

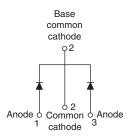


www.vishay.com

Vishay Semiconductors

## High Performance Schottky Rectifier, 2 x 6 A

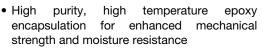




PRODUCT SUMMARY					
Package	TO-220AB				
I <sub>F(AV)</sub>	2 x 6 A				
$V_R$	35 V, 40 V, 45 V				
V <sub>F</sub> at I <sub>F</sub>	0.53 V				
I <sub>RM</sub> max.	7 mA at 125 °C				
T <sub>J</sub> max.	175 °C				
Diode variation	Common cathode				
E <sub>AS</sub>	8 mJ				

#### **FEATURES**

- 175 °C T<sub>J</sub> operation
- Center tap TO-220 package
- · Low forward voltage drop
- · High frequency operation





- Guard ring for enhanced ruggedness and long term reliability
- Designed and qualified according to JEDEC®-JESD 47
- Material categorization: for definitions of compliance please see <a href="https://www.vishay.com/doc?99912">www.vishay.com/doc?99912</a>

#### **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	CHARACTERISTICS VALUES UN				
I <sub>F(AV)</sub>	Rectangular waveform	12	Α			
$V_{RRM}$	Range	35 to 45	V			
I <sub>FSM</sub>	$t_p = 5 \mu s sine$	690	Α			
V <sub>F</sub>	6 A <sub>pk</sub> , 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- 12CTQ035PbF	VS- 12CTQ035-N3	VS- 12CTQ040PbF	VS- 12CTQ040-N3	VS- 12CTQ045PbF	VS- 12CTQ045-N3	UNITS
Maximum DC reverse voltage	$V_{R}$							
Maximum working peak reverse voltage	V <sub>RWM</sub>	35	35	40	40	45	45	V

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



# VS-12CTQ...PbF Series, VS-12CTQ...-N3 Series

www.vishay.com

# Vishay Semiconductors

ELECTRICAL SPECIFICATIONS						
PARAMETER	SYMBOL	TEST CONDITIONS		VALUES	UNITS	
Maximum forward voltage drop per leg See fig. 1	V <sub>FM</sub> <sup>(1)</sup>	6 A	T <sub>.1</sub> = 25 °C	0.60	V	
		12 A	11 = 23 0	0.73		
		6 A	T 405 00	0.53		
		12 A	T <sub>J</sub> = 125 °C	0.64		
Maximum reverse leakage current per leg	I <sub>RM</sub> <sup>(1)</sup>	T <sub>J</sub> = 25 °C	V <sub>R</sub> = Rated V <sub>R</sub>	0.8	- mA	
See fig. 2		T <sub>J</sub> = 125 °C		7.0		
Threshold voltage	$V_{F(TO)}$	$T_J = T_J$ maximum		0.35	V	
Forward slope resistance	r <sub>t</sub>			18.23	mΩ	
Maximum junction capacitance per leg	C <sub>T</sub>	$V_R = 5 V_{DC}$ (test signal range 100 kHz to 1 MHz) 25 °C		400	pF	
Typical series inductance per leg	L <sub>S</sub>	Measured lead to lead 5 mm from package body		8.0	nH	
Maximum voltage rate of change	dV/dt	Rated V <sub>R</sub>		10 000	V/µs	

#### 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	ge	T <sub>J</sub> , T <sub>Stg</sub>		-55 to +175	°C	
Maximum thermal resistance, junction to case per leg		D	DC operation See fig. 4	3.50		
Maximum thermal resistance junction to case per package	•	$R_{thJC}$	DC operation	1.75	°C/W	
Typical thermal resistance, case to heatsink		R <sub>thCS</sub>	Mounting surface, smooth and greased	0.50		
Approximate weight				2	g	
Approximate weight				0.07	OZ.	
Manustina tauana	minimum			6 (5)	kgf · cm	
Mounting torque maximum				12 (10)	(lbf $\cdot$ in)	
					Q035	
Marking device			Case style TO-220AB	12CT	Q040	
				12CT	Q045	

www.vishay.com

## Vishay Semiconductors

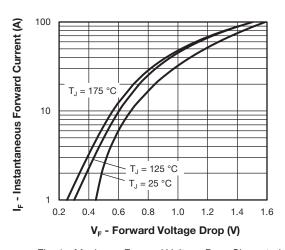


Fig. 1 - Maximum Forward Voltage Drop Characteristics (Per Leg)

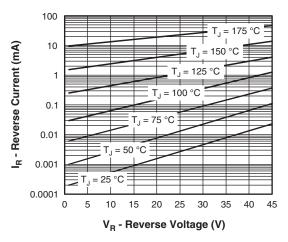


Fig. 2 - Typical Values of Reverse Current vs. Reverse Voltage (Per Leg)

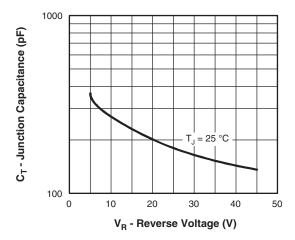


Fig. 3 - Typical Junction Capacitance vs. Reverse Voltage (Per Leg)

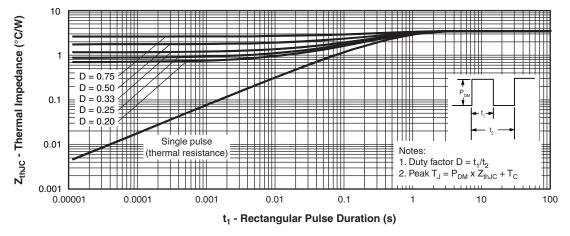


Fig. 4 - Maximum Thermal Impedance ZthJC Characteristics (Per Leg)

www.vishay.com

## Vishay Semiconductors

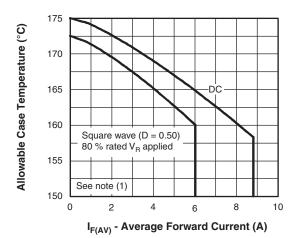


Fig. 5 - Maximum Allowable Case Temperature vs. Average Forward Current (Per Leg)

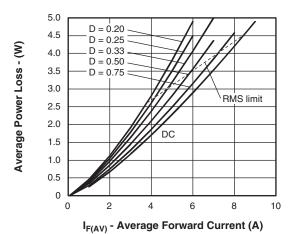


Fig. 6 - Forward Power Loss Characteristics (Per Leg)

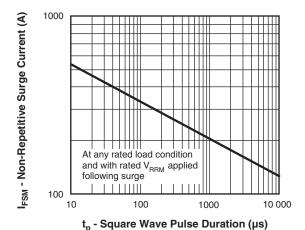


Fig. 7 - Maximum Non-Repetitive Surge Current (Per Leg)

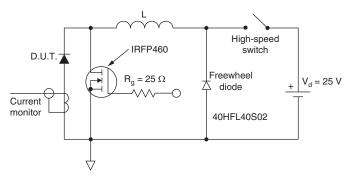


Fig. 8 - Unclamped Inductive Test Circuit

#### Note

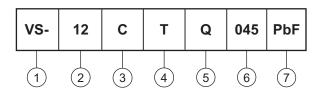
 $^{(1)}$  Formula used: T<sub>C</sub> = T<sub>J</sub> - (Pd + Pd<sub>REV</sub>) x R<sub>thJC</sub>; Pd = Forward power loss = I<sub>F(AV)</sub> x V<sub>FM</sub> at (I<sub>F(AV)</sub>/D) (see fig. 6); Pd<sub>REV</sub> = Inverse power loss = V<sub>R1</sub> x I<sub>R</sub> (1 - D); I<sub>R</sub> at V<sub>R1</sub> = 80 % rated V<sub>R</sub>

## VS-12CTQ...PbF Series, VS-12CTQ...-N3 Series

Vishay Semiconductors

#### **ORDERING INFORMATION TABLE**

**Device code** 



1 - Vishay Semiconductors product

2 - Current rating (12 = 12 A)

3 - Circuit configuration:

C = Common cathode

4 - Package:

T = TO-220

5 - Schottky "Q" series

035 = 35 V 040 = 40 V

6 - Voltage ratings

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-12CTQ035PbF	50	1000	Antistatic plastic tube			
VS-12CTQ035-N3	50	1000	Antistatic plastic tube			
VS-12CTQ040PbF	50	1000	Antistatic plastic tube			
VS-12CTQ040-N3	50	1000	Antistatic plastic tube			
VS-12CTQ045PbF	50	1000	Antistatic plastic tube			
VS-12CTQ045-N3	50	1000	Antistatic plastic tube			

LINKS TO RELATED DOCUMENTS				
Dimensions <u>www.vishay.com/doc?95222</u>				
Doub according information	TO-220AB PbF	www.vishay.com/doc?95225		
Part marking information	TO-220AB -N3	www.vishay.com/doc?95028		
SPICE model		www.vishay.com/doc?95629		



### **Legal Disclaimer Notice**

Vishay

### **Disclaimer**

ALL PRODUCT, PRODUCT SPECIFICATIONS AND DATA ARE SUBJECT TO CHANGE WITHOUT NOTICE TO IMPROVE RELIABILITY, FUNCTION OR DESIGN OR OTHERWISE.

Vishay Intertechnology, Inc., its affiliates, agents, and employees, and all persons acting on its or their behalf (collectively, "Vishay"), disclaim any and all liability for any errors, inaccuracies or incompleteness contained in any datasheet or in any other disclosure relating to any product.

Vishay makes no warranty, representation or guarantee regarding the suitability of the products for any particular purpose or the continuing production of any product. To the maximum extent permitted by applicable law, Vishay disclaims (i) any and all liability arising out of the application or use of any product, (ii) any and all liability, including without limitation special, consequential or incidental damages, and (iii) any and all implied warranties, including warranties of fitness for particular purpose, non-infringement and merchantability.

Statements regarding the suitability of products for certain types of applications are based on Vishay's knowledge of typical requirements that are often placed on Vishay products in generic applications. Such statements are not binding statements about the suitability of products for a particular application. It is the customer's responsibility to validate that a particular product with the properties described in the product specification is suitable for use in a particular application. Parameters provided in datasheets and/or specifications may vary in different applications and performance may vary over time. All operating parameters, including typical parameters, must be validated for each customer application by the customer's technical experts. Product specifications do not expand or otherwise modify Vishay's terms and conditions of purchase, including but not limited to the warranty expressed therein.

Except as expressly indicated in writing, Vishay products are not designed for use in medical, life-saving, or life-sustaining applications or for any other application in which the failure of the Vishay product could result in personal injury or death. Customers using or selling Vishay products not expressly indicated for use in such applications do so at their own risk. Please contact authorized Vishay personnel to obtain written terms and conditions regarding products designed for such applications.

No license, express or implied, by estoppel or otherwise, to any intellectual property rights is granted by this document or by any conduct of Vishay. Product names and markings noted herein may be trademarks of their respective owners.

## **Material Category Policy**

Vishay Intertechnology, Inc. hereby certifies that all its products that are identified as RoHS-Compliant fulfill the definitions and restrictions defined under Directive 2011/65/EU of The European Parliament and of the Council of June 8, 2011 on the restriction of the use of certain hazardous substances in electrical and electronic equipment (EEE) - recast, unless otherwise specified as non-compliant.

Please note that some Vishay documentation may still make reference to RoHS Directive 2002/95/EC. We confirm that all the products identified as being compliant to Directive 2002/95/EC conform to Directive 2011/65/EU.

Vishay Intertechnology, Inc. hereby certifies that all its products that are identified as Halogen-Free follow Halogen-Free requirements as per JEDEC JS709A standards. Please note that some Vishay documentation may still make reference to the IEC 61249-2-21 definition. We confirm that all the products identified as being compliant to IEC 61249-2-21 conform to JEDEC JS709A standards.

Revision: 02-Oct-12 Document Number: 91000