

# Surface-Mount TMBS® (Trench MOS Barrier Schottky) Rectifier



## FEATURES

- Low profile package - typical height of 0.88 mm
- Leadless DFN package with side-wettable flanks suitable for customer AOI (Automatic Optical Inspection)
- Low power losses, high efficiency
- Low forward voltage drop
- Meets MSL level 1, per J-STD-020, LF maximum peak of 260 °C
- AEC-Q101 qualified available - Automotive ordering code; base P/NHM3
- Material categorization: for definitions of compliance please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)

**AUTOMOTIVE  
GRADE**  
Available



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

## LINKS TO ADDITIONAL RESOURCES



PRIMARY CHARACTERISTICS	
$I_{F(AV)}$	9 A
$V_{RRM}$	200 V
$I_{FSM}$	150 A
$V_F$ at $I_F = 4.5$ A ( $T_J = 125$ °C)	0.60 V
$T_J$ max.	175 °C
Package	DFN33A
Circuit configuration	Single

## TYPICAL APPLICATIONS

For use in low voltage, high frequency inverters, freewheeling, DC/DC converters, and polarity protection applications.

## MECHANICAL DATA

**Case:** DFN33A

Molding compound meets UL 94 V-0 flammability rating

Base P/N-M3 - halogen-free, RoHS-compliant, and commercial grade

Base P/NHM3 - halogen-free, RoHS-compliant, and AEC-Q101 qualified

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

M3 and HM3 suffix meet JESD 201 class 2 whisker test

MAXIMUM RATINGS ( $T_A = 25$ °C unless otherwise noted)			
PARAMETER	SYMBOL	V9N3202	UNIT
Device marking code		V922	
Maximum repetitive peak reverse voltage	$V_{RRM}$	200	V
Maximum average forward rectified current (fig. 1)	$I_{F(AV)}^{(1)}$	9	A
	$I_{F(AV)}^{(2)}$	2.2	A
Peak forward surge current 8.3 ms single half sine-wave superimposed on rated load	$I_{FSM}$	150	A
Operating junction temperature range	$T_J^{(3)}$	-40 to +175	°C
Storage temperature range	$T_{STG}$	-55 to +175	°C

## Notes

(1) With infinite heatsink

(2) Free air, mounted on FR4 PCB, 2 oz., standard footprint

(3) The heat generated must be less than the thermal conductivity from junction-to-ambient:  $dP_D/dT_J < 1/R_{\theta JA}$



ELECTRICAL CHARACTERISTICS (T <sub>J</sub> = 25 °C unless otherwise noted)						
PARAMETER	TEST CONDITIONS		SYMBOL	TYP.	MAX.	UNIT
Instantaneous forward voltage	I <sub>F</sub> = 4.5 A	T <sub>J</sub> = 25 °C	V <sub>F</sub> <sup>(1)</sup>	0.74	-	V
	I <sub>F</sub> = 9 A			0.80	0.84	
	I <sub>F</sub> = 4.5 A	T <sub>J</sub> = 125 °C		0.60	-	
	I <sub>F</sub> = 9 A			0.67	0.71	
Reverse current	V <sub>R</sub> = 160 V	T <sub>J</sub> = 25 °C	I <sub>R</sub> <sup>(2)</sup>	0.0008	-	mA
		T <sub>J</sub> = 125 °C		0.7	-	
	V <sub>R</sub> = 200 V	T <sub>J</sub> = 25 °C		-	0.1	
		T <sub>J</sub> = 125 °C		1.5	7	
Typical junction capacitance	4.0 V, 1 MHz		C <sub>J</sub>	500	-	pF

**Notes**(1) Pulse test: 300  $\mu\text{s}$  pulse width, 1 % duty cycle(2) Pulse test: pulse width  $\leq 5\text{ ms}$ 

THERMAL CHARACTERISTICS ( $T_A = 25\text{ }^{\circ}\text{C}$ unless otherwise specified)				
PARAMETER	SYMBOL	TYP.	MAX.	UNIT
Thermal resistance	$R_{\theta JA}^{(1)(2)}$	118	148	$^{\circ}\text{C/W}$
	$R_{\theta JA}^{(3)}$	-	65	
	$R_{\theta JM}^{(4)}$	2.9	3.63	

**Notes**(1) The heat generated must be less than the thermal conductivity from junction-to-ambient:  $dP_D/dT_J < 1/R_{\theta JA}$ (2) Thermal resistance junction-to-ambient to follow JEDEC<sup>®</sup> 51-2A, device mounted on FR4 PCB, 2 oz., standard footprint

(3) Thermal resistance junction-to-ambient, free air with device mounted on FR4 PCB, 2 oz., 20 mm x 20 mm pad area

(4) Thermal resistance junction-to-mount to follow JEDEC 51-14 transient dual interface test method (TDIM)

**ORDERING INFORMATION TABLE**

Device code

V	9	N3	20	2	H	M3
①	②	③	④	⑤	⑥	⑦

- 1** - Vishay TMBS product
- 2** - Current rating (9 = 9 A)
- 3** - Package type (N3 = DFN33A)
- 4** - Voltage rating (20 = 200 V)
- 5** - TMBS generation option (2 = Gen2)
- 6** - Quality grade (H = AEC-Q101 qualified, otherwise = industry grade)
- 7** - Material / environmental category (M3 = halogen-free, RoHS-compliant, and termination lead (Pb)-free)

ORDERING INFORMATION (Example)				
PREFERRED P/N	UNIT WEIGHT (g)	PREFERRED PACKAGE CODE	BASE QUANTITY	DELIVERY MODE
V9N3202-M3/I	0.031	I	6000	13" diameter plastic tape and reel
V9N3202HM3/I <sup>(1)</sup>	0.031	I	6000	13" diameter plastic tape and reel

**Note**

(1) AEC-Q101 qualified

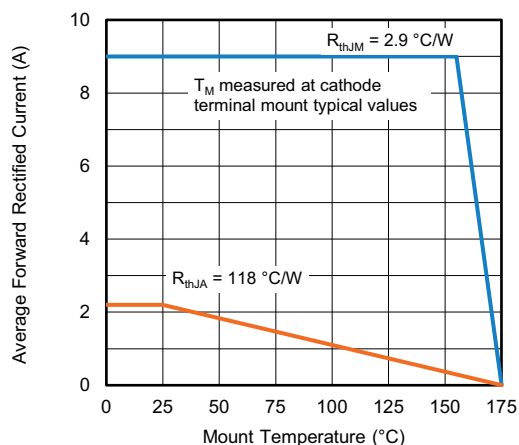
**RATINGS AND CHARACTERISTICS CURVES** ( $T_A = 25\text{ }^{\circ}\text{C}$  unless otherwise noted)


Fig. 1 - Maximum Forward Current Derating Curve

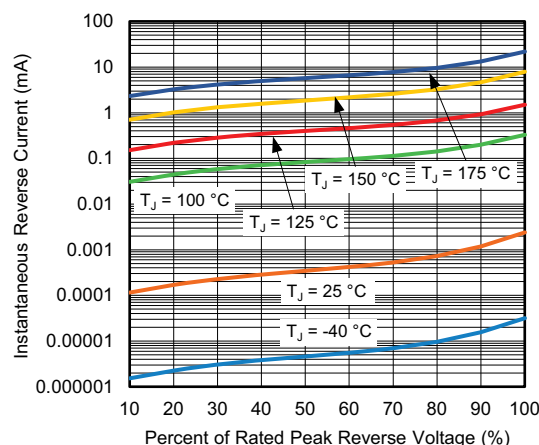


Fig. 4 - Typical Reverse Characteristics

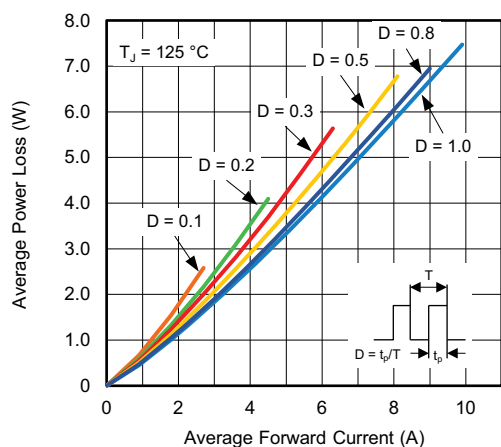


Fig. 2 - Forward Power Loss Characteristics

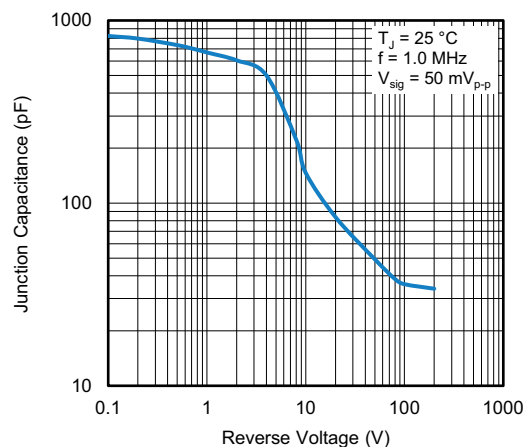


Fig. 5 - Typical Junction Capacitance

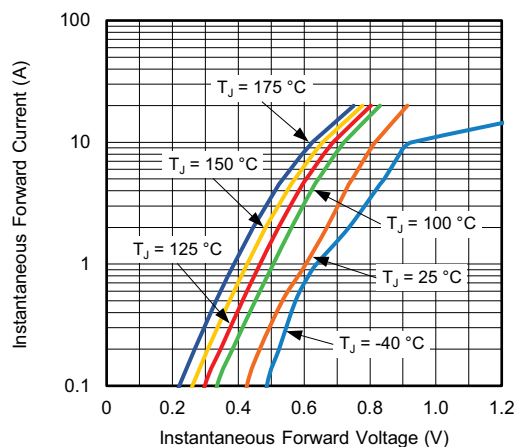


Fig. 3 - Typical Instantaneous Forward Characteristics

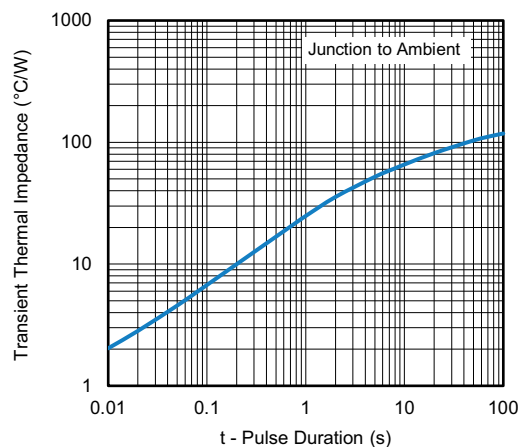


Fig. 6 - Typical Transient Thermal Impedance

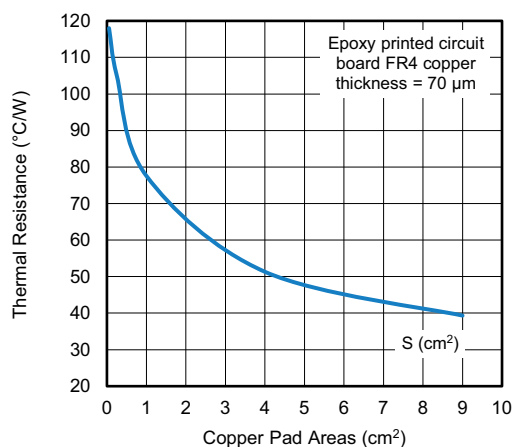


Fig. 7 - Thermal Resistance Junction-to-Ambient vs. Copper Pad Areas

### PACKAGE OUTLINE DIMENSIONS in inches (millimeters)

#### DFN33A





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