

SMPS MOSFET

IRFR3711
 IRFU3711

Applications

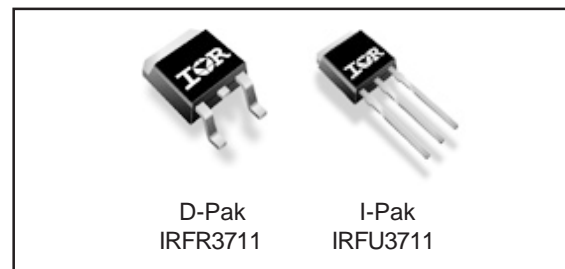
- High Frequency Isolated DC-DC Converters with Synchronous Rectification for Telecom and Industrial Use
- High Frequency Buck Converters for Server Processor Power Synchronous FET
- Optimized for Synchronous Buck Converters Including Capacitive Induced Turn-on Immunity

Benefits

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

HEXFET® Power MOSFET

| | | |
|------------------------|-------------------------------|-------------------------|
| V_{DSS} | R_{DS(on)} max | I_D |
| 20V | 6.5mΩ | 110A^④ |



Absolute Maximum Ratings

| Symbol | Parameter | Max. | Units |
|---|---|------------------|-------|
| V _{DS} | Drain-Source Voltage | 20 | V |
| V _{GS} | Gate-to-Source Voltage | ± 20 | V |
| I _D @ T _C = 25°C | Continuous Drain Current, V _{GS} @ 10V | 110 ^④ | A |
| I _D @ T _C = 100°C | Continuous Drain Current, V _{GS} @ 10V | 69 ^④ | |
| I _{DM} | Pulsed Drain Current ^① | 440 | |
| P _D @ T _A = 25°C | Maximum Power Dissipation ^⑤ | 2.5 | W |
| P _D @ T _C = 25°C | Maximum Power Dissipation | 120 | W |
| | Linear Derating Factor | 0.96 | mW/°C |
| T _J , T _{STG} | Junction and Storage Temperature Range | -55 to + 150 | °C |

Thermal Resistance

| | Parameter | Typ. | Max. | Units |
|------------------|--|------|------|-------|
| R _{θJC} | Junction-to-Case | — | 1.04 | °C/W |
| R _{θJA} | Junction-to-Ambient (PCB mount) ^⑤ | — | 50 | |
| R _{θJA} | Junction-to-Ambient | — | 110 | |

Notes ^① through ^④ are on page 10

Static @ T_J = 25°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 = 250μA |
| ΔV _{(BR)DSS} /ΔT _J | Breakdown Voltage Temp. Coefficient | — | 0.022 | — | V/°C | Reference to 25°C, I _D = 1mA |
| R _{DS(on)} | Static Drain-to-Source On-Resistance | — | 5.2 | 6.5 | mΩ | V _{GS} = 10V, I _D = 15A ③ |
| | | — | 6.7 | 8.5 | | V _{GS} = 4.5V, I _D = 12A ③ |
| V _{GS(th)} | Gate Threshold Voltage | 1.0 | — | 3.0 | V | V _{DS} = V _{GS} , I _D = 250μA |
| 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°C |
| I _{GSS} | Gate-to-Source Forward Leakage | — | — | 200 | nA | V _{GS} = 16V |
| | Gate-to-Source Reverse Leakage | — | — | -200 | | V _{GS} = -16V |

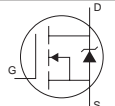
Dynamic @ T_J = 25°C (unless otherwise specified)

| Symbol | Parameter | Min. | Typ. | Max. | Units | Conditions |
|---------------------|---------------------------------|------|------|------|-------|---|
| g _{fs} | Forward Transconductance | 53 | — | — | S | V _{DS} = 16V, I _D = 30A |
| Q _g | Total Gate Charge | — | 29 | 44 | nC | I _D = 15A |
| Q _{gs} | Gate-to-Source Charge | — | 7.3 | — | | V _{DS} = 10V |
| Q _{gd} | Gate-to-Drain ("Miller") Charge | — | 8.9 | — | | V _{GS} = 4.5V ③ |
| Q _{oss} | Output Gate Charge | — | 33 | — | | V _{GS} = 0V, V _{DS} = 10V |
| t _{d(on)} | Turn-On Delay Time | — | 12 | — | ns | V _{DD} = 10V |
| t _r | Rise Time | — | 220 | — | | I _D = 30A |
| t _{d(off)} | Turn-Off Delay Time | — | 17 | — | | R _G = 1.8Ω |
| t _f | Fall Time | — | 12 | — | | V _{GS} = 4.5V ③ |
| C _{iss} | Input Capacitance | — | 2980 | — | pF | V _{GS} = 0V |
| C _{oss} | Output Capacitance | — | 1770 | — | | V _{DS} = 10V |
| C _{rss} | Reverse Transfer Capacitance | — | 280 | — | | f = 1.0MHz |

Avalanche Characteristics

| Symbol | Parameter | Typ. | Max. | Units |
|-----------------|--------------------------------|------|------|-------|
| E _{AS} | Single Pulse Avalanche Energy② | — | 460 | mJ |
| I _{AR} | Avalanche Current① | — | 30 | A |

Diode Characteristics

| Symbol | Parameter | Min. | Typ. | Max. | Units | Conditions |
|-----------------|--|------|------|------|-------|--|
| I _S | Continuous Source Current (Body Diode) | — | — | 110④ | A | MOSFET symbol showing the integral reverse p-n junction diode.  |
| I _{SM} | Pulsed Source Current (Body Diode) ① | — | — | 440 | | |
| V _{SD} | Diode Forward Voltage | — | 0.88 | 1.3 | V | T _J = 25°C, I _S = 30A, V _{GS} = 0V ③ |
| | | — | 0.82 | — | | T _J = 125°C, I _S = 30A, V _{GS} = 0V ③ |
| t _{rr} | Reverse Recovery Time | — | 50 | 75 | ns | T _J = 25°C, I _F = 16A, V _R = 10V |
| Q _{rr} | Reverse Recovery Charge | — | 61 | 92 | nC | di/dt = 100A/μs ③ |
| t _{rr} | Reverse Recovery Time | — | 48 | 72 | ns | T _J = 125°C, I _F = 16A, V _R = 10V |
| Q _{rr} | Reverse Recovery Charge | — | 65 | 98 | nC | di/dt = 100A/μs ③ |

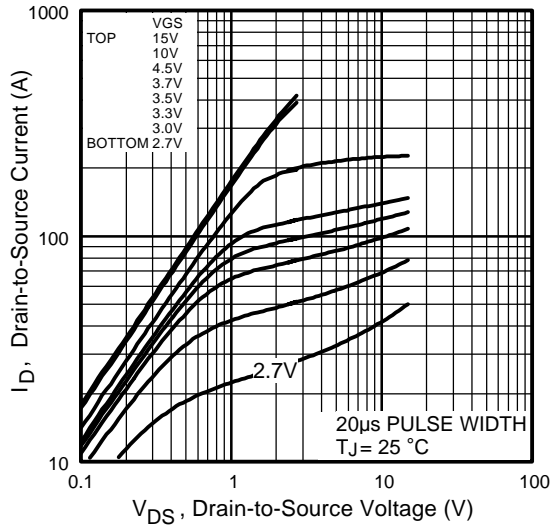


Fig 1. Typical Output Characteristics

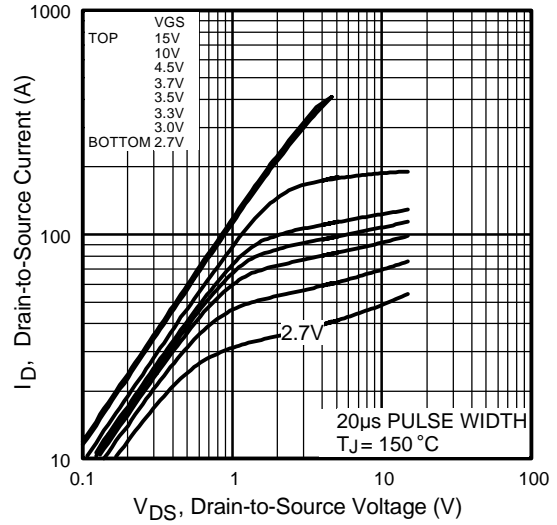


Fig 2. Typical Output Characteristics

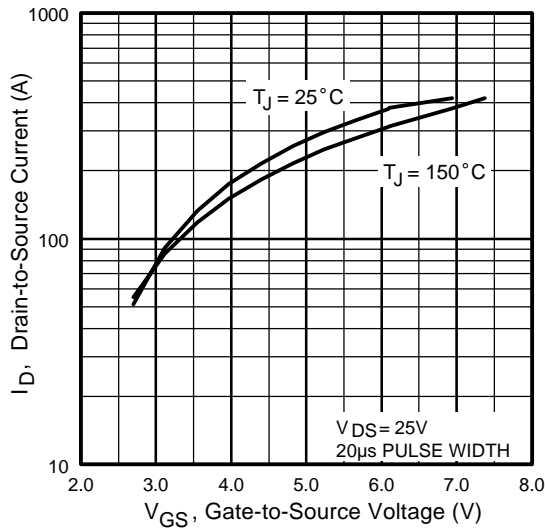


Fig 3. Typical Transfer Characteristics

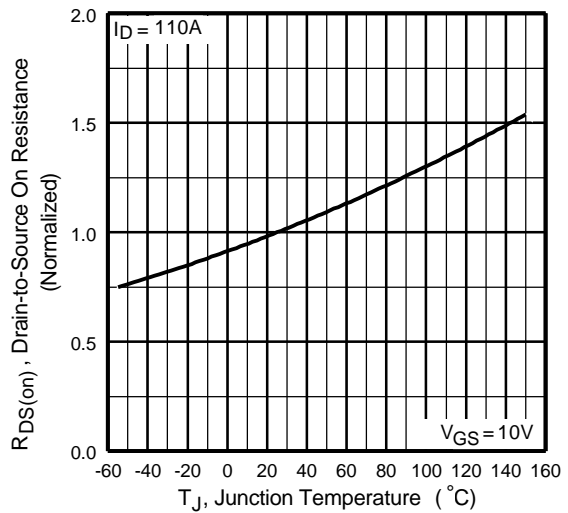


Fig 4. Normalized On-Resistance Vs. Temperature

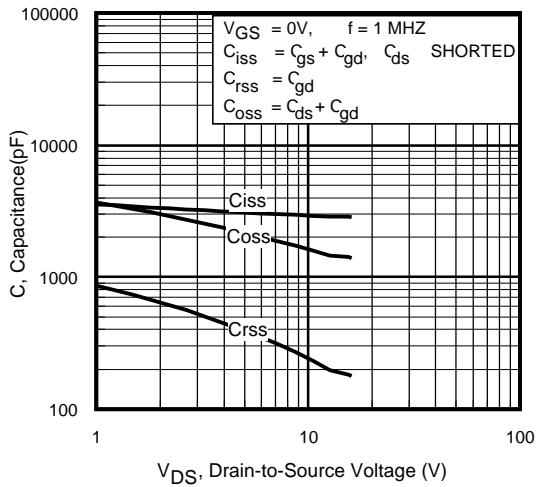


Fig 5. Typical Capacitance Vs. Drain-to-Source Voltage

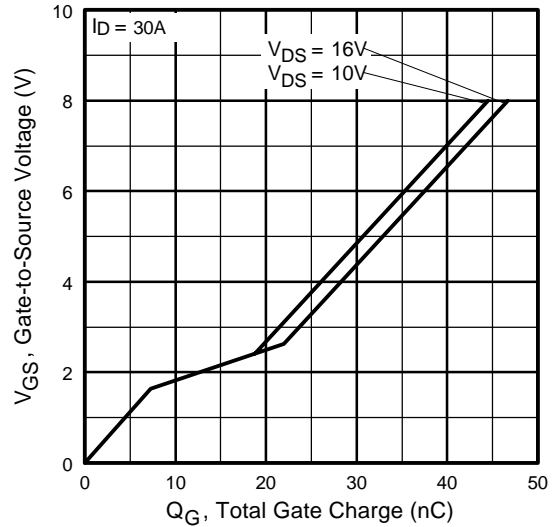


Fig 6. Typical Gate Charge Vs. Gate-to-Source Voltage

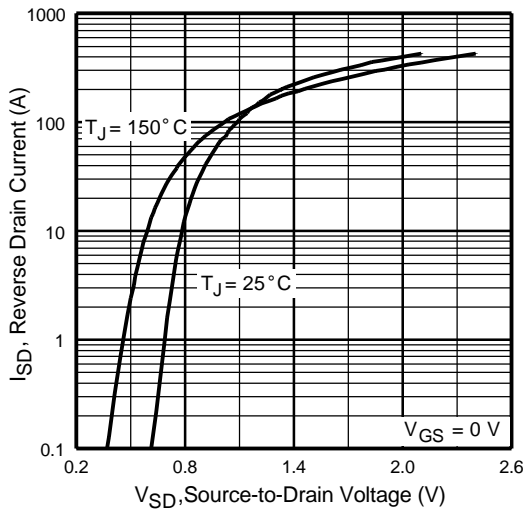


Fig 7. Typical Source-Drain Diode Forward Voltage

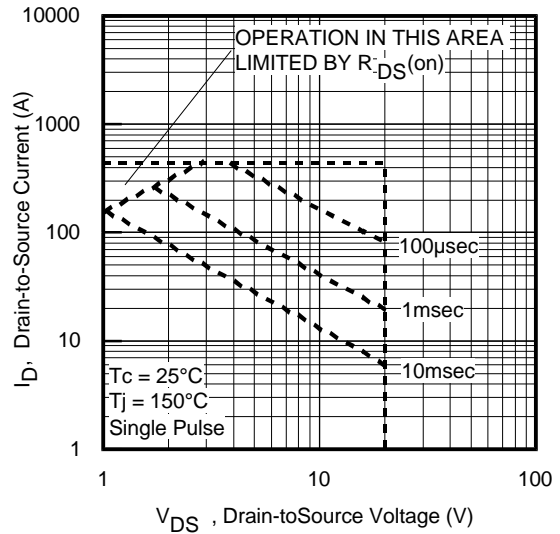


Fig 8. Maximum Safe Operating Area

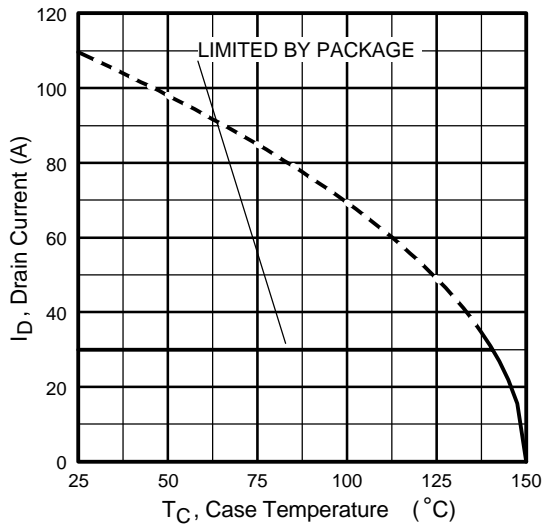


Fig 9. Maximum Drain Current Vs. Case Temperature



Fig 10a. Switching Time Test Circuit



Fig 10b. Switching Time Waveforms

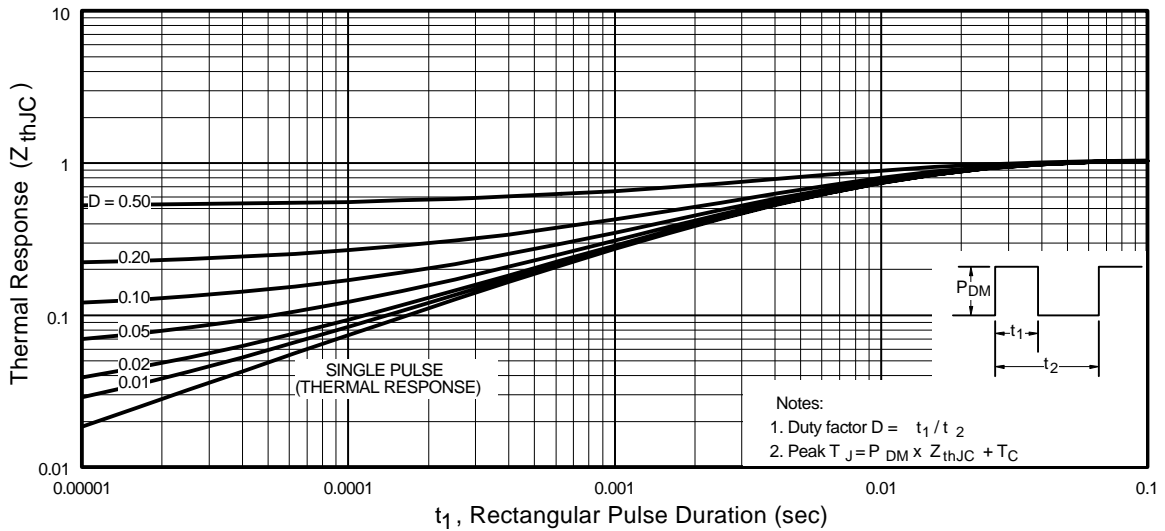


Fig 11. Maximum Effective Transient Thermal Impedance, Junction-to-Case

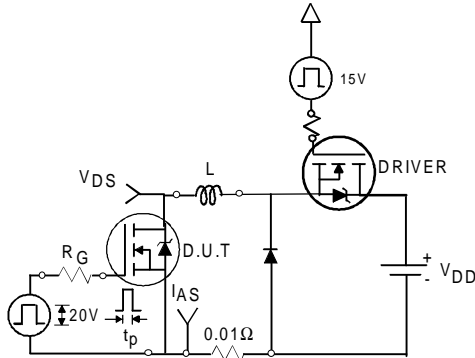


Fig 12a. Unclamped Inductive Test Circuit

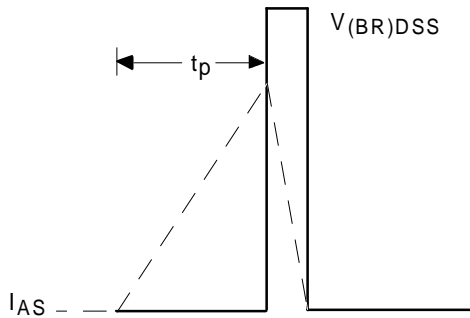


Fig 12b. Unclamped Inductive Waveforms

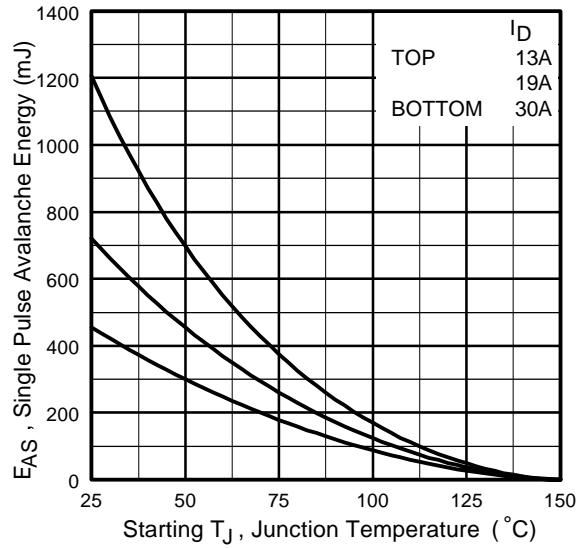


Fig 12c. Maximum Avalanche Energy Vs. Drain Current

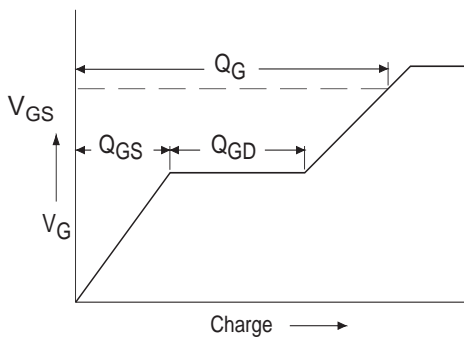


Fig 13a. Basic Gate Charge Waveform

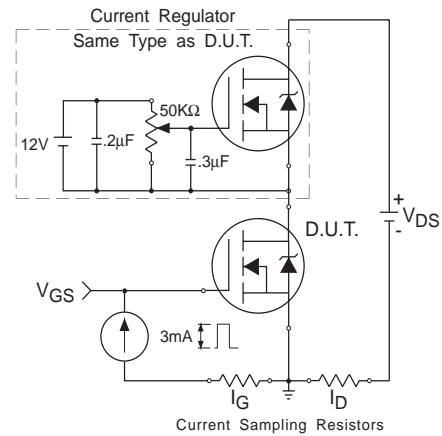
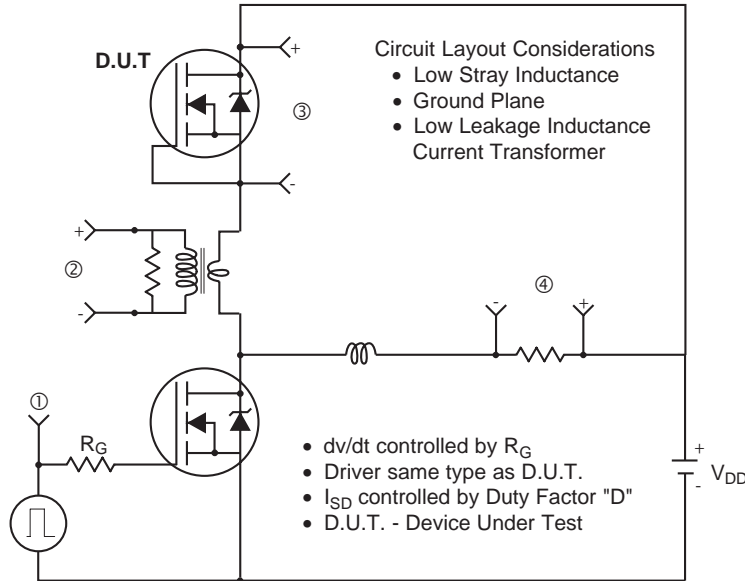


Fig 13b. Gate Charge Test Circuit

Peak Diode Recovery dv/dt Test Circuit



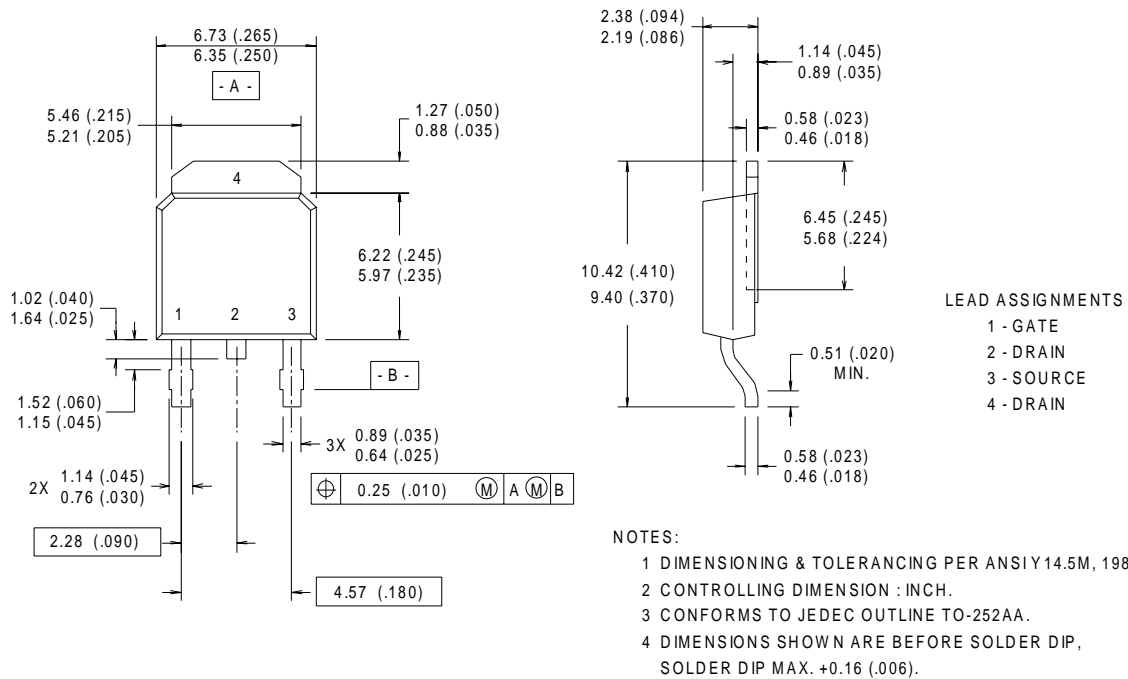
* $V_{GS} = 5V$ for Logic Level Devices

Fig 14. For N-Channel HEXFET® Power MOSFETs

IRFR/U3711

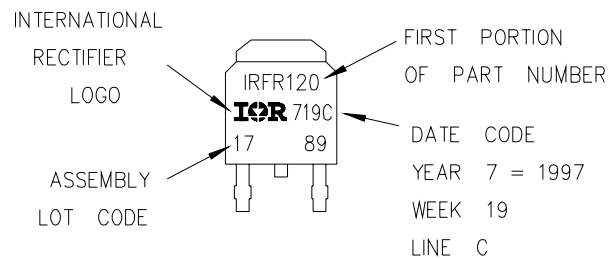
D-Pak (TO-252AA) Package Outline

Dimensions are shown in millimeters (inches)



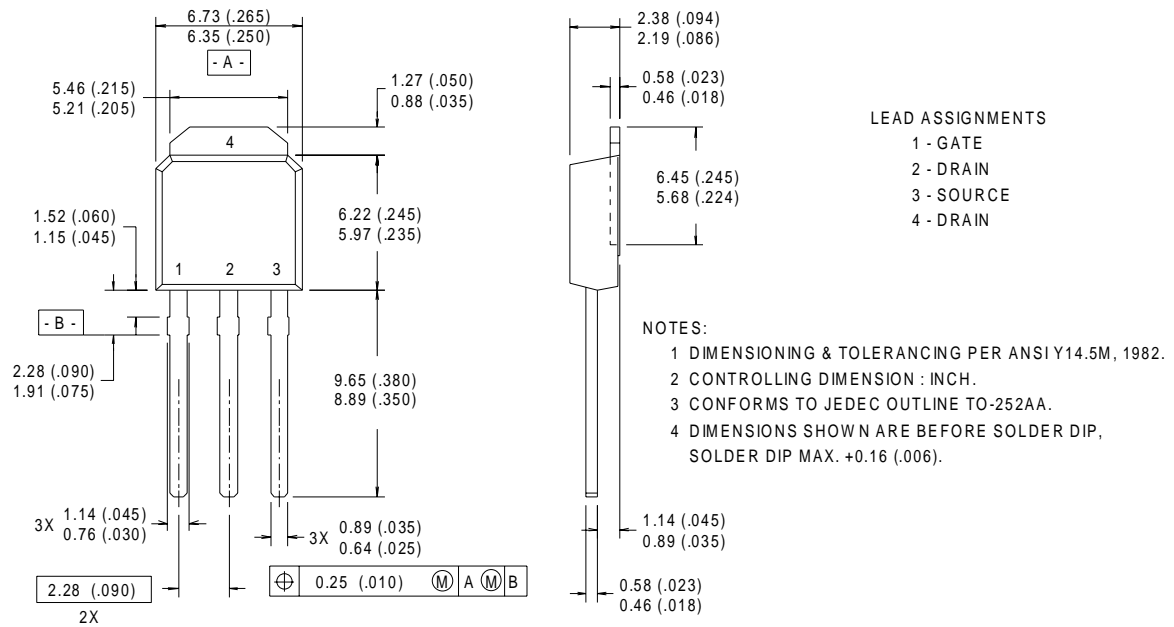
D-Pak (TO-252AA) Part Marking Information

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"

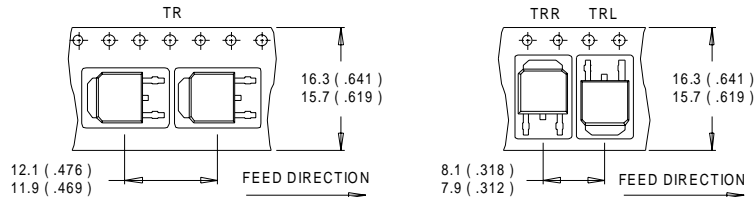


IRFR/U3711

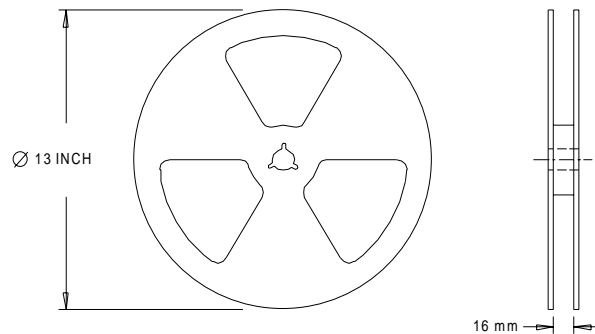
International
IR Rectifier

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 $T_J = 25^\circ\text{C}$, $L = 1.0\text{mH}$
 $R_G = 25\Omega$, $I_{AS} = 30\text{A}$.
- 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.
- ⑤ When mounted on 1" square PCB (FR-4 or G-10 Material) .
For recommended footprint and soldering techniques refer to application note #AN-994

Data and specifications subject to change without notice.
This product has been designed and qualified for the industrial market.
Qualification Standards can be found on IR's Web site.

International
IR Rectifier

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