

# IRF8010PbF

## SMPS MOSFET

HEXFET® Power MOSFET

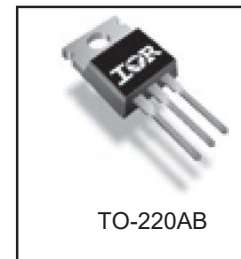
### Applications

- High frequency DC-DC converters
- UPS and Motor Control
- Lead-Free

### Benefits

- Low Gate-to-Drain Charge to Reduce Switching Losses
- Fully Characterized Capacitance Including Effective  $C_{OSS}$  to Simplify Design, (See App. Note AN1001)
- Fully Characterized Avalanche Voltage and Current
- Typical  $R_{DS(on)} = 12m\Omega$

$V_{DSS}$	$R_{DS(on)} \text{ max}$	$I_D$
100V	15m $\Omega$	80A <sup>⑥</sup>



### Absolute Maximum Ratings

	Parameter	Max.	Units
$I_D @ T_C = 25^\circ\text{C}$	Continuous Drain Current, $V_{GS} @ 10\text{V}$	80 <sup>⑥</sup>	A
$I_D @ T_C = 100^\circ\text{C}$	Continuous Drain Current, $V_{GS} @ 10\text{V}$	57	
$I_{DM}$	Pulsed Drain Current <sup>①</sup>	320	
$P_D @ T_C = 25^\circ\text{C}$	Power Dissipation	260	W
	Linear Derating Factor	1.8	W/ $^\circ\text{C}$
$V_{GS}$	Gate-to-Source Voltage	$\pm 20$	V
$dv/dt$	Peak Diode Recovery $dv/dt$ <sup>③</sup>	16	V/ns
$T_J$	Operating Junction and	-55 to + 175	$^\circ\text{C}$
$T_{STG}$	Storage Temperature Range		
	Soldering Temperature, for 10 seconds	300 (1.6mm from case )	
	Mounting torque, 6-32 or M3 screw	1.1(10)	N•m (lbf•in)

### Thermal Resistance

	Parameter	Typ.	Max.	Units
$R_{\theta JC}$	Junction-to-Case	—	0.57	$^\circ\text{C/W}$
$R_{\theta CS}$	Case-to-Sink, Flat, Greased Surface	0.50	—	
$R_{\theta JA}$	Junction-to-Ambient	—	62	

Notes <sup>①</sup> through <sup>⑥</sup> are on page 8

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

	Parameter	Min.	Typ.	Max.	Units	Conditions
$V_{(BR)DSS}$	Drain-to-Source Breakdown Voltage	100	—	—	V	$V_{GS} = 0V, I_D = 250\mu\text{A}$
$\Delta V_{(BR)DSS}/\Delta T_J$	Breakdown Voltage Temp. Coefficient	—	0.11	—	V/ $^\circ\text{C}$	Reference to $25^\circ\text{C}, I_D = 1\text{mA}$
$R_{DS(on)}$	Static Drain-to-Source On-Resistance	—	12	15	$\text{m}\Omega$	$V_{GS} = 10V, I_D = 45A$ ④
$V_{GS(th)}$	Gate Threshold Voltage	2.0	—	4.0	V	$V_{DS} = V_{GS}, I_D = 250\mu\text{A}$
$I_{DSS}$	Drain-to-Source Leakage Current	—	—	20	$\mu\text{A}$	$V_{DS} = 100V, V_{GS} = 0V$
		—	—	250		$V_{DS} = 100V, V_{GS} = 0V, T_J = 125^\circ\text{C}$
$I_{GSS}$	Gate-to-Source Forward Leakage	—	—	200	nA	$V_{GS} = 20V$
	Gate-to-Source Reverse Leakage	—	—	-200		$V_{GS} = -20V$

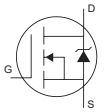
## Dynamic @ $T_J = 25^\circ\text{C}$ (unless otherwise specified)

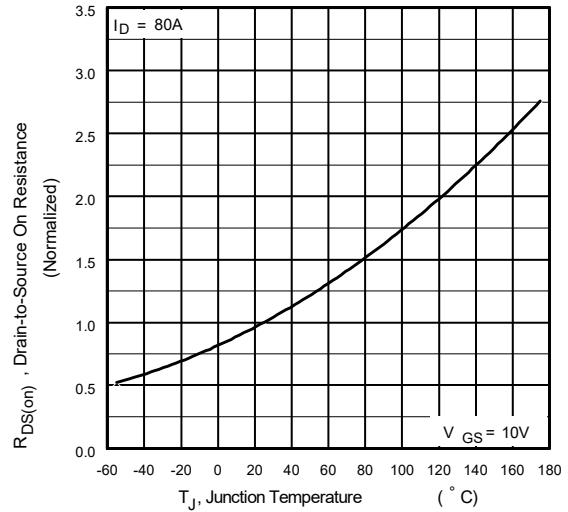
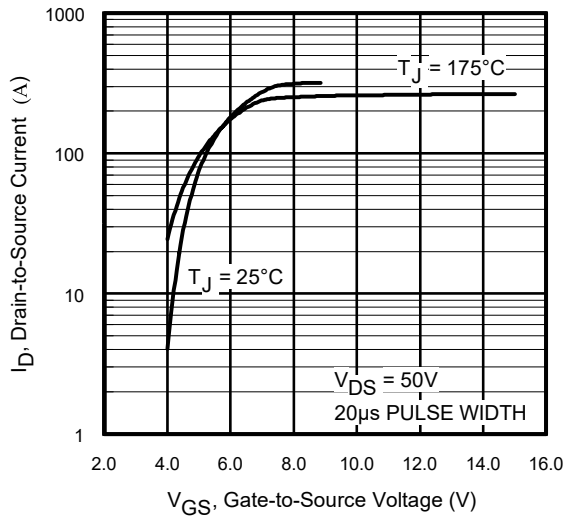
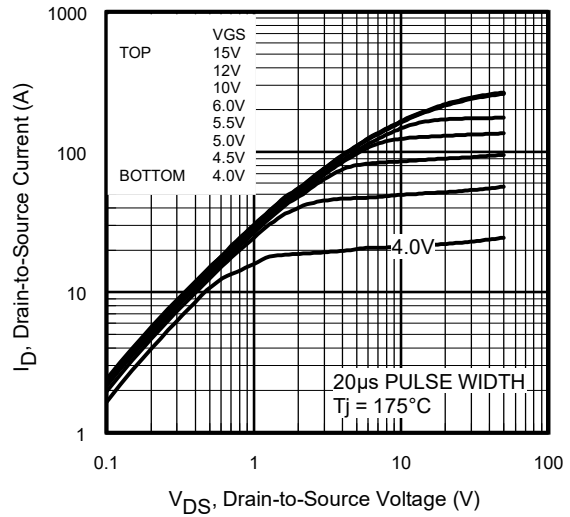
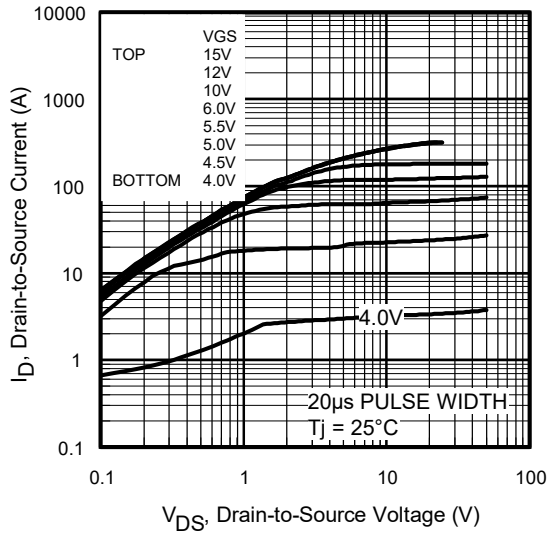
	Parameter	Min.	Typ.	Max.	Units	Conditions
gfs	Forward Transconductance	82	—	—	V	$V_{DS} = 25V, I_D = 45A$
$Q_g$	Total Gate Charge	—	81	120	nC	$I_D = 80A$ $V_{DS} = 80V$ $V_{GS} = 10V$ ④
$Q_{gs}$	Gate-to-Source Charge	—	22	—		
$Q_{gd}$	Gate-to-Drain ("Miller") Charge	—	26	—		
$t_{d(on)}$	Turn-On Delay Time	—	15	—	ns	$V_{DD} = 50V$ $I_D = 80A$ $R_G = 39\Omega$ $V_{GS} = 10V$ ④
$t_r$	Rise Time	—	130	—		
$t_{d(off)}$	Turn-Off Delay Time	—	61	—		
$t_f$	Fall Time	—	120	—		
$C_{iss}$	Input Capacitance	—	3830	—	pF	$V_{GS} = 0V$ $V_{DS} = 25V$ $f = 1.0\text{MHz}$ $V_{GS} = 0V, V_{DS} = 1.0V, f = 1.0\text{MHz}$ $V_{GS} = 0V, V_{DS} = 80V, f = 1.0\text{MHz}$ $V_{GS} = 0V, V_{DS} = 0V$ to $80V$ ③
$C_{oss}$	Output Capacitance	—	480	—		
$C_{riss}$	Reverse Transfer Capacitance	—	59	—		
$C_{oss}$	Output Capacitance	—	3830	—		
$C_{oss}$	Output Capacitance	—	280	—		
$C_{oss \text{ eff.}}$	Effective Output Capacitance	—	530	—		

## Avalanche Characteristics

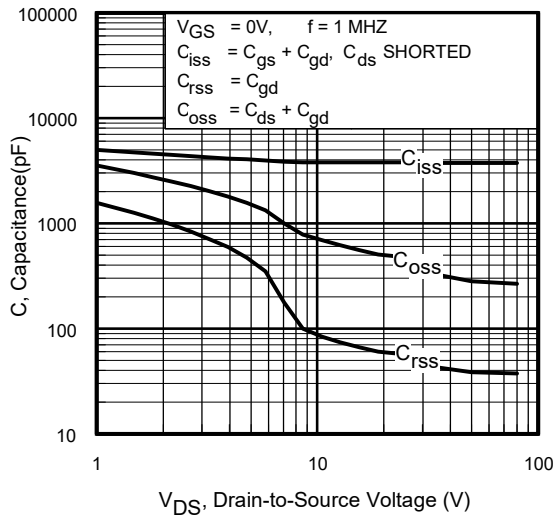
	Parameter	Typ.	Max.	Units
$E_{AS}$	Single Pulse Avalanche Energy ②⑥	—	310	mJ
$I_{AR}$	Avalanche Current ①	—	45	A
$E_{AR}$	Repetitive Avalanche Energy ①	—	26	mJ

## Diode Characteristics

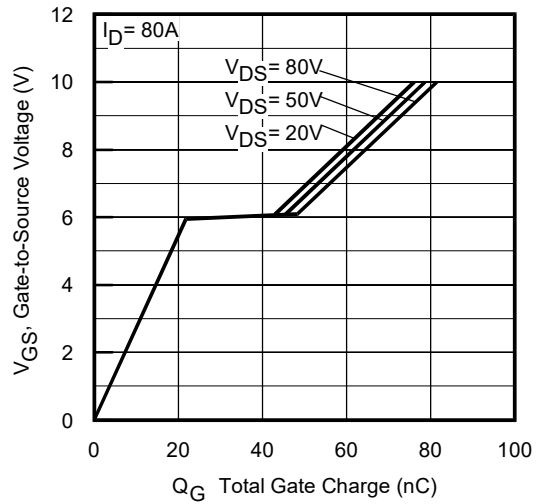
	Parameter	Min.	Typ.	Max.	Units	Conditions
$I_S$	Continuous Source Current (Body Diode)	—	—	80	A	MOSFET symbol showing the integral reverse p-n junction diode.
$I_{SM}$	Pulsed Source Current (Body Diode) ①⑥	—	—	320		
$V_{SD}$	Diode Forward Voltage	—	—	1.3	V	$T_J = 25^\circ\text{C}, I_S = 80A, V_{GS} = 0V$ ④
$t_{rr}$	Reverse Recovery Time	—	99	150	ns	$T_J = 150^\circ\text{C}, I_F = 80A, V_{DD} = 50V$
$Q_{rr}$	Reverse Recovery Charge	—	460	700	nC	$di/dt = 100A/\mu\text{s}$ ④
$t_{on}$	Forward Turn-On Time	Intrinsic turn-on time is negligible (turn-on is dominated by LS+LD)				



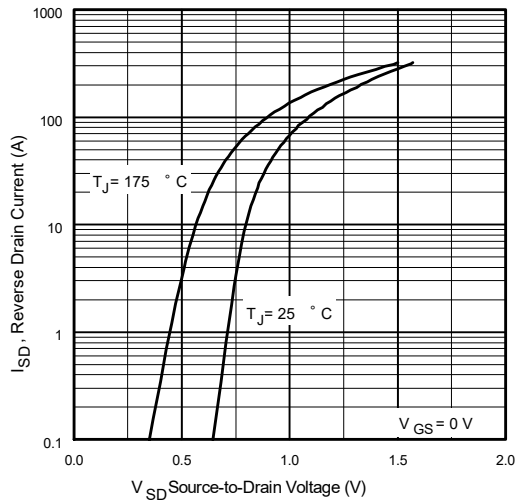
# IRF8010PbF



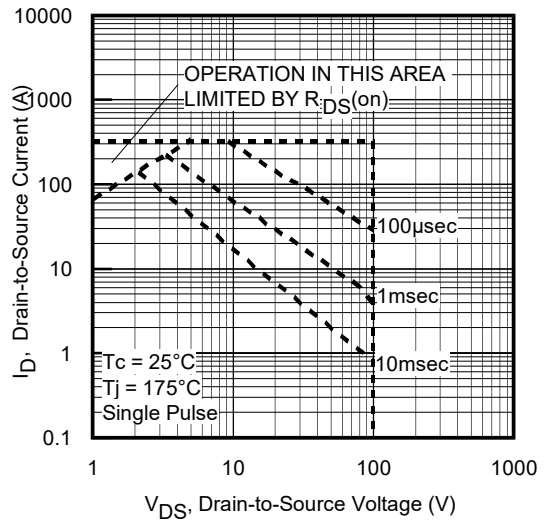
**Fig 5.** Typical Capacitance Vs. Drain-to-Source Voltage



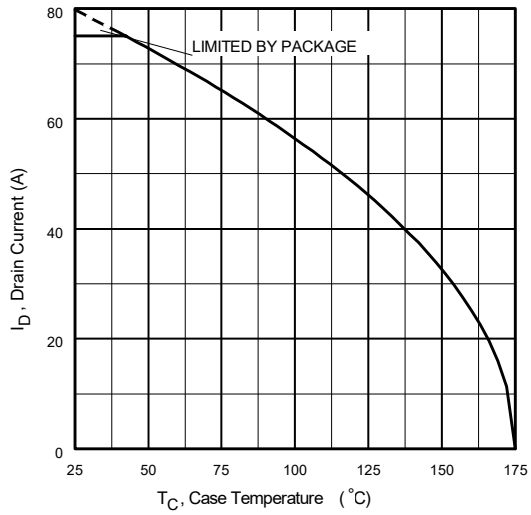
**Fig 6.** Typical Gate Charge Vs. Gate-to-Source Voltage



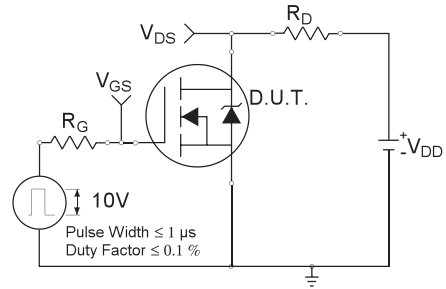
**Fig 7.** Typical Source-Drain Diode Forward Voltage



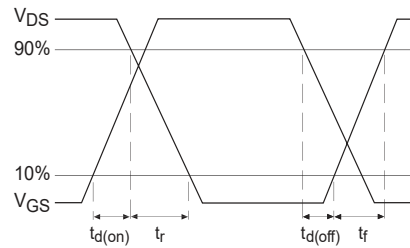
**Fig 8.** Maximum Safe Operating Area



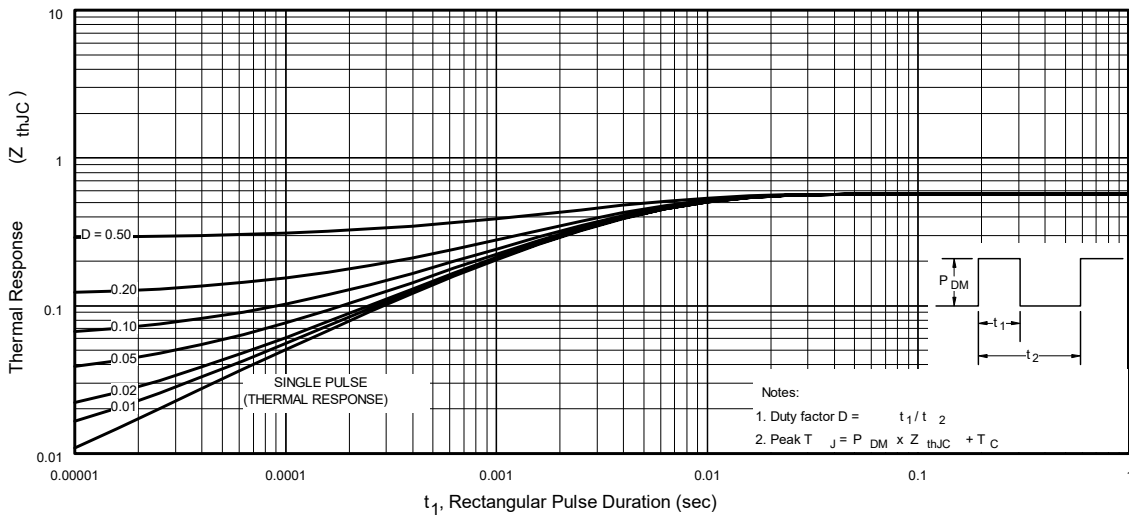
**Fig 9.** Maximum Drain Current Vs. Case Temperature



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

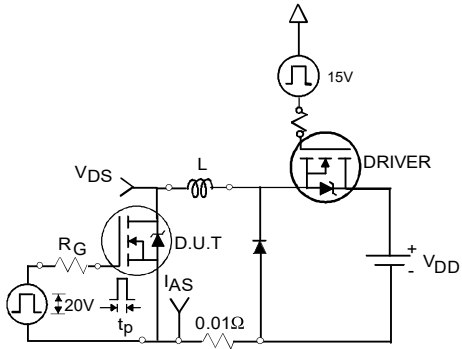


**Fig 10b.** Switching Time Waveforms

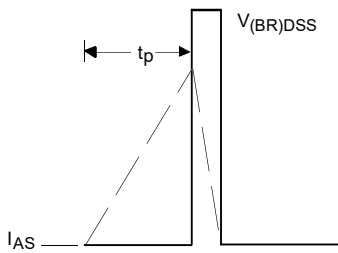


**Fig 11.** Maximum Effective Transient Thermal Impedance, Junction-to-Case

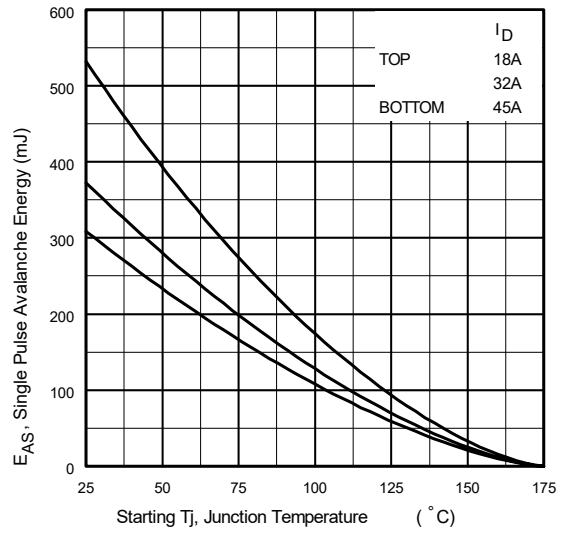
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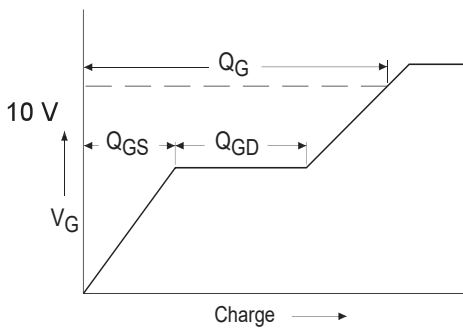
**Fig 12a.** Unclamped Inductive Test Circuit



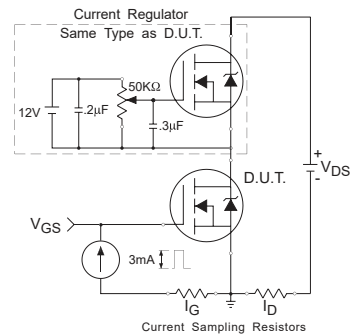
**Fig 12b.** Unclamped Inductive Waveforms



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

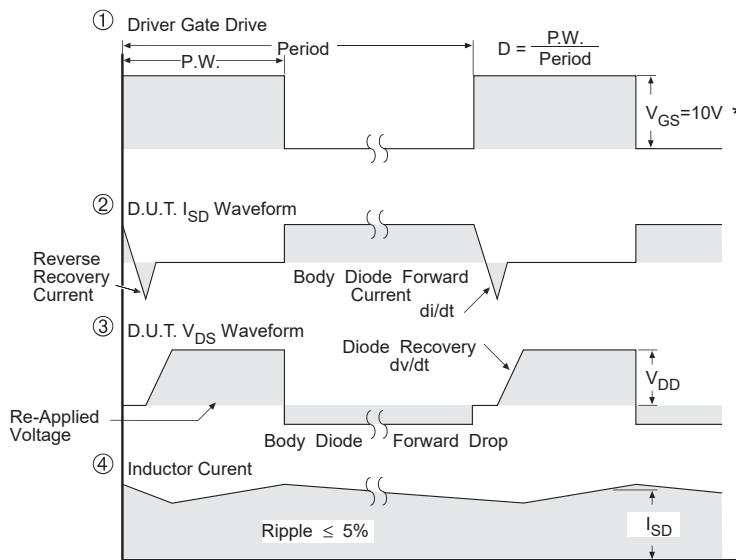
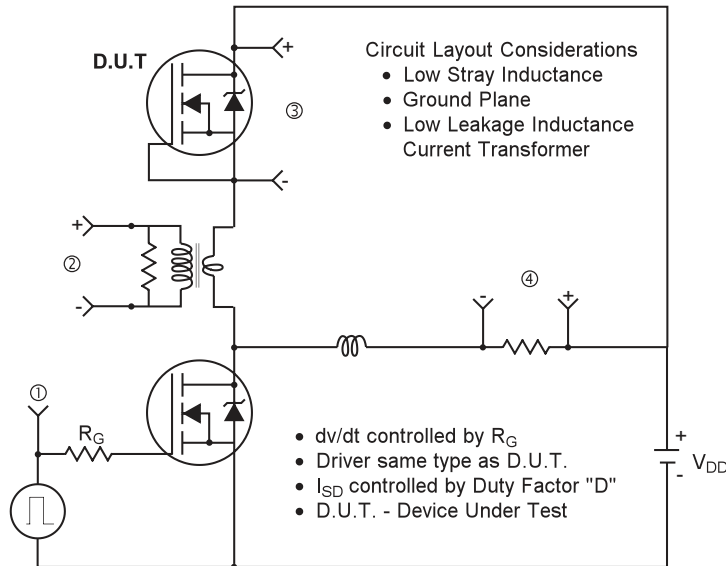


**Fig 13a.** Basic Gate Charge Waveform



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

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



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

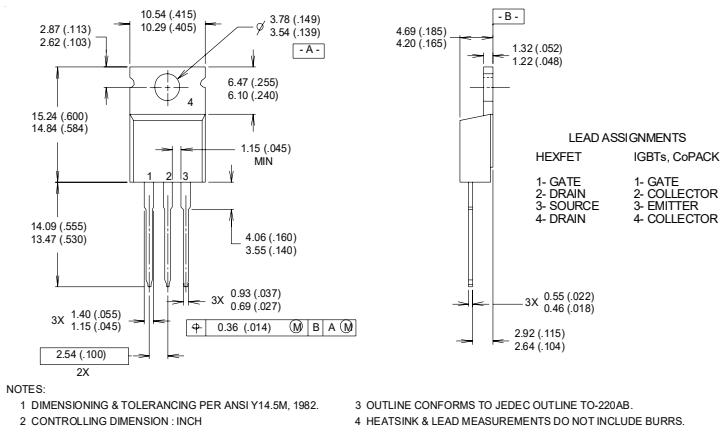
**Fig 14.** For N-Channel HEXFET® Power MOSFETs

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## TO-220AB Package Outline

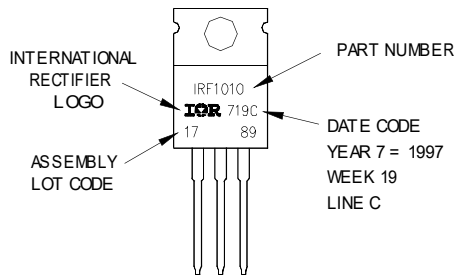
Dimensions are shown in millimeters (inches)

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## 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  $T_J = 25^\circ\text{C}$ ,  $L = 0.31\text{mH}$ ,  $R_G = 25\Omega$ ,  $I_{AS} = 45\text{A}$ .
- ③  $I_{SD} \leq 45\text{A}$ ,  $di/dt \leq 110\text{A}/\mu\text{s}$ ,  $V_{DD} \leq V_{(BR)DSS}$ ,  $T_J \leq 175^\circ\text{C}$ .
- ④ Pulse width  $\leq 300\mu\text{s}$ ; 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%  $V_{DSS}$ .
- ⑥ Calculated continuous current based on maximum allowable junction temperature. Package limitation current is 75A.

**TO-220 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.

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Note: For the most current drawings please refer to the IR website at:  
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