



ON Semiconductor®

February 2018

## FFPF20UA60DN

### 20 A, 600 V, Ultrafast II Dual Diode

#### Features

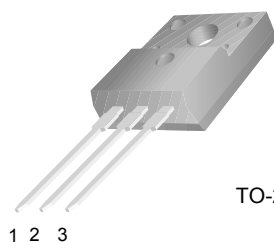
- Ultrafast Recovery  $t_{rr} = 120$  ns (@  $I_F = 10$  A)
- Max Forward Voltage,  $V_F = 2.3$  V (@  $T_C = 25^\circ\text{C}$ )
- 600 V Reverse Voltage and High Reliability
- Avalanche Energy Rated
- RoHS Compliant

#### Applications

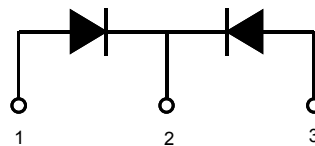
- Boost Diode in PFC and SMPS

#### Description

The FFPF20UA60DN is an ultrafast II dual diode with low forward voltage drop and rugged UIS capability. This device is intended for use as freewheeling and clamping diodes in a variety of switching power supplies and other power switching applications. It is specially suited for use in switching power supplies and industrial applications as welder and UPS application.



TO-220F



1. Anode 2. Cathode 3. Anode

#### Absolute Maximum Ratings $T_C = 25^\circ\text{C}$ unless otherwise noted

| Symbol         | Parameter                                                       | Rating      | Unit             |
|----------------|-----------------------------------------------------------------|-------------|------------------|
| $V_{RRM}$      | Peak Repetitive Reverse Voltage                                 | 600         | V                |
| $V_{RWM}$      | Working Peak Reverse Voltage                                    | 600         | V                |
| $V_R$          | DC Blocking Voltage                                             | 600         | V                |
| $I_{F(AV)}$    | Average Rectified Forward Current @ $T_C = 25^\circ\text{C}$    | 10          | A                |
| $I_{FSM}$      | Non-repetitive Peak Surge Current<br>60Hz Single Half-Sine Wave | 50          | A                |
| $T_J, T_{STG}$ | Operating and Storage Temperature Range                         | -65 to +175 | $^\circ\text{C}$ |

#### Thermal Characteristics $T_C = 25^\circ\text{C}$ unless otherwise noted

| Symbol          | Parameter                                    | Max. | Unit                      |
|-----------------|----------------------------------------------|------|---------------------------|
| $R_{\theta JC}$ | Maximum Thermal Resistance, Junction to Case | 6.3  | $^\circ\text{C}/\text{W}$ |

#### Package Marking and Ordering Information

| Part Number  | Top Mark     | Package | Packing Method | Reel Size | Tape Width | Quantity |
|--------------|--------------|---------|----------------|-----------|------------|----------|
| FFPF20UA60DN | FFPF20UA60DN | TO-220F | Tube           | N/A       | N/A        | 50       |

# Electrical Characteristics $T_C = 25^\circ\text{C}$ unless otherwise noted

| Symbol                                                | Parameter                                             |                                                 | Min.   | Typ.       | Max.       | Unit |
|-------------------------------------------------------|-------------------------------------------------------|-------------------------------------------------|--------|------------|------------|------|
| V <sub>FM1</sub>                                      | I <sub>F</sub> = 10 A<br>I <sub>F</sub> = 10 A        | T <sub>C</sub> = 25°C<br>T <sub>C</sub> = 125°C | -<br>- | 1.8<br>1.7 | 2.3<br>2.2 | V    |
| I <sub>RM1</sub>                                      | V <sub>R</sub> = 600 V<br>V <sub>R</sub> = 600 V      | T <sub>C</sub> = 25°C<br>T <sub>C</sub> = 125°C | -<br>- | -<br>-     | 100<br>500 | μA   |
| t <sub>rr</sub><br>I <sub>rr</sub><br>Q <sub>rr</sub> | I <sub>F</sub> = 10 A, di <sub>F</sub> /dt = 200 A/μs | T <sub>C</sub> = 25°C                           |        | 74         | 120        | ns   |
|                                                       |                                                       |                                                 |        | 6          | 10         | A    |
|                                                       |                                                       |                                                 |        | 213        | 600        | nC   |
| t <sub>rr</sub><br>I <sub>rr</sub><br>Q <sub>rr</sub> | I <sub>F</sub> = 10 A, di <sub>F</sub> /dt = 200 A/μs | T <sub>C</sub> = 125°C                          |        | 120        | 200        | ns   |
|                                                       |                                                       |                                                 |        | 8.8        | 15         | A    |
|                                                       |                                                       |                                                 |        | 530        | 1500       | nC   |
| W <sub>AVL</sub>                                      | Avalanche Energy ( L = 40 mH)                         |                                                 | 10     | -          | -          | mJ   |

## Notes:

1: Pulse: Test Pulse width =  $300\mu\text{s}$ , Duty Cycle = 2%

## Test Circuit and Waveforms

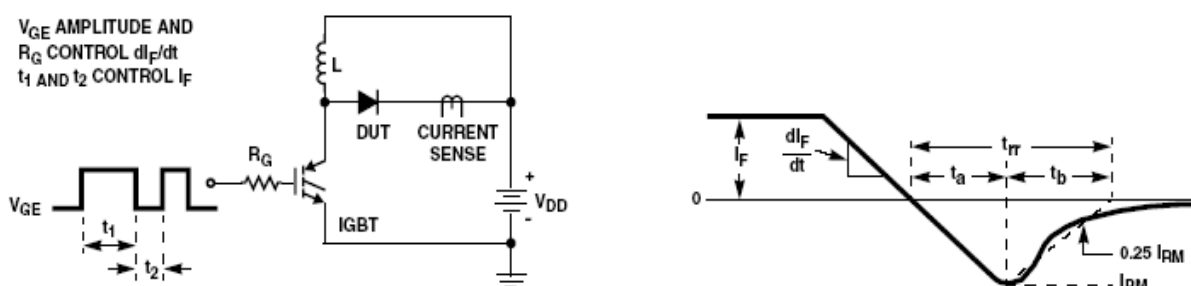


Figure 1. Diode Reverse Recovery Test Circuit & Waveform

$L = 40\text{mH}$   
 $R < 0.1\Omega$   
 $V_{DD} = 50\text{V}$

$E_{AVL} = 1/2LI^2 [V_{R(AVL)}/(V_{R(AVL)} - V_{DD})]$   
 $Q1 = \text{IGBT } (BV_{CES} > \text{DUT } V_{R(AVL)})$

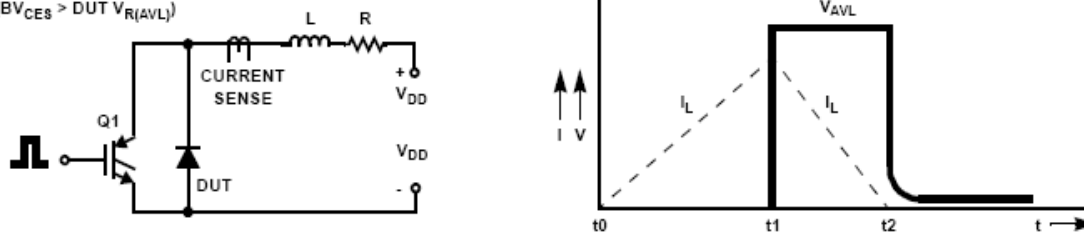


Figure 2. Unclamped Inductive Switching Test Circuit & Waveform

## Typical Performance Characteristics

Figure 3. Typical Forward Voltage Drop vs. Forward Current

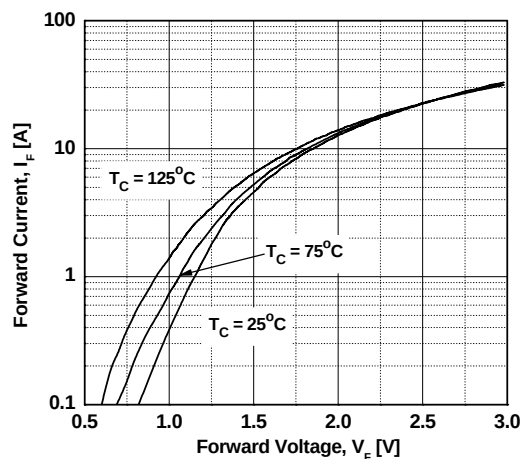


Figure 4. Typical Reverse Current vs. Reverse Voltage

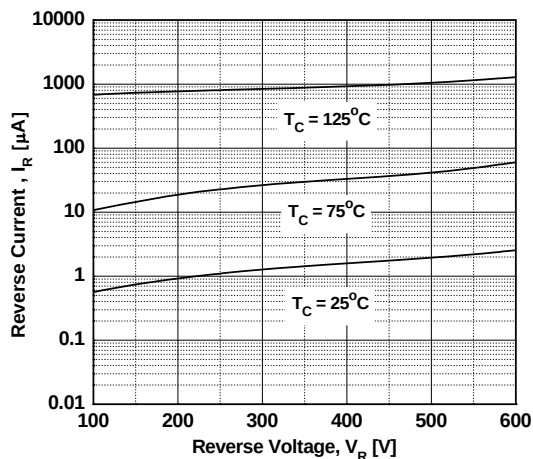


Figure 5. Typical Junction Capacitance

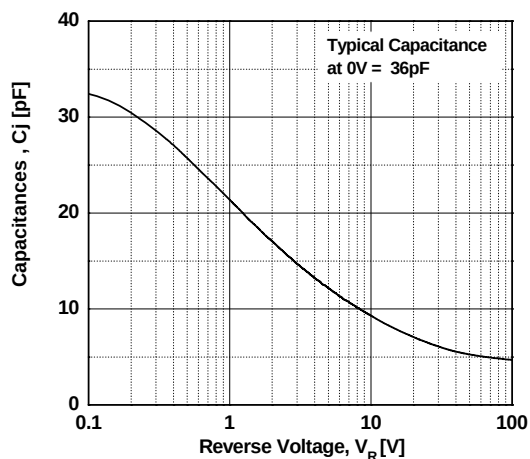


Figure 6. Typical Reverse Recovery Time vs.  $di_F/dt$

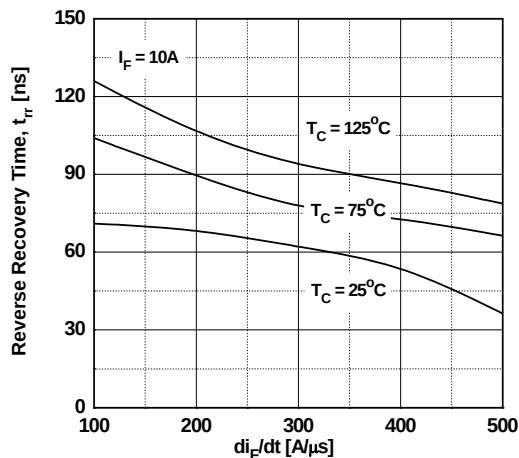


Figure 7. Typical Reverse Recovery Current vs.  $di_F/dt$

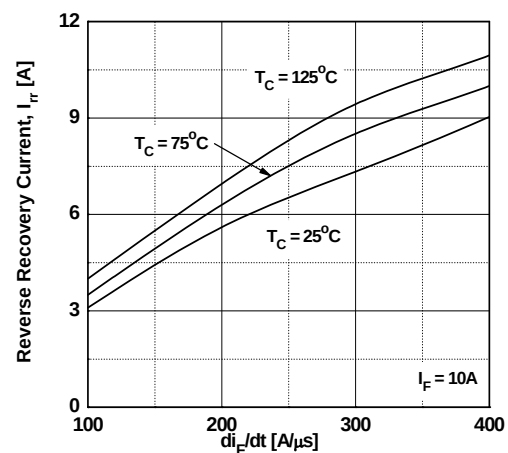


Figure 8. Forward Current Derating Curve

