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FDB8441

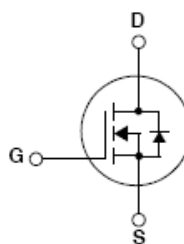
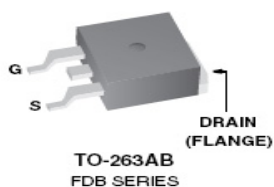
N-Channel PowerTrench® MOSFET 40V, 120A, 2.5mΩ

Features

- Typ $r_{DS(on)}$ = 1.9mΩ 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

- Powertrain Management
- Solenoid and Motor Drivers
- Electronic Steering
- Integrated Starter / Alternator
- Distributed Power Architectures and VRMs
- Primary Switch for 12V Systems



MOSFET Maximum Ratings $T_C = 25^\circ\text{C}$ 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 ($T_C = 25^\circ\text{C}$, Silicon limited) | 262* | A |
| | Drain Current Continuous ($T_C = 100^\circ\text{C}$, Silicon limited) | 185* | |
| | Drain Current Continuous ($T_C = 25^\circ\text{C}$, Package limited) | 120 | |
| | Drain Current Continuous ($T_A = 25^\circ\text{C}$, $R_{\theta JA} = 43^\circ\text{C/W}$) | 28 | |
| | 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/ $^\circ\text{C}$ |
| T_J, T_{STG} | Operating and Storage Temperature | -55 to 175 | $^\circ\text{C}$ |

*Calculated continuous current based on maximum allowable junction temperature. Package limitation current is 120A.

Thermal Characteristics

| | | | |
|-----------------|--|-----|--------------------|
| $R_{\theta JC}$ | Thermal Resistance Junction to Case | 0.5 | $^\circ\text{C/W}$ |
| $R_{\theta JA}$ | Thermal Resistance Junction to Ambient (Note 2) | 62 | $^\circ\text{C/W}$ |
| $R_{\theta JA}$ | Thermal Resistance Junction to Ambient, 1in ² copper pad area | 43 | $^\circ\text{C/W}$ |

Package Marking and Ordering Information

| Device Marking | Device | Package | Reel Size | Tape Width | Quantity |
|----------------|---------|----------|-----------|------------|-----------|
| FDB8441 | FDB8441 | TO-263AB | 330mm | 24mm | 800 units |

Electrical Characteristics $T_J = 25^\circ\text{C}$ unless otherwise noted

| Symbol | Parameter | Test Conditions | Min | Typ | Max | Units |
|--------|-----------|-----------------|-----|-----|-----|-------|
|--------|-----------|-----------------|-----|-----|-----|-------|

Off Characteristics

| | | | | | | |
|-----------|-----------------------------------|---|----|---|-----------|---------------|
| B_{VDS} | Drain to Source Breakdown Voltage | $I_D = 250\mu\text{A}$, $V_{GS} = 0\text{V}$ | 40 | - | - | V |
| I_{DSS} | Zero Gate Voltage Drain Current | $V_{DS} = 32\text{V}$ $V_{GS} = 0\text{V}$ $T_J = 150^\circ\text{C}$ | - | - | 1 | μA |
| I_{GSS} | Gate to Source Leakage Current | $V_{GS} = \pm 20\text{V}$ | - | - | ± 100 | nA |

On Characteristics

| | | | | | | |
|--------------|----------------------------------|---|---|-----|-----|------------|
| $V_{GS(th)}$ | Gate to Source Threshold Voltage | $V_{DS} = V_{GS}$, $I_D = 250\mu\text{A}$ | 2 | 2.8 | 4 | V |
| $r_{DS(on)}$ | Drain to Source On Resistance | $I_D = 80\text{A}$, $V_{GS} = 10\text{V}$ | - | 1.9 | 2.5 | m Ω |
| | | $I_D = 80\text{A}$, $V_{GS} = 10\text{V}$, $T_J = 175^\circ\text{C}$ | - | 3.3 | 4.3 | |

Dynamic Characteristics

| | | | | | | |
|--------------|----------------------------------|---|---|-------|-----|----------|
| C_{iss} | Input Capacitance | $V_{DS} = 25\text{V}$, $V_{GS} = 0\text{V}$, $f = 1\text{MHz}$ | - | 15000 | - | pF |
| C_{oss} | Output Capacitance | | - | 1250 | - | pF |
| C_{rss} | Reverse Transfer Capacitance | | - | 685 | - | pF |
| R_G | Gate Resistance | $V_{GS} = 0.5\text{V}$, $f = 1\text{MHz}$ | - | 1.1 | - | Ω |
| $Q_{g(TOT)}$ | Total Gate Charge at 10V | $V_{GS} = 0$ to 10V | - | 215 | 280 | nC |
| $Q_{g(TH)}$ | Threshold Gate Charge | $V_{GS} = 0$ to 2V | - | 29 | 38 | nC |
| Q_{gs} | Gate to Source Gate Charge | $V_{DD} = 20\text{V}$ $I_D = 35\text{A}$ $I_g = 1\text{mA}$ | - | 60 | - | nC |
| Q_{gs2} | Gate Charge Threshold to Plateau | | - | 32 | - | nC |
| Q_{gd} | Gate to Drain "Miller" Charge | | - | 49 | - | nC |
| | | | - | | | |

Electrical Characteristics $T_J = 25^\circ\text{C}$ unless otherwise noted

| Symbol | Parameter | Test Conditions | Min | Typ | Max | Units |
|--------|-----------|-----------------|-----|-----|-----|-------|
|--------|-----------|-----------------|-----|-----|-----|-------|

Switching Characteristics

| | | | | | | |
|---------------------|---------------------|--|---|------|-----|----|
| t_{on} | Turn-On Time | $V_{\text{DD}} = 20\text{V}$, $I_{\text{D}} = 35\text{A}$ $V_{\text{GS}} = 10\text{V}$, $R_{\text{GS}} = 1.5\Omega$ | - | - | 77 | ns |
| $t_{\text{d(on)}}$ | Turn-On Delay Time | | - | 23 | - | ns |
| t_{r} | Turn-On Rise Time | | - | 24 | - | ns |
| $t_{\text{d(off)}}$ | 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 | $I_{\text{SD}} = 35\text{A}$ | - | 0.8 | 1.25 | V |
| | | $I_{\text{SD}} = 15\text{A}$ | - | 0.8 | 1.0 | V |
| t_{rr} | Reverse Recovery Time | $I_{\text{F}} = 35\text{A}$, $di/dt = 100\text{A}/\mu\text{s}$ | - | 52 | 68 | ns |
| Q_{rr} | Reverse Recovery Charge | $I_{\text{F}} = 35\text{A}$, $di/dt = 100\text{A}/\mu\text{s}$ | - | 76 | 99 | nC |

Notes:1: Starting $T_J = 25^\circ\text{C}$, $L = 0.46\text{mH}$, $I_{\text{AS}} = 64\text{A}$.2: Pulse width = 100 μs .

Typical Characteristics

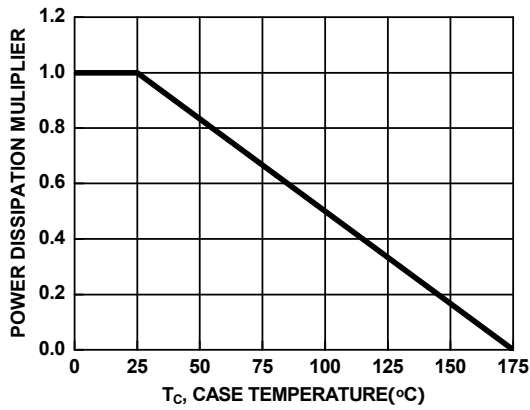


Figure 1. Normalized Power Dissipation vs Case Temperature

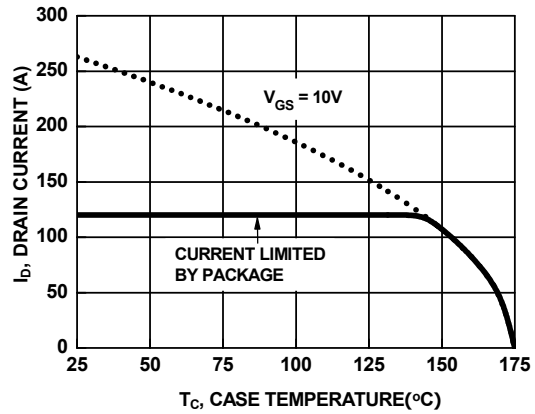


Figure 2. Maximum Continuous Drain Current vs Case Temperature

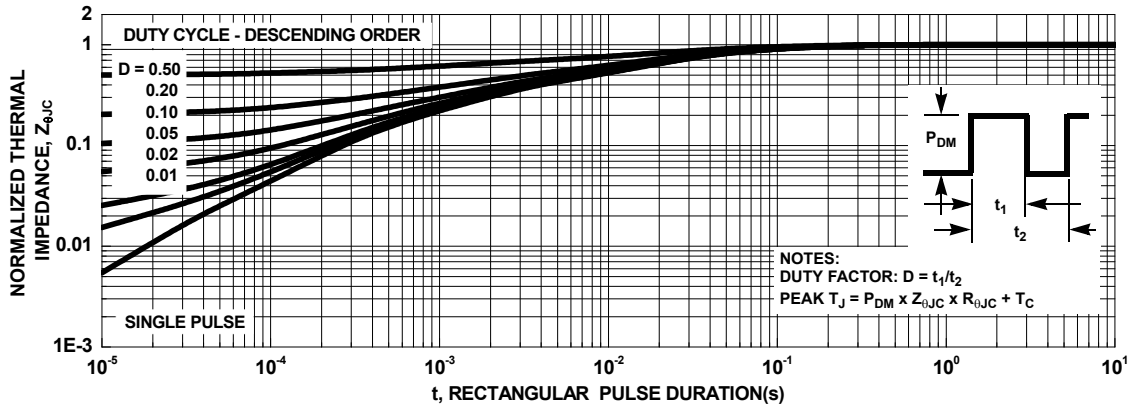


Figure 3. Normalized Maximum Transient Thermal Impedance

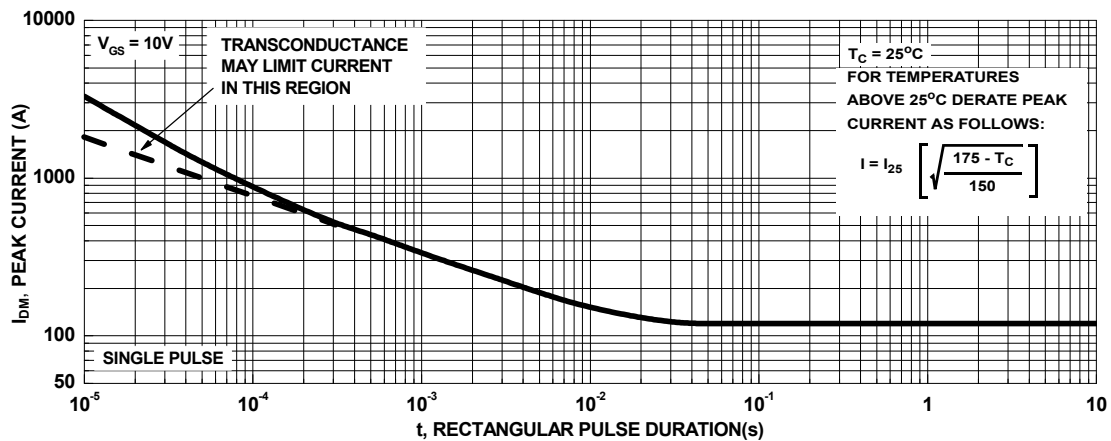


Figure 4. Peak Current Capability

Typical Characteristics

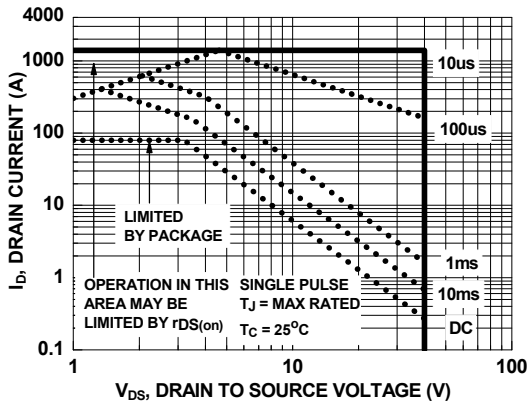
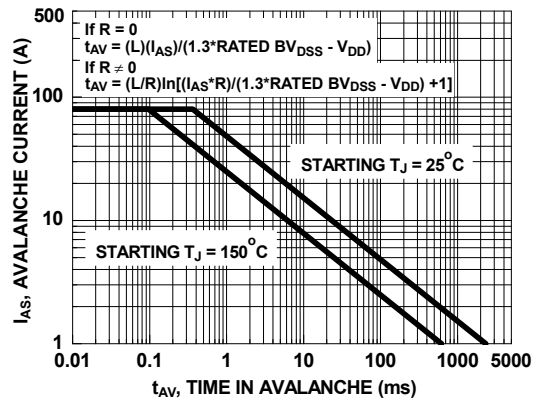


Figure 5. Forward Bias Safe Operating Area



NOTE: Refer to Fairchild Application Notes AN7514 and AN7515

Figure 6. Unclamped Inductive Switching Capability

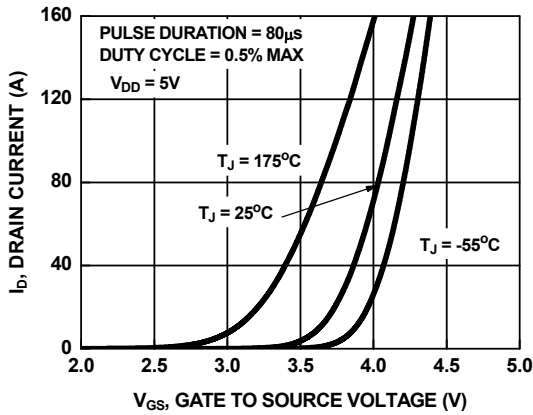


Figure 7. Transfer Characteristics

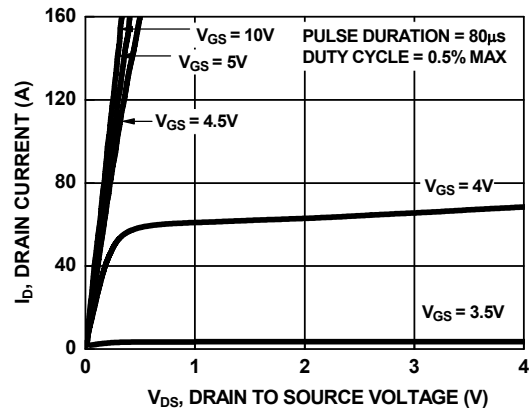


Figure 8. Saturation Characteristics

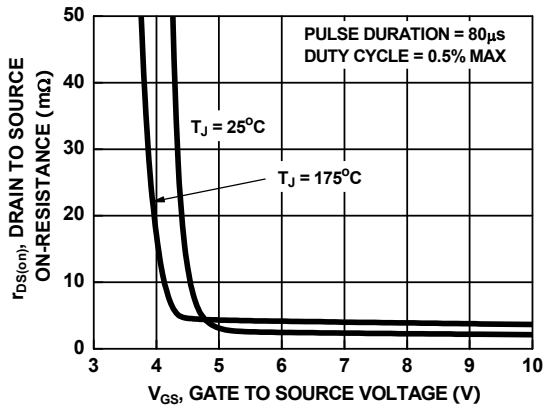


Figure 9. Drain to Source On-Resistance Variation vs Gate to Source Voltage

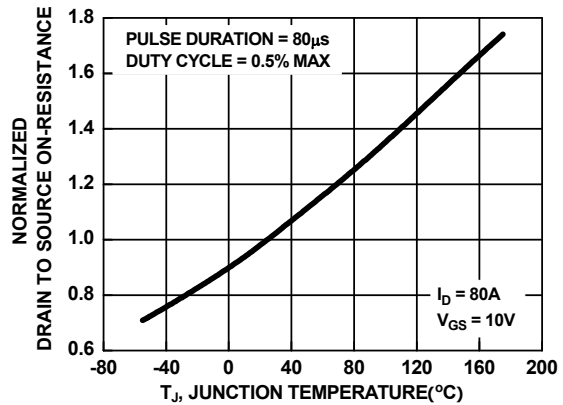


Figure 10. Normalized Drain to Source On-Resistance vs Junction Temperature

Typical Characteristics

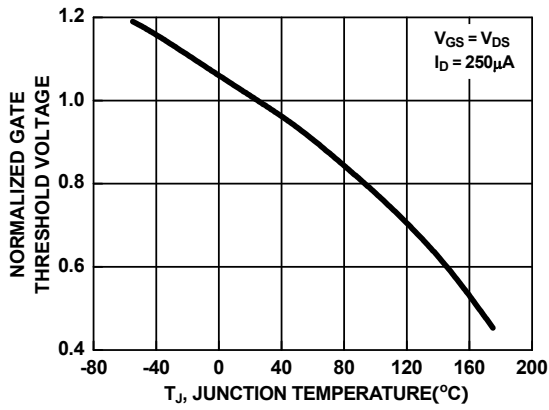


Figure 11. Normalized Gate Threshold Voltage vs Junction Temperature

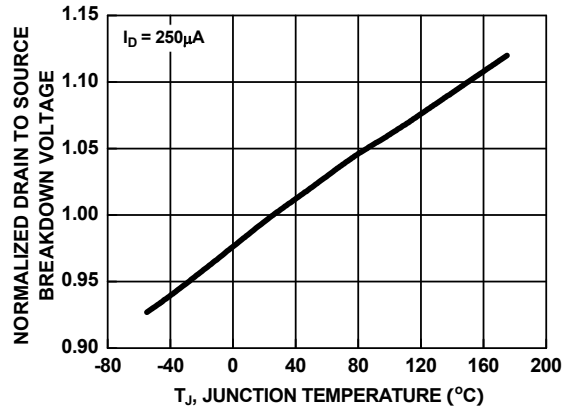


Figure 12. Normalized Drain to Source Breakdown Voltage vs Junction Temperature

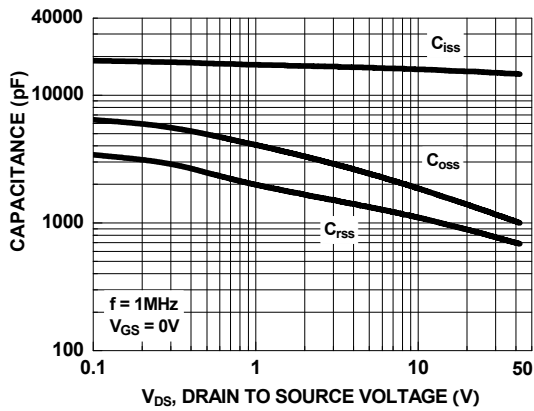


Figure 13. Capacitance vs Drain to Source Voltage

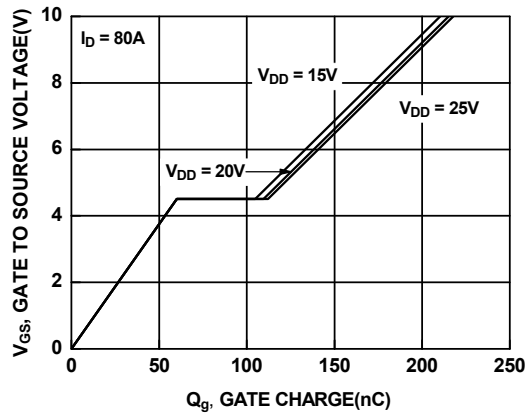





Figure 14. Gate Charge vs Gate to Source Voltage



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