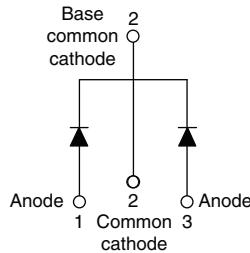


Schottky Rectifier, 2 x 30 A


TO-220AB


RoHS
COMPLIANT
HALOGEN
FREE
Available

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)

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 150 °C junction temperature. Typical applications are in switching power supplies, converters, freewheeling diodes, and reverse battery protection.

PRODUCT SUMMARY	
Package	TO-220AB
$I_{F(AV)}$	2 x 30 A
V_R	35 V, 40 V, 45 V
V_F at I_F	0.53 V
I_{RM} max.	250 mA at 125 °C
T_J max.	150 °C
Diode variation	Common cathode
E_{AS}	20 mJ

MAJOR RATINGS AND CHARACTERISTICS			
SYMBOL	CHARACTERISTICS	VALUES	UNITS
$I_{F(AV)}$	Rectangular waveform (per device)	60	A
V_{RRM}		35 to 45	V
I_{FRM}	$T_C = 113$ °C (per leg)	60	A
I_{FSM}	$t_p = 5$ µs sine	1500	
V_F	30 A _{pk} , $T_J = 125$ °C	0.53	V
T_J	Range	- 65 to 150	°C

VOLTAGE RATINGS								
PARAMETER	SYMBOL	VS-60CTQ035PbF	VS-60CTQ035-N3	VS-60CTQ040PbF	VS-60CTQ040-N3	VS-60CTQ045PbF	VS-60CTQ045-N3	UNITS
Maximum DC reverse voltage	V_R							
Maximum working peak reverse voltage	V_{RWM}	35	35	40	40	45	45	V

ABSOLUTE MAXIMUM RATINGS								
PARAMETER	SYMBOL	TEST CONDITIONS			VALUES	UNITS		
Maximum average forward current per leg	$I_{F(AV)}$	50 % duty cycle at $T_C = 113$ °C, rectangular waveform			30	A		
					60			
Peak repetitive forward current per leg	I_{FRM}	Rated V_R , square wave, 20 kHz, $T_C = 113$ °C			60			
Maximum peak one cycle non-repetitive surge current per leg	I_{FSM}	5 µs sine or 3 µs rect. pulse	Following any rated load condition and with rated V_{RRM} applied		1500			
					300			
Non-repetitive avalanche energy per leg	E_{AS}	$T_J = 25$ °C, $I_{AS} = 3$ A, $L = 4.40$ mH			20	mJ		
Repetitive avalanche current per leg	I_{AR}	Current decaying linearly to zero in 1 µs Frequency limited by T_J maximum $V_A = 1.5 \times V_R$ typical			3	A		

ELECTRICAL SPECIFICATIONS

PARAMETER	SYMBOL	TEST CONDITIONS		TYP.	MAX.	UNITS	
Maximum forward voltage drop	V _{FM} ⁽¹⁾	30 A	T _J = 25 °C	0.51	0.56	V	
		60 A		0.66	0.72		
		30 A	T _J = 125 °C	0.48	0.53		
		60 A		0.68	0.75		
Maximum instantaneous reverse current	I _{RM}	T _J = 25 °C	Rated DC voltage	0.33	2	mA	
		T _J = 125 °C		145	250		
Maximum junction capacitance	C _T	V _R = 5 V _{DC} (test signal range 100 kHz to 1 MHz) 25 °C		2000		pF	
Typical series inductance	L _S	Measured from top of terminal to mounting plane		8.0		nH	
Maximum voltage rate of change	dV/dt	Rated V _R		10 000		V/μs	

Note

⁽¹⁾ Pulse width < 300 μs, duty cycle < 2 %

THERMAL - MECHANICAL SPECIFICATIONS

PARAMETER	SYMBOL	TEST CONDITIONS	VALUES	UNITS	
Maximum junction temperature range	T _J		- 65 to 150	°C	
Maximum storage temperature range	T _{Stg}		- 65 to 175		
Maximum thermal resistance, junction to case per leg	R _{thJC}	DC operation	1.2	°C/W	
Typical thermal resistance, case to heatsink	R _{thCS}		0.50		
Approximate weight			2	g	
			0.07	oz.	
Mounting torque	minimum maximum	Non-lubricated threads	6 (5)	kgf · cm (lbf · in)	
			12 (10)		
Marking device		Case style TO-220AB	60CTQ035		
			60CTQ040		
			60CTQ045		

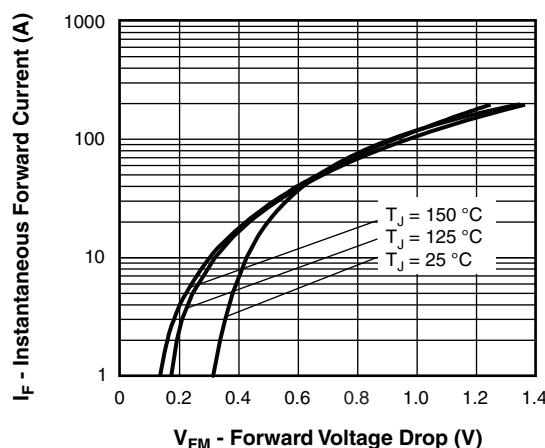


Fig. 1 - Maximum Forward Voltage Drop Characteristics

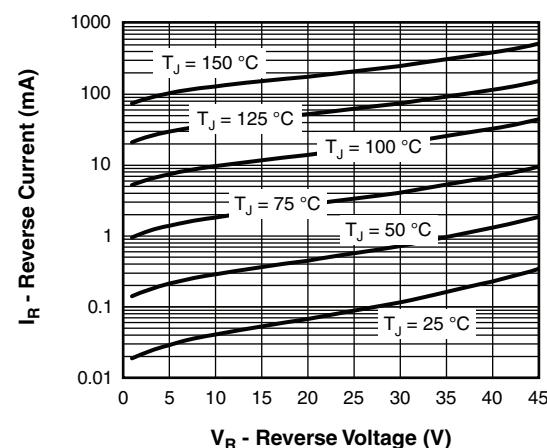


Fig. 2 - Typical Values of Reverse Current vs. Reverse Voltage

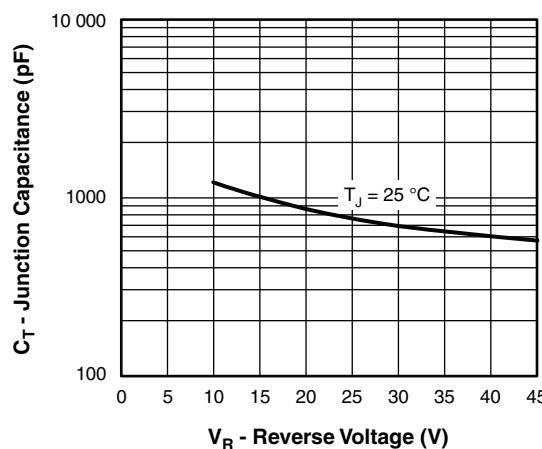


Fig. 3 - Typical Junction Capacitance vs. Reverse Voltage

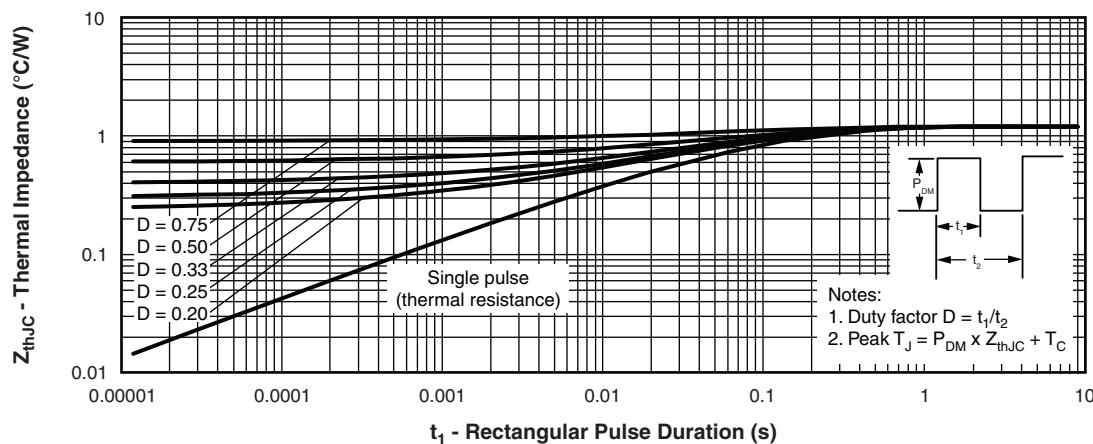


Fig. 4 - Maximum Thermal Impedance Z_{thJC} Characteristics

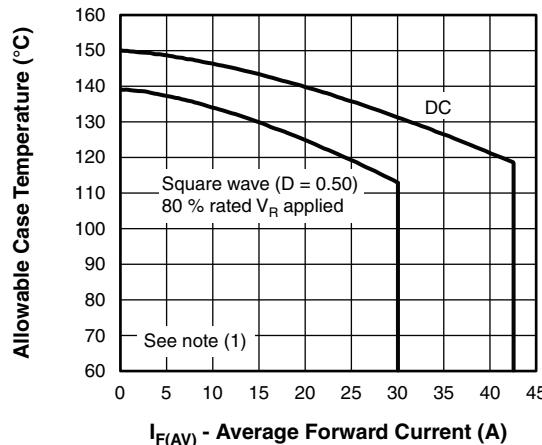


Fig. 5 - Maximum Allowable Case Temperature vs.
Average Forward Current

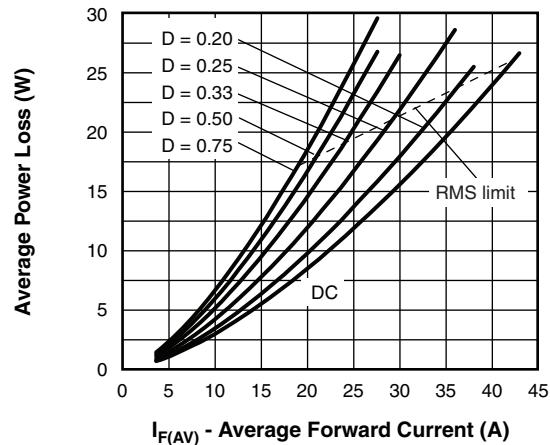


Fig. 6 - Forward Power Loss Characteristics

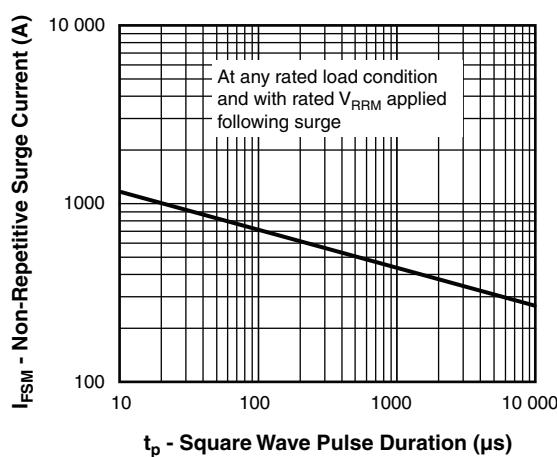


Fig. 7 - Maximum Non-Repetitive Surge Current (Per Leg)

Note

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

ORDERING INFORMATION TABLE

Device code	VS-	60	C	T	Q	045	PbF
	1	2	3	4	5	6	7

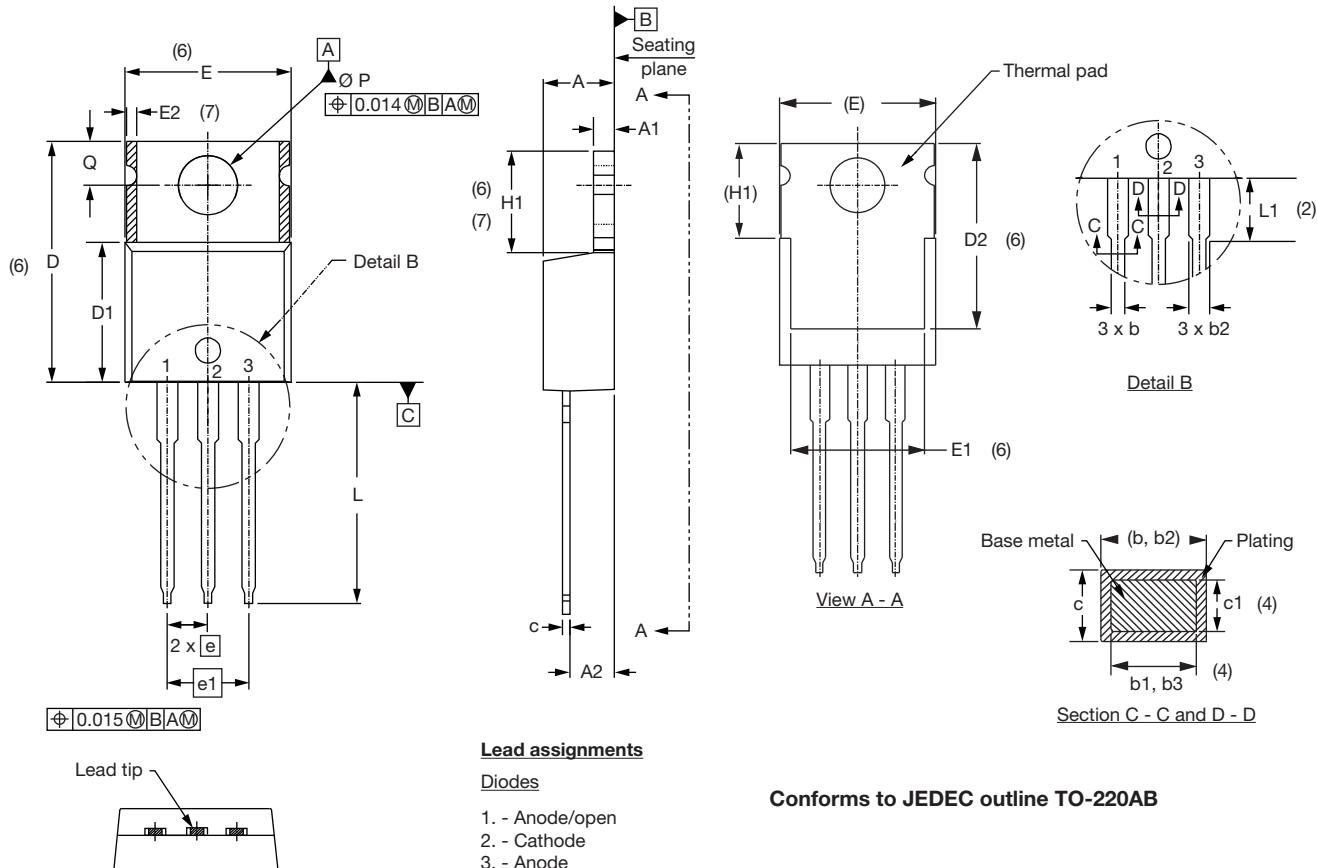
- 1** - Vishay Semiconductors product
- 2** - Current rating (60 = 60 A)
- 3** - Circuit configuration
C = Common cathode
- 4** - Package
T = TO-220
- 5** - Schottky "Q" series
- 6** - Voltage ratings
 - 035 = 35 V
 - 040 = 40 V
 - 045 = 45 V
- 7** - Environmental digit
 - PbF = Lead (Pb)-free and RoHS 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-60CTQ035PbF	50	1000	Antistatic plastic tube
VS-60CTQ035-N3	50	1000	Antistatic plastic tube
VS-60CTQ040PbF	50	1000	Antistatic plastic tube
VS-60CTQ040-N3	50	1000	Antistatic plastic tube
VS-60CTQ045PbF	50	1000	Antistatic plastic tube
VS-60CTQ045-N3	50	1000	Antistatic plastic tube

LINKS TO RELATED DOCUMENTS	
Dimensions	www.vishay.com/doc?95222
Part marking information	www.vishay.com/doc?95225
	www.vishay.com/doc?95028

TO-220AB

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

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 dimensions: inches
- (6) Thermal pad contour optional within dimensions E, H1, D2 and E1

(7) Dimensions E2 x H1 define a zone where stamping and singulation irregularities are allowed

(8) Outline conforms to JEDEC TO-220, except A2 (maximum) and D2 (minimum) where dimensions are derived from the actual package outline

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