

# HEXFRED® Ultrafast Soft Recovery Diode, 70 A



SOT-227

## FEATURES

- Fast recovery time characteristic
- Electrically isolated base plate
- Antiparallel diodes
- 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](http://www.vishay.com/doc?99912)


RoHS  
COMPLIANT

## PRODUCT SUMMARY

|                                   |                |
|-----------------------------------|----------------|
| $V_R$                             | 1200 V         |
| $V_F$ (typical)                   | 2.2 V          |
| $t_{rr}$ (typical)                | 48 ns          |
| $I_{F(DC)}$ at $T_C$ , per module | 70 A at 121 °C |
| Package                           | SOT-227        |

## DESCRIPTION/APPLICATIONS

This SOT-227 modules with HEXFRED® rectifier are in antiparallel configuration. The antiparallel configuration is used for simple series rectifier and high voltage application. The semiconductor in the SOT-227 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 voltage                         | $V_R$          |                                             | 1200        | V     |
| Continuous forward current, per leg              | $I_F$          | $T_C = 121\text{ °C}$                       | 35          | A     |
| Single pulse forward current                     | $I_{FSM}$      | $T_J = 25\text{ °C}$                        | 350         |       |
| Maximum power dissipation, per leg               | $P_D$          | $T_C = 25\text{ °C}$                        | 357         | W     |
|                                                  |                | $T_C = 100\text{ °C}$                       | 143         |       |
| RMS isolation voltage                            | $V_{ISOL}$     | Any terminal to case, $t = 1\text{ minute}$ | 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, per leg           | $V_{FM}$ | $I_F = 30\text{ A}$                           | -    | 2.2  | 3.0  |               |
|                                    |          | $I_F = 60\text{ A}$                           | -    | 2.8  | 4.0  |               |
|                                    |          | $I_F = 30\text{ A}, T_J = 125\text{ °C}$      | -    | 2.13 | -    |               |
|                                    |          | $I_F = 60\text{ A}, T_J = 125\text{ °C}$      | -    | 2.70 | -    |               |
|                                    |          | $I_F = 30\text{ A}, T_J = 150\text{ °C}$      | -    | 2.04 | -    |               |
|                                    |          | $I_F = 60\text{ A}, T_J = 150\text{ °C}$      | -    | 2.65 | -    |               |
| Reverse leakage current, per leg   | $I_{RM}$ | $V_R = V_R\text{ rated}$                      | -    | 2.0  | 75   | $\mu\text{A}$ |
|                                    |          | $T_J = 125\text{ °C}, V_R = V_R\text{ rated}$ | -    | 1.6  | 5    | mA            |
|                                    |          | $T_J = 150\text{ °C}, V_R = V_R\text{ rated}$ | -    | 5    | 10   |               |

**DYNAMIC RECOVERY CHARACTERISTICS** ( $T_J = 25\text{ }^{\circ}\text{C}$  unless otherwise specified)

| PARAMETER                        | SYMBOL    | TEST CONDITIONS                                                                 | MIN. | TYP. | MAX. | UNITS |
|----------------------------------|-----------|---------------------------------------------------------------------------------|------|------|------|-------|
| Reverse recovery time, per leg   | $t_{rr}$  | $I_F = 1\text{ A}$ ; $dI_F/dt = 200\text{ A}/\mu\text{s}$ ; $V_R = 30\text{ V}$ | -    | 48   | -    | ns    |
|                                  |           | $T_J = 25\text{ }^{\circ}\text{C}$                                              | -    | 145  | -    |       |
|                                  |           | $T_J = 125\text{ }^{\circ}\text{C}$                                             | -    | 218  | -    |       |
| Peak recovery current, per leg   | $I_{RRM}$ | $T_J = 25\text{ }^{\circ}\text{C}$                                              | -    | 13   | -    | A     |
|                                  |           | $T_J = 125\text{ }^{\circ}\text{C}$                                             | -    | 19   | -    |       |
| Reverse recovery charge, per leg | $Q_{rr}$  | $T_J = 25\text{ }^{\circ}\text{C}$                                              | -    | 910  | -    | nC    |
|                                  |           | $T_J = 125\text{ }^{\circ}\text{C}$                                             | -    | 1920 | -    |       |
| Junction capacitance, per leg    | $C_T$     | $V_R = 1200\text{ V}$                                                           | -    | 27   | -    | pF    |

**THERMAL - MECHANICAL SPECIFICATIONS**

| PARAMETER                               | SYMBOL     | TEST CONDITIONS       | MIN.    | TYP. | MAX.  | UNITS                       |
|-----------------------------------------|------------|-----------------------|---------|------|-------|-----------------------------|
| Junction to case, single leg conducting | $R_{thJC}$ | Flat, greased surface | -       | -    | 0.35  | $^{\circ}\text{C}/\text{W}$ |
| Junction to case, both legs conducting  |            |                       | -       | -    | 0.175 |                             |
| Case to heatsink                        | $R_{thCS}$ |                       | -       | 0.05 | -     |                             |
| Weight                                  |            |                       | -       | 30   | -     | g                           |
| Mounting torque                         |            |                       | -       | -    | 1.3   | Nm                          |
| Case style                              |            |                       | SOT-227 |      |       |                             |

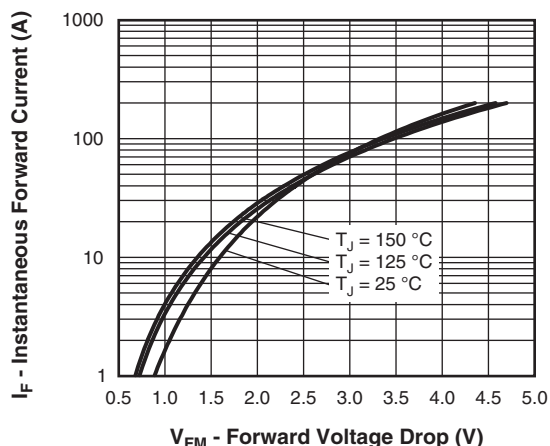


Fig. 1 - Typical Forward Voltage Drop Characteristics

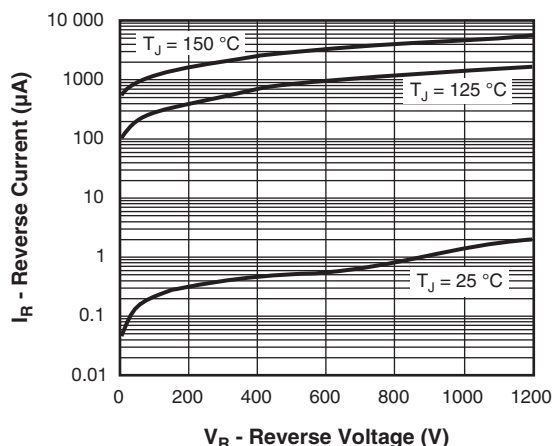


Fig. 2 - Typical Values of Reverse Current vs. Reverse Voltage

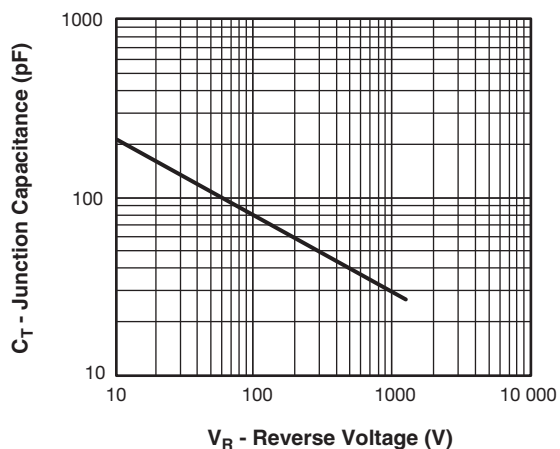
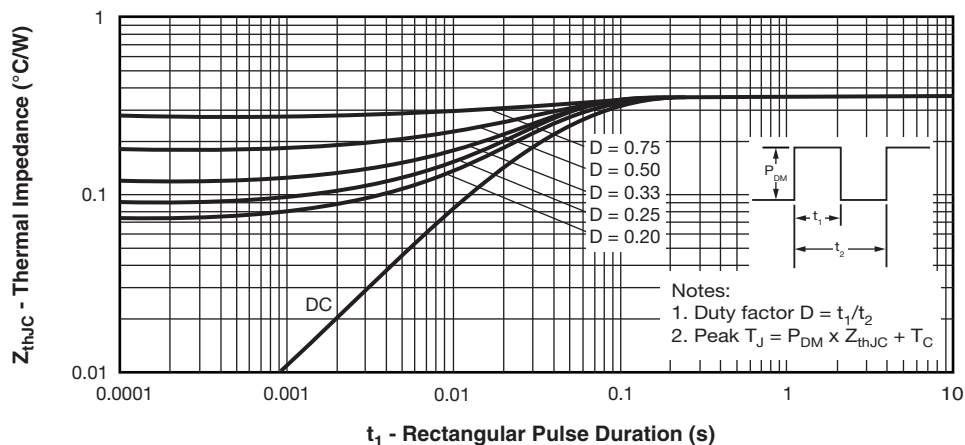


Fig. 3 - Typical Junction Capacitance vs. Reverse Voltage


Fig. 4 - Maximum Thermal Impedance  $Z_{thJC}$  Characteristics

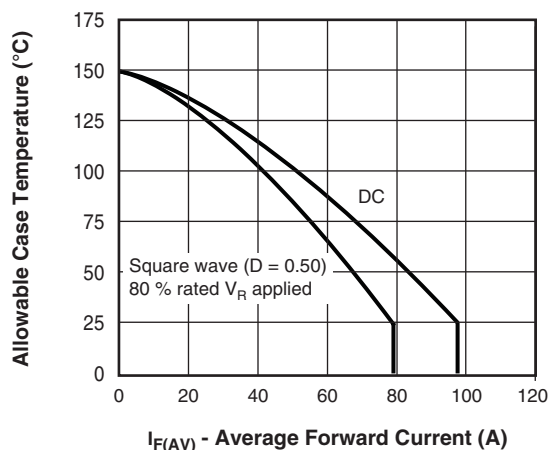


Fig. 5 - Maximum Allowable Case Temperature vs. Average Forward Current

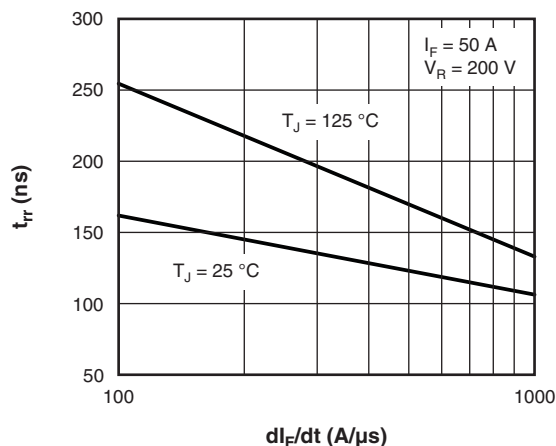


Fig. 7 - Typical Reverse Recovery Time vs.  $dI_F/dt$

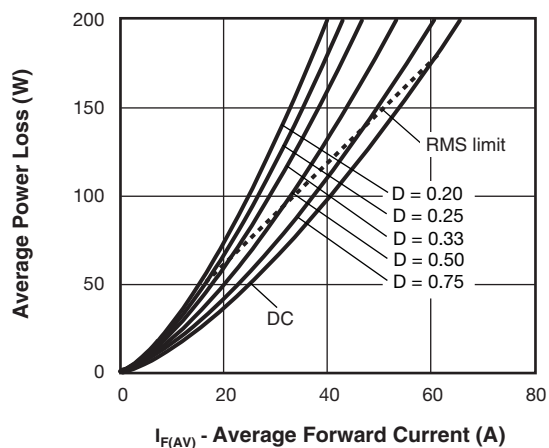


Fig. 6 - Forward Power Loss Characteristics

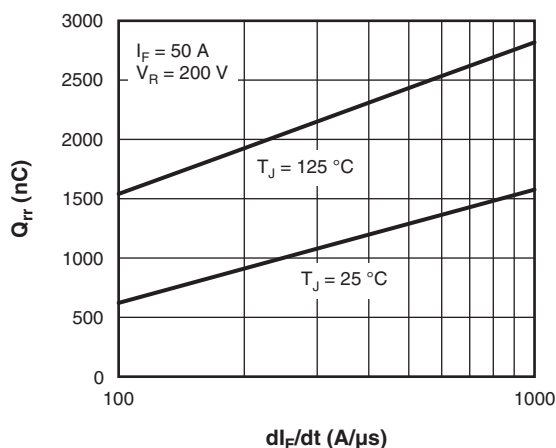


Fig. 8 - Typical Stored Charge vs.  $dI_F/dt$

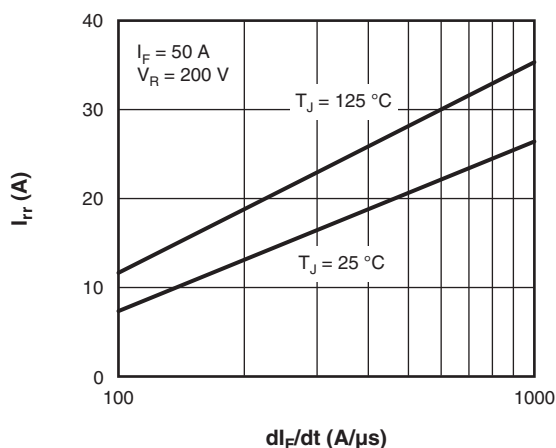


Fig. 9 - Typical Peak Recovery Current vs.  $dI_F/dt$

#### Note

- (1) Formula used:  $T_C = T_J - (P_d + P_{dREV}) \times R_{thJC}$ ;  
 $P_d$  = Forward power loss =  $I_{F(AV)} \times V_{FM}$  at  $(I_{F(AV)}/D)$  (see fig. 5);  
 $P_{dREV}$  = Inverse power loss =  $V_{R1} \times I_R (1 - D)$ ;  $I_R$  at  $V_{R1}$  = Rated  $V_R$

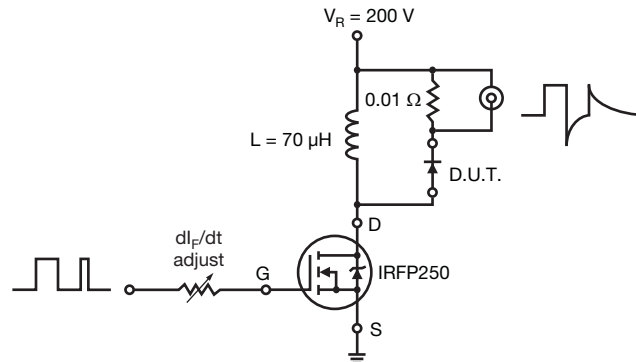


Fig. 10 - Reverse Recovery Parameter Test Circuit

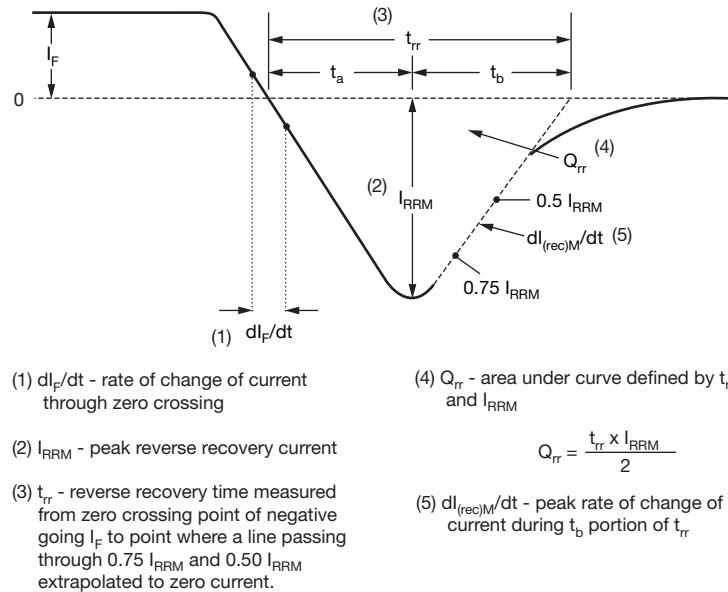
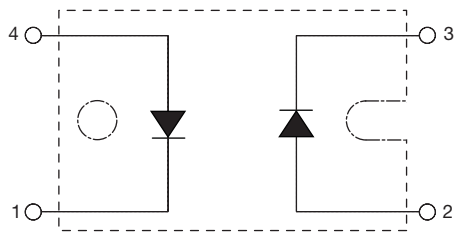
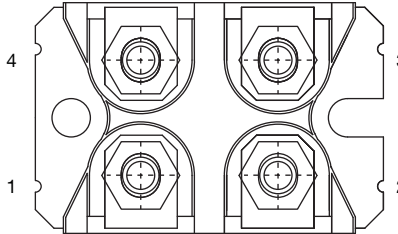


Fig. 11 - Reverse Recovery Waveform and Definitions

**ORDERING INFORMATION TABLE**

|             |            |           |          |           |          |          |            |
|-------------|------------|-----------|----------|-----------|----------|----------|------------|
| Device code | <b>VS-</b> | <b>HF</b> | <b>A</b> | <b>70</b> | <b>E</b> | <b>A</b> | <b>120</b> |
|             | 1          | 2         | 3        | 4         | 5        | 6        | 7          |

- |          |   |                                                                 |
|----------|---|-----------------------------------------------------------------|
| <b>1</b> | - | Vishay Semiconductors product                                   |
| <b>2</b> | - | HEXFRED® family                                                 |
| <b>3</b> | - | Process designator (A = Electron irradiated)                    |
| <b>4</b> | - | Average current (70 = 70 A)                                     |
| <b>5</b> | - | Circuit configuration (2 separate diodes, antiparallel pin-out) |
| <b>6</b> | - | Package indicator (SOT-227 standard insulated base)             |
| <b>7</b> | - | Voltage rating (120 = 1200 V)                                   |

| CIRCUIT CONFIGURATION                   |                            |                                                                                                                                                                                                   |
|-----------------------------------------|----------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| CIRCUIT                                 | CIRCUIT CONFIGURATION CODE | CIRCUIT DRAWING                                                                                                                                                                                   |
| 2 separate diodes, antiparallel pin-out | E                          |  <p>Lead Assignment</p>  |

| LINKS TO RELATED DOCUMENTS |                                                                        |
|----------------------------|------------------------------------------------------------------------|
| Dimensions                 | <a href="http://www.vishay.com/doc?95423">www.vishay.com/doc?95423</a> |
| Part marking information   | <a href="http://www.vishay.com/doc?95425">www.vishay.com/doc?95425</a> |



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