

# MOSFET - Power, Single N-Channel, Small Signal

## 20 V, 220 mA



ON Semiconductor®

[www.onsemi.com](http://www.onsemi.com)

## NTNS0K8N021Z

### Features

- Low Profile Ultra Small Package, XDFN3 (0.62 x 0.42 x 0.4 mm) for Extremely Space-Constrained Applications
- 1.5 V Gate Drive
- These Devices are Pb-Free, Halogen Free/BFR Free and are RoHS Compliant

### Applications

- Small Signal Load Switch
- High Speed Interfacing
- Level Shift

### MAXIMUM RATINGS (T<sub>J</sub> = 25°C unless otherwise stated)

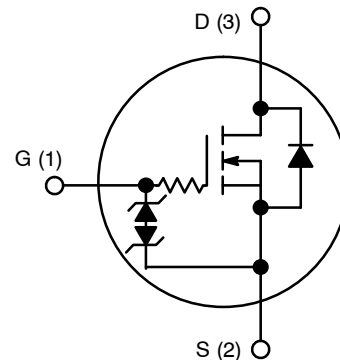
Parameter			Symbol	Value	Unit
Drain-to-Source Voltage			V <sub>DSS</sub>	20	V
Gate-to-Source Voltage			V <sub>GS</sub>	±8	V
Continuous Drain Current (Note 1)	Steady State	T <sub>A</sub> = 25°C	I <sub>D</sub>	220	mA
		T <sub>A</sub> = 85°C		158	
	t ≤ 5 s	T <sub>A</sub> = 25°C		253	
Power Dissipation (Note 1)	Steady State	T <sub>A</sub> = 25°C	P <sub>D</sub>	125	mW
	t ≤ 5 s			166	
Pulsed Drain Current	t <sub>p</sub> = 10 μs		I <sub>DM</sub>	846	mA
Operating Junction and Storage Temperature Range			T <sub>J</sub> , T <sub>STG</sub>	-55 to 150	°C
Source Current (Body Diode) (Note 2)			I <sub>S</sub>	200	mA
Lead Temperature for Soldering Purposes (1/8" from case for 10 s)			T <sub>L</sub>	260	°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.

1. Surface-mounted on FR4 board using the minimum recommended pad size, or 2 mm<sup>2</sup>, 1 oz Cu.
2. Pulse Test: pulse width ≤ 300 μs, duty cycle ≤ 2%

V <sub>(BR)DSS</sub>	R <sub>DS(on)</sub> MAX	I <sub>D</sub> Max
20 V	1.5 Ω @ 4.5 V	220 mA
	3.3 Ω @ 1.8 V	
	8.0 Ω @ 1.2 V	

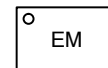
### N-CHANNEL MOSFET



### MARKING DIAGRAM



XDFN3  
CASE 711BH



1

E = Specific Device Code  
M = Date Code

### ORDERING INFORMATION

Device	Package	Shipping†
NTNS0K8N021ZTCG	XDFN3 (Pb-Free)	8000 / 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.

# NTNS0K8N021Z

## THERMAL RESISTANCE RATINGS

Parameter	Symbol	Max	Unit
Junction-to-Ambient – Steady State (Note 3)	$R_{\theta JA}$	998	°C/W
Junction-to-Ambient – $t \leq 5$ s (Note 3)	$R_{\theta JA}$	751	

3. Surface-mounted on FR4 board using the minimum recommended pad size, or 2 mm<sup>2</sup>, 1 oz Cu.

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

Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
-----------	--------	----------------	-----	-----	-----	------

### OFF CHARACTERISTICS

Drain-to-Source Breakdown Voltage	$V_{(BR)DSS}$	$V_{GS} = 0$ V, $I_D = 250$ $\mu$ A	20			V
Zero Gate Voltage Drain Current	$I_{DSS}$	$V_{GS} = 0$ V, $V_{DS} = 5$ V, $T_J = 25^\circ\text{C}$			50	nA
Zero Gate Voltage Drain Current	$I_{DSS}$	$V_{GS} = 0$ V, $V_{DS} = 16$ V, $T_J = 25^\circ\text{C}$			100	nA
Gate-to-Source Leakage Current	$I_{GSS}$	$V_{DS} = 0$ V, $V_{GS} = \pm 5$ V			$\pm 100$	nA

### ON CHARACTERISTICS (Note 4)

Gate Threshold Voltage	$V_{GS(TH)}$	$V_{GS} = V_{DS}$ , $I_D = 250$ $\mu$ A	0.4		1.0	V
Drain-to-Source On Resistance	$R_{DS(on)}$	$V_{GS} = 4.5$ V, $I_D = 100$ mA		0.8	1.5	$\Omega$
		$V_{GS} = 1.8$ V, $I_D = 20$ mA		1.4	3.0	
		$V_{GS} = 1.2$ V, $I_D = 10$ mA		3.2	8.0	
Forward Transconductance	$g_{FS}$	$V_{DS} = 5$ V, $I_D = 125$ mA		0.48		S
Source-Drain Diode Voltage	$V_{SD}$	$V_{GS} = 0$ V, $I_S = 10$ mA		0.6	1.0	V

### CHARGES & CAPACITANCES

Input Capacitance	$C_{ISS}$	$V_{GS} = 0$ V, freq = 1 MHz, $V_{DS} = 15$ V		12.3		pF
Output Capacitance	$C_{OSS}$			3.4		
Reverse Transfer Capacitance	$C_{RSS}$			2.5		

### SWITCHING CHARACTERISTICS, $V_{GS} = 4.5$ V (Note 4)

Turn-On Delay Time	$t_{d(ON)}$	$V_{GS} = 4.5$ V, $V_{DD} = 15$ V, $I_D = 200$ mA, $R_G = 2$ $\Omega$		16.5		ns
Rise Time	$t_r$			25.5		
Turn-Off Delay Time	$t_{d(OFF)}$			142		
Fall Time	$t_f$			80		

4. Switching characteristics are independent of operating junction temperatures

TYPICAL CHARACTERISTICS

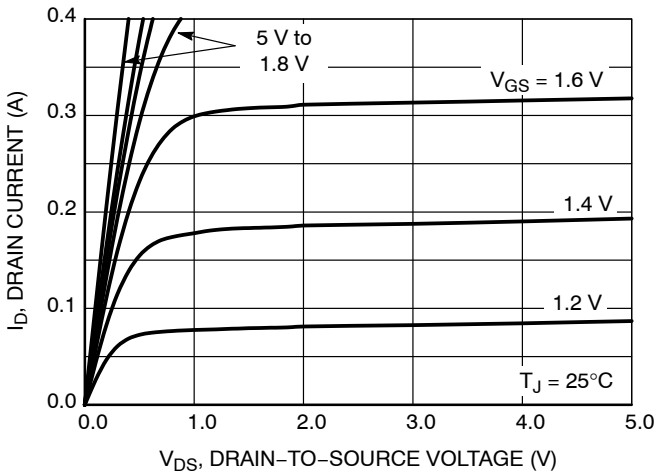


Figure 1. On-Region Characteristics

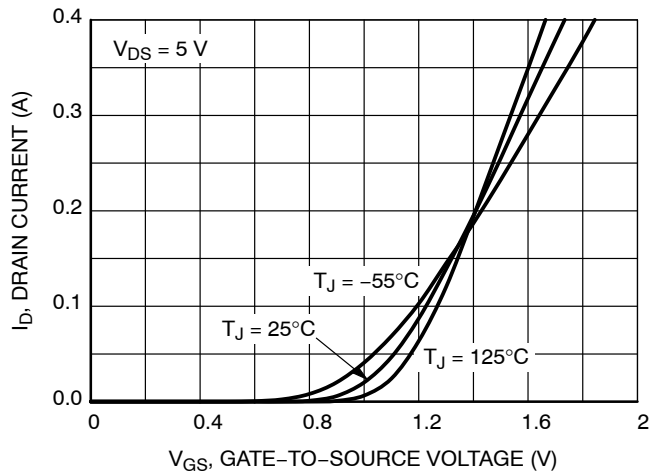


Figure 2. Transfer Characteristics

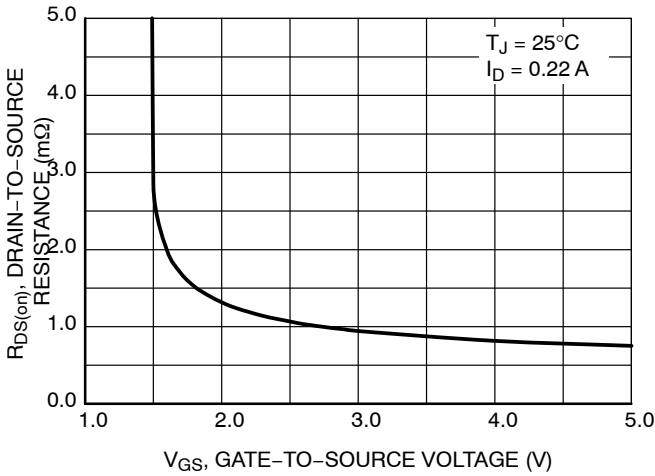


Figure 3. On-Resistance vs. Gate-to-Source Voltage

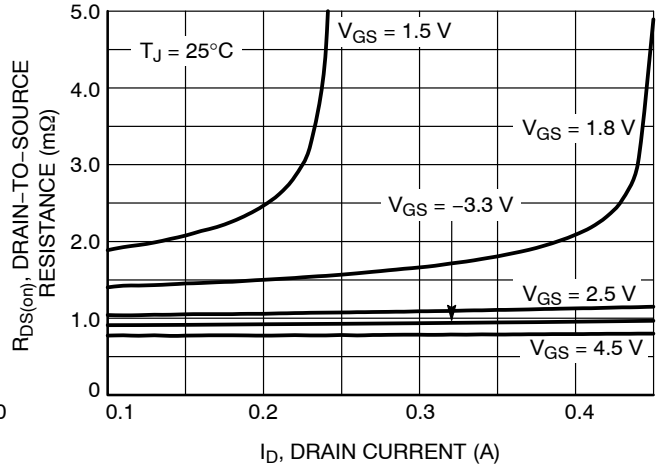


Figure 4. On-Resistance vs. Drain Current and Gate Voltage

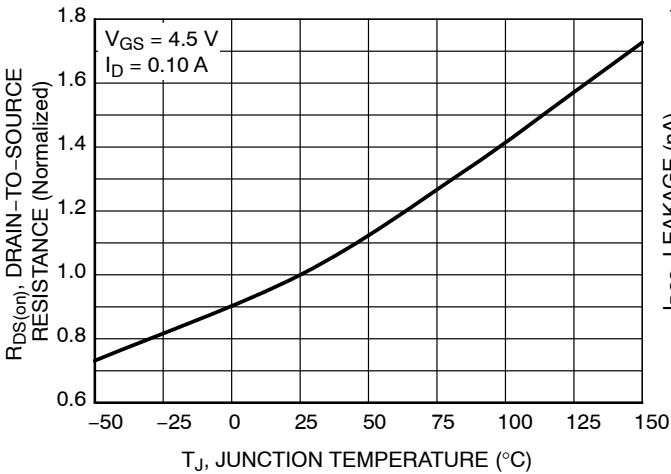


Figure 5. On-Resistance Variation with Temperature

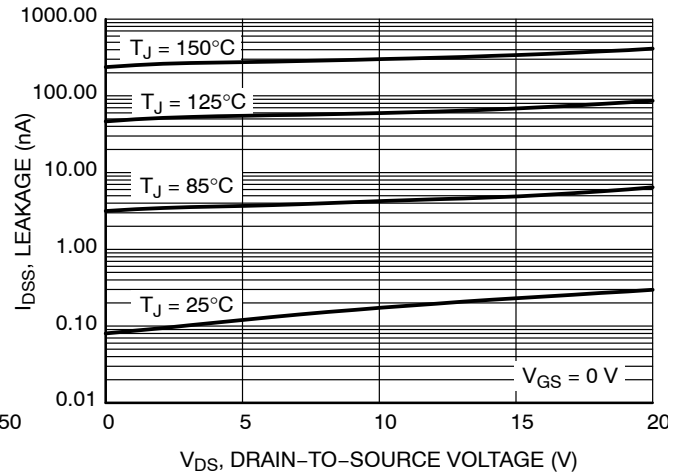


Figure 6. Drain-to-Source Leakage Current vs. Voltage

# NTNS0K8N021Z

## TYPICAL CHARACTERISTICS

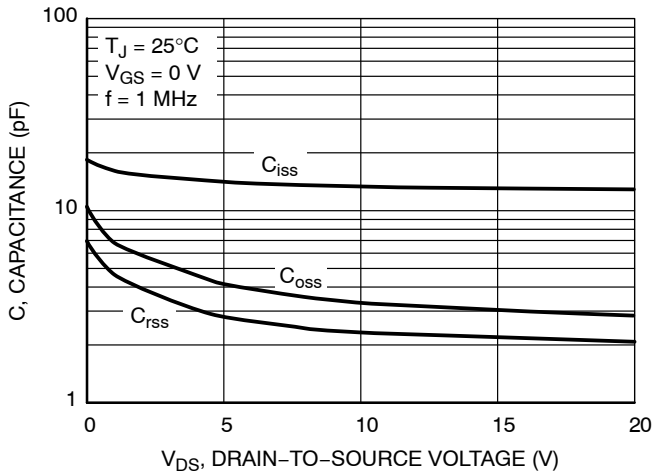


Figure 7. Capacitance Variation

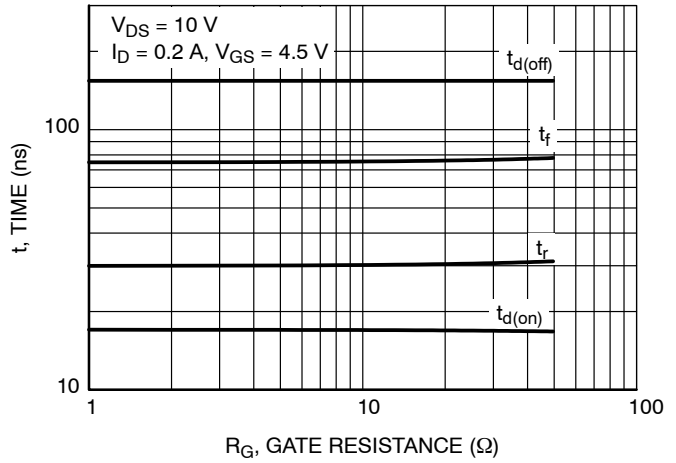


Figure 8. Resistive Switching Time Variation vs. Gate Resistance

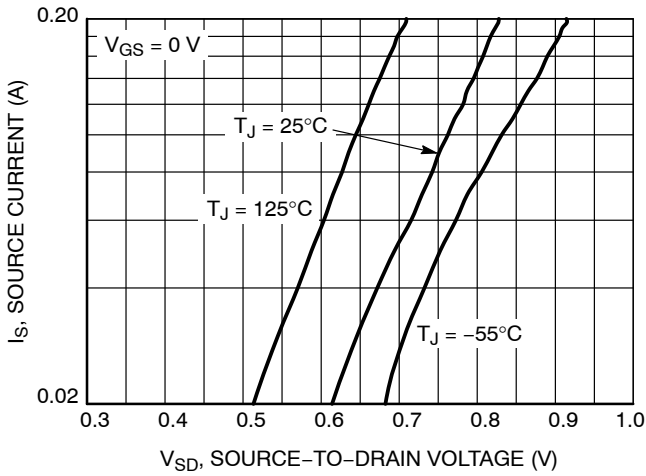


Figure 9. Diode Forward Voltage vs. Current

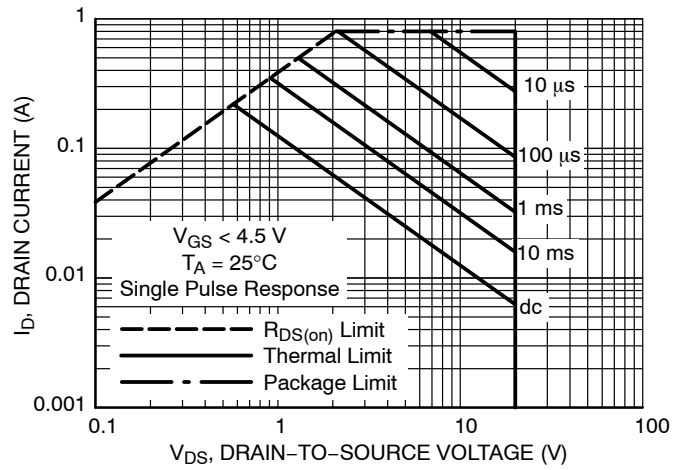


Figure 10. Maximum Rated Forward Biased Safe Operating Area

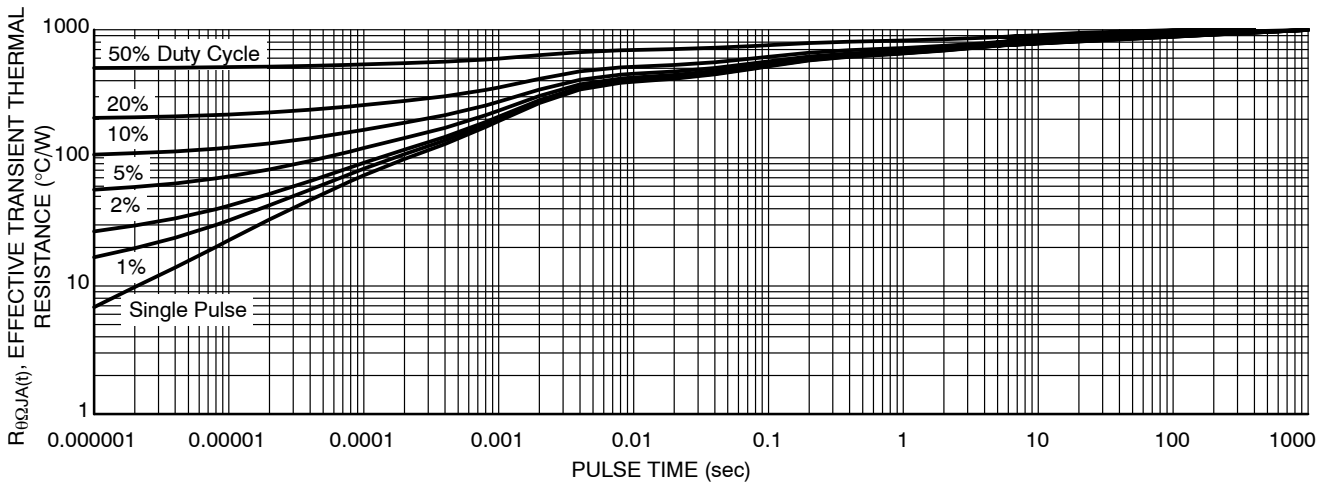


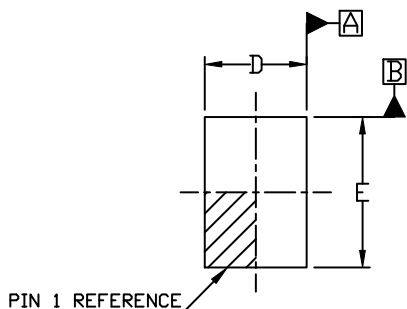
Figure 11. Thermal Response



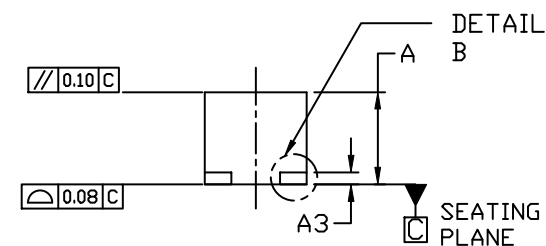
SCALE 8:1

**XDFN3 0.42x0.62, 0.3P**  
CASE 711BH  
ISSUE A

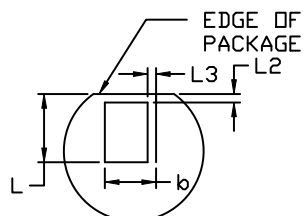
DATE 29 APR 2018



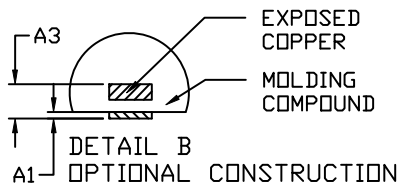
TOP VIEW



SIDE VIEW

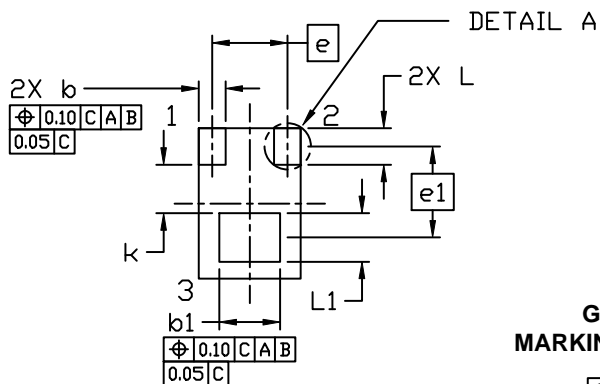


DETAIL A  
OPTIONAL  
CONSTRUCTION



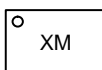
DETAIL B  
OPTIONAL CONSTRUCTION

DIM	MILLIMETERS		
	MIN.	NOM.	MAX.
A	0.33	0.38	0.43
A1	---	---	0.07
A3	0.13 REF		
b	0.05	0.11	0.17
b1	0.20	0.25	0.30
D	0.32	0.42	0.52
E	0.52	0.62	0.72
e	0.30 BSC		
e1	0.38 BSC		
L	0.09	0.15	0.21
L1	0.15	0.20	0.25
L2	---	---	0.03
L3	---	---	0.03
k	0.20 REF		



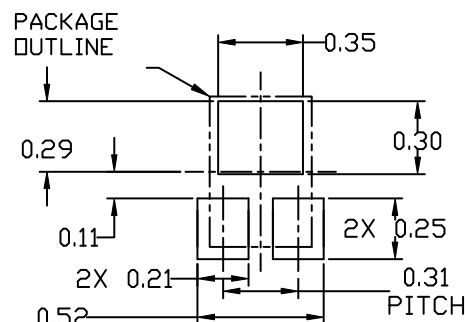
BOTTOM VIEW

**GENERIC MARKING DIAGRAM\***



X = Specific Device Code  
M = Date Code

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



RECOMMENDED  
MOUNTING FOOTPRINT

<b>DOCUMENT NUMBER:</b>	<b>98AON64946G</b>	Electronic versions are uncontrolled except when accessed directly from the Document Repository. Printed versions are uncontrolled except when stamped "CONTROLLED COPY" in red.
<b>DESCRIPTION:</b>	<b>XDFN3 0.42x0.62, 0.3P</b>	<b>PAGE 1 OF 1</b>

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](http://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](mailto:orderlit@onsemi.com)

**onsemi Website:** [www.onsemi.com](http://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