

# IRFB42N20DPbF

HEXFET® Power MOSFET

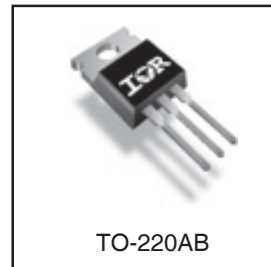
## Applications

- High frequency DC-DC converters
- Motor Control
- Uninterruptible Power Supplies
- Lead-Free

<b>V<sub>DSS</sub></b>	<b>R<sub>DS(on)</sub> max</b>	<b>I<sub>D</sub></b>
<b>200V</b>	<b>0.055Ω</b>	<b>44A</b>

## Benefits

- Low Gate-to-Drain Charge to Reduce Switching Losses
- Fully Characterized Capacitance Including Effective C<sub>OSS</sub> to Simplify Design, (See App. Note AN1001)
- Fully Characterized 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	44	A
I <sub>D</sub> @ T <sub>C</sub> = 100°C	Continuous Drain Current, V <sub>GS</sub> @ 10V	31	
I <sub>DM</sub>	Pulsed Drain Current ①	180	
P <sub>D</sub> @ T <sub>A</sub> = 25°C	Power Dissipation	2.4	W
P <sub>D</sub> @ T <sub>C</sub> = 25°C	Power Dissipation	330	
	Linear Derating Factor	2.2	W/°C
V <sub>GS</sub>	Gate-to-Source Voltage	± 30	V
dv/dt	Peak Diode Recovery dv/dt ②	2.5	V/ns
T <sub>J</sub>	Operating Junction and	-55 to + 175	°C
T <sub>STG</sub>	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)	

## Thermal Resistance

	Parameter	Typ.	Max.	Units
R <sub>θJC</sub>	Junction-to-Case	—	0.45	°C/W
R <sub>θCS</sub>	Case-to-Sink, Flat, Greased Surface	0.50	—	
R <sub>θJA</sub>	Junction-to-Ambient	—	62	

Notes ① through ⑤ are on page 8

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## Static @ T<sub>J</sub> = 25°C (unless otherwise specified)

	Parameter	Min.	Typ.	Max.	Units	Conditions
V <sub>(BR)DSS</sub>	Drain-to-Source Breakdown Voltage	200	—	—	V	V <sub>GS</sub> = 0V, I <sub>D</sub> = 250μA
ΔV <sub>(BR)DSS</sub> /ΔT <sub>J</sub>	Breakdown Voltage Temp. Coefficient	—	0.26	—	V/°C	Reference to 25°C, I <sub>D</sub> = 1mA
R <sub>DS(on)</sub>	Static Drain-to-Source On-Resistance	—	—	0.055	Ω	V <sub>GS</sub> = 10V, I <sub>D</sub> = 26A ④
V <sub>GS(th)</sub>	Gate Threshold Voltage	3.0	—	5.5	V	V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 250μA
I <sub>DSS</sub>	Drain-to-Source Leakage Current	—	—	25	μA	V <sub>DS</sub> = 200V, V <sub>GS</sub> = 0V
		—	—	250		V <sub>DS</sub> = 160V, V <sub>GS</sub> = 0V, T <sub>J</sub> = 150°C
I <sub>GSS</sub>	Gate-to-Source Forward Leakage	—	—	100	nA	V <sub>GS</sub> = 30V
	Gate-to-Source Reverse Leakage	—	—	-100		V <sub>GS</sub> = -30V

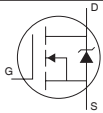
## Dynamic @ T<sub>J</sub> = 25°C (unless otherwise specified)

	Parameter	Min.	Typ.	Max.	Units	Conditions
g <sub>fs</sub>	Forward Transconductance	21	—	—	S	V <sub>DS</sub> = 50V, I <sub>D</sub> = 26A
Q <sub>g</sub>	Total Gate Charge	—	91	140	nC	I <sub>D</sub> = 26A
Q <sub>gs</sub>	Gate-to-Source Charge	—	24	36		V <sub>DS</sub> = 160V
Q <sub>gd</sub>	Gate-to-Drain ("Miller") Charge	—	43	65		V <sub>GS</sub> = 10V,
t <sub>d(on)</sub>	Turn-On Delay Time	—	18	—	ns	V <sub>DD</sub> = 100V
t <sub>r</sub>	Rise Time	—	69	—		I <sub>D</sub> = 26A
t <sub>d(off)</sub>	Turn-Off Delay Time	—	29	—		R <sub>G</sub> = 1.8Ω
t <sub>f</sub>	Fall Time	—	32	—		V <sub>GS</sub> = 10V ④
C <sub>iss</sub>	Input Capacitance	—	3430	—	pF	V <sub>GS</sub> = 0V
C <sub>oss</sub>	Output Capacitance	—	530	—		V <sub>DS</sub> = 25V
C <sub>rss</sub>	Reverse Transfer Capacitance	—	100	—		f = 1.0MHz
C <sub>oss</sub>	Output Capacitance	—	5310	—		V <sub>GS</sub> = 0V, V <sub>DS</sub> = 1.0V, f = 1.0MHz
C <sub>oss</sub>	Output Capacitance	—	210	—		V <sub>GS</sub> = 0V, V <sub>DS</sub> = 160V, f = 1.0MHz
C <sub>oss eff.</sub>	Effective Output Capacitance	—	400	—		V <sub>GS</sub> = 0V, V <sub>DS</sub> = 0V to 160V ⑤

## Avalanche Characteristics

	Parameter	Typ.	Max.	Units
E <sub>AS</sub>	Single Pulse Avalanche Energy②	—	510	mJ
I <sub>AR</sub>	Avalanche Current①	—	26	A
E <sub>AR</sub>	Repetitive Avalanche Energy①	—	33	mJ

## Diode Characteristics

	Parameter	Min.	Typ.	Max.	Units	Conditions
I <sub>S</sub>	Continuous Source Current (Body Diode)	—	—	44	A	MOSFET symbol showing the integral reverse p-n junction diode. 
I <sub>SM</sub>	Pulsed Source Current (Body Diode) ①	—	—	180		
V <sub>SD</sub>	Diode Forward Voltage	—	—	1.3	V	T <sub>J</sub> = 25°C, I <sub>S</sub> = 26A, V <sub>GS</sub> = 0V ④
t <sub>rr</sub>	Reverse Recovery Time	—	220	330	ns	T <sub>J</sub> = 25°C, I <sub>F</sub> = 26A
Q <sub>rr</sub>	Reverse Recovery Charge	—	1860	2790	nC	di/dt = 100A/μs ④
t <sub>on</sub>	Forward Turn-On Time	Intrinsic turn-on time is negligible (turn-on is dominated by L <sub>S</sub> +L <sub>D</sub> )				

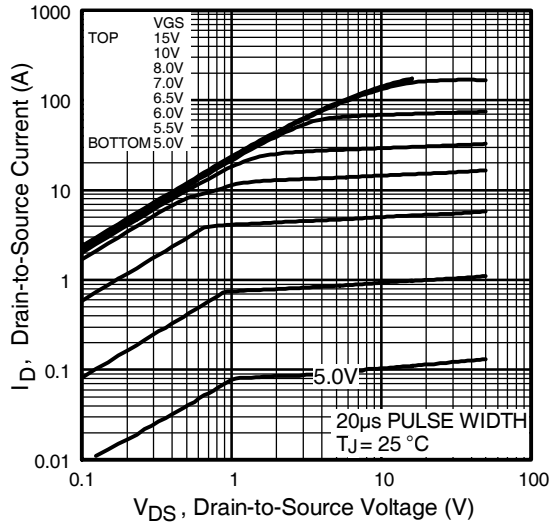


Fig 1. Typical Output Characteristics

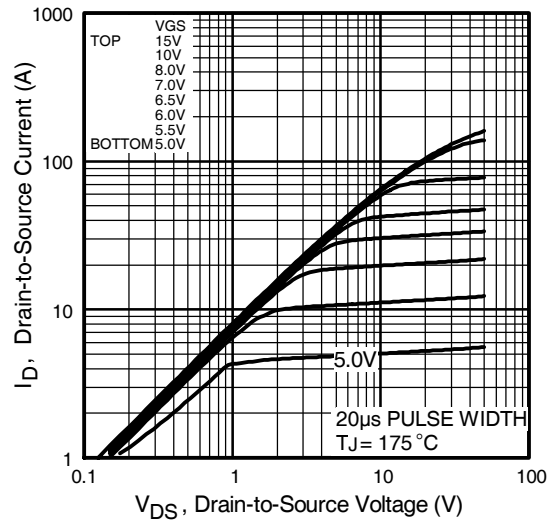


Fig 2. Typical Output Characteristics

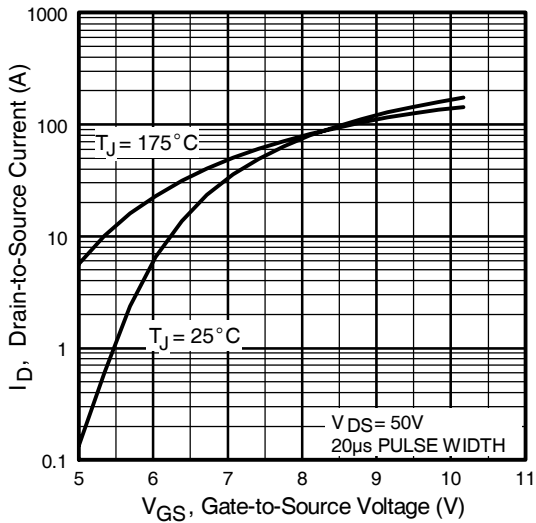


Fig 3. Typical Transfer Characteristics

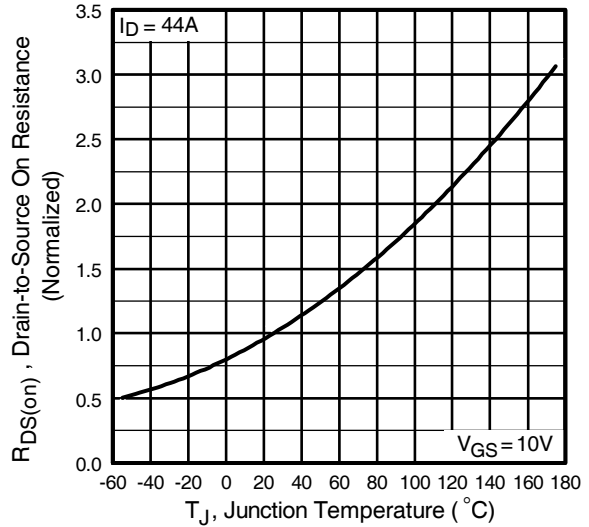
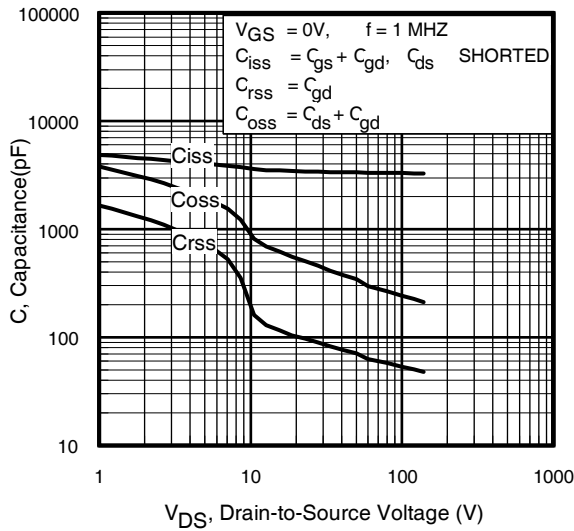


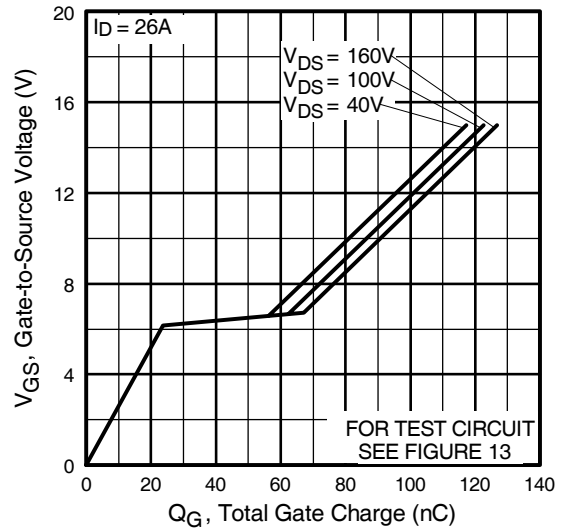
Fig 4. Normalized On-Resistance Vs. Temperature

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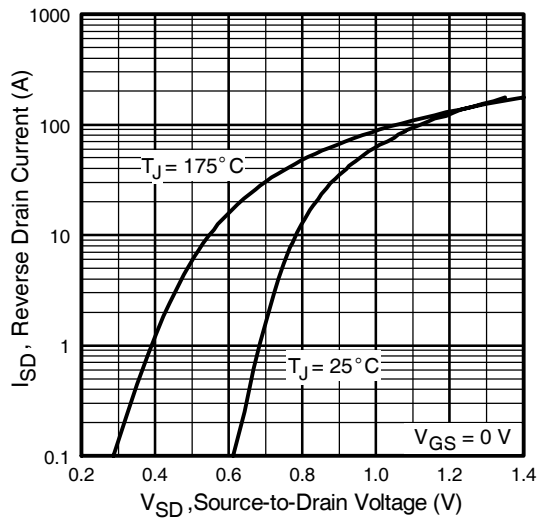
International  
**IR** Rectifier



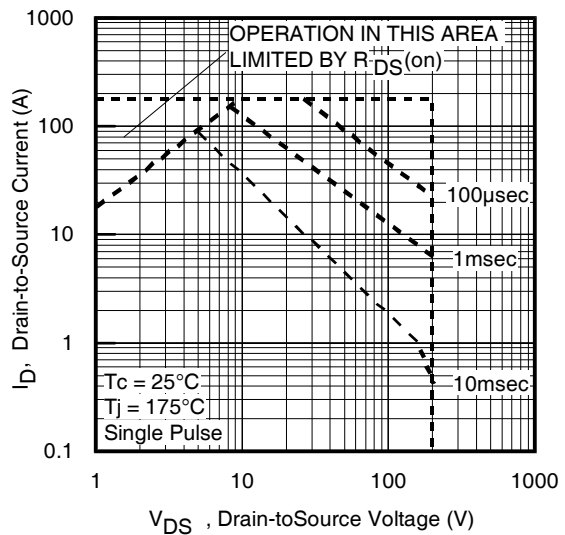
**Fig 5.** Typical Capacitance Vs. Drain-to-Source Voltage



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



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



**Fig 8.** Maximum Safe Operating Area

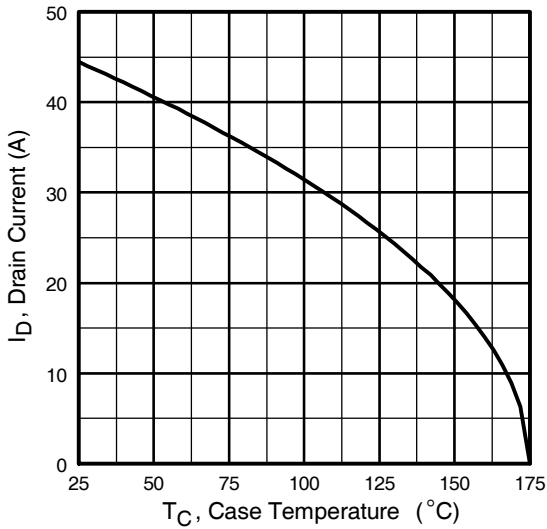


Fig 9. Maximum Drain Current Vs. Case Temperature



Fig 10a. Switching Time Test Circuit



Fig 10b. Switching Time Waveforms

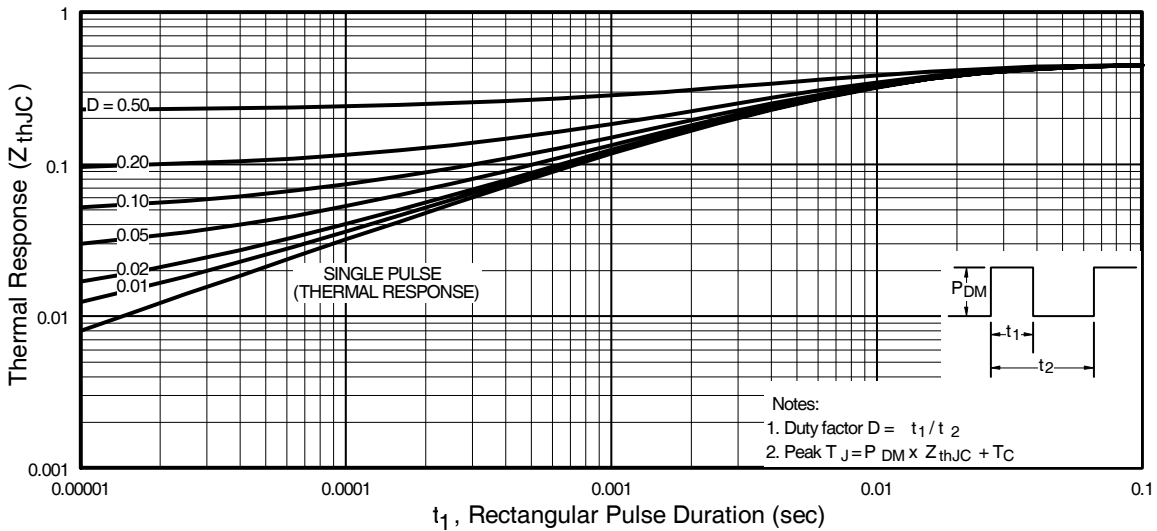
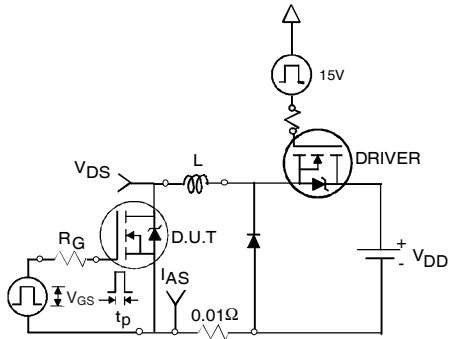


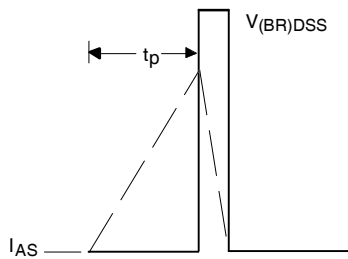
Fig 11. Maximum Effective Transient Thermal Impedance, Junction-to-Case

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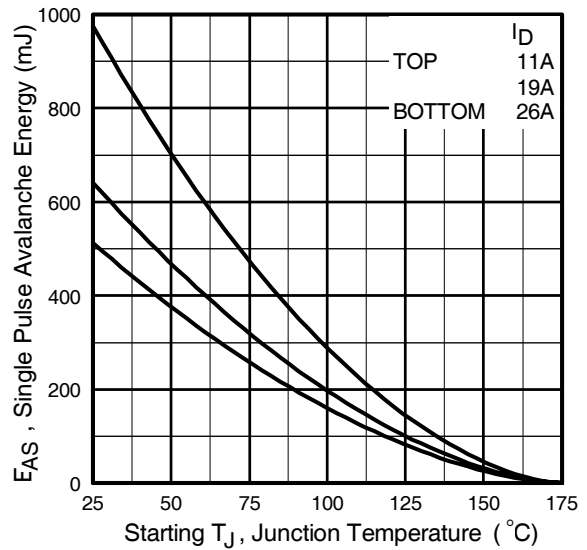
International  
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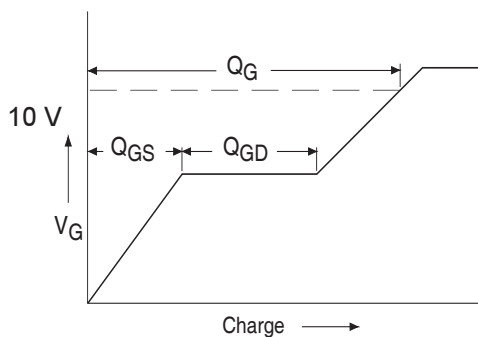
**Fig 12a.** Unclamped Inductive Test Circuit



**Fig 12b.** Unclamped Inductive Waveforms



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

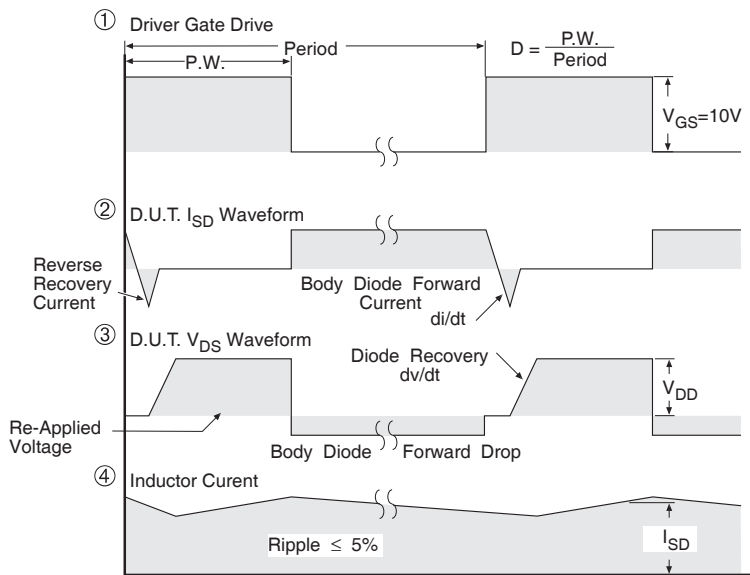
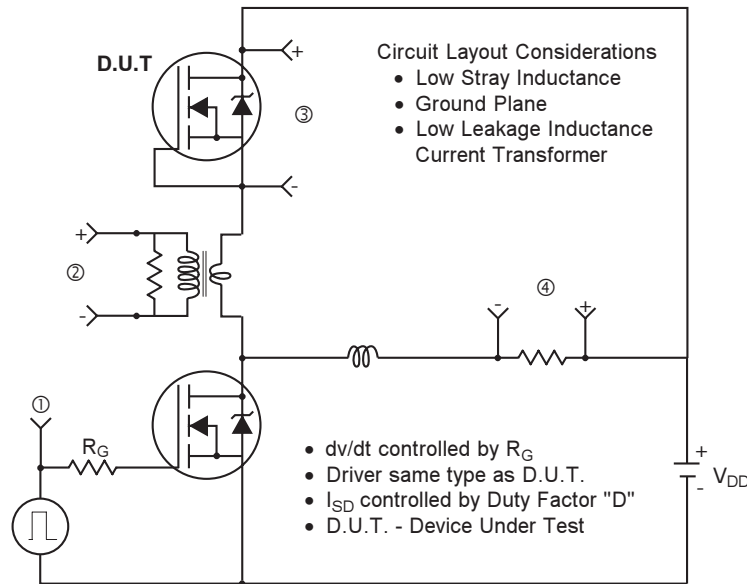


**Fig 13a.** Basic Gate Charge Waveform



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

**Peak Diode Recovery dv/dt Test Circuit**



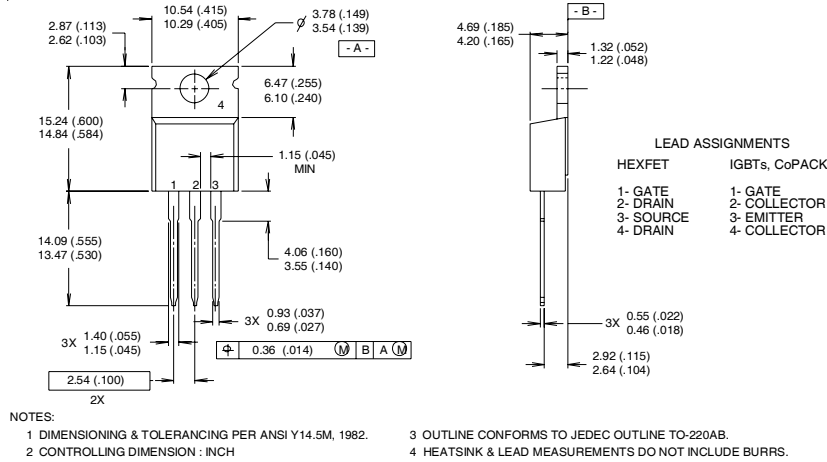
\*  $V_{GS} = 5V$  for Logic Level Devices

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

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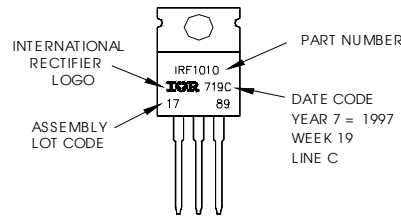
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## TO-220AB Package Outline



## TO-220AB Part Marking Information

EXAMPLE: THIS IS AN IRF1010  
 LOT CODE 1789  
 ASSEMBLED ON WW 19, 1997  
 IN THE ASSEMBLY LINE "C"  
**Note:** "P" in assembly line  
 position indicates "Lead-Free"



### Notes:

- ① Repetitive rating; pulse width limited by max. junction temperature.
- ② Starting  $T_J = 25^\circ\text{C}$ ,  $L = 1.45\text{mH}$   
 $R_G = 25\Omega$ ,  $I_{AS} = 26\text{A}$ ,  $V_{GS} = 10\text{V}$
- ③  $I_{SD} \leq 26\text{A}$ ,  $di/dt \leq 110\text{A}/\mu\text{s}$ ,  $V_{DD} \leq V_{(BR)DSS}$ ,  
 $T_J \leq 175^\circ\text{C}$
- ④ Pulse width  $\leq 400\mu\text{s}$ ; 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%  $V_{DSS}$

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.

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**IR** Rectifier

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Note: For the most current drawings please refer to the IR website at:  
<http://www.irf.com/package/>