

International  
**IR** Rectifier  
 HEXFET® Power MOSFET

PD-95393

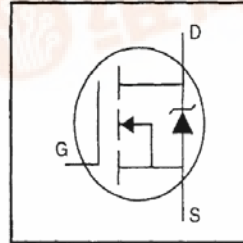
# IRLZ44SPbF

- Surface Mount
- Available in Tape & Reel
- Dynamic dv/dt Rating
- Logic-Level Gate Drive
- RDS(on) Specified at VGS=4V & 5V
- 175°C Operating Temperature
- Fast Switching
- Lead-Free

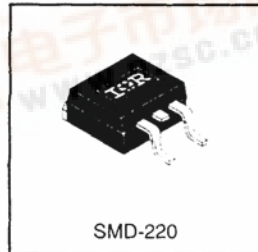
### Description

Third Generation HEXFETs from International Rectifier provide the designer with the best combination of fast switching, ruggedized device design, low on-resistance and cost-effectiveness.

The SMD-220 is a surface mount power package capable of accommodating die sizes up to HEX-4. It provides the highest power capability and the lowest possible on-resistance in any existing surface mount package. The SMD-220 is suitable for high current applications because of its low internal connection resistance and can dissipate up to 2.0W in a typical surface mount application.



$V_{DSS} = 60V$   
 $R_{DS(on)} = 0.028\Omega$   
 $I_D = 50^*A$



### Absolute Maximum Ratings

Parameter	Max.	Units
$I_D @ T_C = 25^\circ C$	Continuous Drain Current, $V_{GS} @ 5.0 V$	50*
$I_D @ T_C = 100^\circ C$	Continuous Drain Current, $V_{GS} @ 5.0 V$	36
$I_{DM}$	Pulsed Drain Current ①	200
$P_D @ T_C = 25^\circ C$	Power Dissipation	150
$P_D @ T_A = 25^\circ C$	Power Dissipation (PCB Mount)**	3.7
	Linear Derating Factor	1.0
	Linear Derating Factor (PCB Mount)**	0.025
$V_{GS}$	Gate-to-Source Voltage	$\pm 10$
EAS	Single Pulse Avalanche Energy ②	400
dv/dt	Peak Diode Recovery dv/dt ③	4.5
$T_J, T_{STG}$	Junction and Storage Temperature Range	-55 to +175
	Soldering Temperature, for 10 seconds	300 (1.6mm from case)

### Thermal Resistance

Parameter	Min.	Typ.	Max.	Units
$R_{\theta JC}$	Junction-to-Case	—	1.0	°C/W
$R_{\theta JA}$	Junction-to-Ambient (PCB mount)**	—	40	
$R_{\theta JA}$	Junction-to-Ambient	—	62	

\*\* When mounted on 1" square PCB (FR-4 or G-10 Material).

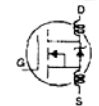
For recommended footprint and soldering techniques refer to application note #AN-994.



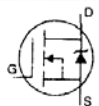
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## Electrical Characteristics @ $T_J = 25^\circ\text{C}$ (unless otherwise specified)

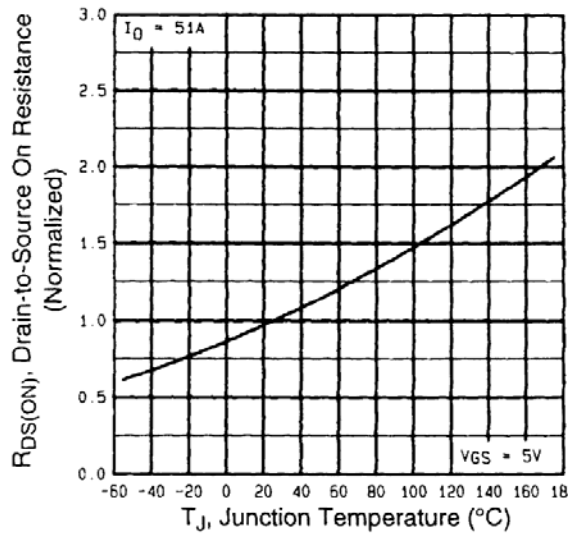
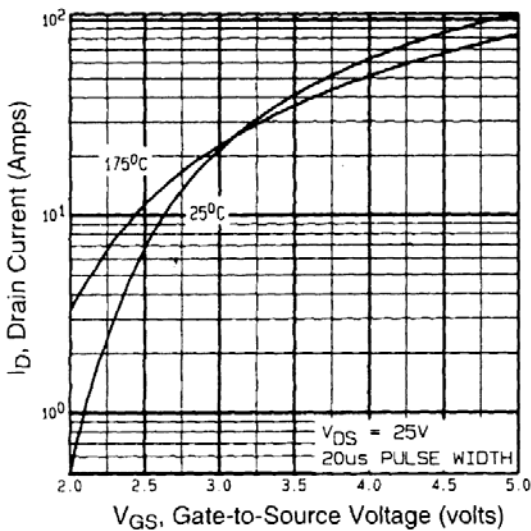
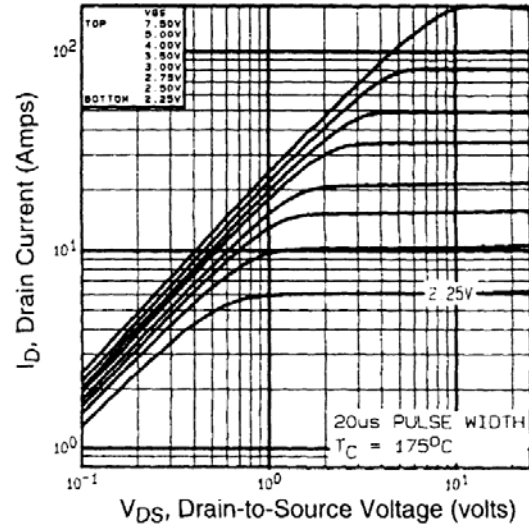
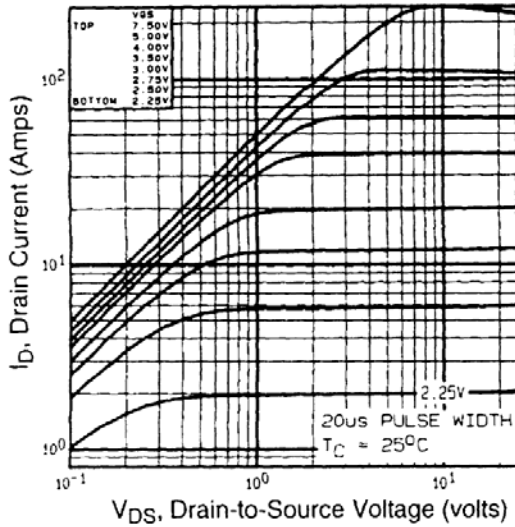
	Parameter	Min.	Typ.	Max.	Units	Test Conditions
$V_{(BR)DSS}$	Drain-to-Source Breakdown Voltage	60	—	—	V	$V_{GS}=0V, I_D=250\mu A$
$\Delta V_{(BR)DSS}/\Delta T_J$	Breakdown Voltage Temp. Coefficient	—	0.070	—	V/ $^\circ\text{C}$	Reference to $25^\circ\text{C}$ , $I_D=1\text{mA}$
$R_{DS(on)}$	Static Drain-to-Source On-Resistance	—	—	0.028	$\Omega$	$V_{GS}=5.0V, I_D=31A$ ④
		—	—	0.039		$V_{GS}=4.0V, I_D=25A$ ④
$V_{GS(th)}$	Gate Threshold Voltage	1.0	—	2.0	V	$V_{DS}=V_{GS}, I_D=250\mu A$
$g_{fs}$	Forward Transconductance	23	—	—	S	$V_{DS}=25V, I_D=31A$ ④
$I_{DSS}$	Drain-to-Source Leakage Current	—	—	25	$\mu A$	$V_{DS}=60V, V_{GS}=0V$
		—	—	250		$V_{DS}=48V, V_{GS}=0V, T_J=150^\circ\text{C}$
$I_{GSS}$	Gate-to-Source Forward Leakage	—	—	100	nA	$V_{GS}=10V$
	Gate-to-Source Reverse Leakage	—	—	-100		$V_{GS}=-10V$
$Q_g$	Total Gate Charge	—	—	66	nC	$I_D=51A$
$Q_{gs}$	Gate-to-Source Charge	—	—	12		$V_{DS}=48V$
$Q_{gd}$	Gate-to-Drain ("Miller") Charge	—	—	43		$V_{GS}=5.0V$ See Fig. 6 and 13 ④
$t_{d(on)}$	Turn-On Delay Time	—	17	—	ns	$V_{DD}=30V$
$t_r$	Rise Time	—	230	—		$I_D=51A$
$t_{d(off)}$	Turn-Off Delay Time	—	42	—		$R_G=4.6\Omega$
$t_f$	Fall Time	—	110	—		$R_D=0.56\Omega$ See Figure 10 ④
$L_D$	Internal Drain Inductance	—	4.5	—	nH	Between lead, 6 mm (0.25in.) from package and center of die contact 
$L_S$	Internal Source Inductance	—	7.5	—		
$C_{ISS}$	Input Capacitance	—	3300	—	pF	$V_{GS}=0V$
$C_{OSS}$	Output Capacitance	—	1200	—		$V_{DS}=25V$
$C_{RSS}$	Reverse Transfer Capacitance	—	200	—		$f=1.0\text{MHz}$ See Figure 5

## Source-Drain Ratings and Characteristics

	Parameter	Min.	Typ.	Max.	Units	Test Conditions
$I_S$	Continuous Source Current (Body Diode)	—	—	50*	A	MOSFET symbol showing the integral reverse p-n junction diode. 
$I_{SM}$	Pulsed Source Current (Body Diode) ①	—	—	200		
$V_{SD}$	Diode Forward Voltage	—	—	2.5	V	$T_J=25^\circ\text{C}, I_S=51A, V_{GS}=0V$ ④
$t_{rr}$	Reverse Recovery Time	—	130	180	ns	$T_J=25^\circ\text{C}, I_F=51A$
$Q_{rr}$	Reverse Recovery Charge	—	0.84	1.3	$\mu\text{C}$	$di/dt=100A/\mu\text{s}$ ④
$t_{on}$	Forward Turn-On Time	Intrinsic turn-on time is negligible (turn-on is dominated by $L_S+L_D$ )				

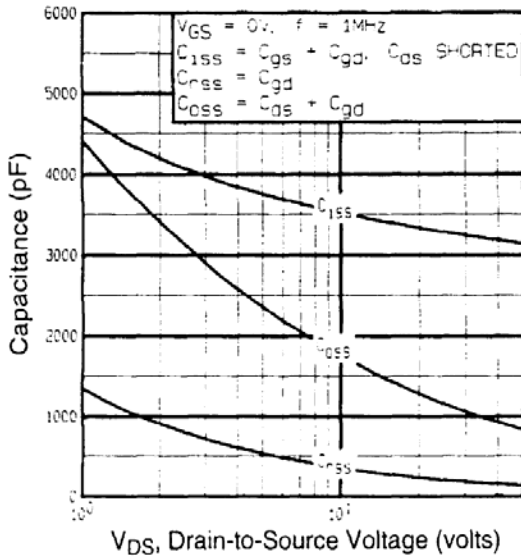
### Notes:

- ① Repetitive rating; pulse width limited by max. junction temperature (See Figure 11)
- ②  $V_{DD}=25V$ , starting  $T_J=25^\circ\text{C}$ ,  $L=179\mu\text{H}$ ,  $R_G=25\Omega$ ,  $I_{AS}=51A$  (See Figure 12)
- ③  $I_{SD}\leq 51A$ ,  $di/dt\leq 250A/\mu\text{s}$ ,  $V_{DD}\leq V_{(BR)DSS}$ ,  $T_J\leq 175^\circ\text{C}$
- ④ Pulse width  $\leq 300\mu\text{s}$ ; duty cycle  $\leq 2\%$
- \* Current limited by the package. (Die Current = 51A)

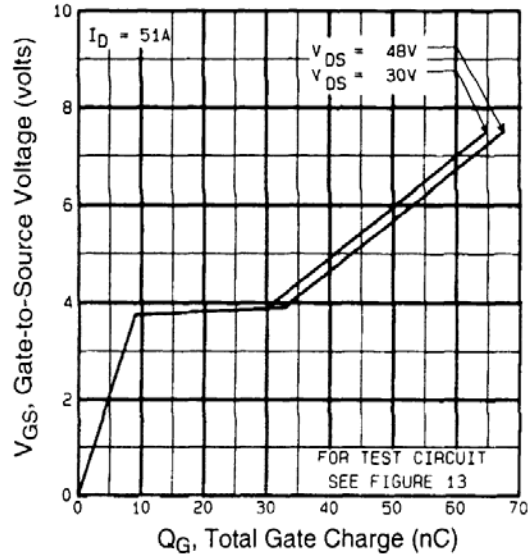


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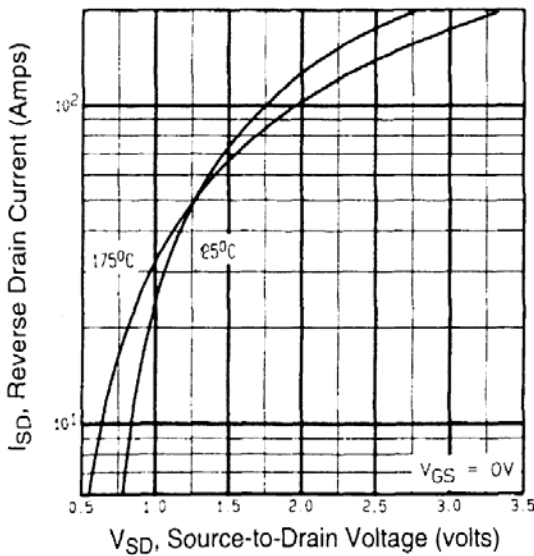
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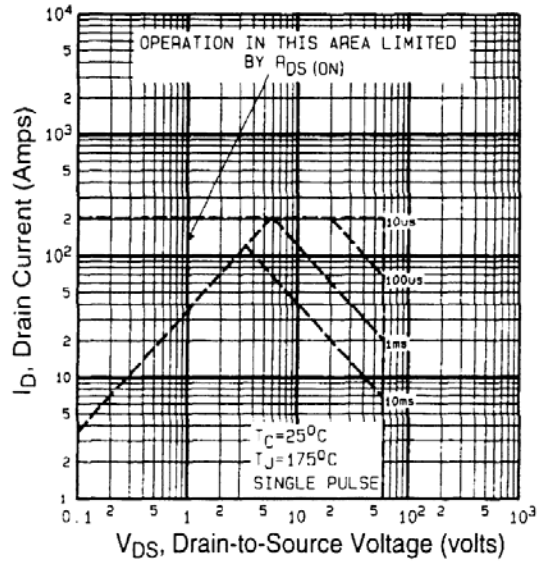
**Fig 5.** Typical Capacitance Vs. Drain-to-Source Voltage



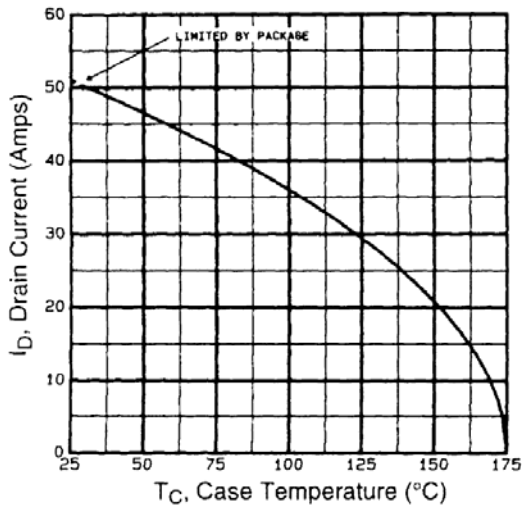
**Fig 6.** Typical Gate Charge Vs. Gate-to-Source Voltage



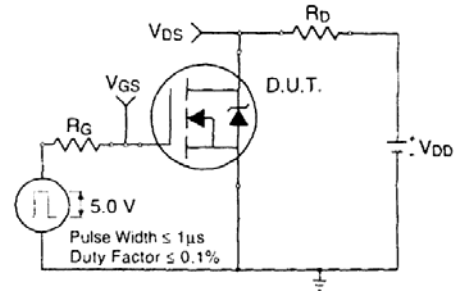
**Fig 7.** Typical Source-Drain Diode Forward Voltage



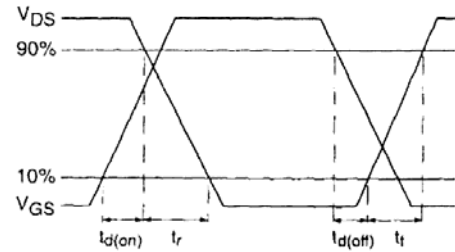
**Fig 8.** Maximum Safe Operating Area



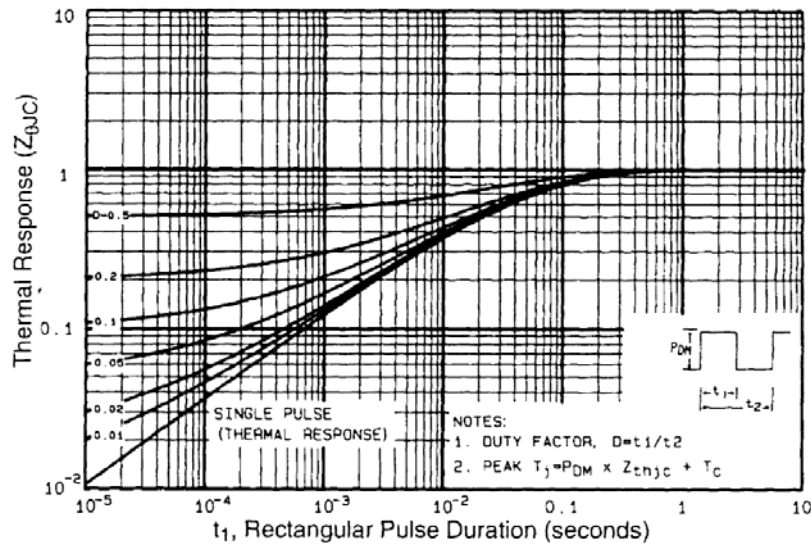
**Fig 9.** Maximum Drain Current Vs. Case Temperature



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



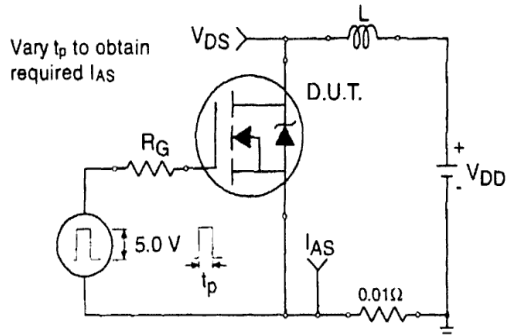
**Fig 10b.** Switching Time Waveforms



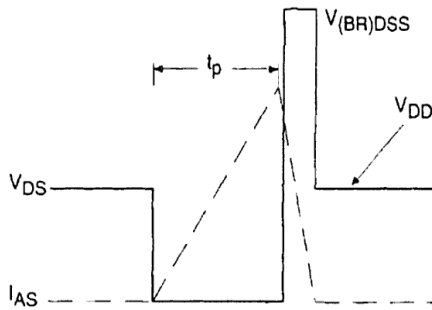
**Fig 11.** Maximum Effective Transient Thermal Impedance, Junction-to-Case

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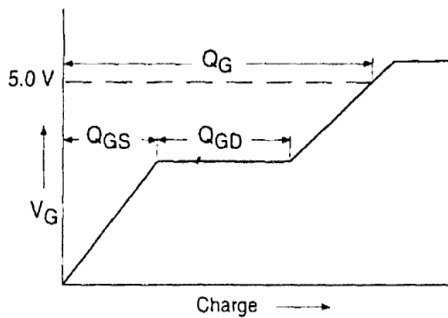
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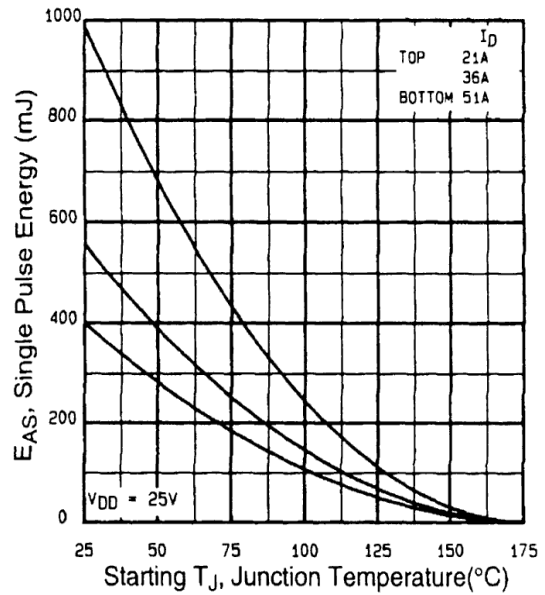
**Fig 12a.** Unclamped Inductive Test Circuit



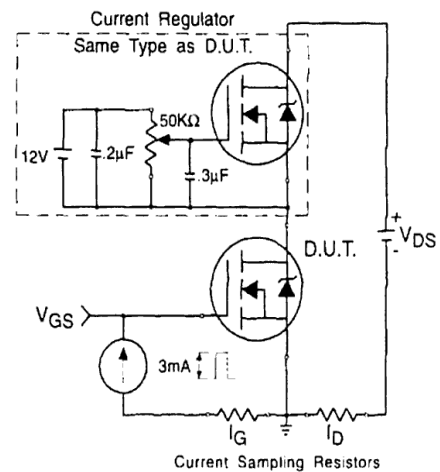
**Fig 12b.** Unclamped Inductive Waveforms



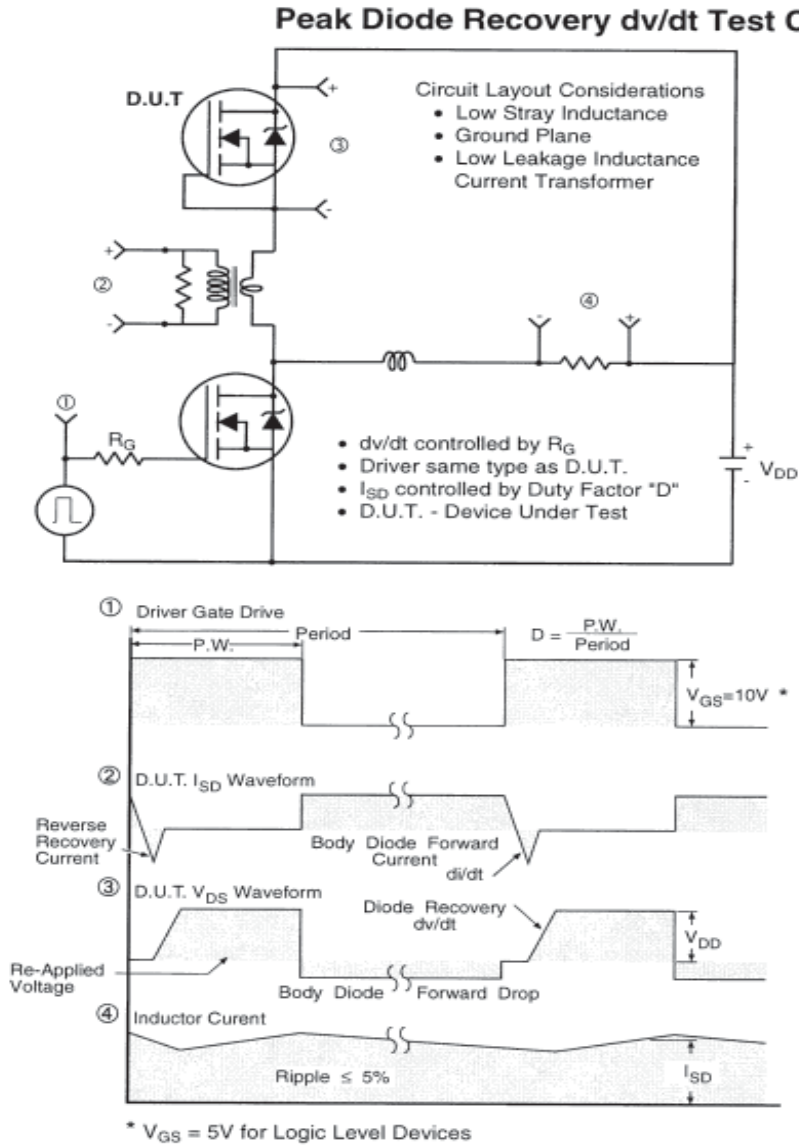
**Fig 13a.** Basic Gate Charge Waveform



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



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

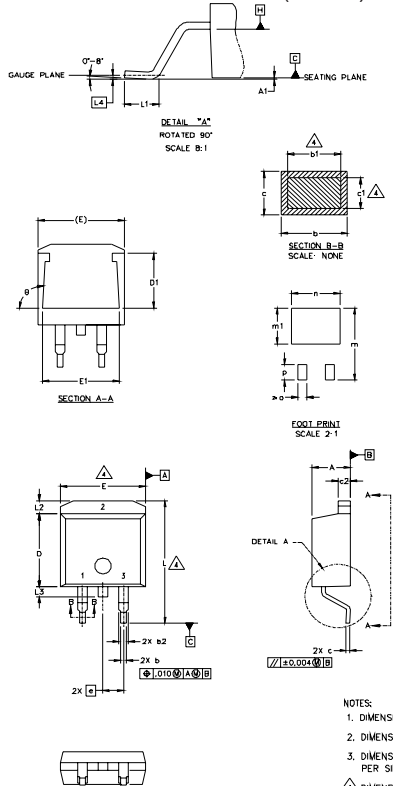


**Fig 14.** For N-Channel HEXFETS

# IRLZ44SPbF

## D<sup>2</sup>Pak Package Outline

Dimensions are shown in millimeters (inches)



SYMBOL	DIMENSIONS				NOTES
	MILLIMETERS		INCHES		
	MIN.	MAX.	MIN.	MAX.	
A	4.06	4.83	.160	.190	4
A1		0.127		.005	
b	0.51	0.99	.020	.039	
b1	0.51	0.89	.020	.035	
b2	1.14	1.40	.045	.055	4
c	0.43	0.63	.017	.025	
c1	0.38	0.74	.015	.029	3
c2	1.14	1.40	.045	.055	
D	8.51	9.65	.335	.380	3
D1	5.33		.210		
E	9.65	10.67	.380	.420	3
E1	6.22		.245		
e	2.54 BSC		.100 BSC		
L	14.61	15.88	.575	.625	
L1	1.78	2.79	.070	.110	
L2	1.27	1.65	.050	.065	
L3	1.27	1.78	.050	.070	
L4	0.25 BSC		.010 BSC		
m	17.78		.700		
m1	8.89		.350		
n	11.43		.450		
o	2.08		.082		
p	3.81		.150		
θ	90°	93°	90°	93°	

### LEAD ASSIGNMENTS

HEXFET	IGBTs, CoPACK	DIODES
1.- GATE	1.- GATE	1.- ANODE *
2.- DRAIN	2.- COLLECTOR	2.- CATHODE
3.- SOURCE	3.- EMITTER	3.- ANODE

\* PART DEPENDENT.

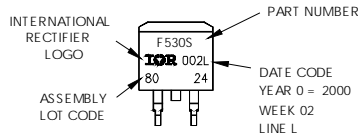
### NOTES:

1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M-1994
2. DIMENSIONS ARE SHOWN IN MILLIMETERS [INCHES].
3. DIMENSION D & E DO NOT INCLUDE MOLD FLASH. MOLD FLASH SHALL NOT EXCEED 0.127 [.005"] PER SIDE. THESE DIMENSIONS ARE MEASURED AT THE OUTMOST EXTREMES OF THE PLASTIC BODY.
4. DIMENSION b1 AND c1 APPLY TO BASE METAL ONLY.
5. CONTROLLING DIMENSION: INCH.

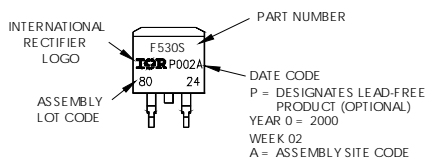
## D<sup>2</sup>Pak Part Marking Information

EXAMPLE: THIS IS AN IRF530S WITH LOT CODE 8024 ASSEMBLED ON WW 02, 2000 IN THE ASSEMBLY LINE "L"

Note: "P" in assembly line position indicates "Lead-Free"



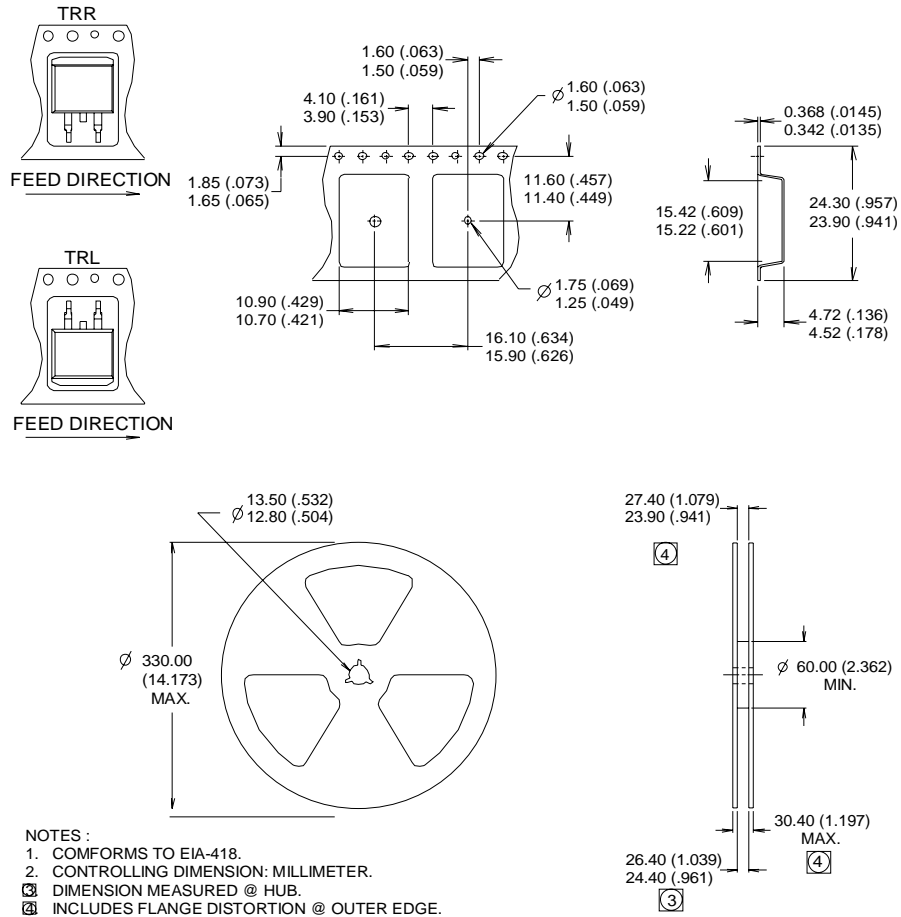
**OR**





## D<sup>2</sup>Pak Tape & Reel Information

Dimensions are shown in millimeters (inches)



Data and specifications subject to change without notice.