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October 2014

#### FDMS86105

# N-Channel Shielded Gate PowerTrench<sup>®</sup> MOSFET 100 V, 26 A, 34 m $\Omega$

#### **Features**

- Shielded Gate MOSFET Technology
- Max  $r_{DS(on)} = 34 \text{ m}\Omega$  at  $V_{GS} = 10 \text{ V}$ ,  $I_D = 6 \text{ A}$
- Max  $r_{DS(on)} = 54 \text{ m}\Omega$  at  $V_{GS} = 6 \text{ V}$ ,  $I_D = 4.5 \text{ A}$
- Advanced package and silicon combination for low r<sub>DS(on)</sub> and high efficiency
- MSL1 robust package design
- 100% UIL tested
- RoHS Compliant

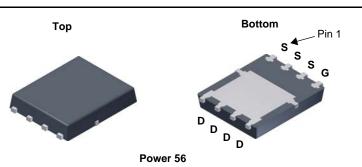


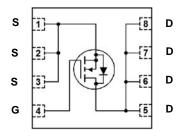
#### **General Description**

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

#### **Applications**

- Primary DC-DC
- Secondary DC-DC
- Load Switch





### **MOSFET Maximum Ratings** $T_A = 25$ °C unless otherwise noted

Symbol	Parame	Ratings	Units		
$V_{DS}$	Drain to Source Voltage			100	V
$V_{GS}$	Gate to Source Voltage			±20	V
I <sub>D</sub>	Drain Current -Continuous	T <sub>C</sub> = 25 °C		26	
	-Continuous	T <sub>A</sub> = 25 °C	(Note 1a)	6	Α
	-Pulsed			30	
E <sub>AS</sub>	Single Pulse Avalanche Energy		(Note 3)	50	mJ
P <sub>D</sub>	Power Dissipation	T <sub>C</sub> = 25 °C		48	W
	Power Dissipation	T <sub>A</sub> = 25 °C	(Note 1a)	2.5	VV
T <sub>J</sub> , T <sub>STG</sub>	Operating and Storage Junction Tempera	ture Range		-55 to +150	°C

#### **Thermal Characteristics**

$R_{\theta JC}$	Thermal Resistance, Junction to Case	2.6	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient (Note 1	a) 50	C/VV

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

Device Marking	Device	Package	Reel Size	Tape Width	Quantity
FDMS86105	FDMS86105	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	cteristics					
$BV_{DSS}$	Drain to Source Breakdown Voltage	$I_D = 250 \mu A, V_{GS} = 0 V$	100			V
$\frac{\Delta BV_{DS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	$I_D$ = 250 $\mu$ A, referenced to 25 °C		70		mV/°C
I <sub>DSS</sub>	Zero Gate Voltage Drain Current	V <sub>DS</sub> = 80 V, V <sub>GS</sub> = 0 V			1	μΑ
$I_{GSS}$	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	$V_{GS} = V_{DS}, I_{D} = 250 \mu A$	2.0	2.8	4.0	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		-9		mV/°C
		V <sub>GS</sub> = 10 V, I <sub>D</sub> = 6 A		27	34	
r <sub>DS(on)</sub>	Static Drain to Source On Resistance	V <sub>GS</sub> = 6 V, I <sub>D</sub> = 4.5 A		37	54	mΩ
		V <sub>GS</sub> = 10 V, I <sub>D</sub> = 6 A, T <sub>J</sub> = 125 °C		46	57	
9 <sub>FS</sub>	Forward Transconductance	V <sub>DS</sub> = 10 V, I <sub>D</sub> = 6 A		15		S

#### **Dynamic Characteristics**

C <sub>iss</sub>	Input Capacitance	V <sub>DS</sub> = 50 V, V <sub>GS</sub> = 0 V, f = 1 MHz	483	645	pF
C <sub>oss</sub>	Output Capacitance		114	155	pF
C <sub>rss</sub>	Reverse Transfer Capacitance		5	10	pF
$R_g$	Gate Resistance		0.9		Ω

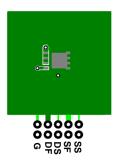
#### **Switching Characteristics**

t <sub>d(on)</sub>	Turn-On Delay Time		6.7	14	ns
t <sub>r</sub>	Rise Time	$V_{DD} = 50 \text{ V}, I_D = 6 \text{ A},$	2.1	10	ns
t <sub>d(off)</sub>	Turn-Off Delay Time	$V_{GS} = 10 \text{ V}, R_{GEN} = 6 \Omega$	12	22	ns
t <sub>f</sub>	Fall Time		2.4	10	ns
$Q_g$	Total Gate Charge	V <sub>GS</sub> = 0 V to 10 V	7.5	11	nC
Qg	Total Gate Charge	$V_{GS} = 0 \ V \text{ to 5 } V$ $V_{DD} = 50 \ V,$	4.2	6	nC
Q <sub>gs</sub>	Gate to Source Charge	I <sub>D</sub> = 6 A	2.1		nC
$Q_{gd}$	Gate to Drain "Miller" Charge		1.7		nC

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

V <sub>SD</sub> So	Source-Drain Diode Forward Voltage	$V_{GS} = 0 \ V, I_S = 2 \ A$ (Note 2)	0.76	1.2	1/
	Source-Drain blode Forward voltage	$V_{GS} = 0 \text{ V}, I_S = 6 \text{ A}$ (Note 2)	0.82	1.3	V
t <sub>rr</sub>	Reverse Recovery Time	I <sub>E</sub> = 6 A, di/dt = 100 A/μs	38	61	ns
Q <sub>rr</sub>	Reverse Recovery Charge		32	51	nC

Notes:
1. 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. 50 °C/W when mounted on a 1 in<sup>2</sup> pad of 2 oz copper.



b. 125 °C/W when mounted on a minimum pad of 2 oz copper.

- 2. Pulse Test: Pulse Width < 300  $\mu\text{s},$  Duty cycle < 2.0%.
- 3. Starting  $T_J$  = 25 °C, L = 1 mH,  $I_{AS}$  = 10 A,  $V_{DD}$  = 90 V,  $V_{GS}$  = 10 V.

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

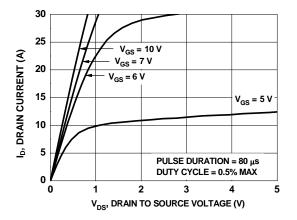


Figure 1. On Region Characteristics

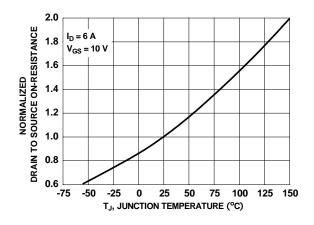


Figure 3. Normalized On Resistance vs Junction Temperature

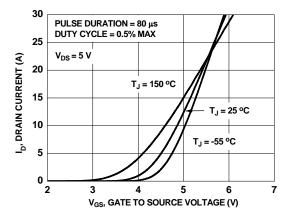


Figure 5. Transfer Characteristics

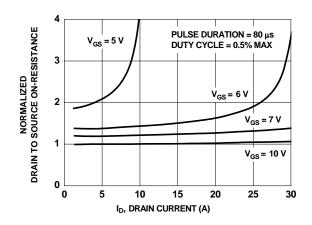


Figure 2. Normalized On-Resistance vs Drain Current and Gate Voltage

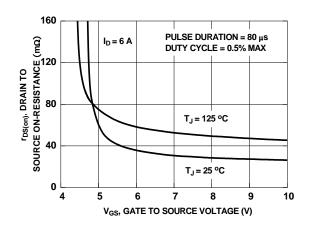


Figure 4. On-Resistance vs Gate to Source Voltage

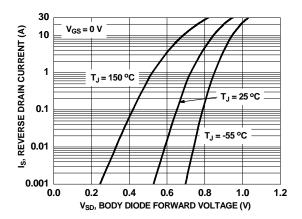


Figure 6. Source to Drain Diode Forward Voltage vs Source Current

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

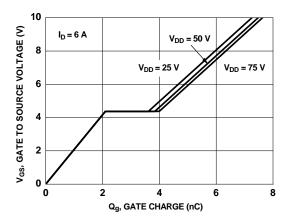


Figure 7. Gate Charge Characteristics

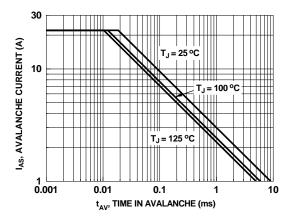


Figure 9. Unclamped Inductive Switching Capability

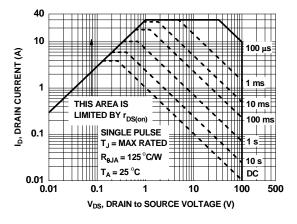


Figure 11. Forward Bias Safe Operating Area

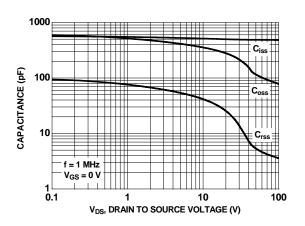


Figure 8. Capacitance vs Drain to Source Voltage

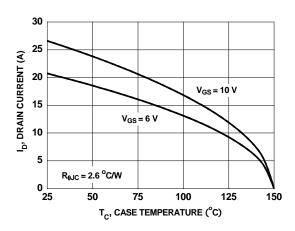


Figure 10. Maximum Continuous Drain Current vs Case Temperature

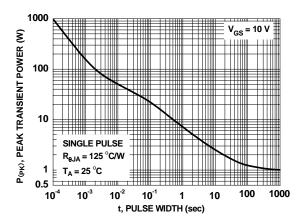


Figure 12. Single Pulse Maximum Power Dissipation

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

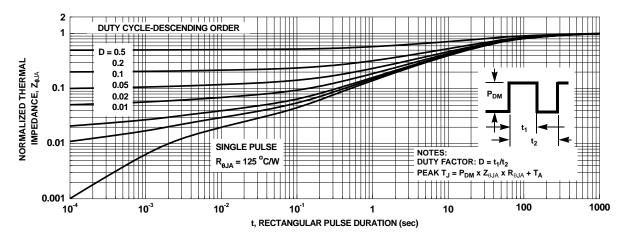


Figure 13. Junction-to-Ambient Transient Thermal Response Curve



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