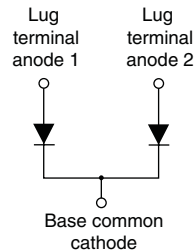


## Schottky Rectifier, 400 A



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
- Lead (Pb)-free
- Designed and qualified for industrial level



### DESCRIPTION

The 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.

### PRODUCT SUMMARY

|             |         |
|-------------|---------|
| $I_{F(AV)}$ | 400 A   |
| $V_R$       | 40/45 V |

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

### VOLTAGE RATINGS

| PARAMETER                            | SYMBOL    | 401CNQ040PbF | 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<br>per leg<br>See fig. 5<br>per device    | $I_{F(AV)}$ | 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<br>See fig. 7 | $I_{FSM}$   | 5 $\mu s$ sine or 3 $\mu s$ rect. pulse   | 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 $\mu s$<br>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<br>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<br>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                  | $C_T$          | $V_R = 5 V_{DC}$ (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/ $\mu\text{s}$ |

**Note**

(1) Pulse width < 300  $\mu\text{s}$ , 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<br>(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       |                     |

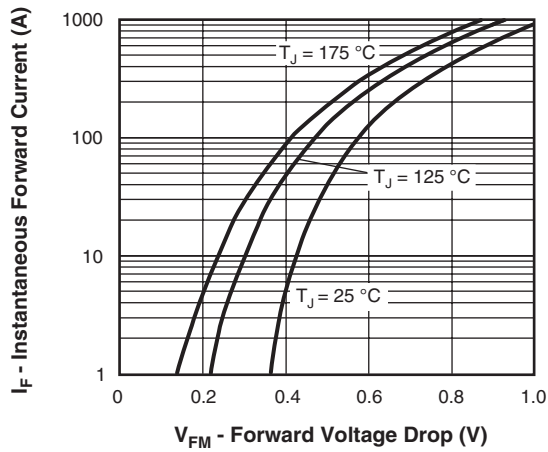


Fig. 1 - Maximum Forward Voltage Drop Characteristics

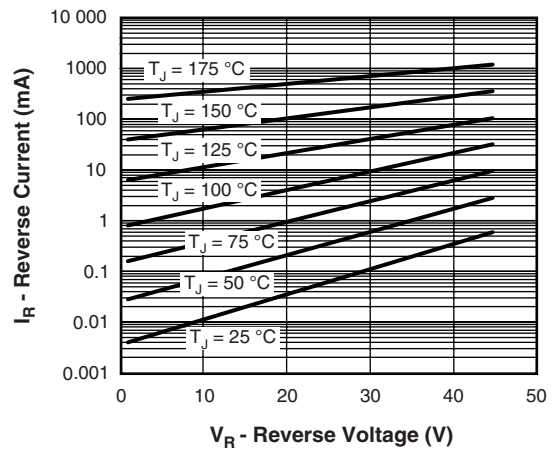


Fig. 2 - Typical Values of Reverse Current vs. Reverse Voltage

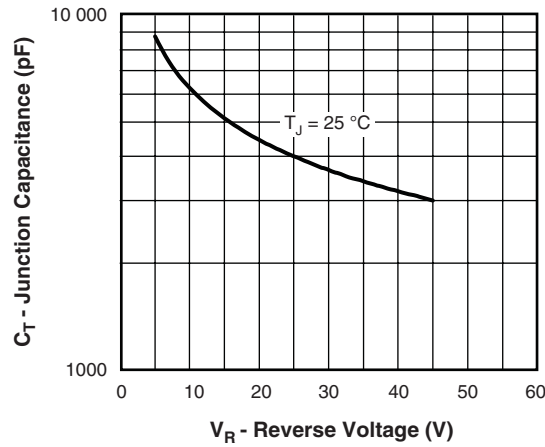


Fig. 3 - Typical Junction Capacitance vs. Reverse Voltage

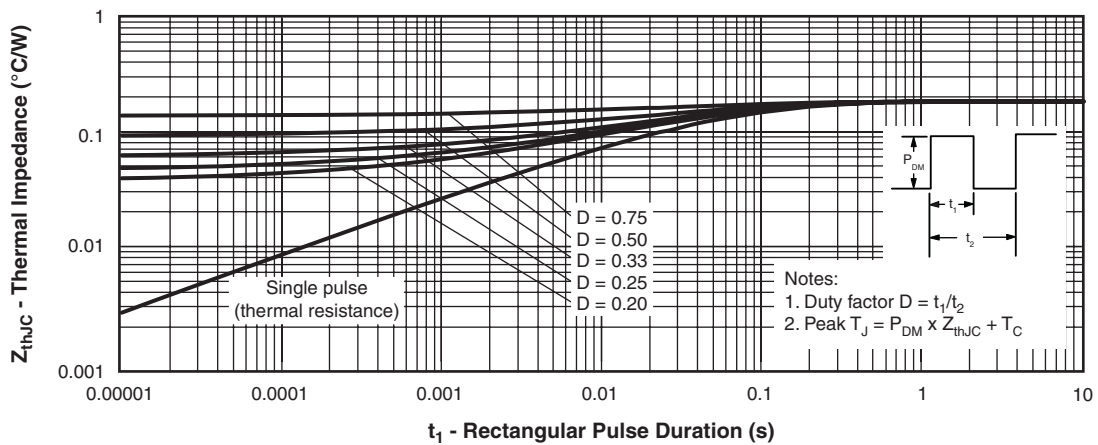


Fig. 4 - Maximum Thermal Impedance  $Z_{thJC}$  Characteristics (Per Leg)

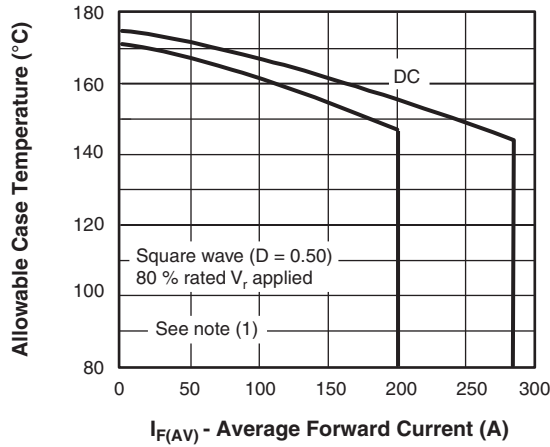


Fig. 5 - Maximum Allowable Case Temperature vs. Average Forward Current

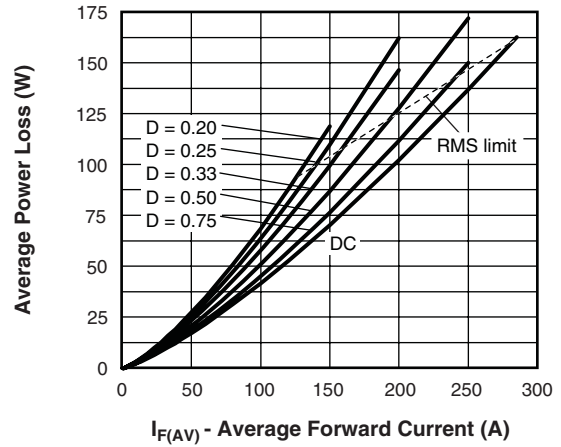


Fig. 6 - Forward Power Loss Characteristics

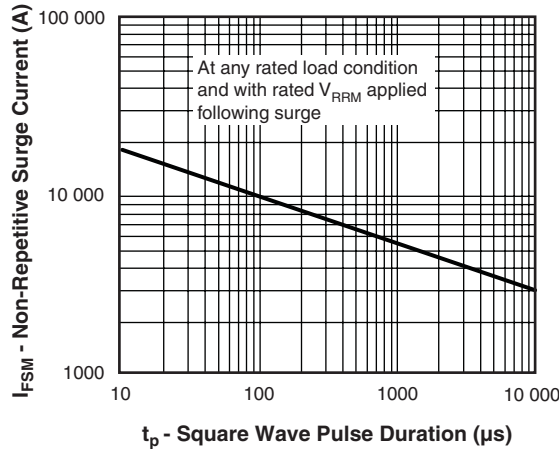


Fig. 7 - Maximum Non-Repetitive Surge Current

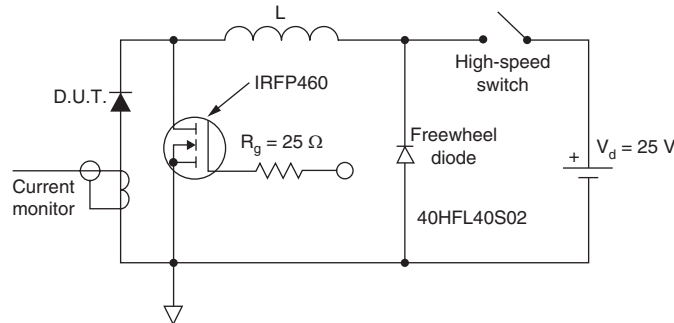


Fig. 8 - Unclamped Inductive Test Circuit

**Note**

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



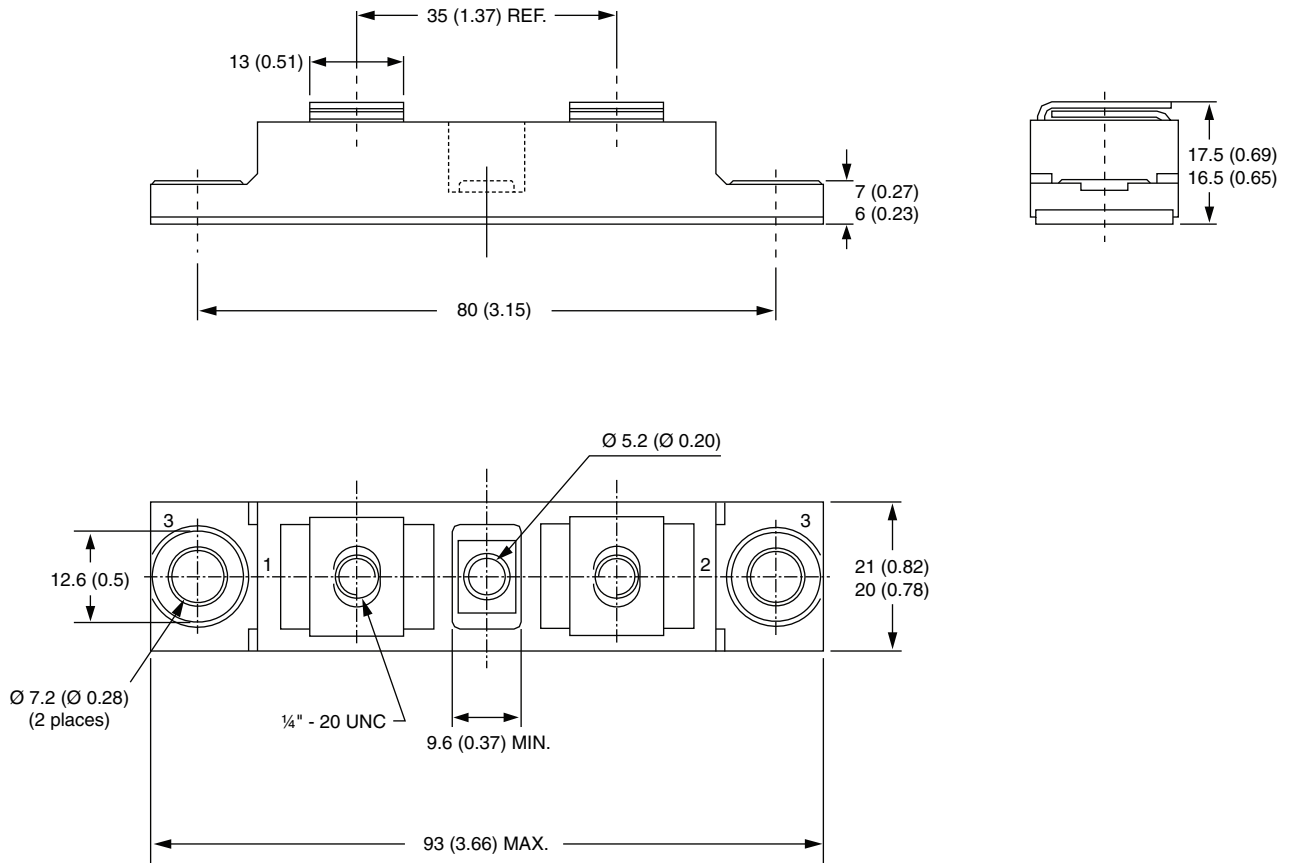
**ORDERING INFORMATION TABLE**

|             |           |          |                                |          |          |                          |            |
|-------------|-----------|----------|--------------------------------|----------|----------|--------------------------|------------|
| Device code | <b>40</b> | <b>1</b> | <b>C</b>                       | <b>N</b> | <b>Q</b> | <b>045</b>               | <b>PbF</b> |
|             | ①         | ②        | ③                              | ④        | ⑤        | ⑥                        | ⑦          |
|             | <b>1</b>  | -        | Average current rating (x 10)  |          |          |                          |            |
|             | <b>2</b>  | -        | Product silicon identification |          |          |                          |            |
|             | <b>3</b>  | -        | C = Circuit configuration      |          |          |                          |            |
|             | <b>4</b>  | -        | N = Not isolated               |          |          |                          |            |
|             | <b>5</b>  | -        | Q = Schottky rectifier diode   |          |          |                          |            |
|             | <b>6</b>  | -        | Voltage ratings                |          |          | 040 = 40 V<br>045 = 45 V |            |
|             | <b>7</b>  | -        | Lead (Pb)-free                 |          |          |                          |            |

| LINKS TO RELATED DOCUMENTS |   |
|----------------------------|---|
| Dimensions                 | <a href="http://www.vishay.com/doc?95021">http://www.vishay.com/doc?95021</a> |

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**DIMENSIONS** in millimeters (inches)





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