P-Channel Enhancement Mode Power MOSFET

**Description**
The HM4453A uses advanced trench technology to provide excellent $R_{DS(ON)}$, low gate charge and operation with gate voltages as low as 2.5V. This device is suitable for use as a load switch or in PWM applications.

**General Features**
- $V_{DS} = -20\text{V}, I_D = -21\text{A}$
- $R_{DS(ON)} < 7\text{m} \Omega @ V_{GS}=-4.5\text{V}$
- $R_{DS(ON)} < 9\text{m} \Omega @ V_{GS}=-2.5\text{V}$
- High power and current handling capability
- Lead free product is acquired
- Surface Mount Package

**Application**
- Motor drive
- Load switch
- Power management

**Package Marking And Ordering Information**

<table>
<thead>
<tr>
<th>Device Marking</th>
<th>Device</th>
<th>Device Package</th>
<th>Reel Size</th>
<th>Tape width</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>HM4453A</td>
<td>HM4453A</td>
<td>SOP-8</td>
<td>Ø330mm</td>
<td>12mm</td>
<td>2500 units</td>
</tr>
</tbody>
</table>

**Absolute Maximum Ratings (T_{A}=25\text{℃}unless otherwise noted)**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Symbol</th>
<th>Limit</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Drain-Source Voltage</td>
<td>$V_{DS}$</td>
<td>-20</td>
<td>V</td>
</tr>
<tr>
<td>Gate-Source Voltage</td>
<td>$V_{GS}$</td>
<td>±12</td>
<td>V</td>
</tr>
<tr>
<td>Drain Current-Continuous</td>
<td>$I_D$</td>
<td>-21</td>
<td>A</td>
</tr>
<tr>
<td>Drain Current-Pulsed (Note 1)</td>
<td>$I_{DM}$</td>
<td>-40</td>
<td>A</td>
</tr>
<tr>
<td>Maximum Power Dissipation</td>
<td>$P_D$</td>
<td>3.1</td>
<td>W</td>
</tr>
<tr>
<td>Operating Junction and Storage Temperature Range</td>
<td>$T_J, T_{STG}$</td>
<td>-55 To 150</td>
<td>℃</td>
</tr>
</tbody>
</table>

**Thermal Characteristic**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Symbol</th>
<th>Limit</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thermal Resistance,Junction-to-Ambient (Note 2)</td>
<td>$R_{θJA}$</td>
<td>42</td>
<td>℃/W</td>
</tr>
</tbody>
</table>

**Electrical Characteristics (T_{A}=25\text{℃}unless otherwise noted)**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Symbol</th>
<th>Condition</th>
<th>Min</th>
<th>Typ</th>
<th>Max</th>
<th>Unit</th>
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</thead>
<tbody>
<tr>
<td>Off Characteristics</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Drain-Source Breakdown Voltage</td>
<td>$BV_{DSS}$</td>
<td>$V_{GS}=0\text{V}, I_D=-250\mu\text{A}$</td>
<td>-20</td>
<td>-</td>
<td>-</td>
<td>V</td>
</tr>
<tr>
<td>Characteristic</td>
<td>Symbol</td>
<td>Condition</td>
<td>Value 1</td>
<td>Value 2</td>
<td>Value 3</td>
<td>Unit</td>
</tr>
<tr>
<td>---------------------------------------------------</td>
<td>--------</td>
<td>----------------------------------</td>
<td>---------</td>
<td>---------</td>
<td>---------</td>
<td>-------</td>
</tr>
<tr>
<td>Zero Gate Voltage Drain Current</td>
<td>IDSS</td>
<td>V_{DS}=-20V, V_{GS}=0V</td>
<td>-</td>
<td>-</td>
<td>-1</td>
<td>μA</td>
</tr>
<tr>
<td>Gate-Body Leakage Current</td>
<td>IDSS</td>
<td>V_{GS}=±12V, V_{DS}=0V</td>
<td>-</td>
<td>-</td>
<td>±100</td>
<td>nA</td>
</tr>
<tr>
<td><strong>On Characteristics</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gate Threshold Voltage</td>
<td>V_{GS(th)}</td>
<td>V_{DS}=V_{GS}, I_D=-250μA</td>
<td>-0.4</td>
<td>-0.6</td>
<td>-1</td>
<td>V</td>
</tr>
<tr>
<td>Drain-Source On-State Resistance</td>
<td>R_{DS(ON)}</td>
<td>V_{GS}=-4.5V, I_D=-6A</td>
<td>-</td>
<td>5.8</td>
<td>7</td>
<td>mΩ</td>
</tr>
<tr>
<td></td>
<td></td>
<td>V_{GS}=-2.5V, I_D=-5A</td>
<td></td>
<td>7.2</td>
<td>9</td>
<td>mΩ</td>
</tr>
<tr>
<td>Forward Transconductance</td>
<td>g_{FS}</td>
<td>V_{DS}=-15V, I_D=-6A</td>
<td>-</td>
<td>17</td>
<td>-</td>
<td>S</td>
</tr>
<tr>
<td><strong>Dynamic Characteristics</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Input Capacitance</td>
<td>C_{iss}</td>
<td>V_{DS}=-10V, V_{GS}=0V, F=1.0MHz</td>
<td>-</td>
<td>2100</td>
<td>-</td>
<td>PF</td>
</tr>
<tr>
<td>Output Capacitance</td>
<td>C_{oss}</td>
<td></td>
<td>-</td>
<td>498</td>
<td>-</td>
<td>PF</td>
</tr>
<tr>
<td>Reverse Transfer Capacitance</td>
<td>C_{rss}</td>
<td></td>
<td>-</td>
<td>300</td>
<td>-</td>
<td>PF</td>
</tr>
<tr>
<td><strong>Switching Characteristics</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Turn-on Delay Time</td>
<td>t_{(on)}</td>
<td>V_{DD}=-10V, R_{L}=10Ω, V_{GS}=-4.5V, R_{GEN}=6Ω</td>
<td>-</td>
<td>25</td>
<td>-</td>
<td>nS</td>
</tr>
<tr>
<td>Turn-on Rise Time</td>
<td>τ_{r}</td>
<td></td>
<td>-</td>
<td>30</td>
<td>-</td>
<td>nS</td>
</tr>
<tr>
<td>Turn-Off Delay Time</td>
<td>t_{(off)}</td>
<td></td>
<td>-</td>
<td>70</td>
<td>-</td>
<td>nS</td>
</tr>
<tr>
<td>Turn-Off Fall Time</td>
<td>τ_{f}</td>
<td></td>
<td>-</td>
<td>50</td>
<td>-</td>
<td>nS</td>
</tr>
<tr>
<td>Total Gate Charge</td>
<td>Q_{g}</td>
<td>V_{DS}=-10V, I_D=-6A, V_{GS}=-4.5V</td>
<td>-</td>
<td>17</td>
<td>-</td>
<td>nC</td>
</tr>
<tr>
<td>Gate-Source Charge</td>
<td>Q_{gs}</td>
<td></td>
<td>-</td>
<td>4.1</td>
<td>-</td>
<td>nC</td>
</tr>
<tr>
<td>Gate-Drain Charge</td>
<td>Q_{gd}</td>
<td></td>
<td>-</td>
<td>4.3</td>
<td>-</td>
<td>nC</td>
</tr>
<tr>
<td><strong>Drain-Source Diode Characteristics</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Diode Forward Voltage</td>
<td>V_{SD}</td>
<td>V_{GS}=0V, I_{D}=-21A</td>
<td>-</td>
<td>-</td>
<td>-1.2</td>
<td>V</td>
</tr>
</tbody>
</table>

**Notes:**
1. Repetitive Rating: Pulse width limited by maximum junction temperature.
2. Surface Mounted on FR4 Board, t ≤ 10 sec.
3. Pulse Test: Pulse Width ≤ 300μs, Duty Cycle ≤ 2%.
4. Guaranteed by design, not subject to production
Typical Electrical and Thermal Characteristics

Figure 1 Switching Test Circuit

Figure 2 Switching Waveforms

Figure 3 Power Dissipation

Figure 4 Drain Current

Figure 5 Output Characteristics

Figure 6 Drain-Source On-Resistance
Figure 7 Transfer Characteristics

Figure 8 Drain-Source On-Resistance

Figure 9 Rdson vs Vgs

Figure 10 Capacitance vs Vds

Figure 11 Gate Charge

Figure 12 Source-Drain Diode Forward
Figure 13 Safe Operation Area

Figure 14 Normalized Maximum Transient Thermal Impedance
## SOP-8 Package Information

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Dimensions In Millimeters</th>
<th>Dimensions In Inches</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Min.</td>
<td>Max.</td>
</tr>
<tr>
<td>A</td>
<td>1.350</td>
<td>1.750</td>
</tr>
<tr>
<td>A1</td>
<td>0.100</td>
<td>0.250</td>
</tr>
<tr>
<td>A2</td>
<td>1.350</td>
<td>1.550</td>
</tr>
<tr>
<td>b</td>
<td>0.330</td>
<td>0.510</td>
</tr>
<tr>
<td>c</td>
<td>0.170</td>
<td>0.250</td>
</tr>
<tr>
<td>D</td>
<td>4.700</td>
<td>5.100</td>
</tr>
<tr>
<td>E</td>
<td>3.800</td>
<td>4.000</td>
</tr>
<tr>
<td>E1</td>
<td>5.800</td>
<td>6.200</td>
</tr>
<tr>
<td>e</td>
<td>1.270</td>
<td>(BSC)</td>
</tr>
<tr>
<td>L</td>
<td>0.400</td>
<td>1.270</td>
</tr>
<tr>
<td>θ</td>
<td>0°</td>
<td>8°</td>
</tr>
</tbody>
</table>
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