

# 18-BIT UNIVERSAL BUS DRIVER WITH 3-STATE OUTPUTS

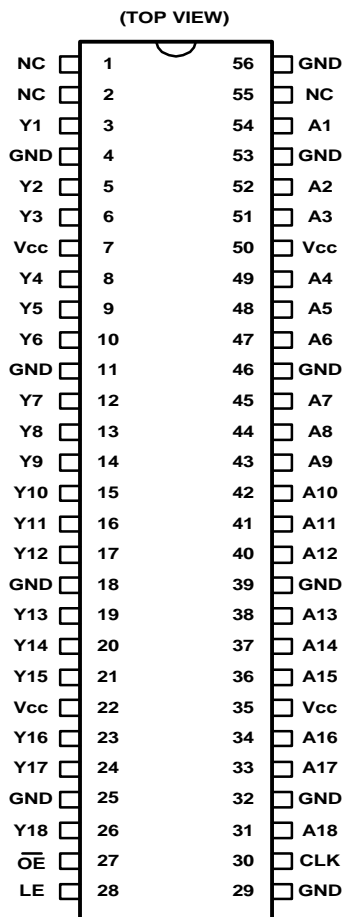
HG74ALVC162835C

Jan. 1999

## Features

- Ideal for Use in PC100 Registered DIMM
- 0.5 $\mu$ m CMOS Technology
- 2.3 ~ 3.6 V<sub>CC</sub> Operation
- Output Port Has 26- $\Omega$  Series Damping Resistor, No External Resistors are Required
- Package Options Include Plastic Thin Shrink Small-Outline Packages, Shrink Small-Outline Packages, Thin Very Small Outline Packages (TSSOP 56 Pins, SSOP 56 Pins, TVSOP 56 Pins)

## Pin Configuration



NC- No internal connection

## General Description

The HG74ALVC162835C is an 18-bit universal bus driver designed for 2.3V to 3.6 V V<sub>CC</sub> Operation.

The Output Enable( $\overline{OE}$ ) controls data flow from A to Y. The device operates in transparent mode when the latch-enable(LE) input is high. When LE is low, the A data is latched if the clock input is held at a high or low logic level. If LE is low, the A data is stored in the latch/flip-flop on the low-to-high transition of CLK.

When  $\overline{OE}$  is high, the Outputs are in the high impedance state.  $\overline{OE}$  should be tied to V<sub>CC</sub> through a pull up resistor to ensure the high impedance state during power up or power down.

The equivalent 26- $\Omega$  series resistors are included in the output to reduce overshoot and undershoot.

The HG74ALVC162835C is characterized for operation from -40°C to 85°C.

## Function Table

INPUTS				OUTPUT
$\overline{OE}$	LE	CLK	A	Y
H	X	X	X	Z
L	H	X	L	L
L	H	X	H	H
L	L	$\uparrow$	L	L
L	L	$\uparrow$	H	H
L	L	L or H	X	Y <sub>0</sub> <sup>†</sup>

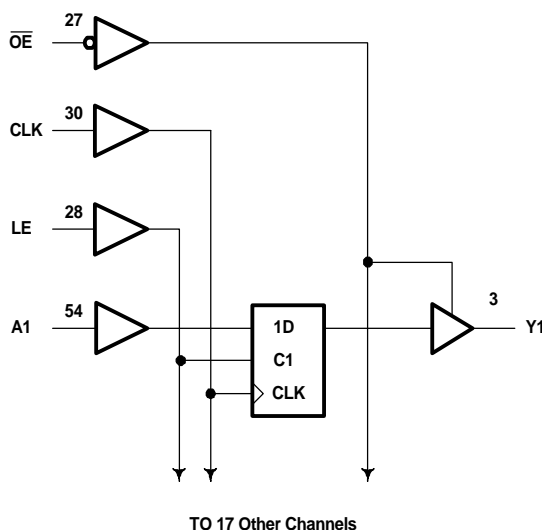
<sup>†</sup>Output level before the indicated steady-state input conditions were established, provided that CLK is high before LE goes low.

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## Logic Diagram (positive logic)



## Absolute Maximum Ratings Over Operating Free-air Temperature Ranges†

Symbols	Parameter	Value	Conditions
$V_{CC}$	Supply Voltage Range	-0.5 V to 4.6 V	
$V_I$	Input Voltage Range (see note 1)	-0.5 V to $V_{CC} + 0.5$ V	
$V_O$	Output Voltage Range (see notes 1 and 2)	-0.5 V to $V_{CC} + 0.5$ V	
$I_{IK}$	Input Clamp Current	-50 mA	$V_I < 0$
$I_{OK}$	Output Clamp Current	$\pm 50$ mA	$V_O < 0$ or $V_O > V_{CC}$
$I_O$	Continuous Output Current	$\pm 50$ mA	$V_O = 0$ to $V_{CC}$
$I_{CC}$	Continuous Current through each $V_{CC}$	+100 mA	
$I_{GND}$	Continuous Current through each GND	-100 mA	
$T_{stg}$	Storage Temperature Range	- 65°C to 150°C	

†Stresses beyond those listed under "absolute maximum rating" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated under "recommended operating condition" is not implied. Exposure to absolute maximum-rated conditions for extended periods may affect device reliability.

Note 1) The input and output voltage ratings may be exceeded if the input and output clamp current are observed.

Note 2) This value is limited to 4.6 V maximum.

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## Recommended Operating Conditions (see Note 3)

Symbols	Parameter	Value		Units	Conditions
		MIN	MAX		
$V_{CC}$	Supply Voltage	2.3	3.6	V	
$V_{IH}$	High -level input Voltage	1.7		V	$V_{CC} = 2.3V$ to 2.7V
		2		V	$V_{CC} = 2.7V$ to 3.6V
$V_{IL}$	Low-level input Voltage		0.7	V	$V_{CC} = 2.3V$ to 2.7V
			0.8	V	$V_{CC} = 2.7V$ to 3.6V
$V_I$	Input Voltage	0	$V_{CC}$	V	
$V_O$	Output Voltage	0	$V_{CC}$	V	
$I_{OH}$	High-level output current		-6	mA	$V_{CC} = 2.3V$
			-8	mA	$V_{CC} = 2.7V$
			-12	mA	$V_{CC} = 3V$
$I_{OL}$	Low-level output current		6	mA	$V_{CC} = 2.3V$
			8	mA	$V_{CC} = 2.7V$
			12	mA	$V_{CC} = 3V$
$\Delta t/\Delta v$	Input transition rise or fall rate	0	10	ns/V	
$T_A$	Operating free-air temperature	-40	85	°C	

Note 3) All unused inputs of the device must be held at  $V_{CC}$  or GND to ensure proper device operation.

## Electrical Characteristics Over Recommended Operating Free-air Temperature Range

Parameter	Test Conditions	Value			Units	$V_{CC}$
		Min	Typ†	Max		
$V_{OH}$	$I_{OH} = -100\mu A$	$V_{CC} - 0.2$			V	2.3V to 3.6V
	$I_{OH} = -4mA$	$V_{IH} = 1.7V$	1.9			2.3V
	$I_{OH} = -6mA$	$V_{IH} = 1.7V$	1.7			2.3V
		$V_{IH} = 2V$	2.4			3V
	$I_{OH} = -8mA$	$V_{IH} = 2V$	2			2.7V
	$I_{OH} = -12mA$	$V_{IH} = 2V$	2			3V
$V_{OL}$	$I_{OL} = 100\mu A$			0.2	V	2.3V to 3.6V
	$I_{OL} = 4mA$	$V_{IL} = 0.7V$		0.4		2.3V
		$V_{IL} = 0.7V$		0.55		2.3V
	$I_{OL} = 6mA$	$V_{IL} = 0.8V$		0.55		3V
		$V_{IL} = 0.8V$		0.6		2.7V
	$I_{OL} = 12mA$	$V_{IL} = 0.8V$		0.8		3V
$I_L$	$V_I = V_{CC}$ or GND			$\pm 5$	$\mu A$	3.6V
$I_{OZ}$	$V_O = V_{CC}$ or GND			$\pm 10$		3.6V
$I_{CC}$	$V_I = V_{CC}$ or GND $I_O = 0$			40	$\mu A$	3.6V
$\Delta I_{CC}$	One input at $V_{CC} - 0.6V$ , Other inputs at $V_{CC}$ or GND			750		3V to 3.6V
$C_I$	Control Inputs	$V_I = V_{CC}$ or GND		3.5	$\rho F$	3.3V
	Data Inputs			5		
$C_O$	Outputs	$V_O = V_{CC}$ or GND		7	$\rho F$	3.3V

† All typical Values are at  $V_{CC} = 3.3V$ ,  $T_A = 25^\circ C$ .

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## Timing Requirements Over Recommended Operating Free-air Temperature Range(see figure1~10)

Symbol	Parameter	Condition	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		
f <sub>clock</sub>	Clock frequency			150		150		150	MHz	
t <sub>w</sub>	Pulse Duration	LE high	3.3		3.3		3.3		ns	
		CLK high or low	3.3		3.3		3.3		ns	
t <sub>su</sub>	Setup time	Data before CLK↑	0.9		0.9		0.7		ns	
		Data before $\overline{LE}\downarrow$	CLK high	1.9		1.6		1.5		ns
			CLK low	1.3		1.1		1		ns
t <sub>h</sub>	Hold time	Data after CLK↑	1.0		1.0		1.1		ns	
		Data after $\overline{LE}\downarrow$	1.4		1.7		1.4		ns	

## Switching Characteristics Over Recommended Operating Free-air Temperature Range

Parameter	Input (From)	Output (To)	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	
f <sub>max</sub>			150		150		150		MHz
t <sub>pd</sub>	A	Y	1	5		5	1	4.2	ns
	$\overline{LE}$		1.3	5.9		5.8	1.3	5.1	ns
	CLK		1.4	6.3		6.1	1.4	5.4	ns
t <sub>en</sub>	$\overline{OE}$	Y	1.4	6.3		6.5	1.1	5.5	ns
t <sub>dis</sub>	$\overline{OE}$	Y	1	4.9		4.9	1.3	4.5	ns

## Switching Characteristics From 0°C to 65°C, C<sub>L</sub>=50pF

Parameter	Input (From)	Output (To)	V <sub>CC</sub> =3.3V±0.15V		Unit
			Min	Max	
t <sub>pd</sub>	CLK	Y	1.9	5	ns

Parameter Measurement ( $V_{CC}=2.5V\pm 0.2V$ )

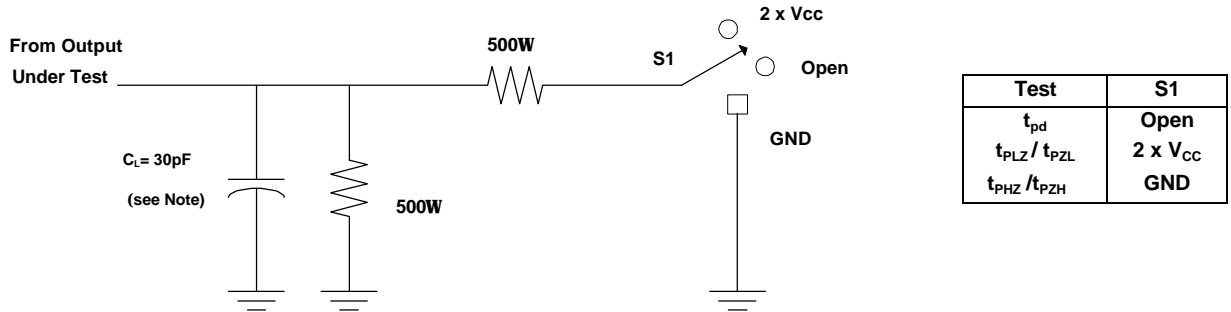


Figure 1. Load Circuit

Note)  $C_L$  includes probe and jig capacitance

Voltage Waveforms

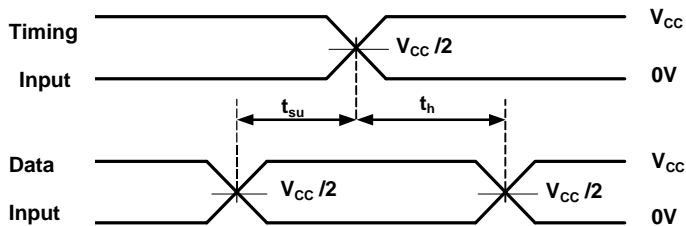


Figure 2. Set up and Hold Times

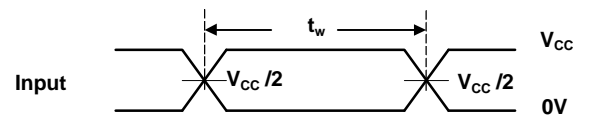


Figure 3. Pulse Duration

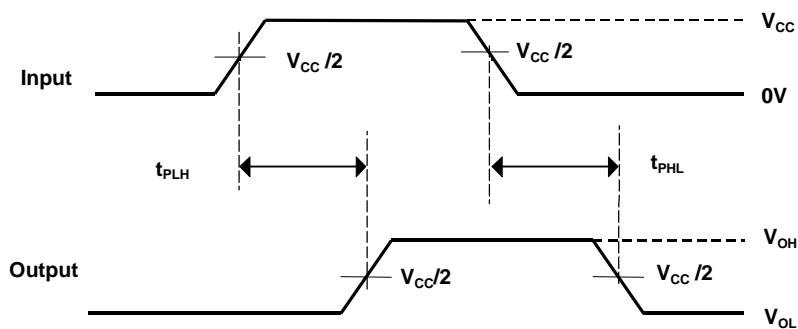


Figure 4. Propagation Delay times

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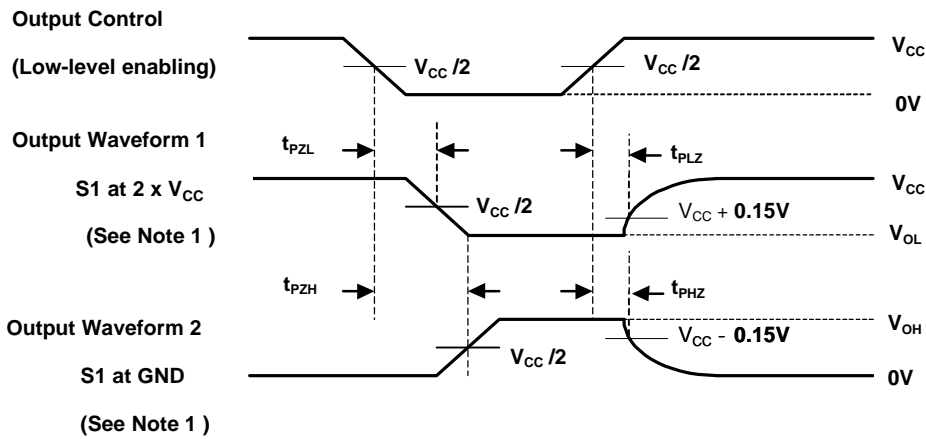


Figure 5. Enable and Disable Times

Note 1) Waveform1 is for an output with internal conditions such that the output is low except when disabled by the output control.

Waveform2 is for an output with internal conditions such that the output is high except when disabled by the output control

Note 2) All input pulses are supplied by generators having the following characteristics:

PRR  $\leq$  10MHz,  $Z_o = 50\Omega$ ,  $t_r \leq 2ns$ ,  $t_f \leq 2ns$ .

Note 3) The output are measured one at a time with one transition per measurement.

Note 4)  $t_{PLZ}$  and  $t_{PHZ}$  are the same as  $t_{dis}$ .

Note 5)  $t_{PZL}$  and  $t_{PZH}$  are the same as  $t_{en}$ .

Note 6)  $t_{PLH}$  and  $t_{PHL}$  are the same as  $t_{pd}$ .

Parameter Measurement ( $V_{CC}=2.7V$  and  $3.3V \pm 0.3V$ )

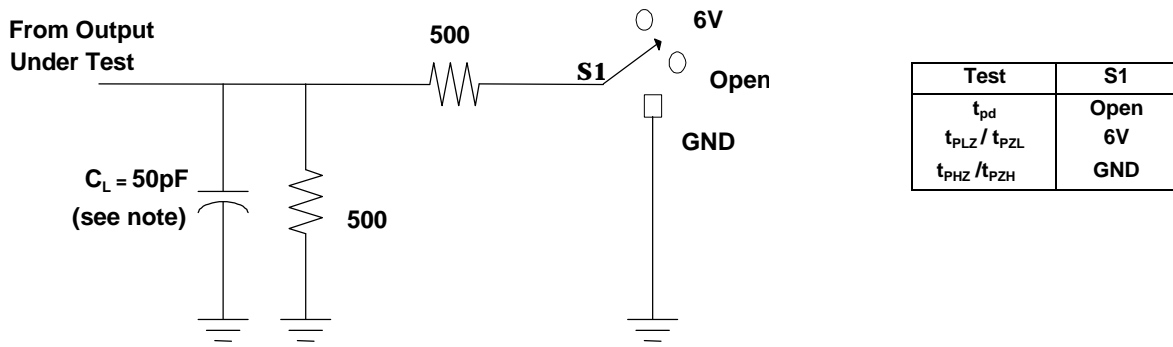


Figure 6. Load Circuit

Note)  $C_L$  includes probe and jig capacitance

Voltage Waveforms

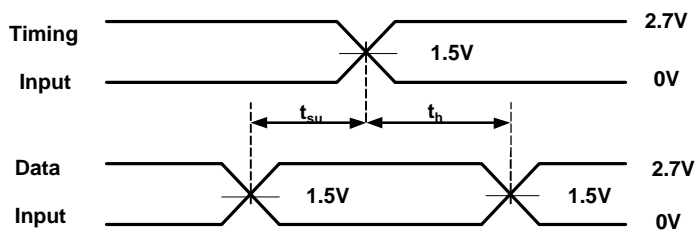


Figure 7. Set up and Hold Times

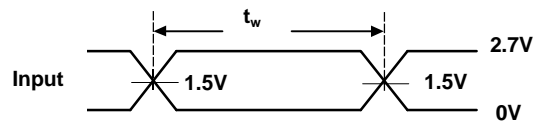


Figure 8. Pulse Duration

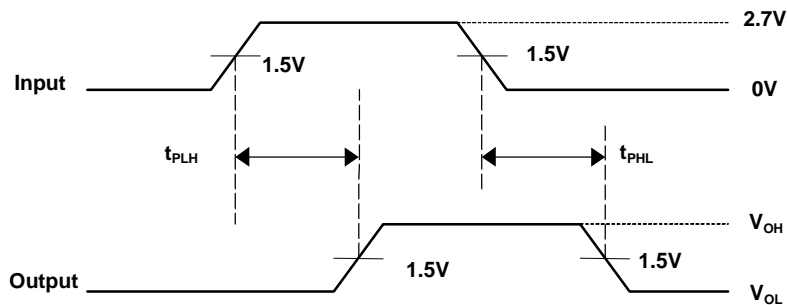


Figure 9. Propagation Delay times

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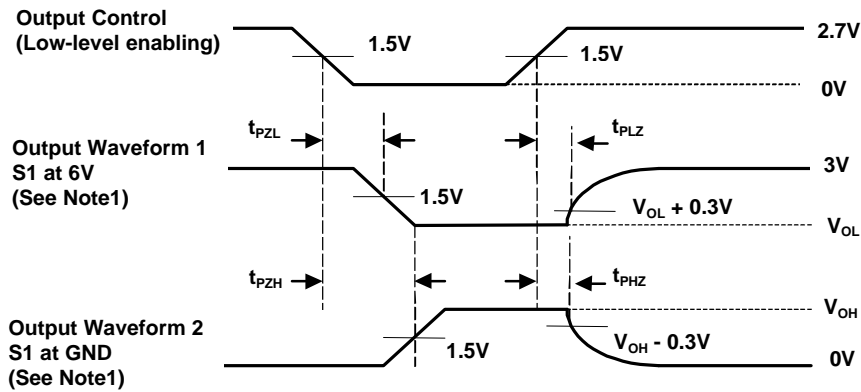


Figure 10. Enable and Disable Times

- Note 1) Waveform1 is for an output with internal conditions such that the output is low except when disabled by the output control.  
Waveform2 is for an output with internal conditions such that the output is high except when disabled by the output control.
- Note 2) All input pulses are supplied by generators having the following characteristics :  
 $PRR \leq 10\text{MHz}$ ,  $Z_o = 50\Omega$ ,  $t_r \leq 2.5\text{ns}$ ,  $t_f \leq 2.5\text{ns}$ .
- Note 3) The output are measured one at a time with one transition per measurement.
- Note 4)  $t_{PLZ}$  and  $t_{PHZ}$  are the same as  $t_{dis}$ .
- Note 5)  $t_{PZL}$  and  $t_{PZH}$  are the same as  $t_{en}$ .
- Note 6)  $t_{PLH}$  and  $t_{PHL}$  are the same as  $t_{pd}$ .