IRL1004PBF Datasheet

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DiGi Electronics Part Number	IRL1004PBF-DG
Manufacturer	Infineon Technologies
Manufacturer Product Number	IRL1004PBF
Description	MOSFET N-CH 40V 130A TO220AB
Detailed Description	N-Channel 40 V 130A (Tc) 200W (Tc) Through Hole TO-220AB

Purchase and inquiry

Manufacturer Product Number:	Manufacturer:
IRL1004PBF	Infineon Technologies
Series:	Product Status:
HEXFET®	Active
FET Type:	Technology:
N-Channel	MOSFET (Metal Oxide)
Drain to Source Voltage (Vdss):	Current - Continuous Drain (Id) @ 25°C:
40 V	130A (Tc)
Drive Voltage (Max Rds On, Min Rds On):	Rds On (Max) @ Id, Vgs:
4.5V, 10V	6.5mOhm @ 78A, 10V
Vgs(th) (Max) @ Id:	Gate Charge (Qg) (Max) @ Vgs:
1V @ 250µA	100 nC @ 4.5 V
Vgs (Max):	Input Capacitance (Ciss) (Max) @ Vds:
±16V	5330 pF @ 25 V
FET Feature:	Power Dissipation (Max):
-	200W (Tc)
Operating Temperature:	Mounting Type:
-55°C ~ 175°C (TJ)	Through Hole
Supplier Device Package:	Package / Case:
TO-220AB	TO-220-3
Base Product Number:	
IRL1004	

Environmental & Export classification

RoHS Status:	Moisture Sensitivity Level (MSL):
ROHS3 Compliant	1 (Unlimited)
REACH Status:	ECCN:
REACH Unaffected	EAR99
HTSUS:	
8541.29.0095	

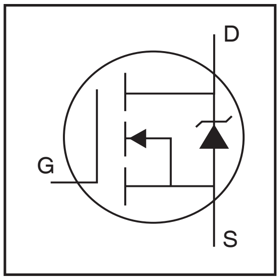
International
IOR Rectifier

PD - 95403

IRL1004PbF

HEXFET® Power MOSFET

- Logic-Level Gate Drive
- Advanced Process Technology
- Ultra Low On-Resistance
- Dynamic dv/dt Rating
- 175°C Operating Temperature
- Fast Switching
- Fully Avalanche Rated
- Lead-Free



V_{DSS} = 40V

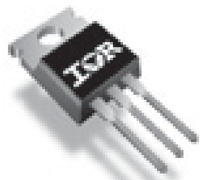
$R_{DS(on)}$ = 0.0065Ω

I_D = 130A⑤

Description

Fifth Generation HEXFET® power MOSFETs from International Rectifier utilize advanced processing techniques to achieve the lowest possible on-resistance per silicon area. This benefit, combined with the fast switching speed and ruggedized device design that HEXFET power MOSFETs are well known for, provides the designer with an extremely efficient and reliable device for use in a wide variety of applications.

The TO-220 package is universally preferred for all commercial-industrial applications at power dissipation levels to approximately 50 watts. The low thermal resistance and low package cost of the TO-220 contribute to its wide acceptance throughout the industry.



TO-220AB

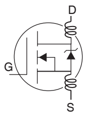
Absolute Maximum Ratings

	Parameter	Max.	Units
I_D @ T_C = 25°C	Continuous Drain Current, V_{GS} @ 10V	130⑤	A
I_D @ T_C = 100°C	Continuous Drain Current, V_{GS} @ 10V	92⑤	
I_{DM}	Pulsed Drain Current ①	520	
P_D @T_C = 25°C	Power Dissipation	200	W
	Linear Derating Factor	1.3	W/°C
V_{GS}	Gate-to-Source Voltage	± 16	V
E_{AS}	Single Pulse Avalanche Energy②	700	mJ
I_{AR}	Avalanche Current①	78	A
E_{AR}	Repetitive Avalanche Energy①	20	mJ
dv/dt	Peak Diode Recovery dv/dt ③	5.0	V/ns
T_J T_{STG}	Operating Junction and Storage Temperature Range	-55 to + 175	°C
	Soldering Temperature, for 10 seconds	300 (1.6mm from case)	
	Mounting torque, 6-32 or M3 srew	10 lbf•in (1.1N•m)	

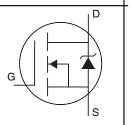
Thermal Resistance

	Parameter	Typ.	Max.	Units
$R_{\theta JC}$	Junction-to-Case	—–	0.75	°C/W
$R_{\theta CS}$	Case-to-Sink, Flat, Greased Surface	0.50	—–	
$R_{\theta JA}$	Junction-to-Ambient	—–	62	

Electrical Characteristics @ T_J = 25°C (unless otherwise specified)

	Parameter	Min.	Typ.	Max.	Units	Conditions
$V_{(BR)DSS}$	Drain-to-Source Breakdown Voltage	40	—	—	V	V_{GS} = 0V, I_D = 250μA
$\Delta V_{(BR)DSS}/\Delta T_J$	Breakdown Voltage Temp. Coefficient	—	0.04	—	V/°C	Reference to 25°C, I_D = 1mA
$R_{DS(on)}$	Static Drain-to-Source On-Resistance	—	—	0.0065	Ω	V_{GS} = 10V, I_D = 78A ④
		—	—	0.009		V_{GS} = 4.5V, I_D = 65A ④
$V_{GS(th)}$	Gate Threshold Voltage	1.0	—	—	V	V_{DS} = V_{GS}, I_D = 250μA
g_{fs}	Forward Transconductance	63	—	—	S	V_{DS} = 25V, I_D = 78A
I_{DSS}	Drain-to-Source Leakage Current	—	—	25	μA	V_{DS} = 40V, V_{GS} = 0V
		—	—	250		V_{DS} = 32V, V_{GS} = 0V, T_J = 150°C
I_{GSS}	Gate-to-Source Forward Leakage	—	—	100	nA	V_{GS} = 16V
	Gate-to-Source Reverse Leakage	—	—	-100		V_{GS} = -16V
Q_g	Total Gate Charge	—	—	100	nC	I_D = 78A
Q_{gs}	Gate-to-Source Charge	—	—	32		V_{DS} = 32V
Q_{gd}	Gate-to-Drain ("Miller") Charge	—	—	43		V_{GS} = 4.5V, See Fig. 6 and 13 ④
$t_{d(on)}$	Turn-On Delay Time	—	16	—	ns	V_{DD} = 20V
t_r	Rise Time	—	210	—		I_D = 78A
$t_{d(off)}$	Turn-Off Delay Time	—	25	—		R_G = 2.5Ω, V_{GS} = 4.5V
t_f	Fall Time	—	14	—		R_D = 0.18Ω, See Fig. 10 ④
L_D	Internal Drain Inductance	—	4.5	—	nH	Between lead, 6mm (0.25in.) from package and center of die contact  D G S
L_S	Internal Source Inductance	—	7.5	—		
C_{iss}	Input Capacitance	—	5330	—	pF	V_{GS} = 0V
C_{oss}	Output Capacitance	—	1480	—		V_{DS} = 25V
C_{rss}	Reverse Transfer Capacitance	—	320	—		ƒ = 1.0MHz, See Fig. 5

Source-Drain Ratings and Characteristics

	Parameter	Min.	Typ.	Max.	Units	Conditions
I_S	Continuous Source Current (Body Diode)	—	—	130⑤	A	MOSFET symbol showing the integral reverse p-n junction diode.  D G S
I_{SM}	Pulsed Source Current (Body Diode) ①	—	—	520		
V_{SD}	Diode Forward Voltage	—	—	1.3	V	T_J = 25°C, I_S = 78A, V_{GS} = 0V ④
t_{rr}	Reverse Recovery Time	—	78	120	ns	T_J = 25°C, I_F = 78A
Q_{rr}	Reverse Recovery Charge	—	180	270	nC	di/dt = 100A/μs ④
t_{on}	Forward Turn-On Time	Intrinsic turn-on time is negligible (turn-on is dominated by L_S+L_D)				

Notes:

① Repetitive rating; pulse width limited by max. junction temperature. (See fig. 11)

② Starting T_J = 25°C, L =0.23mH
R_G = 25Ω, I_{AS} = 78A. (See Figure 12)

③ $I_{SD} \leq$78A, di/dt ≤ 370A/μs, $V_{DD} \leq V_{(BR)DSS}$,
$T_J \leq$ 175°C

④ Pulse width ≤ 300μs; duty cycle ≤ 2%

⑤ Calculated continuous current based on maximum allowable junction temperature; for recommended current-handling of the package refer to Design Tip #93-4

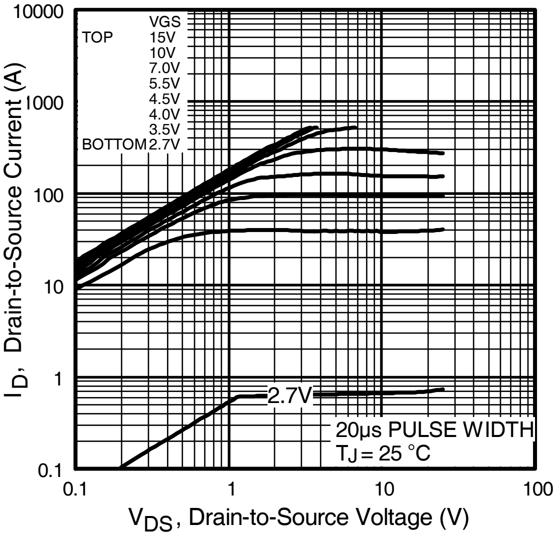


Fig 1. Typical Output Characteristics

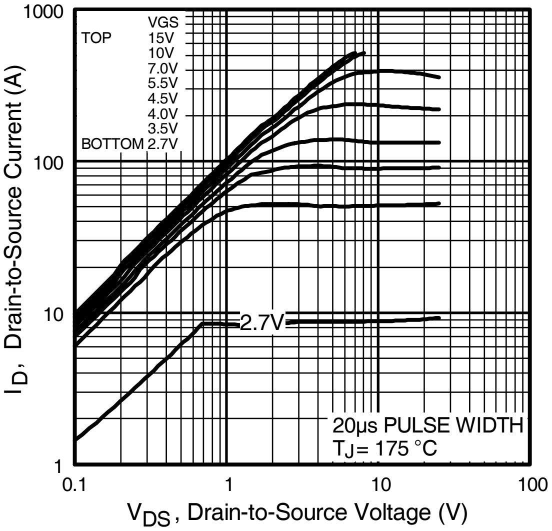


Fig 2. Typical Output Characteristics

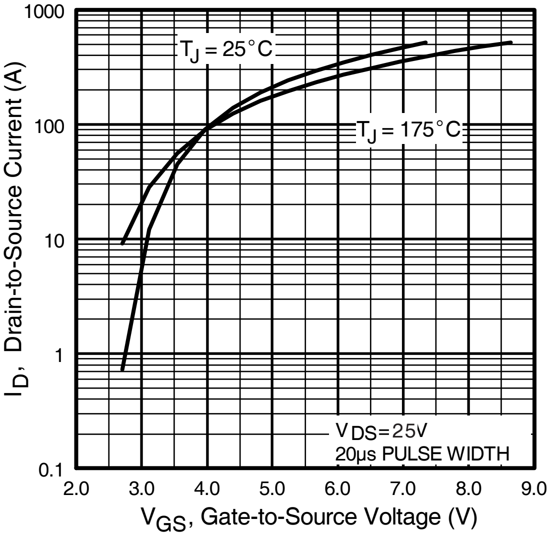


Fig 3. Typical Transfer Characteristics

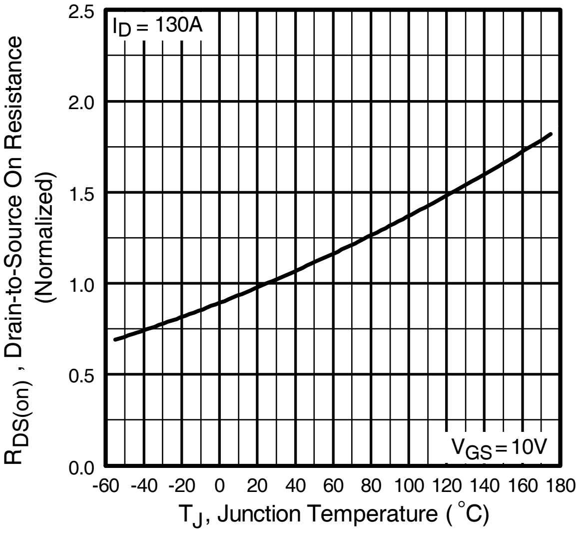


Fig 4. Normalized On-Resistance
Vs. Temperature

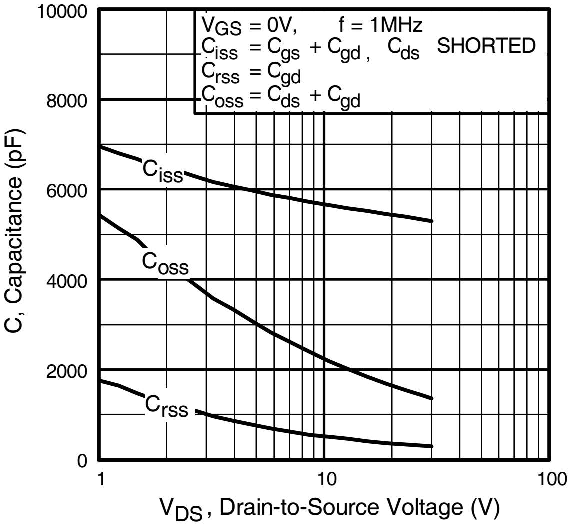


Fig 5. Typical Capacitance Vs. Drain-to-Source Voltage

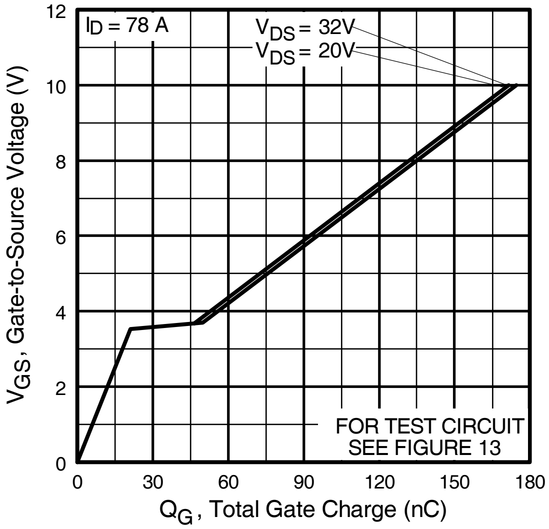


Fig 6. Typical Gate Charge Vs. Gate-to-Source Voltage

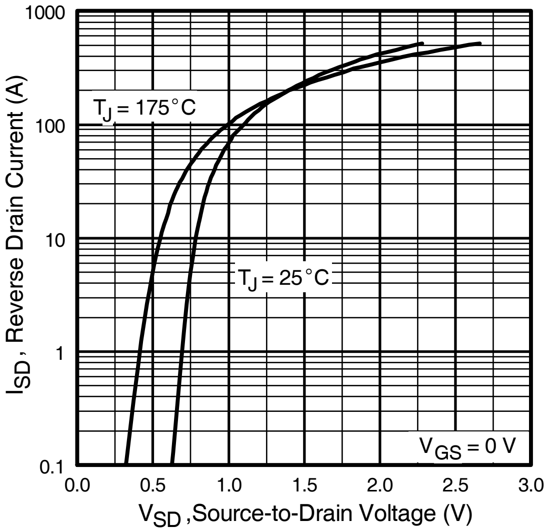


Fig 7. Typical Source-Drain Diode Forward Voltage

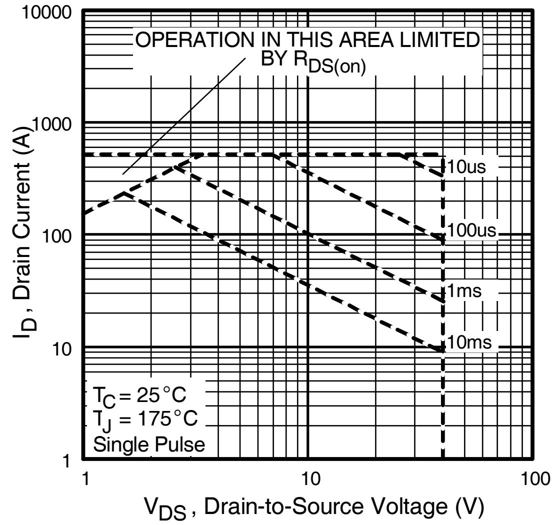


Fig 8. Maximum Safe Operating Area

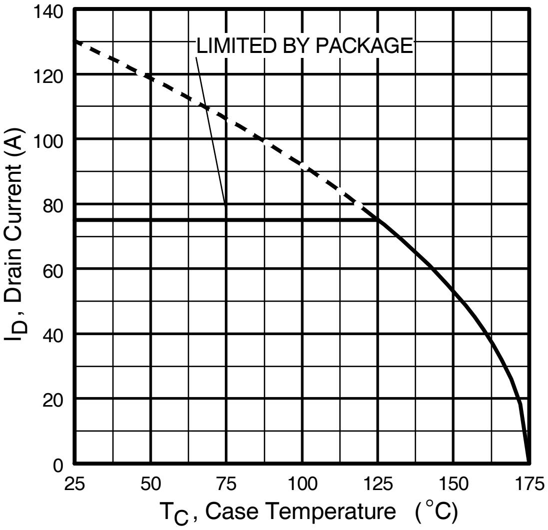


Fig 9. Maximum Drain Current Vs. Case Temperature

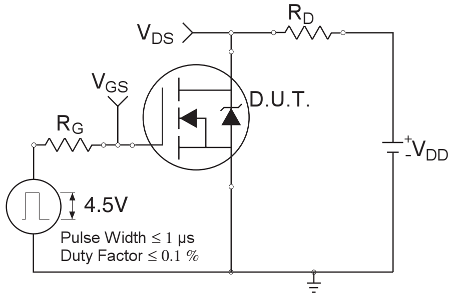


Fig 10a. Switching Time Test Circuit

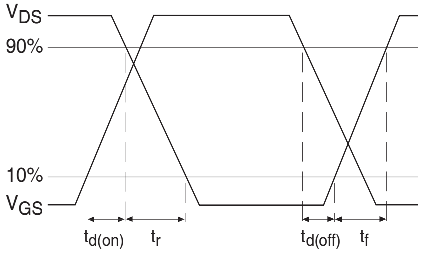


Fig 10b. Switching Time Waveforms

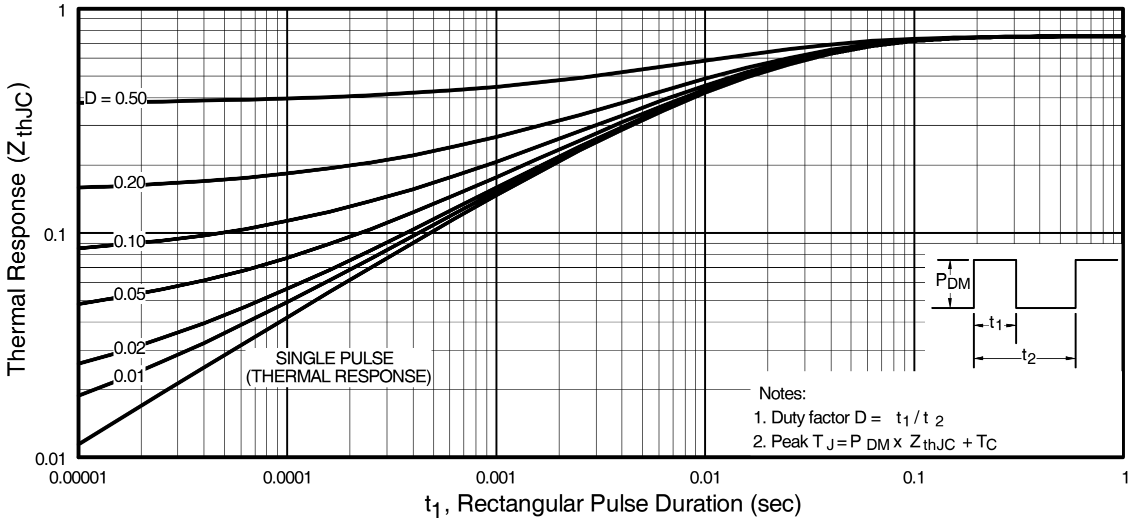


Fig 11. Maximum Effective Transient Thermal Impedance, Junction-to-Case

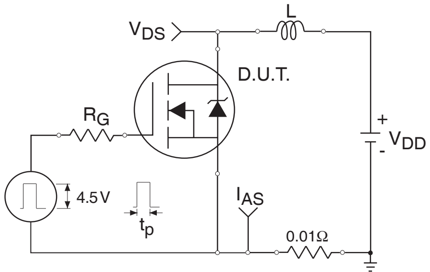


Fig 12a. Unclamped Inductive Test Circuit

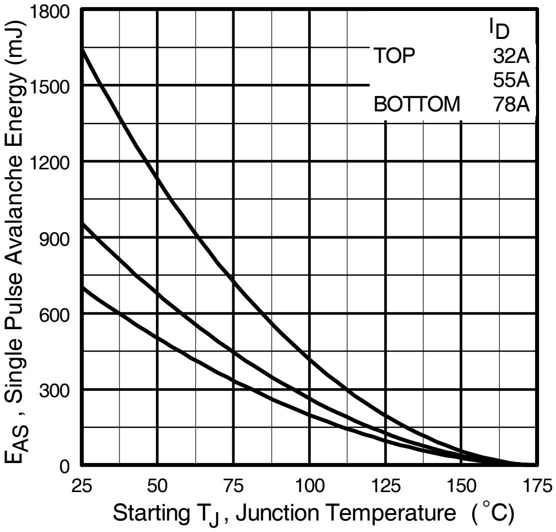


Fig 12c. Maximum Avalanche Energy Vs. Drain Current

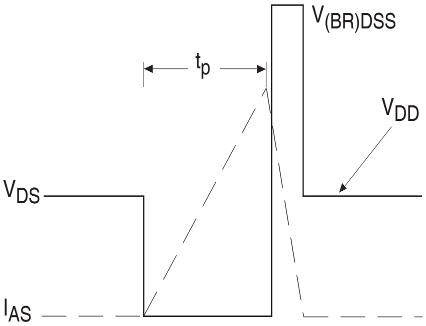


Fig 12b. Unclamped Inductive Waveforms

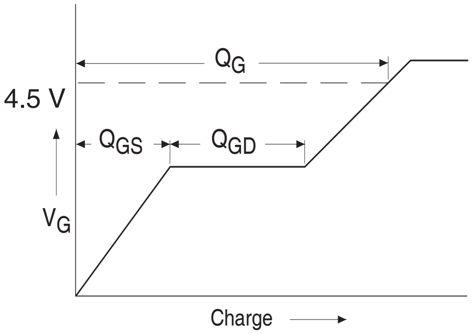


Fig 13a. Basic Gate Charge Waveform

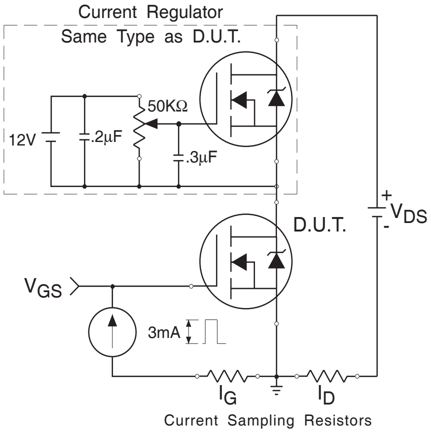
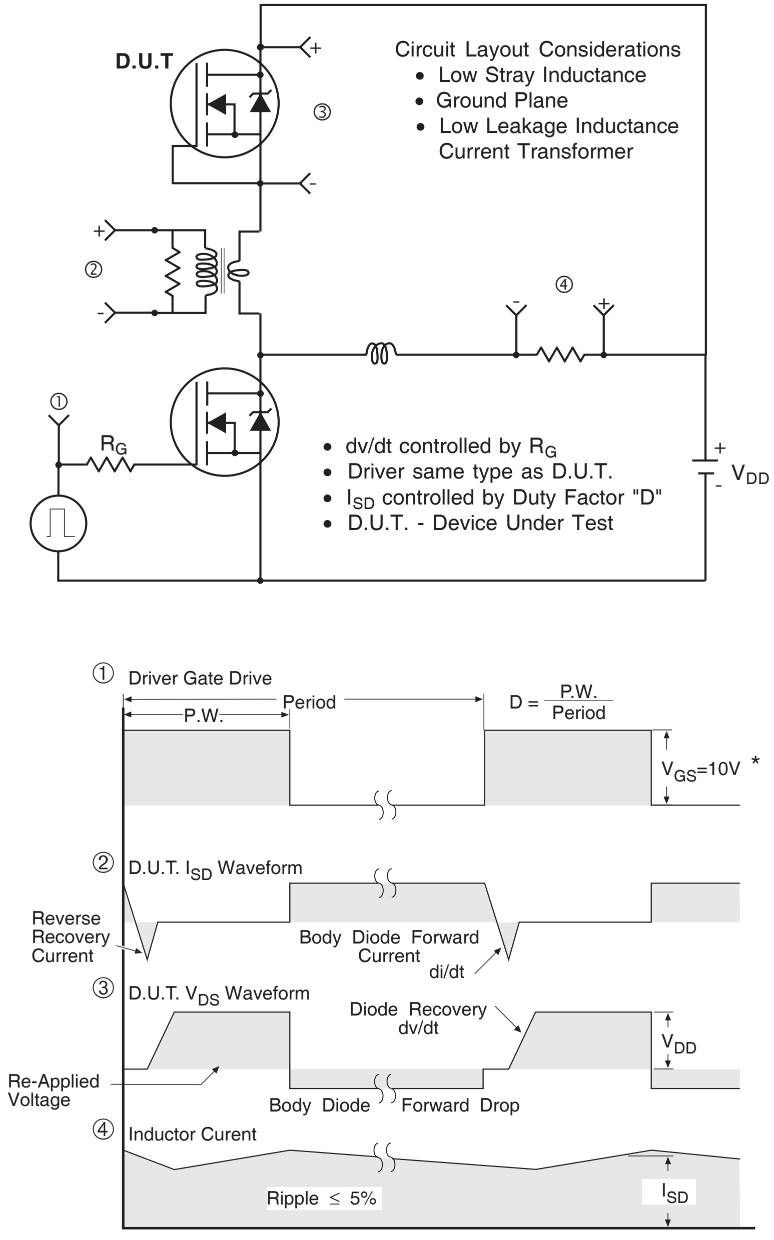


Fig 13b. Gate Charge Test Circuit

Peak Diode Recovery dv/dt Test Circuit

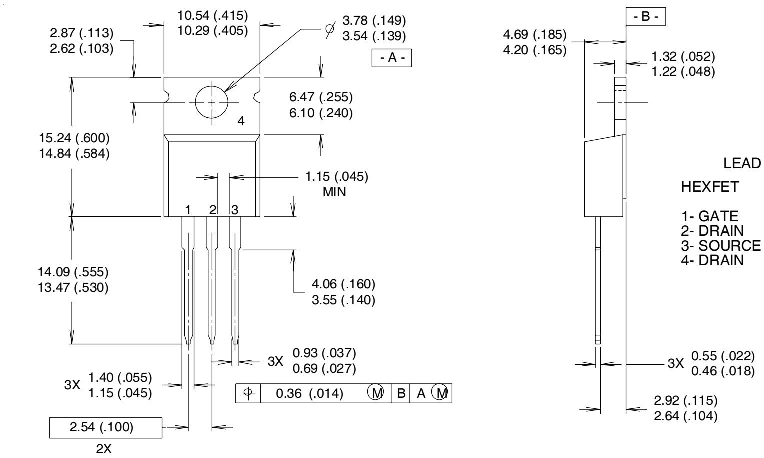


* V_{GS} = 5V for Logic Level Devices

Fig 14. For N-Channel HEXFET® Power MOSFETs

TO-220AB Package Outline

Dimensions are shown in millimeters (inches)



LEAD ASSIGNMENTS

HEXFET	IGBTs, CoPACK
1- GATE	1- GATE
2- DRAIN	2- COLLECTOR
3- SOURCE	3- EMITTER
4- DRAIN	4- COLLECTOR

NOTES:

1 DIMENSIONING & TOLERANCING PER ANSI Y14.5M, 1982.

2 CONTROLLING DIMENSION : INCH

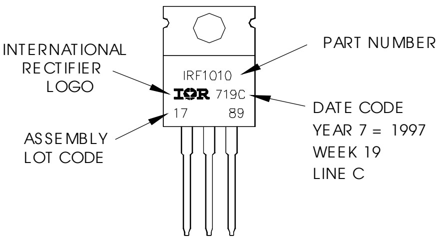
3 OUTLINE CONFORMS TO JEDEC OUTLINE TO-220AB.

4 HEATSINK & LEAD MEASUREMENTS DO NOT INCLUDE BURRS.

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"



International Rectifier

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

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CERTIFICATE OF INCORPORATION

I hereby certify that

DIGI ELECTRONICS HK LIMITED

is this day incorporated in Hong Kong under the Companies Ordinance (Chapter 622 of the Laws of Hong Kong), and that this company is a limited company.

Registrar of Companies
Hong Kong Special Administrative Region

ASA

MEMBERSHIP
Certificate

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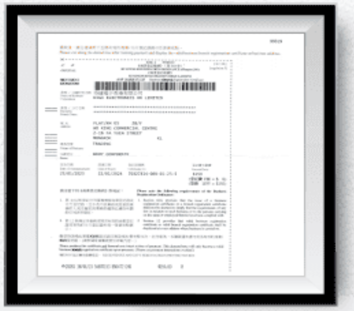

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