

Data Sheet No. PD-2.058B

4855452 INTERNATIONAL RECTIFIER

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INTERNATIONAL RECTIFIER **IR**

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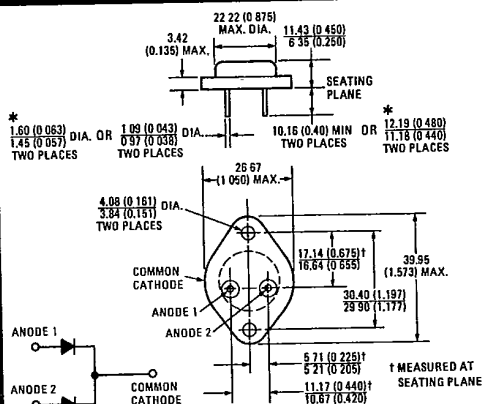
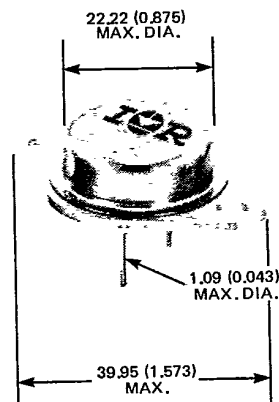
**40CDQ & 60CDQ SERIES AND SD241****40 and 60 Amp Dual Schottky  
Center Tap Rectifiers****Major Ratings and Characteristics**

| Characteristics            | 40CDQ      | SD241  | 60CDQ   | Units         |
|----------------------------|------------|--------|---------|---------------|
| $I_O$ Rectangular Waveform | 40         | 60     | 60      | A             |
| Sinusoidal Waveform        | 36         | 54     | 54      |               |
| $I_{FSM}$ @ 50 Hz          | 380        | 475    |         | A             |
| @ 60 Hz                    | 400        | 500    |         |               |
| $I_{2t}$ @ 50 Hz           | 730        | 1140   |         | $A^2s$        |
| @ 60 Hz                    | 665        | 1040   |         |               |
| $I^2\sqrt{t}$              | 10,325     | 16,130 |         | $A^2\sqrt{s}$ |
| $V_{RWM}$                  | 20 - 45    | 35     | 20 - 45 | V             |
| $C_t$ @ -5V                | 1400       |        |         | pF            |
| $T_J$                      | -55 to 175 |        |         | $^{\circ}C$   |

**Description/Features**

The 40CDQ and 60CDQ Dual Schottky Rectifier Series and SD241 employ the "830" process which results in a very low ratio of reverse leakage current to junction temperature. In addition to offering improvements in reliability and performance, they are rugged devices with a guaranteed repetitive peak reverse voltage capability, and excellent ability to withstand reverse energy transients. They can be used in both existing and new designs.

- 175 $^{\circ}C$   $T_J$  operation
- 100% reverse energy tested (each junction)
- 400A and 500A surge, 60 Hz, one cycle (per junction)
- Extremely low reverse leakage: 10 mA @ 25 $^{\circ}C$
- No voltage derating of  $V_{RWM}$  over temperature range
- A guaranteed repetitive peak reverse voltage capability for short pulses which is 20% above  $V_{RWM}$
- High power supply reliability
- Minimizes problem of thermal runaway
- TO-204AE (Modified TO-3) Case Style available (60CDQ series)
- Can be supplied to meet stringent military, aerospace and other high-reliability requirements.

**CASE STYLE AND DIMENSIONS**

Conforms to JEDEC Outline TO-204AA (TO-3)

\*Conforms to JEDEC Outline TO-204AE (Modified TO-3)

All Dimensions in Millimeters and (Inches)

40CDQ & 60CDQ Series and SD241  
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VOLTAGE RATINGS PER JUNCTION

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| Part Numbers |       |          | $V_{RWM}$ - Max.<br>Working Peak<br>Reverse Voltage (V) ① | $V_{RRM}$ - Max.<br>Repetitive Peak<br>Reverse Voltage (V) ①<br>( $t_p = 200$ ns Max.) | $V_R$ - Max. Direct<br>Reverse Voltage (V) ① |
|--------------|-------|----------|-----------------------------------------------------------|----------------------------------------------------------------------------------------|----------------------------------------------|
| 40CDQ020     | —     | 60CDQ020 | 20                                                        | 24                                                                                     | 20                                           |
| 40CDQ030     | —     | 60CDQ030 | 30                                                        | 36                                                                                     | 30                                           |
| 40CDQ035     | SD241 | 60CDQ035 | 35 ③                                                      | 42 ③                                                                                   | 35                                           |
| 40CDQ040     | —     | 60CDQ040 | 40                                                        | 48                                                                                     | 40                                           |
| 40CDQ045     | —     | 60CDQ045 | 45                                                        | 54                                                                                     | 45                                           |

## ELECTRICAL SPECIFICATIONS

T-23-09

|                                                                                 | 40CDQ  | SD241 | 60CDQ  | Units            | Conditions                                                                                                                 |
|---------------------------------------------------------------------------------|--------|-------|--------|------------------|----------------------------------------------------------------------------------------------------------------------------|
| $I_O$ Max. average output current from center tap circuit                       | 40     | 60    | 60     | A                | 180° conduction, rectangular waveform, $T_C = -40$ to 143°C for 40CDQ, $T_C = -40$ to 120°C for 60CDQ.                     |
|                                                                                 | 36     | 54    | 54     |                  | 180° conduction, sinusoidal waveform, $T_C = -40$ to 141°C for 40CDQ, $T_C = -40$ to 116°C for 60CDQ.                      |
| $I_{FSM}$ Max. peak one cycle, non-repetitive surge current, per junction       | 380    |       | 475    | A                | 50 Hz half cycle sine wave or 6 ms rectangular pulse, Following any rated load condition and with rated $V_{RWM}$ applied. |
|                                                                                 | 400    |       | 500    |                  | 60 Hz half cycle sine wave or 5 ms rectangular pulse,                                                                      |
|                                                                                 | 455    |       | 570    | A                | 50 Hz With $V_{RWM} = 0$ following surge, initial $T_J = 175^\circ\text{C}$ .                                              |
|                                                                                 | 475    |       | 595    |                  | 60 Hz                                                                                                                      |
| $I^2t$ Max. $I^2t$ for fusing, per junction                                     | 730    |       | 1140   | $A^2s$           | $t = 10$ ms. Rated $V_{RWM}$ following surge, initial $T_J = 175^\circ\text{C}$ .                                          |
|                                                                                 | 665    |       | 1040   |                  | $t = 8.3$ ms.                                                                                                              |
| $I^2t$ Max. $I^2t$ for individual junction fusing, per junction                 | 1030   |       | 1610   | $A^2s$           | $t = 10$ ms. $V_{RWM}$ following surge = 0, initial $T_J = 175^\circ\text{C}$ .                                            |
|                                                                                 | 940    |       | 1470   |                  | $t = 8.3$ ms.                                                                                                              |
| $I^2\sqrt{t}$ Max. $I^2\sqrt{t}$ for individual ① junction fusing, per junction | 10,325 |       | 16,130 | $A^2\sqrt{s}$    | $t = 0.1$ to 10 ms, $T_J = 175^\circ\text{C}$ , $V_{RWM} = 0$ following surge.                                             |
| $V_{FM}$ Max. peak forward voltage per junction                                 | 0.70   | 0.82  |        | V                | $T_J = 25^\circ\text{C}$ $I_{FM} = 20\text{A}$ peak for 40CDQ, $I_{FM} = 30\text{A}$ peak for 60CDQ and SD241              |
|                                                                                 | 0.91   | 1.09  |        |                  | 180° rectangular wave. Rated $I_F(AV)$ (40A peak for 40CDQ, 60A peak for 60CDQ and SD241)                                  |
|                                                                                 | 0.74   | 0.92  |        |                  | $T_J = 175^\circ\text{C}$ 180° rectangular wave.                                                                           |
| $I_{RM}$ Max. peak reverse current, per junction                                | 10     |       |        | mA               | $T_J = 25^\circ\text{C}$ $V_{RM} = \text{rated } V_{RWM}$                                                                  |
|                                                                                 | 20     |       |        |                  | $T_J = 125^\circ\text{C}$                                                                                                  |
| $I_{RRM}$ Max. repetitive peak reverse current                                  | 2.0    |       |        | A                | $T_C = 25^\circ\text{C}$ , $t_p = 2$ $\mu\text{s}$ rectangular pulse, $f = 1$ kHz. ① see fig. 11 for test circuit.         |
| $C_t$ Max. capacitance, per junction                                            | 1400   |       |        | pF               | $T_C = 25^\circ\text{C}$ , $V_R = 5$ Vdc (Test signal in the range of 100 kHz to 1 MHz)                                    |
| $dv/dt$ Max. rate of application of reverse voltage, per junction               | 1000   |       |        | V/ $\mu\text{s}$ | $T_C = 25^\circ\text{C}$ , $V_{RM} = \text{rated } V_{RWM}$                                                                |

## THERMAL-MECHANICAL SPECIFICATIONS

|                                                                    |                 |                          |                                                                      |
|--------------------------------------------------------------------|-----------------|--------------------------|----------------------------------------------------------------------|
| $T_J$ Max. operating junction temperature range                    | -55 to 175      | °C                       |                                                                      |
| $T_{stg}$ Max. storage temperature range                           | -55 to 175      | °C                       |                                                                      |
| $R_{thJC}$ Max. thermal resistance, junction-to-case, DC operation | 1.4             | deg. C/W                 | Based on power dissipated in one junction, both junctions operating. |
|                                                                    | 0.7             |                          | Based on power dissipated in both junctions.                         |
| $R_{thCS}$ Thermal resistance, case-to-sink                        | 0.2             | deg. C/W                 | Mounting surface flat, smooth and greased.                           |
| wt Approximate weight                                              | 12.8 (0.45)     | g (oz.)                  |                                                                      |
| Case Style                                                         | TO-204AA (TO-3) | TO-204AE (Modified TO-3) | Terminals 1 and 2: Anodes 1 and 2<br>Case: Common Cathodes           |

①  $T_C = -55$  to  $172^\circ\text{C}$ , 180° conduction①  $T_C = 0$  to  $172^\circ\text{C}$ , 180° conduction①  $T_C = -55$  to  $162^\circ\text{C}$ .

③ For SD241 rated  $V_{RWM}$  and  
 $V_{RRM} = 45\text{V}$  @  $T_J = 25^\circ\text{C}$ ;  
 $= 35\text{V}$  @  $T_J = 150^\circ\text{C}$

①  $I^2t$  for time  $t_x = I^2\sqrt{t} \cdot \sqrt{t_x}$ .

① For test circuit refer to Fig. 11.

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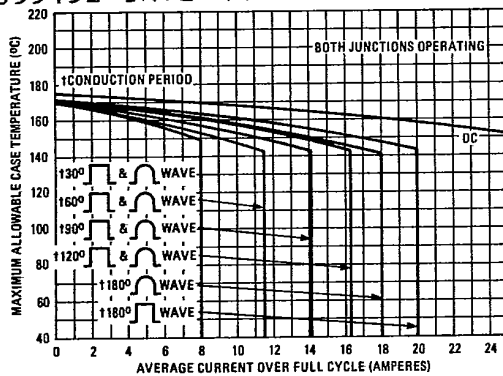


Fig. 1 - Maximum Allowable Case Temperature Vs. Average Forward Current, Per Junction (40CDQ Series)

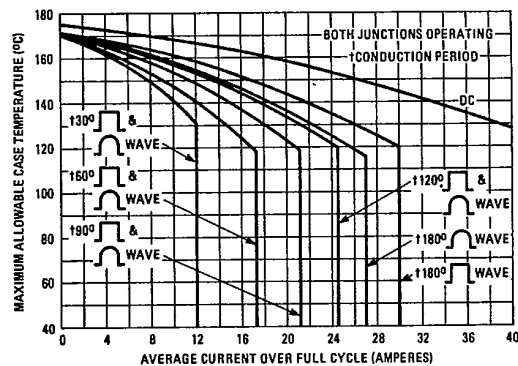


Fig. 2 - Maximum Allowable Case Temperature Vs. Average Forward Current, Per Junction (60CDQ Series and SD241)

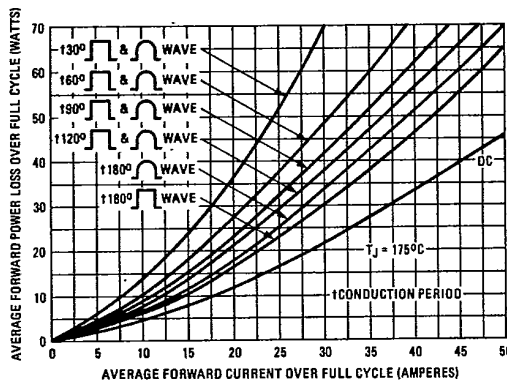


Fig. 3 - Maximum Forward Power Loss Vs. Average Forward Current, Per Junction (Both Series and SD241)

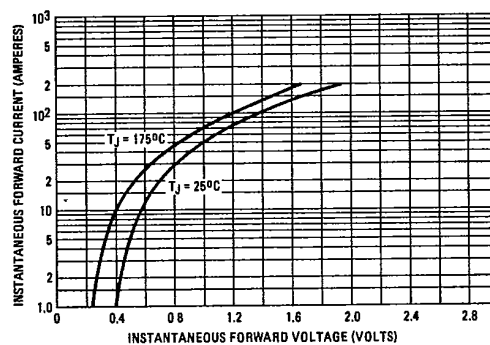


Fig. 4 - Maximum Instantaneous Forward Voltage Vs. Instantaneous Forward Current, Per Junction (Both Series and SD241)

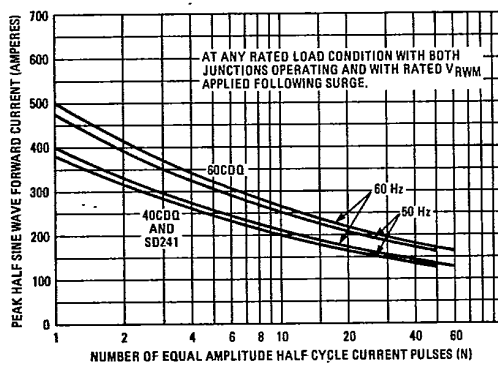


Fig. 5 - Maximum Non-Repetitive Surge Current Vs. Number of Cycles, Per Junction (Both Series and SD241)

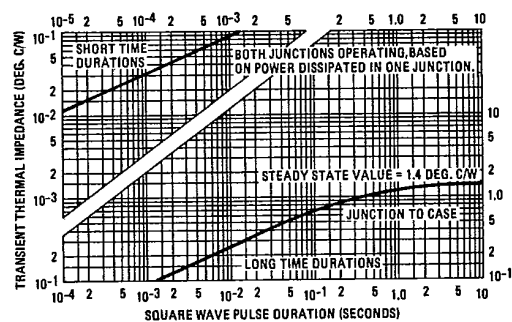


Fig. 6 - Maximum Transient Thermal Impedance, Junction-to-Case, Vs. Square Wave Pulse Duration, Per Junction (Both Series and SD241)

## 40CDQ &amp; 60CDQ Series and SD241

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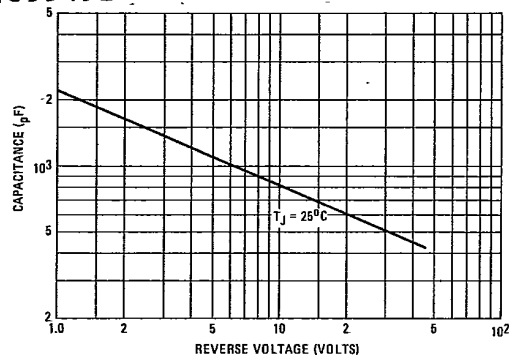


Fig. 7 - Typical Capacitance  
Vs. Reverse Voltage, Per Junction  
(Both Series and SD241)

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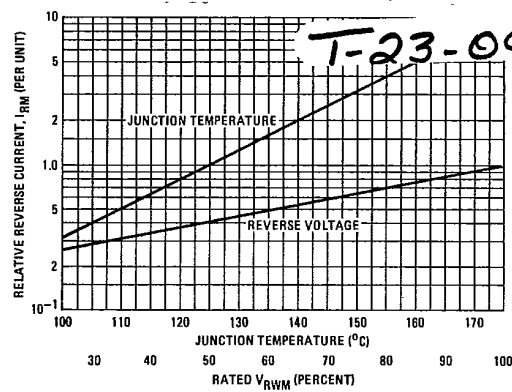


Fig. 8 - Typical Variation of Reverse Current Vs. Junction  
Temperature and Reverse Voltage, Per Junction  
(Both Series and SD241)

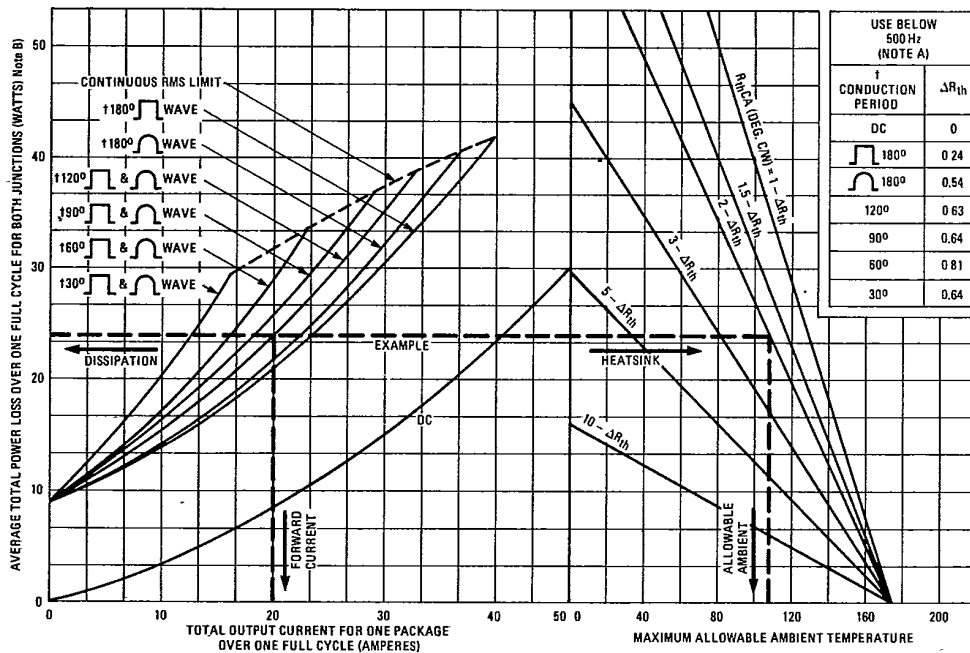


Fig. 9 - Thermal Nomogram  
(40CDQ Series)

Note A: Maximum allowable heatsink thermal resistance,  $R_{thSA}$ , equals the graph value minus  $\Delta R_{th}$  minus  $R_{thCS}$ . At frequencies above 5000 Hz,  $\Delta R_{th}$  becomes essentially zero and can be ignored.

Note B: The total power dissipation curves assume the worst case reverse conditions of half wave rectangular reverse voltage, full rated  $V_{RWM}$  and  $T_j = 175^\circ\text{C}$ . Lower reverse losses allow higher operating ambient, smaller heatsinks or larger operating safety margin.

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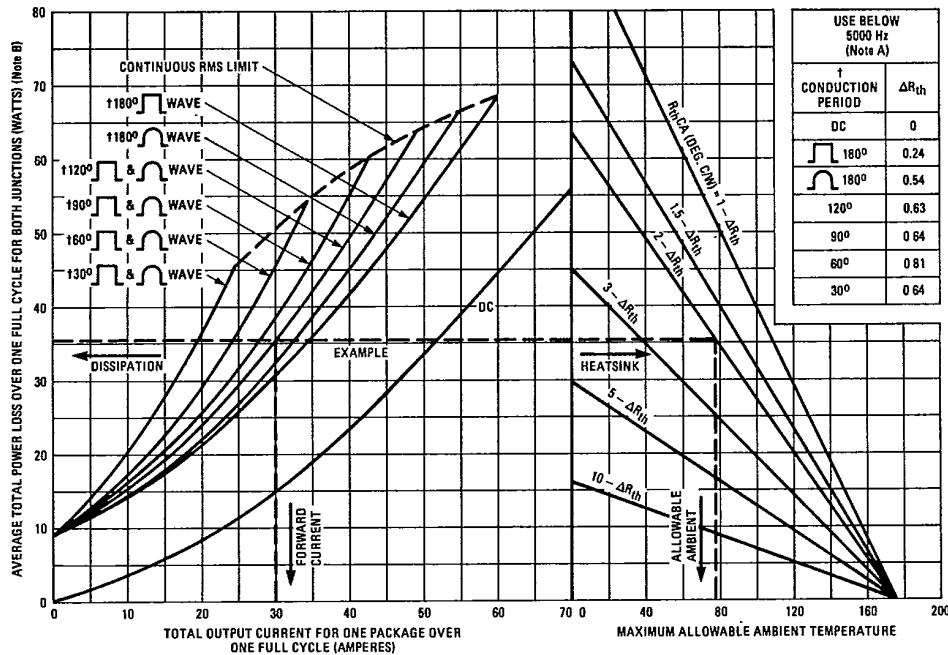


Fig. 10 - Thermal Nomogram  
 (60CDQ Series and SD241)

- Note-A: Maximum allowable heatsink thermal resistance,  $R_{thSA}$ , equals the graph value minus  $\Delta R_{th}$  minus  $R_{thCS}$ . At frequencies above 5000 Hz,  $\Delta R_{th}$  becomes essentially zero and can be ignored.
- Note B: The total power dissipation curves assume the worst case reverse conditions of half wave rectangular reverse voltage, full rated  $V_{RRM}$  and  $T_J = 175^\circ\text{C}$ . Lower reverse losses allow higher operating ambient, smaller heatsinks or larger operating safety margin.

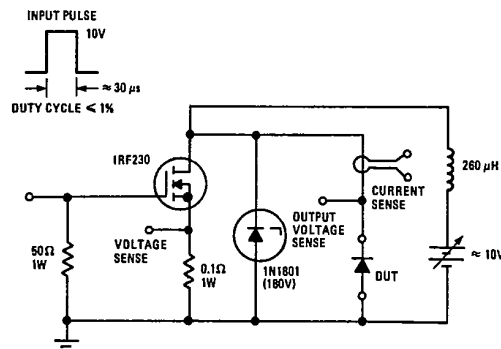


Fig. 11 -  $I_{RRM}$  Test Circuit