

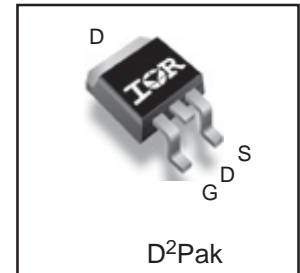
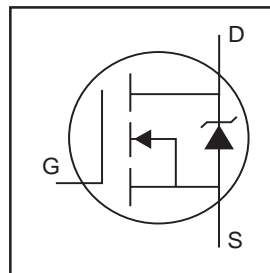
**PDP SWITCH**

**IRFS4229PbF**

**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
- 175°C Operating Junction Temperature for Improved Ruggedness
- Repetitive Avalanche Capability for Robustness and Reliability

Key Parameters		
$V_{DS}$ min	250	V
$V_{DS}$ (Avalanche) typ.	300	V
$R_{DS(ON)}$ typ. @ 10V	42	mΩ
$I_{RP}$ max @ $T_C = 100^\circ\text{C}$	91	A
$T_J$ max	175	°C



G	D	S
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 175°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.

**Absolute Maximum Ratings**

	Parameter	Max.	Units
$V_{GS}$	Gate-to-Source Voltage	±30	V
$I_D$ @ $T_C = 25^\circ\text{C}$	Continuous Drain Current, $V_{GS}$ @ 10V	45	A
$I_D$ @ $T_C = 100^\circ\text{C}$	Continuous Drain Current, $V_{GS}$ @ 10V	32	
$I_{DM}$	Pulsed Drain Current ①	180	
$I_{RP}$ @ $T_C = 100^\circ\text{C}$	Repetitive Peak Current ⑤	91	
$P_D$ @ $T_C = 25^\circ\text{C}$	Power Dissipation	330	W
$P_D$ @ $T_C = 100^\circ\text{C}$	Power Dissipation	190	
	Linear Derating Factor	2.2	W/°C
$T_J$	Operating Junction and	-40 to + 175	°C
$T_{STG}$	Storage Temperature Range		
	Soldering Temperature for 10 seconds	300	
	Mounting Torque, 6-32 or M3 Screw	10lb·in (1.1N·m)	N

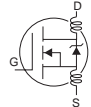
**Thermal Resistance**

	Parameter	Typ.	Max.	Units
$R_{\theta JC}$	Junction-to-Case ④	—	0.45*	
$R_{\theta JA}$	Junction-to-Ambient ④	—	62	

\*  $R_{\theta JC}$  (end of life) for D²Pak and TO-262 = 0.65°C/W. This is the maximum measured value after 1000 temperature cycles from -55 to 150°C and is accounted for by the physical wearout of the die attach medium.

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

	Parameter	Min.	Typ.	Max.	Units	Conditions
BV <sub>DSS</sub>	Drain-to-Source Breakdown Voltage	250	—	—	V	V <sub>GS</sub> = 0V, I <sub>D</sub> = 250μA
ΔBV <sub>DSS</sub> /ΔT <sub>J</sub>	Breakdown Voltage Temp. Coefficient	—	210	—	mV/°C	Reference to 25°C, I <sub>D</sub> = 1mA
R <sub>DS(on)</sub>	Static Drain-to-Source On-Resistance	—	42	48	mΩ	V <sub>GS</sub> = 10V, I <sub>D</sub> = 26A ③
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 Coefficient	—	-14	—	mV/°C	
I <sub>DSS</sub>	Drain-to-Source Leakage Current	—	—	20	μA	V <sub>DS</sub> = 250V, V <sub>GS</sub> = 0V
		—	—	1.0	mA	V <sub>DS</sub> = 250V, 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> = 20V
	Gate-to-Source Reverse Leakage	—	—	-100	nA	V <sub>GS</sub> = -20V
g <sub>fs</sub>	Forward Transconductance	83	—	—	S	V <sub>DS</sub> = 25V, I <sub>D</sub> = 26A
Q <sub>g</sub>	Total Gate Charge	—	72	110	nC	V <sub>DD</sub> = 125V, I <sub>D</sub> = 26A, V <sub>GS</sub> = 10V ③
Q <sub>gd</sub>	Gate-to-Drain Charge	—	26	—	nC	
t <sub>st</sub>	Shoot Through Blocking Time	100	—	—	ns	V <sub>DD</sub> = 200V, V <sub>GS</sub> = 15V, R <sub>G</sub> = 4.7Ω
E <sub>PULSE</sub>	Energy per Pulse	—	790	—	μJ	L = 220nH, C = 0.3μF, V <sub>GS</sub> = 15V V <sub>DS</sub> = 200V, R <sub>G</sub> = 4.7Ω, T <sub>J</sub> = 25°C
		—	1390	—	μJ	L = 220nH, C = 0.3μF, V <sub>GS</sub> = 15V V <sub>DS</sub> = 200V, R <sub>G</sub> = 4.7Ω, T <sub>J</sub> = 100°C
C <sub>iss</sub>	Input Capacitance	—	4560	—	pF	V <sub>GS</sub> = 0V
C <sub>oss</sub>	Output Capacitance	—	390	—	pF	V <sub>DS</sub> = 25V
C <sub>riss</sub>	Reverse Transfer Capacitance	—	100	—	pF	f = 1.0MHz,
C <sub>oss eff.</sub>	Effective Output Capacitance	—	290	—	pF	V <sub>GS</sub> = 0V, V <sub>DS</sub> = 0V to 200V
L <sub>D</sub>	Internal Drain Inductance	—	4.5	—	nH	Between lead, and center of die contact
L <sub>S</sub>	Internal Source Inductance	—	7.5	—	nH	

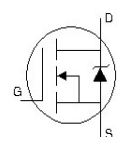


## Avalanche Characteristics

	Parameter	Typ.	Max.	Units
E <sub>AS</sub>	Single Pulse Avalanche Energy ②	—	130	mJ
E <sub>AR</sub>	Repetitive Avalanche Energy ①	—	33	mJ
V <sub>DS(Avalanche)</sub>	Repetitive Avalanche Voltage ①	300	—	V
I <sub>AS</sub>	Avalanche Current ②	—	26	A

## Diode Characteristics

	Parameter	Min.	Typ.	Max.	Units	Conditions
I <sub>S</sub> @ T <sub>C</sub> = 25°C	Continuous Source Current (Body Diode)	—	—	45	A	MOSFET symbol showing the integral reverse p-n junction diode.
I <sub>SM</sub>	Pulsed Source Current (Body Diode) ①	—	—	180	A	
V <sub>SD</sub>	Diode Forward Voltage	—	—	1.3	V	T <sub>J</sub> = 25°C, I <sub>S</sub> = 26A, V <sub>GS</sub> = 0V ③
t <sub>rr</sub>	Reverse Recovery Time	—	190	290	ns	T <sub>J</sub> = 25°C, I <sub>F</sub> = 26A, V <sub>DD</sub> = 50V
Q <sub>rr</sub>	Reverse Recovery Charge	—	840	1260	nC	di/dt = 100A/μs ③



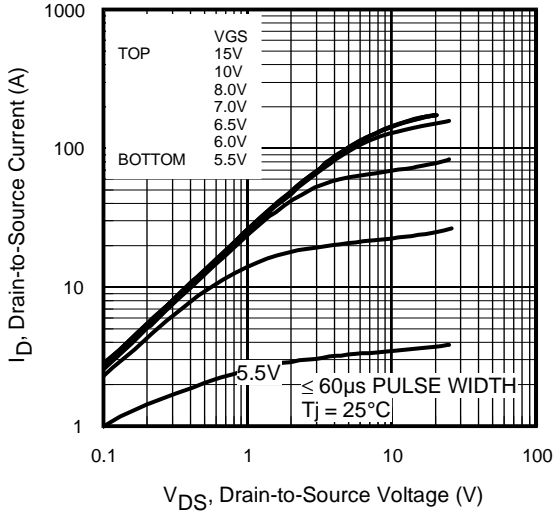


Fig 1. Typical Output Characteristics

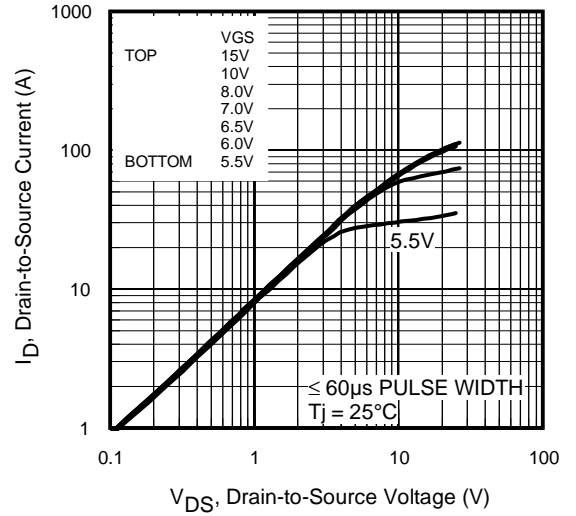


Fig 2. Typical Output Characteristics

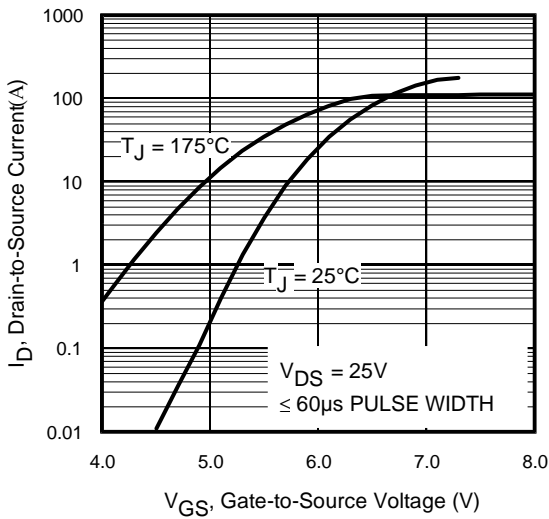


Fig 3. Typical Transfer Characteristics

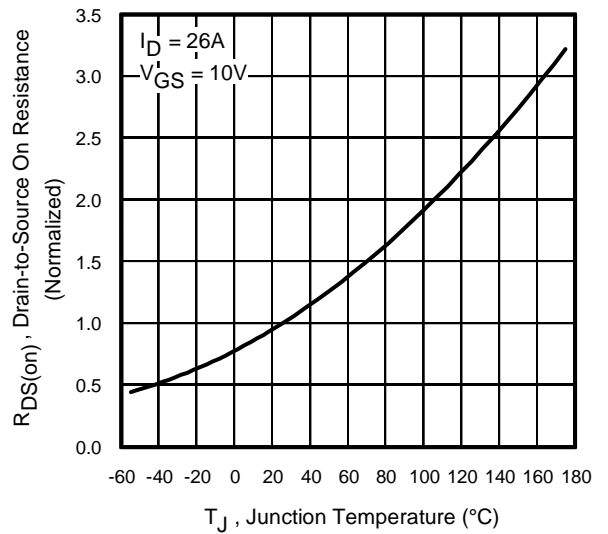


Fig 4. Normalized On-Resistance vs. Temperature

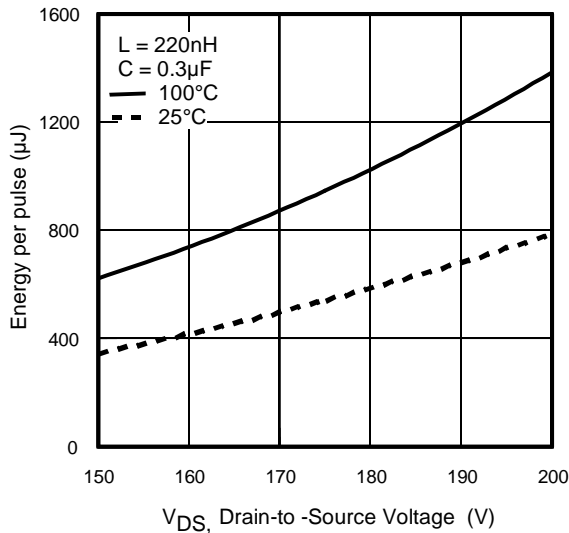


Fig 5. Typical  $E_{PULSE}$  vs. Drain-to-Source Voltage

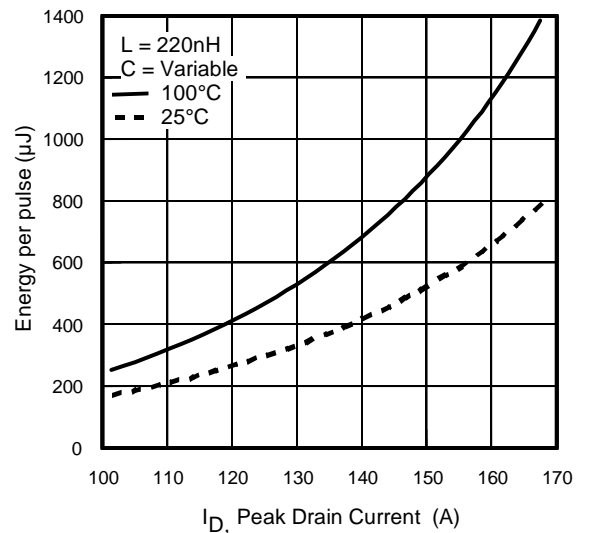
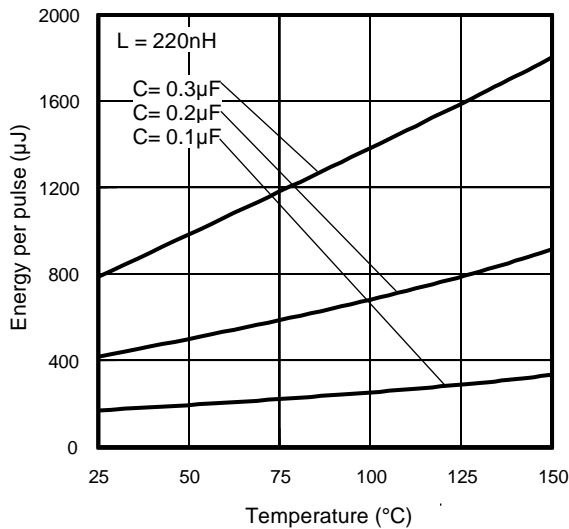
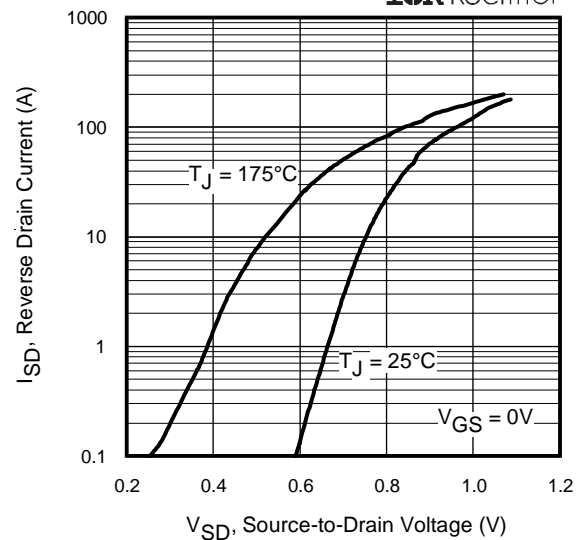


Fig 6. Typical  $E_{PULSE}$  vs. Drain Current

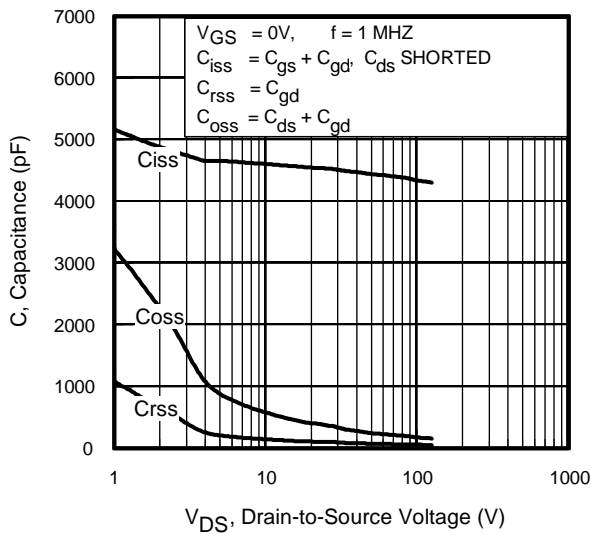
# IRFS4229PbF



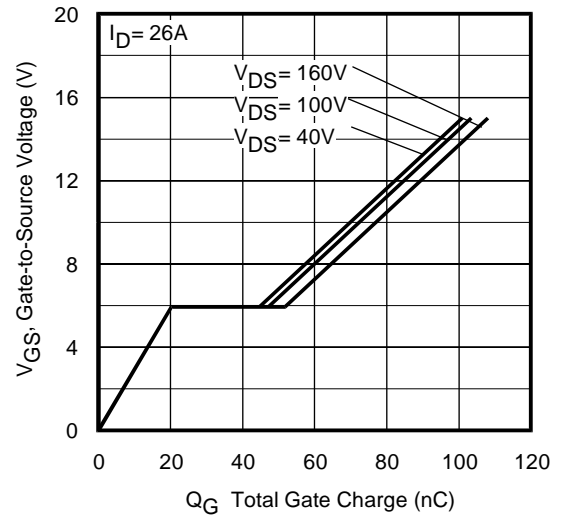
**Fig 7.** Typical  $E_{PULSE}$  vs. Temperature



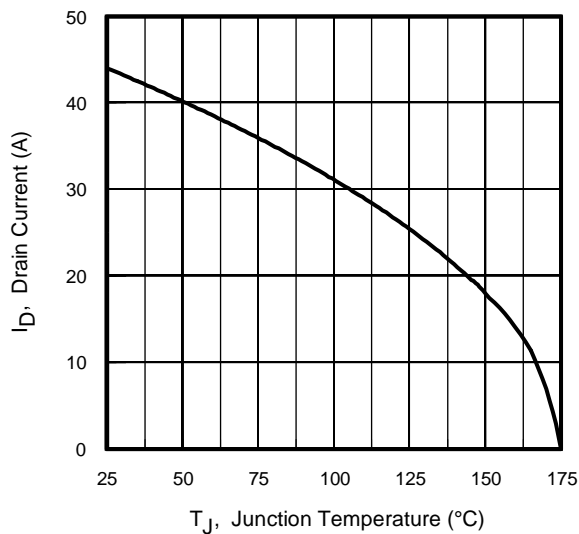
**Fig 8.** Typical Source-Drain Diode Forward Voltage



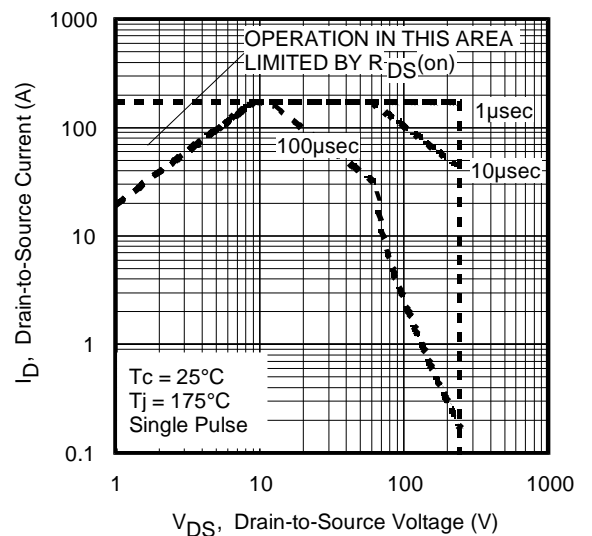
**Fig 9.** Typical Capacitance vs. Drain-to-Source Voltage



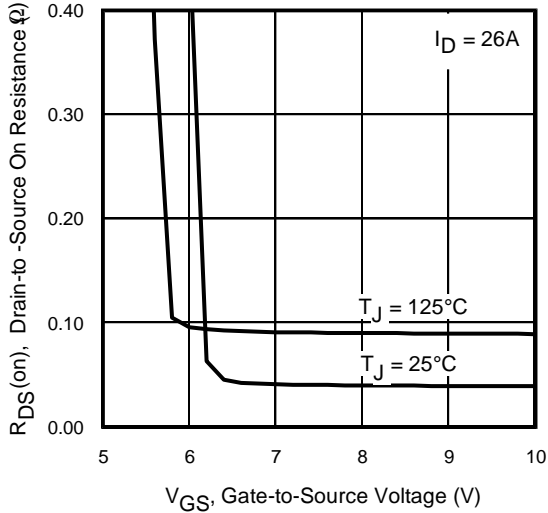
**Fig 10.** Typical Gate Charge vs. Gate-to-Source Voltage



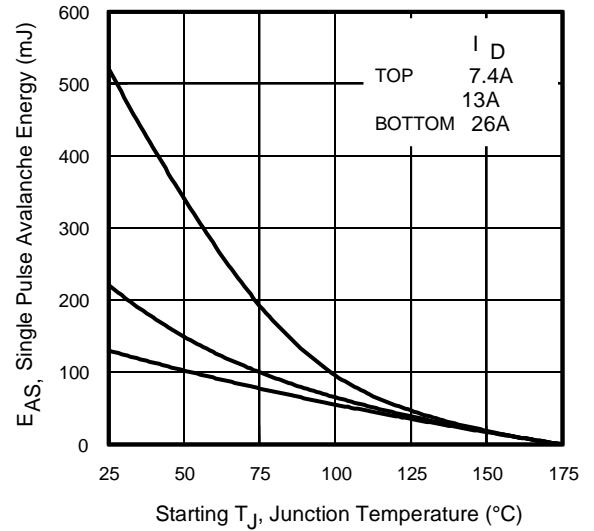
**Fig 11.** Maximum Drain Current vs. Case Temperature



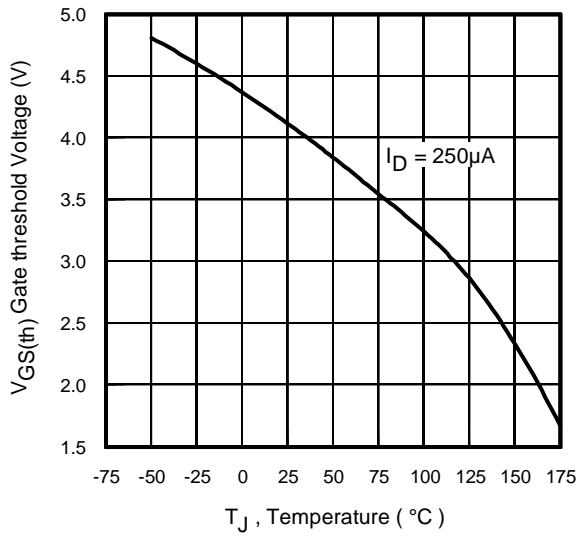
**Fig 12.** Maximum Safe Operating Area



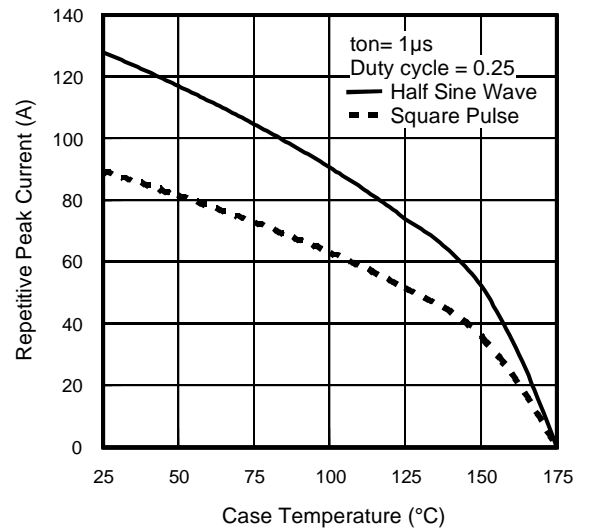
**Fig 13.** On-Resistance Vs. Gate Voltage



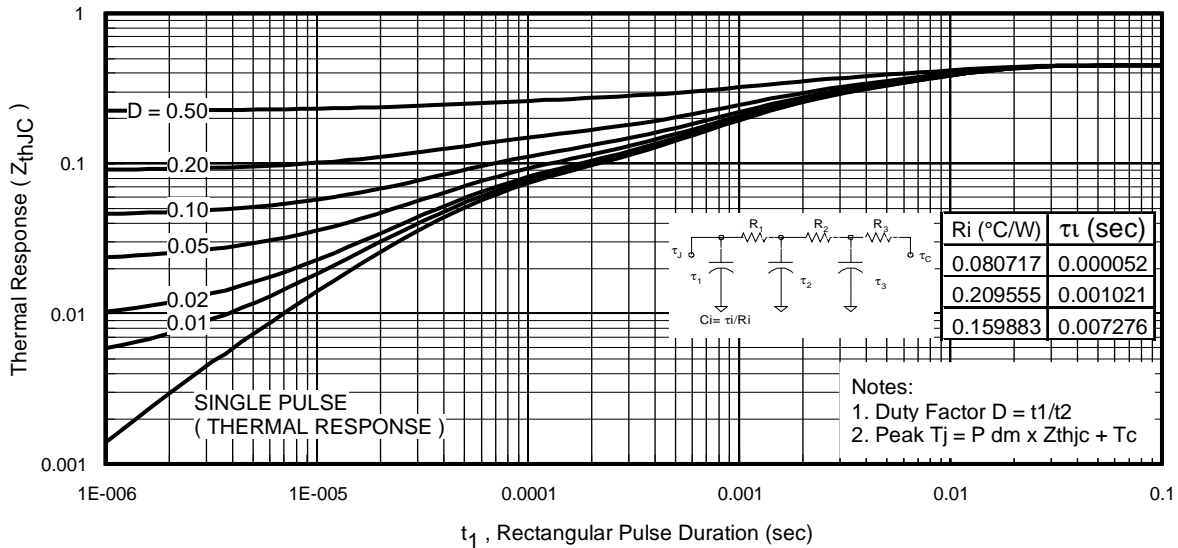
**Fig 14.** Maximum Avalanche Energy Vs. Temperature



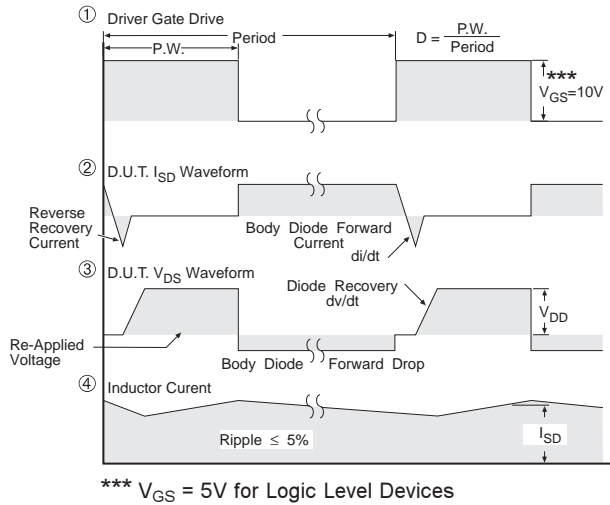
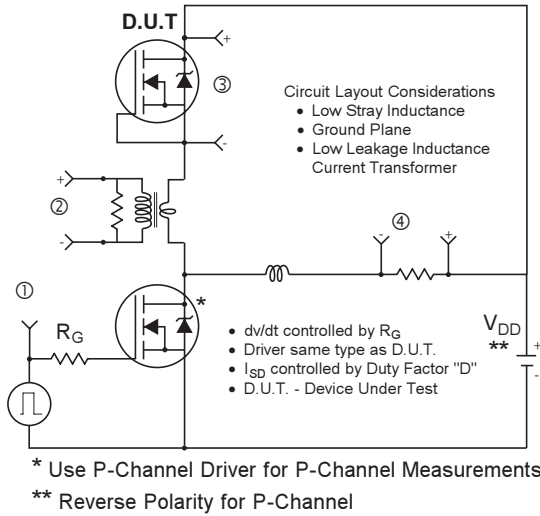
**Fig 15.** Threshold Voltage vs. Temperature



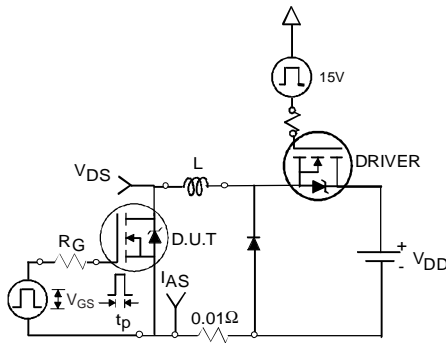
**Fig 16.** Typical Repetitive peak Current vs. Case temperature



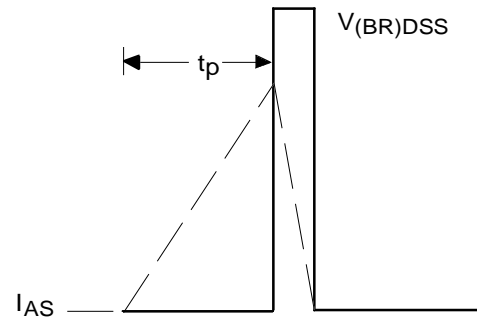
**Fig 17.** Maximum Effective Transient Thermal Impedance, Junction-to-Case



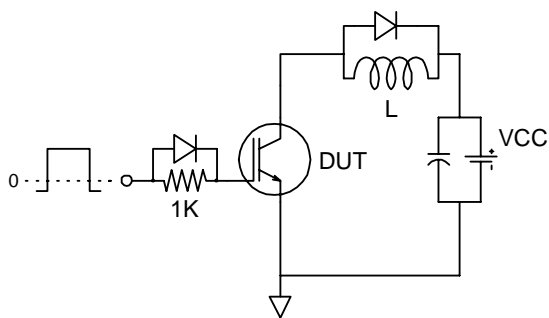
**Fig 18.** Diode Reverse Recovery Test Circuit for HEXFET® Power MOSFETs



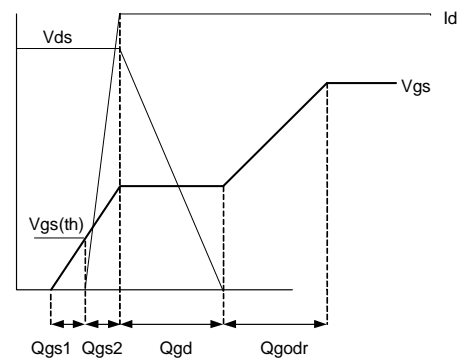
**Fig 19a.** Unclamped Inductive Test Circuit



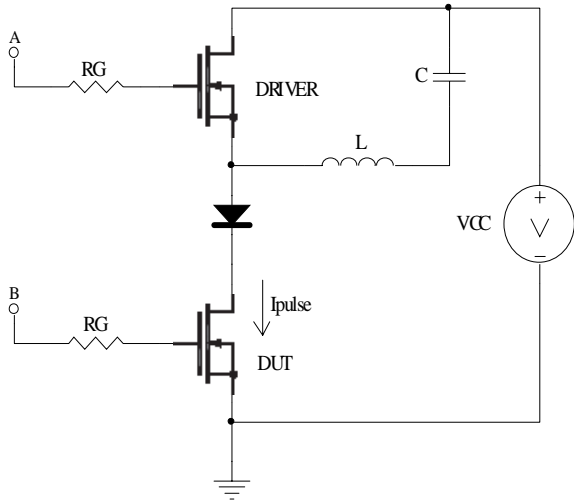
**Fig 19b.** Unclamped Inductive Waveforms



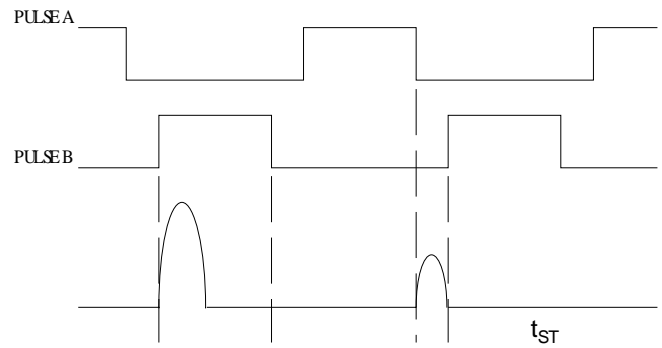
**Fig 20a.** Gate Charge Test Circuit



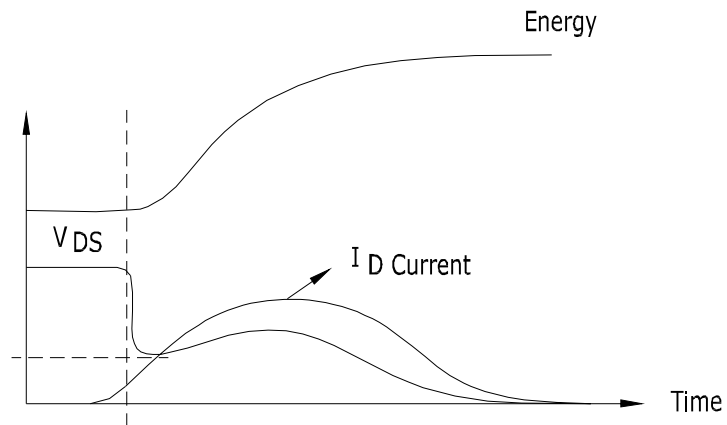
**Fig 20b.** Gate Charge Waveform



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

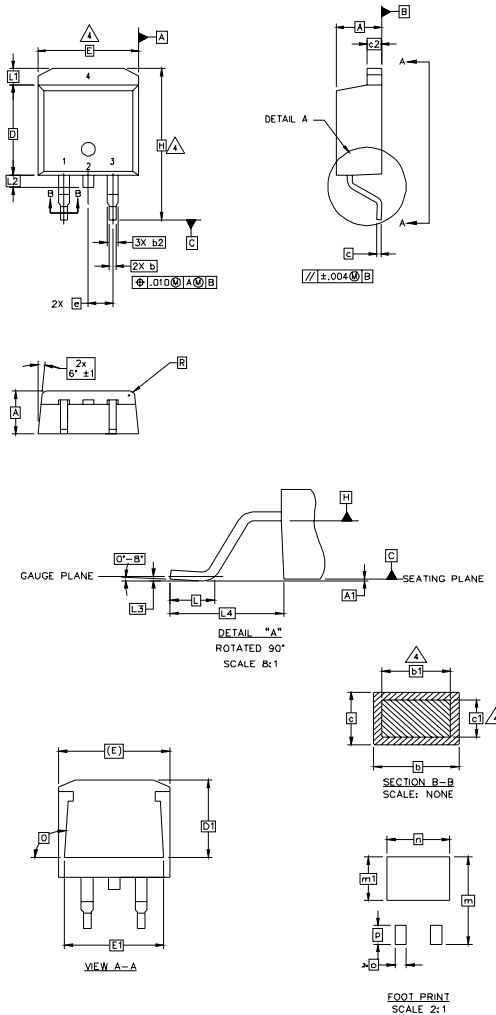


**Fig 21b.**  $t_{st}$  Test Waveforms



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

## D<sup>2</sup>Pak Package Outline (Dimensions are shown in millimeters (inches))



**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.

SYMBOL	DIMENSIONS				NOTES
	MILLIMETERS		INCHES		
	MIN.	MAX.	MIN.	MAX.	
A	4.06	4.83	.160	.190	
A1	0.00	0.254	.000	.010	
b	0.51	0.99	.020	.039	
b1	0.51	0.89	.020	.035	4
b2	1.14	1.78	.045	.070	
c	0.38	0.74	.015	.029	
c1	0.38	0.58	.015	.023	4
c2	1.14	1.65	.045	.065	
D	8.51	9.65	.335	.380	3
D1	6.86		.270		
E	9.65	10.67	.380	.420	3
E1	6.22		.245		
e	2.54 BSC		.100 BSC		
H	14.61	15.88	.575	.625	
L	1.78	2.79	.070	.110	
L1		1.65	.065	.065	
L2	1.27	1.78	.050	.070	
L3	0.25 BSC		.010 BSC		
L4	4.78	5.28	.188	.208	
m	17.78		.700		
m1	8.89		.350		
n	11.43		.450		
o	2.08		.082		
p	3.81		.150		
R	0.51	0.71	.020	.028	
θ	90°	93°	90°	93°	

LEAD ASSIGNMENTS

HEXFET

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

IGBTs, CoPACK

- 1.- GATE
- 2, 4.- COLLECTOR
- 3.- EMITTER

DIODES

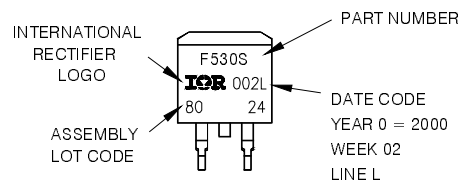
- 1.- ANODE \*
- 2, 4.- CATHODE
- 3.- ANODE

\* PART DEPENDENT.

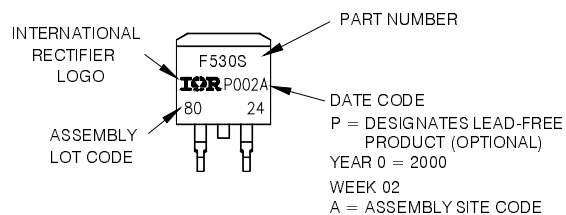
## D<sup>2</sup>Pak Part Marking Information

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'

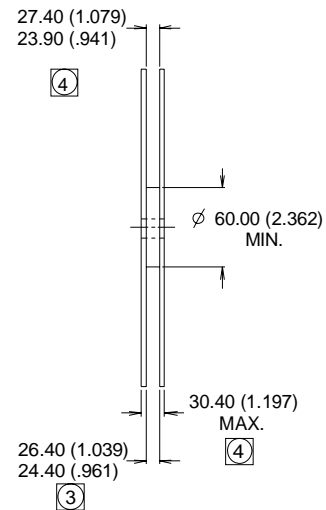
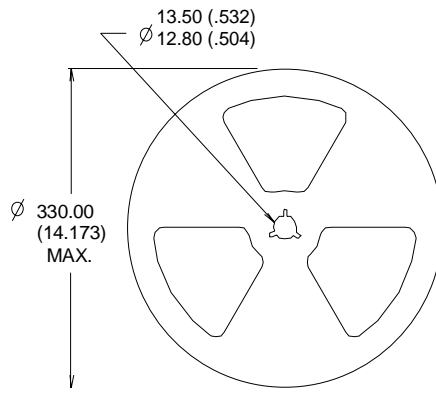
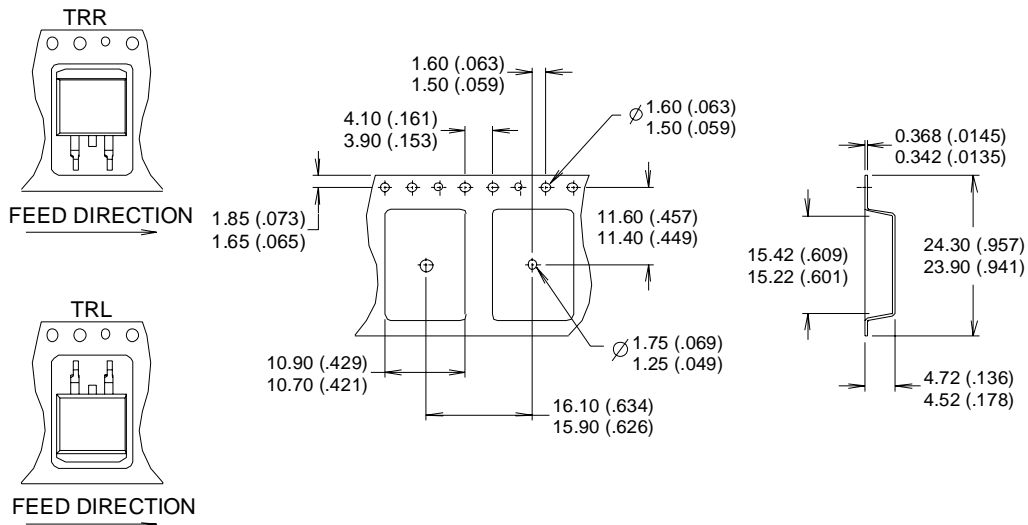


**OR**





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



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

**Notes:**

- ① Repetitive rating; pulse width limited by max. junction temperature.
- ② Starting  $T_J = 25^\circ\text{C}$ ,  $L = 0.37\text{mH}$ ,  $R_G = 25\Omega$ ,  $I_{AS} = 26\text{A}$ .
- ③ Pulse width  $\leq 400\mu\text{s}$ ; duty cycle  $\leq 2\%$ .
- ④  $R_\theta$  is measured at  $T_J$  of approximately  $90^\circ\text{C}$ .
- ⑤ Half sine wave with duty cycle = 0.25,  $t_{on} = 1\mu\text{sec}$ .

Data and specifications subject to change without notice.  
 This product has been designed and qualified for the Industrial market.  
 Qualification Standards can be found on IR's Web site.