

NTNS3193NZ

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

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}	± 8.0	V	
Continuous Drain Current (Note 1)	Steady State	$T_A = 25^\circ\text{C}$	224	mA	
		$T_A = 85^\circ\text{C}$			
	$t \leq 5 \text{ s}$	$T_A = 25^\circ\text{C}$	241		
Power Dissipation (Note 1)	Steady State	$T_A = 25^\circ\text{C}$	120	mW	
		$T_A = 85^\circ\text{C}$			
	$t \leq 5 \text{ s}$	$T_A = 25^\circ\text{C}$	139		
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 – $t \leq 5 \text{ s}$ (Note 1)	$R_{\theta JA}$	900	

1. Surface Mounted on FR4 Board using the minimum recommended pad size, (or 2 mm^2), 1 oz Cu.
2. Pulse Test: pulse width $\leq 300 \mu\text{s}$, duty cycle $\leq 2\%$.



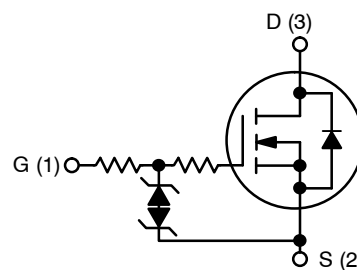
ON Semiconductor®

<http://onsemi.com>

MOSFET

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

N-Channel MOSFET



MARKING DIAGRAM



XLLGA3
CASE 713AB



A = Specific Device Code
M = Date Code

ORDERING INFORMATION

Device	Package	Shipping†
NTNS3193NZT5G	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.

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ELECTRICAL CHARACTERISTICS (T_J = 25°C unless otherwise specified)

Parameter	Symbol	Test Condition	Min	Typ	Max	Units
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OFF CHARACTERISTICS

Drain-to-Source Breakdown Voltage	$V_{(BR)DSS}$	$V_{GS} = 0\text{ V}, I_D = 250\ \mu\text{A}$	20			V
Drain-to-Source Breakdown Voltage Temperature Coefficient	$V_{(BR)DSS}/T_J$	$I_D = -250\ \mu\text{A}, \text{ref to } 25^\circ\text{C}$		19		mV/°C
Zero Gate Voltage Drain Current	I_{DSS}	$V_{GS} = 0\text{ V}, V_{DS} = 20\text{ V}$ $T_J = 25^\circ\text{C}$			1.0	μA
Gate-to-Source Leakage Current	I_{GSS}	$V_{DS} = 0\text{ V}, V_{GS} = \pm 8.0\text{ V}$			±2.0	μA

ON CHARACTERISTICS (Note 3)

Gate Threshold Voltage	$V_{GS(TH)}$	$V_{GS} = V_{DS}, I_D = 250\ \mu\text{A}$	0.4		1.0	V
Negative Gate Threshold Temperature Coefficient	$V_{GS(TH)}/T_J$			1.9		mV/°C
Drain-to-Source On Resistance	$R_{DS(on)}$	$V_{GS} = 4.5\text{ V}, I_D = 100\text{ mA}$		0.65	1.4	Ω
		$V_{GS} = 2.5\text{ V}, I_D = 50\text{ mA}$		0.9	1.9	
		$V_{GS} = 1.8\text{ V}, I_D = 20\text{ mA}$		1.1	2.2	
		$V_{GS} = 1.5\text{ V}, I_D = 10\text{ mA}$		1.4	4.3	
Forward Transconductance	g_{FS}	$V_{DS} = 5\text{ V}, I_D = 100\text{ mA}$		0.56		S
Source-Drain Diode Voltage	V_{SD}	$V_{GS} = 0\text{ V}, I_S = 10\text{ mA}$		0.55	1.0	V

CHARGES & CAPACITANCES

Input Capacitance	C_{ISS}	$V_{GS} = 0\text{ V}, f = 1\text{ MHz}, V_{DS} = 15\text{ V}$		15.8		pF
Output Capacitance	C_{OSS}			3.5		
Reverse Transfer Capacitance	C_{RSS}			2.4		
Total Gate Charge	$Q_{G(TOT)}$	$V_{GS} = 4.5\text{ V}, V_{DS} = 15\text{ V}, I_D = 200\text{ mA}$		0.70		nC
Threshold Gate Charge	$Q_{G(TH)}$			0.05		
Gate-to-Source Charge	Q_{GS}			0.14		
Gate-to-Drain Charge	Q_{GD}			0.10		

SWITCHING CHARACTERISTICS, V_{GS} = 4.5 V (Note 3)

Turn-On Delay Time	$t_{d(ON)}$	$V_{GS} = 4.5\text{ V}, V_{DD} = 15\text{ V}, I_D = 200\text{ mA}, R_G = 2\ \Omega$		18		ns
Rise Time	t_r			35		
Turn-Off Delay Time	$t_{d(OFF)}$			201		
Fall Time	t_f			110		

3. Switching characteristics are independent of operating junction temperatures.

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TYPICAL CHARACTERISTICS

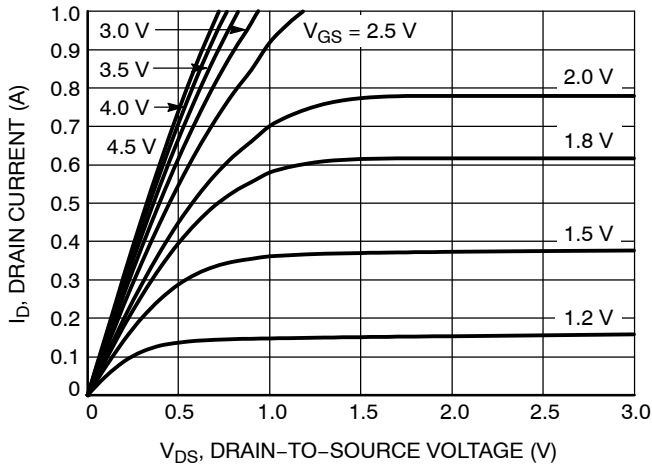


Figure 1. On-Region Characteristics

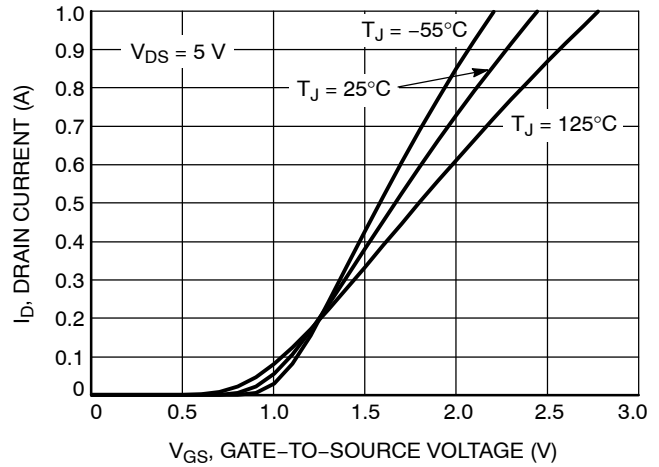


Figure 2. Transfer Characteristics

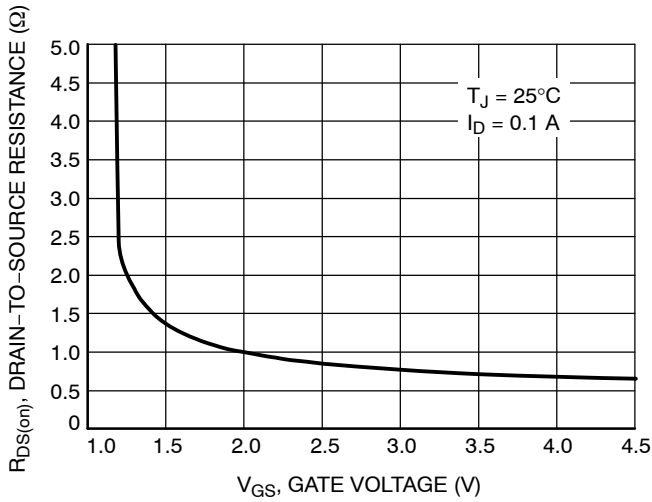


Figure 3. On-Resistance vs. Gate-to-Source Voltage

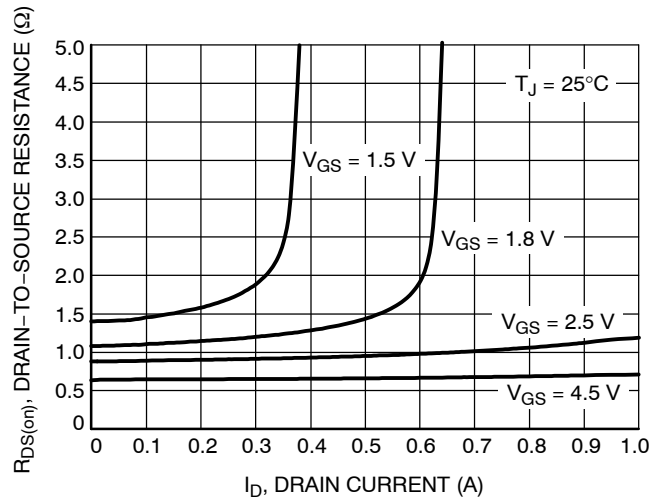


Figure 4. On-Resistance vs. Drain Current and Gate Voltage

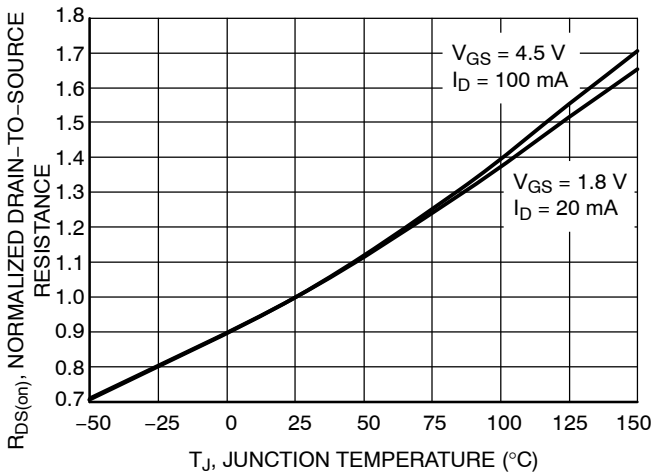


Figure 5. On-Resistance Variation with Temperature

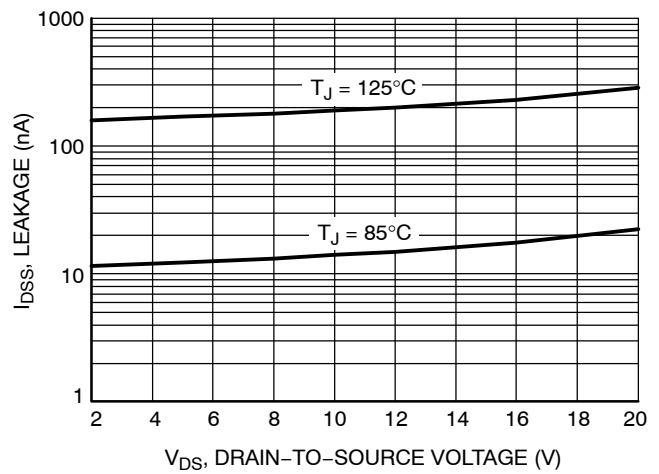


Figure 6. Drain-to-Source Leakage Current vs. Voltage

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TYPICAL CHARACTERISTICS

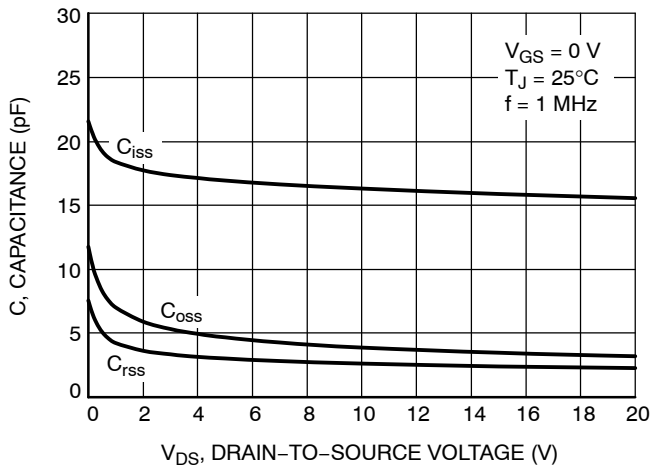


Figure 7. Capacitance Variation

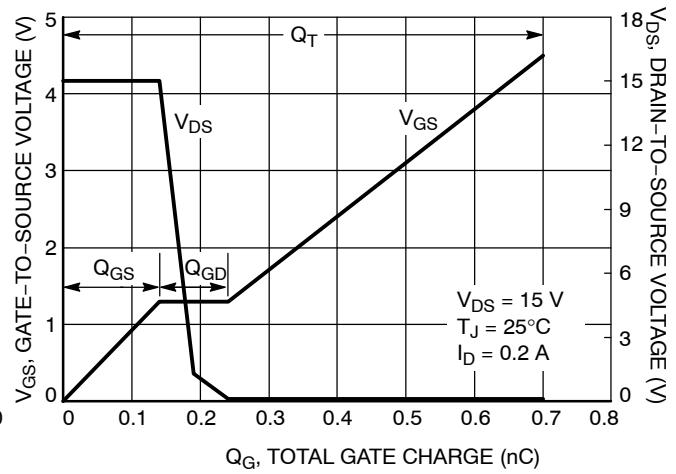


Figure 8. Gate-to-Source and Drain-to-Source Voltage vs. Total Charge

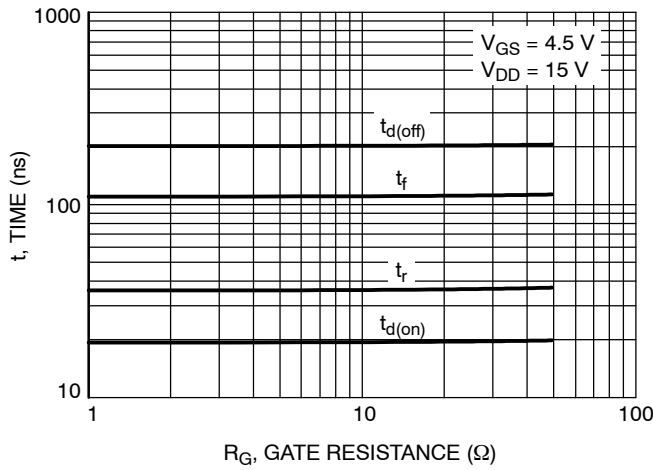


Figure 9. Resistive Switching Time Variation vs. Gate Resistance

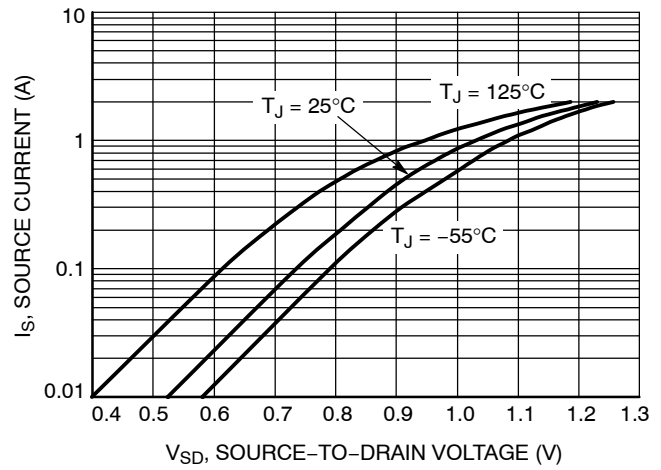


Figure 10. Diode Forward Voltage vs. Current

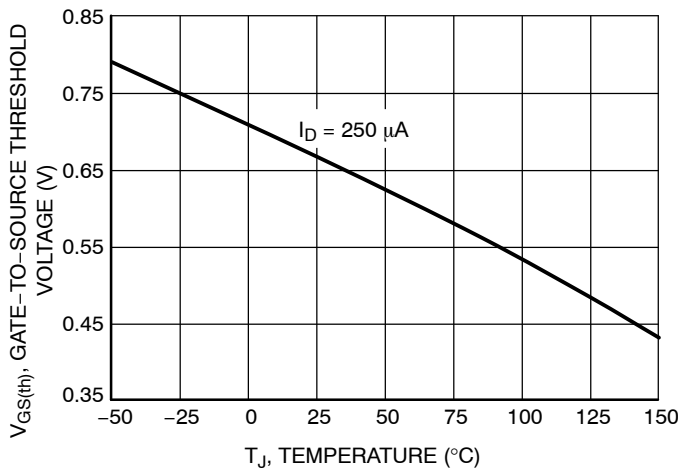


Figure 11. Threshold Voltage

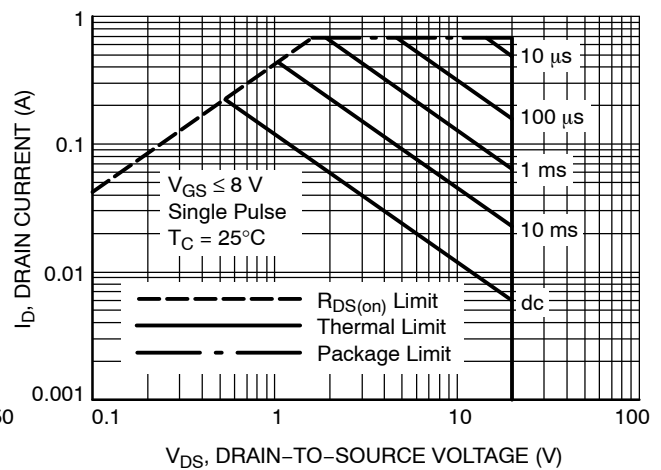


Figure 12. Maximum Rated Forward Biased Safe Operating Area

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TYPICAL CHARACTERISTICS

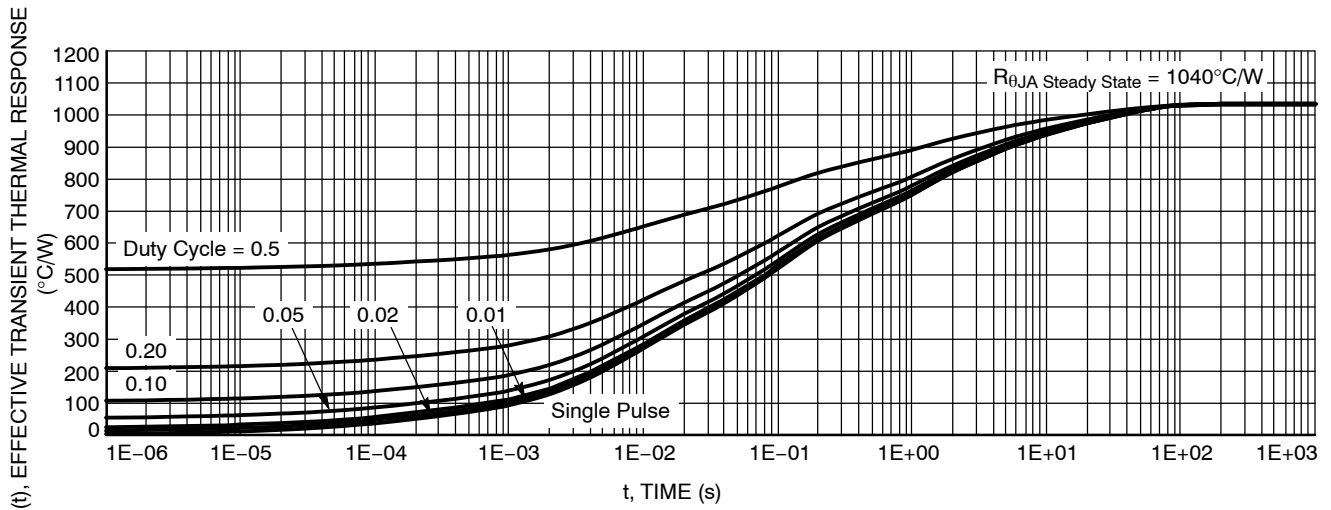
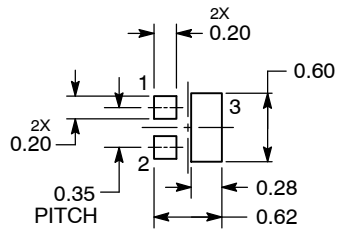


Figure 13. FET Thermal Response

MINIMUM RECOMMENDED SOLDER FOOTPRINT*



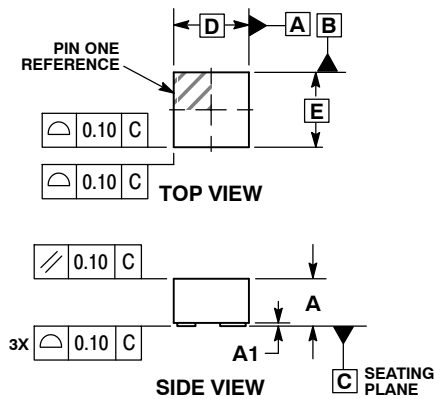
DIMENSIONS: MILLIMETERS

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

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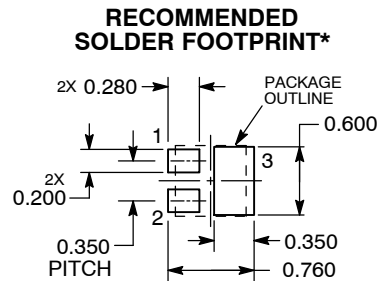
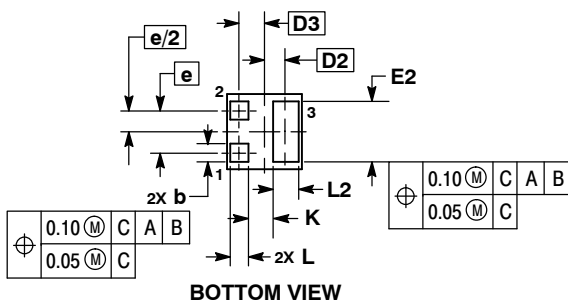
PACKAGE DIMENSIONS

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



- 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



DIMENSIONS: MILLIMETERS

*Additional information concerning board mounting for this package may be found in Document AND9099/D, "Board Level Application Note for XLLGA 3-Lead 0.62x0.62 Package". For additional information on our Pb-Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

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