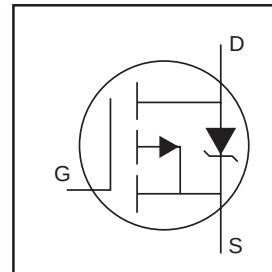


- P-Channel
- 175°C Operating Temperature
- Surface Mount (IRFR6215)
- Straight Lead (IRFU6215)
- Advanced Process Technology
- Fast Switching
- Fully Avalanche Rated

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.

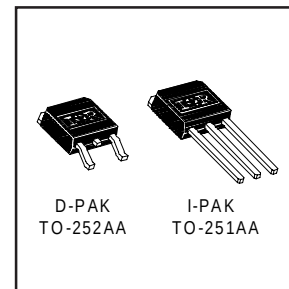
The D-PAK is designed for surface mounting using vapor phase, infrared, or wave soldering techniques. The straight lead version (IRFU series) is for through-hole mounting applications. Power dissipation levels up to 1.5 watts are possible in typical surface mount applications.



$$V_{DSS} = -150V$$

$$R_{DS(on)} = 0.295\Omega$$

$$I_D = -13A$$



Absolute Maximum Ratings

	Parameter	Max.	Units
I_D @ $T_C = 25^\circ\text{C}$	Continuous Drain Current, V_{GS} @ 10V	-13	A
I_D @ $T_C = 100^\circ\text{C}$	Continuous Drain Current, V_{GS} @ 10V	-9.0	
I_{DM}	Pulsed Drain Current ①⑥	-44	
P_D @ $T_C = 25^\circ\text{C}$	Power Dissipation	110	W
	Linear Derating Factor	0.71	W/°C
V_{GS}	Gate-to-Source Voltage	± 20	V
E_{AS}	Single Pulse Avalanche Energy②⑥	310	mJ
I_{AR}	Avalanche Current①⑥	-6.6	A
E_{AR}	Repetitive Avalanche Energy①⑥	11	mJ
dv/dt	Peak Diode Recovery dv/dt ③	5.0	V/ns
T_J	Operating Junction and	-55 to + 175	°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	—	1.4	°C/W
$R_{\theta JA}$	Junction-to-Ambient (PCB mount) **	—	50	
$R_{\theta JA}$	Junction-to-Ambient	—	110	

Electrical Characteristics @ T_J = 25°C (unless otherwise specified)

	Parameter	Min.	Typ.	Max.	Units	Conditions
V _{(BR)DSS}	Drain-to-Source Breakdown Voltage	-150	—	—	V	V _{GS} = 0V, I _D = -250μA
ΔV _{(BR)DSS} /ΔT _J	Breakdown Voltage Temp. Coefficient	—	-0.20	—	V/°C	Reference to 25°C, I _D = -1mA
R _{DS(on)}	Static Drain-to-Source On-Resistance	—	—	0.295	Ω	V _{GS} = -10V, I _D = -6.6A ④
		—	—	0.58		V _{GS} = -10V, I _D = -6.6A ④ T _J = 150°C
V _{GS(th)}	Gate Threshold Voltage	-2.0	—	-4.0	V	V _{DS} = V _{GS} , I _D = -250μA
g _{fs}	Forward Transconductance	3.6	—	—	S	V _{DS} = -50V, I _D = -6.6A⑥
I _{DSS}	Drain-to-Source Leakage Current	—	—	-25	μA	V _{DS} = -150V, V _{GS} = 0V
		—	—	-250		V _{DS} = -120V, V _{GS} = 0V, T _J = 150°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	—	—	66	nC	I _D = -6.6A
Q _{gs}	Gate-to-Source Charge	—	—	8.1		V _{DS} = -120V
Q _{gd}	Gate-to-Drain ("Miller") Charge	—	—	35		V _{GS} = -10V, See Fig. 6 and 13 ④⑥
t _{d(on)}	Turn-On Delay Time	—	14	—	ns	V _{DD} = -75V
t _r	Rise Time	—	36	—		I _D = -6.6A
t _{d(off)}	Turn-Off Delay Time	—	53	—		R _G = 6.8Ω
t _f	Fall Time	—	37	—		R _D = 12Ω, See Fig. 10 ④⑥
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	—	860	—	pF	V _{GS} = 0V
C _{oss}	Output Capacitance	—	220	—		V _{DS} = -25V
C _{rss}	Reverse Transfer Capacitance	—	130	—		f = 1.0MHz, See Fig. 5⑥

Source-Drain Ratings and Characteristics

	Parameter	Min.	Typ.	Max.	Units	Conditions
I _S	Continuous Source Current (Body Diode)	—	—	-13	A	MOSFET symbol showing the integral reverse p-n junction diode.
I _{SM}	Pulsed Source Current (Body Diode) ①⑥	—	—	-44		
V _{SD}	Diode Forward Voltage	—	—	-1.6	V	T _J = 25°C, I _S = -6.6A, V _{GS} = 0V ④
t _{rr}	Reverse Recovery Time	—	160	240	ns	T _J = 25°C, I _F = -6.6A
Q _{rr}	Reverse Recovery Charge	—	1.2	1.7	μC	di/dt = 100A/μs ④⑥
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°C, L = 14mH
R_G = 25Ω, I_{AS} = -6.6A. (See Figure 12)
- ③ I_{SD} ≤ -6.6A, di/dt ≤ -620A/μs, V_{DD} ≤ V_{(BR)DSS}, ⑥ Uses IRF6215 data and test conditions
T_J ≤ 175°C
- ④ Pulse width ≤ 300μs; duty cycle ≤ 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

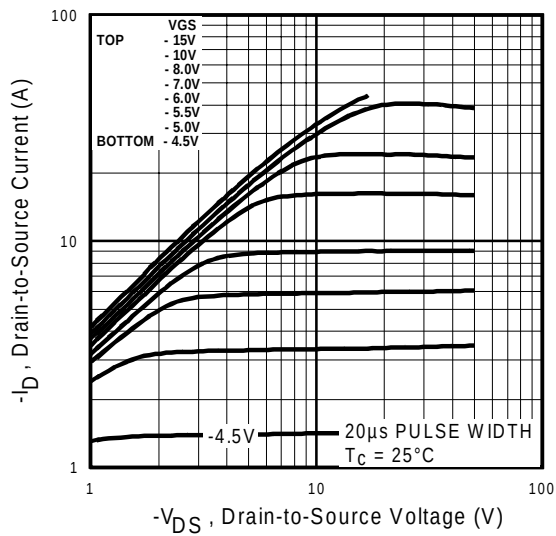


Fig 1. Typical Output Characteristics

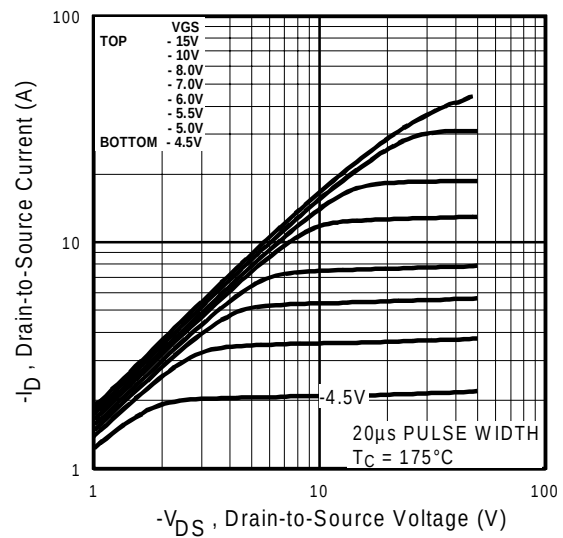


Fig 2. Typical Output Characteristics

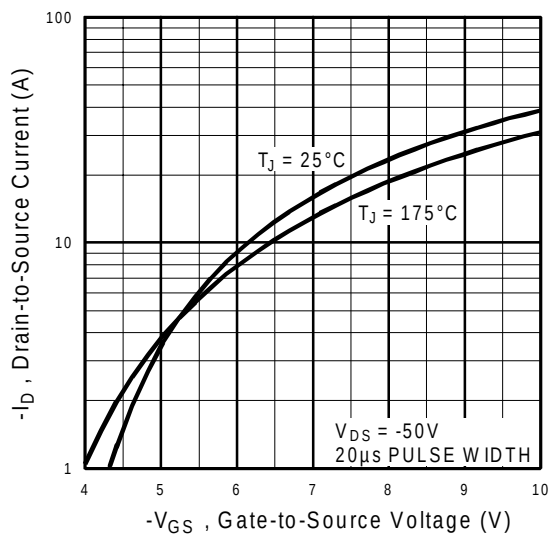


Fig 3. Typical Transfer Characteristics

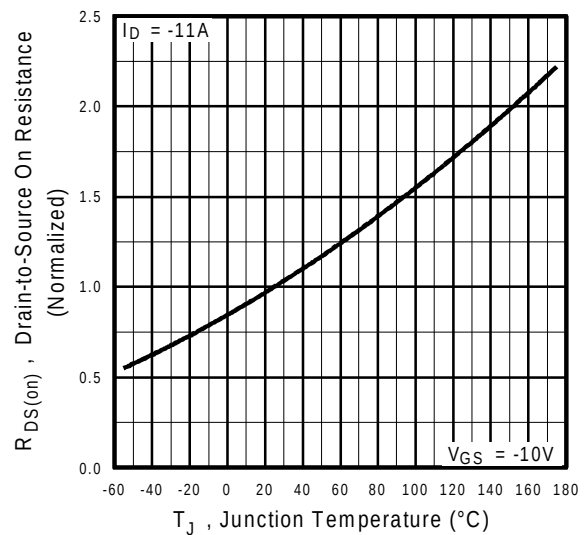


Fig 4. Normalized On-Resistance
Vs. Temperature

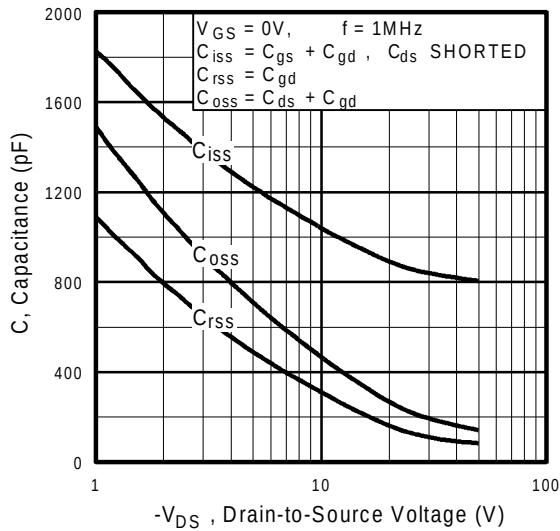


Fig 5. Typical Capacitance Vs. Drain-to-Source Voltage

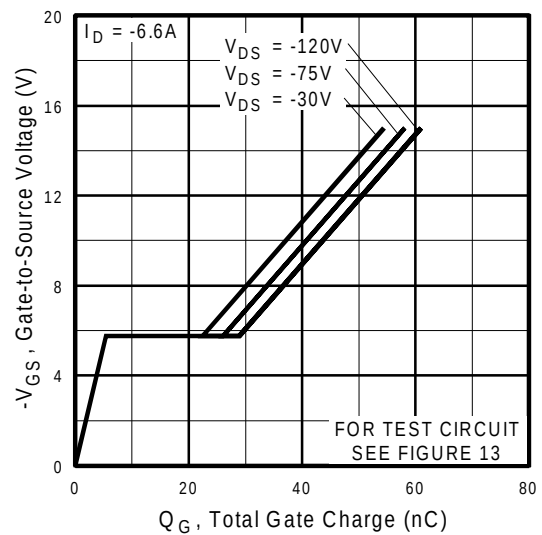


Fig 6. Typical Gate Charge Vs. Gate-to-Source Voltage

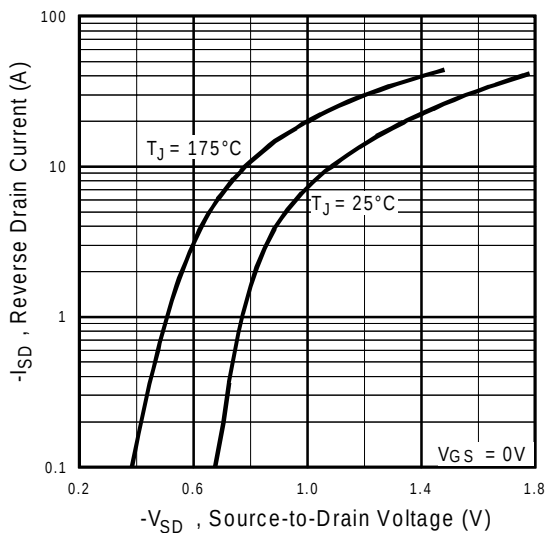


Fig 7. Typical Source-Drain Diode Forward Voltage

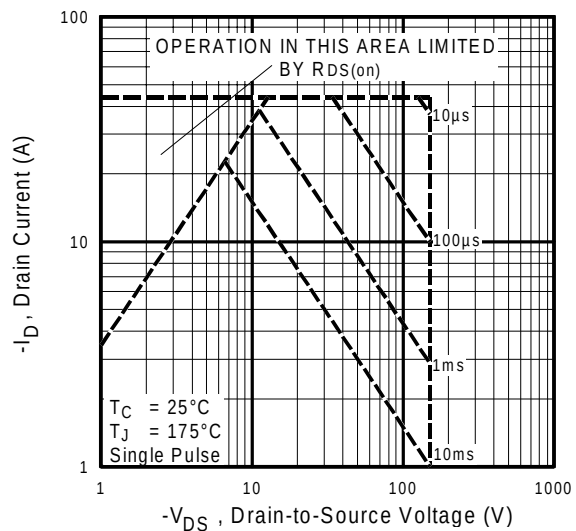


Fig 8. Maximum Safe Operating Area

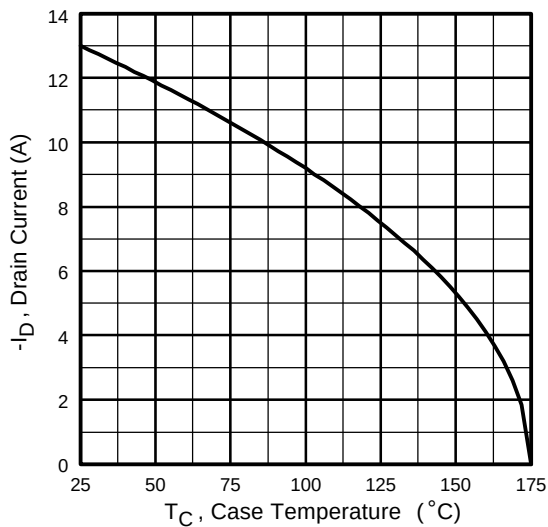


Fig 9. Maximum Drain Current Vs. Case Temperature

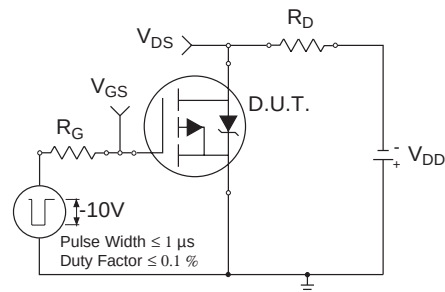


Fig 10a. Switching Time Test Circuit

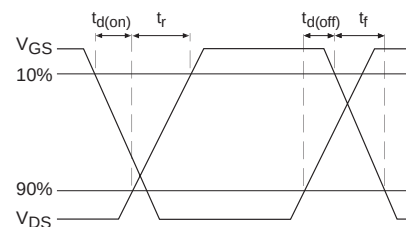


Fig 10b. Switching Time Waveforms

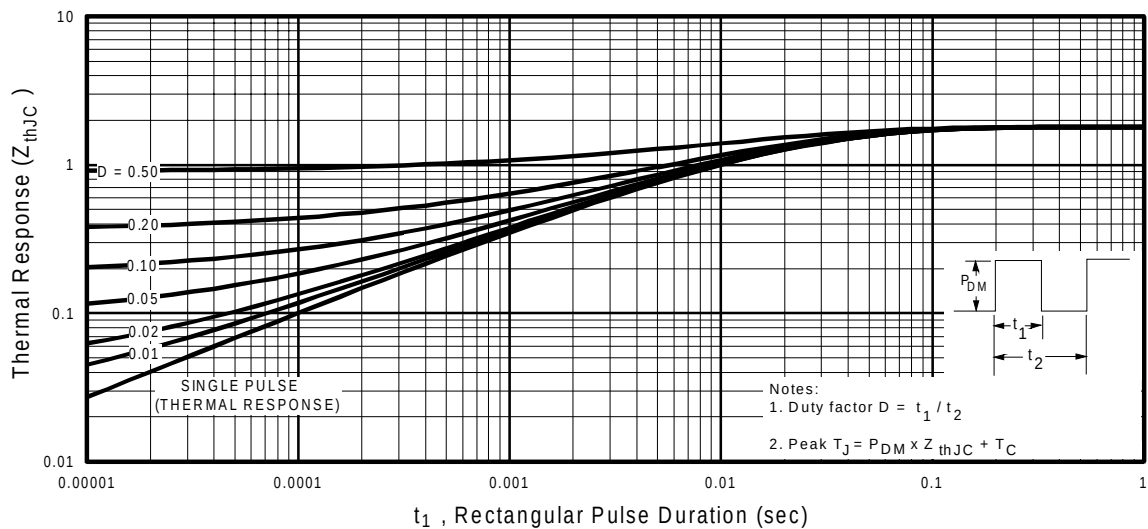


Fig 11. Maximum Effective Transient Thermal Impedance, Junction-to-Case

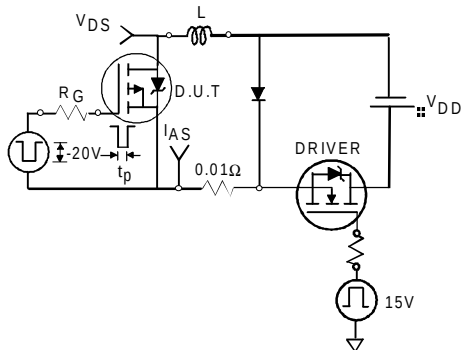


Fig 12a. Unclamped Inductive Test Circuit

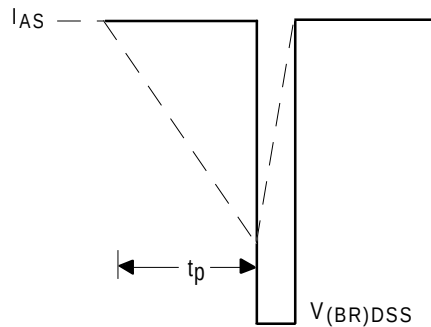


Fig 12b. Unclamped Inductive Waveforms

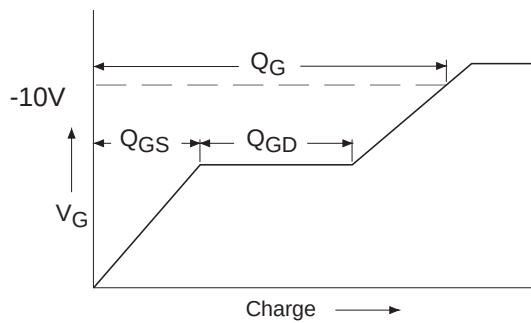


Fig 13a. Basic Gate Charge Waveform

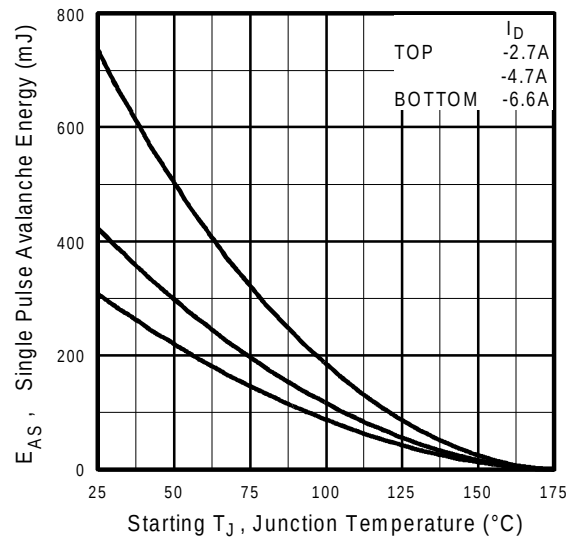


Fig 12c. Maximum Avalanche Energy
Vs. Drain Current

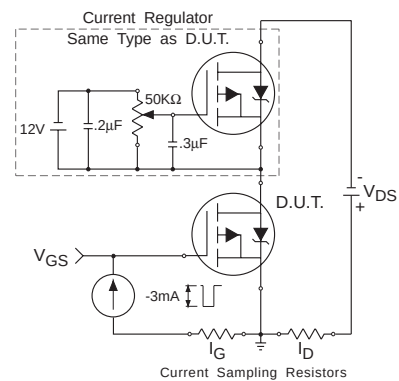
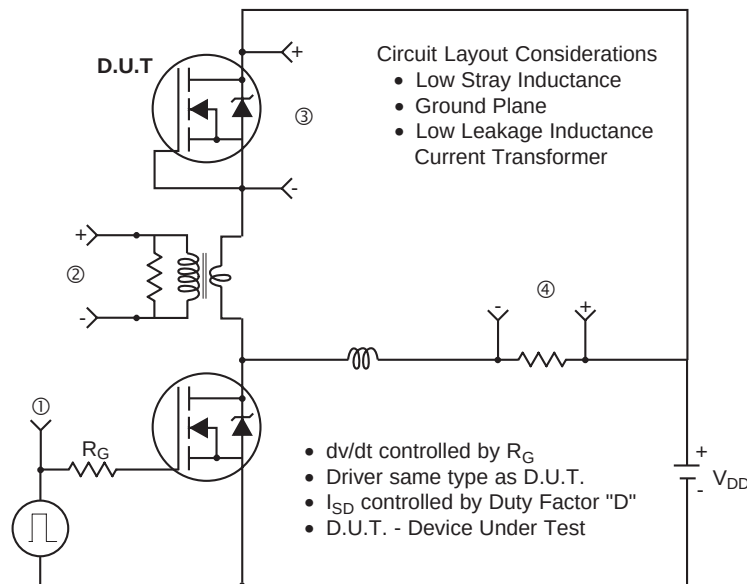
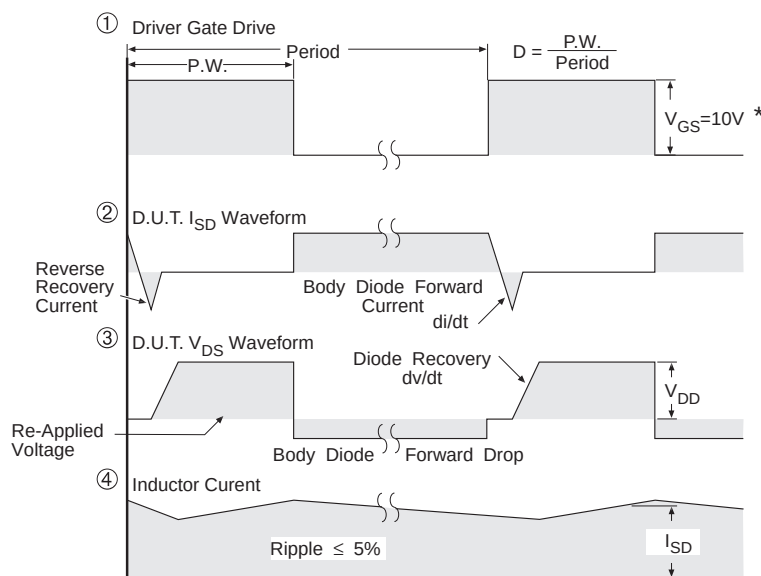


Fig 13b. Gate Charge Test Circuit

Peak Diode Recovery dv/dt Test Circuit



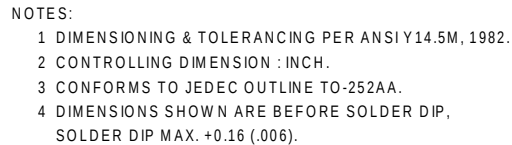
* Reverse Polarity of D.U.T for P-Channel



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

Fig 14. For N-Channel HEXFETS

Dimensions are shown in millimeters (inches)



TO-252AA (D-PARK)

Diagram of an IRFR120 MOSFET package with labels:

- INTERNATIONAL RECTIFIER LOGO (points to the IR logo)
- FIRST PORTION OF PART NUMBER (points to the 'IRFR' text)
- IRFR 120 (the main part number on the package)
- 9U 1P (the assembly lot code on the package)
- SECOND PORTION OF PART NUMBER (points to the '120' text)

TO-251AA Outline

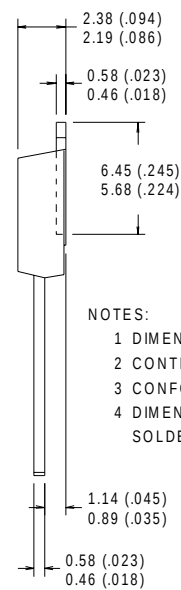
Technical drawing of a mechanical part, likely a valve or plug, showing dimensions in inches and millimeters. The drawing includes a top view with features 1, 2, and 3, and a side view with features 4 and 5. Dimensions are provided for various features, including diameters, radii, and lengths. A table at the bottom right lists material and finish specifications.

Dimensions:

- Top View:
 - Overall Width: 6.73 (.265)
 - Inner Width: 6.35 (.250)
 - Feature 1: 5.46 (.215)
 - Feature 2: 5.21 (.205)
 - Feature 3: 1.27 (.050)
 - Feature 4: 0.88 (.035)
 - Feature 5: 6.22 (.245)
 - Feature 6: 5.97 (.235)
 - Feature 7: 9.65 (.380)
 - Feature 8: 8.89 (.350)
 - Feature 9: 0.89 (.035)
 - Feature 10: 0.64 (.025)
- Side View:
 - Feature 11: 2.28 (.090)
 - Feature 12: 1.91 (.075)
 - Feature 13: 1.14 (.045)
 - Feature 14: 0.76 (.030)

Material and Finish Specifications:

2.28 (.090)	2X	⊕	0.25 (.010)	M	A	M	B
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1 - GATE
2 - DRAIN
3 - SOURCE
4 - DRAIN

1 DIMENSIONING & TOLERANCING PER ANSI Y14.5M, 1982.
2 CONTROLLING DIMENSION : INCH.
3 CONFORMS TO JEDEC OUTLINE TO-252AA.
4 DIMENSIONS SHOWN ARE BEFORE SOLDER DIP,
SOLDER DIP MAX. +0.16 (.006).

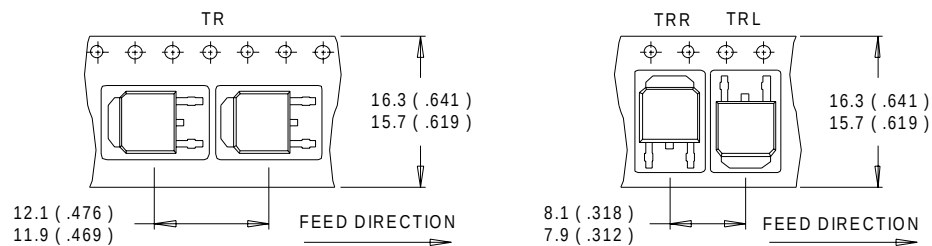
TO-251AA (I-PARK)

Diagram illustrating the markings on a MOSFET package (IRFU120) and their corresponding labels:

- INTERNATIONAL RECTIFIER LOGO**: Points to the **IR** logo on the package.
- FIRST PORTION OF PART NUMBER**: Points to the **120** marking on the package.
- SECOND PORTION OF PART NUMBER**: Points to the **9U 1P** marking on the package.
- ASSEMBLY LOT CODE**: Points to the **9U 1P** marking on the package.

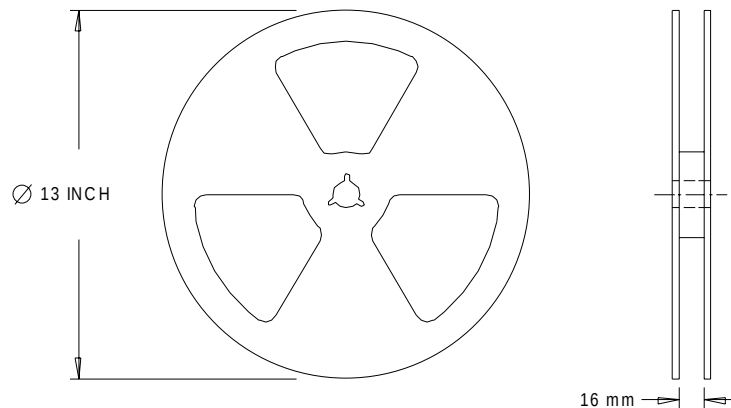
Tape & Reel Information

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
IR Rectifier

WORLD HEADQUARTERS: 233 Kansas St., El Segundo, California 90245, Tel: (310) 322 3331
EUROPEAN HEADQUARTERS: Hurst Green, Oxted, Surrey RH8 9BB, UK Tel: ++ 44 1883 732020

IR CANADA: 15 Lincoln Court, Brampton, Ontario L6T 3Z2, Tel: (905) 453 2200

IR GERMANY: Saalburgstrasse 157, 61350 Bad Homburg Tel: ++ 49 6172 96590

IR ITALY: Via Liguria 49, 10071 Borgaro, Torino Tel: ++ 39 11 451 0111

IR FAR EAST: 171 (K&H Bldg.) 30-4 Nishi-ikebukuro 3-chome, Toshima-ku, Tokyo Japan Tel: 81 33 983 0086

IR SOUTHEAST ASIA: 315 Outram Road, #10-02 Tan Boon Liat Building, Singapore 16907 Tel: 65 221 8371

Data and specifications subject to change without notice.

5/98

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