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September 2015

FDS89141

Dual N-Channel Shielded Gate PowerTrench® MOSFET

100 V, 3.5 A, 62 mΩ

Features

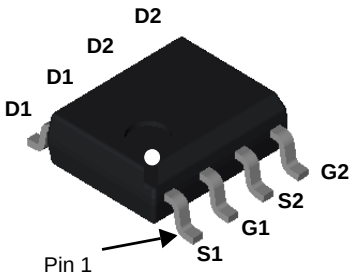
- Shielded Gate MOSFET Technology
- Max $r_{DS(on)}$ = 62 mΩ at V_{GS} = 10 V, I_D = 3.5 A
- Max $r_{DS(on)}$ = 100 mΩ at V_{GS} = 6 V, I_D = 2.8 A
- High performance trench technology for extremely low $r_{DS(on)}$
- High power and current handling capability in a widely used surface mount package
- 100% UIL Tested
- RoHS Compliant

General Description

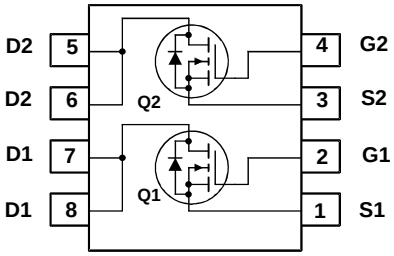
This N-Channel MOSFET is produced using Fairchild Semiconductor's advanced PowerTrench® process that incorporates Shielded Gate technology. This process has been optimized for $r_{DS(on)}$, switching performance and ruggedness.

Applications

- Synchronous Rectifier
- Primary Switch For Bridge Topology



SO-8



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			3.5	A
	-Pulsed			18	
E_{AS}	Single Pulse Avalanche Energy		(Note 3)	37	mJ
P_D	Power Dissipation	T_A = 25 °C	(Note 1a)	31	W
	Power Dissipation	T_A = 25 °C	(Note 1b)	1.6	
T_J, T_{STG}	Operating and Storage Junction Temperature Range			-55 to +150	°C

Thermal Characteristics

$R_{\theta JC}$	Thermal Resistance, Junction to Case	(Note 1)	40	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	(Note 1a)	78	

Package Marking and Ordering Information

Device Marking	Device	Package	Reel Size	Tape Width	Quantity
FDS89141	FDS89141	SO-8	13 ”	12 mm	2500 units

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Electrical Characteristics T_J = 25°C unless otherwise noted

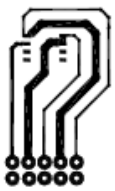
Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
Off Characteristics						
BV_{DSS}	Drain to Source Breakdown Voltage	I_D = 250 μA, V_{GS} = 0 V	100			V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	I_D = 250 μA, referenced to 25 °C		69		mV/°C
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS} = 80 V, V_{GS} = 0 V			1	μA
I_{GSS}	Gate to Source Leakage Current	V_{GS} = ±20 V, V_{DS} = 0 V			±100	nA
On Characteristics						
$V_{GS(th)}$	Gate to Source Threshold Voltage	V_{GS} = V_{DS}, I_D = 250 μA	2	3.1	4	V
$\frac{\Delta V_{GS(th)}}{\Delta T_J}$	Gate to Source Threshold Voltage Temperature Coefficient	I_D = 250 μA, referenced to 25 °C		-9		mV/°C
$r_{DS(on)}$	Static Drain to Source On Resistance	V_{GS} = 10 V, I_D = 3.5 A		47	62	mΩ
		V_{GS} = 6 V, I_D = 2.8 A		63	100	
		V_{GS} = 10 V, I_D = 3.5 A, T_J = 125 °C		81	107	
g_{FS}	Forward Transconductance	V_{DS} = 10 V, I_D = 3.5 A		14.7		S
Dynamic Characteristics						
C_{iss}	Input Capacitance	V_{DS} = 50 V, V_{GS} = 0 V, f = 1MHz		299	398	pF
C_{oss}	Output Capacitance			70	93	pF
C_{rss}	Reverse Transfer Capacitance			4.7	7	pF
R_g	Gate Resistance			1.0		Ω
Switching Characteristics						
$t_{d(on)}$	Turn-On Delay Time	V_{DD} = 50 V, I_D = 3.5 A, V_{GS} = 10 V, R_{GEN} = 6 Ω		5	10	ns
t_r	Rise Time			1.4	10	ns
$t_{d(off)}$	Turn-Off Delay Time			9.8	20	ns
t_f	Fall Time			2.2	10	ns
$Q_{g(TOT)}$	Total Gate Charge	V_{GS} = 0 V to 10 V; V_{DD} = 50 V, I_D = 3.5 A		5.1	7.1	nC
$Q_{g(TOT)}$	Total Gate Charge	V_{GS} = 0 V to 5 V; V_{DD} = 50 V, I_D = 3.5 A		2.9	4.1	nC
Q_{gs}	Gate to Source Charge	V_{DD} = 50 V, I_D = 3.5 A		1.4		nC
Q_{gd}	Gate to Drain “Miller” Charge	V_{DD} = 50 V, I_D = 3.5 A		1.3		nC
Drain-Source Diode Characteristics						
V_{SD}	Source to Drain Diode Forward Voltage	V_{GS} = 0 V, I_S = 3.5 A (Note 2)		0.8	1.3	V
		V_{GS} = 0 V, I_S = 2 A (Note 2)		0.8	1.2	
t_{rr}	Reverse Recovery Time	I_F = 3.5 A, di/dt = 100 A/μs		33	53	ns
Q_{rr}	Reverse Recovery Charge			23	37	nC

NOTES:

1. $R_{\theta JA}$ is determined with the device mounted on a 1in^2 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) 78°C/W when mounted on a 1 in^2 pad of 2 oz copper



b) 135°C/W when mounted on a minimun pad

2. Pulse Test: Pulse Width < 300μs, Duty cycle < 2.0%.
3. Starting T_J = 25°C, L = 3.0 mH, I_{AS} = 5.0 A, V_{DD} = 100 V, V_{GS} = 10V.

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Typical Characteristics (N-Channel) T_J = 25°C unless otherwise noted

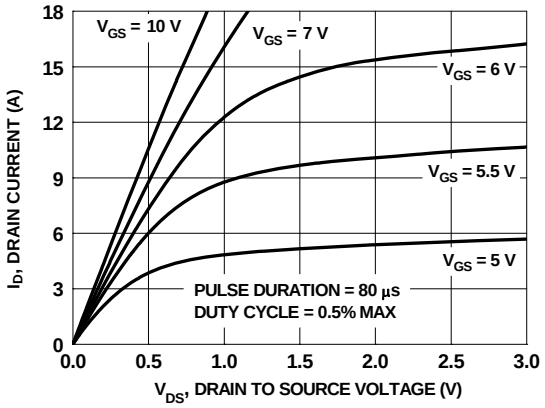


Figure 1. On-Region Characteristics

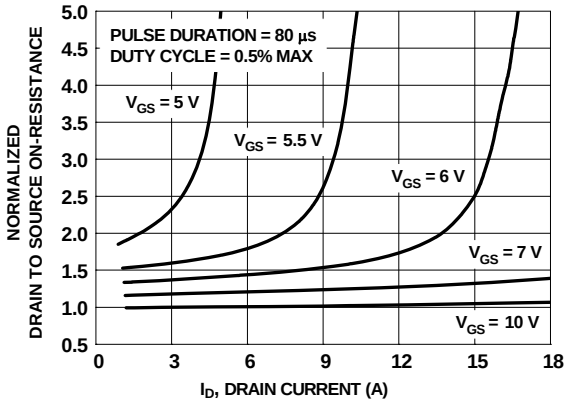


Figure 2. Normalized On-Resistance vs Drain Current and Gate Voltage

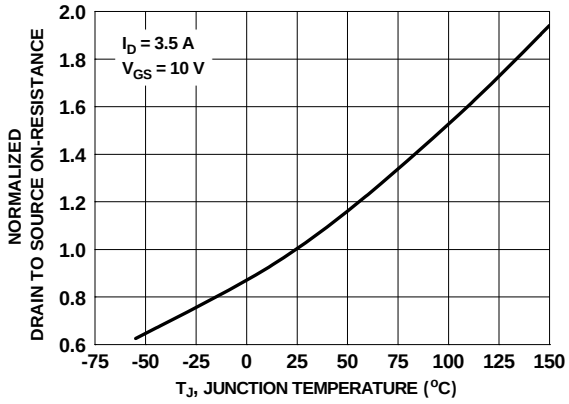


Figure 3. Normalized On-Resistance vs Junction Temperature

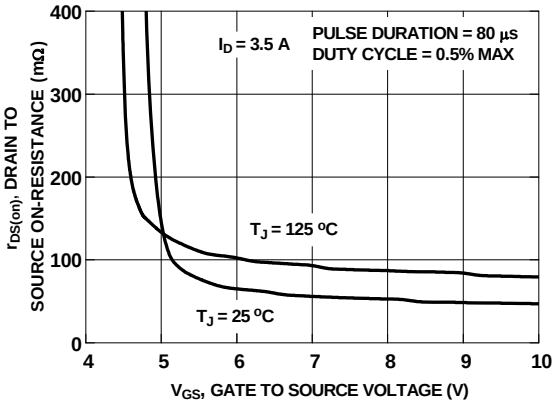


Figure 4. On-Resistance vs Gate to Source Voltage

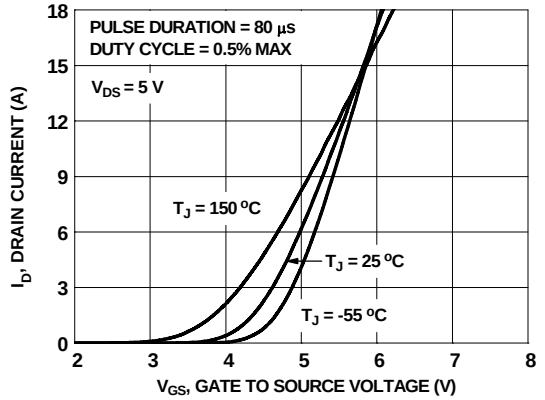


Figure 5. Transfer Characteristics

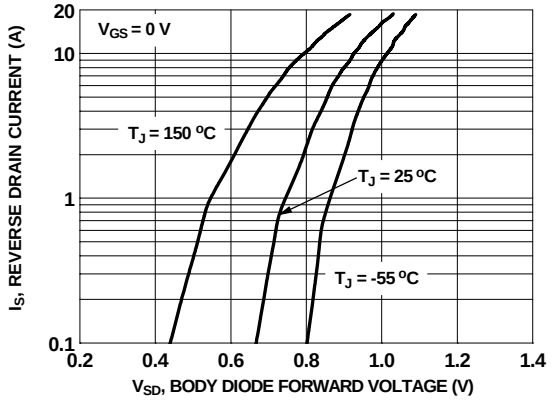


Figure 6. Source to Drain Diode Forward Voltage vs Source Current

Typical Characteristics (N-Channel) T_J = 25°C unless otherwise noted

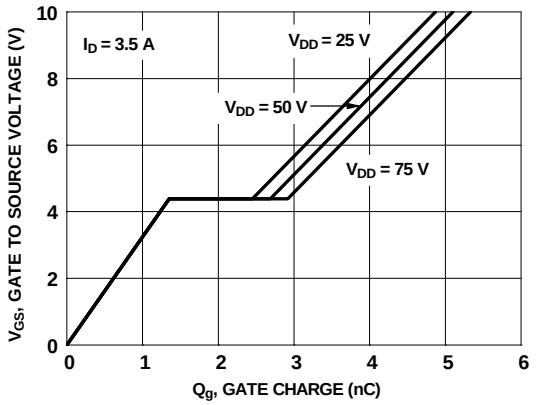


Figure 7. Gate Charge Characteristics

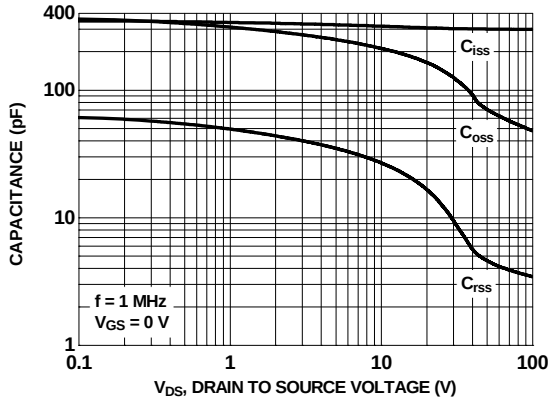


Figure 8. Capacitance vs Drain to Source Voltage

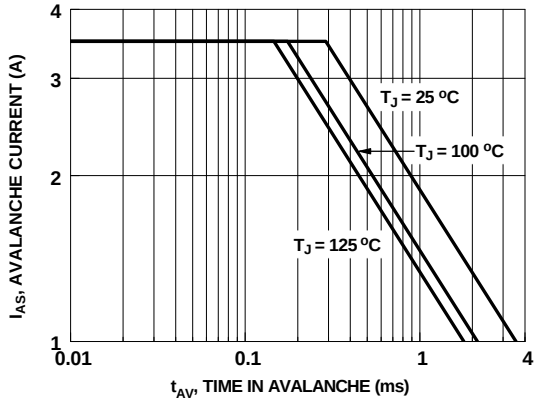


Figure 9. Unclamped Inductive Switching Capability

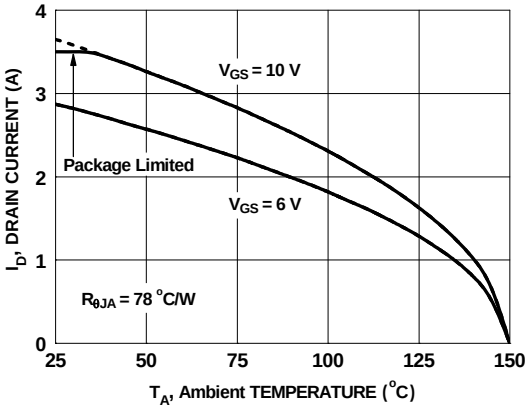


Figure 10. Maximum Continuous Drain Current vs Ambient Temperature

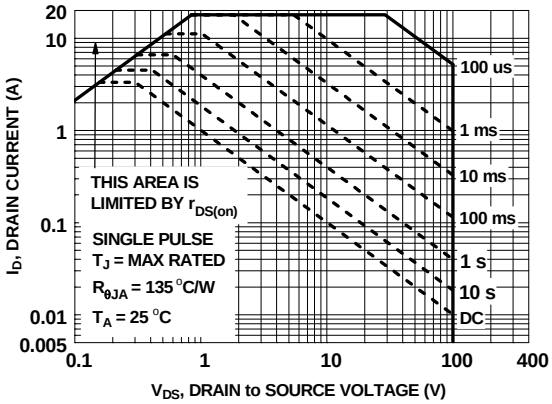


Figure 11. Forward Bias Safe Operating Area

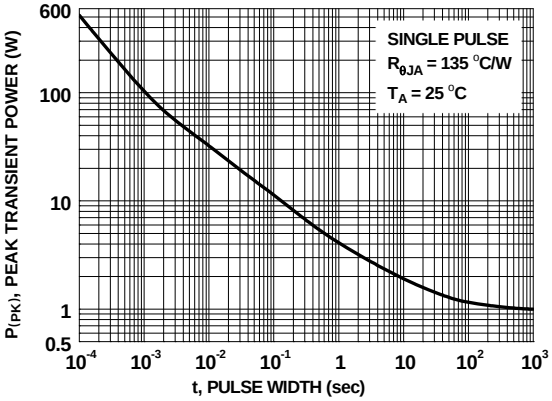


Figure 12. Single Pulse Maximum Power Dissipation

Typical Characteristics (N-Channel) T_J = 25°C unless otherwise noted

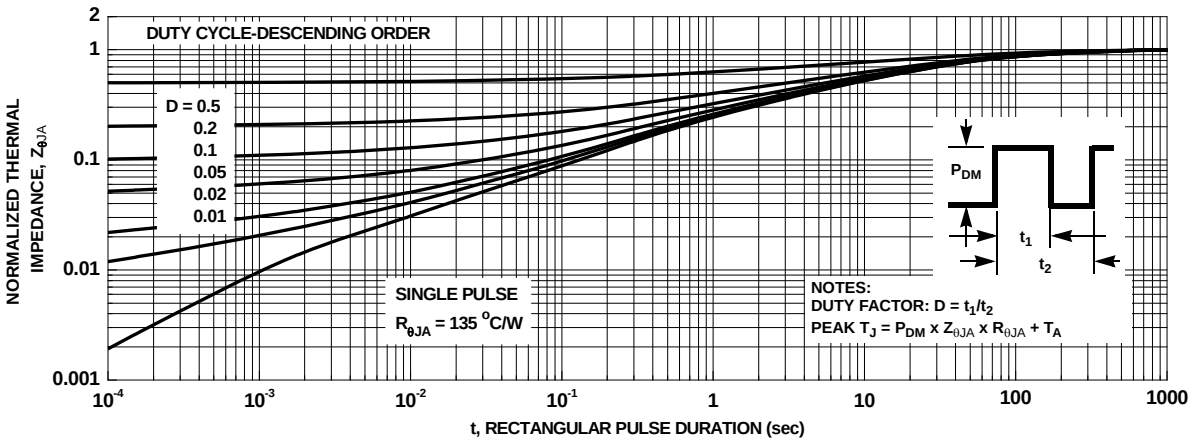
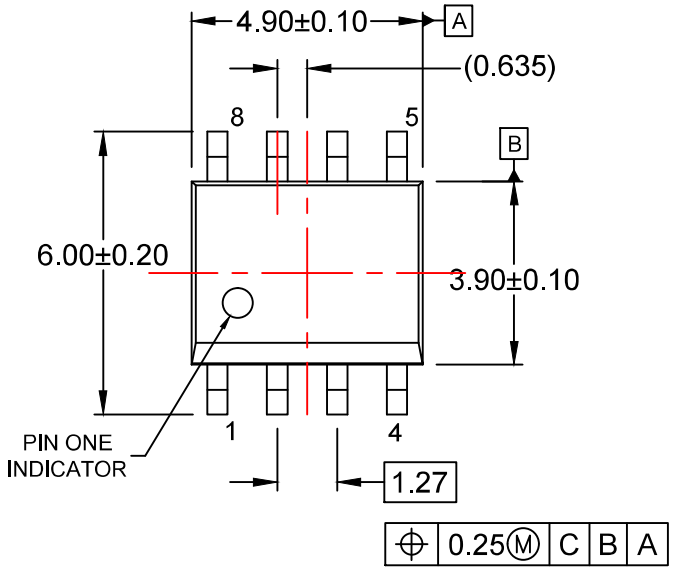
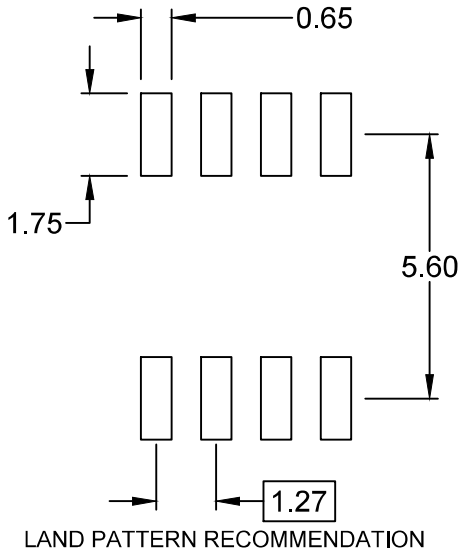
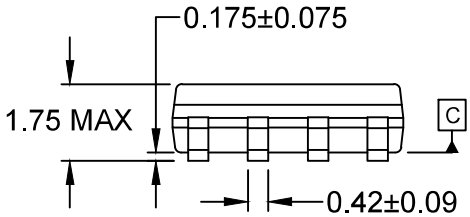


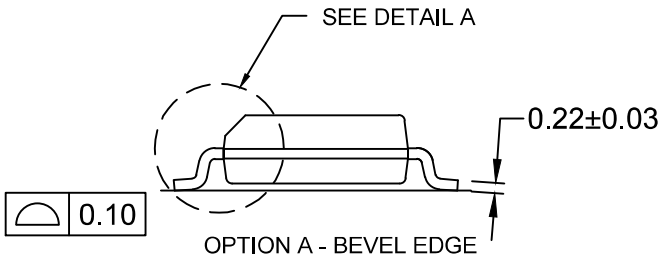
Figure 13. Junction-to-Ambient Transient Thermal Response Curve



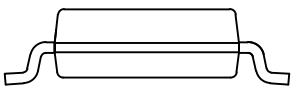


LAND PATTERN RECOMMENDATION

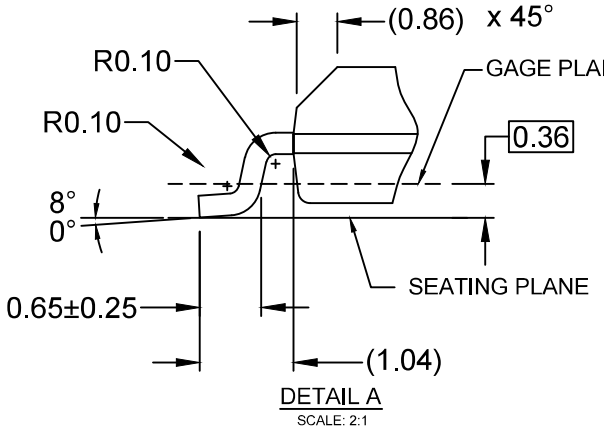




OPTION A - BEVEL EDGE



OPTION B - NO BEVEL EDGE



DETAIL A
SCALE: 2:1

NOTES:

A) THIS PACKAGE CONFORMS TO JEDEC MS-012, VARIATION AA.
B) ALL DIMENSIONS ARE IN MILLIMETERS.
C) DIMENSIONS DO NOT INCLUDE MOLD FLASH OR BURRS.
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