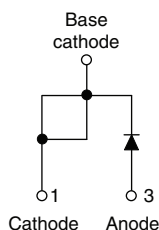


Schottky Rectifier, 20 A



TO-220AC



FEATURES

- 125 °C T_J operation ($V_R < 5$ V)
- Optimized for OR-ing applications
- Ultra low forward voltage drop
- High frequency operation
- Guard ring for enhanced ruggedness and long term reliability
- High purity, high temperature epoxy encapsulation for enhanced mechanical strength and moisture resistance
- 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-220AC
$I_{F(AV)}$	20 A
V_R	15 V
V_F at I_F	See Electrical table
I_{RM} max.	600 mA at 100 °C
T_J max.	125 °C
Diode variation	Single die
E_{AS}	10 mJ

DESCRIPTION

The Schottky rectifier module has been optimized for ultra low forward voltage drop specifically for the OR-ing of parallel power supplies. The proprietary barrier technology allows for reliable operation up to 125 °C junction temperature. Typical applications are in parallel switching power supplies, converters, reverse battery protection, and redundant power subsystems.

MAJOR RATINGS AND CHARACTERISTICS

SYMBOL	CHARACTERISTICS	VALUES	UNITS
$I_{F(AV)}$	Rectangular waveform	20	A
V_{RRM}		15	V
I_{FSM}	$t_p = 5 \mu s$ sine	700	A
V_F	19 A _{pk} , $T_J = 125$ °C (typical)	0.25	V
T_J	Range	- 55 to 125	°C

VOLTAGE RATINGS

PARAMETER	SYMBOL	VS-STPS20L15DPbF	VS-STPS20L15D-N3	UNITS
Maximum DC reverse voltage	V_R	15	15	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, $T_C = 85$ °C, rectangular waveform	20	A
Maximum peak one cycle non-repetitive surge current See fig. 7	I_{FSM}	5 μs sine or 3 μs rect. pulse	700	A
		10 ms sine or 6 ms rect. pulse	330	
Non-repetitive avalanche energy	E_{AS}	$T_J = 25$ °C, $I_{AS} = 2$ A, $L = 6$ mH	10	mJ
Repetitive avalanche current	I_{AR}	Current decaying linearly to zero in 1 μs Frequency limited by T_J maximum $V_A = 1.5 \times V_R$ typical	2	A

**ELECTRICAL SPECIFICATIONS**

PARAMETER	SYMBOL	TEST CONDITIONS	TYP.	MAX.	UNITS
Forward voltage drop See fig. 1	$V_{FM}^{(1)}$	19 A	-	0.41	V
		40 A		0.52	
		19 A	0.25	0.33	
		40 A		0.50	
Reverse leakage current See fig. 2	$I_{RM}^{(1)}$	$T_J = 25\text{ }^{\circ}\text{C}$	-	10	mA
		$T_J = 100\text{ }^{\circ}\text{C}$		600	
Threshold voltage	$V_{F(TO)}$	$T_J = T_J \text{ maximum}$	0.182		V
Forward slope resistance	r_t		7.6		m Ω
Maximum junction capacitance	C_T	$V_R = 5\text{ V}_{DC}$ (test signal range 100 kHz to 1 MHz) $25\text{ }^{\circ}\text{C}$	-	2000	pF
Typical series inductance	L_S	Measured lead to lead 5 mm from package body	8	-	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		- 55 to 125	°C
Maximum storage temperature range	T _{Stg}		- 55 to 150	
Maximum thermal resistance, junction to case	R _{thJC}	DC operation See fig. 4	1.5	°C/W
Typical thermal resistance, case to heatsink	R _{thCS}	Mounting surface, smooth and greased (for TO-220)	0.50	
Maximum thermal resistance, junction to ambient	R _{thJA}	DC operation (for D ² PAK)	40	
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-220AC	STPS20L15D	

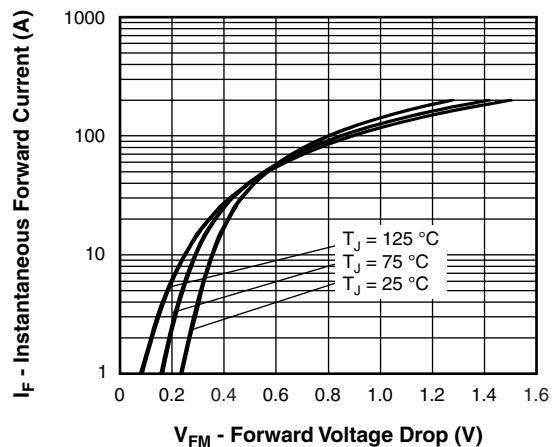


Fig. 1 - Maximum Forward Voltage Drop Characteristics

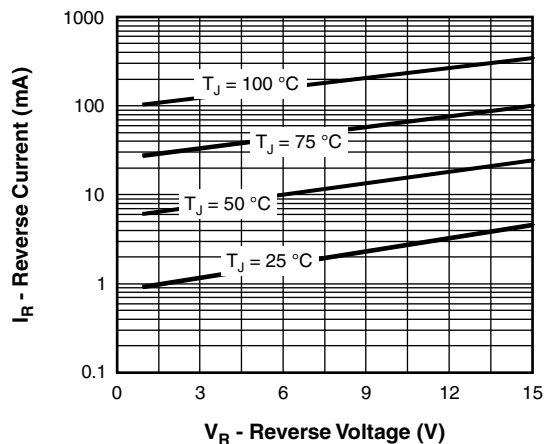


Fig. 2 - Typical Values of Reverse Current vs. Reverse Voltage

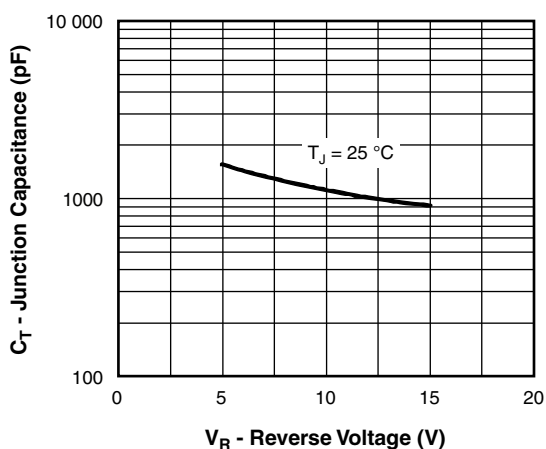
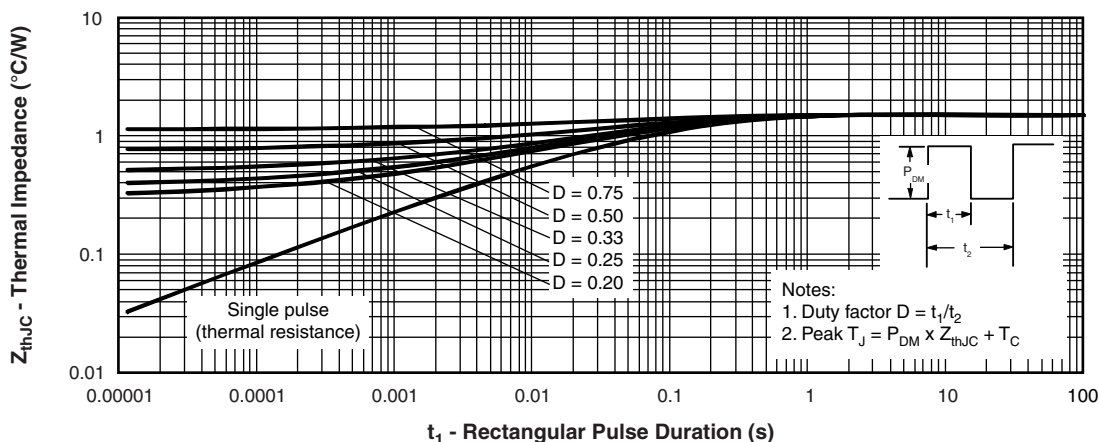


Fig. 3 - Typical Junction Capacitance vs. Reverse Voltage


Fig. 4 - Maximum Thermal Impedance Z_{thJC} Characteristics

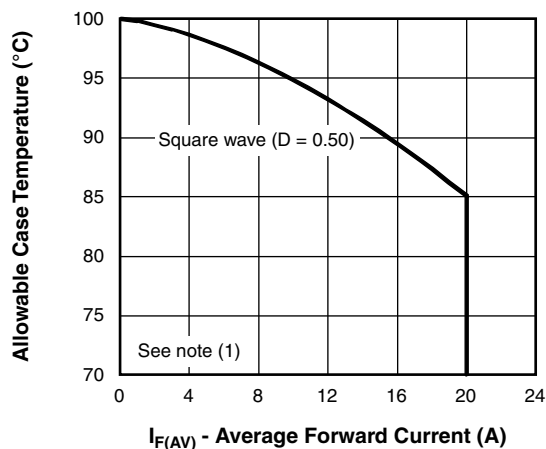


Fig. 5 - Maximum Allowable Case Temperature vs. Average Forward Current

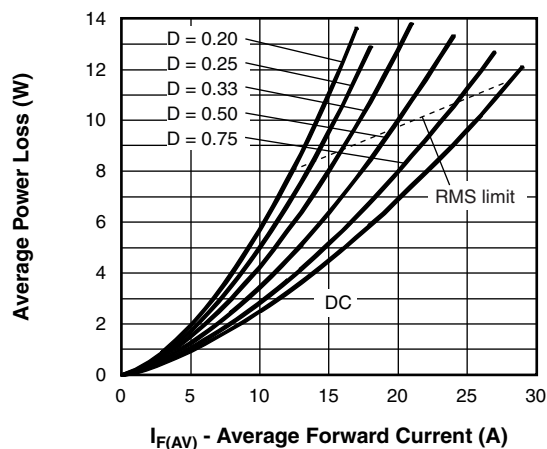


Fig. 6 - Forward Power Loss Characteristics

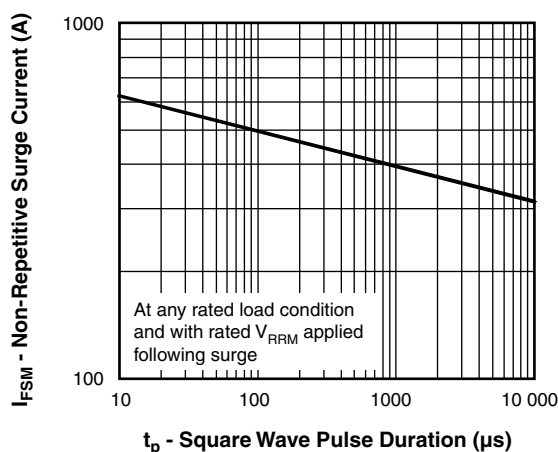


Fig. 7 - Maximum Non-Repetitive Surge Current

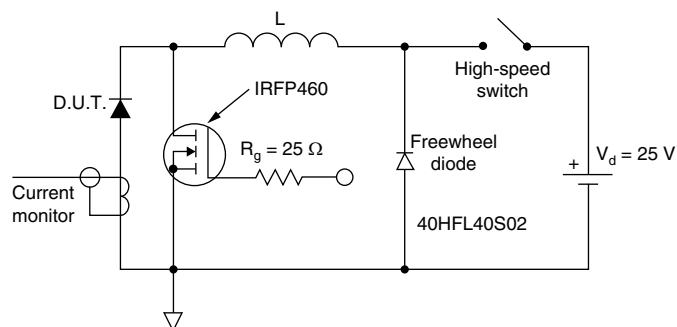


Fig. 8 - Unclamped Inductive Test Circuit

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

**ORDERING INFORMATION TABLE**

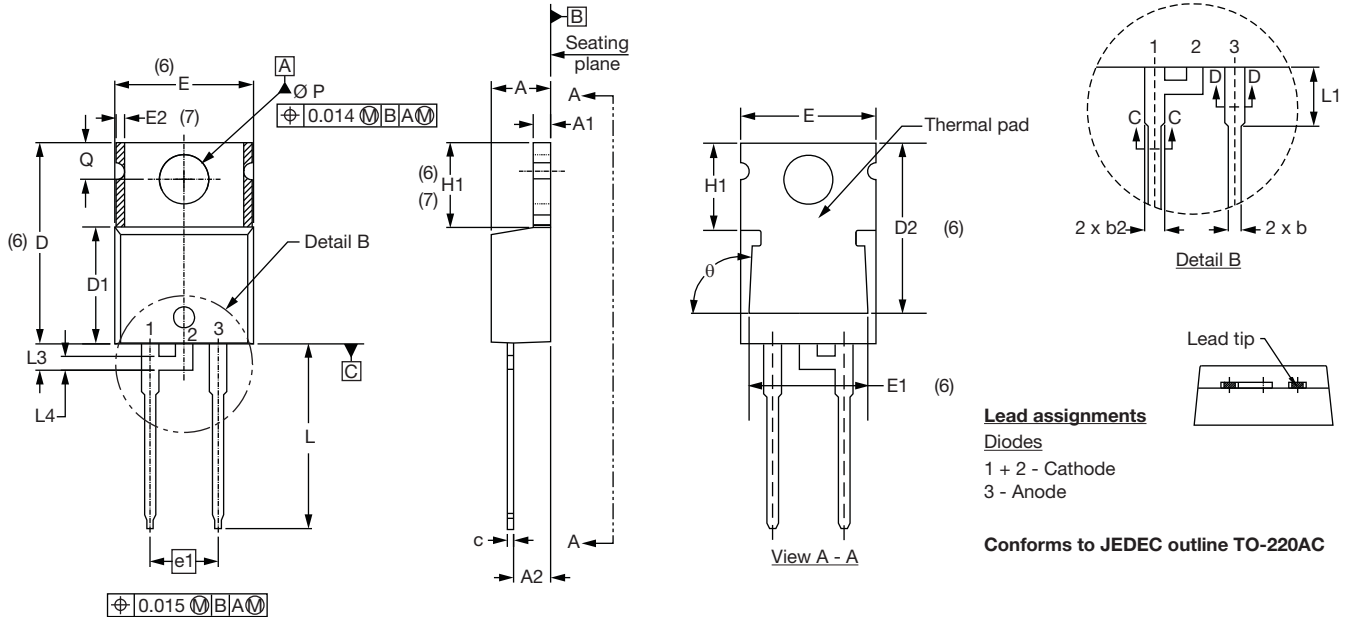
Device code	VS-	STPS	20	L	15	D	PbF
	1	2	3	4	5	6	7
1	- Vishay Semiconductors product						
2	- Schottky STPS series						
3	- Current rating (20 = 20 A)						
4	- L = Low voltage drop						
5	- Voltage rating (15 = 15 V)						
6	- D = Essential part number						
7	- Environmental digit						
	• PbF = 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-STPS20L15DPbF	50	1000	Antistatic plastic tube
VS-STPS20L15D-N3	50	1000	Antistatic plastic tube

LINKS TO RELATED DOCUMENTS	
Dimensions	www.vishay.com/doc?95221
Part marking information	TO-220AC PbF www.vishay.com/doc?95224
	TO-220AC -N3 www.vishay.com/doc?95068
SPICE model	www.vishay.com/doc?95305

TO-220AC

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
E	10.11	10.51	0.398	0.414	3, 6

SYMBOL	MILLIMETERS		INCHES		NOTES
	MIN.	MAX.	MIN.	MAX.	
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
L3	1.78	2.13	0.070	0.084	
L4	0.76	1.27	0.030	0.050	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 dimension: inches
- (6) Thermal pad contour optional within dimensions E, H1, D2 and E1
- (7) Dimension E2 x H1 define a zone where stamping and singulation irregularities are allowed
- (8) Outline conforms to JEDEC TO-220, D2 (minimum) where dimensions are derived from the actual package outline



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