

# 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 ( $1\overline{OE}$ ,  $2\overline{OE}$ ,  $3\overline{OE}$ ,  $4\overline{OE}$ ), 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.

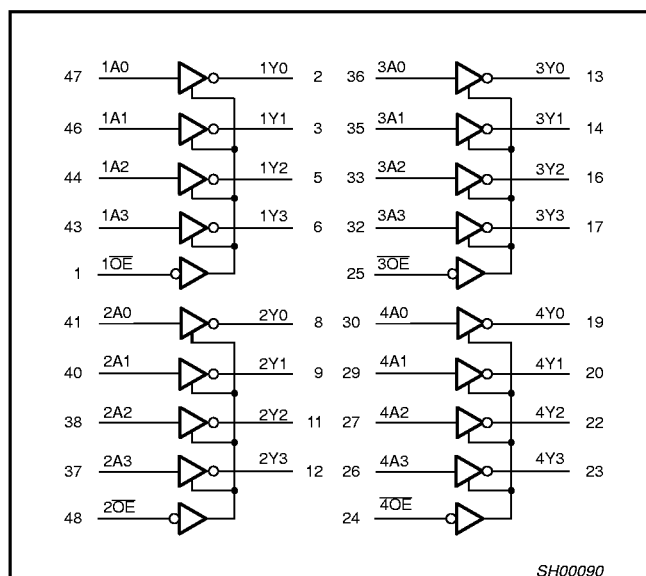
## QUICK REFERENCE DATA

| SYMBOL                 | PARAMETER                             | CONDITIONS<br>$T_{amb} = 25^{\circ}\text{C}$ | TYPICAL    | UNIT          |
|------------------------|---------------------------------------|----------------------------------------------|------------|---------------|
| $t_{PLH}$<br>$t_{PHL}$ | Propagation delay<br>$nA_x$ to $nY_x$ | $C_L = 50\text{pF}$ ;<br>$V_{CC} =$          | 2.0<br>1.8 | ns            |
| $C_{IN}$               | Input capacitance $n\overline{OE}$    | $V_I = 0\text{V}$ or $3.0\text{V}$           | 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        | $\mu\text{A}$ |
| $I_{CCL}$              |                                       | 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 | $-40^{\circ}\text{C}$ to $+85^{\circ}\text{C}$ | 74ABT16240A DL        | BT16240A DL   | SOT370-1   |
| 48-Pin Plastic TSSOP Type II | $-40^{\circ}\text{C}$ to $+85^{\circ}\text{C}$ | 74ABT16240A DGG       | BT16240A DGG  | SOT362-1   |
| 48-Pin Plastic SSOP Type III | $-40^{\circ}\text{C}$ to $+85^{\circ}\text{C}$ | 74ABTH16240A DL       | BH16240A DL   | SOT370-1   |
| 48-Pin Plastic TSSOP Type II | $-40^{\circ}\text{C}$ to $+85^{\circ}\text{C}$ | 74ABTH16240A DGG      | BH16240A DGG  | SOT362-1   |

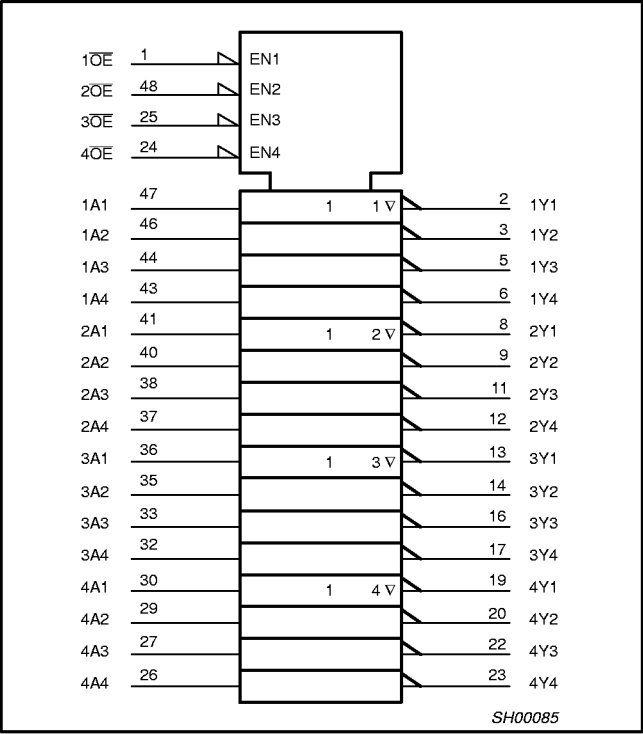
## LOGIC SYMBOL



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

74ABT16240A  
74ABTH16240A

LOGIC SYMBOL (IEEE/IEC)



PIN DESCRIPTION

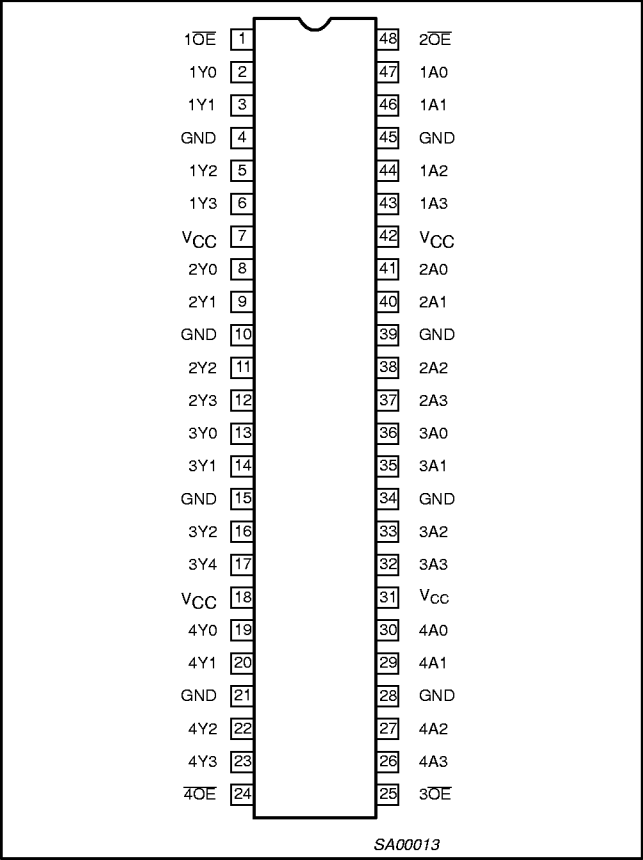
| PIN NUMBER                                                              | SYMBOL                                   | NAME AND FUNCTION       |
|-------------------------------------------------------------------------|------------------------------------------|-------------------------|
| 47, 46, 44,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

| 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 <sup>3</sup>  |                             | -1.2 to +7.0 | V    |
| $I_{OK}$  | DC output diode current        | $V_O < 0$                   | -50          | mA   |
| $V_{OUT}$ | DC output voltage <sup>3</sup> | 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 $\leq 50\%$ ; $f \geq 1\text{kHz}$ |        | 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 <sub>amb</sub> = +25°C |       |      | T <sub>amb</sub> = −40°C to +85°C |      |      |
|                                  |                                                                   |                                                                                                                            |              | Min                      | Typ   | Max  | Min                               | Max  |      |
| V <sub>IK</sub>                  | Input clamp voltage                                               | V <sub>CC</sub> = 4.5V; I <sub>IK</sub> = −18mA                                                                            |              |                          | −0.9  | −1.2 |                                   | −1.2 | V    |
| V <sub>OH</sub>                  | High-level output voltage                                         | V <sub>CC</sub> = 4.5V; I <sub>OH</sub> = −3mA; V <sub>I</sub> = V <sub>IL</sub> or V <sub>IH</sub>                        |              | 2.5                      | 2.9   |      | 2.5                               |      | V    |
|                                  |                                                                   | V <sub>CC</sub> = 5.0V; I <sub>OH</sub> = −3mA; V <sub>I</sub> = V <sub>IL</sub> or V <sub>IH</sub>                        |              | 3.0                      | 3.4   |      | 3.0                               |      | V    |
|                                  |                                                                   | V <sub>CC</sub> = 4.5V; I <sub>OH</sub> = −32mA; V <sub>I</sub> = V <sub>IL</sub> or V <sub>IH</sub>                       |              | 2.0                      | 2.4   |      | 2.0                               |      | V    |
| V <sub>OL</sub>                  | Low-level output voltage                                          | V <sub>CC</sub> = 4.5V; I <sub>OL</sub> = 64mA; V <sub>I</sub> = V <sub>IL</sub> or V <sub>IH</sub>                        |              |                          | 0.42  | 0.55 |                                   | 0.55 | V    |
| I <sub>I</sub>                   | Input leakage current                                             | V <sub>CC</sub> = 5.5V; V <sub>I</sub> = GND or 5.5V                                                                       |              |                          | ±0.01 | ±1.0 |                                   | ±1.0 | μA   |
| I <sub>I</sub>                   | Input leakage current<br>74ABTH16240A                             | V <sub>CC</sub> = 5.5V; V <sub>I</sub> = V <sub>CC</sub> or GND                                                            | Control pins |                          | ±0.01 | ±1   |                                   | ±1   | μA   |
|                                  |                                                                   | V <sub>CC</sub> = 5.5V; V <sub>I</sub> = V <sub>CC</sub>                                                                   | Data pins    |                          | 0.01  | 1    |                                   | 1    | μA   |
|                                  |                                                                   | V <sub>CC</sub> = 5.5V; V <sub>I</sub> = 0                                                                                 |              |                          | −2    | −3   |                                   | −5   | μA   |
| I <sub>HOLD</sub>                | Bus Hold current A inputs<br>74ABTH16240A <sup>3</sup>            | V <sub>CC</sub> = 4.5V; V <sub>I</sub> = 0.8V                                                                              |              | 50                       |       |      | 50                                |      | μA   |
|                                  |                                                                   | V <sub>CC</sub> = 4.5V; V <sub>I</sub> = 2.0V                                                                              |              | −75                      |       |      | −75                               |      |      |
|                                  |                                                                   | V <sub>CC</sub> = 5.5V; V <sub>I</sub> = 0 to 5.5V                                                                         |              | ±500                     |       |      |                                   |      |      |
| I <sub>OFF</sub>                 | Power-off leakage current                                         | V <sub>CC</sub> = 0.0V; V <sub>O</sub> or V <sub>I</sub> ≤ 4.5V                                                            |              |                          | ±5.0  | ±100 |                                   | ±100 | μA   |
| I <sub>PU</sub> /I <sub>PD</sub> | Power-up/down 3-State output current                              | V <sub>CC</sub> = 2.0V; V <sub>O</sub> = 0.5V; V <sub>I</sub> = GND or V <sub>CC</sub> ; V <sub>OE</sub> = V <sub>CC</sub> |              |                          | ±5.0  | ±50  |                                   | ±50  | μA   |
| I <sub>OZH</sub>                 | 3-State output High current                                       | V <sub>CC</sub> = 5.5V; V <sub>O</sub> = 2.7V; V <sub>I</sub> = V <sub>IL</sub> or V <sub>IH</sub>                         |              |                          | 1.0   | 10   |                                   | 10   | μA   |
| I <sub>OZL</sub>                 | 3-State output Low current                                        | V <sub>CC</sub> = 5.5V; V <sub>O</sub> = 0.5V; V <sub>I</sub> = V <sub>IL</sub> or V <sub>IH</sub>                         |              |                          | −1.0  | −10  |                                   | −10  | μA   |
| I <sub>CEX</sub>                 | Output high leakage current                                       | V <sub>CC</sub> = 5.5V; V <sub>O</sub> = 5.5V; V <sub>I</sub> = GND or V <sub>CC</sub>                                     |              |                          | 1.0   | 50   |                                   | 50   | μA   |
| I <sub>O</sub>                   | Output current <sup>1</sup>                                       | V <sub>CC</sub> = 5.5V; V <sub>O</sub> = 2.5V                                                                              |              | −50                      | −70   | −180 | −50                               | −180 | mA   |
| I <sub>CCH</sub>                 | Quiescent supply current                                          | V <sub>CC</sub> = 5.5V; Outputs High, V <sub>I</sub> = GND or V <sub>CC</sub>                                              |              |                          | 0.5   | 1.0  |                                   | 1.0  | mA   |
| I <sub>CCL</sub>                 |                                                                   | V <sub>CC</sub> = 5.5V; Outputs Low, V <sub>I</sub> = GND or V <sub>CC</sub>                                               |              |                          | 8     | 19   |                                   | 19   | mA   |
| I <sub>CCZ</sub>                 |                                                                   | V <sub>CC</sub> = 5.5V; Outputs 3-State; V <sub>I</sub> = GND or V <sub>CC</sub>                                           |              |                          | 0.5   | 1.0  |                                   | 1.0  | mA   |
| ΔI <sub>CC</sub>                 | Additional supply current per input pin <sup>2</sup> 74ABT16240A  | Outputs enabled, one input at 3.4V, other inputs at V <sub>CC</sub> or GND; V <sub>CC</sub> = 5.5V                         |              |                          | 10    | 200  |                                   | 200  | μA   |
| ΔI <sub>CC</sub>                 | Additional supply current per input pin <sup>2</sup> 74ABTH16240A | Outputs enabled, one input at 3.4V, other inputs at V <sub>CC</sub> or GND; V <sub>CC</sub> = 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;  $t_R = t_F = 2.5\text{ns}$ ;  $C_L = 50\text{pF}$ ;  $R_L = 500\Omega$ ;  $T_{amb} = -40^{\circ}\text{C to } +85^{\circ}\text{C}$ .

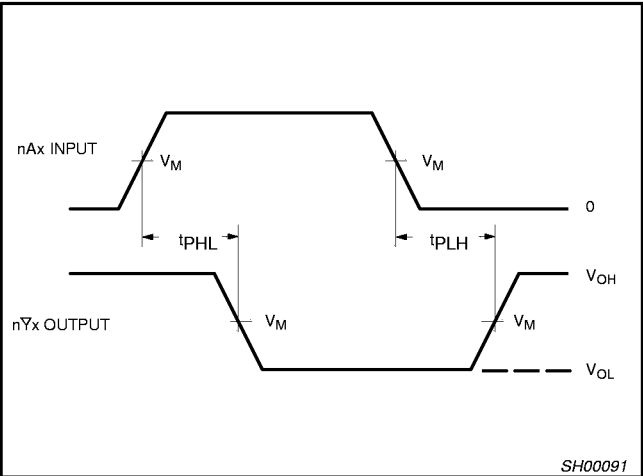
| SYMBOL                               | PARAMETER                                      | WAVEFORM | LIMITS                                              |            |            |                                                                    |            | UNIT |
|--------------------------------------|------------------------------------------------|-----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

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

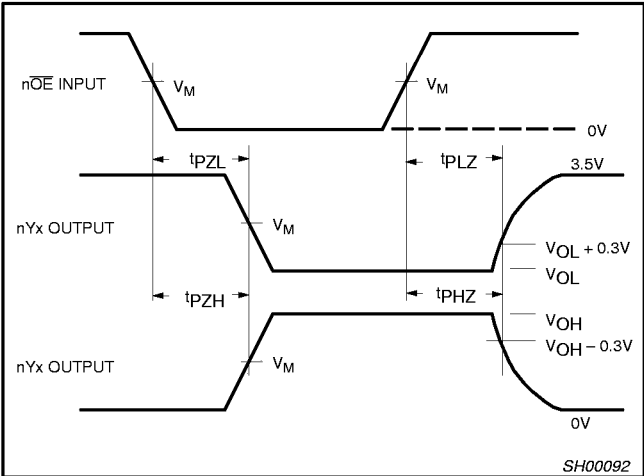
74ABT16240A  
74ABTH16240A

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**

| 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.

**Input Pulse Definition**

$V_M = 1.5V$

| FAMILY  | INPUT PULSE REQUIREMENTS |           |       |       |       |
|---------|--------------------------|-----------|-------|-------|-------|
|         | Amplitude                | Rep. Rate | $t_W$ | $t_R$ | $t_F$ |
| 74ABT16 | 3.0V                     | 1MHz      | 500ns | 2.5ns | 2.5ns |

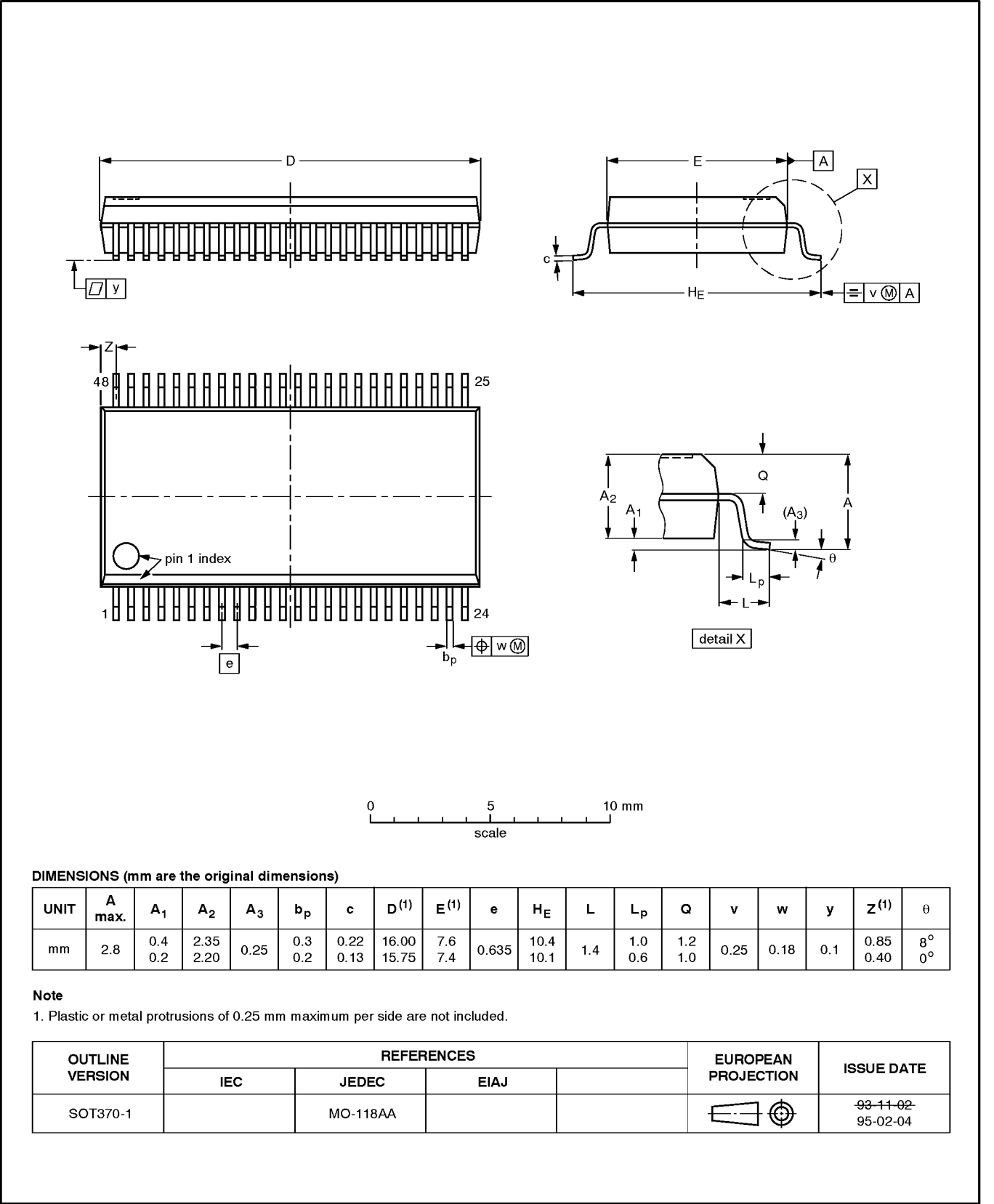
SH00093

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

74ABT16240A  
74ABTH16240A

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

SOT370-1



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

74ABT16240A  
74ABTH16240A

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

SOT362-1

