

HEXFRED® Ultrafast Soft Recovery Diode, 90 A


SOT-227
FEATURES

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


**RoHS
COMPLIANT**

| PRIMARY CHARACTERISTICS | |
|---------------------------------|---------------|
| V_R | 1200 V |
| V_F (typical) | 2.46 V |
| t_{rr} (typical) | 35 ns |
| $I_{F(AV)}$ per module at T_C | 90 A at 63 °C |
| Package | SOT-227 |

DESCRIPTION / APPLICATIONS

The dual diode series configuration (VS-HFA90FA120) is used for output rectification or freewheeling/clamping operation and high voltage application.

The semiconductor in the SOT-227 Gen 2 package is isolated from the copper base plate, allowing for common heatsinks and compact assemblies to be built.

These modules are intended for general applications such as HV power supplies, electronic welders, motor control and inverters.

| ABSOLUTE MAXIMUM RATINGS | | | | |
|--|----------------|--|-------------|-------|
| PARAMETER | SYMBOL | TEST CONDITIONS | MAX. | UNITS |
| Cathode to anode breakdown voltage | V_R | | 1200 | V |
| Continuous forward current, per leg | I_F | $T_C = 83\text{ °C}$ | 45 | A |
| Single pulse forward current, per leg | I_{FSM} | $T_J = 25\text{ °C}$ | 400 | |
| Maximum power dissipation, per leg | P_D | $T_C = 83\text{ °C}$ | 139 | W |
| | | $T_C = 100\text{ °C}$ | 104 | |
| RMS isolation voltage | V_{ISOL} | Any terminal to case, $t = 1\text{ min}$ | 2500 | V |
| Operating junction and storage temperature range | T_J, T_{Stg} | | -55 to +150 | °C |

| ELECTRICAL SPECIFICATIONS ($T_J = 25\text{ °C}$ unless otherwise specified) | | | | | | |
|--|----------|---|------|------|------|---------------|
| PARAMETER | SYMBOL | TEST CONDITIONS | MIN. | TYP. | MAX. | UNITS |
| Cathode to anode breakdown voltage | V_{BR} | $I_R = 100\text{ }\mu\text{A}$ | 1200 | - | - | V |
| Forward voltage | V_{FM} | $I_F = 25\text{ A}$ | - | 2.46 | 3.0 | |
| | | $I_F = 40\text{ A}$ | - | 2.68 | 3.3 | |
| | | $I_F = 25\text{ A}, T_J = 125\text{ °C}$ | - | 2.22 | - | |
| | | $I_F = 40\text{ A}, T_J = 125\text{ °C}$ | - | 2.52 | - | |
| | | $I_F = 25\text{ A}, T_J = 150\text{ °C}$ | - | 2.12 | 2.55 | |
| | | $I_F = 40\text{ A}, T_J = 150\text{ °C}$ | - | 2.43 | 2.96 | |
| Reverse leakage current | I_{RM} | $V_R = V_R\text{ rated}$ | - | 1.5 | 75 | μA |
| | | $T_J = 125\text{ °C}, V_R = V_R\text{ rated}$ | - | 0.5 | 2 | mA |
| | | $T_J = 150\text{ °C}, V_R = V_R\text{ rated}$ | - | 2 | 5 | |
| Junction capacitance | C_T | $V_R = 1200\text{ V}$ | - | 30 | - | pF |



| DYNAMIC RECOVERY CHARACTERISTICS ($T_J = 25\text{ }^\circ\text{C}$ unless otherwise specified) | | | | | | |
|---|-----------|--|------|------|------|-------|
| PARAMETER | SYMBOL | TEST CONDITIONS | MIN. | TYP. | MAX. | UNITS |
| Reverse recovery time | t_{rr} | $I_F = 1.0\text{ A}$, $di_F/dt = 200\text{ A}/\mu\text{s}$, $V_R = 30\text{ V}$ | - | 35 | - | ns |
| | | $T_J = 25\text{ }^\circ\text{C}$ | - | 80 | - | |
| | | $T_J = 125\text{ }^\circ\text{C}$ | - | 130 | - | |
| Peak recovery current | I_{RRM} | $I_F = 40\text{ A}$ $di_F/dt = -200\text{ A}/\mu\text{s}$ $V_R = 200\text{ V}$ | - | 6.8 | - | A |
| | | $T_J = 25\text{ }^\circ\text{C}$ | - | 11.5 | - | |
| | | $T_J = 125\text{ }^\circ\text{C}$ | - | - | - | |
| Reverse recovery charge | Q_{rr} | $T_J = 25\text{ }^\circ\text{C}$ | - | 270 | - | nC |
| | | $T_J = 125\text{ }^\circ\text{C}$ | - | 740 | - | |
| | | | - | - | - | |

| THERMAL - MECHANICAL SPECIFICATIONS | | | | | | |
|---|------------|-----------------------|---------|------|------------|---------------------------|
| PARAMETER | SYMBOL | TEST CONDITIONS | MIN. | TYP. | MAX. | UNITS |
| Junction to case, single leg conducting | R_{thJC} | | - | - | 0.48 | $^\circ\text{C}/\text{W}$ |
| Junction to case, both legs conducting | | | - | - | 0.24 | |
| Case to heatsink | R_{thCS} | Flat, greased surface | - | 0.10 | - | |
| Weight | | | - | 30 | - | g |
| Mounting torque | | Torque to terminal | - | - | 1.1 (9.7) | Nm (lbf.in) |
| | | Torque to heatsink | - | - | 1.8 (15.9) | Nm (lbf.in) |
| Case style | | | SOT-227 | | | |

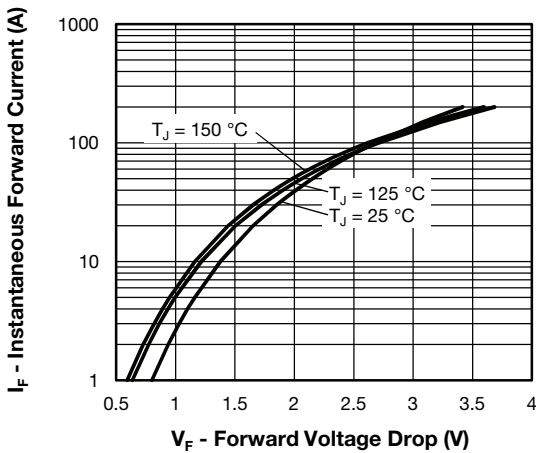


Fig. 1 - Typical Forward Voltage Drop Characteristics (Per Leg)

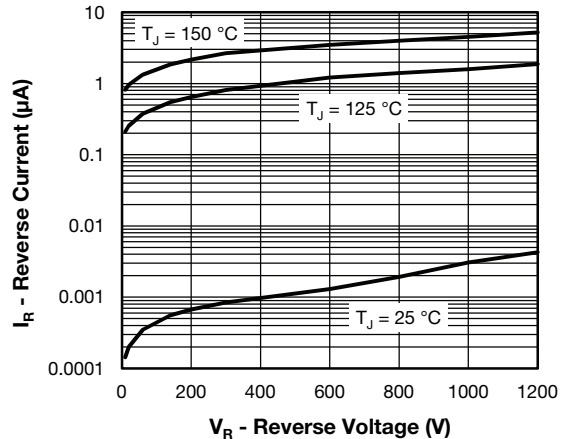


Fig. 2 - Typical Values of Reverse Current vs. Reverse Voltage

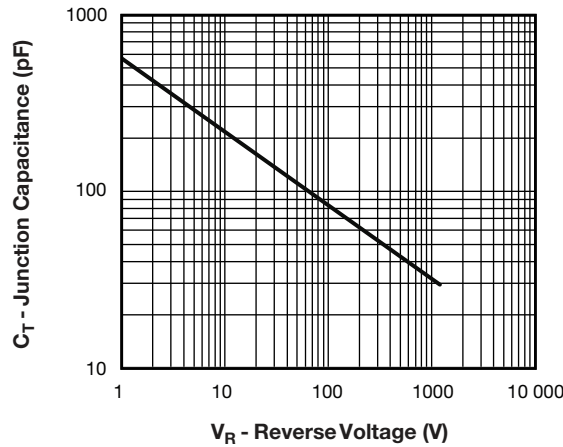


Fig. 3 - Typical Junction Capacitance vs. Reverse Voltage

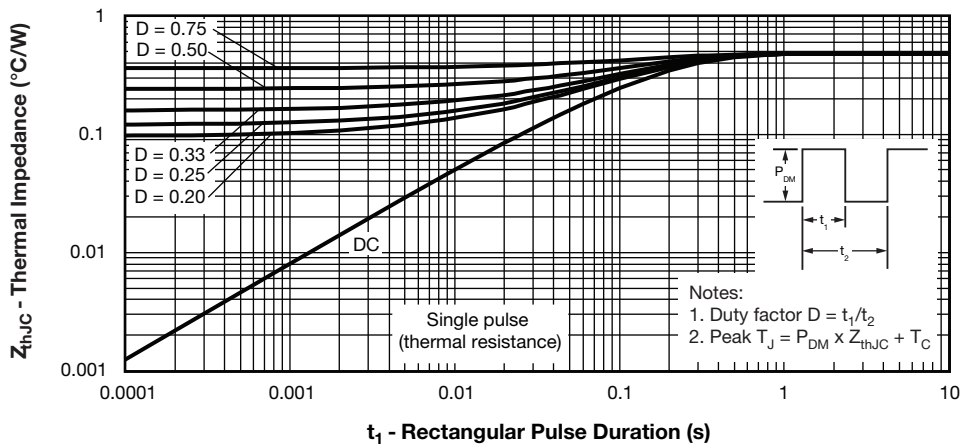


Fig. 4 - Maximum Thermal Impedance Z_{thJC} Characteristics (Per Leg)

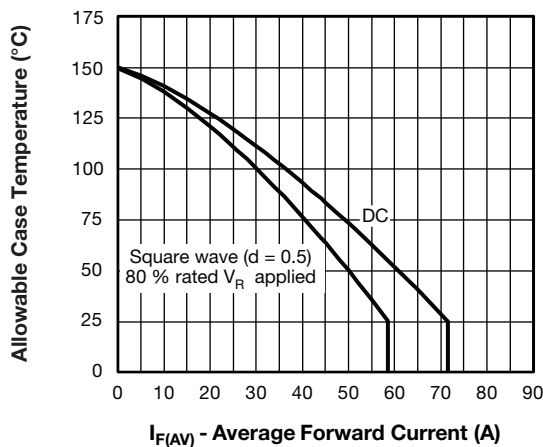


Fig. 5 - Maximum Allowable Case Temperature vs. Average Forward Current (Per Leg)

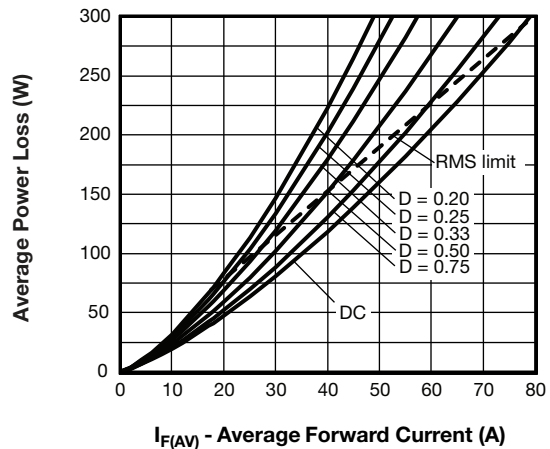


Fig. 6 - Forward Power Loss Characteristics (Per Leg)

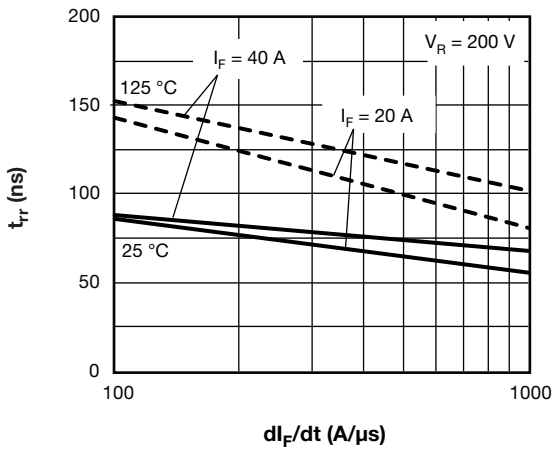


Fig. 7 - Typical Reverse Recovery Time vs. di_F/dt

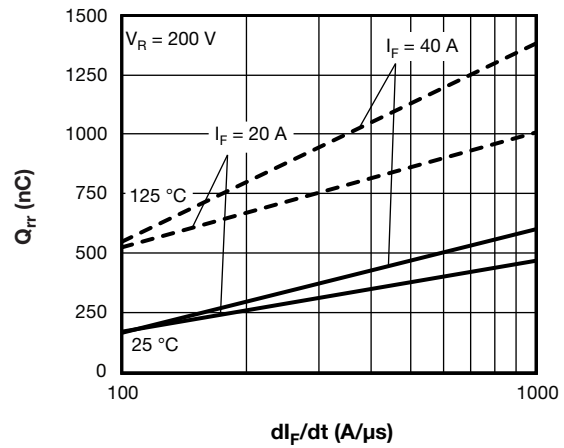


Fig. 8 - Typical Stored Charge vs. di_F/dt

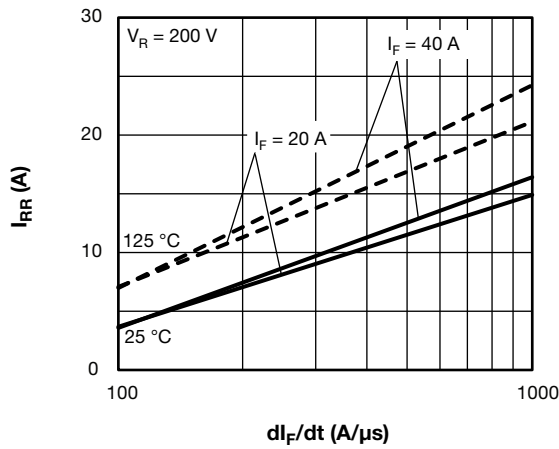


Fig. 9 - Typical Reverse Recovery Current vs. di_F/dt

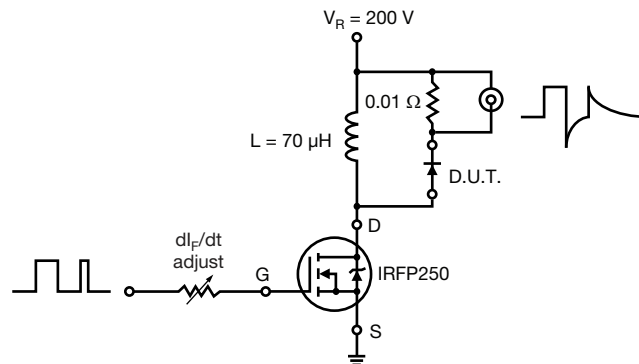
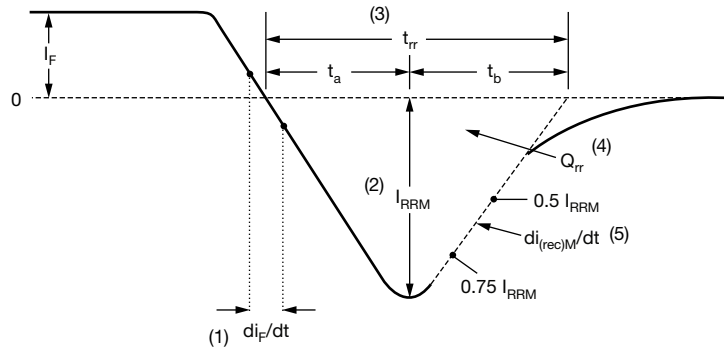


Fig. 10 - Reverse Recovery Parameter Test Circuit



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

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

Fig. 11 - Reverse Recovery Waveform and Definitions

ORDERING INFORMATION TABLE

| | | | | | | | |
|-------------|------------|-----------|----------|-----------|----------|----------|------------|
| Device code | VS- | HF | A | 90 | F | A | 120 |
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 |

- 1** - Vishay Semiconductors product
- 2** - HEXFRED® family
- 3** - Process designator (A = electron irradiated)
- 4** - Average current (90 = 90 A)
- 5** - Circuit configuration (two separate diodes, parallel pin-out)
- 6** - Package indicator (SOT-227 standard insulated base)
- 7** - Voltage rating (120 = 1200 V)

| CIRCUIT CONFIGURATION | | |
|---------------------------------------|----------------------------|------------------------|
| CIRCUIT | CIRCUIT CONFIGURATION CODE | CIRCUIT DRAWING |
| two separate diodes, parallel pin-out | F | <p>Lead Assignment</p> |

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



SOT-227 Generation 2

DIMENSIONS in millimeters (inches)



Note

- Controlling dimension: millimeter



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