National Semiconductor

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54LCX16244
Low Voltage 16-Bit Buffer/Line Driver with 5V Tolerant Inputs and Outputs

General Description

The LCX16244 contains sixteen non-inverting buffers with TRI-STATE® outputs designed to be employed as a memory and address driver, clock driver, or bus oriented transmitter/receiver. The device is nibble controlled. Each nibble has separate TRI-STATE control inputs which can be shorted together for full 16-bit operation.

The LCX16244 is designed for low voltage (3.3V) V_{CC} applications with capability of interfacing to a 5V signal environment.

The LCX16244 is fabricated with an advanced CMOS technology to achieve high speed operation while maintaining CMOS low power dissipation.

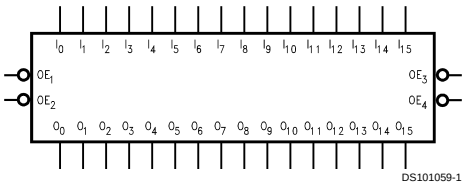
Features

- 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 noise/EMI reduction circuitry
- Functionally compatible with 54 series 16244
- ESD performance:
  - Human body model > 2000V
  - Machine model > 200V
- Standard Microcircuit Drawing (SMD) 5962-9950501

Ordering Code

Order Number	Package Number	Package Description
54LCX16244W-QML	WA48A	48-Lead Cerpack Package

Logic Symbol



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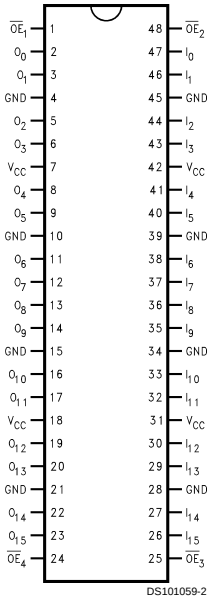
Connection Diagram

Pin Assignment for Cerpack



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

Pin Descriptions

Pin Names	Description
$\overline{OE}_n$	Output Enable Input (Active Low)
I_0–I_{15}	Inputs
O_0–O_{15}	Outputs

Functional Description

The LCX16244 contains sixteen non-inverting buffers with TRI-STATE standard outputs. The device is nibble (4 bits) controlled with each nibble functioning identically, but independent of the other. The control pins can be shorted together to obtain full 16-bit operation. The TRI-STATE outputs are controlled by an Output Enable ($\overline{OE}_n$) input for each nibble. When $\overline{OE}_n$ is LOW, the outputs are in bi-state mode. When $\overline{OE}_n$ is HIGH, the outputs are in the high impedance mode, but this does not interfere with entering new data into the inputs.

Truth Tables

Inputs		Outputs
$\overline{OE}_1$	I_0–I_3	O_0–O_3
L	L	L
L	H	H
H	X	Z

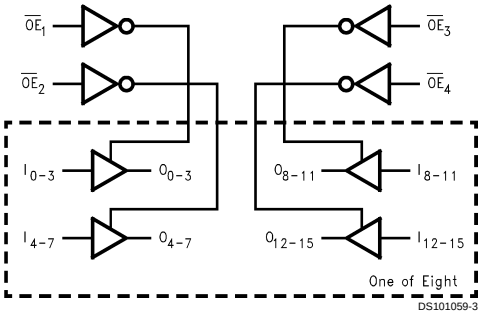
Inputs		Outputs
$\overline{OE}_2$	I_4–I_7	O_4–O_7
L	L	L
L	H	H
H	X	Z

Inputs		Outputs
$\overline{OE}_3$	I_8–I_{11}	O_8–O_{11}
L	L	L
L	H	H
H	X	Z

Inputs		Outputs
$\overline{OE}_4$	I_{12}–I_{15}	O_{12}–O_{15}
L	L	L
L	H	H
H	X	Z

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

Logic Diagram



Absolute Maximum Ratings (Note 1)

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

Supply Voltage (V_{CC})	−0.5V to +7.0V
DC Input Voltage (V_I)	−0.5V to +7.0V
DC Input Diode Current (I_{IK})	
V_I < GND	−50 mA
DC Output Diode Current (I_{OK})	
V_O < GND	−50mA
$V_O \geq V_{CC}$	+50mA
DC Output Voltage (V_O) (Note 2)	
Output in High or Low State	-0.5V to V_{CC} + 0.5V
Output in TRI-STATE	-0.5V to 7.0V
DC Output Source or Sink Current (I_O)	±50mA
DC V_{CC} or Ground Current	±400mA
Storage Temperature Range (T_{STG})	−65˚C to +150˚C
Power Dissapation	750mW
Junction Temperature (T_J)	175˚C

Recommended Operating Conditions (Note 2)

Supply Voltage (V_{CC})	
Operating	2.0V to 3.6V
Data Retention	1.5V to 3.6V
Input Voltage (V_I)	0V to 5.5V
Output Voltage (V_O)	
High or Low State	0V to V_{CC}
TRI-STATE	0V to 5.5V
Operating Temperature (T_A)	−55˚C to +125˚C
Minimum Input Edge Rate ($\Delta t/\Delta V$)	
V_{IN} from 0.8V to 2.0V, V_{CC} = 3.0V	0ns/V to 10ns/V

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 tables 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.

DC Electrical Characteristics

Symbol	Parameter	Conditions	V_{CC} (V)	T_A = −55˚C to +125˚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 µA	2.7–3.6	V_{CC} − 0.2		V
		I_{OH} = −12 mA	2.7	2.2		V
		I_{OH} = −12 mA	3.0	2.4		V
		I_{OH} = −24 mA	3.0	2.2		V
V_{OL}	LOW Level Output Voltage	I_{OL} = 100 µA	2.7–3.6		0.2	V
		I_{OL} = 12 mA	2.7		0.4	V
		I_{OL} = 24 mA	3.0		0.55	V
V_{IC}	Negative Input Clamp Voltage	I_{IN} = -18mA	3.0		-1.2	V
I_I	Input Leakage Current	$0 \leq V_I \leq 5.5V$	2.7–3.6		±5.0	µA
I_{OZ}	3-STATE Output Leakage	$0 \leq V_O \leq 5.5V$ $V_I = V_{IH}$ or V_{IL}	2.7–3.6		±5.0	µA
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	2.7–3.6		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	$T_A = -55^\circ C$ to $+125^\circ C$, $C_L = 50pF$, $R_L = 500\ \Omega$				Units
		$V_{CC} = 3.3V \pm 0.3V$		$V_{CC} = 2.7V$		
		Min	Max	Min	Max	
t_{PHL}	Propagation Delay	0.5	5.5	1.0	6.0	ns
t_{PLH}	Data to Output	0.5	5.5	1.0	6.0	
t_{PZL}	Output Enable Time	0.5	6.5	1.0	7.0	ns
t_{PZH}		0.5	6.5	1.0	7.0	
t_{PLZ}	Output Disable Time	1.0	6.0	1.0	6.0	ns
t_{PHZ}		1.0	6.0	1.0	6.0	
t_{OSHL}	Output to Output Skew (Note 3)		1.0		1.0	ns
t_{OSLH}						

Note 3: 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.

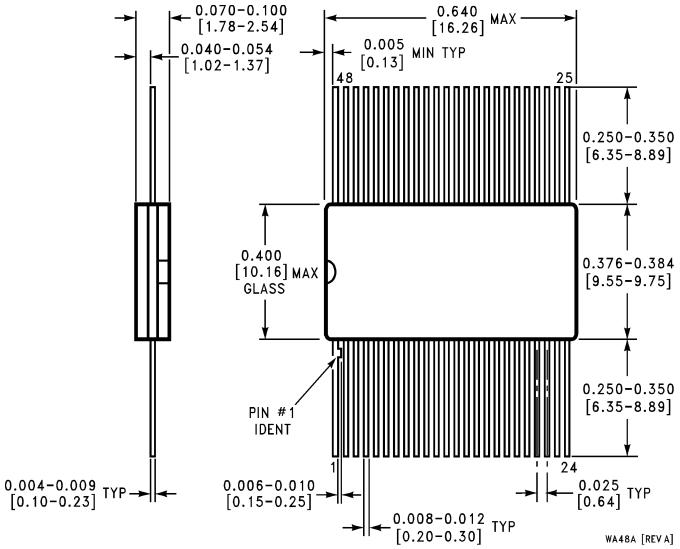
Dynamic Switching Characteristics

Symbol	Parameter	Conditions	V_{CC} (V)	$T_A = 25^\circ C$	Units
				Max	
V_{OLP}	Quiet Output Dynamic Peak V_{OL}	$C_L = 50$ pF, $V_{IH} = 3.3V$, $V_{IL} = 0V$	3.3	1.2	V
V_{OLV}	Quiet Output Dynamic Valley V_{OL}	$C_L = 50$ pF, $V_{IH} = 3.3V$, $V_{IL} = 0V$	3.3	-1.1	V

Capacitance

Symbol	Parameter	Conditions	Max	Units
C_{IN}	Input Capacitance	V_{CC} = Open, $V_I = 0V$ or V_{CC}	10	pF
C_{OUT}	Output Capacitance	$V_{CC} = 3.3V$, $V_I = 0V$ or V_{CC}	12	pF
C_{PD}	Power Dissipation Capacitance	$V_{CC} = 3.3V$, $V_I = 0V$ or V_{CC}, f = 10 MHz	40	pF

Physical Dimensions inches (millimeters) unless otherwise noted



48-Lead Cerpack
Package Number WA48A

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