Please note: As part of the Fairchild Semiconductor integration, some of the Fairchild orderable part numbers will need to change in order to meet ON Semiconductor’s system requirements. Since the ON Semiconductor product management systems do not have the ability to manage part nomenclature that utilizes an underscore (_), the underscore (_) in the Fairchild part numbers will be changed to a dash (-). This document may contain device numbers with an underscore (_). Please check the ON Semiconductor website to verify the updated device numbers. The most current and up-to-date ordering information can be found at www.onsemi.com. Please email any questions regarding the system integration to Fairchild_questions@onsemi.com.
FDB035N10A
N-Channel PowerTrench® MOSFET
100 V, 214 A, 3.5 mΩ

Features
• \( R_{DS(on)} = 3.0 \, \text{mΩ} \) (Typ.) @ \( V_{GS} = 10 \, \text{V}, \, I_D = 75 \, \text{A} \)
• Fast Switching Speed
• Low Gate Charge, \( Q_G = 89 \, \text{nC} \) (Typ.)
• High Performance Trench Technology for Extremely Low \( R_{DS(on)} \)
• High Power and Current Handling Capability
• RoHS Compliant

Description
This N-Channel MOSFET is produced using Fairchild Semiconductor's advanced PowerTrench® process that has been tailored to minimize the on-state resistance while maintaining superior switching performance.

Applications
• Synchronous Rectification for ATX / Server / Telecom PSU
• Battery Protection Circuit
• Motor drives and Uninterruptible Power Supplies
• Micro Solar Inverter

MOSFET Maximum Ratings \( T_J = 25^\circ \text{C} \) unless otherwise noted.

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Parameter</th>
<th>FDB035N10A</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>( V_{DSS} )</td>
<td>Drain to Source Voltage</td>
<td>100</td>
<td>V</td>
</tr>
<tr>
<td>( V_{GS} )</td>
<td>Gate to Source Voltage</td>
<td>±20</td>
<td>V</td>
</tr>
<tr>
<td>( I_D )</td>
<td>Drain Current</td>
<td>214*</td>
<td>A</td>
</tr>
</tbody>
</table>
• Continuous (\( T_J = 25^\circ \text{C}, \text{Silicon Limited} \))
• Continuous (\( T_J = 100^\circ \text{C}, \text{Silicon Limited} \))
• Continuous (\( T_J = 25^\circ \text{C}, \text{Package Limited} \))
| \( I_{DM} \) | Drain Current | 120 | A |
• Pulsed (Note 1)
| \( E_{AS} \) | Single Pulsed Avalanche Energy | 658 | mJ |
• (Note 2)
| \( P_D \) | Peak Diode Recovery dv/dt | 6.0 | V/ns |
• (Note 3)
| \( T_J, T_{STG} \) | Operating and Storage Temperature Range | -55 to +175 | °C |
| \( T_L \) | Maximum Lead Temperature for Soldering, 1/8” from Case for 5 Seconds | 300 | °C |

*Calculated continuous current based on maximum allowable junction temperature. Package limitation current is 120A.

Thermal Characteristics

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Parameter</th>
<th>FDB035N10A</th>
<th>Unit</th>
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<tbody>
<tr>
<td>( R_{JUC} )</td>
<td>Thermal Resistance, Junction to Case, Max.</td>
<td>0.45</td>
<td>°C/W</td>
</tr>
<tr>
<td>( R_{JUA} )</td>
<td>Thermal Resistance, Junction to Ambient (Minimum Pad of 2-oz Copper), Max.</td>
<td>62.5</td>
<td>°C/W</td>
</tr>
<tr>
<td></td>
<td>Thermal Resistance, Junction to Ambient (1 in² Pad of 2-oz Copper), Max.</td>
<td>40</td>
<td>°C/W</td>
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### Package Marking and Ordering Information

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<th>Part Number</th>
<th>Top Mark</th>
<th>Package</th>
<th>Packing Method</th>
<th>Reel Size</th>
<th>Tape Width</th>
<th>Quantity</th>
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<tr>
<td>FDB035N10A</td>
<td>FDB035N10A</td>
<td>D²-PAK</td>
<td>Tape and Reel</td>
<td>330 mm</td>
<td>24 mm</td>
<td>800 units</td>
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### Electrical Characteristics  $T_C = 25°C$ unless otherwise noted.

#### Off Characteristics

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<th>Min.</th>
<th>Typ.</th>
<th>Max.</th>
<th>Unit</th>
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<tr>
<td>$BVDSS$</td>
<td>Drain to Source Breakdown Voltage</td>
<td>$I_D = 250 \mu A, V_{GS} = 0 \text{ V}, T_C = 25°C$</td>
<td>100</td>
<td>-</td>
<td>-</td>
<td>V</td>
</tr>
<tr>
<td>$\Delta BVDSS/\Delta T_J$</td>
<td>Breakdown Voltage Temperature Coefficient</td>
<td>$I_D = 250 \mu A, \text{ Referenced to } 25°C$</td>
<td>-</td>
<td>0.07</td>
<td>-</td>
<td>V/°C</td>
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<tr>
<td>$I_{0SS}$</td>
<td>Zero Gate Voltage Drain Current</td>
<td>$V_{DS} = 80 \text{ V}, V_{GS} = 0 \text{ V}$</td>
<td>-</td>
<td>-</td>
<td>1</td>
<td>μA</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$V_{DS} = 80 \text{ V}, T_C = 150°C$</td>
<td>-</td>
<td>-</td>
<td>500</td>
<td></td>
</tr>
<tr>
<td>$I_{0GS}$</td>
<td>Gate to Body Leakage Current</td>
<td>$V_{DS} = \pm20 \text{ V}, V_{DS} = 0 \text{ V}$</td>
<td>-</td>
<td>-</td>
<td>±100</td>
<td>nA</td>
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#### On Characteristics

<table>
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<th>Typ.</th>
<th>Max.</th>
<th>Unit</th>
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</thead>
<tbody>
<tr>
<td>$V_{GS(th)}$</td>
<td>Gate Threshold Voltage</td>
<td>$V_{GS} = V_{DS}, I_D = 250 \mu A$</td>
<td>2.0</td>
<td>-</td>
<td>4.0</td>
<td>V</td>
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<tr>
<td>$RDSON$</td>
<td>Static Drain to Source On Resistance</td>
<td>$V_{DS} = 10 \text{ V}, I_D = 75 \text{ A}$</td>
<td>-</td>
<td>3.0</td>
<td>3.5</td>
<td>mΩ</td>
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<tr>
<td>$g_{FS}$</td>
<td>Forward Transconductance</td>
<td>$V_{DS} = 10 \text{ V}, I_D = 75 \text{ A}$</td>
<td>-</td>
<td>167</td>
<td>-</td>
<td>S</td>
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#### Dynamic Characteristics

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<th>Min.</th>
<th>Typ.</th>
<th>Max.</th>
<th>Unit</th>
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</thead>
<tbody>
<tr>
<td>$C_{iss}$</td>
<td>Input Capacitance</td>
<td>$V_{DS} = 25 \text{ V}, V_{GS} = 0 \text{ V}$, $f = 1 \text{ MHz}$</td>
<td>-</td>
<td>5485</td>
<td>7295</td>
<td>pF</td>
</tr>
<tr>
<td>$C_{oss}$</td>
<td>Output Capacitance</td>
<td>$V_{DS} = 25 \text{ V}, V_{GS} = 0 \text{ V}$, $f = 1 \text{ MHz}$</td>
<td>-</td>
<td>2430</td>
<td>3230</td>
<td>pF</td>
</tr>
<tr>
<td>$C_{rss}$</td>
<td>Reverse Transfer Capacitance</td>
<td>$V_{DS} = 25 \text{ V}, V_{GS} = 0 \text{ V}$, $f = 1 \text{ MHz}$</td>
<td>-</td>
<td>210</td>
<td>-</td>
<td>pF</td>
</tr>
<tr>
<td>$Q_{gt(total)}$</td>
<td>Total Gate Charge at 10V</td>
<td>$V_{DS} = 80 \text{ V}, I_D = 75 \text{ A}$</td>
<td>-</td>
<td>89</td>
<td>116</td>
<td>nC</td>
</tr>
<tr>
<td>$Q_{gs}$</td>
<td>Gate to Source Gate Charge</td>
<td>$V_{GS} = 10 \text{ V}$</td>
<td>-</td>
<td>24</td>
<td>-</td>
<td>nC</td>
</tr>
<tr>
<td>$Q_{gs2}$</td>
<td>Gate Charge Threshold to Plateau</td>
<td>$V_{GS} = 10 \text{ V}$</td>
<td>-</td>
<td>8</td>
<td>-</td>
<td>nC</td>
</tr>
<tr>
<td>$Q_{gd}$</td>
<td>Gate to Drain &quot;Miller&quot; Charge</td>
<td>$V_{GS} = 10 \text{ V}$</td>
<td>-</td>
<td>25</td>
<td>-</td>
<td>nC</td>
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</table>

#### Switching Characteristics

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Parameter</th>
<th>Test Conditions</th>
<th>Min.</th>
<th>Typ.</th>
<th>Max.</th>
<th>Unit</th>
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</thead>
<tbody>
<tr>
<td>$t_{on}$</td>
<td>Turn-On Delay Time</td>
<td>$V_{DD} = 50 \text{ V}, I_D = 75 \text{ A}$</td>
<td>-</td>
<td>22</td>
<td>54</td>
<td>ns</td>
</tr>
<tr>
<td>$\tau$</td>
<td>Turn-On Rise Time</td>
<td>$V_{GS} = 10 \text{ V}, R_G = 4.7 \text{ Ω}$</td>
<td>-</td>
<td>54</td>
<td>118</td>
<td>ns</td>
</tr>
<tr>
<td>$t_{off}$</td>
<td>Turn-Off Delay Time</td>
<td>$V_{DD} = 50 \text{ V}, I_D = 75 \text{ A}$</td>
<td>-</td>
<td>37</td>
<td>84</td>
<td>ns</td>
</tr>
<tr>
<td>$\tau$</td>
<td>Turn-Off Fall Time</td>
<td>$V_{GS} = 10 \text{ V}$</td>
<td>-</td>
<td>11</td>
<td>32</td>
<td>ns</td>
</tr>
<tr>
<td>$ESR$</td>
<td>Equivalent Series Resistance (G-S)</td>
<td>$f = 1 \text{ MHz}$</td>
<td>-</td>
<td>1.2</td>
<td>-</td>
<td>Ω</td>
</tr>
</tbody>
</table>

#### Drain-Source Diode Characteristics

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Parameter</th>
<th>Test Conditions</th>
<th>Min.</th>
<th>Typ.</th>
<th>Max.</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>$I_{DS}$</td>
<td>Maximum Continuous Drain to Source Diode Forward Current</td>
<td>$V_{DD} = 0 \text{ V}, I_D = 75 \text{ A}$</td>
<td>-</td>
<td>-</td>
<td>214*</td>
<td>A</td>
</tr>
<tr>
<td>$I_{DSM}$</td>
<td>Maximum Pulsed Drain to Source Diode Forward Current</td>
<td>$V_{DD} = 0 \text{ V}, I_D = 75 \text{ A}$</td>
<td>-</td>
<td>-</td>
<td>856</td>
<td>A</td>
</tr>
<tr>
<td>$V_{DS}$</td>
<td>Drain to Source Diode Forward Voltage</td>
<td>$V_{GS} = 0 \text{ V}, I_D = 75 \text{ A}$</td>
<td>-</td>
<td>-</td>
<td>1.25</td>
<td>V</td>
</tr>
<tr>
<td>$t_{tr}$</td>
<td>Reverse Recovery Time</td>
<td>$V_{GS} = 0 \text{ V}, I_{DS} = 75 \text{ A}, V_{DD} = 80 \text{ V}$, $\frac{diF}{dt} = 100 \text{ A/μs}$</td>
<td>-</td>
<td>72</td>
<td>-</td>
<td>ns</td>
</tr>
<tr>
<td>$Q_{tr}$</td>
<td>Reverse Recovery Charge</td>
<td>$V_{GS} = 0 \text{ V}, I_{DS} = 75 \text{ A}, V_{DD} = 80 \text{ V}$, $\frac{diF}{dt} = 100 \text{ A/μs}$</td>
<td>-</td>
<td>129</td>
<td>-</td>
<td>nC</td>
</tr>
</tbody>
</table>

**Notes:**

1. Repetitive rating: pulse-width limited by maximum junction temperature.
2. $T_J = 25°C$, $L = 1 \text{ mH}, V_{GS} = 36.3 \text{ A}$.
3. $I_{DS} = 75 \text{ A}, \text{ di/dt} = 200 \text{ A/μs}, V_{DD} < BVDSS$, starting $T_J = 25°C$.
4. Essentially independent of operating temperature typical characteristics.
Typical Performance Characteristics

**Figure 1. On-Region Characteristics**

- $V_{GS} = 15.0 \text{ V, 10.0 \text{ V, 8.0 \text{ V, 7.0 \text{ V, 6.0 \text{ V, 5.5 \text{ V, 5.0 \text{ V}}}}}$
- $I_{D}, \text{ Drain Current [A]}$
- $V_{DS}, \text{ Drain-Source Voltage [V]}$
- *Notes:*
  1. 250μs Pulse Test
  2. $T_{C} = 25^\circ\text{C}$

**Figure 2. Transfer Characteristics**

- $I_{D}, \text{ Drain Current [A]}$
- $V_{GS}, \text{ Gate-Source Voltage [V]}$
- *Notes:*
  1. $V_{DS} = 10\text{V}$
  2. 250μs Pulse Test

**Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage**

- $R_{DS(on)}$, Drain-Source On-Resistance
- $I_{D}, \text{ Drain Current [A]}$
- $V_{GS}, \text{ Gate-Source Voltage [V]}$
- *Note: $T_{C} = 25^\circ\text{C}$*

**Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature**

- $I_{D}, \text{ Reverse Drain Current [A]}$
- $V_{SD}, \text{ Body Diode Forward Voltage [V]}$
- *Notes:*
  1. $V_{DS} = 10\text{V}$
  2. 250μs Pulse Test

**Figure 5. Capacitance Characteristics**

- $C_{oss}, \text{ Gate-Source Capacitance [pF]}$
- $C_{oss} = C_{gs} + C_{gd}$
- $C_{oss} = C_{ds} + C_{gd}$
- $C_{oss} = C_{gd}$
- $C_{oss} = C_{ds}$
- *Note: $V_{DS} = 0\text{V}$
- *Note: f = 1MHz*

**Figure 6. Gate Charge Characteristics**

- $Q_{g}, \text{ Total Gate Charge [nC]}$
- $V_{DS}, \text{ Gate-Source Voltage [V]}$
- *Notes:*
  1. $V_{DS} = 20\text{V}$
  2. $V_{DS} = 50\text{V}$
  3. $V_{DS} = 80\text{V}$
- *Note: $I_{D} = 75\text{A}$*
Typical Performance Characteristics

**Figure 7. Breakdown Voltage Variation vs. Temperature**

- Notes:
  1. $V_{GS} = 0V$
  2. $I_D = 10mA$

**Figure 8. On-Resistance Variation vs. Temperature**

- Notes:
  1. $V_{GS} = 10V$
  2. $I_D = 75A$

**Figure 9. Maximum Safe Operating Area**

- Notes:
  1. $T_C = 25^\circ C$
  2. $T_J = 175^\circ C$
  3. Single Pulse

**Figure 10. Maximum Drain Current vs. Case Temperature**

- Limited by package

**Figure 11. Unclamped Inductive Switching Capability**

- $I_{AS} = (0.3 \times \text{RATED \(BVDSS-V_{DS} \times R)} + 1$

- $t_{AV} = \frac{(L/R \times I_{AS} \times R)}{1.3 \times \text{RATED \(BVDSS-V_{DS} \times R)} + 1}$
Typical Performance Characteristics

Figure 12. Transient Thermal Response Curve

- Notes:
  1. $Z_{\theta JC(t)} = 0.45°C/W$ Max.
  2. Duty Factor, $D = \frac{t_1}{t_2}$
  3. $T_{JM} - T_{C} = P_{DM} \times Z_{\theta JC}$

*Notes:
1. $Z_{\theta JC(t)} = 0.45°C/W$ Max.
2. Duty Factor, $D = \frac{t_1}{t_2}$
3. $T_{JM} - T_{C} = P_{DM} \times Z_{\theta JC(t)}$
Figure 13. Gate Charge Test Circuit & Waveform

Figure 14. Resistive Switching Test Circuit & Waveforms

Figure 15. Unclamped Inductive Switching Test Circuit & Waveforms
Figure 16. Peak Diode Recovery dv/dt Test Circuit & Waveforms
Figure 17. TO263 (D²PAK), Molded, 2-Lead, Surface Mount

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- FPS™
- F-PFS™
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- MicroPak™
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- RapidConfigure™
- SyncFET™
- XS™

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2. A critical component in any component of a life support, device, or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.

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PRODUCT STATUS DEFINITIONS

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<th>Datasheet Identification</th>
<th>Product Status</th>
<th>Definition</th>
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<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>
</tr>
<tr>
<td>Preliminary</td>
<td>First Production</td>
<td>Datasheet contains preliminary data; supplementary data will be published at a later date. Fairchild reserves the right to make changes at any time without notice to improve design.</td>
</tr>
<tr>
<td>No Identification Needed</td>
<td>Full Production</td>
<td>Datasheet contains final specifications. Fairchild reserves the right to make changes at any time without notice to improve the design.</td>
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<tr>
<td>Obsolete</td>
<td>Not In Production</td>
<td>Datasheet contains specifications on a product that is discontinued by Fairchild Semiconductor. The datasheet is for reference information only.</td>
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