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November 2013

### FDD850N10L

# N-Channel PowerTrench<sup>®</sup> MOSFET 100 V, 15.7 A, 75 m $\Omega$

### **Features**

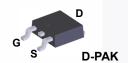
- R<sub>DS(on)</sub> = 61 m $\Omega$  ( yp.) @ V<sub>GS</sub> = 10 V, I<sub>D</sub> = 12 A
- $R_{DS(on)}$  = 64  $m\Omega$  (Typ.) @  $V_{GS}$  = 5 V,  $I_D$  = 12 A
- Low Gate Charge (Typ. 22.2 nC)
- Low C<sub>rss</sub> (Typ. 42 pF)
- · Fast Switching
- · 100% Avalanche Tested
- · Improved dv/dt Capability
- · RoHS Compliant

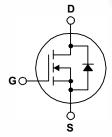
### Description

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

### **Application**

- · Consumer Appliances
- · LED TV and Monitor
- · Synchronous Rectification
- · Uninterruptible Power Supply
- · Micro Solar Inverter





### MOSFET Maximum Ratings T<sub>C</sub> = 25°C unless otherwise noted.

Symbol		Parameter	FDD850N10L	Unit		
V <sub>DSS</sub>	Drain to Source Voltage		100	V		
V <sub>GSS</sub>	Gate to Source Voltage		±20	V		
	- Continuous (T <sub>C</sub> = 25°C)		- Continuous ( $T_C = 25^{\circ}C$ )	- Continuous (T <sub>C</sub> = 25°C)	15.7	Δ.
ID	Drain Current	- Continuous (T <sub>C</sub> = 100°C)	11.1	Α		
I <sub>DM</sub>	Drain Current	- Pulsed (Note 1)	63	Α		
E <sub>AS</sub>	Single Pulsed Avalanche Energy (Note 2)		41	mJ		
dv/dt	Peak Diode Recovery dv/dt (Note 3)		6.0	V/ns		
D	Payer Dissipation	$(T_C = 25^{\circ}C)$	50	W		
P <sub>D</sub> Power Dissipation		- Derate Above 25°C	0.33	W/°C		
T <sub>J</sub> , T <sub>STG</sub>	Operating and Storage Temperat	-55 to +175	°C			
T <sub>L</sub>	Maximum Lead Temperature for	Soldering, 1/8" from Case for 5 Seconds	300	°C		

### **Thermal Characteristics**

Symbol	Parameter FDD8		Unit
$R_{\theta JC}$	Thermal Resistance, Junction to Case, Max.	3.0	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient, Max. 87		*C/VV

### **Package Marking and Ordering Information**

Part Number	Top Mark	Package	Packing Method	Reel Size	Tape Width	Quantity
FDD850N10L	FDD850N10L	DPAK	Tape and Reel	330 mm	16 mm	2500 units

### **Electrical Characteristics** $T_C = 25^{\circ}C$ unless otherwise noted.

Symbol	Parameter	Test Conditions	Min.	Тур.	Max.	Unit
Off Charac	cteristics					
BV <sub>DSS</sub>	Drain to Source Breakdown Voltage	$I_D = 250 \mu\text{A},  V_{GS} = 0 \text{V}$	100	-	-	V
ΔBV <sub>DSS</sub> / ΔT <sub>J</sub>	Breakdown Voltage Temperature Coefficient	$I_D$ = 250 μA, Referenced to 25°C	-	0.1	-	V/°C
	Zero Gate Voltage Drain Current	V <sub>DS</sub> = 80 V, V <sub>GS</sub> = 0 V	-	-	1	
I <sub>DSS</sub> Zero	Zero Gate voltage Drain Current	$V_{DS} = 80 \text{ V}, T_{C} = 150^{\circ}\text{C}$	-	-	500	μΑ
I <sub>GSS</sub>	Gate to Body Leakage Current	V <sub>GS</sub> = ±20 V, V <sub>DS</sub> = 0 V	-	-	±100	nA

### **On Characteristics**

V <sub>GS(th)</sub>	Gate Threshold Voltage	$V_{GS} = V_{DS}, I_D = 250 \mu A$	1.0	-	2.5	V
D	Static Drain to Source On Resistance	V <sub>GS</sub> = 10 V, I <sub>D</sub> = 12 A	-	61	75	mΩ
R <sub>DS(on)</sub>	OS(on) Static Drain to Source On Resistance	$V_{GS} = 5 \text{ V}, I_D = 12 \text{ A}$	-	64	96	mΩ
9 <sub>FS</sub>	Forward Transconductance	V <sub>DS</sub> = 10 V, I <sub>D</sub> = 15.7 A	-	31	-	S

### **Dynamic Characteristics**

C <sub>iss</sub>	Input Capacitance	V/ 05.V/ V	$V_{DS} = 25 \text{ V}, V_{GS} = 0 \text{ V},$ f = 1  MHz		1100	1465	pF
Coss	Output Capacitance	V <sub>DS</sub> = 25 V, V f = 1 MHz			80	105	pF
C <sub>rss</sub>	Reverse Transfer Capacitance	1 - 1 101112			42	-	pF
Q <sub>g(tot)</sub>	Total Gate Charge at 10V	V <sub>GS</sub> = 10 V		-	22.2	28.9	nC
Q <sub>g(tot)</sub>	Total Gate Charge at 5V	V <sub>GS</sub> = 5 V	V <sub>DS</sub> = 80 V,	-	12.3	16.0	nC
$Q_{gs}$	Gate to Source Gate Charge		I <sub>D</sub> = 15.7 A	-	3.0	-	nC
$Q_{gd}$	Gate to Drain "Miller" Charge			-	5.7	-	nC

### **Switching Characteristics**

t <sub>d(on)</sub>	Turn-On Delay Time		-	17	44	ns
t <sub>r</sub>	Turn-On Rise Time	$V_{DD} = 50 \text{ V, } I_{D} = 15.7 \text{ A,}$	-	21	52	ns
t <sub>d(off)</sub>	Turn-Off Delay Time	$V_{GS}$ = 5 V, $R_G$ = 4.7 $\Omega$	-	27	64	ns
t <sub>f</sub>	Turn-Off Fall Time	(Note 4)	-	8	26	ns
ESR	Equivalent Series Resistance (G-S)	f = 1 MHz	/ -	1.75	-	Ω

### **Drain-Source Diode Characteristics**

Is	Maximum Continuous Drain to Source Diod	Maximum Continuous Drain to Source Diode Forward Current			15.7	Α
I <sub>SM</sub>	Maximum Pulsed Drain to Source Diode Fo	Maximum Pulsed Drain to Source Diode Forward Current			63	Α
$V_{SD}$	Drain to Source Diode Forward Voltage	V <sub>GS</sub> = 0 V, I <sub>SD</sub> = 12 A	-	-	1.3	V
t <sub>rr</sub>	Reverse Recovery Time	V <sub>GS</sub> = 0 V, V <sub>DS</sub> = 80 V, I <sub>SD</sub> = 15.7 A,	-	38	-	ns
Q <sub>rr</sub>	Reverse Recovery Charge	$dI_F/dt = 100 A/\mu s$	-	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  $\Omega$ , starting T $_{J}$  = 25°C.
- 3. I\_{SD}  $\leq$  15.7 A, di/dt  $\leq$  200 A/µs, V\_{DD}  $\leq$  BV\_DSS, starting T\_J = 25°C.
- 4. Essentially independent of operating temperature typical characteristics.

### **Typical Performance Characteristics**

Figure 1. On-Region Characteristics

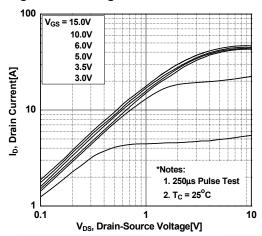


Figure 3. On-Resistance Variation vs. **Drain Current and Gate Voltage** 

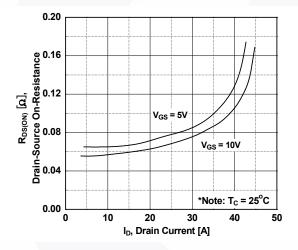


Figure 5. Capacitance Characteristics

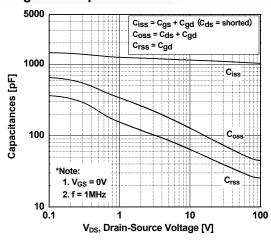


Figure 2. Transfer Characteristics

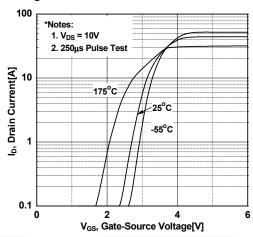


Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature

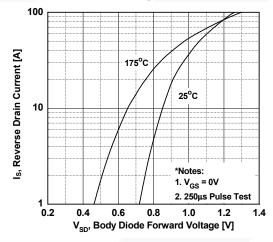
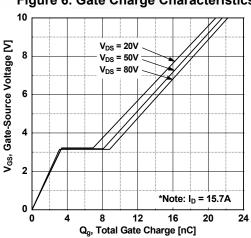


Figure 6. Gate Charge Characteristics



### **Typical Performance Characteristics** (Continued)

Figure 7. Breakdown Voltage Variation vs. Temperature

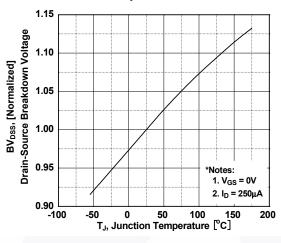


Figure 9. Maximum Safe Operating Area

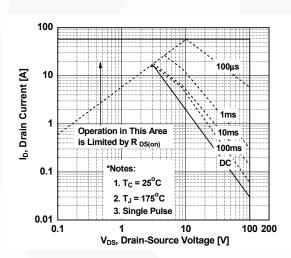


Figure 8. On-Resistance Variation vs. Temperature

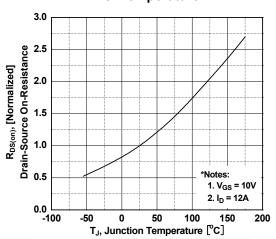


Figure 10. Maximum Drain Current vs. Case Temperature

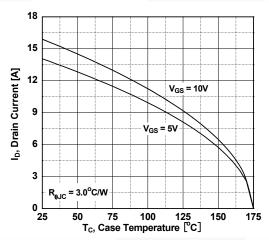
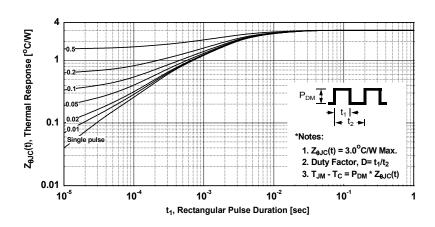


Figure 11. Transient Thermal Response Curve



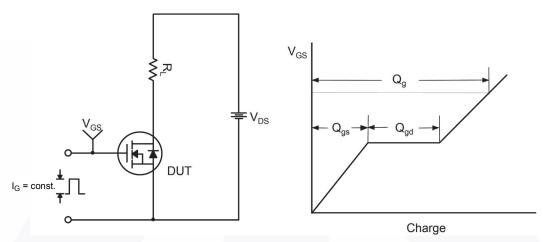


Figure 12. Gate Charge Test Circuit & Waveform

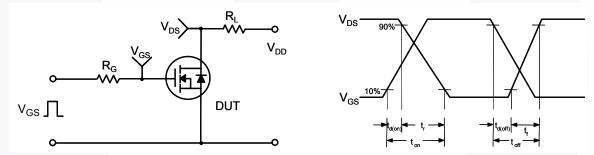


Figure 13. Resistive Switching Test Circuit & Waveforms

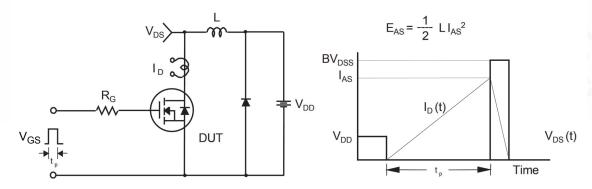


Figure 14. Unclamped Inductive Switching Test Circuit & Waveforms

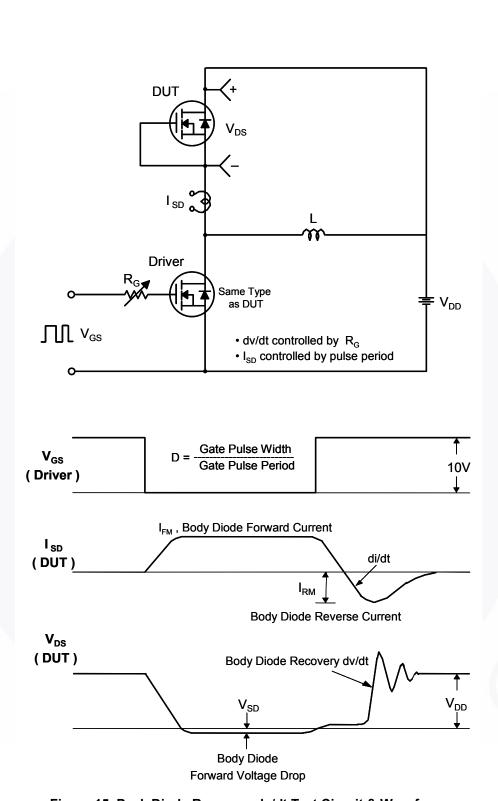


Figure 15. Peak Diode Recovery dv/dt Test Circuit & Waveforms

### **Mechanical Dimensions**

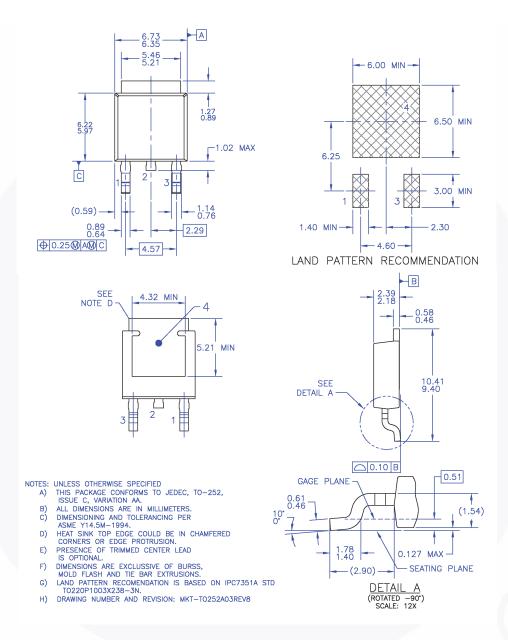


Figure 16. TO252 (D-PAK), Molded, 3-Lead, Option AA&AB

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