



**THE DATASHEET OF
74LVC2G240GS,115**





74LVC2G240

Dual inverting buffer/line driver; 3-state

Rev. 14 — 30 April 2024

Product data sheet

1. General description

The 74LVC2G240 is a dual inverting buffer/line driver with 3-state outputs. The 3-state outputs are controlled by the output enable inputs $1\overline{OE}$ and $2\overline{OE}$. A HIGH level at pins $n\overline{OE}$ causes the outputs to assume a high-impedance OFF-state. Schmitt trigger action at all inputs makes the circuit highly tolerant of slower input rise and fall times.

Inputs can be driven from either 3.3 V or 5 V devices. This feature allows the use of the 74LVC2G240 as a translator in a mixed 3.3 V and 5 V environment.

It is fully specified for partial power-down applications using I_{OFF} . The I_{OFF} circuitry disables the output, preventing a damaging backflow current through the device when it is powered down.

2. Features and benefits

- Wide supply voltage range from 1.65 V to 5.5 V
- 5 V tolerant input/output for interfacing with 5 V logic
- High noise immunity
- ± 24 mA output drive ($V_{CC} = 3.0$ V)
- CMOS low power consumption
- Latch-up performance exceeds 250 mA
- Direct interface with TTL levels
- Inputs accept voltages up to 5 V
- Complies with JEDEC standard:
 - JESD8-7 (1.65 V to 1.95 V)
 - JESD8-5 (2.3 V to 2.7 V)
 - JESD8-B/JESD36 (2.7 V to 3.6 V)
- ESD protection:
 - HBM: ANSI/ESDA/JEDEC JS-001 class 2 exceeds 2000 V
 - CDM: ANSI/ESDA/JEDEC JS-002 class C3 exceeds 1000 V
- Multiple package options
- Specified from -40 °C to $+85$ °C and -40 °C to $+125$ °C

3. Ordering information

Table 1. Ordering information

| Type number | Package | | | Version |
|------------------------------|-------------------|--------|---|--------------------------|
| | Temperature range | Name | Description | |
| 74LVC2G240DP | -40 °C to +125 °C | TSSOP8 | plastic thin shrink small outline package; 8 leads; body width 3 mm; lead length 0.5 mm | SOT505-2 |
| 74LVC2G240DC | -40 °C to +125 °C | VSSOP8 | plastic very thin shrink small outline package; 8 leads; body width 2.3 mm | SOT765-1 |
| 74LVC2G240GT | -40 °C to +125 °C | XSON8 | plastic extremely thin small outline package; no leads; 8 terminals; body 1 × 1.95 × 0.5 mm | SOT833-1 |
| 74LVC2G240GN | -40 °C to +125 °C | XSON8 | extremely thin small outline package; no leads; 8 terminals; body 1.2 × 1.0 × 0.35 mm | SOT1116 |
| 74LVC2G240GS | -40 °C to +125 °C | XSON8 | extremely thin small outline package; no leads; 8 terminals; body 1.35 × 1.0 × 0.35 mm | SOT1203 |

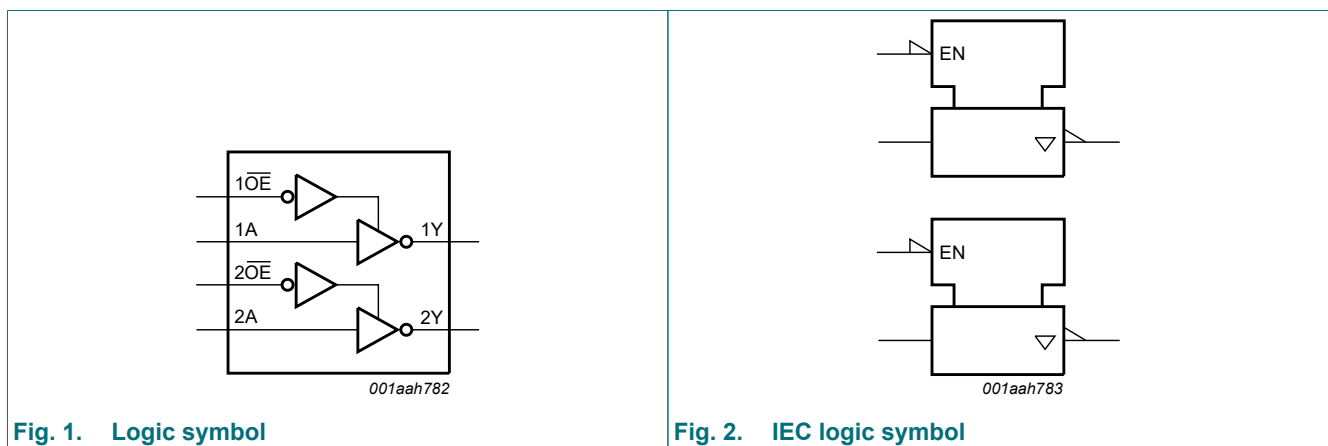
4. Marking

Table 2. Marking codes

| Type number | Marking code [1] |
|--------------|------------------|
| 74LVC2G240DP | V240 |
| 74LVC2G240DC | V40 |
| 74LVC2G240GT | V40 |
| 74LVC2G240GN | V2 |
| 74LVC2G240GS | V2 |

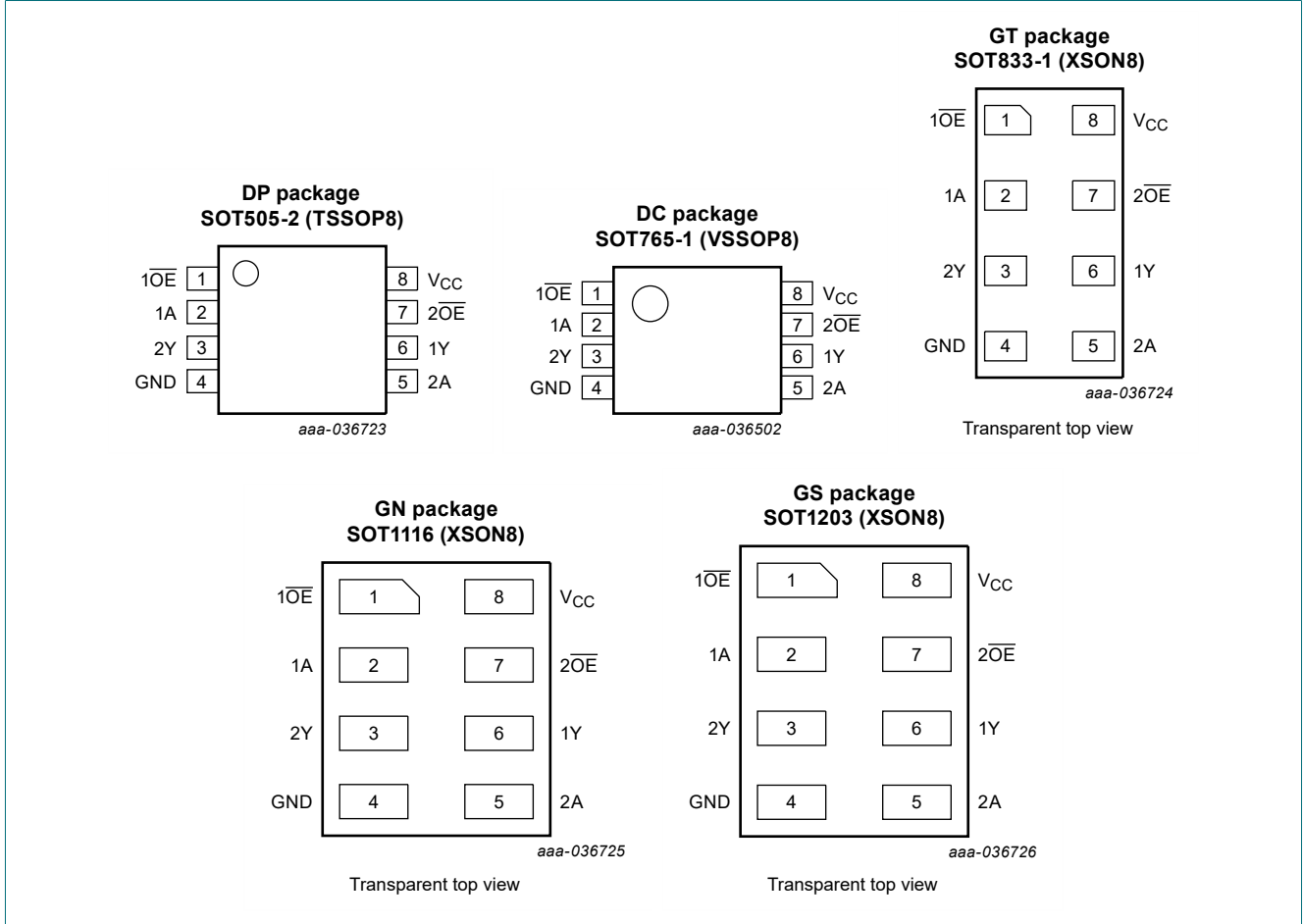
[1] The pin 1 indicator is located on the lower left corner of the device, below the marking code.

5. Functional diagram



6. Pinning information

6.1. Pinning



6.2. Pin description

Table 3. Pin description

| Symbol | Pin | Description |
|-----------------|-----|--------------------------------------|
| 1OE | 1 | output enable input 1OE (active LOW) |
| 1A | 2 | data input |
| 2Y | 3 | data output |
| GND | 4 | ground (0 V) |
| 2A | 5 | data input |
| 1Y | 6 | data output |
| 2OE | 7 | output enable input 2OE (active LOW) |
| V _{CC} | 8 | supply voltage |

7. Functional description

Table 4. Function table

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

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

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 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 | - | ±50 | mA |
| V_O | output voltage | Enable mode | [1] -0.5 | $V_{CC} + 0.5$ | V |
| | | Disable mode | [1] -0.5 | +6.5 | V |
| | | Power-down mode; $V_{CC} = 0$ V | [1] -0.5 | +6.5 | V |
| I_O | output current | $V_O = 0$ V to V_{CC} | - | ±50 | mA |
| I_{CC} | supply current | | - | 100 | mA |
| I_{GND} | ground current | | -100 | - | mA |
| T_{stg} | storage temperature | | -65 | +150 | °C |
| P_{tot} | total power dissipation | $T_{amb} = -40$ °C to +125 °C | [2] - | 250 | mW |

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

- [2] For SOT505-2 (TSSOP8) package: P_{tot} derates linearly with 4.6 mW/K above 96 °C.
 For SOT765-1 (VSSOP8) package: P_{tot} derates linearly with 4.9 mW/K above 99 °C.
 For SOT833-1 (XSON8) package: P_{tot} derates linearly with 3.1 mW/K above 68 °C.
 For SOT1116 (XSON8) package: P_{tot} derates linearly with 4.2 mW/K above 90 °C.
 For SOT1203 (XSON8) package: P_{tot} derates linearly with 3.6 mW/K above 81 °C.

9. Recommended operating conditions

Table 6. Operating conditions

| Symbol | Parameter | Conditions | Min | Max | Unit |
|---------------------|-------------------------------------|--|------|----------|------|
| V_{CC} | supply voltage | | 1.65 | 5.5 | V |
| V_I | input voltage | | 0 | 5.5 | V |
| V_O | output voltage | $V_{CC} = 1.65$ V to 5.5 V; Enable mode | 0 | V_{CC} | V |
| | | $V_{CC} = 1.65$ V to 5.5 V; Disable mode | 0 | 5.5 | V |
| | | $V_{CC} = 0$ V; Power-down mode | 0 | 5.5 | V |
| T_{amb} | ambient temperature | | -40 | +125 | °C |
| $\Delta t/\Delta V$ | input transition rise and fall rate | $V_{CC} = 1.65$ V to 2.7 V | - | 20 | ns/V |
| | | $V_{CC} = 2.7$ V to 5.5 V | - | 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 | T _{amb} = -40 °C to +85 °C | | | T _{amb} = -40 °C to +125 °C | | Unit |
|------------------|---------------------------|--|-------------------------------------|---------|------------------------|--------------------------------------|------------------------|------|
| | | | Min | Typ [1] | Max | Min | Max | |
| V _{IH} | HIGH-level input voltage | V _{CC} = 1.65 V to 1.95 V | 0.65 × V _{CC} | - | - | 0.65 × V _{CC} | - | V |
| | | V _{CC} = 2.3 V to 2.7 V | 1.7 | - | - | 1.7 | - | V |
| | | V _{CC} = 2.7 V to 3.6 V | 2.0 | - | - | 2.0 | - | V |
| | | V _{CC} = 4.5 V to 5.5 V | 0.7 × V _{CC} | - | - | 0.7 × V _{CC} | - | V |
| V _{IL} | LOW-level input voltage | V _{CC} = 1.65 V to 1.95 V | - | - | 0.35 × V _{CC} | - | 0.35 × V _{CC} | V |
| | | V _{CC} = 2.3 V to 2.7 V | - | - | 0.7 | - | 0.7 | V |
| | | V _{CC} = 2.7 V to 3.6 V | - | - | 0.8 | - | 0.8 | V |
| | | V _{CC} = 4.5 V to 5.5 V | - | - | 0.3 × V _{CC} | - | 0.3 × V _{CC} | V |
| V _{OL} | LOW-level output voltage | V _I = V _{IH} or V _{IL} | | | | | | |
| | | I _O = 100 μA; V _{CC} = 1.65 V to 5.5 V | - | - | 0.1 | - | 0.1 | V |
| | | I _O = 4 mA; V _{CC} = 1.65 V | - | - | 0.45 | - | 0.70 | V |
| | | I _O = 8 mA; V _{CC} = 2.3 V | - | - | 0.3 | - | 0.45 | V |
| | | I _O = 12 mA; V _{CC} = 2.7 V | - | - | 0.4 | - | 0.60 | V |
| | | I _O = 24 mA; V _{CC} = 3.0 V | - | - | 0.55 | - | 0.80 | V |
| | | I _O = 32 mA; V _{CC} = 4.5 V | - | - | 0.55 | - | 0.80 | V |
| V _{OH} | HIGH-level output voltage | V _I = V _{IH} or V _{IL} | | | | - | - | |
| | | I _O = -100 μA; V _{CC} = 1.65 V to 5.5 V | V _{CC} - 0.1 | - | - | V _{CC} - 0.1 | - | V |
| | | I _O = -4 mA; V _{CC} = 1.65 V | 1.2 | - | - | 0.95 | - | V |
| | | I _O = -8 mA; V _{CC} = 2.3 V | 1.9 | - | - | 1.7 | - | V |
| | | I _O = -12 mA; V _{CC} = 2.7 V | 2.2 | - | - | 1.9 | - | V |
| | | I _O = -24 mA; V _{CC} = 3.0 V | 2.3 | - | - | 2.0 | - | V |
| | | I _O = -32 mA; V _{CC} = 4.5 V | 3.8 | - | - | 3.4 | - | V |
| I _I | input leakage current | V _I = 5.5 V or GND; V _{CC} = 0 V to 5.5 V | - | ±0.1 | ±1 | - | ±1 | μA |
| I _{OZ} | OFF-state output current | V _I = V _{IH} or V _{IL} ; V _O = 5.5 V or GND; V _{CC} = 3.6 V | - | ±0.1 | ±2 | - | ±2 | μA |
| I _{OFF} | power-off leakage current | V _I or V _O = 5.5 V; V _{CC} = 0 V | - | ±0.1 | ±2 | - | ±2 | μA |
| I _{CC} | supply current | V _I = 5.5 V or GND; I _O = 0 A; V _{CC} = 1.65 V to 5.5 V | - | 0.1 | 4 | - | 4 | μA |
| ΔI _{CC} | additional supply current | per pin; V _I = V _{CC} - 0.6 V; I _O = 0 A; V _{CC} = 2.3 V to 5.5 V | - | 5 | 500 | - | 500 | μA |
| C _I | input capacitance | | - | 2 | - | - | - | pF |

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

11. Dynamic characteristics

Table 8. Dynamic characteristics

Voltages are referenced to GND (ground = 0 V); for test circuit see Fig. 5.

| Symbol | Parameter | Conditions | T _{amb} = -40 °C to +85 °C | | | T _{amb} = -40 °C to +125 °C | | Unit |
|------------------|-------------------------------|---|-------------------------------------|---------|------|--------------------------------------|------|------|
| | | | Min | Typ [1] | Max | Min | Max | |
| t _{pd} | propagation delay | nA to nY; see Fig. 3 [2] | | | | | | |
| | | V _{CC} = 1.65 V to 1.95 V | 1.0 | 4.1 | 9.5 | 1.0 | 11.9 | ns |
| | | V _{CC} = 2.3 V to 2.7 V | 0.5 | 2.6 | 5.2 | 0.5 | 6.5 | ns |
| | | V _{CC} = 2.7 V | 1.0 | 3.0 | 5.5 | 1.0 | 6.9 | ns |
| | | V _{CC} = 3.0 V to 3.6 V | 0.5 | 2.5 | 4.6 | 0.5 | 5.8 | ns |
| t _{en} | enable time | n $\overline{O}E$ to nY; see Fig. 4 [3] | | | | | | |
| | | V _{CC} = 1.65 V to 1.95 V | 1.5 | 4.5 | 10.3 | 1.5 | 12.9 | ns |
| | | V _{CC} = 2.3 V to 2.7 V | 1.0 | 2.9 | 5.6 | 1.0 | 7.0 | ns |
| | | V _{CC} = 2.7 V | 1.5 | 3.4 | 5.6 | 1.5 | 7.0 | ns |
| | | V _{CC} = 3.0 V to 3.6 V | 0.5 | 2.5 | 4.7 | 0.5 | 5.9 | ns |
| t _{dis} | disable time | n $\overline{O}E$ to nY; see Fig. 4 [4] | | | | | | |
| | | V _{CC} = 1.65 V to 1.95 V | 1.0 | 3.5 | 11.6 | 1.0 | 14.1 | ns |
| | | V _{CC} = 2.3 V to 2.7 V | 0.5 | 1.9 | 5.8 | 0.5 | 7.6 | ns |
| | | V _{CC} = 2.7 V | 1.0 | 2.8 | 4.5 | 1.0 | 5.8 | ns |
| | | V _{CC} = 3.0 V to 3.6 V | 1.0 | 2.7 | 4.4 | 1.0 | 5.7 | ns |
| C _{PD} | power dissipation capacitance | per buffer; V _I = GND to V _{CC} [5] | | | | | | |
| | | output enabled | - | 18 | - | - | - | pF |
| | | output disabled | - | 5 | - | - | - | pF |

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

[2] t_{pd} is the same as t_{PLH} and t_{PHL}

[3] t_{en} is the same as t_{PZH} and t_{PZL}

[4] t_{dis} is the same as t_{PLZ} and t_{PHZ}

[5] C_{PD} is used to determine the dynamic power dissipation (P_D in μ W).

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

f_i = input frequency in MHz;

f_o = output frequency in MHz;

C_L = output load capacitance in pF;

V_{CC} = supply voltage in V;

N = number of inputs switching;

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

11.1. Waveforms and test circuit

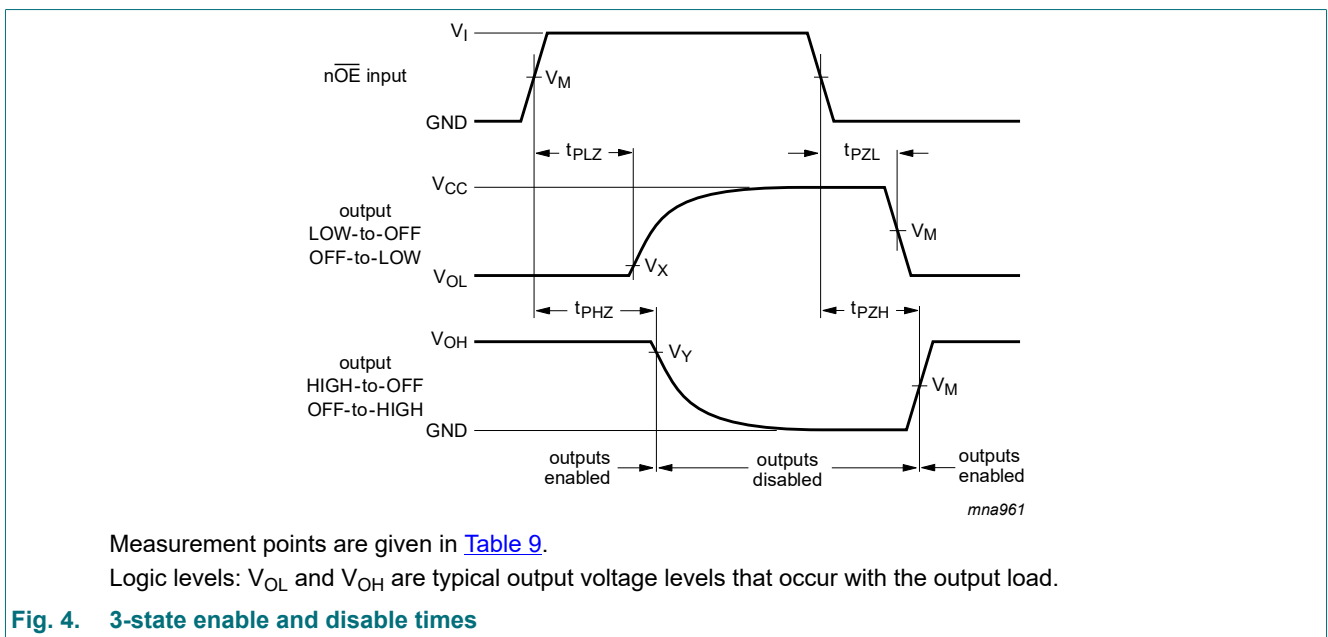
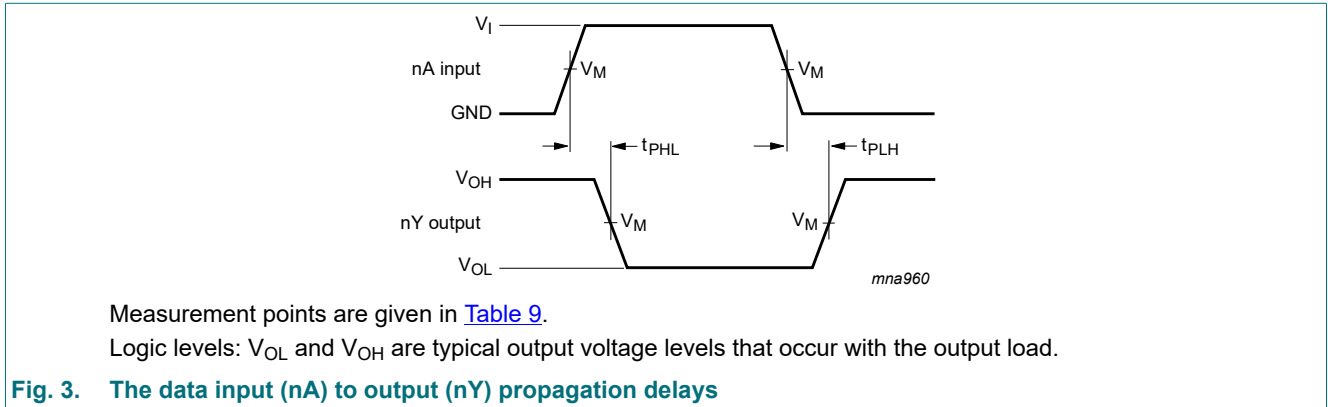
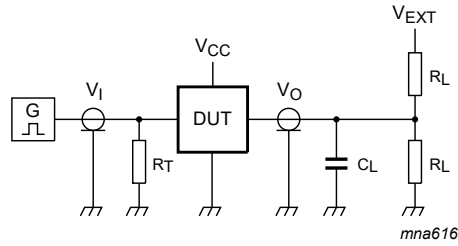


Table 9. Measurement points

| Supply voltage | Input | Output | | |
|------------------|-------------|-------------|-------------------|-------------------|
| V_{CC} | V_M | V_M | V_X | V_Y |
| 1.65 V to 1.95 V | $0.5V_{CC}$ | $0.5V_{CC}$ | $V_{OL} + 0.15 V$ | $V_{OH} - 0.15 V$ |
| 2.3 V to 2.7 V | $0.5V_{CC}$ | $0.5V_{CC}$ | $V_{OL} + 0.15 V$ | $V_{OH} - 0.15 V$ |
| 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 | $V_{OL} + 0.3 V$ | $V_{OH} - 0.3 V$ |
| 4.5 V to 5.5 V | $0.5V_{CC}$ | $0.5V_{CC}$ | $V_{OL} + 0.3 V$ | $V_{OH} - 0.3 V$ |



Test data is given in [Table 10](#).

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 the output impedance Z_o of the pulse generator.

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

Fig. 5. Test circuit for measuring switching times

Table 10. Test data

| Supply voltage | Input | Load | | V_{EXT} | | |
|------------------|----------|-------|--------------|-----------------------|-----------------------|-----------------------|
| V_{CC} | V_I | C_L | R_L | t_{PLH} , t_{PHL} | t_{PZH} , t_{PHZ} | t_{PZL} , t_{PLZ} |
| 1.65 V to 1.95 V | V_{CC} | 30 pF | 1 k Ω | open | GND | $2V_{CC}$ |
| 2.3 V to 2.7 V | V_{CC} | 30 pF | 500 Ω | open | GND | $2V_{CC}$ |
| 2.7 V | 2.7 V | 50 pF | 500 Ω | open | GND | 6 V |
| 3.0 V to 3.6 V | 2.7 V | 50 pF | 500 Ω | open | GND | 6 V |
| 4.5 V to 5.5 V | V_{CC} | 50 pF | 500 Ω | open | GND | $2V_{CC}$ |

12. Package outline

TSSOP8: plastic thin shrink small outline package; 8 leads; body width 3 mm; lead length 0.5 mm SOT505-2

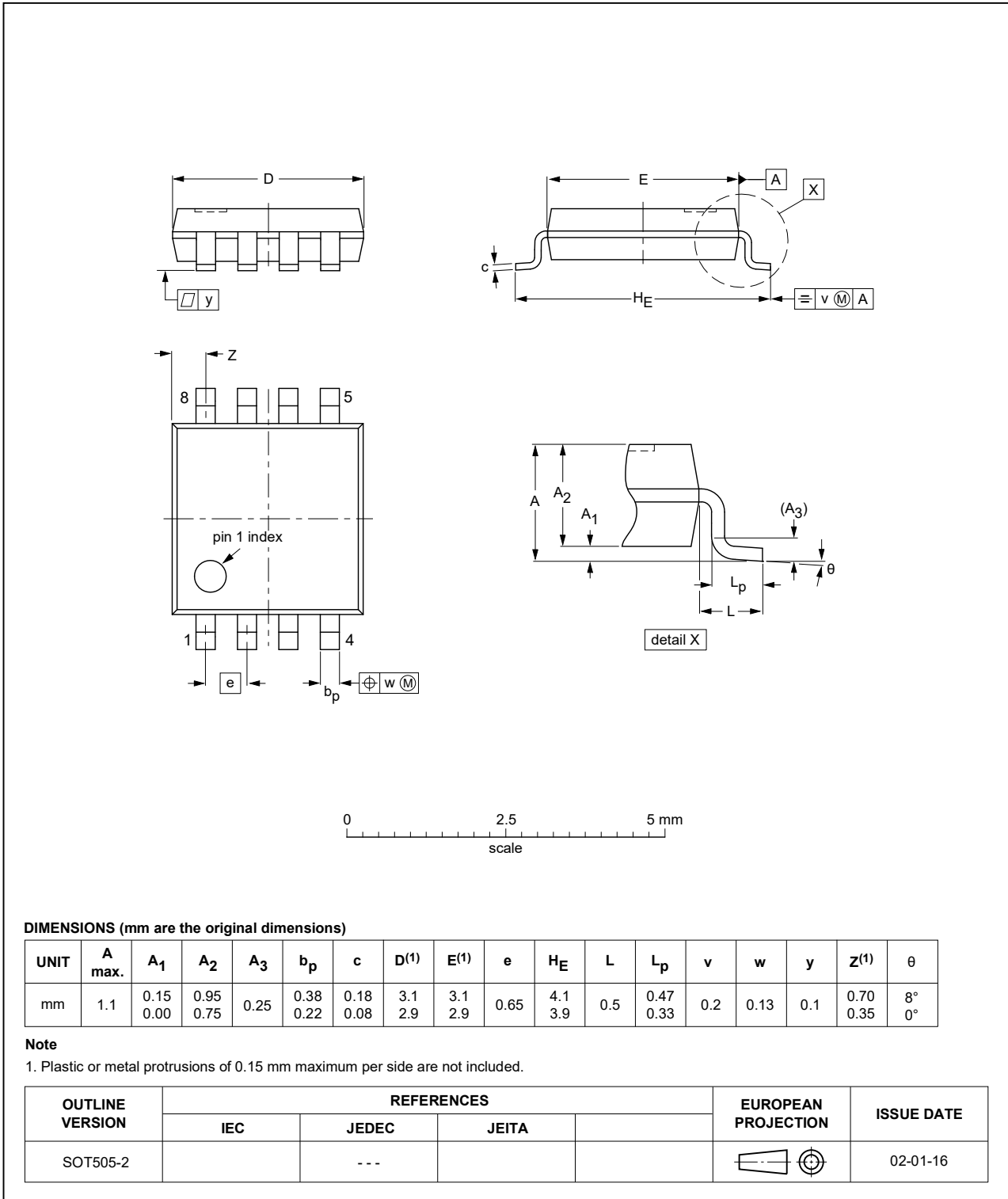


Fig. 6. Package outline SOT505-2 (TSSOP8)

VSSOP8: plastic very thin shrink small outline package; 8 leads; body width 2.3 mm

SOT765-1



Fig. 7. Package outline SOT765-1 (VSSOP8)

XSON8: plastic extremely thin small outline package; no leads; 8 terminals; body 1 x 1.95 x 0.5 mm

SOT833-1



Fig. 8. Package outline SOT833-1 (XSON8)

XSON8: extremely thin small outline package; no leads;
8 terminals; body 1.2 x 1.0 x 0.35 mm

SOT1116



Fig. 9. Package outline SOT1116 (XSON8)

XSON8: extremely thin small outline package; no leads;
8 terminals; body 1.35 x 1.0 x 0.35 mm

SOT1203



Fig. 10. Package outline SOT1203 (XSON8)

13. Abbreviations

Table 11. Abbreviations

| Acronym | Description |
|---------|---|
| CDM | Charged Device Model |
| CMOS | Complementary Metal-Oxide Semiconductor |
| DUT | Device Under Test |
| ESD | ElectroStatic Discharge |
| HBM | Human Body Model |
| TTL | Transistor-Transistor Logic |

14. Revision history

Table 12. Revision history

| Document ID | Release date | Data sheet status | Change notice | Supersedes |
|-----------------|---|-----------------------|---------------|-----------------|
| 74LVC2G240 v.14 | 20240430 | Product data sheet | - | 74LVC2G240 v.13 |
| Modifications: | <ul style="list-style-type: none"> Type number 74LVC2G240GF (SOT1089/XSON8) removed. | | | |
| 74LVC2G240 v.13 | 20230821 | Product data sheet | - | 74LVC2G240 v.12 |
| Modifications: | <ul style="list-style-type: none"> Section 2: ESD specification updated according to the latest JEDEC standard. | | | |
| 74LVC2G240 v.12 | 20230601 | Product data sheet | - | 74LVC2G240 v.11 |
| Modifications: | <ul style="list-style-type: none"> Section 6.1 updated in line with 74LVC2G240_Q100. | | | |
| 74LVC2G240 v.11 | 20190730 | Product data sheet | - | 74LVC2G240 v.10 |
| Modifications: | <ul style="list-style-type: none"> Type number 74LVC2G240GM (SOT902-2/XQFN8) removed. Table 5: Derating values for P_{tot} total power dissipation updated. | | | |
| 74LVC2G240 v.10 | 20181101 | Product data sheet | - | 74LVC2G240 v.9 |
| Modifications: | <ul style="list-style-type: none"> The format of this data sheet has been redesigned to comply with the identity guidelines of Nexperia. Legal texts have been adapted to the new company name where appropriate. Type number 74LVC2G240GD (SOT996-2) removed. | | | |
| 74LVC2G240 v.9 | 20161215 | Product data sheet | - | 74LVC2G240 v.8 |
| Modifications: | <ul style="list-style-type: none"> Table 7: The maximum limits for leakage current and supply current have changed. | | | |
| 74LVC2G240 v.8 | 20130408 | Product data sheet | - | 74LVC2G240 v.7 |
| Modifications: | <ul style="list-style-type: none"> For type number 74LVC2G240GD XSON8U has changed to XSON8. | | | |
| 74LVC2G240 v.7 | 20120622 | Product data sheet | - | 74LVC2G240 v.6 |
| Modifications: | <ul style="list-style-type: none"> For type number 74LVC2G240GM the SOT code has changed to SOT902-2. | | | |
| 74LVC2G240 v.6 | 20111128 | Product data sheet | - | 74LVC2G240 v.5 |
| Modifications: | <ul style="list-style-type: none"> Legal pages updated. | | | |
| 74LVC2G240 v.5 | 20100915 | Product data sheet | - | 74LVC2G240 v.4 |
| 74LVC2G240 v.4 | 20080229 | Product data sheet | - | 74LVC2G240 v.3 |
| 74LVC2G240 v.3 | 20071005 | Product data sheet | - | 74LVC2G240 v.2 |
| 74LVC2G240 v.2 | 20060728 | Product data sheet | - | 74LVC2G240 v.1 |
| 74LVC2G240 v.1 | 20030311 | Product specification | - | - |

15. 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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