# 74LVC16241A

## 16-bit buffer/line driver with 5 V tolerant inputs/outputs; 3-state

Rev. 03 — 16 February 2004 **Product data sheet**

## 1. General description

The 74LVC16241A is a high-performance, low-power and low-voltage Si-gate CMOS device and superior to most advanced CMOS compatible TTL families.

Inputs can be driven from either 3.3 V or 5 V devices. In 3-state operation, outputs can handle 5 V. These features allow the use of these devices in a mixed 3.3 V and 5 V environment.

The 74LVC16241A is a 16-bit non-inverting buffer/line driver with 3-state outputs. The 3-state outputs are controlled by the output enable inputs (1$\overline{OE}$, 2OE, 3OE and 4$\overline{OE}$). Schmitt-trigger action at all inputs makes the circuit highly tolerant for slower input rise and fall times. The device can be used as four 4-bit buffers, two 8-bit buffers or one 16-bit buffer.

## 2. Features

- 5 V tolerant inputs and outputs for interfacing with 5 V logic
- Wide supply voltage range from 1.2 V to 3.6 V
- CMOS low power consumption
- MULTIBYTE flow-through standard pin-out architecture
- Low inductance multiple power and ground pins for minimum noise and ground bounce
- Direct interface with TTL levels
- High-impedance outputs when $V_{CC}$ = 0 V
- Complies with JEDEC standard no. 8-1A
- ESD protection:
  - HBM EIA/JESD22-A114-A exceeds 2000 V
  - MM EIA/JESD22-A115-A exceeds 200 V.
- Specified from –40 °C to +85 °C and –40 °C to +125 °C.

PHILIPS

# 3. Quick reference data

**Table 1: Quick reference data**

*GND = 0 V; $t_r = t_f \leq 2.5$ ns; $T_{amb} = 25\,°C$.*

| Symbol | Parameter | Conditions | | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|---|
| $t_{PHL}$, $t_{PLH}$ | propagation delay nAn to nYn | $C_L = 50$ pF; $V_{CC} = 3.3$ V | | - | 2.4 | - | ns |
| $C_I$ | input capacitance | | | - | 5.0 | - | pF |
| $C_{PD}$ | power dissipation capacitance per buffer | $V_{CC} = 3.3$ V | [1] [2] | | | | |
| | | outputs enabled | | - | 15 | - | pF |
| | | outputs disabled | | - | 3 | - | pF |

[1] $C_{PD}$ is used to determine the dynamic power dissipation ($P_D$ in µW).
$P_D = C_{PD} \times V_{CC}^2 \times f_i \times N + \Sigma(C_L \times V_{CC}^2 \times f_o)$ where:
$f_i$ = input frequency in MHz;
$f_o$ = output frequency in MHz;
$C_L$ = output load capacitance in pF;
$V_{CC}$ = supply voltage in Volts;
N = total load switching outputs;
$\Sigma(C_L \times V_{CC}^2 \times f_o)$ = sum of the outputs.

[2] The condition is $V_I$ = GND to $V_{CC}$.

# 4. Ordering information

**Table 2: Ordering information**

| Type number | Package | | | |
|---|---|---|---|---|
| | Temperature range | Name | Description | Version |
| 74LVC16241ADL | –40 °C to +125 °C | SSOP48 | plastic shrink small outline package; 48 leads; body width 7.5 mm | SOT370-1 |
| 74LVC16241ADGG | –40 °C to +125 °C | TSSOP48 | plastic thin shrink small outline package; 48 leads; body width 6.1 mm | SOT362-1 |

## 5. Functional diagram

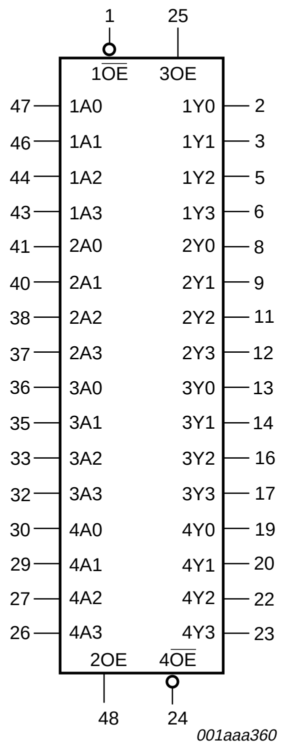



Fig 1. Logic symbol.

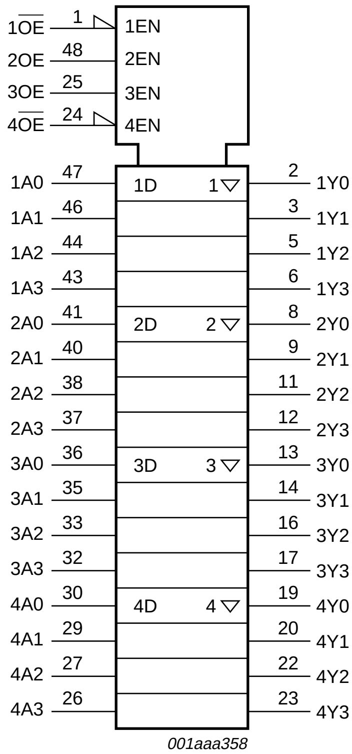



Fig 2. IEC logic symbol.

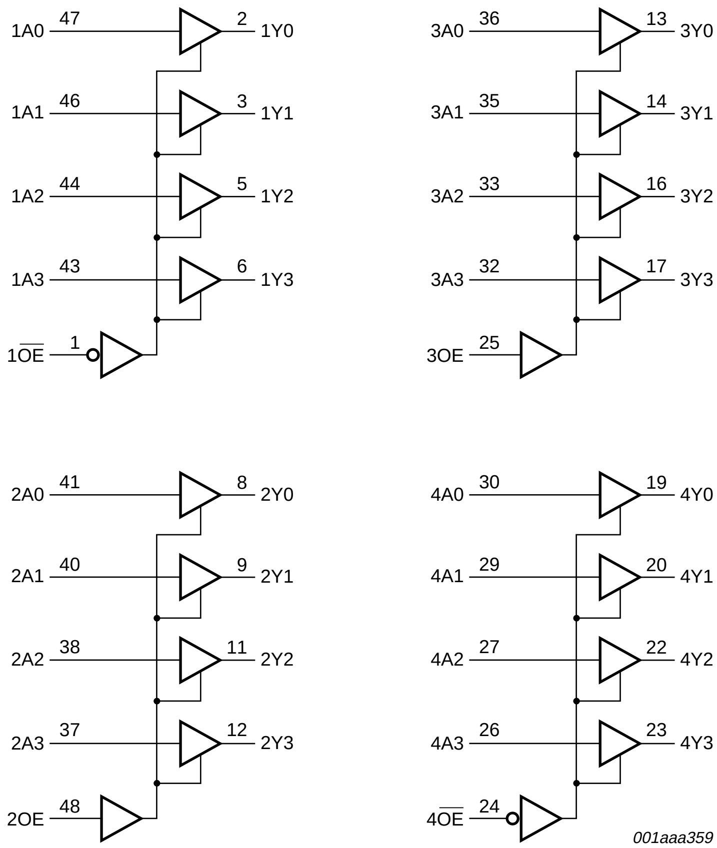



**Fig 3. Logic diagram.**

# 6. Pinning information

## 6.1 Pinning

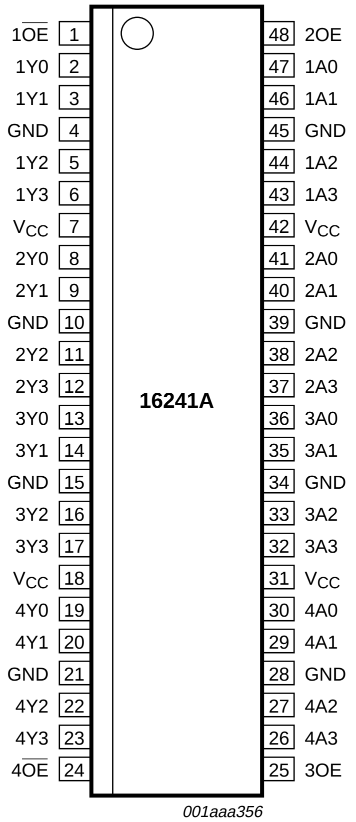



**Fig 4. Pin configuration.**

## 6.2 Pin description

**Table 3: Pin description**

| Pin | Symbol | Description |
|---|---|---|
| 1 | $1\overline{OE}$ | output enable input (active LOW) |
| 2 | 1Y0 | data output |
| 3 | 1Y1 | data output |
| 4 | GND | ground (0 V) |
| 5 | 1Y2 | data output |
| 6 | 1Y3 | data output |
| 7 | $V_{CC}$ | supply voltage |
| 8 | 2Y0 | data output |
| 9 | 2Y1 | data output |
| 10 | GND | ground (0 V) |
| 11 | 2Y2 | data output |

**Table 3: Pin description** *…continued*

| Pin | Symbol | Description |
|---|---|---|
| 12 | 2Y3 | data output |
| 13 | 3Y0 | data output |
| 14 | 3Y1 | data output |
| 15 | GND | ground (0 V) |
| 16 | 3Y2 | data output |
| 17 | 3Y3 | data output |
| 18 | $V_{CC}$ | supply voltage |
| 19 | 4Y0 | data output |
| 20 | 4Y1 | data output |
| 21 | GND | ground (0 V) |
| 22 | 4Y2 | data output |
| 23 | 4Y3 | data output |
| 24 | $4\overline{OE}$ | output enable input (active LOW) |
| 25 | 3OE | output enable input (active HIGH) |
| 26 | 4A3 | data input |
| 27 | 4A2 | data input |
| 28 | GND | ground (0 V) |
| 29 | 4A1 | data input |
| 30 | 4A0 | data input |
| 31 | $V_{CC}$ | supply voltage |
| 32 | 3A3 | data input |
| 33 | 3A2 | data input |
| 34 | GND | ground (0 V) |
| 35 | 3A1 | data input |
| 36 | 3A0 | data input |
| 37 | 2A3 | data input |
| 38 | 2A2 | data input |
| 39 | GND | ground (0 V) |
| 40 | 2A1 | data input |
| 41 | 2A0 | data input |
| 42 | $V_{CC}$ | supply voltage |
| 43 | 1A3 | data input |
| 44 | 1A2 | data input |
| 45 | GND | ground (0 V) |
| 46 | 1A1 | data input |
| 47 | 1A0 | data input |
| 48 | 2OE | output enable input (active HIGH) |

# 7. Functional description

## 7.1 Function table

**Table 4: Function table [1]**

| Input | | | Output |
|---|---|---|---|
| nAn | $n\overline{OE}$ | nOE | nYn |
| H | L | - | H |
| | - | H | H |
| L | L | - | L |
| | - | H | L |
| X | H | - | Z |
| | - | L | Z |

[1] H = HIGH voltage level;
L = LOW voltage level;
X = don’t care;
Z = high-impedance OFF-state.

# 8. Limiting values

**Table 5: Limiting values**

*In accordance with the Absolute Maximum Rating System (IEC 60134). Voltages are referenced to GND (ground = 0 V).*

| Symbol | Parameter | Conditions | | Min | Max | Unit |
|---|---|---|---|---|---|---|
| $V_{CC}$ | supply voltage | | | –0.5 | +6.5 | V |
| $I_{IK}$ | input diode current | $V_I < 0$ V | | - | –50 | mA |
| $V_I$ | input voltage | | [1] | –0.5 | +6.5 | V |
| $I_{OK}$ | output diode current | $V_O > V_{CC}$ or $V_O < 0$ V | | - | ±50 | mA |
| $V_O$ | output voltage | HIGH or LOW state | [1] | –0.5 | $V_{CC}$ + 0.5 | V |
| | | 3-state | [1] | –0.5 | +6.5 | V |
| $I_O$ | output source or sink current | $V_O$ = 0 V to $V_{CC}$ | | - | ±50 | mA |
| $I_{CC}$, $I_{GND}$ | $V_{CC}$ or GND current | | | - | ±100 | mA |
| $T_{stg}$ | storage temperature | | | –65 | +150 | °C |
| $P_{tot}$ | power dissipation | $T_{amb}$ = –40 °C to +125 °C | [2] | - | 500 | mW |

[1] The input and output voltage ratings may be exceeded if the input and output current ratings are observed.

[2] Above 60 °C the value of $P_{tot}$ derates linearly with 5.5 mW/K.

## 9. Recommended operating conditions

**Table 6: Recommended operating conditions**

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| $V_{CC}$ | supply voltage | for maximum speed performance | 2.7 | - | 3.6 | V |
| | | for low-voltage applications | 1.2 | - | 3.6 | V |
| $V_I$ | input voltage | | 0 | - | 5.5 | V |
| $V_O$ | output voltage | HIGH or LOW state | 0 | - | $V_{CC}$ | V |
| | | 3-state | 0 | - | 5.5 | V |
| $T_{amb}$ | operating ambient temperature | in free air | –40 | - | +125 | °C |
| $t_r$, $t_f$ | input rise and fall times | $V_{CC}$ = 1.2 V to 2.7 V | 0 | - | 20 | ns/V |
| | | $V_{CC}$ = 2.7 V to 3.6 V | 0 | - | 10 | ns/V |

## 10. Static characteristics

**Table 7: Static characteristics**

*At recommended operating conditions; voltages are referenced to GND (ground = 0 V).*

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| $T_{amb}$ = –40 °C to +85 °C [1] | | | | | | |
| $V_{IH}$ | HIGH-level input voltage | $V_{CC}$ = 1.2 V | $V_{CC}$ | - | - | V |
| | | $V_{CC}$ = 2.7 V to 3.6 V | 2.0 | - | - | V |
| $V_{IL}$ | LOW-level input voltage | $V_{CC}$ = 1.2 V | - | - | GND | V |
| | | $V_{CC}$ = 2.7 V to 3.6 V | - | - | 0.8 | V |
| $V_{OH}$ | HIGH-level output voltage | $V_I$ = $V_{IH}$ or $V_{IL}$ | | | | |
| | | $I_O$ = –100 μA; $V_{CC}$ = 2.7 V to 3.6 V | $V_{CC}$ – 0.2 | $V_{CC}$ | - | V |
| | | $I_O$ = –12 mA; $V_{CC}$ = 2.7 V | $V_{CC}$ – 0.5 | - | - | V |
| | | $I_O$ = –18 mA; $V_{CC}$ = 3.0 V | $V_{CC}$ – 0.6 | - | - | V |
| | | $I_O$ = –24 mA; $V_{CC}$ = 3.0 V | $V_{CC}$ – 0.8 | - | - | V |
| $V_{OL}$ | LOW-level output voltage | $V_I$ = $V_{IH}$ or $V_{IL}$ | | | | |
| | | $I_O$ = 100 μA; $V_{CC}$ = 2.7 V to 3.6 V | - | GND | 0.2 | V |
| | | $I_O$ = 12 mA; $V_{CC}$ = 2.7 V | - | - | 0.4 | V |
| | | $I_O$ = 24 mA; $V_{CC}$ = 3.0 V | - | - | 0.55 | V |
| $I_{LI}$ | input leakage current | $V_I$ = 5.5 V or GND; $V_{CC}$ = 3.6 V | - | ±0.1 | ±5 | μA |
| $I_{OZ}$ | 3-state output OFF-state current | $V_I$ = $V_{IH}$ or $V_{IL}$; $V_O$ = 5.5 V or GND; $V_{CC}$ = 3.6 V | - | ±0.1 | ±5 | μA |
| $I_{off}$ | power-off leakage supply current | $V_I$ or $V_O$ = 5.5 V; $V_{CC}$ = 0 V | - | ±0.1 | ±10 | μA |
| $I_{CC}$ | quiescent supply current | $V_I$ = $V_{CC}$ or GND; $I_O$ = 0 A; $V_{CC}$ = 3.6 V | - | 0.1 | 20 | μA |
| $\Delta I_{CC}$ | additional quiescent supply current per pin | $V_I$ = $V_{CC}$ – 0.6 V; $I_O$ = 0 A; $V_{CC}$ = 2.7 V to 3.6 V | - | 5 | 500 | μA |
| $C_I$ | input capacitance | | - | 5.0 | - | pF |

**Table 7: Static characteristics** *...continued*
*At recommended operating conditions; voltages are referenced to GND (ground = 0 V).*

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| **$T_{amb}$ = −40 °C to +125 °C** | | | | | | |
| $V_{IH}$ | HIGH-level input voltage | $V_{CC}$ = 1.2 V | $V_{CC}$ | - | - | V |
| | | $V_{CC}$ = 2.7 V to 3.6 V | 2.0 | - | - | V |
| $V_{IL}$ | LOW-level input voltage | $V_{CC}$ = 1.2 V | - | - | GND | V |
| | | $V_{CC}$ = 2.7 V to 3.6 V | - | - | 0.8 | V |
| $V_{OH}$ | HIGH-level output voltage | $V_I$ = $V_{IH}$ or $V_{IL}$ | | | | |
| | | $I_O$ = −100 μA; $V_{CC}$ = 2.7 V to 3.6 V | $V_{CC}$ − 0.3 | - | - | V |
| | | $I_O$ = −12 mA; $V_{CC}$ = 2.7 V | $V_{CC}$ − 0.65 | - | - | V |
| | | $I_O$ = −18 mA; $V_{CC}$ = 3.0 V | $V_{CC}$ − 0.75 | - | - | V |
| | | $I_O$ = −24 mA; $V_{CC}$ = 3.0 V | $V_{CC}$ − 1.0 | - | - | V |
| $V_{OL}$ | LOW-level output voltage | $V_I$ = $V_{IH}$ or $V_{IL}$ | | | | |
| | | $I_O$ = 100 μA; $V_{CC}$ = 2.7 V to 3.6 V | - | - | 0.3 | V |
| | | $I_O$ = 12 mA; $V_{CC}$ = 2.7 V | - | - | 0.6 | V |
| | | $I_O$ = 24 mA; $V_{CC}$ = 3.0 V | - | - | 0.8 | V |
| $I_{LI}$ | input leakage current | $V_I$ = 5.5 V or GND; $V_{CC}$ = 3.6 V | - | - | ±20 | μA |
| $I_{OZ}$ | 3-state output OFF-state current | $V_I$ = $V_{IH}$ or $V_{IL}$; $V_O$ = 5.5 V or GND; $V_{CC}$ = 3.6 V | - | - | ±20 | μA |
| $I_{off}$ | power-off leakage supply current | $V_I$ or $V_O$ = 5.5 V; $V_{CC}$ = 0 V | - | - | ±20 | μA |
| $I_{CC}$ | quiescent supply current | $V_I$ = $V_{CC}$ or GND; $I_O$ = 0 A; $V_{CC}$ = 3.6 V | - | - | 80 | μA |
| $\Delta I_{CC}$ | additional quiescent supply current per pin | $V_I$ = $V_{CC}$ − 0.6 V; $I_O$ = 0 A; $V_{CC}$ = 2.7 V to 3.6 V | - | - | 5000 | μA |

[1] Typical values are measured at $V_{CC}$ = 3.3 V and $T_{amb}$ = 25 °C.

## 11. Dynamic characteristics

**Table 8: Dynamic characteristics**

*At recommended operating conditions; see Figure 8.*

| Symbol | Parameter | Conditions | | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|---|
| **$T_{amb}$ = −40 °C to +85 °C [1]** | | | | | | | |
| $t_{PLH}$, $t_{PHL}$ | propagation delay nAn to nYn | see Figure 5 | | | | | |
| | | $V_{CC}$ = 1.2 V | | - | 13 | - | ns |
| | | $V_{CC}$ = 2.7 V | | 1.0 | - | 5.0 | ns |
| | | $V_{CC}$ = 3.0 V to 3.6 V | [2] | 1.0 | 2.4 | 4.4 | ns |
| $t_{PZH}$, $t_{PZL}$ | 3-state output enable time $n\overline{OE}$ to nYn | see Figure 6 | | | | | |
| | | $V_{CC}$ = 1.2 V | | - | 17 | - | ns |
| | | $V_{CC}$ = 2.7 V | | 1.0 | - | 6.0 | ns |
| | | $V_{CC}$ = 3.0 V to 3.6 V | [2] | 1.0 | 2.5 | 5.5 | ns |
| | 3-state output enable time nOE to nYn | see Figure 7 | | | | | |
| | | $V_{CC}$ = 1.2 V | | - | 19 | - | ns |
| | | $V_{CC}$ = 2.7 V | | 1.5 | - | 6.0 | ns |
| | | $V_{CC}$ = 3.0 V to 3.6 V | [2] | 1.5 | 3.3 | 5.5 | ns |
| $t_{PHZ}$, $t_{PLZ}$ | 3-state output disable time $n\overline{OE}$ to nYn | see Figure 6 | | | | | |
| | | $V_{CC}$ = 1.2 V | | - | 9.0 | - | ns |
| | | $V_{CC}$ = 2.7 V | | 1.5 | - | 5.5 | ns |
| | | $V_{CC}$ = 3.0 V to 3.6 V | [2] | 1.5 | 3.0 | 5.0 | ns |
| | 3-state output disable time nOE to nYn | see Figure 7 | | | | | |
| | | $V_{CC}$ = 1.2 V | | - | 8.0 | - | ns |
| | | $V_{CC}$ = 2.7 V | | 1.5 | - | 5.5 | ns |
| | | $V_{CC}$ = 3.0 V to 3.6 V | [2] | 1.0 | 2.6 | 5.0 | ns |
| $C_{PD}$ | power dissipation capacitance per buffer | $V_{CC}$ = 3.3 V | [3] [4] | | | | |
| | | outputs enabled | | - | 15 | - | pF |
| | | outputs disabled | | - | 3 | - | pF |
| **$T_{amb}$ = −40 °C to +125 °C** | | | | | | | |
| $t_{PLH}$, $t_{PHL}$ | propagation delay nAn to nYn | see Figure 5 | | | | | |
| | | $V_{CC}$ = 1.2 V | | - | - | - | ns |
| | | $V_{CC}$ = 2.7 V | | 1.0 | - | 6.5 | ns |
| | | $V_{CC}$ = 3.0 V to 3.6 V | | 1.0 | - | 5.5 | ns |
| $t_{PZH}$, $t_{PZL}$ | 3-state output enable time $n\overline{OE}$ to nYn | see Figure 6 | | | | | |
| | | $V_{CC}$ = 1.2 V | | - | - | - | ns |
| | | $V_{CC}$ = 2.7 V | | 1.0 | - | 7.5 | ns |
| | | $V_{CC}$ = 3.0 V to 3.6 V | | 1.0 | - | 7.0 | ns |
| | 3-state output enable time nOE to nYn | see Figure 7 | | | | | |
| | | $V_{CC}$ = 1.2 V | | - | - | - | ns |
| | | $V_{CC}$ = 2.7 V | | 1.5 | - | 7.5 | ns |
| | | $V_{CC}$ = 3.0 V to 3.6 V | | 1.5 | - | 7.0 | ns |

**Table 8: Dynamic characteristics** *…continued*

*At recommended operating conditions; see Figure 8.*

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| $t_{PHZ}$, $t_{PLZ}$ | 3-state output disable time $\overline{nOE}$ to nYn | see Figure 6 | | | | |
| | | $V_{CC}$ = 1.2 V | - | - | - | ns |
| | | $V_{CC}$ = 2.7 V | 1.5 | - | 7.0 | ns |
| | | $V_{CC}$ = 3.0 V to 3.6 V | 1.5 | - | 6.5 | ns |
| | 3-state output disable time nOE to nYn | see Figure 7 | | | | |
| | | $V_{CC}$ = 1.2 V | - | - | - | ns |
| | | $V_{CC}$ = 2.7 V | 1.5 | - | 7.0 | ns |
| | | $V_{CC}$ = 3.0 V to 3.6 V | 1.0 | - | 6.5 | ns |

[1] Typical values are measured at $T_{amb}$ = 25 °C.

[2] Typical values are measured at $V_{CC}$ = 3.3 V.

[3] $C_{PD}$ is used to determine the dynamic power dissipation ($P_D$ in μW).

$P_D = C_{PD} \times V_{CC}^2 \times f_i \times N + \Sigma(C_L \times V_{CC}^2 \times f_o)$ where:

$f_i$ = input frequency in MHz;

$f_o$ = output frequency in MHz;

$C_L$ = output load capacitance in pF;

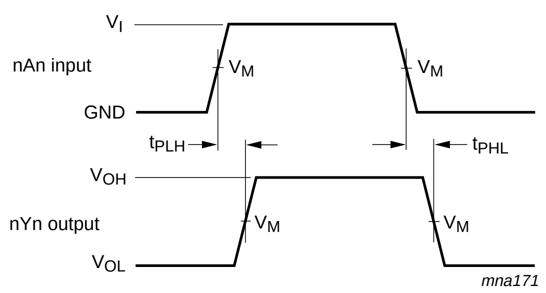
$V_{CC}$ = supply voltage in Volts;

N = total load switching outputs;

$\Sigma(C_L \times V_{CC}^2 \times f_o)$ = sum of the outputs.

[4] The condition is $V_I$ = GND to $V_{CC}$.

## 12. Waveforms



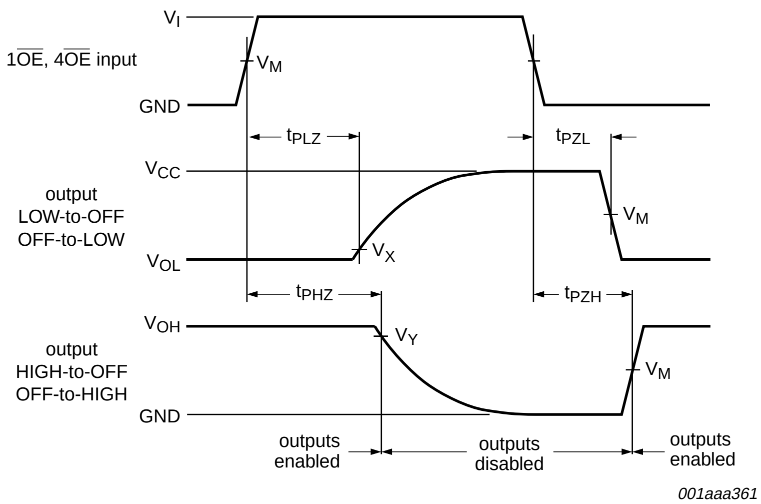

Measurements points are given in Table 9.

$V_{OL}$ and $V_{OH}$ are typical output voltage drop that occur with the output load.

**Fig 5. Input nAn to output nYn propagation delays.**

**Table 9: Measurement points**

| Supply voltage | Input | Output |
|---|---|---|
| $V_{CC}$ | $V_M$ | $V_M$ |
| 1.2 V | 0.5 × $V_{CC}$ | 0.5 × $V_{CC}$ |
| 2.7 V | 1.5 V | 1.5 V |
| 3.0 V to 3.6 V | 1.5 V | 1.5 V |



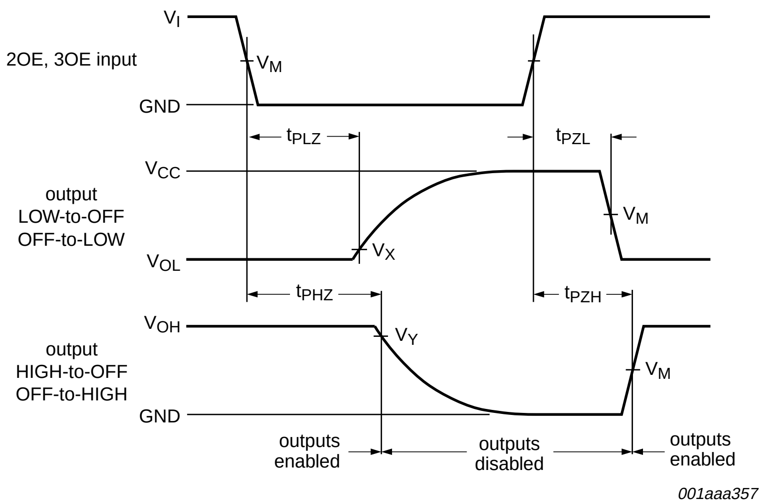

Measurements points are given in Table 10.

$V_{OL}$ and $V_{OH}$ are typical output voltage drop that occur with the output load.

**Fig 6. 3-state enable and disable times for inputs 1$\overline{OE}$ and 4$\overline{OE}$.**

**Table 10: Measurement points**

| Supply voltage | Input | Output | | |
|---|---|---|---|---|
| $V_{CC}$ | $V_M$ | $V_M$ | $V_X$ | $V_Y$ |
| 1.2 V | $0.5 \times V_{CC}$ | $0.5 \times V_{CC}$ | $V_{OL}$ + 0.1 V | $V_{OH}$ – 0.1 V |
| 2.7 V | 1.5 V | 1.5 V | $V_{OL}$ + 0.3 V | $V_{OH}$ – 0.3 V |
| 3.0 V to 3.6 V | 1.5 V | 1.5 V | $V_{OL}$ + 0.3 V | $V_{OH}$ – 0.3 V |



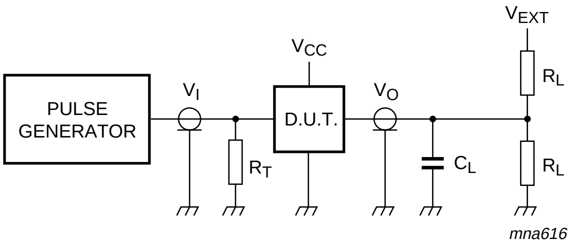

Measurements points are given in Table 11.

$V_{OL}$ and $V_{OH}$ are typical output voltage drop that occur with the output load.

**Fig 7. 3-state enable and disable times for inputs 2OE and 3OE.**

**Table 11: Measurement points**

| Supply voltage | Input | Output | | |
|---|---|---|---|---|
| $V_{CC}$ | $V_M$ | $V_M$ | $V_X$ | $V_Y$ |
| 1.2 V | $0.5 \times V_{CC}$ | $0.5 \times V_{CC}$ | $V_{OL}$ + 0.1 V | $V_{OH}$ – 0.1 V |
| 2.7 V | 1.5 V | 1.5 V | $V_{OL}$ + 0.3 V | $V_{OH}$ – 0.3 V |
| 3.0 V to 3.6 V | 1.5 V | 1.5 V | $V_{OL}$ + 0.3 V | $V_{OH}$ – 0.3 V |




Measurements points are given in Table 12.

**Definitions for test circuit:**

$R_L$ = Load resistor.

$C_L$ = Load capacitance including jig and probe capacitance.

$R_T$ = Termination resistance should be equal to the output impedance $Z_o$ of the pulse generator.

**Fig 8. Load circuitry for switching times.**

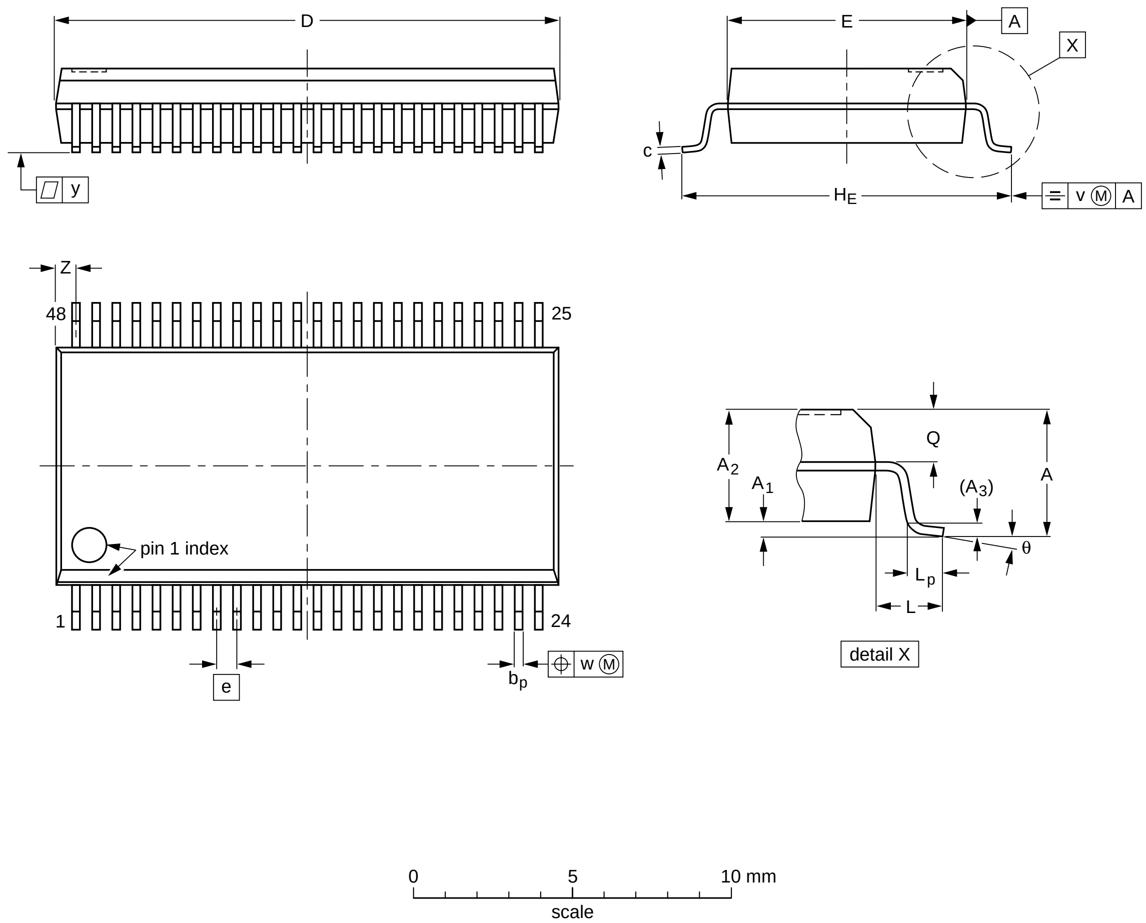
**Table 12: Test data**

| Supply voltage | Input | | Load | | $V_{EXT}$ | | |
|---|---|---|---|---|---|---|---|
| $V_{CC}$ | $V_I$ | $t_r$, $t_f$ | $C_L$ | $R_L$ | $t_{PLH}$, $t_{PHL}$ | $t_{PZH}$, $t_{PHZ}$ | $t_{PZL}$, $t_{PLZ}$ |
| 1.2 V | $V_{CC}$ | ≤ 2.5 ns | 50 pF | 500 Ω [1] | open | GND | 2 × $V_{CC}$ |
| 2.7 V | 2.7 V | ≤ 2.5 ns | 50 pF | 500 Ω | open | GND | 2 × $V_{CC}$ |
| 3.0 V to 3.6 V | 2.7 V | ≤ 2.5 ns | 50 pF | 500 Ω | open | GND | 2 × $V_{CC}$ |

[1] The circuit performs better when $R_L$ = 1000 Ω.

## 13. Package outline

**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<br>0.2 | 2.35<br>2.20 | 0.25 | 0.3<br>0.2 | 0.22<br>0.13 | 16.00<br>15.75 | 7.6<br>7.4 | 0.635 | 10.4<br>10.1 | 1.4 | 1.0<br>0.6 | 1.2<br>1.0 | 0.25 | 0.18 | 0.1 | 0.85<br>0.40 | $8^o$<br>$0^o$ |

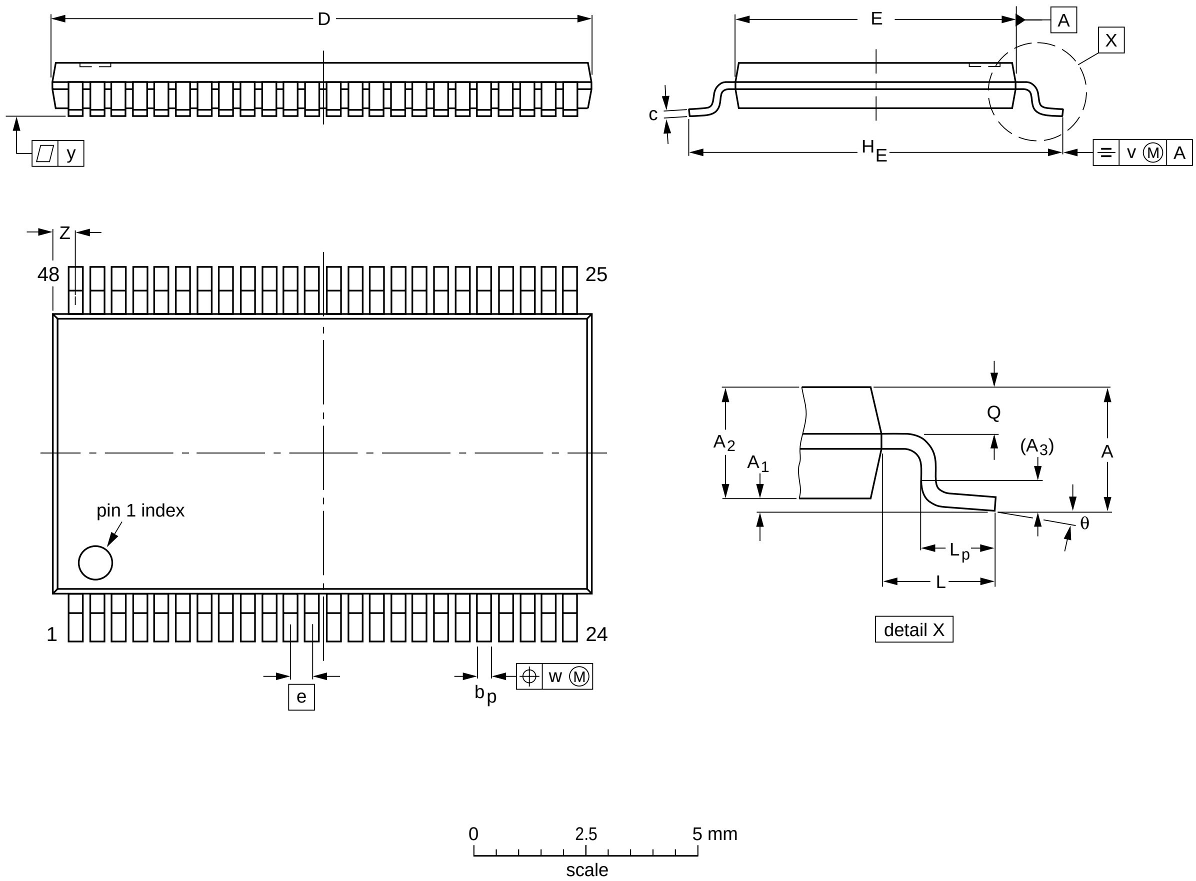
**Note**

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~~<br>03-02-19 |

**Fig 9. Package outline SOT370-1.**

**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<br>0.05 | 1.05<br>0.85 | 0.25 | 0.28<br>0.17 | 0.2<br>0.1 | 12.6<br>12.4 | 6.2<br>6.0 | 0.5 | 8.3<br>7.9 | 1 | 0.8<br>0.4 | 0.50<br>0.35 | 0.25 | 0.08 | 0.1 | 0.8<br>0.4 | $8^o$<br>$0^o$ |

**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~~<br>03-02-19 |

**Fig 10. Package outline SOT362-1.**

## 14. Revision history

**Table 13: Revision history**

| Document ID | Release date | Data sheet status | Change notice | Order number | Supersedes |
|---|---|---|---|---|---|
| 74LVC16241A_3 | 20040216 | Product data | - | 9397 750 12672 | 74LVC16241A_2 |
| Modifications: | • The format of this data sheet has been redesigned to comply with the new presentation and information standard of Philips Semiconductors.<br>• Table 7: added values for $T_{amb}$ = –40 °C to +125 °C<br>• Table 8: changed values for $T_{amb}$ = –40 °C to +85 °C and added values for $T_{amb}$ = –40 °C to +125 °C | | | | |
| 74LVC16241A_2 | 19970729 | Product data | - | 9397 750 04527 | 74LVC16241A_1 |
| 74LVC16241A_1 | 19951226 | - | - | - | - |

## 15. Data sheet status

| Level | Data sheet status [1] | Product status [2] [3] | Definition |
|---|---|---|---|
| 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.

## 16. 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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## 18. Contact information

For additional information, please visit: **http://www.semiconductors.philips.com**

For sales office addresses, send an email to: **sales.addresses@www.semiconductors.philips.com**

## 19. Contents





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