

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

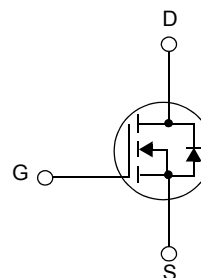
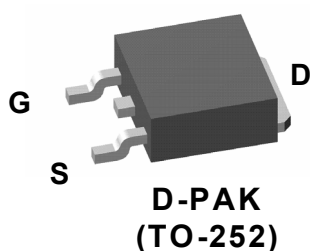


General Description

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



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	Drain Current -Continuous (Package limited) $T_C = 25^\circ\text{C}$	50	A
	-Continuous (Silicon limited) $T_C = 25^\circ\text{C}$	57	
	-Continuous $T_A = 25^\circ\text{C}$ (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 $T_C = 25^\circ\text{C}$	44	W
	$T_A = 25^\circ\text{C}$ (Note 1a)	3.1	
	$T_A = 25^\circ\text{C}$ (Note 1b)	1.3	
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	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
--------	-----------	-----------------	-----	-----	-----	-------

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	$V_{GS} = V_{DS}$, $I_D = 250\mu\text{A}$	1.0	1.9	3.0	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	$V_{GS} = 10\text{V}$, $I_D = 14\text{A}$		7.0	8.5	m Ω
		$V_{GS} = 4.5\text{V}$, $I_D = 11\text{A}$		8.5	11.0	
		$V_{GS} = 10\text{V}$, $I_D = 14\text{A}$, $T_J = 125^\circ\text{C}$		10.4	14.0	
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	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	$V_{GS} = 0\text{V}$, $I_S = 14\text{A}$ (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: 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

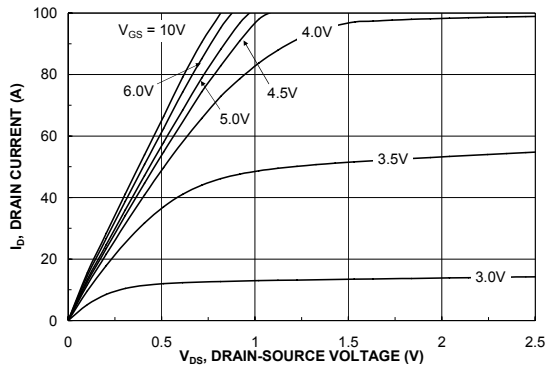


Figure 1. On-Region Characteristics

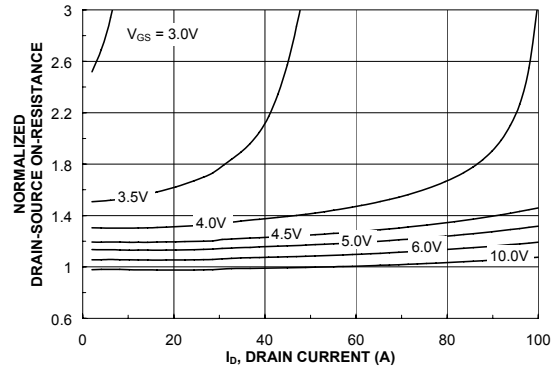


Figure 2. On-Resistance Variation with Drain Current and Gate Voltage

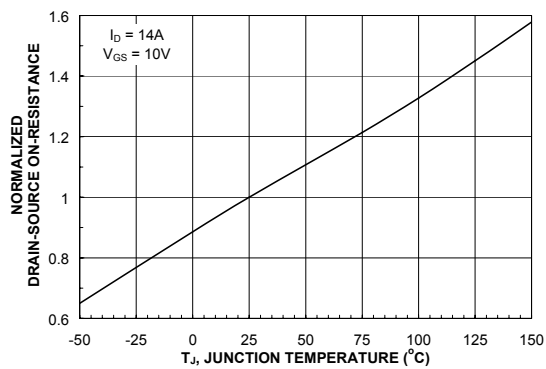


Figure 3. On-Resistance Variation with Temperature

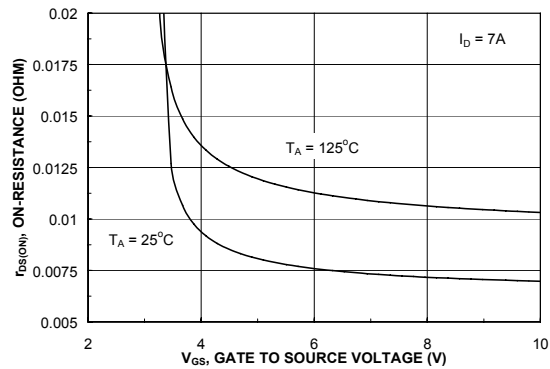


Figure 4. On-Resistance Variation with Gate-to-Source Voltage

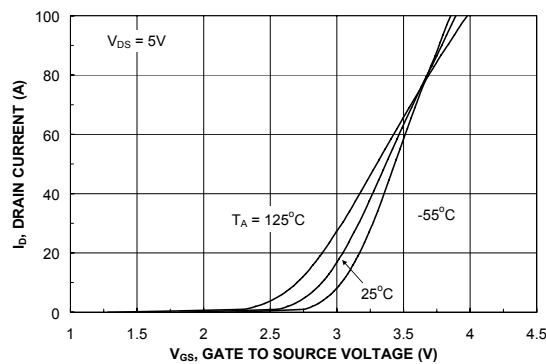


Figure 5. Transfer Characteristics

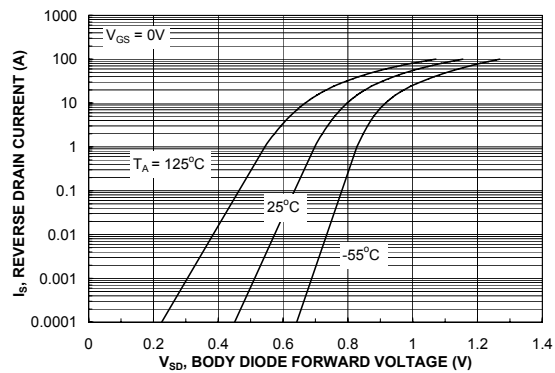


Figure 6. Body Diode Forward Voltage Variation with Source Current and Temperature

Typical Characteristics

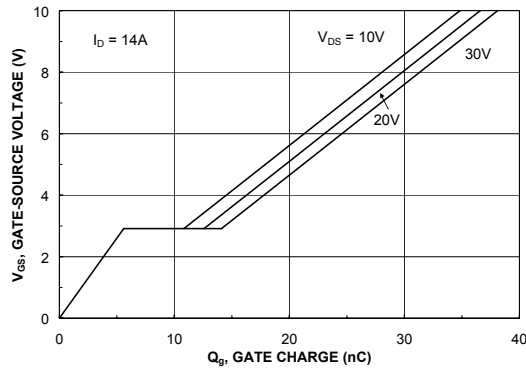


Figure 7. Gate Charge Characteristics

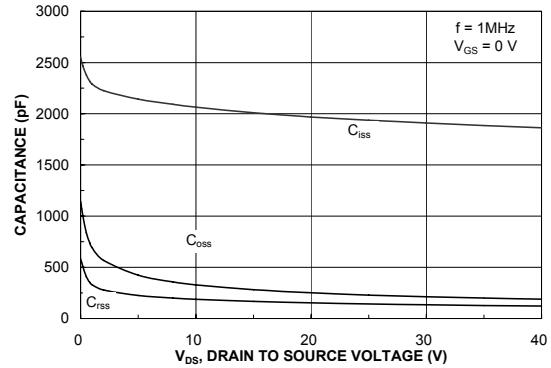


Figure 8. Capacitance Characteristics

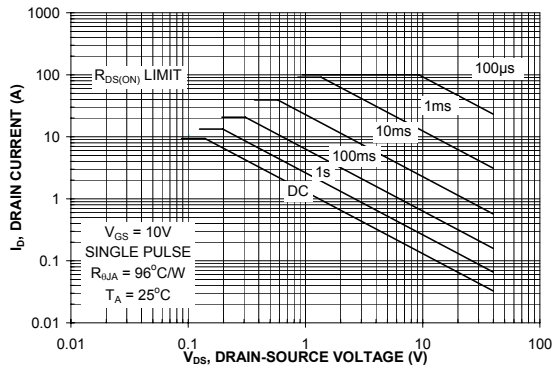


Figure 9. Maximum Safe Operating Area

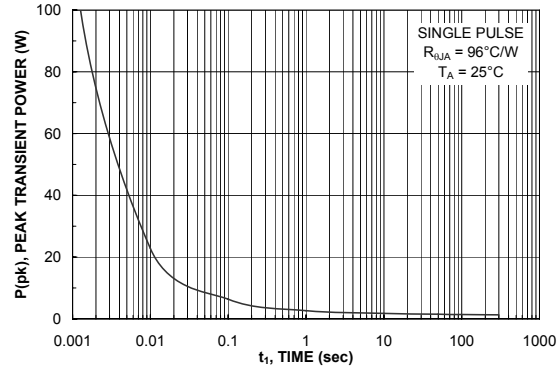


Figure 10. Single Pulse Maximum Power Dissipation

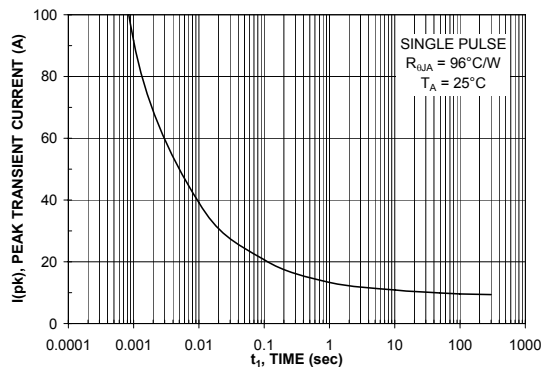


Figure 11. Single Pulse Maximum Peak Current

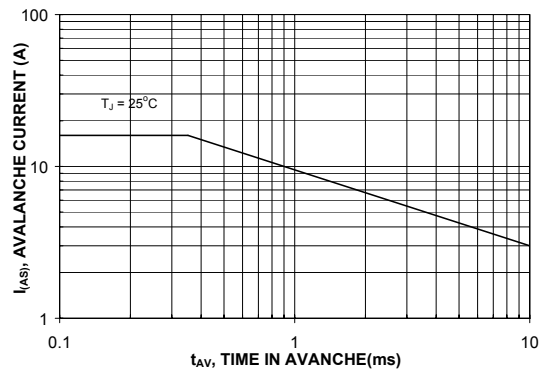


Figure 12. Unclamped Inductive Switching Capability

Typical Characteristics

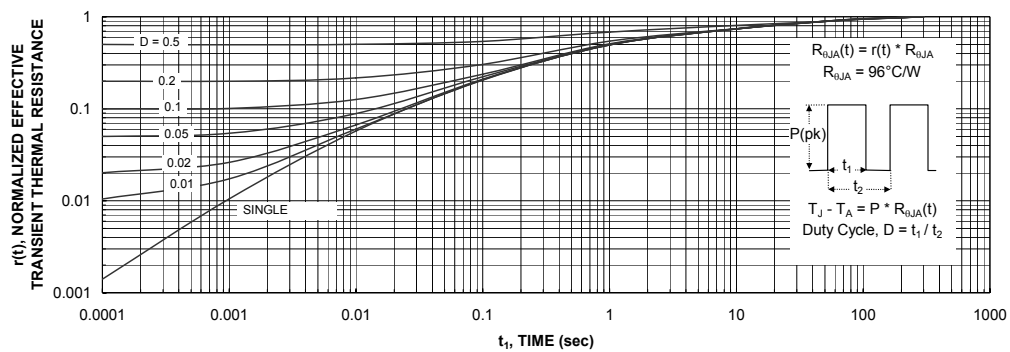







Figure 13. Transient Thermal Response Curve

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



TRADEMARKS

The following includes registered and unregistered trademarks and service marks, owned by Fairchild Semiconductor and/or its global subsidiaries, and is not intended to be an exhaustive list of all such trademarks.

ACE [®]	FPS [™]	PDP-SPM [™]	The Power Franchise [®]
Build it Now [™]	F-PFS [™]	Power-SPM [™]	the power
CorePLUS [™]	FRFET [®]	PowerTrench [®]	franchise
CorePOWER SM	Global Power Resource [™]	Programmable Active Droop [™]	TinyBoost [™]
CROSSVOLT [™]	Green FPS [™]	QFET [®]	TinyBuck [™]
CTL [™]	Green FPS [™] e-Series [™]	QS [™]	TinyLogic [®]
Current Transfer Logic [™]	GTO [™]	Quiet Series [™]	TINYOPTO [™]
EcoSPARK [®]	IntelliMAX [™]	RapidConfigure [™]	TinyPower [™]
EfficientMax [™]	ISOPLANAR [™]	Saving our world 1mW at a time [™]	TinyPWM [™]
EZSWITCH [™] *	MegaBuck [™]	SmartMax [™]	TinyWire [™]
	MICROCOUPLER [™]	SMART START [™]	μSerDes [™]
	MicroFET [™]	SPM [®]	
Fairchild [®]	MicroPak [™]	STEALTH [™]	UHC [®]
Fairchild Semiconductor [®]	MillerDrive [™]	SuperFET [™]	Ultra FRFET [™]
FACT Quiet Series [™]	MotionMax [™]	SuperSOT [™] -3	UniFET [™]
FACT [®]	Motion-SPM [™]	SuperSOT [™] -6	VCX [™]
FAST [®]	OPTOLOGIC [®]	SuperSOT [™] -8	VisualMax [™]
FAST [®]	OPTOPLANAR [®]	SuperMOS [™]	
FastvCore [™]			
FlashWriter [®] *			

* EZSWITCH[™] and FlashWriter[®] are trademarks of System General Corporation, used under license by Fairchild Semiconductor.

DISCLAIMER

FAIRCHILD SEMICONDUCTOR RESERVES THE RIGHT TO MAKE CHANGES WITHOUT FURTHER NOTICE TO ANY PRODUCTS HEREIN TO IMPROVE RELIABILITY, FUNCTION, OR DESIGN. FAIRCHILD DOES NOT ASSUME ANY LIABILITY ARISING OUT OF THE APPLICATION OR USE OF ANY PRODUCT OR CIRCUIT DESCRIBED HEREIN; NEITHER DOES IT CONVEY ANY LICENSE UNDER ITS PATENT RIGHTS, NOR THE RIGHTS OF OTHERS. THESE SPECIFICATIONS DO NOT EXPAND THE TERMS OF FAIRCHILD'S WORLDWIDE TERMS AND CONDITIONS, SPECIFICALLY THE WARRANTY THEREIN, WHICH COVERS THESE PRODUCTS.

LIFE SUPPORT POLICY

FAIRCHILD'S PRODUCTS ARE NOT AUTHORIZED FOR USE AS CRITICAL COMPONENTS IN LIFE SUPPORT DEVICES OR SYSTEMS WITHOUT THE EXPRESS WRITTEN APPROVAL OF FAIRCHILD SEMICONDUCTOR CORPORATION.

As used herein:

- Life support devices or systems are devices or systems which, (a) are intended for surgical implant into the body or (b) support or sustain life, and (c) whose failure to perform when properly used in accordance with instructions for use provided in the labeling, can be reasonably expected to result in a significant injury of the user.
- A critical component in any component of a life support, device, or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.

PRODUCT STATUS DEFINITIONS

Definition of Terms

Datasheet Identification	Product Status	Definition
Advance Information	Formative or In Design	This datasheet contains the design specifications for product development. Specifications may change in any manner without notice.
Preliminary	First Production	This datasheet contains preliminary data; supplementary data will be published at a later date. Fairchild Semiconductor reserves the right to make changes at any time without notice to improve design.
No Identification Needed	Full Production	This datasheet contains final specifications. Fairchild Semiconductor reserves the right to make changes at any time without notice to improve the design.
Obsolete	Not In Production	This datasheet contains specifications on a product that is discontinued by Fairchild Semiconductor. The datasheet is for reference information only.

Rev. I34