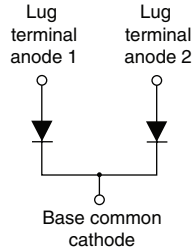


HEXFRED® Ultrafast Soft Recovery Diode, 320 A



TO-244


FEATURES

- Very low Q_{rr} and t_{rr}
- Lead (Pb)-free
- Designed and qualified for industrial level


**RoHS
COMPLIANT**
BENEFITS

- Reduced RFI and EMI
- Reduced snubbing

DESCRIPTION

HEXFRED® diodes are optimized to reduce losses and EMI/RFI in high frequency power conditioning systems. An extensive characterization of the recovery behavior for different values of current, temperature and di/dt simplifies the calculations of losses in the operating conditions. The softness of the recovery eliminates the need for a snubber in most applications. These devices are ideally suited for power converters, motors drives and other applications where switching losses are significant portion of the total losses.

PRODUCT SUMMARY

| | |
|----------------------|----------------|
| $I_{F(AV)}$ | 320 A |
| V_R | 400 V |
| $I_{F(DC)}$ at T_C | 255 A at 85 °C |

ABSOLUTE MAXIMUM RATINGS

| PARAMETER | SYMBOL | TEST CONDITIONS | MAX. | UNITS |
|--|----------------|--|-------------|-------|
| Cathode to anode voltage | V_R | | 400 | V |
| Continuous forward current | I_F | $T_C = 25\text{ °C}$ | 420 | A |
| | | $T_C = 85\text{ °C}$ | 255 | |
| | | $T_C = 115\text{ °C}$ | 160 | |
| Single pulse forward current | I_{FSM} | Limited by junction temperature | 1200 | |
| Non-repetitive avalanche energy | E_{AS} | $L = 100\ \mu\text{H}$, duty cycle limited by maximum T_J | 1.4 | mJ |
| Maximum power dissipation | P_D | $T_C = 25\text{ °C}$ | 625 | W |
| | | $T_C = 100\text{ °C}$ | 250 | |
| 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} | $I_R = 100\ \mu\text{A}$ | 400 | - | - | V | |
| Maximum forward voltage | V_{FM} | $I_F = 160\text{ A}$ | - | 1.10 | 1.35 | | |
| | | $I_F = 320\text{ A}$ | See fig. 1 | - | 1.30 | | 1.54 |
| | | $I_F = 160\text{ A}, T_J = 125\text{ °C}$ | See fig. 1 | - | 1.00 | 1.20 | |
| Maximum reverse leakage current | I_{RM} | $T_J = 125\text{ °C}, V_R = 400\text{ V}$ | See fig. 2 | - | 0.9 | 3 | mA |
| Junction capacitance | C_T | $V_R = 200\text{ V}$ | See fig. 3 | - | 370 | 500 | pF |
| Series inductance | L_S | From top of terminal hole to mounting plane | - | 5.0 | - | nH | |

| DYNAMIC RECOVERY CHARACTERISTICS (T _J = 25 °C unless otherwise specified) | | | | | | |
|--|--------------------------|---|------|------|------|-------|
| PARAMETER | SYMBOL | TEST CONDITIONS | MIN. | TYP. | MAX. | UNITS |
| Reverse recovery time See fig. 5 | t _{rr} | I _F = 1.0 A, dI _F /dt = 200 A/μs, V _R = 30 V | - | 45 | - | ns |
| | | T _J = 25 °C | - | 90 | 140 | |
| | | T _J = 125 °C | - | 290 | 440 | |
| Peak recovery current See fig. 6 | I _{RRM} | T _J = 25 °C | - | 8.7 | 20 | A |
| | | T _J = 125 °C | - | 18 | 30 | |
| Reverse recovery charge See fig. 7 | Q _{rr} | T _J = 25 °C | - | 420 | 1100 | nC |
| | | T _J = 125 °C | - | 2600 | 7000 | |
| Peak rate of recovery current See fig. 8 | dI _{(rec)M} /dt | T _J = 25 °C | - | 300 | - | A/μs |
| | | T _J = 125 °C | - | 280 | - | |

| THERMAL - MECHANICAL SPECIFICATIONS | | | | | | |
|--|-----------------------------------|----------|------|----------|---------------------|--|
| PARAMETER | SYMBOL | MIN. | TYP. | MAX. | UNITS | |
| Maximum junction and storage temperature range | T _J , T _{Stg} | - 55 | - | 150 | °C | |
| Thermal resistance, junction to case | per leg | - | - | 0.19 | °C/W K/W | |
| | per module | - | - | 0.095 | | |
| Typical thermal resistance, case to heatsink | R _{thCS} | - | 0.10 | - | | |
| Weight | | - | 68 | - | g | |
| | | - | 2.4 | - | oz. | |
| Mounting torque | (1) | 30 (3.4) | - | 40 (4.6) | N · m (lbf · in) | |
| | center hole | 12 (1.4) | - | 18 (2.1) | | |
| Terminal torque | | 30 (3.4) | - | 40 (4.6) | | |
| Vertical pull | | - | - | 80 | lbf · in | |
| 2" lever pull | | - | - | 35 | | |

Note

(1) Mounting surface must be smooth, flat, free of burrs or other protrusions. Apply a thin even film or thermal grease to mounting surface. Gradually tighten each mounting bolt in 5 to 10 lbf · in steps until desired or maximum torque limits are reached.



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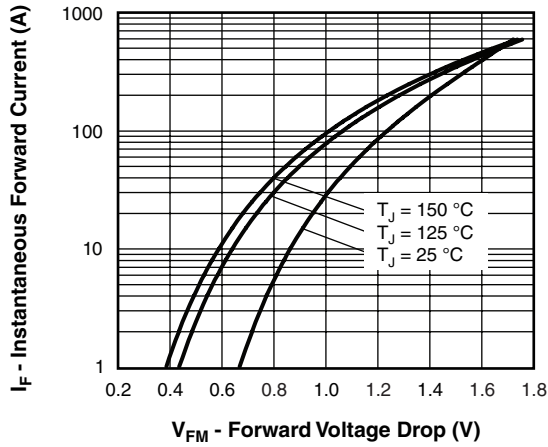


Fig. 1 - Maximum Forward Voltage Drop vs. Instantaneous Forward Current (Per Leg)

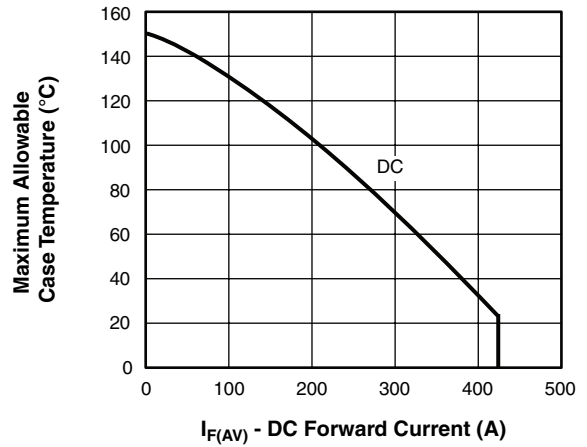


Fig. 4 - Maximum Allowable Case Temperature vs. DC Forward Current (Per Leg)

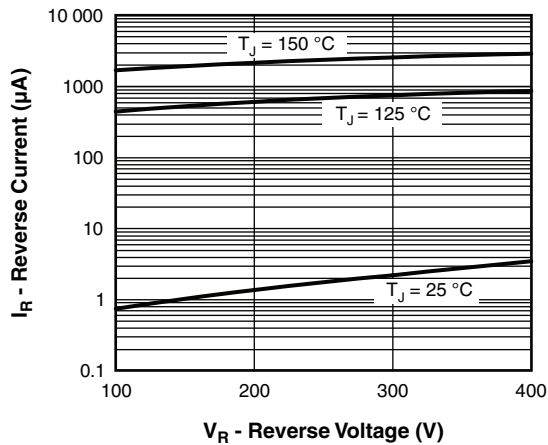


Fig. 2 - Typical Reverse Current vs. Reverse Voltage (Per Leg)

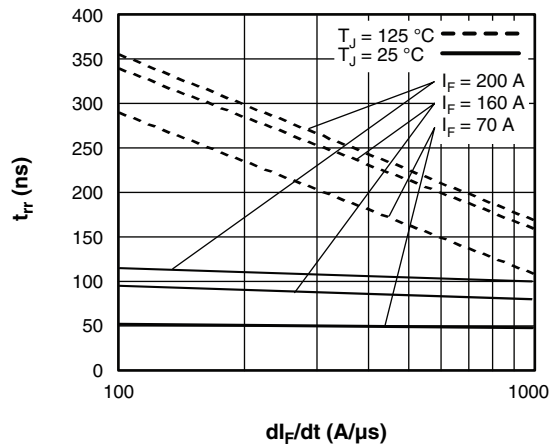


Fig. 5 - Typical Reverse Recovery Time vs. dI_F/dt (Per Leg)

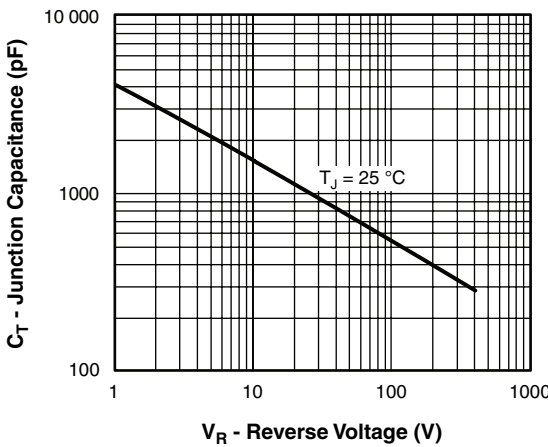


Fig. 3 - Typical Junction Capacitance vs. Reverse Voltage (Per Leg)

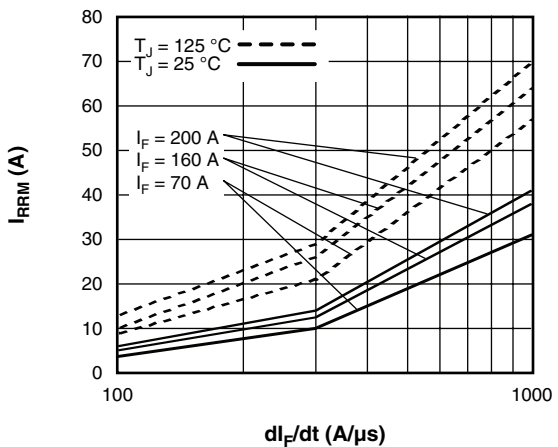


Fig. 6 - Typical Recovery Current vs. dI_F/dt (Per Leg)

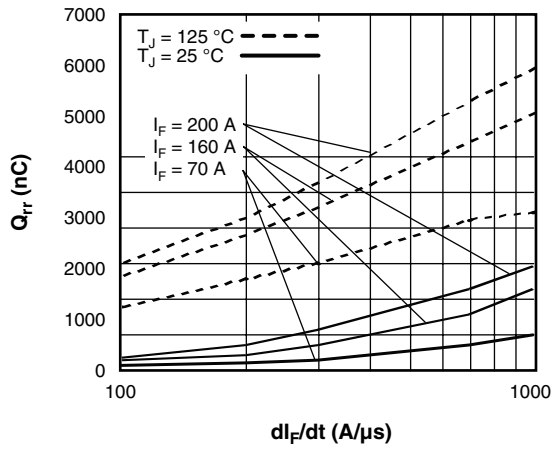


Fig. 7 - Typical Stored Charge vs. di_F/dt (Per Leg)

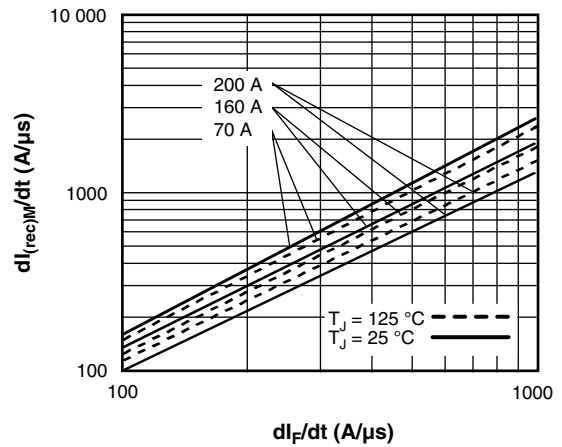


Fig. 8 - Typical $dI_{(rec)M}/dt$ vs. di_F/dt (Per Leg)

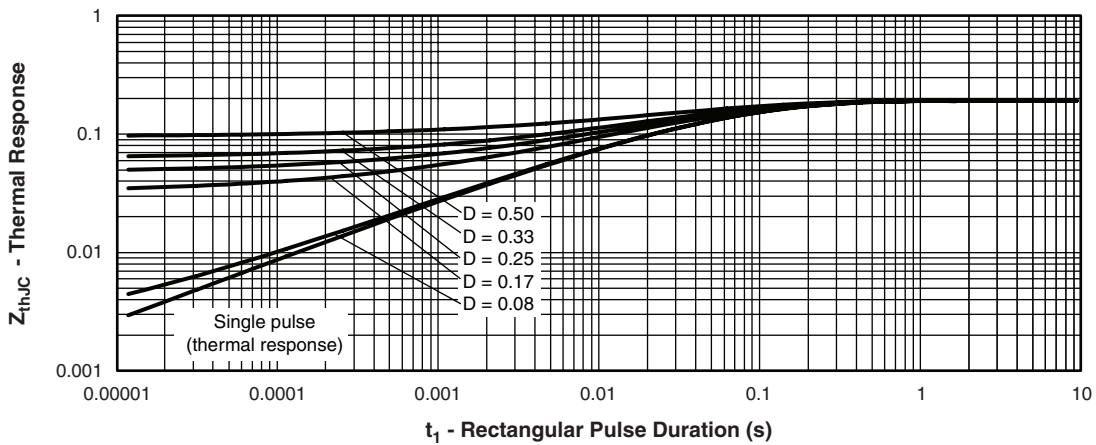


Fig. 9 - Maximum Thermal Impedance Z_{thJC} Characteristics (Per Leg)

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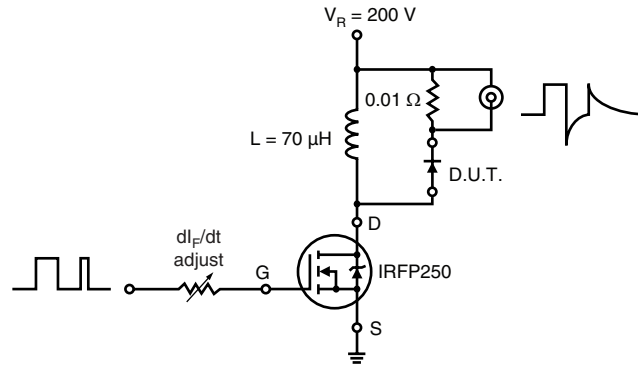
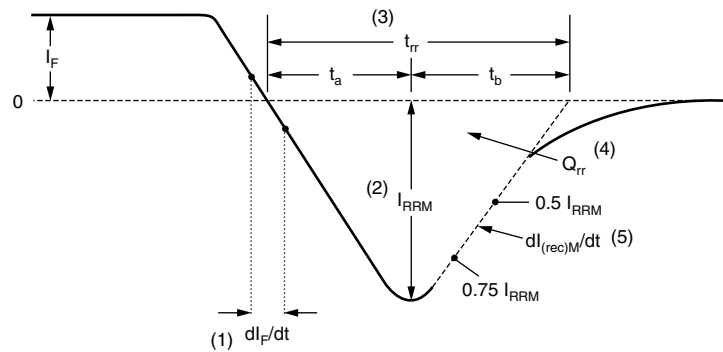


Fig. 10 - Reverse Recovery Parameter Test Circuit


 (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

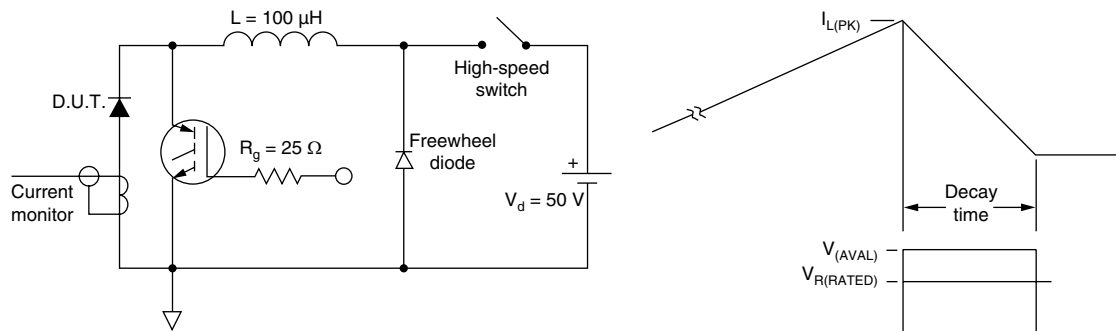


Fig. 12 - Avalanche Test Circuit and Waveforms

HFA320NJ40CPbF

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ORDERING INFORMATION TABLE

| Device code | HFA | 320 | NJ | 40 | C | PbF |
|-------------|-----|-----|--------------------------------------|----|---|-----|
| | ① | ② | ③ | ④ | ⑤ | ⑥ |
| | 1 | - | HEXFRED® family, electron irradiated | | | |
| | 2 | - | Average current rating | | | |
| | 3 | - | NJ = TO-244 | | | |
| | 4 | - | Voltage rating (400 V) | | | |
| | 5 | - | C = Common cathode | | | |
| | 6 | - | Lead (Pb)-free | | | |

LINKS TO RELATED DOCUMENTS

| | |
|------------|---|
| Dimensions | http://www.vishay.com/doc?95021 |
|------------|---|



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