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FDN5630

60V N-Channel PowerTrench® MOSFET

General Description

This N-Channel MOSFET has been designed specifically to improve the overall efficiency of DC/DC converters using either synchronous or conventional switching PWM controllers.

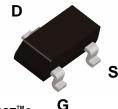
This MOSFET features very low $R_{\rm DS(ON)}$ in a small SOT23 footprint. Fairchild's PowerTrench technology provides faster switching than other MOSFETs with comparable $R_{\rm DS(ON)}$ specifications. The result is higher overall efficiency with less board space.

Features

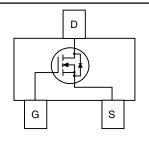
- 1.7 A, 60 V. $R_{DS(ON)} = 0.100 \Omega$ @ $V_{GS} = 10 V$ $R_{DS(ON)} = 0.120 \Omega$ @ $V_{GS} = 6 V$.
- Optimized for use in high frequency DC/DC converters.
- Low gate charge.
- · Very fast switching.
- SuperSOT $^{\text{TM}}$ 3 provides low R $_{\text{DS(ON)}}$ in SOT23 footprint.

Applications

- DC/DC converter
- Motor drives



SuperSOT[™]-3



Absolute Maximum Ratings T_A = 25 C unless otherwise noted

Symbol	Parameter		Ratings	Units
V_{DSS}	Drain-Source Voltage		60	V
V _{GSS}	Gate-Source Voltage		±20	V
I _D	Drain Current - Continuous	(Note 1a)	1.7	А
	- Pulsed		10	1
P _D	Power Dissipation for Single Operation	(Note 1a)	0.5	W
		(Note 1b)	0.46	
T_J , T_{stg}	Operating and Storage Junction Temperature Range		-55 to +150	°C

Thermal Characteristics

$R_{_{\theta}JA}$	Thermal Resistance, Junction-to-Ambient	(Note 1a)	250	°C/W
R₀JC	Thermal Resistance, Junction-to-Case	(Note 1)	75	°C/W

Package Marking and Ordering Information

Device Marking	Device	Reel Size	Tape Width	Quantity
5630	FDN5630	7	8mm	3000 units

©2000 Fairchild Semiconductor Corporation FDN5630 Rev. 3.3

Symbol	Parameter	Test Conditions	Min	Тур	Max	Units
Off Char	acteristics					
BV _{DSS}	Drain-Source Breakdown Voltage	$V_{GS} = 0 \text{ V}, I_D = 250 \mu\text{A}$	60			V
<u>ΔBV_{DSS}</u> ΔT _J	Breakdown Voltage Temperature Coefficient	$I_D = 250 \mu A$, Referenced to $25^{\circ}C$		63		mV/°C
I _{DSS}	Zero Gate Voltage Drain Current	V _{DS} = 48 V, V _{GS} = 0 V			1	μΑ
I _{GSSF}	Gate-Body Leakage Current, Forward	V _{GS} = 20 V, V _{DS} = 0 V			100	nA
I _{GSSR}	Gate-Body Leakage Current, Reverse	V _{GS} = -20 V, V _{DS} = 0 V			-100	nA
On Char	acteristics (Note 2)					
V _{GS(th)}	Gate Threshold Voltage	$V_{DS} = V_{GS}, I_D = 250 \mu\text{A}$	1	2.4	3	V
$\Delta V_{GS(th)} \over \Delta T_J$	Gate Threshold Voltage Temperature Coefficient	$I_D = 250 \mu A$, Referenced to $25^{\circ}C$		-6.9		mV/°C
R _{DS(ON)}	Static Drain-Source On-Resistance	$V_{GS} = 10 \text{ V}, I_D = 1.7 \text{ A}$ $V_{GS} = 10 \text{ V}, I_D = 1.7 \text{ A}, T_J = 125^{\circ}\text{C}$ $V_{GS} = 6 \text{ V}, I_D = 1.6 \text{ A}$		0.073 0.127 0.083	0.100 0.180 0.120	Ω
I _{D(on)}	On-State Drain Current	V _{GS} = 10 V, V _{DS} = 1.7 V	5			Α
g FS	Forward Transconductance	V _{DS} = 10 V, I _D = 1.7 A		6		S
Dynamic	Characteristics					
C _{iss}	Input Capacitance	V _{DS} = 15 V, V _{GS} = 0 V, f = 1.0 MHz		400	560	pF
Coss	Output Capacitance			65	95	pF
C _{rss}	Reverse Transfer Capacitance	1		27	40	pF
Switchin	g Characteristics (Note 2)	,		!		!
t _{d(on)}	Turn-On Delay Time	$V_{DD} = 30 \text{ V}, I_D = 1 \text{ A},$		10	20	ns
t _r	Turn-On Rise Time	V_{GS} = 10 V, R_{GEN} = 6 Ω		6	15	ns
t _{d(off)}	Turn-Off Delay Time	7		15	28	ns
t _f	Turn-Off Fall Time	7		5	15	ns
Qg	Total Gate Charge	V _{DS} = 20 V, I _D = 1.7 A,		7	10	nC
Q _{gs}	Gate-Source Charge	$V_{GS} = 10 \text{ V},$		1.6		nC
Q _{gd}	Gate-Drain Charge	<u> </u>		1.2		nC
Drain-So	urce Diode Characteristics a	and Maximum Ratings				
ls	Maximum Continuous Drain-Source				0.42	Α
V _{SD}	Drain-Source Diode Forward Voltage	V _{GS} = 0 V, I _S = 0.42 A (Note 2)		0.72	1.2	V

1: $R_{a,l,A}$ is the sum of the junction-to-case and case-to-ambient thermal resistance where the case thermal reference is defined as the solder mounting surface of the drain pins. $R_{a,l,C}$ is guaranteed by design while $R_{a,l,A}$ is determined by the user's board design.



a) 250°C/W when mounted on a 0.02 in² Pad of 2 oz. Cu.



b) 270°C/W when mounted on a minimum pad.

Scale 1 : 1 on letter size paper

2: Pulse Test: Pulse Width $\leq\!300~\mu\text{s},$ Duty Cycle $\leq\!2.0\%$

Typical Characteristics

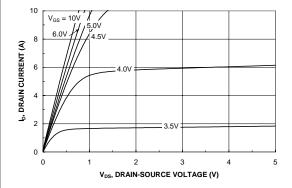


Figure 1. On-Region Characteristics.

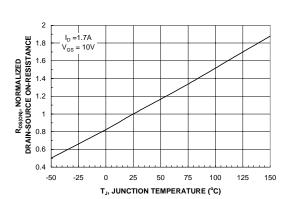


Figure 3. On-Resistance Variation with Temperature.

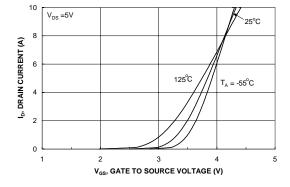


Figure 5. Transfer Characteristics.

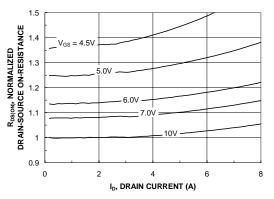


Figure 2. On-Resistance Variation with Drain Current and Gate Voltage.

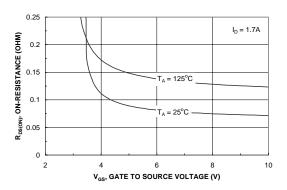


Figure 4. On-Resistance Variation with Gate-to-Source Voltage.

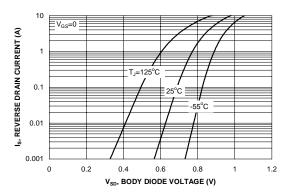
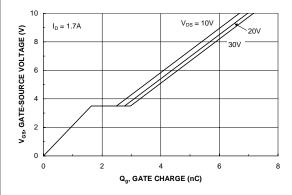


Figure 6. Body Diode Forward Voltage Variation with Source Current and Temperature.

Typical Characteristics (continued)



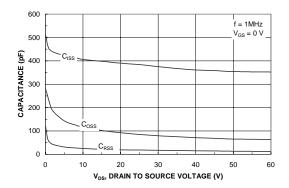
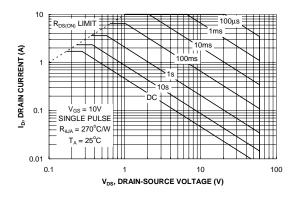


Figure 7. Gate Charge Characteristics.

Figure 8. Capacitance Characteristics.



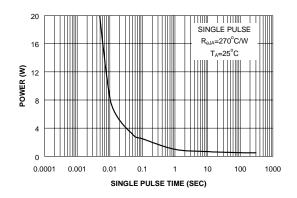


Figure 9. Maximum Safe Operating Area.

Figure 10. Single Pulse Maximum Power Dissipation.

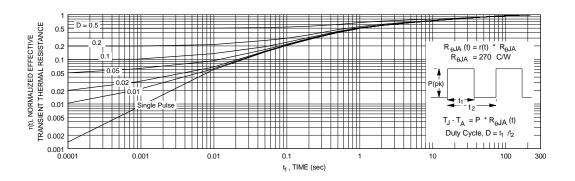
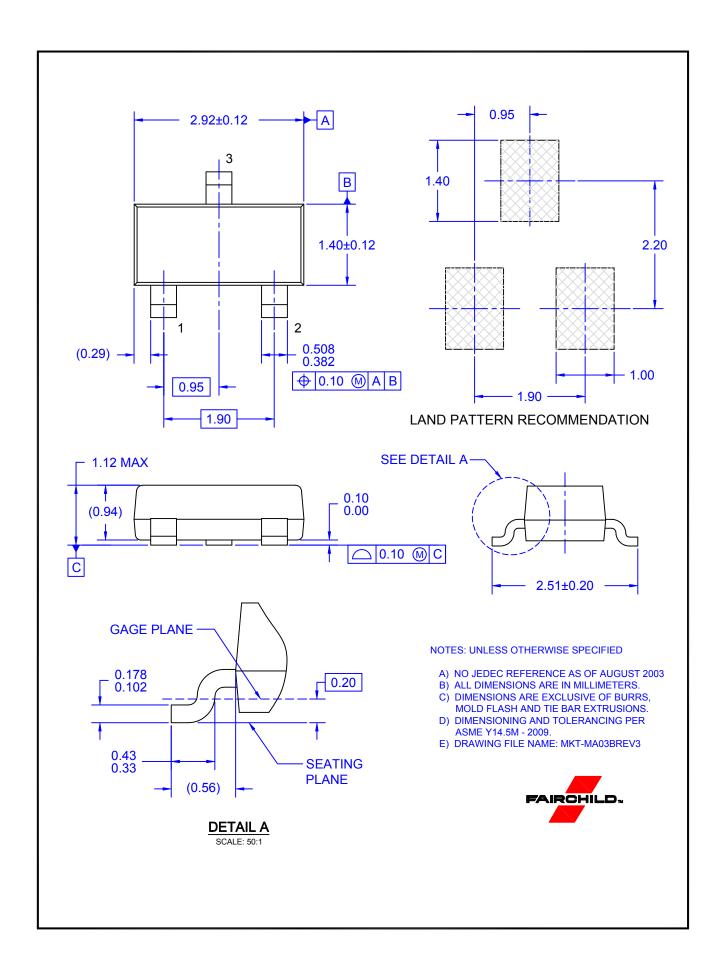


Figure 11. Transient Thermal Response Curve.

Thermal characterization performed using the conditions described in Note 1b. Transient themal response will change depending on the circuit board design.



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