

HEXFET® Power MOSFET

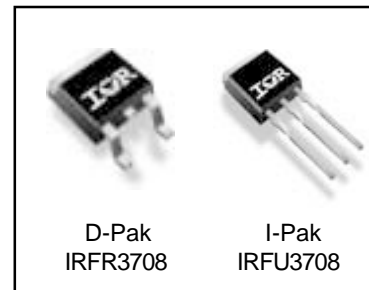
Applications

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

V_{DSS}	$R_{DS(on)}$ max	I_D
30V	12.5m Ω	61A ^④

Benefits

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



Absolute Maximum Ratings

Symbol	Parameter	Max.	Units
V_{DS}	Drain-Source Voltage	30	V
V_{GS}	Gate-to-Source Voltage	± 12	V
$I_D @ T_A = 25^\circ\text{C}$	Continuous Drain Current, $V_{GS} @ 10\text{V}$	61 ^④	A
$I_D @ T_A = 70^\circ\text{C}$	Continuous Drain Current, $V_{GS} @ 10\text{V}$	51 ^④	
I_{DM}	Pulsed Drain Current ^①	244	
$P_D @ T_A = 25^\circ\text{C}$	Maximum Power Dissipation ^③	87	W
$P_D @ T_A = 70^\circ\text{C}$	Maximum Power Dissipation ^③	61	W
	Linear Derating Factor	0.58	W/ $^\circ\text{C}$
T_J, T_{STG}	Junction and Storage Temperature Range	-55 to +175	$^\circ\text{C}$

Thermal Resistance

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

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

	Parameter	Min.	Typ.	Max.	Units	Conditions
$V_{(BR)DSS}$	Drain-to-Source Breakdown Voltage	30	—	—	V	$V_{GS} = 0V, I_D = 250\mu A$
$\Delta V_{(BR)DSS}/\Delta T_J$	Breakdown Voltage Temp. Coefficient	—	0.028	—	V/°C	Reference to $25^\circ\text{C}, I_D = 1\text{mA}$
$R_{DS(on)}$	Static Drain-to-Source On-Resistance	—	8.5	12.5	m Ω	$V_{GS} = 10V, I_D = 15A$ 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	$V_{DS} = V_{GS}, I_D = 250\mu A$
I_{DSS}	Drain-to-Source Leakage Current	—	—	20	μA	$V_{DS} = 24V, V_{GS} = 0V$
		—	—	100		$V_{DS} = 24V, V_{GS} = 0V, T_J = 125^\circ\text{C}$
I_{GSS}	Gate-to-Source Forward Leakage	—	—	200	nA	$V_{GS} = 12V$
	Gate-to-Source Reverse Leakage	—	—	-200		$V_{GS} = -12V$

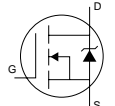
Dynamic @ $T_J = 25^\circ\text{C}$ (unless otherwise specified)

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	$I_D = 24.8A$ $V_{DS} = 15V$ $V_{GS} = 4.5V$ ③
Q_{gs}	Gate-to-Source Charge	—	6.7	—		
Q_{gd}	Gate-to-Drain ("Miller") Charge	—	5.8	—		
Q_{oss}	Output Gate Charge	—	14	21		
$t_{d(on)}$	Turn-On Delay Time	—	7.2	—	ns	$V_{DD} = 15V$ $I_D = 24.8A$ $R_G = 0.6\Omega$ $V_{GS} = 4.5V$ ③
t_r	Rise Time	—	50	—		
$t_{d(off)}$	Turn-Off Delay Time	—	17.6	—		
t_f	Fall Time	—	3.7	—		
C_{iss}	Input Capacitance	—	2417	—	pF	$V_{GS} = 0V$ $V_{DS} = 15V$ $f = 1.0\text{MHz}$
C_{oss}	Output Capacitance	—	707	—		
C_{rss}	Reverse Transfer Capacitance	—	52	—		

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	$T_J = 25^\circ\text{C}, I_S = 31A, V_{GS} = 0V$ ③
		—	0.80	—		$T_J = 125^\circ\text{C}, I_S = 31A, V_{GS} = 0V$ ③
t_{rr}	Reverse Recovery Time	—	41	62	ns	$T_J = 25^\circ\text{C}, I_F = 31A, V_R = 20V$
Q_{rr}	Reverse Recovery Charge	—	64	96	nC	$di/dt = 100A/\mu s$ ③
t_{rr}	Reverse Recovery Time	—	43	65	ns	$T_J = 125^\circ\text{C}, I_F = 31A, V_R = 20V$
Q_{rr}	Reverse Recovery Charge	—	70	105	nC	$di/dt = 100A/\mu s$ ③

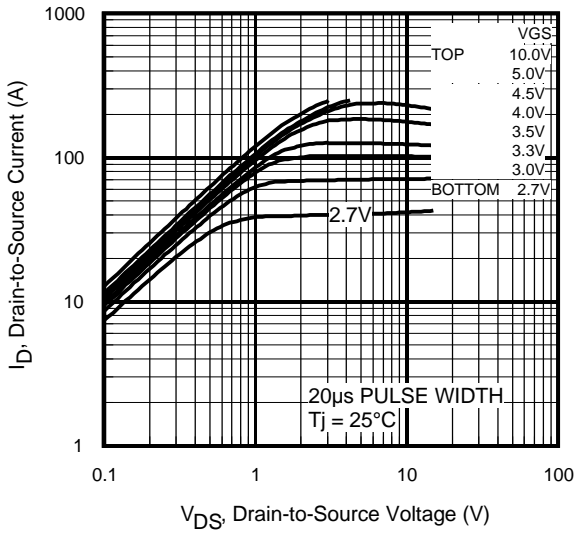


Fig 1. Typical Output Characteristics

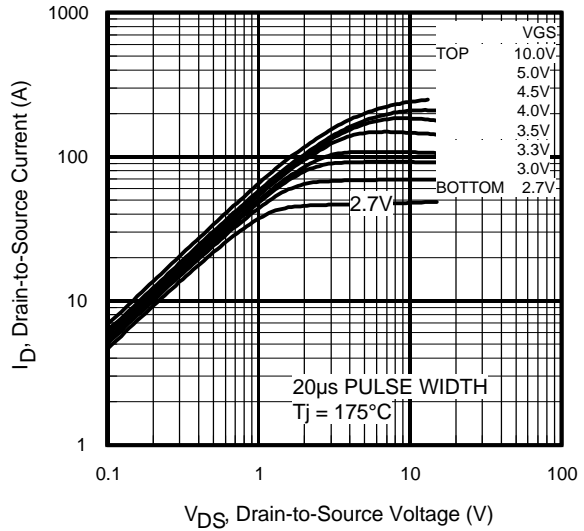


Fig 2. Typical Output Characteristics

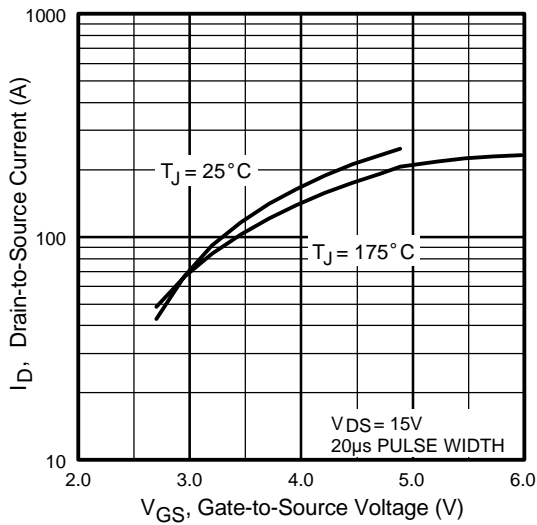


Fig 3. Typical Transfer Characteristics

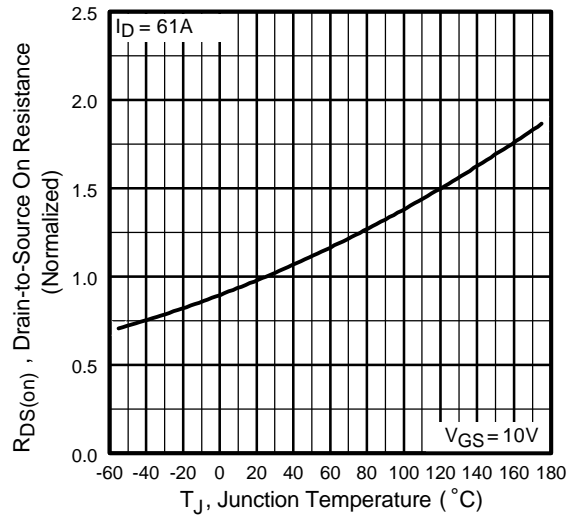


Fig 4. Normalized On-Resistance Vs. Temperature

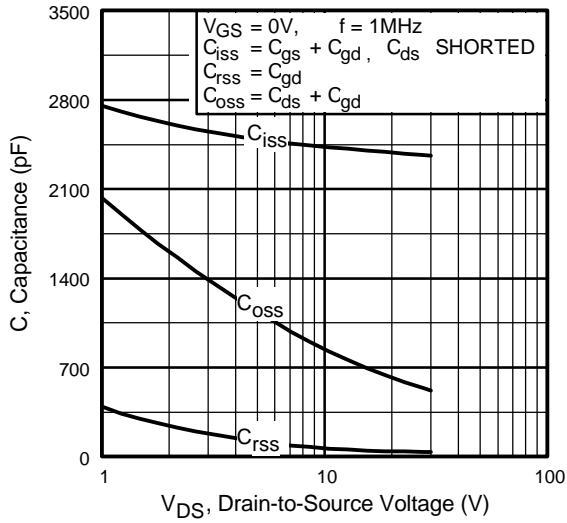


Fig 5. Typical Capacitance Vs. Drain-to-Source Voltage

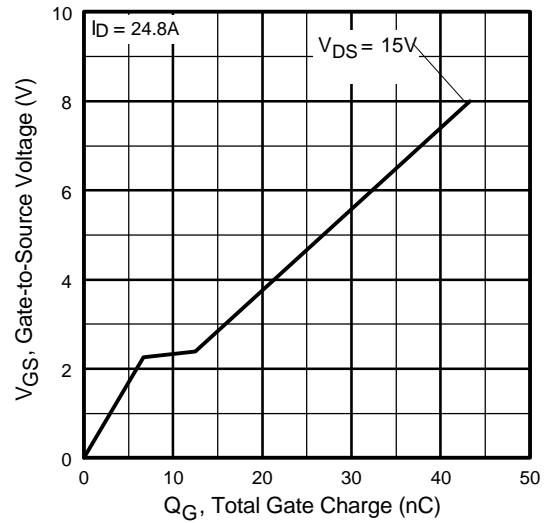


Fig 6. Typical Gate Charge Vs. Gate-to-Source Voltage

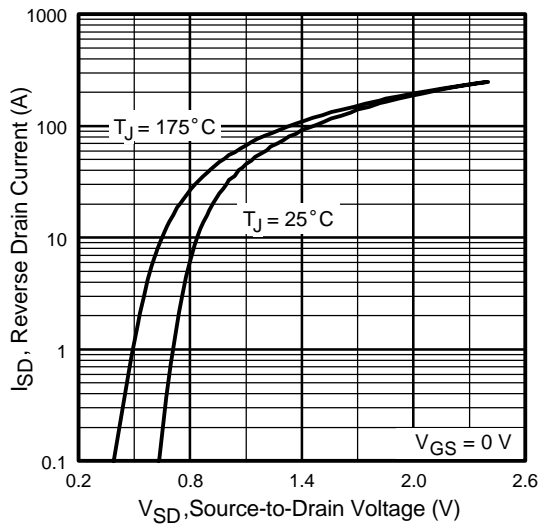


Fig 7. Typical Source-Drain Diode Forward Voltage

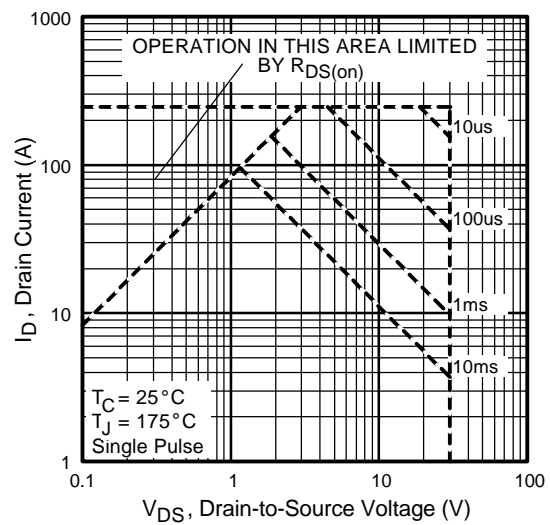


Fig 8. Maximum Safe Operating Area

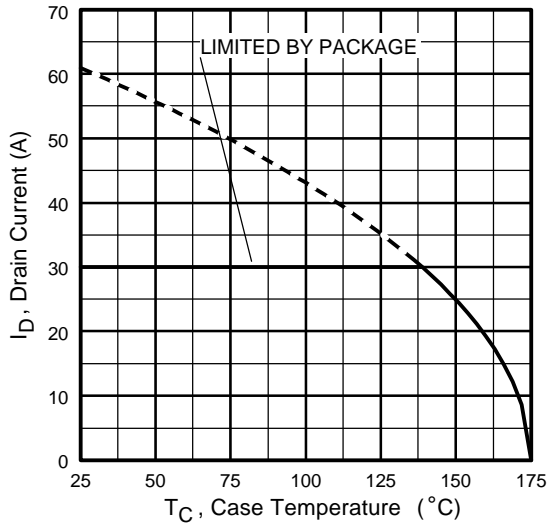


Fig 9. Maximum Drain Current Vs. Case Temperature

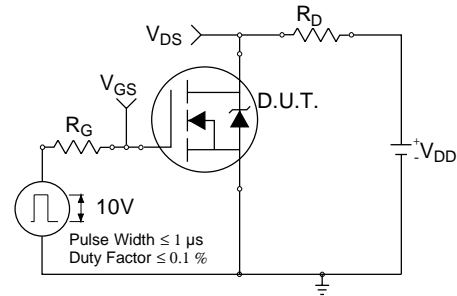


Fig 10a. Switching Time Test Circuit

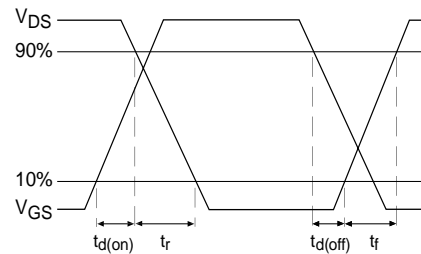


Fig 10b. Switching Time Waveforms

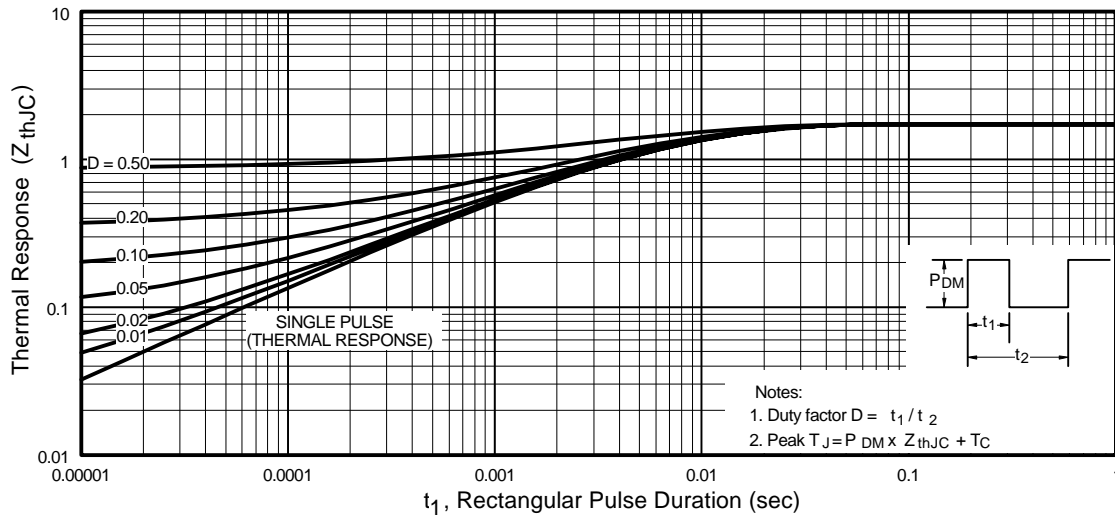


Fig 11. Maximum Effective Transient Thermal Impedance, Junction-to-Case

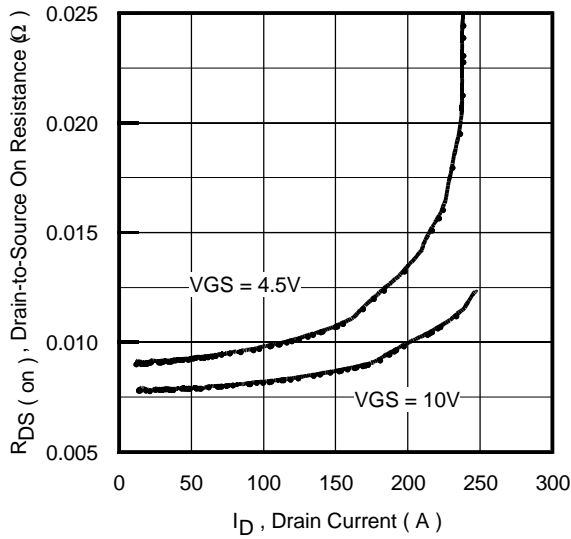


Fig 12. On-Resistance Vs. Drain Current

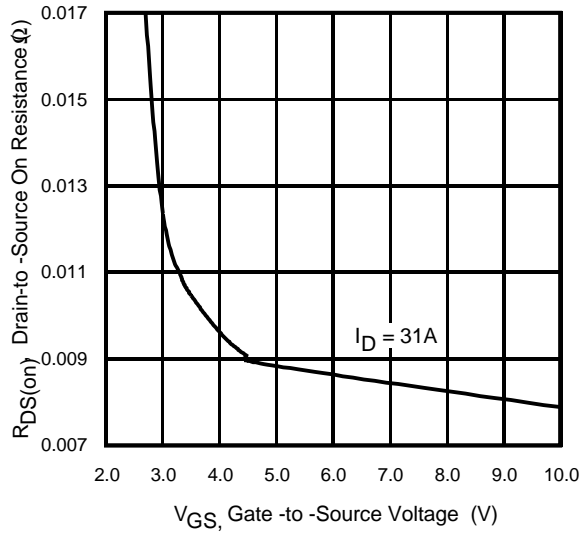


Fig 13. On-Resistance Vs. Gate Voltage

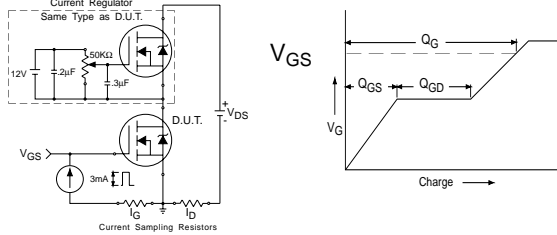


Fig 14a&b. Gate Charge Test Circuit and Waveform

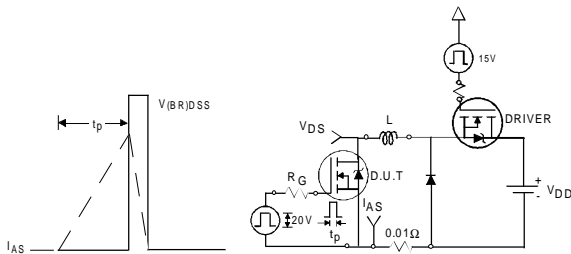


Fig 15a&b. Unclamped Inductive Test circuit and Waveforms

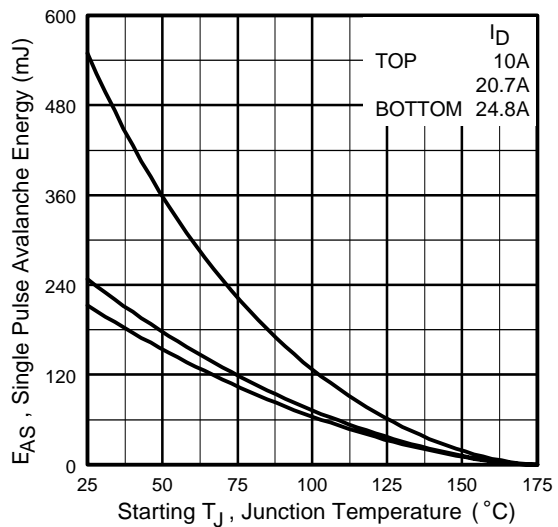
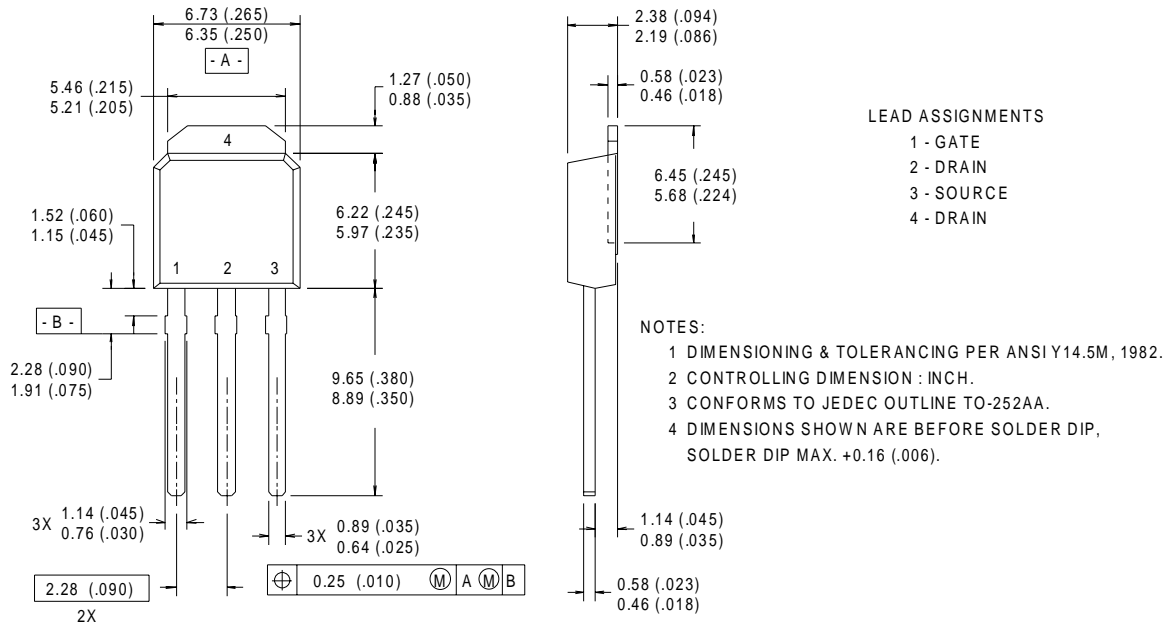


Fig 15c. Maximum Avalanche Energy Vs. Drain Current

IRFR/U3708

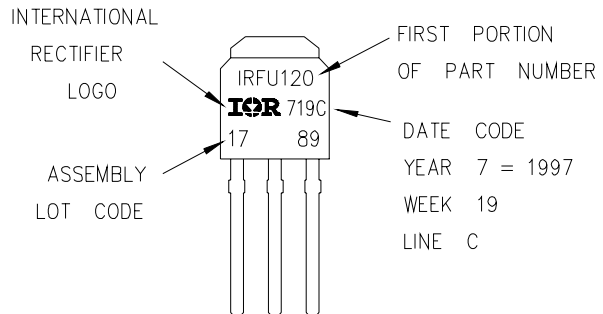
I-Pak (TO-251AA) Package Outline

Dimensions are shown in millimeters (inches)



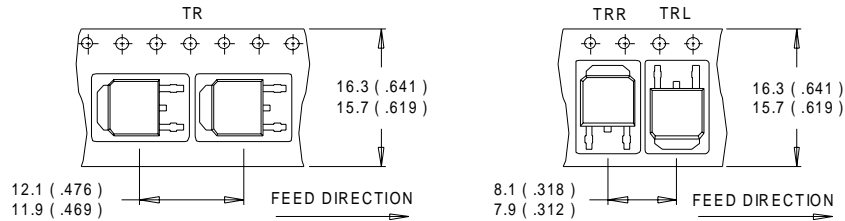
I-Pak (TO-251AA) Part Marking Information

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

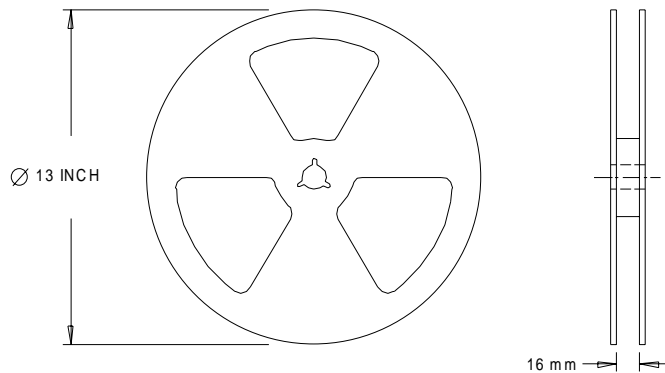


D-Pak (TO-252AA) Tape & Reel Information

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 $T_J = 25^\circ\text{C}$, $L = 0.7 \text{ mH}$
 $R_G = 25\Omega$, $I_{AS} = 24.8 \text{ A}$.
- ③ Pulse width $\leq 300\mu\text{s}$; duty cycle $\leq 2\%$.
- ④ Calculated continuous current based on maximum allowable junction temperature. Package limitation current is 30A.