

FDS86141

N-Channel PowerTrench® MOSFET

100 V, 7 A, 23 mΩ

Features

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

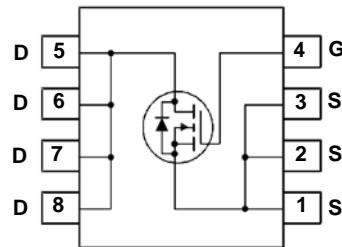
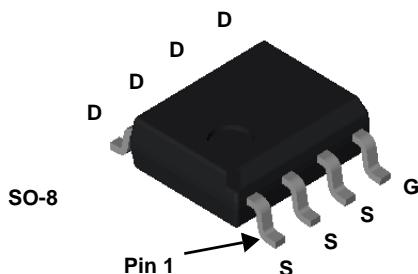


General Description

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 $T_A = 25 \text{ }^\circ\text{C}$ 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	7	A
	-Pulsed	30	
E_{AS}	Single Pulse Avalanche Energy	(Note 3)	mJ
P_D	Power Dissipation $T_A = 25 \text{ }^\circ\text{C}$	5.0	W
	Power Dissipation $T_A = 25 \text{ }^\circ\text{C}$	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
Off Characteristics						
V_{DSS}	Drain-to-Source Breakdown Voltage	$I_D = 250 \mu\text{A}, V_{GS} = 0 \text{ V}$	100			V
$\frac{\Delta V_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	$I_D = 250 \mu\text{A}$, referenced to 25°C		67		$\text{mV/}^\circ\text{C}$
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

$V_{GS(\text{th})}$	Gate-to-Source Threshold Voltage	$V_{GS} = V_{DS}, I_D = 250 \mu\text{A}$	2	3.1	4	V
$\frac{\Delta V_{GS(\text{th})}}{\Delta T_J}$	Gate-to-Source Threshold Voltage Temperature Coefficient	$I_D = 250 \mu\text{A}$, Referenced to 25°C		-10		$\text{mV/}^\circ\text{C}$
$r_{DS(\text{on})}$	Static Drain to Source On Resistance	$V_{GS} = 10 \text{ V}, I_D = 7 \text{ A}$		19	23	$\text{m}\Omega$
		$V_{GS} = 6 \text{ V}, I_D = 5.5 \text{ A}$		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		Ω

Switching Characteristics

$t_{d(on)}$	Turn-On Delay Time	$V_{DD} = 50 \text{ V}, I_D = 7 \text{ A}, V_{GS} = 10 \text{ V}, R_{\text{GEN}} = 6 \Omega$		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
$Q_{g(\text{TOT})}$	Total Gate Charge	$V_{GS} = 0 \text{ V} \text{ to } 10 \text{ V}$		11.8	16.5	nC
	Total Gate Charge	$V_{GS} = 0 \text{ V} \text{ to } 5 \text{ V}$	$V_{DD} = 50 \text{ V}$ $I_D = 7 \text{ A}$	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
				39	62	

NOTES:

1. R_{QJA} 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_{QJC} is guaranteed by design while R_{QCA} is determined by the user's board design.



a) $50^\circ\text{C}/\text{W}$ when mounted on a 1 in^2 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.

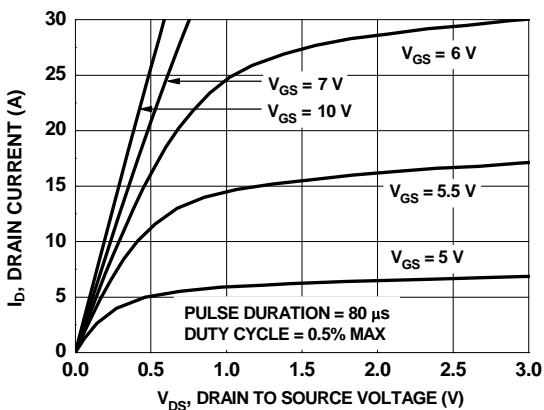


Figure 1. On-Region Characteristics

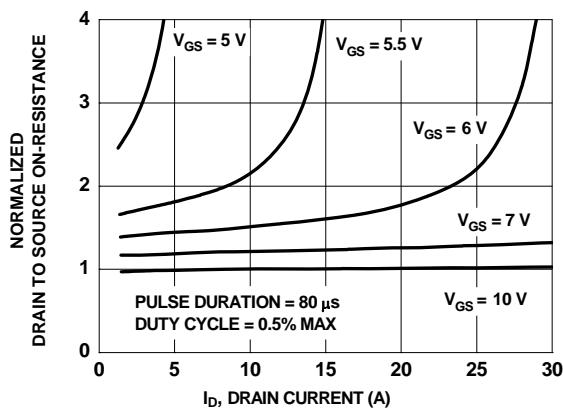


Figure 2. Normalized On-Resistance vs. Drain Current and Gate Voltage

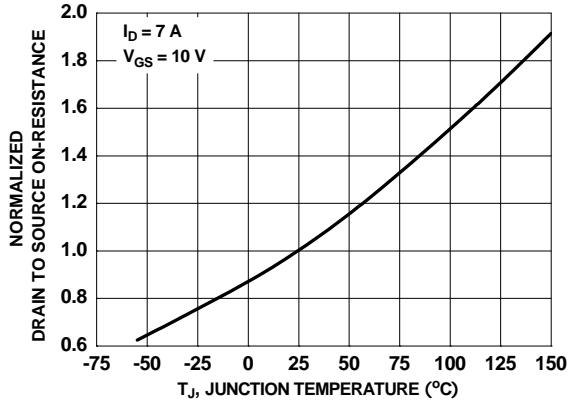


Figure 3. Normalized On-Resistance vs. Junction Temperature

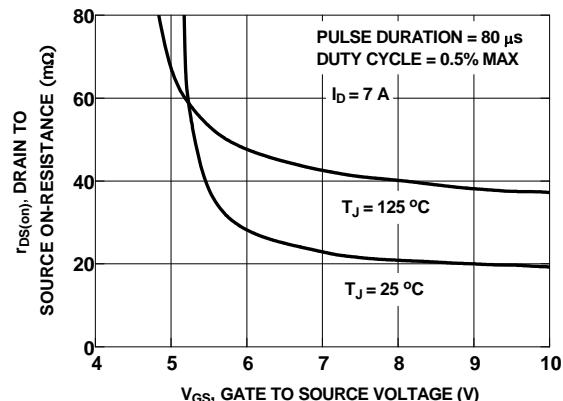


Figure 4. On-Resistance vs. Gate-to-Source Voltage

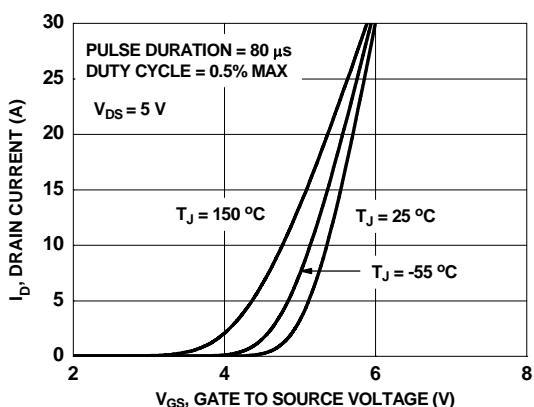


Figure 5. Transfer Characteristics

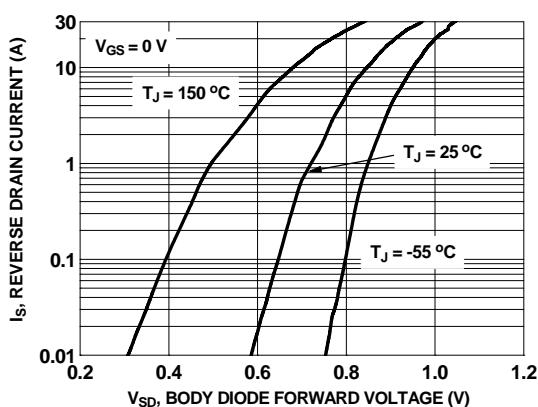


Figure 6. Source-to-Drain Diode Forward Voltage vs. Source Current

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

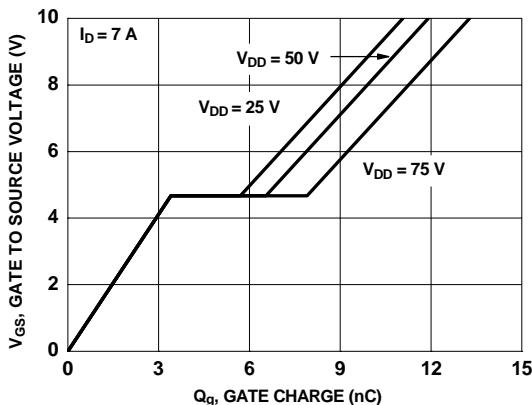


Figure 7. Gate Charge Characteristics

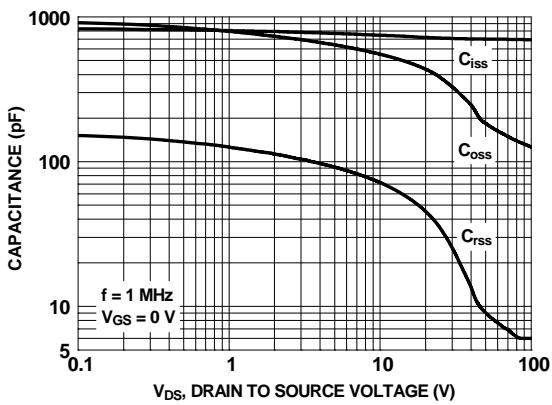


Figure 8. Capacitance vs. Drain-to-Source Voltage

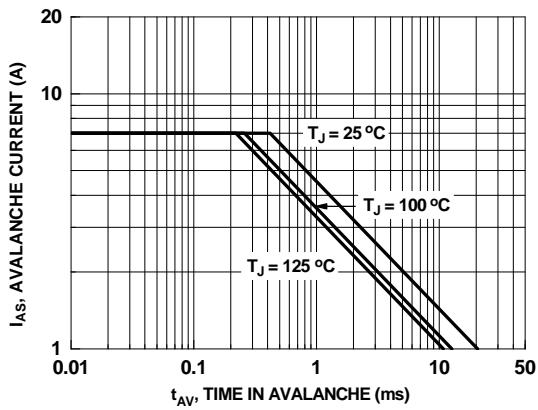


Figure 9. Unclamped Inductive Switching Capability

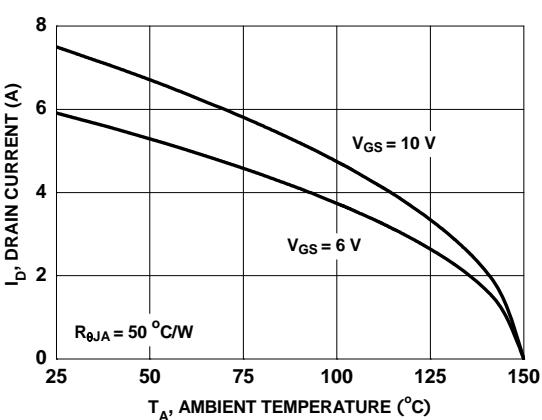


Figure 10. Maximum Continuous Drain Current vs. Ambient Temperature

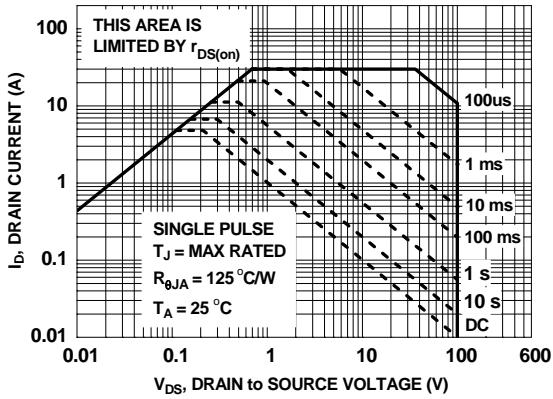


Figure 11. Forward Bias Safe Operating Area

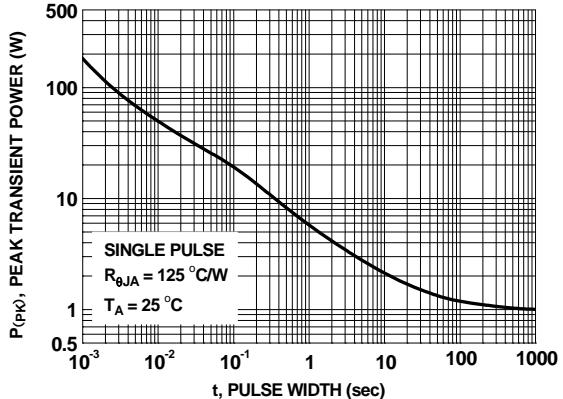


Figure 12. Single-Pulse Maximum Power Dissipation

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

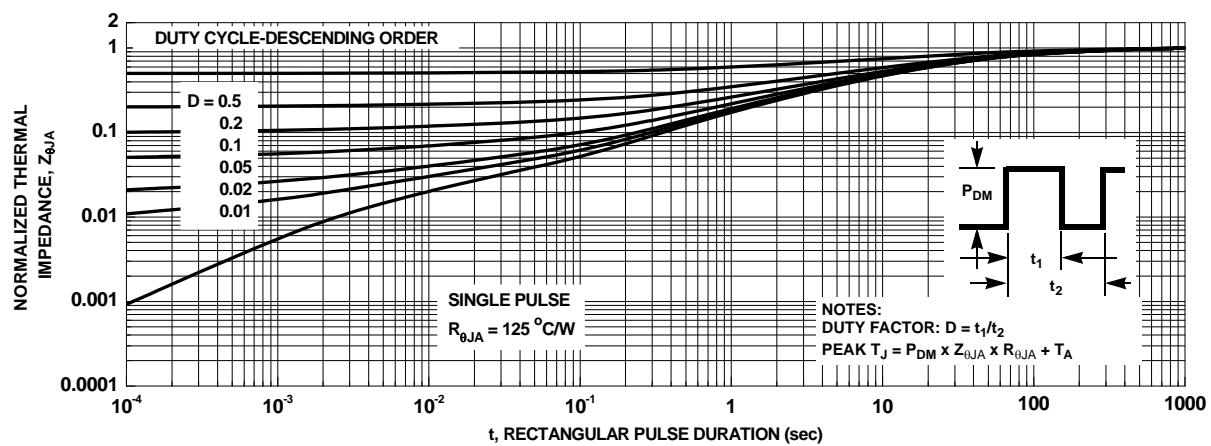
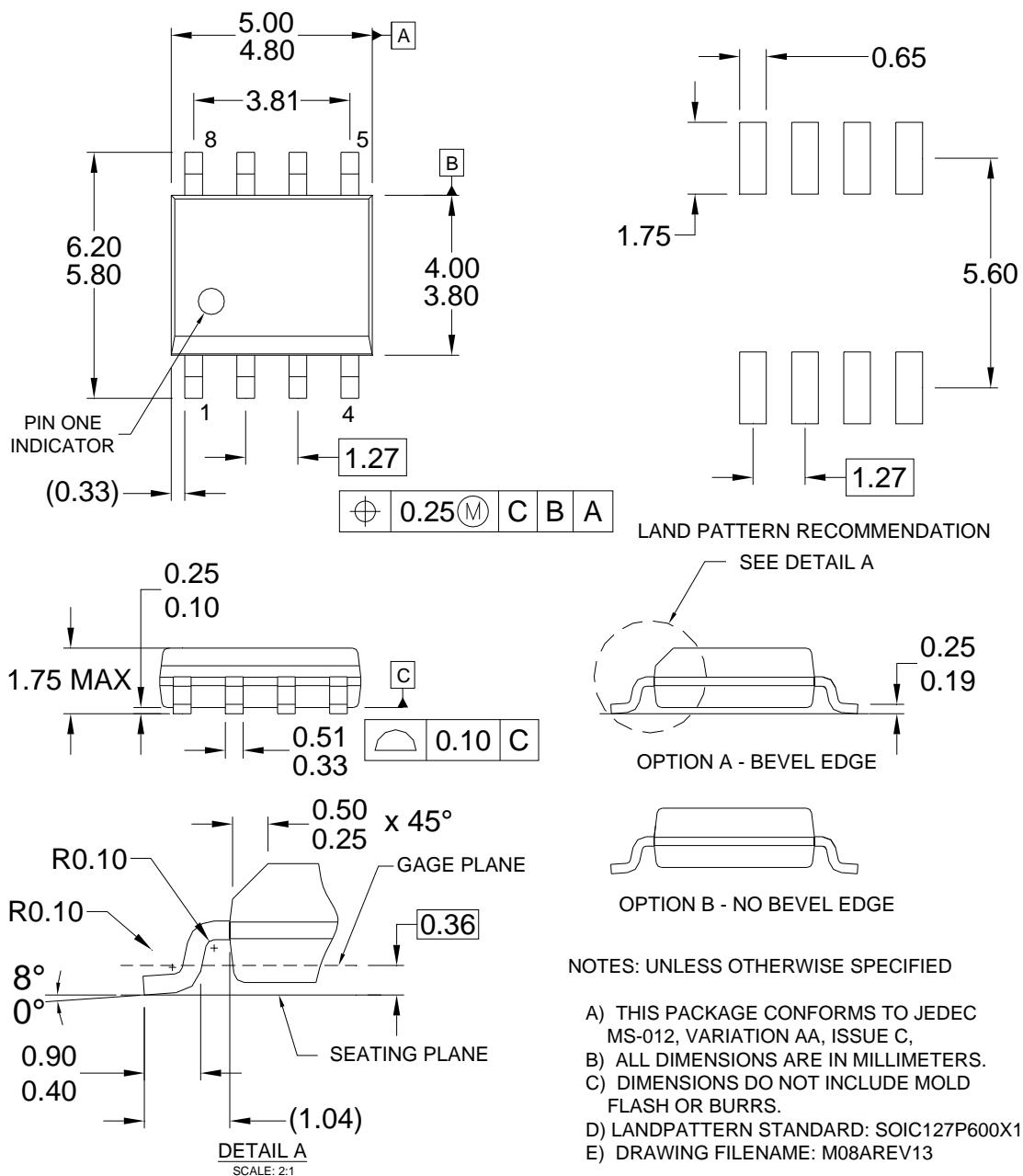


Figure 13. Junction-to-Ambient Transient Thermal Response Curve

Physical Dimensions



NOTES: UNLESS OTHERWISE SPECIFIED

- A) THIS PACKAGE CONFORMS TO JEDEC MS-012, VARIATION AA, ISSUE C,
- B) ALL DIMENSIONS ARE IN MILLIMETERS.
- C) DIMENSIONS DO NOT INCLUDE MOLD FLASH OR BURRS.
- D) LANDPATTERN STANDARD: SOIC127P600X175-8M.
- E) DRAWING FILENAME: M08AREV13

Figure 1. 8-Lead, Small-Outline Integrated Circuit (SOIC), JEDEC MS-012, .150" Narrow Body

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No Identification Needed	Full Production	Datasheet contains final specifications. Fairchild Semiconductor reserves the right to make changes at any time without notice to improve the design.
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