



Chipsmall Limited consists of a professional team with an average of over 10 year of expertise in the distribution of electronic components. Based in Hongkong, we have already established firm and mutual-benefit business relationships with customers from,Europe,America and south Asia,supplying obsolete and hard-to-find components to meet their specific needs.

With the principle of "Quality Parts,Customers Priority,Honest Operation,and Considerate Service",our business mainly focus on the distribution of electronic components. Line cards we deal with include Microchip,ALPS,ROHM,Xilinx,Pulse,ON,Everlight and Freescale. Main products comprise IC,Modules,Potentiometer,IC Socket,Relay,Connector.Our parts cover such applications as commercial,industrial, and automotives areas.

We are looking forward to setting up business relationship with you and hope to provide you with the best service and solution. Let us make a better world for our industry!



## Contact us

Tel: +86-755-8981 8866 Fax: +86-755-8427 6832

Email & Skype: info@chipsmall.com Web: www.chipsmall.com

Address: A1208, Overseas Decoration Building, #122 Zhenhua RD., Futian, Shenzhen, China





Is Now Part of



**ON Semiconductor®**

To learn more about ON Semiconductor, please visit our website at  
[www.onsemi.com](http://www.onsemi.com)

ON Semiconductor and the ON Semiconductor logo 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](http://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.

## 74LCXH16245

### Low Voltage 16-Bit Bidirectional Transceiver with Bushold

#### General Description

The LCXH16245 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/R inputs determine the direction of data flow through the device. The OE inputs disable both the A and B Ports by placing them in a high impedance state.

The LCXH16245 data inputs include active bushold circuitry, eliminating the need for external pull-up resistors to hold unused or floating data inputs at a valid logic level.

The LCXH16245 is fabricated with an advanced CMOS technology to achieve high speed operation while maintaining CMOS low power dissipation.

#### Features

- 2.3V–3.6V  $V_{CC}$  specifications provided
- 4.5 ns  $t_{PD}$  max ( $V_{CC} = 3.3V$ ), 20  $\mu A$   $I_{CC}$  max
- Power-down high impedance outputs
- Bushold on inputs eliminates the need for external pull-up/pull-down resistors
- $\pm 24$  mA output drive ( $V_{CC} = 3.0V$ )
- Implements patented noise/EMI reduction circuitry
- Latch-up performance conforms to the requirements of JESD78
- ESD performance:
  - Human body model > 2000V
  - Machine model > 200V
- Also packaged in plastic Fine-Pitch Ball Grid Array (FBGA)

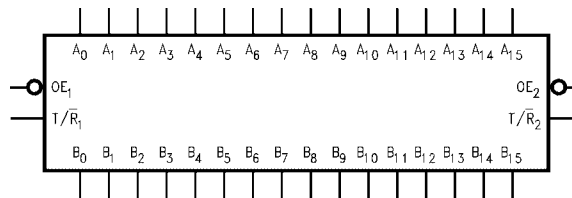
#### Ordering Code:

Order Number	Package Number	Package Description
74LCXH16245G (Note 1) (Note 2)	BGA54A	54-Ball Fine-Pitch Ball Grid Array (FBGA), JEDEC MO-205, 5.5mm Wide
74LCXH16245MTD (Note 2)	MTD48	48-Lead Thin Shrink Small Outline Package (TSSOP), JEDEC MO-153, 6.1mm Wide

**Note 1:** Ordering Code "G" indicates Trays.

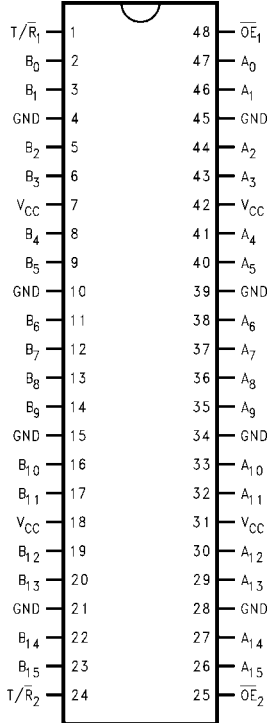
**Note 2:** Devices also available in Tape and Reel. Specify by appending the suffix letter "X" to the ordering code.

#### Logic Symbol

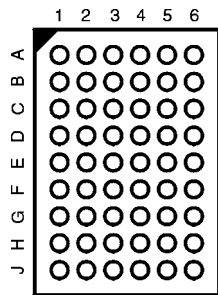


## Connection Diagrams

Pin Assignment for SSOP and TSSOP



Pin Assignment for FBGA



(Top Thru View)

## Pin Descriptions

Pin Names	Description
$\overline{OE}_n$	Output Enable Input
$T/\overline{R}_n$	Transmit/Receive Input
$A_0-A_{15}$	Side A Inputs or 3-STATE Outputs (Bushold)
$B_0-B_{15}$	Side B Inputs or 3-STATE Outputs (Bushold)

## FBGA Pin Assignments

	1	2	3	4	5	6
<b>A</b>	$B_0$	NC	$T/\overline{R}_1$	$\overline{OE}_1$	NC	$A_0$
<b>B</b>	$B_2$	$B_1$	NC	NC	$A_1$	$A_2$
<b>C</b>	$B_4$	$B_3$	$V_{CC}$	$V_{CC}$	$A_3$	$A_4$
<b>D</b>	$B_6$	$B_5$	GND	GND	$A_5$	$A_6$
<b>E</b>	$B_8$	$B_7$	GND	GND	$A_7$	$A_8$
<b>F</b>	$B_{10}$	$B_9$	GND	GND	$A_9$	$A_{10}$
<b>G</b>	$B_{12}$	$B_{11}$	$V_{CC}$	$V_{CC}$	$A_{11}$	$A_{12}$
<b>H</b>	$B_{14}$	$B_{13}$	NC	NC	$A_{13}$	$A_{14}$
<b>J</b>	$B_{15}$	NC	$T/\overline{R}_2$	$\overline{OE}_2$	NC	$A_{15}$

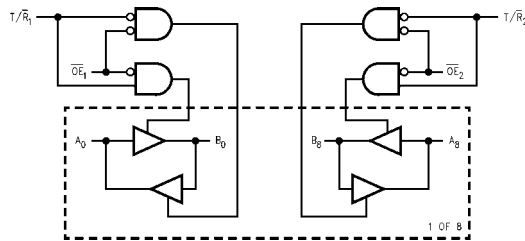
## Truth Tables

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 $A_0-A_7, B_0-B_7$

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 $A_8-A_{15}, B_8-B_{15}$

H = HIGH Voltage Level  
 L = LOW Voltage Level  
 X = Immaterial  
 Z = High Impedance

## Logic Diagram



Absolute Maximum Ratings <sup>(Note 3)</sup>						
Symbol	Parameter	Value	Conditions	Units		
V <sub>CC</sub>	Supply Voltage	-0.5 to +7.0		V		
V <sub>I</sub>	DC Input Voltage	-0.5 to V <sub>CC</sub> + 0.5		V		
V <sub>O</sub>	DC Output Voltage	-0.5 to +7.0	Output in 3-STATE	V		
		-0.5 to V <sub>CC</sub> + 0.5	Output in HIGH or LOW State (Note 4)			
I <sub>IK</sub>	DC Input Diode Current	-50	V <sub>I</sub> < GND	mA		
I <sub>OK</sub>	DC Output Diode Current	-50	V <sub>O</sub> < GND	mA		
		+50	V <sub>O</sub> > V <sub>CC</sub>			
I <sub>O</sub>	DC Output Source/Sink Current	±50		mA		
I <sub>CC</sub>	DC Supply Current per Supply Pin	±100		mA		
I <sub>GND</sub>	DC Ground Current per Ground Pin	±100		mA		
T <sub>STG</sub>	Storage Temperature	-65 to +150		°C		
Recommended Operating Conditions (Note 5)						
Symbol	Parameter	Min	Max	Units		
V <sub>CC</sub>	Supply Voltage	Operating	2.0	3.6	V	
		Data Retention	1.5	3.6		
V <sub>I</sub>	Input Voltage	0	V <sub>CC</sub>	V		
V <sub>O</sub>	Output Voltage	HIGH or LOW State	0	V <sub>CC</sub>	V	
		3-STATE	0	V <sub>CC</sub>		
I <sub>OH</sub> /I <sub>OL</sub>	Output Current	V <sub>CC</sub> = 3.0V – 3.6V		±24	mA	
		V <sub>CC</sub> = 2.7V – 3.0V		±12		
		V <sub>CC</sub> = 2.3V – 2.7V		±8		
T <sub>A</sub>	Free-Air Operating Temperature	-40	85	°C		
Δt/ΔV	Input Edge Rate, V <sub>IN</sub> = 0.8V–2.0V, V <sub>CC</sub> = 3.0V	0	10	ns/V		
<p><b>Note 3:</b> 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.</p> <p><b>Note 4:</b> I<sub>O</sub> Absolute Maximum Rating must be observed.</p> <p><b>Note 5:</b> Floating or unused control inputs must be HIGH or LOW.</p>						
DC Electrical Characteristics						
Symbol	Parameter	Conditions	V <sub>CC</sub> (V)	T <sub>A</sub> = -40°C to +85°C		Units
				Min	Max	
V <sub>IH</sub>	HIGH Level Input Voltage		2.3 – 2.7	1.7		V
			2.7 – 3.6	2.0		
V <sub>IL</sub>	LOW Level Input Voltage		2.3 – 2.7		0.7	V
			2.7 – 3.6		0.8	
V <sub>OH</sub>	HIGH Level Output Voltage	I <sub>OH</sub> = -100 μA	2.3 – 3.6	V <sub>CC</sub> - 0.2		V
		I <sub>OH</sub> = -8 mA	2.3	1.8		
		I <sub>OH</sub> = -12 mA	2.7	2.2		
		I <sub>OH</sub> = -18 mA	3.0	2.4		
		I <sub>OH</sub> = -24 mA	3.0	2.2		
V <sub>OL</sub>	LOW Level Output Voltage	I <sub>OL</sub> = 100 μA	2.3 – 3.6		0.2	V
		I <sub>OL</sub> = 8 mA	2.3		0.6	
		I <sub>OL</sub> = 12 mA	2.7		0.4	
		I <sub>OL</sub> = 16 mA	3.0		0.4	
		I <sub>OL</sub> = 24 mA	3.0		0.55	
I <sub>I</sub>	Input Leakage Current	Data	V <sub>I</sub> = V <sub>CC</sub> or GND	2.3 – 3.6	±5.0	μA
		Control	0 ≤ V <sub>I</sub> ≤ 5.5	2.3 – 3.6	±5.0	

## DC Electrical Characteristics (Continued)

Symbol	Parameter	Conditions	V <sub>CC</sub> (V)	T <sub>A</sub> = -40°C to +85°C		Units
				Min	Max	
I <sub>I(HOLD)</sub>	Bushold Input Minimum Drive Hold Current	V <sub>IN</sub> = 0.7V	2.3	45		μA
		V <sub>IN</sub> = 1.7V		-45		
		V <sub>IN</sub> = 0.8V	3.0	75		
		V <sub>IN</sub> = 2.0V		-75		
I <sub>I(OD)</sub>	Bushold Input Over-Drive Current to Change State	(Note 6)	2.7	300		μA
		(Note 7)		-300		
		(Note 6)	3.6	450		
		(Note 7)		-450		
I <sub>OZ</sub>	3-STATE I/O Leakage	V <sub>O</sub> = V <sub>CC</sub> or GND	2.3 – 3.6		±5.0	μA
I <sub>OFF</sub>	Power-Off Leakage Current	V <sub>I</sub> or V <sub>O</sub> = 5.5V	0		10	μA
I <sub>CC</sub>	Quiescent Supply Current	V <sub>I</sub> = V <sub>CC</sub> or GND	2.3-3.6		20	μA
ΔI <sub>CC</sub>	Increase in I <sub>CC</sub> per Input	V <sub>IH</sub> = V <sub>CC</sub> - 0.6V	2.3-3.6		500	μA

**Note 6:** An external driver must source at least the specified current to switch from LOW-to-HIGH.

**Note 7:** An external driver must sink at least the specified current to switch from HIGH-to-LOW.

## AC Electrical Characteristics

Symbol	Parameter	T <sub>A</sub> = -40°C to +85°C, R <sub>L</sub> = 500Ω						Units
		V <sub>CC</sub> = 3.3V ± 0.3V		V <sub>CC</sub> = 2.7V		V <sub>CC</sub> = 2.5V ± 0.2V		
		C <sub>L</sub> = 50 pF		C <sub>L</sub> = 50 pF		C <sub>L</sub> = 30 pF		
		Min	Max	Min	Max	Min	Max	
t <sub>PHL</sub>	Propagation Delay	1.0	4.5	1.0	5.2	1.0	5.4	ns
t <sub>PLH</sub>	A <sub>n</sub> to B <sub>n</sub> or B <sub>n</sub> to A <sub>n</sub>	1.0	4.5	1.0	5.2	1.0	5.4	
t <sub>PZL</sub>	Output Enable Time	1.0	6.5	1.0	7.2	1.0	8.5	ns
t <sub>PZH</sub>	Output Disable Time	1.0	6.5	1.0	7.2	1.0	8.5	
t <sub>PLZ</sub>	Output Disable Time	1.0	6.4	1.0	6.9	1.0	7.7	ns
t <sub>PHZ</sub>	Output Enable Time	1.0	6.4	1.0	6.9	1.0	7.7	
t <sub>OSSL</sub>	Output to Output Skew (Note 8)		1.0					ns
t <sub>OSLH</sub>			1.0					

**Note 8:** Skew is defined as the absolute value of the difference between the 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<sub>OSSL</sub>) or LOW-to-HIGH (t<sub>OSLH</sub>). Parameter guaranteed by design.

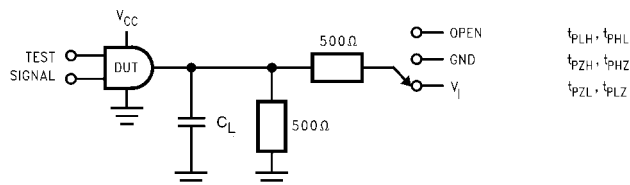
## Dynamic Switching Characteristics

Symbol	Parameter	Conditions	V <sub>CC</sub> (V)	T <sub>A</sub> = 25°C	Units
				Typical	
V <sub>OLP</sub>	Quiet Output Dynamic Peak V <sub>OL</sub>	C <sub>L</sub> = 50 pF, V <sub>IH</sub> = 3.3V, V <sub>IL</sub> = 0V C <sub>L</sub> = 30 pF, V <sub>IH</sub> = 2.5V, V <sub>IL</sub> = 0V	3.3	0.8	V
			2.5	0.6	
V <sub>OLV</sub>	Quiet Output Dynamic Valley V <sub>OL</sub>	C <sub>L</sub> = 50 pF, V <sub>IH</sub> = 3.3V, V <sub>IL</sub> = 0V C <sub>L</sub> = 30 pF, V <sub>IH</sub> = 2.5V, V <sub>IL</sub> = 0V	3.3	-0.8	V
			2.5	-0.6	

## Capacitance

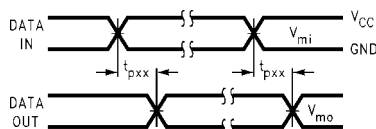
Symbol	Parameter	Conditions	Typical	Units
C <sub>IN</sub>	Input Capacitance	V <sub>CC</sub> = Open, V <sub>I</sub> = 0V or V <sub>CC</sub>	7	pF
C <sub>I/O</sub>	Input/Output Capacitance	V <sub>CC</sub> = 3.3V, V <sub>I</sub> = 0V or V <sub>CC</sub>	8	pF
C <sub>PD</sub>	Power Dissipation Capacitance	V <sub>CC</sub> = 3.3V, V <sub>I</sub> = 0V or V <sub>CC</sub> , f = 10 MHz	20	pF

**AC LOADING and WAVEFORMS** Generic for LCX Family

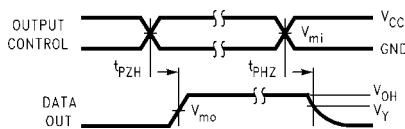


**FIGURE 1. AC Test Circuit** ( $C_L$  includes probe and jig capacitance)

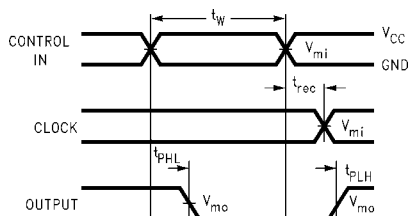
Test	Switch
$t_{PLH}$ , $t_{PHL}$	Open
$t_{PZL}$ , $t_{PLZ}$	6V at $V_{CC} = 3.3 \pm 0.3V$ , 2.7V and $V_{CC} \times 2$ at $V_{CC} = 2.5 \pm 0.2V$
$t_{PZH}$ , $t_{PHZ}$	GND



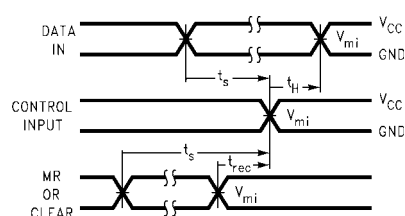
**Waveform for Inverting and Non-Inverting Functions**



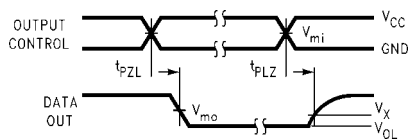
**3-STATE Output High Enable and Disable Times for Logic**



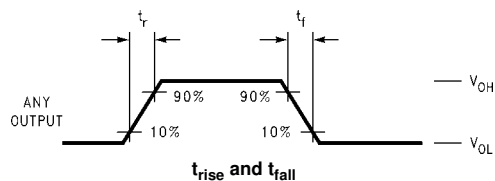
**Propagation Delay, Pulse Width and  $t_{rec}$  Waveforms**



**Setup Time, Hold Time and Recovery Time for Logic**



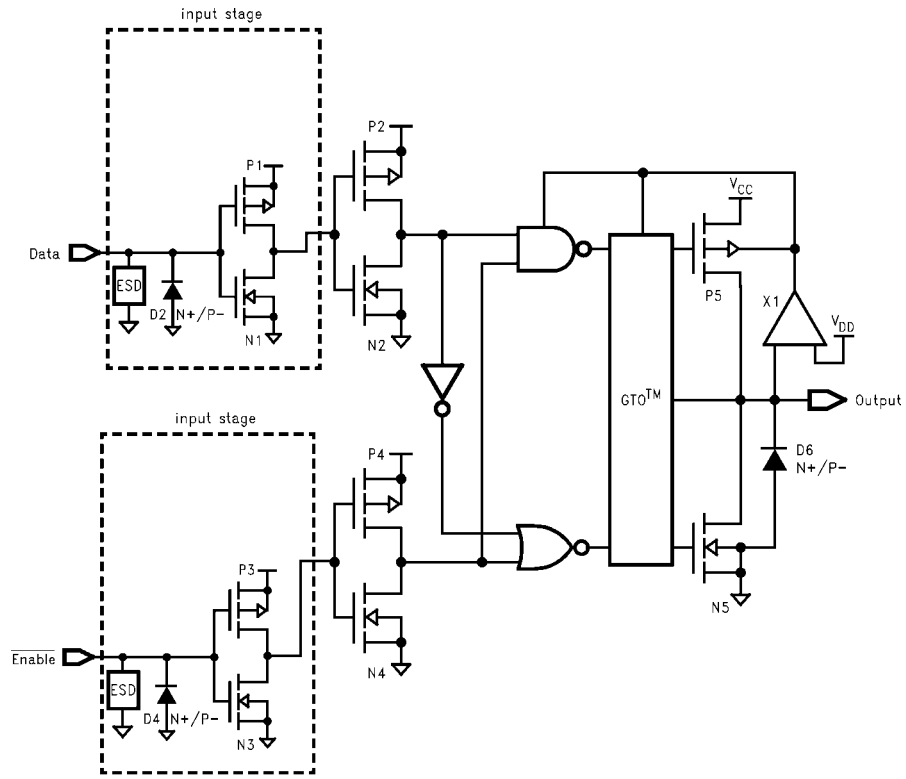
**3-STATE Output Low Enable and Disable Times for Logic**



**FIGURE 2. Waveforms**  
(Input Characteristics;  $f = 1MHz$ ,  $t_r = t_f = 3ns$ )

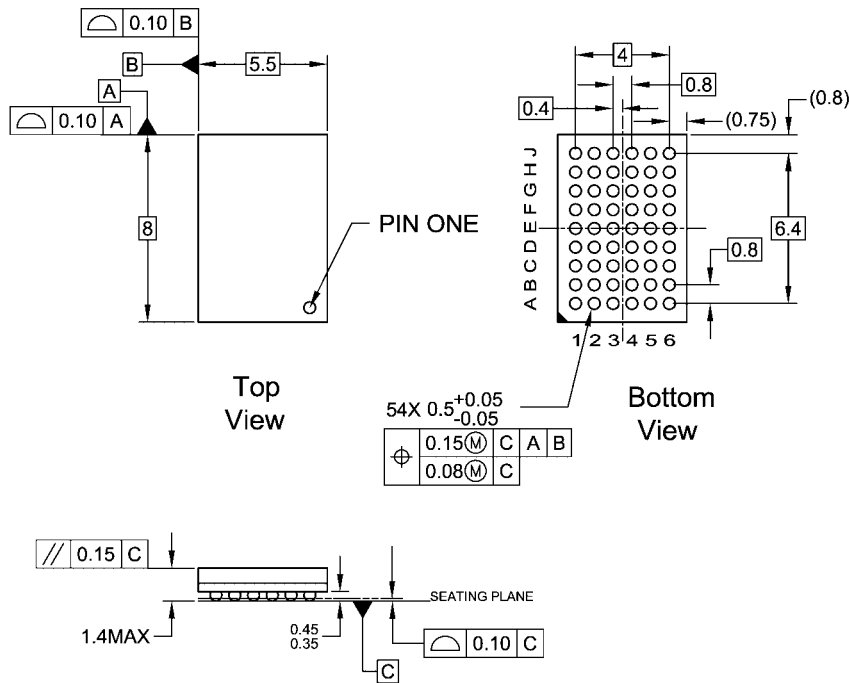
Symbol	$V_{CC}$		
	$3.3V \pm 0.3V$	2.7V	$2.5V \pm 0.2V$
$V_{mi}$	1.5V	1.5V	$V_{CC}/2$
$V_{mo}$	1.5V	1.5V	$V_{CC}/2$
$V_x$	$V_{OL} + 0.3V$	$V_{OL} + 0.3V$	$V_{OL} + 0.15V$
$V_y$	$V_{OH} - 0.3V$	$V_{OH} - 0.3V$	$V_{OH} - 0.15V$

**Schematic Diagram** Generic for LCX Family





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

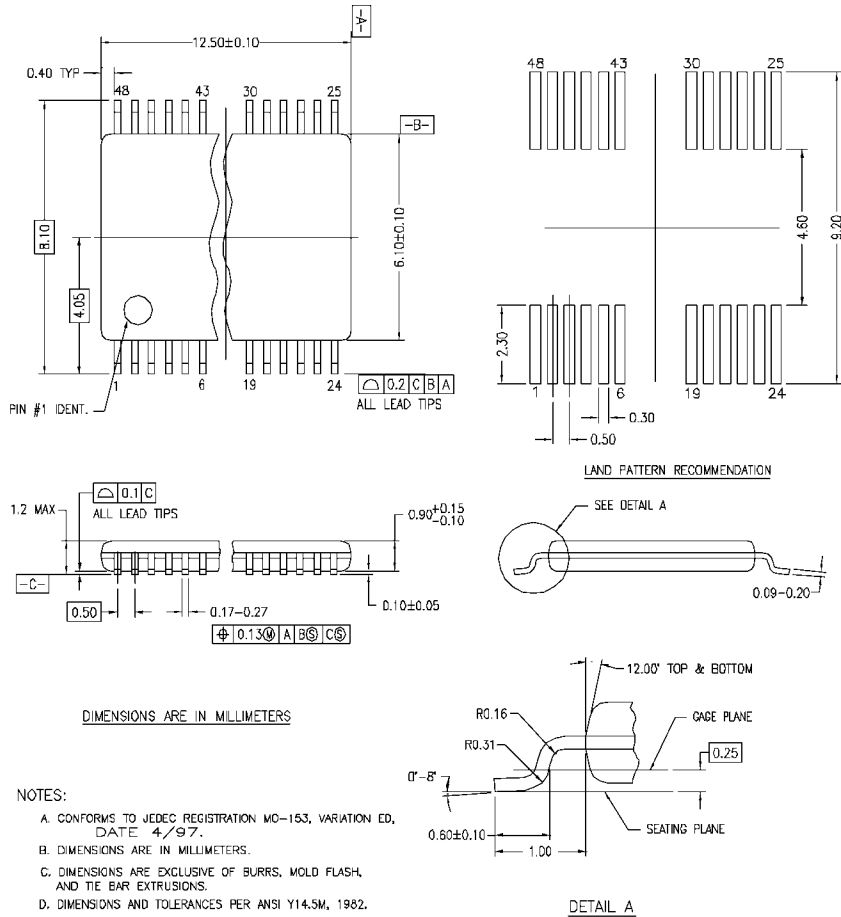


- NOTES:
- A. THIS PACKAGE CONFORMS TO JEDEC M0-205
  - B. ALL DIMENSIONS IN MILLIMETERS
  - C. LAND PATTERN RECOMMENDATION: NSMD (Non Solder Mask Defined)  
.35MM DIA PADS WITH A SOLDERMASK OPENING OF .45MM CONCENTRIC TO PADS
  - D. DRAWING CONFORMS TO ASME Y14.5M-1994

BGA54ArevD

**54-Ball Fine-Pitch Ball Grid Array (FBGA), JEDEC M0-205, 5.5mm Wide  
Package Number BGA54A**

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



MTD48REV C

**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:

- 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.
- 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](http://www.fairchildsemi.com)

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](http://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](mailto: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](http://www.onsemi.com)  
**Order Literature:** <http://www.onsemi.com/orderlit>  
For additional information, please contact your local  
Sales Representative