FAIRCHILD SEMICONDUCTOR™

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# 74ALVCH162244
# Low Voltage 16-Bit Buffer/Line Driver with Bushold and 26Ω Series Resistor in Outputs

## General Description

The ALVCH162244 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 ALVCH162244 data inputs include active bushold circuitry, eliminating the need for external pull-up resistors to hold unused or floating data inputs at a valid logic level

The 74ALVCH162244 is also designed with 26Ω series resistors in the outputs. This design reduces line noise in applications such as memory address drivers, clock drivers, and bus transceivers/transmitters.

The 74ALVCH162244 is designed for low voltage (1.65V to 3.6V) $V_{CC}$ applications with output capability up to 3.6V.

The 74ALVCH162244 is fabricated with an advanced CMOS technology to achieve high speed operation while maintaining low CMOS power dissipation.

## Features

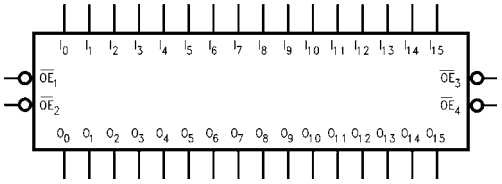
- 1.65V–3.6V $V_{CC}$ supply operation
- 3.6V tolerant control inputs and outputs
- Bushold on data inputs eliminates the need for external pull-up/pull-down resistors
- 26Ω series resistors in outputs
- $t_{PD}$
  - 4.2 ns max for 3.0V to 3.6V $V_{CC}$
  - 4.9 ns max for 2.3V to 2.7V $V_{CC}$
  - 7.6 ns max for 1.65V to 1.95V $V_{CC}$
- Uses patented noise/EMI reduction circuitry
- Latch-up conforms to JEDEC JED78
- ESD performance:
  - Human body model > 2000V
  - Machine model > 200V

## Ordering Code:

| Order Number | Package Number | Package Description |
|---|---|---|
| 74ALVCH162244T | MTD48 | 48-Lead Thin Shrink Small Outline Package (TSSOP), JEDEC MO-153, 6.1mm Wide |

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

## Logic Symbol

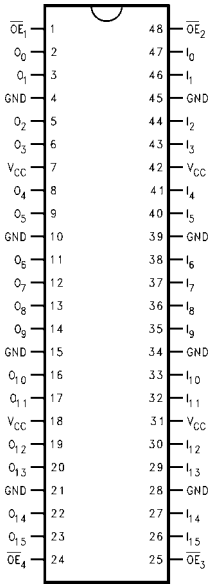



## Pin Descriptions

| Pin Names | Description |
|---|---|
| $\overline{OE}_n$ | Output Enable Input (Active LOW) |
| $I_0$–$I_{15}$ | Bushold Inputs |
| $O_0$–$O_{15}$ | Outputs |

## Connection Diagram




## 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 |
|---|---|---|
| $\overline{OE}_2$ | $I_4$–$I_7$ | $O_4$–$O_7$ |
| 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 |

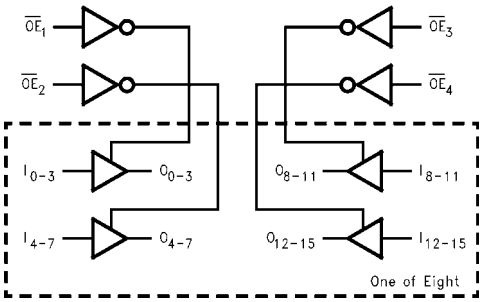
| Inputs | | Outputs |
|---|---|---|
| $\overline{OE}_4$ | $I_{12}$–$I_{15}$ | $O_{12}$–$O_{15}$ |
| L | L | L |
| L | H | H |
| H | X | Z |

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

## Functional Description

The 74ALVCH162244 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 1)

| | |
|---|---|
| Supply Voltage ($V_{CC}$) | −0.5V to +4.6V |
| DC Input Voltage ($V_I$) | −0.5V to 4.6V |
| Output Voltage ($V_O$) (Note 2) | −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 3)

| | |
|---|---|
| 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 1:** 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 2:** $I_O$ Absolute Maximum Rating must be observed.

**Note 3:** 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 |
| | | $I_{OH}$ = −2 mA | 1.65 | 1.2 | | |
| | | $I_{OH}$ = −4 mA | 2.3 | 1.9 | | |
| | | $I_{OH}$ = −6 mA | 2.3 | 1.7 | | |
| | | | 3 | 2.4 | | |
| | | $I_{OH}$ = −8 mA | 2.7 | 2 | | |
| | | $I_{OH}$ = −12 mA | 3.0 | 2 | | |
| $V_{OL}$ | LOW Level Output Voltage | $I_{OL}$ = 100 µA | 1.65 - 3.6 | | 0.2 | V |
| | | $I_{OL}$ = 2 mA | 1.65 | | 0.45 | |
| | | $I_{OL}$ = 4 mA | 2.3 | | 0.4 | |
| | | $I_{OL}$ = 6 mA | 2.3 | | 0.55 | |
| | | | 3 | | 0.55 | |
| | | $I_{OL}$ = 8 mA | 2.7 | | 0.6 | |
| | | $I_{OL}$ = 12 mA | 3 | | 0.8 | |
| $I_{OH}$ | High Level Output Current | | 1.65 | | −2 | mA |
| | | | 2.3 | | −6 | |
| | | | 2.7 | | −8 | |
| | | | 3.0 | | −12 | |
| $I_{OL}$ | Low Level Output Current | | 1.65 | | 2 | mA |
| | | | 2.3 | | 6 | |
| | | | 2.7 | | 8 | |
| | | | 3 | | 12 | |
| $I_I$ | Input Leakage Current | $0 \le V_I \le 3.6V$ | 3.6 | | ±5.0 | µA |

## DC Electrical Characteristics (Continued)

| Symbol | Parameter | Conditions | $V_{CC}$ (V) | Min | Max | Units |
|---|---|---|---|---|---|---|
| $I_{I(HOLD)}$ | Bushold Input Minimum Drive Hold Current | $V_{IN}$ = 0.58V | 1.65 | 25 | | µA |
| | | $V_{IN}$ = 1.07V | 1.65 | −25 | | |
| | | $V_{IN}$ = 0.7V | 2.3 | 45 | | |
| | | $V_{IN}$ = 1.7V | 2.3 | −45 | | |
| | | $V_{IN}$ = 0.8V | 3.0 | 75 | | |
| | | $V_{IN}$ = 2.0V | 3.0 | −75 | | |
| | | 0 < $V_O$ ≤ 3.6V | 3.6 | | ±500 | |
| $I_{OZ}$ | 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 |
| $\Delta I_{CC}$ | Increase in $I_{CC}$ per Input | $V_{IH}$ = $V_{CC}$ − 0.6V | 3 - 3.6 | | 750 | µA |

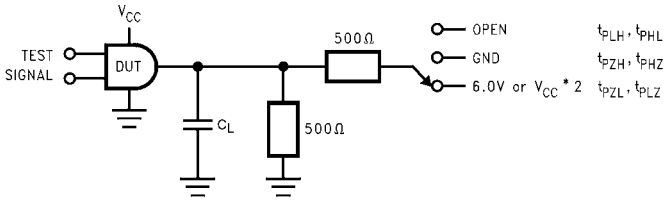
## AC Electrical Characteristics

| Symbol | Parameter | $T_A$ = −40°C to +85°C, $R_L$ = 500Ω | | | | | | | | Units |
|---|---|---|---|---|---|---|---|---|---|---|
| | | $C_L$ = 50 pF | | | | $C_L$ = 30 pF | | | | |
| | | $V_{CC}$ = 3.3V ± 0.3V | | $V_{CC}$ = 2.7V | | $V_{CC}$ = 2.5V ± 0.2V | | $V_{CC}$ = 1.8V ± 0.15V | | |
| | | Min | Max | Min | Max | Min | Max | Min | Max | |
| $t_{PHL}$, $t_{PLH}$ | Propagation Delay | 1.0 | 4.2 | | 4.7 | 1.0 | 4.9 | 1.5 | 7.6 | ns |
| $t_{PZL}$, $t_{PZH}$ | Output Enable Time | 1.0 | 5.6 | | 6.7 | 1.0 | 6.8 | 1.5 | 9.8 | ns |
| $t_{PLZ}$, $t_{PHZ}$ | Output Disable Time | 1.0 | 5.5 | | 5.7 | 1.0 | 6.3 | 1.5 | 7.2 | ns |

## Capacitance

| Symbol | Parameter | | Conditions | $T_A$ = +25°C | | Units |
|---|---|---|---|---|---|---|
| | | | | $V_{CC}$ | Typical | |
| $C_{IN}$ | Input Capacitance | Control | $V_I$ = 0V or $V_{CC}$ | 3.3 | 3 | pF |
| | | Data | $V_I$ = 0V or $V_{CC}$ | 3.3 | 6 | |
| $C_{OUT}$ | Output Capacitance | | $V_I$ = 0V or $V_{CC}$ | 3.3 | 7 | pF |
| $C_{PD}$ | Power Dissipation Capacitance | Outputs Enabled | f = 10 MHz, $C_L$ = 50 pF | 3.3 | 19 | pF |
| | | | | 2.5 | 16 | |
| | | Outputs Disabled | f = 10 MHz, $C_L$ = 50 pF | 3.3 | 5 | |
| | | | | 2.5 | 4 | |

## AC Loading and Waveforms




| TEST | SWITCH |
|---|---|
| $t_{PLH}$, $t_{PHL}$ | Open |
| $t_{PZL}$, $t_{PLZ}$ | 6V at $V_{CC}$ = 3.3 ± 0.3V;<br>$V_{CC}$ x 2 at $V_{CC}$ = 2.5 ± 0.2V; 1.8 ± 0.15V |
| $t_{PZH}$, $t_{PHZ}$ | GND |

**FIGURE 1. AC Test Circuit**

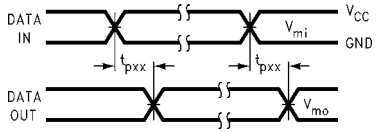



**FIGURE 2. Waveform for Inverting and Non-Inverting Functions**

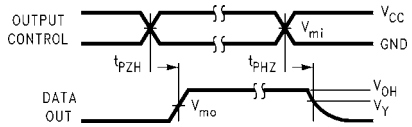



**FIGURE 3. 3-STATE Output High Enable and Disable Times for Low Voltage Logic**

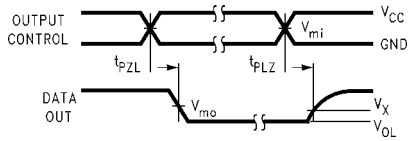
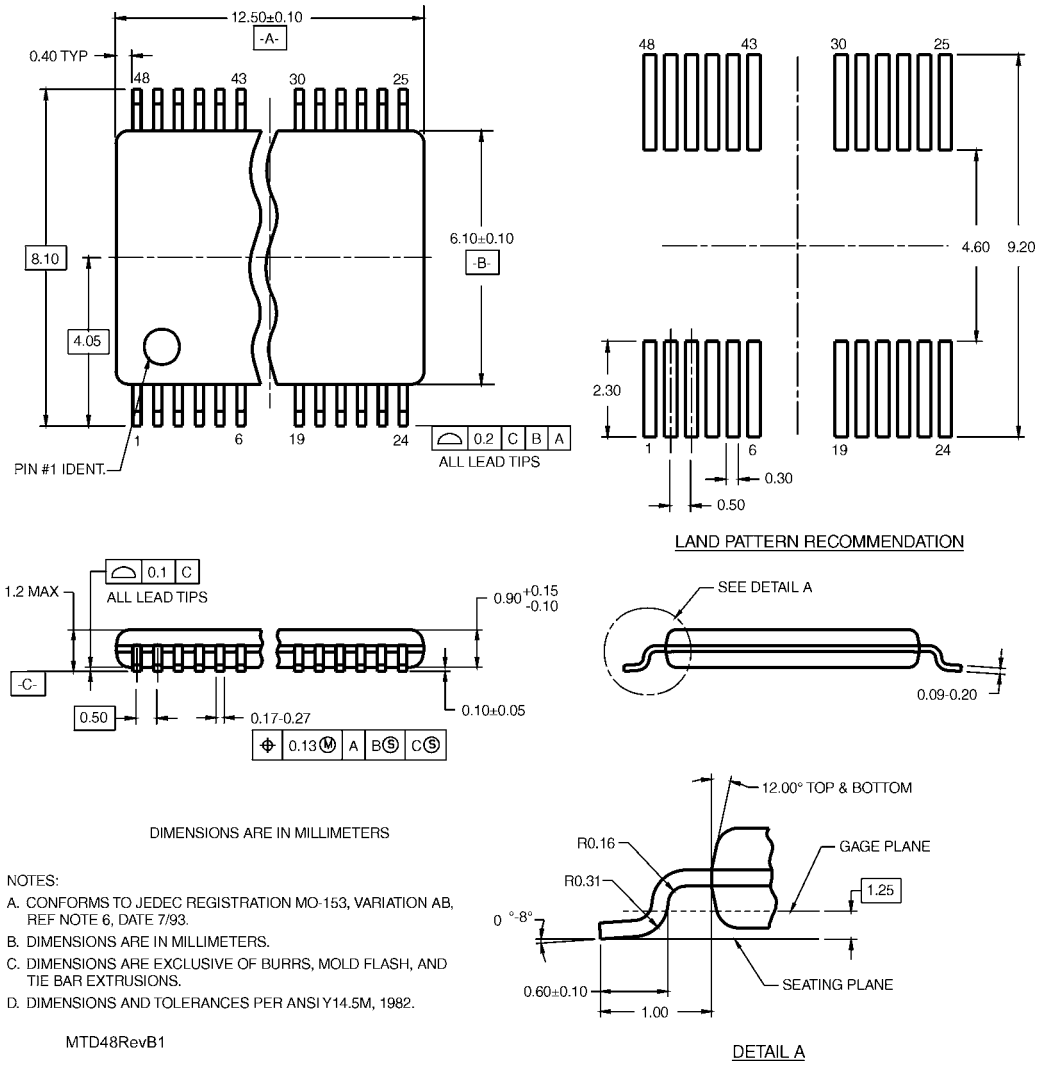



**FIGURE 4. 3-STATE Output Low Enable and Disable Times for Low Voltage Logic**

| Symbol | $V_{CC}$ | | |
|---|---|---|---|
| | **3.3V ± 0.3V** | **2.5V ± 0.2V** | **1.8V ± 0.15V** |
| $V_{mi}$ | 1.5V | $V_{CC}/2$ | $V_{CC}/2$ |
| $V_{mo}$ | 1.5V | $V_{CC}/2$ | $V_{CC}/2$ |
| $V_X$ | $V_{OL}$ +0.3V | $V_{OL}$ +0.15V | $V_{OL}$ +0.15V |
| $V_Y$ | $V_{OH}$ −0.3V | $V_{OH}$ −0.15V | $V_{OH}$ −0.15V |

## Physical Dimensions inches (millimeters) unless otherwise noted




DIMENSIONS ARE IN MILLIMETERS

NOTES:

A. CONFORMS TO JEDEC REGISTRATION MO-153, VARIATION AB, REF NOTE 6, DATE 7/93.

B. DIMENSIONS ARE IN MILLIMETERS.

C. DIMENSIONS ARE EXCLUSIVE OF BURRS, MOLD FLASH, AND TIE BAR EXTRUSIONS.

D. DIMENSIONS AND TOLERANCES PER ANSI Y14.5M, 1982.

MTD48RevB1

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



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