

PD - 93937B

**SMPS MOSFET**

IRF3707

IRF3707S

IRF3707L

HEXFET® Power MOSFET

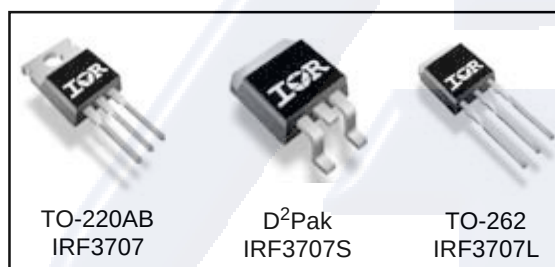
**Applications**

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

| $V_{DS}$ | $R_{DS(on)}$ max | $I_D$ |
|----------|------------------|-------|
| 30V      | 12.5mΩ           | 62A   |

**Benefits**

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

**Absolute Maximum Ratings**

| Symbol                           | Parameter                                | Max.         | Units |
|----------------------------------|------------------------------------------|--------------|-------|
| $V_{DS}$                         | Drain-Source Voltage                     | 30           | V     |
| $V_{GS}$                         | Gate-to-Source Voltage                   | ± 20         | V     |
| $I_D$ @ $T_C = 25^\circ\text{C}$ | Continuous Drain Current, $V_{GS}$ @ 10V | 62           | A     |
| $I_D$ @ $T_C = 70^\circ\text{C}$ | Continuous Drain Current, $V_{GS}$ @ 10V | 52           |       |
| $I_{DM}$                         | Pulsed Drain Current <sup>①</sup>        | 248          |       |
| $P_D$ @ $T_C = 25^\circ\text{C}$ | Maximum Power Dissipation <sup>③</sup>   | 87           | W     |
| $P_D$ @ $T_C = 70^\circ\text{C}$ | Maximum Power Dissipation <sup>③</sup>   | 61           | 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 |
|-----------------|--------------------------------------------------|------|------|-------|
| $R_{\theta JC}$ | Junction-to-Case                                 | —    | 1.73 | °C/W  |
| $R_{\theta CS}$ | Case-to-Sink, Flat, Greased Surface <sup>④</sup> | 0.50 | —    |       |
| $R_{\theta JA}$ | Junction-to-Ambient <sup>④</sup>                 | —    | 62   |       |
| $R_{\theta JA}$ | Junction-to-Ambient (PCB mount)*                 | —    | 40   |       |

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

# IRF3707/3707S/3707L

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

|                                 | Parameter                            | Min. | Typ.  | Max. | Units               | Conditions                                           |
|---------------------------------|--------------------------------------|------|-------|------|---------------------|------------------------------------------------------|
| $V_{(BR)DSS}$                   | Drain-to-Source Breakdown Voltage    | 30   | —     | —    | V                   | $V_{GS} = 0V, I_D = 250\mu A$                        |
| $\Delta V_{(BR)DSS}/\Delta T_J$ | Breakdown Voltage Temp. Coefficient  | —    | 0.027 | —    | V/ $^\circ\text{C}$ | Reference to $25^\circ\text{C}$ , $I_D = 1mA$        |
| $R_{DS(on)}$                    | Static Drain-to-Source On-Resistance | —    | 9.0   | 12.5 | $m\Omega$           | $V_{GS} = 10V, I_D = 15A$ ③                          |
|                                 |                                      | —    | 12.6  | 17   |                     | $V_{GS} = 4.5V, I_D = 12A$ ③                         |
| $V_{GS(th)}$                    | Gate Threshold Voltage               | 1.0  | —     | 3.0  | V                   | $V_{DS} = V_{GS}, I_D = 250\mu A$                    |
| $I_{DSS}$                       | Drain-to-Source Leakage Current      | —    | —     | 20   | $\mu A$             | $V_{DS} = 24V, V_{GS} = 0V$                          |
|                                 |                                      | —    | —     | 100  |                     | $V_{DS} = 24V, V_{GS} = 0V, T_J = 125^\circ\text{C}$ |
| $I_{GSS}$                       | Gate-to-Source Forward Leakage       | —    | —     | 200  | nA                  | $V_{GS} = 16V$                                       |
|                                 | Gate-to-Source Reverse Leakage       | —    | —     | -200 |                     | $V_{GS} = -16V$                                      |

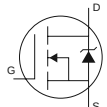
## Dynamic @ $T_J = 25^\circ\text{C}$ (unless otherwise specified)

| Symbol       | Parameter                       | Min. | Typ. | Max. | Units | Conditions                  |
|--------------|---------------------------------|------|------|------|-------|-----------------------------|
| $g_{fs}$     | Forward Transconductance        | 37   | —    | —    | S     | $V_{DS} = 15V, I_D = 49.6A$ |
| $Q_g$        | Total Gate Charge               | —    | 19   | —    | nC    | $I_D = 24.8A$               |
| $Q_{gs}$     | Gate-to-Source Charge           | —    | 8.2  | —    |       | $V_{DS} = 15V$              |
| $Q_{gd}$     | Gate-to-Drain ("Miller") Charge | —    | 6.3  | —    |       | $V_{GS} = 4.5V$ ③           |
| $Q_{oss}$    | Output Gate Charge              | —    | 18   | 27   |       | $V_{GS} = 0V, V_{DS} = 15V$ |
| $t_{d(on)}$  | Turn-On Delay Time              | —    | 8.5  | —    | ns    | $V_{DD} = 15V$              |
| $t_r$        | Rise Time                       | —    | 78   | —    |       | $I_D = 24.8A$               |
| $t_{d(off)}$ | Turn-Off Delay Time             | —    | 11.8 | —    |       | $R_G = 1.8\Omega$           |
| $t_f$        | Fall Time                       | —    | 3.3  | —    |       | $V_{GS} = 4.5V$ ③           |
| $C_{iss}$    | Input Capacitance               | —    | 1990 | —    | pF    | $V_{GS} = 0V$               |
| $C_{oss}$    | Output Capacitance              | —    | 707  | —    |       | $V_{DS} = 15V$              |
| $C_{rss}$    | Reverse Transfer Capacitance    | —    | 50   | —    |       | $f = 1.0MHz$                |

## Avalanche Characteristics

| Symbol   | Parameter                      | Typ. | Max. | Units |
|----------|--------------------------------|------|------|-------|
| $E_{AS}$ | Single Pulse Avalanche Energy② | —    | 213  | mJ    |
| $I_{AR}$ | Avalanche Current①             | —    | 62   | A     |

## Diode Characteristics

| Symbol   | Parameter                              | Min. | Typ. | Max. | Units | Conditions                                                                                                                                           |
|----------|----------------------------------------|------|------|------|-------|------------------------------------------------------------------------------------------------------------------------------------------------------|
| $I_S$    | Continuous Source Current (Body Diode) | —    | —    | 62   | A     | MOSFET symbol showing the integral reverse p-n junction diode.  |
| $I_{SM}$ | Pulsed Source Current (Body Diode) ①   | —    | —    | 248  |       |                                                                                                                                                      |
| $V_{SD}$ | Diode Forward Voltage                  | —    | 0.88 | 1.3  | V     | $T_J = 25^\circ\text{C}, I_S = 31A, V_{GS} = 0V$ ③                                                                                                   |
|          |                                        | —    | 0.8  | —    |       | $T_J = 125^\circ\text{C}, I_S = 31A, V_{GS} = 0V$ ③                                                                                                  |
| $t_{rr}$ | Reverse Recovery Time                  | —    | 39   | 59   | ns    | $T_J = 25^\circ\text{C}, I_F = 31A, V_R = 20V$                                                                                                       |
| $Q_{rr}$ | Reverse Recovery Charge                | —    | 49   | 74   | nC    | $di/dt = 100A/\mu s$ ③                                                                                                                               |
| $t_{rr}$ | Reverse Recovery Time                  | —    | 42   | 63   | ns    | $T_J = 125^\circ\text{C}, I_F = 31A, V_R = 20V$                                                                                                      |
| $Q_{rr}$ | Reverse Recovery Charge                | —    | 62   | 93   | nC    | $di/dt = 100A/\mu s$ ③                                                                                                                               |

## IRF3707/3707S/3707L

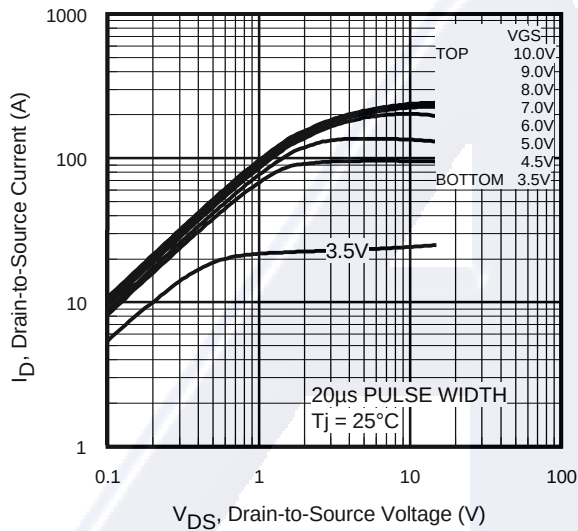


Fig 1. Typical Output Characteristics

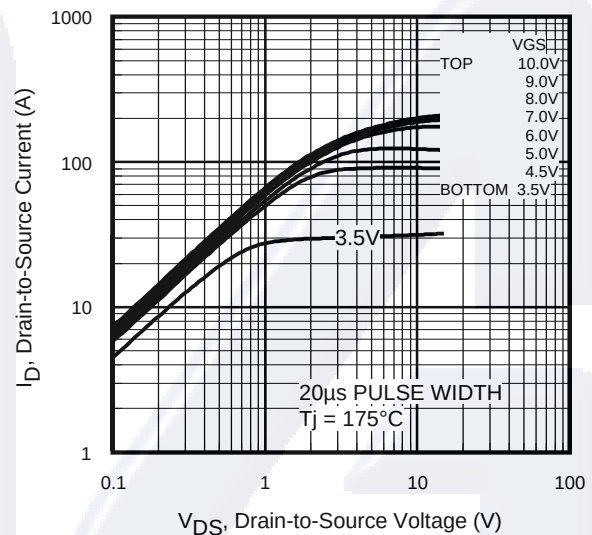


Fig 2. Typical Output Characteristics

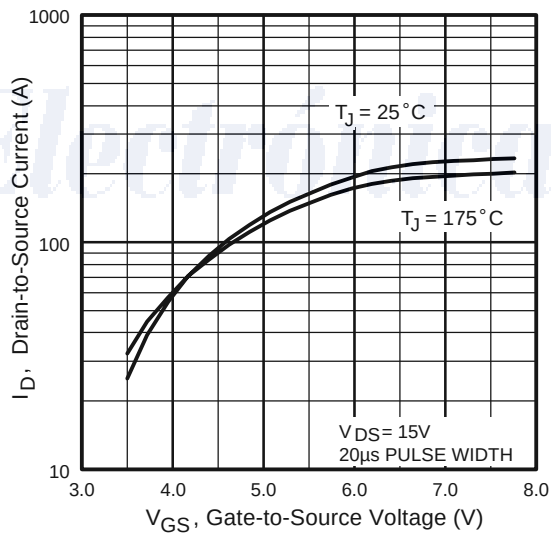


Fig 3. Typical Transfer Characteristics

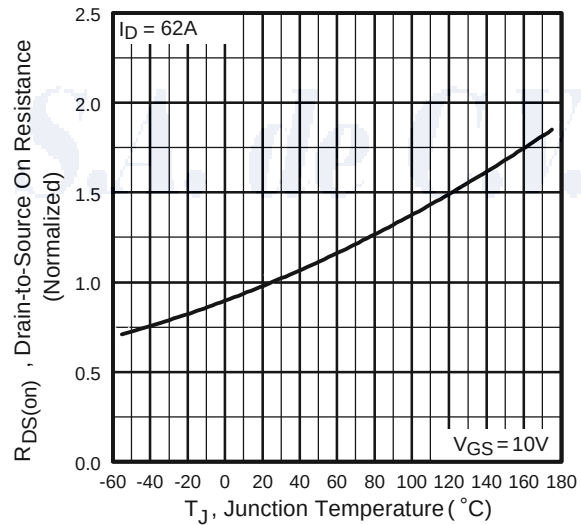
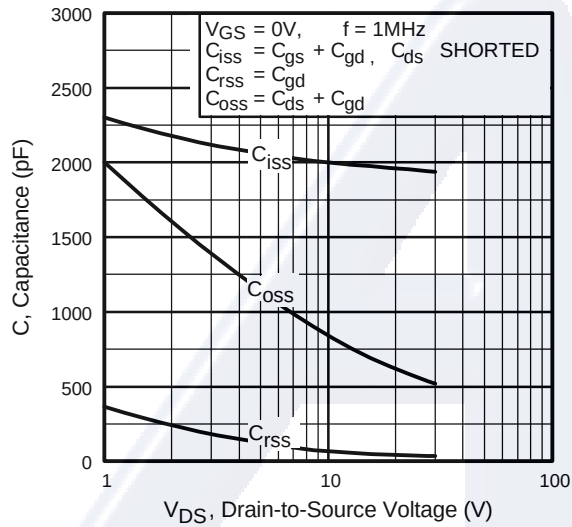
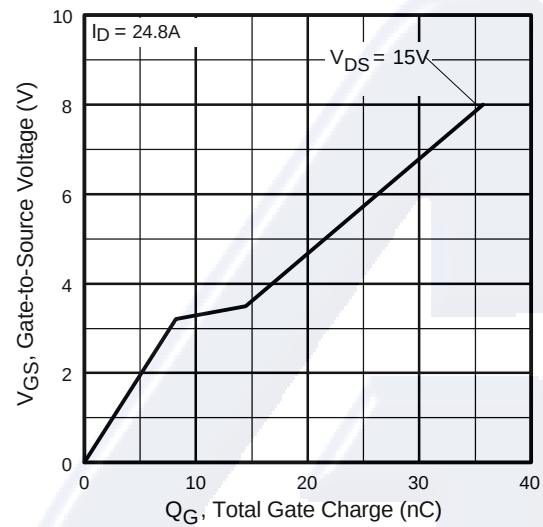


Fig 4. Normalized On-Resistance Vs. Temperature

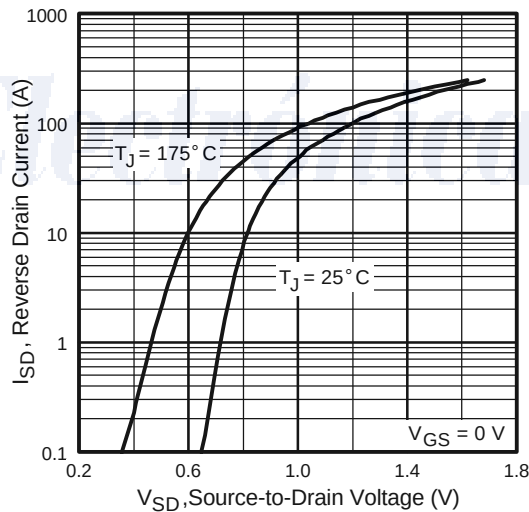
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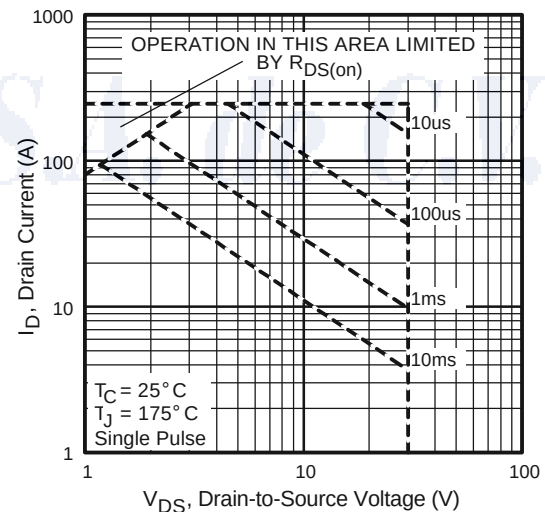
**Fig 5.** Typical Capacitance Vs. Drain-to-Source Voltage



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

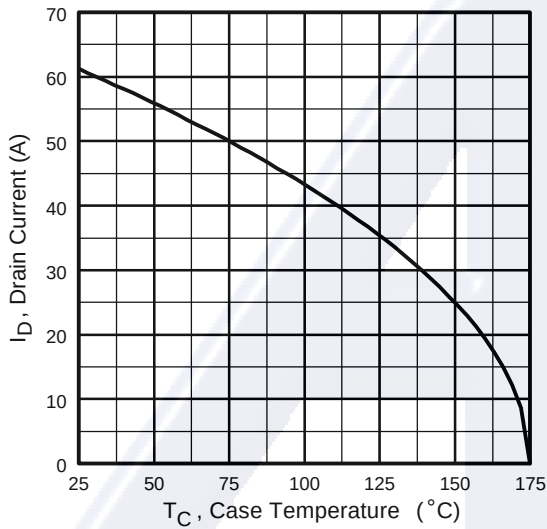


**Fig 7.** Typical Source-Drain Diode Forward Voltage

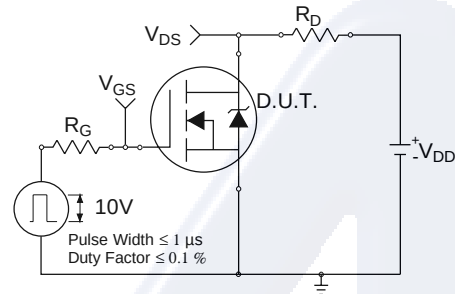


**Fig 8.** Maximum Safe Operating Area

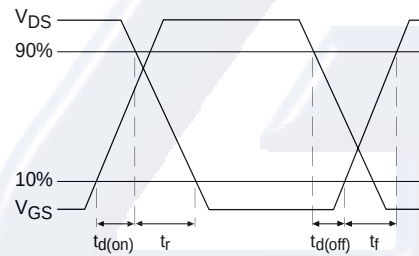
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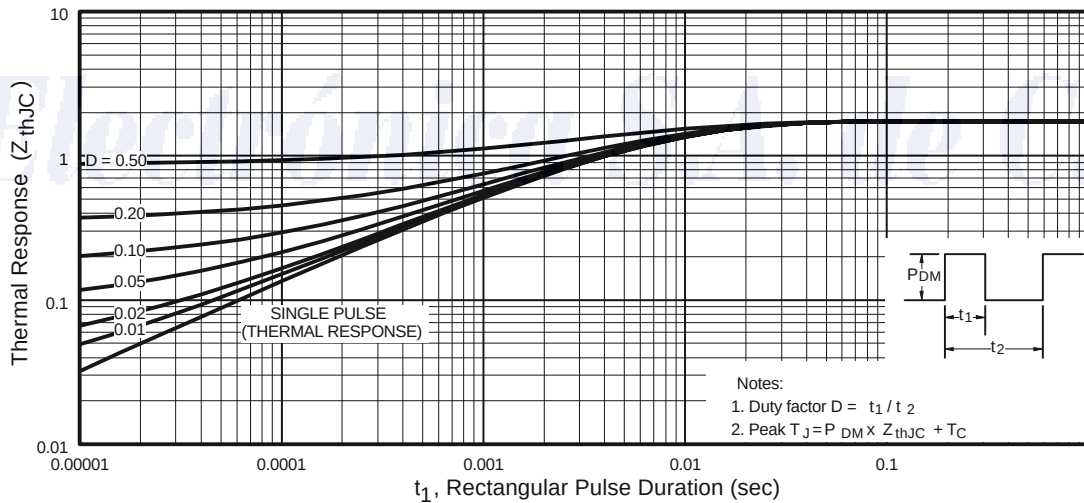
**Fig 9.** Maximum Drain Current Vs. Case Temperature



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

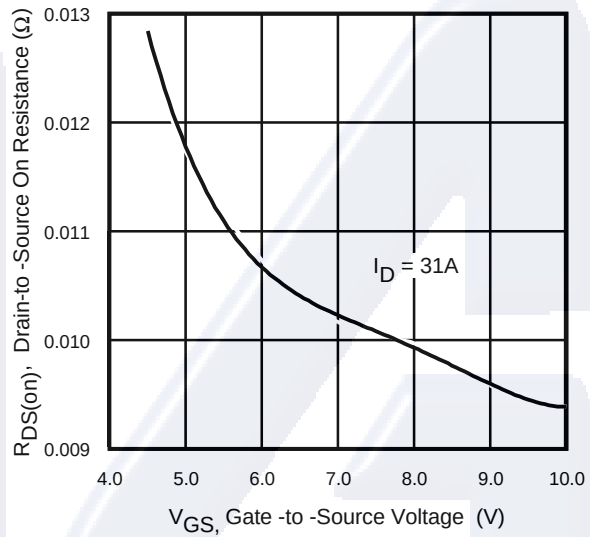
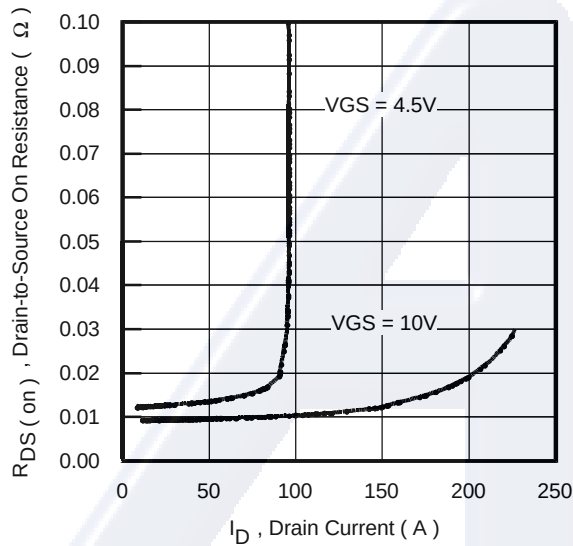


**Fig 10b.** Switching Time Waveforms



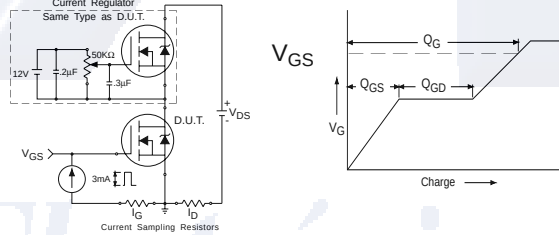
**Fig 11.** Maximum Effective Transient Thermal Impedance, Junction-to-Ambient

# IRF3707/3707S/3707L

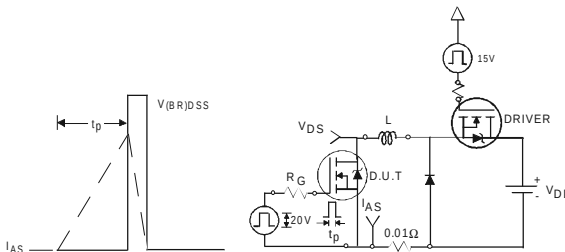


**Fig 12.** On-Resistance Vs. Drain Current

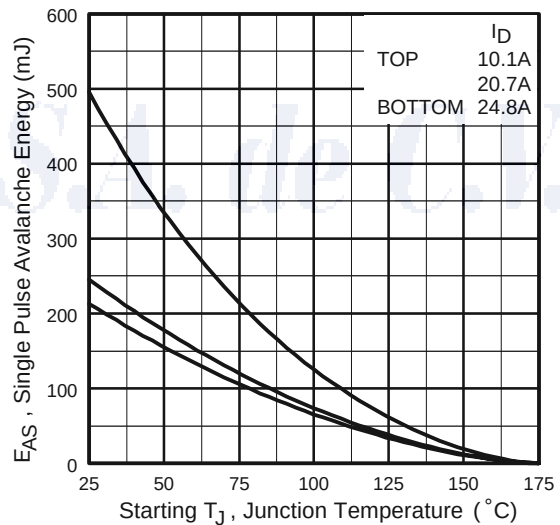
**Fig 13.** On-Resistance Vs. Gate Voltage



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



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

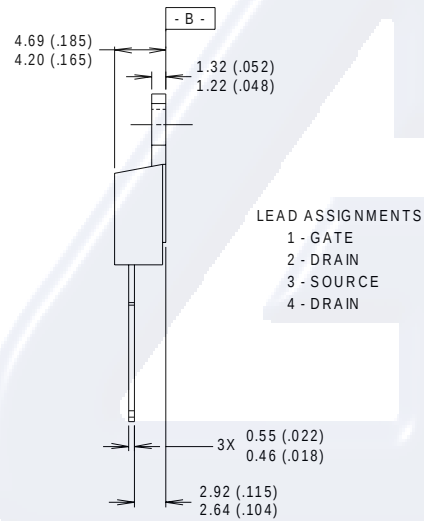
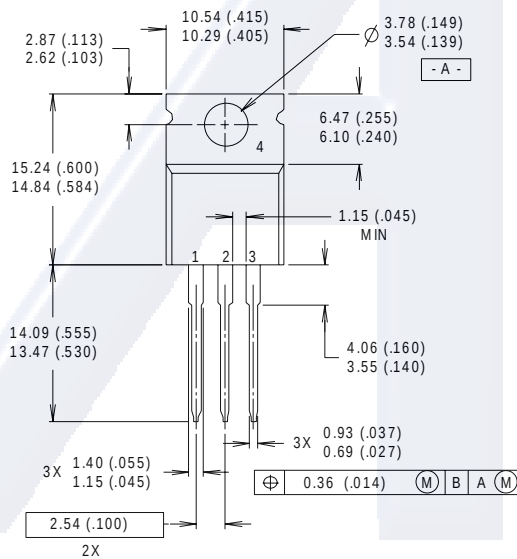


**Fig 15c.** Maximum Avalanche Energy Vs. Drain Current

# IRF3707/3707S/3707L

## TO-220AB Package Outline

Dimensions are shown in millimeters (inches)



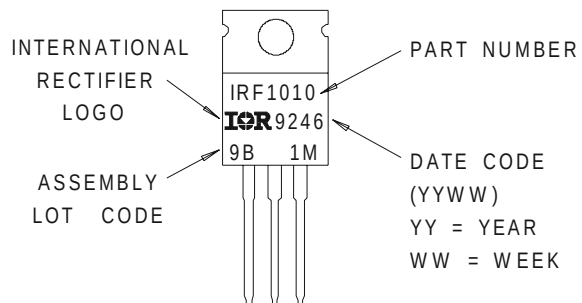
### NOTES:

- 1 DIMENSIONING & TOLERANCING PER ANSI 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  
WITH ASSEMBLY  
LOT CODE 9B1M

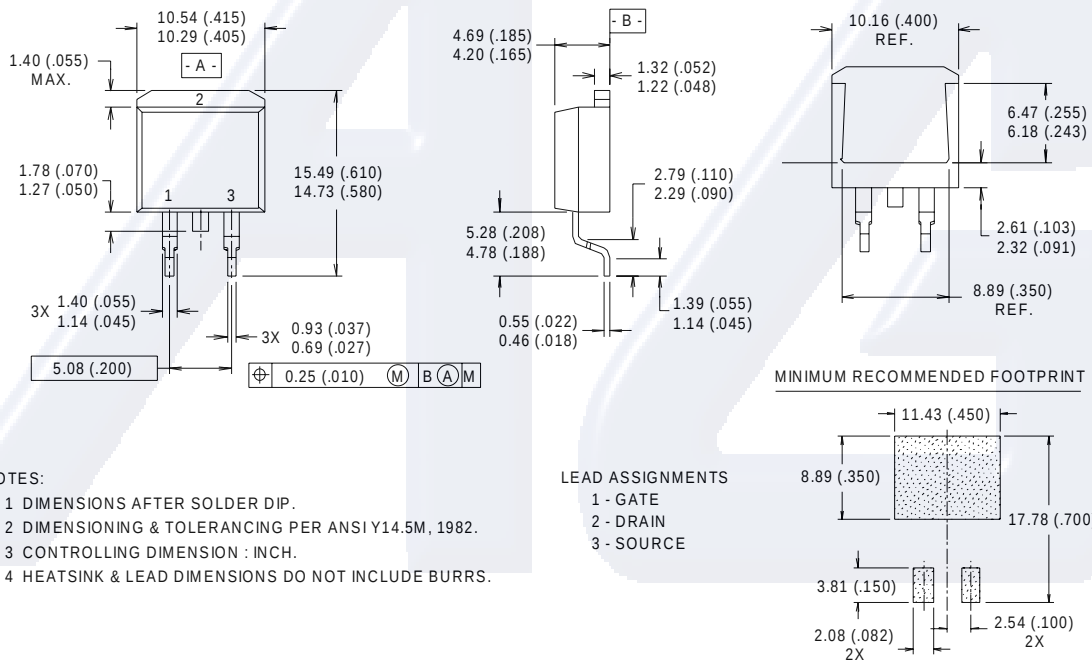


# IRF3707/3707S/3707L

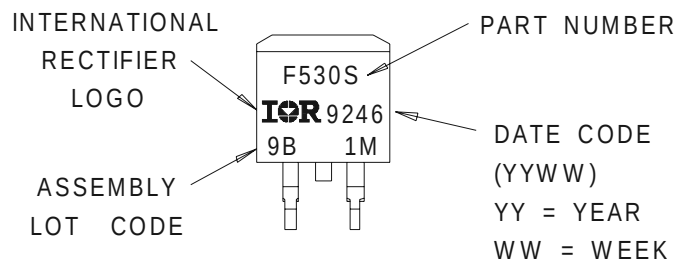
International  
**IOR** Rectifier

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

Dimensions are shown in millimeters (inches)



## D<sup>2</sup>Pak Part Marking Information

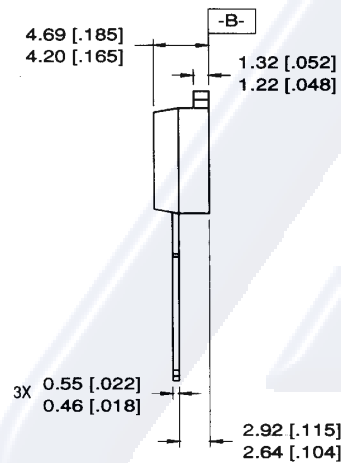
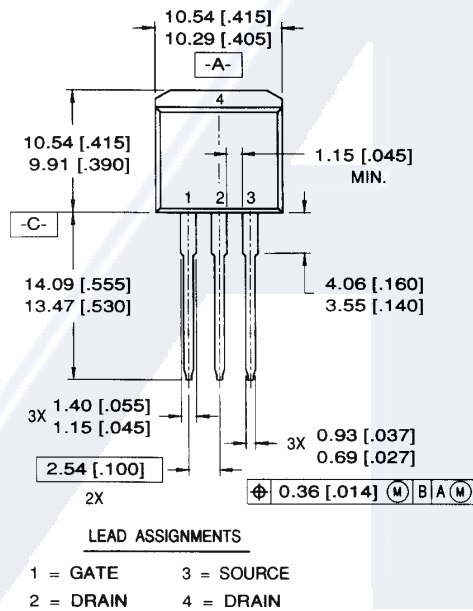




# IRF3707/3707S/3707L

## TO-262 Package Outline

Dimensions are shown in millimeters (inches)

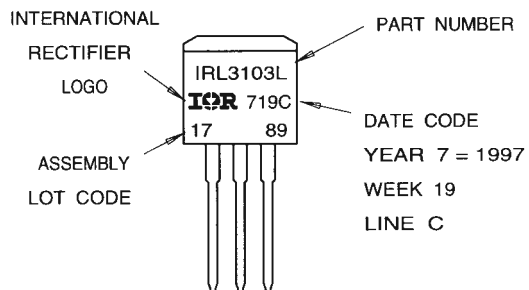


### NOTES:

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"

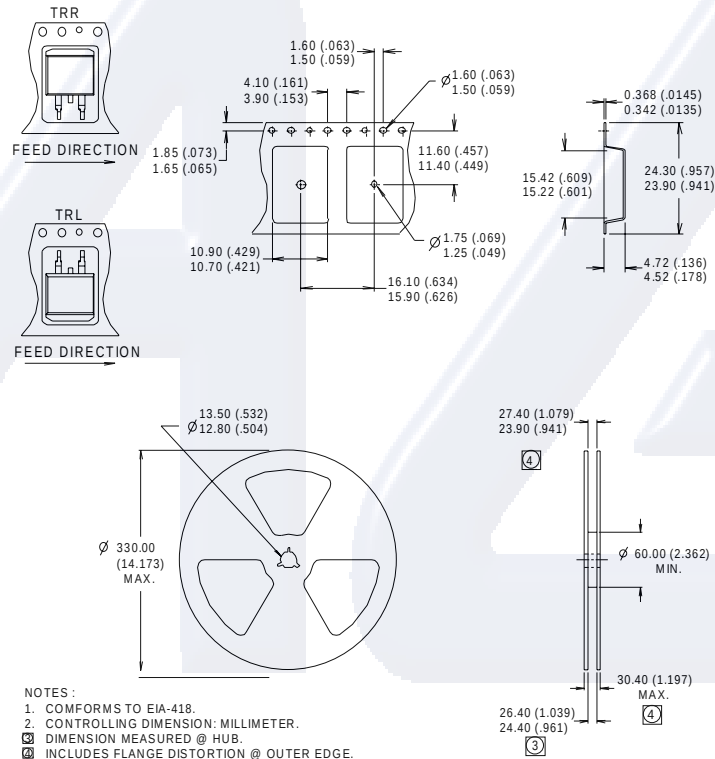


# IRF3707/3707S/3707L

International  
**IR** Rectifier

## D<sup>2</sup>Pak Tape & Reel Information

Dimensions are shown in millimeters (inches)



### Notes:

- ① Repetitive rating; pulse width limited by max. junction temperature.
- ② Starting  $T_J = 25^\circ\text{C}$ ,  $L = 0.7\text{ mH}$ ,  $R_G = 25\Omega$ ,  $I_{AS} = 24.8\text{ A}$ .
- ③ Pulse width  $\leq 300\mu\text{s}$ ; duty cycle  $\leq 2\%$ .
- ④ This is only applied to TO-220AB package