



**THE DATASHEET OF
SMF11A-HE3-08**





eSMP® Flat Type Surface-Mount Packages With Space-Saving Footprints



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- For technical questions contact Diodes@vishay.com



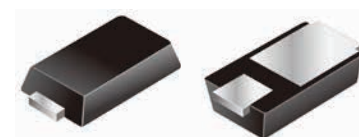
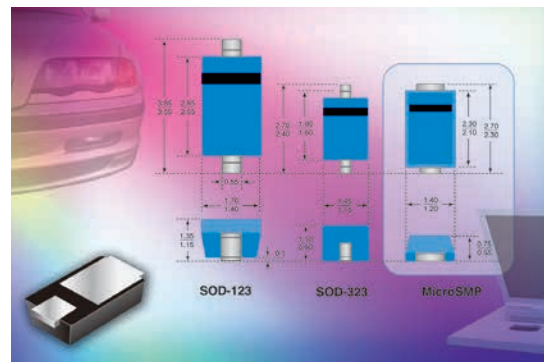


MicroSMP (DO-219AD) Package

MicroSMP (DO-219AD) Miniature, High Power Density Package for Rectifiers and Transient Voltage Suppressors (TVS)

Features

- High power density rectifiers and TVS in space-saving 2.5 mm by 1.3 mm footprint with a 0.65 mm height
- High forward current up to 1 A for rectifiers and 150 W (10/1000 μ s waveform) clamping power capability in TVS
- All the devices offer a high 25 A forward surge current capability for an 8.3 ms pulse for rectifiers
- Up to 175 °C maximum operation junction temperature for rectifiers
- Provide improved reliability and a longer operational life span
- Improve on all previous TVS products in similar package types by combining ESD transient protection with a superior surge clamping capability



eSMP® Series — MicroSMP (DO-219AD)

Applications

- Secondary rectification and freewheeling diode functions for miniature AC/DC and DC/DC converters
- Flywheel and polarity protection for miniature power converters and portable electronic equipment such as digital cameras, MP3 players, navigation systems, GPS, and cellular phones
- Polarity protection of power lines and signal lines for industrial systems
- Power and signal line protection for microprocessors, signal processing ICs, and logic circuits
- High power voltage regulation for non-sensitive input voltage circuits in automotive and industrial electronics



DIODES

MicroSMP (DO-219AD) Package

Schottky Rectifiers

| Device | V _{RRM} Range | I _{F(AV)} | Max V _F @ I _F | | I _{FSM} | T _J Max |
|----------------------------------|------------------------|--------------------|-------------------------------------|-----|------------------|--------------------|
| | (V) | (A) | (V) | (A) | (A) | (°C) |
| MSS1P2L, MSS1P3L | 20 - 30 | 1.0 | 0.50 | 1.0 | 25 | 150 |
| MSS1P3, MSS1P4 | 30 - 40 | 1.0 | 0.55 | 1.0 | 25 | 150 |
| MSS1P5, MSS1P6 | 50 - 60 | 1.0 | 0.68 | 1.0 | 25 | 150 |
| MSS2P2, MSS2P3 | 20 - 30 | 2.0 | 0.6 | 2.0 | 30 | 150 |
| V1PM10 | 100 | 1.0 | 0.77 | 1.0 | 25 | 175 |

Standard ESD Capability Rectifiers

| Device | V _{RRM} Range | I _{F(AV)} | Max V _F @ I _F | | t _{tr} Typical | I _{FSM} | T _J Max |
|--------------------------------------|------------------------|--------------------|-------------------------------------|-----|-------------------------|------------------|--------------------|
| | (V) | (A) | (V) | (A) | (ns) | (A) | (°C) |
| MSE07PB thru MSE07PJ | 100 - 600 | 0.7 | 1.08 | 0.7 | 780 | 20 | 175 |
| MSE1PB thru MSE1PJ | 100 - 600 | 1.0 | 1.1 | 1.0 | 780 | 30 | 175 |
| MSX1PB thru MSX1PJ | 100 - 600 | 1.0 | 1.1 | 1.0 | 960 | 18 | 175 |

TransZorb® TVS

| Device | V _(BR) Range | V _{WM} Range | P _{PPM} (10 x 1000 μs) | P _{PPM} (8 x 20 μs) | T _J Max |
|---------------------------------------|-------------------------|-----------------------|------------------------------------|---------------------------------|--------------------|
| | (V) | (V) | (W) | (W) | (°C) |
| MSP3V3, MSP5.0A | 4.1 - 6.4 | 3.3 - 5.0 | 150 | 1000 | 150 |
| MSMP6.0A thru MSMP20A | 6.67 - 24.5 | 6.0 - 20 | 150 | 1000 | 150 |



DIODES

SMP (DO-220AA) Package

SMP (DO-220AA) Miniature, High Power Density Package for Rectifiers and Transient Voltage Suppressors (TVS)

Features

- High power density rectifiers and TVS in space-saving 3.8 mm by 2 mm footprint with a 1 mm height
- Low forward voltage drop
- Provide space savings with:
 - Rectifiers rated up to 3 A
 - TVS rated up to 400 W (for above 13 V)
- 1 mm device height
- Solder pad compatible with other SMD devices
- Low thermal resistance
- Wide product offering
- Available for TVS and Schottky, Ultrafast, and standard rectifiers



**eSMP® Series – SMP
(DO-220AA)**

Applications

- Secondary rectification of AC/DC and DC/DC converters, freewheeling and polarity protection
- General purpose, polarity protection, and rail to rail protection in automotive applications
- Secondary rectification and freewheeling for ultrafast switching speeds of AC/DC and DC/DC converters in computer and consumer end products and in high-temperature conditions such as automotive applications
- Protection for ICs, drive transistors, signal lines of sensor units, and electronic units in consumer, computer, industrial, and automotive applications



DIODES

SMP (DO-220AA) Package

Schottky Rectifiers

| Device | $I_{F(AV)}$ | V_{RRM} Range | Max $V_F @ I_F$ | | $I_R @ V_{RRM}$ | I_{FSM} | T_J Max |
|-------------------------------------|-------------|-----------------|-----------------|-----|-----------------|-----------|-----------------|
| | (A) | (V) | (V) | (A) | (μ A) | (A) | ($^{\circ}$ C) |
| SS1P3L, SS1P4L | 1.0 | 30 - 40 | 0.45, 0.48 | 1.0 | 150 | 50 | 150 |
| SS1P3, SS1P4 | 1.0 | 30 - 40 | 0.53 | 1.0 | 150 | 30 | 150 |
| SS1P5L, SS1P6L | 1.0 | 50 - 60 | 0.59 | 1.0 | 100 | 50 | 150 |
| SS2P2, SS2P3, SS2P4 | 2.0 | 20 - 40 | 0.55 | 2.0 | 150 | 50 | 150 |
| SS2P2L, SS2P3L | 2.0 | 20 - 30 | 0.50 | 2.0 | 200 | 50 | 150 |
| SS2P5, SS2P6 | 2.0 | 50 - 60 | 0.70 | 2.0 | 100 | 50 | 150 |
| SS2PH9, SS2PH10 | 2.0 | 90 - 100 | 0.80 | 2.0 | 1.0 | 50 | 150 |
| SS3P3 | 3.0 | 30 | 0.58 | 3.0 | 200 | 50 | 150 |
| SS3P4 | 3.0 | 40 | 0.60 | 3.0 | 150 | 50 | 150 |
| SS3P5, SS3P6 | 3.0 | 50 - 60 | 0.78 | 3.0 | 100 | 50 | 150 |
| SS2PH5, SS2PH6 | 2.0 | 50 - 60 | 0.80 | 2.0 | 2 | 50 | 175 |

TMBS[®] (Trench MOS Barrier Schottky) Rectifiers

| Device | $I_{F(AV)}$ | V_{BR} Range | Max $V_F @ I_F$ | | $I_R @ V_{RRM}$ | I_{FSM} | T_J Max |
|----------------------|-------------|----------------|-----------------|-----|-----------------|-----------|-----------------|
| | (A) | (V) | (V) | (A) | (μ A) | (A) | ($^{\circ}$ C) |
| V3P6 | 3 | 60 | 0.63 | 3.0 | 900 | 60 | 150 |

Ultrafast Recovery Rectifiers

| Device | $I_{F(AV)}$ | V_{RRM} Range | Max $V_F @ I_F$ | | $I_R @ V_{RRM}$ | I_{FSM} | t_{tr} Max | T_J Max |
|--|-------------|-----------------|-----------------|-----------|-----------------|-----------|--------------|-----------------|
| | (A) | (V) | (V) | (A) | (μ A) | (A) | (ns) | ($^{\circ}$ C) |
| ES1PB, ES1PC, ES1PD | 1.0 | 100 - 200 | 0.865 / 0.92 | 0.6 / 1.0 | 5 | 30 | 15 | 150 |
| ESH1PB, ESH1PC, ESH1PD | 1.0 | 100 - 200 | 0.86 / 0.90 | 0.7 / 1.0 | 1 | 50 | 25 | 175 |
| ESH2PB, ESH2PC, ESH2PD | 2.0 | 100 - 200 | 0.98 | 2.0 | 1 | 50 | 25 | 175 |

Standard Recovery Rectifiers

| Device | $I_{F(AV)}$ | V_{RRM} Range | Max $V_F @ I_F$ | | $I_R @ V_{RRM}$ | t_{tr} Typ | I_{FSM} | T_J Max |
|--------------------------------|-------------|-----------------|-----------------|-----|-----------------|--------------|-----------|-----------------|
| | (A) | (V) | (V) | (A) | (μ A) | (ns) | (A) | ($^{\circ}$ C) |
| S1PB thru S1PM | 1.0 | 100 - 1000 | 1.1 | 1.0 | 1 | 1800 | 30 | 150 |



DIODES

SMP (DO-220AA) Package

Standard ESD Capability Rectifiers

| Device | $I_{F(AV)}$ | V_{RRM} Range | Max V_F @ I_F | | I_R @ V_{RRM} | t_{rr} Typ | I_{FSM} | T_J Max |
|------------------------------------|-------------|-----------------|-------------------|-----|-------------------|--------------|-----------|-----------------|
| | (A) | (V) | (V) | (A) | (μ A) | (ns) | (A) | ($^{\circ}$ C) |
| SE07PB thru SE07PJ | 0.7 | 100 - 600 | 1.05 | 0.7 | 5 | | 20 | 175 |
| SE10PB thru SE10PJ | 1.0 | 100 - 600 | 1.05 | 1.0 | 5 | 780 | 25 | 175 |
| SE15PB thru SE15PJ | 1.5 | 100 - 600 | 1.05 | 1.5 | 5 | 900 | 30 | 175 |
| SE20PB thru SE20PJ | 2.0 | 100 - 600 | 1.05 | 2.0 | 5 | 1200 | 32 | 175 |

Avalanche Rectifiers

| Device | $I_{F(AV)}$ | V_{RRM} Range | Max V_F @ I_F | | I_R @ V_{RRM} | E_R | t_{rr} Max | I_{FSM} | T_J Max |
|-------------------------------------|-------------|-----------------|-------------------|-----|-------------------|-------|--------------|-----------|-----------------|
| | (A) | (V) | (V) | (A) | (μ A) | (mJ) | (ns) | (A) | ($^{\circ}$ C) |
| AS1PD thru AS1PM | 1.5 | 200 - 1000 | 1.15 | 1.5 | 5 | 20 | 1500 | 30 | 175 |
| AR1PD, AR1PG, AR1PJ | 1 | 200 - 600 | 1.25 | 1 | 1 | 20 | 140 | 20 | 175 |
| AR1PK, AR1PM | 1 | 800 - 1000 | 1.6 | 1 | 1 | 20 | 120 | 20 | 175 |
| AU1PD, AU1PG, AU1PJ | 1 | 200 - 600 | 1.5 | 1 | 1 | 20 | 75 | 100 | 175 |
| AU1PK, AU1PM | 1 | 800 - 1000 | 1.85 | 1 | 1 | 20 | 75 | 100 | 175 |

Fast Switching Rectifiers

| Device | $I_{F(AV)}$ | V_{RRM} Range | Max V_F @ I_F | | I_R @ V_{RRM} | E_R | t_{rr} Max | I_{FSM} | T_J Max |
|----------------------------------|-------------|-----------------|-------------------|-----|-------------------|-------|--------------|-----------|-----------------|
| | (A) | (V) | (V) | (A) | (μ A) | (mJ) | (ns) | (A) | ($^{\circ}$ C) |
| RS1PB thru RS1PG | 1 | 100 - 400 | 1.3 | 1 | 1 | N/A | 150 | 30 | 150 |
| RS1PJ | 1 | 600 | 1.3 | 1 | 1 | N/A | 250 | 30 | 150 |

PAR[®] TVS

| Device | P_{PPM} (10 x 1000 μ s) | $V_{(BR)}$ Range | V_{WM} Range | T_J Max |
|--|----------------------------------|------------------|----------------|-----------------|
| | (W) | (V) | (V) | ($^{\circ}$ C) |
| TPSMP6.8(A) | 250 | 6.8 | 5.8 | 185 |
| TPSMP7.5 thru TPSMP12(A) | 300 | 7.5 - 12 | 6.40 - 10.2 | 185 |
| TPSMP13 thru TPSMP43(A) | 400 | 13 - 43 | 11.1 - 36.8 | 185 |



DIODES

SMP (DO-220AA) Package

TransZorb® TVS

| Device | P_{PPM} (10 x 1000 μ s) | $V_{(BR)}$ Range | V_{WM} Range | T_J Max |
|------------------------------------|----------------------------------|------------------|----------------|-----------|
| | (W) | (V) | (V) | (°C) |
| SMP3V3 thru SMP36A | 400 | 4.10 - 44.2 | 3.3 - 36 | 150 |

Power Voltage-Regulating Diodes

| Device | P_D | V_z Range | T_J Max |
|--|-------|-------------|-----------|
| | (mW) | (V) | (°C) |
| PTV3.9B thru PTV36B | 1500 | 3.9 - 36 | 150 |
| SMPZ3919B thru SMPZ3940B | 1500 | 5.6 - 43 | 150 |



TMBS® Trench MOS Barrier Schottky and Standard Rectifiers in Low Profile SMPA (DO-221BC) Package

Common Features

- Low profile SMPA (DO-221BC) package
- Typical height of 0.95 mm
- Ideal for automated placement
- Meets MSL moisture sensitivity level of 1, per J-STD-020, LF maximum peak of 260 °C
- Compliant to RoHS Directive 2011/65/EU
- Halogen-free according to JEDEC JS709A standards
- Maximum operation junction temperature of 175 °C
- AEC-Q101 qualified (50 V TMBS devices not yet qualified)

Features for TMBS Rectifiers

- Current ratings from 3 A to 8 A
- Low forward voltage drop down to 0.37 V at 3 A
- Low power losses and high efficiency
- Trench MOS Schottky technology

Features for Standard Rectifiers

- Current ratings from 2 A to 5 A
- Low forward voltage drop
- Low leakage current
- Oxide planar chip technology
- ESD capability

Applications

- Low voltage, high frequency DC/DC converters, switching power supplies, freewheeling diodes, and polarity protection in automotive applications and mobile device chargers
- General purpose, power line polarity protection in automotive applications



eSMP® Series — SMPA (DO-221BC)



DIODES

SMPA (DO-221BC) Package

TMBS® (Trench MOS Barrier Schottky) Rectifiers

| Device | $I_{F(AV)}$ | V_{RRM} Range | Max V_F @ I_F | | I_R @ V_{RRM} | I_{FSM} | T_J Max |
|-------------------------|-------------|-----------------|-------------------|-----|-------------------|-----------|-----------|
| | (A) | (V) | (V) | (A) | (μ A) | (A) | (°C) |
| V3PAL45 | 3 | 45 | 0.54 | 3.0 | 450 | 80 | 150 |
| V3PAN50 | 3 | 50 | 0.54 | 3.0 | 600 | 80 | 150 |
| V4PAL45 | 4 | 45 | 0.57 | 4.0 | 450 | 80 | 150 |
| V4PAN50 | 4 | 50 | 0.59 | 4.0 | 600 | 80 | 150 |
| V8PA10 | 8 | 100 | 0.76 | 8.0 | 800 | 100 | 150 |
| V8PA12 | 8 | 120 | 0.87 | 8.0 | 600 | 100 | 150 |
| V8PA15 | 8 | 150 | 1.20 | 8.0 | 500 | 100 | 150 |
| V8PA6 | 8 | 60 | 0.63 | 8.0 | 600 | 100 | 150 |
| V8PAL45 | 8 | 45 | 0.57 | 8.0 | 1850 | 120 | 150 |
| V8PAL50 | 8 | 50 | 0.57 | 8.0 | 400 | 120 | 150 |
| V8PAM10 | 8 | 100 | 0.78 | 8.0 | 200 | 100 | 175 |
| V8PAM12 | 8 | 120 | 0.88 | 8.0 | 500 | 100 | 175 |
| V8PAN50 | 8 | 50 | 0.57 | 8.0 | 400 | 120 | 150 |

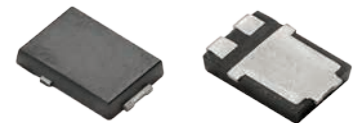
Standard Recovery Rectifiers

| Device | $I_{F(AV)}$ | V_{RRM} Range | Max V_F @ I_F | | I_R @ V_{RRM} | t_{rr} Typ | I_{FSM} | T_J Max |
|--------------------------------------|-------------|-----------------|-------------------|-----|-------------------|--------------|-----------|-----------|
| | (A) | (V) | (V) | (A) | (μ A) | (ns) | (A) | (°C) |
| SE20PAB thru SE20PAJ | 2.0 | 100 - 600 | 1.1 | 2.0 | 5 | 1300 | 32 | 175 |
| SE30PAB thru SE30PAJ | 3.0 | 100 - 600 | 1.16 | 3.0 | 5 | 1300 | 32 | 175 |
| SE50PAB thru SE50PAJ | 5.0 | 100 - 600 | 1.16 | 5.0 | 10 | 2000 | 42 | 175 |

SMPC (TO-277A) Miniature, High Power Density Package for Rectifiers and Transient Voltage Suppressors (TVS)

Features

- Enable higher current density power supply designs
- Very small 1.1 mm height and 4.8 mm by 6.7 mm footprint saves space
- Provide more power in a smaller package
 - TMBS[®] rectifiers rated up to 15 A
 - Planar Schottky rectifiers rated up to 15 A
- Industry-standard SMPC (TO-277A) package outline for easy outline compatibility
- Low forward voltage drops and special wide-bottom plate designs provide greater heat dissipation than other packages of similar sizes
- Ideal for automated placement
- Single- or dual-chip, surface-mount SMPC (TO-277A) package features solder pads that are compatible with other SMD devices



eSMP[®] Series – SMPC (TO-277A)

Applications

- Secondary rectifiers and freewheeling circuitry for AC/DC and DC/DC converters
- Output rectification for small and medium power adapters
- Switchmode power supplies in consumer electronics such as computers, LCD monitors, and cell phones
- Flywheel and polarity protection for solenoid drive circuits in automotive and industry systems
- OR-ing diodes for telecommunication and industrial systems

Schottky Rectifiers

| Device | $I_{F(AV)}$ | V_{RRM} Range | Max V_F @ I_F | | I_R @ V_{RRM} | I_{FSM} | T_J Max |
|------------------------------------|-------------|-----------------|-------------------|-----|-------------------|-----------|-----------------|
| | (A) | (V) | (V) | (A) | (μ A) | (A) | ($^{\circ}$ C) |
| SS3P3L, SS3P4L | 3.0 | 30 - 40 | 0.47 | 3.0 | 250 | 150 | 150 |
| SS3P5L, SS3P6L | 3.0 | 50 - 60 | 0.60 | 3.0 | 150 | 150 | 150 |
| SS5P3, SS5P4 | 5.0 | 50 - 60 | 0.52 | 5.0 | 250 | 150 | 150 |
| SS5P5, SS5P6 | 5.0 | 50 - 60 | 0.69 | 5.0 | 150 | 150 | 150 |
| SS5P9, SS5P10 | 5.0 | 90 - 100 | 0.88 | 5.0 | 15 | 150 | 150 |
| SS6P4C | 6.0 | 40 | 0.65 | 3.0 | 200 | 70 | 150 |
| SS8P2L, SS8P3L | 8.0 | 20 - 30 | 0.57 | 8.0 | 200 | 150 | 150 |
| SS8PH9, SS8PH10 | 8.0 | 90 - 100 | 0.9 | 8.0 | 2 | 150 | 175 |
| SS8P2CL, SS8P3CL | 8.0 | 20 - 30 | 0.54 | 4.0 | 300 | 120 | 150 |
| SS8P3C, SS8P4C | 8.0 | 30 - 40 | 0.58 | 4.0 | 300 | 120 | 150 |
| SS8P5C, SS8P6C | 8.0 | 50 - 60 | 0.70 | 4.0 | 50 | 120 | 150 |
| SS10P2CL, SS10P3CL | 10 | 20 - 30 | 0.52 | 5.0 | 850 | 200 | 150 |
| SS10P3C, SS10P4C | 10 | 30 - 40 | 0.53 | 5 | 550 | 200 | 150 |
| SS10P3, SS10P4 | 10 | 30 - 40 | 0.56 | 10 | 800 | 280 | 150 |
| SS10P5, SS10P6 | 10 | 50 - 60 | 0.67 | 10 | 150 | 280 | 150 |
| SS10PH45 | 10 | 45 | 0.72 | 10 | 80 | 200 | 175 |
| SS10PH9, SS10PH10 | 10 | 90 - 100 | 0.88 | 10 | 10 | 200 | 175 |
| SS12P2L, SS12P3L | 12 | 20 - 30 | 0.56 | 12 | 1000 | 280 | 150 |
| SS12P4C | 12 | 40 | 0.52 | 6 | 500 | 150 | 150 |
| SS12P4S | 12 | 40 | 0.60 | 12 | 800 | 280 | 150 |
| SS15P3S | 15 | 30 | 0.57 | 15 | 1000 | 280 | 150 |



TMBS® (Trench MOS Barrier Schottky) Rectifiers

| Device | $I_{F(AV)}$ | V_{RRM} Range | Max V_F @ I_F | | I_R @ V_{RRM} | I_{FSM} | T_J Max |
|-------------------------|-------------|-----------------|-------------------|-----|-------------------|-----------|-----------|
| | (A) | (V) | (V) | (A) | (μ A) | (A) | (°C) |
| V10P10 | 10 | 100 | 0.68 | 10 | 150 | 180 | 150 |
| V10P12 | 10 | 120 | 0.82 | 10 | 400 | 160 | 150 |
| V10P15 | 10 | 150 | 1.08 | 10 | 200 | 180 | 150 |
| V10P20 | 10 | 200 | 1.34 | 10 | 400 | 180 | 150 |
| V10P45 | 10 | 45 | 0.57 | 10 | 800 | 180 | 150 |
| V10P45S | 10 | 45 | 0.57 | 10 | 800 | 180 | 150 |
| V10P6 | 10 | 60 | 0.59 | 10 | 1600 | 180 | 150 |
| V10P8 | 10 | 80 | 0.68 | 10 | 800 | 180 | 150 |
| V10PL45 | 10 | 45 | 0.52 | 10 | 5000 | 200 | 150 |
| V10PM10 | 10 | 100 | 0.75 | 10 | 120 | 180 | 150 |
| V10PM12 | 10 | 120 | 0.83 | 10 | 400 | 160 | 150 |
| V10PN50 | 10 | 50 | 0.55 | 10 | 150 | 180 | 150 |
| V12P10 | 12 | 100 | 0.70 | 12 | 250 | 200 | 150 |
| V12P12 | 12 | 120 | 0.80 | 12 | 500 | 150 | 150 |
| V12P15 | 12 | 150 | 1.08 | 12 | 250 | 200 | 150 |
| V12P45 | 12 | 45 | 0.58 | 12 | 1000 | 200 | 150 |
| V12P6 | 12 | 60 | 0.61 | 12 | 2900 | 200 | 150 |
| V12P8 | 12 | 80 | 0.66 | 12 | 1000 | 200 | 150 |
| V12PM10 | 12 | 100 | 0.75 | 12 | 200 | 200 | 150 |
| V12PM12 | 12 | 120 | 0.80 | 12 | 500 | 160 | 150 |
| V15P10 | 15 | 100 | 0.71 | 15 | 500 | 220 | 150 |
| V15P12 | 15 | 120 | 0.81 | 15 | 1000 | 220 | 150 |
| V15P15 | 15 | 150 | 1.08 | 15 | 300 | 220 | 150 |
| V15P45 | 15 | 45 | 0.58 | 15 | 1500 | 210 | 150 |
| V15P45S | 15 | 45 | 0.58 | 15 | 1500 | 210 | 150 |
| V15P6 | 15 | 60 | 0.62 | 15 | 3600 | 220 | 150 |
| V15P8 | 15 | 80 | 0.66 | 15 | 1200 | 220 | 150 |
| V15PL50 | 15 | 50 | 0.58 | 15 | 1500 | 200 | 150 |
| V15PM10 | 15 | 100 | 0.75 | 15 | 400 | 220 | 150 |
| V15PM12 | 15 | 120 | 0.84 | 15 | 800 | 220 | 150 |
| V15PN50 | 15 | 50 | 0.56 | 15 | 3000 | 200 | 150 |
| V20PL50 | 20 | 50 | 0.59 | 20 | 3000 | 240 | 150 |
| V20PL60 | 20 | 60 | 0.59 | 20 | 4000 | 240 | 150 |
| V25PL60 | 25 | 60 | 0.59 | 25 | 4000 | 240 | 150 |
| V25PN60 | 25 | 60 | 0.59 | 25 | 6000 | 300 | 150 |
| V8P10 | 8 | 100 | 0.68 | 8.0 | 70 | 150 | 150 |
| V8P12 | 8 | 120 | 0.84 | 8.0 | 300 | 140 | 150 |
| V8P15 | 8 | 150 | 1.08 | 8.0 | 150 | 140 | 150 |
| V8P45 | 8 | 45 | 0.58 | 8.0 | 600 | 140 | 150 |
| V8P6 | 8 | 60 | 0.61 | 8.0 | 600 | 140 | 150 |
| V8P8 | 8 | 80 | 0.66 | 8.0 | 700 | 140 | 150 |
| V8PL6 | 8 | 60 | 0.58 | 8.0 | 2400 | 140 | 150 |
| V8PM10 | 8 | 100 | 0.75 | 8.0 | 60 | 140 | 150 |
| V8PM12 | 8 | 120 | 0.84 | 8.0 | 300 | 140 | 150 |
| V8P20 | 8 | 200 | 1.40 | 8.0 | 250 | 150 | 150 |



Standard ESD Capability Rectifiers

| Device | $I_{F(AV)}$ | V_{RRM} Range | Max $V_F @ I_F$ | | $I_R @ V_{RRM}$ | t_{rr} Max | I_{FSM} | T_J Max |
|------------------------------------|-------------|-----------------|-----------------|-----|-----------------|--------------|-----------|-----------------|
| | (A) | (V) | (V) | (A) | (μ A) | (ns) | (A) | ($^{\circ}$ C) |
| SE40PB thru SE40PJ | 4.0 | 100 - 600 | 1.1 | 4.0 | 10 | 2200 | 60 | 175 |
| SE70PB thru SE70PJ | 7.0 | 100 - 600 | 1.05 | 7.0 | 20 | 2600 | 120 | 175 |

Standard Recovery Rectifiers

| Device | $I_{F(AV)}$ | V_{RRM} Range | Max $V_F @ I_F$ | | $I_R @ V_{RRM}$ | t_{rr} Max | I_{FSM} | T_J Max |
|--------------------------------|-------------|-----------------|-----------------|-----|-----------------|--------------|-----------|-----------------|
| | (A) | (V) | (V) | (A) | (μ A) | (ns) | (A) | ($^{\circ}$ C) |
| S4PB thru S4PM | 4.0 | 100 - 1000 | 1.10 | 4.0 | 10 | 2500 | 100 | 150 |
| S5PMS | 5.0 | 1000 | 1.15 | 5.0 | 10 | 2500 | 100 | 150 |

Fred Pt[®] Ultrafast Rectifiers

| Device | $I_{F(AV)}$ | V_{RRM} Range | Max $V_F @ I_F$ | | $I_R @ V_{RRM}$ | I_{FSM} | t_{rr} Max | T_J Max |
|-------------------------------|-------------|-----------------|-----------------|-----|-----------------|-----------|--------------|-----------------|
| | (A) | (V) | (V) | (A) | (μ A) | (A) | (ns) | ($^{\circ}$ C) |
| VS-4CSH01HM3 | 4.0 | 100 | 0.95 | 2.0 | 2 | 16 | 90 | 175 |
| VS-4CSH01-M3 | 4.0 | 100 | 0.95 | 2.0 | 2 | 16 | 90 | 175 |
| VS-4CSH02HM3 | 4.0 | 200 | 0.95 | 2.0 | 2 | 16 | 90 | 175 |
| VS-4CSH02-M3 | 4.0 | 200 | 0.95 | 2.0 | 2 | 16 | 90 | 175 |
| VS-4ESH01HM3 | 4.0 | 100 | 0.93 | 4.0 | 2 | 20 | 130 | 175 |
| VS-4ESH01-M3 | 4.0 | 100 | 0.93 | 4.0 | 2 | 20 | 130 | 175 |
| VS-4ESH02HM3 | 4.0 | 200 | 0.93 | 4.0 | 2 | 20 | 130 | 175 |
| VS-4ESH02-M3 | 4.0 | 200 | 0.93 | 4.0 | 2 | 20 | 130 | 175 |
| VS-6ESH01HM3 | 6.0 | 100 | 0.94 | 6.0 | 2 | 22 | 150 | 175 |
| VS-6ESH01-M3 | 6.0 | 100 | 0.94 | 6.0 | 2 | 22 | 150 | 175 |
| VS-6ESH02HM3 | 6.0 | 200 | 0.94 | 6.0 | 2 | 22 | 150 | 175 |
| VS-6ESH02-M3 | 6.0 | 200 | 0.94 | 6.0 | 2 | 22 | 150 | 175 |
| VS-6CSH01HM3 | 6.0 | 100 | 0.94 | 3.0 | 2 | 20 | 150 | 175 |
| VS-6CSH01-M3 | 6.0 | 100 | 0.94 | 3.0 | 2 | 20 | 150 | 175 |
| VS-6CSH02HM3 | 6.0 | 200 | 0.94 | 3.0 | 2 | 20 | 150 | 175 |
| VS-6CSH02-M3 | 6.0 | 200 | 0.94 | 3.0 | 2 | 20 | 150 | 175 |
| VS-8CSH01HM3 | 8.0 | 100 | 0.95 | 4.0 | 2 | 18 | 130 | 175 |
| VS-8CSH01-M3 | 8.0 | 100 | 0.95 | 4.0 | 2 | 18 | 130 | 175 |
| VS-8CSH02HM3 | 8.0 | 200 | 0.95 | 4.0 | 2 | 18 | 130 | 175 |
| VS-8CSH02-M3 | 8.0 | 200 | 0.95 | 4.0 | 2 | 18 | 130 | 175 |
| VS-10CSH01HM3 | 10 | 100 | 0.98 | 5.0 | 2 | 18 | 130 | 175 |
| VS-10CSH01-M3 | 10 | 100 | 0.98 | 5.0 | 2 | 18 | 130 | 175 |
| VS-10CSH02HM3 | 10 | 200 | 0.98 | 5.0 | 2 | 18 | 130 | 175 |
| VS-10CSH02-M3 | 10 | 200 | 0.98 | 5.0 | 2 | 18 | 130 | 175 |
| VS-6ESU06HM3 | 6.0 | 600 | 1.3 | 6.0 | 5 | 58 | 120 | 175 |
| VS-6ESU06-M3 | 6.0 | 600 | 1.3 | 6.0 | 5 | 58 | 120 | 175 |
| VS-6ESH06HM3 | 6.0 | 600 | 1.8 | 6.0 | 5 | 40 | 90 | 175 |
| VS-6ESH06-M3 | 6.0 | 600 | 1.8 | 6.0 | 5 | 40 | 90 | 175 |



DIODES

SMPC (TO-277A) Package

Avalanche Rectifiers

| Device | $I_{F(AV)}$ | V_{RRM} Range | Max V_F @ I_F | | I_R @ V_{RRM} | E_R | t_{rr} | I_{FSM} | T_J Max |
|-------------------------------------|-------------|-----------------|-------------------|-----|-------------------|-------|----------|-----------|-----------------|
| | (A) | (V) | (V) | (A) | (μ A) | (mJ) | (ns) | (A) | ($^{\circ}$ C) |
| AS3PD thru AS3PM | 1.5 | 100 - 1000 | 1.1 | 3 | 10 | 20 | 1200 | 70 | 175 |
| AS4PD thru AS4PM | 1 | 100 - 1000 | 1.1 | 4 | 10 | 20 | 1800 | 100 | 175 |
| AR3PD, AR3PG, AR3PJ | 3 | 100, 400, 600 | 1.6 | 3 | 10 | 20 | 140 | 50 | 175 |
| AR3PK, AR3PM | 3 | 800, 1000 | 1.9 | 3 | 10 | 20 | 120 | 50 | 175 |
| AR4PD, AR4PG, AR4PJ | 4 | 100, 400, 600 | 1.6 | 4 | 10 | 20 | 140 | 65 | 175 |
| AR4PK, AR4PM | 4 | 800, 1000 | 1.9 | 4 | 10 | 20 | 120 | 65 | 175 |
| AU2PD, AU2PG, AU2PJ | 2 | 100, 400, 600 | 1.9 | 2 | 10 | 20 | 75 | 30 | 175 |
| AU2PK, AU2PM | 2 | 800, 1000 | 2.5 | 2 | 10 | 20 | 75 | 30 | 175 |
| AU3PD, AU3PG, AU3PJ | 3 | 100, 400, 600 | 1.9 | 3 | 10 | 20 | 75 | 45 | 175 |
| AU3PK, AU3PM | 3 | 800, 1000 | 2.5 | 3 | 10 | 20 | 75 | 45 | 175 |

PAR[®] TVS

| Device | P_{PPM} (10 x 1000 μ s) | $V_{(BR)}$ Range | V_{WM} Range | T_J Max |
|---|-------------------------------|------------------|----------------|-----------------|
| | (W) | (V) | (V) | ($^{\circ}$ C) |
| TPC6.8(A) thru TPC51(A) | 1500 | 6.8 - 51 | 5.5 - 43.6 | 185 |
| TPC11CA thru TPC36CA | 1500 | 10.5 - 37.8 | 9.4 - 30.8 | 185 |

TRANSZORB[®] TVS

| Device | P_{PPM} (10 x 1000 μ s) | $V_{(BR)}$ Range | V_{WM} Range | T_J Max |
|---------------------------------------|-------------------------------|------------------|----------------|-----------------|
| | (W) | (V) | (V) | ($^{\circ}$ C) |
| SMPC5.0A thru SMP36A | 1500 | 6.4 - 40.0 | 5.0 - 36 | 150 |
| SMPC22AN thru SMP85AN | 1500 | 24.4 - 104 | 22 - 85 | 150 |



SlimDPAK (TO-252AE) Package

TMBS® Trench MOS Barrier Schottky and Standard Rectifiers in SlimDPAK (TO-252AE) Package

Features for TMBS Rectifiers

- Very low profile: typical height of 1.3 mm
- Trench MOS Schottky technology
- Ideal for automated placement
- Low forward voltage drop, low power losses
- High efficiency operation
- Meets MSL level 1, per J-STD-020, LF maximum peak of 260 °C
- AEC-Q101 qualified available



Features for Standard Rectifiers

- Very low profile: typical height of 1.3 mm
- Ideal for automated placement
- Oxide planar chip junction
- Low forward voltage drop
- ESD capability
- Meets MSL level 1, per J-STD-020, LF maximum peak of 260 °C
- AEC-Q101 qualified available



eSMP® Series – SlimDPAK
(TO-252AE)

Applications

- For use in low voltage, high frequency DC/DC converters, freewheeling diodes, and polarity protection applications
- General purpose, power line polarity protection in both industry and automotive applications

TMBS (Trench MOS Barrier Schottky) Rectifiers

| Device | $I_{F(AV)}$ | V_{RRM} Range | Max V_F @ I_F | | I_R @ V_{RRM} | I_{FSM} | T_J Max |
|---------------------------|-------------|-----------------|-------------------|------|-------------------|-----------|-----------|
| | (A) | (V) | (V) | (A) | (μ A) | (A) | (°C) |
| V20PW10 | 20 | 100 | 0.86 | 20.0 | 500 | 200 | 150 |
| V20PW10C | 20 | 100 | 0.79 | 10.0 | 300 | 150 | 150 |
| V20PW12 | 20 | 120 | 1.02 | 20.0 | 800 | 200 | 150 |
| V20PW12C | 20 | 120 | 0.92 | 10.0 | 700 | 150 | 150 |
| V20PW15 | 20 | 150 | 1.47 | 20.0 | 250 | 200 | 150 |
| V20PW15C | 20 | 150 | 1.24 | 10.0 | 150 | 150 | 150 |
| V20PW45 | 20 | 45 | 0.61 | 20.0 | 1500 | 200 | 150 |
| V20PW45C | 20 | 45 | 0.60 | 10.0 | 1000 | 150 | 150 |
| V20PW60 | 20 | 60 | 0.66 | 20.0 | 3600 | 200 | 150 |
| V20PW60C | 20 | 60 | 0.64 | 10.0 | 1500 | 150 | 150 |
| V20PWM10 | 20 | 100 | 0.90 | 20.0 | 200 | 200 | 175 |
| V20PWM10C | 20 | 100 | 0.82 | 10.0 | 150 | 150 | 175 |
| V20PWM12 | 20 | 120 | 1.02 | 20.0 | 500 | 200 | 175 |
| V20PWM12C | 20 | 120 | 0.92 | 10.0 | 300 | 150 | 175 |



DIODES

SlimDPAK (TO-252AE) Package

TMBS® (Trench MOS Barrier Schottky) Rectifiers (cont.)

| Device | $I_{F(AV)}$ | V_{RRM} Range | Max $V_F @ I_F$ | | $I_R @ V_{RRM}$ | I_{FSM} | T_J Max |
|---------------------------|-------------|-----------------|-----------------|------|-----------------|-----------|-----------|
| | (A) | (V) | (V) | (A) | (μ A) | (A) | (°C) |
| V20PWM15 | 20 | 150 | 1.47 | 20.0 | 250 | 200 | 175 |
| V20PWM15C | 20 | 150 | 1.24 | 10.0 | 150 | 150 | 175 |
| V20PWM45 | 20 | 45 | 0.66 | 20.0 | 700 | 200 | 175 |
| V20PWM45C | 20 | 45 | 0.62 | 10.0 | 200 | 150 | 175 |
| V20PWM60 | 20 | 60 | 0.70 | 20.0 | 1200 | 200 | 175 |
| V20PWM60C | 20 | 60 | 0.66 | 10.0 | 600 | 150 | 175 |
| V35PW10 | 35 | 100 | 0.88 | 35.0 | 1000 | 260 | 150 |
| V35PW12 | 35 | 120 | 1.05 | 35.0 | 1000 | 260 | 150 |
| V35PW15 | 35 | 150 | 1.40 | 35.0 | 250 | 260 | 150 |
| V35PW45 | 35 | 45 | 0.62 | 35.0 | 2500 | 260 | 150 |
| V35PW60 | 35 | 60 | 0.72 | 35.0 | 5000 | 260 | 150 |
| V35PWM10 | 35 | 100 | 0.90 | 35.0 | 800 | 260 | 175 |
| V35PWM12 | 35 | 120 | 1.05 | 35.0 | 1200 | 260 | 175 |
| V35PWM15 | 35 | 150 | 1.40 | 35.0 | 500 | 260 | 175 |
| V35PWM45 | 35 | 45 | 0.67 | 35.0 | 1100 | 260 | 175 |
| V35PWM60 | 35 | 60 | 0.77 | 35.0 | 2100 | 260 | 175 |
| V40PW10C | 40 | 100 | 0.89 | 20.0 | 500 | 240 | 150 |
| V40PW12C | 40 | 120 | 1.03 | 20.0 | 750 | 240 | 150 |
| V40PW15C | 40 | 150 | 1.45 | 20.0 | 500 | 240 | 150 |
| V40PW45C | 40 | 45 | 0.64 | 20.0 | 1200 | 240 | 150 |
| V40PW60C | 40 | 60 | 0.68 | 20.0 | 2400 | 240 | 150 |
| V40PWM10C | 40 | 100 | 0.89 | 20.0 | 400 | 240 | 175 |
| V40PWM12C | 40 | 120 | 1.00 | 20.0 | 500 | 240 | 175 |
| V40PWM15C | 40 | 150 | 1.45 | 20.0 | 500 | 240 | 175 |
| V40PWM45C | 40 | 45 | 0.67 | 20.0 | 400 | 240 | 175 |
| V40PWM60C | 40 | 60 | 0.72 | 20.0 | 1400 | 240 | 175 |

Standard ESD Capability Rectifiers

| Device | $I_{F(AV)}$ | V_{RRM} Range | Max $V_F @ I_F$ | | $I_R @ V_{RRM}$ | t_{tr} Max | I_{FSM} | T_J Max |
|--|-------------|-----------------|-----------------|-----|-----------------|--------------|-----------|-----------|
| | (A) | (V) | (V) | (A) | (μ A) | (ns) | (A) | (°C) |
| SE80PWB thru SE80PWJ | 8 | 100 - 600 | 1.12 | 8 | 15 | 2400 | 110 | 175 |
| SE100PWB thru SE100PWJ | 10 | 100 - 600 | 1.14 | 10 | 20 | 2600 | 110 | 175 |



TMBS® Trench MOS Barrier Schottky and Standard Rectifiers in SMPD (TO-263AC) Package

Common Features

- Low profile (< 1.7 mm height) SMPD (TO-263AC) package is footprint compatible with D2PAK (TO-263AB) package
- Ideal for automated placement
- Meets MSL moisture sensitivity level of 1, per J-STD-020, LF maximum peak of 260 °C
- Compliant to RoHS Directive 2011/65/EU
- Halogen-free according to JEDEC JS709A standards

Features for TMBS Rectifiers

- Current ratings from 10 A to 60 A
- Low forward voltage drop down to 0.40 V at 15 A
- Low power losses and high efficiency
- Trench MOS Schottky technology
- Maximum operation junction temperature of 150 °C

Features for Standard Rectifiers

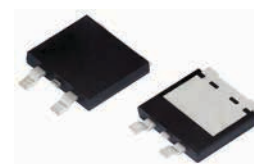
- Oxide planar chip technology
- Current ratings range from 10 A to 20 A
- Low forward voltage drop down to 0.75 V typical with fast recovery time down to 25 ns
- ESD capability
- High operating temperature up to 175 °C
- Soft recovery behavior over a temperature range of -40 °C to 175 °C at any di / dt
- Available in AEC-Q101 qualified and standard versions

Features for FRED Pt® Rectifiers

- High operating temperature up to 175 °C
- Low forward voltage drop down to 0.75 V typical with fast recovery time down to 25 ns
- Soft recovery behavior over a temperature range of -40 °C to 175 °C at any di / dt
- Available in AEC-Q101 qualified and standard versions

Applications

- For use in high frequency DC/DC converters, switching power supplies, freewheeling diodes, OR-ing diodes, and reverse battery protection
- General purpose, power line polarity protection in automotive applications
- Automotive
 - EV / HEV battery charging systems
 - Power supply PFC
- Industrial
 - APD in inverters for motor drives, UPS, and LED and HID lighting systems



eSMP® Series — SMPD (TO-263AC)



DIODES

SMPD (TO-263AC) Package

TMBS® (Trench MOS Barrier Schottky) Rectifiers

| Device | $I_{F(AV)}$ | V_{RRM} Range | Max V_F @ I_F | | I_R @ V_{RRM} | I_{FSM} | T_J Max |
|---------------------------|-------------|-----------------|-------------------|------|-------------------|-----------|-----------------|
| | (A) | (V) | (V) | (A) | (μ A) | (A) | ($^{\circ}$ C) |
| V10D100C | 10 | 100 | 0.75 | 5.0 | 500 | 100 | 150 |
| V10D120C | 10 | 120 | 0.94 | 5.0 | 500 | 100 | 150 |
| V10D202C | 10 | 200 | 0.90 | 5.0 | 50 | 100 | 175 |
| V10D45C | 10 | 45 | 0.58 | 5.0 | 500 | 100 | 150 |
| V10D60C | 10 | 60 | 0.70 | 5.0 | 700 | 100 | 150 |
| V20D202C | 20 | 200 | 0.90 | 10.0 | 150 | 150 | 175 |
| V20DL45 | 20 | 45 | 0.64 | 20 | 2500 | 160 | 150 |
| V20DL45BP | 20 | 45 | 0.64 | 20 | 2500 | 160 | 150 |
| V20DM120 | 20 | 120 | 1.1 | 20.0 | 800 | 150 | 175 |
| V20DM120C | 20 | 120 | 0.93 | 10 | 600 | 120 | 150 |
| V30D202C | 30 | 200 | 0.88 | 15.0 | 200 | 260 | 175 |
| V30D45C | 30 | 45 | 0.57 | 15 | 1500 | 200 | 150 |
| V30D60C | 30 | 60 | 0.70 | 15 | 1200 | 170 | 150 |
| V30D60CL | 30 | 60 | 0.61 | 15 | 4000 | 200 | 150 |
| V30DL45 | 30 | 45 | 0.65 | 30 | 3000 | 200 | 150 |
| V30DL45BP | 30 | 45 | 0.65 | 30 | 3000 | 200 | 150 |
| V30DL50C | 30 | 50 | 0.57 | 15 | 1800 | 300 | 150 |
| V30DM120 | 30 | 120 | 1.06 | 30.0 | 1000 | 250 | 175 |
| V30DM120C | 30 | 120 | 0.93 | 15 | 800 | 150 | 150 |
| V35DM120 | 30 | 120 | 1.05 | 35.0 | 1200 | 320 | 175 |
| V40D100C | 40 | 100 | 0.75 | 20.0 | 1000 | 250 | 175 |
| V40D120C | 40 | 120 | 0.89 | 20.0 | 500 | 250 | 175 |
| V40DL45 | 40 | 45 | 0.66 | 40 | 5000 | 240 | 150 |
| V40DL45BP | 40 | 45 | 0.66 | 40 | 5000 | 240 | 150 |
| V40DM120C | 40 | 120 | 0.89 | 20 | 500 | 250 | 150 |
| V60D100C | 60 | 100 | 0.81 | 30 | 1000 | 320 | 150 |
| V60D120C | 60 | 120 | 0.96 | 30 | 800 | 320 | 150 |
| V60D45C | 60 | 45 | 0.64 | 30 | 2500 | 320 | 150 |
| V60DM120C | 60 | 120 | 0.97 | 30.0 | 700 | 320 | 175 |

Standard ESD Capability Rectifiers

| Device | $I_{F(AV)}$ | V_{RRM} Range | Max V_F @ I_F | | I_R @ V_{RRM} | trr Typ | I_{FSM} | T_J Max |
|------------------------------------|-------------|-----------------|-------------------|-----|-------------------|---------|-----------|-----------------|
| | (A) | (V) | (V) | (A) | (μ A) | (ns) | (A) | ($^{\circ}$ C) |
| SE10DB thru SE10DJ | 10 | 100 - 600 | 1.15 | 10 | 15 | 3000 | 110 | 175 |
| SE12DB thru SE12DJ | 12 | 100 - 600 | 1.15 | 12 | 20 | 3000 | 125 | 175 |
| SE20DB thru SE20DJ | 20 | 100 - 600 | 1.20 | 20 | 25 | 3000 | 150 | 175 |



DIODES

SMPD (TO-263AC) Package

FRED Pt® Ultrafast Recovery Rectifiers

| Device | $I_{F(AV)}$ | V_{RRM} Range | Max V_F @ I_F | | I_R @ V_{RRM} | trr Typ | I_{FSM} | T_J Max |
|---------------------------------|-------------|--------------------|-------------------|-----|-------------------|---------|-----------|-----------|
| | (A) | (V) | (V) | (A) | (μ A) | (ns) | (A) | (°C) |
| VS-16CDH02-M3/I | 16 | 200 | 0.77 | 8 | 2 | 27 | 190 | 175 |
| VS-16CDH02HM3/I | 16 | 200 | 0.77 | 8 | 2 | 27 | 190 | 175 |
| VS-16EDH02-M3/I | 16 | 200 | 0.75 | 16 | 15 | 32 | 250 | 175 |
| VS-16EDH02HM3/I | 16 | 200 | 0.75 | 16 | 15 | 32 | 250 | 175 |
| VS-20CDH02-M3/I | 20 | 200 | 0.77 | 10 | 2 | 25 | 210 | 175 |
| VS-20CDH02HM3/I | 20 | 200 | 0.77 | 10 | 2 | 25 | 210 | 175 |
| VS-10CDH06-M3/I | 10 | 600 | 1 | 5 | 3 | 35 | 110 | 175 |
| VS-10CDH06HM3/I | 10 | 600 | 1 | 5 | 3 | 35 | 110 | 175 |
| VS-12CDU06-M3/I | 12 | 600 | 0.89 | 6 | 5 | 45 | 200 | 175 |
| VS-12CDU06HM3/I | 12 | 600 | 0.89 | 6 | 5 | 45 | 200 | 175 |
| VS-16CDU06-M3/I | 16 | 600 | 0.94 | 8 | 5 | 45 | 200 | 175 |
| VS-16CDU06HM3/I | 16 | 600 | 0.94 | 8 | 5 | 45 | 200 | 175 |
| VS-16EDU06-M3/I | 16 | 600 | 0.91 | 16 | 15 | 55 | 160 | 175 |
| VS-16EDU06HM3/I | 16 | 600 | 0.91 | 16 | 15 | 55 | 160 | 175 |
| VS-30CDU06-M3/I | 30 | 600 | 0.9 | 15 | 15 | 55 | 300 | 175 |
| VS-30CDU06HM3/I | 30 | 600 | 0.9 | 15 | 15 | 55 | 300 | 175 |



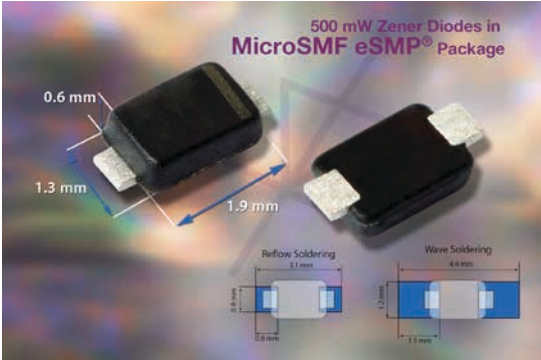
DIODES

MicroSMF (DO-219AC) Package

PLZ Series 500 mW Zener Diodes in New Low Profile MicroSMF (DO-219AC) eSMP® Series Package

Features

- New MicroSMF package (JEDEC registration: DO-219AC)
- SOD-323FL package size
- Cu wire bonded
- 500 mW power dissipation
- Excellent thermal characteristics: RthJA 130 K/W
- Very tight Zener voltage tolerances: ± 2.5 % in six inch Planar technology
- Surge current and ESD rated
- Excellent stability, low leakage, and low noise current
- RoHS-compliant, halogen-free, and Vishay Green
- Symmetrical leads
- Wave and reflow solderable
- Visual solder quality inspection possible (no x-ray needed)
- Whisker Level 2 qualified according to JESD 201
- AEC-Q101 qualified



eSMP Series – MicroSMF (DO-219AC)

| Device | T _J Max | V _F @ 0.01 A | P _{tot} | V _Z |
|----------------------------|--------------------|-------------------------|------------------|----------------|
| | (°C) | (V) | (W) | (V) |
| PLZ Series | 150 | 0.9 | 0.5 | 2.0 to 39 |



Diodes in SMF (DO-219AB) Package: Improved Performance in a Smaller Footprint

Introduction

Vishay provides innovative SMD solutions in a wide range of new devices in the SMF (DO-219AB) package. The SMF package meets the demand for smaller and thinner diodes that enable small and light portable products, such as cellular phones, notebook PCs, and portable consumer products, as well as space-constrained automotive modules. With its exceptionally low height profile of 0.98 mm, the SMF package reduces space requirements and improves circuit board density. Vishay Semiconductors diode products offered in the SMF package address all industry segments and include switching, fast switching, ultrafast switching, Schottky diodes, TVS and ESD protection, zener diodes, and rectifiers.



Features

- SOD-123 footpad size
- 0.98 mm package height
- 0.8 W power dissipation
- Broad product range
- Excellent stability
- Best in class reliability
- Flat terminal allows stable mounting on PCB
- High reliability due to planar structure of the die
- High surge current capability due to soldered construction
- High power rating despite small package size
- Ultra low stress epoxy molding compound
- AEC-Q101 qualified
- Reflow and wave solderable
- Symmetrical leads allow visual inspection after soldering
- Reverse voltage up to 1000 V
- Halogen-free versions available
- Package dimensions are common industry standard

Applications

- Fast and superfast diodes
 - Portable products
 - Reverse current protection
 - DC/DC converters
 - Lighting
- General purpose and rectifiers
 - Rectification
 - Reverse polarity protection
 - Free wheeling
 - Automotive
- Zener, TVS, and ESD protection diodes
 - Voltage stabilization
 - Gate protection for MOSFETs
 - ESD protection
 - Lighting



**eSMP® Series —
SMF
(DO-219AB)**

Patented





DIODES

SMF (DO-219AB) Package

ESD Protection Diodes

| Device | T _J Max | V _F | P _{PPM} @ 10/1000 μs | P _{PPM} @ 8/20 μs | V _(BR) | ESD Protection Air / Contact |
|---|--------------------|----------------|-------------------------------|----------------------------|-------------------|------------------------------|
| | (°C) | (V) | (W) | (W) | (V) | (kV) |
| VTVS5V0ASMF to VTVS63GSMF | 175 | 1.8 @ 50 A | 400 | – | 6.4 to 78.2 | 30/30 |
| SMF5V0A to SMF85A | 175 | 2.5 @ 50 A | 200 | 1000 | 6.4 to 64.4 | 30/30 |
| BZD27C Series | 175 | 1.2 @ 0.2 A | 150 | – | 7.0 to 188 | 30/8 |
| BZD27B Series | 175 | 1.2 @ 0.2 A | 150 | – | 7.35 to 196 | 30/8 |

Zener Diodes

| Device | T _J Max | V _F @ 0.2 A | P _{tot} | V _z |
|---|--------------------|------------------------|------------------|----------------|
| | (°C) | (V) | (W) | (V) |
| BZD27C3V6P - BZD27C200P | 175 | 1.2 | 0.8 | 3.6 to 200 |
| BZD27B3V6P - BZD27B200P | 175 | 1.2 | 0.8 | 3.6 to 200 |

Schottky Diodes

| Device | T _J Max | I _{FSM} | I _{F(AV)} | V _{RRM} | V _F @ 0.5 A | V _F @ 1.1 A | I _R @ 25 °C | I _R @ 100 °C |
|----------------------|--------------------|------------------|--------------------|------------------|------------------------|------------------------|------------------------|-------------------------|
| | (°C) | (A) | (A) | (V) | (V) | (V) | (μA) | (mA) |
| SL02 | 125 | 40 | 1.1 | 20 | 0.36 | 0.42 | 250 | 8 |
| SL03 | 125 | 40 | 1.1 | 30 | 0.395 | 0.45 | 130 | 6 |
| SL04 | 175 | 40 | 1.1 | 40 | 0.41 | 0.48 | 20 | 2.6 |

Schottky Rectifiers

| Device | T _J Max | I _{FSM} | I _{F(AV)} | V _{RRM} | Max V _F @ I _F | I _R @ 25 °C |
|-------------------------|--------------------|------------------|--------------------|------------------|-------------------------------------|------------------------|
| | (°C) | (A) | (A) | (V) | | (μA) |
| SS1F4 | 150 | 40 | 1 | 40 | 0.52 | 150 |
| SS1FH10 | 175 | 40 | 1 | 100 | 0.80 | 5 |
| SS1FH6 | 175 | 40 | 1 | 60 | 0.70 | 3 |
| SS1FL3 | 150 | 40 | 1 | 30 | 0.48 | 200 |
| SS1FL4 | 150 | 40 | 1 | 40 | 0.5 | 200 |
| SS1FN6 | 150 | 40 | 1 | 60 | 0.53 | 800 |
| SS2FH10 | 175 | 50 | 2 | 100 | 0.86 | 5 |
| SS2FH6 | 175 | 40 | 2 | 60 | 0.78 | 3 |
| SS2FL3 | 150 | 50 | 2 | 30 | 0.54 | 200 |
| SS2FL4 | 150 | 50 | 2 | 40 | 0.58 | 220 |
| SS2FN6 | 150 | 50 | 2 | 60 | 0.6 | 900 |



DIODES

SMF (DO-219AB) Package

Standard Rectifiers

| Device | T _J Max | I _{FSM} | I _{F(AV)} | V _{RRM} | Max V _F @ I _F | I _R @ 25 °C | I _R @ 125 °C | t _r |
|------------------------------------|--------------------|------------------|--------------------|------------------|-------------------------------------|------------------------|-------------------------|----------------|
| | (°C) | (A) | (A) | (V) | | (μA) | (μA) | (μs) |
| SE10FD thru SE10FJ | 175 | 25 | 1 | 200 - 600 | 1.05 | 5 | 50 | 780 |
| SE15FD thru SE15FJ | 175 | 30 | 1.5 | 200 - 600 | 1.05 | 5 | 50 | 900 |
| SE20FD thru SE20FJ | 175 | 35 | 2 | 200 - 600 | 1.10 | 5 | 100 | 920 |

Switching Diodes

| Device | T _J Max | I _{FSM} | I _{F(AV)} | V _{RRM} | V _F @ 1.0 A | I _R @ 25 °C | I _R @ 125 °C | t _r |
|----------------------|--------------------|------------------|--------------------|------------------|------------------------|------------------------|-------------------------|----------------|
| | (°C) | (A) | (A) | (V) | (V) | (μA) | (μA) | (μs) |
| S07B | 175 | 25 | 1.5 | 100 | 1.1 | 10 | 50 | 1.8 |
| S07D | 175 | 25 | 1.5 | 200 | 1.1 | 10 | 50 | 1.8 |
| S07G | 175 | 25 | 1.5 | 400 | 1.1 | 10 | 50 | 1.8 |
| S07J | 175 | 25 | 1.5 | 600 | 1.1 | 10 | 50 | 1.8 |
| S07M | 175 | 25 | 1.5 | 1000 | 1.1 | 10 | 50 | 1.8 |

Fast Switching Diodes

| Device | T _J Max | I _{FSM} | I _{F(AV)} | V _{RRM} | V _F @ 0.7 A | I _R @ 25 °C | I _R @ 125 °C | t _r |
|-----------------------|--------------------|------------------|--------------------|------------------|------------------------|------------------------|-------------------------|----------------|
| | (°C) | (A) | (A) | (V) | (V) | (μA) | (μA) | (ns) |
| RS07B | 150 | 30 | 1.4 | 100 | 1.15 | 10 | 50 | 150 |
| RS07D | 150 | 30 | 1.4 | 200 | 1.15 | 10 | 50 | 150 |
| RS07G | 150 | 30 | 1.4 | 400 | 1.15 | 10 | 50 | 150 |
| RS07J | 150 | 30 | 1.4 | 600 | 1.15 | 10 | 50 | 250 |
| RS07K | 150 | 30 | 1.4 | 800 | 1.3 @ 1 A | 2 | 150 | 300 |

Ultrafast Switching Diodes

| Device | T _J Max | I _{FSM} | I _{F(AV)} | V _{RRM} | V _F @ 1.0 A | I _R @ 25 °C | I _R @ 100 °C | t _r |
|-----------------------|--------------------|------------------|--------------------|------------------|------------------------|------------------------|-------------------------|----------------|
| | (°C) | (A) | (A) | (V) | (V) | (μA) | (μA) | (ns) |
| ES07B | 150 | 30 | 1.2 | 100 | 0.98 | 10 | 50 | 25 |
| ES07D | 150 | 30 | 1.2 | 200 | 0.98 | 10 | 50 | 25 |



DIODES

SMF (DO-219AB) Package

FRED Pt® Ultrafast Recovery Rectifiers

| Device | $I_{F(AV)}$ | V_{RRM} Range | Max V_F @ I_F | | I_R @ V_{RRM} | t_{rr} Typ | I_{FSM} | T_J Max |
|--------------------------------|-------------|-----------------|-------------------|-----|-------------------|--------------|------------|-----------------|
| | (A) | (V) | (V) | (A) | (μ A) | (V) | (μ A) | ($^{\circ}$ C) |
| VS-1EFH01-M3/I | 1 | 100 | 0.74 | 1 | 2 | 25 | 35 | 175 |
| VS-1EFH01HM3/I | 1 | 100 | 0.74 | 1 | 2 | 25 | 35 | 175 |
| VS-1EFH02-M3/I | 1 | 200 | 0.74 | 1 | 2 | 25 | 35 | 175 |
| VS-1EFH02HM3/I | 1 | 200 | 0.74 | 1 | 2 | 25 | 35 | 175 |
| VS-1EFU06-M3/I | 1 | 600 | 0.83 | 1 | 3 | 55 | 30 | 175 |
| VS-1EFU06HM3/I | 1 | 600 | 0.83 | 1 | 3 | 55 | 30 | 175 |
| VS-2EFH01-M3/I | 2 | 100 | 0.75 | 2 | 2 | 25 | 50 | 175 |
| VS-2EFH01HM3/I | 2 | 100 | 0.75 | 2 | 2 | 25 | 50 | 175 |
| VS-2EFH02-M3/I | 2 | 200 | 0.75 | 2 | 2 | 25 | 50 | 175 |
| VS-2EFH02HM3/I | 2 | 200 | 0.75 | 2 | 2 | 25 | 50 | 175 |
| VS-2EFU06-M3/I | 2 | 600 | 0.95 | 2 | 3 | 55 | 30 | 175 |
| VS-2EFU06HM3/I | 2 | 600 | 0.95 | 2 | 3 | 55 | 30 | 175 |

Compatible With Common Industry-Standard Packages

| Package | SMF Mounting Pad Compatibility | SMF Package Height Comparison | SMF Mounting Pad Area Comparison |
|-----------------|--------------------------------|-------------------------------|----------------------------------|
| SMA | - | 120 % | 110 % |
| M1F | Yes | 40 % | 5 % |
| SOD-123W | Yes | 2 % | 5 % |
| SMF Competition | Yes | 0% | 19 % |
| PMDU | Yes | 8% | 17 % |
| SubSMA | Yes | 36 % | 0 % |
| SOD-123FL | Yes | 0 % | 5 % |
| S-Flat | Yes | 0 % | 93 % |
| Mini2-F3-B | Yes | 18 % | 14 % |
| SOD-123F | Yes | 0 % | 5 % |
| SOD-123FA | Yes | 6 % | 1 % |



DIODES

SlimSMA (DO-221AC) Package

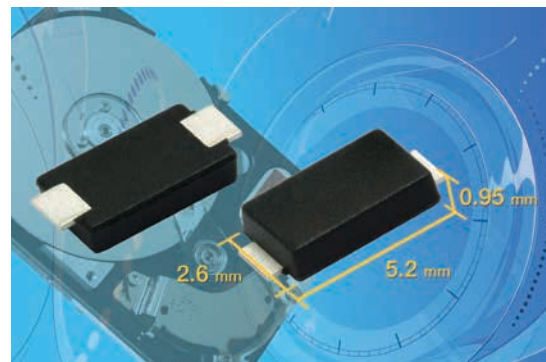
Low Profile SlimSMA (DO-221AC) Package for Rectifiers and Transient Voltage Suppressors (TVS)

Features

- Very low profile - typical height of 0.95 mm
- Ideal for automated placement
- AEC-Q101 qualified
- Halogen-free, RoHS-compliant
- Meet the MSL Level 1 standard, per J-STD-020, LF maximum peak of 260 °C

Applications

- Consumer
- Computer
- Telecommunication
- Industrial
- Automotive



eSMP® Series – SlimSMA (DO-221AC)

TMBS® (Trench MOS Barrier Schottky) Rectifiers

| Device | $I_{F(AV)}$ | V_{RRM} Range | Max V_F @ I_F | | $I_R @ V_{RRM}$ | I_{FSM} | T_J Max |
|---------------------------|-------------|-----------------|-------------------|-----|-----------------|------------|-----------|
| | (A) | (V) | (V) | (A) | (μ A) | (μ A) | (°C) |
| VSSAF3L45 | 3 | 45 | 0.54 | 3.0 | 450 | 80 | 150 |
| VSSAF3M10 | 3 | 100 | 0.72 | 3.0 | 200 | 80 | 175 |
| VSSAF3M6 | 3 | 60 | 0.62 | 3.0 | 300 | 80 | 175 |
| VSSAF3N50 | 3 | 50 | 0.54 | 3.0 | 1000 | 80 | 150 |
| VSSAF510 | 5 | 100 | 0.75 | 5.0 | 500 | 100 | 150 |
| VSSAF512 | 5 | 120 | 0.88 | 5.0 | 400 | 100 | 150 |
| VSSAF515 | 5 | 150 | 1.1 | 5.0 | 200 | 100 | 150 |
| VSSAF56 | 5 | 60 | 0.62 | 5.0 | 400 | 100 | 150 |
| VSSAF5L45 | 5 | 45 | 0.56 | 5.0 | 650 | 100 | 150 |
| VSSAF5M10 | 5 | 100 | 0.79 | 5.0 | 400 | 100 | 175 |
| VSSAF5M12 | 5 | 120 | 0.89 | 5.0 | 350 | 100 | 175 |
| VSSAF5M15 | 5 | 150 | 1.15 | 5.0 | 180 | 100 | 175 |
| VSSAF5M6 | 5 | 60 | 0.66 | 5.0 | 350 | 100 | 175 |
| VSSAF5N50 | 5 | 50 | 0.56 | 5.0 | 1400 | 1000 | 150 |



DIODES

SlimSMA (DO-221AC) Package

Standard Recovery Rectifiers

| Device | $I_{F(AV)}$ | V_{RRM} Range | Max V_F @ I_F | | I_R @ V_{RRM} | t_{rr} Typ | I_{FSM} | T_J Max |
|--------------------------------------|-------------|-----------------|-------------------|-----|-------------------|--------------|------------|-----------------|
| | (A) | (V) | (V) | (A) | (μ A) | (ns) | (μ A) | ($^{\circ}$ C) |
| S1AFG thru S1AFM | 1.0 | 400 - 1000 | 1.1 | 1.0 | 5 | 1470 | 35 | 150 |
| SE20AFB thru SE20AFJ | 2.0 | 100 - 600 | 1.1 | 2.0 | 5 | 1200 | 35 | 175 |
| SE30AFB thru SE30AFJ | 3.0 | 100 - 600 | 1.1 | 2.0 | 10 | 1500 | 40 | 175 |

FRED Pt[®] Ultrafast Recovery Rectifiers

| Device | $I_{F(AV)}$ | V_{RRM} Range | Max V_F @ I_F | | I_R @ V_{RRM} | t_{rr} Typ | I_{FSM} | T_J Max |
|------------------------------|-------------|-----------------|-------------------|-----|-------------------|--------------|------------|-----------------|
| | (A) | (V) | (V) | (A) | (μ A) | (ns) | (μ A) | ($^{\circ}$ C) |
| VS-2EJH01-M3 | 2 | 100 | 0.72 | 2 | 2 | 25 | 65 | 175 |
| VS-2EJH01HM3 | 2 | 100 | 0.72 | 2 | 2 | 25 | 65 | 175 |
| VS-2EJH02-M3 | 2 | 200 | 0.72 | 2 | 2 | 25 | 65 | 175 |
| VS-2EJH02HM3 | 2 | 200 | 0.72 | 2 | 2 | 25 | 65 | 175 |
| VS-3EJH01-M3 | 3 | 100 | 0.74 | 3 | 2 | 30 | 85 | 175 |
| VS-3EJH01HM3 | 3 | 100 | 0.74 | 3 | 2 | 30 | 85 | 175 |
| VS-3EJH02-M3 | 3 | 200 | 0.74 | 3 | 2 | 30 | 85 | 175 |
| VS-3EJH02HM3 | 3 | 200 | 0.74 | 3 | 2 | 30 | 85 | 175 |
| VS-3EJU06-M3 | 3 | 600 | 1.35 | 3 | 3 | 45 | 50 | 175 |
| VS-3EJU06HM3 | 3 | 600 | 1.35 | 3 | 3 | 45 | 50 | 175 |

PAR[®] TVS

| Device | P_{PPM} (10 x 1000 μ s) | $V_{(BR)}$ Range | V_{WM} Range | T_J Max |
|---------------------------------------|-------------------------------|------------------|----------------|-----------------|
| | (A) | (V) | (μ A) | ($^{\circ}$ C) |
| TA6F6.8A thru TA6F51A | 600 | 6.45 - 53.6 | 5.8 - 43.6 | 185 |

TransZorb[®] TVS

| Device | P_{PPM} (10 x 1000 μ s) | $V_{(BR)}$ Range | V_{WM} Range | T_J Max |
|---|-------------------------------|------------------|----------------|-----------------|
| | (A) | (V) | (μ A) | ($^{\circ}$ C) |
| SMA6F5.0A thru SMA6F20A | 600 | 6.4 - 24.5 | 5.0 - 20 | 175 |



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Diodes

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