18-BIT UNIVERSAL BUS DRIVER WITH 3-STATE OUTPUTS

HG74ALVC162835C

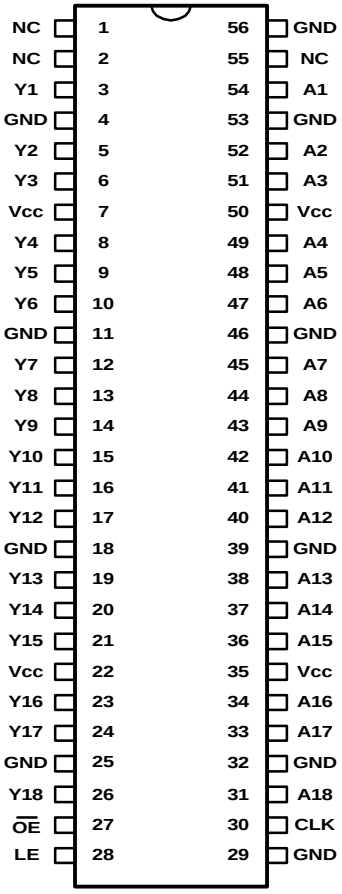
Jan. 1999

Features

- **Ideal for Use in PC100 Registered DIMM**
- **0.5㎜m CMOS Technology**
- **2.3 ~ 3.6 V_{CC} Operation**
- **Output Port Has 26-Ω 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

(TOP VIEW)



NC- No ineternal connection

General Description

The HG74ALVC162835C is an 18-bit universal bus driver designed for 2.3V to 3.6 V V_{CC} 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_{CC} through a pull up resistor to ensure the high impedance state during power up or power down.

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

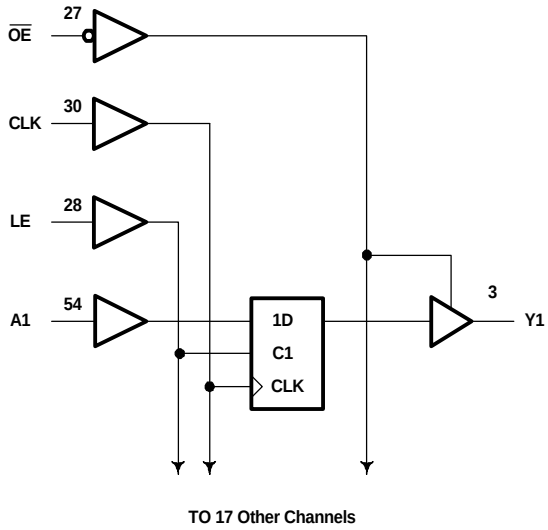
The HG74ALVC162835C is characterized for operation from -40°C to 85°C.

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	↑	L	L
L	L	↑	H	H
L	L	L or H	X	Y_O†

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

Logic Diagram (positive logic)



Absolute Maximum Ratings Over Operating Free-air Temperature Range†

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	**±50 mA**	$V_O <0$ or $V_O > V_{CC}$
I_O	Continuous Output Current	**±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.

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} = **-**100µA		**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} = **-**12 mA	V_{IH} = 2V	**2**				3V
V_{OL}		I_{OL} = 100µA				**0.2**	V	2.3V to 3.6V
		I_{OL} = 4mA	V_{IL} = 0.7V			**0.4**		2.3V
		I_{OL} = 6mA	V_{IL} = 0.7V			**0.55**		2.3V
			V_{IL} = 0.8V			**0.55**		3V
		I_{OL} =8mA	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				±**5**	µA	3.6V
I_{OZ}		V_O = V_{CC} or GND				±**10**		3.6V
I_{CC}		V_I = V_{CC} or GND I_O = 0				**40**		3.6V
ΔI_{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**		pF	3.3V
	Data Inputs				**5**			
C_o	Outputs	V_O= V_{CC} or GND			**7**		pF	3.3V

† All typical Values are at V_{CC} =3.3V, T_A = 25°C.

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

Symbol	Parameter	Condition		V_{CC}=2.5V±0.2V		V_{CC}=2.7V		V_{CC}=3.3V±0.3V		Unit
				Min	Max	Min	Max	Min	Max	
f_{clock}	Clock frequency				150		150		150	MHz
t_w	Pulse Duration	LE high		3.3		3.3		3.3		ns
		CLK high or low		3.3		3.3		3.3		ns
t_{su}	Setup time	Data before CLK↑		0.9		0.9		0.7		ns
		Data before $\overline{LE}$↓	CLK high	1.9		1.6		1.5		ns
			CLK low	1.3		1.1		1		ns
t_h	Hold time	Data after CLK↑		1.0		1.0		1.1		ns
		Data after $\overline{LE}$↓	CLK high or low	1.4		1.7		1.4		ns

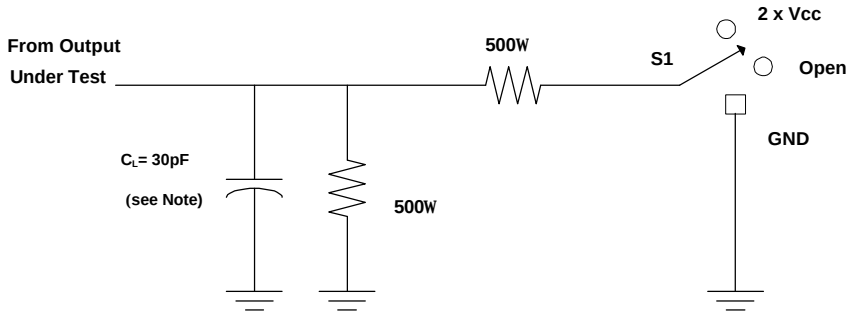
Switching Characteristics Over Recommended Operating Free-air Temperature Range

Parameter	Input (From)	Output (To)	V_{CC}=2.5V± 0.2V		V_{CC}=2.7V		V_{CC}=3.3V±0.3V		Unit
			Min	Max	Min	Max	Min	Max	
f_{max}			150		150		150		MHz
t_{pd}	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_{en}	$\overline{OE}$	Y	1.4	6.3		6.5	1.1	5.5	ns
t_{dis}	$\overline{OE}$	Y	1	4.9		4.9	1.3	4.5	ns

Switching Characteristics From 0°C to 65°C, C_L=50ρF

Parameter	Input (From)	Output (To)	V_{CC} =3.3V± 0.15V		Unit
			Min	Max	
t_{pd}	CLK	Y	1.9	5	ns

Parameter Measurement (V_{CC}=2.5V±0.2V)



Test	S1
t_{pd}	Open
t_{PLZ} / t_{PZL}	2 x V_{CC}
t_{PHZ} /t_{PZH}	GND

Figure 1. Load Circuit

Note) C_L includes probe and jig capacitance

Voltage Waveforms

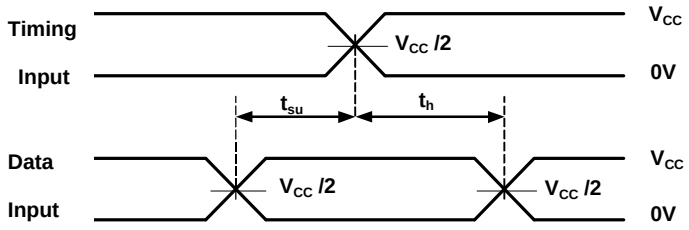


Figure 2. Set up and Hold Times

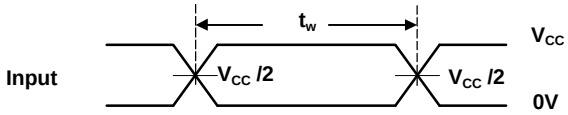


Figure 3. Pulse Duration

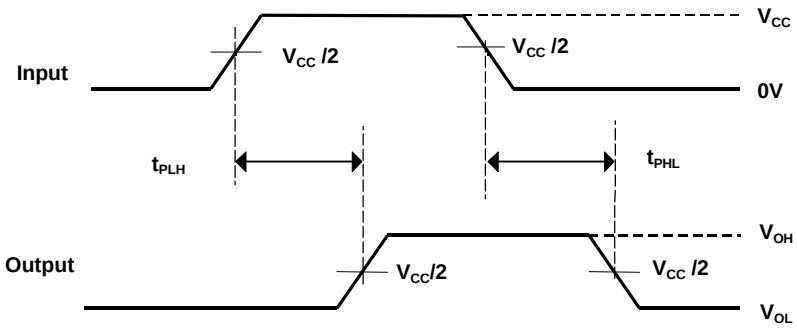


Figure 4. Propagation Delay times

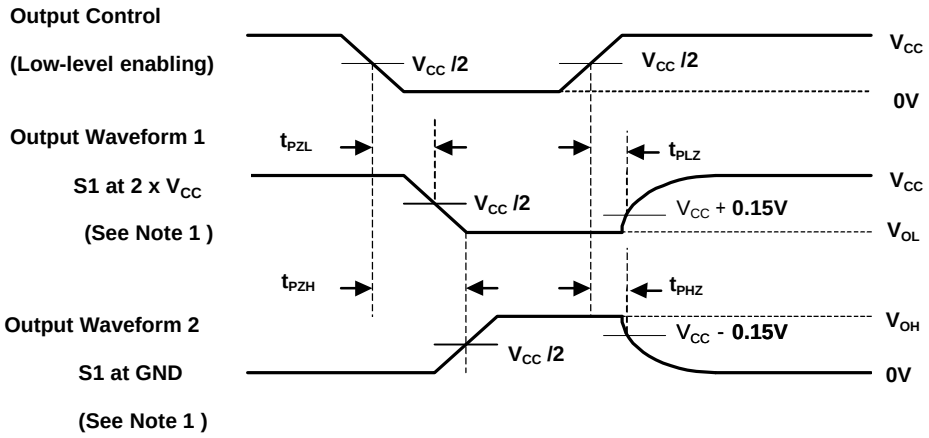
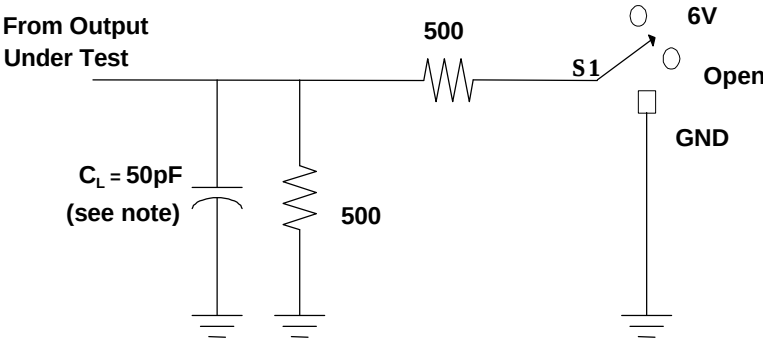


Figure 5. Enable and Disable Times

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 ⊆ 10Mhz, Z_o = 50Ω , t_r ⊆ 2ns, t_f ⊆ 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 (Vcc=2.7V and 3.3V ± 0.3V)



Test	S1
t_{pd}	Open
t_{PLZ} / t_{PZL}	6V
t_{PHZ} /t_{PZH}	GND

Figure 6. Load Circuit

Note) C_L includes probe and jig capacitance

Voltage Waveforms

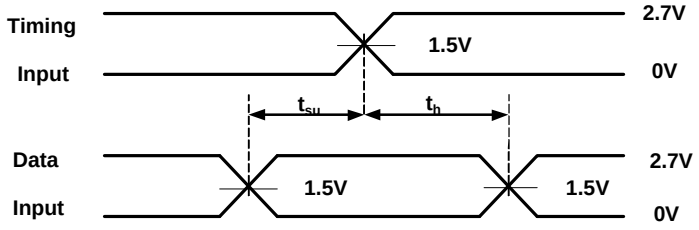


Figure 7. Set up and Hold Times

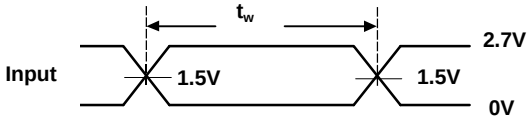


Figure 8. Pulse Duration

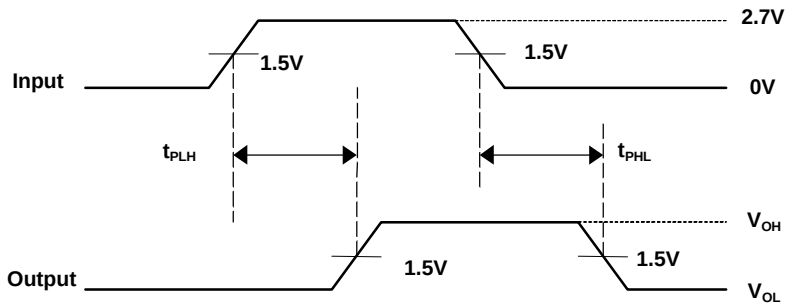


Figure 9. Propagation Delay times

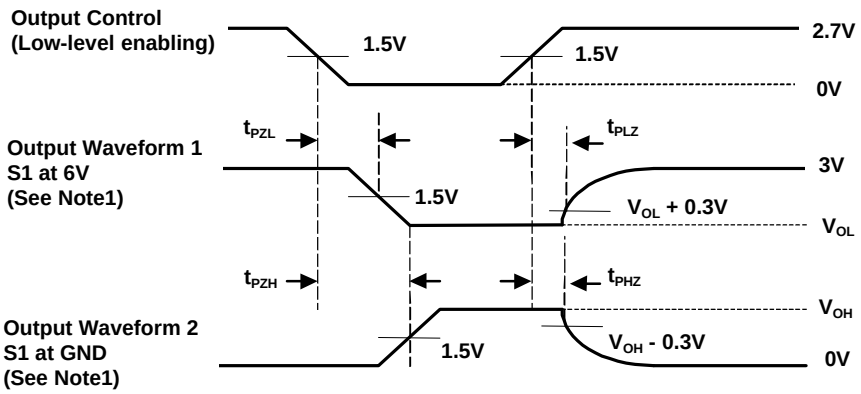


Figure 10. Enable and Disable Times

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 ⊆ 10MHz, Z_o = 50Ω, t_r ⊆ 2.5ns, t_f ⊆ 2.5ns.
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}.