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FAIRCHILD SEMICONDUCTOR®

February 2010

# FDP2710_F085

## N-Channel PowerTrench® MOSFET

## 250V, 50A, 47mΩ

### Features

- Typ $r_{DS(on)}$ = 38mΩ at $V_{GS}$ = 10V, $I_D$ = 50A
- Typ $Q_{g(TOT)}$ = 78nC at $V_{GS}$ = 10V
- Fast switching speed
- Low gate charge
- High performance trench technology for extremely low RDS(on)
- High power and current handling capability
- Qualified to AEC Q101
- RoHS Compliant

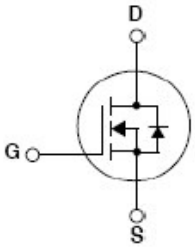
### General Description

This N-Channel MOSFET is produced using Fairchil Semiconductor's advanced PowerTrench process that has been especially tailored to minimize the on-state resistance and yet maintain superior switching performance.

### Applications

- PDP application
- Hybrid Electric Vehicle DC/DC converters


TO-220AB
FDP SERIES



## MOSFET Maximum Ratings $T_C$ = 25°C unless otherwise noted

| Symbol | Parameter | Ratings | Units |
|---|---|---|---|
| $V_{DSS}$ | Drain to Source Voltage | 250 | V |
| $V_{GS}$ | Gate to Source Voltage | ±30 | V |
| $I_D$ | Drain Current Continuous ($T_C$ < 50°C, $V_{GS}$ = 10V) | 50 | A |
| | Continuous ($T_{amb}$ = 25°C, $V_{GS}$ = 10V, with $R_{\theta JA}$ = 62°C/W) | 4 | |
| | Pulsed | See Figure 4 | |
| $E_{AS}$ | Single Pulse Avalanche Energy (Note 1) | 483 | mJ |
| $P_D$ | Power Dissipation | 403 | W |
| | Derate above 25°C | 3.2 | W/°C |
| $T_J$, $T_{STG}$ | Operating and Storage Temperature | -55 to +150 | °C |

## Thermal Characteristics

| | | | |
|---|---|---|---|
| $R_{\theta JC}$ | Maximum Thermal Resistance Junction to Case | 0.31 | °C/W |
| $R_{\theta JA}$ | Maximum Thermal Resistance Junction to Ambient (Note 2) | 62 | °C/W |

## Package Marking and Ordering Information

| Device Marking | Device | Package | Reel Size | Tape Width | Quantity |
|---|---|---|---|---|---|
| FDP2710 | FDP2710_F085 | TO220 | Tube | NA | 50 units |

## Electrical Characteristics $T_C$ = 25°C unless otherwise noted

| Symbol | Parameter | Test Conditions | Min | Typ | Max | Units |
|---|---|---|---|---|---|---|
| **Off Characteristics** | | | | | | |
| $B_{VDSS}$ | Drain to Source Breakdown Voltage | $I_D$ = 250μA, $V_{GS}$ = 0V | 250 | - | - | V |
| $\Delta BV_{DSS}$ / $\Delta T_J$ | Breakdown Voltage Temperature Coefficient | $I_D$ = 250μA, Referenced to 25°C | - | 0.25 | - | V/°C |
| $I_{DSS}$ | Zero Gate Voltage Drain Current | $V_{DS}$ = 250V, $V_{GS}$ = 0V | - | - | 1 | μA |
| | | $V_{DS}$ = 250V, $V_{GS}$ = 0V, $T_C$ = 125°C | - | - | 500 | |
| $I_{GSS}$ | Gate to Source Leakage Current | $V_{GS}$ = ±30V | - | - | ±100 | nA |
| **On Characteristics** | | | | | | |
| $V_{GS(th)}$ | Gate to Source Threshold Voltage | $V_{GS}$ = $V_{DS}$, $I_D$ = 250μA | 3 | 3.9 | 5 | V |
| $r_{DS(on)}$ | Drain to Source On Resistance | $I_D$ = 50A, $V_{GS}$= 10V, | - | 38 | 47 | mΩ |
| | | $I_D$ = 50A, $V_{GS}$= 10V, $T_J$ = 150°C | - | 104 | 129 | |
| $g_{FS}$ | Forward Transconductance | $I_D$ = 25A, $V_{DS}$= 10V | - | 63 | - | S |
| **Dynamic Characteristics** | | | | | | |
| $C_{iss}$ | Input Capacitance | $V_{DS}$ = 25V, $V_{GS}$ = 0V, f = 1MHz | - | 5690 | - | pF |
| $C_{oss}$ | Output Capacitance | | - | 425 | - | pF |
| $C_{rss}$ | Reverse Transfer Capacitance | | - | 115 | - | pF |
| $Q_{g(TOT)}$ | Total Gate Charge at 20V | $V_{GS}$ = 0 to 10V, $V_{DD}$ = 125V, $I_D$ = 50A | - | 78 | 101 | nC |
| $Q_{gs}$ | Gate to Source Gate Charge | | - | 31 | - | nC |
| $Q_{gd}$ | Gate to Drain “Miller“ Charge | | - | 20 | - | nC |

## Electrical Characteristics $T_C$ = 25°C unless otherwise noted

| Symbol | Parameter | Test Conditions | Min | Typ | Max | Units |
|---|---|---|---|---|---|---|
| **Switching Characteristics** | | | | | | |
| $t_{d(on)}$ | Turn-On Delay Time | $V_{DD}$ = 125V, $I_D$ = 50A<br>$V_{GS}$ = 10V, $R_{GEN}$ = 25Ω | - | 85 | - | ns |
| $t_r$ | Rise Time | | - | 183 | - | ns |
| $t_{d(off)}$ | Turn-Off Delay Time | | - | 140 | - | ns |
| $t_f$ | Fall Time | | - | 121 | - | ns |
| **Drain-Source Diode Characteristics** | | | | | | |
| $I_S$ | Maximum Continuous Drain-Source Diode Forward Current | | - | - | 50 | A |
| $I_{SM}$ | Maximum Pulsed Drain-Source Diode Forward Current | | - | - | 150 | A |
| $V_{SD}$ | Source to Drain Diode Voltage | $I_{SD}$ = 50A | - | 0.9 | 1.2 | V |
| $t_{rr}$ | Reverse Recovery Time | $I_{SD}$ = 50A, $dI_{SD}/dt$ = 100A/μs | - | 166 | 216 | ns |
| $Q_{rr}$ | Reverse Recovery Charge | | - | 1 | 1.3 | uC |

**Notes:**

**1:** Starting $T_J$ = 25°C, L = 1.68mH, $I_{AS}$ = 24A.

**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 Fairchild Semiconductor products are manufactured, assembled and tested under ISO9000 and QS9000 quality systems certification.**

## Typical Characteristics

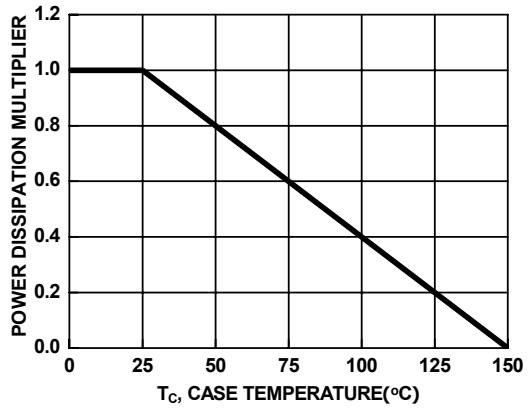



**Figure 1. Normalized Power Dissipation vs Case Temperature**

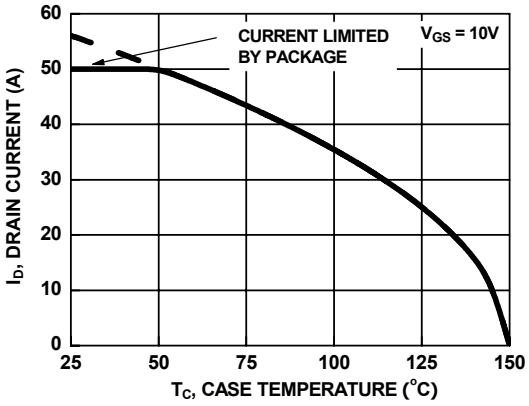



**Figure 2. Maximum Continuous Drain Current vs Case Temperature**

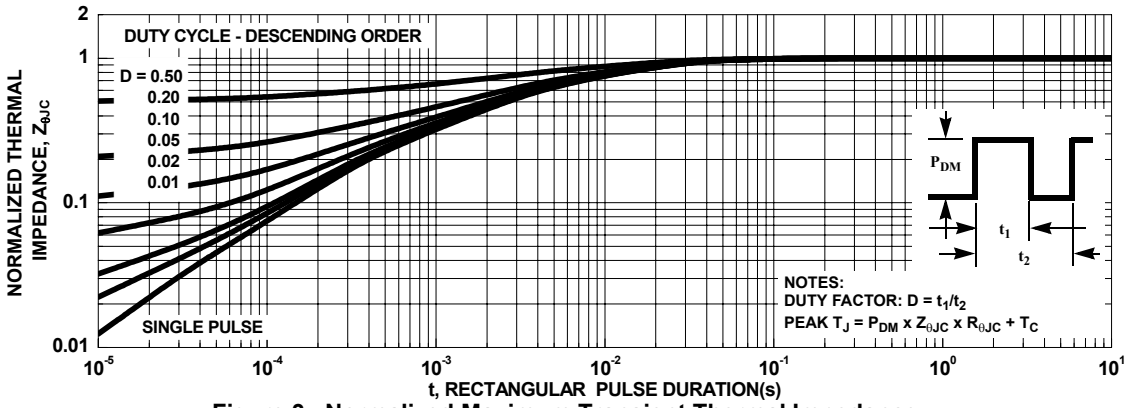



**Figure 3. Normalized Maximum Transient Thermal Impedance**

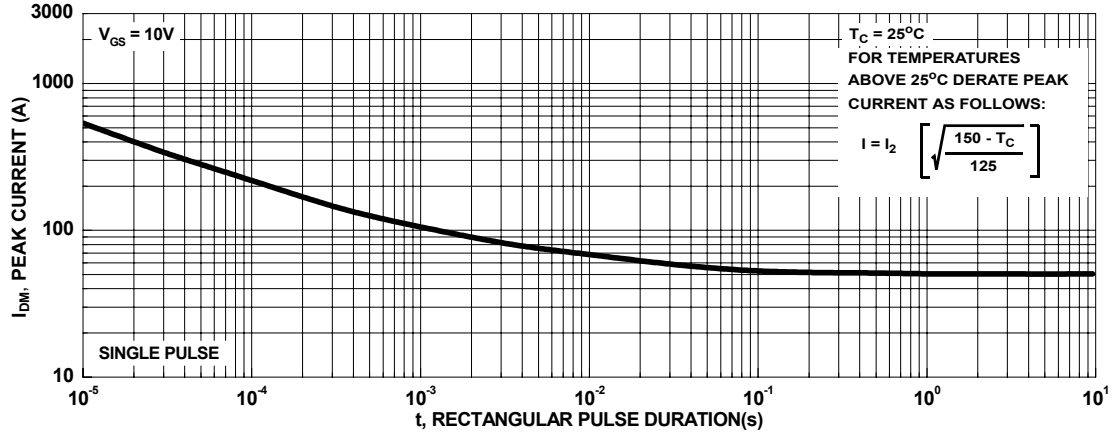



**Figure 4. Peak Current Capability**

## Typical Characteristics

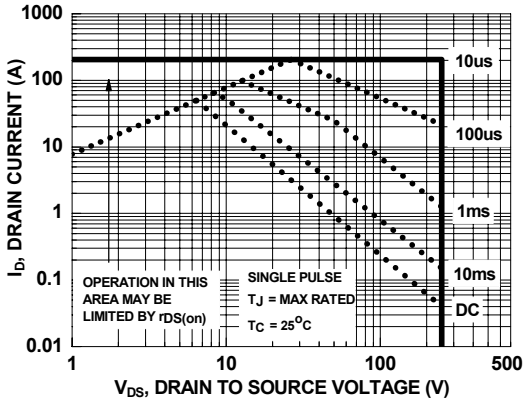
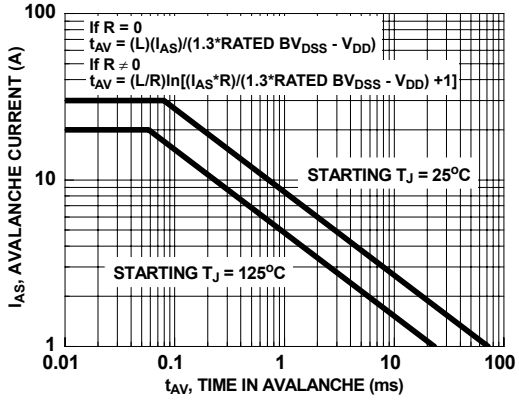



**Figure 5. Forward Bias Safe Operating Area**




NOTE: Refer to Fairchild Application Notes AN7514 and AN7515

**Figure 6. Unclamped Inductive Switching Capability**

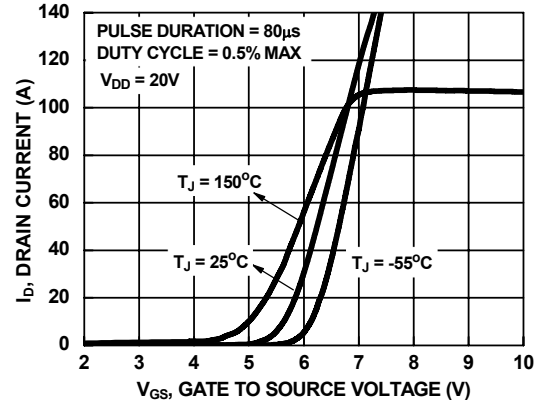



**Figure 7. Transfer Characteristics**

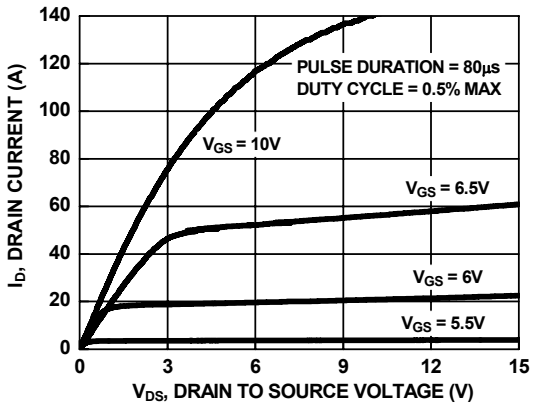



**Figure 8. Saturation Characteristics**

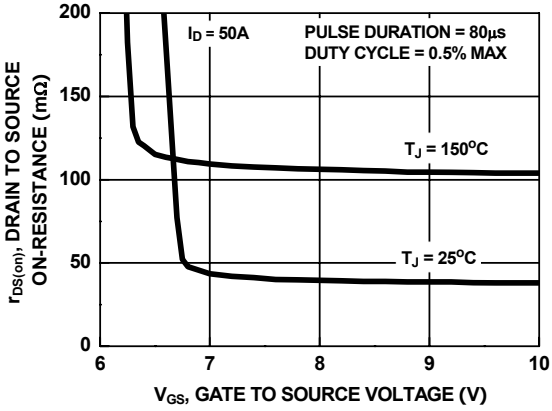



**Figure 9. Drain to Source On-Resistance Variation vs Gate to Source Voltage**

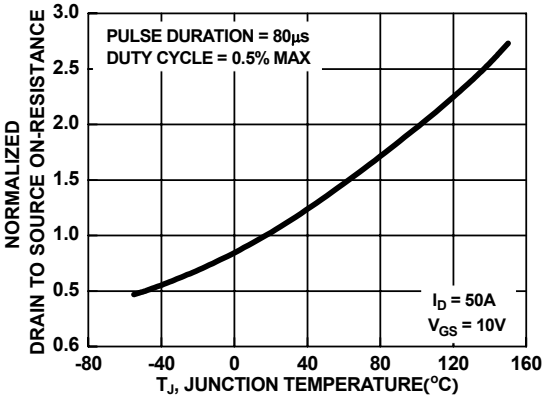



**Figure 10. Normalized Drain to Source On Resistance vs Junction Temperature**

## Typical Characteristics

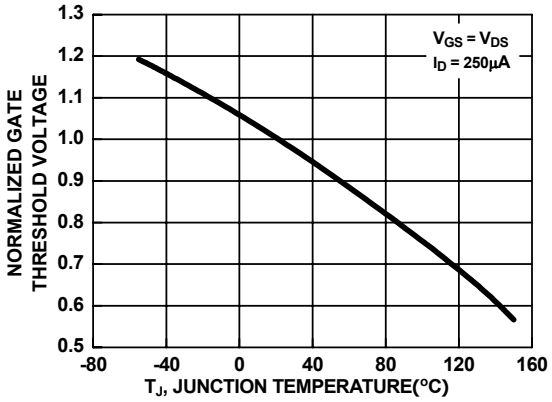



**Figure 11. Normalized Gate Threshold Voltage vs Junction Temperature**

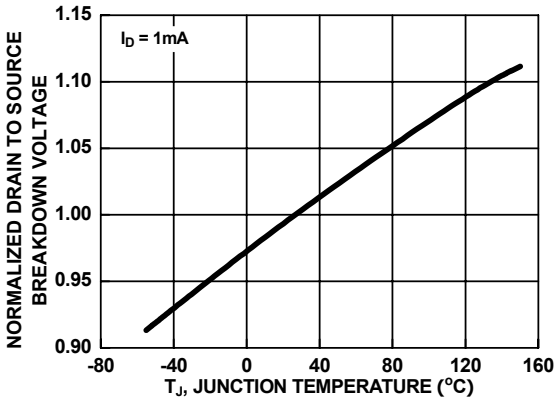



**Figure 12. Normalized Drain to Source Breakdown Voltage vs Junction Temperature**

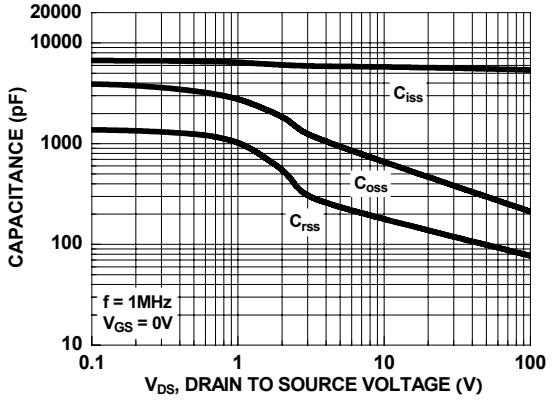



**Figure 13. Capacitance vs Drain to Source Voltage**

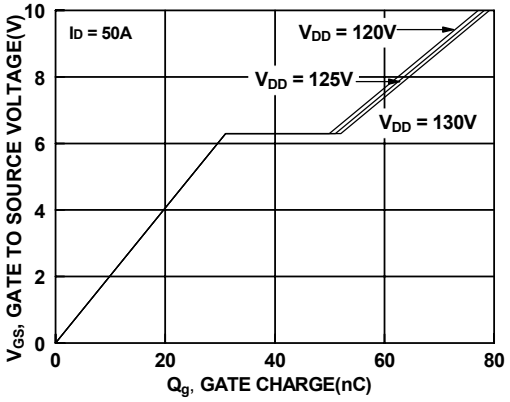



**Figure 14. Gate Charge vs Gate to Source Voltage**

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