

International **IR** Rectifier

SMPS MOSFET

IRFU3709PbF

Applications

- High Frequency Isolated DC-DC Converters with Synchronous Rectification for Telecom and Industrial Use
- High Frequency Buck Converters for Computer Processor Power
- Lead-Free

Benefits

- Ultra-Low Gate Impedance
- Very Low R_{DS(on)} at 4.5V V_{GS}
- Fully Characterized Avalanche Voltage and Current

HEXFET® Power MOSFET

V _{DSS}	R _{DS(on)} max	I _D
30V	9.0mΩ	90A ^④



Absolute Maximum Ratings

Symbol	Parameter	Max.	Units
V _{DS}	Drain-Source Voltage	30	V
V _{GS}	Gate-to-Source Voltage	±20	V
I _D @ T _C = 25°C	Continuous Drain Current, V _{GS} @ 10V	90 ^④	A
I _D @ T _C = 100°C	Continuous Drain Current, V _{GS} @ 10V	57 ^④	
I _{DM}	Pulsed Drain Current ^①	360	
P _D @ T _C = 25°C	Maximum Power Dissipation	120	W
P _D @ T _C = 100°C	Maximum Power Dissipation	48	W
	Linear Derating Factor	0.96	mW/°C
T _J , T _{STG}	Junction and Storage Temperature Range	-55 to + 150	°C

Thermal Resistance

	Parameter	Typ.	Max.	Units
R _{θJC}	Junction-to-Case	—	1.04	°C/W
R _{θJA}	Junction-to-Ambient	—	110	

Notes ① through ④ are on page 9

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Static @ T_J = 25°C (unless otherwise specified)

	Parameter	Min.	Typ.	Max.	Units	Conditions
V _{(BR)DSS}	Drain-to-Source Breakdown Voltage	30	—	—	V	V _{GS} = 0V, I _D = 250μA
ΔV _{(BR)DSS} /ΔT _J	Breakdown Voltage Temp. Coefficient	—	0.029	—	V/°C	Reference to 25°C, I _D = 1mA
R _{DS(on)}	Static Drain-to-Source On-Resistance	—	6.9	9.0	mΩ	V _{GS} = 10V, I _D = 15A ③
		—	7.9	10.5		V _{GS} = 4.5V, I _D = 12A ③
V _{GS(th)}	Gate Threshold Voltage	1.0	—	3.0	V	V _{DS} = V _{GS} , I _D = 250μA
I _{DSS}	Drain-to-Source Leakage Current	—	—	20	μA	V _{DS} = 24V, V _{GS} = 0V
		—	—	100		V _{DS} = 24V, V _{GS} = 0V, T _J = 125°C
I _{GSS}	Gate-to-Source Forward Leakage	—	—	200	nA	V _{GS} = 16V
	Gate-to-Source Reverse Leakage	—	—	-200		V _{GS} = -16V

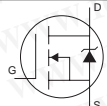
Dynamic @ T_J = 25°C (unless otherwise specified)

Symbol	Parameter	Min.	Typ.	Max.	Units	Conditions
g _{fs}	Forward Transconductance	53	—	—	S	V _{DS} = 15V, I _D = 30A
Q _g	Total Gate Charge	—	27	41	nC	I _D = 15A
Q _{gs}	Gate-to-Source Charge	—	6.7	—		V _{DS} = 15V
Q _{gd}	Gate-to-Drain ("Miller") Charge	—	9.7	—		V _{GS} = 4.5V ③
Q _{oss}	Output Gate Charge	—	22	—		V _{GS} = 0V, V _{DS} = 10V
t _{d(on)}	Turn-On Delay Time	—	11	—	ns	V _{DD} = 15V
t _r	Rise Time	—	171	—		I _D = 30A
t _{d(off)}	Turn-Off Delay Time	—	21	—		R _G = 1.8Ω
t _f	Fall Time	—	9.2	—		V _{GS} = 4.5V ③
C _{iss}	Input Capacitance	—	2672	—	pF	V _{GS} = 0V
C _{oss}	Output Capacitance	—	1064	—		V _{DS} = 16V
C _{rss}	Reverse Transfer Capacitance	—	109	—		f = 1.0MHz

Avalanche Characteristics

Symbol	Parameter	Typ.	Max.	Units
E _{AS}	Single Pulse Avalanche Energy②	—	382	mJ
I _{AR}	Avalanche Current①	—	30	A

Diode Characteristics

Symbol	Parameter	Min.	Typ.	Max.	Units	Conditions
I _S	Continuous Source Current (Body Diode)	—	—	90④	A	MOSFET symbol showing the integral reverse p-n junction diode. 
I _{SM}	Pulsed Source Current (Body Diode) ①	—	—	360		
V _{SD}	Diode Forward Voltage	—	0.88	1.3	V	T _J = 25°C, I _S = 30A, V _{GS} = 0V ③
		—	0.82	—		T _J = 125°C, I _S = 30A, V _{GS} = 0V ③
t _{rr}	Reverse Recovery Time	—	48	72	ns	T _J = 25°C, I _F = 30A, V _R = 15V
Q _{rr}	Reverse Recovery Charge	—	46	69		di/dt = 100A/μs ③
t _{rr}	Reverse Recovery Time	—	48	72	ns	T _J = 125°C, I _F = 30A, V _R = 15V
Q _{rr}	Reverse Recovery Charge	—	52	78		di/dt = 100A/μs ③

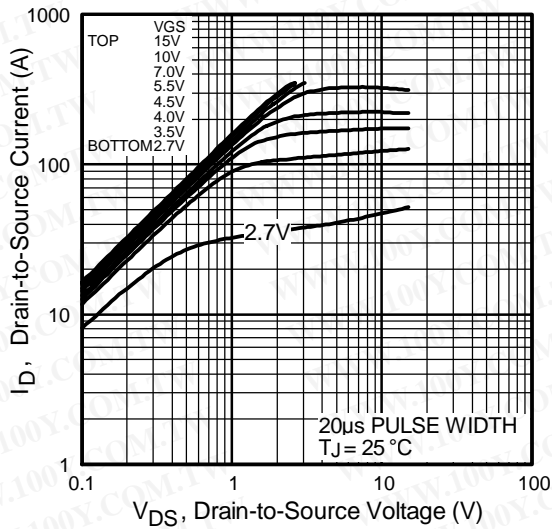


Fig 1. Typical Output Characteristics

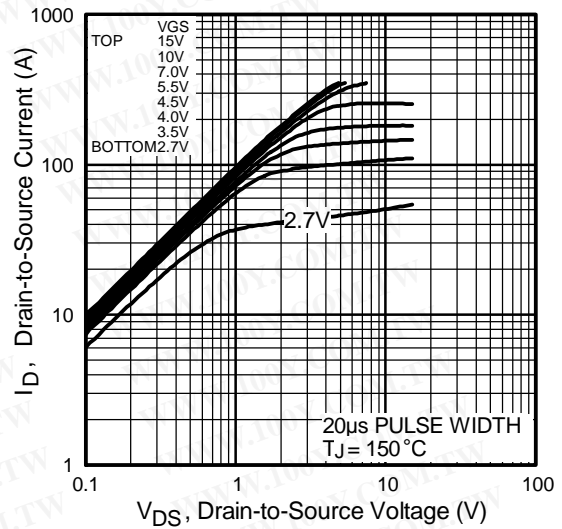


Fig 2. Typical Output Characteristics

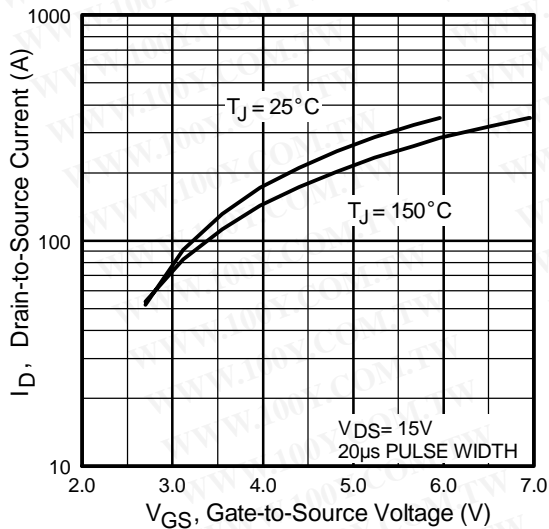


Fig 3. Typical Transfer Characteristics

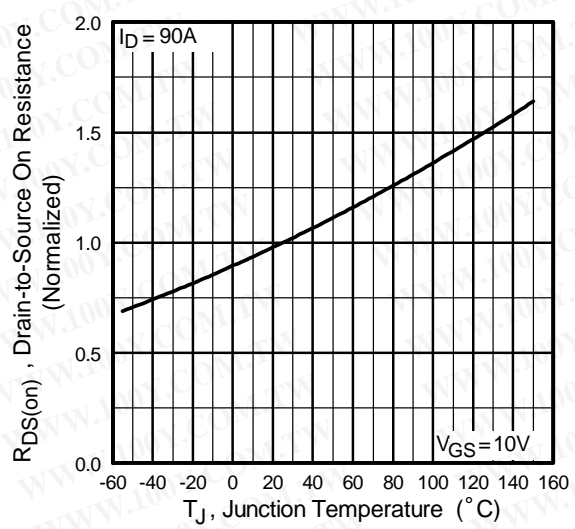


Fig 4. Normalized On-Resistance Vs. Temperature

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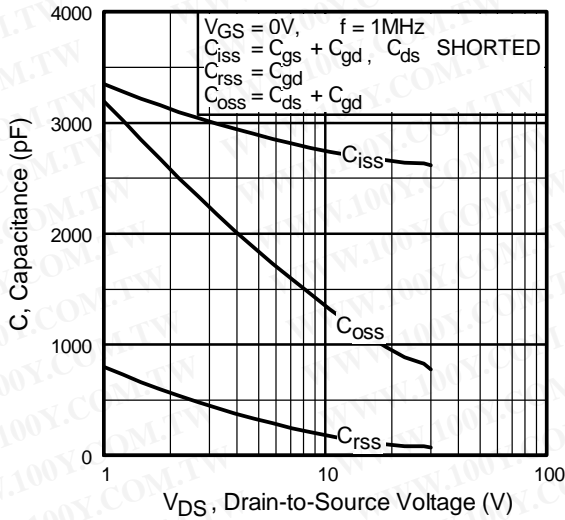


Fig 5. Typical Capacitance Vs. Drain-to-Source Voltage

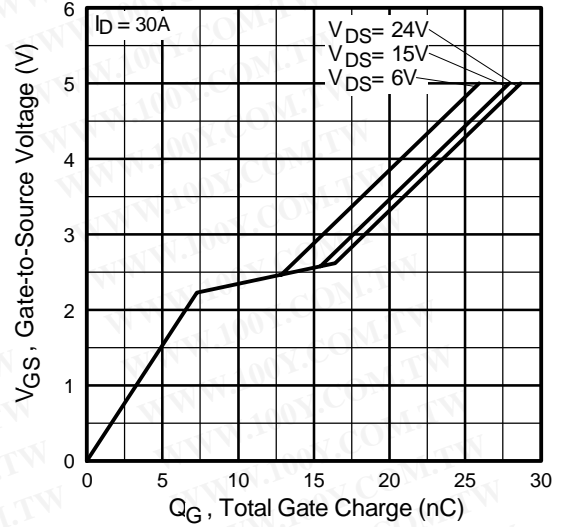


Fig 6. Typical Gate Charge Vs. Gate-to-Source Voltage

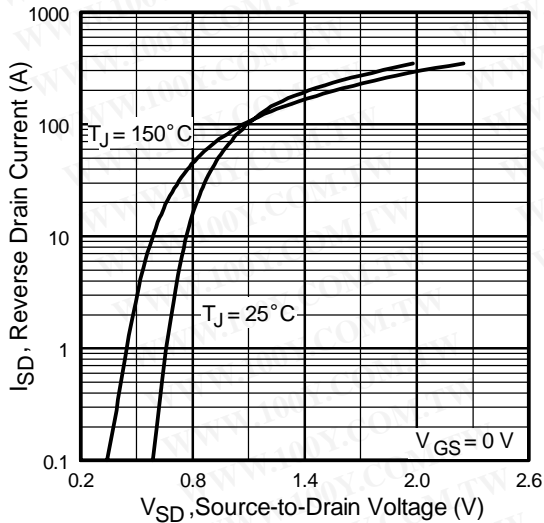


Fig 7. Typical Source-Drain Diode Forward Voltage

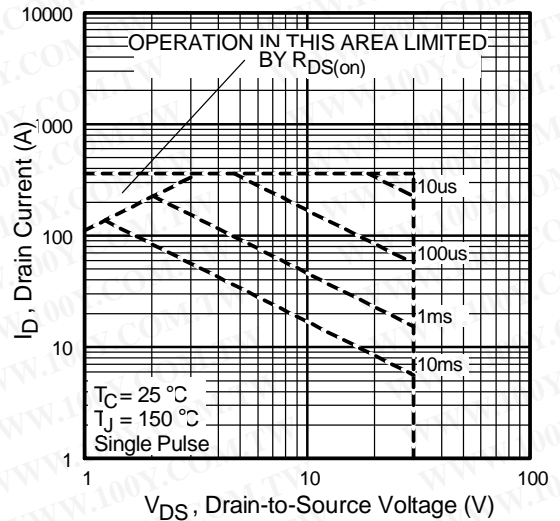


Fig 8. Maximum Safe Operating Area

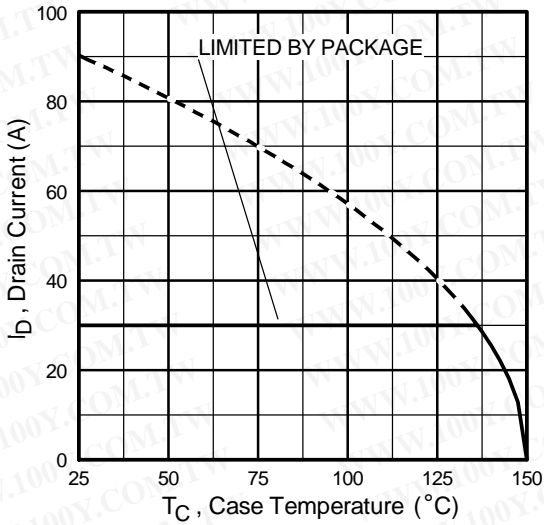


Fig 9. Maximum Drain Current Vs. Case Temperature

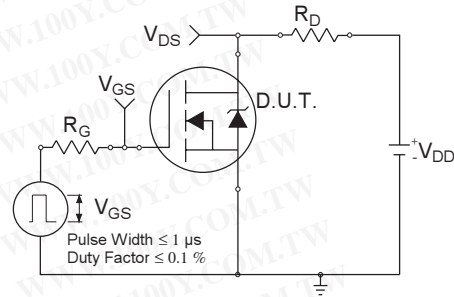


Fig 10a. Switching Time Test Circuit

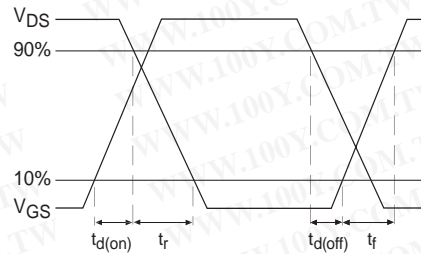


Fig 10b. Switching Time Waveforms

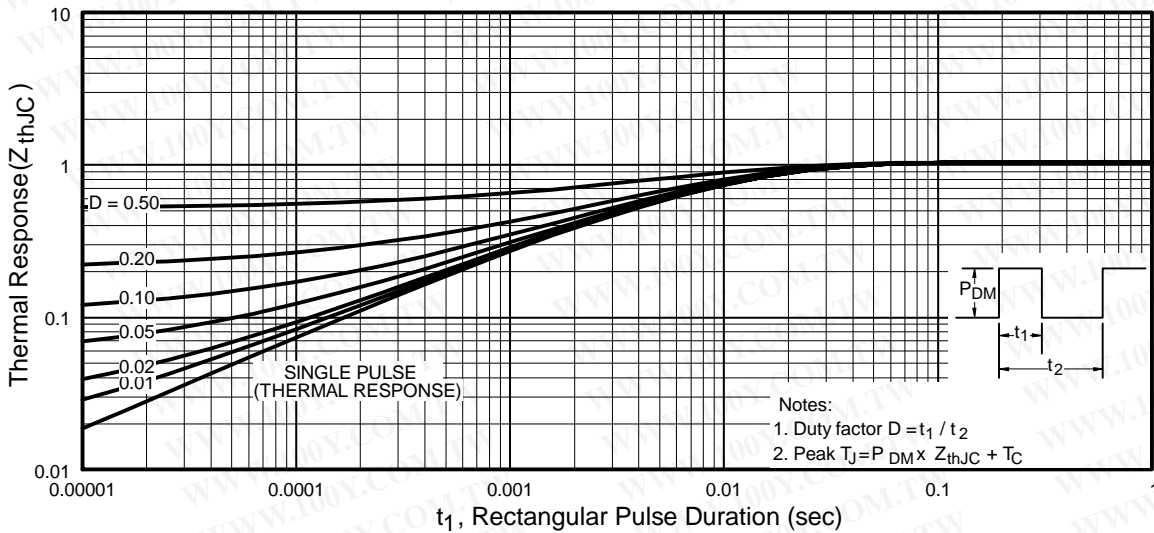


Fig 11. Maximum Effective Transient Thermal Impedance, Junction-to-Case

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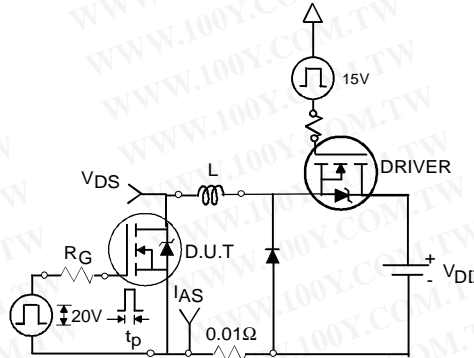


Fig 12a. Unclamped Inductive Test Circuit

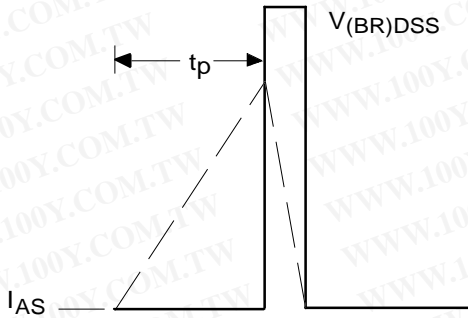


Fig 12b. Unclamped Inductive Waveforms

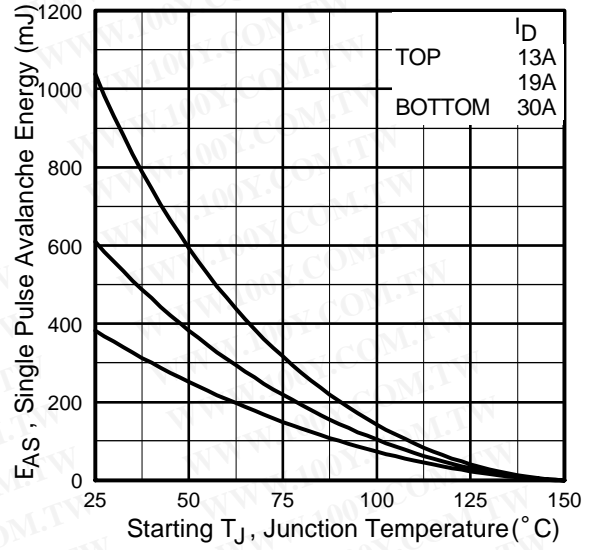


Fig 12c. Maximum Avalanche Energy Vs. Drain Current

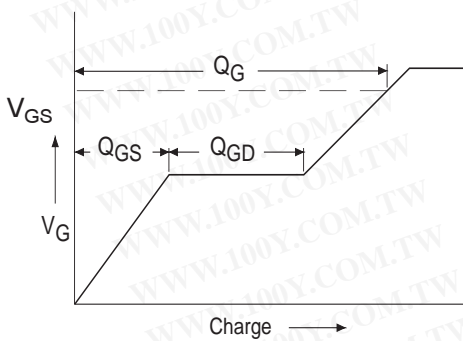


Fig 13a. Basic Gate Charge Waveform

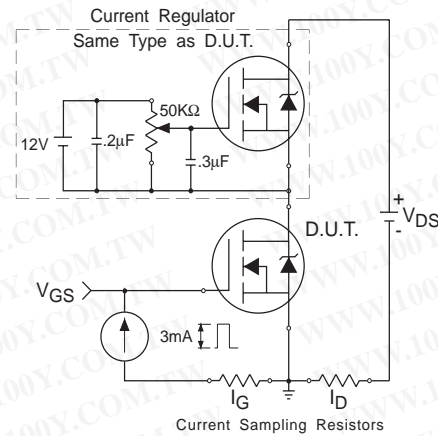
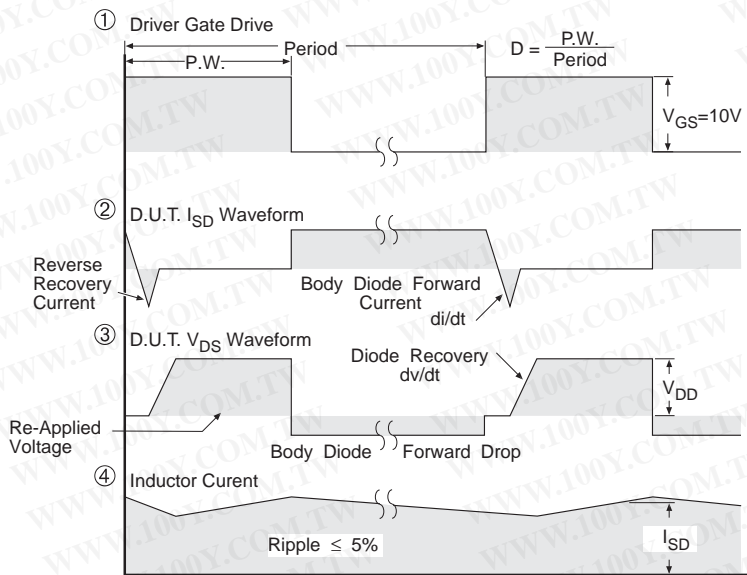
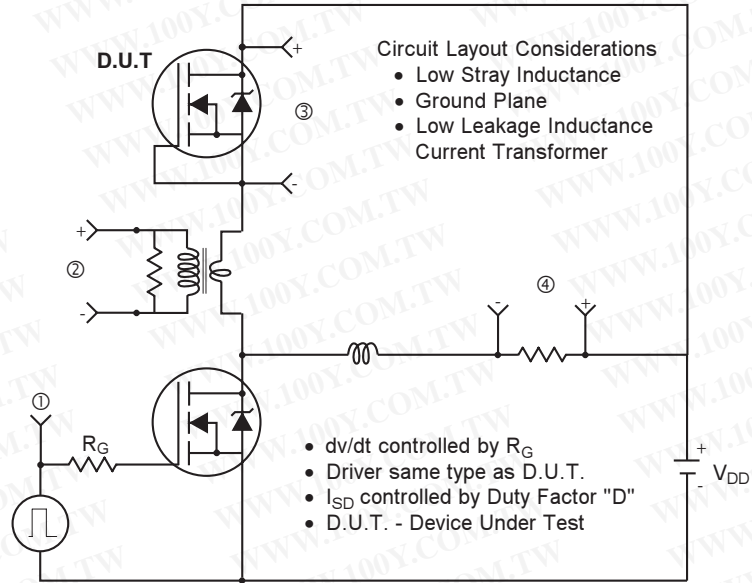


Fig 13b. Gate Charge Test Circuit

Peak Diode Recovery dv/dt Test Circuit



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

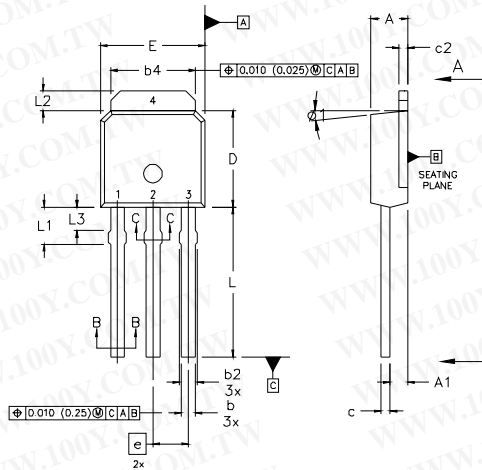
Fig 14. For N-Channel HEXFET® Power MOSFETs

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I-Pak (TO-251AA) Package Outline

Dimensions are shown in millimeters (inches)



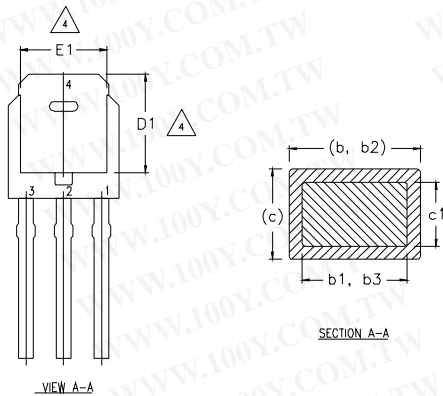
NOTES:

- 1 DIMENSIONING AND TOLERANCING PER ASME Y14.5 M- 1994.
- 2 DIMENSIONS ARE SHOWN IN MILLIMETERS [INCHES].
- 3 DIMENSION D & E DO NOT INCLUDE MOLD FLASH. MOLD FLASH SHALL NOT EXCEED 0.005" (0.127) PER SIDE. THESE DIMENSIONS ARE MEASURED AT THE OUTERMOST EXTREMES OF THE PLASTIC BODY.
- 4 THERMAL PAD CONTOUR OPTION WITHIN DIMENSION b4, L2, E1 & D1.
- 5 LEAD DIMENSION UNCONTROLLED IN L3.
- 6 DIMENSION b1, b3 APPLY TO BASE METAL ONLY.
- 7 OUTLINE CONFORMS TO JEDEC OUTLINE TO-251AA.
- 8 CONTROLLING DIMENSION : INCHES.

LEAD ASSIGNMENTS

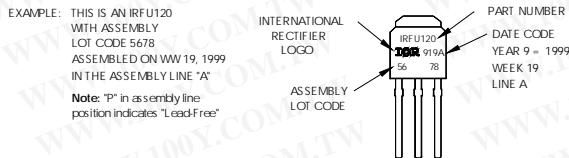
HEXFEEET

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

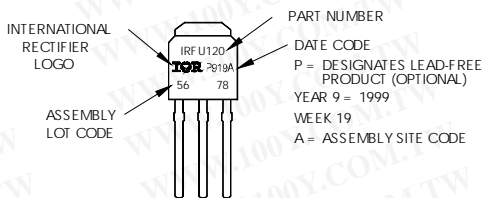


SYMBOL	DIMENSIONS				NOTES
	MILLIMETERS		INCHES		
	MIN.	MAX.	MIN.	MAX.	
A	2.18	2.39	0.086	.094	
A1	0.89	1.14	0.035	0.045	
b	0.64	0.89	0.025	0.035	
b1	0.64	0.79	0.025	0.031	4
b2	0.76	1.14	0.030	0.045	
b3	0.76	1.04	0.030	0.041	
b4	5.00	5.46	0.195	0.215	4
c	0.46	0.61	0.018	0.024	
c1	0.41	0.56	0.016	0.022	
c2	.046	0.86	0.018	0.035	
D	5.97	6.22	0.235	0.245	3, 4
D1	5.21	-	0.205	-	4
E	6.35	6.73	0.250	0.265	3, 4
E1	4.32	-	0.170	-	4
e	2.29		0.090 BSC		
L	8.89	9.60	0.350	0.380	
L1	1.91	2.29	0.075	0.090	
L2	0.89	1.27	0.035	0.050	4
L3	1.14	1.52	0.045	0.060	5
ø1	0"	15'	0"	15'	

I-Pak (TO-251AA) Part Marking Information



OR



Notes:

- ① Repetitive rating; pulse width limited by max. junction temperature.
- ② Starting $T_J = 25^\circ\text{C}$, $L = 0.85\text{mH}$
 $R_G = 25\Omega$, $I_{AS} = 30\text{A}$.
- ③ Pulse width $\leq 400\mu\text{s}$; duty cycle $\leq 2\%$.
- ④ Calculated continuous current based on maximum allowable junction temperature. Package limitation current is 30A.

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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