

# IRFIB8N50K

HEXFET® Power MOSFET

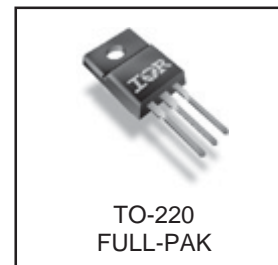
### Applications

- Switch Mode Power Supply (SMPS)
- Uninterruptible Power Supply
- High Speed Power Switching

$V_{DSS}$	$R_{DS(on)}$ typ.	$I_D$
500V	290mΩ	6.7A

### Benefits

- Low Gate Charge Qg results in Simple Drive Requirement
- Improved Gate, Avalanche and Dynamic dv/dt Ruggedness
- Fully Characterized Capacitance and Avalanche Voltage and Current



### Absolute Maximum Ratings

	Parameter	Max.	Units
$I_D$ @ $T_C = 25^\circ\text{C}$	Continuous Drain Current, $V_{GS}$ @ 10V	6.7	A
$I_D$ @ $T_C = 100^\circ\text{C}$	Continuous Drain Current, $V_{GS}$ @ 10V	4.2	
$I_{DM}$	Pulsed Drain Current ①	27	
$P_D$ @ $T_C = 25^\circ\text{C}$	Power Dissipation	45	W
	Linear Derating Factor	0.36	W/°C
$V_{GS}$	Gate-to-Source Voltage	±30	V
dv/dt	Peak Diode Recovery dv/dt ③	24	V/ns
$T_J$	Operating Junction and	-55 to + 150	°C
$T_{STG}$	Storage Temperature Range		
	Soldering Temperature, for 10 seconds		
	Mounting torque, 6-32 or M3 screw	1.1(10)	N•m (lbf•in)

### Avalanche Characteristics

	Parameter	Typ.	Max.	Units
$E_{AS}$	Single Pulse Avalanche Energy ②	—	290	mJ
$I_{AR}$	Avalanche Current ①	—	6.7	A
$E_{AR}$	Repetitive Avalanche Energy ①	—	4.5	mJ

### Thermal Resistance

	Parameter	Typ.	Max.	Units
$R_{\theta JC}$	Junction-to-Case ⑥	—	2.76	°C/W
$R_{\theta JA}$	Junction-to-Ambient ⑥	—	65	

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IR Rectifier

Static @  $T_J = 25^\circ\text{C}$  (unless otherwise specified)

	Parameter	Min.	Typ.	Max.	Units	Conditions
$V_{(BR)DSS}$	Drain-to-Source Breakdown Voltage	500	—	—	V	$V_{GS} = 0V, I_D = 250\mu A$
$\Delta V_{(BR)DSS}/\Delta T_J$	Breakdown Voltage Temp. Coefficient	—	0.59	—	V/ $^\circ\text{C}$	Reference to $25^\circ\text{C}, I_D = 1\text{mA}$
$R_{DS(on)}$	Static Drain-to-Source On-Resistance	—	290	350	m $\Omega$	$V_{GS} = 10V, I_D = 4.0A$ ④
$V_{GS(th)}$	Gate Threshold Voltage	3.0	—	5.0	V	$V_{DS} = V_{GS}, I_D = 250\mu A$
$I_{DSS}$	Drain-to-Source Leakage Current	—	—	50	$\mu A$	$V_{DS} = 500V, V_{GS} = 0V$
		—	—	250		$V_{DS} = 400V, V_{GS} = 0V, T_J = 125^\circ\text{C}$
$I_{GSS}$	Gate-to-Source Forward Leakage	—	—	100	nA	$V_{GS} = 30V$
	Gate-to-Source Reverse Leakage	—	—	-100		$V_{GS} = -30V$

Dynamic @  $T_J = 25^\circ\text{C}$  (unless otherwise specified)

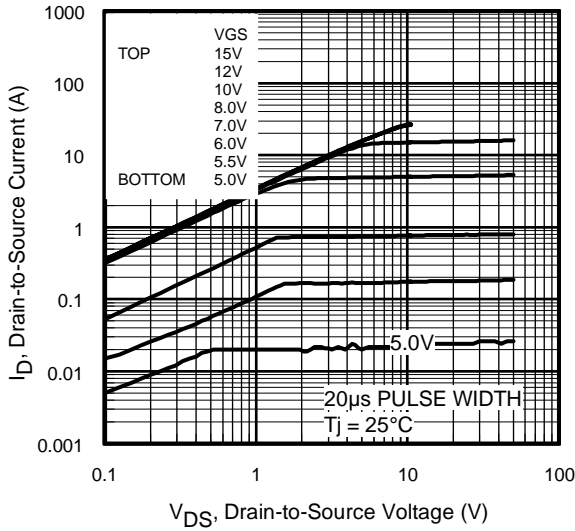
	Parameter	Min.	Typ.	Max.	Units	Conditions
gfs	Forward Transconductance	4.7	—	—	V	$V_{DS} = 50V, I_D = 4.0A$
$Q_g$	Total Gate Charge	—	—	89	nC	$I_D = 6.7A$
$Q_{gs}$	Gate-to-Source Charge	—	—	24		$V_{DS} = 400V$
$Q_{gd}$	Gate-to-Drain ("Miller") Charge	—	—	44		$V_{GS} = 10V$ ④
$t_{d(on)}$	Turn-On Delay Time	—	17	—	ns	$V_{DD} = 250V$
$t_r$	Rise Time	—	16	—		$I_D = 6.7A$
$t_{d(off)}$	Turn-Off Delay Time	—	28	—		$R_G = 38\Omega$
$t_f$	Fall Time	—	8.4	—		$V_{GS} = 10V$ ④
$C_{iss}$	Input Capacitance	—	2160	—	pF	$V_{GS} = 0V$
$C_{oss}$	Output Capacitance	—	240	—		$V_{DS} = 25V$
$C_{riss}$	Reverse Transfer Capacitance	—	27	—		$f = 1.0\text{MHz}$
$C_{oss}$	Output Capacitance	—	2600	—		$V_{GS} = 0V, V_{DS} = 1.0V, f = 1.0\text{MHz}$
$C_{oss}$	Output Capacitance	—	62	—		$V_{GS} = 0V, V_{DS} = 400V, f = 1.0\text{MHz}$
$C_{oss\ eff.}$	Effective Output Capacitance	—	120	—		$V_{GS} = 0V, V_{DS} = 0V \text{ to } 400V$ ⑤

## Diode Characteristics

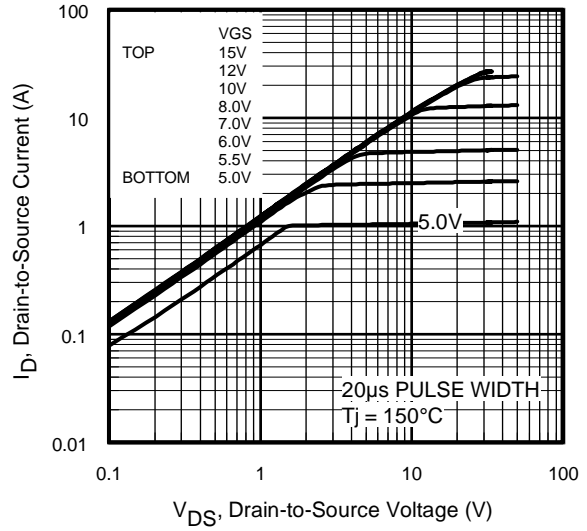
	Parameter	Min.	Typ.	Max.	Units	Conditions
$I_S$	Continuous Source Current (Body Diode)	—	—	6.7	A	MOSFET symbol showing the integral reverse p-n junction diode.
$I_{SM}$	Pulsed Source Current (Body Diode) ① ⑥	—	—	27		
$V_{SD}$	Diode Forward Voltage	—	—	2.0	V	$T_J = 25^\circ\text{C}, I_S = 6.7A, V_{GS} = 0V$ ④
$t_{rr}$	Reverse Recovery Time	—	430	640	ns	$T_J = 25^\circ\text{C}, I_F = 6.7A$
$Q_{rr}$	Reverse Recovery Charge	—	2840	4270	nC	$di/dt = 100A/\mu s$ ④
$t_{on}$	Forward Turn-On Time	Intrinsic turn-on time is negligible (turn-on is dominated by LS+LD)				

### Notes:

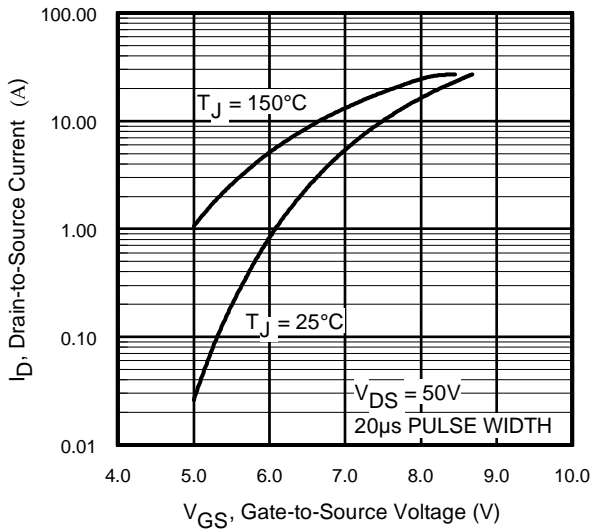
- ① Repetitive rating; pulse width limited by max. junction temperature. (See Fig. 11).
- ② Starting  $T_J = 25^\circ\text{C}$ ,  $L = 13\text{mH}$ ,  $R_G = 25\Omega$ ,  $I_{AS} = 6.7A$ , (See Figure 12a).
- ③  $I_{SD} \leq 6.7A$ ,  $di/dt \leq 500A/\mu s$ ,  $V_{DD} \leq V_{(BR)DSS}$ ,  $T_J \leq 150^\circ\text{C}$ .
- ④ Pulse width  $\leq 300\mu s$ ; duty cycle  $\leq 2\%$ .
- ⑤  $C_{oss\ eff.}$  is a fixed capacitance that gives the same charging time as  $C_{oss}$  while  $V_{DS}$  is rising from 0 to 80%  $V_{DSS}$ .
- ⑥  $R_\theta$  is measured at  $T_J$  approximately  $90^\circ\text{C}$



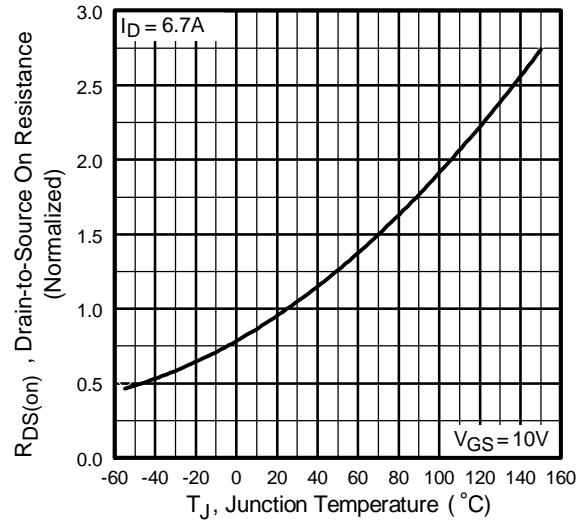
**Fig 1.** Typical Output Characteristics



**Fig 2.** Typical Output Characteristics

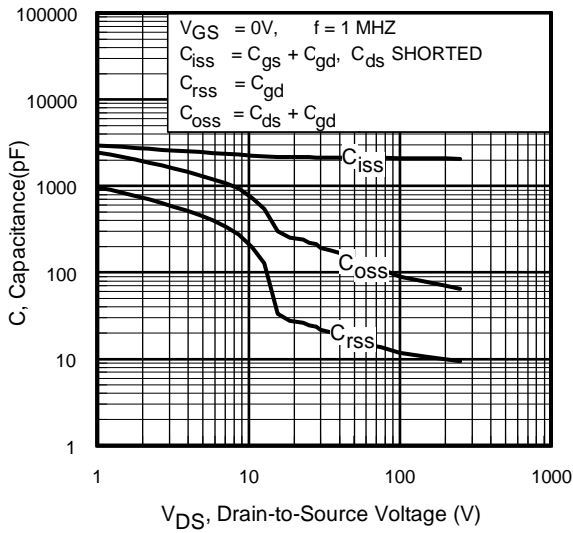


**Fig 3.** Typical Transfer Characteristics

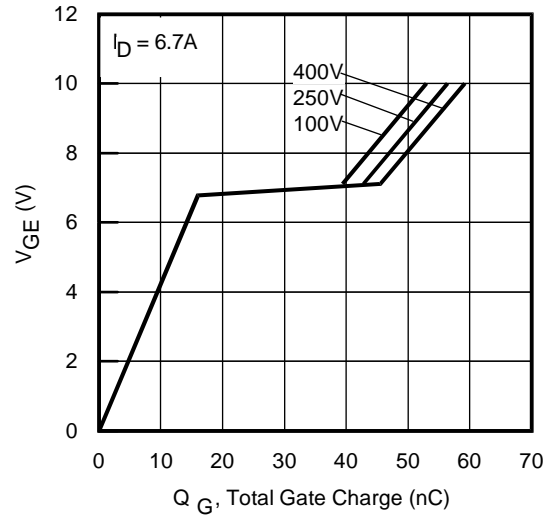


**Fig 4.** Normalized On-Resistance Vs. Temperature

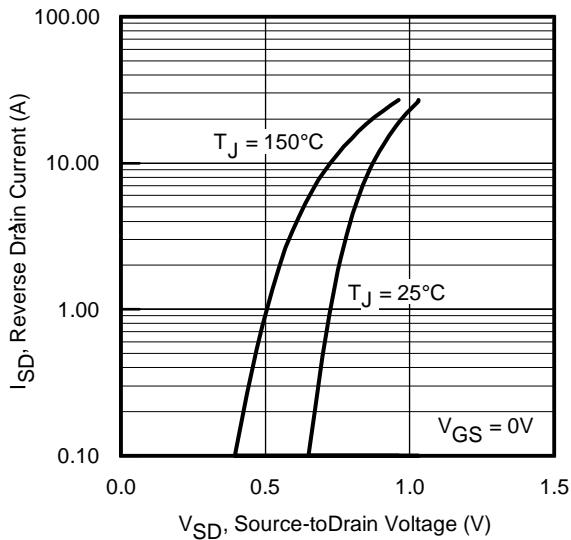
# IRFIB8N50K



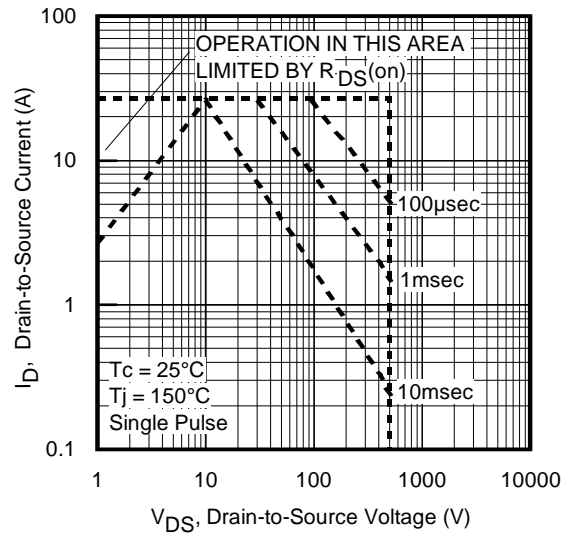
**Fig 5.** Typical Capacitance Vs. Drain-to-Source Voltage



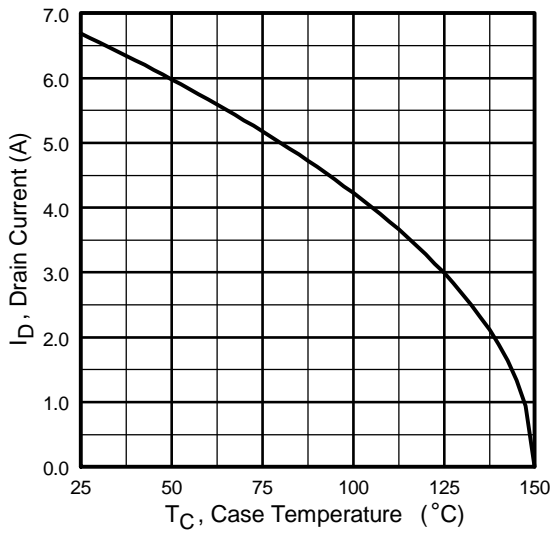
**Fig 6.** Typical Gate Charge Vs. Gate-to-Source Voltage



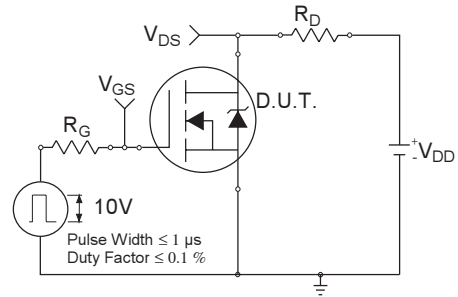
**Fig 7.** Typical Source-Drain Diode Forward Voltage



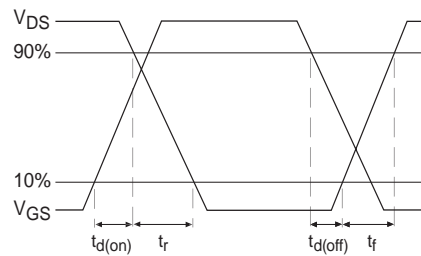
**Fig 8.** Maximum Safe Operating Area



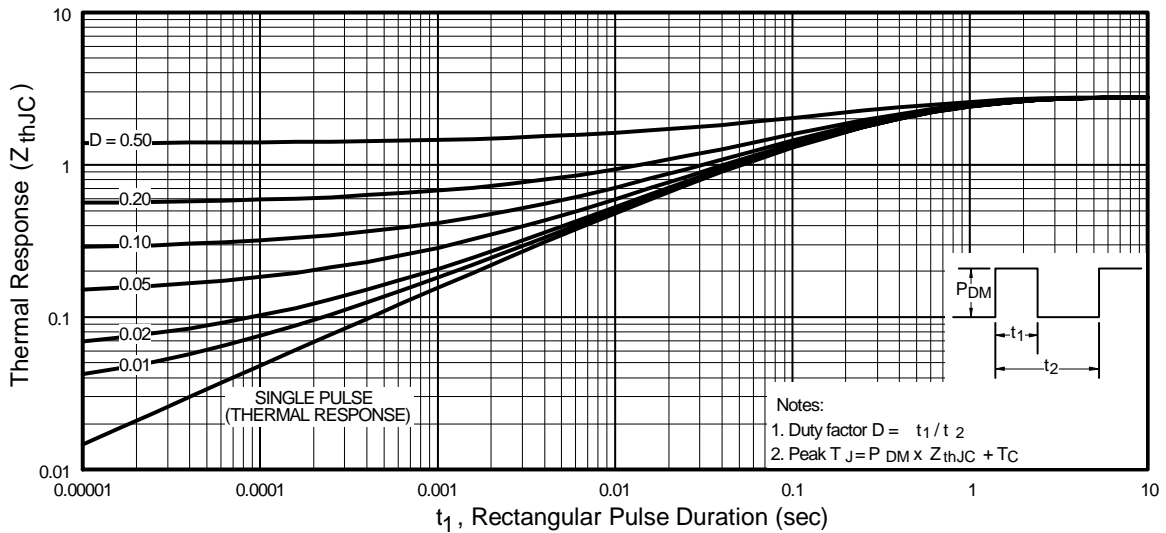
**Fig 9.** Maximum Drain Current Vs. Case Temperature



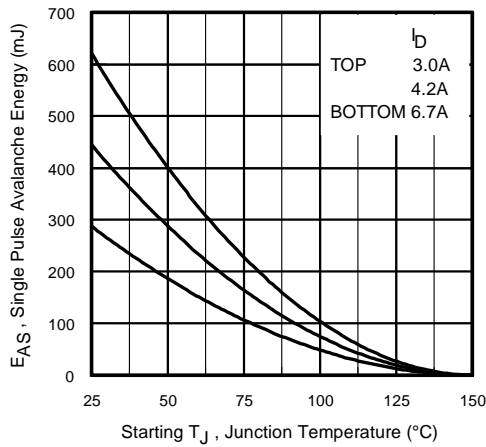
**Fig 10a.** Switching Time Test Circuit



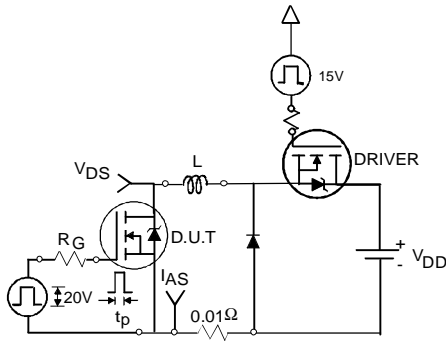
**Fig 10b.** Switching Time Waveforms



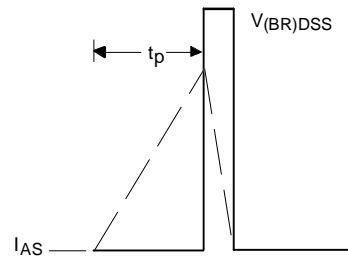
**Fig 11.** Maximum Effective Transient Thermal Impedance, Junction-to-Case



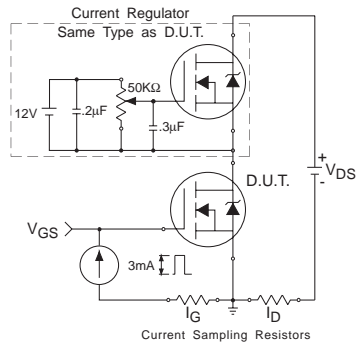
**Fig 12a. Maximum Avalanche Energy Vs. Drain Current**



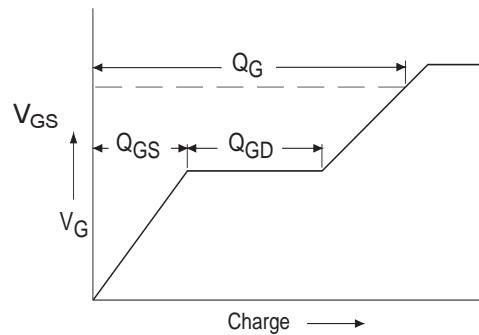
**Fig 12b. Unclamped Inductive Test Circuit**



**Fig 12c. Unclamped Inductive Waveforms**

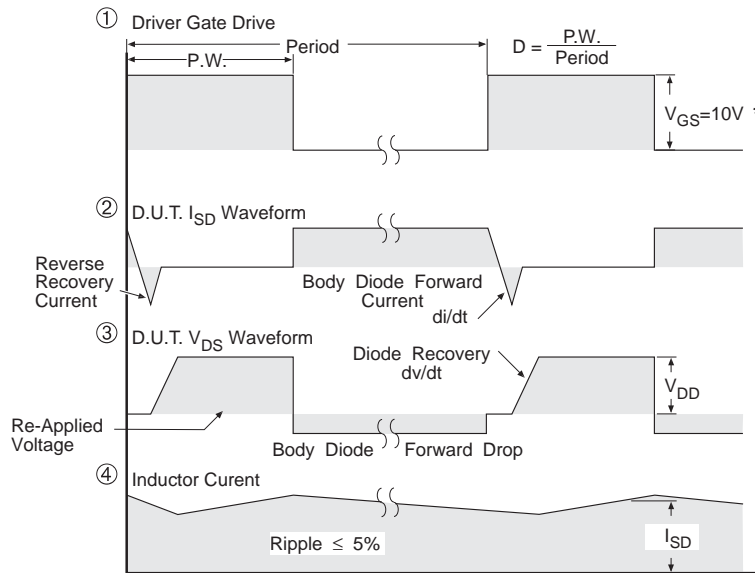
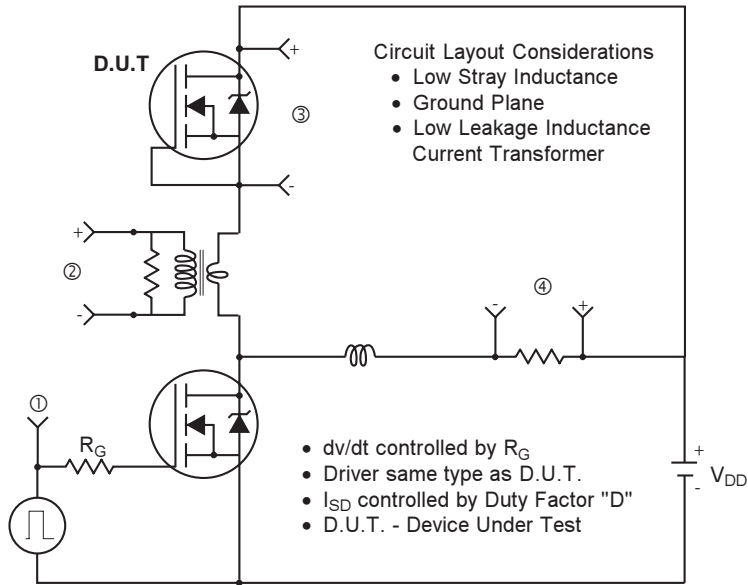


**Fig 13a. Gate Charge Test Circuit**



**Fig 13b. Basic Gate Charge Waveform**

## Peak Diode Recovery dv/dt Test Circuit



\*  $V_{GS} = 5V$  for Logic Level Devices

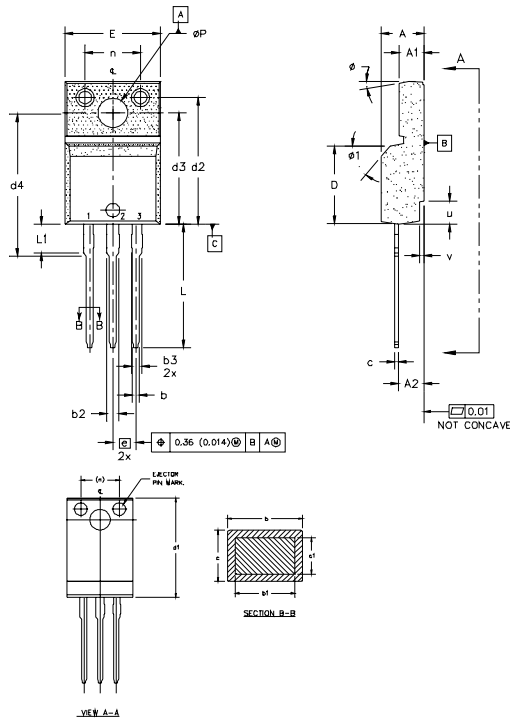
**Fig 14.** For N-Channel HEXFET® Power MOSFETs

# IRFIB8N50K

## TO-220 Full-Pak Package Outline

Dimensions are shown in millimeters (inches)

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- NOTES:
- 1.0 DIMENSIONING AND TOLERANCING PER ASME Y14.5 M- 1994.
  - 2.0 DIMENSIONS ARE SHOWN IN MILLIMETERS [INCHES].
  - 3.0 LEAD DIMENSION AND FINISH UNCONTROLLED IN L1.
  - 4.0 DIMENSION D & E DO NOT INCLUDE MOLD FLASH. MOLD FLASH SHALL NOT EXCEED 0.005" (0.127) PER SIDE. THESE DIMENSIONS ARE MEASURED AT THE OUTERMOST EXTREMES OF THE PLASTIC BODY.
  - 5.0 DIMENSION b1 APPLY TO BASE METAL ONLY.
  - 6.0 STEP OPTIONAL ON PLASTIC BODY DEFINED BY DIMENSIONS u & v.
  - 7.0 CONTROLLING DIMENSION : INCHES.

SYMBOL	DIMENSIONS				NOTES
	MILLIMETERS		INCHES		
	MIN.	MAX.	MIN.	MAX.	
A	4.57	4.83	0.180	0.190	
A1	2.57	2.83	0.101	0.114	
A2	2.51	2.85	0.099	0.112	
b	0.622	0.89	0.024	0.035	
b1	0.622	0.838	0.024	0.033	5
b2	1.229	1.400	0.048	0.055	
b3	1.229	1.400	0.048	0.055	
c	0.440	0.629	0.017	0.025	
c1	0.440	0.584	0.017	0.023	
D	8.65	9.80	0.341	0.386	4
d1	15.80	16.12	0.622	0.635	
d2	13.97	14.22	0.550	0.560	
d3	12.30	12.92	0.484	0.509	
d4	8.64	9.91	0.340	0.390	
E	10.36	10.63	0.408	0.419	4
e	2.54 BSC		0.100 BSC		
L	13.20	13.73	0.520	0.541	
L1	3.10	3.50	0.122	0.138	3
n	6.05	6.15	0.238	0.242	
øP	3.05	3.45	0.120	0.136	
u	2.40	2.50	0.094	0.098	6
v	0.40	0.50	0.016	0.020	6
ø	3'		3'	7'	
ø1		45'		45'	

### LEAD ASSIGNMENTS

#### HEXFEET

- 1.- GATE
- 2.- DRAIN
- 3.- SOURCE

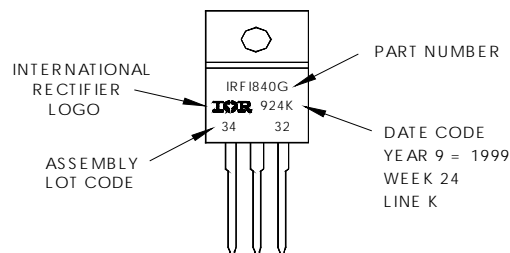
#### IGBTs, CoPACK

- 1.- GATE
- 2.- COLLECTOR
- 3.- EMITTER

## TO-220 Full-Pak Part Marking Information

EXAMPLE: THIS IS AN IRFIB40G  
WITH ASSEMBLY  
LOT CODE 3432  
ASSEMBLED ON WW 24 1999  
IN THE ASSEMBLY LINE "K"

**Note:** "P" in assembly line position indicates "Lead-Free"



**TO-220 Full-Pak package is not recommended for Surface Mount Application.**

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

International  
**IR** Rectifier

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TAC Fax: (310) 252-7903

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### Notice

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