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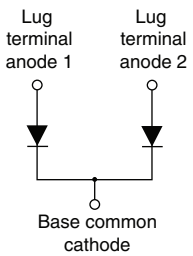
High Performance Schottky Rectifier, 400 A



TO-244



FEATURES

- 150 °C T_J operation
- Center tap module
- Very 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

RoHS COMPLIANT

PRIMARY CHARACTERISTICS

$I_{F(AV)}$	400 A
V_R	45 V
Package	TO-244
Circuit configuration	Two diodes common cathode

DESCRIPTION / APPLICATIONS

The VS-400CNQ045PbF center tap, high current, Schottky rectifier module has been optimized for very low forward voltage drop, with moderate leakage. The proprietary barrier technology allows for reliable operation up to 150 °C junction temperature. Typical applications are in switching power supplies, 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}		45	V
I_{FSM}	t_p = 5 µs sine	29 000	A
V_F	200 A_{pk}, T_J = 125 °C (per leg)	0.52	V
T_J	Range	-55 to +150	°C

VOLTAGE RATINGS

PARAMETER	SYMBOL	VS-400CNQ045PbF	UNITS
Maximum DC reverse voltage	V_R	45	V
Maximum working peak reverse voltage	V_{RWM}		

ABSOLUTE MAXIMUM RATINGS

PARAMETER	SYMBOL	TEST CONDITIONS		VALUES	UNITS
Maximum average forward current per leg See fig. 5	$I_{F(AV)}$	50 % duty cycle at T_C = 114 °C, rectangular waveform		200	A
Maximum average forward current per device See fig. 5				400	
Maximum peak one cycle non-repetitive surge current per leg See fig. 7	I_{FSM}	5 µs sine or 3 µs rect. pulse	Following any rated load condition and with rated V_{RRM} applied	29 000	
		10 ms sine or 6 ms rect. pulse		3400	
Non-repetitive avalanche energy per leg	E_{AS}	T_J = 25 °C, I_{AS} = 19 A, L = 1 mH		180	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		40	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	0.57	V
		400 A		0.73	
		200 A	T_J = 125 °C	0.52	
		400 A		0.7	
Maximum reverse leakage current per leg See fig. 2	I_{RM} (1)	T_J = 25 °C	V_R = Rated V_R	20	mA
		T_J = 125 °C		1.2	A
Threshold voltage	$V_{F(TO)}$	T_J = T_J maximum		0.32	V
Forward slope resistance	r_t			0.81	mΩ
Maximum junction capacitance per leg	C_T	V_R = 5 V_{DC} (test signal range 100 kHz to 1 MHz), 25 °C		10 300	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	-	150	°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	

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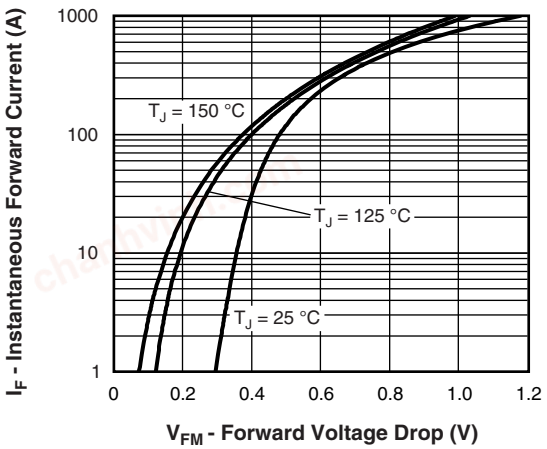

Fig. 1 - Maximum Forward Voltage Drop Characteristics (Per Leg)

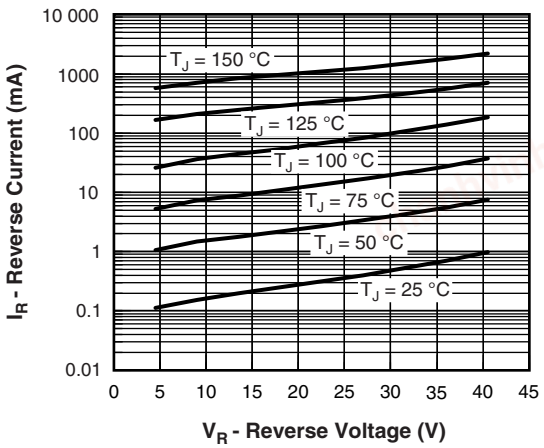

Fig. 2 - Typical Values of Reverse Current vs. Reverse Voltage (Per Leg)

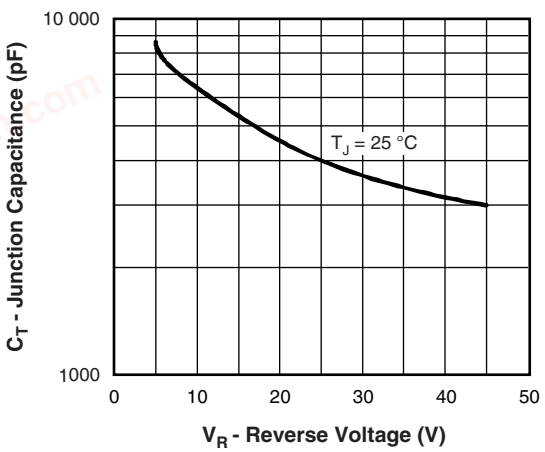

Fig. 3 - Typical Junction Capacitance vs. Reverse Voltage (Per Leg)

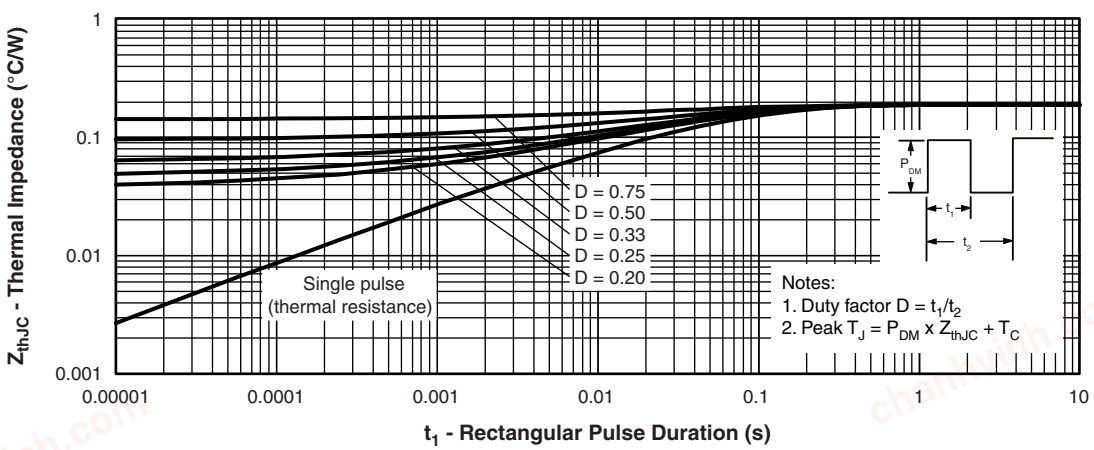

Fig. 4 - Maximum Thermal Impedance Z_{thJC} Characteristics (Per Leg)

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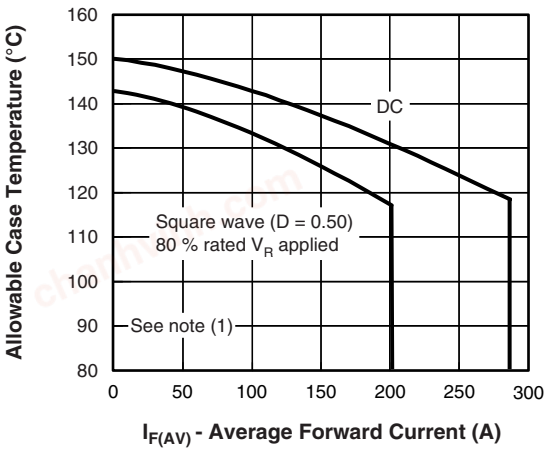

Fig. 5 - Maximum Allowable Case Temperature vs. Average Forward Current (Per Leg)

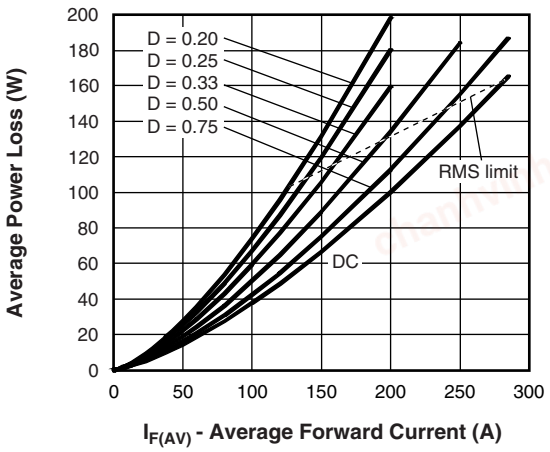

Fig. 6 - Forward Power Loss Characteristics (Per Leg)

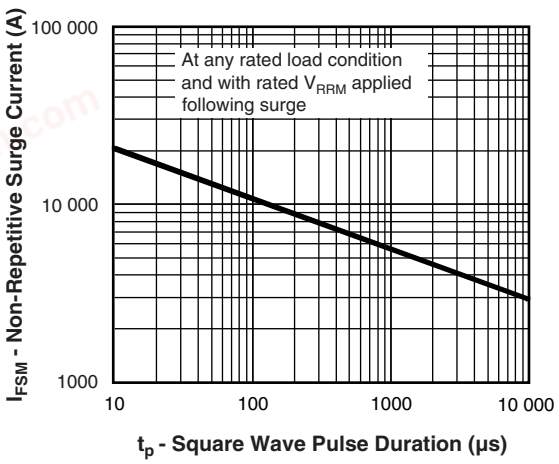

Fig. 7 - Maximum Non-Repetitive Surge Current (Per Leg)

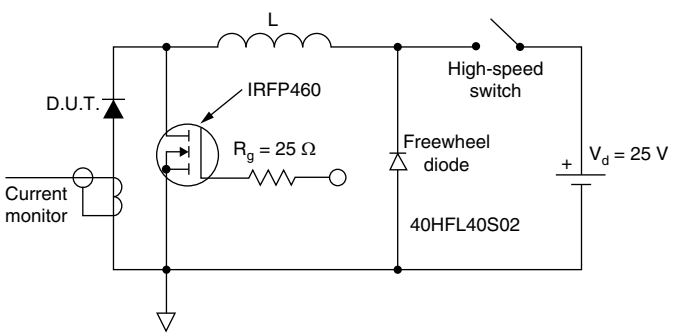

Fig. 8 - Unclamped Inductive Test Circuit

Note

(1) Formula used: $T_C = T_J - (Pd + Pd_{REV}) \times R_{thJC}$;
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} = 80 % rated V_R

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ORDERING INFORMATION TABLE

Device code

VS-	40	0	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 rating (045 = 45 V)
8	-	Lead (Pb)-free

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

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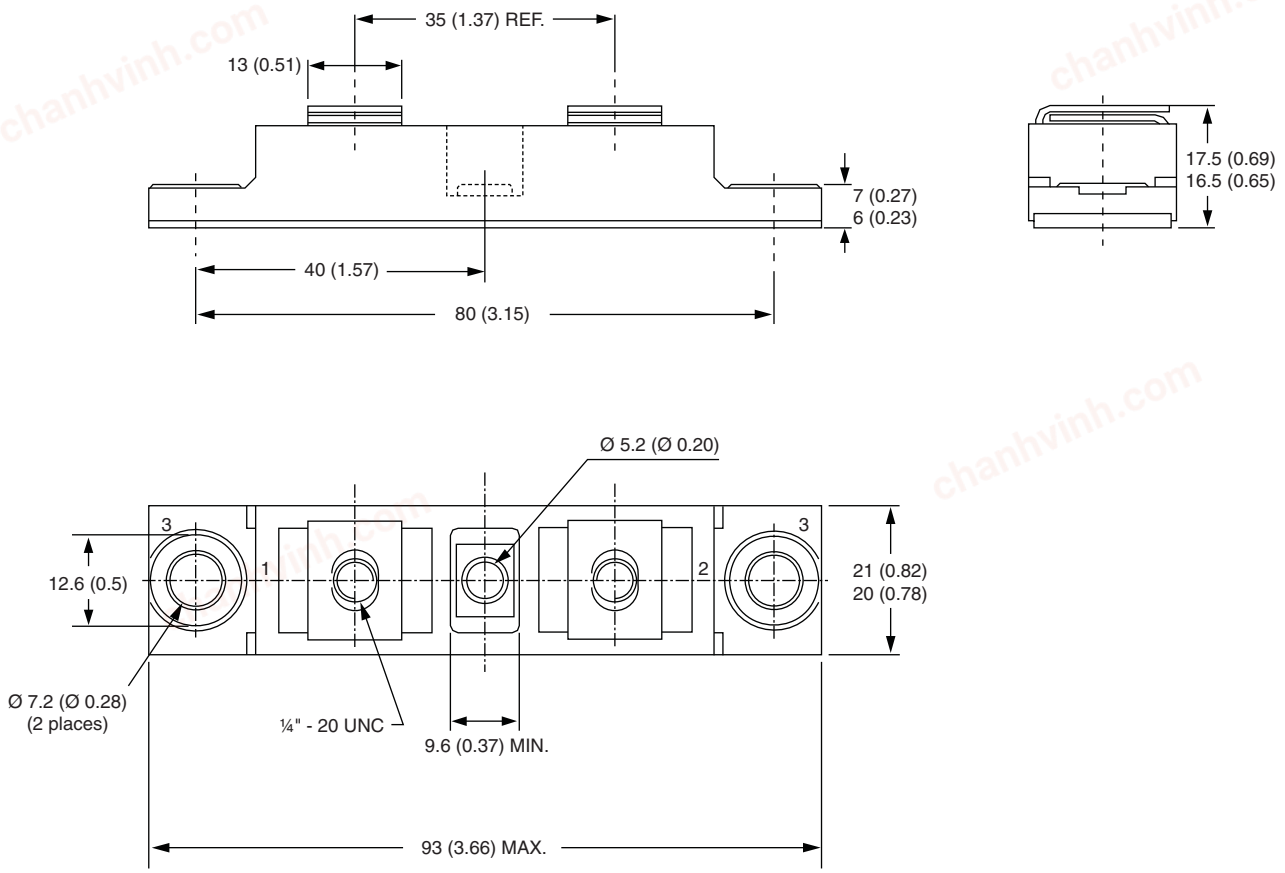
TO-244

DIMENSIONS in millimeters (inches)



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