

**SMPS MOSFET IRFB16N50K**

**Applications**

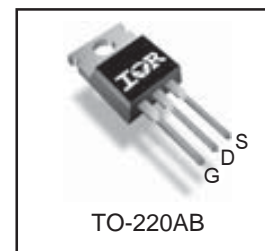
- Switch Mode Power Supply (SMPS)
- Uninterruptible Power Supply
- High Speed Power Switching
- Hard Switched and High Frequency Circuits

HEXFET® Power MOSFET

$V_{DSS}$	$R_{DS(on)}$ typ.	$I_D$
500V	285mΩ	17A

**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
- Low  $R_{DS(on)}$



**Absolute Maximum Ratings**

	Parameter	Max.	Units
$I_D$ @ $T_C = 25^\circ\text{C}$	Continuous Drain Current, VGS @ 10V	17	A
$I_D$ @ $T_C = 100^\circ\text{C}$	Continuous Drain Current, VGS @ 10V	11	
$I_{DM}$	Pulsed Drain Current ①	68	
$P_D$ @ $T_C = 25^\circ\text{C}$	Power Dissipation	280	W
	Linear Derating Factor	2.3	W/°C
$V_{GS}$	Gate-to-Source Voltage	± 30	V
dv/dt	Peak Diode Recovery dv/dt ③	8.0	V/ns
$T_J$	Operating Junction and	-55 to + 150	°C
$T_{STG}$	Storage Temperature Range		
	Soldering Temperature, for 10 seconds	300 (1.6mm from case )	
	Mounting torque, 6-32 or M3 screw	10 lbf•in (1.1N•m)	

**Avalanche Characteristics**

	Parameter	Typ.	Max.	Units
$E_{AS}$	Single Pulse Avalanche Energy②	—	310	mJ
$I_{AR}$	Avalanche Current ①	—	17	A
$E_{AR}$	Repetitive Avalanche Energy ①	—	28	mJ

**Thermal Resistance**

	Parameter	Typ.	Max.	Units
$R_{\theta JC}$	Junction-to-Case	—	0.44	°C/W
$R_{\theta CS}$	Case-to-Sink, Flat, Greased Surface	0.50	—	
$R_{\theta JA}$	Junction-to-Ambient	—	62	

# IRFB16N50K

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	—	0.58	—	V/°C	Reference to $25^\circ\text{C}, I_D = 1\text{mA}$
$R_{DS(on)}$	Static Drain-to-Source On-Resistance	—	285	350	m $\Omega$	$V_{GS} = 10V, I_D = 10A$ 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	5.7	—	—	S	$V_{DS} = 50V, I_D = 10A$
$Q_g$	Total Gate Charge	—	60	89	nC	$I_D = 17A$
$Q_{gs}$	Gate-to-Source Charge	—	18	27		$V_{DS} = 400V$
$Q_{gd}$	Gate-to-Drain ("Miller") Charge	—	28	43		$V_{GS} = 10V$ ④
$t_{d(on)}$	Turn-On Delay Time	—	20	—	ns	$V_{DD} = 250V$
$t_r$	Rise Time	—	77	—		$I_D = 17A$
$t_{d(off)}$	Turn-Off Delay Time	—	38	—		$R_G = 8.8\Omega$
$t_f$	Fall Time	—	30	—		$V_{GS} = 10V$ ④
$C_{iss}$	Input Capacitance	—	2210	—	pF	$V_{GS} = 0V$
$C_{oss}$	Output Capacitance	—	240	—		$V_{DS} = 25V$
$C_{riss}$	Reverse Transfer Capacitance	—	26	—		$f = 1.0\text{MHz}$
$C_{oss}$	Output Capacitance	—	2620	—		$V_{GS} = 0V, V_{DS} = 1.0V, f = 1.0\text{MHz}$
$C_{oss}$	Output Capacitance	—	63	—		$V_{GS} = 0V, V_{DS} = 400V, f = 1.0\text{MHz}$
$C_{oss\ eff.}$	Effective Output Capacitance	—	120	—		$V_{GS} = 0V, V_{DS} = 0V\ \text{to}\ 400V$ ③

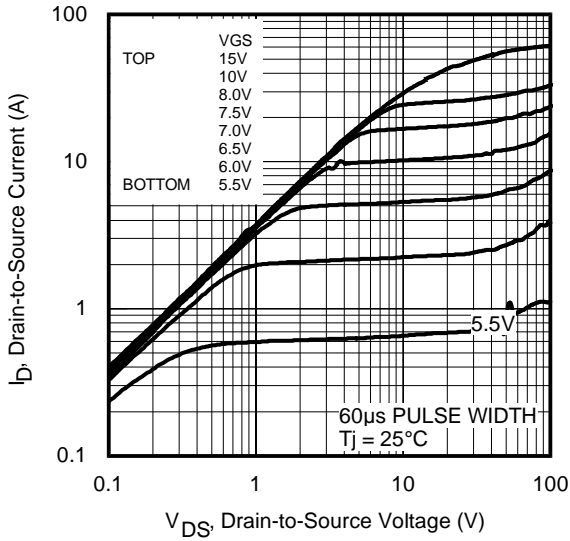
## Diode Characteristics

	Parameter	Min.	Typ.	Max.	Units	Conditions
$I_S$	Continuous Source Current (Body Diode)	—	—	17	A	MOSFET symbol showing the integral reverse p-n junction diode.
$I_{SM}$	Pulsed Source Current (Body Diode) ①⑥	—	—	68	A	
$V_{SD}$	Diode Forward Voltage	—	—	1.5	V	$T_J = 25^\circ\text{C}, I_S = 17A, V_{GS} = 0V$ ④
$t_{rr}$	Reverse Recovery Time	—	490	730	ns	$T_J = 25^\circ\text{C}, I_F = 17A$
$Q_{rr}$	Reverse Recovery Charge	—	5710	8560	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)				

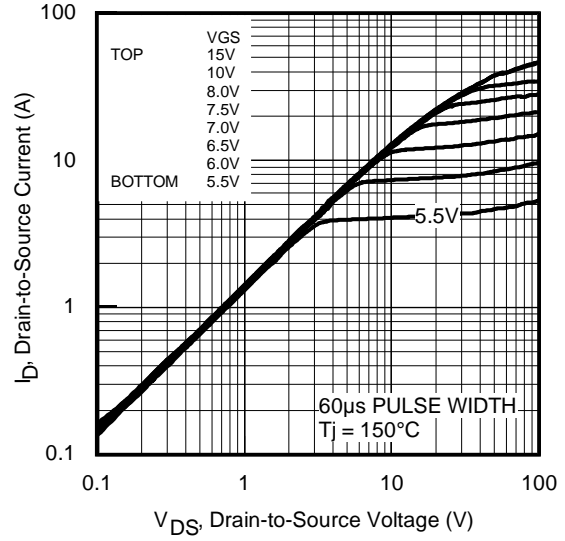
### Notes:

- ① Repetitive rating; pulse width limited by max. junction temperature.
- ② Starting  $T_J = 25^\circ\text{C}$ ,  $L = 2.2\text{mH}$ ,  $R_G = 25\Omega$ ,  $I_{AS} = 17A$ .

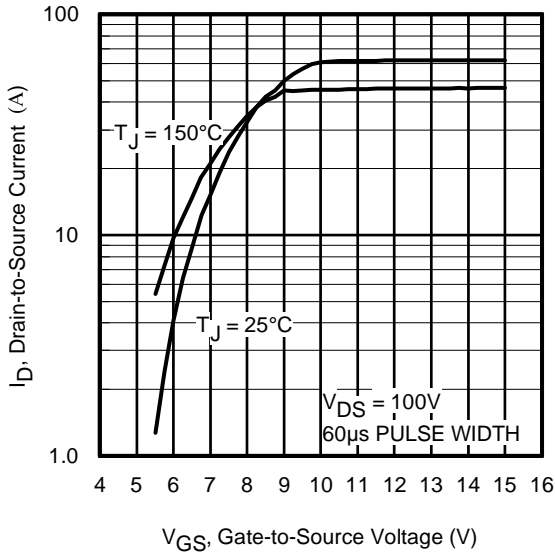
- ③  $I_{SD} \leq 17A, di/dt \leq 340A/\mu s, V_{DD} \leq V_{(BR)DSS}, T_J \leq 150^\circ\text{C}$ .
- ④ Pulse width  $\leq 300\mu s$ ; duty cycle  $\leq 2\%$ .



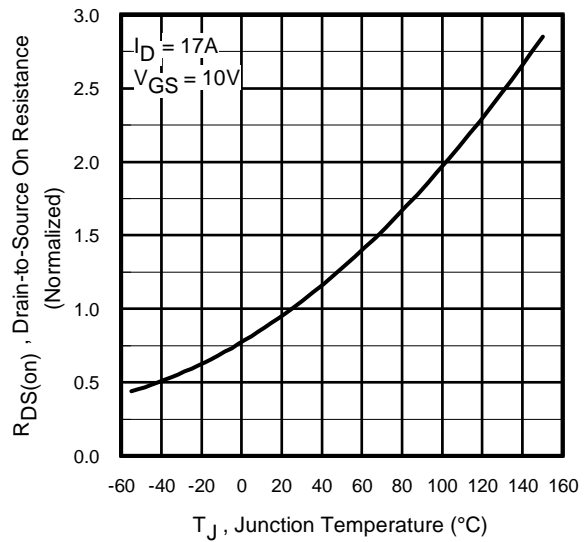
**Fig 1.** Typical Output Characteristics



**Fig 2.** Typical Output Characteristics

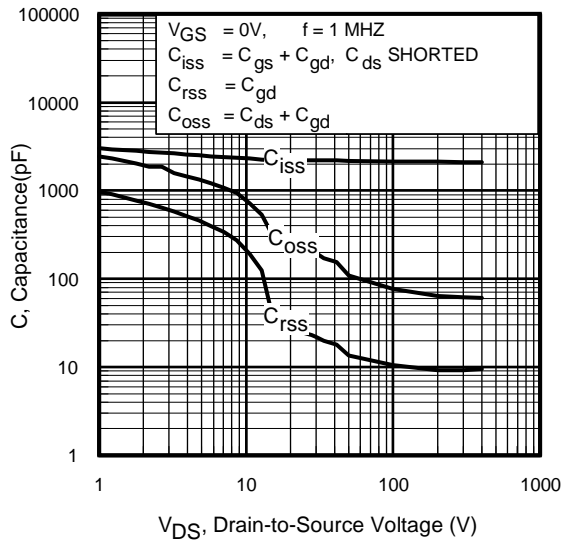


**Fig 3.** Typical Transfer Characteristics

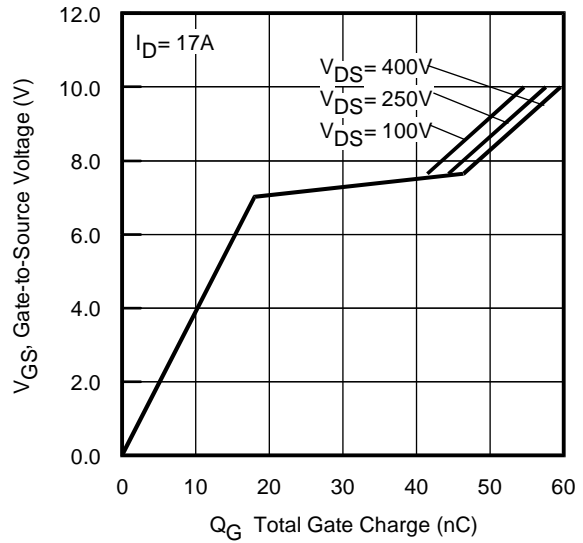


**Fig 4.** Normalized On-Resistance vs. Temperature

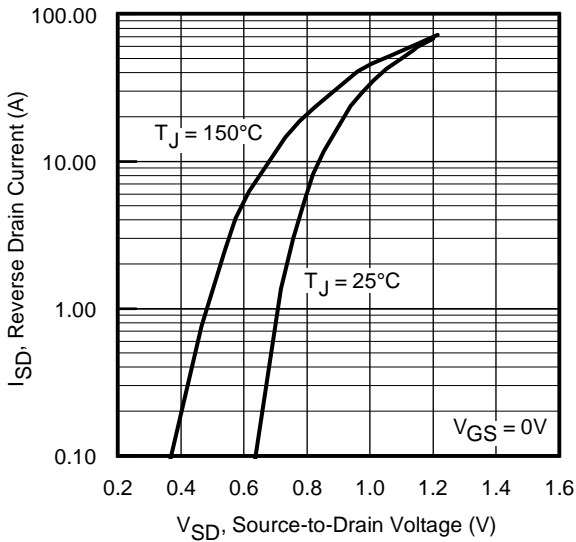
# IRFB16N50K



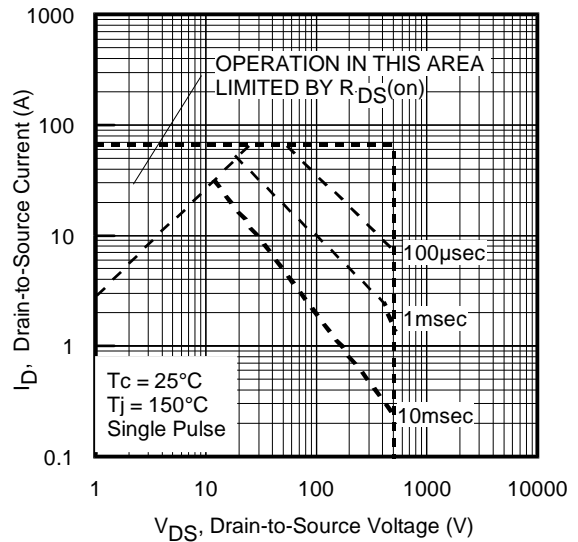
**Fig 5.** Typical Capacitance vs. Drain-to-Source Voltage



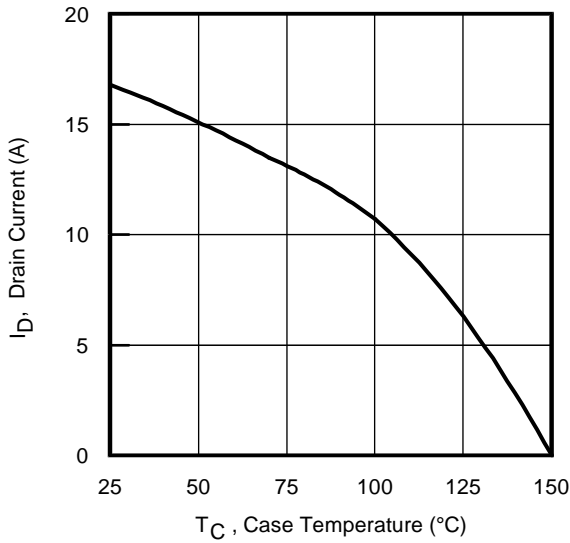
**Fig 6.** Typical Gate Charge vs. Gate-to-Source Voltage



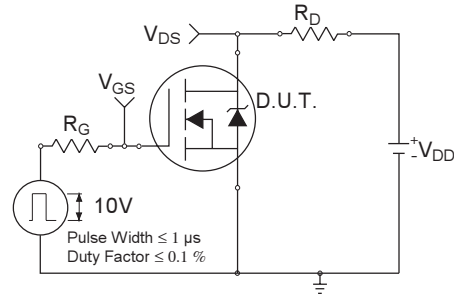
**Fig 7.** Typical Source-Drain Diode Forward Voltage



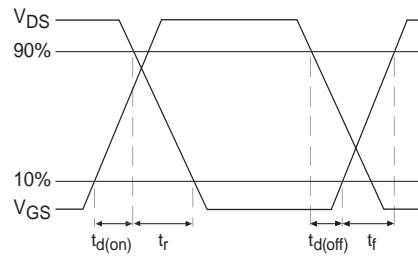
**Fig 8.** Maximum Safe Operating Area



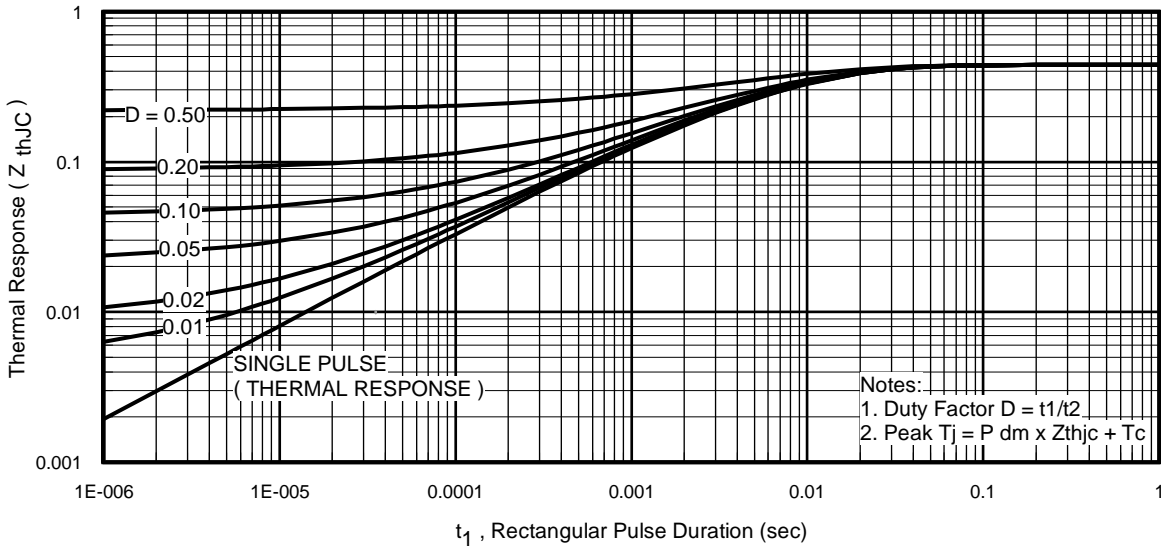
**Fig 9.** Maximum Drain Current vs. Case Temperature



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

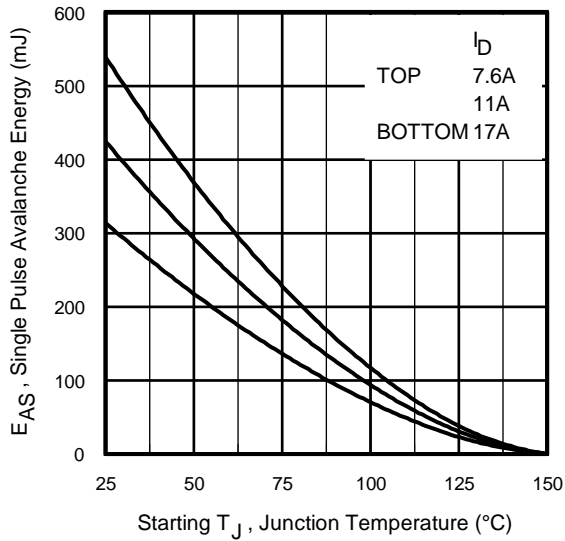


**Fig 10b.** Switching Time Waveforms

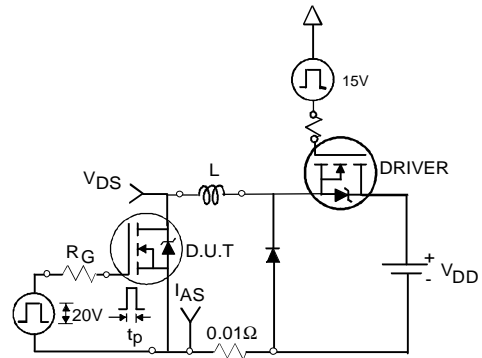


**Fig 11.** Maximum Effective Transient Thermal Impedance, Junction-to-Case

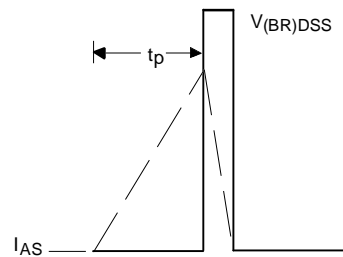
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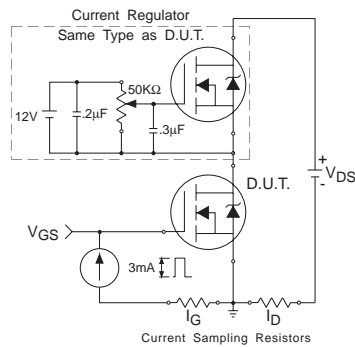
**Fig 12.** Maximum Avalanche Energy vs. Drain Current



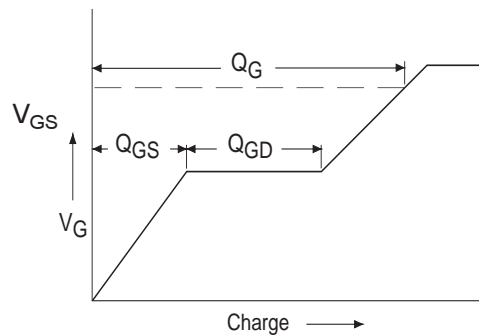
**Fig 13a.** Unclamped Inductive Test Circuit



**Fig 13b.** Unclamped Inductive Waveforms

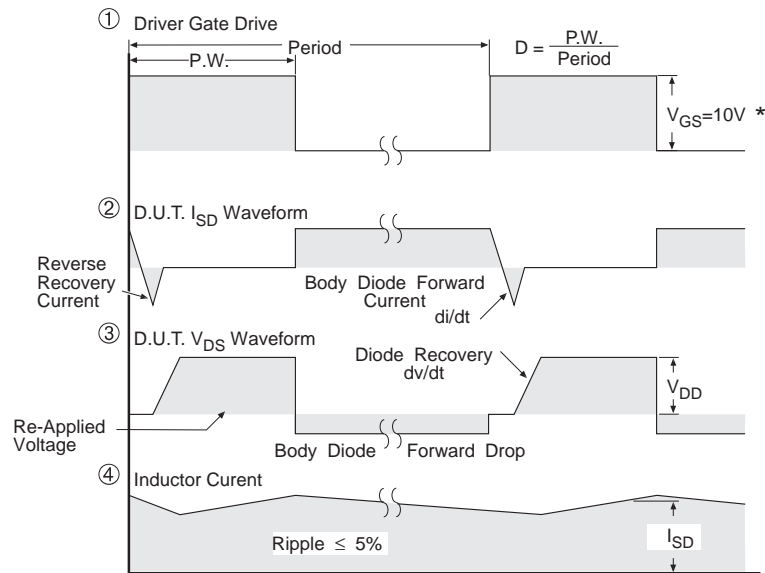
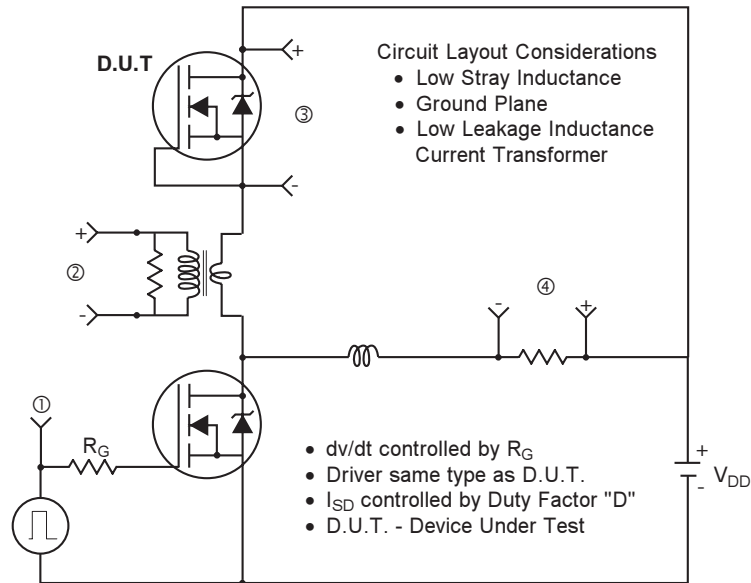


**Fig 14a.** Gate Charge Test Circuit



**Fig 14b.** Basic Gate Charge Waveform

## Peak Diode Recovery dv/dt Test Circuit



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

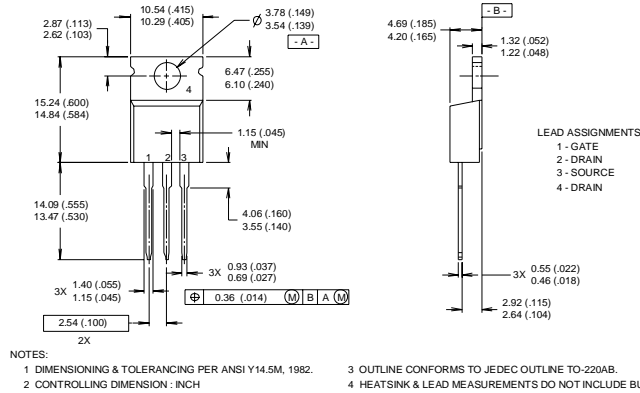
**Fig 15.** For N-Channel HEXFET® Power MOSFETs

# IRFB16N50K

International  
**IR** Rectifier

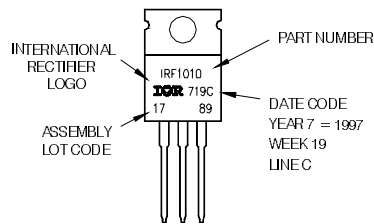
## TO-220AB Package Outline

Dimensions are shown in millimeters (inches)



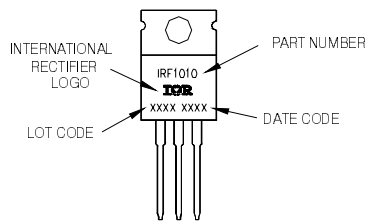
## TO-220AB Part Marking Information

EXAMPLE: THIS IS AN IRF1010  
LOT CODE 1789  
ASSEMBLED ON WW 19, 1997  
IN THE ASSEMBLY LINE "C"



For GB Production

EXAMPLE: THIS IS AN IRF1010  
LOT CODE 1789  
ASSEMBLED ON WW 19, 1997  
IN THE ASSEMBLY LINE "C"



**TO-220AB 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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