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FAIRCHILD SEMICONDUCTOR®

October 2001
Revised May 2005

74ALVC16244
Low Voltage 16-Bit Buffer/Line Driver with 3.6V Tolerant Inputs and Outputs

General Description

The ALVC16244 contains sixteen non-inverting buffers with 3-STATE outputs to be employed as a memory and address driver, clock driver, or bus oriented transmitter/receiver. The device is nibble (4-bit) controlled. Each nibble has separate 3-STATE control inputs which can be shorted together for full 16-bit operation.

The 74ALVC16244 is designed for low voltage (1.65V to 3.6V) V_{CC} applications with I/O capability up to 3.6V.

The 74ALVC16244 is fabricated with an advanced CMOS technology to achieve high speed operation while maintaining low CMOS power dissipation.

Features

- 1.65V–3.6V V_{CC} supply operation
- 3.6V tolerant inputs and outputs
- t_{PD}
  - 3.0 ns max for 3.0V to 3.6V V_{CC}
  - 3.5 ns max for 2.3V to 2.7V V_{CC}
  - 6.0 ns max for 1.65V to 1.95V V_{CC}
- Power-off high impedance inputs and outputs
- Supports live insertion and withdrawal (Note 1)
- Uses patented noise/EMI reduction circuitry
- Latch-up conforms to JEDEC JED98
- ESD performance:
  - Human body model > 2000V
  - Machine model > 200V
- Also packaged in plastic Fine-Pitch Ball Grid Array (FBGA)

Note 1: To ensure the high-impedance state during power up or power down, $\overline{OE}$ should be tied to V_{CC} through a pull-up resistor; the minimum value of the resistor is determined by the current-sourcing capability of the driver.

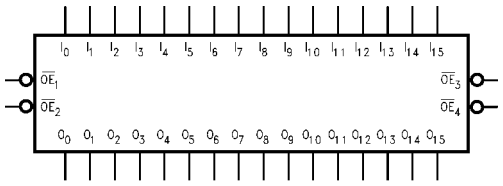
Ordering Code:

Order Number	Package Number	Package Description
74ALVC16244GX (Note 2)	BGA54A	54-Ball Fine-Pitch Ball Grid Array (FBGA), JEDEC MO-205, 5.5mm Wide [Tape and Reel]
74ALVC16244MTD (Note 3)	MTD48	48-Lead Thin Shrink Small Outline Package (TSSOP), JEDEC MO-153, 6.1mm Wide

Note 2: BGA package available in Tape and Reel only.

Note 3: Devices also available in Tape and Reel. Specify by appending the suffix letter "X" to the ordering code.

Logic Symbol



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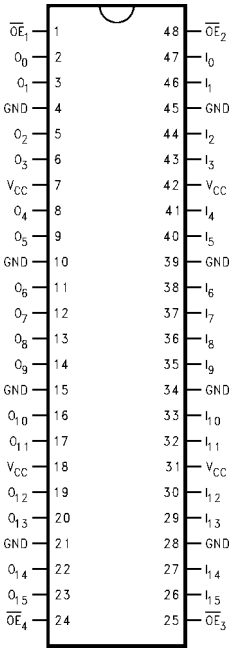
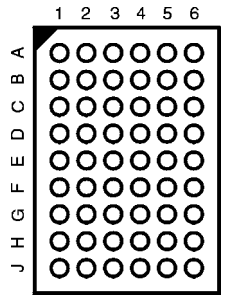
Connection Diagrams

Pin Assignment for TSSOP



Pin Assignment for FBGA



(Top Thru View)

Pin Descriptions

Pin Names	Description
$\overline{OE}_n$	Output Enable Input (Active LOW)
I_0–I_{15}	Inputs
O_0–O_{15}	Outputs
NC	No Connect

FBGA Pin Assignments

	1	2	3	4	5	6
A	O_0	NC	$\overline{OE}_1$	$\overline{OE}_2$	NC	I_0
B	O_2	O_1	NC	NC	I_1	I_2
C	O_4	O_3	V_{CC}	V_{CC}	I_3	I_4
D	O_6	O_5	GND	GND	I_5	I_6
E	O_8	O_7	GND	GND	I_7	I_8
F	O_{10}	O_9	GND	GND	I_9	I_{10}
G	O_{12}	O_{11}	V_{CC}	V_{CC}	I_{11}	I_{12}
H	O_{14}	O_{13}	NC	NC	I_{13}	I_{14}
J	O_{15}	NC	$\overline{OE}_4$	$\overline{OE}_3$	NC	I_{15}

Truth Tables

Inputs		Outputs
$\overline{OE}_1$	I_0–I_3	O_0–O_3
L	L	L
L	H	H
H	X	Z

Inputs		Outputs
$\overline{OE}_3$	I_8-I_{11}	O_8–O_{11}
L	L	L
L	H	H
H	X	Z

Inputs		Outputs
$\overline{OE}_2$	I_4-I_7	O_4-O_7
L	L	L
L	H	H
H	X	Z

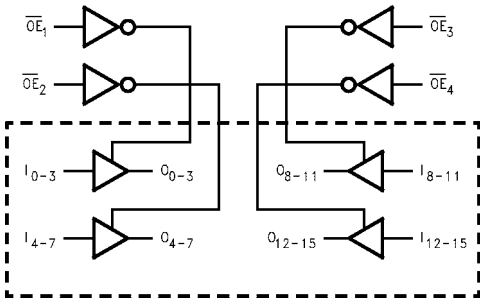
Inputs		Outputs
$\overline{OE}_4$	I_{12}-I_{15}	O_{12}-O_{15}
L	L	L
L	H	H
H	X	Z

H = HIGH Voltage Level
L = LOW Voltage Level
X = Immaterial (HIGH or LOW, inputs may not float)
Z = High Impedance

Functional Description

The 74ALVC16244 contains sixteen non-inverting buffers with 3-STATE outputs. The device is nibble (4 bits) controlled with each nibble functioning identically, but independent of each other. The control pins may be shorted together to obtain full 16-bit operation.The 3-STATE outputs are controlled by an Output Enable ($\overline{OE}_n$) input. When $\overline{OE}_n$ is LOW, the outputs are in the 2-state mode. When $\overline{OE}_n$ is HIGH, the standard outputs are in the high impedance mode but this does not interfere with entering new data into the inputs.

Logic Diagram



Absolute Maximum Ratings(Note 4)

Supply Voltage (V_{CC})	−0.5V to +4.6V
DC Input Voltage (V_I)	−0.5V to 4.6V
Output Voltage (V_O) (Note 5)	−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 6)

Power Supply	
Operating	1.65V to 3.6V
Input Voltage (V_I)	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 4: 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 5: I_O Absolute Maximum Rating must be observed, limited to 4.6V.

Note 6: 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	0.65 x V_{CC}		V
			2.3 - 2.7	1.7		
			2.7 - 3.6	2.0		
V_{IL}	LOW Level Input Voltage		1.65 - 1.95		0.35 x V_{CC}	V
			2.3 - 2.7		0.7	
			2.7 - 3.6		0.8	
V_{OH}	HIGH Level Output Voltage	I_{OH} = −100 μA	1.65 - 3.6	V_{CC} - 0.2		V
		I_{OH} = −4 mA	1.65	1.2		
		I_{OH} = −6 mA	2.3	2.0		
		I_{OH} = −12 mA	2.3	1.7		
			2.7	2.2		
			3.0	2.4		
		I_{OH} = −24 mA	3.0	2		
V_{OL}	LOW Level Output Voltage	I_{OL} = 100 μA	1.65 - 3.6		0.2	V
		I_{OL} = 4 mA	1.65		0.45	
		I_{OL} = 6 mA	2.3		0.4	
		I_{OL} = 12 mA	2.3		0.7	
			2.7		0.4	
		I_{OL} = 24 mA	3.0		0.55	
I_I	Input Leakage Current	0 ≤ V_I ≤ 3.6V	3.6		±5.0	μA
I_{OZ}	3-STATE Output Leakage	0 ≤ V_O ≤ 3.6V	3.6		±10	μA
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	3 - 3.6		750	μA

AC Electrical Characteristics

Symbol	Parameter	$T_A = -40°C$ to $+85°C$, $R_L = 500\Omega$								Units
		$C_L = 50$ pF				$C_L = 30$ pF				
		$V_{CC} = 3.3V \pm 0.3V$		$V_{CC} = 2.7V$		$V_{CC} = 2.5V \pm 0.2V$		$V_{CC} = 1.8V \pm 0.15V$		
		Min	Max	Min	Max	Min	Max	Min	Max	
t_{PHL}, t_{PLH}	Propagation Delay	1.3	3	1.5	3.5	1.0	3.0	1.5	6.0	ns
t_{PZL}, t_{PZH}	Output Enable Time	1.3	4.0	1.5	4.6	1.0	4.1	1.5	8.2	ns
t_{PLZ}, t_{PHZ}	Output Disable Time	1.3	4.0	1.5	4.3	1.0	3.8	1.5	6.8	ns

Capacitance

Symbol	Parameter		Conditions	$T_A = +25°C$		Units
				V_{CC}	Typical	
C_{IN}	Input Capacitance		$V_I = 0V$ or V_{CC}	3.3	6	pF
C_{OUT}	Output Capacitance		$V_I = 0V$ or V_{CC}	3.3	7	pF
C_{PD}	Power Dissipation Capacitance	Outputs Enabled	$f = 10$ MHz, $C_L = 0$ pF	3.3	20	pF
				2.5	20	

AC Loading and Waveforms

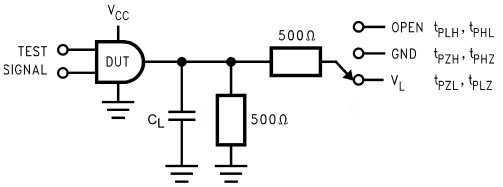


FIGURE 1. AC Test Circuit

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 = 1MHz; $t_r = t_f$ = 2ns; Z_0 = 50Ω)

Symbol	V_{CC}			
	3.3V ± 0.3V	**2.7V**	**2.5V ± 0.2V**	**1.8V ± 0.15V**
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} + 0.3V	V_{OL} + 0.3V	V_{OL} + 0.15V	V_{OL} + 0.15V
V_Y	V_{OH} − 0.3V	V_{OH} − 0.3V	V_{OH} − 0.15V	V_{OH} − 0.15V
V_L	6V	6V	V_{CC}*2	V_{CC}*2

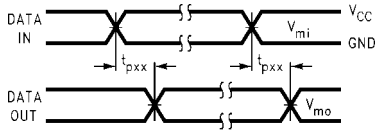


FIGURE 2. Waveform for Inverting and Non-Inverting Functions

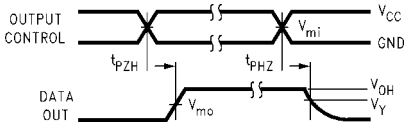


FIGURE 3. 3-STATE Output High Enable and Disable Times for Low Voltage Logic

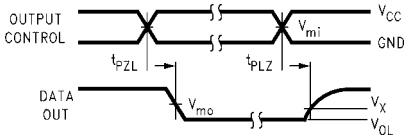
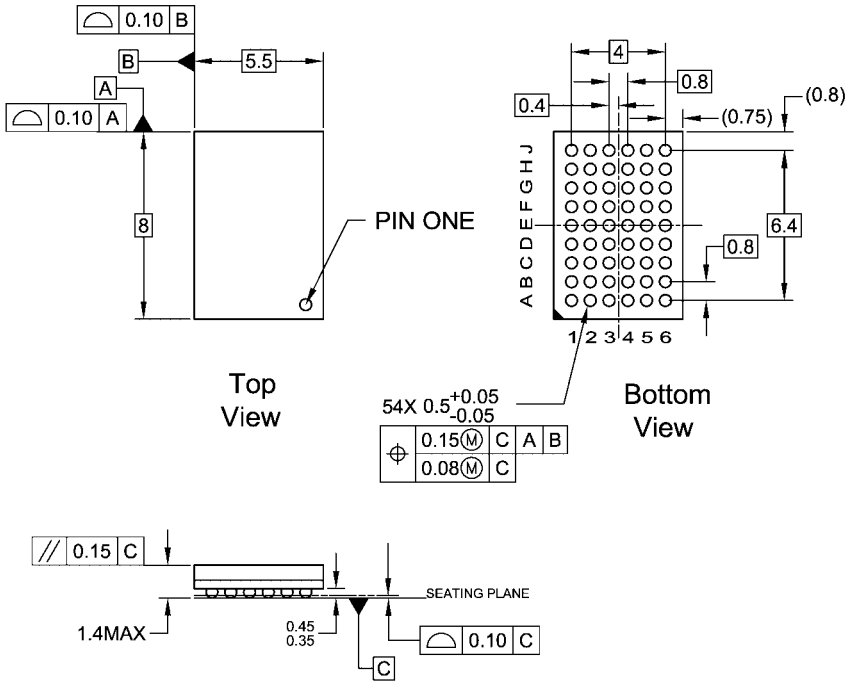


FIGURE 4. 3-STATE Output Low Enable and Disable Times for Low Voltage Logic

Physical Dimensions inches (millimeters) unless otherwise noted



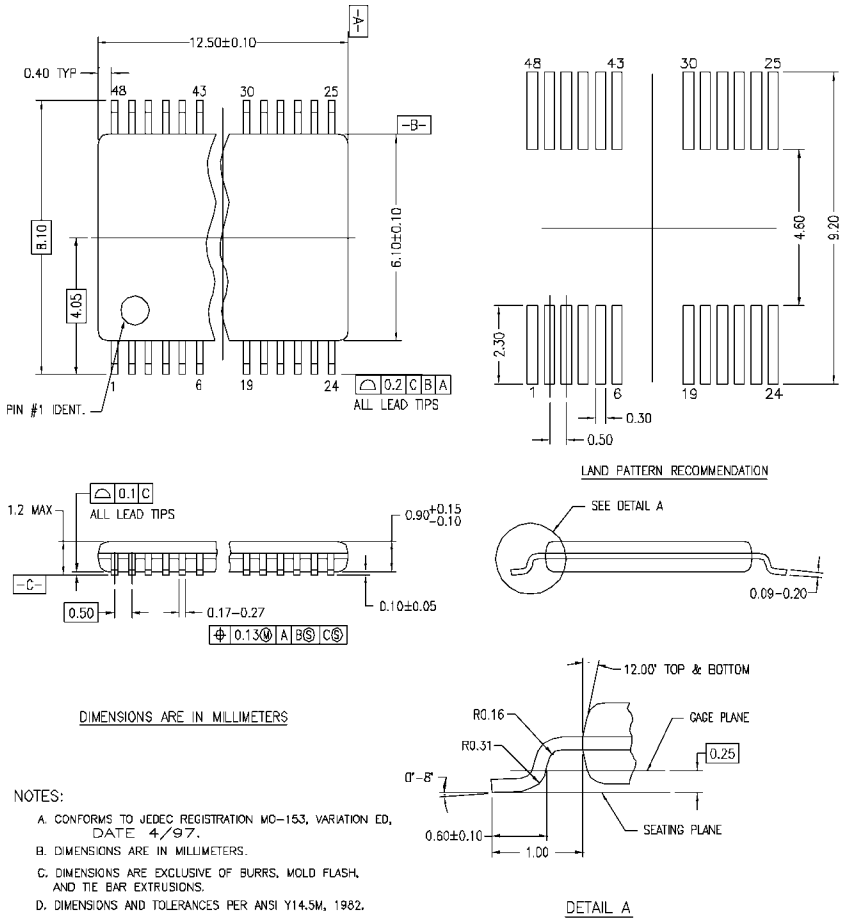
NOTES:

A. THIS PACKAGE CONFORMS TO JEDEC M0-205
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

BGA54ArevD

54-Ball Fine-Pitch Ball Grid Array (FBGA), JEDEC MO-205, 5.5mm Wide
Package Number BGA54A

Physical Dimensions inches (millimeters) unless otherwise noted (Continued)



48-Lead Thin Shrink Small Outline Package (TSSOP), JEDEC MO-153, 6.1mm Wide
Package Number MTD48

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