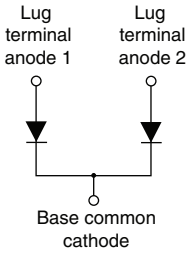
High Performance Schottky Rectifier, 400 A

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

RoHS COMPLIANT

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.

PRIMARY CHARACTERISTICS	
$I_{F(AV)}$	400 A
V_R	40 V, 45 V
Package	TO-244
Circuit configuration	Two diodes common cathode

MAJOR RATINGS AND CHARACTERISTICS			
SYMBOL	CHARACTERISTICS	VALUES	UNITS
$I_{F(AV)}$	Rectangular waveform	400	A
V_{RRM}	Range	40/45	V
I_{FSM}	t_p = 5 µs sine	25 000	A
V_F	200 A_{pk}, T_J = 125 °C (per leg)	0.56	V
T_J	Range	-55 to +175	°C

VOLTAGE RATINGS				
PARAMETER	SYMBOL	VS-401CNQ040PbF	VS-401CNQ045PbF	UNITS
Maximum DC reverse voltage	V_R	40	45	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 = 147 °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	25 000	
			10 ms sine or 6 ms rect. pulse		3450	
Non-repetitive avalanche energy per leg		E_{AS}	T_J = 25 °C, I_{AS} = 24 A, L = 1 mH		270	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

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	0.67	V
		400 A		0.78	
		200 A	T_J = T_J maximum	0.56	
		400 A		0.69	
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		180	
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	-	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	

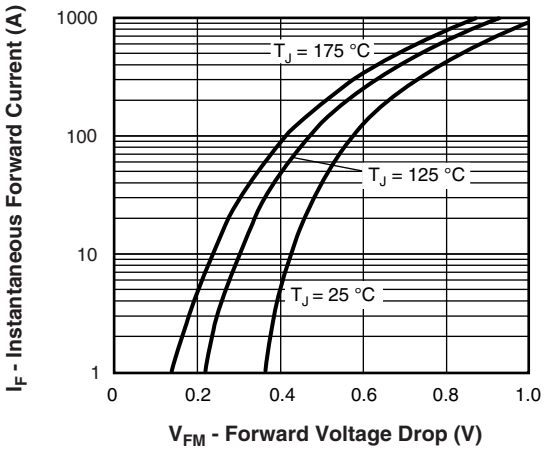


Fig. 1 - Maximum Forward Voltage Drop Characteristics

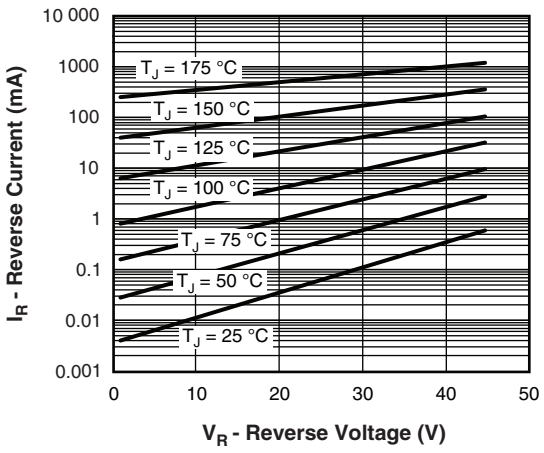


Fig. 2 - Typical Values of Reverse Current vs. Reverse Voltage

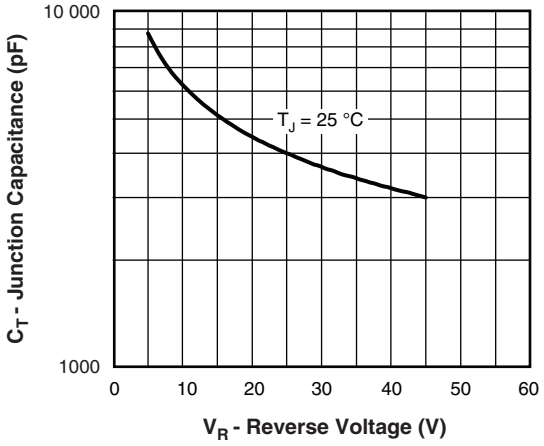


Fig. 3 - Typical Junction Capacitance vs. Reverse Voltage

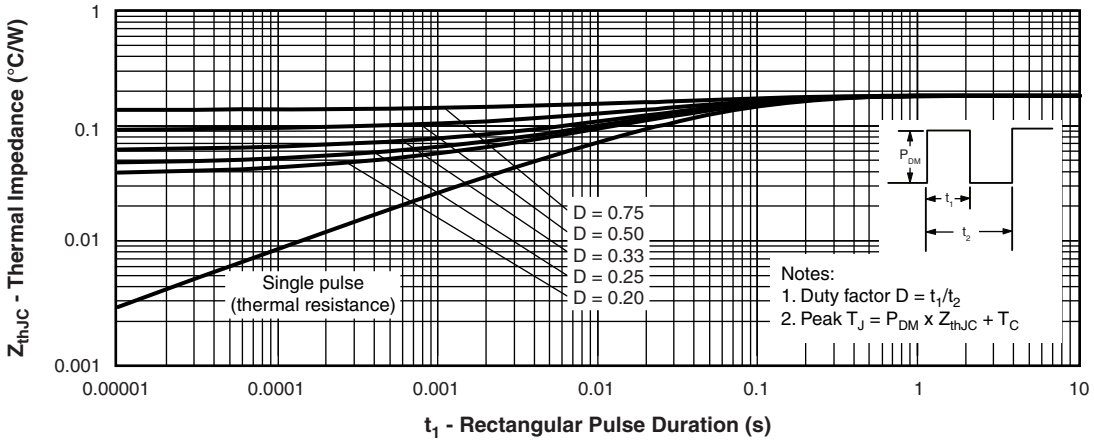


Fig. 4 - Maximum Thermal Impedance Z_{thJC} Characteristics (Per Leg)

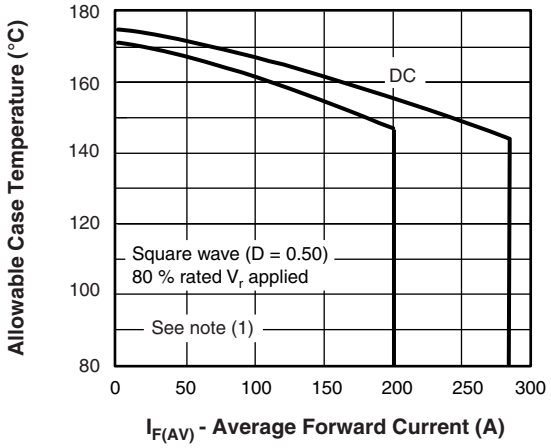


Fig. 5 - Maximum Allowable Case Temperature vs. Average Forward Current

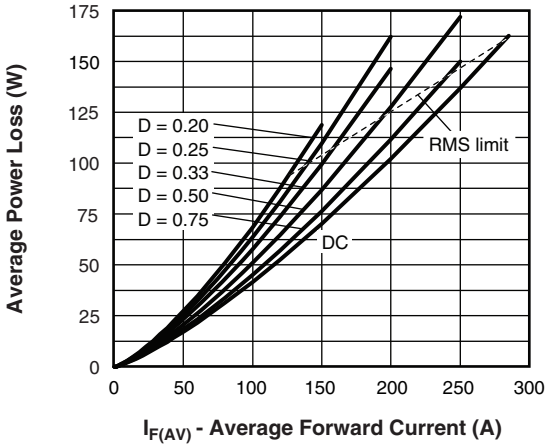


Fig. 6 - Forward Power Loss Characteristics

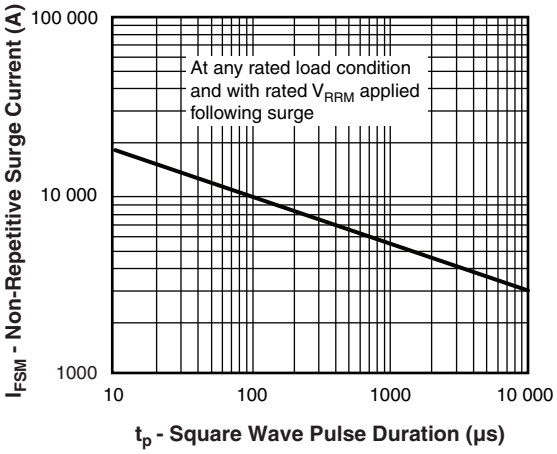


Fig. 7 - Maximum Non-Repetitive Surge Current

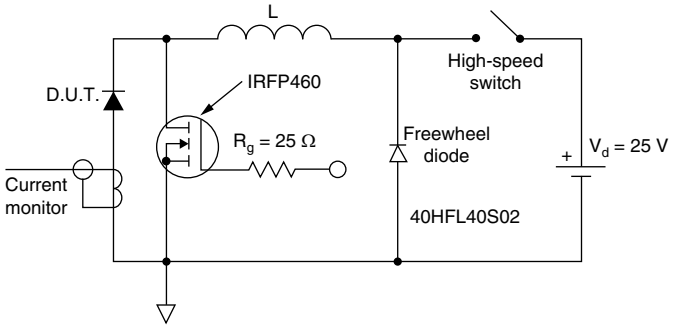


Fig. 8 - Unclamped Inductive Test Circuit

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} = 80 % rated V_R

ORDERING INFORMATION TABLE

Device code

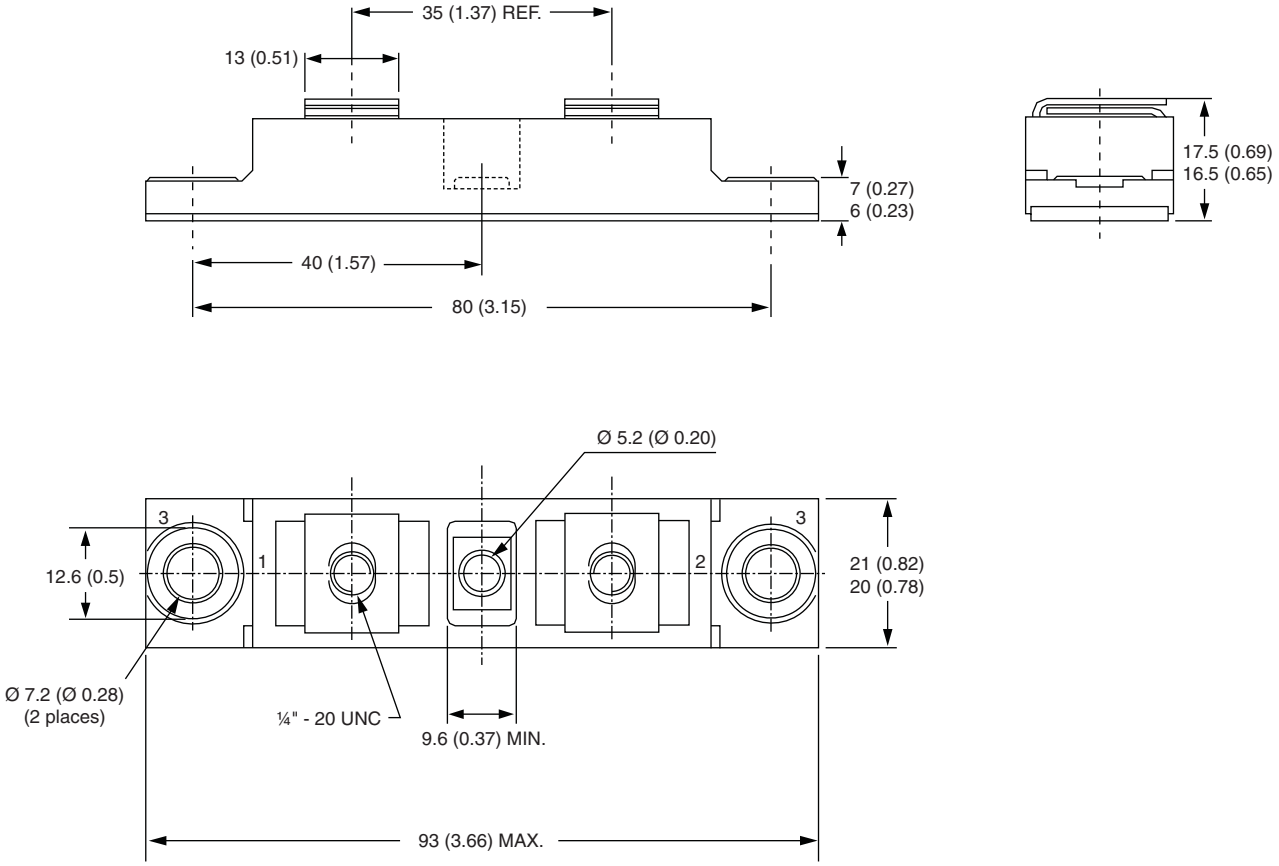
VS-	40	1	C	N	Q	045	PbF
1	2	3	4	5	6	7	8

- 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 — 040 = 40 V, 045 = 45 V
- 8 - Lead (Pb)-free

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

TO-244

DIMENSIONS in millimeters (inches)



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