

# FDB5800

## N-Channel Logic Level PowerTrench® MOSFET

60 V, 80 A, 6 mΩ

### Features

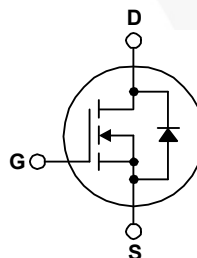
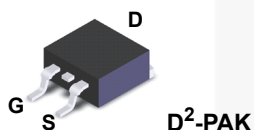
- $R_{DS(on)} = 4.6 \text{ m}\Omega$  (Typ.),  $V_{GS} = 10 \text{ V}$ ,  $I_D = 80 \text{ A}$
- High Performance Trench Technology for Externally Low  $R_{DS(on)}$
- Low Gate Charge
- High Power and Current Handling Capability
- RoHs Compliant

### Description

This N-Channel MOSFET is produced using Fairchild Semiconductor's advanced PowerTrench® process that has been tailored to minimize the on-state resistance while maintaining superior switching performance.

### Applications

- Power tools
- Motor drives and Uninterruptible Power Supplies



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

| Symbol         | Parameter                                                                                                           | FDB5800    | Unit                |
|----------------|---------------------------------------------------------------------------------------------------------------------|------------|---------------------|
| $V_{DSS}$      | Drain to Source Voltage                                                                                             | 60         | V                   |
| $V_{GS}$       | Gate to Source Voltage                                                                                              | $\pm 20$   | V                   |
| $I_D$          | Drain Current                                                                                                       |            |                     |
|                | - Continuous ( $T_C < 102^\circ\text{C}$ , $V_{GS} = 10 \text{ V}$ )                                                | 80         | A                   |
|                | - Continuous ( $T_C < 90^\circ\text{C}$ , $V_{GS} = 5 \text{ V}$ )                                                  | 80         | A                   |
|                | - Continuous ( $T_{amb} = 25^\circ\text{C}$ , $V_{GS} = 10 \text{ V}$ , with $R_{\theta JA} = 43^\circ\text{C/W}$ ) | 14         | A                   |
|                | - Pulsed                                                                                                            | Figure 4   | A                   |
| $E_{AS}$       | Single Pulse Avalanche Energy (Note 1)                                                                              | 652        | mJ                  |
| $P_D$          | - Power Dissipation                                                                                                 | 242        | W                   |
|                | - Derate above $25^\circ\text{C}$                                                                                   | 1.61       | W/ $^\circ\text{C}$ |
| $T_J, T_{STG}$ | - Operating and Storage Temperature                                                                                 | -55 to 175 | $^\circ\text{C}$    |

### Thermal Characteristics

|                 |                                                                                 |      |                    |
|-----------------|---------------------------------------------------------------------------------|------|--------------------|
| $R_{\theta JC}$ | Thermal Resistance Junction to Case TO-263, Max.                                | 0.62 | $^\circ\text{C/W}$ |
| $R_{\theta JA}$ | Thermal Resistance Junction to Ambient TO-263, Max. (Note 2)                    | 62.5 | $^\circ\text{C/W}$ |
| $R_{\theta JA}$ | Thermal Resistance Junction to Ambient TO-263, 1in <sup>2</sup> copper pad area | 43   | $^\circ\text{C/W}$ |

## Package Marking and Ordering Information

| Part Number | Top Mark | Package             | Packing Method | Reel Size | Tape Width | Quantity  |
|-------------|----------|---------------------|----------------|-----------|------------|-----------|
| FDB5800     | FDB5800  | D <sup>2</sup> -PAK | Tape and Reel  | 330 mm    | 24 mm      | 800 units |

## Electrical Characteristics T<sub>C</sub> = 25°C unless otherwise noted.

| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|--------|-----------|-----------------|------|------|------|------|
|--------|-----------|-----------------|------|------|------|------|

### Off Characteristics

|                   |                                   |                                                 |    |   |      |    |
|-------------------|-----------------------------------|-------------------------------------------------|----|---|------|----|
| B <sub>VDSS</sub> | Drain to Source Breakdown Voltage | I <sub>D</sub> = 250 μA, V <sub>GS</sub> = 0 V  | 60 | - | -    | V  |
| I <sub>DSS</sub>  | Zero Gate Voltage Drain Current   | V <sub>DS</sub> = 48 V<br>V <sub>GS</sub> = 0 V | -  | - | 1    | μA |
| I <sub>GSS</sub>  | Gate to Source Leakage Current    | V <sub>GS</sub> = ±20 V                         | -  | - | ±100 | nA |

### On Characteristics

|                     |                                  |                                                                          |     |     |      |    |
|---------------------|----------------------------------|--------------------------------------------------------------------------|-----|-----|------|----|
| V <sub>GS(TH)</sub> | Gate to Source Threshold Voltage | V <sub>GS</sub> = V <sub>DS</sub> , I <sub>D</sub> = 250 μA              | 1.0 | -   | 2.5  | V  |
| r <sub>DS(ON)</sub> | Drain to Source On Resistance    | I <sub>D</sub> = 80 A, V <sub>GS</sub> = 10 V                            | -   | 4.6 | 6.0  | mΩ |
|                     |                                  | I <sub>D</sub> = 80 A, V <sub>GS</sub> = 4.5 V                           | -   | 5.8 | 7.2  |    |
|                     |                                  | I <sub>D</sub> = 80 A, V <sub>GS</sub> = 5 V                             | -   | 5.5 | 7.0  |    |
|                     |                                  | I <sub>D</sub> = 80 A, V <sub>GS</sub> = 10 V,<br>T <sub>J</sub> = 175°C | -   | 10  | 12.6 |    |

### Dynamic Characteristics

|                     |                                  |                                                                            |   |      |     |    |
|---------------------|----------------------------------|----------------------------------------------------------------------------|---|------|-----|----|
| C <sub>ISS</sub>    | Input Capacitance                | V <sub>DS</sub> = 15 V, V <sub>GS</sub> = 0 V,<br>f = 1 MHz                | - | 6625 | -   | pF |
| C <sub>OSS</sub>    | Output Capacitance               |                                                                            | - | 628  | -   | pF |
| C <sub>RSS</sub>    | Reverse Transfer Capacitance     |                                                                            | - | 262  | -   | pF |
| R <sub>G</sub>      | Gate Resistance                  | V <sub>GS</sub> = 0.5 V, f = 1 MHz                                         | - | 1.4  | -   | Ω  |
| Q <sub>g(TOT)</sub> | Total Gate Charge at 10V         | V <sub>GS</sub> = 0 V to 10 V                                              | - | 104  | 135 | nC |
| Q <sub>g(5)</sub>   | Total Gate Charge at 5V          | V <sub>GS</sub> = 0 V to 5 V                                               | - | 55   | 72  | nC |
| Q <sub>g(TH)</sub>  | Threshold Gate Charge            | V <sub>GS</sub> = 0 V to 1 V                                               | - | 6.0  | -   | nC |
| Q <sub>gs</sub>     | Gate to Source Gate Charge       | V <sub>DD</sub> = 30 V<br>I <sub>D</sub> = 80 A<br>I <sub>g</sub> = 1.0 mA | - | 18.4 | -   | nC |
| Q <sub>gs2</sub>    | Gate Charge Threshold to Plateau |                                                                            | - | 12.5 | -   | nC |
| Q <sub>gd</sub>     | Gate to Drain "Miller" Charge    |                                                                            | - | 20.1 | -   | nC |

### Switching Characteristics (V<sub>GS</sub> = 5V)

|                     |                     |                                                                                               |   |      |      |    |
|---------------------|---------------------|-----------------------------------------------------------------------------------------------|---|------|------|----|
| t <sub>ON</sub>     | Turn-On Time        | V <sub>DD</sub> = 30 V, I <sub>D</sub> = 80 A<br>V <sub>GS</sub> = 5 V, R <sub>GS</sub> = 2 Ω | - | -    | 62.1 | ns |
| t <sub>d(ON)</sub>  | Turn-On Delay Time  |                                                                                               | - | 20.3 | -    | ns |
| t <sub>r</sub>      | Rise Time           |                                                                                               | - | 22.0 | -    | ns |
| t <sub>d(OFF)</sub> | Turn-Off Delay Time |                                                                                               | - | 27.1 | -    | ns |
| t <sub>f</sub>      | Fall Time           |                                                                                               | - | 12.1 | -    | ns |
| t <sub>OFF</sub>    | Turn-Off Time       |                                                                                               | - | -    | 59.0 | ns |

### Drain-Source Diode Characteristics

|                 |                               |                                                         |   |   |      |    |
|-----------------|-------------------------------|---------------------------------------------------------|---|---|------|----|
| V <sub>SD</sub> | Source to Drain Diode Voltage | I <sub>SD</sub> = 80 A                                  | - | - | 1.25 | V  |
|                 |                               | I <sub>SD</sub> = 40 A                                  | - | - | 1.0  | V  |
| t <sub>r</sub>  | Reverse Recovery Time         | I <sub>SD</sub> = 60 A, dI <sub>SD</sub> /dt = 100 A/μs | - | - | 44   | ns |
| Q <sub>SD</sub> | Reverse Recovered Charge      | I <sub>SD</sub> = 60 A, dI <sub>SD</sub> /dt = 100 A/μs | - | - | 57   | nC |

#### Notes:

- 1: Starting T<sub>J</sub> = 25°C, L = 1mH, I<sub>AS</sub> = 36A, V<sub>DD</sub> = 54V, V<sub>GS</sub> = 10V.  
2: Pulse width = 100s.

## Typical Characteristics $T_C = 25^\circ\text{C}$ unless otherwise noted

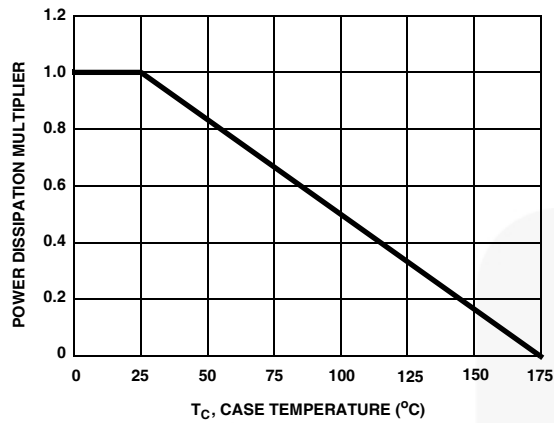


Figure 1. Normalized Power Dissipation vs Case Temperature

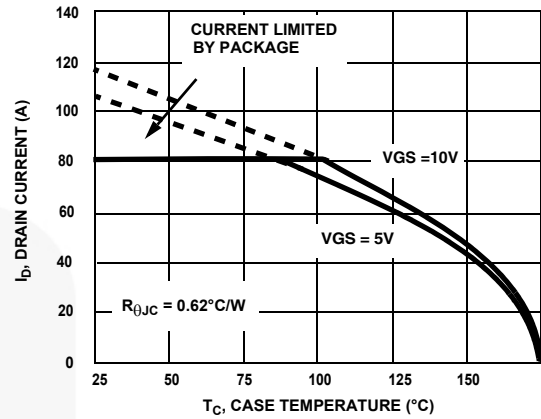


Figure 2. Maximum Continuous Drain Current vs Case Temperature

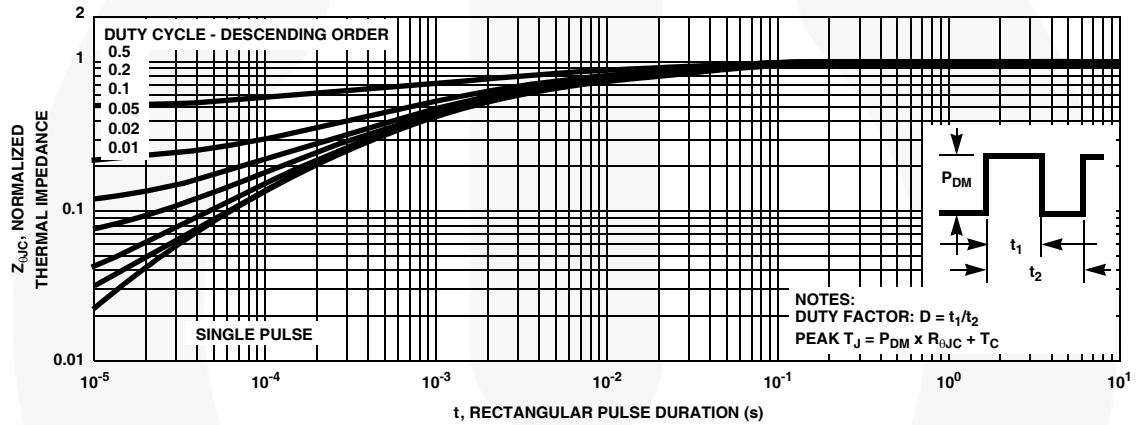


Figure 3. Normalized Maximum Transient Thermal Impedance

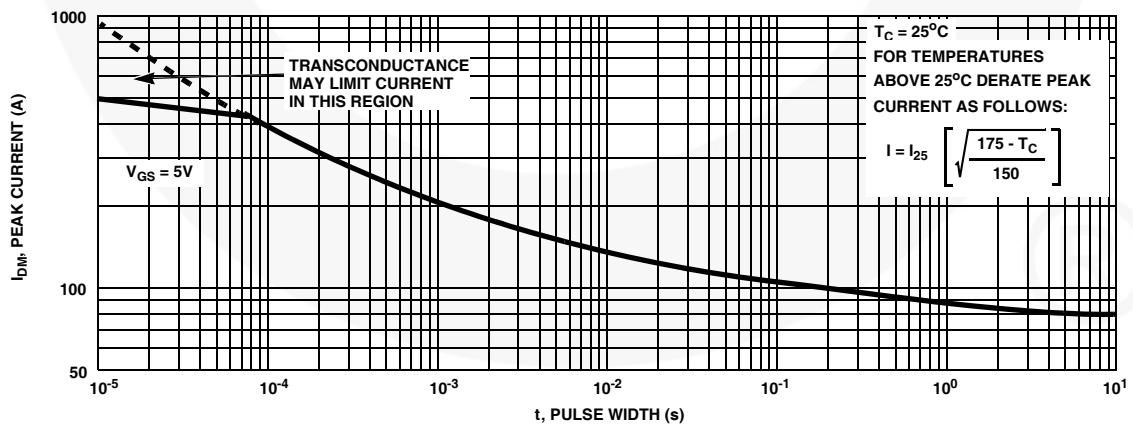


Figure 4. Peak Current Capability

## Typical Characteristics $T_C = 25^\circ\text{C}$ unless otherwise noted

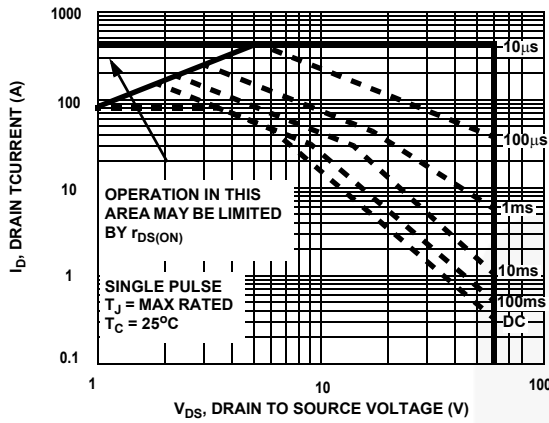
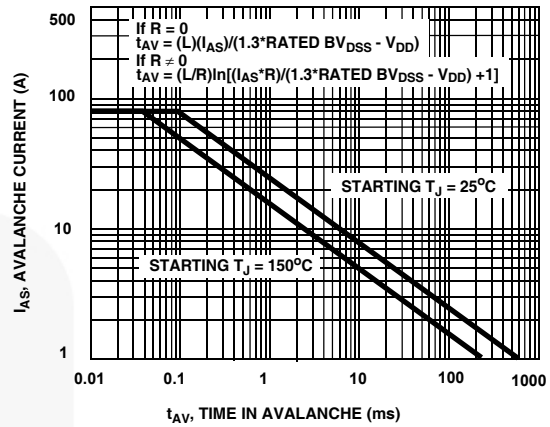


Figure 5. Forward Bias Safe Operating Area



NOTE: Refer to Fairchild Application Notes AN7514 and AN7515

Figure 6. Unclamped Inductive Switching Capability

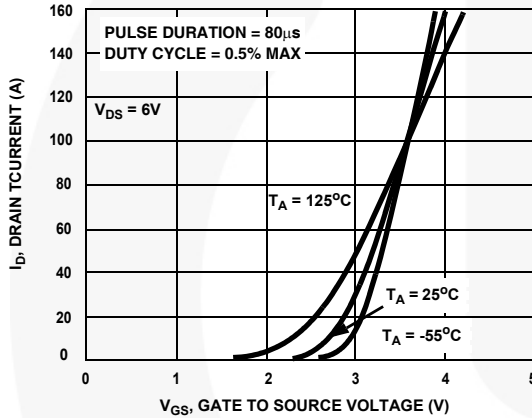


Figure 7. Transfer Characteristics

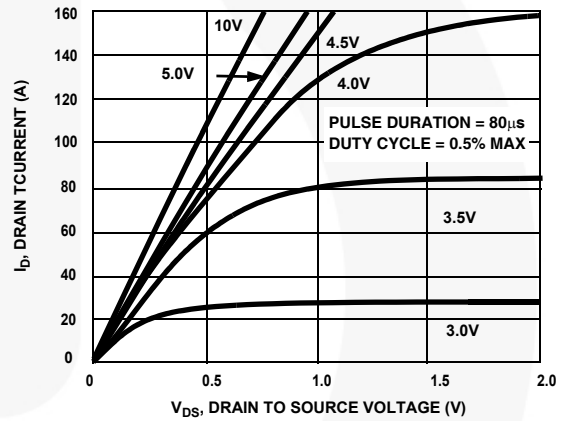


Figure 8. Saturation Characteristics

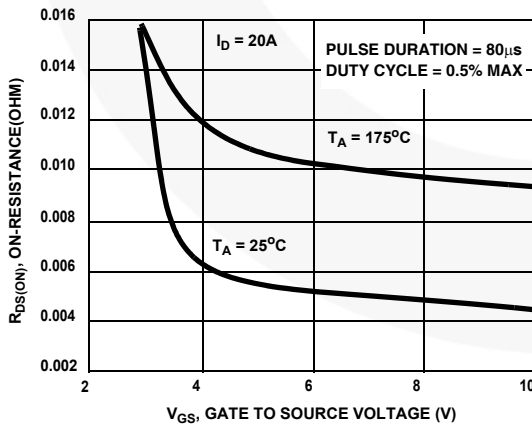


Figure 9. On-Resistance Variation vs. Gate-to-

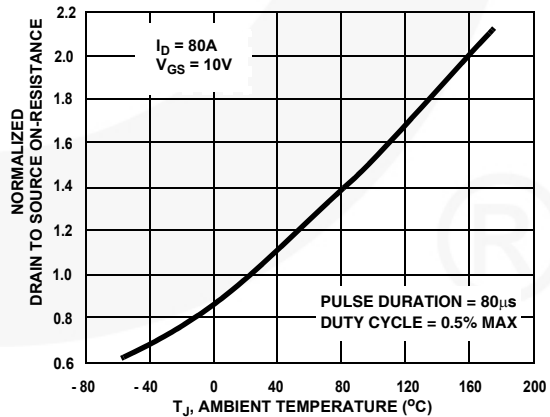
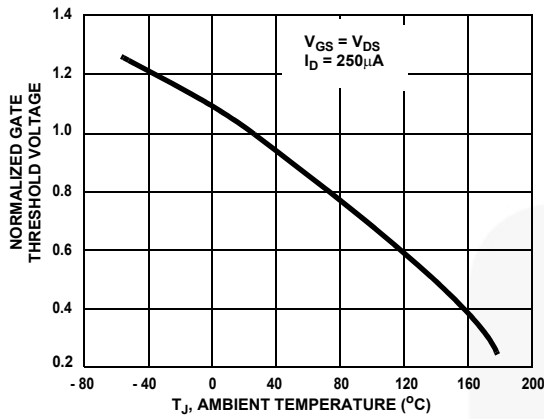
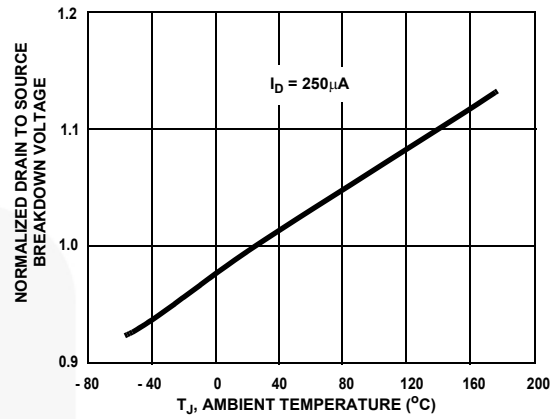


Figure 10. Normalized Drain to Source On

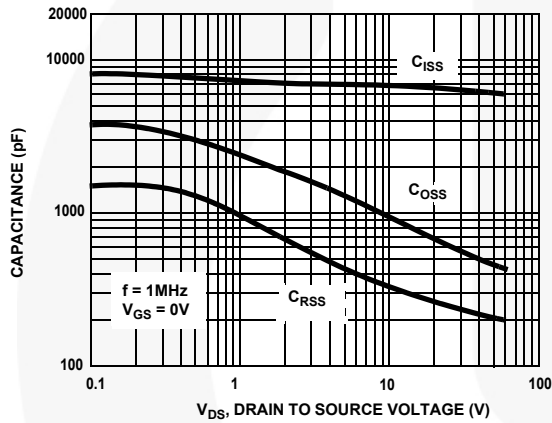
**Typical Characteristics**  $T_C = 25^\circ\text{C}$  unless otherwise noted



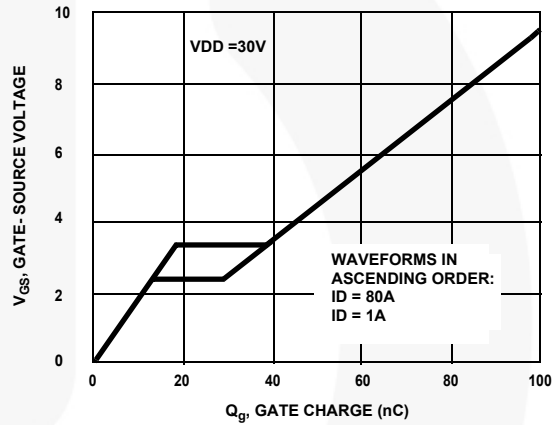
**Figure 11. Normalized Gate Threshold Voltage vs Junction Temperature**



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

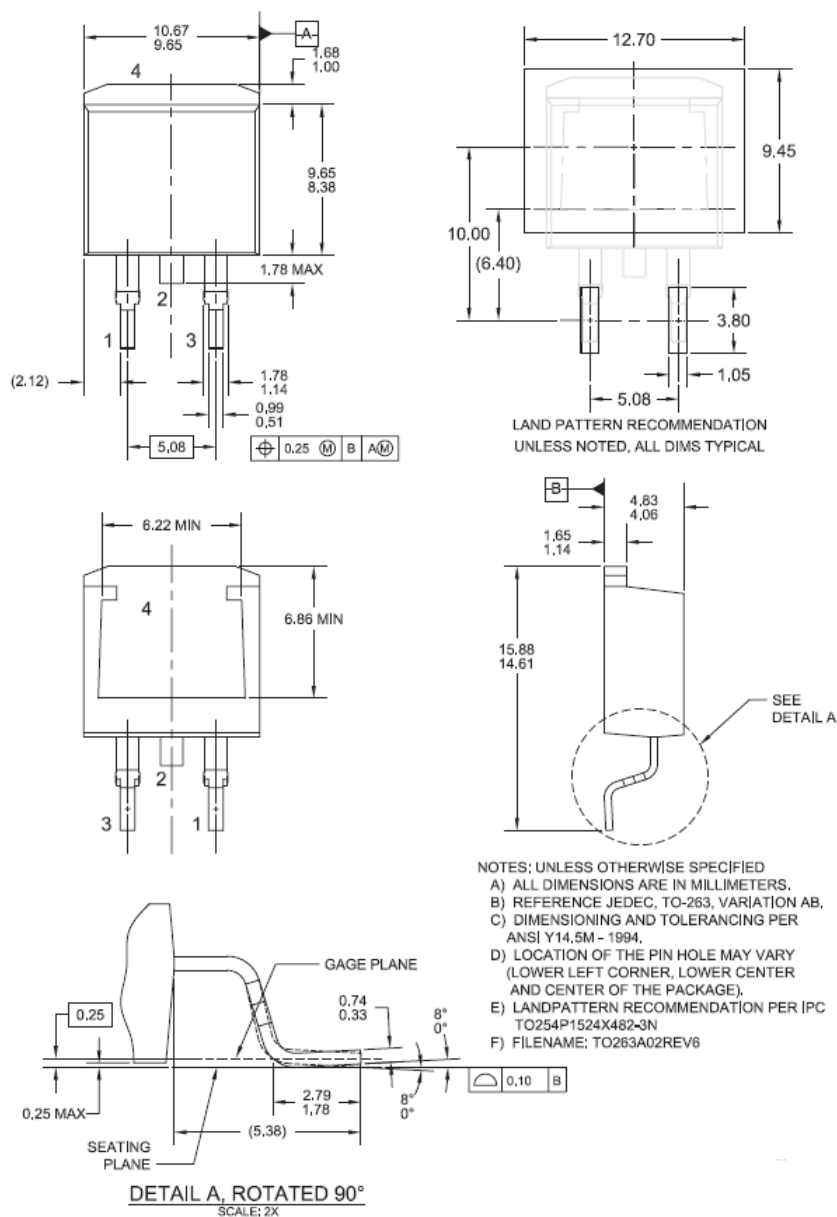


**Figure 13. Capacitance vs Drain to Source Voltage**



**Figure 14. Gate Charge Waveforms for Constant Gate Current**

## Mechanical Dimensions

Figure 15. TO263 (D<sup>2</sup>PAK), Molded, 2-Lead, Surface Mount

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| Fairchild®                                                                        | MicroPak2™                                      |                            | UHC®                                                                                |
| Fairchild Semiconductor®                                                          | MillerDrive™                                    |                            | Ultra FRFET™                                                                        |
| FACT Quiet Series™                                                                | MotionMax™                                      |                            | UniFET™                                                                             |
| FACT®                                                                             | mWSaver®                                        |                            | VCX™                                                                                |
| FAST®                                                                             | OptoHiT™                                        |                            | VisualMax™                                                                          |
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