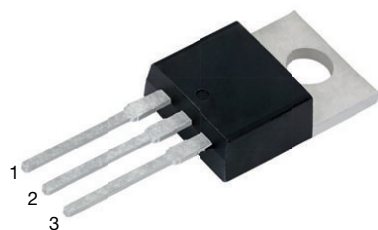
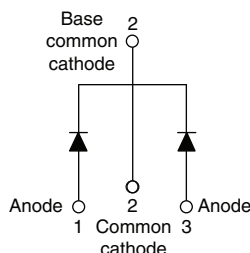


# High Performance Schottky Rectifier, 2 x 20 A



TO-220AB 3L



## 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
- Designed and qualified according to JEDEC®-JESD 47
- Material categorization: for definitions of compliance please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)



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

## 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.

## PRIMARY CHARACTERISTICS

$I_{F(AV)}$	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
$E_{AS}$	20 mJ
Package	3L TO-220AB
Circuit configuration	Common cathode

## 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
$I_{FSM}$	$t_p = 5$ $\mu$ s sine	900	
$V_F$	20 A <sub>pk</sub> , $T_J = 125$ °C	0.58	V
$T_J$	Range	-65 to +150	°C

## VOLTAGE RATINGS

PARAMETER	SYMBOL	VS-MBR4045CT-M3	UNITS
Maximum DC reverse voltage	$V_R$	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	A
			40	
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 $\mu$ s sine or 3 $\mu$ 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 $\mu$ 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		0.75
		40 A				
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/ $\mu$ s	

**Note**

<sup>(1)</sup> Pulse width < 300  $\mu$ s, duty cycle < 2 %

**THERMAL - MECHANICAL SPECIFICATIONS**

PARAMETER	SYMBOL	TEST CONDITIONS	VALUES	UNITS
Maximum junction temperature range	T <sub>J</sub>		-65 to +150	°C
Maximum storage temperature range	T <sub>Stg</sub>		-65 to +175	
Maximum thermal resistance, junction to case per leg	R <sub>thJC</sub>	DC operation	1.5	°C/W
Typical thermal resistance, case to heatsink	R <sub>thCS</sub>	Mounting surface, smooth and greased (Only for TO-220)	0.50	
Maximum thermal resistance, junction to ambient	R <sub>thJA</sub>	DC operation (For D <sup>2</sup> 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 3L TO-220AB	MBR4045CT	

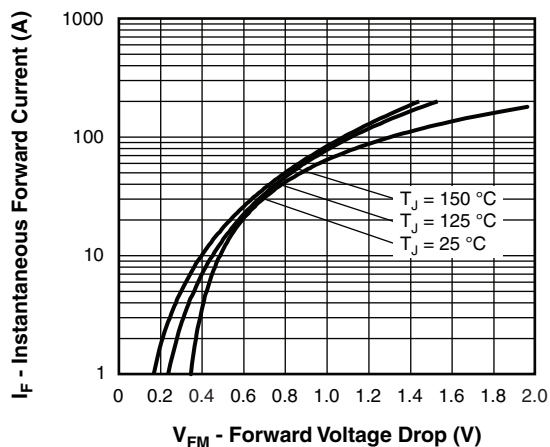


Fig. 1 - Maximum Forward Voltage Drop Characteristics (Per Leg)

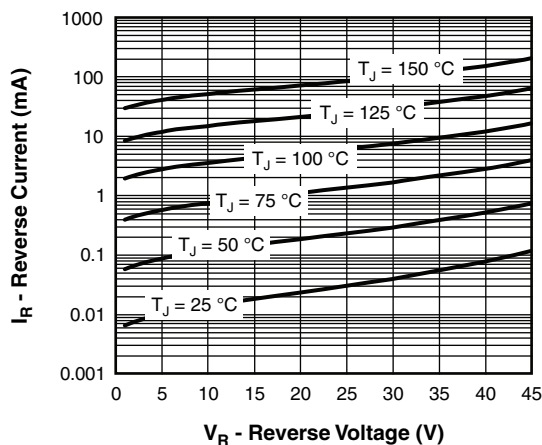


Fig. 2 - Typical Values of Reverse Current vs. Reverse Voltage (Per Leg)

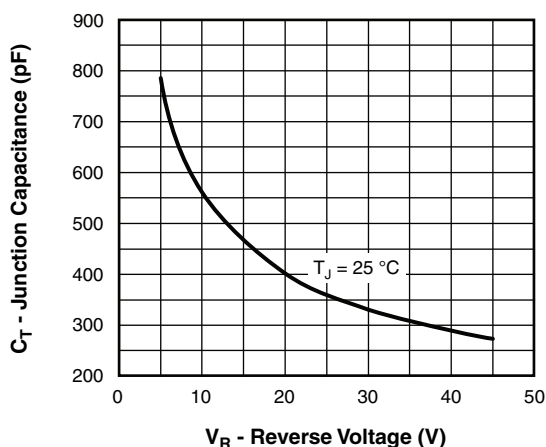
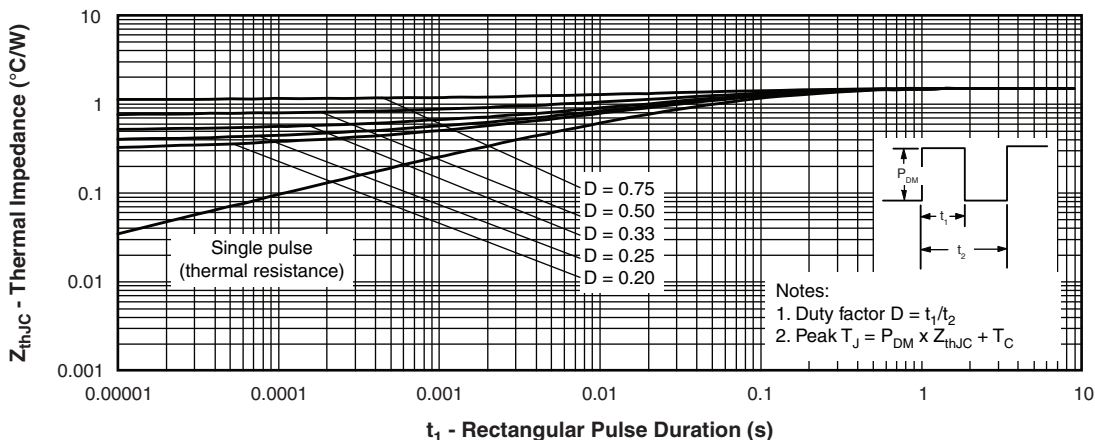


Fig. 3 - Typical Junction Capacitance vs. Reverse Voltage (Per Leg)


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

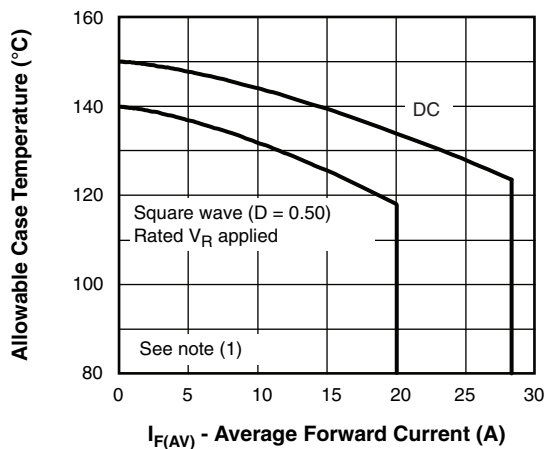


Fig. 5 - Maximum Allowable Case Temperature vs. Average Forward Current

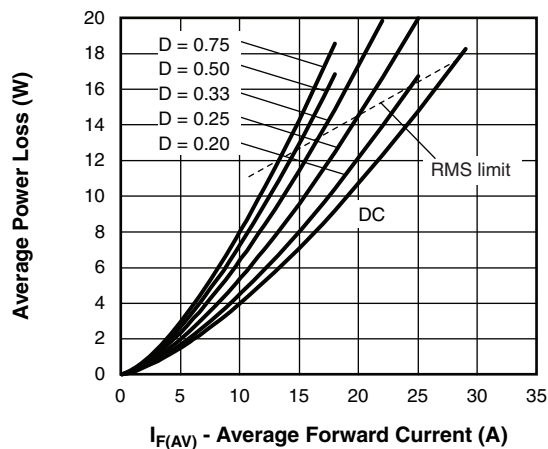


Fig. 6 - Forward Power Loss Characteristics

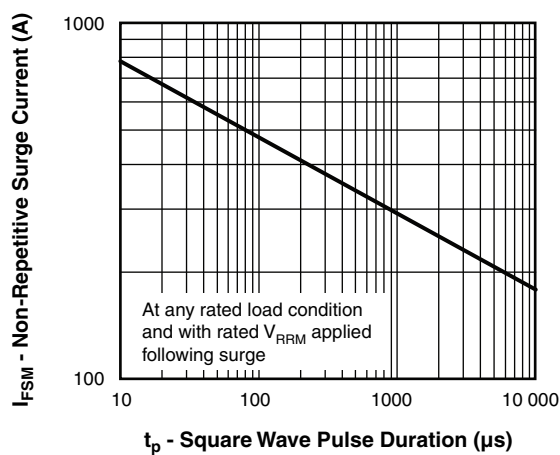


Fig. 7 - Maximum Non-Repetitive Surge Current (Per Leg)

#### Note

- (1) Formula used:  $T_C = T_J - (P_d + P_{d_{REV}}) \times R_{thJC}$ ;  
 $P_d$  = forward power loss =  $I_{F(AV)} \times V_{FM}$  at  $(I_{F(AV)}/D)$  (see fig. 6);  
 $P_{d_{REV}}$  = inverse power loss =  $V_{R1} \times I_R (1 - D)$ ;  $I_R$  at  $V_{R1}$  = rated  $V_R$



## ORDERING INFORMATION TABLE

Device code	<b>VS-</b>	<b>MBR</b>	<b>40</b>	<b>45</b>	<b>CT</b>	<b>-M3</b>
	1	2	3	4	5	6

- |   |   |                               |
|---|---|-------------------------------|
| 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           |
- M3 = halogen-free, RoHS-compliant, and terminations lead (Pb)-free

### ORDERING INFORMATION (Example)

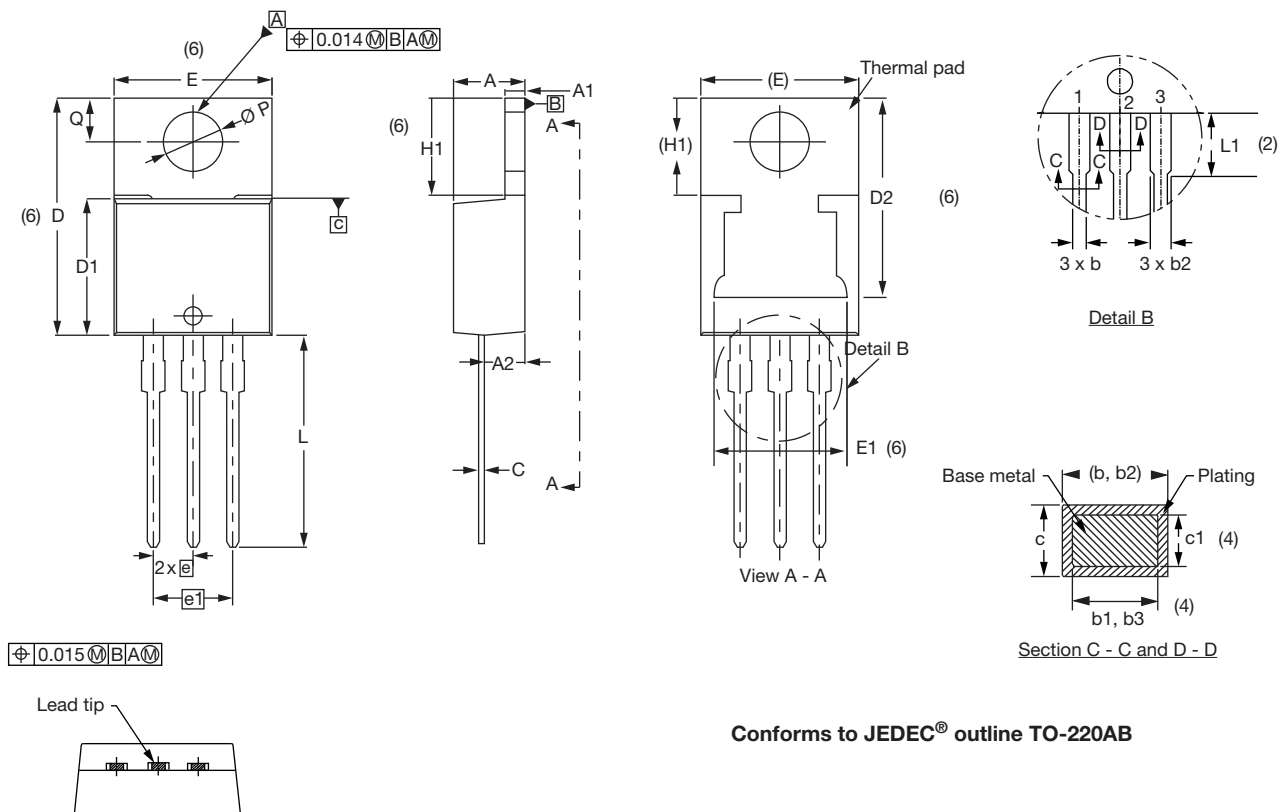
PREFERRED P/N	BASE QUANTITY	PACKAGING DESCRIPTION
VS-MBR4045CT-M3	50	Antistatic plastic tubes

### LINKS TO RELATED DOCUMENTS

Dimensions	<a href="http://www.vishay.com/doc?96154">www.vishay.com/doc?96154</a>
Part marking information	<a href="http://www.vishay.com/doc?95028">www.vishay.com/doc?95028</a>
SPICE model	<a href="http://www.vishay.com/doc?95296">www.vishay.com/doc?95296</a>

# 3L TO-220AB

**DIMENSIONS** in millimeters and inches



**Conforms to JEDEC® outline TO-220AB**

SYMBOL	MILLIMETERS		INCHES		NOTES		SYMBOL	MILLIMETERS		INCHES		NOTES
	MIN.	MAX.	MIN.	MAX.				MIN.	MAX.			
A	4.25	4.65	0.167	0.183			D2	11.68	13.30	0.460	0.524	6, 7
A1	1.14	1.40	0.045	0.055			E	10.11	10.51	0.398	0.414	3, 6
A2	2.50	2.92	0.098	0.115			E1	6.86	8.89	0.270	0.350	6
b	0.69	1.01	0.027	0.040			e	2.41	2.67	0.095	0.105	
b1	0.38	0.97	0.015	0.038	4		e1	4.88	5.28	0.192	0.208	
b2	1.20	1.73	0.047	0.068			H1	6.09	6.48	0.240	0.255	6
b3	1.14	1.73	0.045	0.068	4		L	13.52	14.02	0.532	0.552	
c	0.36	0.61	0.014	0.024			L1	3.32	3.82	0.131	0.150	2
c1	0.36	0.56	0.014	0.022	4		Ø P	3.54	3.91	0.139	0.154	
D	14.85	15.35	0.585	0.604	3		Q	2.60	3.00	0.102	0.118	
D1	8.38	9.02	0.330	0.355								

## 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) Outline conforms to JEDEC® TO-220, except D2



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