FAIRCHILD SEMICONDUCTOR®

April 2010

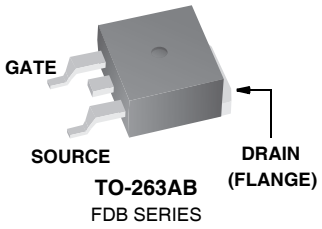
# FDB5800
# N-Channel Logic Level PowerTrench® MOSFET
## 60V, 80A, 7mΩ

## Features

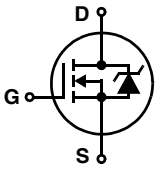
- $r_{DS(ON)}$ = 5.5mΩ (Typ.), $V_{GS}$ = 5V, $I_D$ = 80A
- High performance trench technology for extermely low Rdson
- Low Gate Charge
- High power and current handling capability
- RoHS Compliant

## Applications

- DC-DC Converters and Off-Line UPS




TO-263AB
FDB SERIES



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

| Symbol | Parameter | Ratings | Units |
|---|---|---|---|
| $V_{DSS}$ | Drain to Source Voltage | 60 | V |
| $V_{GS}$ | Gate to Source Voltage | ±20 | V |
| $I_D$ | Drain Current<br>Continuous ($T_C$ < 102°C, $V_{GS}$ = 10V) | 80 | A |
| | Continuous ($T_C$ < 90°C, $V_{GS}$ = 5V) | 80 | A |
| | Continuous ($T_{amb}$ = 25°C, $V_{GS}$ = 10V, with $R_{\theta JA}$ = 43°C/W) | 14 | A |
| | Pulsed | Figure 4 | A |
| $E_{AS}$ | Single Pulse Avalanche Energy (Note 1) | 652 | mJ |
| $P_D$ | Power dissipation | 242 | W |
| | Derate above 25°C | 1.61 | W/°C |
| $T_J$, $T_{STG}$ | Operating and Storage Temperature | -55 to 175 | °C |

## Thermal Characteristics

| | | | |
|---|---|---|---|
| $R_{\theta JC}$ | Thermal Resistance Junction to Case TO-263 | 0.62 | °C/W |
| $R_{\theta JA}$ | Thermal Resistance Junction to Ambient TO-263 ( Note 2) | 62.5 | °C/W |
| $R_{\theta JA}$ | Thermal Resistance Junction to Ambient TO-263, 1in$^2$ copper pad area | 43 | °C/W |

## Package Marking and Ordering Information

| Device Marking | Device | Package | Reel Size | Tape Width | Quantity |
|---|---|---|---|---|---|
| FDB5800 | FDB5800 | TO-263AB | 330mm | 24mm | 800 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 | 60 | - | - | V |
| $I_{DSS}$ | Zero Gate Voltage Drain Current | $V_{DS}$ = 48V, $V_{GS}$ = 0V | - | - | 1 | μA |
| | | $V_{DS}$ = 48V, $V_{GS}$ = 0V, $T_C$ = 150°C | - | - | 250 | |
| $I_{GSS}$ | Gate to Source Leakage Current | $V_{GS}$ = ±20V | - | - | ±100 | nA |
| **On Characteristics** | | | | | | |
| $V_{GS(TH)}$ | Gate to Source Threshold Voltage | $V_{GS}$ = $V_{DS}$, $I_D$ = 250μA | 1.0 | - | 2.5 | V |
| $r_{DS(ON)}$ | Drain to Source On Resistance | $I_D$ = 80A, $V_{GS}$ = 10V | - | 4.6 | 6.0 | mΩ |
| | | $I_D$ = 80A, $V_{GS}$ = 4.5V | - | 5.8 | 7.2 | |
| | | $I_D$ = 80A, $V_{GS}$ = 5V | - | 5.5 | 7.0 | |
| | | $I_D$ = 80A, $V_{GS}$ = 10V, $T_J$ = 175°C | - | 10 | 12.6 | |
| **Dynamic Characteristics** | | | | | | |
| $C_{ISS}$ | Input Capacitance | $V_{DS}$ = 15V, $V_{GS}$ = 0V, f = 1MHz | - | 6625 | - | pF |
| $C_{OSS}$ | Output Capacitance | | - | 628 | - | pF |
| $C_{RSS}$ | Reverse Transfer Capacitance | | - | 262 | - | pF |
| $R_G$ | Gate Resistance | $V_{GS}$ = 0.5V, f = 1MHz | - | 1.4 | - | Ω |
| $Q_{g(TOT)}$ | Total Gate Charge at 10V | $V_{GS}$ = 0V to 10V, $V_{DD}$ = 30V, $I_D$ = 80A, $I_g$ = 1.0mA | - | 104 | 135 | nC |
| $Q_{g(5)}$ | Total Gate Charge at 5V | $V_{GS}$ = 0V to 5V | - | 55 | 72 | nC |
| $Q_{g(TH)}$ | Threshold Gate Charge | $V_{GS}$ = 0V to 1V | - | 6.0 | - | nC |
| $Q_{gs}$ | Gate to Source Gate Charge | | - | 18.4 | - | nC |
| $Q_{gs2}$ | Gate Charge Threshold to Plateau | | - | 12.5 | - | nC |
| $Q_{gd}$ | Gate to Drain “Miller” Charge | | - | 20.1 | - | nC |

## Switching Characteristics ($V_{GS}$ = 5V)

| | | | | | | |
|---|---|---|---|---|---|---|
| $t_{ON}$ | Turn-On Time | $V_{DD}$ = 30V, $I_D$ = 80A<br>$V_{GS}$ = 5V, $R_{GS}$ = 2Ω | - | - | 62.1 | ns |
| $t_{d(ON)}$ | Turn-On Delay Time | | - | 20.3 | - | ns |
| $t_r$ | Rise Time | | - | 22.0 | - | ns |
| $t_{d(OFF)}$ | Turn-Off Delay Time | | - | 27.1 | - | ns |
| $t_f$ | Fall Time | | - | 12.1 | - | ns |
| $t_{OFF}$ | Turn-Off Time | | - | - | 59.0 | ns |

## Drain-Source Diode Characteristics

| | | | | | | |
|---|---|---|---|---|---|---|
| $V_{SD}$ | Source to Drain Diode Voltage | $I_{SD}$ = 80A | - | - | 1.25 | V |
| | | $I_{SD}$ = 40A | - | - | 1.0 | V |
| $t_{rr}$ | Reverse Recovery Time | $I_{SD}$ = 60A, $dI_{SD}/dt$ = 100A/μs | - | - | 44 | ns |
| $Q_{RR}$ | Reverse Recovered Charge | $I_{SD}$ = 60A, $dI_{SD}/dt$ = 100A/μs | - | - | 57 | nC |

**Notes:**
**1:** Starting $T_J$ = 25°C, L = 1mH, $I_{AS}$ = 36A, $V_{DD}$ = 54V, $V_{GS}$ = 10V.
**2:** Pulse width = 100s.

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

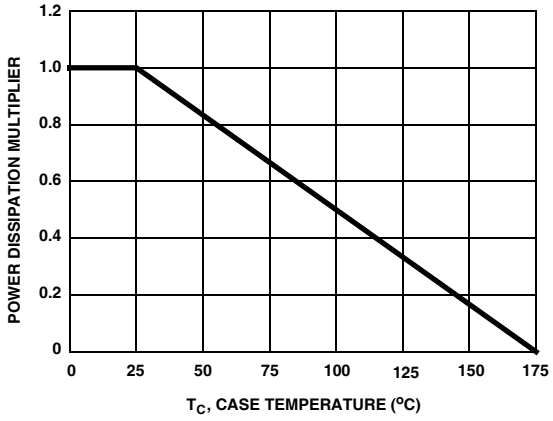



**Figure 1. Normalized Power Dissipation vs Case Temperature**

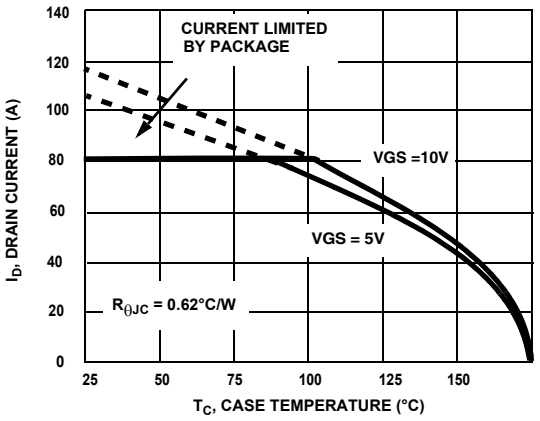



**Figure 2. Maximum Continuous Drain Current vs Case Temperature**

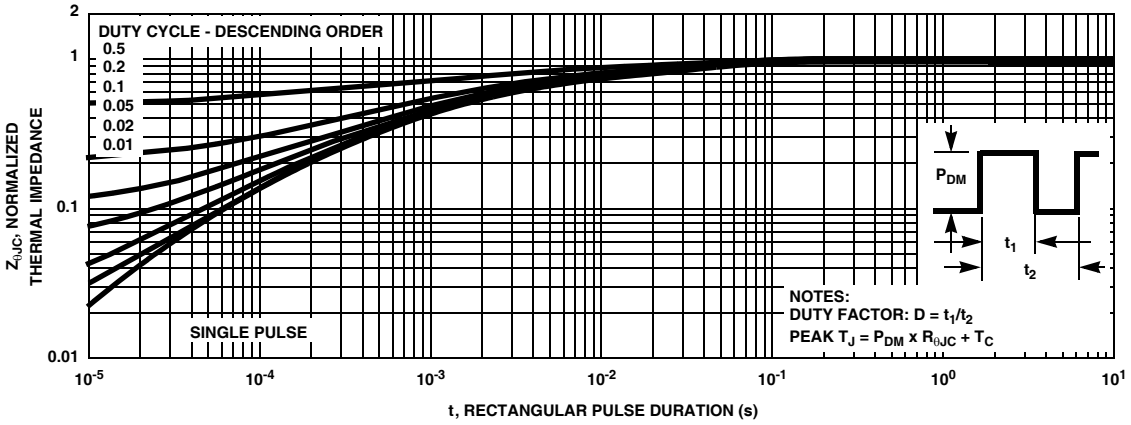



**Figure 3. Normalized Maximum Transient Thermal Impedance**

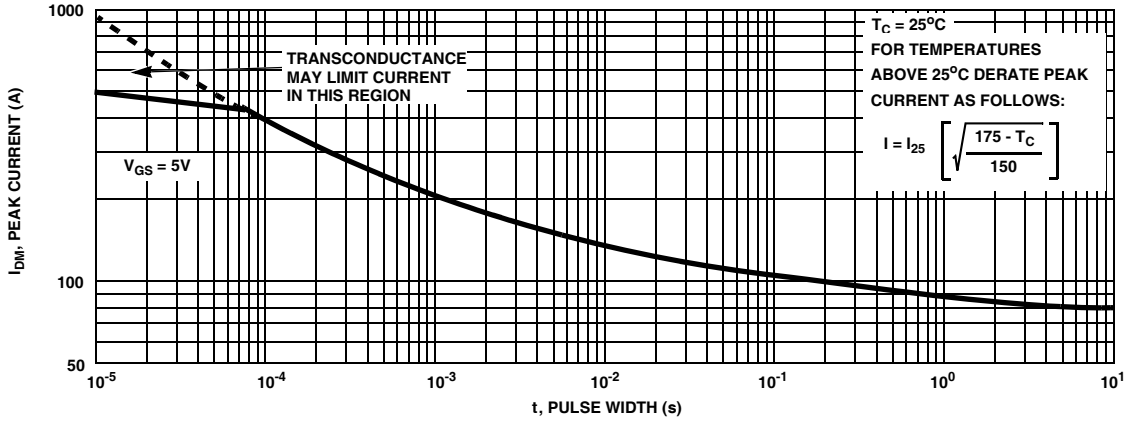



**Figure 4. Peak Current Capability**

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

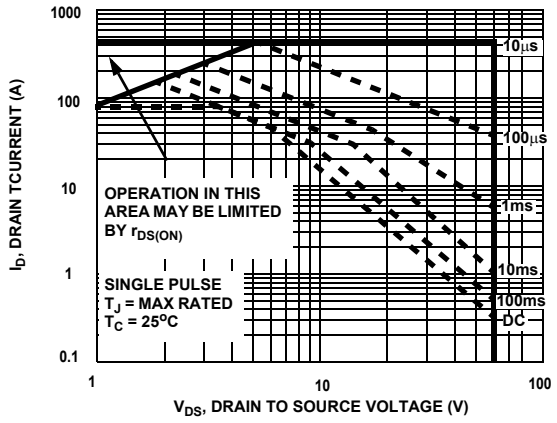
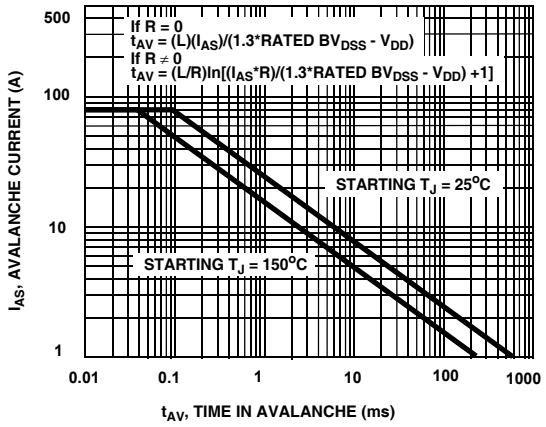



**Figure 5. Forward Bias Safe Operating Area**




NOTE: Refer to Fairchild Application Notes AN7514 and AN7515

**Figure 6. Unclamped Inductive Switching Capability**

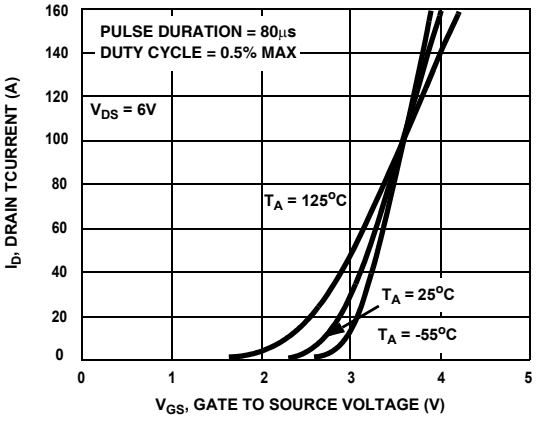



**Figure 7. Transfer Characteristics**

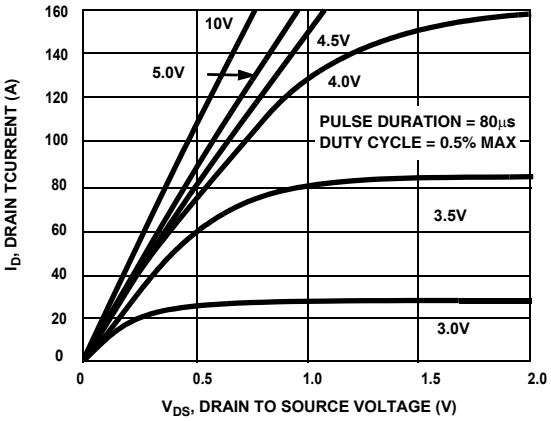



**Figure 8. Saturation Characteristics**

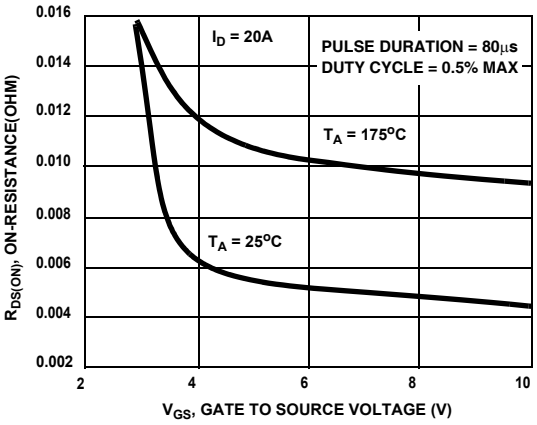



**Figure 9. On-Resistance Variation vs Gate-to-Source Voltage**

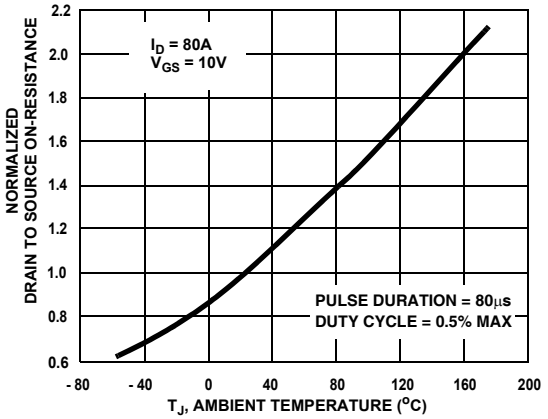



**Figure 10. Normalized Drain to Source On Resistance vs Junction Temperature**

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

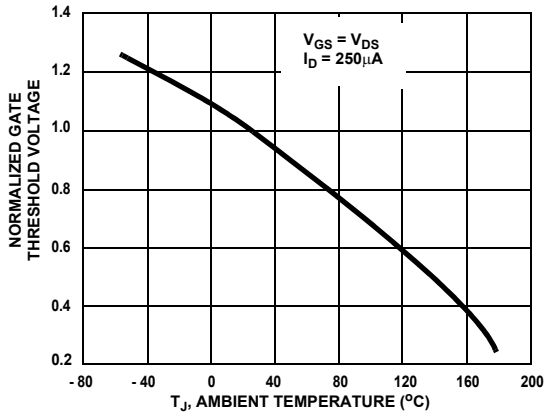



**Figure 11. Normalized Gate Threshold Voltage vs Junction Temperature**

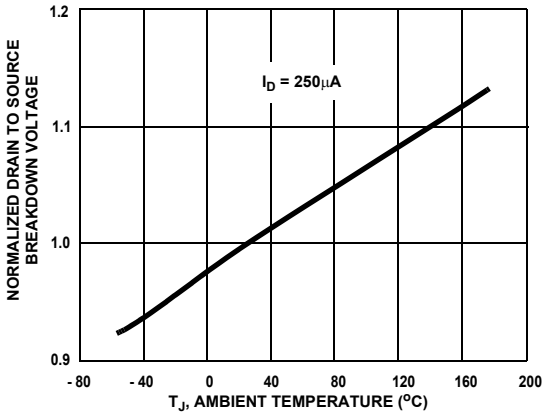



**Figure 12. Normalized Drain to Source Breakdown Voltage vs Junction Temperature**

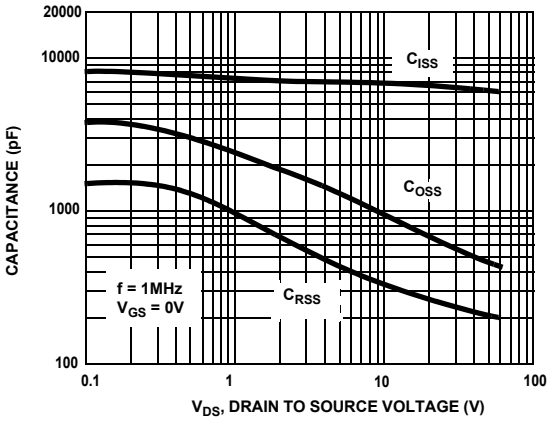



**Figure 13. Capacitance vs Drain to Source Voltage**

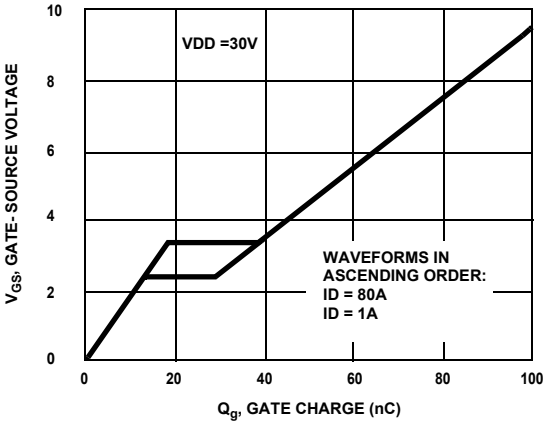



**Figure 14. Gate Charge Waveforms for Constant Gate Current**

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