

International  
**IR** Rectifier

40CTQ045  
40CTQ045S  
40CTQ045-1

SCHOTTKY RECTIFIER

40 Amp

Major Ratings and Characteristics

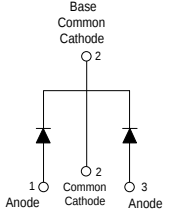
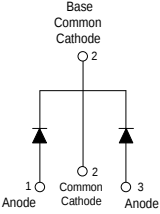
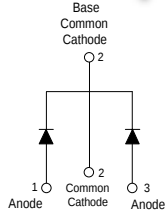
| Characteristics                                    | Values     | Units            |
|----------------------------------------------------|------------|------------------|
| $I_{F(AV)}$ Rectangular waveform                   | 40         | A                |
| $V_{RRM}$                                          | 45         | V                |
| $I_{FSM}$ @ tp = 5 $\mu$ s sine                    | 1240       | A                |
| $V_F$ @20 Apk, $T_J = 125^\circ\text{C}$ (per leg) | 0.48       | V                |
| $T_J$ range                                        | -55 to 150 | $^\circ\text{C}$ |

Description/Features

This center tap Schottky rectifier has been optimized for very low forward voltage drop, with moderate leakage. The proprietary barrier technology allows for reliable operation up to  $150^\circ\text{C}$  junction temperature. Typical applications are in switching power supplies, converters, free-wheeling diodes, and reverse battery protection.

- $150^\circ\text{C}$   $T_J$  operation
- Center tap configuration
- Very low forward voltage drop
- High purity, high temperature epoxy encapsulation for enhanced mechanical strength and moisture resistance
- High frequency operation
- Guard ring for enhanced ruggedness and long term reliability

Case Styles

| 40CTQ...                                                                                                                                                                             | 40CTQ...S                                                                                                                                                                                        | 40CTQ...-1                                                                                                                                                                               |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <br><br>TO-220 | <br><br>D <sup>2</sup> PAK | <br><br>TO-262 |

## Voltage Ratings

| Parameters                                      | 40CTQ045<br>40CTQ045S<br>40CTQ045-1 |
|-------------------------------------------------|-------------------------------------|
| $V_R$ Max. DC Reverse Voltage (V)               | 45                                  |
| $V_{RRM}$ Max. Working Peak Reverse Voltage (V) |                                     |

## Absolute Maximum Ratings

| Parameters                                                                           | Values      | Units | Conditions                                                                                                                                                 |
|--------------------------------------------------------------------------------------|-------------|-------|------------------------------------------------------------------------------------------------------------------------------------------------------------|
| $I_{F(AV)}$ Max. Average Forward (Per Leg)<br>Current * See Fig. 5 (Per Device)      | 20<br>40    | A     | 50% duty cycle @ $T_C = 116^\circ\text{C}$ , rectangular wave form                                                                                         |
| $I_{FSM}$ Max. Peak One Cycle Non-Repetitive<br>Surge Current (Per Leg) * See Fig. 7 | 1240<br>350 | 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 $V_{RRM}$ applied |
| $E_{AS}$ Non-Repetitive Avalanche Energy (Per Leg)                                   | 20          | mJ    | $T_J = 25^\circ\text{C}$ , $I_{AS} = 3\text{Amps}$ , $L = 4.40\text{mH}$                                                                                   |
| $I_{AR}$ Repetitive Avalanche Current (Per Leg)                                      | 3           | 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                                                       | Values | Units            | Conditions                                                              |
|------------------------------------------------------------------|--------|------------------|-------------------------------------------------------------------------|
| $V_{FM}$ Max. Forward Voltage Drop (Per Leg) * See Fig. 1 (1)    | 0.53   | V                | @ 20A<br>$T_J = 25^\circ\text{C}$                                       |
|                                                                  | 0.68   | V                | @ 40A                                                                   |
|                                                                  | 0.48   | V                | @ 20A<br>$T_J = 125^\circ\text{C}$                                      |
|                                                                  | 0.67   | V                | @ 40A                                                                   |
| $I_{RM}$ Max. Reverse Leakage Current (Per Leg) * See Fig. 2 (1) | 3      | mA               | $T_J = 25^\circ\text{C}$<br>$V_R = \text{rated } V_R$                   |
|                                                                  | 115    | mA               | $T_J = 125^\circ\text{C}$                                               |
| $V_{F(TO)}$ Threshold Voltage                                    | 0.27   | V                | $T_J = T_J \text{ max.}$                                                |
| $r_t$ Forward Slope Resistance                                   | 8.72   | m $\Omega$       |                                                                         |
| $C_T$ Max. Junction Capacitance (Per Leg)                        | 2800   | pF               | $V_R = 5V_{DC}$ , (test signal range 100Khz to 1Mhz) $25^\circ\text{C}$ |
| $L_S$ Typical Series Inductance (Per Leg)                        | 8.0    | nH               | Measured lead to lead 5mm from package body                             |
| $dv/dt$ Max. Voltage Rate of Change (Rated $V_R$ )               | 10000  | V/ $\mu\text{s}$ |                                                                         |

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

## Thermal-Mechanical Specifications

| Parameters                                                        | Values     | Units              | Conditions                                             |
|-------------------------------------------------------------------|------------|--------------------|--------------------------------------------------------|
| $T_J$ Max. Junction Temperature Range                             | -55 to 150 | $^\circ\text{C}$   |                                                        |
| $T_{stg}$ Max. Storage Temperature Range                          | -55 to 150 | $^\circ\text{C}$   |                                                        |
| $R_{thJC}$ Max. Thermal Resistance Junction to Case (Per Leg)     | 2.0        | $^\circ\text{C/W}$ | DC operation                                           |
| $R_{thJC}$ Max. Thermal Resistance Junction to Case (Per Package) | 1.0        | $^\circ\text{C/W}$ | DC operation                                           |
| $R_{thCS}$ Typical Thermal Resistance, Case to Heatsink           | 0.50       | $^\circ\text{C/W}$ | Mounting surface, smooth and greased (only for TO-220) |
| wt Approximate Weight                                             | 2(0.07)    | g(oz.)             |                                                        |
| T Mounting Torque                                                 | Min.       | 6(5)               | Kg-cm<br>(lbf-in)                                      |
|                                                                   | Max.       | 12(10)             |                                                        |

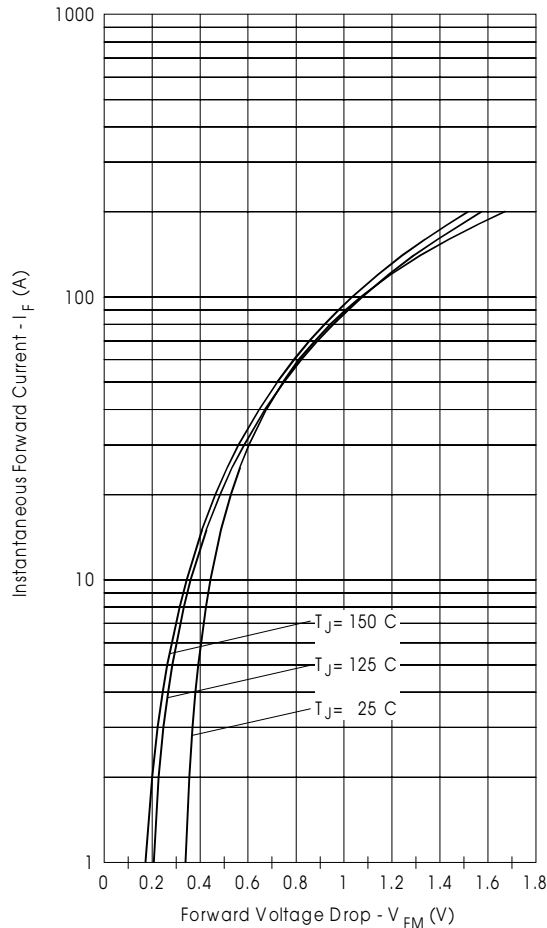


Fig. 1 - Max. Forward Voltage Drop Characteristics (PerLeg)

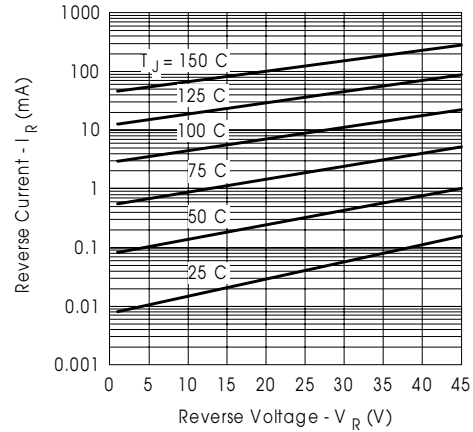


Fig. 2 - Typical Values Of Reverse Current Vs. Reverse Voltage (PerLeg)

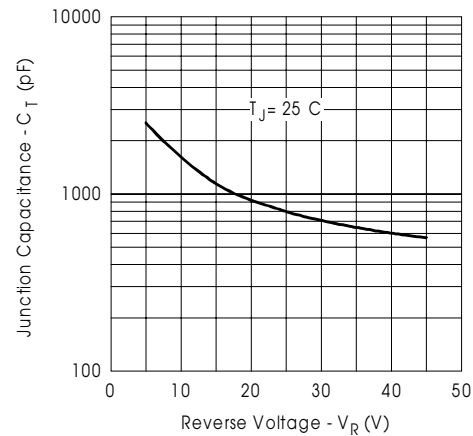


Fig. 3 - Typical Junction Capacitance Vs. Reverse Voltage (PerLeg)

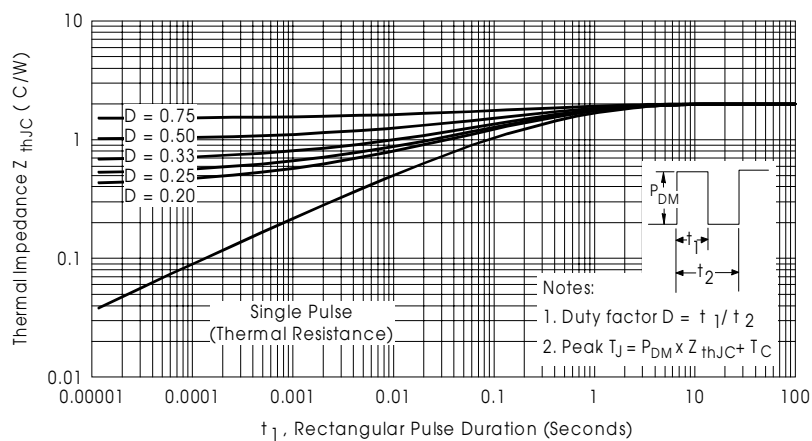


Fig. 4 - Max. Thermal Impedance  $Z_{thJC}$  Characteristics (PerLeg)

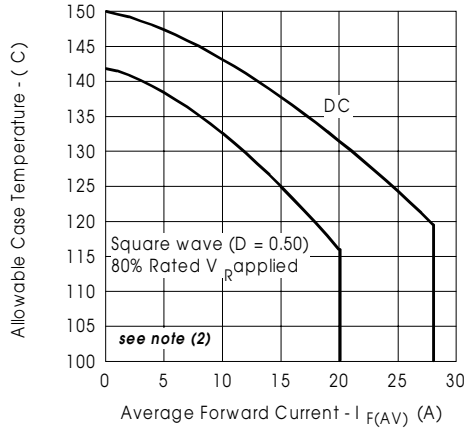


Fig. 5 - Max. Allowable Case Temperature Vs. Average Forward Current (Per Leg)

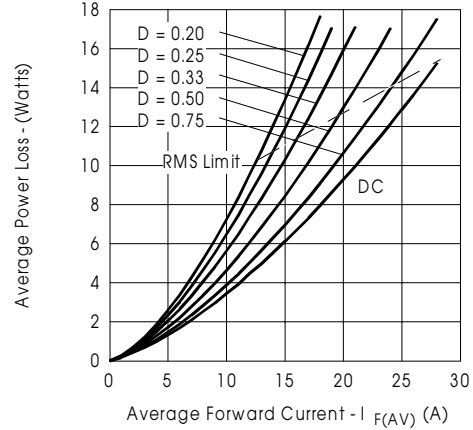


Fig. 6 - Forward Power Loss Characteristics (Per Leg)

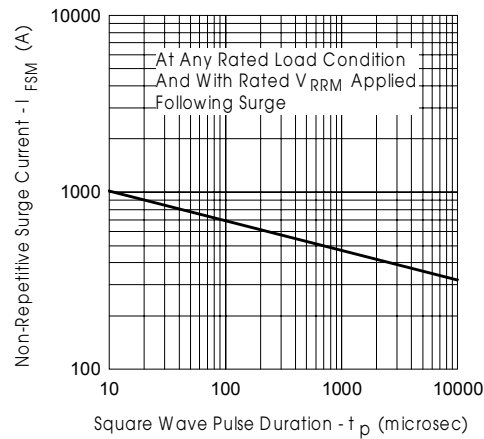


Fig. 7 - Max. Non-Repetitive Surge Current (Per Leg)

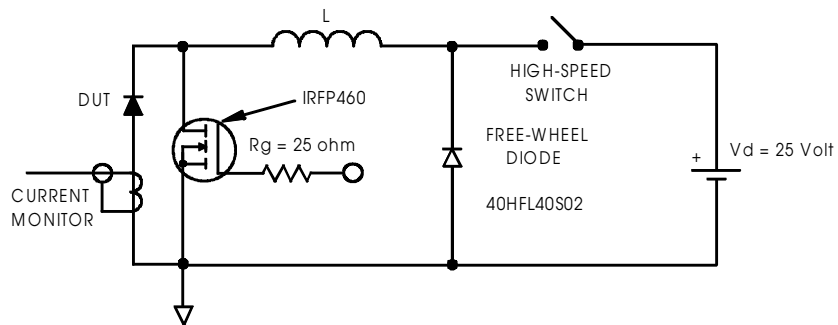


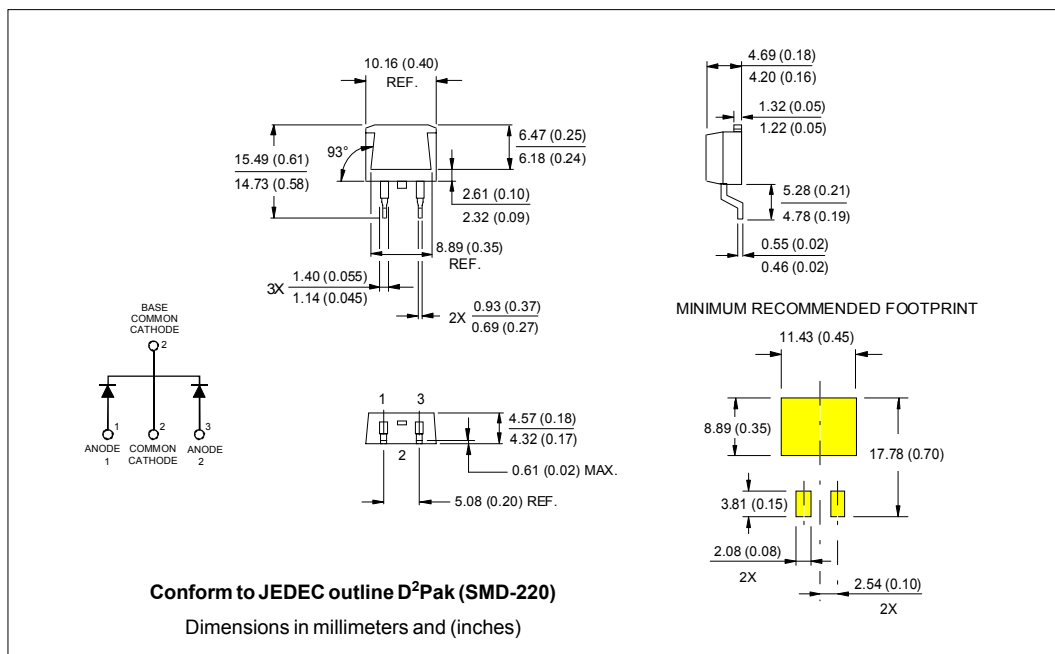
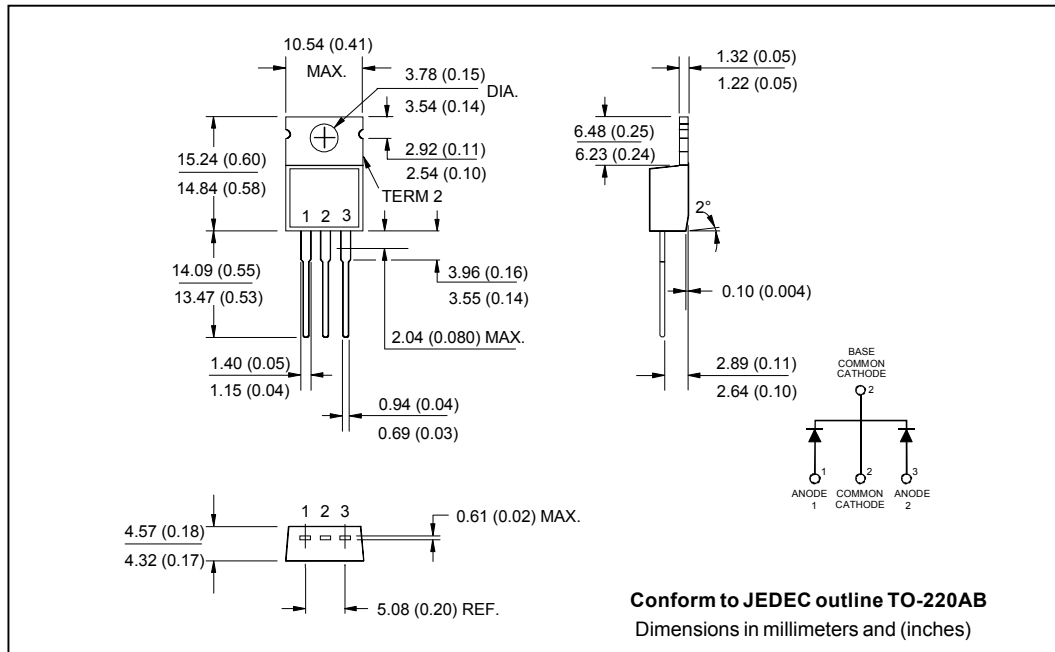
Fig. 8 - Unclamped Inductive Test Circuit

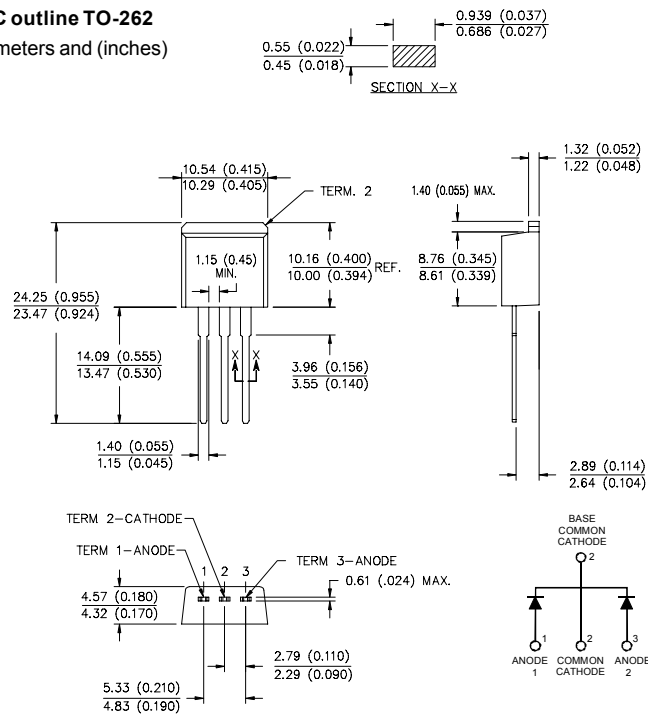
(2) Formula used:  $T_C = T_J - (P_d + P_{d_{REV}}) \times R_{thJC}$ ;

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

$P_{d_{REV}}$  = Inverse Power Loss =  $V_{R1} \times I_R (1 - D)$ ;  $I_R @ V_{R1} = 10V$

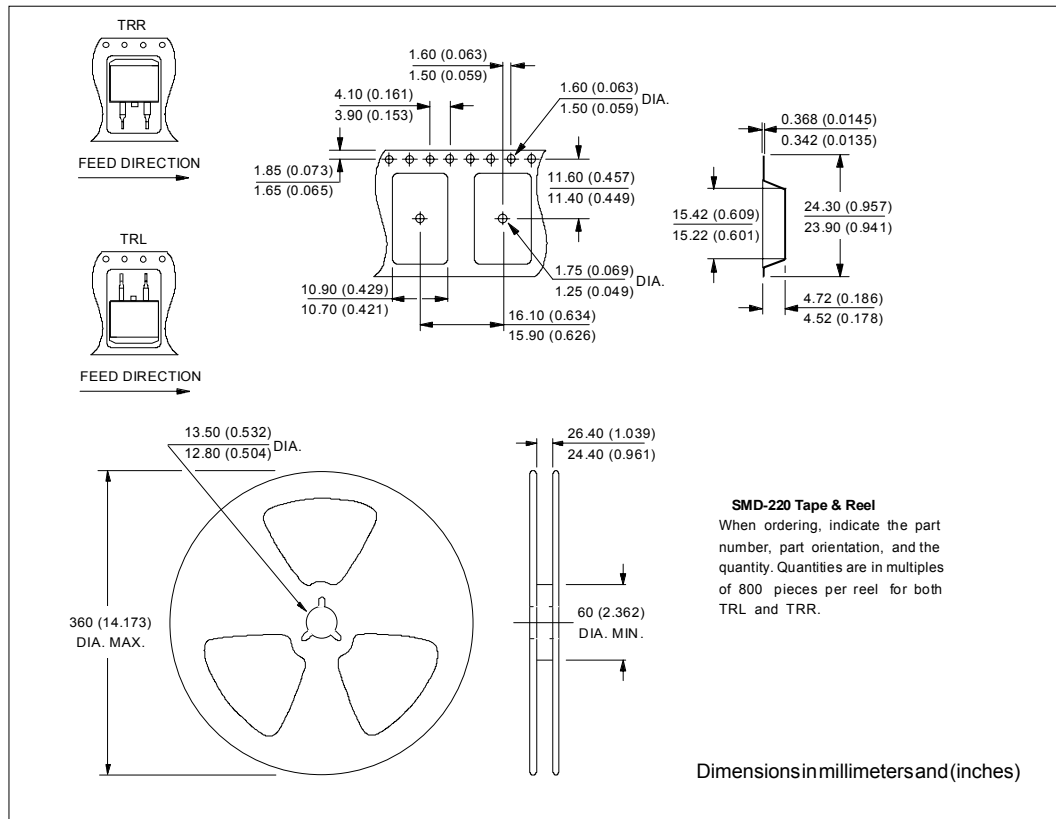
## Outline Table





DATE CODE  
YEAR 7 = 1999  
WEEK 19  
LINE C

## Tape & Reel Information



## Ordering Information Table

| Device Code |   |                        |   |     |    |
|-------------|---|------------------------|---|-----|----|
| 40          | C | T                      | Q | 045 | -1 |
| ①           | ② | ③                      | ④ | ⑤   | ⑥  |
| 1           | - | Essential Part Number  |   |     |    |
| 2           | - | Common Cathode         |   |     |    |
| 3           | - | T = TO-220             |   |     |    |
| 4           | - | Q = Schottky Q Series  |   |     |    |
| 5           | - | Voltage Rating         |   |     |    |
| 6           | - | S = D <sup>2</sup> Pak |   |     |    |
|             | - | -1 = TO-262            |   |     |    |

035 = 35V  
040 = 40V  
045 = 45V

40CTQ045, 40CTQ045S, 40CTQ045-1

Bulletin PD-20544 rev. C 12/01

International  
**IOR** Rectifier

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.

International  
**IOR** Rectifier

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