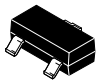
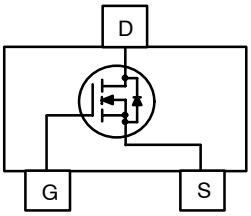
MOSFET – N-Channel, POWERTRENCH®

60 V

FDN5630



SOT−23−3
CASE 527AG



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. **onsemi**'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.

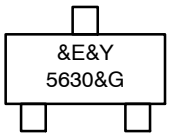
Features

- −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
- This Device is Pb−Free and Halogen Free

Applications

- DC−DC Converters
- Motor Drives

MARKING DIAGRAM



&E	= Designates Space
&Y	= Binary Calendar Year Coding Scheme
5630	= Specific Device Code
&G	= Date Code

ORDERING INFORMATION

Device	Package	Shipping†
FDN5630	SOT−23−3 (Pb−Free)	3000 / Tape & Reel

†For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specification Brochure, BRD8011/D.

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December, 2022 − Rev. 5
Publication Order Number:
FDN5630/D

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ABSOLUTE MAXIMUM RATINGS (T_A = 25°C unless otherwise noted)

Symbol	Parameter	Ratings	Unit
V_{DSS}	Drain−Source Voltage	60	V
V_{GSS}	Gate−Source Voltage	±20	V
I_D	Drain Current − Continuous (Note 1a)	1.7	A
	Drain Current − Pulsed	10	
P_D	Power Dissipation for Single Operation (Note 1a)	0.5	W
	Power Dissipation for Single Operation (Note 1b)	0.46	
T_J, T_{STG}	Operating and Storage Junction Temperature Range	−55 to +150	°C

Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

THERMAL CHARACTERISTICS

Symbol	Parameter	Ratings	Unit
$R_{\theta JA}$	Thermal Resistance, Junction−to−Ambient (Note 1a)	250	°C/W
$R_{\theta JC}$	Thermal Resistance, Junction−to−Case (Note 1)	75	°C/W

ELECTRICAL CHARACTERISTICS (T_A = 25°C unless otherwise noted)

Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit
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	–	0.073	0.100	Ω
		V_{GS} = 10 V, I_D = 1.7 A T_J = 125°C	–	0.127	0.180	
		V_{GS} = 6 V, I_D = 1.6 A	–	0.083	0.120	
$I_{D(on)}$	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	
C_{rss}	Reverse Transfer Capacitance		–	27	40	

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ELECTRICAL CHARACTERISTICS (T_A = 25°C unless otherwise noted) (continued)

Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit
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	
$t_{d(off)}$	Turn–Off Delay Time		–	15	28	
t_f	Turn–Off Fall Time		–	5	15	
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	–	
Q_{gd}	Gate–Drain Charge		–	1.2	–	
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

Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

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 in^2 pad of 2 oz. copper.

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

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

TYPICAL CHARACTERISTICS

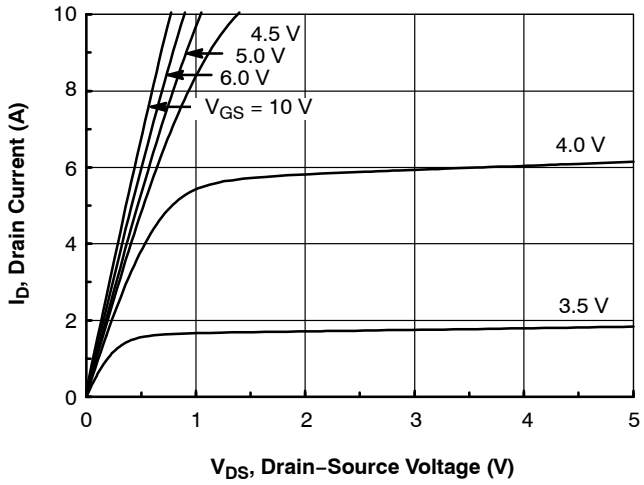

Figure 1. On–Region Characteristics

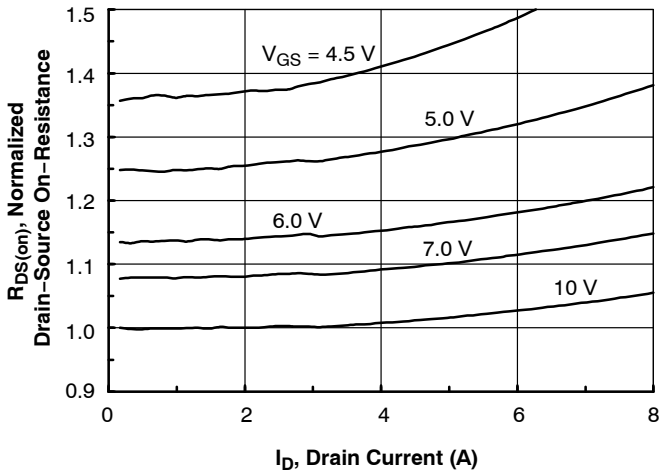

Figure 2. On–Resistance Variation with Drain Current and Gate Voltage

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TYPICAL CHARACTERISTICS (CONTINUED)

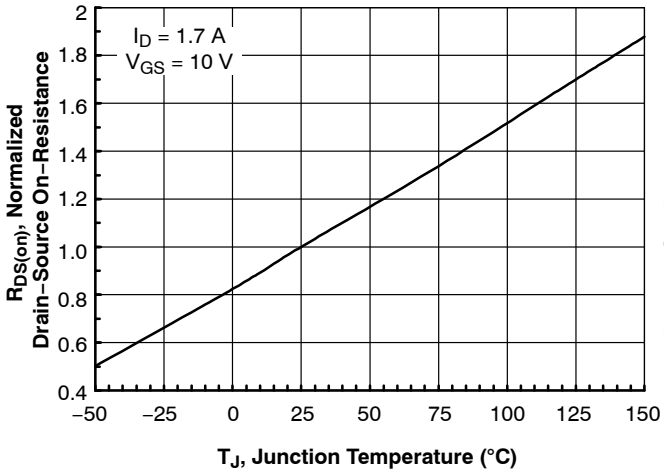

Figure 3. On−Resistance Variation with Temperature

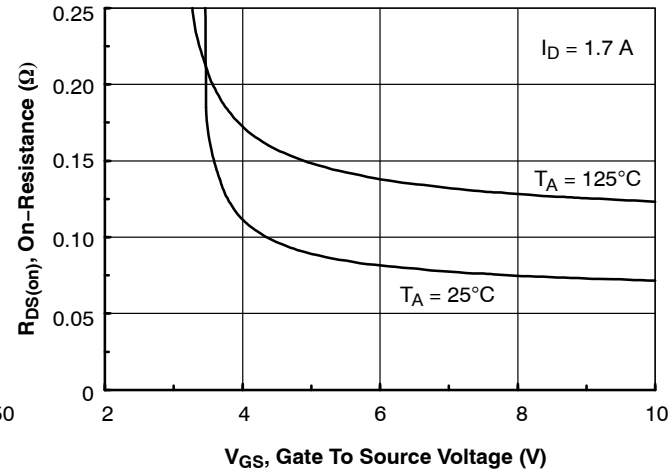

Figure 4. On−Resistance Variation with Gate−to−Source Voltage

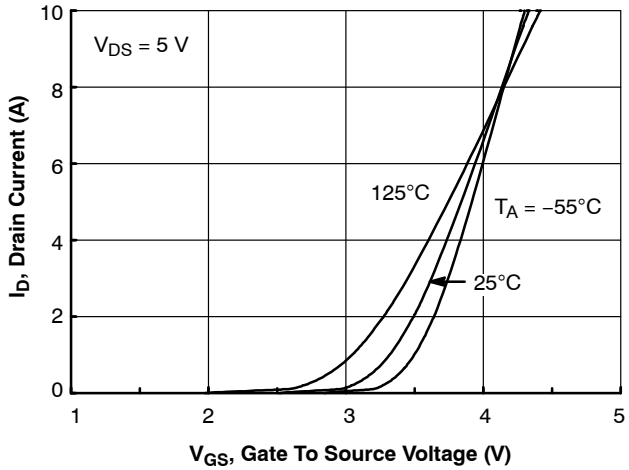

Figure 5. Transfer Characteristics

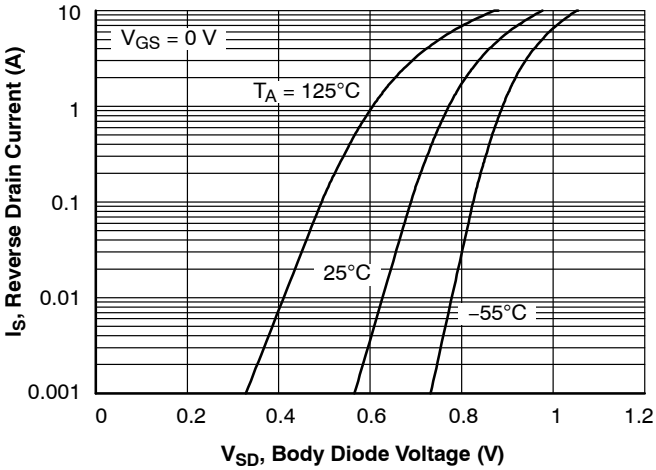

Figure 6. Body Diode Forward Voltage Variation with Source Current and Temperature

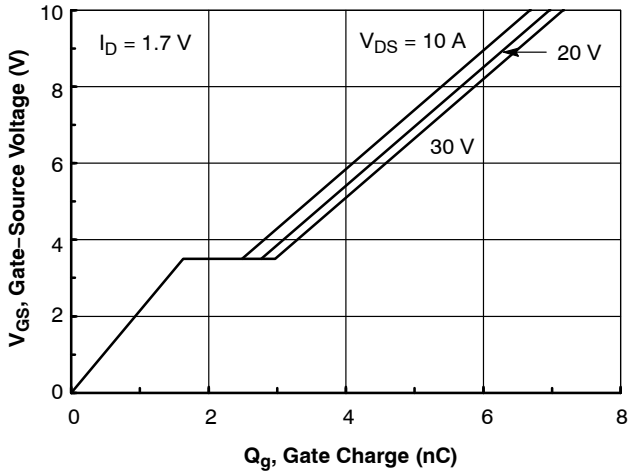

Figure 7. Gate Charge Characteristics

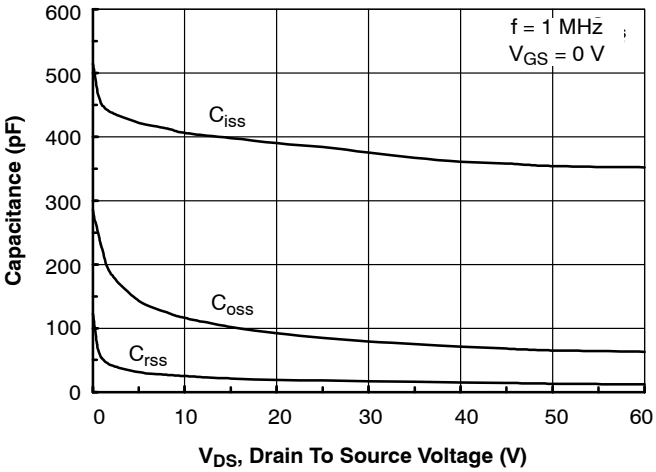

Figure 8. Capacitance Characteristics

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TYPICAL CHARACTERISTICS (CONTINUED)

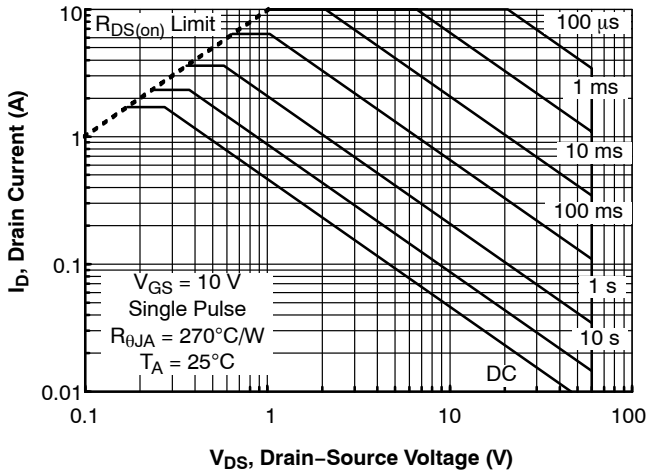

Figure 9. Maximum Safe Operating Area

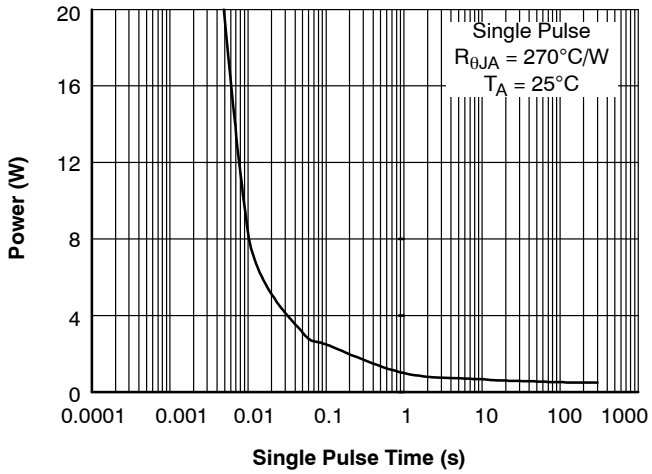

Figure 10. Single Pulse Maximum Power Dissipation

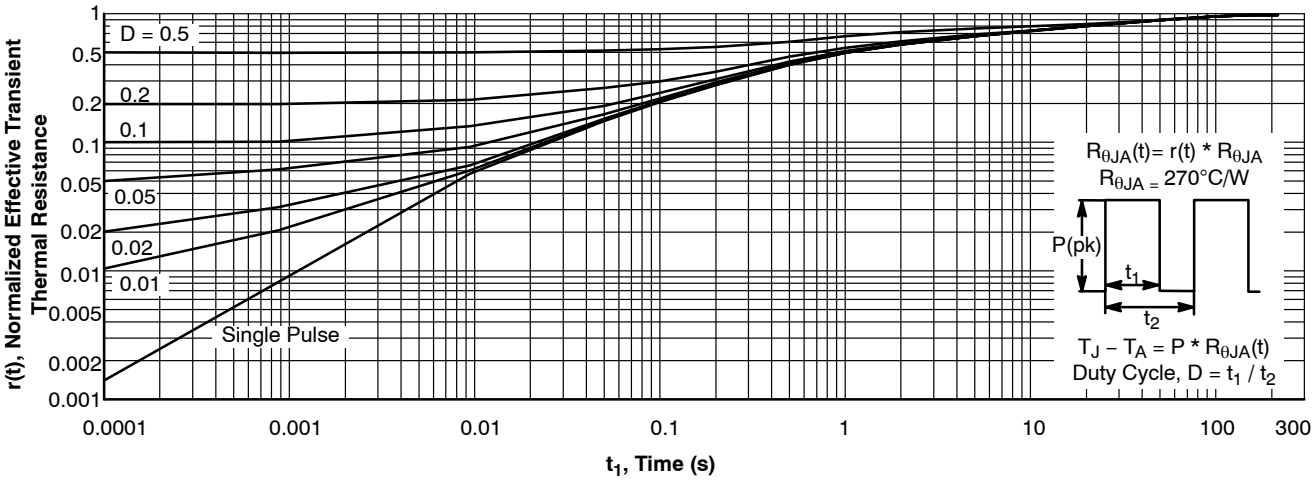

Figure 11. Transient Thermal Response Curve

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

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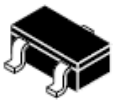
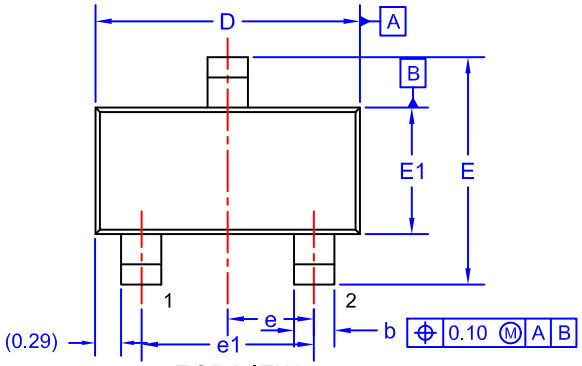


SOT−23/SUPERSOT™ −23, 3 LEAD, 1.4x2.9
CASE 527AG
ISSUE A

DATE 09 DEC 2019

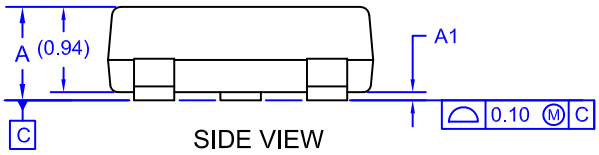


TOP VIEW

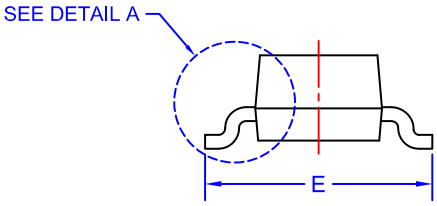
NOTES: UNLESS OTHERWISE SPECIFIED

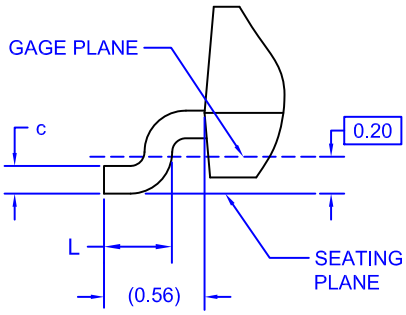
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 2009.
2. ALL DIMENSIONS ARE IN MILLIMETERS.
3. DIMENSIONS ARE EXCLUSIVE OF BURRS, MOLD FLASH AND TIE BAR EXTRUSIONS.

DIM	MIN.	NOM.	MAX.
A	0.85	0.95	1.12
A1	0.00	0.05	0.10
b	0.370	0.435	0.508
c	0.085	0.150	0.180
D	2.80	2.92	3.04
E	2.31	2.51	2.71
E1	1.20	1.40	1.52
e	0.95 BSC		
e1	1.90 BSC		
L	0.33	0.38	0.43

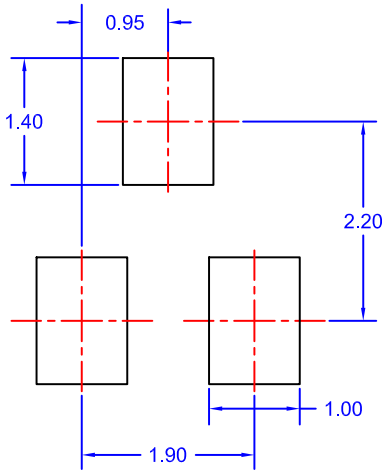


SIDE VIEW





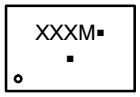
DETAIL A



LAND PATTERN RECOMMENDATION*

*FOR ADDITIONAL INFORMATION ON OUR Pb-FREE STRATEGY AND SOLDERING DETAILS, PLEASE DOWNLOAD THE ON SEMICONDUCTOR SOLDERING AND MOUNTING TECHNIQUES REFERENCE MANUAL, SOLDERRM/D.

GENERIC MARKING DIAGRAM*



XXX = Specific Device Code
M = Month Code
▪ = Pb−Free Package

(Note: Microdot may be in either location)

*This information is generic. Please refer to device data sheet for actual part marking. Pb−Free indicator, "G" or microdot "▪", may or may not be present. Some products may not follow the Generic Marking.

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