF TRANSISTORS
- Bipolar Transistors (AF and RF)
- Dual Gate MOSFETs
- MOSMICs®

## OPTOELECTRONICS
- IR Emitters and Detectors, and IR Receiver Modules
- Optocouplers and Solid-State Relays
- Optical Sensors
- LEDs and 7-Segment Displays
- Infrared Data Transceiver Modules
- Custom Products

## ICs
- Power ICs
- Analog Switches
- DC/DC Converters
- RF Transceivers
- ICs for Optoelectronics

# PASSIVE COMPONENTS

## RESISTIVE PRODUCTS
- Foil Resistors
- Film Resistors
- Metal Film Resistors
- Thin Film Resistors
- Thick Film Resistors
- Metal Oxide Film Resistors
- Carbon Film Resistors
- Wirewound Resistors
- Power Metal Strip® Resistors
- Chip Fuses
- Variable Resistors
  - Cermet Variable Resistors
  - Wirewound Variable Resistors
  - Conductive Plastic Variable Resistors
- Networks/Arrays
- Non-Linear Resistors
  - NTC Thermistors
  - PTC Thermistors
  - Varistors

## MAGNETICS
- Inductors
- Transformers

## CAPACITORS
- Tantalum Capacitors
- Molded Chip Tantalum Capacitors
- Coated Chip Tantalum Capacitors
- Solid Through-Hole Tantalum Capacitors
- Wet Tantalum Capacitors
- Ceramic Capacitors
- Multilayer Chip Capacitors
- Disc Capacitors
- Film Capacitors
- Power Capacitors
- Heavy-Current Capacitors
- Aluminum Capacitors
- Silicon RF Capacitors

## STRAIN GAGE TRANSDUCERS AND STRESS ANALYSIS SYSTEMS
- PhotoStress®
- Strain Gages
- Load Cells
- Force Transducers
- Instruments
- Weighing Systems
- Specialized Strain Gage Systems
Aerospace Market Solutions

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Vishay was founded in 1962 to manufacture and market foil resistors, an invention of physicist Dr. Felix Zandman, Chairman of the Board and founder. The Company began operations with foil resistors and strain gages as its initial product offerings. In 1985, having grown from a start-up into the world’s leading manufacturer of these original products, Vishay began an ongoing series of strategic acquisitions to broaden its product portfolio.

**Broad-Line Manufacturer, Global Presence**

Today, Vishay is a broad-line manufacturer with a global presence. It is one of the world’s largest manufacturers of discrete semiconductors and passive electronic components. Vishay’s acquisitions include the infrared component business of Infineon and such top names as Siliconix, Dale, Draloric, Sprague, Vitramon, and BComponents (the former passive components business of Philips Electronics and Beyschlag).

**Innovations in Technology**

Over the years, Vishay’s R&D efforts have led to a steady stream of technological breakthroughs and innovative products. These include packageless power MOSFETs, the industry’s first silicon-based RF capacitors, dc-to-dc converter modules with all the active and passive components required for a complete power conversion solution, high-current IHLP inductors, Power Metal Strip® resistors, and many more.

**Leading Industry Rankings**

Vishay’s global footprint includes manufacturing facilities in China and other Asian countries, Israel, Europe, and the Americas, as well as sales offices around the world. Vishay has market shares ranging from substantial to number-one for each of its products.

**Discrete Semiconductors**

- Number 1 worldwide in low-voltage power MOSFETs
- Number 1 worldwide in rectifiers
- Number 1 worldwide in glass diodes
- Number 1 worldwide in infrared components
  ...and others

**Passive Components**

- Number 1 worldwide in wirewound and other power resistors
- Number 1 worldwide in foil, MELF, thin film, and current sense resistors
- Number 1 worldwide in wet tantalum capacitors
- Number 1 worldwide in strain gage sensors and load cells
  ...and others

**“One-Stop Shop” Service**

With Vishay’s “one-stop shop” service, customers can send their bills of materials (BOMs) to Vishay and ask the Company to cross-reference Vishay products in all categories. This enables customers to order multiple components from one source—Vishay. In addition, Vishay’s product sample service for design engineers provides free product samples worldwide. Quick turnaround time and a complete range of Vishay samples enable customers to rely on Vishay for discrete electronic component solutions. For more information about Vishay samples, please visit us on the Web at www.vishay.com or contact a local Vishay sales representative or office.
The worldwide market for aerospace equipment is extremely demanding and is expected to expand over the next several years. It is estimated that more than 500 platforms will be launched into space in the near future, with at least half of those providing commercial telephone, satellite, TV and data services.

Vishay is a worldwide manufacturer with a long-term commitment to aerospace customers. Vishay offers one of the industry’s broadest lines of high-reliability resistors, capacitors and inductors for aerospace applications. Vishay components used in aerospace equipment are designed to function reliably when subjected to extremely hot and cold temperatures, intense vibration, extreme humidity, and other environmental stresses. In addition, Vishay also offers custom-design components that provide the high quality and reliability demanded by aerospace customers.

Vishay components are designed for use in cockpit equipment, GPS navigation, radar units, radio and satellite communications, and a variety of other mission-critical space, airborne, and aerospace systems.

Resistors

More than four decades after its invention by Dr. Felix Zandman in 1962, Bulk Metal® Foil technology still outperforms all other resistor technologies available for applications that require high precision, stability, and reliability. Foil resistors are considered by many to be the ideal resistor. A typical foil resistor application is in a satellite that requires stable positioning circuitry to function properly while withstanding temperatures changes along the temperature spectrum. The only feasible solution for such extreme applications is the use of a foil resistor with an exceptionally low temperature coefficient of resistance and low total error budget.

The Bulk Metal Foil Resistor has precision characteristics that are unavailable in other technologies. A variety of resistor configurations and chip packages from 0805 and larger are used to provide variations in power, size, and other operating specifications to meet the needs of various applications.

The Vishay Foil Resistors VSMP series of ultra-high-precision, surface-mount resistors (0805, 1206, 1506, 2010, and 2512) are the industry’s first devices to provide a combination of features that include power ratings up to 750 mW at 70 °C with load life stability down to ±0.005 %, typical TCR of ±0.05 ppm/°C (industrial range) and ±0.2 ppm/°C (military range), a power coefficient of resistance (PCR) of ±5 ppm at rated power (ΔR due to self heating), Electrosensitive Discharge (ESD) above 25 kV, tolerance: to ±0.01 %, short-time overload of <0.005 %, a non inductive/non capacitive design, and a rise time of 1 ns without ringing.

Vishay’s revolutionary Bulk Metal Z Foil technology provides a significant reduction of the resistive component’s sensitivity to ambient temperature variations and applied power changes. This breakthrough level of stability, at least one order of magnitude better than any other resistor technology, allows designers to guarantee a high degree of accuracy in fixed-resistor applications.

The Vishay Beyschlag MCS 0402, MCT 0603, MCU 0805, and MCA 1206 resistors are aimed at applications that require extended value ranges with high stability and accuracy. The resistors have an ultra-stable thin film resistive layer and high-quality contacts between the resistive and conductive layers, and are manufactured using a proprietary laser trimming technique. All of the devices meet the requirements of EN 140401-801, and have the industry’s widest resistance range for CECC-compliant precision resistors, with values from 39 Ω to 2 MΩ. Characteristics include tolerances of ±0.1 % or ±0.25 %, superior overall stability (class 0.1 and 0.25), and TCR ratings as low as ±10 ppm/°C.
Capacitors

Vishay offers a wide selection of aluminum, tantalum, ceramic, and film capacitors for use in high-reliability aerospace applications.

The SuperTan® Extended (STE) capacitors from Vishay Sprague provide reliable performance in low-voltage filtering and energy storage applications in demanding, high-stress aerospace systems. The SuperTan design dramatically increased the available capacitance in each of the four standard cased sizes. It provides two to three times more capacitance per unit volume while substantially increasing ripple current capability as well as reduced ESR. The STE wet tantalum capacitor is hermetically sealed, and comes in industry-standard T1, T2, T3, and T4 case sizes. STE capacitors are capable of withstanding a 2,000-hour life test at a temperature of +85 °C at the applicable rated dc working voltage. In airborne, aerospace, and satellite applications, where size and weight are the primary considerations, SuperTan is the preferred capacitor style for the energy storage, voltage hold-up, timing and filtering circuit design.

The CWR06 and CWR11 series of conformal-coated tantalum capacitors are qualified to mil-C-55365/4 and /8, respectively. They are available in capacitances from 0.10 μF to 100 μF, 4 WVDC to 50 WVDC range, and with Weibull failure rates B and C. The devices are rated for an extended –55 °C to +85 °C operating temperature range and a derating temperature of +125 °C.

The T83 and T95 Hi-Rel COTS series of tantalum capacitors are intended for aerospace and industrial applications. They are particularly well suited for high volume, highly automated surface mount manufacturing processes. Designed for a variety of avionics and military systems, the molded T83 capacitors are available in five case codes, sizes A through E, per EIA-535BAAC. They provide designers with a high-reliability, screened capacitor that does not require a source control or customer drawing. The T95 conformal-coated capacitors offer high-reliability screening options including Weibull grading, and surge current testing options in accordance with mil-PrF-55365 in a wide variety of cases. The devices, part of Vishay’s TANTAMOUNT® tantalum capacitor family, have a capacitance range of 0.1 μF to 330 μF for the T83, and 0.1 μF to 680 μF for the T95. The capacitors operate over a temperature range of –55 °C to +125 °C.

Devices in the CLR series of wet tantalum capacitors have established reliability to MIL-PRF-39006 and have been listed as a preferred capacitor on NASA and ESA (European Space Alliance) specifications. The axial-led hermetically-sealed CLR capacitors are qualified to failure rates up to level R (0.01 % per 1000 hours). The CLR79 and CLR81 capacitors have been tested by NASA and been found to be tolerant to radiation doses. For testing data or more information on the CLR series, contact wettants@vishay.com.
The Vishay HPC series of high-frequency silicon RF capacitors exhibit exceptional capacitance versus frequency stability. Available in several small case sizes—0201, 0402, and 0603—the HPC devices also feature low ESR, low parasitics, high SRF, high Q, tight tolerances, and no required trimming. The HPC series is specially designed to help reduce any tomb-stoning problems under wave-soldering manufacturing conditions. It is the ideal choice for GPS systems, mobile communications and other RF-related applications.

The established-reliability CDR series and Hi-Rel VJ series from Vishay Vitramon are manufactured for system-critical applications. They offer tin-lead terminations for critical and sensitive aerospace environments and are periodically tested to MIL-PRF-55681 group A and C guidelines to maintain the utmost degree of quality. Vishay’s wet build-up manufacturing process helps to minimize chip-cracking problems due to board flexing and thermal breakdown in the specialty ceramic multi-layer capacitor series, which includes our OMD-Cap and RuGGed chips. The OMD-Cap series is also available with a high-reliability, 100% voltage conditioning option. Custom testing per customer specific and other established-reliability specifications can also be accommodated. For more information contact mlcc.specials@vishay.com.
Measurement and Analysis

Vishay Micro-Measurements produces strain gages and associated instruments for stress analysis testing in the aerospace industry. Aircraft, space vehicles, aircraft engines, and propulsion units are examples of numerous devices that require rigorous testing prior to launch. Strain gages are sensors used for testing the structural integrity of the devices. Typically the data collected from physical testing is compared with results obtained through computer simulation. In quantities ranging from just a few to many thousands, strain gages are attached at various points on the interior and exterior of the structure and are connected to specialized strain measurement instrumentation. Vishay Micro-Measurements offers a selection of over 250,000 different strain gage types and instrumentation in the form of indicators, amplifiers, and data acquisition systems for a wide variety of measurement applications. Available strain gage installation accessories include surface preparation materials, adhesives, installation tools, protective coatings and other supplies, making Vishay your complete source for strain measurement needs. Vishay also offers dedicated training programs, seminars, workshops, and on-site training to properly train managers, design and test engineers, and technicians on the proper use and installation of Vishay strain gages and instrumentation.

A fast, cost-effective method of improving structural design in aerospace applications is using the Vishay PhotoStress® method. PhotoStress is a widely used full-field technique for accurately measuring surface strains to determine the stresses in a part or structure during static or dynamic testing.

With the PhotoStress method, a special strain-sensitive plastic coating is first bonded to the test part. Then, as test or service loads are applied to the part, the coating is illuminated by polarized light from a reflection polariscope. When viewed through the polariscope, the coating displays the strains in a colorful, informative pattern that immediately reveals the overall strain distribution and pinpoints highly strained areas. With an optical transducer (compensator) attached to the polariscope, quantitative stress analysis can be quickly and easily performed. The PhotoStress method enables a full-field stress analysis on actual structures of virtually any size, shape, and material under actual service conditions. For more information regarding PhotoStress, email vmm.us@vishaymg.com.

The Vishay Revere JetWeigh-W™ wireless aircraft weighing system is an accurate and easy-to-use system that integrates wireless communication and digital weighing. The JetWeigh-W system allows for routine weight and center-of-gravity monitoring, as well as weight checking after airframe repairs and modifications. The JetWeigh-W system includes a rugged handheld PC that communicates with up to five hermetically sealed load cells and a thermal printer that provides weight result printouts. The system has a weight capacity range of up to 600,000 pounds, operation range over 220 feet, and accuracy of ±0.1 % of applied load or ±0.02 % of channel capacity, whichever was greater.
One of the World’s Largest Manufacturers
of Discrete Semiconductors and Passive Components

SEMIConDUCTORS:
Rectifiers • Small-Signal Diodes • Zener and Suppressor Diodes • MOSFETs • RF Transistors • Optoelectronics • ICs

PASSIVE COMPONENTS:
Resistive Products • Magnetics • Capacitors • Strain Gage Transducers and Stress Analysis Systems

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