

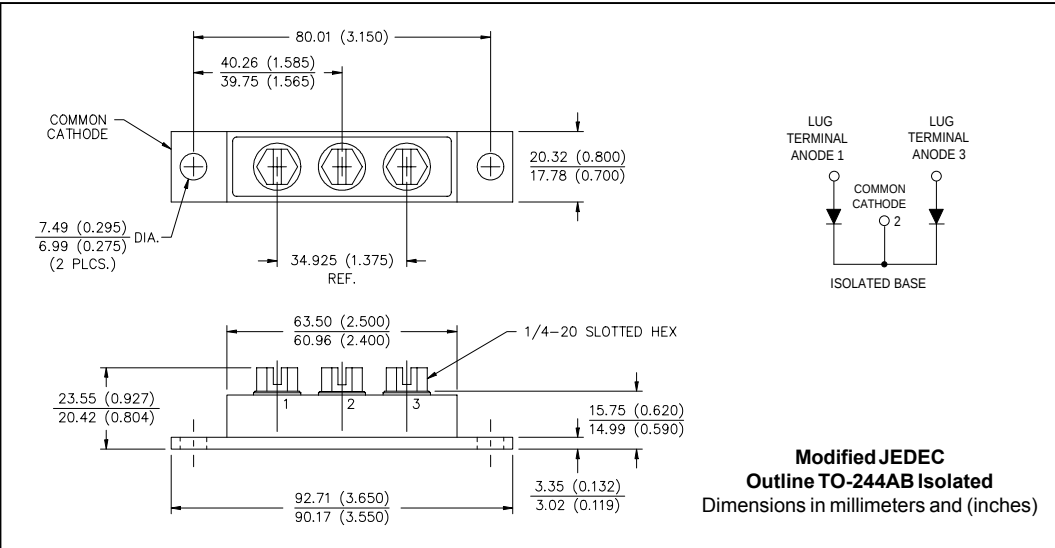
Major Ratings and Characteristics

| Characteristics                                    | 401CMQ...  | Units            |
|----------------------------------------------------|------------|------------------|
| $I_{F(AV)}$ Rectangular waveform                   | 400        | A                |
| $V_{RRM}$ range                                    | 35 to 45   | V                |
| $I_{FSM}$ @tp = 5 $\mu$ s sine                     | 25,000     | A                |
| $V_F$ @200Apk, $T_J = 125^\circ\text{C}$ (per leg) | 0.56       | V                |
| $T_J$ range                                        | -55 to 175 | $^\circ\text{C}$ |

Description/Features

The 401CMQ center tap, high current, 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 $^\circ\text{C}$  junction temperature. Typical applications are in high current switching power supplies, converters, free-wheeling diodes, welding and reverse battery protection.

- 175 $^\circ\text{C}$   $T_J$  operation
- Center tap module
- High purity, high temperature epoxy encapsulation for enhanced mechanical strength and moisture resistance
- Low forward voltage drop
- High frequency operation
- Guard ring for enhanced ruggedness and long term reliability



## 401CMQ... Series

Bulletin PD-20735 rev. B 08/01

International  
**IR** Rectifier

### Voltage Ratings

| Part number                                     | 401CMQ035 | 401CMQ040 | 401CMQ045 |
|-------------------------------------------------|-----------|-----------|-----------|
| $V_R$ Max. DC Reverse Voltage (V)               | 35        | 40        | 45        |
| $V_{RWM}$ Max. Working Peak Reverse Voltage (V) |           |           |           |

### Absolute Maximum Ratings

| Parameters                                                                           | 401CMQ         | Units | Conditions                                                                                                                                                 |
|--------------------------------------------------------------------------------------|----------------|-------|------------------------------------------------------------------------------------------------------------------------------------------------------------|
| $I_{F(AV)}$ Max. Average Forward (Per Leg)<br>Current * See Fig. 5 (Per Device)      | 200<br>400     | A     | 50% duty cycle @ $T_C = 116^\circ\text{C}$ , rectangular waveform                                                                                          |
| $I_{FSM}$ Max. Peak One Cycle Non-Repetitive<br>Surge Current (Per Leg) * See Fig. 7 | 25,000<br>3450 | A     | 5 $\mu\text{s}$ Sine or 3 $\mu\text{s}$ Rect. pulse<br>10ms Sine or 6ms Rect. pulse<br>Following any rated load condition and with rated $V_{RWM}$ applied |
| $E_{AS}$ Non-Repetitive Avalanche Energy (Per Leg)                                   | 270            | mJ    | $T_J = 25^\circ\text{C}$ , $I_{AS} = 40$ Amps, $L = 0.34$ mH                                                                                               |
| $I_{AR}$ Repetitive Avalanche Current (Per Leg)                                      | 40             | A     | Current decaying linearly to zero in 1 $\mu\text{sec}$<br>Frequency limited by $T_J$ , max. $V_A = 1.5 \times V_R$ typical                                 |

### Electrical Specifications

| Parameters                                                       | 401CMQ | Units            | Conditions                                                              |
|------------------------------------------------------------------|--------|------------------|-------------------------------------------------------------------------|
| $V_{FM}$ Max. Forward Voltage Drop (Per Leg) * See Fig. 1 (1)    | 0.67   | V                | @ 200A<br>$T_J = 25^\circ\text{C}$                                      |
|                                                                  | 0.78   | V                | @ 400A                                                                  |
|                                                                  | 0.56   | V                | @ 200A<br>$T_J = 125^\circ\text{C}$                                     |
|                                                                  | 0.68   | V                | @ 400A                                                                  |
| $I_{RM}$ Max. Reverse Leakage Current (Per Leg) * See Fig. 2 (1) | 20     | mA               | $T_J = 25^\circ\text{C}$<br>$V_R = \text{rated } V_R$                   |
|                                                                  | 180    | mA               | $T_J = 125^\circ\text{C}$                                               |
| $C_T$ Max. Junction Capacitance (Per Leg)                        | 10,300 | pF               | $V_R = 5V_{DC}$ , (test signal range 100Khz to 1Mhz) $25^\circ\text{C}$ |
| $L_S$ Typical Series Inductance (Per Leg)                        | 5.0    | nH               | From top of terminal hole to mounting plane                             |
| $dv/dt$ Max. Voltage Rate of Change                              | 10000  | V/ $\mu\text{s}$ | (Rated $V_R$ )                                                          |
| $V_{RMS}$ Insulation Voltage                                     | 1000   | V                |                                                                         |

(1) Pulse Width < 300 $\mu\text{s}$ , Duty Cycle < 2%

### Thermal-Mechanical Specifications

| Parameters                                                        | 401CMQ               | Units              | Conditions                           |
|-------------------------------------------------------------------|----------------------|--------------------|--------------------------------------|
| $T_J$ Max. Junction Temperature Range                             | -55 to 175           | $^\circ\text{C}$   |                                      |
| $T_{stg}$ Max. Storage Temperature Range                          | -55 to 175           | $^\circ\text{C}$   |                                      |
| $R_{thJC}$ Max. Thermal Resistance Junction to Case (Per Leg)     | 0.4                  | $^\circ\text{C/W}$ | DC operation * See Fig. 4            |
| $R_{thJC}$ Max. Thermal Resistance Junction to Case (Per Package) | 0.2                  | $^\circ\text{C/W}$ | DC operation                         |
| $R_{thCS}$ Typical Thermal Resistance, Case to Heatsink           | 0.1                  | $^\circ\text{C/W}$ | Mounting surface, smooth and greased |
| wt Approximate Weight                                             | 79 (2.80)            | g (oz.)            |                                      |
| T Mounting Torque                                                 | Base Min.            | 24 (20)            | Kg-cm<br>(lbf-in)                    |
|                                                                   | Base Max.            | 35 (30)            |                                      |
|                                                                   | Center Hole Typ.     | 13.5 (12)          |                                      |
|                                                                   | Terminal Torque Min. | 35 (30)            |                                      |
|                                                                   | Terminal Torque Max. | 46 (40)            |                                      |
| Case Style                                                        | TO-244AB isolated    |                    | Modified JEDEC                       |

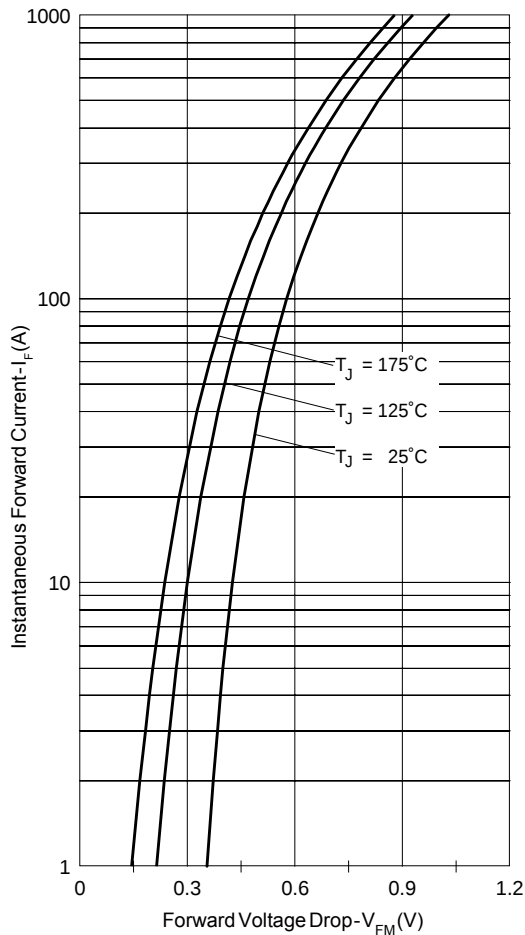


Fig. 1 - Max. Forward Voltage Drop Characteristics

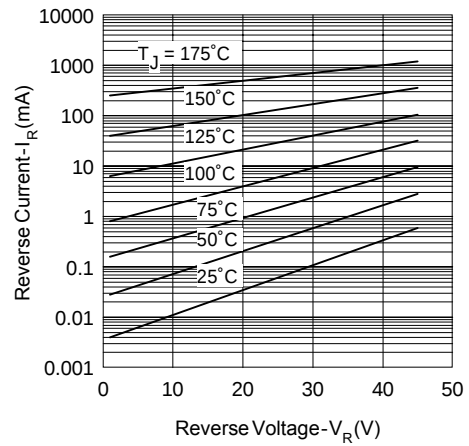


Fig. 2 - Typical Values Of Reverse Current Vs. Reverse Voltage

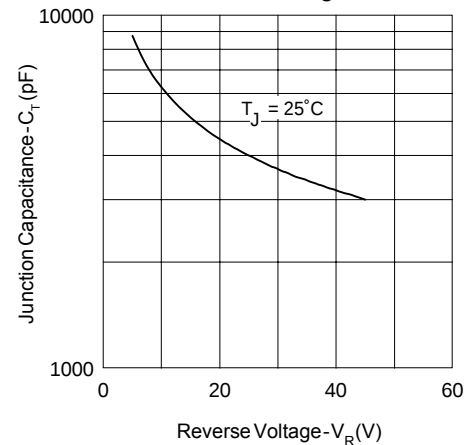


Fig. 3 - Typical Junction Capacitance Vs. Reverse Voltage

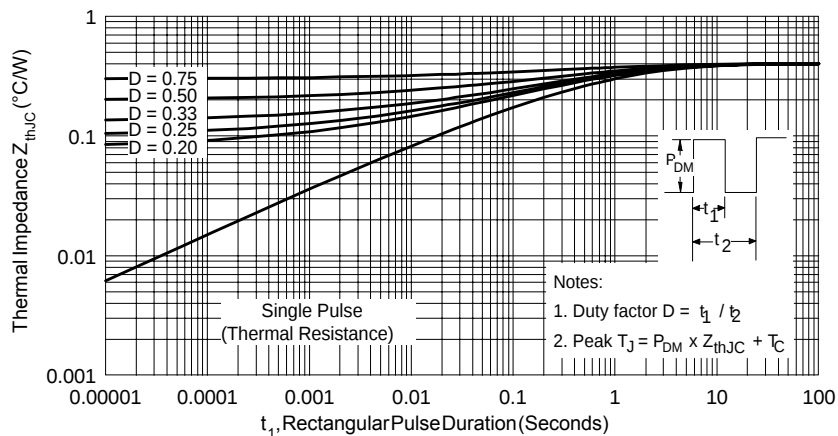
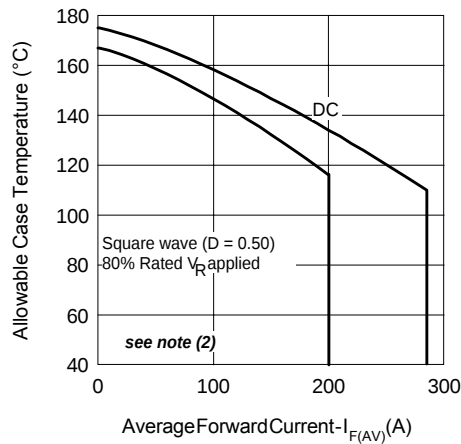
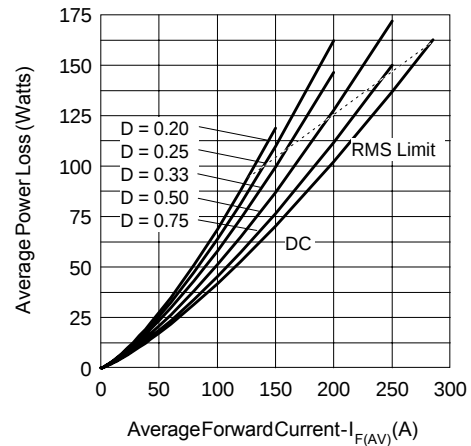


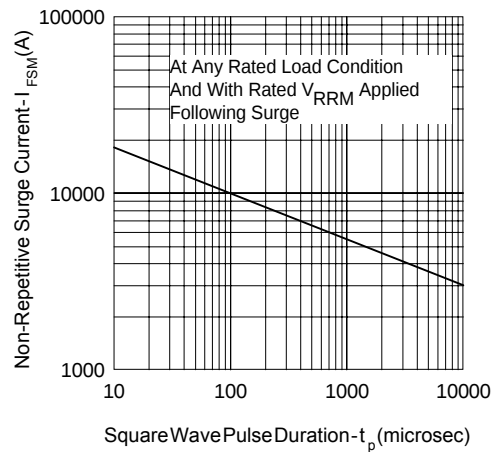
Fig. 4 - Max. Thermal Impedance  $Z_{thJC}$  Characteristics (Per Leg)



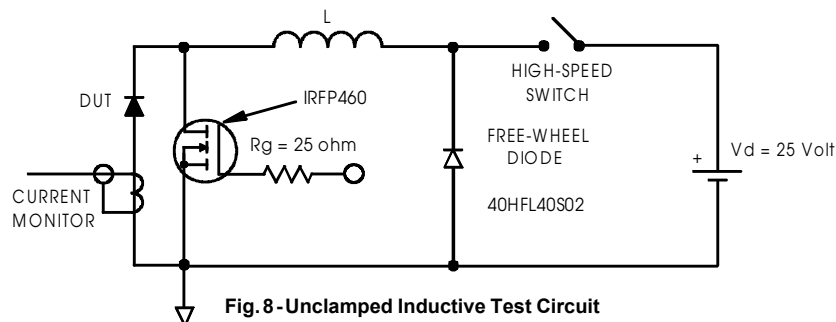
**Fig. 5 - Max. Allowable Case Temperature Vs. Average Forward Current**



**Fig. 6 - Forward Power Loss Characteristics**



**Fig. 7 - Max. Non-Repetitive Surge Current**



**Fig. 8 - Unclamped Inductive Test Circuit**

(2) Formula used:  $T_C = T_J - (P_d + P_{d_{REV}}) \times R_{thJC}$ ;

$P_d$  = Forward Power Loss =  $I_{F(AV)} \times V_{FM} @ (I_{F(AV)} / D)$  (see Fig. 6);

$P_{d_{REV}}$  = Inverse Power Loss =  $V_{R1} \times I_R (1 - D)$ ;  $I_R @ V_{R1} = 80\%$  rated  $V_R$

## Ordering Information Table

| Device Code |   |                      |                                                                |     |
|-------------|---|----------------------|----------------------------------------------------------------|-----|
| 401         | C | M                    | Q                                                              | 045 |
| ①           | ② | ③                    | ④                                                              | ⑤   |
| 1           | - | Current Rating: 400A |                                                                |     |
| 2           | - | Common Cathode       |                                                                |     |
| 3           | - | Module               |                                                                |     |
| 4           | - | Schottky Q Series    |                                                                |     |
| 5           | - | Voltage Rating:      |                                                                |     |
|             |   |                      | <div>035 = 35V</div> <div>040 = 40V</div> <div>045 = 45V</div> |     |

Data and specifications subject to change without notice.  
This product has been designed and qualified for Industrial Level.  
Qualification Standards can be found on IR's Web site.