

# 16-bit buffer/line driver with 30Ω series termination resistors (3-State)

**74ABT162244**  
**74ABTH162244**

## FEATURES

- 16-bit bus interface
- Multiple  $V_{CC}$  and GND pins minimize switching noise
- Power-up 3-State
- 3-State buffers
- Output capability: +12 mA/−32mA
- Live insertion/extraction permitted
- Latch-up protection exceeds 500mA per JEDEC Std 17
- ESD protection exceeds 2000 V per MIL STD 883 Method 3015 and 200 V per Machine Model
- Same part as 74ABT16244-1
- 74ABTH162244 incorporates bus hold data inputs which eliminate the need for external pull-up resistors to hold unused inputs
- Bus-hold data inputs eliminate the need for external pull-up resistors to hold unused inputs

## DESCRIPTION

The 74ABT162244 high-performance BiCMOS device combines low static and dynamic power dissipation with high speed.

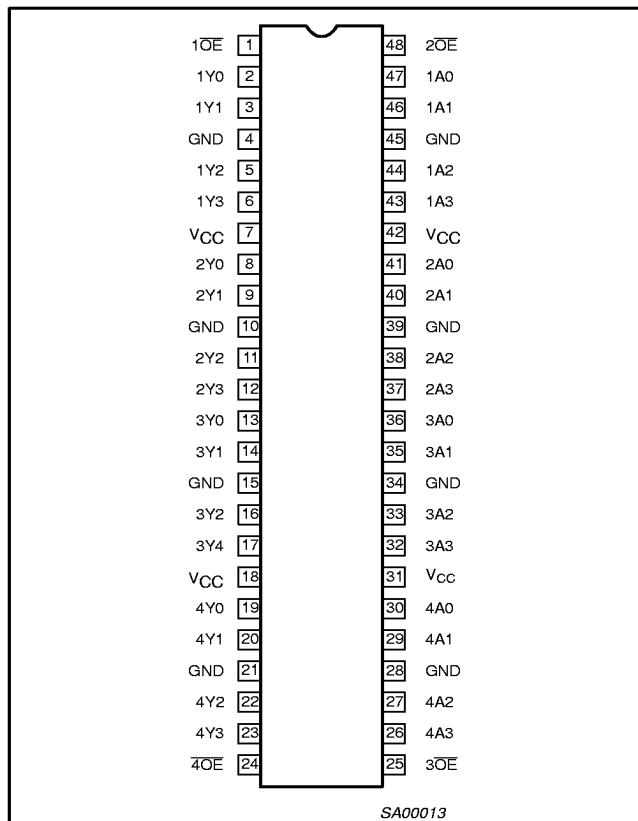
The 74ABT162244 device is a 16-bit buffer that is ideal for driving bus lines. The device features four Output Enables (1OE, 2OE, 3OE, 4OE), each controlling four of the 3-State outputs.

The 74ABT162244 is designed with 30Ω series resistance in both the upper and lower output structures. This design reduces line noise in applications such as memory address drivers, clock drivers and bus receivers/transmitters.

The 74ABT162244 is the same as the 74ABT16244-1. The part number has been changed to reflect industry standards.

Two options are available, 74ABT162244 which does not have the bus hold feature and the 74ABTH162244 which incorporates the bus hold feature.

## PIN CONFIGURATION



## QUICK REFERENCE DATA

| SYMBOL                 | PARAMETER                       | CONDITIONS<br>$T_{amb} = 25^{\circ}\text{C}$ ; GND = 0V | TYPICAL    | UNIT          |
|------------------------|---------------------------------|---------------------------------------------------------|------------|---------------|
| $t_{PLH}$<br>$t_{PHL}$ | Propagation delay<br>nAx to nYx | $C_L = 50\text{pF}$ ; $V_{CC} = 5\text{V}$              | 1.8<br>3.2 | ns            |
| $C_{IN}$               | Input capacitance               | $V_I = 0\text{V}$ or $V_{CC}$                           | 3          | pF            |
| $C_{OUT}$              | Output capacitance              | $V_O = 0\text{V}$ or $V_{CC}$ ; 3-State                 | 7          | pF            |
| $I_{CCZ}$              | Quiescent supply current        | Outputs disabled; $V_{CC} = 5.5\text{V}$                | 500        | $\mu\text{A}$ |
| $I_{CCL}$              |                                 | Outputs Low; $V_{CC} = 5.5\text{V}$                     | 10         | mA            |

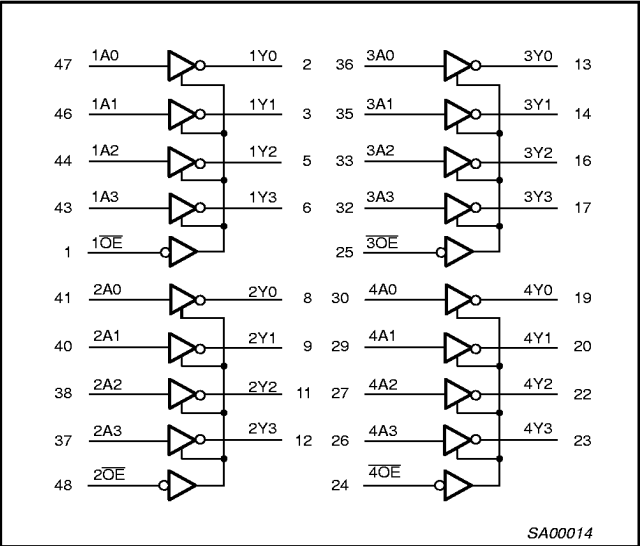
## ORDERING INFORMATION

| PACKAGES                     | TEMPERATURE RANGE | OUTSIDE NORTH AMERICA | NORTH AMERICA | DWG NUMBER |
|------------------------------|-------------------|-----------------------|---------------|------------|
| 48-Pin Plastic SSOP Type III | −40°C to +85°C    | 74ABT162244 DL        | BT162244 DL   | SOT370-1   |
| 48-Pin Plastic TSSOP Type II | −40°C to +85°C    | 74ABT162244 DGG       | BT162244 DGG  | SOT362-1   |
| 48-Pin Plastic SSOP Type III | −40°C to +85°C    | 74ABTH162244 DL       | BH162244 DL   | SOT370-1   |
| 48-Pin Plastic TSSOP Type II | −40°C to +85°C    | 74ABTH162244 DGG      | BH162244 DGG  | SOT362-1   |

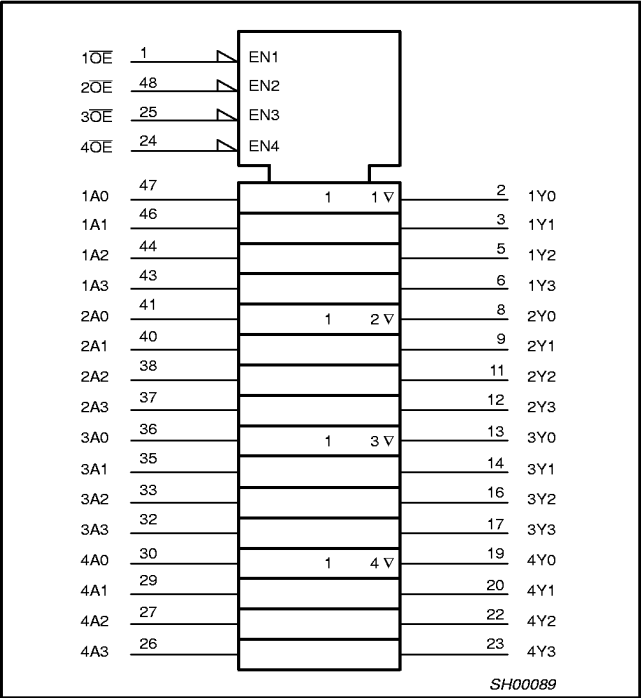
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LOGIC SYMBOL



LOGIC SYMBOL (IEEE/IEC)

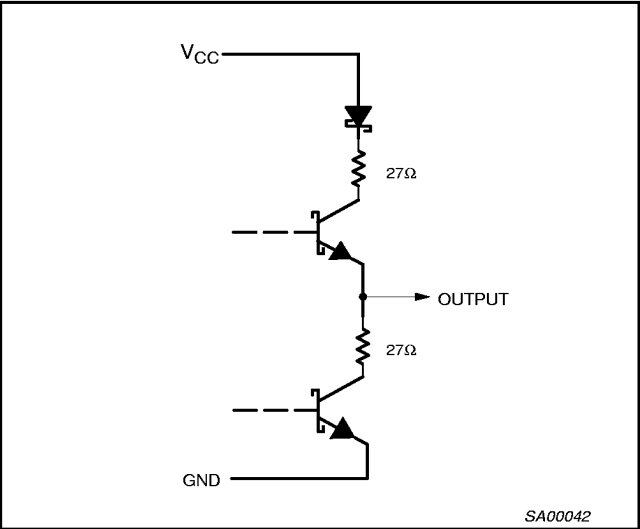


FUNCTION TABLE

| INPUTS |     | OUTPUTS |
|--------|-----|---------|
| nOE    | nAx | nYx     |
| L      | L   | L       |
| L      | H   | H       |
| H      | X   | Z       |

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

SCHEMATIC OF Y OUTPUTS



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<br>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 |

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## ABSOLUTE MAXIMUM RATINGS<sup>1, 2</sup>

| SYMBOL           | PARAMETER                      | CONDITIONS                  | RATING       | UNIT |
|------------------|--------------------------------|-----------------------------|--------------|------|
| V <sub>CC</sub>  | DC supply voltage              |                             | −0.5 to +7.0 | V    |
| I <sub>IK</sub>  | DC input diode current         | V <sub>I</sub> < 0          | −18          | mA   |
| V <sub>I</sub>   | DC input voltage <sup>3</sup>  |                             | −1.2 to +7.0 | V    |
| I <sub>OK</sub>  | DC output diode current        | V <sub>O</sub> < 0          | −50          | mA   |
| V <sub>OUT</sub> | DC output voltage <sup>3</sup> | output in Off or High state | −0.5 to +5.5 | V    |
| I <sub>OUT</sub> | DC output current              | output in Low state         | 128          | mA   |
|                  |                                | output in High state        | −64          |      |
| T <sub>stg</sub> | 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 <sub>CC</sub>  | DC supply voltage                    | 4.5    | 5.5             | V    |
| V <sub>I</sub>   | Input voltage                        | 0      | V <sub>CC</sub> | V    |
| V <sub>IH</sub>  | High-level input voltage             | 2.0    |                 | V    |
| V <sub>IL</sub>  | Low-level input voltage              |        | 0.8             | V    |
| I <sub>OH</sub>  | High-level output current            |        | −32             | mA   |
| I <sub>OL</sub>  | Low-level output current             |        | 12              | mA   |
| Δt/Δv            | Input transition rise or fall rate   | 0      | 10              | ns/V |
| T <sub>amb</sub> | Operating free-air temperature range | −40    | +85             | °C   |

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## 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 <sup>3</sup>                  | 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> = 5V; 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> = 8mA; V <sub>I</sub> = V <sub>IL</sub> or V <sub>IH</sub>                       |              |                          |       | 0.65 |                                   | 0.65 | V    |
|                    |                                                         | V <sub>CC</sub> = 4.5V; I <sub>OL</sub> = 12mA; V <sub>I</sub> = V <sub>IL</sub> or V <sub>IH</sub>                      |              |                          |       | 0.80 |                                   | 0.80 | 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>74ABTH162244                   | V <sub>CC</sub> = 5.5V; V <sub>I</sub> = V <sub>CC</sub> or GND                                                          | Control pins |                          | ±0.01 | ±1.0 |                                   | ±1.0 | μA   |
|                    |                                                         | V <sub>CC</sub> = 5.5V; V <sub>I</sub> = V <sub>CC</sub>                                                                 | Data pins    |                          | 0.01  | 1.0  |                                   | 1.0  | μA   |
|                    |                                                         | V <sub>CC</sub> = 5.5V; V <sub>I</sub> = 0                                                                               |              |                          | −2.0  | −3.0 |                                   | −5.0 | μA   |
| I <sub>HOLD</sub>  | Bus Hold Current A Inputs <sup>4</sup><br>74ABTH162244  | V <sub>CC</sub> = 4.5V; V <sub>I</sub> = 0.8V                                                                            |              | 50                       |       |      | 50                                |      | μA   |
|                    |                                                         | V <sub>CC</sub> = 5.5V; 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/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> = Don't care    |              |                          | ±5.0  | ±50  |                                   | ±50  | μA   |
| I <sub>OZH</sub>   | 3-State output High current                             | V <sub>CC</sub> = 5.5V; V <sub>O</sub> = 5.5V; V <sub>I</sub> = V <sub>IL</sub> or V <sub>IH</sub>                       |              |                          | 0.1   | 10   |                                   | 10   | μA   |
| I <sub>OZL</sub>   | 3-State output Low current                              | V <sub>CC</sub> = 5.5V; V <sub>O</sub> = 0.0V; V <sub>I</sub> = V <sub>IL</sub> or V <sub>IH</sub>                       |              |                          | −0.1  | −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>                                   |              |                          | 5.0   | 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                      | −100  | −180 | −50                               | −180 | mA   |
| I <sub>CCH</sub>   | Quiescent supply current <sup>3</sup>                   | V <sub>CC</sub> = 5.5V; Outputs High, V <sub>I</sub> = GND or V <sub>CC</sub>                                            |              |                          | 0.50  | 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>                                             |              |                          | 10    | 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>                                         |              |                          | 0.50  | 1.0  |                                   | 1.0  | mA   |
| ΔI <sub>CC</sub>   | Additional supply current per input pin <sup>2, 3</sup> | Outputs enabled, one data input at 3.4V, other inputs at V <sub>CC</sub> or GND; V <sub>CC</sub> = 5.5V                  |              |                          | 100   | 250  |                                   | 250  | μA   |
|                    |                                                         | Outputs disabled, one data input at 3.4V, other inputs at V <sub>CC</sub> or GND; V <sub>CC</sub> = 5.5V                 |              |                          | 100   | 250  |                                   | 250  | μA   |
|                    |                                                         | Control pins, outputs disabled, one enable input at 3.4V, other inputs at V <sub>CC</sub> or GND; V <sub>CC</sub> = 5.5V |              |                          | 100   | 250  |                                   | 250  | μA   |

### NOTES:

1. Not more than one output should be tested at a time, and the duration of the test should not exceed one second.
2. This is the increase in supply current for each input at 3.4V.
3. This data sheet limit may vary among suppliers.
4. This is the bus hold overdrive current required to force the input to the opposite logic state.

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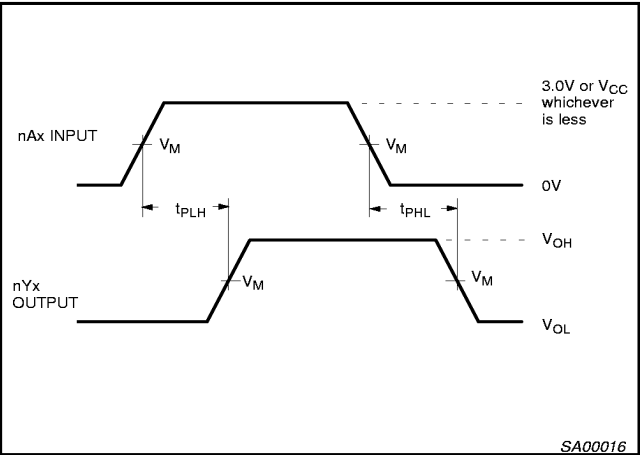
AC CHARACTERISTICS

GND = 0V;  $t_R = t_F = 2.5\text{ns}$ ;  $C_L = 50\text{pF}$ ;  $R_L = 500\Omega$

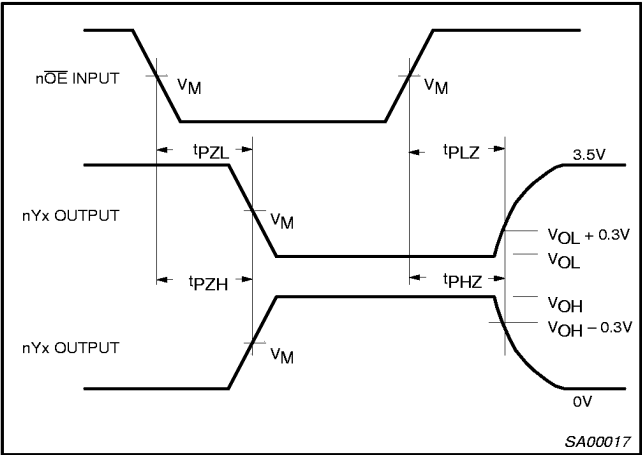
| SYMBOL                               | PARAMETER                                      | WAVEFORM | LIMITS                                              |            |            |                                                                    |            | UNIT |
|--------------------------------------|------------------------------------------------|----------|-----------------------------------------------------|------------|------------|--------------------------------------------------------------------|------------|------|
|                                      |                                                |          | 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>1.6                                          | 1.8<br>3.2 | 2.4<br>4.0 | 1.0<br>1.6                                                         | 2.7<br>4.4 | ns   |
| t <sub>PZH</sub><br>t <sub>PZL</sub> | Output enable time<br>to High and Low level    | 2        | 1.2<br>2.6                                          | 2.7<br>5.0 | 3.5<br>6.2 | 1.2<br>2.6                                                         | 4.3<br>7.3 | ns   |
| t <sub>PHZ</sub><br>t <sub>PLZ</sub> | Output disable time<br>from High and Low level | 2        | 1.5<br>1.3                                          | 3.0<br>2.6 | 3.8<br>3.3 | 1.5<br>1.3                                                         | 4.5<br>4.6 | ns   |

AC WAVEFORMS

$V_M = 1.5\text{V}$ ;  $V_{\text{IN}} = \text{GND to } 3.0\text{V}$



Waveform 1. Input (An) to Output (Yn) Propagation Delays

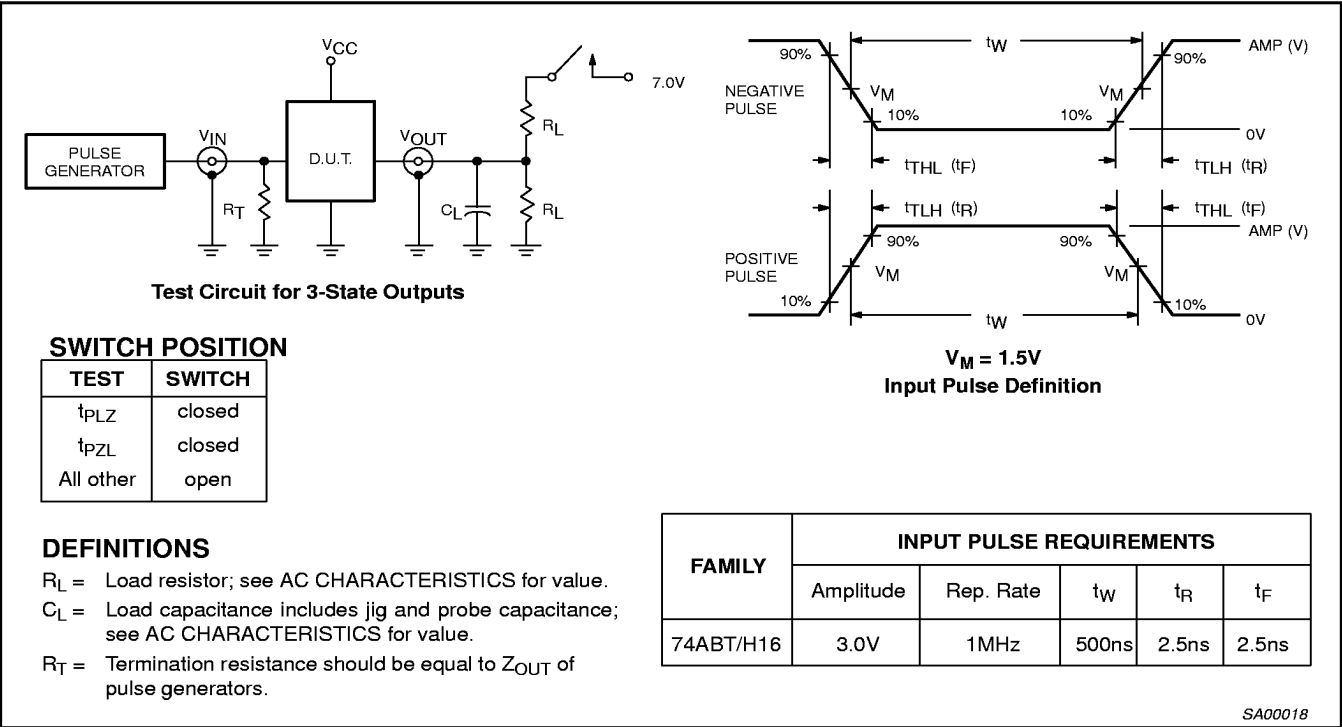


Waveform 2. 3-State Output Enable and Disable Times

16-bit buffer/line driver with 30Ω series termination resistors (3-State)

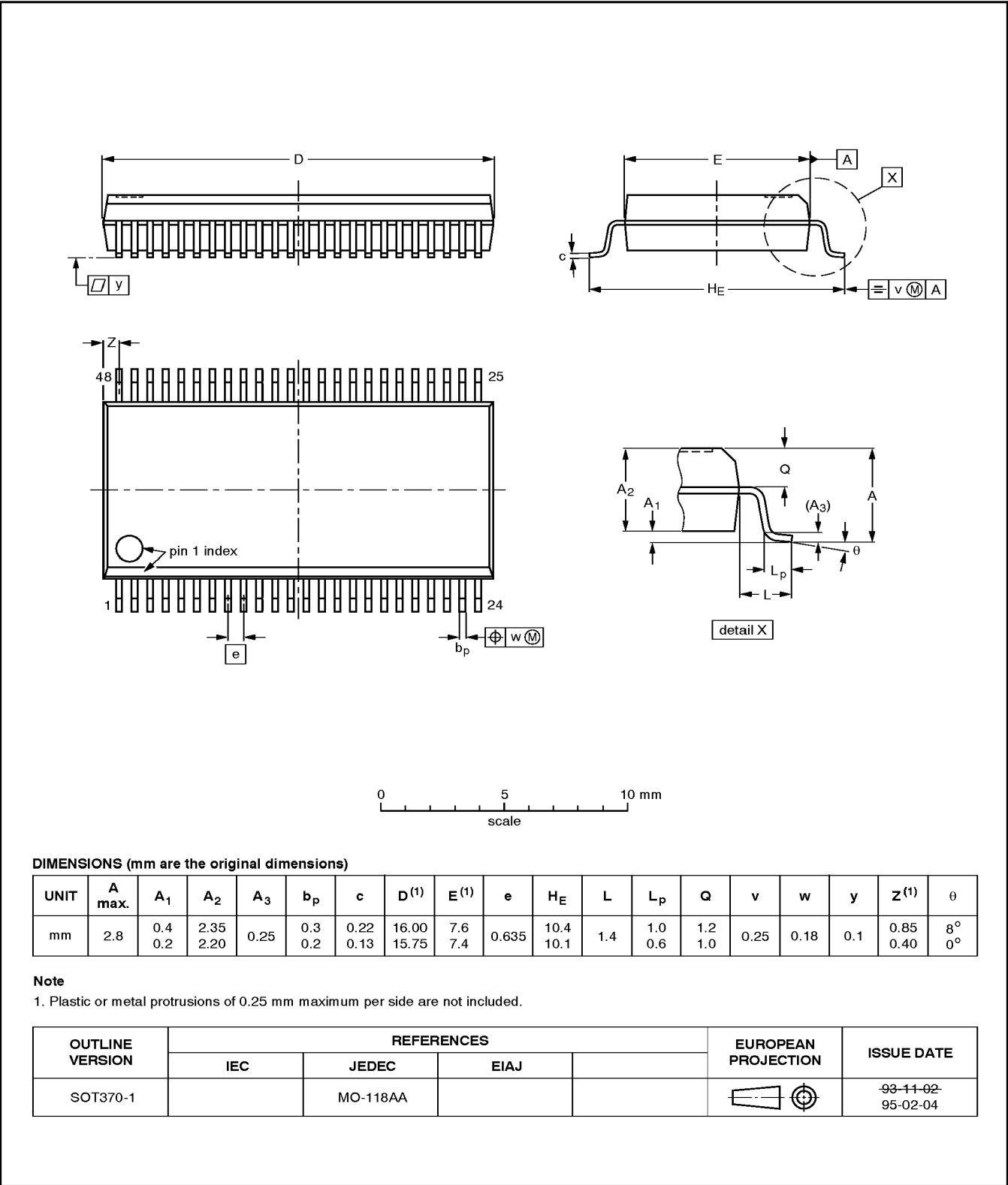
74ABT162244  
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TEST CIRCUIT AND WAVEFORMS



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

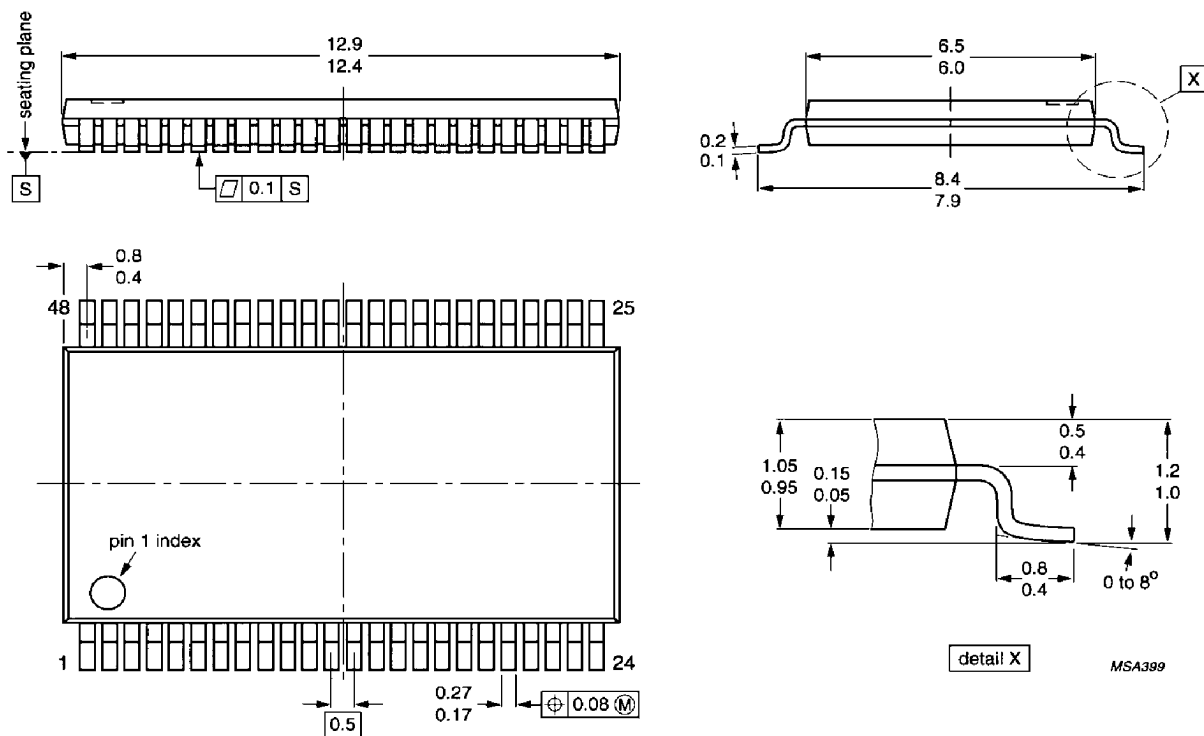
SOT370-1



16-bit buffer/line driver with 30Ω series termination resistors (3-State)

74ABT162244  
74ABTH162244

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

**SOT362-1**

Dimensions in mm.