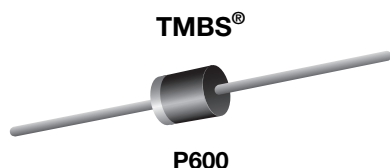


# Photovoltaic Solar Cell Protection Schottky Rectifier

Ultra Low  $V_F = 0.26\text{ V}$  at  $I_F = 5\text{ A}$



## FEATURES

- Trench MOS Schottky technology
- Low forward voltage drop, low power losses
- High efficiency operation
- High forward surge capability
- ESD capability
- Solder dip 275 °C max. 10 s, per JESD 22-B106
- $T_J$  200 °C max. in solar by-pass mode application
- Material categorization: For definitions of compliance please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)



**RoHS**  
COMPLIANT  
HALOGEN  
**FREE**

## PRIMARY CHARACTERISTICS

|                                 |            |
|---------------------------------|------------|
| $I_{F(DC)}$                     | 20 A       |
| $V_{RRM}$                       | 45 V       |
| $I_{FSM}$                       | 250 A      |
| $V_F$ at $I_F = 20\text{ A}$    | 0.40 V     |
| $T_{OP}$ max. (AC mode)         | 150 °C     |
| $T_J$ max. (DC forward current) | 200 °C     |
| Package                         | P600       |
| Diode variation                 | Single die |

## TYPICAL APPLICATIONS

For use in solar cell junction box as a bypass diode for protection, using DC forward current without reverse bias.

## MECHANICAL DATA

**Case:** P600

Molding compound meets UL 94 V-0 flammability rating  
Base P/N-M3 - halogen-free, RoHS-compliant, and commercial grade

**Terminals:** Matte tin plated leads, solderable per J-STD-002 and JESD 22-B102

M3 suffix meets JESD 201 class 1A whisker test

**Polarity:** Color band denotes cathode end

## MAXIMUM RATINGS ( $T_A = 25\text{ °C}$ unless otherwise noted)

| PARAMETER                                                                            | SYMBOL            | VSB20L45    | UNIT |
|--------------------------------------------------------------------------------------|-------------------|-------------|------|
| Device marking code                                                                  |                   | V20L45      |      |
| Maximum repetitive peak reverse voltage                                              | $V_{RRM}$         | 45          | V    |
| Maximum average forward rectified current (fig. 1)                                   | $I_{F(AV)}^{(1)}$ | 20          | A    |
|                                                                                      | $I_{F(AV)}^{(2)}$ | 7.5         |      |
| Peak forward surge current 8.3 ms single half sine-wave superimposed on rated load   | $I_{FSM}$         | 250         |      |
| Operating junction temperature range (AC mode)                                       | $T_{OP}$          | -40 to +150 | °C   |
| Storage temperature range                                                            | $T_{STG}$         | -40 to +175 |      |
| Junction temperature in DC forward current without reverse bias, $t \leq 1\text{ h}$ | $T_J^{(3)}$       | $\leq 200$  |      |

## Notes

(1) With heatsink

(2) Without heatsink, free air

(3) Meets the requirements of IEC 61215 ed. 2 bypass diode thermal test



| ELECTRICAL CHARACTERISTICS (T <sub>A</sub> = 25 °C unless otherwise noted) |                        |                         |                               |      |      |      |
|----------------------------------------------------------------------------|------------------------|-------------------------|-------------------------------|------|------|------|
| PARAMETER                                                                  | TEST CONDITIONS        |                         | SYMBOL                        | TYP. | MAX. | UNIT |
| Instantaneous forward voltage                                              | I <sub>F</sub> = 5.0 A | T <sub>A</sub> = 25 °C  | V <sub>F</sub> <sup>(1)</sup> | 0.39 | -    | V    |
|                                                                            | I <sub>F</sub> = 10 A  |                         |                               | 0.42 | -    |      |
|                                                                            | I <sub>F</sub> = 20 A  |                         |                               | 0.48 | 0.56 |      |
|                                                                            | I <sub>F</sub> = 5.0 A | T <sub>A</sub> = 125 °C |                               | 0.26 | -    |      |
|                                                                            | I <sub>F</sub> = 10 A  |                         |                               | 0.32 | -    |      |
|                                                                            | I <sub>F</sub> = 20 A  |                         |                               | 0.40 | 0.48 |      |
| Reverse current                                                            | V <sub>R</sub> = 45 V  | T <sub>A</sub> = 25 °C  | I <sub>R</sub> <sup>(2)</sup> | -    | 5.0  | mA   |
|                                                                            |                        | T <sub>A</sub> = 125 °C |                               | 30   | 65   |      |
| Typical junction capacitance                                               | 4.0 V, 1 MHz           |                         | C <sub>J</sub>                | 2470 | -    | pF   |

**Notes**(1) Pulse test: 300  $\mu\text{s}$  pulse width, 1 % duty cycle

(2) Pulse test: 40 ms pulse width

| THERMAL CHARACTERISTICS ( $T_A = 25\text{ }^{\circ}\text{C}$ unless otherwise noted) |                       |          |                      |
|--------------------------------------------------------------------------------------|-----------------------|----------|----------------------|
| PARAMETER                                                                            | SYMBOL                | VSB20L45 | UNIT                 |
| Thermal resistance                                                                   | $R_{\theta JA}^{(1)}$ | 55       | $^{\circ}\text{C/W}$ |
|                                                                                      | $R_{\theta JL}^{(1)}$ | 3.5      |                      |
| Typical thermal resistance                                                           | $R_{\theta JL}^{(2)}$ | 2.5      | $^{\circ}\text{C/W}$ |

**Notes**

(1) Without heatsink, free air; units mounted on PCB with 2 mm x 2 mm copper pad areas at 9.5 mm lead length

(2) Leads clipped at 3 mm lead length from plastic body on 7.0 cm x 2.2 cm x 1.9 cm x 2 heatsink

| IMMUNITY TO ELECTRICAL STATIC DISCHARGE TO THE FOLLOWING STANDARDS<br>( $T_A = 25\text{ }^{\circ}\text{C}$ unless otherwise noted) |                                   |                                               |        |       |         |
|------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------|-----------------------------------------------|--------|-------|---------|
| STANDARD                                                                                                                           | TEST TYPE                         | TEST CONDITIONS                               | SYMBOL | CLASS | VALUE   |
| JESD22-A114                                                                                                                        | Human body model (contact mode)   | $C = 150\text{ pF}$ , $R = 1.5\text{ }\Omega$ | $V_C$  | 3B    | > 8 kV  |
| JESD22-A115                                                                                                                        | Machine model (contact mode)      | $C = 200\text{ pF}$ , $R = 0\text{ }\Omega$   |        | C     | > 400 V |
| IEC 61000-4-2 <sup>(2)</sup>                                                                                                       | Air discharge mode <sup>(1)</sup> | $C = 150\text{ pF}$ , $R = 330\text{ }\Omega$ |        | 4     | > 15 kV |

**Notes**

(1) Immunity to IEC 61000-4-2 air discharge mode has a typical performance &gt; 25 kV

(2) System ESD standard

| ORDERING INFORMATION (Example) |                 |                        |               |                                  |
|--------------------------------|-----------------|------------------------|---------------|----------------------------------|
| PREFERRED P/N                  | UNIT WEIGHT (g) | PREFERRED PACKAGE CODE | BASE QUANTITY | DELIVERY MODE                    |
| VSB20L45-M3/54                 | 1.88            | 54                     | 800           | 13" diameter paper tape and reel |
| VSB20L45-M3/73                 | 1.88            | 73                     | 300           | Ammo pack packaging              |

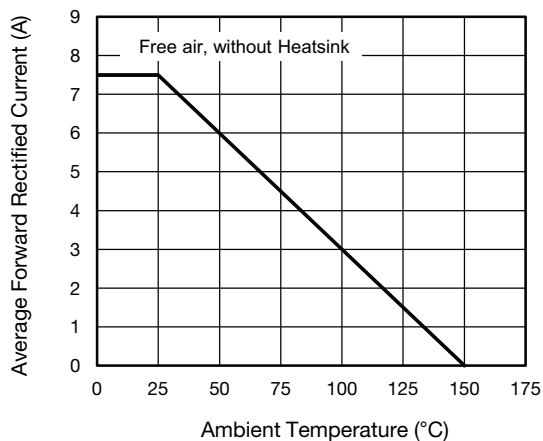
**RATINGS AND CHARACTERISTICS CURVES** ( $T_A = 25\text{ }^{\circ}\text{C}$  unless otherwise noted)


Fig. 1 - Forward Current Derating Curve

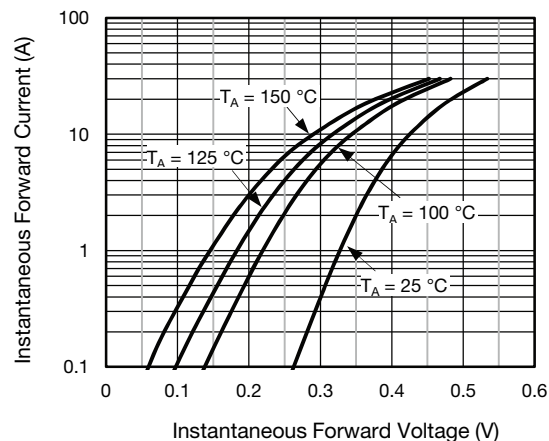


Fig. 4 - Typical Instantaneous Forward Characteristics

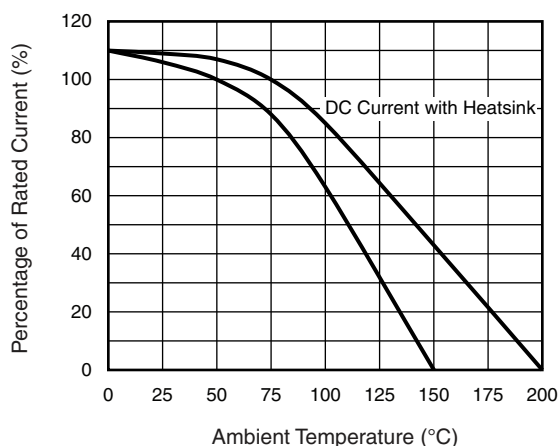


Fig. 2 - Rated Forward Current vs. Ambient Temperature

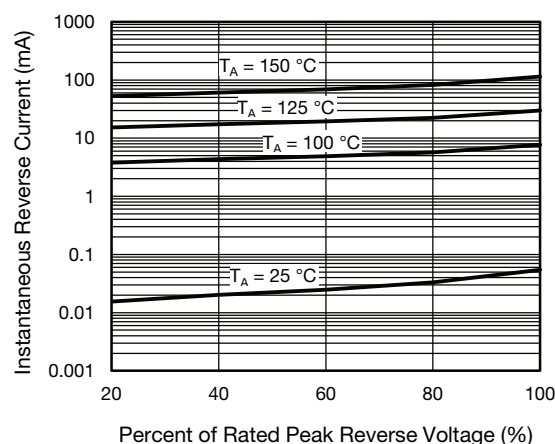


Fig. 5 - Typical Reverse Leakage Characteristics

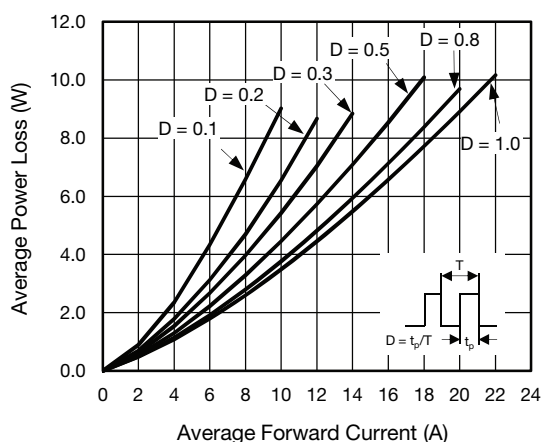


Fig. 3 - Forward Power Loss Characteristics

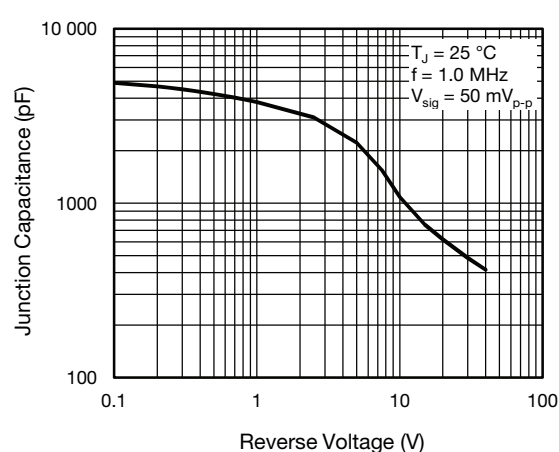
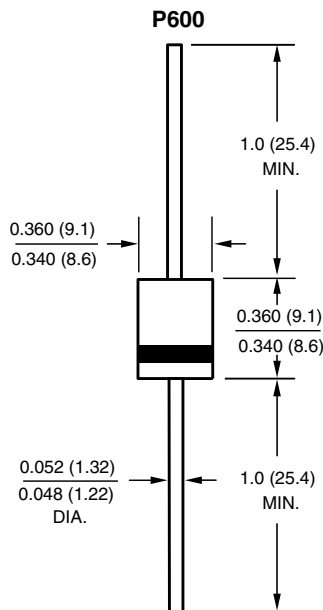


Fig. 6 - Typical Junction Capacitance



**PACKAGE OUTLINE DIMENSIONS** in inches (millimeters)





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