



September 2015

# FDS89161

## 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  $r_{DS(on)}$  = 171 mΩ at  $V_{GS}$  = 6 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
- 100% UIL Tested
- RoHS Compliant

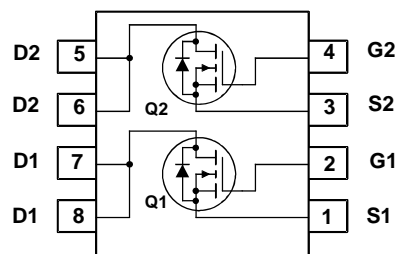
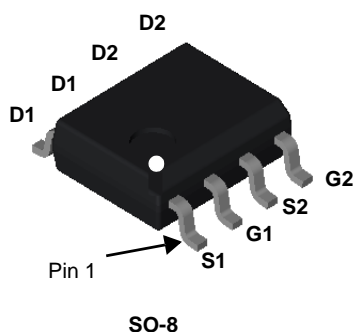


### General Description

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



### 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	$\pm 20$	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
FDS89161	FDS89161	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 $25^\circ\text{C}$		67		mV/ $^\circ\text{C}$
$I_{DSS}$	Zero Gate Voltage Drain Current	$V_{DS} = 80\ \text{V}$ , $V_{GS} = 0\ \text{V}$			1	$\mu\text{A}$
$I_{GSS}$	Gate to Source Leakage Current	$V_{GS} = \pm 20\ \text{V}$ , $V_{DS} = 0\ \text{V}$			$\pm 100$	nA

**On Characteristics**

$V_{GS(th)}$	Gate to Source Threshold Voltage	$V_{GS} = V_{DS}$ , $I_D = 250\ \mu\text{A}$	2	3	4	V
$\frac{\Delta V_{GS(th)}}{\Delta T_J}$	Gate to Source Threshold Voltage Temperature Coefficient	$I_D = 250\ \mu\text{A}$ , referenced to $25^\circ\text{C}$		-9		mV/ $^\circ\text{C}$
$r_{DS(on)}$	Static Drain to Source On Resistance	$V_{GS} = 10\ \text{V}$ , $I_D = 2.7\ \text{A}$		86	105	m $\Omega$
		$V_{GS} = 6\ \text{V}$ , $I_D = 2.1\ \text{A}$		120	171	
		$V_{GS} = 10\ \text{V}$ , $I_D = 2.7\ \text{A}$ , $T_J = 125^\circ\text{C}$		144	176	
$g_{FS}$	Forward Transconductance	$V_{DS} = 10\ \text{V}$ , $I_D = 2.7\ \text{A}$		5		S

**Dynamic Characteristics**

$C_{iss}$	Input Capacitance	$V_{DS} = 50\ \text{V}$ , $V_{GS} = 0\ \text{V}$ , $f = 1\ \text{MHz}$		158	210	pF
$C_{oss}$	Output Capacitance			43	58	pF
$C_{rss}$	Reverse Transfer Capacitance			3	5	pF
$R_g$	Gate Resistance			1		$\Omega$

**Switching Characteristics**

$t_{d(on)}$	Turn-On Delay Time	$V_{DD} = 50\ \text{V}$ , $I_D = 2.7\ \text{A}$ , $V_{GS} = 10\ \text{V}$ , $R_{GEN} = 6\ \Omega$		4.2	10	ns
$t_r$	Rise Time			1.3	10	ns
$t_{d(off)}$	Turn-Off Delay Time			7.3	15	ns
$t_f$	Fall Time			1.9	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	4.1	nC
$Q_{g(TOT)}$	Total Gate Charge	$V_{GS} = 0\ \text{V}$ to $5\ \text{V}$		1.7	2.4	
$Q_{gs}$	Gate to Source Charge			0.8		nC
$Q_{gd}$	Gate to Drain "Miller" Charge			0.8		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)		0.85	1.3	V
		$V_{GS} = 0\ \text{V}$ , $I_S = 2\ \text{A}$ (Note 2)		0.82	1.2	
$t_{rr}$	Reverse Recovery Time	$I_F = 2.7\ \text{A}$ , $di/dt = 100\ \text{A}/\mu\text{s}$		34	54	ns
$Q_{rr}$	Reverse Recovery Charge			21	34	nC

NOTES:

1.  $R_{\theta JA}$  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.  $R_{\theta JC}$  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<sup>2</sup> pad of 2 oz copperb)  $135^\circ\text{C}/\text{W}$  when mounted on a minimum pad2. Pulse Test: Pulse Width < 300  $\mu\text{s}$ , Duty cycle < 2.0%.3. Starting  $T_J = 25^\circ\text{C}$ ,  $L = 3\ \text{mH}$ ,  $I_{AS} = 3\ \text{A}$ ,  $V_{DD} = 100\ \text{V}$ ,  $V_{GS} = 10\ \text{V}$ .

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

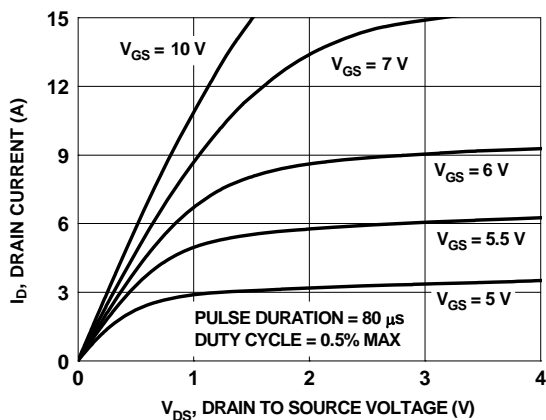


Figure 1. On-Region Characteristics

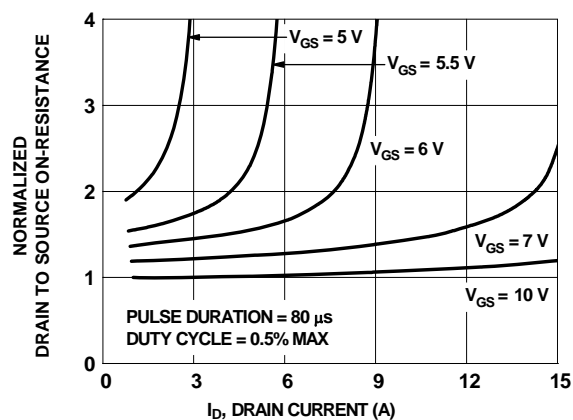


Figure 2. Normalized On-Resistance vs Drain Current and Gate Voltage

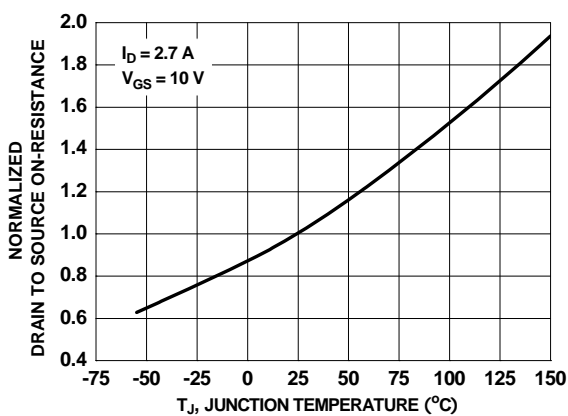


Figure 3. Normalized On-Resistance vs Junction Temperature

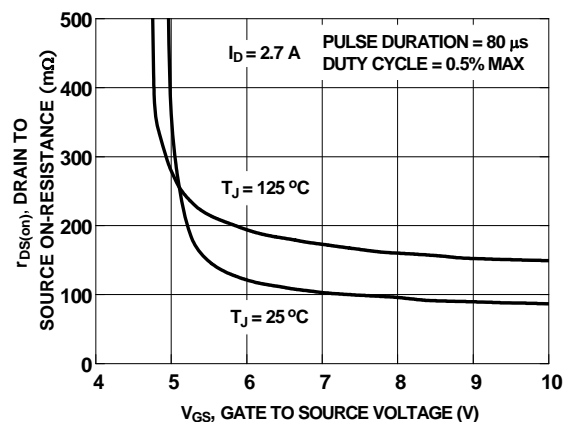


Figure 4. On-Resistance vs Gate to Source Voltage

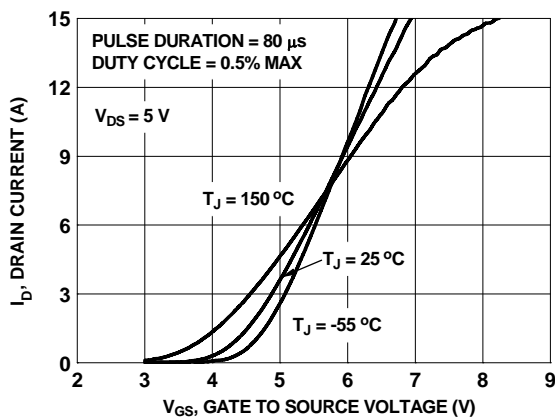


Figure 5. Transfer Characteristics

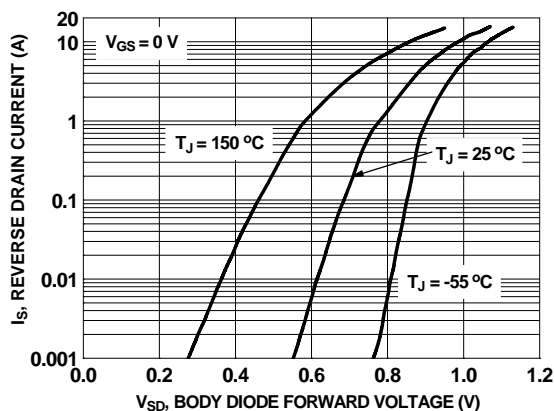


Figure 6. Source to Drain Diode Forward Voltage vs Source Current

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

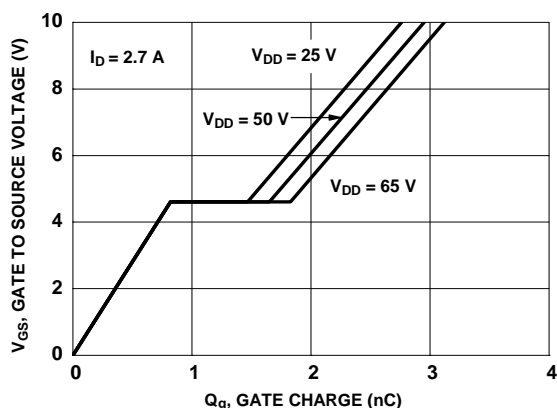


Figure 7. Gate Charge Characteristics

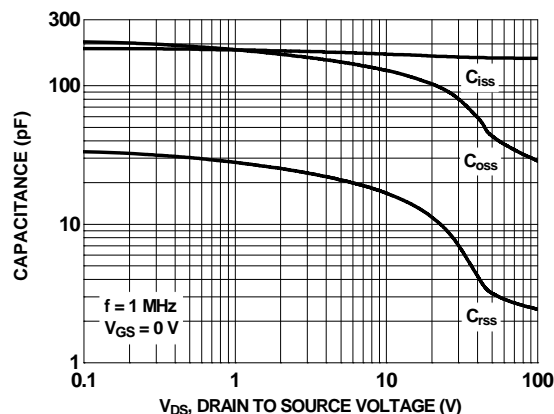


Figure 8. Capacitance vs Drain to Source Voltage

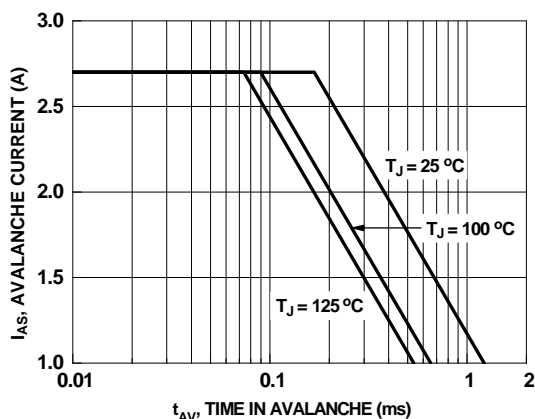


Figure 9. Unclamped Inductive Switching Capability

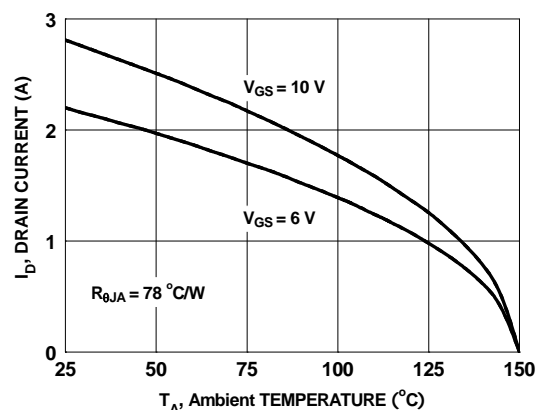


Figure 10. Maximum Continuous Drain Current vs Ambient Temperature

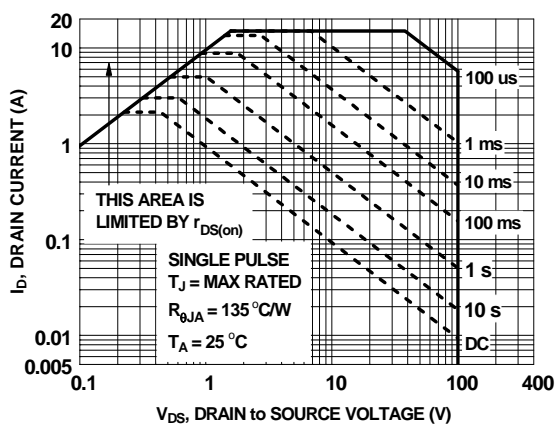


Figure 11. Forward Bias Safe Operating Area

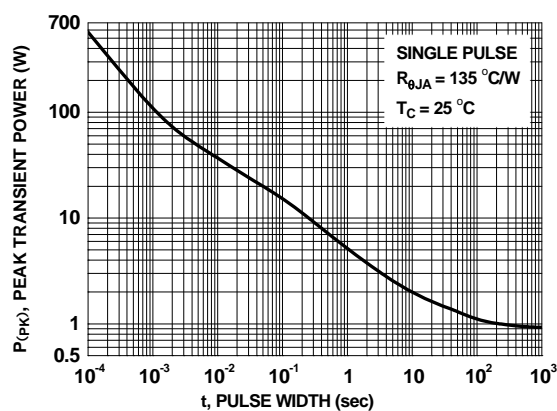


Figure 12. Single Pulse Maximum Power Dissipation

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

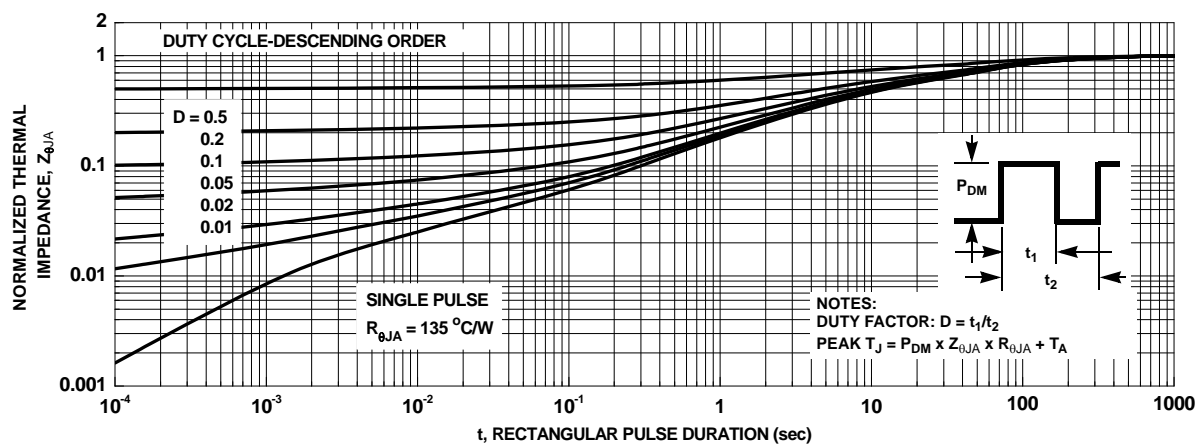
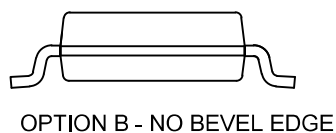
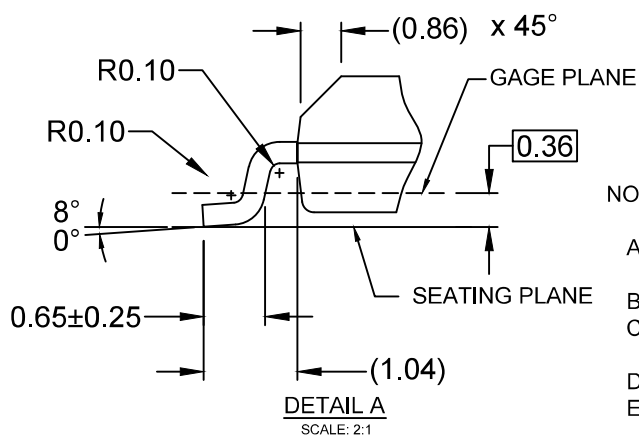
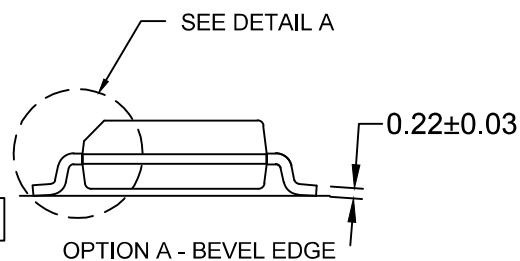
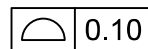
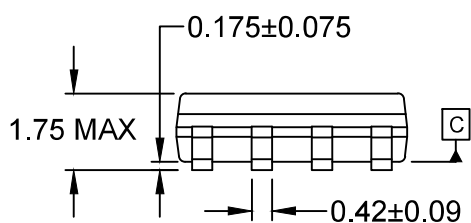
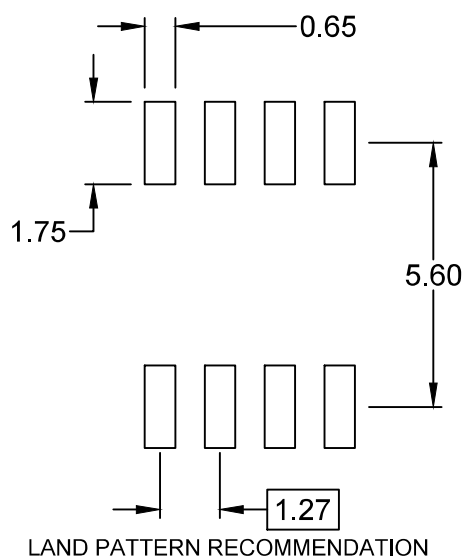
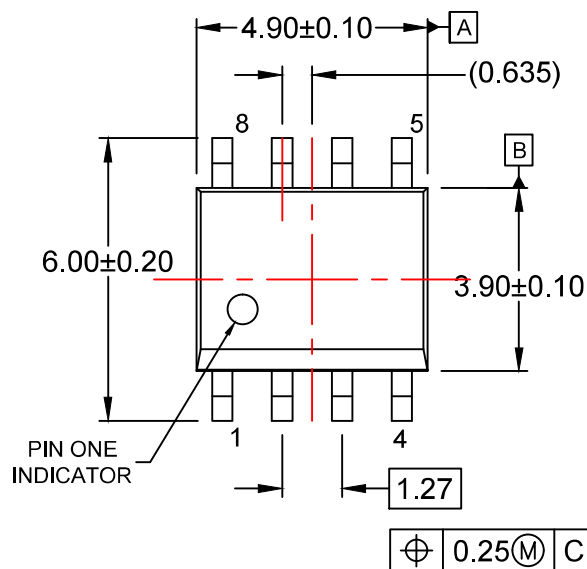


Figure 13. Junction-to-Ambient Transient Thermal Response Curve



#### NOTES:

- THIS PACKAGE CONFORMS TO JEDEC MS-012, VARIATION AA.
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- DIMENSIONS DO NOT INCLUDE MOLD FLASH OR BURRS.
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