

# 74LVC125A-Q100

Quad buffer/line driver with 5 V tolerant inputs/outputs;  
3-state

Rev. 2 — 5 May 2020

Product data sheet

## 1. General description

The 74LVC125A-Q100 consists of four non-inverting buffers/line drivers with 3-state outputs (nY) that are controlled by the output enable input (nOE). A HIGH at nOE causes the outputs to assume a high-impedance OFF-state.

Inputs can be driven from either 3.3 V or 5 V devices. When disabled, up to 5.5 V can be applied to the outputs.

This product has been qualified to the Automotive Electronics Council (AEC) standard Q100 (Grade 1) and is suitable for use in automotive applications.

## 2. Features and benefits

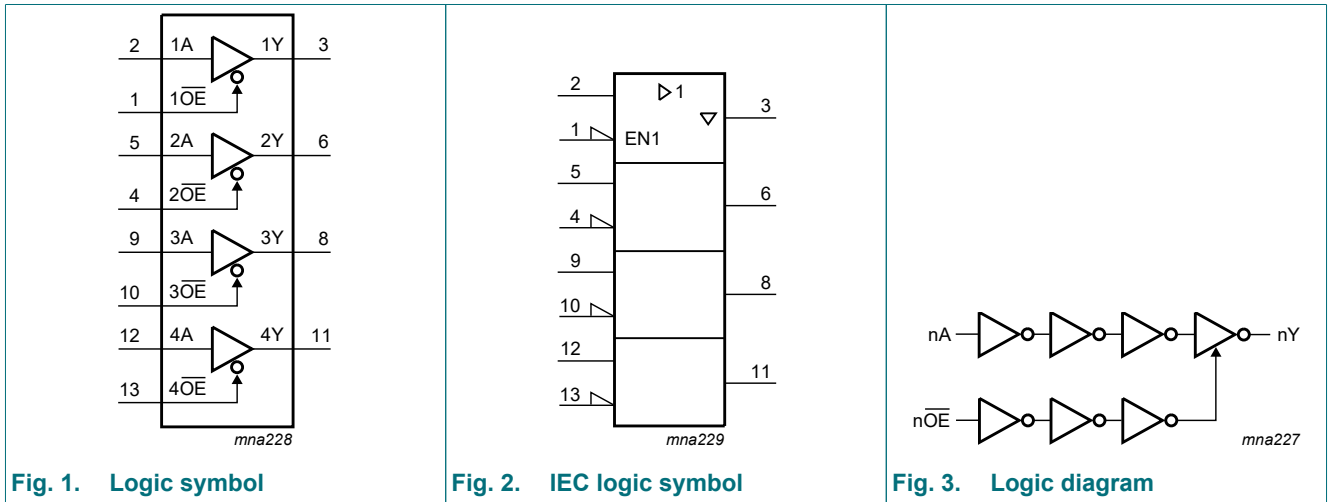
- Automotive product qualification in accordance with AEC-Q100 (Grade 1)
  - Specified from -40 °C to +85 °C and from -40 °C to +125 °C
- 5 V tolerant inputs/outputs for interfacing with 5 V logic
- Wide supply voltage range from 2.3 V to 3.6 V
- CMOS low power consumption
- Direct interface with TTL levels
- Complies with JEDEC standard:
  - JESD8-7A (1.65 V to 1.95 V)
  - JESD8-5A (2.3 V to 2.7 V)
  - JESD8-C/JESD36 (2.7 V to 3.6 V)
- ESD protection:
  - MIL-STD-883, method 3015 exceeds 2000 V
  - HBM JESD22-A114F exceeds 2000 V
  - MM JESD22-A115-A exceeds 200 V (C = 200 pF, R = 0 Ω)
- Multiple package options
- DHVQFN package with Side-Wettable Flanks enabling Automatic Optical Inspection (AOI) of solder joints

## 3. Ordering information

Table 1. Ordering information

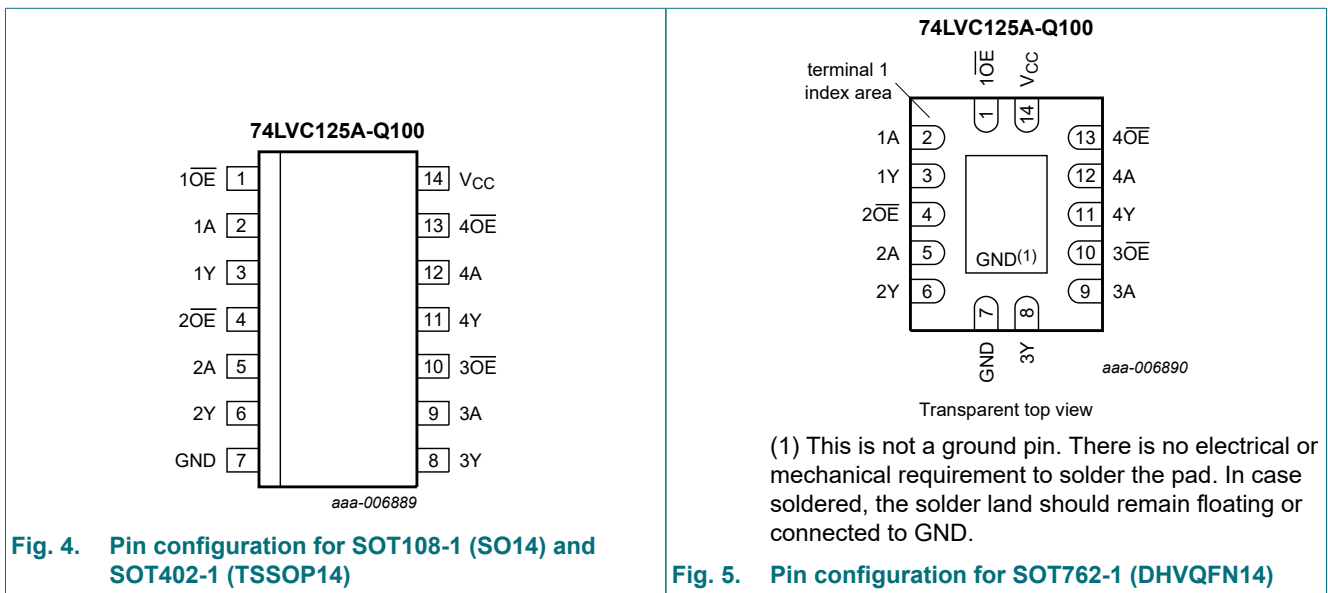
| Type number      | Package           |          |  |          |
|------------------|-------------------|----------|--|----------|
|                  | Temperature range | Name     | Description  | Version  |
| 74LVC125AD-Q100  | -40 °C to +125 °C | SO14     | plastic small outline package; 14 leads; body width 3.9 mm   | SOT108-1 |
| 74LVC125APW-Q100 | -40 °C to +125 °C | TSSOP14  | plastic thin shrink small outline package; 14 leads; body width 4.4 mm   | SOT402-1 |
| 74LVC125ABQ-Q100 | -40 °C to +125 °C | DHVQFN14 | plastic dual in-line compatible thermal enhanced very thin quad flat package; no leads; 14 terminals; body 2.5 × 3 × 0.85 mm | SOT762-1 |

### 4. Functional diagram



### 5. Pinning information

#### 5.1. Pinning



#### 5.2. Pin description

Table 2. Pin description

| Symbol             | Pin          | Description                    |
|--------------------|--------------|--------------------------------|
| 1OE, 2OE, 3OE, 4OE | 1, 4, 10, 13 | data enable input (active LOW) |
| 1A, 2A, 3A, 4A     | 2, 5, 9, 12  | data input                     |
| 1Y, 2Y, 3Y, 4Y     | 3, 6, 8, 11  | data output                    |
| GND                | 7            | ground (0 V)                   |
| VCC                | 14           | supply voltage                 |

## 6. Functional description

**Table 3. Function selection**

*H = HIGH voltage level; L = LOW voltage level; X = don't care; Z = high-impedance OFF-state*

| Inputs |    | Output |
|--------|----|--------|
| nOE    | nA | nY     |
| L      | L  | L      |
| L      | H  | H      |
| H      | X  | Z      |

## 7. Limiting values

**Table 4. 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 clamping current  | $V_I < 0$ V                     | -50  | -        | mA             |   |
| $V_I$     | input voltage           | [1]                             | -0.5 | +6.5     | V              |   |
| $I_{OK}$  | output clamping current | $V_O > V_{CC}$ or $V_O < 0$ V   | -    | $\pm 50$ | mA             |   |
| $V_O$     | output voltage          | output HIGH or LOW-state        | [2]  | -0.5     | $V_{CC} + 0.5$ | V |
|           |                         | output 3-state                  | [2]  | -0.5     | +6.5           | V |
| $I_O$     | output current          | $V_O = 0$ V to $V_{CC}$         | -    | $\pm 50$ | mA             |   |
| $I_{CC}$  | supply current          |                                 | -    | 100      | mA             |   |
| $I_{GND}$ | ground current          |                                 | -100 | -        | mA             |   |
| $P_{tot}$ | total power dissipation | $T_{amb} = -40$ °C to $+125$ °C | [3]  | 500      | mW             |   |
| $T_{stg}$ | storage temperature     |                                 | -65  | +150     | °C             |   |

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

[2] The output voltage ratings may be exceeded if the output current ratings are observed.

[3] For SOT108-1 (SO14) package:  $P_{tot}$  derates linearly with 10.1 mW/K above 100 °C.  
 For SOT402-1 (TSSOP14) package:  $P_{tot}$  derates linearly with 7.3 mW/K above 81 °C.  
 For SOT762-1 (DHVQFN14) package:  $P_{tot}$  derates linearly with 9.6 mW/K above 98 °C.

## 8. Recommended operating conditions

**Table 5. Recommended operating conditions**

| Symbol              | Parameter                           | Conditions                  | Min  | Typ | Max      | Unit |
|---------------------|-------------------------------------|-----------------------------|------|-----|----------|------|
| $V_{CC}$            | supply voltage                      |                             | 1.65 | -   | 3.6      | V    |
|                     |                                     | functional                  | 1.2  | -   | -        | V    |
| $V_I$               | input voltage                       |                             | 0    | -   | 5.5      | V    |
| $V_O$               | output voltage                      | output HIGH or LOW state    | 0    | -   | $V_{CC}$ | V    |
|                     |                                     | output 3-state              | 0    | -   | 5.5      | V    |
| $T_{amb}$           | ambient temperature                 |                             | -40  | -   | +125     | °C   |
| $\Delta t/\Delta V$ | input transition rise and fall rate | $V_{CC} = 2.3$ V to $2.7$ V | 0    | -   | 20       | ns/V |
|                     |                                     | $V_{CC} = 2.7$ V to $3.6$ V | 0    | -   | 10       | ns/V |

## 9. Static characteristics

**Table 6. Static characteristics**

At recommended operating conditions. Voltages are referenced to GND (ground = 0 V).

| Symbol           | Parameter                 | Conditions  | -40 °C to +85 °C      |         |                     | -40 °C to +125 °C     |                     | Unit |
|------------------|---------------------------|---|-----------------------|---------|---------------------|-----------------------|---------------------|------|
|                  |                           |   | Min                   | Typ [1] | Max                 | Min                   | Max                 |      |
| V <sub>IH</sub>  | HIGH-level input voltage  | V <sub>CC</sub> = 1.2 V   | 1.08                  | -       | -                   | 1.08                  | -                   | V    |
|                  |                           | V <sub>CC</sub> = 1.65 V to 1.95 V  | 0.65V <sub>CC</sub>   | -       | -                   | 0.65V <sub>CC</sub>   | -                   | V    |
|                  |                           | V <sub>CC</sub> = 2.3 V to 2.7 V  | 1.7                   | -       | -                   | 1.7                   | -                   | V    |
|                  |                           | V <sub>CC</sub> = 2.7 V to 3.6 V  | 2.0                   | -       | -                   | 2.0                   | -                   | V    |
| V <sub>IL</sub>  | LOW-level input voltage   | V <sub>CC</sub> = 1.2 V   | -                     | -       | 0.12                | -                     | 0.12                | V    |
|                  |                           | V <sub>CC</sub> = 1.65 V to 1.95 V  | -                     | -       | 0.35V <sub>CC</sub> | -                     | 0.35V <sub>CC</sub> | V    |
|                  |                           | V <sub>CC</sub> = 2.3 V to 2.7 V  | -                     | -       | 0.7                 | -                     | 0.7                 | V    |
|                  |                           | V <sub>CC</sub> = 2.7 V to 3.6 V  | -                     | -       | 0.8                 | -                     | 0.8                 | V    |
| V <sub>OH</sub>  | HIGH-level output voltage | V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub>   |                       |         |                     |                       |                     |      |
|                  |                           | I <sub>O</sub> = -100 µA; V <sub>CC</sub> = 1.65 V to 3.6 V   | V <sub>CC</sub> - 0.2 | -       | -                   | V <sub>CC</sub> - 0.3 | -                   | V    |
|                  |                           | I <sub>O</sub> = -4 mA; V <sub>CC</sub> = 1.65 V  | 1.2                   | -       | -                   | 1.05                  | -                   | V    |
|                  |                           | I <sub>O</sub> = -8 mA; V <sub>CC</sub> = 2.3 V   | 1.8                   | -       | -                   | 1.65                  | -                   | V    |
|                  |                           | I <sub>O</sub> = -12 mA; V <sub>CC</sub> = 2.7 V  | 2.2                   | -       | -                   | 2.05                  | -                   | V    |
|                  |                           | I <sub>O</sub> = -18 mA; V <sub>CC</sub> = 3.0 V  | 2.4                   | -       | -                   | 2.25                  | -                   | V    |
|                  |                           | I <sub>O</sub> = -24 mA; V <sub>CC</sub> = 3.0 V  | 2.2                   | -       | -                   | 2.0                   | -                   | V    |
| V <sub>OL</sub>  | LOW-level output voltage  | V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub>   |                       |         |                     |                       |                     |      |
|                  |                           | I <sub>O</sub> = 100 µA; V <sub>CC</sub> = 1.65 V to 3.6 V  | -                     | -       | 0.2                 | -                     | 0.3                 | V    |
|                  |                           | I <sub>O</sub> = 4 mA; V <sub>CC</sub> = 1.65 V   | -                     | -       | 0.45                | -                     | 0.65                | V    |
|                  |                           | I <sub>O</sub> = 8 mA; V <sub>CC</sub> = 2.3 V  | -                     | -       | 0.6                 | -                     | 0.8                 | V    |
|                  |                           | I <sub>O</sub> = 12 mA; V <sub>CC</sub> = 2.7 V   | -                     | -       | 0.4                 | -                     | 0.6                 | V    |
|                  |                           | I <sub>O</sub> = 24 mA; V <sub>CC</sub> = 3.0 V   | -                     | -       | 0.55                | -                     | 0.8                 | V    |
| I <sub>I</sub>   | input leakage current     | V <sub>CC</sub> = 3.6 V; V <sub>I</sub> = 5.5 V or GND  | -                     | ±0.1    | ±5                  | -                     | ±20                 | µA   |
| I <sub>OZ</sub>  | OFF-state output current  | V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub> ; V <sub>CC</sub> = 3.6 V; V <sub>O</sub> = 5.5 V or GND    | -                     | ±0.1    | ±5                  | -                     | ±20                 | µA   |
| I <sub>OFF</sub> | power-off leakage current | V <sub>CC</sub> = 0.0 V; V <sub>I</sub> or V <sub>O</sub> = 5.5 V   | -                     | ±0.1    | ±10                 | -                     | ±20                 | µA   |
| I <sub>CC</sub>  | supply current            | V <sub>CC</sub> = 3.6 V; V <sub>I</sub> = V <sub>CC</sub> or GND; I <sub>O</sub> = 0 A                          | -                     | 0.1     | 10                  | -                     | 40                  | µA   |
| ΔI <sub>CC</sub> | additional supply current | per input pin; V <sub>I</sub> = V <sub>CC</sub> - 0.6 V; I <sub>O</sub> = 0 A; V <sub>CC</sub> = 2.7 V to 3.6 V | -                     | 5       | 500                 | -                     | 5000                | µA   |
| C <sub>I</sub>   | input capacitance         | V <sub>CC</sub> = 0 V to 3.6 V; V <sub>I</sub> = GND to V <sub>CC</sub>   | -                     | 4.0     | -                   | -                     | -                   | pF   |

[1] All typical values are measured at V<sub>CC</sub> = 3.3 V (unless stated otherwise) and T<sub>amb</sub> = 25 °C.

## 10. Dynamic characteristics

**Table 7. Dynamic characteristics**

Voltages are referenced to GND (ground = 0 V). For test circuit see Fig. 8.

| Symbol             | Parameter                     | Conditions  | -40 °C to +85 °C |         |      | -40 °C to +125 °C |      | Unit |
|--------------------|-------------------------------|---|------------------|---------|------|-------------------|------|------|
|                    |                               |   | Min              | Typ [1] | Max  | Min               | Max  |      |
| t <sub>pd</sub>    | propagation delay             | nA to nY; see Fig. 6 [2]                                |                  |         |      |                   |      |      |
|                    |                               | V <sub>CC</sub> = 1.2 V                                 | -                | 12.0    | -    | -                 | -    | ns   |
|                    |                               | V <sub>CC</sub> = 1.65 V to 1.95 V                      | 1.5              | 5.4     | 11.0 | 1.5               | 12.8 | ns   |
|                    |                               | V <sub>CC</sub> = 2.3 V to 2.7 V                        | 1.0              | 2.9     | 5.7  | 1.0               | 6.7  | ns   |
|                    |                               | V <sub>CC</sub> = 2.7 V                                 | 1.5              | 2.8     | 5.5  | 1.5               | 7.0  | ns   |
|                    |                               | V <sub>CC</sub> = 3.0 V to 3.6 V                        | 1.0              | 2.5     | 4.8  | 1.0               | 6.0  | ns   |
| t <sub>en</sub>    | enable time                   | nOE to nY; see Fig. 7 [2]                               |                  |         |      |                   |      |      |
|                    |                               | V <sub>CC</sub> = 1.2 V                                 | -                | 16.0    | -    | -                 | -    | ns   |
|                    |                               | V <sub>CC</sub> = 1.65 V to 1.95 V                      | 1.0              | 5.0     | 12.2 | 1.0               | 14.2 | ns   |
|                    |                               | V <sub>CC</sub> = 2.3 V to 2.7 V                        | 0.5              | 2.9     | 6.8  | 0.5               | 7.9  | ns   |
|                    |                               | V <sub>CC</sub> = 2.7 V                                 | 1.5              | 3.1     | 6.6  | 1.5               | 8.5  | ns   |
|                    |                               | V <sub>CC</sub> = 3.0 V to 3.6 V                        | 1.0              | 2.3     | 5.4  | 1.0               | 7.0  | ns   |
| t <sub>dis</sub>   | disable time                  | nOE to nY; see Fig. 7 [2]                               |                  |         |      |                   |      |      |
|                    |                               | V <sub>CC</sub> = 1.2 V                                 | -                | 7.0     | -    | -                 | -    | ns   |
|                    |                               | V <sub>CC</sub> = 1.65 V to 1.95 V                      | 2.2              | 4.6     | 7.5  | 2.2               | 8.7  | ns   |
|                    |                               | V <sub>CC</sub> = 2.3 V to 2.7 V                        | 0.5              | 2.6     | 4.2  | 0.5               | 5.0  | ns   |
|                    |                               | V <sub>CC</sub> = 2.7 V                                 | 1.5              | 3.1     | 5.0  | 1.5               | 6.5  | ns   |
|                    |                               | V <sub>CC</sub> = 3.0 V to 3.6 V                        | 1.0              | 3.2     | 4.6  | 1.0               | 6.0  | ns   |
| t <sub>sk(o)</sub> | output skew time              | V <sub>CC</sub> = 3.0 V to 3.6 V [3]                    | -                | -       | 1.0  | -                 | 1.5  | ns   |
| C <sub>PD</sub>    | power dissipation capacitance | per buffer; V <sub>I</sub> = GND to V <sub>CC</sub> [4] |                  |         |      |                   |      |      |
|                    |                               | V <sub>CC</sub> = 1.65 V to 1.95 V                      | -                | 6.0     | -    | -                 | -    | pF   |
|                    |                               | V <sub>CC</sub> = 2.3 V to 2.7 V                        | -                | 9.4     | -    | -                 | -    | pF   |
|                    |                               | V <sub>CC</sub> = 3.0 V to 3.6 V                        | -                | 12.4    | -    | -                 | -    | pF   |

[1] Typical values are measured at T<sub>amb</sub> = 25 °C and V<sub>CC</sub> = 1.2 V, 1.8 V, 2.5 V, 2.7 V, and 3.3 V respectively.

[2] t<sub>pd</sub> is the same as t<sub>PLH</sub> and t<sub>PHL</sub>.

t<sub>en</sub> is the same as t<sub>PZL</sub> and t<sub>PZH</sub>.

t<sub>dis</sub> is the same as t<sub>PLZ</sub> and t<sub>PHZ</sub>.

[3] Skew between any two outputs of the same package switching in the same direction. This parameter is guaranteed by design.

[4] C<sub>PD</sub> is used to determine the dynamic power dissipation (P<sub>D</sub> 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<sub>i</sub> = input frequency in MHz; f<sub>o</sub> = output frequency in MHz

C<sub>L</sub> = output load capacitance in pF

V<sub>CC</sub> = supply voltage in Volts

N = number of inputs switching

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

10.1. Waveforms and test circuit

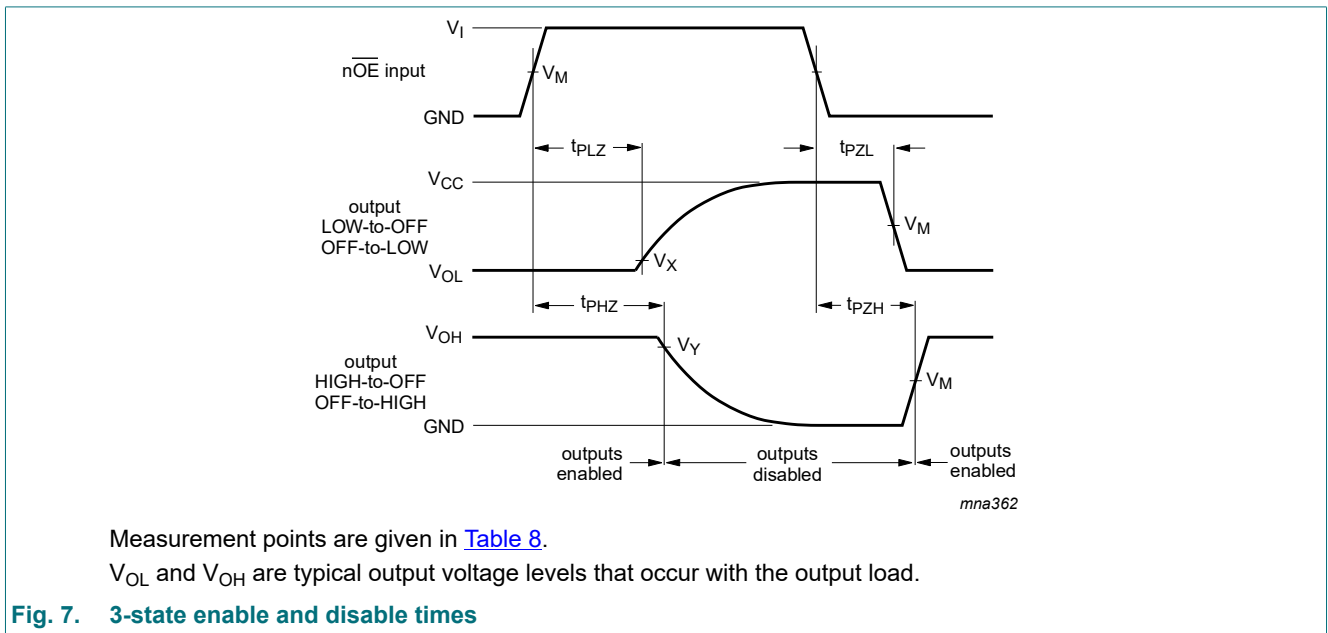
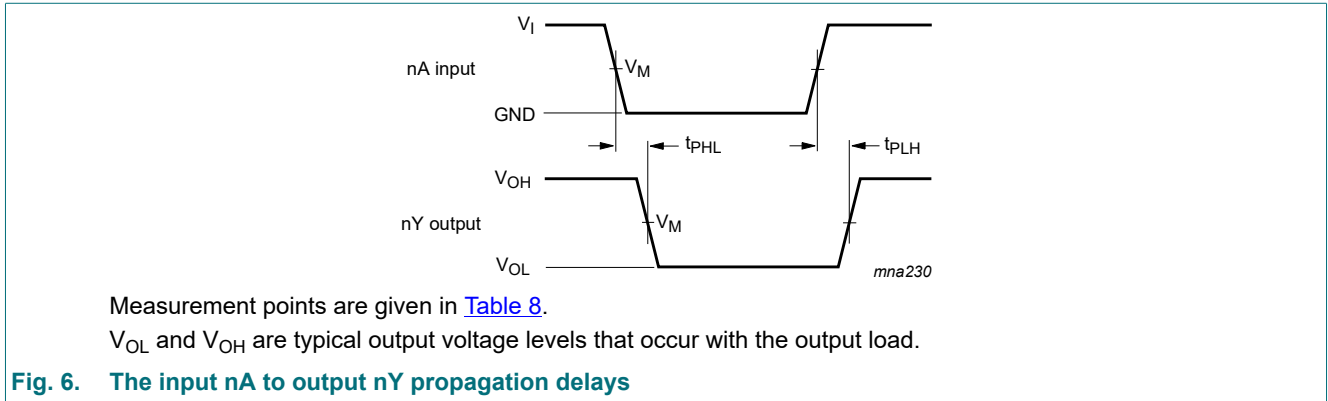
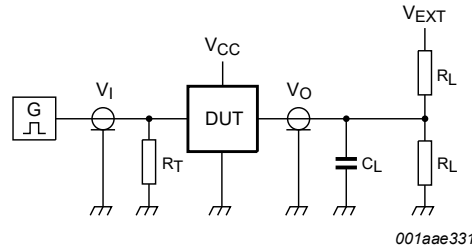
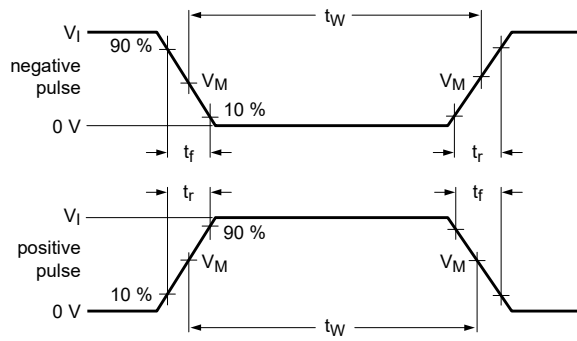


Table 8. Measurement points

| Supply voltage   | Input    |                     | Output              |                           |                           |
|------------------|----------|---------------------|---------------------|---------------------------|---------------------------|
|                  | $V_I$    | $V_M$               | $V_M$               | $V_X$                     | $V_Y$                     |
| 1.2 V            | $V_{CC}$ | $0.5 \times V_{CC}$ | $0.5 \times V_{CC}$ | $V_{OL} + 0.15 \text{ V}$ | $V_{OH} - 0.15 \text{ V}$ |
| 1.65 V to 1.95 V | $V_{CC}$ | $0.5 \times V_{CC}$ | $0.5 \times V_{CC}$ | $V_{OL} + 0.15 \text{ V}$ | $V_{OH} - 0.15 \text{ V}$ |
| 2.3 V to 2.7 V   | $V_{CC}$ | $0.5 \times V_{CC}$ | $0.5 \times V_{CC}$ | $V_{OL} + 0.15 \text{ V}$ | $V_{OH} - 0.15 \text{ V}$ |
| 2.7 V            | 2.7 V    | 1.5 V               | 1.5 V               | $V_{OL} + 0.3 \text{ V}$  | $V_{OH} - 0.3 \text{ V}$  |
| 3.0 V to 3.6 V   | 2.7 V    | 1.5 V               | 1.5 V               | $V_{OL} + 0.3 \text{ V}$  | $V_{OH} - 0.3 \text{ V}$  |

Quad buffer/line driver with 5 V tolerant inputs/outputs; 3-state



001aae331

Test data is given in [Table 9](#).

Definitions for test circuit:

$R_L$  = Load resistance.

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

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

$V_{EXT}$  = External voltage for measuring switching times.

**Fig. 8. Test circuit for measuring switching times**

**Table 9. Test data**

| Supply voltage   | Input    |               | Load  |              | $V_{EXT}$          |                    |                    |
|------------------|----------|---------------|-------|--------------|--------------------|--------------------|--------------------|
| $V_{CC}$         | $V_I$    | $t_r, t_f$    | $C_L$ | $R_L$        | $t_{PLH}, t_{PHL}$ | $t_{PLZ}, t_{PZL}$ | $t_{PHZ}, t_{PZH}$ |
| 1.2 V            | $V_{CC}$ | $\leq 2$ ns   | 30 pF | 1 k $\Omega$ | open               | $2 \times V_{CC}$  | GND                |
| 1.65 V to 1.95 V | $V_{CC}$ | $\leq 2$ ns   | 30 pF | 1 k $\Omega$ | open               | $2 \times V_{CC}$  | GND                |
| 2.3 V to 2.7 V   | $V_{CC}$ | $\leq 2$ ns   | 30 pF | 500 $\Omega$ | open               | $2 \times V_{CC}$  | GND                |
| 2.7 V            | 2.7 V    | $\leq 2.5$ ns | 50 pF | 500 $\Omega$ | open               | $2 \times V_{CC}$  | GND                |
| 3.0 V to 3.6 V   | 2.7 V    | $\leq 2.5$ ns | 50 pF | 500 $\Omega$ | open               | $2 \times V_{CC}$  | GND                |

11. Package outline

SO14: plastic small outline package; 14 leads; body width 3.9 mm

SOT108-1



Fig. 9. Package outline SOT108-1 (SO14)



TSSOP14: plastic thin shrink small outline package; 14 leads; body width 4.4 mm

SOT402-1



Fig. 10. Package outline SOT402-1 (TSSOP14)

DHVQFN14: plastic dual in-line compatible thermal enhanced very thin quad flat package; no leads; 14 terminals; body 2.5 x 3 x 0.85 mm

SOT762-1



Fig. 11. Package outline SOT762-1 (DHVQFN14)

## 12. Abbreviations

Table 10. Abbreviations

| Acronym | Description                             |
|---------|---|
| CMOS    | Complementary Metal-Oxide Semiconductor |
| DUT     | Device Under Test                       |
| ESD     | ElectroStatic Discharge                 |
| HBM     | Human Body Model                        |
| MIL     | Military                                |
| MM      | Machine Model                           |
| TTL     | Transistor-Transistor Logic             |

## 13. Revision history

Table 11. Revision history

| Document ID        | Release date   | Data sheet status  | Change notice | Supersedes         |
|--------------------|--|--------------------|---------------|--------------------|
| 74LVC125A_Q100 v.2 | 20200505   | Product data sheet | -             | 74LVC125A_Q100 v.1 |
| Modifications:     | <ul style="list-style-type: none"> <li>The format of this data sheet has been redesigned to comply with the identity guidelines of Nexperia.</li> <li>Legal texts have been adapted to the new company name where appropriate.</li> <li><a href="#">Section 2</a> updated.</li> <li><a href="#">Table 4</a>: Derating values for <math>P_{tot}</math> total power dissipation updated.</li> <li><a href="#">Table 8</a>: added measurement points for <math>V_X</math> and <math>V_Y</math>.</li> <li><a href="#">Fig. 11</a>: Package outline drawing SOT762-1 (DHVQFN14) updated.</li> </ul> |                    |               |                    |
| 74LVC125A_Q100 v.1 | 20130404   | Product data sheet | -             | -                  |

## 14. Legal information

### Data sheet status

| Document status [1][2]         | Product status [3] | Definition  |
|--------------------------------|--------------------|---|
| Objective [short] data sheet   | Development        | This document contains data from the objective specification for product development. |
| Preliminary [short] data sheet | Qualification      | This document contains data from the preliminary specification.                       |
| Product [short] data sheet     | Production         | This document contains the product specification.                                     |

- [1] Please consult the most recently issued document before initiating or completing a design.
- [2] The term 'short data sheet' is explained in section "Definitions".
- [3] The product status of device(s) described in this document may have changed since this document was published and may differ in case of multiple devices. The latest product status information is available on the internet at <https://www.nexperia.com>.

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