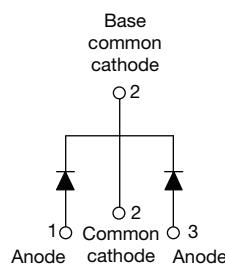
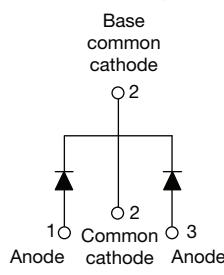


Schottky Rectifier, 2 x 6 A

VS-12CTQ...SPbF



VS-12CTQ...-1PbF



FEATURES

- 175 °C T_J operation
- Center tap TO-220 package
- Low forward voltage drop
- High purity, high temperature epoxy encapsulation for enhanced mechanical strength and moisture resistance
- High frequency operation
- Guard ring for enhanced ruggedness and long term reliability
- Meets MSL level 1, per J-STD-020, LF maximum peak of 260 °C
- Halogen-free according to IEC 61249-2-21 definition
- Compliant to RoHS directive 2002/95/EC
- AEC-Q101 qualified



RoHS
COMPLIANT
HALOGEN
FREE

PRODUCT SUMMARY

$I_{F(AV)}$	2 x 6 A
V_R	35 V to 45 V

DESCRIPTION

The VS-12CTQ... center tap 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	12	A
V_{RRM}	Range	35 to 45	V
I_{FSM}	$t_p = 5 \mu s$ sine	690	A
V_F	6 Apk, $T_J = 125$ °C (per leg)	0.53	V
T_J	Range	- 55 to 175	°C

VOLTAGE RATINGS

PARAMETER	SYMBOL	VS-12CTQ035SPbF VS-12CTQ035-1PbF	VS-12CTQ040SPbF VS-12CTQ040-1PbF	VS-12CTQ045SPbF VS-12CTQ045-1PbF	UNITS
Maximum DC reverse voltage	V_R				
Maximum working peak reverse voltage	V_{RWM}	35	40	45	V

ABSOLUTE MAXIMUM RATINGS

PARAMETER	SYMBOL	TEST CONDITIONS	VALUES	UNITS
Maximum average forward current per leg See fig. 5	$I_{F(AV)}$	50 % duty cycle at $T_C = 160$ °C, rectangular waveform	6	A
per device			12	
Maximum peak one cycle non-repetitive surge current per leg See fig. 7	I_{FSM}	5 μs sine or 3 μs rect. pulse	690	A
		10 ms sine or 6 ms rect. pulse	140	
Non-repetitive avalanche energy per leg	E_{AS}	$T_J = 25$ °C, $I_{AS} = 1.20$ A, $L = 11.10$ mH	8	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	1.20	A

VS-12CTQ...SPbF, VS-12CTQ...-1PbF Series

Vishay High Power Products

Schottky Rectifier,
2 x 6 A



ELECTRICAL SPECIFICATIONS

PARAMETER	SYMBOL	TEST CONDITIONS		VALUES	UNITS	
Maximum forward voltage drop per leg 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 per leg See fig. 2	$I_{RM}^{(1)}$	$T_J = 25 \text{ } ^\circ\text{C}$	$V_R = \text{Rated } V_R$	0.8	mA	
		$T_J = 125 \text{ } ^\circ\text{C}$		7.0		
Threshold voltage	$V_{F(TO)}$	$T_J = T_J \text{ maximum}$		0.35	V	
Forward slope resistance	r_t			18.23	$\text{m}\Omega$	
Maximum junction capacitance per leg	C_T	$V_R = 5 \text{ V}_{DC}$ (test signal range 100 kHz to 1 MHz), $25 \text{ } ^\circ\text{C}$		400	pF	
Typical series inductance per leg	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	$\text{V}/\mu\text{s}$	

Note

⁽¹⁾ Pulse width < 300 μs , 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 per leg	R_{thJC}	DC operation See fig. 4		3.50	$^\circ\text{C}/\text{W}$		
Maximum thermal resistance, junction to case per package		DC operation		1.75			
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)	$\text{k}\text{gf} \cdot \text{cm}$ (lbf · in)		
	maximum			12 (10)			
Marking device		Case style D ² PAK		12CTQ035S			
				12CTQ040S			
				12CTQ045S			
		Case style TO-262		12CTQ035-1			
				12CTQ040-1			
				12CTQ045-1			

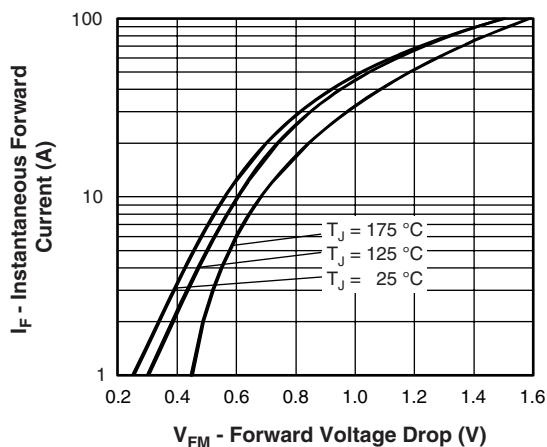


Fig. 1 - Maximum Forward Voltage Drop Characteristics
(Per Leg)

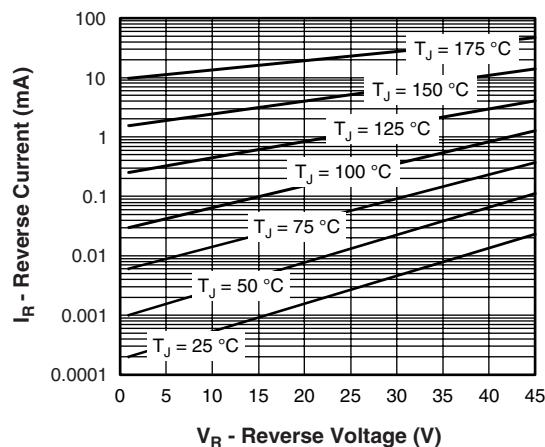


Fig. 2 - Typical Values of Reverse Current vs.
Reverse Voltage (Per Leg)

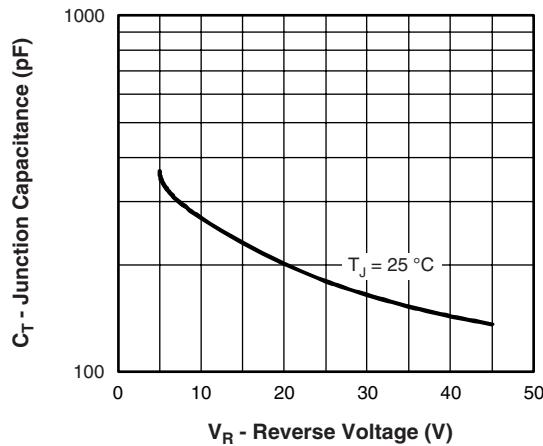


Fig. 3 - Typical Junction Capacitance vs. Reverse Voltage (Per Leg)

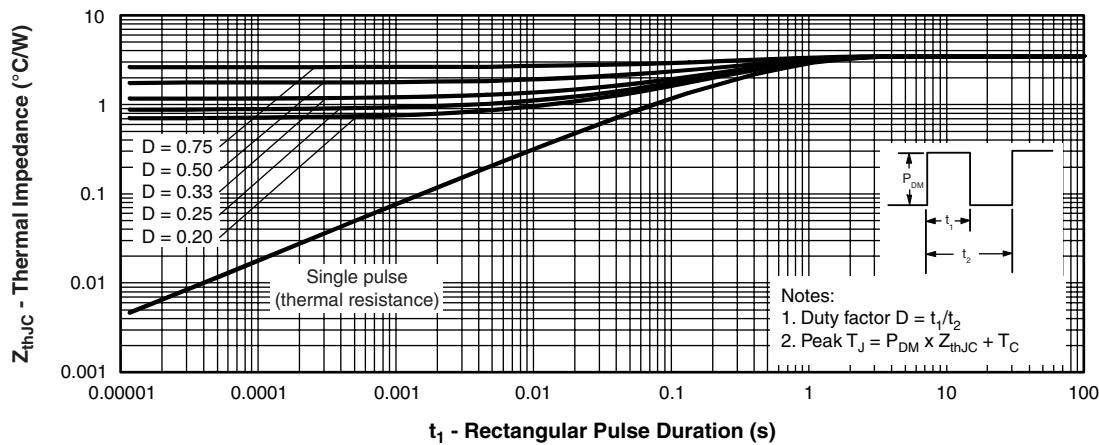


Fig. 4 - Maximum Thermal Impedance Z_{thJC} Characteristics (Per Leg)

VS-12CTQ...SPbF, VS-12CTQ...-1PbF Series

Vishay High Power Products

Schottky Rectifier,
2 x 6 A

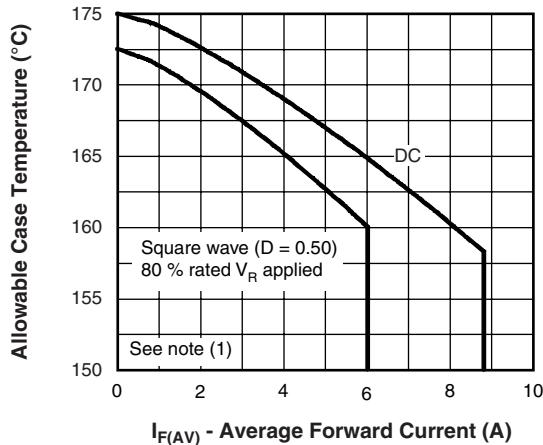


Fig. 5 - Maximum Allowable Case Temperature vs. Average Forward Current (Per Leg)

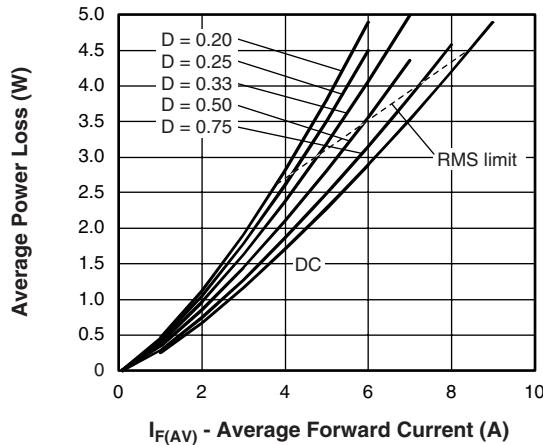


Fig. 6 - Forward Power Loss Characteristics (Per Leg)

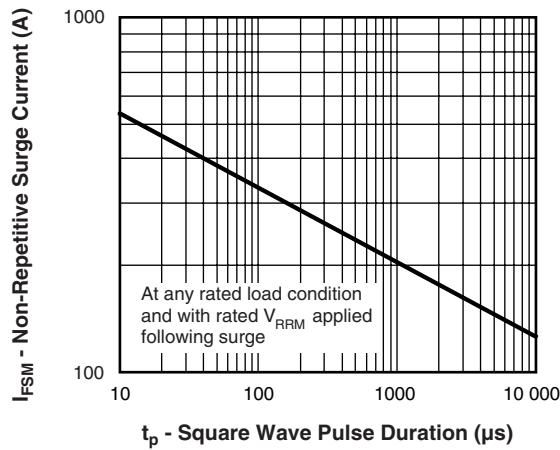


Fig. 7 - Maximum Non-Repetitive Surge Current (Per Leg)

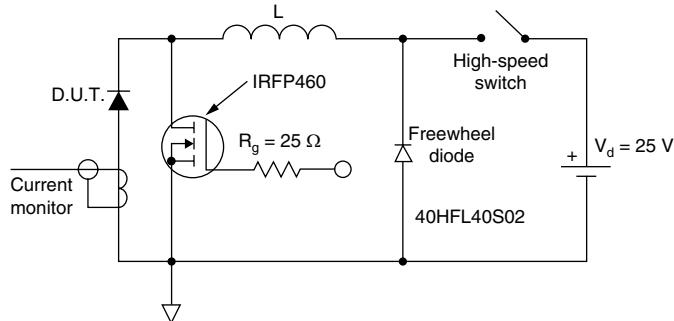


Fig. 8 - Unclamped Inductive Test Circuit

Note

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



VS-12CTQ...SPbF, VS-12CTQ...-1PbF Series

Schottky Rectifier, Vishay High Power Products
2 x 6 A

ORDERING INFORMATION TABLE

Device code	VS-	12	C	T	Q	045	S	TRL	PbF
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)

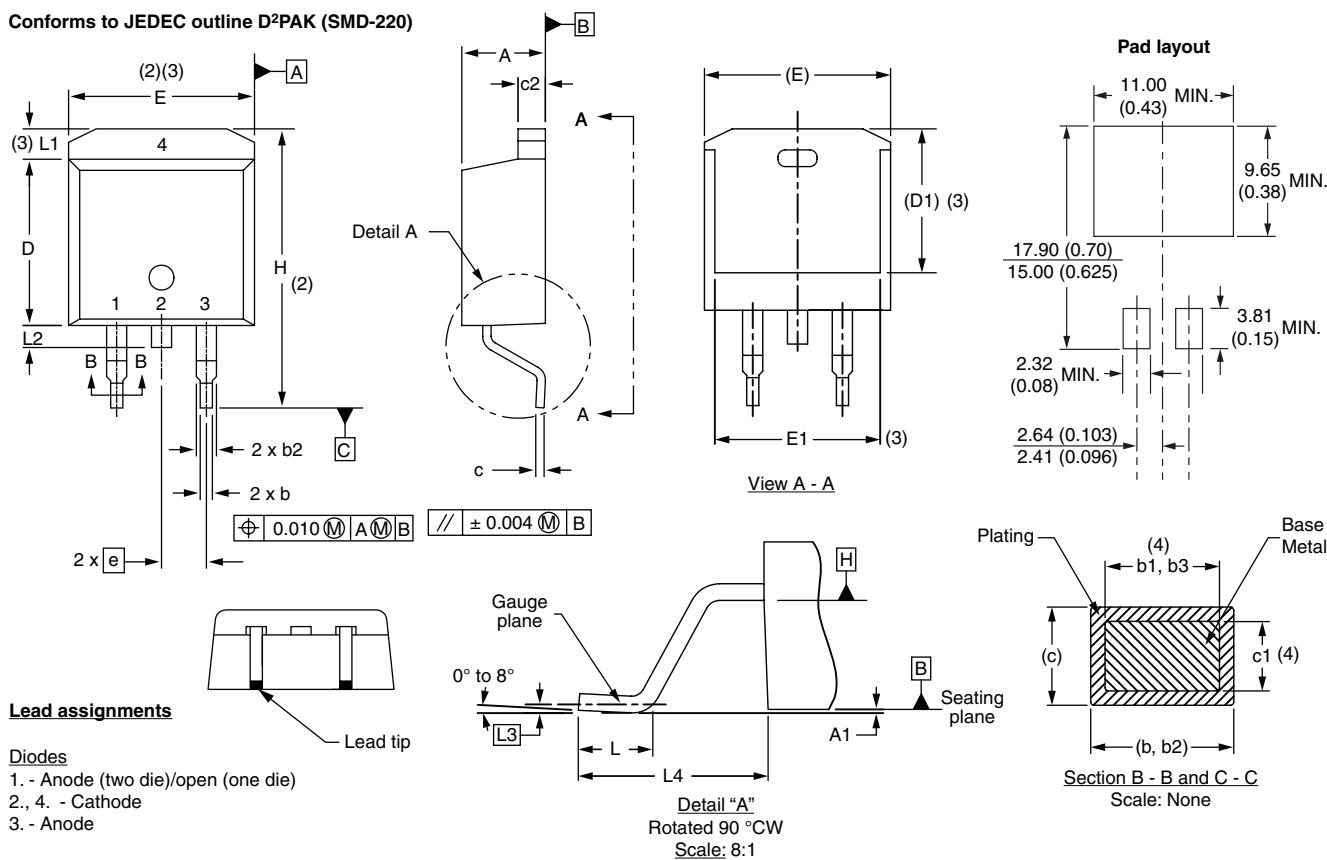
- 1** - HPP product suffix
- 2** - Current rating (12 A)
- 3** - Circuit configuration: C = Common cathode
- 4** - T = TO-220
- 5** - Schottky "Q" series
- 6** - Voltage ratings
 - 035 = 35 V
 - 040 = 40 V
 - 045 = 45 V
- 7** - • S = D²PAK
 - -1 = TO-262
- 8** - • None = Tube (50 pieces)
 - TRL = Tape and reel (left oriented - for D²PAK only)
 - TRR = Tape and reel (right oriented - for D²PAK only)
- 9** - PbF = Lead (Pb)-free

LINKS TO RELATED DOCUMENTS	
Dimensions	www.vishay.com/doc?95014
Part marking information	www.vishay.com/doc?95008
Packaging information	www.vishay.com/doc?95032

D²PAK, TO-262

DIMENSIONS FOR D²PAK in millimeters and inches

Conforms to JEDEC outline D²PAK (SMD-220)



SYMBOL	MILLIMETERS		INCHES		NOTES		SYMBOL	MILLIMETERS		INCHES		NOTES
	MIN.	MAX.	MIN.	MAX.				MIN.	MAX.	MIN.	MAX.	
A	4.06	4.83	0.160	0.190			D1	6.86	8.00	0.270	0.315	3
A1	0.00	0.254	0.000	0.010			E	9.65	10.67	0.380	0.420	2, 3
b	0.51	0.99	0.020	0.039			E1	7.90	8.80	0.311	0.346	3
b1	0.51	0.89	0.020	0.035	4		e	2.54 BSC		0.100 BSC		
b2	1.14	1.78	0.045	0.070			H	14.61	15.88	0.575	0.625	
b3	1.14	1.73	0.045	0.068	4		L	1.78	2.79	0.070	0.110	
c	0.38	0.74	0.015	0.029			L1	-	1.65	-	0.066	3
c1	0.38	0.58	0.015	0.023	4		L2	1.27	1.78	0.050	0.070	
c2	1.14	1.65	0.045	0.065			L3	0.25 BSC		0.010 BSC		
D	8.51	9.65	0.335	0.380	2		L4	4.78	5.28	0.188	0.208	

Notes

- (1) Dimensioning and tolerancing per ASME Y14.5 M-1994
- (2) Dimension D 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 outmost extremes of the plastic body
- (3) Thermal pad contour optional within dimension E, L1, D1 and E1
- (4) Dimension b1 and c1 apply to base metal only
- (5) Datum A and B to be determined at datum plane H
- (6) Controlling dimension: inch

(7) Outline conforms to JEDEC outline TO-263AB

Outline Dimensions

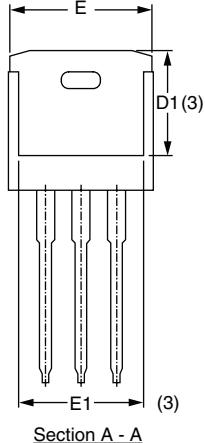
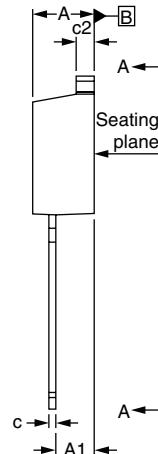
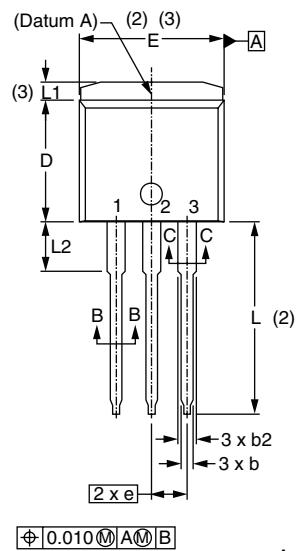
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D²PAK, TO-262

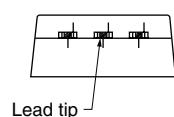


DIMENSIONS FOR TO-262 in millimeters and inches

Modified JEDEC outline TO-262



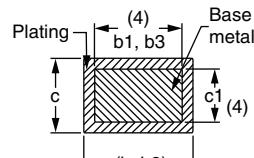
Section A - A



Lead assignments

Diodes

1. - Anode (two die)/open (one die)
- 2., 4. - Cathode
3. - Anode



Section B - B and C - C

Scale: None

SYMBOL	MILLIMETERS		INCHES		NOTES
	MIN.	MAX.	MIN.	MAX.	
A	4.06	4.83	0.160	0.190	
A1	2.03	3.02	0.080	0.119	
b	0.51	0.99	0.020	0.039	
b1	0.51	0.89	0.020	0.035	4
b2	1.14	1.78	0.045	0.070	
b3	1.14	1.73	0.045	0.068	4
c	0.38	0.74	0.015	0.029	
c1	0.38	0.58	0.015	0.023	4
c2	1.14	1.65	0.045	0.065	
D	8.51	9.65	0.335	0.380	2
D1	6.86	8.00	0.270	0.315	3
E	9.65	10.67	0.380	0.420	2, 3
E1	7.90	8.80	0.311	0.346	3
e	2.54 BSC		0.100 BSC		
L	13.46	14.10	0.530	0.555	
L1	-	1.65	-	0.065	3
L2	3.56	3.71	0.140	0.146	

Notes

- (1) Dimensioning and tolerancing as per ASME Y14.5M-1994
- (2) Dimension D 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 outmost extremes of the plastic body
- (3) Thermal pad contour optional within dimension E, L1, D1 and E1
- (4) Dimension b1 and c1 apply to base metal only
- (5) Controlling dimension: inches

- (6) Outline conform to JEDEC TO-262 except A1 (maximum), b (minimum) and D1 (minimum) where dimensions derived the actual package outline

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