# PI74ALVTC16344

## 2.5V, 1-Bit to 4-Bit Address Driver with 3-State Outputs

### Product Features

- PI74ALVTC16344 is designed for low voltage operation, $V_{DD}$ = 1.65V to 3.6V
- Supports Live Insertion
- 3.6V I/O Tolerant Inputs and Outputs
- Bus Hold
- High Drive, –32/64mA @ 3.3V
- Uses patented noise reduction circuitry
- Power-off high impedance inputs and outputs
- Industrial operation at –40°C to +85°C
- Packages available:
  – 56-pin 240-mil wide plastic TSSOP (A56)
  – 56-pin 173-mil wide plastic TVSOP (K56)

### Product Description

Pericom Semiconductor's PI74ALVTC series of logic circuits are produced using the Company's advanced 0.35 micron CMOS technology, achieving industry leading speed.

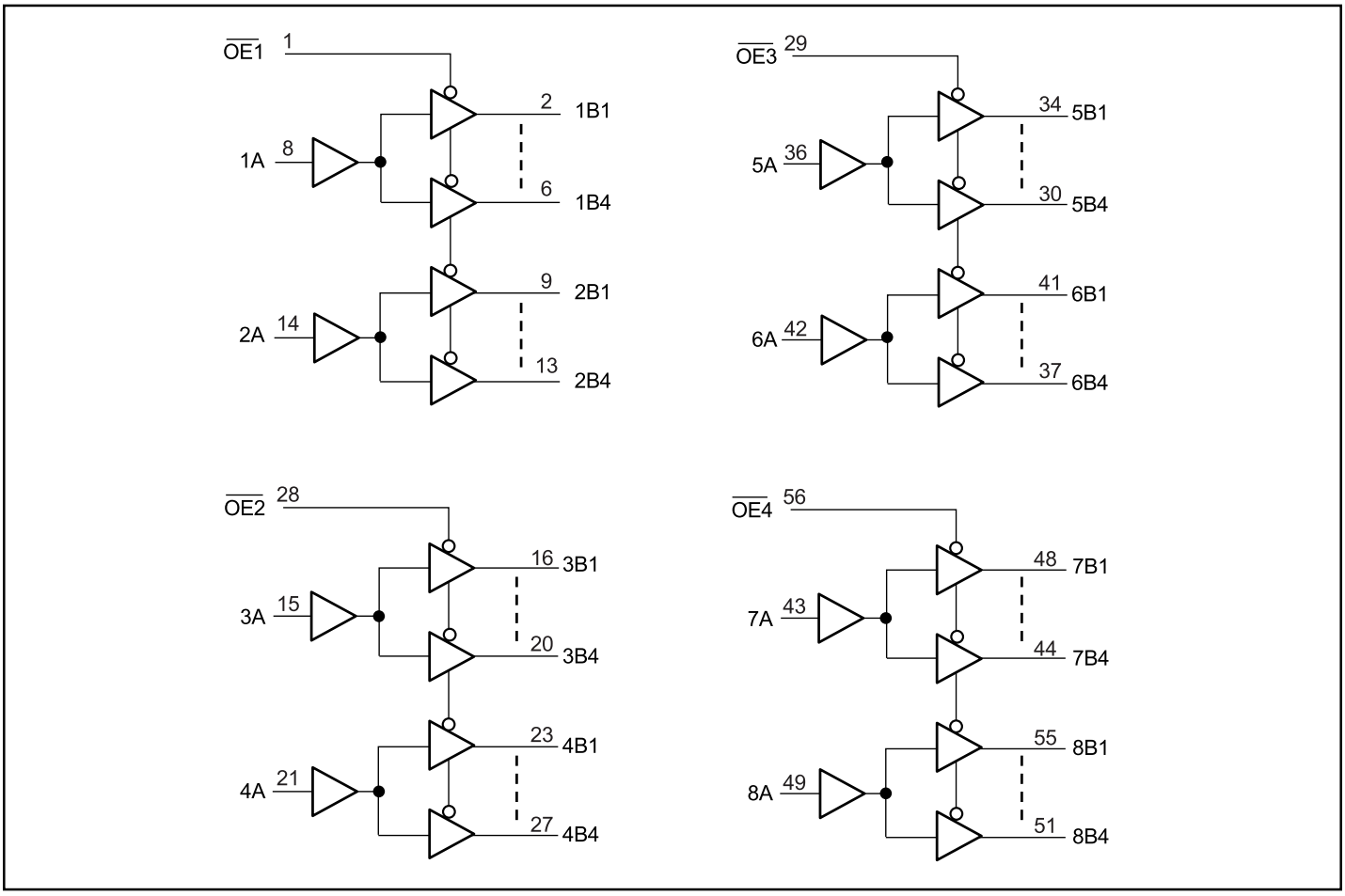
The PI74ALVTC16344 is a 1-bit to 4-bit buffer/driver designed for 1.65V to 3.6V $V_{CC}$ operation.

The address/driver is designed for applications where four separate memory locations must be addressed by a single address.

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

The family offers both I/O Tolerant, which allows it to operate in mixed 1.65/3.6V systems, and "Bus Hold," which retains the data input's last state preventing "floating" inputs and eliminating the need for pullup/down resistors.

### Logic Block Diagram



## Pin Description

| Pin Name | Description |
|---|---|
| $\overline{OE}$ | 3-State Output Enable Inputs (Active LOW) |
| A | Inputs |
| B | 3-State Outputs |
| GND | Ground |
| VCC | Power |

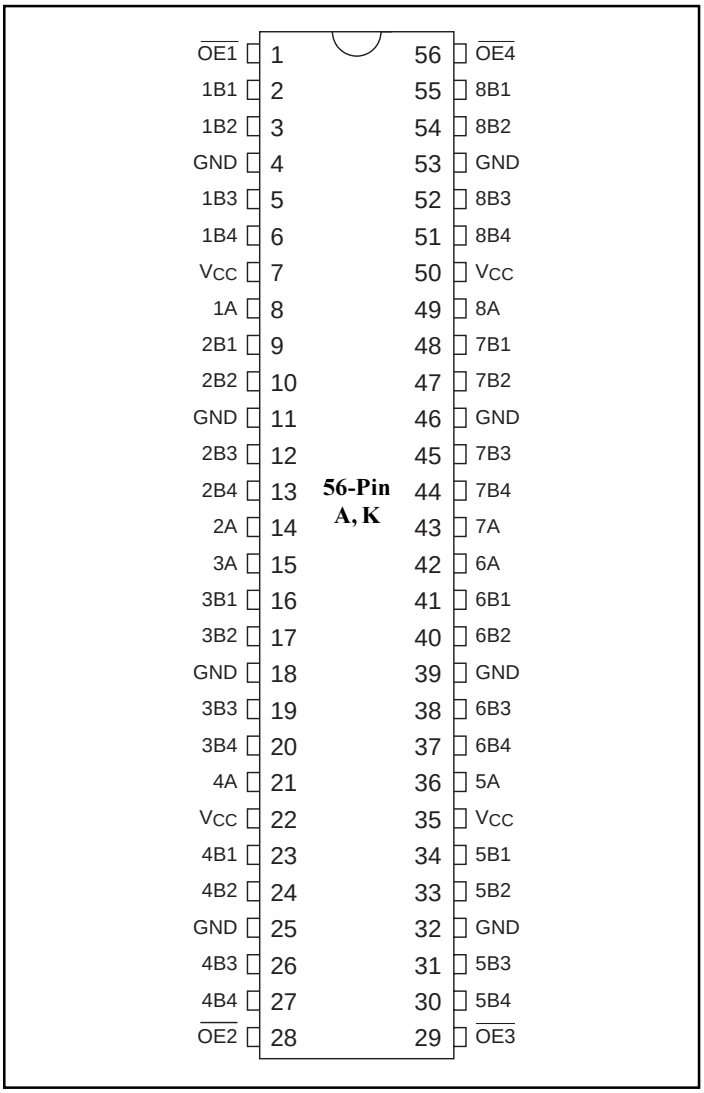
## Truth Table[1]

| Inputs | | Outputs |
|---|---|---|
| $\overline{OE}$n | A | Bn |
| L | H | H |
| L | L | L |
| H | H | Z |

**Note:**

1. H = High Signal Level
   L = Low Signal Level
   X = Irrelevant
   Z = High Impedance

## Pin Configuration



## Maximum Ratings

(Above which the useful life may be impaired. For user guidelines, not tested.)

Supply Voltage Range, $V_{DD}$ ..... –0.5V to 4.6V
Input Voltage Range, $V_I$ ..... –0.5V to 4.6V
Output Voltage Range, $V_O$ (3-Stated) ..... –0.5V to 4.6V
Output Voltage Range, $V_O$[1] (Active) ..... –0.5V to $V_{DD}$ +0.5V
DC Input Diode Current ($I_{IK}$) $V_I$ < 0V ..... –50mA
DC Output Diode Current ($I_{OK}$)
$V_O$ < 0V ..... –50mA
$V_O$ > $V_{DD}$ ..... ±50mA
DC Output Source/Sink Current ($I_{OH}/I_{OL}$) ..... –64/128mA
DC $V_{DD}$ or GND Current per Supply Pin ($I_{CC}$ or GND) ..... ±100mA
Storage Temperature Range, $T_{stg}$ ..... –65°C to 150°C

**Note:**
Stresses greater than those listed under MAXIMUM RATINGS may cause permanent damage to the device. This is a stress rating only and functional operation of the device at these or any other conditions above those indicated in the operational sections of this specification is not implied. Exposure to absolute maximum rating conditions for extended periods may affect reliability.

## Recommended Operating Conditions[2]

| | | | Min. | Max. | Units |
|---|---|---|---|---|---|
| $V_{DD}$ | Supply voltage | Operating | 1.65 | 3.6 | V |
| | | Data Retention Only | 1.2 | 3.6 | |
| $V_{IH}$ | High-level input voltage | $V_{DD}$ = 2.7V to 3.6V | 2.0 | | |
| $V_{IL}$ | Low-level input voltage | $V_{DD}$ = 2.7V to 3.6V | | 0.8 | |
| $V_I$ | Input voltage | | –0.3 | 3.6 | |
| $V_O$ | Output voltage | Active State | 0 | $V_{DD}$ | |
| | | Off State | 0 | 3.6 | |
| | Output current in $I_{OH}/I_{OL}$ | $V_{DD}$ = 3.0V to 3.6V<br>$V_{DD}$ = 3.0V to 3.6V<br>$V_{DD}$ = 2.3V to 2.7V<br>$V_{DD}$ = 1.65V to 1.95V | | –32/64<br>±24<br>±18<br>±6 | mA |
| $\Delta t/\Delta v$ | Input transistion rise or fall rate[3] | | 0 | 10 | ns/V |
| $T_A$ | Operating free-air temperature | | –40 | 85 | C |

**Notes:**
1. Absolute maximum of $I_O$ must be observed.
2. Unused control inputs must be held HIGH or LOW to prevent them from floating.
3 As measured between 0.8V and 2.0V, $V_{DD}$=3.0V.

## Electrical Characteristics over Recommended Operating Free-Air Temperature Range

(unless otherwise noted)

### DC Characteristics ($2.7V < V_{DD} \leq 3.6V$)

| | Parameter | Conditions | $V_{DD}$ | Min. | Typ. | Max. | Units |
|---|---|---|---|---|---|---|---|
| $V_{IK}$ | Input Clamp Diode | $I_{IK}$ = –18mA | 3.0 | | | –1.2 | V |
| $V_{OH}$ | HIGH Level Output Voltage | $I_{OH}$ = –100µA | 2.7 - 3.6 | $V_{DD}$ – 0.2 | | | |
| | | $I_{OH}$ = –12mA | 2.7 | 2.2 | | | |
| | | $I_{OH}$ = –18mA | 3.0 | 2.4 | | | |
| | | $I_{OH}$ = –24mA | | 2.2 | | | |
| | | $I_{OH}$ = –32mA | | 2.0 | | | |
| $V_{OL}$ | LOW Level Output Voltage | $I_{OL}$ = 100µA | 2.7 - 3.6 | | | 0.2 | |
| | | $I_{OL}$ = 12mA | 2.7 | | | 0.4 | |
| | | $I_{OL}$ = 18mA | 3.0 | | | 0.4 | |
| | | $I_{OL}$ = 24mA | | | | 0.45 | |
| | | $I_{OL}$ = 32mA | | | | 0.5 | |
| | | $I_{OL}$ = 64mA | | | | 0.55 | |
| $I_I$ | Input Leakage Current | $V_I = V_{DD}$, or GND | 3.6 | | | ±5.0 | µA |
| $I_{OZ}$ | 3-State Output Leakage | $V_O$ = 3.6V | 2.7 | | | ±10 | |
| $I_{OFF}$ | Power-OFF Leakage Current | $V_I$ or $V_O \leq$ 3.6V | 0 | | | 10 | |
| $I_{HOLD}$ | Bus Hold Current A or B Outputs | $V_I$ = 0.8V | 3.0 | 75 | | | |
| | | $V_I$ = 2.0V | | –75 | | | |
| | | $V_I$ = 0 to 3.6V | 3.6 | | | ±500 | |
| $I_{DD}$ | Quiescent Supply Current | $V_I = V_{DD}$ or GND | 2.7 - 3.6 | | | 50 | |
| | | $V_{DD} \leq (V_I, V_O) \leq$ 3.6V | | | | ±50 | |
| $\Delta I_{DD}$ | Increase in $I_{DD}$ per input | $V_{IH} = V_{DD}$ –0.6V, Other inputs at $V_{DD}$ or Gnd | | | | 400 | |

## Electrical Characteristics over Recommended Operating Free-Air Temperature Range

(unless otherwise noted; continued from previous page)

### DC Characteristics ($2.3V \leq V_{DD} \leq 2.7V$)

| Description | Parameters | Conditions | $V_{DD}$ | Min. | Typ. | Max. | Units |
|---|---|---|---|---|---|---|---|
| $V_{IK}$ | Input Clamp Diode | $I_{IK}$ = –18mA | 2.3 | | | –1.2 | V |
| $V_{OH}$ | HIGH Level Output Voltage | $I_{OH}$ = –100µA | 2.3 -2.7 | $V_{DD}$– 0.2 | | | |
| | | $I_{OH}$ = –12mA | 2.3 | 1.8 | | | |
| | | $I_{OH}$ = –18mA | | 1.7 | | | |
| $V_{OL}$ | LOW Level Output Voltage | $I_{OL}$ = 100µA | 2.3 - 2.7 | | | 0.2 | |
| | | $I_{OL}$ = 12mA | 2.3 | | | 0.4 | |
| | | $I_{OL}$ = 18mA | | | | 0.5 | |
| | | $I_{OL}$ = 24mA | | | | 0.55 | |
| $I_I$ | Input Leakage Current | $V_I$ = $V_{DD}$ or GND | 2.7 | | | ±5.0 | µA |
| $I_{OZ}$ | 3-State Output Leakage | $V_O$ = 3.6V | 2.3 | | | ±10 | |
| $I_{OFF}$ | Power-OFF Leakage Current | $V_I$ or $V_O \leq$ 3.6V | 0 | | | 10 | |
| $I_{HOLD}$(1) | Bus Hold Current A or B Outputs | $V_I$ = 0.7V | 2.5 | | 90 | | µA |
| | | $V_I$ = 1.7V | | | –90 | | |
| $I_{DD}$ | Quiescent Supply Current | $V_I$ = $V_{DD}$ or GND | 2.3 - 2.7 | | | 40 | |
| | | $V_{DD} \leq (V_I, V_O) \leq$ 3.6V | | | | ±40 | |
| $\Delta I_{DD}$ | Increase in $I_{DD}$ per input | $V_{IH}$ = $V_{DD}$ –0.6V, Inputs at $V_{DD}$ or Gnd | | | | 400 | |

**Note:**

1. Not Guaranteed

## Electrical Characteristics over Recommended Operating Free-Air Temperature Range

(unless otherwise noted; continued from previous page)

### DC Characteristics ($1.65V \leq V_{DD} \leq 1.95V$)

| Description | Parameters | Conditions | $V_{DD}$ | Min. | Typ. | Max. | Units |
|---|---|---|---|---|---|---|---|
| $V_{IK}$ | Input Clamp Diode | $I_{IK}$ = –18mA | 1.65 | | | –1.2 | V |
| $V_{OH}$ | HIGH Level Output Voltage | $I_{OH}$ = –100µA | 1.65-1.95 | $V_{DD}$ –0.2 | | | |
| | | $I_{OH}$ = –6mA | 1.65 | 1.4 | | | |
| $V_{OL}$ | LOW Level Output Voltage | $I_{OL}$ = 100µA | | | | 0.2 | |
| | | $I_{OL}$ = 6mA | | | | 0.3 | |
| $I_I$ | Input Leakage Current | $V_I = V_{DD}$ or GND | 1.95 | | | ±5.0 | µA |
| $I_{OZ}$ | 3-State Output Leakage | $V_O$ = 3.6V | 1.65 | | | ±10 | |
| $I_{OFF}$ | Power-OFF Leakage Current | $V_I = V_O \leq 3.6V$ | 0 | | | 10 | |
| $I_{HOLD}$(1) | Bus Hold Current A or B Outputs | $V_I$ = 0.4 | 1.65 | | 50 | | |
| | | $V_I$ = 1.3 | | | –50 | | |
| $I_{DD}$ | Quiescent Supply Current | $V_I = V_{DD}$ or GND | 1.65-1.95 | | | 20 | |
| | | $V_{DD} \leq (V_I, V_O) \leq 3.6V$ | | | | ±20 | |
| $\Delta I_{DD}$ | Increase in $I_{DD}$ per input | $V_I = V_{DD}$ –06V, Other inputs at $V_{DD}$ or Gnd | | | | 400 | |

**Note:**
1. Not Guaranteed

### Switching Characteristics over recommended operating free-air temperature range

(unless otherwise noted, see Figures 1 thru 4)

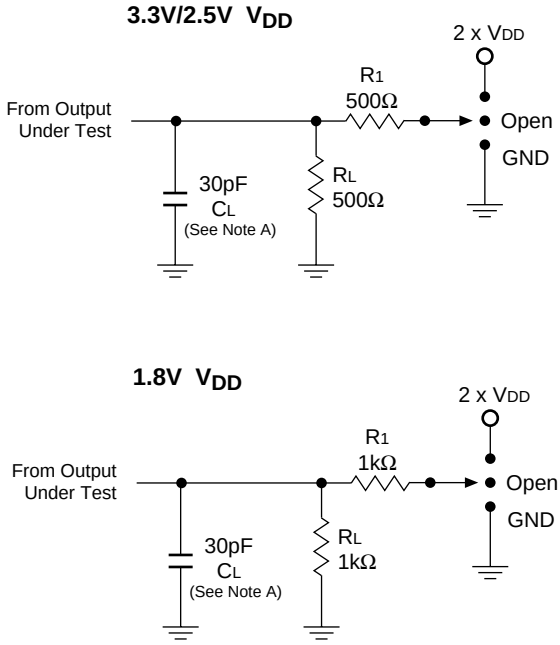
| Parameters | From (Input) | To (Output) | $V_{CC}$ = 1.8V ±0.15V | | $V_{CC}$ = 2.5V ±0.2V | | $V_{CC}$ = 3.3V ±0.3V | | Units |
|---|---|---|---|---|---|---|---|---|---|
| | | | Min. | Max. | Min. | Max. | Min. | Max. | |
| $t_{pd}$ | A | B | | | 1.0 | 5.3 | 1.0 | 4.6 | ns |
| $t_{en}$ | $\overline{OE}$ | | | | 1.6 | 5.0 | 1.6 | 4.0 | |
| $t_{dis}$ | OE | | | | 2.2 | 6.5 | 2.2 | 5.0 | |
| $t_{sk(o)}$(1) | | | | | | | | | |
| $t_{sk(b)}$(1) | | | | | | | | | |

### Operating Characteristics $T_A$ = 25°C

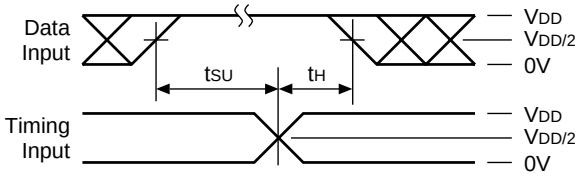
| Parameters | | Test Conditions | Vcc = 2.5V ±0.2V | Vcc = 3.3V ±0.3V | Units |
|---|---|---|---|---|---|
| | | | Typical | Typical | |
| $C_{pd}$ Power Dissipation Capacitance | Outputs Enabled | $C_L$ = 0pF, f = 10 MHz | TBD | TBD | pF |
| | Outputs Disabled | | TBD | TBD | |

## Test Circuits and Switching Waveforms

**Parameter Measurement Information ($V_{DD}$ = 1.65V - 3.6V)**




## Setup, Hold, and Release Timing




**Notes:**

A. $C_L$ includes probe and jig capacitance.

B. Waveform 1 is for an output with internal conditions such that the output is LOW except when disabled by the output control.
Waveform 2 is for an output with internal conditions such that the output is HIGH except when disabled by the output control.

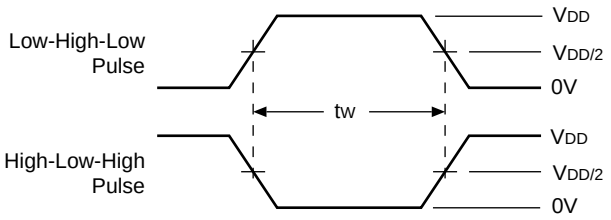
C. All input pulses are supplied by generators having the following characteristics: PRR ≤ 10 MHz, $Z_O$ = 50Ω, $t_r$ ≤ 2ns, $t_f$ ≤ 2ns, ***measured from 10% to 90%, unless otherwise specified.***

D. The outputs are measured one at a time with one transition per measurement.

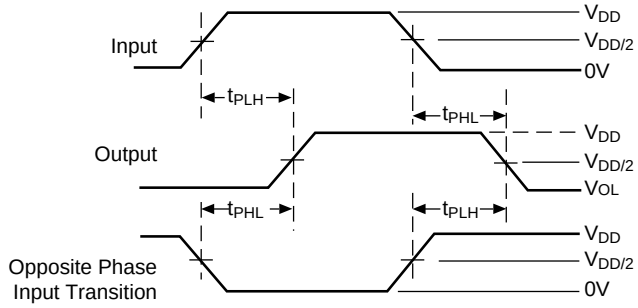
## Switch Position

| Test | S1 |
|---|---|
| $t_{PD}$ | Open |
| $t_{PLZ}/t_{PZL}$ | 2 x $V_{DD}$ |
| $t_{PHZ}/t_{PZH}$ | GND |

## Pulse Width




## Propagation Delay




## Enable Disable Timing