

DATA SHEET

74LVT162244B

**3.3V 16-bit buffer/driver with 30 Ω
termination resistors**

Product specification
Supersedes data of 1998 Feb 19
IC23 Data Handbook

1998 Oct 07

3.3V 16-bit buffer/driver with 30Ω termination resistors (3-State)

74LVT162244B

FEATURES

- 16-bit bus interface
- 3-State buffers
- Output capability: +12mA/-12mA
- 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
- Outputs include series resistance of 30Ω making external terminating resistors unnecessary
- Power-up 3-State
- No bus current loading when output is tied to 5V bus
- Latch-up protection exceeds 500mA per JEDEC Std 17
- ESD protection exceeds 2000V per MIL STD 883 Method 3015 and 200V per Machine Model
- Same part as 74LVT16244B-1

DESCRIPTION

The 74LVT162244B is a high-performance BiCMOS product designed for V_{CC} operation at 3.3V.

The 74LVT162244B is designed with 30Ω series resistance in both the High and Low states of the output. This design reduces line noise in applications such as memory address drivers, clock drivers, and bus receivers/transmitters.

This device is a 16-bit buffer and line driver featuring non-inverting 3-State bus outputs. The device can be used as four 4-bit buffers, two 8-bit buffers, or one 16-bit buffer.

The 74LVT162244B is the same as the 74LVT16244B-1. The part number has been changed to reflect industry standards.

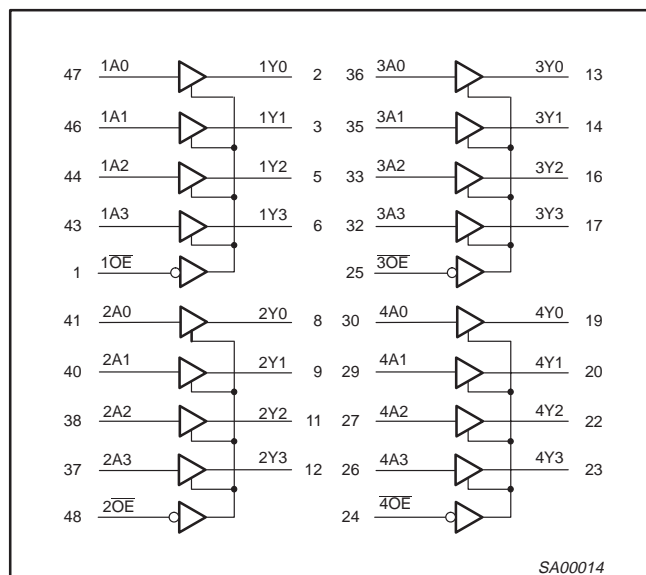
QUICK REFERENCE DATA

| SYMBOL | PARAMETER | CONDITIONS $T_{amb} = 25^{\circ}\text{C}$ | TYPICAL | UNIT |
|------------------------|---------------------------------|-------------------------------------------------|---------|------|
| t_{PLH} t_{PHL} | Propagation delay nAx to nYx | $C_L = 50\text{pF}$; $V_{CC} = 3.3\text{V}$ | 2.8 | ns |
| C_{IN} | Input capacitance nOE | $V_I = 0\text{V}$ or 3.0V | 3 | pF |
| C_{OUT} | Output capacitance | Outputs disabled; $V_O = 0\text{V}$ or 3.0V | 9 | pF |
| I_{CCZ} | Total supply current | Outputs disabled; $V_{CC} = 3.6\text{V}$ | 70 | μA |

ORDERING INFORMATION

| PACKAGES | TEMPERATURE RANGE | OUTSIDE NORTH AMERICA | NORTH AMERICA | DWG NUMBER |
|------------------------------|-------------------|-----------------------|---------------|------------|
| 48-Pin Plastic SSOP Type III | -40°C to +85°C | 74LVT162244B DL | VT162244B DL | SOT370-1 |
| 48-Pin Plastic TSSOP Type II | -40°C to +85°C | 74LVT162244B DGG | VT162244B DGG | SOT362-1 |

LOGIC SYMBOL



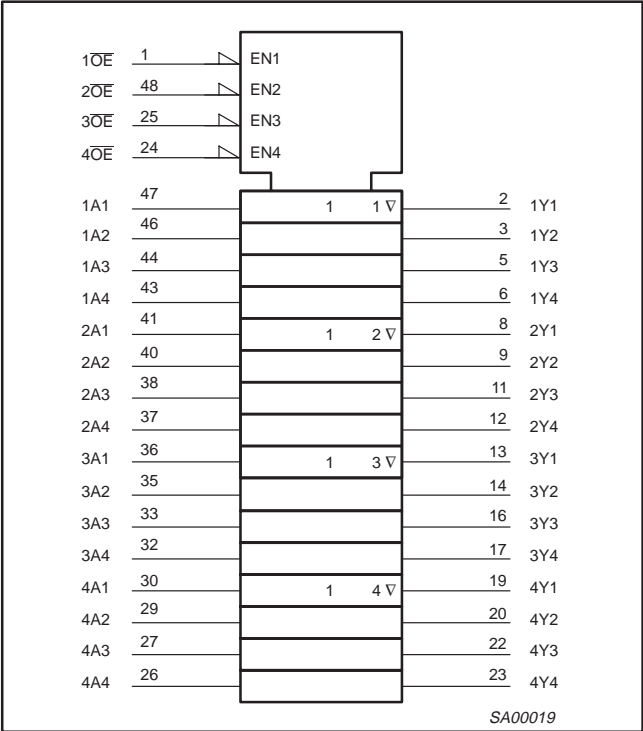
PIN DESCRIPTION

| 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 |

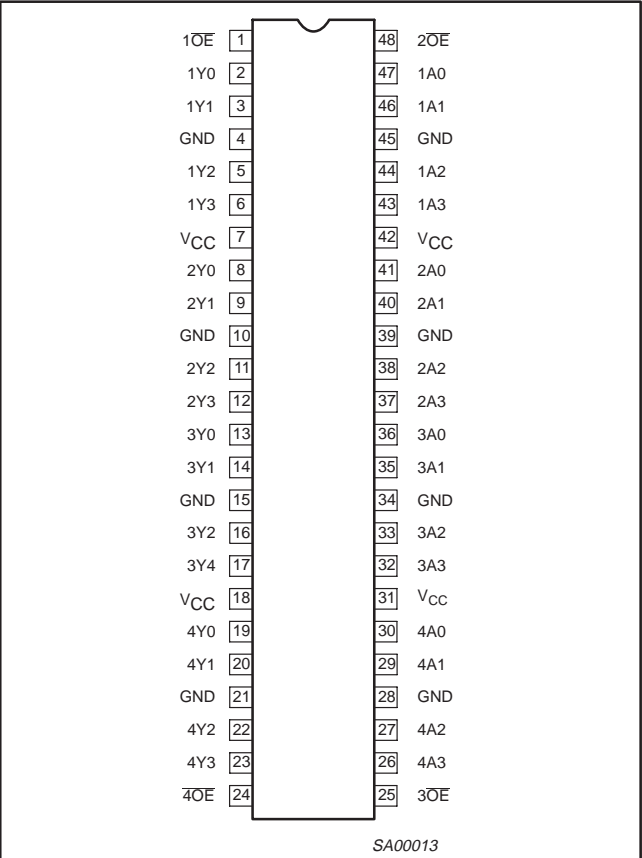
3.3V 16-bit buffer/driver with 30Ω termination resistors (3-State)

74LVT162244B

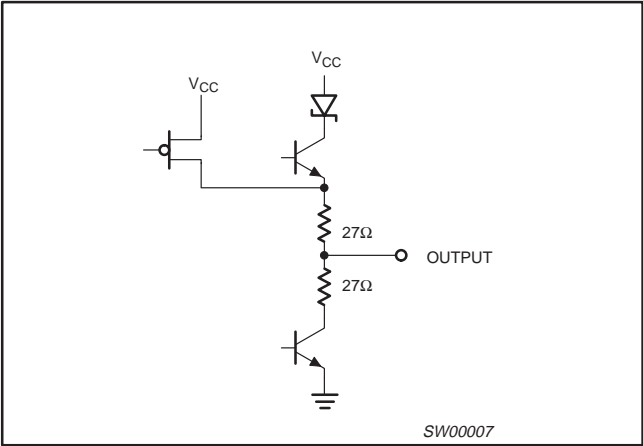
LOGIC SYMBOL (IEEE/IEC)



PIN CONFIGURATION



SCHEMATIC OF EACH OUTPUT



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

3.3V 16-bit buffer/driver with 30 Ω termination resistors (3-State)

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ABSOLUTE MAXIMUM RATINGS^{1, 2}

| SYMBOL | PARAMETER | CONDITIONS | RATING | UNIT |
|-----------|--------------------------------|-----------------------------|--------------|------|
| V_{CC} | DC supply voltage | | -0.5 to +4.6 | V |
| I_{IK} | DC input diode current | $V_I < 0$ | -50 | mA |
| V_I | DC input voltage ³ | | -0.5 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 +7.0 | 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 | 2.7 | 3.6 | V |
| V_I | Input voltage | 0 | 5.5 | V |
| V_{IH} | High-level input voltage | 2.0 | | V |
| V_{IL} | Input voltage | | 0.8 | V |
| I_{OH} | High-level output current | | -12 | mA |
| I_{OL} | Low-level output current | | 12 | mA |
| $\Delta t/\Delta v$ | Input transition rise or fall rate; Outputs enabled | | 10 | ns/V |
| T_{amb} | Operating free-air temperature range | -40 | +85 | °C |

3.3V 16-bit buffer/driver with 30Ω termination resistors (3-State)

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DC ELECTRICAL CHARACTERISTICS

| SYMBOL | PARAMETER | TEST CONDITIONS | | LIMITS | | | UNIT |
|--------------------|--------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------|------------------------|-----------------------|------------------|------|------|
| | | | | Temp = -40°C to +85°C | | | |
| | | | | MIN | TYP ¹ | MAX | |
| V _{IK} | Input clamp voltage | V _{CC} = 2.7V; I _{IK} = -18mA | | | | -1.2 | V |
| V _{OH} | High-level output voltage | V _{CC} = 3.0V; I _{OH} = -12mA | | 2.0 | | | |
| V _{OL} | Low-level output voltage | V _{CC} = 3.0V; I _{OL} = 12mA | | | | 0.8 | |
| I _I | Input leakage current | V _{CC} = 3.6V; V _I = V _{CC} or GND | Control pins | | 0.1 | ±1.0 | μA |
| | | V _{CC} = 0 or 3.6V; V _I = 5.5V | | | 0.4 | 10 | |
| | | V _{CC} = 3.6V; V _I = V _{CC} | Data pins ⁴ | | 0.1 | 1 | |
| | | V _{CC} = 3.6V; V _I = 0 | | | -0.4 | -5 | |
| I _{OFF} | Output off current | V _{CC} = 0V; V _I or V _O = 0 to 4.5V | | | 0.1 | ±100 | μA |
| I _{HOLD} | Bus Hold current A inputs ⁶ | V _{CC} = 3V; V _I = 0.8V | | 75 | 135 | | μA |
| | | V _{CC} = 3V; V _I = 2.0V | | -75 | -135 | | |
| | | V _{CC} = 0V to 3.6V; V _{CC} = 3.6V | | ±500 | | | |
| I _{EX} | Current into an output in the High state when V _O > V _{CC} | V _O = 5.5V; V _{CC} = 3.0V | | | 50 | 125 | μA |
| I _{PU/PD} | Power up/down 3-State output current ³ | V _{CC} ≤ 1.2V; V _O = 0.5V to V _{CC} ; V _I = GND or V _{CC} ; OE/OE = Don't care | | | 1 | ±100 | μA |
| I _{OZH} | 3-State output High current | V _{CC} = 3.6V; V _O = 3.0V; V _I = V _{IL} or V _{IH} | | | 0.5 | 5 | μA |
| I _{OZL} | 3-State output Low current | V _{CC} = 3.6V; V _O = 0.5V; V _I = V _{IL} or V _{IH} | | | 0.5 | -5 | μA |
| I _{CCH} | Quiescent supply current | V _{CC} = 3.6V; Outputs High, V _I = GND or V _{CC} , I _O = 0 | | | 0.07 | 0.12 | mA |
| I _{CCL} | | V _{CC} = 3.6V; Outputs Low, V _I = GND or V _{CC} , I _O = 0 | | | 4.0 | 6.0 | |
| I _{CCZ} | | V _{CC} = 3.6V; Outputs Disabled; V _I = GND or V _{CC} , I _O = 0 ⁵ | | | 0.07 | 0.12 | |
| ΔI _{CC} | Additional supply current per input pin ² | V _{CC} = 3V to 3.6V; One input at V _{CC} -0.6V, Other inputs at V _{CC} or GND | | | 0.1 | 0.2 | mA |

NOTES:

1. All typical values are at V_{CC} = 3.3V and T_{amb} = 25°C.
2. This is the increase in supply current for each input at the specified voltage level other than V_{CC} or GND.
3. This parameter is valid for any V_{CC} between 0V and 1.2V with a transition time of up to 10msec. From V_{CC} = 1.2V to V_{CC} = 3.3V ± 0.3V a transition time of 100μsec is permitted. This parameter is valid for T_{amb} = 25°C only.
4. Unused pins at V_{CC} or GND.
5. I_{CCZ} is measured with outputs pulled to V_{CC} or GND.
6. 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 |
|--------------------------------------|------------------------------------------------|----------|-------------------------------|------------------|------------|------------------------|------|
| | | | V _{CC} = 3.3V ± 0.3V | | | V _{CC} = 2.7V | |
| | | | MIN | TYP ¹ | MAX | MAX | |
| t _{PLH} t _{PHL} | Propagation delay nAx to nYx | 1 | 0.5 0.5 | 2.8 2.5 | 4.2 4.2 | 5.0 5.0 | ns |
| t _{PZH} t _{PZL} | Output enable time to High and Low level | 2 | 1.0 1.0 | 3.5 3.1 | 5.5 5.5 | 7.0 6.5 | ns |
| t _{PHZ} t _{PLZ} | Output disable time from High and Low Level | 2 | 1.0 1.0 | 3.6 3.1 | 5.5 5.5 | 6.0 6.0 | ns |

NOTE:

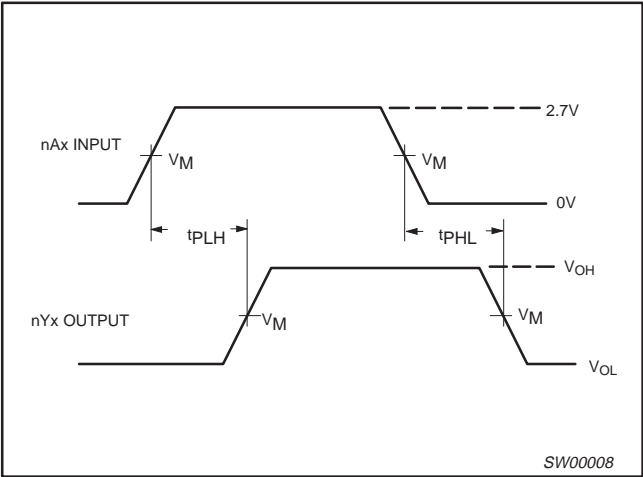
1. All typical values are at V_{CC} = 3.3V and T_{amb} = 25°C.

3.3V 16-bit buffer/driver with 30Ω termination resistors (3-State)

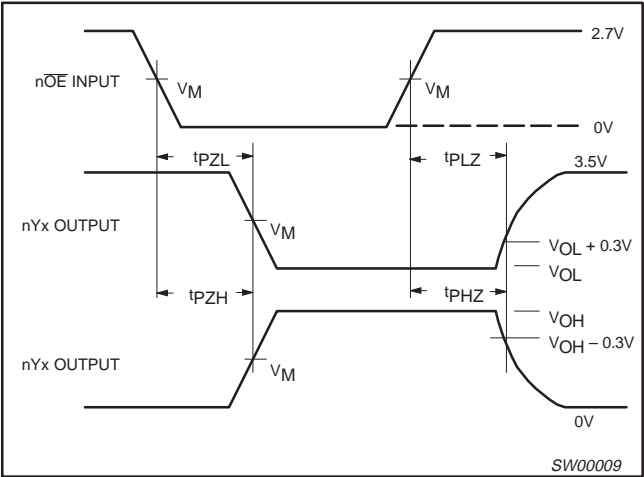
74LVT162244B

AC WAVEFORMS

$V_M = 1.5V$, $V_{IN} = GND$ to $3.0V$



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_{PHZ}/t_{PZH} | GND |
| t_{PLZ}/t_{PZL} | 6V |
| t_{PLH}/t_{PHL} | 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.

$V_M = 1.5V$ Input Pulse Definition

| FAMILY | INPUT PULSE REQUIREMENTS | | | | |
|---------|--------------------------|--------------|-------|--------------|--------------|
| | Amplitude | Rep. Rate | t_W | t_R | t_F |
| 74LVT16 | 2.7V | $\leq 10MHz$ | 500ns | $\leq 2.5ns$ | $\leq 2.5ns$ |

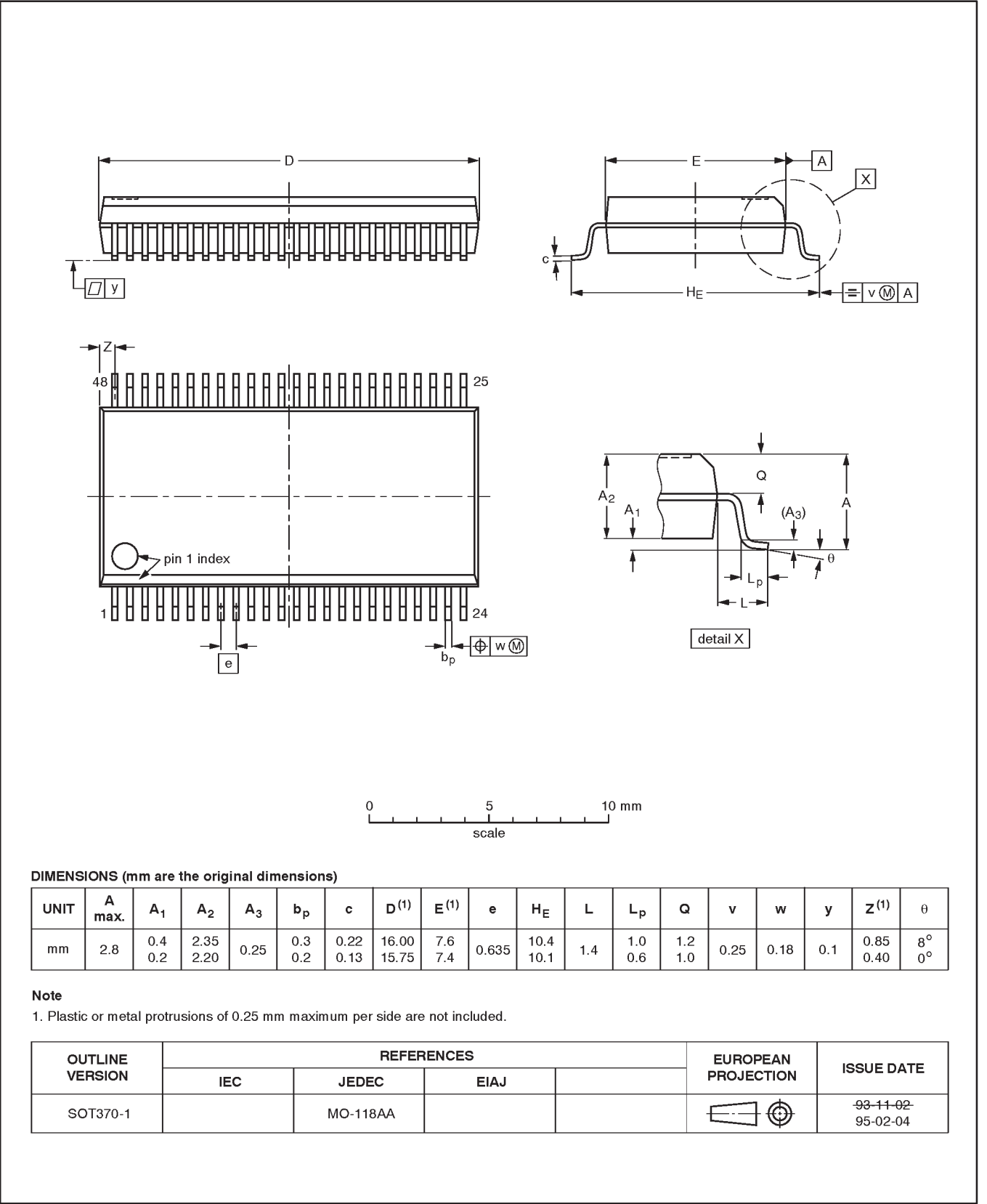
SW00003

3.3V 16-bit buffer/driver with 30Ω termination resistors (3-State)

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

SOT370-1

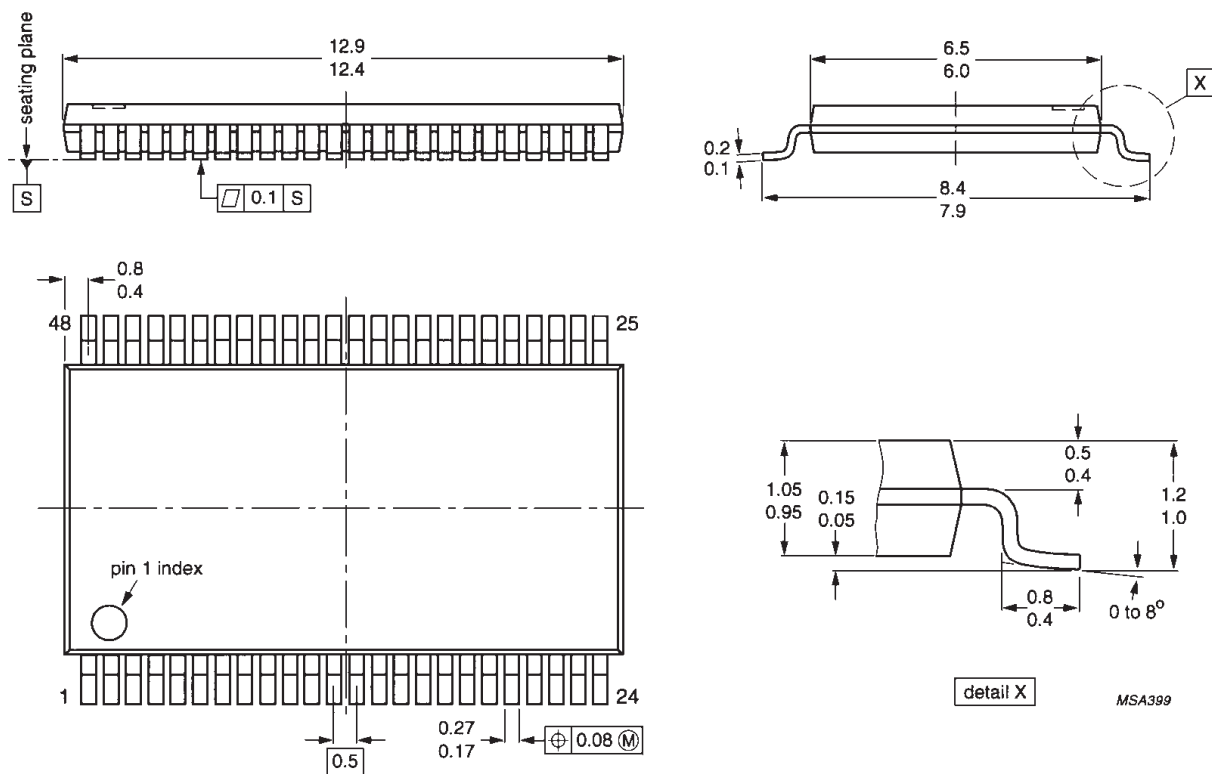


3.3V 16-bit buffer/driver with 30Ω termination resistors (3-State)

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

SOT362-1



Dimensions in mm.

3.3V 16-bit buffer/driver with 30 Ω
termination resistors (3-State)

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NOTES

3.3V LVT 16-bit buffer/driver with 30Ω
termination resistors (3-State)

74LVT162244B

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 chages at any time without notice in order to improve design and supply the best possible product. |
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[1] Please consult the most recently issued datasheet before initiating or completing a design.

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 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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Philips Semiconductors
811 East Arques Avenue
P.O. Box 3409
Sunnyvale, California 94088-3409
Telephone 800-234-7381

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