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September 2015

# **FDMS8350LET40**

# N-Channel PowerTrench<sup>®</sup> MOSFET 40 V, 300 A, 0.85 m $\Omega$

#### **Features**

- Max  $r_{DS(on)} = 0.85 \text{ m}\Omega$  at  $V_{GS} = 10 \text{ V}$ ,  $I_D = 47 \text{ A}$
- Max  $r_{DS(on)} = 1.2 \text{ m}\Omega$  at  $V_{GS} = 4.5 \text{ V}$ ,  $I_D = 38 \text{ A}$
- Advanced Package and Silicon Combination for Low r<sub>DS(on)</sub> and High Efficiency
- MSL1 Robust Package Design
- 100% UIL Tested
- RoHS Compliant

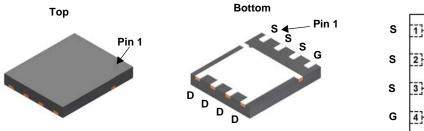


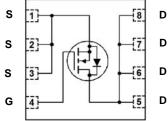
### **General Description**

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

## **Applications**

- Primary DC-DC MOSFET
- Secondary Synchronous Rectifier
- Load Switch





Power 56

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

Symbol	Param	eter		Ratings	Units
$V_{DS}$	Drain to Source Voltage			40	V
$V_{GS}$	Gate to Source Voltage			±20	V
	Drain Current -Continuous	T <sub>C</sub> = 25 °C	(Note 5)	300	
	-Continuous	T <sub>C</sub> = 100 °C	(Note 5)	212	^
ID	-Continuous	T <sub>A</sub> = 25 °C	(Note 1a)	49	Α
	-Pulsed		(Note 4)	1464	
E <sub>AS</sub>	Single Pulse Avalanche Energy		(Note 3)	1176	mJ
ם	Power Dissipation	T <sub>C</sub> = 25 °C		125	W
$P_{D}$	Power Dissipation	T <sub>A</sub> = 25 °C	(Note 1a)	3.33	VV
T <sub>J</sub> , T <sub>STG</sub>	Operating and Storage Junction Tempera	Operating and Storage Junction Temperature Range			°C

#### **Thermal Characteristics**

$R_{\theta JC}$	Thermal Resistance, Junction to Case	1.2	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient (Note	a) 45	C/VV

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

Device Marking	Device	Package	Reel Size	Tape Width	Quantity
FDMS8350L	FDMS8350LET40	Power 56	13 "	12 mm	3000 units

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

Symbol	Parameter	Test Conditions	Min.	Тур.	Max.	Units
Off Chara	acteristics					
BV <sub>DSS</sub>	Drain to Source Breakdown Voltage	$I_D = 250 \mu A, V_{GS} = 0 V$	40			V
$\frac{\Delta BV_{DS}}{\Delta T_{J}}$	Breakdown Voltage Temperature Coefficient	$I_D$ = 250 $\mu$ A, referenced to 25 °C		17		mV/°C
I <sub>DSS</sub>	Zero Gate Voltage Drain Current	V <sub>DS</sub> = 32 V, V <sub>GS</sub> = 0 V			1	μΑ
I <sub>GSS</sub>	Gate to Source Leakage Current	$V_{GS} = \pm 20 \text{ V}, V_{DS} = 0 \text{ V}$			±100	nA

#### On Characteristics

$V_{GS(th)}$	Gate to Source Threshold Voltage	$V_{GS} = V_{DS}, I_D = 250 \mu A$	1.0	1.8	3.0	V
$\frac{\Delta V_{GS(th)}}{\Delta T_J}$	Gate to Source Threshold Voltage Temperature Coefficient	$I_D$ = 250 $\mu$ A, referenced to 25 °C		-6		mV/°C
		V <sub>GS</sub> = 10 V, I <sub>D</sub> = 47 A		0.68	0.85	
r <sub>DS(on)</sub>	Static Drain to Source On Resistance	$V_{GS} = 4.5 \text{ V}, I_D = 38 \text{ A}$		0.96	1.2	mΩ
, ,		$V_{GS} = 10 \text{ V}, I_D = 47 \text{ A}, T_J = 150 ^{\circ}\text{C}$		1.1	1.4	
g <sub>FS</sub>	Forward Transconductance	$V_{DS} = 5 \text{ V}, I_{D} = 47 \text{ A}$		247		S

#### **Dynamic Characteristics**

C <sub>iss</sub>	Input Capacitance	V 20 V V 0 V		11850	16590	pF
Coss	Output Capacitance	$V_{DS} = 20 \text{ V}, V_{GS} = 0 \text{ V},$ $f = 1 \text{ MHz}$		3430	4805	рF
C <sub>rss</sub>	Reverse Transfer Capacitance	1 - 1 1011 12		69	100	pF
$R_g$	Gate Resistance		0.1	1.2	2.4	Ω

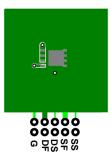
#### **Switching Characteristics**

t <sub>d(on)</sub>	Turn-On Delay Time		32	51	ns
t <sub>r</sub>	Rise Time	V <sub>DD</sub> = 20 V, I <sub>D</sub> = 47 A,	19	34	ns
t <sub>d(off)</sub>	Turn-Off Delay Time	$V_{GS} = 10 \text{ V}, R_{GEN} = 6 \Omega$	74	118	ns
t <sub>f</sub>	Fall Time		15	27	ns
$Q_g$	Total Gate Charge	V <sub>GS</sub> = 0 V to 10 V	156	219	nC
Qg	Total Gate Charge	$V_{GS} = 0 \text{ V to } 4.5 \text{ V} V_{DD} = 20 \text{ V},$	73	102	nC
Q <sub>gs</sub>	Gate to Source Charge	I <sub>D</sub> = 47 A	33		nC
$Q_{gd}$	Gate to Drain "Miller" Charge		16		nC

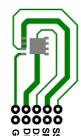
#### **Drain-Source Diode Characteristics**

V <sub>SD</sub>	Source to Drain Diode Forward Voltage	$V_{GS} = 0 \text{ V}, I_{S} = 2.1 \text{ A}$ (Note 2)	0.7	1.2	V
		$V_{GS} = 0 \text{ V}, I_{S} = 47 \text{ A}$ (Note 2)	8.0	1.3	v
t <sub>rr</sub>	Reverse Recovery Time	I <sub>E</sub> = 47 A, di/dt = 100 A/μs	81	129	ns
Q <sub>rr</sub>	Reverse Recovery Charge	$T_F = 47$ A, divide = 100 A/ $\mu$ S	82	131	nC

<sup>1</sup> R<sub>0JA</sub> is determined with the device mounted on a 1 in<sup>2</sup> pad 2 oz copper pad on a 1.5 x 1.5 in. board of FR-4 material. R<sub>0JC</sub> is guaranteed by design while R<sub>0CA</sub> is determined by the user's board design.



a. 45 °C/W when mounted on a 1 in<sup>2</sup> pad of 2 oz copper.



b. 115 °C/W when mounted on a minimum pad of 2 oz copper.

- 2. Pulse Test: Pulse Width < 300  $\mu$ s, Duty cycle < 2.0%. 3. E<sub>AS</sub> of 1176 mJ is based on starting T<sub>J</sub> = 25 °C, L = 3 mH, I<sub>AS</sub> = 28 A, V<sub>DD</sub> = 40 V, V<sub>GS</sub> = 10 V. 100% test at L = 0.1 mH, I<sub>AS</sub> = 87 A.
- 4. Pulsed Id please refer to Fig 11 SOA graph for more details.
- 5. Computed continuous current limited to Max Junction Temperature only, actual continuous current will be limited by thermal & electro-mechanical application board design.

### **Typical Characteristics** T<sub>J</sub> = 25°C unless otherwise noted.

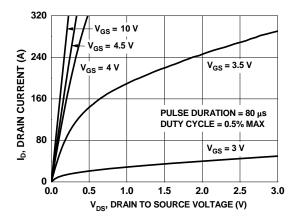


Figure 1. On Region Characteristics

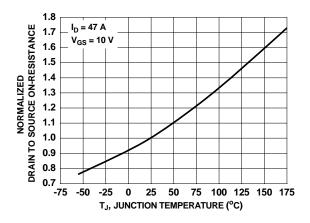


Figure 3. Normalized On Resistance vs. Junction Temperature

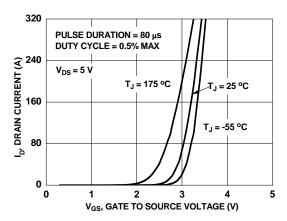


Figure 5. Transfer Characteristics

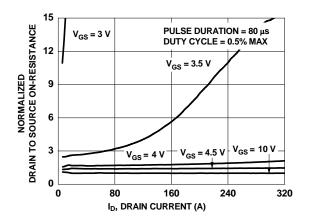


Figure 2. Normalized On-Resistance vs. Drain Current and Gate Voltage

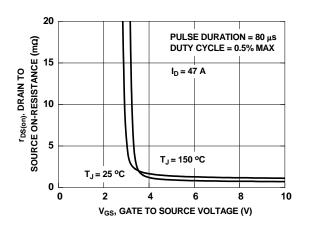


Figure 4. On-Resistance vs. Gate to Source Voltage

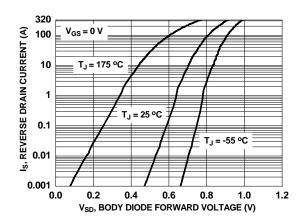


Figure 6. Source to Drain Diode Forward Voltage vs. Source Current

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

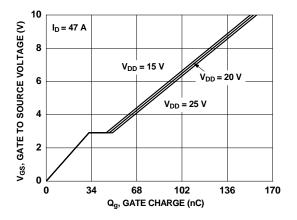


Figure 7. Gate Charge Characteristics

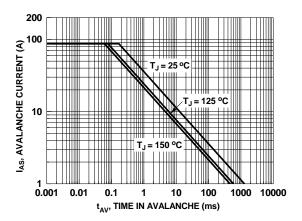


Figure 9. Unclamped Inductive Switching Capability

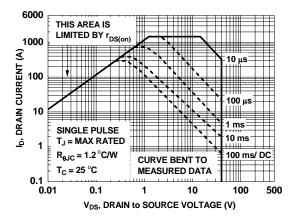


Figure 11. Forward Bias Safe Operating Area

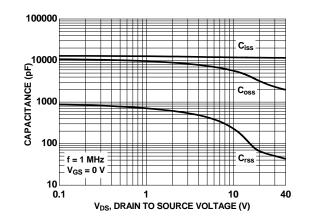


Figure 8. Capacitance vs. Drain to Source Voltage

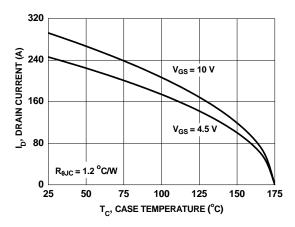


Figure 10. Maximum Continuous Drain Current vs. Case Temperature

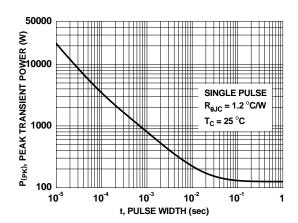


Figure 12. Single Pulse Maximum Power Dissipation

# Typical Characteristics $T_J = 25$ °C unless otherwise noted.

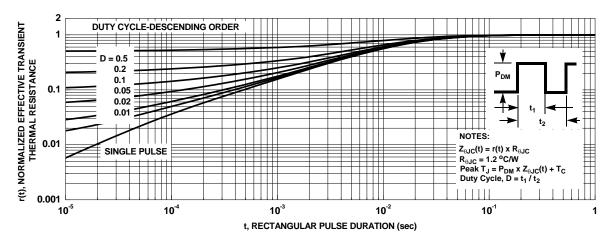
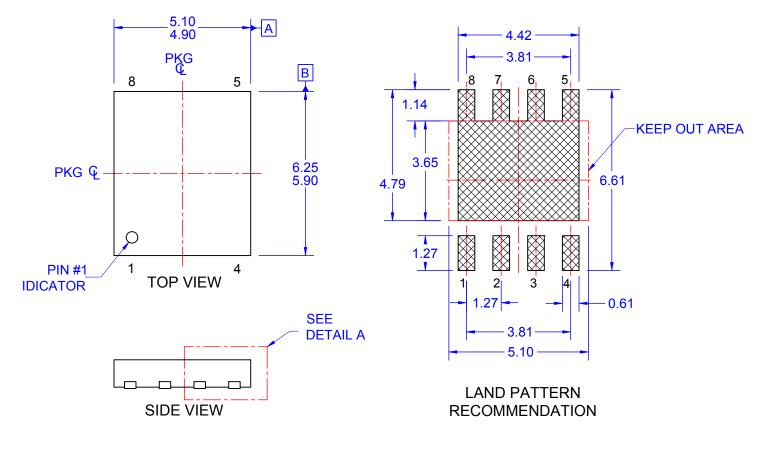
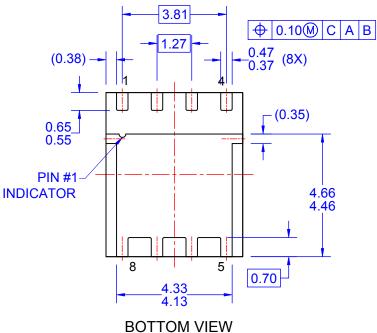
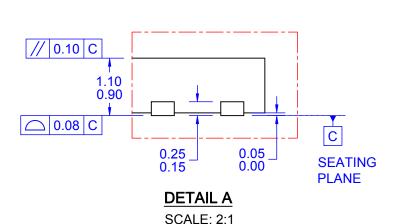


Figure 13. Junction-to-Case Transient Thermal Response Curve







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- A) PACKAGE STANDARD REFERENCE: JEDEC MO-240, ISSUE A, VAR. AA,
- B) ALL DIMENSIONS ARE IN MILLIMETERS.
- C) DIMENSIONS DO NOT INCLUDE BURRS OR MOLD FLASH. MOLD FLASH OR BURRS DOES NOT EXCEED 0.10MM.
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#### Офис по работе с юридическими лицами:

105318, г. Москва, ул. Щербаковская д. 3, офис 1107, 1118, ДЦ «Щербаковский»

Телефон: +7 495 668-12-70 (многоканальный)

Факс: +7 495 668-12-70 (доб.304)

E-mail: info@moschip.ru

Skype отдела продаж:

moschip.ru moschip.ru\_6 moschip.ru\_4 moschip.ru\_9