

74ALVCF322835 Low Voltage 36-Bit Universal Bus Driver with 3.6V Tolerant Outputs and 26Ω Series Resistors in Outputs

General Description

The 74ALVCF322835 low voltage 36-bit universal bus driver combines D-type latches and D-type flip-flops to allow data flow in transparent, latched and clocked modes. Data flow is controlled by output-enable (\overline{OE}), latch-enable (LE), and clock (CLK) inputs. The device operates in Transparent Mode when LE is held HIGH. The device operates in clocked mode when LE is LOW and CLK is toggled. Data transfers from the Inputs (I_n) to Outputs (O_n) on a Positive Edge Transition of the Clock. When \overline{OE} is LOW, the output data is enabled. When \overline{OE} is HIGH the output port is in a high impedance state.

The 74ALVCF322835 is designed with 26Ω series resistors in the outputs. This design reduces noise in applications such as memory address drivers, clock drivers, and bus transceivers/transmitters.

The 74ALVCF322835 is designed for low voltage (1.65V to 3.6V) V_{CC} applications with I/O capability up to 3.6V.

The 74ALVCF322835 is fabricated with an advanced CMOS technology to achieve high speed operation while maintaining low CMOS power dissipation.

Features

- Compatible with PC133 DIMM module specifications
- 1.65V to 3.6V V_{CC} specifications provided
- 3.6V tolerant outputs
- 26Ω series resistors in outputs
- t_{PD} (CLK to O_n)
 - 3.7 ns max for 3.0V to 3.6V V_{CC}
 - 4.6 ns max for 2.3V to 2.7V V_{CC}
 - 7.4 ns max for 1.65V to 1.95V V_{CC}
- Power-down high impedance outputs
- Latchup conforms to JEDEC JED78
- ESD performance:
 - Human body model > 2000V
 - Machine model >200V

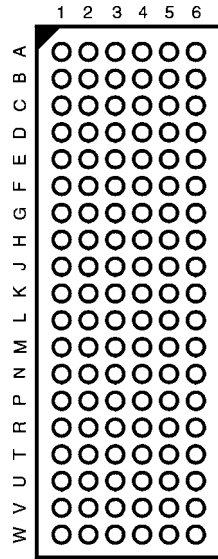
Ordering Code:

Order Number	Package Number	Package Description
74ALVCF322835G (Note 1) (Note 2)	BGA114A	114-Ball Fine-Pitch Ball Grid Array (FBGA), JEDEC MO-205, 5.5mm Wide

Note 1: Ordering Code "G" indicates Trays.

Note 2: Devices also available in Tape and Reel. Specify by appending the suffix letter "X" to the ordering code.

Connection Diagram



(Top Thru View)

FBGA Pin Assignments

	1	2	3	4	5	6
A	1O ₂	1O ₁	NC	NC	1I ₁	1I ₂
B	1O ₄	1O ₃	NC	GND	1I ₃	1I ₄
C	1O ₆	1O ₅	GND	GND	1I ₅	1I ₆
D	1O ₈	1O ₇	V _{CC}	V _{CC}	1I ₇	1I ₈
E	1O ₁₀	1O ₉	GND	GND	1I ₉	1I ₁₀
F	1I ₁₂	1O ₁₁	GND	GND	1I ₁₁	1I ₁₂
G	1O ₁₄	1O ₁₃	V _{CC}	V _{CC}	1I ₁₃	1I ₁₄
H	1O ₁₅	1O ₁₆	GND	GND	1I ₁₆	1I ₁₅
J	1O ₁₇	1O ₁₈	\overline{OE}_1	CLK ₁	1I ₁₈	1I ₁₇
K	NC	NC	LE ₁	GND	NC	NC
L	2O ₂	2O ₁	NC	GND	2I ₁	2I ₂
M	2O ₄	2O ₃	GND	GND	2I ₃	2I ₄
N	2O ₆	2O ₅	V _{CC}	V _{CC}	2I ₅	2I ₆
P	2O ₈	2O ₇	GND	GND	2O ₇	2I ₈
R	2O ₁₀	2O ₉	GND	GND	2I ₉	2I ₁₀
T	2O ₁₂	2O ₁₁	V _{CC}	V _{CC}	2I ₁₁	2I ₁₂
U	2O ₁₄	2O ₁₃	GND	GND	2I ₁₃	2I ₁₄
V	2O ₁₅	2O ₁₆	\overline{OE}_2	CLK ₂	2I ₁₆	2I ₁₅
W	2O ₁₇	2O ₁₈	LE ₂	GND	2I ₁₈	2I ₁₇

Pin Descriptions

Pin Names	Description
\overline{OE}_n	Output Enable Input (Active LOW)
LE _n	Latch Enable Input
CLK _n	Clock Input
1I ₁ - 1I ₁₈	Data Inputs
2I ₁ - 2I ₁₈	Data Inputs
1O ₁ - 1O ₁₈	3-STATE Outputs
2O ₁ - 2O ₁₈	3-STATE Outputs

Truth Table

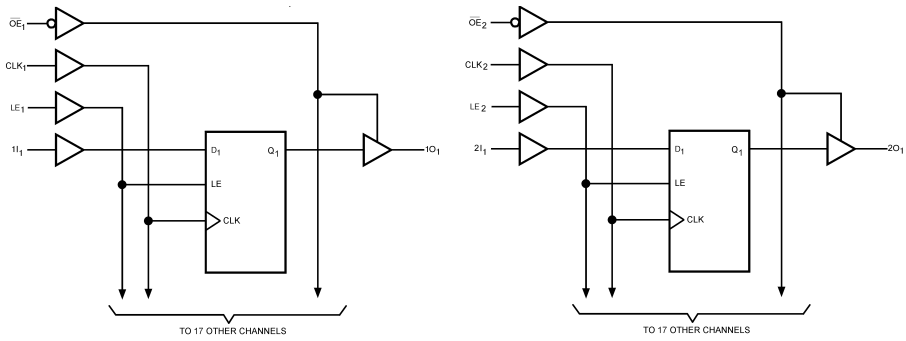
Inputs				Outputs
\overline{OE}_n	LE _n	CLK _n	I _n	O _n
H	X	X	X	Z
L	H	X	L	L
L	H	X	H	H
L	L	↑	L	L
L	L	↑	H	H
L	L	H	X	O ₀ (Note 3)
L	L	L	X	O ₀ (Note 4)

H = Logic HIGH
 L = Logic LOW
 X = Don't Care, but not floating
 Z = High Impedance
 ↑ = LOW-to-HIGH Clock Transition

Note 3: Output level before the indicated steady-state input conditions were established provided that CLK was HIGH before LE went LOW.

Note 4: Output level before the indicated steady-state input conditions were established.

Logic Diagram



74ALVCF322835

Absolute Maximum Ratings (Note 5)

Supply Voltage (V_{CC})	-0.5V to +4.6V
DC Input Voltage (V_I)	-0.5V to 4.6V
Output Voltage (V_O) (Note 6)	-0.5V to $V_{CC} + 0.5V$
DC Input Diode Current (I_{IK})	
$V_I < 0V$	-50 mA
DC Output Diode Current (I_{OK})	
$V_O < 0V$	-50 mA
DC Output Source/Sink Current (I_{OH}/I_{OL})	±50 mA
DC V_{CC} or GND Current per Supply Pin (I_{CC} or GND)	±100 mA
Storage Temperature Range (T_{STG})	-65°C to +150°C

Recommended Operating Conditions (Note 7)

Power Supply	
Operating	1.65V to 3.6V
Input Voltage	0V to V_{CC}
Output Voltage (V_O)	0V to V_{CC}
Free Air Operating Temperature (T_A)	-40°C to +85°C
Minimum Input Edge Rate ($\Delta t/\Delta V$)	
$V_{IN} = 0.8V$ to 2.0V, $V_{CC} = 3.0V$	10 ns/V

Note 5: The Absolute Maximum Ratings are those values beyond which the safety of the device cannot be guaranteed. The device should not be operated at these limits. The parametric values defined in the Electrical Characteristics tables are not guaranteed at the Absolute Maximum Ratings. The "Recommended Operating Conditions" table will define the conditions for actual device operation.

Note 6: I_O Absolute Maximum Rating must be observed.

Note 7: Floating or unused control inputs must be held HIGH or LOW.

DC Electrical Characteristics

Symbol	Parameter	Conditions	V_{CC} (V)	Min	Max	Units
V_{IH}	HIGH Level Input Voltage		1.65 - 1.95 2.3 - 2.7 2.7 - 3.6	$0.65 \times V_{CC}$ 1.7 2.0		V
V_{IL}	LOW Level Input Voltage		1.65 - 1.95 2.3 - 2.7 2.7 - 3.6		$0.35 \times V_{CC}$ 0.7 0.8	V
V_{OH}	HIGH Level Output Voltage	$I_{OH} = -100 \mu A$ $I_{OH} = -2 \text{ mA}$ $I_{OH} = -4 \text{ mA}$ $I_{OH} = -6 \text{ mA}$ $I_{OH} = -8 \text{ mA}$ $I_{OH} = -12 \text{ mA}$	1.65 - 3.6 1.65 2.3 2.3 3.0 2.7 3.0	$V_{CC} - 0.2$ 1.2 1.9 1.7 2.4 2 2		V
V_{OL}	LOW Level Output Voltage	$I_{OL} = 100 \mu A$ $I_{OL} = 2 \text{ mA}$ $I_{OL} = 4 \text{ mA}$ $I_{OL} = 6 \text{ mA}$ $I_{OL} = 8 \text{ mA}$ $I_{OL} = 12 \text{ mA}$	1.65 - 3.6 1.65 2.3 2.3 3.0 2.7 3.0		0.2 0.45 0.4 0.55 0.6 0.8	V
I_{OH}	High Level Output Current		1.65 2.3 2.7 3.0		-2 -6 -8 -12	mA
I_{OL}	Low Level Output Current		1.65 2.3 2.7 3.0		2 6 8 12	mA
I_I	Input Leakage Current	$0 \leq V_I \leq 3.6V$	1.65 - 3.6		±5.0	μA
I_{OZ}	3-STATE Output Leakage	$0 \leq V_O \leq 3.6V, V_I = V_{IH}$ or V_{IL}	1.65 - 3.6		±10	μA
I_{OFF}	Power Off Leakage Current	$0V \leq (V_I, V_O) \leq 3.6V$	0		10	mA
I_{CC}	Quiescent Supply Current	$V_I = V_{CC}$ or GND, $I_O = 0$	3.6		40	μA
ΔI_{CC}	Increase in I_{CC} per Input	$V_{IH} = V_{CC} - 0.6V$	2.7 - 3.6		750	μA

AC Electrical Characteristics

Symbol	Parameter	$T_A = -40^\circ\text{C to } +85^\circ\text{C}, R_L = 500\Omega$								Units
		$C_L = 50\text{ pF}$				$C_L = 30\text{ pF}$				
		$V_{CC} = 3.3V \pm 0.3V$		$V_{CC} = 2.7V$		$V_{CC} = 2.5 \pm 0.2V$		$V_{CC} = 1.8V \pm 0.15V$		
		Min	Max	Min	Max	Min	Max	Min	Max	
f_{MAX}	Maximum Clock Frequency	250		200		200		100		MHz
t_{PHL}, t_{PLH}	Propagation Delay Bus-to-Bus	1.1	3.6	1.3	4.5	0.8	4.0	1.5	7.2	ns
t_{PHL}, t_{PLH}	Propagation Delay Clock to Bus	1.5	3.7	2.0	4.6	1.5	4.1	2.0	7.4	ns
t_{PHL}, t_{PLH}	Propagation Delay LE to Bus	1.1	4.2	1.3	5.2	0.8	4.7	1.5	8.5	ns
t_{PZL}, t_{PZH}	Output Enable Time	1.1	4.8	1.3	6.4	0.8	5.9	1.5	9.8	ns
t_{PLZ}, t_{PHZ}	Output Disable Time	1.1	4.7	1.3	5.2	0.8	4.7	1.5	7.9	ns
t_S	Setup Time	1.5		1.5		1.5		2.5		ns
t_H	Hold Time	0.7		0.7		0.7		1.0		ns
t_W	Pulse Width	1.5		1.5		1.5		4.0		ns

Capacitance

Symbol	Parameter	Conditions	$T_A = +25^\circ\text{C}$		Units	
			V_{CC}	Typical		
C_{IN}	Input Capacitance	$V_I = 0V \text{ or } V_{CC}$	3.3	3.5	pF	
C_{OUT}	Output Capacitance	$V_I = 0V \text{ or } V_{CC}$	3.3	5.5	pF	
C_{PD}	Power Dissipation Capacitance	Outputs Enabled	$f = 10\text{ MHz}, C_L = 0\text{ pF}$	3.3	13	pF
				2.5	13	

I_{OUT} - V_{OUT} Characteristics

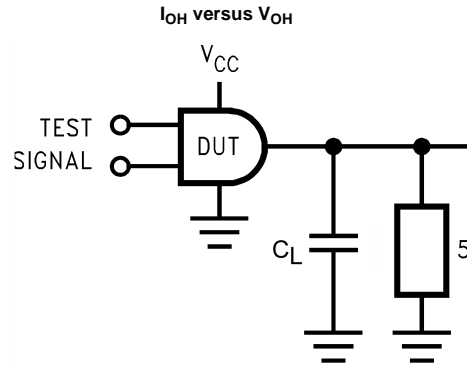


FIGURE 1. Characteristics for Output - Pull Up Drive

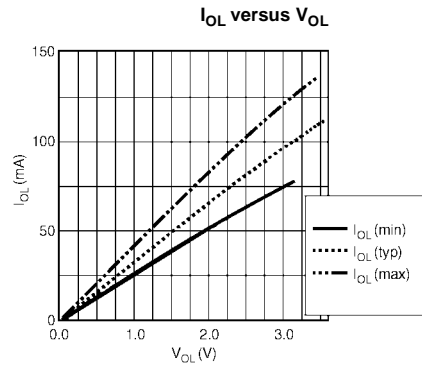


FIGURE 2. Characteristics for Output - Pull Down Driver

AC Loading and Waveforms

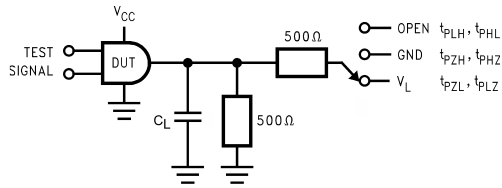


FIGURE 3. AC Test Circuit

Table 1: Values for Figure 1

TEST	SWITCH
t_{PLH} , t_{PHL}	Open
t_{PZL} , t_{PLZ}	V_L
t_{PZH} , t_{PHZ}	GND

Table 2: Variable Matrix
(Input Characteristics: $f = 1\text{MHz}$; $t_r = t_f = 2\text{ns}$; $Z_0 = 50\Omega$)

Symbol	V_{CC}			
	$3.3\text{V} \pm 0.3\text{V}$	2.7V	$2.5\text{V} \pm 0.2\text{V}$	$1.8\text{V} \pm 0.15\text{V}$
V_{mi}	1.5V	1.5V	$V_{CC}/2$	$V_{CC}/2$
V_{mo}	1.5V	1.5V	$V_{CC}/2$	$V_{CC}/2$
V_X	$V_{OL} + 0.3\text{V}$	$V_{OL} + 0.3\text{V}$	$V_{OL} + 0.15\text{V}$	$V_{OL} + 0.15\text{V}$
V_Y	$V_{OH} - 0.3\text{V}$	$V_{OH} - 0.3\text{V}$	$V_{OH} - 0.15\text{V}$	$V_{OH} - 0.15\text{V}$
V_L	6V	6V	$V_{CC} * 2$	$V_{CC} * 2$

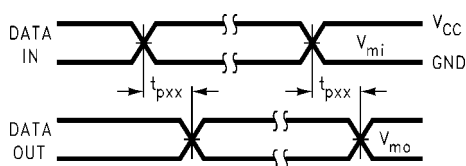


FIGURE 4. Waveform for Inverting and Non-inverting Functions

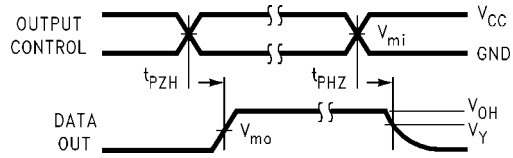


FIGURE 5. 3-STATE Output High Enable and Disable Times for Low Voltage Logic

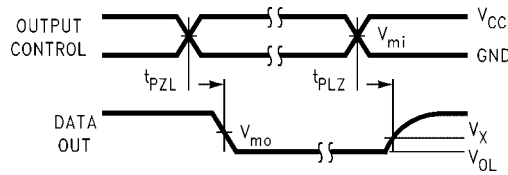
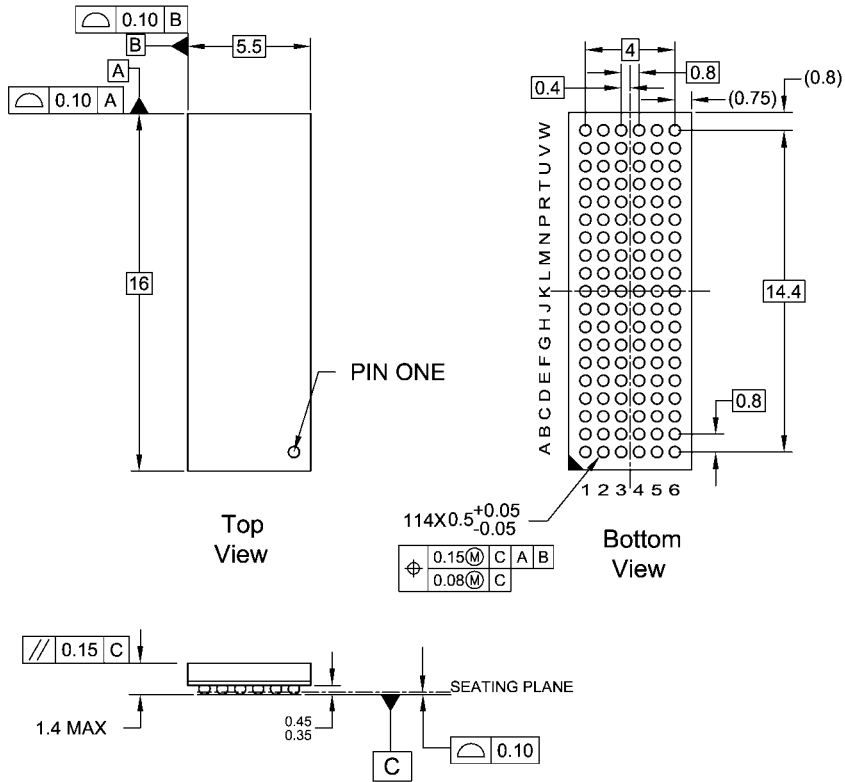


FIGURE 6. 3-STATE Output Low Enable and Disable Times for Low Voltage Logic

Physical Dimensions inches (millimeters) unless otherwise noted



- NOTES:
- A. THIS PACKAGE CONFORMS TO JEDEC MO-205
 - B. ALL DIMENSIONS IN MILLIMETERS
 - C. LAND PATTERN RECOMMENDATION: NSMD (Non Solder Mask Defined)
.35MM DIA PADS WITH A SOLDERMASK OPENING OF .45MM CONCENTRIC TO PADS
 - D. DRAWING CONFORMS TO ASME Y14.5M-1994

BGA114ArevE

**56-Lead Thin Shrink Small Outline Package (TSSOP), JEDEC MO-153, 6.1mm Wide
Package Number MTD56**

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