



# THE DATASHEET OF IRFIB8N50KPBF



HEXFET® Power MOSFET

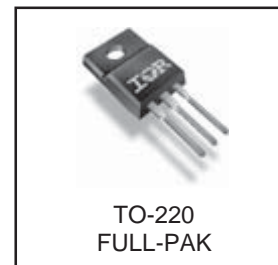
**Applications**

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

<b>V<sub>DSS</sub></b>	<b>R<sub>DS(on)</sub> typ.</b>	<b>I<sub>D</sub></b>
<b>500V</b>	<b>290mΩ</b>	<b>6.7A</b>

**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 <sub>D</sub> @ T <sub>C</sub> = 25°C	Continuous Drain Current, V <sub>GS</sub> @ 10V	6.7	A
I <sub>D</sub> @ T <sub>C</sub> = 100°C	Continuous Drain Current, V <sub>GS</sub> @ 10V	4.2	
I <sub>DM</sub>	Pulsed Drain Current ①	27	
P <sub>D</sub> @ T <sub>C</sub> = 25°C	Power Dissipation	45	W
	Linear Derating Factor	0.36	W/°C
V <sub>GS</sub>	Gate-to-Source Voltage	±30	V
dv/dt	Peak Diode Recovery dv/dt ③	17	V/ns
T <sub>J</sub>	Operating Junction and	-55 to + 150	°C
T <sub>STG</sub>	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 <sub>AS</sub>	Single Pulse Avalanche Energy ②	—	290	mJ
I <sub>AR</sub>	Avalanche Current ①	—	6.7	A
E <sub>AR</sub>	Repetitive Avalanche Energy ①	—	4.5	mJ

**Thermal Resistance**

	Parameter	Typ.	Max.	Units
R <sub>θJC</sub>	Junction-to-Case	—	2.76	°C/W
R <sub>θJA</sub>	Junction-to-Ambient	—	65	

# IRFIB8N50K

International  
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	$I_D = 6.7A$ $V_{DS} = 400V$ $V_{GS} = 10V$ ④
$Q_{gs}$	Gate-to-Source Charge	—	—	24		
$Q_{gd}$	Gate-to-Drain ("Miller") Charge	—	—	44		
$t_{d(on)}$	Turn-On Delay Time	—	17	—	ns	$V_{DD} = 250V$ $I_D = 6.7A$ $R_G = 38\Omega$ $V_{GS} = 10V$ ④
$t_r$	Rise Time	—	16	—		
$t_{d(off)}$	Turn-Off Delay Time	—	28	—		
$t_f$	Fall Time	—	8.4	—		
$C_{iss}$	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  $T_J = 25^\circ\text{C}$ ,  $L = 13\text{mH}$ ,  $R_G = 25\Omega$ ,  $I_{AS} = 6.7A$ ,  $dv/dt = 17V/ns$  (See Figure 12a).
- ③  $I_{SD} \leq 6.7A$ ,  $di/dt \leq 330A/\mu s$ ,  $V_{DD} \leq V_{(BR)DSS}$ ,  $T_J \leq 150^\circ\text{C}$ .

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%  $V_{DSS}$ .

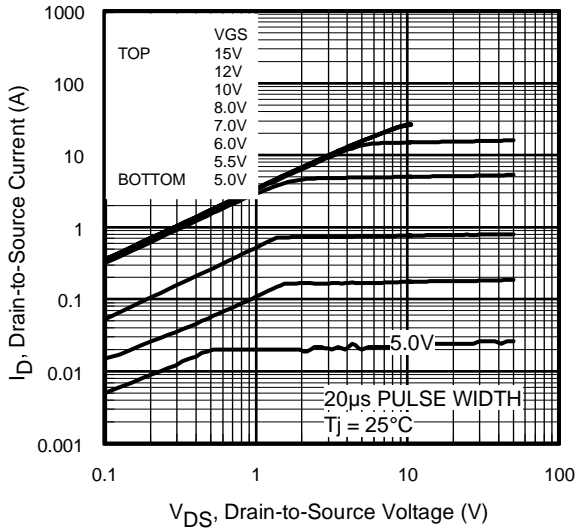


Fig 1. Typical Output Characteristics

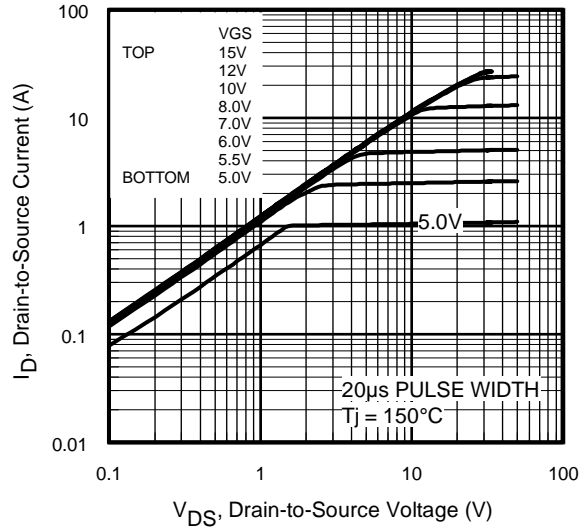


Fig 2. Typical Output Characteristics

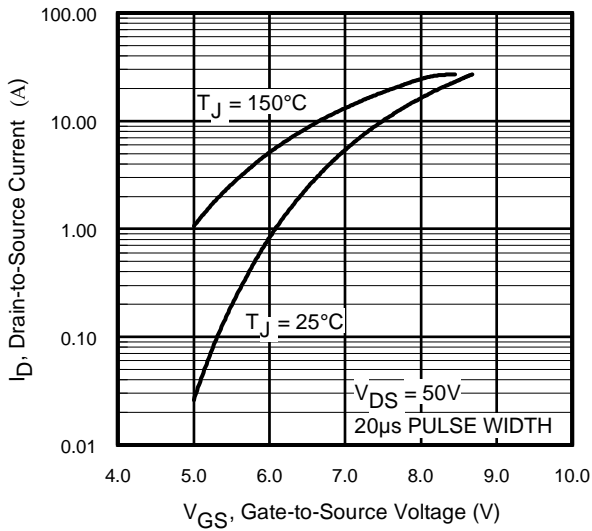


Fig 3. Typical Transfer Characteristics

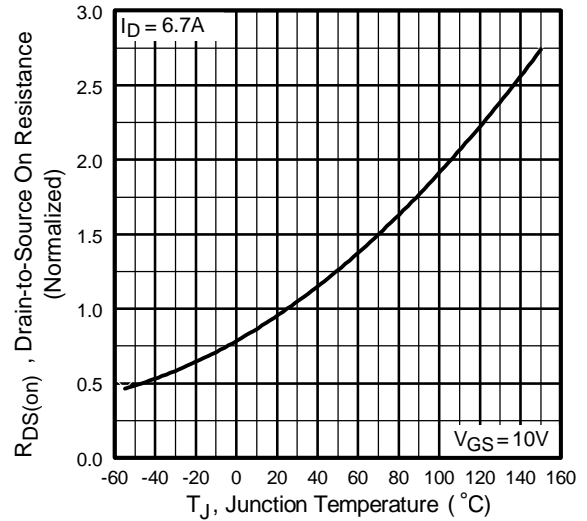
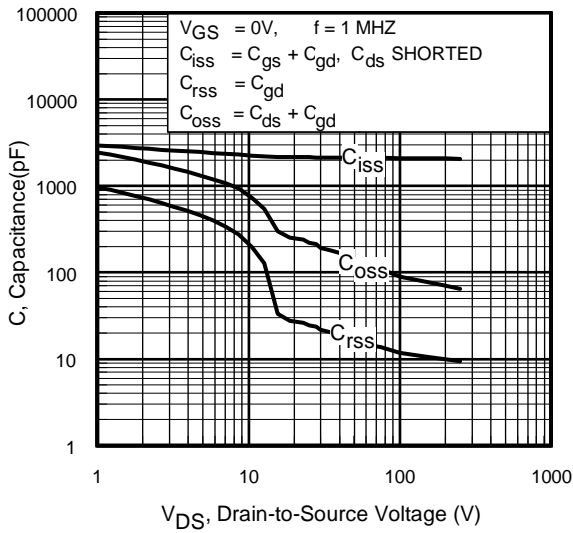
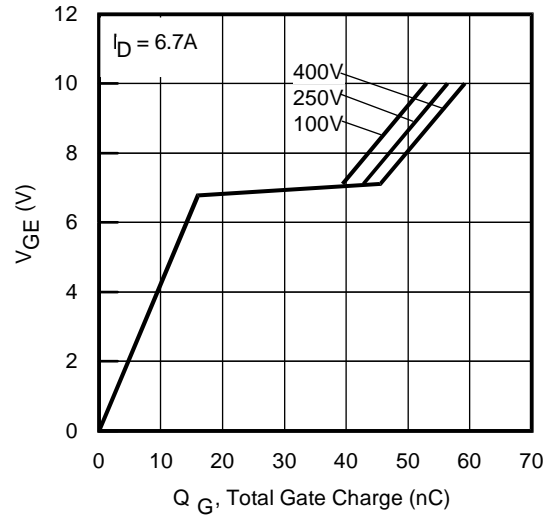


Fig 4. Normalized On-Resistance Vs. Temperature

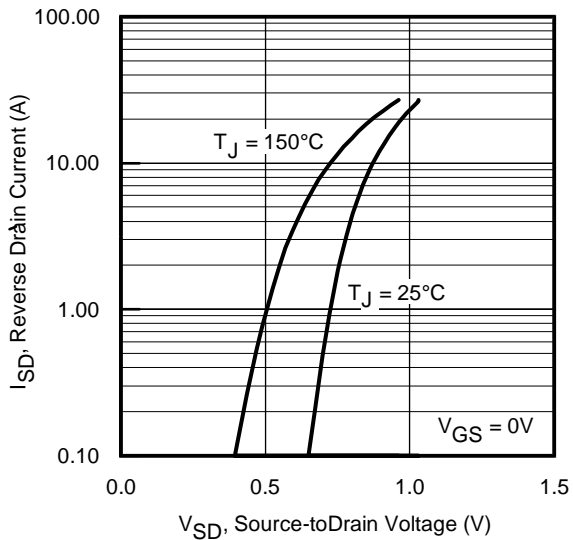
# IRFIB8N50K



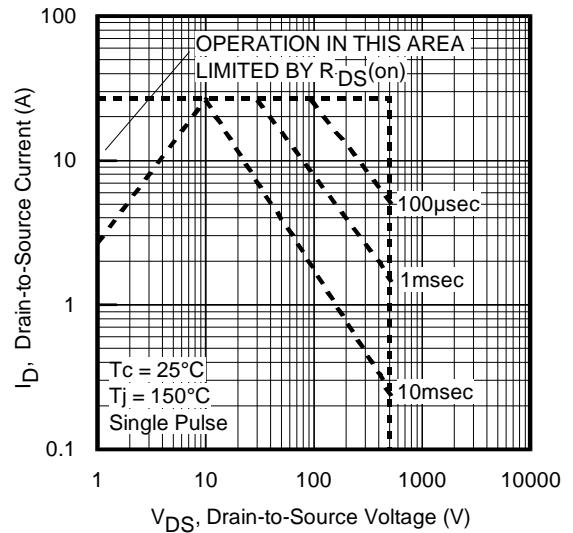
**Fig 5.** Typical Capacitance Vs. Drain-to-Source Voltage



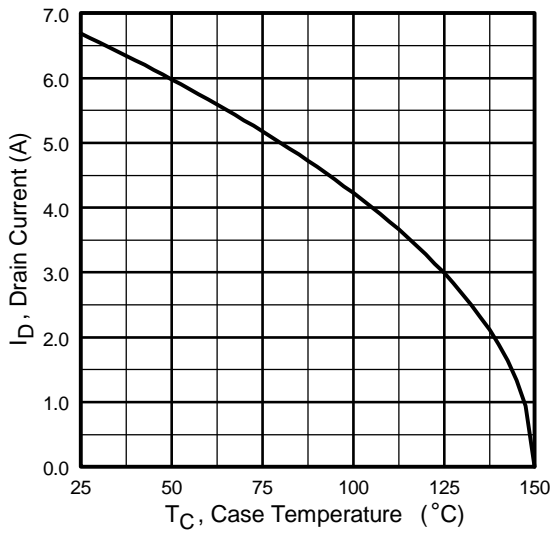
**Fig 6.** Typical Gate Charge Vs. Gate-to-Source Voltage



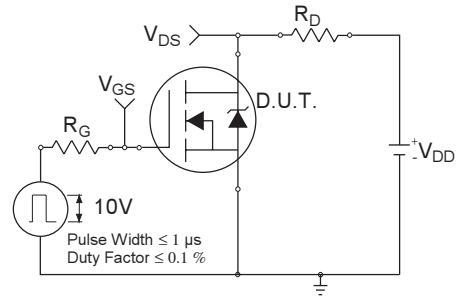
**Fig 7.** Typical Source-Drain Diode Forward Voltage



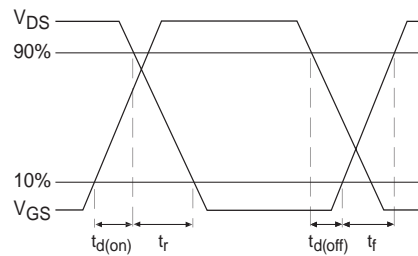
**Fig 8.** Maximum Safe Operating Area



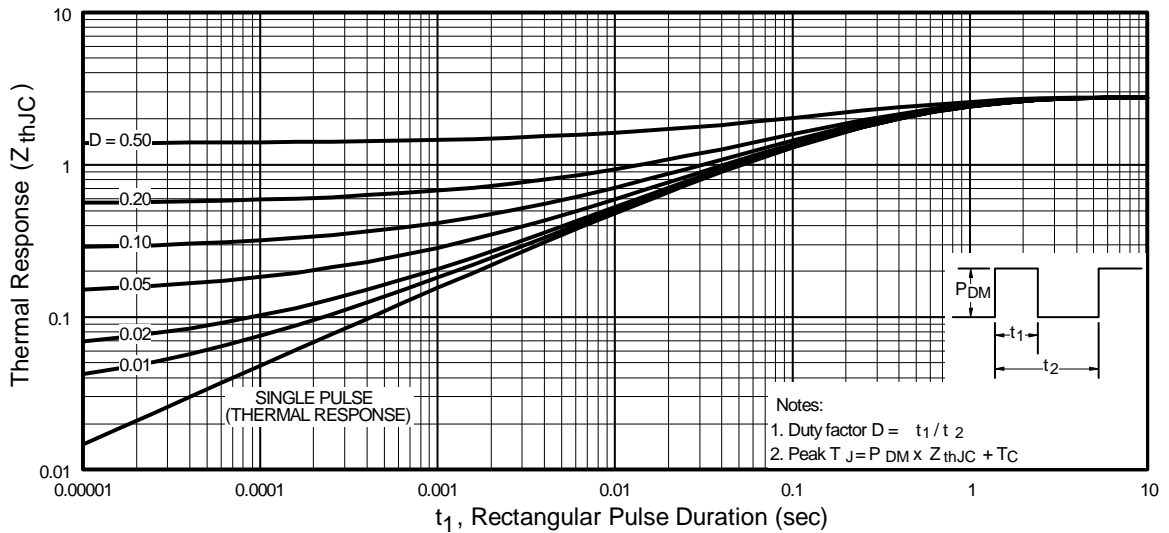
**Fig 9.** Maximum Drain Current Vs. Case Temperature



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



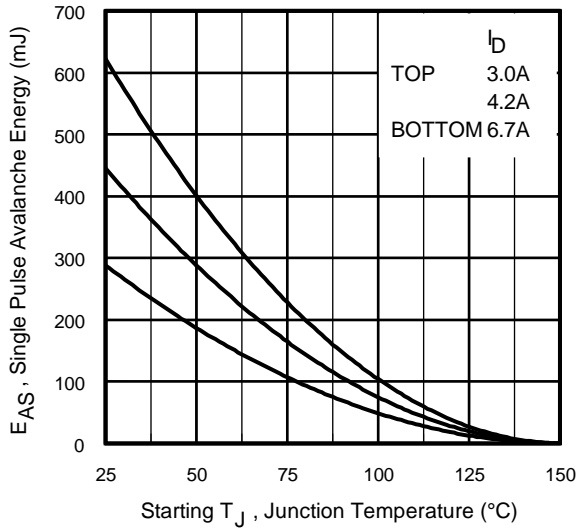
**Fig 10b.** Switching Time Waveforms



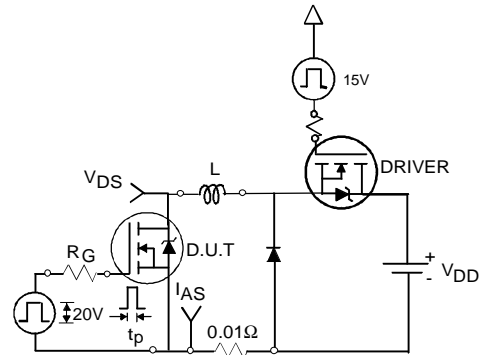
**Fig 11.** Maximum Effective Transient Thermal Impedance, Junction-to-Case

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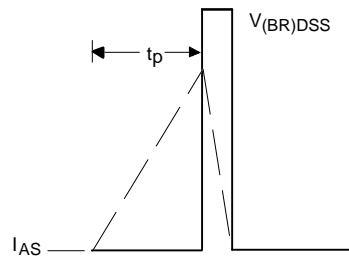
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**IR** Rectifier



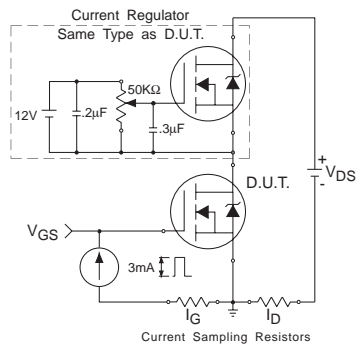
**Fig 12a.** Maximum Avalanche Energy Vs. Drain Current



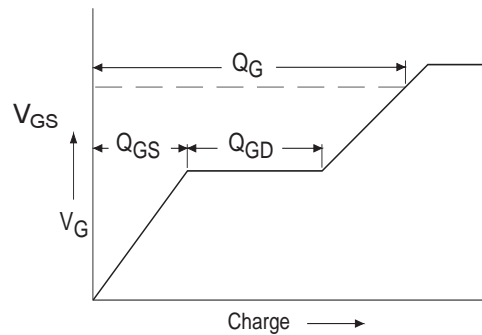
**Fig 12c.** Unclamped Inductive Test Circuit



**Fig 12d.** Unclamped Inductive Waveforms

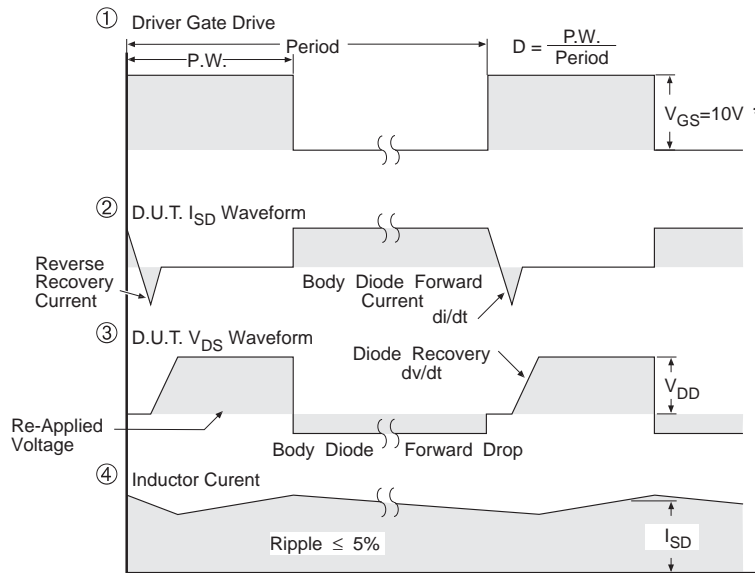
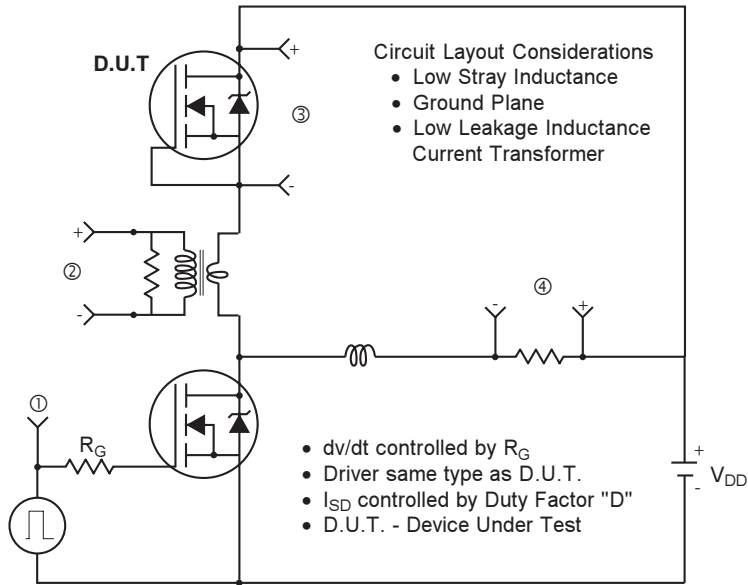


**Fig 13a.** Gate Charge Test Circuit



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

## Peak Diode Recovery dv/dt Test Circuit



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

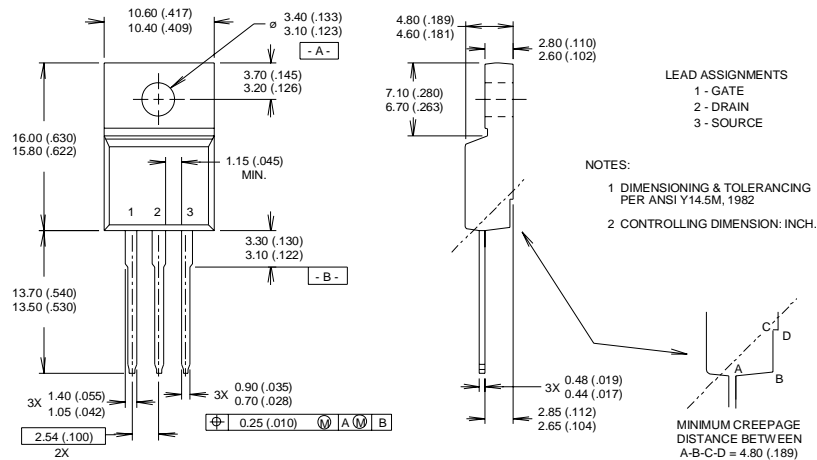
**Fig 14.** For N-Channel HEXFET® Power MOSFETs

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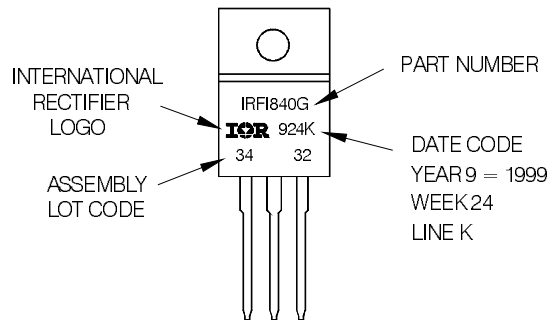
## TO-220 Full-Pak Package Outline

Dimensions are shown in millimeters (inches)



## TO-220 Full-Pak Part Marking Information

EXAMPLE: THIS IS AN IRF1840G  
WITH ASSEMBLY  
LOT CODE 3432  
ASSEMBLED ON WW 24 1999  
IN THE ASSEMBLY LINE "K"



**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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