



# 3.3V CMOS 18-BIT TRANSCIVER WITH 3-STATE OUTPUTS AND BUS-HOLD

**IDT74ALVCH16863**

## 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  $-40^{\circ}\text{C}$  to  $+85^{\circ}\text{C}$
- $V_{CC} = 3.3\text{V} \pm 0.3\text{V}$ , Normal Range
- $V_{CC} = 2.7\text{V}$  to  $3.6\text{V}$ , Extended Range
- $V_{CC} = 2.5\text{V} \pm 0.2\text{V}$
- CMOS power levels (0.4 $\mu\text{W}$  typ. static)
- Rail-to-Rail output swing for increased noise margin

## Drive Features for ALVCH16863:

- High Output Drivers:  $\pm 24\text{mA}$
- Suitable for heavy loads

## APPLICATIONS:

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

## DESCRIPTION:

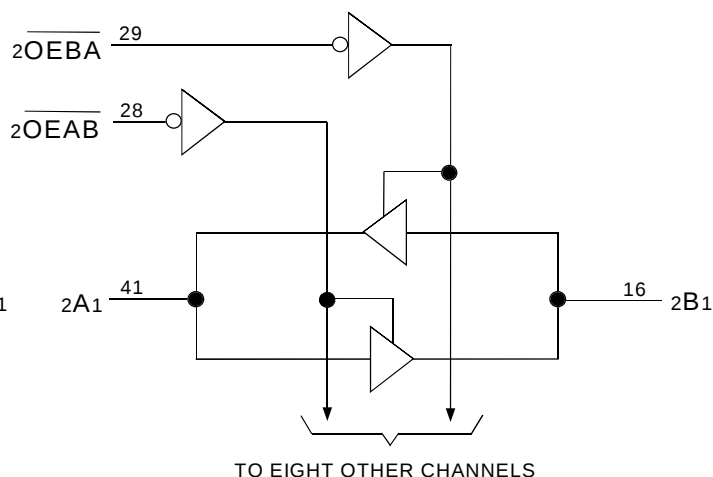
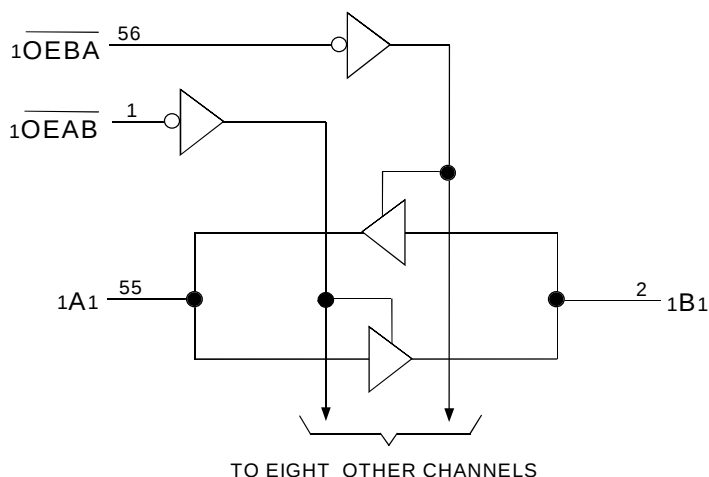
This 18-bit transceiver is built using advanced dual metal CMOS technology. The ALVCH16863 is a noninverting transceiver designed for asynchronous communication between data buses. The control-function implementation minimizes external timing requirements.

This high speed device can be used as two independent 9-bit transceivers or one 18-bit transceiver. It allows data transmission from the A bus to the B bus or from the B bus to the A bus, depending on the logic level at the output-enable ( $\overline{\text{OEAB}}$  or  $\overline{\text{OEBA}}$ ) inputs.

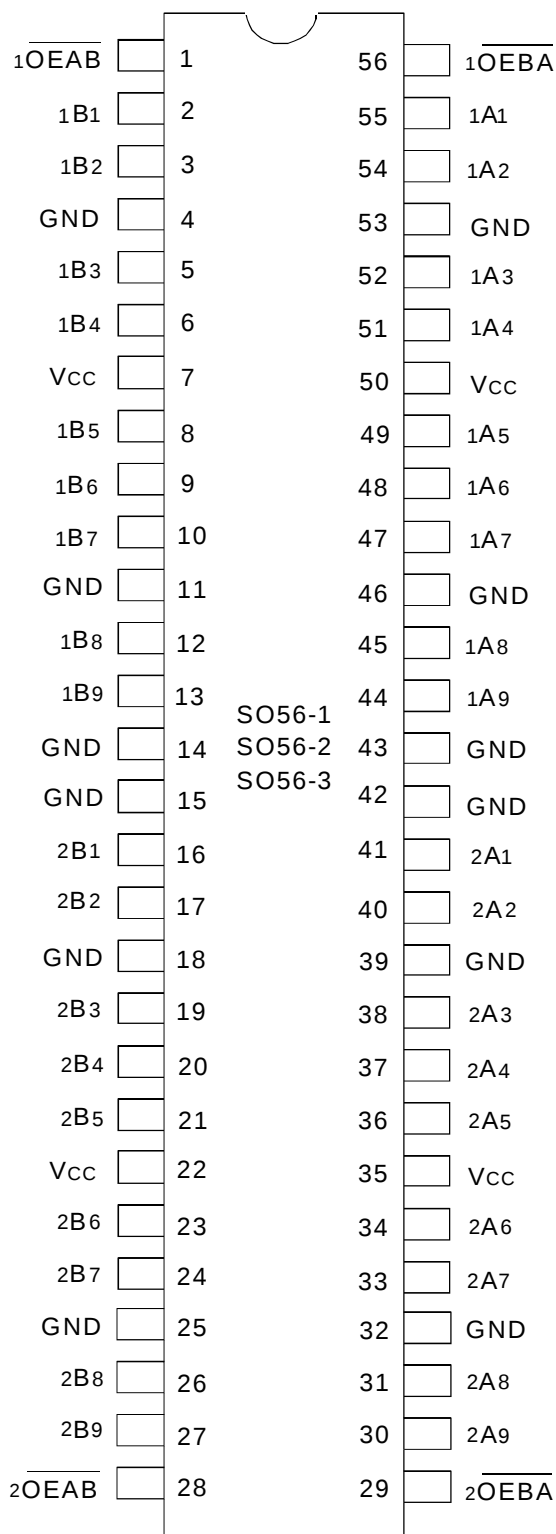
The ALVCH16863 has been designed with a  $\pm 24\text{mA}$  output driver. This driver is capable of driving a moderate to heavy load while maintaining speed performance.

The ALVCH16863 has "bus-hold" which retains the inputs' last state whenever the input bus goes to a high impedance. This prevents floating inputs and eliminates the need for pull-up/down resistors.

## Functional Block Diagram



## PIN CONFIGURATION



## 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   |
| $I_{CC}$<br>$I_{SS}$ | Continuous Current through each $V_{CC}$ or GND       | ±100                    | mA   |

NEW16link

### NOTES:

- 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.
- $V_{CC}$  terminals.
- All terminals except  $V_{CC}$ .

## CAPACITANCE ( $T_A = +25^\circ\text{C}$ , $f = 1.0\text{MHz}$ )

| Symbol    | Parameter <sup>(1)</sup> | 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:

- As applicable to the device type.

## PIN DESCRIPTION

| Pin Names          | Description                                                 |
|--------------------|-------------------------------------------------------------|
| $\overline{xOEAB}$ | A-to-B Output Enable Input (Active LOW)                     |
| $\overline{xOEBA}$ | B-to-A Output Enable Input (Active LOW)                     |
| $xAx$              | A-to-B Data Inputs or B-to-A 3-State Outputs <sup>(1)</sup> |
| $xBx$              | B-to-A Data Inputs or A-to-B 3-State Outputs <sup>(1)</sup> |

### NOTE:

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

## FUNCTION TABLE (each 9-bit section) <sup>(1)</sup>

| Inputs             |                    | Operation       |
|--------------------|--------------------|-----------------|
| $\overline{xOEAB}$ | $\overline{xOEBA}$ |                 |
| H                  | L                  | B data to A bus |
| L                  | H                  | A data to B bus |
| H                  | H                  | Isolation       |

### NOTES:

- H = HIGH Voltage Level  
L = LOW Voltage Level

## 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. <sup>(1)</sup> | 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   |      |
| IiH                  | Input HIGH Current                                     | VCC = 3.6V                                             | Vi = VCC | —    | —                   | ± 5   | μA   |
| IiL                  | Input LOW Current                                      | VCC = 3.6V                                             | Vi = GND | —    | —                   | ± 5   |      |
| IoZH<br>IoZL         | High Impedance Output Current<br>(3-State Output pins) | VCC = 3.6V                                             | Vo = VCC | —    | —                   | ± 10  | μA   |
|                      |                                                        |                                                        | Vo = GND | —    | —                   | ± 10  | μA   |
| Vik                  | Clamp Diode Voltage                                    | VCC = 2.3V, IIN = – 18mA                               |          | —    | – 0.7               | – 1.2 | V    |
| VH                   | Input Hysteresis                                       | VCC = 3.3V                                             |          | —    | 100                 | —     | mV   |
| ICCL<br>ICCH<br>ICCZ | Quiescent Power Supply Current                         | VCC = 3.6V<br>VIN = GND or VCC                         |          | —    | 0.1                 | 40    | μA   |
| ΔICC                 | Quiescent Power Supply Current Variation               | One input at VCC – 0.6V,<br>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 <sup>(1)</sup>         | Test Conditions |                | Min. | Typ. <sup>(2)</sup> | Max.  | Unit |
|----------------|----------------------------------|-----------------|----------------|------|---------------------|-------|------|
| IBHH<br>IBHL   | Bus-Hold Input Sustain Current   | VCC = 3.0V      | Vi = 2.0V      | – 75 | —                   | —     | μA   |
|                |                                  |                 | Vi = 0.8V      | 75   | —                   | —     |      |
| IBHH<br>IBHL   | Bus-Hold Input Sustain Current   | VCC = 2.3V      | Vi = 1.7V      | – 45 | —                   | —     | μA   |
|                |                                  |                 | Vi = 0.7V      | 45   | —                   | —     |      |
| IBHHO<br>IBHLO | Bus-Hold Input Overdrive Current | VCC = 3.6V      | Vi = 0 to 3.6V | —    | —                   | ± 500 | μA   |

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 <sup>(1)</sup> |                           | Min.                  | Max. | Unit |
|-----------------|---------------------|--------------------------------|---------------------------|-----------------------|------|------|
| V <sub>OH</sub> | Output HIGH Voltage | V <sub>CC</sub> = 2.3V to 3.6V | I <sub>OH</sub> = – 0.1mA | V <sub>CC</sub> – 0.2 | —    | V    |
|                 |                     | V <sub>CC</sub> = 2.3V         | I <sub>OH</sub> = – 6mA   | 2                     | —    |      |
|                 |                     | V <sub>CC</sub> = 2.3V         | I <sub>OH</sub> = – 12mA  | 1.7                   | —    |      |
|                 |                     | V <sub>CC</sub> = 2.7V         |                           | 2.2                   | —    |      |
|                 |                     | V <sub>CC</sub> = 3.0V         |                           | 2.4                   | —    |      |
|                 |                     | V <sub>CC</sub> = 3.0V         | I <sub>OH</sub> = – 24mA  | 2                     | —    |      |
| V <sub>OL</sub> | Output LOW Voltage  | V <sub>CC</sub> = 2.3V to 3.6V | I <sub>OL</sub> = 0.1mA   | —                     | 0.2  | V    |
|                 |                     | V <sub>CC</sub> = 2.3V         | I <sub>OL</sub> = 6mA     | —                     | 0.4  |      |
|                 |                     |                                | I <sub>OL</sub> = 12mA    | —                     | 0.7  |      |
|                 |                     | V <sub>CC</sub> = 2.7V         | I <sub>OL</sub> = 12mA    | —                     | 0.4  |      |
|                 |                     | V <sub>CC</sub> = 3.0V         | I <sub>OL</sub> = 24mA    | —                     | 0.55 |      |

NEW16link

### NOTE:

1. V<sub>IH</sub> and V<sub>IL</sub> must be within the min. or max. range shown in the DC ELECTRICAL CHARACTERISTICS OVER OPERATING RANGE table for the appropriate V<sub>CC</sub> range. T<sub>A</sub> = – 40°C to + 85°C.

## OPERATING CHARACTERISTICS, T<sub>A</sub> = 25°C

| Symbol | Parameter                                         | Test Conditions                 | V <sub>CC</sub> = 2.5V ± 0.2V | V <sub>CC</sub> = 3.3V ± 0.3V | Unit |
|--------|---------------------------------------------------|---------------------------------|-------------------------------|-------------------------------|------|
|        |                                                   |                                 | Typical                       | Typical                       |      |
| CPD    | Power Dissipation Capacitance<br>Outputs enabled  | C <sub>L</sub> = 0pF, f = 10MHz | 21                            | 30                            | pF   |
| CPD    | Power Dissipation Capacitance<br>Outputs disabled |                                 | 2                             | 3                             | pF   |

## SWITCHING CHARACTERISTICS<sup>(1)</sup>

| Symbol                               | Parameter                                           | V <sub>CC</sub> = 2.5V ± 0.2V |      | V <sub>CC</sub> = 2.7V |      | V <sub>CC</sub> = 3.3V ± 0.3V |      | Unit |
|--------------------------------------|-----------------------------------------------------|-------------------------------|------|------------------------|------|-------------------------------|------|------|
|                                      |                                                     | Min.                          | Max. | Min.                   | Max. | Min.                          | Max. |      |
| t <sub>PLH</sub><br>t <sub>PHL</sub> | Propagation Delay<br>xAx to xBx or xBx to xAx       | 1                             | 4.1  | —                      | 4    | 1                             | 3.4  | ns   |
| t <sub>PZH</sub><br>t <sub>PZL</sub> | Output Enable Time<br>xOEBA to xAx or xOEAB to xBx  | 1                             | 5.7  | —                      | 5.8  | 1                             | 4.7  | ns   |
| t <sub>PHZ</sub><br>t <sub>PLZ</sub> | Output Disable Time<br>xOEBA to xAx or xOEAB to xBx | 1.3                           | 5.5  | —                      | 4.7  | 1.4                           | 4.2  | ns   |
| tsk(0)                               | Output Skew <sup>(2)</sup>                          | —                             | —    | —                      | —    | —                             | 500  | ps   |

### NOTES:

1. See test circuits and waveforms. T<sub>A</sub> = – 40°C to + 85°C.
2. Skew between any two outputs of the same package and switching in the same direction.

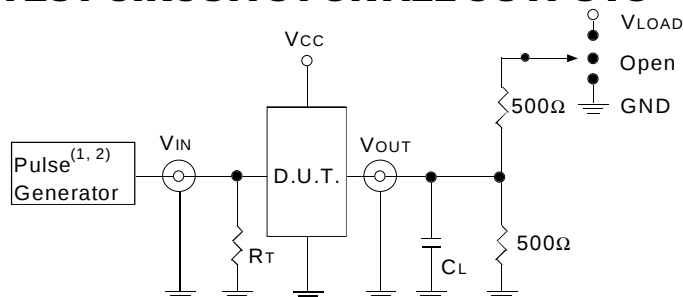
## TEST CIRCUITS AND WAVEFORMS

### TEST CONDITIONS

| Symbol            | V <sub>cc</sub> (1)= 3.3V±0.3V | V <sub>cc</sub> (1)= 2.7V | V <sub>cc</sub> (2)= 2.5V±0.2V | Unit |
|-------------------|--------------------------------|---------------------------|--------------------------------|------|
| V <sub>LOAD</sub> | 6                              | 6                         | 2 x V <sub>cc</sub>            | V    |
| V <sub>IH</sub>   | 2.7                            | 2.7                       | V <sub>cc</sub>                | V    |
| V <sub>T</sub>    | 1.5                            | 1.5                       | V <sub>cc</sub> / 2            | V    |
| V <sub>LZ</sub>   | 300                            | 300                       | 150                            | mV   |
| V <sub>HZ</sub>   | 300                            | 300                       | 150                            | mV   |
| C <sub>L</sub>    | 50                             | 50                        | 30                             | pF   |

NEW16link

### TEST CIRCUITS FOR ALL OUTPUTS



ALVC Link

#### DEFINITIONS:

C<sub>L</sub> = Load capacitance: includes jig and probe capacitance.

R<sub>T</sub> = Termination resistance: should be equal to Z<sub>out</sub> of the Pulse Generator.

#### NOTES:

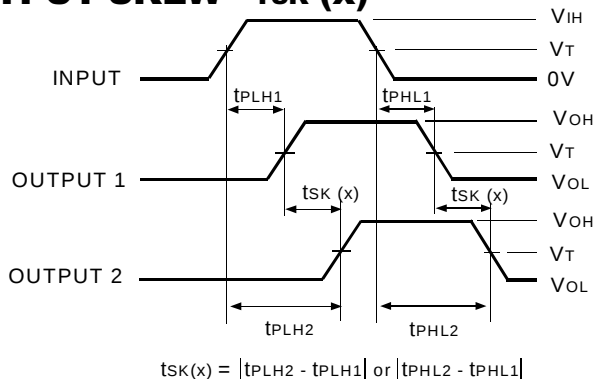
1. Pulse Generator for All Pulses: Rate ≤ 10MHz; t<sub>F</sub> ≤ 2.5ns; t<sub>R</sub> ≤ 2.5ns.
2. Pulse Generator for All Pulses: Rate ≤ 10MHz; t<sub>F</sub> ≤ 2ns; t<sub>R</sub> ≤ 2ns.

### SWITCH POSITION

| Test                                    | Switch            |
|-----------------------------------------|-------------------|
| Open Drain<br>Disable Low<br>Enable Low | V <sub>LOAD</sub> |
| Disable High<br>Enable High             | GND               |
| All Other tests                         | Open              |

NEW16link

### OUTPUT SKEW - t<sub>SK</sub> (x)

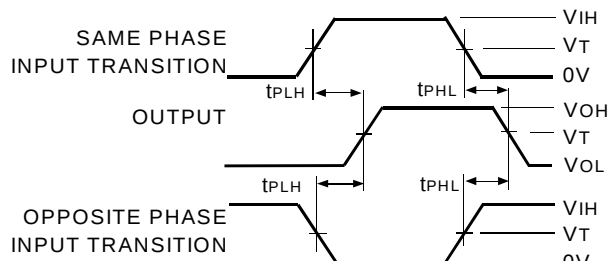


ALVC Link

#### NOTES:

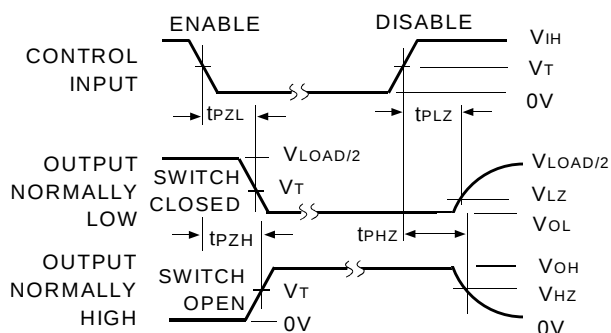
1. For t<sub>SK</sub>(o) OUTPUT1 and OUTPUT2 are any two outputs.
2. For t<sub>SK</sub>(b) OUTPUT1 and OUTPUT2 are in the same bank.

### PROPAGATION DELAY



ALVC Link

### ENABLE AND DISABLE TIMES

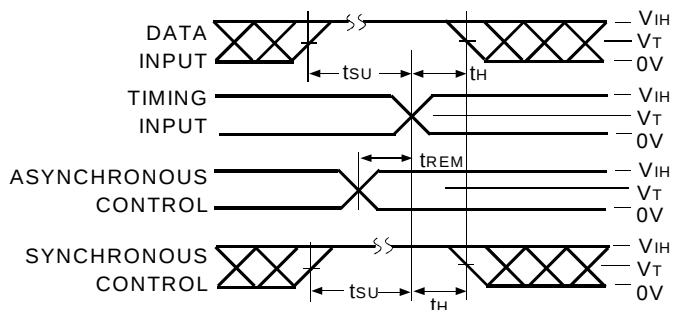


ALVC Link

#### NOTE:

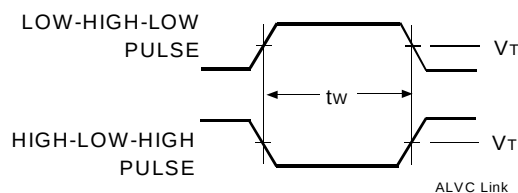
1. Diagram shown for input Control Enable-LOW and input Control Disable-HIGH.

### SET-UP, HOLD, AND RELEASE TIMES



ALVC Link

### PULSE WIDTH



ALVC Link

## ORDERING INFORMATION

| IDT | XX          | ALVC | X        | XX     | XXX         | XX      |                                                  |
|-----|-------------|------|----------|--------|-------------|---------|--------------------------------------------------|
|     | Temp. Range |      | Bus-Hold | Family | Device Type | Package |                                                  |
|     |             |      |          |        |             | PV      | Shrink Small Outline Package (SO56-1)            |
|     |             |      |          |        |             | PA      | Thin Shrink Small Outline Package (SO56-2)       |
|     |             |      |          |        |             | PF      | Thin Very Small Outline Package (SO56-3)         |
|     |             |      |          |        | 863         |         | 18-Bit Transceiver with 3-State Outputs          |
|     |             |      |          |        | 16          |         | Double-Density with Resistors, $\pm 24\text{mA}$ |
|     |             |      |          |        | H           |         | Bus-hold                                         |
|     |             |      |          |        | 74          |         | $-40^{\circ}\text{C}$ to $+85^{\circ}\text{C}$   |



**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](http://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.