

IRLR/U3103

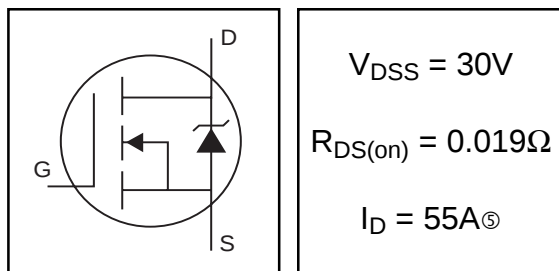
HEXFET® Power MOSFET

- Logic-Level Gate Drive
- Ultra Low On-Resistance
- Surface Mount (IRLR3103)
- Straight Lead (IRLU3103)
- Advanced Process Technology
- Fast Switching
- Fully Avalanche Rated

Description

Fifth Generation HEXFETs from International Rectifier utilize advanced processing techniques to achieve the lowest possible 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 device for use in a wide variety of applications.

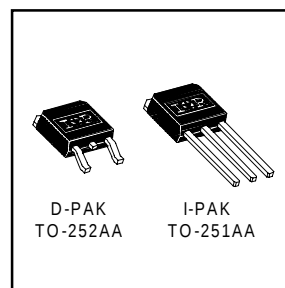
The D-PAK is designed for surface mounting using vapor phase, infrared, or wave soldering techniques. The straight lead version (IRFU series) is for through-hole mounting applications. Power dissipation levels up to 1.5 watts are possible in typical surface mount applications.



$$V_{DS} = 30V$$

$$R_{DS(on)} = 0.019\Omega$$

$$I_D = 55A^{\circ}$$



D-PAK
TO-252AA

I-PAK
TO-251AA

Absolute Maximum Ratings

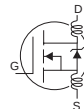
	Parameter	Max.	Units
I_D @ $T_C = 25^{\circ}C$	Continuous Drain Current, V_{GS} @ 10V	55 ^⑤	A
I_D @ $T_C = 100^{\circ}C$	Continuous Drain Current, V_{GS} @ 10V	39 ^⑤	
I_{DM}	Pulsed Drain Current ① ⑦	220	
P_D @ $T_C = 25^{\circ}C$	Power Dissipation	107	W
	Linear Derating Factor	0.71	W/ $^{\circ}C$
V_{GS}	Gate-to-Source Voltage	± 16	V
E_{AS}	Single Pulse Avalanche Energy ② ⑦	240	mJ
I_{AR}	Avalanche Current ① ⑦	34	A
E_{AR}	Repetitive Avalanche Energy ① ⑦	11	mJ
dv/dt	Peak Diode Recovery dv/dt 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		

Thermal Resistance

	Parameter	Typ.	Max.	Units
$R_{\theta JC}$	Junction-to-Case	—	1.4	$^{\circ}C/W$
$R_{\theta JA}$	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	30	—	—	V	$V_{GS} = 0V, I_D = 250\mu A$
$\Delta V_{(BR)DSS}/\Delta T_J$	Breakdown Voltage Temp. Coefficient	—	0.037	—	V/ $^\circ\text{C}$	Reference to 25°C , $I_D = 1mA$
$R_{DS(on)}$	Static Drain-to-Source On-Resistance	—	—	0.019	Ω	$V_{GS} = 10V, I_D = 33A$ ④
		—	—	0.024		$V_{GS} = 4.5V, I_D = 25A$ ④
$V_{GS(th)}$	Gate Threshold Voltage	1.0	—	—	V	$V_{DS} = V_{GS}, I_D = 250\mu A$
g_{fs}	Forward Transconductance	23	—	—	S	$V_{DS} = 25V, I_D = 34A$ ⑦
I_{DSS}	Drain-to-Source Leakage Current	—	—	25	μA	$V_{DS} = 30V, V_{GS} = 0V$
		—	—	250		$V_{DS} = 18V, V_{GS} = 0V, T_J = 150^\circ\text{C}$
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	—	—	50	nC	$I_D = 34A$
Q_{gs}	Gate-to-Source Charge	—	—	14		$V_{DS} = 24V$
Q_{gd}	Gate-to-Drain ("Miller") Charge	—	—	28		$V_{GS} = 4.5V$, See Fig. 6 and 13 ④ ⑦
$t_{d(on)}$	Turn-On Delay Time	—	9.0	—	ns	$V_{DD} = 15V$
t_r	Rise Time	—	210	—		$I_D = 34A$
$t_{d(off)}$	Turn-Off Delay Time	—	20	—		$R_G = 3.4\Omega, V_{GS} = 4.5V$
t_f	Fall Time	—	54	—		$R_D = 0.43\Omega$, See Fig. 10 ④ ⑦
L_D	Internal Drain Inductance	—	4.5	—	nH	Between lead, 6mm (0.25in.)
L_S	Internal Source Inductance	—	7.5	—		from package and center of die contact⑥
C_{iss}	Input Capacitance	—	1600	—	pF	$V_{GS} = 0V$
C_{oss}	Output Capacitance	—	640	—		$V_{DS} = 25V$
C_{rss}	Reverse Transfer Capacitance	—	320	—		$f = 1.0MHz$, See Fig. 5⑦



Source-Drain Ratings and Characteristics

	Parameter	Min.	Typ.	Max.	Units	Conditions
I_S	Continuous Source Current (Body Diode)	—	—	55⑤	A	MOSFET symbol showing the integral reverse p-n junction diode.
I_{SM}	Pulsed Source Current (Body Diode) ① ⑦	—	—	220		
V_{SD}	Diode Forward Voltage	—	—	1.3	V	$T_J = 25^\circ\text{C}, I_S = 28A, V_{GS} = 0V$ ④
t_{rr}	Reverse Recovery Time	—	81	120	ns	$T_J = 25^\circ\text{C}, I_F = 34A$
Q_{rr}	Reverse Recovery Charge	—	210	310	nC	$di/dt = 100A/\mu s$ ④ ⑥
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 $V_{DD} = 15V$, starting $T_J = 25^\circ\text{C}$, $L = 300\mu H$
 $R_G = 25\Omega$, $I_{AS} = 34A$. (See Figure 12)
- ③ $I_{SD} \leq 34A$, $di/dt \leq 140A/\mu s$, $V_{DD} \leq V_{(BR)DSS}$,
 $T_J \leq 175^\circ\text{C}$
- 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 IRL3103 data and test conditions

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

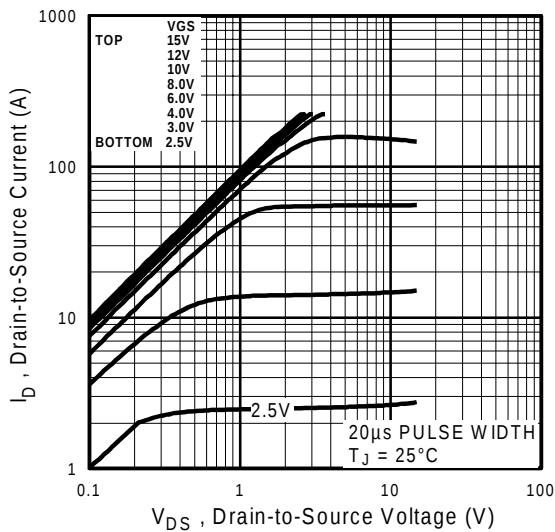


Fig 1. Typical Output Characteristics

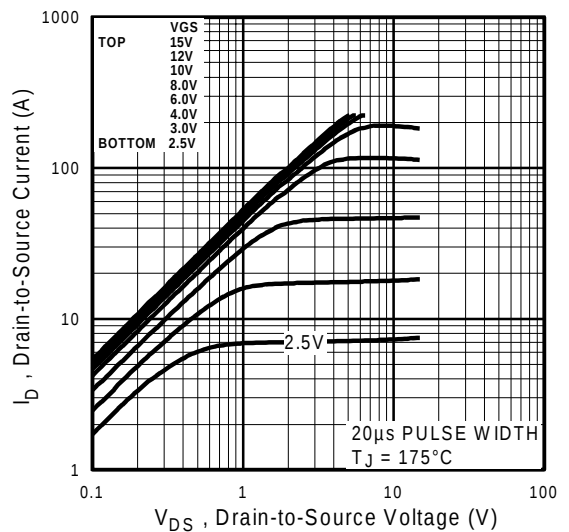


Fig 2. Typical Output Characteristics

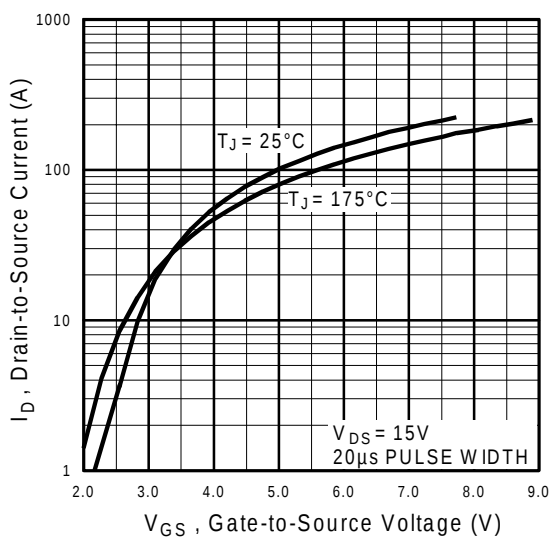


Fig 3. Typical Transfer Characteristics

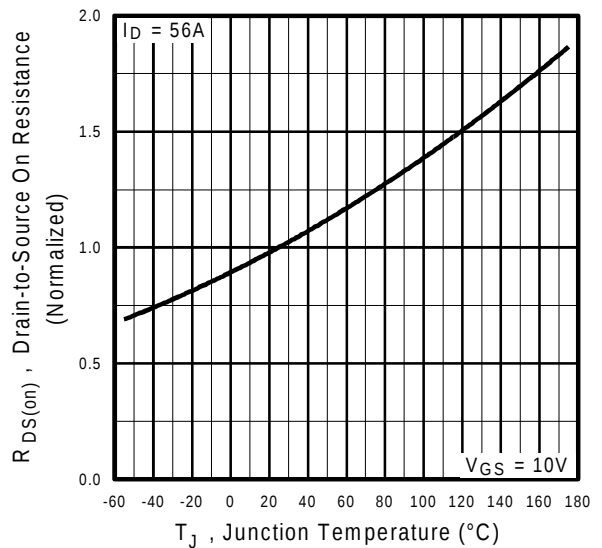


Fig 4. Normalized On-Resistance
Vs. Temperature

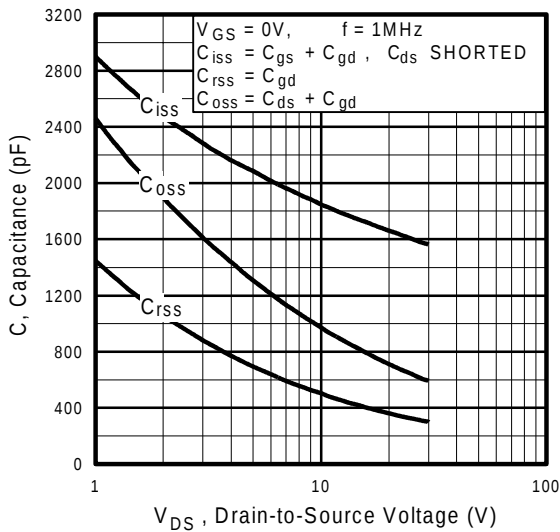


Fig 5. Typical Capacitance Vs. Drain-to-Source Voltage

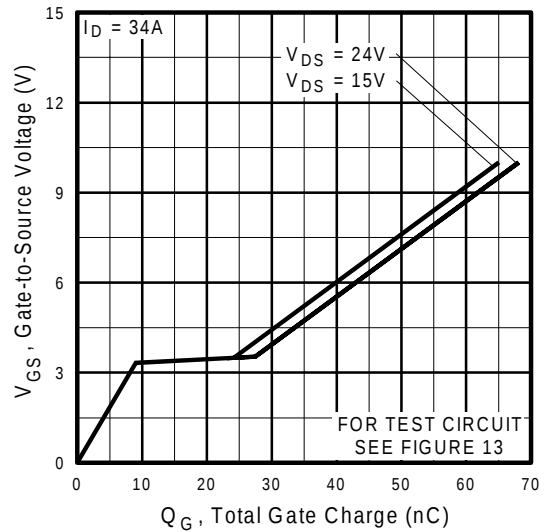


Fig 6. Typical Gate Charge Vs. Gate-to-Source Voltage

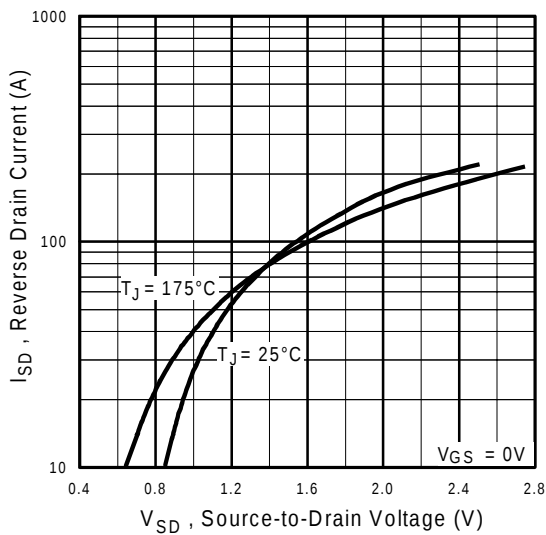


Fig 7. Typical Source-Drain Diode Forward Voltage

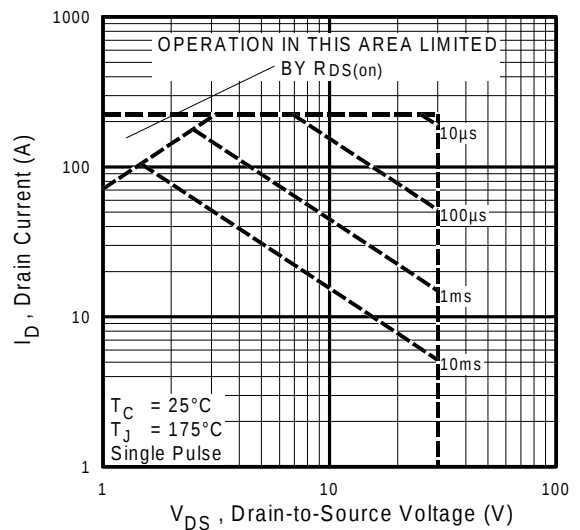


Fig 8. Maximum Safe Operating Area

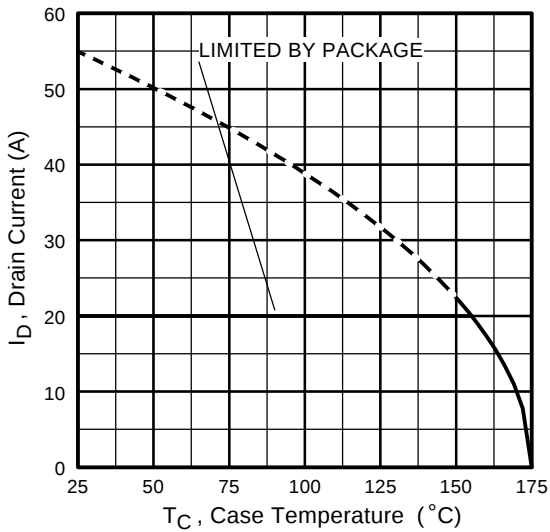


Fig 9. Maximum Drain Current Vs. Case Temperature

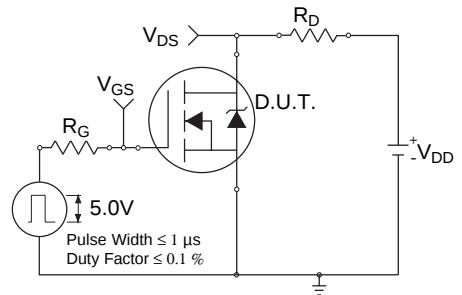


Fig 10a. Switching Time Test Circuit

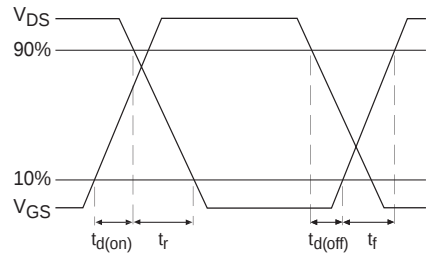


Fig 10b. Switching Time Waveforms

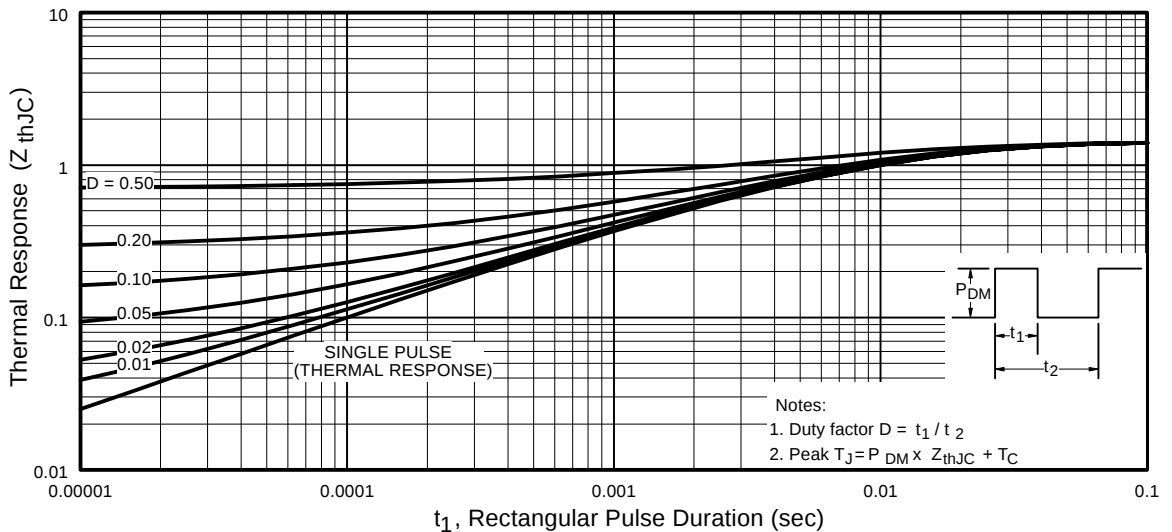


Fig 11. Maximum Effective Transient Thermal Impedance, Junction-to-Case

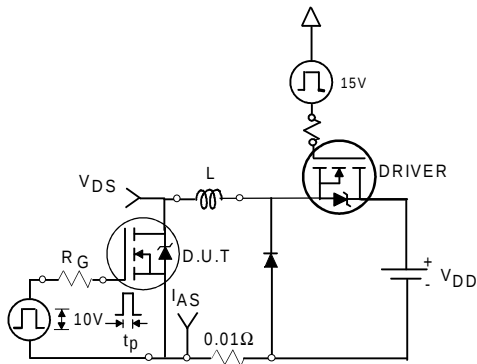


Fig 12a. Unclamped Inductive Test Circuit

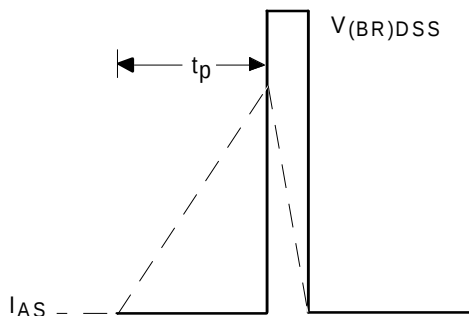


Fig 12b. Unclamped Inductive Waveforms

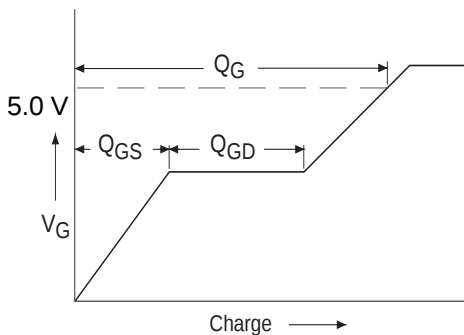


Fig 13a. Basic Gate Charge Waveform

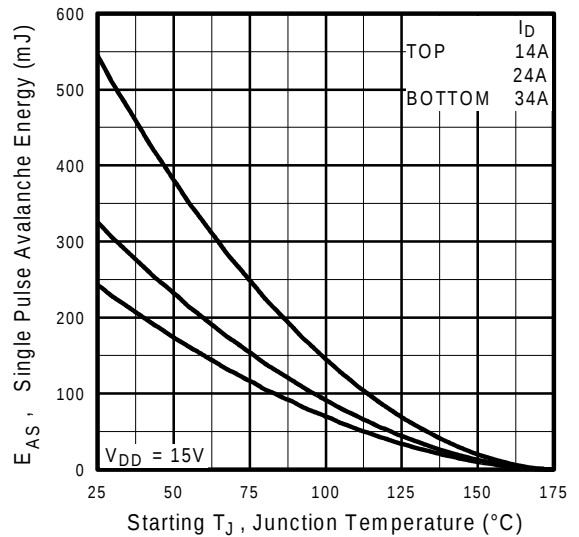
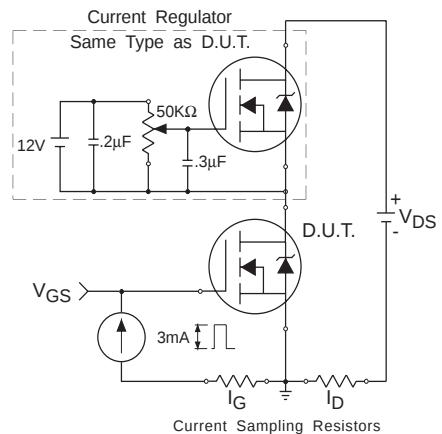
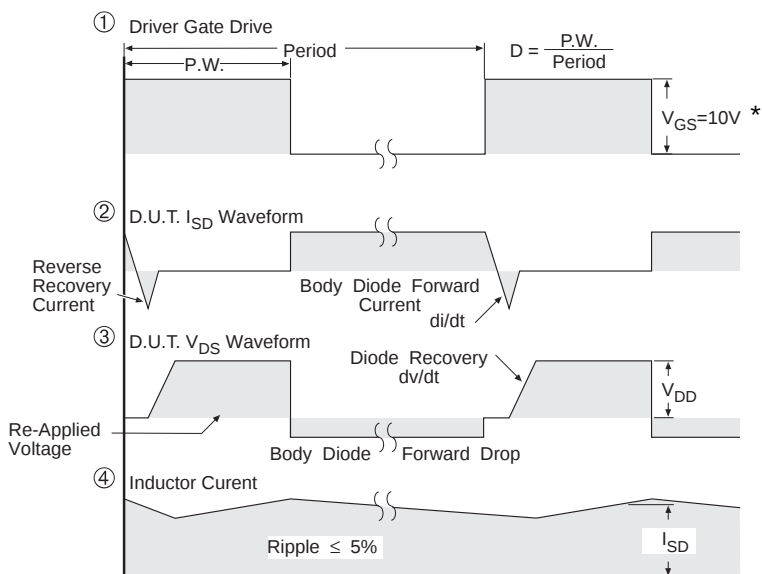
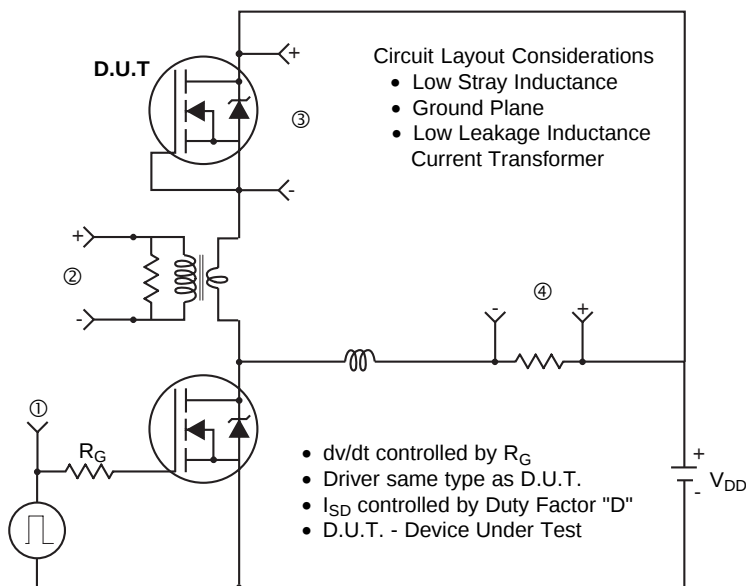
Fig 12c. Maximum Avalanche Energy
Vs. Drain Current

Fig 13b. Gate Charge Test Circuit

Peak Diode Recovery dv/dt Test Circuit



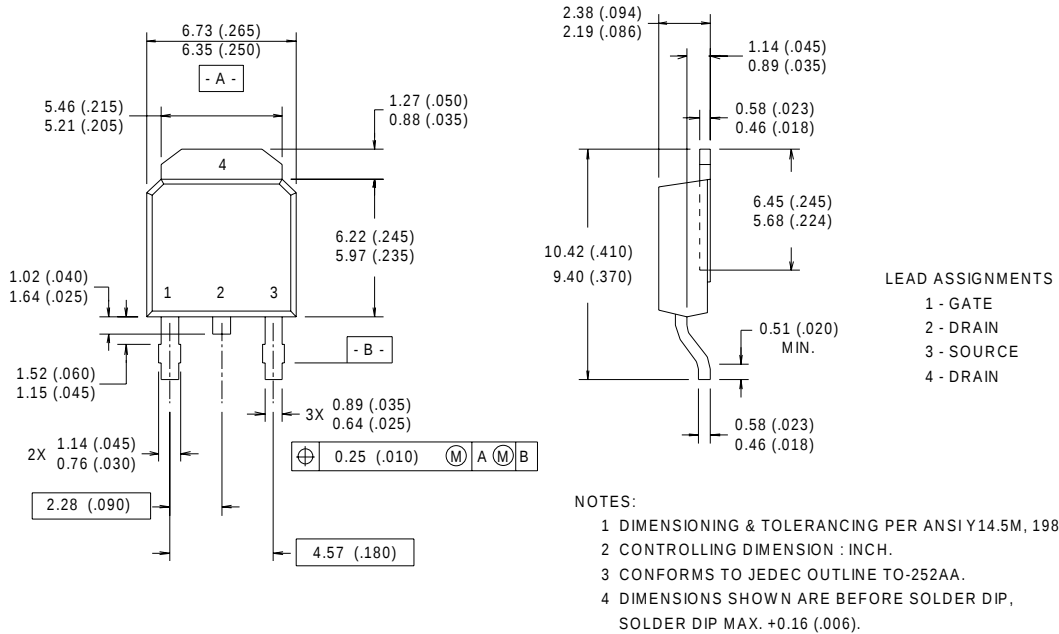
* $V_{GS} = 5V$ for Logic Level Devices

Fig 14. For N-Channel HEXFETS

Package Outline

TO-252AA Outline

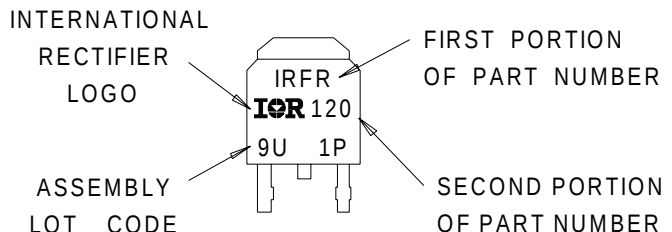
Dimensions are shown in millimeters (inches)



Part Marking Information

TO-252AA (D-PARK)

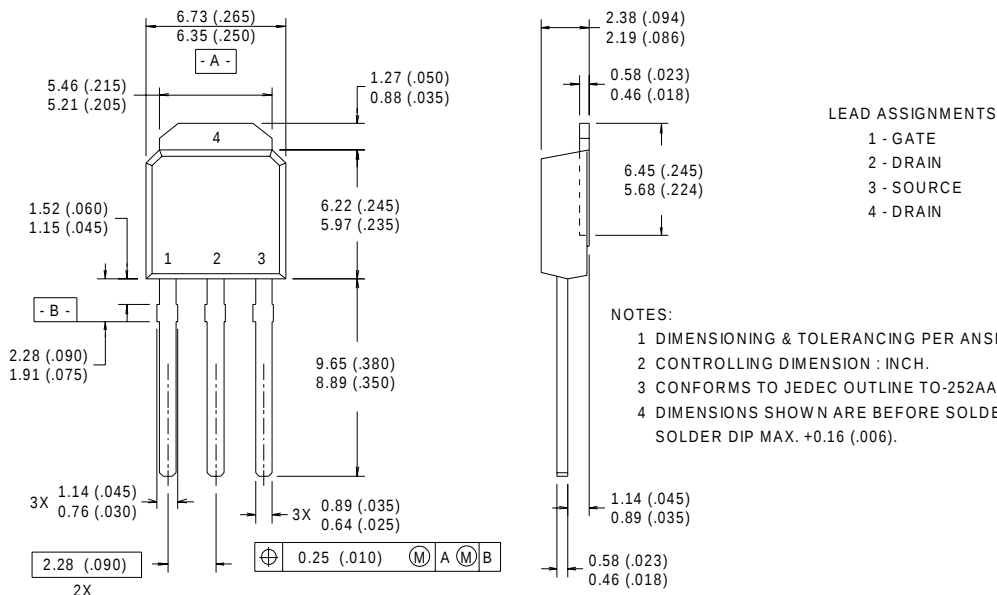
EXAMPLE : THIS IS AN IRFR120
WITH ASSEMBLY
LOT CODE 9U1P



Package Outline

TO-251AA Outline

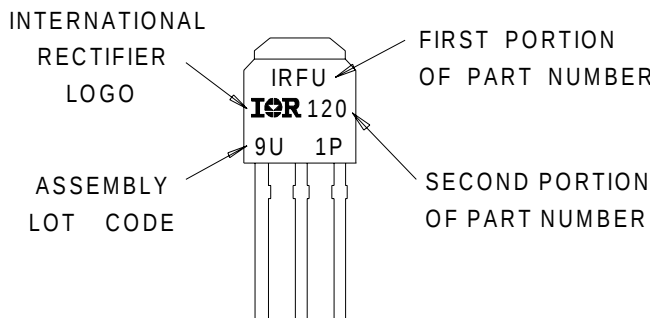
Dimensions are shown in millimeters (inches)



Part Marking Information

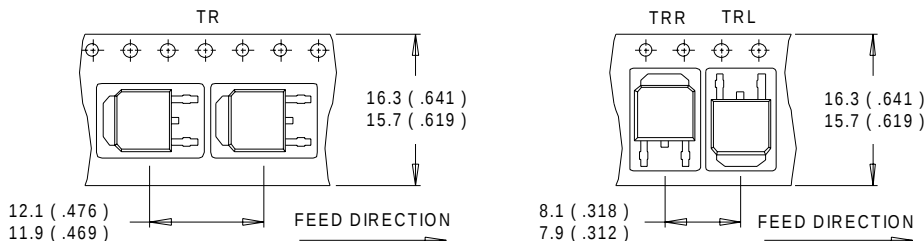
TO-251AA (I-PARK)

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



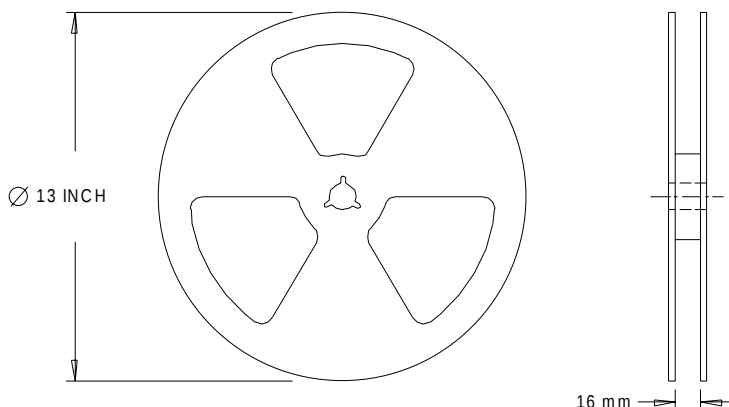
Tape & Reel Information

TO-252AA



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.

International
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Data and specifications subject to change without notice.

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