

# NTNS3193NZ

## MOSFET – Single N-Channel, Small Signal, XLLGA3, 0.62 x 0.62 x 0.4 20 V, 224 mA



ON Semiconductor®

<http://onsemi.com>

### Features

- Single N-Channel MOSFET
- Ultra Small and Thin Package (0.62 x 0.62 x 0.4 mm)
- Low  $R_{DS(on)}$  Solution in 0.62 x 0.62 mm Package
- 1.5 V Gate Voltage Rating
- These Devices are Pb-Free, Halogen Free/BFR Free and are RoHS Compliant

### Applications

- Small Signal Load Switch
- Analog Switch
- High Speed Interfacing
- Optimized for Power Management in Ultra Portable Products

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

Parameter		Symbol	Value	Units	
Drain-to-Source Voltage		$V_{DSS}$	20	V	
Gate-to-Source Voltage		$V_{GS}$	$\pm 8.0$	V	
Continuous Drain Current (Note 1)	Steady State	$T_A = 25^\circ\text{C}$	$I_D$	224	mA
				$T_A = 85^\circ\text{C}$	
	$t \leq 5$ s	$T_A = 25^\circ\text{C}$		241	
Power Dissipation (Note 1)	Steady State	$T_A = 25^\circ\text{C}$	$P_D$	120	mW
				$t \leq 5$ s	
Pulsed Drain Current		$t_p = 10 \mu\text{s}$	$I_{DM}$	673	mA
Operating Junction and Storage Temperature		$T_J, T_{STG}$	-55 to 150		$^\circ\text{C}$
Source Current (Body Diode)		$I_S$	120	mA	
Lead Temperature for Soldering Purposes (1/8" from case for 10 s)		$T_L$	260		$^\circ\text{C}$

Stresses exceeding Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.

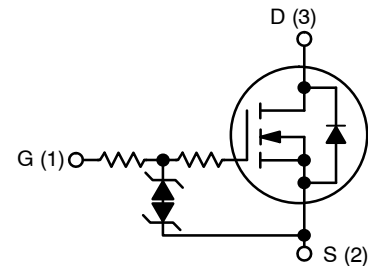
### THERMAL RESISTANCE RATINGS

Parameter	Symbol	Max	Units
Junction-to-Ambient – Steady State (Note 1)	$R_{\theta JA}$	1040	$^\circ\text{C}/\text{W}$
Junction-to-Ambient – $t \leq 5$ s (Note 1)	$R_{\theta JA}$	900	

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  $\leq 300 \mu\text{s}$ , duty cycle  $\leq 2\%$ .

MOSFET		
$V_{(BR)DSS}$	$R_{DS(on)}$ MAX	$I_D$ MAX
20 V	1.4 $\Omega$ @ 4.5 V	224 mA
	1.9 $\Omega$ @ 2.5 V	
	2.2 $\Omega$ @ 1.8 V	
	4.3 $\Omega$ @ 1.5 V	

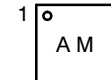
### N-Channel MOSFET



### MARKING DIAGRAM



XLLGA3  
CASE 713AB



A = Specific Device Code  
M = Date Code

### ORDERING INFORMATION

Device	Package	Shipping†
NTNS3193N2T5G	XLLGA3 (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 Specifications Brochure, BRD8011/D.

# NTNS3193NZ

## ELECTRICAL CHARACTERISTICS (T<sub>J</sub> = 25°C unless otherwise specified)

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

### OFF CHARACTERISTICS

Drain-to-Source Breakdown Voltage	V <sub>(BR)DSS</sub>	V <sub>GS</sub> = 0 V, I <sub>D</sub> = 250 μA	20			V
Drain-to-Source Breakdown Voltage Temperature Coefficient	V <sub>(BR)DSS</sub> /T <sub>J</sub>	I <sub>D</sub> = -250 μA, ref to 25°C		19		mV/°C
Zero Gate Voltage Drain Current	I <sub>DSS</sub>	V <sub>GS</sub> = 0 V, V <sub>DS</sub> = 20 V			1.0	μA
Gate-to-Source Leakage Current	I <sub>GSS</sub>	V <sub>DS</sub> = 0 V, V <sub>GS</sub> = ±8.0 V			±2.0	μA

### ON CHARACTERISTICS (Note 3)

Gate Threshold Voltage	V <sub>GS(TH)</sub>	V <sub>GS</sub> = V <sub>DS</sub> , I <sub>D</sub> = 250 μA	0.4		1.0	V
Negative Gate Threshold Temperature Coefficient	V <sub>GS(TH)</sub> /T <sub>J</sub>			1.9		mV/°C
Drain-to-Source On Resistance	R <sub>DS(on)</sub>	V <sub>GS</sub> = 4.5 V, I <sub>D</sub> = 100 mA		0.65	1.4	Ω
		V <sub>GS</sub> = 2.5 V, I <sub>D</sub> = 50 mA		0.9	1.9	
		V <sub>GS</sub> = 1.8 V, I <sub>D</sub> = 20 mA		1.1	2.2	
		V <sub>GS</sub> = 1.5 V, I <sub>D</sub> = 10 mA		1.4	4.3	
Forward Transconductance	g <sub>FS</sub>	V <sub>DS</sub> = 5 V, I <sub>D</sub> = 100 mA		0.56		S
Source-Drain Diode Voltage	V <sub>SD</sub>	V <sub>GS</sub> = 0 V, I <sub>S</sub> = 10 mA		0.55	1.0	V

### CHARGES & CAPACITANCES

Input Capacitance	C <sub>ISS</sub>	V <sub>GS</sub> = 0 V, f = 1 MHz, V <sub>DS</sub> = 15 V		15.8		pF
Output Capacitance	C <sub>OSS</sub>			3.5		
Reverse Transfer Capacitance	C <sub>RSS</sub>			2.4		
Total Gate Charge	Q <sub>G(TOT)</sub>	V <sub>GS</sub> = 4.5 V, V <sub>DS</sub> = 15 V, I <sub>D</sub> = 200 mA		0.70		nC
Threshold Gate Charge	Q <sub>G(TH)</sub>			0.05		
Gate-to-Source Charge	Q <sub>GS</sub>			0.14		
Gate-to-Drain Charge	Q <sub>GD</sub>			0.10		

### SWITCHING CHARACTERISTICS, V<sub>GS</sub> = 4.5 V (Note 3)

Turn-On Delay Time	t <sub>d(ON)</sub>	V <sub>GS</sub> = 4.5 V, V <sub>DD</sub> = 15 V, I <sub>D</sub> = 200 mA, R <sub>G</sub> = 2 Ω		18		ns
Rise Time	t <sub>r</sub>			35		
Turn-Off Delay Time	t <sub>d(OFF)</sub>			201		
Fall Time	t <sub>f</sub>			110		

3. Switching characteristics are independent of operating junction temperatures.

# NTNS3193NZ

## TYPICAL CHARACTERISTICS

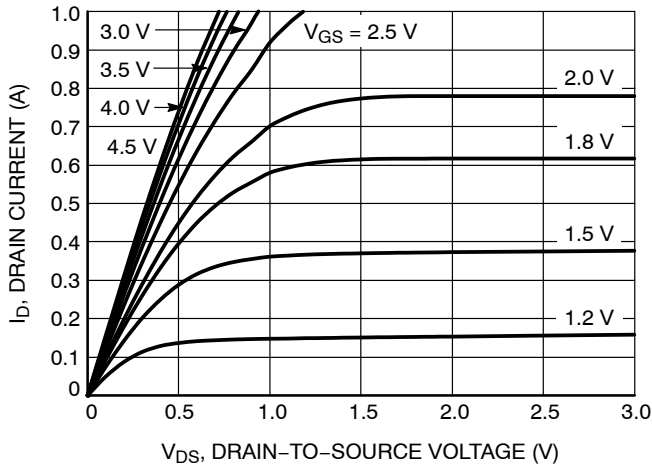


Figure 1. On-Region Characteristics

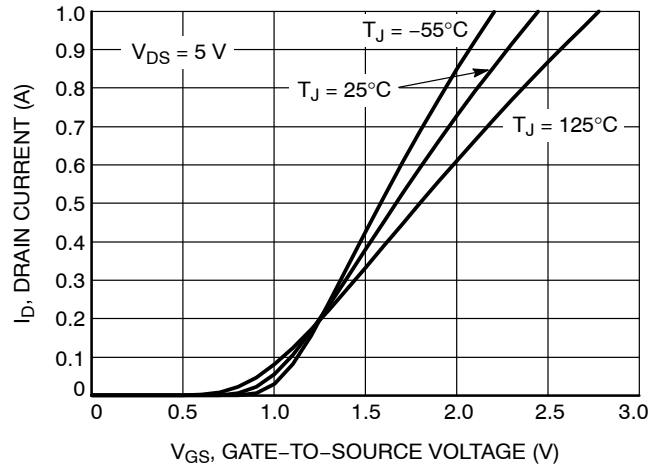


Figure 2. Transfer Characteristics

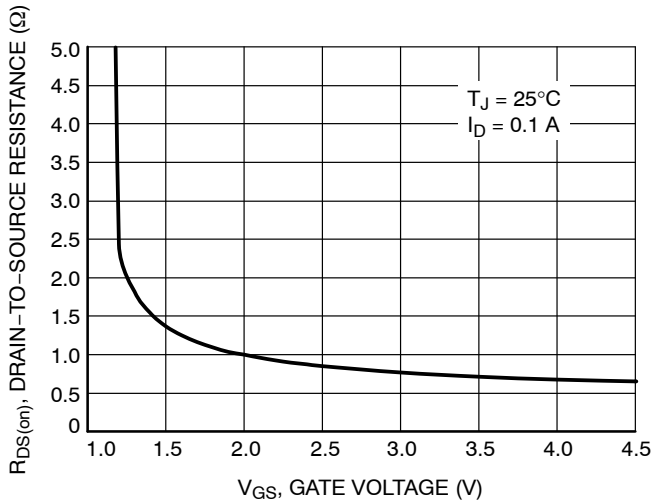


Figure 3. On-Resistance vs. Gate-to-Source Voltage

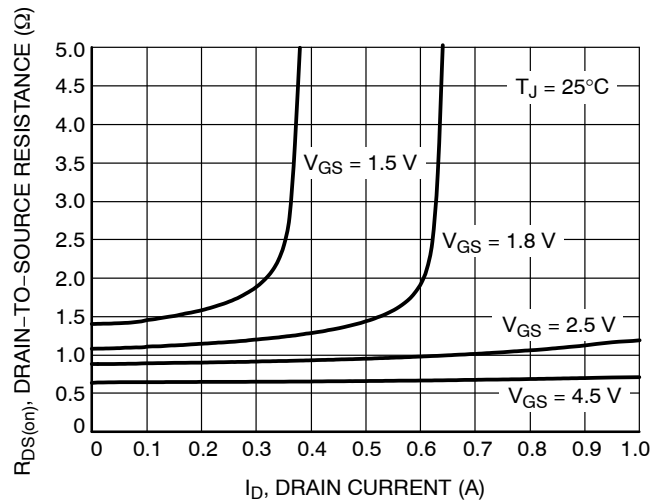


Figure 4. On-Resistance vs. Drain Current and Gate Voltage

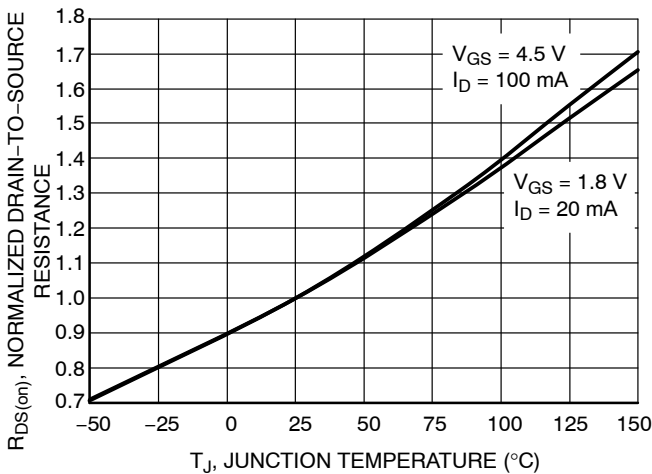


Figure 5. On-Resistance Variation with Temperature

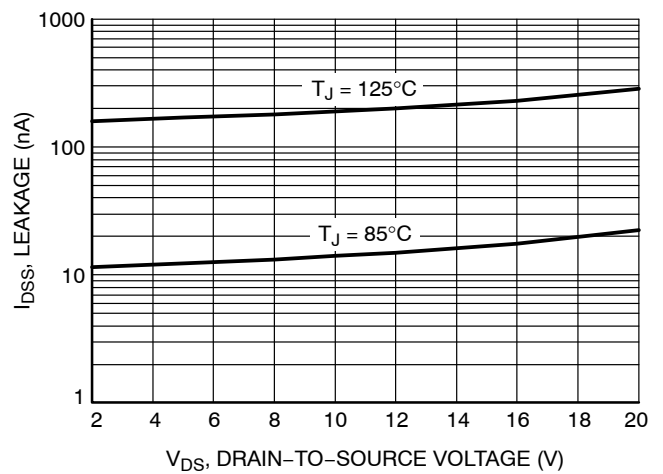


Figure 6. Drain-to-Source Leakage Current vs. Voltage

# NTNS3193NZ

## TYPICAL CHARACTERISTICS

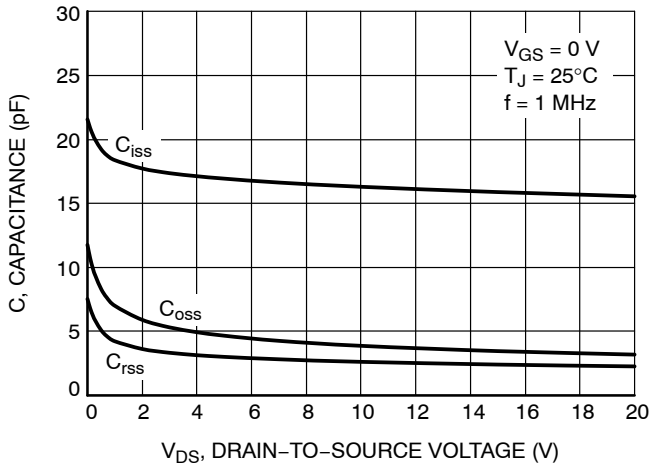


Figure 7. Capacitance Variation

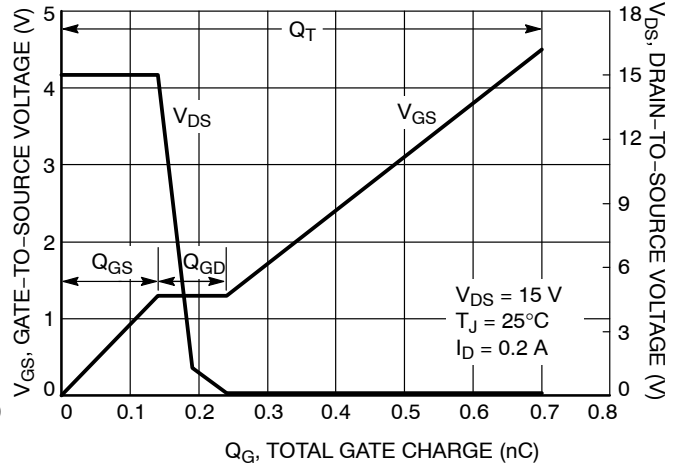


Figure 8. Gate-to-Source and Drain-to-Source Voltage vs. Total Charge

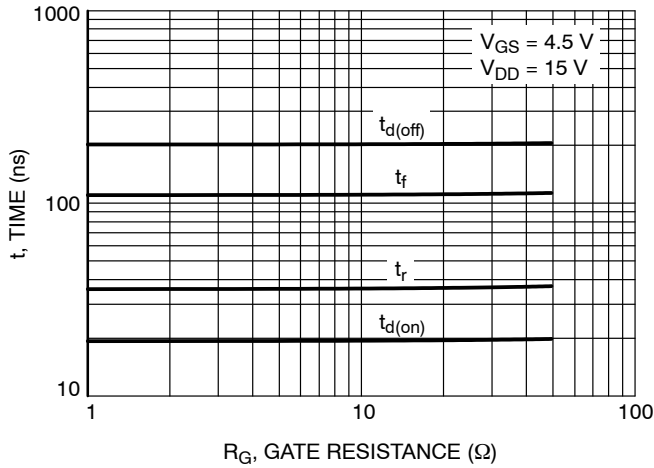


Figure 9. Resistive Switching Time Variation vs. Gate Resistance

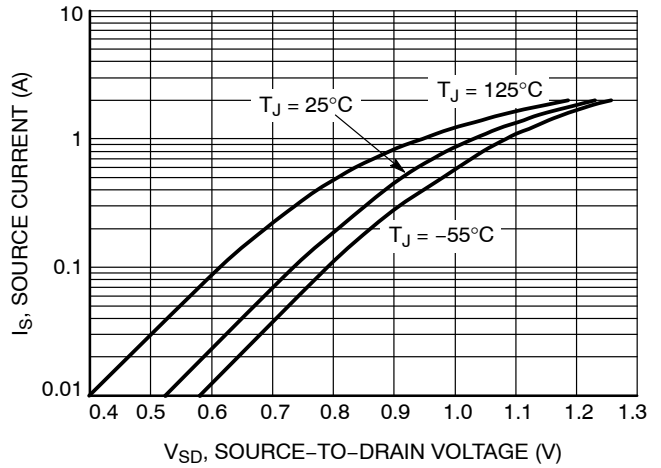


Figure 10. Diode Forward Voltage vs. Current

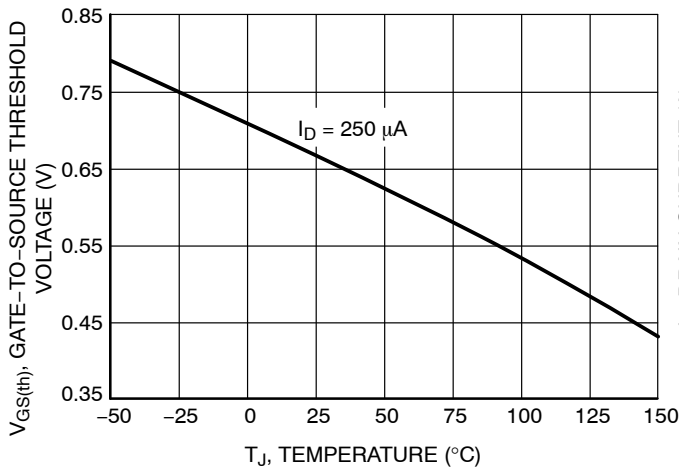


Figure 11. Threshold Voltage

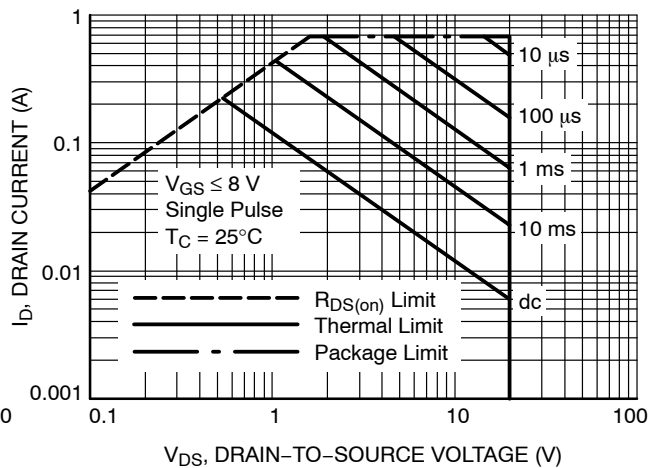


Figure 12. Maximum Rated Forward Biased Safe Operating Area

# NTNS3193NZ

## TYPICAL CHARACTERISTICS

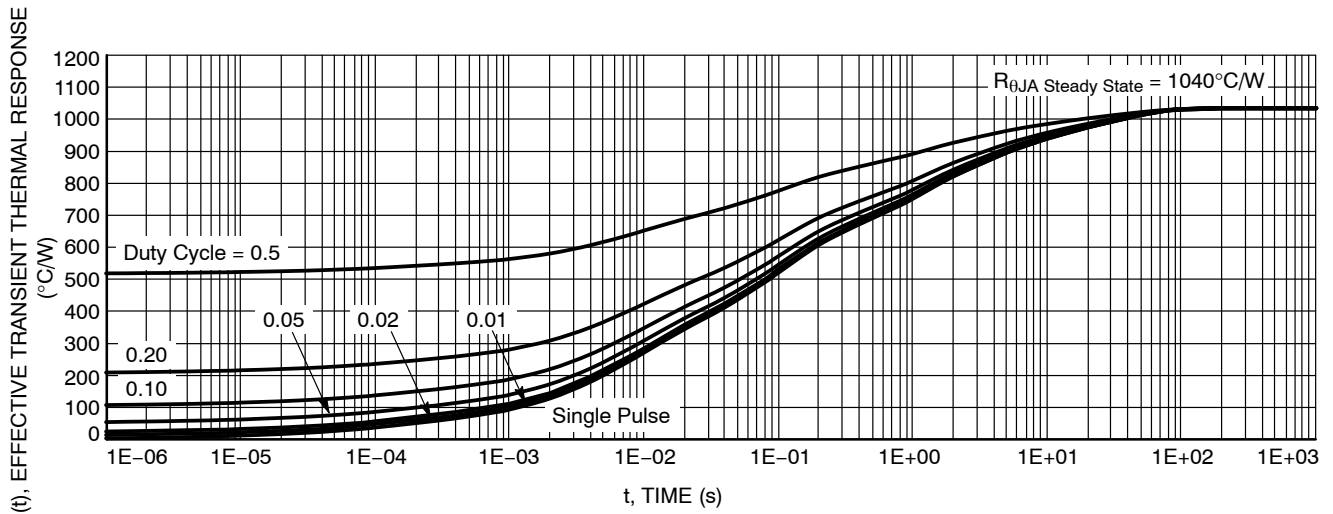
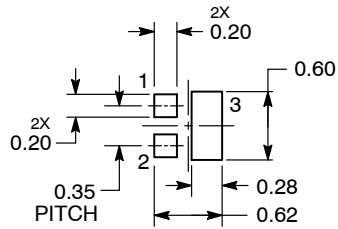


Figure 13. FET Thermal Response

### MINIMUM RECOMMENDED SOLDER FOOTPRINT\*



DIMENSIONS: MILLIMETERS

\*Dependent upon end user capabilities, this footprint could be used as a minimum.

# MECHANICAL CASE OUTLINE

## PACKAGE DIMENSIONS

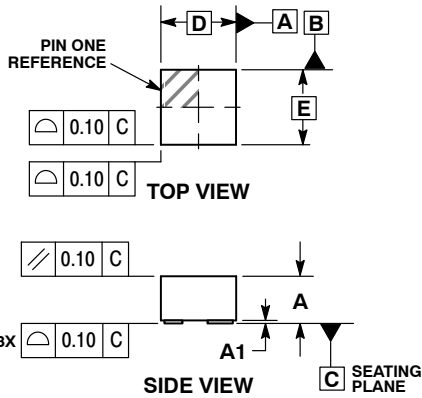
ON Semiconductor®



SCALE 8:1

**XLLGA3, 0.62x0.62, 0.35P**  
**CASE 713AB**  
**ISSUE O**

DATE 25 SEP 2012



**NOTES:**

1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: MILLIMETERS.

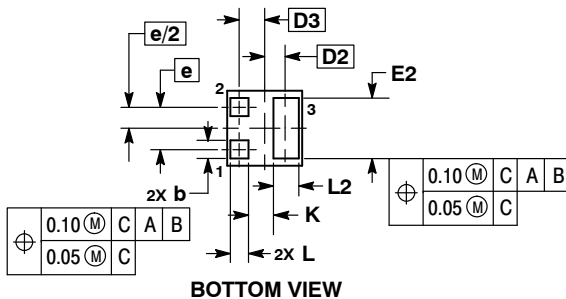
MILLIMETERS		
DIM	MIN	MAX
A	0.340	0.440
A1	0.000	0.030
b	0.100	0.200
D	0.620 BSC	
D2	0.175 BSC	
D3	0.205 BSC	
E	0.620 BSC	
E2	0.400	0.600
e	0.350 BSC	
K	0.200 REF	
L	0.090	0.210
L2	0.110	0.310

**GENERIC MARKING DIAGRAM\***

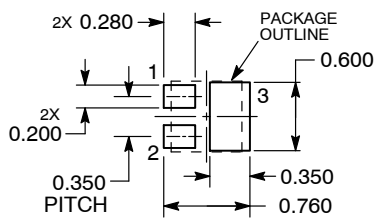


- X = Specific Device Code
- M = Date Code

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



**RECOMMENDED SOLDER FOOTPRINT\***



DIMENSIONS: MILLIMETERS

\*For additional information on our Pb-Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

<b>DOCUMENT NUMBER:</b>	<b>98AON84074E</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>XLLGA3, 0.62X0.62, 0.35P</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