

PHILIPS 74ABT16373B Electronic component datasheet

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The 74ABT16373B high-performance BiCMOS device combines low static and dynamic power dissipation with high speed and high output drive.

The 74ABT16373B device is a dual octal transparent latch coupled to two sets of eight 3-State output buffers. The two sections of the device are controlled independently by Enable (nE) and Output Enable (nOE) control gates.

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DATA SHEET

74ABT16373B

16-bit transparent latch (3-State)

Product data

2004 Feb 27

Replaces 74ABT16373B/74ABTH16373B of 1998 Feb 27

Philips
Semiconductors



PHILIPS

16-bit transparent latch (3-State)

74ABT16373B

FEATURES

- 16-bit transparent latch
- Multiple V_{CC} and GND pins minimize switching noise
- Power-up 3-State
- Live insertion/extraction permitted
- Power-up reset
- 3-State output buffers
- Output capability: +64 mA/-32 mA
- I_{CCL} -19 mA maximum
- Latch-up protection exceeds 500 mA per JEDEC Std 17
- ESD protection exceeds 2000 V per MIL STD 883 Method 3015 and 200 V per Machine Model

DESCRIPTION

The 74ABT16373B high-performance BiCMOS device combines low static and dynamic power dissipation with high speed and high output drive.

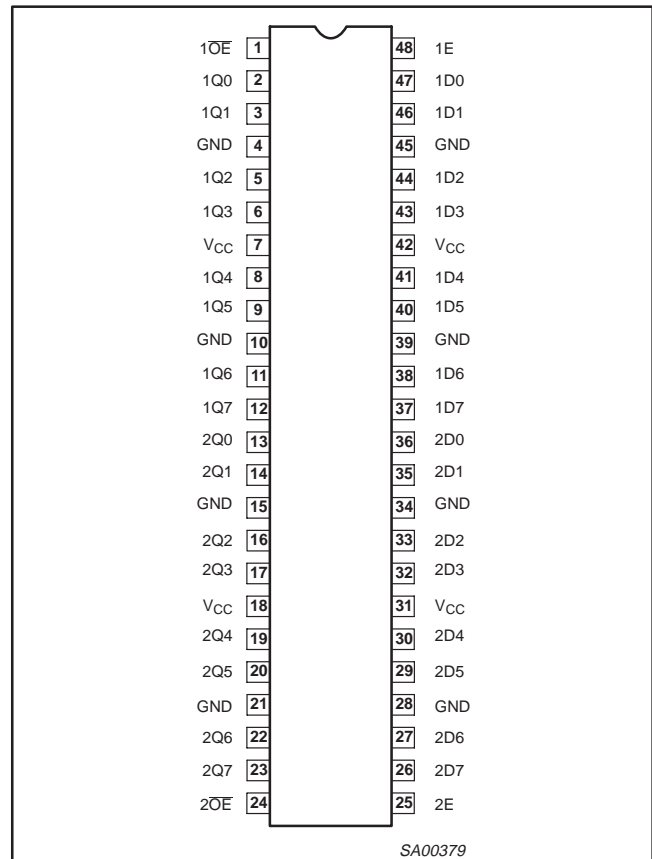
The 74ABT16373B device is a dual octal transparent latch coupled to two sets of eight 3-State output buffers. The two sections of the device are controlled independently by Enable (nE) and Output Enable (nOE) control gates.

The data on each set of D inputs are transferred to the latch outputs when the Latch Enable (nE) input is HIGH. The latch remains transparent to the data inputs while nE is HIGH, and stores the data that is present one set-up time before the HIGH-to-LOW enable transition.

The 3-State output buffers are designed to drive heavily loaded 3-State buses, MOS memories, or MOS microprocessors. Each active-LOW Output Enable (nOE) controls eight 3-State buffers independent of the latch operation.

When nOE is LOW, the latched or transparent data appears at the outputs. When nOE is HIGH, the outputs are in the high-impedance "OFF" state, which means they will neither drive nor load the bus.

PIN CONFIGURATION



QUICK REFERENCE DATA

| SYMBOL | PARAMETER | CONDITIONS $T_{amb} = 25\text{ }^{\circ}\text{C}; \text{GND} = 0\text{ V}$ | TYPICAL | UNIT |
|------------------------|-------------------------------|---|------------|---------------|
| t_{PLH} t_{PHL} | Propagation delay Dn to Qn | $C_L = 50\text{ pF}; V_{CC} = 5\text{ V}$ | 2.5 2.0 | ns |
| C_{IN} | Input capacitance | $V_I = 0\text{ V or } V_{CC}$ | 4 | pF |
| C_{OUT} | Output capacitance | $V_O = 0\text{ V or } V_{CC}; \text{3-State}$ | 7 | pF |
| I_{CCZ} | Quiescent supply current | Outputs disabled; $V_{CC} = 5.5\text{ V}$ | 500 | μA |
| I_{CCL} | | Outputs low; $V_{CC} = 5.5\text{ V}$ | 8 | mA |

ORDERING INFORMATION

$T_{amb} = -40\text{ }^{\circ}\text{C to } +85\text{ }^{\circ}\text{C}$

| Type number | Package | | Version |
|----------------|---------|--|----------|
| | Name | Description | |
| 74ABT16373BDL | SSOP48 | plastic shrink small outline package; 48 leads; body width 7.5 mm | SOT370-1 |
| 74ABT16373BDGG | TSSOP48 | plastic thin shrink small outline package; 48 leads; body width 6.1 mm | SOT362-1 |

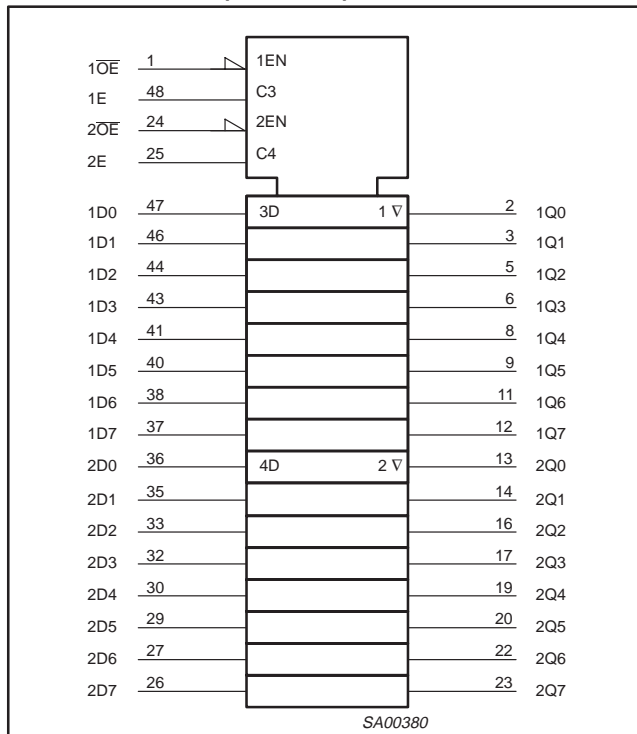
16-bit transparent latch (3-State)

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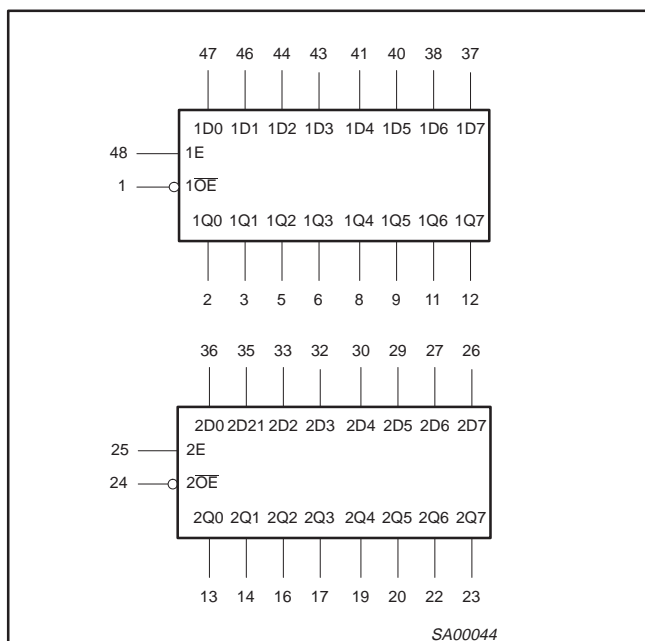
PIN DESCRIPTION

| PIN NUMBER | SYMBOL | FUNCTION |
|--|------------------------|-----------------------------------|
| 47, 46, 44, 43, 41, 40, 38, 37, 36, 35, 33, 32, 30, 29, 27, 26 | 1D0 – 1D7 2D0 – 2D7 | Data inputs |
| 2, 3, 5, 6, 8, 9, 11, 12, 13, 14, 16, 17, 19, 20, 22, 23 | 1Q0 – 1Q7 2Q0 – 2Q7 | Data outputs |
| 1, 24 | 1OE, 2OE | Output enable inputs (active-LOW) |
| 48, 25 | 1E, 2E | Enable inputs (active-HIGH) |
| 4, 10, 15, 21, 28, 34, 39, 45 | GND | Ground (0 V) |
| 7, 18, 31, 42 | V _{CC} | Positive supply voltage |

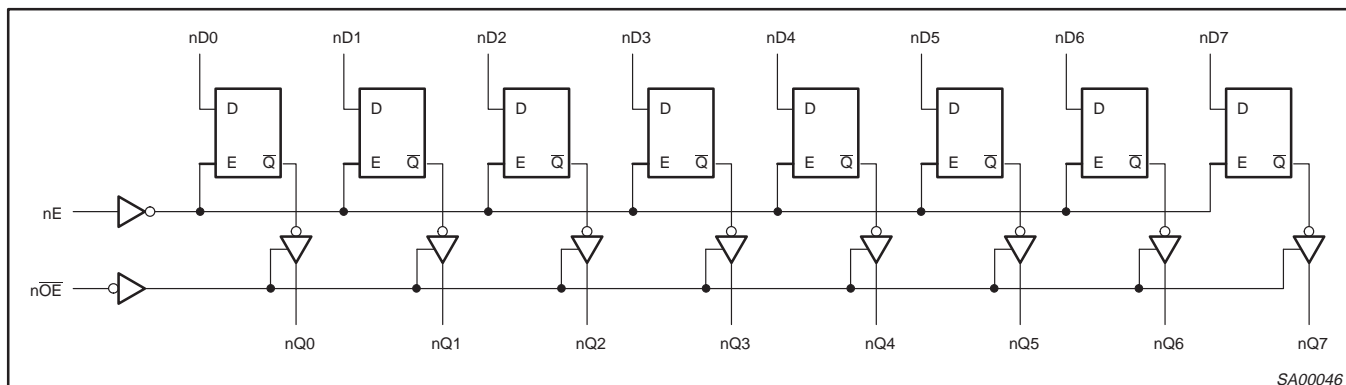
LOGIC SYMBOL (IEEE/IEC)



LOGIC SYMBOL



LOGIC DIAGRAM



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FUNCTION TABLE

| INPUTS | | | INTERNAL REGISTER | OUTPUTS | OPERATING MODE |
|--------|--------|---------|-------------------|-----------|--------------------------|
| nOE | nE | nDx | | nQ0 – nQ7 | |
| L L | H H | L H | L H | L H | Enable and read register |
| L L | ↓ ↓ | i h | L H | L H | Latch and read register |
| L | L | X | NC | NC | Hold |
| H H | L H | X Dn | NC Dn | Z Z | Disable outputs |

H = HIGH voltage level

h = HIGH voltage level one set-up time prior to the HIGH-to-LOW E transition

L = LOW voltage level

l = LOW voltage level one set-up time prior to the HIGH-to-LOW E transition

NC= No change

X = Don't care

Z = High-impedance "off" state

↓ = HIGH-to-LOW E transition

ABSOLUTE MAXIMUM RATINGS^{1, 2}

| SYMBOL | PARAMETER | CONDITIONS | RATING | UNIT |
|------------------|--------------------------------|-----------------------------|--------------|------|
| V _{CC} | DC supply voltage | | -0.5 to +7.0 | V |
| I _{IK} | DC input diode current | V _I < 0 V | -18 | mA |
| V _I | DC input voltage ³ | | -1.2 to +7.0 | V |
| I _{OK} | DC output diode current | V _O < 0 V | -50 | mA |
| V _{OUT} | DC output voltage ³ | output in Off or HIGH state | -0.5 to +5.5 | V |
| I _{OUT} | DC output current | output in LOW state | 128 | mA |
| | | output in HIGH state | -64 | |
| T _{stg} | Storage temperature range | | -65 to 150 | °C |

NOTES:

- Stresses beyond those listed may cause permanent damage to the device. These are stress ratings only and functional operation of the device at these or any other conditions beyond those indicated under "recommended operating conditions" is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.
- The performance capability of a high-performance integrated circuit in conjunction with its thermal environment can create junction temperatures which are detrimental to reliability. The maximum junction temperature of this integrated circuit should not exceed 150 °C.
- The input and output voltage ratings may be exceeded if the input and output current ratings are observed.

RECOMMENDED OPERATING CONDITIONS

| SYMBOL | PARAMETER | LIMITS | | UNIT |
|------------------|--------------------------------------|--------|-----------------|------|
| | | MIN | MAX | |
| V _{CC} | DC supply voltage | 4.5 | 5.5 | V |
| V _I | Input voltage | 0 | V _{CC} | V |
| V _{IH} | HIGH-level input voltage | 2.0 | - | V |
| V _{IL} | LOW-level Input voltage | - | 0.8 | V |
| I _{OH} | HIGH-level output current | - | -32 | mA |
| I _{OL} | LOW-level output current | - | 64 | mA |
| Δt/Δv | Input transition rise or fall rate | 0 | 10 | ns/V |
| T _{amb} | Operating free-air temperature range | -40 | +85 | °C |

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DC ELECTRICAL CHARACTERISTICS

| SYMBOL | PARAMETER | TEST CONDITIONS | LIMITS | | | | | UNIT |
|----------------------------------|--|--|---------------------------|-------|------|-------------------------------------|------|------|
| | | | T _{amb} = +25 °C | | | T _{amb} = -40 °C to +85 °C | | |
| | | | MIN | TYP | MAX | MIN | MAX | |
| V _{IK} | Input clamp voltage | V _{CC} = 4.5 V; I _{IK} = -18 mA | - | -0.9 | -1.2 | | -1.2 | V |
| V _{OH} | High-level output voltage | V _{CC} = 4.5 V; I _{OH} = -3 mA; V _I = V _{IL} or V _{IH} | 2.5 | 2.9 | - | 2.5 | - | V |
| | | V _{CC} = 5.0 V; I _{OH} = -3 mA; V _I = V _{IL} or V _{IH} | 3.0 | 3.4 | - | 3.0 | - | V |
| | | V _{CC} = 4.5 V; I _{OH} = -32 mA; V _I = V _{IL} or V _{IH} | 2.0 | 2.4 | - | 2.0 | - | V |
| V _{OL} | Low-level output voltage | V _{CC} = 4.5 V; I _{OL} = 64 mA; V _I = V _{IL} or V _{IH} | - | 0.42 | 0.55 | - | 0.55 | V |
| V _{RST} | Power-up output voltage ³ | V _{CC} = 5.5 V; I _O = 1 mA; V _I = GND or V _{CC} | - | 0.13 | 0.55 | - | 0.55 | V |
| I _I | Input leakage current | V _{CC} = 5.5 V; V _I = V _{CC} or GND | - | ±0.01 | ±1 | - | ±1 | µA |
| I _{OFF} | Power-off leakage current | V _{CC} = 0.0 V; V _O or V _I ≤ 4.5 V | - | ±5.0 | ±100 | - | ±100 | µA |
| I _{PU} /I _{PD} | Power-up/down 3-State output current ⁴ | V _{CC} = 2.1 V; V _O = 0.5 V; V _I = GND or V _{CC} ; V _{OE} = GND | - | ±5.0 | ±50 | - | ±50 | µA |
| I _{OZH} | 3-State output HIGH current | V _{CC} = 5.5 V; V _O = 5.5 V; V _I = V _{IL} or V _{IH} | - | 0.5 | 10 | - | 10 | µA |
| I _{OZL} | 3-State output LOW current | V _{CC} = 5.5 V; V _O = 0.0 V; V _I = V _{IL} or V _{IH} | - | -0.5 | -10 | | -10 | µA |
| I _O | Output current ¹ | V _{CC} = 5.5 V; V _O = 2.5 V | -50 | -70 | -180 | -50 | -180 | mA |
| I _{CEX} | Output HIGH leakage current | V _{CC} = 5.5 V; V _O = 5.5 V; V _I = GND or V _{CC} | - | 0.1 | 50 | - | 50 | µA |
| I _{CCH} | Quiescent supply current | V _{CC} = 5.5 V; Outputs HIGH; V _I = GND or V _{CC} | - | 0.5 | 2 | - | 2 | mA |
| I _{CCL} | | V _{CC} = 5.5 V; Outputs Low; V _I = GND or V _{CC} | - | 8 | 19 | - | 19 | mA |
| I _{CCZ} | | V _{CC} = 5.5 V; Outputs 3-State; V _I = GND or V _{CC} | - | 0.5 | 2 | - | 2 | mA |
| ΔI _{CC} | Additional supply current per input pin ² | V _{CC} = 5.5 V; one input at 3.4 V, other inputs at V _{CC} or GND | - | 5 | 100 | - | 100 | µA |

NOTES:

- Not more than one output should be tested at a time, and the duration of the test should not exceed one second.
- This is the increase in supply current for each input at 3.4 V.
- For valid test results, data must not be loaded into the flip-flops (or latches) after applying the power.
- This parameter is valid for any V_{CC} between 0 V and 2.1 V, with a transition time of up to 10 msec. From V_{CC} = 2.1 to V_{CC} = 5 V ± 10% a transition time of up to 100 µsec is permitted.
- Unused pins at V_{CC} or GND.

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AC CHARACTERISTICS

GND = 0 V, $t_R = t_F = 2.5$ ns, $C_L = 50$ pF, $R_L = 500$ Ω

| SYMBOL | PARAMETER | WAVEFORM | LIMITS | | | | | UNIT |
|------------------------|--|----------|---|------------|------------|---|------------|------|
| | | | $T_{amb} = +25$ °C $V_{CC} = +5.0$ V | | | $T_{amb} = -40$ °C to $+85$ °C $V_{CC} = +5.0$ V \pm 0.5 V | | |
| | | | MIN | TYP | MAX | MIN | MAX | |
| t_{PLH} t_{PHL} | Propagation delay nDx to nQx | 2 | 1.5 1.1 | 2.5 2.0 | 3.8 3.1 | 1.5 1.1 | 4.4 3.8 | ns |
| t_{PLH} t_{PHL} | Propagation delay nE to nQx | 1 | 1.6 1.3 | 2.5 2.1 | 3.8 3.1 | 1.6 1.3 | 4.4 3.6 | ns |
| t_{PZH} t_{PZL} | Output enable time to HIGH and LOW level | 4 5 | 1.2 1.3 | 2.3 2.3 | 3.5 3.5 | 1.2 1.3 | 4.6 4.5 | ns |
| t_{PHZ} t_{PLZ} | Output disable time from HIGH and LOW level | 4 5 | 1.9 1.7 | 3.1 2.6 | 4.5 3.8 | 1.9 1.7 | 5.3 4.2 | ns |

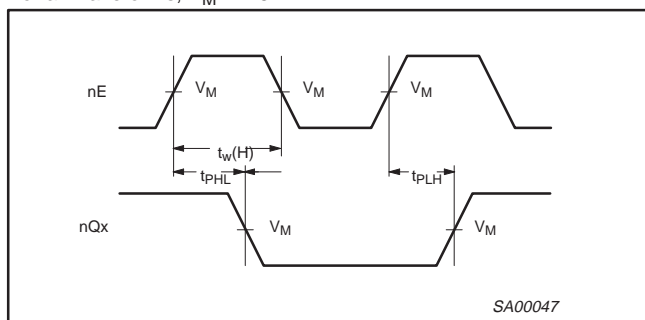
AC SET-UP REQUIREMENTS

GND = 0 V, $t_R = t_F = 2.5$ ns, $C_L = 50$ pF, $R_L = 500$ Ω

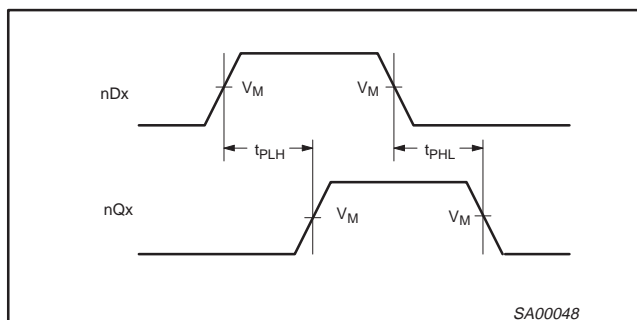
| SYMBOL | PARAMETER | WAVEFORM | LIMITS | | | UNIT |
|----------------------|---------------------------------------|----------|---|-------------|---|------|
| | | | $T_{amb} = +25$ °C $V_{CC} = +5.0$ V | | $T_{amb} = -40$ °C to $+85$ °C $V_{CC} = +5.0$ V \pm 0.5 V | |
| | | | MIN | TYP | MIN | |
| $t_s(H)$ $t_s(L)$ | Set-up time, HIGH or LOW nDx to nE | 3 | 1.0 1.0 | 0.0 0.3 | 1.0 1.0 | ns |
| $t_h(H)$ $t_h(L)$ | Hold time, HIGH or LOW nDx to nE | 3 | 0.5 0.5 | -0.2 0.0 | 0.5 0.5 | ns |
| $t_w(H)$ | Enable pulse width HIGH | 1 | 2.5 | 1.0 | 2.5 | ns |

AC WAVEFORMS

For all waveforms, $V_M = 1.5$ V.



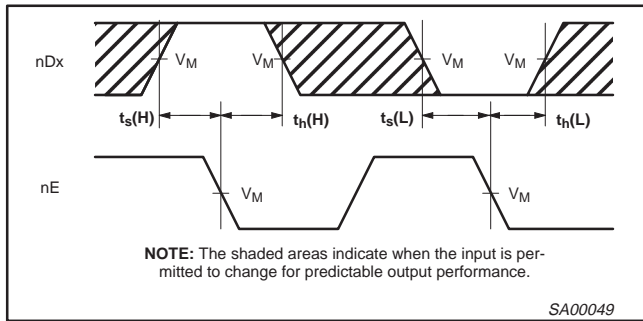
Waveform 1. Propagation Delay, Enable to Output, and Enable Pulse Width



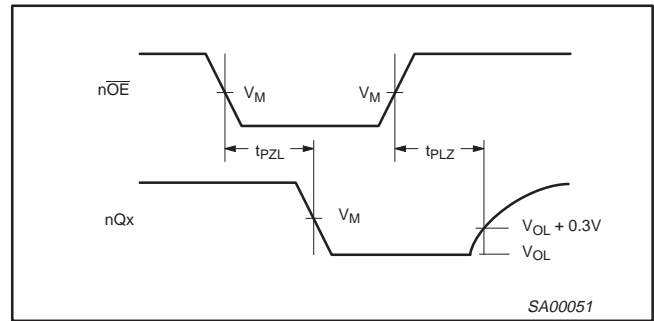
Waveform 2. Propagation Delay for Data to Outputs

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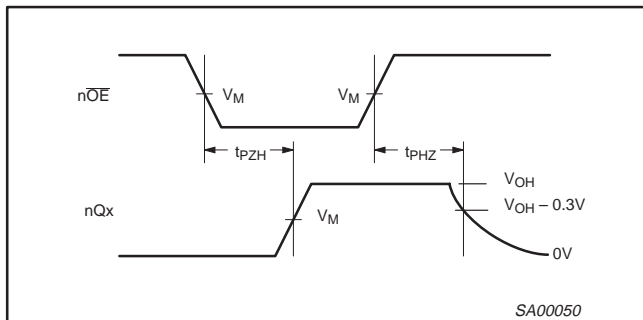
74ABT16373B



Waveform 3. Data Set-up and Hold Times



Waveform 5. 3-State Output Enable Time to LOW Level and Output Disable Time from LOW Level



Waveform 4. 3-State Output Enable Time to HIGH Level and Output Disable Time from HIGH Level

TEST CIRCUIT AND WAVEFORM

Test Circuit for 3-State Outputs

Input Pulse Definition

$V_M = 1.5\text{ V}$

SWITCH POSITION

| TEST | SWITCH |
|-----------|--------|
| t_{pLZ} | closed |
| t_{pZL} | closed |
| All other | open |

DEFINITIONS

R_L = Load resistor; see AC CHARACTERISTICS for value.

C_L = Load capacitance includes jig and probe capacitance; see AC CHARACTERISTICS for value.

R_T = Termination resistance should be equal to Z_{OUT} of pulse generators.

| FAMILY | INPUT PULSE REQUIREMENTS | | | | |
|--------|--------------------------|-----------|--------|--------|--------|
| | Amplitude | Rep. Rate | t_W | t_R | t_F |
| 74ABT | 3.0 V | 1 MHz | 500 ns | 2.5 ns | 2.5 ns |

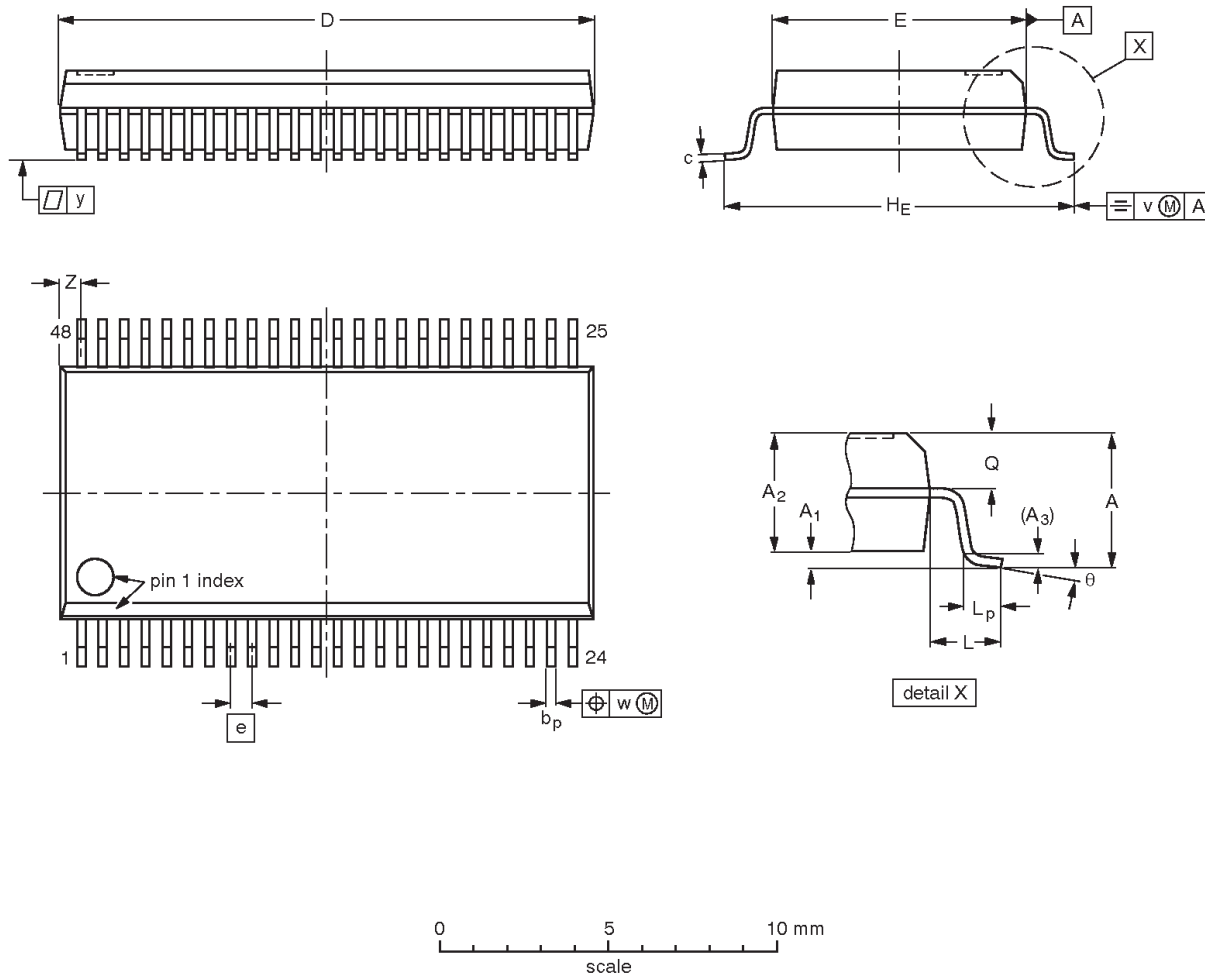
SA00654

16-bit transparent latch (3-State)

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SSOP48: plastic shrink small outline package; 48 leads; body width 7.5 mm

SOT370-1



DIMENSIONS (mm are the original dimensions)

| UNIT | A max. | A ₁ | A ₂ | A ₃ | b _p | c | D ⁽¹⁾ | E ⁽¹⁾ | e | H _E | L | L _p | Q | v | w | y | Z ⁽¹⁾ | θ |
|------|--------|----------------|----------------|----------------|----------------|--------------|------------------|------------------|-------|----------------|-----|----------------|------------|------|------|-----|------------------|----------|
| mm | 2.8 | 0.4 0.2 | 2.35 2.20 | 0.25 | 0.3 0.2 | 0.22 0.13 | 16.00 15.75 | 7.6 7.4 | 0.635 | 10.4 10.1 | 1.4 | 1.0 0.6 | 1.2 1.0 | 0.25 | 0.18 | 0.1 | 0.85 0.40 | 8° 0° |

Note

1. Plastic or metal protrusions of 0.25 mm maximum per side are not included.

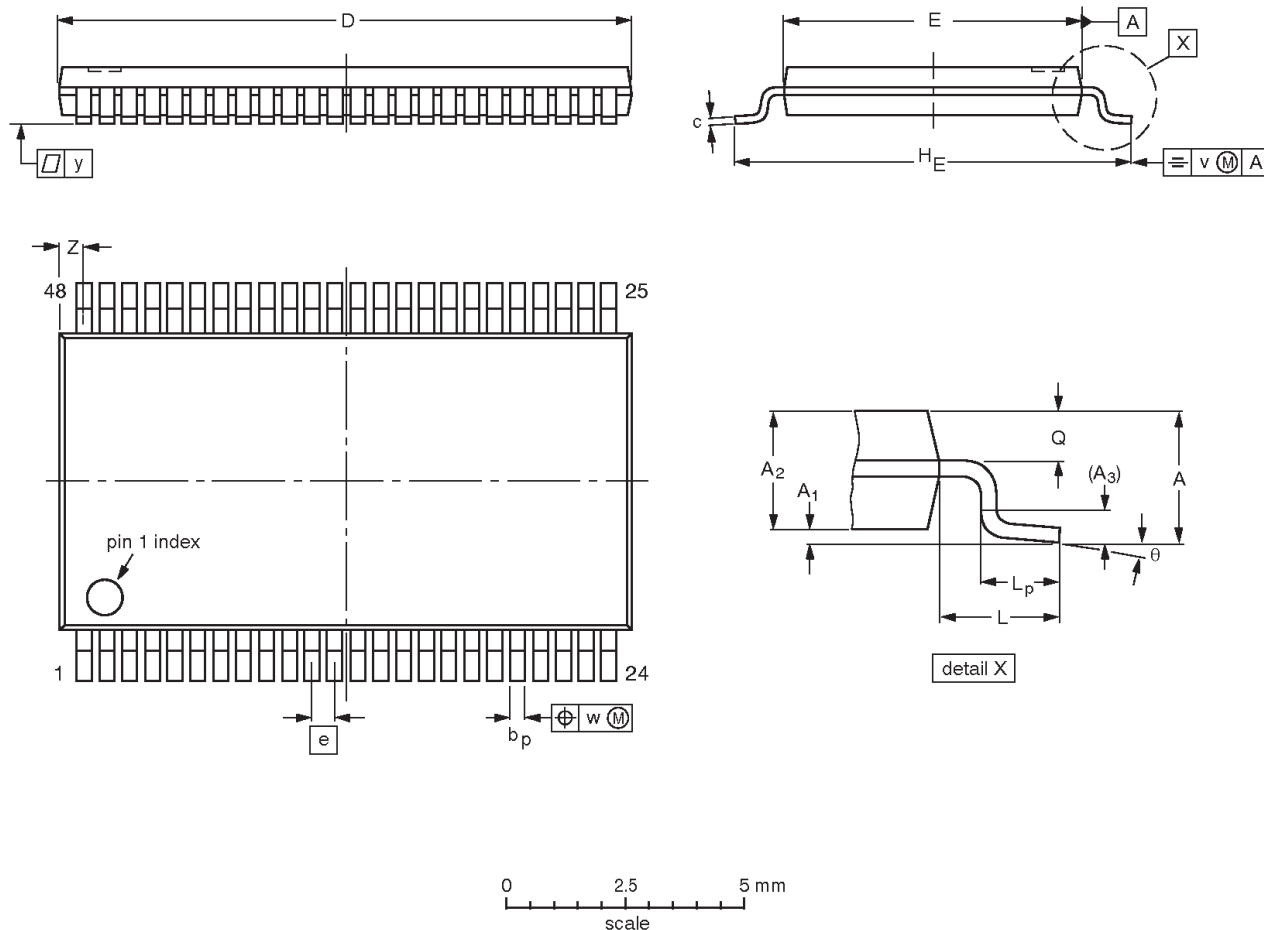
| OUTLINE VERSION | REFERENCES | | | | EUROPEAN PROJECTION | ISSUE DATE |
|-----------------|------------|--------|-------|--|---------------------|----------------------|
| | IEC | JEDEC | JEITA | | | |
| SOT370-1 | | MO-118 | | | | 99-12-27 03-02-19 |

16-bit transparent latch (3-State)

74ABT16373B

TSSOP48: plastic thin shrink small outline package; 48 leads; body width 6.1 mm

SOT362-1



DIMENSIONS (mm are the original dimensions).

| UNIT | A max. | A ₁ | A ₂ | A ₃ | b _p | c | D ⁽¹⁾ | E ⁽²⁾ | e | H _E | L | L _p | Q | v | w | y | Z | θ |
|------|--------|----------------|----------------|----------------|----------------|------------|------------------|------------------|-----|----------------|---|----------------|--------------|------|------|-----|------------|----------|
| mm | 1.2 | 0.15 0.05 | 1.05 0.85 | 0.25 | 0.28 0.17 | 0.2 0.1 | 12.6 12.4 | 6.2 6.0 | 0.5 | 8.3 7.9 | 1 | 0.8 0.4 | 0.50 0.35 | 0.25 | 0.08 | 0.1 | 0.8 0.4 | 8° 0° |

Notes

1. Plastic or metal protrusions of 0.15 mm maximum per side are not included.
2. Plastic interlead protrusions of 0.25 mm maximum per side are not included.

| OUTLINE VERSION | REFERENCES | | | | EUROPEAN PROJECTION | ISSUE DATE |
|-----------------|------------|--------|-------|--|---------------------|-----------------------|
| | IEC | JEDEC | JEITA | | | |
| SOT362-1 | | MO-153 | | | | -99-12-27 03-02-19 |

16-bit transparent latch (3-State)

74ABT16373B

REVISION HISTORY

| Rev | Date | Description |
|-----|----------|---|
| _3 | 20040227 | Product data (9397 750 12821); 853-1751 ECN 01-A15429 of 27 January 2004. Replaces data sheet 74ABT_H16373B_2 of 1998 Feb 27 (9397 750 03491). Modifications: <ul style="list-style-type: none">• Delete all references to 74ABTH16373B (product discontinued). |
| _2 | 19980227 | Product specification (9397 750 03491); ECN 853-1751 19027 of 27 February 1998. Supersedes data of 1995 Aug 03. |
| _1 | 19950803 | |

16-bit transparent latch (3-State)

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Data sheet status

| Level | Data sheet status ^[1] | Product status ^{[2] [3]} | Definitions |
|-------|----------------------------------|-----------------------------------|--|
| I | Objective data | Development | This data sheet contains data from the objective specification for product development. Philips Semiconductors reserves the right to change the specification in any manner without notice. |
| II | Preliminary data | Qualification | This data sheet contains data from the preliminary specification. Supplementary data will be published at a later date. Philips Semiconductors reserves the right to change the specification without notice, in order to improve the design and supply the best possible product. |
| III | Product data | Production | This data sheet contains data from the product specification. Philips Semiconductors reserves the right to make changes at any time in order to improve the design, manufacturing and supply. Relevant changes will be communicated via a Customer Product/Process Change Notification (CPCN). |

[1] Please consult the most recently issued data sheet before initiating or completing a design.

[2] The product status of the device(s) described in this data sheet may have changed since this data sheet was published. The latest information is available on the Internet at URL <http://www.semiconductors.philips.com>.

[3] For data sheets describing multiple type numbers, the highest-level product status determines the data sheet status.

Definitions

Short-form specification — The data in a short-form specification is extracted from a full data sheet with the same type number and title. For detailed information see the relevant data sheet or data handbook.

Limiting values definition — Limiting values given are in accordance with the Absolute Maximum Rating System (IEC 60134). Stress above one or more of the limiting values may cause permanent damage to the device. These are stress ratings only and operation of the device at these or at any other conditions above those given in the Characteristics sections of the specification is not implied. Exposure to limiting values for extended periods may affect device reliability.

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Contact information

For additional information please visit
<http://www.semiconductors.philips.com>. Fax: +31 40 27 24825

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For sales offices addresses send e-mail to:
sales.addresses@www.semiconductors.philips.com

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