

HEXFET® Power MOSFET

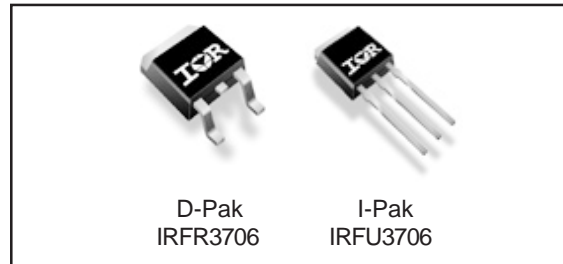
Applications

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

V_{DSS}	R_{DS(on)} max	I_D
20V	9.0mΩ	75A^④

Benefits

- Ultra-Low Gate Impedance
- Very Low RDS(on) at 4.5V V_{GS}
- Fully Characterized Avalanche Voltage and Current



Absolute Maximum Ratings

Symbol	Parameter	Max.	Units
V _{DS}	Drain-Source Voltage	20	V
V _{GS}	Gate-to-Source Voltage	± 12	V
I _D @ T _C = 25°C	Continuous Drain Current, V _{GS} @ 10V	75 ^④	A
I _D @ T _C = 100°C	Continuous Drain Current, V _{GS} @ 10V	53 ^④	
I _{DM}	Pulsed Drain Current ^①	280	
P _D @ T _C = 25°C	Maximum Power Dissipation ^③	88	W
P _D @ T _C = 100°C	Maximum Power Dissipation ^③	44	W
	Linear Derating Factor	0.59	mW/°C
T _J , T _{STG}	Junction and Storage Temperature Range	-55 to + 175	°C

Thermal Resistance

	Parameter	Typ.	Max.	Units
R _{θJC}	Junction-to-Case	—	1.7	°C/W
R _{θJA}	Junction-to-Ambient (PCB mount)*	—	50	
R _{θJA}	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 10

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

	Parameter	Min.	Typ.	Max.	Units	Conditions
$V_{(BR)DSS}$	Drain-to-Source Breakdown Voltage	20	—	—	V	$V_{GS} = 0V, I_D = 250\mu A$
$\Delta V_{(BR)DSS}/\Delta T_J$	Breakdown Voltage Temp. Coefficient	—	0.021	—	V/ $^\circ\text{C}$	Reference to $25^\circ\text{C}, I_D = 1\text{mA}$
$R_{DS(on)}$	Static Drain-to-Source On-Resistance	—	6.9	9.0	m Ω	$V_{GS} = 10V, I_D = 36A$ ③
		—	8.1	11		$V_{GS} = 4.5V, I_D = 28A$ ③
		—	11.5	23		$V_{GS} = 2.8V, I_D = 18A$ ③
$V_{GS(th)}$	Gate Threshold Voltage	0.6	—	2.0	V	$V_{DS} = V_{GS}, I_D = 250\mu A$
I_{DSS}	Drain-to-Source Leakage Current	—	—	20	μA	$V_{DS} = 16V, V_{GS} = 0V$
		—	—	100		$V_{DS} = 16V, V_{GS} = 0V, T_J = 125^\circ\text{C}$
I_{GSS}	Gate-to-Source Forward Leakage	—	—	200	nA	$V_{GS} = 12V$
	Gate-to-Source Reverse Leakage	—	—	-200		$V_{GS} = -12V$

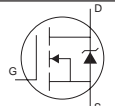
Dynamic @ $T_J = 25^\circ\text{C}$ (unless otherwise specified)

Symbol	Parameter	Min.	Typ.	Max.	Units	Conditions
g_{fs}	Forward Transconductance	53	—	—	S	$V_{DS} = 16V, I_D = 57A$
Q_g	Total Gate Charge	—	23	35	nC	$I_D = 28A$
Q_{gs}	Gate-to-Source Charge	—	8.0	12		$V_{DS} = 10V$
Q_{gd}	Gate-to-Drain ("Miller") Charge	—	5.5	8.3		$V_{GS} = 4.5V$ ③
Q_{oss}	Output Gate Charge	—	16	24		$V_{GS} = 0V, V_{DS} = 10V$
$t_{d(on)}$	Turn-On Delay Time	—	6.8	—	ns	$V_{DD} = 10V$
t_r	Rise Time	—	87	—		$I_D = 28A$
$t_{d(off)}$	Turn-Off Delay Time	—	17	—		$R_G = 1.8\Omega$
t_f	Fall Time	—	4.8	—		$V_{GS} = 4.5V$ ③
C_{iss}	Input Capacitance	—	2410	—		$V_{GS} = 0V$
C_{oss}	Output Capacitance	—	1070	—	$V_{DS} = 10V$	
C_{rss}	Reverse Transfer Capacitance	—	140	—	pF	$f = 1.0\text{MHz}$

Avalanche Characteristics

Symbol	Parameter	Typ.	Max.	Units
E_{AS}	Single Pulse Avalanche Energy②	—	220	mJ
I_{AR}	Avalanche Current①	—	28	A

Diode Characteristics

Symbol	Parameter	Min.	Typ.	Max.	Units	Conditions
I_S	Continuous Source Current (Body Diode)	—	—	75④	A	MOSFET symbol showing the integral reverse p-n junction diode. 
I_{SM}	Pulsed Source Current (Body Diode) ①	—	—	280		
V_{SD}	Diode Forward Voltage	—	0.88	1.3	V	$T_J = 25^\circ\text{C}, I_S = 36A, V_{GS} = 0V$ ③
		—	0.82	—		$T_J = 125^\circ\text{C}, I_S = 36A, V_{GS} = 0V$ ③
t_{rr}	Reverse Recovery Time	—	45	68	ns	$T_J = 25^\circ\text{C}, I_F = 36A, V_R = 20V$
Q_{rr}	Reverse Recovery Charge	—	65	98	nC	$di/dt = 100A/\mu s$ ③
t_{rr}	Reverse Recovery Time	—	49	74	ns	$T_J = 125^\circ\text{C}, I_F = 36A, V_R = 20V$
Q_{rr}	Reverse Recovery Charge	—	78	120	nC	$di/dt = 100A/\mu s$ ③

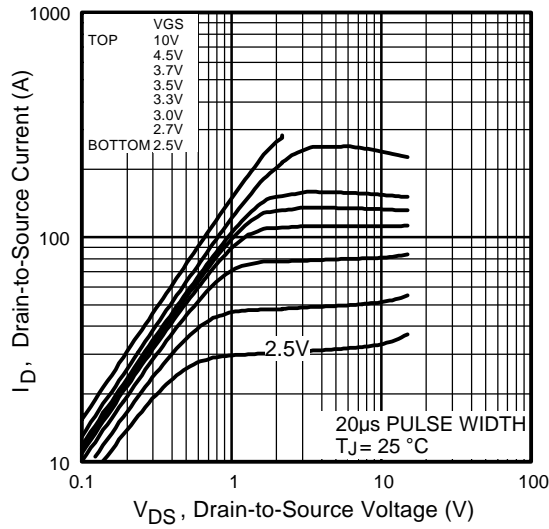


Fig 1. Typical Output Characteristics

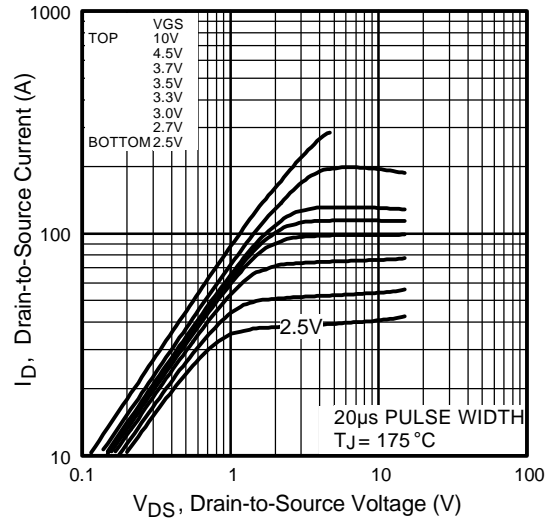


Fig 2. Typical Output Characteristics

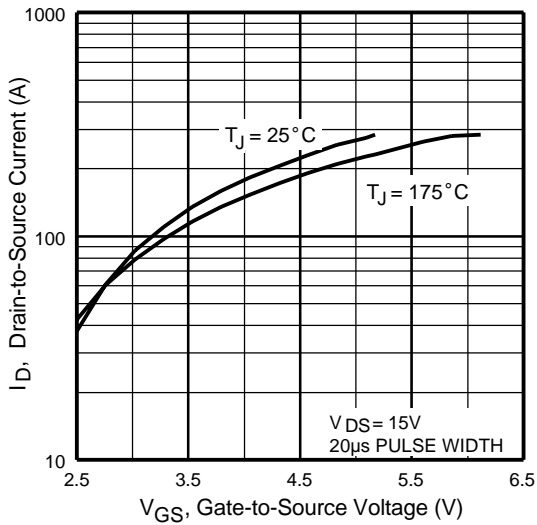


Fig 3. Typical Transfer Characteristics

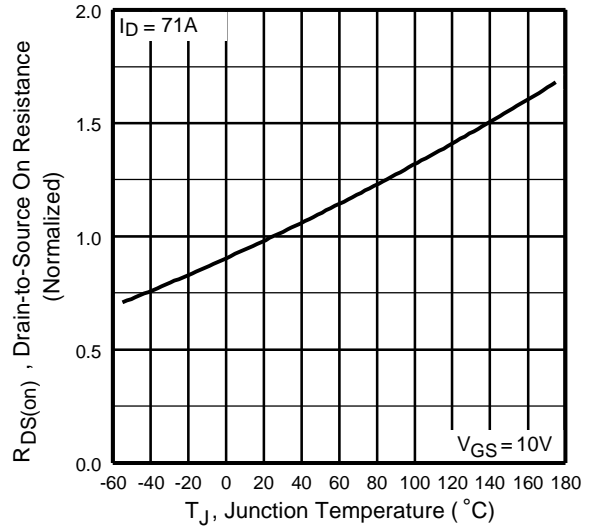


Fig 4. Normalized On-Resistance Vs. Temperature

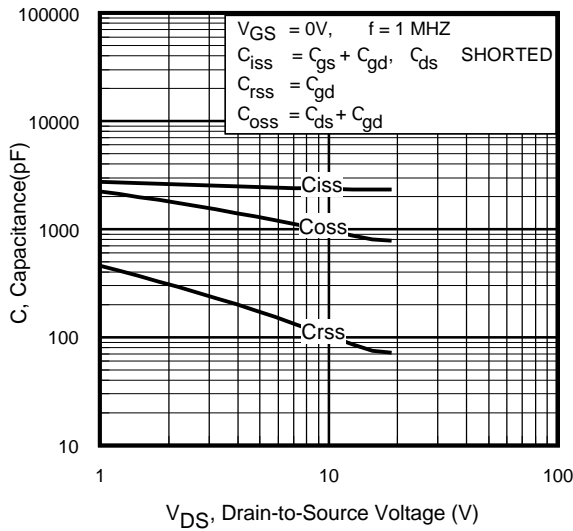


Fig 5. Typical Capacitance Vs. Drain-to-Source Voltage

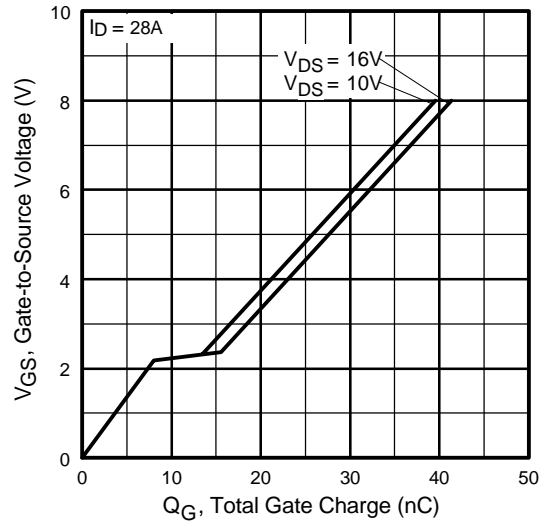


Fig 6. Typical Gate Charge Vs. Gate-to-Source Voltage

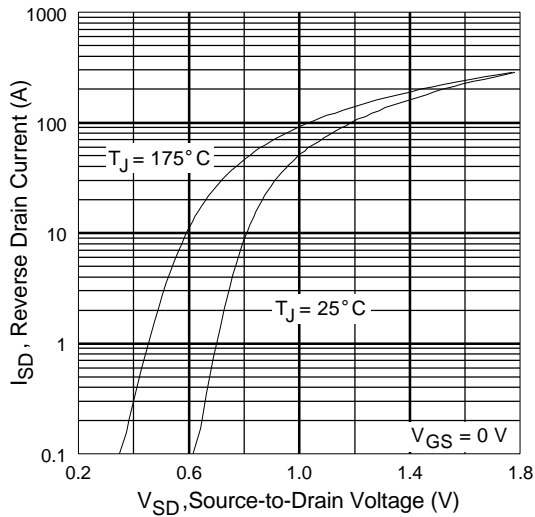


Fig 7. Typical Source-Drain Diode Forward Voltage

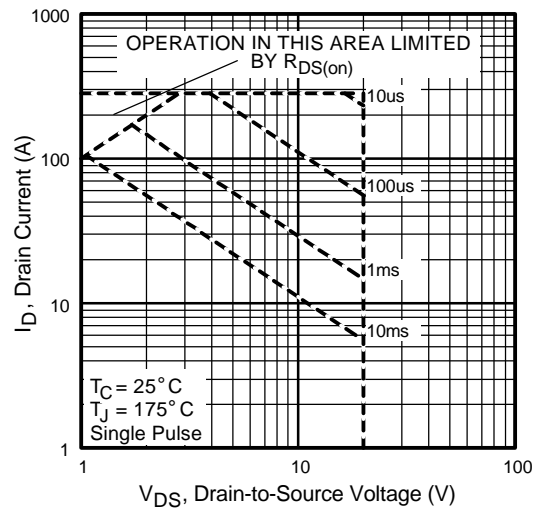


Fig 8. Maximum Safe Operating Area

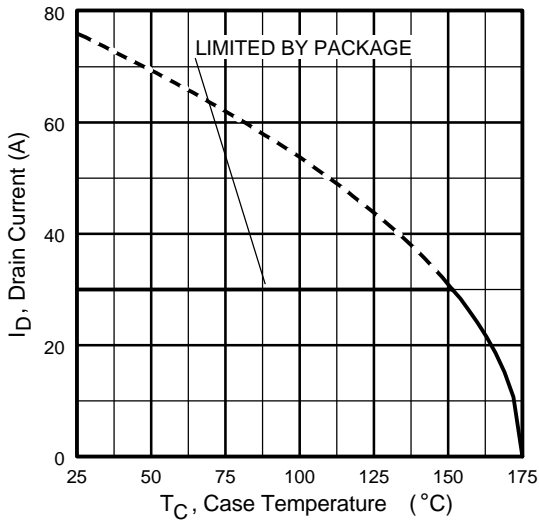


Fig 9. Maximum Drain Current Vs. Case Temperature

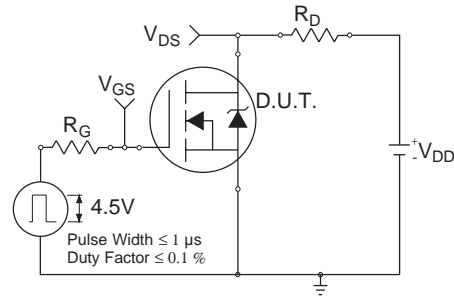


Fig 10a. Switching Time Test Circuit



Fig 10b. Switching Time Waveforms

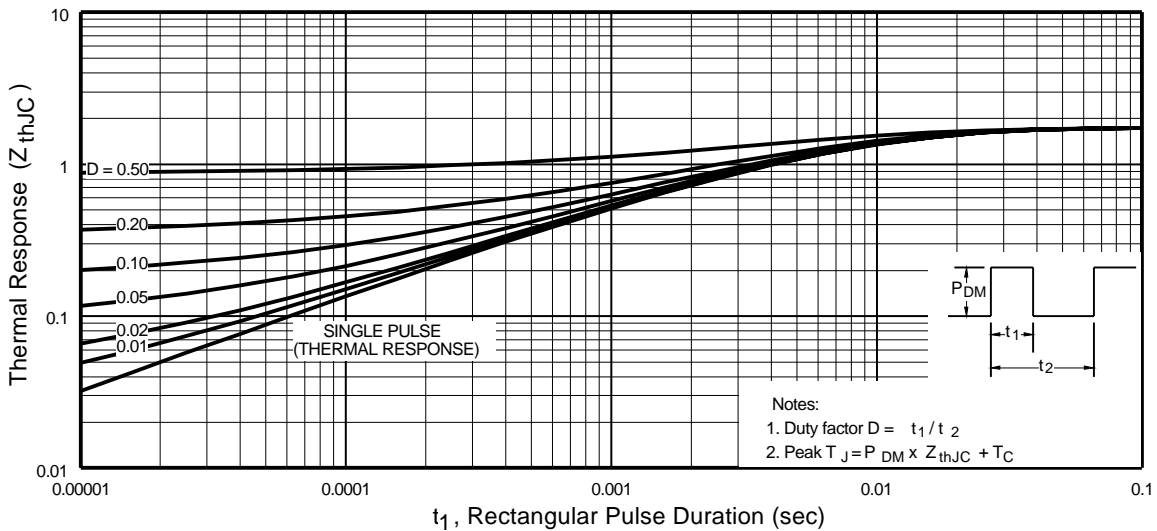


Fig 11. Maximum Effective Transient Thermal Impedance, Junction-to-Case

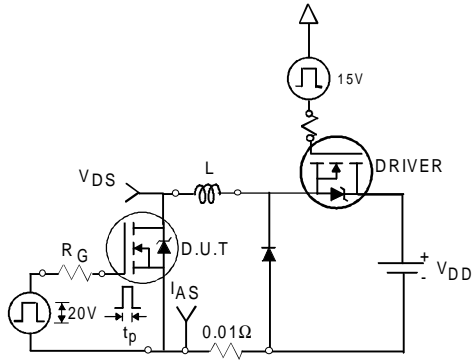


Fig 12a. Unclamped Inductive Test Circuit



Fig 12b. Unclamped Inductive Waveforms

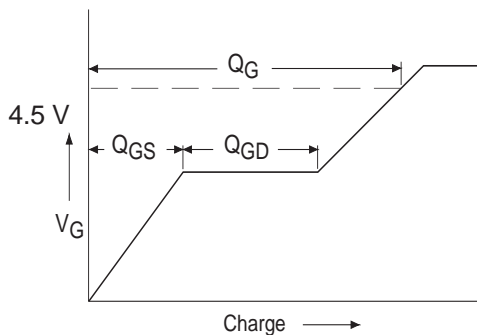


Fig 13a. Basic Gate Charge Waveform

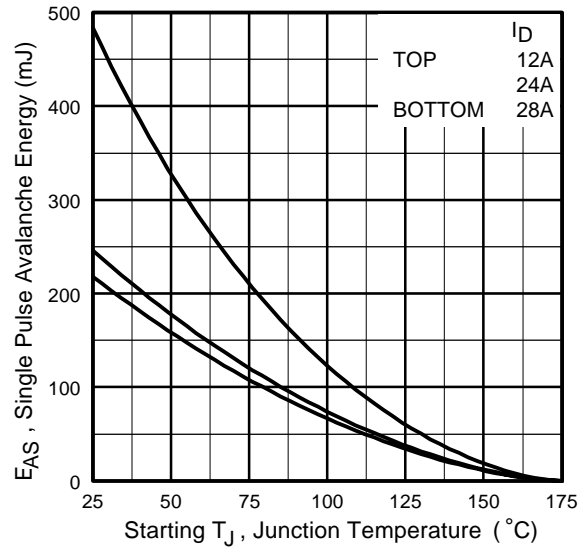
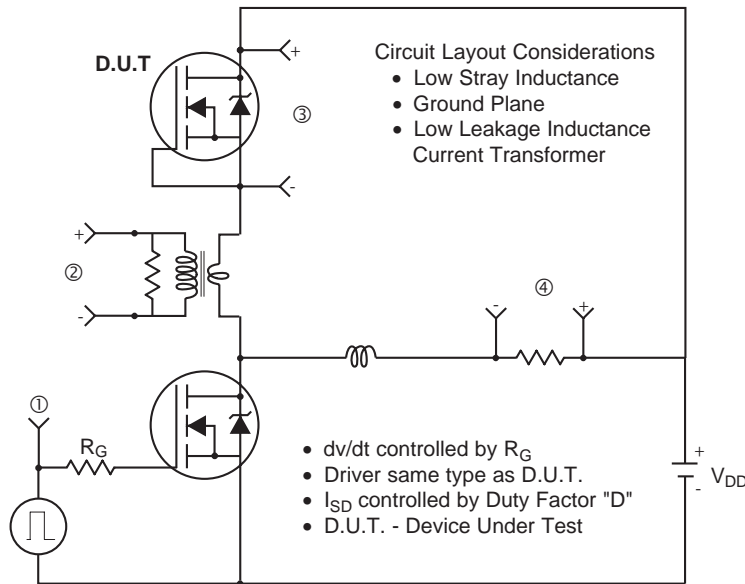


Fig 12c. Maximum Avalanche Energy Vs. Drain Current



Fig 13b. Gate Charge Test Circuit

Peak Diode Recovery dv/dt Test Circuit



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

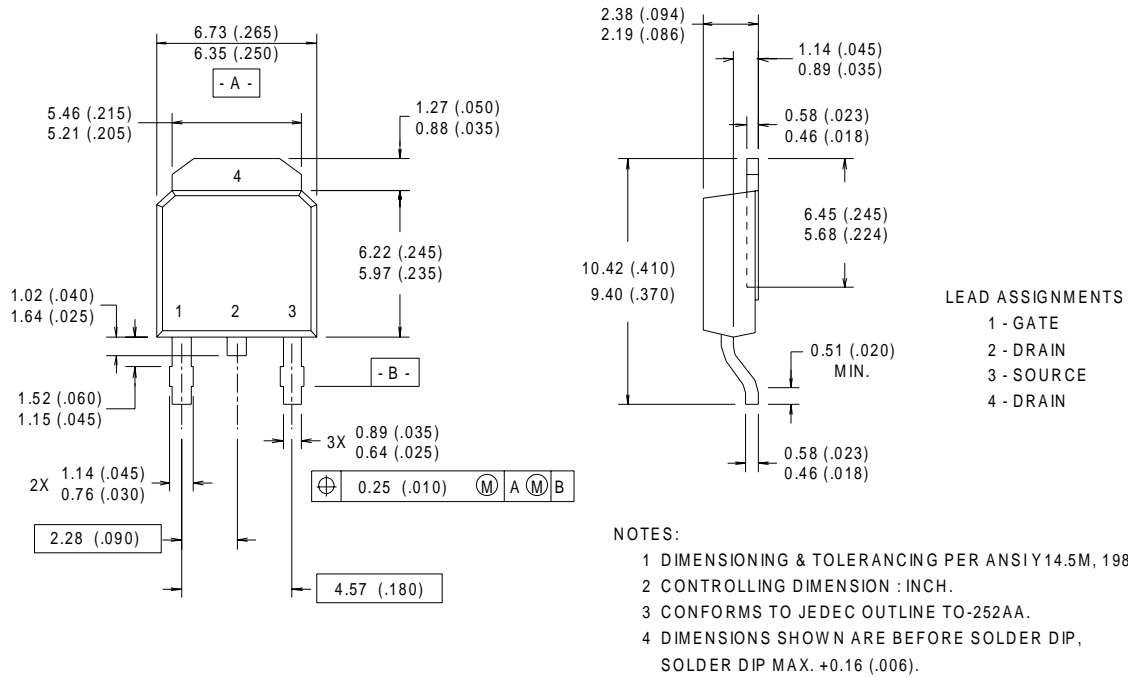
Fig 14. For N-Channel HEXFET® Power MOSFETs

IRFR/U3706



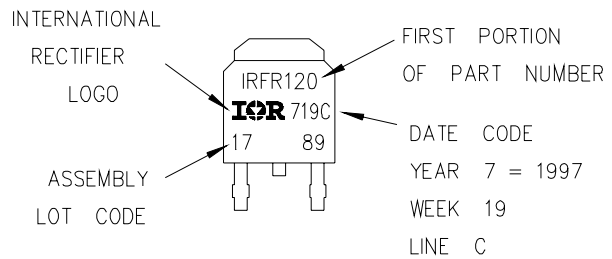
D-Pak (TO-252AA) Package Outline

Dimensions are shown in millimeters (inches)



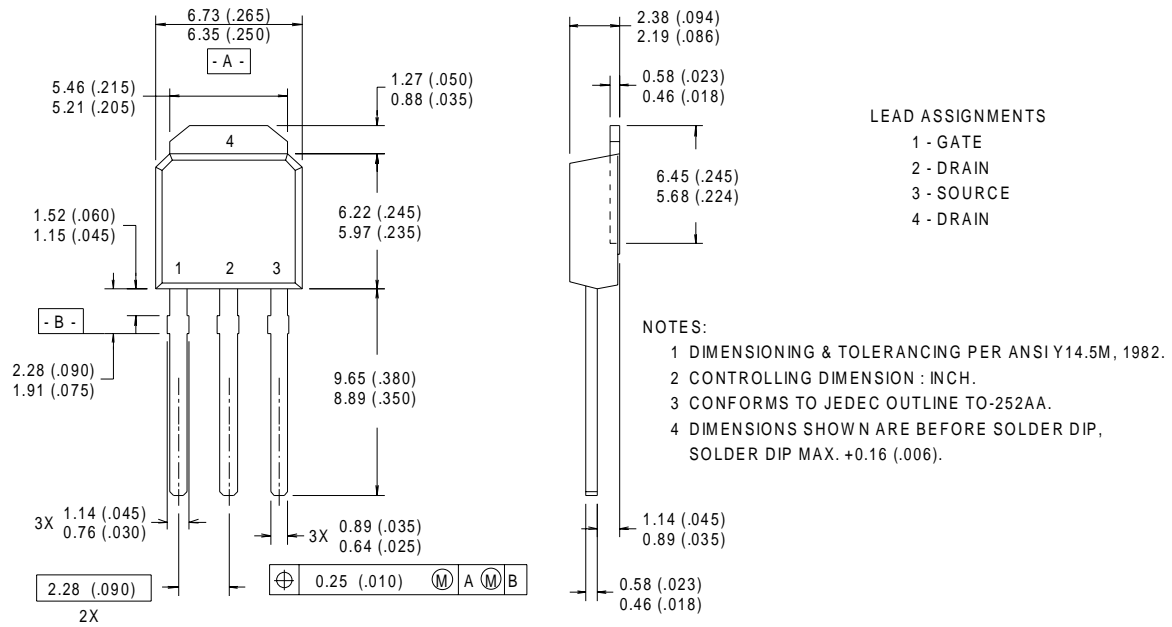
D-Pak (TO-252AA) Part Marking Information

EXAMPLE: THIS IS AN IRFR120
 LOT CODE 1789
 ASSEMBLED ON WW 19, 1997
 IN THE ASSEMBLY LINE "C"



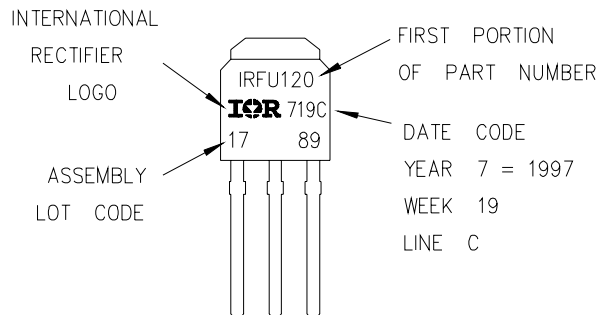
I-Pak (TO-251AA) Package Outline

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"

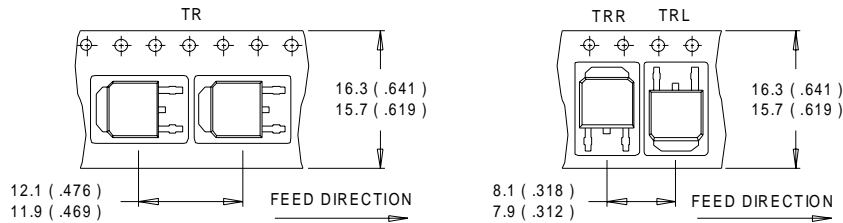


IRFR/U3706

International
IR Rectifier

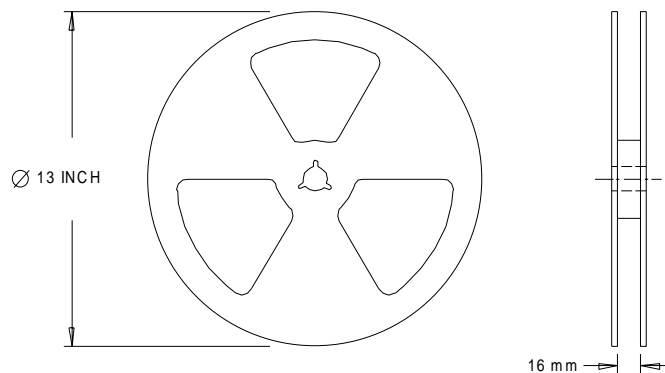
D-Pak (TO-252AA) Tape & Reel Information

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 $T_J = 25^\circ\text{C}$, $L = 0.54\text{mH}$
 $R_G = 25\Omega$, $I_{AS} = 28\text{A}$.
- ③ Pulse width $\leq 400\mu\text{s}$; duty cycle $\leq 2\%$.
- ④ Calculated continuous current based on maximum allowable junction temperature. Package limitation current is 30A.

International
IR Rectifier

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Data and specifications subject to change without notice. 7/00