FDMS86200
N-Channel Shielded Gate PowerTrench® MOSFET
150 V, 35 A, 18 mΩ

Features
- Shielded Gate MOSFET Technology
- Max $r_{DS(on)} = 18 \, \text{mΩ}$ at $V_{GS} = 10 \, \text{V}$, $I_D = 9.6 \, \text{A}$
- Max $r_{DS(on)} = 21 \, \text{mΩ}$ at $V_{GS} = 6 \, \text{V}$, $I_D = 8.8 \, \text{A}$
- Advanced Package and Silicon combination for low $r_{DS(on)}$ and high efficiency
- MSL1 robust package design
- 100% UIL tested
- RoHS Compliant

General Description
This N-Channel MOSFET is produced using Fairchild Semiconductor’s advanced PowerTrench® process that incorporates Shielded Gate technology. This process has been optimized for the on-state resistance and yet maintain superior switching performance.

Application
- DC-DC Conversion

MOSFET Maximum Ratings $T_A = 25 ^\circ \text{C}$ unless otherwise noted

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<tr>
<th>Symbol</th>
<th>Parameter</th>
<th>Ratings</th>
<th>Units</th>
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<tbody>
<tr>
<td>$V_{DS}$</td>
<td>Drain to Source Voltage</td>
<td>150</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>Continuous $T_C = 25 ^\circ \text{C}$</td>
<td>35</td>
<td>A</td>
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<tr>
<td></td>
<td>Continuous $T_A = 25 ^\circ \text{C}$ (Note 1a)</td>
<td>9.6</td>
<td></td>
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<tr>
<td></td>
<td>Pulsed</td>
<td>100</td>
<td></td>
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<tr>
<td>$E_{AS}$</td>
<td>Single Pulse Avalanche Energy</td>
<td>220</td>
<td>mJ</td>
</tr>
<tr>
<td>$P_D$</td>
<td>Power Dissipation $T_C = 25 ^\circ \text{C}$</td>
<td>104</td>
<td>W</td>
</tr>
<tr>
<td></td>
<td>Power Dissipation $T_A = 25 ^\circ \text{C}$ (Note 1a)</td>
<td>2.5</td>
<td></td>
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<tr>
<td>$T_J, T_{STG}$</td>
<td>Operating and Storage Junction Temperature Range</td>
<td>-55 to +150</td>
<td>°C</td>
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</table>

Thermal Characteristics

| $R_{JC}$ | Thermal Resistance, Junction to Case | 1.2 | °C/W |
| $R_{JA}$ | Thermal Resistance, Junction to Ambient (Note 1a) | 50 | |

Package Marking and Ordering Information

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<tr>
<th>Device Marking</th>
<th>Device</th>
<th>Package</th>
<th>Reel Size</th>
<th>Tape Width</th>
<th>Quantity</th>
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<tr>
<td>FDMS86200</td>
<td>FDMS86200</td>
<td>Power 56</td>
<td>13 &quot;</td>
<td>12 mm</td>
<td>3000 units</td>
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### Electrical Characteristics  \( T_J = 25 \, ^\circ C \) unless otherwise noted

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<tr>
<th>Symbol</th>
<th>Parameter</th>
<th>Test Conditions</th>
<th>Min</th>
<th>Typ</th>
<th>Max</th>
<th>Units</th>
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<td><strong>Off Characteristics</strong></td>
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<td></td>
<td></td>
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<tr>
<td>( BVDSS )</td>
<td>Drain to Source Breakdown Voltage ( I_D = 250 , \mu A, V_{GS} = 0 , V )</td>
<td>150</td>
<td></td>
<td></td>
<td></td>
<td>V</td>
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<tr>
<td>( \Delta BVDSS/\Delta T_J )</td>
<td>Breakdown Voltage Temperature Coefficient ( I_D = 250 , \mu A, ) referenced to 25 °C</td>
<td>110 mV/°C</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>( I_{DSS} )</td>
<td>Zero Gate Voltage Drain Current ( V_DS = 120 , V, V_{GS} = 0 , V )</td>
<td>1 ( \mu A )</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>( I_{GSS} )</td>
<td>Gate to Source Leakage Current ( V_{GS} = \pm 20 , V, V_{DS} = 0 , V )</td>
<td>100 nA</td>
<td></td>
<td></td>
<td></td>
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</table>

| **On Characteristics**                                              |                 |                 |     |     |     |       |
| \( V_{GS(th)} \)   | Gate to Source Threshold Voltage \( V_{GS} = V_{DS}, I_D = 250 \, \mu A \) | 2.0 V | 2.5 V | 4.0 V | V |       |
| \( \Delta V_{GS(th)}/\Delta T_J \)   | Gate to Source Threshold Voltage Temperature Coefficient \( I_D = 250 \, \mu A, \) referenced to 25 °C | -10 mV/°C |     |     |     |       |
| \( r_{DS(on)} \)   | Static Drain to Source On Resistance \( V_{DS} = 10 \, V, I_D = 9.6 \, A \) | 15 mΩ | 18 mΩ |     |     |       |
| \( g_{FS} \)   | Forward Transconductance \( V_{DD} = 10 \, V, I_D = 9.6 \, A \) | 33 S |     |     |     |       |

| **Dynamic Characteristics**                                          |                 |                 |     |     |     |       |
| \( C_{iss} \)   | Input Capacitance \( V_{DS} = 75 \, V, V_{GS} = 0 \, V, f = 1 \, MHz \) | 2041 pF | 2715 pF |     |     | pF |
| \( C_{oss} \)   | Output Capacitance \( f = 1 \, MHz \) | 203 pF | 270 pF |     |     | pF |
| \( C_{rss} \)   | Reverse Transfer Capacitance \( f = 1 \, MHz \) | 10 pF | 16 pF |     |     | pF |
| \( R_{G} \)   | Gate Resistance | 1.2 Ω | 3 Ω |     |     | Ω |

| **Switching Characteristics**                                         |                 |                 |     |     |     |       |
| \( t_{d(on)} \)   | Turn-On Delay Time \( V_{DD} = 75 \, V, I_D = 9.6 \, A, R_{GEN} = 6 \, \Omega \) | 13 ns | 23 ns |     |     | ns |
| \( t_{r} \)   | Rise Time \( V_{GS} = 10 \, V, R_{GEN} = 6 \, \Omega \) | 7.9 ns | 16 ns |     |     | ns |
| \( t_{d(off)} \)   | Turn-Off Delay Time \( V_{GS} = 10 \, V, R_{GEN} = 6 \, \Omega \) | 27 ns | 44 ns |     |     | ns |
| \( t_{f} \)   | Fall Time \( V_{GS} = 10 \, V, R_{GEN} = 6 \, \Omega \) | 5.8 ns | 12 ns |     |     | ns |
| \( Q_{g(TOT)} \)   | Total Gate Charge \( V_{GS} = 0 \, V \) to 10 V | 33 nC | 46 nC |     |     | nC |
| \( Q_{gs} \)   | Total Gate Charge \( V_{GS} = 0 \, V \) to 5 V \( V_{DD} = 75 \, V, I_D = 9.6 \, A \) | 18 nC | 26 nC |     |     | nC |
| \( Q_{gd} \)   | Gate to Drain “Miller” Charge | 7.9 nC |     |     |     | nC |

| **Drain-Source Diode Characteristics**                                |                 |                 |     |     |     |       |
| \( V_{SD} \)   | Source to Drain Diode Forward Voltage \( V_{GS} = 0 \, V, I_S = 2 \, A \) (Note 2) | 0.69 V | 1.2 V |     |     | V |
| \( I_{rr} \)   | Reverse Recovery Time \( I_S = 9.6 \, A \) | 0.77 V | 1.3 V |     |     | V |
| \( Q_{rr} \)   | Reverse Recovery Charge \( I_F = 9.6 \, A, \) \( \text{di/dt} = 100 \, \text{A/\mu s} \) | 76 ns | 120 ns |     |     | ns |

**NOTES:**
1. \( R_{UJ} \) is determined with the device mounted on a 1 in\(^2\) pad 2 oz copper pad on a 1.5 x 1.5 in. board of FR-4 material. \( R_{UC} \) is guaranteed by design while \( R_{CA} \) is determined by the user's board design.
2. Pulse Test: Pulse Width < 300 \( \mu \)s, Duty cycle < 2.0%.
3. \( E_{AS} \) of 220 mJ is based on starting \( T_J = 25 \, ^\circ C, L = 1 \, \text{mH}, I_{AS} = 21 \, A, V_{DD} = 150 \, V, V_{GS} = 10 \, V \). 100% test at \( L = 0.1 \, \text{mH}, I_{AS} = 46 \, A \).
Typical Characteristics  $T_J = 25 \, ^\circ C$ unless otherwise noted

**Figure 1.** On-Region Characteristics

**Figure 2.** Normalized On-Resistance vs Drain Current and Gate Voltage

**Figure 3.** Normalized On-Resistance vs Junction Temperature

**Figure 4.** On-Resistance vs Gate to Source Voltage

**Figure 5.** Transfer Characteristics

**Figure 6.** Source to Drain Diode Forward Voltage vs Source Current
Typical Characteristics $T_J = 25 \, ^\circ C$ unless otherwise noted

**Figure 7.** Gate Charge Characteristics

**Figure 8.** Capacitance vs Drain to Source Voltage

**Figure 9.** Unclamped Inductive Switching Capability

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

**Figure 11.** Forward Bias Safe Operating Area

**Figure 12.** Single Pulse Maximum Power Dissipation
Typical Characteristics \( T_J = 25 \, ^\circ\text{C} \) unless otherwise noted

Figure 13. Transient Thermal Response Curve
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Rev. I71
NOTES: UNLESS OTHERWISE SPECIFIED
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F. DRAWING FILE NAME: PQFN08AREV9
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