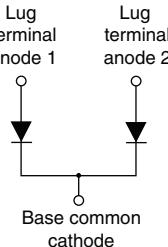


High Performance Schottky Rectifier, 400 A


TO-244

RoHS
COMPLIANT

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

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}	$t_p = 5 \mu s$ 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)	$I_{F(AV)}$	50 % duty cycle at $T_C = 147$ °C, rectangular waveform		200	A	
per leg				400		
per device						
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	A	
		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 $V_A = 1.5 \times V_R$ 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	$T_J = 25^\circ\text{C}$	0.67	V	
		400 A		0.78		
		200 A	$T_J = T_J \text{ maximum}$	0.56		
		400 A		0.69		
Maximum reverse leakage current per leg See fig. 2	$I_{RM}^{(1)}$	$T_J = 25^\circ\text{C}$		20	mA	
		$T_J = 125^\circ\text{C}$		180		
Maximum junction capacitance per leg	C_T	$V_R = 5 \text{ V}_{\text{DC}}$ (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	$^\circ\text{C}$
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)	$\text{lbf} \cdot \text{in}$ (N · m)
Mounting torque center hole		30 (3.4)		40 (4.6)	
Terminal torque		30 (3.4)	-	44.2 (5)	
Vertical pull		-	-	80	$\text{lbf} \cdot \text{in}$
2" lever pull		-	-	35	

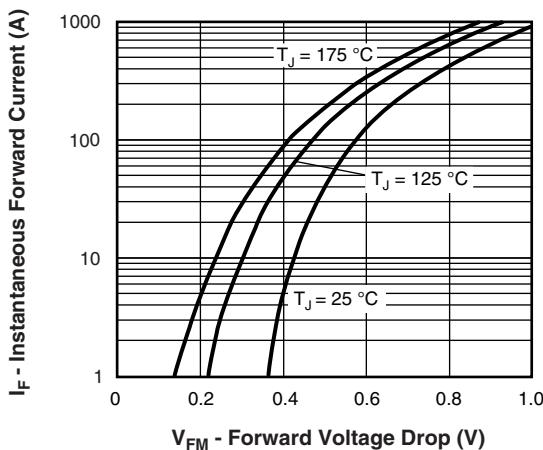


Fig. 1 - Maximum Forward Voltage Drop Characteristics

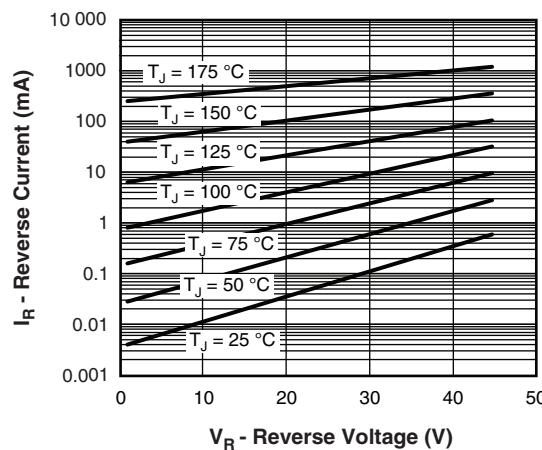


Fig. 2 - Typical Values of Reverse Current vs. Reverse Voltage

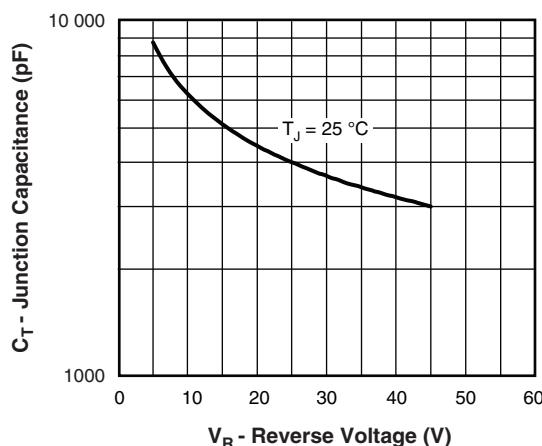


Fig. 3 - Typical Junction Capacitance vs. Reverse Voltage

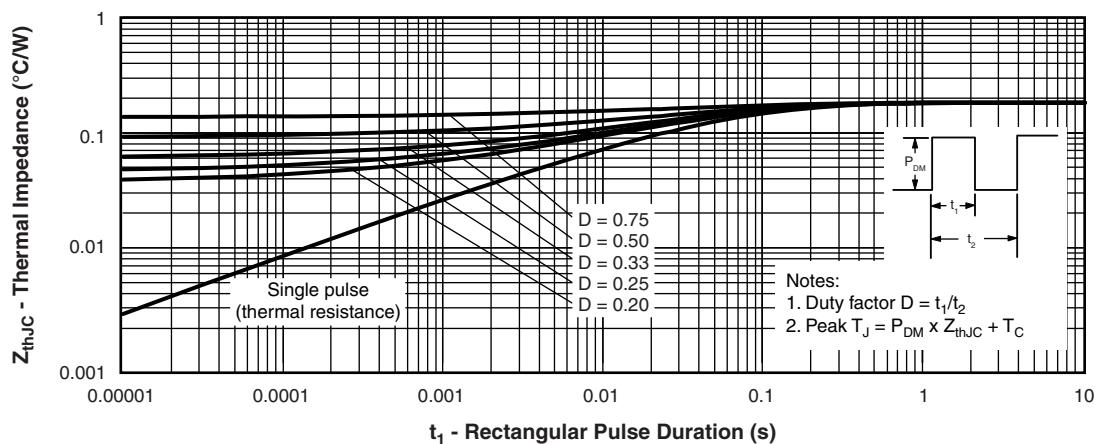


Fig. 4 - Maximum Thermal Impedance Z_{thJC} Characteristics (Per Leg)

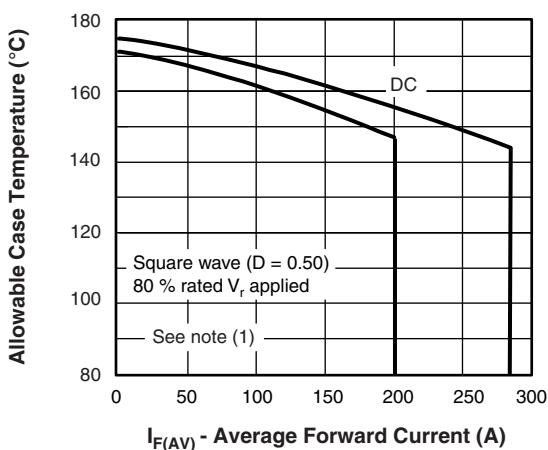


Fig. 5 - Maximum Allowable Case Temperature vs. Average Forward Current

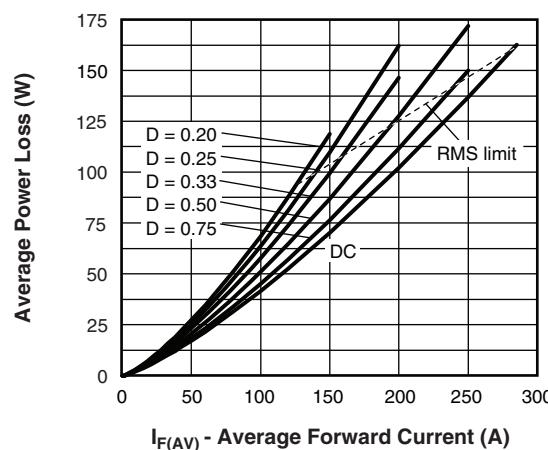


Fig. 6 - Forward Power Loss Characteristics

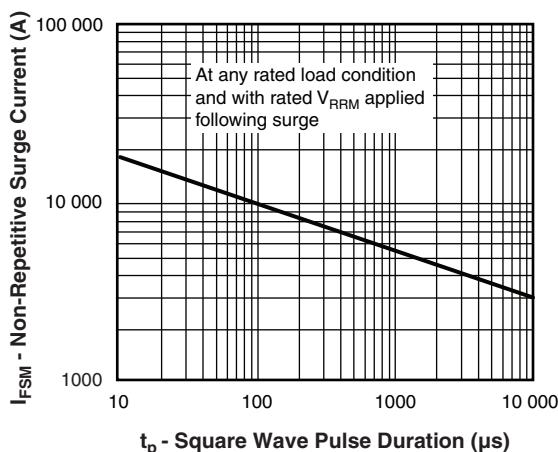


Fig. 7 - Maximum Non-Repetitive Surge Current

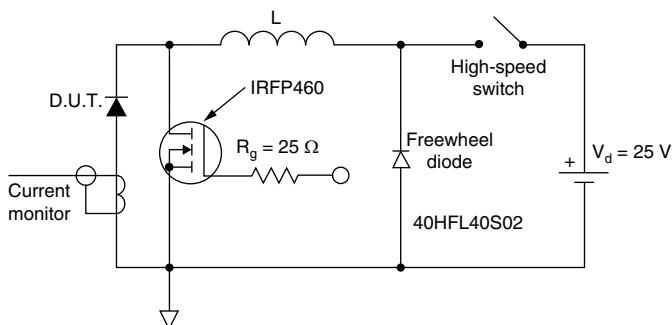


Fig. 8 - Unclamped Inductive Test Circuit

Note

(1) Formula used: $T_C = T_J - (P_d + P_{dREV}) \times R_{thJC}$;
 $P_d = \text{forward power loss} = I_{F(AV)} \times V_{FM}$ at $(I_{F(AV)}/D)$ (see fig. 6);
 $P_{dREV} = \text{inverse power loss} = V_{R1} \times I_R (1 - D)$; I_R at $V_{R1} = 80\%$ rated V_R

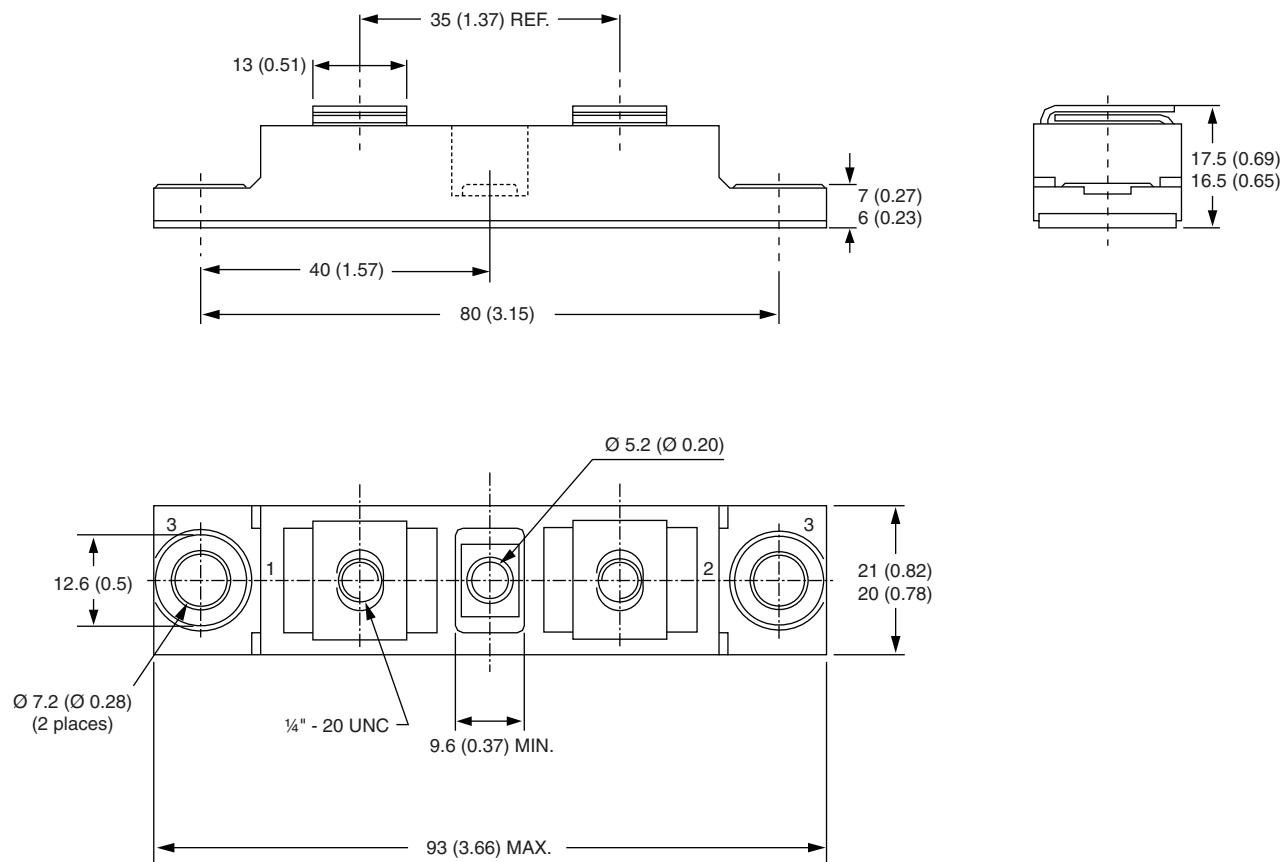
ORDERING INFORMATION TABLE

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	
	8	- Lead (Pb)-free					045 = 45 V	

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

TO-244

DIMENSIONS in millimeters (inches)



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