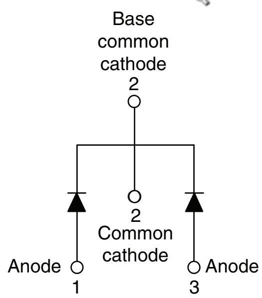
# HEXFRED®
# Ultrafast Soft Recovery Diode, 2 x 15 A




TO-220AB

## FEATURES

- Ultrafast recovery
- Ultrasoft recovery
- Very low $I_{RRM}$
- Very low $Q_{rr}$
- Guaranteed avalanche
- Specified at operating conditions
- Designed and qualified for industrial level

## BENEFITS

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

## DESCRIPTION

HFA30TA60C is a state of the art center tap 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 600 V and 15 A per leg continuous current, the HFA30TA60C 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 HFA30TA60C 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 | |
|---|---|
| $V_R$ | 600 V |
| $V_F$ at 15 A at 25 °C | 1.7 V |
| $I_{F(AV)}$ | 2 x 15 A |
| $t_{rr}$ (typical) | 19 ns |
| $T_J$ (maximum) | 150 °C |
| $Q_{rr}$ (typical) | 80 nC |
| $dI_{(rec)M}/dt$ (typical) at 125 °C | 160 A/µs |
| $I_{RRM}$ (typical) | 4.0 A |

**ABSOLUTE MAXIMUM RATINGS**

| PARAMETER | | SYMBOL | TEST CONDITIONS | VALUES | UNITS |
|---|---|---|---|---|---|
| Cathode to anode voltage | | $V_R$ | | 600 | V |
| Maximum continuous forward current | per leg | $I_F$ | $T_C$ = 100 °C | 15 | A |
| | per device | | | 30 | |
| Single pulse forward current | | $I_{FSM}$ | | 150 | |
| Maximum repetitive forward current | | $I_{FRM}$ | | 60 | |
| Maximum power dissipation | | $P_D$ | $T_C$ = 25 °C | 74 | W |
| | | | $T_C$ = 100 °C | 29 | |
| 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 | $V_{FM}$ | $I_F$ = 15 A | See fig. 1 | - | 1.3 | 1.7 | |
| | | $I_F$ = 30 A | | - | 1.5 | 2.0 | |
| | | $I_F$ = 15 A, $T_J$ = 125 °C | | - | 1.2 | 1.6 | |
| Maximum reverse leakage current | $I_{RM}$ | $V_R$ = $V_R$ rated | See fig. 2 | - | 1.0 | 10 | µA |
| | | $T_J$ = 125 °C, $V_R$ = 0.8 x $V_R$ rated | | - | 400 | 1000 | |
| Junction capacitance | $C_T$ | $V_R$ = 200 V | See fig. 3 | - | 25 | 50 | pF |
| Series inductance | $L_S$ | Measured lead to lead 5 mm from package body | | - | 8 | - | nH |

| DYNAMIC RECOVERY CHARACTERISTICS PER LEG ($T_J$ = 25 °C unless otherwise specified) | | | | | | | |
|---|---|---|---|---|---|---|---|
| PARAMETER | SYMBOL | TEST CONDITIONS | | MIN. | TYP. | MAX. | UNITS |
| Reverse recovery time See fig. 5 and 10 | $t_{rr}$ | $I_F$ = 1.0 A, $dI_F/dt$ = 200 A/µs, $V_R$ = 30 V | | - | 19 | - | ns |
| | $t_{rr1}$ | $T_J$ = 25 °C | $I_F$ = 15 A<br>$dI_F/dt$ = 200 A/µs<br>$V_R$ = 200 V | - | 42 | 60 | |
| | $t_{rr2}$ | $T_J$ = 125 °C | | - | 70 | 120 | |
| Peak recovery current See fig. 6 | $I_{RRM1}$ | $T_J$ = 25 °C | | - | 4.0 | 6.0 | A |
| | $I_{RRM2}$ | $T_J$ = 125 °C | | - | 6.5 | 10 | |
| Reverse recovery charge See fig. 7 | $Q_{rr1}$ | $T_J$ = 25 °C | | - | 80 | 180 | nC |
| | $Q_{rr2}$ | $T_J$ = 125 °C | | - | 220 | 600 | |
| Peak rate of fall of recovery current during $t_b$ See fig. 8 | $dI_{(rec)M}/dt1$ | $T_J$ = 25 °C | | - | 250 | - | A/µs |
| | $dI_{(rec)M}/dt2$ | $T_J$ = 125 °C | | - | 160 | - | |

| THERMAL - MECHANICAL SPECIFICATIONS PER LEG | | | | | | |
|---|---|---|---|---|---|---|
| PARAMETER | SYMBOL | TEST CONDITIONS | MIN. | TYP. | MAX. | UNITS |
| Lead temperature | $T_{lead}$ | 0.063" from case (1.6 mm) for 10 s | - | - | 300 | °C |
| Junction to case, single leg conducting | $R_{thJC}$ | | | | 1.7 | K/W |
| Junction to case, both legs conducting | | | - | - | 0.85 | |
| Thermal resistance, junction to ambient | $R_{thJA}$ | Typical socket mount | - | - | 40 | |
| Thermal resistance, case to heatsink | $R_{thCS}$ | Mounting surface, flat, smooth and greased | - | 0.25 | - | |
| Weight | | | - | 6.0 | - | g |
| | | | - | 0.21 | - | oz. |
| Mounting torque | | | 6.0<br>(5.0) | - | 12<br>(10) | kgf · cm<br>(lbf · in) |
| Marking device | | Case style TO-220AB | HFA30TA60C | | | |

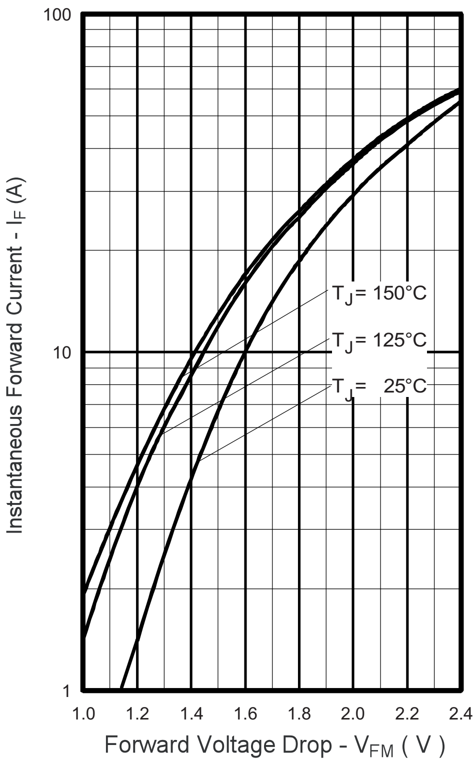



Fig. 1 - Maximum Forward Voltage Drop vs. Instantaneous Forward Current (Per Leg)

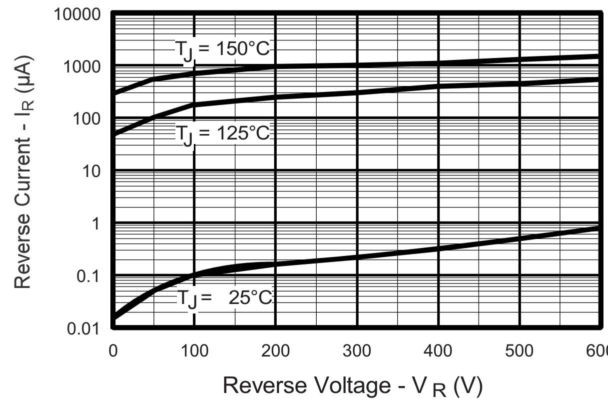



Fig. 2 - Typical Reverse Current vs. Reverse Voltage (Per Leg)

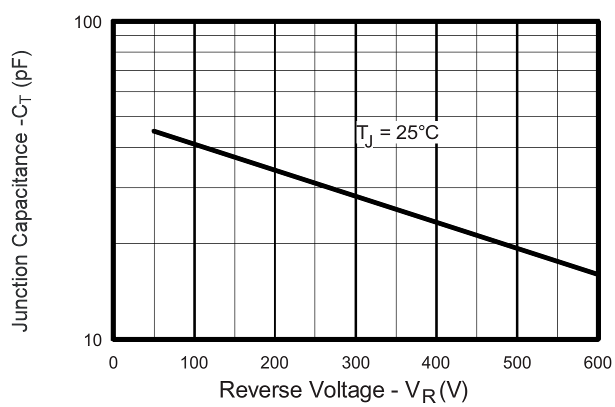



Fig. 3 - Typical Junction Capacitance vs. Reverse Voltage (Per Leg)

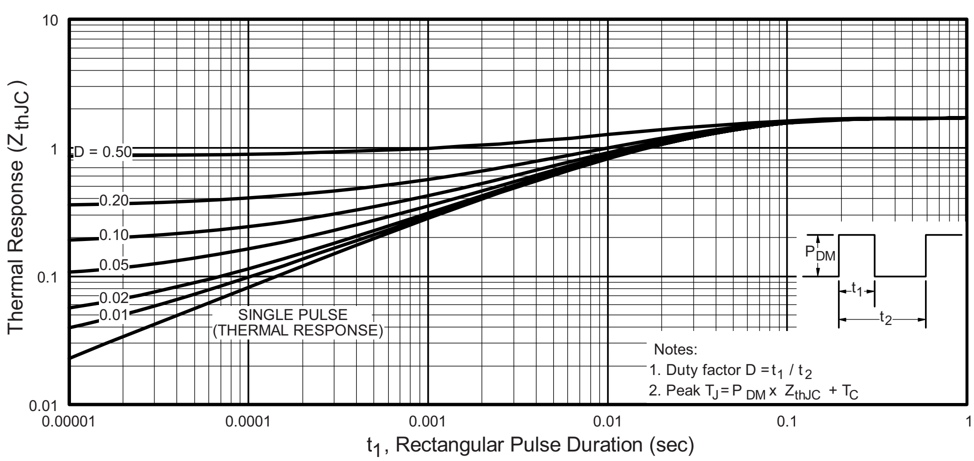



Fig. 4 - Maximum Thermal Impedance $Z_{thJC}$ Characteristics (Per Leg)

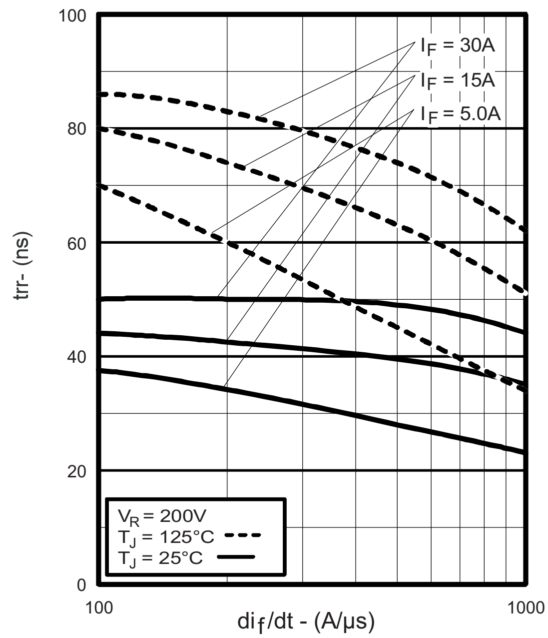



Fig. 5 - Typical Reverse Recovery Time vs. $dI_F/dt$ (Per Leg)

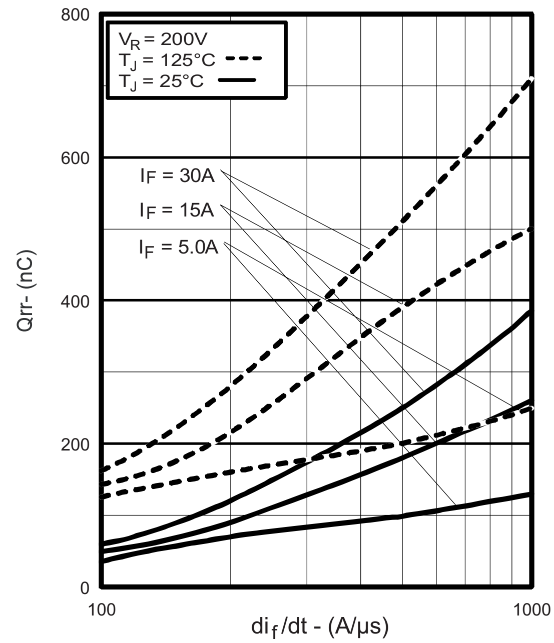



Fig. 7 - Typical Stored Charge vs. $dI_F/dt$ (Per Leg)

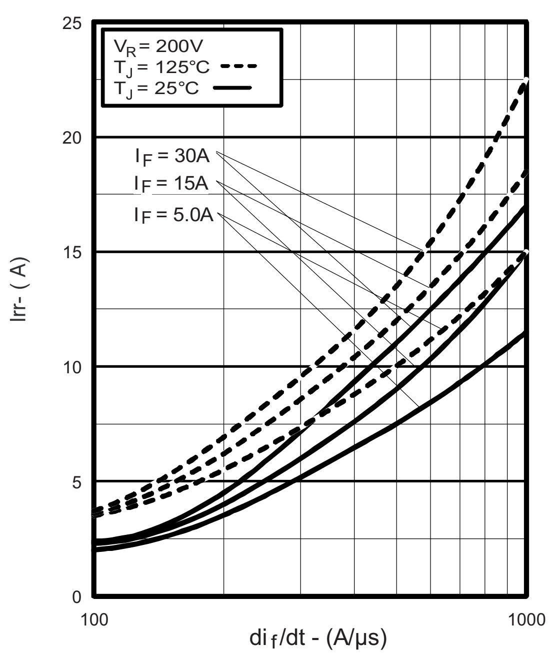



Fig. 6 - Typical Recovery Current vs. $dI_F/dt$ (Per Leg)

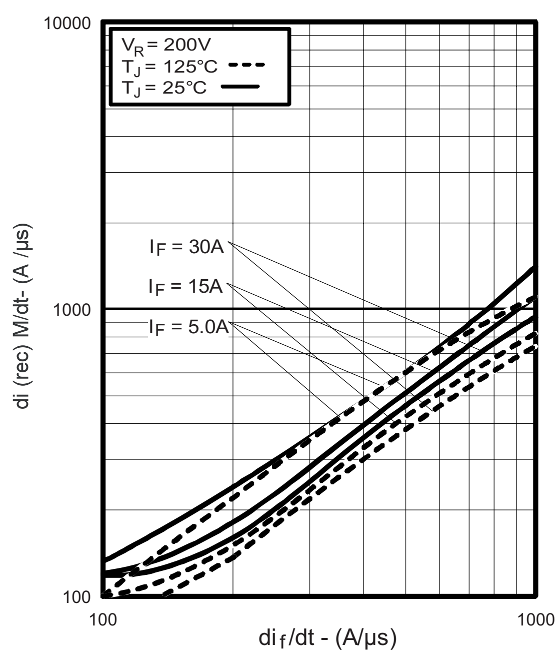



Fig. 8 - Typical $dI_{(rec)M}/dt$ vs. $dI_F/dt$ (Per Leg)

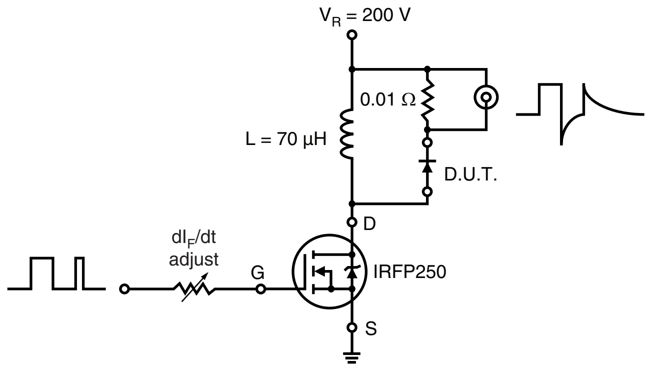
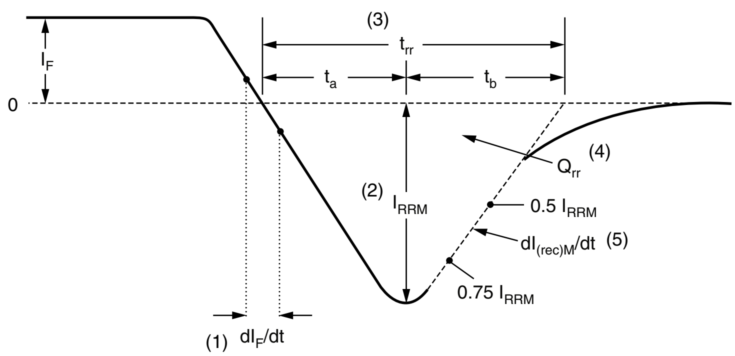



Fig. 9 - Reverse Recovery Parameter Test Circuit




(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

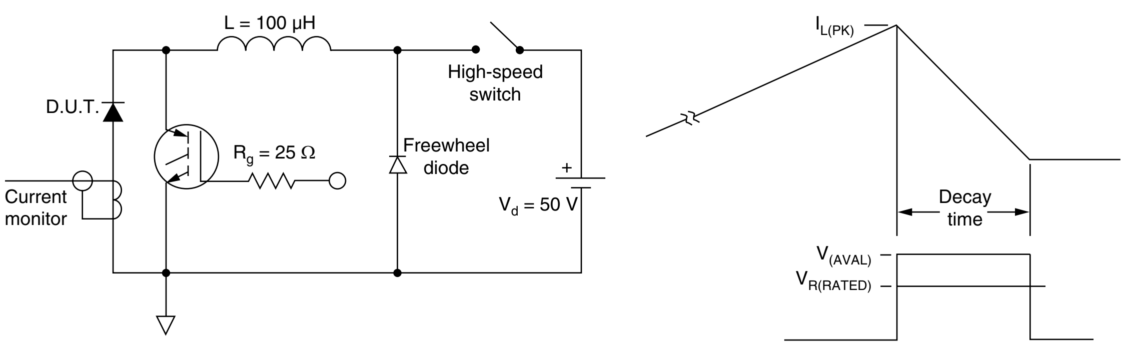



Fig. 11 - Avalanche Test Circuit and Waveforms

| LINKS TO RELATED DOCUMENTS | |
|---|---|
| Dimensions | http://www.vishay.com/doc?95222 |
| Part marking information | http://www.vishay.com/doc?95225 |

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