



## INFOGRAPHICS

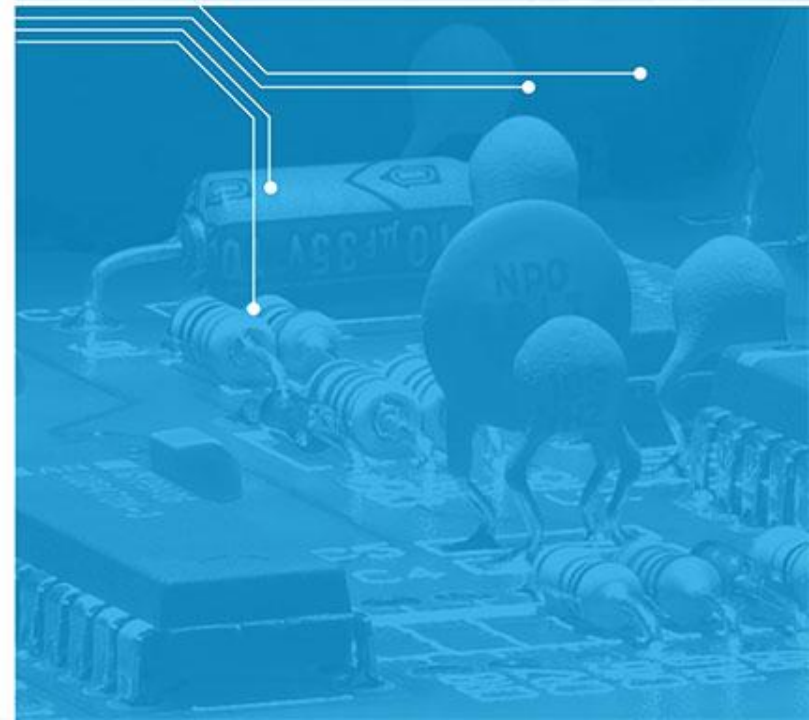
# Discrete Semiconductors in a Nutshell

Markus Walz, Business Development Manager Europe



**TTI, Inc.**

The Specialist in Electronic  
Component Distribution







## Optical Solutions

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## IC Solutions

[SIC46x microBUCK SERIES - 4.5V TO 60V BUCK REGULATORS](#)

## MOSFET Solutions

[LOW VOLTAGE TRENCH MOSFETS](#)

[MEDIUM VOLTAGE TRENCH MOSFETS](#)

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# PROXIMITY SENSORS

## LIGHT TO DIGITAL – VCNL4X SERIES

## IN A NUTSHELL

1.5  
m

**Presence and proximity**  
sensing up to **1.5 meters**

Programmable emitter current

Upper and lower thresholds, and interrupt functions

16-bit resolution

0.85  
mm

**Low profile of 0.85 mm**

Connects directly to a microcontroller via I<sup>2</sup>C



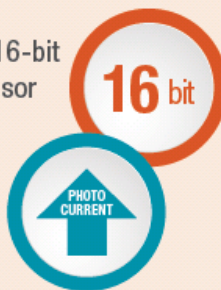
Fully integrated solutions with infrared emitter, proximity photodiode, and signal conditioning IC

**Automotive-qualified options (-X01)**



### COMPETITIVE ADVANTAGE

- Sensors include 16-bit ambient light sensor at no extra cost
- Optical noise suppression



### APPLICATIONS

- Mobile devices (e.g. smart phones, touch phones, PDAs, GPS) for touch screen locking, power saving
- Automotive for presence detection
- Attract mode engagement
- Automatic doors, faucets, and toilets
- Robots for cliff detection and docking
- Toys for edge of table detection and collision avoidance



ROBOTS



AUTOMATIC FAUCETS,  
DOORS, AND TOILETS



AUTOMOTIVE

Part Number	L	W	H	IR LED	Prox	ALS	Interrupt	Package	AEC-Q101	Range	Remark
VCNL4010	3.9	3.9	0.7	•	•	•	•	FAM		0.2 m	Lowest height
VCNL4020X01	4.9	2.4	0.8	•	•	•	•	FAM	•	0.2 m	Highest operating temperature in market
VCNL3020	4.9	2.4	0.8	•	•		•	FAM		0.2 m	Low height, proximity only
VCNL4040	4	2	1.1	•	•	•	•	PCB		0.2 m	Smallest package in the market. <i>Improved ALS with Filtron™</i>
VCNL4200	8	3	1.8	•	•	•	•	PCB		1.5 m	1.5 meter proximity





# VCNL4035X01 OPTICAL SENSOR

FULLY INTEGRATED PROXIMITY AND AMBIENT LIGHT SENSOR

IN A  
NUTSHELL

**High** resolution  
**proximity** and  
**ambient light**  
sensor at **16 bit**



**Low profile**  
(0.75 mm)  
package

**HALOGEN  
FREE**

**RoHS  
COMPLIANT**

**AEC-Q101  
Qualified**

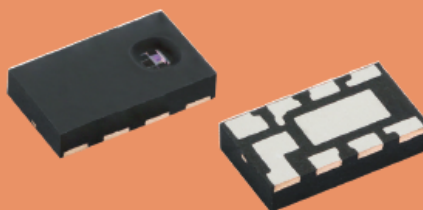
## COMPETITIVE ADVANTAGE

- 16-bit resolution for not only ALS but also for proximity
- External emitters for gesture recognition for design flexibility
- Excellent sunlight cancellation capability

**Sunlight  
Cancellation**



SUPERIOR GESTURE RECOGNITION



Low profile package: 0.75 mm

Greater Design Flexibility

**Outstanding** sensitivity allowing  
**high** object **detection** distance



**Excellent** background light **cancellation**



**16-bit resolution** for ambient  
light and proximity sensing

**2D** and **3D** **gesture** function  
supported

## APPLICATIONS

Ideal for gesture recognition in automotive, consumer, and industrial applications



## PRIMARY CHARACTERISTICS

Operating Range (V)	2.5 to 3.6
I <sup>2</sup> C BUS Voltage Range (V)	1.8 to 5
IRED Pulse Current (mA)	200
Ambient Light Range (lx)	0.004 to 4192
Ambient Light Resolution (lx)	0.004
Output Code 16 bit	I <sup>2</sup> C





## VCNL4035X01 Optical Sensor

Fully integrated Automotive Grade proximity and ambient light sensor for gesture recognition. Featuring Filtron™ technology, the Vishay Semiconductors VCNL4035X01 combines photo detectors for proximity and ambient light, a signal conditioning IC, a 16-bit ADC, and a driver for up to three external IREDs in one compact 4 mm by 2.36 mm by 0.75 mm surface-mount package.

Advantages	Benefits
16-bit high resolution	Superior sensing capabilities for both proximity and ambient light
Driver for up to three external IREDs	Enables more intricate gestures and better resolution for swiping gestures
Programmable interrupt function	Allows both high and low thresholds to be set to reduce the overall power consumption

[VCNL4035X01 datasheet](#)

[Optical Sensors Portfolio](#)

[AppNote - Designing the VCNL4035X01 Into an Application](#)

[Demo board and software](#)

[Video - VCNL4035X01](#)







# TSOPx9xxxTR1 SERIES

## LOWEST SIDE-VIEW IR RECEIVER PROFILE

## IN A NUTSHELL

2 V supply voltage available



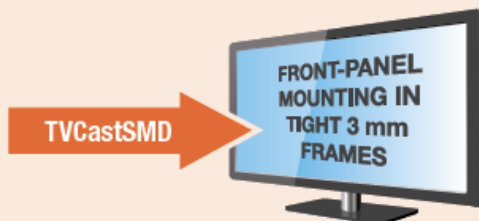
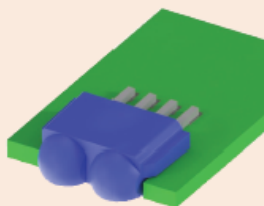
Low profile (2.6 mm)  
side-view package

**HALOGEN  
FREE**

**RoHS  
COMPLIANT**

### COMPETITIVE ADVANTAGE

- Winged package for "in the board" mounting
- High sensitivity and long range
- Reflow solderable



Low current consumption

Excellent noise suppression



Very fast response time

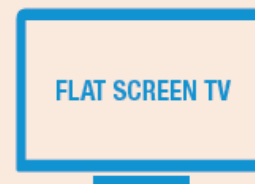
Tape and reel packaging



All AGC variants are available  
(36 kHz to 56 kHz)

### APPLICATIONS

Ideal for space-constrained electronics



### PRIMARY CHARACTERISTICS

Dimensions Width, Height, Depth (mm)	6.8 x 2.6 x 5.3
Supply Current (typ)	0.35 mA
Minimum Irradiance (typ)	0.08 mW/m <sup>2</sup>





## TV-Cast SMD IR Receivers

New series of miniature infrared (IR) receiver modules for IR remote control applications in flat-panel TVs and monitors for superior remote control performance. For front mounting in 3 mm frames the TSOP39xxxTR1 and TSOP59xxxTR1 series devices are industry first; offered in the TVCastSMD side-view, winged, surface-mount package with an ultra low height of 2.6 mm.

Advantages	Benefits
Side-view, winged package with ultra low 2.6 mm height	Front mounting in tight 3 mm frames for superior remote control performance
Photodetector, preamplifier circuit, and IR filter in a single 4-pin epoxy package featuring a two-lens design	High sensitivity with transmission range up to 45 meter, improved immunity against ambient light, and insensitive to supply voltage variations and ripple noise

### [TVCastSMD Portfolio](#)

[AppNote - Using Vishay Infrared Receivers in a Wi-Fi Environment](#)

[AppNote - Data Formats for IR Remote Control](#)

[Video - TVCast / TVCastSMD save space in consumer products](#)

[Video - Minimold IR Receivers withstand infrared reflow soldering](#)

[3D Models \(zip\)](#)







# TSOP33x, TSOP53x SERIES

OUT-PERFORMS FULL LENS PACKAGES

IN A NUTSHELL

Supports IR reflow soldering



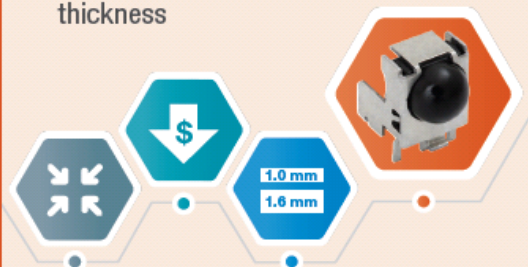
Available in two holder and three bend options, including a top-view surface-mount version

**HALOGEN  
FREE**

**RoHS  
COMPLIANT**

## COMPETITIVE ADVANTAGE

- Smaller outline and lower cost than full lens packages
- Robust RF with enhanced optical filter against out of band optical noise
- Pin in paste capable  
TSOP53xxxP10P or P16P side-view holder for 1.0 mm to 1.6 mm PCB thickness



**45°** Superior angular performance with off-angles up to 45°

**Low current** consumption



**Narrow optical filter** option available

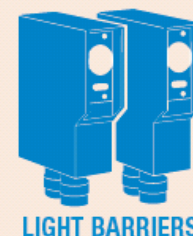
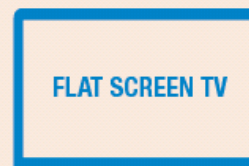


**Pin to pin** compatible with market standard



- All AGC variants are available (36 kHz to 56 kHz)
- TSSP530xx series for mid range sensor applications available
- Several mechanical variants available (holder, bends, and cuts)

## APPLICATIONS



Key Specifications	TSOP33xxx	TSOP53xxx
Typical irradiance at 0° (mW/m <sup>2</sup> )	0.08	0.12
Supply voltage (V)	2.5 to 5.5	
Typical supply current (mA)	0.35	0.7
Transmission range (m)	45	
Carrier frequencies (kHz)	30 to 56	





## TSOP33x, TSOP53x Minimold Series

Minimold package delivers the same RF noise rejection as Minicast while surpassing the high optical performance of Mold package devices. For products such as televisions, set-top boxes, air conditioners, and hi-fi audio systems, the devices provide high sensitivity with typical irradiance down to 0.08 mW/m<sup>2</sup> at 0° for the TSOP33xxx series and 0.12 mW/m<sup>2</sup> for the TSOP53xxx series

Advantages	Benefits
Smaller package with bigger lense	Better price performance ratio
Improved RF robustness	Absolute design freedom for STB designers
Qualified for Reflow soldering	DF1P SMD version for pick and place, or P10P/P16P version for Pin in paste process

[Product Portfolio](#)

[Product Brochure](#)

[Application Note: Using Vishay Infrared Receivers in a Wi-Fi Environment](#)

[Video- Minimold IR Receivers](#)

[3D - Models](#)







# TRANSMISSIVE SENSORS

## SURFACE-MOUNT

**3 mm** Wide gap of 3 mm

Moisture sensitivity level (MSL) of 1

Surface-mount package

Rugged, single piece construction

**Output current of 1.6 mA** **1.6 mA**

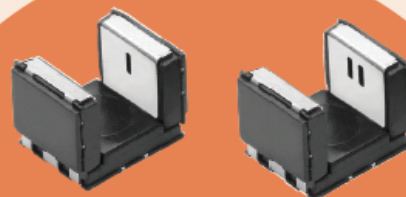
Compact size, 5.5 mm x 4.0 mm x 4.0 mm

Automotive qualified, AEC-Q101

**9 μs** Rise time of 9 μs, typical

**Deep slot for turn and push function**

**Operating temperature up to +125°C**



TCPT1350X01 / TCUT1350X01



TCPT1350X01 / TCUT1350X01

## IN A NUTSHELL



### APPLICATIONS

- Gear shift
- Ignition lock
- Adaptive headlight control
- Climate control knobs
- Latches
- Simple encoders
- Switches
- Motor speed and travel distance



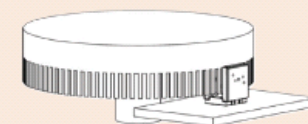
AUTOMOTIVE

### COMPETITIVE ADVANTAGE

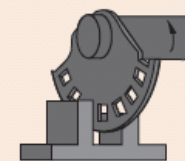
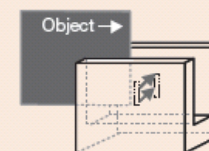
- Extremely high operating temperature
- Package design ensures alignment of emitter and detector
- High photo current output allows lower forward current of emitter



Part Number	TCPT1350X01	TCUT1350X01	TCPT1600X01	TCUT1600X01
Single Channel	•		•	
Dual Channel		•		•
Slot Depth	2.8	2.8	4.5	4.5
L x W x H	5.5 mm x 4 mm x 4 mm		5.5 mm x 4 mm x 5.7 mm	
Function	Presence of object determines speed of turn	Determines speed and direction of turn	Turn and push function presence of object determines speed of turn	Turn and push function determines speed and direction of turn
Gap	3 mm			
Operating Temperature	-40 °C to +125 °C		-40 °C to +105 °C	
Output Current	1.6 mA at I <sub>f</sub> = 15 mA			
On / Off Time	9 μs, 16 μs			



How it works: simple encoder drawings







# SOLID-STATE RELAYS

## VOR SERIES

## IN A NUTSHELL

**High** reliability and noiseless switching (no click)

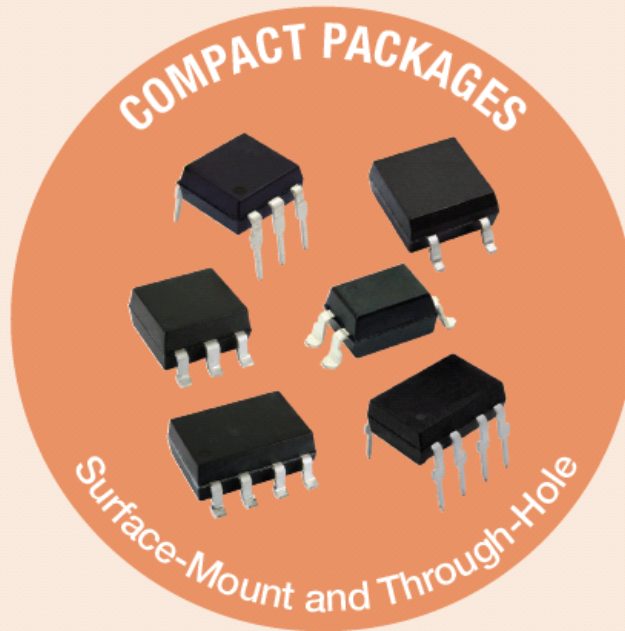


**Tiny footprint** relative to **electro-mechanical** relays

**Fast** switching times



**Low on-resistance**, down to **12  $\Omega$**  (typ.)



### APPLICATIONS



SECURITY SYSTEMS



BATTERY MANAGEMENT



AUTOMATIC MEASUREMENT EQUIPMENT



INDUSTRIAL EQUIPMENT



METERING



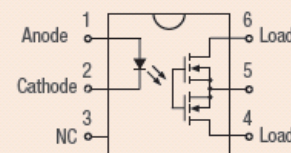
TELECOMMUNICATION



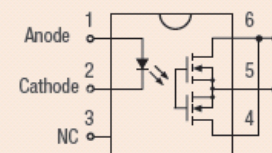
INSTRUMENTATION

### AC AND DC CONFIGURATION WITH SSRs

#### AC/DC Configuration



#### DC-Only Configuration



	VOR1121A6	VOR1121B6	VOR2121A8	VOR2121B8	VOR1142M4	VOR1142B4	VOR1142A6	VOR1142B6	VOR2142A8	VOR2142B8
Single / Dual Channel	Single	Single	Dual	Dual	Single	Single	Single	Single	Dual	Dual
Package	DIP-6	SMD-6	DIP-8	SMD-8	SOP-4	SMD-4	DIP-6	SMD-6	DIP-8	SMD-8
Isolation Test Voltage ( $V_{RMS}$ / 1 min)	5300	5300	5300	5300	3750	5300	5300	5300	5300	5300
Typical On-Resistance ( $\Omega$ )	12	12	12	12	22	22	22	22	22	22
Load Voltage (V)	250	250	250	250	400	400	400	400	400	400
Typical Turn-On Time (ms)	0.2	0.2	0.2	0.2	0.2	0.13	0.13	0.13	0.13	0.13
Typical Turn-Off Time (ms)	0.03	0.03	0.03	0.03	0.05	0.05	0.05	0.05	0.05	0.05







## VORx Solid-State Relay Series

Vishay's solid-state relays (SSRs) designed to deliver superior electrical characteristics for telecommunications, industrial, security system, and metering applications. Vishay's VORx Series provide provide faster, bounce-free switching and a wider operating temperature range, and are more cost-effective than electro-mechanical relays.

Advantages	Benefits
Tiny package foot print options	Saves board space compared to bulky electro-mechanical relays
High Reliability	Superior performance
Fast Switching and low on-resistance	Faster applications and less power consumption

[VORx Solid-State Relay Products](#)

[3D Models](#)

[FAQ: Solid-State Relays](#)

[Video: Benefits of SSRs over Mechanical Relays](#)







# LARGE PIN PHOTO DIODES

**7.5 mm<sup>2</sup> ACTIVE AREA**

Radiant sensitive area of **7.5 mm<sup>2</sup>**



**High** photo sensitivity

**Low** profile of **0.9 mm**

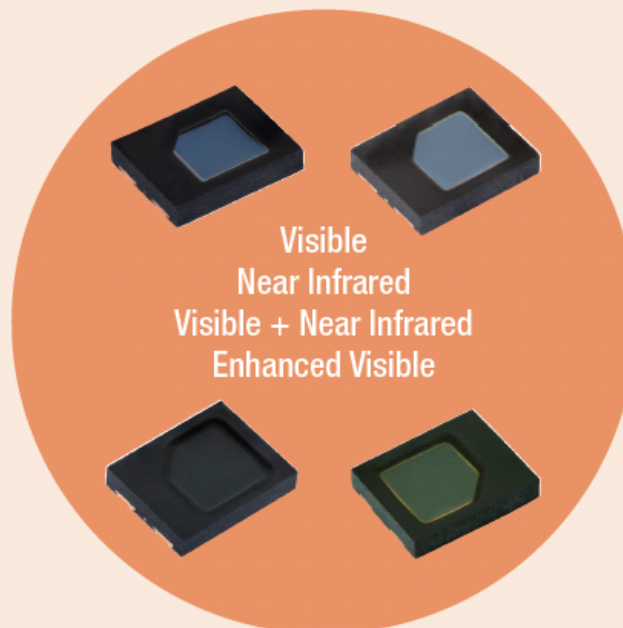


Rise and fall time down to **5 ns**

Excellent **photocurrent linearity**

**Narrow variance** of **output current**

from part to part



Visible  
Near Infrared  
Visible + Near Infrared  
Enhanced Visible

## IN A NUTSHELL

### APPLICATIONS

#### Wearables

- Fitness bands
- Smart Watches



#### Medical

- Pulse Oximetry
- Blood Analysis

#### Automotive

- Rain-Light-Tunnel Sensor
- Solar sensor



Part Number	Spectral Bandwidth (nm)	Peak Wavelength $\lambda_p$ (nm)	Output Current ( $\mu A$ )	Angle of Half Sensitivity, $\varphi$ ( $\pm deg$ )	Photo Sensitive Area (mm <sup>2</sup> )	Package Dimensions L x W x H (mm)	Competitive Advantages	
<a href="#">VEMD5010X01</a>	430 to 1100	940	48	65	7.5	5 x 4 x 0.9	AEC-Q101 qualified	Unique FAM packaging allows for high operating temperature up to +110 °C
<a href="#">VEMD5060X01</a>	350 to 1070	820	26				Fastest rise and fall times. AEC-Q101 qualified	
<a href="#">VEMD5080X01</a>	350 to 1100	950	45				Enhanced sensitivity to visible light. AEC-Q101 qualified	
<a href="#">VEMD5110X01</a>	790 to 1050	940	48				Daylight blocking filter. AEC-Q101 qualified	
<a href="#">VEMD5160X01</a>	700 to 1070	840	26				Daylight blocking filter with fastest rise and fall times. AEC-Q101 qualified	
<a href="#">VEMD5510C</a>	440 to 700	550	0.6				Not sensitive to infrared radiation	
<a href="#">VEMD5510CF</a>	440 to 620	540	0.25				Not sensitive to infrared radiation and matches human eye sensitivity	







# FRED Pt<sup>®</sup> RECTIFIERS IN SlimDPAK PACKAGE

## IN A NUTSHELL

INCREASE POWER DENSITY AND IMPROVE THERMAL PERFORMANCE

Reverse voltages: 200 V and 600 V



Ultrafast recovery times down to 14 ns

Low forward drop reduces power losses and improves efficiency

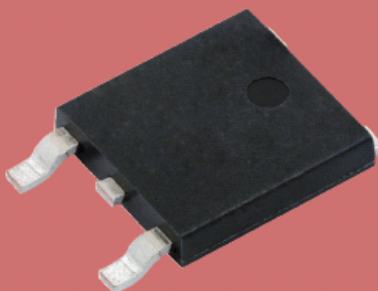


Footprint compatible with DPAK with 43 % lower profile for slimmer end products while heatsink area is 14 % larger for lower thermal resistance



and Commercial / Industrial Versions Available

SlimDPAK (TO-252AE) Package



9.0 mm x 6.2 mm x 1.3 mm  
(L x W x H)

FRED Pt<sup>®</sup> (Fast Recovery Epitaxial Diodes) products are based on a Pt doping technology that allows **maximum operating junction temperature**

Up to 175 °C



## APPLICATIONS



AUTOMOTIVE  
ECU, ABS, and  
HID / LED lighting



COMMERCIAL / INDUSTRIAL  
Telecom power supplies



DC/DC CONVERTERS

Vishay P/N	$I_{FSM}$ (A)	$V_{on}$ (V)	$V_f$ (V)	at $I_F$ (A)	$t_{rr}$ (ns)	$I_{TSM}$ (A)	$T_{j,max.}$ (°C)	AEC-Q101 Available
<a href="#">VS-4EVH02HM3</a>	4	200	0.71	4	16	100	175	Yes
<a href="#">VS-4EVH02-M3</a>	4	200	0.71	4	16	100	175	No
<a href="#">VS-6CVH02HM3</a>	2 x 3	200	0.75	3	20	140	175	Yes
<a href="#">VS-6CVH02-M3</a>	2 x 3	200	0.75	3	16	100	175	No
<a href="#">VS-8CVH02HM3</a>	2 x 4	200	0.71	4	16	200	175	Yes
<a href="#">VS-8CVH02-M3</a>	2 x 4	200	0.71	4	16	200	175	No
<a href="#">VS-10CVH02HM3</a>	2 x 5	200	0.74	5	16	200	175	Yes
<a href="#">VS-10CVH02-M3</a>	2 x 5	200	0.74	5	16	200	175	No
<a href="#">VS-6EVL06HM3</a>	6	600	0.98	6	34	80	175	Yes
<a href="#">VS-6EVL06-M3</a>	6	600	0.98	6	34	80	175	No
<a href="#">VS-6EVH06HM3</a>	6	600	1.26	6	16	70	175	Yes
<a href="#">VS-6EVH06-M3</a>	6	600	1.26	6	16	70	175	No
<a href="#">VS-6EVX06HM3</a>	6	600	1.65	6	14	50	175	Yes

Vishay P/N	$I_{FSM}$ (A)	$V_{on}$ (V)	$V_f$ (V)	at $I_F$ (A)	$t_{rr}$ (ns)	$I_{TSM}$ (A)	$T_{j,max.}$ (°C)	AEC-Q101 Available
<a href="#">VS-6EVX06-M3</a>	6	600	1.65	6	14	50	175	No
<a href="#">VS-8EVL06HM3</a>	8	600	0.98	8	34	130	175	Yes
<a href="#">VS-8EVL06-M3</a>	8	600	0.98	8	34	130	175	No
<a href="#">VS-8EVH06HM3</a>	8	600	1.30	8	16	90	175	Yes
<a href="#">VS-8EVH06-M3</a>	8	600	1.30	8	16	90	175	No
<a href="#">VS-8EVX06HM3</a>	8	600	1.40	8	14	80	175	Yes
<a href="#">VS-8EVX06-M3</a>	8	600	1.40	8	14	80	175	No
<a href="#">VS-15EVL06HM3</a>	15	600	0.98	15	38	180	175	Yes
<a href="#">VS-15EVL06-M3</a>	15	600	0.98	15	38	180	175	No
<a href="#">VS-15EVH06HM3</a>	15	600	1.10	15	26	160	175	Yes
<a href="#">VS-15EVH06-M3</a>	15	600	1.10	15	26	160	175	No
<a href="#">VS-15EVH06HM3</a>	15	600	1.20	15	20	120	175	Yes
<a href="#">VS-15EVH06-M3</a>	15	600	1.20	15	20	120	175	No





# FRED Pt<sup>®</sup> RECTIFIERS IN SMPD (TO-263AC)

## OFFER HIGHER POWER DENSITY

## IN A NUTSHELL

### FEATURES

- Hyperfast and ultrafast recovery
- Fast and soft recovery (down to 25 ns)
- Low forward voltage drop (down to 0.75 V typ.)
- AEC-Q101 qualified

### REDUCED POWER LOSSES



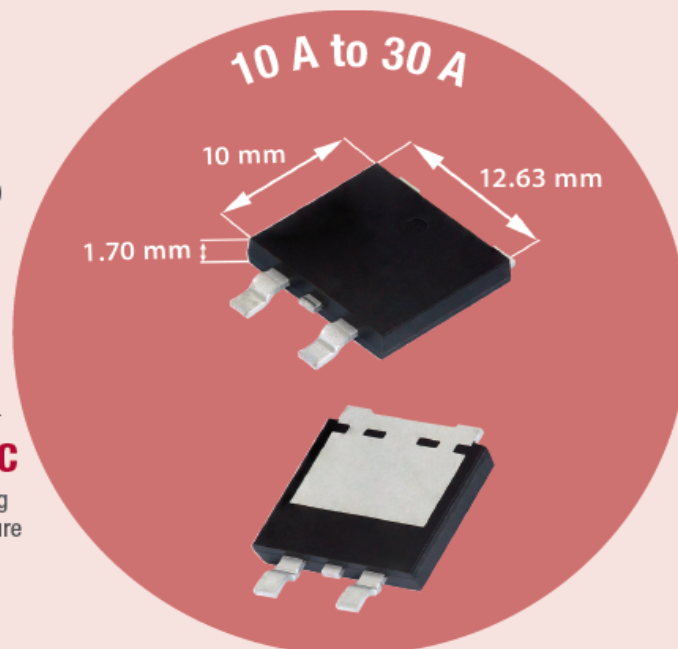
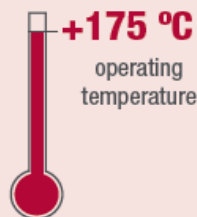
Reduced noise



Reduced EMI

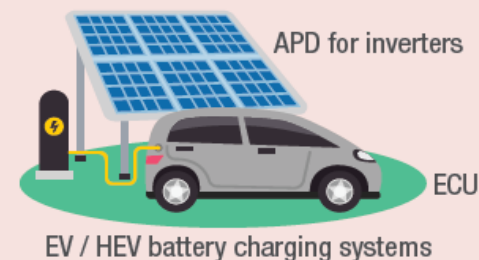
### MORE EFFICIENT DESIGNS

**FRED Pt<sup>®</sup> technology allows high operating temperatures to +175 °C**



### APPLICATIONS

AUTOMOTIVE and INDUSTRIAL



**SMPD package is compatible with D<sup>2</sup>PAK footprint but with lower profile**

SMPD  $h > 1.70 \text{ mm}$

D<sup>2</sup>PAK  $h 4.45 \text{ mm}$

Vishay P/N	Type	Diode Variation	$I_{F(AV)}$ (A)	$V_R$ (V)	$V_F$ Typ at Rated I (V)	$T_r$ Typ (ns)	AEC-Q101
<a href="#">VS-10CDH06-M3</a>	Hyperfast	Dual	2 x 5	600	1	35	No
<a href="#">VS-10CDH06HM3</a>	Hyperfast	Dual	2 x 5	600	1	35	Yes
<a href="#">VS-12CDU06-M3</a>	Ultrafast	Dual	2 x 6	600	0.89	45	No
<a href="#">VS-12CDU06HM3</a>	Ultrafast	Dual	2 x 6	600	0.89	45	Yes
<a href="#">VS-16CDH02-M3</a>	Hyperfast	Dual	2 x 8	200	0.77	27	No
<a href="#">VS-16CDH02HM3</a>	Hyperfast	Dual	2 x 8	200	0.77	27	Yes
<a href="#">VS-16CDU06-M3</a>	Ultrafast	Dual	2 x 8	600	0.94	45	No
<a href="#">VS-16CDU06HM3</a>	Ultrafast	Dual	2 x 8	600	0.94	45	Yes

Vishay P/N	Type	Diode Variation	$I_{F(AV)}$ (A)	$V_R$ (V)	$V_F$ Typ at Rated I (V)	$T_r$ Typ (ns)	AEC-Q101
<a href="#">VS-16EDH02-M3</a>	Hyperfast	Single	16	200	0.75	32	No
<a href="#">VS-16EDH02HM3</a>	Hyperfast	Single	16	200	0.75	32	Yes
<a href="#">VS-16EDU06-M3</a>	Ultrafast	Single	16	600	0.91	55	No
<a href="#">VS-16EDU06HM3</a>	Ultrafast	Single	16	600	0.91	55	Yes
<a href="#">VS-20CDH02-M3</a>	Hyperfast	Dual	2 x 10	200	0.77	25	No
<a href="#">VS-20CDH02HM3</a>	Hyperfast	Dual	2 x 10	200	0.77	25	Yes
<a href="#">VS-30CDU06-M3</a>	Ultrafast	Dual	2 x 15	600	0.9	55	No
<a href="#">VS-30CDU06HM3</a>	Ultrafast	Dual	2 x 15	600	0.9	55	Yes







## FRED Pt® Rectifiers in the SMPD (TO-263AC) Package

10 A to 30 A FRED Pt® hyperfast and ultrafast recovery rectifiers in the SMPD (TO-263AC) package combine extremely fast and soft recovery characteristics with low leakage current and low forward voltage drop, to reduce switching losses and over-dissipation in automotive and telecom applications.

Advantages	Benefits
Increased power density	More efficient and slimmer end products
Operating junction temperature range from -55 °C to +175 °C	More robust designs
Low profile (< 1.7 mm) SMPD (TO-263AC) package	High density alternative to TO-263 (D2PAK) package

[Product sheet](#)

[Press release](#)







# VTVSxxGSMF SERIES

## 400 W TVS IN SMF (DO-219AB) PACKAGE

# IN A NUTSHELL

High surge capability of 400 W  
at 10/1000  $\mu$ s



Low profile (1 mm)  
SMF (DO-219AB) package

**HALOGEN  
FREE**

**RoHS  
COMPLIANT**

**AEC-Q101  
Qualified**

### COMPETITIVE ADVANTAGE

- Low avalanche breakdown voltage tolerance allows tighter design of electronic circuit
- Lower avalanche breakdown voltage tolerance = lower clamping voltage tolerance



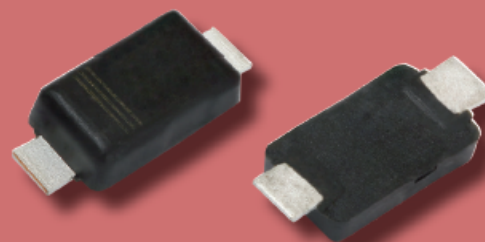
**AVALANCHE  
BREAKDOWN  
VOLTAGE  
TOLERANCE**



**CLAMPING  
VOLTAGE  
TOLERANCE**

- Important when a transient voltage signal must be clamped close to the max voltage range!

FIRST TO FEATURE ACCURATE 2%  $V_Z^*$



*\*Only parts with 5%  $V_Z$  (breakdown voltage tolerance) offered by competitors*



Low leakage current

Low noise technology



Very fast response time

Precise protection for  
key components



**VTVS Series** consists of 23 devices  
([VTVS5V0ASMF](#) to [VTVS63GSMF](#))

### APPLICATIONS

Ideal for space-constrained electronics



### PRIMARY CHARACTERISTICS

$V_{BR}$	6.4 V to 78.2 V
$V_{WM}$	5.0 V to 63 V
$P_{PPM}$	400 W
$T_J \text{ max.}$	175 °C
Polarity	Unidirectional
Package	DO-219AB (SMF)







## VTVS Series: 400 W TVS in the SMF (DO-219AB) Package

VTVS Series TVS protection diodes are the industry's first to feature a 2 % breakdown voltage tolerance with 400 W surge capability at 10/1000  $\mu$ s. The VTVS Series devices are ideal for line transient voltage protection in space-constrained portable electronics such as laptops, notebooks, tablets, smartphones, and external hard drives.

Advantages	Benefits
Low avalanche breakdown voltage tolerance	Tighter design of electronic circuits – TVS signal can be clamped close to maximum voltage range
Working voltages from 5 V to 63 V with breakdown voltage tolerances ( $V_z$ ) of 2 % or 5 %	Competitors only offer parts with 5 % $V_z$
Low leakage current, low noise technology, and very fast response time	Precise protection for key components

[Datasheet](#)

[Product sheet](#)

[Press release](#)

[Technical note](#)







# eSMP® SERIES

SMALL AND LOW PROFILE PACKAGE SOLUTIONS FOR SELECT DIODES AND RECTIFIERS

**IN A  
NUTSHELL**

## eSMP® Packages

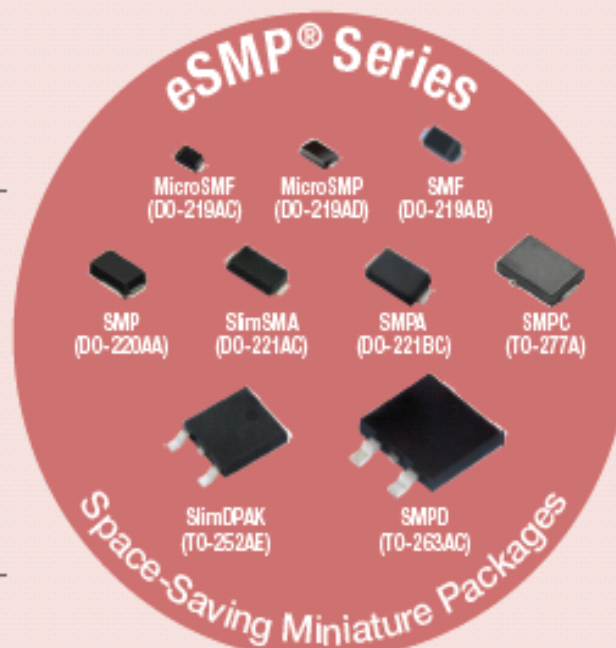
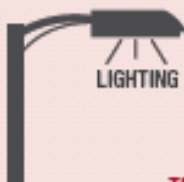
enhanced **S**urface-**M**ount **P**ower packages



Enable **higher current** and **power efficiency** with a unique design that promotes better **thermal performance** and **reliability**



## APPLICATIONS



**Product technologies** available in **eSMP®** series packages:

- ESD protection diodes
- PAR® TVS diodes
- TRANSZORB® TVS diodes
- Zener diodes
- Avalanche rectifiers
- FRED Pt® rectifiers
- Schottky rectifiers
- Standard and fast recovery rectifiers
- TMBS® rectifiers
- Ultrafast recovery rectifiers

## USEFUL LINKS

eSMP® series product overview:

[www.vishay.com/doc?49383](http://www.vishay.com/doc?49383)

Diodes / rectifiers in eSMP® series package:

[www.vishay.com/landingpage/tradeshows/diodes/](http://www.vishay.com/landingpage/tradeshows/diodes/)

Available in **asymmetrical** and **symmetrical** flat type packages





## eSMP® Series

eSMP® (enhanced Surface-Mount Power) Series packages are small, low-profile package solutions for select diodes and rectifiers product technologies.

Advantages	Benefits
Higher current and power efficiency	Better thermal performance and reliability
Available in asymmetrical and symmetrical flat type packages	Space-saving miniature packages allow for slimmer end products

[Product Portfolio](#)

[Product Evolution](#)

[Landing Page](#)







# STANDARD RECOVERY RECTIFIERS

## ESD CAPABILITY

# IN A NUTSHELL

- Oxide planar chip technology
- ESD capability
  - Provide class H3B (> 8 kV) performance based on the AEC-Q101-001 human body model (contact mode) and / or JESD22-A114, class 3B



### Electrical Static Discharge (ESD)

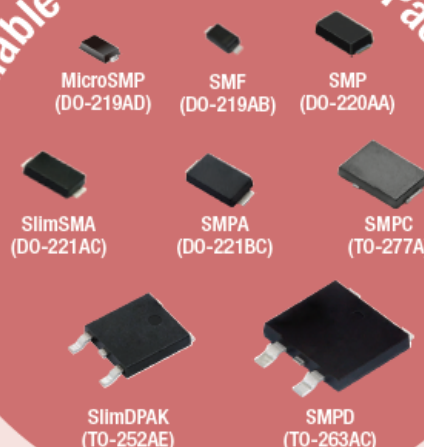


Current range from 0.7 A to 20 A



Reverse voltage from 100 V to 600 V

Available in eSMP® Series Packages



### APPLICATIONS



AUTOMOTIVE

- General purpose
- Polarity protection
- Rail to rail protection



CONSUMER

Maximum operating junction temperature of +175 °C



Low forward voltage drop, low leakage current

AEC-Q101 Qualified Products have undergone **part average testing (PAT)** and **statistical yield limit (SYL)** analysis to ensure their electrical parameters meet the **highest quality** level for **automotive** applications



AEC-Q101 Qualified

Device <sup>(1)</sup>	eSMP® Package	I <sub>FM</sub> (A)	V <sub>RR</sub> Range (V)	Max V <sub>F</sub> at I <sub>F</sub> (V)	AEC-Q101	Automotive Grade
<a href="#">SE07PB thru SE07PJ</a>	SMP (DO-220AA)	0.7	100 to 600	1.05	No	No
<a href="#">MSE07PB thru MSE07PJ</a>	MicroSMP (DO-219AD)	0.7	100 to 600	1.08	Yes	Yes
<a href="#">SE10PB thru SE10PJ</a>	SMP (DO-220AA)	1.0	100 to 600	1.05	Yes	Yes
<a href="#">MSE1PB thru MSE1PJ</a>	MicroSMP (DO-219AD)	1.0	100 to 600	1.10	Yes	Yes
<a href="#">MSX1PB thru MSX1PJ</a>	MicroSMP (DO-219AD)	1.0	100 to 600	1.10	Yes	Yes
<a href="#">SE10FD thru SE10FJ</a>	SMF (DO-219AB)	1.0	200 to 600	1.05	Yes	Yes
<a href="#">SE15PB thru SE15PJ</a>	SMP (DO-220AA)	1.5	100 to 600	1.05	Yes	Yes
<a href="#">SE15FD thru SE15FJ</a>	SMF (DO-219AB)	1.5	200 to 600	1.05	Yes	Yes
<a href="#">SE20PB thru SE20PJ</a>	SMP (DO-220AA)	2.0	100 to 600	1.05	Yes	Yes
<a href="#">SE20FD thru SE20FJ</a>	SMF (DO-219AB)	2.0	200 to 600	1.10	Yes	Yes
<a href="#">SE20AFB thru SE20AFJ</a>	SlimSMA (DO-221AC)	2.0	100 to 600	1.10	Yes	No

Device <sup>(1)</sup>	eSMP® Package	I <sub>FM</sub> (A)	V <sub>RR</sub> Range (V)	Max V <sub>F</sub> at I <sub>F</sub> (V)	AEC-Q101	Automotive Grade
<a href="#">SE20PAB thru SE20PAJ</a>	SMPA (DO-221BC)	2.0	100 to 600	1.10	Yes	No
<a href="#">SE30AFB thru SE30AFJ</a>	SlimSMA (DO-221AC)	3.0	100 to 600	1.10	Yes	No
<a href="#">SE30PAB thru SE30PAJ</a>	SMPA (DO-221BC)	3.0	100 to 600	1.16	Yes	No
<a href="#">SE40PB thru SE40PJ</a>	SMPC (TO-277A)	4.0	100 to 600	1.05	Yes	Yes
<a href="#">SE50PAB thru SE50PAJ</a>	SMPA (DO-221BC)	5.0	100 to 600	1.16	Yes	No
<a href="#">SE70PB thru SE70PJ</a>	SMPC (TO-277A)	7.0	100 to 600	1.05	Yes	Yes
<a href="#">SE80PWB thru SE80PWJ</a>	SlimDPAK (TO252AE)	8.0	100 to 600	1.12	Yes	No
<a href="#">SE10DB thru SE10DJ</a>	SMPD (TO-263AC)	10	100 to 600	1.15	Yes	No
<a href="#">SE100PWB thru SE100PWJ</a>	SlimDPAK (TO252AE)	10	100 to 600	1.14	Yes	No
<a href="#">SE12DB thru SE12DJ</a>	SMPD (TO-263AC)	12	100 to 600	1.15	Yes	No
<a href="#">SE20DB thru SE20DJ</a>	SMPD (TO-263AC)	20	100 to 600	1.20	Yes	No

(1) Reverse voltage, where: A = 50 V, B = 100 V, C = 150 V, D = 200 V, F = 300 V, G = 400 V, H = 500 V, J = 600 V





## Standard Recovery Rectifiers with ESD Capability

ESD capability combined with a wide range of current ratings provide class H3B (> 8 kV) performance based on the AEC-Q101-001 human body model (contact mode) and/or JESD22-A114, class 3B.

Advantages	Benefits
Standard recovery rectifiers with ESD capability available in a wide range of current ratings and reverse voltage ratings	Available in eSMP® packages that allow for slimmer end products

[Product Sheet](#)

[Landing Page](#)







# TMBS® Rectifiers in eSMP® SERIES

TRENCH MOS BARRIER SCHOTTKY TECHNOLOGY IN SPACE-SAVING FOOTPRINTS AND LOW PROFILE PACKAGE SOLUTIONS

## IN A NUTSHELL



Reverse voltage from 45 V to 200 V

Current range from 1 A to 60 A



Low profile package heights

Low power losses and high efficiency



Trench MOS Schottky technology provides low forward voltage drop



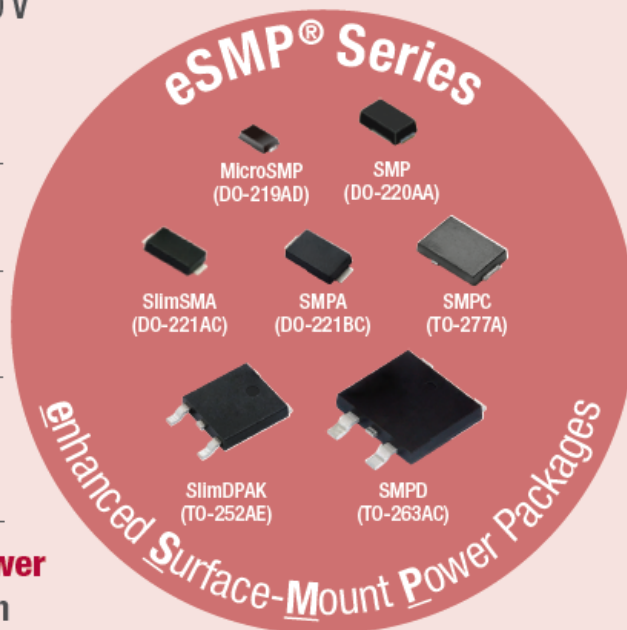
Enable **higher current** and **power efficiency** with a unique design that promotes better **thermal performance** and **reliability**



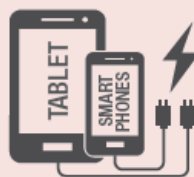
MAXIMUM OPERATING JUNCTION TEMPERATURE

Up to 175 °C

For M type Schottky barrier part numbers



### APPLICATIONS



DC/DC CONVERTERS  
FREE-WHEELING



CONSUMER



AUTOMOTIVE



INDUSTRIAL

Select **TMBS®** rectifiers available in the following packages:

- MicroSMP (DO-219AD)
- SlimDPAK (TO-252AE)
- SlimSMA (DO-221AC)
- SMP (DO-220AA)
- SMPA (DO-221BC)
- SMPC (TO-277A)
- SMPD (TO-263AC)

**AEC-Q101  
Qualified**



TMBS® **AEC-Q101 Qualified** Products have undergone **part average testing (PAT)** and **statistical yield limit (SYL)** analysis to ensure their electrical parameters meet the **highest quality** level for **automotive** applications



AEC-Q101  
Qualified

**eSMP® Series  
Packages Overview**



For Technical Questions: [DiodesAmericas@vishay.com](mailto:DiodesAmericas@vishay.com), [DiodesEurope@vishay.com](mailto:DiodesEurope@vishay.com), or [DiodesAsia@vishay.com](mailto:DiodesAsia@vishay.com)





## TMBS<sup>®</sup> Rectifiers in eSMP<sup>®</sup> Series

Trench MOS Barrier Schottky (TMBS) technology in space-saving footprints and low-profile packages.

Advantages	Benefits
Trench MOS Schottky technology provides low forward voltage drops	Low power losses and high efficiency

[Product Overview](#)

[Landing Page](#)

[Video: TMBS Rectifiers](#)







# FRED Pt<sup>®</sup> RECTIFIERS IN eSMP<sup>®</sup> SERIES

## SPACE-SAVING FOOTPRINTS AND LOW PROFILE PACKAGE SOLUTIONS FOR ALL MAJOR APPLICATIONS

## IN A NUTSHELL

FRED Pt<sup>®</sup> (Fast Recovery Epitaxial Diodes) products are based on a Pt doping technology that allows **maximum operating junction temperature**

Up to 175 °C



Current range from 1 A to 30 A

Reverse voltage: 100 V, 200 V, and 600 V



Fast and soft recovery characteristics

Low leakage currents

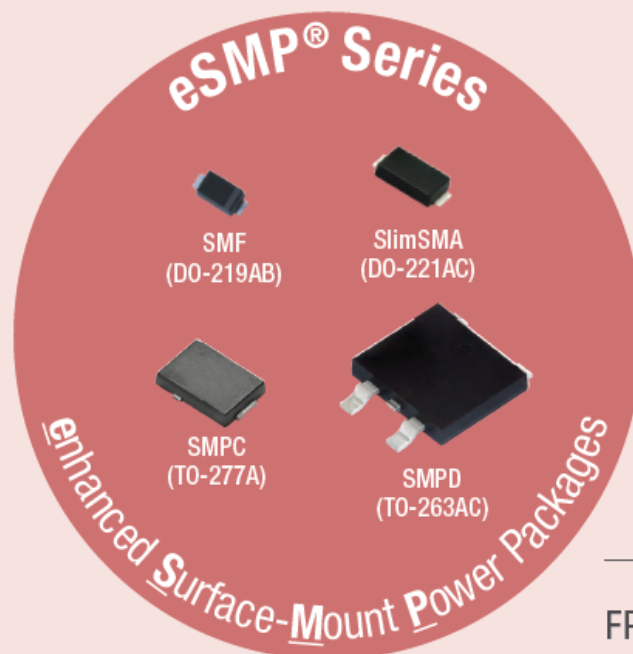


Low forward voltage drop

Reduce switching losses



eSMP<sup>®</sup> Series Packages Overview



### APPLICATIONS



**FRED Pt<sup>®</sup> rectifiers** available in the following packages:

- Standard Products
  - SMF (DO-219AB)
  - SlimSMA (DO-221AC)
  - SMPC (TO-277A)
  - SMPD (TO-263AC)
- AEC-Q101 Qualified Products
  - SMF (DO-219AB)
  - SlimSMA (DO-221AC)
  - SMPC (TO-277A)
  - SMPD (TO-213AC)

FRED Pt<sup>®</sup> **AEC-Q101 Qualified** Products have undergone **part average testing (PAT)** and **statistical yield limit (SYL)** analysis to ensure their electrical parameters meet the **highest quality** level for **automotive** applications



**AEC-Q101 Qualified**







## FRED Pt<sup>®</sup> Rectifiers in eSMP<sup>®</sup> Series Packages

Space-saving footprints and low-profile package solutions for all major applications.

Advantages	Benefits
FRED Pt <sup>®</sup> (Fast Recovery Epitaxial Diodes) products are based on a PT doping technology that allows maximum operating temperature up to 175 °C	Allow for more robust designs
Low leakage current ratings and low forward voltage drops	Reduce switching losses, provide fast and soft recovery characteristics

[Product Overview](#)

[Landing Page](#)







# PLZ SERIES

## ZENER DIODES IN MicroSMF (DO-219AC) PACKAGE

## IN A NUTSHELL

**500 mW** power dissipation



**Ultra compact** MicroSMF (DO-219AC) flat lead package;  
**< 0.6 mm** low profile

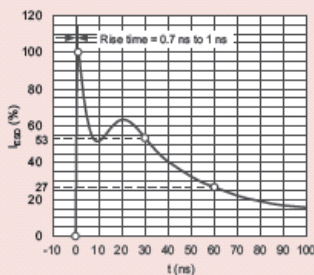
Extremely **tight tolerances** of  **$\pm 2.5\%$**

### COMPETITIVE ADVANTAGE

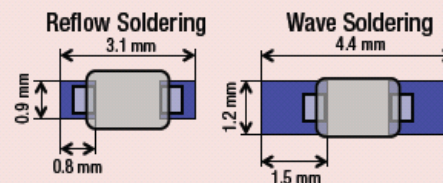
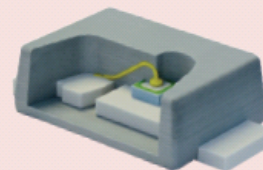
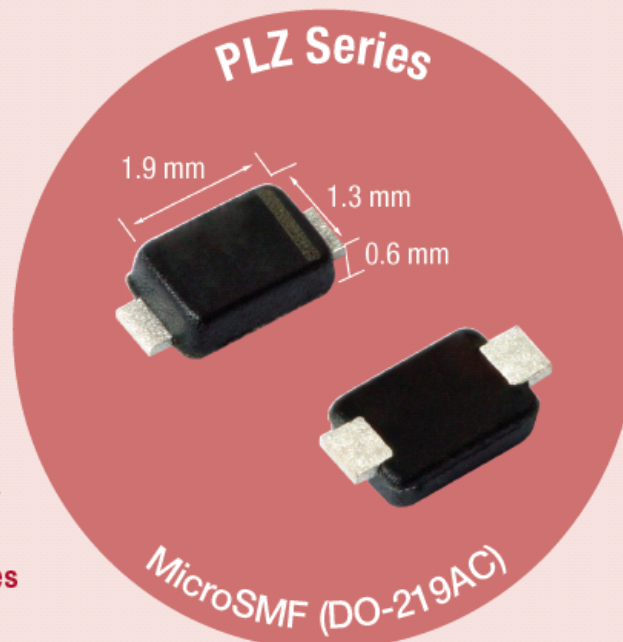
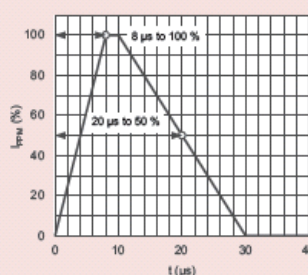
Combining extremely tight tolerances with **low leakage current** and **excellent stability**, the PLZ Series is designed to withstand **ESD pulses** of **8000 V** (human body model)

### ESD / SURGE CAPABILITY

ESD Discharge Current



Peak Pulse Current



**Saves PCB space**



**Increases** pick and place **speeds** on assembly lines

**AEC-Q101 Qualified**

### APPLICATIONS

Voltage stabilization and reference voltage generation in power supplies and LED lighting



AUTOMOTIVE



TELECOM AND INDUSTRIAL



COMPUTERS



ELECTRONIC LIGHTING



SWITCHING POWER SUPPLIES

### Primary Characteristics

$V_Z$ range nom.	2.0 V to 39 V
Test current $I_{ZT}$	5 mA to 20 mA
$V_Z$ specification	Pulse current
Int. construction	Single





# ESD PROTECTION DIODES

## IN ULTRA COMPACT CHIP LEVEL PACKAGE (CLP)



**Single-line** and **4-line**  
ESD protection diodes

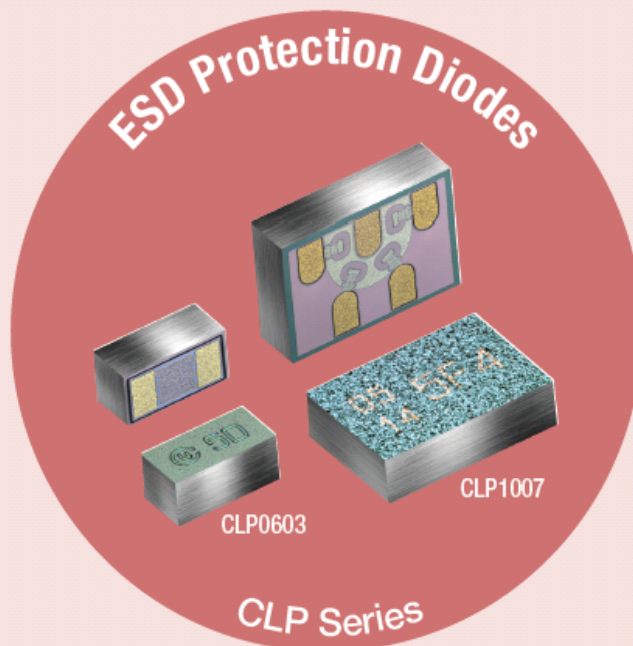


**Working** range:  
 **$\pm 3.3 \text{ V}$  to  $\pm 10 \text{ V}$**



**Low** leakage current:  
 **$< 0.1 \mu\text{A}$**

AEC-Q101  
Qualified versions **available**



## IN A NUTSHELL

Operating **temperature** range:  
 **$-55 \text{ }^{\circ}\text{C}$  to  $+150 \text{ }^{\circ}\text{C}$**



### APPLICATIONS

ESD protection of high speed interfaces in:



SMARTPHONES



DIGITAL CAMERAS



AUTOMOTIVE  
ENTERTAINMENT  
SYSTEMS



GAMING SYSTEMS

Vishay P/N	$V_{RWM} \text{ (V)}$		$I_R \text{ (}\mu\text{A)}$	$C_D \text{ (PF)}$	Contact Discharge (KV)	Air Discharge (KV)	AEC-Q101 Available
	Unidirectional	Bidirectional					
<a href="#">VBUS03B1-SD0</a>		$\pm 3.3$	$< 0.05$	0.29 typ.	$\pm 16$	$\pm 16$	Yes
<a href="#">VBUS05B1-SD0</a>		$\pm 5.5$	$< 0.05$	0.29 typ.	$\pm 16$	$\pm 16$	Yes
<a href="#">VBUS54FD-SD1</a>	$\pm 5.5$		$< 0.1$	0.9 typ.	$\pm 15$	$\pm 15$	No
<a href="#">VCUT03E1-SD0</a>		$\pm 3.3$	$< 0.1$	$< 14$	$\pm 30$	$\pm 30$	Yes
<a href="#">VCUT05E1-SD0</a>		$\pm 5.5$	$< 0.1$	$< 14$	$\pm 30$	$\pm 30$	Yes
<a href="#">VCUT10A1-SD0</a>		$\pm 10$	$< 0.1$	$< 9$	$\pm 24$	$\pm 24$	Yes







# TRANSZORB® TVS IN SMB (DO-214AA)

## OFFER TIGHTER $\pm 3.5\%$ BREAKDOWN VOLTAGE TOLERANCE

# IN A NUTSHELL

### FEATURES

**$\pm 3.5\%$  Tightened** breakdown voltage tolerance of  $\pm 3.5\%$

**High** peak pulse surge currents from **2.03 A to 65.9 A**



**9.1 V to 301 V** Excellent clamping capability from **9.1 V to 301 V**

**High** surge capability to **600 W** at 10/1000  $\mu$ s

600 W

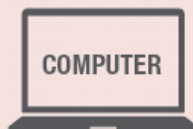
Available with **unidirectional** or **bidirectional** polarity

### APPLICATIONS



Designed to **protect** sensitive electronics against **voltage transients** induced by inductive load switching and lightning

General voltage surge protection in **consumer, computer, industrial,** and **telecommunications** equipment



COMPUTER



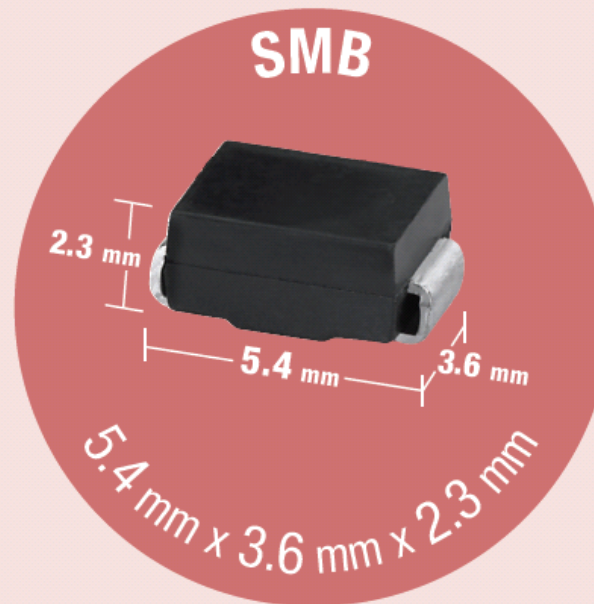
CONSUMER



TELECOM



INDUSTRIAL



### ELECTRICAL CHARACTERISTICS ( $T_A = 25^\circ\text{C}$ unless otherwise noted)

Device Type	Breakdown Voltage $V_{BR}$ at $I_T$ (V)	Test Current $I_T$ (A)	Stand-Off Voltage $V_{RM}$ (V)	Max Reverse Leakage at $V_{RM}$ ( $\mu$ A) <sup>(2)</sup>	Max Peak Pulse Surge Current $I_{PPM}$ (A) <sup>(3)</sup>	Max Clamping Voltage at $I_{PPM}$ $V_C$ (V)
SMBJ5.0D*	6.50 min 6.97 max	10	5.0	500	65.9	9.1
SMBJ6.0D*	6.77 min 7.27 max	10	6.0	500	58.9	10.2
SMBJ6.5D*	7.33 min 7.87 max	10	6.5	300	54.5	11.0
SMBJ7.0D*	7.90 min 8.48 max	10	7.0	150	50.8	11.8
SMBJ7.5D*	8.46 min 9.08 max	1.0	7.5	75	47.2	12.7
SMBJ8.0D*	9.03 min 9.69 max	1.0	8.0	35	44.8	13.4
SMBJ8.5D*	9.57 min 10.3 max	1.0	8.5	15	42.2	14.3
SMBJ9.0D*	10.2 min 10.9 max	1.0	9.0	5.0	39.7	15.1
SMBJ10D*	11.3 min 12.1 max	1.0	10	2.0	35.9	16.7
SMBJ11D*	12.4 min 13.3 max	1.0	11	2.0	33.5	17.9
SMBJ12D*	13.5 min 14.5 max	1.0	12	2.0	30.6	19.6
SMBJ13D*	14.6 min 15.7 max	1.0	13	0.5	28.3	21.2
SMBJ14D*	15.8 min 17.0 max	1.0	14	0.5	26.2	22.9
SMBJ15D*	17.0 min 18.2 max	1.0	15	0.5	25.0	24.0
SMBJ16D*	18.1 min 19.4 max	1.0	16	0.5	23.4	25.6
SMBJ17D*	19.2 min 20.6 max	1.0	17	0.5	22.1	27.2
SMBJ18D*	20.3 min 21.8 max	1.0	18	0.5	20.8	28.8
SMBJ20D*	22.5 min 24.2 max	1.0	20	0.5	18.8	32.0
SMBJ22D*	24.8 min 26.6 max	1.0	22	0.5	17.1	35.1
SMBJ24D*	27.1 min 29.1 max	1.0	24	0.5	15.6	38.4
SMBJ26D*	29.3 min 31.5 max	1.0	26	0.5	14.5	41.6
SMBJ28D*	31.6 min 33.9 max	1.0	28	0.5	13.4	44.7
SMBJ30D*	33.8 min 36.3 max	1.0	30	0.5	12.6	47.7
SMBJ33D*	37.3 min 40.0 max	1.0	33	0.5	11.5	52.5
SMBJ36D*	40.6 min 43.6 max	1.0	36	0.5	10.5	57.3
SMBJ40D*	45.1 min 48.4 max	1.0	40	0.5	9.43	63.6
SMBJ43D*	48.5 min 52.1 max	1.0	43	0.5	8.76	68.5
SMBJ45D*	50.8 min 54.5 max	1.0	45	0.5	8.40	71.6
SMBJ48D*	54.1 min 58.1 max	1.0	48	0.5	7.90	76.3
SMBJ51D*	57.6 min 61.8 max	1.0	51	0.5	7.40	81.2
SMBJ54D*	60.9 min 65.4 max	1.0	54	0.5	7.00	85.9
SMBJ58D*	65.4 min 70.2 max	1.0	58	0.5	6.50	92.3
SMBJ60D*	67.7 min 72.7 max	1.0	60	0.5	6.28	95.5
SMBJ64D*	72.2 min 77.5 max	1.0	64	0.5	5.88	102
SMBJ70D*	79.0 min 84.8 max	1.0	70	0.5	5.40	111
SMBJ75D*	84.6 min 90.8 max	1.0	75	0.5	5.06	119
SMBJ78D*	88.1 min 94.4 max	1.0	78	0.5	4.86	124
SMBJ85D*	95.7 min 103 max	1.0	85	0.5	4.46	135
SMBJ90D*	102 min 109 max	1.0	90	0.5	4.17	144
SMBJ100D*	113 min 121 max	1.0	100	0.5	3.77	159
SMBJ110D*	124 min 133 max	1.0	110	0.5	3.45	174
SMBJ120D*	135 min 145 max	1.0	120	0.5	3.15	190
SMBJ130D*	146 min 157 max	1.0	130	0.5	2.94	206
SMBJ150D*	170 min 182 max	1.0	150	0.5	2.53	239
SMBJ160D*	181 min 194 max	1.0	160	0.5	2.34	256
SMBJ170D*	192 min 206 max	1.0	170	0.5	2.23	270
SMBJ188D	212 min 228 max	1.0	188	0.5	2.03	301

To view datasheet, click here





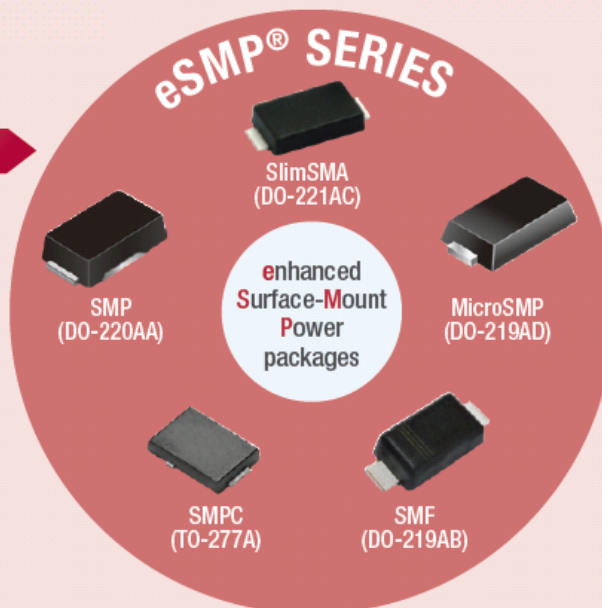
# TRANSIENT VOLTAGE SUPPRESSORS IN eSMP® SERIES PACKAGES

## SNAPSHOT

**High temperature stability** in high reliability conditions **to +185 °C**

**Low profile eSMP® packages:**  
MicroSMP (DO-219AD): 0.65 mm typical  
SlimSMA (DO-221AC): 0.95 mm  
SMF (DO-219AB): 1.0 mm  
SMP (DO-220AA): 1.0 mm  
SMPC (T0-277A): 1.1 mm typical

**AEC-Q101 qualified and** **Automotive Grade versions available**



### Applications

Protect sensitive electronics against voltage transients



CONSUMER



COMPUTER



INDUSTRIAL



TELECOM



AUTOMOTIVE

**TRANSZORB® TVS diodes are recommended for general applications**

**#1 PAR® TVS diodes are the first choice for automotive applications**

Series	Package Outline	Power Rating (W)	TVS Polarity	V <sub>BR</sub> Min. (V)	V <sub>WM</sub> Min. (V)	V <sub>WM</sub> Max. (V)	T <sub>J</sub> Max. (°C)	Product Line
<a href="#">MSMP6.0A thru MSMP20A</a>	MicroSMP (DO-219AD)	150	Unidirectional	6.67	6	20	150	TRANSZORB® TVS
<a href="#">MSP3V3, MSP5.0A</a>	MicroSMP (DO-219AD)	150	Unidirectional	4.1	3.3	5	150	TransZorb® TVS
<a href="#">SMP3V3 thru SMP36A</a>	SMP (DO-220AA)	400	Unidirectional	4.1	3.3	36	150	TransZorb® TVS
<a href="#">TPSMP6.8A thru TPSMP43A</a>	SMP (DO-220AA)	400	Unidirectional	6.45	5.8	36.8	185	PAR® TVS
<a href="#">SMPC5.0A thru SMPC36A</a> <a href="#">SMPC22AN thru SMPC85AN</a>	SMPC (T0-277A)	1500	Unidirectional	6.4	5	85	150	TransZorb® TVS
<a href="#">TPC11CA thru TPC36CA</a>	SMPC (T0-277A)	1500	Bidirectional	10.5	9.4	30.8	185	PAR® TVS
<a href="#">TPC6.8A thru TPC51A</a>	SMPC (T0-277A)	1500	Unidirectional	6.45	5.8	43.6	185	PAR® TVS
<a href="#">VTVS3V3ASM to VTVS63GSMF</a>	SMF (DO-219AB)	400	Unidirectional	6.4	3.3	63	175	TransZorb® TVS
<a href="#">SMA6F5.0A thru SMA6F20A</a>	SlimSMA (DO-221AC)	600	Unidirectional	6.4	5	20	175	TransZorb® TVS
<a href="#">TA6F6.8A thru TA6F51A</a>	SlimSMA (DO-221AC)	600	Unidirectional	6.45	5.8	43.6	185	PAR® TVS





# SiC46X microBUCK® SERIES

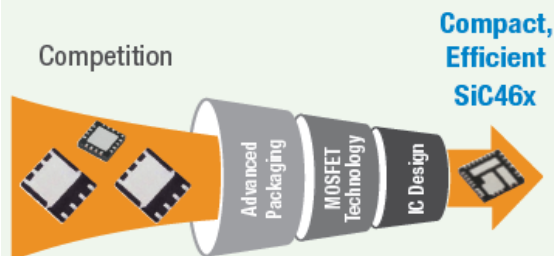
4.5 V TO 60 V BUCK REGULATORS

IN A  
NUTSHELL

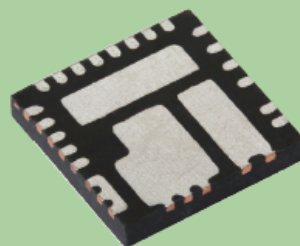
**75 W**  
UP  
TO  
OUTPUT POWER  
4.5 V to 60 V **buck**  
**regulator** capable  
of delivering up to  
**75 W output power**

COMPETITIVE ADVANTAGE

**Highly Integrated**



DELIVERING UP TO 75 W OUTPUT POWER



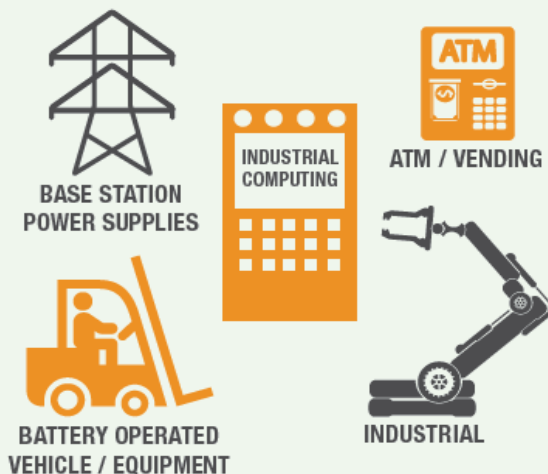
2 A, 3 A, 6 A, and 10 A  
buck regulators in compact  
MLP 5x5 package

**Rugged** and **Reliable**

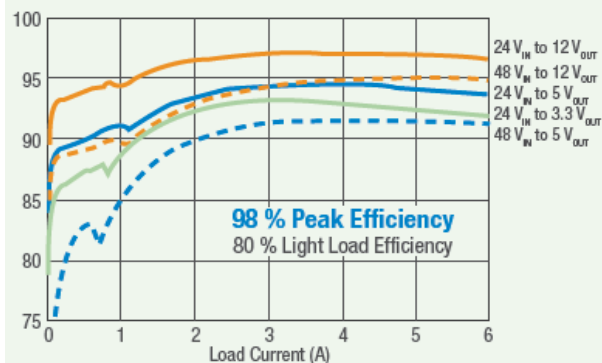


## APPLICATIONS

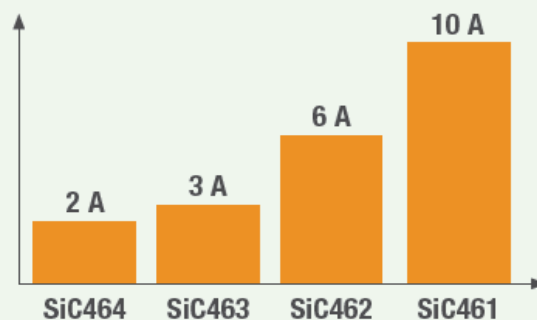
Design your application using our **online PowerCAD Simulation Tool**



SiC462 Efficiency at 300 kHz



## Scalable Solution



For Technical Questions: [powerictechsupport@vishay.com](mailto:powerictechsupport@vishay.com)







## SiC46x microBUCK® Series

Achieve Over 72 W output power with the SiC46x buck regulator! With a 4.5 V to 60 V input voltage range, the SiC462 synchronous buck regulator enables simple, flexible, and rugged designs. The family of 2 A, 3 A, 6 A, and 10 A parts in a single package footprint enables designs that can be scaled as the user's power needs change.

Advantages	Benefits
The SiC46x microBUCK family integrates a rugged controller design and benchmark MOSFETs in a compact 5 x 5 MLP package	Compact, low part count design enabling high power density
Efficiencies of Up to 98%	Excellent thermal performance and long term reliability
Low Quiescent current	Excellent light load efficiency

[microBUCK® Product Portfolio](#)

[PowerCAD Simulator Tool](#)

[AppNote: Creating a Negative Output Voltage Using a Buck Converter](#)







# POWER MOSFETs

Low Voltage TrenchFET®

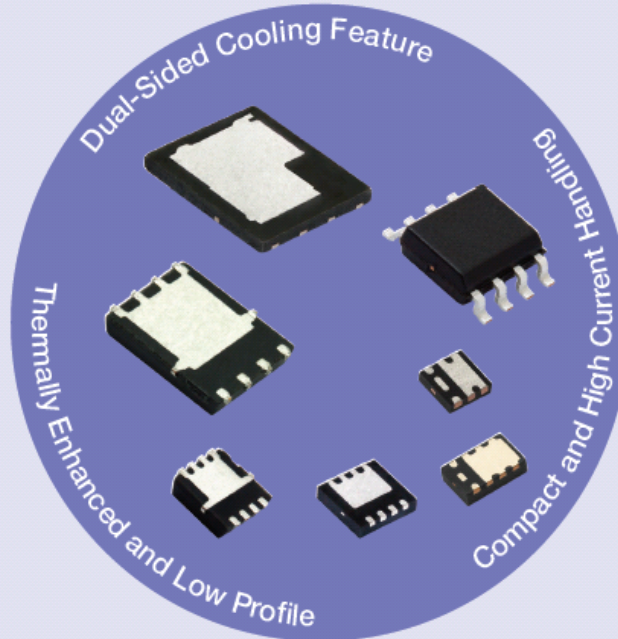
## IN A NUTSHELL



**Industry's lowest**

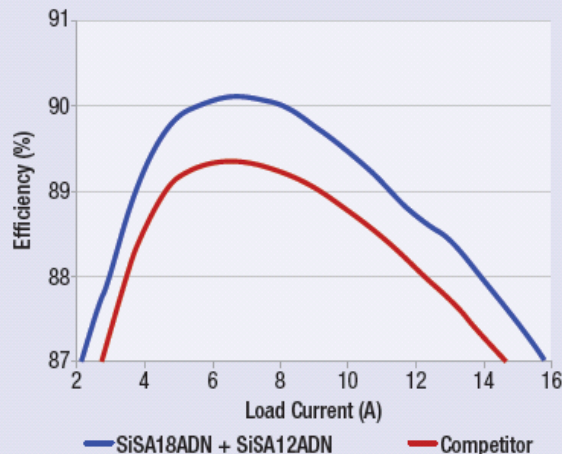
**$R_{DS(on)}$  n-channel MOSFETs** in an array of advanced packages

- Less than 0.58 mΩ
- Breakdown voltages: 25 V to 30 V
- Excellent  $R_{DS} - Q_g$  FOM improves efficiency for switch-mode power supplies

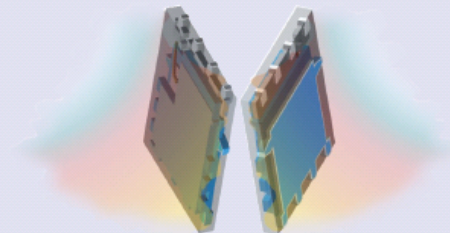


### TYPICAL EFFICIENCY IMPROVEMENT EXPECTATION

Benchmarking condition 12.9 V<sub>IN</sub>, 1.8 V<sub>OUT</sub>, 800 kHz



### Dual-sided cooling feature



**Higher** efficiency

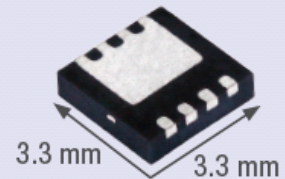
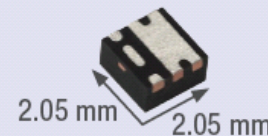


**Increased** power density

### Space-saving packages

SiA468DJ

SiSS02DN



Up to 37.8 A  
continuous  $I_D$

< 1.2 mΩ,  
10.89 mm<sup>2</sup> footprint

### APPLICATIONS







## Power MOSFET Low Voltage TrenchFET®

Vishay Siliconix leads the industry in the development of power semiconductor products that improve the efficiency of power management circuitry in end products while reducing space requirements.

Advantages	Benefits
Industry's Lowest $R_{DS(ON)}$	Increases efficiency, minimizes power loss and achieves higher power delivery per device. Reduces the number of component required.
Increased Power Density	Highly efficient devices in an array of compact packages enable PCB optimization and reduce footprint requirement.
Advanced Package Options	Dual sided cooling option supports optimization of thermal management designs. The footprint is compatible to standard PowerPAK SO-8 and provides a drop-in replacement.

[SPICE Models](#)

[Parametric Search](#)

[Application Note MOSFETs](#)



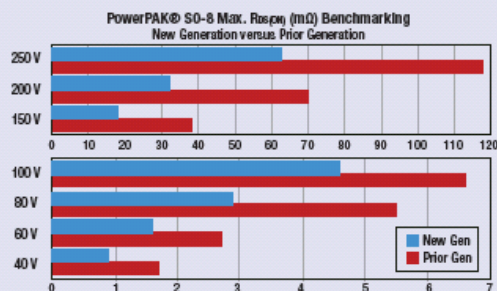




# POWER MOSFET | IN A NUTSHELL

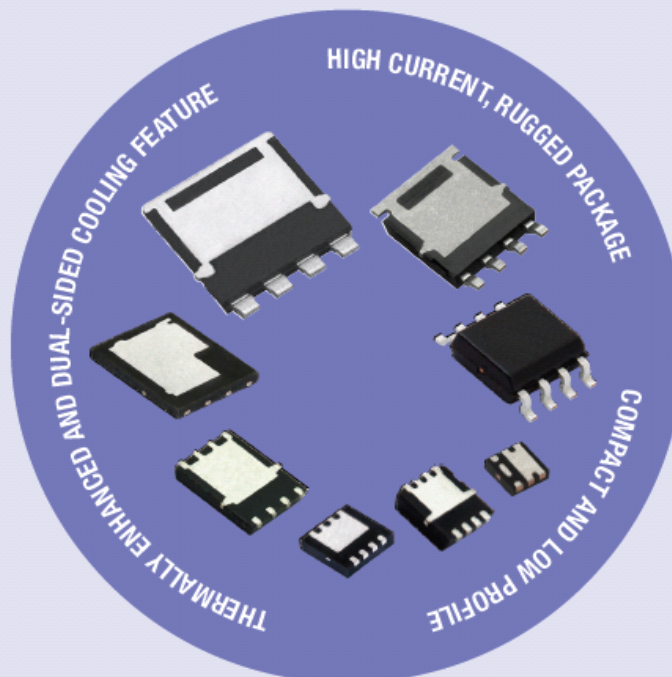
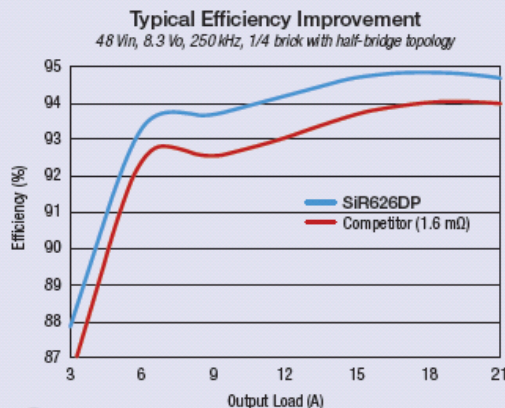
## MEDIUM VOLTAGE TRENCHFET®

Breakdown voltages: **40 V to 250 V**



**Industry's lowest  $R_{DS(on)}$  -  $Q_{oss}$**   
Figure-of-merit (FOM) in an advanced package array

Excellent dynamic parameters optimize switching characteristics



Double-cooled PowerPAK SO-8



**THIN PROFILE** with 0.56 mm typical height  
Footprint **COMPATIBLE** to PowerPAK SO-8  
 $R_{DS(on)}$  as low as **0.73 mΩ**

Enable the **HIGHEST** efficiency

**↑ INCREASE** power density  
**↓ REDUCE** component count  
**COMPACT** and **HIGHLY EFFICIENT** devices enable layout optimization



**80 %** footprint reduction from D2PAK  
**75 %** lower package profile

## APPLICATIONS







## Power MOSFET Medium Voltage TrenchFET®

Vishay Siliconix leads the industry in the development of power semiconductor products that improve the efficiency of power management circuitry in end products while reducing space requirements.

Advantages	Benefits
Industry's Lowest $R_{DS} - Q_{OSS}$ Figure of Merit	Enables the highest efficiency by reducing the power loss from conduction and switching simultaneously, especially for ZVS topologies. The improvement also helps increasing power density and reducing component count.
Excellent Dynamic Parameters - Low $Q_g$ , $Q_{gd}$ and $Q_{OSS}$	Reduces undesired power loss from switching and optimizes switching characteristics. The more efficient converter also operates at lower temperature.
Array of Advanced Package Options	New double-cooled package enables optimization of thermal management design. The high performance devices in compact packages supports layout optimization.

[SPICE Models](#)

[Parametric Search](#)

[Application Note: MOSFETs](#)







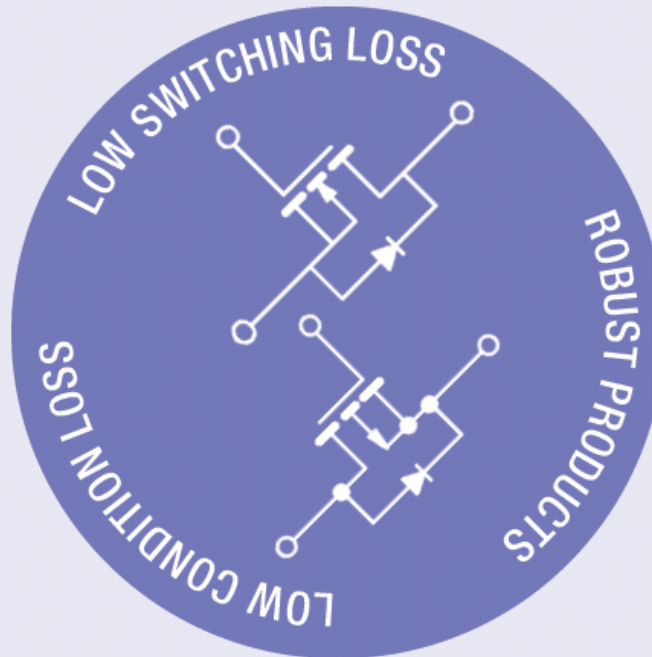
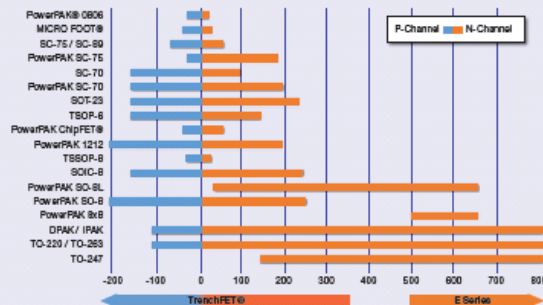
# Power MOSFETs | IN A NUTSHELL

## TrenchFET® AND E SERIES

### Broad range of power MOSFETs in a wide selection of advanced packages

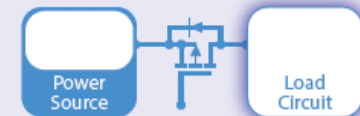
- N- and p-channel families
- Breakdown voltages: -200 V to 800 V
- Wide range of gate drive voltages starting at 1.2 V
- Commercial, automotive, and medical product grades

Breakdown Voltage and Package Selection

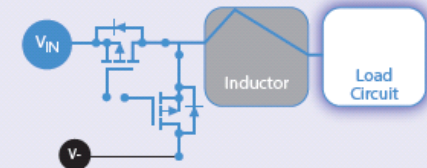


### Application-Specific Technology Platforms

- Optimized with lowest  $R_{ds(on)}$  for load switch applications



- Optimized for lowest gate charge and capacitances for fast switching



### MARKETS AND APPLICATIONS



### Full Range Of Leaded and Surface-Mount Packages, Including:

TO-247	D2PAK / DPAK	PowerPAK® 8x8 / 8x8L	PowerPAK® S08 to 0806	SOT, TSOP, SC Families	MICRO FOOT®

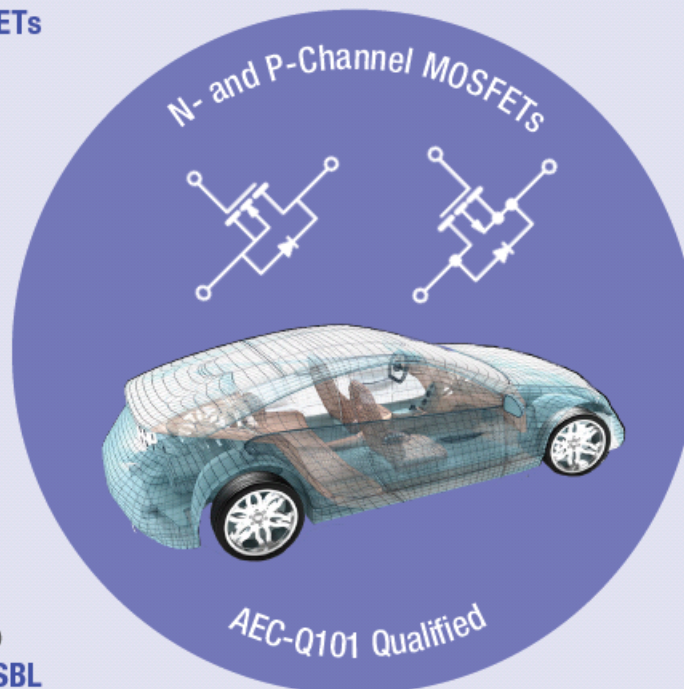




# AUTOMOTIVE TrenchFET®

## SQ SERIES POWER MOSFETs

- Wide range of **N- and P-channel MOSFETs**
  - N-ch  $V_{DS} = 12 \text{ V to } 300 \text{ V}$
  - P-ch  $V_{DS} = -12 \text{ V to } -200 \text{ V}$
- Available in **single, dual, and dual asymmetric configurations**
- **Highly efficient** packages with power density up to  $11 \text{ W/mm}^2$ 
  - $R_{DS(ON)}$  down to **1 mΩ**
- **AEC Q-101 Qualified** to + 175 °C
- Latest trench technologies optimized for **low conduction and low switching losses**
- Product testing includes extended temp screening with dynamic **PAT, SYL, and SBL** to reduce defects



## IN A NUTSHELL APPLICATIONS



AUTOMOTIVE



CAR BATTERIES



INFOTAINMENT



LIGHTING



BRAKING

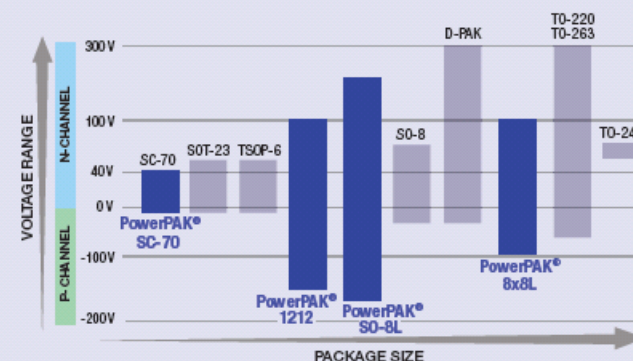


ELECTRIC VEHICLES

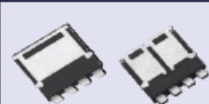


POWER TRAIN

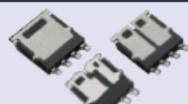
## SQ Package Portfolio



### Compact PowerPAK® packages ~ Optimized for high board-level reliability



PowerPAK® 8x8L  
8 mm x 8 mm



PowerPAK® SO-8L  
5 mm x 6 mm



PowerPAK® 1212  
3.3 mm x 3.3 mm



PowerPAK® SC-70  
2 mm x 2mm



KGD Known Good Die  
1 m x 1 mm to  
8 mm x 12 mm

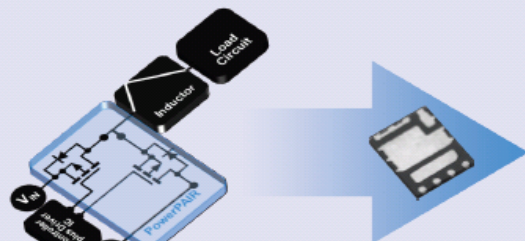




# POWERPAIR® MOSFETS

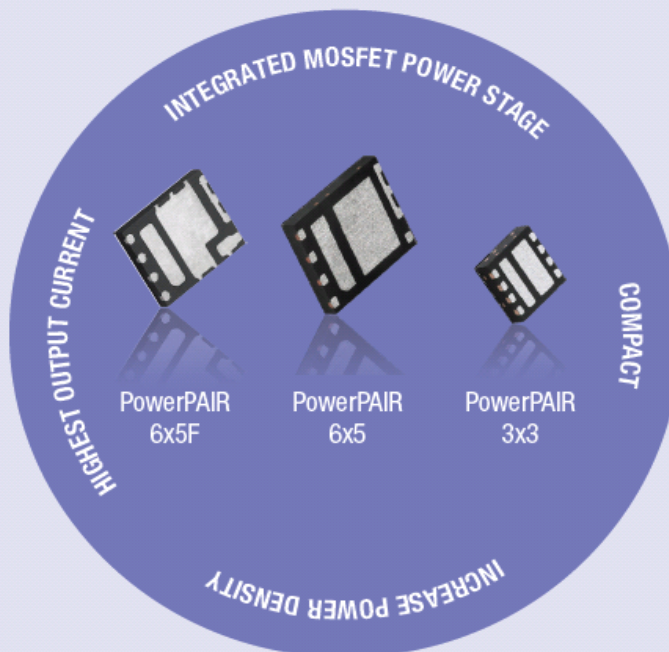
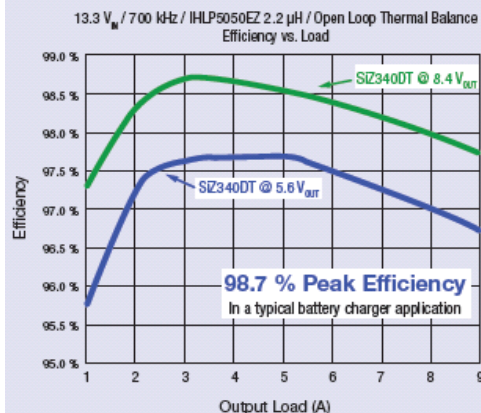
INTEGRATED DUAL-MOSFET POWER STAGE

Input Voltage Range: **4.5 V to 24 V**  
Internally Connected Half-Bridge



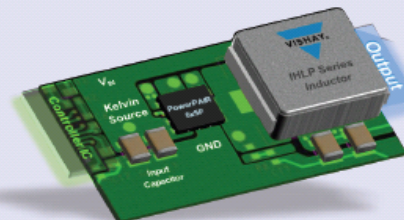
Supports Single or Multi-Phase Designs, Reduces PCB Footprint Area for MOSFET Components

**Optimized Gen IV MOSFET Pair**  
Enables High Efficiency



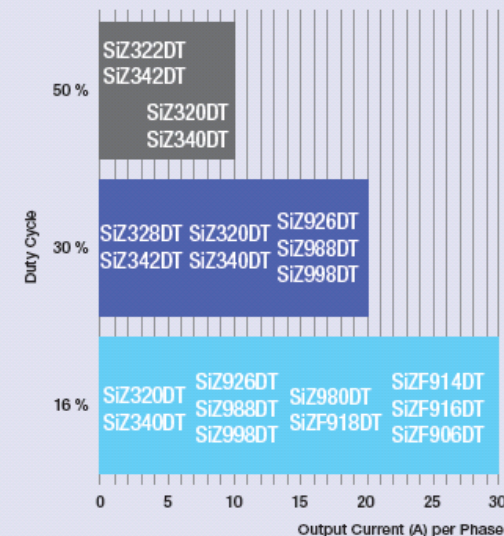
## PowerPAIR 6x5F for Layout Optimization

Simplifies Placement of Input Capacitor  
Separation of "Power" and "Signal" Partition



## IN A NUTSHELL

**WIDE RANGE** of Solutions That Support Popular Output Power and Duty Cycle Requirements



## APPLICATIONS



COMPUTERS



GRAPHIC CARDS



GAME CONSOLES



TELECOM EQUIPMENT



CONSUMER ELECTRONICS



DRONES



USER INTERFACES





# P-CHANNEL MOSFETS IN A NUTSHELL

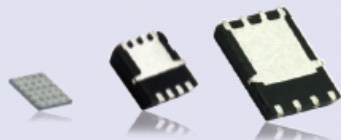
## -12 V TO -40 V TrenchFET® GEN III AND IV

Breakdown voltages: **-12 V to -40 V**

**Industry's lowest  $R_{DS(ON)}$**

in an array of advanced packages

- Minimize power loss and voltage drop

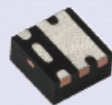


Part #	Si8851EDB	SiSA01DN	Si7155DP
$V_{DS}$	-20 V	-30 V	-40 V
$R_{DS(ON)}$	< 8 mΩ	< 4.9 mΩ	< 3.6 mΩ
Footprint (mm)	2.4 x 2	3.3 x 3.3	6 x 5

**Up to 31 A** continuous drain current rating in **2 mm x 2 mm** package

**PowerPAK® SC-70**

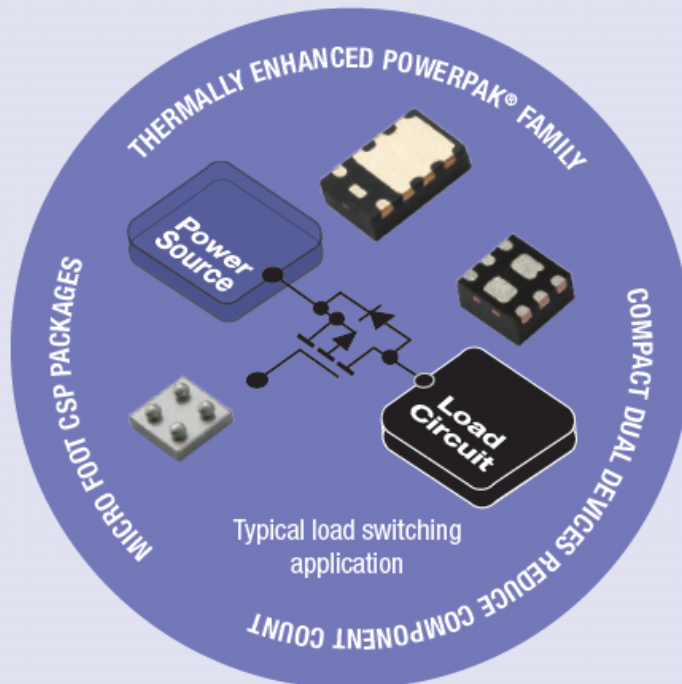
2.05 mm x 2.05 mm x 0.75 mm



Part #	SiA467EDJ	SiA437DJ
$V_{DS}$	-12 V	-20 V
$R_{DS(ON)}$	< 13 mΩ	< 14.5 mΩ
Continuous $I_D$	31	29.7

**Battery application driven features**

- Guaranteed **1.5 V** rated  $R_{DS(ON)}$
- ESD** protection **up to 8 kV (HBM)**



**Minimizes Footprint Requirement**

Package size down to 0.8 mm x 0.6 mm



**MICRO FOOT®**  
0.8 mm x 0.8 mm



**PowerPAK® 0806**  
0.8 mm x 0.6 mm

Enable **LONGER** battery life

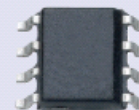


**INCREASE** efficiency of power delivery

**PREVENT** undesired fault signals  
**COMPACT** and space saving PCB layout **OPTIMIZATION**



**SiSA01DN**  
-30 V, 4.9 mΩ  
PowerPAK® 1212-8  
10.89 mm²



**SO-8 equivalent**  
-30 V, 5 mΩ  
SO-8  
31 mm²

**65 %** Smaller footprint

## APPLICATIONS



**BATTERY  
POWERED  
EQUIPMENT**



**NOTEBOOKS /  
TABLETS**



**GAME  
CONSOLES**



**CONSUMER  
ELECTRONICS**



**WEARABLES**