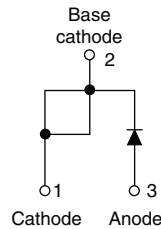


## Schottky Rectifier, 6 A


**TO-220AC**


### FEATURES

- 175 °C  $T_J$  operation
- High frequency operation
- Low forward voltage drop
- 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)



PRODUCT SUMMARY	
Package	TO-220AC
$I_{F(AV)}$	6 A
$V_R$	35 V, 40 V, 45 V
$V_F$ at $I_F$	0.53 V
$I_{RM}$ max.	7 mA at 125 °C
$T_J$ max.	175 °C
Diode variation	Single die
$E_{AS}$	8 mJ

### DESCRIPTION

The VS-6TQ... Schottky rectifier series 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	6	A
$V_{RRM}$	Range	35 to 45	V
$I_{FSM}$	$t_p = 5 \mu s$ sine	690	A
$V_F$	6 A <sub>pk</sub> , $T_J = 125 \text{ }^\circ\text{C}$	0.53	V
$T_J$	Range	- 55 to 175	°C

VOLTAGE RATINGS								
PARAMETER	SYMBOL	VS-6TQ035PbF	VS-6TQ035-N3	VS-6TQ040PbF	VS-6TQ040-N3	VS-6TQ045PbF	VS-6TQ045-N3	UNITS
Maximum DC reverse voltage	$V_R$	35	35	40	40	45	45	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 at $T_C = 164 \text{ }^\circ\text{C}$ , rectangular waveform	6	A
Maximum peak one cycle non-repetitive surge current See fig. 7	$I_{FSM}$	5 $\mu s$ sine or 3 $\mu s$ rect. pulse	690	A
		10 ms sine or 6 ms rect. pulse		
Non-repetitive avalanche energy	$E_{AS}$	$T_J = 25 \text{ }^\circ\text{C}$ , $I_{AS} = 1.20 \text{ A}$ , $L = 11.10 \text{ mH}$	8	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	1.20	A



ELECTRICAL SPECIFICATIONS					
PARAMETER	SYMBOL	TEST CONDITIONS		VALUES	UNITS
Maximum forward voltage drop See fig. 1	$V_{FM}^{(1)}$	6 A	$T_J = 25\text{ }^\circ\text{C}$	0.60	V
		12 A		0.73	
		6 A	$T_J = 125\text{ }^\circ\text{C}$	0.53	
		12 A		0.64	
Maximum reverse leakage current See fig. 2	$I_{RM}^{(1)}$	$T_J = 25\text{ }^\circ\text{C}$	$V_R = \text{Rated } V_R$	0.8	mA
		$T_J = 125\text{ }^\circ\text{C}$		7	
Threshold voltage	$V_{F(TO)}$	$T_J = T_J \text{ maximum}$		0.35	V
Forward slope resistance	$r_t$			18.23	m $\Omega$
Maximum junction capacitance	$C_T$	$V_R = 5 V_{DC}$ (test signal range 100 kHz to 1 MHz) 25 $^\circ\text{C}$		400	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/ $\mu\text{s}$

Note

(1) 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	$R_{thJC}$	DC operation See fig. 4		2.2	$^\circ\text{C/W}$
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			6 (5)	kgf · cm (lbf · in)
	maximum			12 (10)	
Marking device		Case style TO-220AC		6TQ035	
				6TQ040	
				6TQ045	

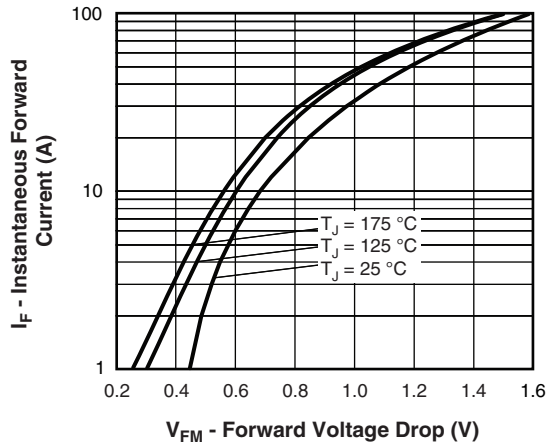


Fig. 1 - Maximum Forward Voltage Drop Characteristics

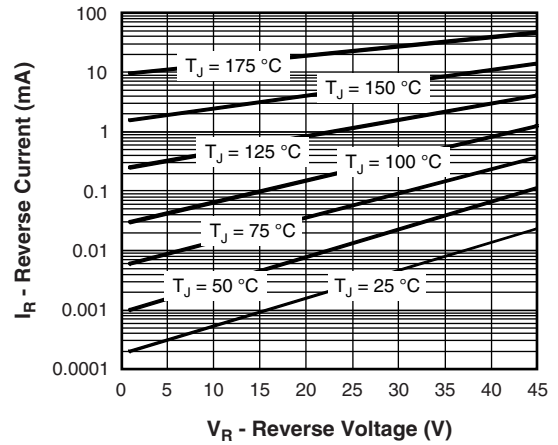


Fig. 2 - Typical Values of Reverse Current vs. Reverse Voltage

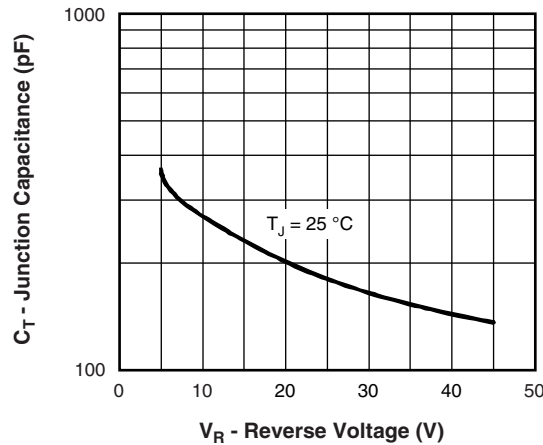


Fig. 3 - Typical Junction Capacitance vs. Reverse Voltage

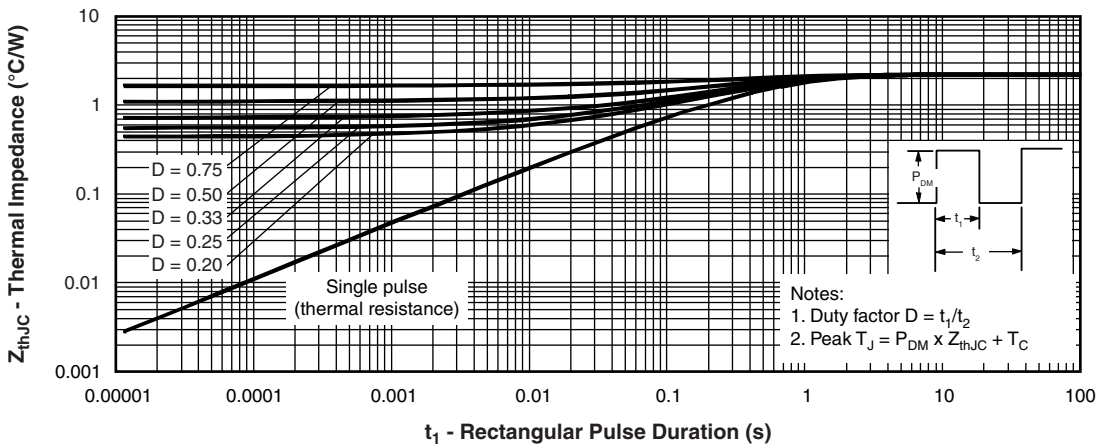


Fig. 4 - Maximum Thermal Impedance  $Z_{thJC}$  Characteristics

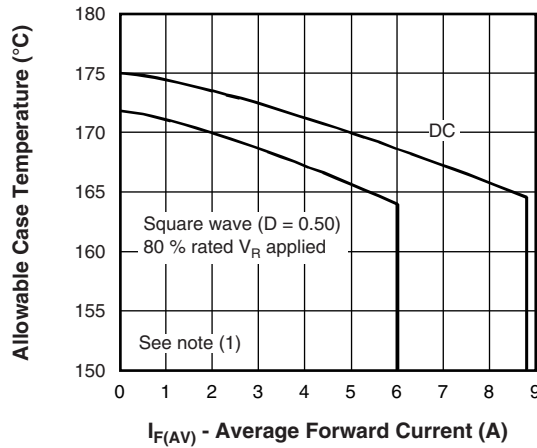


Fig. 5 - Maximum Allowable Case Temperature vs. Average Forward Current

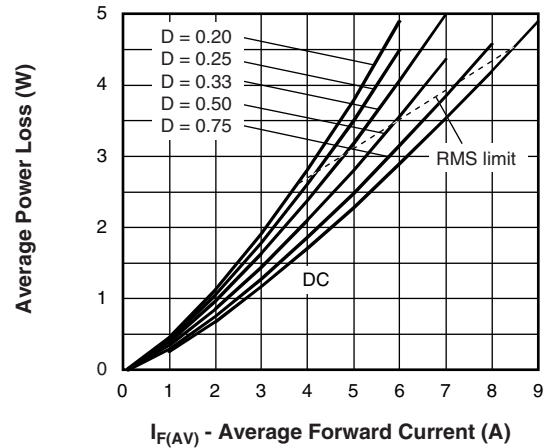


Fig. 6 - Forward Power Loss Characteristics

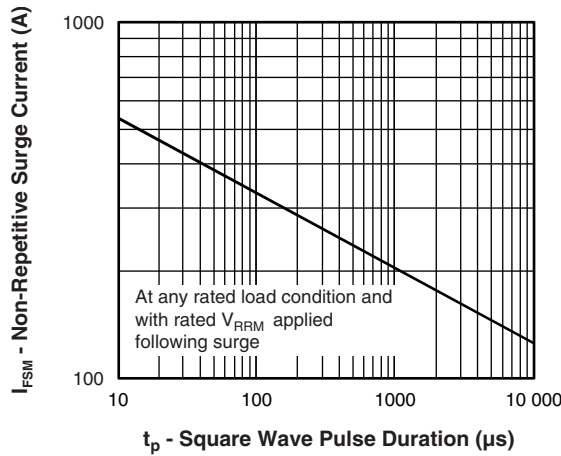


Fig. 7 - Maximum Non-Repetitive Surge Current



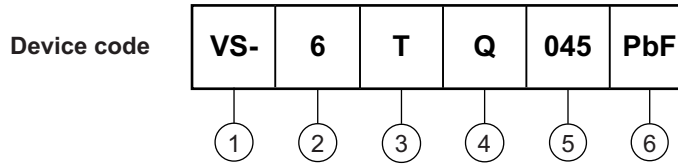
Fig. 8 - Unclamped Inductive Test Circuit

**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



- 1** - Vishay Semiconductors product
- 2** - Current rating (6 = 6 A)
- 3** - Package:  
T = TO-220
- 4** - Schottky "Q" series
- 5** - Voltage ratings
 

035 = 35 V
040 = 40 V
045 = 45 V
- 6** - 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-6TQ035PbF	50	1000	Antistatic plastic tube
VS-6TQ035-N3	50	1000	Antistatic plastic tube
VS-6TQ040PbF	50	1000	Antistatic plastic tube
VS-6TQ040-N3	50	1000	Antistatic plastic tube
VS-6TQ045PbF	50	1000	Antistatic plastic tube
VS-6TQ045-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	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	SYMBOL	MILLIMETERS		INCHES		NOTES
	MIN.	MAX.	MIN.	MAX.			MIN.	MAX.	MIN.	MAX.	
A	4.25	4.65	0.167	0.183		E1	6.86	8.89	0.270	0.350	6
A1	1.14	1.40	0.045	0.055		E2	-	0.76	-	0.030	7
A2	2.56	2.92	0.101	0.115		e	2.41	2.67	0.095	0.105	
b	0.69	1.01	0.027	0.040		e1	4.88	5.28	0.192	0.208	
b1	0.38	0.97	0.015	0.038	4	H1	6.09	6.48	0.240	0.255	6, 7
b2	1.20	1.73	0.047	0.068		L	13.52	14.02	0.532	0.552	
b3	1.14	1.73	0.045	0.068	4	L1	3.32	3.82	0.131	0.150	2
c	0.36	0.61	0.014	0.024		L3	1.78	2.13	0.070	0.084	
c1	0.36	0.56	0.014	0.022	4	L4	0.76	1.27	0.030	0.050	2
D	14.85	15.25	0.585	0.600	3	Ø P	3.54	3.73	0.139	0.147	
D1	8.38	9.02	0.330	0.355		Q	2.60	3.00	0.102	0.118	
D2	11.68	12.88	0.460	0.507	6	θ	90° to 93°		90° to 93°		
E	10.11	10.51	0.398	0.414	3, 6						

**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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