

FEATURES:

- 0.5 MICRON CMOS Technology
- Typical  $t_{sk(o)}$  (Output Skew) < 250ps
- ESD > 2000V per MIL-STD-883, Method 3015; > 200V using machine model (C = 200pF, R = 0)
- $V_{cc} = 3.3V \pm 0.3V$ , Normal Range
- $V_{cc} = 2.7V$  to  $3.6V$ , Extended Range
- $V_{cc} = 2.5V \pm 0.2V$
- CMOS power levels ( $0.4\mu W$  typ. static)
- Rail-to-Rail output swing for increased noise margin
- Available in TSSOP package

DRIVE FEATURES:

- High Output Drivers:  $\pm 24mA$
- Suitable for heavy loads

APPLICATIONS:

- 3.3V high speed systems
- 3.3V and lower voltage computing systems

DESCRIPTION:

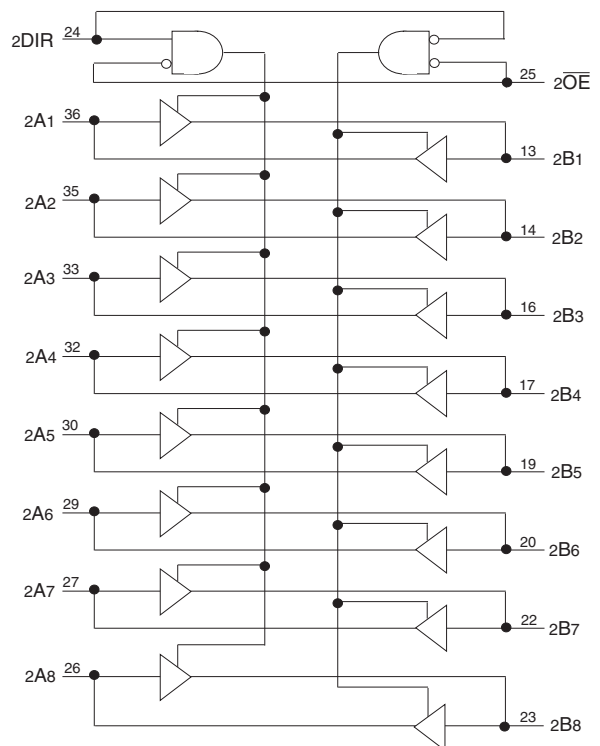
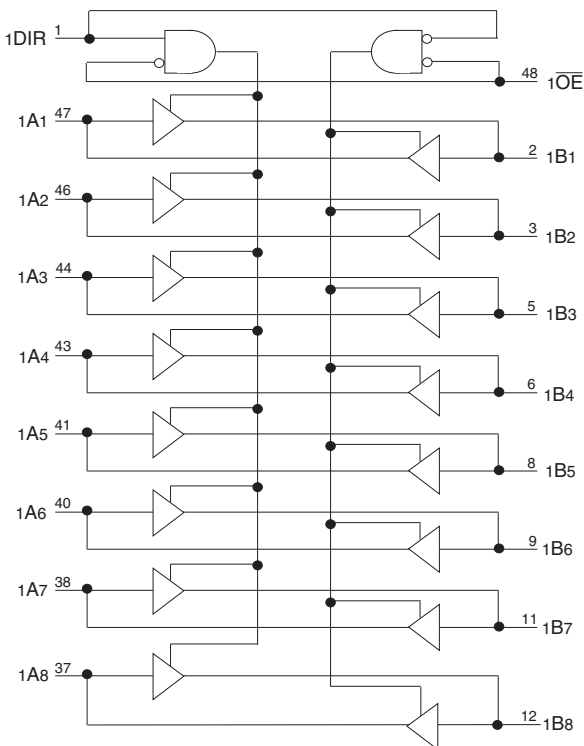
This 16-bit bus transceiver is built using advanced dual metal CMOS technology. The ALVCH16245 is designed for asynchronous communication between data buses. The control-function implementation minimizes external timing requirements.

This device can be used as two 8-bit transceivers or one 16-bit transceiver. It allows data transmission from the A bus to the B bus or from the B bus to the A bus, depending on the logic level at the direction-control (DIR) input. The output-enable ( $\overline{OE}$ ) input can be used to disable the device so that the buses are effectively isolated.

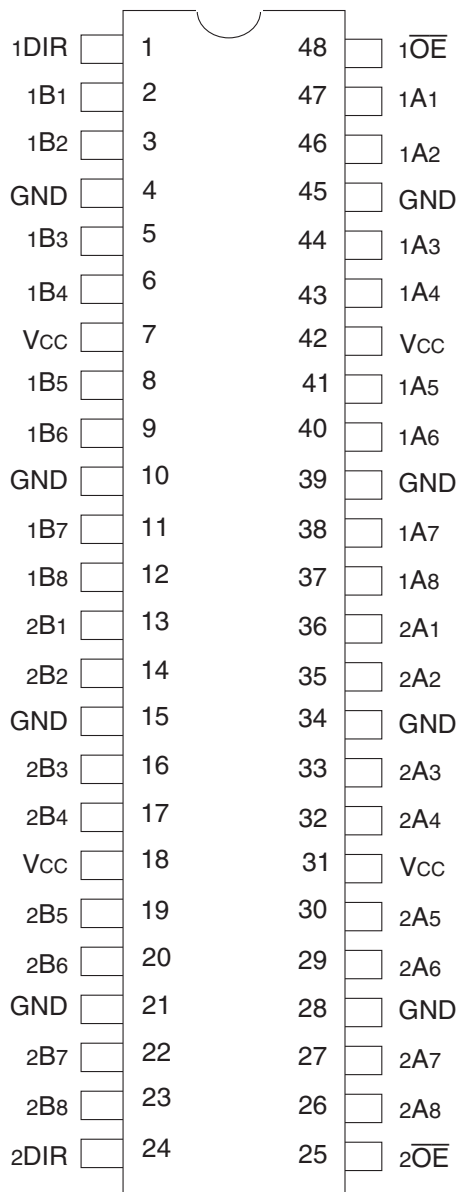
The ALVCH16245 has been designed with a  $\pm 24mA$  output driver. This driver is capable of driving a moderate to heavy load while maintaining speed performance.

The ALVCH16245 has "bus-hold" which retains the inputs' last state whenever the input bus goes to a high impedance. This prevents floating inputs and eliminates the need for pull-up/down resistors.

FUNCTIONAL BLOCK DIAGRAM



## PIN CONFIGURATION



TSSOP  
TOP VIEW

## ABSOLUTE MAXIMUM RATINGS<sup>(1)</sup>

Symbol	Description	Max	Unit
VTERM <sup>(2)</sup>	Terminal Voltage with Respect to GND	-0.5 to +4.6	V
VTERM <sup>(3)</sup>	Terminal Voltage with Respect to GND	-0.5 to V <sub>CC</sub> +0.5	V
TSTG	Storage Temperature	-65 to +150	°C
I <sub>OUT</sub>	DC Output Current	-50 to +50	mA
I <sub>IK</sub>	Continuous Clamp Current, V <sub>I</sub> < 0 or V <sub>I</sub> > V <sub>CC</sub>	±50	mA
I <sub>OK</sub>	Continuous Clamp Current, V <sub>O</sub> < 0	-50	mA
I <sub>CC</sub> I <sub>SS</sub>	Continuous Current through each V <sub>CC</sub> or GND	±100	mA

### NOTES:

- Stresses greater than those listed under ABSOLUTE MAXIMUM RATINGS may cause permanent damage to the device. This is a stress rating only and functional operation of the device at these or any other conditions above those indicated in the operational sections of this specification is not implied. Exposure to absolute maximum rating conditions for extended periods may affect reliability.
- V<sub>CC</sub> terminals.
- All terminals except V<sub>CC</sub>.

## CAPACITANCE (T<sub>A</sub> = +25°C, F = 1.0MHz)

Symbol	Parameter <sup>(1)</sup>	Conditions	Typ.	Max.	Unit
C <sub>IN</sub>	Input Capacitance	V <sub>IN</sub> = 0V	5	7	pF
C <sub>OUT</sub>	Output Capacitance	V <sub>OUT</sub> = 0V	7	9	pF
C <sub>I/O</sub>	I/O Port Capacitance	V <sub>IN</sub> = 0V	7	9	pF

### NOTE:

- As applicable to the device type.

## PIN DESCRIPTION

Pin Names	Description
x $\overline{OE}$	Output Enable Inputs (Active LOW)
DIR	Direction Control Inputs
xAx	Side A Inputs or 3-State Outputs <sup>(1)</sup>
xBx	Side B Inputs or 3-State Outputs <sup>(1)</sup>

### NOTE:

- These pins have "Bus-Hold". All other pins are standard inputs, outputs, or I/Os.

## FUNCTION TABLE (EACH 8-BIT SECTION)<sup>(1)</sup>

Inputs		Outputs
x $\overline{OE}$	xDIR	
L	L	Bus B Data to Bus A
L	H	Bus A Data to Bus B
H	X	High Z state

### NOTE:

- H = HIGH Voltage Level  
L = LOW Voltage Level  
X = Don't Care

## DC ELECTRICAL CHARACTERISTICS OVER OPERATING RANGE

Following Conditions Apply Unless Otherwise Specified:

Operating Condition: TA = -40°C to +85°C

Symbol	Parameter	Test Conditions		Min.	Typ. <sup>(1)</sup>	Max.	Unit
VIH	Input HIGH Voltage Level	VCC = 2.3V to 2.7V		1.7	—	—	V
		VCC = 2.7V to 3.6V		2	—	—	
VIL	Input LOW Voltage Level	VCC = 2.3V to 2.7V		—	—	0.7	V
		VCC = 2.7V to 3.6V		—	—	0.8	
I <sub>IH</sub>	Input HIGH Current	VCC = 3.6V	VI = VCC	—	—	±5	μA
I <sub>IL</sub>	Input LOW Current	VCC = 3.6V	VI = GND	—	—	±5	μA
IOZH IOZL	High Impedance Output Current (3-State Output pins)	VCC = 3.6V		—	—	±10	μA
		VO = GND		—	—	±10	
V <sub>IK</sub>	Clamp Diode Voltage	VCC = 2.3V, I <sub>IN</sub> = -18mA		—	-0.7	-1.2	V
V <sub>H</sub>	Input Hysteresis	VCC = 3.3V		—	100	—	mV
ICCL ICCH ICCZ	Quiescent Power Supply Current	VCC = 3.6V VIN = GND or VCC		—	0.1	40	μA
ΔICC	Quiescent Power Supply Current Variation	One input at VCC - 0.6V, other inputs at VCC or GND		—	—	750	μA

NOTE:

1. Typical values are at VCC = 3.3V, +25°C ambient.

## BUS-HOLD CHARACTERISTICS

Symbol	Parameter <sup>(1)</sup>	Test Conditions		Min.	Typ. <sup>(2)</sup>	Max.	Unit
IBHH IBHL	Bus-Hold Input Sustain Current	VCC = 3V		—75	—	—	μA
		VI = 0.8V		75	—	—	
IBHH IBHL	Bus-Hold Input Sustain Current	VCC = 2.3V		—45	—	—	μA
		VI = 0.7V		45	—	—	
IBHHO IBHLO	Bus-Hold Input Overdrive Current	VCC = 3.6V		—	—	±500	μA

NOTES:

1. Pins with Bus-Hold are identified in the pin description.
2. Typical values are at VCC = 3.3V, +25°C ambient.

## OUTPUT DRIVE CHARACTERISTICS

Symbol	Parameter	Test Conditions <sup>(1)</sup>		Min.	Max.	Unit
V <sub>OH</sub>	Output HIGH Voltage	V <sub>CC</sub> = 2.3V to 3.6V	I <sub>OH</sub> = -0.1mA	V <sub>CC</sub> -0.2	—	V
		V <sub>CC</sub> = 2.3V	I <sub>OH</sub> = -6mA	2	—	
		V <sub>CC</sub> = 2.3V	I <sub>OH</sub> = -12mA	1.7	—	
		V <sub>CC</sub> = 2.7V		2.2	—	
		V <sub>CC</sub> = 3V		2.4	—	
		V <sub>CC</sub> = 3V	I <sub>OH</sub> = -24mA	2	—	
V <sub>OL</sub>	Output LOW Voltage	V <sub>CC</sub> = 2.3V to 3.6V	I <sub>OL</sub> = 0.1mA	—	0.2	V
		V <sub>CC</sub> = 2.3V	I <sub>OL</sub> = 6mA	—	0.4	
			I <sub>OL</sub> = 12mA	—	0.7	
		V <sub>CC</sub> = 2.7V	I <sub>OL</sub> = 12mA	—	0.4	
		V <sub>CC</sub> = 3V	I <sub>OL</sub> = 24mA	—	0.55	

NOTE:  
1. V<sub>IH</sub> and V<sub>IL</sub> must be within the min. or max. range shown in the DC ELECTRICAL CHARACTERISTICS OVER OPERATING RANGE table for the appropriate V<sub>CC</sub> range. T<sub>A</sub> = -40°C to +85°C.

## OPERATING CHARACTERISTICS, T<sub>A</sub> = 25°C

Symbol	Parameter	Test Conditions	V <sub>CC</sub> = 2.5V ± 0.2V	V <sub>CC</sub> = 3.3V ± 0.3V	Unit
			Typical	Typical	
CPD	Power Dissipation Capacitance Outputs enabled	C <sub>L</sub> = 0pF, f = 10Mhz	22	29	pF
CPD	Power Dissipation Capacitance Outputs disabled		4	5	

## SWITCHING CHARACTERISTICS<sup>(1)</sup>

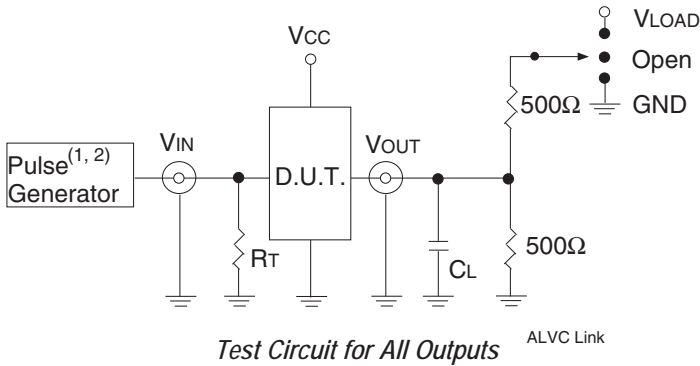
Symbol	Parameter	V <sub>CC</sub> = 2.5V ± 0.2V		V <sub>CC</sub> = 2.7V		V <sub>CC</sub> = 3.3V ± 0.3V		Unit
		Min.	Max.	Min.	Max.	Min.	Max.	
t <sub>PLH</sub>	Propagation Delay	1	3.7	—	3.6	1	3	ns
t <sub>PHL</sub>	xAx to xYx							
t <sub>PZH</sub>	Output Enable Time	1	5.7	—	5.4	1	4.4	ns
t <sub>PZL</sub>	x $\overline{OE}$ to xYx							
t <sub>PHZ</sub>	Output Disable Time	1	5.2	—	4.6	1	4.1	ns
t <sub>PLZ</sub>	x $\overline{OE}$ to xYx							
t <sub>SK(o)</sub>	Output Skew <sup>(2)</sup>	—	—	—	—	—	500	ps

NOTES:  
1. See TEST CIRCUITS AND WAVEFORMS. T<sub>A</sub> = -40°C to +85°C.  
2. Skew between any two outputs of the same package and switching in the same direction.

## TEST CIRCUITS AND WAVEFORMS

### TEST CONDITIONS

Symbol	V <sub>CC</sub> <sup>(1)</sup> =3.3V±0.3V	V <sub>CC</sub> <sup>(1)</sup> =2.7V	V <sub>CC</sub> <sup>(2)</sup> =2.5V±0.2V	Unit
V <sub>LOAD</sub>	6	6	2 x V <sub>CC</sub>	V
V <sub>IH</sub>	2.7	2.7	V <sub>CC</sub>	V
V <sub>T</sub>	1.5	1.5	V <sub>CC</sub> / 2	V
V <sub>LZ</sub>	300	300	150	mV
V <sub>HZ</sub>	300	300	150	mV
C <sub>L</sub>	50	50	30	pF



Test Circuit for All Outputs ALVC Link

#### DEFINITIONS:

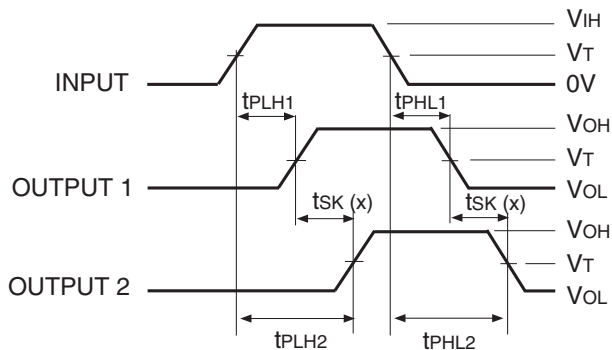
C<sub>L</sub> = Load capacitance: includes jig and probe capacitance.  
R<sub>T</sub> = Termination resistance: should be equal to Z<sub>OUT</sub> of the Pulse Generator.

#### NOTES:

1. Pulse Generator for All Pulses: Rate ≤ 1.0MHz; t<sub>r</sub> ≤ 2.5ns; t<sub>r</sub> ≤ 2.5ns.
2. Pulse Generator for All Pulses: Rate ≤ 1.0MHz; t<sub>r</sub> ≤ 2ns; t<sub>r</sub> ≤ 2ns.

### SWITCH POSITION

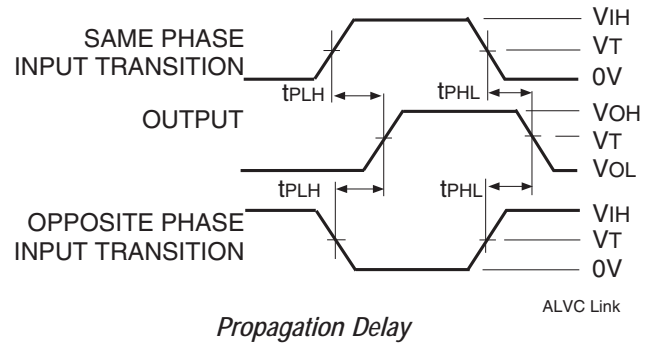
Test	Switch
Open Drain Disable Low Enable Low	V <sub>LOAD</sub>
Disable High Enable High	GND
All Other Tests	Open



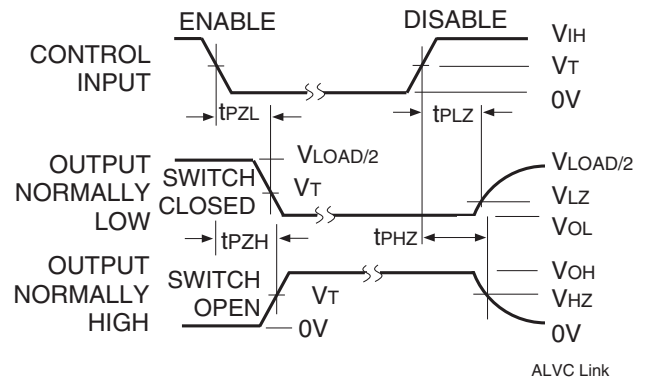
$t_{SK}(x) = |t_{PLH2} - t_{PLH1}|$  or  $|t_{PHL2} - t_{PHL1}|$   
Output Skew -  $t_{SK}(x)$  ALVC Link

#### NOTES:

1. For t<sub>sk</sub>(o) OUTPUT1 and OUTPUT2 are any two outputs.
2. For t<sub>sk</sub>(b) OUTPUT1 and OUTPUT2 are in the same bank.



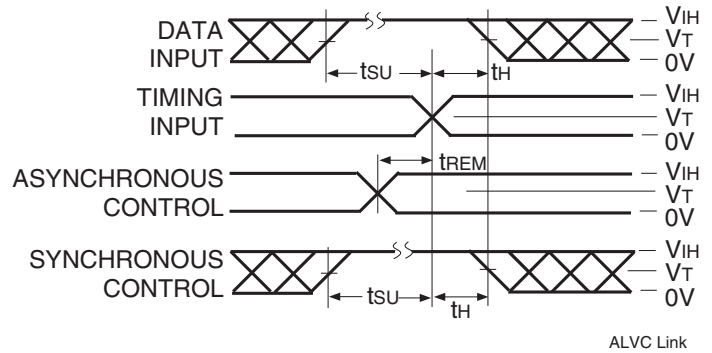
Propagation Delay



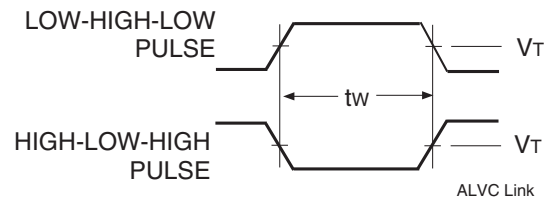
Enable and Disable Times

#### NOTE:

1. Diagram shown for input Control Enable-LOW and input Control Disable-HIGH.

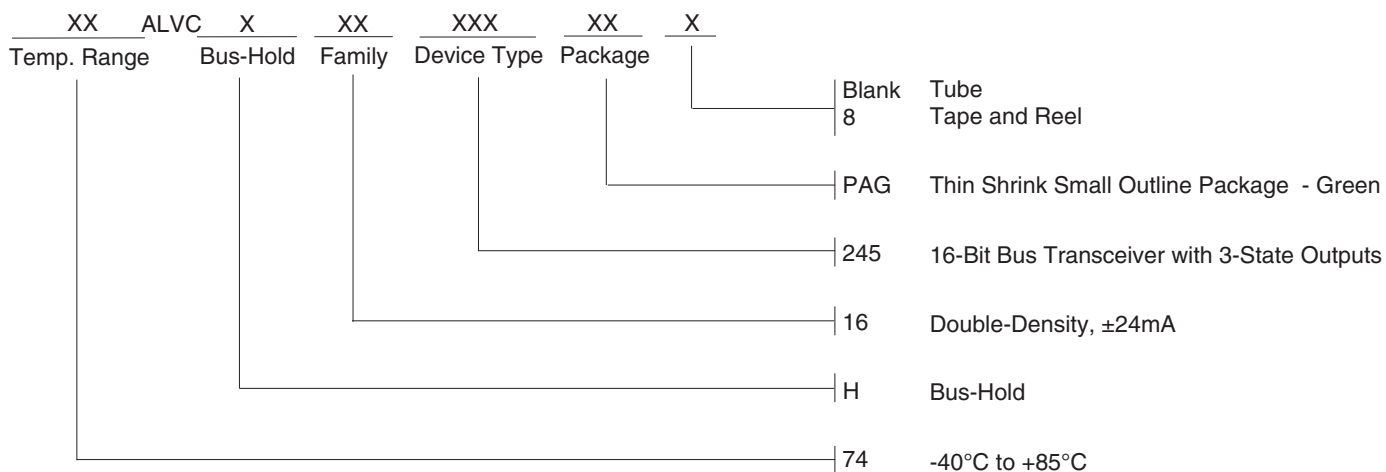


Set-up, Hold, and Release Times



Pulse Width

## ORDERING INFORMATION



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