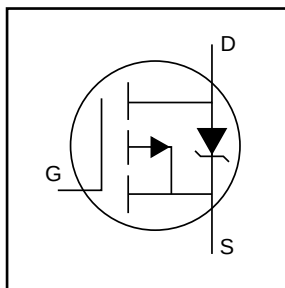


IRFR/U5505

HEXFET® Power MOSFET

- Ultra Low On-Resistance
- P-Channel
- Surface Mount (IRFR5505)
- Straight Lead (IRFU5505)
- Advanced Process Technology
- Fast Switching
- Fully Avalanche Rated



$$V_{DS} = -55V$$

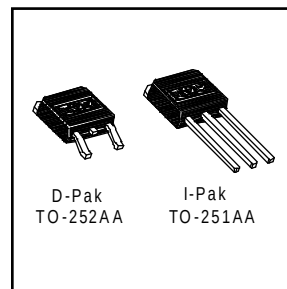
$$R_{DS(on)} = 0.11\Omega$$

$$I_D = -18A$$

Description

Fifth Generation HEXFETs from International Rectifier utilize advanced processing techniques to achieve extremely low 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 D-Pak is designed for surface mounting using vapor phase, infrared, or wave soldering techniques. The straight lead version (IRFU series) is for through-hole mounting applications. Power dissipation levels up to 1.5 watts are possible in typical surface mount applications.



Absolute Maximum Ratings

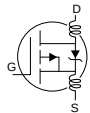
	Parameter	Max.	Units
I_D @ $T_C = 25^\circ C$	Continuous Drain Current, V_{GS} @ -10V	-18	A
I_D @ $T_C = 100^\circ C$	Continuous Drain Current, V_{GS} @ -10V	-11	
I_{DM}	Pulsed Drain Current ①	-64	
P_D @ $T_C = 25^\circ C$	Power Dissipation	57	W
	Linear Derating Factor	0.45	W/°C
V_{GS}	Gate-to-Source Voltage	± 20	V
E_{AS}	Single Pulse Avalanche Energy②	150	mJ
I_{AR}	Avalanche Current①	-9.6	A
E_{AR}	Repetitive Avalanche Energy①	5.7	mJ
dv/dt	Peak Diode Recovery dv/dt ③	-5.0	V/ns
T_J	Operating Junction and	-55 to + 150	°C
T_{STG}	Storage Temperature Range		
	Soldering Temperature, for 10 seconds	300 (1.6mm from case)	

Thermal Resistance

	Parameter	Typ.	Max.	Units
$R_{\theta JC}$	Junction-to-Case	—	2.2	°C/W
$R_{\theta JA}$	Junction-to-Ambient (PCB mount)**	—	50	
$R_{\theta JA}$	Junction-to-Ambient	—	110	

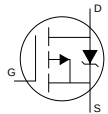
Electrical Characteristics @ $T_J = 25^\circ\text{C}$ (unless otherwise specified)

	Parameter	Min.	Typ.	Max.	Units	Conditions
$V_{(BR)DSS}$	Drain-to-Source Breakdown Voltage	-55	—	—	V	$V_{GS} = 0V, I_D = -250\mu A$
$\Delta V_{(BR)DSS}/\Delta T_J$	Breakdown Voltage Temp. Coefficient	—	-0.049	—	V/ $^\circ\text{C}$	Reference to 25°C , $I_D = -1mA$
$R_{DS(on)}$	Static Drain-to-Source On-Resistance	—	—	0.11	Ω	$V_{GS} = -10V, I_D = -9.6A$ ④
$V_{GS(th)}$	Gate Threshold Voltage	-2.0	—	-4.0	V	$V_{DS} = V_{GS}, I_D = -250\mu A$
g_{fs}	Forward Transconductance	4.2	—	—	S	$V_{DS} = -25V, I_D = -9.6A$
I_{DSS}	Drain-to-Source Leakage Current	—	—	-25	μA	$V_{DS} = -55V, V_{GS} = 0V$
		—	—	-250		$V_{DS} = -44V, V_{GS} = 0V, T_J = 150^\circ\text{C}$
I_{GSS}	Gate-to-Source Forward Leakage	—	—	-100	nA	$V_{GS} = 20V$
	Gate-to-Source Reverse Leakage	—	—	100		$V_{GS} = -20V$
Q_g	Total Gate Charge	—	—	32	nC	$I_D = -9.6A$
Q_{gs}	Gate-to-Source Charge	—	—	7.1		$V_{DS} = -44V$
Q_{gd}	Gate-to-Drain ("Miller") Charge	—	—	15		$V_{GS} = -10V$, See Fig. 6 and 13 ④
$t_{d(on)}$	Turn-On Delay Time	—	12	—	ns	$V_{DD} = -28V$
t_r	Rise Time	—	28	—		$I_D = -9.6A$
$t_{d(off)}$	Turn-Off Delay Time	—	20	—		$R_G = 2.6\Omega$
t_f	Fall Time	—	16	—		$R_D = 2.8\Omega$, See Fig. 10 ④
L_D	Internal Drain Inductance	—	4.5	—	nH	Between lead, 6mm (0.25in.) from package and center of die contact⑤
L_S	Internal Source Inductance	—	7.5	—		
C_{iss}	Input Capacitance	—	650	—	pF	$V_{GS} = 0V$
C_{oss}	Output Capacitance	—	270	—		$V_{DS} = -25V$
C_{rss}	Reverse Transfer Capacitance	—	120	—		$f = 1.0MHz$, See Fig. 5



Source-Drain Ratings and Characteristics

	Parameter	Min.	Typ.	Max.	Units	Conditions
I_S	Continuous Source Current (Body Diode)	—	—	-18	A	MOSFET symbol showing the integral reverse p-n junction diode.
I_{SM}	Pulsed Source Current (Body Diode) ①	—	—	-64		
V_{SD}	Diode Forward Voltage	—	—	-1.6	V	$T_J = 25^\circ\text{C}, I_S = -9.6A, V_{GS} = 0V$ ④
t_{rr}	Reverse Recovery Time	—	51	77	ns	$T_J = 25^\circ\text{C}, I_F = -9.6A$
Q_{rr}	Reverse Recovery Charge	—	110	160	nC	$di/dt = 100A/\mu s$ 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 $T_J = 25^\circ\text{C}$, $L = 3.2mH$
 $R_G = 25\Omega$, $I_{AS} = -9.6A$. (See Figure 12)

③ $I_{SD} \leq -9.6A$, $di/dt \leq 290A/\mu s$, $V_{DD} \leq V_{(BR)DSS}$,
 $T_J \leq 150^\circ\text{C}$

④ Pulse width $\leq 300\mu s$; duty cycle $\leq 2\%$.

⑤ This is applied for I-PAK, L_S of D-PAK is measured between lead and center of die contact

** When mounted on 1" square PCB (FR-4 or G-10 Material) .

For recommended footprint and soldering techniques refer to application note #AN-994

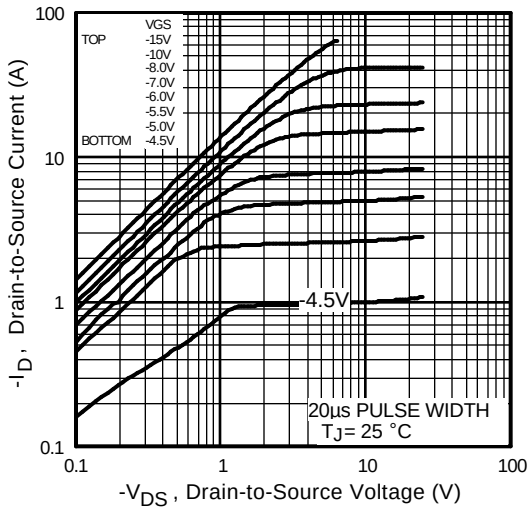


Fig 1. Typical Output Characteristics

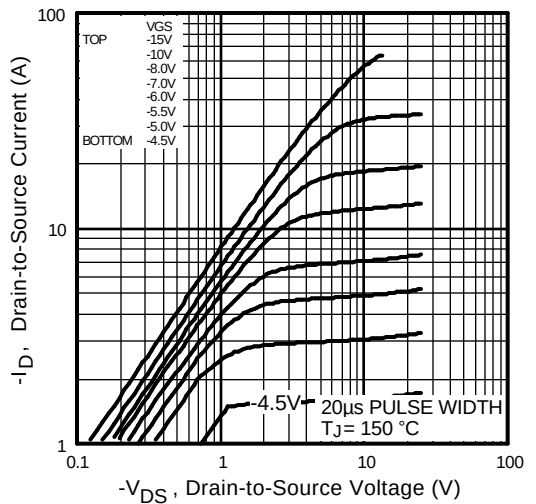


Fig 2. Typical Output Characteristics

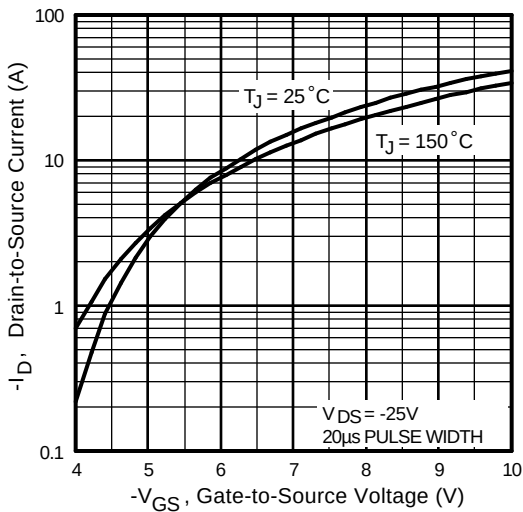


Fig 3. Typical Transfer Characteristics

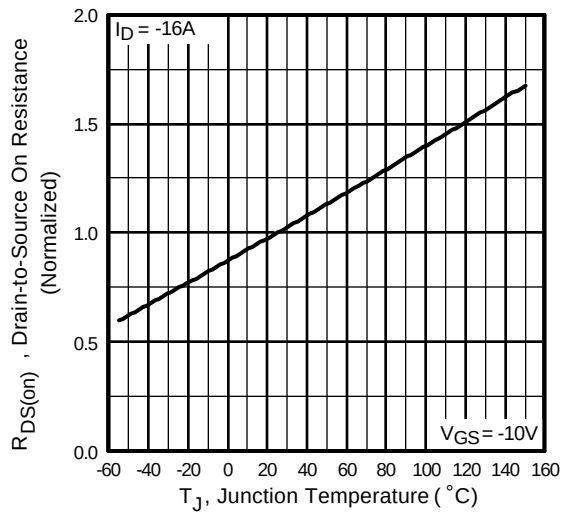


Fig 4. Normalized On-Resistance Vs. Temperature

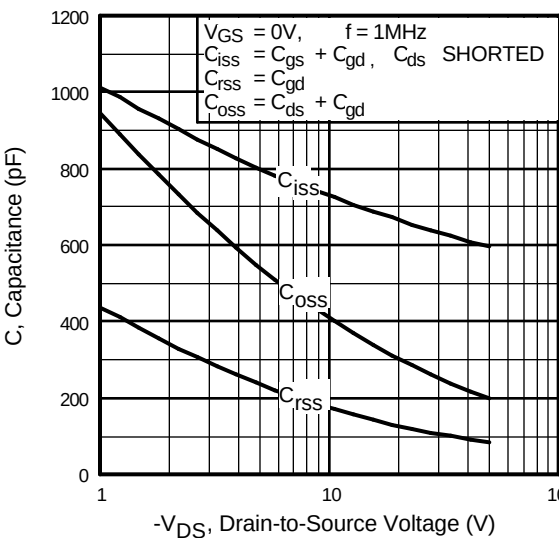


Fig 5. Typical Capacitance Vs. Drain-to-Source Voltage

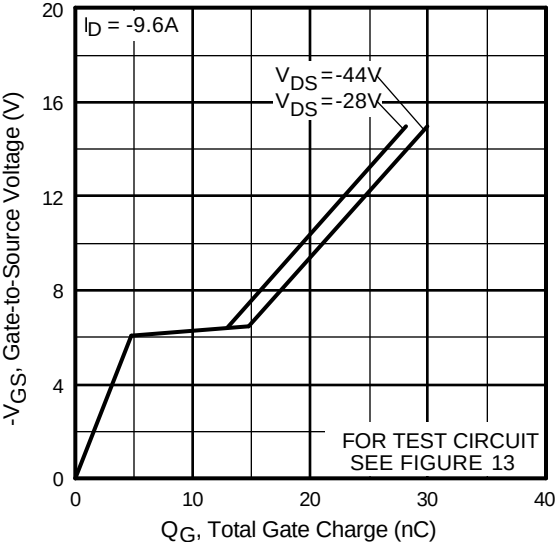


Fig 6. Typical Gate Charge Vs. Gate-to-Source Voltage

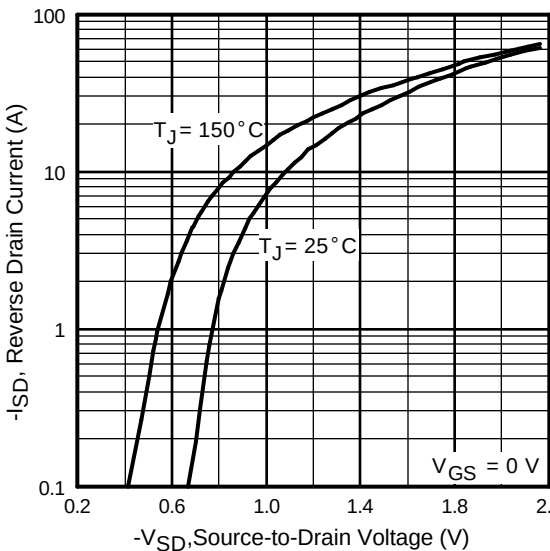


Fig 7. Typical Source-Drain Diode Forward Voltage

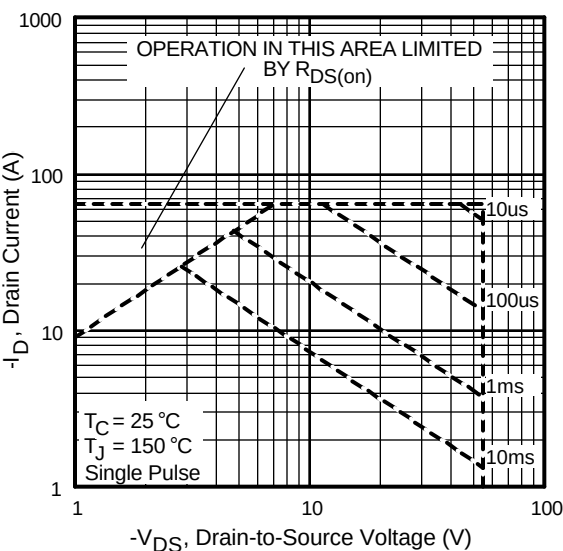


Fig 8. Maximum Safe Operating Area

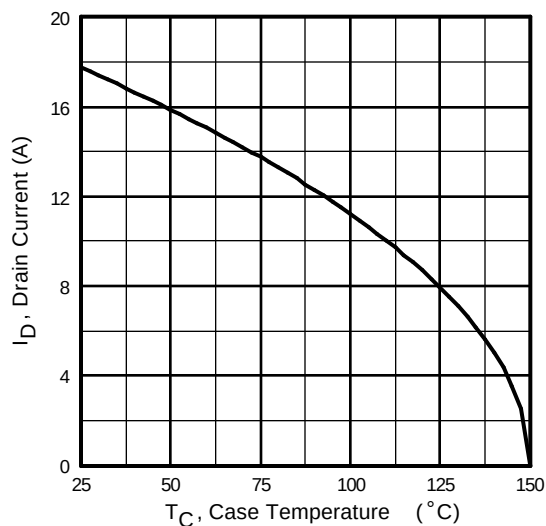


Fig 9. Maximum Drain Current Vs. Case Temperature

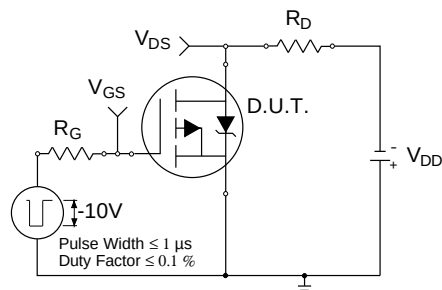


Fig 10a. Switching Time Test Circuit

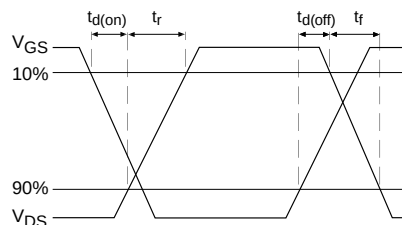


Fig 10b. Switching Time Waveforms

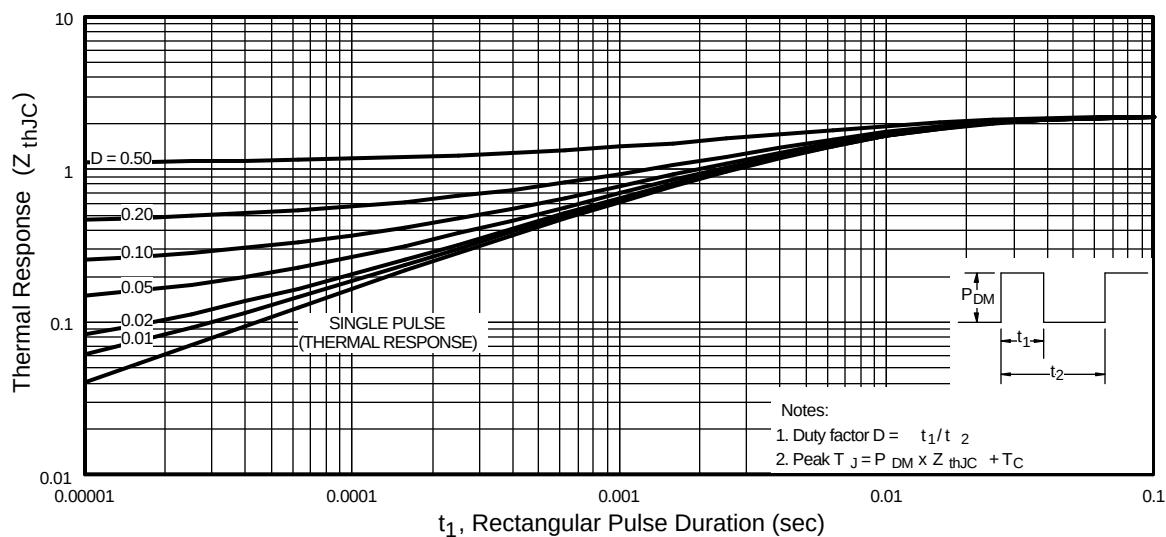


Fig 11. Maximum Effective Transient Thermal Impedance, Junction-to-Case

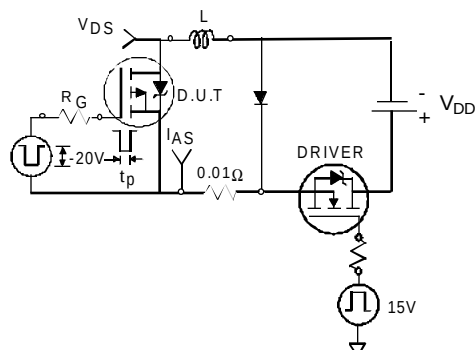


Fig 12a. Unclamped Inductive Test Circuit

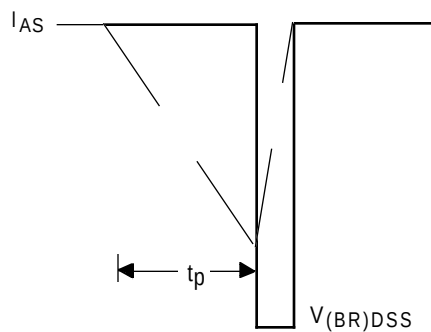


Fig 12b. Unclamped Inductive Waveforms

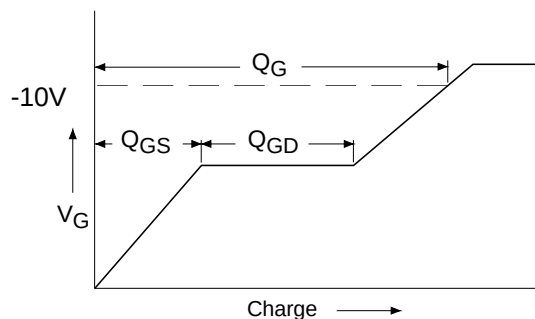


Fig 13a. Basic Gate Charge Waveform

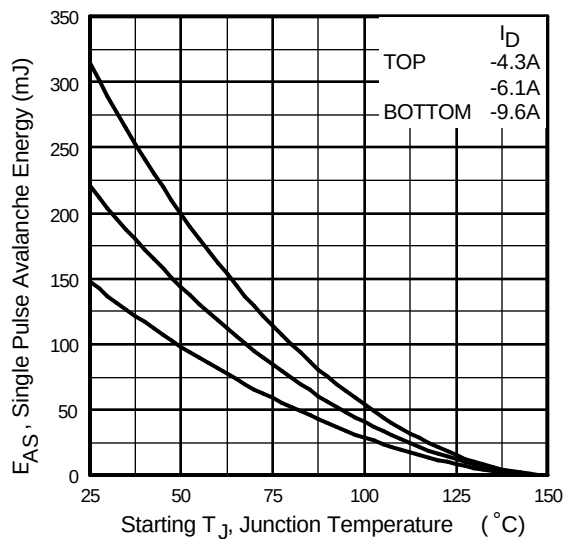


Fig 12c. Maximum Avalanche Energy Vs. Drain Current

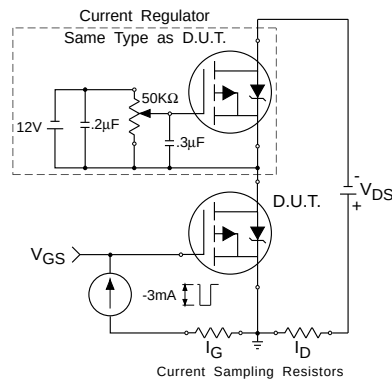


Fig 13b. Gate Charge Test Circuit

Circuit Layout Considerations

- Low Stray Inductance
- Ground Plane
- Low Leakage Inductance Current Transformer

dv/dt controlled by R_G

I_{SD} controlled by Duty Factor "D"

D.U.T. - Device Under Test

① Driver Gate Drive

Period

P.W.

$D = \frac{P.W.}{Period}$

$[V_{GS}=10V]$ ***

② D.U.T. I_{SD} Waveform

Reverse Recovery Current

Body Diode Forward Current

di/dt

③ D.U.T. V_{DS} Waveform

Diode Recovery dv/dt

Re-Applied Voltage

Body Diode Forward Drop

$[V_{DD}]$

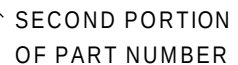
④ Inductor Current

Ripple $\leq 5\%$

$[I_{SD}]$

Fig 14. For P-Channel HEXFETS

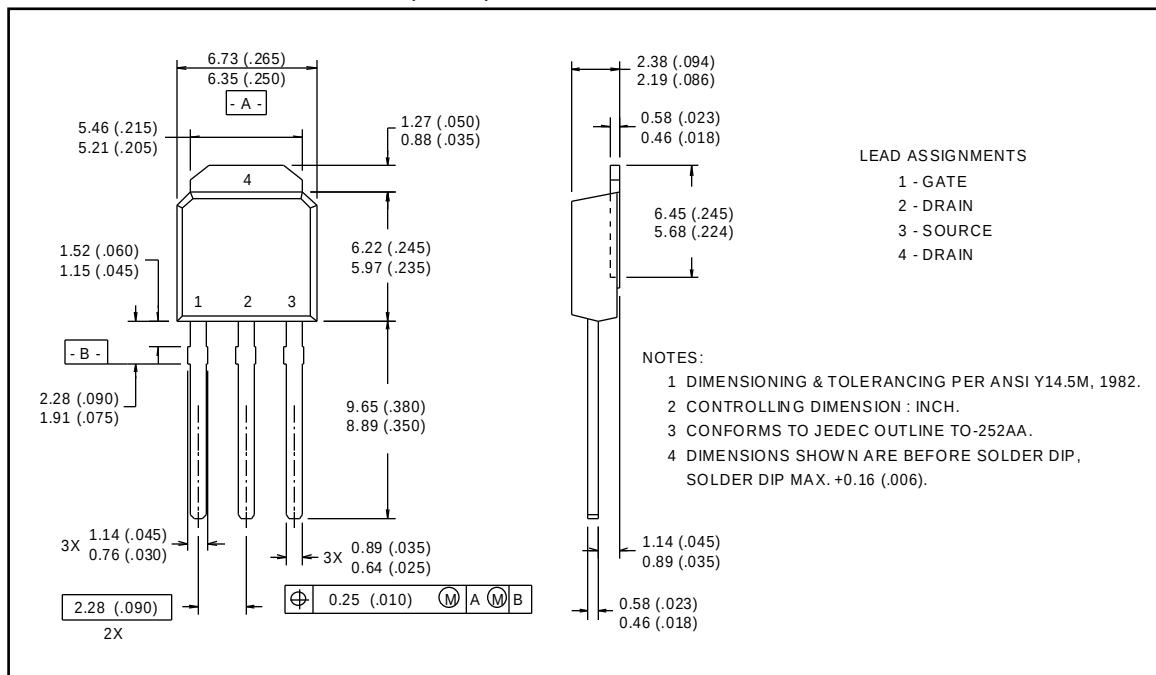
Dimensions are shown in millimeters (inches)



Package Outline

TO-251AA Outline

Dimensions are shown in millimeters (inches)



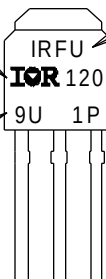
Part Marking Information

TO-251AA (I-Pak)

EXAMPLE : THIS IS AN IRFU120
WITH ASSEMBLY
LOT CODE 9U1P

INTERNATIONAL
RECTIFIER
LOGO

ASSEMBLY
LOT CODE

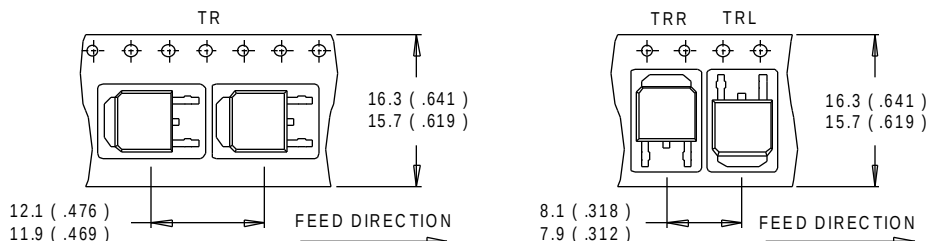


FIRST PORTION
OF PART NUMBER

SECOND PORTION
OF PART NUMBER

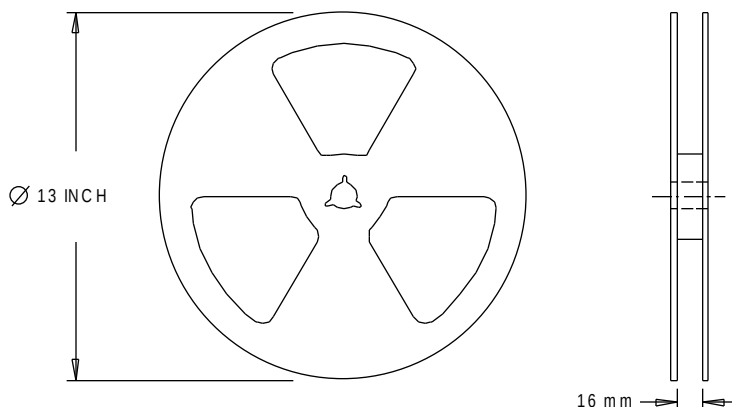
Tape & Reel Information

TO-252AA



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.

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