FAIRCHILD™

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

Applications

- DC/DC converter
- Motor drives

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™ - 3 provides low $R_{DS(ON)}$ in SOT23 footprint.

D

S

G

SuperSOT™-3

D

G   S
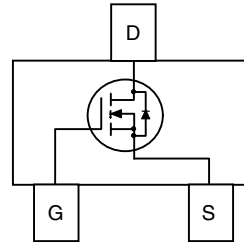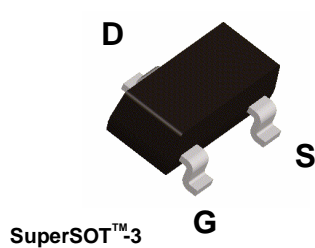
Absolute Maximum Ratings $T_A = 25$ C unless otherwise noted

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	A
	- Pulsed		10	
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
$R_{\theta JC}$	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

Electrical Characteristics

T_A = 25 C unless otherwise noted

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
Off Characteristics						
BV_{DSS}	Drain-Source Breakdown Voltage	V_{GS} = 0 V, I_D = 250 µA	60			V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	I_D = 250 µA, Referenced to 25°C		63		mV/°C
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS} = 48 V, V_{GS} = 0 V			1	µA
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 Characteristics (Note 2)						
$V_{GS(th)}$	Gate Threshold Voltage	V_{DS} = V_{GS}, I_D = 250 µA	1	2.4	3	V
$\frac{\Delta V_{GS(th)}}{\Delta T_J}$	Gate Threshold Voltage Temperature Coefficient	I_D = 250 µA, Referenced to 25°C		-6.9		mV/°C
$R_{DS(ON)}$	Static Drain-Source On-Resistance	V_{GS} = 10 V, I_D = 1.7 A V_{GS} = 10 V, I_D = 1.7 A, T_J = 125°C V_{GS} = 6 V, I_D = 1.6 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			A
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
C_{oss}	Output Capacitance			65	95	pF
C_{rss}	Reverse Transfer Capacitance			27	40	pF
Switching Characteristics (Note 2)						
$t_{d(on)}$	Turn-On Delay Time	V_{DD} = 30 V, I_D = 1 A, V_{GS} = 10 V, R_{GEN} = 6 Ω		10	20	ns
t_r	Turn-On Rise Time			6	15	ns
$t_{d(off)}$	Turn-Off Delay Time			15	28	ns
t_f	Turn-Off Fall Time			5	15	ns
Q_g	Total Gate Charge	V_{DS} = 20 V, I_D = 1.7 A, V_{GS} = 10 V,		7	10	nC
Q_{gs}	Gate-Source Charge			1.6		nC
Q_{gd}	Gate-Drain Charge			1.2		nC
Drain-Source Diode Characteristics and Maximum Ratings						
I_S	Maximum Continuous Drain-Source Diode Forward Current				0.42	A
V_{SD}	Drain-Source Diode Forward Voltage	V_{GS} = 0 V, I_S = 0.42 A (Note 2)		0.72	1.2	V

Notes:

1: $R_{\theta JA}$ 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. $R_{\theta JC}$ is guaranteed by design while $R_{\theta JA}$ is determined by the user's board design.

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

Scale 1 : 1 on letter size paper

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

2: Pulse Test: Pulse Width ≤ 300 µs, Duty Cycle ≤ 2.0%
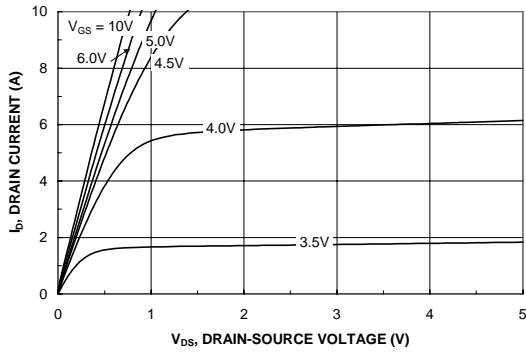
Typical Characteristics

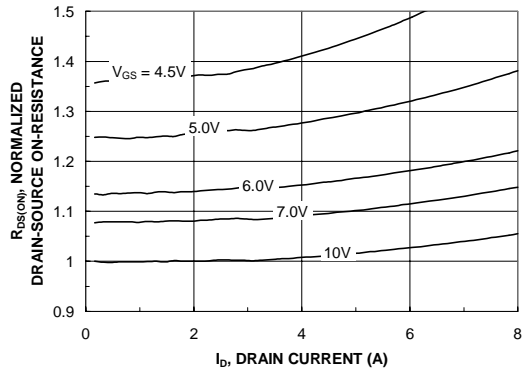
Figure 1. On-Region Characteristics.

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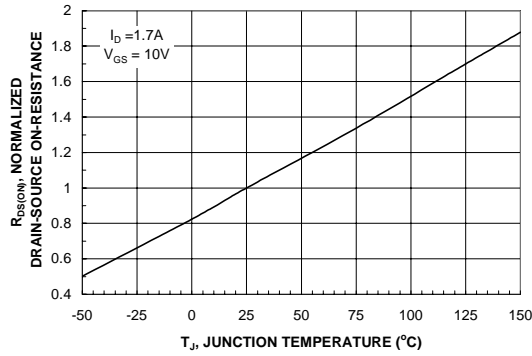with Drain Current and Gate Voltage.**

**Figure 3. On-Resistance Variation
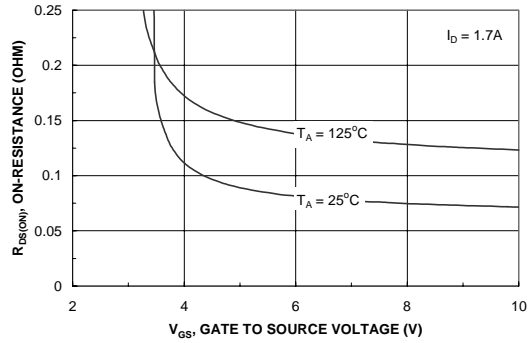with Temperature.**

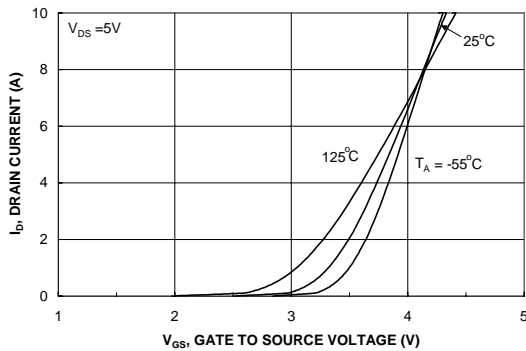

**Figure 4. On-Resistance Variation
with Gate-to-Source Voltage.**
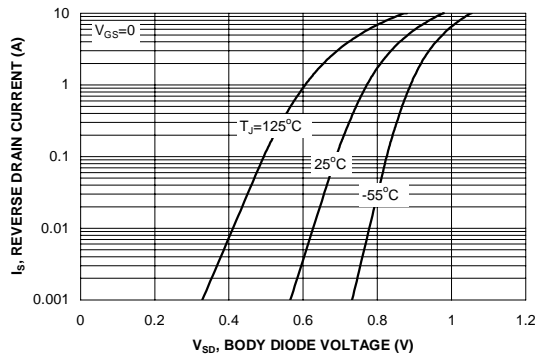

Figure 5. Transfer Characteristics.

**Figure 6. Body Diode Forward Voltage
Variation with Source Current
and Temperature.**
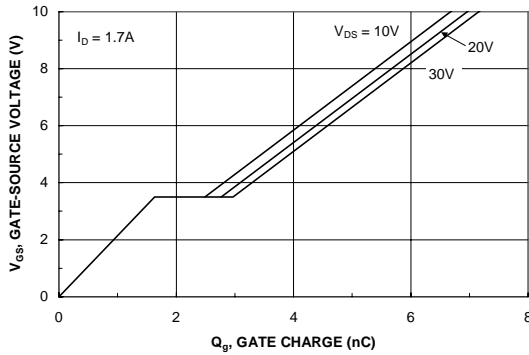
Typical Characteristics (continued)
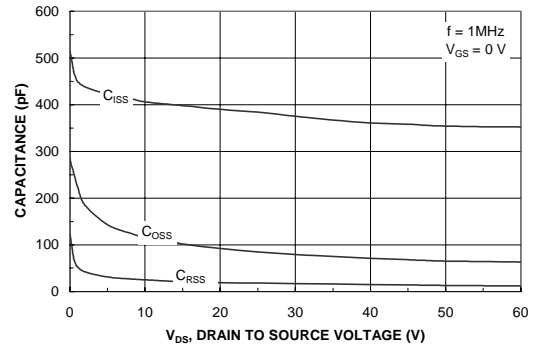

Figure 7. Gate Charge Characteristics.
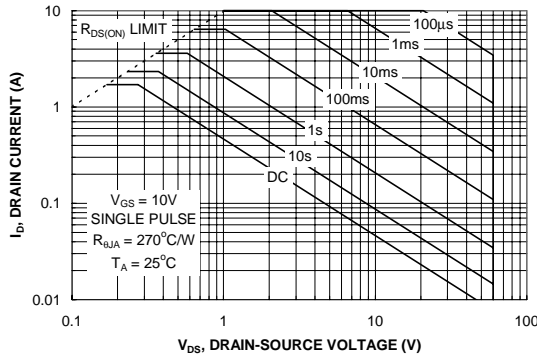

Figure 8. Capacitance Characteristics.
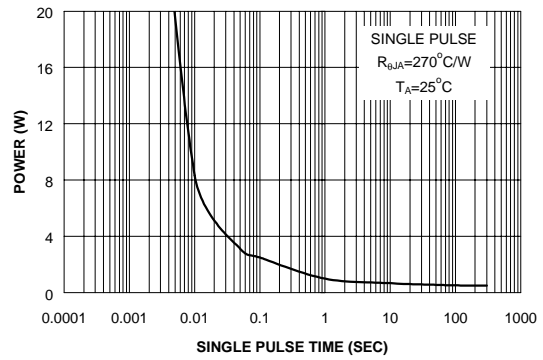

Figure 9. Maximum Safe Operating Area.

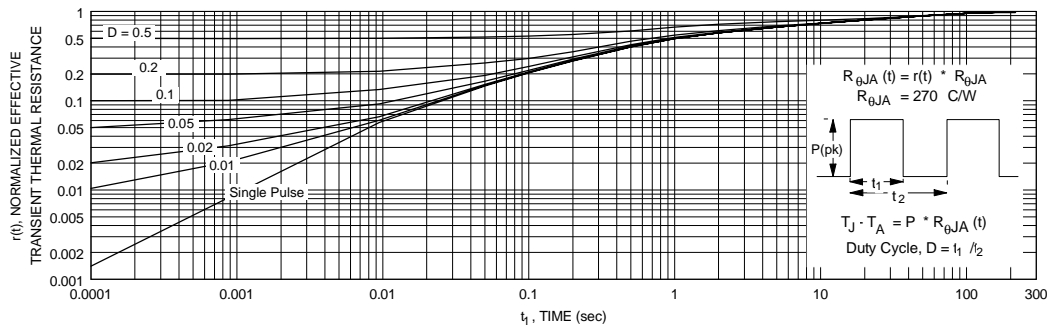**Figure 10. Single Pulse Maximum Power Dissipation.**

Figure 11. Transient Thermal Response Curve.
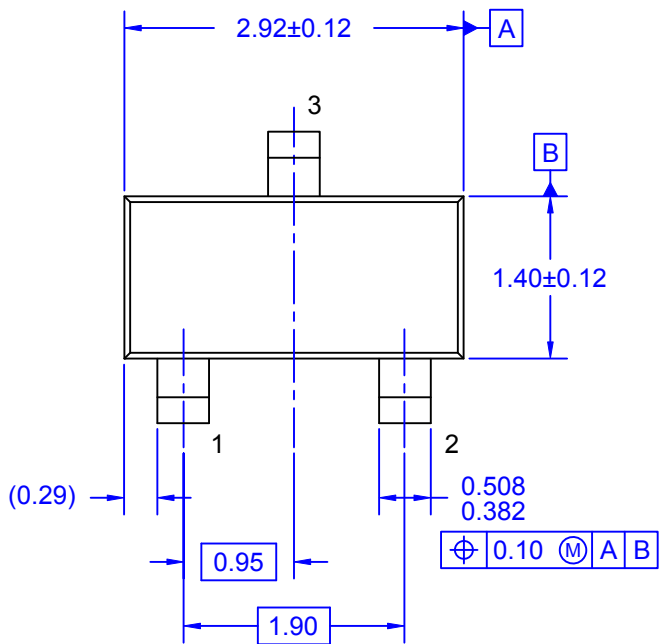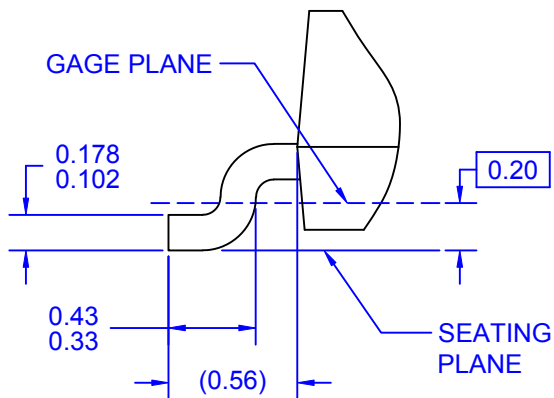
Thermal characterization performed using the conditions described in Note 1b.
Transient thermal response will change depending on the circuit board design.

A

2.92±0.12

3

B

1.40±0.12

1   2

(0.29)

0.508
0.382

0.95

1.90

⊕ | 0.10 | Ⓜ | A | B

1.12 MAX

(0.94)

0.10
0.00

C

⌓ | 0.10 | Ⓜ | C

SEE DETAIL A

2.51±0.20

0.95

1.40

2.20

1.00

1.90
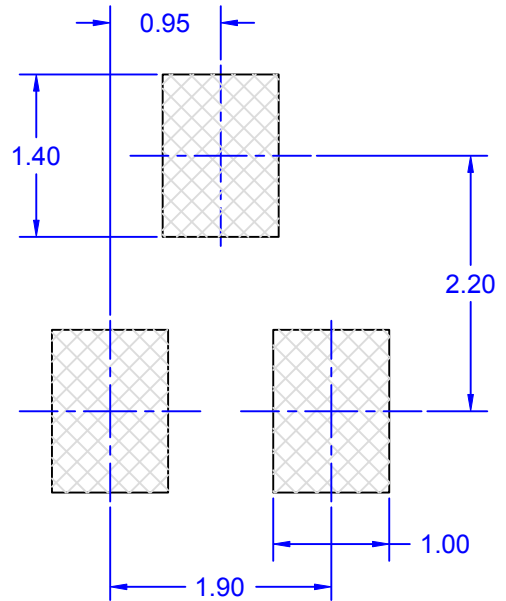
LAND PATTERN RECOMMENDATION

GAGE PLANE

0.178
0.102

0.20

0.43
0.33

(0.56)

SEATING
PLANE
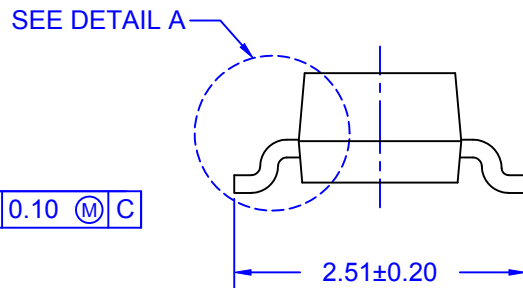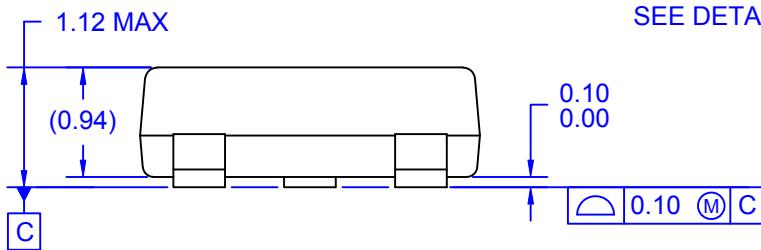
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C) DIMENSIONS ARE EXCLUSIVE OF BURRS,
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D) DIMENSIONING AND TOLERANCING PER
   ASME Y14.5M - 2009.
E) DRAWING FILE NAME: MKT-MA03BREV3

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DETAIL A
SCALE: 50:1

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Datasheet Identification	Product Status	Definition
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Rev. I77