



3.3V CMOS 1-BIT TO 4-BIT ADDRESS DRIVER WITH 3-STATE OUTPUTS AND BUS-HOLD

IDT74ALVCH162344

FEATURES:

- 0.5 MICRON CMOS Technology
- Typical $t_{sk(0)}$ (Output Skew) < 250ps
- ESD > 2000V per MIL-STD-883, Method 3015;
> 200V using machine model (C = 200pF, R = 0)
- 0.635mm pitch SSOP, 0.50mm pitch TSSOP,
and 0.40mm pitch TVSOP packages
- Extended commercial range of -40°C to +85°C
- $V_{CC} = 3.3V \pm 0.3V$, Normal Range
- $V_{CC} = 2.7V$ to $3.6V$, Extended Range
- $V_{CC} = 2.5V \pm 0.2V$
- CMOS power levels (0.4μW typ. static)
- Rail-to-Rail output swing for increased noise margin

Drive Features for ALVCH162344:

- Balanced Output Drivers: $\pm 12mA$
- Low switching noise

APPLICATIONS:

- 3.3V High Speed Systems
- 3.3V and lower voltage computing systems

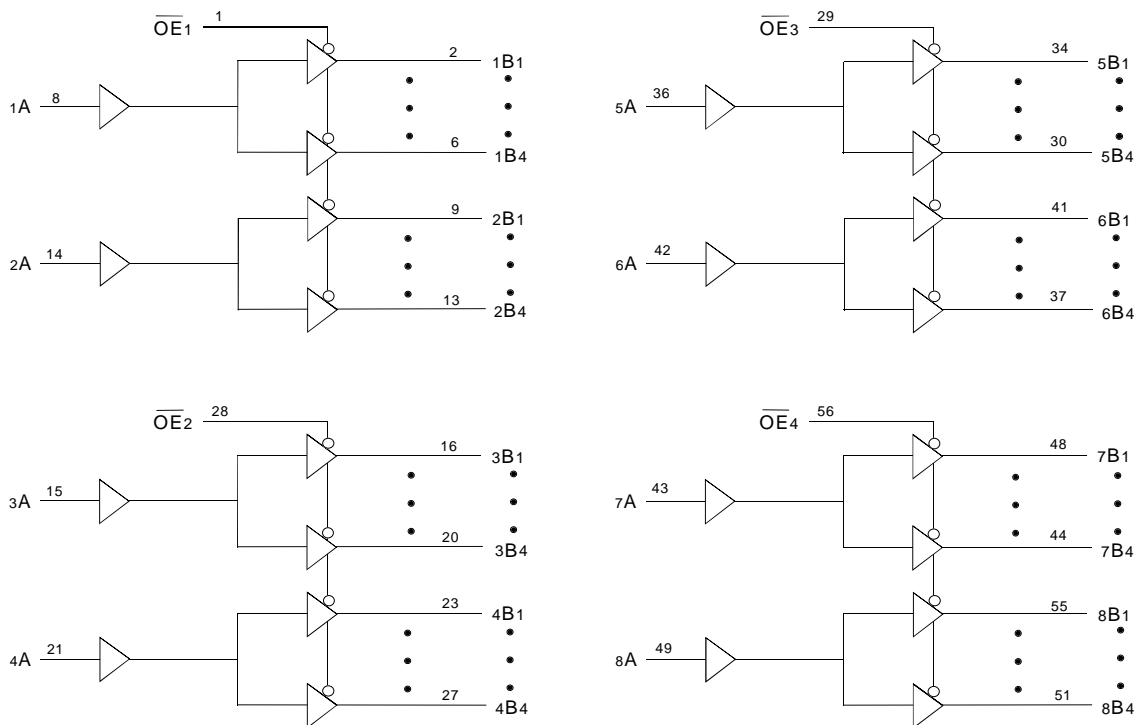
DESCRIPTION:

This 1-bit to 4-bit address driver is built using advanced dual metal CMOS technology. The ALVCH162344 device is used in applications in which four separate memory locations must be addressed by a single address.

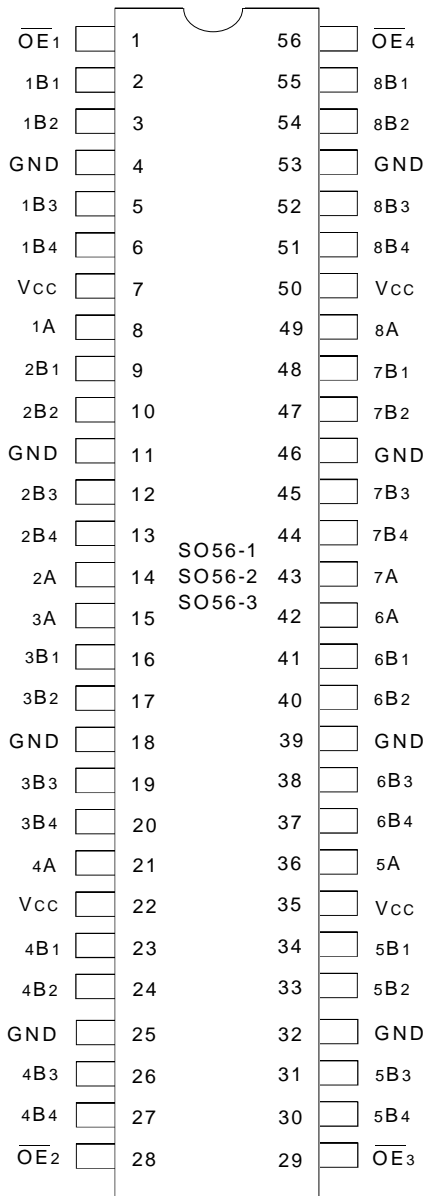
The ALVCH162344 has series resistors in the device output structure which will significantly reduce line noise when used with light loads. This driver has been designed to drive $\pm 12mA$ at the designated threshold levels.

The ALVCH162344 has "bus-hold" which retains the inputs' last state whenever the input goes to a high-impedance. This prevents floating inputs and eliminates the need for pull-up/down resistors.

Functional Block Diagram



PIN CONFIGURATION



SSOP/
TSSOP/TVSOP
TOP VIEW

PIN DESCRIPTION

| Pin Names | Description |
|-----------------|---|
| OE _x | 3-State Output Enable Inputs (Active LOW) |
| x _A | Data Inputs ⁽¹⁾ |
| x _{Bx} | 3-State Outputs |

NOTE:

1. These pins have "Bus-Hold." All other pins are standard inputs, outputs, or I/Os.

ABSOLUTE MAXIMUM RATING (1)

| Symbol | Description | Max. | Unit |
|----------------------------------|--|--------------------------------|------|
| V _{TERM} ⁽²⁾ | Terminal Voltage with Respect to GND | - 0.5 to + 4.6 | V |
| V _{TERM} ⁽³⁾ | Terminal Voltage with Respect to GND | - 0.5 to V _{CC} + 0.5 | V |
| T _{STG} | Storage Temperature | - 65 to + 150 | °C |
| I _{OUT} | DC Output Current | - 50 to + 50 | mA |
| I _{IK} | Continuous Clamp Current, V _I < 0 or V _I > V _{CC} | ± 50 | mA |
| I _{OK} | Continuous Clamp Current, V _O < 0 | - 50 | mA |
| I _{CC} | Continuous Current through each V _{CC} or GND | ± 100 | mA |

NEW16link

NOTES:

1. Stresses greater than those listed under ABSOLUTE 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.
2. V_{CC} terminals.
3. All terminals except V_{CC}.

CAPACITANCE (T_A = +25°C, f = 1.0MHz)

| Symbol | Parameter ⁽¹⁾ | Conditions | Typ. | Max. | Unit |
|------------------|--------------------------|-----------------------|------|------|------|
| C _{IN} | Input Capacitance | V _{IN} = 0V | 5 | 7 | pF |
| C _{OUT} | Output Capacitance | V _{OUT} = 0V | 7 | 9 | pF |
| C _{I/O} | I/O Port Capacitance | V _{IN} = 0V | 7 | 9 | pF |

NEW16link

NOTE:

1. As applicable to the device type.

A TO B FUNCTION TABLE (1)

| Inputs | | Outputs |
|-----------------|----------------|-----------------|
| OE _x | x _A | x _{Bx} |
| L | L | L |
| L | H | H |
| H | X | Z |

NOTE:

1. H = HIGH Voltage Level
L = LOW Voltage Level
X = Don't Care
Z = High-Impedance

DC ELECTRICAL CHARACTERISTICS OVER OPERATING RANGE

Following Conditions Apply Unless Otherwise Specified:

Operating Condition: TA = - 40°C to +85°C

| Symbol | Parameter | Test Conditions | | Min. | Typ. ⁽¹⁾ | Max. | Unit |
|------------------|--|--|----------------------|------|---------------------|-------|------|
| VIH | Input HIGH Voltage Level | VCC = 2.3V to 2.7V | | 1.7 | — | — | V |
| | | VCC = 2.7V to 3.6V | | 2 | — | — | |
| VIL | Input LOW Voltage Level | VCC = 2.3V to 2.7V | | — | — | 0.7 | V |
| | | VCC = 2.7V to 3.6V | | — | — | 0.8 | |
| I _{IH} | Input HIGH Current | VCC = 3.6V | V _I = VCC | — | — | ± 5 | μA |
| I _{IL} | Input LOW Current | VCC = 3.6V | V _I = GND | — | — | ± 5 | |
| I _{OZH} | High Impedance Output Current (3-State Output pins) | VCC = 3.6V | V _O = VCC | — | — | ± 10 | μA |
| I _{OZL} | | | V _O = GND | — | — | ± 10 | μA |
| V _{IK} | Clamp Diode Voltage | VCC = 2.3V, I _{IN} = - 18mA | | — | - 0.7 | - 1.2 | V |
| V _H | Input Hysteresis | VCC = 3.3V | | — | 100 | — | mV |
| I _{CC} | Quiescent Power Supply Current | VCC = 3.6V | | — | 0.1 | 40 | μA |
| I _{CC} | | V _{IN} = GND or VCC | | — | 0.1 | 40 | |
| I _{CC} | | V _{IN} = GND or VCC | | — | 0.1 | 40 | |
| ΔI _{CC} | Quiescent Power Supply Current Variation | One input at VCC - 0.6V, other inputs at VCC or GND | | — | — | 750 | μA |

NEW16link

NOTE:

1. Typical values are at VCC = 3.3V, +25°C ambient.

BUS-HOLD CHARACTERISTICS

| Symbol | Parameter ⁽¹⁾ | Test Conditions | | Min. | Typ. ⁽²⁾ | Max. | Unit |
|-------------------|----------------------------------|-----------------|----------------------------|------|---------------------|-------|------|
| I _{BHH} | Bus-Hold Input Sustain Current | VCC = 3.0V | V _I = 2.0V | - 75 | — | — | μA |
| | | | V _I = 0.8V | 75 | — | — | |
| I _{BHL} | Bus-Hold Input Sustain Current | VCC = 2.3V | V _I = 1.7V | - 45 | — | — | μA |
| | | | V _I = 0.7V | 45 | — | — | |
| I _{BHHO} | Bus-Hold Input Overdrive Current | VCC = 3.6V | V _I = 0 to 3.6V | — | — | ± 500 | μA |
| I _{BHLO} | | | | — | — | ± 500 | |

NEW16link

NOTES:

1. Pins with Bus-hold are identified in the pin description.
2. Typical values are at VCC = 3.3V, +25°C ambient.

OUTPUT DRIVE CHARACTERISTICS

| Symbol | Parameter | Test Conditions ⁽¹⁾ | | Min. | Max. | Unit |
|-------------------------|---------------------|--------------------------------|--------------------------|-----------------------|------|------|
| VOH | Output HIGH Voltage | V _{CC} = 2.3V to 3.6V | I _{OH} = -0.1mA | V _{CC} - 0.2 | — | V |
| | | V _{CC} = 2.3V | I _{OH} = -4mA | 1.9 | — | |
| | | | I _{OH} = -6mA | 1.7 | — | |
| | | V _{CC} = 2.7V | I _{OH} = -4mA | 2.2 | — | |
| | | | I _{OH} = -8mA | 2 | — | |
| | | V _{CC} = 3.0V | I _{OH} = -6mA | 2.4 | — | |
| I _{OH} = -12mA | 2 | | — | | | |
| VOL | Output LOW Voltage | V _{CC} = 2.3V to 3.6V | I _{OL} = 0.1mA | — | 0.2 | V |
| | | V _{CC} = 2.3V | I _{OL} = 4mA | — | 0.4 | |
| | | | I _{OL} = 6mA | — | 0.55 | |
| | | V _{CC} = 2.7V | I _{OL} = 4mA | — | 0.4 | |
| | | | I _{OL} = 8mA | — | 0.6 | |
| | | V _{CC} = 3.0V | I _{OL} = 6mA | — | 0.55 | |
| I _{OL} = 12mA | — | | 0.8 | | | |

NEW16link

NOTE:

- V_{IH} and V_{IL} must be within the min. or max. range shown in the DC ELECTRICAL CHARACTERISTICS OVER OPERATING RANGE table for the appropriate V_{CC} range. T_A = -40°C to +85°C.

OPERATING CHARACTERISTICS, T_A = 25°C

| Symbol | Parameter | Test Conditions | V _{CC} = 2.5V ± 0.2V | V _{CC} = 3.3V ± 0.3V | Unit |
|--------|---|---------------------------------|-------------------------------|-------------------------------|------|
| | | | Typical | Typical | |
| CPD | Power Dissipation Capacitance Outputs enabled | C _L = 0pF, f = 10Mhz | 68 | 82 | pF |
| CPD | Power Dissipation Capacitance Outputs disabled | | 12 | 14 | pF |

SWITCHING CHARACTERISTICS ⁽¹⁾

| Symbol | Parameter | V _{CC} = 2.5V ± 0.2V | | V _{CC} = 2.7V | | V _{CC} = 3.3V ± 0.3V | | Unit |
|------------------|---|-------------------------------|------|------------------------|------|-------------------------------|------|------|
| | | Min. | Max. | Min. | Max. | Min. | Max. | |
| t _{PLH} | Propagation Delay | 1 | 4.9 | — | 5.1 | 1.4 | 4.4 | ns |
| t _{PHL} | x _A to x _{Bx} | | | | | | | |
| t _{PZH} | Output Enable Time | 1 | 6.4 | — | 6.6 | 1.2 | 5.7 | ns |
| t _{PZL} | $\overline{\text{OE}}$ to x _{Bx} | | | | | | | |
| t _{PHZ} | Output Disable Time | 1 | 5.4 | — | 4.7 | 1.2 | 4.5 | ns |
| t _{PLZ} | $\overline{\text{OE}}$ to x _{Bx} | | | | | | | |
| tsk(o) | Output Skew ⁽²⁾ | — | — | — | — | — | 0.5 | ns |
| tsk(b) | Output Skew ⁽²⁾ | — | — | — | — | — | 0.35 | ns |

NOTES:

- See test circuits and waveforms. T_A = -40°C to +85°C.
- Skew between any two outputs of the same package and switching in the same direction. For tsk(o), OUTPUT1 and OUTPUT2 are any two outputs of the same package. For tsk(b), OUTPUT1 and OUTPUT2 are in the same bank of the same package; this parameter is guaranteed but not production tested.

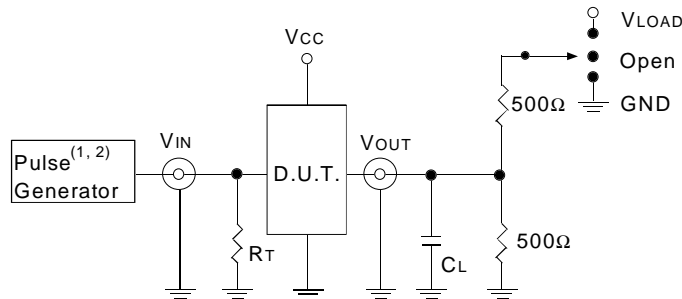
TEST CIRCUITS AND WAVEFORMS:

TEST CONDITIONS

| Symbol | V _{CC} (1)= 3.3V±0.3V | V _{CC} (1)= 2.7V | V _{CC} (2)= 2.5V±0.2V | Unit |
|-------------------|--------------------------------|---------------------------|--------------------------------|------|
| V _{LOAD} | 6 | 6 | 2 x V _{CC} | V |
| V _{IH} | 2.7 | 2.7 | V _{CC} | V |
| V _T | 1.5 | 1.5 | V _{CC} / 2 | V |
| V _{LZ} | 300 | 300 | 150 | mV |
| V _{HZ} | 300 | 300 | 150 | mV |
| C _L | 50 | 50 | 30 | pF |

NEW16link

TEST CIRCUITS FOR ALL OUTPUTS



ALVC Link

DEFINITIONS:

C_L= Load capacitance: includes jig and probe capacitance.

R_T= Termination resistance: should be equal to Z_{OUT} of the Pulse Generator.

NOTES:

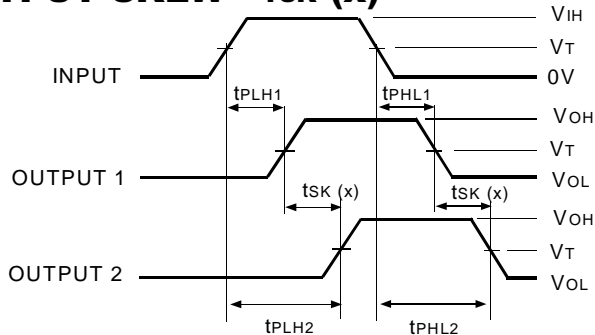
1. Pulse Generator for All Pulses: Rate ≤ 10MHz; t_F ≤ 2.5ns; t_R ≤ 2.5ns.
2. Pulse Generator for All Pulses: Rate ≤ 10MHz; t_F ≤ 2ns; t_R ≤ 2ns.

SWITCH POSITION

| Test | Switch |
|---|-------------------|
| Open Drain Disable Low Enable Low | V _{LOAD} |
| Disable High Enable High | GND |
| All Other tests | Open |

NEW16link

OUTPUT SKEW - TSK (x)



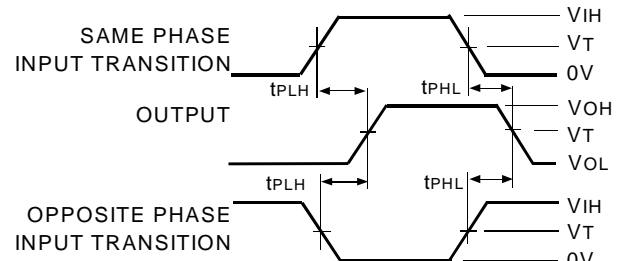
$$t_{SK}(x) = |t_{PLH2} - t_{PLH1}| \text{ or } |t_{PHL2} - t_{PHL1}|$$

ALVC Link

NOTES:

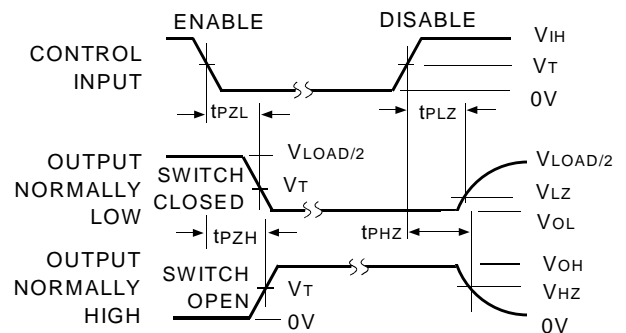
1. For t_{SK}(o) OUTPUT1 and OUTPUT2 are any two outputs.
2. For t_{SK}(b) OUTPUT1 and OUTPUT2 are in the same bank.

PROPAGATION DELAY



ALVC Link

ENABLE AND DISABLE TIMES

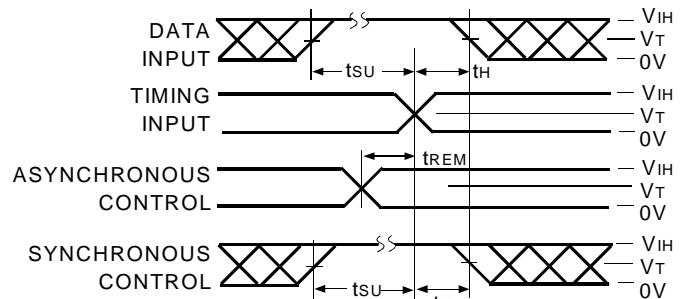


ALVC Link

NOTE:

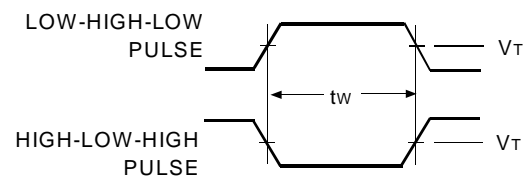
1. Diagram shown for input Control Enable-LOW and input Control Disable-HIGH.

SET-UP, HOLD, AND RELEASE TIMES



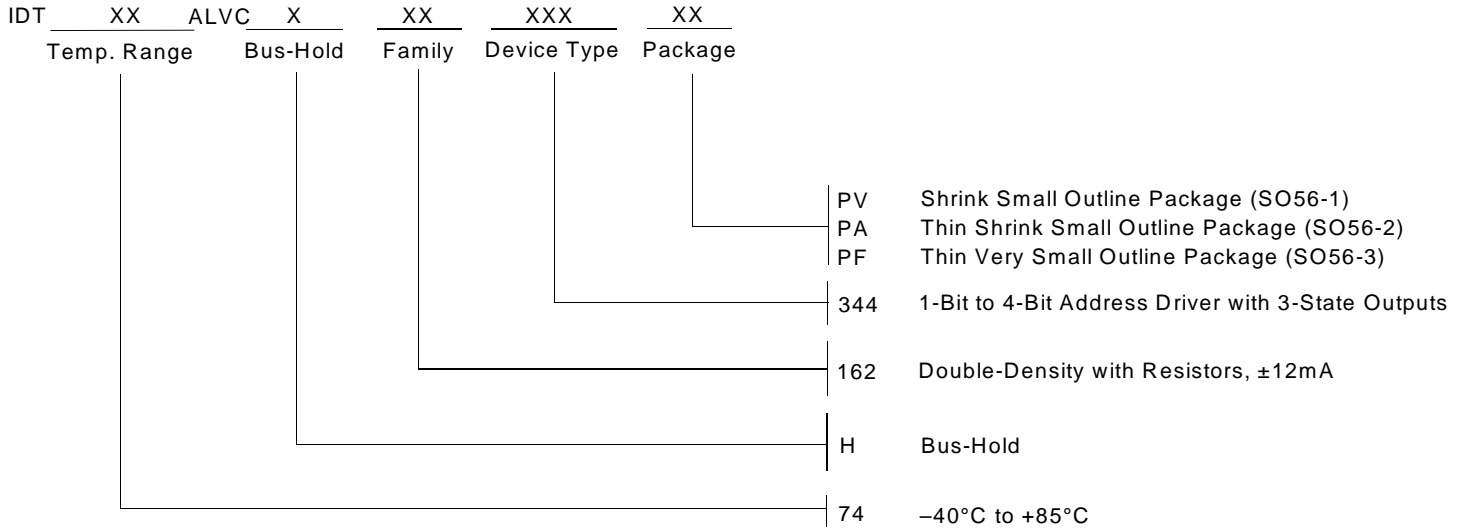
ALVC Link

PULSE WIDTH



ALVC Link

ORDERING INFORMATION



CORPORATE HEADQUARTERS
 2975 Stender Way
 Santa Clara, CA 95054

for SALES:
 800-345-7015 or 408-727-6116
 fax: 408-492-8674
www.idt.com*

**To search for sales office near you, please click the sales button found on our home page or dial the 800# above and press 2.
 The IDT logo is a registered trademark of Integrated Device Technology, Inc.*