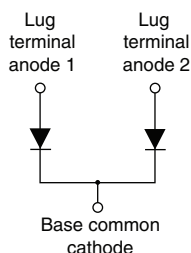



# High Performance Schottky Rectifier, 400 A



TO-244



## FEATURES

- 175 °C T<sub>J</sub> operation
- Center tap module
- Low forward voltage drop
- High frequency operation
- Guard ring for enhanced ruggedness and long term reliability
- UL approved file E222165 
- Designed and qualified for industrial level
- Material categorization: for definitions of compliance please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)


**RoHS**  
COMPLIANT

## PRIMARY CHARACTERISTICS

I <sub>F(AV)</sub>	400 A
V <sub>R</sub>	40 V, 45 V
Package	TO-244
Circuit configuration	Two diodes common cathode

## DESCRIPTION / APPLICATIONS

The VS-401CNQ... center tap Schottky rectifier module 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 high current switching power supplies, converters, freewheeling diodes, welding and reverse battery protection.

## MAJOR RATINGS AND CHARACTERISTICS

SYMBOL	CHARACTERISTICS	VALUES	UNITS
I <sub>F(AV)</sub>	Rectangular waveform	400	A
V <sub>RRM</sub>	Range	40/45	V
I <sub>FSM</sub>	t <sub>p</sub> = 5 μs sine	25 000	A
V <sub>F</sub>	200 A <sub>pk</sub> , T <sub>J</sub> = 125 °C (per leg)	0.56	V
T <sub>J</sub>	Range	-55 to +175	°C

## VOLTAGE RATINGS

PARAMETER	SYMBOL	VS-401CNQ040PbF	VS-401CNQ045PbF	UNITS
Maximum DC reverse voltage	V <sub>R</sub>	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 (fig. 5)	I <sub>F(AV)</sub>	50 % duty cycle at T <sub>C</sub> = 147 °C, rectangular waveform		200	A
				400	
Maximum peak one cycle non-repetitive surge current per leg (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	25 000	
		10 ms sine or 6 ms rect. pulse		3450	
Non-repetitive avalanche energy per leg	E <sub>AS</sub>	T <sub>J</sub> = 25 °C, I <sub>AS</sub> = 24 A, L = 1 mH		270	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		40	A

**ELECTRICAL SPECIFICATIONS**

PARAMETER	SYMBOL	TEST CONDITIONS		VALUES	UNITS
Maximum forward voltage drop per leg See fig. 1	V <sub>FM</sub> <sup>(1)</sup>	200 A	T <sub>J</sub> = 25 °C	0.67	V
		400 A		0.78	
		200 A	T <sub>J</sub> = T <sub>J</sub> maximum	0.56	
		400 A		0.69	
Maximum reverse leakage current per leg See fig. 2	I <sub>RM</sub> <sup>(1)</sup>	T <sub>J</sub> = 25 °C	V <sub>R</sub> = Rated V <sub>R</sub>	20	mA
		T <sub>J</sub> = 125 °C		180	
Maximum junction capacitance per leg	C <sub>T</sub>	V <sub>R</sub> = 5 V <sub>DC</sub> (test signal range 100 kHz to 1 MHz) 25 °C		10 300	pF
Typical series inductance per leg	L <sub>S</sub>	From top of terminal hole to mounting plane		5.0	nH
Maximum voltage rate of change	dV/dt	Rated V <sub>R</sub>		10 000	V/μs

**Note**

<sup>(1)</sup> Pulse width < 300  $\mu$ s, duty cycle < 2 %

**THERMAL - MECHANICAL SPECIFICATIONS**

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNITS
Maximum junction and storage temperature range	$T_J, T_{Stg}$	-55	-	175	$^{\circ}\text{C}$
Thermal resistance, junction to case per leg	$R_{thJC}$	-	-	0.19	$^{\circ}\text{C/W}$
Thermal resistance, junction to case per module		-	-	0.095	
Thermal resistance, case to heatsink	$R_{thCS}$	-	0.10	-	
Weight		-	68	-	g
		-	2.4	-	oz.
Mounting torque		35.4 (4)		53.1 (6)	lbf · in (N · m)
Mounting torque center hole		30 (3.4)		40 (4.6)	
Terminal torque		30 (3.4)	-	44.2 (5)	
Vertical pull		-	-	80	lbf · in
2" lever pull		-	-	35	

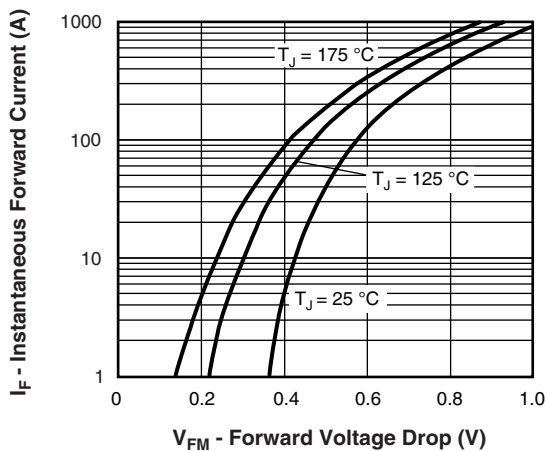


Fig. 1 - Maximum Forward Voltage Drop Characteristics

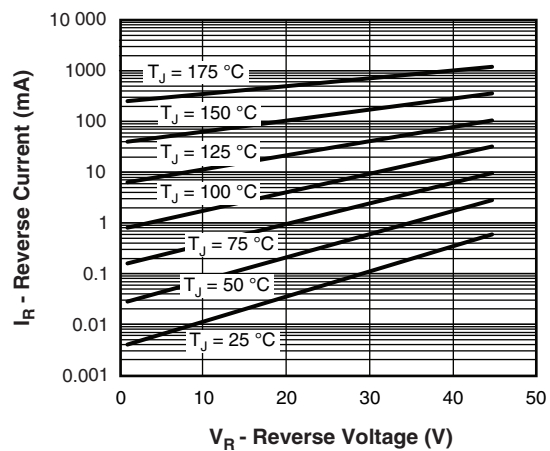


Fig. 2 - Typical Values of Reverse Current vs. Reverse Voltage

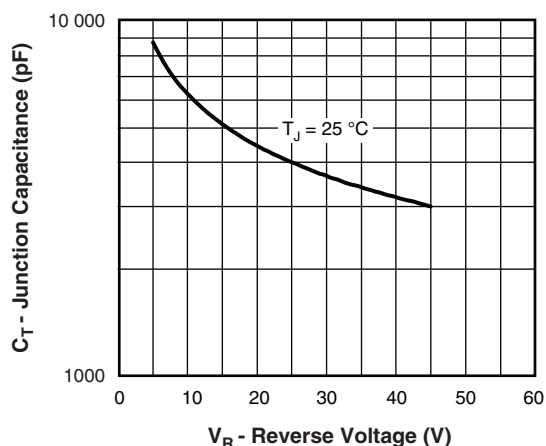


Fig. 3 - Typical Junction Capacitance vs. Reverse Voltage

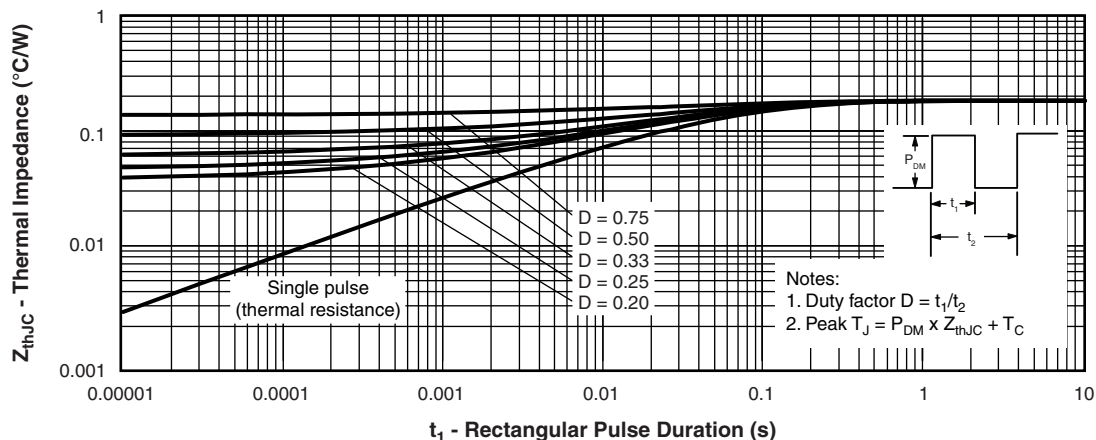
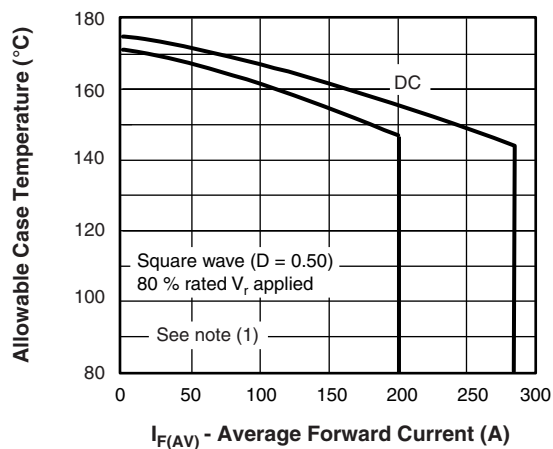

Fig. 4 - Maximum Thermal Impedance  $Z_{thJC}$  Characteristics (Per Leg)


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

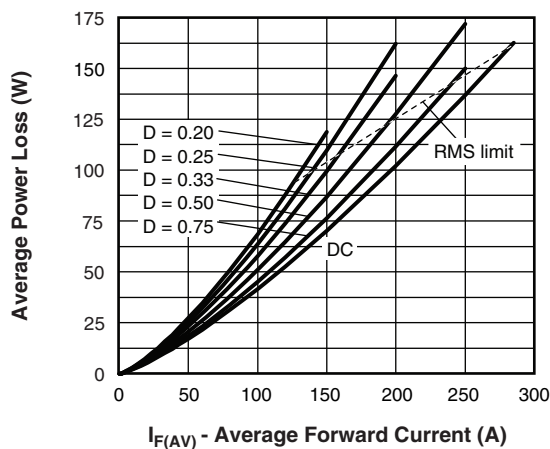


Fig. 6 - Forward Power Loss Characteristics

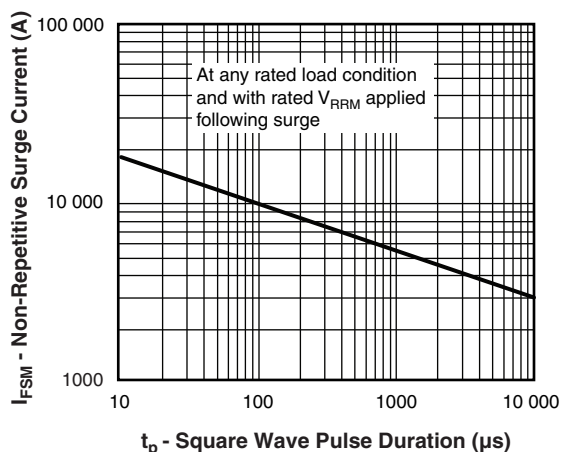


Fig. 7 - Maximum Non-Repertive Surge Current

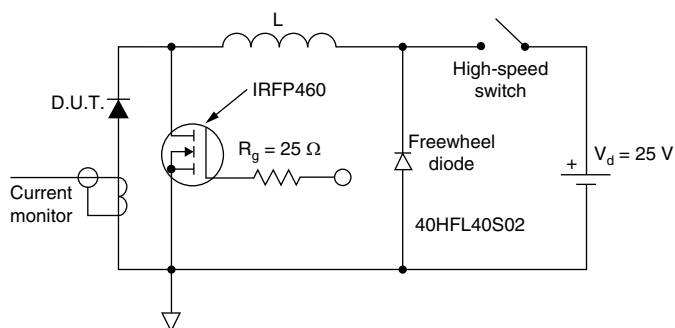


Fig. 8 - Unclamped Inductive Test Circuit

**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-	40	1	C	N	Q	045	PbF
	1	2	3	4	5	6	7	8

- 1** - Vishay Semiconductors product
- 2** - Average current rating (x 10)
- 3** - Product silicon identification
- 4** - C = circuit configuration
- 5** - N = not isolated
- 6** - Q = Schottky rectifier diode
- 7** - Voltage ratings
- 8** - Lead (Pb)-free

040 = 40 V
045 = 45 V

**LINKS TO RELATED DOCUMENTS**

Dimensions

[www.vishay.com/doc?95021](http://www.vishay.com/doc?95021)



## TO-244

**DIMENSIONS** in millimeters (inches)





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