International
IOR Rectifier

PD - 93935B

SMPS MOSFET

IRFR3708
IRFU3708

HEXFET® Power MOSFET

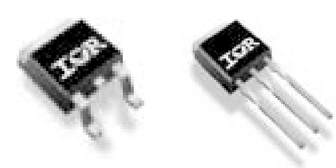
V_{DSS}	$R_{DS(on)}$ max	I_D
30V	**12.5mΩ**	**61A**④

Applications

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

Benefits

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



D-Pak IRFR3708 I-Pak IRFU3708

Absolute Maximum Ratings

Symbol	Parameter	Max.	Units
V_{DS}	Drain-Source Voltage	30	V
V_{GS}	Gate-to-Source Voltage	± 12	V
I_D @ T_A = 25°C	Continuous Drain Current, V_{GS} @ 10V	61 ④	
I_D @ T_A = 70°C	Continuous Drain Current, V_{GS} @ 10V	51 ④	A
I_{DM}	Pulsed Drain Current①	244	
P_D @T_A = 25°C	Maximum Power Dissipation③	87	W
P_D @T_A = 70°C	Maximum Power Dissipation③	61	W
	Linear Derating Factor	0.58	W/°C
T_J , T_{STG}	Junction and Storage Temperature Range	-55 to + 175	°C

Thermal Resistance

	Parameter	Typ.	Max.	Units
$R_{\theta JC}$	Junction-to-Case	—	1.73	
$R_{\theta JA}$	Junction-to-Ambient (PCB mount)*	—	50	°C/W
$R_{\theta JA}$	Junction-to-Ambient	—	110	

* When mounted on 1" square PCB (FR-4 or G-10 Material) .
For recommended footprint and soldering techniques refer to application note #AN-994

Notes ① through ④ are on page 9

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
$\Delta V_{(BR)DSS}/\Delta T_J$	Breakdown Voltage Temp. Coefficient	——	0.028	——	V/°C	Reference to 25°C, I_D = 1mA
$R_{DS(on)}$	Static Drain-to-Source On-Resistance	——	8.5	12.5	mΩ	V_{GS} = 10V, I_D = 15A ③
		——	10.0	14.0		V_{GS} = 4.5V, I_D = 12A ③
		——	15.0	30.0		V_{GS} = 2.8V, I_D = 7.5A ③
$V_{GS(th)}$	Gate Threshold Voltage	0.6	——	2.0	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} = 12V
	Gate-to-Source Reverse Leakage	——	——	-200		V_{GS} = -12V

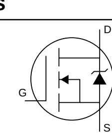
Dynamic @ T_J = 25°C (unless otherwise specified)

Symbol	Parameter	Min.	Typ.	Max.	Units	Conditions
g_{fs}	Forward Transconductance	49	——	——	S	V_{DS} = 15V, I_D = 50A
Q_g	Total Gate Charge	——	24	——	nC	I_D = 24.8A
Q_{gs}	Gate-to-Source Charge	——	6.7	——		V_{DS} = 15V
Q_{gd}	Gate-to-Drain ("Miller") Charge	——	5.8	——		V_{GS} = 4.5V ③
Q_{oss}	Output Gate Charge	——	14	21		V_{GS} = 0V, I_D = 24.8A, V_{DS} = 15V
$t_{d(on)}$	Turn-On Delay Time	——	7.2	——	ns	V_{DD} = 15V
t_r	Rise Time	——	50	——		I_D = 24.8A
$t_{d(off)}$	Turn-Off Delay Time	——	17.6	——		R_G = 0.6Ω
t_f	Fall Time	——	3.7	——		V_{GS} = 4.5V ③
C_{iss}	Input Capacitance	——	2417	——	pF	V_{GS} = 0V
C_{oss}	Output Capacitance	——	707	——		V_{DS} = 15V
C_{rss}	Reverse Transfer Capacitance	——	52	——		ƒ = 1.0MHz

Avalanche Characteristics

Symbol	Parameter	Typ.	Max.	Units
E_{AS}	Single Pulse Avalanche Energy②	——	213	mJ
I_{AR}	Avalanche Current①	——	62	A

Diode Characteristics

Symbol	Parameter	Min.	Typ.	Max.	Units	Conditions
I_S	Continuous Source Current (Body Diode)	——	——	61④	A	MOSFET symbol showing the integral reverse p-n junction diode. 
I_{SM}	Pulsed Source Current (Body Diode) ①	——	——	244		
V_{SD}	Diode Forward Voltage	——	0.88	1.3	V	T_J = 25°C, I_S = 31A, V_{GS} = 0V ③
		——	0.80	——		T_J = 125°C, I_S = 31A, V_{GS} = 0V ③
t_{rr}	Reverse Recovery Time	——	41	62	ns	T_J = 25°C, I_F = 31A, V_R=20V
Q_{rr}	Reverse Recovery Charge	——	64	96	nC	di/dt = 100A/µs ③
t_{rr}	Reverse Recovery Time	——	43	65	ns	T_J = 125°C, I_F = 31A, V_R=20V
Q_{rr}	Reverse Recovery Charge	——	70	105	nC	di/dt = 100A/µs ③

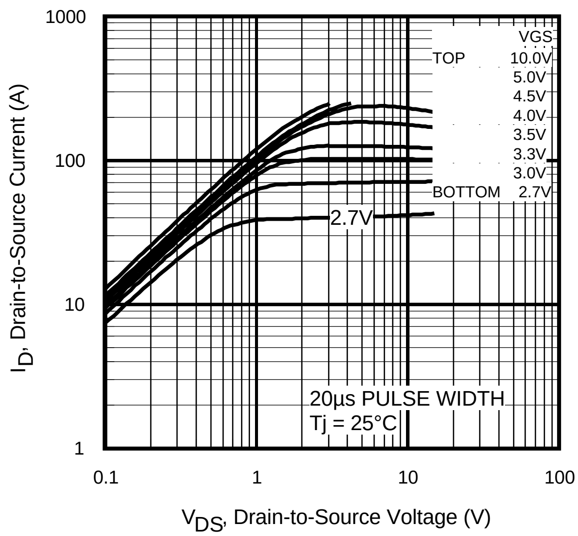


Fig 1. Typical Output Characteristics

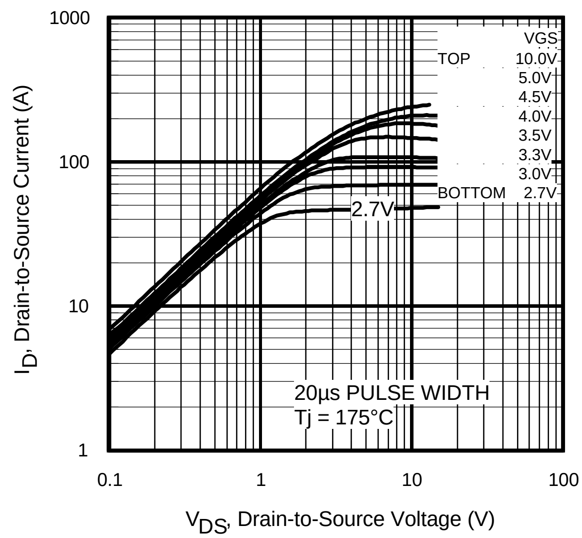


Fig 2. Typical Output Characteristics

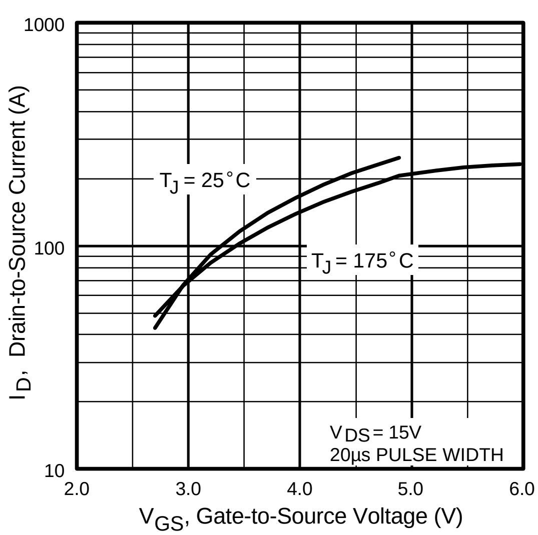


Fig 3. Typical Transfer Characteristics

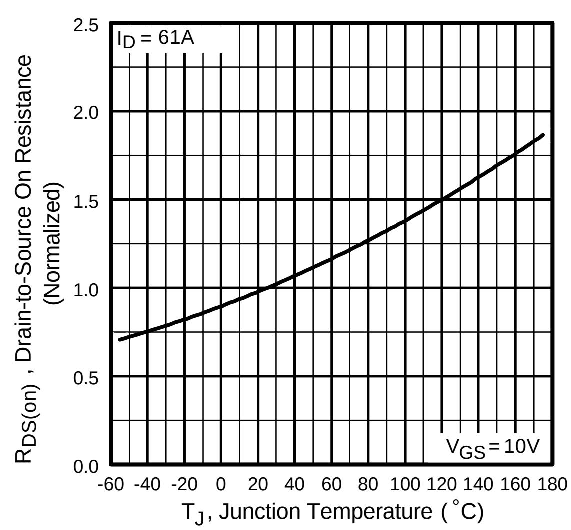


Fig 4. Normalized On-Resistance Vs. Temperature

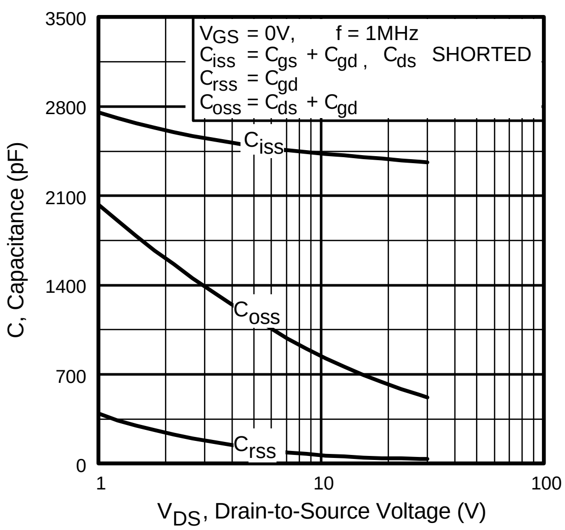


Fig 5. Typical Capacitance Vs. Drain-to-Source Voltage

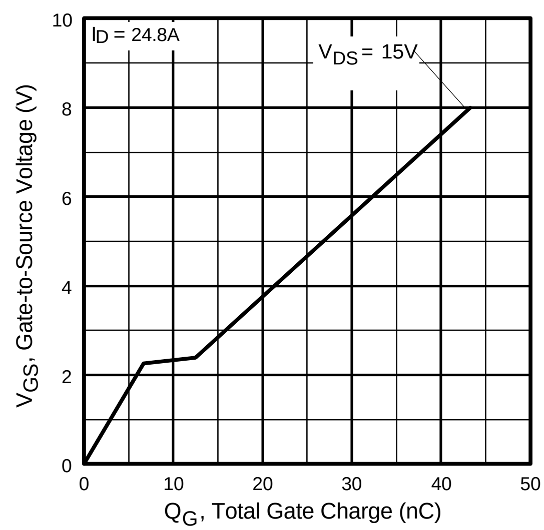


Fig 6. Typical Gate Charge Vs. Gate-to-Source Voltage

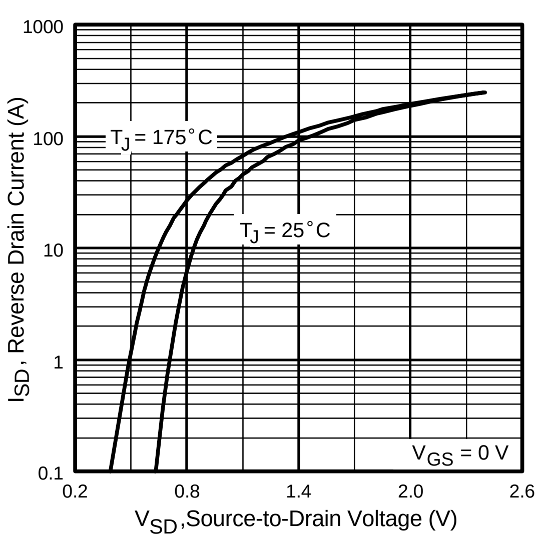


Fig 7. Typical Source-Drain Diode Forward Voltage

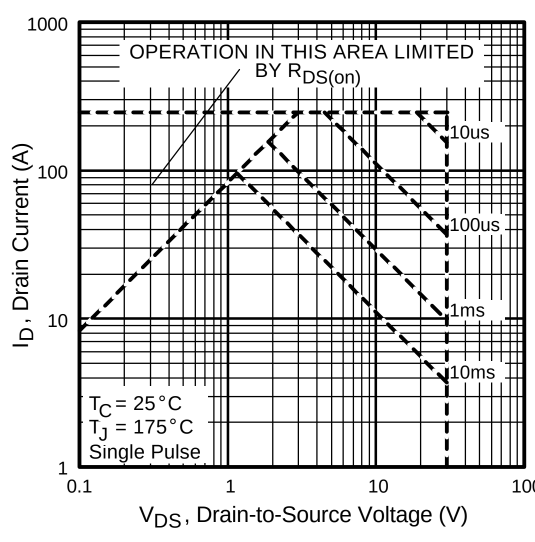


Fig 8. Maximum Safe Operating Area

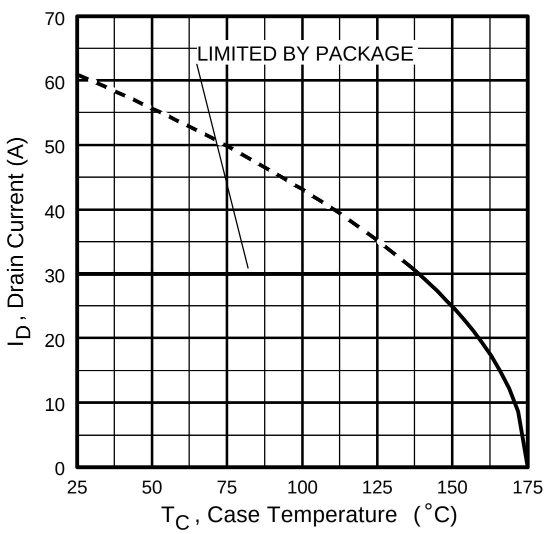


Fig 9. Maximum Drain Current Vs. Case Temperature

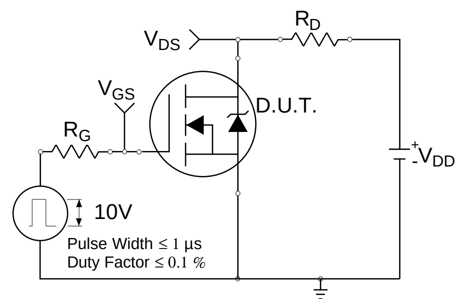


Fig 10a. Switching Time Test Circuit

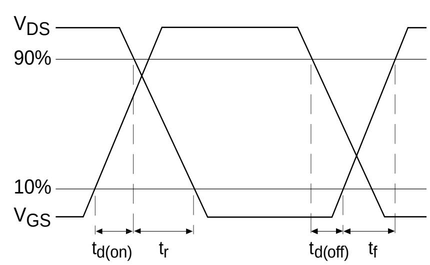


Fig 10b. Switching Time Waveforms

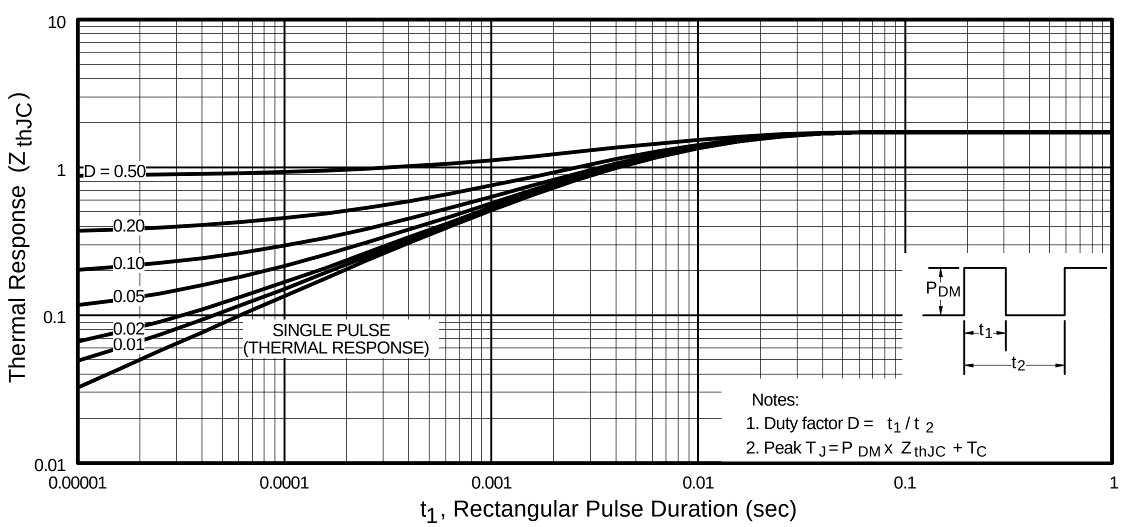


Fig 11. Maximum Effective Transient Thermal Impedance, Junction-to-Case

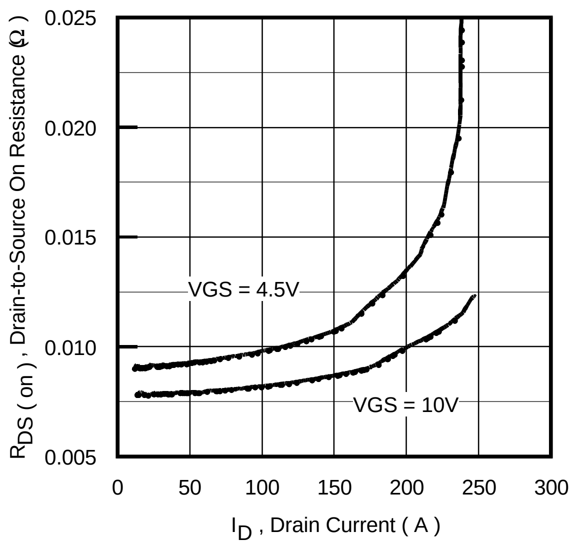


Fig 12. On-Resistance Vs. Drain Current

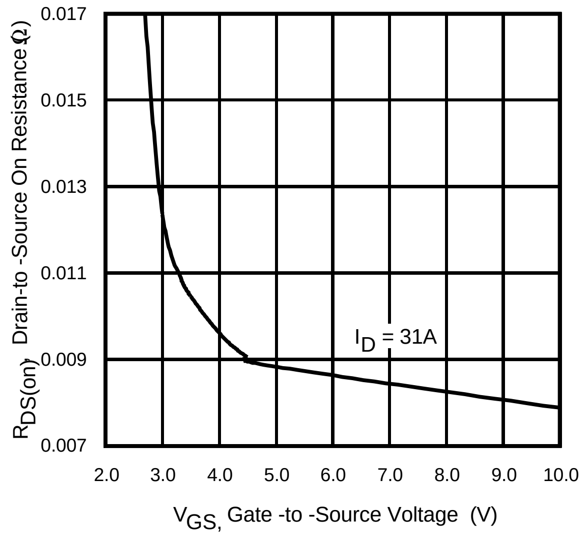


Fig 13. On-Resistance Vs. Gate Voltage

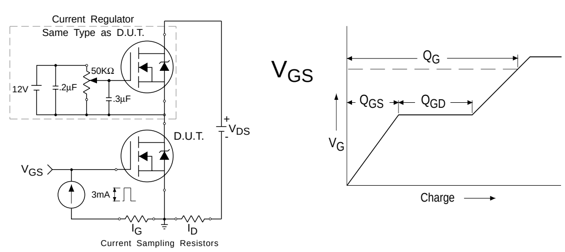
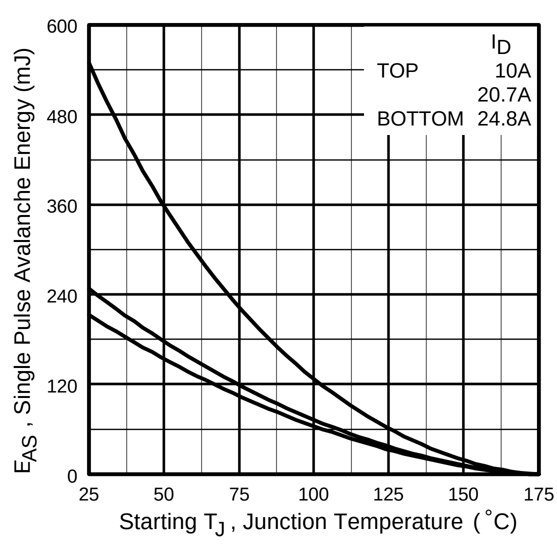


Fig 14a&b. Gate Charge Test Circuit and Waveform



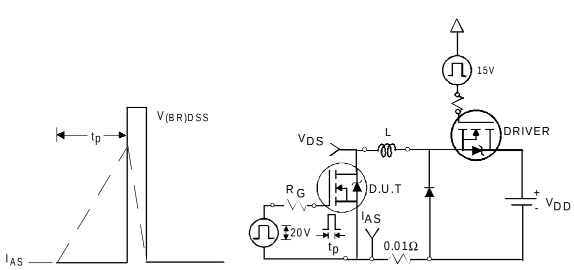
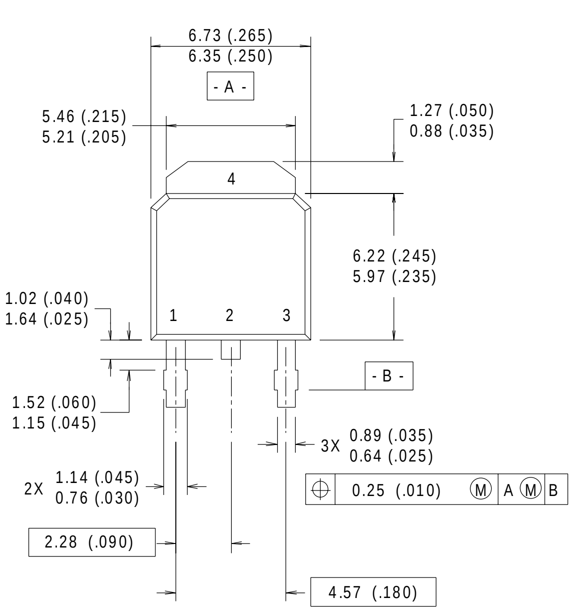


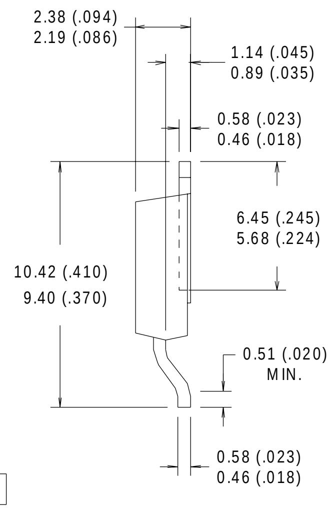
Fig 15a&b. Unclamped Inductive Test circuit and Waveforms

Fig 15c. Maximum Avalanche Energy Vs. Drain Current

D-Pak (TO-252AA) Package Outline

Dimensions are shown in millimeters (inches)



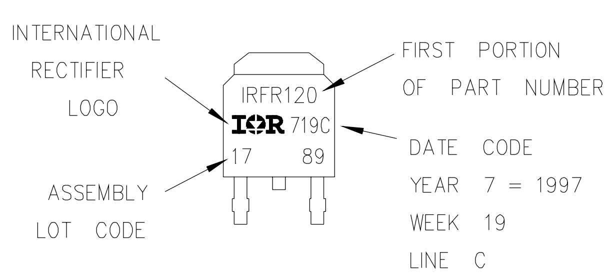


LEAD ASSIGNMENTS
1 - GATE
2 - DRAIN
3 - SOURCE
4 - DRAIN

NOTES:
1 DIMENSIONING & TOLERANCING PER ANSI Y14.5M, 1982.
2 CONTROLLING DIMENSION : INCH.
3 CONFORMS TO JEDEC OUTLINE TO-252AA.
4 DIMENSIONS SHOWN ARE BEFORE SOLDER DIP, SOLDER DIP MAX. +0.16 (.006).

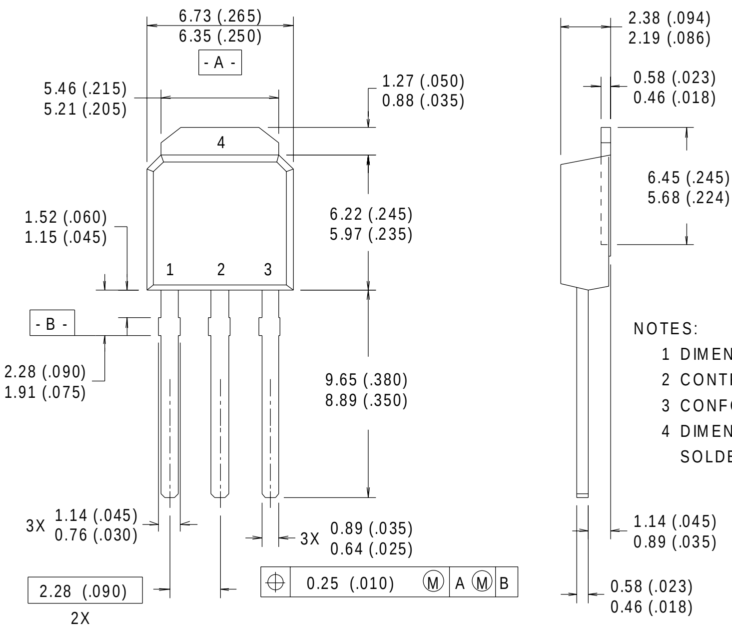
D-Pak (TO-252AA) Part Marking Information

EXAMPLE: THIS IS AN IRFR120
LOT CODE 1789
ASSEMBLED ON WW 19, 1997
IN THE ASSEMBLY LINE "C"



I-Pak (TO-251AA) Package Outline

Dimensions are shown in millimeters (inches)

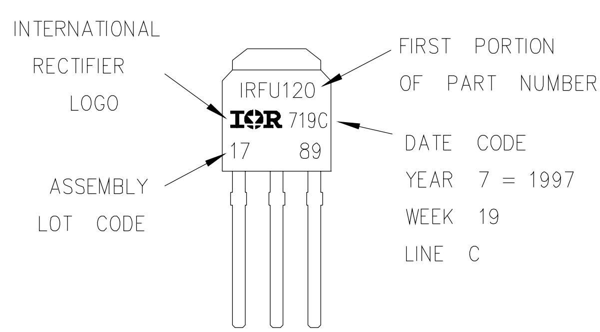


LEAD ASSIGNMENTS
1 - GATE
2 - DRAIN
3 - SOURCE
4 - DRAIN

NOTES:
1 DIMENSIONING & TOLERANCING PER ANSI Y14.5M, 1982.
2 CONTROLLING DIMENSION : INCH.
3 CONFORMS TO JEDEC OUTLINE TO-252AA.
4 DIMENSIONS SHOWN ARE BEFORE SOLDER DIP, SOLDER DIP MAX. +0.16 (.006).

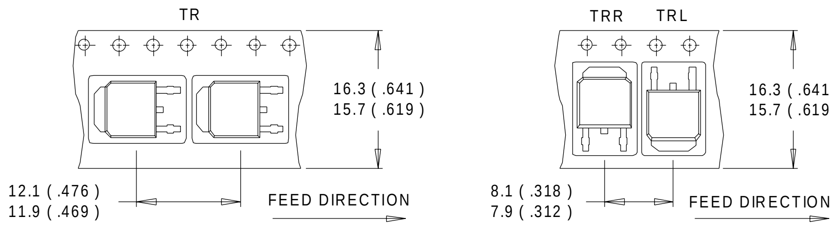
I-Pak (TO-251AA) Part Marking Information

EXAMPLE: THIS IS AN IRFU120
LOT CODE 1789
ASSEMBLED ON WW 19, 1997
IN THE ASSEMBLY LINE "C"

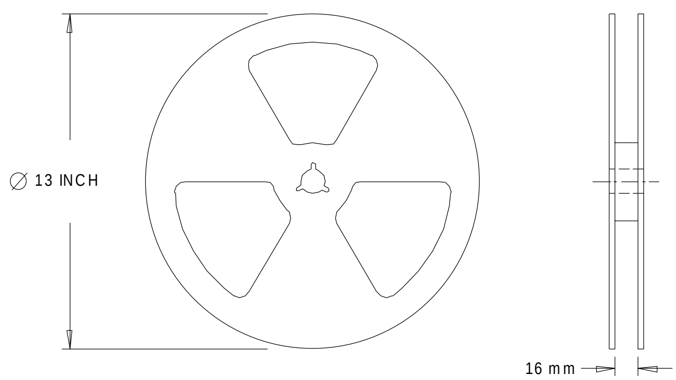


D-Pak (TO-252AA) Tape & Reel Information

Dimensions are shown in millimeters (inches)



NOTES :
1. CONTROLLING DIMENSION : MILLIMETER.
2. ALL DIMENSIONS ARE SHOWN IN MILLIMETERS (INCHES).
3. OUTLINE CONFORMS TO EIA-481 & EIA-541.



NOTES :
1. OUTLINE CONFORMS TO EIA-481.

Notes:

① Repetitive rating; pulse width limited by max. junction temperature.

② Starting T_J = 25°C, L = 0.7 mH R_G = 25Ω, I_{AS} = 24.8 A.

③ Pulse width ≤ 300µs; duty cycle ≤ 2%.

④ Calculated continuous current based on maximum allowable junction temperature. Package limitation current is 30A.

International Rectifier

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IR ITALY: Via Liguria 49, 10071 Borgaro, Torino Tel: ++ 39 011 451 0111
IR JAPAN: K&H Bldg., 2F, 30-4 Nishi-Ikebukuro 3-Chome, Toshima-Ku, Tokyo 171 Tel: 81 (0)3 3983 0086
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Data and specifications subject to change without notice. 8/00

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