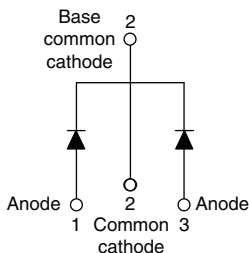




Schottky Rectifier, 2 x 30 A



TO-220AB



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)



RoHS
COMPLIANT
HALOGEN
FREE
Available

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

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.

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}	$t_p = 5$ μ s 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	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	$I_{F(AV)}$	50 % duty cycle at $T_C = 113$ °C, rectangular waveform	30 60	A
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 μ s sine or 3 μ s rect. pulse 10 ms sine or 6 ms rect. pulse	1500 300	
		Following any rated load condition and with rated V_{RRM} applied		
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 μ s 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 μ s, 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}	Mounting surface, smooth and greased	0.50	
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-220AB	60CTQ035	
			60CTQ040	
			60CTQ045	

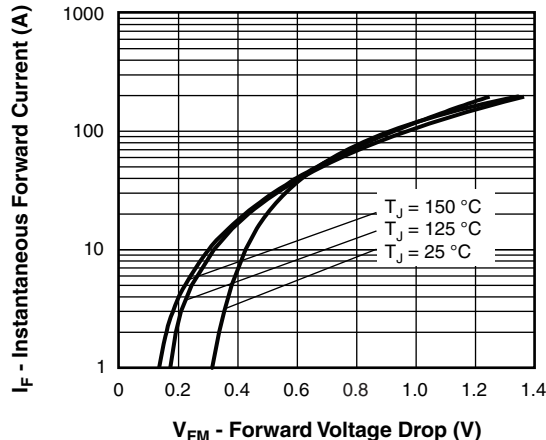


Fig. 1 - Maximum Forward Voltage Drop Characteristics

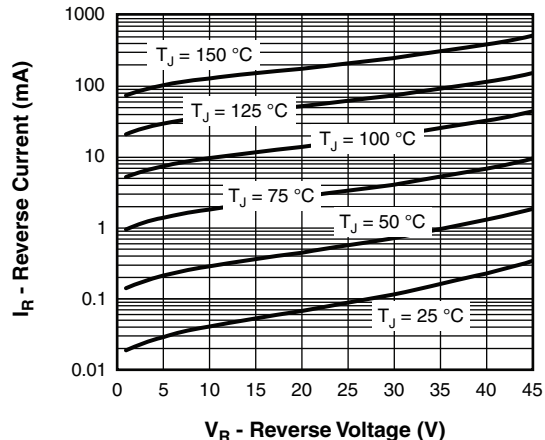


Fig. 2 - Typical Values of Reverse Current vs. Reverse Voltage

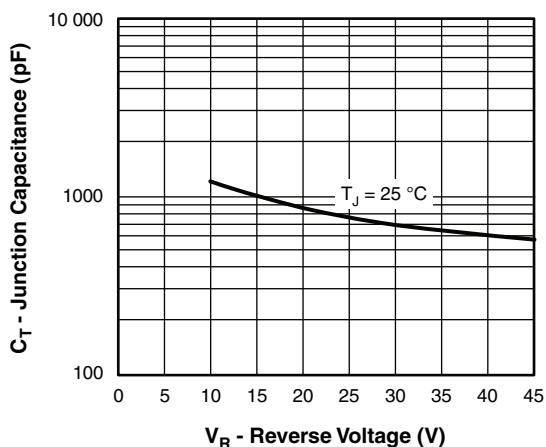
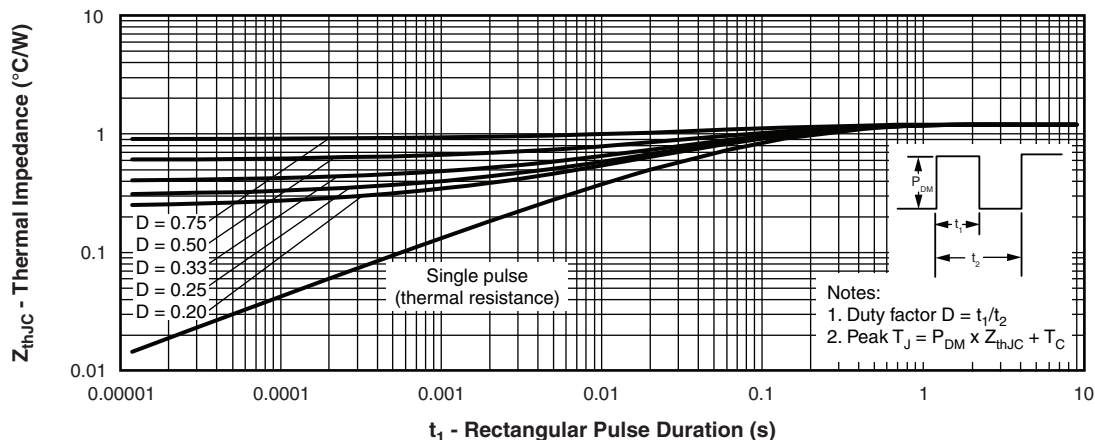


Fig. 3 - Typical Junction Capacitance vs. Reverse Voltage


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

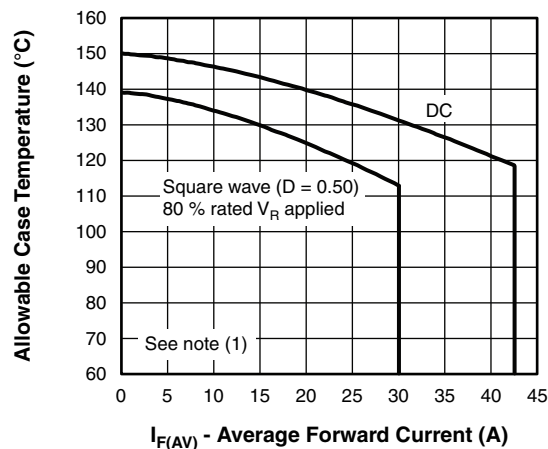


Fig. 5 - Maximum Allowable Case Temperature vs. Average Forward Current

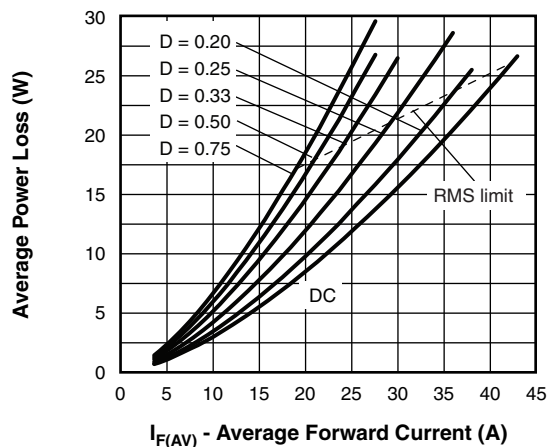


Fig. 6 - Forward Power Loss Characteristics

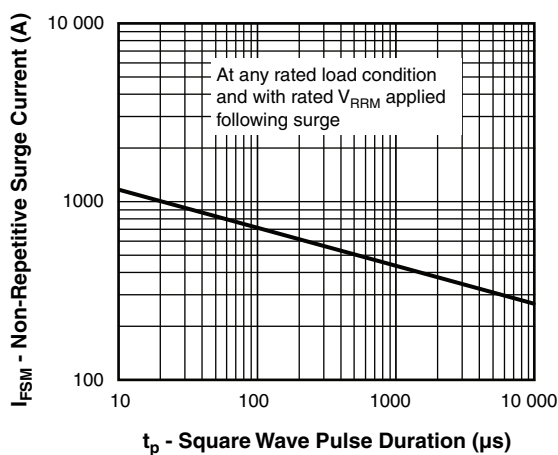


Fig. 7 - Maximum Non-Repetitive Surge Current (Per Leg)

Note

- (1) Formula used: $T_C = T_J - (P_d + P_{dREV}) \times R_{thJC}$;
 P_d = 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**

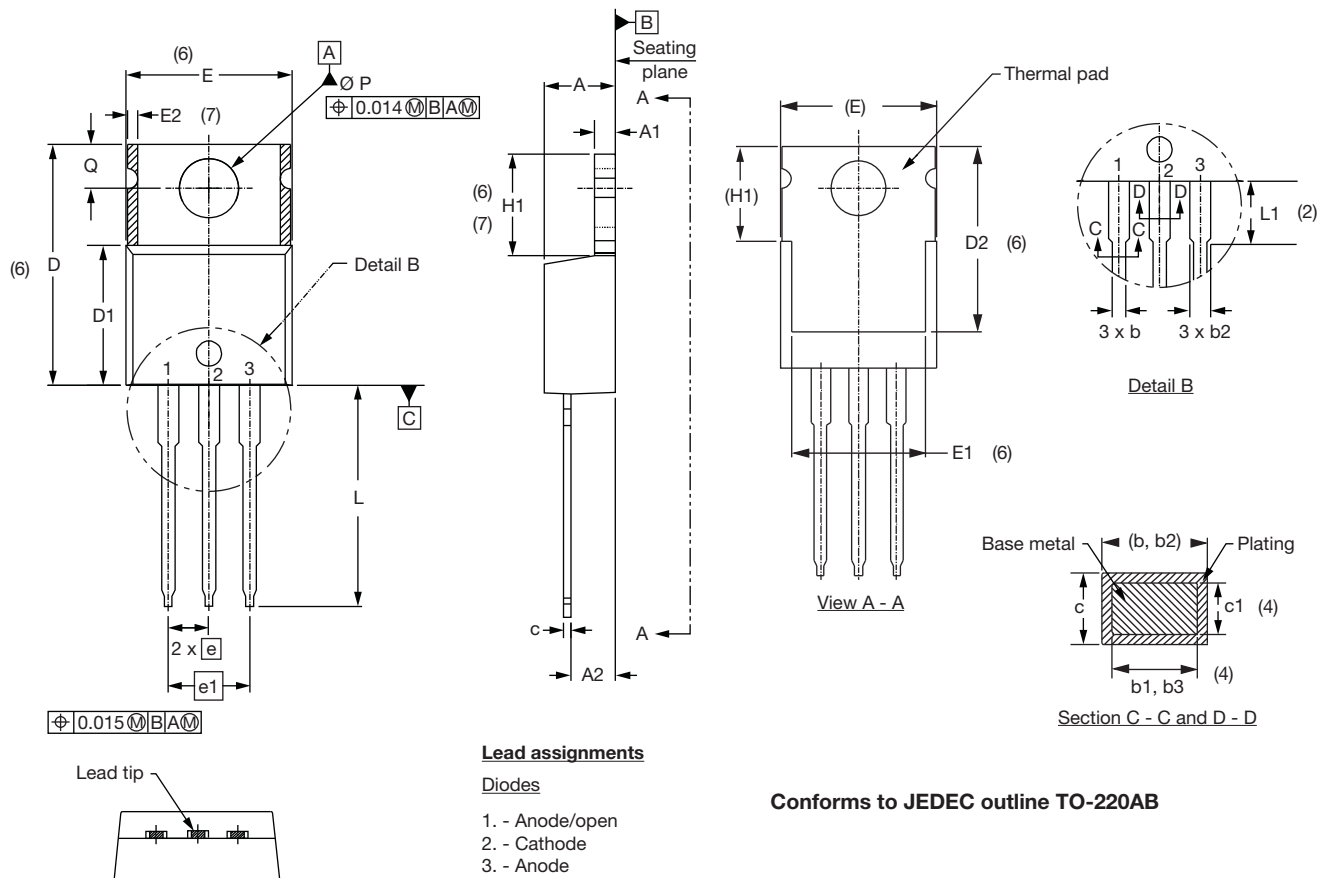
Device code	VS-	60	C	T	Q	045	PbF
	1	2	3	4	5	6	7
1	-	Vishay Semiconductors product					
2	-	Current rating (60 = 60 A)					
3	-	Circuit configuration					
		C = Common cathode					
4	-	Package					
		T = TO-220					
5	-	Schottky "Q" series					
6	-	Voltage ratings					
		035 = 35 V					
		040 = 40 V					
		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	TO-220AB PbF www.vishay.com/doc?95225
	TO-220AB -N3 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

SYMBOL	MILLIMETERS		INCHES		NOTES
	MIN.	MAX.	MIN.	MAX.	
E	10.11	10.51	0.398	0.414	3, 6
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
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 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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