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[International Rectifier \(Infineon Technologies Americas Corp.\)
IRFB4233PBF](#)

For any questions, you can email us directly:

sales@integrated-circuit.com

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PDP SWITCH

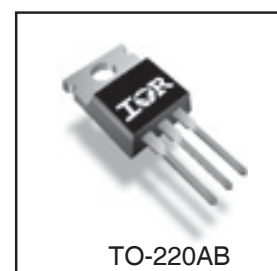
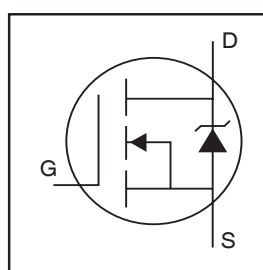
IRFB4233PbF

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	230	V
V_{DS} (Avalanche) typ.	276	V
$R_{DS(ON)}$ typ. @ 10V	31	mΩ
I_{RP} max @ $T_C = 100^\circ\text{C}$	114	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	±30	V
I_D @ $T_C = 25^\circ\text{C}$	Continuous Drain Current, V_{GS} @ 10V	56	A
I_D @ $T_C = 100^\circ\text{C}$	Continuous Drain Current, V_{GS} @ 10V	39	
I_{DM}	Pulsed Drain Current ①	220	
I_{RP} @ $T_C = 100^\circ\text{C}$	Repetitive Peak Current ⑤	114	
P_D @ $T_C = 25^\circ\text{C}$	Power Dissipation	370	W
P_D @ $T_C = 100^\circ\text{C}$	Power Dissipation	190	
	Linear Derating Factor	2.5	W/°C
T_J T_{STG}	Operating Junction and Storage Temperature Range	-40 to + 175	°C
	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	—	0.402	°C/W
$R_{\theta CS}$	Case-to-Sink, Flat, Greased Surface	0.50	—	
$R_{\theta JA}$	Junction-to-Ambient ④	—	62	

Notes ① through ⑥ are on page 8

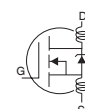
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Electrical Characteristics @ $T_J = 25^\circ\text{C}$ (unless otherwise specified)

	Parameter	Min.	Typ.	Max.	Units	Conditions
BV_{DSS}	Drain-to-Source Breakdown Voltage	230	—	—	V	$V_{GS} = 0V, I_D = 250\mu A$
$\Delta BV_{DSS}/\Delta T_J$	Breakdown Voltage Temp. Coefficient	—	200	—	mV/ $^\circ\text{C}$	Reference to 25°C , $I_D = 1\text{mA}$
$R_{DS(on)}$	Static Drain-to-Source On-Resistance	—	31	37	m Ω	$V_{GS} = 10V, I_D = 28A$ 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	—	—	5.0	μA	$V_{DS} = 184V, V_{GS} = 0V$
		—	—	150		$V_{DS} = 184V, V_{GS} = 0V, T_J = 125^\circ\text{C}$
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	83	—	—	S	$V_{DS} = 25V, I_D = 39A$
Q_g	Total Gate Charge	—	120	170	nC	$V_{DD} = 115V, I_D = 39A, V_{GS} = 10V$ ③
Q_{gd}	Gate-to-Drain Charge	—	44	—		
$t_{d(on)}$	Turn-On Delay Time	—	31	—	ns	$V_{DD} = 115V, V_{GS} = 10V$ ③ $I_D = 39A$ $R_G = 5\Omega$ See Fig. 22
t_r	Rise Time	—	71	—		
$t_{d(off)}$	Turn-Off Delay Time	—	51	—		
t_f	Fall Time	—	41	—		
t_{st}	Shoot Through Blocking Time	100	—	—	ns	$V_{DD} = 184V, V_{GS} = 15V, R_G = 4.7\Omega$
E_{PULSE}	Energy per Pulse	—	460	—	μJ	$L = 220\text{nH}, C = 0.4\mu F, V_{GS} = 15V$ $V_{DS} = 184V, R_G = 4.7\Omega, T_J = 25^\circ\text{C}$
		—	970	—		$L = 220\text{nH}, C = 0.4\mu F, V_{GS} = 15V$ $V_{DS} = 184V, R_G = 4.7\Omega, T_J = 100^\circ\text{C}$
C_{iss}	Input Capacitance	—	5510	—	pF	$V_{GS} = 0V$
C_{oss}	Output Capacitance	—	480	—		$V_{DS} = 25V$
C_{rss}	Reverse Transfer Capacitance	—	220	—		$f = 1.0\text{MHz}$
$C_{oss \text{ eff.}}$	Effective Output Capacitance	—	340	—		$V_{GS} = 0V, V_{DS} = 0V \text{ to } 184V$
L_D	Internal Drain Inductance	—	4.5	—	nH	Between lead, 6mm (0.25in.) from package and center of die contact
L_S	Internal Source Inductance	—	7.5	—		



Avalanche Characteristics

	Parameter	Typ.	Max.	Units
E_{AS}	Single Pulse Avalanche Energy ②	—	250	mJ
E_{AR}	Repetitive Avalanche Energy ①	—	39	mJ
$V_{DS(Avalanche)}$	Repetitive Avalanche Voltage ①	276	—	V
I_{AS}	Avalanche Current ②	—	39	A

Diode Characteristics

	Parameter	Min.	Typ.	Max.	Units	Conditions
$I_S @ T_C = 25^\circ\text{C}$	Continuous Source Current (Body Diode)	—	—	56	A	MOSFET symbol showing the integral reverse p-n junction diode.
I_{SM}	Pulsed Source Current (Body Diode) ①	—	—	220		
V_{SD}	Diode Forward Voltage	—	—	1.0	V	$T_J = 25^\circ\text{C}, I_S = 39A, V_{GS} = 0V$ ③
t_{rr}	Reverse Recovery Time	—	190	280	ns	$T_J = 25^\circ\text{C}, I_F = 39A, V_{DD} = 50V$
Q_{rr}	Reverse Recovery Charge	—	760	1140	nC	$di/dt = 100A/\mu s$ ③

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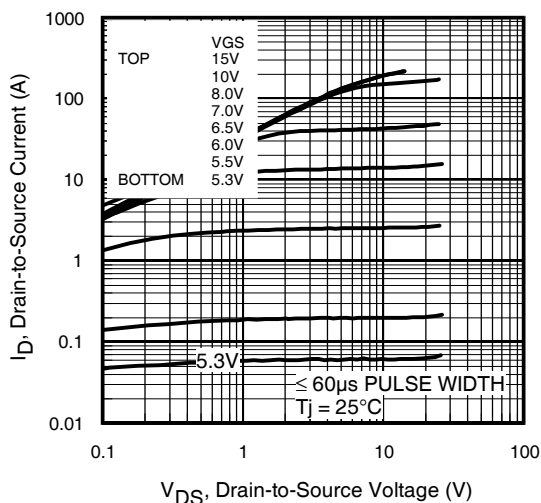


Fig 1. Typical Output Characteristics

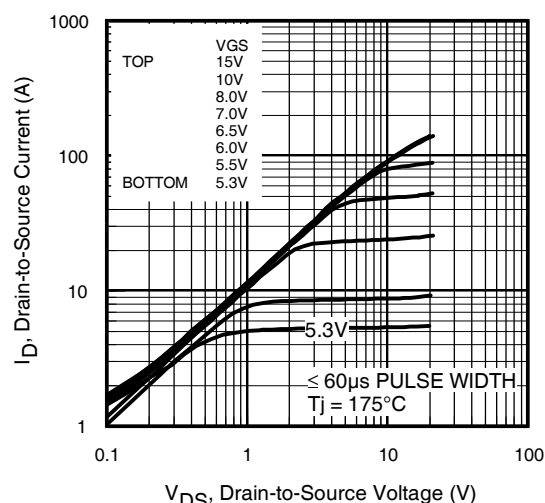


Fig 2. Typical Output Characteristics

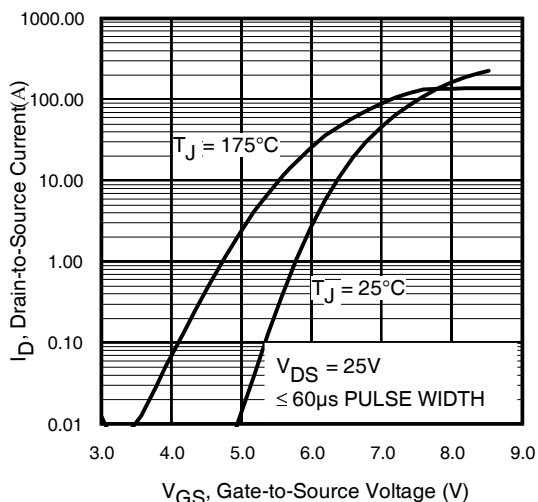


Fig 3. Typical Transfer Characteristics

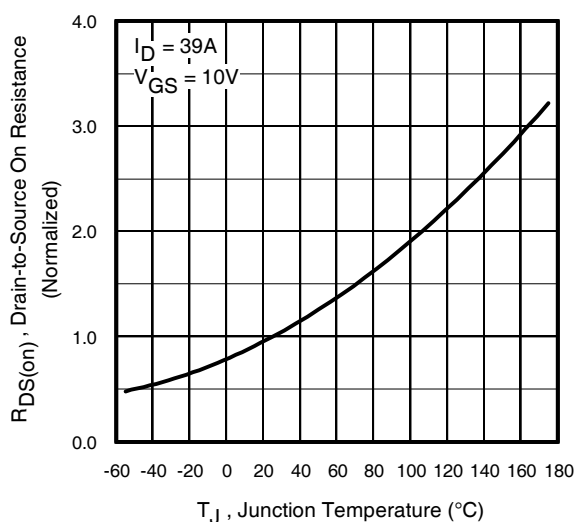


Fig 4. Normalized On-Resistance vs. Temperature

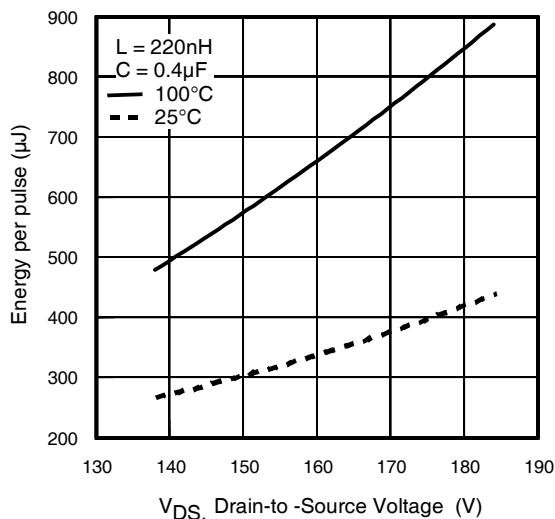


Fig 5. Typical E_{PULSE} vs. Drain-to-Source Voltage
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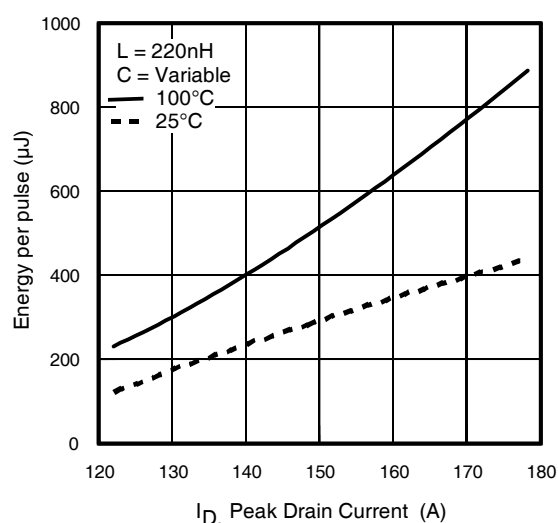


Fig 6. Typical E_{PULSE} vs. Drain Current

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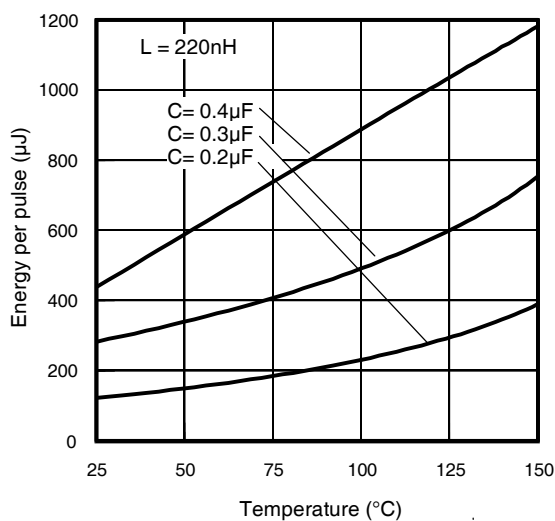


Fig 7. Typical E_{PULSE} vs. Temperature

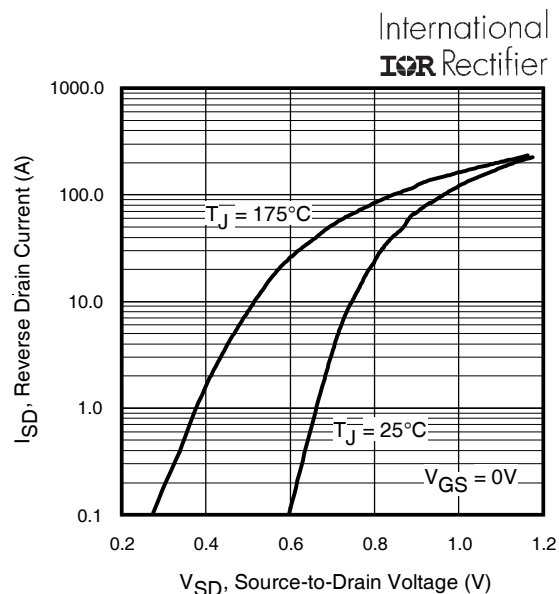


Fig 8. Typical Source-Drain Diode Forward Voltage

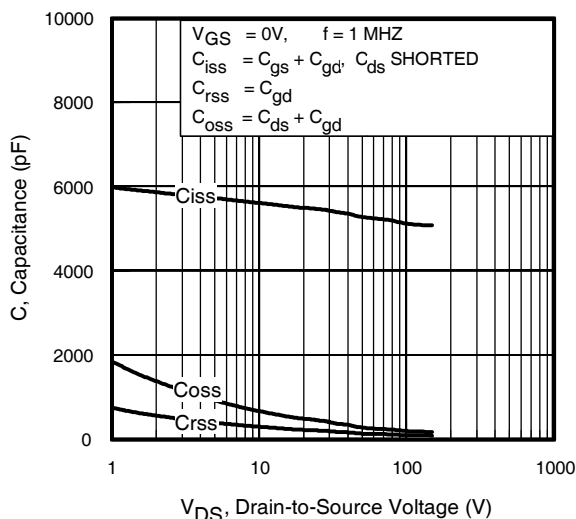


Fig 9. Typical Capacitance vs. Drain-to-Source Voltage

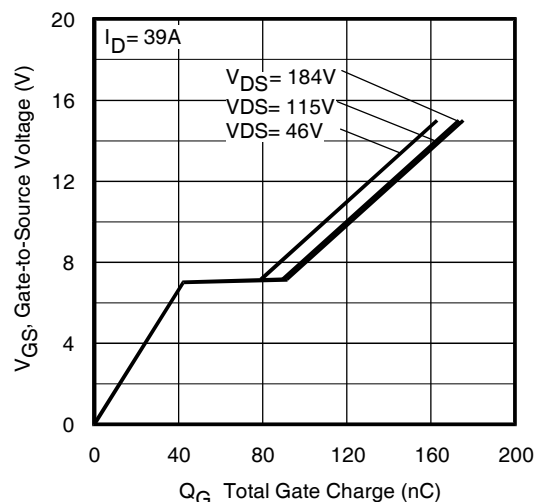


Fig 10. Typical Gate Charge vs. Gate-to-Source Voltage

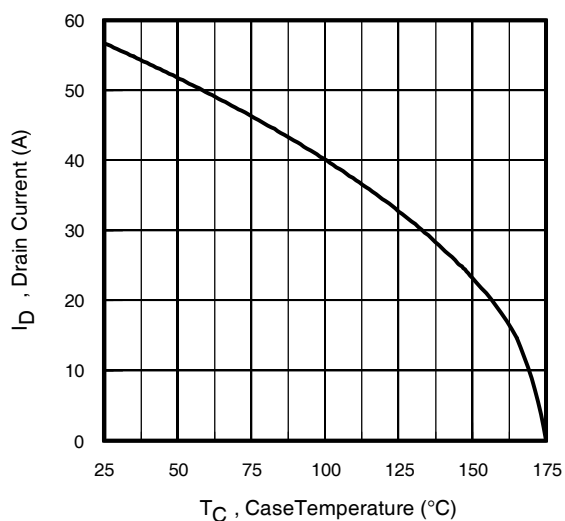


Fig 11. Maximum Drain Current vs. Case Temperature

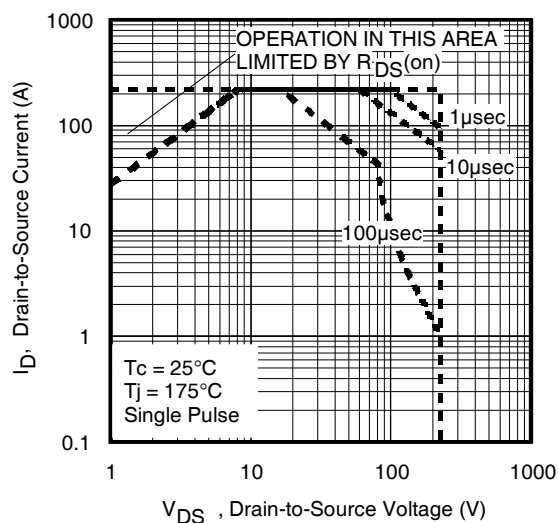


Fig 12. Maximum Safe Operating Area

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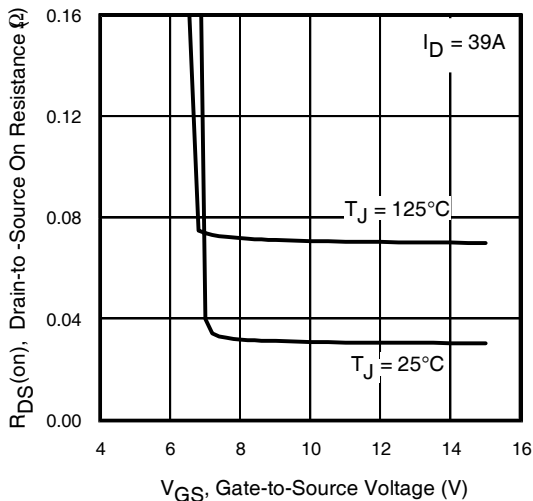


Fig 13. On-Resistance Vs. Gate Voltage

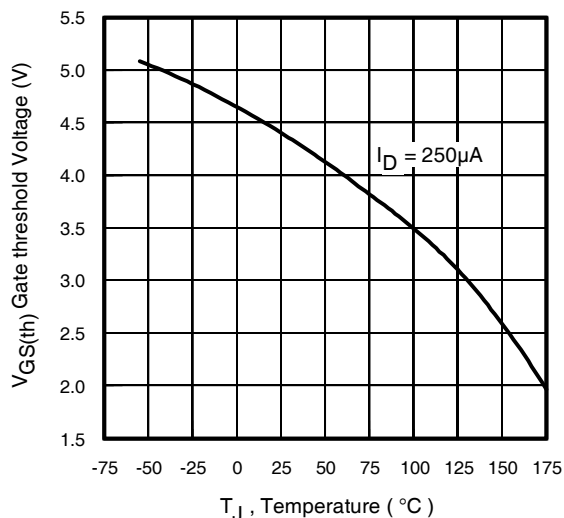


Fig 15. Threshold Voltage vs. Temperature

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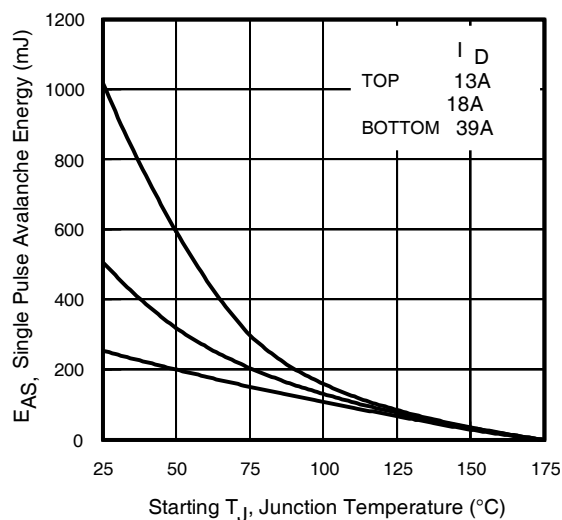


Fig 14. Maximum Avalanche Energy Vs. Temperature

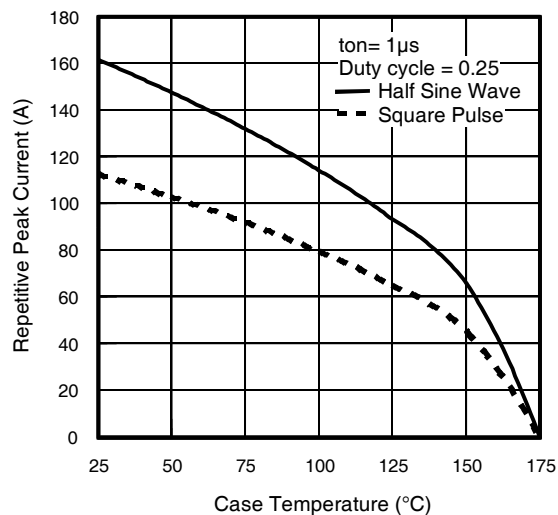


Fig 16. Typical Repetitive peak Current vs. Case temperature

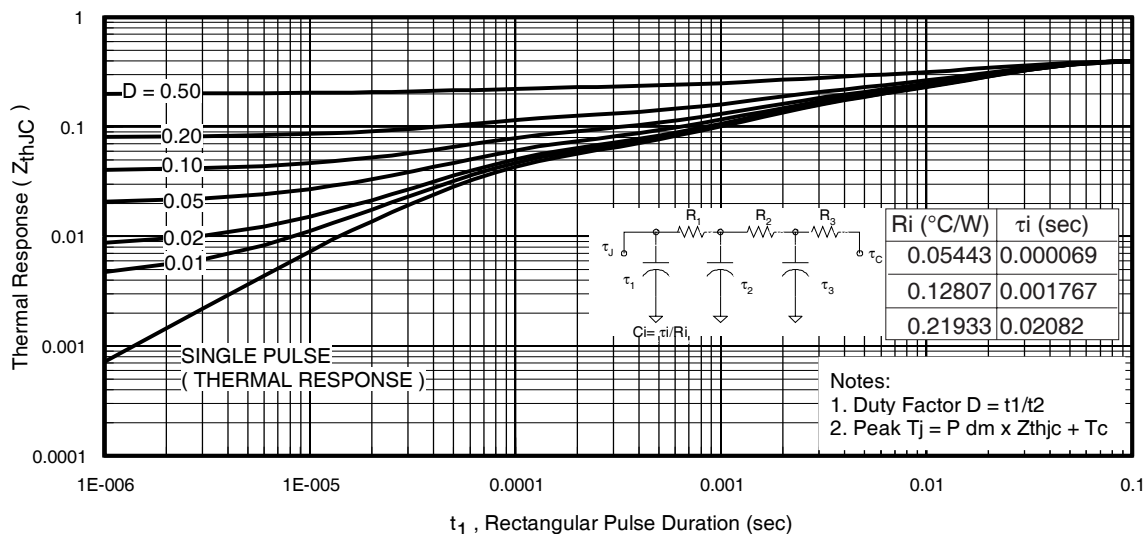
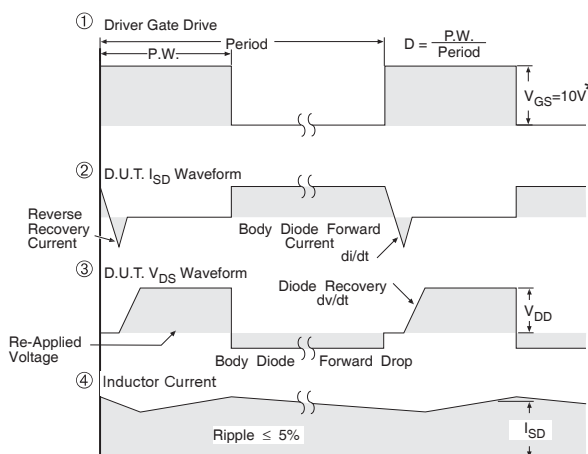
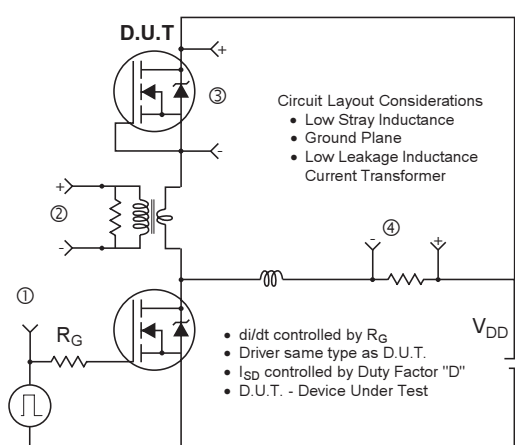


Fig 17. Maximum Effective Transient Thermal Impedance, Junction-to-Case

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

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

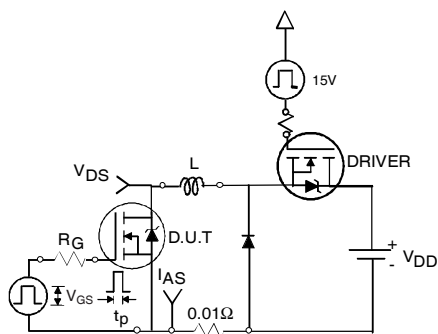


Fig 19a. Unclamped Inductive Test Circuit

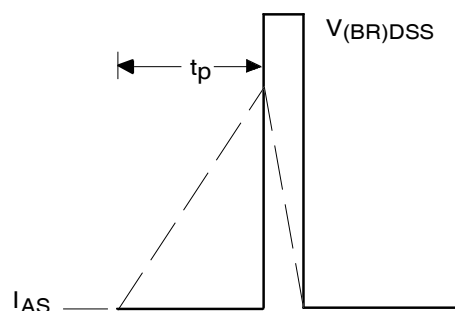


Fig 19b. Unclamped Inductive Waveforms

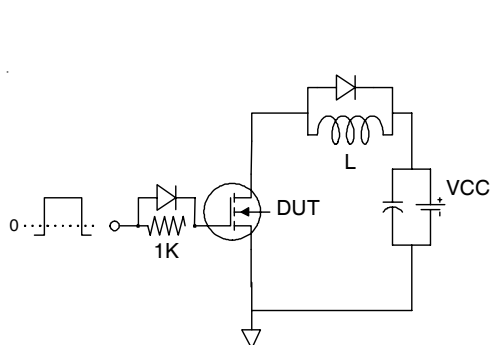


Fig 20a. Gate Charge Test Circuit

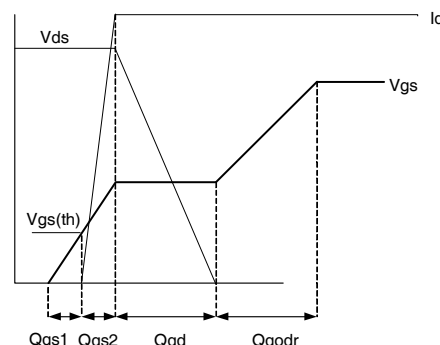


Fig 20b. Gate Charge Waveform

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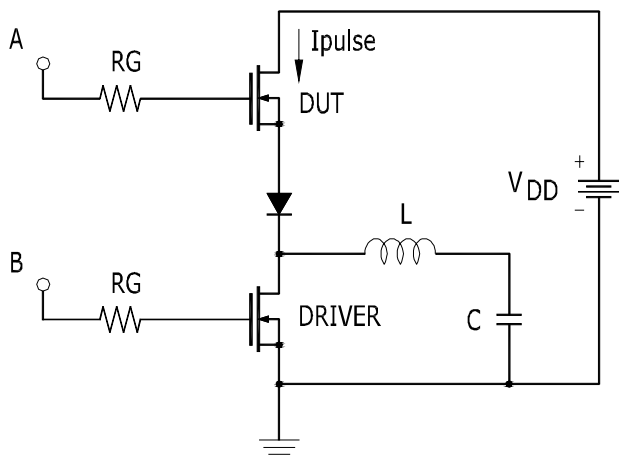


Fig 21a. t_{st} and E_{PULSE} Test Circuit

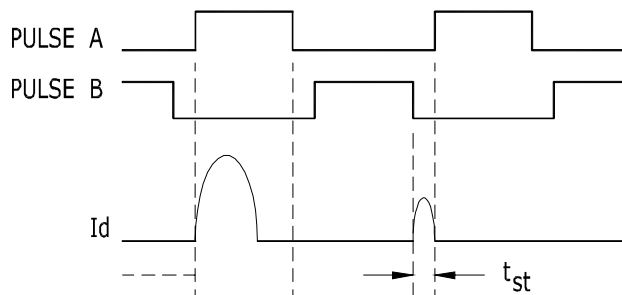


Fig 21b. t_{st} Test Waveforms

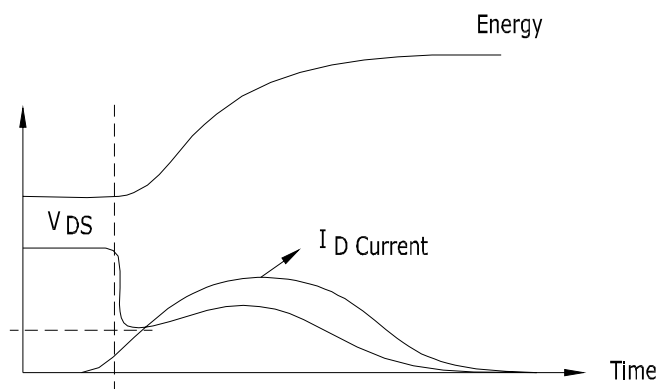


Fig 21c. E_{PULSE} Test Waveforms

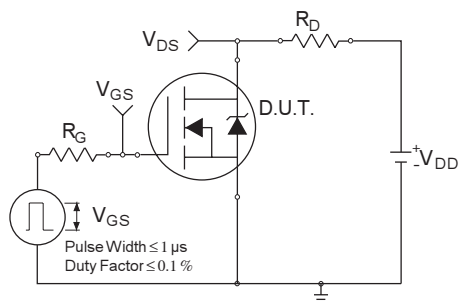


Fig 22a. Switching Time Test Circuit

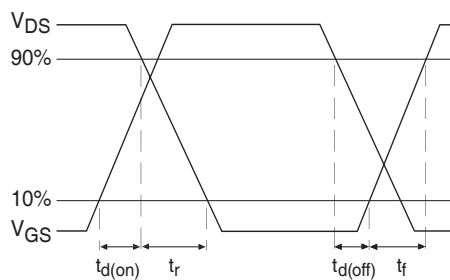
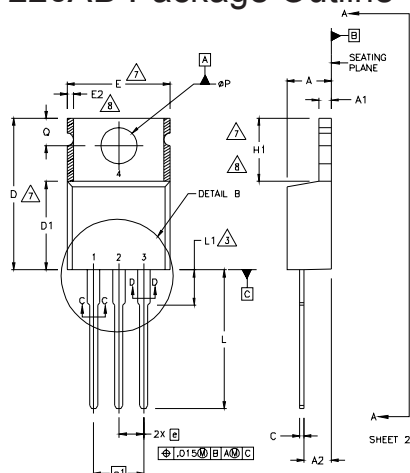


Fig 22b. Switching Time Waveforms

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TO-220AB Package Outline (Dimensions are shown in millimeters (inches))



NOTES:

- 1 DIMENSIONING AND TOLERANCING PER ASME Y14.5 M- 1994.
- 2 DIMENSIONS ARE SHOWN IN INCHES [MILLIMETERS].
- 3 LEAD DIMENSION AND FINISH UNCONTROLLED IN L1.
- 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 DIMENSION b1 & c1 APPLY TO BASE METAL ONLY.
- 6 CONTROLLING DIMENSION : INCHES.
- 7 THERMAL PAD CONTOUR OPTIONAL WITHIN DIMENSIONS E,H1,D2 & E1
- 8 DIMENSION E2 X H1 DEFINE A ZONE WHERE STAMPING AND SINGULATION IRREGULARITIES ARE ALLOWED.

LEAD ASSIGNMENTS

HERFET

- 1- GATE
- 2- DRAIN
- 3- SOURCE

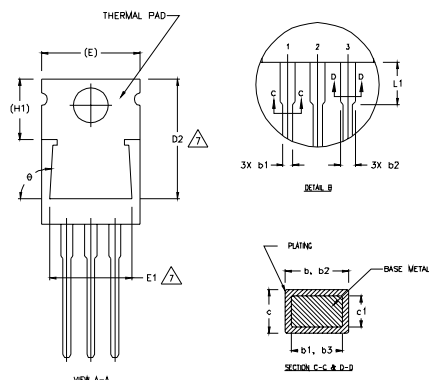
IGBTs- CoPACK

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

DIODES

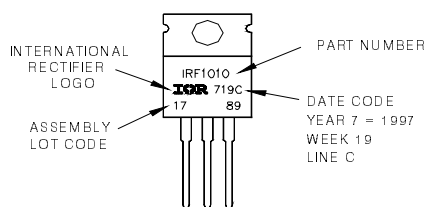
- 1- ANODE/OPEN
- 2- CATHODE
- 3- ANODE

SYMBOL	DIMENSIONS				NOTES
	MILLIMETERS		INCHES		
	MIN.	MAX.	MIN.	MAX.	
A	3.56	4.82	.140	.190	5
A1	0.51	1.40	.020	.055	
A2	2.04	2.92	.080	.115	
b	0.38	1.01	.015	.040	
b1	0.38	0.96	.015	.038	
b2	1.15	1.77	.045	.070	
b3	1.15	1.73	.045	.068	
c	0.36	0.61	.014	.024	
c1	0.36	0.56	.014	.022	5
D	14.22	16.51	.560	.650	4
D1	8.38	9.02	.330	.355	
D2	12.19	12.88	.480	.507	7
E	9.66	10.66	.380	.420	4,7
E1	8.38	8.89	.330	.350	7
e	2.54 BSC		.100 BSC		
e1	5.08		.200 BSC		
H1	5.85	6.55	.230	.270	7,8
L	12.70	14.73	.500	.580	
L1	—	6.35	—	.250	3
øP	3.54	4.08	.139	.161	
Q	2.54	3.42	.100	.135	
ø	90°–93°		90°–93°		



TO-220AB Part Marking Information

EXAMPLE: THIS IS AN IRF1010
LOT CODE 1789
ASSEMBLED ON WW 19, 1997
IN THE ASSEMBLY LINE 'C'
Note: "P" in assembly line position indicates "Lead-Free"



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

Notes:

- ① Repetitive rating; pulse width limited by max. junction temperature.
- ② Starting $T_J = 25^\circ\text{C}$, $L = 0.34\text{mH}$, $R_G = 25\Omega$, $I_{AS} = 39\text{A}$.
- 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 and qualified for the Industrial market.
Qualification Standards can be found on IR's Web site.

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TAC Fax: (310) 252-7903

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