

August 2007

### **FDP8443**

# N-Channel PowerTrench<sup>®</sup> MOSFET

### **40V**, **80A**, **3.5m**Ω

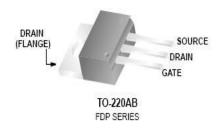
#### **Features**

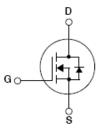
- Typ  $r_{DS(on)}$  = 2.7m $\Omega$  at  $V_{GS}$  = 10V,  $I_D$  = 80A
- Typ  $Q_{q(10)}$  = 142nC at  $V_{GS}$  = 10V
- Low Miller Charge
- Low Q<sub>rr</sub> Body Diode
- UIS Capability (Single Pulse and Repetitive Pulse)
- Qualified to AEC Q101
- RoHS Compliant

### **Applications**

- Automotive Engine Control
- Powertrain Management
- Solenoid and Motor Drivers
- Electronic Steering
- Integrated Starter / Alternator
- 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 (T <sub>C</sub> < 144°C, V <sub>GS</sub> = 10V)                       |          | 80           |       |
| $I_D$             | Continuous ( $T_{amb} = 25^{\circ}C$ , $V_{GS} = 10V$ , with $R_{\theta JA} = 62^{\circ}C/W$ ) |          | 20           | Α     |
|                   | Pulsed   |          | See Figure 4 |       |
| E <sub>AS</sub>   | Single Pulse Avalanche Energy  | (Note 1) | 531          | mJ    |
| П                 | Power Dissipation  |          | 188          | W     |
| $P_{D}$           | Derate above 25°C  |          | 1.25         | W/°C  |
| $T_J$ , $T_{STG}$ | Operating and Storage Temperature  |          | -55 to +175  | °C    |

### **Thermal Characteristics**

| $R_{\theta JC}$ | Thermal Resistance Junction to Case    |          | 0.8 | °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 |
|----------------|---------|----------|-----------|------------|----------|
| FDP8443        | FDP8443 | TO-220AB | Tube      | N/A        | 50 units |

**Test Conditions** 

Min

Тур

Units

# **Electrical Characteristics** $T_C = 25^{\circ}C$ unless otherwise noted

**Parameter** 

| Off Cha           | Off Characteristics               |                             |                                  |    |   |      |    |
|-------------------|-----------------------------------|-----------------------------|----------------------------------|----|---|------|----|
| B <sub>VDSS</sub> | Drain to Source Breakdown Voltage | $I_D = 250 \mu A, V_{GS} =$ | OV                               | 40 | - | -    | V  |
|                   | Zero Gate Voltage Drain Current   | $V_{DS} = 32V$ ,            |                                  | -  | - | 1    |    |
| DSS               | Zero Gate voltage Drain Current   | $V_{GS} = 0V$               | $T_{\rm C} = 150^{\rm o}{\rm C}$ | -  | - | 250  | μА |
| $I_{GSS}$         | Gate to Source Leakage Current    | $V_{GS} = \pm 20V$          |                                  | -  | - | ±100 | nA |

#### **On Characteristics**

Symbol

| $V_{GS(th)}$        | Gate to Source Threshold Voltage | $V_{GS} = V_{DS}, I_{D} = 250 \mu A$         | 2 | 2.8 | 4   | V  |
|---------------------|----------------------------------|--|---|-----|-----|----|
|                     |                                  | I <sub>D</sub> = 80A, V <sub>GS</sub> = 10V  | - | 2.7 | 3.5 |    |
| r <sub>DS(on)</sub> | Drain to Source On Resistance    | $I_D = 80A, V_{GS} = 10V,$<br>$T_J = 175$ °C | - | 4.7 | 6.1 | mΩ |

### **Dynamic Characteristics**

| C <sub>iss</sub> | Input Capacitance                | V 05V V   | N /                   | - | 9310 | -   | pF |
|------------------|----------------------------------|---|-----------------------|---|------|-----|----|
| Coss             | Output Capacitance               | <sup>-</sup> V <sub>DS</sub> = 25V, V <sub>GS</sub> = (<br>- f = 1MHz | JV,                   | - | 800  | -   | pF |
| C <sub>rss</sub> | Reverse Transfer Capacitance     | - 11VII 12  |                       | - | 510  | -   | pF |
| $R_G$            | Gate Resistance                  | V <sub>GS</sub> = 0.5V, f = 1MI                                       | Hz                    | - | 0.9  | -   | Ω  |
| $Q_{g(TOT)}$     | Total Gate Charge at 10V         | V <sub>GS</sub> = 0 to 10V  |                       | - | 142  | 185 | nC |
| $Q_{g(TH)}$      | Threshold Gate Charge            | $V_{GS} = 0$ to 2V  | V <sub>DD</sub> = 20V | - | 17.5 | 23  | nC |
| Q <sub>gs</sub>  | Gate to Source Gate Charge       |   | I <sub>D</sub> = 35A  | - | 36   | -   | nC |
| Q <sub>gs2</sub> | Gate Charge Threshold to Plateau |   | $I_g = 1mA$           | - | 18.8 | -   | nC |
| $Q_{gd}$         | Gate to Drain "Miller" Charge    |   |                       | - | 32   | -   | nC |

# **Electrical Characteristics** $T_C = 25^{\circ}C$ unless otherwise noted

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

## **Switching Characteristics** (V<sub>GS</sub> = 10V)

| t <sub>on</sub>    | Turn-On Time        |  | - | -    | 58  | ns |
|--------------------|---------------------|--|---|------|-----|----|
| t <sub>d(on)</sub> | Turn-On Delay Time  |  | - | 18.4 | -   | ns |
| t <sub>r</sub>     | Rise Time           | $V_{DD}$ = 20V, $I_{D}$ = 35A<br>$V_{GS}$ = 10V, $R_{GS}$ = 2 $\Omega$ | - | 17.9 | 1   | ns |
| $t_{d(off)}$       | Turn-Off Delay Time | VGS - 10V, NGS - 252   | - | 55   | 1   | ns |
| t <sub>f</sub>     | Fall Time           |  | - | 13.5 | -   | ns |
| t <sub>off</sub>   | Turn-Off Time       |  | - | -    | 109 | ns |

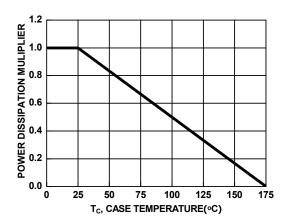
#### **Drain-Source Diode Characteristics**

| V <sub>SD</sub> Source to Drain Diode Voltage | I <sub>SD</sub> = 35A         | -  | 0.8 | 1.25 | V   |    |
|---|-------------------------------|--|-----|------|-----|----|
| V <sub>SD</sub>                               | Source to Drain blode voltage | I <sub>SD</sub> = 15A                      | -   | 0.8  | 1.0 | V  |
| t <sub>rr</sub>                               | Reverse Recovery Time         | 1 = 25A dl /dt = 100A/                     | -   | 42   | 55  | ns |
| Q <sub>rr</sub>                               | Reverse Recovery Charge       | $I_{SD} = 35A$ , $dI_{SD}/dt = 100A/\mu s$ | -   | 48   | 62  | nC |

1: Starting T<sub>J</sub> = 25°C, L = 0.26mH, I<sub>AS</sub> = 64A. 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**



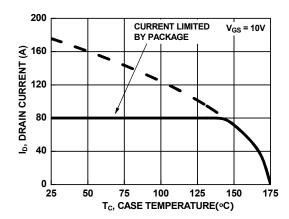


Figure 1. Normalized Power Dissipation vs Case Temperature

Figure 2. Maximum Continuous Drain Current vs Case Temperature

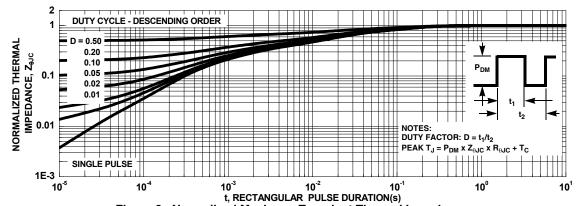


Figure 3. Normalized Maximum Transient Thermal Impedance

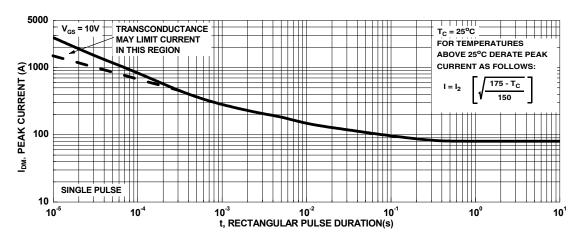


Figure 4. Peak Current Capability

### **Typical Characteristics**

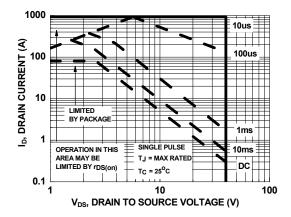
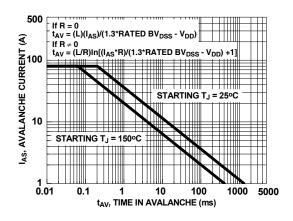


Figure 5. Forward Bias Safe Operating Area



NOTE: Refer to Fairchild Application Notes AN7514 and AN7515

Figure 6. Unclamped Inductive Switching

Capability

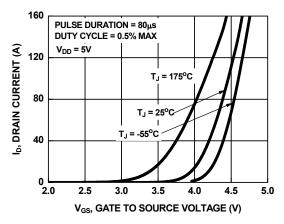


Figure 7. Transfer Characteristics

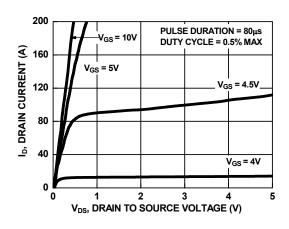


Figure 8. Saturation Characteristics

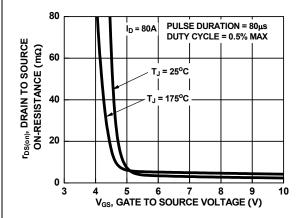


Figure 9. Drain to Source On-Resistance Variation vs Gate to Source Voltage

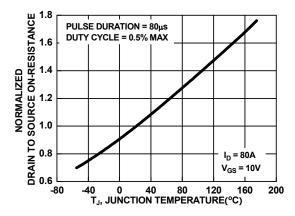


Figure 10. Normalized Drain to Source On Resistance vs Junction Temperature

### **Typical Characteristics**

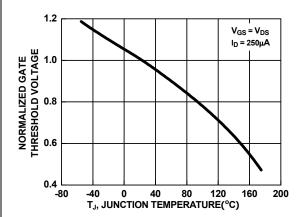


Figure 11. Normalized Gate Threshold Voltage vs Junction Temperature

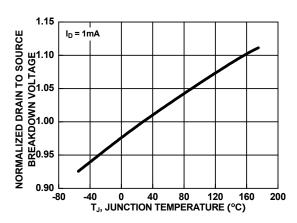


Figure 12. Normalized Drain to Source Breakdown Voltage vs Junction Temperature

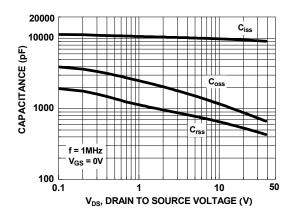


Figure 13. Capacitance vs Drain to Source Voltage

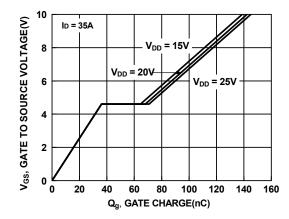


Figure 14. Gate Charge vs Gate to Source Voltage





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