Generation V Technology
- Ultra Low On-Resistance
- N-Channel MOSFET
- SOT-23 Footprint
- Low Profile (<1.1mm)
- Available in Tape and Reel
- Fast Switching

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.

A customized leadframe has been incorporated into the standard SOT-23 package to produce a HEXFET Power MOSFET with the industry’s smallest footprint. This package, dubbed the Micro3, is ideal for applications where printed circuit board space is at a premium. The low profile (<1.1mm) of the Micro3 allows it to fit easily into extremely thin application environments such as portable electronics and PCMCIA cards.

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°C</td>
<td>Continuous Drain Current, V_GS @ 4.5V</td>
<td>1.2</td>
</tr>
<tr>
<td>I_D @ T_A = 70°C</td>
<td>Continuous Drain Current, V_GS @ 4.5V</td>
<td>0.96</td>
</tr>
<tr>
<td>I_DM</td>
<td>Pulsed Drain Current</td>
<td>7.4</td>
</tr>
<tr>
<td>P_D @ T_A = 25°C</td>
<td>Power Dissipation</td>
<td>540</td>
</tr>
<tr>
<td></td>
<td>Linear Derating Factor</td>
<td>4.3</td>
</tr>
<tr>
<td>V_GS</td>
<td>Gate-to-Source Voltage</td>
<td>±12</td>
</tr>
<tr>
<td>dv/dt</td>
<td>Peak Diode Recovery dv/dt</td>
<td>5.0</td>
</tr>
<tr>
<td>T_J, T_STG</td>
<td>Junction and Storage Temperature Range</td>
<td>-55 to +150</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_JA</td>
<td>Maximum Junction-to-Ambient</td>
<td>230</td>
<td>°C/W</td>
</tr>
</tbody>
</table>

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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>V_{BRDSS}</td>
<td></td>
<td></td>
<td></td>
<td>V</td>
<td>V_{GS} = 0V, I_D = 250μA</td>
</tr>
<tr>
<td>\Delta V_{BRDSS}/\Delta T_J</td>
<td></td>
<td></td>
<td></td>
<td>V/°C</td>
<td>Reference to 25°C, I_D = 1mA</td>
</tr>
<tr>
<td>R_{DS(on)}</td>
<td></td>
<td>0.25</td>
<td></td>
<td>Ω</td>
<td>V_{GS} = 4.5V, I_D = 0.93A ⊗</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.35</td>
<td></td>
<td>Ω</td>
<td>V_{GS} = 2.7V, I_D = 0.47A ⊗</td>
</tr>
<tr>
<td>V_{GS(th)}</td>
<td>0.70</td>
<td></td>
<td></td>
<td>V</td>
<td>V_{GS} = V_{GSS}, I_D = 250μA</td>
</tr>
<tr>
<td>g_s</td>
<td>1.3</td>
<td></td>
<td></td>
<td>S</td>
<td>V_{DS} = 10V, I_D = 0.47A</td>
</tr>
<tr>
<td>I_{DSS}</td>
<td></td>
<td>1.0</td>
<td></td>
<td>μA</td>
<td>V_{DS} = 16V, V_{GS} = 0V</td>
</tr>
<tr>
<td>I_{GSS}</td>
<td></td>
<td></td>
<td>-100</td>
<td>nA</td>
<td>V_{DS} = 16V, V_{GS} = 0V, T_J = 125°C</td>
</tr>
<tr>
<td>G_{SRS}</td>
<td></td>
<td></td>
<td></td>
<td>Ω</td>
<td></td>
</tr>
<tr>
<td>Q_p</td>
<td>2.6</td>
<td>3.9</td>
<td></td>
<td>nC</td>
<td>I_D = 0.93A</td>
</tr>
<tr>
<td>Q_{ps}</td>
<td>0.41</td>
<td>0.62</td>
<td></td>
<td>nC</td>
<td>V_{DS} = 16V</td>
</tr>
<tr>
<td>Q_{pd}</td>
<td>1.1</td>
<td>1.7</td>
<td></td>
<td>nC</td>
<td>V_{GS} = 4.5V, See Fig. 6 and 9 ⊗</td>
</tr>
<tr>
<td>t_{on}</td>
<td>2.5</td>
<td></td>
<td></td>
<td>ns</td>
<td>V_{DD} = 10V</td>
</tr>
<tr>
<td>t_r</td>
<td>9.5</td>
<td></td>
<td></td>
<td>ns</td>
<td>I_D = 0.93A</td>
</tr>
<tr>
<td>t_{off}</td>
<td>9.7</td>
<td></td>
<td></td>
<td>ns</td>
<td>R_D = 6.2Ω</td>
</tr>
<tr>
<td>t_f</td>
<td>4.8</td>
<td></td>
<td></td>
<td>ns</td>
<td>R_D = 11Ω, See Fig. 10 ⊗</td>
</tr>
<tr>
<td>C_{gs}</td>
<td>110</td>
<td></td>
<td></td>
<td>pF</td>
<td>V_{GS} = 0V</td>
</tr>
<tr>
<td>C_{rss}</td>
<td>51</td>
<td></td>
<td></td>
<td>pF</td>
<td>V_{DS} = 15V</td>
</tr>
<tr>
<td>C_{rs}</td>
<td>25</td>
<td></td>
<td></td>
<td>pF</td>
<td>f = 1.0MHz, See Fig. 5</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</td>
<td></td>
<td>0.54</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></td>
<td>7.4</td>
<td></td>
<td>A</td>
<td></td>
</tr>
<tr>
<td>V_{SD}</td>
<td></td>
<td>1.2</td>
<td></td>
<td>V</td>
<td>T_J = 25°C, I_S = 0.93A, V_{GS} = 0V ⊗</td>
</tr>
<tr>
<td>t_{rr}</td>
<td></td>
<td>25</td>
<td>38</td>
<td>ns</td>
<td>T_J = 25°C, I_R = 0.93A</td>
</tr>
<tr>
<td>Q_{rr}</td>
<td></td>
<td>16</td>
<td>24</td>
<td>nC</td>
<td>dt/dt = 100A/μs ⊗</td>
</tr>
</tbody>
</table>

Notes:

1. Repetitive rating: pulse width limited by max. junction temperature. (See fig. 11)
2. Pulse width ≤ 300μs; duty cycle ≤ 2%.
3. I_{BRDSS} ≤ 0.93A, dt/dt ≤ 90A/μs, V_{DD} ≤ V_{BRDSS}, T_J ≤ 150°C
4. Surface mounted on FR-4 board, t ≤ 5sec.
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

\[ V_{GS} = 0V, \quad f = 1\text{MHz} \]
\[ C_{iss} = C_{gs} + C_{gd}, \quad C_{ds} \text{ SHORTED} \]
\[ C_{rss} = C_{gd} \]
\[ C_{os} = C_{ds} + C_{gd} \]

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

\[ I_D = 0.93A, \quad V_{DS} = 16V \]

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

\[ T_J = 150°C \]
\[ T_J = 25°C \]
\[ V_{GS} = 0V \]

**Fig 8.** Maximum Safe Operating Area

\[ T_A = 25°C \]
\[ T_J = 150°C \]
Single Pulse

\[ 100\mu s \]
\[ 10\text{ms} \]

\[ 0.1 \]
\[ 1 \]
\[ 10 \]
\[ 100 \]

\[ 0.01 \]
\[ 0.1 \]
\[ 1 \]
\[ 10 \]

\[ 0.01 \]
\[ 0.1 \]
\[ 1 \]
\[ 10 \]

\[ 0.01 \]
\[ 0.1 \]
\[ 1 \]
\[ 10 \]

\[ 0.01 \]
\[ 0.1 \]
\[ 1 \]
\[ 10 \]

\[ 0.01 \]
\[ 0.1 \]
\[ 1 \]
\[ 10 \]

\[ 0.01 \]
\[ 0.1 \]
\[ 1 \]
\[ 10 \]

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**Fig 9a.** Basic Gate Charge Waveform

**Fig 9b.** Gate Charge Test Circuit

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

**Fig 10b.** Switching Time Waveforms

**Fig 11.** Maximum Effective Transient Thermal Impedance, Junction-to-Ambient
Fig 12. For N-Channel HEXFETS
Micro3 (SOT-23) (Lead-Free) Package Outline
Dimensions are shown in millimeters (inches)

Micro3 / SOT-23 Package Marking

PART NUMBER
Y = YEAR
W = WEEK
H = HALOGEN FREE INDICATOR
Lot Code

PART NUMBER CODE REFERENCE:
A = IRLML2402
B = IRLML2803
C = IRLML2402
D = IRLML5103
E = IRLML6402
F = IRLML6401
G = IRLML2502
H = IRLML6203

Recommended Footprint

Recommended Footprint

Recommended Footprint

Micro3 (SOT-23 / TO-236AB) Part Marking Information

Part Marking Information

PART NUMBER

W = (1-26) IF PRECEDED BY LAST DIGIT OF CALENDAR YEAR

YEAR Wk Week W
2001 1 A
2002 2 B
2003 3 C
2004 4 D
2005 5
2006 6
2007 7
2008 8
2009 9
2010 0 Y

W = (A-Z) IF PRECEDED BY LETTER

YEAR Wk Week W
2001 A
2002 B
2003 C
2004 D
2005 E
2006 F
2007 G
2008 H
2009 J
2010 K

Note: For the most current drawing please refer to IR website at http://www.irf.com/package
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Micro3™ Tape & Reel Information
Dimensions are shown in millimeters (inches)

Notes:
1. CONTROLLING DIMENSION: MILLIMETER.
2. OUTLINE CONFORMS TO EIA-481 & EIA-541.

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

Data and specifications subject to change without notice.

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