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September 2015

FDMS86103L

N-Channel Shielded Gate PowerTrench[®] MOSFET 100 V, 81 A, 8 mΩ

Features

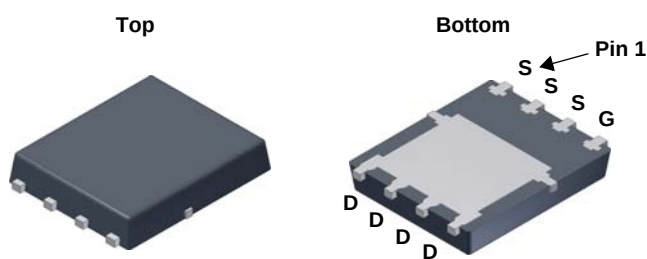
- Shielded Gate MOSFET Technology
- Max $r_{DS(on)}$ = 8 mΩ at V_{GS} = 10 V, I_D = 12 A
- Max $r_{DS(on)}$ = 11 mΩ at V_{GS} = 4.5 V, I_D = 10 A
- Advanced Package and Silicon combination for low $r_{DS(on)}$ and high efficiency
- MSL1 robust package design
- 100% UIL tested
- RoHS Compliant

General Description

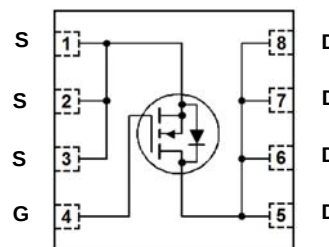
This N-Channel MOSFET is produced using Fairchild Semiconductor's advanced PowerTrench[®] process that incorporates Shielded Gate technology. This process has been optimized for the on-state resistance and yet maintain superior switching performance.

Application

- DC-DC Conversion



Power 56



MOSFET Maximum Ratings T_A = 25 °C unless otherwise noted.

Symbol	Parameter	Ratings	Units
V_{DS}	Drain to Source Voltage	100	V
V_{GS}	Gate to Source Voltage	±20	V
I_D	Drain Current -Continuous T_C = 25 °C (Note 5)	81	A
	Drain Current -Continuous T_C = 100 °C (Note 5)	51	
	-Continuous T_A = 25 °C	12	
	-Pulsed (Note 4)	414	
E_{AS}	Single Pulse Avalanche Energy (Note 3)	312	mJ
P_D	Power Dissipation T_C = 25 °C	104	W
	Power Dissipation T_A = 25 °C	2.5	
T_J, T_{STG}	Operating and Storage Junction Temperature Range	-55 to +150	°C

Thermal Characteristics

$R_{\theta JC}$	Thermal Resistance, Junction to Case	1.2	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient (Note 1a)	50	

Package Marking and Ordering Information

Device Marking	Device	Package	Reel Size	Tape Width	Quantity
FDMS86103L	FDMS86103L	Power 56	13 "	12 mm	3000 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	$I_D = 250\ \mu\text{A}$, $V_{GS} = 0\ \text{V}$	100			V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	$I_D = 250\ \mu\text{A}$, referenced to 25°C		68		mV/ $^\circ\text{C}$
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS} = 80\ \text{V}$, $V_{GS} = 0\ \text{V}$			1	μA
I_{GSS}	Gate to Source Leakage Current	$V_{GS} = \pm 20\ \text{V}$, $V_{DS} = 0\ \text{V}$			± 100	nA

On Characteristics

$V_{GS(th)}$	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		-7		mV/ $^\circ\text{C}$
$r_{DS(on)}$	Static Drain to Source On Resistance	$V_{GS} = 10\ \text{V}$, $I_D = 12\ \text{A}$		6.4	8	m Ω
		$V_{GS} = 4.5\ \text{V}$, $I_D = 10\ \text{A}$		8.4	11	
		$V_{GS} = 10\ \text{V}$, $I_D = 12\ \text{A}$, $T_J = 125^\circ\text{C}$		10.6	14	
g_{FS}	Forward Transconductance	$V_{DS} = 5\ \text{V}$, $I_D = 12\ \text{A}$		59		S

Dynamic Characteristics

C_{iss}	Input Capacitance	$V_{DS} = 50\ \text{V}$, $V_{GS} = 0\ \text{V}$, $f = 1\ \text{MHz}$		2790	3710	pF
C_{oss}	Output Capacitance			469	625	pF
C_{rss}	Reverse Transfer Capacitance			22	35	pF
R_g	Gate Resistance			1.3		Ω

Switching Characteristics

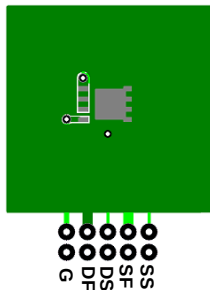
$t_{d(on)}$	Turn-On Delay Time	$V_{DD} = 50\ \text{V}$, $I_D = 12\ \text{A}$, $V_{GS} = 10\ \text{V}$, $R_{GEN} = 6\ \Omega$		13	23	ns
t_r	Rise Time			7.2	15	ns
$t_{d(off)}$	Turn-Off Delay Time			35	57	ns
t_f	Fall Time			6	13	ns
Q_g	Total Gate Charge	$V_{GS} = 0\ \text{V}$ to $10\ \text{V}$	$V_{DD} = 50\ \text{V}$, $I_D = 12\ \text{A}$	43	60	nC
Q_g	Total Gate Charge	$V_{GS} = 0\ \text{V}$ to $5\ \text{V}$		23	32	nC
Q_{gs}	Gate to Source Charge			7.5		nC
Q_{gd}	Gate to Drain "Miller" Charge			7		nC

Drain-Source Diode Characteristics

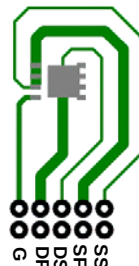
V_{SD}	Source to Drain Diode Forward Voltage	$V_{GS} = 0\ \text{V}$, $I_S = 2\ \text{A}$ (Note 2)		0.70	1.2	V
		$V_{GS} = 0\ \text{V}$, $I_S = 12\ \text{A}$ (Note 2)		0.78	1.3	
t_{rr}	Reverse Recovery Time	$I_F = 12\ \text{A}$, $di/dt = 100\ \text{A}/\mu\text{s}$		57	90	ns
Q_{rr}	Reverse Recovery Charge			68	108	nC

Notes:

1. $R_{\theta JA}$ is determined with the device mounted on a 1 in² pad 2 oz copper pad on a 1.5 x 1.5 in. board of FR-4 material. $R_{\theta JC}$ is guaranteed by design while $R_{\theta CA}$ is determined by the user's board design.



a. $50^\circ\text{C}/\text{W}$ when mounted on a 1 in² pad of 2 oz copper.



b. $125^\circ\text{C}/\text{W}$ when mounted on a minimum pad of 2 oz copper.

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

3. Starting $T_J = 25^\circ\text{C}$, $L = 1\ \text{mH}$, $I_{AS} = 25\ \text{A}$, $V_{DD} = 90\ \text{V}$, $V_{GS} = 10\ \text{V}$

4. Pulsed I_d 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 $T_J = 25^\circ\text{C}$ unless otherwise noted.

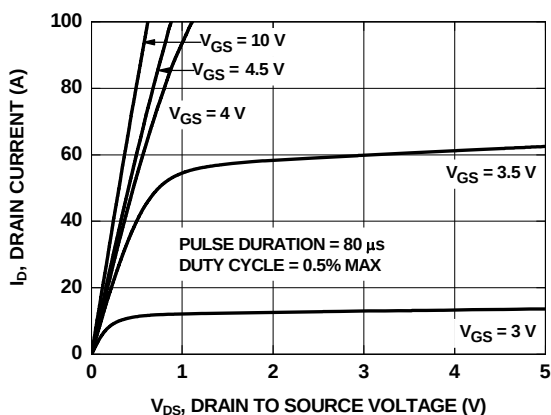


Figure 1. On-Region Characteristics

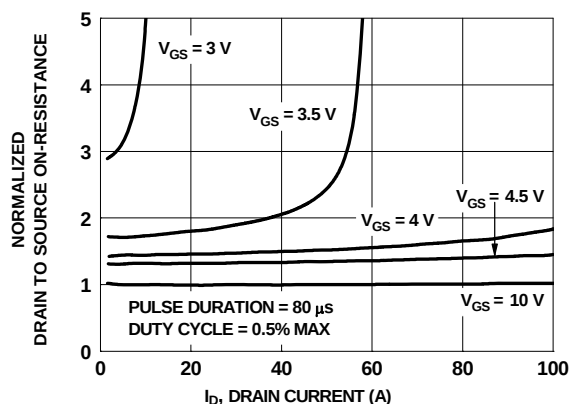


Figure 2. Normalized On-Resistance vs Drain Current and Gate Voltage

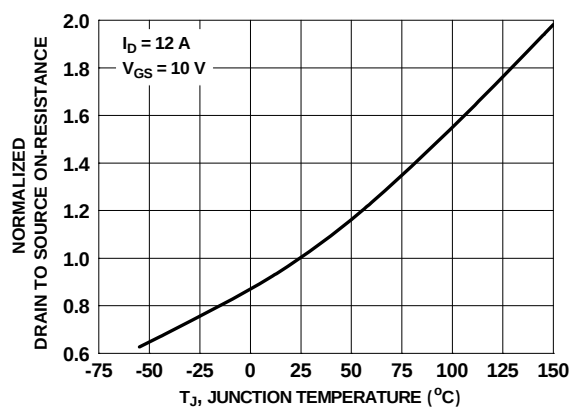


Figure 3. Normalized On-Resistance vs Junction Temperature

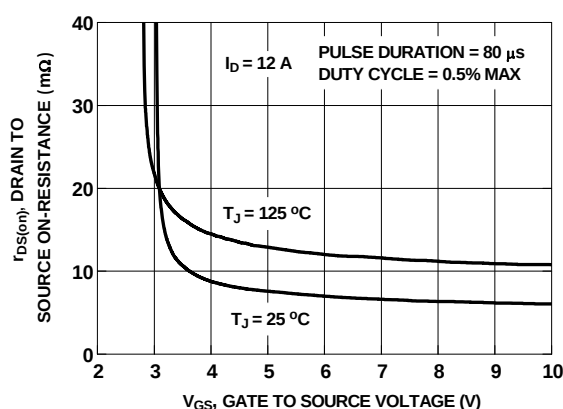


Figure 4. On-Resistance vs Gate to Source Voltage

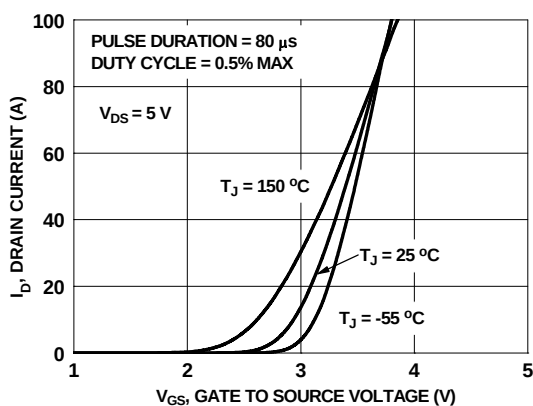


Figure 5. Transfer Characteristics

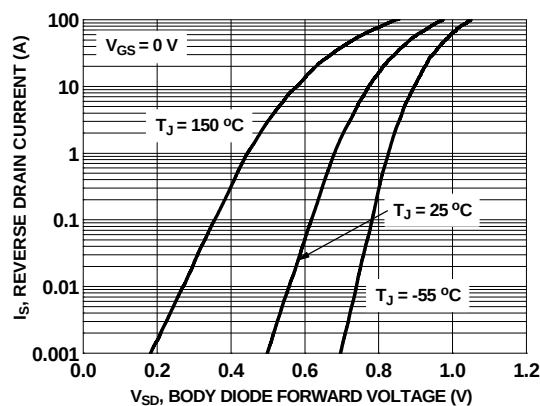


Figure 6. Source to Drain Diode Forward Voltage vs Source Current

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

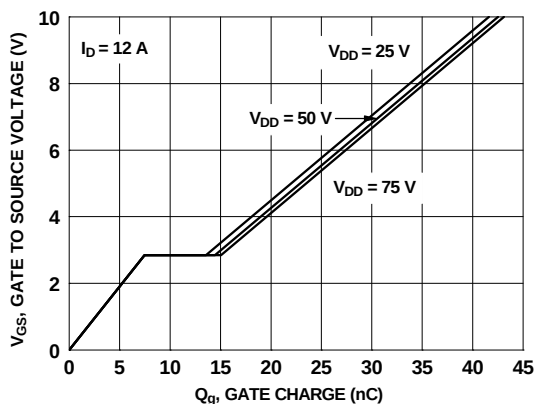


Figure 7. Gate Charge Characteristics

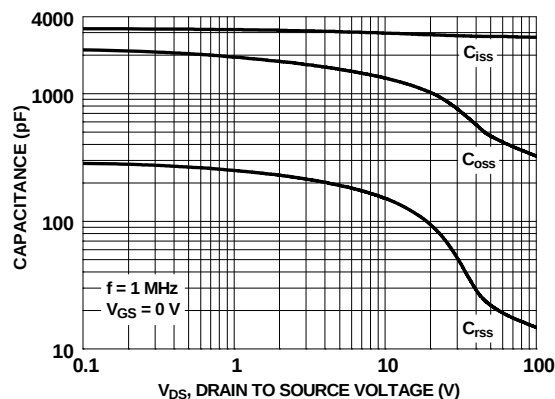


Figure 8. Capacitance vs Drain to Source Voltage

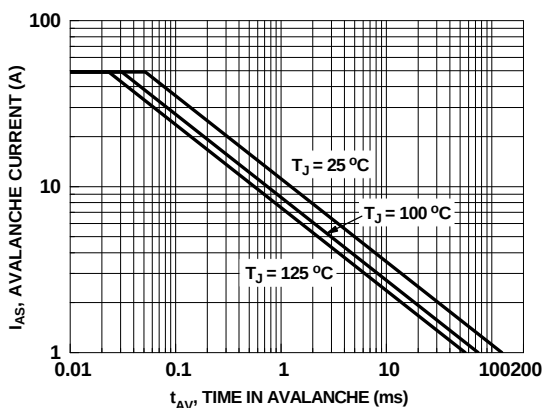


Figure 9. Unclamped Inductive Switching Capability

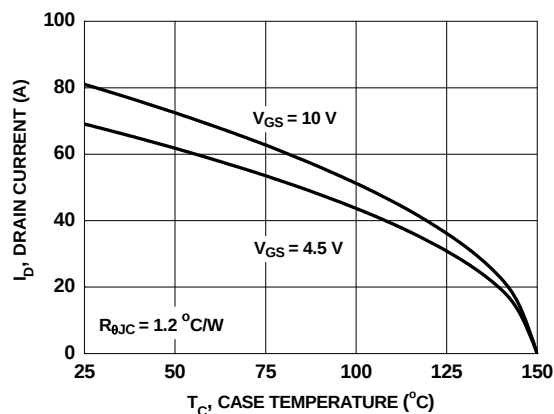


Figure 10. Maximum Continuous Drain Current vs Case Temperature

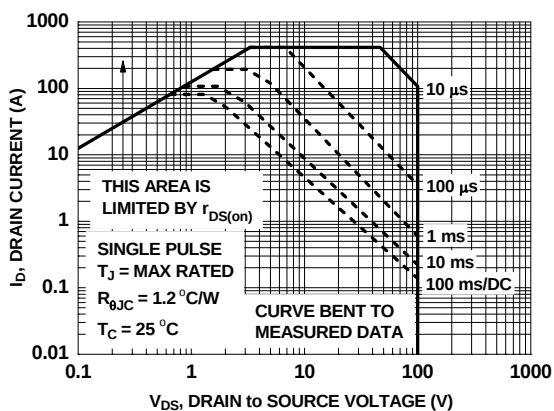


Figure 11. Forward Bias Safe Operating Area

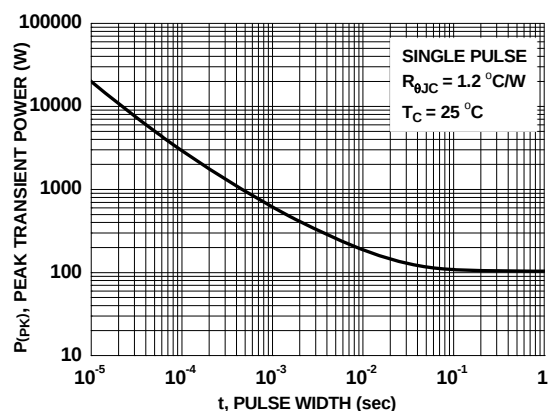


Figure 12. Single Pulse Maximum Power Dissipation

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

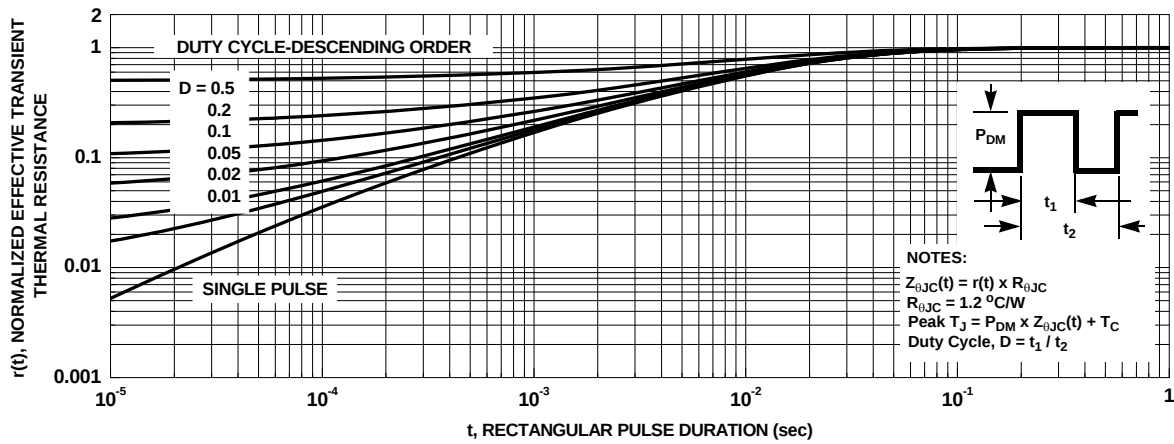
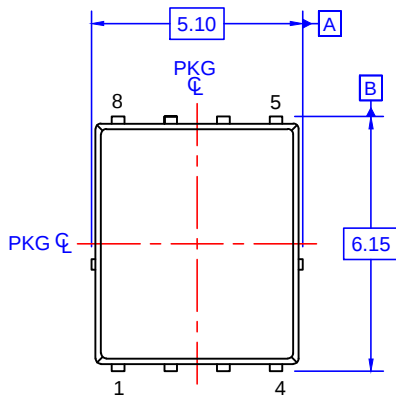
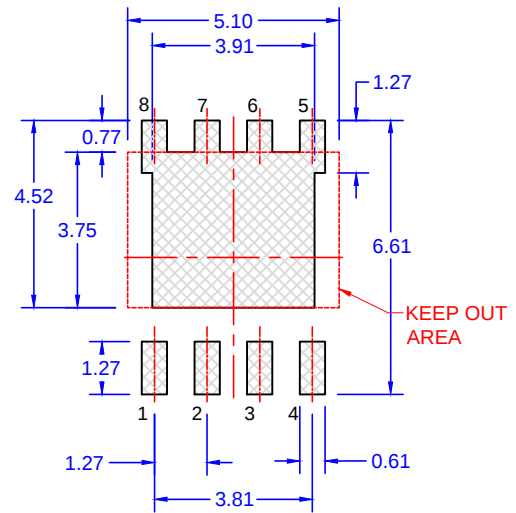
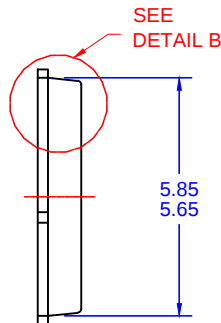


Figure 13. Junction-to-Ambient Transient Thermal Response Curve

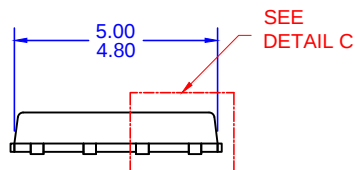
PQFN8 5X6, 1.27P
CASE 483AE
ISSUE A



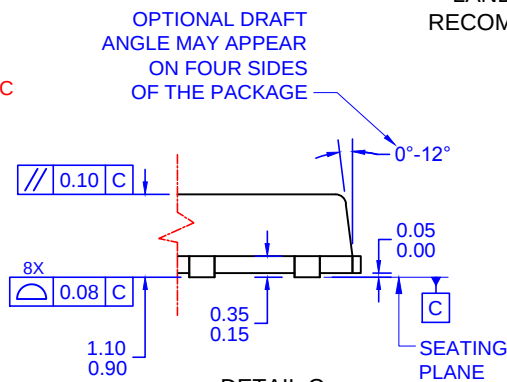
TOP VIEW



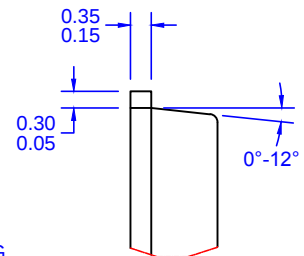
LAND PATTERN
RECOMMENDATION



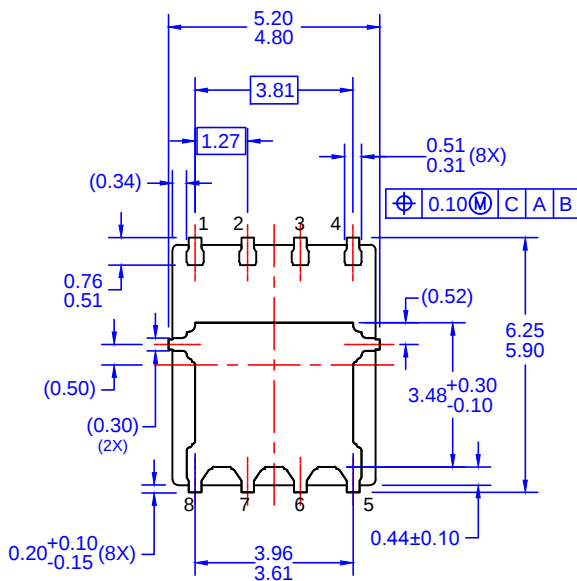
SIDE VIEW



DETAIL C
SCALE: 2:1



DETAIL B
SCALE: 2:1



BOTTOM VIEW

NOTES: UNLESS OTHERWISE SPECIFIED

- PACKAGE STANDARD REFERENCE: JEDEC MO-240, ISSUE A, VAR. AA,.
- DIMENSIONS DO NOT INCLUDE BURRS OR MOLD FLASH. MOLD FLASH OR BURRS DOES NOT EXCEED 0.10MM.
- ALL DIMENSIONS ARE IN MILLIMETERS.
- DIMENSIONING AND TOLERANCING PER ASME Y14.5M-2009.
- IT IS RECOMMENDED TO HAVE NO TRACES OR VIAS WITHIN THE KEEP OUT AREA.

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