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December 2014

# FFPF20UP40S

## 20 A, 400 V, Ultrafast Diode

### Features

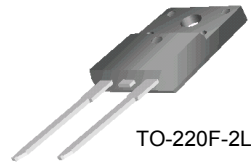
- Ultrafast Recovery  $t_{rr} = 50 \text{ ns}$  (@  $I_F = 20 \text{ A}$ )
- Max Forward Voltage,  $V_F = 1.4 \text{ V}$  (@  $T_C = 25^\circ\text{C}$ )
- Reverse Voltage,  $V_{RRM} = 400 \text{ V}$
- Avalanche Energy Rated
- RoHS Compliant

### Applications

- Boost Diode in PFC and SMPS
- Freewheeling Diodes

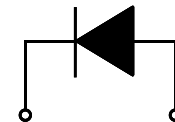
### Description

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 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

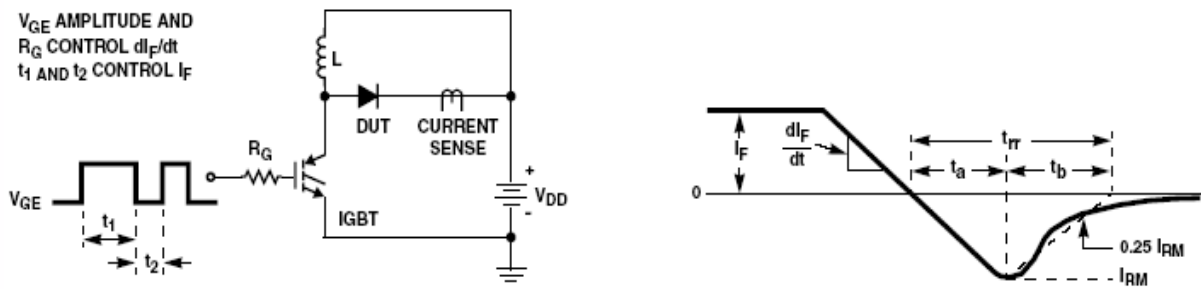
**Electrical Characteristics**  $T_C = 25^\circ\text{C}$  unless otherwise noted

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%

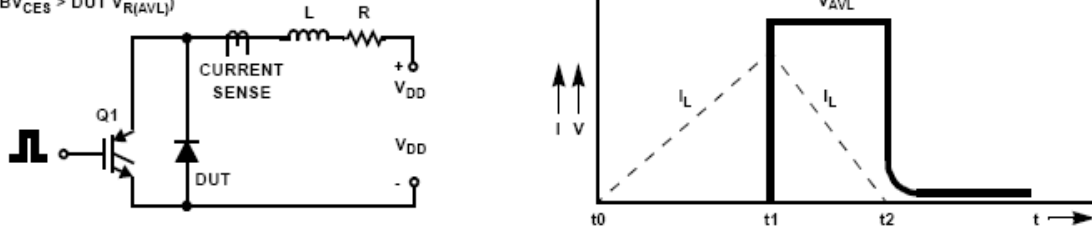
**Test Circuit and Waveforms**



**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

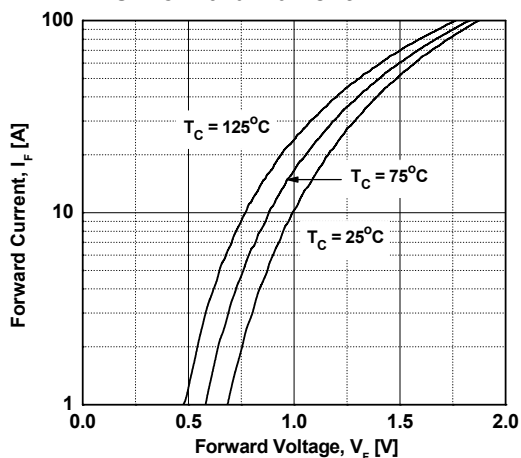


Figure 5. Typical Junction Capacitance

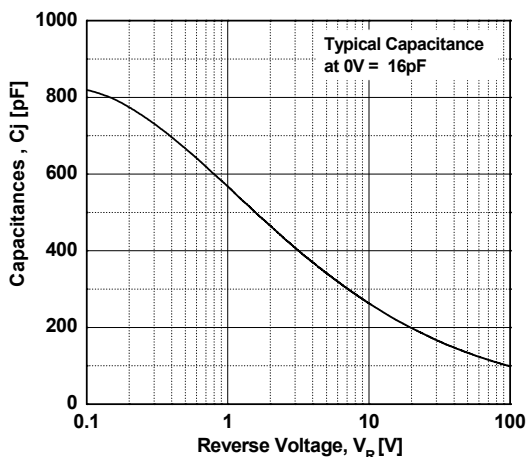


Figure 7. Typical Reverse Recovery Current vs.  $di_F/dt$

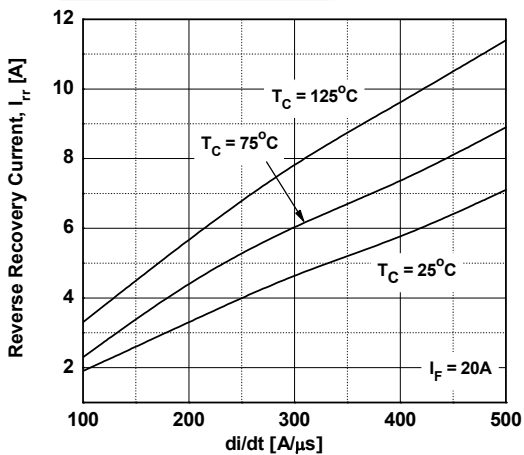


Figure 4. Typical Reverse Current vs. Reverse Voltage

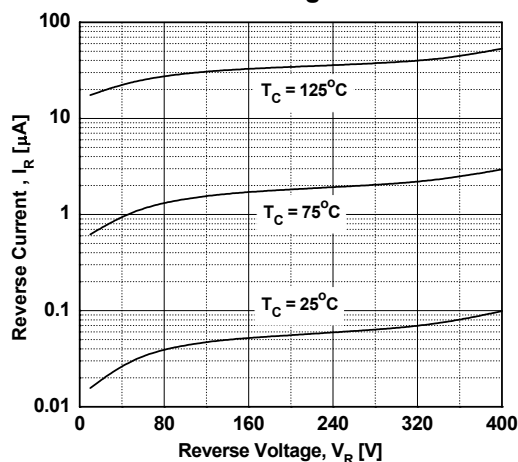


Figure 6. Typical Reverse Recovery Time vs.  $di_F/dt$

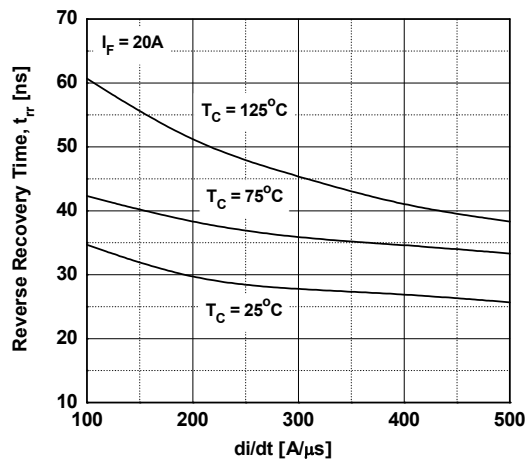
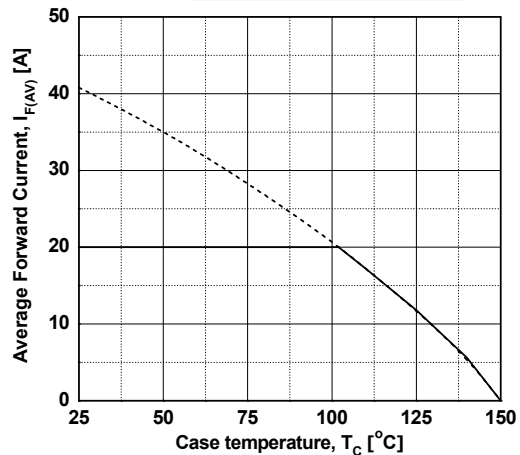
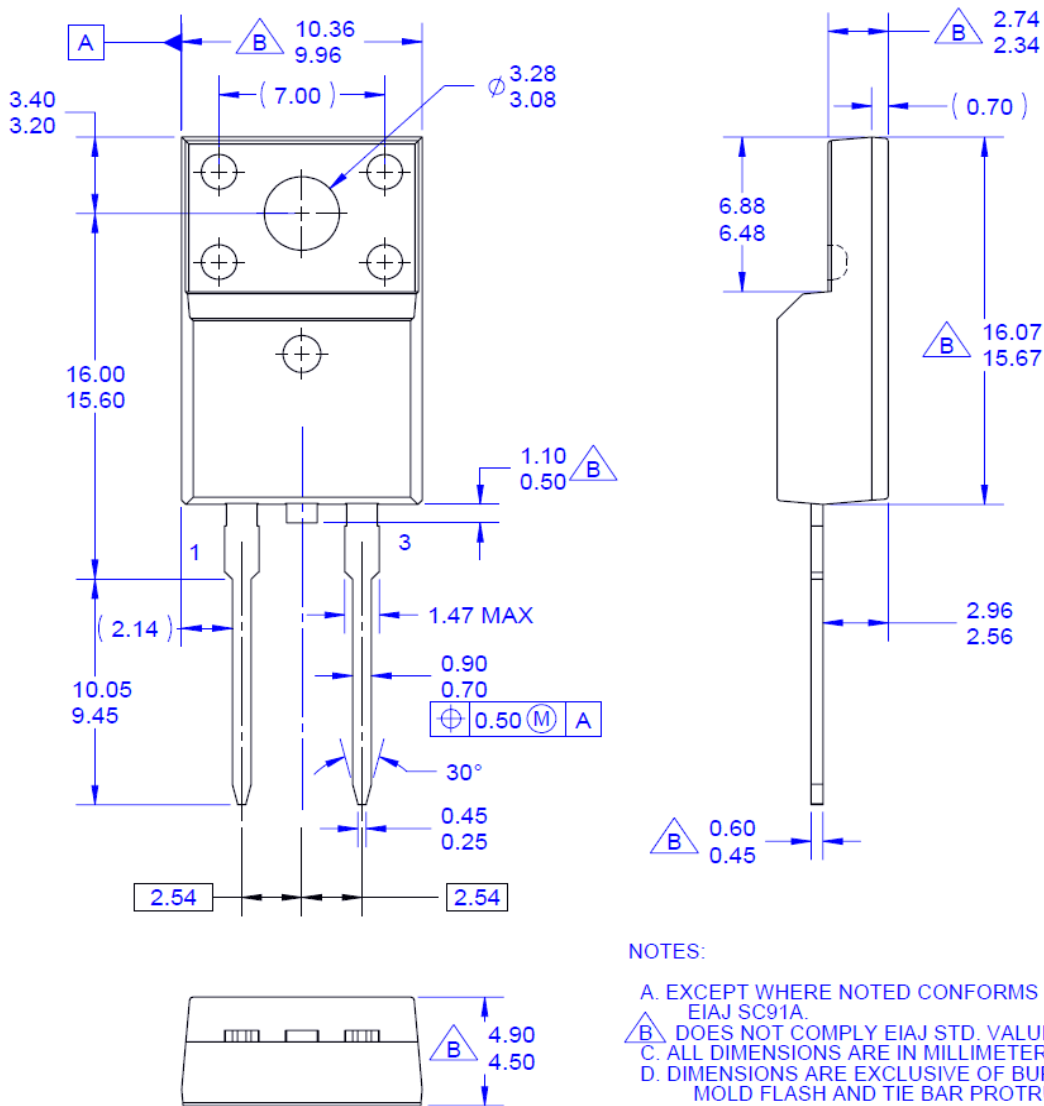


Figure 8. Forward Current Derating Curve



**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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