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FAIRCHILD SEMICONDUCTOR®

December 2012

# FDP8441

## N-Channel PowerTrench® MOSFET
## 40V, 80A, 2.7mΩ

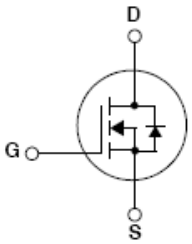
### Features

- Typ $r_{DS(on)}$ = 2.1mΩ at $V_{GS}$ = 10V, $I_D$ = 80A
- Typ $Q_{g(10)}$ = 215nC at $V_{GS}$ = 10V
- Low Miller Charge
- Low $Q_{rr}$ Body Diode
- UIS Capability (Single Pulse and Repetitive Pulse)
- RoHS Compliant

### Applications

- Solenoid and Motor Drivers
- Distributed Power Architectures and VRMs

TO-220AB
FDP SERIES



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

| Symbol | Parameter | Ratings | Units |
|---|---|---|---|
| $V_{DS}$ | Drain to Source Voltage | 40 | V |
| $V_{GS}$ | Gate to Source Voltage | ±20 | V |
| $I_D$ | Drain Current Continuous ($T_C$ < 160°C, $V_{GS}$ = 10V) | 80 | A |
| | Continuous ($T_{amb}$ = 25°C, $V_{GS}$ = 10V, with $R_{\theta JA}$ = 62°C/W) | 23 | |
| | Pulsed | See Figure 4 | |
| $E_{AS}$ | Single Pulse Avalanche Energy (Note 1) | 947 | mJ |
| $P_D$ | Power dissipation | 300 | W |
| | Derate above 25°C | 2 | W/°C |
| $T_J$, $T_{STG}$ | Operating and Storage Temperature | -55 to 175 | °C |

## Thermal Characteristics

| | | | |
|---|---|---|---|
| $R_{\theta JC}$ | Thermal Resistance Junction to Case | 0.5 | °C/W |
| $R_{\theta JA}$ | Thermal Resistance Junction to Ambient (Note 2) | 62 | °C/W |

## Package Marking and Ordering Information

| Device Marking | Device | Package | Reel Size | Tape Width | Quantity |
|---|---|---|---|---|---|
| FDP8441 | FDP8441 | TO-220AB | Tube | N/A | 50 units |

## Electrical Characteristics $T_J$ = 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 | 40 | - | - | V |
| $I_{DSS}$ | Zero Gate Voltage Drain Current | $V_{DS}$ = 32V, $V_{GS}$ = 0V | - | - | 1 | μA |
| | | $V_{DS}$ = 32V, $V_{GS}$ = 0V, $T_J$ = 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 | $V_{DS}$ = $V_{GS}$, $I_D$ = 250μA | 2 | 2.8 | 4 | V |
| $r_{DS(on)}$ | Drain to Source On Resistance | $I_D$ = 80A, $V_{GS}$ = 10V | - | 2.1 | 2.7 | mΩ |
| | | $I_D$ = 80A, $V_{GS}$ = 10V, $T_J$ = 175°C | - | 3.6 | 4.7 | |
| **Dynamic Characteristics** | | | | | | |
| $C_{iss}$ | Input Capacitance | $V_{DS}$ = 25V, $V_{GS}$ = 0V, f = 1MHz | - | 15000 | - | pF |
| $C_{oss}$ | Output Capacitance | | - | 1250 | - | pF |
| $C_{rss}$ | Reverse Transfer Capacitance | | - | 685 | - | pF |
| $R_G$ | Gate Resistance | $V_{GS}$ = 0.5V, f = 1MHz | - | 1.1 | - | Ω |
| $Q_{g(TOT)}$ | Total Gate Charge at 10V | $V_{GS}$ = 0 to 10V; $V_{DD}$ = 20V, $I_D$ = 35A, $I_g$ = 1mA | - | 215 | 280 | nC |
| $Q_{g(TH)}$ | Threshold Gate Charge | $V_{GS}$ = 0 to 2V; $V_{DD}$ = 20V, $I_D$ = 35A, $I_g$ = 1mA | - | 29 | 38 | nC |
| $Q_{gs}$ | Gate to Source Gate Charge | $V_{DD}$ = 20V, $I_D$ = 35A, $I_g$ = 1mA | - | 60 | - | nC |
| $Q_{gs2}$ | Gate Charge Threshold to Plateau | $V_{DD}$ = 20V, $I_D$ = 35A, $I_g$ = 1mA | - | 32 | - | nC |
| $Q_{gd}$ | Gate to Drain "Miller" Charge | $V_{DD}$ = 20V, $I_D$ = 35A, $I_g$ = 1mA | - | 49 | - | nC |



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

| Symbol | Parameter | Test Conditions | Min | Typ | Max | Units |
|---|---|---|---|---|---|---|
| **Switching Characteristics** | | | | | | |
| $t_{(on)}$ | Turn-On Time | $V_{DD}$ = 20V, $I_D$ = 35A<br>$V_{GS}$ = 10V, $R_{GS}$ = 1.5Ω | - | - | 77 | ns |
| $t_{d(on)}$ | Turn-On Delay Time | | - | 23 | - | ns |
| $t_r$ | Turn-On Rise Time | | - | 24 | - | ns |
| $t_{d(off)}$ | Turn-Off Delay Time | | - | 75 | - | ns |
| $t_f$ | Turn-Off Fall Time | | - | 17.9 | - | ns |
| $t_{off}$ | Turn-Off Time | | - | - | 147 | ns |
| **Drain-Source Diode Characteristics** | | | | | | |
| $V_{SD}$ | Source to Drain Diode Voltage | $I_{SD}$ = 35A | - | 0.8 | 1.25 | V |
| | | $I_{SD}$ = 15A | - | 0.8 | 1.0 | V |
| $t_{rr}$ | Reverse Recovery Time | $I_F$ = 35A, di/dt = 100A/µs | - | 52 | 68 | ns |
| $Q_{rr}$ | Reverse Recovery Charge | $I_F$ = 35A, di/dt = 100A/µs | - | 76 | 99 | nC |

**Notes:**
**1:** Starting $T_J$ = 25°C, L = 0.46mH, $I_{AS}$ = 64A.
**2:** Pulse width = 100s.



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## Typical Characteristics

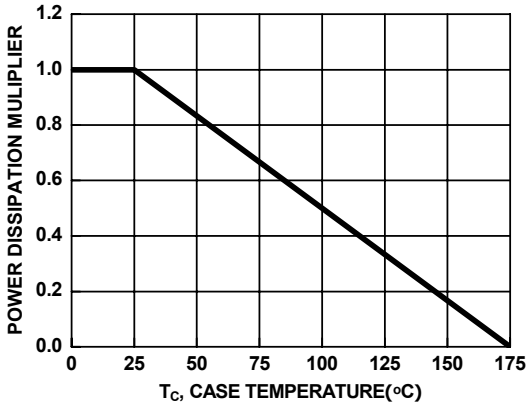


**Figure 1. Normalized Power Dissipation vs Case Temperature**

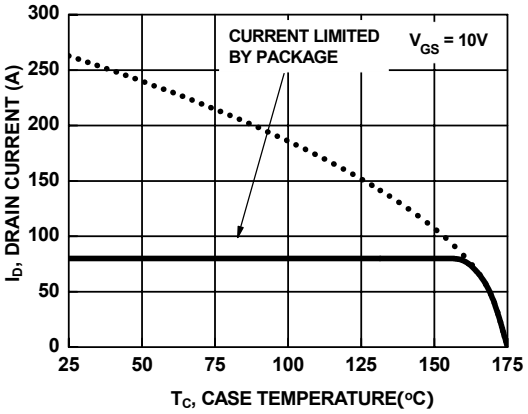


**Figure 2. Maximum Continuous Drain Current vs Case Temperature**

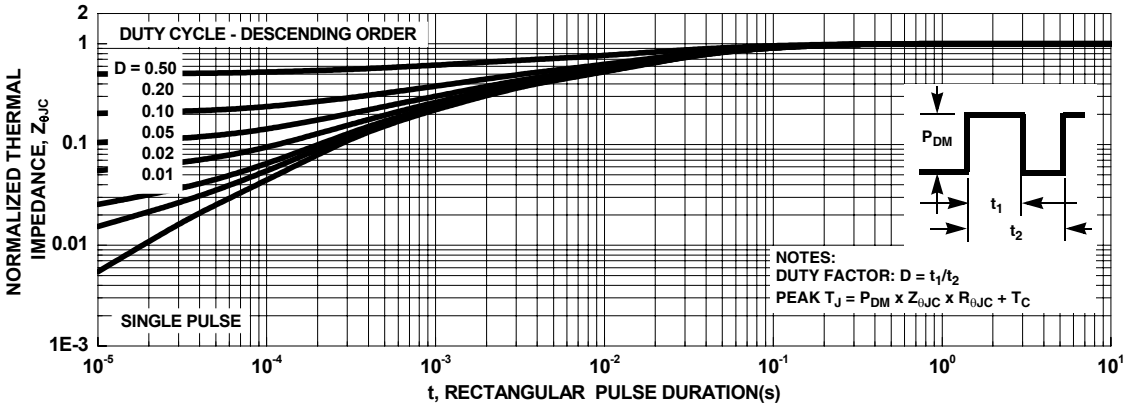


**Figure 3. Normalized Maximum Transient Thermal Impedance**

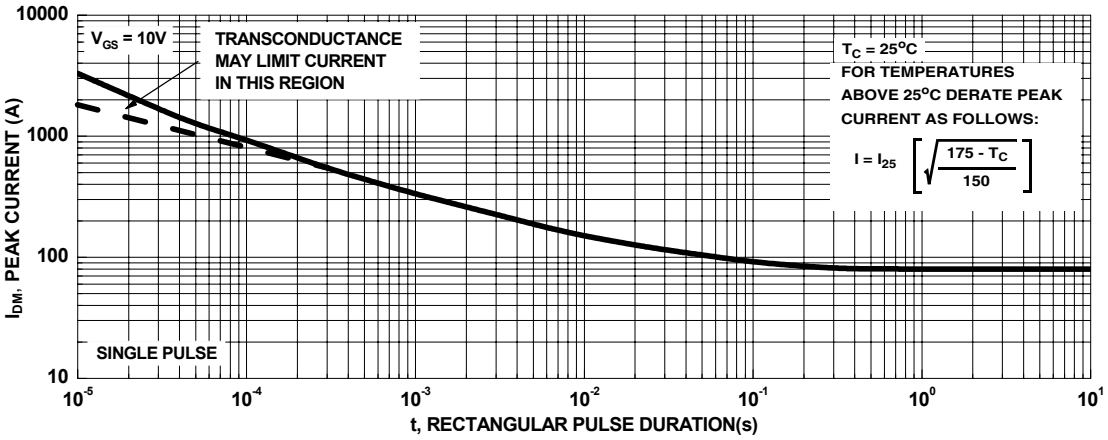


**Figure 4. Peak Current Capability**



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## Typical Characteristics

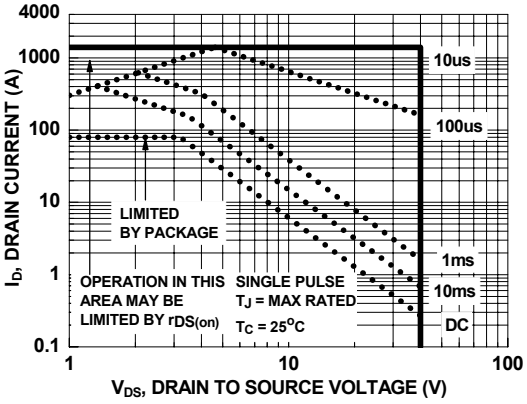
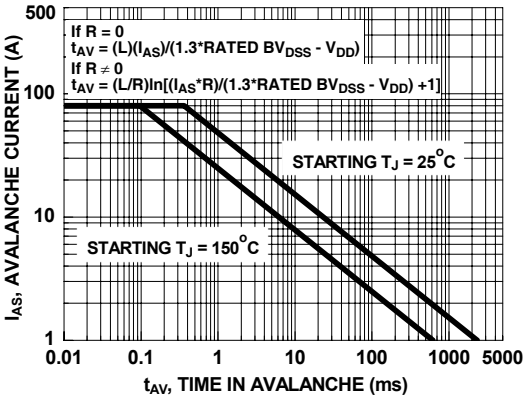



**Figure 5. Forward Bias Safe Operating Area**




NOTE: Refer to Fairchild Application Notes AN7514 and AN7515

**Figure 6. Unclamped Inductive Switching Capability**

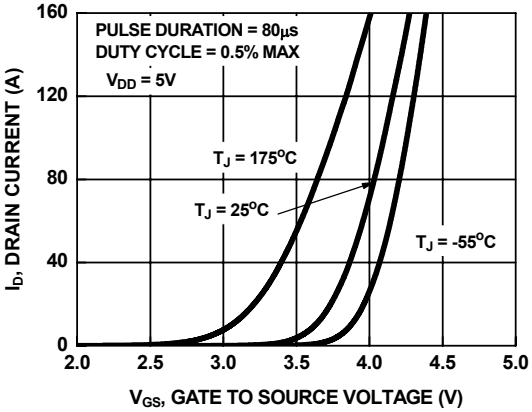



**Figure 7. Transfer Characteristics**

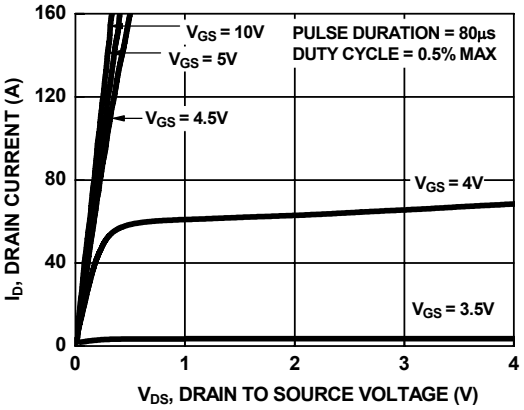



**Figure 8. Saturation Characteristics**

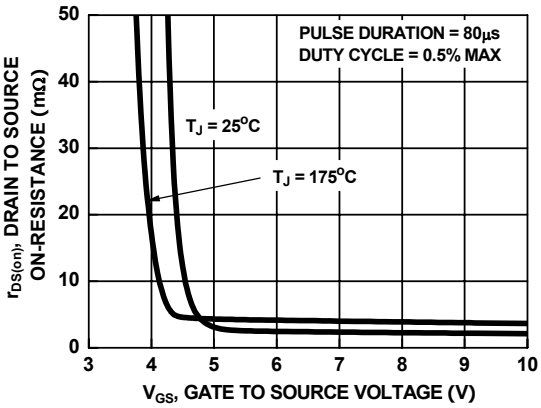



**Figure 9. Drain to Source On-Resistance Variation vs Gate to Source Voltage**

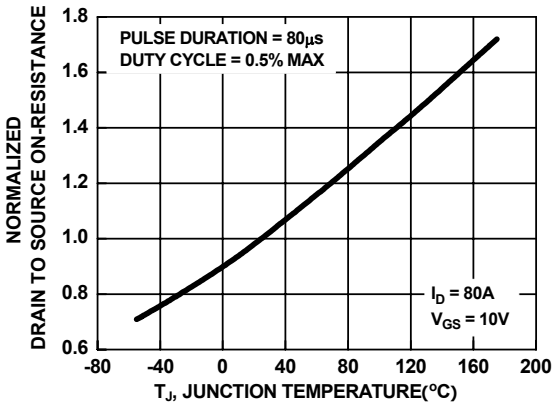



**Figure 10. Normalized Drain to Source On Resistance vs Junction Temperature**



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## Typical Characteristics

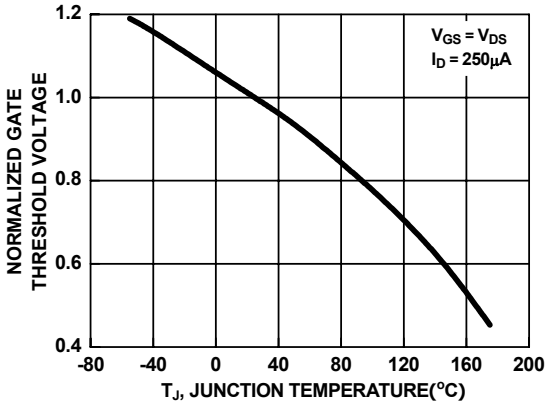


**Figure 11. Normalized Gate Threshold Voltage vs Junction Temperature**

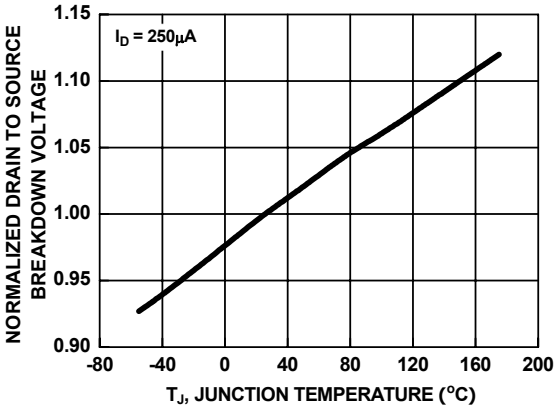


**Figure 12. Normalized Drain to Source Breakdown Voltage vs Junction Temperature**

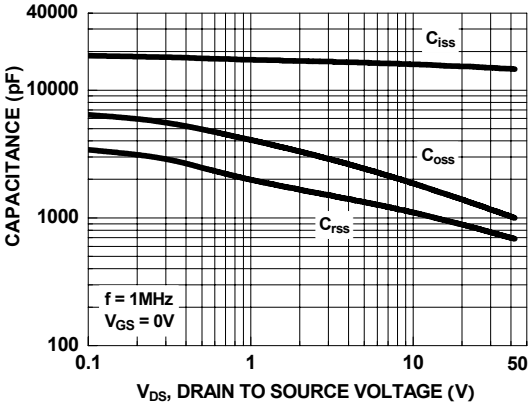


**Figure 13. Capacitance vs Drain to Source Voltage**

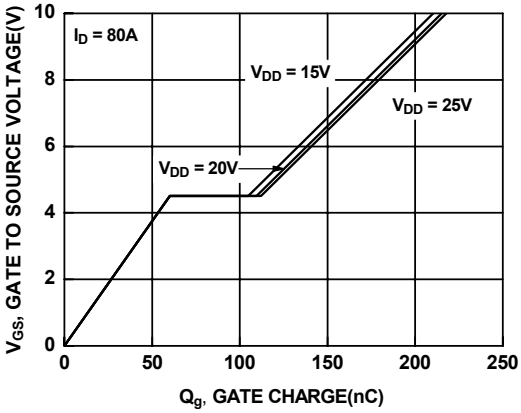


**Figure 14. Gate Charge vs Gate to Source Voltage**



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