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December 2014

# FFPF20UP40S

## 20 A, 400 V, Ultrafast Diode

### Features

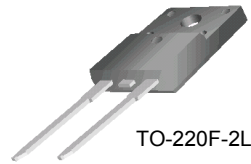
- Ultrafast Recovery  $t_{rr} = 50 \text{ ns}$  (@  $I_F = 20 \text{ A}$ )
- Max Forward Voltage,  $V_F = 1.4 \text{ V}$  (@  $T_C = 25^\circ\text{C}$ )
- Reverse Voltage,  $V_{RRM} = 400 \text{ V}$
- Avalanche Energy Rated
- RoHS Compliant

### Applications

- Boost Diode in PFC and SMPS
- Freewheeling Diodes

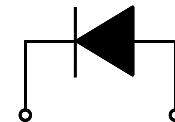
### Description

The FFPF20UP40S is an ultrafast diode with low forward voltage drop. 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 application.



TO-220F-2L

1. Cathode 2. Anode



1. Cathode 2. Anode

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

| Symbol         | Parameter   | Rating      | Unit             |
|----------------|---|-------------|------------------|
| $V_{RRM}$      | Peak Repetitive Reverse Voltage                                 | 400         | V                |
| $V_{RWM}$      | Working Peak Reverse Voltage                                    | 400         | V                |
| $V_R$          | DC Blocking Voltage   | 400         | V                |
| $I_{F(AV)}$    | Average Rectified Forward Current @ $T_C = 102^\circ\text{C}$   | 20          | A                |
| $I_{FSM}$      | Non-repetitive Peak Surge Current<br>60Hz Single Half-Sine Wave | 200         | A                |
| $T_J, T_{STG}$ | Operating and Storage Temperature Range                         | -55 to +175 | $^\circ\text{C}$ |

### Thermal Characteristics

| Symbol          | Parameter                                    | Max. | Unit                      |
|-----------------|--|------|---------------------------|
| $R_{\theta JC}$ | Maximum Thermal Resistance, Junction to Case | 2.6  | $^\circ\text{C}/\text{W}$ |

### Package Marking and Ordering Information

| Part Number | Top Mark    | Package    | Packing Method | Reel Size | Tape Width | Quantity |
|-------------|-------------|------------|----------------|-----------|------------|----------|
| FFPF20UP40S | FFPF20UP40S | TO-220F-2L | Tube           | N/A       | N/A        | 50       |

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

| Symbol    | Parameter   | Min. | Typ. | Max. | Unit          |
|-----------|---|------|------|------|---------------|
| $V_{F1}$  | $I_F = 20\text{ A}$                                     | -    | -    | 1.4  | V             |
|           | $I_F = 20\text{ A}$                                     | -    | -    | 1.4  |               |
| $I_{R1}$  | $V_R = 400\text{ V}$                                    | -    | -    | 50   | $\mu\text{A}$ |
|           | $V_R = 400\text{ V}$                                    | -    | -    | 50   |               |
| $t_{rr}$  | $I_F = 20\text{ A}, di_F/dt = 200\text{ A}/\mu\text{s}$ | -    | 29   | 50   | ns            |
| $I_{rr}$  |   | -    | 3.3  | 5.5  | A             |
| $Q_{rr}$  |   | -    | 47   | 138  | nC            |
| $W_{AVL}$ | Avalanche Energy ( $L = 40\text{ mH}$ )                 | 1    | -    | -    | mJ            |

**Notes:**

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

### Test Circuit and Waveforms

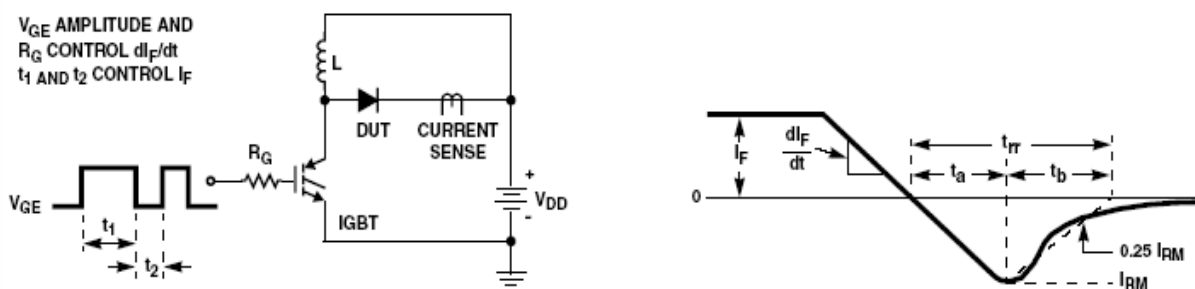


Figure 1. Diode Reverse Recovery Test Circuit & Waveform

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

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

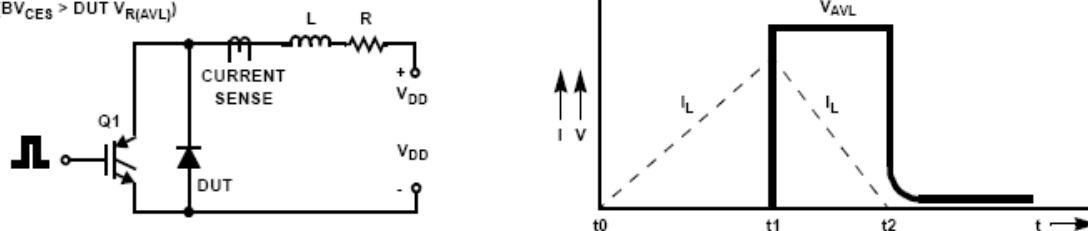
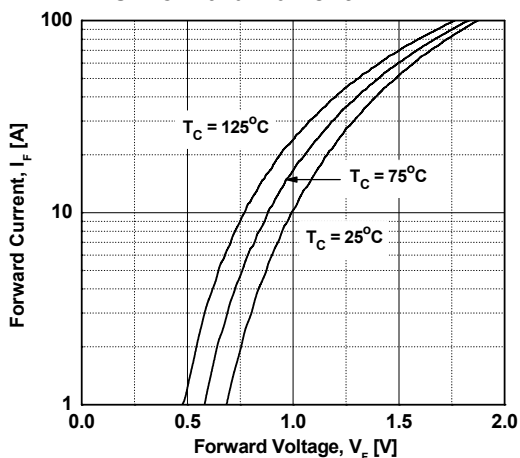


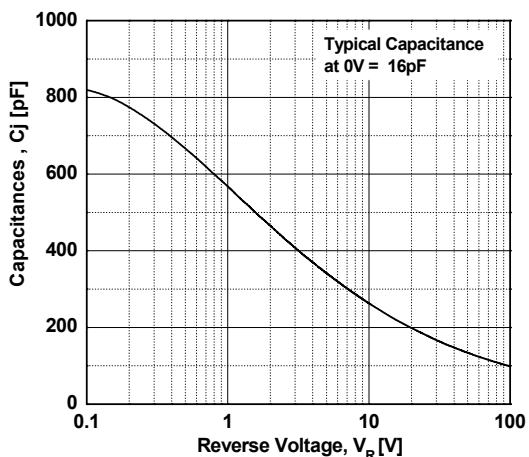
Figure 2. Unclamped Inductive Switching Test Circuit & Waveform

## Typical Performance Characteristics

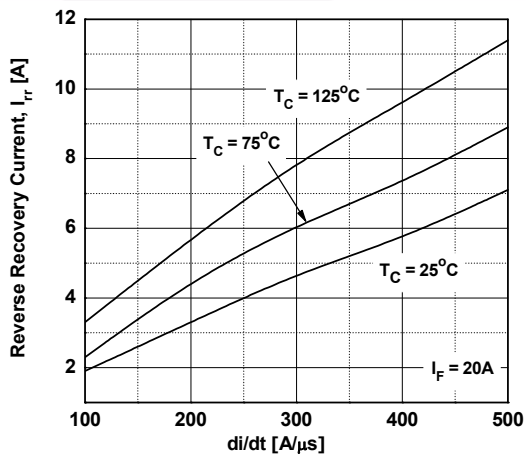
**Figure 3. Typical Forward Voltage Drop vs. Forward Current**



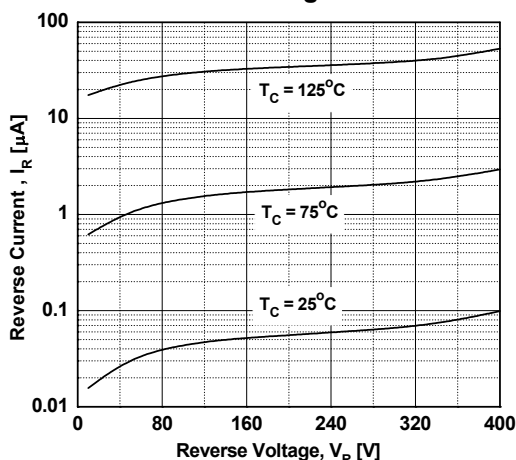
**Figure 5. Typical Junction Capacitance**



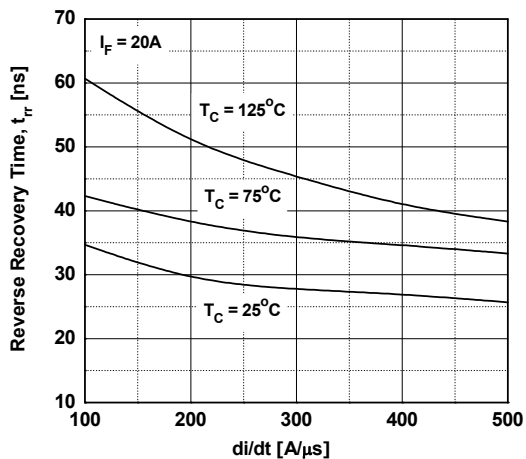
**Figure 7. Typical Reverse Recovery Current vs.  $di_F/dt$**



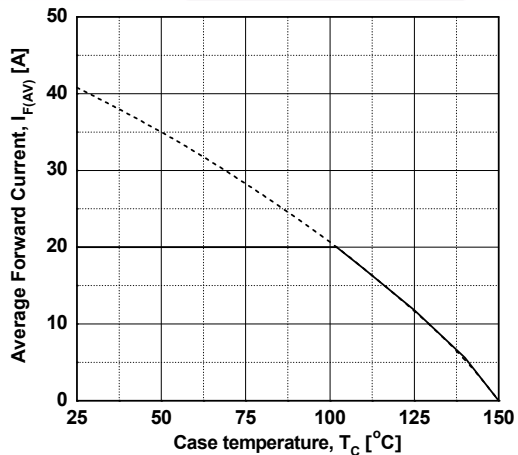
**Figure 4. Typical Reverse Current vs. Reverse Voltage**



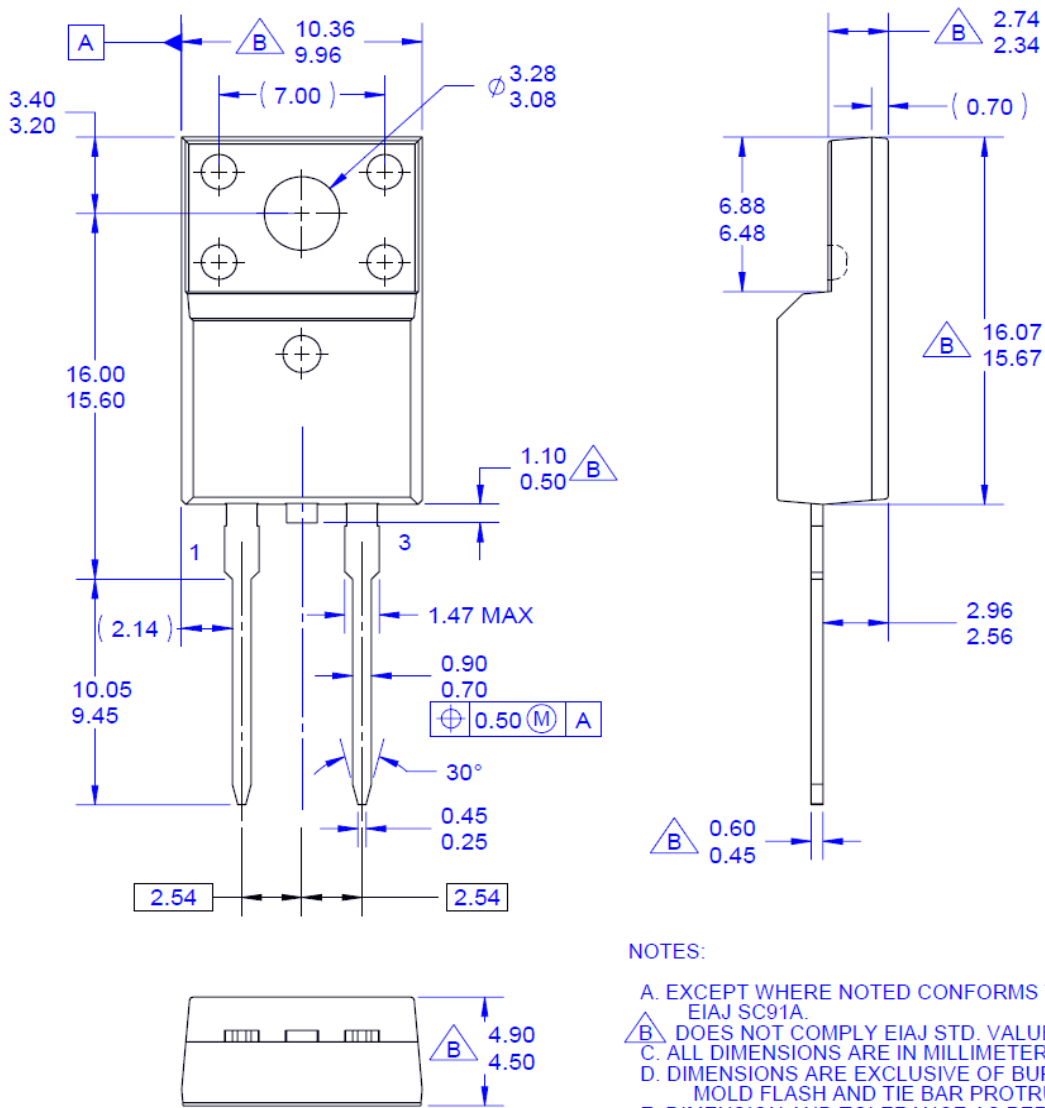
**Figure 6. Typical Reverse Recovery Time vs.  $di_F/dt$**



**Figure 8. Forward Current Derating Curve**



**Mechanical Dimensions**



**NOTES:**

- A. EXCEPT WHERE NOTED CONFORMS TO EIAJ SC91A.
- B. DOES NOT COMPLY EIAJ STD. VALUE.
- C. ALL DIMENSIONS ARE IN MILLIMETERS.
- D. DIMENSIONS ARE EXCLUSIVE OF BURRS, MOLD FLASH AND TIE BAR PROTRUSIONS.
- E. DIMENSION AND TOLERANCE AS PER ASME Y14.5-1994.
- F. DRAWING FILE NAME: TO220C02REV2

**Figure 9. TO-220F 2L - 2LD; TO220; MOLDED; FULL PACK**

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| BitSiC™                  | GreenBridge™                                    | QFET®                                 |  |
| Build it Now™            | Green FPS™                                      | QS™                                   |  |
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