

DATA SHEET

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74ABT16240A
74ABTH16240A
16-bit inverting buffer/driver (3-State)

Product specification
Supersedes data of 1996 Oct 01
IC23 Data Handbook

1998 Feb 25

16-bit inverting buffer/driver (3-State)

74ABT16240A 74ABTH16240A

FEATURES

- 16-bit bus interface
- 3-State buffers
- Output capability: +64mA/-32mA
- TTL input and output switching levels
- Input and output interface capability to systems at 5V supply
- Bus-hold data inputs eliminate the need for external pull-up resistors to hold unused inputs
- Live insertion/extraction permitted
- Power-up 3-State
- 74ABTH16240A incorporates bus hold data inputs which eliminate the need for external pull up resistors to hold unused inputs
- Latch-up protection exceeds 500mA per JEDEC Std 17
- ESD protection exceeds 2000V per MIL STD 883 Method 3015 and 200V per Machine Model

DESCRIPTION

The 74ABT16240A is a high-performance BiCMOS device which combines low static and dynamic power dissipation with high speed and high output drive.

This device is an inverting 16-bit buffer that is ideal for driving bus lines. The device features four Output Enables (1OE, 2OE, 3OE, 4OE), each controlling four of the 3-State outputs.

Two options are available, 74ABT16240A which does not have the bus hold feature and 74ABTH16240A which incorporates the bus hold feature.

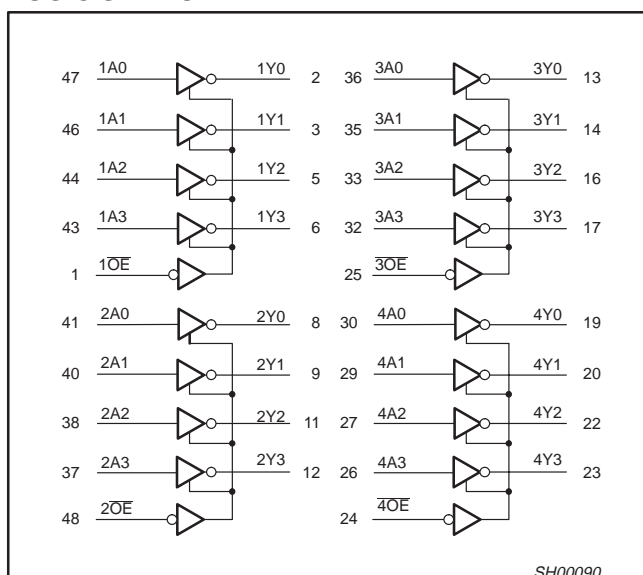
QUICK REFERENCE DATA

| SYMBOL | PARAMETER | CONDITIONS $T_{amb} = 25^{\circ}\text{C}$ | TYPICAL | UNIT |
|------------------------|---------------------------------|----------------------------------------------|------------|---------------|
| t_{PLH} t_{PHL} | Propagation delay nAx to nYx | $C_L = 50\text{pF}$; $V_{CC} =$ | 2.0 1.8 | ns |
| C_{IN} | Input capacitance nOE | $V_I = 0\text{V}$ or 3.0V | 4 | pF |
| C_{OUT} | Output capacitance | Outputs disabled; $V_O = 0\text{V}$ or | 6 | pF |
| I_{CCZ} | Quiescent supply current | Outputs disabled; $V_{CC} =$ | 500 | μA |
| I_{CCL} | | Outputs low; $V_{CC} = 5.5\text{V}$ | 9 | mA |

ORDERING INFORMATION

| PACKAGES | TEMPERATURE RANGE | OUTSIDE NORTH AMERICA | NORTH AMERICA | DWG NUMBER |
|------------------------------|------------------------------------------------|-----------------------|---------------|------------|
| 48-Pin Plastic SSOP Type III | -40°C to $+85^{\circ}\text{C}$ | 74ABT16240A DL | BT16240A DL | SOT370-1 |
| 48-Pin Plastic TSSOP Type II | -40°C to $+85^{\circ}\text{C}$ | 74ABT16240A DGG | BT16240A DGG | SOT362-1 |
| 48-Pin Plastic SSOP Type III | -40°C to $+85^{\circ}\text{C}$ | 74ABTH16240A DL | BH16240A DL | SOT370-1 |
| 48-Pin Plastic TSSOP Type II | -40°C to $+85^{\circ}\text{C}$ | 74ABTH16240A DGG | BH16240A DGG | SOT362-1 |

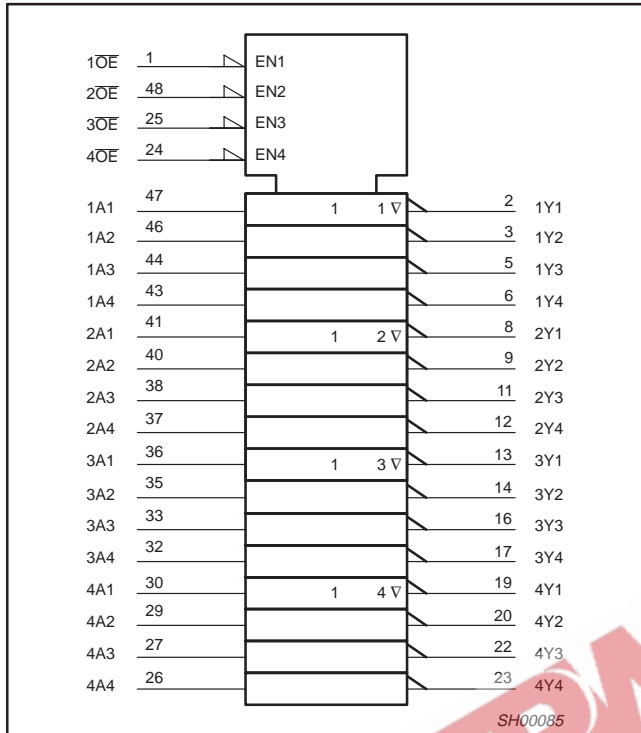
LOGIC SYMBOL



16-bit inverting buffer/driver (3-State)

74ABT16240A
74ABTH16240A

LOGIC SYMBOL (IEEE/IEC)



PIN DESCRIPTION

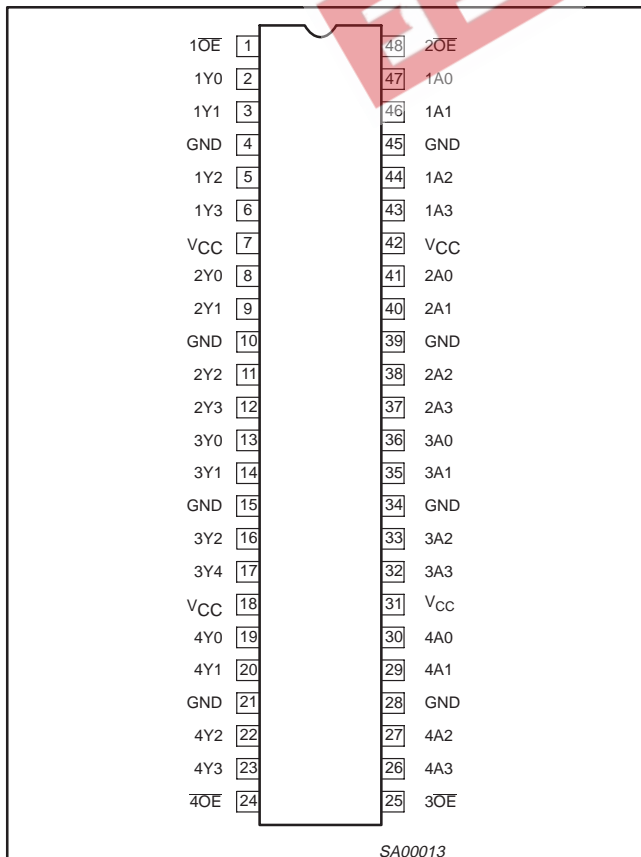
| PIN NUMBER | SYMBOL | NAME AND FUNCTION |
|----------------------------------------------------------------|------------------------------------------|-------------------------|
| 47, 46, 44, 43, 41, 40, 38, 37, 36, 35, 33, 32, 30, 29, 27, 26 | 1A0-1A3 2A0-2A3 3A0-3A3 4A0-4A3 | Data inputs |
| 2, 3, 5, 6, 8, 9, 11, 12, 13, 14, 16, 17, 19, 20, 22, 23 | 1Y0-1Y3 2Y0-2Y3 3Y0-3Y3 4Y0-4Y3 | Data outputs |
| 1, 48, 25, 24 | 1OE, 2OE, 3OE, 4OE | Output enables |
| 4, 10, 15, 21, 28, 34, 39, 45 | GND | Ground (0V) |
| 7, 18, 31, 42 | V _{CC} | Positive supply voltage |

FUNCTION TABLE

| Inputs | | Outputs |
|--------|-----|---------|
| nOE | nAx | nYx |
| L | L | H |
| L | H | L |
| H | X | Z |

H = High voltage level
L = Low voltage level
X = Don't care
Z = High Impedance "off" state

PIN CONFIGURATION



16-bit inverting buffer/driver (3-State)

74ABT16240A
74ABTH16240A**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 | $V_I < 0$ | -18 | mA |
| V_I | DC input voltage ³ | | -1.2 to +7.0 | V |
| I_{OK} | DC output diode current | $V_O < 0$ | -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 negative voltage ratings may be exceeded if the input and output clamp 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} | Input voltage | | 0.8 | V |
| I_{OH} | High-level output current | | -32 | mA |
| I_{OL} | Low-level output current | | 32 | mA |
| | Low-level output current; current duty cycle $\leq 50\%$; $f \geq 1$ kHz | | 64 | |
| $\Delta t/\Delta v$ | Input transition rise or fall rate; Outputs enabled | 0 | 10 | ns/V |
| T_{amb} | Operating free-air temperature range | -40 | +85 | °C |

16-bit inverting buffer/driver (3-State)

74ABT16240A
74ABTH16240A

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} = 4.5V; I _{IK} = -18mA | | -0.9 | -1.2 | | -1.2 | V |
| V _{OH} | High-level output voltage | V _{CC} = 4.5V; I _{OH} = -3mA; V _I = V _{IL} or V _{IH} | 2.5 | 2.9 | | 2.5 | | V |
| | | V _{CC} = 5.0V; I _{OH} = -3mA; V _I = V _{IL} or V _{IH} | 3.0 | 3.4 | | 3.0 | | V |
| | | V _{CC} = 4.5V; I _{OH} = -32mA; V _I = V _{IL} or V _{IH} | 2.0 | 2.4 | | 2.0 | | V |
| V _{OL} | Low-level output voltage | V _{CC} = 4.5V; I _{OL} = 64mA; V _I = V _{IL} or V _{IH} | | 0.42 | 0.55 | | 0.55 | V |
| I _I | Input leakage current | V _{CC} = 5.5V; V _I = GND or 5.5V | | ±0.01 | ±1.0 | | ±1.0 | µA |
| I _I | Input leakage current 74ABTH16240A | V _{CC} = 5.5V; V _I = V _{CC} or GND | | ±0.01 | ±1 | | ±1 | µA |
| | | V _{CC} = 5.5V; V _I = V _{CC} | | 0.01 | 1 | | 1 | µA |
| | | V _{CC} = 5.5V; V _I = 0 | | -2 | -3 | | -5 | µA |
| I _{HOLD} | Bus Hold current A inputs 74ABTH16240A ³ | V _{CC} = 4.5V; V _I = 0.8V | 50 | | | 50 | | µA |
| | | V _{CC} = 4.5V; V _I = 2.0V | -75 | | | -75 | | |
| | | V _{CC} = 5.5V; V _I = 0 to 5.5V | ±500 | | | | | |
| I _{OFF} | Power-off leakage current | V _{CC} = 0.0V; V _O or V _I ≤ 4.5V | | ±5.0 | ±100 | | ±100 | µA |
| I _{PU} /I _{PD} | Power-up/down 3-State output current | V _{CC} = 2.0V; V _O = 0.5V; V _I = GND or V _{CC} ; V _{OE} = V _{CC} | | ±5.0 | ±50 | | ±50 | µA |
| I _{OZH} | 3-State output High current | V _{CC} = 5.5V; V _O = 2.7V; V _I = V _{IL} or V _{IH} | | 1.0 | 10 | | 10 | µA |
| I _{OZL} | 3-State output Low current | V _{CC} = 5.5V; V _O = 0.5V; V _I = V _{IL} or V _{IH} | | -1.0 | -10 | | -10 | µA |
| I _{CEX} | Output high leakage current | V _{CC} = 5.5V; V _O = 5.5V; V _I = GND or V _{CC} | | 1.0 | 50 | | 50 | µA |
| I _O | Output current ¹ | V _{CC} = 5.5V; V _O = 2.5V | -50 | -70 | -180 | -50 | -180 | mA |
| I _{CCH} | Quiescent supply current | V _{CC} = 5.5V; Outputs High, V _I = GND or V _{CC} | | 0.5 | 1.0 | | 1.0 | mA |
| I _{CCL} | | V _{CC} = 5.5V; Outputs Low, V _I = GND or V _{CC} | | 8 | 19 | | 19 | mA |
| I _{CCZ} | | V _{CC} = 5.5V; Outputs 3-State; V _I = GND or V _{CC} | | 0.5 | 1.0 | | 1.0 | mA |
| ΔI _{CC} | Additional supply current per input pin ² 74ABT16240A | Outputs enabled, one input at 3.4V, other inputs at V _{CC} or GND; V _{CC} = 5.5V | | 10 | 200 | | 200 | µA |
| ΔI _{CC} | Additional supply current per input pin ² 74ABTH16240A | Outputs enabled, one input at 3.4V, other inputs at V _{CC} or GND; V _{CC} = 5.5V | | 0.2 | 1.0 | | 1.0 | mA |

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 3.4V.
- This is the bus hold overdrive current required to force the input to the opposite logic state.

AC CHARACTERISTICS

GND = 0V; t_R = t_F = 2.5ns; C_L = 50pF; R_L = 500Ω; T_{amb} = -40°C to +85°C.

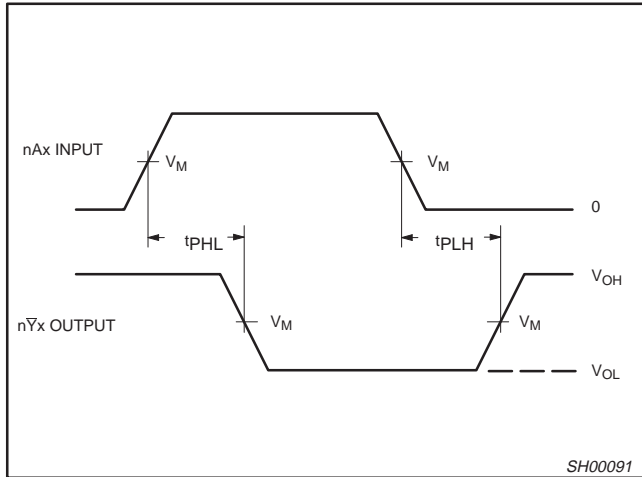
| SYMBOL | PARAMETER | WAVEFORM | LIMITS | | | | | UNIT |
|--------------------------------------|------------------------------------------------|----------|-----------------------------------------------------|-----|-----|--------------------------------------------------------------------|-----|------|
| | | | T _{amb} = +25°C V _{CC} = +5.0V | | | T _{amb} = -40°C to +85°C V _{CC} = +5.0V ±0.5V | | |
| | | | Min | Typ | Max | Min | Max | |
| t _{PLH} t _{PHL} | Propagation delay nAx to nYx | 1 | 1.0 | 2.0 | 3.0 | 1.0 | 3.7 | ns |
| | | | 1.0 | 1.5 | 3.0 | 1.0 | 3.5 | |
| t _{PZH} t _{PZL} | Output enable time to High and Low level | 2 | 1.2 | 2.4 | 3.3 | 1.2 | 4.2 | ns |
| | | | 1.2 | 2.3 | 3.2 | 1.0 | 4.2 | |
| t _{PHZ} t _{PLZ} | Output disable time from High and Low level | 2 | 1.3 | 2.7 | 4.1 | 1.6 | 4.7 | ns |
| | | | 1.3 | 2.5 | 3.6 | 1.4 | 4.1 | |

16-bit inverting buffer/driver (3-State)

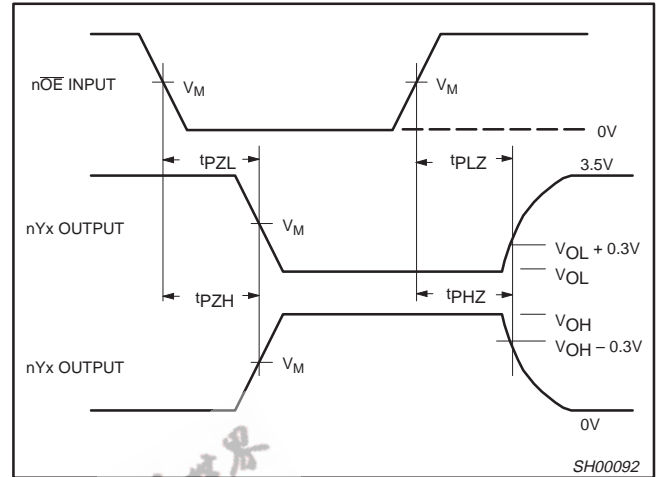
74ABT16240A 74ABTH16240A

AC WAVEFORMS

$V_M = 1.5V$, $V_{IN} = GND$ to $2.7V$



Waveform 1. Input (nAx) to Output (nYx) Propagation Delays



Waveform 2. 3-State Output Enable and Disable Times

TEST CIRCUIT AND WAVEFORMS

Test Circuit for 3-State Outputs

Input Pulse Definition

$V_M = 1.5V$

SWITCH POSITION

| TEST | SWITCH |
|-----------|--------|
| t_{PLZ} | closed |
| t_{PZL} | 7V |
| 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 |
| 74ABT16 | 3.0V | 1MHz | 500ns | 2.5ns | 2.5ns |

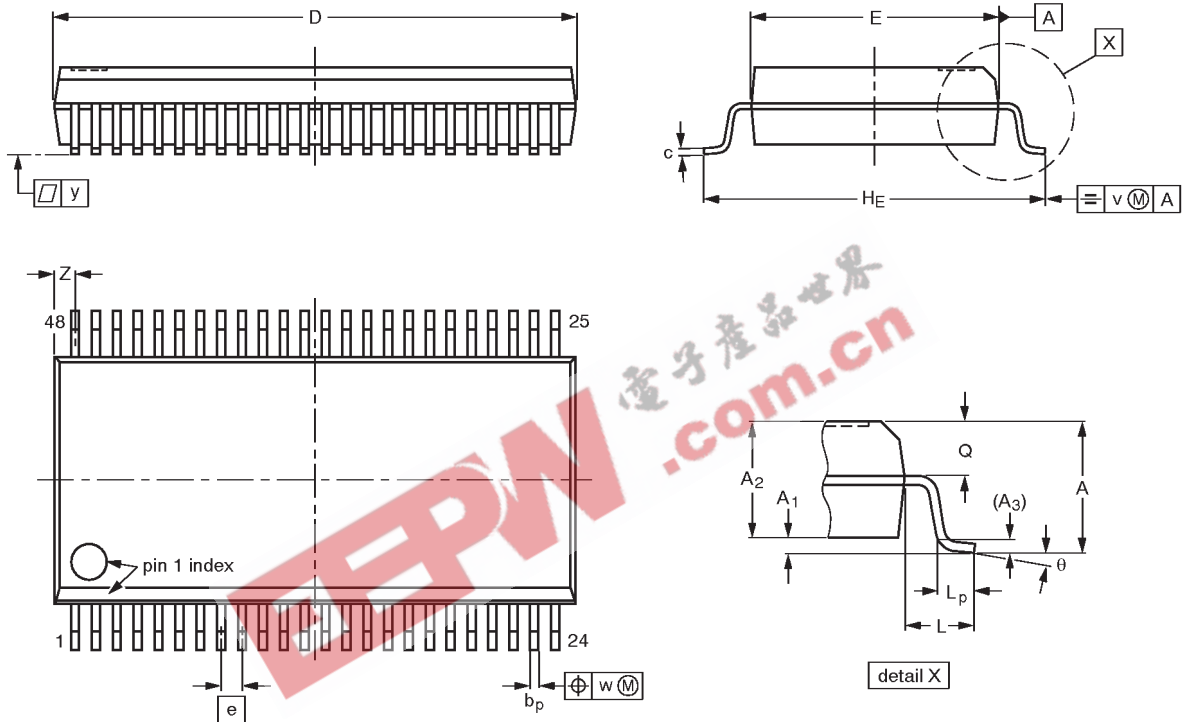
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16-bit inverting buffer/driver (3-State)

74ABT16240A
74ABTH16240A

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.

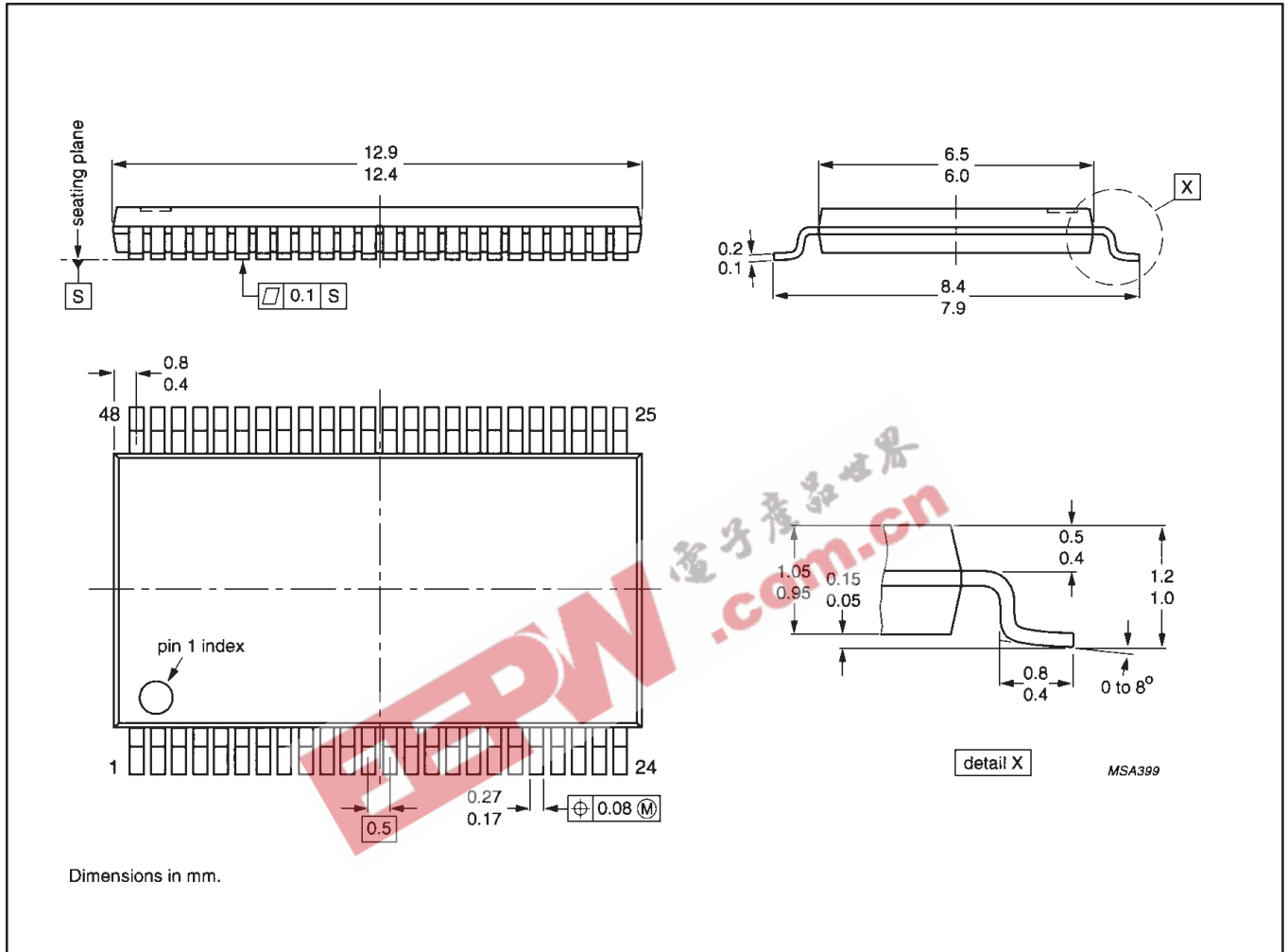
| OUTLINE VERSION | REFERENCES | | | | EUROPEAN PROJECTION | ISSUE DATE |
|-----------------|------------|----------|------|--|---------------------|----------------------|
| | IEC | JEDEC | EIAJ | | | |
| SOT370-1 | | MO-118AA | | | | 93-11-02 95-02-04 |

16-bit inverting buffer/driver (3-State)

74ABT16240A
74ABTH16240A

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

SOT362-1



16-bit inverting buffer/driver (3-State)

74ABT16240A
74ABTH16240A

NOTES



16-bit inverting buffer/driver (3-State)

74ABT16240A
74ABTH16240A

Data sheet status

| Data sheet status | Product status | Definition [1] |
|---------------------------|----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Objective specification | Development | This data sheet contains the design target or goal specifications for product development. Specification may change in any manner without notice. |
| Preliminary specification | Qualification | This data sheet contains preliminary data, and supplementary data will be published at a later date. Philips Semiconductors reserves the right to make changes at any time without notice in order to improve design and supply the best possible product. |
| Product specification | Production | This data sheet contains final specifications. Philips Semiconductors reserves the right to make changes at any time without notice in order to improve design and supply the best possible product. |

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

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Limiting values definition — Limiting values given are in accordance with the Absolute Maximum Rating System (IEC 134). 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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