



3.3V CMOS 16-BIT BUFFER/DRIVER WITH 3-STATE OUTPUTS AND BUS-HOLD

IDT74ALVCH16240

FEATURES:

- 0.5 MICRON CMOS Technology
- Typical $t_{SK(0)}$ (Output Skew) < 250ps
- ESD > 2000V per MIL-STD-883, Method 3015;
> 200V using machine model (C = 200pF, R = 0)
- 0.635mm pitch SSOP, 0.50mm pitch TSSOP,
and 0.40mm pitch TVSOP packages
- Extended commercial range of -40°C to $+85^{\circ}\text{C}$
- $V_{CC} = 3.3\text{V} \pm 0.3\text{V}$, Normal Range
- $V_{CC} = 2.7\text{V}$ to 3.6V , Extended Range
- $V_{CC} = 2.5\text{V} \pm 0.2\text{V}$
- CMOS power levels (0.4 μW typ. static)
- Rail-to-Rail output swing for increased noise margin

Drive Features for ALVCH16240:

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

APPLICATIONS:

- 3.3V High Speed Systems
- 3.3V and lower voltage computing systems

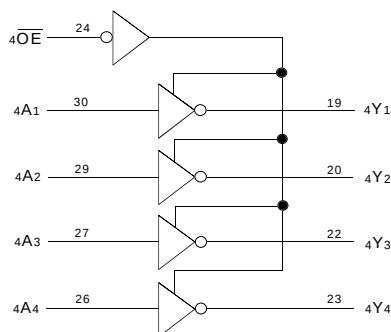
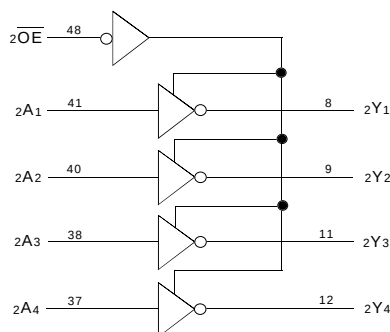
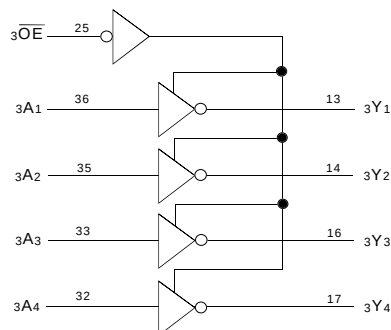
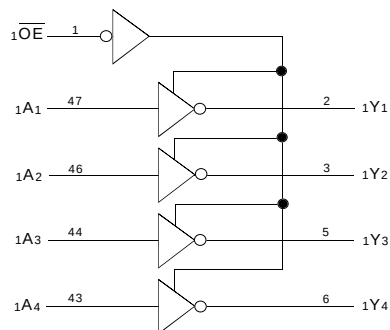
DESCRIPTION:

This 16-bit buffer/driver is built using advanced dual metal CMOS technology. The ALVCH16240 is designed specifically to improve the performance and density of 3-state memory address drivers, clock drivers, and bus-oriented receivers and transmitters. The device can be used as four 4-bit buffers, two 8-bit buffers, or one 16-bit buffer. It provides inverting outputs and symmetrical active-low output-enable ($\overline{\text{OE}}$) inputs.

The ALVCH16240 has been designed with a $\pm 24\text{mA}$ output driver. This driver is capable of driving a moderate to heavy load while maintaining speed performance.

The ALVCH16240 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.

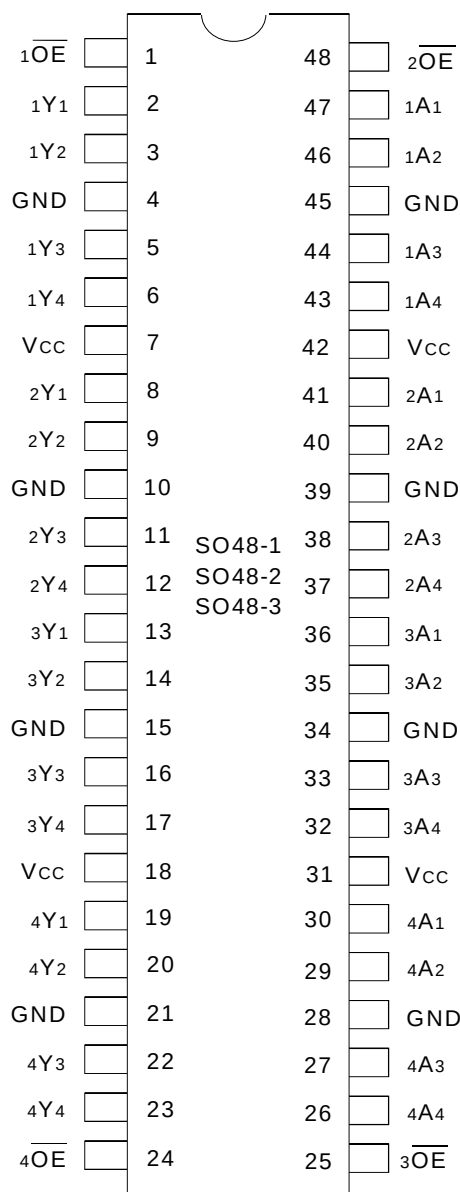
Functional Block Diagram



EXTENDED COMMERCIAL TEMPERATURE RANGE

MARCH 1999

PIN CONFIGURATION



SSOP/
TSSOP/TVSOP
TOP VIEW

PIN DESCRIPTION

Pin Names	Description
$\overline{xOE}$	3-State Output Enable Inputs (Active LOW)
xAx	Data Inputs ⁽¹⁾
xYx	3-State Outputs

NOTE:

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

ABSOLUTE MAXIMUM RATING (1)

Symbol	Description	Max.	Unit
$V_{TERM}^{(2)}$	Terminal Voltage with Respect to GND	- 0.5 to + 4.6	V
$V_{TERM}^{(3)}$	Terminal Voltage with Respect to GND	- 0.5 to $V_{CC} + 0.5$	V
T_{STG}	Storage Temperature	- 65 to + 150	°C
I_{OUT}	DC Output Current	- 50 to + 50	mA
I_{IK}	Continuous Clamp Current, $V_I < 0$ or $V_I > V_{CC}$	± 50	mA
I_{OK}	Continuous Clamp Current, $V_O < 0$	- 50	mA
I_{CC}	Continuous Current through each V_{CC} or GND	± 100	mA

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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_{CC} terminals.
- All terminals except V_{CC} .

CAPACITANCE ($T_A = +25^\circ\text{C}$, $f = 1.0\text{MHz}$)

Symbol	Parameter ⁽¹⁾	Conditions	Typ.	Max.	Unit
C_{IN}	Input Capacitance	$V_{IN} = 0V$	5	7	pF
C_{OUT}	Output Capacitance	$V_{OUT} = 0V$	7	9	pF
$C_{I/O}$	I/O Port Capacitance	$V_{IN} = 0V$	7	9	pF

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NOTE:

- As applicable to the device type.

FUNCTION TABLE (each 4-bit buffer)⁽¹⁾

Inputs		Outputs
$\overline{xOE}$	xAx	xYx
L	L	H
L	H	L
H	X	Z

NOTE:

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

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. ⁽¹⁾	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 _{IH}	Input HIGH Current	VCC = 3.6V	V _I = VCC	—	—	± 5	μA
I _{IL}	Input LOW Current	VCC = 3.6V	V _I = GND	—	—	± 5	
I _{OZH} I _{OZL}	High Impedance Output Current (3-State Output pins)	VCC = 3.6V	V _O = VCC	—	—	± 10	μA
			V _O = GND	—	—	± 10	μA
V _{IK}	Clamp Diode Voltage	VCC = 2.3V, I _{IN} = – 18mA		—	– 0.7	– 1.2	V
V _H	Input Hysteresis	VCC = 3.3V		—	100	—	mV
I _{CC} I _{CH} I _{CZ}	Quiescent Power Supply Current	VCC = 3.6V V _{IN} = GND or VCC		—	0.1	40	μA
ΔI _{CC}	Quiescent Power Supply Current Variation	One input at VCC – 0.6V, other inputs at VCC or GND		—	—	750	μA

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NOTE:

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

BUS-HOLD CHARACTERISTICS

Symbol	Parameter ⁽¹⁾	Test Conditions		Min.	Typ. ⁽²⁾	Max.	Unit
I _{BHH} I _{BHL}	Bus-Hold Input Sustain Current	VCC = 3.0V	V _I = 2.0V	– 75	—	—	μA
			V _I = 0.8V	75	—	—	
I _{BHH} I _{BHL}	Bus-Hold Input Sustain Current	VCC = 2.3V	V _I = 1.7V	– 45	—	—	μA
			V _I = 0.7V	45	—	—	
I _{BHHO} I _{BHLO}	Bus-Hold Input Overdrive Current	VCC = 3.6V	V _I = 0 to 3.6V	—	—	± 500	μA

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NOTES:

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

OUTPUT DRIVE CHARACTERISTICS

Symbol	Parameter	Test Conditions ⁽⁴⁾		Min.	Max.	Unit
VOH	Output HIGH Voltage	V _{CC} = 2.3V to 3.6V	I _{OH} = – 0.1mA	V _{CC} – 0.2	—	V
		V _{CC} = 2.3V	I _{OH} = – 6mA	2	—	
		V _{CC} = 2.3V	I _{OH} = – 12mA	1.7	—	
		V _{CC} = 2.7V		2.2	—	
		V _{CC} = 3.0V		2.4	—	
		V _{CC} = 3.0V	I _{OH} = – 24mA	2	—	
VOL	Output LOW Voltage	V _{CC} = 2.3V to 3.6V	I _{OL} = 0.1mA	—	0.2	V
		V _{CC} = 2.3V	I _{OL} = 6mA	—	0.4	
			I _{OL} = 12mA	—	0.7	
		V _{CC} = 2.7V	I _{OL} = 12mA	—	0.4	
		V _{CC} = 3.0V	I _{OL} = 24mA	—	0.55	

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NOTE:

- V_{IH} and V_{IL} must be within the min. or max. range shown in the DC ELECTRICAL CHARACTERISTICS OVER OPERATING RANGE table for the appropriate V_{CC} range. T_A = – 40°C to + 85°C.

OPERATING CHARACTERISTICS, T_A = 25°C

Symbol	Parameter	Test Conditions	V _{CC} = 2.5V ± 0.2V	V _{CC} = 3.3V ± 0.3V	Unit
			Typical	Typical	
CPD	Power Dissipation Capacitance Outputs enabled	C _L = 0pF, f = 10MHz	16	19	pF
CPD	Power Dissipation Capacitance Outputs disabled		4	5	pF

SWITCHING CHARACTERISTICS ⁽¹⁾

Symbol	Parameter	V _{CC} = 2.5V ± 0.2V		V _{CC} = 2.7V		V _{CC} = 3.3V ± 0.3V		Unit
		Min.	Max.	Min.	Max.	Min.	Max.	
t _{PLH} t _{PHL}	Propagation Delay xAX to xYx	1	5.3	—	5.3	1	3.9	ns
t _{PZH} t _{PZL}	Output Enable Time xOE to xYx	1	6.4	—	6.1	1	5	ns
t _{PHZ} t _{PLZ}	Output Disable Time xOE to xYx	1	5.4	—	4.8	1	4.4	ns
tsk(o)	Output skew between any two outputs of the same package and switching in the same direction.	—	—	—	—	—	500	ps
tsk(b)	Output skew for outputs in the same bank.	—	—	—	—	—	350	ps

NOTE:

- See test circuits and waveforms. T_A = – 40°C to + 85°C.

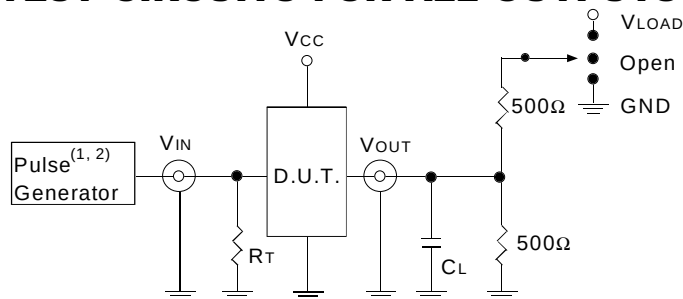
TEST CIRCUITS AND WAVEFORMS:

TEST CONDITIONS

Symbol	V _{CC} (1)= 3.3V±0.3V	V _{CC} (1)= 2.7V	V _{CC} (2)= 2.5V±0.2V	Unit
V _{LOAD}	6	6	2 x V _{CC}	V
V _{IH}	2.7	2.7	V _{CC}	V
V _T	1.5	1.5	V _{CC} / 2	V
V _{LZ}	300	300	150	mV
V _{HZ}	300	300	150	mV
C _L	50	50	30	pF

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TEST CIRCUITS FOR ALL OUTPUTS



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DEFINITIONS:

C_L = Load capacitance: includes jig and probe capacitance.

R_T = Termination resistance: should be equal to Z_{OUT} of the Pulse Generator.

NOTES:

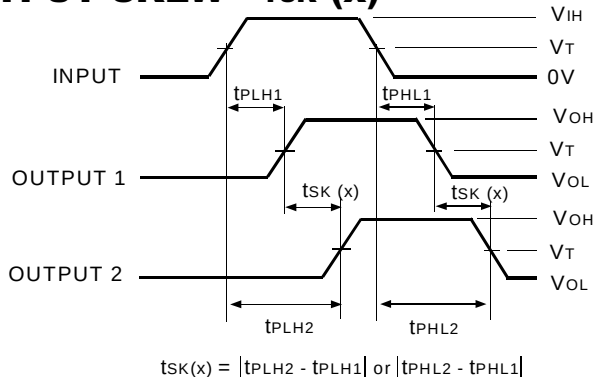
1. Pulse Generator for All Pulses: Rate ≤ 10MHz; t_F ≤ 2.5ns; t_R ≤ 2.5ns.
2. Pulse Generator for All Pulses: Rate ≤ 10MHz; t_F ≤ 2ns; t_R ≤ 2ns.

SWITCH POSITION

Test	Switch
Open Drain Disable Low Enable Low	V _{LOAD}
Disable High Enable High	GND
All Other tests	Open

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OUTPUT SKEW - t_{SK} (x)



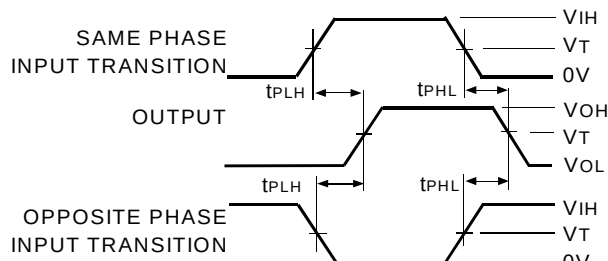
$$t_{SK}(x) = |t_{PLH2} - t_{PLH1}| \text{ or } |t_{PHL2} - t_{PHL1}|$$

ALVC Link

NOTES:

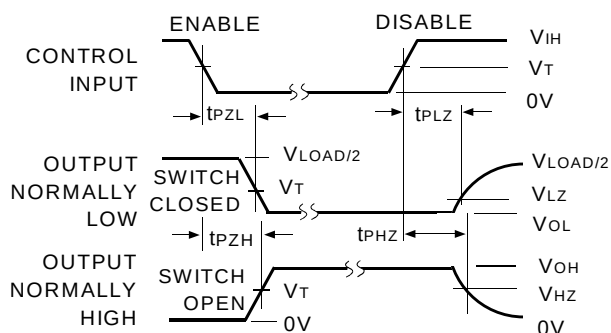
1. For t_{SK}(o) OUTPUT1 and OUTPUT2 are any two outputs.
2. For t_{SK}(b) OUTPUT1 and OUTPUT2 are in the same bank.

PROPAGATION DELAY



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ENABLE AND DISABLE TIMES

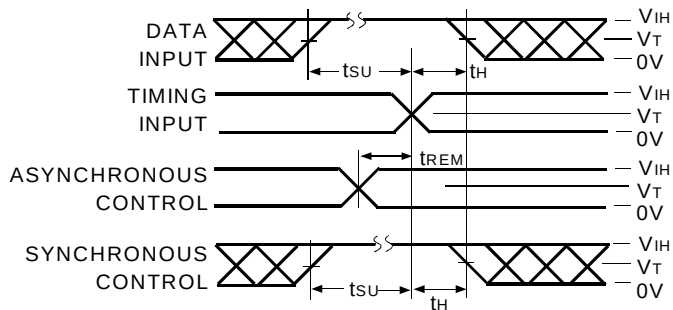


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NOTE:

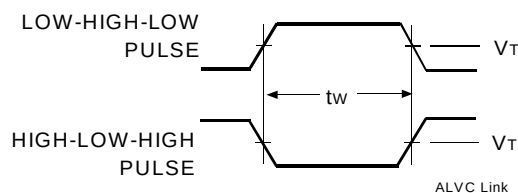
1. Diagram shown for input Control Enable-LOW and input Control Disable-HIGH.

SET-UP, HOLD, AND RELEASE TIMES



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PULSE WIDTH



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ORDERING INFORMATION

IDT	XX	ALVC	X	XX	XXX	XX	
	Temp. Range		Bus-Hold	Family	Device Type	Package	
						PV	Shrink Small Outline Package (SO48-1)
						PA	Thin Shrink Small Outline Package (SO48-2)
						PF	Thin Very Small Outline Package (SO48-3)
					240		16-Bit Buffer/Driver with 3-State Outputs
				16			Double-Density with Resistors, $\pm 24\text{mA}$
			H				Bus-Hold
						74	-40°C to $+85^{\circ}\text{C}$



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