

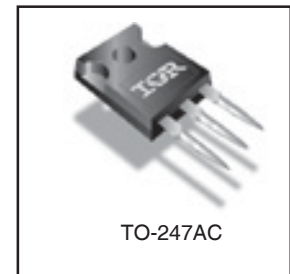
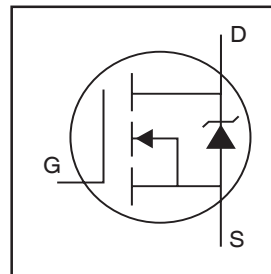
PDP MOSFET

IRFP4232PbF

Features

- Advanced process technology
- Key parameters optimized for PDP Sustain & Energy Recovery applications
- Low E_{PULSE} rating to reduce the power dissipation in Sustain & ER 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	30	mΩ
E_{PULSE} typ.	310	μJ
I_{RP} max @ $T_C = 100^\circ\text{C}$	117	A
T_J max	175	°C



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	±20	V
V_{GS} (TRANSIENT)	Gate-to-Source Voltage	±30	
I_D @ $T_C = 25^\circ\text{C}$	Continuous Drain Current, V_{GS} @ 10V	60	A
I_D @ $T_C = 100^\circ\text{C}$	Continuous Drain Current, V_{GS} @ 10V	42	
I_{DM}	Pulsed Drain Current ①	240	
I_{RP} @ $T_C = 100^\circ\text{C}$	Repetitive Peak Current ⑤	117	
P_D @ $T_C = 25^\circ\text{C}$	Power Dissipation	430	W
P_D @ $T_C = 100^\circ\text{C}$	Power Dissipation	210	
	Linear Derating Factor	2.9	W/°C
T_J	Operating Junction and Storage Temperature Range	-40 to + 175	°C
T_{STG}			
	Soldering Temperature for 10 seconds	300	
	Mounting Torque, 6-32 or M3 Screw	10lb·in (1.1N·m)	N

Thermal Resistance

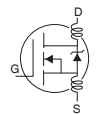
	Parameter	Typ.	Max.	Units
$R_{\theta JC}$	Junction-to-Case ④	—	0.35	°C/W

Notes ① through ⑤ are on page 8

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

	Parameter	Min.	Typ.	Max.	Units	Conditions
BV_{DSS}	Drain-to-Source Breakdown Voltage	250	—	—	V	$V_{GS} = 0V, I_D = 250\mu A$
$\Delta BV_{DSS}/\Delta T_J$	Breakdown Voltage Temp. Coefficient	—	180	—	mV/°C	Reference to $25^\circ\text{C}, I_D = 1mA$
$R_{DS(on)}$	Static Drain-to-Source On-Resistance	—	30	35.7	mΩ	$V_{GS} = 10V, I_D = 42A$ ③
$V_{GS(th)}$	Gate Threshold Voltage	3.0	—	5.0	V	$V_{DS} = V_{GS}, I_D = 250\mu A$
$\Delta V_{GS(th)}/\Delta T_J$	Gate Threshold Voltage Coefficient	—	-15	—	mV/°C	
I_{DSS}	Drain-to-Source Leakage Current	—	—	5.0	μA	$V_{DS} = 200V, V_{GS} = 0V$
		—	—	150		$V_{DS} = 200V, V_{GS} = 0V, T_J = 125^\circ\text{C}$
I_{GSS}	Gate-to-Source Forward Leakage	—	—	100	nA	$V_{GS} = 20V$
	Gate-to-Source Reverse Leakage	—	—	-100		$V_{GS} = -20V$
g_{fs}	Forward Transconductance	95	—	—	S	$V_{DS} = 25V, I_D = 42A$
Q_g	Total Gate Charge	—	160	240	nC	$V_{DD} = 125V, I_D = 42A, V_{GS} = 10V$ ③
Q_{gd}	Gate-to-Drain Charge	—	60	—		
$t_{d(on)}$	Turn-On Delay Time	—	37	—	ns	$V_{DD} = 125V, V_{GS} = 10V$ ③ $I_D = 42A$ $R_G = 5.0\Omega$ See Fig. 22
t_r	Rise Time	—	100	—		
$t_{d(off)}$	Turn-Off Delay Time	—	64	—		
t_f	Fall Time	—	63	—		
t_{st}	Shoot Through Blocking Time	100	—	—	ns	$V_{DD} = 200V, V_{GS} = 15V, R_G = 4.7\Omega$
E_{PULSE}	Energy per Pulse	—	310	—	μJ	$L = 220nH, C = 0.4\mu F, V_{GS} = 15V$ $V_{DS} = 200V, R_G = 4.7\Omega, T_J = 25^\circ\text{C}$
		—	950	—		$L = 220nH, C = 0.4\mu F, V_{GS} = 15V$ $V_{DS} = 200V, R_G = 4.7\Omega, T_J = 100^\circ\text{C}$
C_{iss}	Input Capacitance	—	7290	—	pF	$V_{GS} = 0V$ $V_{DS} = 25V$ $f = 1.0MHz,$ See Fig.5 $V_{GS} = 0V, V_{DS} = 0V$ to 200V
C_{oss}	Output Capacitance	—	610	—		
C_{rss}	Reverse Transfer Capacitance	—	240	—		
$C_{oss\ eff.}$	Effective Output Capacitance	—	420	—		
L_D	Internal Drain Inductance	—	5.0	—	nH	Between lead, 6mm (0.25in.) from package and center of die contact
L_S	Internal Source Inductance	—	13	—		

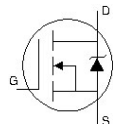


Avalanche Characteristics

	Parameter	Typ.	Max.	Units
E_{AS}	Single Pulse Avalanche Energy ②	—	220	mJ
E_{AR}	Repetitive Avalanche Energy ①	—	43	mJ
$V_{DS(Avalanche)}$	Repetitive Avalanche Voltage ①	300	—	V
I_{AS}	Avalanche Current ②	—	42	A

Diode Characteristics

	Parameter	Min.	Typ.	Max.	Units	Conditions
$I_S @ T_C = 25^\circ\text{C}$	Continuous Source Current (Body Diode)	—	—	60	A	MOSFET symbol showing the integral reverse p-n junction diode.
I_{SM}	Pulsed Source Current (Body Diode) ①	—	—	240		
V_{SD}	Diode Forward Voltage	—	—	1.0	V	$T_J = 25^\circ\text{C}, I_S = 42A, V_{GS} = 0V$ ③
t_{rr}	Reverse Recovery Time	—	240	360	ns	$T_J = 25^\circ\text{C}, I_F = 42A, V_{DD} = 50V$
Q_{rr}	Reverse Recovery Charge	—	1230	1850	nC	$di/dt = 100A/\mu s$ ③



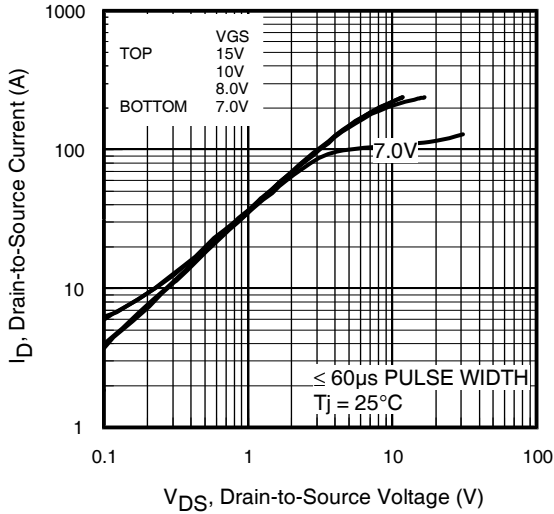


Fig 1. Typical Output Characteristics

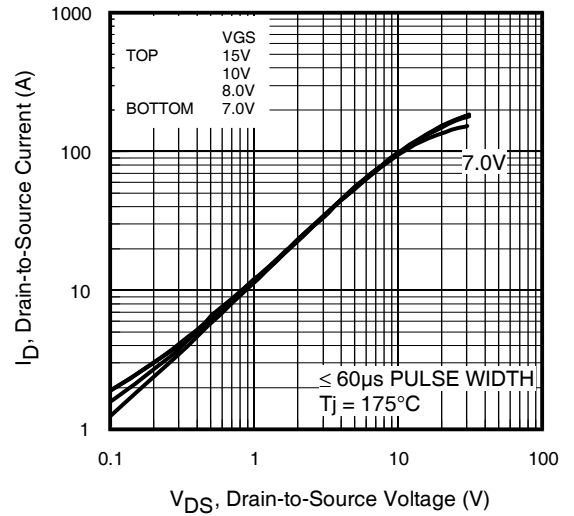


Fig 2. Typical Output Characteristics

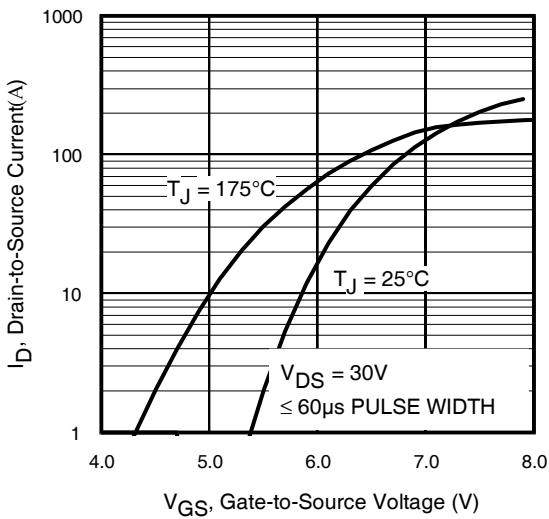


Fig 3. Typical Transfer Characteristics

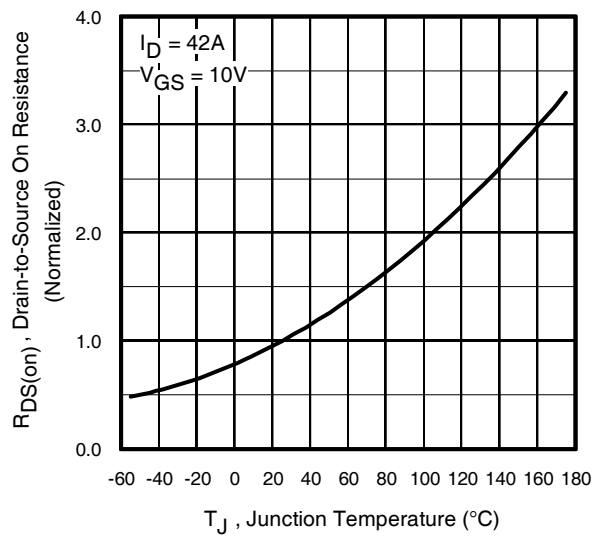


Fig 4. Normalized On-Resistance vs. Temperature

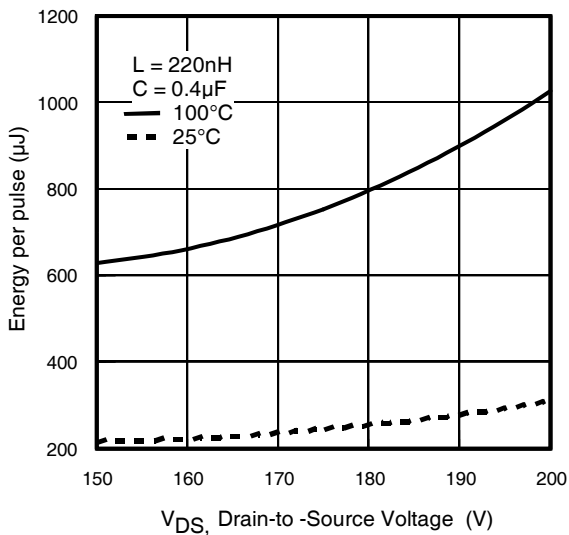


Fig 5. Typical E_{PULSE} vs. Drain-to-Source Voltage
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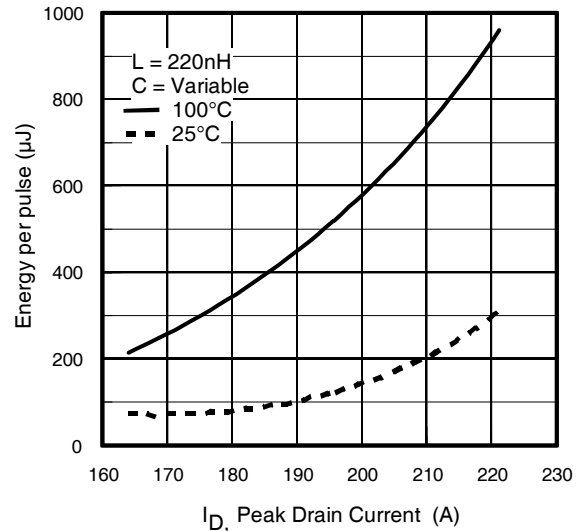


Fig 6. Typical E_{PULSE} vs. Peak Drain Current

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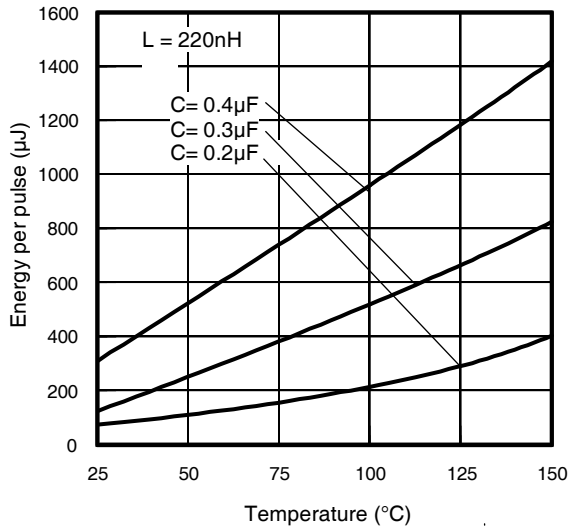


Fig 7. Typical E_{PULSE} vs. Temperature

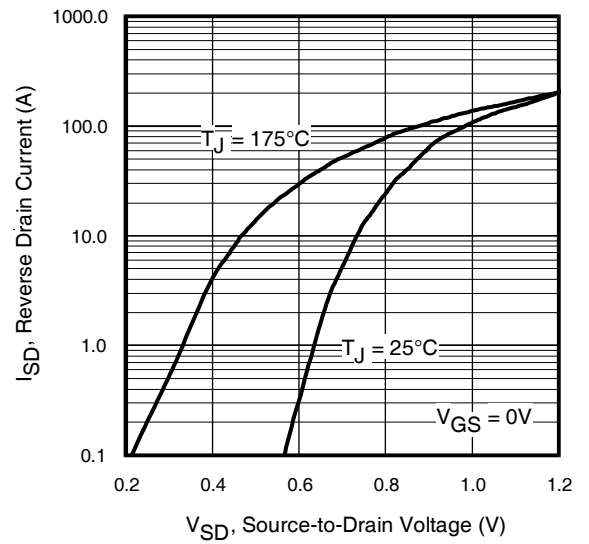


Fig 8. Typical Source-Drain Diode Forward Voltage

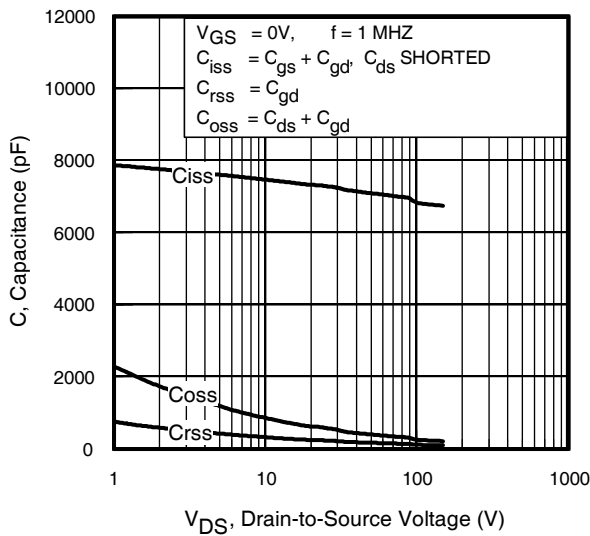


Fig 9. Typical Capacitance vs. Drain-to-Source Voltage

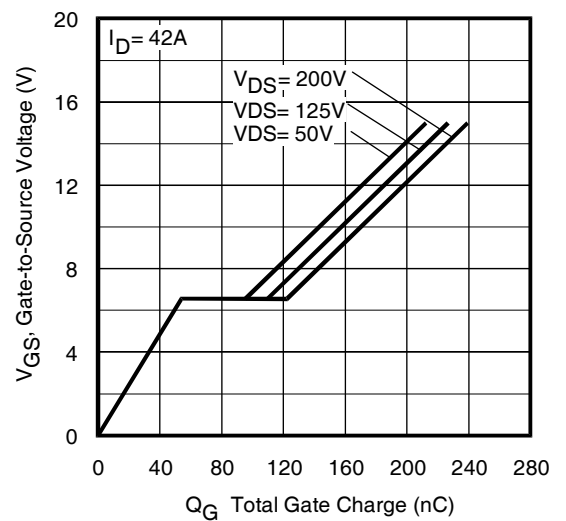


Fig 10. Typical Gate Charge vs. Gate-to-Source Voltage

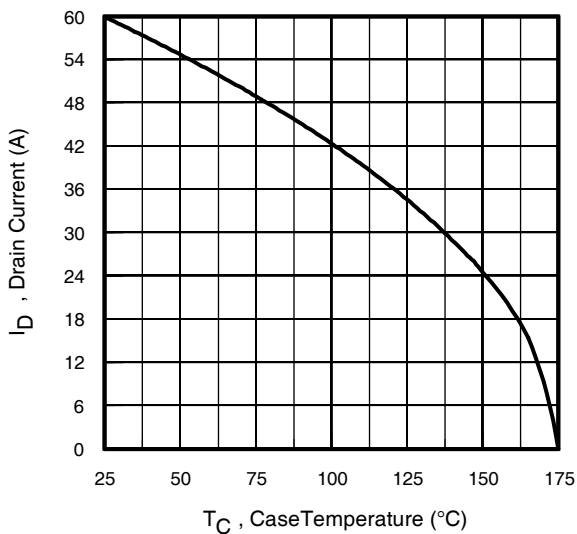


Fig 11. Maximum Drain Current vs. Case Temperature

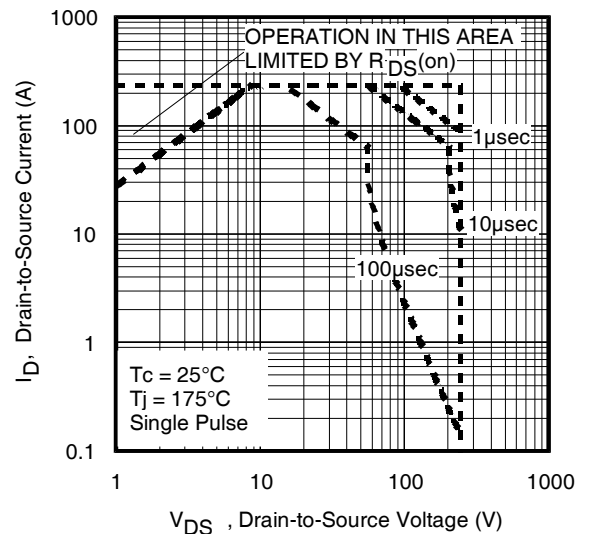


Fig 12. Maximum Safe Operating Area

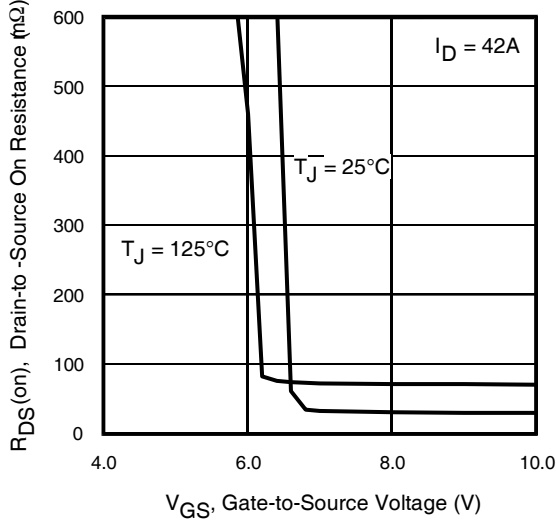


Fig 13. On-Resistance Vs. Gate Voltage

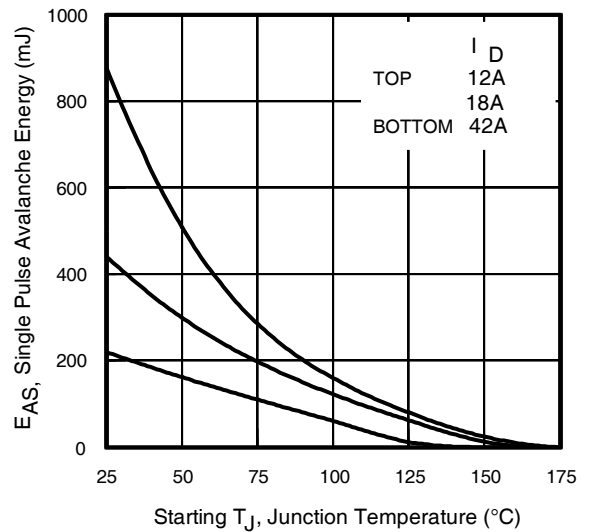


Fig 14. Maximum Avalanche Energy Vs. Temperature

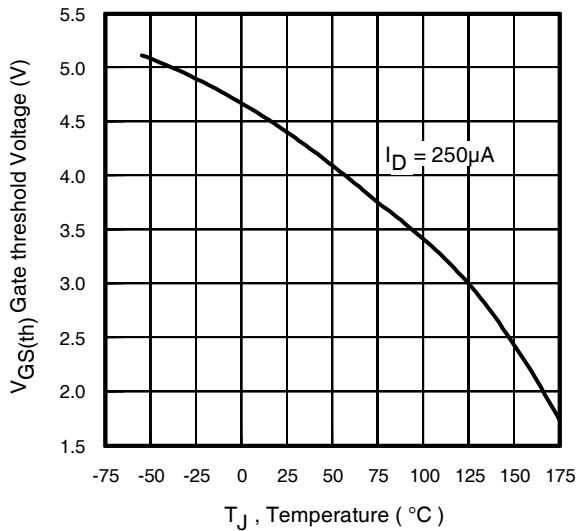


Fig 15. Threshold Voltage vs. Temperature

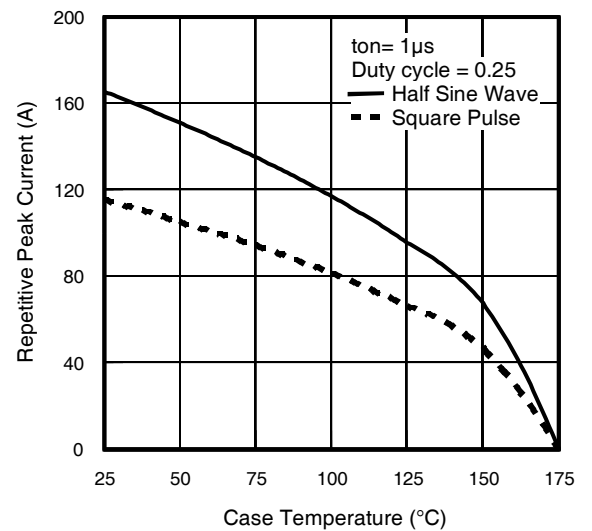


Fig 16. Typical Repetitive peak Current vs. Case temperature

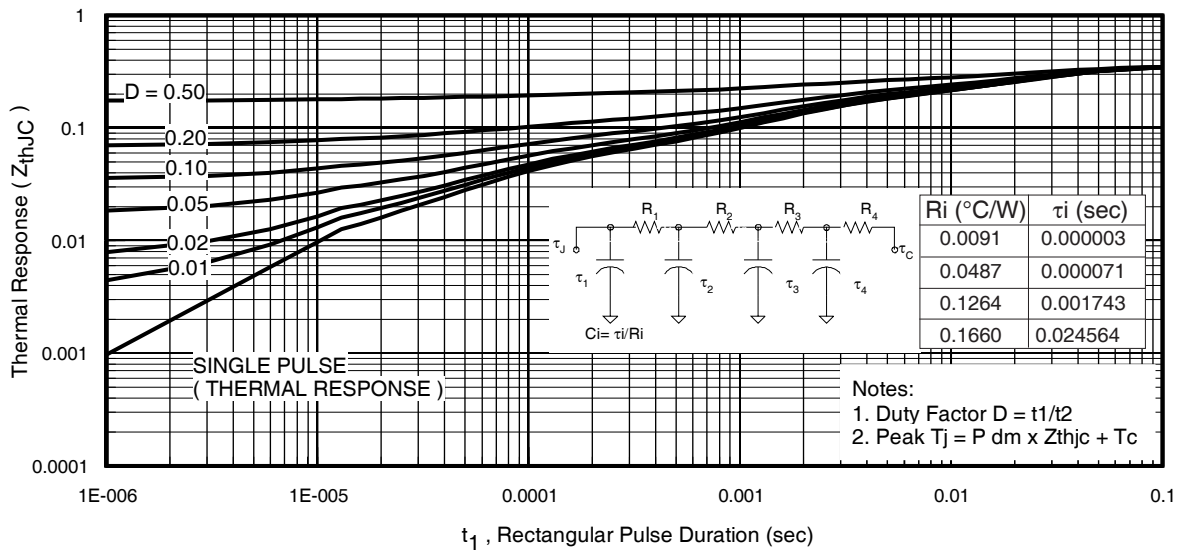
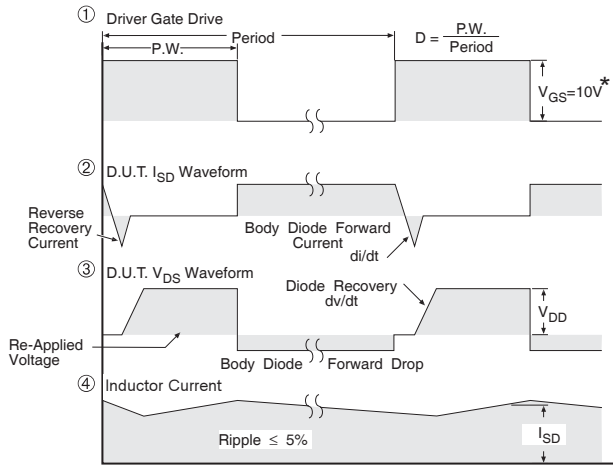
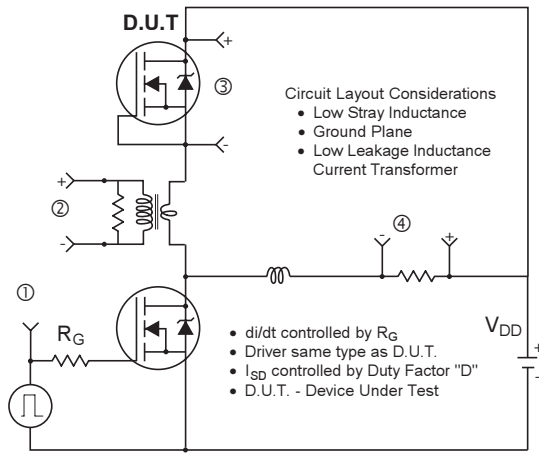


Fig 17. Maximum Effective Transient Thermal Impedance, Junction-to-Case



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

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

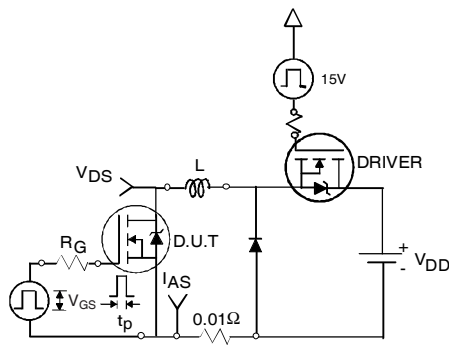


Fig 19a. Unclamped Inductive Test Circuit

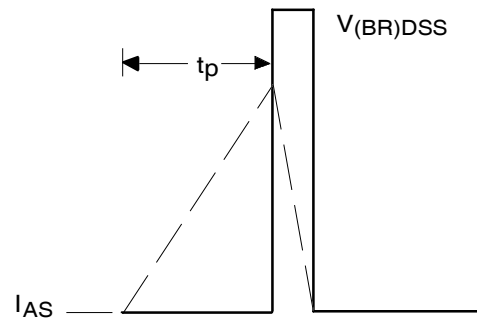


Fig 19b. Unclamped Inductive Waveforms

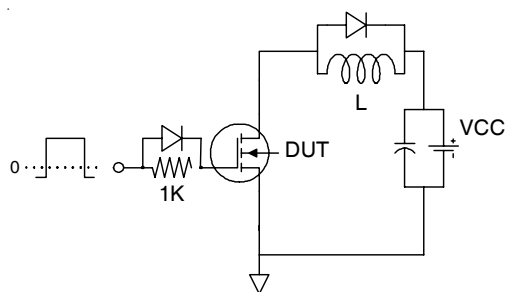


Fig 20a. Gate Charge Test Circuit

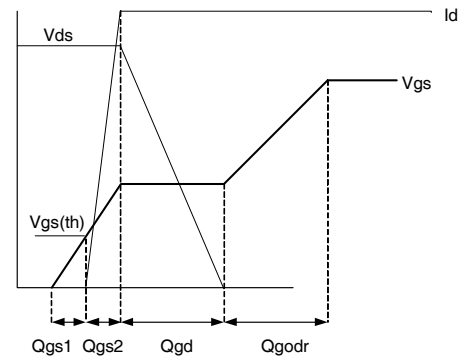


Fig 20b. Gate Charge Waveform

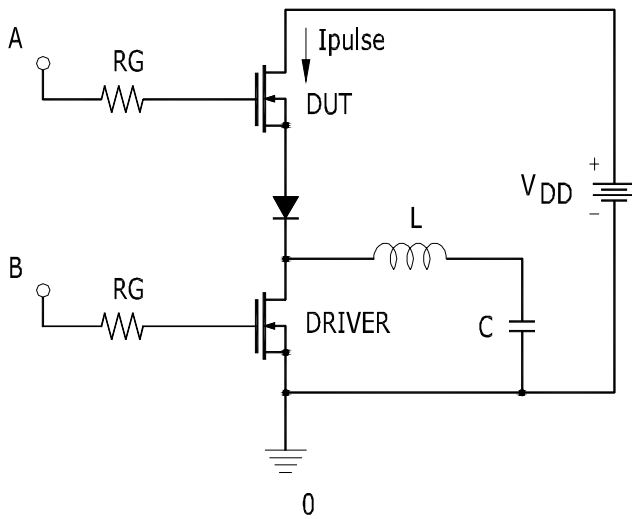


Fig 21a. t_{st} and E_{PULSE} Test Circuit

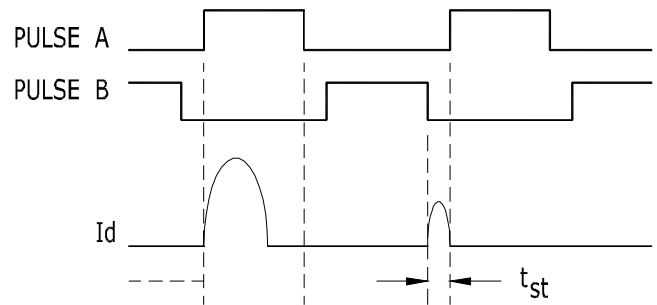


Fig 21b. t_{st} Test Waveforms

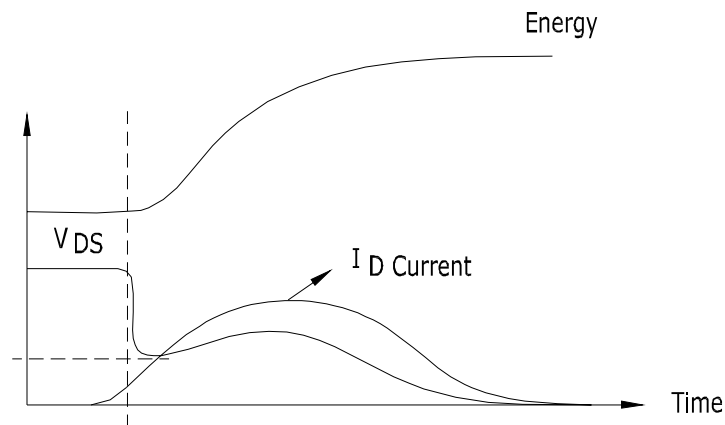


Fig 21c. E_{PULSE} Test Waveforms

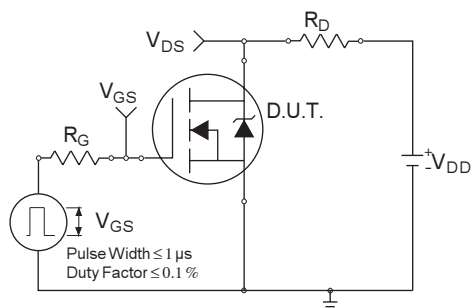


Fig 22a. Switching Time Test Circuit

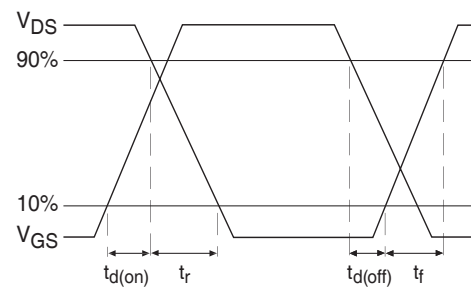
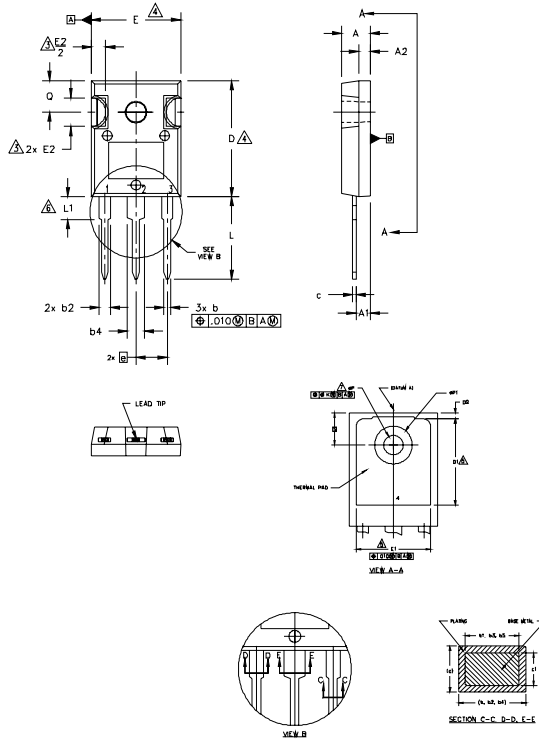


Fig 22b. Switching Time Waveforms

IRFP4232PbF

TO-247AC Package Outline

Dimensions are shown in millimeters (inches)



- NOTES:
1. DIMENSIONING AND TOLERANCING AS PER ASME Y14.5M 1994.
 2. DIMENSIONS ARE SHOWN IN INCHES.
 3. CONTOUR OF SLOT OPTIONAL.
 4. DIMENSION D & E DO NOT INCLUDE MOLD FLASH. MOLD FLASH SHALL NOT EXCEED .005" (0.127) PER SIDE. THESE DIMENSIONS ARE MEASURED AT THE OUTERMOST EXTREMES OF THE PLASTIC BODY.
 5. THERMAL PAD CONTOUR OPTIONAL WITHIN DIMENSIONS D1 & E1.
 6. LEAD FINISH UNCONTROLLED IN L1.
 7. ØP TO HAVE A MAXIMUM DRAFT ANGLE OF 1.5 ° TO THE TOP OF THE PART WITH A MAXIMUM HOLE DIAMETER OF .154 INCH.
 8. OUTLINE CONFORMS TO JEDEC OUTLINE TO-247AC .

SYMBOL	DIMENSIONS				NOTES	
	INCHES		MILLIMETERS			
	MIN.	MAX.	MIN.	MAX.		
A	.183	.209	4.65	5.31		
A1	.087	.102	2.21	2.59		
A2	.059	.098	1.50	2.49		
b	.039	.065	0.99	1.40		
b1	.039	.053	0.99	1.35		
b2	.065	.094	1.65	2.39		
b3	.065	.092	1.65	2.34		
b4	.102	.135	2.59	3.43		
b5	.102	.133	2.59	3.38		
c	.015	.035	0.38	0.89		
c1	.015	.033	0.38	0.84		
D	.776	.815	19.71	20.70		4
D1	.515	-	13.08	-		5
D2	.020	.053	0.51	1.35		4
E	.602	.625	15.29	15.87		
E1	.530	-	13.46	-		
E2	.178	.216	4.52	5.49		
e	.215 BSC		5.46 BSC			
Øk	.010		0.25			
L	.559	.634	14.20	16.10		
L1	.146	.169	3.71	4.29		
ØP	.140	.144	3.56	3.66		
ØP1	-	.291	-	7.39		
Q	.209	.224	5.31	5.69		
S	.217 BSC		5.51 BSC			

LEAD ASSIGNMENTS

HEXFLET

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

IGBTs CoPACK

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

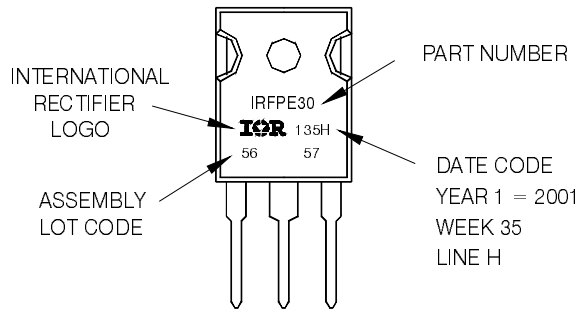
DIODES

- 1.- ANODE/OPEN
- 2.- CATHODE
- 3.- ANODE

TO-247AC Part Marking Information

EXAMPLE: THIS IS AN IRFPE30
WITH ASSEMBLY
LOT CODE 5657
ASSEMBLED ON WW 35, 2001
IN THE ASSEMBLY LINE "H"

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



TO-247AC package is not recommended for Surface Mount Application.

Notes:

- ① Repetitive rating; pulse width limited by max. junction temperature.
- ② Starting $T_J = 25^\circ\text{C}$, $L = 0.25\text{mH}$, $R_G = 25\Omega$, $I_{AS} = 42\text{A}$.
- ③ Pulse width $\leq 400\mu\text{s}$; duty cycle $\leq 2\%$.
- ④ R_θ is measured at T_J of approximately 90°C .
- ⑤ Half sine wave with duty cycle = 0.25, $t_{on} = 1\mu\text{sec}$.

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

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