

FDD8444

N-Channel PowerTrench $^{\circledR}$ MOSFET

40V, 50A, 5.2mΩ

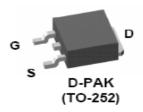
Features

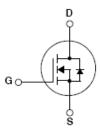
- Typ $r_{DS(on)}$ = 4m Ω at V_{GS} = 10V, I_D = 50A
- Typ $Q_{g(10)}$ = 89nC at V_{GS} = 10V
- Low Miller Charge
- Low Q_{rr} Body Diode
- UIS Capability (Single Pulse/ Repetitive Pulse)
- Qualified to AEC Q101
- RoHS Compliant



Applications

- Automotive Engine Control
- Powertrain Management
- Solenoid and Motor Drivers
- Electronic Transmission
- Distributed Power Architecture and VRMs
- Primary Switch for 12V Systems





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

| Symbol | Parameter | Ratings | Units |
|-----------------------------------|--|-------------|-------|
| V_{DSS} | Drain to Source Voltage | 40 | V |
| V_{GS} | Gate to Source Voltage | ±20 | V |
| | Drain Current Continuous (V _{GS} = 10V) (Note | 145 | |
| I_D | Continuous ($V_{GS} = 10V$, with $R_{\theta JA} = 52^{\circ}C/W$) | 20 | Α |
| | Pulsed | Figure 4 | |
| E _{AS} | Single Pulse Avalanche Energy (Note 2 | 2) 535 | mJ |
| П | Power Dissipation | 153 | W |
| P_{D} | Derate above 25°C | 1.02 | W/°C |
| T _J , T _{STG} | Operating and Storage Temperature | -55 to +175 | °C |

Thermal Characteristics

| $R_{\theta JC}$ | Thermal Resistance, Junction to Case | 0.98 | °C/W |
|-----------------|--|------|------|
| $R_{\theta JA}$ | Thermal Resistance, Junction to Ambient TO-252, 1in ² copper pad area | 52 | °C/W |

Package Marking and Ordering Information

| Device Marking | Device | Package | Reel Size | Tape Width | Quantity |
|----------------|---------|----------|-----------|------------|------------|
| FDD8444 | FDD8444 | TO-252AA | 13" | 12mm | 2500 units |

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

Parameter

Gate to Source Leakage Current

| Off Characteristics | | | | | | |
|---------------------|-----------------------------------|------------------------------------|----|---|-----|----|
| B _{VDSS} | Drain to Source Breakdown Voltage | $I_D = 250 \mu A, V_{GS} = 0 V$ | 40 | - | - | V |
| 1 | Zero Gate Voltage Drain Current | V _{DS} = 32V | - | - | 1 | |
| DSS | Zero Gate Voltage Drain Current | $V_{GS} = 0V$ $T_J = 150^{\circ}C$ | - | - | 250 | μΑ |

 $V_{GS} = \pm 20V$

Test Conditions

Min

Тур

Max

±100

Units

nΑ

On Characteristics

Symbol

| $V_{GS(th)}$ | Gate to Source Threshold Voltage | $V_{GS} = V_{DS}, I_{D} = 250 \mu A$ | 2 | 2.5 | 4 | V |
|---------------------|---|--|---|-----|-----|----|
| | $I_D = 50A, V_{GS} = 10V$ | | 4 | 5.2 | | |
| r _{DS(on)} | r _{DS(on)} Drain to Source On Resistance | $I_D = 50A, V_{GS} = 10V,$ $T_J = 175^{\circ}C$ | ı | 7.2 | 9.4 | mΩ |

Dynamic Characteristics

| C _{iss} | Input Capacitance | V 05V V | V _{DS} = 25V, V _{GS} = 0V, | | 6195 | - | pF |
|------------------|----------------------------------|---|--|---|------|------|----|
| C _{oss} | Output Capacitance | ¬ v _{DS} = 25v, v _{GS} = 0 −f = 1MHz | | | 585 | - | pF |
| C _{rss} | Reverse Transfer Capacitance | - 1 - 11VII 12 | | - | 332 | - | pF |
| R_G | Gate Resistance | f = 1MHz | | - | 1.9 | - | Ω |
| $Q_{g(TOT)}$ | Total Gate Charge at 10V | V _{GS} = 0 to 10V | | - | 89 | 116 | nC |
| $Q_{g(5)}$ | Total Gate Charge at 5V | $V_{GS} = 0 \text{ to } 5V$ |],, | | 43 | 56 | nC |
| $Q_{g(TH)}$ | Threshold Gate Charge | $V_{GS} = 0 \text{ to } 2V$ | $V_{DD} = 20V$ $I_{D} = 50A$ | - | 11 | 14.3 | nC |
| Q_{gs} | Gate to Source Gate Charge | | $I_0 = 30A$ $I_0 = 1.0mA$ | - | 23 | - | nC |
| Q _{gs2} | Gate Charge Threshold to Plateau | | .g | - | 11 | - | nC |
| Q_{gd} | Gate to Drain "Miller" Charge | | | - | 20 | - | nC |

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

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

Switching Characteristics

| t _{on} | Turn-On Time | | - | - | 135 | ns |
|---------------------|---------------------|--|---|----|-----|----|
| t _{d(on)} | Turn-On Delay Time | | 1 | 12 | - | ns |
| t _r | Turn-On Rise Time | V_{DD} = 20V, I_{D} = 50A V_{GS} = 10V, R_{GS} = 2 Ω | - | 78 | - | ns |
| t _{d(off)} | Turn-Off Delay Time | $V_{GS} = 10V$, $R_{GS} = 2\Omega$ | - | 48 | - | ns |
| t _f | Turn-Off Fall Time | | - | 15 | - | ns |
| t _{off} | Turn-Off Time | | - | - | 95 | ns |

Drain-Source Diode Characteristics

| V _{SD} Source to Drain Diode Voltage | Course to Drain Diade Voltage | I _{SD} = 50A | - | 0.9 | 1.25 | \/ | |
|---|-------------------------------|---|-----|-----|------|----|--|
| | I _{SD} = 25A | - | 0.8 | 1.0 | V | | |
| t _{rr} | Reverse Recovery Time | $I_{\rm F} = 50$ A, $dI_{\rm F}/dt = 100$ A/ μ s | - | 39 | 51 | ns | |
| Q _{rr} | Reverse Recovery Charge | - 1 _F = 50A, d1 _F /dt = 100A/μs | - | 45 | 59 | nC | |

Package current limitation is 50A.
 Starting T_J = 25°C, L = 0.67mH, I_{AS} = 40A

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 160 V_{GS} = 10V CURRENT LIMITED 140 BY PACKAGE **€**120) DRAIN CURRENT (20 0.0 50 100 150 175 0 25 100 25 125

Figure 1. Normalized Power Dissipation vs Case Temperature

T_C, CASE TEMPERATURE(°C)

Figure 2. Maximum Continuous Drain Current vs Case Temperature

T_C, CASE TEMPERATURE(°C)

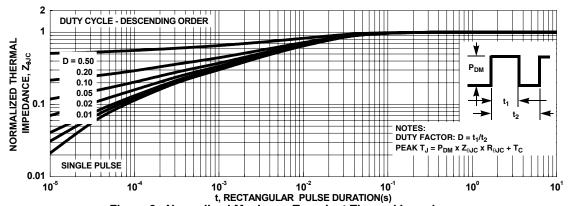


Figure 3. Normalized Maximum Transient Thermal Impedance

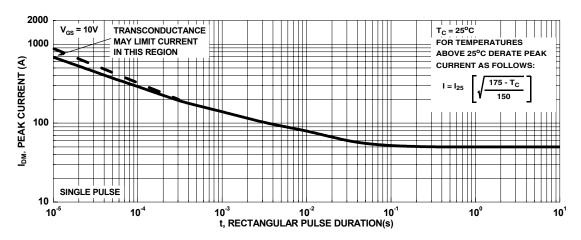


Figure 4. Peak Current Capability

Typical Characteristics

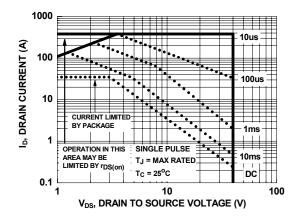
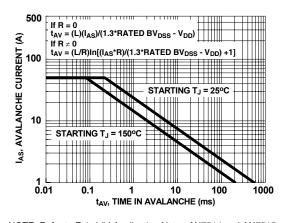


Figure 5. Forward Bias Safe Operating Area



NOTE: Refer to Fairchild Application Notes AN7514 and AN7515

Figure 6. Unclamped Inductive Switching

Capability

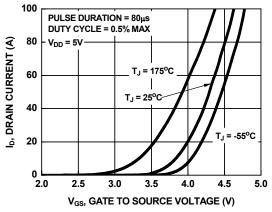


Figure 7. Transfer Characteristics

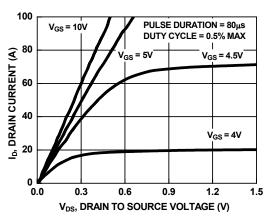


Figure 8. Saturation Characteristics

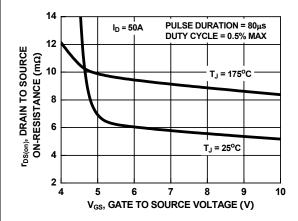


Figure 9. Drain to Source On-Resistance Variation vs Gate to Source Voltage

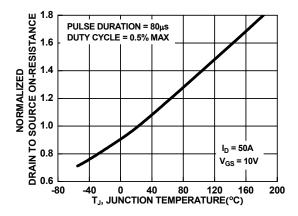


Figure 10. Normalized Drain to Source On Resistance vs Junction Temperature

Typical Characteristics

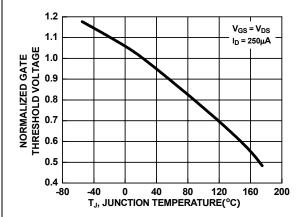


Figure 11. Normalized Gate Threshold Voltage vs Junction Temperature

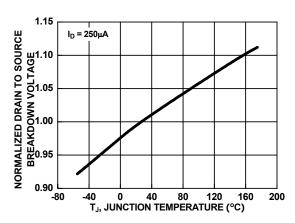


Figure 12. Normalized Drain to Source Breakdown Voltage vs Junction Temperature

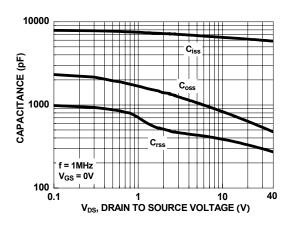


Figure 13. Capacitance vs Drain to Source Voltage

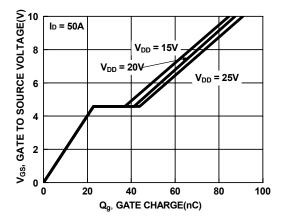


Figure 14. Gate Charge vs Gate to Source Voltage

UniFET™ $\mathsf{UltraFET}^{\circledR}$ VCX^{TM} Wire™



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