

勝特力材料 886-3-5753170  
 勝特力电子(上海) 86-21-34970699  
 勝特力电子(深圳) 86-755-83298787  
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International  
**IR** Rectifier

PD - 94978

SMPS MOSFET

**IRF820APbF**

HEXFET® Power MOSFET

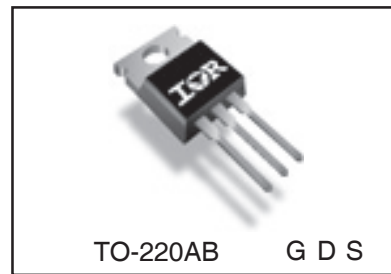
**Applications**

- Switch Mode Power Supply (SMPS)
- Uninterruptable Power Supply
- High speed power switching
- Lead-Free

<b>V<sub>DSS</sub></b>	<b>R<sub>DS(on)</sub> max</b>	<b>I<sub>D</sub></b>
<b>500V</b>	<b>3.0Ω</b>	<b>2.5A</b>

**Benefits**

- Low Gate Charge Q<sub>g</sub> results in Simple Drive Requirement
- Improved Gate, Avalanche and dynamic dv/dt Ruggedness
- Fully Characterized Capacitance and Avalanche Voltage and Current
- Effective C<sub>OSS</sub> specified (See AN 1001)



**Absolute Maximum Ratings**

	<b>Parameter</b>	<b>Max.</b>	<b>Units</b>
I <sub>D</sub> @ T <sub>C</sub> = 25°C	Continuous Drain Current, V <sub>GS</sub> @ 10V	2.5	A
I <sub>D</sub> @ T <sub>C</sub> = 100°C	Continuous Drain Current, V <sub>GS</sub> @ 10V	1.6	
I <sub>DM</sub>	Pulsed Drain Current ①	10	
P <sub>D</sub> @ T <sub>C</sub> = 25°C	Power Dissipation	50	W
	Linear Derating Factor	0.4	W/°C
V <sub>GS</sub>	Gate-to-Source Voltage	± 30	V
dv/dt	Peak Diode Recovery dv/dt ②	3.4	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	300 (1.6mm from case )	
	Mounting torque, 6-32 or M3 screw	10 lbf•in (1.1N•m)	

**Typical SMPS Topologies:**

- Two transistor Forward
- Half Bridge and Full Bridge

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	500	—	—	V	V <sub>GS</sub> = 0V, I <sub>D</sub> = 250μA
ΔV <sub>(BR)DSS/ΔT<sub>J</sub></sub>	Breakdown Voltage Temp. Coefficient	—	0.60	—	V/°C	Reference to 25°C, I <sub>D</sub> = 1mA
R <sub>DS(on)</sub>	Static Drain-to-Source On-Resistance	—	—	3.0	Ω	V <sub>GS</sub> = 10V, I <sub>D</sub> = 1.5A ④
V <sub>GS(th)</sub>	Gate Threshold Voltage	2.0	—	4.5	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> = 500V, V <sub>GS</sub> = 0V
		—	—	250		V <sub>DS</sub> = 400V, V <sub>GS</sub> = 0V, T <sub>J</sub> = 125°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	1.4	—	—	S	V <sub>DS</sub> = 50V, I <sub>D</sub> = 1.5A
Q <sub>g</sub>	Total Gate Charge	—	—	17	nC	I <sub>D</sub> = 2.5A
Q <sub>gs</sub>	Gate-to-Source Charge	—	—	4.3		V <sub>DS</sub> = 400V
Q <sub>gd</sub>	Gate-to-Drain ("Miller") Charge	—	—	8.5		V <sub>GS</sub> = 10V, See Fig. 6 and 13 ④
t <sub>d(on)</sub>	Turn-On Delay Time	—	8.1	—	ns	V <sub>DD</sub> = 250V
t <sub>r</sub>	Rise Time	—	12	—		I <sub>D</sub> = 2.5A
t <sub>d(off)</sub>	Turn-Off Delay Time	—	16	—		R <sub>G</sub> = 21Ω
t <sub>f</sub>	Fall Time	—	13	—		R <sub>D</sub> = 97Ω, See Fig. 10 ④
C <sub>iss</sub>	Input Capacitance	—	340	—	pF	V <sub>GS</sub> = 0V
C <sub>oss</sub>	Output Capacitance	—	53	—		V <sub>DS</sub> = 25V
C <sub>rss</sub>	Reverse Transfer Capacitance	—	2.7	—		f = 1.0MHz, See Fig. 5
C <sub>oss</sub>	Output Capacitance	—	490	—		V <sub>GS</sub> = 0V, V <sub>DS</sub> = 1.0V, f = 1.0MHz
C <sub>oss</sub>	Output Capacitance	—	15	—		V <sub>GS</sub> = 0V, V <sub>DS</sub> = 400V, f = 1.0MHz
C <sub>oss eff.</sub>	Effective Output Capacitance	—	28	—		V <sub>GS</sub> = 0V, V <sub>DS</sub> = 0V to 400V ⑤

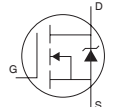
## Avalanche Characteristics

	Parameter	Typ.	Max.	Units
E <sub>AS</sub>	Single Pulse Avalanche Energy②	—	140	mJ
I <sub>AR</sub>	Avalanche Current①	—	2.5	A
E <sub>AR</sub>	Repetitive Avalanche Energy①	—	5.0	mJ

## Thermal Resistance

	Parameter	Typ.	Max.	Units
R <sub>θJC</sub>	Junction-to-Case	—	2.5	°C/W
R <sub>θCS</sub>	Case-to-Sink, Flat, Greased Surface	0.50	—	
R <sub>θJA</sub>	Junction-to-Ambient	—	62	

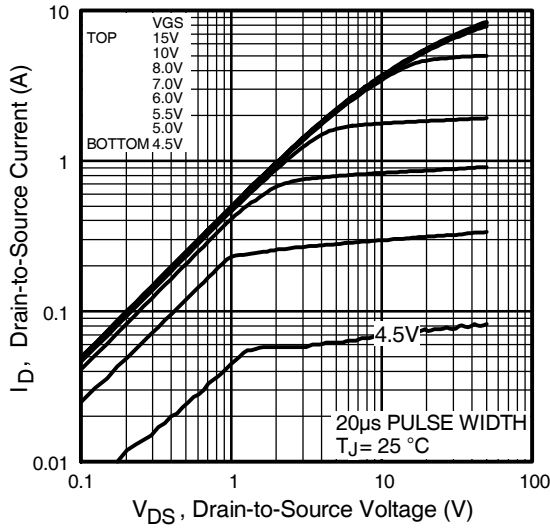
## Diode Characteristics

	Parameter	Min.	Typ.	Max.	Units	Conditions
I <sub>S</sub>	Continuous Source Current (Body Diode)	—	—	2.5	A	MOSFET symbol showing the integral reverse p-n junction diode. 
I <sub>SM</sub>	Pulsed Source Current (Body Diode) ①	—	—	10		
V <sub>SD</sub>	Diode Forward Voltage	—	—	1.6	V	T <sub>J</sub> = 25°C, I <sub>S</sub> = 2.5A, V <sub>GS</sub> = 0V ④
t <sub>rr</sub>	Reverse Recovery Time	—	330	500	ns	T <sub>J</sub> = 25°C, I <sub>F</sub> = 2.5A
Q <sub>rr</sub>	Reverse Recovery Charge	—	760	1140	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> )				

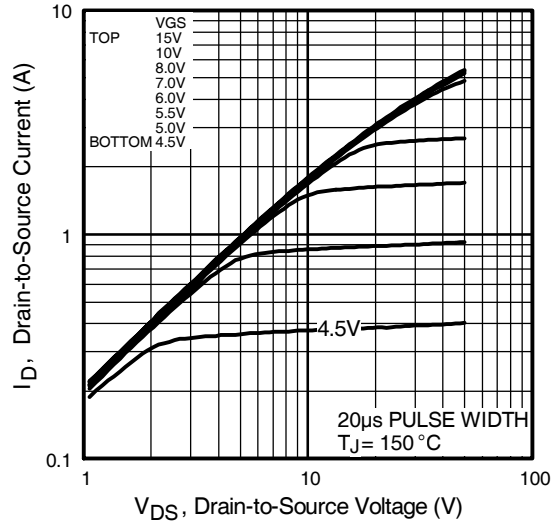
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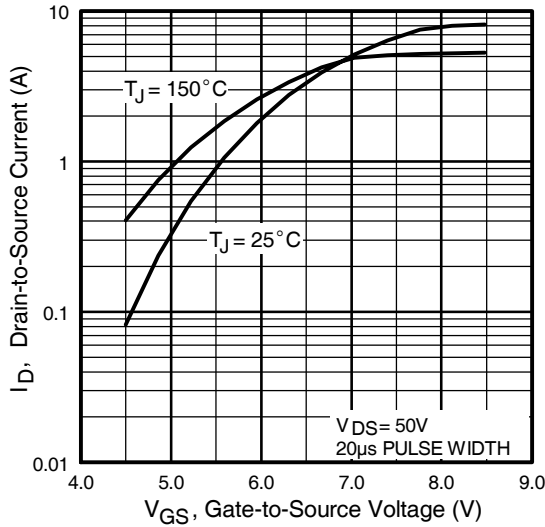
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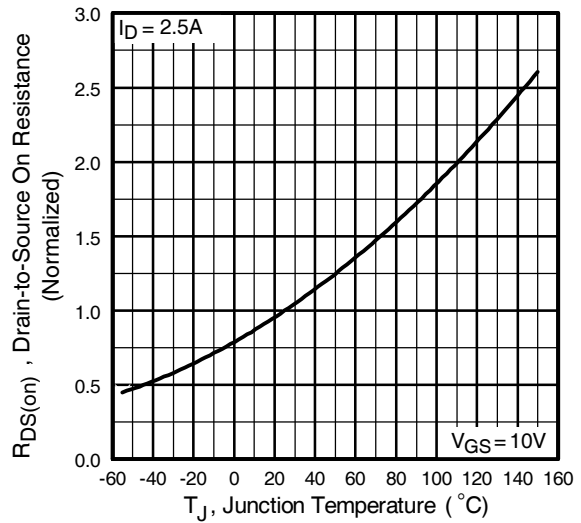
**Fig 1.** Typical Output Characteristics



**Fig 2.** Typical Output Characteristics



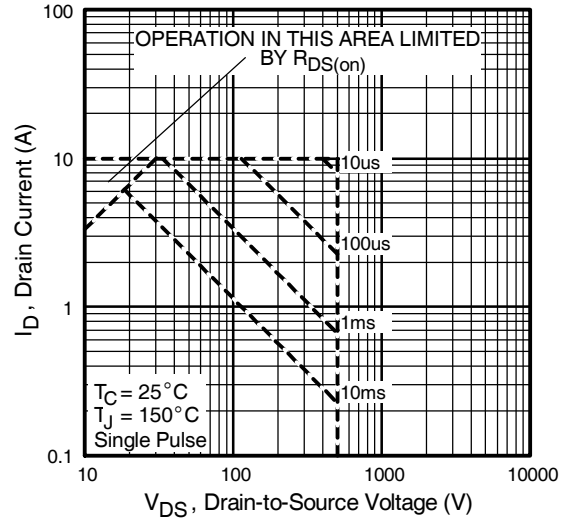
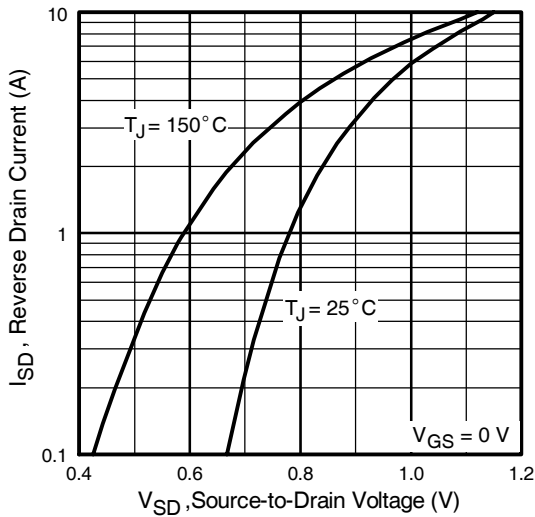
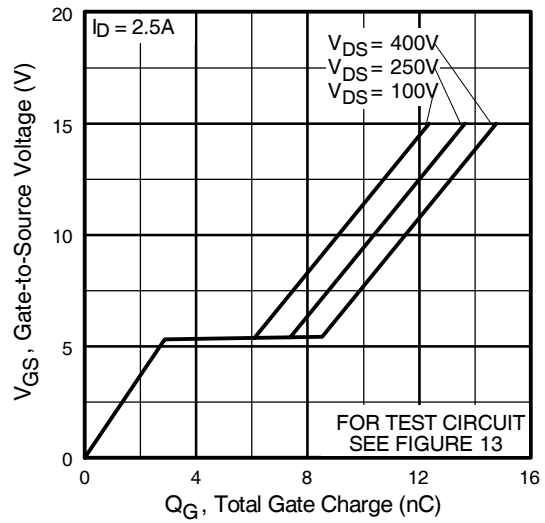
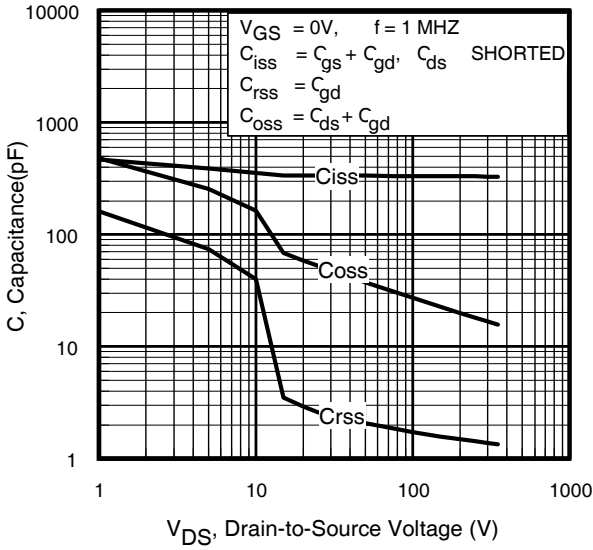
**Fig 3.** Typical Transfer Characteristics



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

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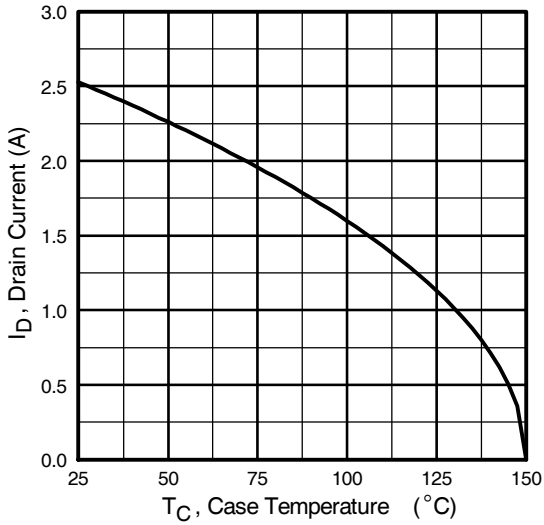
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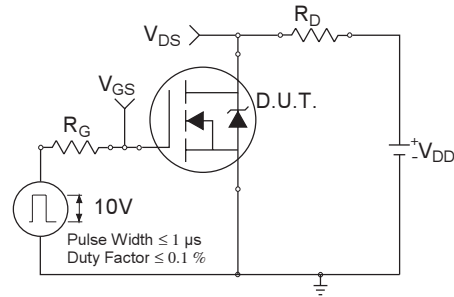
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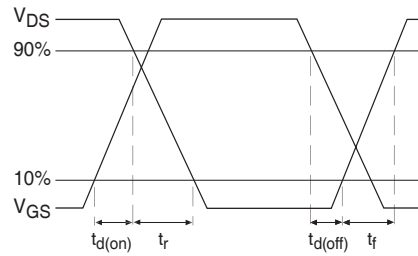
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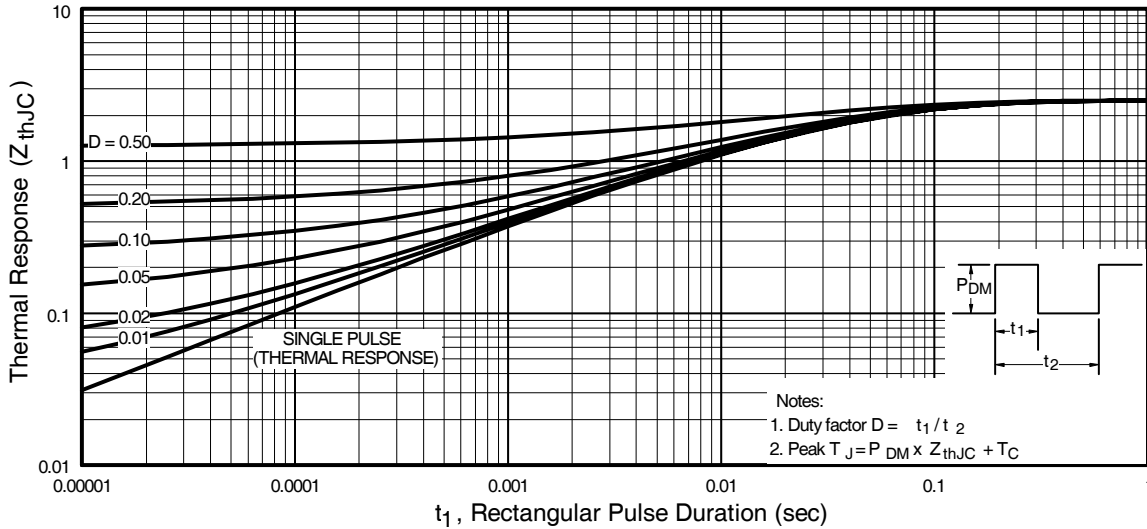
**Fig 9.** Maximum Drain Current Vs. Case Temperature



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



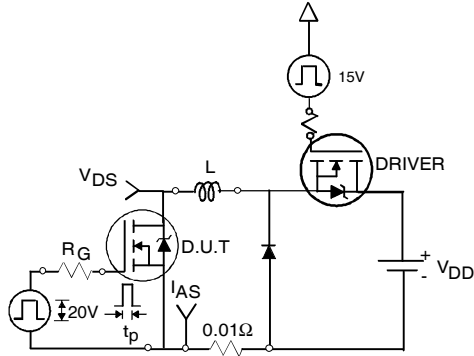
**Fig 10b.** Switching Time Waveforms



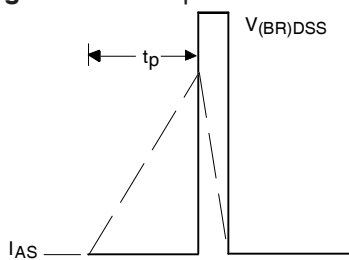
**Fig 11.** Maximum Effective Transient Thermal Impedance, Junction-to-Case

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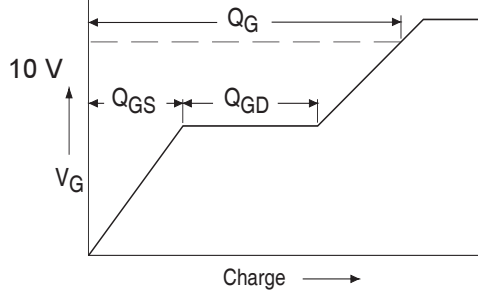
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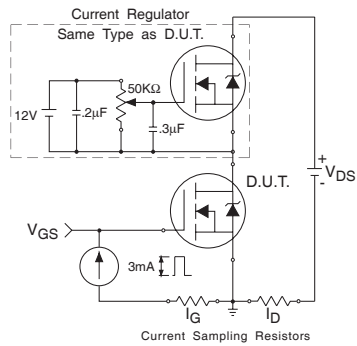
**Fig 12a.** Unclamped Inductive Test Circuit



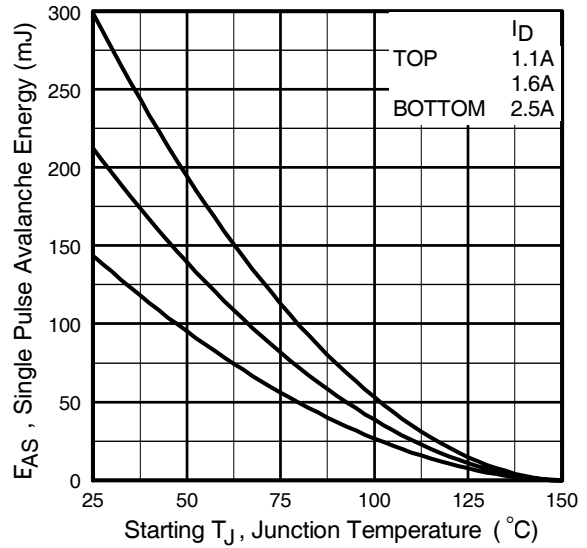
**Fig 12b.** Unclamped Inductive Waveforms



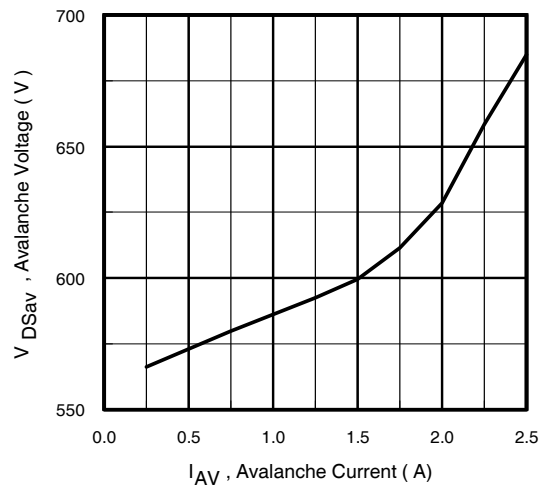
**Fig 13a.** Basic Gate Charge Waveform



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



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



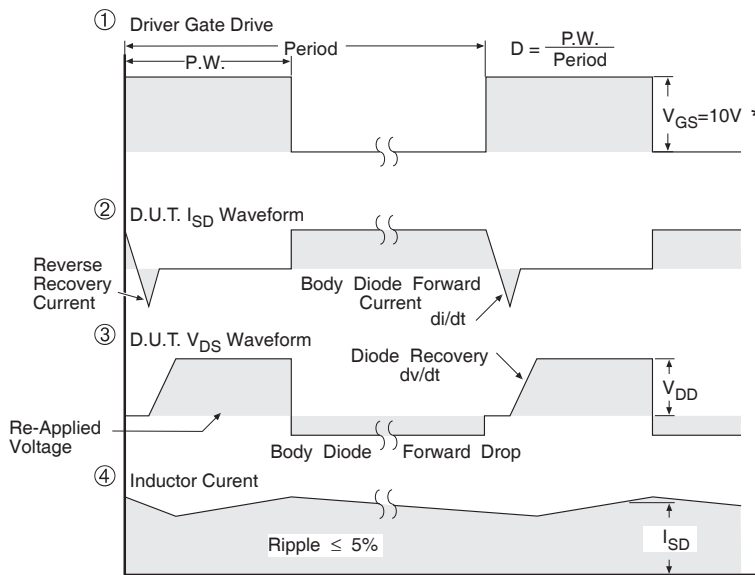
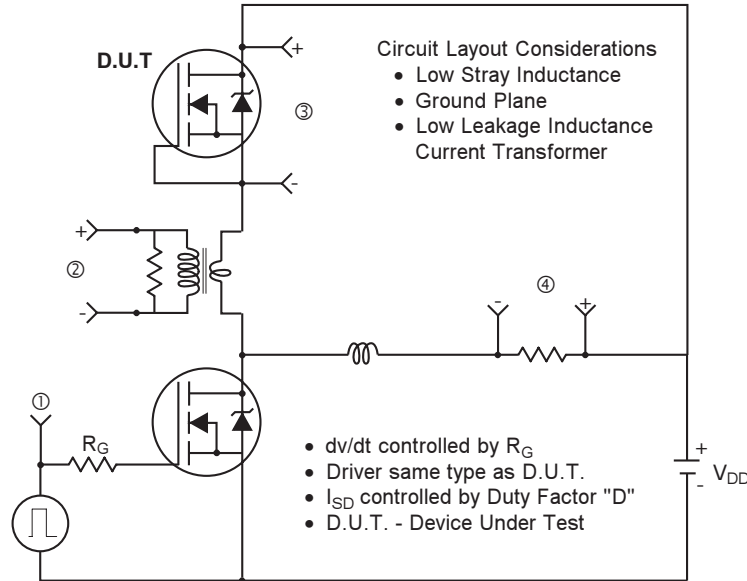
**Fig 12d.** Typical Drain-to-Source Voltage Vs. Avalanche Current

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



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

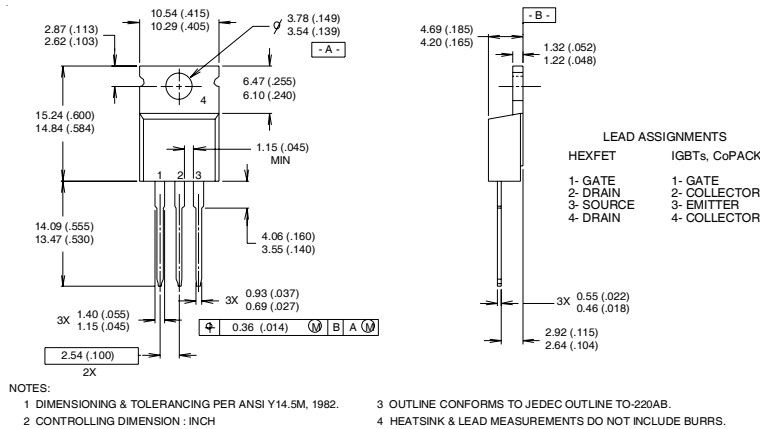
**Fig 14.** For N-Channel HEXFET® Power MOSFETs

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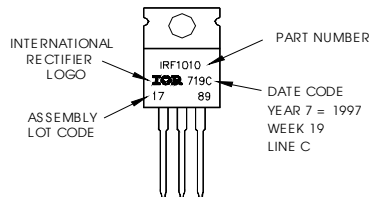
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## TO-220AB Package Outline



## 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. ( See fig. 11 )
- ② Starting  $T_J = 25^\circ\text{C}$ ,  $L = 45\text{mH}$   
 $R_G = 25\Omega$ ,  $I_{AS} = 2.5\text{A}$ . (See Figure 12)
- ③  $I_{SD} \leq 2.5\text{A}$ ,  $di/dt \leq 270\text{A}/\mu\text{s}$ ,  $V_{DD} \leq V_{(BR)DSS}$ ,  
 $T_J \leq 150^\circ\text{C}$
- 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%  $V_{DSS}$

Data and specifications subject to change without notice.

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