

# HEXFRED® Ultrafast Soft Recovery Diode, 220 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](http://www.vishay.com/doc?99912)


**RoHS**  
COMPLIANT

## DESCRIPTION / APPLICATIONS

The dual diode series configuration (VS-HFA220FA120) is used for output rectification or freewheeling/clamping operation 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.

## PRODUCT SUMMARY

|                                 |                |
|---------------------------------|----------------|
| $V_R$                           | 1200 V         |
| $V_F$ (typical)                 | 2.68 V         |
| $t_{rr}$ (typical)              | 58 ns          |
| $I_{F(AV)}$ per module at $T_C$ | 220 A at 38 °C |
| Package                         | SOT-227        |

## ABSOLUTE MAXIMUM RATINGS

| PARAMETER                                        | SYMBOL         | TEST CONDITIONS                             | MAX.        | UNITS |
|--------------------------------------------------|----------------|---------------------------------------------|-------------|-------|
| Cathode to anode voltage                         | $V_R$          |                                             | 1200        | V     |
| Continuous forward current <sup>(1)</sup>        | $I_F$          | $T_C = 68\text{ °C}$                        | 110         | A     |
| Single pulse forward current                     | $I_{FSM}$      | $T_J = 25\text{ °C}$                        | 700         |       |
| Maximum power dissipation per leg                | $P_D$          | $T_C = 25\text{ °C}$                        | 500         | W     |
|                                                  |                | $T_C = 100\text{ °C}$                       | 400         |       |
| 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                    | $V_{FM}$ | $I_F = 100\text{ A}$                          | -    | 2.68 | 3.60 |               |
|                                    |          | $I_F = 200\text{ A}$                          | -    | 3.41 | 4.70 |               |
|                                    |          | $I_F = 100\text{ A}, T_J = 150\text{ °C}$     | -    | 2.62 | 2.89 |               |
|                                    |          | $I_F = 200\text{ A}, T_J = 150\text{ °C}$     | -    | 3.59 | 3.89 |               |
| Reverse leakage current            | $I_{RM}$ | $V_R = V_R\text{ rated}$                      | -    | 10   | 75   | $\mu\text{A}$ |
|                                    |          | $T_J = 125\text{ °C}, V_R = V_R\text{ rated}$ | -    | 2    | -    | mA            |
|                                    |          | $T_J = 150\text{ °C}, V_R = V_R\text{ rated}$ | -    | 6    | 15   |               |

### Note

<sup>(1)</sup> Maximum continuous forward current must be limited at 100 A to do not exceed the maximum temperature of power terminals.

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

| PARAMETER               | SYMBOL    | TEST CONDITIONS                                                                  | MIN. | TYP. | MAX. | UNITS |
|-------------------------|-----------|----------------------------------------------------------------------------------|------|------|------|-------|
| Reverse recovery time   | $t_{rr}$  | $I_F = 1\text{ A}$ ; $di_F/dt = -200\text{ A}/\mu\text{s}$ ; $V_R = 30\text{ V}$ | -    | 58   | -    | ns    |
|                         |           | $T_J = 25\text{ }^{\circ}\text{C}$                                               | -    | 157  | -    |       |
|                         |           | $T_J = 125\text{ }^{\circ}\text{C}$                                              | -    | 255  | -    |       |
| Peak recovery current   | $I_{RRM}$ | $T_J = 25\text{ }^{\circ}\text{C}$                                               | -    | 15   | -    | A     |
|                         |           | $T_J = 125\text{ }^{\circ}\text{C}$                                              | -    | 22.5 | -    |       |
| Reverse recovery charge | $Q_{rr}$  | $T_J = 25\text{ }^{\circ}\text{C}$                                               | -    | 1150 | -    | nC    |
|                         |           | $T_J = 125\text{ }^{\circ}\text{C}$                                              | -    | 2850 | -    |       |
| Junction capacitance    | $C_T$     | $V_R = 1200\text{ V}$                                                            | -    | 53   | -    | pF    |

**THERMAL - MECHANICAL SPECIFICATIONS**

| PARAMETER                               | SYMBOL     | TEST CONDITIONS       | MIN.    | TYP. | MAX.       | UNITS                       |
|-----------------------------------------|------------|-----------------------|---------|------|------------|-----------------------------|
| Junction to case, single leg conducting | $R_{thJC}$ |                       | -       | -    | 0.25       | $^{\circ}\text{C}/\text{W}$ |
| Junction to case, both legs conducting  |            |                       | -       | -    | 0.125      |                             |
| 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    | -       | -    | 1.3 (11.5) | Nm (lbf.in)                 |
| Case style                              |            |                       | SOT-227 |      |            |                             |

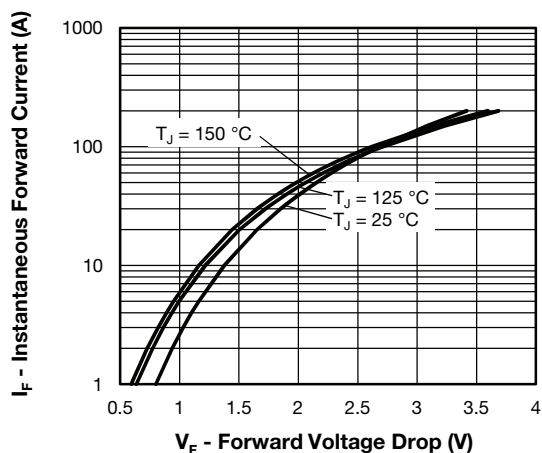


Fig. 1 - Typical Forward Voltage Drop Characteristics (Per Leg)

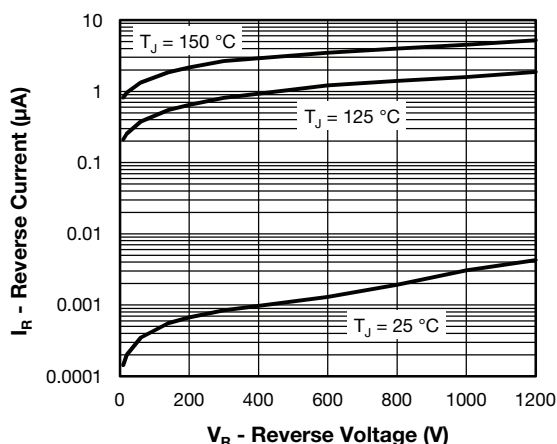


Fig. 2 - Typical Values of Reverse Current vs. Reverse Voltage

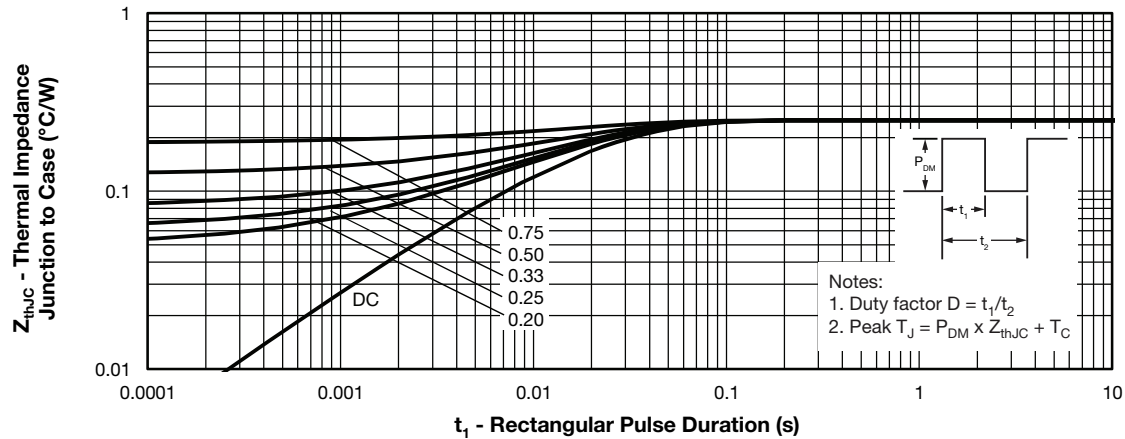


Fig. 3 - Maximum Thermal Impedance  $Z_{thJC}$  Characteristics (Per Leg)

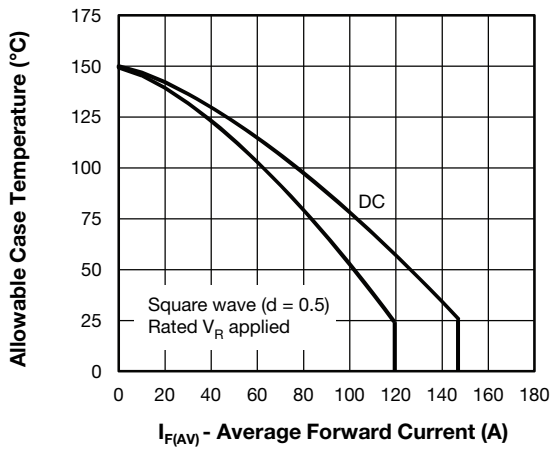


Fig. 4 - Maximum Allowable Case Temperature vs. Average Forward Current (Per Leg)

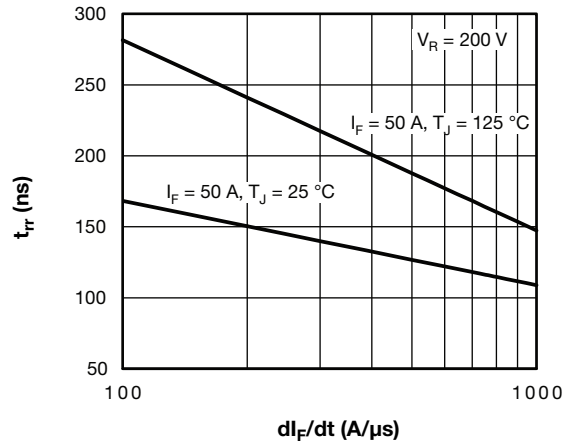


Fig. 6 - Typical Reverse Recovery Time vs.  $dI_F/dt$

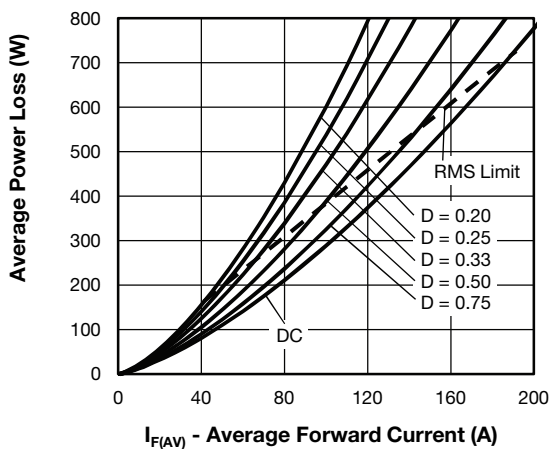


Fig. 5 - Forward Power Losses Characteristics (Per Leg)

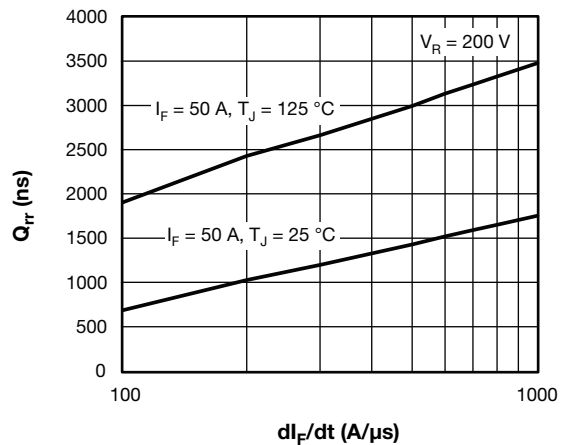


Fig. 7 - Typical Stored Charge vs.  $dI_F/dt$

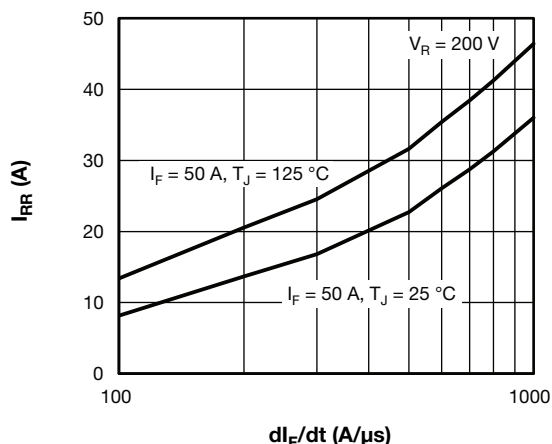
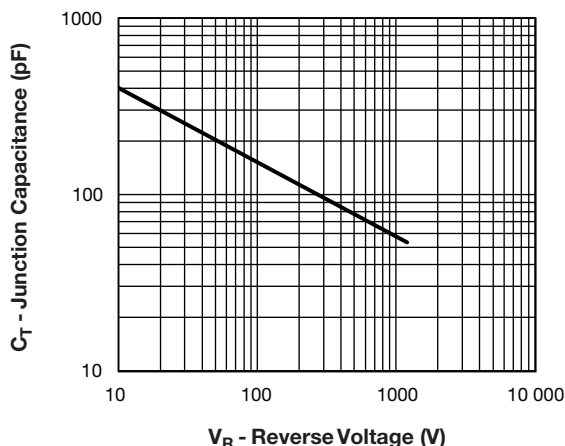

Fig. 8 - Typical Peak Recovery Current vs.  $dI_F/dt$ 


Fig. 9 - Typical Junction Capacitance vs. Reverse Voltage

**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  $V_R$

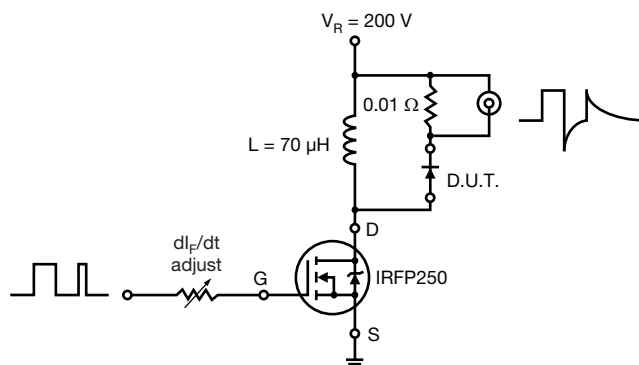


Fig. 10 - Reverse Recovery Parameter Test Circuit

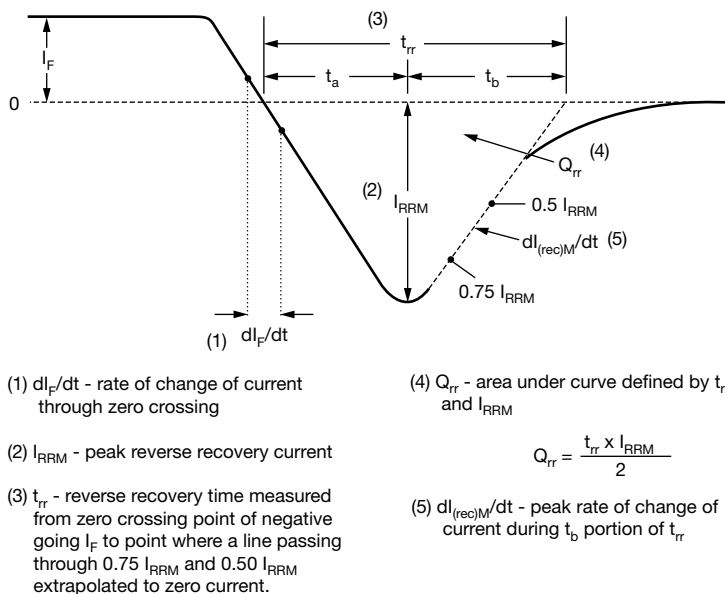
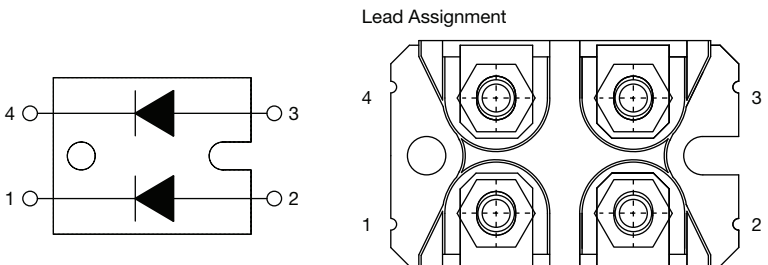


Fig. 11 - Reverse Recovery Waveform and Definitions

**ORDERING INFORMATION TABLE**

| Device code | VS-                                                         | HF | A | 220 | 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 (220 = 220 A)                               |    |   |     |   |   |     |
| 5           | Circuit configuration (2 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                                                                     |
| 2 separate diodes, parallel pin-out | F                          |  |

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



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