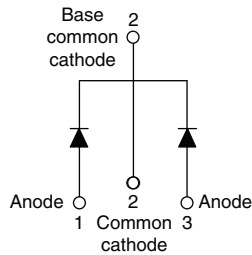


## Schottky Rectifier, 2 x 10 A


**TO-220AB**


### FEATURES

- 175 °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)



### PRODUCT SUMMARY

Package	TO-220AB
$I_{F(AV)}$	2 x 10 A
$V_R$	150 V
$V_F$ at $I_F$	0.66 V
$I_{RM}$ max.	5 mA at 125 °C
$T_J$	175 °C
Diode variation	Common cathode
$E_{AS}$	2.45 mJ

### DESCRIPTION

The center tap Schottky rectifier series has been optimized for low reverse leakage at high temperature. The proprietary barrier technology allows for reliable operation up to 175 °C junction temperature. Typical applications are in switching power supplies, converters, freewheeling diodes, and reverse battery protection.

### MAJOR RATINGS AND CHARACTERISTICS

SYMBOL	CHARACTERISTICS	VALUES	UNITS
$I_{F(AV)}$	Rectangular waveform	20	A
$V_{RRM}$		150	V
$I_{FSM}$	$t_p = 5 \mu s$ sine	1030	A
$V_F$	10 $A_{pk}$ , $T_J = 125$ °C (per leg)	0.66	V
$T_J$	Range	- 55 to 175	°C

### VOLTAGE RATINGS

PARAMETER	SYMBOL	VS-20CTQ150PbF	VS-20CTQ150-N3	UNITS
Maximum DC reverse voltage	$V_R$	150	150	V
Maximum working peak reverse voltage	$V_{RWM}$			

### ABSOLUTE MAXIMUM RATINGS

PARAMETER	SYMBOL	TEST CONDITIONS	VALUES	UNITS	
Maximum average forward current See fig. 5	$I_{F(AV)}$	50 % duty cycle at $T_C = 154$ °C, rectangular waveform	per leg	10	A
			per device	20	
Maximum peak one cycle non-repetitive surge current per leg See fig. 7	$I_{FSM}$	5 $\mu s$ sine or 3 $\mu s$ rect. pulse	Following any rated load condition and with rated $V_{RRM}$ applied	1030	A
		10 ms sine or 6 ms rect. pulse		180	
Non-repetitive avalanche energy per leg	$E_{AS}$	$T_J = 25$ °C, $I_{AS} = 0.7$ A, $L = 10$ mH	2.45	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	0.7	A	



ELECTRICAL SPECIFICATIONS						
PARAMETER	SYMBOL	TEST CONDITIONS		TYP.	MAX.	UNITS
Maximum forward voltage drop per leg See fig. 1	V <sub>FM</sub> <sup>(1)</sup>	10 A	T <sub>J</sub> = 25 °C	0.80	0.88	V
		20 A		0.90	1.0	
		10 A	T <sub>J</sub> = 125 °C	0.63	0.66	
		20 A		0.73	0.77	
Maximum reverse leakage current per leg See fig. 2	I <sub>RM</sub>	T <sub>J</sub> = 25 °C	V <sub>R</sub> = Rated V <sub>R</sub>	3.0	25	µA
		T <sub>J</sub> = 125 °C		2.7	5.0	mA
Typical junction capacitance per leg	C <sub>T</sub>	V <sub>R</sub> = 5 V <sub>DC</sub> (test signal range 100 kHz to 1 MHz) 25 °C		-	280	pF
Typical series inductance per leg	L <sub>S</sub>	Measured lead to lead 5 mm from package body		-	8.0	nH
Maximum voltage rate of change	dV/dt	Rated V <sub>R</sub>		-	10 000	V/µs

Note

(1) Pulse width < 300 µs, duty cycle < 2 %

THERMAL - MECHANICAL SPECIFICATIONS				
PARAMETER	SYMBOL	TEST CONDITIONS	VALUES	UNITS
Maximum junction and storage temperature range	T <sub>J</sub> , T <sub>Stg</sub>		- 55 to 175	°C
Maximum thermal resistance, junction to case per leg	R <sub>thJC</sub>	DC operation	2.0	°C/W
Maximum thermal resistance, junction to case per package			1.0	
Typical thermal resistance, case to heatsink	R <sub>thCS</sub>	Mounting surface, smooth and greased (Only for TO-220)	0.50	
Approximate weight			2	g
			0.07	oz.
Mounting torque	minimum		6 (5)	kgf · cm (lbf · in)
	maximum		12 (10)	
Marking device		Case style TO-220AB	20CTQ150	

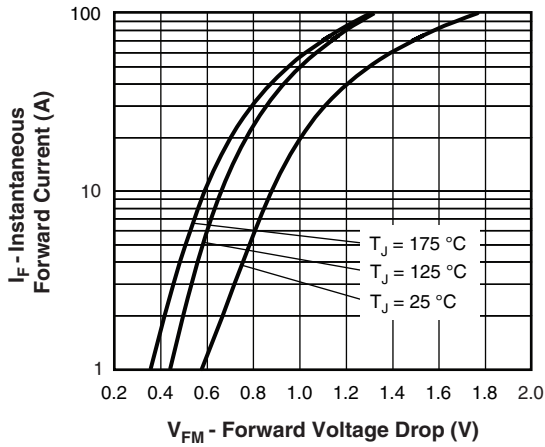


Fig. 1 - Maximum Forward Voltage Drop Characteristics (Per Leg)

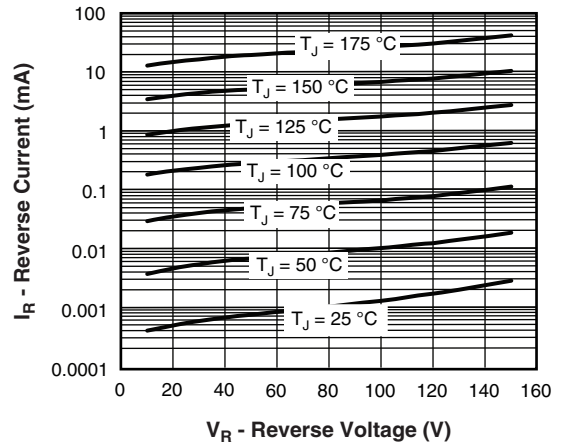


Fig. 2 - Typical Values of Reverse Current vs. Reverse Voltage (Per Leg)

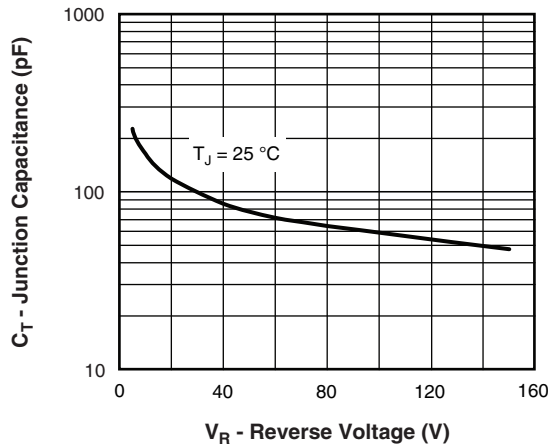


Fig. 3 - Typical Junction Capacitance vs. Reverse Voltage (Per Leg)

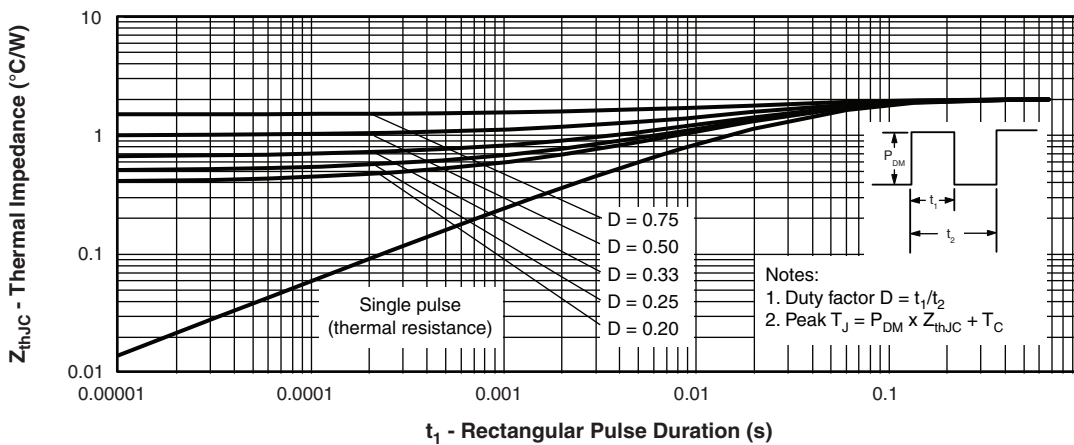


Fig. 4 - Maximum Thermal Impedance  $Z_{thJC}$  Characteristics (Per Leg)

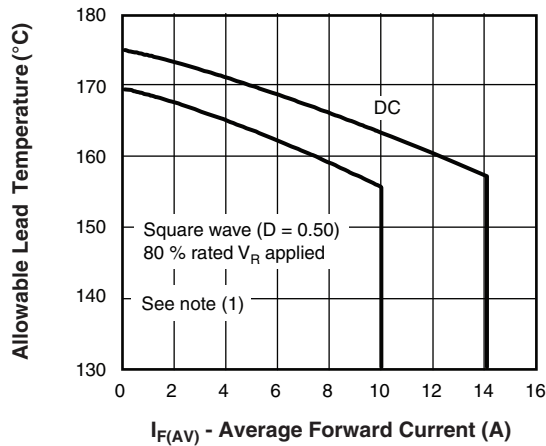


Fig. 5 - Maximum Average Forward Current vs. Allowable Lead Temperature

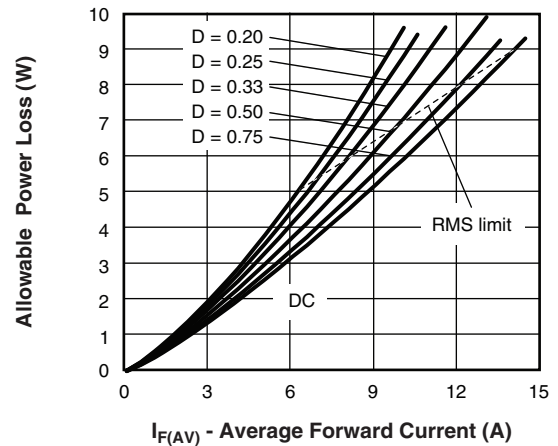


Fig. 6 - Maximum Average Forward Dissipation vs. Average Forward Current

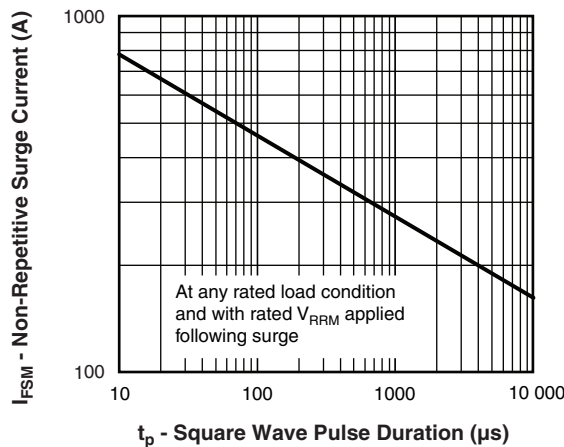


Fig. 7 - Maximum Peak Surge Forward Current vs. Pulse Duration

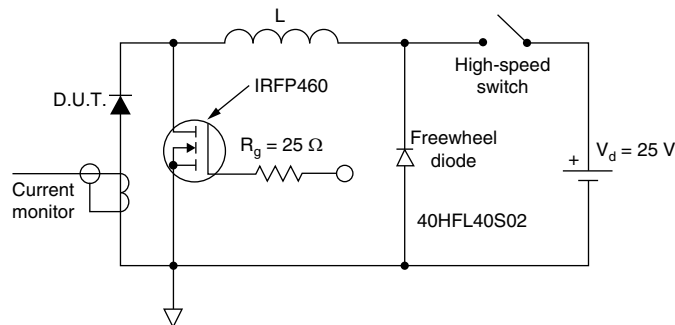


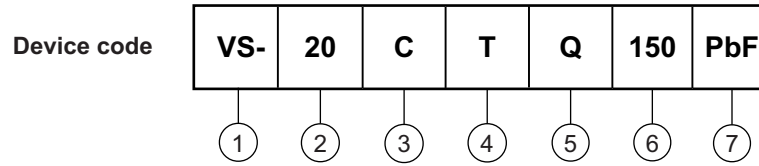
Fig. 8 - Unclamped Inductive Test Circuit

**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  $V_{R1} = 80\%$  rated  $V_R$



## ORDERING INFORMATION TABLE



- 1** - Vishay Semiconductors product
- 2** - Current rating (20 = 20 A)
- 3** - Circuit configuration:  
C = Common cathode
- 4** - Package:  
T = TO-220
- 5** - Schottky "Q" series
- 6** - Voltage ratings (150 = 150 A)
- 7** - 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-20CTQ150PbF	50	1000	Antistatic plastic tube
VS-20CTQ150-N3	50	1000	Antistatic plastic tube

LINKS TO RELATED DOCUMENTS	
Dimensions	<a href="http://www.vishay.com/doc?95222">www.vishay.com/doc?95222</a>
Part marking information	TO-220AB PbF <a href="http://www.vishay.com/doc?95225">www.vishay.com/doc?95225</a>
	TO-220AB -N3 <a href="http://www.vishay.com/doc?95028">www.vishay.com/doc?95028</a>

## TO-220AB

**DIMENSIONS** in millimeters and inches



**Lead assignments**

Diodes

- 1. - Anode/open
- 2. - Cathode
- 3. - Anode

Conforms to JEDEC outline TO-220AB

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
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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