# Single Phase Fast Recovery Bridge (Power Modules), 61 A

SOT-227

## FEATURES

- Fast recovery time characteristic
- Electrically isolated base plate
- Simplified mechanical designs, rapid assembly
- Excellent power/volume ratio
- Designed and qualified for industrial and consumer level
- UL approved file E78996
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912

RoHS COMPLIANT

## DESCRIPTION

The semiconductor in the SOT-227 package is isolated from the copper base plate, allowing for common heatsinks and compact assemblies to be built.

| PRODUCT SUMMARY | |
|---|---|
| $V_{RRM}$ | 600 V |
| $I_O$ | 61 A |
| $t_{rr}$ | 170 ns |
| Type | Modules - Bridge, Fast |
| Package | SOT-227 |
| Circuit | Single phase bridge |

| MAJOR RATINGS AND CHARACTERISTICS | | | |
|---|---|---|---|
| SYMBOL | CHARACTERISTICS | VALUES | UNITS |
| $I_O$ | | 61 | A |
| | $T_C$ | 57 | °C |
| $I_{FSM}$ | 50 Hz | 300 | A |
| | 60 Hz | 310 | |
| $I^2t$ | 50 Hz | 442 | $A^2s$ |
| | 60 Hz | 402 | |
| $V_{RRM}$ | | 600 | V |
| $T_J$ | | -55 to +150 | °C |

## ELECTRICAL SPECIFICATIONS

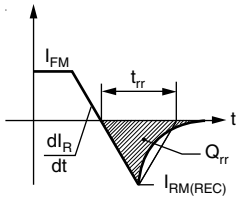
| VOLTAGE RATINGS | | | | |
|---|---|---|---|---|
| TYPE NUMBER | VOLTAGE CODE | $V_{RRM}$, MAXIMUM REPETITIVE PEAK REVERSE VOLTAGE V | $V_{RSM}$, MAXIMUM NON-REPETITIVE PEAK REVERSE VOLTAGE V | $I_{RRM}$ MAXIMUM AT $T_J$ MAXIMUM mA |
| SA61BA60 | 60 | 600 | 700 | 10 |

## FORWARD CONDUCTION

| PARAMETER | SYMBOL | TEST CONDITIONS | | | VALUES | UNITS |
|---|---|---|---|---|---|---|
| Maximum DC output current at case temperature | $I_O$ | Resistive or inductive load | | | 61 | A |
| | | | | | 57 | °C |
| Maximum peak, one-cycle non-repetitive forward current | $I_{FSM}$ | t = 10 ms | No voltage reapplied | Initial $T_J$ = $T_J$ maximum | 300 | A |
| | | t = 8.3 ms | | | 310 | |
| | | t = 10 ms | 100 % $V_{RRM}$ reapplied | | 250 | |
| | | t = 8.3 ms | | | 260 | |
| Maximum $I^2t$ for fusing | $I^2t$ | t = 10 ms | No voltage reapplied | | 442 | $A^2s$ |
| | | t = 8.3 ms | | | 402 | |
| | | t = 10 ms | 100 % $V_{RRM}$ reapplied | | 313 | |
| | | t = 8.3 ms | | | 284 | |
| Maximum $I^2\sqrt{t}$ for fusing | $I^2\sqrt{t}$ | $I^2t$ for time $t_x = I_2\sqrt{t} \times \sqrt{t_x}$; $0.1 \le t_x \le 10$ ms, $V_{RRM}$ = 0 V | | | 4.4 | $kA^2\sqrt{s}$ |
| Value of threshold voltage | $V_{F(TO)}$ | $T_J$ maximum | | | 0.914 | V |
| Forward slope resistance | $r_t$ | | | | 10.5 | mΩ |
| Maximum forward voltage drop | $V_{FM}$ | $T_J$ = 25 °C, $I_{FM}$ = 30 $A_{pk}$ | | $t_p$ = 400 µs | 1.33 | V |
| | | $T_J$ = $T_J$ maximum, $I_{FM}$ = 30 $A_{pk}$ | | | 1.23 | |
| RMS isolation voltage base plate | $V_{ISOL}$ | f = 50 Hz, t = 1 s | | | 3000 | |

## RECOVERY CHARACTERISTICS

| PARAMETER | SYMBOL | TEST CONDITIONS | VALUES | UNITS |
|---|---|---|---|---|
| Reverse recovery time, typical | $t_{rr}$ | $T_J$ = 25 °C, $I_F$ = 20 A, $V_R$ = 30 V, $dI_F/dt$ = 100 A/µs | 170 | ns |
| | | $T_J$ = 125 °C, $I_F$ = 20 A, $V_R$ = 30 V, $dI_F/dt$ = 100 A/µs | 250 | |
| Reverse recovery current, typical | $I_{rr}$ | $T_J$ = 25 °C, $I_F$ = 20 A, $V_R$ = 30 V, $dI_F/dt$ = 100 A/µs | 10.5 | A |
| | | $T_J$ = 125 °C, $I_F$ = 20 A, $V_R$ = 30 V, $dI_F/dt$ = 100 A/µs | 16 | |
| Reverse recovery charge, typical | $Q_{rr}$ | $T_J$ = 25 °C, $I_F$ = 20 A, $V_R$ = 30 V, $dI_F/dt$ = 100 A/µs | 900 | nC |
| | | $T_J$ = 125 °C, $I_F$ = 20 A, $V_R$ = 30 V, $dI_F/dt$ = 100 A/µs | 1970 | |
| Snap factor, typical | S | $T_J$ = 25 °C | 0.6 | - |
| Junction capacitance, typical | $C_T$ | $V_R$ = 600 V | 67 | pF |




## THERMAL AND MECHANICAL SPECIFICATIONS

| PARAMETER | SYMBOL | TEST CONDITIONS | MIN. | TYP. | MAX. | UNITS |
|---|---|---|---|---|---|---|
| Junction and storage temperature range | $T_J$, $T_{Stg}$ | | - 55 | - | 150 | °C |
| Thermal resistance junction to case | $R_{thJC}$ | | - | - | 0.30 | °C/W |
| Thermal resistance case to heatsink | $R_{thCS}$ | Flat, greased surface | - | 0.05 | - | |
| Weight | | | - | 30 | - | g |
| Mounting torque | | Torque to terminal | - | - | 1.1 (9.7) | Nm (lbf.in) |
| | | Torque to heatsink | - | - | 1.3 (11.5) | Nm (lbf.in) |
| Case style | | | SOT-227 | | | |

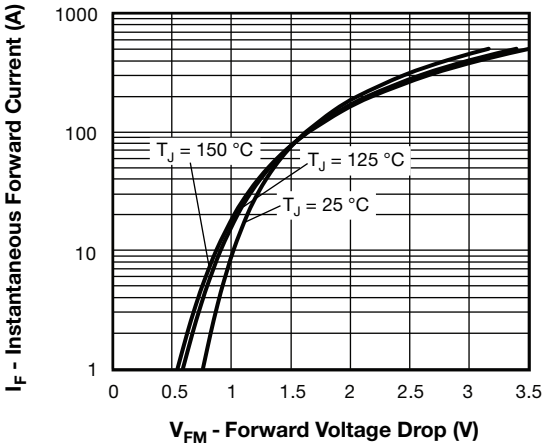



Fig. 1 - Typical Forward Voltage Drop Characteristics

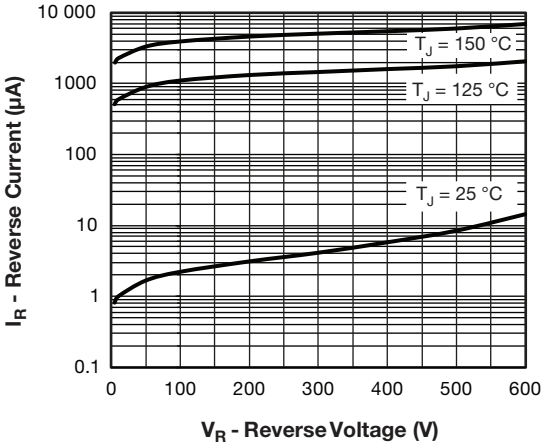



Fig. 2 - Typical Values of Reverse Current vs. Reverse Voltage

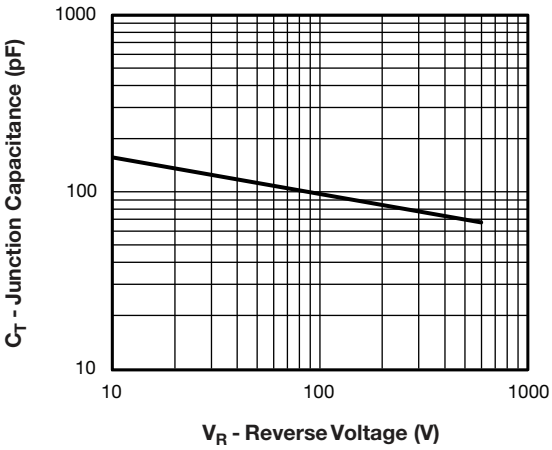



Fig. 3 - Typical Junction Capacitance vs. Reverse Voltage

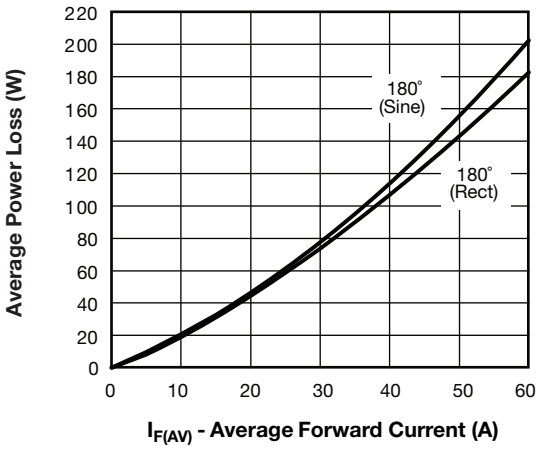



Fig. 4 - Current Rating Characteristics

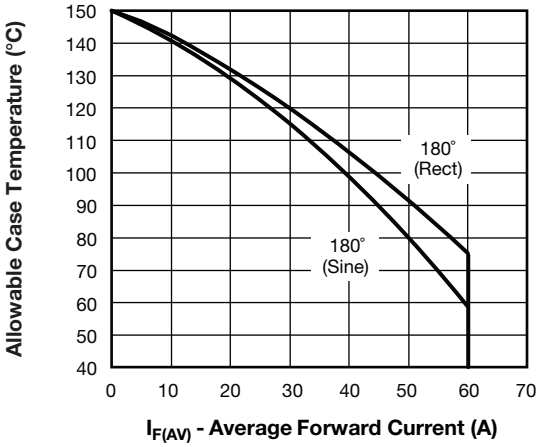



Fig. 5 - Forward Power Loss Characteristics

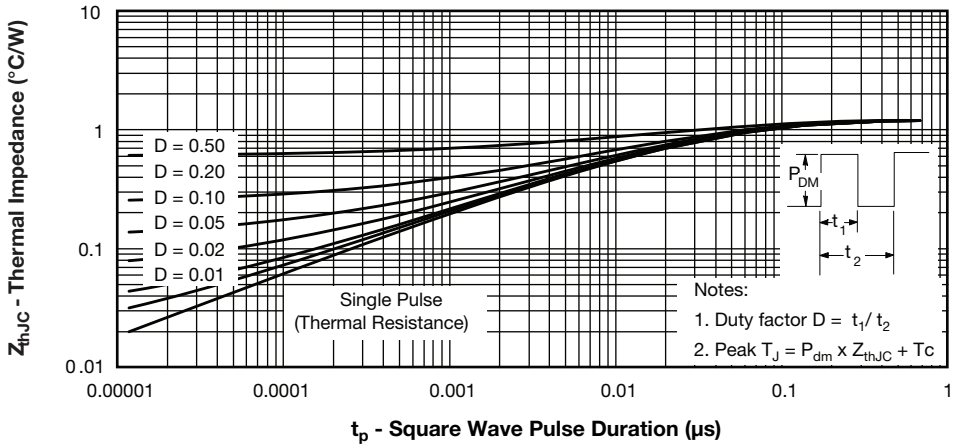



Fig. 6 - Typical Forward Voltage Drop Characteristics

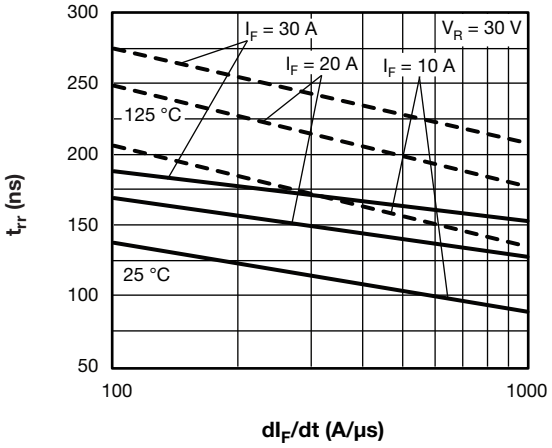



Fig. 7 - Typical Reverse Recovery Time vs. $dI_F/dt$

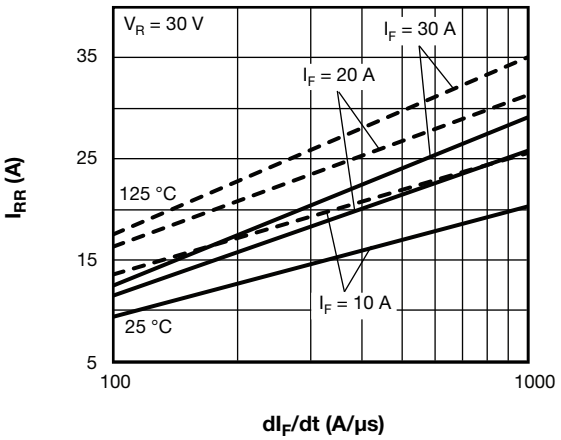



Fig. 9 - Typical Reverse Recovery Current vs. $dI_F/dt$

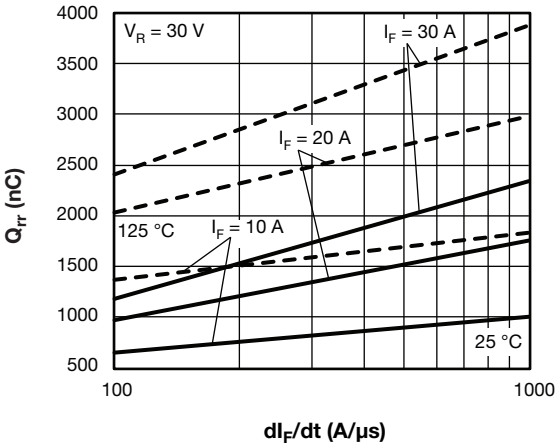



Fig. 8 - Typical Stored Charge vs. $dI_F/dt$

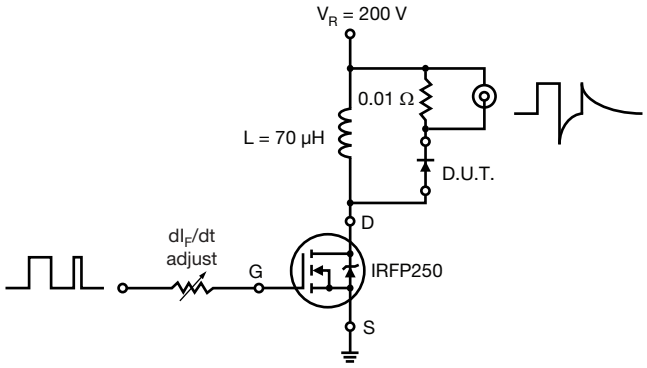
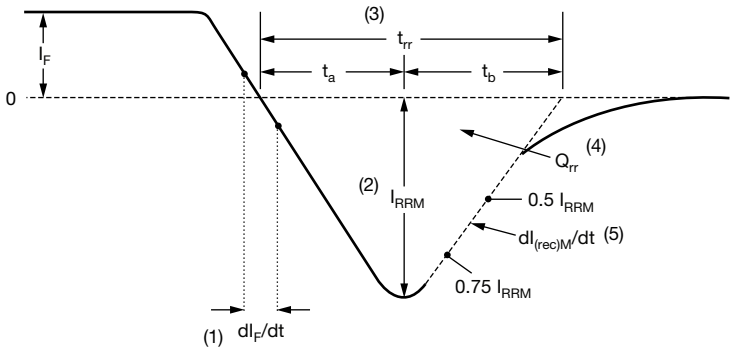



Fig. 10 - Reverse Recovery Parameter Test Circuit




(1) $dI_F/dt$ - rate of change of current through zero crossing

(2) $I_{RRM}$ - peak reverse recovery current

(3) $t_{rr}$ - reverse recovery time measured from zero crossing point of negative going $I_F$ to point where a line passing through 0.75 $I_{RRM}$ and 0.50 $I_{RRM}$ extrapolated to zero current.

(4) $Q_{rr}$ - area under curve defined by $t_{rr}$ and $I_{RRM}$

$$Q_{rr} = \frac{t_{rr} \times I_{RRM}}{2}$$

(5) $dI_{(rec)M}/dt$ - peak rate of change of current during $t_b$ portion of $t_{rr}$

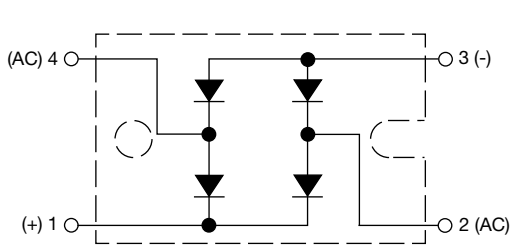
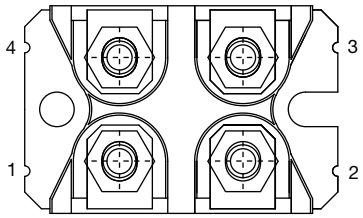
Fig. 11 - Reverse Recovery Waveform and Definitions

## ORDERING INFORMATION TABLE

Device code

| VS- | S | A | 61 | B | A | 60 |
|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |

- 1 - Vishay Semiconductors product
- 2 - S = Fast recovery diode
- 3 - A = Present Silicon Generation
- 4 - Current rating (61 = 61 A)
- 5 - Circuit configuration:
  B = Single phase bridge
- 6 - Package indicator:
  A = SOT-227, standard insulated base
- 7 - Voltage rating (60 = 600 V)

| CIRCUIT CONFIGURATION | | |
|---|---|---|
| **CIRCUIT** | **CIRCUIT CONFIGURATION CODE** | **CIRCUIT DRAWING** |
| Single phase bridge | B |   Lead Assignment   |

| LINKS TO RELATED DOCUMENTS | |
|---|---|
| Dimensions | www.vishay.com/doc?95423 |
| Packaging information | www.vishay.com/doc?95425 |

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