FDT434P
P-Channel 2.5V Specified PowerTrench® MOSFET

General Description
This P-Channel 2.5V specified MOSFET is produced using Fairchild Semiconductor’s advanced PowerTrench process that has been especially tailored to minimize the on-state resistance and yet maintain low gate charge for superior switching performance.

Applications
- Low Dropout Regulator
- DC/DC converter
- Load switch
- Motor driving

Features
- –5.5 A, –20 V. \( R_{\text{DS(ON)}} = 0.050 \ \Omega \) @ \( V_{\text{GS}} = –4.5 \ \text{V} \)
- \( R_{\text{DS(ON)}} = 0.070 \ \Omega \) @ \( V_{\text{GS}} = –2.5 \ \text{V} \).
- Low gate charge (13nC typical)
- High performance trench technology for extremely low \( R_{\text{DS(ON)}} \).
- High power and current handling capability in a widely used surface mount package.

Absolute Maximum Ratings \( T_a = 25^\circ \text{C} \) unless otherwise noted

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Parameter</th>
<th>Ratings</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>( V_{\text{DS}} )</td>
<td>Drain-Source Voltage</td>
<td>–20</td>
<td>V</td>
</tr>
<tr>
<td>( V_{\text{GS}} )</td>
<td>Gate-Source Voltage</td>
<td>±8</td>
<td>V</td>
</tr>
<tr>
<td>( I_D )</td>
<td>Drain Current – Continuous (Note 1a)</td>
<td>–6</td>
<td>A</td>
</tr>
<tr>
<td></td>
<td>– Pulsed (Note 1b)</td>
<td>–30</td>
<td></td>
</tr>
<tr>
<td>( P_D )</td>
<td>Power Dissipation for Single Operation (Note 1c)</td>
<td>3</td>
<td>W</td>
</tr>
<tr>
<td></td>
<td>(Note 1a)</td>
<td>1.3</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(Note 1b)</td>
<td>1.1</td>
<td></td>
</tr>
<tr>
<td>( T_{\text{J}}, T_{\text{STG}} )</td>
<td>Operating and Storage Junction Temperature Range</td>
<td>–55 to +150</td>
<td>°C</td>
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Thermal Characteristics

<table>
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<th>Symbol</th>
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<th>Ratings</th>
<th>Units</th>
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<tbody>
<tr>
<td>( R_{\text{JA}} )</td>
<td>Thermal Resistance, Junction-to-Ambient (Note 1a)</td>
<td>42</td>
<td>°C/W</td>
</tr>
<tr>
<td>( R_{\text{JC}} )</td>
<td>Thermal Resistance, Junction-to-Case (Note 1)</td>
<td>12</td>
<td>°C/W</td>
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Package Marking and Ordering Information

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<thead>
<tr>
<th>Device Marking</th>
<th>Device</th>
<th>Reel Size</th>
<th>Tape width</th>
<th>Quantity</th>
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<tr>
<td>434</td>
<td>FDT434P</td>
<td>13''</td>
<td>12mm</td>
<td>2500 units</td>
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## Electrical Characteristics

### Off Characteristics

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Parameter</th>
<th>Test Conditions</th>
<th>Min</th>
<th>Typ</th>
<th>Max</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>BV_{DSS}</td>
<td>Drain–Source Breakdown Voltage</td>
<td>( V_{GS} = 0 \text{ V}, \ I_D = -250 \text{ } \mu\text{A} )</td>
<td>-20</td>
<td></td>
<td></td>
<td>V</td>
</tr>
<tr>
<td>\Delta BV_{DSS} / \Delta T_J</td>
<td>Breakdown Voltage Temperature Coefficient</td>
<td>( I_D = -250 \text{ } \mu\text{A}, \text{Referenced to } 25^\circ\text{C} )</td>
<td>-28</td>
<td></td>
<td></td>
<td>mV/°C</td>
</tr>
<tr>
<td>I_{DSS}</td>
<td>Zero Gate Voltage Drain Current</td>
<td>( V_{DS} = -16 \text{ V}, \ V_{GS} = 0 \text{ V} )</td>
<td>-1</td>
<td></td>
<td></td>
<td>µA</td>
</tr>
<tr>
<td>I_{GSOFF}</td>
<td>Gate–Body Leakage Current, Forward</td>
<td>( V_{GS} = 8 \text{ V}, \ V_{DS} = 0 \text{ V} )</td>
<td>100</td>
<td></td>
<td></td>
<td>nA</td>
</tr>
<tr>
<td>I_{GSRR}</td>
<td>Gate–Body Leakage Current, Reverse</td>
<td>( V_{GS} = -8 \text{ V}, \ V_{DS} = 0 \text{ V} )</td>
<td>-100</td>
<td></td>
<td></td>
<td>nA</td>
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### On Characteristics

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Parameter</th>
<th>Test Conditions</th>
<th>Min</th>
<th>Typ</th>
<th>Max</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>V_{GS(th)}</td>
<td>Gate Threshold Voltage</td>
<td>( V_{DS} = V_{GS}, \ I_D = -250 \text{ } \mu\text{A} )</td>
<td>-0.4</td>
<td>-0.6</td>
<td>-1</td>
<td>V</td>
</tr>
<tr>
<td>\Delta V_{GS(th)} / \Delta T_J</td>
<td>Gate Threshold Voltage Temperature Coefficient</td>
<td>( I_D = -250 \text{ } \mu\text{A}, \text{Referenced to } 25^\circ\text{C} )</td>
<td>2</td>
<td></td>
<td></td>
<td>mV/°C</td>
</tr>
<tr>
<td>R_{D(on)}</td>
<td>Static Drain–Source On–Resistance</td>
<td>( V_{GS} = -4.5 \text{ V}, \ I_D = -6 \text{ A} )</td>
<td>0.040</td>
<td>0.050</td>
<td>0.070</td>
<td>Ω</td>
</tr>
<tr>
<td>I_{DS(on)}</td>
<td>On–State Drain Current</td>
<td>( V_{GS} = -4.5 \text{ V}, \ V_{DS} = -5 \text{ V} )</td>
<td>-20</td>
<td></td>
<td></td>
<td>A</td>
</tr>
<tr>
<td>g_{FS}</td>
<td>Forward Transconductance</td>
<td>( V_{DS} = -10 \text{ V}, \ I_D = -6 \text{ A} )</td>
<td>6.5</td>
<td></td>
<td></td>
<td>S</td>
</tr>
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### Dynamic Characteristics

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Parameter</th>
<th>Test Conditions</th>
<th>Min</th>
<th>Typ</th>
<th>Max</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>C_{iss}</td>
<td>Input Capacitance</td>
<td>( V_{DS} = V_{GS}, \ I_D = 0 \text{ V} )</td>
<td>1187</td>
<td></td>
<td></td>
<td>pF</td>
</tr>
<tr>
<td>C_{oss}</td>
<td>Output Capacitance</td>
<td>( f = 1.0 \text{ MHz} )</td>
<td>270</td>
<td></td>
<td></td>
<td>pF</td>
</tr>
<tr>
<td>C_{rss}</td>
<td>Reverse Transfer Capacitance</td>
<td></td>
<td>114</td>
<td></td>
<td></td>
<td>pF</td>
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### Switching Characteristics

<table>
<thead>
<tr>
<th>Symbol</th>
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<th>Min</th>
<th>Typ</th>
<th>Max</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>t_{(on)}</td>
<td>Turn–On Delay Time</td>
<td>( V_{DD} = -5 \text{ V}, \ I_D = -1 \text{ A} )</td>
<td>8</td>
<td>16</td>
<td></td>
<td>ns</td>
</tr>
<tr>
<td>t_{r}</td>
<td>Turn–On Rise Time</td>
<td>( V_{GS} = -4.5 \text{ V}, \ R_{GEN} = 6 \text{ Ω} )</td>
<td>15</td>
<td>25</td>
<td></td>
<td>ns</td>
</tr>
<tr>
<td>t_{(off)}</td>
<td>Turn–Off Delay Time</td>
<td>( V_{GS} = -4.5 \text{ V} )</td>
<td>45</td>
<td>65</td>
<td></td>
<td>ns</td>
</tr>
<tr>
<td>t_{f}</td>
<td>Turn–Off Fall Time</td>
<td></td>
<td>30</td>
<td>50</td>
<td></td>
<td>ns</td>
</tr>
<tr>
<td>Q_{g}</td>
<td>Total Gate Charge</td>
<td>( V_{DS} = -10 \text{ V}, \ I_D = -6 \text{ A} )</td>
<td>13</td>
<td>19</td>
<td></td>
<td>nC</td>
</tr>
<tr>
<td>Q_{gs}</td>
<td>Gate–Source Charge</td>
<td>( V_{GS} = -4.5 \text{ V} )</td>
<td>1.8</td>
<td></td>
<td></td>
<td>nC</td>
</tr>
<tr>
<td>Q_{gd}</td>
<td>Gate–Drain Charge</td>
<td></td>
<td>3</td>
<td></td>
<td></td>
<td>nC</td>
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### Drain–Source Diode Characteristics and Maximum Ratings

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Parameter</th>
<th>Test Conditions</th>
<th>Min</th>
<th>Typ</th>
<th>Max</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>I_{DSS}</td>
<td>Maximum Continuous Drain–Source Diode Forward Current</td>
<td>( V_{GS} = 0 \text{ V}, \ I_D = -2.5 \text{ A} )</td>
<td>-2.5</td>
<td></td>
<td></td>
<td>A</td>
</tr>
<tr>
<td>V_{DS}</td>
<td>Drain–Source Diode Forward Voltage</td>
<td>( V_{GS} = 0 \text{ V} )</td>
<td>-0.75</td>
<td>-1.2</td>
<td></td>
<td>V</td>
</tr>
</tbody>
</table>

**Notes:**

1. \( R_{\theta JA} \) is the sum of the junction-to-case and case-to-ambient thermal resistance where the case thermal reference is defined as the solder mounting surface of the drain pins. \( R_{\theta JC} \) is guaranteed by design while \( R_{\theta CA} \) is determined by the user’s board design.

2. Pulse Test: Pulse Width < 300µs, Duty Cycle < 2.0%
Typical Characteristics

Figure 1. On-Region Characteristics.

Figure 2. On-Resistance Variation with Drain Current and Gate Voltage.

Figure 3. On-Resistance Variation with Temperature.

Figure 4. On-Resistance Variation with Gate-to-Source Voltage.

Figure 5. Transfer Characteristics.

Figure 6. Body Diode Forward Voltage Variation with Source Current and Temperature.
**Typical Characteristics**

![Graph](image1)

**Figure 7. Gate Charge Characteristics.**

![Graph](image2)

**Figure 8. Capacitance Characteristics.**

![Graph](image3)

**Figure 9. Maximum Safe Operating Area.**

![Graph](image4)

**Figure 10. Single Pulse Maximum Power Dissipation.**

![Graph](image5)

**Figure 11. Transient Thermal Response Curve.**

Thermal characterization performed using the conditions described in Note 1c. Transient thermal response will change depending on the circuit board design.
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<th>Datasheet Identification</th>
<th>Product Status</th>
<th>Definition</th>
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<tr>
<td>Advance Information</td>
<td>Formative / In Design</td>
<td>Datasheet contains the design specifications for product development. Specifications may change in any manner without notice.</td>
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<tr>
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