Applications
- High Frequency DC-DC Isolated 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

Absolute Maximum Ratings

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Parameter</th>
<th>Max.</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>$V_{DS}$</td>
<td>Drain-Source Voltage</td>
<td>30</td>
<td>V</td>
</tr>
<tr>
<td>$V_{GS}$</td>
<td>Gate-to-Source Voltage</td>
<td>±12</td>
<td>V</td>
</tr>
<tr>
<td>$I_{D}$ @ $T_{C} = 25^\circ$C</td>
<td>Continuous Drain Current, $V_{GS} @ 10V$</td>
<td>62</td>
<td>A</td>
</tr>
<tr>
<td>$I_{D}$ @ $T_{C} = 70^\circ$C</td>
<td>Continuous Drain Current, $V_{GS} @ 10V$</td>
<td>52</td>
<td>A</td>
</tr>
<tr>
<td>$I_{DM}$</td>
<td>Pulsed Drain Current</td>
<td>248</td>
<td></td>
</tr>
<tr>
<td>$P_{D} @T_{C} = 25^\circ$C</td>
<td>Maximum Power Dissipation</td>
<td>87</td>
<td>W</td>
</tr>
<tr>
<td>$P_{D} @T_{C} = 70^\circ$C</td>
<td>Maximum Power Dissipation</td>
<td>61</td>
<td>W</td>
</tr>
<tr>
<td>$R_{\pi}$</td>
<td>Linear Derating Factor</td>
<td>0.58</td>
<td>W/°C</td>
</tr>
<tr>
<td>$T_{J}, T_{STG}$</td>
<td>Junction and Storage Temperature Range</td>
<td>-55 to +175</td>
<td>°C</td>
</tr>
</tbody>
</table>

Thermal Resistance

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Typ.</th>
<th>Max.</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>$R_{JUC}$</td>
<td>Junction-to-Case</td>
<td>——</td>
<td>1.73</td>
</tr>
<tr>
<td>$R_{HCS}$</td>
<td>Case-to-Sink, Flat, Greased Surface</td>
<td>0.50</td>
<td>——</td>
</tr>
<tr>
<td>$R_{JUA}$</td>
<td>Junction-to-Ambient</td>
<td>——</td>
<td>62</td>
</tr>
<tr>
<td>$R_{JUA}$</td>
<td>Junction-to-Ambient (PCB mount)*</td>
<td>——</td>
<td>40</td>
</tr>
</tbody>
</table>

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

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

Notes © through ® are on page 10

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# IRF3708/3708S/3708L

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

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Parameter</th>
<th>Min.</th>
<th>Typ.</th>
<th>Max.</th>
<th>Units</th>
<th>Conditions</th>
</tr>
</thead>
<tbody>
<tr>
<td>qgs</td>
<td>Forward Transconductance</td>
<td>49</td>
<td>——</td>
<td>——</td>
<td>S</td>
<td>V_DS = 15V, I_D = 50A</td>
</tr>
<tr>
<td>Q_g</td>
<td>Total Gate Charge</td>
<td>——</td>
<td>24</td>
<td>——</td>
<td>——</td>
<td>I_D = 24.8A</td>
</tr>
<tr>
<td>Q_gs</td>
<td>Gate-to-Source Charge</td>
<td>——</td>
<td>6.7</td>
<td>——</td>
<td>nC</td>
<td>V_DS = 15V</td>
</tr>
<tr>
<td>Q GD</td>
<td>Gate-to-Drain (&quot;Miller&quot;) Charge</td>
<td>——</td>
<td>5.8</td>
<td>——</td>
<td>——</td>
<td>V_DS = 4.5V</td>
</tr>
<tr>
<td>Qossed</td>
<td>Output Gate Charge</td>
<td>——</td>
<td>14</td>
<td>21</td>
<td>——</td>
<td>V_DS = 0V, I_D = 24.8A, V_DS = 15V</td>
</tr>
<tr>
<td>t_on</td>
<td>Turn-On Delay Time</td>
<td>——</td>
<td>7.2</td>
<td>——</td>
<td>ns</td>
<td>V_DD = 15V</td>
</tr>
<tr>
<td>t_r</td>
<td>Rise Time</td>
<td>——</td>
<td>50</td>
<td>——</td>
<td>——</td>
<td>I_D = 24.8A, R_G = 0.6Ω</td>
</tr>
<tr>
<td>t_off</td>
<td>Turn-Off Delay Time</td>
<td>——</td>
<td>17.6</td>
<td>——</td>
<td>——</td>
<td>V_DS = 15V</td>
</tr>
<tr>
<td>t_f</td>
<td>Fall Time</td>
<td>——</td>
<td>3.7</td>
<td>——</td>
<td>——</td>
<td>V_DS = 4.5V</td>
</tr>
<tr>
<td>Ciss</td>
<td>Input Capacitance</td>
<td>——</td>
<td>2417</td>
<td>——</td>
<td>——</td>
<td>V_DS = 0V</td>
</tr>
<tr>
<td>Coss</td>
<td>Output Capacitance</td>
<td>——</td>
<td>707</td>
<td>——</td>
<td>——</td>
<td>V_DS = 15V</td>
</tr>
<tr>
<td>Crss</td>
<td>Reverse Transfer Capacitance</td>
<td>——</td>
<td>52</td>
<td>——</td>
<td>pF</td>
<td>f = 1.0MHz</td>
</tr>
</tbody>
</table>

## Avalanche Characteristics

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Parameter</th>
<th>Typ.</th>
<th>Max.</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>EAS</td>
<td>Single Pulse Avalanche Energy</td>
<td>213</td>
<td>mJ</td>
<td></td>
</tr>
<tr>
<td>IAR</td>
<td>Avalanche Current</td>
<td>62</td>
<td>A</td>
<td></td>
</tr>
</tbody>
</table>

## Diode Characteristics

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Parameter</th>
<th>Min.</th>
<th>Typ.</th>
<th>Max.</th>
<th>Units</th>
<th>Conditions</th>
</tr>
</thead>
<tbody>
<tr>
<td>I_D</td>
<td>Continuous Source Current (Body Diode)</td>
<td>——</td>
<td>62</td>
<td>——</td>
<td>A</td>
<td>MOSFET symbol showing the integral reverse p-n junction diode.</td>
</tr>
<tr>
<td>I_SM</td>
<td>Pulsed Source Current (Body Diode)</td>
<td>——</td>
<td>248</td>
<td>——</td>
<td>——</td>
<td></td>
</tr>
<tr>
<td>V_SD</td>
<td>Diode Forward Voltage</td>
<td>——</td>
<td>0.88</td>
<td>1.3</td>
<td>V</td>
<td>T_J = 25°C, I_S = 31A, V_DS = 0V</td>
</tr>
<tr>
<td>I_F</td>
<td>Reverse Recovery Time</td>
<td>——</td>
<td>41</td>
<td>62</td>
<td>ns</td>
<td>T_J = 25°C, I_F = 31A, V_R = 20V</td>
</tr>
<tr>
<td>Q_FR</td>
<td>Reverse Recovery Charge</td>
<td>——</td>
<td>64</td>
<td>96</td>
<td>nC</td>
<td>dl/dt = 100A/µs</td>
</tr>
<tr>
<td>C_F</td>
<td>Reverse Recovery Time</td>
<td>——</td>
<td>43</td>
<td>65</td>
<td>ns</td>
<td>T_J = 125°C, I_F = 31A, V_R = 20V</td>
</tr>
<tr>
<td>Q_FR</td>
<td>Reverse Recovery Charge</td>
<td>——</td>
<td>70</td>
<td>105</td>
<td>nC</td>
<td>dl/dt = 100A/µs</td>
</tr>
</tbody>
</table>
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
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 12.** On-Resistance Vs. Drain Current

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

**Fig 14a&b.** Gate Charge Test Circuit and Waveform

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

**Fig 15c.** Maximum Avalanche Energy Vs. Drain Current
TO-220AB Package Outline
Dimensions are shown in millimeters (inches)

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

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

INTERNATIONAL RECTIFIER
LOGO

IRF1010
DR9246
9B 1M

PART NUMBER

DATE CODE (YYWW)
YY = YEAR
WW = WEEK

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D²Pak Package Outline
Dimensions are shown in millimeters (inches)

NOTES:
1 DIMENSIONS AFTER SOLDER DIP.
3 CONTROLLING DIMENSION: INCH.
4 HEATSINK & LEAD DIMENSIONS DO NOT INCLUDE BURRS.

D²Pak Part Marking Information

INTERNATIONAL RECTIFIER LOGO

ASSEMBLY LOT CODE

PART NUMBER

DATE CODE (YYWW)
YY = YEAR
WW = WEEK

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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"

INTERNATIONAL RECTIFIER
LOGO

PART NUMBER

DATE CODE
YEAR 7 = 1997
WEEK 19
LINE C
Notes:

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

IR WORLD HEADQUARTERS: 233 Kansas St., El Segundo, California 90245, USA Tel: (310) 252-7105
IR EUROPEAN REGIONAL CENTRE: 439/445 Godstone Rd, Whyteleafe, Surrey CR3 OBL, UK Tel: ++ 44 (0)20 8645 8000
IR CANADA: 15 Lincoln Court, Brampton, Ontario L6T3Z2, Tel: (905) 453 2200
IR GERMANY: Saalburgstrasse 157, 61350 Bad Homburg Tel: ++ 49 (0) 6172 96590
IR ITALY: Via Liguria 49, 10071 Borgaro, Torino Tel: ++ 39 011 451 0111
IR JAPAN: K&H Bldg., 2F, 30-4 Nishi-Ikebukuro 3-Chome, Toshima-Ku, Tokyo 171 Tel: 81 (0)3 3983 0086
IR SOUTHEAST ASIA: 1 Kim Seng Promenade, Great World City West Tower, 13-11, Singapore 237994 Tel: ++ 65 (0)383 4630
IR TAIWAN: 16 Fl. Suite D. 207, Sec. 2, Tun Haw South Road, Taipei, 10673 Tel: 886-(0)2 2377 9936

Data and specifications subject to change without notice. 8/00

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