

MOSFET – P-Channel 1.8 V Specified POWERTRENCH®

FDN304P

General Description

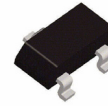
This P-Channel 1.8 V specified MOSFET uses **onsemi**'s advanced low voltage POWERTRENCH process. It has been optimized for battery power management applications.

Features

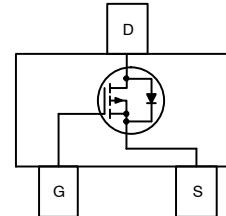
- -2.4 A, -20 V
 - ◆ $R_{DS(ON)} = 52 \text{ m}\Omega @ V_{GS} = -4.5 \text{ V}$
 - ◆ $R_{DS(ON)} = 70 \text{ m}\Omega @ V_{GS} = -2.5 \text{ V}$
 - ◆ $R_{DS(ON)} = 100 \text{ m}\Omega @ V_{GS} = -1.8 \text{ V}$
- Fast Switching Speed
- High Performance Trench Technology for Extremely Low $R_{DS(ON)}$
- SUPERSOT™ -23 provides Low $R_{DS(ON)}$ and 30% Higher Power Handling Capability than SOT23 in the same Footprint
- These Devices are Pb-Free, Halogen Free/BFR Free and are RoHS Compliant

Applications

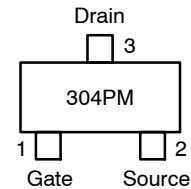
- Battery Management
- Load Switch
- Battery Protection



SOT-23/SUPERSOT-23, 3 LEAD, 1.4x2.9
 CASE 527AG



MARKING DIAGRAM



304P = Specific Device Code
 M = Date Code

ORDERING INFORMATION

See detailed ordering and shipping information on page 3 of this data sheet.

FDN304P

ABSOLUTE MAXIMUM RATINGS

T_A = 25°C unless otherwise noted

Symbol	Parameter	Ratings	Unit
V _{DSS}	Drain–Source Voltage	–20	V
V _{GSS}	Gate–Source Voltage	±8	V
I _D	Drain Current Continuous (Note 1a) Pulsed	–2.4 –10	A
P _D	Maximum Power Dissipation (Note 1a) (Note 1b)	0.5 0.46	W
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 _{θJA}	Thermal Resistance, Junction–to–Ambient (Note 1a)	250	°C/W
R _{θJC}	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	–20			V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	I _D = –250 μA, Referenced to 25°C		–13		mV/°C
I _{DSS}	Zero Gate Voltage Drain Current	V _{DS} = –16 V, V _{GS} = 0 V			–1	μA
I _{GSSF}	Gate–Body Leakage, Forward	V _{GS} = 8 V, V _{DS} = 0 V			100	nA
I _{GSSR}	Gate–Body Leakage, Reverse	V _{GS} = –8 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	–0.4	–0.8	–1.5	V
$\frac{\Delta V_{GS(th)}}{\Delta T_J}$	Gate Threshold Voltage Temperature Coefficient	I _D = –250 μA, Referenced to 25°C		3		mV/°C
R _{DS(on)}	Static Drain–Source On–Resistance	V _{GS} = –4.5 V, I _D = –2.4 A		36	52	mΩ
		V _{GS} = –2.5 V, I _D = –2 A		47	70	
		V _{GS} = –1.8 V, I _D = –1.8 A		65	100	
I _{D(on)}	On–State Drain Current	V _{GS} = –4.5 V, V _{DS} = –5 V	–10			A
g _{FS}	Forward Transconductance	V _{DS} = –5 V, I _D = –1.25 A		12		S

DYNAMIC CHARACTERISTICS

C _{iss}	Input Capacitance	V _{DS} = –10 V, V _{GS} = 0 V, f = 1.0 MHz		1312		pF
C _{oss}	Output Capacitance			240		pF
C _{rss}	Reverse Transfer Capacitance			106		pF

SWITCHING CHARACTERISTICS (Note 2)

t _{d(on)}	Turn–On Delay Time	V _{DD} = –10 V, I _D = –1 A, V _{GS} = –4.5 V, R _{GEN} = 6 Ω		15	27	ns
t _r	Turn–On Rise Time			15	27	ns
t _{d(off)}	Turn–Off Delay Time			40	64	ns
t _f	Turn–Off Fall Time			25	40	ns

FDN304P

ELECTRICAL CHARACTERISTICS (continued)

T_A = 25°C unless otherwise noted

Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit
SWITCHING CHARACTERISTICS (Note 2)						
Q _g	Total Gate Charge	V _{DS} = -10 V, I _D = -2.4 A, V _{GS} = -4.5 V		12	20	nC
Q _{gs}	Gate-Source Charge			2		nC
Q _{gd}	Gate-Drain Charge			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)		-0.6	-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:

- R_{θJA} 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_{θJC} is guaranteed by design while R_{θCA} is determined by the user's board design.



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



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

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

PACKAGE MARKING AND ORDERING INFORMATION

Device	Device Marking	Package	Shipping†
FDN304P	304P	SOT-23 (Pb-Free)	3000 units / Tape & Reel

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

TYPICAL CHARACTERISTICS

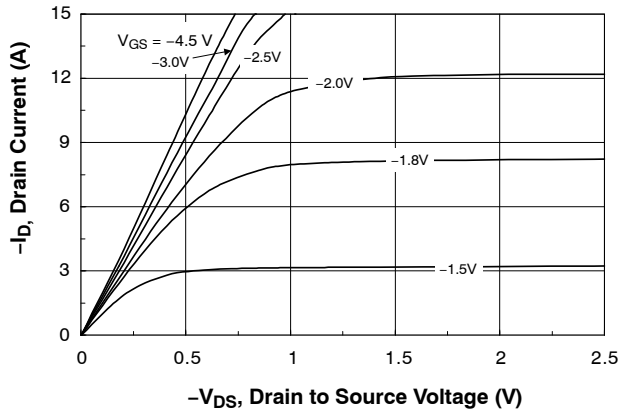


Figure 1. On-Region Characteristics

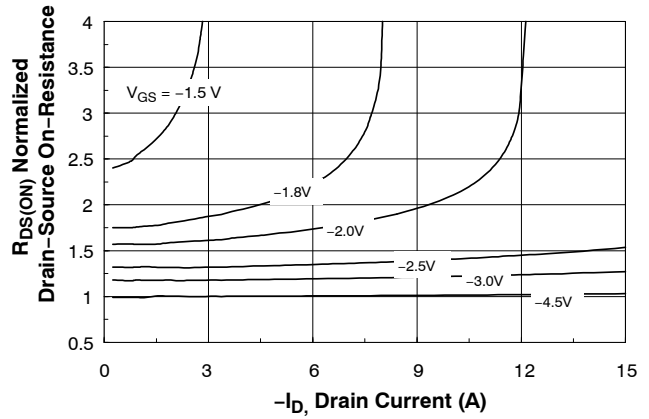


Figure 2. On-Resistance Variation with Drain Current and Gate Voltage

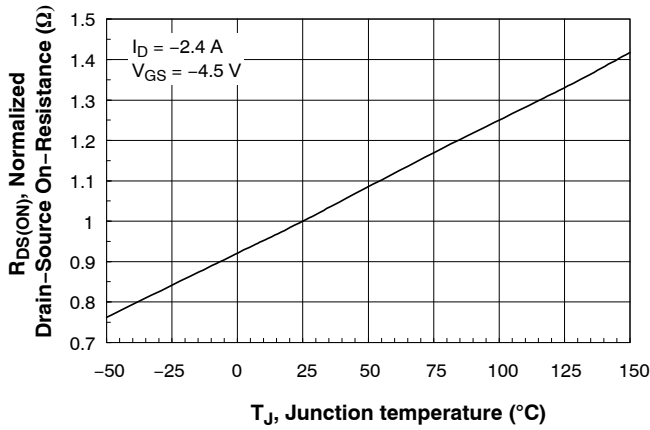


Figure 3. On-Resistance Variation with Temperature

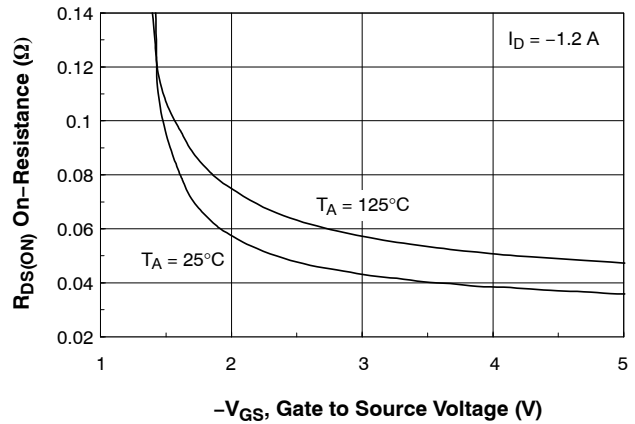


Figure 4. On-Resistance Variation with Gate-to-Source Voltage

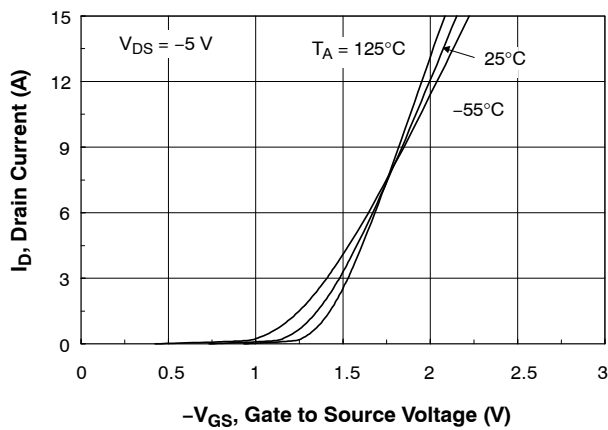


Figure 5. Transfer Characteristics

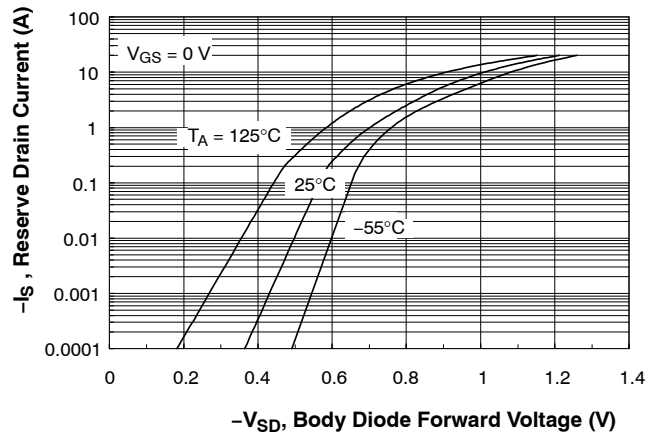


Figure 6. Body Diode Forward Voltage Variation with Source Current and Temperature

FDN304P

TYPICAL CHARACTERISTICS (Continued)

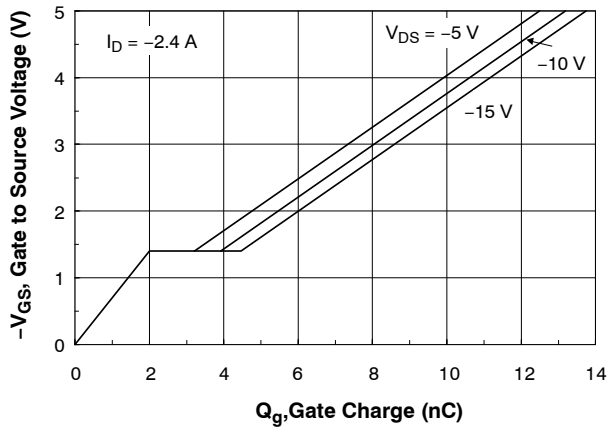


Figure 7. Gate Charge Characteristics

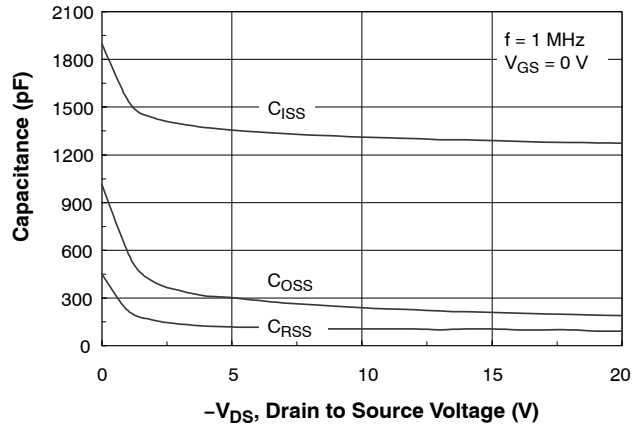


Figure 8. Capacitance Characteristics

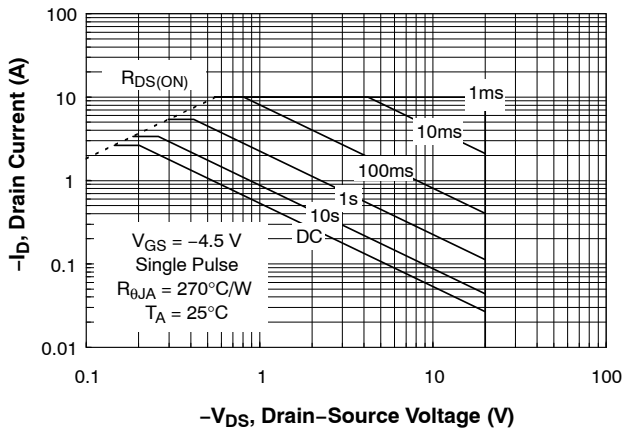


Figure 9. Maximum Safe Operating Area

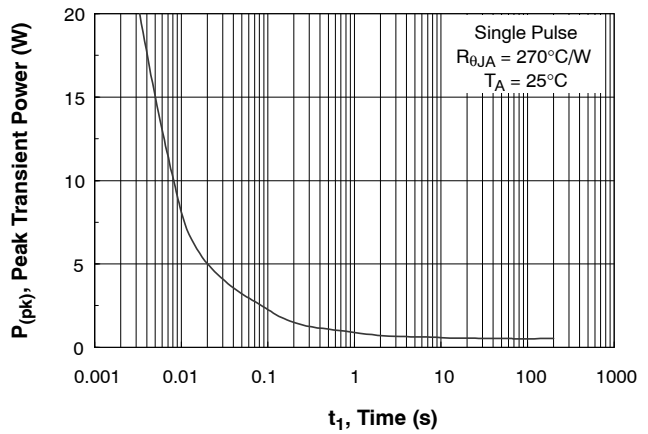


Figure 10. Single Pulse Maximum Power Dissipation

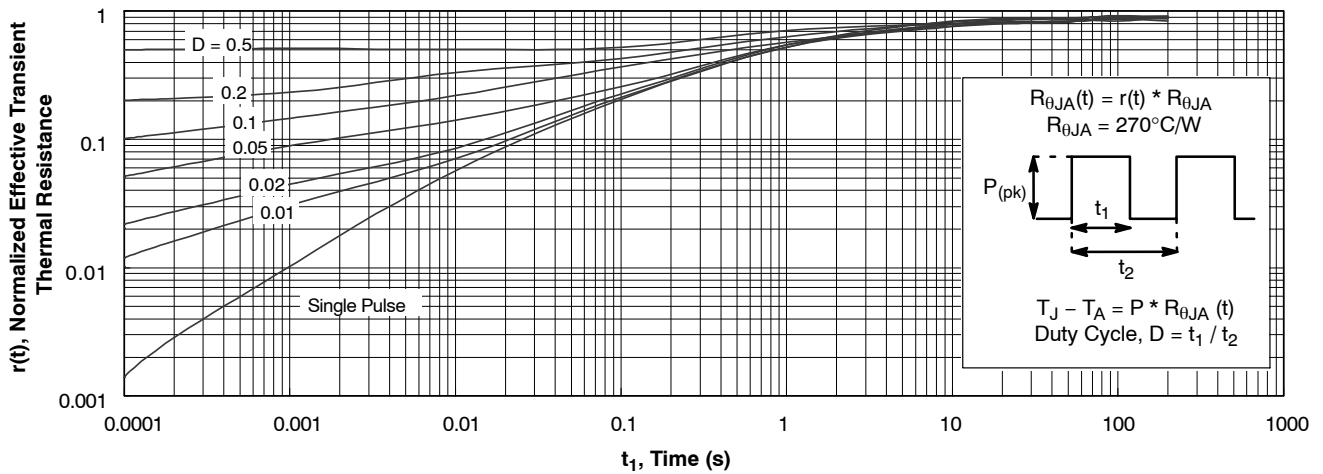


Figure 11. Transient Thermal Response Curve

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

MECHANICAL CASE OUTLINE

PACKAGE DIMENSIONS

ON Semiconductor®



SOT-23/SUPERSOT™ -23, 3 LEAD, 1.4x2.9

CASE 527AG
ISSUE A

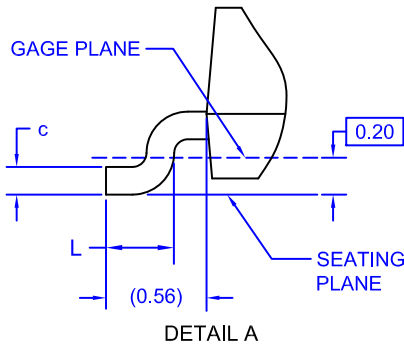
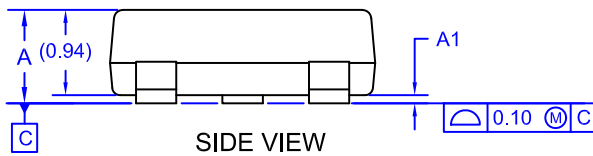
DATE 09 DEC 2019



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.

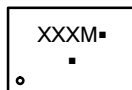
DIM	MIN.	NOM.	MAX.
A	0.85	0.95	1.12
A1	0.00	0.05	0.10
b	0.370	0.435	0.508
c	0.085	0.150	0.180
D	2.80	2.92	3.04
E	2.31	2.51	2.71
E1	1.20	1.40	1.52
e	0.95 BSC		
e1	1.90 BSC		
L	0.33	0.38	0.43



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.

DOCUMENT NUMBER:	98AON34319E	Electronic versions are uncontrolled except when accessed directly from the Document Repository. Printed versions are uncontrolled except when stamped "CONTROLLED COPY" in red.
DESCRIPTION:	SOT-23/SUPERSOT-23, 3 LEAD, 1.4X2.9	PAGE 1 OF 1

ON Semiconductor and are trademarks of Semiconductor Components Industries, LLC dba ON Semiconductor or its subsidiaries in the United States and/or other countries. ON Semiconductor reserves the right to make changes without further notice to any products herein. ON Semiconductor makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does ON Semiconductor assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation special, consequential or incidental damages. ON Semiconductor does not convey any license under its patent rights nor the rights of others.

onsemi, **Onsemi**, and other names, marks, and brands are registered and/or common law trademarks of Semiconductor Components Industries, LLC dba "**onsemi**" or its affiliates and/or subsidiaries in the United States and/or other countries. **onsemi** owns the rights to a number of patents, trademarks, copyrights, trade secrets, and other intellectual property. A listing of **onsemi**'s product/patent coverage may be accessed at www.onsemi.com/site/pdf/Patent-Marking.pdf. **onsemi** reserves the right to make changes at any time to any products or information herein, without notice. The information herein is provided "as-is" and **onsemi** makes no warranty, representation or guarantee regarding the accuracy of the information, product features, availability, functionality, or suitability of its products for any particular purpose, nor does **onsemi** assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation special, consequential or incidental damages. Buyer is responsible for its products and applications using **onsemi** products, including compliance with all laws, regulations and safety requirements or standards, regardless of any support or applications information provided by **onsemi**. "Typical" parameters which may be provided in **onsemi** data sheets and/or specifications can and do vary in different applications and actual performance may vary over time. All operating parameters, including "Typicals" must be validated for each customer application by customer's technical experts. **onsemi** does not convey any license under any of its intellectual property rights nor the rights of others. **onsemi** products are not designed, intended, or authorized for use as a critical component in life support systems or any FDA Class 3 medical devices or medical devices with a same or similar classification in a foreign jurisdiction or any devices intended for implantation in the human body. Should Buyer purchase or use **onsemi** products for any such unintended or unauthorized application, Buyer shall indemnify and hold **onsemi** and its officers, employees, subsidiaries, affiliates, and distributors harmless against all claims, costs, damages, and expenses, and reasonable attorney fees arising out of, directly or indirectly, any claim of personal injury or death associated with such unintended or unauthorized use, even if such claim alleges that **onsemi** was negligent regarding the design or manufacture of the part. **onsemi** is an Equal Opportunity/Affirmative Action Employer. This literature is subject to all applicable copyright laws and is not for resale in any manner.

PUBLICATION ORDERING INFORMATION

LITERATURE FULFILLMENT:

Email Requests to: orderlit@onsemi.com

onsemi Website: www.onsemi.com

TECHNICAL SUPPORT

North American Technical Support:

Voice Mail: 1 800-282-9855 Toll Free USA/Canada

Phone: 011 421 33 790 2910

Europe, Middle East and Africa Technical Support:

Phone: 00421 33 790 2910

For additional information, please contact your local Sales Representative