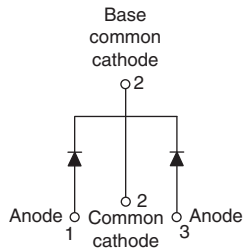




**THE DATASHEET OF  
VS-12CTQ040-N3**



## High Performance Schottky Rectifier, 2 x 6 A


**TO-220AB**


### FEATURES

- 175 °C  $T_J$  operation
- Center tap TO-220 package
- 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
- Designed and qualified according to JEDEC®-JESD 47
- Material categorization: for definitions of compliance please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)



PRODUCT SUMMARY	
Package	TO-220AB
$I_{F(AV)}$	2 x 6 A
$V_R$	35 V, 40 V, 45 V
$V_F$ at $I_F$	0.53 V
$I_{RM}$ max.	7 mA at 125 °C
$T_J$ max.	175 °C
Diode variation	Common cathode
$E_{AS}$	8 mJ

### 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 $A_{pk}$ , $T_J = 125 \text{ °C}$ (per leg)	0.53	V	
$T_J$	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	$V_R$	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. See fig. 5	$I_{F(AV)}$	50 % duty cycle at $T_C = 160 \text{ °C}$ , rectangular waveform	6	A
			12	
Maximum peak one cycle non-repetitive surge current per leg. See fig. 7	$I_{FSM}$	5 $\mu s$ sine or 3 $\mu s$ rect. pulse	690	A
		10 ms sine or 6 ms rect. pulse	140	
Non-repetitive avalanche energy per leg	$E_{AS}$	$T_J = 25 \text{ °C}$ , $I_{AS} = 1.20 \text{ A}$ , $L = 11.10 \text{ mH}$	8	mJ
Repetitive avalanche current per leg	$I_{AR}$	Current decaying linearly to zero in 1 $\mu s$ Frequency limited by $T_J$ maximum $V_A = 1.5 \times V_R$ typical	1.20	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 $^\circ\text{C}$		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	V/ $\mu\text{s}$

**Note**

(1) Pulse width < 300  $\mu\text{s}$ , 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	minimum			6 (5)	kgf · cm (lbf · in)
	maximum			12 (10)	
Marking device	Case style TO-220AB		12CTQ035		
			12CTQ040		
			12CTQ045		

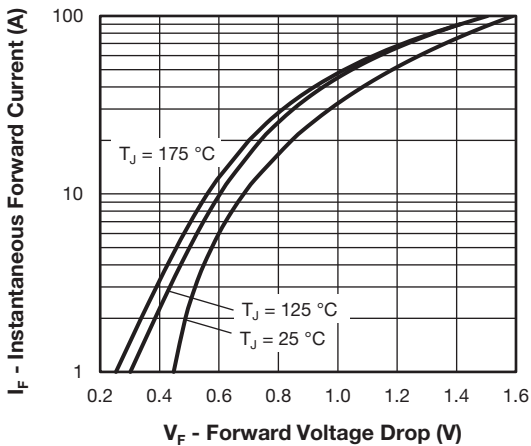


Fig. 1 - Maximum Forward Voltage Drop Characteristics (Per Leg)

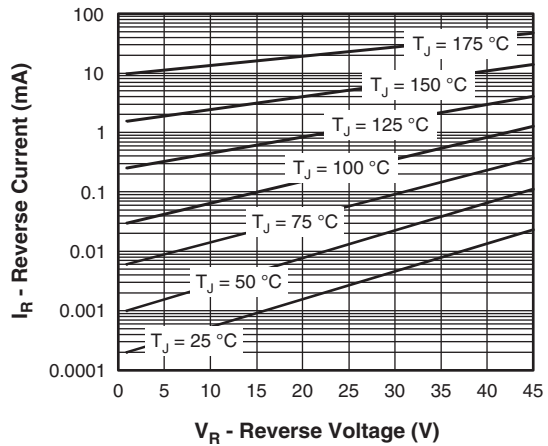


Fig. 2 - Typical Values of Reverse Current vs. Reverse Voltage (Per Leg)

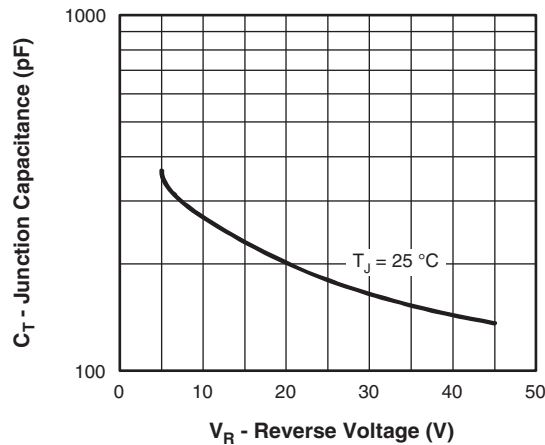


Fig. 3 - Typical Junction Capacitance vs. Reverse Voltage (Per Leg)

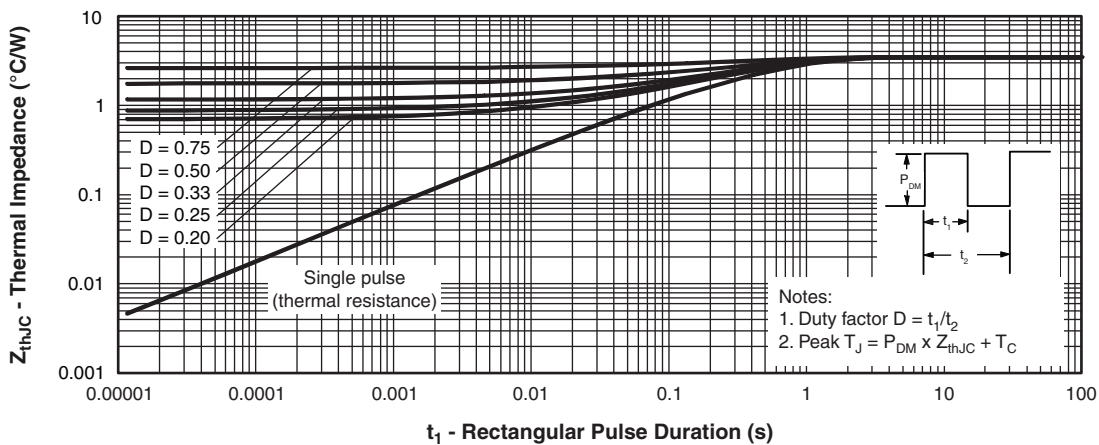


Fig. 4 - Maximum Thermal Impedance  $Z_{thJC}$  Characteristics (Per Leg)

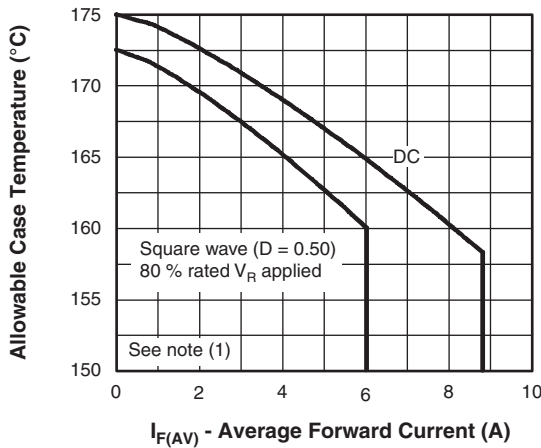


Fig. 5 - Maximum Allowable Case Temperature vs. Average Forward Current (Per Leg)

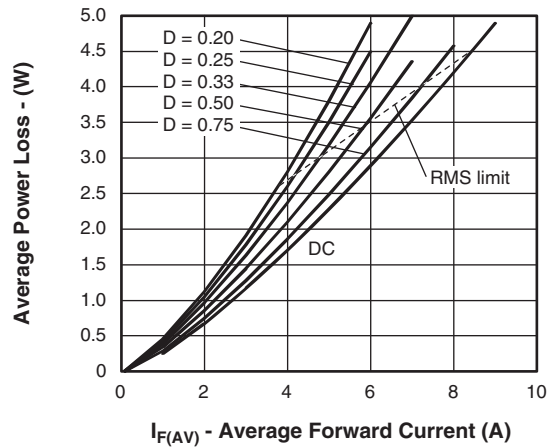


Fig. 6 - Forward Power Loss Characteristics (Per Leg)

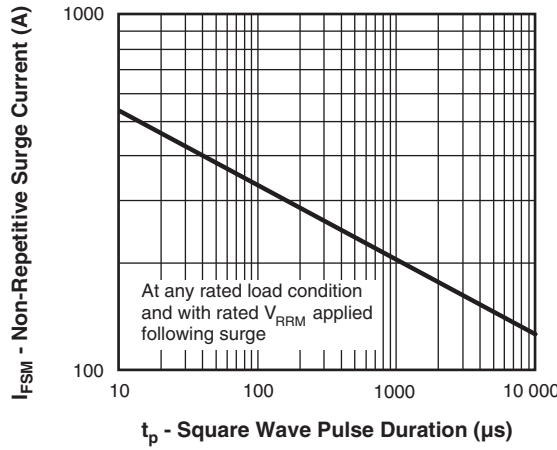


Fig. 7 - Maximum Non-Repetitive Surge Current (Per Leg)

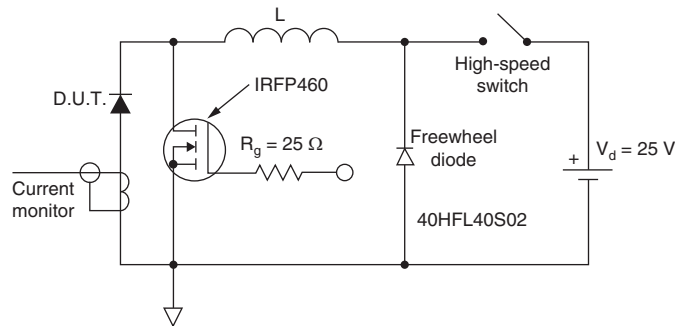


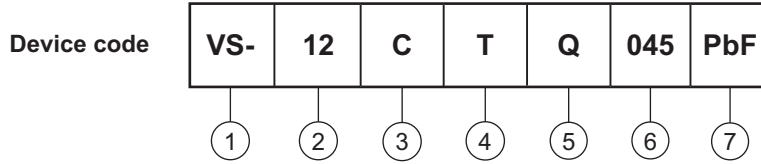
Fig. 8 - Unclamped Inductive Test Circuit

**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  $V_R$



## ORDERING INFORMATION TABLE



- 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
- 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-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	<a href="http://www.vishay.com/doc?95222">www.vishay.com/doc?95222</a>
Part marking information	TO-220AB PbF <a href="http://www.vishay.com/doc?95225">www.vishay.com/doc?95225</a>
	TO-220AB -N3 <a href="http://www.vishay.com/doc?95028">www.vishay.com/doc?95028</a>
SPIICE model	<a href="http://www.vishay.com/doc?95629">www.vishay.com/doc?95629</a>



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