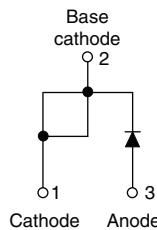


## Schottky Rectifier, 20 A


**TO-220AC**


<b>PRODUCT SUMMARY</b>	
Package	TO-220AC
$I_{F(AV)}$	20 A
$V_R$	35 V, 40 V, 45 V
$V_F$ at $I_F$	0.51 V
$I_{RM}$ max.	105 mA at 125 °C
$T_J$	150 °C
Diode variation	Single die
$E_{AS}$	27 mJ

### FEATURES

- 150 °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)


**e3**
**RoHS**  
COMPLIANT  
HALOGEN  
**FREE**  
Available

### DESCRIPTION

The VS-20TQ... Schottky rectifier series has been optimized for very low forward voltage drop, with moderate leakage. The proprietary barrier technology allows for reliable operation up to 150 °C junction temperature. Typical applications are in switching power supplies, converters, freewheeling diodes, and reverse battery protection.

<b>MAJOR RATINGS AND CHARACTERISTICS</b>			
SYMBOL	CHARACTERISTICS	VALUES	UNITS
$I_{F(AV)}$	Rectangular waveform	20	A
$V_{RRM}$	Range	35 to 45	V
$I_{FSM}$	$t_p = 5 \mu s$ sine	1800	A
$V_F$	20 A <sub>pk</sub> , $T_J = 125$ °C	0.51	V
$T_J$	Range	- 55 to 150	°C

PARAMETER	SYMBOL	VS-20TQ035PbF	VS-20TQ035-N3	VS-20TQ040PbF	VS-20TQ040-N3	VS-20TQ045PbF	VS-20TQ045-N3	UNITS
Maximum DC reverse voltage	$V_R$	35	35	40	40	45	45	V
Maximum working peak reverse voltage	$V_{RWM}$							

<b>ABSOLUTE MAXIMUM RATINGS</b>							
PARAMETER	SYMBOL	TEST CONDITIONS			VALUES	UNITS	
Maximum average forward current See fig. 5	$I_{F(AV)}$	50 % duty cycle at $T_C = 116$ °C, rectangular waveform			20	A	
Maximum peak one cycle non-repetitive surge current 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	1800		
		10 ms sine or 6 ms rect. pulse			400		
Non-repetitive avalanche energy	$E_{AS}$	$T_J = 25$ °C, $I_{AS} = 4$ A, $L = 3.4$ mH			27	mJ	
Repetitive avalanche current	$I_{AR}$	Current decaying linearly to zero in 1 $\mu s$ Frequency limited by $T_J$ maximum $V_A = 1.5 \times V_R$ typical			4	A	

**ELECTRICAL SPECIFICATIONS**

PARAMETER	SYMBOL	TEST CONDITIONS		VALUES	UNITS	
Maximum forward voltage drop See fig. 1	$V_{FM}^{(1)}$	20 A	$T_J = 25^\circ C$	0.57	V	
		40 A		0.73		
		20 A	$T_J = 125^\circ C$	0.51		
		40 A		0.67		
Maximum reverse leakage current See fig. 2	$I_{RM}^{(1)}$	$T_J = 25^\circ C$	$V_R = \text{Rated } V_R$	2.7	mA	
		$T_J = 125^\circ C$		105		
Maximum junction capacitance	$C_T$	$V_R = 5 V_{DC}$ , (test signal range 100 kHz to 1 MHz) $25^\circ C$		1400	pF	
Typical series inductance	$L_S$	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/ $\mu$ s	

**Note**

<sup>(1)</sup> 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 150	°C
Maximum thermal resistance, junction to case	$R_{thJC}$	DC operation See fig. 4		1.50	°C/W
Typical thermal resistance, case to heatsink	$R_{thCS}$	Mounting surface, smooth and greased		0.50	
Approximate weight				2	g
				0.07	oz.
Mounting torque	minimum maximum			6 (5)	kgf · cm (lbf · in)
				12 (10)	
Marking device				20TQ035	
				20TQ040	
				20TQ045	

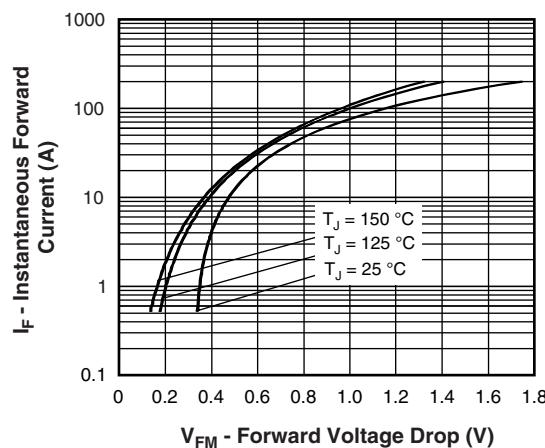


Fig. 1 - Maximum Forward Voltage Drop Characteristics

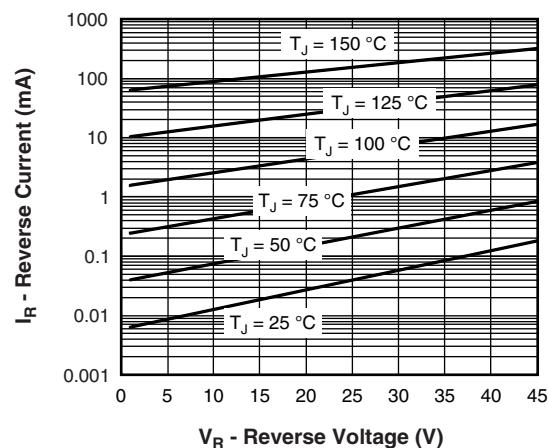


Fig. 2 - Typical Values of Reverse Current vs. Reverse Voltage

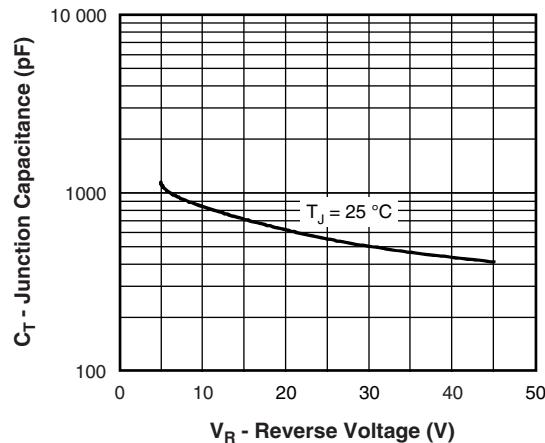


Fig. 3 - Typical Junction Capacitance vs. Reverse Voltage

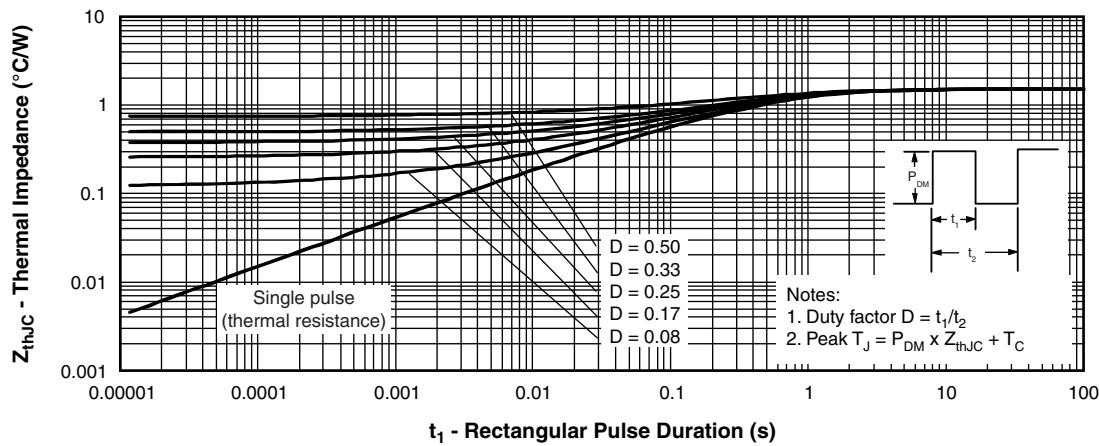


Fig. 4 - Maximum Thermal Impedance  $Z_{thJC}$  Characteristics

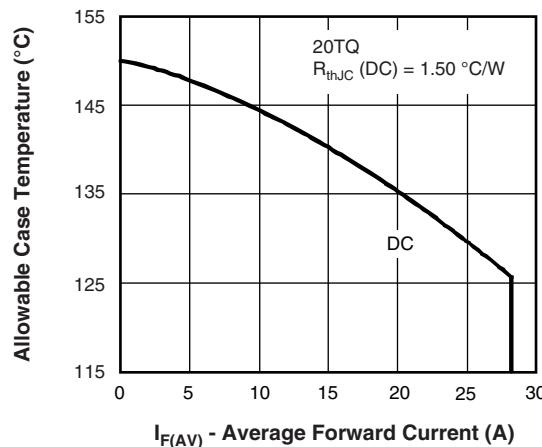


Fig. 5 - Maximum Allowable Case Temperature vs.  
Average Forward Current

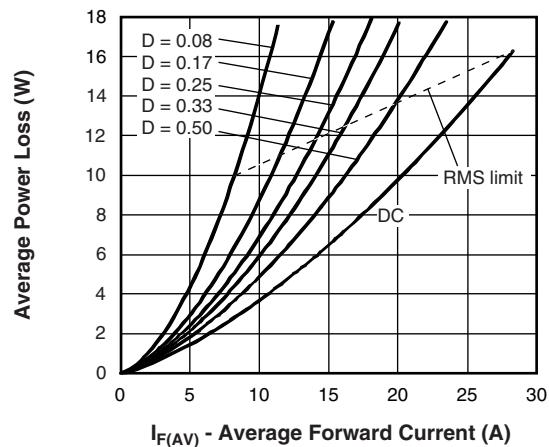


Fig. 6 - Forward Power Loss Characteristics

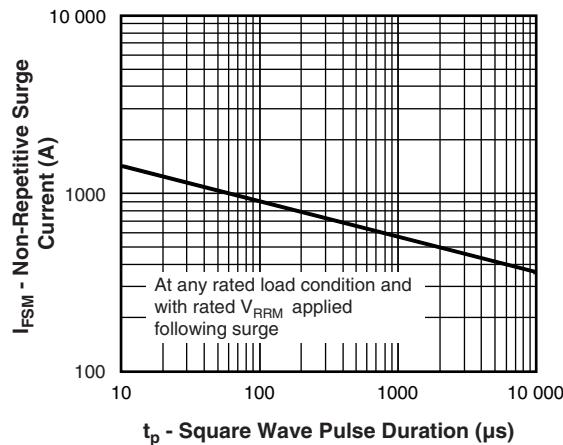


Fig. 7 - Maximum Non-Repetitive Surge Current

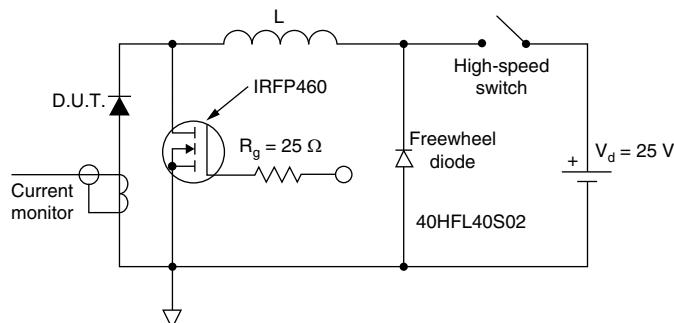


Fig. 8 - Unclamped Inductive Test Circuit

**ORDERING INFORMATION TABLE**

Device code	VS-	20	T	Q	045	PbF
	1	2	3	4	5	6

<b>1</b>	- Vishay Semiconductors product	
<b>2</b>	- Current rating (20 = 20 A)	
<b>3</b>	- Package: T = TO-220	
<b>4</b>	- Schottky "Q" series	035 = 35 V
<b>5</b>	- Voltage ratings	040 = 40 V
<b>6</b>	- Environmental digit	045 = 45 V

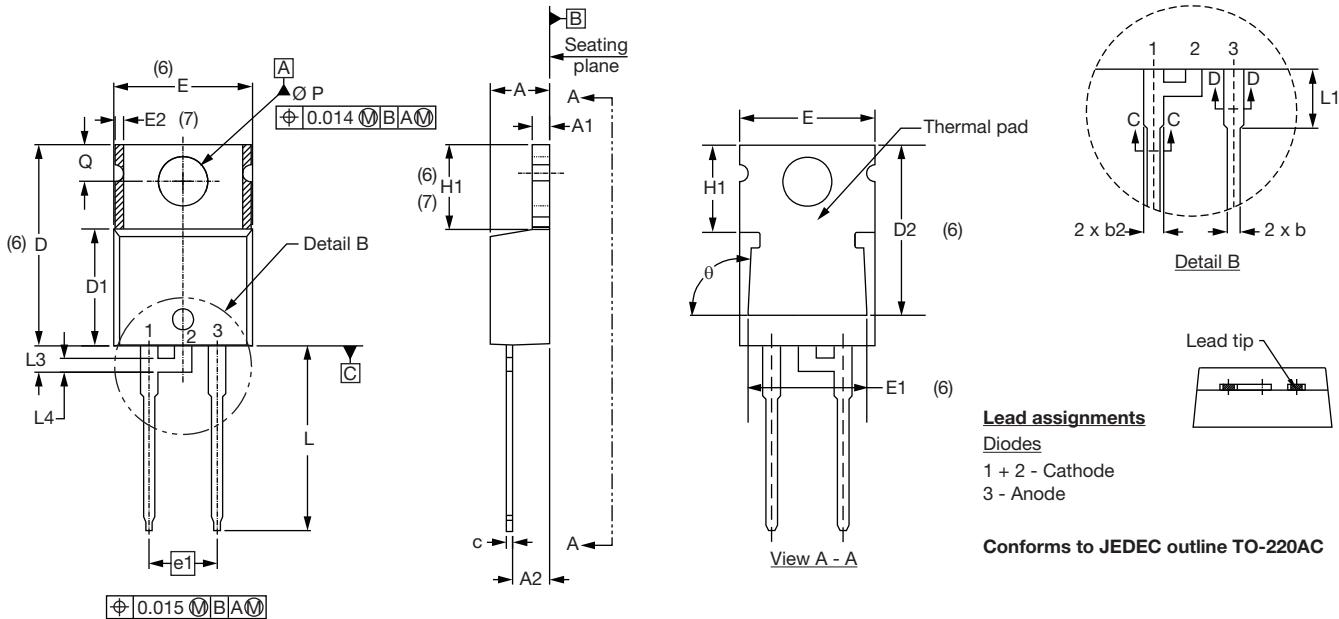
- PbF = Lead (Pb)-free and RoHS compliant
- -N3 = Halogen-free, RoHS compliant, and totally lead (Pb)-free

<b>ORDERING INFORMATION</b> (Example)			
PREFERRED P/N	QUANTITY PER T/R	MINIMUM ORDER QUANTITY	PACKAGING DESCRIPTION
VS-20TQ035PbF	50	1000	Antistatic plastic tube
VS-20TQ035-N3	50	1000	Antistatic plastic tube
VS-20TQ040PbF	50	1000	Antistatic plastic tube
VS-20TQ040-N3	50	1000	Antistatic plastic tube
VS-20TQ045PbF	50	1000	Antistatic plastic tube
VS-20TQ045-N3	50	1000	Antistatic plastic tube

<b>LINKS TO RELATED DOCUMENTS</b>		
Dimensions		<a href="http://www.vishay.com/doc?95221">www.vishay.com/doc?95221</a>
Part marking information	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

**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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