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September 2015

FDS89161LZ

Dual N-Channel Shielded Gate PowerTrench[®] MOSFET

100 V, 2.7 A, 105 mΩ

Features

- Shielded Gate MOSFET Technology
- Max $r_{DS(on)}$ = 105 mΩ at $V_{GS} = 10$ V, $I_D = 2.7$ A
- Max $r_{DS(on)}$ = 160 mΩ at $V_{GS} = 4.5$ V, $I_D = 2.1$ A
- High performance trench technology for extremely low $r_{DS(on)}$
- High power and current handling capability in a widely used surface mount package
- CDM ESD protection level > 2KV typical (Note 4)
- 100% UIL Tested
- RoHS Compliant

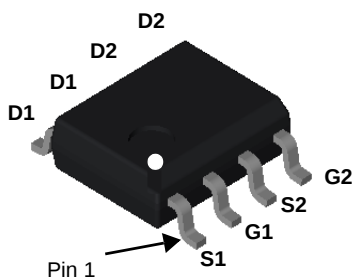


General Description

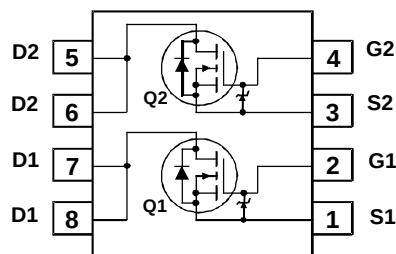
This N-Channel logic Level MOSFETs are produced using Fairchild Semiconductor's advanced PowerTrench[®] process that incorporates Shielded Gate technology. This process has been optimized for the on-state resistance and yet maintain superior switching performance. G-S zener has been added to enhance ESD voltage level.

Application

- DC-DC conversion



SO-8



MOSFET Maximum Ratings $T_A = 25^\circ\text{C}$ 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	2.7	A
	-Pulsed	15	
E_{AS}	Single Pulse Avalanche Energy (Note 3)	13	mJ
P_D	Power Dissipation $T_C = 25^\circ\text{C}$	31	W
	Power Dissipation $T_A = 25^\circ\text{C}$ (Note 1a)	1.6	
T_J, T_{STG}	Operating and Storage Junction Temperature Range	-55 to +150	$^\circ\text{C}$

Thermal Characteristics

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

Package Marking and Ordering Information

Device Marking	Device	Package	Reel Size	Tape Width	Quantity
FDS89161LZ	FDS89161LZ	SO-8	13 "	12 mm	2500 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	$V_{GS} = \pm 20\ \text{V}$, $V_{DS} = 0\ \text{V}$			± 10	μA

On Characteristics

$V_{GS(th)}$	Gate to Source Threshold Voltage	$V_{GS} = V_{DS}$, $I_D = 250\ \mu\text{A}$	1	1.7	2.2	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		-6		mV/ $^\circ\text{C}$
$r_{DS(on)}$	Static Drain to Source On Resistance	$V_{GS} = 10\ \text{V}$, $I_D = 2.7\ \text{A}$		81	105	m Ω
		$V_{GS} = 4.5\ \text{V}$, $I_D = 2.1\ \text{A}$		110	160	
		$V_{GS} = 10\ \text{V}$, $I_D = 2.7\ \text{A}$, $T_J = 125^\circ\text{C}$		140	182	
g_{FS}	Forward Transconductance	$V_{DS} = 10\ \text{V}$, $I_D = 2.7\ \text{A}$		7.8		S

Dynamic Characteristics

C_{iss}	Input Capacitance	$V_{DS} = 50\ \text{V}$, $V_{GS} = 0\ \text{V}$, $f = 1\ \text{MHz}$		227	302	pF
C_{oss}	Output Capacitance			44	58	pF
C_{rss}	Reverse Transfer Capacitance			3	4	pF
R_g	Gate Resistance			0.9		Ω

Switching Characteristics

$t_{d(on)}$	Turn-On Delay Time	$V_{DD} = 50\ \text{V}$, $I_D = 2.7\ \text{A}$, $V_{GS} = 10\ \text{V}$, $R_{GEN} = 6\ \Omega$		3.8	10	ns
t_r	Rise Time			1.2	10	ns
$t_{d(off)}$	Turn-Off Delay Time			9.5	17	ns
t_f	Fall Time			1.6	10	ns
$Q_{g(TOT)}$	Total Gate Charge	$V_{GS} = 0\ \text{V}$ to $10\ \text{V}$	$V_{DD} = 50\ \text{V}$, $I_D = 2.7\ \text{A}$	3.8	5.3	nC
$Q_{g(TOT)}$	Total Gate Charge	$V_{GS} = 0\ \text{V}$ to $5\ \text{V}$		2.1	2.9	nC
Q_{gs}	Gate to Source Charge			0.7		nC
Q_{gd}	Gate to Drain "Miller" Charge			0.7		nC

Drain-Source Diode Characteristics

V_{SD}	Source to Drain Diode Forward Voltage	$V_{GS} = 0\ \text{V}$, $I_S = 2.7\ \text{A}$ (Note 2)		0.8	1.3	V
		$V_{GS} = 0\ \text{V}$, $I_S = 2\ \text{A}$ (Note 2)		0.8	1.2	
t_{rr}	Reverse Recovery Time	$I_F = 2.7\ \text{A}$, $di/dt = 100\ \text{A}/\mu\text{s}$		31	56	ns
Q_{rr}	Reverse Recovery Charge			20	36	nC

NOTES:

1. $R_{\theta JA}$ 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) $78^\circ\text{C}/\text{W}$ when mounted on a 1 in^2 pad of 2 oz copper



b) $135^\circ\text{C}/\text{W}$ when mounted on a minimum pad

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

3. Starting $T_J = 25^\circ\text{C}$, $L = 0.3\ \text{mH}$, $I_{AS} = 25\ \text{A}$, $V_{DD} = 27\ \text{V}$, $V_{GS} = 10\ \text{V}$.

4. The diode connected between gate and source serves only as protection against ESD. No gate overvoltage rating is implied.

Typical Characteristics (N-Channel) $T_J = 25^\circ\text{C}$ unless otherwise noted

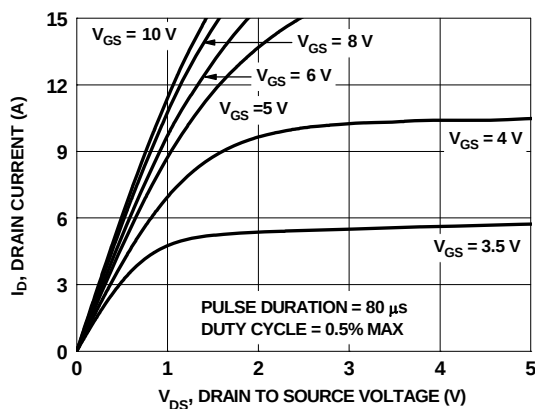


Figure 1. On-Region Characteristics

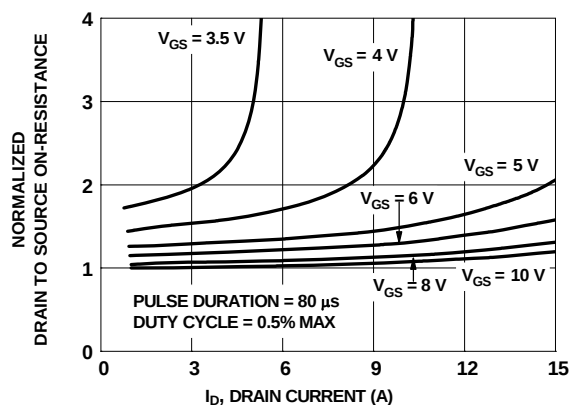


Figure 2. Normalized On-Resistance vs Drain Current and Gate Voltage

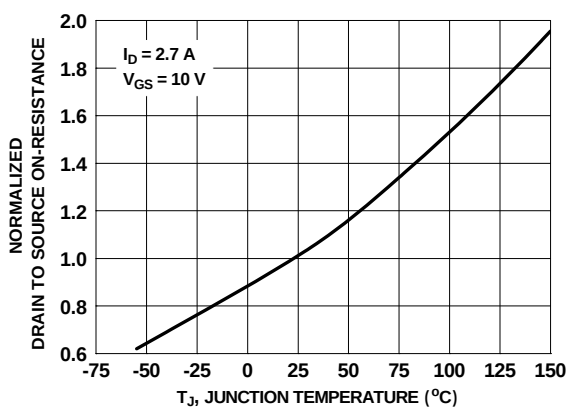


Figure 3. Normalized On-Resistance vs Junction Temperature

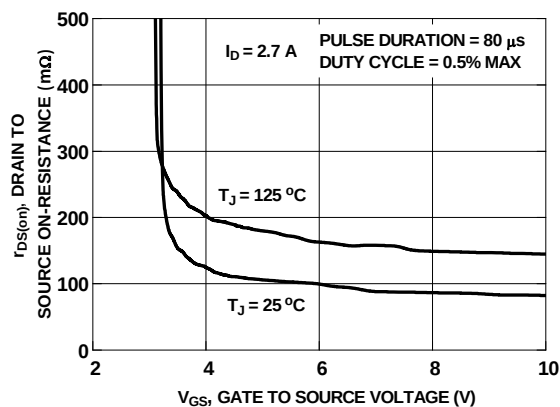


Figure 4. On-Resistance vs Gate to Source Voltage

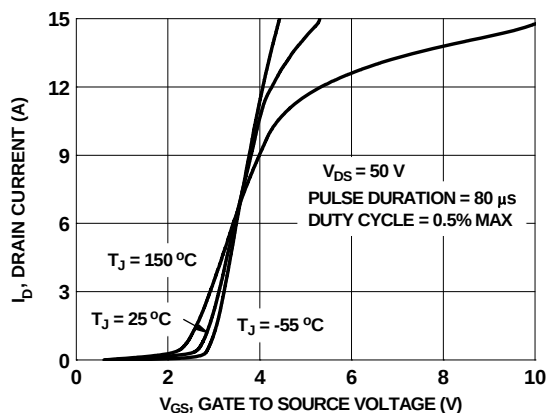


Figure 5. Transfer Characteristics

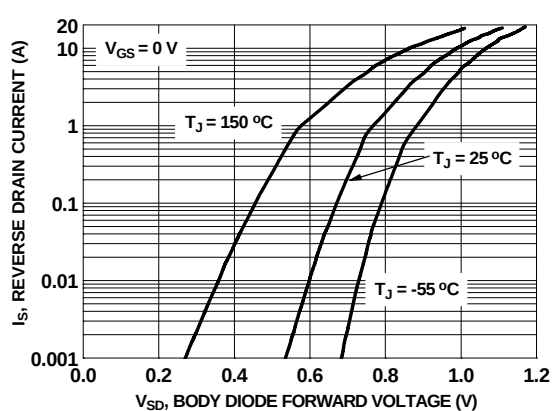


Figure 6. Source to Drain Diode Forward Voltage vs Source Current

Typical Characteristics (N-Channel) $T_J = 25^\circ\text{C}$ unless otherwise noted

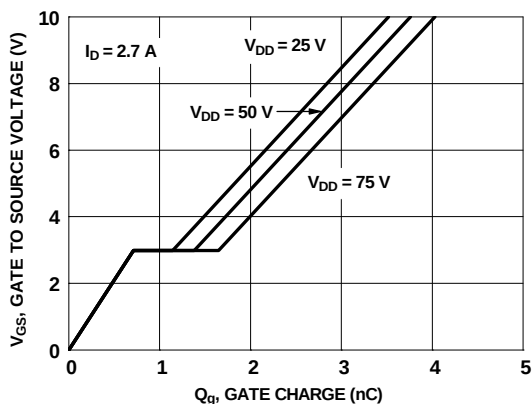


Figure 7. Gate Charge Characteristics

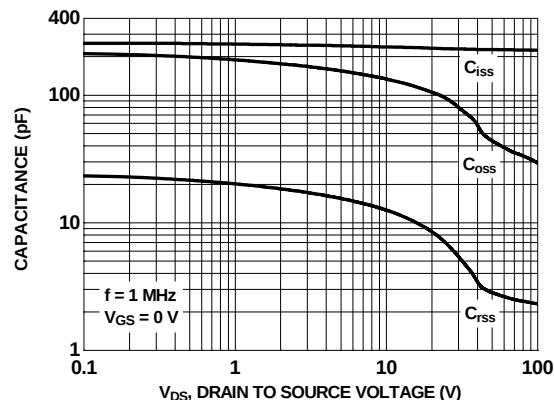


Figure 8. Capacitance vs Drain to Source Voltage

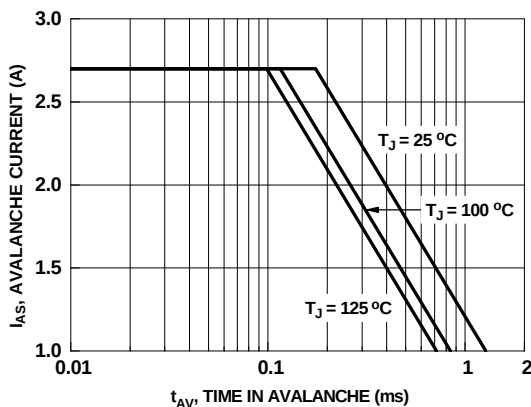


Figure 9. Unclamped Inductive Switching Capability

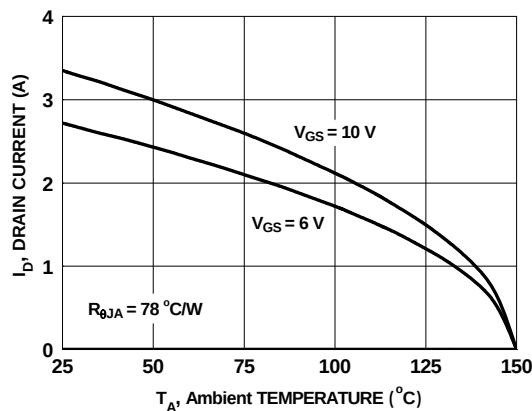


Figure 10. Maximum Continuous Drain Current vs Ambient Temperature

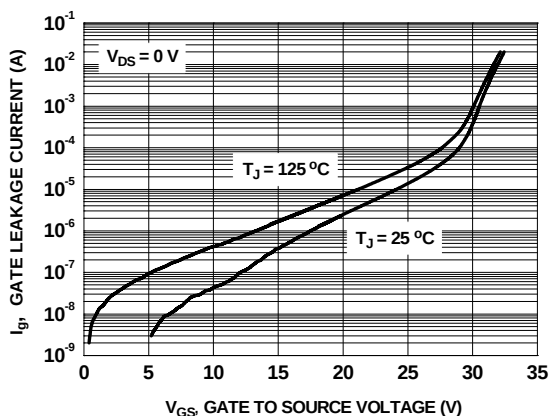


Figure 11. Gate Leakage Current vs Gate to Source Voltage

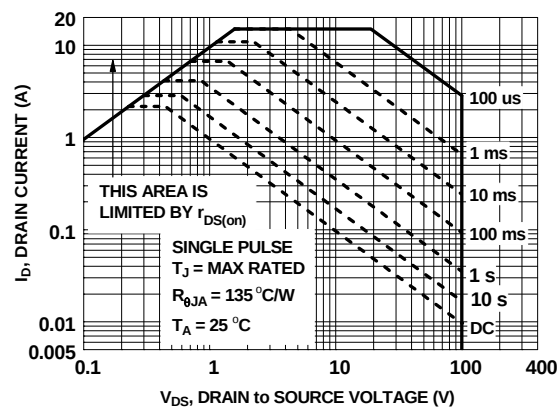


Figure 12. Forward Bias Safe Operating Area

Typical Characteristics (N-Channel) $T_J = 25^\circ\text{C}$ unless otherwise noted

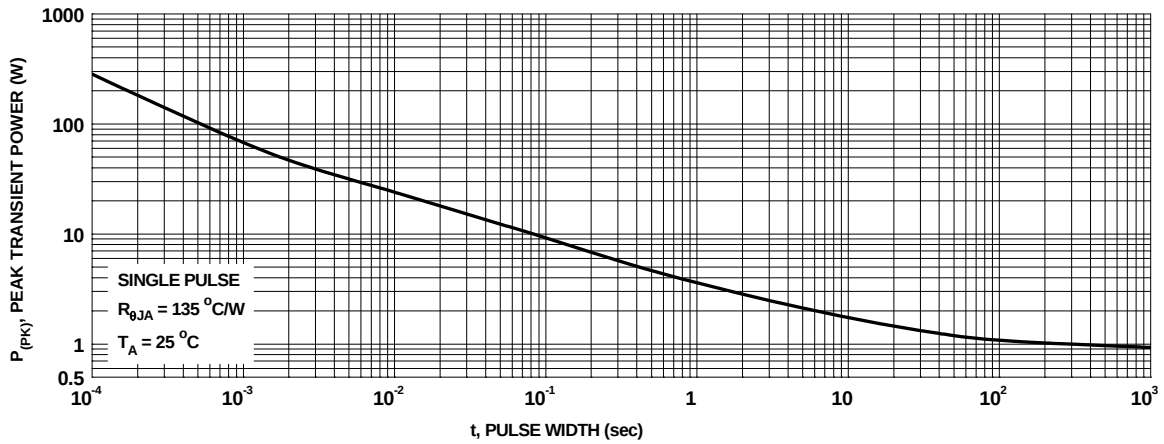


Figure 13. Single Pulse Maximum Power Dissipation

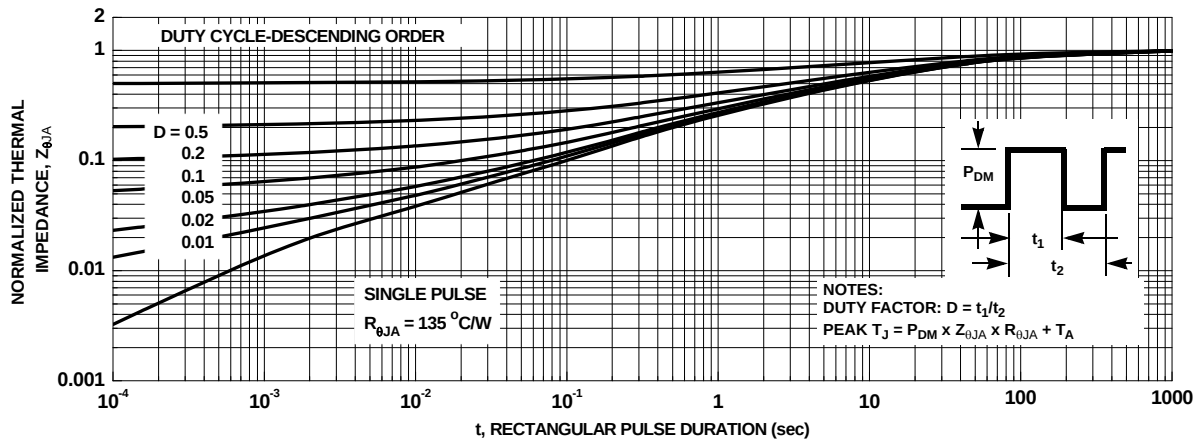
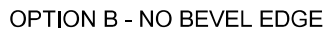
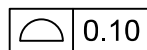
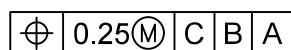


Figure 14. Junction-to-Ambient Transient Thermal Response Curve



- 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.
- D) LANDPATTERN STANDARD: SOIC127P600X175-8M
- E) DRAWING FILENAME: M08Arev16

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