

FDD8447L

40V N-Channel PowerTrench® MOSFET

40V, 54A, 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

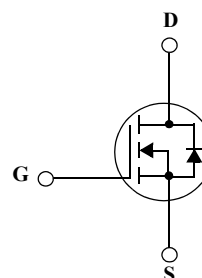
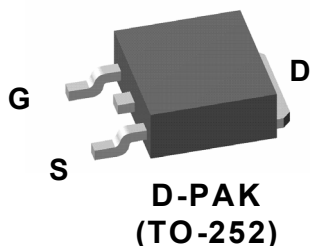


General Description

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	Ratings	Units
V_{DS}	Drain to Source Voltage	40	V
V_{GS}	Gate to Source Voltage	± 20	V
I_D	Continuous Drain Current @ $T_C = 25^\circ\text{C}$ (Note 3)	54	A
	@ $T_A = 25^\circ\text{C}$ (Note 1a)	21	
	Pulsed (Note 1a)	100	
E_{AS}	Drain-Source Avalanche Energy (Note 3)	153	mJ
P_D	Power Dissipation @ $T_C = 25^\circ\text{C}$ (Note 3)	45	W
	@ $T_A = 25^\circ\text{C}$ (Note 1a)	3.8	
	@ $T_A = 25^\circ\text{C}$ (Note 1b)	1.6	
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)	2.8	$^\circ\text{C/W}$
$R_{\theta JA}$	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"	12mm	2500 units

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

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
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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°C		35		mV/ $^\circ\text{C}$
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS} = 32\text{V}$, $V_{GS} = 0\text{V}$			1	μA
I_{GSS}	Gate to Source Leakage Current	$V_{GS} = \pm 20\text{V}$, $V_{DS} = 0\text{V}$			± 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°C		-5		mV/ $^\circ\text{C}$
$r_{DS(on)}$	Static Drain to Source On Resistance	$V_{GS} = 10\text{V}$, $I_D = 14\text{A}$		7	8.5	m Ω
		$V_{GS} = 4.5\text{V}$, $I_D = 11\text{A}$		8.5	11	
		$V_{GS} = 10\text{V}$, $I_D = 14\text{A}$, $T_J = 125^\circ\text{C}$		10.4	14	
g_{FS}	Forward Transconductance	$V_{DS} = 5\text{V}$, $I_D = 14\text{A}$		58		S

Dynamic Characteristics

C_{iss}	Input Capacitance	$V_{DS} = 20\text{V}$, $V_{GS} = 0\text{V}$, $f = 1\text{MHz}$		1970		pF
C_{oss}	Output Capacitance			250		pF
C_{rss}	Reverse Transfer Capacitance			150		pF
R_g	Gate Resistance	$f = 1\text{MHz}$		1.27		Ω

Switching Characteristics

$t_{d(on)}$	Turn-On Delay Time	$V_{DD} = 20\text{V}$, $I_D = 1\text{A}$ $V_{GS} = 10\text{V}$, $R_{GEN} = 6\Omega$		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, $V_{GS} = 10\text{V}$	$V_{DD} = 20\text{V}$, $I_D = 14\text{A}$ $V_{GS} = 10\text{V}$		37	52	nC
$Q_{g(TOT)}$	Total Gate Charge, $V_{GS} = 5\text{V}$			20	28	
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	$I_F = 14\text{A}$, $di/dt = 100\text{A}/\mu\text{s}$		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. $40^\circ\text{C}/\text{W}$ when mounted on a 1 in² pad of 2 oz copper
b. $96^\circ\text{C}/\text{W}$ when mounted on a minimum pad.

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

3: Maximum current is calculated as:

$$\sqrt{\frac{P_D}{r_{DS(on)}}}$$

where P_D is maximum power dissipation at $T_C = 25^\circ\text{C}$ and $r_{DS(on)}$ is at $T_{J(max)}$ and $V_{GS} = 10\text{V}$. Package current limitation is 21A.

4: 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

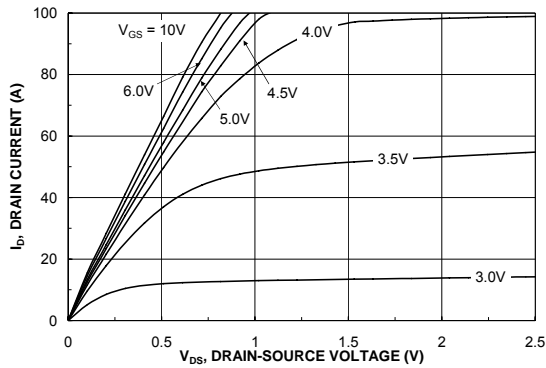


Figure 1. On-Region Characteristics

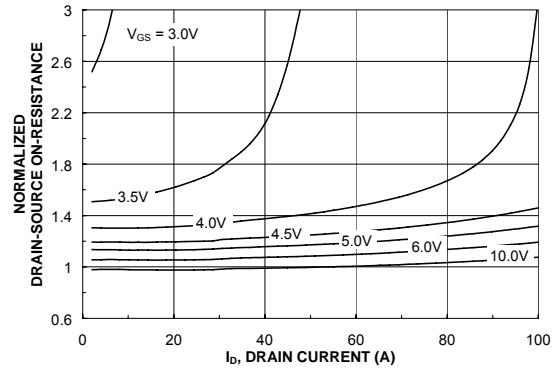


Figure 2. On-Resistance Variation with Drain Current and Gate Voltage

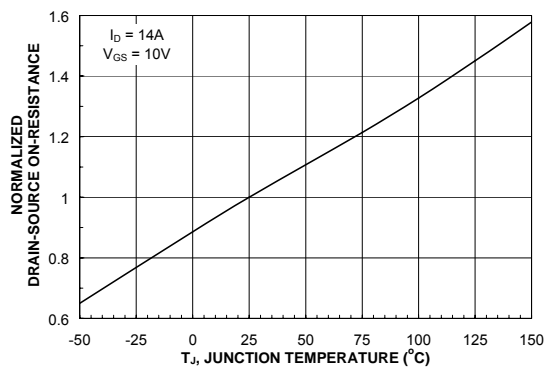


Figure 3. On-Resistance Variation with Temperature

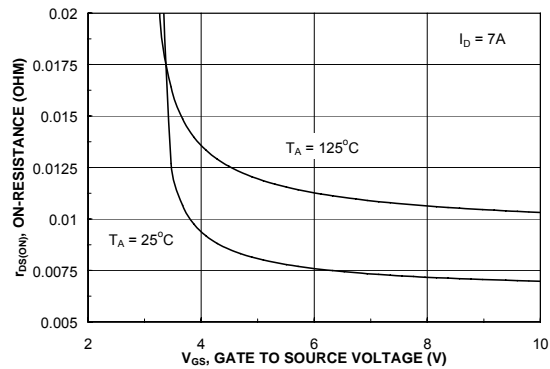


Figure 4. On-Resistance Variation with Gate-to-Source Voltage

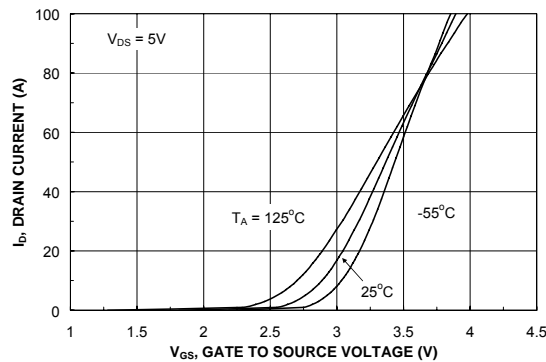


Figure 5. Transfer Characteristics

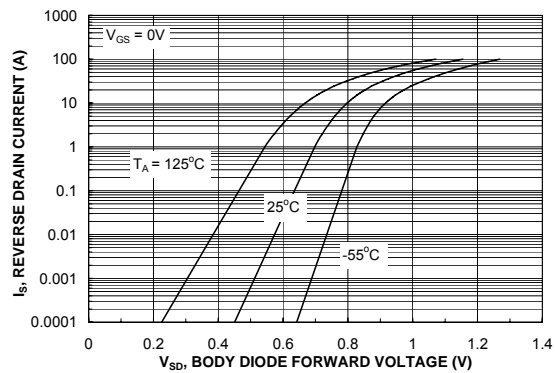


Figure 6. Body Diode Forward Voltage Variation with Source Current and Temperature

Typical Characteristics

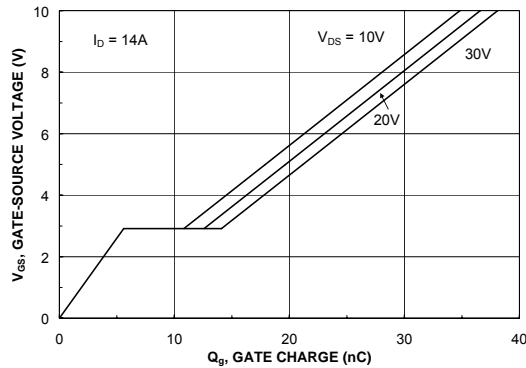


Figure 7. Gate Charge Characteristics

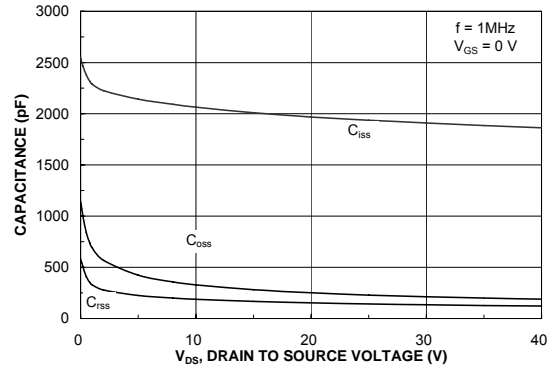


Figure 8. Capacitance Characteristics

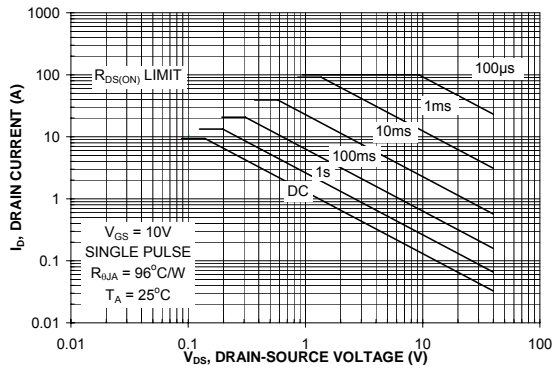


Figure 9. Maximum Safe Operating Area

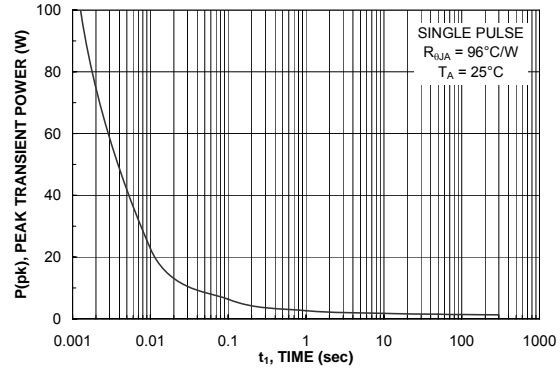


Figure 10. Single Pulse Maximum Power Dissipation

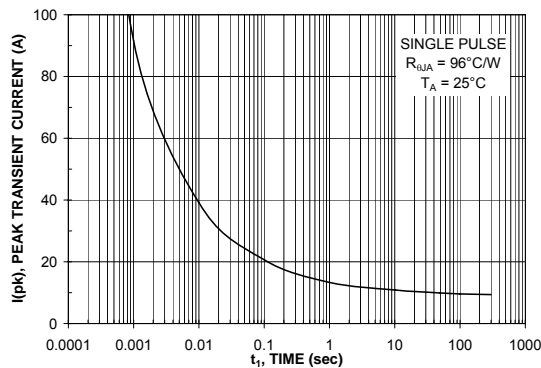


Figure 11. Single Pulse Maximum Peak Current

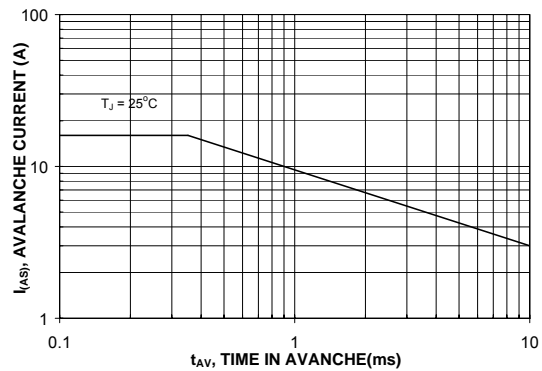


Figure 12. Unclamped Inductive Switching Capability

Typical Characteristics

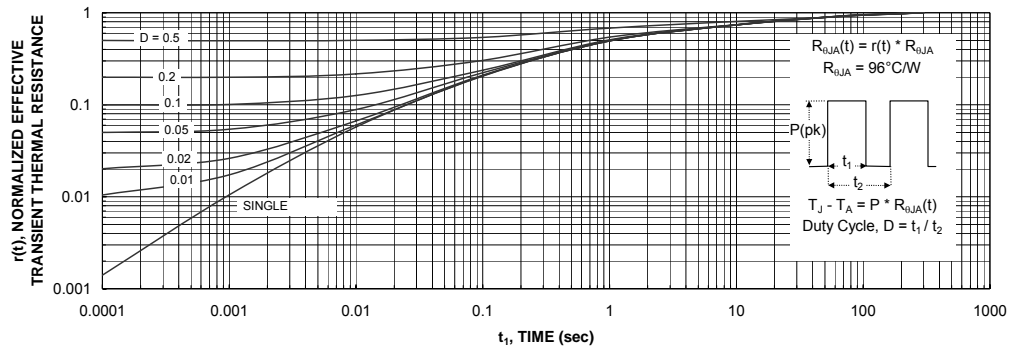


Figure 13. Transient Thermal Response Curve

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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