

74LCX16245

Low-Voltage 16-Bit Bidirectional Transceiver with 5V Tolerant Inputs and Outputs

General Description

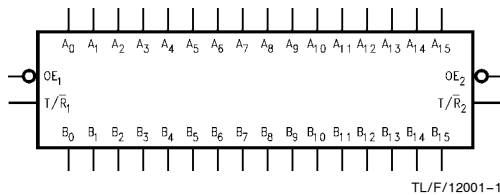
The 74LCX16245 contains sixteen non-inverting bidirectional buffers with TRI-STATE® outputs and is intended for bus oriented applications. The device is designed for low voltage (3.3V) V_{CC} applications with capability of interfacing to a 5V signal environment. The device is byte controlled. Each byte 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.

The LCX16245 is fabricated with an advanced CMOS technology to achieve high speed operation while maintaining CMOS low power dissipation.

Features

- 4.5 ns t_{PD} max, 20 μA I_{CCQ} max
- 5V tolerant inputs and outputs
- Power down high impedance inputs and outputs
- Supports live insertion/withdrawal
- 2.0V–3.6V V_{CC} supply operation
- ± 24 mA output drive
- Implements patented Quiet Series™ noise/EMI reduction circuitry
- Functionally compatible with 74 series 16245
- Latch-up performance exceeds 500 mA
- ESD performance:
 - Human body model > 2000V
 - Machine model > 200V

Logic Symbol

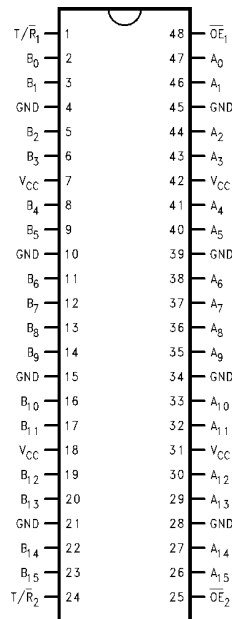


Pin Names	Description
$\overline{OE}$	Output Enable Input
$T/\bar{R}$	Transmit/Receive Input
A_0-A_{15}	Side A Inputs or TRI-STATE Outputs
B_0-B_{15}	Side B Inputs or TRI-STATE Outputs

	SSOP	TSSOP
Order Number	74LCX16245MEA 74LCX16245MEAX	74LCX16245MTD 74LCX16245MTDX
See NS Package Number	MS48A	MTD48

Connection Diagram

Pin Assignment for SSOP and TSSOP



TRI-STATE® is a registered trademark of National Semiconductor Corporation.
Quiet Series™ is a trademark of National Semiconductor Corporation.

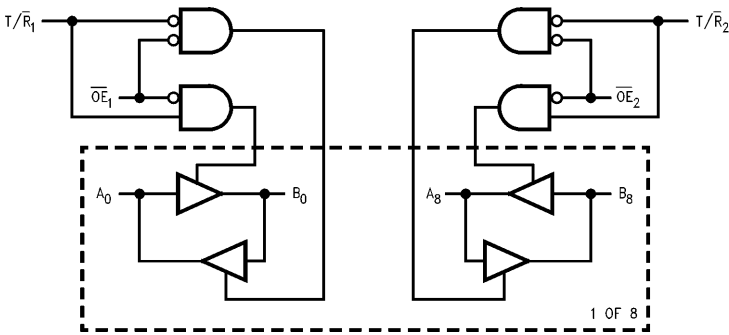
Truth Tables

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

H = High Voltage Level
L = Low Voltage Level
X = Immaterial
Z = High Impedance

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

Logic Diagram



TL/F/12001-3

Absolute Maximum Ratings (Note 1)

If Military/Aerospace specified devices are required, please contact the National Semiconductor Sales Office/Distributors for availability and specifications.

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	Output in TRI-STATE	V
		−0.5 to $V_{CC} + 0.5$	Output in High or Low State (Note 2)	V
I_{IK}	DC Input Diode Current	−50	$V_I < \text{GND}$	mA
I_{OK}	DC Output Diode Current	−50	$V_O < \text{GND}$	mA
		+50	$V_O > V_{CC}$	
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

Note 1: 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" table are not guaranteed at the Absolute Maximum Ratings. The "Recommended Operating Conditions" table will define the conditions for actual device operation.

Note 2: I_O Absolute Maximum Rating must be observed.

Recommended Operating Conditions

Symbol	Parameter	Min	Max	Units
V_{CC}	Supply Voltage	Operating	2.0	3.6
		Data Retention	1.5	3.6
V_I	Input Voltage	0	5.5	V
V_O	Output Voltage	HIGH or LOW State	0	V_{CC}
		TRI-STATE	0	5.5
I_{OH}/I_{OL}	Output Current	$V_{CC} = 3.0V - 3.6V$ $V_{CC} = 2.7V$	±24 ±12	mA
T_A	Free-Air Operating Temperature	−40	85	°C
$\Delta t/\Delta V$	Input Edge Rate, $V_{IN} = 0.8V - 2.0V$, $V_{CC} = 3.0V$	0	10	ns/V

DC Electrical Characteristics

Symbol	Parameter	Conditions	V_{CC} (V)	$T_A = -40^\circ\text{C to } +85^\circ\text{C}$		Units
				Min	Max	
V_{IH}	HIGH Level Input Voltage		2.7–3.6	2.0		V
V_{IL}	LOW Level Input Voltage		2.7–3.6		0.8	V
V_{OH}	HIGH Level Output Voltage	$I_{OH} = -100 \mu A$	2.7–3.6	$V_{CC} - 0.2$		V
		$I_{OH} = -12 \text{ mA}$	2.7	2.2		V
		$I_{OH} = -18 \text{ mA}$	3.0	2.4		V
		$I_{OH} = -24 \text{ mA}$	3.0	2.2		V
V_{OL}	LOW Level Output Voltage	$I_{OL} = 100 \mu A$	2.7–3.6		0.2	V
		$I_{OL} = 12 \text{ mA}$	2.7		0.4	V
		$I_{OL} = 16 \text{ mA}$	3.0		0.4	V
		$I_{OL} = 24 \text{ mA}$	3.0		0.55	V
I_I	Input Leakage Current	$0 \leq V_I \leq 5.5V$	2.7–3.6		±5.0	μA
I_{OZ}	TRI-STATE I/O Leakage	$0 \leq V_O \leq 5.5V$ $V_I = V_{IH} \text{ or } V_{IL}$	2.7–3.6		±5.0	μA
I_{OFF}	Power-Off Leakage Current	$V_I \text{ or } V_O = 5.5V$	0		10	μA
I_{CC}	Quiescent Supply Current	$V_I = V_{CC} \text{ or } \text{GND}$	2.7–3.6		20	μA
		$3.6V \leq V_I, V_O \leq 5.5V$	2.7–3.6		±20	μA
ΔI_{CC}	Increase in I_{CC} per Input	$V_{IH} = V_{CC} - 0.6V$	2.7–3.6		500	μA

AC Electrical Characteristics

Symbol	Parameter	T _A = −40°C to +85°C				Units
		V _{CC} = 3.3V ±0.3V		V _{CC} = 2.7V		
		Min	Max	Min	Max	
t _{PHL}	Propagation Delay A _n to B _n or B _n to A _n	1.5	4.5	1.5	5.2	ns
t _{PLH}		1.5	4.5	1.5	5.2	
t _{PZL}	Output Enable Time	1.5	6.5	1.5	7.2	ns
t _{PZH}		1.5	6.5	1.5	7.2	
t _{PLZ}	Output Disable Time	1.5	6.4	1.5	6.9	ns
t _{PHZ}		1.5	6.4	1.5	6.9	
t _{OSHL}	Output to Output Skew (Note 1)		1.0			ns
t _{OSLH}			1.0			

Note 1: 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_{OSHL}) or LOW to HIGH (t_{OSLH}). Parameter guaranteed by design.

Dynamic Switching Characteristics

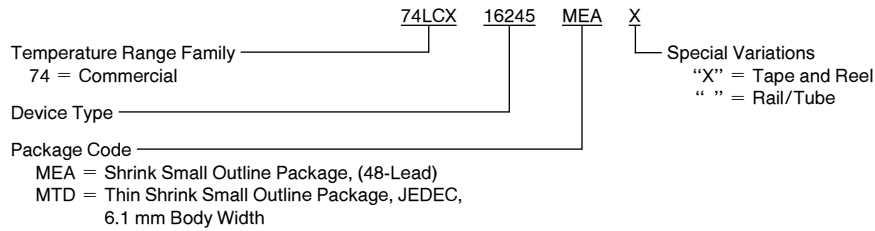
Symbol	Parameter	Conditions	V_{CC} (V)	$T_A = 25^{\circ}\text{C}$	Units
				Typical	
V_{OLP}	Quiet Output Dynamic Peak V_{OL}	$C_L = 50\text{ pF}$, $V_{IH} = 3.3V$, $V_{IL} = 0V$	3.3	0.8	V
V_{OLV}	Quiet Output Dynamic Valley V_{OL}	$C_L = 50\text{ pF}$, $V_{IH} = 3.3V$, $V_{IL} = 0V$	3.3	-0.8	V

Capacitance

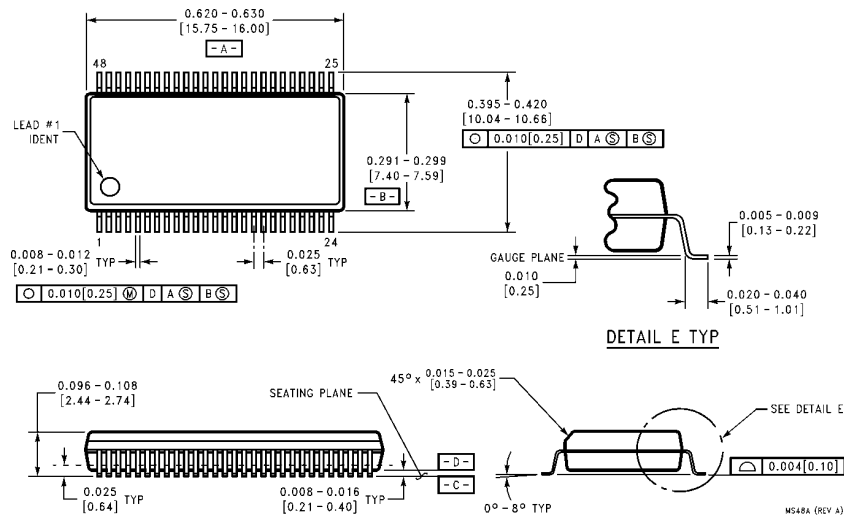
Symbol	Parameter	Conditions	Typical	Units
C_{IN}	Input Capacitance	$V_{CC} = \text{Open}$, $V_I = 0V$ or V_{CC}	7	pF
$C_{I/O}$	Input/Output Capacitance	$V_{CC} = 3.3V$, $V_I = 0V$ or V_{CC}	8	pF
C_{PD}	Power Dissipation Capacitance	$V_{CC} = 3.3V$, $V_I = 0V$ or V_{CC} , $F = 10\text{ MHz}$	20	pF

74LCX16245 Ordering Information

The device number is used to form part of a simplified purchasing code where the package type is defined as follows:

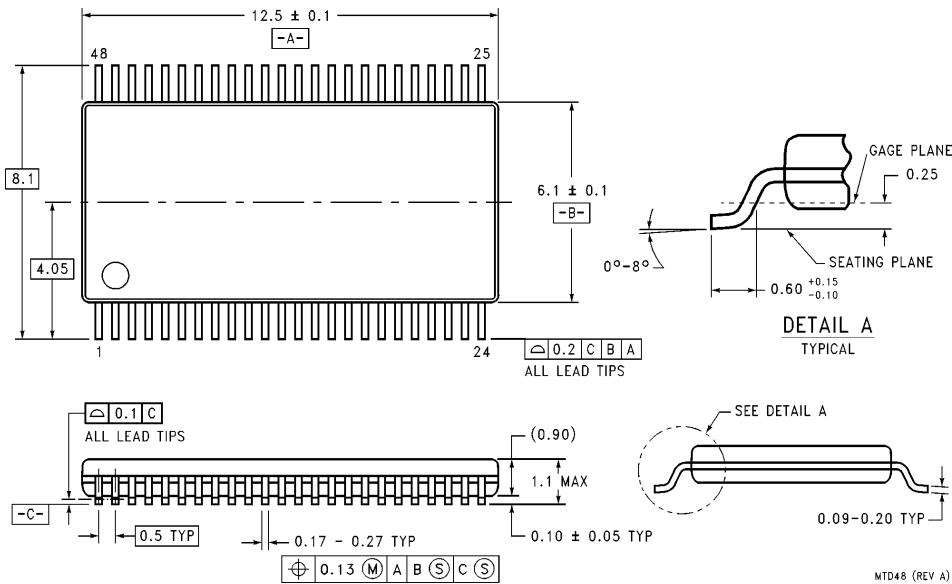


Physical Dimensions All dimensions are in inches (millimeters)



48-Lead Shrink Small Outline Package
Order Number 74LCX16245MEA or 74LCX16245MEAX
NS Package Number MS48A

Physical Dimensions All dimensions are in millimeters (Continued)



48-Lead Thin Shrink Small Outline Package, JEDEC, 6.1 mm Body Width
Order Number 74LCX16245MTD or 74LCX16245MTDX
NS Package Number MTD48

LIFE SUPPORT POLICY

NATIONAL'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 NATIONAL 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 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 is 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.



National Semiconductor Corporation
Americas
 Tel: 1(800) 272-9959
 Fax: 1(800) 737-7018
 Email: support@nsc.com

<http://www.national.com>

National Semiconductor Europe
 Fax: +49 (0) 180-530 85 86
 Email: europe.support@nsc.com
 Deutsch Tel: +49 (0) 180-530 85 85
 English Tel: +49 (0) 180-532 78 32
 Français Tel: +49 (0) 180-532 93 58
 Italiano Tel: +49 (0) 180-534 16 80

National Semiconductor Southeast Asia
 Fax: (852) 2376 3901
 Email: sea.support@nsc.com

National Semiconductor Japan Ltd.
 Tel: 81-3-5620-7561
 Fax: 81-3-5620-6179

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