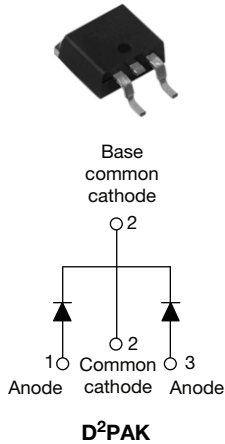
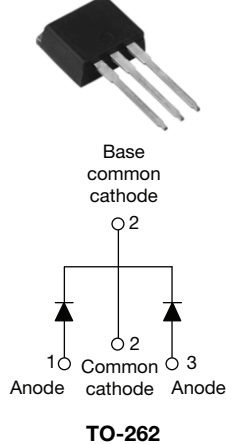


## Schottky Rectifier, 2 x 6 A

VS-12CTQ...SPbF



VS-12CTQ...-1PbF



### FEATURES

- 175 °C T<sub>J</sub> 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**

### 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.

### PRODUCT SUMMARY

I <sub>F(AV)</sub>	2 x 6 A
V <sub>R</sub>	35 V to 45 V

### MAJOR RATINGS AND CHARACTERISTICS

SYMBOL	CHARACTERISTICS	VALUES	UNITS
I <sub>F(AV)</sub>	Rectangular waveform	12	A
V <sub>RRM</sub>	Range	35 to 45	V
I <sub>FSM</sub>	t <sub>p</sub> = 5 μs sine	690	A
V <sub>F</sub>	6 Apk, T <sub>J</sub> = 125 °C (per leg)	0.53	V
T <sub>J</sub>	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 <sub>R</sub>	35	40	45	V
Maximum working peak reverse voltage	V <sub>RWM</sub>				

### ABSOLUTE MAXIMUM RATINGS

PARAMETER	SYMBOL	TEST CONDITIONS	VALUES	UNITS	
Maximum average forward current See fig. 5	I <sub>F(AV)</sub>	50 % duty cycle at T <sub>C</sub> = 160 °C, rectangular waveform	per leg	6	A
			per device	12	
Maximum peak one cycle non-repetitive surge current per leg See fig. 7	I <sub>FSM</sub>	5 μs sine or 3 μs rect. pulse	Following any rated load condition and with rated V <sub>RRM</sub> applied	690	A
		10 ms sine or 6 ms rect. pulse		140	
Non-repetitive avalanche energy per leg	E <sub>AS</sub>	T <sub>J</sub> = 25 °C, I <sub>AS</sub> = 1.20 A, L = 11.10 mH	8	mJ	
Repetitive avalanche current per leg	I <sub>AR</sub>	Current decaying linearly to zero in 1 μs Frequency limited by T <sub>J</sub> maximum V <sub>A</sub> = 1.5 x V <sub>R</sub> 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	m $\Omega$
Maximum junction capacitance per leg	$C_T$	$V_R = 5 V_{DC}$ (test signal range 100 kHz to 1 MHz), 25 °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	V/ $\mu$ s

**Note**

(1) 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 175	$^\circ\text{C}$
Maximum thermal resistance, junction to case per leg	$R_{thJC}$	DC operation See fig. 4		3.50	$^\circ\text{C/W}$
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				6 (5)	kgf · cm
				12 (10)	(lbf · in)
Marking device		Case style D <sup>2</sup> PAK		12CTQ035S	
				12CTQ040S	
				12CTQ045S	
		Case style TO-262		12CTQ035-1	
				12CTQ040-1	
				12CTQ045-1	



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

Schottky Rectifier,  
2 x 6 A

Vishay High Power Products

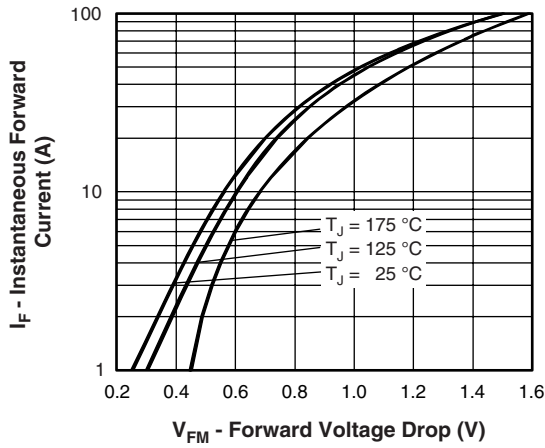


Fig. 1 - Maximum Forward Voltage Drop Characteristics (Per Leg)

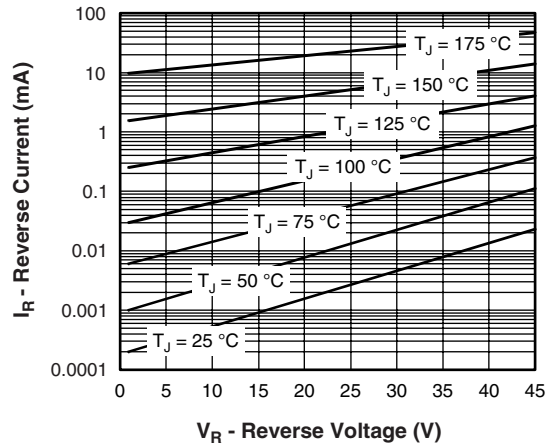


Fig. 2 - Typical Values of Reverse Current vs. Reverse Voltage (Per Leg)

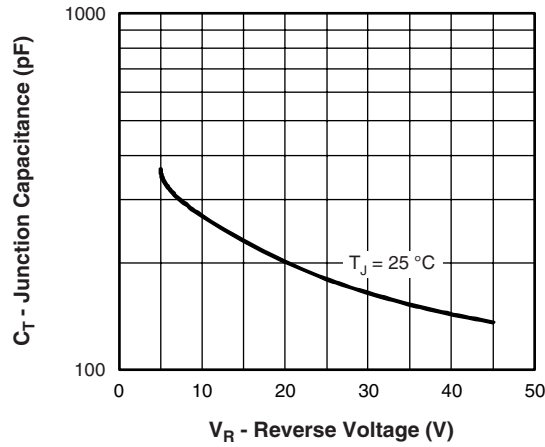


Fig. 3 - Typical Junction Capacitance vs. Reverse Voltage (Per Leg)

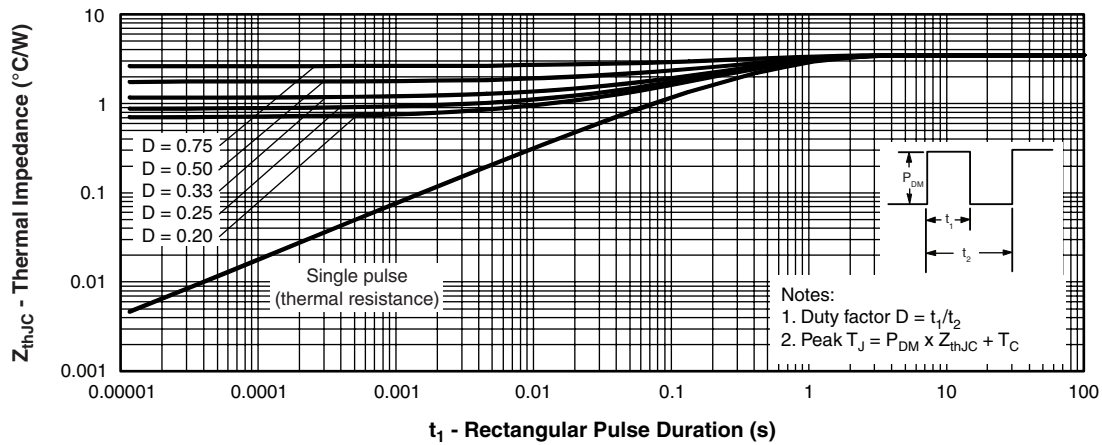


Fig. 4 - Maximum Thermal Impedance  $Z_{thJC}$  Characteristics (Per Leg)

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



Vishay High Power Products

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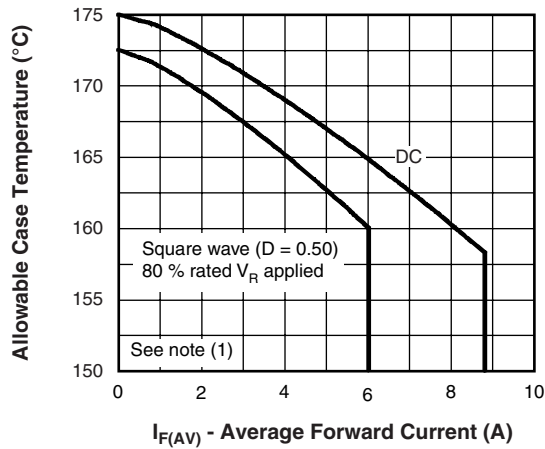


Fig. 5 - Maximum Allowable Case Temperature vs. Average Forward Current (Per Leg)

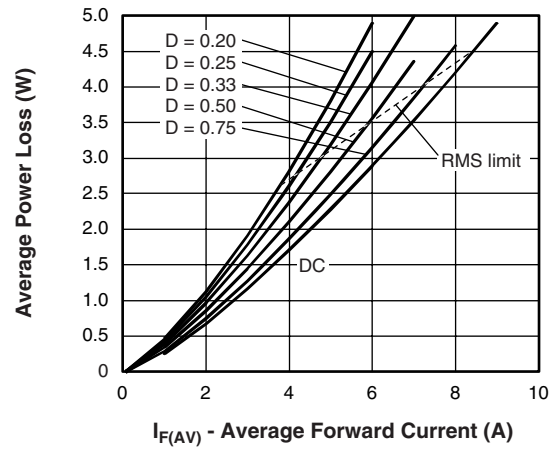


Fig. 6 - Forward Power Loss Characteristics (Per Leg)

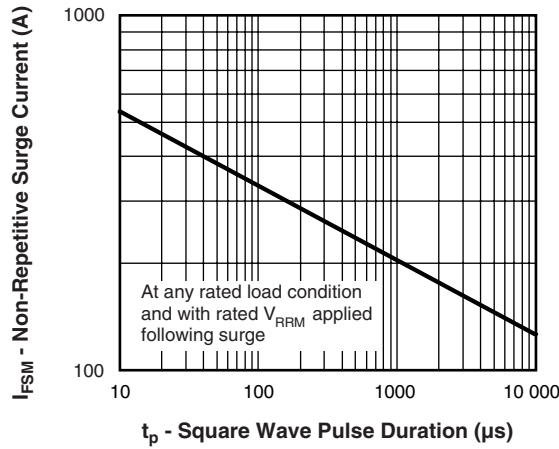


Fig. 7 - Maximum Non-Repetitive Surge Current (Per Leg)

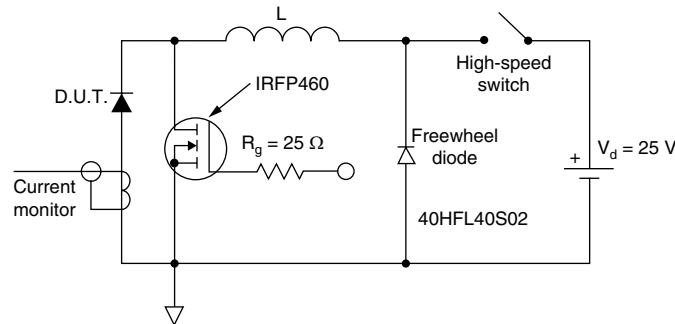


Fig. 8 - Unclamped Inductive Test Circuit

**Note**

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



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

Schottky Rectifier,  
2 x 6 A

Vishay High Power Products

## ORDERING INFORMATION TABLE

Device code	<b>VS-</b>	<b>12</b>	<b>C</b>	<b>T</b>	<b>Q</b>	<b>045</b>	<b>S</b>	<b>TRL</b>	<b>PbF</b>
	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  | 035 = 35 V<br>040 = 40 V<br>045 = 45 V |
| 6 | - | Voltage ratings  |  |
| 7 | - | <ul style="list-style-type: none"> <li>• S = D<sup>2</sup>PAK</li> <li>• -1 = TO-262</li> </ul>  |  |
| 8 | - | <ul style="list-style-type: none"> <li>• None = Tube (50 pieces)</li> <li>• TRL = Tape and reel (left oriented - for D<sup>2</sup>PAK only)</li> <li>• TRR = Tape and reel (right oriented - for D<sup>2</sup>PAK only)</li> </ul> |  |
| 9 | - | PbF = Lead (Pb)-free   |  |

LINKS TO RELATED DOCUMENTS	
Dimensions	<a href="http://www.vishay.com/doc?95014">www.vishay.com/doc?95014</a>
Part marking information	<a href="http://www.vishay.com/doc?95008">www.vishay.com/doc?95008</a>
Packaging information	<a href="http://www.vishay.com/doc?95032">www.vishay.com/doc?95032</a>



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