

PDP SWITCH

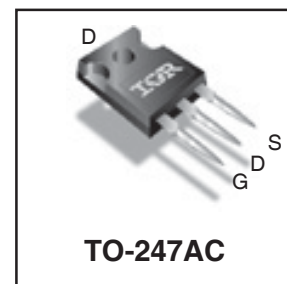
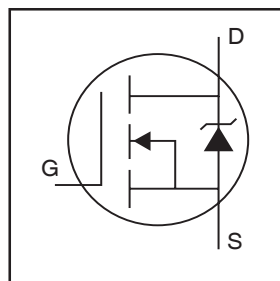
IRFP4332PbF

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
$R_{DS(ON)\ typ.\ @\ 10V}$	29	m Ω
$I_{RP\ max\ @\ T_C = 100^\circ C}$	120	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
$I_D @ T_C = 25^\circ C$	Continuous Drain Current, $V_{GS} @ 10V$	57	A
$I_D @ T_C = 100^\circ C$	Continuous Drain Current, $V_{GS} @ 10V$	40	
I_{DM}	Pulsed Drain Current ①	230	
$I_{RP} @ T_C = 100^\circ C$	Repetitive Peak Current ⑤	120	
$P_D @ T_C = 25^\circ C$	Power Dissipation	360	W
$P_D @ T_C = 100^\circ C$	Power Dissipation	180	
	Linear Derating Factor	2.4	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

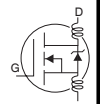
Thermal Resistance

	Parameter	Typ.	Max.	Units
$R_{\theta JC}$	Junction-to-Case ④	—	0.42	°C/W
$R_{\theta CS}$	Case-to-Sink, Flat, Greased Surface	0.24	—	
$R_{\theta JA}$	Junction-to-Ambient ④	—	40	

Notes ① through ⑤ are on page 8

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	—	170	—	mV/ $^\circ\text{C}$	Reference to 25°C , $I_D = 1\text{mA}$
$R_{DS(on)}$	Static Drain-to-Source On-Resistance	—	29	33	m Ω	$V_{GS} = 10V, I_D = 35A$ 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	—	-14	—	mV/ $^\circ\text{C}$	
I_{DSS}	Drain-to-Source Leakage Current	—	—	20	μA	$V_{DS} = 250V, V_{GS} = 0V$
		—	—	1.0	mA	$V_{DS} = 250V, V_{GS} = 0V, T_J = 125^\circ\text{C}$
I_{GSS}	Gate-to-Source Forward Leakage	—	—	100	nA	$V_{GS} = 20V$
	Gate-to-Source Reverse Leakage	—	—	-100	nA	$V_{GS} = -20V$
g_{fs}	Forward Transconductance	100	—	—	S	$V_{DS} = 25V, I_D = 35A$
Q_g	Total Gate Charge	—	99	150	nC	$V_{DD} = 125V, I_D = 35A, V_{GS} = 10V$ ③
Q_{gd}	Gate-to-Drain Charge	—	35	—	nC	
t_{st}	Shoot Through Blocking Time	100	—	—	ns	$V_{DD} = 200V, V_{GS} = 15V, R_G = 4.7\Omega$
E_{PULSE}	Energy per Pulse	—	520	—	μJ	$L = 220\text{nH}, C = 0.3\mu F, V_{GS} = 15V$ $V_{DS} = 200V, R_G = 5.1\Omega, T_J = 25^\circ\text{C}$
		—	920	—	μJ	$L = 220\text{nH}, C = 0.3\mu F, V_{GS} = 15V$ $V_{DS} = 200V, R_G = 5.1\Omega, T_J = 100^\circ\text{C}$
C_{iss}	Input Capacitance	—	5860	—	pF	$V_{GS} = 0V$
C_{oss}	Output Capacitance	—	530	—	pF	$V_{DS} = 25V$
C_{rss}	Reverse Transfer Capacitance	—	130	—	pF	$f = 1.0\text{MHz}$,
$C_{oss \text{ eff.}}$	Effective Output Capacitance	—	360	—	pF	$V_{GS} = 0V, V_{DS} = 0V \text{ to } 200V$
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	—	nH	

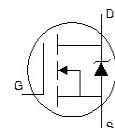


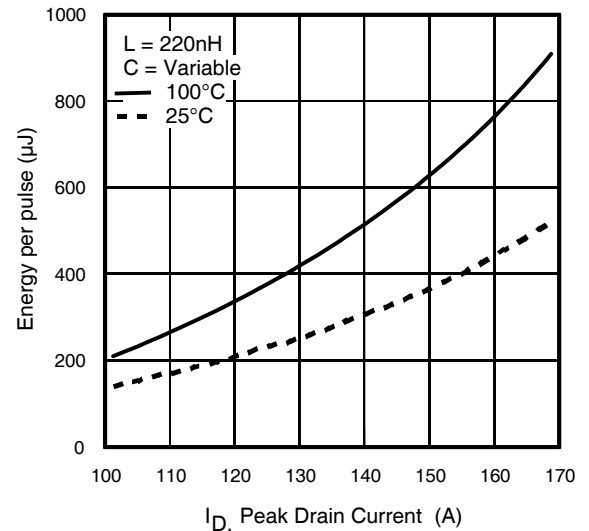
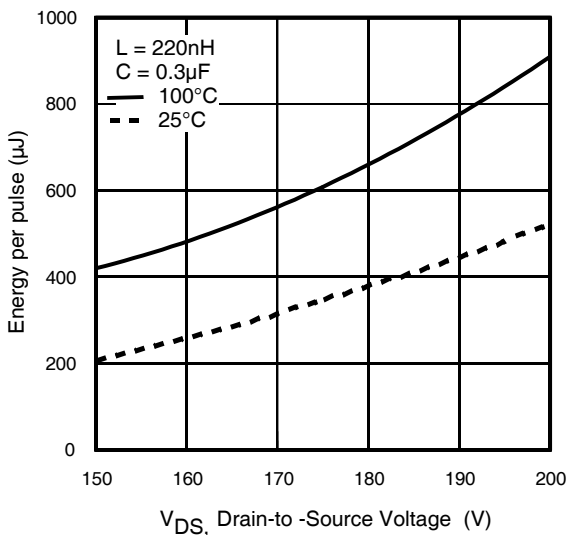
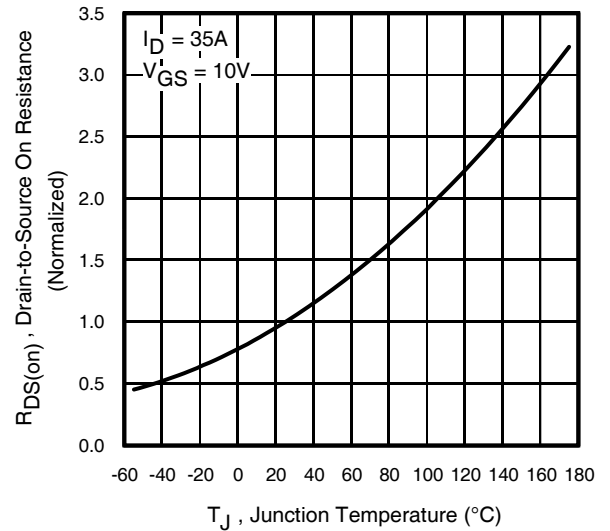
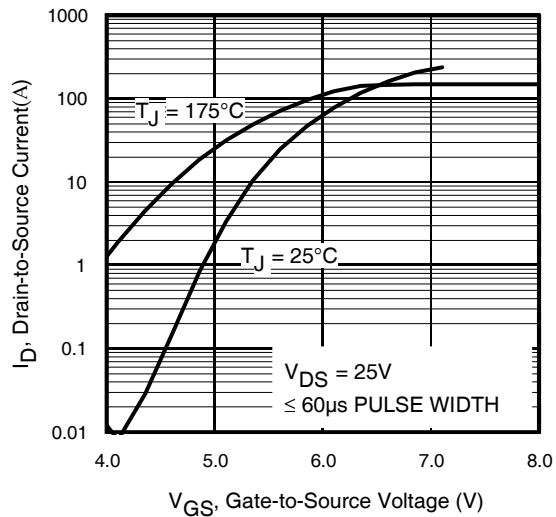
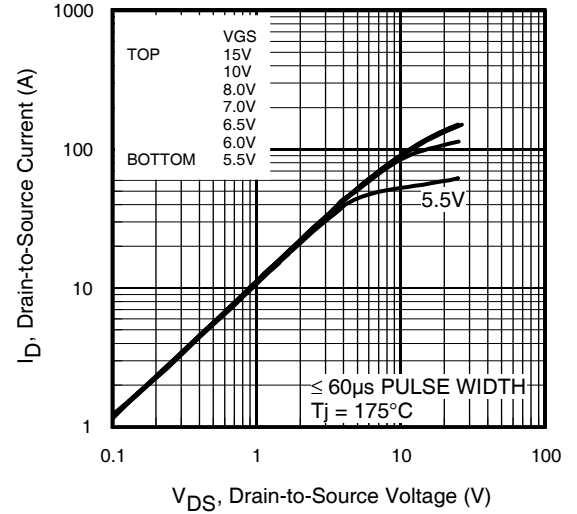
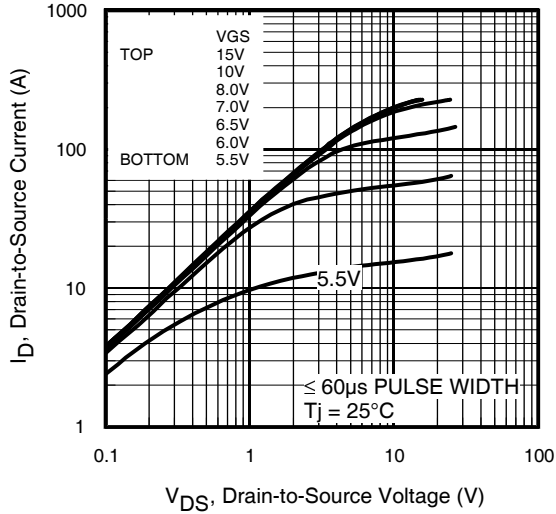
Avalanche Characteristics

	Parameter	Typ.	Max.	Units
E_{AS}	Single Pulse Avalanche Energy ②	—	210	mJ
E_{AR}	Repetitive Avalanche Energy ①	—	36	mJ
$V_{DS(Avalanche)}$	Repetitive Avalanche Voltage ①	300	—	V
I_{AS}	Avalanche Current ②	—	35	A

Diode Characteristics

	Parameter	Min.	Typ.	Max.	Units	Conditions
$I_S @ T_C = 25^\circ\text{C}$	Continuous Source Current (Body Diode)	—	—	57	A	MOSFET symbol showing the integral reverse p-n junction diode.
I_{SM}	Pulsed Source Current (Body Diode) ①	—	—	230	A	
V_{SD}	Diode Forward Voltage	—	—	1.3	V	$T_J = 25^\circ\text{C}, I_S = 35A, V_{GS} = 0V$ ③
t_{rr}	Reverse Recovery Time	—	190	290	ns	$T_J = 25^\circ\text{C}, I_F = 35A, V_{DD} = 50V$
Q_{rr}	Reverse Recovery Charge	—	820	1230	nC	$di/dt = 100A/\mu s$ ③





IRFP4332PbF

International
IR Rectifier

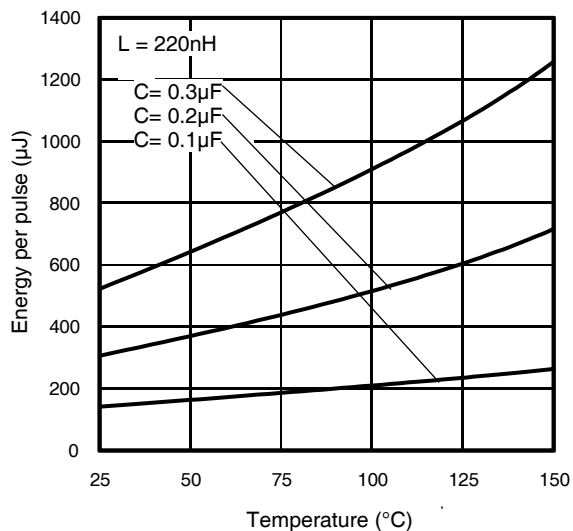


Fig 7. Typical E_{PULSE} vs. Temperature

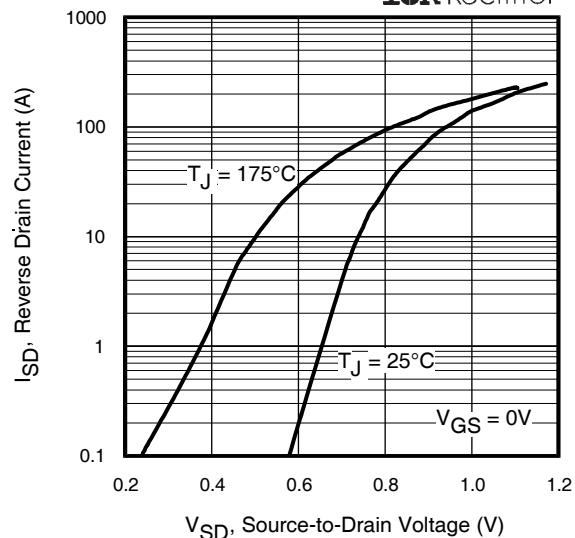


Fig 8. Typical Source-Drain Diode Forward Voltage

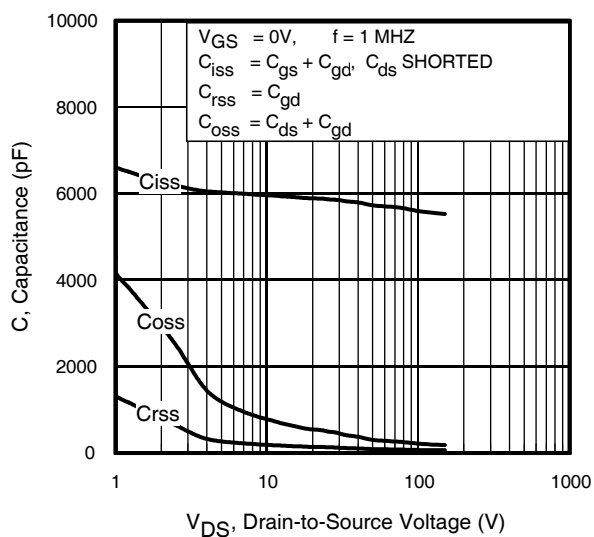


Fig 9. Typical Capacitance vs. Drain-to-Source Voltage

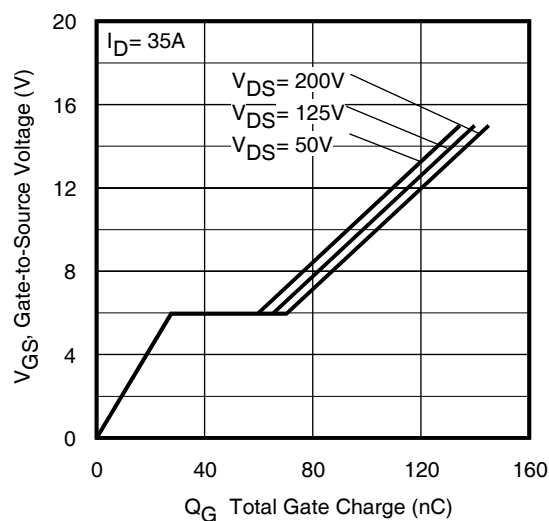


Fig 10. Typical Gate Charge vs. Gate-to-Source Voltage

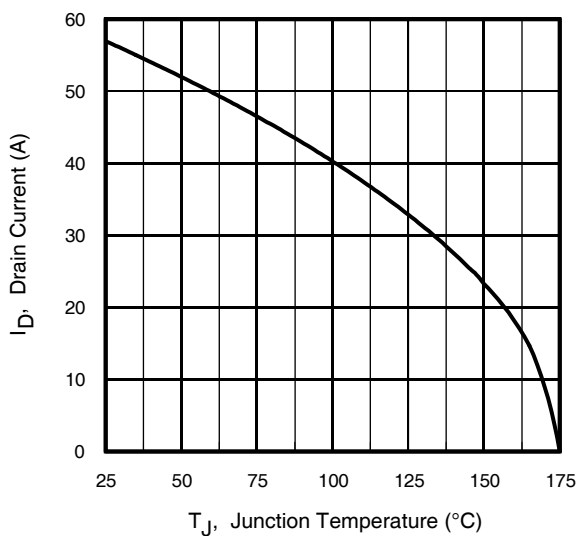


Fig 11. Maximum Drain Current vs. Case Temperature

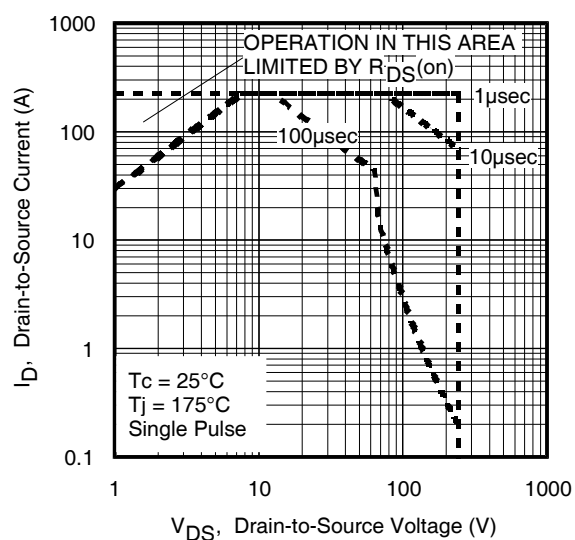


Fig 12. Maximum Safe Operating Area

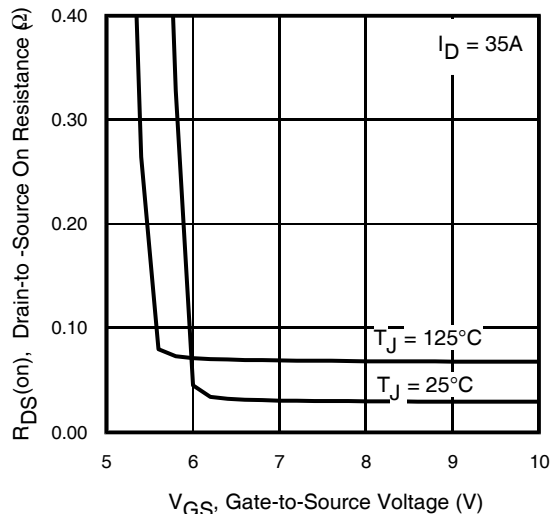


Fig 13. On-Resistance Vs. Gate Voltage

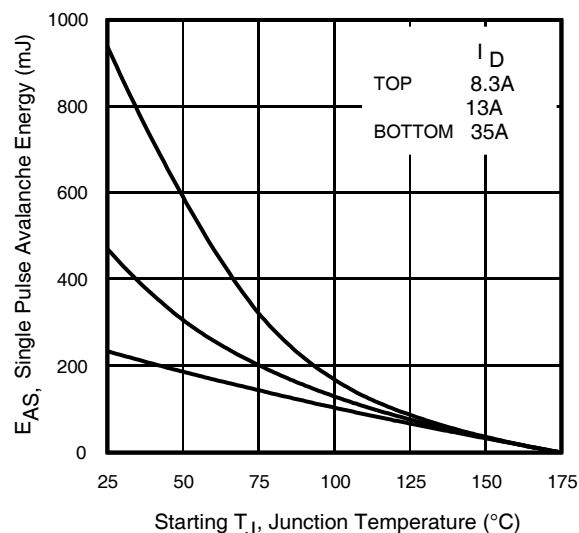


Fig 14. Maximum Avalanche Energy Vs. Temperature

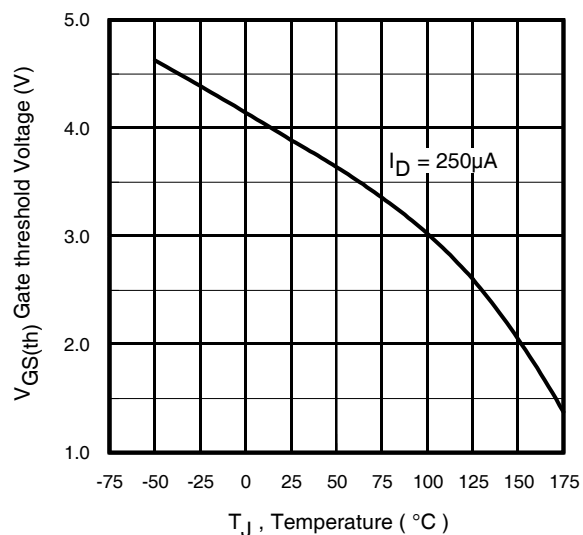


Fig 15. Threshold Voltage vs. Temperature

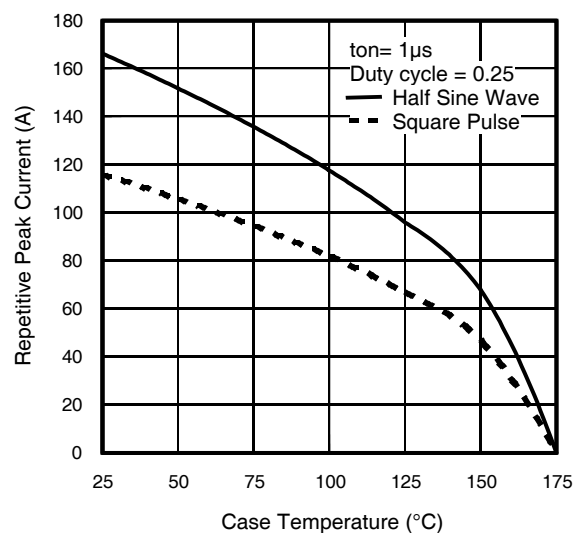


Fig 16. Typical Repetitive peak Current vs. Case temperature

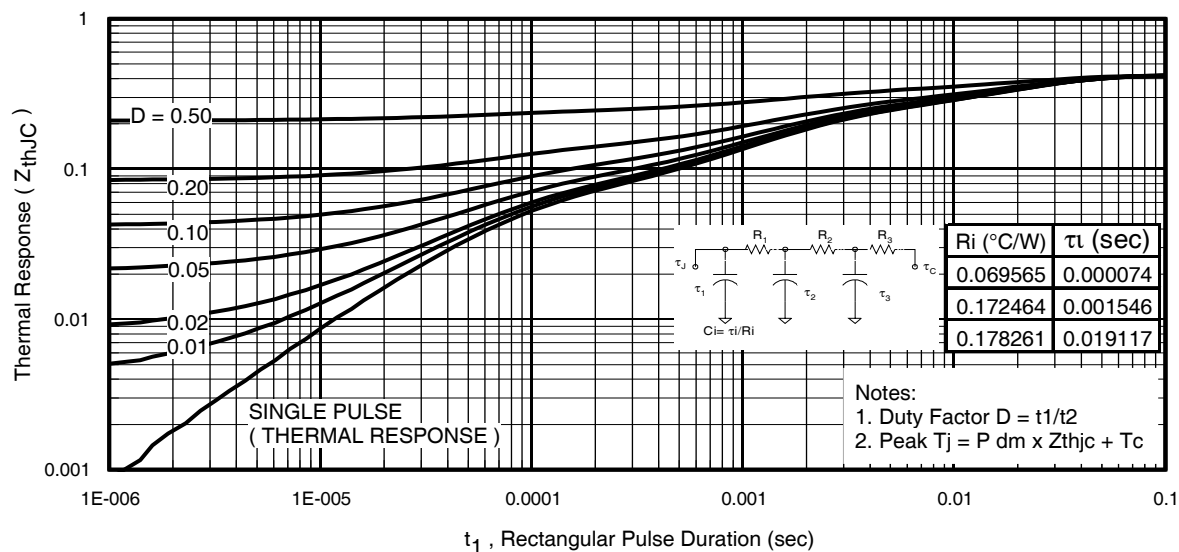
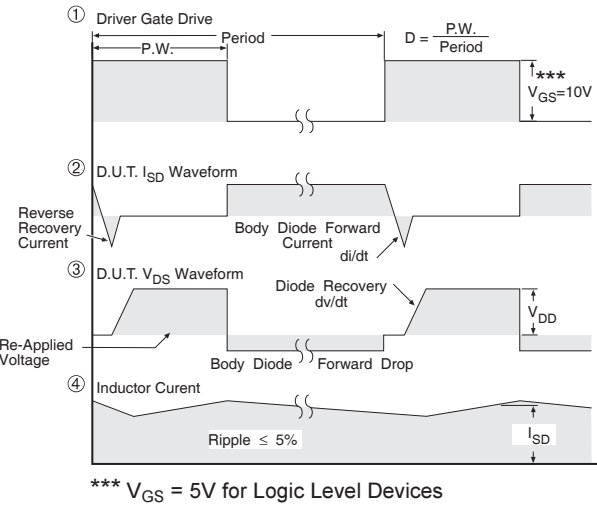


Fig 17. Maximum Effective Transient Thermal Impedance, Junction-to-Case



Timing diagram for a DSS signal. The signal is high for a duration t_p and then returns to low. The high level is labeled $V_{(BR)DSS}$ and the low level is labeled I_{AS} .

The diagram shows a circuit with two MOSFETs in series. The top MOSFET is labeled "Current Regulator" and "Same Type as D.U.T.". Its gate is connected to a 12V source through a $2\mu\text{F}$ capacitor. Its drain is connected to the source of the bottom MOSFET. The bottom MOSFET is labeled "D.U.T.". Its gate is connected to a V_{GS} source through a 3mA current source. Its drain is connected to a V_{DS} source. Both MOSFETs have a $50\text{K}\Omega$ resistor in series with their drains. The source of the bottom MOSFET is connected to ground through a resistor labeled I_G , and the drain is connected to ground through a resistor labeled I_D .

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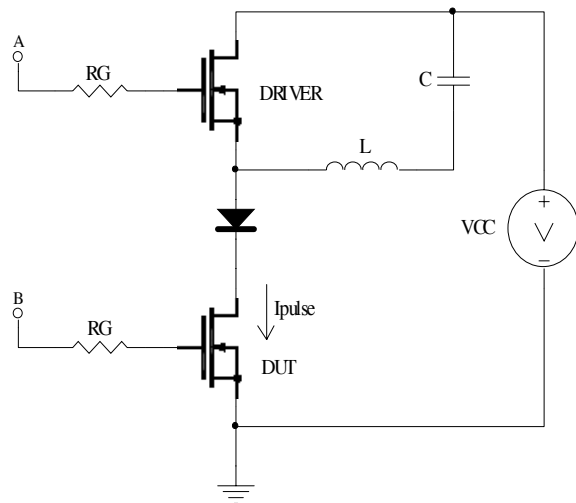


Fig 21a. t_{st} and E_{PULSE} Test Circuit

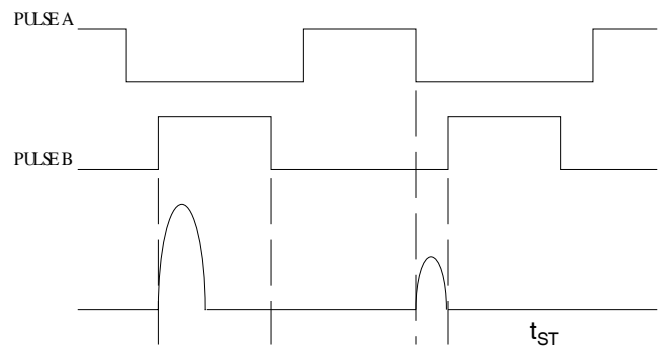


Fig 21b. t_{st} Test Waveforms

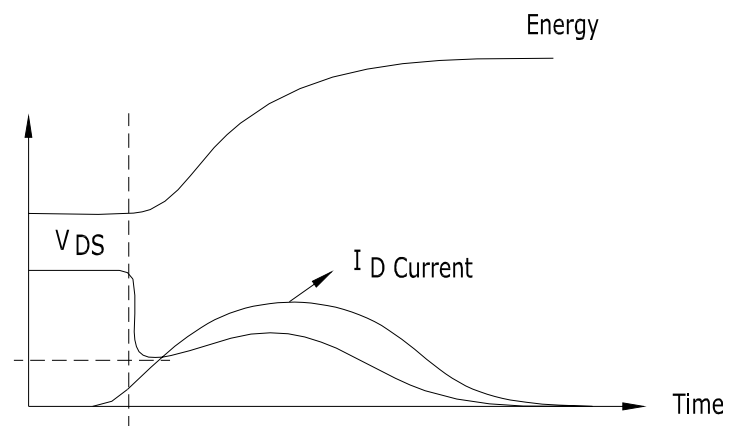
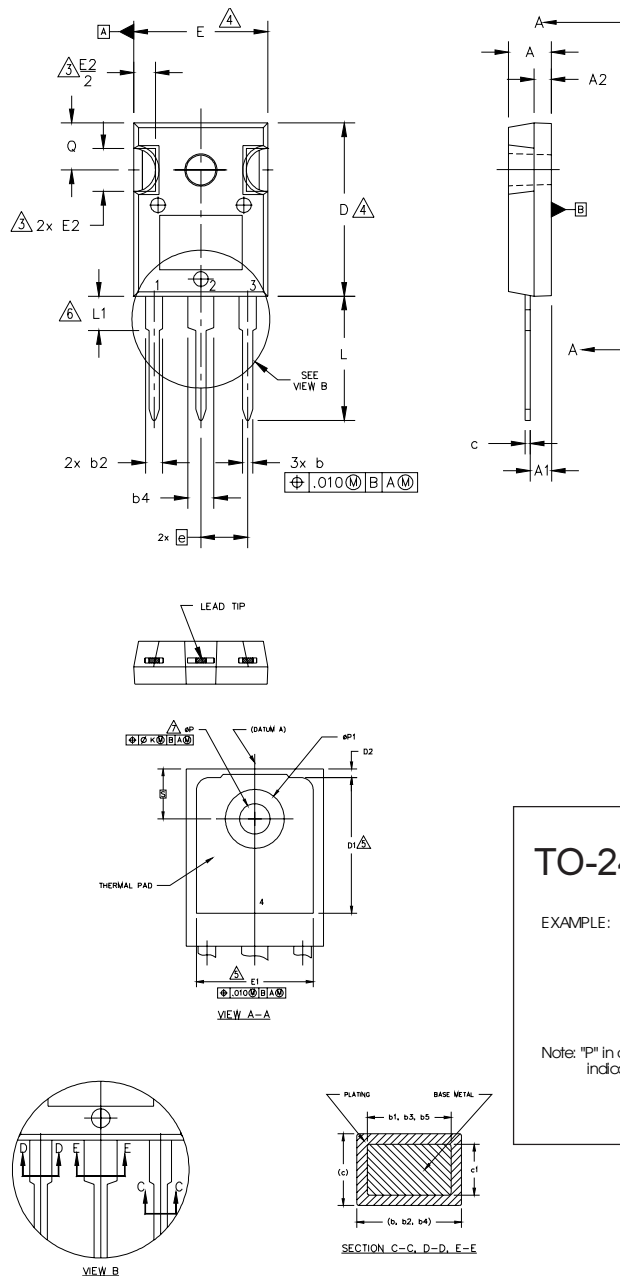


Fig 21c. E_{PULSE} Test Waveforms

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. ϕP 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	.055	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	
E	.602	.625	15.29	15.87	4
E1	.530	—	13.46	—	
E2	.178	.216	4.52	5.49	
e	.215 BSC		5.46 BSC		
ek	.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

HEXFET

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

IGBTs, CoPACK

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

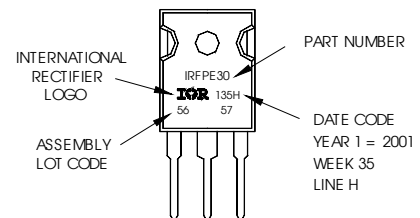
DIODES

- 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 $T_J = 25^\circ\text{C}$, $L = 0.35\text{mH}$, $R_G = 25\Omega$, $I_{AS} = 35\text{A}$.
- ③ Pulse width $\leq 400\mu\text{s}$; duty cycle $\leq 2\%$.
- ④ R_0 is measured at T_J of approximately 90°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.