

# 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 μs pulse width, 1 % duty cycle  
(2) Pulse test: 40 ms pulse width

THERMAL CHARACTERISTICS (T <sub>A</sub> = 25 °C unless otherwise noted)			
PARAMETER	SYMBOL	VSB20L45	UNIT
Thermal resistance	R <sub>θJA</sub> <sup>(1)</sup>	55	°C/W
	R <sub>θJL</sub> <sup>(1)</sup>	3.5	
Typical thermal resistance	R <sub>θJL</sub> <sup>(2)</sup>	2.5	°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 (T <sub>A</sub> = 25 °C unless otherwise noted)					
STANDARD	TEST TYPE	TEST CONDITIONS	SYMBOL	CLASS	VALUE
JESD22-A114	Human body model (contact mode)	C = 150 pF, R = 1.5 Ω	V <sub>C</sub>	3B	> 8 kV
JESD22-A115	Machine model (contact mode)	C = 200 pF, R = 0 Ω		C	> 400 V
IEC 61000-4-2 <sup>(2)</sup>	Air discharge mode <sup>(1)</sup>	C = 150 pF, R = 330 Ω		4	> 15 kV

**Notes**

- (1) Immunity to IEC 61000-4-2 air discharge mode has a typical performance > 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)

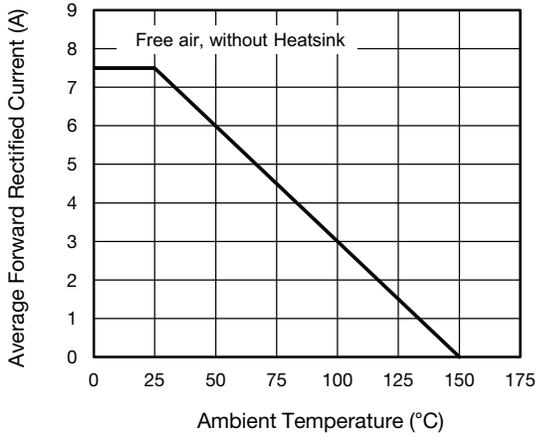


Fig. 1 - Forward Current Derating Curve

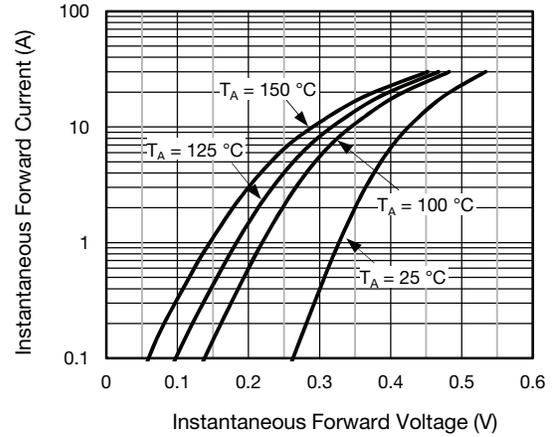


Fig. 4 - Typical Instantaneous Forward Characteristics

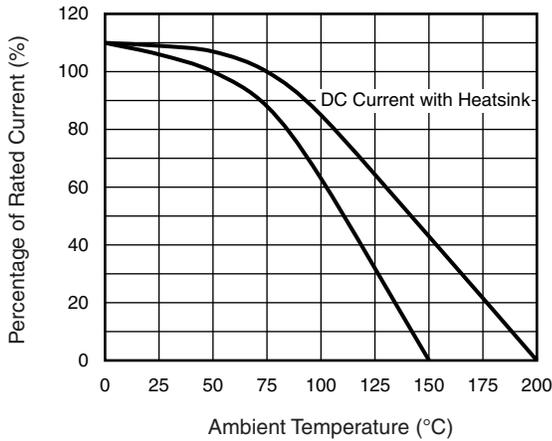


Fig. 2 - Rated Forward Current vs. Ambient Temperature

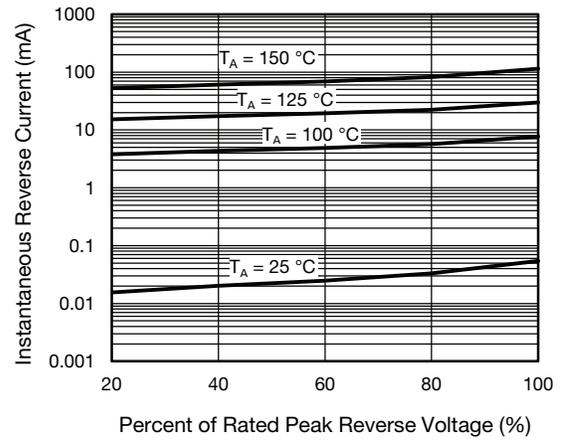


Fig. 5 - Typical Reverse Leakage Characteristics

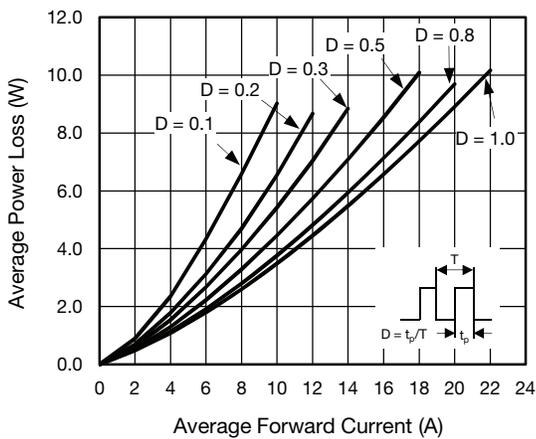


Fig. 3 - Forward Power Loss Characteristics

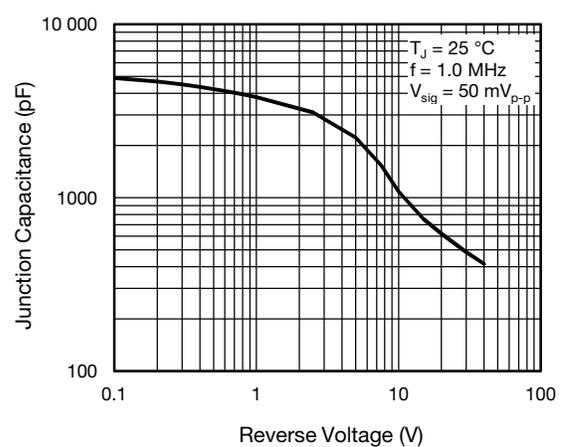
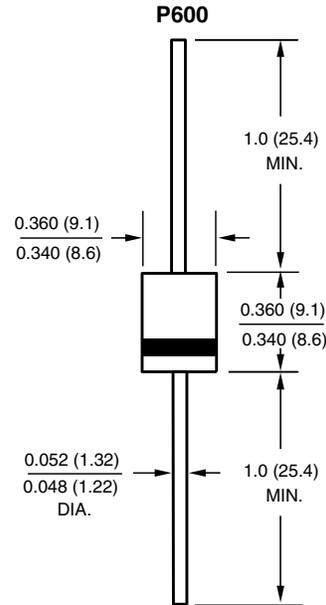


Fig. 6 - Typical Junction Capacitance



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





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