

## High Performance Schottky Rectifier, 400 A



TO-244



### FEATURES

- 175 °C  $T_J$  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

$I_{F(AV)}$	400 A
$V_R$	135 V, 150 V
Package	TO-244
Circuit configuration	Two diodes common cathode

### DESCRIPTION / APPLICATIONS

The VS-409CNQ... 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, plating power supplies, UPS systems, converters, freewheeling diodes, welding, and reverse battery protection.

### MAJOR RATINGS AND CHARACTERISTICS

SYMBOL	CHARACTERISTICS	VALUES	UNITS
$I_{F(AV)}$	Rectangular waveform	400	A
$V_{RRM}$	Range	135/150	V
$I_{FSM}$	$t_p = 5 \mu s$ sine	20 000	A
$V_F$	200 $A_{pk}$ , $T_J = 125^\circ C$ (per leg)	0.75	V
$T_J$	Range	-55 to +175	°C

### VOLTAGE RATINGS

PARAMETER	SYMBOL	VS-409CNQ135PbF	VS-409CNQ150PbF	UNITS
Maximum DC reverse voltage	$V_R$	135	150	V
Maximum working peak reverse voltage	$V_{RWM}$			

### ABSOLUTE MAXIMUM RATINGS

PARAMETER	SYMBOL	TEST CONDITIONS	VALUES	UNITS
Maximum average forward current (fig. 5)	$I_{F(AV)}$	50 % duty cycle at $T_C = 129^\circ C$ , rectangular waveform	200	A
			400	
Maximum peak one cycle non-repetitive surge current per leg (fig. 7)	$I_{FSM}$	5 $\mu s$ sine or 3 $\mu s$ rect. pulse	20 000	A
		10 ms sine or 6 ms rect. pulse	2300	
Non-repetitive avalanche energy per leg	$E_{AS}$	$T_J = 25^\circ C$ , $I_{AS} = 5.5 A$ , $L = 1 mH$	15	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	A



ELECTRICAL SPECIFICATIONS					
PARAMETER	SYMBOL	TEST CONDITIONS		VALUES	UNITS
Maximum forward voltage drop per leg See fig. 1	$V_{FM}^{(1)}$	200 A	$T_J = 25\text{ }^\circ\text{C}$	1.13	V
		400 A		1.46	
		200 A	$T_J = 125\text{ }^\circ\text{C}$	0.75	
		400 A		0.89	
Maximum reverse leakage current per leg See fig. 2	$I_{RM}^{(1)}$	$T_J = 25\text{ }^\circ\text{C}$	$V_R = \text{Rated } V_R$	6	mA
		$T_J = 125\text{ }^\circ\text{C}$		85	
Maximum junction capacitance per leg	$C_T$	$V_R = 5 V_{DC}$ (test signal range 100 kHz to 1 MHz) $25\text{ }^\circ\text{C}$		6000	pF
Typical series inductance per leg	$L_S$	From top of terminal hole to mounting plane		5.0	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	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	$^\circ\text{C}/\text{W}$
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	

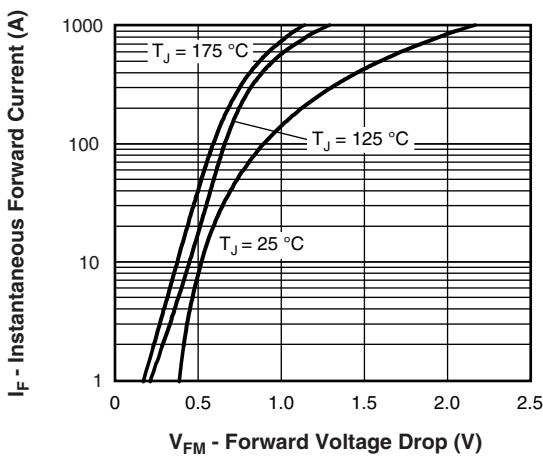


Fig. 1 - Maximum Forward Voltage Drop Characteristics

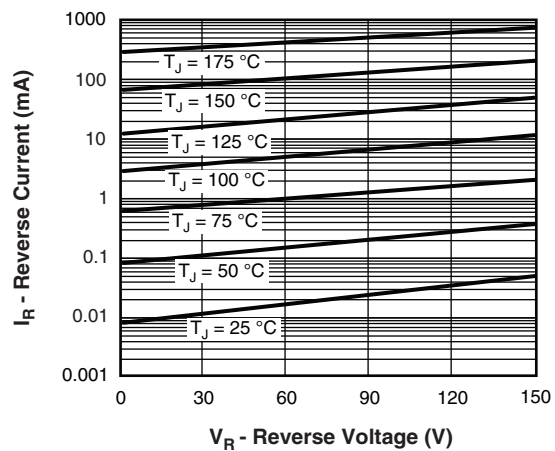


Fig. 2 - Typical Values of Reverse Current vs. Reverse Voltage

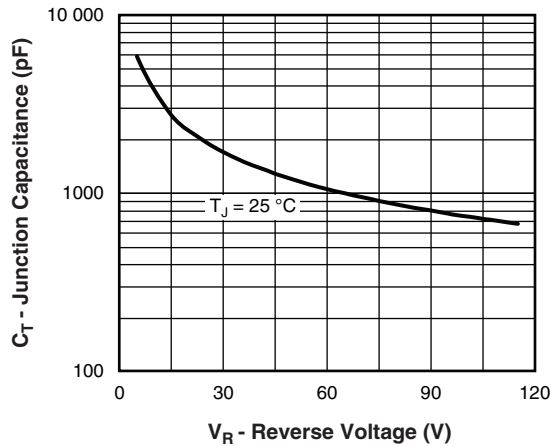


Fig. 3 - Typical Junction Capacitance vs. Reverse Voltage

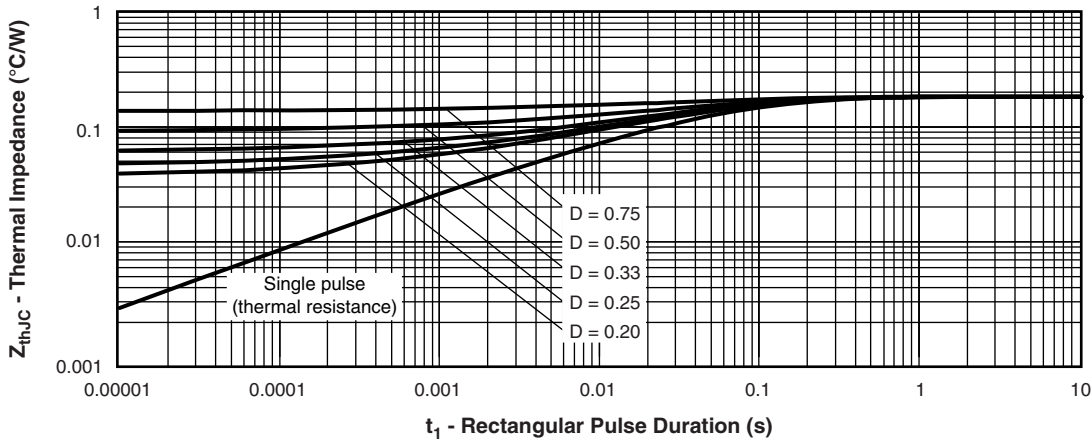


Fig. 4 - Maximum Thermal Impedance  $Z_{thJC}$  Characteristics

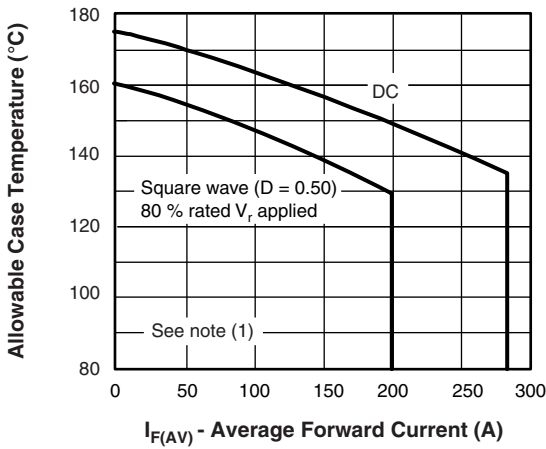


Fig. 5 - Maximum Allowable Case Temperature vs. Average Forward Current

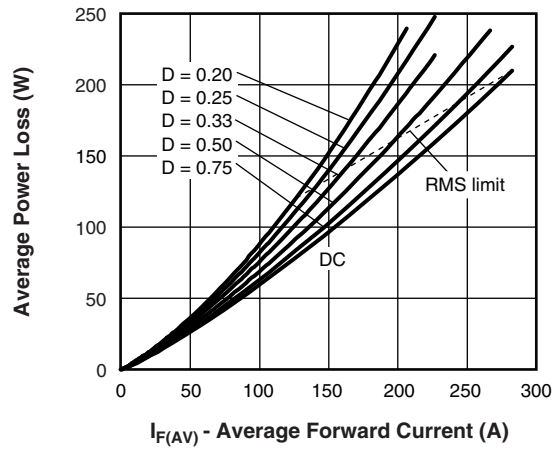


Fig. 6 - Forward Power Loss Characteristics

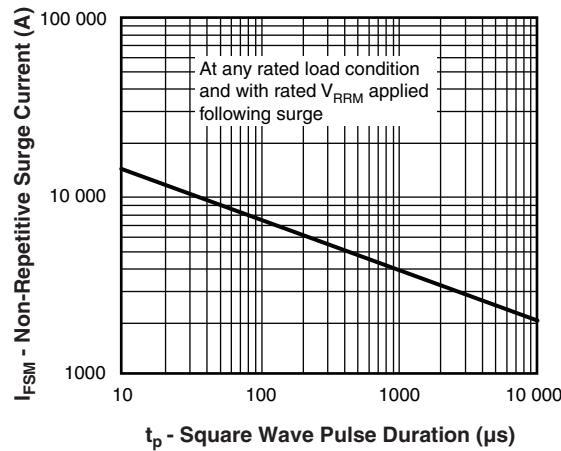


Fig. 7 - Maximum Non-Repetitive Surge Current

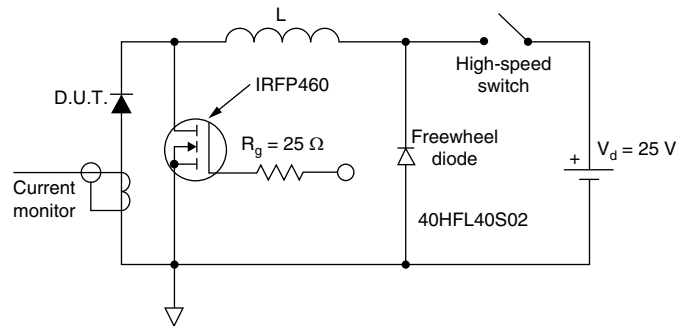


Fig. 8 - Unclamped Inductive Test Circuit

**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  $V_{R1}$  = Rated  $V_R$

**ORDERING INFORMATION TABLE**

Device code	<b>VS-</b>	<b>40</b>	<b>9</b>	<b>C</b>	<b>N</b>	<b>Q</b>	<b>135</b>	<b>PbF</b>
	①	②	③	④	⑤	⑥	⑦	⑧
<b>1</b>	-	Vishay Semiconductors product						
<b>2</b>	-	Average current rating (x 10)						
<b>3</b>	-	Product silicon identification						
<b>4</b>	-	C = circuit configuration						
<b>5</b>	-	N = not isolated						
<b>6</b>	-	Q = Schottky rectifier diode						
<b>7</b>	-	Voltage ratings					135 = 135 V 150 = 150 V	
<b>8</b>	-	Lead (Pb)-free						

**LINKS TO RELATED DOCUMENTS**

Dimensions	<a href="http://www.vishay.com/doc?95021">www.vishay.com/doc?95021</a>
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[>>Vishay\(威世\)](#)