# 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
- Compliant to RoHS directive 2002/95/EC
- Designed and qualified for industrial level

Pb-free
RoHS COMPLIANT

## DESCRIPTION/APPLICATIONS

The dual diode series configuration (HFA60FA120P) 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) | 2.2 V |
| $t_{rr}$ (typical) | 123 ns |
| $I_{F(DC)}$ at $T_C$ | 30 A at 110 °C |

**ABSOLUTE MAXIMUM RATINGS**

| PARAMETER | SYMBOL | TEST CONDITIONS | MAX. | UNITS |
|---|---|---|---|---|
| Cathode to anode voltage | $V_R$ | | 1200 | V |
| Continuous forward current | $I_F$ | $T_C$ = 110 °C | 30 | A |
| Single pulse forward current | $I_{FSM}$ | $T_J$ = 25 °C | 350 | |
| Maximum repetitive forward current | $I_{FRM}$ | Rated $V_R$, square wave, 20 kHz, $T_C$ = 60 °C | 110 | |
| Maximum power dissipation | $P_D$ | $T_C$ = 25 °C | 216 | W |
| | | $T_C$ = 100 °C | 86 | |
| 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 °C unless otherwise specified)

| PARAMETER | SYMBOL | TEST CONDITIONS | MIN. | TYP. | MAX. | UNITS |
|---|---|---|---|---|---|---|
| Cathode to anode breakdown voltage | $V_{BR}$ | $I_R$ = 100 µA | 1200 | - | - | V |
| Forward voltage | $V_{FM}$ | $I_F$ = 30 A | - | 2.2 | 3.0 | |
| | | $I_F$ = 60 A | - | 2.7 | 3.8 | |
| | | $I_F$ = 60 A, $T_J$ = 150 °C | - | 3.4 | - | |
| Reverse leakage current | $I_{RM}$ | $V_R$ = $V_R$ rated | - | 1.0 | 75 | µA |
| | | $T_J$ = 150 °C, $V_R$ = $V_R$ rated | - | 2.7 | 10 | mA |

| DYNAMIC RECOVERY CHARACTERISTICS ($T_J$ = 25 °C unless otherwise specified) | | | | | | | |
|---|---|---|---|---|---|---|---|
| **PARAMETER** | **SYMBOL** | **TEST CONDITIONS** | | **MIN.** | **TYP.** | **MAX.** | **UNITS** |
| Reverse recovery time | $t_{rr}$ | $T_J$ = 25 °C | $I_F$ = 50 A<br>$dI_F/dt$ = - 200 A/µs<br>$V_R$ = 200 V | - | 123 | - | ns |
| | | $T_J$ = 125 °C | | - | 188 | - | |
| Peak recovery current | $I_{RRM}$ | $T_J$ = 25 °C | | - | 12 | - | A |
| | | $T_J$ = 125 °C | | - | 17 | - | |
| Reverse recovery charge | $Q_{rr}$ | $T_J$ = 25 °C | | - | 675 | - | nC |
| | | $T_J$ = 125 °C | | - | 1500 | - | |

| THERMAL - MECHANICAL SPECIFICATIONS | | | | | | |
|---|---|---|---|---|---|---|
| **PARAMETER** | **SYMBOL** | **TEST CONDITIONS** | **MIN.** | **TYP.** | **MAX.** | **UNITS** |
| Junction to case, single leg conducting | $R_{thJC}$ | | - | - | 0.58 | °C/W |
| Junction to case, both legs conducting | | | - | - | 0.29 | |
| Case to heatsink | $R_{thCS}$ | Flat, greased and surface | - | 0.05 | - | |
| Weight | | | - | 30 | - | g |
| Mounting torque | | | - | 1.3 | - | Nm |


For technical questions within your region, please contact one of the following:
DiodesAmericas@vishay.com, DiodesAsia@vishay.com, DiodesEurope@vishay.com
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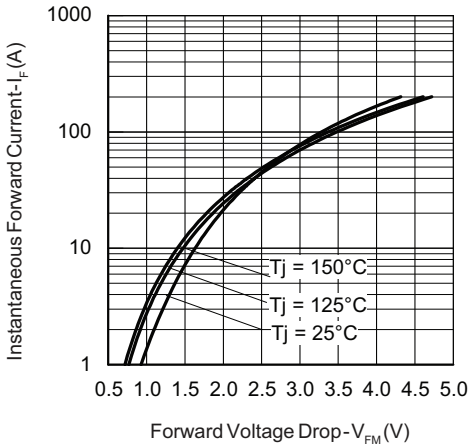


Fig. 1 - Typical Forward Voltage Drop Characteristics

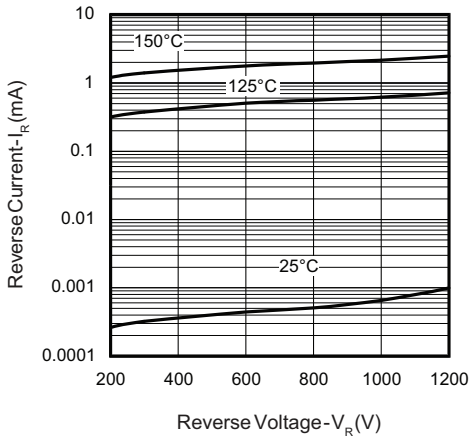


Fig. 2 - Typical Values of Reverse Current vs. Reverse Voltage

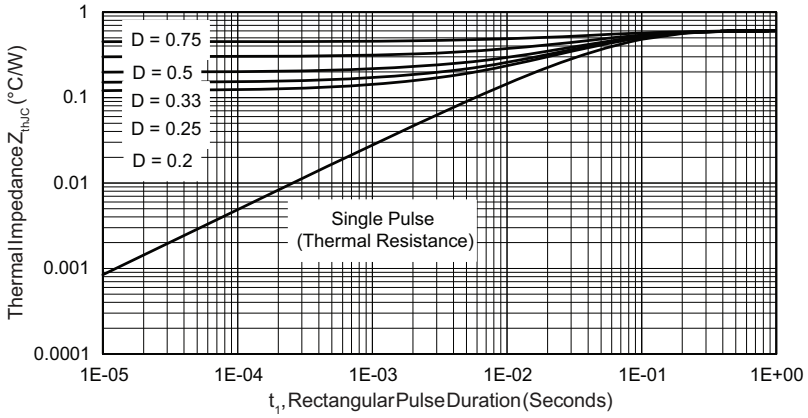


Fig. 3 - Maximum Thermal Impedance $Z_{thJC}$ Characteristics

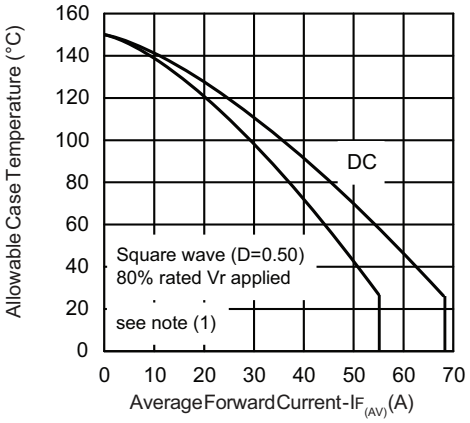


Fig. 4 - Maximum Allowable Case Temperature vs. Average Forward Current

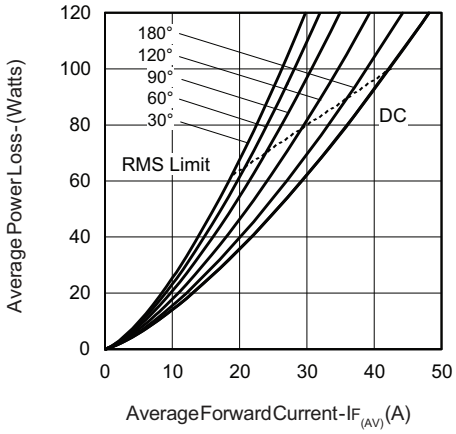


Fig. 5 - Forward Power Loss Characteristics

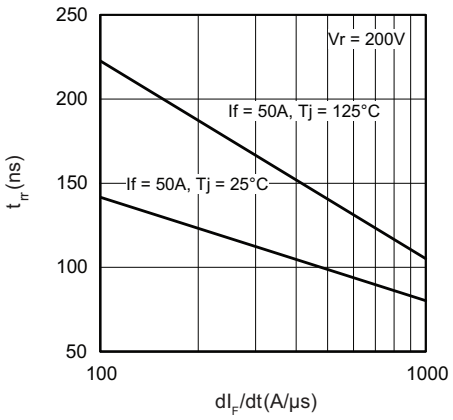


Fig. 6 - Typical Reverse Recovery Time vs. $dI_F/dt$

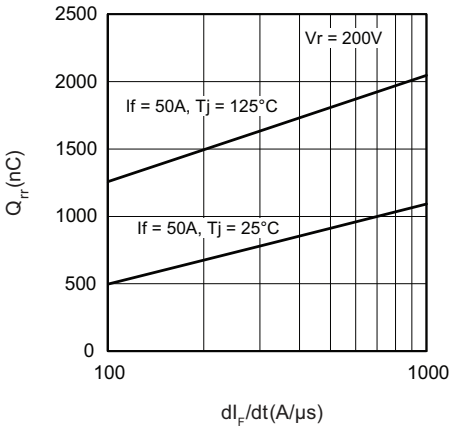


Fig. 7 - Typical Stored Charge vs. $dI_F/dt$

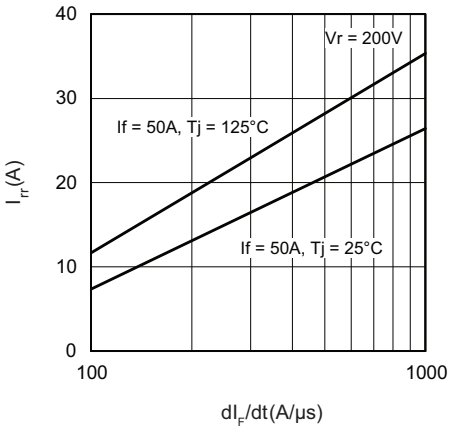


Fig. 8 - Typical Peak Recovery Current vs. $dI_F/dt$

**Note**

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



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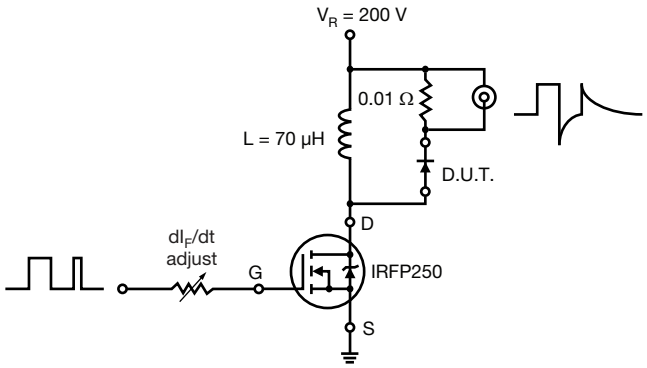
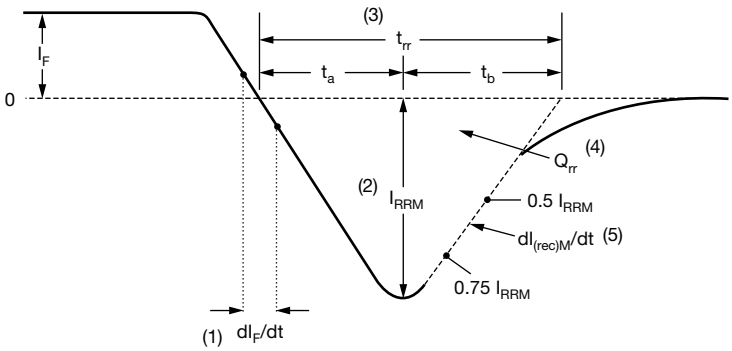



Fig. 9 - Reverse Recovery Parameter Test Circuit




(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

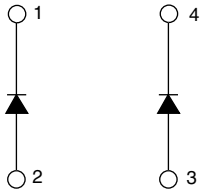
## ORDERING INFORMATION TABLE

**Device code**

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

1 - HEXFRED® family
2 - Process designator (A = Electron irradiated)
3 - Average current (60 = 60 A)
4 - Package outline (FA = SOT-227)
5 - Voltage rating (120 = 1200 V)
6 - P = Lead (Pb)-free

## CIRCUIT CONFIGURATION




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

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