

# FDS86141

## N-Channel PowerTrench® MOSFET 100 V, 7 A, 23 mΩ

### Features

- Maximum  $R_{DS(on)}$  = 23 mΩ at  $V_{GS} = 10$  V,  $I_D = 7$  A
- Maximum  $R_{DS(on)}$  = 36 mΩ at  $V_{GS} = 6$  V,  $I_D = 5.5$  A
- High-Performance Trench Technology; Extremely Low  $R_{DS(on)}$
- 100% UIL Tested
- RoHS Compliant

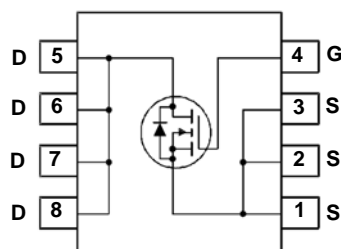
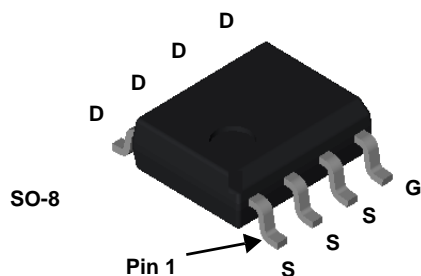


### General Description

This N-channel MOSFET is produced using Fairchild Semiconductor's advanced PowerTrench® process that has been especially tailored to minimize the on-state resistance and maintain superior switching performance.

### Applications

- DC-DC Conversion



### 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	7	A
	-Pulsed	30	
$E_{AS}$	Single Pulse Avalanche Energy (Note 3)	121	mJ
$P_D$	Power Dissipation $T_A = 25^\circ\text{C}$ (Note 1a)	5.0	W
	Power Dissipation $T_A = 25^\circ\text{C}$ (Note 1b)	2.5	
$T_J, T_{STG}$	Operating and Storage Junction Temperature Range	-55 to +150	$^\circ\text{C}$

### Thermal Characteristics

$R_{\theta JC}$	Thermal Resistance, Junction to Case (Note 1)	2.5	$^\circ\text{C/W}$
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient (Note 1a)	50	

### Package Marking and Ordering Information

Device Marking	Device	Package	Reel Size	Tape Width	Quantity
FDS86141	FDS86141	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	3.1	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 $25^\circ\text{C}$		-10		mV/ $^\circ\text{C}$
$r_{DS(on)}$	Static Drain to Source On Resistance	$V_{GS} = 10\ \text{V}$ , $I_D = 7\ \text{A}$		19	23	m $\Omega$
		$V_{GS} = 6\ \text{V}$ , $I_D = 5.5\ \text{A}$		27	37	
		$V_{GS} = 10\ \text{V}$ , $I_D = 7\ \text{A}$ , $T_J = 125^\circ\text{C}$		33	40	
$g_{FS}$	Forward Transconductance	$V_{DS} = 10\ \text{V}$ , $I_D = 7\ \text{A}$		19		S

**Dynamic Characteristics**

$C_{iss}$	Input Capacitance	$V_{DS} = 50\ \text{V}$ , $V_{GS} = 0\ \text{V}$ , $f = 1\ \text{MHz}$		703	934	pF
$C_{oss}$	Output Capacitance			186	247	pF
$C_{rss}$	Reverse Transfer Capacitance			8.6	13	pF
$R_g$	Gate Resistance			0.5		$\Omega$

**Switching Characteristics**

$t_{d(on)}$	Turn-On Delay Time	$V_{DD} = 50\ \text{V}$ , $I_D = 7\ \text{A}$ , $V_{GS} = 10\ \text{V}$ , $R_{GEN} = 6\ \Omega$		8.3	17	ns
$t_r$	Rise Time			3.2	10	ns
$t_{d(off)}$	Turn-Off Delay Time			14.3	26	ns
$t_f$	Fall Time			3.2	10	ns
$Q_{g(TOT)}$	Total Gate Charge	$V_{GS} = 0\ \text{V}$ to $10\ \text{V}$	$V_{DD} = 50\ \text{V}$ , $I_D = 7\ \text{A}$	11.8	16.5	nC
	Total Gate Charge	$V_{GS} = 0\ \text{V}$ to $5\ \text{V}$		6.7	9.4	nC
$Q_{gs}$	Total Gate Charge			3.4		nC
$Q_{gd}$	Gate to Drain "Miller" Charge			3.1		nC

**Drain-Source Diode Characteristics**

$V_{SD}$	Source-to-Drain Diode Forward Voltage	$V_{GS} = 0\ \text{V}$ , $I_S = 7\ \text{A}$ (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	$I_F = 7\ \text{A}$ , $di/dt = 100\ \text{A}/\mu\text{s}$		43	69	ns
$Q_{rr}$	Reverse Recovery Charge			39	62	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) 50  $^\circ\text{C}/\text{W}$  when mounted on a 1 in<sup>2</sup> pad of 2 oz copper.



b) 125  $^\circ\text{C}/\text{W}$  when mounted on a minimum pad.

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

3. Starting  $T_J = 25^\circ\text{C}$ ; N-ch:  $L = 3\ \text{mH}$ ,  $I_{AS} = 9\ \text{A}$ ,  $V_{DD} = 100\ \text{V}$ ,  $V_{GS} = 10\ \text{V}$ .

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

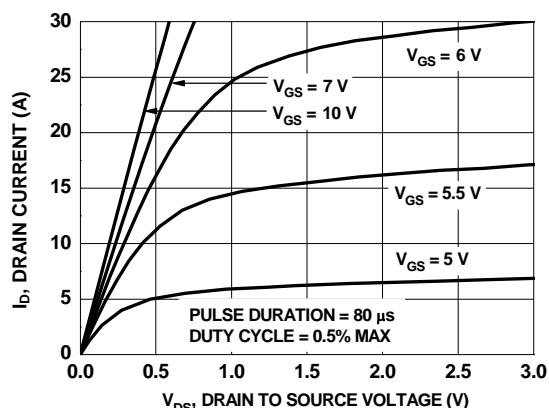


Figure 1. On-Region Characteristics

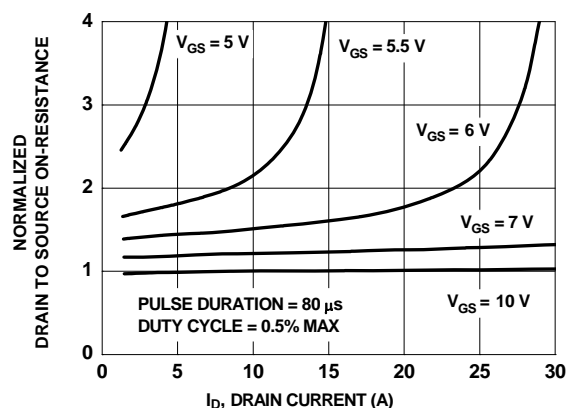


Figure 2. Normalized On-Resistance vs. Drain Current and Gate Voltage

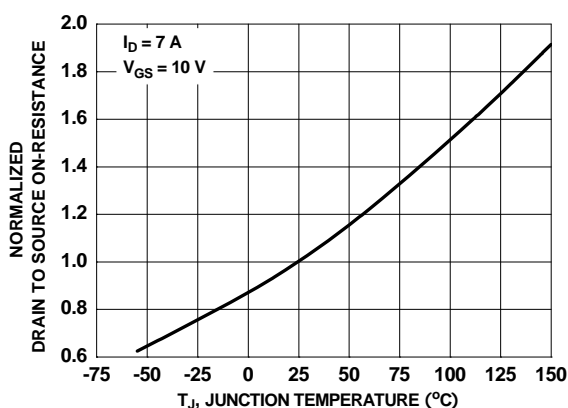


Figure 3. Normalized On-Resistance vs. Junction Temperature

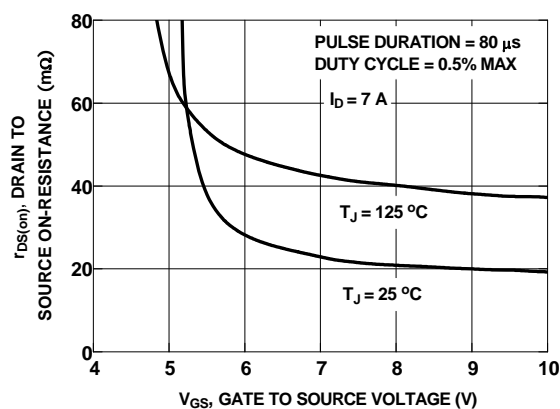


Figure 4. On-Resistance vs. Gate-to-Source Voltage

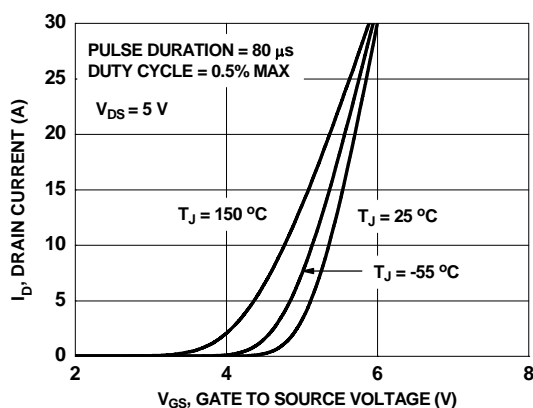


Figure 5. Transfer Characteristics

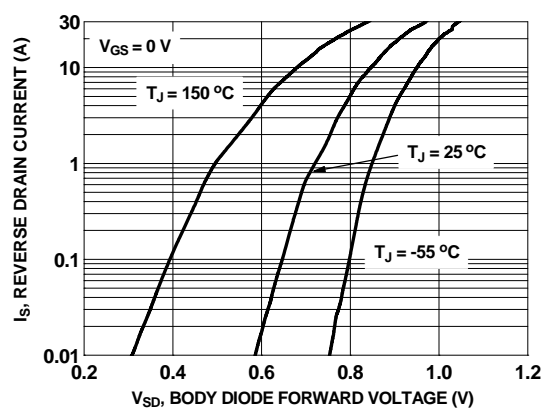
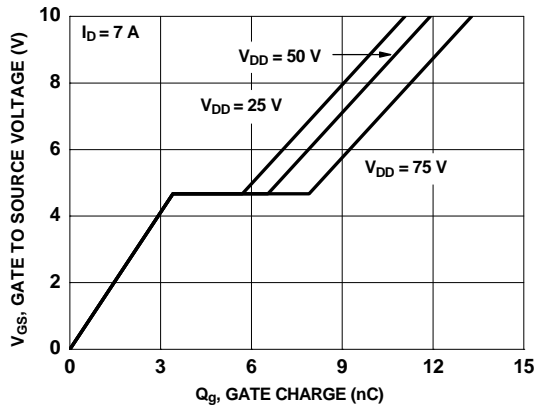
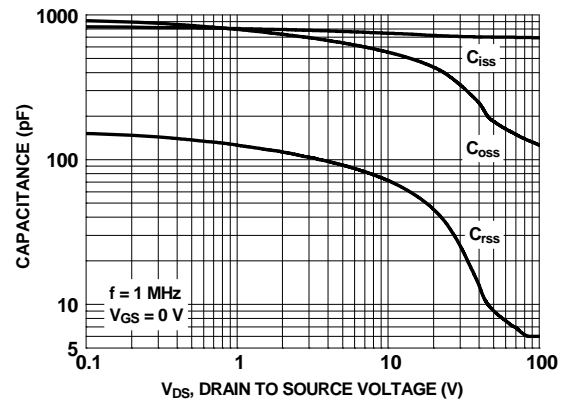


Figure 6. Source-to-Drain Diode Forward Voltage vs. Source Current

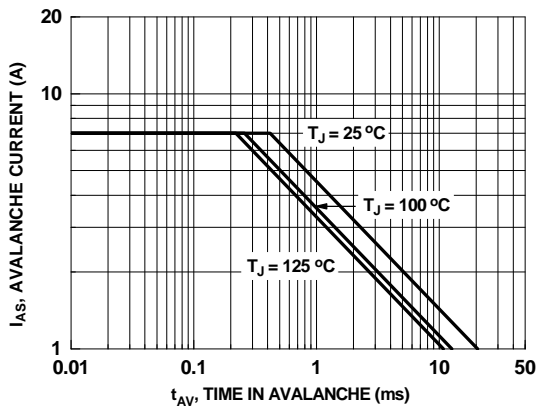
# **Typical Characteristics** $T_J = 25^\circ\text{C}$ unless otherwise noted.



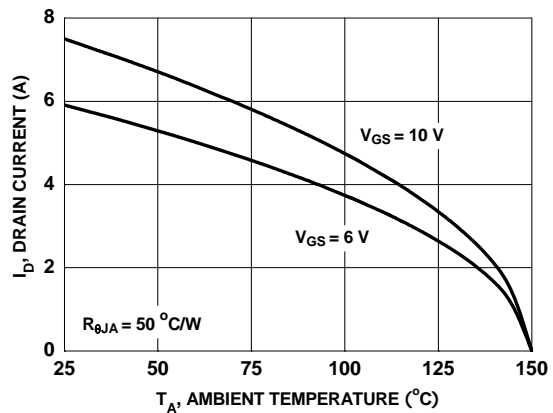
**Figure 7. Gate Charge Characteristics**



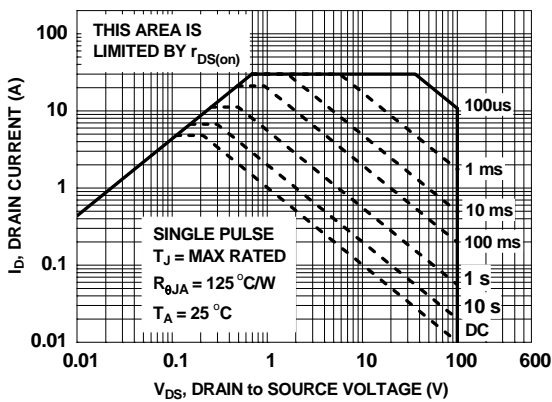
**Figure 8. Capacitance vs. Drain-to-Source Voltage**



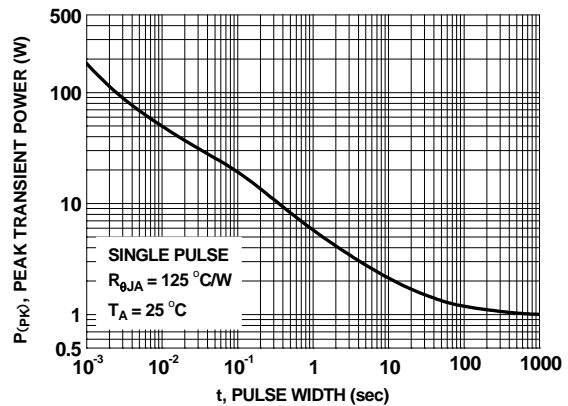
**Figure 9. Unclamped Inductive Switching Capability**



**Figure 10. Maximum Continuous Drain Current vs. Ambient Temperature**

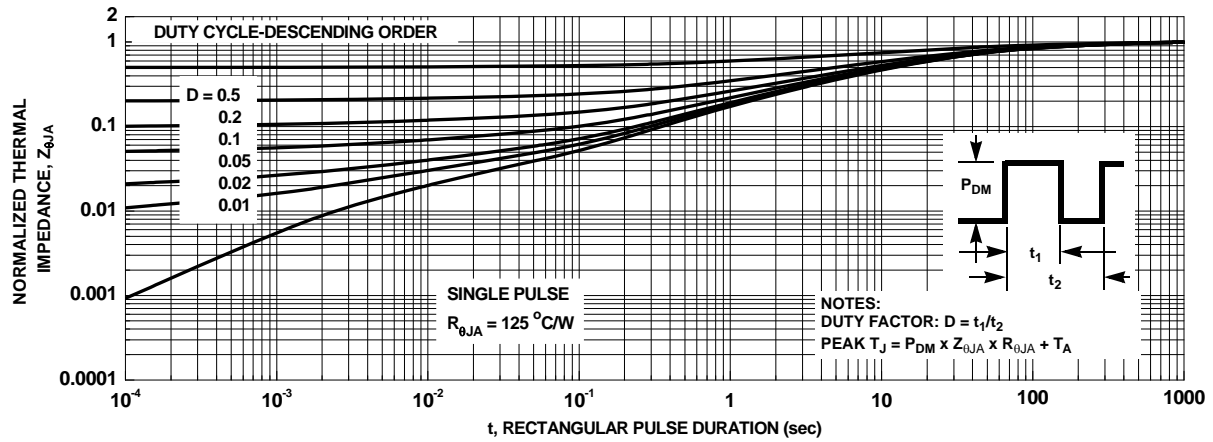


**Figure 11. Forward Bias Safe Operating Area**



**Figure 12. Single-Pulse Maximum Power Dissipation**

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










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Rev. I56

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