

## Robust, High Power, and Long Life Solutions



### PRECISION POTENTIOMETERS / MOTION TRANSDUCERS

- Long operational life: 10 million cycles and up
- Linearity of 1 % or less and excellent repeatability
- Redundant track and fully sealed options available
- Wide operating temperature range of -55 °C to +125 °C
- For harsh environments, models based on Hall effect technology are highly recommended, as these products can withstand high levels of vibration

### PANEL POTENTIOMETERS

- IP67 sealing
- High operating and end-stop torques
- Long operational life: 2 million cycles for P30L and P11L
- Multi-gang assembly with switch / detent options

### THICK FILM POWER RESISTORS

- High power in standard TO-220, DPAK, or D<sup>2</sup>PAK packages
- Non-inductive by design
- Low profile and small size
- Low thermal radiation
- Cost competitive
- High pulse
- AEC-Q200

### RESOURCES

- Potentiometers: [www.vishay.com/resistors-variable/potentiometers](http://www.vishay.com/resistors-variable/potentiometers)
- Thick film resistors: [www.vishay.com/resistors-linear/thick-film](http://www.vishay.com/resistors-linear/thick-film)
- For technical questions on Potentiometers: [sferprecisionpot@vishay.com](mailto:sferprecisionpot@vishay.com)





# SOLUTIONS FOR OFF-ROAD VEHICLES

Vishay Sfernice

## Precision Potentiometers / Motion Transducers

Vishay Sfernice precision potentiometers are built with a conductive plastic ink laid upon various types of supports. This resistive element is then mounted inside a housing or directly in the customer’s sub-assemblies and joined to a high quality wiper assembly constructed from precious metal alloy. The range of Vishay Sfernice motion transducers includes both single-turn, rotational, and linear devices.

Vishay Sfernice also offers some products based on a contact-less Hall effect solution for all applications requiring a high level of dithering. The models are easily recognizable by the letters “HE” in their reference.

### Products: 357, KIT LMF, KIT RMF, 351 HE, RMHE, and 981 HE

#### Features and Benefits

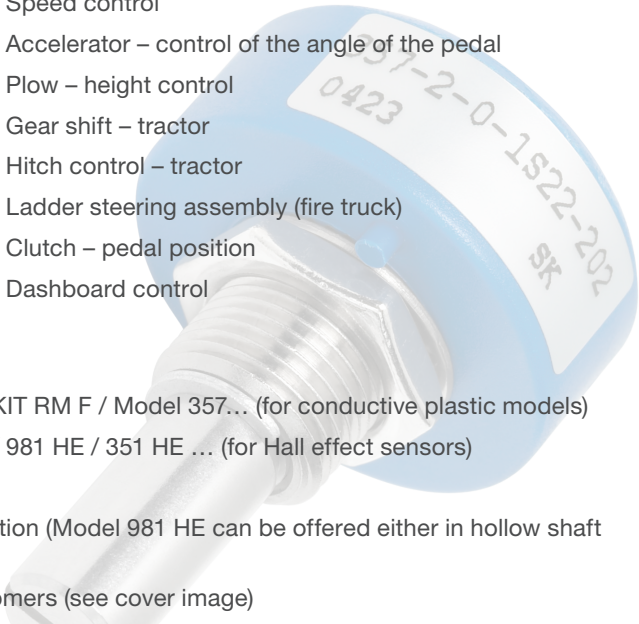
- Long operational life: 10 million cycles and up
- Linearity of 1 % or less and excellent repeatability
- Redundant track and fully sealed options available
- Wide operating temperature range of -55 °C to +125 °C
- For harsh environments, models based on Hall effect technology are highly recommended as these products can withstand high levels of vibration

#### Major Off-Road Vehicle Applications

- Forklift positioning and steering
- Speed control
- Accelerator – control of the angle of the pedal
- Plow – height control
- Gear shift – tractor
- Hitch control – tractor
- Ladder steering assembly (fire truck)
- Clutch – pedal position
- Dashboard control

#### Available Custom Kits for Forklifts, Tractors, and Trucks

- Generally based on the following catalog products: KIT LM F / KIT RM F / Model 357... (for conductive plastic models)
- Generally based on the following catalog products: KIT RMHE / 981 HE / 351 HE ... (for Hall effect sensors)
- All products are then customized to fit in each application
- A throttle body case can also be offered with a spring return option (Model 981 HE can be offered either in hollow shaft or in steel D-shaft versions)
- Special housings can be designed in partnership with our customers (see cover image)



Precision Potentiometers / Hall Effect Sensors						
Models	<a href="#">357</a>	<a href="#">KIT LMF</a>	<a href="#">KIT RMF</a>	<a href="#">351 HE</a>	<a href="#">RMHE</a>	<a href="#">981 HE</a>
Main Features	Conductive plastic	Conductive plastic	Conductive plastic	Hall effect	Hall effect	Hall effect
Life Cycle	5 M	25 M	25 M	10 M	20 M	10 M
Linearity	± 1 %	± 0.1 %	± 0.1 %	± 0.5 %	± 0.5 %	± 0.5 %
Miscellaneous Features	Fully customized model	Fully customized model	Fully customized model	360° electrical angle	Fully sealed IP67	Spring loaded shaft

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## Panel Potentiometers

Vishay Sfernice offers both cermet and conductive plastic single-turn panel potentiometers. Our wide range of products includes standard sealed designs units, modular potentiometers, robust high power, and long-life solutions. Our value added and custom capabilities help customers to reduce their assembly costs.

### Products: PE30, P11S, PRV4, P30L, PRV6, and P11L

#### Features and Benefits

- IP67 sealing
- High operating and end-stop torques
- Long operational life: 2 million cycles for P30L and P11L
- Multi-gang assembly with switch / detent options







#### Major Off-Road Vehicle Applications

- Climate control
- Dashboard and interior illumination
- Compartment HVAC
- Fork lift speed control
- Fork lift dashboard control
- Lighting controls

#### Available Custom Kits for Forklifts, Tractors, and Trucks

- Shaft and panel sealing
- Locking devices
- Cable, harness, and connectors to customer's specification
- Custom bushings and shafts
- Special tapers and track angles
- Special linearity or inter-linearity



Panel Potentiometers						
	<a href="#">PE30</a>	<a href="#">P11S</a>	<a href="#">PRV4</a>	<a href="#">P30L</a>	<a href="#">PRV6</a>	<a href="#">P11L</a>
<b>Models</b>						
<b>Main Features</b>	Fully sealed 3 W Robust High torque	Versatile modular options	Fully sealed 2 W Robust High torque	High rotational life Fully sealed High torque	Fully sealed Mil design	High rotational life Modular options
<b>Life Cycle</b>	25 000	50 000	25 000	2 000 000	50 000	2 000 000
<b>Size</b>	19.7 mm diam. 3/4 in	12.5 mm square 1/2 in	19.7 mm diam. 3/4 in	19.7 mm diam. 3/4 in	12.5 mm square 1/2 in	12.5 mm square 1/2 in
<b>Power Rating (PR)</b>	3 W	1 W	2 W	2 W	1.5 W	0.1 W
<b>Miscellaneous Features</b>	300° Mech. travel IP67 sealing Panel sealing optional	300° Mech. travel IP64 sealing Panel sealing optional	300° Mech. travel IP67 sealing Panel sealing optional	300° Mech. travel IP67 sealing Panel sealing optional	300° Mech. travel IP67 sealing Panel sealing optional	300° Mech. travel IP64 sealing

# SOLUTIONS FOR OFF-ROAD VEHICLES

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## Thick Film Power Resistors

Vishay Sfernice offers the widest range of thick film power resistors in the industry. Offered in standard semiconductor packages such as the TO-220, TO-247, DPAK, or D<sup>2</sup>PAK, our thick film technology is non-inductive by design and allows high power dissipation in small cases.

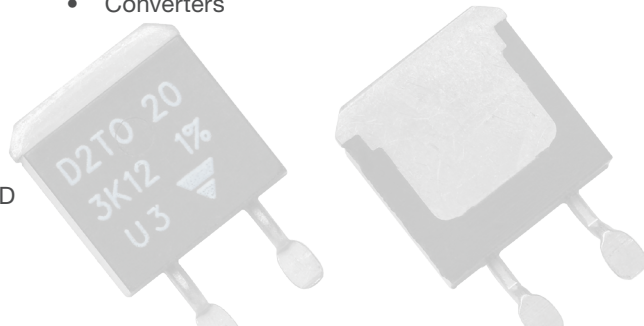
### Products: RTO 20, RTO 50, LTO 30 to 150, D2TO20, and D2TO35

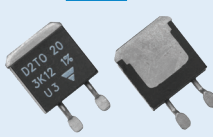
#### Features and Benefits

- High power in standard TO-220 to TO-247, DPAK, or D<sup>2</sup>PAK packages
- Non-inductive by design
- Low profile and small size
- Low thermal radiation
- Cost-competitive
- RoHS-compliant for high temperature soldering of SMD products
- AEC-Q200

#### Major Off-Road Vehicle Applications

- Engine control units
- Converters



Thick Film Power Resistors			
Models	<u>RTO</u>	<u>LTO</u>	<u>D2TO</u>
			
<b>Power Rating Mounted (PR)</b>	20 W and 50 W	30 W to 150 W	20 W and 35 W
<b>Thermal Resistance</b>	RTO 20 = 6.5 °C/W RTO 50 = 2.6 °C/W	4.2 °C/W to 0.87 °C/W	D2TO20: 6.5 °C/W D2TO35: 4.2 °C/W
<b>Package</b>	TO-220	TO-220 and TO-247	TO-263 Style (D <sup>2</sup> PAK)
<b>Features</b>	<ul style="list-style-type: none"> <li>• Two models within range</li> <li>• Custom designs available</li> <li>• Through-hole and SMD</li> <li>• Lead (Pb)-free and RoHS available</li> </ul>	<ul style="list-style-type: none"> <li>• Four models within range</li> <li>• Direct mounting ceramic on heatsink</li> <li>• Lead (Pb)-free and RoHS-compliant</li> <li>• Custom designs available</li> </ul>	<ul style="list-style-type: none"> <li>• Two models within range</li> <li>• Standard package for SMD</li> <li>• Lead (Pb)-free and RoHS-compliant</li> <li>• Solder reflow secure at 270 °C/10s</li> <li>• AEC-Q200 (D2TO35)</li> </ul>





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## SEMICONDUCTORS

### *MOSFETs Segment*

#### MOSFETs

- Low Voltage TrenchFET® Power MOSFETs
- Medium Voltage Power MOSFETs
- High Voltage Planar MOSFETs
- High Voltage Superjunction MOSFETs
- Automotive Grade MOSFETs

#### ICs

- VRPower® DrMOS Integrated Power Stages
- Power Management and Power Control ICs
- Smart Load Switches
- Analog Switches and Multiplexers

### *Diodes Segment*

#### Rectifiers

- Schottky Rectifiers
- Ultrafast Recovery Rectifiers
- Standard and Fast Recovery Rectifiers
- High Power Rectifiers / Diodes
- Bridge Rectifiers

#### Small-Signal Diodes

- Schottky and Switching Diodes
- Zener Diodes
- RF PIN Diodes

#### Protection Diodes

- TVS TRANSZORB® and PAR® Diodes (unidirectional, bidirectional)
- ESD Protection Diodes (including arrays)

#### Thyristors / SCRs

- Phase Control Thyristors
- Fast Thyristors

#### Power Modules

- Input Modules (diodes and thyristors)
- Output and Switching Modules (contain MOSFETs, IGBTs, and diodes)
- Custom Modules

### *Optoelectronic Components Segment*

#### Infrared Emitters and Detectors

#### Optical Sensors

- Proximity
- Ambient Light
- Light Index (RGBW, UV, IR)
- Humidity
- Quadrant Sensors
- Transmissive
- Reflective

#### Infrared Remote Control Receivers

#### Optocouplers

- Phototransistor, Photodarlington
- Linear
- Phototriac
- High Speed
- IGBT and MOSFET Drivers

#### Solid-State Relays

#### LEDs and 7-Segment Displays

#### Infrared Data Transceiver Modules

#### Custom Products

## PASSIVE COMPONENTS

### *Resistors and Inductors Segment*

#### Film Resistors

- Metal Film Resistors
- Thin Film Resistors
- Thick Film Resistors
- Power Thick Film Resistors
- Metal Oxide Film Resistors
- Carbon Film Resistors

#### Wirewound Resistors

- Vitreous, Cemented, and Housed Resistors
- Braking and Neutral Grounding Resistors
- Custom Load Banks

#### Power Metal Strip® Resistors

- Battery Management Shunts
- Crowbar and Steel Blade Resistors

#### Thermo Fuses

#### Chip Fuses

#### Pyrotechnic Initiators / Igniters

#### Variable Resistors

- Cement Variable Resistors
- Wirewound Variable Resistors
- Conductive Plastic Variable Resistors
- Contactless Potentiometers
- Hall Effect Position Sensors
- Precision Management Encoders

#### Networks / Arrays

#### RF and Microwave Resistors

#### High Voltage Resistors

#### Dividers

#### Non-Linear Resistors and Temperature Sensors

- NTC Thermistors
- PTC Thermistors
- Thin Film RTDs
- Varistors
- Platinum Chip Temperature Sensors

#### Magnetics

- Power Inductors
- Power Chokes
- High Frequency RF Inductors
- Magnetic Actuators
- Wireless Charging Coils
- Planar Devices
- Transformers
- Custom Magnetics

#### Connectors

### *Capacitors Segment*

#### Tantalum Capacitors

- Molded Chip Tantalum Capacitors
- Molded Chip Polymer Tantalum Capacitors
- Tantalum MAP Capacitors
- Polymer Tantalum MAP Capacitors
- Coated Chip Tantalum Capacitors
- Solid Through-Hole Tantalum Capacitors
- Wet Tantalum Capacitors

#### Ceramic Capacitors

- Multilayer Chip Capacitors
- Disc Capacitors
- Multilayer Chip RF Capacitors
- Chip Antennas
- Thin Film Capacitors

#### Film Capacitors

#### Power Capacitors

#### Heavy-Current Capacitors

#### Aluminum Electrolytic Capacitors

#### ENYCAP™ Energy Storage Capacitors