

74ALCX16245

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

General Description

The ALCX16245 contains sixteen non-inverting bidirectional buffers with TRI-STATE® outputs and is intended for bus oriented applications. 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.

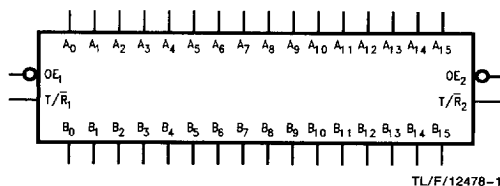
The ALCX family of devices excel in bus interface applications where very high speeds and low power consumption are required. ALCX devices are capable of interfacing to the latest high-speed busses while consuming < 20 μ A of quiescent current. In keeping with National's *CROSSVOLT*™ philosophy, ALCX inputs and outputs are 5V tolerant allowing them to interface to both 3V and 5V components. ALCX inputs and outputs also power up/down in the high impedance state, facilitating power management and live insertion system features. Bus hold on all input, I/O, and control pins removes the need for power-hungry pull-up resistors on TRI-STATE busses. ± 24 mA output drive

means ALCX devices can drive all but the heaviest bus and backplane loads quietly due to National's patented Quiet Series™ circuitry.

Features

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

Logic Symbol

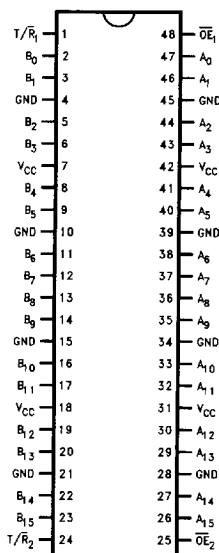


Pin Names	Description
OE	Output Enable Input
T/R	Transmit/Receive Input
A ₀ –A ₁₅	Side A Inputs or TRI-STATE Outputs
B ₀ –B ₁₅	Side B Inputs or TRI-STATE Outputs

	SSOP	TSSOP
Order Number	74ALCX16245MEA 74ALCX16245MEAX	74ALCX16245MTD 74ALCX16245MTDX
See NS Package Number	MS48A	MTD48

Connection Diagram

Pin Assignment for
SSOP and TSSOP



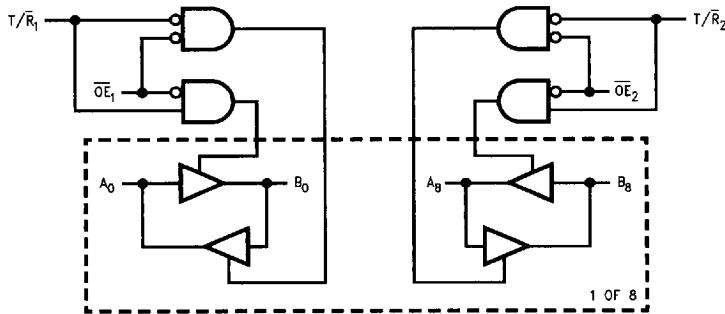
Truth Tables

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/12478-3

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	$V_I < GND$	mA
I_{OK}	DC Output Diode Current	-50	$V_O < GND$	mA
		+50	$V_O > V_{CC}$	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

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 Data Retention	2.0 1.5	3.6	V
V _I	Input Voltage	0	5.5	V
V _O	Output Voltage HIGH or LOW State TRI-STATE	0	V _{CC} 5.5	V
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
Δt/ΔV	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)	$T_A = -40^\circ C \text{ to } +85^\circ C$		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	Inputs I/O	$V_I = 0V \text{ or } 5.5V$ $V_{I/O} = 0V \text{ or } 5.5V$	2.7-3.6	± 5.0	μA

DC Electrical Characteristics (Continued)

Symbol	Parameter	Conditions	V _{CC} (V)	T _A = -40°C to +85°C		Units
				Min	Max	
I _I (HOLD)	Bushold Leakage Current	V _I = 0.8V V _I = 2.0V	3.0	-75 75		μA
I _I (OD)	Bushold Overdrive Current		3.0	± 500		μA
I _{OZ}	TRI-STATE I/O Leakage	V _O = 0V or 5.5V V _I = V _{IH} or V _{IL}	2.7-3.6		± 5.0	μA
I _{OFF}	Power-Off Leakage Current	0 ≤ V _I , 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 ≤ V _I , V _O ≤ 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 (Note 3)	Min	Max (Note 3)	
t _{PHL}	Propagation Delay	1.5	3.6	1.5	4.5	ns
t _{PLH}	A _n to B _n or B _n to A _n	1.5	3.6	1.5	4.5	
t _{PZL}	Output Enable Time	1.5	5.0	1.5	5.5	ns
t _{PZH}		1.5	5.0	1.5	5.5	
t _{PLZ}	Output Disable Time	1.5	5.0	1.5	5.5	ns
t _{PHZ}		1.5	5.0	1.5	5.5	
t _{OSHL}	Output to Output Skew (Note 4)		0.5			ns
t _{OSLH}			0.5			

Note 3: The Maximum AC limits are design target. Actual performance will be specified upon completion of characterization.

Note 4: 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}).

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	0.8	V
V _{OLV}	Quiet Output Dynamic Valley V _{OL}	C _L = 50 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} = 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 MHz	20	pF