

## **SMPS MOSFET**

V<sub>DSS</sub>

20V

IRFR3704 IRFU3704

75A<sup>4</sup>

#### **Applications**

HEXFET® Power MOSFET

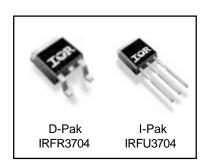
R<sub>DS(on)</sub> max

 $9.5m\Omega$ 

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

R	۵r	16	fi	ts
ப	C-1	15		

- Ultra-Low R<sub>DS(on)</sub>
- Very Low Gate Impedance
- Fully Characterized Avalanche Voltage and Current



#### **Absolute Maximum Ratings**

Symbol	Parameter	Max.	Units
$V_{DS}$	Drain-Source Voltage	20	V
V <sub>GS</sub>	Gate-to-Source Voltage	± 20	V
I <sub>D</sub> @ T <sub>C</sub> = 25°C	Continuous Drain Current, V <sub>GS</sub> @ 10V	75 ④	
$I_D @ T_C = 70^{\circ}C$	Continuous Drain Current, V <sub>GS</sub> @ 10V	63 ④	Α
I <sub>DM</sub>	Pulsed Drain Current①	300	
P <sub>D</sub> @T <sub>C</sub> = 25°C	Maximum Power Dissipation®	90	W
P <sub>D</sub> @T <sub>C</sub> = 70°C	Maximum Power Dissipation®	62	W
	Linear Derating Factor	0.58	mW/°C
$T_J$ , $T_{STG}$	Junction and Storage Temperature Range	-55 to + 175	°C

#### **Thermal Resistance**

	Parameter	Тур.	Max.	Units
$R_{\theta JC}$	Junction-to-Case		1.7	
$R_{\theta JA}$	Junction-to-Ambient (PCB mount)*		50	°C/W
$R_{\theta JA}$	Junction-to-Ambient		110	

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

## Static @ T<sub>J</sub> = 25°C (unless otherwise specified)

	Parameter	Min.	Тур.	Max.	Units	Conditions
V <sub>(BR)DSS</sub>	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/°C	Reference to 25°C, I <sub>D</sub> = 1mA
D	Static Drain-to-Source On-Resistance		7.3	9.5	mΩ	V <sub>GS</sub> = 10V, I <sub>D</sub> = 15A ③
R <sub>DS(on)</sub>			11	14	11122	$V_{GS} = 4.5V, I_D = 12A$ ③
V <sub>GS(th)</sub>	Gate Threshold Voltage	1.0		3.0	/	$V_{DS} = V_{GS}, I_{D} = 250 \mu A$
lana	Drain-to-Source Leakage Current			20	μA	$V_{DS} = 16V, V_{GS} = 0V$
I <sub>DSS</sub>	Diam-to-Source Leakage Guirent			100	μΛ	$V_{DS} = 16V, V_{GS} = 0V, T_{J} = 125$ °C
I <sub>GSS</sub>	Gate-to-Source Forward Leakage			200	nA	V <sub>GS</sub> = 16V
	Gate-to-Source Reverse Leakage			-200	IIA	V <sub>GS</sub> = -16V

## Dynamic @ $T_J = 25$ °C (unless otherwise specified)

Symbol	Parameter	Min.	Тур.	Max.	Units	Conditions
9fs	Forward Transconductance	42			S	V <sub>DS</sub> = 10V, I <sub>D</sub> = 57A
Qg	Total Gate Charge		19			I <sub>D</sub> = 28.4A
Q <sub>gs</sub>	Gate-to-Source Charge		8.1		nC	$V_{DS} = 10V$
Q <sub>gd</sub>	Gate-to-Drain ("Miller") Charge		6.4			$V_{GS} = 4.5V$ ③
Q <sub>oss</sub>	Output Gate Charge		16	24		$V_{GS} = 0V$ , $V_{DS} = 10V$
t <sub>d(on)</sub>	Turn-On Delay Time		8.4			$V_{DD} = 10V$
t <sub>r</sub>	Rise Time		98		ns	$I_D = 28.4A$
t <sub>d(off)</sub>	Turn-Off Delay Time		12		113	$R_G = 1.8\Omega$
t <sub>f</sub>	Fall Time		5.0			$V_{GS} = 4.5V$ 3
C <sub>iss</sub>	Input Capacitance		1996			V <sub>GS</sub> = 0V
Coss	Output Capacitance		1085			$V_{DS} = 10V$
C <sub>rss</sub>	Reverse Transfer Capacitance		155		pF	f = 1.0MHz

#### **Avalanche Characteristics**

Symbol	Parameter	Тур.	Max.	Units
E <sub>AS</sub>	Single Pulse Avalanche Energy@		216	mJ
I <sub>AR</sub>	Avalanche Current①		71	Α

#### **Diode Characteristics**

Symbol	Parameter	Min.	Тур.	Max.	Units	Conditions
Is	Continuous Source Current					MOSFET symbol
	(Body Diode)			75④	Α	showing the
I <sub>SM</sub>	Pulsed Source Current			300	, ,	integral reverse
	(Body Diode) ①			300		p-n junction diode.
$V_{SD}$	Diode Forward Voltage		0.88	1.3	V	$T_J = 25$ °C, $I_S = 35.5$ A, $V_{GS} = 0$ V ③
• 30	2.646 / 6.114.4 Voltage		0.82			$T_J = 125$ °C, $I_S = 35.5$ A, $V_{GS} = 0$ V ③
t <sub>rr</sub>	Reverse Recovery Time		38	57	ns	$T_J = 25$ °C, $I_F = 35.5$ A, $V_R = 20$ V
Q <sub>rr</sub>	Reverse Recovery Charge		45	68	nC	di/dt = 100A/µs ③
t <sub>rr</sub>	Reverse Recovery Time		41	62	ns	$T_J = 125$ °C, $I_F = 35.5$ A, $V_R = 20$ V
$Q_{rr}$	Reverse Recovery Charge		50	75	nC	di/dt = 100A/µs ③

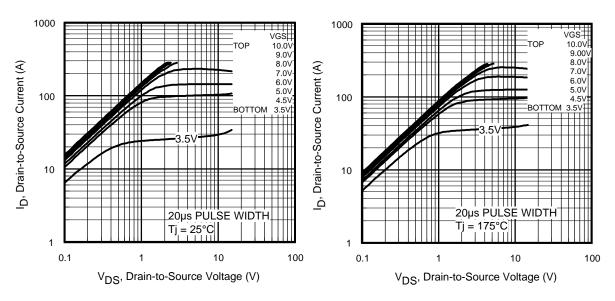


Fig 1. Typical Output Characteristics

Fig 2. Typical Output Characteristics

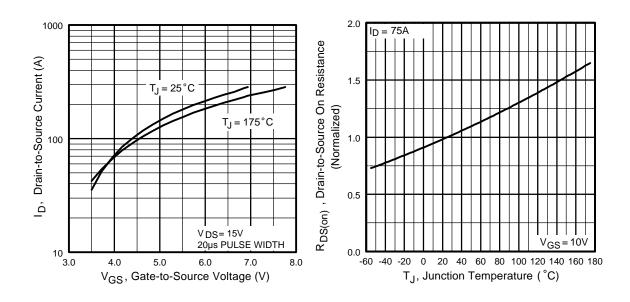
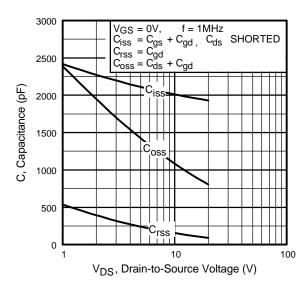


Fig 3. Typical Transfer Characteristics

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

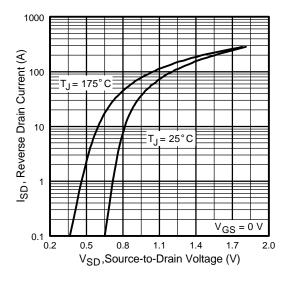
 $V_{DS} = 10V$ 

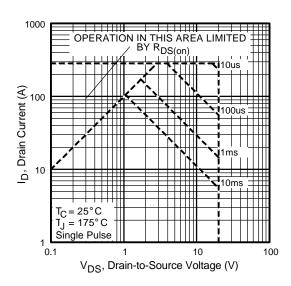


I<sub>D</sub> = 28.4A

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

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



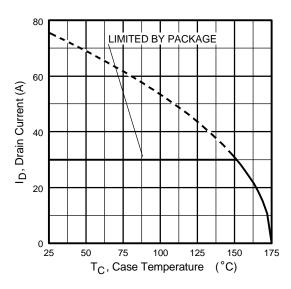


**Fig 7.** Typical Source-Drain Diode Forward Voltage

Fig 8. Maximum Safe Operating Area www.irf.com

# International Rectifier

## IRFR/U3704



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

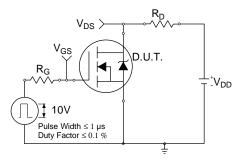


Fig 10a. Switching Time Test Circuit

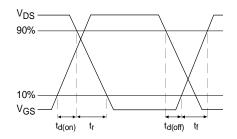


Fig 10b. Switching Time Waveforms

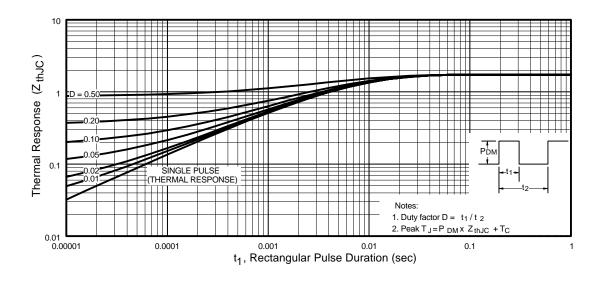


Fig 11. Maximum Effective Transient Thermal Impedance, Junction-to-Ambient

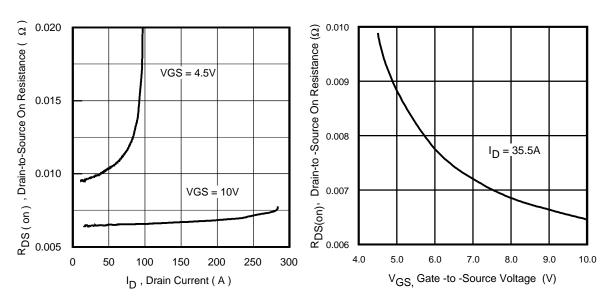
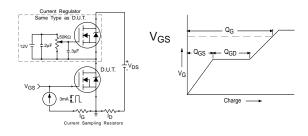
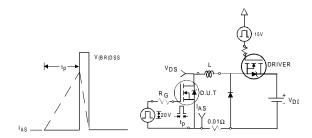


Fig 12. On-Resistance Vs. Drain Current

Fig 13. On-Resistance Vs. Gate Voltage

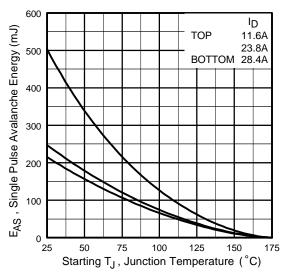


**Fig 14a&b.** Basic Gate Charge Test Circuit and Waveforms



**Fig 15a&b.** Unclamped Inductive Test Circuit and Waveforms

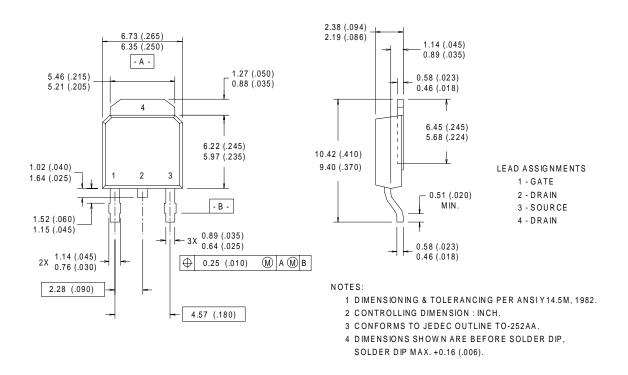
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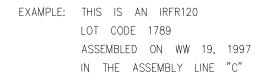
**Fig 15c.** Maximum Avalanche Energy Vs. Drain Current

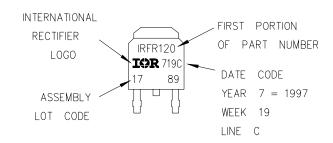
#### D-Pak (TO-252AA) Package Outline

Dimensions are shown in millimeters (inches)



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



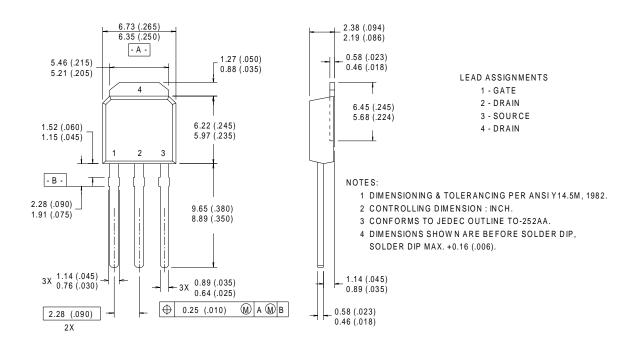


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#### I-Pak (TO-251AA) Package Outline

Dimensions are shown in millimeters (inches)

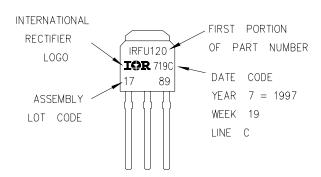


## I-Pak (TO-251AA) Part Marking Information

EXAMPLE: THIS IS AN IRFU120

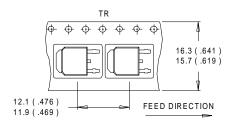
LOT CODE 1789

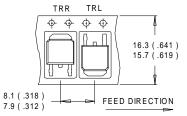
ASSEMBLED ON WW 19, 1997 IN THE ASSEMBLY LINE "C"



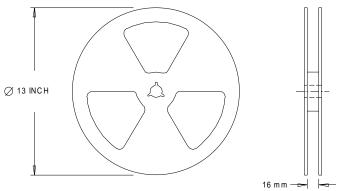
#### D-Pak (TO-252AA) Tape & Reel Information

Dimensions are shown in millimeters (inches)





- 1. CONTROLLING DIMENSION: MILLIMETER.
- 2. ALL DIMENSIONS ARE SHOWN IN MILLIMETERS (INCHES).
  3. OUTLINE CONFORMS TO EIA-481 & EIA-541.



1. OUTLINE CONFORMS TO EIA-481.

#### Notes:

- ① Repetitive rating; pulse width limited by max. junction temperature.
- ② Starting  $T_J = 25$ °C, L = 0.5 mH  $R_G = 25\Omega$ ,  $I_{AS} = 28.4$  A.
- ③ Pulse width ≤ 300 $\mu$ s; duty cycle ≤ 2%.
- Calculated continuous current based on maximum allowable junction temperature. Package limitation current is 30A

## International IOR Rectifier

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