

# Photovoltaic Solar Cell Protection Schottky Rectifier

Ultra Low  $V_F$  = 0.26 V at  $I_F$  = 5 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)



## PRIMARY CHARACTERISTICS

$I_{F(DC)}$	20 A
$V_{RRM}$	45 V
$I_{FSM}$	250 A
$V_F$ at $I_F$ = 20 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 °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, $t \leq 1$ h	$T_J$ <sup>(3)</sup>	≤ 200	

### Notes

(1) With heatsink

(2) Without heatsink, free air

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

<b>ELECTRICAL CHARACTERISTICS</b> ( $T_A = 25^\circ\text{C}$ unless otherwise noted)							
PARAMETER	TEST CONDITIONS		SYMBOL	TYP.	MAX.	UNIT	
Instantaneous forward voltage	$I_F = 5.0 \text{ A}$	$T_A = 25^\circ\text{C}$	$V_F$ <sup>(1)</sup>	0.39	-	V	
	$I_F = 10 \text{ A}$			0.42	-		
	$I_F = 20 \text{ A}$			0.48	0.56		
	$I_F = 5.0 \text{ A}$	$T_A = 125^\circ\text{C}$		0.26	-		
	$I_F = 10 \text{ A}$			0.32	-		
	$I_F = 20 \text{ A}$			0.40	0.48		
Reverse current	$V_R = 45 \text{ V}$	$T_A = 25^\circ\text{C}$	$I_R$ <sup>(2)</sup>	-	5.0	mA	
		$T_A = 125^\circ\text{C}$		30	65		
Typical junction capacitance	4.0 V, 1 MHz		$C_J$	2470	-	pF	

**Notes**

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

(2) Pulse test: 40 ms pulse width

<b>THERMAL CHARACTERISTICS</b> ( $T_A = 25^\circ\text{C}$ unless otherwise noted)					
PARAMETER	SYMBOL	VSB20L45			UNIT
Thermal resistance	$R_{\theta JA}$ <sup>(1)</sup>	55			°C/W
	$R_{\theta JL}$ <sup>(1)</sup>	3.5			
Typical thermal resistance	$R_{\theta JL}$ <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

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

**Notes**

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

(2) System ESD standard

<b>ORDERING INFORMATION</b> (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	

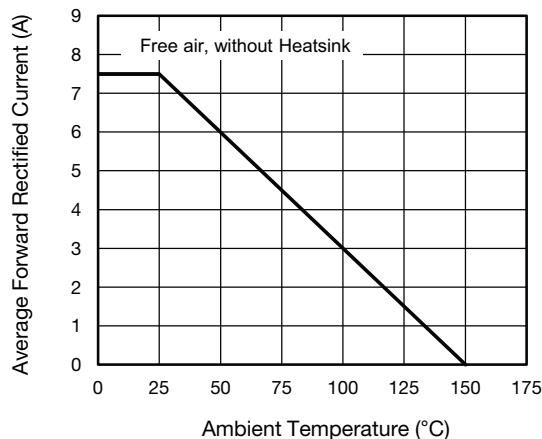
**RATINGS AND CHARACTERISTICS CURVES** ( $T_A = 25^\circ\text{C}$  unless otherwise noted)


Fig. 1 - Forward Current Derating Curve

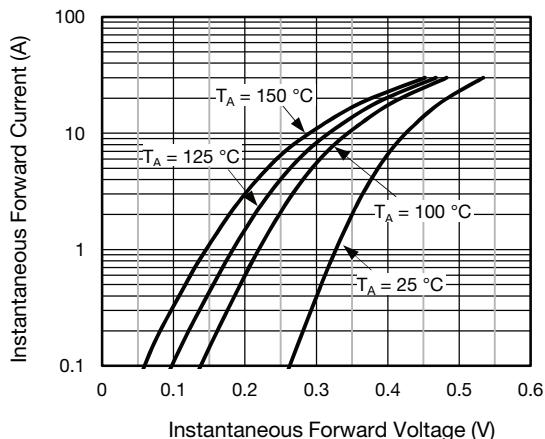


Fig. 4 - Typical Instantaneous Forward Characteristics

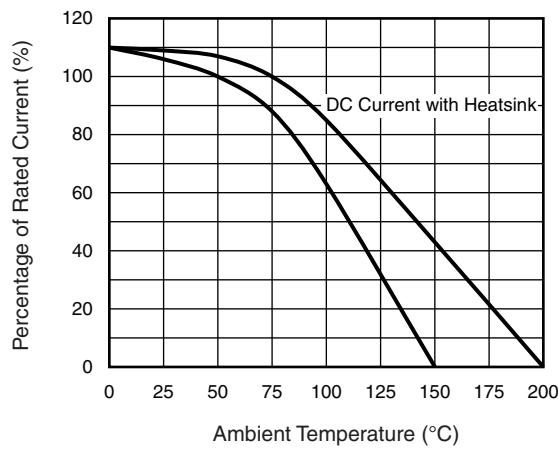


Fig. 2 - Rated Forward Current vs. Ambient Temperature

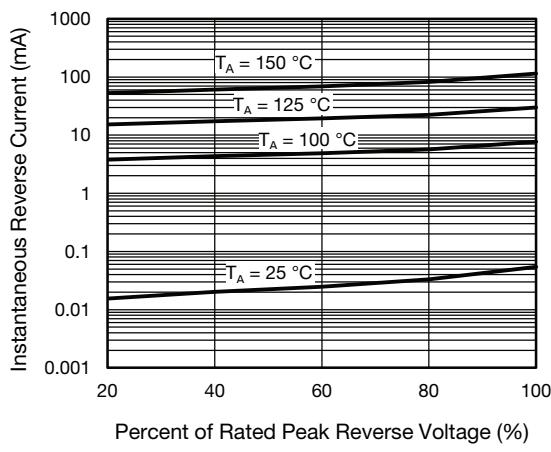


Fig. 5 - Typical Reverse Leakage Characteristics

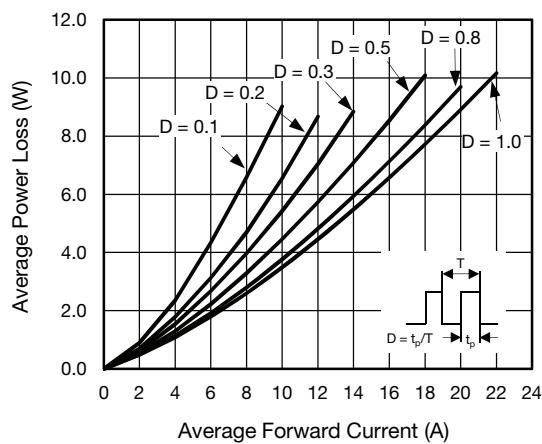


Fig. 3 - Forward Power Loss Characteristics

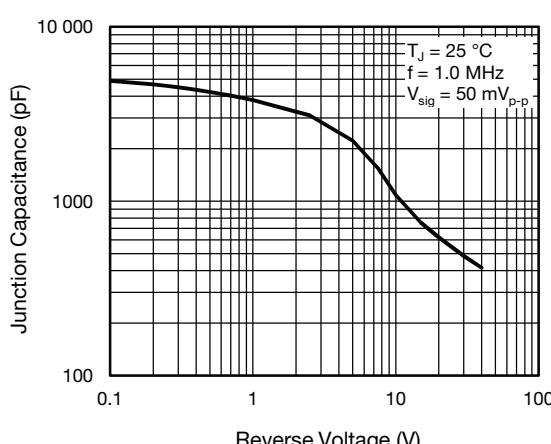
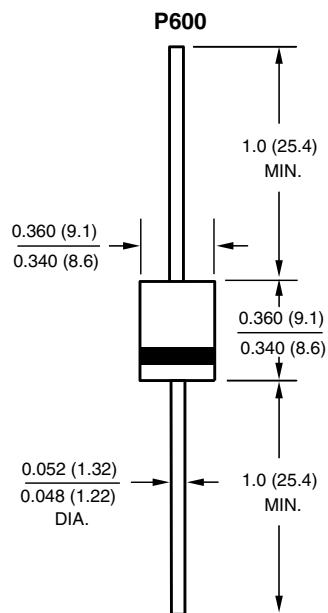


Fig. 6 - Typical Junction Capacitance

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

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