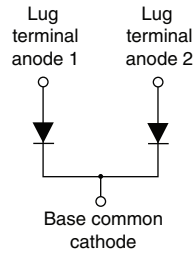


High Performance Schottky Rectifier, 400 A



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



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

DESCRIPTION

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.

| 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} , $T_J = 125 \text{ }^\circ\text{C}$ (per leg) | 0.56 | V |
| T_J | Range | -55 to 175 | $^\circ\text{C}$ |

| 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 $T_C = 147 \text{ }^\circ\text{C}$, rectangular waveform | | 200 | A |
| | | | | 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} | $T_J = 25 \text{ }^\circ\text{C}$, $I_{AS} = 24 \text{ A}$, $L = 1 \text{ mH}$ | | 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 | $T_J = 25\text{ }^\circ\text{C}$ | 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 | $I_{RM}^{(1)}$ | $T_J = 25\text{ }^\circ\text{C}$ | $V_R = \text{Rated } V_R$ | 20 | mA |
| | | $T_J = 125\text{ }^\circ\text{C}$ | | 180 | |
| Maximum junction capacitance per leg | C_T | $V_R = 5\text{ }V_{DC}$ (test signal range 100 kHz to 1 MHz) $25\text{ }^\circ\text{C}$ | | 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 | $^\circ\text{C/W}$ |
| 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 | |

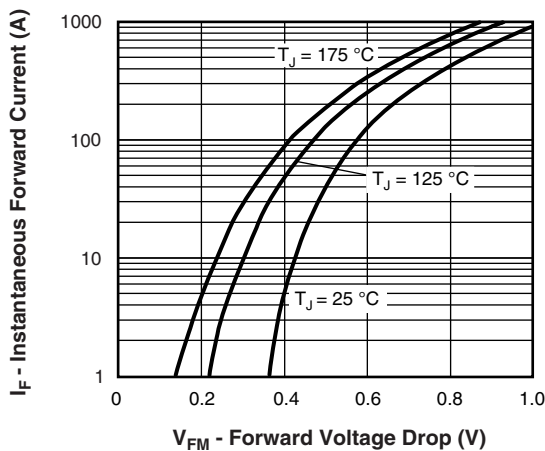


Fig. 1 - Maximum Forward Voltage Drop Characteristics

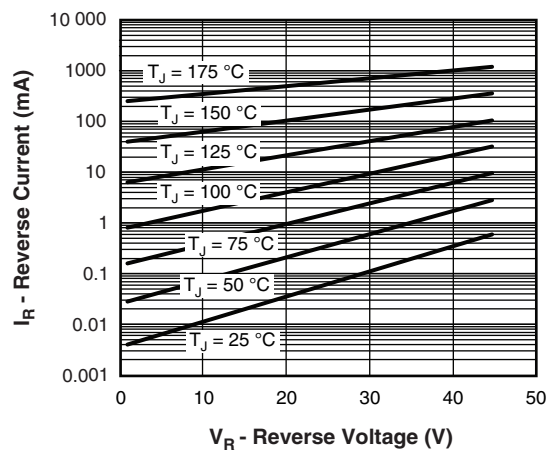


Fig. 2 - Typical Values of Reverse Current vs. Reverse Voltage

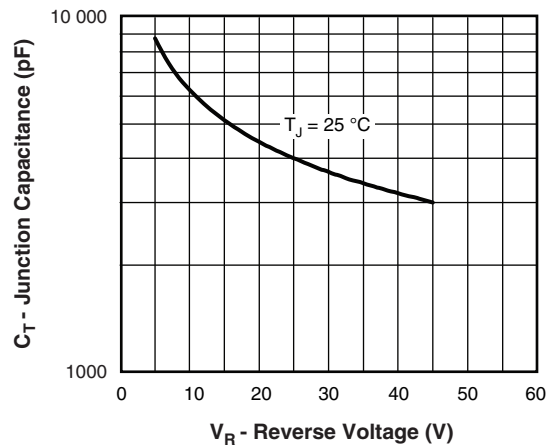


Fig. 3 - Typical Junction Capacitance vs. Reverse Voltage

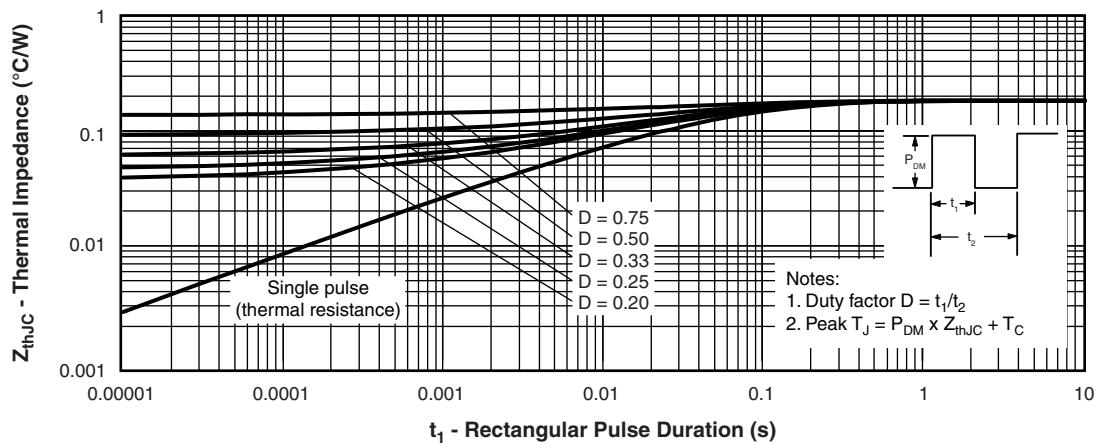


Fig. 4 - Maximum Thermal Impedance Z_{thJC} Characteristics (Per Leg)

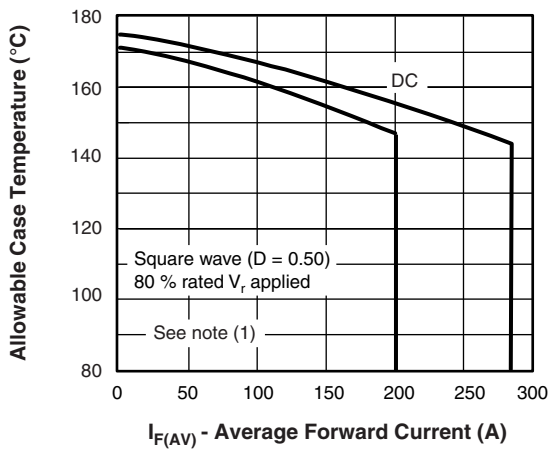


Fig. 5 - Maximum Allowable Case Temperature vs. Average Forward Current

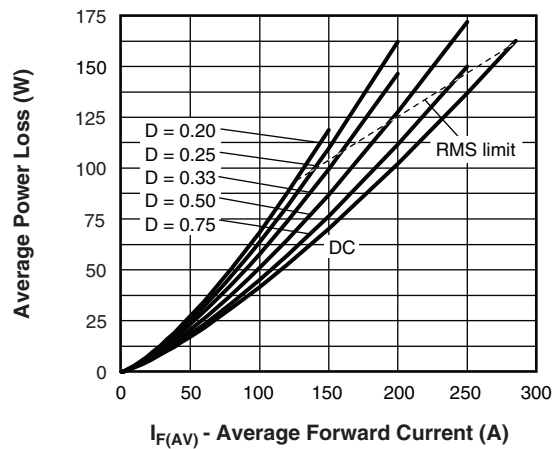


Fig. 6 - Forward Power Loss Characteristics

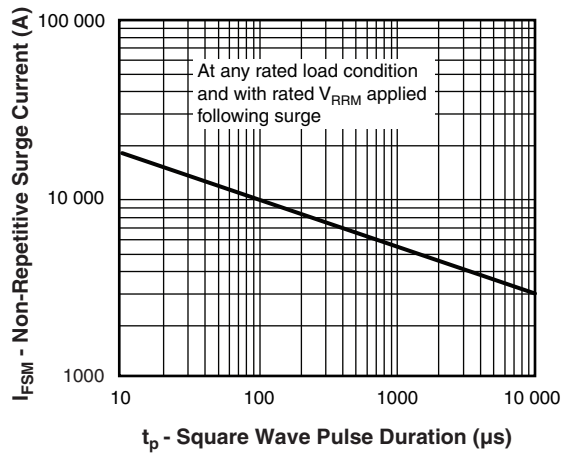


Fig. 7 - Maximum Non-Repetitive Surge Current

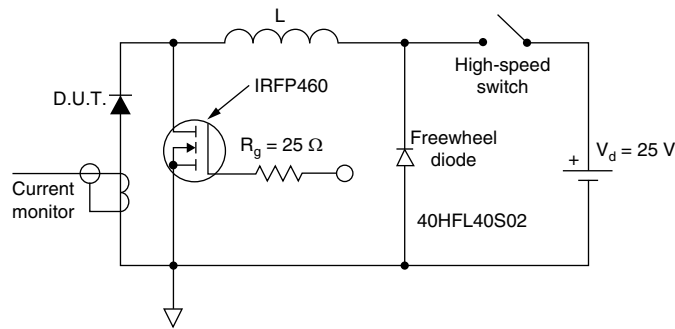


Fig. 8 - Unclamped Inductive Test Circuit

Note

- (1) Formula used: $T_C = T_J - (P_d + P_{dREV}) \times R_{thJC}$;
- 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 $V_{R1} = 80\%$ rated V_R

ORDERING INFORMATION TABLE

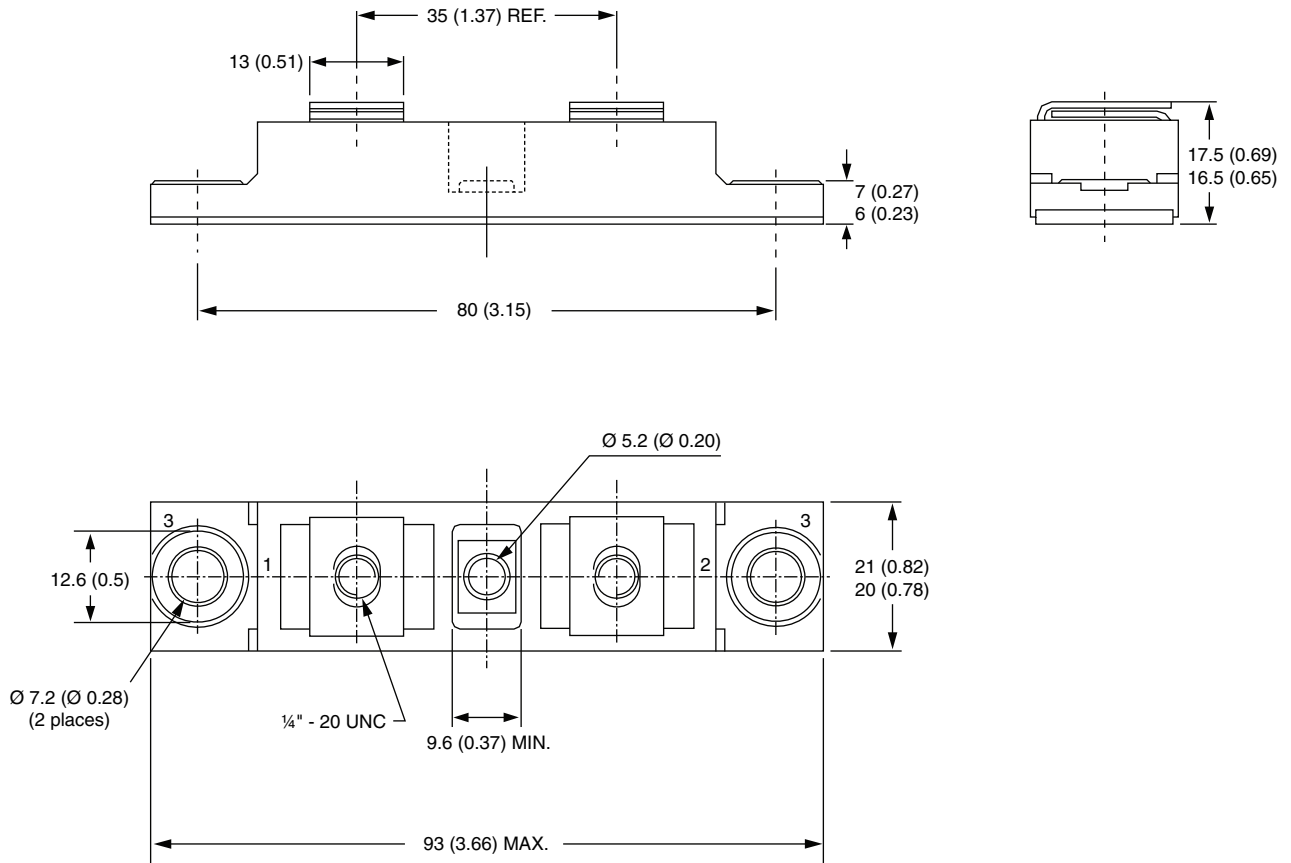
| | | | | | | | | |
|-------------|------------|-----------|----------|----------|----------|----------|------------|------------|
| Device code | VS- | 40 | 1 | C | N | Q | 045 | PbF |
| | ① | ② | ③ | ④ | ⑤ | ⑥ | ⑦ | ⑧ |

- 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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