

SMPS MOSFET

**IRFR3706
IRFU3706**

HEXFET® Power MOSFET

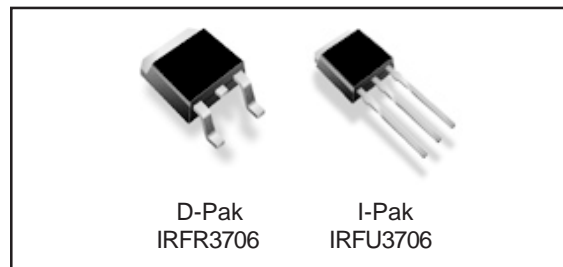
Applications

- 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 R_{DS(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 Current① | 280 | |
| P _D @ T _C = 25°C | Maximum Power Dissipation③ | 88 | W |
| P _D @ T _C = 100°C | Maximum Power Dissipation③ | 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 | |



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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 | — | 0.021 | — | V/°C | Reference to 25°C, I _D = 1mA |
| R _{DS(on)} | Static Drain-to-Source On-Resistance | — | 6.9 | 9.0 | mΩ | 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 = 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} = 12V |
| | Gate-to-Source Reverse Leakage | — | — | -200 | | V _{GS} = -12V |

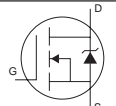
Dynamic @ T_J = 25°C (unless otherwise specified)

| Symbol | Parameter | Min. | Typ. | Max. | Units | Conditions |
|---------------------|---------------------------------|------|------|------|-------|---|
| g _{fs} | Forward Transconductance | 53 | — | — | S | V _{DS} = 16V, I _D = 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 = 1.8Ω |
| t _f | Fall Time | — | 4.8 | — | | V _{GS} = 4.5V ③ |
| C _{iss} | Input Capacitance | — | 2410 | — | pF | V _{GS} = 0V |
| C _{oss} | Output Capacitance | — | 1070 | — | | V _{DS} = 10V |
| C _{rss} | Reverse Transfer Capacitance | — | 140 | — | | f = 1.0MHz |

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°C, I _S = 36A, V _{GS} = 0V ③ |
| | | — | 0.82 | — | | T _J = 125°C, I _S = 36A, V _{GS} = 0V ③ |
| t _{rr} | Reverse Recovery Time | — | 45 | 68 | ns | T _J = 25°C, I _F = 36A, V _R = 20V |
| Q _{rr} | Reverse Recovery Charge | — | 65 | 98 | nC | di/dt = 100A/μs ③ |
| t _{rr} | Reverse Recovery Time | — | 49 | 74 | ns | T _J = 125°C, I _F = 36A, V _R = 20V |
| Q _{rr} | Reverse Recovery Charge | — | 78 | 120 | nC | di/dt = 100A/μs ③ |

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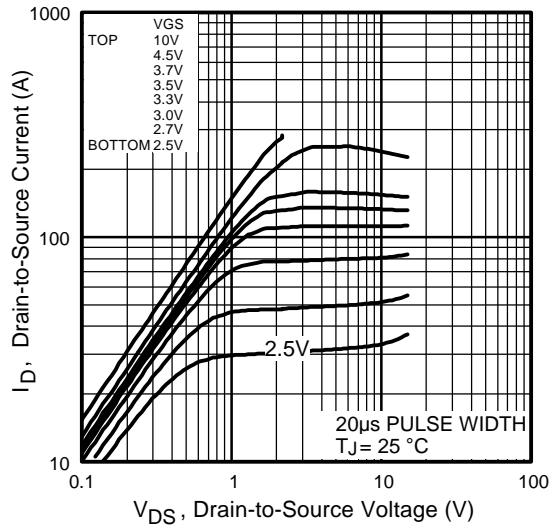


Fig 1. Typical Output Characteristics

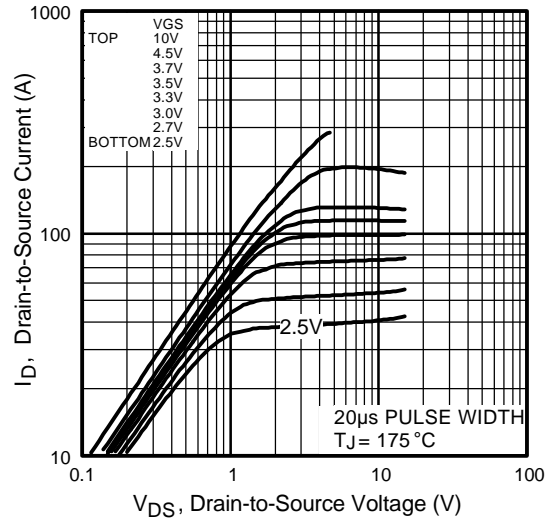


Fig 2. Typical Output Characteristics

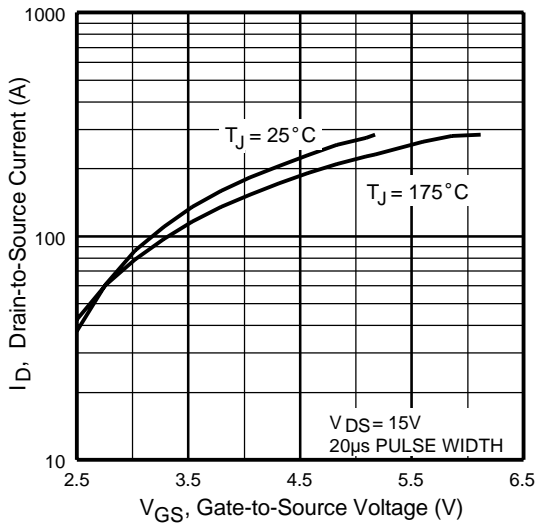


Fig 3. Typical Transfer Characteristics

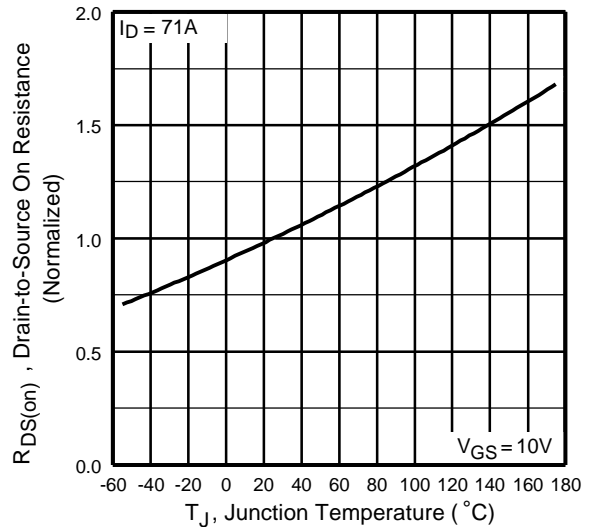


Fig 4. Normalized On-Resistance Vs. Temperature

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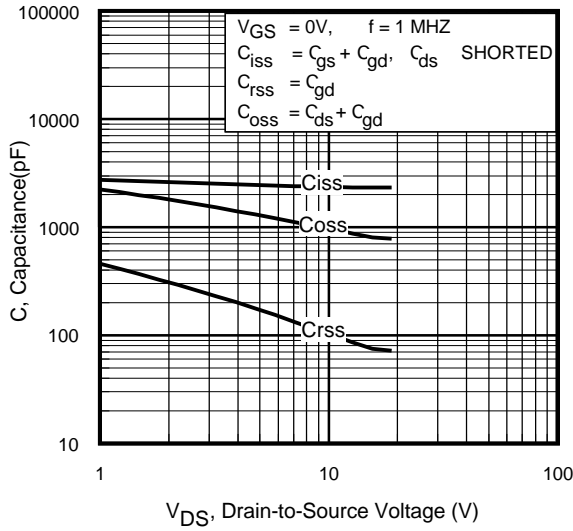


Fig 5. Typical Capacitance Vs. Drain-to-Source Voltage

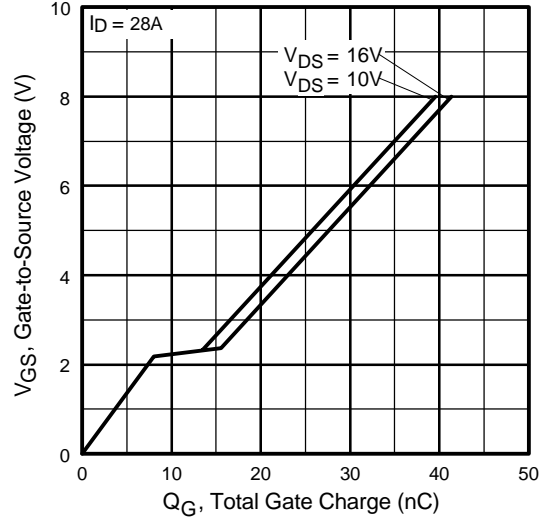


Fig 6. Typical Gate Charge Vs. Gate-to-Source Voltage

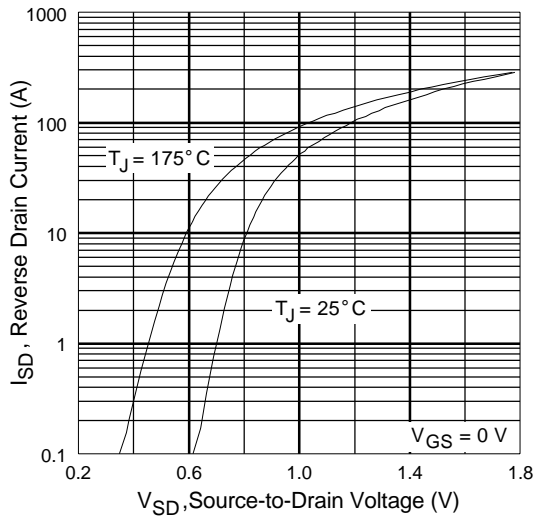


Fig 7. Typical Source-Drain Diode Forward Voltage

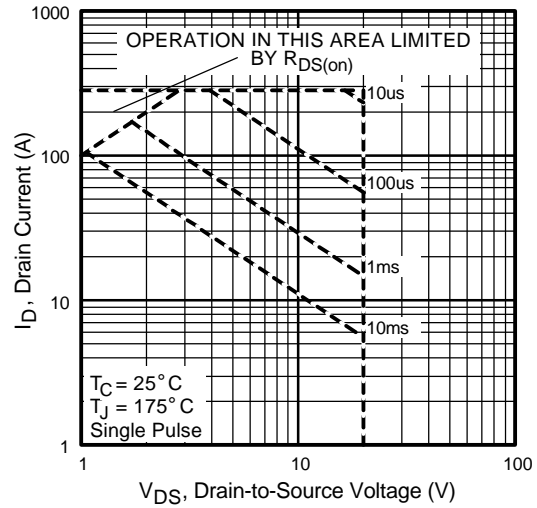


Fig 8. Maximum Safe Operating Area

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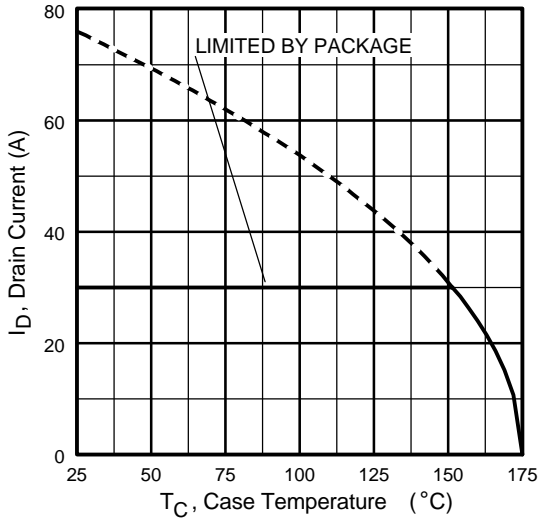


Fig 9. Maximum Drain Current Vs. Case Temperature

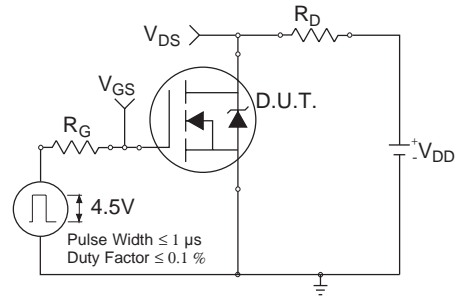


Fig 10a. Switching Time Test Circuit

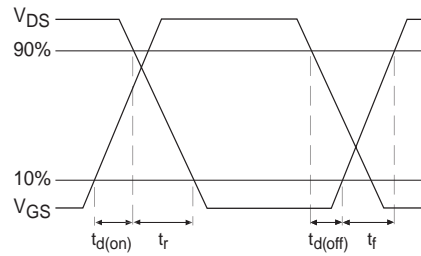


Fig 10b. Switching Time Waveforms

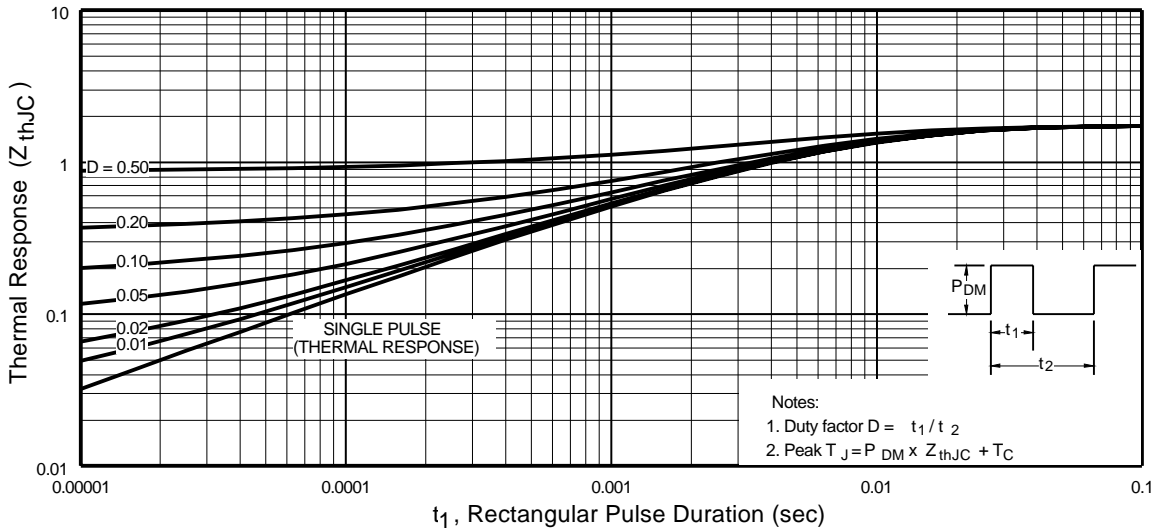


Fig 11. Maximum Effective Transient Thermal Impedance, Junction-to-Case

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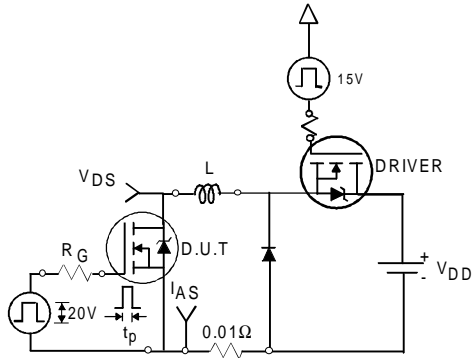


Fig 12a. Unclamped Inductive Test Circuit

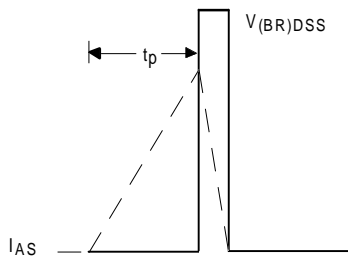


Fig 12b. Unclamped Inductive Waveforms

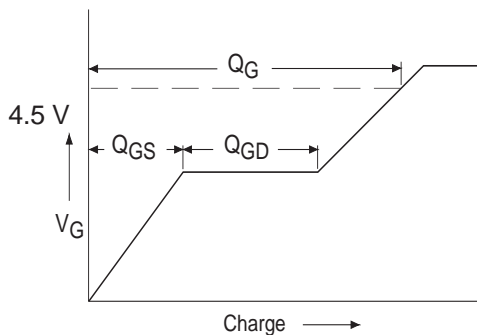


Fig 13a. Basic Gate Charge Waveform

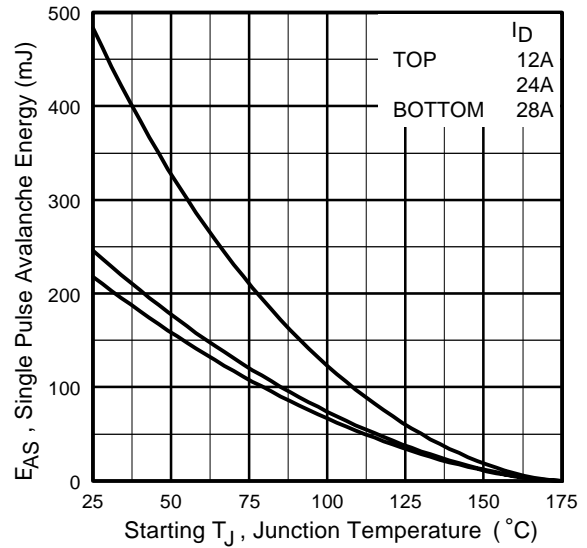


Fig 12c. Maximum Avalanche Energy Vs. Drain Current

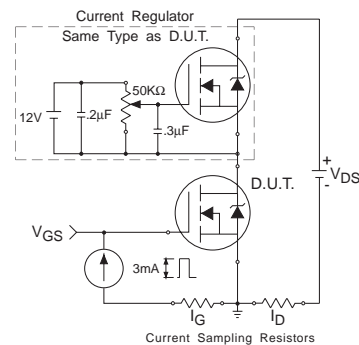
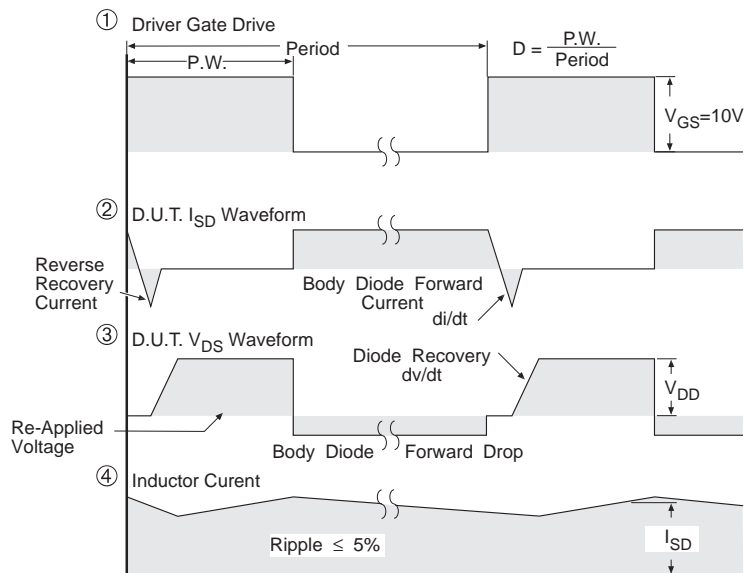
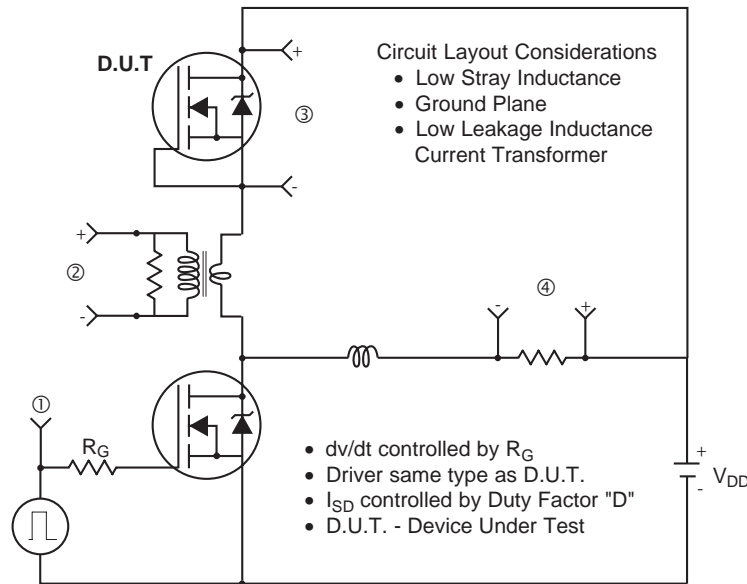


Fig 13b. Gate Charge Test Circuit

Peak Diode Recovery dv/dt Test Circuit



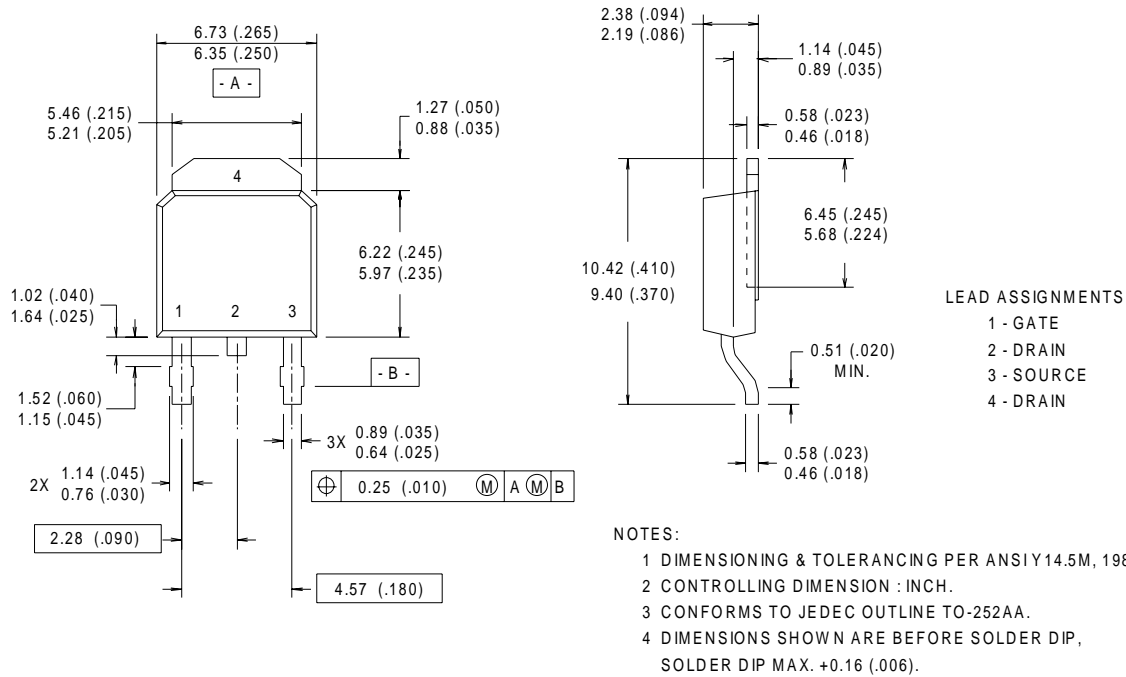
* $V_{GS} = 5V$ for Logic Level Devices

Fig 14. For N-Channel HEXFET® Power MOSFETs

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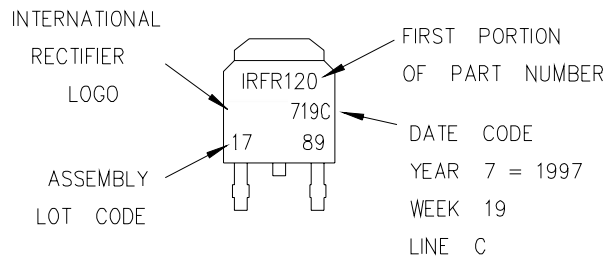
D-Pak (TO-252AA) Package Outline

Dimensions are shown in millimeters (inches)



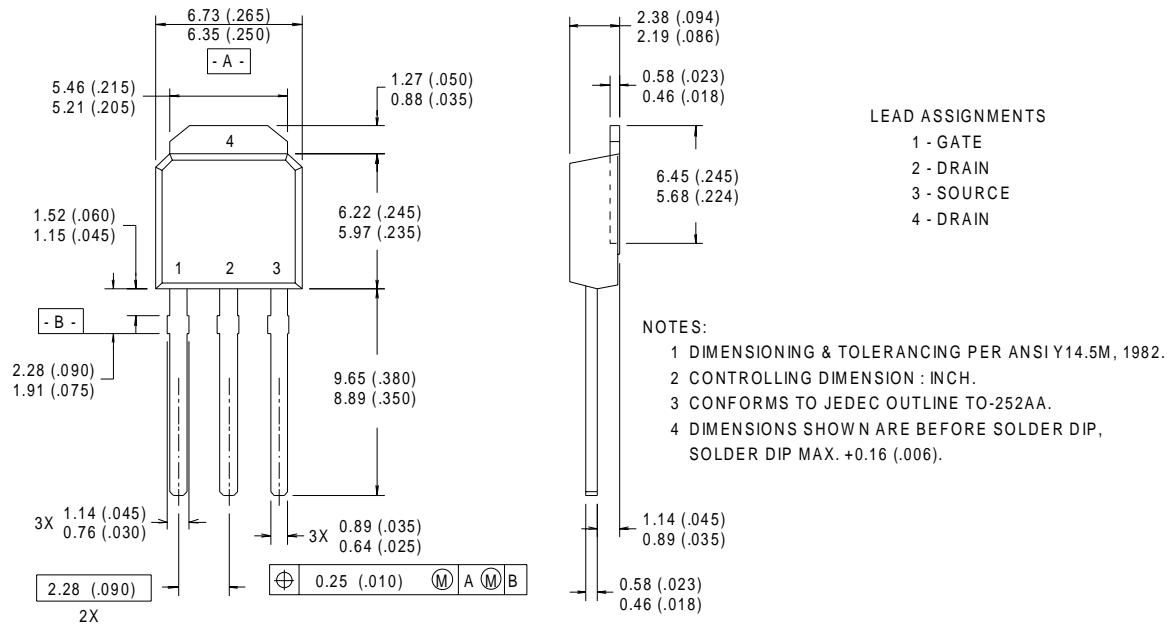
D-Pak (TO-252AA) Part Marking Information

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



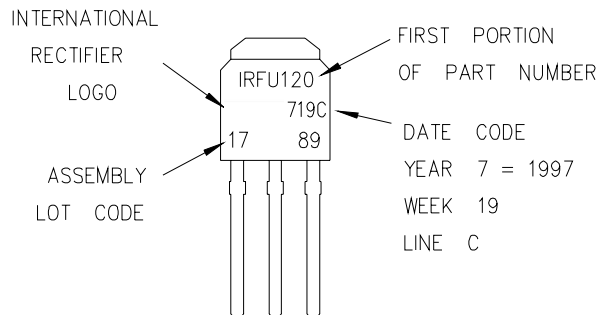
I-Pak (TO-251AA) Package Outline

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"



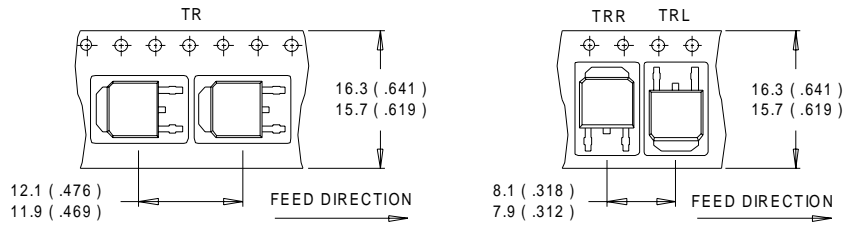


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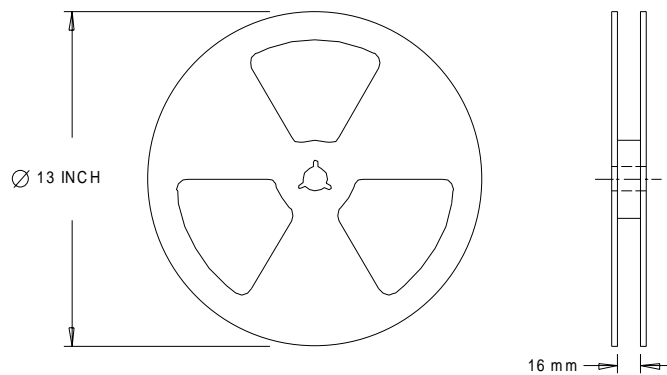
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D-Pak (TO-252AA) Tape & Reel Information

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.