# HEXFRED® Ultrafast Soft Recovery Diode, 60 A

SOT-227

## FEATURES

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

Pb-free

RoHS COMPLIANT

| PRODUCT SUMMARY | |
|---|---|
| $V_R$ | 600 V |
| $V_F$ (typical) at 125 °C | 1.4 V |
| $Q_{rr}$ (typical) | 270 nC |
| $I_{RRM}$ (typical) | 7.0 A |
| $t_{rr}$ (typical) | 65 ns |
| $dI_{(rec)M}/dt$ (typical) at 125 °C | 270 A/µs |
| $I_{F(DC)}$ at $T_C$ | 40 A at 100 °C |
| Package | SOT-227 |
| Circuit configuration | Two separate diodes |

## DESCRIPTION

This SOT-227 modules with HEXFRED® rectifier are available in two basic configurations. They are the antiparallel and the parallel configurations. The antiparallel configuration (VS-HFA120EA60) is used for simple series rectifier and high voltage application. The parallel configuration (VS-HFA120FA60) is used for simple parallel rectifier and high current 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 power supplies, battery chargers, electronic welders, motor control, DC chopper, and inverters.

## ABSOLUTE MAXIMUM RATINGS PER LEG

| PARAMETER | SYMBOL | TEST CONDITIONS | VALUES | UNITS |
|---|---|---|---|---|
| Cathode to anode voltage | $V_R$ | | 600 | V |
| Continuous forward current | $I_F$ | $T_C$ = 25 °C | 75 | A |
| | | $T_C$ = 100 °C | 40 | |
| Single pulse forward current | $I_{FSM}$ | $T_J$ = 25 °C | 800 | |
| Maximum repetitive forward current | $I_{FRM}$ | Rated $V_R$, square wave, 20 kHz, $T_C$ = 60 °C | 180 | |
| RMS isolation voltage, any terminal to case | $V_{ISOL}$ | t = 1 minute | 2500 | V |
| Maximum power dissipation | $P_D$ | $T_C$ = 25 °C | 180 | W |
| | | $T_C$ = 100 °C | 71 | |
| Operating junction and storage temperature range | $T_J$, $T_{Stg}$ | | - 55 to 150 | °C |

## ELECTRICAL SPECIFICATIONS PER LEG ($T_J$ = 25 °C unless otherwise specified)

| PARAMETER | SYMBOL | TEST CONDITIONS | | MIN. | TYP. | MAX. | UNITS |
|---|---|---|---|---|---|---|---|
| Cathode to anode breakdown voltage | $V_{BR}$ | $I_R$ = 100 µA | | 600 | - | - | V |
| Maximum forward voltage | $V_{FM}$ | $I_F$ = 60 A | See fig. 1 | - | 1.5 | 1.7 | |
| | | $I_F$ = 120 A | | - | 1.9 | 2.1 | |
| | | $I_F$ = 60 A, $T_J$ = 125 °C | | - | 1.4 | 1.6 | |
| Maximum reverse leakage current | $I_{RM}$ | $V_R$ = $V_R$ rated | See fig. 2 | - | 2.5 | 20 | µA |
| | | $T_J$ = 125 °C, $V_R$ = 0.8 x $V_R$ rated | | - | 130 | 2000 | |
| Junction capacitance | $C_T$ | $V_R$ = 200 V | See fig. 3 | - | 120 | 170 | pF |

| DYNAMIC RECOVERY CHARACTERISTICS PER LEG ($T_J$ = 25 °C unless otherwise specified) | | | | | | | |
|---|---|---|---|---|---|---|---|
| **PARAMETER** | **SYMBOL** | **TEST CONDITIONS** | | **MIN.** | **TYP.** | **MAX.** | **UNITS** |
| Reverse recovery time<br>See fig. 5, 6 and 16 | $t_{rr}$ | $I_F$ = 1.0 A, $dI_F/dt$ = 200 A/µs, $V_R$ = 30 V | | - | 34 | - | ns |
| | $t_{rr1}$ | $T_J$ = 25 °C | $I_F$ = 60 A<br>$dI_F/dt$ = 200 A/µs<br>$V_R$ = 200 V | - | 65 | 98 | |
| | $t_{rr2}$ | $T_J$ = 125 °C | | - | 130 | 200 | |
| Peak recovery current<br>See fig. 7 and 8 | $I_{RRM1}$ | $T_J$ = 25 °C | | - | 7.0 | 13 | A |
| | $I_{RRM2}$ | $T_J$ = 125 °C | | - | 13 | 23 | |
| Reverse recovery charge<br>See fig. 9 and 10 | $Q_{rr1}$ | $T_J$ = 25 °C | | - | 270 | 410 | nC |
| | $Q_{rr2}$ | $T_J$ = 125 °C | | - | 490 | 740 | |
| Peak rate of recovery current during $t_b$<br>See fig. 11 and 12 | $dI_{(rec)M}/dt1$ | $T_J$ = 25 °C | | - | 350 | - | A/µs |
| | $dI_{(rec)M}/dt2$ | $T_J$ = 125 °C | | - | 270 | - | |

| THERMAL - MECHANICAL SPECIFICATIONS | | | | | | |
|---|---|---|---|---|---|---|
| **PARAMETER** | **SYMBOL** | **TEST CONDITIONS** | **MIN.** | **TYP.** | **MAX.** | **UNITS** |
| Junction to case, single leg conducting | $R_{thJC}$ | | - | - | 0.70 | °C/W |
| Junction to case, both legs conducting | | | - | - | 0.35 | |
| Case to heatsink | $R_{thCS}$ | Flat, greased surface | - | 0.05 | - | |
| Weight | | | - | 30 | - | g |
| Mounting torque | | | - | - | 1.3 | Nm |
| Case style | | | SOT-227 | | | |

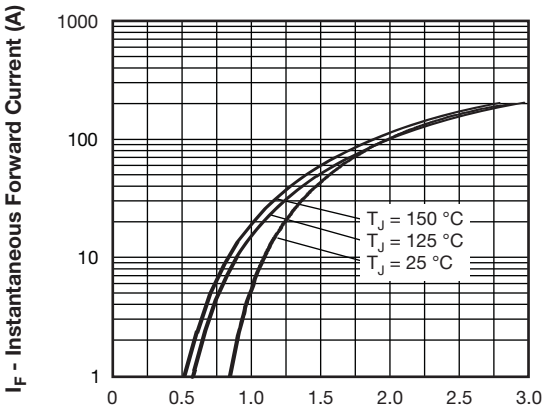



Fig. 1 - Maximum Forward Voltage Drop vs. Instantaneous Forward Current (Per Leg)

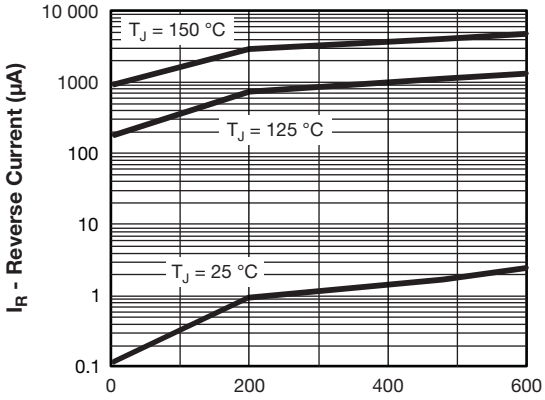



Fig. 2 - Typical Reverse Current vs. Reverse Voltage (Per Leg)

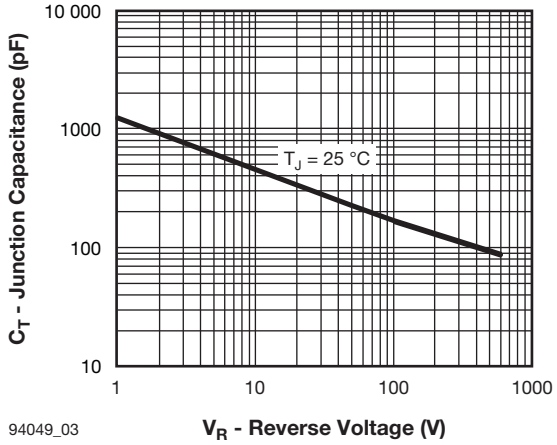



Fig. 3 - Typical Junction Capacitance vs. Reverse Voltage (Per Leg)

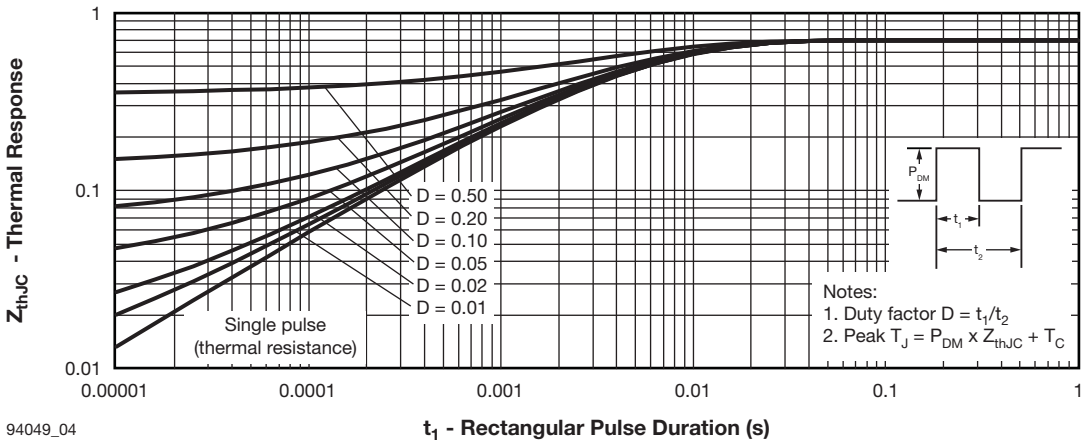



Fig. 4 - Maximum Thermal Impedance $Z_{thJC}$ Characteristics (Per Leg)

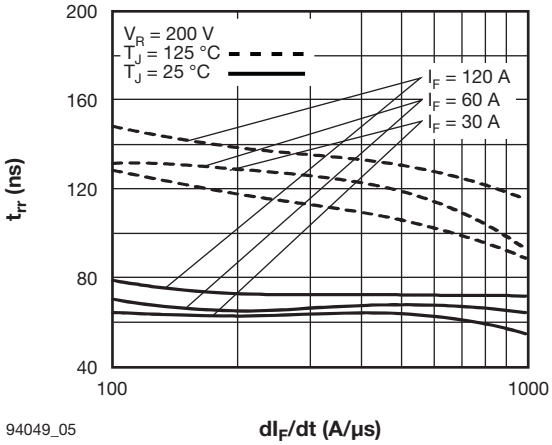



Fig. 5 - Typical Reverse Recovery Time vs. $dI_F/dt$ (Per Leg)

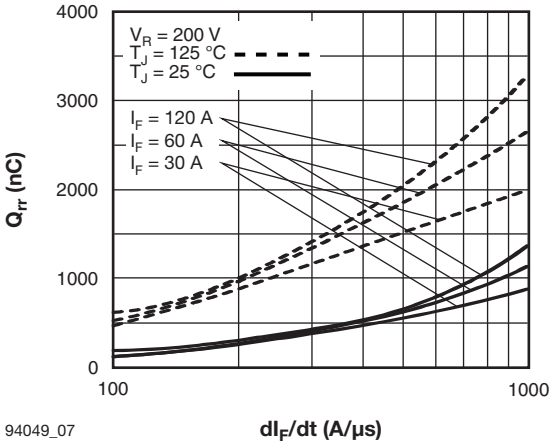



Fig. 7 - Typical Stored Charge vs. $dI_F/dt$ (Per Leg)

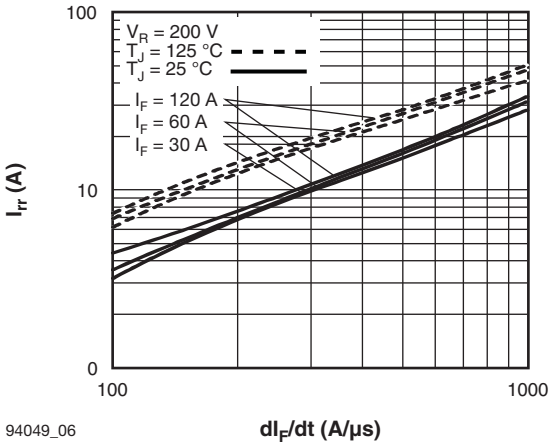



Fig. 6 - Typical Recovery Current vs. $dI_F/dt$ (Per Leg)

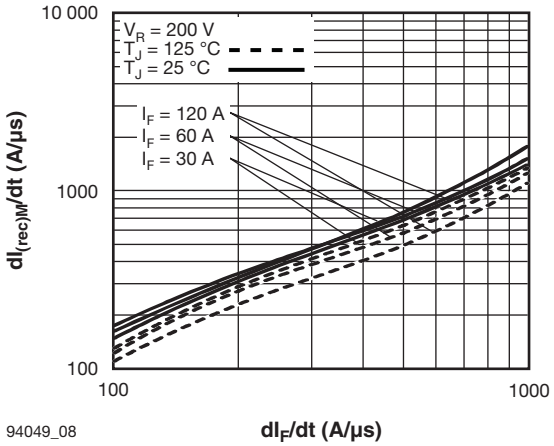



Fig. 8 - Typical $dI_{(rec)M}/dt$ vs. $dI_F/dt$ (Per Leg)

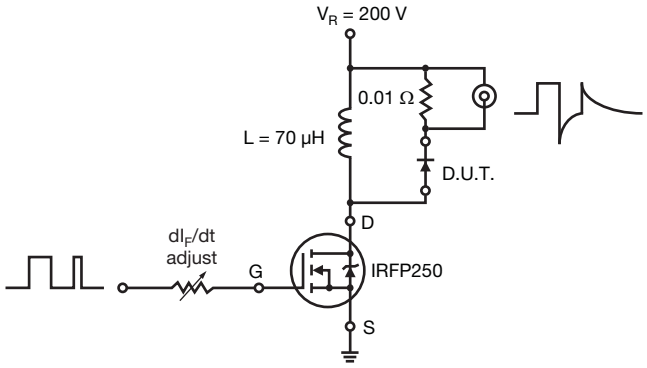
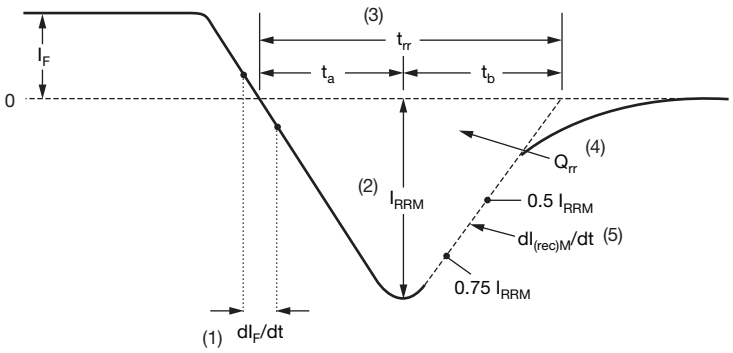



Fig. 9 - Reverse Recovery Parameter Test Circuit




(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. 10 - Reverse Recovery Waveform and Definitions

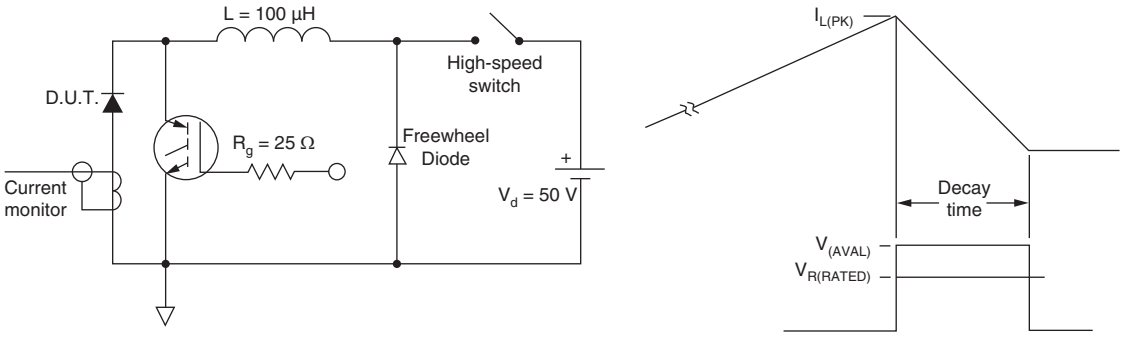
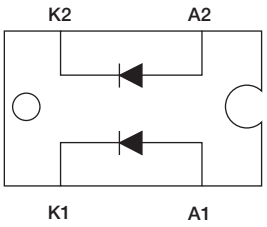



Fig. 11 - Avalanche Test Circuit and Waveforms

## CIRCUIT CONFIGURATION




## ORDERING INFORMATION TABLE

Device code

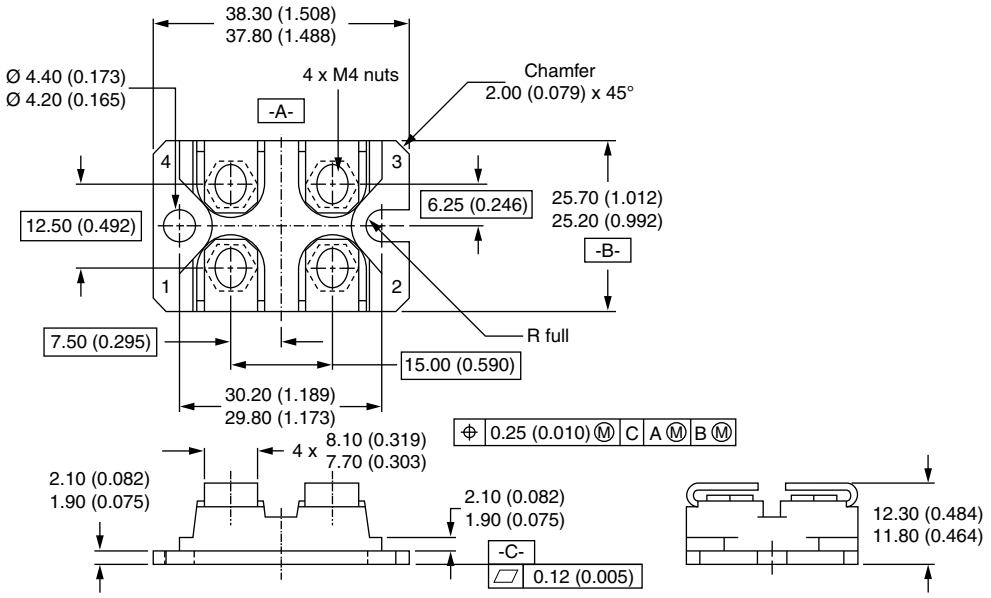
| VS- | HF | A | 120 | FA | 60 | P |
|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |

| | | |
|---|---|---|
| 1 | - | Vishay Semiconductors product |
| 2 | - | HEXFRED® family |
| 3 | - | Process: A electron irradiated |
| 4 | - | Current rating (120 = 120 A) |
| 5 | - | Package indicator (SOT-227) |
| 6 | - | Voltage rating (60 = 600 V) |
| 7 | - | P = Lead (Pb)-free |

| LINKS TO RELATED DOCUMENTS | |
|---|---|
| Dimensions | www.vishay.com/doc?95036 |
| Packaging information | www.vishay.com/doc?95037 |

# SOT-227

**DIMENSIONS** in millimeters (inches)




**Notes**

- Dimensioning and tolerancing per ANSI Y14.5M-1982
- Controlling dimension: millimeter

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