

74LCXR162245

Low Voltage 16-Bit Bidirectional Transceiver with 5V Tolerant Inputs/Outputs and 26Ω Series Resistors in the Outputs

General Description

The LCXR162245 contains sixteen non-inverting bidirectional buffers with 3-STATE outputs and is intended for bus oriented applications. The device is designed for low voltage (2.5V or 3.3V) V_{CC} applications with capability of interfacing to a 5V signal environment. The device is byte controlled. Each byte has separate control inputs which could be shorted together for full 16-bit operation. The $T/\bar{R}$ inputs determine the direction of data flow through the device. The $\overline{OE}$ inputs disable both the A and B ports by placing them in a high impedance state.

In addition, all A and B outputs include equivalent 26Ω (nominal) series resistors to reduce overshoot and undershoot and are designed to sink/source up to 12 mA at $V_{CC} = 3.0V$.

The LCXR162245 is fabricated with an advanced CMOS technology to achieve high speed operation while maintaining CMOS low power dissipation.

Features

- 5V tolerant inputs and outputs
- 2.3V–3.6V V_{CC} specifications provided
- A and B side outputs have equivalent 26Ω series resistors
- 5.3 ns t_{PD} max ($V_{CC} = 3V$, $I_{OL} = 10\mu A$, $t_{R} = 10\mu A$ max)
- Power down high impedance inputs and outputs
- Supports live insertion, without fail (Note 1)
- Flow through pin current
- Implements proprietary noise/EMI reduction circuitry
- Load capacitance performance exceeds 50 pF
- ESD performance:
 - Human body model > 2000V
 - Machine model > 200V

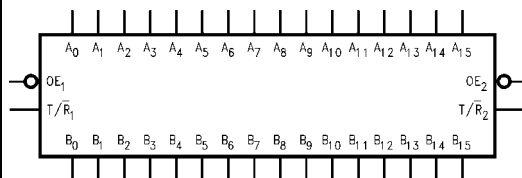
Note 1: To ensure the high-impedance state during power up or down $\overline{OE}$ should be tied to V_{CC} through a pull-up resistor; the minimum value of the resistor is determined by the current-sourcing capability of the driver.

Ordering Codes

Order Number	Package Number	Package Description
74LCXR162245MFA	MS48A	48-Lead Small Shrink Outline Package (SSOP), JEDEC MO-118, 0.300" Wide [RAIL]
74LCXR162245MTX	MS48A	48-Lead Small Shrink Outline Package (SSOP), JEDEC MO-118, 0.300" Wide [TAPE and REEL]
74LCXR162245MTD	MTD48	48-Lead Thin Shrink Small Outline Package (TSSOP), JEDEC MO-153, 6.1mm Wide [RAIL]
74LCXR162245MTX	MTD48	48-Lead Thin Shrink Small Outline Package (TSSOP), JEDEC MO-153, 6.1mm Wide [TAPE and REEL]

Devices also available in Tape and Reel. Specify by appending the suffix letter "X" to the ordering code.

Logic Symbol

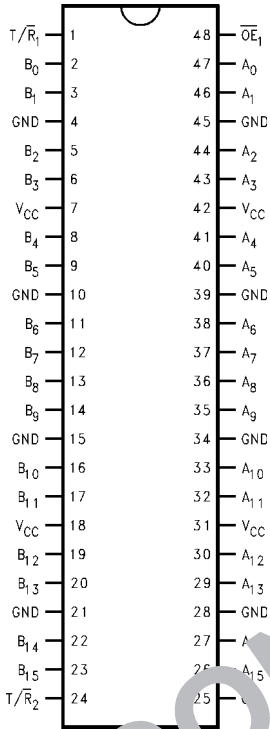


Pin Descriptions

Pin Names	Description
$\overline{OE}_n$	Output Enable Input
$T/\bar{R}_n$	Transmit/Receive Input
A ₀ –A ₁₅	Side A Inputs or 3-STATE Outputs
B ₀ –B ₁₅	Side B Inputs or 3-STATE Outputs

74LCXR162245 Low Voltage 16-Bit Bidirectional Transceiver with 5V Tolerant Inputs/Outputs and 26Ω Series Resistors in the Outputs

Connection Diagram



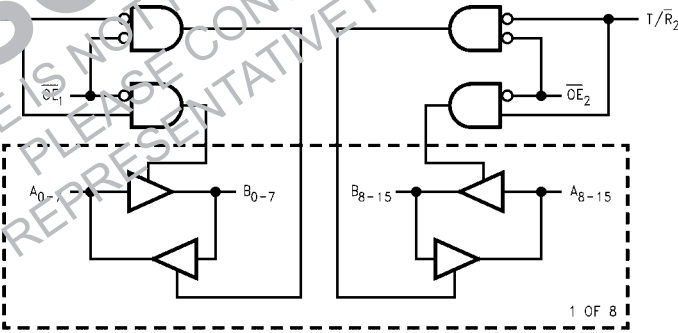
Truth Tables

Inputs		Outputs
$\overline{OE}_1$	$T/\overline{R}_1$	
L	L	Bus B ₀ –B ₇ Data to Bus A ₀ –A ₇
L	H	Bus A ₀ –A ₇ Data to Bus B ₀ –B ₇
H	X	HIGH Z State on A ₀ –A ₇ , B ₀ –B ₇ (Note 2)

Inputs		Outputs
$\overline{OE}_2$	$T/\overline{R}_2$	
L	L	Bus B ₈ –B ₁₅ Data to Bus A ₈ –A ₁₅
L	H	Bus A ₈ –A ₁₅ Data to Bus B ₈ –B ₁₅
H	X	HIGH Z State on A ₈ –A ₁₅ , B ₈ –B ₁₅ (Note 2)

Note 2: A and B port inputs are still active

Logic Diagram



Absolute Maximum Ratings(Notes 3)				
Symbol	Parameter	Value	Conditions	Units
V _{CC}	Supply Voltage	−0.5 to +7.0		V
V _I	DC Input Voltage	−0.5 to +7.0		V
V _O	DC Output Voltage	−0.5 to +7.0 −0.5 to V _{CC} + 0.5	Output in 3-STATE Output in HIGH or LOW State (Note 4)	V
I _{IK}	DC Input Diode Current	−50	V _I < GND	mA
I _{OK}	DC Output Diode Current	−50 +50	V _O < GND V _O > V _{CC}	mA
I _O	DC Output Source/Sink Current	±50		mA
I _{CC}	DC Supply Current per Supply Pin	±100		mA
I _{GND}	DC Ground Current per Ground Pin	±100		mA
T _{STG}	Storage Temperature	−65 to +150		°C

THIS DOCUMENT IS NOT RECOMMENDED FOR NEW DESIGN
PLEASE CONTACT YOUR INFORMATION

Recommended Operating Conditions (Notes 5)					
Symbol	Parameter	Min	Max	Units	
V _{CC}	Supply Voltage	Operating Data Retention	2.0 1.5	3.6 3.6	V
V _I	Input Voltage	0	5.5	V	
V _O	Output Voltage	Low State 3-STATE	0 0	V _{CC} 5.5	V
I _{OH} /I _{OL}	Output Current	V _{CC} = 3.0V – 3.6V V _{CC} = 2.7V – 3.0V V _{CC} = 2.3V – 2.7V	±12 ±8 ±4	mA	
T _A	Free-Air Operating Temperature	−40	85	°C	
Δt/ΔV	Input Edge Rate, V _{IN} = 0.8V – 1.0V, V _{CC} = 3.0V	0	10	ns/V	

Note 3: The Absolute Maximum Ratings are those values beyond which the safety of the device cannot be guaranteed. The device should not be operated at these limits. The parametric values defined in the Electrical Characteristics tables are not guaranteed at the Absolute Maximum Ratings. The “Recommended Operating Conditions” table will define the conditions for actual device operation.

Note 4: I_O Absolute Maximum Rating must be observed.

Note 5: Unused pins (inputs and/or outputs) must be held HIGH or LOW. They may not float.

DC Electrical Characteristics						
Symbol	Parameter	Conditions	V _{CC} (V)	T _A = −40°C to +85°C		Units
				Min	Max	
V _{IH}	HIGH Level Input Voltage		2.3 – 2.7 2.7 – 3.6	1.7 2.0		V
V _{IL}	LOW Level Input Voltage		2.3 – 2.7 2.7 – 3.6		0.7 0.8	V
V _{OH}	HIGH Level Output Voltage	I _{OH} = −100 μA I _{OH} = −4 mA I _{OH} = −4 mA I _{OH} = −6 mA I _{OH} = −8 mA I _{OH} = −12 mA	2.3 – 3.6 2.3 2.7 3.0 2.7 3.0	V _{CC} − 0.2 1.8 2.2 2.4 2.0 2.0		V
V _{OL}	LOW Level Output Voltage	I _{OL} = 100 μA I _{OL} = 4 mA I _{OL} = 4 mA I _{OL} = 6 mA I _{OL} = 8 mA I _{OL} = 12 mA	2.3 – 3.6 2.3 2.7 3.0 2.7 3.0		0.2 0.6 0.4 0.55 0.6 0.8	V
I _I	Input Leakage Current	0 ≤ V _I ≤ 5.5V	2.3 – 3.6		±5.0	μA
I _{OZ}	3-STATE I/O Leakage	0 ≤ V _O ≤ 5.5V V _I = V _{IH} or V _{IL}	2.3 – 3.6		±5.0	μA

DC Electrical Characteristics (Continued)

Symbol	Parameter	Conditions	V _{CC} (V)	T _A = -40°C to +85°C		Units
				Min	Max	
I _{OFF}	Power-Off Leakage Current	V _I or V _O = 5.5V	0		10	μA
I _{CC}	Quiescent Supply Current	V _I = V _{CC} or GND	2.3 – 3.6		20	μA
		3.6V ≤ V _I , V _O ≤ 5.5V (Note 6)	2.3 – 3.6		±20	
ΔI _{CC}	Increase in I _{CC} per Input	V _{IH} = V _{CC} - 0.6V	2.3 – 3.6		500	μA

Note 6: Outputs disabled or 3-STATE only.

AC Electrical Characteristics

Symbol	Parameter	T _A = -40°C to +85°C, R _L = 500Ω						Units
		V _{CC} = 3.3V ± 0.3V		V _{CC} = 2.7V		V _{CC} = 2.5V ± 0.2		
		C _L = 50 pF		C _L = 50 pF		C _L = 30 pF		
		Min	Max	Min	Max	Min	Max	
t _{PHL}	Propagation Delay	1.5	5.3	1.5	6.0	1.5	6.4	ns
t _{PLH}	A _n to B _n or B _n to A _n	1.5	5.3	1.5	6.0	1.5	6.4	
t _{PZL}	Output Enable Time	1.5	7.3	1.5	8.0	1.5	9.5	ns
t _{PZH}		1.5	7.3	1.5	8.0	1.5	9.5	
t _{PLZ}	Output Disable Time	1.5	6.4	1.5	6.9	1.5	7.7	ns
t _{PHZ}		1.5	6.4	1.5	6.9	1.5	7.7	
t _{OSHL}	Output to Output Skew (Note 7)		0					ns
t _{OSLH}			1.5					

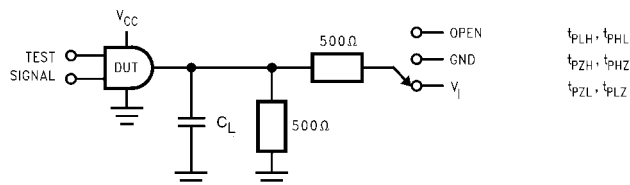
Note 7: Skew is defined as the absolute value of the difference between actual propagation delay for any two separate outputs of the same device. The specification applies to any outputs switching in the same direction, either HIGH-to-LOW (t_{OSHL}) or LOW-to-HIGH (t_{OSLH}). Parameter guaranteed by design.

Dynamic Switching Characteristics

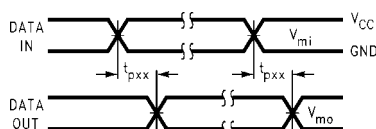
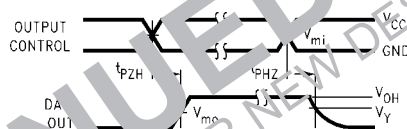
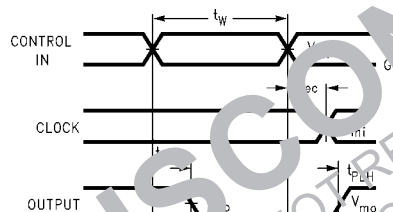
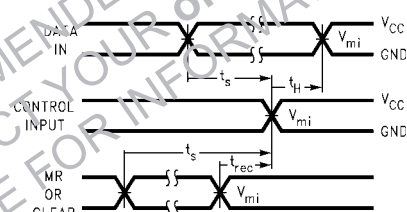
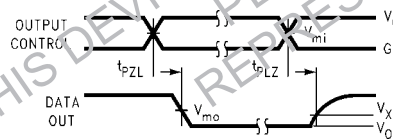
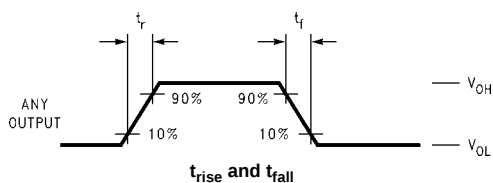
Symbol	Parameter	Conditions	V _{CC} (V)	T _A = 25°C	Units
				Typical	
V _{OLP}	Quiet Output Dynamic Peak V _{OL}	C _L = 50 pF, V _{IH} = 3.3V, V _{IL} = 0V	3.3	0.35	V
		C _L = 50 pF, V _{IH} = 2.5V, V _{IL} = 0V	2.5	0.25	
V _{OLV}	Quiet Output Dynamic Valley V _{OL}	C _L = 50 pF, V _{IH} = 3.3V, V _{IL} = 0V	3.3	-0.35	V
		C _L = 50 pF, V _{IH} = 2.5V, V _{IL} = 0V	2.5	-0.25	

Capacitance

Symbol	Parameter	Conditions	Typical	Units
C _{IN}	Input Capacitance	V _{CC} = Open, V _I = 0V or V _{CC}	7	pF
C _{IO}	Input/Output Capacitance	V _{CC} = 3.3V, V _I = 0V or V _{CC}	8	pF
C _{PD}	Power Dissipation Capacitance	V _{CC} = 3.3V, V _I = 0V or V _{CC} , f = 10 MHz	20	pF

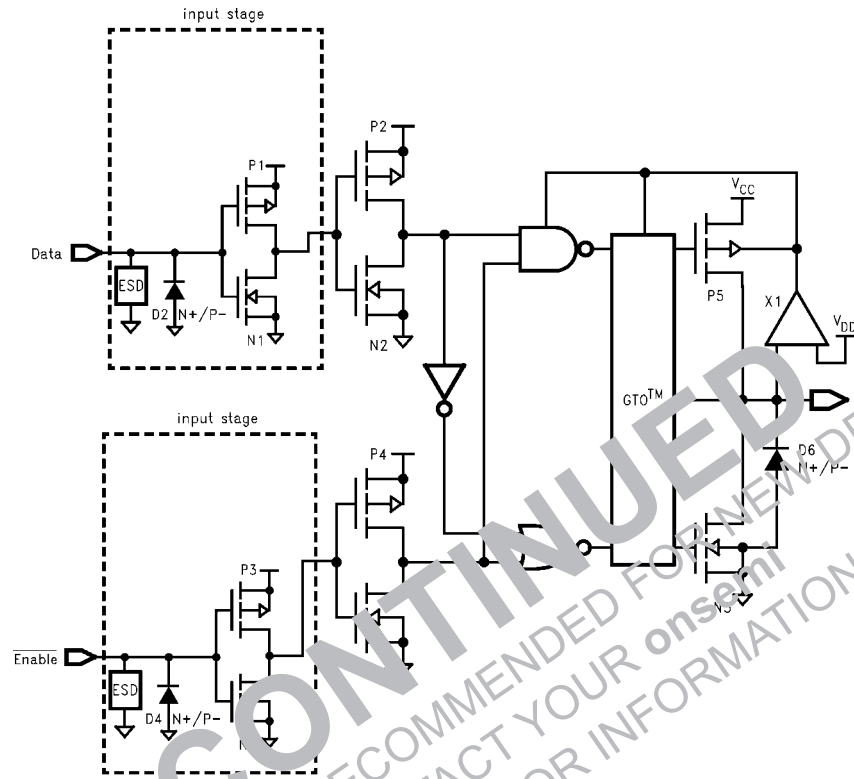
AC LOADING and WAVEFORMS Generic for LCX Family**FIGURE 1. AC Test Circuit (C_L includes probe and jig capacitance)**

Test	Switch
t_{PLH} , t_{PHL}	Open
t_{PZL} , t_{PLZ}	6V at $V_{CC} = 3.3 \pm 0.3V$ $V_{CC} \times 2$ at $V_{CC} = 2.5 \pm 0.2V$
t_{PZH} , t_{PHZ}	GND

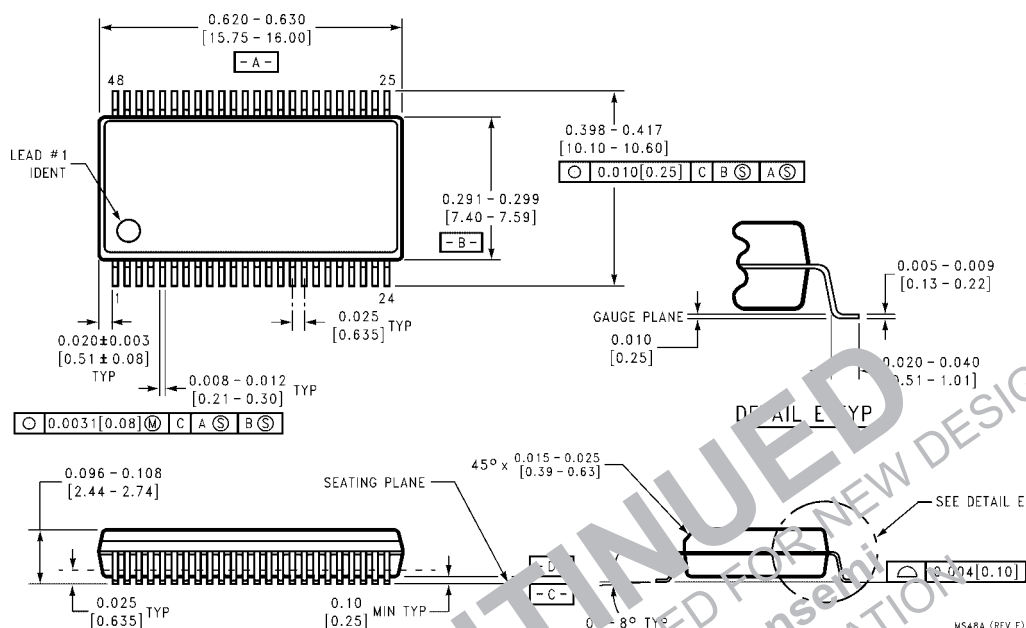
**Waveform for Inverting and Non-Inverting Functions****3-STATE Output High Enable and Disable Times for Logic****Propagation Delay, Pulse Width, and t_{rec} Waveforms****Setup Time, Hold Time, and Recovery Time for Logic****3-STATE Output Low Enable and Disable Times for Logic****FIGURE 2. Waveforms**
(Input Characteristics; $f = 1\text{MHz}$, $t_R = t_F = 3\text{ns}$)

Symbol	V_{CC}		
	$3.3V \pm 0.3V$	$2.7V$	$2.5V \pm 0.2V$
V_{mi}	1.5V	1.5V	$V_{CC}/2$
V_{mo}	1.5V	1.5V	$V_{CC}/2$
V_x	$V_{OL} + 0.3V$	$V_{OL} + 0.3V$	$V_{OL} + 0.15V$
V_y	$V_{OH} - 0.3V$	$V_{OH} - 0.3V$	$V_{OH} - 0.15V$

Schematic Diagram Generic for LCX Family



Physical Dimensions inches (millimeters) unless otherwise noted



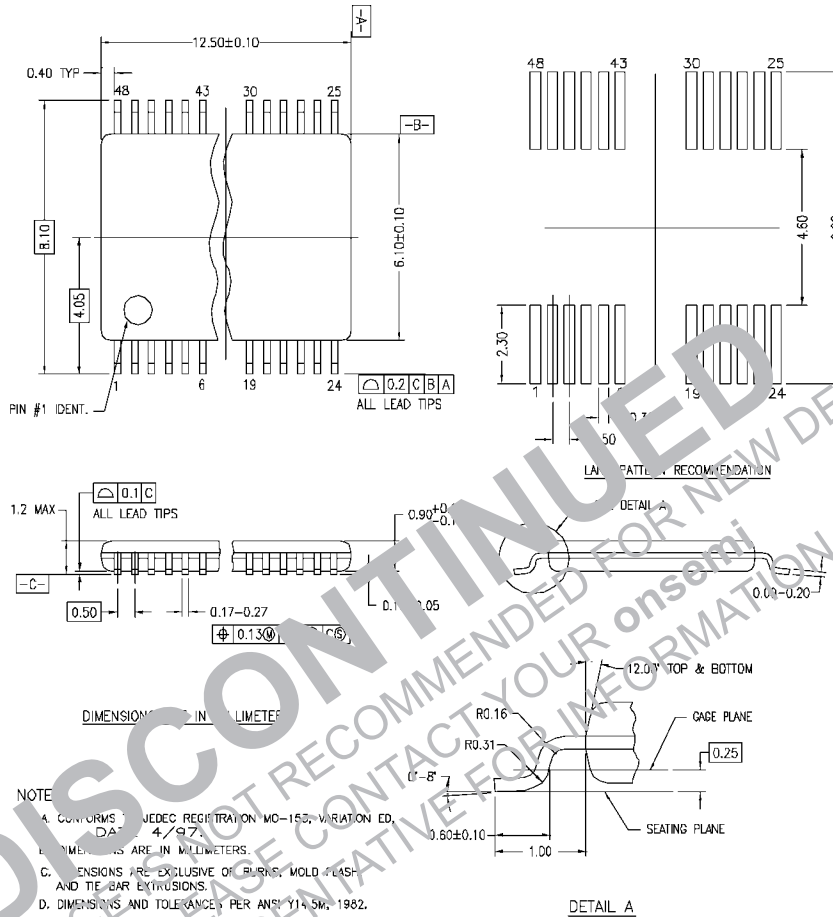
48-Lead Small Shrink Outline Package (SSOP), JEDEC MO-116, 0.300" Wide
Package Number MS48A

DISCONTINUED

THIS DEVICE IS NOT RECOMMENDED FOR NEW DESIGN

PLEASE CONTACT YOUR FAIRCHILD REPRESENTATIVE FOR INFORMATION

Physical Dimensions inches (millimeters) unless otherwise noted (Continued)



48-Lead Thin Shrink Small Outline Package (TSSOP), JEDEC MO-153, 6.1mm Wide
Package Number MTD48

Fairchild does not assume any responsibility for use of any circuitry described, no circuit patent licenses are implied and Fairchild reserves the right at any time without notice to change said circuitry and specifications.

LIFE SUPPORT POLICY

FAIRCHILD'S PRODUCTS ARE NOT AUTHORIZED FOR USE AS CRITICAL COMPONENTS IN LIFE SUPPORT DEVICES OR SYSTEMS WITHOUT THE EXPRESS WRITTEN APPROVAL OF THE PRESIDENT OF FAIRCHILD SEMICONDUCTOR CORPORATION. As used herein:

1. Life support devices or systems are devices or systems which, (a) are intended for surgical implant into the body, or (b) support or sustain life, and (c) whose failure to perform when properly used in accordance with instructions for use provided in the labeling, can be reasonably expected to result in a significant injury to the user.
2. A critical component in any component of a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.

www.fairchildsemi.com

DISCONTINUED
THIS DEVICE IS NOT RECOMMENDED FOR NEW DESIGN
PLEASE CONTACT YOUR onsemi
REPRESENTATIVE FOR INFORMATION

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 owns the rights to a number of patents, trademarks, copyrights, trade secrets, and other intellectual property. A listing of ON Semiconductor's product/patent coverage may be accessed at www.onsemi.com/site/pdf/Patent-Marking.pdf. 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. Buyer is responsible for its products and applications using ON Semiconductor products, including compliance with all laws, regulations and safety requirements or standards, regardless of any support or applications information provided by ON Semiconductor. "Typical" parameters which may be provided in ON Semiconductor 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. ON Semiconductor does not convey any license under its patent rights nor the rights of others. ON Semiconductor 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 ON Semiconductor products for any such unintended or unauthorized application, Buyer shall indemnify and hold ON Semiconductor 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 ON Semiconductor was negligent regarding the design or manufacture of the part. ON Semiconductor 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:

Literature Distribution Center for ON Semiconductor
19521 E. 32nd Pkwy, Aurora, Colorado 80011 USA
Phone: 303-675-2175 or 800-344-3860 Toll Free USA/Canada
Fax: 303-675-2176 or 800-344-3867 Toll Free USA/Canada
Email: orderlit@onsemi.com

N. American Technical Support: 800-282-9855 Toll Free
USA/Canada
Europe, Middle East and Africa Technical Support:
Phone: 421 33 790 2910
Japan Customer Focus Center
Phone: 81-3-5817-1050

ON Semiconductor Website: www.onsemi.com

Order Literature: <http://www.onsemi.com/orderlit>

For additional information, please contact your local Sales Representative