



Vishay Intertechnology, Inc.

# Transportation

(AC and Hybrid Trains)



One of the World's Largest Manufacturers of  
**Discrete Semiconductors and Passive Components**





## **Transportation** AC and Hybrid Trains

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More information on the Engineer's Toolbox, including product datasheet links, can be found at [www.vishay.com/ref/et3](http://www.vishay.com/ref/et3).




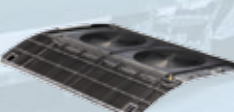
For inquiries, please contact your local sales representative.

# Key components for AC AND HYBRID TRAINS



**THE VISHAY ADVANTAGE**

- Robust Design
- High Reliability
- Durability
- Long Life
- Safety Approvals

<b>Main Inverters</b>	
<b>Auxiliary Inverters</b>	
<b>Auxiliary Rectifiers</b>	
<b>Motor Blowers / Cooling Fans</b>	






# Main Inverters



RESISTORS

**Very High Energy Absorption Wirewound Resistor (up to 16 KJ) and High Overloads**




[C52T](#)

- Overload up to  $10 \times P_n$  during 30 s
- Superior reliability

OPTOELECTRONICS

**2.5 A Output Current IGBT and MOSFET Driver**



[VO3120](#)

- 2.5 A peak output current in a DIP or SMD package
- 35 kV/ $\mu$ s common mode rejection and UL, cUL, and VDE certified


INDUCTORS

**Numerous Custom Designs for High-Efficiency Inductor and Transformer Applications**

- Current ratings up to 1000 A, switching frequency power levels from 1 W to 1 MW
- Amorphous, powder, and ferrite cores including low profile packaging

DIODES

**TRANSZORB® Transient Voltage Suppressors**




[5KP60A](#)

- AEC-Q101 qualified
- 5000 W peak pulse power capability with a 10/1000  $\mu$ s waveform

ESTA POWER CAPACITORS

**Capacitors for Power Electronics (PEC) – Rectangular**

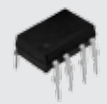


[DCMKP Rectangular](#)

- Heavy duty
- Low self inductance

OPTOELECTRONICS

**High-Speed Optocoupler, Single and Dual, 10 MBd**



[VO2611](#)

- 25 kV/ $\mu$ s common mode rejection and VDE, BSI, UL, cUL certified
- Guaranteed AC and DC performance from -40 °C to +100 °C

RESISTORS

**Power Resistors for Mounting onto a Heatsink, Thick Film Technology**




[RTOP100V820RJB](#)

- ISOTOP case SOT-227, high power up to 200 W, wide ohmic value range 0.046  $\Omega$  to 1 M $\Omega$
- Non-inductive, easy mounting, low thermal radiation of the case

FILM CAPACITORS

**Metallized Polypropylene Film Capacitors, DC-Link Capacitor**




[MKP1848](#)

- High-performance DC-link capacitor with high RMS current capabilities
- Automotive Grade, AEC-Q200 compliant

RESISTORS

**Power Metal Strip® Resistors, Low Value (Down to 0.001  $\Omega$ ), Surface-Mount**




[WSR](#)

- High power ratings to 5 W in molded 4527 size package
- Molded package with compliant leads that give superior thermal shock resilience

RESISTORS

**High-Power Custom-Designed Power Resistors**




[CS61](#)

- Custom designs offering electrical and mechanical application-specific features
- Designed to meet heavy-duty requirements where space is at a premium

RESISTORS

**Vitreous Wirewound Resistors with Corrugated Ribbon**




[GBS / ZBS](#)

- High power rating up to 1000 W
- Complete vitreous coating for perfect humidity protection

RESISTORS

**Aluminum-Housed Compact Wirewound Resistor**



[VACR](#)

- High power rating up to 500 W
- Easy to mount due to rectangular design

View datasheets for these products [www.vishay.com/ref/et3tr2a](http://www.vishay.com/ref/et3tr2a)



# Auxiliary Inverters



RESISTORS

**Vitreous Wirewound Resistors with Corrugated Ribbon**



[GBS309603829JLX000](#)

- High power rating up to 1000 W
- Complete vitreous coating for perfect humidity protection

MODULES

**ADD-A-PAK Generation VII Power Modules, Standard Diodes, 80 A**




[VSKC71/12](#)

- UL approved file E78996
- Industrial standard package used in high-voltage regulated power supplies

ESTA POWER CAPACITORS

**Capacitors for Power Electronic (PEC) – Rectangular**




[ACMKP Rectangular](#)

- High RMS and impulse current rating
- High reliability

OPTOELECTRONICS

**High-Speed Optocoupler, Single and Dual, 10 MBd**




[VO2611](#)

- 25 kV/ $\mu$ s common mode rejection and VDE, BSI, UL, and cUL certified
- Guaranteed AC and DC performance from -40 °C to +100 °C

RESISTORS

**High Power Dissipation with Standards and Custom Terminals**




[RCEC500](#)

- Resistance range: 0.47 W to 1 MW
- Creeping distance up to 75 mm

RESISTORS

**Wirewound Resistors, Industrial Power, Tubular**




[RDSF](#)

- High-temperature silicone or vitreous enamel coatings
- Non-inductive options available

FILM CAPACITORS

**Metallized Polypropylene Film Capacitor, Radial Snubber Type**




[MKP386M](#)

- IGBT direct-mount snubber
- High peak current capabilities for demanding power electronics applications

OPTOELECTRONICS

**2.5 A Output Current IGBT and MOSFET Driver**




[VO3120](#)

- 2.5 A peak output current in a DIP or SMD package
- 35 kV/ $\mu$ s common mode rejection and UL, cUL, and VDE certified

RESISTORS

**MCRL Series, Metal Case Wirewound Resistors**



[MCR](#)

- High power-to-size ratio
- Heatsink-mountable for high power dissipation

RESISTORS

**Vitreous Wirewound Resistors with Lugs**




[GWS / ZWS](#)

- High power rating up to 500 W
- Available in adjustable = “E” or non-inductive design = “Ni”

ALUMINUM CAPACITORS

**Aluminum Capacitors, Power Ultra Long Life Snap-In**



[159 PUL-SI](#)

- Most popular series; long life snap-in, up to 500 V at 105 °C
- Custom-made parts based on the needs of your application are available on request


View datasheets for these products  
[www.vishay.com/ref/et3tr2b](http://www.vishay.com/ref/et3tr2b)



# Auxiliary Rectifiers



OPTOELECTRONICS

**Optocoupler, Phototransistor Output, High Reliability, 5300 V<sub>RMS</sub>** 

[VO617A-3X007T](#)

- Isolation test voltage of 5300 V<sub>RMS</sub> and VDE, UL, cUL, BSI, and FIMKO certified
- Operating temperature from -55 °C to +110 °C and 5 mA trigger current


RESISTORS

**High-Power Thick Film Resistor with Low Partial Discharge** 

[RCEC 750](#)

- Partial discharge < 10 pC at 5000 V
- Rated dissipation 750 W at 75 °C

MODULES

**Full-Bridge IGBT MTP Module, 20 A, 1200 V for High-Frequency Applications** 

[VS-20MT120UFAPbF](#)

- UL E78996 approved
- Speed: 8 kHz to 60 kHz


RESISTORS

**Very High Power Water Cooled Resistor with Multiple Resistive Functions** 

[WCR](#)

- Power up to 2500 W at 60 °C water inlet temperature and 5 l/min
- Possible to have up to eight resistive functions on the same support

OPTOELECTRONICS

**2.5 A Output Current IGBT and MOSFET Driver** 

[VO3120](#)

- 2.5 A peak output current in a DIP or SMD package
- 35 kV/μs common mode rejection and UL, cUL, and VDE certified


RESISTORS

**Stainless Steel Power Resistor** 

[VSGR](#)

- High power capability up to 20 kW at 40 °C
- Operating temperature range: -25 °C to +250 °C

MODULES

**High-Power Module, Three-Phase Bridge, from 130 A to 160 A and up to 1600 V** 

[VS-130-160MT..KPbF](#)

- UL approved file E78996
- Package fully compatible with the industry-standard INT-A-PAK series

RESISTORS

**Vitreous Wirewound Resistors with Corrugated Ribbon** 

[GBS Load Bank](#)

- High power rating up to 1000 W
- Customer-specific assembly of standard resistors

FILM CAPACITORS

**Metallized Polypropylene Film Capacitors, DC-Link Capacitor** 

[MKP1848](#)

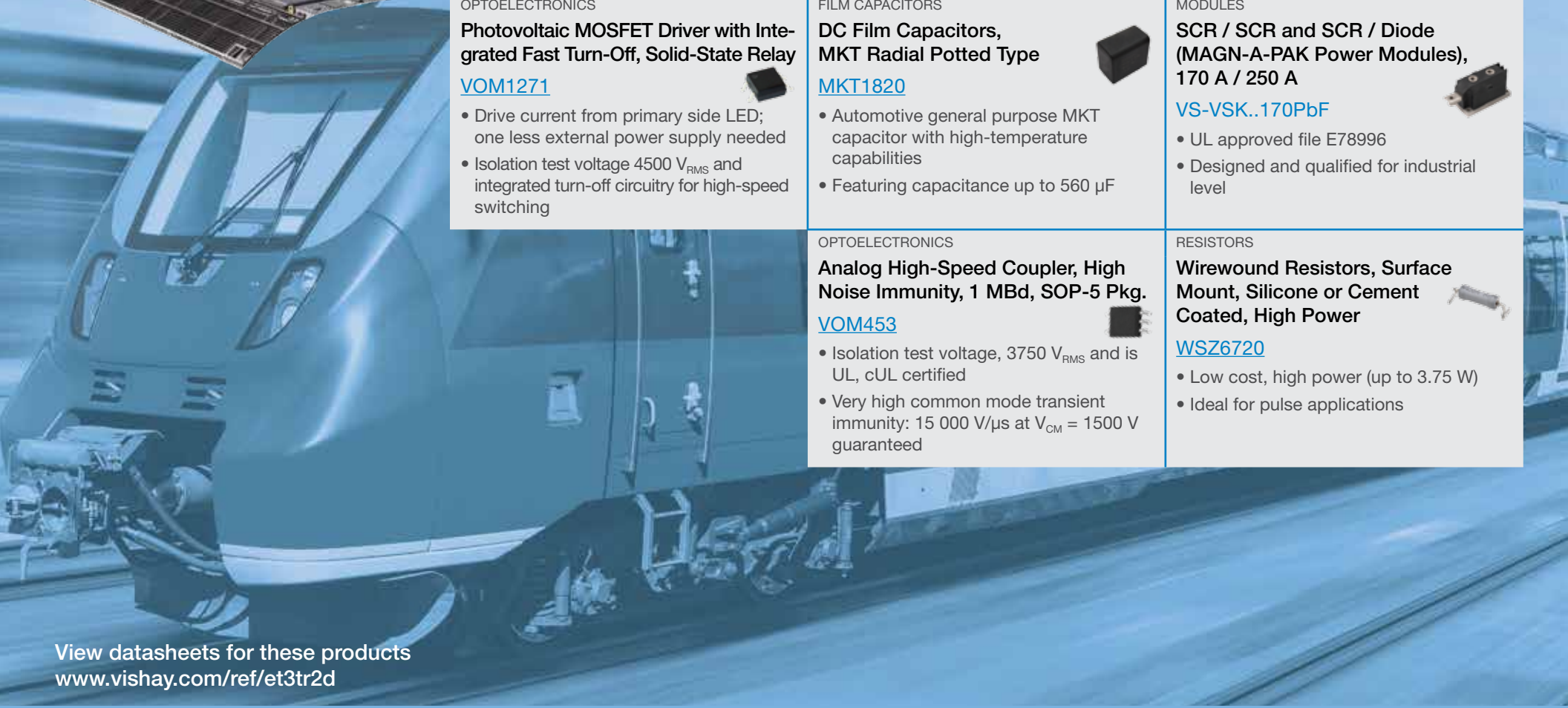
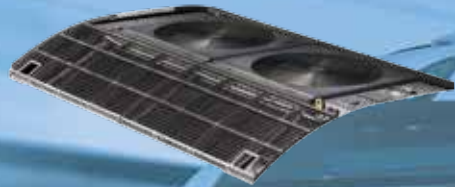
- High-performance DC-link capacitor with high RMS current capabilities
- Automotive Grade, AEC-Q200 compliant

View datasheets for these products [www.vishay.com/ref/et3tr2c](http://www.vishay.com/ref/et3tr2c)





# Motor Blowers / Cooling Fans



NON-LINEAR RESISTORS

**NTC Thermistors, Standard Lug Sensors**

[NTCALUG01A](#)

- Robust surface temperature sensor
- AEC-Q200 compliant, UL recognized



THYRISTORS

**Inverter-Grade Thyristors (Hockey PUK Version), 330 A**

[VS-ST173C](#)

- International standard case TO-200AB (A-PUK)
- Guaranteed high di/dt and high dv/dt

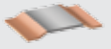


RESISTORS

**Power Metal Strip® SMD Resistors, Very High Power (to 10 W), Low Value (to 0.0002 Ω)**

[WSLP5931](#)

- Very high power rating of 7 W to 10 W in WSLP5931 package
- Extremely low resistance values from 0.0002 Ω to 0.003 Ω and tolerance of 1 %



OPTOELECTRONICS

**Photovoltaic MOSFET Driver with Integrated Fast Turn-Off, Solid-State Relay**

[VOM1271](#)

- Drive current from primary side LED; one less external power supply needed
- Isolation test voltage 4500 V<sub>RMS</sub> and integrated turn-off circuitry for high-speed switching



FILM CAPACITORS

**DC Film Capacitors, MKT Radial Potted Type**

[MKT1820](#)

- Automotive general purpose MKT capacitor with high-temperature capabilities
- Featuring capacitance up to 560 μF



MODULES

**SCR / SCR and SCR / Diode (MAGN-A-PAK Power Modules), 170 A / 250 A**

[VS-VSK..170PbF](#)

- UL approved file E78996
- Designed and qualified for industrial level



OPTOELECTRONICS

**Analog High-Speed Coupler, High Noise Immunity, 1 MBd, SOP-5 Pkg.**

[VOM453](#)

- Isolation test voltage, 3750 V<sub>RMS</sub> and is UL, cUL certified
- Very high common mode transient immunity: 15 000 V/μs at V<sub>CM</sub> = 1500 V guaranteed



RESISTORS

**Wirewound Resistors, Surface Mount, Silicone or Cement Coated, High Power**

[WSZ6720](#)

- Low cost, high power (up to 3.75 W)
- Ideal for pulse applications



View datasheets for these products  
[www.vishay.com/ref/et3tr2d](http://www.vishay.com/ref/et3tr2d)



Vishay Intertechnology, Inc.



A *WORLD OF*  
*SOLUTIONS*