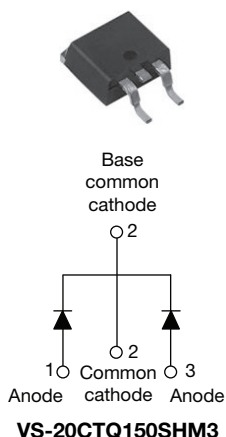
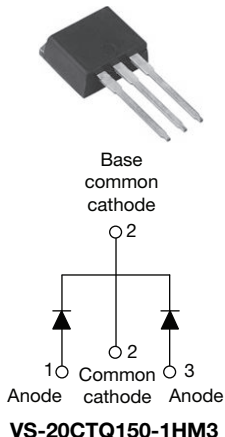


# High Performance Schottky Rectifier, 2 x 10 A

**D<sup>2</sup>PAK (TO-263AB)**

**TO-262AA**


## FEATURES

- 175 °C T<sub>J</sub> operation
- Center tap configuration
- 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
- Meets MSL level 1, per J-STD-020, LF maximum peak of 260 °C
- AEC-Q101 qualified meets JESD-201 class 1A whisker test
- Material categorization: for definitions of compliance please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)



**RoHS**  
COMPLIANT  
HALOGEN  
FREE

## PRIMARY CHARACTERISTICS

Package	D <sup>2</sup> PAK (TO-263AB), TO-262AA
I <sub>F(AV)</sub>	2 x 10 A
V <sub>R</sub>	150 V
V <sub>F</sub> at I <sub>F</sub>	0.66 V
I <sub>RM</sub> max.	5.0 mA at 125 °C
T <sub>J</sub> max.	175 °C
E <sub>AS</sub>	1.0 mJ
Diode variation	Common cathode

## 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 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 <sub>F(AV)</sub>	Rectangular waveform	20	A
V <sub>RRM</sub>		150	V
I <sub>FSM</sub>	t <sub>p</sub> = 5 μs sine	1030	A
V <sub>F</sub>	10 A <sub>pk</sub> , T <sub>J</sub> = 125 °C (per leg)	0.66	V
T <sub>J</sub>	Range	-55 to +175	°C

## VOLTAGE RATINGS

PARAMETER	SYMBOL	VS-20CTQ150SHM3 VS-20CTQ150-1HM3	UNITS
Maximum DC reverse voltage	V <sub>R</sub>	150	V
Maximum working peak reverse voltage	V <sub>RWM</sub>		

## ABSOLUTE MAXIMUM RATINGS

PARAMETER	SYMBOL	TEST CONDITIONS	VALUES	UNITS
Maximum average forward current See fig. 5	I <sub>F(AV)</sub>	50 % duty cycle at T <sub>C</sub> = 154 °C, rectangular waveform	10	A
per leg			20	
Maximum peak one cycle non-repetitive surge current per leg See fig. 7	I <sub>FSM</sub>	5 μs sine or 3 μs rect. pulse 10 ms sine or 6 ms rect. pulse	1030 180	
Non-repetitive avalanche energy per leg	E <sub>AS</sub>	T <sub>J</sub> = 25 °C, I <sub>AS</sub> = 1 A, L = 2 mH	1.0	mJ
Repetitive avalanche current per leg	I <sub>AR</sub>	Current decaying linearly to zero in 1 μs Frequency limited by T <sub>J</sub> maximum V <sub>A</sub> = 1.5 x V <sub>R</sub> typical	1	A

**ELECTRICAL SPECIFICATIONS**

PARAMETER	SYMBOL	TEST CONDITIONS		TYP.	MAX.	UNITS
Maximum forward voltage drop per leg See fig. 1	$V_{FM}^{(1)}$	10 A	$T_J = 25\text{ }^{\circ}\text{C}$	0.80	0.88	V
		20 A		0.90	1.0	
		10 A	$T_J = 125\text{ }^{\circ}\text{C}$	0.63	0.66	
		20 A		0.73	0.77	
Maximum reverse leakage current per leg See fig. 2	$I_{RM}^{(1)}$	$T_J = 25\text{ }^{\circ}\text{C}$	$V_R = \text{Rated } V_R$	3.0	25	$\mu\text{A}$
		$T_J = 125\text{ }^{\circ}\text{C}$		2.7	5.0	mA
Typical junction capacitance per leg	$C_T$	$V_R = 5\text{ }V_{DC}$ (test signal range 100 kHz to 1 MHz), $25\text{ }^{\circ}\text{C}$		-	280	pF
Typical series inductance per leg	$L_S$	Measured lead to lead 5 mm from package body		-	8.0	nH
Maximum voltage rate of change	dV/dt	Rated $V_R$		-	10 000	V/ $\mu\text{s}$

**Note**

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

**THERMAL - MECHANICAL SPECIFICATIONS**

PARAMETER	SYMBOL	TEST CONDITIONS	VALUES	UNITS
Maximum junction and storage temperature range	$T_J, T_{Stg}$		-55 to +175	$^{\circ}\text{C}$
Maximum thermal resistance, junction to case per leg per package	$R_{thJC}$	DC operation	2.0	$^{\circ}\text{C/W}$
			1.0	
Typical thermal resistance, case to heatsink	$R_{thCS}$	Mounting surface, smooth and greased (Only for TO-262)	0.50	
Approximate weight			2	g
			0.07	oz.
Mounting torque minimum maximum			6 (5)	kgf · cm
			12 (10)	(lbf · in)
Marking device		Case style D <sup>2</sup> PAK (TO-263AB)	20CTQ150SH	
		Case style TO-262	20CTQ150-1H	

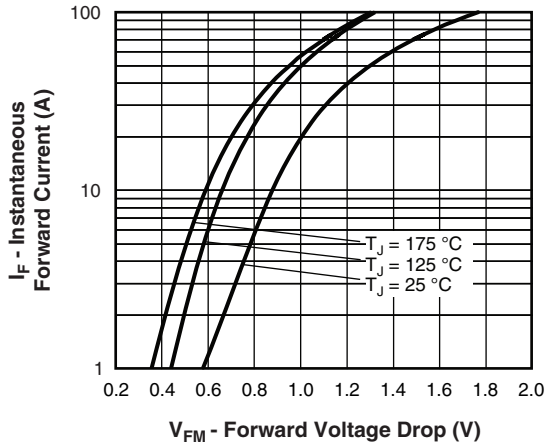


Fig. 1 - Maximum Forward Voltage Drop Characteristics (Per Leg)

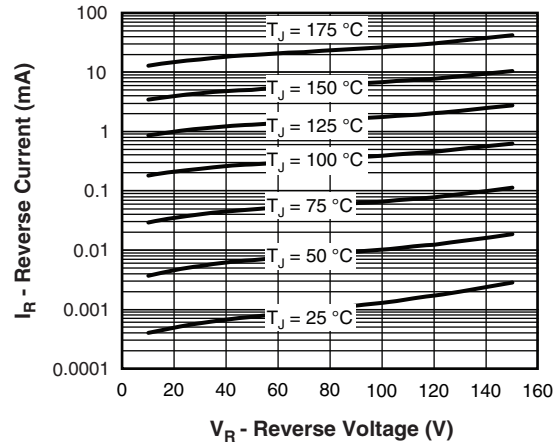


Fig. 2 - Typical Values of Reverse Current vs. Reverse Voltage (Per Leg)

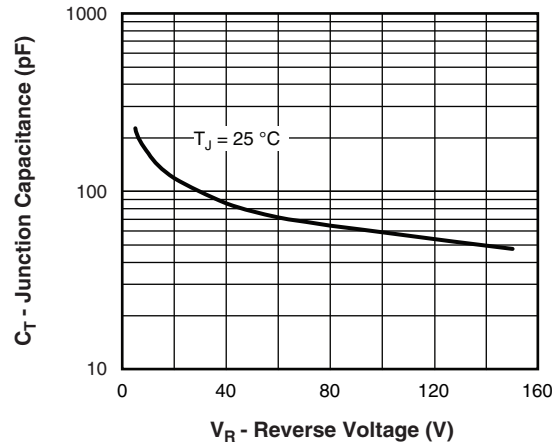


Fig. 3 - Typical Junction Capacitance vs. Reverse Voltage (Per Leg)

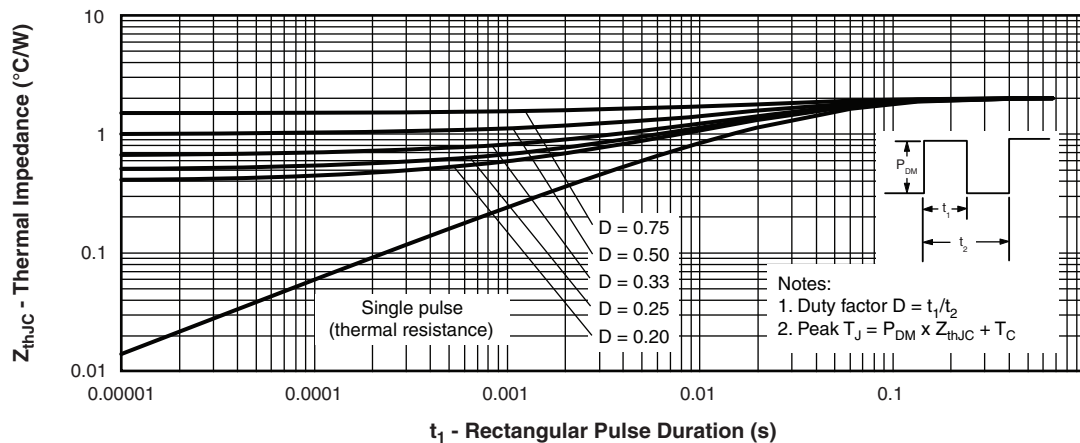


Fig. 4 - Maximum Thermal Impedance  $Z_{thJC}$  Characteristics (Per Leg)

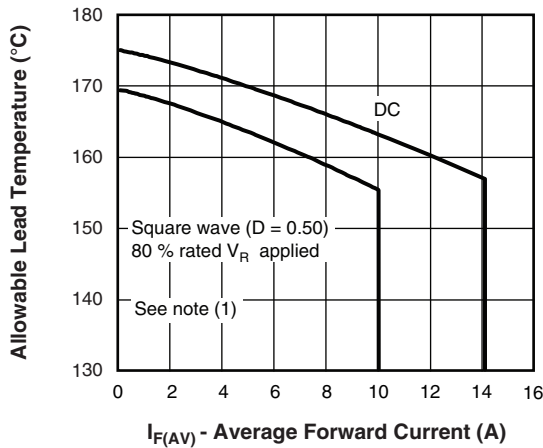


Fig. 5 - Maximum Average Forward Current vs. Allowable Lead Temperature

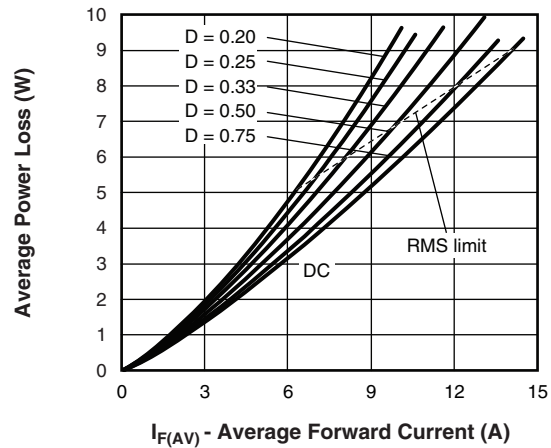


Fig. 6 - Maximum Average Forward Dissipation vs. Average Forward Current

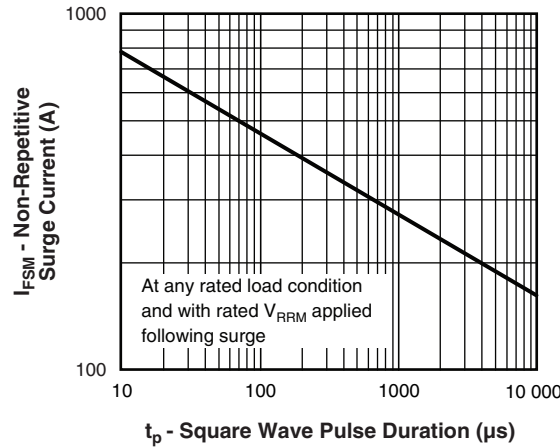


Fig. 7 - Maximum Peak Surge Forward Current vs. Pulse Duration

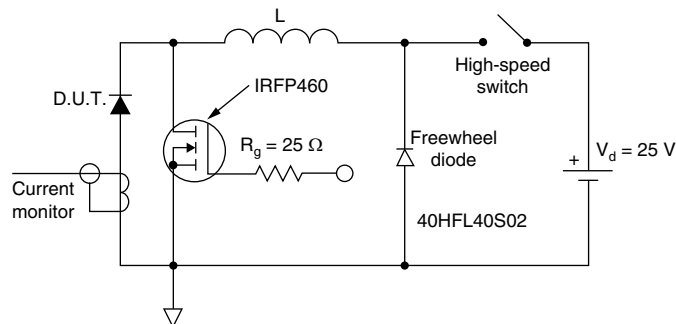


Fig. 8 - Unclamped Inductive Test Circuit

## Note

- (1) Formula used:  $T_C = T_J - (P_d + P_{dREV}) \times R_{thJC}$ ;  
 $P_d$  = Forward power loss =  $I_{F(AV)} \times V_{FM}$  at  $(I_{F(AV)}/D)$  (see fig. 6);  
 $P_{dREV}$  = Inverse power loss =  $V_{R1} \times I_R (1 - D)$ ;  $I_R$  at  $V_{R1} = 80\%$  rated  $V_R$

## ORDERING INFORMATION TABLE

Device code	VS-	20	C	T	Q	150	S	TRL	H	M3
	1	2	3	4	5	6	7	8	9	10

<b>1</b>	-	Vishay Semiconductors product
<b>2</b>	-	Current rating (20 = 20 A)
<b>3</b>	-	C = common cathode
<b>4</b>	-	T = TO-220
<b>5</b>	-	Schottky "Q" series
<b>6</b>	-	Voltage rating (150 = 150 V)
<b>7</b>	-	<ul style="list-style-type: none"> <li>• S = D<sup>2</sup>PAK</li> <li>• -1 = TO-262</li> </ul>
<b>8</b>	-	<ul style="list-style-type: none"> <li>• None = tube</li> <li>• TRL = tape and reel (left oriented - for D<sup>2</sup>PAK only)</li> <li>• TRR = tape and reel (right oriented - for D<sup>2</sup>PAK only)</li> </ul>
<b>9</b>	-	H = AEC-Q101 qualified
<b>10</b>	-	M3 = halogen-free, RoHS-compliant, and termination lead (Pb)-free

ORDERING INFORMATION (Example)			
PREFERRED P/N	QUANTITY PER T/R	MINIMUM ORDER QUANTITY	PACKAGING DESCRIPTION
VS-20CTQ150SHM3	50	1000	Antistatic plastic tubes
VS-20CTQ150STRLHM3	800	800	13" diameter reel
VS-20CTQ150STRRHM3	800	800	13" diameter reel
VS-20CTQ150-1HM3	50	1000	Antistatic plastic tubes

LINKS TO RELATED DOCUMENTS		
Dimensions	D <sup>2</sup> PAK (TO-263AB)	<a href="http://www.vishay.com/doc?95046">www.vishay.com/doc?95046</a>
	TO-262AA	<a href="http://www.vishay.com/doc?95419">www.vishay.com/doc?95419</a>
Part marking information	D <sup>2</sup> PAK (TO-263AB)	<a href="http://www.vishay.com/doc?95444">www.vishay.com/doc?95444</a>
	TO-262AA	<a href="http://www.vishay.com/doc?95443">www.vishay.com/doc?95443</a>
Packaging information		<a href="http://www.vishay.com/doc?95032">www.vishay.com/doc?95032</a>

### D<sup>2</sup>PAK

#### DIMENSIONS in millimeters and inches

Conforms to JEDEC® outline D<sup>2</sup>PAK (SMD-220)



SYMBOL	MILLIMETERS		INCHES		NOTES
	MIN.	MAX.	MIN.	MAX.	
A	4.06	4.83	0.160	0.190	
A1	0.00	0.254	0.000	0.010	
b	0.51	0.99	0.020	0.039	
b1	0.51	0.89	0.020	0.035	4
b2	1.14	1.78	0.045	0.070	
b3	1.14	1.73	0.045	0.068	4
c	0.38	0.74	0.015	0.029	
c1	0.38	0.58	0.015	0.023	4
c2	1.14	1.65	0.045	0.065	
D	8.51	9.65	0.335	0.380	2

SYMBOL	MILLIMETERS		INCHES		NOTES
	MIN.	MAX.	MIN.	MAX.	
D1	6.86	8.00	0.270	0.315	3
E	9.65	10.67	0.380	0.420	2, 3
E1	7.90	8.80	0.311	0.346	3
e	2.54 BSC		0.100 BSC		
H	14.61	15.88	0.575	0.625	
L	1.78	2.79	0.070	0.110	
L1	-	1.65	-	0.066	3
L2	1.27	1.78	0.050	0.070	
L3	0.25 BSC		0.010 BSC		
L4	4.78	5.28	0.188	0.208	

#### Notes

- Dimensioning and tolerancing per ASME Y14.5 M-1994
- Dimension D 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 outmost extremes of the plastic body
- Thermal pad contour optional within dimension E, L1, D1 and E1
- Dimension b1 and c1 apply to base metal only
- Datum A and B to be determined at datum plane H
- Controlling dimension: inch
- Outline conforms to JEDEC® outline TO-263AB

### TO-262

**DIMENSIONS** in millimeters and inches

Modified JEDEC® outline TO-262

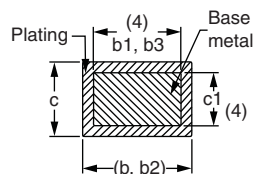
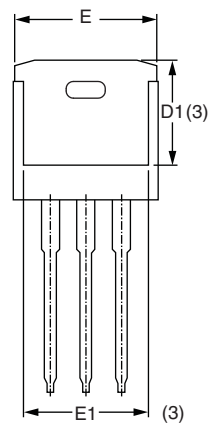


⌀ 0.010 (M) (B)



#### Lead assignments

- Diodes**  
 1. - Anode (two die)/open (one die)  
 2., 4. - Cathode  
 3. - Anode



Section B - B and C - C  
 Scale: None

SYMBOL	MILLIMETERS		INCHES		NOTES
	MIN.	MAX.	MIN.	MAX.	
A	4.06	4.83	0.160	0.190	
A1	2.03	3.02	0.080	0.119	
b	0.51	0.99	0.020	0.039	
b1	0.51	0.89	0.020	0.035	4
b2	1.14	1.78	0.045	0.070	
b3	1.14	1.73	0.045	0.068	4
c	0.38	0.74	0.015	0.029	
c1	0.38	0.58	0.015	0.023	4
c2	1.14	1.65	0.045	0.065	
D	8.51	9.65	0.335	0.380	2
D1	6.86	8.00	0.270	0.315	3
E	9.65	10.67	0.380	0.420	2, 3
E1	7.90	8.80	0.311	0.346	3
e	2.54 BSC		0.100 BSC		
L	13.46	14.10	0.530	0.555	
L1	-	1.65	-	0.065	3
L2	3.36	3.71	0.132	0.146	

#### Notes

- (1) Dimensioning and tolerancing as per ASME Y14.5M-1994
- (2) Dimension D 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 outmost extremes of the plastic body
- (3) Thermal pad contour optional within dimension E, L1, D1 and E1
- (4) Dimension b1 and c1 apply to base metal only
- (5) Controlling dimension: inches
- (6) Outline conform to JEDEC TO-262 except A1 (maximum), b (minimum), D1 (minimum) and L2 where dimensions derived the actual package outline



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