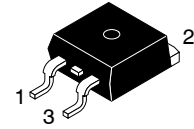


# Ultrafast Diode

## 200 V, 20 A

### FFB20UP20S



D<sup>2</sup>PAK  
3-LEAD  
CASE 418AJ

#### Description

The FFB20UP20S is an ultrafast 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 application.

#### Features

- Ultrafast Recovery,  $t_{rr} = 45 \text{ ns}$  (@  $I_F = 20 \text{ A}$ )
- Max Forward Voltage,  $V_F = 1.15 \text{ V}$  (@  $T_C = 25^\circ\text{C}$ )
- Reverse Voltage,  $V_{RRM} = 200 \text{ V}$
- Avalanche Energy Rated
- RoHS Compliant

#### Applications

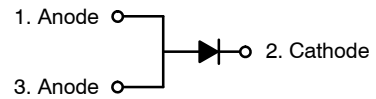
- Output Rectifiers
- SMPS, Welder, UPS
- Free-Wheeling Diode for Motor Application
- Power Switching Circuits

#### ABSOLUTE MAXIMUM RATINGS

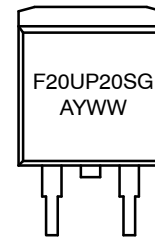
$T_C = 25^\circ\text{C}$  unless otherwise noted

Symbol	Parameter	Rating	Unit
$V_{RRM}$	Peak Repetitive Reverse Voltage	200	V
$V_{RWM}$	Working Peak Reverse Voltage	200	V
$V_R$	DC Blocking Voltage	200	V
$I_{F(AV)}$	Average Rectified Forward Current @ $T_C = 115^\circ\text{C}$	20	A
$I_{FSM}$	Non-repetitive Peak Surge Current 60 Hz Single Half-Sine Wave	200	A
$T_J, T_{STG}$	Operating Junction and Storage Temperature Range	-65 to +175	$^\circ\text{C}$

Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.



#### MARKING DIAGRAM



F20UP20S = Specific Device Code  
A = Assembly Location  
Y = Year  
WW = Work Week  
G = Pb-Free Package

# FFB20UP20S

## THERMAL CHARACTERISTICS $T_C = 25^\circ\text{C}$ unless otherwise noted

Symbol	Parameter	Max	Unit
$R_{\theta JC}$	Maximum Thermal Resistance, Junction-to-Case	2.0	$^\circ\text{C}/\text{W}$

## PACKAGE MARKING AND ORDERING INFORMATION

Part Number	Top Mark	Package	Packing Method	Reel Size	Tape Width	Quantity
FFB20UP20STM	F20UP20S	D <sup>2</sup> PAK	Reel	13" Dia	N/A	800

## ELECTRICAL CHARACTERISTICS $T_C = 25^\circ\text{C}$ unless otherwise noted

Parameter	Conditions	Min	Typ	Max	Unit
$V_F$ (Note 1)	Forward Voltage $I_F = 20\text{ A}$ $I_F = 20\text{ A}$	$T_C = 25^\circ\text{C}$ -	-	1.15 1.0	V
$I_R$ (Note 1)	Reverse Current $V_R = 200\text{ V}$ $V_R = 200\text{ V}$	$T_C = 25^\circ\text{C}$ -	-	100 500	$\mu\text{A}$
$t_{rr}$	$I_F = 1\text{ A}$ , $di_F/dt = 100\text{ A}/\mu\text{s}$ , $V_R = 30\text{ V}$ $I_F = 20\text{ A}$ , $di_F/dt = 200\text{ A}/\mu\text{s}$ , $V_R = 130\text{ V}$	$T_C = 25^\circ\text{C}$	-	35 45	ns
$t_a$ $t_b$ $Q_{rr}$	$I_F = 20\text{ A}$ , $di_F/dt = 200\text{ A}/\mu\text{s}$ , $V_R = 130\text{ V}$	$T_C = 25^\circ\text{C}$	-	11 13 21	ns ns nC
$W_{AVL}$	Avalanche Energy (L = 40 mH)	20	-	-	mJ

Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

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

## Test Circuit and Waveforms

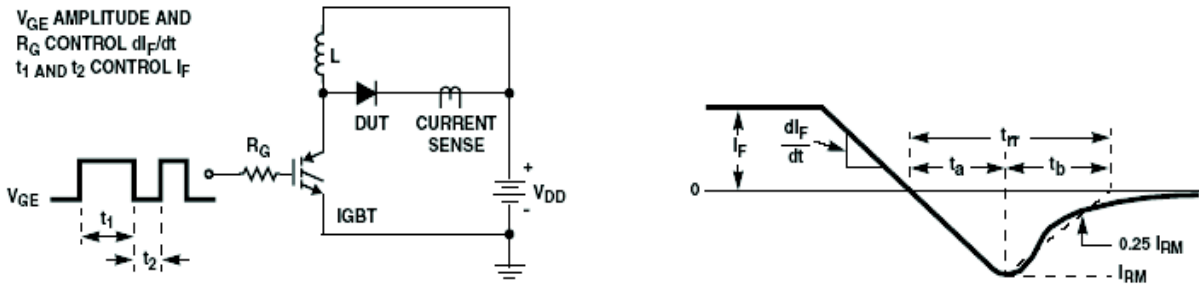


Figure 1. Diode Reverse Recovery Test Circuit & Waveform

L = 40mH  
R < 0.1 $\Omega$   
VDD = 50V

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

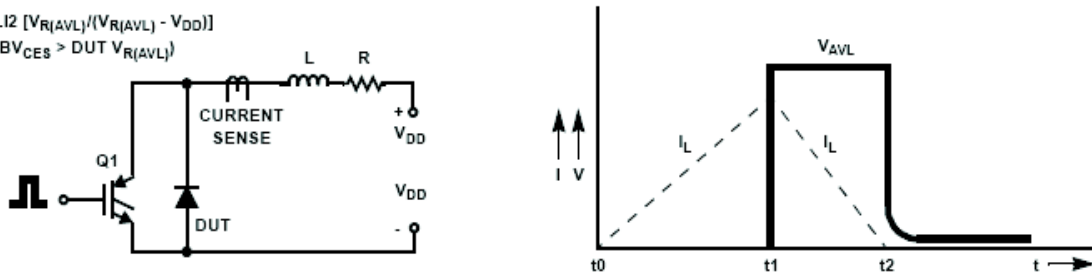


Figure 2. Unclamped Inductive Switching Test Circuit & Waveform

# FFB20UP20S

## TYPICAL CHARACTERISTICS

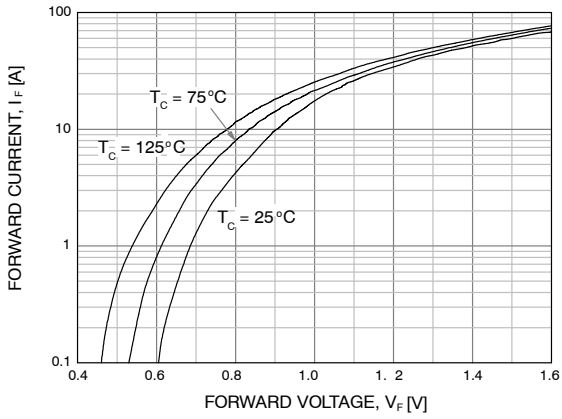


Figure 3. Typical Forward Voltage Drop

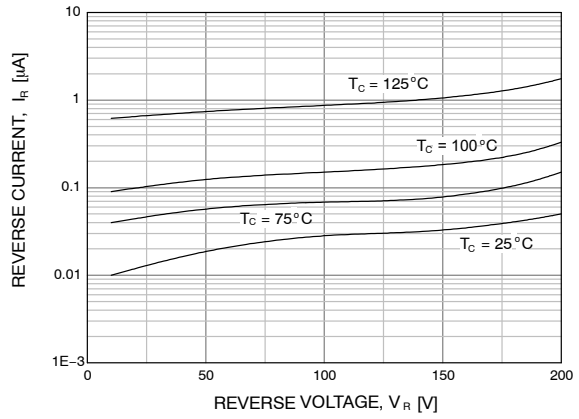


Figure 4. Typical Reverse Current

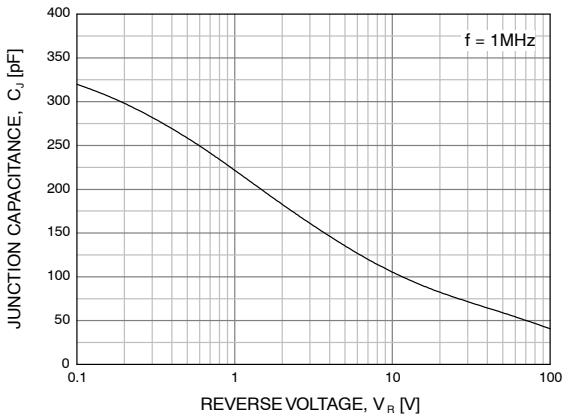


Figure 5. Typical Junction Capacitance

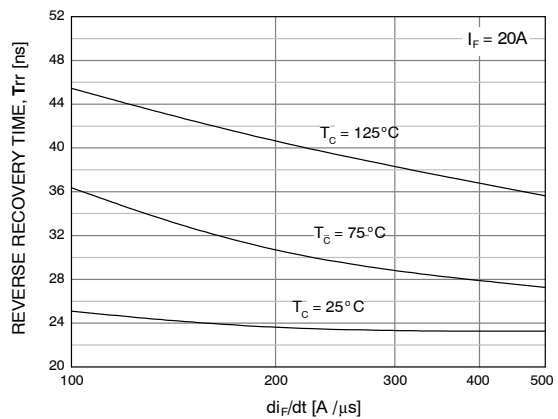


Figure 6. Typical Reverse Recovery Time

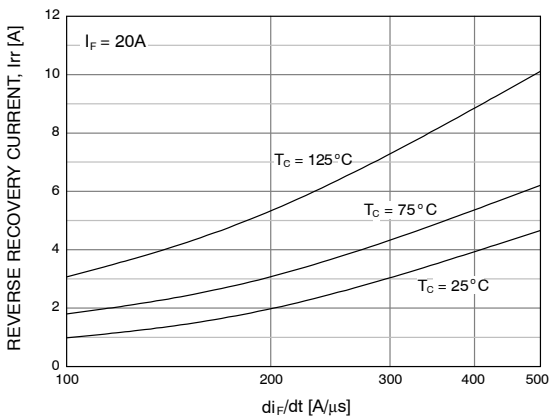


Figure 7. Typical Reverse Recovery Current

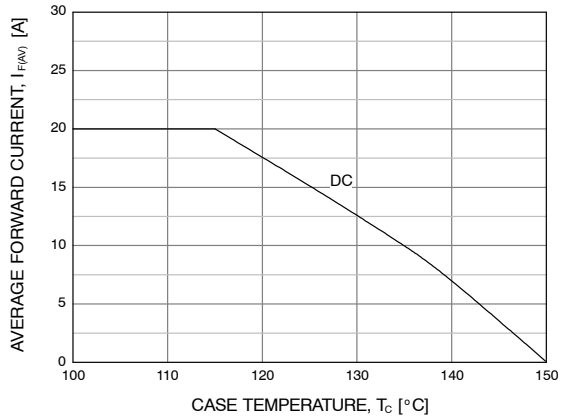
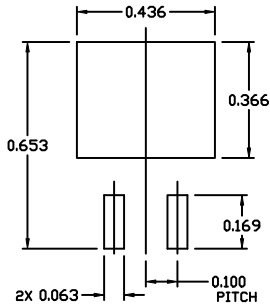


Figure 8. Forward Current Derating Curve

# FFB20UP20S

## PACKAGE DIMENSIONS

### D<sup>2</sup>PAK-3 (TO-263, 3-LEAD) CASE 418AJ ISSUE F



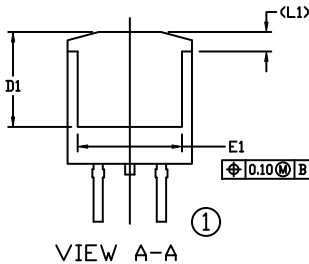
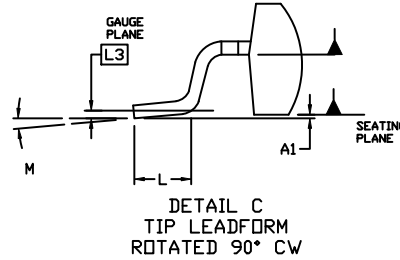
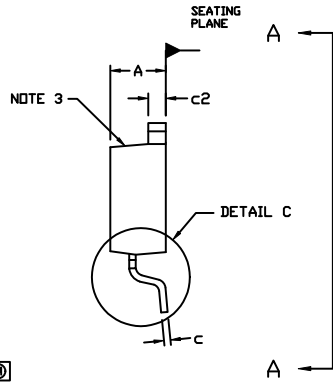
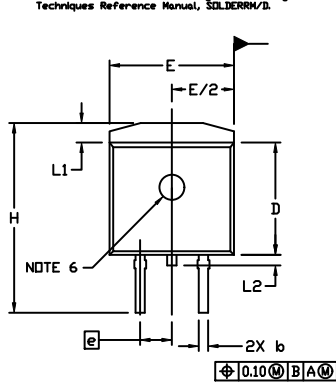
RECOMMENDED  
MOUNTING FOOTPRINT

For additional information on our Pb-free strategy and soldering details, please download the IM Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDER/D.

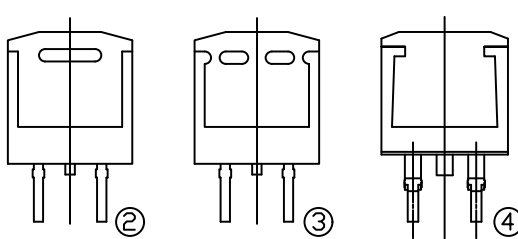
NOTES:

1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 2009.
2. CONTROLLING DIMENSION: INCHES
3. CHAMFER OPTIONAL.
4. DIMENSIONS D AND E DO NOT INCLUDE MOLD FLASH. MOLD FLASH SHALL NOT EXCEED 0.005 PER SIDE. THESE DIMENSIONS ARE MEASURED AT THE OUTERMOST EXTREMES OF THE PLASTIC BODY AT DATUM H.
5. THERMAL PAD CONTOUR IS OPTIONAL WITHIN DIMENSIONS E, L1, D1, AND E1.
6. OPTIONAL MOLD FEATURE.
7. Ⓛ, Ⓞ ... OPTIONAL CONSTRUCTION FEATURE CALL OUTS.

DIM	INCHES		MILLIMETERS	
	MIN.	MAX.	MIN.	MAX.
A	0.160	0.190	4.06	4.83
A1	0.000	0.010	0.00	0.25
b	0.020	0.039	0.51	0.99
c	0.012	0.029	0.30	0.74
c2	0.045	0.065	1.14	1.65
D	0.330	0.380	8.38	9.65
D1	0.260	---	6.60	---
E	0.380	0.420	9.65	10.67
E1	0.245	---	6.22	---
e	0.100	BSC	2.54	BSC
H	0.575	0.625	14.60	15.88
L	0.070	0.110	1.78	2.79
L1	---	0.066	---	1.68
L2	---	0.070	---	1.78
L3	0.010	BSC	0.25	BSC
M	0°	8°	0°	8°



VIEW A-A



VIEW A-A  
OPTIONAL CONSTRUCTIONS

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