

## FDR4420A

### Single N-Channel, Logic Level, PowerTrench™ MOSFET

#### General Description

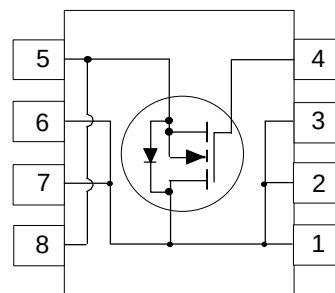
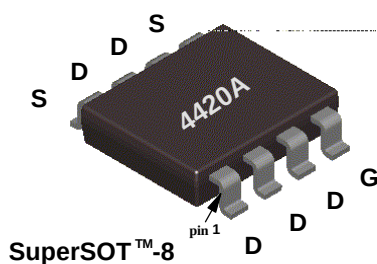
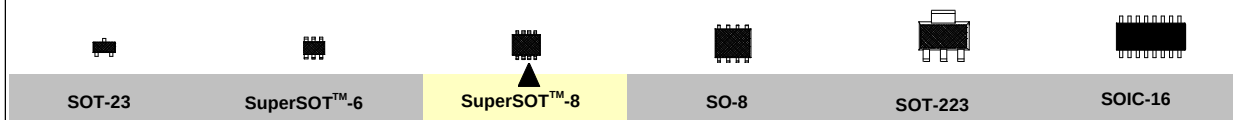
The SuperSOT-8 family of N-Channel Logic Level MOSFETs have been designed to provide a low profile, small footprint alternative to industry standard SO-8 little foot type product.

These MOSFETs are produced using Fairchild Semiconductor's advanced PowerTrench process that has been tailored to minimize the on-state resistance and yet maintain superior switching performance.

These devices are well suited for low voltage and battery powered applications where small package size is required without compromising power handling and fast switching.

#### Features

- 11 A, 30 V.  $R_{DS(ON)} = 0.009 \Omega @ V_{GS} = 10 \text{ V}$ ,  
 $R_{DS(ON)} = 0.013 \Omega @ V_{GS} = 4.5 \text{ V}$ .
- Fast switching speed.
- Low gate charge.
- Small footprint 38% smaller than a standard SO-8.
- Low profile package(1mm thick).
- Power handling capability similar to SO-8.



#### Absolute Maximum Ratings $T_A = 25^\circ\text{C}$ unless otherwise noted

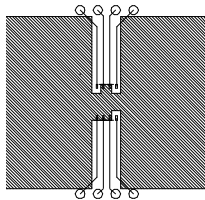
| Symbol                         | Parameter                                         | FDR4420A   | Units              |
|--------------------------------|---------------------------------------------------|------------|--------------------|
| $V_{DSS}$                      | Drain-Source Voltage                              | 30         | V                  |
| $V_{GSS}$                      | Gate-Source Voltage                               | $\pm 20$   | V                  |
| $I_D$                          | Drain Current - Continuous (Note 1a)              | 11         | A                  |
|                                | - Pulsed                                          | 40         |                    |
| $P_D$                          | Maximum Power Dissipation (Note 1a)               | 1.8        | W                  |
|                                | (Note 1b)                                         | 1          |                    |
|                                | (Note 1c)                                         | 0.9        |                    |
| $T_J, T_{STG}$                 | Operating and Storage Temperature Range           | -55 to 150 | $^\circ\text{C}$   |
| <b>THERMAL CHARACTERISTICS</b> |                                                   |            |                    |
| $R_{\theta JA}$                | Thermal Resistance, Junction-to-Ambient (Note 1a) | 70         | $^\circ\text{C/W}$ |
| $R_{\theta JC}$                | Thermal Resistance, Junction-to-Case (Note 1)     | 20         | $^\circ\text{C/W}$ |

## Electrical Characteristics (T<sub>A</sub> = 25°C unless otherwise noted )

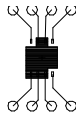
| Symbol                                                 | Parameter                                             | Conditions                                                                                     | Min | Typ    | Max   | Units  |
|--------------------------------------------------------|-------------------------------------------------------|------------------------------------------------------------------------------------------------|-----|--------|-------|--------|
| OFF CHARACTERISTICS                                    |                                                       |                                                                                                |     |        |       |        |
| BV <sub>DSS</sub>                                      | Drain-Source Breakdown Voltage                        | V <sub>GS</sub> = 0 V, I <sub>D</sub> = 250 μA                                                 | 30  |        |       | V      |
| ΔBV <sub>DSS</sub> /ΔT <sub>J</sub>                    | Breakdown Voltage Temp. Coefficient                   | I <sub>D</sub> = 250 μA, Referenced to 25 °C                                                   |     | 20     |       | mV /°C |
| I <sub>DSS</sub>                                       | Zero Gate Voltage Drain Current                       | V <sub>DS</sub> = 24 V, V <sub>GS</sub> = 0 V                                                  |     |        | 1     | μA     |
|                                                        |                                                       | T <sub>J</sub> = 55°C                                                                          |     |        | 10    | μA     |
| I <sub>GSS</sub>                                       | Gate - Body Leakage Current                           | V <sub>GS</sub> = 20 V, V <sub>DS</sub> = 0 V                                                  |     |        | 100   | nA     |
| I <sub>GSS</sub>                                       | Gate - Body Leakage, Reverse                          | V <sub>GS</sub> = -20 V, V <sub>DS</sub> = 0 V                                                 |     |        | -100  | nA     |
| ON CHARACTERISTICS (Note 2)                            |                                                       |                                                                                                |     |        |       |        |
| ΔV <sub>GS(th)</sub> /ΔT <sub>J</sub>                  | Gate Threshold Voltage Temp.Coefficient               | I <sub>D</sub> = 250 μA, Referenced to 25 °C                                                   |     | -6     |       | mV /°C |
| V <sub>GS(th)</sub>                                    | Gate Threshold Voltage                                | V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 250 μA                                    | 1   | 1.4    | 3     | V      |
| R <sub>DS(on)</sub>                                    | Static Drain-Source On-Resistance                     | V <sub>GS</sub> = 10 V, I <sub>D</sub> = 11A                                                   |     | 0.0075 | 0.009 | Ω      |
|                                                        |                                                       | T <sub>J</sub> =125°C                                                                          |     | 0.0125 | 0.016 |        |
|                                                        |                                                       | V <sub>GS</sub> = 4.5 V, I <sub>D</sub> = 9 A                                                  |     | 0.01   | 0.013 |        |
| I <sub>D(on)</sub>                                     | On-State Drain Current                                | V <sub>GS</sub> = 10 V, V <sub>DS</sub> = 5 V                                                  | 30  |        |       | A      |
| g <sub>FS</sub>                                        | Forward Transconductance                              | V <sub>DS</sub> = 10 V, I <sub>D</sub> = 11 A                                                  |     | 25     |       | S      |
| DYNAMIC CHARACTERISTICS                                |                                                       |                                                                                                |     |        |       |        |
| C <sub>iss</sub>                                       | Input Capacitance                                     | V <sub>DS</sub> = 15 V, V <sub>GS</sub> = 0 V,<br>f = 1.0 MHz                                  |     | 2560   |       | pF     |
| C <sub>oss</sub>                                       | Output Capacitance                                    |                                                                                                |     | 560    |       | pF     |
| C <sub>rss</sub>                                       | Reverse Transfer Capacitance                          |                                                                                                |     | 280    |       | pF     |
| SWITCHING CHARACTERISTICS (Note 2)                     |                                                       |                                                                                                |     |        |       |        |
| t <sub>D(on)</sub>                                     | Turn - On Delay Time                                  | V <sub>DD</sub> = 10 V, I <sub>D</sub> = 1 A,<br>V <sub>GS</sub> = 10V, R <sub>GEN</sub> = 1 Ω |     | 11     | 20    | ns     |
| t <sub>r</sub>                                         | Turn - On Rise Time                                   |                                                                                                |     | 15     | 27    | ns     |
| t <sub>D(off)</sub>                                    | Turn - Off Delay Time                                 |                                                                                                |     | 25     | 40    | ns     |
| t <sub>f</sub>                                         | Turn - Off Fall Time                                  |                                                                                                |     | 21     | 34    | ns     |
| Q <sub>g</sub>                                         | Total Gate Charge                                     | V <sub>DS</sub> = 15 V, I <sub>D</sub> = 9.3 A,<br>V <sub>GS</sub> = 5 V                       |     | 23     | 33    | nC     |
| Q <sub>gs</sub>                                        | Gate-Source Charge                                    |                                                                                                |     | 7      |       | nC     |
| Q <sub>gd</sub>                                        | Gate-Drain Charge                                     |                                                                                                |     | 11     |       | nC     |
| DRAIN-SOURCE DIODE CHARACTERISTICS AND MAXIMUM RATINGS |                                                       |                                                                                                |     |        |       |        |
| I <sub>S</sub>                                         | Maximum Continuous Drain-Source Diode Forward Current |                                                                                                |     |        | 1.5   | A      |
| V <sub>SD</sub>                                        | Drain-Source Diode Forward Voltage                    | V <sub>GS</sub> = 0 V, I <sub>S</sub> = 1.5 A (Note 2)                                         |     | 0.7    | 1.2   | V      |

Notes:

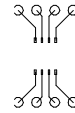
1. R<sub>θJA</sub> is the sum of the junction-to-case and case-to-ambient thermal resistance where the case thermal reference is defined as the solder mounting surface of the drain pins. R<sub>θJC</sub> is guaranteed by design while R<sub>θJA</sub> is determined by the user's board design. R<sub>θJA</sub> shown below for single device operation on FR-4 board in still air.



a. 70°C/W on a 1 in² pad of 2oz copper.



b. 125°C/W on a 0.026 in² of pad of 2oz copper.



c. 135°C/W on a 0.005 in² of pad of 2oz copper.

Scale 1 : 1 on letter size paper

2. Pulse Test: Pulse Width ≤ 300μs, Duty Cycle ≤ 2.0%.

## Typical Electrical Characteristics

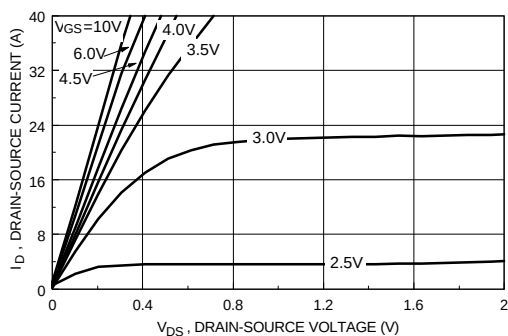


Figure 1. On-Region Characteristics.

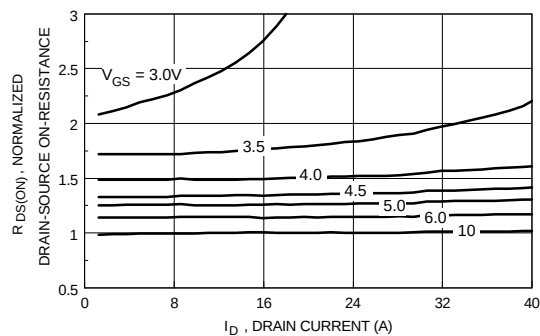


Figure 2. On-Resistance Variation with Drain Current and Gate Voltage.

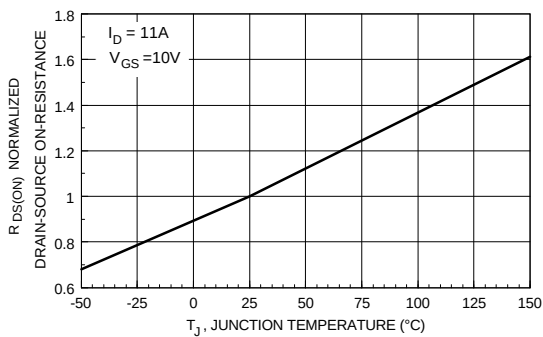


Figure 3. On-Resistance Variation with Temperature.

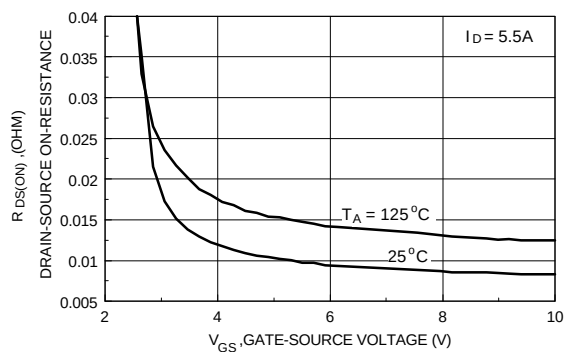


Figure 4. On Resistance Variation with Gate-To-Source Voltage.

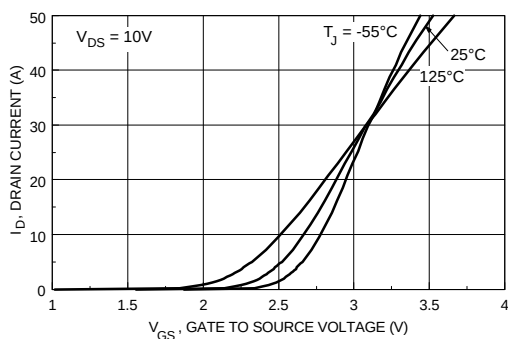


Figure 5. Transfer Characteristics.

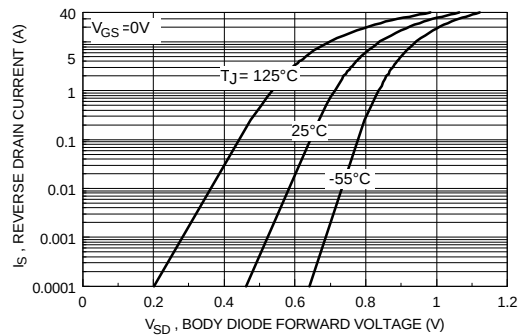


Figure 6. Body Diode Forward Voltage Variation with Source Current and Temperature.

## Typical Electrical Characteristics (continued)

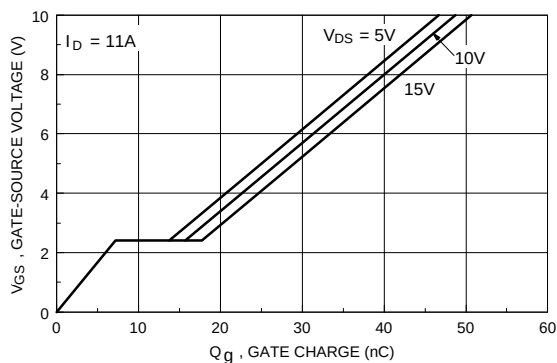


Figure 7. Gate Charge Characteristics.

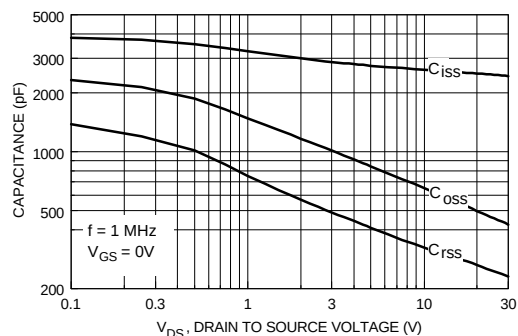


Figure 8. Capacitance Characteristics.

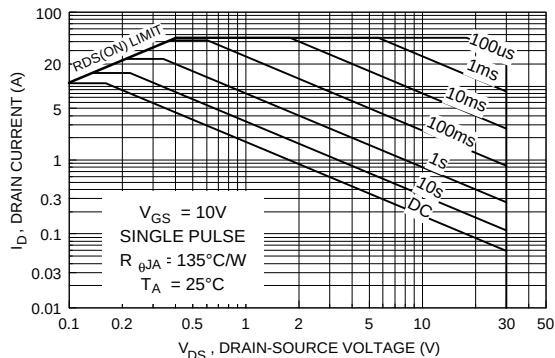


Figure 9. Maximum Safe Operating Area.

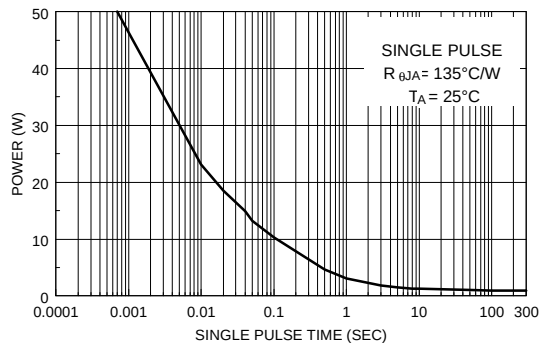


Figure 10. Single Pulse Maximum Power Dissipation.

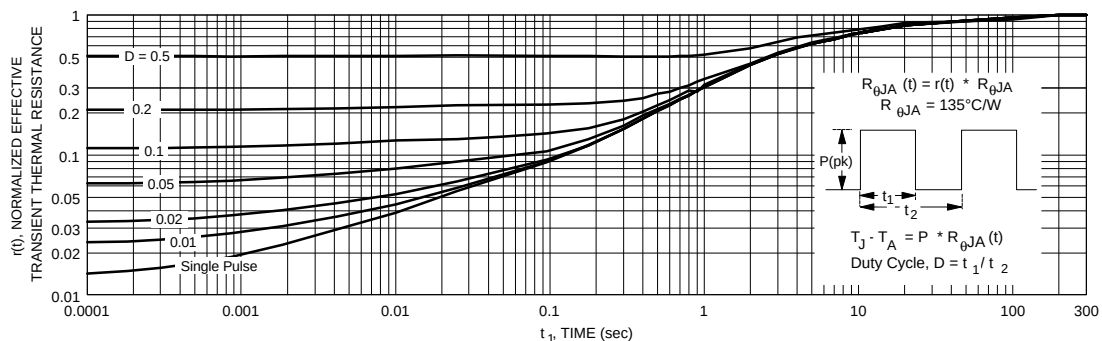


Figure 11. Transient Thermal Response Curve.

Thermal characterization performed using the conditions described in note 1c.  
Transient thermal response will change depending on the circuit board design.

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| DenseTrench™         | GTO™                | Power247™           | SuperSOT™-6     |      |
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