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FDMS86150

N-Channel Shielded Gate PowerTrench[®] MOSFET

100 V, 80 A, 4.85 mΩ

Features

- Shielded Gate MOSFET Technology
- Max $r_{DS(on)}$ = 4.85 mΩ at $V_{GS} = 10$ V, $I_D = 16$ A
- Max $r_{DS(on)}$ = 7.8 mΩ at $V_{GS} = 6$ V, $I_D = 13$ A
- Advanced Package and Silicon combination for low $r_{DS(on)}$ and high efficiency
- MSL1 robust package design
- 100% UIL tested
- RoHS Compliant

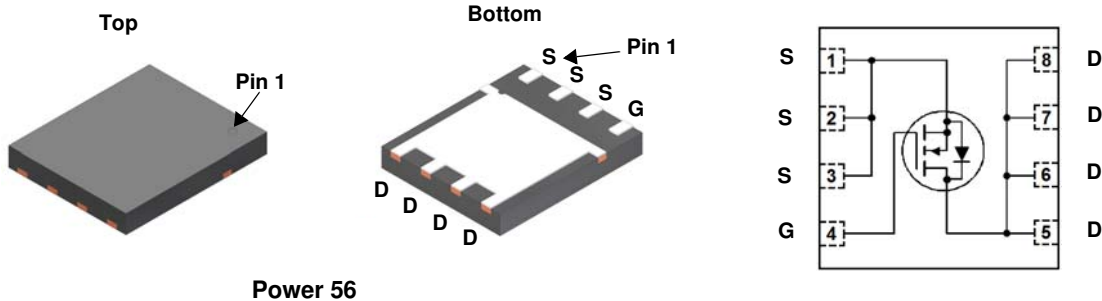


General Description

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.

Applications

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



Power 56

MOSFET Maximum Ratings $T_A = 25^\circ\text{C}$ unless otherwise noted

Symbol	Parameter	Rated	Units
V_{DS}	Drain to Source Voltage	100	V
V_{GS}	Gate to Source Voltage	± 20	V
I_D	Drain Current -Continuous	$T_C = 25^\circ\text{C}$	80
	-Continuous	$T_A = 25^\circ\text{C}$ (Note 1a)	16
	-Pulsed		300
E_{AS}	Single Pulse Avalanche Energy	(Note 3)	726
P_D	Power Dissipation	$T_C = 25^\circ\text{C}$	156
	Power Dissipation	$T_A = 25^\circ\text{C}$ (Note 1a)	2.7
T_J, T_{STG}	Operating and Storage Junction Temperature Range		-55 to +150

Thermal Characteristics

$R_{\theta JC}$	Thermal Resistance, Junction to Case	0.8	$^\circ\text{C}/\text{W}$
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient (Note 1a)	45	

Package Marking and Ordering Information

Device Marking	Device	Package	Reel Size	Tape Width	Quantity
FDMS86150	FDMS86150	Power 56	13"	12 mm	3000 units

FDMS86150 N-Channel Shielded Gate PowerTrench[®] MOSFET

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

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
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Off Characteristics

BV_{DSS}	Drain to Source Breakdown Voltage	$I_D = 250\text{ }\mu\text{A}$, $V_{GS} = 0\text{ V}$	100			V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	$I_D = 250\text{ }\mu\text{A}$, referenced to $25\text{ }^\circ\text{C}$		72		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	$V_{GS} = V_{DS}$, $I_D = 250\text{ }\mu\text{A}$	2	3	4	V
$\frac{\Delta V_{GS(th)}}{\Delta T_J}$	Gate to Source Threshold Voltage Temperature Coefficient	$I_D = 250\text{ }\mu\text{A}$, referenced to $25\text{ }^\circ\text{C}$		-10		mV/ $^\circ\text{C}$
$r_{DS(on)}$	Static Drain to Source On Resistance	$V_{GS} = 10\text{ V}$, $I_D = 16\text{ A}$		3.9	4.85	m Ω
		$V_{GS} = 6\text{ V}$, $I_D = 13\text{ A}$		6	7.8	
		$V_{GS} = 10\text{ V}$, $I_D = 16\text{ A}$, $T_J = 125\text{ }^\circ\text{C}$		7.3	9.1	
g_{FS}	Forward Transconductance	$V_{DS} = 10\text{ V}$, $I_D = 16\text{ A}$		53		S

Dynamic Characteristics

C_{iss}	Input Capacitance	$V_{DS} = 50\text{ V}$, $V_{GS} = 0\text{ V}$, $f = 1\text{ MHz}$		3055	4065	pF
C_{oss}	Output Capacitance			696	930	pF
C_{rss}	Reverse Transfer Capacitance			29	50	pF
R_g	Gate Resistance		0.1	0.7	3.6	Ω

Switching Characteristics

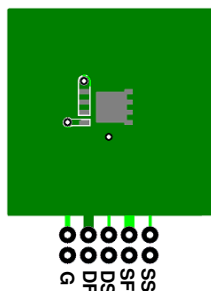
$t_{d(on)}$	Turn-On Delay Time	$V_{DD} = 50\text{ V}$, $I_D = 16\text{ A}$, $V_{GS} = 10\text{ V}$, $R_{GEN} = 6\text{ }\Omega$		18	33	ns	
t_r	Rise Time			8.3	17	ns	
$t_{d(off)}$	Turn-Off Delay Time			28	45	ns	
t_f	Fall Time			6	12	ns	
Q_g	Total Gate Charge		$V_{GS} = 0\text{ V to } 10\text{ V}$		44	62	nC
Q_g	Total Gate Charge	$V_{GS} = 0\text{ V to } 5\text{ V}$	$V_{DD} = 50\text{ V}$, $I_D = 16\text{ A}$		25	35	nC
Q_{gs}	Gate to Source Charge				12.9		nC
Q_{gd}	Gate to Drain "Miller" Charge				9.2		nC

Drain-Source Diode Characteristics

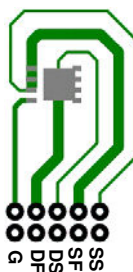
V_{SD}	Source to Drain Diode Forward Voltage	$V_{GS} = 0\text{ V}$, $I_S = 2.1\text{ A}$ (Note 2)		0.69	1.2	V
		$V_{GS} = 0\text{ V}$, $I_S = 16\text{ A}$ (Note 2)		0.78	1.3	
t_{rr}	Reverse Recovery Time	$I_F = 16\text{ A}$, $di/dt = 100\text{ A}/\mu\text{s}$		69	110	ns
Q_{rr}	Reverse Recovery Charge			94	150	nC

Notes:

- $R_{\theta JA}$ is determined with the device mounted on a 1 in^2 pad 2 oz copper pad on a $1.5 \times 1.5\text{ in.}$ 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. $45\text{ }^\circ\text{C/W}$ when mounted on a 1 in^2 pad of 2 oz copper.



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

- Pulse Test: Pulse Width < $300\text{ }\mu\text{s}$, Duty cycle < 2.0%.

- E_{AS} of 726 mJ is based on starting $T_J = 25\text{ }^\circ\text{C}$, $L = 3\text{ mH}$, $I_{AS} = 22\text{ A}$, $V_{DD} = 100\text{ V}$, $V_{GS} = 10\text{ V}$, 100% test at $L = 0.1\text{ mH}$, $I_{AS} = 69\text{ A}$.

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

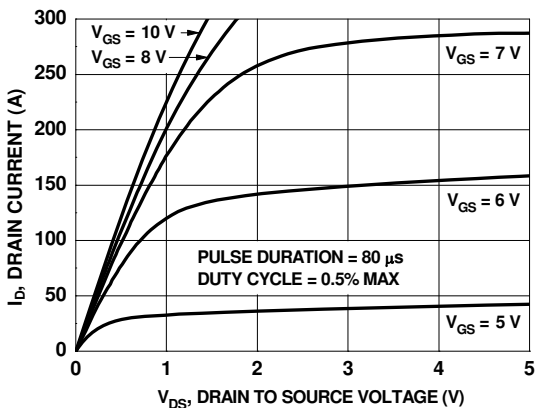


Figure 1. On Region Characteristics

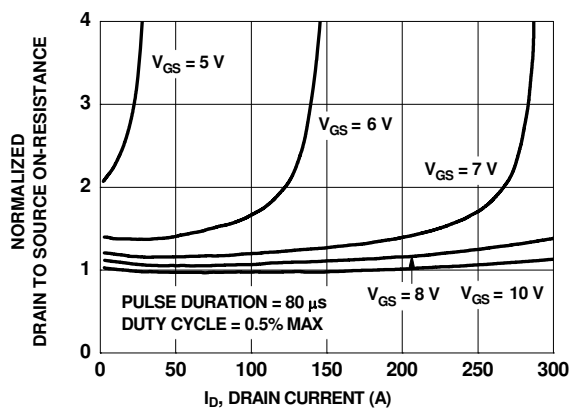


Figure 2. Normalized On-Resistance vs Drain Current and Gate Voltage

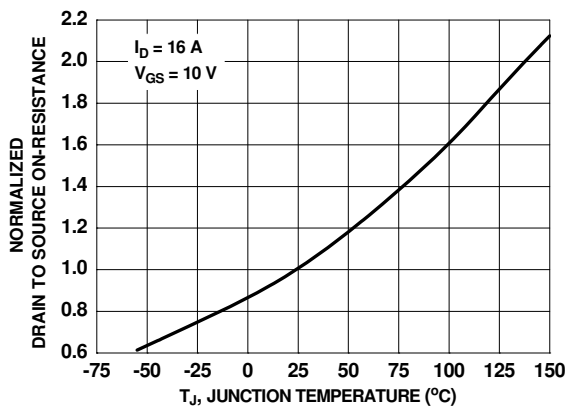


Figure 3. Normalized On Resistance vs Junction Temperature

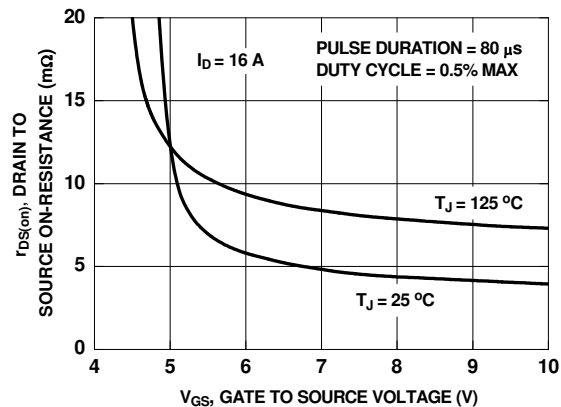


Figure 4. On-Resistance vs Gate to Source Voltage

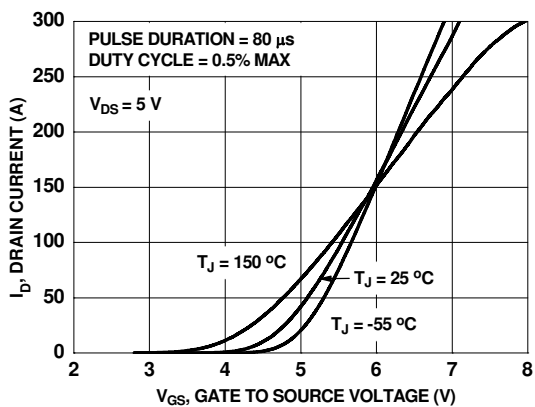


Figure 5. Transfer Characteristics

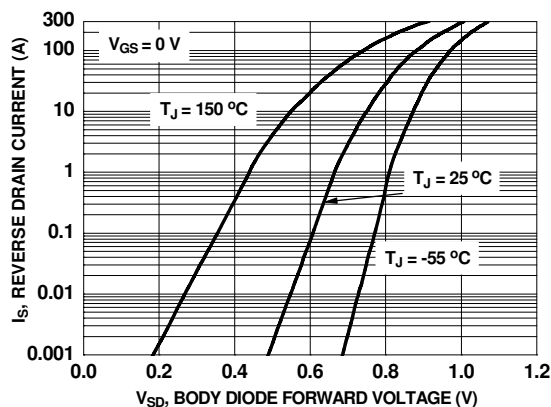


Figure 6. Source to Drain Diode Forward Voltage vs Source Current

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

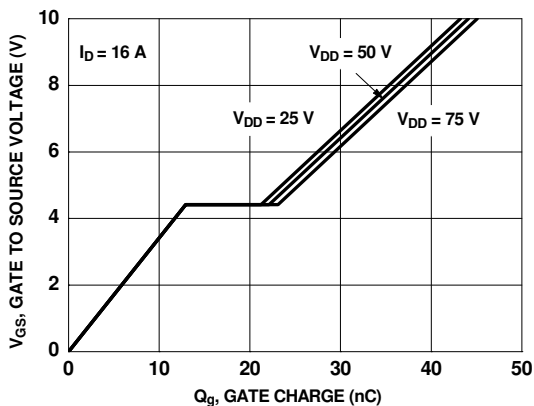


Figure 7. Gate Charge Characteristics

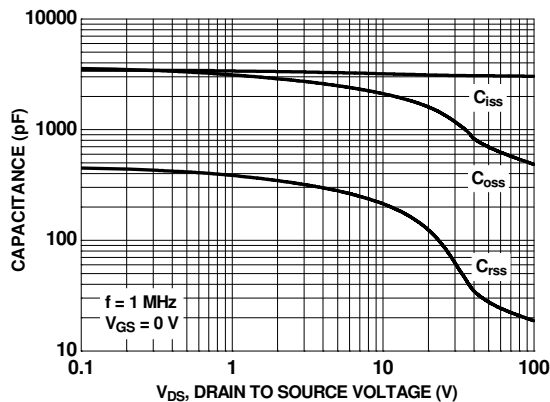


Figure 8. Capacitance vs Drain to Source Voltage

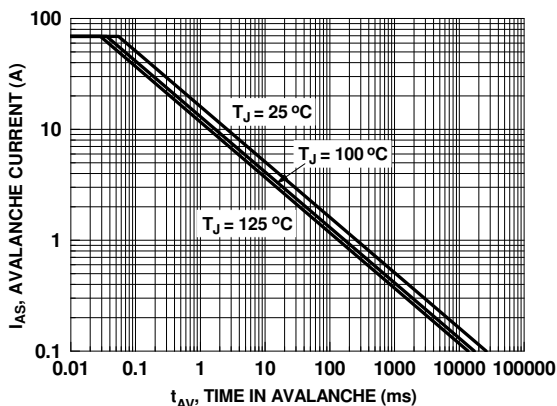


Figure 9. Unclamped Inductive Switching Capability

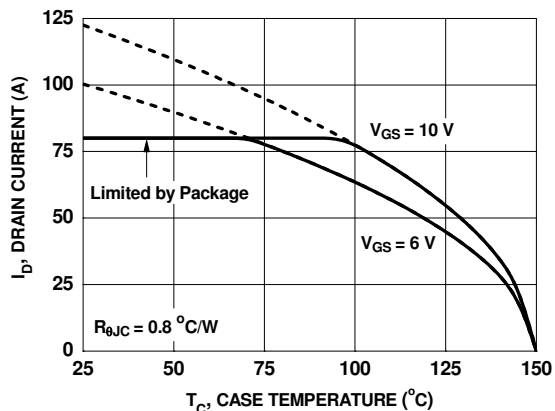


Figure 10. Maximum Continuous Drain Current vs Case Temperature

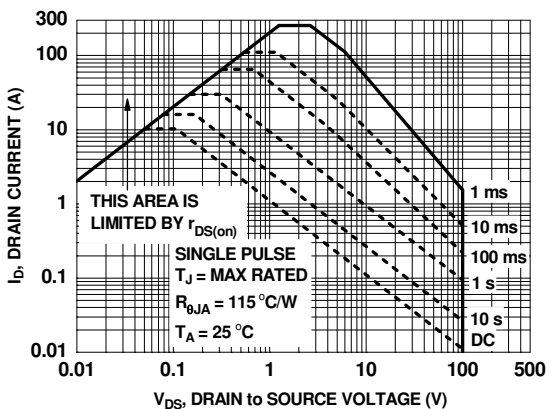


Figure 11. Forward Bias Safe Operating Area

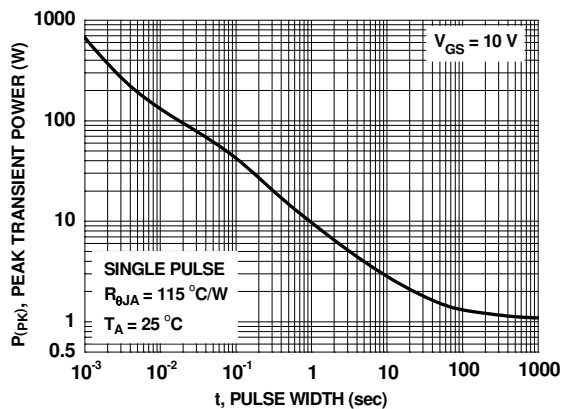


Figure 12. Single Pulse Maximum Power Dissipation

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

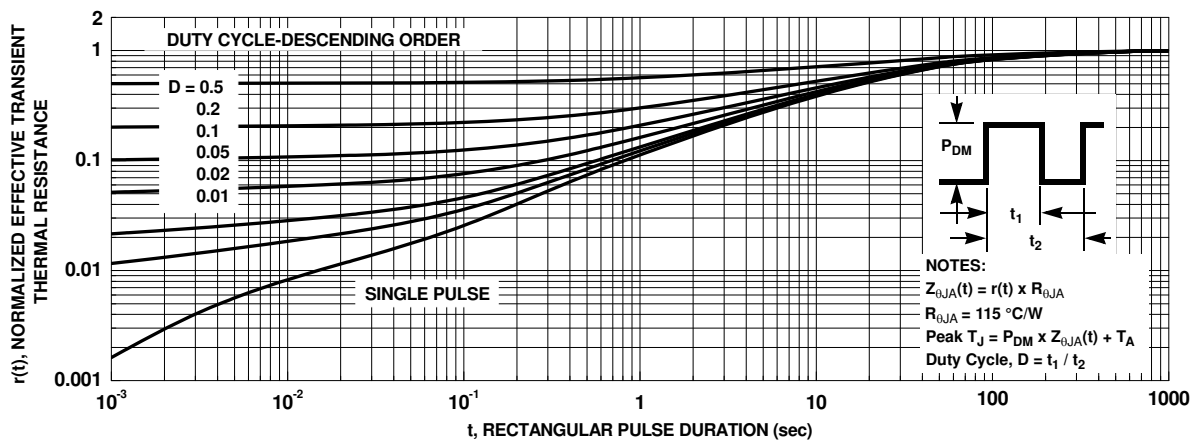


Figure 13. Junction-to-Ambient Transient Thermal Response Curve

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