

MOSFET - Power, N-Channel, Shielded Gate

40 V, 2.75 mΩ, 104 A

NTTFS2D8N04HL

General Description

This N-Channel MOSFET is produced using ON Semiconductor's advanced MOSFET process that incorporates Shielded Gate technology. This process has been optimized to minimize on-state resistance and yet maintain superior switching performance with best in class soft body diode.

Features

- Shielded Gate MOSFET Technology
- Max $r_{DS(on)} = 2.75 \text{ m}\Omega$ at $V_{GS} = 10 \text{ V}$, $I_D = 16 \text{ A}$
- Max $r_{DS(on)} = 4.3 \text{ m}\Omega$ at $V_{GS} = 4.5 \text{ V}$, $I_D = 13 \text{ A}$
- Lowers Switching Noise/EMI
- MSL1 Robust Package Design
- 100% UIL Tested
- RoHS Compliant

Applications

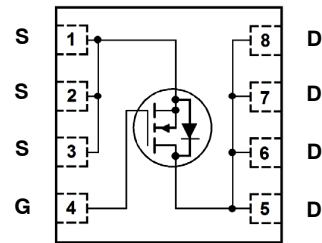
- Primary DC-DC MOSFET
- Synchronous Rectifier in DC-DC and AC-DC
- Motor Drive



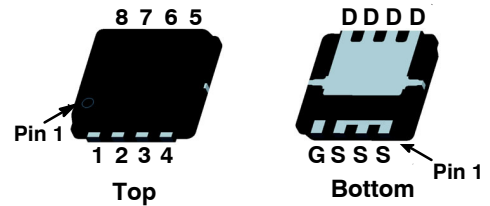
ON Semiconductor®

www.onsemi.com

ELECTRICAL CONNECTION

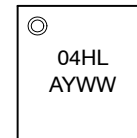


N-Channel MOSFET



WDFN8
(3.3x3.3, 0.65 P)
CASE 511DY

MARKING DIAGRAM



- | | |
|------|---------------------|
| 04HL | = Device Code |
| A | = Assembly Location |
| Y | = Year Code |
| WW | = Work Week Code |

ORDERING INFORMATION

See detailed ordering and shipping information on page 2 of this data sheet.

NTTFS2D8N04HL

MOSFET MAXIMUM RATINGS ($T_A = 25^\circ\text{C}$ unless otherwise noted)

Symbol	Parameter	Ratings	Unit
V_{DS}	Drain to Source Voltage	40	V
V_{GS}	Gate to Source Voltage	± 20	V
I_D	Drain Current	-Continuous $T_C = 25^\circ\text{C}$ (Note 5)	104
		-Continuous $T_C = 100^\circ\text{C}$ (Note 5)	66
		-Continuous $T_A = 25^\circ\text{C}$ (Note 1a)	24
		-Pulsed (Note 4)	216
E_{AS}	Single Pulse Avalanche Energy (Note 3)	109	mJ
P_D	Power Dissipation $T_C = 25^\circ\text{C}$	63	W
	Power Dissipation $T_A = 25^\circ\text{C}$ (Note 1a)	3.2	
T_J, T_{STG}	Operating and Storage Junction Temperature Range	-55 to +150	$^\circ\text{C}$

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
$R_{\theta JC}$	Thermal Resistance, Junction to Case	2	$^\circ\text{C}/\text{W}$
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient (Note 1a)	39	

PACKAGE MARKING AND ORDERING INFORMATION

Device Marking	Device	Package	Reel Size	Tape Width	Quantity
04HL	NTTFS2D8N04HL	WDFN8 (3.3x3.3)	7"	12 mm	1500 Units

ELECTRICAL CHARACTERISTICS ($T_J = 25^\circ\text{C}$ unless otherwise noted)

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
--------	-----------	-----------------	-----	-----	-----	-------

OFF CHARACTERISTICS

BV_{DSS}	Drain to Source Breakdown Voltage	$I_D = 250 \mu\text{A}, V_{GS} = 0 \text{V}$	40			V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	$I_D = 250 \mu\text{A}$, referenced to 25°C		22		$\text{mV}/^\circ\text{C}$
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS} = 32 \text{V}, V_{GS} = 0 \text{V}$			10	μA
I_{GSS}	Gate to Source Leakage Current	$V_{GS} = +20 \text{V}, V_{DS} = 0 \text{V}$			100	nA

ON CHARACTERISTICS

$V_{GS(th)}$	Gate to Source Threshold Voltage	$V_{GS} = V_{DS}, I_D = 80 \mu\text{A}$	1.2	1.6	2.0	V
$\frac{\Delta V_{GS(th)}}{\Delta T_J}$	Gate to Source Threshold Voltage Temperature Coefficient	$I_D = 80 \mu\text{A}$, referenced to 25°C		-4.9		$\text{mV}/^\circ\text{C}$
$r_{DS(on)}$	Static Drain to Source On Resistance	$V_{GS} = 10 \text{V}, I_D = 16 \text{A}$		2.4	2.75	m Ω
		$V_{GS} = 4.5 \text{V}, I_D = 13 \text{A}$		3.4	4.3	

DYNAMIC CHARACTERISTICS

C_{ISS}	Input Capacitance	$V_{DS} = 20 \text{V}, V_{GS} = 0 \text{V}, f = 1 \text{MHz}$		1960		pF
C_{OSS}	Output Capacitance			460		
C_{RSS}	Reverse Transfer Capacitance			30		
R_G	Gate Resistance			0.8		

NTTFS2D8N04HL

ELECTRICAL CHARACTERISTICS ($T_J = 25^\circ\text{C}$ unless otherwise noted) (continued)

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
--------	-----------	-----------------	-----	-----	-----	-------

SWITCHING CHARACTERISTICS

$t_{d(ON)}$	Turn – On Delay Time	$V_{DD} = 20\text{ V}, I_D = 16\text{ A},$ $V_{GS} = 10\text{ V}, R_{GEN} = 2.5\ \Omega$		7.5		ns
$t_{rd(ON)}$	Rise Time			16.6		
$t_{d(OFF)}$	Turn – Off Delay Time			30		
t_f	Fall Time			2.8		
Q_g	Total Gate Charge	$V_{GS} = 0\text{ V to }10\text{ V}$		32		nC
Q_g	Total Gate Charge	$V_{GS} = 0\text{ V to }4.5\text{ V}$		15		
Q_{gs}	Gate to Source Charge	$V_{DD} = 20\text{ V}$ $I_D = 16\text{ A}$		5.6		
Q_{gd}	Gate to Drain “Miller” Charge			3.4		

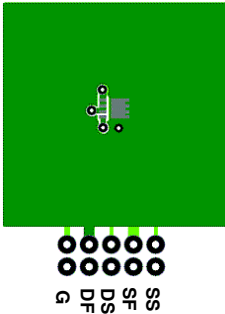
DRAIN-SOURCE DIODE CHARACTERISTICS

V_{SD}	Source to Drain Diode Forward Voltage	$V_{GS} = 0\text{ V}, I_S = 16\text{ A}$ (Note 2)		0.78	1.2	V
		$V_{GS} = 0\text{ V}, I_S = 16\text{ A}$ (Note 2)		0.63	1.3	
t_{rr}	Reverse Recovery Time	$I_F = 16\text{ A}, di/dt = 100\text{ A}/\mu\text{s}$		32.2		ns
Q_{rr}	Reverse Recovery Charge			27.4		nC

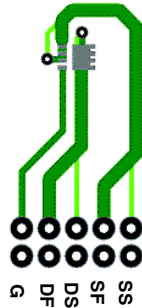
Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

NOTES:

- $R_{\theta JA}$ is determined with the device mounted on a 1 in² pad 2 oz copper pad on a 1.5 × 1.5 in. board of FR-4 material. $R_{\theta CA}$ is determined by the user's board design.



- 53°C/W when mounted on a 1 in² pad of 2 oz copper.



- 125°C/W when mounted on a minimum pad of 2 oz copper.

- Pulse Test: Pulse Width < 300 μs , Duty cycle < 2.0%.
- E_{AS} of 109 mJ is based on starting $T_J = 25^\circ\text{C}$; $L = 0.3\text{ mH}$, $I_{AS} = 27\text{ A}$, $V_{DD} = 32\text{ V}$, $V_{GS} = 10\text{ V}$. 100% test at $L = 0.3\text{ mH}$, $I_{AS} = 27\text{ A}$. Pulsed I_D please refer to SOA graph for more details.
- Computed continuous current limited to Max Junction Temperature only, actual continuous current will be limited by thermal & electro-mechanical application board design.

NTTFS2D8N04HL

TYPICAL CHARACTERISTICS

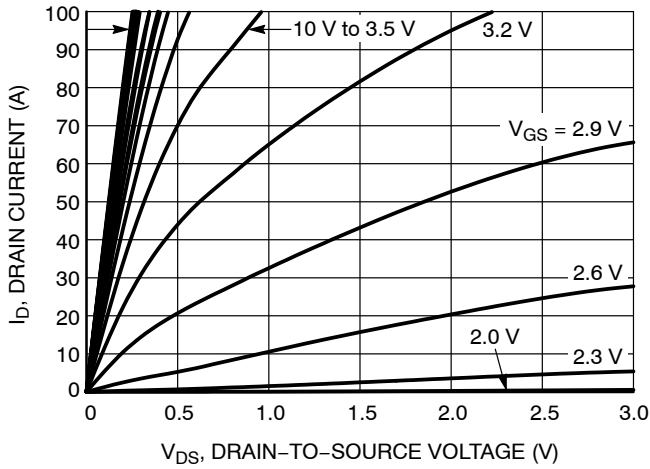


Figure 1. On-Region Characteristics

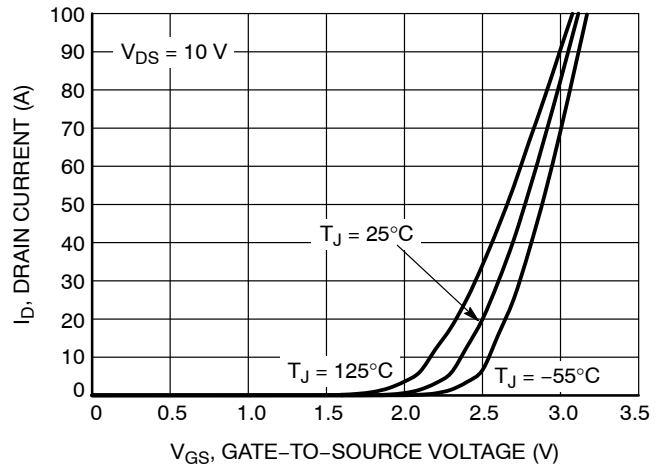


Figure 2. Transfer Characteristics

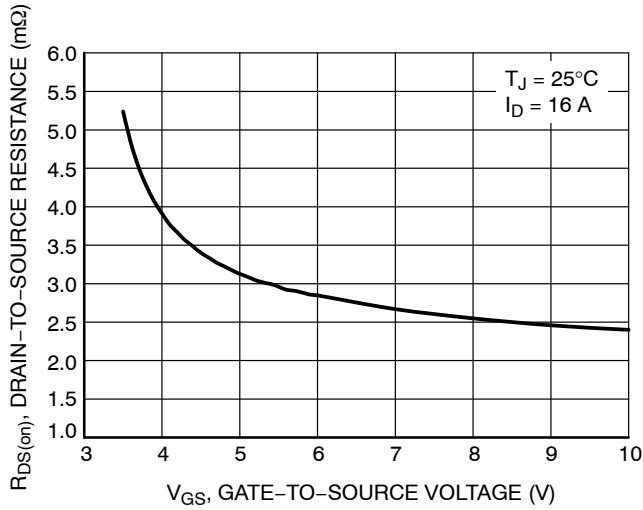


Figure 3. On-Resistance vs. Gate-to-Source Voltage

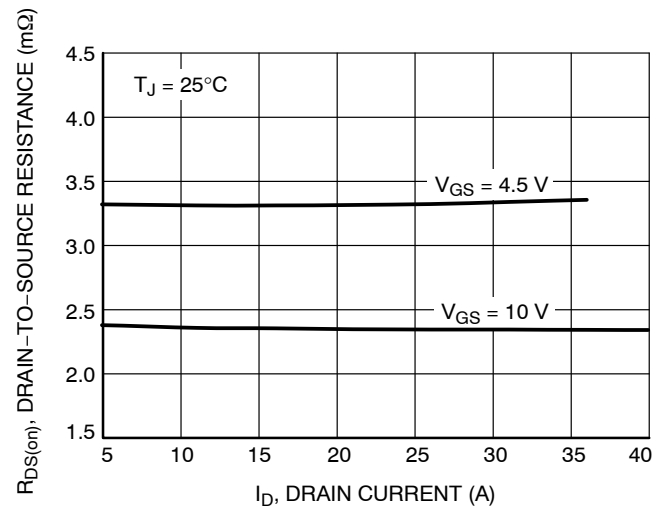


Figure 4. On-Resistance vs. Drain Current and Gate Voltage

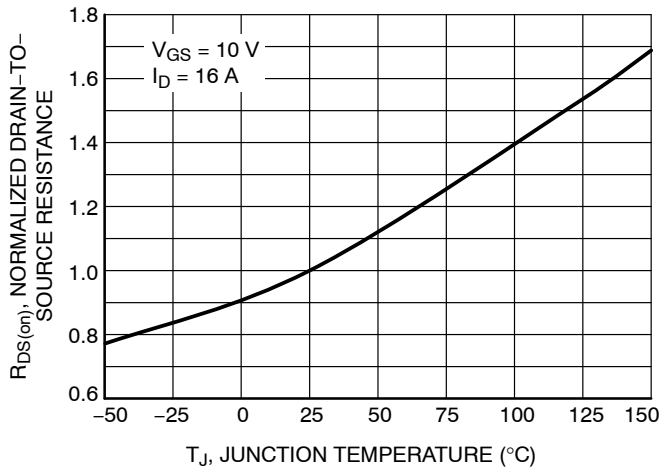


Figure 5. On-Resistance Variation with Temperature

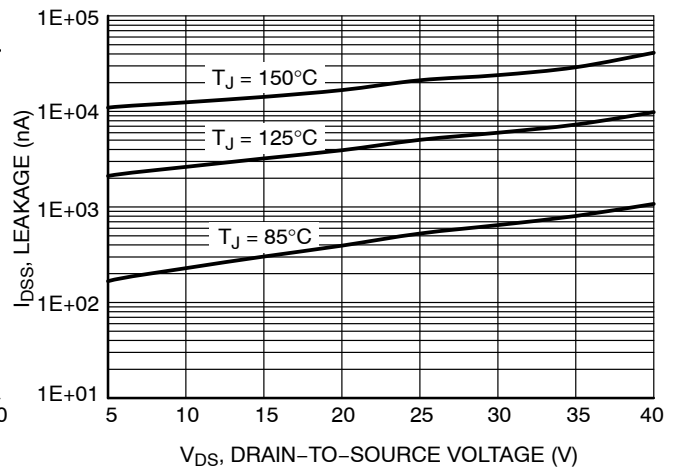


Figure 6. Drain-to-Source Leakage Current vs. Voltage

NTTFS2D8N04HL

TYPICAL CHARACTERISTICS

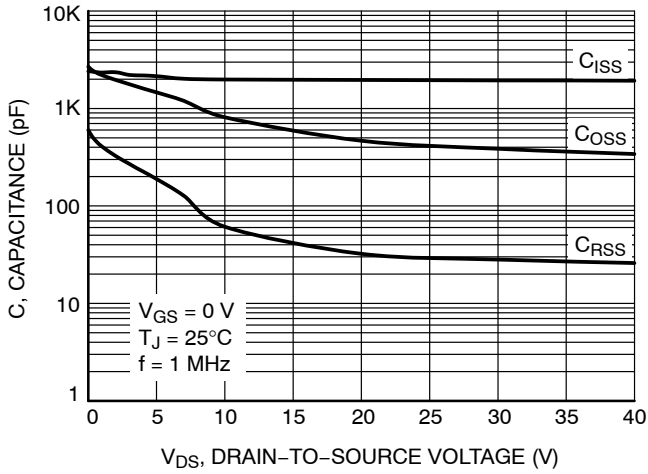


Figure 7. Capacitance Variation

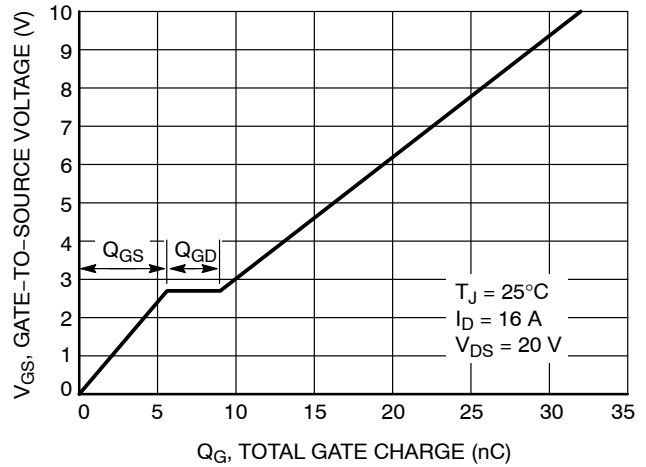


Figure 8. Gate-to-Source Voltage vs. Total Charge

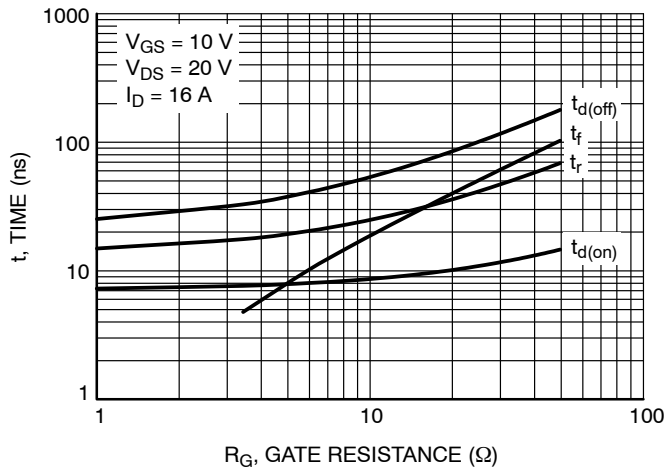


Figure 9. Resistive Switching Time Variation vs. Gate Resistance

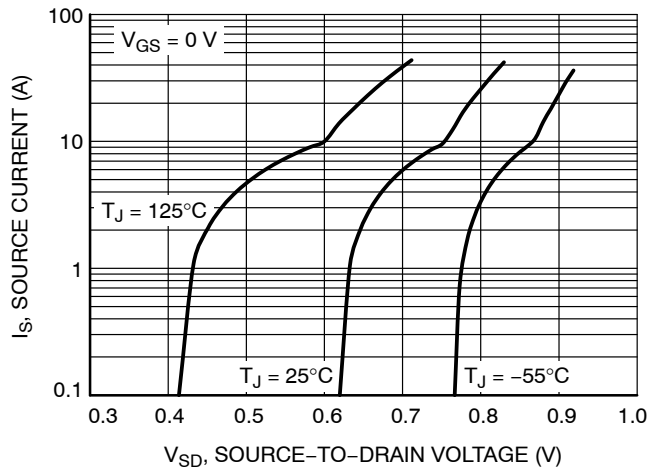


Figure 10. Diode Forward Voltage vs. Current

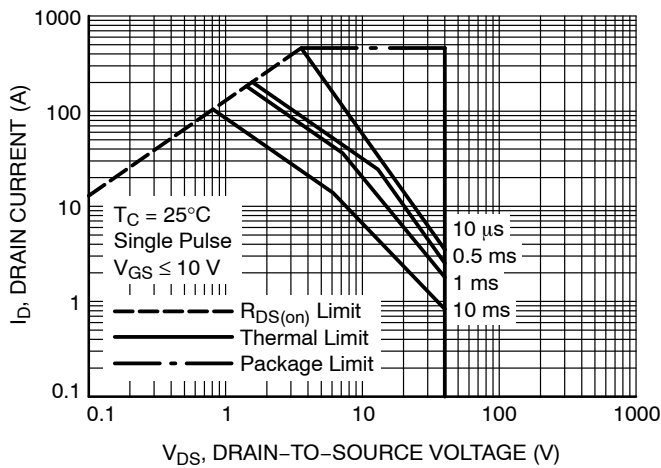


Figure 11. Maximum Rated Forward Biased Safe Operating Area

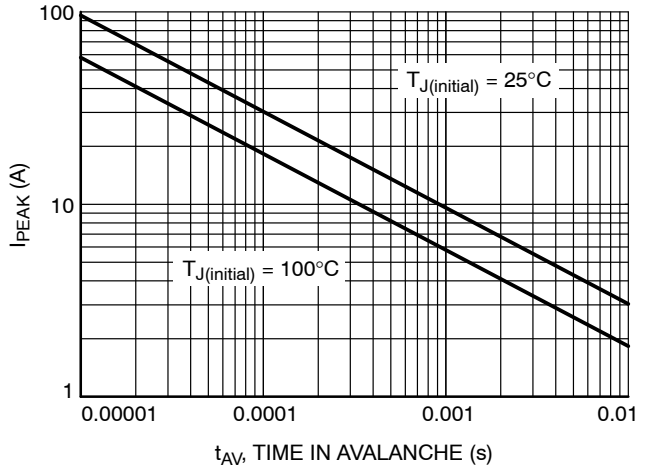


Figure 12. Maximum Drain Current vs. Time in Avalanche

NTTFS2D8N04HL

TYPICAL CHARACTERISTICS

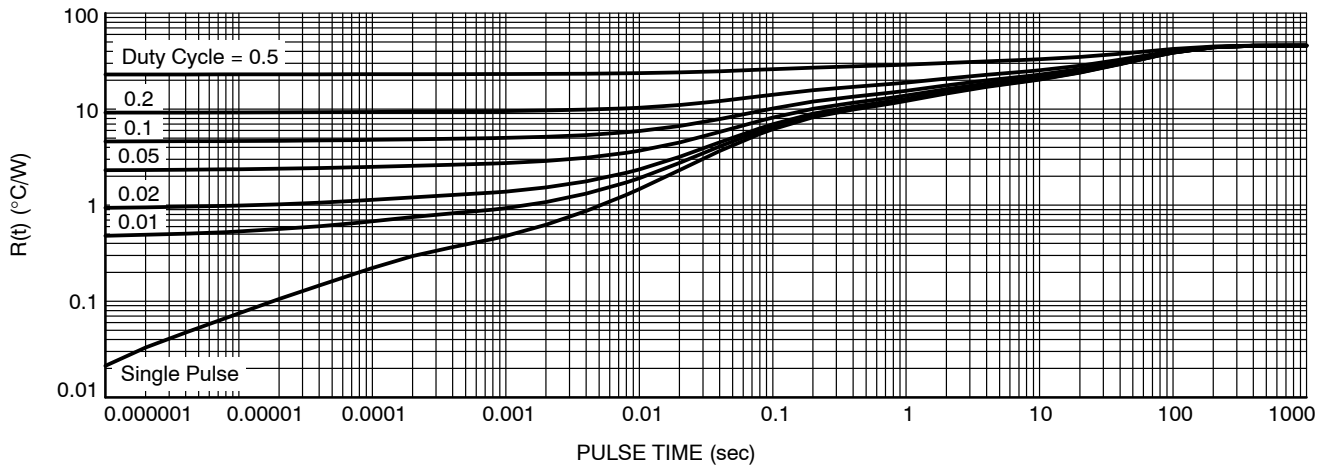


Figure 13. Transient Thermal Impedance

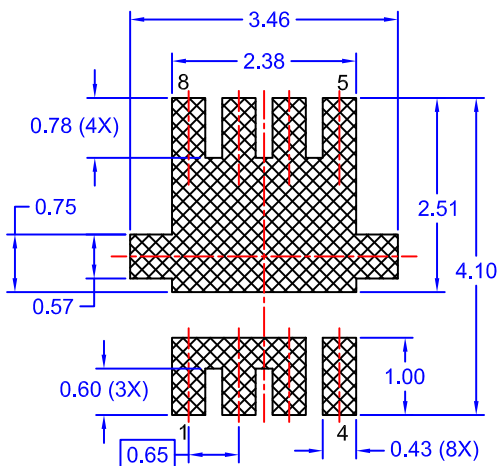
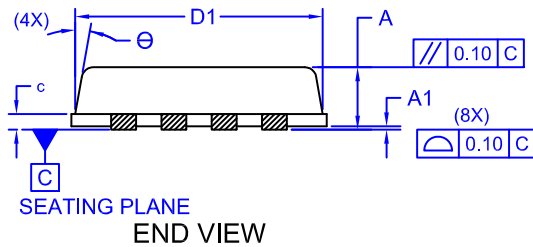
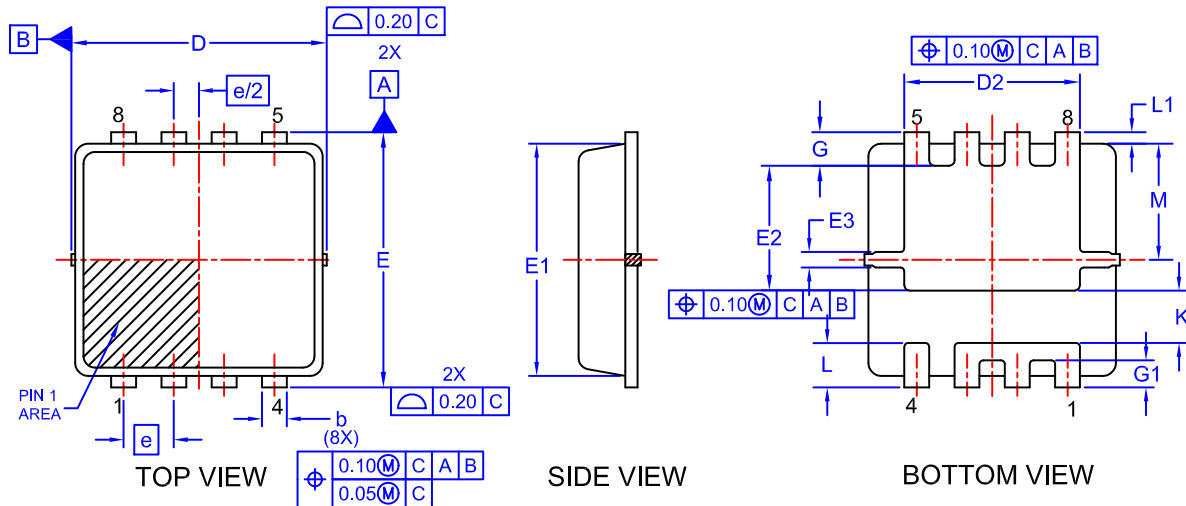
MECHANICAL CASE OUTLINE PACKAGE DIMENSIONS

ON Semiconductor®



WDFN8 3.3x3.3, 0.65P
CASE 511DY
ISSUE A

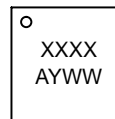
DATE 21 AUG 2018



NOTES:

1. CONTROLLING DIMENSION: MILLIMETERS
2. DIMENSIONS D1 & E1 DO NOT INCLUDE MOLD FLASH PROTRUSIONS NOR GATE BURRS.

GENERIC MARKING DIAGRAM*



XXXX = Specific Device Code
A = Assembly Location
Y = Year Code
WW = Work Week Code

DIM	MILLIMETERS		
	MIN	NOM	MAX
A	0.70	0.75	0.80
A1	0.00	-	0.05
b	0.23	0.33	0.43
c	0.15	0.20	0.25
D	3.20	3.30	3.40
D1	2.95	3.13	3.30
E	3.20	3.30	3.40
E1	2.80	3.00	3.15
E2	1.40	1.60	1.80
E3	0.15	0.25	0.40
e	0.65 BSC		
G	0.30	0.43	0.55
G1	0.25	0.35	0.45
K	0.55	0.75	0.95
L	0.35	0.52	0.65
L1	0.06	0.15	0.30
M	1.35	1.50	1.60
Θ	0	-	12

*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:	98AON90827G	Electronic versions are uncontrolled except when accessed directly from the Document Repository. Printed versions are uncontrolled except when stamped "CONTROLLED COPY" in red.
DESCRIPTION:	WDFN8 3.3x3.3, 0.65P	PAGE 1 OF 1

ON Semiconductor and ON 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.

ADDITIONAL INFORMATION

TECHNICAL PUBLICATIONS:

Technical Library: www.onsemi.com/design/resources/technical-documentation
onsemi Website: www.onsemi.com

ONLINE SUPPORT: www.onsemi.com/support

For additional information, please contact your local Sales Representative at www.onsemi.com/support/sales