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# FDB8447L

## 40V N-Channel PowerTrench® MOSFET

40V, 50A, 8.5mΩ

### Features

- Max  $r_{DS(on)}$  = 8.5mΩ at  $V_{GS} = 10V$ ,  $I_D = 14A$
- Max  $r_{DS(on)}$  = 11mΩ at  $V_{GS} = 4.5V$ ,  $I_D = 11A$
- Fast Switching
- RoHS Compliant

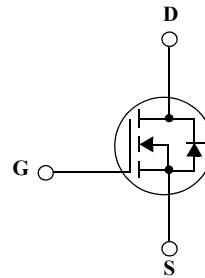
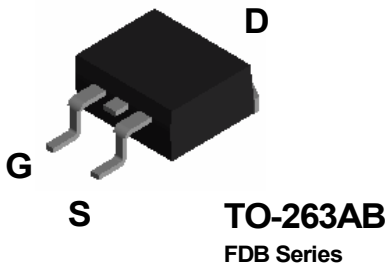


### General Description

This N-Channel MOSFET has been produced using Fairchild Semiconductor's proprietary PowerTrench® technology to deliver low  $r_{DS(on)}$  and optimized  $BV_{DSS}$  capability to offer superior performance benefit in the application.

### Application

- Inverter
- Power Supplies



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

| Symbol         | Parameter  | Rated                              | Units            |
|----------------|--|------------------------------------|------------------|
| $V_{DS}$       | Drain to Source Voltage                          | 40                                 | V                |
| $V_{GS}$       | Gate to Source Voltage                           | ±20                                | V                |
| $I_D$          | Drain Current -Continuous (Package limited)      | $T_C = 25^\circ\text{C}$           | A                |
|                | -Continuous (Silicon limited)                    | $T_C = 25^\circ\text{C}$ (Note 1)  |                  |
|                | -Continuous                                      | $T_A = 25^\circ\text{C}$ (Note 1a) |                  |
|                | -Pulsed  |                                    |                  |
| $E_{AS}$       | Drain-Source Avalanche Energy                    | (Note 3)                           | mJ               |
| $P_D$          | Power Dissipation                                | $T_C = 25^\circ\text{C}$           | W                |
|                | Power Dissipation                                | (Note 1a)                          |                  |
| $T_J, T_{STG}$ | Operating and Storage Junction Temperature Range | -55 to +150                        | $^\circ\text{C}$ |

### Thermal Characteristics

|                 |   |           |     |                    |
|-----------------|---|-----------|-----|--------------------|
| $R_{\theta JC}$ | Thermal Resistance, Junction to Case    | (Note 1)  | 2.1 | $^\circ\text{C/W}$ |
| $R_{\theta JA}$ | Thermal Resistance, Junction to Ambient | (Note 1a) | 40  |                    |

### Package Marking and Ordering Information

| Device Marking | Device   | Package  | Reel Size | Tape Width | Quantity  |
|----------------|----------|----------|-----------|------------|-----------|
| FDB8447L       | FDB8447L | 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

|                                      |   |   |    |    |           |               |
|--------------------------------------|---|---|----|----|-----------|---------------|
| $BV_{DSS}$                           | Drain to Source Breakdown Voltage         | $I_D = 250\mu\text{A}, V_{GS} = 0\text{V}$                | 40 |    |           | V             |
| $\frac{\Delta BV_{DSS}}{\Delta T_J}$ | Breakdown Voltage Temperature Coefficient | $I_D = 250\mu\text{A}$ , referenced to $25^\circ\text{C}$ |    | 35 |           | mV/°C         |
| $I_{DSS}$                            | Zero Gate Voltage Drain Current           | $V_{DS} = 32\text{V}, V_{GS} = 0\text{V}$                 |    |    | 1         | $\mu\text{A}$ |
| $I_{GSS}$                            | Gate to Source Leakage Current            | $V_{GS} = \pm 20\text{V}, V_{DS} = 0\text{V}$             |    |    | $\pm 100$ | nA            |

### On Characteristics (Note 2)

|  |  |  |   |      |      |            |
|--|--|--|---|------|------|------------|
| $V_{GS(th)}$                           | Gate to Source Threshold Voltage                         | $V_{GS} = V_{DS}, I_D = 250\mu\text{A}$                          | 1 | 1.9  | 3    | V          |
| $\frac{\Delta V_{GS(th)}}{\Delta T_J}$ | Gate to Source Threshold Voltage Temperature Coefficient | $I_D = 250\mu\text{A}$ , referenced to $25^\circ\text{C}$        |   | -5   |      | mV/°C      |
| $r_{DS(on)}$                           | Static Drain to Source On Resistance                     | $V_{GS} = 10\text{V}, I_D = 14\text{A}$                          |   | 7.4  | 8.5  | m $\Omega$ |
|  |  | $V_{GS} = 4.5\text{V}, I_D = 11\text{A}$                         |   | 8.7  | 11.0 |            |
|  |  | $V_{GS} = 10\text{V}, I_D = 14\text{A}, T_J = 125^\circ\text{C}$ |   | 10.8 | 12.4 |            |
| $g_{FS}$                               | Forward Transconductance                                 | $V_{DS} = 5\text{V}, I_D = 14\text{A}$                           |   | 58   |      | S          |

### Dynamic Characteristics

|           |                              |   |                   |      |      |    |
|-----------|------------------------------|---|-------------------|------|------|----|
| $C_{iss}$ | Input Capacitance            | $V_{DS} = 20\text{V}, V_{GS} = 0\text{V},$<br>$f = 1\text{MHz}$ |                   | 1970 | 2620 | pF |
| $C_{oss}$ | Output Capacitance           |   |                   | 250  | 335  | pF |
| $C_{rss}$ | Reverse Transfer Capacitance |   |                   | 150  | 225  | pF |
| $R_g$     | Gate Resistance              |   | $f = 1\text{MHz}$ |      | 1.0  |    |

### Switching Characteristics

|              |  |   |  |    |    |    |
|--------------|--|---|--|----|----|----|
| $t_{d(on)}$  | Turn-On Delay Time                       | $V_{DD} = 20\text{V}, I_D = 14\text{A}$<br>$V_{GS} = 10\text{V}, R_{GEN} = 6\Omega$ |  | 11 | 20 | ns |
| $t_r$        | Rise Time                                |   |  | 6  | 12 | ns |
| $t_{d(off)}$ | Turn-Off Delay Time                      |   |  | 28 | 45 | ns |
| $t_f$        | Fall Time                                |   |  | 4  | 10 | ns |
| $Q_{g(TOT)}$ | Total Gate Charge, $V_{GS} = 10\text{V}$ |   |  | 37 | 52 | nC |
| $Q_{g(TOT)}$ | Total Gate Charge, $V_{GS} = 5\text{V}$  | $V_{DD} = 20\text{V}, I_D = 14\text{A}$<br>$V_{GS} = 10\text{V}$                    |  | 20 | 28 | nC |
| $Q_{gs}$     | Gate to Source Gate Charge               |   |  | 6  |    | nC |
| $Q_{gd}$     | Gate to Drain "Miller" Charge            |   |  | 7  |    | nC |

### Drain-Source Diode Characteristics

|          |                                       |   |  |     |     |    |
|----------|---------------------------------------|---|--|-----|-----|----|
| $V_{SD}$ | Source to Drain Diode Forward Voltage | $V_{GS} = 0\text{V}, I_S = 14\text{A}$ (Note 2)     |  | 0.8 | 1.2 | V  |
| $t_{rr}$ | Reverse Recovery Time                 | $I_F = 14\text{A}, di/dt = 100\text{A}/\mu\text{s}$ |  | 28  | 42  | ns |
| $Q_{rr}$ | Reverse Recovery Charge               |   |  | 24  | 36  | nC |

#### Notes:

1:  $R_{\theta JA}$  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.  $R_{\theta JC}$  is guaranteed by design while  $R_{\theta JA}$  is determined by the user's board design.

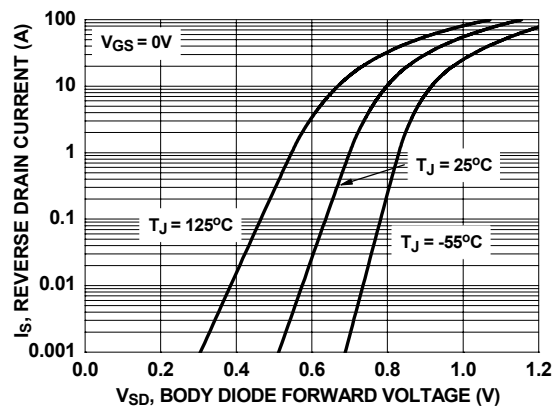
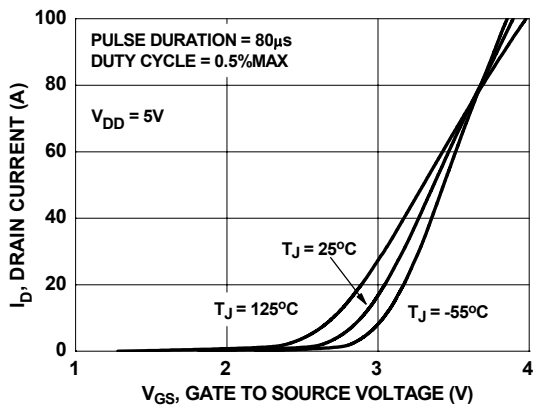
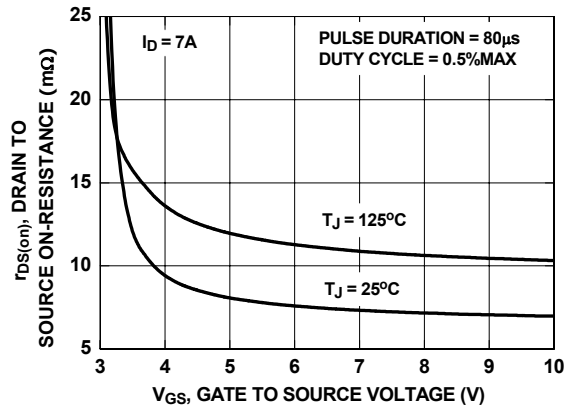
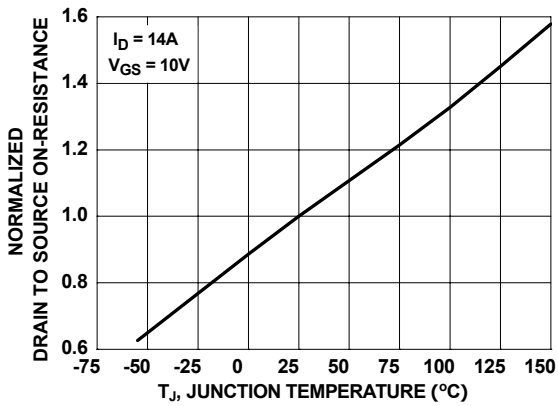
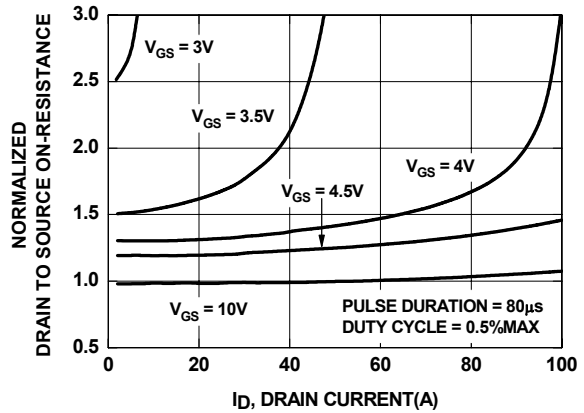
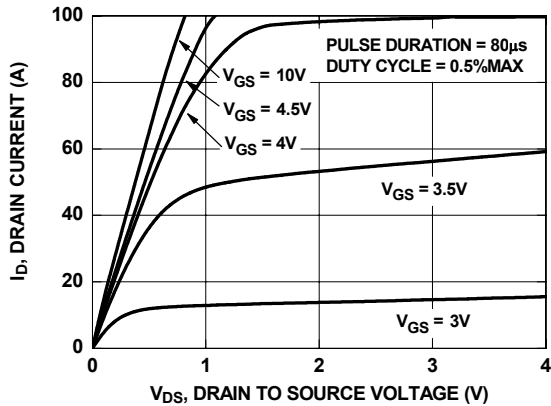
a.  $40^\circ\text{C}/\text{W}$  when mounted on a  $1\text{ in}^2$  pad of 2 oz copper

b.  $62.5^\circ\text{C}/\text{W}$  when mounted on a minimum pad.

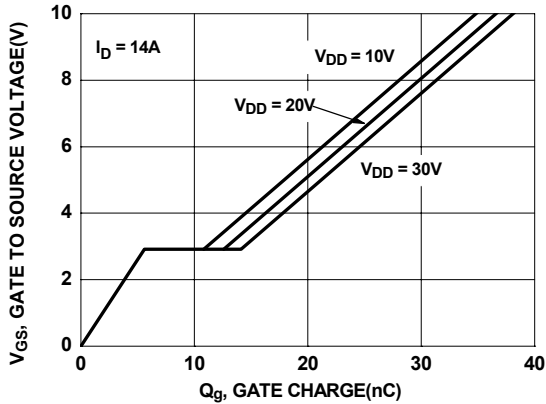
2: Pulse Test: Pulse Width <  $300\mu\text{s}$ , Duty cycle < 2.0%.

3: Starting  $T_J = 25^\circ\text{C}$ ,  $L = 1\text{mH}$ ,  $I_{AS} = 17.5\text{A}$ ,  $V_{DD} = 40\text{V}$ ,  $V_{GS} = 10\text{V}$ .

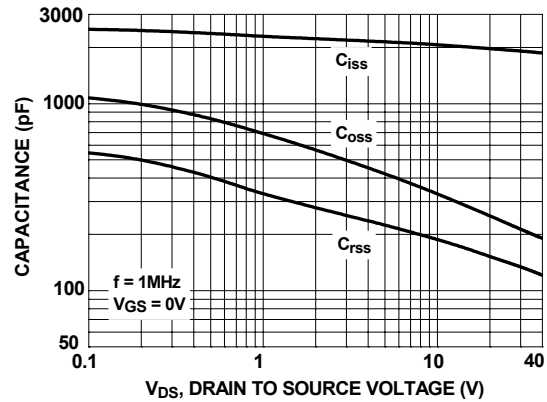
**Typical Characteristics**  $T_J = 25^\circ\text{C}$  unless otherwise noted



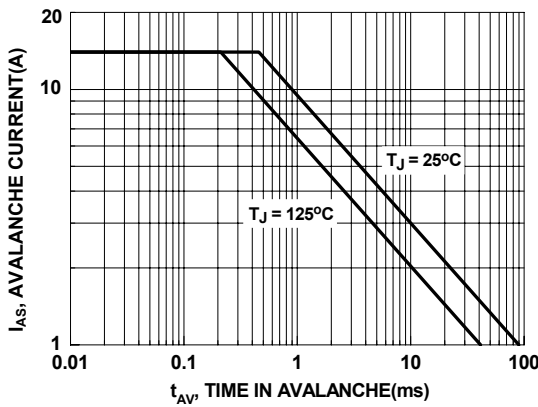
**Typical Characteristics**  $T_J = 25^\circ\text{C}$  unless otherwise noted



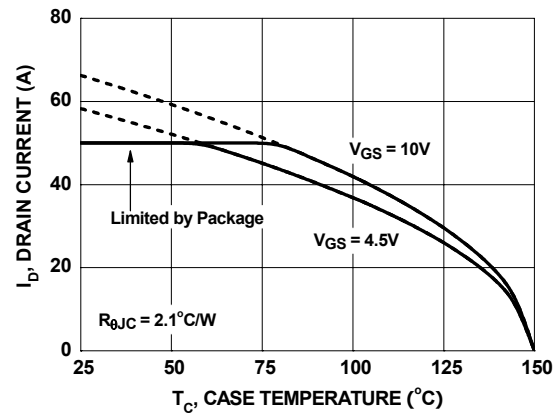
**Figure 7. Gate Charge Characteristics**



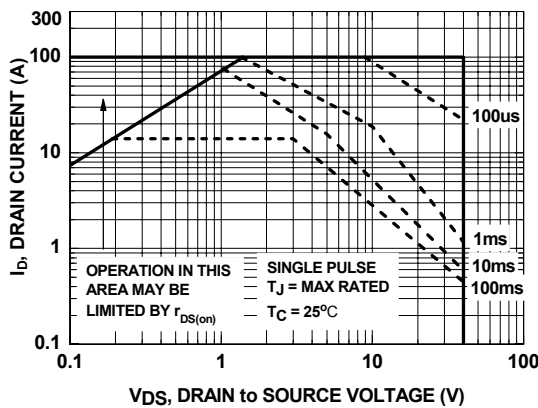
**Figure 8. Capacitance vs Drain to Source Voltage**



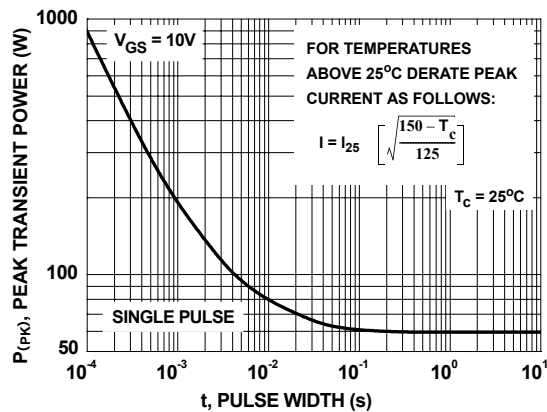
**Figure 9. Unclamped Inductive Switching Capability**



**Figure 10. Maximum Continuous Drain Current vs Case Temperature**

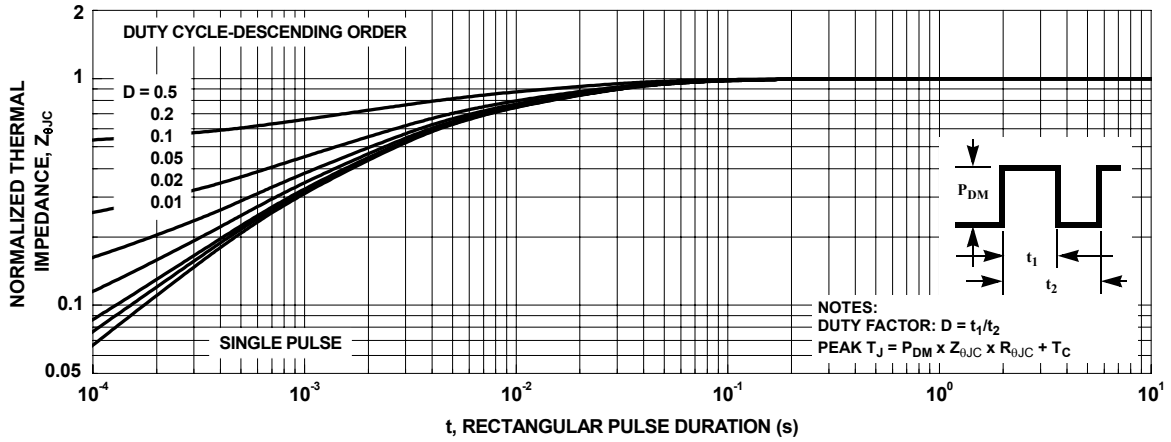


**Figure 11. Forward Bias Safe Operating Area**



**Figure 12. Single Pulse Maximum Power Dissipation**


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



**Figure 13. Transient Thermal Response Curve**

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