



**THE DATASHEET OF  
IRFR3707TR**



**Applications**

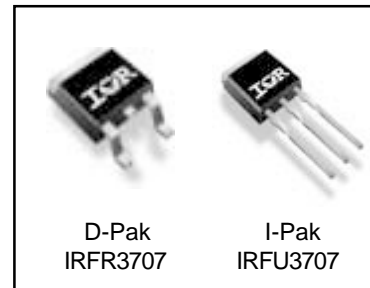
- High Frequency DC-DC Isolated Converters with Synchronous Rectification for Telecom and Industrial use
- High Frequency Buck Converters for Computer Processor Power

HEXFET® Power MOSFET

<b>V<sub>DSS</sub></b>	<b>R<sub>DS(on)</sub> max</b>	<b>I<sub>D</sub></b>
<b>30V</b>	<b>13mΩ</b>	<b>61A<sup>④</sup></b>

**Benefits**

- Ultra-Low R<sub>DS(on)</sub>
- Very Low Gate Impedance
- Fully Characterized Avalanche Voltage and Current



**Absolute Maximum Ratings**

<b>Symbol</b>	<b>Parameter</b>	<b>Max.</b>	<b>Units</b>
V <sub>DS</sub>	Drain-Source Voltage	30	V
V <sub>GS</sub>	Gate-to-Source Voltage	± 20	V
I <sub>D</sub> @ T <sub>C</sub> = 25°C	Continuous Drain Current, V <sub>GS</sub> @ 10V	61 <sup>④</sup>	A
I <sub>D</sub> @ T <sub>C</sub> = 70°C	Continuous Drain Current, V <sub>GS</sub> @ 10V	51 <sup>④</sup>	
I <sub>DM</sub>	Pulsed Drain Current <sup>①</sup>	244	
P <sub>D</sub> @ T <sub>C</sub> = 25°C	Maximum Power Dissipation <sup>③</sup>	87	W
P <sub>D</sub> @ T <sub>C</sub> = 70°C	Maximum Power Dissipation <sup>③</sup>	61	W
	Linear Derating Factor	0.59	mW/°C
T <sub>J</sub> , T <sub>STG</sub>	Junction and Storage Temperature Range	-55 to + 175	°C

**Thermal Resistance**

	<b>Parameter</b>	<b>Typ.</b>	<b>Max.</b>	<b>Units</b>
R <sub>θJC</sub>	Junction-to-Case	—	1.73	°C/W
R <sub>θJA</sub>	Junction-to-Ambient (PCB mount)*	—	50	
R <sub>θJA</sub>	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<sub>J</sub> = 25°C (unless otherwise specified)

	Parameter	Min.	Typ.	Max.	Units	Conditions
V <sub>(BR)DSS</sub>	Drain-to-Source Breakdown Voltage	30	—	—	V	V <sub>GS</sub> = 0V, I <sub>D</sub> = 250μA
ΔV <sub>(BR)DSS</sub> /ΔT <sub>J</sub>	Breakdown Voltage Temp. Coefficient	—	0.027	—	V/°C	Reference to 25°C, I <sub>D</sub> = 1mA
R <sub>DS(on)</sub>	Static Drain-to-Source On-Resistance	—	9.7	13	mΩ	V <sub>GS</sub> = 10V, I <sub>D</sub> = 15A ③
		—	13.2	17.5		V <sub>GS</sub> = 4.5V, I <sub>D</sub> = 12A ③
V <sub>GS(th)</sub>	Gate Threshold Voltage	1.0	—	3.0	V	V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 250μA
I <sub>DSS</sub>	Drain-to-Source Leakage Current	—	—	20	μA	V <sub>DS</sub> = 24V, V <sub>GS</sub> = 0V
		—	—	100		V <sub>DS</sub> = 24V, V <sub>GS</sub> = 0V, T <sub>J</sub> = 125°C
I <sub>GSS</sub>	Gate-to-Source Forward Leakage	—	—	200	nA	V <sub>GS</sub> = 16V
	Gate-to-Source Reverse Leakage	—	—	-200		V <sub>GS</sub> = -16V

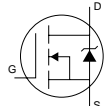
## Dynamic @ T<sub>J</sub> = 25°C (unless otherwise specified)

Symbol	Parameter	Min.	Typ.	Max.	Units	Conditions
g <sub>fs</sub>	Forward Transconductance	37	—	—	S	V <sub>DS</sub> = 15V, I <sub>D</sub> = 49.6A
Q <sub>g</sub>	Total Gate Charge	—	19	—	nC	I <sub>D</sub> = 24.8A
Q <sub>gs</sub>	Gate-to-Source Charge	—	8.2	—		V <sub>DS</sub> = 15V
Q <sub>gd</sub>	Gate-to-Drain ("Miller") Charge	—	6.3	—		V <sub>GS</sub> = 4.5V ③
Q <sub>oss</sub>	Output Gate Charge	—	18	27		V <sub>GS</sub> = 0V, V <sub>DS</sub> = 15V
t <sub>d(on)</sub>	Turn-On Delay Time	—	8.5	—	ns	V <sub>DD</sub> = 15V
t <sub>r</sub>	Rise Time	—	78	—		I <sub>D</sub> = 24.8A
t <sub>d(off)</sub>	Turn-Off Delay Time	—	11.8	—		R <sub>G</sub> = 1.8Ω
t <sub>f</sub>	Fall Time	—	3.3	—		V <sub>GS</sub> = 4.5V ③
C <sub>iss</sub>	Input Capacitance	—	1990	—	pF	V <sub>GS</sub> = 0V
C <sub>oss</sub>	Output Capacitance	—	707	—		V <sub>DS</sub> = 15V
C <sub>rss</sub>	Reverse Transfer Capacitance	—	50	—		f = 1.0MHz

## Avalanche Characteristics

Symbol	Parameter	Typ.	Max.	Units
E <sub>AS</sub>	Single Pulse Avalanche Energy②	—	213	mJ
I <sub>AR</sub>	Avalanche Current①	—	61	A

## Diode Characteristics

Symbol	Parameter	Min.	Typ.	Max.	Units	Conditions
I <sub>S</sub>	Continuous Source Current (Body Diode)	—	—	61④	A	MOSFET symbol showing the integral reverse p-n junction diode. 
I <sub>SM</sub>	Pulsed Source Current (Body Diode) ①	—	—	244		
V <sub>SD</sub>	Diode Forward Voltage	—	0.88	1.3	V	T <sub>J</sub> = 25°C, I <sub>S</sub> = 31A, V <sub>GS</sub> = 0V ③
		—	0.8	—		T <sub>J</sub> = 125°C, I <sub>S</sub> = 31A, V <sub>GS</sub> = 0V ③
t <sub>rr</sub>	Reverse Recovery Time	—	39	59	ns	T <sub>J</sub> = 25°C, I <sub>F</sub> = 31A, V <sub>R</sub> = 20V
Q <sub>rr</sub>	Reverse Recovery Charge	—	49	74	nC	di/dt = 100A/μs ③
t <sub>rr</sub>	Reverse Recovery Time	—	42	63	ns	T <sub>J</sub> = 125°C, I <sub>F</sub> = 31A, V <sub>R</sub> = 20V
Q <sub>rr</sub>	Reverse Recovery Charge	—	62	93	nC	di/dt = 100A/μs ③

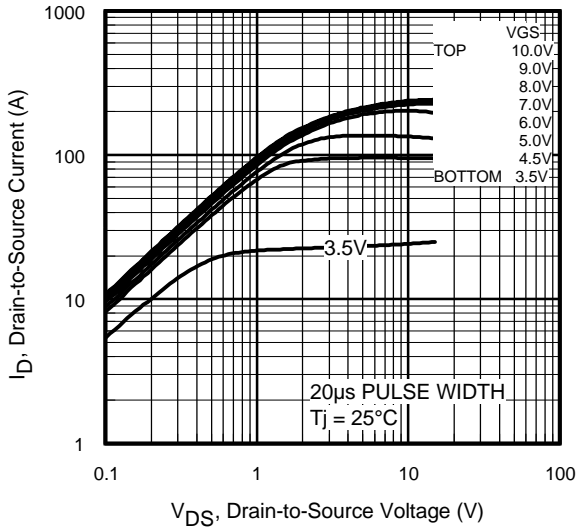


Fig 1. Typical Output Characteristics

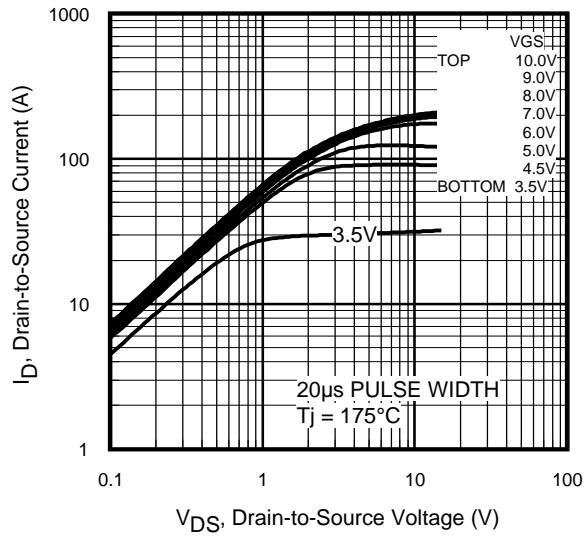


Fig 2. Typical Output Characteristics

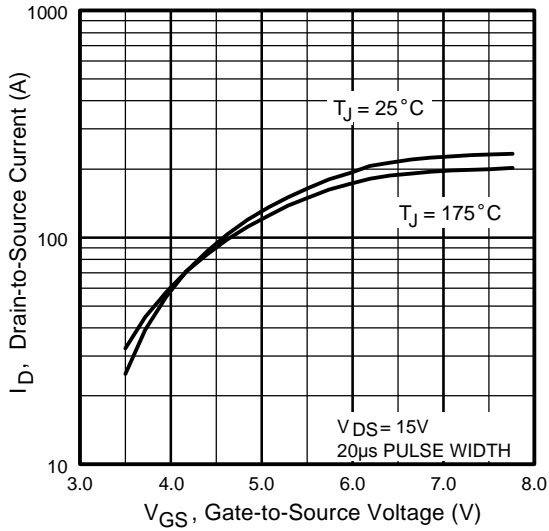


Fig 3. Typical Transfer Characteristics

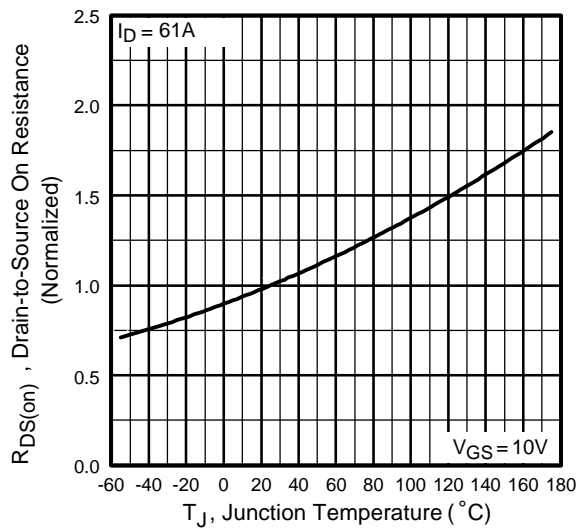
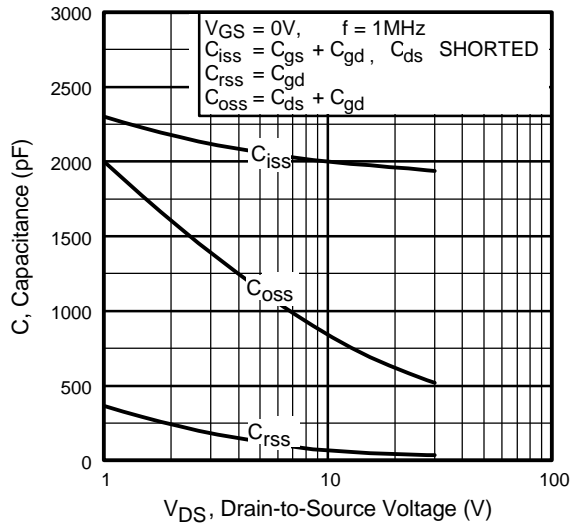
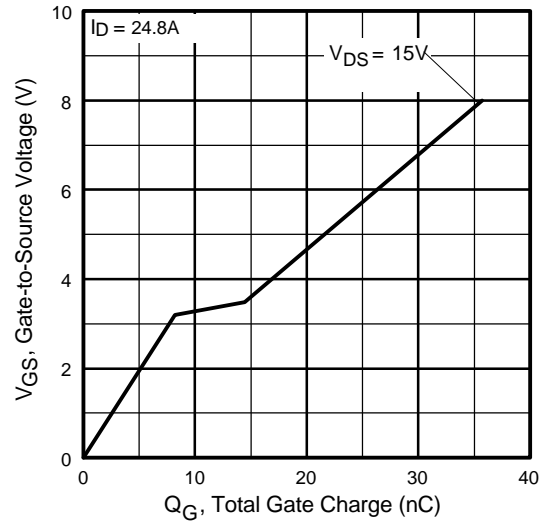


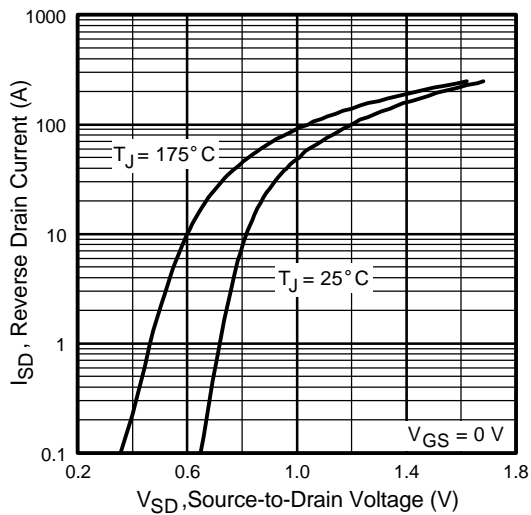
Fig 4. Normalized On-Resistance Vs. Temperature



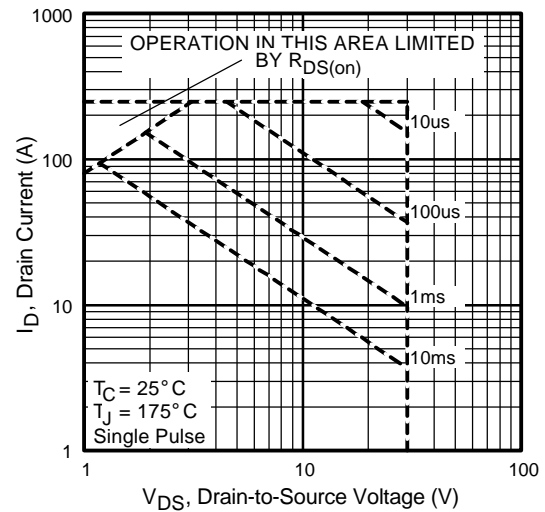
**Fig 5.** Typical Capacitance Vs. Drain-to-Source Voltage



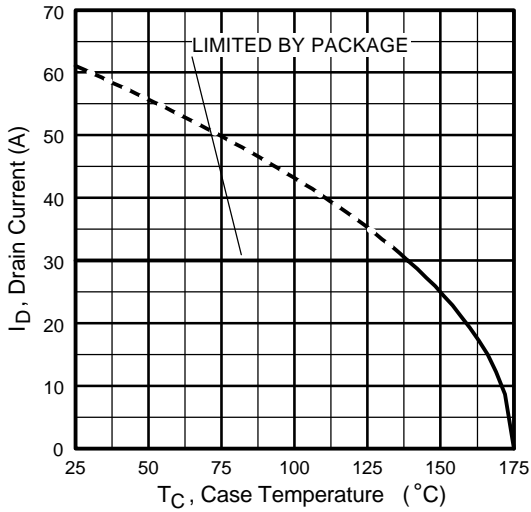
**Fig 6.** Typical Gate Charge Vs. Gate-to-Source Voltage



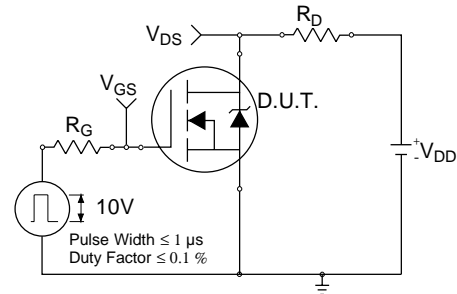
**Fig 7.** Typical Source-Drain Diode Forward Voltage



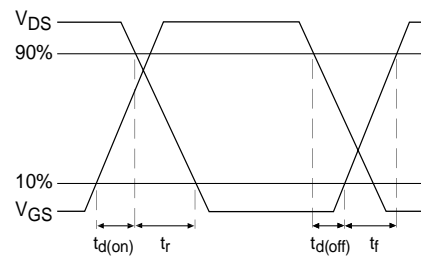
**Fig 8.** Maximum Safe Operating Area



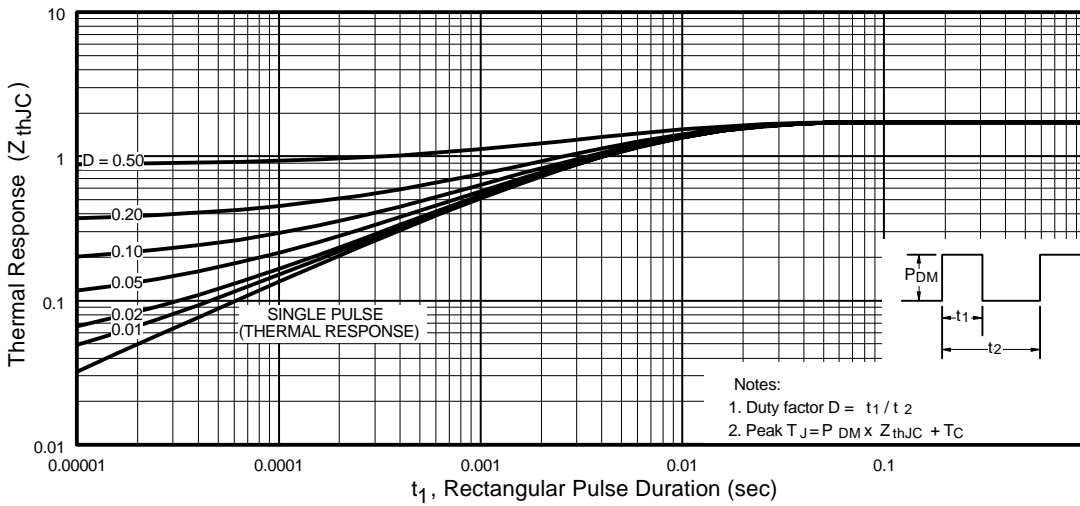
**Fig 9.** Maximum Drain Current Vs. Case Temperature



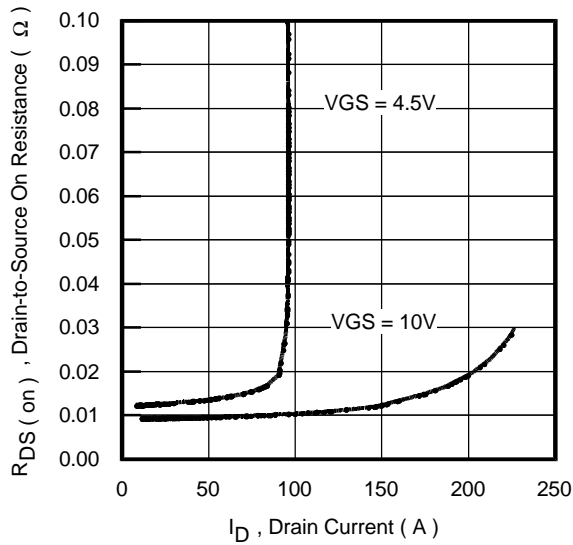
**Fig 10a.** Switching Time Test Circuit



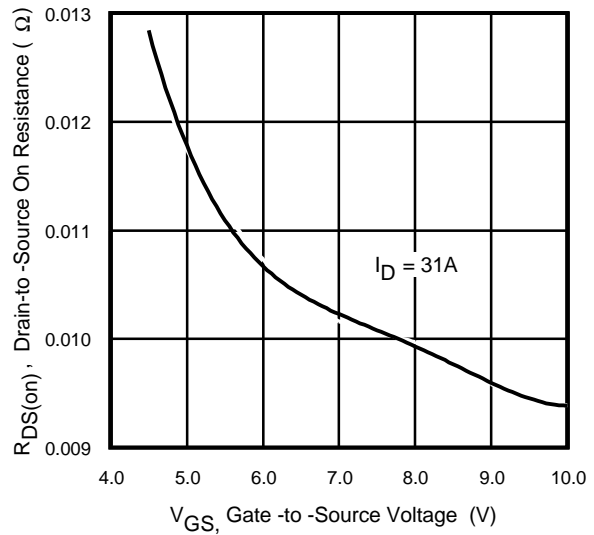
**Fig 10b.** Switching Time Waveforms



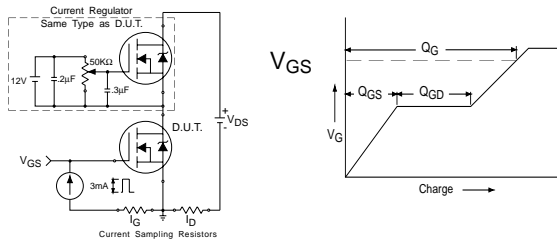
**Fig 11.** Maximum Effective Transient Thermal Impedance, Junction-to-Ambient



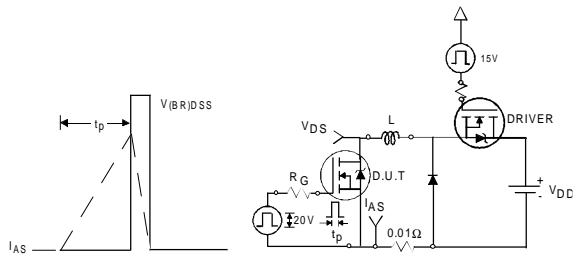
**Fig 12.** On-Resistance Vs. Drain Current



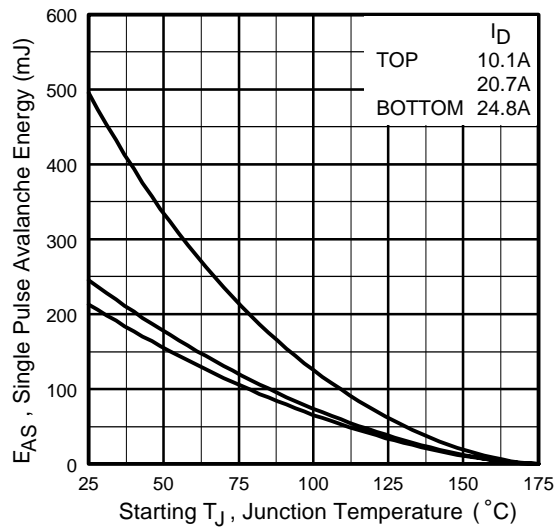
**Fig 13.** On-Resistance Vs. Gate Voltage



**Fig 14a&b.** Basic Gate Charge Test Circuit and Waveforms



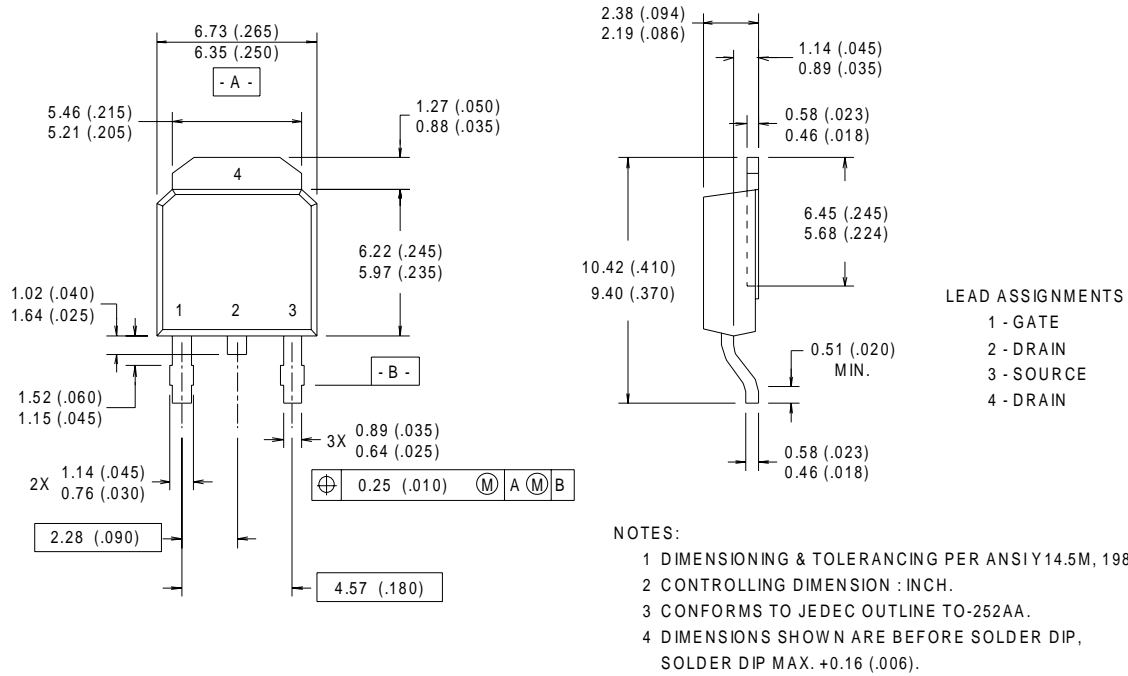
**Fig 15a&b.** Unclamped Inductive Test Circuit and Waveforms



**Fig 15c.** Maximum Avalanche Energy Vs. Drain Current

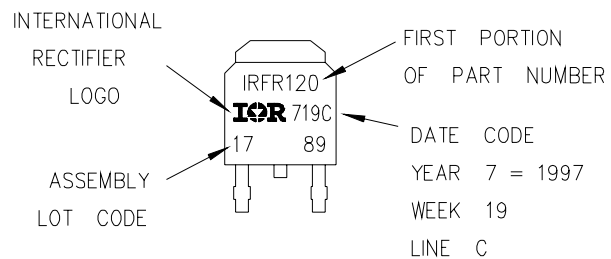
## D-Pak (TO-252AA) Package Outline

Dimensions are shown in millimeters (inches)



## 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"

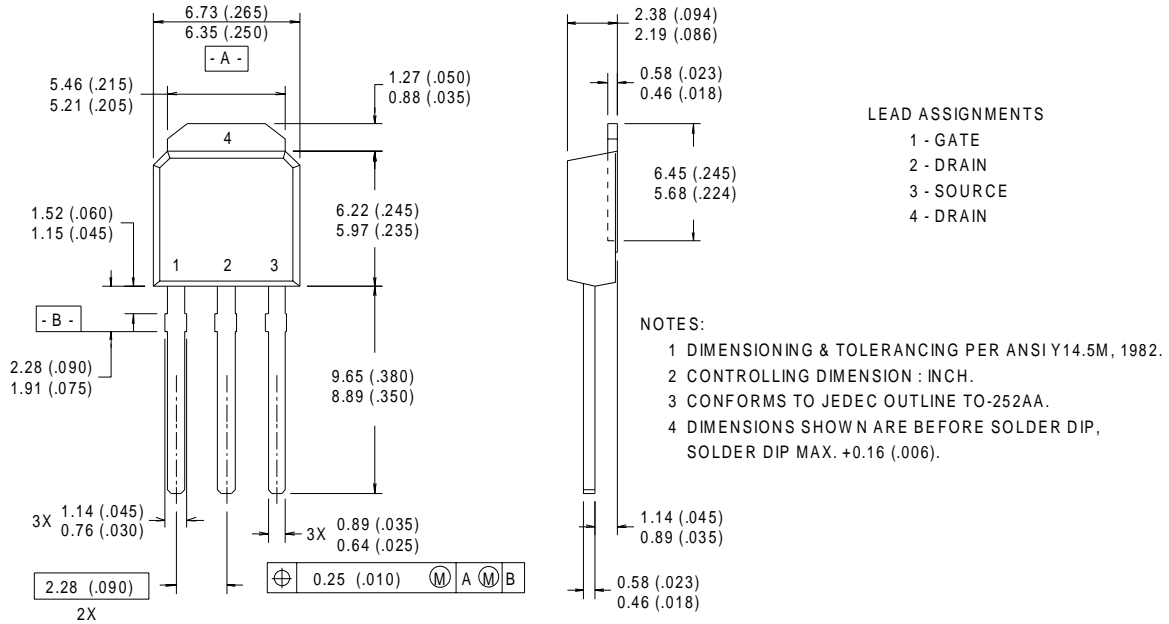


# IRFR/U3707

International  
**IR** Rectifier

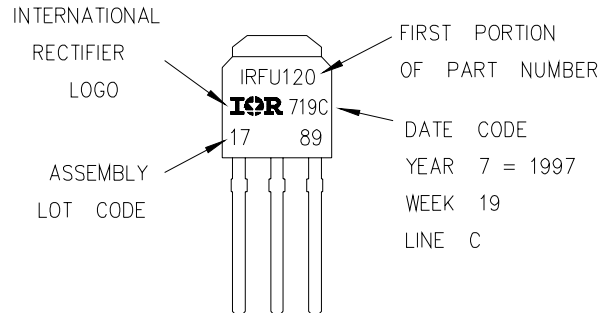
## I-Pak (TO-251AA) Package Outline

Dimensions are shown in millimeters (inches)



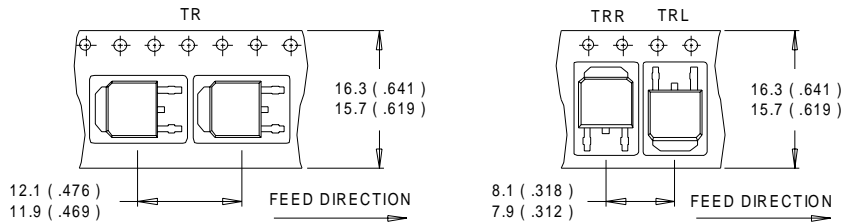
## I-Pak (TO-251AA) Part Marking Information

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

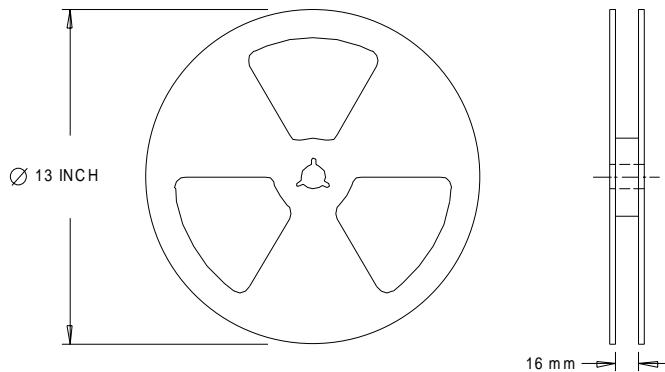


**D-Pak (TO-252AA) Tape & Reel Information**

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

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

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