**Description**

Fifth Generation HEXFETs from International Rectifier utilize advanced processing techniques to achieve extremely low on-resistance per silicon area. This benefit, combined with the fast switching speed and ruggedized device design that HEXFET Power MOSFETs are well known for, provides the designer with an extremely efficient and reliable device for use in a wide variety of applications.

The SO-8 has been modified through a customized leadframe for enhanced thermal characteristics and multiple-die capability making it ideal in a variety of power applications. With these improvements, multiple devices can be used in an application with dramatically reduced board space. The package is designed for vapor phase, infra red, or wave soldering techniques. Power dissipation of greater than 0.8W is possible in a typical PCB mount application.

**Absolute Maximum Ratings**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Max.</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>$I_D @ T_A = 25^\circ C$</td>
<td>-10</td>
<td>A</td>
</tr>
<tr>
<td>$I_D @ T_A = 70^\circ C$</td>
<td>-7.1</td>
<td>A</td>
</tr>
<tr>
<td>$I_{DM}$</td>
<td>-45</td>
<td></td>
</tr>
<tr>
<td>$P_D @ T_A = 25^\circ C$</td>
<td>2.5</td>
<td>W</td>
</tr>
<tr>
<td>$V_{GS}$</td>
<td>0.02</td>
<td>mW/°C</td>
</tr>
<tr>
<td>$E_{AS}$</td>
<td>370</td>
<td>mJ</td>
</tr>
<tr>
<td>$dV/dt$</td>
<td>-5.0</td>
<td>V/ns</td>
</tr>
<tr>
<td>$T_J, T_{STG}$</td>
<td>-55 to +150</td>
<td>°C</td>
</tr>
</tbody>
</table>

**thermal Resistance Ratings**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Typ.</th>
<th>Max.</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>$R_{\theta JA}$</td>
<td>—</td>
<td>50</td>
<td>°C/W</td>
</tr>
</tbody>
</table>
### Electrical Characteristics @ T_J = 25°C (unless otherwise specified)

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Min.</th>
<th>Typ.</th>
<th>Max.</th>
<th>Units</th>
<th>Conditions</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>V_{BRIDSS}</strong> Drain-to-Source Breakdown Voltage</td>
<td>-30</td>
<td>—</td>
<td>—</td>
<td>V</td>
<td>V_{GS} = 0V, I_D = -250µA</td>
</tr>
<tr>
<td>ΔV_{BRIDSS}/T_J Breakdown Voltage Temp. Coefficient</td>
<td>—</td>
<td>-0.024</td>
<td>—</td>
<td>V/°C</td>
<td>Reference to 25°C, I_D = -1mA</td>
</tr>
<tr>
<td>R_{DS(on)} Static Drain-to-Source On-Resistance</td>
<td>—</td>
<td>0.020</td>
<td>—</td>
<td>Ω</td>
<td>V_{GS} = -10V, I_D = -5.6A</td>
</tr>
<tr>
<td></td>
<td>—</td>
<td>0.035</td>
<td>—</td>
<td></td>
<td>V_{GS} = -4.5V, I_D = -2.8A</td>
</tr>
<tr>
<td>V_{GS(th)} Gate Threshold Voltage</td>
<td>-1.0</td>
<td>—</td>
<td>—</td>
<td>V</td>
<td>V_{DS} = V_{GS}, I_D = -250µA</td>
</tr>
<tr>
<td>g_f Forward Transconductance</td>
<td>5.6</td>
<td>—</td>
<td>—</td>
<td>S</td>
<td>V_{DS} = -10V, I_D = -2.8A</td>
</tr>
<tr>
<td>I_DSS Drain-to-Source Leakage Current</td>
<td>—</td>
<td>—</td>
<td>-1.0</td>
<td>µA</td>
<td>V_{DS} = -24V, V_{GS} = 0V</td>
</tr>
<tr>
<td></td>
<td>—</td>
<td>—</td>
<td>-25</td>
<td></td>
<td>V_{DS} = -24V, V_{GS} = 0V, T_J = 125°C</td>
</tr>
<tr>
<td>I_GSS Gate-to-Source Forward Leakage</td>
<td>—</td>
<td>—</td>
<td>-100</td>
<td>nA</td>
<td>V_{GS} = -20V</td>
</tr>
<tr>
<td></td>
<td>—</td>
<td>—</td>
<td>100</td>
<td></td>
<td>V_{GS} = 20V</td>
</tr>
<tr>
<td>Q_g Total Gate Charge</td>
<td>61</td>
<td>92</td>
<td>—</td>
<td>nC</td>
<td>I_D = -5.6A</td>
</tr>
<tr>
<td>Q_{gs} Gate-to-Source Charge</td>
<td>8.0</td>
<td>12</td>
<td>—</td>
<td></td>
<td>V_{DS} = -24V</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>I_D = -5.6A, R_G = 6.2Ω, V_{DD} = 15V, See Fig. 6 and 9</td>
</tr>
<tr>
<td>Q_{gd} Gate-to-Drain (&quot;Miller&quot;) Charge</td>
<td>22</td>
<td>32</td>
<td>—</td>
<td>nC</td>
<td>V_{GS} = -20V</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>V_{GS} = -10V, See Fig. 10</td>
</tr>
<tr>
<td>t_d(on) Turn-On Delay Time</td>
<td>18</td>
<td>—</td>
<td>—</td>
<td>ns</td>
<td>V_{DD} = -15V</td>
</tr>
<tr>
<td>t_r Rise Time</td>
<td>49</td>
<td>—</td>
<td>—</td>
<td></td>
<td>I_D = -5.6A</td>
</tr>
<tr>
<td>t_{d(off)} Turn-Off Delay Time</td>
<td>59</td>
<td>—</td>
<td>—</td>
<td></td>
<td>R_G = 6.2Ω, V_{DD} = 27Ω, See Fig. 10</td>
</tr>
<tr>
<td>t_f Fall Time</td>
<td>60</td>
<td>—</td>
<td>—</td>
<td></td>
<td>V_{GS} = 0V</td>
</tr>
<tr>
<td>C_{iss} Input Capacitance</td>
<td>1700</td>
<td>—</td>
<td>—</td>
<td>pF</td>
<td>V_{DS} = -25V</td>
</tr>
<tr>
<td>C_{oss} Output Capacitance</td>
<td>890</td>
<td>—</td>
<td>—</td>
<td></td>
<td>f = 1.0MHz, See Fig. 5</td>
</tr>
<tr>
<td>C_{rss} Reverse Transfer Capacitance</td>
<td>410</td>
<td>—</td>
<td>—</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Source-Drain Ratings and Characteristics

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Min.</th>
<th>Typ.</th>
<th>Max.</th>
<th>Units</th>
<th>Conditions</th>
</tr>
</thead>
<tbody>
<tr>
<td>I_S Continuous Source Current (Body Diode)</td>
<td>—</td>
<td>—</td>
<td>-3.1</td>
<td>A</td>
<td>MOSFET symbol showing the integral reverse p-n junction diode.</td>
</tr>
<tr>
<td>I_{SM} Pulsed Source Current (Body Diode)</td>
<td>—</td>
<td>—</td>
<td>-45</td>
<td></td>
<td></td>
</tr>
<tr>
<td>V_SD Diode Forward Voltage</td>
<td>—</td>
<td>—</td>
<td>-1.0</td>
<td>V</td>
<td>T_J = 25°C, I_S = -5.6A, V_{GS} = 0V</td>
</tr>
<tr>
<td>t_{rr} Reverse Recovery Time</td>
<td>56</td>
<td>85</td>
<td>—</td>
<td>ns</td>
<td>T_J = 25°C, I_F = -5.6A</td>
</tr>
<tr>
<td>Q_{rr} Reverse RecoveryCharge</td>
<td>99</td>
<td>150</td>
<td>—</td>
<td>nC</td>
<td>di/dt = 100A/µs</td>
</tr>
</tbody>
</table>

### Notes:

1. Repetitive rating: pulse width limited by max. junction temperature. (See fig. 11)
2. Starting T_J = 25°C, L = 25mH, R_G = 25Ω, I_A = -5.6A. (See Figure 12)
3. I_{SD} ≤ -5.6A, di/dt ≤ 100A/µs, V_{DD} ≤ V_{BRIDSS}, T_J ≤ 150°C
4. Pulse width ≤ 300µs; duty cycle ≤ 2%.
5. Surface mounted on FR-4 board, t ≤ 10sec.
**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 9a. Basic Gate Charge Waveform

Fig 10a. Switching Time Test Circuit

Fig 9b. Gate Charge Test Circuit

Fig 10b. Switching Time Waveforms

Fig 11. Maximum Effective Transient Thermal Impedance, Junction-to-Ambient
Fig 12a. Unclamped Inductive Test Circuit

Fig 12b. Unclamped Inductive Waveforms

Fig 12c. Maximum Avalanche Energy Vs. Drain Current
Peak Diode Recovery $dv/dt$ Test Circuit

Circuit Layout Considerations
- Low Stray Inductance
- Ground Plane
- Low Leakage Inductance

Current Transformer

* Reverse Polarity for P-Channel
** Use P-Channel Driver for P-Channel Measurements

1. Driver Gate Drive
   - Period
   - $D = \frac{P.W.}{\text{Period}}$
   - $V_{\text{GS}} = 10V$

2. D.U.T. $I_{SD}$ Waveform
   - Reverse Recovery Current
   - Body Diode Forward Current
   - Diode Recovery $dv/dt$

3. D.U.T. $V_{DS}$ Waveform
   - Re-Applied Voltage
   - Body Diode Forward Drop
   - Diode Recovery $dv/dt$

4. Inductor Current
   - Ripple $\leq 5\%$
   - $I_{SD}$

*** $V_{\text{GS}} = 5.0V$ for Logic Level and 3V Drive Devices

Fig 13. For P-Channel HEXFETS
IRF7416

Package Outline
SO8 Outline

NOTES:
2. CONTROLLING DIMENSION: INCH.
3. DIMENSIONS ARE SHOWN IN MILLIMETERS (INCHES).
4. OUTLINE CONFORMS TO JEDEC OUTLINE MS-012AA.
5. DIMENSION DOES NOT INCLUDE MOLD PROTRUSIONS.
   MOLD PROTRUSIONS NOT TO EXCEED 0.25 (.006).
6. DIMENSIONS IS THE LENGTH OF LEAD FOR SOLDERING TO A SUBSTRATE.

Part Marking Information
SO8

EXAMPLE: THIS IS AN IRF7101

DATE CODE (YWW)
Y = LAST DIGIT OF THE YEAR
WW = WEEK

INTERNATIONAL
RECTIFIER
LOGO

PART NUMBER

WAFER
LOT CODE
(LAST 4 DIGITS)

BOTTOM

XXX

0.72 (.028)
8X

6.46 (.255)
8X

1.78 (.070)
8X

1.27 (.050)
3X

0° 8° 0° 8°
Tape & Reel Information
SO8
Dimensions are shown in millimeters (inches)

NOTES:
1. CONTROLLING DIMENSION: MILLIMETER.
2. ALL DIMENSIONS ARE SHOWN IN MILLIMETERS (INCHES).
3. OUTLINE CONFORMS TO EIA-481 & EIA-541.

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IR CANADA: 7321 Victoria Park Ave., Suite 201, Markham, Ontario L3R 2Z8, Tel: (905) 475 1897
IR GERMANY: Saalburgrasstrasse 157, 61350 Bad Homburg Tel: ++ 49 6172 96590
IR ITALY: Via Liguria 49, 10071 Borgaro, Torino Tel: ++ 39 11 451 0111
IR FAR EAST: K&H Bldg., 2F, 30-4 Nishi-Ikebukuro 3-Chome, Toshima-Ku, Tokyo Japan 171 Tel: 81 3 3983 0086
IR SOUTHEAST ASIA: 315 Outram Road, #10-02 Tan Boon Liat Building, Singapore 0316 Tel: 65 221 8371
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