

November 2013

FDD850N10LD

BoostPak (N-Channel PowerTrench[®] MOSFET + Diode) 100 V, 15.3 A, 75 m Ω

Features

- $R_{DS(on)}$ = 61 m Ω (Typ.) @ V_{GS} = 10 V, I_D = 12 A
- $R_{DS(on)} = 64 \text{ m}\Omega \text{ (Typ.)} @ V_{GS} = 5.0 \text{ V}, I_D = 12 \text{ A}$
- Low Gate Charge (Typ. 22.2 nC)
- Low C_{rss} (Typ. 42 pF)
- · Fast Switching
- · 100% Avalanche Tested
- · Improved dv/dt Capability
- · RoHS Compliant

Description

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

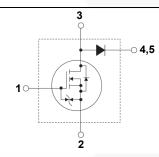
The NP diode is hyperfast rectifier with low forward voltage drop and excellent switching performance.

Applications

- · LED Monitor Backlight
- · LED TV Backlight
- · LED Lighting
- Consumer Appliances, DC-DC converter (Step up & Step down)



- 1. Gate
- 2. Source
- 3. Drain / Anode
- 4. Cathode
- 5. Cathode



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

Symbol		Parameter			Unit
V_{DSS}	Drain to Source Voltage	Drain to Source Voltage			V
V_{GSS}	Gate to Source Voltage			±20	V
	Drain Current	- Continuous (T _C = 25°C)		15.3	А
ID	Diain Current	- Continuous (T _C = 100°C)		9.7	A
I _{DM}	Drain Current	- Pulsed	(Note 1)	46	Α
E _{AS}	Single Pulsed Avalanche Energy (Note 2)		(Note 2)	41	mJ
dv/dt	Peak Diode Recovery of	v/dt	(Note 3)	6.0	V/ns
В	Power Dissipation	(T _C = 25°C)		42	W
P_{D}	Power Dissipation	- Derate Above 25°C		0.33	W/°C
I _F (AV)	Diode Average Rectifie	d Forward Current (T _C = 138°C)		5	Α
I _{FSM}	Diode Non-repetitive Peak Surge Current 60 Hz Single Half-Sine Wave			50	Α
T _J , T _{STG}	Operating and Storage Temperature Range			-55 to +150	°C
T _L	Maximum Lead Temper	ature for Soldering, 1/8" from Case for	5 Seconds	300	°C

Thermal Characteristics

Symbol	Parameter	FDD850N10LD	Unit
$R_{\theta JC}$	Thermal Resistance, Junction to Case for MOSFET, Max.	3.0	
$R_{\theta JC}$	Thermal Resistance, Junction to Case for Diode, Max. 2.5		°C/W
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient, Max.	87	

Package Marking and Ordering Information

Part Number	Top Mark	Package	Packing Method	Reel Size	Tape Width	Quantity
FDD850N10LD	850N10LD	TO-252 5L	Tape and Reel	13"	16 mm	2500 units

Electrical Characteristics of the MOSFET $T_C = 25^{\circ}$ C unless otherwise noted.

Symbol	Parameter	Test Conditions	Min.	Тур.	Max.	Unit
Off Charac	cteristics					
BV _{DSS}	Drain to Source Breakdown Voltage	$I_D = 250 \mu A, V_{GS} = 0 V$	100	-	-	V
ΔBV _{DSS} / ΔT _J	Breakdown Voltage Temperature Coefficient	I_D = 250 μA, Referenced to 25°C	-	0.1	-	V/°C
	Zero Gate Voltage Drain Current	V _{DS} = 80 V, V _{GS} = 0 V	-	-	1	
I _{DSS} Zero Gate Voltaç	Zero Gate voltage Drain Current	$V_{DS} = 80 \text{ V}, T_{C} = 125^{\circ}\text{C}$	-	-	500	μΑ
I _{GSS}	Gate to Body Leakage Current	V _{GS} = ±20 V, V _{DS} = 0 V	-	-	±100	nA

On Characteristics

V _{GS(th)}	Gate Threshold Voltage	$V_{GS} = V_{DS}, I_{D} = 250 \mu\text{A}$	1.0	-	2.5	V
D	Static Drain to Source On Resistance	$V_{GS} = 10 \text{ V}, I_D = 12 \text{ A}$	-	61	75	mΩ
R _{DS(on)} Static Drain to Source On Resistance	V _{GS} = 5 V, I _D =12 A	-	64	96	11152	
9 _{FS}	Forward Transconductance	V _{DS} = 10 V, I _D = 15.3 A	-	31	-	S

Dynamic Characteristics

C _{iss}	Input Capacitance		V 05.V.V 0.V	-	1100	1465	pF
C _{oss}	Output Capacitance		$V_{DS} = 25 \text{ V}, V_{GS} = 0 \text{ V},$ f = 1 MHz	-	80	105	pF
C _{rss}	Reverse Transfer Capacitance	I – 1 WITZ		-	42	-	pF
Q _{g(tot)}	Total Gate Charge at 10V			-	22.2	28.9	nC
$Q_{g(tot)}$	Total Gate Charge at 5V		V _{DS} = 80 V, I _D = 15.3 A		12.3	16.0	nC
Q_{gs}	Gate to Source Gate Charge		20	-	3.0	-	nC
Q_{gd}	Gate to Drain "Miller" Charge		(Note	-	5.7	-	nC
ESR	Equivalent Series Resistance (G-S)		f = 1 MHz	-	1.75	-	Ω

Switching Characteristics

t _{d(on)}	Turn-On Delay Time		-	17	44	ns
t _r		$V_{DD} = 50 \text{ V}, I_{D} = 15.3 \text{ A},$	-/	21	52	ns
t _{d(off)}	Turn-Off Delay Time	V_{GS} = 5 V, R_G = 4.7 Ω	-	27	64	ns
t _f	Turn-Off Fall Time	(Note 4)	/-	8	26	ns

Drain-Source Diode Characteristics

I _S	Maximum Continuous Drain to Source Diode Forward Current		-	-	15.3	Α
I _{SM}	Maximum Pulsed Drain to Source Diode Forward Current		-	-	46	Α
V_{SD}	Drain to Source Diode Forward Voltage	V _{GS} = 0 V, I _{SD} = 12 A	-	-	1.3	V
t _{rr}	Reverse Recovery Time	V _{GS} = 0 V, I _{SD} = 15.3 A, V _{DS} = 80 V,	-	38	-	ns
Q _{rr}	Reverse Recovery Charge	dI _F /dt = 100 A/μs	-	50	-	nC

Notes:

- 1. Repetitive rating: pulse-width limited by maximum junction temperature.
- 2. L = 1 mH, I $_{AS}$ = 9.1 A, R $_{G}$ = 25 Ω , starting T $_{J}$ = 25°C.
- 3. I_{SD} \leq 15.3 A, di/dt \leq 200 A/ μ s, V_{DD} \leq BV_{DSS}, starting T_J = 25°C.
- 4. Essentially independent of operating temperature typical characteristics.

Electrical Characteristics of the Diode $T_C = 25^{\circ}C$ unless otherwise noted.

Symbol	Parameter	Test Conditions		Min.	Тур.	Max.	Unit
V_R	DC Blocking Voltage	I _R = 250 μA		150	-	-	V
V	V _{FM} Maximum Instantaneous Forward Voltage	I _F = 5 A	T _C = 25°C	-	-	2.5	V
v _{FM}		IF - 5 A	$T_{\rm C} = 125^{\rm o}{\rm C}$	-	0.9	-	V
ı	Maximum Instantaneous Reverse Current	2) rated VD	T _C = 25°C	-	-	50	uA
I _{RM}	waximum instantaneous Reverse Current (d		$T_{\rm C} = 125^{\rm o}{\rm C}$	-	-	1000	uA
+	Diode Reverse Recovery Time		$T_{\rm C} = 25^{\rm o}{\rm C}$	-	10.7	22	ns
^L rr	Diode Reverse Recovery Time		$T_{\rm C} = 125^{\rm o}{\rm C}$	-	14.5	-	115
1	Diode Peak Reverse Recovery Current	I _F = 5 A, dI/dt = 200 A/μs	$T_{\rm C} = 25^{\rm o}{\rm C}$	-	2.2	5	Α
'rr	Diode Feak Reverse Recovery Current	di/dt = 200 A/μS	$T_{\rm C} = 125^{\rm o}{\rm C}$	-	3.4	-	^
0	Diada Davarra Dasavaru Charra		$T_{\rm C} = 25^{\rm o}{\rm C}$	-	11.7	-	nC
Q _{rr}	Diode Reverse Recovery Charge		$T_{\rm C} = 125^{\rm o}{\rm C}$	-	24.7	-	110
W _{AVL}	Avalanche Energy (L = 40 mH)			10	-	-	mJ

Typical Performance Characteristics - MOSFET

Figure 1. On-Region Characteristics

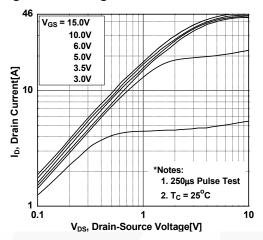


Figure 3. On-Resistance Variation vs.

Drain Current and Gate Voltage

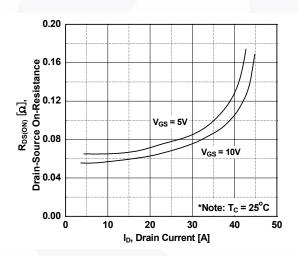


Figure 5. Capacitance Characteristics

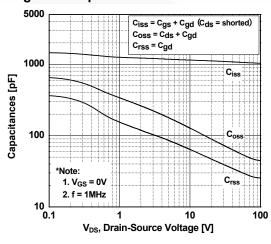


Figure 2. Transfer Characteristics

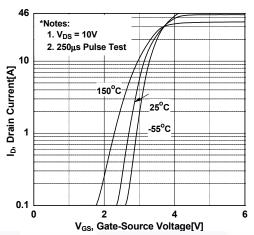


Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature

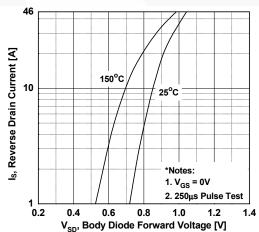
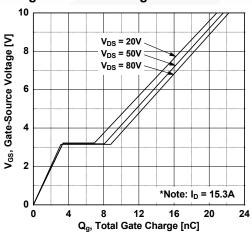


Figure 6. Gate Charge Characteristics



Typical Performance Characteristics - MOSFET (Continued)

Figure 7. Breakdown Voltage Variation vs. Temperature

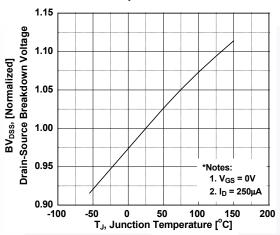


Figure 9. Maximum Safe Operating Area

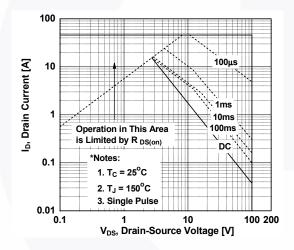


Figure 8. On-Resistance Variation vs. Temperature

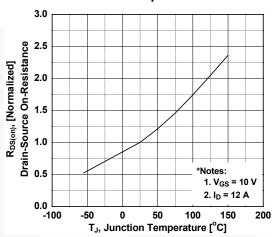
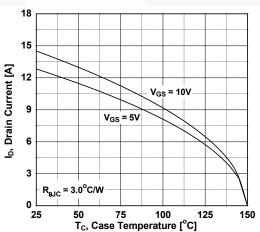


Figure 10. Maximum Drain Current vs. Case Temperature



Typical Performance Characteristics - Diode (Continued)

Figure 11. Diode Forward Voltage Drop vs. Forward Current

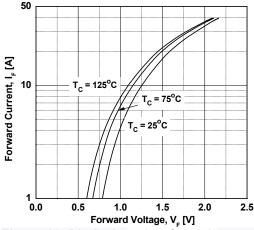


Figure 13. Diode Junction Capacitance

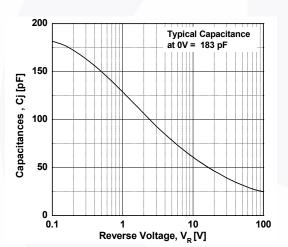


Figure 15. Diode Reverse Recovery Current vs. di/dt

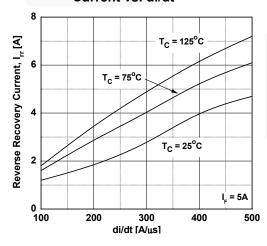


Figure 12. Diode Reverse Current vs. Reverse Voltage

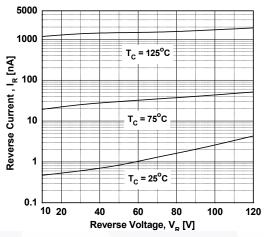


Figure 14. Diode Reverse Recovery Time vs. di/dt

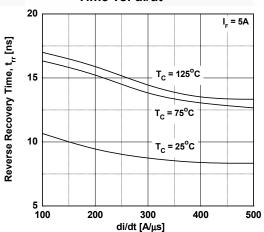
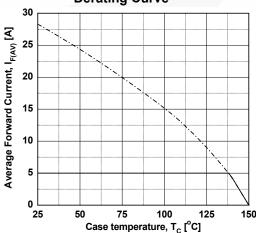


Figure 16. Diode Forward Current Derating Curve



Typical Performance Characteristics (Continued)

Figure 17. Transient Thermal Response Curve of MOSFET

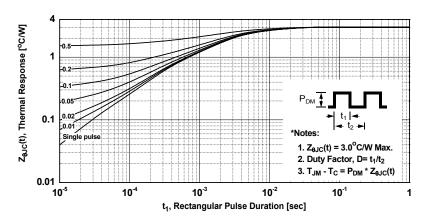
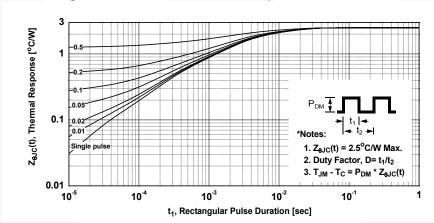


Figure 18. Transient Thermal Response Curve of Diode



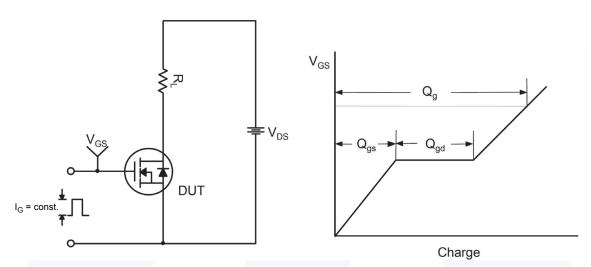


Figure 19. Gate Charge Test Circuit & Waveform

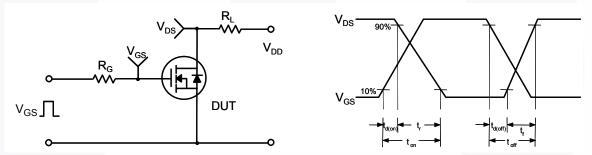


Figure 20. Resistive Switching Test Circuit & Waveforms

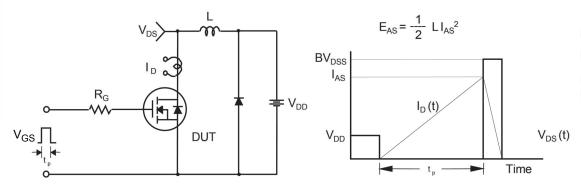


Figure 21. Unclamped Inductive Switching Test Circuit & Waveforms

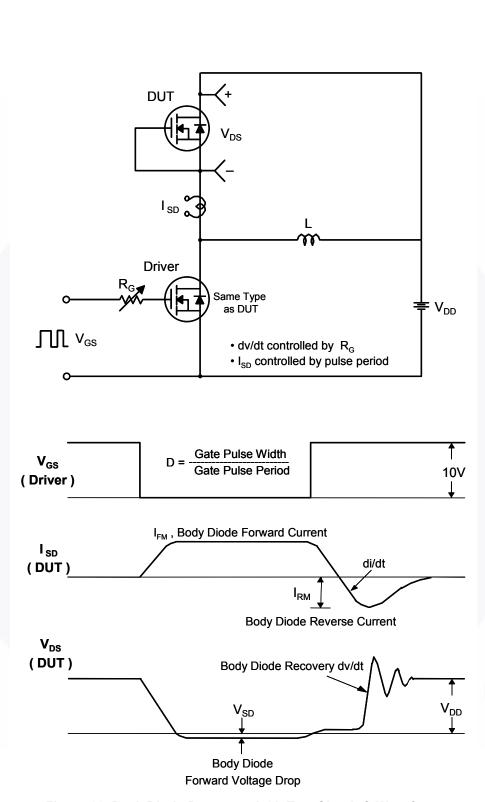


Figure 22. Peak Diode Recovery dv/dt Test Circuit & Waveforms

Mechanical Dimensions

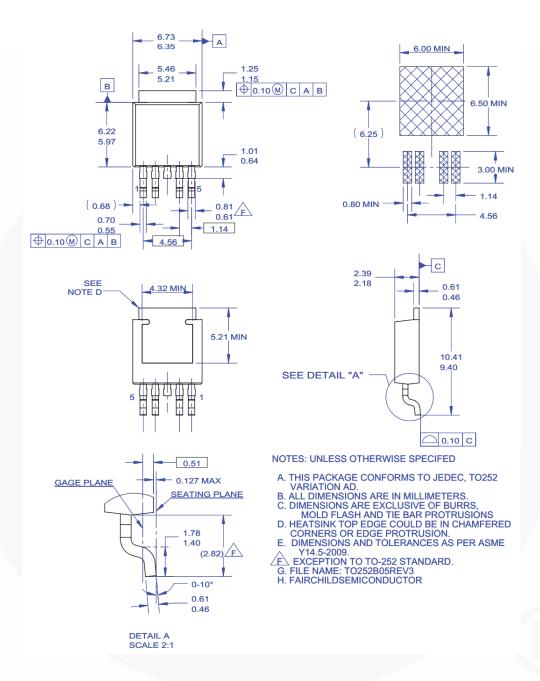


Figure 23. TO252 (D-PAK), Molded, 5-Lead, Option AD

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Website:

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Contact Us:

> Address:

401 Building No.5, JiuGe Business Center, Lane 2301, Yishan Rd Minhang District, Shanghai , China

> Sales:

Direct +86 (21) 6401-6692

Email amall@ameya360.com

QQ 800077892

Skype ameyasales1 ameyasales2

Customer Service :

Email service@ameya360.com

Partnership :

Tel +86 (21) 64016692-8333

Email mkt@ameya360.com