



Vishay Intertechnology, Inc.

# *Automotive/Transportation Heavy-Duty Transportation*





***Automotive/  
Transportation***

Heavy-Duty  
Transportation

Railroad Equipment, Traction Heads

Boats, Ships, Vessels

Forklift Trucks, Cranes

4

5

6



The Engineer's Toolbox highlights, by market application, some innovative components Vishay manufactures that help design engineers develop superior end products. We recognize that offering unique component solutions helps improve the performance of next-generation devices, overcome technical barriers, and create new markets.

More information on the Engineer's Toolbox, including product datasheet links, can be found at [www.vishay.com/ref/et2](http://www.vishay.com/ref/et2). For inquiries, please contact your local sales representative.



*Key components for*  
**HEAVY-DUTY  
TRANSPORTATION**



**RAILROAD EQUIPMENT/  
TRACTION HEADS**



**BOATS, SHIPS, VESSELS**



**FORKLIFTS, CRANES**

**THE VISHAY ADVANTAGE**

- AEC Qualifications
- High Power Density
- High-Voltage Performance
- Inrush Current Capabilities
- Long Life
- High Reliability
- and more...*



### RAILROAD EQUIPMENT/ TRACTION HEADS

#### RESISTORS

##### RPS250DH100K

High-Power Thick Film Technology

##### Features

- 250 W at 70 °C, heatsink mounted
- Low thermal radiation of case
- RoHS-compliant
- High overload capability up to 1000 W, 10 s



#### CAPACITORS

##### DCMKP 1.0/18 mF

DC-Link and DC-Filter for Converter

##### Features

- High impulse current: 500 A
- Low self-inductance: < 50 nH
- Low series resistance
- Compact design



#### DIODES

##### 5KP60A

5000 W TRANSZORB® TVS in P600

##### Features

- P600 glass-passivated chip junction
- Available in unidirectional polarity only
- 5000 W peak pulse power capability with 10/1000  $\mu$ s waveform
- Solder dip: 275 °C max 10 s, per JESD 22-B106



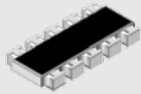
#### RESISTORS

##### CRA12S10

Thick Film Chip Array

##### Features

- Convex terminal array with square corners
- 10 terminal package
- Saves board space
- Reduced pick-and-place cost



#### RESISTORS

##### RWST 50 x 373

High-Power Wirewound Power Resistor

##### Features

- 95 W to 800 W at 25 °C
- Rugged construction for use in severe environmental conditions
- RoHS-compliant
- High pulse capabilities up to 8000 W, 5 s



#### CAPACITORS

##### 101/102 PHR-ST

Power High-Ripple Current Screw Terminal

##### Features

- Long useful life: up to 15 000 h at 85 °C and 400 000 h at 40 °C
- Available in voltages from 25 V to 450 V; capacitance values from 220  $\mu$ F to 1 000 000  $\mu$ F
- Sizes up to 90 mm x 220 mm; standard and high-current terminals



#### DIODES

##### ST730CLPbF

990 A Phase-Control Thyristor in Hockey PUK Package

##### Features

- Metal case with ceramic insulator
- Center amplifying gate
- High voltage: up to 2000 V
- Suitable for DC motor controls, controlled DC power supplies, AC controllers



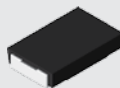
#### RESISTORS

##### WSRx

SMD, Power Metal Strip® Resistor

##### Features

- 2 W, 3 W, and 5 W versions of current sensing resistor in 4527 package size
- Features a very low 1 m $\Omega$  to 1  $\Omega$  resistance range
- Standard tolerance of 1.0 % with 0.5 % available
- High-temperature performance up to + 275 °C



#### CAPACITORS

##### HDMKP 1.1-420 I

DC-Link and DC-Filter for Converter

##### Features

- High-current capability
- Low self-inductance: < 70 nH
- Compact design



#### OPTOELECTRONICS

##### LH1540

Solid-State Relay

##### Features

- 6-pin surface-mount package
- Isolation test voltage: 5300 V<sub>RMS</sub>
- Typical R<sub>ON</sub> of 20  $\Omega$ , 25  $\Omega$  max
- Employs current-limiting circuitry meeting light surge requirements per ANSI/TIA-968-B



### THE VISHAY ADVANTAGE

AEC Qualifications

High Power Density

High-Voltage Performance

Inrush Current Capabilities

Long Life

High Reliability

and more...



### BOATS, SHIPS, VESSELS

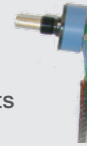
#### RESISTORS, VARIABLE

##### ECO78CBA502Wxxxx

Rudder Position Control for Boats

#### Features

- Delivered with 3-wire cable plus sleeve and ending with Molex connector
- Electrical/mechanical phasing for easier and faster mounting in production
- Special electrical angle for perfect fit in customer application



#### INDUCTORS

##### IHLP-2525CZ-5A

Low-Profile, High-Current  
IHLP® Inductor

#### Features

- AEC-Q200 qualified
- High-temperature series, up to 155°C
- Shielded construction
- Handles high transient current spikes without saturation



#### DIODES

##### MMBZ5235

Silicon Planar Small-Signal Zener  
Diode

#### Features

- Voltage tolerance:  $\pm 5\%$  for "B" suffix (e.g. MMBZ5225B-V),  $\pm 2\%$  for "C" suffix
- High-temperature soldering guaranteed: 260 °C/4 x 10 s at terminals
- AEC-Q101 qualified
- RoHS-compliant



#### DISPLAYS

##### LCD160H128B-TFK-VZ

160 x 128 Graphic Display with  
Controller

#### Features

- White LED backlight, FSTN positive LCD mode, transfective, wide temperature
- Built in controller, RA6963, + 5 V supply
- Wide temperature operation (- 20 °C to + 70 °C) with 12 O'clock viewing
- Ideal for low lighting conditions as well as full sunlight viewing



#### RESISTORS, VARIABLE

##### 981 HE

Non-Contacting Technology:  
Hall Effect

#### Features

- Throttle position sensor
- Accurate linearity down to  $\pm 0.5\%$
- Designed for applications in harsh environments
- Spring-loaded types available



#### MOSFETS

##### SQ4425EY

- 30 V P-Channel in SO-8: 0.012  $\Omega$ ,  
18 A

#### Features

- AEC-Q101 qualified
- SO-8 - 30 V p-channel for any high-side load switch in automotive
- 175 °C maximum temperature



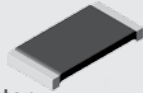
#### RESISTORS

##### WSL2512

SMD, Power Metal Strip® Resistor

#### Features

- 1 W current sensing resistor in 2512 package size
- Features a very low 0.5 m $\Omega$  to 500 m $\Omega$  resistance range
- Standard tolerance of 1.0 % with 0.5 % available
- High-temperature performance up to + 170 °C



#### RESISTORS

##### RPH100

High-Power Thick Film  
Technology

#### Features

- 100 W at 25 °C
- Easy SMD mounting
- RoHS-compliant
- High dielectric strength up to 5 kV<sub>RMS</sub>



#### RECTIFIERS

##### ES1B

100 V, 1 A Ultrafast Rectifier in  
SMA

#### Features

- Glass passivated chip technology
- Ideal for automated placement
- Meets MSL level 1
- RoHS-compliant



#### Key Website Content

AEC-Qualified Products Overview  
[www.vishay.com/doc?49923](http://www.vishay.com/doc?49923)

Automotive Grade Products Overview  
[www.vishay.com/doc?49924](http://www.vishay.com/doc?49924)

#### Design Support Tools

Thermal Simulation Tools, Performance Calculators, and SPICE and 3D Models  
[www.vishay.com/how/design-support-tools/](http://www.vishay.com/how/design-support-tools/)

Technical Library  
[www.vishay.com/how/onlineliterature/technical-library/](http://www.vishay.com/how/onlineliterature/technical-library/)

Video Library  
[www.vishay.com/videos/](http://www.vishay.com/videos/)

View datasheets for these products at  
[www.vishay.com/ref/et2au](http://www.vishay.com/ref/et2au)



### FORKLIFTS, CRANES

#### RESISTORS, VARIABLE

##### Auto A XXXX HE

Position Sensor Tiller Head Control



#### Features

- Redundant electrical laws for safety purposes
- Special design: molded housing for perfect fit in customer assembly
- Integrated connector for easy mounting on forklift truck
- Fully sealed sensor: IP67, hollow shaft design actuated by customer flatted axis

#### INDUCTORS

##### IHLP-6767GZ-5A

Low-Profile, High-Current IHLP® Inductor



#### Features

- AEC-Q200 qualified
- Shielded construction
- Handles high transient current spikes without saturation
- Ultra-low buzz noise due to composite construction

#### RECTIFIERS

##### S1J

600 V, 1 A Standard Rectifier in SMA



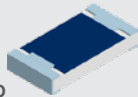
#### Features

- Glass-passivated chip technology
- Ideal for automated placement
- Meets MSL level 1
- RoHS-compliant

#### RESISTORS

##### RCWE2512

Thick Film Surface-Mount Chip Resistor



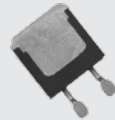
#### Features

- Extremely low resistance value range (10 mΩ to 976 mΩ)
- 2 W power rating and wraparound termination
- Standard tolerance of 1.0 % and 5.0 %
- Temperature coefficient: ± 600 ppm/°C to ± 100 ppm/°C

#### RESISTORS

##### D2T020

Power Thick Film Resistor



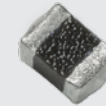
#### Features

- TO-263 standard package
- AEC-Q200 qualified
- RoHS-compliant/high temperature capability
- High pulse capability up to 10 J short pulse

#### RESISTORS, NON-LINEAR

##### NTC0805E3104JMT

Glass-Protected SMD 0805 NTC Thermistors



#### Features

- High stability with  $R_{25}$  drift of < 0.1%
- High operating temperature up to 150° C
- AEC-Q200 qualified

#### MODULES

##### GA400TD60S

400 A Dual INT-A-PAK Low Profile Half-Bridge



#### Features

- Generation 4 IGBT technology
- Standard: optimized for hard switching speed DC to 1 kHz
- Low  $V_{CE(on)}$  and square RBSOA
- HEXFRED® antiparallel diode with ultrasoft reverse recovery characteristics

#### RESISTORS

##### GBS

Vitreous Wirewound Resistor



#### Features

- Corrugated ribbon construction aids rapid cooling
- Power rating: up to 1000 W
- All-welded construction

#### CAPACITORS

##### 101/102 PHR-ST

Power High Ripple Current Screw Terminal



#### Features

- Long useful life: up to 15 000 h at 85 °C and 400 000 h at 40 °C
- Available in voltages from 25 V to 450 V; capacitance values from 220 μF to 1 000 000 μF
- Sizes up to 90 mm x 220 mm; standard and high-current terminals

#### MOSFETs

##### SQD50N10-8m9L

100 V, N-Channel DPAK (TO-252): 8.9 mΩ, 50 A



#### Features

- AEC-Q101 qualified
- Highly optimized medium voltage ThunderFET® technology
- Maximum on-resistance down to 0.0089 Ω
- 175 °C maximum temperature

### THE VISHAY ADVANTAGE

AEC Qualifications

High Power Density

High-Voltage Performance

Inrush Current Capabilities

Long Life

High Reliability

and more...



Vishay Intertechnology, Inc.

**BUILD VISHAY**

into your **DESIGN**

