

74LVC2G125

Dual bus buffer/line driver; 3-state

Rev. 09 — 26 February 2008

Product data sheet

1. General description

The 74LVC2G125 provides a dual non-inverting buffer/line driver with 3-state output. The 3-state output is controlled by the output enable input (pin $\overline{\text{OE}}$). A HIGH-level at pin $\overline{\text{OE}}$ causes the output 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 these devices as translators in a mixed 3.3 V and 5 V environment.

This device 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

- 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
- 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 EIA/JESD22-A114E exceeds 2000 V
 - ◆ MM EIA/JESD22-A115-A exceeds 200 V
- ± 24 mA output drive ($V_{\text{CC}} = 3.0$ V)
- CMOS low-power consumption
- Latch-up performance exceeds 250 mA
- Direct interface with TTL levels
- Inputs accept voltages up to 5 V
- Multiple package options
- Specified from -40 °C to $+85$ °C and -40 °C to $+125$ °C

3. Ordering information

Table 1. Ordering information

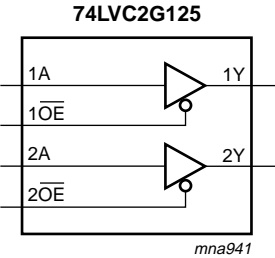
| Type number | Package | | | |
|--------------|-------------------|--------|--|----------|
| | Temperature range | Name | Description | Version |
| 74LVC2G125DP | -40 °C to +125 °C | TSSOP8 | plastic thin shrink small outline package; 8 leads; body width 3 mm; lead length 0.5 mm | SOT505-2 |
| 74LVC2G125DC | -40 °C to +125 °C | VSSOP8 | plastic very thin shrink small outline package; 8 leads; body width 2.3 mm | SOT765-1 |
| 74LVC2G125GT | -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 |
| 74LVC2G125GM | -40 °C to +125 °C | XQFN8U | plastic extremely thin quad flat package; no leads; 8 terminals; UTLP based; body 1.6 × 1.6 × 0.5 mm | SOT902-1 |

4. Marking

Table 2. Marking codes

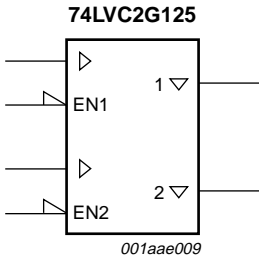
| Type number | Marking code |
|--------------|--------------|
| 74LVC2G125DP | V25 |
| 74LVC2G125DC | V25 |
| 74LVC2G125GT | V25 |
| 74LVC2G125GM | V25 |

5. Functional diagram



74LVC2G125

mna941



74LVC2G125

001aae009

Fig 1. Logic symbol

Fig 2. IEC logic symbol

6. Pinning information

6.1 Pinning

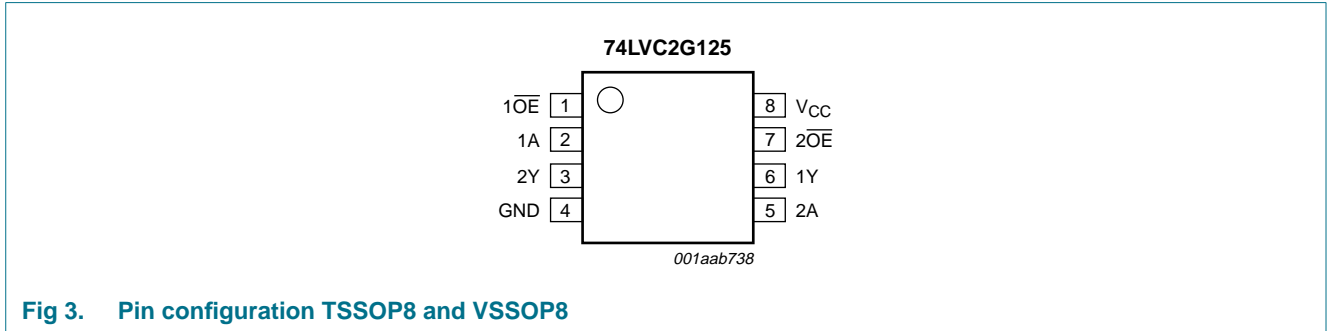


Fig 3. Pin configuration TSSOP8 and VSSOP8

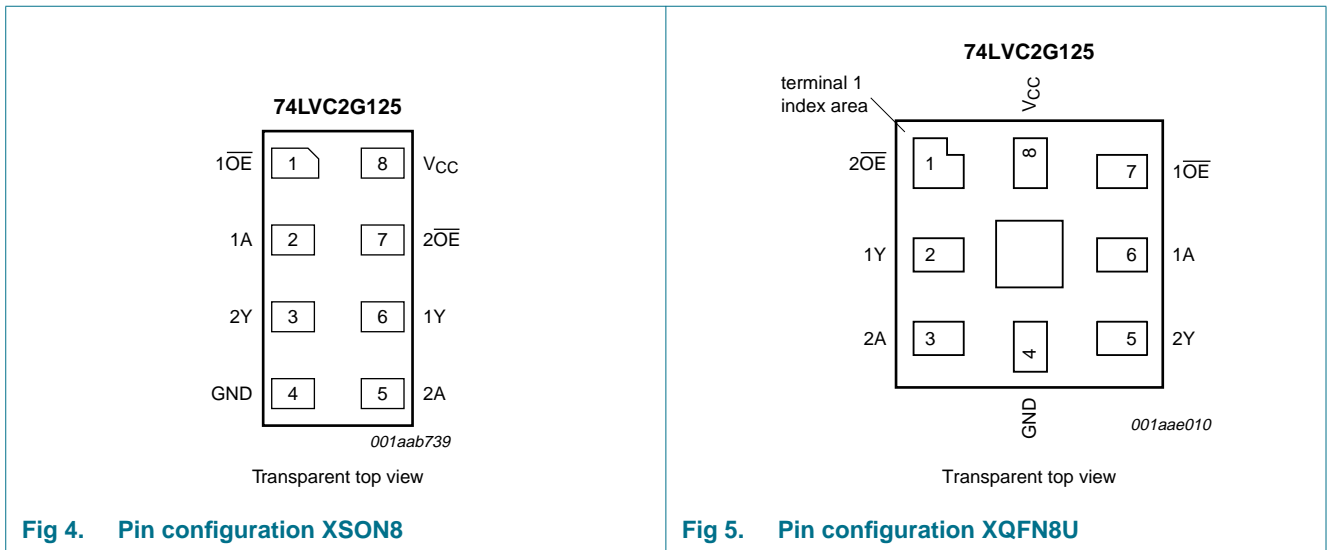


Fig 4. Pin configuration XSON8

Fig 5. Pin configuration XQFN8U

6.2 Pin description

Table 3. Pin description

| Symbol | Pin | | | Description |
|--------|----------------|-------|--------|----------------------------------|
| | TSSOP8; VSSOP8 | XSON8 | XQFN8U | |
| 1OE | 1 | 1 | 7 | output enable input (active LOW) |
| 1A | 2 | 2 | 6 | data input |
| 2Y | 3 | 3 | 5 | data output |
| GND | 4 | 4 | 4 | ground (0 V) |
| 2A | 5 | 5 | 3 | data input |
| 1Y | 6 | 6 | 2 | data output |
| 2OE | 7 | 7 | 1 | output enable input (active LOW) |
| VCC | 8 | 8 | 8 | supply voltage |

7. Functional description

Table 4. Function table^[1]

| Control | Input | Output |
|-------------------------|------------------------|-------------|
| $\overline{\text{nOE}}$ | $\overline{\text{nA}}$ | nY |
| L | L | L |
| | H | H |
| H | X | 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 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 | [1][2] -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 | - | 300 | mW |

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

[2] When $V_{CC} = 0$ V (Power-down mode), the output voltage can be 5.5 V in normal operation.

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 | Min | Typ | Max | Unit |
|--|---------------------------|---|----------------|-----------|--------------|---------------|
| $T_{amb} = -40\text{ °C to }+85\text{ °C}$ | | | | | | |
| V_{IH} | HIGH-level input voltage | $V_{CC} = 1.65\text{ V to }1.95\text{ V}$ | $0.65V_{CC}$ | - | - | V |
| | | $V_{CC} = 2.3\text{ V to }2.7\text{ V}$ | 1.7 | - | - | V |
| | | $V_{CC} = 2.7\text{ V to }3.6\text{ V}$ | 2.0 | - | - | V |
| | | $V_{CC} = 4.5\text{ V to }5.5\text{ V}$ | $0.7V_{CC}$ | - | - | V |
| V_{IL} | LOW-level input voltage | $V_{CC} = 1.65\text{ V to }1.95\text{ V}$ | - | - | $0.35V_{CC}$ | V |
| | | $V_{CC} = 2.3\text{ V to }2.7\text{ V}$ | - | - | 0.7 | V |
| | | $V_{CC} = 2.7\text{ V to }3.6\text{ V}$ | - | - | 0.8 | V |
| | | $V_{CC} = 4.5\text{ V to }5.5\text{ V}$ | - | - | $0.3V_{CC}$ | V |
| V_{OL} | LOW-level output voltage | $V_I = V_{IH}\text{ or }V_{IL}$ | | | | |
| | | $I_O = 100\text{ }\mu\text{A}; V_{CC} = 1.65\text{ V to }5.5\text{ V}$ | - | - | 0.1 | V |
| | | $I_O = 4\text{ mA}; V_{CC} = 1.65\text{ V}$ | - | - | 0.45 | V |
| | | $I_O = 8\text{ mA}; V_{CC} = 2.3\text{ V}$ | - | - | 0.3 | V |
| | | $I_O = 12\text{ mA}; V_{CC} = 2.7\text{ V}$ | - | - | 0.4 | V |
| | | $I_O = 24\text{ mA}; V_{CC} = 3.0\text{ V}$ | - | - | 0.55 | V |
| | | $I_O = 32\text{ mA}; V_{CC} = 4.5\text{ V}$ | - | - | 0.55 | V |
| V_{OH} | HIGH-level output voltage | $V_I = V_{IH}\text{ or }V_{IL}$ | | | | |
| | | $I_O = -100\text{ }\mu\text{A}; V_{CC} = 1.65\text{ V to }5.5\text{ V}$ | $V_{CC} - 0.1$ | - | - | V |
| | | $I_O = -4\text{ mA}; V_{CC} = 1.65\text{ V}$ | 1.2 | - | - | V |
| | | $I_O = -8\text{ mA}; V_{CC} = 2.3\text{ V}$ | 1.9 | - | - | V |
| | | $I_O = -12\text{ mA}; V_{CC} = 2.7\text{ V}$ | 2.2 | - | - | V |
| | | $I_O = -24\text{ mA}; V_{CC} = 3.0\text{ V}$ | 2.3 | - | - | V |
| | | $I_O = -32\text{ mA}; V_{CC} = 4.5\text{ V}$ | 3.8 | - | - | V |
| I_I | input leakage current | $V_I = 5.5\text{ V or GND}; V_{CC} = 0\text{ V to }5.5\text{ V}$ | - | ± 0.1 | ± 5 | μA |
| I_{OZ} | OFF-state output current | $V_I = V_{IH}\text{ or }V_{IL}; V_O = 5.5\text{ V or GND}; V_{CC} = 3.6\text{ V}$ | - | ± 0.1 | ± 10 | μA |
| I_{OFF} | power-off leakage current | $V_I\text{ or }V_O = 5.5\text{ V}; V_{CC} = 0\text{ V}$ | - | ± 0.1 | ± 10 | μA |
| I_{CC} | supply current | $V_I = 5.5\text{ V or GND}; V_{CC} = 1.65\text{ V to }5.5\text{ V}; I_O = 0\text{ A}$ | - | 0.1 | 10 | μA |
| ΔI_{CC} | additional supply current | per pin; $V_I = V_{CC} - 0.6\text{ V}; I_O = 0\text{ A}; V_{CC} = 2.3\text{ V to }5.5\text{ V}$ | - | 5 | 500 | μA |
| C_i | input capacitance | | - | 2 | - | 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} = 1.65 V to 1.95 V | 0.65V _{CC} | - | - | V |
| | | V _{CC} = 2.3 V to 2.7 V | 1.7 | - | - | V |
| | | V _{CC} = 2.7 V to 3.6 V | 2.0 | - | - | V |
| | | V _{CC} = 4.5 V to 5.5 V | 0.7V _{CC} | - | - | V |
| V _{IL} | LOW-level input voltage | V _{CC} = 1.65 V to 1.95 V | - | - | 0.35V _{CC} | V |
| | | V _{CC} = 2.3 V to 2.7 V | - | - | 0.7 | V |
| | | V _{CC} = 2.7 V to 3.6 V | - | - | 0.8 | V |
| | | V _{CC} = 4.5 V to 5.5 V | - | - | 0.3V _{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 | V |
| | | I _O = 4 mA; V _{CC} = 1.65 V | - | - | 0.70 | V |
| | | I _O = 8 mA; V _{CC} = 2.3 V | - | - | 0.45 | V |
| | | I _O = 12 mA; V _{CC} = 2.7 V | - | - | 0.60 | V |
| | | I _O = 24 mA; V _{CC} = 3.0 V | - | - | 0.80 | V |
| | | I _O = 32 mA; V _{CC} = 4.5 V | - | - | 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 |
| | | I _O = -4 mA; V _{CC} = 1.65 V | 0.95 | - | - | V |
| | | I _O = -8 mA; V _{CC} = 2.3 V | 1.7 | - | - | V |
| | | I _O = -12 mA; V _{CC} = 2.7 V | 1.9 | - | - | V |
| | | I _O = -24 mA; V _{CC} = 3.0 V | 2.0 | - | - | V |
| | | I _O = -32 mA; V _{CC} = 4.5 V | 3.4 | - | - | V |
| I _I | input leakage current | V _I = 5.5 V or GND; V _{CC} = 0 V to 5.5 V | - | - | ±20 | 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 | - | - | ±20 | μA |
| I _{OFF} | power-off leakage current | V _I or V _O = 5.5 V; V _{CC} = 0 V | - | - | ±20 | μA |
| I _{CC} | supply current | V _I = 5.5 V or GND; V _{CC} = 1.65 V to 5.5 V; I _O = 0 A | - | - | 40 | 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 | mA |

[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 [Figure 8](#).

| Symbol | Parameter | Conditions | -40 °C to +85 °C | | | -40 °C to +125 °C | | Unit |
|------------------|-------------------------------|--|------------------|--------------------|------|-------------------|------|------|
| | | | Min | Typ ^[1] | Max | Min | Max | |
| t _{pd} | propagation delay | nA to nY; see Figure 6 ^[2] | | | | | | |
| | | V _{CC} = 1.65 V to 1.95 V | 1.0 | 3.7 | 9.1 | 1.0 | 11.4 | ns |
| | | V _{CC} = 2.3 V to 2.7 V | 0.5 | 2.5 | 4.8 | 0.5 | 6.0 | ns |
| | | V _{CC} = 2.7 V | 1.0 | 2.7 | 4.8 | 1.0 | 6.0 | ns |
| | | V _{CC} = 3.0 V to 3.6 V | 0.5 | 2.3 | 4.3 | 0.5 | 5.5 | ns |
| | | V _{CC} = 4.5 V to 5.5 V | 0.5 | 1.9 | 3.7 | 0.5 | 4.6 | ns |
| t _{en} | enable time | nOE to nY; see Figure 7 ^[3] | | | | | | |
| | | V _{CC} = 1.65 V to 1.95 V | 1.5 | 4.3 | 9.9 | 1.5 | 12.4 | ns |
| | | V _{CC} = 2.3 V to 2.7 V | 1.0 | 2.8 | 5.6 | 1.0 | 7.0 | ns |
| | | V _{CC} = 2.7 V | 1.5 | 3.3 | 5.7 | 1.5 | 7.1 | ns |
| | | V _{CC} = 3.0 V to 3.6 V | 0.5 | 2.4 | 4.7 | 0.5 | 5.9 | ns |
| | | V _{CC} = 4.5 V to 5.5 V | 0.5 | 2.0 | 3.8 | 0.5 | 4.8 | ns |
| t _{dis} | disable time | nOE to nY; see Figure 7 ^[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 | 1.8 | 5.8 | 0.5 | 7.6 | ns |
| | | V _{CC} = 2.7 V | 1.0 | 2.7 | 4.8 | 1.0 | 6.2 | ns |
| | | V _{CC} = 3.0 V to 3.6 V | 1.0 | 2.7 | 4.6 | 1.0 | 5.9 | ns |
| | | V _{CC} = 4.5 V to 5.5 V | 0.5 | 1.8 | 3.4 | 0.5 | 4.6 | 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 μW).

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

f_i = input frequency in MHz;

f_o = output frequency in MHz;

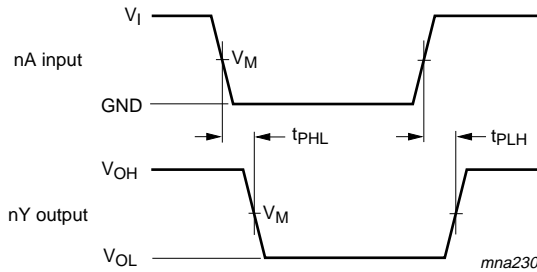
C_L = output load capacitance in pF;

V_{CC} = supply voltage in V;

N = number of inputs switching;

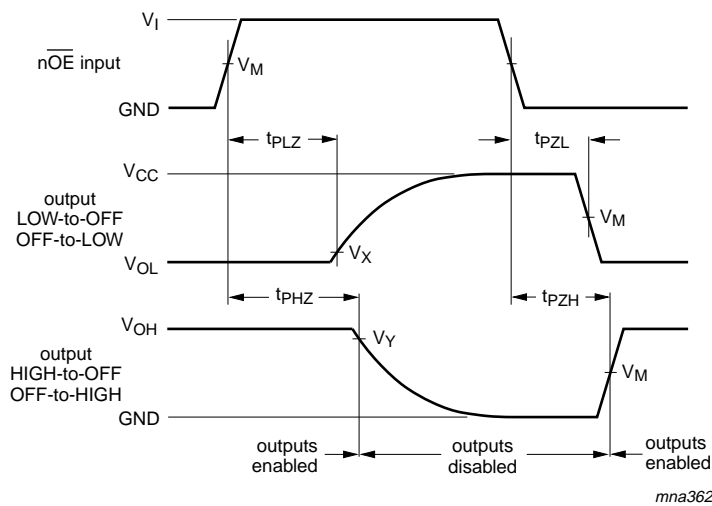
Σ(C_L × V_{CC}² × f_o) = sum of outputs.

12. Waveforms



Measurement points are given in [Table 9](#).
 Logic levels: V_{OL} and V_{OH} are typical output voltage levels that occur with the output load.

Fig 6. Propagation delay input (nA) to output (nY)

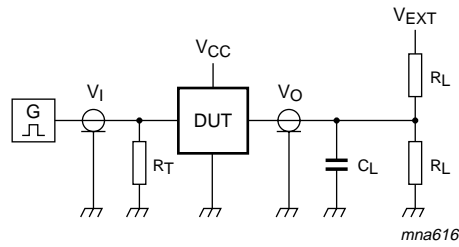


Measurement points are given in [Table 9](#).
 Logic levels: V_{OL} and V_{OH} are typical output voltage levels that occur with the output load.

Fig 7. 3-state output enable and disable times

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

C_L = Load capacitance including jig and probe capacitance.

R_L = Load resistance.

V_{EXT} = Test voltage for switching times.

Fig 8. Load circuitry for switching times

Table 10. Test data

| Supply voltage V_{CC} | Input | | Load | | V_{EXT} | | |
|----------------------------|----------|---------------|-------|--------------|--------------------|--------------------|--------------------|
| | V_I | t_r, t_f | 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} | ≤ 2.0 ns | 30 pF | 1 k Ω | open | GND | $2V_{CC}$ |
| 2.3 V to 2.7 V | V_{CC} | ≤ 2.0 ns | 30 pF | 500 Ω | open | GND | $2V_{CC}$ |
| 2.7 V | 2.7 V | ≤ 2.5 ns | 50 pF | 500 Ω | open | GND | 6 V |
| 3.0 V to 3.6 V | 2.7 V | ≤ 2.5 ns | 50 pF | 500 Ω | open | GND | 6 V |
| 4.5 V to 5.5 V | V_{CC} | ≤ 2.5 ns | 50 pF | 500 Ω | open | GND | $2V_{CC}$ |

13. Package outline

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

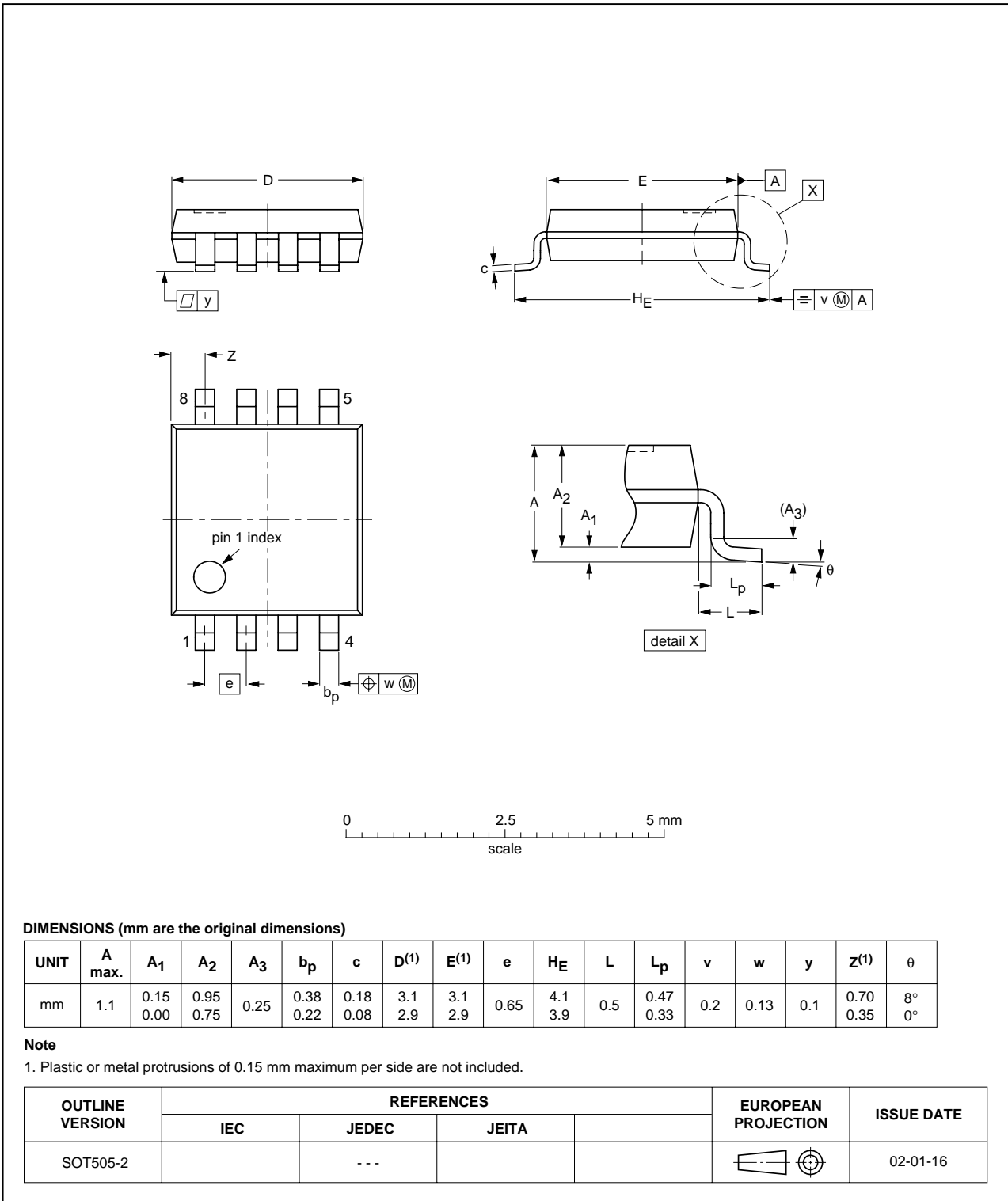


Fig 9. Package outline SOT502-2 (TSSOP8)

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

SOT765-1

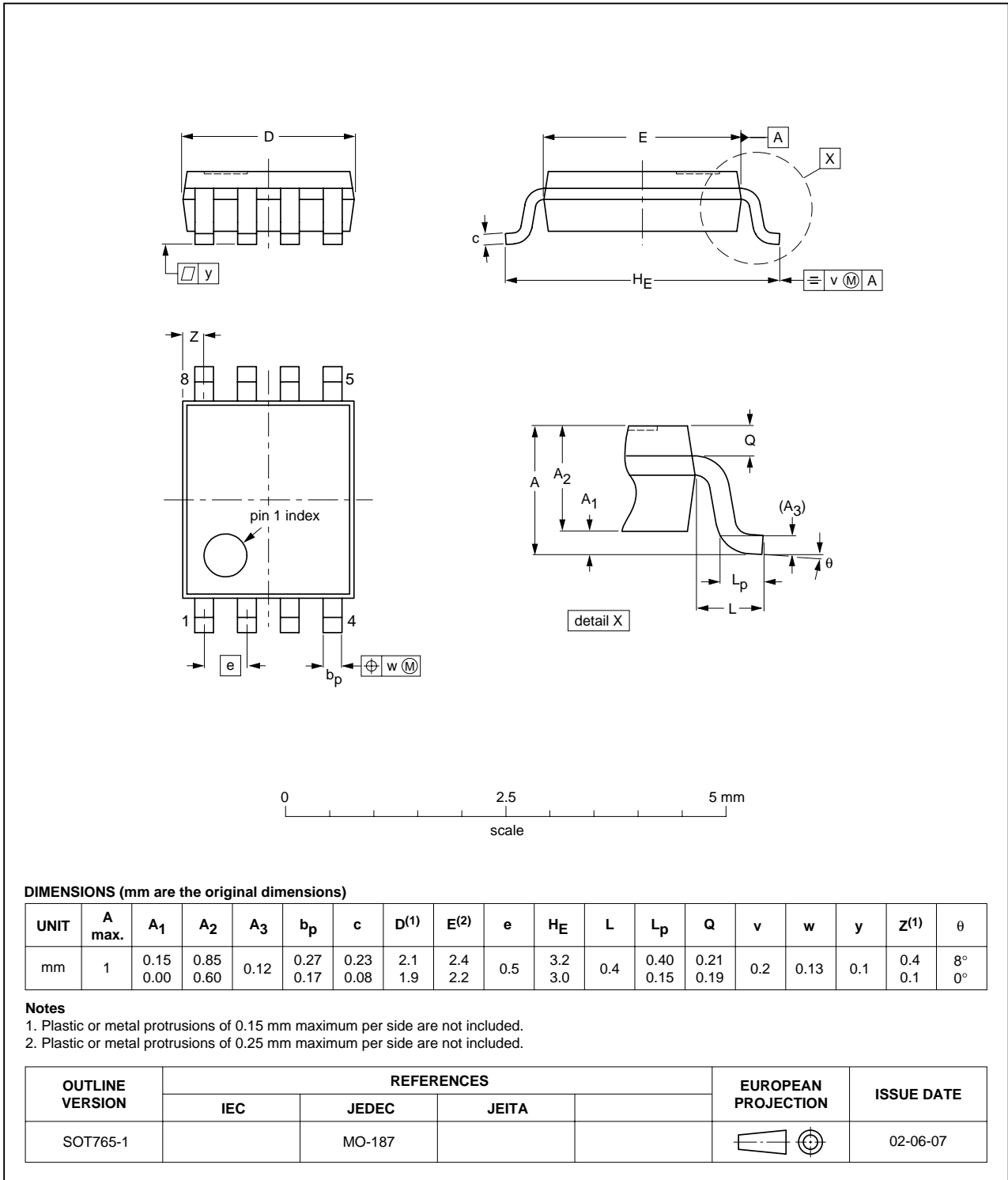


Fig 10. Package outline SOT765-1 (VSSOP8)

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

SOT833-1

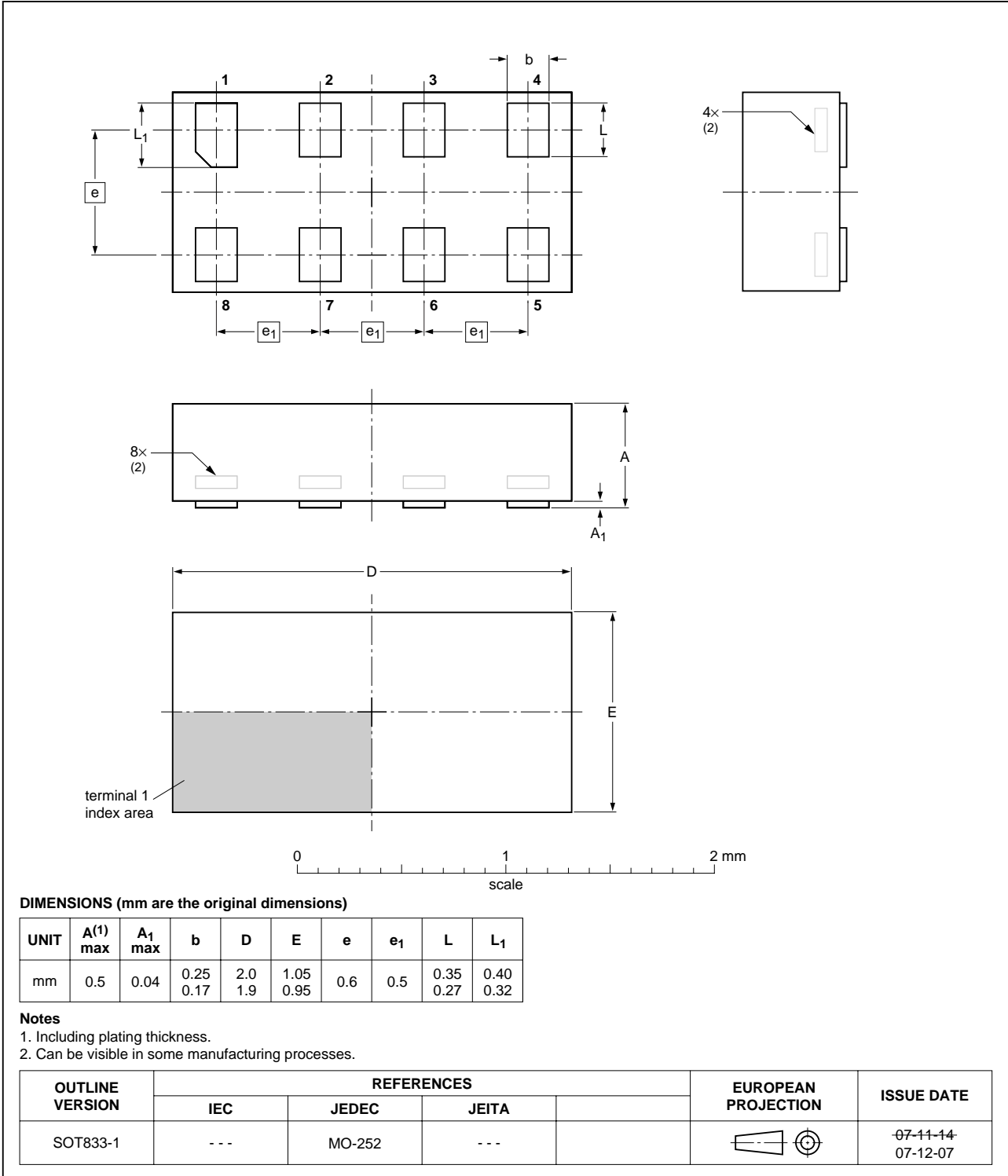


Fig 11. Package outline SOT833-1 (XSON8)

XQFN8U: plastic extremely thin quad flat package; no leads; 8 terminals; UTLP based; body 1.6 x 1.6 x 0.5 mm

SOT902-1



Fig 12. Package outline SOT902-1 (XQFN8U)

14. Abbreviations

Table 11. Abbreviations

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

15. Revision history

Table 12. Revision history

| Document ID | Release date | Data sheet status | Change notice | Supersedes |
|----------------|---|-----------------------|---------------|--------------|
| 74LVC2G125_9 | 20080226 | Product data sheet | - | 74LVC2G125_8 |
| Modifications: | <ul style="list-style-type: none"> • Figure 1 and Figure 2: pin numbers removed from logic symbols • Figure 12: package outline drawing updated to latest version | | | |
| 74LVC2G125_8 | 20070907 | Product data sheet | - | 74LVC2G125_7 |
| 74LVC2G125_7 | 20060523 | Product data sheet | - | 74LVC2G125_6 |
| 74LVC2G125_6 | 20051223 | Product data sheet | - | 74LVC2G125_5 |
| 74LVC2G125_5 | 20050201 | Product specification | - | 74LVC2G125_4 |
| 74LVC2G125_4 | 20040922 | Product specification | - | 74LVC2G125_3 |
| 74LVC2G125_3 | 20040109 | Product specification | - | 74LVC2G125_2 |
| 74LVC2G125_2 | 20030901 | Product specification | - | 74LVC2G125_1 |
| 74LVC2G125_1 | 20030310 | Product specification | - | - |

16. Legal information

16.1 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. |
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