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Vishay Semiconductors

RoHS

COMPLIANT

HALOGEN

FREE

High Performance Schottky Rectifier, 2 x 10 A

Base common cathode 02 02

1 Common 3
Anode cathode Anode
VS-20CTQ150SPbF

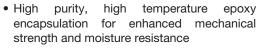
Anode cathode Anode VS-20CTQ150-1PbF

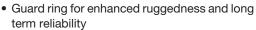
1 Common 3

PRODUCT SUMMARY					
I _{F(AV)}	2 x 10 A				
V_{R}	150 V				
V _F at I _F	0.66 V				
I _{RM} max.	5.0 mA at 125 °C				
T_J max.	175 °C				
E _{AS}	1.0 mJ				
Package	TO-263AB (D ² PAK), TO-262AA				
Diode variation	Common cathode				

FEATURES

- 175 °C T_{.I} operation
- Center tap configuration
- Low forward voltage drop
- High frequency operation





- Meets MSL level 1, per J-STD-020, LF maximum peak of 260 °C
- AEC-Q101 qualified
- Material categorization: for definitions of compliance please see <u>www.vishay.com/doc?99912</u>

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 _{F(AV)}	Rectangular waveform	20	A			
V _{RRM}		150	V			
I _{FSM}	t _p = 5 μs sine	1030	A			
V _F	10 A _{pk} , T _J = 125 °C (per leg)	0.66	V			
TJ	Range	-55 to +175	°C			

VOLTAGE RATINGS						
PARAMETER SYMBOL VS-20CTQ150SPbF UNITS						
Maximum DC reverse voltage	V_R	150	V			
Maximum working peak reverse voltage	V_{RWM}	130	V			

ABSOLUTE MAXIMUM RATINGS						
PARAMETER	SYMBOL	TEST CONDI	TIONS	VALUES	UNITS	
Maximum average forward per leg		50.0/		10		
current See fig. 5 per device	I _{F(AV)}	50 % duty cycle at T_C = 154 °C, rectangular waveform		20		
Maximum peak one cycle	I _{FSM}	5 μs sine or 3 μs rect. pulse	Following any rated load condition and with	1030	A	
non-repetitive surge current per leg See fig. 7		10 ms sine or 6 ms rect. pulse	rated V _{RRM} applied	180		
Non-repetitive avalanche energy per leg	E _{AS}	$T_J = 25 ^{\circ}\text{C}, I_{AS} = 1 \text{A}, L = 2 \text{mH}$		1.0	mJ	
Repetitive avalanche current per leg	I _{AR}	Current decaying linearly to zer Frequency limited by T _J maxim		1	Α	



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ELECTRICAL SPECIFICATIONS						
PARAMETER	SYMBOL	TEST CO	NDITIONS	TYP.	MAX.	UNITS
		10 A	T 05 00	0.80	0.88	V
Maximum forward voltage drop per leg	V _{FM} ⁽¹⁾	20 A	- T _J = 25 °C	0.90	1.0	
See fig. 1		10 A	T _{.1} = 125 °C	0.63	0.66	
		20 A	1J=125 C	0.73	0.77	
Maximum reverse leakage current per leg	I _{RM} ⁽¹⁾	T _J = 25 °C	V _R = Rated V _R	3.0	25	μΑ
See fig. 2	'RM (*)	T _J = 125 °C	VR = nateu VR	2.7	5.0	mA
Typical junction capacitance per leg	C _T	$V_R = 5 V_{DC}$ (test signal range	ge 100 kHz to 1 MHz), 25 °C	-	280	pF
Typical series inductance per leg	L _S	Measured lead to lead 5 m	nm from package body	-	8.0	nΗ
Maximum voltage rate of change	dV/dt	Rated V _R		-	10 000	V/µs

Note

 $^{^{(1)}\,}$ Pulse width < 300 $\mu s,$ 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	°C	
Maximum thermal resistance,	per leg	J	DC energtion	2.0		
junction to case	per package	R _{thJC} DC operation	1.0	°C/W		
Typical thermal resistance, case to heatsink		R _{thCS}	Mounting surface, smooth and greased (Only for TO-262)	0.50	2	
Approximate weight				2	g	
Approximate weight				0.07	oz.	
Mounting toward	minimum			6 (5)	kgf · cm	
Mounting torque	maximum			12 (10)	(lbf·in)	
			Case style D ² PAK	20CTC	150S	
Marking device			Case style TO-262	20CTQ	150-1	





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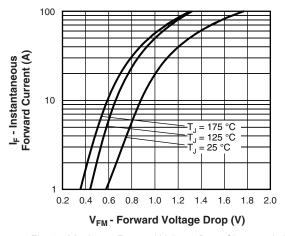


Fig. 1 - Maximum Forward Voltage Drop Characteristics (Per Leg)

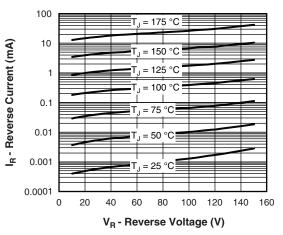


Fig. 2 - Typical Values of Reverse Current vs. Reverse Voltage (Per Leg)

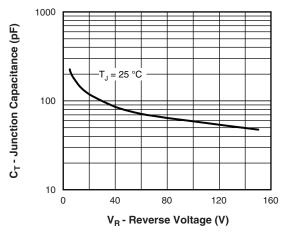


Fig. 3 - Typical Junction Capacitance vs. Reverse Voltage (Per Leg)

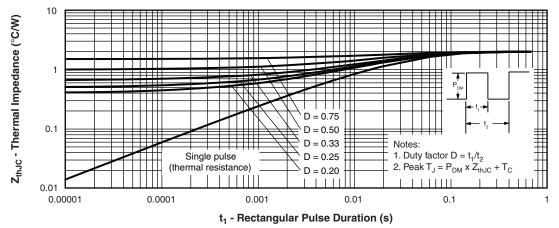


Fig. 4 - Maximum Thermal Impedance Z_{thJC} Characteristics (Per Leg)

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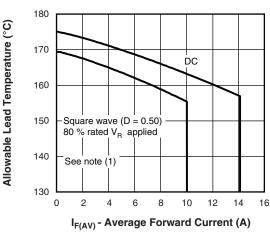


Fig. 5 - Maximum Average Forward Current vs. Allowable Lead Temperature

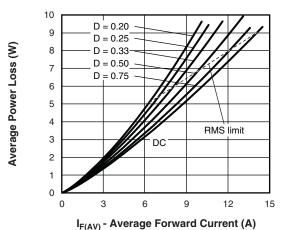


Fig. 6 - Maximum Average Forward Dissipation vs.
Average Forward Current

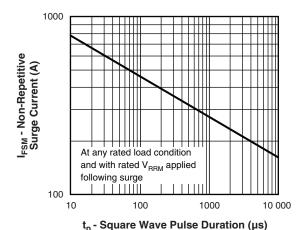


Fig. 7 - Maximum Peak Surge Forward Current vs. Pulse Duration

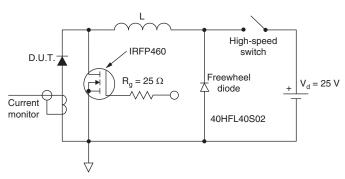


Fig. 8 - Unclamped Inductive Test Circuit

Note

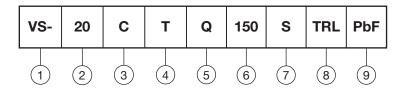
 $\begin{array}{l} \text{(1)} \ \ \text{Formula used:} \ T_C = T_J - (Pd + Pd_{REV}) \times R_{thJC}; \\ Pd = \text{Forward power loss} = I_{F(AV)} \times V_{FM} \ \text{at} \ (I_{F(AV)}/D) \ \text{(see fig. 6)}; \\ Pd_{REV} = \text{Inverse power loss} = V_{R1} \times I_R \ \text{(1 - D)}; \ I_R \ \text{at} \ V_{R1} = 80 \ \% \ \text{rated} \ V_R \\ \end{array}$

VS-20CTQ150SPbF, VS-20CTQ150-1PbF

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ORDERING INFORMATION TABLE

Device code



1 - Vishay Semiconductors product

2 - Current rating (20 = 20 A)

C = common cathode

4 - T = TO-220

5 - Schottky "Q" series

6 - Voltage rating (150 = 150 V)

7 - • S = D²PAK

• -1 = TO-262

• None = tube

• TRL = tape and reel (left oriented - for D²PAK only)

• TRR = tape and reel (right oriented - for D²PAK only)

9 - PbF = lead (Pb)-free

ORDERING INFORMATION (Example)						
PREFERRED P/N	QUANTITY PER T/R	MINIMUM ORDER QUANTITY	PACKAGING DESCRIPTION			
VS-20CTQ150SPbF	50	1000	Antistatic plastic tubes			
VS-20CTQ150STRLPbF	800	800	13" diameter reel			
VS-20CTQ150STRRPbF	800	800	13" diameter reel			
VS-20CTQ150-1PbF	50	1000	Antistatic plastic tubes			

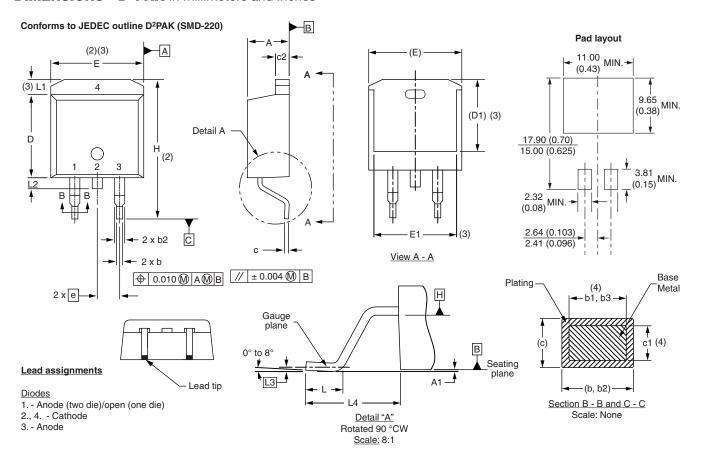
LINKS TO RELATED DOCUMENTS					
Dimensions <u>www.vishay.com/doc?95014</u>					
Part marking information	www.vishay.com/doc?95008				
Packaging information	www.vishay.com/doc?95032				



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D²PAK, TO-262

DIMENSIONS - D²PAK in millimeters and inches



SYMBOL	MILLIN	IETERS	INC	NOTES	
STIMBUL	MIN.	MAX.	MIN.	MAX.	NOTES
А	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
С	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	MILLIN	IETERS	INC	HES	NOTES
STIVIBOL	MIN.	MAX.	MIN.	MAX.	NOTES
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
е	2.54 BSC		0.100 BSC		
Н	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

- (1) Dimensioning and tolerancing per ASME Y14.5 M-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) Datum A and B to be determined at datum plane H
- (6) Controlling dimension: inch

(7) Outline conforms to JEDEC outline TO-263AB

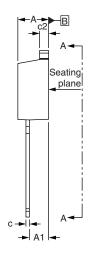
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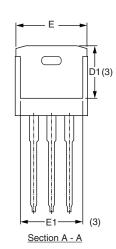
D²PAK, TO-262



DIMENSIONS - TO-262 in millimeters and inches

Modified JEDEC outline TO-262 (Datum A) (2) (3) (3) 1 L2 B B B L (2) 3 x b2 3 x b2 3 x b2





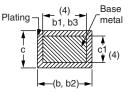
⊕ 0.010 M AM B

Lead assignments



<u>Diodes</u>
1. - Anode (two die)/open (one die)
2., 4. - Cathode

3. - Anode



Section B - B and C - C Scale: None

SYMBOL	MILLIM	MILLIMETERS		INCHES		
	MIN.	MAX.	MIN.	MAX.	NOTES	
А	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	
С	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	
Е	9.65	10.67	0.380	0.420	2, 3	
E1	7.90	8.80	0.311	0.346	3	
е	2.54	BSC	0.100) BSC		
L	13.46	14.10	0.530	0.555		
L1	-	1.65	-	0.065	3	
L2	3.56	3.71	0.140	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) and D1 (minimum) where dimensions derived the actual package outline



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