

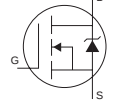
# IRF3415S/L

International  
IR Rectifier

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

|                                 | Parameter                            | Min. | Typ. | Max.  | Units              | Conditions                                            |
|---------------------------------|--------------------------------------|------|------|-------|--------------------|-------------------------------------------------------|
| $V_{(BR)DSS}$                   | Drain-to-Source Breakdown Voltage    | 150  | —    | —     | V                  | $V_{GS} = 0V, I_D = 250\mu A$                         |
| $\Delta V_{(BR)DSS}/\Delta T_J$ | Breakdown Voltage Temp. Coefficient  | —    | 0.17 | —     | $V/^\circ\text{C}$ | Reference to $25^\circ\text{C}$ , $I_D = 1mA$ ⑤       |
| $R_{DS(on)}$                    | Static Drain-to-Source On-Resistance | —    | —    | 0.042 | $\Omega$           | $V_{GS} = 10V, I_D = 22A$ ④                           |
| $V_{GS(th)}$                    | Gate Threshold Voltage               | 2.0  | —    | 4.0   | V                  | $V_{DS} = V_{GS}, I_D = 250\mu A$                     |
| $g_{fs}$                        | Forward Transconductance             | 19   | —    | —     | S                  | $V_{DS} = 50V, I_D = 22A$ ⑤                           |
| $I_{DSS}$                       | Drain-to-Source Leakage Current      | —    | —    | 25    | $\mu A$            | $V_{DS} = 150V, V_{GS} = 0V$                          |
|                                 |                                      | —    | —    | 250   |                    | $V_{DS} = 120V, V_{GS} = 0V, T_J = 150^\circ\text{C}$ |
| $I_{GSS}$                       | Gate-to-Source Forward Leakage       | —    | —    | 100   | nA                 | $V_{GS} = 20V$                                        |
|                                 | Gate-to-Source Reverse Leakage       | —    | —    | -100  |                    | $V_{GS} = -20V$                                       |
| $Q_g$                           | Total Gate Charge                    | —    | —    | 200   | nC                 | $I_D = 22A$                                           |
| $Q_{gs}$                        | Gate-to-Source Charge                | —    | —    | 17    |                    | $V_{DS} = 120V$                                       |
| $Q_{gd}$                        | Gate-to-Drain ("Miller") Charge      | —    | —    | 98    |                    | $V_{GS} = 10V$ , See Fig. 6 and 13 ④⑤                 |
| $t_{d(on)}$                     | Turn-On Delay Time                   | —    | 12   | —     | ns                 | $V_{DD} = 75V$                                        |
| $t_r$                           | Rise Time                            | —    | 55   | —     |                    | $I_D = 22A$                                           |
| $t_{d(off)}$                    | Turn-Off Delay Time                  | —    | 71   | —     |                    | $R_G = 2.5\Omega$                                     |
| $t_f$                           | Fall Time                            | —    | 69   | —     |                    | $R_D = 3.3\Omega$ , See Fig. 10 ④⑤                    |
| $L_S$                           | Internal Source Inductance           | —    | 7.5  | —     | nH                 | Between lead, and center of die contact               |
| $C_{iss}$                       | Input Capacitance                    | —    | 2400 | —     | pF                 | $V_{GS} = 0V$                                         |
| $C_{oss}$                       | Output Capacitance                   | —    | 640  | —     |                    | $V_{DS} = 25V$                                        |
| $C_{rss}$                       | Reverse Transfer Capacitance         | —    | 340  | —     |                    | $f = 1.0MHz$ , See Fig. 5⑤                            |

## Source-Drain Ratings and Characteristics

|          | Parameter                              | Min.                                                                        | Typ. | Max. | Units   | Conditions                                                                                                                                           |
|----------|----------------------------------------|-----------------------------------------------------------------------------|------|------|---------|------------------------------------------------------------------------------------------------------------------------------------------------------|
| $I_S$    | Continuous Source Current (Body Diode) | —                                                                           | —    | 43   | A       | MOSFET symbol showing the integral reverse p-n junction diode.  |
| $I_{SM}$ | Pulsed Source Current (Body Diode) ①⑤  | —                                                                           | —    | 150  |         |                                                                                                                                                      |
| $V_{SD}$ | Diode Forward Voltage                  | —                                                                           | —    | 1.3  | V       | $T_J = 25^\circ\text{C}, I_S = 22A, V_{GS} = 0V$ ④                                                                                                   |
| $t_{rr}$ | Reverse Recovery Time                  | —                                                                           | 260  | 390  | ns      | $T_J = 25^\circ\text{C}, I_F = 22A$                                                                                                                  |
| $Q_{rr}$ | Reverse Recovery Charge                | —                                                                           | 2.2  | 3.3  | $\mu C$ | $di/dt = 100A/\mu s$ ④⑤                                                                                                                              |
| $t_{on}$ | Forward Turn-On Time                   | Intrinsic turn-on time is negligible (turn-on is dominated by $L_S + L_D$ ) |      |      |         |                                                                                                                                                      |

### Notes:

① Repetitive rating; pulse width limited by max. junction temperature. ( See fig. 11 )

② Starting  $T_J = 25^\circ\text{C}$ ,  $L = 2.4mH$   
 $R_G = 25\Omega$ ,  $I_{AS} = 22A$ . (See Figure 12)

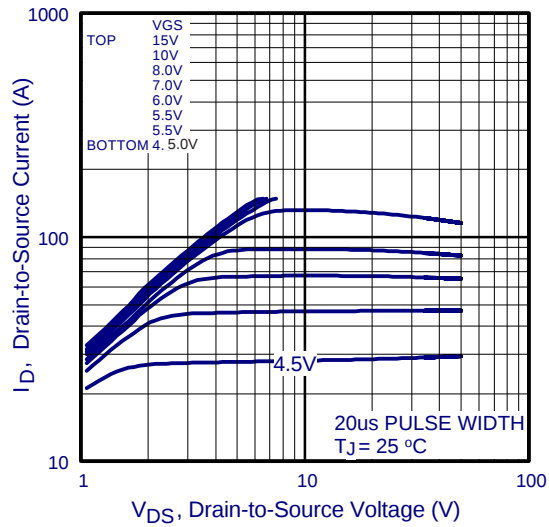
③  $I_{SD} \leq 22A$ ,  $di/dt \leq 820A/\mu s$ ,  $V_{DD} \leq V_{(BR)DSS}$ ,  
 $T_J \leq 175^\circ\text{C}$

④ Pulse width  $\leq 300\mu s$ ; duty cycle  $\leq 2\%$ .

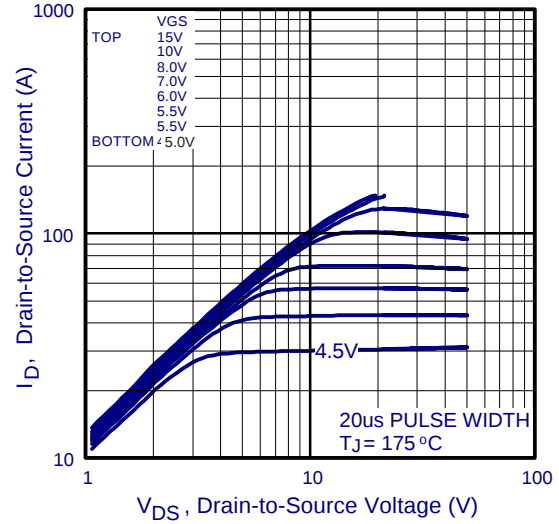
⑤ Uses IRF3415 data and test conditions

\*\* When mounted on 1" square PCB ( FR-4 or G-10 Material ).

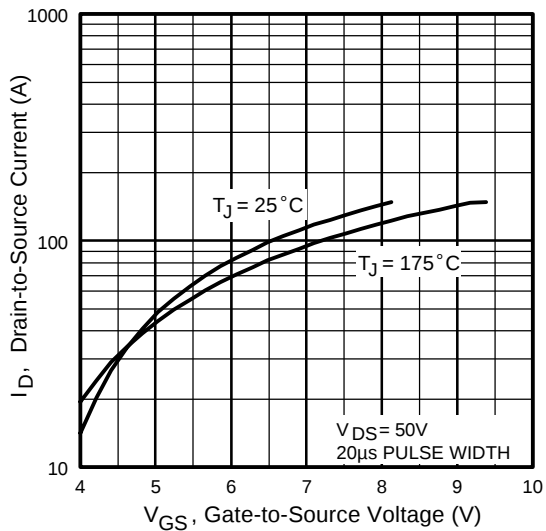
For recommended soldering techniques refer to application note #AN-994.



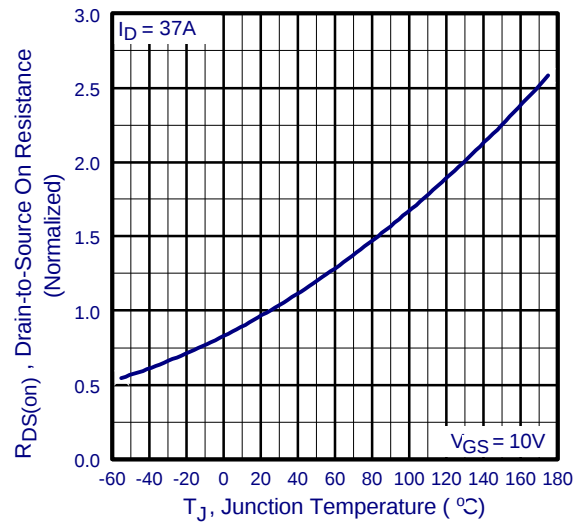
**Fig 1.** Typical Output Characteristics



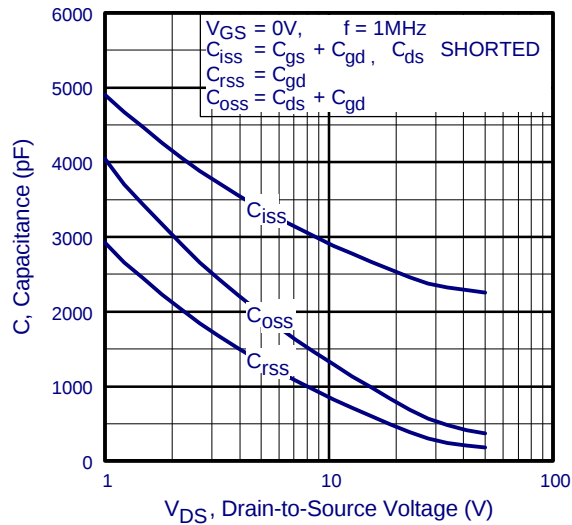
**Fig 2.** Typical Output Characteristics



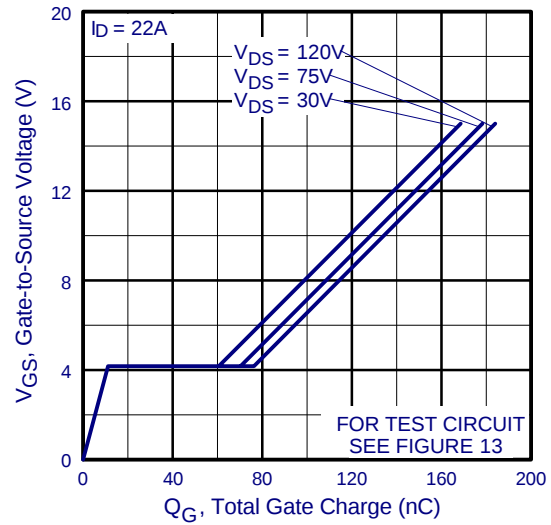
**Fig 3.** Typical Transfer Characteristics



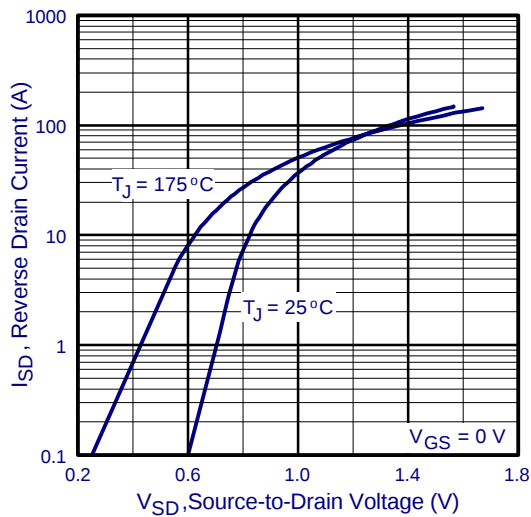
**Fig 4.** Normalized On-Resistance Vs. Temperature



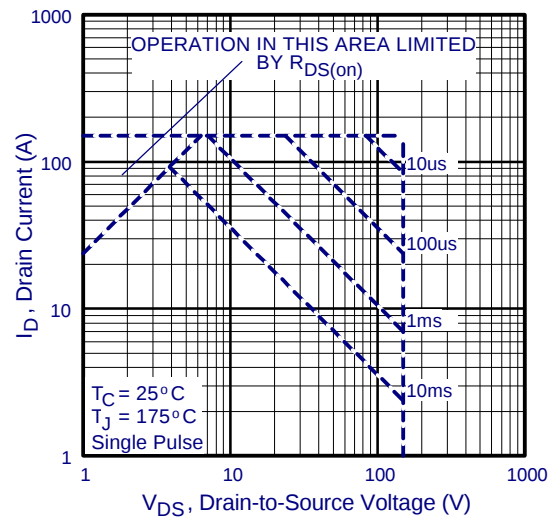
**Fig 5.** Typical Capacitance Vs. Drain-to-Source Voltage



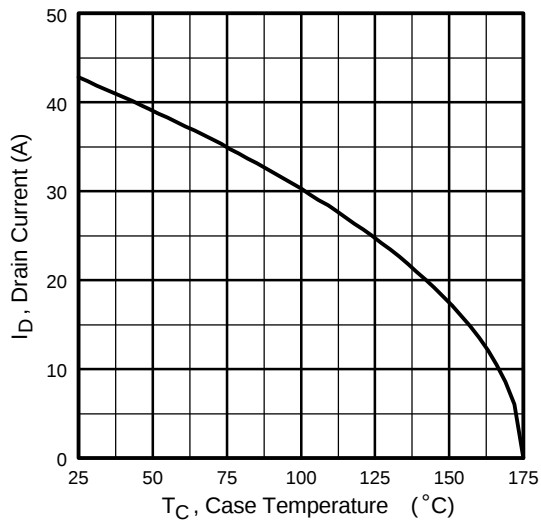
**Fig 6.** Typical Gate Charge Vs. Gate-to-Source Voltage



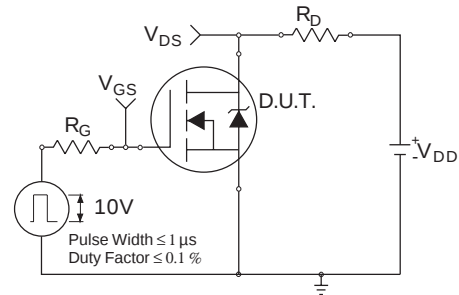
**Fig 7.** Typical Source-Drain Diode Forward Voltage



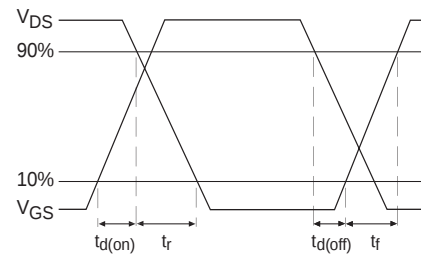
**Fig 8.** Maximum Safe Operating Area



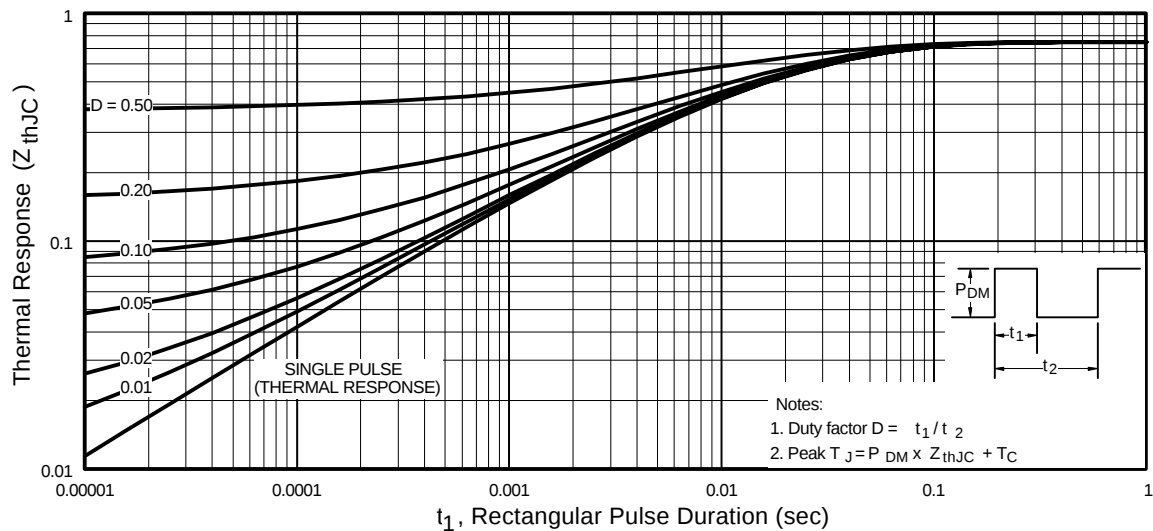
**Fig 9.** Maximum Drain Current Vs. Case Temperature



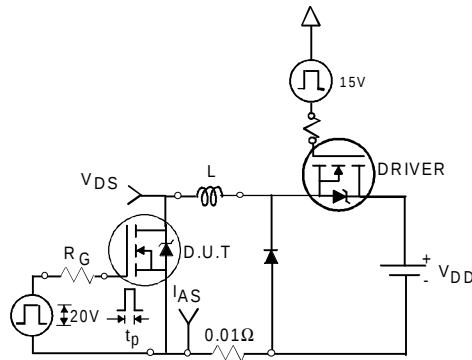
**Fig 10a.** Switching Time Test Circuit



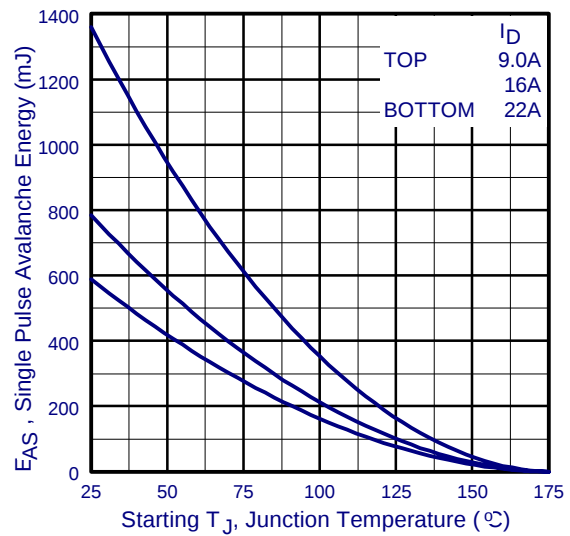
**Fig 10b.** Switching Time Waveforms



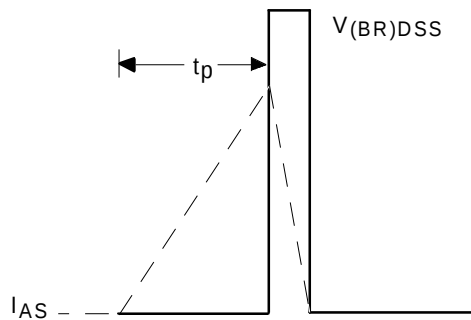
**Fig 11.** Maximum Effective Transient Thermal Impedance, Junction-to-Case



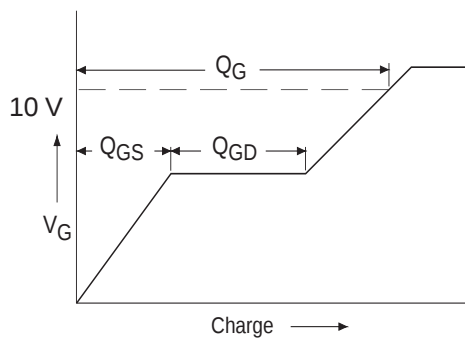
**Fig 12a.** Unclamped Inductive Test Circuit



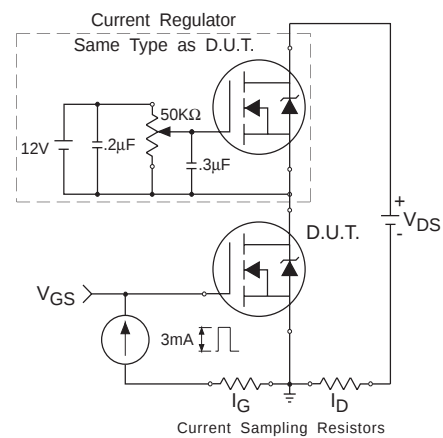
**Fig 12c.** Maximum Avalanche Energy Vs. Drain Current



**Fig 12b.** Unclamped Inductive Waveforms

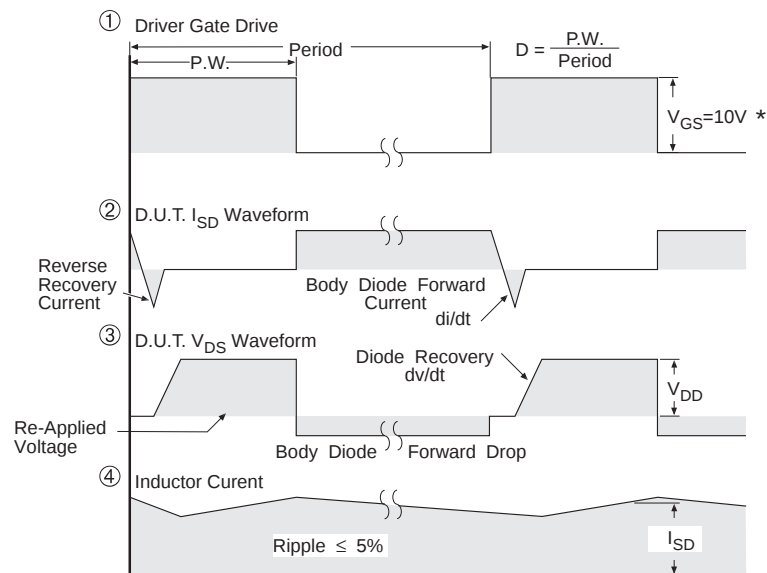
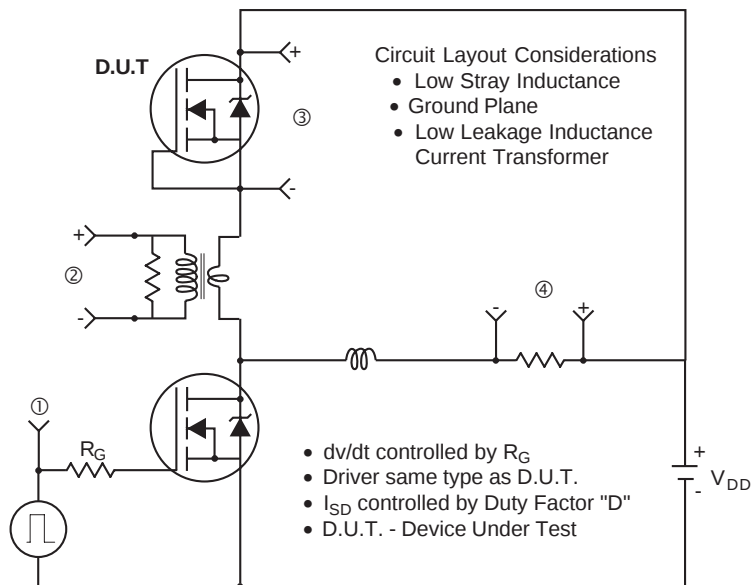


**Fig 13a.** Basic Gate Charge Waveform



**Fig 13b.** Gate Charge Test Circuit

## Peak Diode Recovery dv/dt Test Circuit



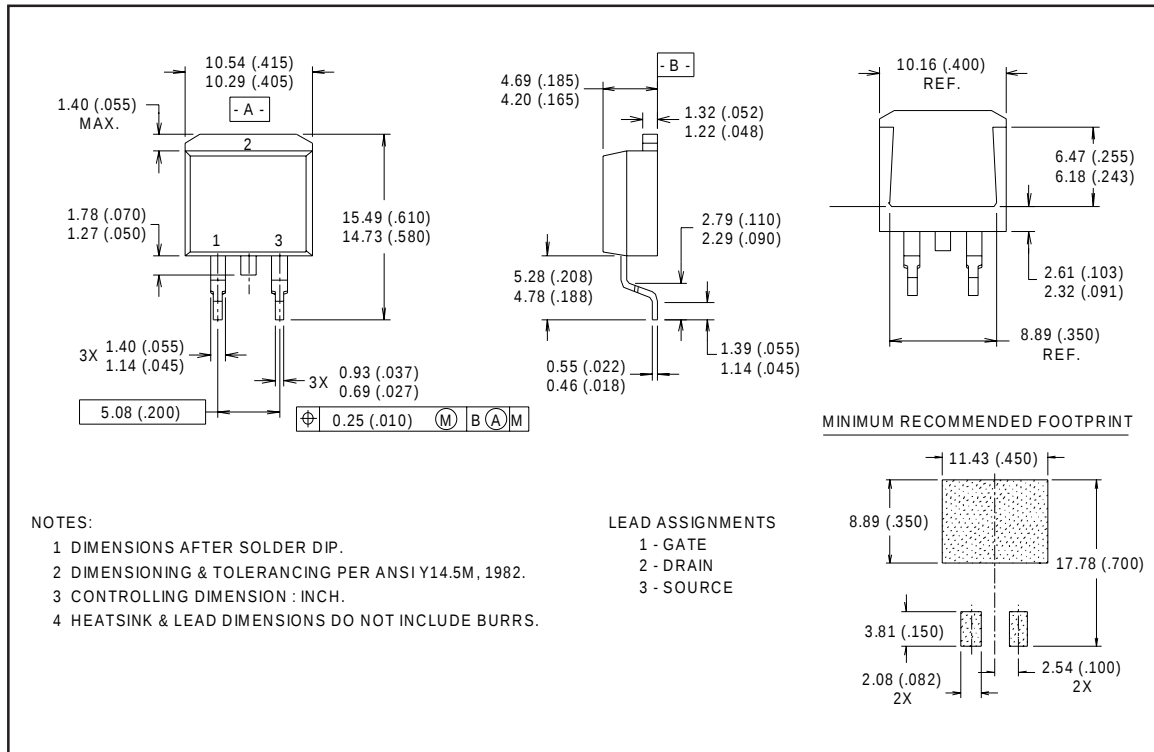
\*  $V_{GS} = 5V$  for Logic Level Devices

**Fig 14.** For N-Channel HEXFETS

# IRF3415S/L

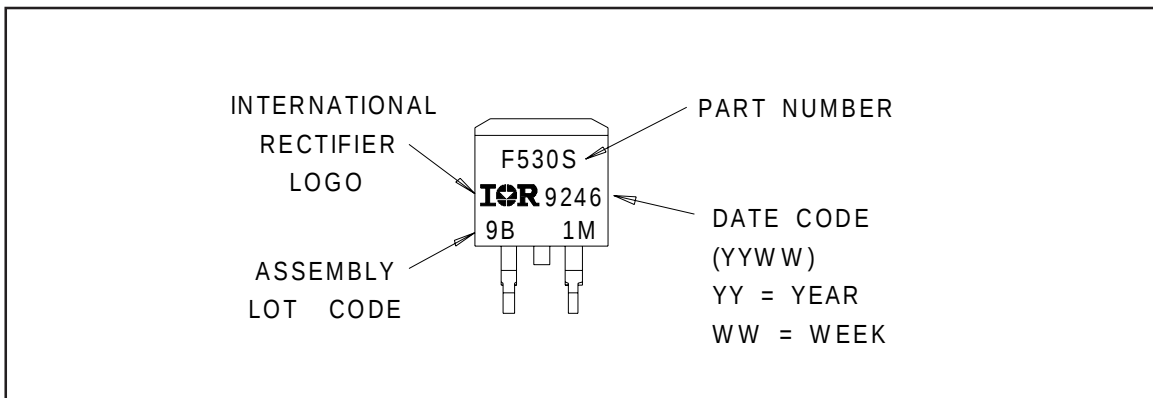
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## D<sup>2</sup>Pak Package Outline



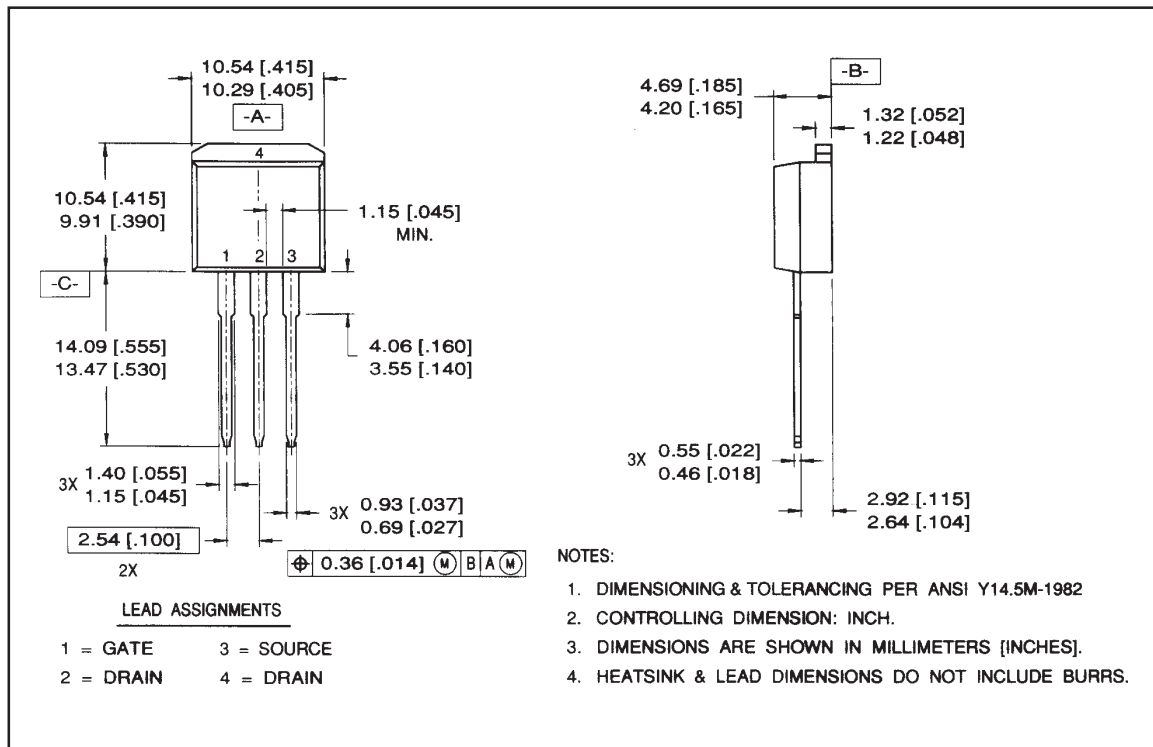
## Part Marking Information

D<sup>2</sup>Pak



## Package Outline

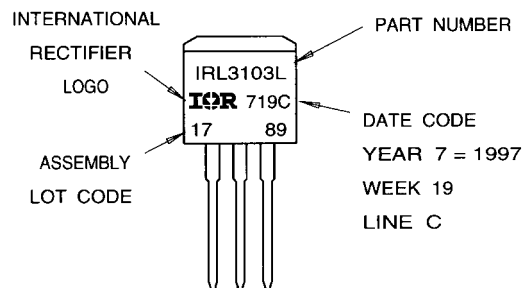
### TO-262 Outline



## Part Marking Information

### TO-262

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

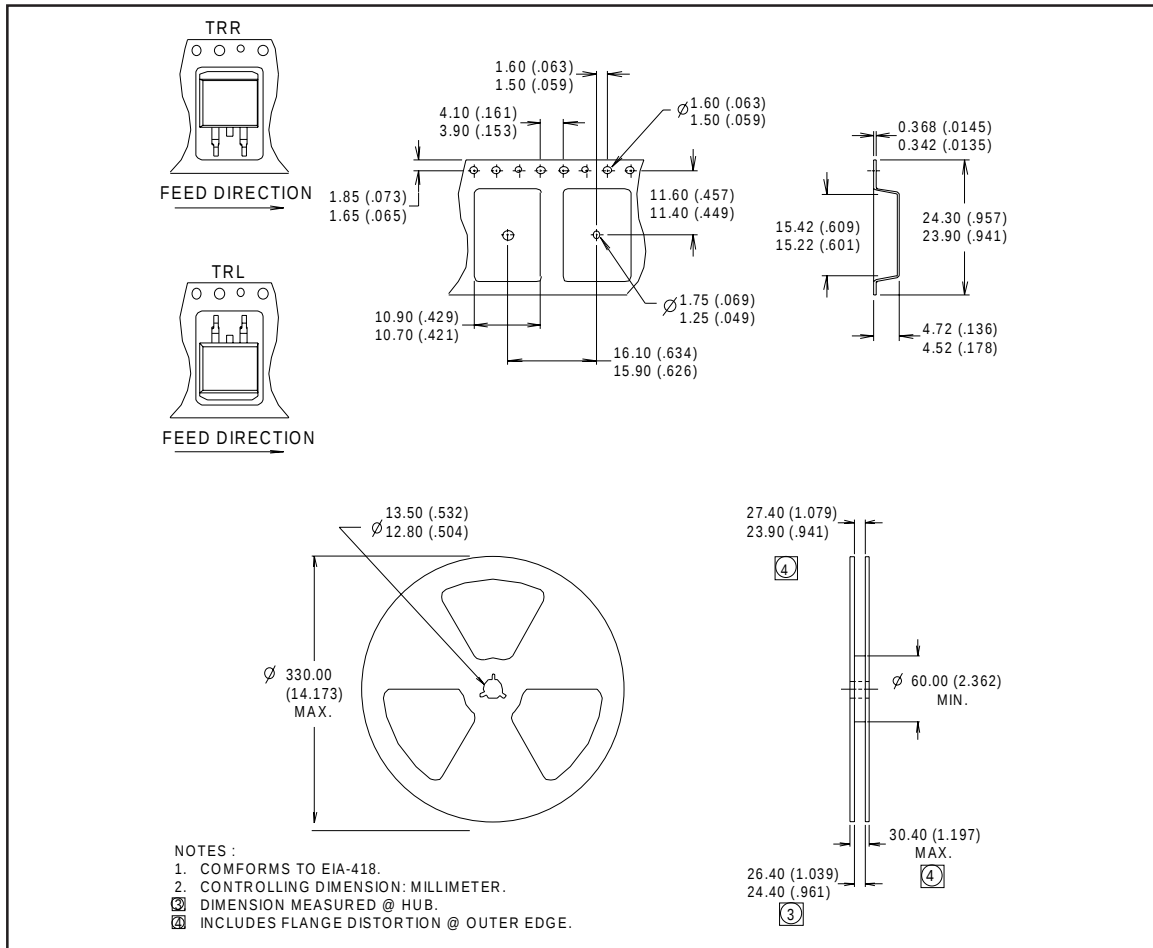


# IRF3415S/L

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## Tape & Reel Information

D<sup>2</sup>Pak



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**EUROPEAN HEADQUARTERS:** Hurst Green, Oxted, Surrey RH8 9BB, UK Tel: ++ 44 1883 732020

**IR CANADA:** 7321 Victoria Park Ave., Suite 201, Markham, Ontario L3R 2Z8, Tel: (905) 475 1897

**IR GERMANY:** Saalburgstrasse 157, 61350 Bad Homburg Tel: ++ 49 6172 96590

**IR ITALY:** Via Liguria 49, 10071 Borgaro, Torino Tel: ++ 39 11 451 0111

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<http://www.irf.com/> Data and specifications subject to change without notice. 5/98

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