

**SMPS MOSFET**

**IRF3709**  
**IRF3709S**  
**IRF3709L**

**Applications**

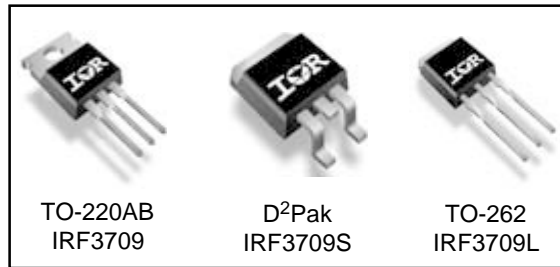
- High Frequency Isolated DC-DC Converters with Synchronous Rectification for Telecom and Industrial Use
- High Frequency Buck Converters for Server Processor Power Synchronous FET
- Optimized for Synchronous Buck Converters Including Capacitive Induced Turn-on Immunity

**Benefits**

- Ultra-Low Gate Impedance
- Very Low RDS(on) at 4.5V V<sub>GS</sub>
- Fully Characterized Avalanche Voltage and Current

HEXFET® Power MOSFET

|                        |                               |                        |
|------------------------|-------------------------------|------------------------|
| <b>V<sub>DSS</sub></b> | <b>R<sub>DS(on)</sub> max</b> | <b>I<sub>D</sub></b>   |
| <b>30V</b>             | <b>9.0mΩ</b>                  | <b>90A<sup>Ⓒ</sup></b> |



**Absolute Maximum Ratings**

| Symbol                                  | Parameter                                       | Max.            | Units |
|---|---|-----------------|-------|
| V <sub>DS</sub>                         | Drain-Source Voltage                            | 30              | V     |
| V <sub>GS</sub>                         | Gate-to-Source Voltage                          | ± 20            | V     |
| I <sub>D</sub> @ T <sub>C</sub> = 25°C  | Continuous Drain Current, V <sub>GS</sub> @ 10V | 90 <sup>Ⓒ</sup> | A     |
| I <sub>D</sub> @ T <sub>C</sub> = 100°C | Continuous Drain Current, V <sub>GS</sub> @ 10V | 57              |       |
| I <sub>DM</sub>                         | Pulsed Drain Current <sup>Ⓓ</sup>               | 360             |       |
| P <sub>D</sub> @ T <sub>C</sub> = 25°C  | Maximum Power Dissipation <sup>Ⓒ</sup>          | 120             | W     |
| P <sub>D</sub> @ T <sub>A</sub> = 25°C  | Maximum Power Dissipation <sup>Ⓔ</sup>          | 3.1             | W     |
|   | Linear Derating Factor                          | 0.96            | mW/°C |
| T <sub>J</sub> , T <sub>STG</sub>       | Junction and Storage Temperature Range          | -55 to + 150    | °C    |

**Thermal Resistance**

|                  | Parameter  | Typ. | Max. | Units |
|------------------|--|------|------|-------|
| R <sub>θJC</sub> | Junction-to-Case                                 | —    | 1.04 | °C/W  |
| R <sub>θCS</sub> | Case-to-Sink, Flat, Greased Surface <sup>Ⓓ</sup> | 0.50 | —    |       |
| R <sub>θJA</sub> | Junction-to-Ambient <sup>Ⓓ</sup>                 | —    | 62   |       |
| R <sub>θJA</sub> | Junction-to-Ambient (PCB mount) <sup>Ⓔ</sup>     | —    | 40   |       |

Notes <sup>Ⓓ</sup> through <sup>Ⓔ</sup> are on page 11

# IRF3709/3709S/3709L

International  
**IR** Rectifier

## 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  | —    | 0.029 | —    | V/°C  | Reference to $25^\circ\text{C}, I_D = 1mA$           |
| $R_{DS(on)}$                    | Static Drain-to-Source On-Resistance | —    | 6.4   | 9.0  | mΩ    | $V_{GS} = 10V, I_D = 15A$ ③                          |
|                                 |                                      | —    | 7.4   | 10.5 |       | $V_{GS} = 4.5V, I_D = 12A$ ③                         |
| $V_{GS(th)}$                    | Gate Threshold Voltage               | 1.0  | —     | 3.0  | V     | $V_{DS} = V_{GS}, I_D = 250\mu A$                    |
| $I_{DSS}$                       | Drain-to-Source Leakage Current      | —    | —     | 20   | μA    | $V_{DS} = 24V, V_{GS} = 0V$                          |
|                                 |                                      | —    | —     | 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 |       | $V_{GS} = -16V$                                      |

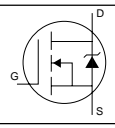
## Dynamic @ $T_J = 25^\circ\text{C}$ (unless otherwise specified)

| Symbol       | Parameter                       | Min. | Typ. | Max. | Units | Conditions                  |
|--------------|---------------------------------|------|------|------|-------|-----------------------------|
| $g_{fs}$     | Forward Transconductance        | 53   | —    | —    | S     | $V_{DS} = 15V, I_D = 30A$   |
| $Q_g$        | Total Gate Charge               | —    | 27   | 41   | nC    | $I_D = 15A$                 |
| $Q_{gs}$     | Gate-to-Source Charge           | —    | 6.7  | —    |       | $V_{DS} = 16V$              |
| $Q_{gd}$     | Gate-to-Drain ("Miller") Charge | —    | 9.7  | —    |       | $V_{GS} = 5.0V$ ③           |
| $Q_{oss}$    | Output Gate Charge              | —    | 22   | —    |       | $V_{GS} = 0V, V_{DS} = 10V$ |
| $t_{d(on)}$  | Turn-On Delay Time              | —    | 11   | —    | ns    | $V_{DD} = 15V$              |
| $t_r$        | Rise Time                       | —    | 171  | —    |       | $I_D = 30A$                 |
| $t_{d(off)}$ | Turn-Off Delay Time             | —    | 21   | —    |       | $R_G = 1.8\Omega$           |
| $t_f$        | Fall Time                       | —    | 9.2  | —    |       | $V_{GS} = 4.5V$ ③           |
| $C_{iss}$    | Input Capacitance               | —    | 2672 | —    | pF    | $V_{GS} = 0V$               |
| $C_{oss}$    | Output Capacitance              | —    | 1064 | —    |       | $V_{DS} = 16V$              |
| $C_{rss}$    | Reverse Transfer Capacitance    | —    | 109  | —    |       | $f = 1.0MHz$                |

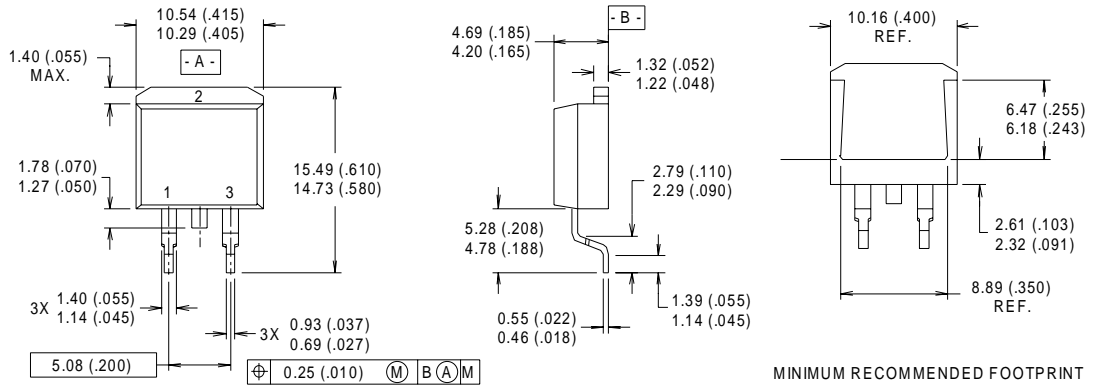
## Avalanche Characteristics

| Symbol   | Parameter                      | Typ. | Max. | Units |
|----------|--------------------------------|------|------|-------|
| $E_{AS}$ | Single Pulse Avalanche Energy② | —    | 382  | mJ    |
| $I_{AR}$ | Avalanche Current①             | —    | 30   | A     |

## Diode Characteristics

| Symbol   | Parameter                                 | Min. | Typ. | Max. | Units | Conditions   |
|----------|---|------|------|------|-------|--|
| $I_S$    | Continuous Source Current<br>(Body Diode) | —    | —    | 90⑥  | A     | MOSFET symbol showing the integral reverse p-n junction diode.  |
| $I_{SM}$ | Pulsed Source Current<br>(Body Diode) ①   | —    | —    | 360  |       |  |
| $V_{SD}$ | Diode Forward Voltage                     | —    | 0.88 | 1.3  | V     | $T_J = 25^\circ\text{C}, I_S = 30A, V_{GS} = 0V$ ③   |
|          |   | —    | 0.82 | —    |       | $T_J = 125^\circ\text{C}, I_S = 30A, V_{GS} = 0V$ ③  |
| $t_{rr}$ | Reverse Recovery Time                     | —    | 48   | 72   | ns    | $T_J = 25^\circ\text{C}, I_F = 30A, V_R = 15V$   |
| $Q_{rr}$ | Reverse Recovery Charge                   | —    | 46   | 69   | nC    | $di/dt = 100A/\mu s$ ③   |
| $t_{rr}$ | Reverse Recovery Time                     | —    | 48   | 72   | ns    | $T_J = 125^\circ\text{C}, I_F = 30A, V_R = 15V$  |
| $Q_{rr}$ | Reverse Recovery Charge                   | —    | 52   | 78   | nC    | $di/dt = 100A/\mu s$ ③   |

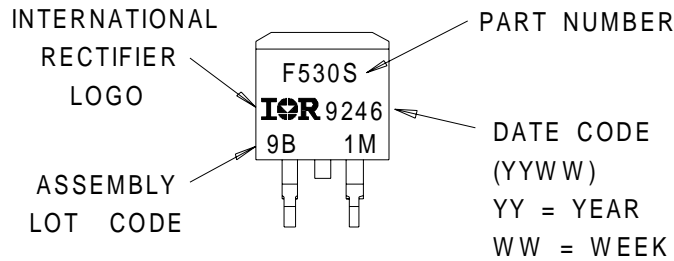
D<sup>2</sup>Pak Package Outline



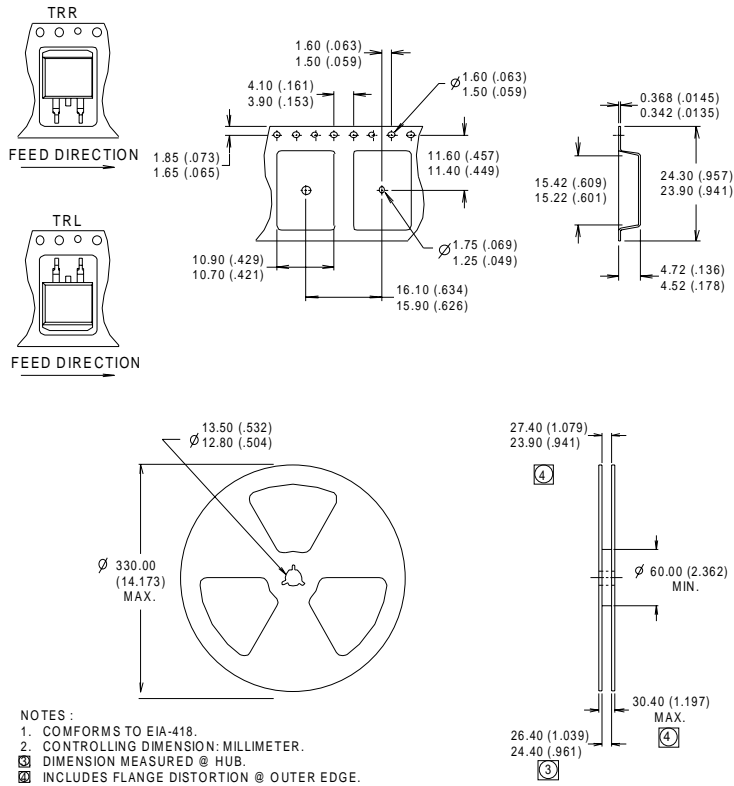
- NOTES:
- 1 DIMENSIONS AFTER SOLDER DIP.
  - 2 DIMENSIONING & TOLERANCING PER ANSI Y14.5M, 1982.
  - 3 CONTROLLING DIMENSION : INCH.
  - 4 HEATSINK & LEAD DIMENSIONS DO NOT INCLUDE BURRS.

- LEAD ASSIGNMENTS
- 1 - GATE
  - 2 - DRAIN
  - 3 - SOURCE

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



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



**Notes:**

- ① Repetitive rating; pulse width limited by max. junction temperature.
- ② Starting  $T_J = 25^\circ\text{C}$ ,  $L = 0.85\text{mH}$   
 $R_G = 25\Omega$ ,  $I_{AS} = 30\text{A}$ .
- ③ Pulse width  $\leq 400\mu\text{s}$ ; duty cycle  $\leq 2\%$ .
- ④ This is only applied to TO-220AB package
- ⑤ This is applied to D<sup>2</sup>Pak, 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 75A.

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.