FDB8860-F085
N-Channel Logic Level PowerTrench® MOSFET
30V, 80A, 2.6mΩ

Features
- \( R_{\text{DS(ON)}} = 1.9\, \text{mΩ} \) (Typ), \( V_{\text{GS}} = 5\, \text{V} \), \( I_D = 80\, \text{A} \)
- \( Q_{\text{g}} = 89\, \text{nC} \) (Typ), \( V_{\text{GS}} = 5\, \text{V} \)
- Low Miller Charge
- Low \( Q_{\text{RR}} \) Body Diode
- UIS Capability (Single Pulse and Repetitive Pulse)
- Qualified to AEC Q101
- RoHS Compliant

Applications
- 12V Automotive Load Control
- Start / Alternator Systems
- Electronic Power Steering Systems
- ABS
- DC-DC Converters
### Electrical Characteristics  \( T_J = 25 \degree C \) unless otherwise noted

<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_{DSS} )</td>
<td>Drain to Source Voltage</td>
<td></td>
<td>30</td>
<td>-</td>
<td>-</td>
<td>V</td>
</tr>
<tr>
<td>( V_{GS} )</td>
<td>Gate to Source Voltage</td>
<td></td>
<td>±20</td>
<td>-</td>
<td>-</td>
<td>V</td>
</tr>
<tr>
<td>( I_D )</td>
<td>Drain Current</td>
<td>Continuous (( V_{GS} = 10V, \ T_J &lt; 163 \degree C ))</td>
<td>80</td>
<td>A</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Continuous (( V_{GS} = 5V, \ T_J &lt; 162 \degree C ))</td>
<td>80</td>
<td>A</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Continuous (( V_{GS} = 10V, \ T_J = 25 \degree C ), with ( R_{iuA} = 43 \degree C/W ))</td>
<td>31</td>
<td>A</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Pulsed</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>( E_{AS} )</td>
<td>Single Pulse Avalanche Energy (Note 1)</td>
<td></td>
<td>947</td>
<td>mJ</td>
<td></td>
<td></td>
</tr>
<tr>
<td>( P_D )</td>
<td>Power Dissipation</td>
<td></td>
<td>254</td>
<td>W</td>
<td></td>
<td></td>
</tr>
<tr>
<td>( T_J, \ T_{STG} )</td>
<td>Operating and Storage Temperature</td>
<td></td>
<td>-55 to +175</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Thermal Characteristics

- \( R_{JC} \): Thermal Resistance Junction to Case 0.59 \degree C/W
- \( R_{JA} \): Thermal Resistance Junction to Ambient (Note 2) 62 \degree C/W
- \( R_{JA} \): Thermal Resistance Junction to Ambient TO-263, 1\( \text{in}^2 \) copper pad area 43 \degree C/W

### Package Marking and Ordering Information

<table>
<thead>
<tr>
<th>Device Marking</th>
<th>Device</th>
<th>Package</th>
<th>Reel Size</th>
<th>Tape Width</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>FDB8860</td>
<td>FDB8860-F085</td>
<td>TO-263AB</td>
<td>330mm</td>
<td>24mm</td>
<td>800 units</td>
</tr>
</tbody>
</table>

### 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></td>
<td></td>
<td></td>
<td></td>
<td>pF</td>
</tr>
<tr>
<td>( C_{oss} )</td>
<td>Output Capacitance</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>pF</td>
</tr>
<tr>
<td>( C_{rss} )</td>
<td>Reverse Transfer Capacitance</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>pF</td>
</tr>
<tr>
<td>( R_g )</td>
<td>Gate Resistance</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>( \Omega )</td>
</tr>
<tr>
<td>( Q_{g(TOT)} )</td>
<td>Total Gate Charge at 10V</td>
<td>( V_{GS} = 0V ) to 10V</td>
<td>-</td>
<td>165</td>
<td>214</td>
<td>nC</td>
</tr>
<tr>
<td>( Q_{g(S)} )</td>
<td>Total Gate Charge at 5V</td>
<td>( V_{GS} = 0V ) to 5V</td>
<td>-</td>
<td>89</td>
<td>115</td>
<td>nC</td>
</tr>
<tr>
<td>( Q_{g(th)} )</td>
<td>Threshold Gate Charge</td>
<td>( V_{GS} = 0V ) to 1V</td>
<td>-</td>
<td>9.1</td>
<td>12</td>
<td>nC</td>
</tr>
<tr>
<td>( Q_{g(s)} )</td>
<td>Gate to Source Gate Charge</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>nC</td>
</tr>
<tr>
<td>( Q_{gd} )</td>
<td>Gate Charge Threshold to Plateau</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>nC</td>
</tr>
<tr>
<td>( Q_{GD} )</td>
<td>Gate to Drain “Miller” Charge</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>nC</td>
</tr>
<tr>
<td>Symbol</td>
<td>Parameter</td>
<td>Test Conditions</td>
<td>Min</td>
<td>Typ</td>
<td>Max</td>
<td>Units</td>
</tr>
<tr>
<td>--------</td>
<td>---------------------------</td>
<td>--------------------------</td>
<td>-----</td>
<td>-----</td>
<td>-----</td>
<td>-------</td>
</tr>
<tr>
<td>( t_{(on)} )</td>
<td>Turn-On Time</td>
<td>( V_{DD} = 15V, I_D = 80A )</td>
<td>-</td>
<td>-</td>
<td>340</td>
<td>ns</td>
</tr>
<tr>
<td>( t_{(on)} )</td>
<td>Turn-On Delay Time</td>
<td>( V_{GS} = 5V, R_{GS} = 1\Omega )</td>
<td>-</td>
<td>14</td>
<td>-</td>
<td>ns</td>
</tr>
<tr>
<td>( t_r )</td>
<td>Turn-On Rise Time</td>
<td>( V_{DD} = 15V, I_D = 80A )</td>
<td>-</td>
<td>213</td>
<td>-</td>
<td>ns</td>
</tr>
<tr>
<td>( t_{(off)} )</td>
<td>Turn-Off Delay Time</td>
<td>( V_{GS} = 5V, R_{GS} = 1\Omega )</td>
<td>-</td>
<td>79</td>
<td>-</td>
<td>ns</td>
</tr>
<tr>
<td>( t_f )</td>
<td>Turn-Off Fall Time</td>
<td></td>
<td>-</td>
<td>49</td>
<td>-</td>
<td>ns</td>
</tr>
<tr>
<td>( t_{off} )</td>
<td>Turn-Off Time</td>
<td></td>
<td>-</td>
<td>192</td>
<td>-</td>
<td>ns</td>
</tr>
</tbody>
</table>

**Drain-Source Diode Characteristics**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Source to Drain Diode Voltage</th>
<th>( I_{SD} = 80A )</th>
<th>-</th>
<th>-</th>
<th>1.25</th>
<th>V</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>( I_{SD} = 40A )</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>1.0</td>
<td>V</td>
</tr>
<tr>
<td>( t_{rr} )</td>
<td>Reverse Recovery Time</td>
<td>( I_{SD} = 80A, \frac{dl_{SD}}{dt} = 100A/\mu s )</td>
<td>-</td>
<td>-</td>
<td>43</td>
<td>ns</td>
</tr>
<tr>
<td>( Q_{rr} )</td>
<td>Reverse Recovery Charge</td>
<td>( I_{SD} = 80A, \frac{dl_{SD}}{dt} = 100A/\mu s )</td>
<td>-</td>
<td>-</td>
<td>29</td>
<td>nC</td>
</tr>
</tbody>
</table>

**Notes:**
1. Starting \( T_J = 25^\circ C \), \( L = 0.47 \text{mH}, I_{AS} = 64A \), \( V_{DD} = 30V, V_{GS} = 10V \).
2. Pulse width = 100s.

---

This product has been designed to meet the extreme test conditions and environment demanded by the automotive industry. For a copy of the requirements, see AEC Q101 at: http://www.aecouncil.com/

All ON Semiconductor products are manufactured, assembled and tested under ISO9000 and QS9000 quality systems certification.

www.onsemi.com
Typical Characteristics  $T_J = 25^\circ C$ unless otherwise noted

Figure 1. Normalized Power Dissipation vs Case Temperature

Figure 2. Maximum Continuous Drain Current vs Case Temperature

Figure 3. Normalized Maximum Transient Thermal Impedance

Figure 4. Peak Current Capability
Typical Characteristics  \( T_J = 25^\circ\text{C} \) unless otherwise noted

\[
\begin{align*}
V_{DS}, \text{DRAIN TO SOURCE VOLTAGE (V)} & \quad I_D, \text{DRAIN CURRENT (A)} \\
\text{CURRENT LIMITED} & \quad \text{BY PACKAGE} \\
\text{OPERATION IN THIS} & \quad \text{AREA MAY BE} \\
\text{LIMITED BY} & \quad \text{R}_{DS(ON)} \\
T_J & \quad \text{MAX RATED} \\
T_J = 25^\circ\text{C} & \quad \text{DC} \\
T_J = -55^\circ\text{C} & \quad 10\mu\text{s} \\
T_J = 175^\circ\text{C} & \quad 100\mu\text{s} \\
T_J = 25^\circ\text{C} & \quad 1\text{ms} \\
T_J = 175^\circ\text{C} & \quad 100\text{ms}
\end{align*}
\]

Figure 5. Forward Bias Safe Operating Area

\[
\begin{align*}
\text{I}_A, \text{AVALANCHE CURRENT (A)} & \quad \text{t}_A, \text{TIME IN AVALANCHE (ms)} \\
\text{R} & \quad \text{CURRENT LIMITED} \\
\text{BY PACKAGE} & \quad \text{OPERATION IN THIS} \\
\text{AREA MAY BE} & \quad \text{LIMITED BY} \quad \text{R}_{DS(ON)} \\
T_J & \quad \text{MAX RATED} \\
T_J = 25^\circ\text{C} & \quad 10\mu\text{s} \\
T_J = 175^\circ\text{C} & \quad 100\mu\text{s} \\
T_J = 25^\circ\text{C} & \quad 1\text{ms} \\
T_J = 175^\circ\text{C} & \quad 100\text{ms}
\end{align*}
\]

NOTE: Refer to ON Semiconductor Application Notes AN7514 and AN7515

Figure 6. Unclamped Inductive Switching Capability

\[
\begin{align*}
V_GS, \text{GATE TO SOURCE VOLTAGE (V)} & \quad I_D, \text{DRAIN CURRENT (A)} \\
V_{DS}, \text{DRAIN TO SOURCE VOLTAGE (V)} & \quad \text{NO LIMIT} \\
PULSE DURATION = 80\mu\text{s} & \quad \text{DUTY CYCLE} = 0.5\% \text{ MAX}
\end{align*}
\]

Figure 7. Transfer Characteristics

\[
\begin{align*}
I_D, \text{DRAIN CURRENT (A)} & \quad V_{DS}, \text{DRAIN TO SOURCE VOLTAGE (V)} \\
V_GS, \text{GATE TO SOURCE VOLTAGE (V)} & \quad \text{NO LIMIT}
\end{align*}
\]

Figure 8. Saturation Characteristics

\[
\begin{align*}
R_{DSS}, \text{NORMALIZED DRAIN TO SOURCE ON-RESISTANCE (m\text{\ohm})} & \quad V_GS, \text{GATE TO SOURCE VOLTAGE (V)} \\
T_J, \text{JUNCTION TEMPERATURE (\degree C)} & \quad \text{NO LIMIT}
\end{align*}
\]

Figure 9. Drain to Source On-Resistance Variation vs Gate to Source Voltage

\[
\begin{align*}
I_D = 40\text{A} & \quad \text{PULSE DURATION} = 80\mu\text{s} \\
\text{DUTY CYCLE} = 0.5\% \text{ MAX}
\end{align*}
\]

Figure 10. Normalized Drain to Source On-Resistance vs Junction Temperature

\[
\begin{align*}
I_D = 80\text{A} & \quad V_GS = 10\text{V}
\end{align*}
\]
Typical Characteristics  $T_J = 25^\circ C$ unless otherwise noted

Figure 11. Normalized Gate Threshold Voltage vs Junction Temperature

Figure 12. Normalized Drain to Source Breakdown Voltage vs Junction Temperature

Figure 13. Capacitance vs Drain to Source Voltage

Figure 14. Gate Charge vs Gate to Source Voltage