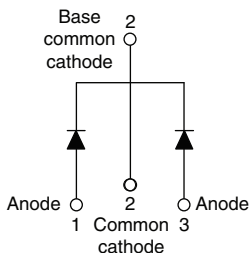


Schottky Rectifier, 2 x 20 A


TO-220AB


FEATURES

- 150 °C T_J operation
- Low forward voltage drop
- High frequency operation
- High purity, high temperature epoxy encapsulation for enhanced mechanical strength and moisture resistance
- Guard ring for enhanced ruggedness and long term reliability
- Compliant to RoHS Directive 2002/95/EC
- Designed and qualified according to JEDEC-JESD47
- Halogen-free according to IEC 61249-2-21 definition (-N3 only)



RoHS
COMPLIANT
HALOGEN
FREE
Available

DESCRIPTION

This center tap Schottky rectifier has been optimized for low reverse leakage at high temperature. The proprietary barrier technology allows for reliable operation up to 150 °C junction temperature. Typical applications are in switching power supplies, converters, freewheeling diodes, and reverse battery protection.

PRODUCT SUMMARY

Package	TO-220AB
$I_{F(AV)}$	2 x 20 A
V_R	45 V
V_F at I_F	0.58 V
I_{RM} max.	95 mA at 125 °C
T_J max.	150 °C
Diode variation	Common cathode
E_{AS}	20 mJ

MAJOR RATINGS AND CHARACTERISTICS

SYMBOL	CHARACTERISTICS	VALUES	UNITS
$I_{F(AV)}$	Rectangular waveform (per device)	40	A
V_{RRM}		45	V
I_{FRM}	$T_C = 118$ °C (per leg)	40	A
I_{FSM}	$t_p = 5$ μ s sine	900	
V_F	20 A_{pk} , $T_J = 125$ °C	0.58	V
T_J	Range	- 65 to 150	°C

VOLTAGE RATINGS

PARAMETER	SYMBOL	VS-MBR4045CTPbF	VS-MBR4045CT-N3	UNITS
Maximum DC reverse voltage	V_R	45	45	V
Maximum working peak reverse voltage	V_{RWM}			

ABSOLUTE MAXIMUM RATINGS

PARAMETER	SYMBOL	TEST CONDITIONS	VALUES	UNITS
Maximum average forward current per leg per device	$I_{F(AV)}$	$T_C = 118$ °C, rated V_R	20 40	A
Peak repetitive forward current per leg	I_{FRM}	Rated V_R , square wave, 20 kHz, $T_C = 118$ °C	40	
Maximum peak one cycle non-repetitive surge current per leg	I_{FSM}	5 μ s sine or 3 μ s rect. pulse	900	
		10 ms sine or 6 ms rect. pulse	210	
Non-repetitive avalanche energy per leg	E_{AS}	$T_J = 25$ °C, $I_{AS} = 3$ A, $L = 4.40$ mH	20	mJ
Repetitive avalanche current per leg	I_{AR}	Current decaying linearly to zero in 1 μ s Frequency limited by T_J maximum $V_A = 1.5 \times V_R$ typical	3	A



ELECTRICAL SPECIFICATIONS						
PARAMETER	SYMBOL	TEST CONDITIONS		VALUES	UNITS	
Maximum forward voltage drop	$V_{FM}^{(1)}$	20 A	$T_J = 25\text{ }^{\circ}\text{C}$	0.60	V	
		40 A		0.78		
		20 A	$T_J = 125\text{ }^{\circ}\text{C}$	0.58		
		40 A		0.75		
Maximum instantaneous reverse current	$I_{RM}^{(1)}$	$T_J = 25\text{ }^{\circ}\text{C}$	Rated DC voltage	1	mA	
		$T_J = 100\text{ }^{\circ}\text{C}$		50		
		$T_J = 125\text{ }^{\circ}\text{C}$		95		
Maximum junction capacitance	C_T	$V_R = 5\text{ }V_{DC}$, (test signal range 100 kHz to 1 MHz) $25\text{ }^{\circ}\text{C}$		900	pF	
Typical series inductance	L_S	Measured from top of terminal to mounting plane		8.0	nH	
Maximum voltage rate of change	dV/dt	Rated V_R		10 000	V/ μ s	

Note(1) Pulse width < 300 μ s, duty cycle < 2 %

THERMAL - MECHANICAL SPECIFICATIONS				
PARAMETER	SYMBOL	TEST CONDITIONS	VALUES	UNITS
Maximum junction temperature range	T _J		- 65 to 150	°C
Maximum storage temperature range	T _{Stg}		- 65 to 175	
Maximum thermal resistance, junction to case per leg	R _{thJC}	DC operation	1.5	°C/W
Typical thermal resistance, case to heatsink	R _{thCS}	Mounting surface, smooth and greased (Only for TO-220)	0.50	
Maximum thermal resistance, junction to ambient	R _{thJA}	DC operation (For D ² PAK and TO-262)	50	
Approximate weight			2	g
			0.07	oz.
Mounting torque	minimum	Non-lubricated threads	6 (5)	kgf · cm (lbf · in)
	maximum		12 (10)	
Marking device		Case style TO-220AB	MBR4045CT	

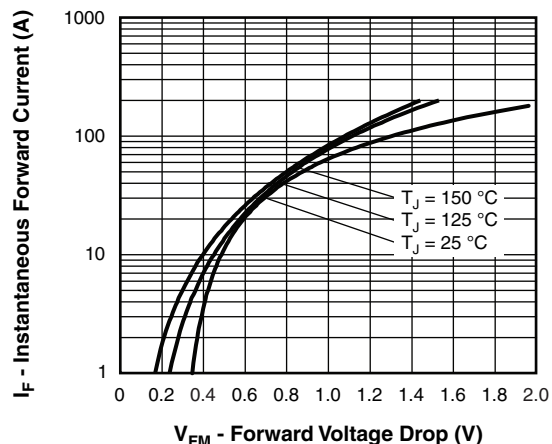


Fig. 1 - Maximum Forward Voltage Drop Characteristics (Per Leg)

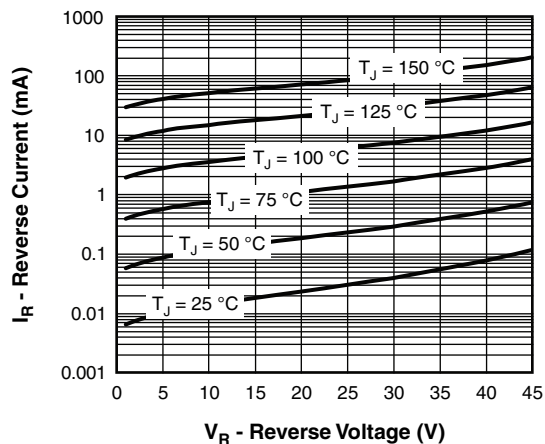


Fig. 2 - Typical Values of Reverse Current vs. Reverse Voltage (Per Leg)

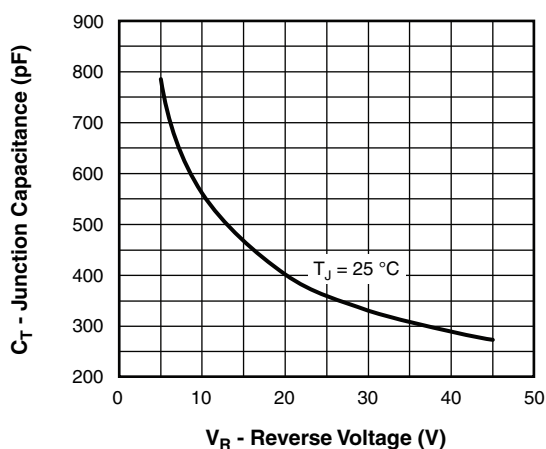


Fig. 3 - Typical Junction Capacitance vs. Reverse Voltage (Per Leg)

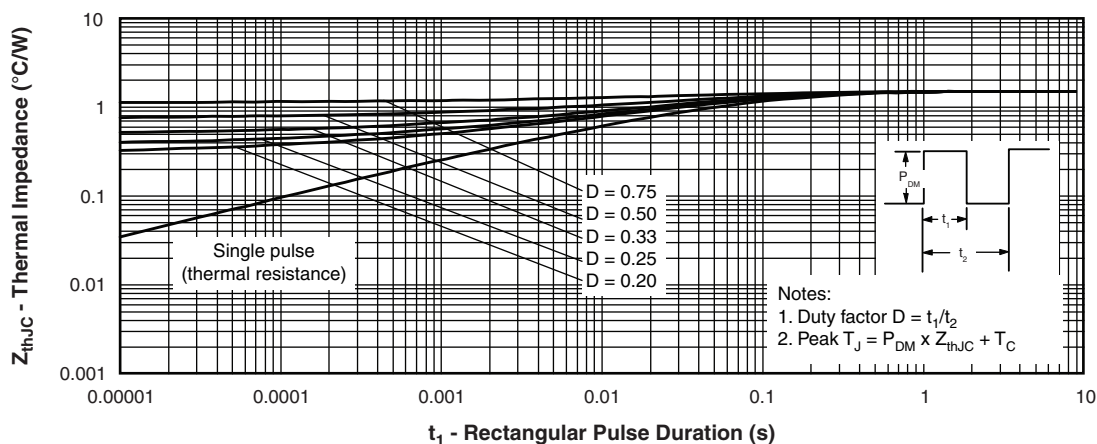


Fig. 4 - Maximum Thermal Impedance Z_{thJC} Characteristics (Per Leg)

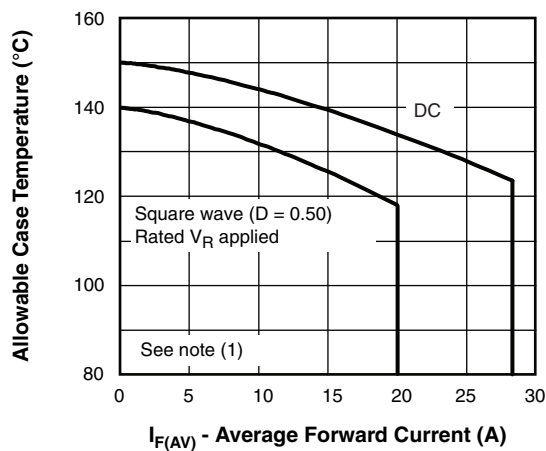


Fig. 5 - Maximum Allowable Case Temperature vs. Average Forward Current

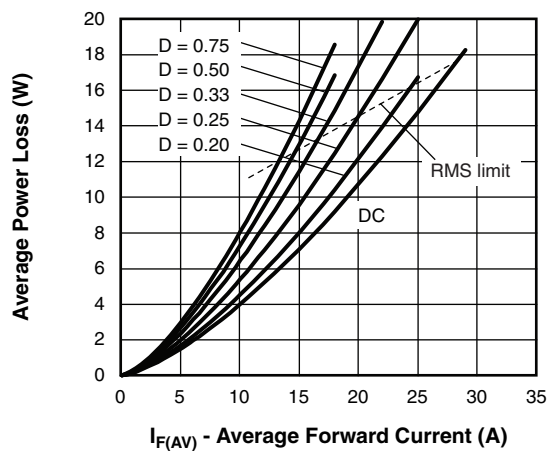


Fig. 6 - Forward Power Loss Characteristics

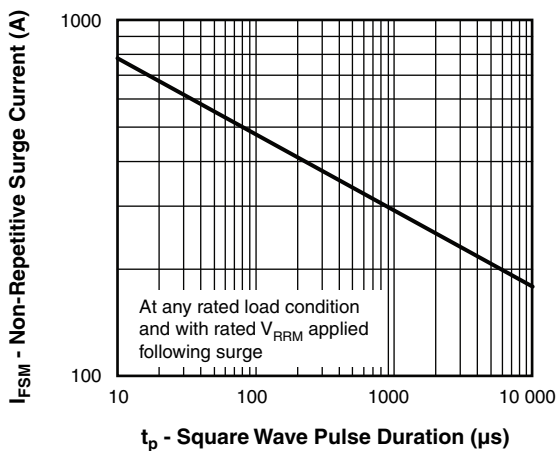
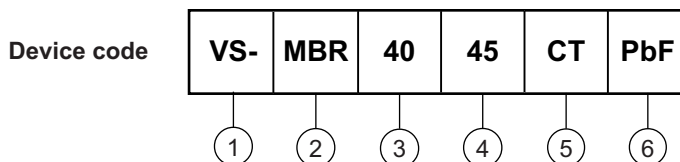


Fig. 7 - Maximum Non-Repetitive Surge Current (Per Leg)

Note

- (1) Formula used: $T_C = T_J - (Pd + Pd_{REV}) \times R_{thJC}$;
 Pd = Forward power loss = $I_{F(AV)} \times V_{FM}$ at $(I_{F(AV)}/D)$ (see fig. 6);
 Pd_{REV} = Inverse power loss = $V_{R1} \times I_R (1 - D)$; I_R at V_{R1} = Rated V_R

**ORDERING INFORMATION TABLE**

- | | |
|---|---------------------------------|
| 1 | - Vishay Semiconductors product |
| 2 | - Schottky MBR series |
| 3 | - Current rating (40 = 40 A) |
| 4 | - Voltage rating (45 = 45 V) |
| 5 | - CT = Essential part number |
| 6 | - Environmental digit |
- PbF = Lead (Pb)-free and RoHS compliant
 - -N3 = Halogen-free, RoHS compliant, and totally lead (Pb)-free

ORDERING INFORMATION (Example)			
PREFERRED P/N	QUANTITY PER T/R	MINIMUM ORDER QUANTITY	PACKAGING DESCRIPTION
VS-MBR4045CTPbF	50	1000	Antistatic plastic tube
VS-MBR4045CT-N3	50	1000	Antistatic plastic tube

LINKS TO RELATED DOCUMENTS	
Dimensions	www.vishay.com/doc?95222
Part marking information	TO-220AB PbF www.vishay.com/doc?95225
	TO-220AB -N3 www.vishay.com/doc?95028
SPIICE model	www.vishay.com/doc?95296

TO-220AB

DIMENSIONS in millimeters and inches



SYMBOL	MILLIMETERS		INCHES		NOTES
	MIN.	MAX.	MIN.	MAX.	
A	4.25	4.65	0.167	0.183	
A1	1.14	1.40	0.045	0.055	
A2	2.56	2.92	0.101	0.115	
b	0.69	1.01	0.027	0.040	
b1	0.38	0.97	0.015	0.038	4
b2	1.20	1.73	0.047	0.068	
b3	1.14	1.73	0.045	0.068	4
c	0.36	0.61	0.014	0.024	
c1	0.36	0.56	0.014	0.022	4
D	14.85	15.25	0.585	0.600	3
D1	8.38	9.02	0.330	0.355	
D2	11.68	12.88	0.460	0.507	6

SYMBOL	MILLIMETERS		INCHES		NOTES
	MIN.	MAX.	MIN.	MAX.	
E	10.11	10.51	0.398	0.414	3, 6
E1	6.86	8.89	0.270	0.350	6
E2	-	0.76	-	0.030	7
e	2.41	2.67	0.095	0.105	
e1	4.88	5.28	0.192	0.208	
H1	6.09	6.48	0.240	0.255	6, 7
L	13.52	14.02	0.532	0.552	
L1	3.32	3.82	0.131	0.150	2
Ø P	3.54	3.73	0.139	0.147	
Q	2.60	3.00	0.102	0.118	
θ	90° to 93°		90° to 93°		

Notes

- (1) Dimensioning and tolerancing as per ASME Y14.5M-1994
- (2) Lead dimension and finish uncontrolled in L1
- (3) Dimension D, D1 and E do not include mold flash. Mold flash shall not exceed 0.127 mm (0.005") per side. These dimensions are measured at the outermost extremes of the plastic body
- (4) Dimension b1, b3 and c1 apply to base metal only
- (5) Controlling dimensions: inches
- (6) Thermal pad contour optional within dimensions E, H1, D2 and E1
- (7) Dimensions E2 x H1 define a zone where stamping and singulation irregularities are allowed
- (8) Outline conforms to JEDEC TO-220, except A2 (maximum) and D2 (minimum) where dimensions are derived from the actual package outline



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