



Vishay Intertechnology, Inc.



element14

Automotive / Transportation



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



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Transportation

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

For inquiries, please contact your local sales representative.

Key components for POWERTRAIN – 12 V / 24 V



**Engine
Cooling**



**Exhaust Emission
Control System**



**Heating,
Ventilation, Air
Conditioning
(HVAC)**



THE VISHAY ADVANTAGE

- AEC Qualifications
- High-Temperature Performance
- High Reliability
- Low Profile
- Long Life
- High Vibration



Engine Cooling



ALUMINUM CAPACITORS

Advanced Temperature Range Up to 150 °C



160 CLA

- High ripple current: up to 1.4 A at 150 °C / 100 kHz
- Useful life up to 2000 h at 150 °C

CERAMIC CAPACITORS

Radial Leaded Multilayer Ceramic Capacitors for Automotive Applications



K...V

- High-reliability MLCC insert with wet build process
- High operating temperature up to 160 °C, rated voltages: 50 V, 100 V, and 200 V

NON-LINEAR RESISTORS

SMD, Glass Protected NTC Thermistors



NTCS...e3

- Standard series, AEC-Q200 compliant
- Glass protected with soft terminations

RESISTORS

Power Metal Strip® SMD Resistors, High Power (7 W) Low Value (Down to 0.001 Ω)



WSHM2818

- Very high power rating of 7 W in small 2818 package
- Very low resistance values, 0.001 Ω to 0.10 Ω, with tolerance of 1 %

RECTIFIERS

High Barrier Technology for Improved High-Temperature Performance



MBRB25H45CT

- Halogen-free according to IEC 61249-2-21 definition and AEC-Q101 qualified
- Low leakage current

CERAMIC CAPACITORS

AEC-Q200 Qualified, Broad Range of Sizes and Working Voltages C0G (NP0), X7R, and X8R



VJ...31/VJ...34 Automotive MLCC

- RoHS and GREEN compliant parts available
- AgPd termination available for epoxy bonding

INDUCTORS

Low-Profile, High-Current IHLP® Inductors



IHLP-6767GZ-5A

- Lowest DCR/μH in this package size
- High temperature, up to 155 °C shielded construction

RESISTORS

Power Metal Strip® SMD Resistors, Very High Power (to 9 W), Low Value (Down to 0.0002 Ω)



WSLP3921

- High power rating of 5 W to 9 W in WSLP3921 package
- Very low resistance values, 0.0002 Ω to 0.004 Ω, with tolerance of 1 %

NON-LINEAR RESISTORS

NTC Thermistors, Radial Leaded, Accuracy Line



NTCLE203...

- Accurate over a wide temperature range (tolerance on B-value down to 0.5 %)
- Low heat conductive wiring



Exhaust Emission Control System

MOSFETs

Automotive N-Channel 60 V (D-S) 175 °C MOSFET

SQJ858AEP

- TrenchFET® Gen III technology, AEC-Q101 qualified, maximum $R_{DS(on)}$ 6.3 m Ω
- Thermally enhanced PowerPAK® SO-8L packaging



RESISTORS

Power Metal Strip® SMD Resistors, High Temperature (275 °C), High Power (1 W)

WSLT2010...18

- High temp. for harsh environments; resistance values down to 0.01 Ω
- Power Metal Strip construction offers high reliability in critical applications



RECTIFIERS

High Current Density Surface-Mount Schottky Rectifier

SS3P4

- AEC-Q101 qualified
- Very low profile – typical height of 1.1 mm



RESISTORS

Precision Automotive High Temperature (155 °C at Full Rated Power) Thin Film Chip Resistor

PATT

- Wide resis. range of 1 Ω to 1 M Ω ; tol. as low as $\pm 0.1\%$ and 25 ppm/ $^{\circ}\text{C}$ TCR
- Load-life stability of < 0.2 % at 155 $^{\circ}\text{C}$ and full rated power for 1000 hours



DIODES

Surface-Mount PAR® Transient Voltage Suppressors for Automotive Load Dump Application

SM8S10

- AEC-Q101 qualified
- Meets ISO7637-2 surge specification (varied by test condition)



NON-LINEAR RESISTORS

NTC Thermistor for High-Temperature Applications

NTCV101...

- Wide temperature range from -40 $^{\circ}\text{C}$ to +900 $^{\circ}\text{C}$
- Small body diameter of maximum 2 mm



CERAMIC CAPACITORS

AEC-Q200 Qualified Broad Range of Sizes and Working Voltages, C0G (NP0), X7R, and X8R

VJ...31/VJ...34 Automotive MLCC

- RoHS and GREEN compliant parts available
- AgPd termination available for epoxy bonding



NON-LINEAR RESISTORS

Platinum SMD Flat Chip Temperature Sensor

PTS...AT

- Standardized characteristics according to IEC 60751
- Short reaction times down to 2 s (in air)

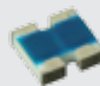




Heating, Ventilation, Air Conditioning (HVAC)

RESISTORS

Precision Thin Film Chip Resistor Array, Superior Moisture Resistivity



ACAS0606 AT

- Arbitrary resistance ratio up to 1:20, superior tracking stability over lifetime
- Relative TCR down to ± 5 ppm/K (tracking), AEC-Q200 qualified, sulfur resistant

MOSFETs

Automotive N-Channel 40 V (D-S) 175 °C MOSFET



SQJ422EP

- TrenchFET® Gen III technology, AEC-Q101 qualified, maximum $R_{DS(on)}$ 3.4 m Ω
- Thermally enhanced PowerPAK® SO-8L packaging

RESISTORS

Power Metal Strip® SMD Resistors, Very High Power (to 9 W), Low Value (Down to 0.0002 Ω)



WSLP3921

- High power rating of 5 W to 9 W in WSLP3921 package
- Very low resistance values, 0.0002 Ω to 0.004 Ω , with tolerance of 1 %

RECTIFIERS

High Current Density Surface-Mount Trench MOS Barrier Schottky Rectifier



V15P45HM3

- Very low profile – typical height of 1.1 mm
- Trench MOS Schottky technology

FILM CAPACITORS

DC Film Capacitors MKT Radial Potted Type



MKT370

- General purpose MKT pitch 5 mm / 7.5 mm and 10 mm

OPTOELECTRONICS

Transmissive Sensor as Optical Potentiometer (Climate Control) with Phototransistor Output



TCUT1350X01

- Resolve direction and speed with dual channel transmissive (interrupter) sensor
- Wide operating temperature range from -40 °C to +125 °C

INDUCTORS

Low-Profile, High-Current IHLP® Inductors



IHLP-5050FD-5A

- High current, low DCR, low saturation for excellent noise suppression

DIODES

Surface-Mount PAR® Transient Voltage Suppressors for Automotive Load Dump Application



SMxS24A

- AEC-Q101 qualified
- Meets ISO7637-2 surge specification (varied by test condition)

CERAMIC CAPACITORS

AEC-Q200 Qualified Broad Range of Sizes and Working Voltages, C0G (NP0), X7R, and X8R



VJ...31/VJ...34 Automotive MLCC

- RoHS and GREEN compliant parts available
- AgPd termination available for epoxy bonding

FUSES

High Current Thermal Fuse



HCTF235

- Functioning temperature: $\vartheta_F = (235 \pm 15) ^\circ\text{C}$
- Current: ≤ 55 A

NON-LINEAR RESISTORS

SMD, Glass Protected NTC Thermistors



NTCS...e3

- Standard series, AEC-Q200 compliant
- Glass protected with soft terminations

ALUMINUM CAPACITORS

Aluminum Capacitors SMD (Chip), High Temperature, Low Impedance



146 CTI

- High temperature up to 125 °C, long life, low impedance, high ripple current
- Soldering according JEDEC-J-STD-020

View datasheets for these products
www.vishay.com/ref/et3au1c

Key components for POWERTRAIN – INJECTION CONTROL AND FUEL PUMP



**Direct Injector
Control (Solenoid)**



**Piezo Injection
Control**



**Fuel Pump
Control**



THE VISHAY ADVANTAGE

- AEC Qualifications
- High-Temperature Performance
- High Reliability
- Low Profile
- Long Life
- High-Voltage SMD



Direct Injector Control (Solenoid)



ALUMINUM CAPACITORS

**Advanced Temperature
Range Up to 150 °C**

160 CLA

- High ripple current: up to 1.4 A at 150 °C / 100 kHz
- Useful life up to 2000 h at 150 °C



RESISTORS

**Precision Thin Film Chip
Resistor Array, Superior
Moisture Resistivity**

ACAS...AT

- Arbitrary resistance ratio up to 1:20, superior tracking stability over lifetime
- Relative TCR down to ± 5 ppm/K (tracking), AEC-Q200 qualified, sulfur resistant



MOSFETs

**Automotive Dual N-Channel
75 V (D-S) 175 °C MOSFET**

SQJ986EP

- Medium-voltage ThunderFET® technology, AEC-Q101 qualified, maximum $R_{DS(on)}$ 21 m Ω
- Thermally enhanced PowerPAK® SO-8L packaging



INDUCTORS

**Low-Profile, High-Current
IHL® Inductors**

IHLP-2525CZ-5A

- Excellent high-temperature performance for DC/DC converter input and output filters



RECTIFIERS

**Ultrafast Rectifier,
1 A FRED Pt®**

1EFH02W

- AEC-Q101 qualified, meets JESD 201 class 2 whisker test
- Ultrafast recovery time, reduced Q_{rr} and soft recovery with T_j maximum 175 °C



RESISTORS

**Power Metal Strip® SMD Resistors,
Very High Power (0.5 W), Low Value
(Down to 0.005 Ω)**

WSLP0805

- Very high power rating of 0.5 W in small 0805 package
- All-welded construction offers high pulse capacity



MOSFETs

**Automotive N-Channel 100 V
(D-S) 175 °C MOSFET**

SQJ488EP

- 100 % UIS tested
- Thermally enhanced PowerPAK SO-8L packaging



RECTIFIERS

**Ultrafast Rectifier,
3 A FRED Pt®**

3EJH02

- Ultrafast recovery time, reduced Q_{rr} and soft recovery



TANTALUM CAPACITORS

**Solid Tantalum Surface-Mount Chip
Capacitors, TANTAMOUNT® Molded
Case, Automotive Grade**

TP3

- High-performance molded tantalum capacitor, AEC-Q200 qualified
- Applications: motor control, body electronics, dash board





Piezo Injection Control



RESISTORS

Professional High-Temperature MINI-MELF Resistor



MMA0204...HT

- Operating temperature of 175 °C, power handling of 500 mW, high surge capability
- AEC-Q200 qualified, high overall stability < 0.1 %, sulfur resistant

MOSFETs

Automotive N-Channel 300 V (D-S) 175 °C MOSFET



SQD10N30-330H

- Classic TrenchFET® technology, AEC-Q101 qualified, maximum $R_{DS(on)}$ 330 mΩ
- Popular DPAK packaging

CERAMIC CAPACITORS

AEC-Q200 Qualified, Broad Range of Sizes and Working Voltages, C0G (NP0), X7R, and X8R



VJ...31/VJ...34 Automotive MLCC

- RoHS and GREEN compliant parts available
- AgPd termination available for epoxy bonding

RECTIFIERS

Ultrafast Rectifier, 6 A FRED Pt®



6ESU06

- AEC-Q101 qualified, meets JESD 201 class 2 whisker test
- Ultrafast recovery time, reduced Q_{rr} and soft recovery with T_j maximum 175 °C

INDUCTORS

Low-Profile, High-Current IHLP® Inductors



IHLP-2525CZ-5A

- Excellent high-temperature performance for DC/DC converter input and output filters

NON-LINEAR RESISTORS

SMD, Glass Protected NTC Thermistors



NTCS...e3

- Standard series, AEC-Q200 compliant
- Glass protected with soft terminations

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

RESISTORS

Power Metal Strip® SMD Resistors, Very High Power (to 9 W), Low Value (Down to 0.0002 Ω)



WSLP3921

- Very low resistance values from 0.0002 Ω to 0.004 Ω, with tolerance of 1 %

ALUMINUM CAPACITORS

Radial Miniature, High Voltage 250 V_{DC} to 270 V_{DC} with C_R up to 220 μF



152 RMH

- High-voltage applications, 105 °C long life
- Miniaturized, ultra high CV-product per unit volume

INDUCTORS

Low-Profile, High-Current IHLP® Inductors



IHLP-5050FD-5A

- Excellent high-temperature performance and noise filtering

RESISTORS

Thick Film Surface-Mount Chip Resistors, Wraparound, Extremely Low Value



RCWE

- Low resistance values from 0.01 Ω to 0.976 Ω and tolerance of 1 %
- Thick film construction with 2x power capacity

View datasheets for these products
www.vishay.com/ref/et3au2b



Fuel Pump Control

MOSFETs

**Automotive N-Channel
40 V (D-S) 175 °C MOSFET**



SQJ422EP

- TrenchFET® Gen III technology, AEC-Q101 qualified, maximum $R_{DS(on)}$ 3.4 m Ω
- Thermally enhanced PowerPAK® SO-8L packaging

CERAMIC CAPACITORS

**Radial Leaded Multilayer
Ceramic Capacitors for
Automotive Applications**



K...V

- High-reliability MLCC insert with wet build process
- High operating temp. up to 160 °C, rated voltages: 50 V, 100 V, and 200 V

RECTIFIERS

**HEXFRED® Ultrafast
Soft Recovery Diode, 30 A**



HFA30PB120PbF

- Very low I_{RRM} and Q_{rr}
- Ultrafast and ultrasoft recovery

RESISTORS

**Power Metal Strip® SMD Resistors,
Very High Power (to 9 W), Low Value
(Down to 0.0002 Ω)**



WSLP3921

- High power rating of 5 W to 9 W in WSLP3921 package
- Very low resistance values from 0.0002 Ω to 0.004 Ω , with tolerance of 1 %

RECTIFIERS

**High Current Density
Surface-Mount
Schottky Rectifiers**



SS3P4HM3

- AEC-Q101 qualified
- Very low profile – typical height of 1.0 mm

NON-LINEAR RESISTORS

**SMD 0603, Glass Protected
NTC Thermistors**



NTCS0603E3...T

- Standard series, AEC-Q200 compliant
- Glass protected with soft terminations

DIODES

**Surface-Mount PAR®
Transient Voltage
Suppressors**



SM8S24A

- AEC-Q101 qualified
- Meets ISO7637-2 surge specification (varied by test condition)

CERAMIC CAPACITORS

**AEC-Q200 Qualified, Broad Range
of Sizes and Working Voltages,
C0G (NP0), X7R, and X8R**



VJ....31/VJ....34 Automotive MLCC

- RoHS and GREEN compliant parts available
- AgPd termination available for epoxy bonding

RECTIFIERS

**Ultrafast Rectifier,
3 A FRED Pt®**



3EJH02

- Ultrafast recovery time, reduced Q_{rr} and soft recovery
- 175 °C maximum operating junction temperature and halogen-free

INDUCTORS

**Low-Profile, High-Current
IHLP® Inductors**



IHLP-4040DZ-5A

- Excellent high-temperature performance and noise filtering

RECTIFIERS

**Ultrafast Rectifier,
1 A FRED Pt®**



1EFH02W

- AEC-Q101 qualified, meets JESD 201 class 2 whisker test
- Ultrafast recovery time, reduced Q_{rr} and soft recovery with T_j maximum 175 °C

RESISTORS

**Power Metal Strip® SMD Resistors,
Very High Power (3 W),
Low Value (to 0.0005 Ω)**



WSLP2512

- Very high power rating of 3 W in 2512 package
- Extremely low resistance values from 0.0005 Ω to 0.01 Ω and tolerance of 1 %

View datasheets for these products
www.vishay.com/ref/et3au2c

Key components for CHASSIS CONTROL



**Electric Power
Steering (BLDC
Motor Drive)**



**Brake and Active
Safety Control**



**Transmission
ECU, Double
Clutch BLDC**



THE VISHAY ADVANTAGE

- AEC Qualifications
- High Power Density
- High-Pulse Current Capabilities
- Low Profile
- Long Life
- Small Size



Electric Power Steering (BLDC Motor Drive)



RESISTORS

High-Stability Thin Film Flat Chip Resistors



TNPW e3

- Excellent overall stability, endurance < 0.05 %, resistance range from 10 Ω to 3 M Ω
- AEC-Q200 qualified, sulfur resistant, halogen-free

RECTIFIERS

High Current Density Surface-Mount Trench MOS Barrier Schottky Rectifier



V15P45HM3

- Trench MOS Schottky technology
- AEC-Q101 qualified

INDUCTORS

Low-Profile, High-Current IHLP® Inductors



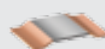
IHLP-6767GZ-5A

- Excellent high-current, low-saturation performance for noise filters

Customized high-current ferrite filters available

RESISTORS

Power Metal Strip® SMD Resistors, Very High Power (to 9 W), Low Value (Down to 0.0002 Ω)



WSLP3921

- High power rating of 5 W to 9 W in WSLP3921 package
- Very low resistance values from 0.0002 Ω to 0.004 Ω , with tolerance of 1 %

MOSFETs

Automotive N-Channel 40 V (D-S) 175 °C MOSFET



SQM200N04-1m1L

- TrenchFET® Gen III technology, AEC-Q101 qualified, maximum $R_{DS(on)}$ 1.1 m Ω
- 7-lead D²PAK packaging

NON-LINEAR RESISTORS

SMD 0603, Glass Protected NTC Thermistors



NTCS0603E3....T

- Standard series, AEC-Q200 compliant
- Glass protected with soft terminations

OPTOELECTRONICS

Subminiature Dual-Channel Transmissive Optical Sensor with Phototransistor Outputs



TCUT1350X01

- Resolve direction and speed with dual-channel transmissive (interrupter) sensor
- Wide operating temperature range from -40 °C to +125 °C

FILM CAPACITORS

DC Film Capacitors, MKT Radial Potted Type



MKT1820

- Automotive general purpose MKT capacitor, with high-temperature capabilities
- Featuring capacitance up to 560 μ F

ALUMINUM CAPACITORS

Advanced Temperature Range up to 150 °C



160 CLA

- High ripple current: up to 1.4 A at 150 °C / 100 kHz
- Useful life up to 2000 h at 150 °C

DIODES

Surface-Mount PAR® Transient Voltage Suppressors



SM8S24A

- AEC-Q101 qualified
- Meets ISO7637-2 surge specification (varied by test condition)

CERAMIC CAPACITORS

AEC-Q200 Qualified, Broad Range of Sizes and Working Voltages, C0G (NP0), X7R, and X8R



VJ....31/VJ....34 Automotive MLCC

- RoHS and GREEN compliant parts available
- AgPd termination available for epoxy bonding

INDUCTORS

Low-Profile, High-Current IHLP® Inductors



IHLP-8787MZ-5A

- Highest current composite inductor available
- High temperature up to 155 °C, shielded construction

View datasheets for these products
www.vishay.com/ref/et3au3a



Brake and Active Safety Control

MOSFETs

**Automotive N-Channel
40 V (D-S) 175 °C MOSFET**



SQJ422EP

- TrenchFET® Gen III technology, AEC-Q101 qualified, maximum $R_{DS(on)}$ 3.4 mΩ
- Thermally enhanced PowerPAK® SO-8L packaging

RESISTORS

**Pulse-Proof, High-Power
Thick Film Chip Resistors**



CRCW...HP e3

- Excellent pulse load capability
- Enhanced power rating

RECTIFIERS

**Low-Voltage Trench MOS
Barrier Schottky Rectifier**



V30DL45-M3

- Very low profile – typical height of 1.7 mm
- AEC-Q101 qualified

ALUMINUM CAPACITORS

**Advanced Temperature
Range Up to 150 °C**



160 CLA

- High ripple current: up to 1.4 A at 150 °C / 100 kHz
- Useful life up to 2000 h at 150 °C

DIODES

**Surface-Mount PAR® Transient
Voltage Suppressors**



SM8S24A

- AEC-Q101 qualified
- Meets ISO7637-2 surge specification (varied by test condition)

NON-LINEAR RESISTORS

**Platinum SMD Flat Chip
Temperature Sensor**

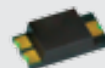


PTS...AT

- Standardized characteristics according to IEC 60751
- Short reaction times down to 2 s (in air)

OPTOELECTRONICS

**Miniature PIN Photodiode with
Widest Operating Temperature
Range up to 110 °C**



VEMD6110X01

- SMD photo-pin-diode in 1206 package with active chip area of 0.85 mm²
- Daylight blocking filter for infrared light sensing applications

INDUCTORS

**Low-Profile, High-Current
IHL® Inductors**



IHLP-6767GZ-5A

- Excellent high-current, low-saturation performance for noise filters and DC/DC converters

MOSFETs

**Automotive N-Channel
40 V (D-S) 175 °C MOSFET**



SQJ858AEP

- TrenchFET® Gen III technology, AEC-Q101 qualified, maximum $R_{DS(on)}$ 6.3 mΩ
- Thermally enhanced PowerPAK® SO-8L packaging

RESISTORS

**Professional Thin Film
MELF Resistors**



MMA0204

- Unrivalled surge handling capability, ultimate stability over lifetime
- AEC-Q200 qualified, approved acc. EN 140401-803, sulfur resistant, GREEN product

RESISTORS

**Power Metal Strip® SMD Resistors,
Very High Power (1 W), Low Value
(to 0.001 Ω)**



WSLP1206

- Very high power rating of 1 W in small 1206 package
- Power Metal Strip construction offers high reliability in critical applications

TANTALUM CAPACITORS

**Solid Tantalum Surface-Mount Chip
Capacitors, TANTAMOUNT® Molded
Case, Automotive Grade**



TH4

- High-temperature molded tantalum capacitor, HI TMP® up to 175 °C
- Applications: filtering, decoupling, LDO-regulators, braking systems

View datasheets for these products
www.vishay.com/ref/et3au3b



Transmission ECU, Double Clutch BLDC



RESISTORS

**Power Metal Strip® Resistors,
High-Power, Surface-Mount,
4-Terminal**



WSK0612

- High power of 1 W in small 0612 package size with 4-terminal construction
- Power Metal Strip construction offers high reliability in critical applications

OPTOELECTRONICS

**Single-Channel Transmissive
Optical Sensor with
Phototransistor Output**



TCPT1300X01

- Position sensor for submillimeter encoding
- -40 °C to +105 °C operating temperature range

NON-LINEAR RESISTORS

**SMD 0805, Glass Protected
NTC Thermistors**



NTCS0805E3.....T

- Standard series, AEC-Q200 compliant
- Glass protected with soft terminations

MOSFETs

**Automotive N-Channel
40 V (D-S) 175 °C MOSFET**



SQJ412EP

- Classic TrenchFET® technology, AEC-Q101 qualified, maximum $R_{DS(on)}$ 4.1 m Ω
- Thermally enhanced PowerPAK® SO-8L packaging

INDUCTORS

**Low-Profile, High-Current
IHL® Inductors**



IHL-2525CZ-5A

- High-temperature DC/DC converter performance with silver / epoxy bond compatibility

DIODES

**Surface-Mount PAR® Transient
Voltage Suppressors for
Automotive Load Dump
Applications**



SMxS24A

- AEC-Q101 qualified
- Meets ISO7637-2 surge specification (varied by test condition)

RESISTORS

**Power Metal Strip SMD Resistors,
Wide Terminal, Low Value
(0.003 Ω to 0.006 Ω)**



WSL1020

- Reverse geometry allows for 2 W power rating in small 1020 size
- Construction offers high reliability in critical applications

RECTIFIERS

**Ultrafast Rectifier,
1 A FRED Pt®**



1EFH02W

- AEC-Q101 qualified, meets JESD 201 class 2 whisker test
- Ultrafast recovery time, reduced Q_{rr} and soft recovery with T_j maximum 175 °C

TANTALUM CAPACITORS

**Solid Tantalum Surface-Mount Chip
Capacitors, TANTAMOUNT® Molded
Case, Automotive Grade**



TH4

- High-temperature molded tantalum capacitor, HI TMP® up to 175 °C
- Applications: filtering, decoupling, LDO-regulators, braking systems

MOSFETs

**Automotive N-Channel
40 V (D-S) 175 °C MOSFET**



SQJ422EP

- TrenchFET® Gen III technology, AEC-Q101 qualified, maximum $R_{DS(on)}$ 3.4 m Ω
- Thermally enhanced PowerPAK® SO-8L packaging

CERAMIC CAPACITORS

**AEC-Q200 Qualified, Broad Range
of Sizes and Working Voltages,
C0G (NP0), X7R, and X8R**



VJ....31/VJ....34 Automotive MLCC

- RoHS and GREEN compliant parts available
- AgPd termination available for epoxy bonding

MOSFETs

**Automotive N-Channel
40 V Bare Die MOSFET**



SQC200N04-1m7KGD

- TrenchFET® Gen III technology, AEC-Q101 qualified, maximum $R_{DS(on)}$ 1.7 m Ω
- Supplied in bare die form in tape and reel

View datasheets for these products
www.vishay.com/ref/et3au3c

Key components for BODY ELECTRONICS



**Comfort, Door,
Window Controls**



**Infotainment,
Navigation, Audio**



**Interior
LED Lighting**



THE VISHAY ADVANTAGE

- AEC Qualifications
- High Power Density
- Low Profile
- Durability
- Customization



Comfort, Door, Window Controls

MOSFETs

**Automotive N-Channel
40 V (D-S) 175 °C MOSFET**

SQJ858AEP

- TrenchFET® Gen III technology, AEC-Q101 qualified, maximum $R_{DS(on)}$ 6.3 mΩ
- Thermally enhanced PowerPAK® SO-8L packaging



RESISTORS

**Pulse-Proof, High-Power
Thick Film Chip Resistors**

CRCW...HP e3

- Excellent pulse load capability
- Enhanced power rating



RECTIFIERS

**High Current Density
Surface-Mount Schottky
Barrier Rectifiers**

SS3P4L

- AEC-Q101 qualified
- Very low profile – typical height of 1.0 mm



RESISTORS

**Thick Film Surface-Mount Chip
Resistors, Wraparound and
Extremely Low Value**

RCWE

- Low resistance values from 0.01 Ω to 0.99 Ω and tolerance of 1 %
- Thick film construction with 2x power capacity



DIODES

**Surface-Mount PAR® Transient
Voltage Suppressors for
Automotive Load Dump
Applications**

SMxS24A

- AEC-Q101 qualified
- Meets ISO7637-2 surge specification (varied by test condition)



INDUCTORS

**Low-Profile, High-Current
IHL® Inductors**

IHLP-4040DZ-5A

- Excellent high-current performance for noise filters



OPTOELECTRONICS

**Subminiature Dual-Channel
Transmissive Optical Sensor
with Phototransistor Outputs**

TCUT1350X01

- Resolve direction and speed with dual-channel transmissive (interrupter) sensor
- Wide operating temperature range from -40 °C to +125 °C



TANTALUM CAPACITORS

**Solid Tantalum Chip Capacitors,
High CV Leadframeless Molded,
Automotive Grade**

TP8

- Smallest AEC-Q200-qualified tantalum capacitor with case sizes as small as 0603
- Perfect for space-constrained designs



MOSFETs

**Automotive Dual N-Channel
40 V (D-S) 175 °C MOSFET**

SQJ912AEP

- TrenchFET® Gen III technology, AEC-Q101 qualified, maximum $R_{DS(on)}$ 9.3 mΩ
- Thermally enhanced PowerPAK® SO-8L packaging

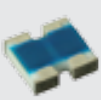


RESISTORS

**Precision Thin Film Chip
Resistor Array, Superior
Moisture Resistivity**

ACAS0606 AT

- Arbitrary resistance ratio up to 1:20, superior tracking stability over lifetime
- Relative TCR down to ± 5 ppm/K (tracking), AEC-Q200 qualified, sulfur resistant



OPTOELECTRONICS

**Ambient Light Sensor with High-
Speed and High-Sensitivity
PIN Photodiode Output**

TEMD6200FX01

- Wavelength of peak sensitivity of 550 nm; similar to human eye sensitivity
- Excellent linearity over operating temperature range of -40 °C to +100 °C



NON-LINEAR RESISTORS

**SMD 0603, Glass Protected
NTC Thermistors**

NTCS6030E3...T

- Standard series, AEC-Q200 compliant
- Glass protected with soft terminations



View datasheets for these products
www.vishay.com/ref/et3au4a



Infotainment, Navigation, Audio



TANTALUM CAPACITORS

Solid Tantalum Chip Capacitors, High CV Leadframeless Molded, Automotive Grade



TP8

- Smallest AEC-Q200-qualified tantalum capacitor with case sizes as small as 0603
- Perfect for space-constrained designs

RECTIFIERS

Surface-Mount Schottky Barrier Rectifiers



MSS1P4

- Very low profile – typical height of 0.65 mm
- AEC-Q101 qualified

INDUCTORS

Low-Profile, High-Current IHLP® Inductors



IHLP-4040DZ-5A

- High current, low DCR, low saturation for excellent noise suppression
- High temperature up to 155 °C, shielded construction

INDUCTORS

Dual Inductor Using IHLP® High-Temperature (155 °C) Automotive Grade Part



IHLD-4032KB-5A

- Optimal design realizes high-quality sound and low distortion
- Low coupling for minimal cross-talk between inductors

DIODES

Surface-Mount PAR® Transient Voltage Suppressors for Automotive Load Dump Applications



SMxS24A

- AEC-Q101 qualified
- Meets ISO7637-2 surge specification (varied by test condition)

NON-LINEAR RESISTORS

SMD 0603, Glass Protected NTC Thermistors



NTCS6030E3...T

- Standard series, AEC-Q200 compliant
- Glass protected with soft terminations

RESISTORS

Precision Thin Film Chip Resistor Array, Superior Moisture Resistivity



ACAS0606 AT

- Arbitrary resistance ratio up to 1:20, superior tracking stability over lifetime
- Relative TCR down to ± 5 ppm/K (tracking), AEC-Q200 qualified, sulfur resistant

ALUMINUM CAPACITORS

Aluminum Capacitors SMD (Chip), High-Temperature, Low Impedance



146 CTI

- High temperature up to 125 °C, long life, low impedance, high ripple current
- Soldering according to JEDEC-J-STD-020

RESISTORS

Thick Film Surface-Mount Chip Resistors, Wraparound and Extremely Low Value



RCWE

- Low resistance values from 0.01 Ω to 0.976 Ω and tolerance of 1 %
- Thick film construction with 2x power capacity

OPTOELECTRONICS

Amber, Red, and Yellow LED in a PLCC-2 Plus Package with High Luminous Intensity



VLMK51Z1AA

- Amber color has wavelength of 610 nm to 621 nm
- Compact package 3.5 mm x 3.5 mm x 1.2 mm

MOSFETS

Automotive Dual N-Channel 40 V (D-S) 175 °C MOSFETs



SQJ942EP

- TrenchFET® Gen III technology, AEC-Q101 qualified, maximum $R_{DS(on)}$ 11 m Ω
- Thermally enhanced PowerPAK® SO-8L packaging

OPTOELECTRONICS

Ambient Light Sensor in Miniature 0805 Package with Phototransistor Output



TEMT6200FX01

- Wavelength of peak sensitivity of 550 nm; similar to human eye sensitivity
- Excellent linearity over operating temperature range of -40 °C to +100 °C

View datasheets for these products
www.vishay.com/ref/et3au4b



Interior LED Lighting

DIODES

Surface-Mount PAR® Transient Voltage Suppressors



TPSMB

- AEC-Q101 qualified, $T_j = 185\text{ }^{\circ}\text{C}$ capability suitable for automotive requirement
- 600 W peak pulse power capability with a 10/1000 μs waveform

CERAMIC CAPACITORS

AEC-Q200 Qualified, Broad Range of Sizes and Working Voltages, C0G (NP0), X7R, and X8R



VJ....31/VJ....34 Automotive MLCC

- RoHS and GREEN compliant parts available
- AgPd termination available for epoxy bonding

MOSFETs

Automotive N-Channel 30 V (D-S) 175 °C MOSFET



SQS482EN

- Classic TrenchFET® technology, AEC-Q101 qualified, maximum $R_{DS(on)}$ 8.5 m Ω
- Thermally enhanced PowerPAK® 1212-8 is 1/3 the size of an SO-8

NON-LINEAR RESISTORS

SMD 0603, Glass Protected NTC Thermistors



NTCS6030E3...T

- Standard series, AEC-Q200 compliant
- Glass protected with soft terminations

RESISTORS

Power Metal Strip® SMD Resistors, Very High Power (to 3 W), Low Value (to 0.0005 Ω)



WSLP

- Very high power rating to 3 W in WSLP0603 to WSLP2512 size packages
- Extremely low resistance values from 0.0005 Ω to 0.1 Ω and tolerance of 1 %

RECTIFIERS

Surface-Mount Schottky Barrier Rectifiers



MSS1P4

- Very low profile – typical height of 0.65 mm
- AEC-Q101 qualified

RESISTORS

Pulse-Proof, High-Power Thick Film Chip Resistors



CRCW...HP e3

- Excellent pulse load capability
- Enhanced power rating

MOSFETs

Automotive N-Channel 40 V (D-S) 175 °C MOSFET



SQS840EN

- Classic TrenchFET technology, AEC-Q101 qualified, maximum $R_{DS(on)}$ 16.6 m Ω
- Thermally enhanced PowerPAK 1212-8 is 1/3 the size of an SO-8

OPTOELECTRONICS

Little Star® 1 W Power SMD LED



VLMK71ABAD

- Red, amber, and yellow colors with luminous intensity up to 18 000 mcd
- Amber color has wavelength of 610 nm to 621 nm

INDUCTORS

Low-Profile, High-Current IHLP® Inductors



IHLP-2525CZ-5A

- Compact size and high current, low saturation for noise filtering

DIODES

Surface-Mount PAR® Transient Voltage Suppressors



TPSMA

- AEC-Q101 qualified, $T_j = 185\text{ }^{\circ}\text{C}$ capability suitable for automotive requirement
- 400 W peak pulse power capability with a 10/1000 μs waveform

TANTALUM CAPACITORS

Solid Tantalum Chip Capacitors, High CV Leadframeless Molded, Automotive Grade

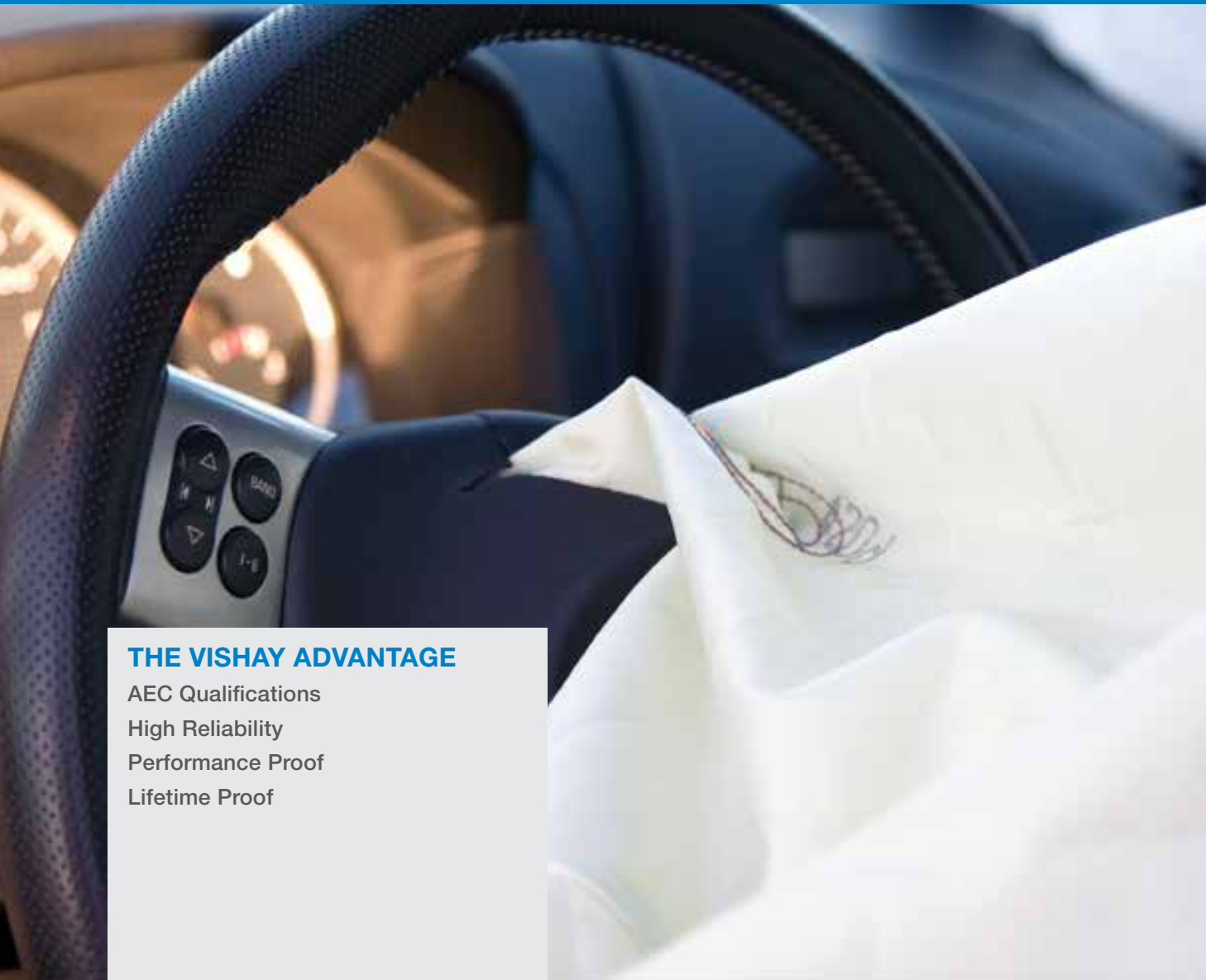


TP8

- Smallest AEC-Q200-qualified tantalum capacitor with case sizes as small as 0603
- Perfect for space-constrained designs

View datasheets for these products
www.vishay.com/ref/et3au4c

Key components for **PASSIVE SAFETY**



Airbag Control Systems



Restraint System Power Supplies



Pedestrian Protection Systems



THE VISHAY ADVANTAGE

AEC Qualifications
High Reliability
Performance Proof
Lifetime Proof

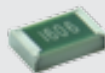


Airbag Control Systems



RESISTORS

Lead (Pb)-Bearing High-Stability Thin Film Chip Resistors



TNPW

- Excellent overall stability, endurance < 0.05 %, resistance range from 10 Ω to 3 M Ω
- SnPb plating with Pb content > 6 %, TCR down to 10 ppm/K, tol. down to 0.1 %

MOSFETs

Automotive Dual N-Channel 40 V (D-S) 175 °C MOSFET



SQ4284EY

- Classic TrenchFET® technology, AEC-Q101 qualified, maximum $R_{DS(on)}$ 13.5 m Ω
- Popular SO-8 packaging

CERAMIC CAPACITORS

AEC-Q200 Qualified, Broad Range of Sizes and Working Voltages, C0G (NP0), X7R, and X8R



VJ....31/VJ....34 Automotive MLCC

- RoHS and GREEN compliant parts available
- AgPd termination available for epoxy bonding

RECTIFIERS

High Current Density Surface-Mount Schottky Barrier Rectifiers

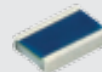


SS3P4L

- AEC-Q101 qualified
- Very low profile – typical height of 1.0 mm

RESISTORS

Professional Wide Terminal Thin Film Chip Resistors



MCW 0406 AT

- Power handling up to 300 mW, extreme thermocycling robustness up to 3000 cycles
- Avail. to 1 Ω , TCR to 25 ppm/K and 0.1 % tol., AEC-Q200 qualified, sulfur resistant

INDUCTORS

Low-Profile, High-Current IHLP® Inductors



IHLP-4040DZ-5A

- High current, low DCR, and low saturation for excellent noise suppression

TANTALUM CAPACITORS

Solid Tantalum Surface-Mount Chip Capacitors, TANTAMOUNT® Molded Case, Automotive Grade

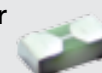


TP3

- High-performance molded tantalum capacitor, AEC-Q200 qualified
- Automotive applications such as motor control, body electronics, and dash board

RESISTORS

Electro-Pyrotechnic Initiator Thin Film Chip Resistor



EPIC

- Low firing energy down to 50 μ J, fast firing time down to 50 μ s
- Standard SMD case 0603, alternative to bridge wire technology

ALUMINUM CAPACITORS

Aluminum Capacitors Radial, High-Temperature, Low Impedance



146 RTI

- High temperature up to 125 °C, long life, low impedance, high ripple current

RESISTORS

Professional Thin Film MELF Resistors



MMA0204

- Unrivaled surge handling capability, ultimate stability over lifetime
- AEC-Q200 qualified, approved acc. EN 140401-803, sulfur resistant, GREEN product

RESISTORS

Power Metal Strip® SMD Resistors, Very High Power (to 3 W), Low Value (to 0.0005 Ω)



WSLP

- Very high power rating to 3 W in WSLP0603 to WSLP2512 size packages
- Extremely low resistance values from 0.0005 Ω to 0.1 Ω and tolerance of 1 %

RESISTORS

Massive Electro-Pyrotechnic Initiator Chip Resistor



MEPIC

- Low firing energy down to 1.5 mJ, fast firing time down to 250 μ s
- Standard SMD case 0805, alternative to bridge wire technology, AKLV16 qualification

View datasheets for these products
www.vishay.com/ref/et3au5a



Restraint System Power Supplies

MOSFETs

**Automotive N-Channel
40 V (D-S) 175 °C MOSFET**

SQJ858AEP

- TrenchFET® Gen III technology, AEC-Q101 qualified, maximum $R_{DS(on)}$ 6.3 mΩ
- Thermally enhanced PowerPAK® SO-8L packaging



RESISTORS

**Pulse-Proof, High-Power
Thick Film Chip Resistors**

CRCW...HP e3

- Excellent pulse load capability
- Enhanced power rating



RECTIFIERS

**High Current Density
Surface-Mount Schottky
Barrier Rectifiers**

SS3P4L

- AEC-Q101 qualified
- Very low profile – typical height of 1.0 mm



ALUMINUM CAPACITORS

**Aluminum Capacitors SMD (Chip),
High-Temperature,
Low Impedance**

146 CTI

- High temperature up to 125 °C, long life, low impedance, high ripple current
- Soldering according to JEDEC-J-STD-020



MOSFETs

**Automotive N-Channel
40 V (D-S) 175 °C MOSFET**

SQJ422EP

- TrenchFET Gen III technology, AEC-Q101 qualified, maximum $R_{DS(on)}$ 3.4 mΩ
- Thermally enhanced PowerPAK SO-8L packaging



INDUCTORS

**Low-Profile, High-Current
IHLP® Inductors**

IHLP-4040DZ-5A

- High current, low DCR, and low saturation for excellent noise suppression



RECTIFIERS

**High Current Density
Surface-Mount Schottky
Barrier Rectifiers**

SS5P4L

- Meets MSL level 1, per J-STD-020
- Very low profile – typical height of 1.1 mm



RESISTORS

**Power Metal Strip® SMD Resistors,
Wide Terminal, Low Value
(0.003 Ω to 0.006 Ω)**

WSL1020

- Reverse geometry allows for 2 W power rating in small 1020 size
- Power Metal Strip construction offers high reliability in critical applications



CERAMIC CAPACITORS

**AEC-Q200 Qualified, Broad Range
of Sizes and Working Voltages,
C0G (NP0), X7R, and X8R**

VJ...31/VJ...34 Automotive MLCC

- RoHS and GREEN compliant parts available
- AgPd termination available for epoxy bonding



RESISTORS

**Professional Thin Film
MELF Resistors**

MMA0204

- Unrivaled surge handling capability, ultimate stability over lifetime
- AEC-Q200 qualified, approved acc. EN 140401-803, sulfur resistant, GREEN product





Pedestrian Protection Systems



RESISTORS

Power Metal Strip® SMD Resistors, Very High Power (to 3 W), Low Value (to 0.0005 Ω)

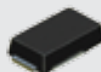


WSLP

- Very high power rating to 3 W in WSLP0603 to WSLP2512 size packages
- Extremely low resistance values from 0.0005 Ω to 0.1 Ω and tolerance of 1 %

RECTIFIERS

High Current Density Surface-Mount Schottky Barrier Rectifier



SS2P3L

- Meets MSL level 1 per J-STD-020, LF maximum
- AEC-Q101 qualified

RESISTORS

Lead (Pb)-Bearing High-Stability Thin Film Chip Resistors



TNPW

- Excellent overall stability, endurance < 0.05 %, resistance range from 10 Ω to 3 M Ω
- SnPb plating with Pb content > 6 %, TCR down to 10 ppm/K, tol. down to 0.1 %

MOSFETs

Automotive N-Channel 40 V (D-S) 175 °C MOSFET



SQJ422EP

- TrenchFET® Gen III technology, AEC-Q101 qualified, maximum $R_{DS(on)}$ 3.4 m Ω
- Thermally enhanced PowerPAK® SO-8L packaging

ALUMINUM CAPACITORS

Aluminum Capacitors SMD (Chip), High-Temperature, Low Impedance



146 CTI

- High temperature up to 125 °C, long life, low impedance, high ripple current
- Soldering according JEDEC-J-STD-020

OPTOELECTRONICS

High-Sensitivity PIN Photodiode in Leadless Low-Profile Package



VEMD5110X01

- 0.8 mm height SMD photodiode featuring a chip with a 7.5 mm² sensitive area
- Daylight blocking filter matched with IR emitters operating at wavelengths of 870 nm or 950 nm

INDUCTORS

Low-Profile, High-Current IHLP® Inductors



IHLP-4040DZ-5A

- High current, low DCR, and low saturation for excellent noise suppression

OPTOELECTRONICS

High-Power SurfLight™ Emitter with 850 nm Peak Wavelength



VSMY7850X01

- Wavelength matches CMOS-based camera systems for nighttime and low-visibility illumination
- 170 mW/sr intensity at 1 A forward current, 780 mW/sr at 5 A forward current

CERAMIC CAPACITORS

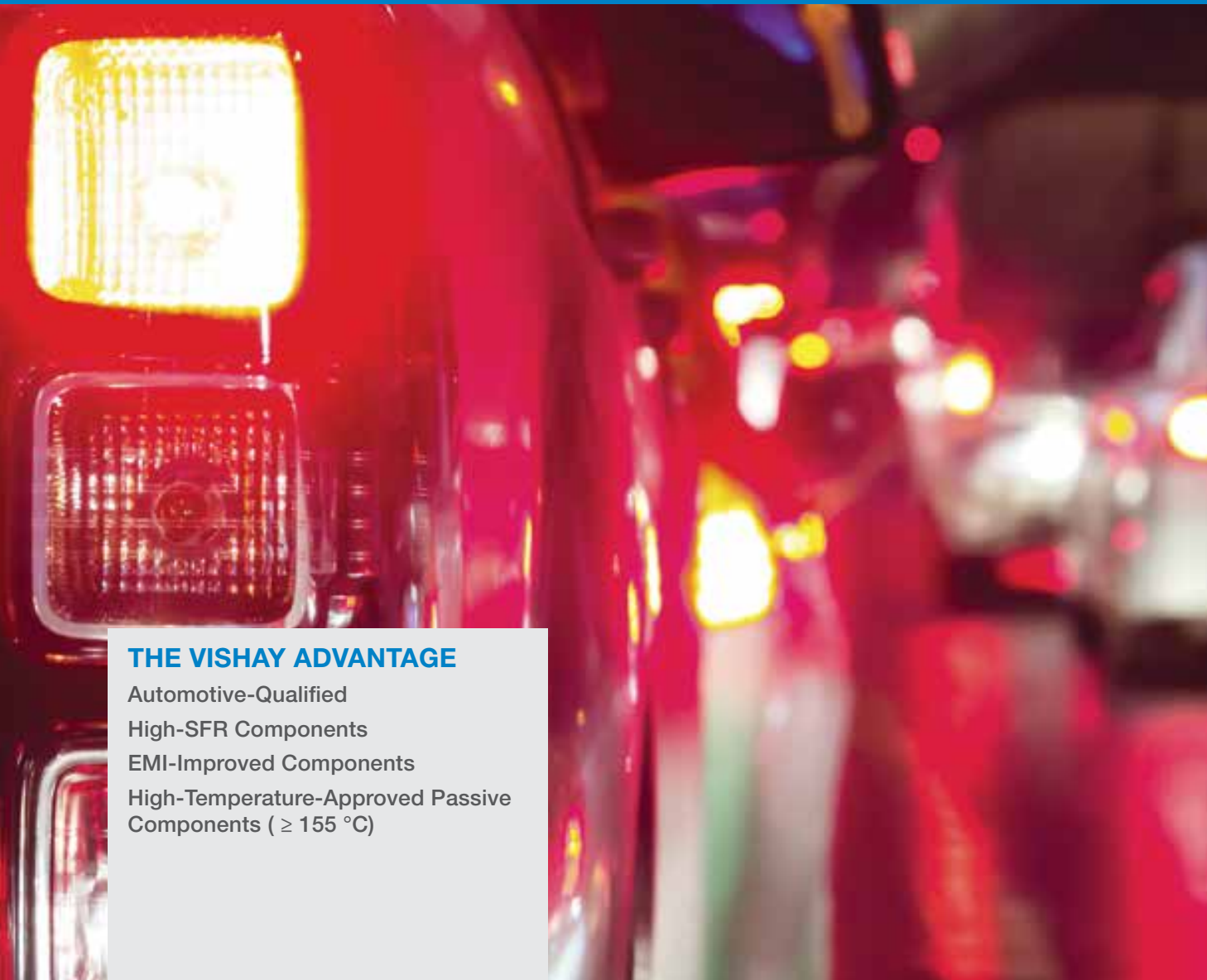
AEC-Q200 Qualified, Broad Range of Sizes and Working Voltages, C0G (NP0), X7R, and X8R



VJ....31/VJ....34 Automotive MLCC

- RoHS and GREEN compliant parts available
- AgPd termination available for epoxy bonding

Key components for EXTERIOR LIGHTING



**LED Headlight
Units**



Day Lighting



**LED Fog
Lighting**



**Rear and Signal
LED Lights**



THE VISHAY ADVANTAGE

Automotive-Qualified
High-SFR Components
EMI-Improved Components
High-Temperature-Approved Passive
Components ($\geq 155^{\circ}\text{C}$)



LED Headlight Units



DIODES

**Surface-Mount TRANSZORB®
Transient Voltage Suppressors****P6SMB36CA**

- AEC-Q101 qualified
- 600 W peak pulse power capability with a 10/1000 μ s waveform



RESISTORS

**Low-Ohmic, Wide-Terminal
Thin Film Chip Resistors****NCW0406 AT**

- Power handling up to 300 mW, extreme thermocycling robustness up to 3000 cycles
- Available from 0.33 Ω to 0.91 Ω with TCR of 50 ppm/K and 1 % tolerance



MOSFETs

**Automotive N-Channel
100 V (D-S) 175 °C MOSFET****SQJ488EP**

- Medium-voltage ThunderFET® technology, AEC-Q101 qualified, maximum $R_{DS(on)}$ 21 m Ω
- Thermally enhanced PowerPAK® SO-8L packaging



OPTOELECTRONICS

**Subminiature Dual-Channel
Transmissive Optical Sensor
with Phototransistor Outputs****TCUT1350X01**

- Resolve direction and speed with dual-channel transmissive (interrupter) sensor
- Wide operating temperature range from -40 °C to +125 °C



RESISTORS

**Pulse-Proof, High-Power
Thick Film Chip Resistors****CRCW...HP e3**

- Excellent pulse load capability
- Enhanced power rating



RECTIFIERS

**High Current Density
Surface-Mount Trench MOS
Barrier Schottky Rectifier****V8P10HM3**

- Trench MOS Schottky technology
- AEC-Q101 qualified



INDUCTORS

**Low-Profile, High-Current
IHL® Inductors****IHL-2525CZ-5A**

- Compact size and high current, low saturation for noise filtering



MOSFETs

**Automotive N-Channel
100 V (D-S) 175 °C MOSFET****SQJ402EP**

- Medium-voltage ThunderFET technology, AEC-Q101 qualified, maximum $R_{DS(on)}$ 11 m Ω
- Thermally enhanced PowerPAK SO-8L packaging



RESISTORS

**Thick Film Surface-Mount Chip
Resistors, Wraparound and
Extremely Low Value****RCWE**

- Low resistance values from 0.01 Ω to 0.976 Ω and tolerance of 1 %
- Thick film construction with 2x power capacity



RESISTORS

**Power Metal Strip® SMD Resistors,
Very High Power (to 3 W),
Low Value (to 0.0005 Ω)****WSLP**

- Very high power rating to 3 W in WSLP0603 to WSLP2512 size packages
- Extremely low resistance values from 0.0005 Ω to 0.1 Ω and tolerance of 1 %



INDUCTORS

**Low-Profile, High-Current
IHL Inductors****IHL-4040DZ-5A**

- High current, low DCR, low saturation for excellent noise suppression



NON-LINEAR RESISTORS

**SMD Glass Protected
NTC Thermistors****NTCS...e3**

- Standard series, AEC-Q200 compliant
- Glass protected with soft terminations



View datasheets for these products
www.vishay.com/ref/et3au6a



Day Lighting

TANTALUM CAPACITORS

Solid Tantalum Surface-Mount Chip Capacitors, TANTAMOUNT® Molded Case, Automotive Grade



TP3

- High-performance molded tantalum capacitor, AEC-Q200 qualified
- Automotive applications: motor control, body electronics, dash board

RECTIFIERS

Surface-Mount Schottky Barrier Rectifiers



MSS2P3

- Very low profile – typical height of 0.65 mm
- AEC-Q101 qualified

INDUCTORS

Low-Profile, High-Current IHLP® Inductors

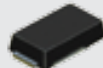


IHLP-2525CZ-5A

- Compact size and high current, low saturation for noise filtering

DIODES

High Power Density Surface-Mount PAR® Transient Voltage Suppressors



TPSMP

- AEC-Q101 qualified, $T_J = 185\text{ }^{\circ}\text{C}$ capability suitable for automotive requirements
- Very low profile – typical height of 1.0 mm

NON-LINEAR RESISTORS

SMD Glass Protected NTC Thermistors



NTCS...e3

- Standard series, AEC-Q200 compliant
- Glass protected with soft terminations

MOSFETS

Automotive N-Channel 100 V (D-S) 175 °C MOSFET



SQJ402EP

- Medium-voltage ThunderFET® technology, AEC-Q101 qualified, maximum $R_{DS(on)}$ 11 mΩ
- Thermally enhanced PowerPAK® SO-8L packaging

RESISTORS

Power Metal Strip® Resistors, Low Value (Down to 0.0005 Ω), Surface Mount



WSL2010

- Low TCR element (< 20 ppm) results in accurate current sensing in application
- Power Metal Strip construction offers high reliability in critical applications

OPTOELECTRONICS

Little Star® 1 W Power SMD LED White



VLMW712U2U3XV

- Luminous intensity up to 113 lm in a compact 6.0 mm x 6.0 mm x 1.5 mm surface-mount package
- White color coordinates of 0.33 (X), 0.33 (Y) with a 120° viewing angle

RECTIFIERS

High Current Density Surface-Mount Schottky Barrier Rectifier



SS2P4

- AEC-Q101 qualified
- Very low profile – typical height of 1.0 mm

RESISTORS

Pulse-Proof, High-Power Thick Film Chip Resistors



CRCW...HP e3

- Excellent pulse load capability
- Enhanced power rating

MOSFETS

Automotive N-Channel 100 V (D-S) 175 °C MOSFET



SQJ488EP

- Medium-voltage ThunderFET technology, AEC-Q101 qualified, maximum $R_{DS(on)}$ 21 mΩ
- Thermally enhanced PowerPAK SO-8L packaging

RESISTORS

Thick Film Surface-Mount Chip Resistors, Wraparound and Extremely Low Value



RCWE

- Low resistance values from 0.01 Ω to 0.976 Ω and tolerance of 1 %
- Thick film construction with 2x power capacity

View datasheets for these products
www.vishay.com/ref/et3au6b



LED Fog Lighting

RECTIFIERS

Surface-Mount Schottky Barrier Rectifiers**MSS1P6HM3**

- Very low profile – typical height of 0.65 mm
- AEC-Q101 qualified

INDUCTORS

Low-Profile, High-Current IHL® Inductors**IHL-2020CZ-5A**

- Compact size and high current, low saturation for noise filtering
- Up to 155 °C continuous operation

OPTOELECTRONICS

Little Star® 1 W Power SMD LED White**VLMW712U2U3XV**

- Luminous intensity up to 113 lm in a compact 6.0 mm x 6.0 mm x 1.5 mm surface-mount package
- White color coordinates of 0.33 (X), 0.33 (Y) with a 120° viewing angle

RESISTORS

Thick Film Surface-Mount Chip Resistors, Wraparound and Extremely Low Value**RCWE**

- Low resistance values from 0.01 Ω to 0.976 Ω and tolerance of 1 %
- Thick film construction with 2x power capacity

DIODES

Surface-Mount PAR® Transient Voltage Suppressors**TPSMA**

- AEC-Q101 qualified, $T_j = 185$ °C capability suitable for automotive requirements
- 400 W peak pulse power capability with a 10/1000 μ s waveform

RESISTORS

Pulse-Proof, High-Power Thick Film Chip Resistors**CRCW...HP e3**

- Excellent pulse load capability
- Enhanced power rating

MOSFETs

Automotive N-Channel 40 V (D-S) 175 °C MOSFET**SQJ858AEP**

- TrenchFET® Gen III technology, AEC-Q101 qualified, maximum $R_{DS(on)}$ 6.3 m Ω
- Thermally enhanced PowerPAK® SO-8L packaging

CERAMIC CAPACITORS

AEC-Q200 Qualified, Broad Range of Sizes and Working Voltages, C0G (NP0), X7R, and X8R**VJ....31/VJ....34 Automotive MLCC**

- RoHS and GREEN compliant parts available
- AgPd termination available for epoxy bonding

NON-LINEAR RESISTORS

SMD Glass Protected NTC Thermistors**NTCS...e3**

- Standard series, AEC-Q200 compliant
- Glass protected with soft terminations

RESISTORS

Professional Thin Film MELF Resistors**MMB0207**

- Unrivaled surge handling capability, ultimate stability over lifetime
- AEC-Q200 qualified, approved acc. EN 140401-803, sulfur resistant, GREEN product

INDUCTORS

Low-Profile, High-Current IHL® Inductors**IHL-1616BZ-5A**

- Very small size, high-current operation for DC/DC conversion and noise filtering

View datasheets for these products
www.vishay.com/ref/et3au6c



Rear and Signal LED Lights



RESISTORS

Pulse-Proof, High-Power Thick Film Chip Resistors



CRCW...HP e3

- Excellent pulse load capability
- Enhanced power rating

MOSFETs

Automotive N-Channel 40 V (D-S) 175 °C MOSFET



SQS484EN

- Classic TrenchFET® technology, AEC-Q101 qualified, maximum $R_{DS(on)}$ 9 m Ω
- Thermally enhanced PowerPAK® 1212-8 is 1/3 the size of an SO-8

INDUCTORS

Low-Profile, High-Current IHLP® Inductors



IHLP-1212AB-5A

- Extremely small size, high-current filter and energy storage

RECTIFIERS

Surface-Mount Schottky Barrier Rectifiers



MSS1P6HM3

- Very low profile – typical height of 0.65 mm
- AEC-Q101 qualified

NON-LINEAR RESISTORS

SMD Glass Protected NTC Thermistors



NTCS...e3

- Standard series, AEC-Q200 compliant
- Glass protected with soft terminations

MOSFETs

Automotive P-Channel 60 V (D-S) 175 °C MOSFET

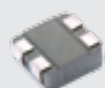


SQ2309ES

- Classic TrenchFET technology, AEC-Q101 qualified, maximum $R_{DS(on)}$ 335 m Ω
- Popular SOT-23 packaging

INDUCTORS

Low-Profile, High-Current Coupled Inductor



IHCL-4040DZ-5A

- Unique 2-coil design coupled inductor in a composite IHLP-style package
- Optimized for SEPIC circuits for high efficiency and compact size

DIODES

High Power Density Surface-Mount PAR® Transient Voltage Suppressors



TPSMP

- AEC-Q101 qualified, $T_j = 185$ °C capability suitable for automotive requirements
- Very low profile – typical height of 1.0 mm

RESISTORS

Thick Film Surface-Mount Chip Resistors, Wraparound and Extremely Low Value



RCWE

- Low resistance values from 0.01 Ω to 0.976 Ω and tolerance of 1 %
- Thick film construction with 2x power capacity

OPTOELECTRONICS

PLCC-2 Plus, High Luminous Output White LED



VLMW51Q2R3

- Luminous intensity up to 51.7 lm in a compact 3.5 mm x 3.5 mm x 1.2 mm surface-mount package
- White color coordinates of 0.33 (X), 0.33 (Y) with a 120° viewing angle

INDUCTORS

Low-Profile, High-Current IHLP Inductors



IHLP-1616BZ-5A

- Very small size, high-current operation for DC/DC conversion and noise filtering

MOSFETs

Automotive P-Channel 40 V (D-S) 175 °C MOSFET



SQS401EN

- Classic TrenchFET technology, AEC-Q101 qualified, maximum $R_{DS(on)}$ 29 m Ω
- Thermally enhanced PowerPAK 1212-8 is 1/3 the size of an SO-8

View datasheets for these products
www.vishay.com/ref/et3au6d

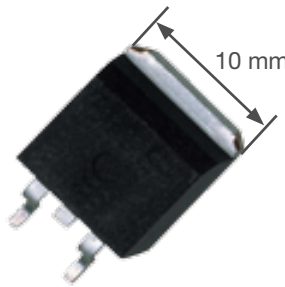
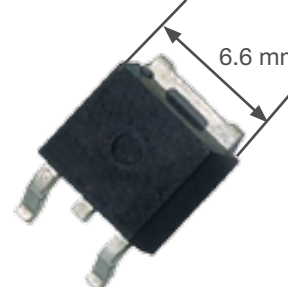
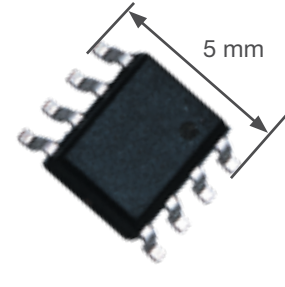
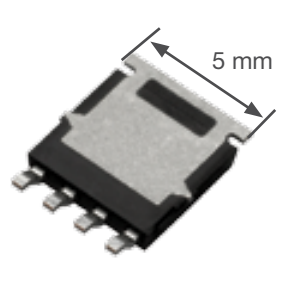
Spotlight on SQ Rugged Series of Automotive MOSFETs

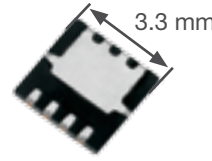
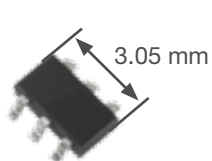
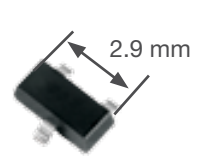
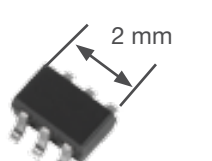

Dedicated Automotive Process Flow Reduces Defects

The Vishay Siliconix SQ series of AEC-Q101-qualified power MOSFETs is produced using a special process that is optimized for automotive excellence. Featuring n-channel and p-channel TrenchFET® technologies with low on-resistance, our automotive power MOSFETs are rated for a maximum junction temperature of 175 °C.

Packages include the TO-262, D²PAK (TO-263), and DPAK (TO-252), as well as several space-saving, small-outline options. For example, the PowerPAK® SO-8L, at 5.13 mm by 6.15 mm, is half the size of a DPAK but delivers the same on-resistance, and thermal resistance as low as 1.5 °C/W. Even smaller at 3.3 mm by 3.3 mm, the PowerPAK 1212-8 delivers on-resistance similar to the SO-8 in about 1/3 the size, with thermal resistance of 2.4 °C/W. The PowerPAK SO-8L Dual Asymmetric optimizes a high-side and a low-side MOSFET in one compact package while lowering low-side on-resistance over 30 % over conventional duals. The SQ series also includes devices in small packages such as the TSOP-6, SOT-23, and tiny 2 mm by 2 mm SC-70 and PowerPAK SC-70.

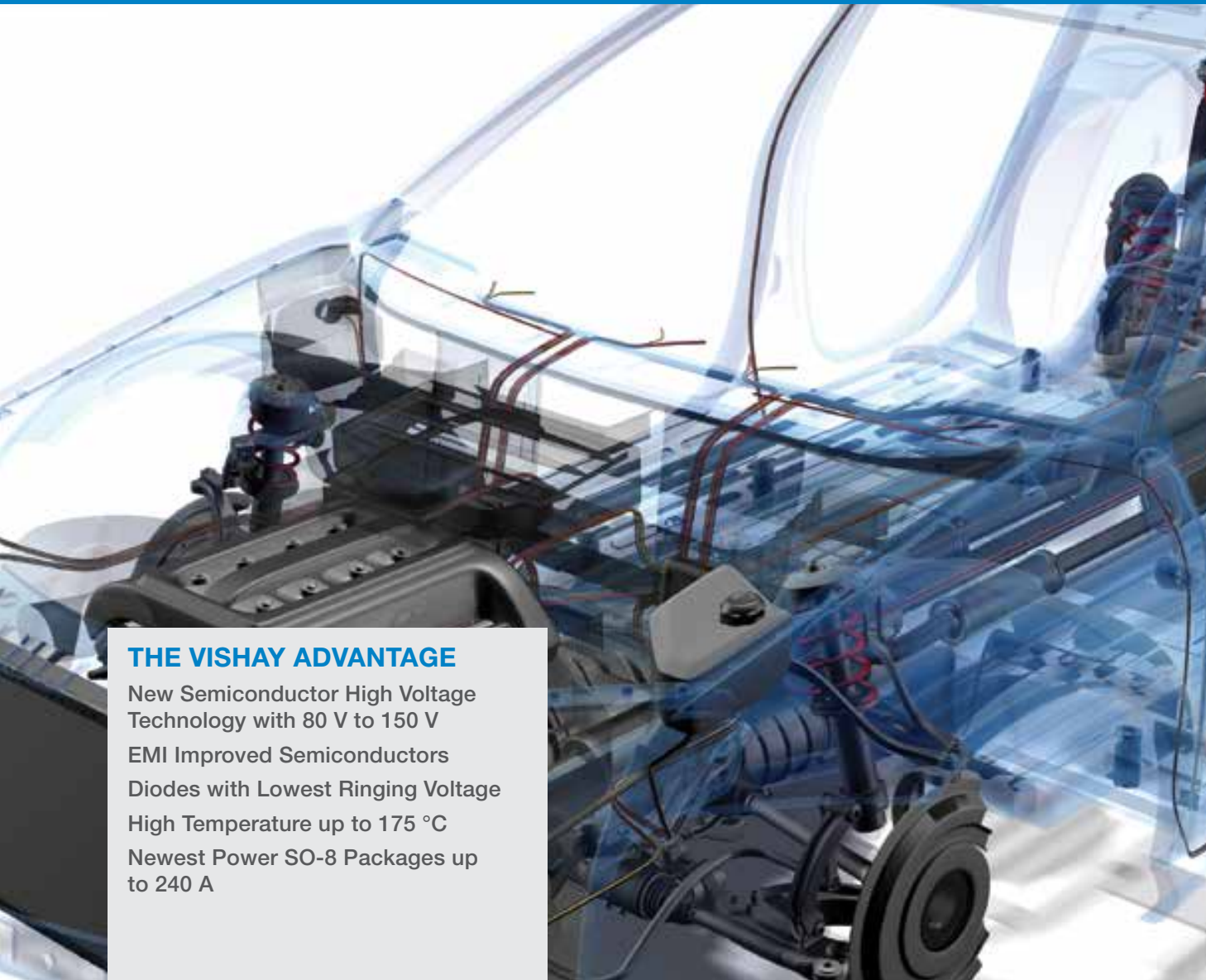
For details on these and other MOSFETs for automotive applications, visit <http://www.vishay.com/mosfets/automotive-mosfets/>

D ² PAK*	DPAK and Reverse DPAK	SO-8	PowerPAK SO-8L
			

PowerPAK 1212	TSOP-6	SOT-23	SC-70	PowerPAK SC-70
				

* 7 lead also available

Key components for 48 V_{DC} BOARDNET



THE VISHAY ADVANTAGE

New Semiconductor High Voltage Technology with 80 V to 150 V
EMI Improved Semiconductors
Diodes with Lowest Ringing Voltage
High Temperature up to 175 °C
Newest Power SO-8 Packages up to 240 A

Integrated Starter Generators
(48 V_{DC})



DC/DC Converters, Bidirectional
(48 V_{DC})



HVAC
(E-Compressor for 48 V_{DC})



Steering (BLDC Motor Drive for 48 V_{DC})





Integrated Starter Generators (48 V_{DC})



RESISTORS

Power Metal Strip® Meter Shunt Resistor, Very Low Value (Down to 0.0003 Ω)



WSMS2906

- Extremely low resistance values: 300 μΩ to 660 μΩ
- 3 W power capability with sensing terminals to mount in PCB

MODULES

EMIPAK-1B / 2B PressFit Power Module



Custom EMIPAK-1B / 2B

- UL approved file E78996
- Exposed Al₂O₃ substrate with low thermal optimized for low internal inductance

RESISTORS

Surface-Mount Molded Divider, High Precision



CDMP4527

- High precision to ± 0.25 % with low TCR to 50 ppm/°C, sulfur resistant
- Automotive-compliant terminations with wide range of resistance values and ratios

MOSFETs

Automotive Bare Die MOSFET Family, Available in Tape-and-Reel Format



SQC100N08-3m5

- High-performance MOSFET technologies available in bare die
- Known good die processing with comprehensive testing

NON-LINEAR RESISTORS

2-Point Radial Leaded, Automotive-Grade NTC Thermistors



NTCLE...E3...SB

- Automotive line
- Thermal cycling resistant, suitable for potting

INDUCTORS

Custom Magnetics



- High-current, high-temperature designs for boardnet and DC/DC conversion
- Current handling capability to several hundred amps

FILM CAPACITORS

DC Film Capacitors, MKT Radial Potted Type



MKT1820S

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

INDUCTORS

Low-Profile, High-Current IHLP® Inductors



IHLP-8787MZ-5A

- Highest current composite inductor available
- High temperature up to 155 °C, shielded construction

CERAMIC CAPACITORS

AEC-Q200 Qualified, Broad Range of Sizes and Working Voltages, C0G (NP0), X7R, and X8R



VJ....31/VJ....34 Automotive MLCC

- RoHS and GREEN compliant parts available
- AgPd termination available for epoxy bonding

RESISTORS

Power Metal Strip Battery Shunt Resistor, Very Low Value (100 μΩ, 125 μΩ, and 250 μΩ)



WSBS8518

- Extremely low resistance values: 50 μΩ to 1000 μΩ
- 36 W (850 A) power capability in an 8518 package

View datasheets for these products
www.vishay.com/ref/et3au7a



DC/DC Converters, Bidirectional (48 V_{DC})



MOSFETs

**Automotive N-Channel
100 V (D-S) 175 °C MOSFET**



SQM120N10-3m8

- Medium-voltage ThunderFET® technology, AEC-Q101 qualified, maximum R_{DS(on)} 3.8 mΩ
- Popular D²PAK packaging

RESISTORS

**Professional Thin Film
MELF Resistors**



MMA0204

- Unrivaled surge handling capability, ultimate stability over lifetime
- AEC-Q200 qualified, approved acc. EN 140401-803, sulfur resistant, GREEN product

RESISTORS

**High-Stability Thin Film
Flat Chip Resistors**



TNPW...e3

- Excellent overall stability, endurance < 0.05 %, resistance range from 10 Ω to 3 MΩ
- AEC-Q200-qualified, sulfur resistant, halogen-free

RESISTORS

**Power Metal Strip® SMD Resistors,
Very High Power (to 9 W), Low Value
(Down to 0.0002 Ω)**



WSLP3921

- High power rating of 5 W to 9 W in WSLP3921 package
- Very low resistance values from 0.0002 Ω to 0.004 Ω, with tolerance of 1 %

FILM CAPACITORS

**DC Film Capacitors
MKT Radial Potted Type**



MKT1820S

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

INDUCTORS

**Low-Profile, High-Current
IHLP® Inductors**



IHLP-6767GZ-5A

- Very high-current, low-saturation inductor for DC/DC conversion and filtering
- High-temperature continuous operation at 155 °C

CERAMIC CAPACITORS

**AEC-Q200 Qualified, Broad Range
of Sizes and Working Voltages,
C0G (NP0), X7R, and X8R**



VJ....31/VJ....34 Automotive MLCC

- RoHS and GREEN compliant parts available
- AgPd termination available for epoxy bonding

MODULES

**EMIPAK-1B / 2B
PressFit Power Module**



Custom EMIPAK-1B / 2B

- UL approved file E78996
- Exposed Al₂O₃ substrate with low thermal optimized for low internal inductance

RESISTORS

**High-Voltage Thin Film Resistor
Divider Network**



HVRD1206

- High-precision thin film construction with 0.1 % tol. and 10 ppm/°C TCR track
- High-voltage divider with 120 V operating voltage, R1 = 3 KΩ to 9 KΩ and R2 = 1 MΩ

RESISTORS

**Surface-Mount Power Resistor
Thick Film Technology**



D2TO

- AEC-Q200-qualified D²PAK TO-263 standard package, 20 W and 35 W at 25 °C case temperature
- High-pulse capability up to 10 J for short pulse, high-temp. soldering, RoHS-comp.

INDUCTORS

**Low-Profile, High-Current
IHLP Inductors**



IHLP-8787MZ-5A

- Highest current composite inductor available
- High temperature up to 155 °C, shielded construction

RESISTORS

**Power Metal Strip SMD Resistors,
Very High Power (3 W),
Low Value (to 0.0005 Ω)**



WSLP2512

- Very high power rating of 3 W in 2512 package
- Extremely low resistance values from 0.0005 Ω to 0.01 Ω and tolerance of 1 %

View datasheets for these products
www.vishay.com/ref/et3au7b



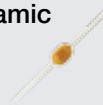
HVAC

(E-Compressor for 48 V_{DC})



CERAMIC CAPACITORS

Axial Leaded Multilayer Ceramic Capacitors for Automotive Applications



A...V

- High-reliability MLCC insert with wet build process
- High operating temp. up to 160 °C, rated voltages: 50 V, 100 V, and 200 V

INDUCTORS

Low-Profile, High-Current IHLP® Inductors



IHLP-8787MZ-5A

- Highest current composite inductor available
- High temperature up to 155 °C, shielded construction

MOSFETs

Automotive N-Channel 100 V (D-S) 175 °C MOSFET



SQM100N10-10

- Classic TrenchFET® technology, AEC-Q101 qualified, maximum R_{DS(on)} 10.5 mΩ
- Popular D²PAK packaging

CERAMIC CAPACITORS

AEC-Q200 Qualified, Broad Range of Sizes and Working Voltages, C0G (NP0), X7R, and X8R



VJ...31/VJ...34 Automotive MLCC

- RoHS and GREEN compliant parts available
- AgPd termination available for epoxy bonding

RESISTORS

Power Metal Strip® SMD Resistors, Very High Power (to 9 W), Low Value (Down to 0.0002 Ω)



WSLP3921

- High power rating of 5 W to 9 W in WSLP3921 package
- Very low resistance values from 0.0002 Ω to 0.004 Ω, with tolerance of 1 %

INDUCTORS

Custom Ferrite Filters and Transformers; High-Current PressFit Customized Topologies High Isolation Voltage

- Many options available for low-loss, high-efficiency filtering

NON-LINEAR RESISTORS

SMD Glass Protected NTC Thermistors



NTCS...e3

- Standard series, AEC-Q200 compliant
- Glass protected with soft terminations

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



Steering (BLDC Motor Drive for 48 V_{DC})



DIODES

**Surface-Mount TRANSZORB[®]
Transient Voltage
Suppressors**



1.5SMC86A

- 1500 W peak pulse power capability with a 10/1000 μ s waveform
- AEC-Q101 qualified

RESISTORS

**Pulse-Proof, High-Power
Thick Film Chip Resistors**



CRCW...HP e3

- Excellent pulse load capability
- Enhanced power rating

OPTOELECTRONICS

**Subminiature Dual-Channel
Transmissive Optical Sensor
with Phototransistor Outputs**



TCUT1350X01

- Resolve direction and speed with dual-channel transmissive (interrupter) sensor
- Wide operating temperature range from -40 °C to +125 °C

INDUCTORS

**Low-Profile, High-Current
IHLP[®] Inductors**



IHLP-6767GZ-5A

- High-current, high-temperature designs for boardnet and DC/DC conversion

MOSFETs

**Automotive N-Channel
100 V (D-S) 175 °C MOSFET**



SCQ120N04-1m7KGD

- Medium-voltage ThunderFET[®] technology, AEC-Q101 qualified, maximum R_{DS(on)} 3.8 m Ω
- Popular D²PAK packaging

TANTALUM CAPACITORS

**Solid Tantalum Surface-Mount Chip
Capacitors, TANTAMOUNT[®] Molded
Case, Automotive Grade**



TP3

- High-performance molded tantalum capacitor, AEC-Q200-qualified
- Automotive applications: motor control, body electronics, dash board

CERAMIC CAPACITORS

**Radial Leaded Multilayer
Ceramic Capacitors for
Automotive Applications**



K...V

- High-reliability MLCC insert with wet build process
- High operating temp. up to 160 °C, rated voltages: 50 V, 100 V, and 200 V

NON-LINEAR RESISTORS

**SMD Glass Protected
NTC Thermistors**



NTCS...e3

- Standard series, AEC-Q200 compliant
- Glass protected with soft terminations

DIODES

Small-Signal Zener Diodes



BZX84B

- ESD capability acc. to AEC-Q101
- The Zener voltages are graded according to the international E24 standard

FILM CAPACITORS

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



MKT1820

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

RESISTORS

**Power Metal Strip[®] SMD Resistors,
Very High Power (to 9 W), Low Value
(Down to 0.0002 Ω)**



WSLP3921

- High power rating of 5 W to 9 W in WSLP3921 package
- Very low resistance values from 0.0002 Ω to 0.004 Ω , with tolerance of 1 %

CERAMIC CAPACITORS

**AEC-Q200 Qualified, Broad Range
of Sizes and Working Voltages,
C0G (NP0), X7R, and X8R**



VJ...31/VJ...34 Automotive MLCC

- RoHS and GREEN compliant parts available
- AgPd termination available for epoxy bonding

View datasheets for these products
www.vishay.com/ref/et3au7d

Spotlight on MELF Resistors

The World's Most Reliable and Predictable High-Performance Film Resistors



For more than 25 years, Vishay's MELF resistors have successfully met the demanding requirements of the automotive industry. They offer superior SMD resistor performance in terms of accuracy, stability, reliability, and pulse load capability. The cylindrical construction of MELF devices provides an optimal power rating and pulse load capability related to the mounting space. Continuous development has led to improved long-term stability and moisture resistance, and allows high-temperature operation to +175 °C.

KEY PERFORMANCE BENEFITS:

- Predictable behavior of components
- Zero-defect philosophy
- Harsh operating environments
- Long-term stability
- Moisture resistance
- Reliability
- Temperature cycling in lead (Pb)-free assembly processes
- Insulation voltage up to 500 V

APPROVALS

- EN140401-803
- AEC-Q200

All products are completely lead (Pb)-free and comply with the Global Automotive Declarable Substances List (GADSL), which includes full compliance with the RoHS directive.

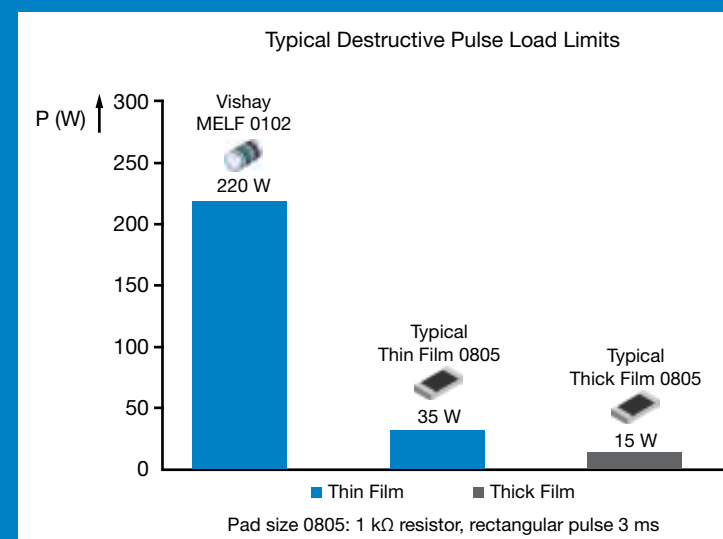
TEMPERATURE COEFFICIENT, TOLERANCE, AND STABILITY

Resistor temperature coefficients down to ± 5 ppm/K are available, as well as tolerances down to ± 0.02 %. Long-term stability results in a superior maximum resistance change ($\Delta R/R$) of $< \pm 0.05$ % after 8000 h operation for high-precision MELF resistors.

PULSE LOAD CAPABILITY

Another aspect of MELF resistors is their reliability when exposed to various overload conditions. The metal film technology, together with the cylindrical construction of the MELF devices, provides an advantage compared to standard thick and thin film chip resistors in regard to pulse load capability. MELF resistors are also available in advanced carbon film technology, offering up to 6 kV ESD capability on the 1206 pad size, or 10 kV surge handling on the 2512 pad size. As shown in the diagram below, thick film flat chip resistors fail at much lower pulse loads than thin film flat chips, and both types are outperformed by thin film MELF resistors.

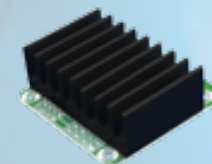
For technical questions, contact: melf@vishay.com



Key components for MICRO HYBRID – START / STOP (12 V)



**Generator and
Alternator
Power Modules**



**Generator and
Alternator
Control Modules**



**Boardnet
Stabilizer
DC/DC
Converters**

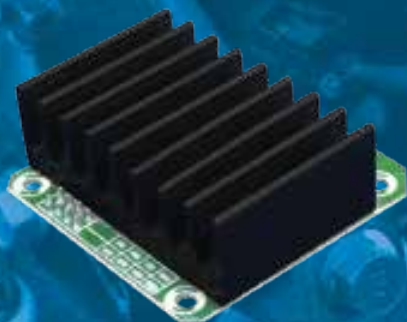


THE VISHAY ADVANTAGE

- AEC Qualifications
- High-Temperature Performance
- Customized Storage Elements
- High Reliability
- High Power Density
- KGD Semiconductor Solutions



Generator and Alternator Power Modules



MOSFETs

Automotive Bare Die MOSFET Family Available in Tape-and-Reel Format



SQC100N10-1-KGD

- High-performance MOSFET technologies available in bare die
- Known good die processing with comprehensive testing

RESISTORS

Precision Thin Film Chip Resistor Array, Superior Moisture Resistivity



ACAS0606 AT

- Arbitrary resistance ratio up to 1:20, superior tracking stability over lifetime
- Relative TCR down to ± 5 ppm/K (tracking), AEC-Q200 qualified, sulfur resistant

CERAMIC CAPACITORS

Radial Leaded Multilayer Ceramic Capacitors for Automotive Applications



K...V

- High-reliability MLCC insert with wet build process
- High operating temp. up to 160 °C, rated voltages: 50 V, 100 V, and 200 V

NON-LINEAR RESISTORS

SMD Glass Protected NTC Thermistors



NTCS...e3

- Standard series, AEC-Q200 compliant
- Glass protected with soft terminations

FILM CAPACITORS

DC Film Capacitors, MKT Radial Potted Type



MKT1820S

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

INDUCTORS

Custom Magnetics



- High-current, high-temperature designs for boardnet and DC/DC conversion
- Current handling capability to several hundred amps

RESISTORS

Power Metal Strip® SMD Resistors, Very High Power (to 9 W), Low Value (Down to 0.0002 Ω)



WSLP3921

- High power rating of 5 W to 9 W in WSLP3921 package
- Very low resistance values from 0.0002 Ω to 0.004 Ω , with tolerance of 1 %



Generator and Alternator Control Modules



CERAMIC CAPACITORS

AEC-Q200 Qualified, Broad Range of Sizes and Working Voltages, C0G (NP0), X7R, and X8R



VJ...31/VJ...34 Automotive MLCC

- RoHS and GREEN compliant parts available
- AgPd termination available for epoxy bonding

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

MOSFETs

Automotive Bare Die MOSFET Family Available in Tape-and-Reel Format



SQC100N08-5m0KGD

- High-performance MOSFET technologies available in bare die
- Known good die processing with comprehensive testing

RESISTORS

High-Stability Thin Film Flat Chip Resistors



TNPW...e3

- Excellent overall stability, endurance < 0.05 %, resistance range from 10 Ω to 3 M Ω
- AEC-Q200-qualified, sulfur resistant, halogen-free

RESISTORS

Professional Thin Film MELF Resistors



MMB0207

- Unrivaled surge handling capability, ultimate stability over lifetime
- AEC-Q200 qualified, approved acc. EN 140401-803, sulfur resistant, GREEN product

RESISTORS

Power Metal Strip® Battery Shunt Resistor, Very Low Value (100 $\mu\Omega$, 125 $\mu\Omega$, and 250 $\mu\Omega$)



WSBS8518

- Extremely low resistance values: 50 $\mu\Omega$ to 1000 $\mu\Omega$
- 36 W (850 A) power capability in an 8518 package

INDUCTORS

Custom Magnetics



- High-current, compact size for high efficiency
- Litz wire and flat conductor designs available for best efficiency

ALUMINUM CAPACITORS

Aluminum Capacitors SMD (Chip), High-Temperature, Low Impedance



146 CTI

- High temperature up to 125 °C, long life, low impedance, high ripple current
- Soldering according JEDEC-J-STD-020



Boardnet Stabilizer DC/DC Converters



RECTIFIERS

Low-Voltage Trench MOS Barrier Schottky Rectifier



V20DL45HM3

- Very low profile – typical height of 1.7 mm
- Trench MOS Schottky technology

INDUCTORS

Low-Profile, High-Current IHLP® Inductors



IHLP-6767GZ-5A

- Excellent high-current, low-saturation performance for noise filters and DC/DC converters

DIODES

Surface-Mount PAR® Transient Voltage Suppressors



SM8S24A

- AEC-Q101 qualified
- Meets ISO7637-2 surge specification (varied by test condition)

RESISTORS

Power Metal Strip® SMD Resistors, Very High Power (3 W), Low Value (to 0.0005 Ω)



WSLP2512

- Very high power rating of 3 W in 2512 package
- Extremely low resistance values from 0.0005 Ω to 0.01 Ω and tolerance of 1 %

MOSFETs

Automotive N-Channel 40 V (D-S) 175 °C MOSFET



SQJ422EP

- TrenchFET® Gen III technology, AEC-Q101 qualified, maximum $R_{DS(on)}$ 3.4 mΩ
- Thermally enhanced PowerPAK® SO-8L packaging

CERAMIC CAPACITORS

AEC-Q200 Qualified, Broad Range of Sizes and Working Voltages, C0G (NP0), X7R, and X8R



VJ...31/VJ...34 Automotive MLCC

- RoHS and GREEN compliant parts available
- AgPd termination available for epoxy bonding

RECTIFIERS

Dual Low-Voltage Trench MOS Barrier Schottky Rectifier



V60D45C

- Very low profile – typical height of 1.7 mm
- Trench MOS Schottky technology

FILM CAPACITORS

DC Film Capacitors, MKT Radial Potted Type

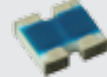


MKT1820

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

RESISTORS

Precision Thin Film Chip Resistor Array, Superior Moisture Resistivity



ACAS0606 AT

- Arbitrary resistance ratio up to 1:20, superior tracking stability over lifetime
- Relative TCR down to ± 5 ppm/K (tracking), AEC-Q200 qualified, sulfur resistant

NON-LINEAR RESISTORS

SMD Glass Protected NTC Thermistors



NTCS...e3

- Standard series, AEC-Q200 compliant
- Glass protected with soft terminations

ALUMINUM CAPACITORS

Advanced Temperature Range Up to 150 °C



160 CLA

- High ripple current: up to 1.4 A at 150 °C / 100 kHz
- Useful life up to 2000 h at 150 °C

View datasheets for these products
www.vishay.com/ref/et3au8c

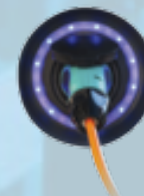
Key components for FULL HYBRID VEHICLES (HEVs)



**Electrical Motor
Drives (DC/AC)**



**DC/DC
Bidirectional
and Chargers**



**Energy
Control Modules**



THE VISHAY ADVANTAGE

- AEC Qualifications
- High-Temperature Performance
- High Reliability
- New High-Voltage Passive Components in SMD
- High-Voltage Semiconductors
- Transient-Voltage Capabilities and more...



Electrical Motor Drives (DC/AC)



CERAMIC CAPACITORS

Radial Leaded Multilayer Ceramic Capacitors for Automotive Applications

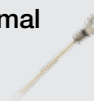


K...V

- High-reliability MLCC insert with wet build process
- High operating temp. up to 160 °C, rated voltages: 50 V, 100 V, and 200 V

NON-LINEAR RESISTORS

NTC Thermistors, Low Thermal Gradient Lug Sensors



NTCALUG02A

- Low thermal gradient surface temperature sensor
- High insulation voltage

INDUCTORS

Custom Filter

- Many options available for low-loss, high-efficiency filtering

RESISTORS

Precision Thin Film Chip Resistor Array, Superior Moisture Resistivity



ACAS0612 AT

- Arbitrary resistance ratio up to 1:20, superior tracking stability over lifetime
- Relative TCR down to ± 5 ppm/K (tracking), AEC-Q200 qualified, sulfur resistant

CERAMIC CAPACITORS

AEC-Q200 Qualified, Broad Range of Sizes and Working Voltages, C0G (NP0), X7R, and X8R



VJ....31/VJ....34 Automotive MLCC

- RoHS and GREEN compliant parts available
- AgPd termination available for epoxy bonding

RESISTORS

Power Metal Strip® SMD Resistors, Very High Power (to 9 W), Low Value (Down to 0.0002 Ω)



WSLP3921

- High power rating of 5 W to 9 W in WSLP3921 package
- Very low resistance values from 0.0002 Ω to 0.004 Ω , with tolerance of 1 %

FILM CAPACITORS

Customized High-Voltage DC-Link Capacitor



MKP1849

- High capacitance up to 6 mF
- Operating voltage up to 1200 V_{DC}, operating temperature up to 105 °C

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

Surface-Mount Molded Divider, High Voltage

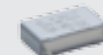


CDMH4527

- High voltages up to 3000 V, sulfur resistant
- Automotive-compliant terminations with wide range of resistance values and ratios

FILM CAPACITORS

Interference Suppression Film Capacitor – Class Y2, Radial MKP 300 V_{AC}



MKP338 6

- RFI Y2 capacitor for bypass applications
- Automotive Grade with AEC-Q200 compliance

FILM CAPACITORS

DC Film Capacitors, MKT Radial Potted Type



MKT1820S

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

View datasheets for these products
www.vishay.com/ref/et3au9a



DC/DC Bidirectional and Chargers



MOSFETs

**Automotive N-Channel
100 V (D-S) 175 °C MOSFET**
SQJ402EP



- Medium-voltage ThunderFET® technology, AEC-Q101 qualified, maximum $R_{DS(on)}$ 11 mΩ
- Thermally enhanced PowerPAK® SO-8L packaging

ALUMINUM CAPACITORS

**Aluminum Capacitors SMD (Chip),
High Temperature,
Low Impedance**



146 CTI

- High temperature up to 125 °C, long life, low impedance, high ripple current
- Soldering according JEDEC-J-STD-020

NON-LINEAR RESISTORS

**NTC Thermistors, Radial
Leaded, Accuracy Line**



NTCLE203E3

- Accuracy line
- Low-heat conductive wiring

CERAMIC CAPACITORS

**Radial Leaded Multilayer
Ceramic Capacitors for
Automotive Applications**



K...V

- High-reliability MLCC insert with wet build process
- High operating temp. up to 160 °C, rated voltages: 50 V, 100 V, and 200 V

RESISTORS

**Professional Thin Film
Chip Resistors**



MC...AT

- Power rating improved by 60 %
- 175 °C maximum operating temperature

FILM CAPACITORS

**Interference Suppression
Film Capacitors,
MKP Radial Potted Type**



MKP339

- RFI X2 capacitor for standard across-the-line applications
- Automotive Grade with AEC-Q200 compliance

RESISTORS

**Wirebondable Gate Resistor
for IGBT Applications**



IGBR

- Back contact resistor for single wirebond assembly with power rating up to 4 W
- Available case sizes from 0202 to 2010

INDUCTORS

**2 kW to 5 kW Standard Power
Planar Transformer and Custom
Power Planar Inductor**



PLA

- Planar and flat wire designs available for improved efficiency
- Power supply topology: full-bridge; push-pull; half-bridge; forward

RESISTORS

**Surface-Mount Molded
Divider, High Precision**



CDMP4527

- High precision to ± 0.25 % with low TCR to 50 ppm/°C, sulfur resistant
- Automotive-compliant terminations with wide range of resistance values and ratios

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

**Professional Thin Film
MELF Resistors**



MMB0207

- Unrivaled surge handling capability, ultimate stability over lifetime
- AEC-Q200 qualified, approved acc. EN 140401-803, sulfur resistant, GREEN product

CERAMIC CAPACITORS

**AEC-Q200 Qualified, Broad Range
of Sizes and Working Voltages,
C0G (NP0), X7R, and X8R**



VJ....31/VJ....34 Automotive MLCC

- RoHS and GREEN compliant parts available
- AgPd termination available for epoxy bonding

View datasheets for these products
www.vishay.com/ref/et3au9b



Energy Control Modules



RESISTORS

High-Power Resistor for Mounting onto a Heatsink, Thick Film Technology



LPS 300

- High power 57 mm x 57 mm size up to 300 W at 25 °C on heatsink
- Non-inductive down to 1 μ H, high pulse capability up to 1000 J for short pulse

NON-LINEAR RESISTORS

SMD Glass Protected NTC Thermistors



NTCS...e3

- Standard series, AEC-Q200 compliant
- Glass protected with soft terminations

RESISTORS

Power Metal Strip® SMD Resistors, Very High Power (to 9 W), Low Value (Down to 0.0002 Ω)



WSLP3921

- High power rating of 5 W to 9 W in WSLP3921 package
- Very low resistance values from 0.0002 Ω to 0.004 Ω , with tolerance of 1 %

FILM CAPACITORS

Metallized Polypropylene Film Capacitors, DC-Link Capacitor



MKP1848S

- Slim high-performance DC-Link for low building height applications

INDUCTORS

Low-Profile, High-Current IHLP® Inductors



IHLP-5050FD-5A

- High-current, high-temperature designs for boardnet and DC/DC conversion

CERAMIC CAPACITORS

AEC-Q200 Qualified, Broad Range of Sizes and Working Voltages, C0G (NP0), X7R, and X8R



VJ....31/VJ....34 Automotive MLCC

- RoHS and GREEN compliant parts available
- AgPd termination available for epoxy bonding

RESISTORS

Surface-Mount Power Resistor, Thick Film Technology



D2TO

- AEC-Q200-qualified D²PAK TO-263 standard package, 20 W and 35 W at 25 °C case temperature
- High-pulse capability up to 10 J for short pulse, high-temp. soldering, RoHS comp.

RESISTORS

Professional Thin Film MELF Resistors



MMB0207

- Unrivalled surge handling capability, ultimate stability over lifetime
- AEC-Q200 qualified, approved acc. EN 140401-803, sulfur resistant, GREEN product

RESISTORS

Matched Pair, Molded, Automotive, Thin Film, SOT-23, Resistor, Surface-Mount Network



MPMA

- Multiple standard divider ratios available with TCR tracking down to 2 ppm/°C
- Excellent long-term ratio stability ± 0.03 % over 1000 h at 125 °C

Key components for FULL ELECTRIC VEHICLES (FEVs)



**Electrical Motor
Drives (DC/AC)**



**Battery
Management
and DC/DC**



**On-Board
Chargers**



THE VISHAY ADVANTAGE

AEC Qualifications
High-Temperature Performance
High Reliability
New High-Voltage Passive
Components in SMD
High-Voltage Semiconductors
Transient-Voltage Capabilities
and more...



Electric Motor Drives (DC/AC)

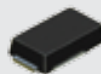


RECTIFIERS

Surface-Mount Ultrafast Avalanche Rectifiers

AU1PK

- Very low profile – typical height of 1.0 mm
- AEC-Q101 qualified

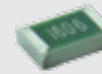


RESISTORS

High-Stability Thin Film Flat Chip Resistors

TNPW e3

- Excellent overall stability, endurance < 0.05 %, resistance range from 10 Ω to 3 M Ω
- AEC-Q200 qualified, sulfur resistant, halogen-free



CERAMIC CAPACITORS

Radial Leaded Multilayer Ceramic Capacitors for Automotive Applications

K...V

- High-reliability MLCC insert with wet build process
- High operating temp. up to 160 °C, rated voltages: 50 V, 100 V, and 200 V



RESISTORS

Surface-Mount Molded Divider, High Voltage

CDMH4527

- High voltage up to 3000 V, sulfur resistant
- Automotive-compliant terminations with wide range of resistance values and ratios



CERAMIC CAPACITORS

AEC-Q200 Qualified, Broad Range of Sizes and Working Voltages, C0G (NP0), X7R, and X8R

VJ...31/VJ...34 Automotive MLCC

- RoHS and GREEN compliant parts available
- AgPd termination available for epoxy bonding



NON-LINEAR RESISTORS

NTC Thermistors, Low Thermal Gradient Lug Sensors

NTCALUG02A

- Low thermal gradient surface temperature sensor
- High insulation voltage



RESISTORS

Power Thick Film Resistor

LTO100

- TO-247 package: 100 W at 25 °C case temperature and heatsink mounted
- Compliant to RoHS AEC-Q200



INDUCTORS

Custom Magnetics

- Many custom designs for low-loss, high-efficiency filtering and transformers
- Litz wire and flat conductor designs available for best efficiency



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



FILM CAPACITORS

Customized High-Voltage DC-Link Capacitor

MKP1849

- High capacitance up to 6 mF, excellent V/I pulse performance
- Operating voltage up to 1200 V_{DC}, operating temperature up to 105 °C



RESISTORS

Precision Automotive Thin Film Chip Resistors, AEC-Q200 Qualified, 2 kV ESD Rating

PAT

- Moisture-resistant tantalum nitride film and added silicon nitride layer for ESD
- Wide resistance range from 2.5 Ω to 3 M Ω with tolerance down to ± 0.1 %



View datasheets for these products
www.vishay.com/ref/et3au10a



Battery Management and DC/DC

CERAMIC CAPACITORS

X1 / Y2 AC Line Rated Disc Capacitors for Automotive Applications



AY2

- AEC-Q200 qualified, X1 / Y2 safety rating according to IEC 60384-14, 3rd edition
- Proven to withstand more than 2000 temp. cycles from -55 °C to +125 °C

DIODES

Surface-Mount TRANSZORB® Transient Voltage Suppressors



1.5SMC86A

- 1500 W peak pulse power capability with a 10/1000 μ s waveform
- AEC-Q101 qualified

RESISTORS

Surface-Mount Power Resistor Thick Film Technology



D2TO

- AEC-Q200-qualified D²PAK TO-263 standard package, 20 W and 35 W at 25 °C case temperature
- High-pulse capability up to 10 J for short pulse, high-temp. soldering, RoHS comp.

NON-LINEAR RESISTORS

SMD Glass Protected NTC Thermistors

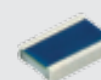


NTCS...e3

- Standard series, AEC-Q200 compliant
- Glass protected with soft terminations

RESISTORS

Professional Wide-Terminal Thin Film Chip Resistors



MCW 0406 AT

- Power handling up to 300 mW, extreme thermocycling robustness up to 3000 cycles
- Avail. to 1 Ω , TCR to 25 ppm/K and 0.1 % tol., AEC-Q200 qualified, sulfur resistant

FILM CAPACITORS

DC Film Capacitors, MKT Radial Potted Type



MKT1820

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

INDUCTORS

Custom Filters

- Many options available for low-loss, high-efficiency filtering
- Litz wire and flat conductor designs available for best efficiency

ALUMINUM CAPACITORS

Advanced Temperature Range Up to 150 °C



160 CLA

- High ripple current: up to 1.4 A at 150 °C / 100 kHz
- Useful life up to 2000 h at 150 °C

TANTALUM CAPACITORS

Solid Tantalum Surface-Mount Chip Capacitors, TANTAMOUNT® Molded Case, Automotive Grade



TH4

- High-temperature molded tantalum capacitor, HI-TMP® up to 175 °C
- Applications: filtering, decoupling, LDO-regulators, braking systems

RESISTORS

Power Metal Strip® Battery Shunt Resistor, Very Low Value (100 $\mu\Omega$, 125 $\mu\Omega$, and 250 $\mu\Omega$)

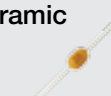


WSBS8518

- Extremely low resistance values: 50 $\mu\Omega$ to 1000 $\mu\Omega$
- 36 W (850 A) power capability in an 8518 package

CERAMIC CAPACITORS

Axial Leaded Multilayer Ceramic Capacitors for Automotive Applications



A...V

- High-reliability MLCC insert with wet build process
- High operating temp. up to 160 °C, rated voltages: 50 V, 100 V, and 200 V

NON-LINEAR RESISTORS

NTC Thermistors, Standard Lug Sensors



NTCALUG

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

View datasheets for these products
www.vishay.com/ref/et3au10b



On-Board Chargers



DIODES

Surface-Mount TRANSZORB® Transient Voltage Suppressors



1.5SMC540A

- 1500 W peak pulse power capability with a 10/1000 μ s waveform
- AEC-Q101 qualified

RESISTORS

Wirebondable Gate Resistor for IGBT Applications



IGBR

- Back contact resistor for single wirebond assembly with power rating up to 4 W
- Available case sizes from 0202 to 2010

CERAMIC CAPACITORS

AEC-Q200 Qualified, Broad Range of Sizes and Working Voltages, C0G (NP0), X7R, and X8R



VJ....31/VJ....34 Automotive MLCC

- RoHS and GREEN compliant parts available
- AgPd termination available for epoxy bonding

RESISTORS

Precision Thin Film Chip Resistor Array, Superior Moisture Resistivity



ACAS...AT

- Arbitrary resistance ratio up to 1:20, superior tracking stability over lifetime
- Relative TCR down to ± 5 ppm/K (tracking), AEC-Q200 qualified, sulfur resistant

FILM CAPACITORS

Interference Suppression Film Capacitor, Class X2 MKT 310 V_{AC}, High-Stability Grade



F1772

- RFI X2 film capacitors for continuous across-the-line and series impedance app.
- Withstanding 85 °C / 85 % RH for 1000 h at 240 V_{AC}

RESISTORS

Surface-Mount Power Resistor Thick Film Technology



D2TO20

- AEC-Q200-qualified D²PAK TO-263 standard package, 20 W and 35 W at 25 °C case temperature
- High-pulse capability up to 10 J for short pulse, high-temp. soldering, RoHS comp.

CERAMIC CAPACITORS

X1 / Y2 AC Line Rated Disc Capacitors for Automotive Applications



AY2

- AEC-Q200 qualified, X1 / Y2 safety rating according to IEC 60384-14, 3rd edition
- Proven to withstand more than 2000 temp. cycles from -55 °C to +125 °C

RESISTORS

Power Metal Strip® SMD Resistors, Very High Power (to 3 W), Low Value (to 0.0005 Ω)

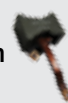


WSLP

- Very high power rating to 3 W in WSLP0603 to WSLP2512 size packages
- Extremely low resistance values from 0.0005 Ω to 0.1 Ω and tolerance of 1 %

INDUCTORS

2 kW to 5 kW Standard Power Planar Transformer and Custom Power Planar Inductor



PLA

- Planar and flat wire designs available for improved efficiency
- Power supply topology: full-bridge; push-pull; half-bridge; forward

FILM CAPACITORS

Customized High-Voltage DC-Link Capacitor



MKP1849

- High capacitance up to 6 mF
- Operating voltage up to 1200 V_{DC}, operating temperature up to 105 °C

FILM CAPACITORS

Interference Suppression Film Capacitors, MKP Radial Potted Type



MKP339

- RFI X2 capacitor for standard across-the-line applications
- Automotive Grade with AEC-Q200 compliance

NON-LINEAR RESISTORS

SMD Glass Protected NTC Thermistors



NTCS...e3

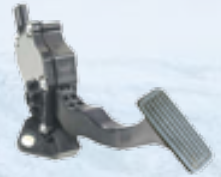
- Standard series, AEC-Q200 compliant
- Glass protected with soft terminations

View datasheets for these products
www.vishay.com/ref/et3au10c

Key components for OFF-ROAD EQUIPMENT



Pedal Position Controls



Steering Controls



Panel Controls



THE VISHAY ADVANTAGE

- AEC Qualifications
- Robust Design
- High Reliability
- Durability
- Long Life
- and more...



Pedal Position Controls



OPTOELECTRONICS

Subminiature Dual-Channel Transmissive Optical Sensor with Deep Slot for Turn-and-Push Encoding



TCUT1600X01

- Resolve direction and speed with dual-channel transmissive (interrupter) sensor
- High slot height for turn-and-push sensing

RESISTORS

High-Stability Thin Film Flat Chip Resistors



TNPW e3

- Excellent overall stability, endurance < 0.05 %, resistance range from 10 Ω to 3 M Ω
- AEC-Q200 qualified, sulfur resistant, halogen-free

SENSORS

Throttle Position Sensor in Hall Effect Technology, Hollow and D-Shaft Versions



981 HE

- Accurate linearity down to ± 0.5 %, hollow and d-shaft versions available
- Spring-loaded types available, dedicated to applications in harsh environments

RESISTORS

Precision Automotive Thin Film Chip Resistors, AEC-Q200 Qualified, 2 kV ESD Rating



PAT

- Moisture-resistant tantalum nitride film and added silicon nitride layer for ESD
- Wide resistance range from 2.5 Ω to 3 M Ω with tolerance down to ± 0.1 %

MOSFETs

Automotive P-Channel 60 V (D-S) 175 $^{\circ}$ C MOSFET



SQJ461EP-T1-GE3

- TrenchFET[®] technology, AEC-Q101 qualified, maximum $R_{DS(on)}$ 16 m Ω
- Thermally enhanced PowerPAK[®] SO-8L packaging

RESISTORS

Thick Film Surface-Mount Chip Resistors, Wraparound and Extremely Low Value



RCWE

- Low resistance values from 0.01 Ω to 0.976 Ω and tolerance of 1 %
- Thick film construction with 2x power capacity

DIODES

Surface-Mount PAR[®] Transient Voltage Suppressors



TPSMA

- AEC-Q101 qualified, $T_J = 185$ $^{\circ}$ C capability suitable for automotive requirements
- 400 W peak pulse power capability with a 10/1000 μ s waveform

NON-LINEAR RESISTORS

SMD 0603, Glass Protected NTC Thermistors



NTCS0603

- Standard series, AEC-Q200 compliant
- Glass protected with soft terminations

CERAMIC CAPACITORS

AEC-Q200 Qualified, Broad Range of Sizes and Working Voltages, C0G (NP0), X7R, and X8R

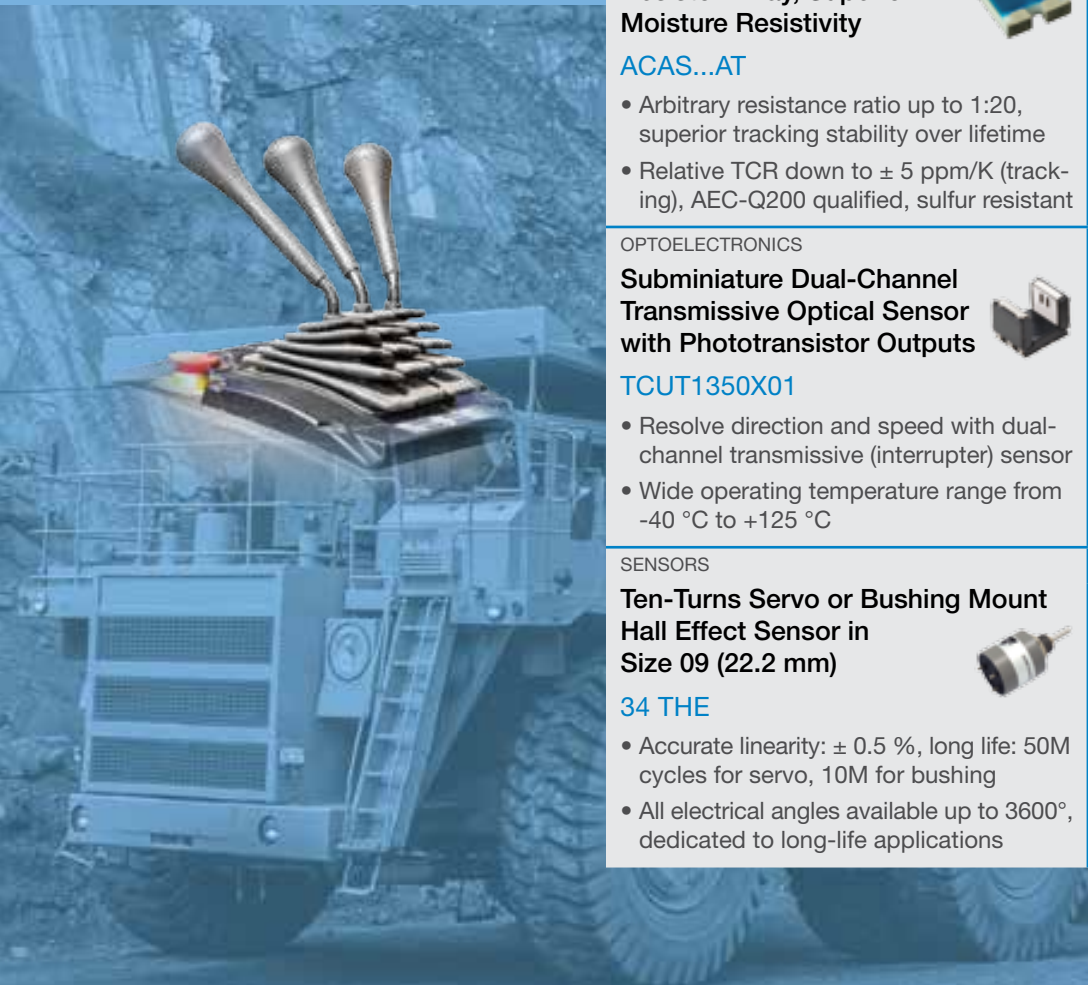


VJ...31/VJ...34 Automotive MLCC

- RoHS and GREEN compliant parts available
- AgPd termination available for epoxy bonding

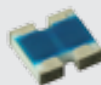


Steering Controls



RESISTORS

Precision Thin Film Chip Resistor Array, Superior Moisture Resistivity



ACAS...AT

- Arbitrary resistance ratio up to 1:20, superior tracking stability over lifetime
- Relative TCR down to ± 5 ppm/K (tracking), AEC-Q200 qualified, sulfur resistant

DIODES

Small-Signal Zener Diodes



BZX84B6V8

- ESD capability according to AEC-Q101
- The Zener voltages are graded according to the international E24 standard

TANTALUM CAPACITORS

Solid Tantalum Chip Capacitors, High CV Leadframeless Molded, Automotive Grade



TP8

- Smallest AEC-Q200-qualified tantalum capacitor with case sizes as small as 0603
- Perfect for space-constrained designs

OPTOELECTRONICS

Subminiature Dual-Channel Transmissive Optical Sensor with Phototransistor Outputs



TCUT1350X01

- Resolve direction and speed with dual-channel transmissive (interrupter) sensor
- Wide operating temperature range from -40°C to $+125^{\circ}\text{C}$

RESISTORS

Molded, 50 mil Pitch, Dual-In-Line Thin Film Resistor Network, Precision Automotive



NOMCA

- Tantalum nitride resistive film for superior moisture protection
- Excellent long term ratio stability $\pm 0.015\%$ for 1000 h at 125°C

RECTIFIERS

Surface-Mount Glass Passivated Rectifier



S1G

- Glass passivated diode technology
- AEC-Q101 qualified

SENSORS

Ten-Turns Servo or Bushing Mount Hall Effect Sensor in Size 09 (22.2 mm)



34 THE

- Accurate linearity: $\pm 0.5\%$, long life: 50M cycles for servo, 10M for bushing
- All electrical angles available up to 3600° , dedicated to long-life applications

ALUMINUM CAPACITORS

Advanced Temperature Range Up to 150°C



160 CLA

- High ripple current: up to 1.4 A at 150°C / 100 kHz
- Useful life up to 2000 h at 150°C

NON-LINEAR RESISTORS

NTC Thermistors, SMD 0402, 0603, 0805, and 1206 Chip



NTHS...

- Standard series
- Glass protected

RESISTORS

Lead (Pb)-Bearing High-Stability Thin Film Chip Resistors



TNPW

- Excellent overall stability, endurance $< 0.05\%$, resistance range from $10\ \Omega$ to $3\ \text{M}\Omega$
- SnPb plating with Pb content $> 6\%$, TCR down to 10 ppm/K, tol. down to 0.1%

View datasheets for these products
www.vishay.com/ref/et3tr1b



Panel Controls

RECTIFIERS

Surface-Mount Ultrafast Rectifier



US1G

- High forward surge capability
- Meets MSL level 1, per J-STD-020, LF maximum peak of 260 °C

ALUMINUM CAPACITORS

Aluminum Capacitors SMD (Chip), High Temperature, Low Impedance



146 CTI

- High temperature up to 125 °C, long life, low impedance, high ripple current
- Soldering according to JEDEC-J-STD-020

OPTOELECTRONICS

Standard SMD LED PLCC-2



VLMW41R1T1

- Luminous intensity up to 355 mcd with typical color temperature of 5000 K
- White color coordinates of 0.345 (X), 0.352 (Y) with a 120° viewing angle

RESISTORS

Thin Film Mini-MELF Resistors



SMM0204

- Unrivalled surge handling capability, ultimate stability over lifetime
- AEC-Q200 qualified, sulfur resistant, GREEN product

DIODES

Surface-Mount PAR® Transient Voltage Suppressors



3KASMC24

- AEC-Q101 qualified, $T_J = 185\text{ °C}$ capability suitable for automotive requirement
- Meets MSL level 1, per J-STD-020, LF maximum peak of 260 °C

INDUCTORS

Low-Profile, High-Current IHLP® Inductors



IHLP-1616AB

- Extremely small, high-current inductors for DC/DC conversion
- High-efficiency, high-frequency operation

DISPLAYS

High-Quality Displays Offer Excellent Human-to-Machine Interface Solutions



LCD, OLED, Color TFT

- Selection of transreflective LCD, sunlight-readable OLED, and high-brightness color TFT
- High-visibility displays for use in the transportation industry

RESISTORS

Long-Life Cermet Potentiometer



P11L

- Long life 2M cycles 12.5 mm square single-turn panel control, versatile options
- Compliant to RoHS, tested according to CECC, value added and custom designs available

OPTOELECTRONICS

Subminiature Dual-Channel Transmissive Optical Sensor with Deep Slot for Turn-and-Push Encoding



TCUT1600X01

- Resolve direction and speed with dual-channel transmissive (interrupter) sensor
- High slot height for turn-and-push sensing

CERAMIC CAPACITORS

AEC-Q200 Qualified, Broad Range of Sizes and Working Voltages, C0G (NP0), X7R, and X8R



VJ...31/VJ...34 Automotive MLCC

- RoHS and GREEN compliant parts available
- AgPd termination available for epoxy bonding

RESISTORS

Fully Sealed Panel Potentiometer, Military and Professional Grades



PE30

- Robust 2 W, 19.7 mm axial single-turn panel control
- Compliant to RoHS, tested according to CECC, value added and custom designs available

View datasheets for these products
www.vishay.com/ref/et3tr1c



Key components for AC AND HYBRID TRAINS



THE VISHAY ADVANTAGE

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

**Main
Inverters**



**Auxiliary
Inverters**



**Auxiliary
Rectifiers**



**Motor Blowers /
Cooling Fans**





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/ μ 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 μ 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/ μ 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 Ω to 1 M Ω
- 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 Ω), Surface-Mount

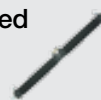


WSR

- 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



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/μs 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/μs 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



Auxiliary Rectifiers



OPTOELECTRONICS

Optocoupler, Phototransistor Output, High Reliability, 5300 V_{RMS}



VO617A-3X007T

- Isolation test voltage of 5300 V_{RMS} 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



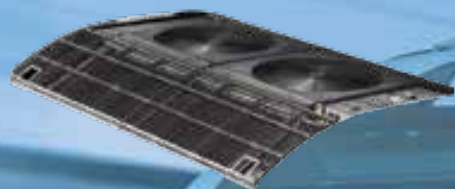
MKP1848

- 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



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_{RMS} 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 μ F



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_{RMS} and is UL, cUL certified
- Very high common mode transient immunity: 15 000 V/ μ s at V_{CM} = 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





Spotlight on Vishay ESTA Power Capacitors for Transportation Applications

Vishay ESTA is the world's only manufacturer to offer a complete range of power capacitors. These cost-effective devices for harmonic control, energy savings, and voltage stabilization are highly reliable and environmentally safe, and can be used under the most rugged conditions.

Their efficient operation helps promote CO2 reduction as well as reducing losses in long-distance HVDC transmissions. The power capacitors are also used for RFI filters and voltage and frequency converters in traction and industrial drives.

Vishay ESTA capacitors are manufactured with the highest quality standards and come complete and ready to use for all applications.

APPLICATIONS

- Static converters for:
 - Heavy-haul locomotives
 - Light local trains
 - Trolley busses
 - Trams / streetcars

STANDARDS

- IEC 61071
- IEC 61881
- Customer specifications

RANGES

- AC up to 24 kV per unit
- DC up to 125 kV and 15 kJ per unit
- Rectangular and tubular designs for casings

BENEFITS

- All appropriate capacitor technologies available to ensure optimum suitability to specific applications
- Highest flexibility in mechanical designs, including designs for low quantities



For custom requirements complete your specification details at www.vishay.com/doc?13018 and / or email esta@vishay.com.



Key components for
FORKLIFTS, LIFT TRUCKS



THE VISHAY ADVANTAGE

High Reliability
Durability
Long Life
Safety Approvals
High Precision

**Main Inverters /
Motor Drives**



**Battery Chargers /
Monitoring
Systems**



**Electronic
Controls**





Main Inverters / Motor Drives



RESISTORS

Thin Film Mini-MELF Resistors

SMM0204

- Unrivaled surge handling capability, ultimate stability over lifetime
- AEC-Q200 qualified, sulfur resistant, GREEN product



MOSFETs

Automotive Bare Die MOSFET, Family Available in Tape-and-Reel Format

SQM100N08-5m0KGD

- High-performance MOSFET technologies available in bare die
- Known good die processing with comprehensive testing



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

Surface-Mount TRANSZORB® Transient Voltage Suppressors

SMBJ

- AEC-Q101 qualified
- Peak pulse power: 600 W (10/1000 μ s)



RESISTORS

Wirewound Resistors, Industrial Power, Tubular

RBSF

- High-temperature silicone or vitreous enamel coatings
- Designed to meet heavy-duty requirements where space is at a premium



OPTOELECTRONICS

Widebody IGBT and MOSFET Driver with 10 mm Creepage and Clearance

VOW3120

- 10 mm min. external creepage distance, 8000 V max. transient isolation voltage
- 2.5 A minimum peak output current, 45 kV/ μ s common mode rejection



NON-LINEAR RESISTORS

NTC Thermistors, Naked Chips

NTCC100E4

- High stability over long time
- Wire-bondable NTC die version available



OPTOELECTRONICS

Widebody 1 MBd High-Speed Optocoupler with 10 mm Creepage and Clearance

VOW2611

- 8000 V max. transient isolation voltage
- Integrated faraday shield provides very high input-to-output noise isolation of 40 kV/ μ s



ESTA POWER CAPACITORS

Capacitors for Power Electronics (PEC) – Cylindrical

HDMKP

- Low self inductance
- High current rating



MOSFETs

Automotive N-Channel 40 V (D-S) 175 °C MOSFET

SQM200n04-1m1L

- TrenchFET® Gen III technology, AEC-Q101 qualified, maximum $R_{DS(on)}$ 1.1 m Ω
- 7-leaded D²PAK packaging



RESISTORS

Power Metal Strip® SMD Resistors, Very High Power (to 7 W), Low Value (to 0.0005 Ω)

WSLP2726

- High power rating of 5 W to 7 W in WSLP2726 package
- Very low resistance values from 0.0005 Ω to 0.002 Ω in 4-terminal package



OPTOELECTRONICS

Widebody 1 MBd High-Speed Optocoupler with 10 mm Creepage and Clearance

VOW136

- 10 mm min. external creepage distance, 8000 V max. transient isolation voltage
- Integrated faraday shield provides very high input-to-output noise isolation



View datasheets for these products
www.vishay.com/ref/et3tr3a



Battery Chargers / Monitoring Systems



DIODES

Surface-Mount TRANSZORB® Transient Voltage Suppressors

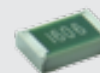


SMBJ150-E3/52

- AEC-Q101 qualified
- Peak pulse power: 600 W (10/1000 μ s)

RESISTORS

High-Stability Thin Film Flat Chip Resistors



TNPW e3

- Excellent overall stability, endurance < 0.05 %, resistance range from 10 Ω to 3 M Ω
- AEC-Q200 qualified, sulfur resistant, halogen-free

MOSFETs

E Series 600 V N-Channel Power MOSFET

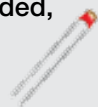


SiHG22N60E

- High-performance E Series high-voltage technology, maximum $R_{DS(on)}$ 180 m Ω
- Popular TO-247 packaging, maximum continuous current of 21 A

NON-LINEAR RESISTORS

NTC Thermistors, Radial Leaded, Standard Precision



NTCLE100E3103HT1

- Standard classic series
- Color band coded

OPTOELECTRONICS

AC and DC Linear Optocoupler with VDE, UL, BSI, and FIMKO Certification

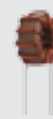


IL300

- Feedback photodiode compensates for LED's time and temperature characteristics
- Isolation test voltage, 5300 V_{RMS} in a DIP or SMD package

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

MOSFETs

Automotive N-Channel 100 V (D-S) 175 °C MOSFET



SQM120N10-3m8

- Medium-voltage ThunderFET® technology, AEC-Q101 qualified, maximum $R_{DS(on)}$ 3.8 m Ω
- Popular D²PAK packaging

RESISTORS

Power Metal Strip® Battery Shunt Resistor, Very Low Value (100 $\mu\Omega$, 125 $\mu\Omega$, and 250 $\mu\Omega$)



WSBS8518

- 36 W (850 A) power capability in an 8518 package
- Power Metal Strip all-welded construction for severe environments

DISPLAYS

High-Quality Displays Offer Excellent Human-to-Machine Interface Solutions



LCD, Color TFT, OLED

- Selection of transfective LCD, sunlight-readable OLED and high-brightness color TFT
- High-visibility displays for use in the transportation industry

OPTOELECTRONICS

Optocoupler, Phototransistor Output, High Reliability, 5300 V_{RMS}



VO617A-3X007T

- Isolation test voltage of 5300 V_{RMS} and VDE, UL, cUL, BSI, and FIMKO certified
- Operating temperature from -55 °C to +110 °C and 5 mA trigger current

RESISTORS

Power Metal Strip SMD Resistors, Very High Power (to 3 W), Low Value (to 0.0005 Ω)



WSLP

- Very high power rating to 3 W in WSLP0603 to WSLP2512 size packages
- Extremely low resistance values from 0.0005 Ω to 0.1 Ω and tolerance of 1 %

OPTOELECTRONICS

Widebody 1 MBd High-Speed Optocoupler with 10 mm Creepage and Clearance



VOW2611

- 8000 V max. transient isolation voltage
- Integrated faraday shield provides very high input-to-output noise isolation of 40 kV/ μ s

View datasheets for these products
www.vishay.com/ref/et3tr3b



Electronic Controls



TANTALUM CAPACITORS

Solid Tantalum Chip Capacitors, 298D MICROTAN®, 298W Extended Range MICROTAN



298D

- High capacitance in small case sizes, including 0603 and 0402 footprint
- Perfect for space-constrained designs

SENSORS

Single-Turn Bushing Mount Hall Effect Sensor in Size 09 (22.2 mm)



351 HE

- Accurate linearity: $\pm 0.5\%$, all angles available up to 360° , no dead band
- Dedicated to applications in harsh environments, long life > than 10M cycles

RESISTORS

Professional Thin Film MELF Resistors



MMU 0102, MMA 0204, MMB 0207

- Unrivaled surge-handling capability, ultimate stability over lifetime
- AEC-Q200 qualified, approved acc. EN 140401-803, sulfur resistant, GREEN product

RECTIFIERS

Surface-Mount Ultrafast Plastic Rectifier



MURS120-E3/53T

- Glass passivated diode technology
- Meets MSL level 1, per J-STD-020, LF maximum peak of 260°C

INDUCTORS

Low-Profile, High-Current IHLP® Inductors



IHLP-5050

- High-current, high-temperature inductor for filtering and DC/DC conversion

MOSFETs

Automotive N-Channel 75 V (D-S) 175°C MOSFET



SQJ486EP

- Classic TrenchFET® technology, AEC-Q101 qualified, maximum $R_{DS(on)}$ 26 m Ω
- Thermally enhanced PowerPAK® SO-8L packaging

SENSORS

Position Sensor, Non-Contacting



A1260HE

- Easy and fast mounting (2 ears) d-shaft design, output cable and connector
- Redundant laws for security, 8-turns electrical signal, steering applications

OPTOELECTRONICS

Widebody 1 MBd High-Speed Optocoupler with 10 mm Creepage and Clearance



VOW2611

- 8000 V max. transient isolation voltage
- Integrated faraday shield provides very high input-to-output noise isolation of 40 kV/ μs

ALUMINUM CAPACITORS

Aluminum Capacitors SMD (Chip), High Temperature, Low Impedance



146 CTI

- High temperature up to 125°C , long life, low impedance, high ripple current
- Soldering according JEDEC-J-STD-020

DIODES

Small-Signal Schottky Diodes



BAS281

- AEC-Q101 qualified
- Integrated protection ring against static

DISPLAYS

High-Quality Displays Offer Excellent Human-to-Machine Interface Solutions



LCD, Color TFT, OLED

- Selection of transfective LCD, sunlight-readable OLED, and high-brightness color TFT
- High-visibility displays for use in the transportation industry

OPTOELECTRONICS

0.5 A Output Current IGBT and MOSFET Driver



VO3150A

- 0.5 A minimum peak output current in a DIP or SMD package
- 25 kV/ μs minimum common mode rejection and is UL, cUL, and VDE certified

View datasheets for these products
www.vishay.com/ref/et3tr3c

Key components for HEAVY TRANSPORTATION



Cranes



Mining Trucks



Boats, Ships, Vessels



THE VISHAY ADVANTAGE

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



Cranes



RECTIFIERS

Surface-Mount Glass Passivated Rectifier



S1J

- Glass passivated diode technology
- Meets MSL level 1, per J-STD-020, LF maximum peak of 260 °C

ESTA POWER CAPACITORS

Capacitors for Power Electronics (PEC) – Rectangular



DCMKP Rectangular

- Heavy duty
- Low self inductance

MOSFETs

Automotive N-Channel 100 V (D-S) 175 °C MOSFET



SQD50N10-8m9L

- Medium-voltage ThunderFET® technology, AEC-Q101 qualified, maximum $R_{DS(on)}$ 8.9 mΩ
- Popular DPAK packaging

RESISTORS

Precision Thin Film Chip Resistor Array, Superior Moisture Resistivity



ACAS...AT

- Arbitrary resistance ratio up to 1:20, superior tracking stability over lifetime
- Relative TCR down to ± 5 ppm/K (tracking), AEC-Q200 qualified, sulfur resistant

OPTOELECTRONICS

Widebody IGBT and MOSFET Driver with 10 mm Creepage and Clearance



VOW3120

- 10 mm min. external creepage distance, 8000 V max. transient isolation voltage
- 2.5 A minimum peak output current, 45 kV/μs common mode rejection

RESISTORS

High-Power, High-Current Grid Resistors, 1 kW and Larger



GRE1

- High active mass with good thermal dissipation
- IP00, IP20, and IP23 rated enclosures available

SENSORS

Single-Turn Bushing Mount Hall Effect Sensor in Size 09 (22.2 mm)



351 HE

- Accurate linearity: ± 0.5 %, all angles available up to 360°, no dead band
- Dedicated to applications in harsh environments, long life > than 10M cycles

INDUCTORS

Low-Profile, High-Current IHLP® Inductors



IHLP-6767GZER470M11

- High-current, high-temperature inductor for filtering and DC/DC conversion

RESISTORS

High-Stability Thin Film Flat Chip Resistors



TNPW e3

- Excellent overall stability, endurance < 0.05 %, resistance range from 10 Ω to 3 MΩ
- AEC-Q200 qualified, sulfur resistant, halogen-free

RESISTORS

Surface-Mount Power Resistor Thick Film Technology



D2TO020

- AEC-Q200-qualified D²PAK TO-263 standard package, 20 W and 35 W at 25 °C case temperature
- High-pulse capability up to 10 J for short pulse, high-temp. soldering, RoHS comp.

NON-LINEAR CAPACITORS

SMD 0805, Glass Protected NTC Thermistors



NTCS0805E3...

- Standard series, AEC-Q200 compliant
- Glass protected with soft terminations

RESISTORS

Thick Film Surface-Mount Chip Resistors, Wraparound and Extremely Low Value



RCWE

- Low resistance values from 0.01 Ω to 0.976 Ω and tolerance of 1 %
- Thick film construction with 2x power capacity

View datasheets for these products
www.vishay.com/ref/et3tr4a



Mining Trucks



RESISTORS

Vitreous Wirewound Resistors with Corrugated Ribbon



GBS

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

MOSFETs

Automotive N-Channel 100 V (D-S) 175 °C MOSFET



SQD50N10-8m9L

- Medium-voltage ThunderFET® technology, AEC-Q101 qualified, maximum $R_{DS(on)}$ 8.9 mΩ
- Popular DPAK packaging

RESISTORS

Integrated Braking Resistor with Fans



Grid Box Braking Resistor

- Power of 4.4 MW
- Dedicated for severe conditions (mining)

OPTOELECTRONICS

Widebody 1 MBd High-Speed Optocoupler with 10 mm Creepage and Clearance



VOW2611

- 8000 V max. transient isolation voltage
- Integrated faraday shield provides very high input-to-output noise isolation of 40 kV/μs

RESISTORS

Universal Mount Edgewound Power Wirewound Resistors



EDGU

- High current capability
- Enclosures and mounting frames available

INDUCTORS

Low-Profile, High-Current IHLP® Inductors



IHLP-6767GZER470M11

- High-current, high-temperature inductor for filtering and DC/DC conversion

NON-LINEAR RESISTORS

SMD 0805, Glass Protected NTC Thermistors



NTCS0805E3...

- Standard series, AEC-Q200 compliant
- Glass protected with soft terminations

RECTIFIERS

Surface-Mount Glass Passivated Rectifier



S1J

- Glass passivated diode technology
- Meets MSL level 1, per J-STD-020, LF maximum peak of 260 °C

SENSORS

Position Sensor Tiller Head Control



Auto xxxxHE

- Redundant laws for safety, molded housing for perfectly fitting in applications
- Sealed sensor: IP67, integrated connector, hollow shaft actuated by flatted axis

RESISTORS

Thick Film Surface-Mount Chip Resistors, Wraparound and Extremely Low Value



RCWE

- Low resistance values from 0.01 Ω to 0.976 Ω and tolerance of 1 %
- Thick film construction with 2x power capacity

ESTA POWER CAPACITORS

Capacitors for Power Electronic (PEC) - Rectangular



ACMKP Rectangular

- High RMS and impulse current rating
- High reliability

RESISTORS

Vitreous Wirewound Resistors with Ferrules



GWK

- High power rating up to 260 W
- Complete vitreous coating for perfect humidity protection

View datasheets for these products
www.vishay.com/ref/et3tr4b



Boats, Ships, Vessels



DIODES

Small-Signal Zener Diodes

MMBZ5235

- AEC-Q101 qualified
- ESD capability according to AEC-Q101



TRANSDUCERS

Precision Rotative Transducers, Conductive Plastic, Economic Series (ECO)

ECO78

- Rudder position control for boats, phased for easier mounting in production
- Special electrical angle for a perfect fitting with customer application



RECTIFIERS

Surface-Mount Ultrafast Plastic Rectifier

ES1B

- Glass passivated diode technology
- Meets MSL level 1, per J-STD-020, LF maximum peak of 260 °C



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



MOSFETs

Automotive P-Channel 30 V (D-S) 175 °C MOSFET

SQ4425EY

- TrenchFET® technology, AEC-Q101 qualified, maximum $R_{DS(on)}$ down to 12 mΩ
- Popular SO-8 packaging



INDUCTORS

Low-Profile, High-Current IHLP® Inductors

IHLP-2525CZ-5A

- Compact size and high current, low saturation for noise filtering



SENSORS

Throttle Position Sensor in Hall Effect Technology, Hollow and D-Shaft Versions

981 HE

- Accurate linearity down to $\pm 0.5\%$, hollow and d-shaft versions available
- Spring-loaded types available, dedicated to applications in harsh environments



RESISTORS

Aluminum-Housed Compact Wirewound Resistor

VACR

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



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_{RMS} and integrated turn-off circuitry for high-speed switching



RESISTORS

Vitreous Wirewound Resistors

RW

- High power rating up to 480 W
- Complete vitreous coating for perfect humidity



DISPLAYS

High-Quality Displays Offer Excellent Human-to-Machine Interface Solutions

LCD, Color TFT, OLED

- Selection of transfective LCD, sunlight-readable OLED, and high-brightness color TFT
- High-visibility displays for use in the transportation industry

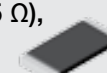


RESISTORS

Power Metal Strip® Resistors, Low Value (Down to 0.0005 Ω), Surface-Mount

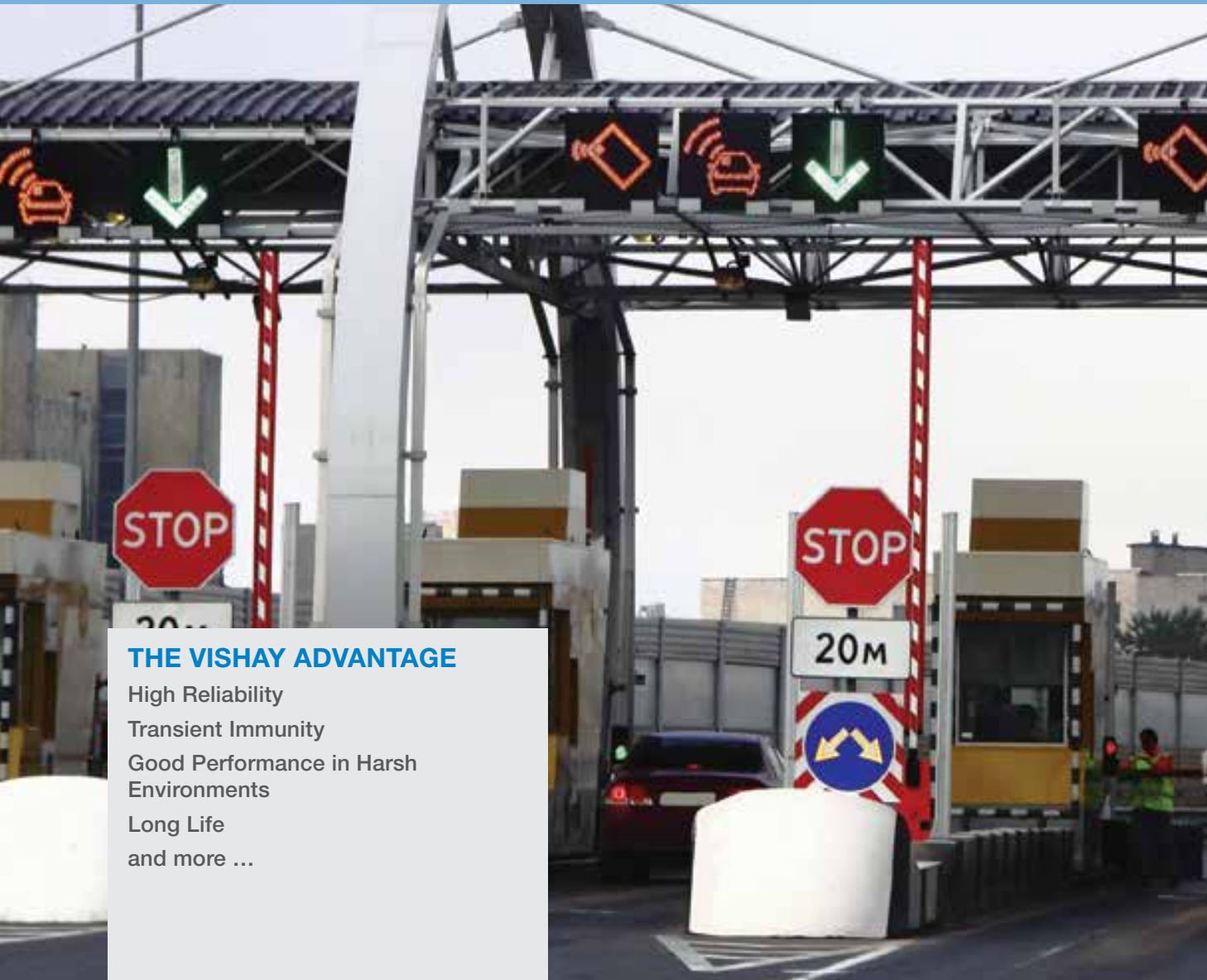
WSL2512

- Extremely low resistance values from 0.0005 Ω to 0.5 Ω and tolerance of 1 %
- High power of 1 W in 2512 size resistor



View datasheets for these products
www.vishay.com/ref/et3tr4c

Key components for TOLL SYSTEMS



**Toll Systems
(Coin, Card, Cash)**



THE VISHAY ADVANTAGE

- High Reliability
- Transient Immunity
- Good Performance in Harsh Environments
- Long Life
- and more ...



Toll Systems (Coin, Card, Cash)



CERAMIC CAPACITORS

AC Line Rated Disc Capacitors
Class X1, 760 V_{AC},
Class Y1, 500 V_{AC}



VY1

- X1 / Y1 safety rating according to IEC 60384-14, 3rd edition
- Highest reliability and lifetime, operating temperature: -40 °C to +125 °C

INDUCTORS

**Low-Profile, High-Current
IHL® Inductors**



IHLP-2525CZ-5A

- Compact size and high current, low saturation for noise filtering

RESISTORS

**Professional Thin Film
MELF Resistors**



MMU 0102, MMA 0204, MMB 0207

- Unrivalled surge-handling capability, ultimate stability over lifetime
- AEC-Q200 qualified, approved acc. EN 140401-803, sulfur resistant, GREEN product

DIODES

Small-Signal Zener Diodes



MMBZ5235

- AEC-Q101 qualified
- ESD capability according to AEC-Q101

RECTIFIERS

**Surface-Mount Glass
Passivated Rectifier**



S1J

- Glass passivated diode technology
- Meets MSL level 1, per J-STD-020, LF maximum peak of 260 °C

DIODES

**Small-Signal
Schottky Diodes**



BAS281

- AEC-Q101 qualified
- Integrated protection ring against static

TANTALUM CAPACITORS

**Solid Tantalum Chip Capacitors,
298D MICROTAN®, 298W
Extended Range MICROTAN**



298D

- High capacitance in small case sizes, including 0603 and 0402 footprint
- Perfect for space-constrained designs

OPTOELECTRONICS

**High-Power SurfLight™ Emitter
with 850 nm Peak Wavelength**

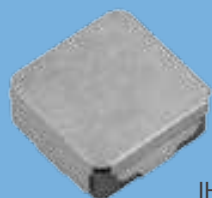


VSMY7850X01

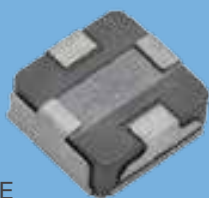
- Wavelength matches CMOS-based camera systems for nighttime and low-visibility illumination
- 170 mW/sr intensity at 1 A forward current, 780 mW/sr at 5 A forward current



Vishay Delivers Saturation Performance Advantages



IHLE



IHCL



IHLD



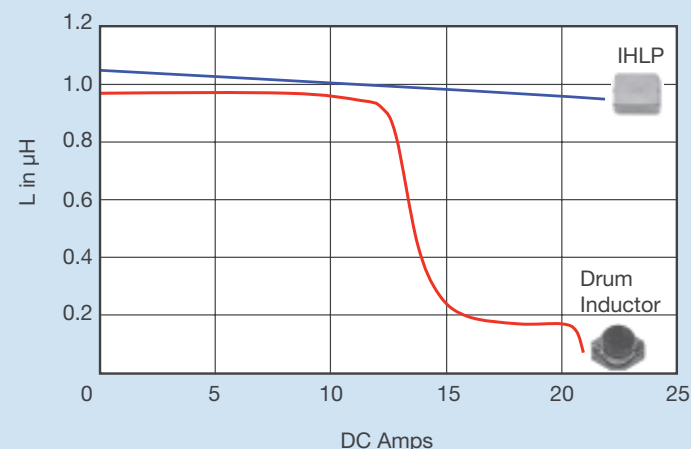
Taking the Vishay innovation of composite inductor technology to the next step, three new products, the IHLE, IHCL, and IHLD open the door for more robust automotive applications.

The IHCL is an IHLP® with two highly coupled inductors in one standard SMD package. Primarily designed for SEPIC converters, the 94 % coupling of the two inductors provides more efficient operation with a reduced footprint and lower profile compared to other standard ferrite solutions. The low core loss, high temperature stability, and soft saturation inherent in IHLP technology provide superior performance at continuous operating temperatures of 155 °C. Available in three footprints, 3232, 4040, and 5050, with inductance range from 2.7 μ H to 33 μ H for each inductor, the IHCL coupled inductor can cover a wide range of SEPIC converter output currents for LED drives and other circuits that require a stable operating voltage regardless of the input voltage.

The IHLD product also has two inductors in one package. However, these inductors are not coupled. The IHLD is designed for Class D audio amplifiers and contains two IHLP inductor vertically mounted in a robust LCP housing, reducing the board space needed for two IHLP inductors by 50 %. Again, the temperature stability of the IHLP as a function of inductance and saturation provides a more stable output inductor for Class D amplifier circuits that can improve fidelity and total harmonic distortion. The IHLD inductor is currently available in the IHLD4032 and IHLD3232 footprints in 10 μ H, 15 μ H, 22 μ H and 33 μ H values to cover the needs of most Class D amplifiers

While the IHLP is one of the best self-shielded inductors on the market due to the fact that its wire coil is completely surrounded by magnetic material with no discrete air gap to keep the magnetic flux inside the package, all inductors still emit EMI through an e-field which sometimes has to be shielded with an external metal shield. The IHLE inductor utilizes a standard IHLP but integrates an e-field shield that, when connected to ground, can attenuate the e-field emitted by the inductor by up to -20 dB at 1 cm. The IHLE can eliminate the need for a large, bulky, expensive shield by just shielding the high-current inductor. The IHLE is currently available in the 4040 footprint in any IHLP4040 standard value. Other sizes down to IHLE1616 are in the prototype stage. Use the IHLE in sensitive circuits where EMI is present due to switching noise in the inductor for a compact and cost-effective alternative to board-level shielding.

Important Parameters of Inductors – Saturation





Overview of Automotive Grade Products

Vishay has incorporated key automotive industry quality initiatives into an Automotive Grade Product line. The goal is zero defects. The requirements cover design, qualification, and manufacturing, and are used to continuously improve Vishay products and processes. Products fulfilling the Vishay Automotive Grade requirements, described below, earn our Automotive Grade stamp on their datasheets.

DESIGN

- Robust Design Policy: New and modified products are designed using design rules, DFMEA, and lessons learned. The design rules ensure Automotive Grade Products are robust through manufacturing and assembly. Testing to failure confirms that design margins meet the demands of automotive use.
- Safe Launch: Vishay's Safe Launch Policy ensures everything from design through production roll-out happens according to plan. Process corner evaluation, yield analysis, process capability review, and reliability testing are all incorporated.

QUALIFICATIONS

- AEC-Q100-, AEC-Q101-, AEC-Q200-Qualified: Automotive Grade Products are qualified to the latest AEC qualification standards and presented for approval using PPAP.

MANUFACTURING

- TS16949 Facility: All Automotive Grade Products are produced in facilities certified to TS16949.
- Maverick Lot Program: The Maverick Lot Program employs Part Average Testing (PAT), Statistical Yield Limit (SYL), and Statistical Bin Limit (SBL) according to AEC-Q001 and AEC-Q002 to identify statistically different parts and lots.
- Periodic Verification to AEC Requirements: Product families are verified to AEC Stress Test Qualification standards every two years.

CONTINUOUS IMPROVEMENT

- Error Proofing: Error proofing is performed during the entire process to identify and eliminate potential causes of defects.
- Lessons Learned / Look Across: All continual improvement actions are linked to lessons learned and look across programs to ensure improvement everywhere in the Company.



DISCRETE SEMICONDUCTORS

- MOSFETs
- Optoelectronics

PASSIVE COMPONENTS

- Capacitors
 - Aluminum
 - Tantalum
 - Ceramic
 - Film
- Resistors
 - Film
 - Wirewound
 - Power Metal Strip®
 - Thick Film Power
- Inductors
 - IHLP®
 - IHTH





Vishay Intertechnology, Inc.



A *WORLD OF*
SOLUTIONS