



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

IDT74ALVC162244

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 ALVC162244:

- Balanced Output Drivers: $\pm 12\text{mA}$
- Low switching noise

DESCRIPTION:

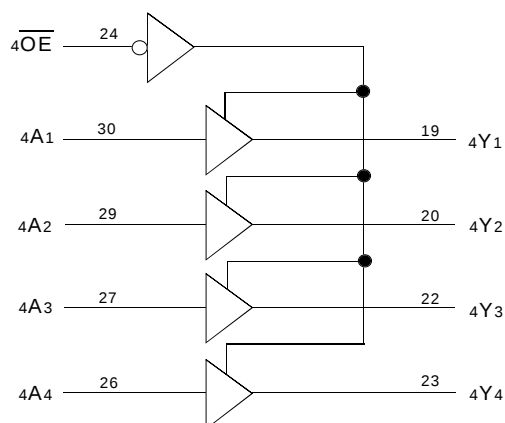
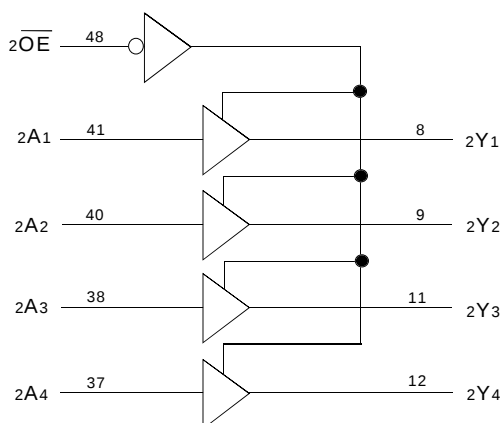
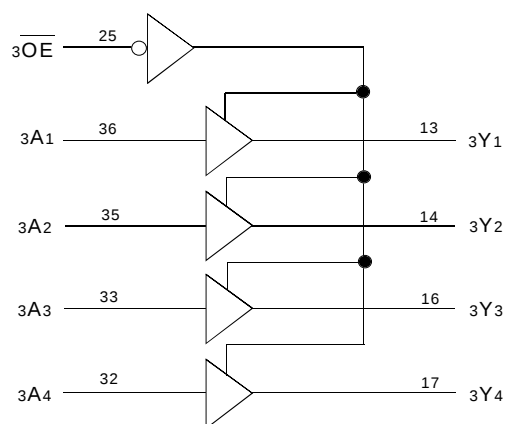
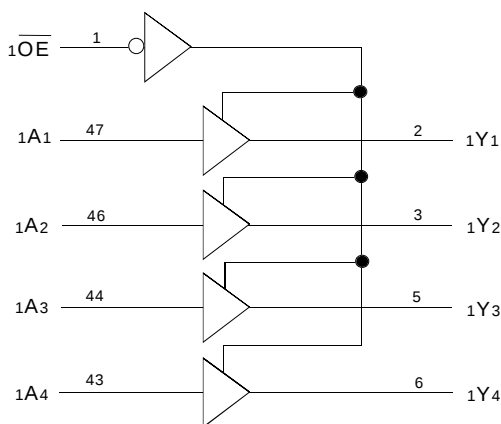
This 16-bit buffer/driver is built using advanced dual metal CMOS technology. The ALVC162244 is designed specifically to improve the performance and density of 3-state memory address drivers, clock drivers, and bus-oriented receivers and transmitters. The device can be used as four 4-bit buffers, two 8-bit buffers, or one 16-bit buffer. It provides true outputs and symmetrical active-low output-enable ($\overline{\text{OE}}$) inputs.

The ALVC162244 has series resistors in the device output structure which will significantly reduce line noise when used with light loads. This driver has been designed to drive $\pm 12\text{mA}$ at the designated threshold levels.

APPLICATIONS:

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

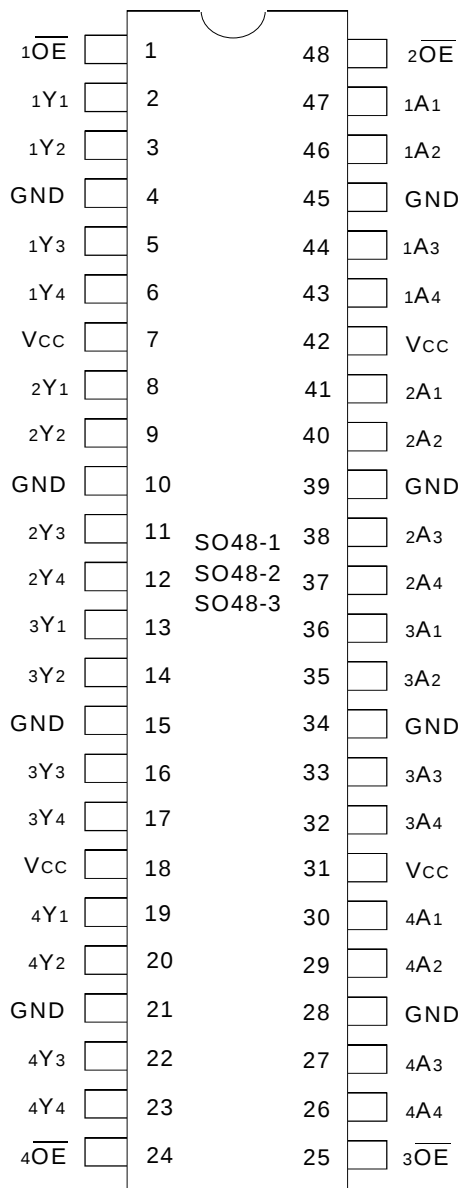
Functional Block Diagram



EXTENDED COMMERCIAL TEMPERATURE RANGE

MARCH 1999

PIN CONFIGURATION



SSOP/
TSSOP/ TVSOP
TOP VIEW

ABSOLUTE MAXIMUM RATING (1)

Symbol	Description	Max.	Unit
VTERM ⁽²⁾	Terminal Voltage with Respect to GND	– 0.5 to + 4.6	V
VTERM ⁽³⁾	Terminal Voltage with Respect to GND	– 0.5 to V _{CC} + 0.5	V
TSTG	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°C, f = 1.0MHz)

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.

PIN DESCRIPTION

Pin Names	Description
xOE	3-State Output Enable Inputs (Active LOW)
xAx	Data Inputs
xYx	3-State Outputs

FUNCTION TABLE (each 4-bit buffer)⁽¹⁾

Inputs		Outputs
xOE	xAx	xYx
L	H	H
L	L	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: $T_A = -40^{\circ}\text{C}$ to $+85^{\circ}\text{C}$

Symbol	Parameter	Test Conditions		Min.	Typ. ⁽¹⁾	Max.	Unit
V_{IH}	Input HIGH Voltage Level	$V_{CC} = 2.3\text{V}$ to 2.7V		1.7	—	—	V
		$V_{CC} = 2.7\text{V}$ to 3.6V		2	—	—	
V_{IL}	Input LOW Voltage Level	$V_{CC} = 2.3\text{V}$ to 2.7V		—	—	0.7	V
		$V_{CC} = 2.7\text{V}$ to 3.6V		—	—	0.8	
I_{IH}	Input HIGH Current	$V_{CC} = 3.6\text{V}$	$V_I = V_{CC}$	—	—	± 5	μA
I_{IL}	Input LOW Current	$V_{CC} = 3.6\text{V}$	$V_I = \text{GND}$	—	—	± 5	
I_{OZH} I_{OZL}	High Impedance Output Current (3-State Output pins)	$V_{CC} = 3.6\text{V}$	$V_O = V_{CC}$	—	—	± 10	μA
			$V_O = \text{GND}$	—	—	± 10	μA
V_{IK}	Clamp Diode Voltage	$V_{CC} = 2.3\text{V}$, $I_{IN} = -18\text{mA}$		—	-0.7	-1.2	V
V_H	Input Hysteresis	$V_{CC} = 3.3\text{V}$		—	100	—	mV
I_{CCL} I_{CCH} I_{CCZ}	Quiescent Power Supply Current	$V_{CC} = 3.6\text{V}$ $V_{IN} = \text{GND}$ or V_{CC}		—	0.1	40	μA
ΔI_{CC}	Quiescent Power Supply Current Variation	One input at $V_{CC} - 0.6\text{V}$, other inputs at V_{CC} or GND		—	—	750	

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NOTE:1. Typical values are at $V_{CC} = 3.3\text{V}$, $+25^{\circ}\text{C}$ ambient.**OUTPUT DRIVE CHARACTERISTICS**

Symbol	Parameter	Test Conditions ⁽¹⁾		Min.	Max.	Unit
V_{OH}	Output HIGH Voltage	$V_{CC} = 2.3\text{V}$ to 3.6V	$I_{OH} = -0.1\text{mA}$	$V_{CC} - 0.2$	—	V
			$I_{OH} = -4\text{mA}$	1.9	—	
		$V_{CC} = 2.7\text{V}$	$I_{OH} = -6\text{mA}$	1.7	—	
			$I_{OH} = -4\text{mA}$	2.2	—	
		$V_{CC} = 3.0\text{V}$	$I_{OH} = -8\text{mA}$	2	—	
			$I_{OH} = -6\text{mA}$	2.4	—	
V_{OL}	Output LOW Voltage	$V_{CC} = 2.3\text{V}$ to 3.6V	$I_{OL} = 0.1\text{mA}$	—	0.2	V
			$I_{OL} = 4\text{mA}$	—	0.4	
		$V_{CC} = 2.7\text{V}$	$I_{OL} = 6\text{mA}$	—	0.55	
			$I_{OL} = 4\text{mA}$	—	0.4	
		$V_{CC} = 3.0\text{V}$	$I_{OL} = 8\text{mA}$	—	0.6	
			$I_{OL} = 6\text{mA}$	—	0.55	
			$I_{OL} = 12\text{mA}$	—	0.8	

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NOTE:1. 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. $T_A = -40^{\circ}\text{C}$ to $+85^{\circ}\text{C}$.

OPERATING CHARACTERISTICS, $T_A = 25^\circ\text{C}$

Symbol	Parameter	Test Conditions	VCC = 2.5V $\pm$ 0.2V	VCC = 3.3V $\pm$ 0.3V	Unit
			Typical	Typical	
CPD	Power Dissipation Capacitance Outputs enabled	CL = 0pF, f = 10Mhz	16	19	pF
CPD	Power Dissipation Capacitance Outputs disabled		4	5	pF

SWITCHING CHARACTERISTICS⁽¹⁾

Symbol	Parameter	VCC = 2.5V $\pm$ 0.2V		VCC = 2.7V		VCC = 3.3V $\pm$ 0.3V		Unit
		Min.	Max.	Min.	Max.	Min.	Max.	
tPLH tPHL	Propagation Delay xAx to xYx	1	4.9	—	4.7	1	4.2	ns
tPZH tPZL	Output Enable Time $\overline{\text{xOE}}$ to xYx	1	6.8	—	6.7	1	5.6	ns
tPHZ tPLZ	Output Disable Time $\overline{\text{xOE}}$ to xYx	1	6.3	—	5.7	1	5.5	ns
tsk(0)	Output Skew ⁽²⁾	—	—	—	—	—	500	ps

NOTES:

1. See test circuits and waveforms. $T_A = -40^\circ\text{C}$ to $+85^\circ\text{C}$.
2. Skew between any two outputs of the same package and switching in the same direction.

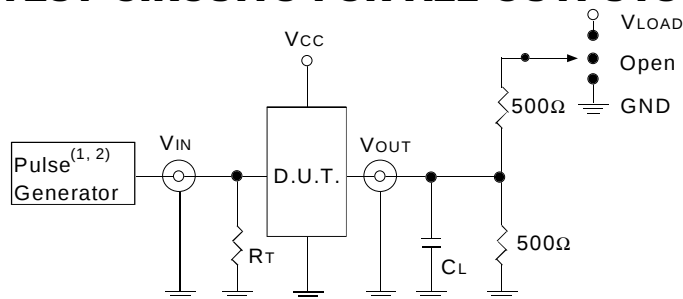
TEST CIRCUITS AND WAVEFORMS

TEST CONDITIONS

Symbol	V _{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:

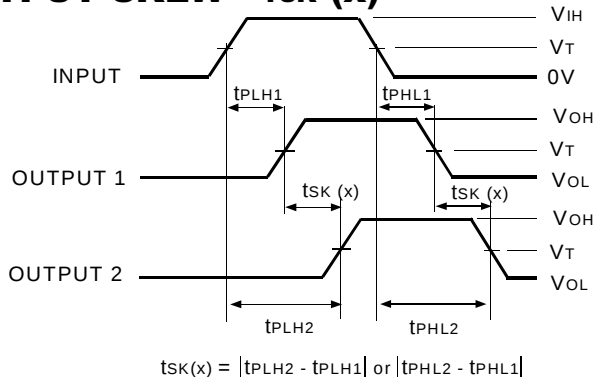
1. Pulse Generator for All Pulses: Rate ≤ 10MHz; t_F ≤ 2.5ns; t_R ≤ 2.5ns.
2. Pulse Generator for All Pulses: Rate ≤ 10MHz; t_F ≤ 2ns; t_R ≤ 2ns.

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)

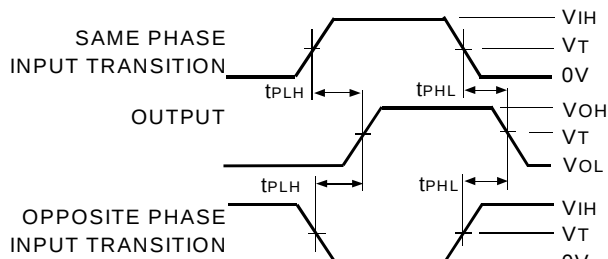


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NOTES:

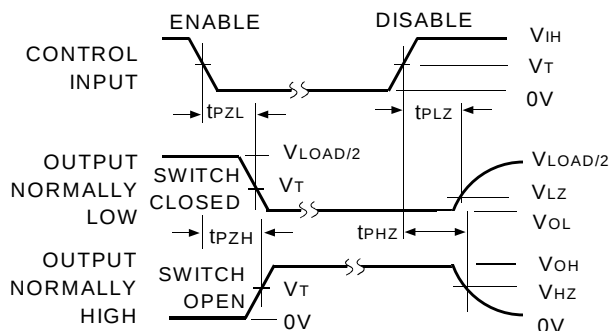
1. For t_{SK}(o) OUTPUT1 and OUTPUT2 are any two outputs.
2. For t_{SK}(b) OUTPUT1 and OUTPUT2 are in the same bank.

PROPAGATION DELAY



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ENABLE AND DISABLE TIMES

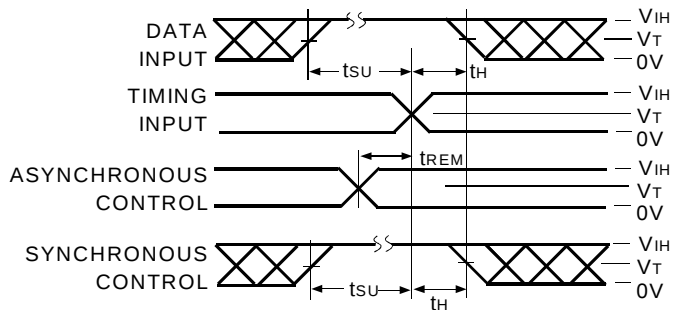


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NOTE:

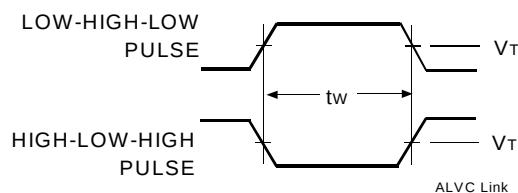
1. Diagram shown for input Control Enable-LOW and input Control Disable-HIGH.

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)
					244		16-Bit Buffer/Driver with 3-State Outputs
					162		Double-Density with Resistors, $\pm 12\text{mA}$
					Blank		No Bus-Hold
					74		-40°C to $+85^{\circ}\text{C}$



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