

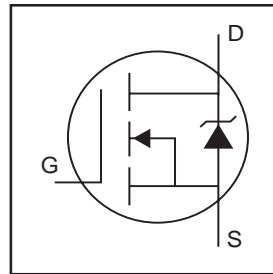
- Logic-Level Gate Drive
- Ultra Low On-Resistance
- Surface Mount (IRLR2705)
- Straight Lead (IRLU2705)
- Advanced Process Technology
- Fast Switching
- Fully Avalanche Rated

**D-Pak  
TO-252AA**

**I-Pak  
TO-251AA**


### Description

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.



$V_{DSS} = 55V$
$R_{DS(on)} = 0.040\Omega$
$I_D = 28A^{\textcircled{5}}$

### Absolute Maximum Ratings

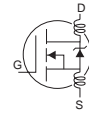
	Parameter	Max.	Units
$I_D @ T_C = 25^\circ C$	Continuous Drain Current, $V_{GS} @ 10V$	28	A
$I_D @ T_C = 100^\circ C$	Continuous Drain Current, $V_{GS} @ 10V$	20	
$I_{DM}$	Pulsed Drain Current $\textcircled{1}$	110	
$P_D @ T_C = 25^\circ C$	Power Dissipation	68	W
	Linear Derating Factor	0.45	W/ $^\circ C$
$V_{GS}$	Gate-to-Source Voltage	$\pm 16$	V
$E_{AS}$	Single Pulse Avalanche Energy $\textcircled{2}$	110	mJ
$I_{AR}$	Avalanche Current $\textcircled{1}$	16	A
$E_{AR}$	Repetitive Avalanche Energy $\textcircled{1}$	6.8	mJ
dv/dt	Peak Diode Recovery dv/dt $\textcircled{3}$	5.0	V/ns
$T_J$	Operating Junction and	-55 to + 175	$^\circ C$
$T_{STG}$	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	$^\circ C/W$
$R_{\theta JA}$	Case-to-Ambient (PCB mount)**	—	50	
$R_{\theta JA}$	Junction-to-Ambient	—	110	

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

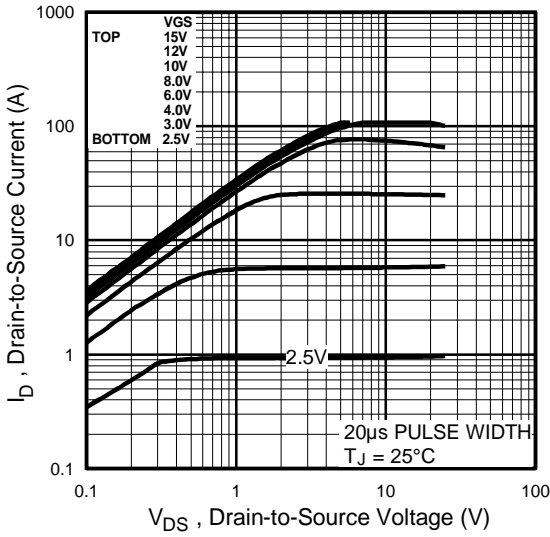
	Parameter	Min.	Typ.	Max.	Units	Conditions
$V_{(BR)DSS}$	Drain-to-Source Breakdown Voltage	55	—	—	V	$V_{GS} = 0V, I_D = 250\mu A$
$\Delta V_{(BR)DSS}/\Delta T_J$	Breakdown Voltage Temp. Coefficient	—	0.065	—	V/°C	Reference to $25^\circ\text{C}, I_D = 1\text{mA}$
$R_{DS(on)}$	Static Drain-to-Source On-Resistance	—	—	0.040	W	$V_{GS} = 10V, I_D = 17A$ ④
		—	—	0.051		$V_{GS} = 5.0V, I_D = 17A$ ④
		—	—	0.065		$V_{GS} = 4.0V, I_D = 14A$ ④
$V_{GS(th)}$	Gate Threshold Voltage	1.0	—	2.0	V	$V_{DS} = V_{GS}, I_D = 250\mu A$
$g_{fs}$	Forward Transconductance	11	—	—	S	$V_{DS} = 25V, I_D = 16A$ ⑦
$I_{DSS}$	Drain-to-Source Leakage Current	—	—	25	$\mu A$	$V_{DS} = 55V, V_{GS} = 0V$
		—	—	250		$V_{DS} = 44V, V_{GS} = 0V, T_J = 150^\circ\text{C}$
$I_{GSS}$	Gate-to-Source Forward Leakage	—	—	100	nA	$V_{GS} = 16V$
	Gate-to-Source Reverse Leakage	—	—	-100		$V_{GS} = -16V$
$Q_g$	Total Gate Charge	—	—	25	nC	$I_D = 16A$
$Q_{gs}$	Gate-to-Source Charge	—	—	5.2		$V_{DS} = 44V$
$Q_{gd}$	Gate-to-Drain ("Miller") Charge	—	—	14		$V_{GS} = 5.0V$ , See Fig. 6 and 13 ④ ⑦
$t_{d(on)}$	Turn-On Delay Time	—	8.9	—	ns	$V_{DD} = 28V$
$t_r$	Rise Time	—	100	—		$I_D = 16A$
$t_{d(off)}$	Turn-Off Delay Time	—	21	—		$R_G = 6.5\Omega, V_{GS} = 5.0V$
$t_f$	Fall Time	—	29	—		$R_D = 1.8\Omega$ , See Fig. 10 ④ ⑦
$L_D$	Internal Drain Inductance	—	4.5	—	nH	Between lead, 6mm (0.25in.) from package and center of die contact ⑥
$L_S$	Internal Source Inductance	—	7.5	—		
$C_{iss}$	Input Capacitance	—	880	—	pF	$V_{GS} = 0V$
$C_{oss}$	Output Capacitance	—	220	—		$V_{DS} = 25V$
$C_{rss}$	Reverse Transfer Capacitance	—	94	—		$f = 1.0\text{MHz}$ , See Fig. 5 ⑦


**Source-Drain Ratings and Characteristics**

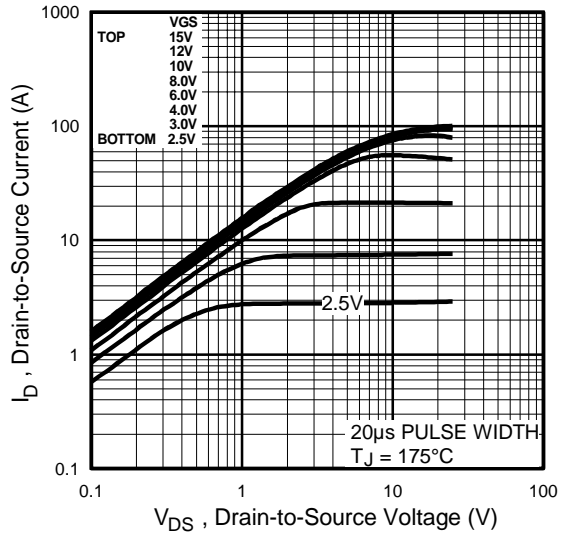
	Parameter	Min.	Typ.	Max.	Units	Conditions
$I_S$	Continuous Source Current (Body Diode)	—	—	28	A	MOSFET symbol showing the integral reverse p-n junction diode.
$I_{SM}$	Pulsed Source Current (Body Diode) ①	—	—	110		
$V_{SD}$	Diode Forward Voltage	—	—	1.3	V	$T_J = 25^\circ\text{C}, I_S = 17A, V_{GS} = 0V$ ④
$t_{rr}$	Reverse Recovery Time	—	76	110	ns	$T_J = 25^\circ\text{C}, I_F = 16A$
$Q_{rr}$	Reverse Recovery Charge	—	190	290	nC	$di/dt = 100A/\mu s$ ④ ⑦
$t_{on}$	Forward Turn-On Time	Intrinsic turn-on time is negligible (turn-on is dominated by $L_S + L_D$ )				

**Notes:**

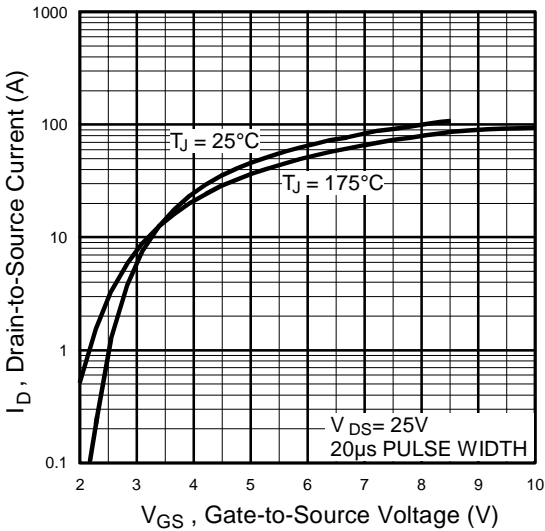
- ① Repetitive rating; pulse width limited by max. junction temperature. ( See fig. 11 )
- ②  $V_{DD} = 25V$ , starting  $T_J = 25^\circ\text{C}$ ,  $L = 610\mu H$   
 $R_G = 25\Omega, I_{AS} = 16A$ . (See Figure 12)
- ③  $I_{SD} \leq 16A, di/dt \leq 270A/\mu s, V_{DD} \leq V_{(BR)DSS}, T_J \leq 175^\circ\text{C}$
- ④ Pulse width  $\leq 300\mu s$ ; duty cycle  $\leq 2\%$ .
- ⑤ Calculated continuous current based on maximum allowable junction temperature; Package limitation current = 20A.
- ⑥ This is applied for I-PAK,  $L_S$  of D-PAK is measured between lead and center of die contact.
- ⑦ Uses IRLZ34N data and test conditions.



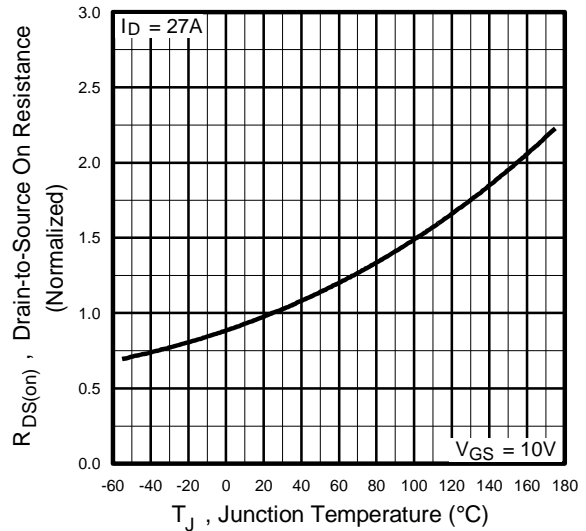
**Fig 1.** Typical Output Characteristics



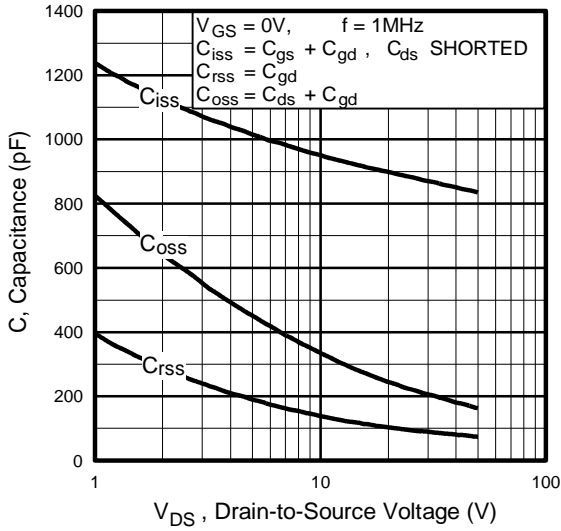
**Fig 2.** Typical Output Characteristics



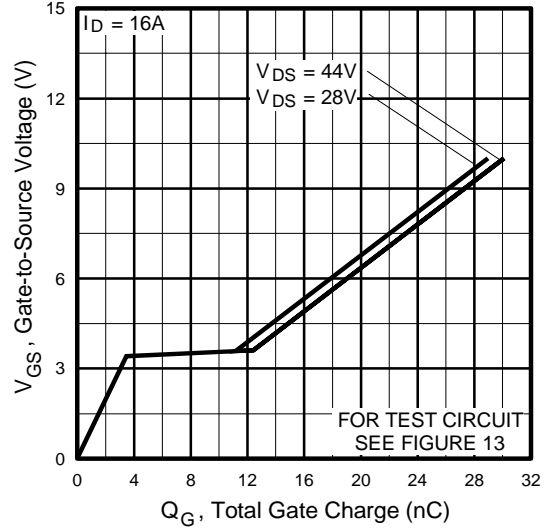
**Fig 3.** Typical Transfer Characteristics



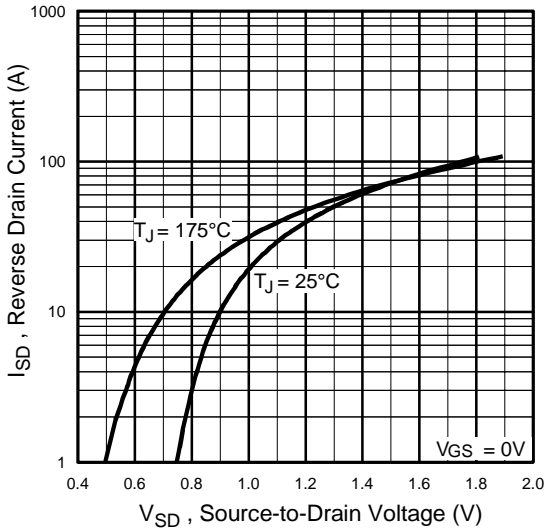
**Fig 4.** Normalized On-Resistance Vs. Temperature



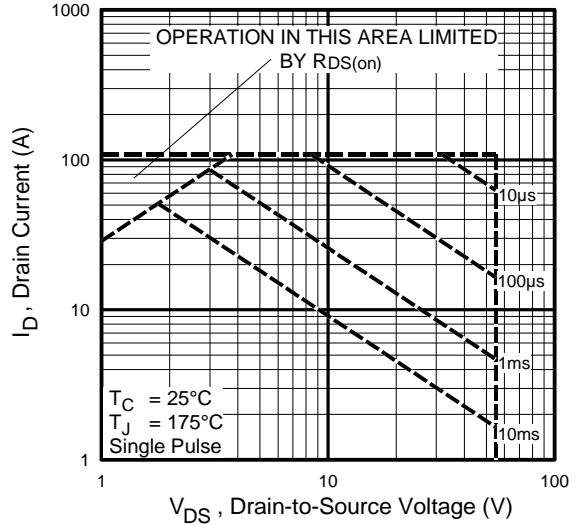
**Fig 5.** Typical Capacitance Vs. Drain-to-Source Voltage



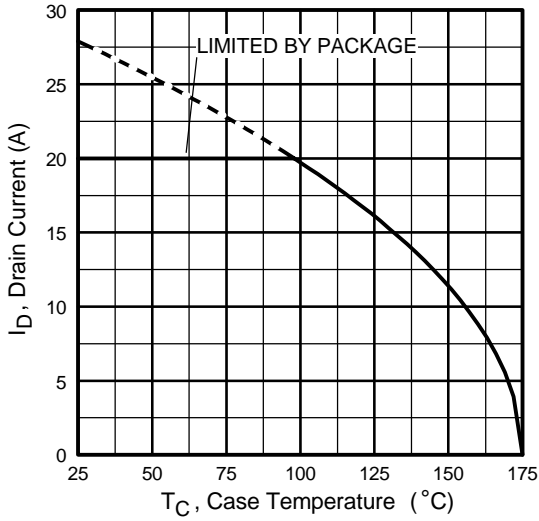
**Fig 6.** Typical Gate Charge Vs. Gate-to-Source Voltage



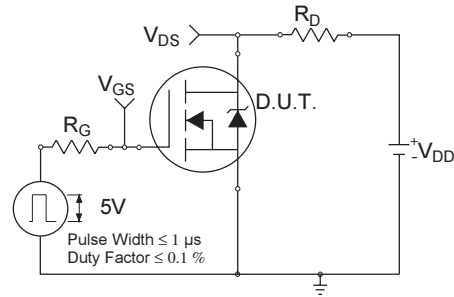
**Fig 7.** Typical Source-Drain Diode Forward Voltage



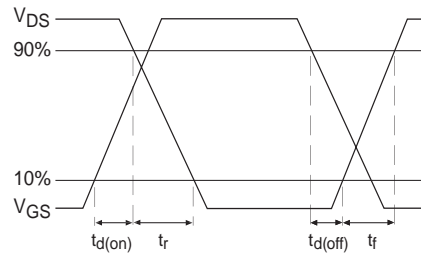
**Fig 8.** Maximum Safe Operating Area



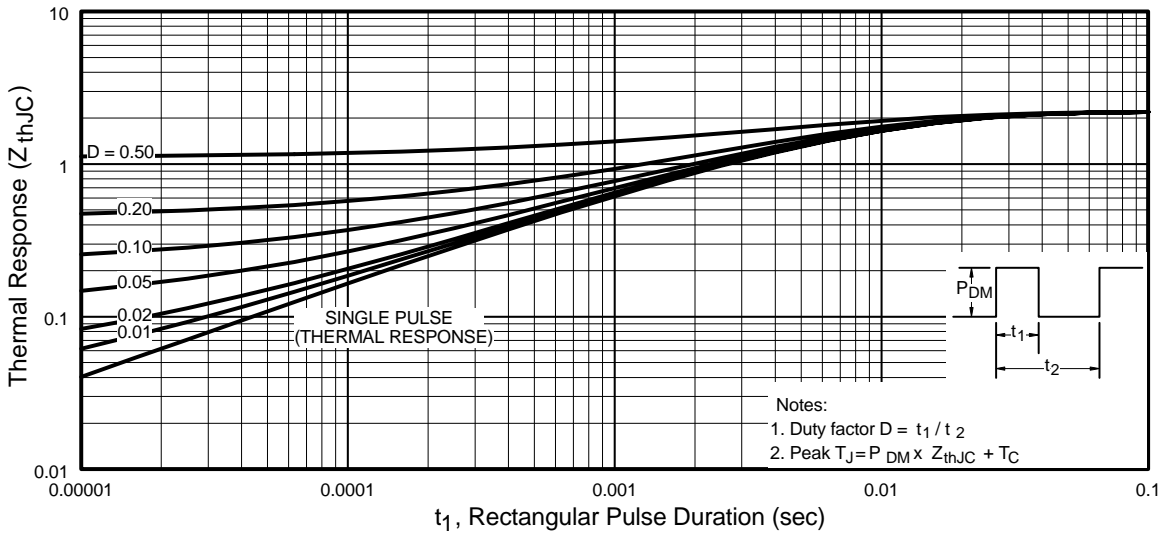
**Fig 9.** Maximum Drain Current Vs. Case Temperature



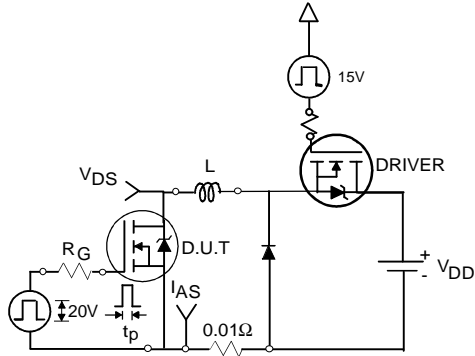
**Fig 10a.** Switching Time Test Circuit



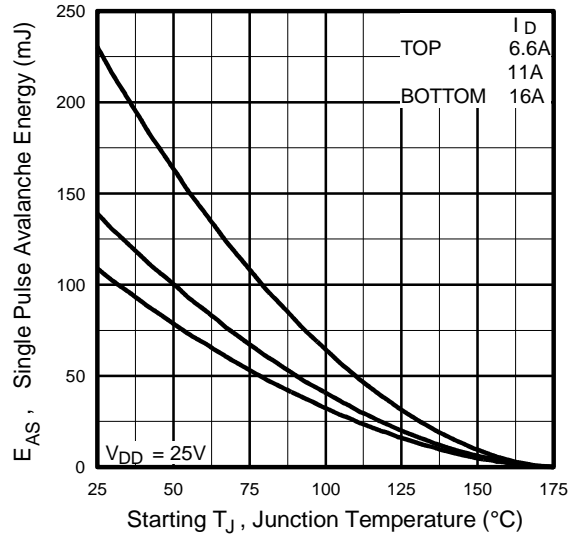
**Fig 10b.** Switching Time Waveforms



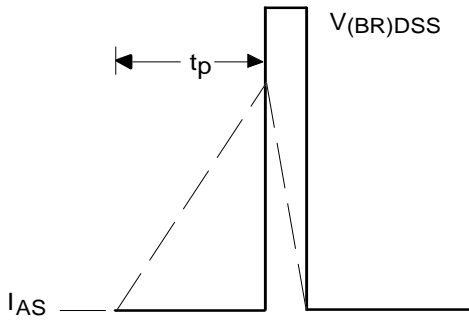
**Fig 11.** Maximum Effective Transient Thermal Impedance, Junction-to-Case



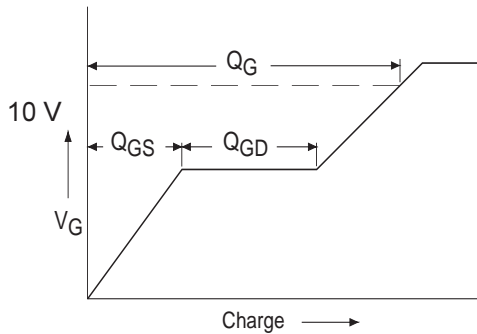
**Fig 12a.** Unclamped Inductive Test Circuit



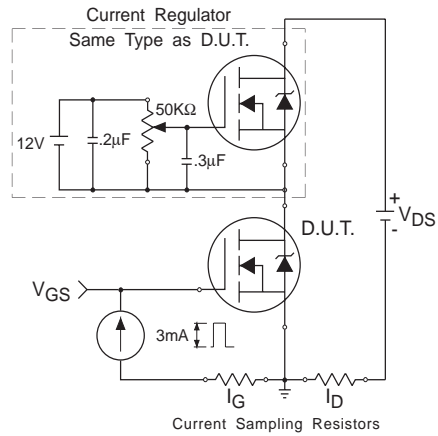
**Fig 12c.** Maximum Avalanche Energy Vs. Drain Current



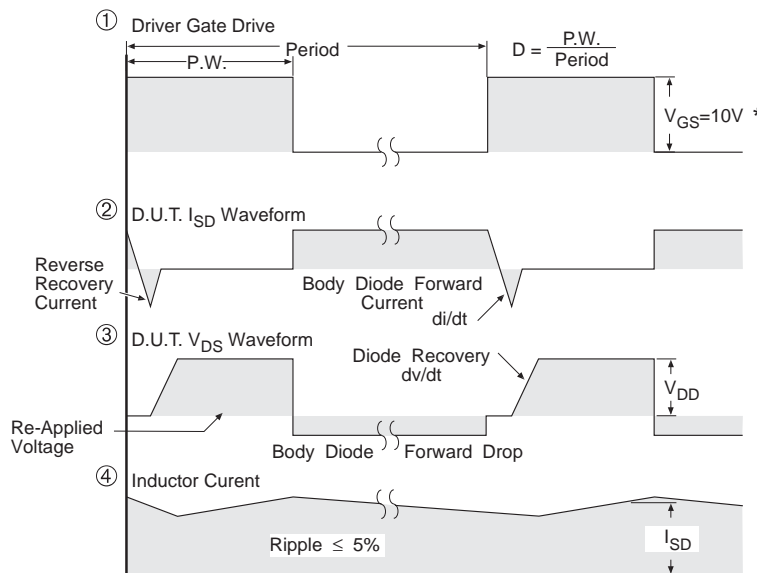
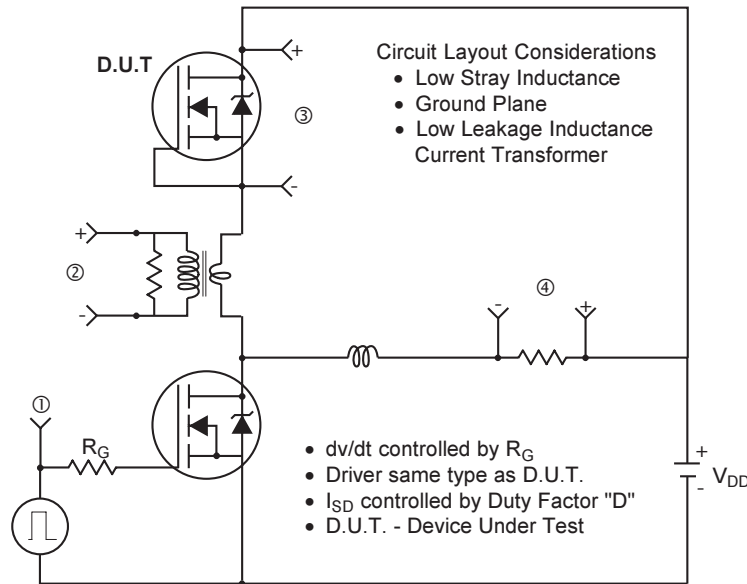
**Fig 12b.** Unclamped Inductive Waveforms



**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 HEXFETS

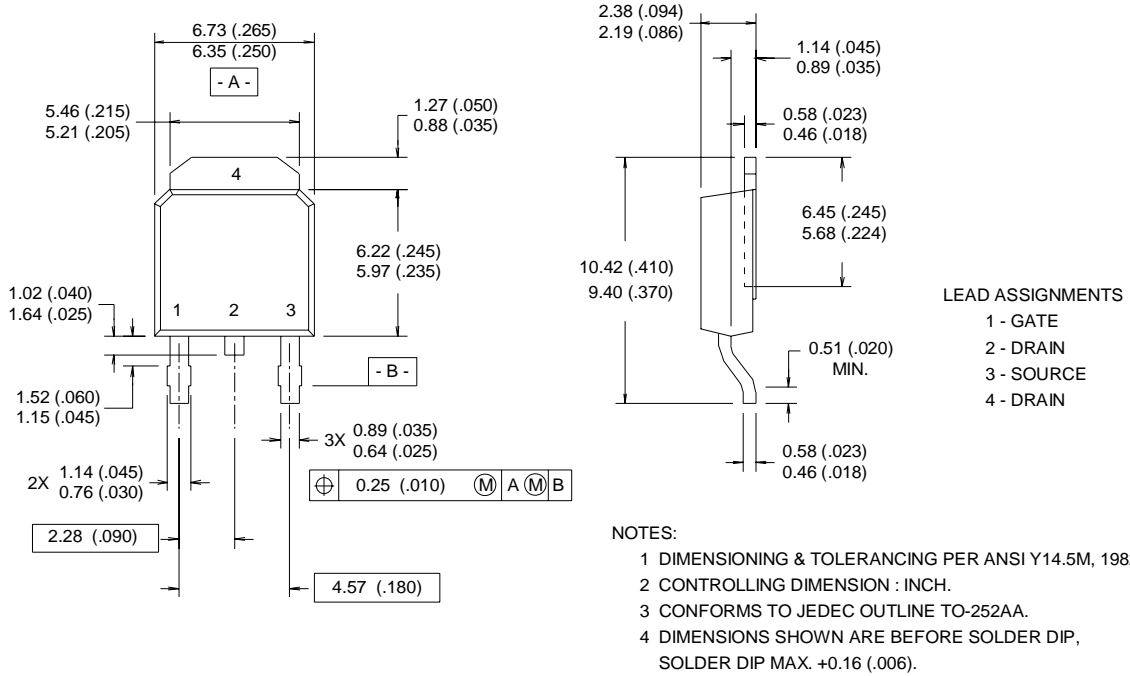


# IRLR/U2705

## Package Outline

### TO-252AA Outline

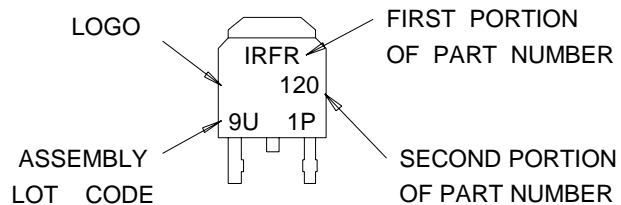
Dimensions are shown in millimeters (inches)



## Part Marking Information

### TO-252AA (D-PARK)

EXAMPLE : THIS IS AN IRFR120  
WITH ASSEMBLY  
LOT CODE 9U1P

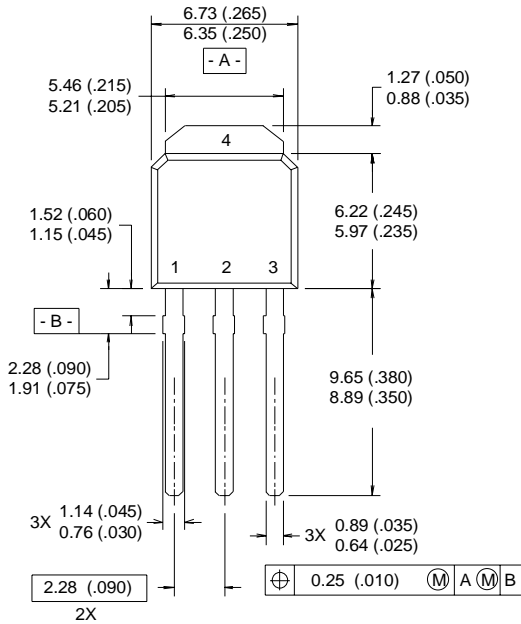




## Package Outline

### TO-251AA Outline

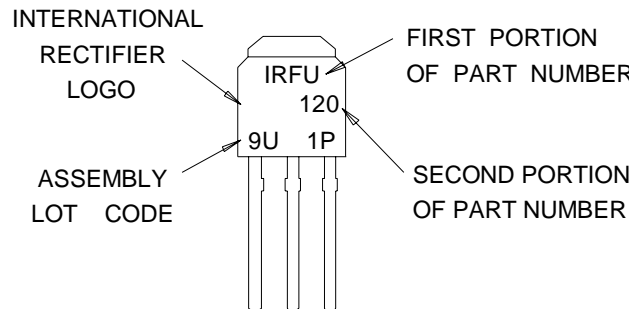
Dimensions are shown in millimeters (inches)



## Part Marking Information

### TO-251AA (I-PARK)

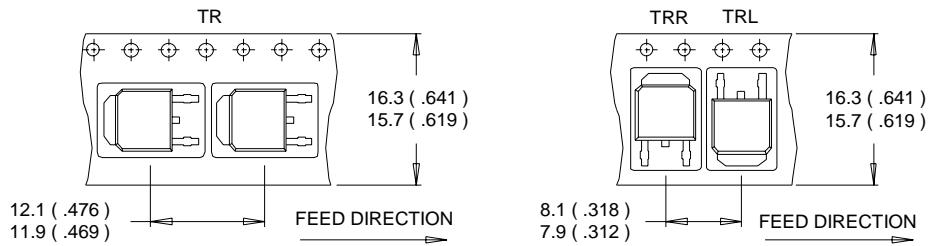
EXAMPLE : THIS IS AN IRFU120  
WITH ASSEMBLY  
LOT CODE 9U1P



## Tape & Reel Information

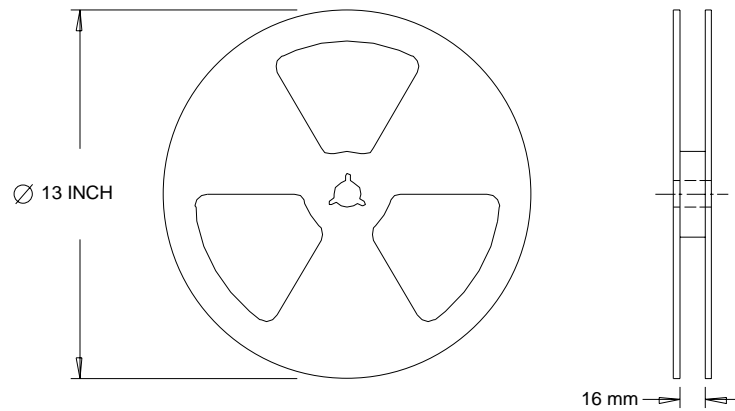
TO-252AA

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.