

HEXFRED®

Ultrafast Soft Recovery Diode, 140 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

| PRODUCT SUMMARY | |
|-----------------------------------|----------------|
| V_R | 1200 V |
| V_F (typical) | 2.8 V |
| t_{rr} (typical) | 48 ns |
| $I_{F(DC)}$ at T_C , per module | 140 A at 74 °C |
| $I_{F(AV)}$ at T_C , per module | 140 A at 46 °C |

DESCRIPTION/APPLICATIONS

The dual diode series configuration VS-HFA140FA120 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.

| ABSOLUTE MAXIMUM RATINGS | | | | |
|--|----------------|--------------------------------------|---------------|-------|
| PARAMETER | SYMBOL | TEST CONDITIONS | MAX. | UNITS |
| Cathode to anode voltage | V_R | | 1200 | V |
| Continuous forward current | I_F | $T_C = 74\text{ °C}$ | 70 | A |
| | | | 140 | |
| 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, $t = 1$ 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} | $I_F = 60\text{ A}$ | - | 2.8 | 4.0 | |
| | | $I_F = 120\text{ A}$ | - | 3.6 | 5.3 | |
| | | $I_F = 60\text{ A}, T_J = 125\text{ °C}$ | - | 2.7 | - | |
| | | $I_F = 60\text{ A}, T_J = 150\text{ °C}$ | - | 2.65 | - | |
| Reverse leakage current, per leg | I_{RM} | $V_R = V_R$ rated | - | 2.0 | 75 | μA |
| | | $T_J = 125\text{ °C}, V_R = V_R$ rated | - | 1.6 | 5 | mA |
| | | $T_J = 150\text{ °C}, V_R = V_R$ 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 |
| | | $T_J = 125\text{ }^\circ\text{C}$ | - | 18 | - | |
| 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} | | - | - | 0.35 | $^\circ\text{C}/\text{W}$ |
| Junction to case, both legs conducting | | | - | - | 0.175 | |
| Case to heatsink, per leg | R_{thCS} | Flat, greased and surface | - | 0.05 | - | |
| Weight | | | - | 30 | - | g |
| Mounting torque, on terminals and heatsink | T | | - | - | 1.3 | Nm |

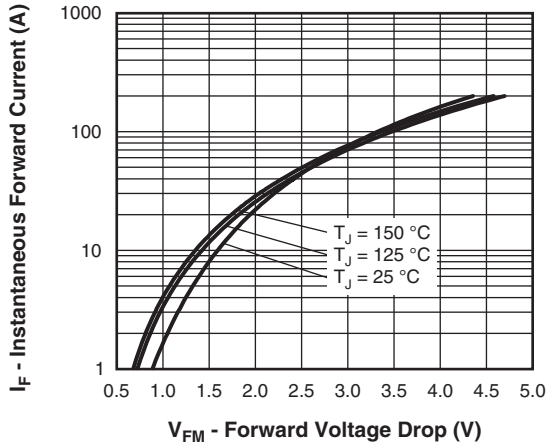


Fig. 1 - Typical Forward Voltage Drop Characteristics

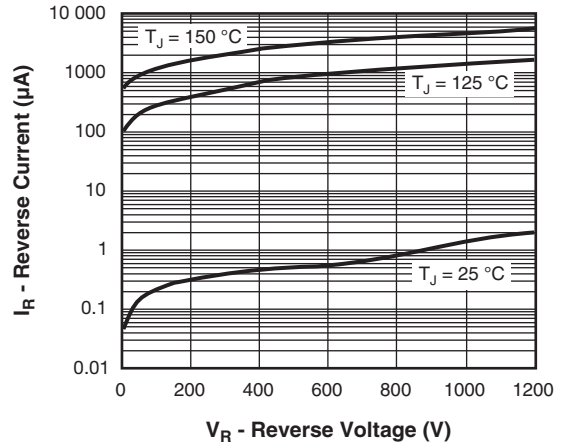


Fig. 2 - Typical Values of Reverse Current vs. Reverse Voltage

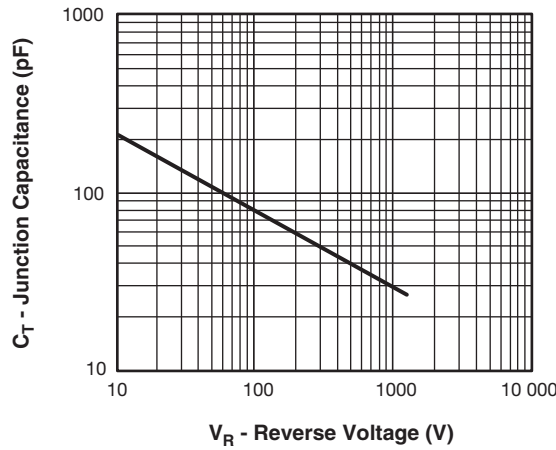


Fig. 3 - Typical Junction Capacitance vs. Reverse Voltage

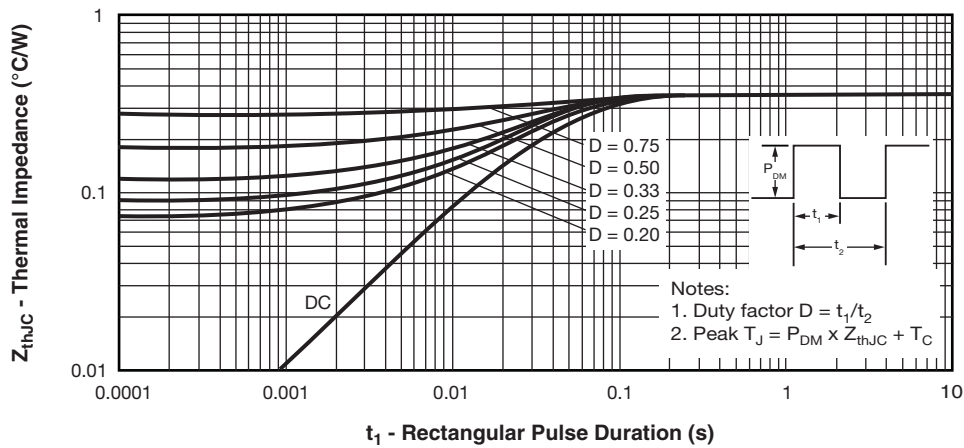


Fig. 4 - Maximum Thermal Impedance Z_{thJC} Characteristics (Per Leg)

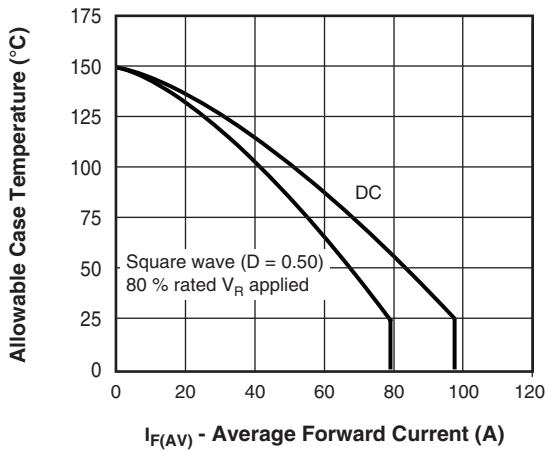


Fig. 5 - Maximum Allowable Case Temperature vs. Average Forward Current

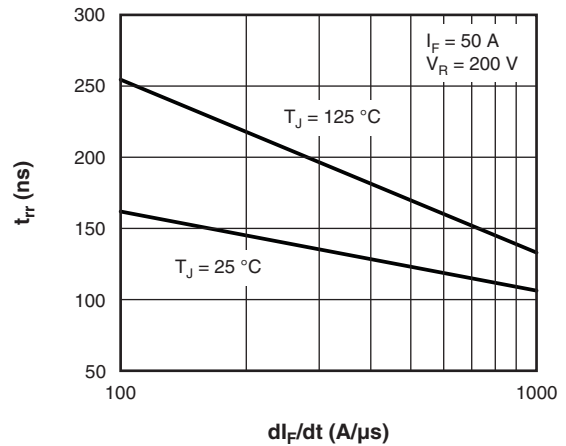


Fig. 7 - Typical Reverse Recovery Time vs. dI_F/dt

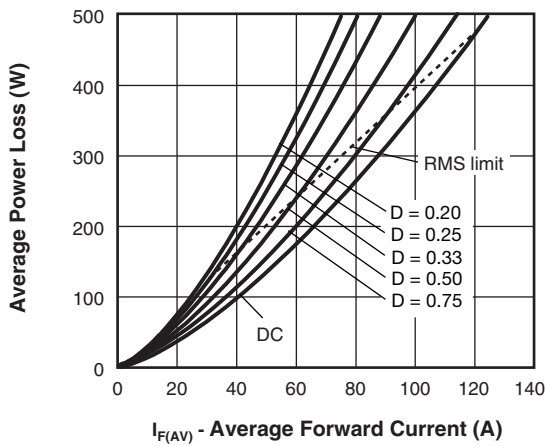


Fig. 6 - Forward Power Loss Characteristics

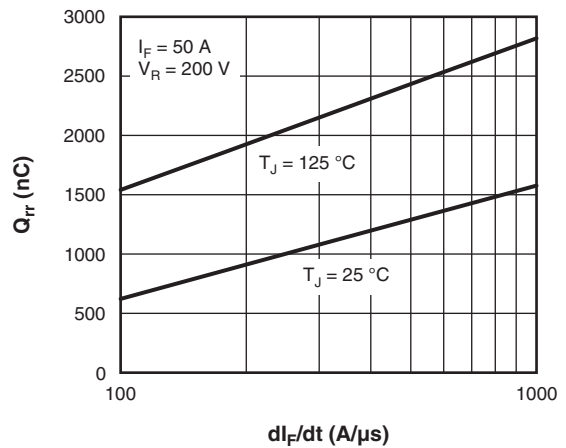


Fig. 8 - Typical Stored Charge vs. dI_F/dt

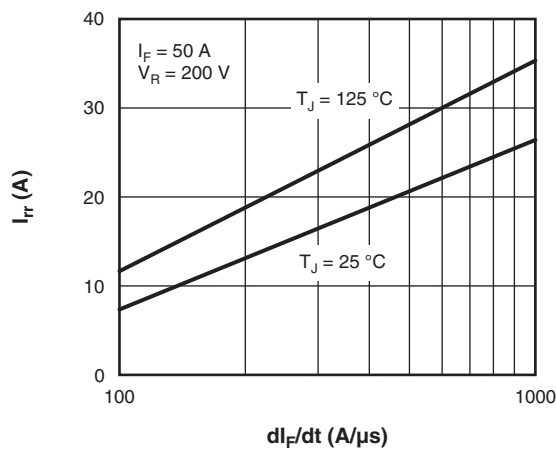


Fig. 9 - Typical Peak Recovery Current vs. dI_F/dt

Note

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

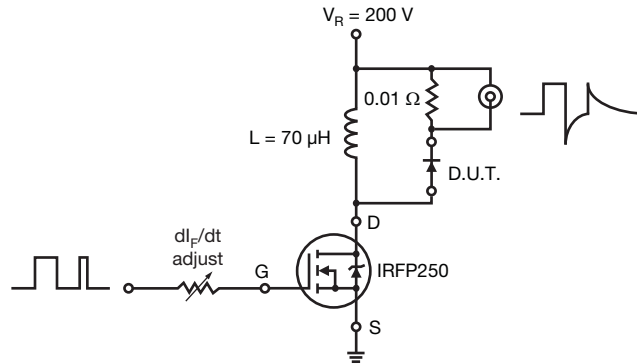
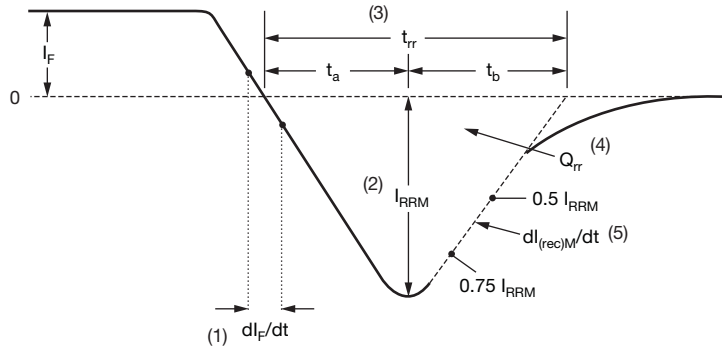


Fig. 10 - Reverse Recovery Parameter Test Circuit



(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}

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

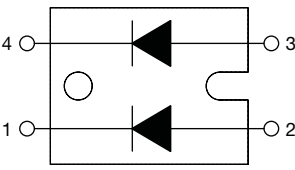
(5) $di_{(rec)M}/dt$ - peak rate of change of current during t_b portion of t_{rr}

Fig. 11 - Reverse Recovery Waveform and Definitions

ORDERING INFORMATION TABLE

| | | | | | | | |
|-------------|------------|-----------|----------|------------|----------|----------|------------|
| Device code | VS- | HF | A | 140 | 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 (140 = 140 A)
- 5** - Circuit configuration (2 separate diodes, parallel pin-out)
- 6** - Package indicator (SOT-227 standard isolated 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 | www.vishay.com/doc?95423 |
| Part marking information | www.vishay.com/doc?95425 |



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