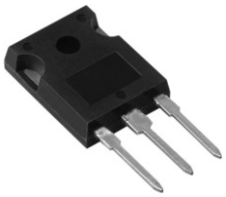
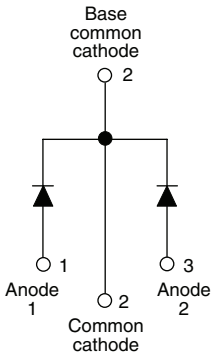
# HEXFRED®
# Ultrafast Soft Recovery Diode, 2 x 8 A



TO-247AC




## FEATURES

- Ultrafast recovery
- Ultrasoft recovery
- Very low $I_{RRM}$
- Very low $Q_{rr}$
- Specified at operating conditions
- Lead (Pb)-free
- Designed and qualified for industrial level

Pb-free Available

RoHS* COMPLIANT

## BENEFITS

- Reduced RFI and EMI
- Reduced power loss in diode and switching transistor
- Higher frequency operation
- Reduced snubbing
- Reduced parts count

## DESCRIPTION

HFA16PA120C is a state of the art ultrafast recovery diode. Employing the latest in epitaxial construction and advanced processing techniques it features a superb combination of characteristics which result in performance which is unsurpassed by any rectifier previously available. With basic ratings of 1200 V and 8 A per leg continuous current, the HFA16PA120C is especially well suited for use as the companion diode for IGBTs and MOSFETs. In addition to ultrafast recovery time, the HEXFRED® product line features extremely low values of peak recovery current ($I_{RRM}$) and does not exhibit any tendency to “snap-off” during the $t_b$ portion of recovery. The HEXFRED features combine to offer designers a rectifier with lower noise and significantly lower switching losses in both the diode and the switching transistor. These HEXFRED advantages can help to significantly reduce snubbing, component count and heatsink sizes. The HEXFRED HFA16PA120C is ideally suited for applications in power supplies and power conversion systems (such as inverters), motor drives, and many other similar applications where high speed, high efficiency is needed.

| PRODUCT SUMMARY | |
|---|---|
| $V_R$ per leg | 1200 V |
| $V_F$ at 8 A at 25 °C | 3.3 V |
| $I_{F(AV)}$ | 2 x 8 A |
| $t_{rr}$ (typical) | 28 ns |
| $T_J$ (maximum) | 150 °C |
| $I_{RRM}$ (typical) per leg | 4.5 A |

| ABSOLUTE MAXIMUM RATINGS | | | | | |
|---|---|---|---|---|---|
| PARAMETER | | SYMBOL | TEST CONDITIONS | VALUES | UNITS |
| Cathode to anode voltage | | $V_R$ | | 1200 | V |
| Maximum continuous forward current | per leg | $I_F$ | $T_C$ = 100 °C | 8 | A |
| | per device | | | 16 | |
| Single pulse forward current | | $I_{FSM}$ | | 130 | |
| Maximum repetitive forward current | | $I_{FRM}$ | | 32 | |
| Maximum power dissipation | | $P_D$ | $T_C$ = 25 °C | 73.5 | W |
| | | | $T_C$ = 100 °C | 29 | |
| Operating junction and storage temperature range | | $T_J$, $T_{Stg}$ | | - 55 to + 150 | °C |

* Pb containing terminations are not RoHS compliant, exemptions may apply

| **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 | 1200 | - | - | V |
| Maximum forward voltage | $V_{FM}$ | $I_F$ = 8.0 A | - | 2.6 | 3.3 | V |
| | | $I_F$ = 16 A | - | 3.4 | 4.3 | V |
| | | $I_F$ = 8.0 A, $T_J$ = 125 °C | - | 2.4 | 3.1 | V |
| Maximum reverse leakage current | $I_{RM}$ | $V_R = V_R$ rated | - | 0.31 | 10 | µA |
| | | $T_J$ = 125 °C, $V_R$ = 0.8 x $V_R$ rated | - | 135 | 1000 | µA |
| Junction capacitance | $C_T$ | $V_R$ = 200 V | - | 11 | 20 | pF |
| Series inductance | $L_S$ | Measured lead to lead 5 mm from package | - | 8.0 | - | nH |

| **DYNAMIC RECOVERY CHARACTERISTICS PER LEG** ($T_J$ = 25 °C unless otherwise specified) | | | | | | | |
|---|---|---|---|---|---|---|---|
| **PARAMETER** | **SYMBOL** | **TEST CONDITIONS** | | **MIN.** | **TYP.** | **MAX.** | **UNITS** |
| Reverse recovery time | $t_{rr}$ | $I_F$ = 1.0 A, $dI_F/dt$ = 200 A/µs, $V_R$ = 30 V | | - | 28 | - | ns |
| | $t_{rr1}$ | $T_J$ = 25 °C | $I_F$ = 8.0 A<br>$dI_F/dt$ = 200 A/µs<br>$V_R$ = 200 V | - | 63 | 95 | ns |
| | $t_{rr2}$ | $T_J$ = 125 °C | | - | 106 | 160 | ns |
| Peak recovery current | $I_{RRM1}$ | $T_J$ = 25 °C | | - | 4.5 | 8.0 | A |
| | $I_{RRM2}$ | $T_J$ = 125 °C | | - | 6.2 | 11 | A |
| Reverse recovery charge | $Q_{rr1}$ | $T_J$ = 25 °C | | - | 140 | 380 | nC |
| | $Q_{rr2}$ | $T_J$ = 125 °C | | - | 335 | 880 | nC |
| Peak rate of recovery current during $t_b$ | $dI_{(rec)M}/dt1$ | $T_J$ = 25 °C | | - | 133 | - | A/µs |
| | $dI_{(rec)M}/dt2$ | $T_J$ = 125 °C | | - | 85 | - | A/µs |

| **THERMAL - MECHANICAL SPECIFICATIONS** | | | | | | |
|---|---|---|---|---|---|---|
| **PARAMETER** | **SYMBOL** | **TEST CONDITIONS** | **MIN.** | **TYP.** | **MAX.** | **UNITS** |
| Lead temperature | $T_{lead}$ | 0.063" from case (1.6 mm) for 10 s | - | - | 300 | °C |
| Thermal resistance, junction to case | $R_{thJC}$ | | - | - | 1.7 | K/W |
| Thermal resistance, junction to ambient | $R_{thJA}$ | Typical socket mount | - | - | 40 | K/W |
| Thermal resistance, case to heatsink | $R_{thCS}$ | Mounting surface, flat, smooth and greased | - | 0.25 | - | K/W |
| Weight | | | - | 6.0 | - | g |
| | | | - | 0.21 | - | oz. |
| Mounting torque | | | 6.0 (5.0) | - | 12 (10) | kgf · cm (lbf · in) |
| Marking device | | Case style TO-247AC (JEDEC) | HFA16PA120C | | | |

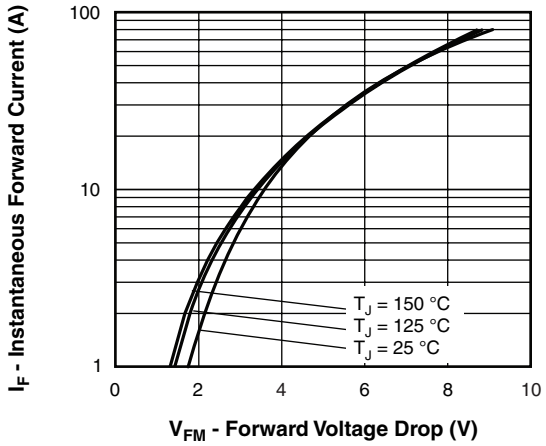



Fig. 1 - Maximum Forward Voltage Drop Characteristics

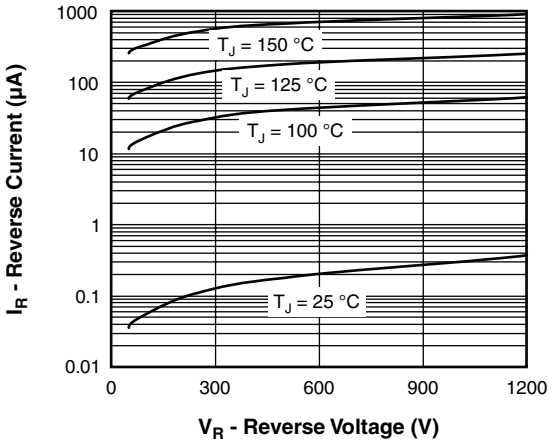



Fig. 2 - Typical Values of Reverse Current vs. Reverse Voltage

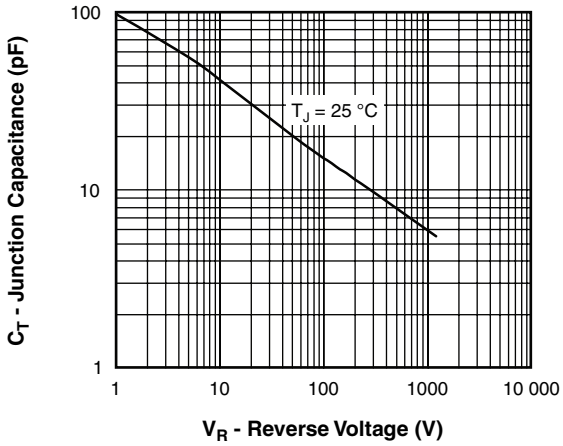



Fig. 3 - Typical Junction Capacitance vs. Reverse Voltage

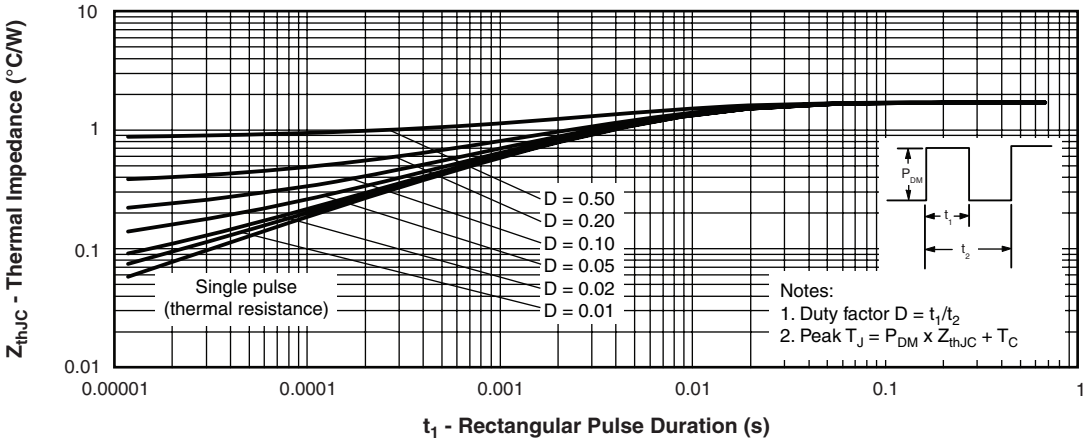



Fig. 4 - Maximum Thermal Impedance $Z_{thJC}$ Characteristics

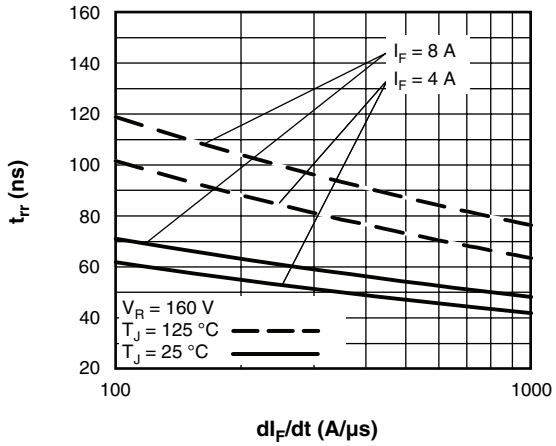



Fig. 5 - Typical Reverse Recovery Time vs. $dI_F/dt$

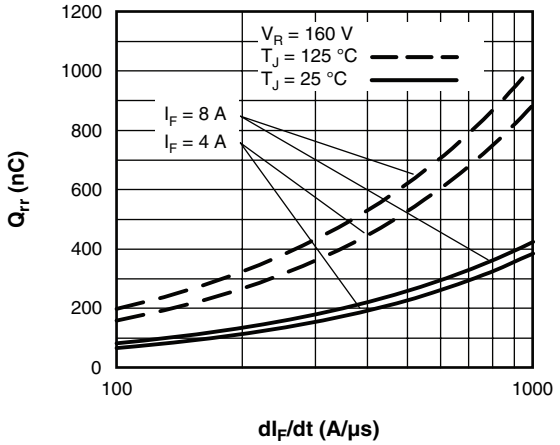



Fig. 7 - Typical Stored Charge vs. $dI_F/dt$

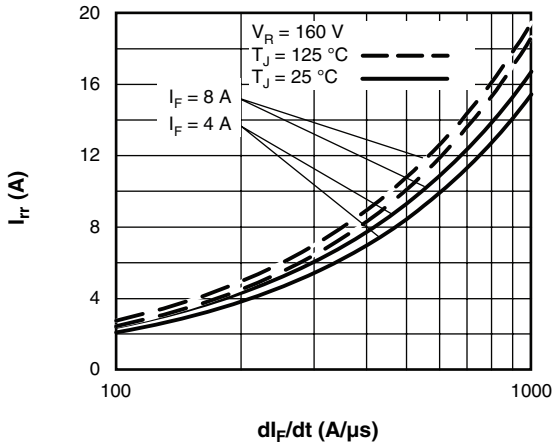



Fig. 6 - Typical Recovery Current vs. $dI_F/dt$

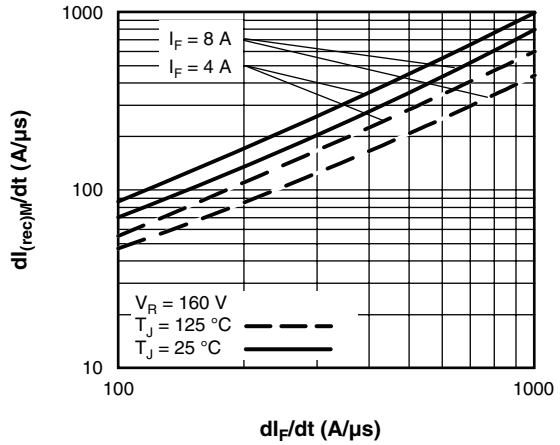



Fig. 8 - Typical $dI_{(rec)M}/dt$ vs. $dI_F/dt$

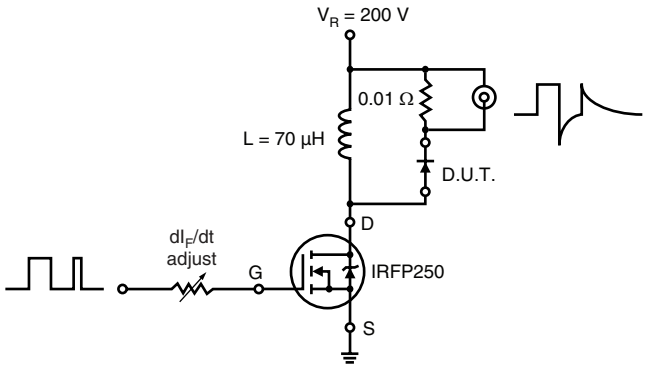
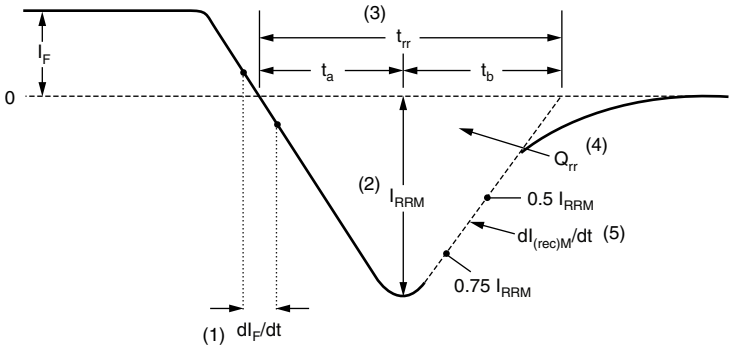



Fig. 9 - Reverse Recovery Parameter Test Circuit




(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 $I_{RRM}$

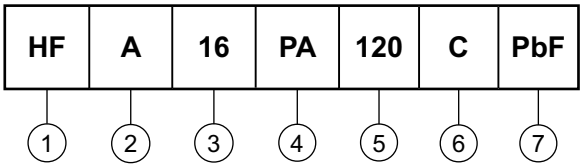
$$Q_{rr} = \frac{t_{rr} \times I_{RRM}}{2}$$

(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**




1 - HEXFRED® family

2 - Process designator: A = Subs. electron irradiated
B = Subs. platinum

3 - Current rating (16 = 16 A)

4 - Package outline (PA = TO-247, 3 pins)

5 - Voltage rating (120 = 1200 V)

6 - Configuration (C = Center tap common cathode)

7 - • None = Standard production
• PbF = Lead (Pb)-free

| LINKS TO RELATED DOCUMENTS | |
|---|---|
| Dimensions | http://www.vishay.com/doc?95223 |
| Part marking information | http://www.vishay.com/doc?95226 |

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