

Ultrafast Soft Recovery Diode

Features

- Ultrafast Recovery
- 175°C Operating Junction Temperature
- Lead-Free ("PbF" suffix)

Benefits

- Reduced RFI and EMI
- Higher Frequency Operation
- Reduced Snubbing
- Reduced Parts Count

Description/ Applications

These diodes are optimized to reduce losses and EMI/ RFI in high frequency power conditioning systems. The softness of the recovery eliminates the need for a snubber in most applications. These devices are ideally suited for HF welding, power converters and other applications where switching losses are not significant portion of the total losses.

$$t_{rr} = 50\text{ns (typ)}$$

$$I_{F(AV)} = 60\text{Amp}$$

$$V_R = 400\text{V}$$

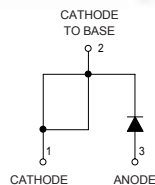
Absolute Maximum Ratings

| Parameters | Max | Units |
|---|-------------|------------------|
| V_R Cathode to Anode Voltage | 400 | V |
| $I_{F(AV)}$ Continuous Forward Current, $T_C = 127^\circ\text{C}$ | 60 | A |
| I_{FSM} Single Pulse Forward Current, $T_C = 25^\circ\text{C}$ | 600 | |
| I_{FRM} ① Maximum Repetitive Forward Current | 120 | |
| T_J, T_{STG} Operating Junction and Storage Temperatures | - 55 to 175 | $^\circ\text{C}$ |

① Square Wave, 20kHz

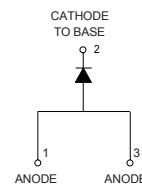
Case Styles

60EPU04PbF



TO-247AC (Modified)

60APU04PbF



TO-247AC

Electrical Characteristics @ T_J = 25°C (unless otherwise specified)

| Parameters | Min | Typ | Max | Units | Test Conditions |
|--|-----|------|------|-------|---|
| V _{BR} , V _r Breakdown Voltage, Blocking Voltage | 400 | - | - | V | I _R = 100μA |
| V _F Forward Voltage | - | 1.05 | 1.25 | V | I _F = 60A |
| | - | 0.87 | 1.03 | V | I _F = 60A, T _J = 175°C |
| | - | 0.93 | 1.10 | V | I _F = 60A, T _J = 125°C |
| I _R Reverse Leakage Current | - | - | 50 | μA | V _R = V _R Rated |
| | - | - | 2 | mA | T _J = 150°C, V _R = V _R Rated |
| C _T Junction Capacitance | - | 50 | - | pF | V _R = 400V |
| L _S Series Inductance | - | 3.5 | - | nH | Measured lead to lead 5mm from package body |

Dynamic Recovery Characteristics @ T_J = 25°C (unless otherwise specified)

| Parameters | Min | Typ | Max | Units | Test Conditions |
|---|-----|------|-----|-------|--|
| t _{rr} Reverse Recovery Time | - | 50 | 60 | ns | I _F = 1A, di _F /dt = 200A/μs, V _R = 30V |
| | - | 85 | - | | T _J = 25°C |
| | - | 145 | - | | T _J = 125°C |
| I _R RM Peak Recovery Current | - | 8.8 | - | A | T _J = 25°C |
| | - | 15.4 | - | | T _J = 125°C |
| Q _{rr} Reverse Recovery Charge | - | 375 | - | nC | T _J = 25°C |
| | - | 1120 | - | | T _J = 125°C |

Thermal - Mechanical Characteristics

| Parameters | Min | Typ | Max | Units |
|--|------------------|-----|----------|--------------|
| R _{thJC} Thermal Resistance, Junction to Case | | | 0.70 | K/W |
| R _{thCS} ② Thermal Resistance, Case to Heatsink | | 0.2 | | |
| Wt Weight | | 5.5 | | g |
| | | 0.2 | | (oz) |
| T Mounting Torque | 1.2 (10) | | 2.4 (20) | N*m (lbf.in) |
| Marking Device | 60EPU04, 60APU04 | | | |

② Mounting Surface, Flat, Smooth and Greased

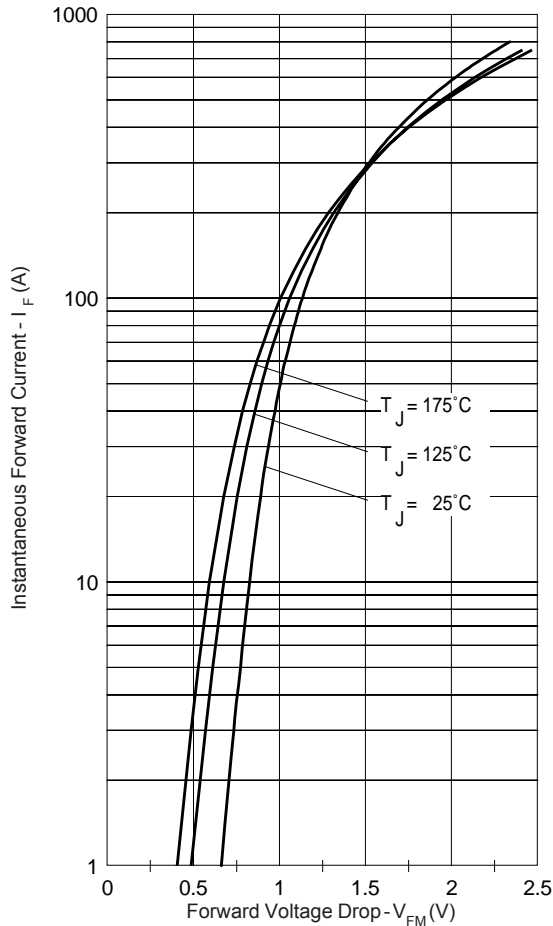


Fig. 1 - Typical Forward Voltage Drop Characteristics

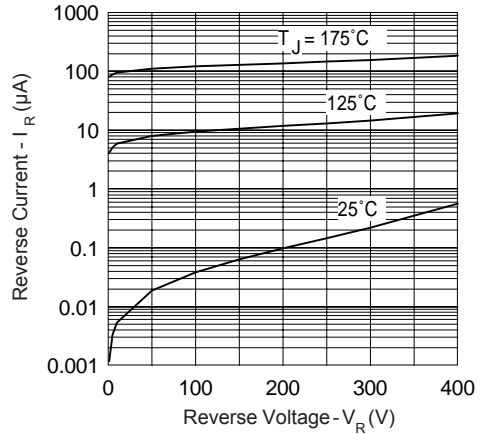


Fig. 2 - Typical Values Of Reverse Current Vs. Reverse Voltage

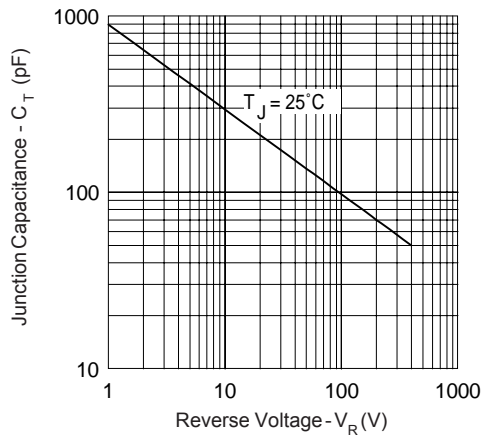


Fig. 3 - Typical Junction Capacitance Vs. Reverse Voltage

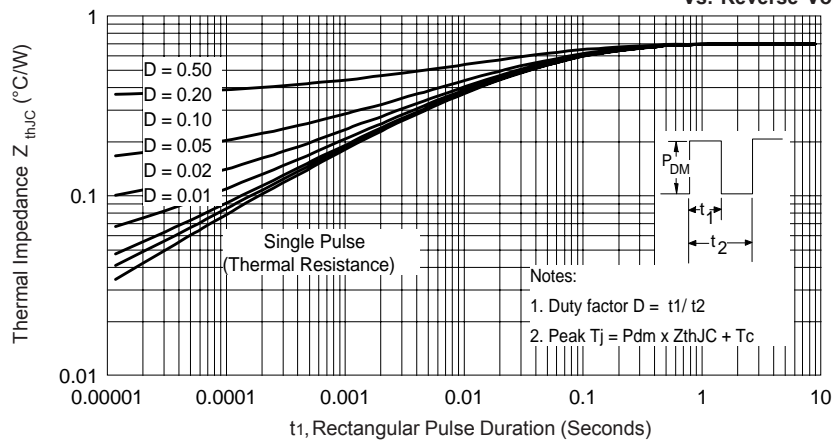


Fig. 4 - Max. Thermal Impedance Z_{thJC} Characteristics

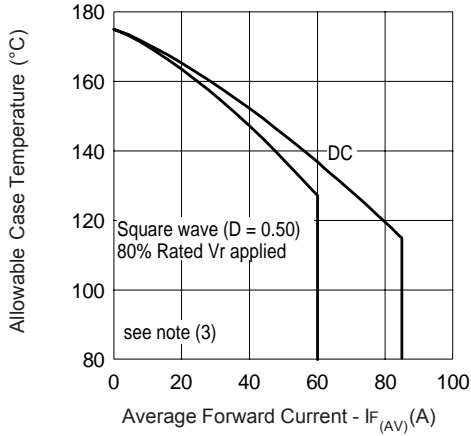


Fig. 5 - Max. Allowable Case Temperature Vs. Average Forward Current

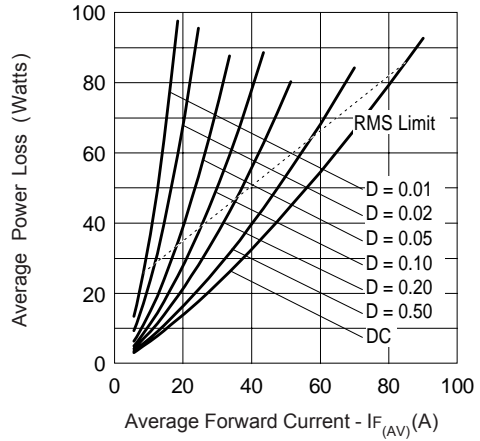


Fig. 6 - Forward Power Loss Characteristics

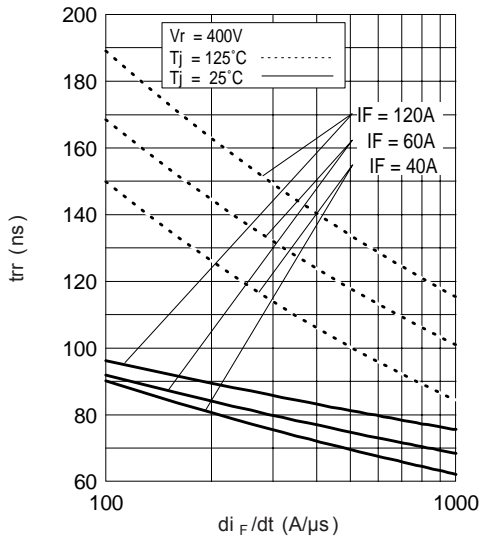


Fig. 7 - Typical Reverse Recovery time vs. di_F/dt

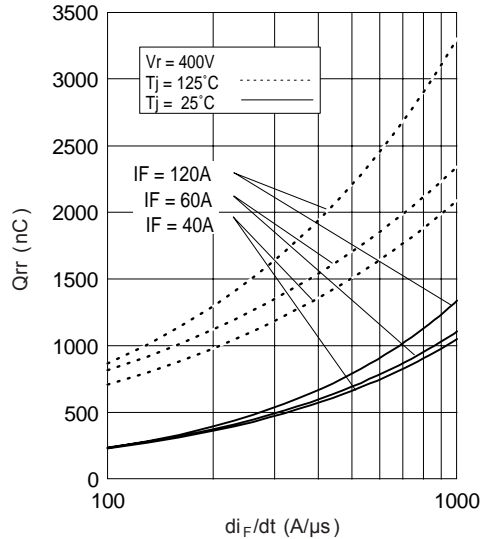


Fig. 8 - Typical Stored Charge vs. di_F/dt

(3) Formula used: $T_C = T_J - (P_d + P_{d_{REV}}) \times R_{thJC}$;

P_d = Forward Power Loss = $I_{F(AV)} \times V_{FM} @ (I_{F(AV)} / D)$ (see Fig. 6);

$P_{d_{REV}}$ = Inverse Power Loss = $V_{R1} \times I_R (1 - D)$; $I_R @ V_{R1} = 80\%$ rated V_R

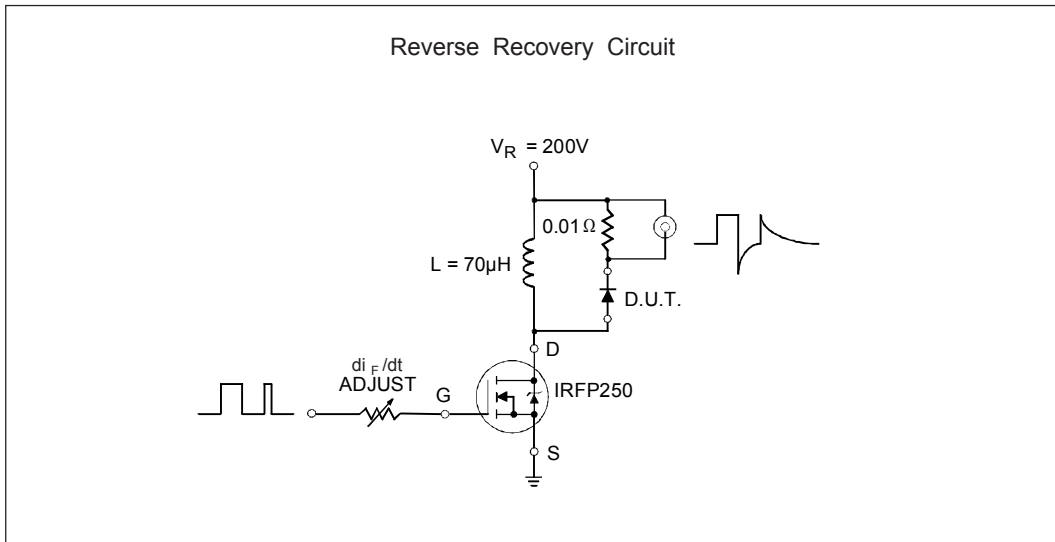


Fig. 9- Reverse Recovery Parameter Test Circuit

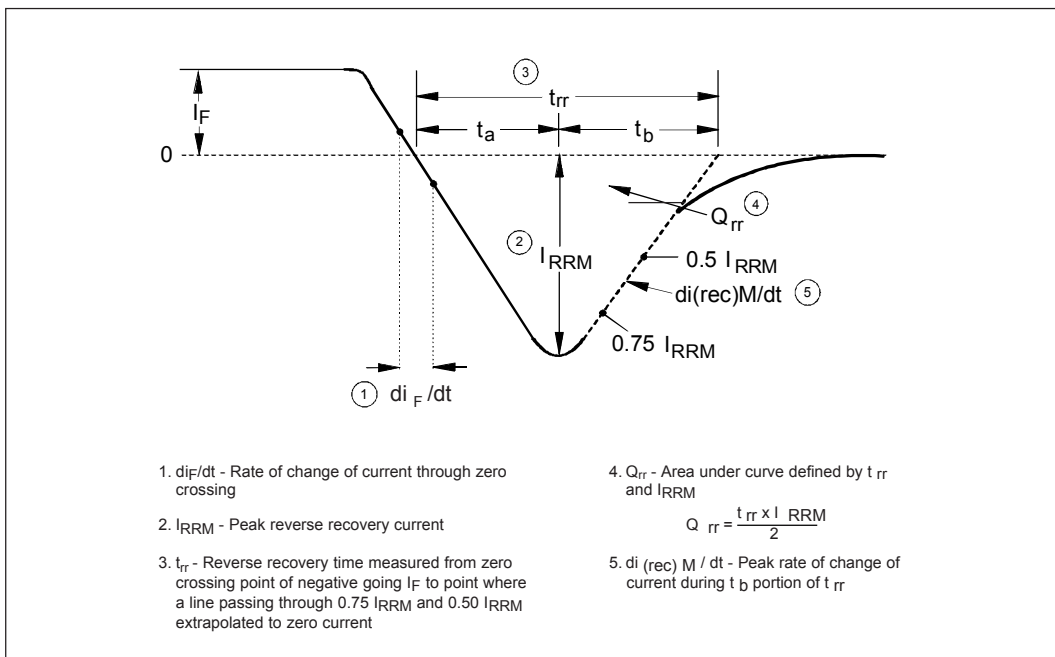
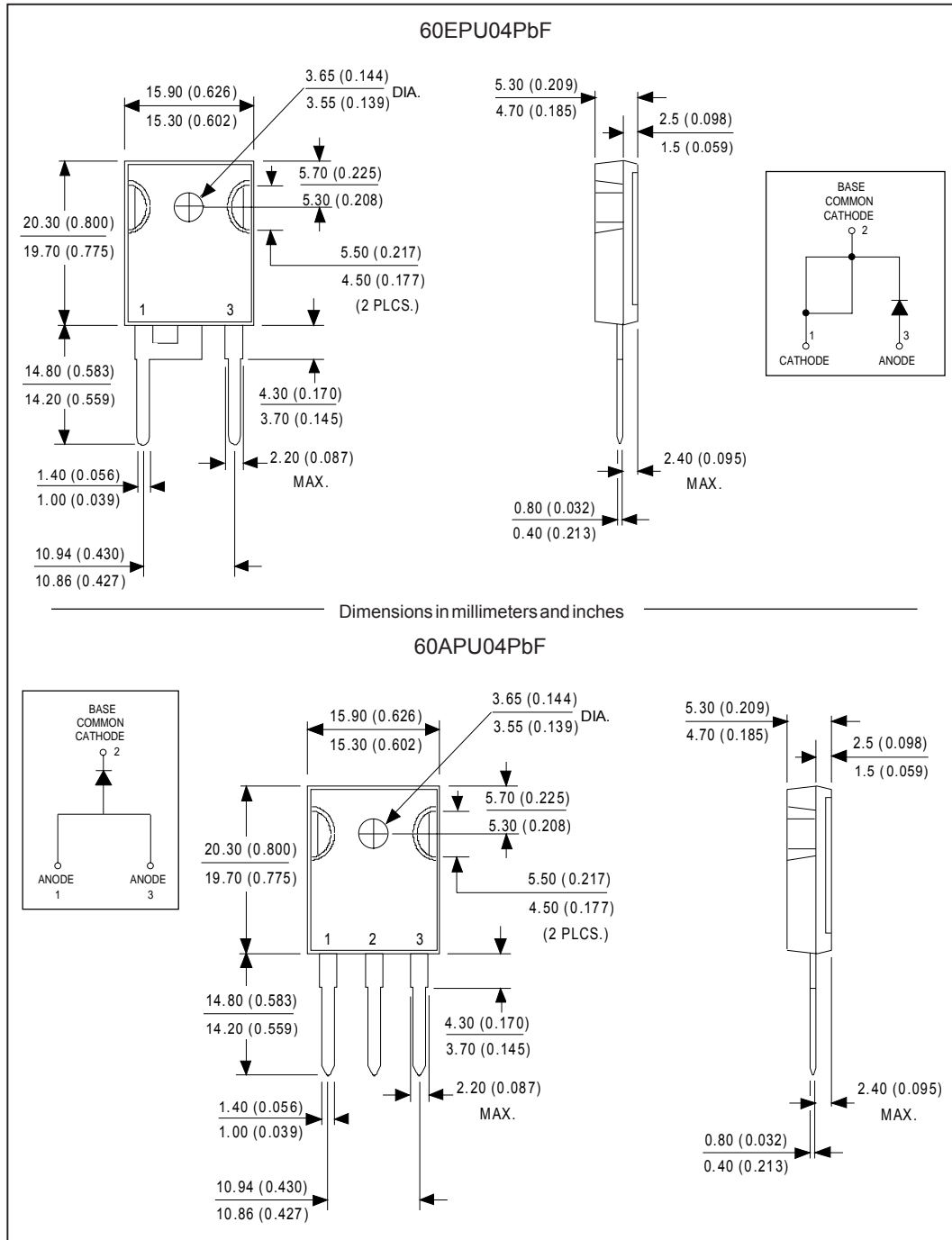


Fig. 10 - Reverse Recovery Waveform and Definitions

Outline Table



Marking Information

EXAMPLE: THIS IS A 60EPU04
 WITH ASSEMBLY
 LOT CODE 5657
 ASSEMBLED ON WW 35, 2000
 IN ASSEMBLY LINE "H"

INTERNATIONAL
RECTIFIER
LOGO

ASSEMBLY
LOT CODE

PART NUMBER

DATE CODE
 P = LEAD-FREE
 YEAR 0 = 2000
 WEEK 35
 LINE H

EXAMPLE: THIS IS A 60APU04
 WITH ASSEMBLY
 LOT CODE 5657
 ASSEMBLED ON WW 35, 2000
 IN ASSEMBLY LINE "H"

INTERNATIONAL
RECTIFIER
LOGO

ASSEMBLY
LOT CODE

PART NUMBER

DATE CODE
 P = LEAD-FREE
 YEAR 0 = 2000
 WEEK 35
 LINE H

Ordering Information Table

| Device Code | | | | | |
|-------------|--|---|---|----|-----|
| 60 | E | P | U | 04 | PbF |
| ① | ② | ③ | ④ | ⑤ | ⑥ |
| 1 | - Current Rating (60 = 60A) | | | | |
| 2 | - Circuit Configuration: E = Single Diode A = Single Diode, 3 pins | | | | |
| 3 | - Package: P = TO-247AC (Modified) | | | | |
| 4 | - Type of Silicon: U = UltraFast Recovery | | | | |
| 5 | - Voltage Rating (04 = 400V) | | | | |
| 6 | - • none = Standard Production • PbF = Lead-Free | | | | |

60EPU04PbF, 60APU04PbF

Bulletin PD-21080 08/05

International
IOR Rectifier

Data and specifications subject to change without notice.
This product has been designed and qualified for Industrial Level and Lead-Free.
Qualification Standards can be found on IR's Web site.

International
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IR WORLD HEADQUARTERS: 233 Kansas St., El Segundo, California 90245, USA Tel: (310) 252-7105
TAC Fax: (310) 252-7309
Visit us at www.irf.com for sales contact information. 08/05