

4855452 INTERNATIONAL RECTIFIER

55C 05051 D

Data Sheet No. PD-2.060A

T-03-17

INTERNATIONAL RECTIFIER



## 50SQ SERIES

### 5 Amp Schottky Power Rectifiers

#### Major Ratings and Characteristics

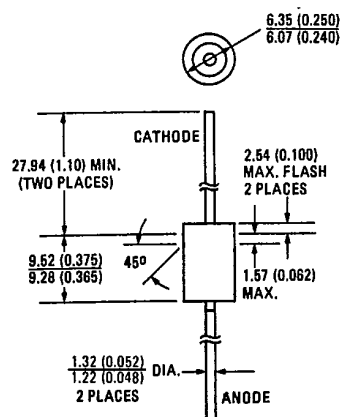
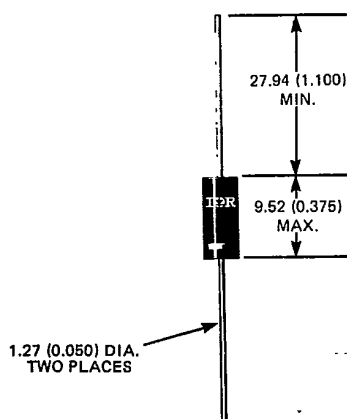
| Characteristic        | 50SQ       | Units             |
|-----------------------|------------|-------------------|
| $I_F(AV)$             |            |                   |
| @ 180° Rectangular    | 5          | A                 |
| @ 180° Half Sine Wave | 4.5        | A                 |
| $I_{FSM}$             |            |                   |
| 60 Hz                 | 215        | A                 |
| 60 Hz                 | 225        | A                 |
| $I_2^t$               |            |                   |
| @ 50 Hz               | 230        | A <sup>2</sup> s  |
| @ 60 Hz               | 210        | A <sup>2</sup> s  |
| $I_2\sqrt{t}$         | 3250       | A <sup>2</sup> √s |
| $C_t @ -5V$           | 1000       | pF                |
| $T_J$                 | -65 to 150 | °C                |
| $V_{RWM}$             | 30 to 100  | V                 |

#### Description/Features

The 50SQ, 100V Schottky family employs the "830" process which results in a very low ratio of reverse leakage current to junction temperature. In addition to improvements in reliability and performance, it is a rugged device with a guaranteed repetitive peak reverse voltage capability and excellent ability to withstand reverse energy transients. It can be used in both existing and new designs.

- $V_{RWM}$  30 to 100 Volts
- Ultra fast switching
- Extremely low  $V_F$
- Economical axial lead package
- $T_J = 150^\circ\text{C}$  (rep.),  $T_J = 175^\circ\text{C}$  (non-rep.)  
( $T_J$  is limited to  $150^\circ\text{C}$  because of plastic case)
- Extremely low reverse leakage: 13 mA at  $125^\circ\text{C}$
- No voltage derating on  $V_{RWM}$  over temperature range
- Provides extremely high power supply reliability
- No thermal runaway at rated temperature and operating parameters
- A guaranteed repetitive peak reverse voltage capability for short pulses which is 20% above  $V_{RWM}$
- Ability to withstand reverse energy transients

#### CASE STYLE AND DIMENSIONS



Case Style C-24  
Dimensions in Millimeters and (Inches)

## 50SQ Series

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## VOLTAGE RATINGS

| Part Numbers | $V_{RWM}$ - Max.<br>Working Peak<br>Reverse Voltage (V) ① | $V_{RRM}$ - Max.<br>Repetitive Peak<br>Reverse Voltage (V) ②<br>(200 ns Max. Pulse Width) | $V_R$ - Max.<br>Direct Reverse Voltage (V) ③ |
|--------------|-----------------------------------------------------------|-------------------------------------------------------------------------------------------|----------------------------------------------|
| 50SQ030      | 30                                                        | 36                                                                                        | 30                                           |
| 50SQ035      | 35                                                        | 42                                                                                        | 35                                           |
| 50SQ040      | 40                                                        | 48                                                                                        | 40                                           |
| 50SQ045      | 45                                                        | 54                                                                                        | 45                                           |
| 50SQ060      | 60                                                        | 72                                                                                        | 60                                           |
| 50SQ080      | 80                                                        | 96                                                                                        | 80                                           |
| 50SQ090      | 90                                                        | 108                                                                                       | 90                                           |
| 50SQ100      | 100                                                       | 120                                                                                       | 100                                          |

## ELECTRICAL SPECIFICATIONS

|                                                                    | 50SQ  | Units                     | Conditions                                                                                                                      |
|--------------------------------------------------------------------|-------|---------------------------|---------------------------------------------------------------------------------------------------------------------------------|
| $I_{F(AV)}$ Maximum average forward current                        | 5     | A                         | 180° conduction @ $T_L = -65$ to $92^\circ\text{C}$ rectangular waveform ① ③                                                    |
|                                                                    | 4.5   | A                         | 180° conduction @ $T_L = -65$ to $96^\circ\text{C}$ sinusoidal waveform ① ③                                                     |
| $I_{FSM}$ Maximum peak one cycle, non-repetitive surge current     | 215   | A                         | Half cycle 60 Hz sine wave or 6 ms rectangular pulse Following any rated load condition and with rated $V_{RWM}$ reapplied.     |
|                                                                    | 225   | A                         | Half cycle 60 Hz sine wave or 5 ms rectangular pulse                                                                            |
|                                                                    | 255   | A                         | Half cycle 60 Hz sine wave or 6 ms rectangular pulse Following any rated load condition and with $V_{RWM} = 0$ following surge. |
|                                                                    | 270   | A                         | Half cycle 60 Hz sine wave or 5 ms rectangular pulse                                                                            |
| $I^2t$ Maximum $I^2t$ (for fusing)                                 | 230   | A <sup>2</sup> s          | $t = 10$ ms With rated $V_{RWM}$ following surge, initial $T_J \leq 150^\circ\text{C}$ .                                        |
|                                                                    | 210   | A <sup>2</sup> s          | $t = 8.3$ ms                                                                                                                    |
| Maximum $I^2t$ for individual device fusing                        | 325   | A <sup>2</sup> s          | $t = 10$ ms With $V_{RWM} = 0$ following surge, initial $T_J \leq 150^\circ\text{C}$ .                                          |
|                                                                    | 300   | A <sup>2</sup> s          | $t = 8.3$ ms                                                                                                                    |
| $I^2\sqrt{t}$ Maximum $I^2\sqrt{t}$ for individual device fusing ① | 3250  | A <sup>2</sup> $\sqrt{s}$ | $t = 0.1$ to $10$ ms, initial $T_J \leq 150^\circ\text{C}$ , $V_{RWM} = 0$ following surge.                                     |
| $V_{FM}$ Maximum peak forward voltage                              | 0.79  | V                         | $T_J = 25^\circ\text{C}$ Rated $I_{F(AV)}$ (10A peak) 180° conduction, rectangular waveform                                     |
|                                                                    | 0.65  | V                         | $T_J = 150^\circ\text{C}$                                                                                                       |
|                                                                    | 0.67  | V                         | $T_J = 25^\circ\text{C}$ 1/2 Rated $I_{F(AV)}$ (5A peak)                                                                        |
| $I_{RM}$ Maximum peak reverse current                              | 5     | mA                        | 50SQ030 through 50SQ045 $T_J = 25^\circ\text{C}$ , rated $V_{RWM}$                                                              |
|                                                                    | 1     | mA                        | 50SQ060 through 50SQ100                                                                                                         |
|                                                                    | 13    | mA                        | 50SQ030 through 50SQ045 $T_J = 125^\circ\text{C}$ , rated $V_{RWM}$                                                             |
|                                                                    | 7     | mA                        | 50SQ060 through 50SQ100                                                                                                         |
| $I_{RRM}$ Maximum repetitive peak reverse current                  | 0.5 ⑦ | A                         | $T_C = 25^\circ\text{C}$ , $f = 1$ kHz, see fig. 9 for test circuit                                                             |
| $C_t$ Maximum capacitance                                          | 1000  | pF                        | 50SQ030 through 50SQ045 $T_C = 25^\circ\text{C}$ , $V_R = 5$ Vdc (Test signal in the range of 100 kHz to 1 MHz)                 |
|                                                                    | 600   | pF                        | 50SQ060 through 50SQ100                                                                                                         |
| $dv/dt$ Maximum rate of reverse voltage application                | 1000  | V/ $\mu\text{s}$          | $T_C = 25^\circ\text{C}$ , $V_{RM} = \text{rated } V_{RWM}$                                                                     |

## THERMAL-MECHANICAL SPECIFICATIONS

|                                                                                                               |             |                  |  |
|---------------------------------------------------------------------------------------------------------------|-------------|------------------|--|
| $T_J$ Maximum operating junction temperature range                                                            | -65 to 150  | $^\circ\text{C}$ |  |
| $T_{stg}$ Maximum storage temperature range                                                                   | -65 to 150  | $^\circ\text{C}$ |  |
| $R_{thL}$ Maximum thermal resistance, dc operation, junction-to-leads, double side cooling (composite values) |             | deg C/W          |  |
| Lead Length = 3.2mm (1/8 in.)                                                                                 | 11.0        |                  |  |
| = 9.5mm (3/8 in.)                                                                                             | 14.7        |                  |  |
| = 19.0mm (3/4 in.)                                                                                            | 20.0        |                  |  |
| wt Approximate weight                                                                                         | 1.5 (0.053) | g (oz.)          |  |
| Case Style                                                                                                    | C-24        |                  |  |

①  $T_L = -65$  to  $141^\circ\text{C}$ , 180° conduction. ②  $T_L = 0$  to  $141^\circ\text{C}$ , 180° conduction.③  $T_L = -65$  to  $126^\circ\text{C}$  for lead length ( $\ell$ ) = 1/8" (3.2 mm) ⑤ $T_L = -65$  to  $118^\circ\text{C}$  for lead length ( $\ell$ ) = 3/8" (9.5 mm) ⑤ $T_L = -65$  to  $106^\circ\text{C}$  for lead length ( $\ell$ ) = 3/4" (19.0 mm) ⑤④  $\ell = 9.5$  mm (3/8 in.)

⑤ Length of leads to temperature measurement points (heat sinks).

⑥  $I^2t$  for time  $t_x = I^2\sqrt{t} \cdot \sqrt{t_x}$ .⑦  $I_{RRM} = 1.0\text{A}$  for devices rated 45V or less.

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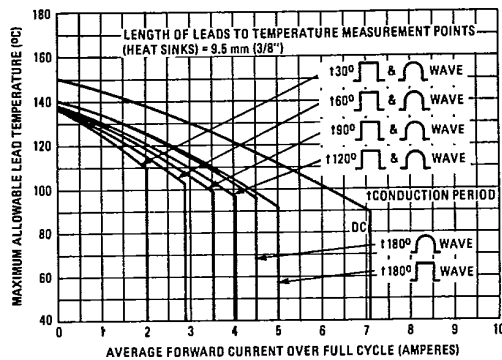


Fig. 1 - Maximum Allowable Lead Temperature Vs. Average Forward Current

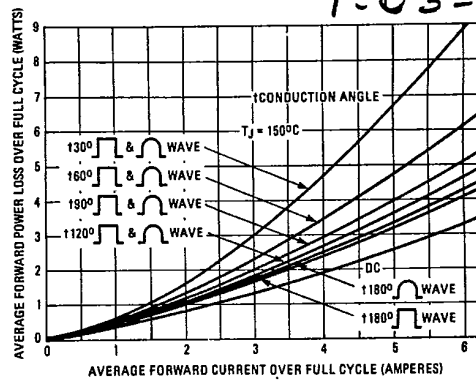


Fig. 2 - Maximum Forward Power Loss Vs. Average Forward Current

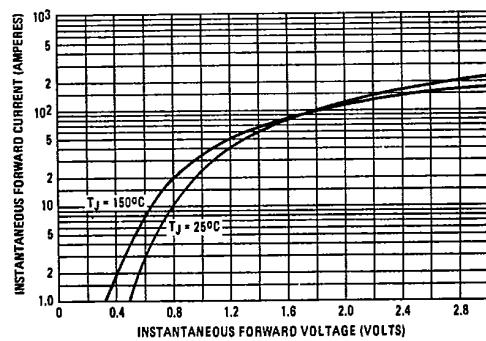


Fig. 3 - Maximum Instantaneous Forward Voltage Vs. Instantaneous Forward Current

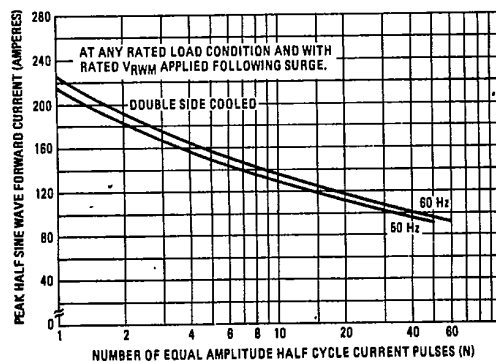


Fig. 4 - Maximum Non-Repetitive Surge Current Vs. Number of Current Pulses

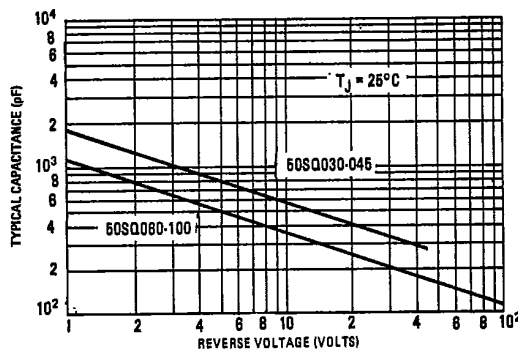


Fig. 5 - Typical Capacitance Vs. Reverse Voltage

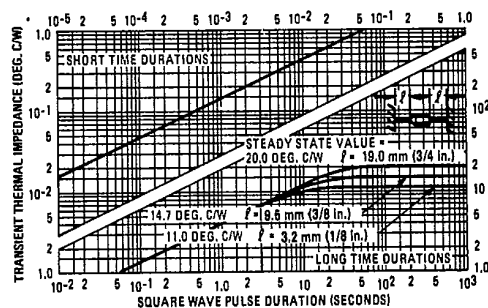


Fig. 6 - Maximum Transient Thermal Impedance, Junction-to-Lead Vs. Square Wave Duration

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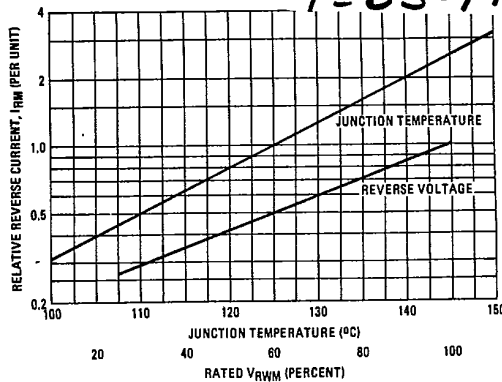
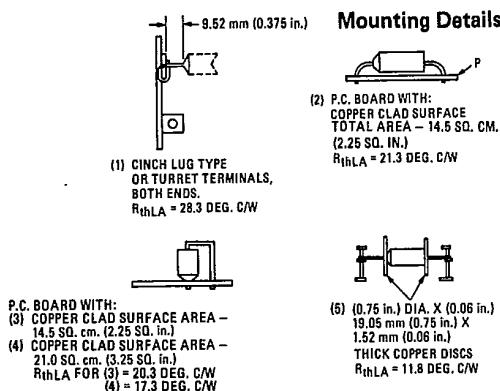


Fig. 7 - Typical Variation of Reverse Current Vs. Junction Temperature and Reverse Voltage

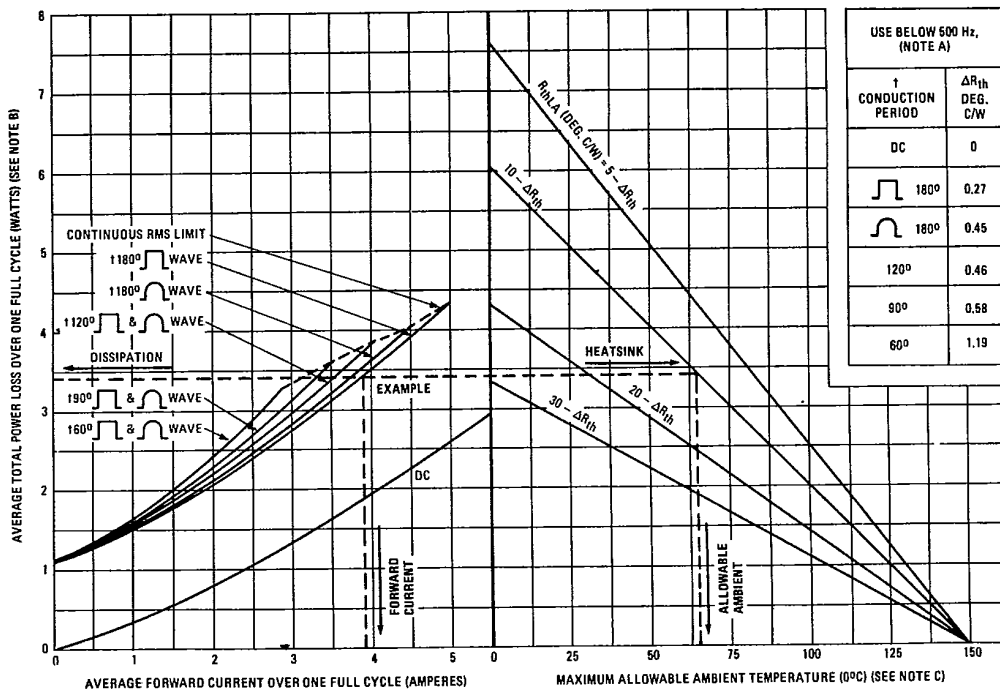


Fig. 8 - Thermal Nomogram

Notes: A. Maximum allowable heatsink thermal resistance,  $R_{thLA}$ , equals the graph value minus the  $\Delta R_{th}$  factor which allows for instantaneous  $T_j$  excursion. At frequencies above 5000 Hz,  $\Delta R_{th}$  becomes essentially zero and can be ignored.

B. The total power dissipation curves assume the worst case reverse conditions of half wave (180°) rectangular reverse voltage, full rated  $V_{RWM}$ , and  $T_j = 150^\circ\text{C}$ . Lower reverse power losses allow higher operating ambient, smaller heatsinks or larger operating safety margin.

C. Caution: Data assumes that the rectifier is mounted with heatsinks attached to the leads at a maximum of 3/8 of an inch (9.5 mm) from the ends of the body of the rectifier.

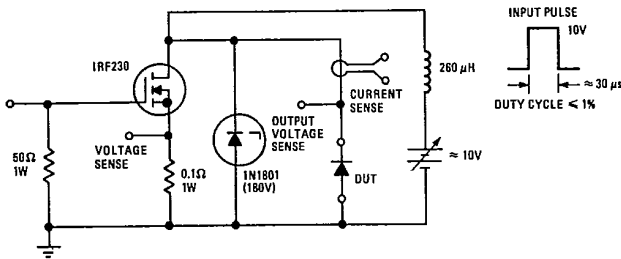


Fig. 9 -  $I_{RRM}$  Test Circuit