

FDMS86255

N-Channel Shielded Gate PowerTrench® MOSFET

150 V, 45 A, 12.4 mΩ

Features

- Shielded Gate MOSFET Technology
- Max $r_{DS(on)}$ = 12.4 mΩ at $V_{GS} = 10$ V, $I_D = 10$ A
- Max $r_{DS(on)}$ = 15.5 mΩ at $V_{GS} = 6$ V, $I_D = 8$ A
- Advanced Package and Silicon combination for low $r_{DS(on)}$ and high efficiency
- Next generation enhanced body diode technology, engineered for soft recovery
- MSL1 robust package design
- 100% UIL tested
- RoHS Compliant

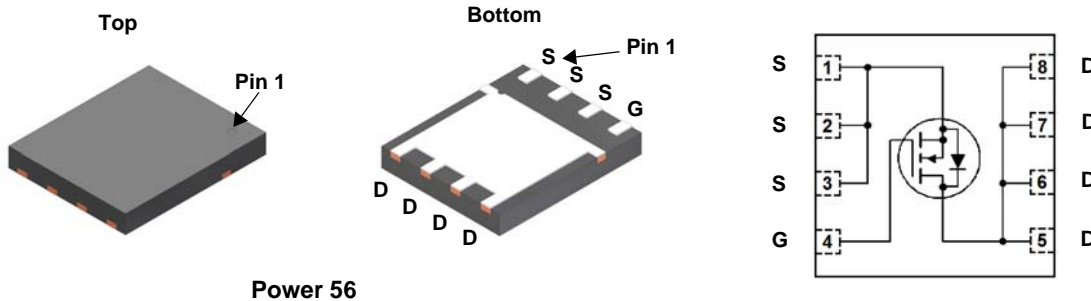


General Description

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

- OringFET / Load Switching
- Synchronous rectification
- DC-DC Conversion



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

Symbol	Parameter	Rated	Units
V_{DS}	Drain to Source Voltage	150	V
V_{GS}	Gate to Source Voltage	±20	V
I_D	Drain Current -Continuous	$T_C = 25$ °C	45
	-Continuous	$T_A = 25$ °C (Note 1a)	10
	-Pulsed	(Note 4)	100
E_{AS}	Single Pulse Avalanche Energy	(Note 3)	541
P_D	Power Dissipation	$T_C = 25$ °C	113
	Power Dissipation	$T_A = 25$ °C (Note 1a)	2.7
T_J, T_{STG}	Operating and Storage Junction Temperature Range	-55 to +150	°C

Thermal Characteristics

$R_{\theta JC}$	Thermal Resistance, Junction to Case	1.1	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient (Note 1a)	45	

Package Marking and Ordering Information

Device Marking	Device	Package	Reel Size	Tape Width	Quantity
FDMS86255	FDMS86255	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	$I_D = 250\ \mu\text{A}, V_{GS} = 0\ \text{V}$	150			V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	$I_D = 250\ \mu\text{A}$, referenced to 25°C		109		mV/ $^\circ\text{C}$
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS} = 120\ \text{V}, V_{GS} = 0\ \text{V}$			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	$V_{GS} = V_{DS}, I_D = 250\ \mu\text{A}$	2.0	3.0	4.0	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		-11		mV/ $^\circ\text{C}$
$r_{DS(on)}$	Static Drain to Source On Resistance	$V_{GS} = 10\ \text{V}, I_D = 10\ \text{A}$		9.5	12.4	m Ω
		$V_{GS} = 6\ \text{V}, I_D = 8\ \text{A}$		11.5	15.5	
		$V_{GS} = 10\ \text{V}, I_D = 10\ \text{A}, T_J = 125^\circ\text{C}$		19	25	
g_{FS}	Forward Transconductance	$V_{DS} = 5\ \text{V}, I_D = 10\ \text{A}$		35		S

Dynamic Characteristics

C_{iss}	Input Capacitance	$V_{DS} = 75\ \text{V}, V_{GS} = 0\ \text{V}, f = 1\ \text{MHz}$		3200	4480	pF
C_{oss}	Output Capacitance			291	410	pF
C_{rss}	Reverse Transfer Capacitance			11	20	pF
R_g	Gate Resistance		0.1	0.7	2.1	Ω

Switching Characteristics

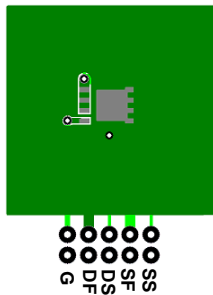
$t_{d(on)}$	Turn-On Delay Time	$V_{DD} = 75\ \text{V}, I_D = 10\ \text{A}, V_{GS} = 10\ \text{V}, R_{GEN} = 6\ \Omega$		21	34	ns	
t_r	Rise Time			4.5	10	ns	
$t_{d(off)}$	Turn-Off Delay Time			28	45	ns	
t_f	Fall Time			6.2	12	ns	
Q_g	Total Gate Charge		$V_{GS} = 0\ \text{V to } 10\ \text{V}$		45	63	nC
Q_g	Total Gate Charge		$V_{GS} = 0\ \text{V to } 6\ \text{V}$		29	41	nC
Q_{gs}	Gate to Source Charge	$V_{DD} = 75\ \text{V}, I_D = 10\ \text{A}$		14		nC	
Q_{gd}	Gate to Drain "Miller" Charge			8.8		nC	

Drain-Source Diode Characteristics

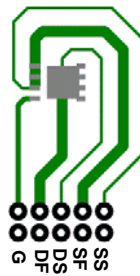
V_{SD}	Source to Drain Diode Forward Voltage	$V_{GS} = 0\ \text{V}, I_S = 1.9\ \text{A}$ (Note 2)		0.7	1.2	V
		$V_{GS} = 0\ \text{V}, I_S = 10\ \text{A}$ (Note 2)		0.8	1.3	
t_{rr}	Reverse Recovery Time	$I_F = 10\ \text{A}, di/dt = 100\ \text{A}/\mu\text{s}$		87	139	ns
Q_{rr}	Reverse Recovery Charge			165	264	nC

Notes:

- $R_{\theta JA}$ 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. $45^\circ\text{C}/\text{W}$ when mounted on a 1 in² pad of 2 oz copper.



b. $115^\circ\text{C}/\text{W}$ when mounted on a minimum pad of 2 oz copper.

- Pulse Test: Pulse Width < 300 μs , Duty cycle < 2.0%.
- E_{AS} of 541 mJ is based on starting $T_J = 25^\circ\text{C}$, $L = 3\ \text{mH}$, $I_{AS} = 19\ \text{A}$, $V_{DD} = 150\ \text{V}$, $V_{GS} = 10\ \text{V}$. 100% tested at $L = 0.1\ \text{mH}$, $I_{AS} = 60\ \text{A}$.
- Pulse Id refers to Figure.11 Forward Bias Safe Operation Area.

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

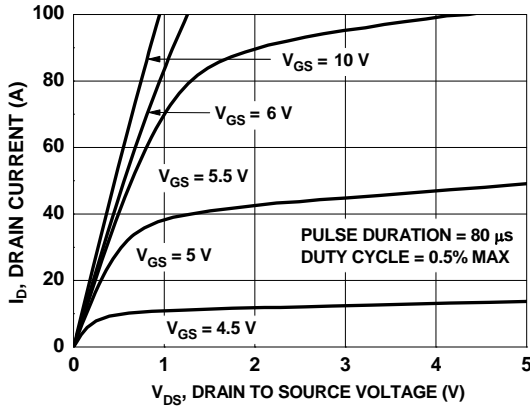


Figure 1. On-Region Characteristics

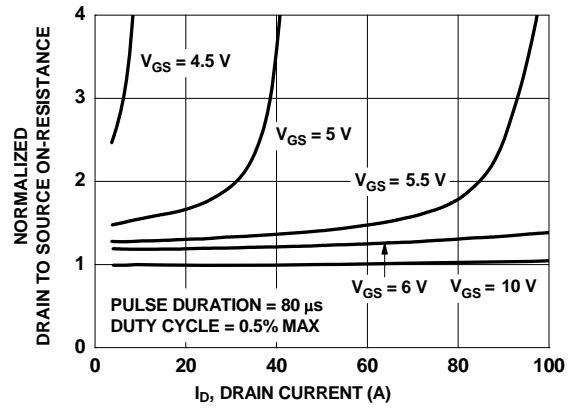


Figure 2. Normalized On-Resistance vs Drain Current and Gate Voltage

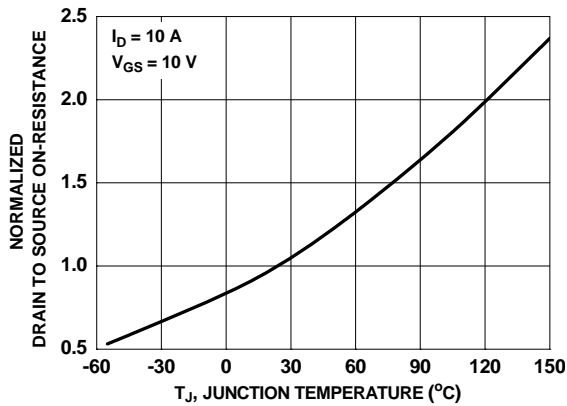


Figure 3. Normalized On-Resistance vs Junction Temperature

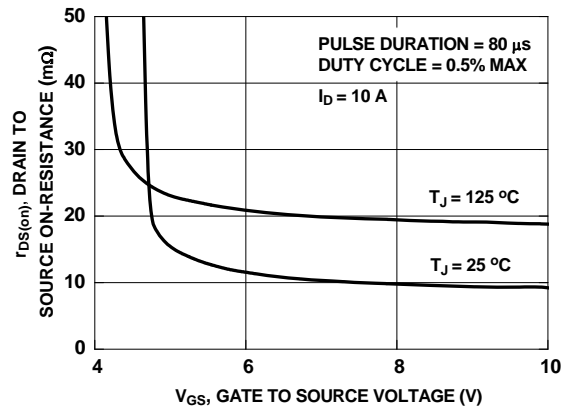


Figure 4. On-Resistance vs Gate to Source Voltage

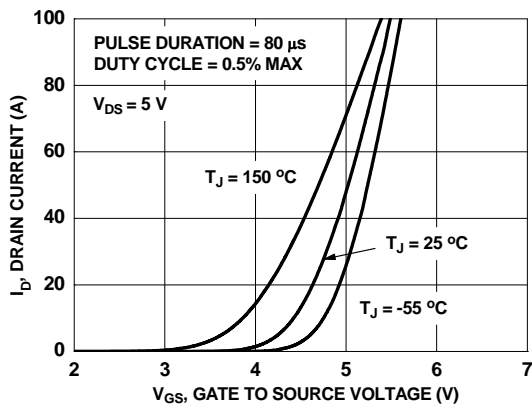


Figure 5. Transfer Characteristics

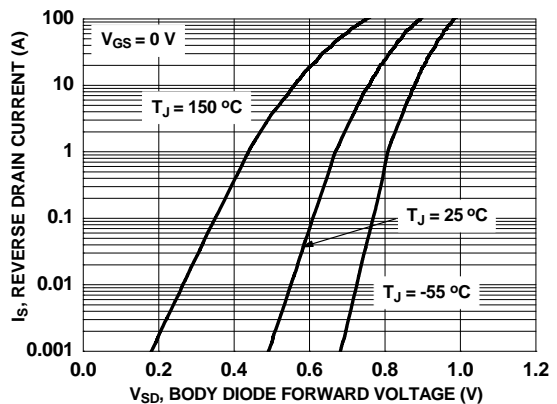


Figure 6. Source to Drain Diode Forward Voltage vs Source Current

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

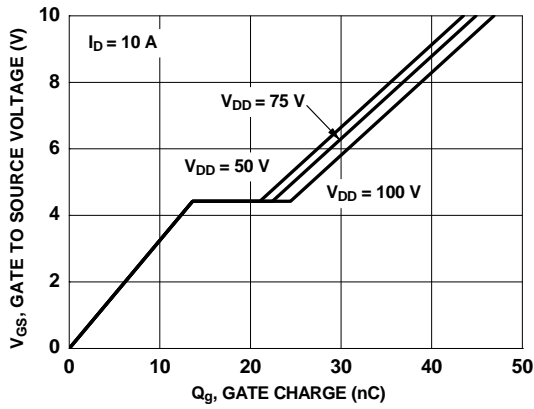


Figure 7. Gate Charge Characteristics

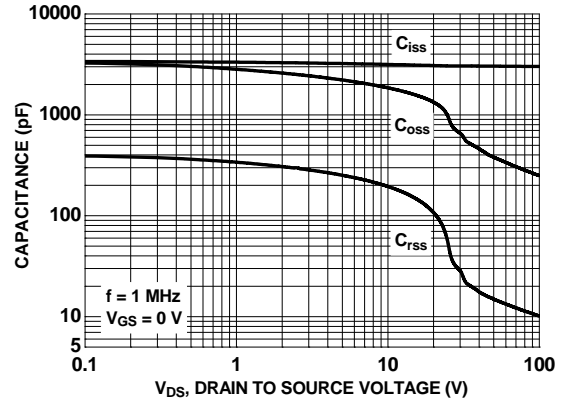


Figure 8. Capacitance vs Drain to Source Voltage

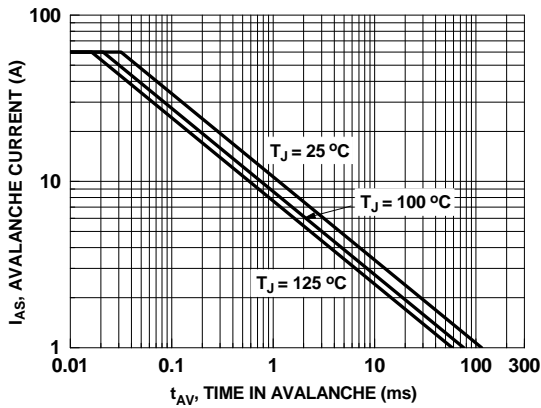


Figure 9. Unclamped Inductive Switching Capability

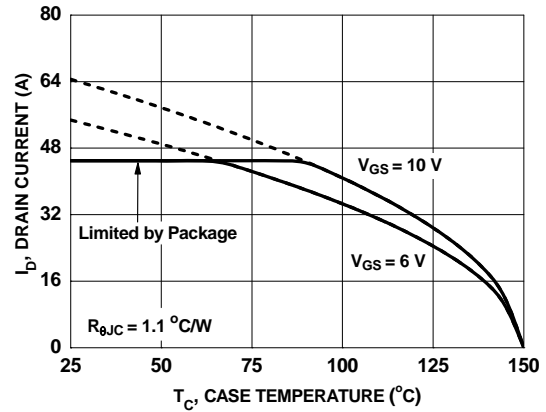


Figure 10. Maximum Continuous Drain Current vs Case Temperature

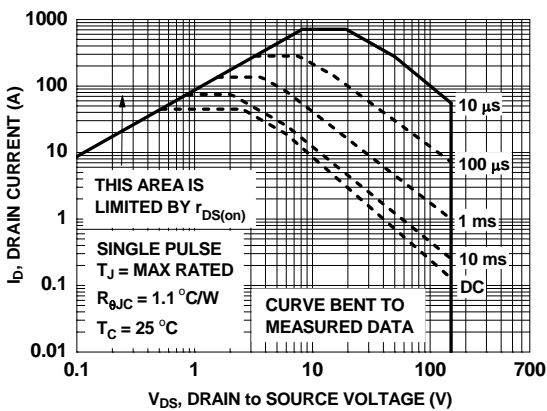


Figure 11. Forward Bias Safe Operating Area

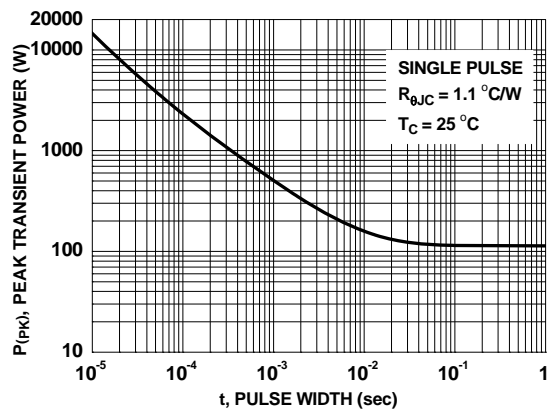
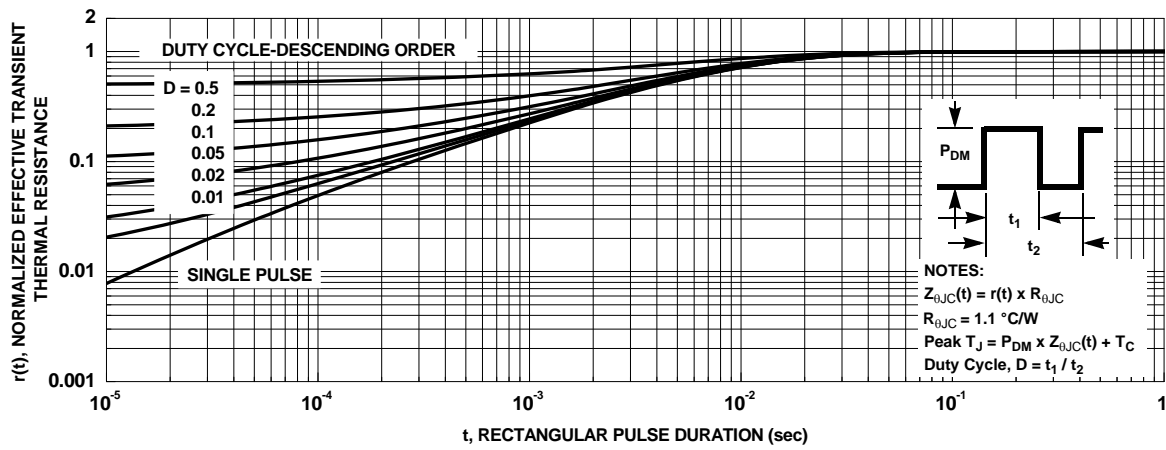
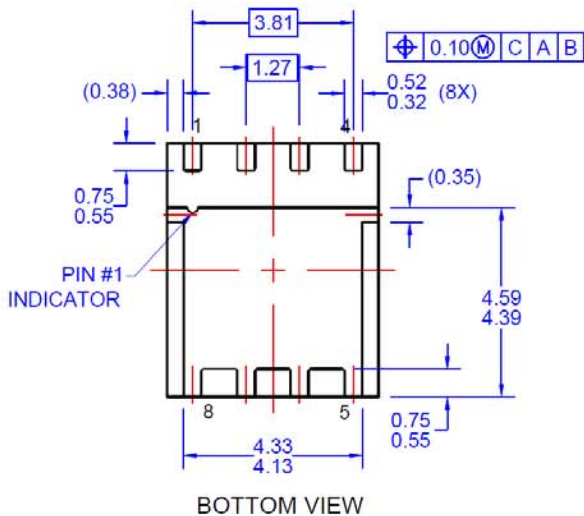
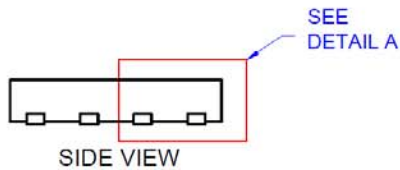
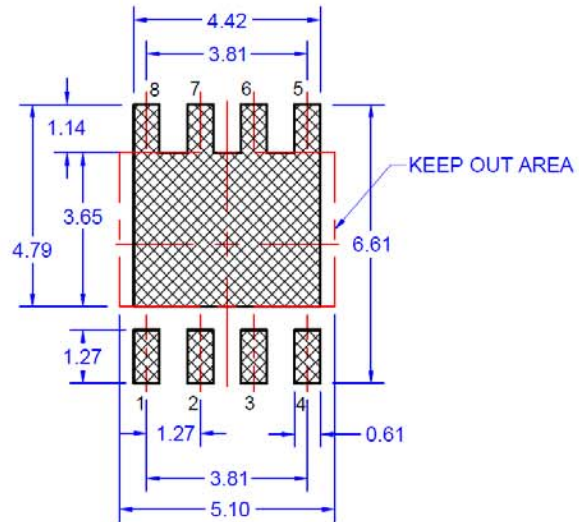
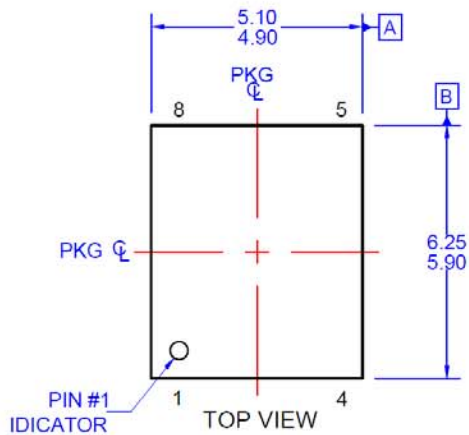


Figure 12. Single Pulse Maximum Power Dissipation

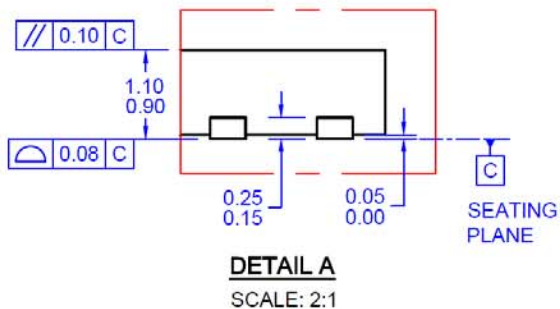
Typical Characteristics $T_J = 25\text{ }^\circ\text{C}$ unless otherwise noted



Dimensional Outline and Pad Layout






- NOTES: UNLESS OTHERWISE SPECIFIED
- 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.
 - D) DIMENSIONING AND TOLERANCING PER ASME Y14.5M-1994.
 - E) IT IS RECOMMENDED TO HAVE NO TRACES OR VIAS WITHIN THE KEEP OUT AREA.
 - F) DRAWING FILE NAME:
 - E) FAIRCHILD SEMICONDUCTOR





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Definition of Terms

Datasheet Identification	Product Status	Definition
Advance Information	Formative / In Design	Datasheet contains the design specifications for product development. Specifications may change in any manner without notice.
Preliminary	First Production	Datasheet contains preliminary data; supplementary data will be published at a later date. Fairchild Semiconductor reserves the right to make changes at any time without notice to improve design.
No Identification Needed	Full Production	Datasheet contains final specifications. Fairchild Semiconductor reserves the right to make changes at any time without notice to improve the design.
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