

# IRF730AS/LPbF

HEXFET® Power MOSFET

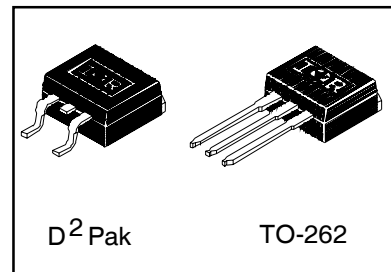
## Applications

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

V <sub>DSS</sub>	R <sub>ds(on)</sub> max	I <sub>D</sub>
400V	1.0Ω	5.5A

## 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 Coss Specified (See AN1001)



## Absolute Maximum Ratings

	Parameter	Max.	Units
I <sub>D</sub> @ T <sub>C</sub> = 25°C	Continuous Drain Current, V <sub>GS</sub> @ 10V①	5.5	A
I <sub>D</sub> @ T <sub>C</sub> = 100°C	Continuous Drain Current, V <sub>GS</sub> @ 10V①	3.5	
I <sub>DM</sub>	Pulsed Drain Current ①②	22	
P <sub>D</sub> @ T <sub>C</sub> = 25°C	Power Dissipation	74	W
	Linear Derating Factor	0.6	W/°C
V <sub>GS</sub>	Gate-to-Source Voltage	± 30	V
dv/dt	Peak Diode Recovery dv/dt ③④	4.6	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 )	

## Typical SMPS Topologies:

- Single Transistor Flyback Xfmr. Reset
- Single Transistor Forward Xfmr. Reset  
(Both US Line input only).

Notes ① through ⑥ are on page 10

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

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	Parameter	Min.	Typ.	Max.	Units	Conditions
V <sub>(BR)DSS</sub>	Drain-to-Source Breakdown Voltage	400	—	—	V	V <sub>GS</sub> = 0V, I <sub>D</sub> = 250μA
ΔV <sub>(BR)DSS/ΔT<sub>J</sub></sub>	Breakdown Voltage Temp. Coefficient	—	0.5	—	V/°C	Reference to 25°C, I <sub>D</sub> = 1mA ⑥
R <sub>DS(on)</sub>	Static Drain-to-Source On-Resistance	—	—	1.0	Ω	V <sub>GS</sub> = 10V, I <sub>D</sub> = 3.3A 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> = 400V, V <sub>GS</sub> = 0V
		—	—	250		V <sub>DS</sub> = 320V, 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	3.1	—	—	S	V <sub>DS</sub> = 50V, I <sub>D</sub> = 3.3A⑥
Q <sub>g</sub>	Total Gate Charge	—	—	22	nC	I <sub>D</sub> = 3.5A
Q <sub>gs</sub>	Gate-to-Source Charge	—	—	5.8		V <sub>DS</sub> = 320V
Q <sub>gd</sub>	Gate-to-Drain ("Miller") Charge	—	—	9.3		V <sub>GS</sub> = 10V, See Fig. 6 and 13 ④⑥
t <sub>d(on)</sub>	Turn-On Delay Time	—	10	—	ns	V <sub>DD</sub> = 200V
t <sub>r</sub>	Rise Time	—	22	—		I <sub>D</sub> = 3.5A
t <sub>d(off)</sub>	Turn-Off Delay Time	—	20	—		R <sub>G</sub> = 12Ω
t <sub>f</sub>	Fall Time	—	16	—		R <sub>D</sub> = 57Ω, See Fig. 10 ④⑥
C <sub>iss</sub>	Input Capacitance	—	600	—	pF	V <sub>GS</sub> = 0V
C <sub>oss</sub>	Output Capacitance	—	103	—		V <sub>DS</sub> = 25V
C <sub>rss</sub>	Reverse Transfer Capacitance	—	4.0	—		f = 1.0MHz, See Fig. 5⑥
C <sub>oss</sub>	Output Capacitance	—	890	—		V <sub>GS</sub> = 0V, V <sub>DS</sub> = 1.0V, f = 1.0MHz
C <sub>oss</sub>	Output Capacitance	—	30	—		V <sub>GS</sub> = 0V, V <sub>DS</sub> = 320V, f = 1.0MHz
C <sub>oss eff.</sub>	Effective Output Capacitance	—	45	—		V <sub>GS</sub> = 0V, V <sub>DS</sub> = 0V to 320V ⑤⑥

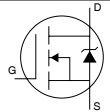
## Avalanche Characteristics

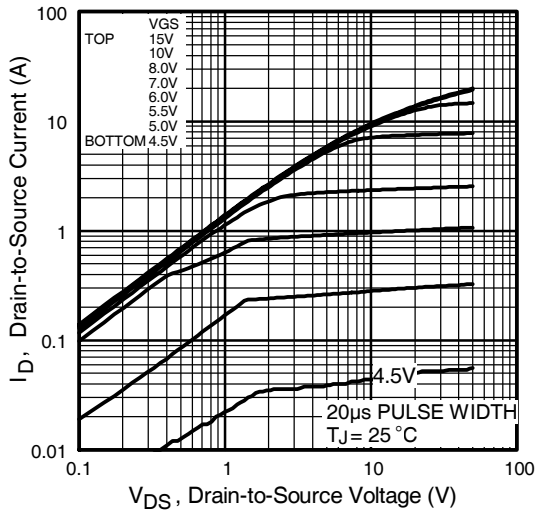
	Parameter	Typ.	Max.	Units
E <sub>AS</sub>	Single Pulse Avalanche Energy②⑥	—	290	mJ
I <sub>AR</sub>	Avalanche Current①	—	5.5	A
E <sub>AR</sub>	Repetitive Avalanche Energy①⑥	—	7.4	mJ

## Thermal Resistance

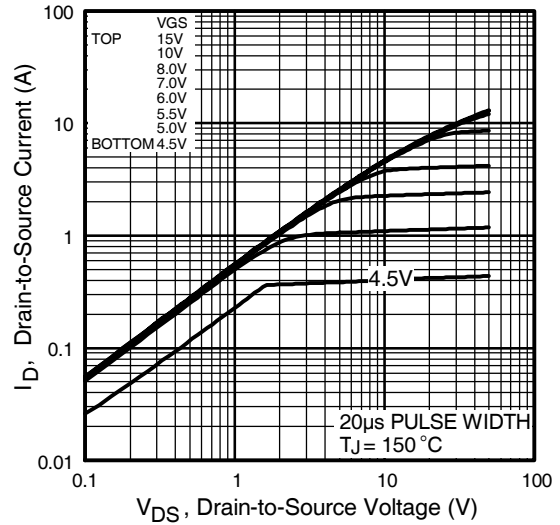
	Parameter	Typ.	Max.	Units
R <sub>θJC</sub>	Junction-to-Case	—	1.7	°C/W
R <sub>θJA</sub>	Junction-to-Ambient ( PCB Mounted, steady-state)*	—	40	

## Diode Characteristics

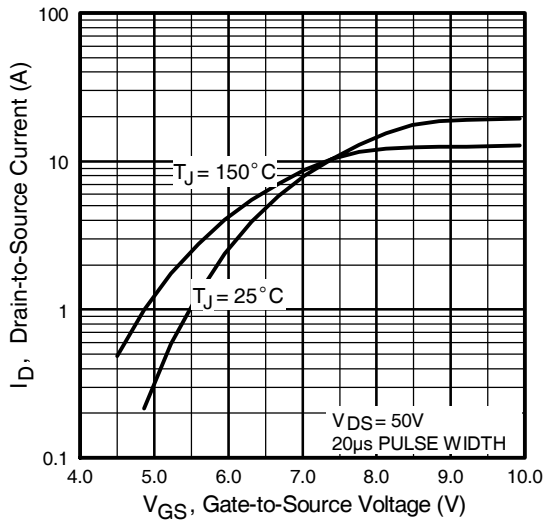
	Parameter	Min.	Typ.	Max.	Units	Conditions
I <sub>S</sub>	Continuous Source Current (Body Diode)	—	—	5.5	A	MOSFET symbol showing the integral reverse p-n junction diode. 
I <sub>SM</sub>	Pulsed Source Current (Body Diode) ①	—	—	22		
V <sub>SD</sub>	Diode Forward Voltage	—	—	1.6	V	T <sub>J</sub> = 25°C, I <sub>S</sub> = 5.5A, V <sub>GS</sub> = 0V ④
t <sub>rr</sub>	Reverse Recovery Time	—	370	550	ns	T <sub>J</sub> = 25°C, I <sub>F</sub> = 3.5A
Q <sub>rr</sub>	Reverse Recovery Charge	—	1.6	2.4	μC	di/dt = 100A/μs ④⑥
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> )				



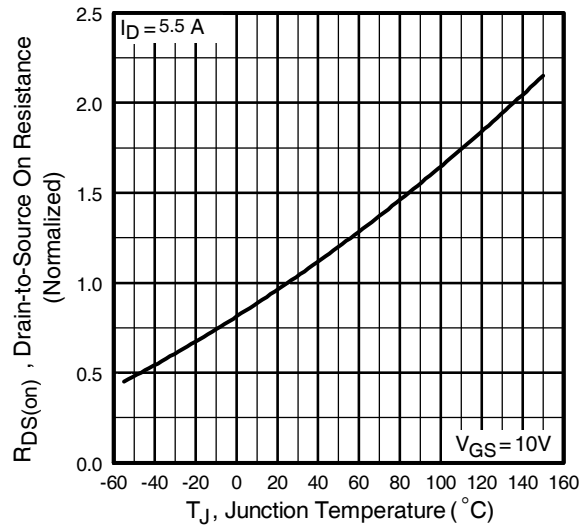
**Fig 1.** Typical Output Characteristics



**Fig 2.** Typical Output Characteristics

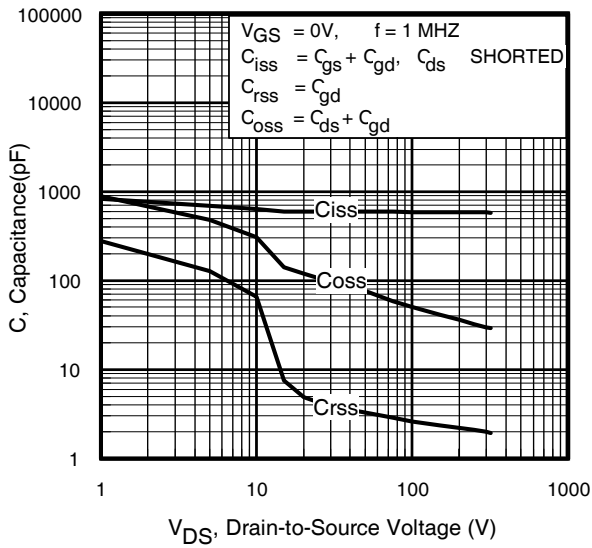


**Fig 3.** Typical Transfer Characteristics

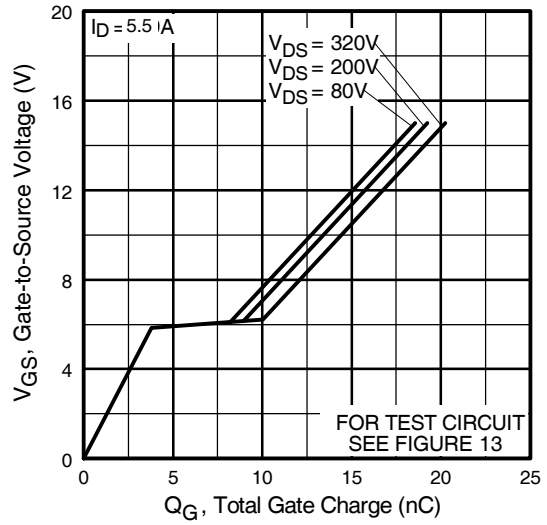


**Fig 4.** Normalized On-Resistance Vs. Temperature

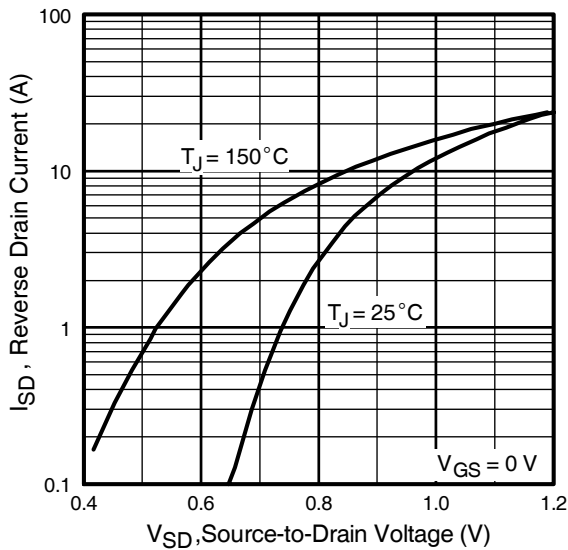
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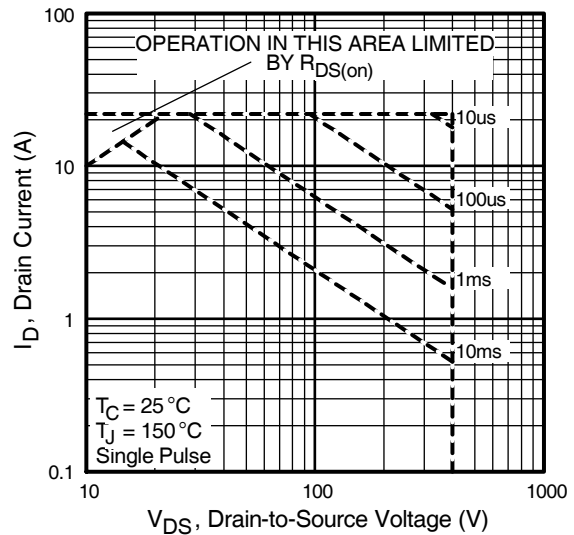
**Fig 5.** Typical Capacitance Vs. Drain-to-Source Voltage



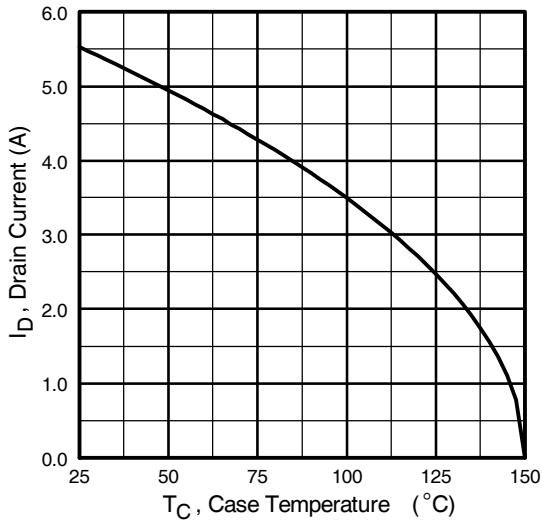
**Fig 6.** Typical Gate Charge Vs. Gate-to-Source Voltage



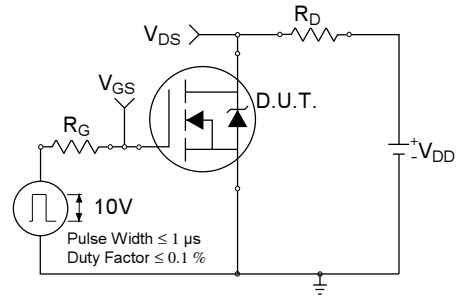
**Fig 7.** Typical Source-Drain Diode Forward Voltage



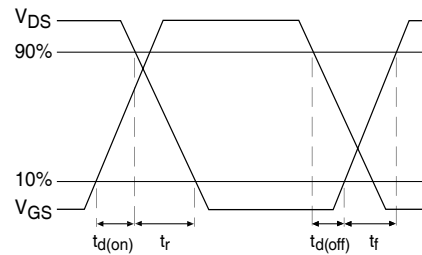
**Fig 8.** Maximum Safe Operating Area



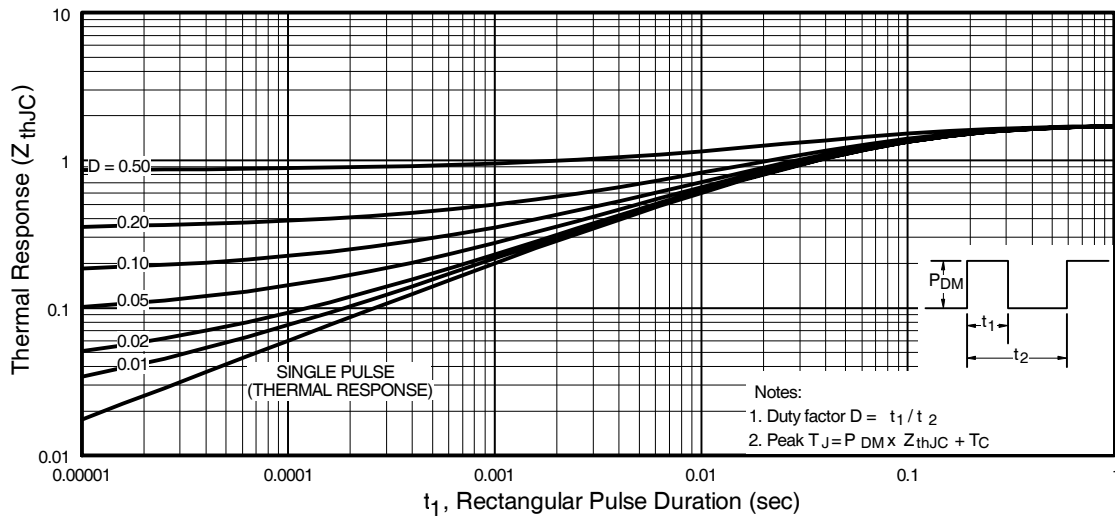
**Fig 9.** Maximum Drain Current Vs. Case Temperature



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

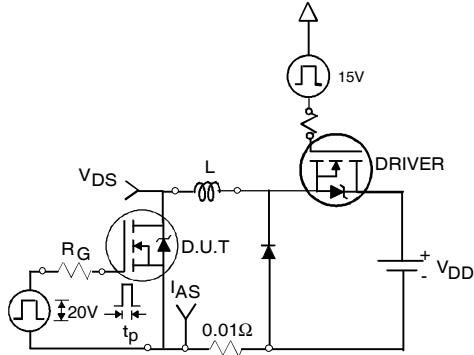


**Fig 10b.** Switching Time Waveforms

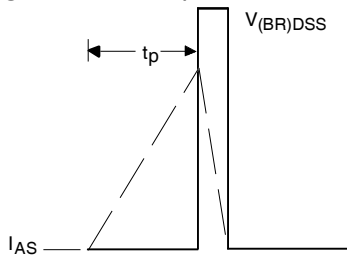


**Fig 11.** Maximum Effective Transient Thermal Impedance, Junction-to-Case

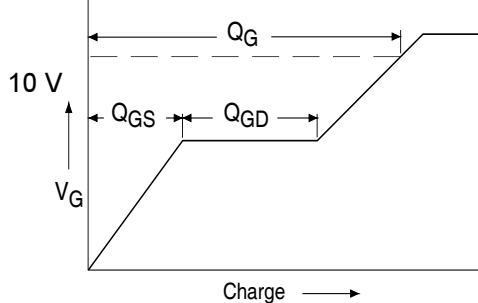
# IRF730AS/LPbF



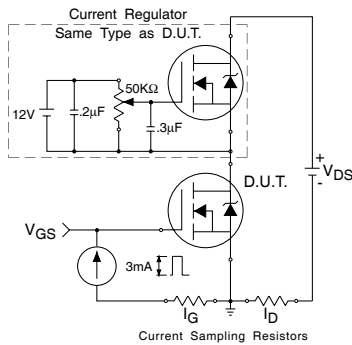
**Fig 12a.** Unclamped Inductive Test Circuit



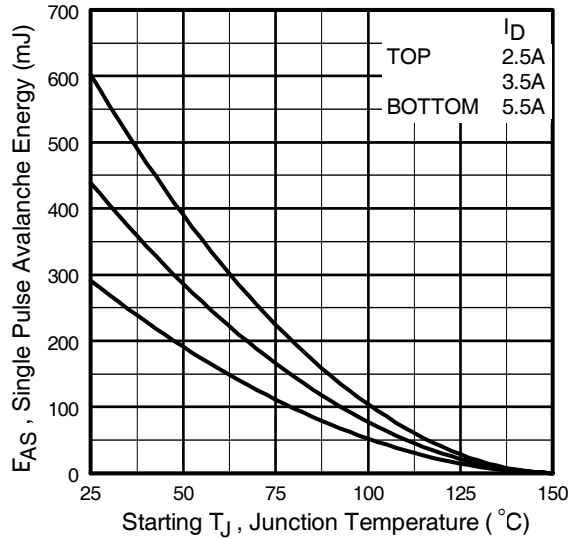
**Fig 12b.** Unclamped Inductive Waveforms



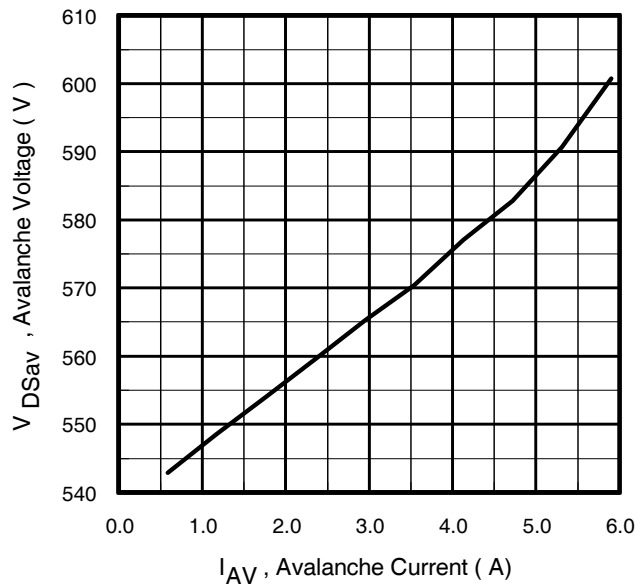
**Fig 13a.** Basic Gate Charge Waveform



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

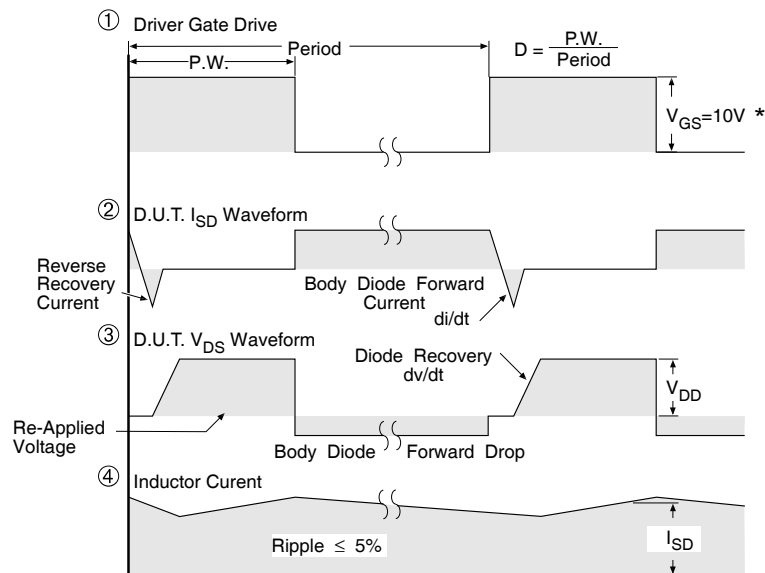
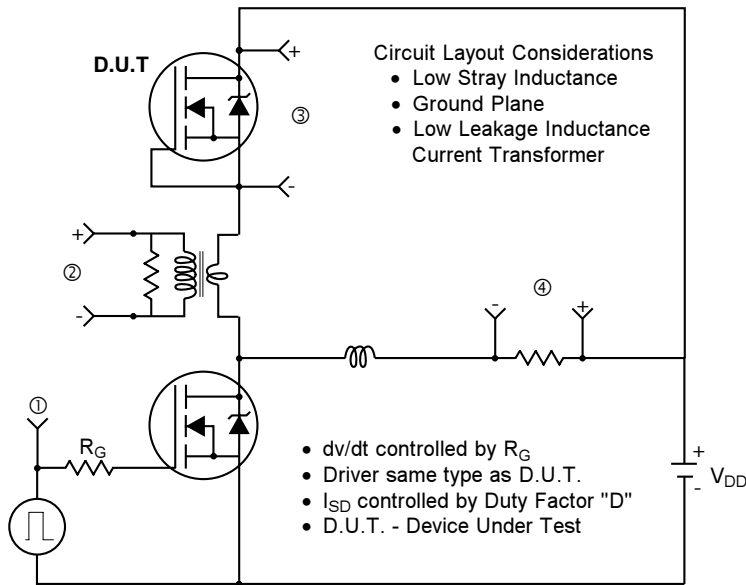


**Fig 12c.** Maximum Avalanche Energy Vs. Drain Current



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

## Peak Diode Recovery dv/dt Test Circuit



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

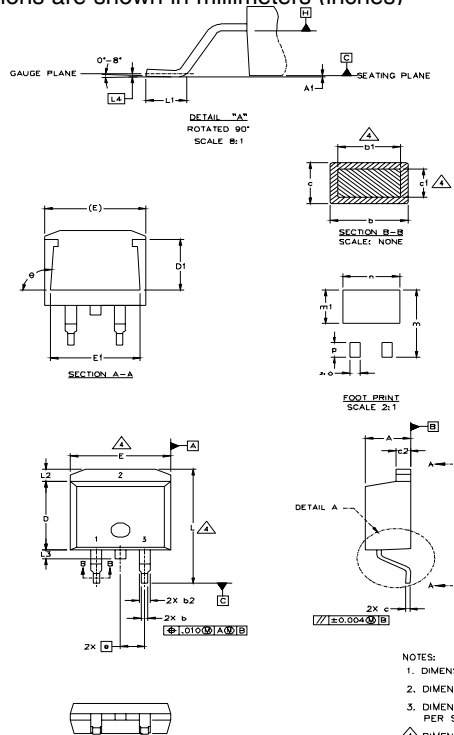
**Fig 14.** For N-Channel HEXFETS

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## 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	
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	
E1	6.22		.245		3
e	2.54 BSC		.100 BSC		
L	14.61	15.88	.575	.625	
L1	1.78	2.79	.070	.110	
L2		1.65		.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

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

\* PART DEPENDENT.

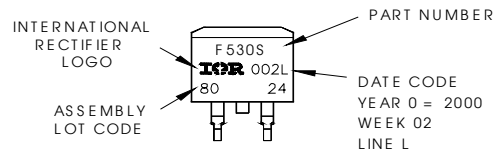
### NOTES:

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 [0.005"] 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.

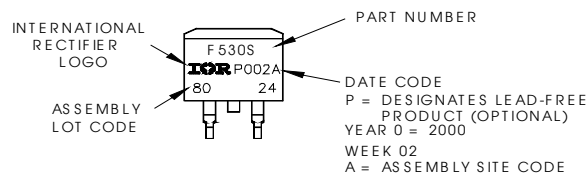
## D<sup>2</sup>Pak Part Marking Information (Lead-Free)

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"

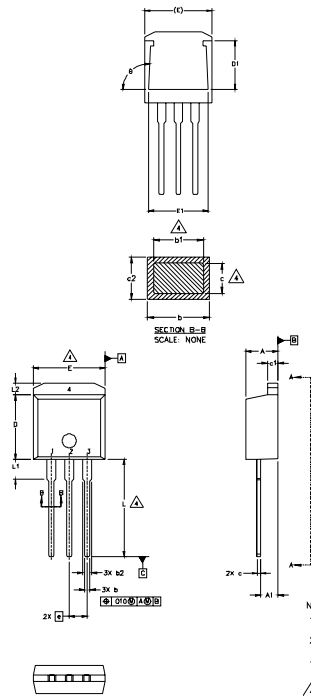


**OR**





## TO-262 Package Outline



SYMBOL	DIMENSIONS				NOTES
	MILLIMETERS		INCHES		
	MIN.	MAX.	MIN.	MAX.	
A	4.06	4.83	.160	.190	
A1	2.03	2.92	.080	.115	
b	0.51	0.99	.020	.039	
b1	0.51	0.89	.020	.035	4
b2	1.14	1.40	.045	.055	
c	0.38	0.63	.015	.025	4
c1	1.14	1.40	.045	.055	
c2	0.43	.063	.017	.029	
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	13.46	14.09	.530	.555	
L1	3.56	3.71	.140	.146	
L2		1.65		.065	

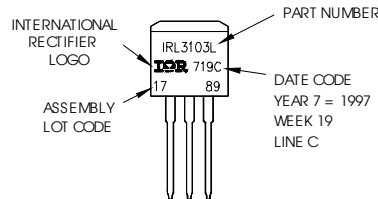
### LEAD ASSIGNMENTS

HEXFET	IGBT
1.- GATE	1- GATE
2.- DRAIN	2- COLLECTOR
3.- SOURCE	3- EMITTER
4.- DRAIN	

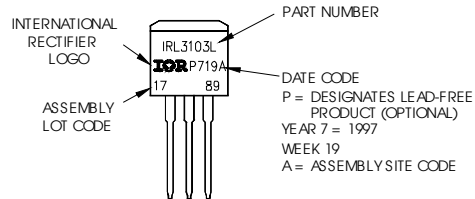
- NOTES:
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  2. DIMENSIONS ARE SHOWN IN MILLIMETERS [INCHES]
  3. DIMENSION D & E DO NOT INCLUDE MOLD FLASH. MOLD FLASH SHALL NOT EXCEED 0.127 [0.005] PER SIDE. THESE DIMENSIONS ARE MEASURED AT THE OUTMOST EXTREMES OF THE PLASTIC BODY.
  4. DIMENSION b1 AND c1 APPLY TO BASE METAL ONLY.
  5. CONTROLLING DIMENSION- INCH.

## TO-262 Part Marking Information

EXAMPLE: THIS IS AN IRL3103L  
 LOT CODE 1789  
 ASSEMBLED ON WW 19, 1997  
 IN THE ASSEMBLY LINE "C"  
 Note: "P" in assembly line position indicates "Lead-Free"



OR

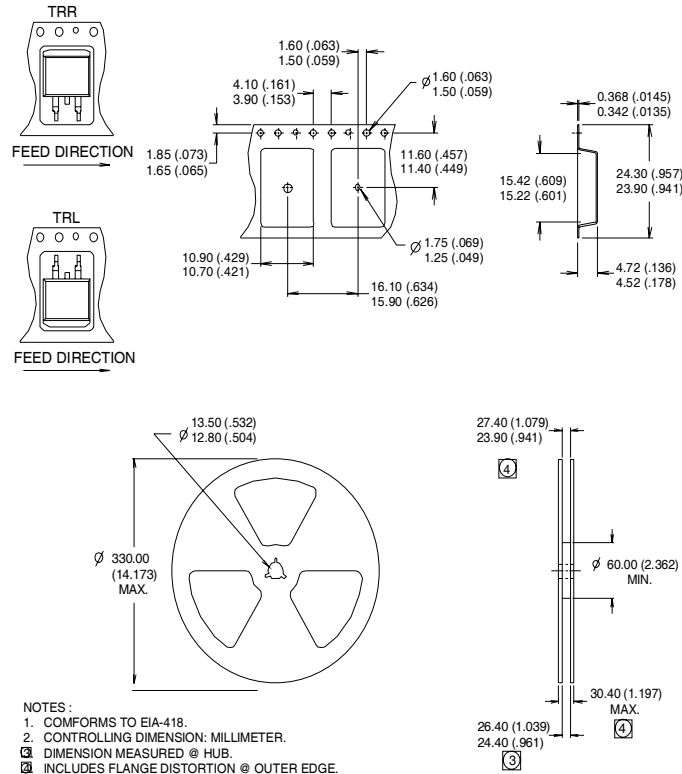


# IRF730AS/LPbF

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**IR** Rectifier

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

Dimensions are shown in millimeters (inches)



### Notes:

- ① Repetitive rating; pulse width limited by max. junction temperature. ( See fig. 11 )
  - ② Starting  $T_J = 25^\circ\text{C}$ ,  $L = 19\text{mH}$   
 $R_G = 25\Omega$ ,  $I_{AS} = 5.5\text{A}$ . (See Figure 12)
  - ③  $I_{SD} \leq 5.5\text{A}$ ,  $di/dt \leq 90\text{A}/\mu\text{s}$ ,  $V_{DD} \leq V_{(BR)DSS}$ ,  
 $T_J \leq 150^\circ\text{C}$
  - 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%  $V_{DSS}$
  - ⑥ Uses IRF730A data and test conditions
- \* When mounted on 1" square PCB ( FR-4 or G-10 Material ).  
For recommended footprint and soldering techniques refer to application note #AN-994.

Data and specifications subject to change without notice.

International  
**IR** Rectifier

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TAC Fax: (310) 252-7903

03/04



## Notice

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