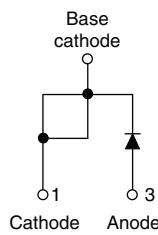


## Schottky Rectifier, 20 A



TO-220AC



e3

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

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

### 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)

### 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
$I_{FSM}$	$t_p = 5$ µs sine	700	A
$V_F$	19 A <sub>pk</sub> , $T_J = 125$ °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	Following any rated load condition and with rated $V_{RRM}$ applied	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	$T_J = 25 \text{ }^\circ\text{C}$	-	0.41	V	
		40 A		-	0.52		
		19 A	$T_J = 125 \text{ }^\circ\text{C}$	0.25	0.33		
		40 A		0.37	0.50		
Reverse leakage current See fig. 2	$I_{RM}^{(1)}$	$T_J = 25 \text{ }^\circ\text{C}$	$V_R = \text{Rated } V_R$	-	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		$\text{m}\Omega$	
Maximum junction capacitance	$C_T$	$V_R = 5 \text{ V}_{\text{DC}}$ (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/ $\mu$ s	

**Note**

(1) Pulse width < 300  $\mu$ 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 <sup>2</sup> PAK)		40	
Approximate weight				2	g
				0.07	oz.
Mounting torque	minimum		Non-lubricated threads		6 (5)
	maximum				kgf · cm (lbf · in)
Marking device		Case style TO-220AC		STPS20L15D	

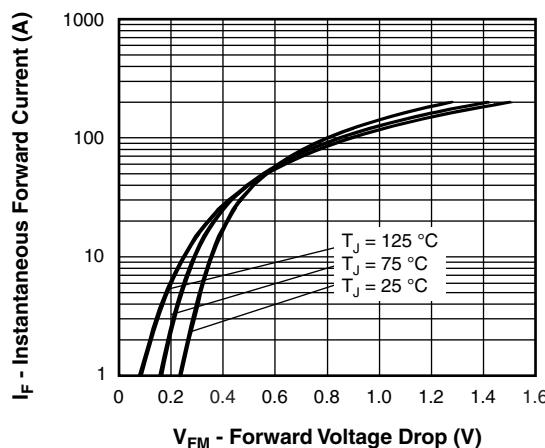


Fig. 1 - Maximum Forward Voltage Drop Characteristics

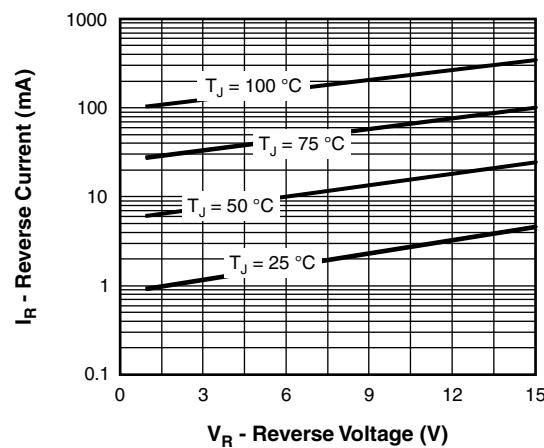


Fig. 2 - Typical Values of Reverse Current vs. Reverse Voltage

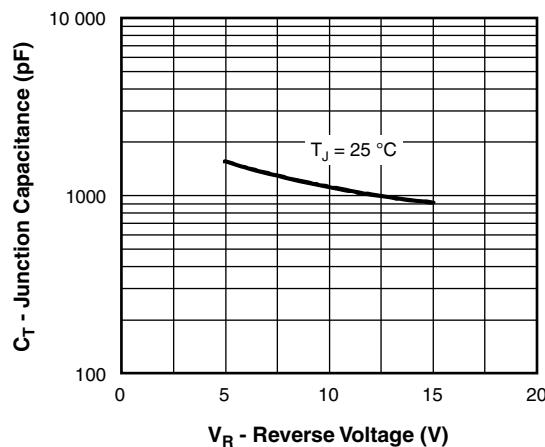


Fig. 3 - Typical Junction Capacitance vs. Reverse Voltage

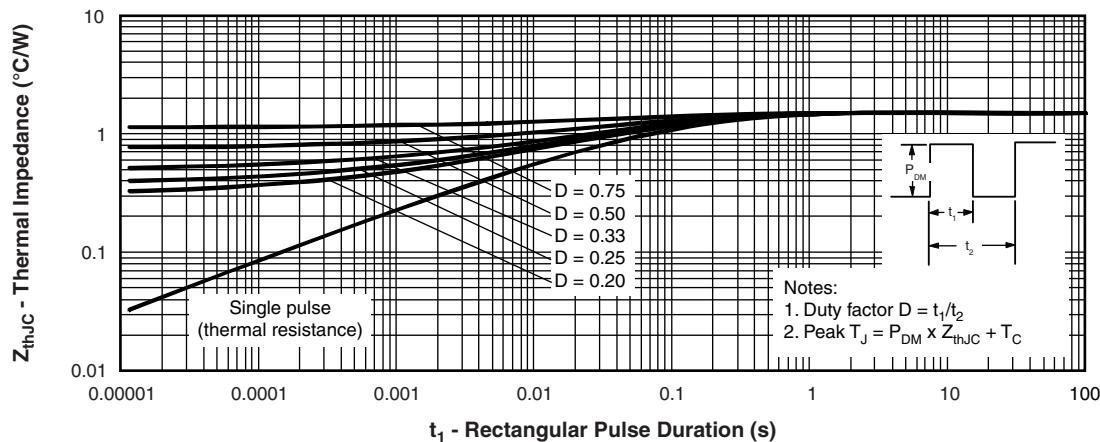


Fig. 4 - Maximum Thermal Impedance  $Z_{thJC}$  Characteristics

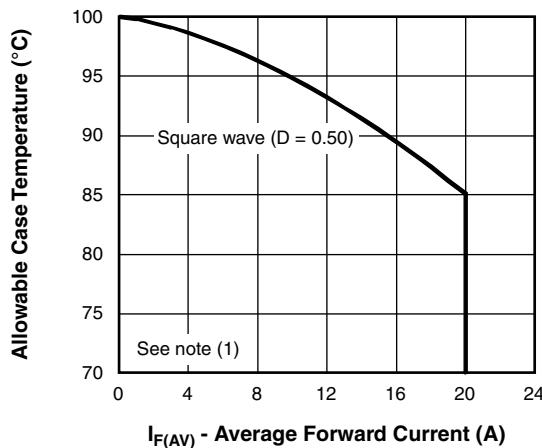


Fig. 5 - Maximum Allowable Case Temperature vs.  
Average Forward Current

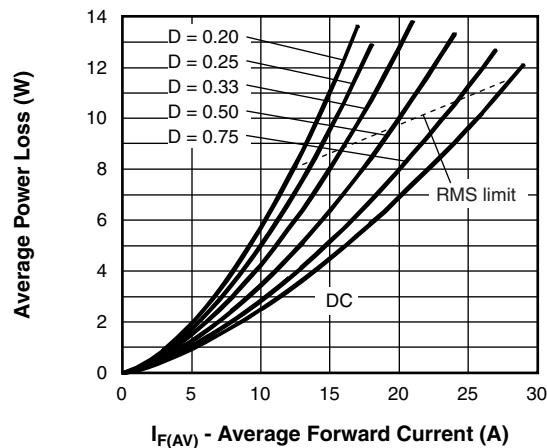


Fig. 6 - Forward Power Loss Characteristics

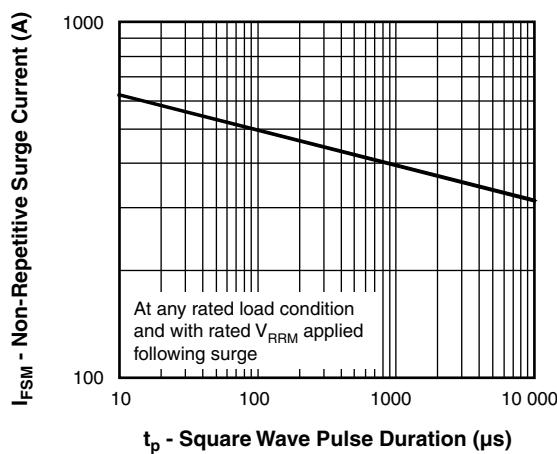


Fig. 7 - Maximum Non-Repetitive Surge Current

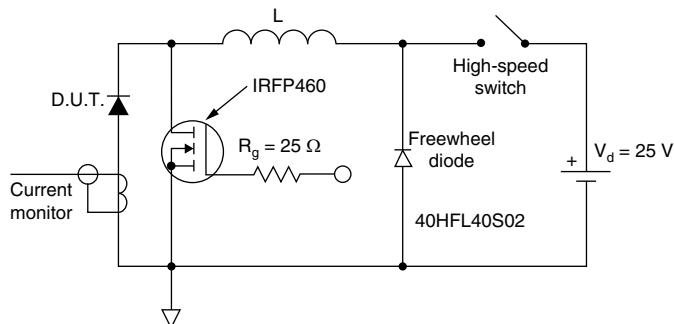


Fig. 8 - Unclamped Inductive Test Circuit

#### Note

(1) Formula used:  $T_C = T_J - (P_d + P_{dREV}) \times R_{thJC}$   
 $P_d$  = 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-	STPS	20	L	15	D	PbF
	(1)	(2)	(3)	(4)	(5)	(6)	(7)

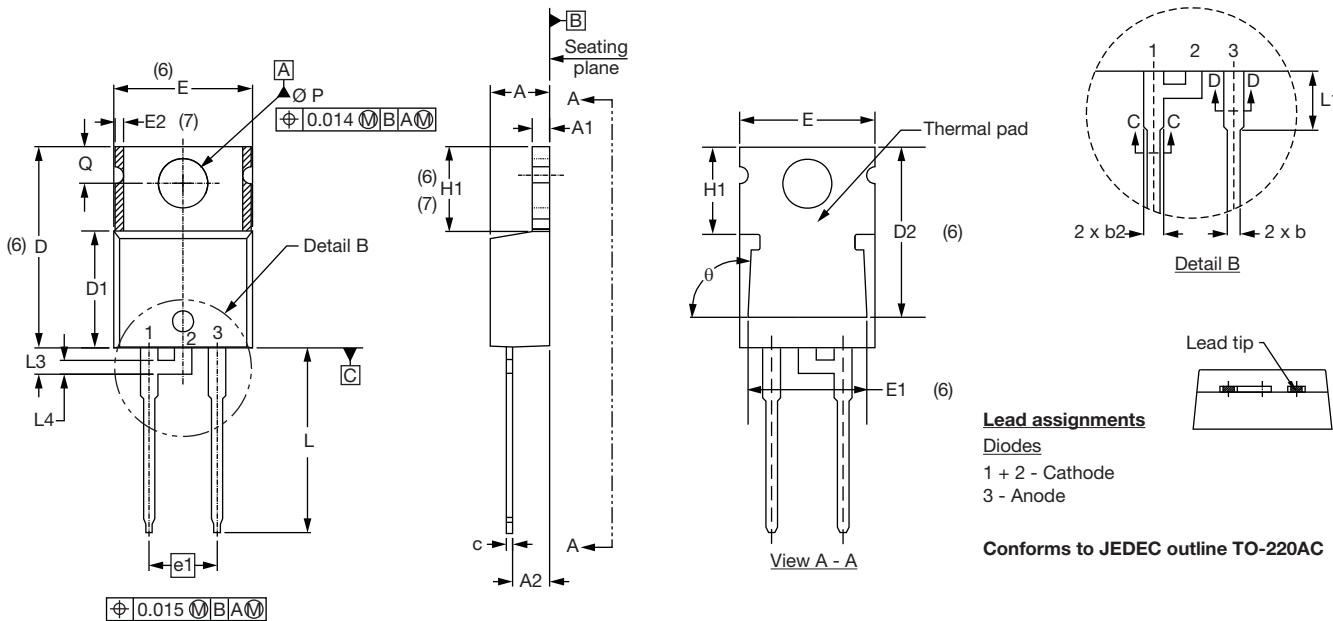
1	- Vishay Semiconductors product
2	- Schottky STPS series
3	- Current rating (20 = 20 A)
4	- L = Low voltage drop
5	- Voltage rating (15 = 15 V)
6	- D = Essential part number
7	<ul style="list-style-type: none"> <li>- Environmental digit</li> <li>• PbF = Lead (Pb)-free and RoHS compliant</li> <li>• -N3 = Halogen-free, RoHS compliant, and totally lead (Pb)-free</li> </ul>

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	<a href="http://www.vishay.com/doc?95221">www.vishay.com/doc?95221</a>				
Part marking information	<table border="0"> <tr> <td>TO-220AC PbF</td> <td><a href="http://www.vishay.com/doc?95224">www.vishay.com/doc?95224</a></td> </tr> <tr> <td>TO-220AC -N3</td> <td><a href="http://www.vishay.com/doc?95068">www.vishay.com/doc?95068</a></td> </tr> </table>	TO-220AC PbF	<a href="http://www.vishay.com/doc?95224">www.vishay.com/doc?95224</a>	TO-220AC -N3	<a href="http://www.vishay.com/doc?95068">www.vishay.com/doc?95068</a>
TO-220AC PbF	<a href="http://www.vishay.com/doc?95224">www.vishay.com/doc?95224</a>				
TO-220AC -N3	<a href="http://www.vishay.com/doc?95068">www.vishay.com/doc?95068</a>				
SPICE model	<a href="http://www.vishay.com/doc?95305">www.vishay.com/doc?95305</a>				

# 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°		

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## 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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