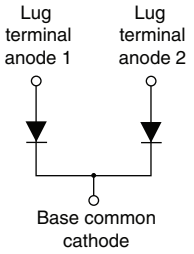
High Performance Schottky Rectifier, 400 A

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

Pb-free

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 µs sine	20 000	A
V_F	200 A_{pk}, T_J = 125 °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)	per leg	$I_{F(AV)}$	50 % duty cycle at T_C = 129 °C, rectangular waveform		200	A
	per device				400	
Maximum peak one cycle non-repetitive surge current per leg (fig. 7)		I_{FSM}	5 µs sine or 3 µs rect. pulse	Following any rated load condition and with rated V_{RRM} applied	20 000	
			10 ms sine or 6 ms rect. pulse		2300	
Non-repetitive avalanche energy per leg		E_{AS}	T_J = 25 °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 µs Frequency limited by T_J maximum V_A = 1.5 x V_R typical		1	A

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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 °C	1.13	V
		400 A		1.46	
		200 A	T_J = 125 °C	0.75	
		400 A		0.89	
Maximum reverse leakage current per leg See fig. 2	I_{RM} (1)	T_J = 25 °C	V_R = Rated V_R	6	mA
		T_J = 125 °C		85	
Maximum junction capacitance per leg	C_T	V_R = 5 V_{DC} (test signal range 100 kHz to 1 MHz) 25 °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/µs

Note

(1) Pulse width < 300 µs, duty cycle < 2 %

THERMAL - MECHANICAL SPECIFICATIONS

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNITS
Maximum junction and storage temperature range	T_J, T_{Stg}	-55	-	175	°C
Thermal resistance, junction to case per leg	R_{thJC}	-	-	0.19	°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	

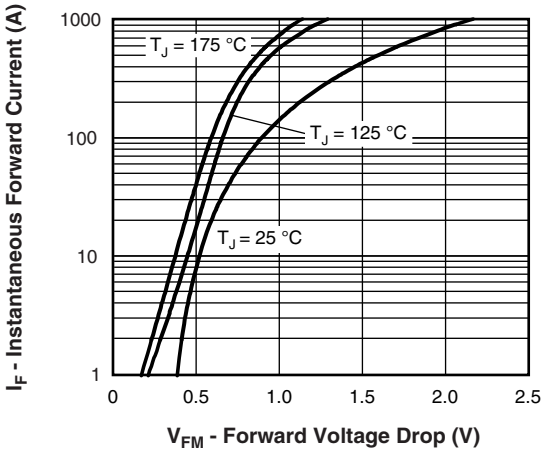

Fig. 1 - Maximum Forward Voltage Drop Characteristics

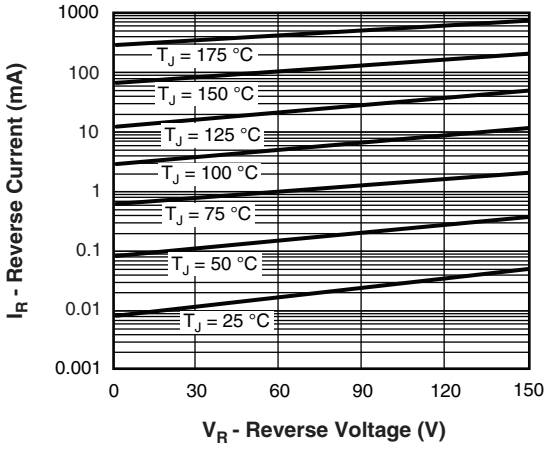

Fig. 2 - Typical Values of Reverse Current vs. Reverse Voltage

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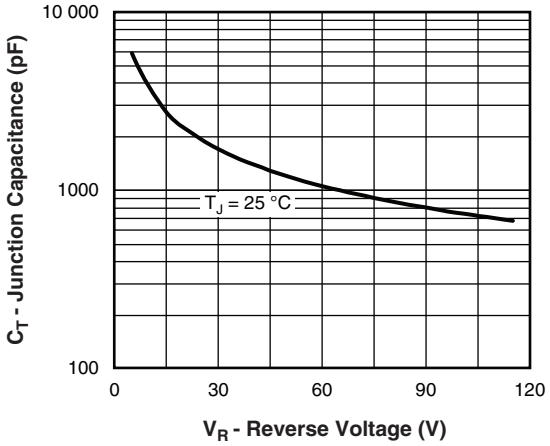

Fig. 3 - Typical Junction Capacitance vs. Reverse Voltage

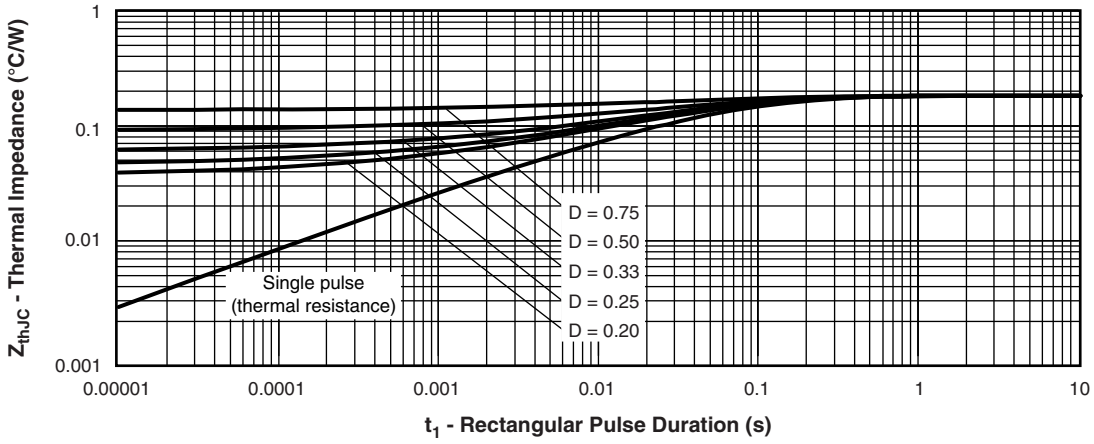

Fig. 4 - Maximum Thermal Impedance Z_{thJC} Characteristics

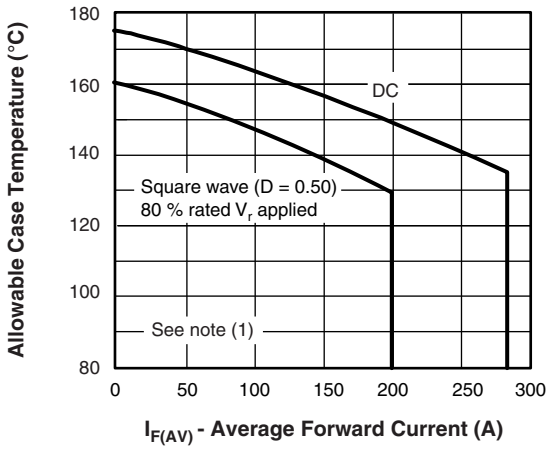

Fig. 5 - Maximum Allowable Case Temperature vs. Average Forward Current

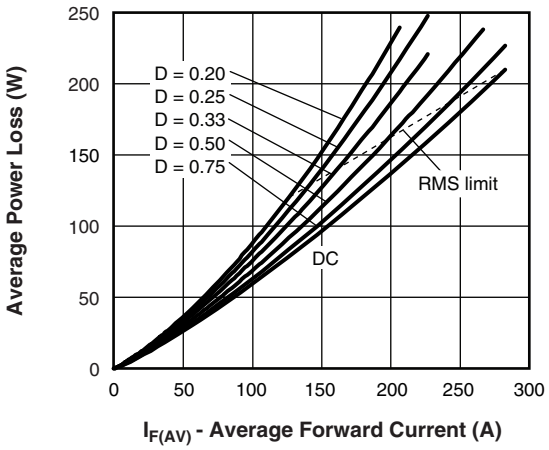

Fig. 6 - Forward Power Loss Characteristics

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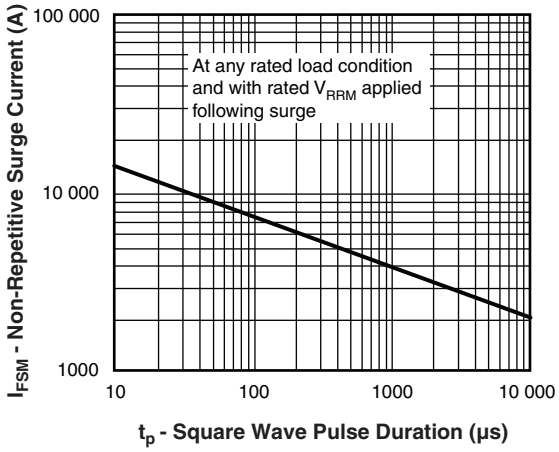

Fig. 7 - Maximum Non-Repetitive Surge Current

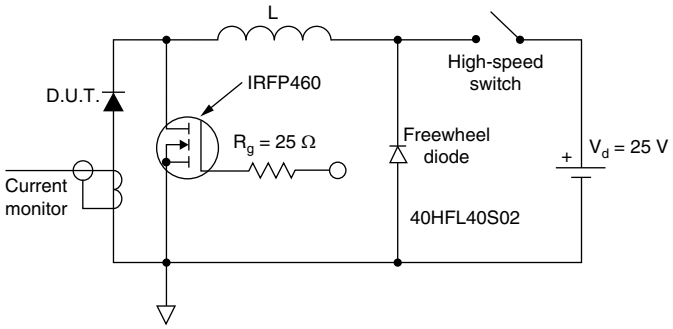

Fig. 8 - Unclamped Inductive Test Circuit

Note

(1) Formula used: $T_C = T_J - (Pd + Pd_{REV}) \times R_{thJC}$;
Pd = forward power loss = $I_{F(AV)} \times V_{FM}$ at ($I_{F(AV)}$/D) (see fig. 6);
Pd_{REV} = inverse power loss = $V_{R1} \times I_R (1 - D)$; I_R at V_{R1} = Rated V_R

ORDERING INFORMATION TABLE

Device code

VS-	40	9	C	N	Q	135	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 — 135 = 135 V, 150 = 150 V
- 8 - Lead (Pb)-free

LINKS TO RELATED DOCUMENTS	
Dimensions	www.vishay.com/doc?95021

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