ON Semiconductor®

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. ON Semiconductor'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.

Features

- 1.7 A, 60 V. $R_{DS(ON)}$ = 0.100 Ω @ V_{GS} = 10 V
  $R_{DS(ON)}$ = 0.120 Ω @ 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.

Applications
- DC/DC converter
- Motor drives

D

S

G

SuperSOT™-3
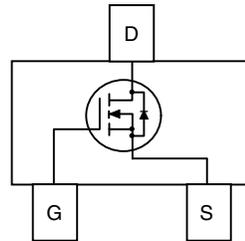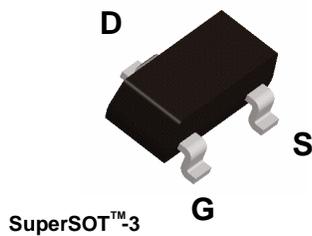
Absolute Maximum Ratings T_A = 25 C unless otherwise noted

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	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
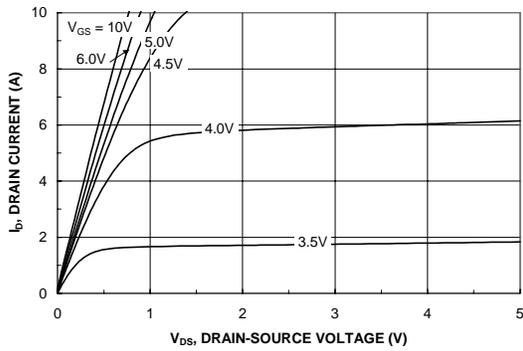
Figure 1. On-Region Characteristics.
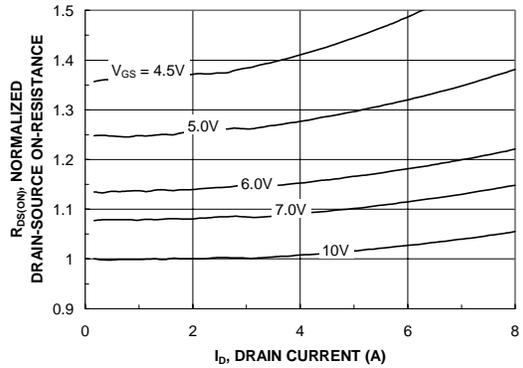
Figure 2. On-Resistance Variation with Drain Current and Gate Voltage.
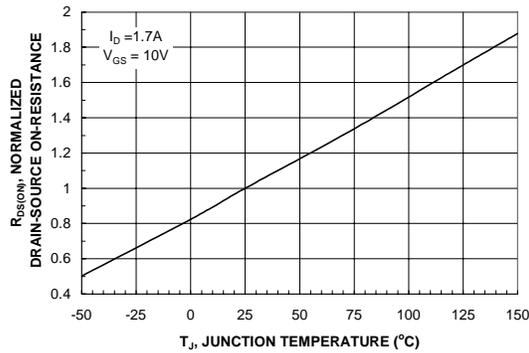
Figure 3. On-Resistance Variation with Temperature.
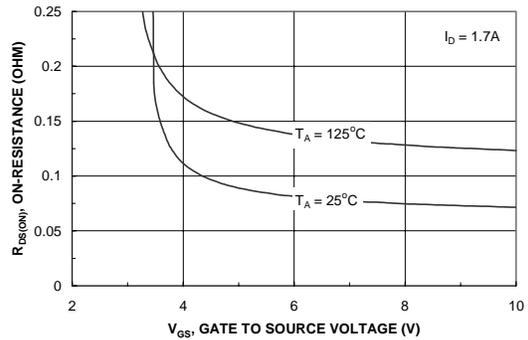
Figure 4. On-Resistance Variation with Gate-to-Source Voltage.
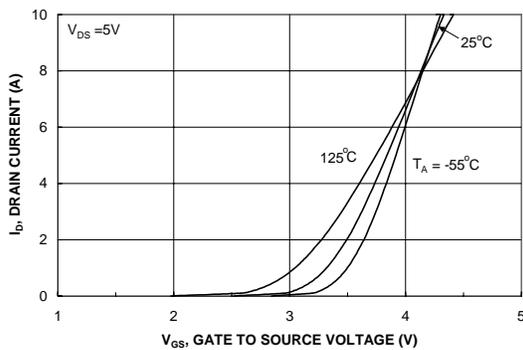
Figure 5. Transfer Characteristics.
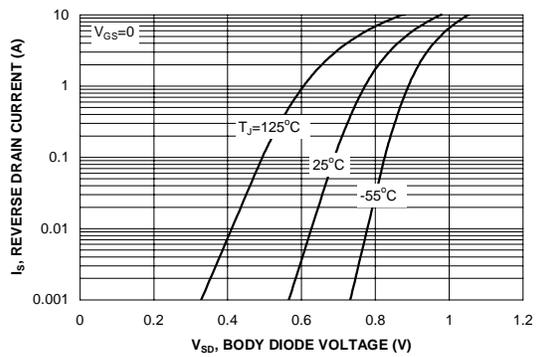
Figure 6. Body Diode Forward Voltage Variation with Source Current and Temperature.

Typical Characteristics (continued)
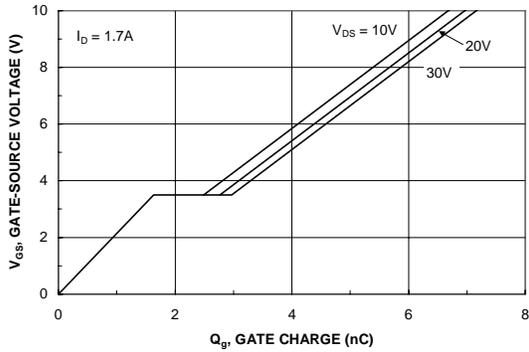
Figure 7. Gate Charge Characteristics.
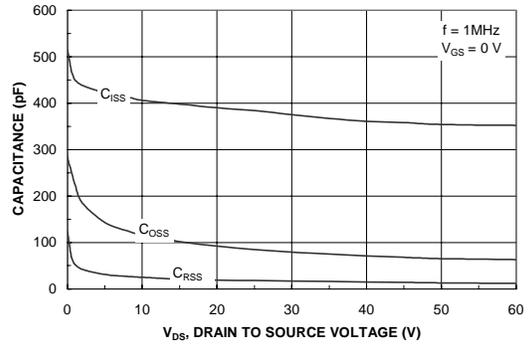
Figure 8. Capacitance Characteristics.
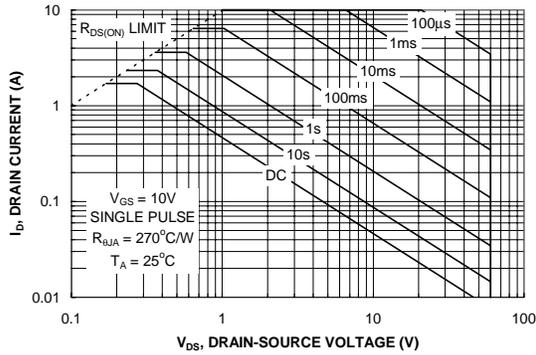
Figure 9. Maximum Safe Operating Area.
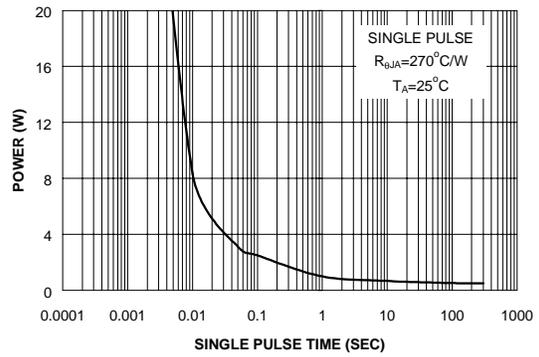
Figure 10. Single Pulse Maximum Power Dissipation.
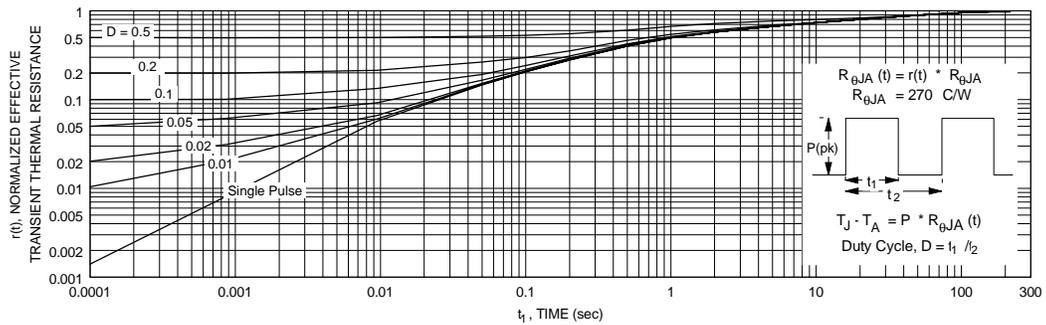
Figure 11. Transient Thermal Response Curve.

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

PUBLICATION ORDERING INFORMATION

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