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[International Rectifier \(Infineon Technologies Americas Corp.\)
IRL3715](#)

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sales@integrated-circuit.com

International IR Rectifier

SMPS MOSFET

PD - 94194A

IRL3715
IRL3715S
IRL3715L

HEXFET® Power MOSFET

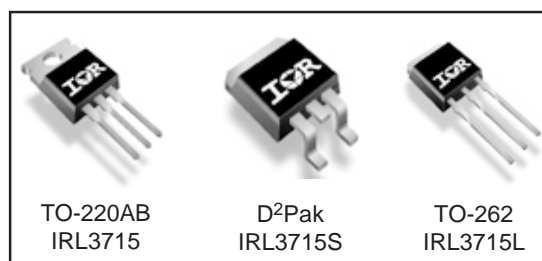
Applications

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

Benefits

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

| V_{DSS} | $R_{DS(on)}$ max | I_D |
|-----------|------------------|------------------|
| 20V | 14mΩ | 54A ^⑥ |



Absolute Maximum Ratings

| Symbol | Parameter | Max. | Units |
|-----------------------------------|--|-----------------|-------|
| V_{DS} | Drain-Source Voltage | 20 | V |
| V_{GS} | Gate-to-Source Voltage | ± 20 | V |
| I_D @ $T_C = 25^\circ\text{C}$ | Continuous Drain Current, V_{GS} @ 10V | 54 ^⑥ | A |
| I_D @ $T_C = 100^\circ\text{C}$ | Continuous Drain Current, V_{GS} @ 10V | 38 ^⑥ | |
| I_{DM} | Pulsed Drain Current ^① | 210 | |
| P_D @ $T_C = 25^\circ\text{C}$ | Maximum Power Dissipation | 71 | W |
| P_D @ $T_A = 25^\circ\text{C}$ | Maximum Power Dissipation ^⑤ | 3.8 | W |
| | Linear Derating Factor | 0.48 | W/°C |
| T_J, T_{STG} | Junction and Storage Temperature Range | -55 to + 175 | °C |

Thermal Resistance

| | Parameter | Typ. | Max. | Units |
|-----------------|--|------|------|-------|
| $R_{\theta JC}$ | Junction-to-Case | — | 2.1 | °C/W |
| $R_{\theta CS}$ | Case-to-Sink, Flat, Greased Surface ^④ | 0.50 | — | |
| $R_{\theta JA}$ | Junction-to-Ambient ^④ | — | 62 | |
| $R_{\theta JA}$ | Junction-to-Ambient (PCB mount) ^⑤ | — | 40 | |

Notes ① through ⑥ are on page 11

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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 | — | 0.022 | — | V/°C | Reference to 25°C, I _D = 1mA |
| R _{DS(on)} | Static Drain-to-Source On-Resistance | — | 11 | 14 | mΩ | V _{GS} = 10V, I _D = 26A ③ |
| | | — | 15 | 20 | | V _{GS} = 4.5V, I _D = 21A 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 |

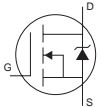
Dynamic @ T_J = 25°C (unless otherwise specified)

| Symbol | Parameter | Min. | Typ. | Max. | Units | Conditions |
|---------------------|---------------------------------|------|------|------|-------|---|
| g _{fs} | Forward Transconductance | 26 | — | — | S | V _{DS} = 10V, I _D = 21A |
| Q _g | Total Gate Charge | — | 11 | 17 | nC | I _D = 21A |
| Q _{gs} | Gate-to-Source Charge | — | 3.8 | — | | V _{DS} = 10V |
| Q _{gd} | Gate-to-Drain ("Miller") Charge | — | 4.4 | — | | V _{GS} = 4.5V |
| Q _{oss} | Output Gate Charge | — | 11 | 17 | | V _{GS} = 0V, V _{DS} = 10V |
| t _{d(on)} | Turn-On Delay Time | — | 6.4 | — | ns | V _{DD} = 10V |
| t _r | Rise Time | — | 73 | — | | I _D = 21A |
| t _{d(off)} | Turn-Off Delay Time | — | 12 | — | | R _G = 1.8Ω |
| t _f | Fall Time | — | 5.1 | — | | V _{GS} = 4.5V ③ |
| C _{iss} | Input Capacitance | — | 1060 | — | pF | V _{GS} = 0V |
| C _{oss} | Output Capacitance | — | 700 | — | | V _{DS} = 10V |
| C _{rss} | Reverse Transfer Capacitance | — | 120 | — | | f = 1.0MHz |

Avalanche Characteristics

| Symbol | Parameter | Typ. | Max. | Units |
|-----------------|--------------------------------|------|------|-------|
| E _{AS} | Single Pulse Avalanche Energy② | — | 110 | mJ |
| I _{AR} | Avalanche Current① | — | 21 | A |

Diode Characteristics

| Symbol | Parameter | Min. | Typ. | Max. | Units | Conditions |
|-----------------|--|------|------|------|-------|--|
| I _S | Continuous Source Current (Body Diode) | — | — | 54⑥ | A | MOSFET symbol showing the integral reverse p-n junction diode.  |
| I _{SM} | Pulsed Source Current (Body Diode) ① | — | — | 210 | | |
| V _{SD} | Diode Forward Voltage | — | 0.9 | 1.3 | V | T _J = 25°C, I _S = 21A, V _{GS} = 0V ③ |
| | | — | 0.8 | — | | T _J = 125°C, I _S = 21A, V _{GS} = 0V ③ |
| t _{rr} | Reverse Recovery Time | — | 37 | 56 | ns | T _J = 25°C, I _F = 21A, V _R = 20V |
| Q _{rr} | Reverse Recovery Charge | — | 28 | 42 | nC | di/dt = 100A/μs ③ |
| t _{rr} | Reverse Recovery Time | — | 38 | 57 | ns | T _J = 125°C, I _F = 21A, V _R = 20V |
| Q _{rr} | Reverse Recovery Charge | — | 30 | 45 | nC | di/dt = 100A/μs ③ |

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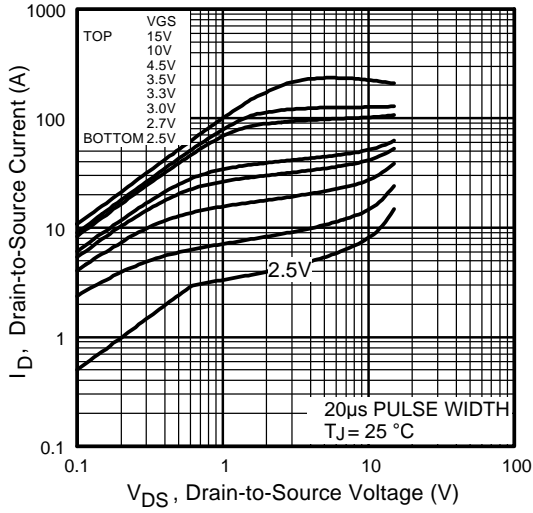


Fig 1. Typical Output Characteristics

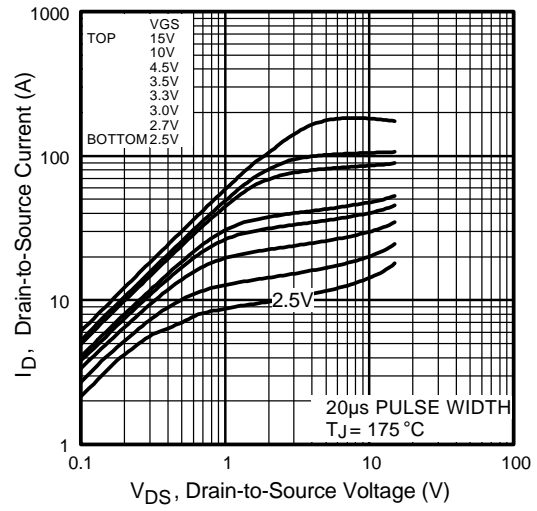


Fig 2. Typical Output Characteristics

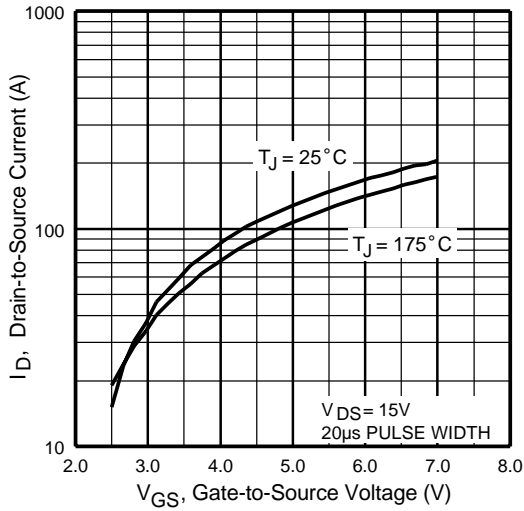


Fig 3. Typical Transfer Characteristics

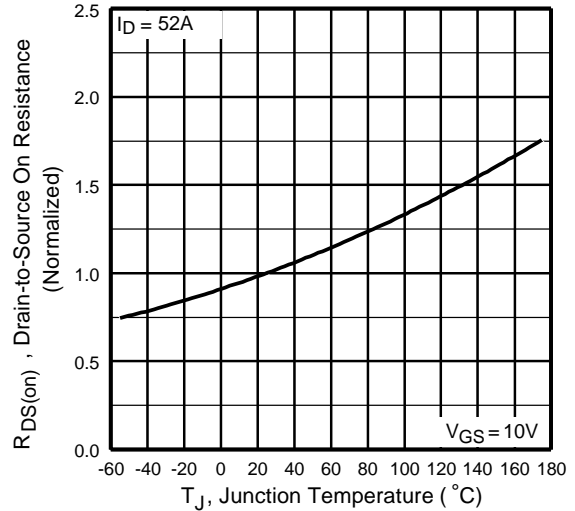


Fig 4. Normalized On-Resistance Vs. Temperature

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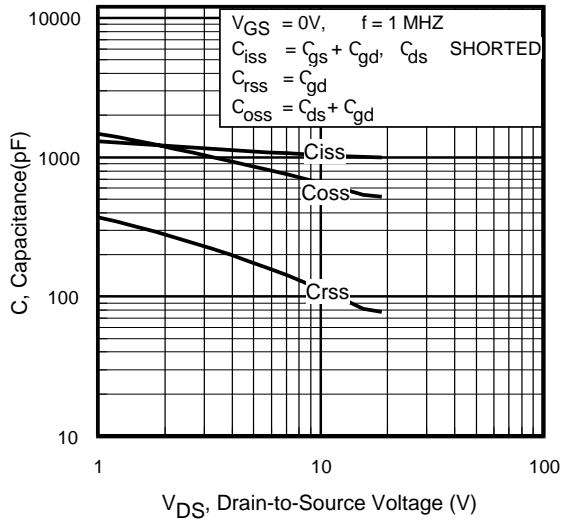


Fig 5. Typical Capacitance Vs. Drain-to-Source Voltage

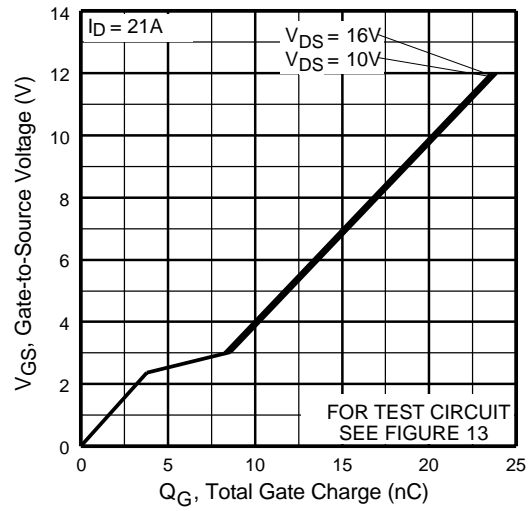


Fig 6. Typical Gate Charge Vs. Gate-to-Source Voltage

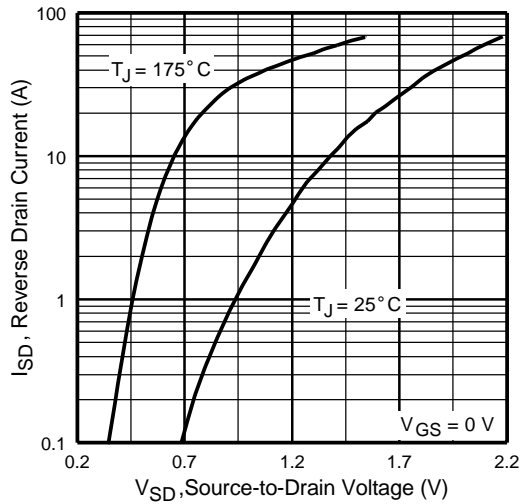


Fig 7. Typical Source-Drain Diode Forward Voltage

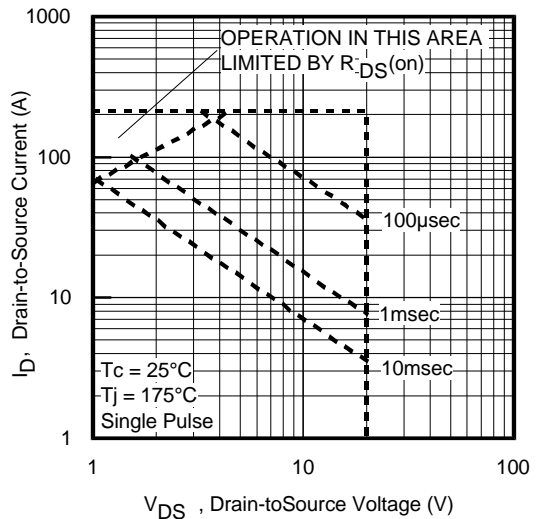


Fig 8. Maximum Safe Operating Area

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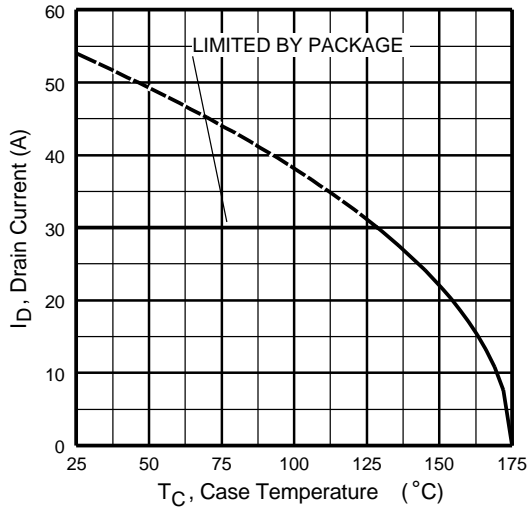


Fig 9. Maximum Drain Current Vs. Case Temperature

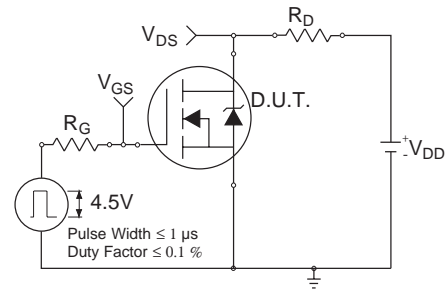


Fig 10a. Switching Time Test Circuit

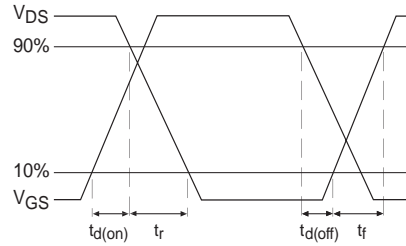


Fig 10b. Switching Time Waveforms

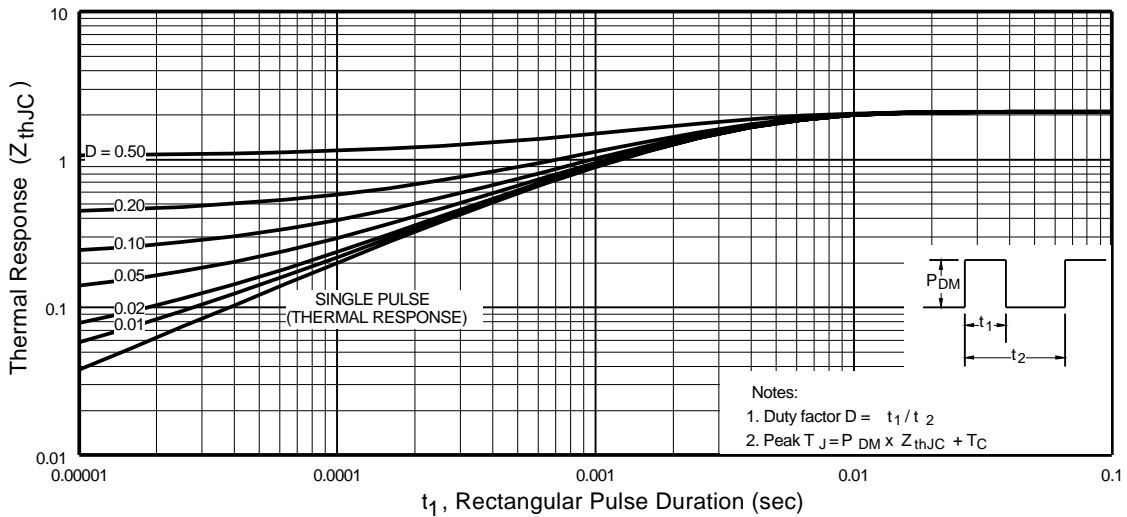


Fig 11. Maximum Effective Transient Thermal Impedance, Junction-to-Case

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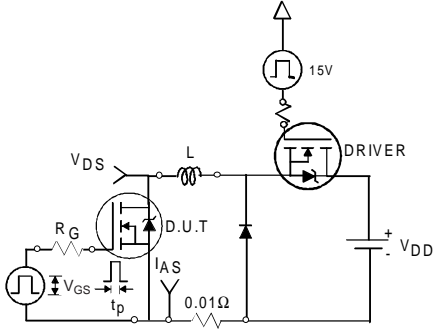


Fig 12a. Unclamped Inductive Test Circuit

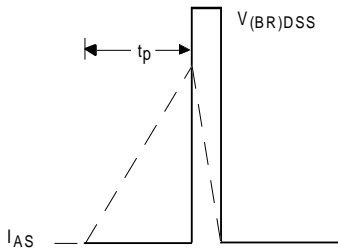


Fig 12b. Unclamped Inductive Waveforms

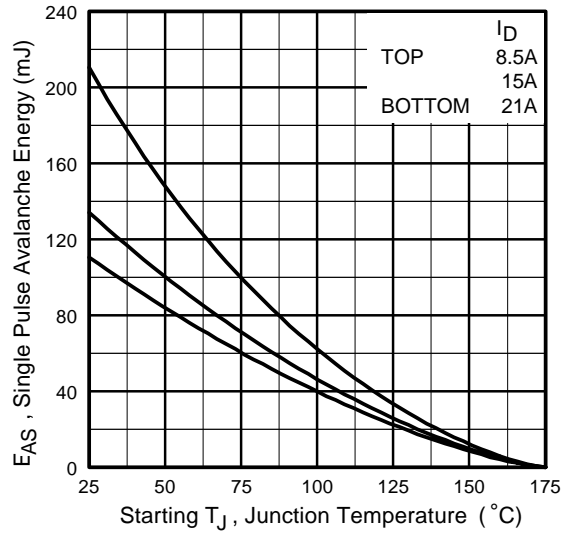


Fig 12c. Maximum Avalanche Energy Vs. Drain Current

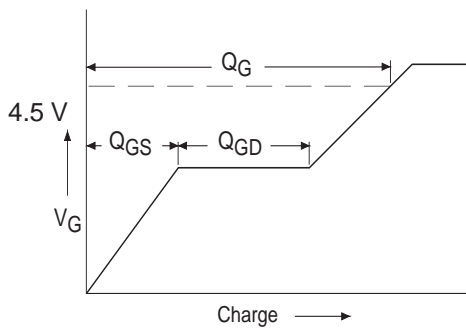


Fig 13a. Basic Gate Charge Waveform

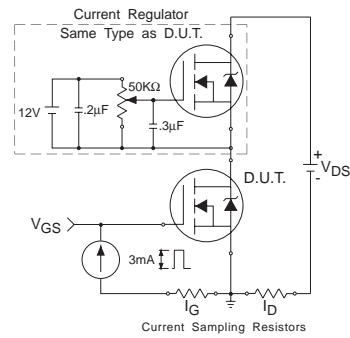
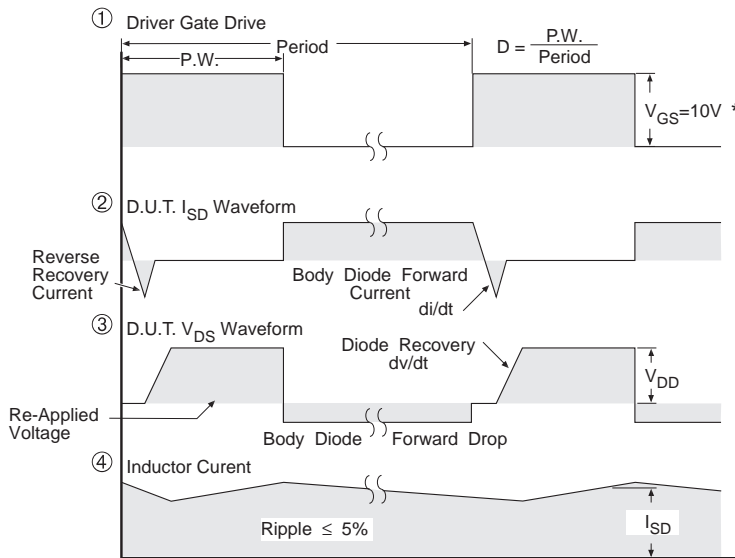
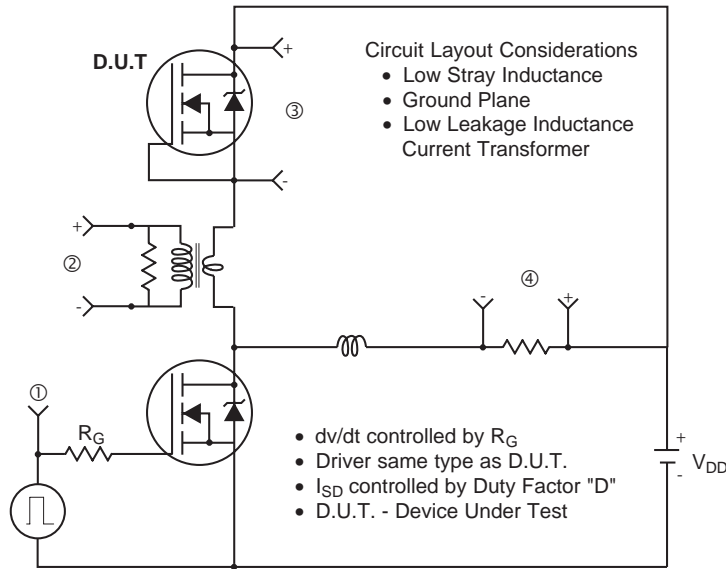


Fig 13b. Gate Charge Test Circuit

Peak Diode Recovery dv/dt Test Circuit



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

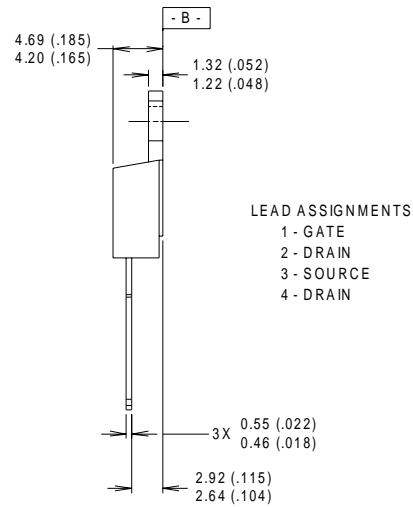
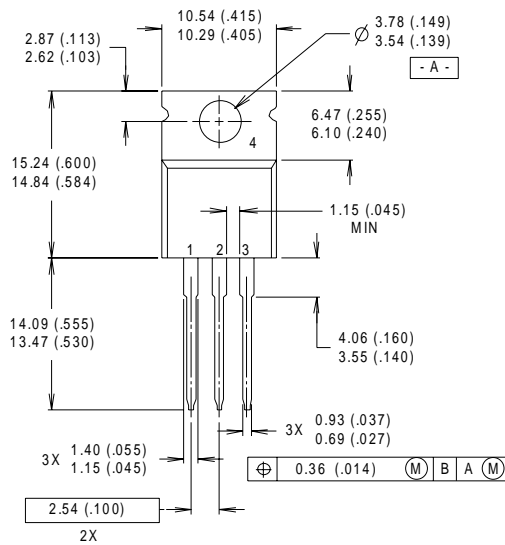
Fig 14. For N-Channel HEXFET® Power MOSFETs

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TO-220AB Package Outline

Dimensions are shown in millimeters (inches)

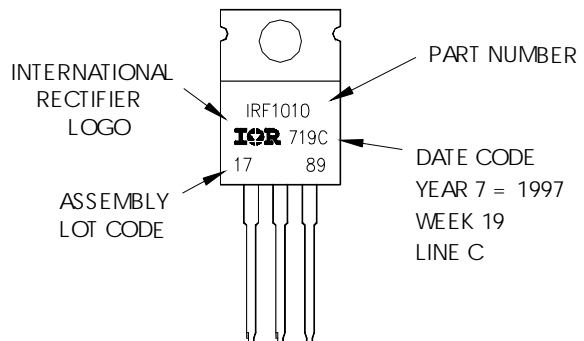


NOTES:

- 1 DIMENSIONING & TOLERANCING PER ANSII Y14.5M, 1982.
- 2 CONTROLLING DIMENSION : INCH
- 3 OUTLINE CONFORMS TO JEDEC OUTLINE TO-220AB.
- 4 HEATSINK & LEAD MEASUREMENTS DO NOT INCLUDE BURRS.

TO-220AB Part Marking Information

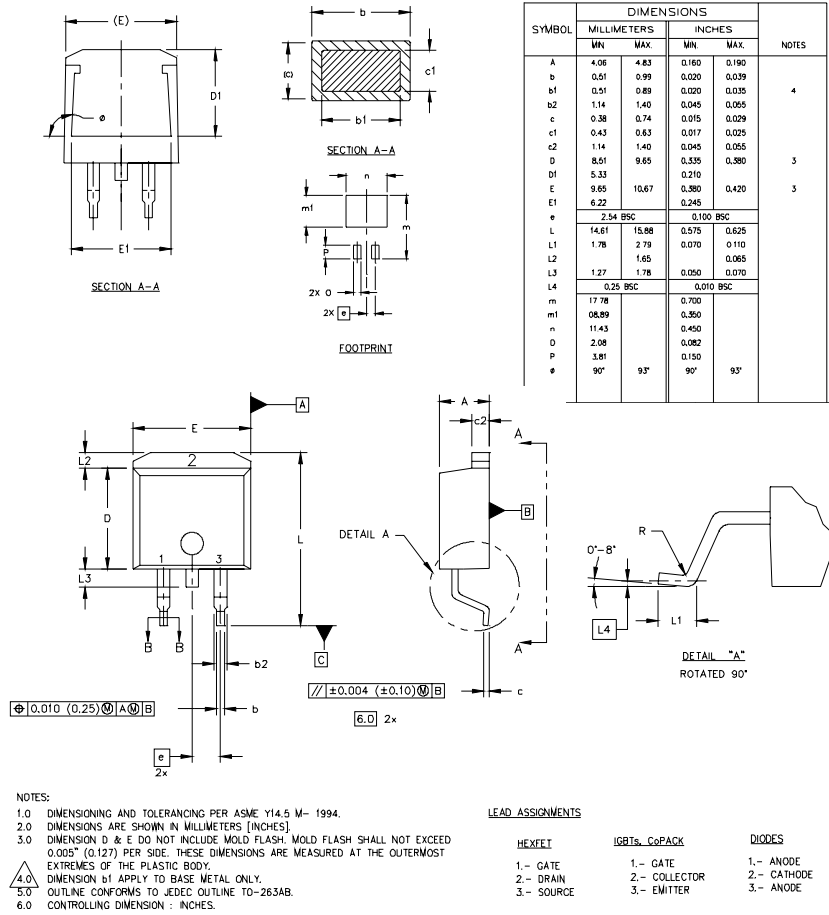
EXAMPLE: THIS IS AN IRF1010
 LOT CODE 1789
 ASSEMBLED ON WW 19, 1997
 IN THE ASSEMBLY LINE "C"



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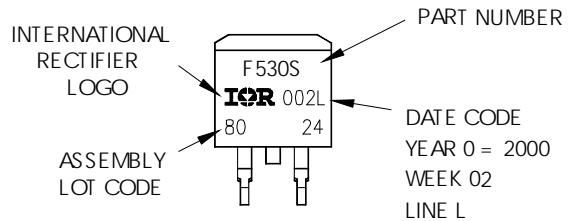
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D²Pak Package Outline



D²Pak Part Marking Information

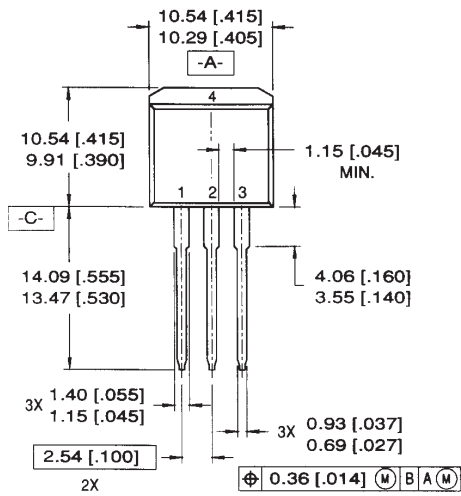
EXAMPLE: THIS IS AN IRF530S WITH
 LOT CODE 8024
 ASSEMBLED ON WW02, 2000
 IN THE ASSEMBLY LINE "L"



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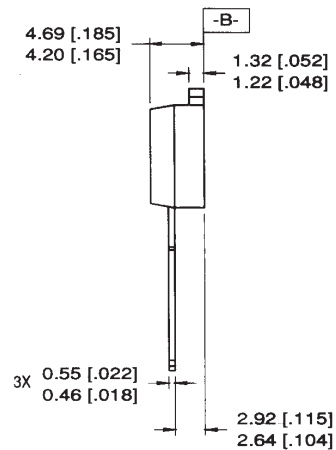
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TO-262 Package Outline



LEAD ASSIGNMENTS

- 1 = GATE 3 = SOURCE
- 2 = DRAIN 4 = DRAIN

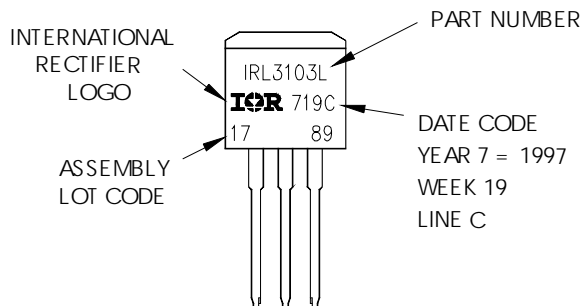


NOTES:

1. DIMENSIONING & TOLERANCING PER ANSI Y14.5M-1982
2. CONTROLLING DIMENSION: INCH.
3. DIMENSIONS ARE SHOWN IN MILLIMETERS [INCHES].
4. HEATSINK & LEAD DIMENSIONS DO NOT INCLUDE BURRS.

TO-262 Part Marking Information

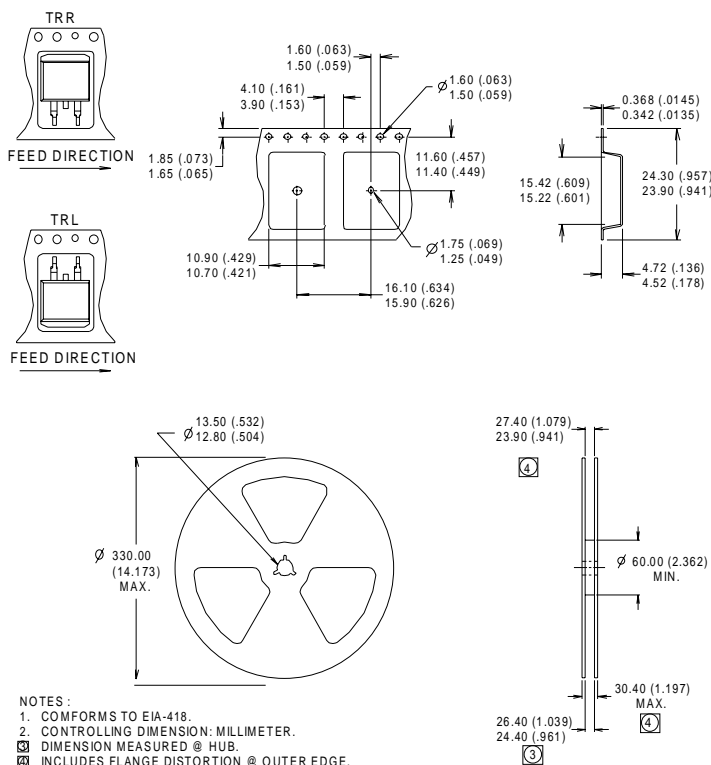
EXAMPLE: THIS IS AN IRL3103L
 LOT CODE 1789
 ASSEMBLED ON WW 19, 1997
 IN THE ASSEMBLY LINE "C"



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D²Pak Tape & Reel Information



NOTES:
 1. CONFORMS TO EIA-418.
 2. CONTROLLING DIMENSION: MILLIMETER.
 3. DIMENSION MEASURED @ HUB.
 4. INCLUDES FLANGE DISTORTION @ OUTER EDGE.

Notes:

- ① Repetitive rating; pulse width limited by max. junction temperature.
- ② Starting $T_J = 25^\circ\text{C}$, $L = 0.51\text{mH}$
 $R_G = 25\Omega$, $I_{AS} = 21\text{A}$, $V_{GS} = 10\text{V}$
- ③ Pulse width $\leq 400\mu\text{s}$; duty cycle $\leq 2\%$.
- ④ This is only applied to TO-220A package
- ⑤ This is applied to D²Pak, when mounted on 1" square PCB (FR-4 or G-10 Material).
 For recommended footprint and soldering techniques refer to application note #AN-994.
- ⑥ Calculated continuous current based on maximum allowable junction temperature.
 Package limitation current is 30A.

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.

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Visit us at www.irf.com for sales contact information. 6/01

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