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March 2015

# FDD8447L
# 40V N-Channel PowerTrench® MOSFET
**40V, 50A, 8.5mΩ**

## Features

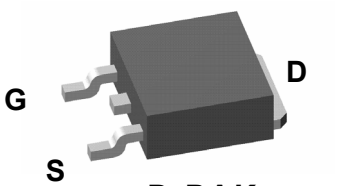
- Max $r_{DS(on)}$ = 8.5mΩ at $V_{GS}$ = 10V, $I_D$ = 14A
- Max $r_{DS(on)}$ = 11.0mΩ at $V_{GS}$ = 4.5V, $I_D$ = 11A
- Fast Switching
- RoHS Compliant

## General Description

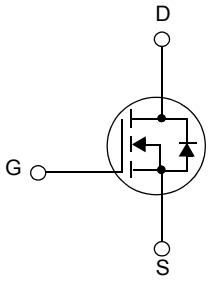
This N-Channel MOSFET has been produced using Fairchild Semiconductor's proprietary PowerTrench® technology to deliver low $r_{DS(on)}$ and optimized $BV_{DSS}$ capability to offer superior performance benefit in the application.

## Applications

- Inverter
- Power Supplies




D-PAK
(TO-252)




## MOSFET Maximum Ratings $T_C$ = 25°C unless otherwise noted

| Symbol | Parameter | | | Ratings | 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°C | | 50 | A |
| | -Continuous (Silicon limited) | $T_C$= 25°C | | 57 | |
| | -Continuous | $T_A$= 25°C | (Note 1a) | 15.2 | |
| | -Pulsed | | | 100 | |
| $I_S$ | Max Pulse Diode Current | | | 100 | A |
| $E_{AS}$ | Drain-Source Avalanche Energy | | (Note 3) | 153 | mJ |
| $P_D$ | Power Dissipation | $T_C$= 25°C | | 44 | W |
| | | $T_A$= 25°C | (Note 1a) | 3.1 | |
| | | $T_A$= 25°C | (Note 1b) | 1.3 | |
| $T_J$, $T_{STG}$ | Operating and Storage Junction Temperature Range | | | -55 to +150 | °C |

## Thermal Characteristics

| | | | | |
|---|---|---|---|---|
| $R_{\theta JC}$ | Thermal Resistance, Junction to Case | | 2.8 | °C/W |
| $R_{\theta JA}$ | Thermal Resistance, Junction to Ambient | (Note 1a) | 40 | |
| $R_{\theta JA}$ | Thermal Resistance, Junction to Ambient | (Note 1b) | 96 | |

## Package Marking and Ordering Information

| Device Marking | Device | Package | Reel Size | Tape Width | Quantity |
|---|---|---|---|---|---|
| FDD8447L | FDD8447L | D-PAK(TO-252) | 13" | 16mm | 2500 units |

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

| Symbol | Parameter | Test Conditions | Min | Typ | Max | Units |
|---|---|---|---|---|---|---|
| **Off Characteristics** | | | | | | |
| $BV_{DSS}$ | Drain to Source Breakdown Voltage | $I_D$ = 250μA, $V_{GS}$ = 0V | 40 | | | V |
| $\frac{\Delta BV_{DSS}}{\Delta T_J}$ | Breakdown Voltage Temperature Coefficient | $I_D$ = 250μA, referenced to 25°C | | 35 | | mV/°C |
| $I_{DSS}$ | Zero Gate Voltage Drain Current | $V_{DS}$ = 32V, $V_{GS}$ = 0V | | | 1 | μA |
| $I_{GSS}$ | Gate to Source Leakage Current | $V_{GS}$ = ±20V, $V_{GS}$ = 0V | | | ±100 | nA |
| **On Characteristics (Note 2)** | | | | | | |
| $V_{GS(th)}$ | Gate to Source Threshold Voltage | $V_{GS}$ = $V_{DS}$, $I_D$ = 250μA | 1.0 | 1.9 | 3.0 | V |
| $\frac{\Delta V_{GS(th)}}{\Delta T_J}$ | Gate to Source Threshold Voltage Temperature Coefficient | $I_D$ = 250μA, referenced to 25°C | | -5 | | mV/°C |
| $r_{DS(on)}$ | Static Drain to Source On Resistance | $V_{GS}$ = 10V, $I_D$ = 14A | | 7.0 | 8.5 | mΩ |
| | | $V_{GS}$ = 4.5V, $I_D$ = 11A | | 8.5 | 11.0 | |
| | | $V_{GS}$ = 10V, $I_D$ = 14A, $T_J$=125°C | | 10.4 | 14.0 | |
| $g_{FS}$ | Forward Transconductance | $V_{DS}$ = 5V, $I_D$ = 14A | | 58 | | S |
| **Dynamic Characteristics** | | | | | | |
| $C_{iss}$ | Input Capacitance | $V_{DS}$ = 20V, $V_{GS}$ = 0V, f = 1MHz | | 1970 | | pF |
| $C_{oss}$ | Output Capacitance | | | 250 | | pF |
| $C_{rss}$ | Reverse Transfer Capacitance | | | 150 | | pF |
| $R_g$ | Gate Resistance | f = 1MHz | | 1.27 | | Ω |
| **Switching Characteristics** | | | | | | |
| $t_{d(on)}$ | Turn-On Delay Time | $V_{DD}$ = 20V, $I_D$ = 1A, $V_{GS}$ = 10V, $R_{GEN}$ = 6Ω | | 12 | 21 | ns |
| $t_r$ | Rise Time | | | 12 | 21 | ns |
| $t_{d(off)}$ | Turn-Off Delay Time | | | 38 | 61 | ns |
| $t_f$ | Fall Time | | | 9 | 18 | ns |
| $Q_{g(TOT)}$ | Total Gate Charge, $V_{GS}$ = 10V | $V_{DD}$ = 20V, $I_D$ = 14A, $V_{GS}$ = 10V | | 37 | 52 | nC |
| $Q_{g(TOT)}$ | Total Gate Charge, $V_{GS}$ = 5V | | | 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** | | | | | | |
| $I_S$ | Maximum Continuous Drain-Source Diode Forward Current | (Note 1a) | | | 2.6 | A |
| $V_{SD}$ | Source to Drain Diode Forward Voltage | $V_{GS}$ = 0V, $I_S$ = 14A (Note 2) | | 0.8 | 1.2 | V |
| $t_{rr}$ | Reverse Recovery Time | $I_F$ = 14A, di/dt = 100A/μs | | 22 | | ns |
| $Q_{rr}$ | Reverse Recovery Charge | | | 11 | | 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°C/W when mounted on a 1 $in^2$ pad of 2 oz copper

b. 96°C/W when mounted on a minimum pad.

**2:** Pulse Test: Pulse Width < 300μs, Duty cycle < 2.0%.

**3:** Starting TJ = 25°C, L = 1mH, IAS = 17.5A, VDD = 40V, VGS = 10V.

## Typical Characteristics

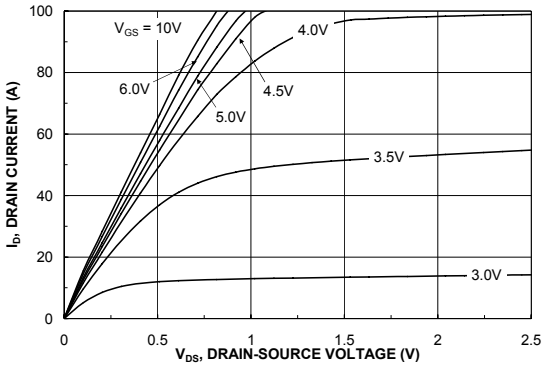



**Figure 1. On-Region Characteristics**

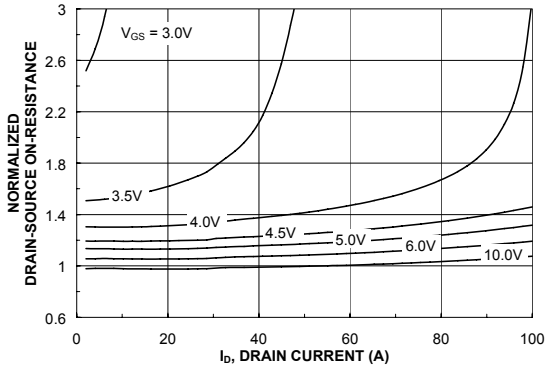



**Figure 2. On-Resistance Variation with Drain Current and Gate Voltage**

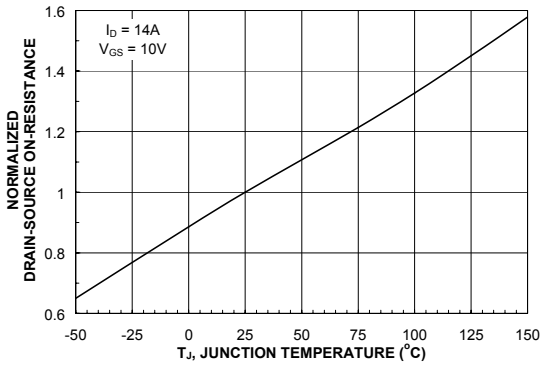



**Figure 3. On-Resistance Variation with Temperature**

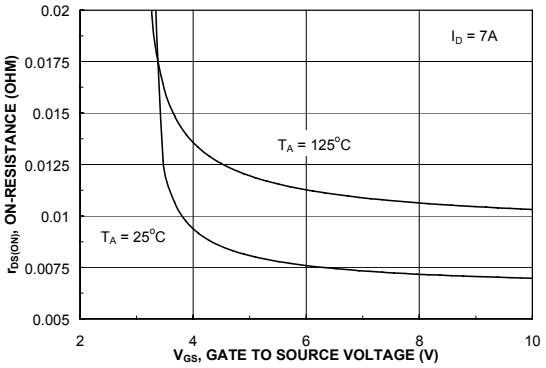



**Figure 4. On-Resistance Variation with Gate-to-Source Voltage**

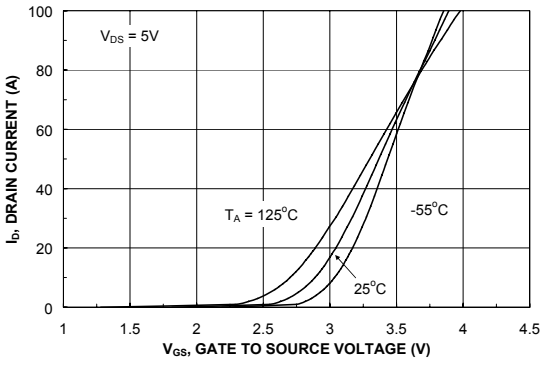



**Figure 5. Transfer Characteristics**

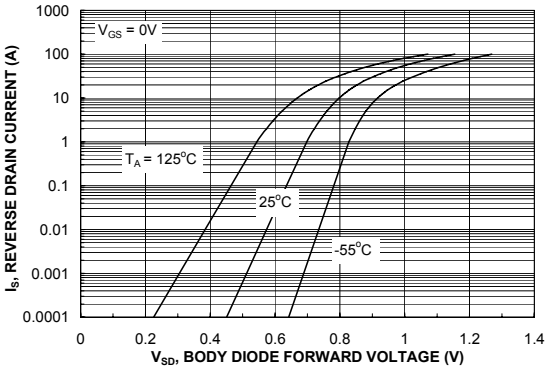



**Figure 6. Body Diode Forward Voltage Variation with Source Current and Temperature**

## Typical Characteristics

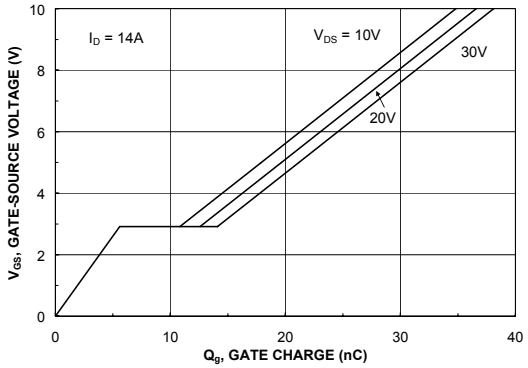



**Figure 7. Gate Charge Characteristics**

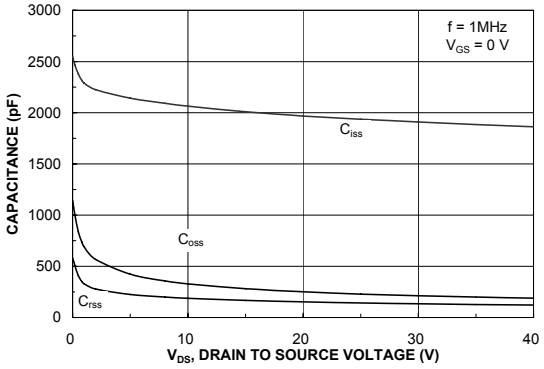



**Figure 8. Capacitance Characteristics**

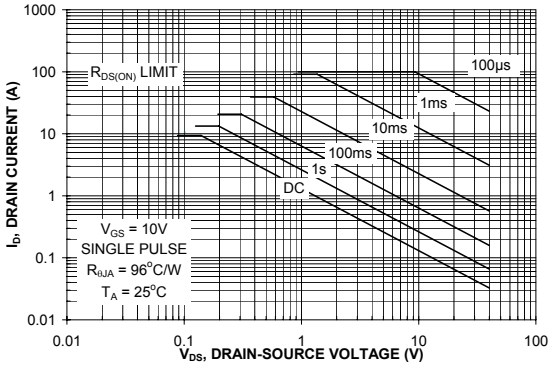



**Figure 9. Maximum Safe Operating Area**

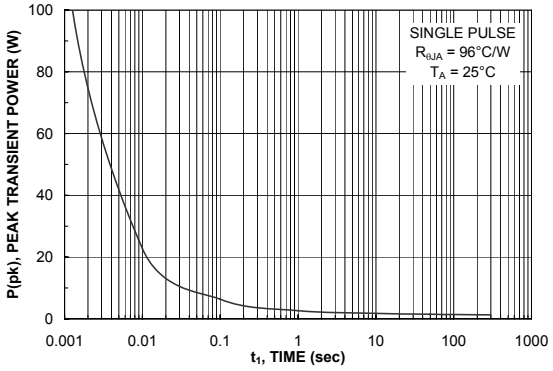



**Figure 10. Single Pulse Maximum Power Dissipation**

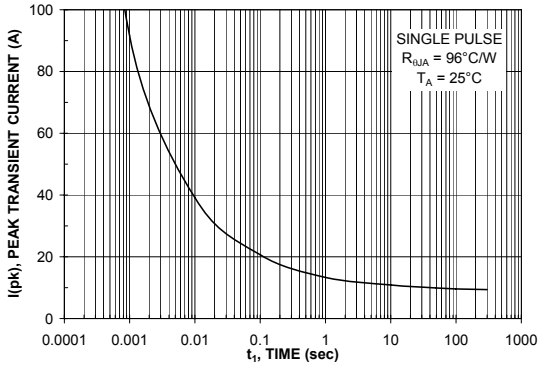



**Figure 11. Single Pulse Maximum Peak Current**

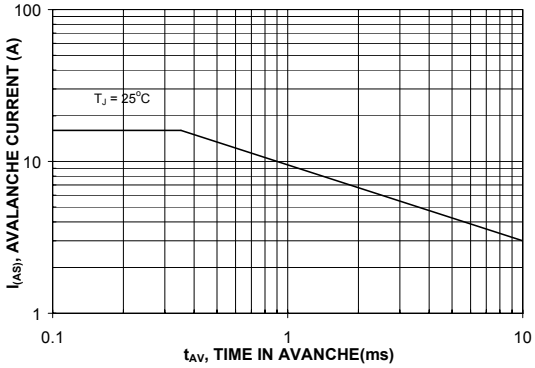



**Figure 12. Unclamped Inductive Switching Capability**

## Typical Characteristics

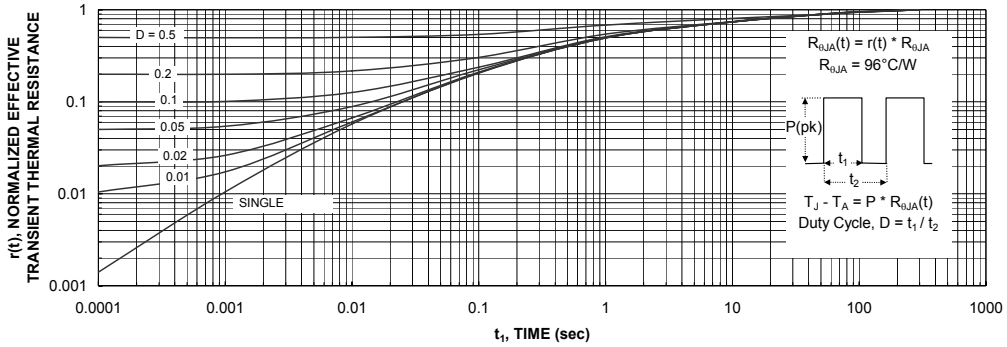
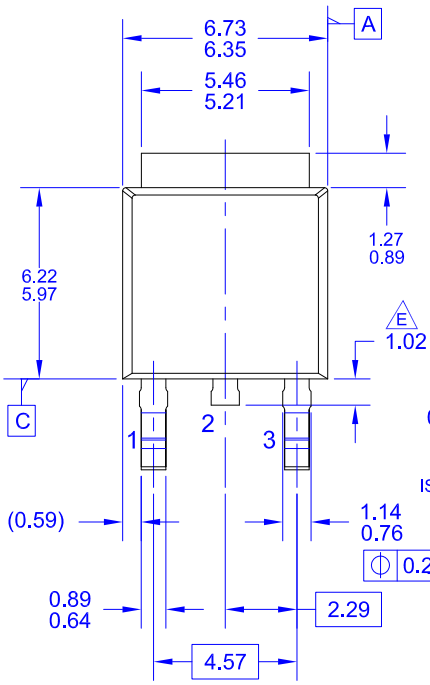
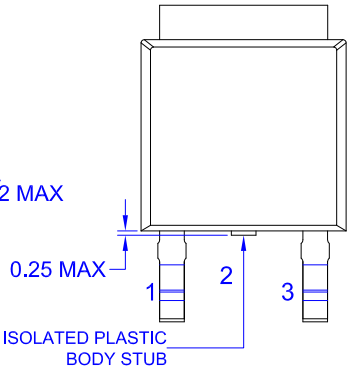



**Figure 13. Transient Thermal Response Curve**

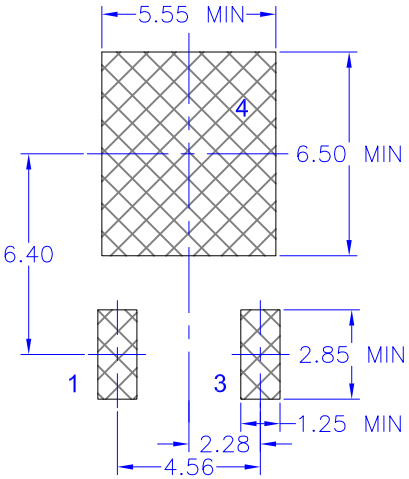
**Thermal characterization performed using the conditions described in Note 1b.**
**Transient thermal response will change depending on the circuit board design.**



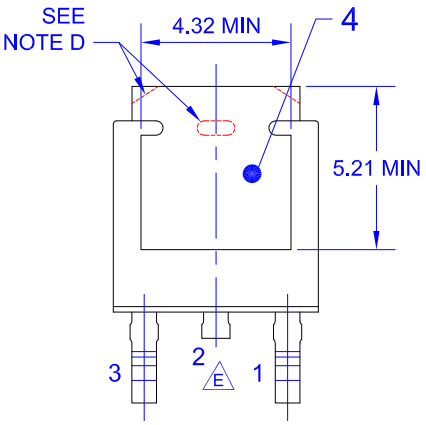

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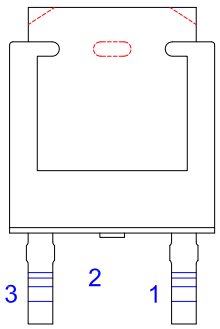

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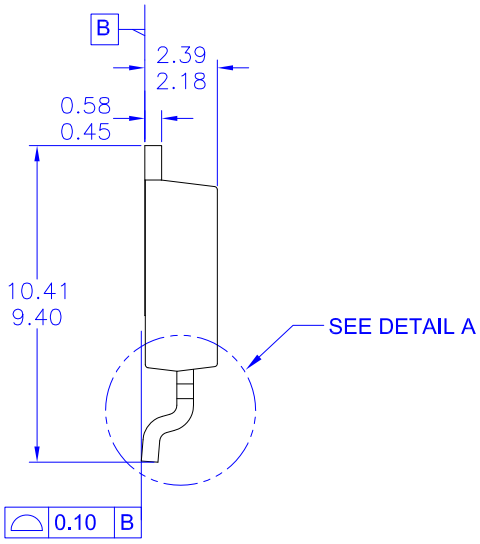

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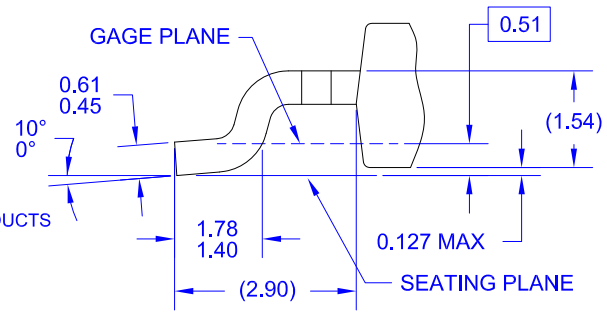



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