

**Typical Applications**

- Industrial Motor Drive

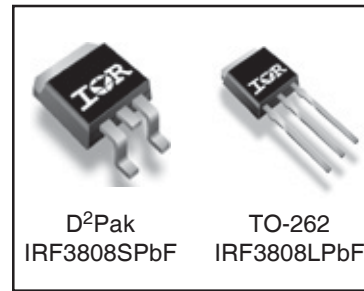
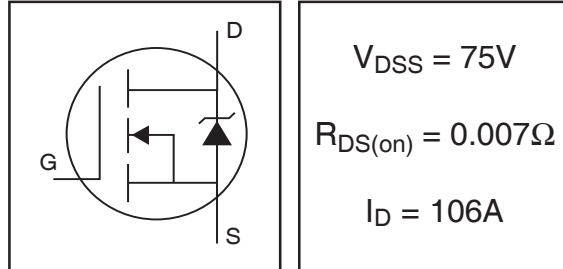
**Benefits**

- Advanced Process Technology
- Ultra Low On-Resistance
- Dynamic dv/dt Rating
- 175°C Operating Temperature
- Fast Switching
- Repetitive Avalanche Allowed up to Tjmax
- Lead-Free

**Description**

This Advanced Planar Stripe HEXFET® Power MOSFET utilizes the latest processing techniques to achieve extremely low on-resistance per silicon area. Additional features of this HEXFET power MOSFET are a 175°C junction operating temperature, low RθJC, fast switching speed and improved repetitive avalanche rating. This combination makes the design an extremely efficient and reliable choice for use in a wide variety of applications.

HEXFET® Power MOSFET



Base Part Number	Package Type	Standard Pack		Orderable Part Number
		Form	Quantity	
IRF3808LPbF	TO-262	Tube	50	IRF3808LPbF
		Tube	50	IRF3808SPbF
IRF3808SPbF	D²Pak	Tape and Reel Left	800	IRF3808STRLPbF
		Tape and Reel Right	800	IRF3808STRRPbF

**Absolute Maximum Ratings**

	Parameter	Max.	Units
I <sub>D</sub> @ T <sub>C</sub> = 25°C	Continuous Drain Current, V <sub>GS</sub> @ 10V	106	A
I <sub>D</sub> @ T <sub>C</sub> = 100°C	Continuous Drain Current, V <sub>GS</sub> @ 10V	75	
I <sub>DM</sub>	Pulsed Drain Current ①	550	
P <sub>D</sub> @ T <sub>C</sub> = 25°C	Power Dissipation	200	W
	Linear Derating Factor	1.3	W/°C
V <sub>GS</sub>	Gate-to-Source Voltage	± 20	V
E <sub>AS</sub>	Single Pulse Avalanche Energy②	430	mJ
I <sub>AR</sub>	Avalanche Current①	82	A
E <sub>AR</sub>	Repetitive Avalanche Energy③	See Fig.12a, 12b, 15, 16	mJ
dv/dt	Peak Diode Recovery dv/dt ④	5.5	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		

**Thermal Resistance**

	Parameter	Typ.	Max.	Units
R <sub>θJC</sub>	Junction-to-Case	—	0.75	°C/W
R <sub>θJA</sub>	Junction-to-Ambient (PCB Mounted, Steady State)②	—	40	

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

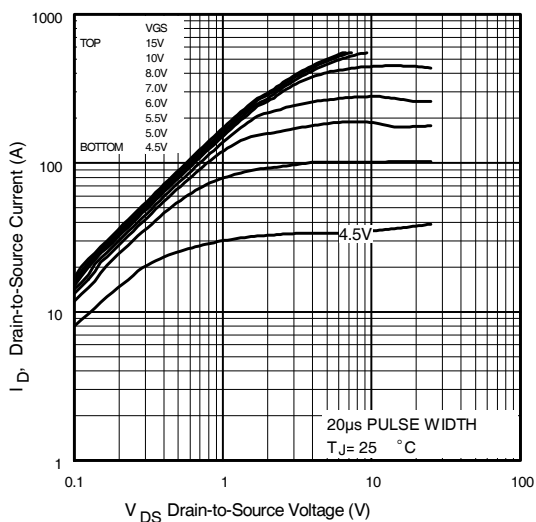
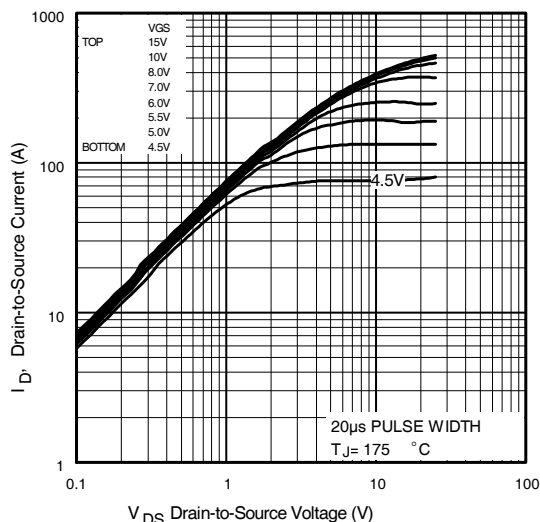
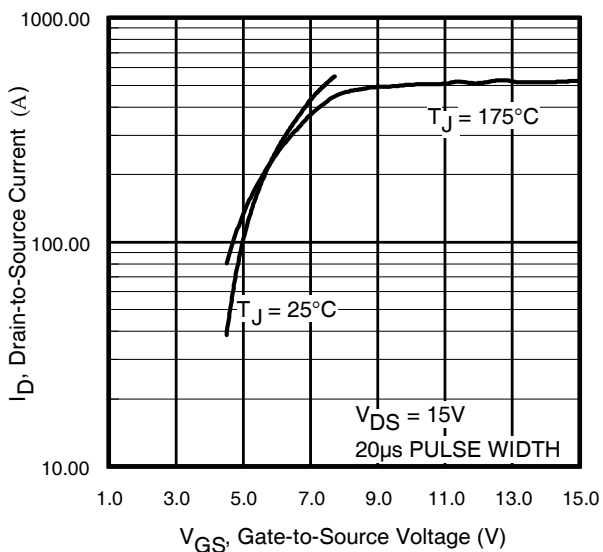
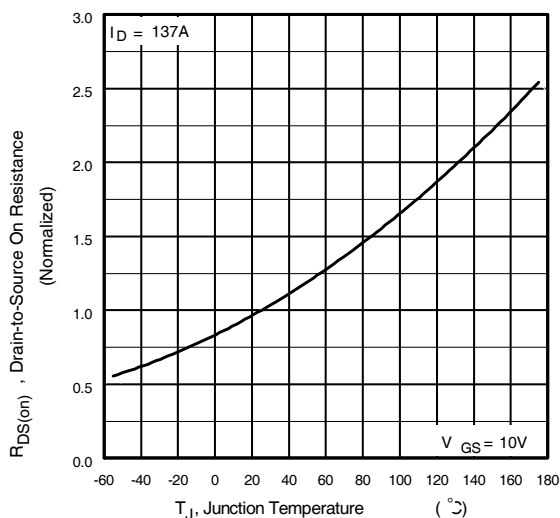
	Parameter	Min.	Typ.	Max.	Units	Conditions
V <sub>(BR)DSS</sub>	Drain-to-Source Breakdown Voltage	75	—	—	V	V <sub>GS</sub> = 0V, I <sub>D</sub> = 250μA
ΔV <sub>(BR)DSS/ΔT<sub>J</sub></sub>	Breakdown Voltage Temp. Coefficient	—	0.086	—	V/°C	Reference to 25°C, I <sub>D</sub> = 1mA
R <sub>DS(on)</sub>	Static Drain-to-Source On-Resistance	—	5.9	7.0	mΩ	V <sub>GS</sub> = 10V, I <sub>D</sub> = 82A ④
V <sub>GS(th)</sub>	Gate Threshold Voltage	2.0	—	4.0	V	V <sub>DS</sub> = 10V, I <sub>D</sub> = 250μA
g <sub>fs</sub>	Forward Transconductance	100	—	—	S	V <sub>DS</sub> = 25V, I <sub>D</sub> = 82A
I <sub>DSS</sub>	Drain-to-Source Leakage Current	—	—	20	μA	V <sub>DS</sub> = 75V, V <sub>GS</sub> = 0V
		—	—	250		V <sub>DS</sub> = 60V, V <sub>GS</sub> = 0V, T <sub>J</sub> = 150°C
I <sub>GSS</sub>	Gate-to-Source Forward Leakage	—	—	200	nA	V <sub>GS</sub> = 20V
	Gate-to-Source Reverse Leakage	—	—	-200		V <sub>GS</sub> = -20V
Q <sub>g</sub>	Total Gate Charge	—	150	220	nC	I <sub>D</sub> = 82A
Q <sub>gs</sub>	Gate-to-Source Charge	—	31	47		V <sub>DS</sub> = 60V
Q <sub>gd</sub>	Gate-to-Drain ("Miller") Charge	—	50	76		V <sub>GS</sub> = 10V ④
t <sub>d(on)</sub>	Turn-On Delay Time	—	16	—	ns	V <sub>DD</sub> = 38V
t <sub>r</sub>	Rise Time	—	140	—		I <sub>D</sub> = 82A
t <sub>d(off)</sub>	Turn-Off Delay Time	—	68	—		R <sub>G</sub> = 2.5Ω
t <sub>f</sub>	Fall Time	—	120	—		V <sub>GS</sub> = 10V ④
L <sub>D</sub>	Internal Drain Inductance	—	4.5	—	nH	Between lead, 6mm (0.25in.) from package and center of die contact
L <sub>S</sub>	Internal Source Inductance	—	7.5	—		
C <sub>iss</sub>	Input Capacitance	—	5310	—	pF	V <sub>GS</sub> = 0V
C <sub>oss</sub>	Output Capacitance	—	890	—		V <sub>DS</sub> = 25V
C <sub>rss</sub>	Reverse Transfer Capacitance	—	130	—		f = 1.0MHz, See Fig. 5
C <sub>oss</sub>	Output Capacitance	—	6010	—		V <sub>GS</sub> = 0V, V <sub>DS</sub> = 1.0V, f = 1.0MHz
C <sub>oss</sub>	Output Capacitance	—	570	—		V <sub>GS</sub> = 0V, V <sub>DS</sub> = 60V, f = 1.0MHz
C <sub>oss eff.</sub>	Effective Output Capacitance ⑤	—	1140	—		V <sub>GS</sub> = 0V, V <sub>DS</sub> = 0V to 60V

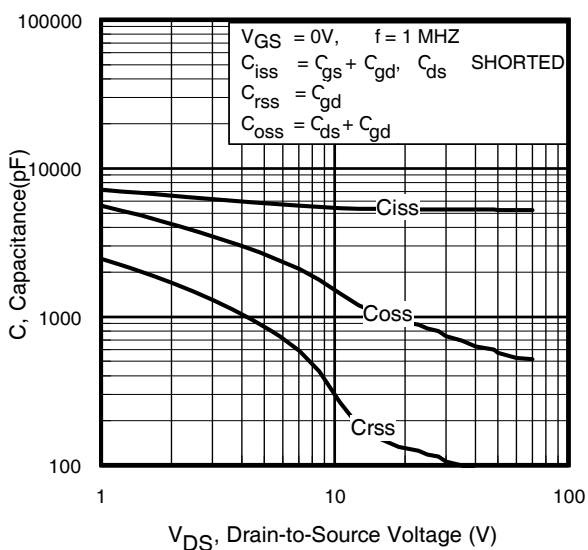
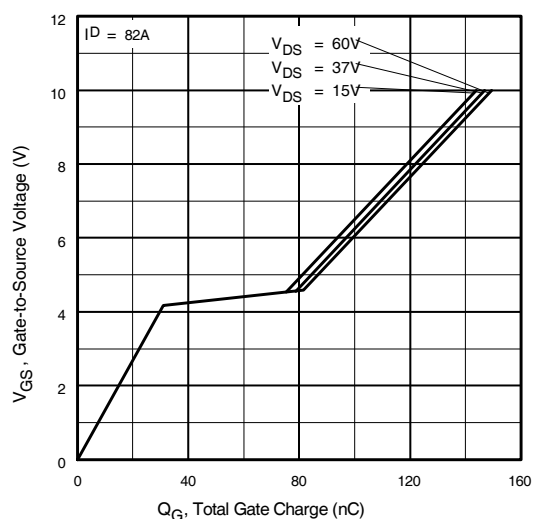
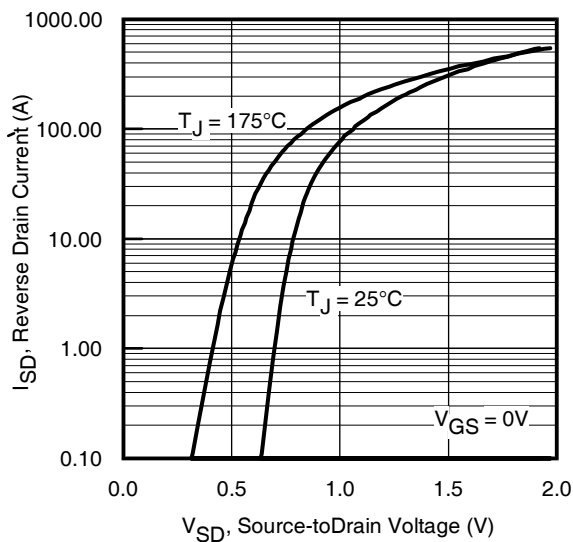
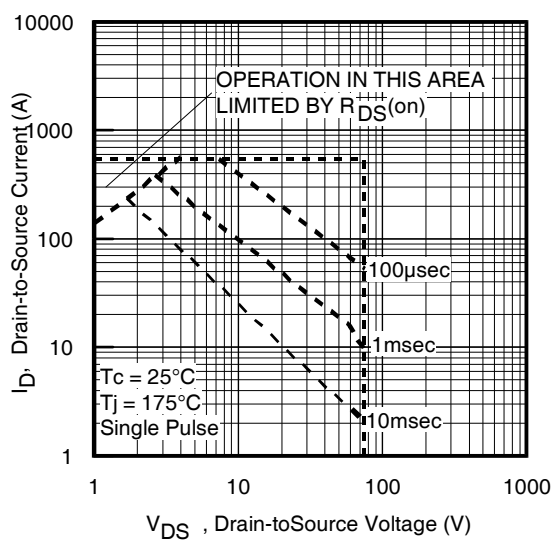
**Source-Drain Ratings and Characteristics**

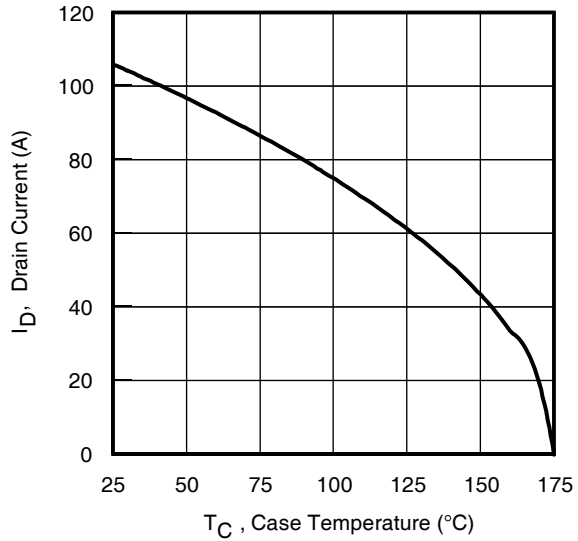
	Parameter	Min.	Typ.	Max.	Units	Conditions
I <sub>S</sub>	Continuous Source Current (Body Diode)	—	—	106	A	MOSFET symbol showing the integral reverse p-n junction diode. 
I <sub>SM</sub>	Pulsed Source Current (Body Diode) ①	—	—	550		
V <sub>SD</sub>	Diode Forward Voltage	—	—	1.3	V	T <sub>J</sub> = 25°C, I <sub>S</sub> = 82A, V <sub>GS</sub> = 0V ④
t <sub>rr</sub>	Reverse Recovery Time	—	93	140	ns	T <sub>J</sub> = 25°C, I <sub>F</sub> = 82A
Q <sub>rr</sub>	Reverse Recovery Charge	—	340	510	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> )				

**Notes:**

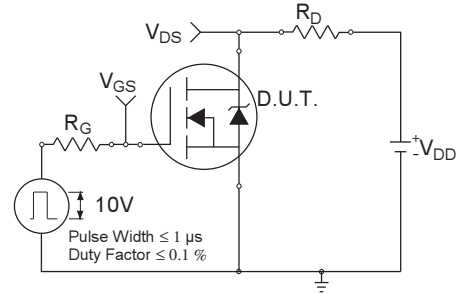
- ① Repetitive rating; pulse width limited by max. junction temperature. (See fig. 11).
- ② Starting T<sub>J</sub> = 25°C, L = 0.130mH  
R<sub>G</sub> = 25Ω, I<sub>AS</sub> = 82A. (See Figure 12).
- ③ I<sub>SD</sub> ≤ 82A, di/dt ≤ 310A/μs, V<sub>DD</sub> ≤ V<sub>(BR)DSS</sub>, T<sub>J</sub> ≤ 175°C
- ④ Pulse width ≤ 400μs; duty cycle ≤ 2%.
- ⑤ C<sub>oss eff.</sub> is a fixed capacitance that gives the same charging time as C<sub>oss</sub> while V<sub>DS</sub> is rising from 0 to 80% V<sub>DSS</sub>.
- ⑥ Limited by T<sub>Jmax</sub>, see Fig.12a, 12b, 15, 16 for typical repetitive avalanche performance.
- ⑦ When mounted on 1" square PCB (FR-4 or G-10 Material). For recommended footprint and soldering techniques refer to application note #AN-994.


**Fig 1. Typical Output Characteristics**

**Fig 2. Typical Output Characteristics**

**Fig 3. Typical Transfer Characteristics**

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

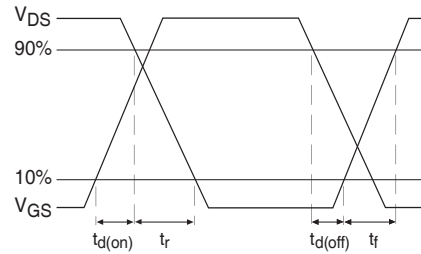

**Fig 5.** Typical Capacitance Vs. Drain-to-Source Voltage

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

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

**Fig 8.** Maximum Safe Operating Area



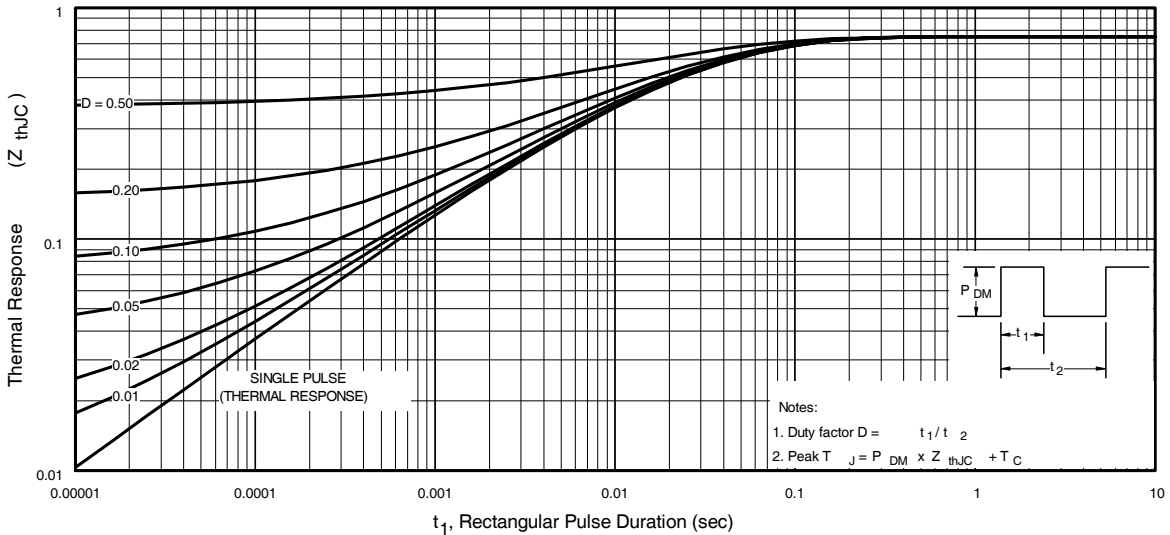
**Fig 9.** Maximum Drain Current Vs. Case Temperature



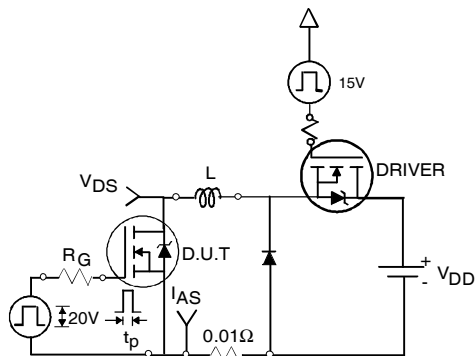
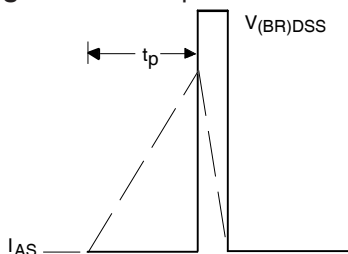
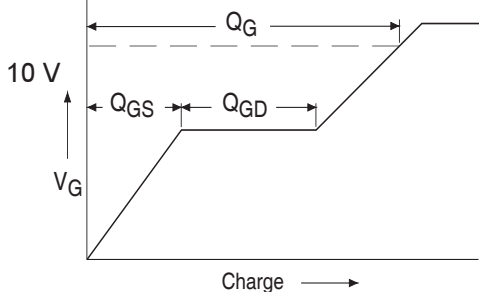
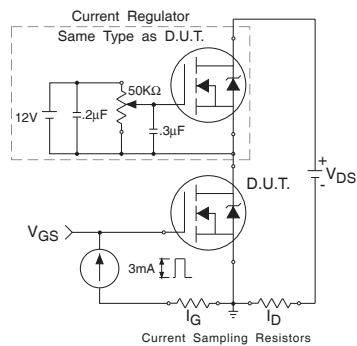
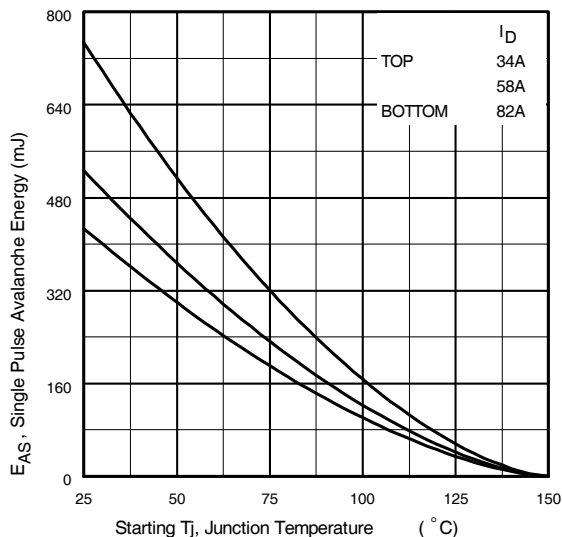
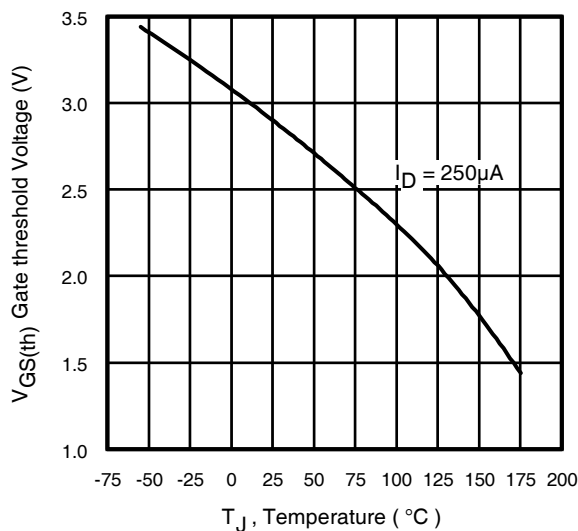
**Fig 10a.** Switching Time Test Circuit

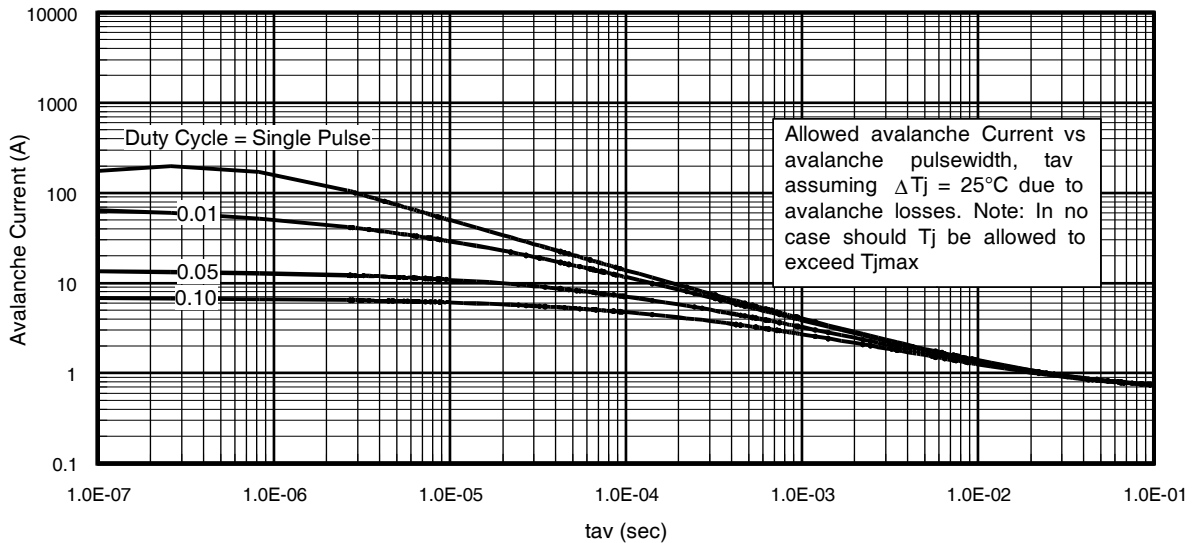
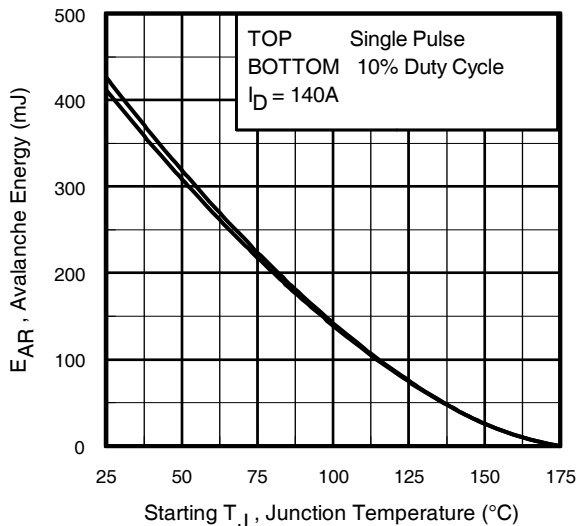


**Fig 10b.** Switching Time Waveforms



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


**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 14. Threshold Voltage Vs. Temperature**

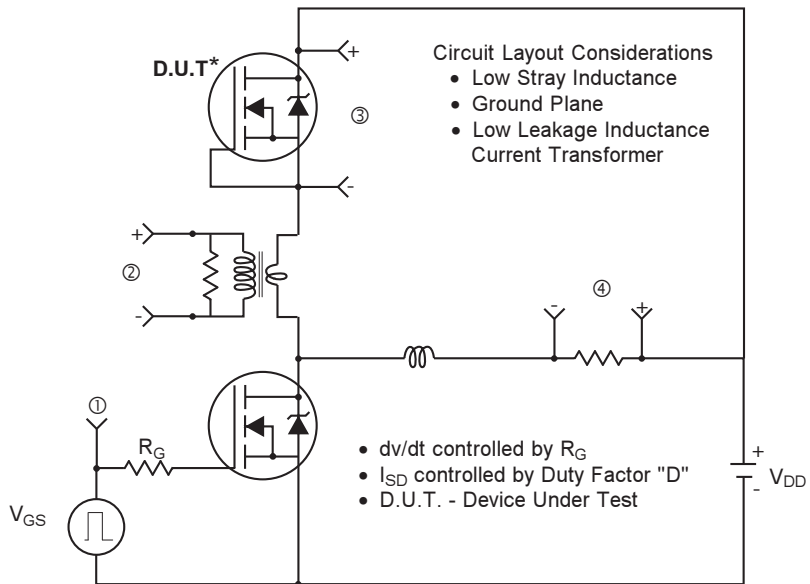

**Fig 15. Typical Avalanche Current Vs.Pulsewidth**

**Fig 16. Maximum Avalanche Energy Vs. Temperature**
**Notes on Repetitive Avalanche Curves , Figures 15, 16: (For further info, see AN-1005 at www.irf.com)**

1. Avalanche failures assumption: Purely a thermal phenomenon and failure occurs at a temperature far in excess of  $T_{jmax}$ . This is validated for every part type.
2. Safe operation in Avalanche is allowed as long as  $T_{jmax}$  is not exceeded.
3. Equation below based on circuit and waveforms shown in Figures 12a, 12b.
4.  $P_{D(ave)}$  = Average power dissipation per single avalanche pulse.
5.  $BV$  = Rated breakdown voltage (1.3 factor accounts for voltage increase during avalanche).
6.  $I_{av}$  = Allowable avalanche current.
7.  $\Delta T$  = Allowable rise in junction temperature, not to exceed  $T_{jmax}$  (assumed as 25°C in Figure 15, 16).  
 $t_{av}$  = Average time in avalanche.  
 $D$  = Duty cycle in avalanche =  $t_{av} \cdot f$   
 $Z_{thJC}(D, t_{av})$  = Transient thermal resistance, see figure 11)

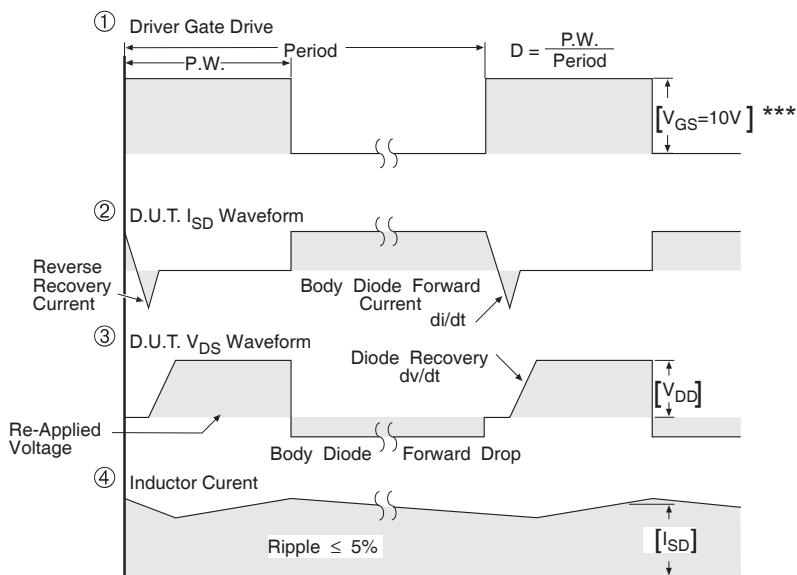
$$P_{D(ave)} = 1/2 ( 1.3 \cdot BV \cdot I_{av} ) = \Delta T / Z_{thJC}$$

$$I_{av} = 2\Delta T / [1.3 \cdot BV \cdot Z_{th}]$$

$$E_{AS(AR)} = P_{D(ave)} \cdot t_{av}$$

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


\* Reverse Polarity of D.U.T for P-Channel



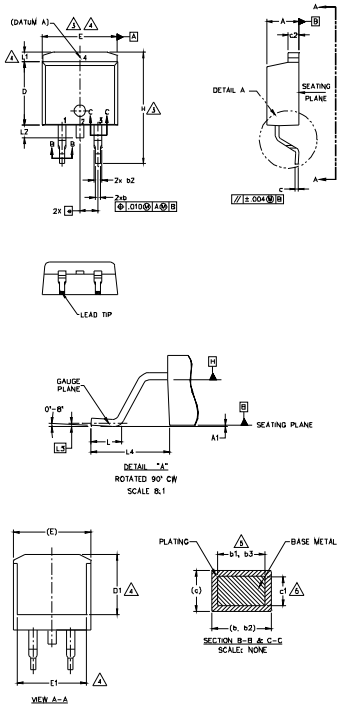
\*\*\*  $V_{GS} = 5.0V$  for Logic Level and 3V Drive Devices

**Fig 17.** For N-channel HEXFET® power MOSFETs



## D<sup>2</sup>Pak (TO-263AB) Package Outline

Dimensions are shown in millimeters (inches)



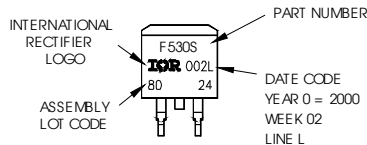
SYMBOL	DIMENSIONS				NOTES
	MILLIMETERS		INCHES		
	MIN.	MAX.	MIN.	MAX.	
A	4.06	4.83	.160	.190	5
A1	0.00	0.254	.000	.010	
b	0.51	0.99	.020	.039	5
b1	0.51	0.89	.020	.035	
b2	1.14	1.78	.045	.070	5
b3	1.14	1.73	.045	.068	
c	0.38	0.74	.015	.029	5
c1	0.38	0.58	.015	.023	
c2	1.14	1.65	.045	.065	3
D	8.38	9.65	.330	.380	
D1	6.86	-	.270	-	4
E	9.65	10.67	.380	.420	3,4
E1	6.22	-	.245	-	4
e	2.54 BSC		.100 BSC		4
H	14.61	15.88	.575	.625	
L	1.78	2.79	.070	.110	4
L1	-	1.65	-	.066	
L2	-	1.78	-	.070	4
L3	0.25 BSC		.010 BSC		
L4	4.78	5.28	.188	.208	

- NOTES:
- DIMENSIONING AND TOLERANCING PER ASME Y14.5M-1994
  - DIMENSIONS ARE SHOWN IN MILLIMETERS [INCHES]
  - 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 AT DATUM H.
  - THERMAL PAD CONTOUR OPTIONAL WITHIN DIMENSION E, L1, D1 & E1.
  - DIMENSION b1 AND c1 APPLY TO BASE METAL ONLY.
  - DATUM A & B TO BE DETERMINED AT DATUM PLANE H.
  - CONTROLLING DIMENSION: INCH.
  - OUTLINE CONFORMS TO JEDEC OUTLINE TO-263AB.

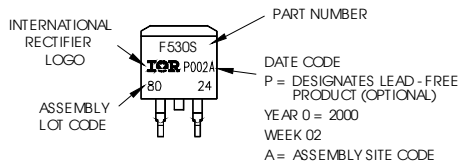
## D<sup>2</sup>Pak (TO-263AB) Part Marking Information

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"



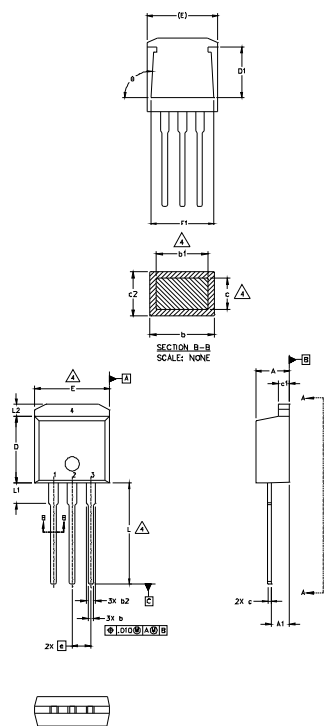
OR



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

## TO-262 Package Outline

Dimensions are shown in millimeters (inches)



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	10.67	.210	.420	3
E	9.65	10.67	.380	.420	
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

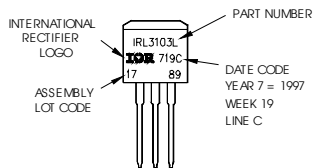
- 1.- GATE
- 2.- DRAIN
- 3.- SOURCE
- 4.- DRAIN

#### IGBT

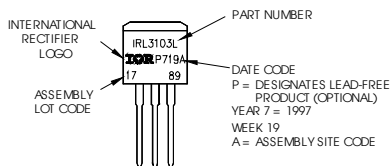
- 1 - GATE
- 2 - COLLECTOR
- 3 - EMITTER

## 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"

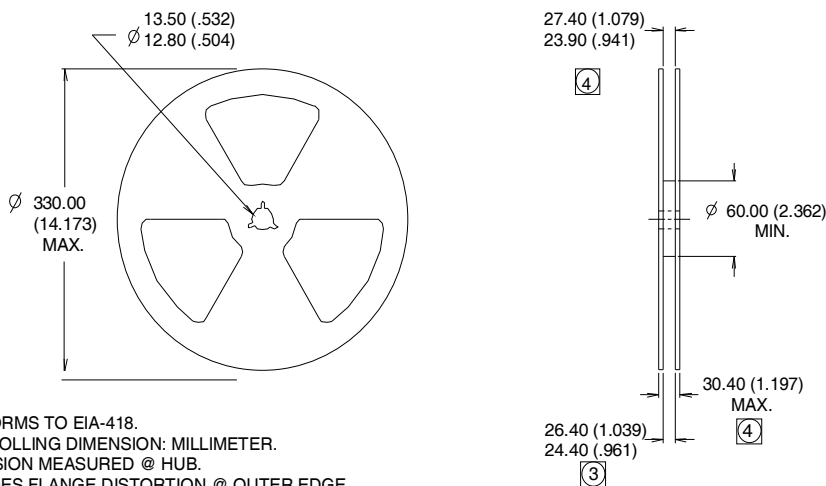
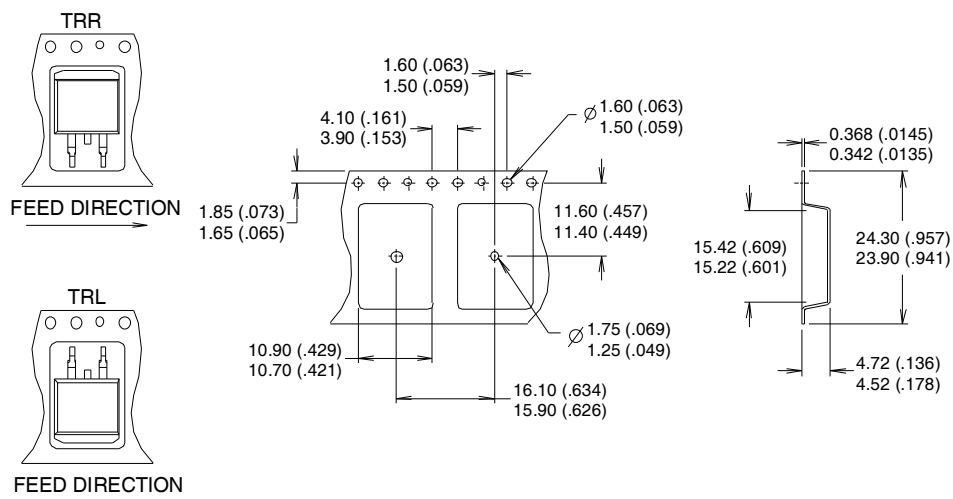


**OR**



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

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



- NOTES :
1. COMFORMS TO EIA-418.
  2. CONTROLLING DIMENSION: MILLIMETER.
  - ③ DIMENSION MEASURED @ HUB.
  - ④ INCLUDES FLANGE DISTORTION @ OUTER EDGE.

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

**Qualification information†**

Qualification level	Industrial (per JEDEC JESD47F†† guidelines)	
Moisture Sensitivity Level	TO-262 PAK	N/A
	D2-PAK	MSL1 (per JEDEC J-STD-020D††)
RoHS compliant	Yes	

† Qualification standards can be found at International Rectifier's web site: <http://www.irf.com/product-info/reliability>

†† Applicable version of JEDEC standard at the time of product release

**Revision History**

Date	Comments
11/1/2013	<ul style="list-style-type: none"> <li>• Updated datasheet with New IR corporate template</li> <li>• Removed note6 because update package ID from "75A" to "106A"-page 1 &amp; 2</li> <li>• Added Odering information table-page 1</li> <li>• Corrected fig9-page 5</li> <li>• Added Qualification information table-page 12</li> </ul>

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