Passives Quarterly Newsletter
#14-Q4/2014

Welcome to the new Passives Quarterly Newsletter, which covers Q4 of 2013. Included in this newsletter are brief items on recent product releases, divisional news, new and updated literature, and other highlights of the past 90 days. Please remember that we encourage your feedback or suggestions on any additional pieces of information or improvements that we could consider for inclusion.

Paul Harrison

Product News

Capacitors

Aluminum

New 159 PUL-SI Series of Snap-In Power Aluminum Capacitors
For solar PV inverters, industrial motor controls, and power supplies, the Vishay BCcomponents 159 PUL-SI series has been enhanced with a high rated voltage of 500 V at +105 °C.

Product Benefits:
- Rated voltage of 500 V at +105 °C
- Useful life of > 3000 hours
- High ripple current to 2.80 A at 120 Hz and +105 °C
- Max. ESR down to 150 mΩ at 100 Hz
- Available in a variety of case sizes ranging from 22 mm x 25 mm to 35 mm x 60 mm

Market Applications:
- Smoothing, filtering, and energy storage in pulsed power applications
- End products include solar PV inverters, industrial motor controls, and power supplies

Datasheet link:
http://www.vishay.com/doc?28341 (159 PUL-SI)

Ceramic – Single-Layer

New VY1 and VY2 Series Leaded Ceramic Safety Capacitor Sample Kits Available
The new sample kits contain the most common capacitance values of both the VY1 and VY2 series of ceramic safety capacitors.

Product Benefits:
- Each kit contains samples of the seven most common capacitance values
- Give engineers the possibility to find the best AC-line-rated EMI filter capacitor for their application
- Compliant to IEC 60384-14, third edition
- VY1 series is X1 / Y1 classified with a rated voltage of 760 VAC / 500 VAC
- VY2 series is X1 / Y2 classified with a rated voltage of 440 VAC / 300 VAC
- RoHS-compliant
- Halogen-free
- SAP part numbers: VY11-KIT-HF (VY1 kit) and VY21-KIT-HF (VY2 kit)

Market Applications:
- Safety capacitors are mandatory in every device directly connected to the mains supply
- Power supplies, white goods, consumer electronics, smart and power meters, lighting ballasts, and more
3D Step Files for the 715C and 660R Series High-Voltage Ceramic Disc Capacitors Have Been Uploaded to Our Website

Benefits:
- Perfect tool for engineers and PCB layout designers
- Exact digital 3D drawings of our components, taking into account dimensions and tolerances
- Directly implement our components into standard PCB design programs

Ceramic – MLCCs

New VJ Safety Series Surface-Mount MLCCs
For safety-certified applications, Vishay Vitramon VJ Safety series surface-mount multilayer ceramic chip capacitors (MLCC) are available with C0G (NP0) and X7R dielectrics, and X1 / Y2 and X2 safety classifications.

Product Benefits:
- Offer low profiles to save board space and fully conform with latest creepage distance requirements
- Manufactured in noble metal electrode technology (NME) with a wet build process
- Low capacitance down to 10 pF for C0G (NP0) dielectric
- High capacitance to 12 nF for X7R dielectric
- 250 VAC voltage ratings
- 2008, 2012, and 2220 case sizes
- Approved to IEC 60384-14:2005, 3rd edition
- Peak impulse voltages of 5000 V (X1 / Y2) and 2500 V (X2)
- RoHS-compliant, halogen-free, and comply with Vishay "Green" standards

Market Applications:
- EMI and AC line filtering, and lightning strike and voltage surge protection in power supplies, battery chargers, and isolators for fax machines and telephones, modems and routers, and AC equipment and appliances

Datasheet links:

Vishay’s MLCC Division Earns ISO 13485:2003 Certification for Migdal Ha’Emek, Israel Plant

Vishay’s Multilayer Ceramic Chip Capacitor (MLCC) Division has earned the International Organization for Standardization (ISO) 13485:2003 certification for its plant in Migdal Ha’Emek, Israel. Vishay’s ISO 13485:2003 registration audit was conducted by the Standards Institution of Israel (SII), and the site was certified for the design and manufacture of MLCCs for the medical market.

ISO 13485:2003 certification specifies processes for an organization’s quality management system to demonstrate its ability to provide medical devices and related services that consistently meet regulatory and customer requirements pertaining to medical device application standards.

At Vishay’s Migdal Ha’Emek plant, the company manufactures MLCCs for implantable life support equipment, such as pacemakers and ICDs, as well as neurostimulation devices. By producing these components to the stringent requirements set by ISO 13485:2003, the company continues to demonstrate its commitment to the medical industry. For more information please visit: http://www.vishay.com/company/press/releases/2013/130910MigdalISO/.
Film
MKP1848C - New Environment Friendly DC-Link MKP Film Capacitor for Industrial Power Applications
Vishay introduces new DC-link metalized polypropylene film capacitor featuring environment friendly materials. The MKP1848C is RoHS compliant, Halogen-Free and Vishay GREEN, and stands out by offering the Industry’s broadest capacitance range from 1 µF up to 500 µF capacitors for a voltage range from 500 Vdc up to 1200 Vdc.

Product Benefits:
- Low ESR down to 1.5 mΩ
- Low Self inductance of < 1 nH per mm of lead spacing
- High peak current capabilities up to 156 0A
- High RMS current up to 55 A
- Operating temperature up to 105 °C
- Long useful lifetime > 100 000 h, at 70 °C under nominal voltage.
- RoHS-compliant, halogen-free, and comply with Vishay "Green" standards

Market Applications:
- Solar and Wind Inverters
- Motor drives
- Frequency converters
- Switch mode power supplies
- Battery Chargers

Datasheet links:
http://www.vishay.com/doc?26015

Tantalum
Commercial-Grade Molded Solid Tantalum Capacitors Now Qualified to ECIA EIA-717 Specification
Our Tantalum Capacitors Division is now qualifying Vishay’s commercial-grade molded tantalum chip capacitors to the Electronic Components Industry Association’s (ECIA) EIA-717 specification. By meeting the standard’s rigorous testing and screening requirements, Vishay is providing its customers with a secure source for high-performance tantalum products.

Replacing multiple company-specific standards, EIA-717 is designed to simplify the purchasing process by providing a consistent way to compare surface-mount tantalum and niobium capacitors across suppliers. Developed by a committee of engineering experts from both the supplier and user communities, the specification’s testing suite includes life tests, thermal shock, biased humidity, temperature stabilities, resistance to solder heat, and more.

An internationally recognized reference for commercial-grade products, qualification to the EIA-717 specification signifies a product’s high quality and performance. Vishay’s initiative to utilize the standard allows the company’s customers to maintain stability in their end products.

More information on our commercial-grade solid tantalum capacitors can be found at http://www.vishay.com/capacitors/tantalum/tantalum-solid/

New TP8 Automotive-Grade MicroTan® Solid Tantalum Chip Capacitors
For automotive electronics, Vishay’s MicroTan® TP8 is the first AEC-Q200-qualified solid tantalum chips capacitor series to employ a high-volumetrically efficient packaging solution for industry-high capacitance-voltage ratings in small case sizes down to 0603.

Product Benefits:
- Offered in a variety of small case sizes, including the 0603, 0805, and 0906
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- Capacitance-voltage ratings from 1.0 µF-40 V to 100 µF-6.3 V
- Standard capacitance tolerances of ± 10 % and ± 20 %
- Rectangular molded case encapsulation is ideal for high-volume PCB assembly
- Lead (Pb)-free, L-shaped facedown terminations offer better mechanical and electrical contact to the solder pad than traditional facedown-style terminations
- RoHS compliant
- Available in 8 mm tape and reel packaging per EIA-481

Market Applications:
- Bulk capacitance, energy storage, filtering, and decoupling in space-constrained automotive applications including tire pressure monitoring systems, camera modules, rearview mirrors, and remote keyless entry

Datasheet link:
http://www.vishay.com/doc?40151 (TP8)

Tantalum-Cased Wet Tantalum Capacitors Approved to DLA Drawing 13017
Vishay has introduced a new tantalum-cased wet tantalum capacitor with a glass-to-tantalum hermetic seal that is approved to Defense Logistics Agency (DLA) drawing 13017. For avionics and aerospace systems, the device is the industry's first extended capacitance DLA-approved wet tantalum capacitor to combine a reverse voltage of 1.5 V at +85 ºC with improved vibration and thermal shock capabilities.

Product Benefits:
- Provides all the advantages of Vishay’s SuperTan® series devices, while offering improved reverse voltage, thermal shock, and high vibration capabilities
- Enhanced performance, high-reliability design
- Designed for the avionics and aerospace applications
- Improved vibration (sine: 50 g; random: 27.7 g) capability
- Improved thermal shock (300 cycles) capability
- High capacitance from 10 µF to 680 µF
- Capacitance tolerance of ± 10 % and ± 20 % standard at 120 Hz and +25 ºC
- Low ESR down to 0.70 Ω at 120 Hz and +25 ºC
- Standard tin / lead terminations, with RoHS-compliant 100 % tin terminations available

Market Applications:
- Timing, filtering, energy hold-up, and pulse power applications in power supplies for space and avionics equipment

Datasheet link:
http://www.vishay.com/doc?40167 (DLA 13017)

Marking Changes Notification for TR3 and TL3 – Commercial Molded Chip Tantalum Capacitors
As part of our continuous improvement process and to conform to Vishay marking rules, the tantalum capacitor division has updated the case marking for TR3 and TL3 commercial series.
For more information please visit:

Coming Soon: T42 Solid Tantalum Surface-Mount Capacitors with Built-In Fuse
The T42 series of TANTAMOUNT® solid tantalum capacitors features a built-in fuse to provide circuit protection for mission- or safety-critical systems. Designed for reliable operation, and with additional reliability screening available, the T42 provides guaranteed fuse protection at 5 A and 10 ms to protect against catastrophic failures, while avoiding
false triggering. The device features a molded, surface-mount construction available with tin / lead or 100 % tin
wraparound terminations.

**Inductors**

**Vishay Dale**

**New IHLP-8787MZ-51 Low-Profile, High-Current Inductor**

The new Vishay Dale IHLP-8787MZ-51 IHLP® low-profile, high-current inductor in the 8787 case size features high
rated current from 7 A to 100 A and a high operating temperature to +155 °C.

**Product Benefits:**
- High rated current to 100 A
- High efficiency:
  - Max. DCR from 0.67 mΩ to 39.4 mΩ
  - Wide range of inductance values from 0.47 µH to 100 µH
- Handles high transient current spikes without hard saturation
- Halogen-free and Vishay GREEN

**Market Applications:**
- DC / DC converter applications in servers; low-profile, high-current power supplies and point of load (POL)
  converters; distributed power systems; solar inverters; and industrial lighting

**Datasheet link:**

**Vishay’s HiRel Division Earns ISO 14001:2004 Certification for Marshall, Minnesota Plant**

Vishay’s HiRel Division has earned the International Organization for Standardization (ISO) 14001:2004 certification
for our Marshall, Minnesota plant. The ISO 14001:2004 registration audit was conducted by UL DQS Inc., and the site
was certified for the design and manufacture of magnetic devices.

ISO 14001:2004 is a global specification covering the processes and practices necessary to limit environmental impact
through significantly reduced energy and raw materials consumption, and lower production of waste materials.
Certification requires an organization to identify the environmental impact of its operations, document controls that are
in place, and take a systematic approach to continuously improving its environmental performance.

At our Marshall plant, Vishay manufactures custom magnetics — including inductors, transformers, and telemetry coils
— for implantable medical devices. By producing these components to the stringent requirements set by ISO
14001:2004, we’re demonstrating our commitment to conserving resources and decreasing its impact on the
environment.

**New IWAS-4832EC-50 Wireless Charging Receiving Coil**

For the wireless charging of 7 V portable electronics, the powdered-iron-based, WPC-compliant IWAS-4832EC-50
wireless charging receiving coil offers high efficiency greater than 75 % and is optimized for use with or without an
alignment magnet.

**Product Benefits:**
- Not affected by permanent locating magnets
- Durable construction and high permeability shielding
- Provides high efficiency greater than 75 %
- Blocks charging flux from sensitive components or batteries
- Magnetic saturation of 50 % of inductance at 4000 gauss
- RoHS compliant
Market Applications:
- Wireless charging of 7 V portable electronics


Resistors
Vishay Dale

WANTED Posters
The Vishay Dale Resistor Division continues to issue monthly "WANTED" posters based on the playing card marketing campaign. These posters contain the focus product(s) for each month and will contain the playing card, applications (Common Hideouts) they can be found in, competitors (Aliases) with similar product, and contact information. Along with the poster, there will be several training slides for the product – these can be used for training in the field or QBRs. Detailed information will be released via Fast Facts.

For Q1 2014 – the three posters will be for MR / MRA Ultra Precision / Audio Wirewound (7 of Diamonds); Custom RB, RD & EDG High Power Wirewound Resistor Assemblies and Solutions (8 of Clubs) and Wire Bondable Chips (Queen of Diamonds).

New RCP Series of Thick Film Chip Resistors on AlN Substrates
For high-power, surface-mount RF applications, the Vishay Dale RCP series of thick film chip resistors on AlN substrates features power ratings up to 11 W with active temperature control in the compact 1206 case size.

Product Benefits:
- High power ratings:
  - 1 W at +70 °C with a standard board mount
  - Up to 11 W with active temperature control
- Operating temperature range from -55 °C to +155 °C
- Resistance range from 10 Ω to 2 kΩ
- Tolerance down to ± 2 %
• TCR of ± 100 ppm/°C
• Compliant to RoHS directive 2011/65/EU
• Halogen-free according to the JEDEC JS709A definition

Market Applications:
• RF applications for high-power aerospace, military, industrial, and telecom systems

Datasheet link:
http://www.vishay.com/doc?31098 (RCP)

New Miniature Axial-Leaded HML Thick Film Resistor
For hearing aids and industrial high-frequency probe tips, the Vishay Techno HML miniature axial-leaded thick film resistor is encapsulated in a robust plastic housing and offers an ultra-compact 1.85 mm by 0.91 mm case size.

Product Benefits:
• High-temperature performance to +150 °C
• Non-inductive design
• Power rating of 0.063 W at +70 °C
• Maximum working voltage of 50 V
• Resistance range of 1 Ω to 22 MΩ
• Tolerances down to ± 1 %
• Temperature coefficients to ± 100 ppm/°C
• RoHS-compliant

Market Applications:
• Hearing aids and industrial high-frequency probe tips

Datasheet link:
http://www.vishay.com/doc?68038 (HML)

Expanded Failure Rate QPL approval:
RLR20 Metal Film Resistor Now Available with “S” Failure Rate
The Vishay Dale RLR20 metal film resistor is now available with a qualification extension to the “S” Failure Rate (0.001 %/1 000 h). Vishay Dale can now support the full failure rate levels of “M”, “P”, “R”, and “S” on the RLR20 series (MIL-PRF-39017/2) for the value range 4.3 Ω to 3.01 MΩ, and in tolerances of either 1 % or 2 %. The standard solder finish on the lead wires of the RLR products is an electroplated Sn60/Pb40 solder finish. The RLR products are also available with an optional hot solder dipped Sn63/Pb37 solder finish for an added charge.

Product Benefits:
• Vacuum deposited Ni-chrome alloy resistive element on a high purity ceramic substrate
• Epoxy coated construction provides superior moisture protection
• Power rating of 0.5 W for the RLR20 size
• Resistance range from 4.3 Ω to 3.01 MΩ
• Operating temperature range of - 65 °C to + 150 °C

Datasheet link:
http://www.vishay.com/doc?31023 (RLR20)

High Voltage “Fast Fact”:
Be sure to review and utilize the “Fast Fact” information published on December 4, 2013 referencing the “Wanted Poster” and playing cards for the SMD and Through-Hole High Voltage Resistors. Here is link to that “Fast Fact”...
LEGACY PRODUCT REVIEW
CMF Precision Metal Film Resistors
The CMF series are axial-leaded precision metal film resistors, with tolerance ranges down to ± 0.1 % and temperature coefficients down to ± 25 ppm/˚C. The CMF series comes in seven sizes (50, 55, 60, 65, 70, 07 and 20) with power ratings from 0.125 W to 1 W. The CMF series has precision deposited Ni-chrome alloy film resistive elements with controlled annealing and a proprietary epoxy coating that provides superior moisture protection. The CMF series is available in either a lead-bearing, or lead (Pb)-free (compliant to RoHS directive 2011/65/EU) construction. The CMF series is also available in fusible, non-magnetic, military qualified (MIL-R-10509 and MIL-PRF-22684), flame retardant, and pulse withstanding versions.

Product Benefits:
• Low temperature coefficient of resistance
• Very low noise and voltage coefficient
• Excellent high frequency characteristics
• Proprietary epoxy coating provides superior moisture protection
• Operating temperature range of - 55 °C to + 175 °C

Datasheet link:
http://www.vishay.com/doc?31018 (CMF)

WSLP3921 and WSLP5931 Surface-Mount Power Metal Strip® Resistors
Vishay’s WSLP3921 and WSLP5931 surface-mount Power Metal Strip® resistors combine high power ratings from 5 W to 10 W with extremely low resistance values down to 0.0003 Ω.

Product Benefits:
• Offered in 3921 and 5931 case sizes
• High-temperature performance to + 170 °C
• Tight tolerances of 1.0 % and 5.0 %
• Very low inductance of 0.5 nH to 5 nH
• Low thermal EMF (< 3 μV/°C)

Market Applications:
• Current sensing, voltage division, and pulse applications, including switching and linear power supplies, instruments, and power amplifiers in automotive electronic controls such as engine, anti-lock brakes, and climate controls; industrial controls, including down-hole test/measurement equipment for oil/gas well drilling; and inverter controls for HVAC systems

Datasheet link:
http://www.vishay.com/doc?30176 (WSLP3921, WSLP5931)

WSBM8518 Power Metal Strip® Battery Shunt Resistor
Vishay’s WSBM8518 Power Metal Strip® battery shunt resistor features a molded enclosure to simplify PCB connection, high 36 W power capability, and low resistance of 100 µΩ in the 8518 package size.

Product Benefits:
• Molded enclosure with a 4-pin connector
  • Provides easy PCB connection to the shunt resistor assembly
  • Simplifies designs to reduce overall solution costs
• High 36 W power capability
• 8518 package size
• Extremely low resistance of 100 µΩ
• Tolerance of 5.0 %
• Features an all-welded construction that allows operation with continuous
currents as high as 600 A

- Low inductance values of < 5 nH
- Low thermal EMF of < 3 µV/°C
- Lead (Pb)-free and RoHS compliant

Market Applications:
- Battery shunt applications for gas, diesel, hybrid, and electric cars and trucks, as well as electric forklifts, utility trucks, and other heavy industrial applications

Datasheet link:
http://www.vishay.com/doc?31094 (WSBM8518)

WSLP0603 Surface-Mount Power Metal Strip® Resistor
Vishay’s WSLP0603 Power Metal Strip™ resistor is the industry’s first 0.4 W current sensing resistor in the compact 0603 package size.

Product Benefits:
- Industry’s first 0.4-W current sensing resistor in the compact 0603 package size
  - Saves space on the circuit board
  - Creates smaller and lighter products for the consumer
- Features a very low 10-mΩ to 100-mΩ resistance value range
- High-temperature performance up to + 170 °C
- Very low inductance values from 0.5 nH to 5 nH
- Excellent frequency response to 50 MHz
- Low thermal EMF of less than 3 µV/°C

Market Applications:
- Current sensing applications in dc-to-dc converters, VRMs for laptops, and Li-Ion battery safety and management; and electronic automotive systems, including engine controls, multi-media electronics, climate controls, and anti-lock brakes

Link to product datasheet:
http://www.vishay.com/doc?30122 (WSLP)

CPL Wirewound Resistors, Commercial Power, Axial Lead, Low Value
The Vishay Dale CPL wirewound resistor series features low ohmic values in a low-cost, flameproof ceramic package. Ideal for current sensing applications in high-volume, commercial products, the CPL resistors are available with power ratings from 2 W to 15 W. The devices also feature very low inductance, low TCR, and an optional PC board stand-off package.

Product Benefits:
- High power to size ratio
- Low inductance, less than 5 nH
- Ceramic cases are available with circuit board stand-offs (designated with a -3 model ending)
- Superior surge capability
- Extremely low resistance values
- Complete welded construction
- Special inorganic potting compound and ceramic case provide high thermal conductivity in a fireproof package
- Compliant to RoHS Directive 2002/95/EC

Link to product datasheet:
http://www.vishay.com/docs/30212/30212.pdf
MCR Resistors
Vishay Milwaukee MCR style resistors are compact power resistors for mounting on heat sinks.

Product Overview
- High power/size ratio
- 45 W to 125 W power rating, heat sink mounted
- 0.2 Ω to 76 kΩ resistance range
- Dielectric voltage 750 Vrms standard, 1500 Vrms on request
- Non-inductive styles available
- Customers can reduce assembly labor by specifying connectors and/or wires

Market Applications
- Dynamic braking, motor control, rail car, pre-charge

Link to product datasheet:
www.vishay.com/doc?31834 (MCR)

Vishay Dale Thin Film
Extended PHP Series Thin Film Chip Resistors
Vishay has extended the Vishay Dale Thin Film PHP series of precision high-power thin film chip resistors with new devices in the compact 0603 and 0805 case sizes.

Product Benefits:
- Now offers 0603 and 0805 case sizes with power ratings of 0.375 W and 0.675 W, respectively
  - High power up to 2.5 W for the series
- Low absolute TCR of ± 25 ppm/°C
- Tolerances down to ± 0.1 %
- Wide temperature range of -55 °C to +125 °C
- Stable film and performance characteristics of 1000 ppm at +70 °C for 2,000 hours
- Offers a resistance range from 10 Ω to 30.1 kΩ, with non-standard values available
- Low noise of < -30 dB
- Low voltage coefficients of 0.1 ppm/V
- Voltage ratings from 75 V to 200 V

Market Applications:
- High-precision medical imaging, and industrial, telecommunications, and test and measurement instrumentation and equipment

Datasheet link:
http://www.vishay.com/doc?60076 (PHP)

PATT Precision Automotive Thin Film Chip Resistor Now Available in 0805 Case Size
Vishay's PATT precision automotive thin film chip resistor is now available in the 0805 case size. The device features high-temperature operation to +155 °C with 100 % power, derated linearly to 0 mW power at +250 °C.

Product Benefits:
- AEC-Q200 qualified
- Low absolute TCR down to ± 25 ppm/°C
- Laser-trimmed tolerances down to ± 0.1 %
• Load-life stability of < 0.2 % at 155 °C and full rated power for 1000 hours
• Compact 0603 case size
• Wide resistance range from 2.75 Ω to 120 kΩ, with non-standard values available
• Very low noise of < -35 dB
• Low voltage coefficients of 0.1 ppm/V
• Withstands ESD to 2 kV per AEC-Q200 Class 1C
• Moisture resistant to MIL-STD-202, method 202
• Flame resistant in accordance to UL 94 V-0
• Sulfur resistant per ASTM B809-95 humid vapor test
• 100 % visually inspected per MIL-PRF-55342
• Lead (Pb)-free, RoHS-compliant, halogen-free, and conforms to Vishay "green" standards

Market Applications:
• Low-noise, single-signal processing
• Under-the-hood automotive applications; high-precision oil and gas exploration; and telecommunications and industrial equipment

Datasheet link:
http://www.vishay.com/doc?60124 (PATT)

Vishay Draloric/Beyschlag

New AC05..CS Axial Silicone Cemented, Fusible Wirewound Safety Resistor
Vishay's AC05..CS 5 W axial silicone cemented, fusible wirewound safety resistor that is the industry's first designed to ensure safe and silent fusing operation during overload conditions, while offering surge voltage withstanding capability up to 6 kV (1.2 μs / 50 μs).

Product Benefits:
• Ensures safe and silent fusing operation during overload conditions and acts as inrush current limiting resistor during normal operation
• Offers surge voltage withstanding capability up to 6 kV (1.2 μs / 50 μs)
• Fusing time of < 45 s for a 100 W overload
• Special non-flammable silicone cement coating for immediate interruption without flame and explosion when AC mains voltage (230 VAC) is applied
• Power rating to 5 W
• RoHS compliant

Market Applications:
• Electric appliances, energy meters, and power supplies

Datasheet link:
http://www.vishay.com/doc?28894 (AC05..CS)

New ULDCR Series Stainless Steel Braking / Crowbar Resistors
The Vishay Draloric ULDCR series of stainless steel braking / crowbar resistors offers industry-high pulse energy capability to 3.46 MJ and pulse current capability up to 12 kA, with higher pulse load capacity versions built to customer specifications also available.

Product Benefits:
• Features a patented, robust, and modular design
• Simple assembly and compact size
• Typical temperature rise below 350 °C for a single pulse
• High operating temperatures up to 375 °C
- Resistance values from 1 mΩ to several ohms
- Tolerances at room temperature of ± 5 % and ± 10 %
- Change in resistance in service less than ± 20 %
- Manufactured without any organic compounds
- RoHS compliant and Vishay GREEN

Market Applications:
- Crowbar resistors and frequency converters for three-phase generators in wind power plants and pumped-storage hydro power stations
- Brake and chopper resistors for railways, elevators, and industrial applications


**New UMB 0207 Series of High-Precision Thin Film MELF Resistors**

For demanding applications with high accuracy and stability requirements, Vishay’s UMB 0207 series of high-precision thin film MELF resistors is the industry's first to offer low TCR down to ± 5 ppm/K and tolerances down to ± 0.02 % in the standard 0207 case size.

**Product Benefits:**
- Low TCR down to ± 5 ppm/K
- Tolerances down to ± 0.02 %
- Standard 0207 case size
- Resistance range from 100 Ω to 390 kΩ
- High operating voltage of 350 V
- Rated power dissipation to 400 mW at +70 ºC
- Excellent long term stability down to < 0.02 % after 1000 hours
- Suitable for processing on automatic SMD assembly systems

**Market Applications:**
- Precision circuits in measurement and calibration equipment, industrial process control systems, aerospace electronics, and medical equipment


**Extended MC Series Professional and Precision Thin Film Chip Resistors**

The Vishay Beyschlag MC series of professional and precision thin film chip resistors has been extended with lower ohmic values in the compact 0402 and 0603 case sizes.

**Product Benefits:**
- Professional
  - Improved resistance down to 10 Ω in 0402 case size for all TCR / tolerance combinations
  - Improved resistance down to 10 Ω in 0603 case size for TCRs of ± 50 ppm/K and ± 25 ppm/K, with a 0.5 % tolerance
  - High rated dissipation at 70 ºC to 400 mW
  - Operating temperature to +155 ºC
- Precision
  - Improved resistance range down to 100 Ω in 0402 case size for all TCR / tolerance combinations
  - Low tolerance down to ± 0.1 %
  - Low TCR down to ± 10 ppm/K
- Approved according to EN 140401-801
• RoHS compliant

**Market Applications:**
- Industrial electronics such as sensors, scales, bridges, and precision amplifiers
- Automotive electronics including engine control units, gearbox controls, body electronics, and safety, power supply, and braking systems; and battery management, measurement control, and steering technology
- Telecommunication base stations
- Medical equipment

**Datasheet links:**

**Enhanced MC AT Professional and Precision Series Thin Film Chip Resistors**
Optimized to provide high reliability in harsh environments, Vishay's enhanced MC AT professional and precision series of automotive thin film chip resistors feature lower TCR down to ± 10 ppm/K and a wider range of resistance values from 1 Ω to 1 MΩ.

**Product Benefits:**
- Available in 0402, 0603, 0805, and 1206 case sizes
- MC AT professional series:
  - High-temperature performance to +175 °C for 1000 hours
  - Extended resistance range of 1 Ω to 1 MΩ
- MC AT precision series:
  - Now offers resistance values of 47 Ω to 1 MΩ with tolerances down to ± 0.1 %
  - Lower TCR down to ± 10 ppm/K
- High power ratings of 400 mW in 1206 case size
- Excellent moisture and sulfur resistivity
- Operating voltages from 50 V to 200 V
- Up to 2000 V ESD capability
- AEC-Q200 qualified
- Approved to EN 140401-801
- Suitable for processing on automatic SMD assembly systems
- RoHS-compliant
- Compatible with lead (Pb)-free and tin / lead (Sn / Pb) reflow and vapor-phase soldering processes

**Market Applications:**
- Engine control units, climate control, braking systems, power supplies, lighting, and sensors in automobiles; telecom base stations; and industrial and medical measurement equipment

**Datasheet links:**

**GBS Arrays / Banks for High-Power Applications**
With power ratings to 1000 W, the GBS series has long been known as the most powerful class of wirewound Vishay Draloric / Beyschlag products. Today, high-power solutions are required by a number of industrial, transportation, and renewable energy applications. While a single resistor alone cannot meet this demand, a combination of several resistors can. This interconnection of single standard resistors to wirewound arrays or banks (Figure 1) opens a new field for customized power resistor solutions.
Figure 1: a) 4 kW power wirewound b) 12 kW load bank

Product Benefits:
- High power levels in the multiple kW range
- Very high pulse load capability
- Customized resistance values by serial or parallel connections
- High quality through use of mature products
- Robust design

Market Applications:
- Load bank
- AC filter
- Pre–discharge resistor
- Brake resistor

Datasheet links:
www.vishay.com/doc?21004 (GBS series)
www.vishay.com/doc?21015 (Mounting accessories)

Vishay Sfernice
New PRA073 and PRA074 High-Precision Thin Film SMD Wraparound Chip Resistor Arrays
The Vishay Sfernice PRA series of high-precision thin film surface-mount wraparound chip resistor arrays has been extended to the ultra-compact 073 and 074 case sizes to save valuable board space.

Product Benefits:
- Compact 073 and 074 case sizes with 0.7 mm pitch
  - PRA073 (with two resistors): 1.4 mm by 0.75 mm
  - PRA074 (with two resistors): 1.4 mm by 1 mm
- Tight tolerance ratios down to 0.01 %
- Tight TCR of 10 ppm/°C
- TCR tracking to 1 ppm/°C
- Resistance range from 10 Ω to 100 KΩ
- Power ratings to 40 mW per resistor at +70 °C
- Limiting voltages to 40 V
- Very low noise of ≤ 35 dB
- Low voltage coefficient of ≤ 0.01 ppm/V
- Load-life ratio of 0.02 % for 1000 hours at +70 °C
- RoHS-compliant and Vishay GREEN
- Available with humidity withstand testing to AEC-Q200

Market Applications:
- Instrumentation, calibration, and data conversion systems in aircraft engine controls and flight command computers; precision scales; automatic test equipment; and medical applications
Vishay Sfernice is proud to announce its presence in the Automotive Grade and AEC-Q200 brochures. Its well-established D2TO automotive SMD resistor is now displayed amongst Vishay's qualified products. In addition, the LTO 100 resistor in the TO247 package is now also officially AEC-Q200 qualified.

**Features and benefits:**
- Standard compact and easy-to-mount D2Pak and TO247 packages
- Non inductive (< 1 µH)
- High dielectric strength up to 2500 Vrms
- High power capability up to 100 W
- High energy capability up to 50 J+ for pulses < 1 s
- MTTF 349 years, M failure rate for D2TO series

**Market and applications:**
- Automotive EV and HEV
- Battery management pre-charge and discharge

**Datasheets links:**
- [http://www.vishay.com/doc?51055](http://www.vishay.com/doc?51055) (D2TO20)
- [http://www.vishay.com/doc?51058](http://www.vishay.com/doc?51058) (D2TO35)

**Application notes links:**

**Brochure links:**

**Vishay Acquires MCB Industrie S.A., a Specialty Resistor Company**
Vishay has acquired MCB Industrie S.A., a manufacturer of specialty resistors for professional market segments. MCB Industrie S.A. resistors are used as motion sensors in avionics, military, and space systems, and as power resistors in traction, energy distribution, and various other industrial applications.


**Non-Linear Resistors**

**New NTCS...E3...SMT Series SMD NTC Thermistors**
The Vishay BCcomponents NTCS...E3...SMT series SMD NTC thermistors experience an ultra-low ± 0.5 % maximum variation in their initial R25 values after 10,000 hours of operation over a wide temperature range of -40 °C to +125 °C.

**Product Benefits:**
- Monolithic SMD thermistors with nickel barrier and pure tin
- Feature non-standard R25 values adapted to the resistivity of the thermistors' stable ceramic material and case dimensions
- Preserves the devices' original electrical properties throughout their lifetime for increased accuracy
- Delivered on punched paper tape-on-reel packaging
- High R25 values from 100 kΩ to 210 kΩ reduce self-heating effects
• Ideal for wave and reflow soldering
• RoHS compliant

Market Applications:
• Temperature sensing and compensation circuits
• Heat counters, body thermometers, and other medical applications

Datasheet link:
http://www.vishay.com/doc?29151 (NTCS....E3...SMT)

NTCALUG Series Thermistors Gain UL Recognition
Based on an extensive testing program, Vishay’s NTCALUG series of NTC thermistors, including the NTCALUG01, NTCALUG02, and NTCALUG03, have gained official UL recognition under the UL1434 standard for thermistor type devices.

Component recognition / certification can save equipment manufacturers time and money when applying for safety approvals. Safety recognition guarantees that the NTCALUG products have been inspected for safe design practices and construction. To ensure continued product integrity, the safety agencies inspect Vishay manufacturing facilities on a periodic basis. The safety recognition numbers assigned to Vishay non-linear resistor products are listed both for U.S. and Canada usage as follows:

UL, Vishay File Number E148885
Link for UL-US recognized parts: UL certificate XGPU2 file E148885
Link for cUL-Canada recognized parts: UL certificate XPGU8 file E148885

The updated datasheets can be found at:
http://www.vishay.com/doc?29092 (NTCALUG01)
http://www.vishay.com/doc?29094 (NTCALUG02)
http://www.vishay.com/doc?29114 (NTCALUG03)

Displays
Vishay Dale
Product Introduction - OLED-256Y064C OLED Graphic Series
In Q1 2014, Vishay released the OLED-256Y064C OLED COF (Chip On Flex) graphic series. This display has a built-in SSD1322 IC measuring 87.4 mm by 28.5 mm. For reference, the basic specification for the OLED-256Y064C is below:

<table>
<thead>
<tr>
<th>OLED-256Y064C</th>
<th>Dimension</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Graphic</td>
<td>256 x 64 Dots</td>
<td>—</td>
</tr>
<tr>
<td>Module dimension</td>
<td>87.4 x 28.5 x 2.22</td>
<td>mm</td>
</tr>
<tr>
<td>Active Area</td>
<td>79.089 x 19.756</td>
<td>mm</td>
</tr>
<tr>
<td>Pixel Size</td>
<td>0.289 x 0.289</td>
<td>mm</td>
</tr>
<tr>
<td>Pixel Pitch</td>
<td>0.309 x 0.309</td>
<td>mm</td>
</tr>
<tr>
<td>Display Mode</td>
<td>Passive Matrix</td>
<td></td>
</tr>
<tr>
<td>Available Color</td>
<td>White and Yellow</td>
<td></td>
</tr>
<tr>
<td>Drive Duty</td>
<td>1/64 Duty</td>
<td></td>
</tr>
<tr>
<td>IC</td>
<td>SSD1322</td>
<td></td>
</tr>
</tbody>
</table>
Complete data sheets and pricing will be available in Q1 2014. Please contact Neal Kratochvil for more information.

**MarCom News**

**Website Update**

**New Cross-Reference Search Tool**

Vishay's cross-reference search tool is now available on [www.vishay.com](http://www.vishay.com). The new feature allows the company's customers to cross-reference part numbers from other manufacturers with Vishay's entire product offering, making it easy to identify matching devices and make substitutions.

"Customers have been asking us for the cross-reference feature to help them find Vishay replacements for competitor parts. Most often they're looking for access to better supply-chain support, as well as the quality and reliability that Vishay products are so well known for," said Craig Hunter, Senior Director of Global MarCom. "Providing access to information on hundreds of thousands of industry part numbers is a major new feature we're happy to offer to our customers."

The new cross-reference search tool can be accessed from the "Search" box on Vishay's website. Users simply select the "Cross-Reference" option, enter the part number they wish to replace, and receive the corresponding Vishay part number and links to product datasheets to review against their application requirements.

**Improved Web Search**

Vishay has improved its web search functionality, which allows users to find the products they are looking for faster than ever before. Once a part number or keyword search has been initiated, search results are then displayed in an organized, easy-to-read web table. Users can then explore all of the available products from their search results. From the search results table, they can access product datasheets and supporting product materials like technical notes, app notes, SPICE models, packaging information, and more.
eNewsletters

Mandarin eNewsletter
This publication provides translated press releases on new product introductions, information on translated technical articles and application notes, and highlights key Vishay products in target applications for the China market.
Dec 2013 > Medical - http://www.vishay.com/landingpage/newsletters/mandarin/1311/

Asia eNewsletter
This publication provides press releases on new product introductions and highlights key Vishay products in target applications for the Asian market.

India eNewsletter
This publication provides press releases on new product introductions and highlights key Vishay products in target applications for the Indian market.

New / Updated Application and Technical Notes:

<table>
<thead>
<tr>
<th>Title</th>
<th>Application</th>
<th>Date</th>
</tr>
</thead>
<tbody>
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<td>Guidelines for Vishay Sfernice Resistive and Inductive Components</td>
<td>Resistors, Draloric</td>
<td>Jan-14</td>
</tr>
<tr>
<td>Mechanical Stress and Deformation of SMT Components During Temperature Cycling and PCB Bending</td>
<td>Resistors, Sfernice</td>
<td>Jan-14</td>
</tr>
<tr>
<td>Pulse Load on SMD Resistors: At the Limit</td>
<td>Inductors</td>
<td>Dec-13</td>
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<tr>
<td>Using Laser Trimmable Resistors</td>
<td>Resistors, Beyschlag</td>
<td>Oct-13</td>
</tr>
<tr>
<td>AC Film Capacitors in Connection with the Mains</td>
<td>Resistors, Sfernice</td>
<td>Oct-13</td>
</tr>
<tr>
<td>NSR Noise Suppressors - Wirewound Resistors</td>
<td>Resistors, Dale</td>
<td>Oct-13</td>
</tr>
<tr>
<td>Versatile Planar Transformer - PLAC 100 SOFT</td>
<td>Resistors, Sfernice</td>
<td>Oct-13</td>
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<tr>
<td>PLAC 100 Versatile Planar Transformer</td>
<td>Resistors, Sfernice</td>
<td>Oct-13</td>
</tr>
</tbody>
</table>

Recent Trade Shows

eCarTec 2013: Oct 15–17, Munich, Germany
Vishay exhibited its latest passive components at eCarTec Munich 2013, the world's largest trade fair for electric and hybrid mobility, held at the Munich Trade Fair Center. At the event, the company highlighted industry-leading inductors, resistors, thermal fuses, and more for a wide range of applications in hybrid electric vehicles (HEV) and full electric vehicles (FEV).

Electrama: Jan 8–12, Bangalore, India
Vishay highlighted its latest industry-leading power MOSFET, passive component, diode, and optoelectronics technologies for solar, smart grid, wind turbine, and railroad applications.

SPIE/Photonics West: Feb 4–6, San Francisco CA
Vishay showcased its latest industry-leading Vishay Electro-Films (EFI) solutions at the 2014 SPIE Photonics West Exhibition. Products on display included a wide range of Vishay EFI custom submounts, custom substrates with sidewall patterning, high-performance RF capacitors, and wire-bondable products.
Upcoming Trade Shows

**CMSE 2014: Feb. 18–21, Los Angeles**
Vishay will be showcasing its extensive offering of military-qualified resistors and custom magnetics capabilities at the 2014 Components for Military and Space Electronics (CMSE) conference and exhibition. The event will take place Feb. 18-21 at the LAX Radisson Hotel in Los Angeles.

CMSE is the premier conference on designing military and space systems with military-qualified and COTS components, subsystems, and software. In booth B-4, Vishay will be displaying a wide variety of military-qualified resistors with established reliability. These will include metal, thick, and thin film chip resistors; leaded and housed wirewound devices; and thick and thin film resistor networks.

For more information on CMSE 2014, please visit http://www.cti-us.com/cmsemain.htm.

**2014 OFC/NFOEC, Mar. 9–13, San Francisco**
Vishay will be showcasing its latest industry-leading Vishay Electro-Films (EFI) solutions at the 2014 Optical Fiber Communications Conference and Exhibition/National Fiber Optic Engineers Conference (OFC/NFOEC), taking place from Mar. 9-13 at the Moscone Center in San Francisco. In booth 3482, products on display will include a wide range of Vishay EFI custom submounts, custom substrates with sidewall patterning, high-performance RF capacitors, and wire-bondable products.

The OFC/NFOEC is the largest global conference and exposition for optical communications and networking professionals. For more information on the event, visit http://www.ofcnfoec.org.

**APEC: Mar 17–19, Fort Worth, TX**
At APEC 2014, Vishay will be highlighting its latest industry-leading power MOSFET, passive component, diode, and power IC technologies for a wide range of applications.

Virtual Trade Shows

High Temperature > http://www.vishay.com/landingpage/tradeshows/virtual/temperature/
Medical > http://www.vishay.com/landingpage/tradeshows/virtual/medical/
Power Management > http://www.vishay.com/landingpage/tradeshows/virtual/power/

Asset Bank
This library of product images is continuing to grow, and in turn it is becoming a very useful tool for product marketing. Please note that any high-quality images you may have can be sent to me for upload. Any photography of new products shot will enable us to further populate the image library.

Most of our recent tradeshow posters can be found and downloaded from the Asset Bank library:

If you’d like access to Asset Bank or to learn more about it, please contact either myself (paul.harrison@vishay.com) or Connie (connie.kurzeknabe@vishay.com) and information will be sent to you.

Published Articles
Several articles were published last year and a few of the more recent ones are listed below. Publishing articles is a great way to advertise Vishay and our offerings. However, as you may well know, we’re restricted from marketing a particular product, but we can tout our product offerings for certain applications and technologies. Please keep an open mind when we in MarCom (including Bob Decker and Rae Morrow from Redpines) approach you for an article.

- **Advanced Current Measurement Resistors for Energy Management.**
- **Trends in Components for Solar and Wind Inverter Applications**
• Widerstände in der Energietechnik / Passive Components and Next-Generation Electricity Grids
  by Ove Hach, Markt&Technik, Jun 2013, ECN, Nov 2013.
• Functions and properties of film and aluminum electrolytic caps in power converters and capacitor banks for voltage stabilization in HV grids
  by Theo van de Steeg, Anton Maier, Olaf Lüthje, Norbert Pieper, Markt&Technik, Nov 2013.
• Passive Spezialbauteile für den Automotive Einsatz / Special Passive Components for Automotive Applications
  by Olaf Lüthje, Markt&Technik, Jan 2013, Electronic Products, Oct 2013.
• Increasing Accuracy in Feedback Circuits and Voltage Dividers
• New Performance Requirements for Resistors in Aeronautics Applications
• Surface-Mount Ceramic Chip Antennas for UHF Applications
• Passive Bauelemente erleben in der Leistungselektronik eine Renaissance/ The Renaissance of Passive Components in power electronics
  by Olaf Lüthje, Markt&Technik, Mar 2013.
• Increased Performance with Cost-Effective HDI Technology
• Wirelessly Charging your Medical Devices
• Selecting Capacitors for the Energy Buffer in Solar Inverters
• Dünnfilmwiderstände für die Raumfahrt unter der Lupe (Comparing Failure Rates of Thin Film Resistors According to ESA R Qualifications and to MIL-R)
  by Dominique Vignolo, Elektronik Praxis, Feb 2012.
• Using Capacitors in Medical Electronic Applications
  by Pat Gormally, Practical Electronic Design Circuits, Jan 2012.

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paul.harrison@vishay.com