

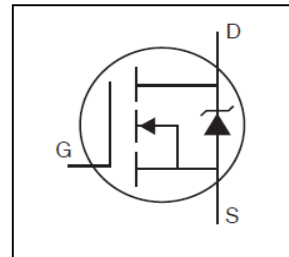
**Features**

- Advanced Process Technology
- Key Parameters Optimized for PDP Sustain, Energy Recovery and Pass Switch Applications
- Low  $E_{PULSE}$  Rating to Reduce Power Dissipation in PDP Sustain, Energy Recovery and Pass Switch Applications
- Low  $Q_G$  for Fast Response
- High Repetitive Peak Current Capability for Reliable Operation
- Short Fall & Rise Times for Fast Switching
- 150°C Operating Junction Temperature for Improved Ruggedness
- Repetitive Avalanche Capability for Robustness and Reliability

HEXFET® Power MOSFET

**Key Parameters**

$V_{DS\ max}$	250	V
$V_{DS\ (Avalanche)\ typ.}$	300	V
$R_{DS(ON)\ typ.\ @\ 10V}$	38	mΩ
$I_{RP\ max\ @\ T_C = 100^\circ C}$	32	A
$T_J\ max$	150	°C



<b>G</b>	<b>D</b>	<b>S</b>
Gate	Drain	Source

**Description**

This HEXFET® Power MOSFET is specifically designed for Sustain; Energy Recovery & Pass switch applications in Plasma Display Panels. This MOSFET utilizes the latest processing techniques to achieve low on-resistance per silicon area and low  $E_{PULSE}$  rating. Additional features of this MOSFET are 150°C operating junction temperature and high repetitive peak current capability. These features combine to make this MOSFET a highly efficient, robust and reliable device for PDP driving applications

Base Part Number	Package Type	Standard Pack		Orderable Part Number
		Form	Quantity	
IRFI4229PbF	TO-220 Full-Pak	Tube	50	IRFI4229PbF

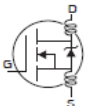
**Absolute Maximum Ratings**

Symbol	Parameter	Max.	Units
$V_{GS}$	Gate-to-Source Voltage	± 30	V
$I_D @ T_C = 25^\circ C$	Continuous Drain Current, $V_{GS} @ 10V$	19	A
$I_D @ T_C = 100^\circ C$	Continuous Drain Current, $V_{GS} @ 10V$	12	
$I_{DM}$	Pulsed Drain Current ①	72	
$I_{RP} @ T_C = 100^\circ C$	Repetitive Peak Current ⑤	32	W
$P_D @ T_C = 25^\circ C$	Maximum Power Dissipation	46	
$P_D @ T_C = 100^\circ C$	Maximum Power Dissipation	18	W/°C
	Linear Derating Factor	0.37	
$T_J$	Operating Junction and	-40 to + 150	°C
$T_{STG}$	Storage Temperature Range		
	Soldering Temperature, for 10 seconds (1.6mm from case)	300	
	Mounting torque, 6-32 or M3 screw	10 lbf•in (1.1N•m)	

**Thermal Resistance**

Symbol	Parameter	Typ.	Max.	Units
$R_{\theta JC}$	Junction-to-Case ④	—	2.73	°C/W
$R_{\theta JA}$	Junction-to-Ambient	—	65	

**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	250	—	—	V	V <sub>GS</sub> = 0V, I <sub>D</sub> = 250μA
ΔV <sub>(BR)DSS</sub> /ΔT <sub>J</sub>	Breakdown Voltage Temp. Coefficient	—	340	—	mV/°C	Reference to 25°C, I <sub>D</sub> = 1mA
R <sub>DS(on)</sub>	Static Drain-to-Source On-Resistance	—	38	46	mΩ	V <sub>GS</sub> = 10V, I <sub>D</sub> = 11A
V <sub>GS(th)</sub>	Gate Threshold Voltage	3.0	—	5.0	V	V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 250μA
ΔV <sub>GS(th)</sub> /ΔT <sub>J</sub>	Gate Threshold Voltage Temp. Coefficient	—	-12	—	mV/°C	
I <sub>DSS</sub>	Drain-to-Source Leakage Current	—	—	20	μA	V <sub>DS</sub> = 250V, V <sub>GS</sub> = 0V
		—	—	200		V <sub>DS</sub> = 250V, V <sub>GS</sub> = 0V, T <sub>J</sub> = 150°C
I <sub>GSS</sub>	Gate-to-Source Forward Leakage	—	—	100	nA	V <sub>GS</sub> = 20V
	Gate-to-Source Reverse Leakage	—	—	-100		V <sub>GS</sub> = -20V
g <sub>fs</sub>	Forward Trans conductance	26	—	—	S	V <sub>DS</sub> = 25V, I <sub>D</sub> = 11A
Q <sub>g</sub>	Total Gate Charge	—	73	110	nC	I <sub>D</sub> = 11A, V <sub>DS</sub> = 125V
Q <sub>gd</sub>	Gate-to-Drain Charge	—	24	—		V <sub>GS</sub> = 10V
t <sub>d(on)</sub>	Turn-On Delay Time	—	18	—	ns	V <sub>DD</sub> = 125V, V <sub>GS</sub> = 10V
t <sub>r</sub>	Rise Time	—	17	—		I <sub>D</sub> = 11A
t <sub>d(off)</sub>	Turn-Off Delay Time	—	32	—		R <sub>G</sub> = 2.4Ω
t <sub>f</sub>	Fall Time	—	13	—		See Fig. 22
t <sub>st</sub>	Shoot Through Blocking Time	100	—	—	ns	V <sub>DD</sub> = 200V, V <sub>GS</sub> = 15V, R <sub>G</sub> = 5.1Ω
E <sub>PULSE</sub>	Energy per Pulse	—	770	—	μJ	L = 220nH, C = 0.3μF, V <sub>GS</sub> = 15V V <sub>DD</sub> = 200V, R <sub>G</sub> = 5.1Ω, T <sub>J</sub> = 25°C
		—	1380	—		L = 220nH, C = 0.3μF, V <sub>GS</sub> = 15V V <sub>DD</sub> = 200V, R <sub>G</sub> = 5.1Ω, T <sub>J</sub> = 100°C
C <sub>iSS</sub>	Input Capacitance	—	4480	—	pF	V <sub>GS</sub> = 0V
C <sub>oSS</sub>	Output Capacitance	—	400	—		V <sub>DS</sub> = 25V
C <sub>rSS</sub>	Reverse Transfer Capacitance	—	100	—		f = 1.0MHz
C <sub>oSS eff.</sub>	Effective Output Capacitance	—	270	—		V <sub>GS</sub> = 0V, V <sub>DS</sub> = 0V to 200V
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	—		

**Avalanche Characteristics**

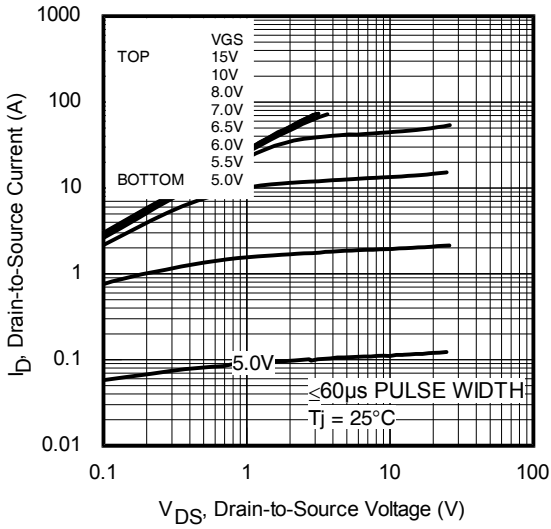
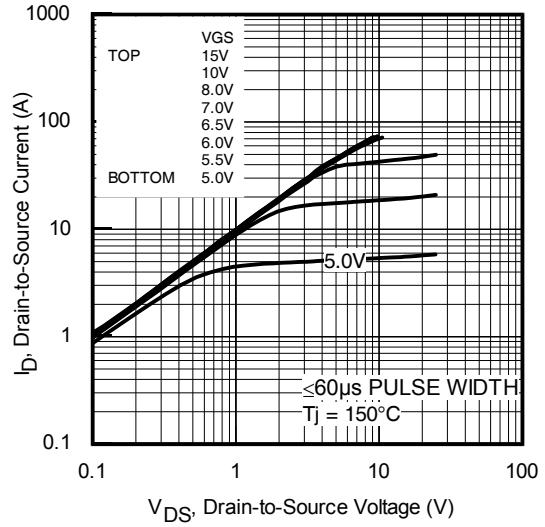
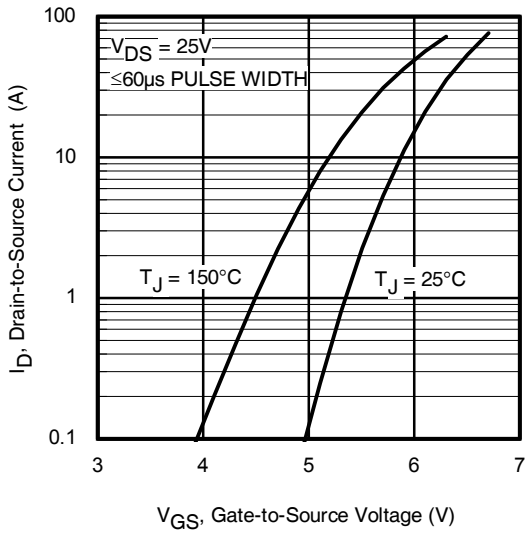
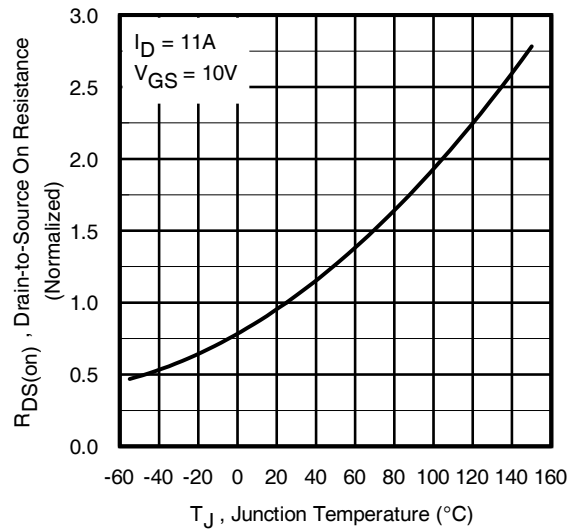
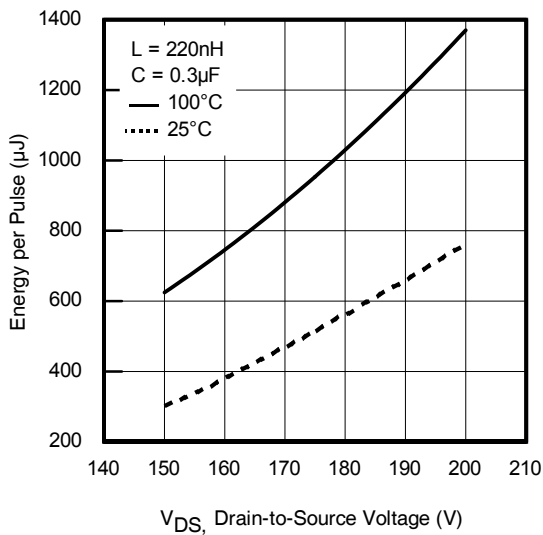
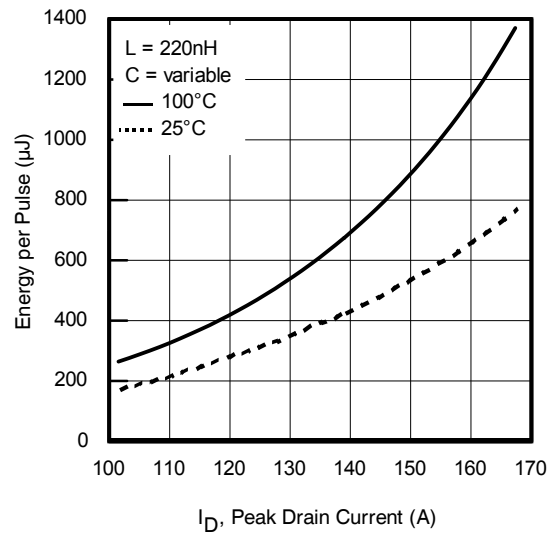
	Parameter	Typ.	Max.	Units
E <sub>AS</sub>	Single Pulse Avalanche Energy ②	—	110	mJ
E <sub>AR</sub>	Repetitive Avalanche Energy ①	—	4.6	
V <sub>DS(Avalanche)</sub>	Repetitive Avalanche Voltage ①	300	—	V
I <sub>AS</sub>	Avalanche Current ②	—	11	A

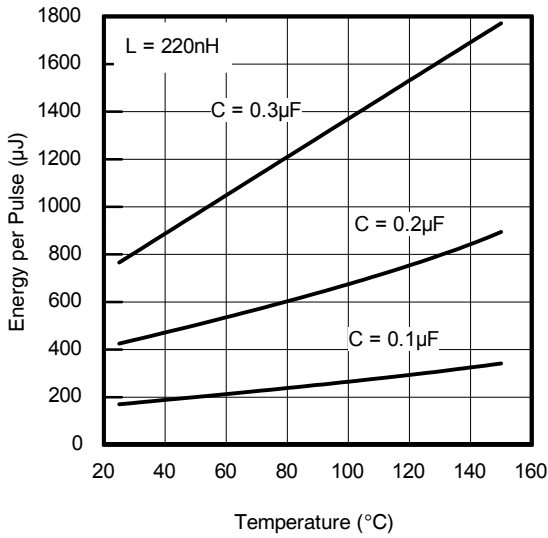
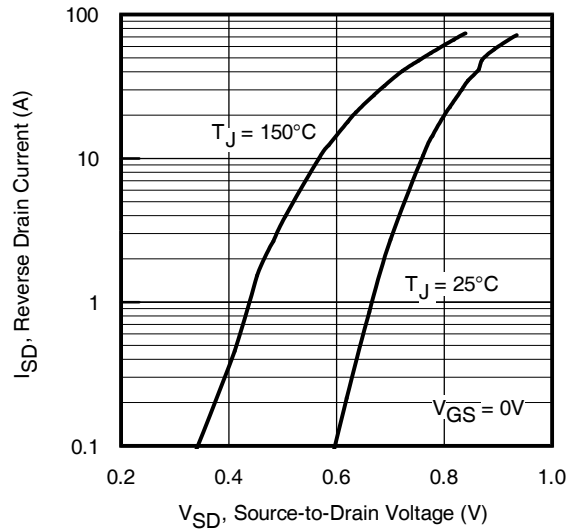
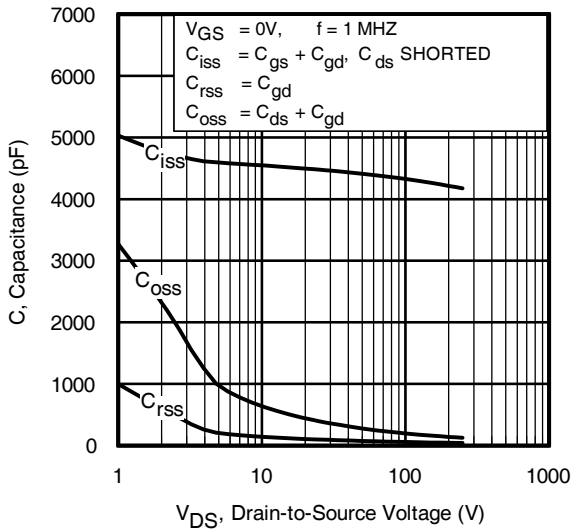
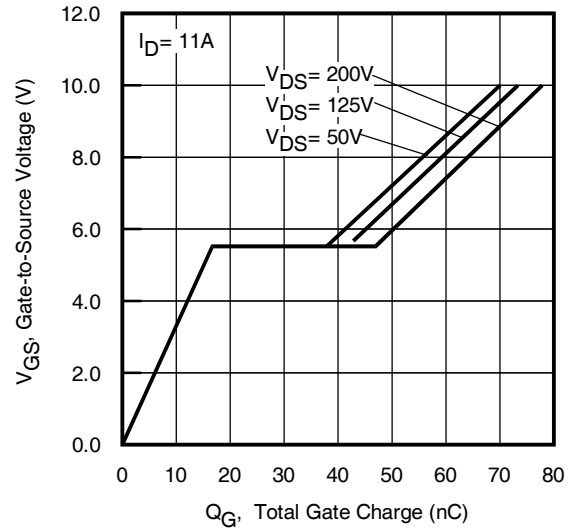
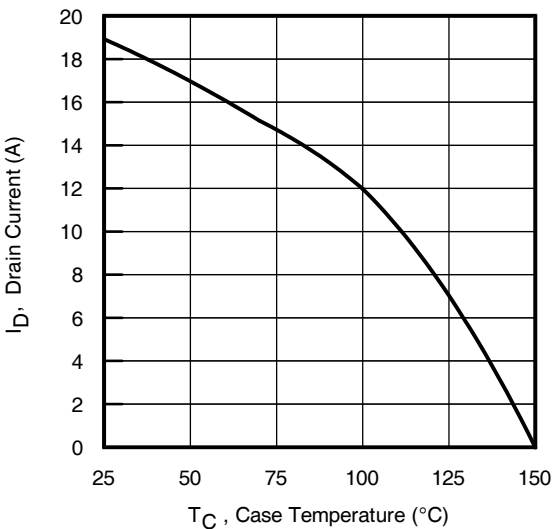
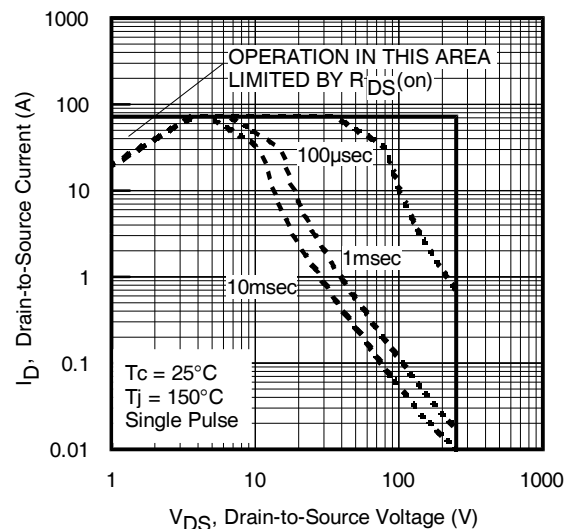
**Diode Characteristics**

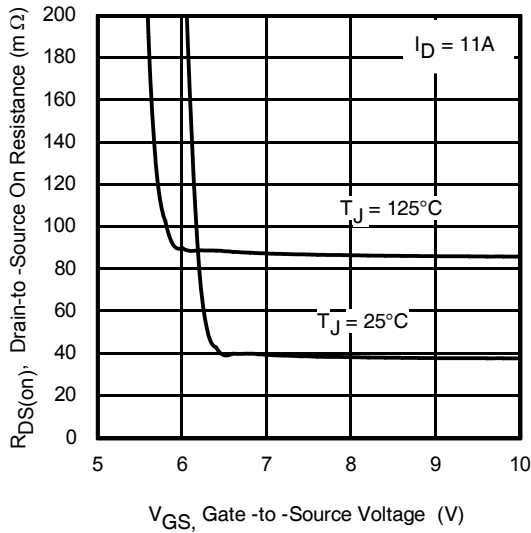
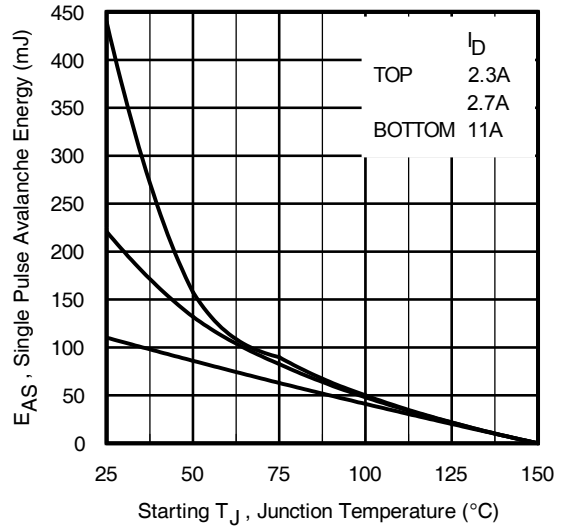
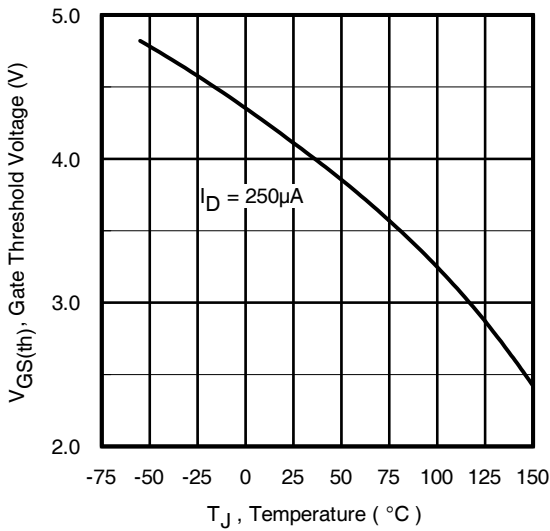
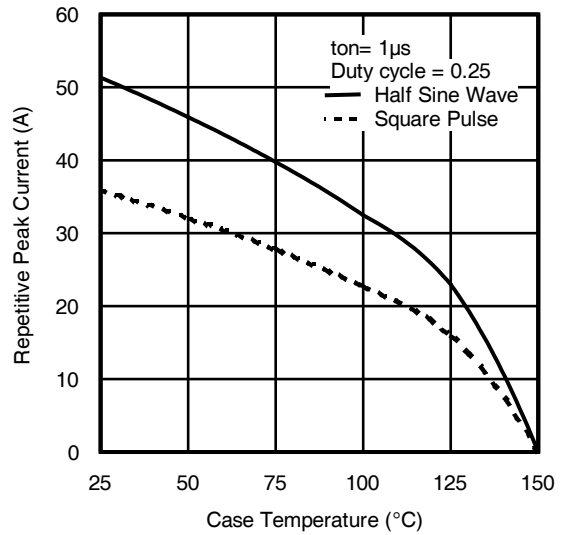
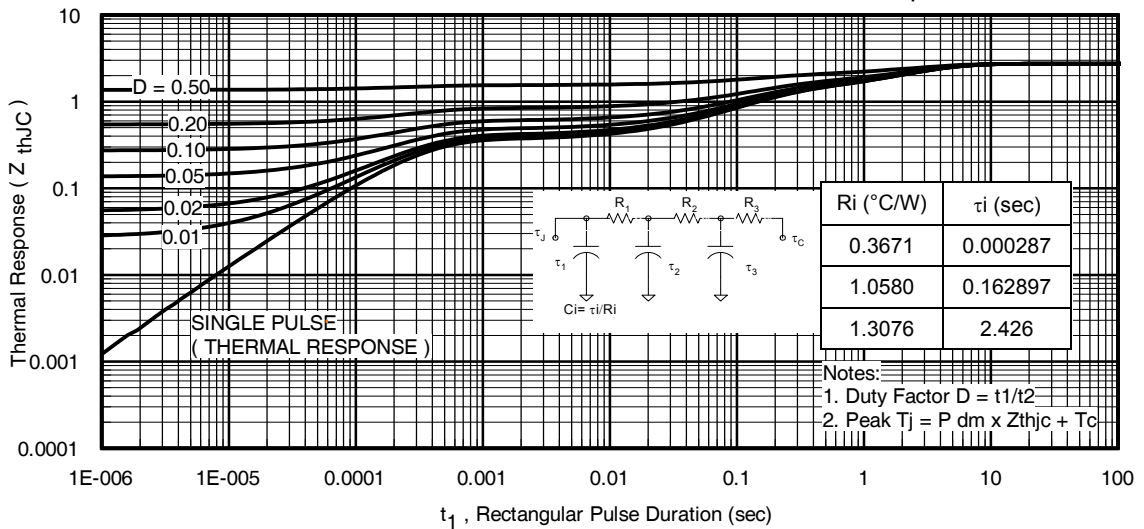
	Parameter	Min.	Typ.	Max.	Units	Conditions
I <sub>S</sub> @ T <sub>C</sub> = 25°C	Continuous Source Current (Body Diode)	—	—	18	A	MOSFET symbol showing the integral reverse p-n junction diode.
I <sub>SM</sub>	Pulsed Source Current (Body Diode) ①	—	—	72		
V <sub>SD</sub>	Diode Forward Voltage	—	—	1.3	V	T <sub>J</sub> = 25°C, I <sub>S</sub> = 11A, V <sub>GS</sub> = 0V ③
t <sub>rr</sub>	Reverse Recovery Time	—	120	180	ns	T <sub>J</sub> = 25°C, I <sub>F</sub> = 11A, V <sub>DD</sub> = 50V
Q <sub>rr</sub>	Reverse Recovery Charge	—	540	810	nC	di/dt = 100A/μs ③

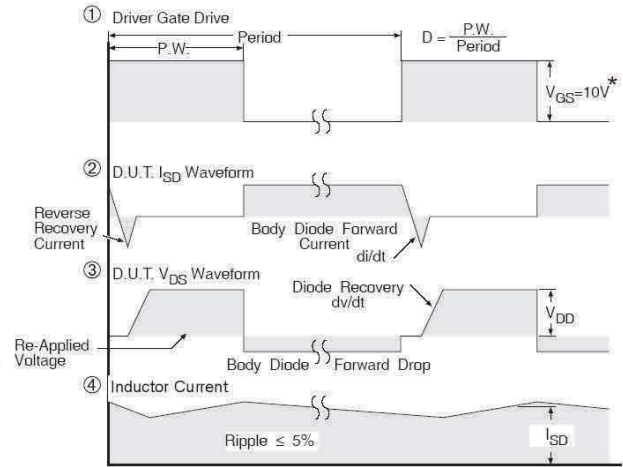
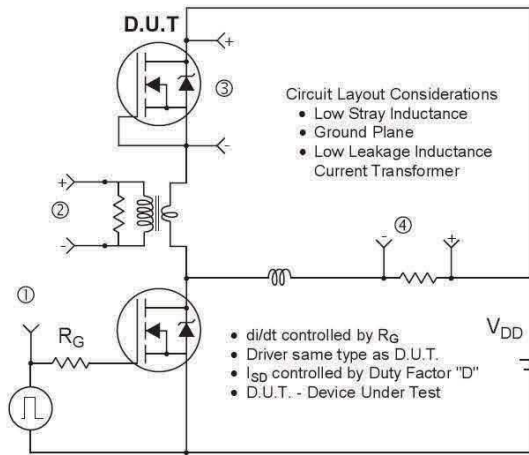
**Notes:**

- ① Repetitive rating; pulse width limited by max. junction temperature.
- ② starting T<sub>J</sub> = 25°C, L = 1.9mH, R<sub>G</sub> = 25Ω, I<sub>AS</sub> = 11A.
- ③ Pulse width ≤ 400μs; duty cycle ≤ 2%.
- ④ R<sub>θ</sub> is measured at T<sub>J</sub> of approximately 90°C.
- ⑤ Half sine wave with duty cycle = 0.25, ton = 1μsec.


**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  $E_{PULSE}$  vs. Drain-to-Source Voltage**

**Fig 6. Typical  $E_{PULSE}$  vs. Drain Current**

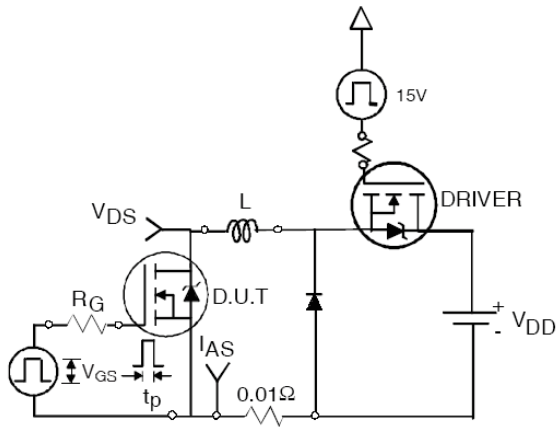

**Fig. 7.** Typical  $E_{PULSE}$  vs. Temperature

**Fig. 8.** Typical Source-Drain Diode Forward Voltage

**Fig. 9.** Typical Capacitance vs. Drain-to-Source Voltage

**Fig. 10.** Typical Gate Charge vs. Gate-to-Source Voltage

**Fig. 11.** Maximum Drain Current vs. Case Temperature

**Fig. 12.** Maximum Safe Operating Area


**Fig. 13.** On-Resistance Vs. Gate Voltage

**Fig. 14.** Maximum Avalanche Energy Vs. Temperature

**Fig. 15.** Threshold Voltage vs. Temperature

**Fig. 16.** Typical Repetitive peak Current vs. Case temperature

**Fig 17.** Maximum Effective Transient Thermal Impedance, Junction-to-Case

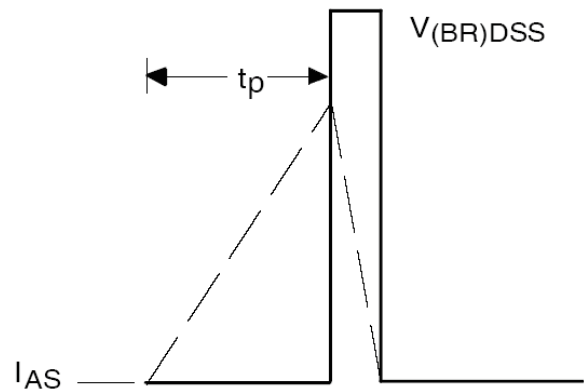


\*  $V_{GS} = 5V$  for Logic Level Devices

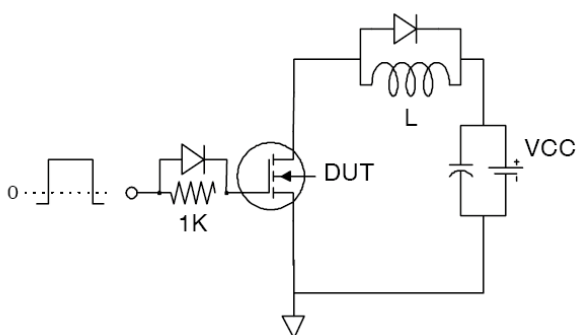
**Fig 18.** Diode Reverse Recovery Test Circuit for N-Channel HEXFET® Power MOSFETs



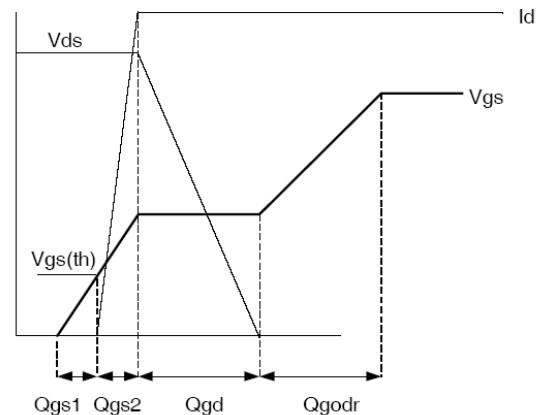
**Fig 19a.** Unclamped Inductive Test Circuit



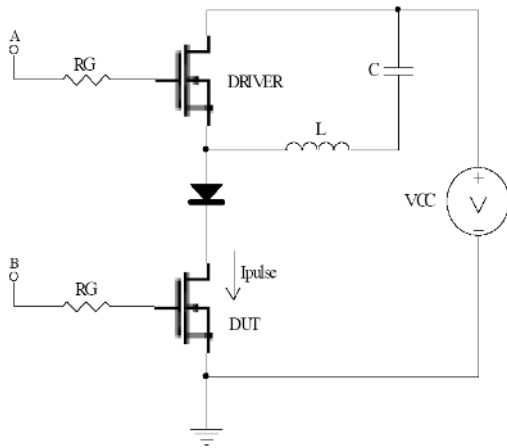
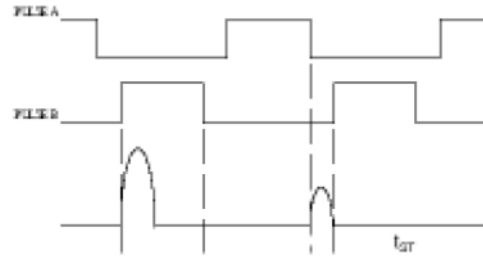
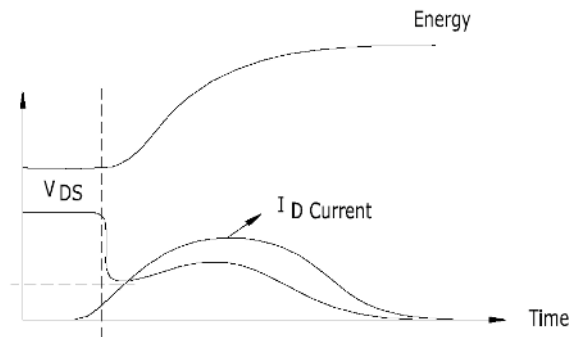
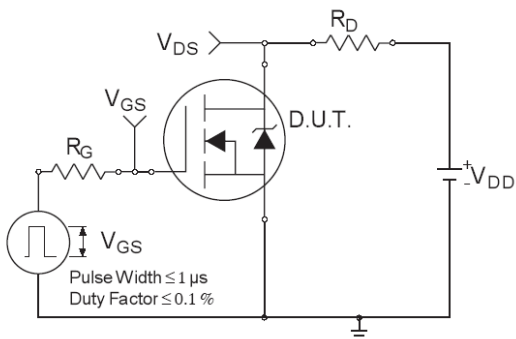
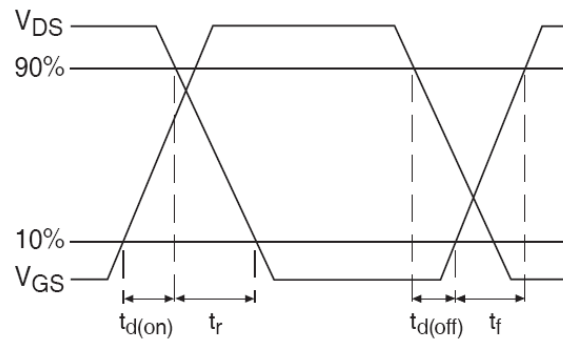
**Fig 19b.** Unclamped Inductive Waveforms

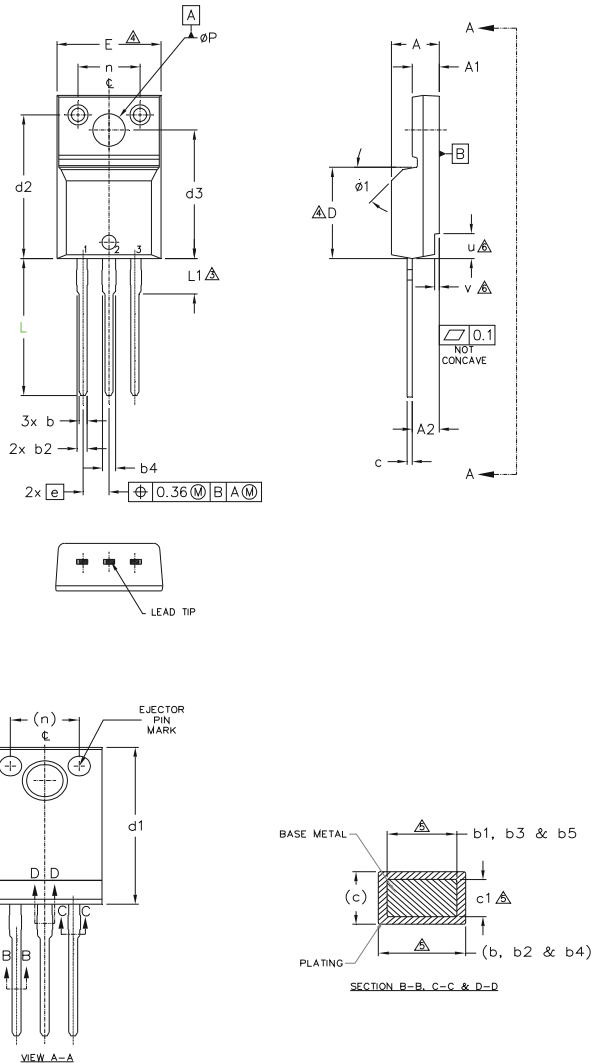


**Fig 20a.** Gate Charge Test Circuit



**Fig 20b.** Gate Charge Waveform


**Fig 21a.**  $t_{st}$  and  $E_{PULSE}$  Test Circuit

**Fig 21b.**  $t_{st}$  Test Waveforms

**Fig 21c.**  $E_{PULSE}$  Test Waveforms

**Fig 22a.** Switching Time Test Circuit

**Fig 22b.** Switching Time Waveforms

**TO-220 Full-Pak Package Outline (Dimensions are shown in millimeters (inches))**

**NOTES:**

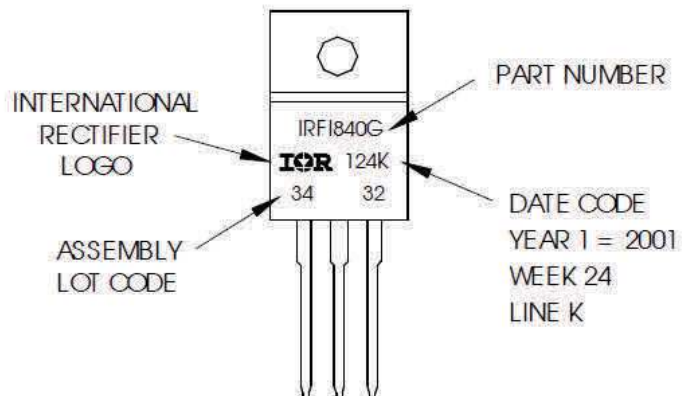
- 1.0 DIMENSIONING AND TOLERANCING AS PER ASME Y14.5 M- 1994.
- 2.0 DIMENSIONS ARE SHOWN IN MILLIMETERS [INCHES].
- 3.0 LEAD DIMENSION AND FINISH UNCONTROLLED IN L1.
- 4.0 DIMENSION D & E DO NOT INCLUDE MOLD FLASH. MOLD FLASH SHALL NOT EXCEED .005" (0.127) PER SIDE. THESE DIMENSIONS ARE MEASURED AT THE OUTER MOST EXTREMES OF THE PLASTIC BODY.
- 5.0 DIMENSION b1, b3, b5 & c1 APPLY TO BASE METAL ONLY.
- 6.0 STEP OPTIONAL ON PLASTIC BODY DEFINED BY DIMENSIONS u & v.
- 7.0 CONTROLLING DIMENSION : INCHES.

SYMBOL	DIMENSIONS				NOTES
	MILLIMETERS		INCHES		
	MIN.	MAX.	MIN.	MAX.	
A	4.57	4.83	.180	.190	<b>LEAD ASSIGNMENTS</b>  <u>HEXFET</u> 1.- GATE 2.- DRAIN 3.- SOURCE  <u>IGBTs, CoPACK</u> 1.- GATE 2.- COLLECTOR 3.- EMITTER
A1	2.57	2.82	.101	.111	
A2	2.51	2.92	.099	.115	
b	0.61	0.94	.024	.037	
b1	0.61	0.89	.024	.035	
b2	0.76	1.27	.030	.050	
b3	0.76	1.22	.030	.048	
b4	1.02	1.52	.040	.060	
b5	1.02	1.47	.040	.058	
c	0.33	0.63	.013	.025	
c1	0.33	0.58	.013	.023	
D	8.66	9.80	.341	.386	
d1	15.80	16.13	.622	.635	
d2	13.97	14.22	.550	.560	
d3	12.29	12.93	.484	.509	
E	9.63	10.74	.379	.423	
e	2.54 BSC		.100 BSC		
L	13.21	13.72	.520	.540	
L1	3.10	3.68	.122	.145	
n	6.05	6.60	.238	.260	
øP	3.05	3.45	.120	.136	
u	2.39	2.49	.094	.098	
v	0.41	0.51	.016	.020	
ø1	-	45°	-	45°	

**TO-220 Full-Pak Part Marking Information**

EXAMPLE: THIS IS AN IRFI840G  
 WITH ASSEMBLY  
 LOT CODE 3432  
 ASSEMBLED ON WW 24, 2001  
 IN THE ASSEMBLY LINE "K"

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



TO-220AB Full-Pak packages are not recommended for Surface Mount Application.

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



**Qualification Information**

<b>Qualification Level</b>	Industrial (per JEDEC JESD47F) †	
<b>Moisture Sensitivity Level</b>	TO-220 Full-Pak	N/A
<b>RoHS Compliant</b>	Yes	

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

**Revision History**

Date	Comments
04/27/2017	<ul style="list-style-type: none"> <li>Changed datasheet with Infineon logo - all pages.</li> <li>Corrected Package Outline on page 8.</li> <li>Added disclaimer on last page.</li> </ul>

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