HEXFET® Power MOSFET

- Dynamic dv/dt Rating
- Repetitive Avalanche Rated
- Fast Switching
- Ease of Paralleling
- Simple Drive Requirements

Description

Third Generation HEXFETs from International Rectifier provide the designer with the best combination of fast switching, ruggedized device design, low on-resistance and cost-effectiveness.

The TO-220 package is universally preferred for all commercial-industrial applications at power dissipation levels to approximately 50 watts. The low thermal resistance and low package cost of the TO-220 contribute to its wide acceptance throughout the industry.

Absolute Maximum Ratings

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Max.</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>$I_D$ @ $T_C = 25^\circ$</td>
<td>Continuous Drain Current, $V_{GS} @ 10$ V</td>
<td>4.1</td>
</tr>
<tr>
<td>$I_D$ @ $T_C = 100^\circ$</td>
<td>Continuous Drain Current, $V_{GS} @ 10$ V</td>
<td>2.6</td>
</tr>
<tr>
<td>$I_{DM}$</td>
<td>Pulsed Drain Current</td>
<td>16</td>
</tr>
<tr>
<td>$P_D$ @ $T_C = 25^\circ$</td>
<td>Power Dissipation</td>
<td>125</td>
</tr>
<tr>
<td>Linear Derating Factor</td>
<td>1.0</td>
<td>W/°C</td>
</tr>
<tr>
<td>$V_{GS}$</td>
<td>Gate-to-Source Voltage</td>
<td>±20</td>
</tr>
<tr>
<td>$E_{AS}$</td>
<td>Single Pulse Avalanche Energy</td>
<td>260</td>
</tr>
<tr>
<td>$I_{AR}$</td>
<td>Avalanche Current</td>
<td>4.1</td>
</tr>
<tr>
<td>$E_{AR}$</td>
<td>Repetitive Avalanche Energy</td>
<td>13</td>
</tr>
<tr>
<td>$dv/dt$</td>
<td>Peak Diode Recovery dv/dt</td>
<td>2.0</td>
</tr>
<tr>
<td>$T_J$</td>
<td>Operating Junction and Storage Temperature Range</td>
<td>-55 to +150</td>
</tr>
<tr>
<td>$T_{STG}$</td>
<td>Soldering Temperature, for 10 seconds</td>
<td>300 (1.6mm from case)</td>
</tr>
<tr>
<td>Mounting Torque, 6-32 or M3 screw</td>
<td>10 lb•in (1.1 N•m)</td>
<td></td>
</tr>
</tbody>
</table>

Thermal Resistance

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Min.</th>
<th>Typ.</th>
<th>Max.</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>$R_{JJC}$</td>
<td>Junction-to-Case</td>
<td>—</td>
<td>—</td>
<td>1.0</td>
</tr>
<tr>
<td>$R_{JCS}$</td>
<td>Case-to-Sink, Flat, Greased Surface</td>
<td>—</td>
<td>0.50</td>
<td>—</td>
</tr>
<tr>
<td>$R_{JJA}$</td>
<td>Junction-to-Ambient</td>
<td>—</td>
<td>—</td>
<td>62</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>Test Conditions</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>V_{DSS}</strong></td>
<td>800</td>
<td>—</td>
<td>—</td>
<td>V</td>
<td>V_{GS}=0V, I_D=250μA</td>
</tr>
<tr>
<td><strong>ΔV_{DSS}/ΔT_J</strong></td>
<td>0.90</td>
<td>—</td>
<td>—</td>
<td>V/°C</td>
<td>Reference to 25°C, I_D=1mA</td>
</tr>
<tr>
<td><strong>R_{DS(on)}</strong></td>
<td>3.0</td>
<td>—</td>
<td>—</td>
<td>Ω</td>
<td>V_{GS}=10V, I_D=2.5A</td>
</tr>
<tr>
<td><strong>V_{GS(th)}</strong></td>
<td>2.0</td>
<td>—</td>
<td>4.0</td>
<td>V</td>
<td>V_{GS}=V_{GS}, I_D=250μA</td>
</tr>
<tr>
<td><strong>g_m</strong></td>
<td>2.5</td>
<td>—</td>
<td>—</td>
<td>S</td>
<td>V_{DS}=100V, I_D=2.5A</td>
</tr>
<tr>
<td><strong>I_{DSS}</strong></td>
<td>—</td>
<td>—</td>
<td>100</td>
<td>μA</td>
<td>V_{GS}=800V</td>
</tr>
<tr>
<td><strong>I_{GSS}</strong></td>
<td>—</td>
<td>—</td>
<td>100</td>
<td>nA</td>
<td>V_{GS}=20V</td>
</tr>
<tr>
<td><strong>Q_g</strong></td>
<td>—</td>
<td>—</td>
<td>78</td>
<td>nC</td>
<td>I_D=4.1A</td>
</tr>
<tr>
<td><strong>Q_{gs}</strong></td>
<td>—</td>
<td>—</td>
<td>9.6</td>
<td>nC</td>
<td>V_{DS}=400V</td>
</tr>
<tr>
<td><strong>Q_{od}</strong></td>
<td>—</td>
<td>—</td>
<td>45</td>
<td>nC</td>
<td>V_{DD}=10V See Fig. 6 and 13</td>
</tr>
<tr>
<td><strong>t_{on}</strong></td>
<td>12</td>
<td>—</td>
<td>—</td>
<td>ns</td>
<td>V_{DD}=400V</td>
</tr>
<tr>
<td><strong>t_r</strong></td>
<td>33</td>
<td>—</td>
<td>—</td>
<td>ns</td>
<td>I_D=4.1A</td>
</tr>
<tr>
<td><strong>t_{off}</strong></td>
<td>82</td>
<td>—</td>
<td>—</td>
<td>ns</td>
<td>R_D=12Ω</td>
</tr>
<tr>
<td><strong>t_i</strong></td>
<td>30</td>
<td>—</td>
<td>—</td>
<td>ns</td>
<td>R_D=95Ω See Figure 10</td>
</tr>
<tr>
<td><strong>L_D</strong></td>
<td>—</td>
<td>—</td>
<td>4.5</td>
<td>nH</td>
<td>Between lead, 6 mm (.25in.) from package and center of die contact</td>
</tr>
<tr>
<td><strong>L_S</strong></td>
<td>—</td>
<td>—</td>
<td>7.5</td>
<td>nH</td>
<td></td>
</tr>
<tr>
<td><strong>C_{iss}</strong></td>
<td>—</td>
<td>—</td>
<td>1300</td>
<td>pF</td>
<td>V_{DS}=0V</td>
</tr>
<tr>
<td><strong>C_{oss}</strong></td>
<td>—</td>
<td>—</td>
<td>310</td>
<td>pF</td>
<td>V_{DS}=25V</td>
</tr>
<tr>
<td><strong>C_{rss}</strong></td>
<td>—</td>
<td>—</td>
<td>190</td>
<td>pF</td>
<td>f=1.0MHz See Figure 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>Test Conditions</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>I_S</strong></td>
<td>—</td>
<td>—</td>
<td>4.1</td>
<td>A</td>
<td>MOSFET symbol showing the integral reverse p-n junction diode.</td>
</tr>
<tr>
<td><strong>I_{SM}</strong></td>
<td>—</td>
<td>—</td>
<td>16</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>V_{DSD}</strong></td>
<td>—</td>
<td>—</td>
<td>1.8</td>
<td>V</td>
<td>T_J=25°C, I_S=4.1A, V_{GS}=0V</td>
</tr>
<tr>
<td><strong>t_{rr}</strong></td>
<td>—</td>
<td>480</td>
<td>720</td>
<td>ns</td>
<td>T_J=25°C, I_F=4.1A</td>
</tr>
<tr>
<td><strong>Q_{rr}</strong></td>
<td>—</td>
<td>1.8</td>
<td>2.7</td>
<td>μC</td>
<td>d/dt=100A/μs</td>
</tr>
<tr>
<td><strong>t_{on}</strong></td>
<td>—</td>
<td>—</td>
<td>—</td>
<td></td>
<td>Intrinsic turn-on time is negligible (turn-on is dominated by L_S+L_D)</td>
</tr>
</tbody>
</table>

**Notes:**

1. Repetitive rating; pulse width limited by max. junction temperature (See Figure 11)
2. V_{DD}=50V, starting T_J=25°C, L=29mH R_G=25Ω, I_{AS}=4.1A (See Figure 12)
3. I_{SD}≤4.1A, d/dt≤100A/μs, V_{DD}≤600, T_J≤150°C
4. Pulse width ≤ 300 μs; duty cycle ≤ 2%.
**Fig 1.** Typical Output Characteristics, $T_C=25^\circ C$

**Fig 2.** Typical Output Characteristics, $T_C=150^\circ C$

**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 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
Appendix A: Figure 14, Peak Diode Recovery dv/dt Test Circuit – See page 1505
Appendix B: Package Outline Mechanical Drawing – See page 1509
Appendix C: Part Marking Information – See page 1516
Appendix E: Optional Leadforms – See page 1525