• Advanced Process Technology
• Dynamic dv/dt Rating
• 175°C Operating Temperature
• Fast Switching
• Fully Avalanche Rated
• Lead-Free

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 TO-247 package is preferred for commercial-industrial applications where higher power levels preclude the use of TO-220 devices. The TO-247 is similar but superior to the earlier TO-218 package because of its isolated mounting hole.

Absolute Maximum Ratings

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Max.</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>(I_D ) @ (T_C = 25^\circ C)</td>
<td>42</td>
<td>A</td>
</tr>
<tr>
<td>(I_D ) @ (T_C = 100^\circ C)</td>
<td>30</td>
<td>A</td>
</tr>
<tr>
<td>(I_{DM})</td>
<td>140</td>
<td>A</td>
</tr>
<tr>
<td>(P_D ) @ (T_C = 25^\circ C)</td>
<td>160</td>
<td>W</td>
</tr>
<tr>
<td>(V_{GS})</td>
<td>1.1</td>
<td>W/°C</td>
</tr>
<tr>
<td>(E_{AS})</td>
<td>420</td>
<td>mJ</td>
</tr>
<tr>
<td>(I_{AR})</td>
<td>22</td>
<td>A</td>
</tr>
<tr>
<td>(E_{AR})</td>
<td>16</td>
<td>mJ</td>
</tr>
<tr>
<td>(dv/dt)</td>
<td>5.0</td>
<td>V/ns</td>
</tr>
<tr>
<td>(T_J)</td>
<td>-55 to +175</td>
<td>°C</td>
</tr>
<tr>
<td>(T_{STG})</td>
<td>300 (1.8mm from case)</td>
<td></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_{JIC})</td>
<td>—</td>
<td>0.95</td>
<td>°C/W</td>
</tr>
<tr>
<td>(R_{JCS})</td>
<td>—</td>
<td>0.24</td>
<td>—</td>
</tr>
<tr>
<td>(R_{JAI})</td>
<td>—</td>
<td>40</td>
<td>—</td>
</tr>
</tbody>
</table>
## Electrical Characteristics @ $T_J = 25^\circ C$ (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>
</table>
| $V_{BRDSS}$ | 100 | | | V | $V_{GS} = 0V$, $I_D = 250\mu A$
| $\Delta V_{BRDSS}/\Delta T_J$ | 0.11 | | | V/$^\circ C$ | Reference to $25^\circ C$, $I_D = 1mA$
| $R_{DS(on)}$ | | | 0.036 | $\Omega$ | $V_{GS} = 10V$, $I_D = 23A$
| $V_{GS(th)}$ | 2.0 | | 4.0 | V | $V_{GS(th)} = 25V$, $I_D = 250\mu A$
| $I_{FS}$ | 14 | | | S | $V_{GS} = 25V$, $I_D = 22A$
| $I_{DSS}$ | | | 25 | $\mu A$ | $V_{DS} = 100V$, $V_{GS} = 0V$
| $I_{GD}$ | | | | | $V_{DS} = 80V$, $V_{GS} = 0V$, $T_J = 150^\circ C$
| $Q_{g}$ | | | 100 | nA | $V_{DS} = 20V$
| $Q_{p}$ | | | | | $V_{DS} = 20V$
| $Q_{gd}$ | | | 11 | ns | $V_{DD} = 50V$
| $Q_{df}$ | | | 15 | | $I_D = 22A$
| $t_{ON}$ | | | 58 | | $V_{GS} = 10V$, See Fig. 6 and 13
| $t_{R}$ | | | 56 | | $R_D = 3.6\Omega$, See Fig. 10
| $t_{f}$ | | | 45 | | $R_D = 2.9\Omega$, See Fig. 10
| $L_D$ | | | 40 | | Between lead, 6mm (0.25in.),
| $C_{iss}$ | | | 5.0 | nH | from package and center of die contact
| $I_{iss}$ | | | 13 | |
| $C_{oss}$ | | | 1900 | pF | $V_{GS} = 0V$
| $C_{oss}$ | | | 450 | | $V_{DS} = 25V$
| $C_{tss}$ | | | | | $f = 1.0MHz$, See Fig. 5
| $C_{tss}$ | | | 230 | | |

## 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></td>
<td>42</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></td>
<td>140</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
| $V_{DS}$ | | | 1.3 | V | $T_J = 25^\circ C$, $I_S = 23A$, $V_{GS} = 0V$
| $V_{FR}$ | | | 180 | ns | $T_J = 25^\circ C$, $I_F = 22A$
| $Q_{FR}$ | | | 1.2 | $\mu C$ | $dI/dt = 100A/\mu s$
| $R_{ON}$ | | | 1.8 | | |

### Notes:

1. Repetitive rating: pulse width limited by max. junction temperature. (See fig. 11)
2. Starting $T_J = 25^\circ C$, $L = 1.7mH$, $R_D = 22A$, (See Figure 12)
3. $I_{DS} = 22A$, $dI/dt = 180A/\mu s$, $V_{DD} = V_{BRDSS}$, $T_J = 175^\circ C$

4. Pulse width $\leq 300\mu s$; duty cycle $\leq 2%$.
5. Uses IRF1510 data and test conditions.
**Fig 1.** Typical Output Characteristics

**Fig 2.** Typical Output Characteristics

**Fig 3.** Typical Transfer Characteristics

**Fig 4.** Normalized On-Resistance Vs. Temperature
IRFP150NPbF

**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 12a. Unclamped Inductive Test Circuit

Fig 12b. Unclamped Inductive Waveforms

Fig 12c. Maximum Avalanche Energy Vs. Drain Current

Fig 13a. Basic Gate Charge Waveform

Fig 13b. Gate Charge Test Circuit
Peak Diode Recovery dv/dt Test Circuit

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

- dv/dt controlled by R3
- Driver same type as D.U.T.
- ISD controlled by Duty Factor *D*
- D.U.T. - Device Under Test

Driver Gate Drive

D.U.T. ISD Waveform

Reverse Recovery Current

D.U.T. VDS Waveform

Diode Recovery dv/dt

Re-Applied Voltage

Inductor Current

* VGs = 5V for Logic Level Devices

Fig 14. For N-Channel HEXFETS
TO-247AC Package Outline
Dimensions are shown in millimeters (inches)

TO-247AC Part Marking Information

EXAMPLE: THIS IS AN IRFE30 WITH ASSEMBLY LOT CODE 5507 ASSEMBLED ON WW 35, 2000 IN THE ASSEMBLY LINE "H"

Note: "P" in assembly line position indicates "Lead-Free"

Data and specifications subject to change without notice.
Note: For the most current drawings please refer to the IR website at:
http://www.irf.com/package/