

74LVC1G17-Q100

Single Schmitt trigger buffer

Rev. 6 — 15 August 2023

Product data sheet

1. General description

The 74LVC1G17-Q100 is a single buffer Schmitt-trigger. Inputs can be driven from either 3.3 V or 5 V devices. This feature allows the use of these devices as translators in mixed 3.3 V and 5 V environments. This device is fully specified for partial power down applications using I_{OFF} . The I_{OFF} circuitry disables the output, preventing the potentially damaging backflow current through the device when it is powered down.

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
- Wide supply voltage range from 1.65 V to 5.5 V
- Overvoltage tolerant inputs to 5.5 V
- High noise immunity
- CMOS low power dissipation
- I_{OFF} circuitry provides partial Power-down mode operation
- ± 24 mA output drive ($V_{CC} = 3.0$ V)
- Latch-up performance exceeds 250 mA
- Direct interface with TTL levels
- Unlimited rise and fall times
- Complies with JEDEC standard:
 - JESD8-7 (1.65 V to 1.95 V)
 - JESD8-5 (2.3 V to 2.7 V)
 - JESD8C (2.7 V to 3.6 V)
 - JESD36 (4.5 V to 5.5 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

3. Ordering information

Table 1. Ordering information

| Type number | Package | | | |
|----------------------------------|-------------------|--------|---|--------------------------|
| | Temperature range | Name | Description | Version |
| 74LVC1G17GW-Q100 | -40 °C to +125 °C | TSSOP5 | plastic thin shrink small outline package; 5 leads; body width 1.25 mm | SOT353-1 |
| 74LVC1G17GV-Q100 | -40 °C to +125 °C | SC-74A | plastic surface-mounted package; 5 leads | SOT753 |
| 74LVC1G17GM-Q100 | -40 °C to +125 °C | XSON6 | plastic extremely thin small outline package; no leads; 6 terminals; body 1 × 1.45 × 0.5 mm | SOT886 |

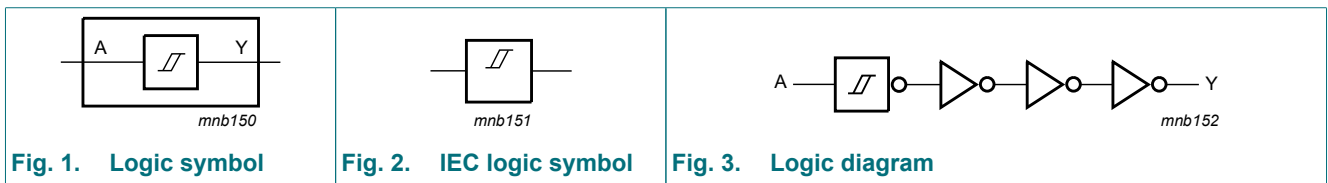
4. Marking

Table 2. Marking codes

| Type number | Marking ^[1] |
|------------------|------------------------|
| 74LVC1G17GW-Q100 | VJ |
| 74LVC1G17GV-Q100 | V17 |
| 74LVC1G17GM-Q100 | VJ |

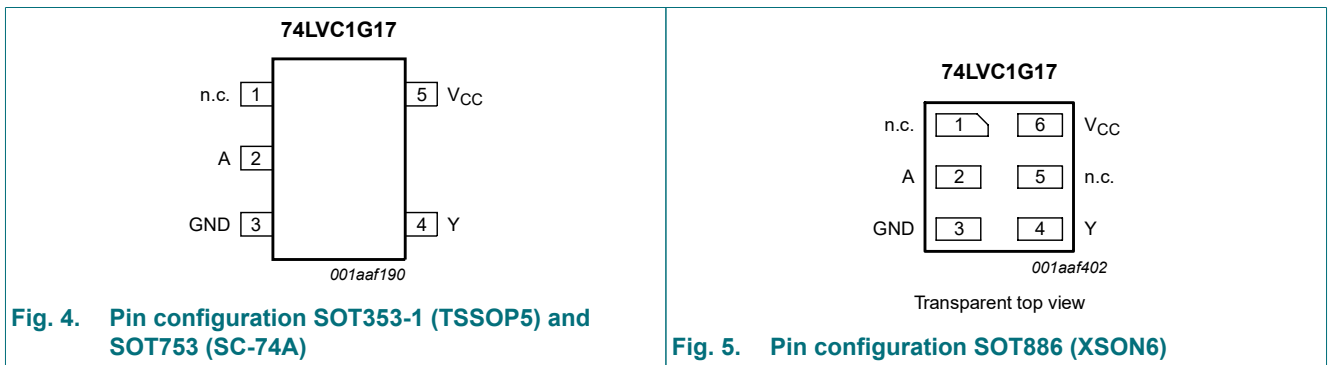
[1] The pin 1 indicator is located on the lower left corner of the device, below the marking code.

5. Functional diagram



6. Pinning information

6.1. Pinning



6.2. Pin description

Table 3. Pin description

| Symbol | Pin | | Description |
|-----------------|-------------------|-------|----------------|
| | TSSOP5 and SC-74A | XSON6 | |
| n.c. | 1 | 1, 5 | not connected |
| A | 2 | 2 | data input |
| GND | 3 | 3 | ground (0 V) |
| Y | 4 | 4 | data output |
| V _{CC} | 5 | 6 | supply voltage |

7. Functional description

Table 4. Function table

H = HIGH voltage level; L = LOW voltage level.

| Input | Output |
|-------|--------|
| A | Y |
| L | L |
| H | H |

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 | Active mode [1] | -0.5 | $V_{CC} + 0.5$ | 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 | | | |
| | | SOT353-1 (TSSOP5) [2] | - | 250 | mW |
| | | SOT753 (SC-74A) [3] | - | 250 | mW |
| | | SOT886 (XSON6) [4] | - | 250 | mW |

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

[2] For SOT353-1 (TSSOP5) package: P_{tot} derates linearly with 3.3 mW/K above 74 °C.

[3] For SOT753 (SC-74A) package: P_{tot} derates linearly with 3.8 mW/K above 85 °C.

[4] For SOT886 (XSON6) package: P_{tot} derates linearly with 3.3 mW/K above 74 °C.

9. Recommended operating conditions

Table 6. Recommended operating conditions

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|-----------|---------------------|---------------------------------|------|-----|----------|------|
| V_{CC} | supply voltage | | 1.65 | - | 5.5 | V |
| V_I | input voltage | | 0 | - | 5.5 | V |
| V_O | output voltage | Active mode | 0 | - | V_{CC} | V |
| | | Power-down mode; $V_{CC} = 0$ V | 0 | - | 5.5 | V |
| T_{amb} | ambient temperature | | -40 | - | +125 | °C |

10. Static characteristics

Table 7. Static characteristics

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

| Symbol | Parameter | Conditions | Min | Typ[1] | Max | Unit |
|--|---------------------------|--|-----------------------|--------|------|------|
| T_{amb} = -40 °C to +85 °C | | | | | | |
| V _{OH} | HIGH-level output voltage | V _I = V _{T+} or V _{T-} | | | | |
| | | 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 | 1.2 | - | - | V |
| | | I _O = -8 mA; V _{CC} = 2.3 V | 1.9 | - | - | V |
| | | I _O = -12 mA; V _{CC} = 2.7 V | 2.2 | - | - | V |
| | | I _O = -24 mA; V _{CC} = 3.0 V | 2.3 | - | - | V |
| | | I _O = -32 mA; V _{CC} = 4.5 V | 3.8 | - | - | V |
| V _{OL} | LOW-level output voltage | V _I = V _{T+} or V _{T-} | | | | |
| | | 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 | - | - | 0.45 | V |
| | | I _O = 8 mA; V _{CC} = 2.3 V | - | - | 0.3 | 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 _O = 32 mA; V _{CC} = 4.5 V | - | - | 0.55 | V |
| I _I | input leakage current | V _I = 5.5 V or GND; V _{CC} = 0 V to 5.5 V | - | ±0.1 | ±1 | μA |
| I _{OFF} | power-off leakage current | V _I or V _O = 5.5 V; V _{CC} = 0 V | - | ±0.1 | ±2 | 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 | - | 0.1 | 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 | μA |
| C _I | input capacitance | | - | 5 | - | pF |
| T_{amb} = -40 °C to +125 °C | | | | | | |
| V _{OH} | HIGH-level output voltage | V _I = V _{T+} or V _{T-} | | | | |
| | | 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 |
| V _{OL} | LOW-level output voltage | V _I = V _{T+} or V _{T-} | | | | |
| | | 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 | - | - | 0.7 | V |
| | | I _O = 8 mA; V _{CC} = 2.3 V | - | - | 0.45 | V |
| | | I _O = 12 mA; V _{CC} = 2.7 V | - | - | 0.6 | 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 |

| Symbol | Parameter | Conditions | Min | Typ[1] | Max | Unit |
|-----------------|---------------------------|--|-----|--------|---------|---------------|
| I_I | input leakage current | $V_I = 5.5 \text{ V}$ or GND; $V_{CC} = 0 \text{ V}$ to 5.5 V | - | - | ± 1 | μA |
| I_{OFF} | power-off leakage current | V_I or $V_O = 5.5 \text{ V}$; $V_{CC} = 0 \text{ V}$ | - | - | ± 2 | μA |
| I_{CC} | supply current | $V_I = 5.5 \text{ V}$ or GND; $V_{CC} = 1.65 \text{ V}$ to 5.5 V ; $I_O = 0 \text{ A}$ | - | - | 4 | 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 V | - | - | 500 | μA |

[1] All typical values are measured at maximum V_{CC} and $T_{amb} = 25 \text{ }^\circ\text{C}$.

10.1. Transfer characteristics

Table 8. Transfer 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_{T+} | positive-going threshold voltage | see Fig. 6 and Fig. 7 | | | | | | |
| | | $V_{CC} = 1.8 \text{ V}$ | 0.82 | 1.0 | 1.14 | 0.79 | 1.14 | V |
| | | $V_{CC} = 2.3 \text{ V}$ | 1.03 | 1.2 | 1.40 | 1.00 | 1.40 | V |
| | | $V_{CC} = 3.0 \text{ V}$ | 1.29 | 1.5 | 1.71 | 1.26 | 1.71 | V |
| | | $V_{CC} = 4.5 \text{ V}$ | 1.84 | 2.1 | 2.36 | 1.81 | 2.36 | V |
| V_{T-} | negative-going threshold voltage | see Fig. 6 and Fig. 7 | | | | | | |
| | | $V_{CC} = 1.8 \text{ V}$ | 0.46 | 0.6 | 0.75 | 0.46 | 0.78 | V |
| | | $V_{CC} = 2.3 \text{ V}$ | 0.65 | 0.8 | 0.96 | 0.65 | 0.99 | V |
| | | $V_{CC} = 3.0 \text{ V}$ | 0.88 | 1.0 | 1.24 | 0.88 | 1.27 | V |
| | | $V_{CC} = 4.5 \text{ V}$ | 1.32 | 1.5 | 1.84 | 1.32 | 1.87 | V |
| V_H | hysteresis voltage | see Fig. 6 , Fig. 7 and Fig. 8 | | | | | | |
| | | $V_{CC} = 1.8 \text{ V}$ | 0.26 | 0.4 | 0.51 | 0.19 | 0.51 | V |
| | | $V_{CC} = 2.3 \text{ V}$ | 0.28 | 0.4 | 0.57 | 0.22 | 0.57 | V |
| | | $V_{CC} = 3.0 \text{ V}$ | 0.31 | 0.5 | 0.64 | 0.25 | 0.64 | V |
| | | $V_{CC} = 4.5 \text{ V}$ | 0.40 | 0.6 | 0.77 | 0.34 | 0.77 | V |
| | $V_{CC} = 5.5 \text{ V}$ | 0.47 | 0.6 | 0.88 | 0.41 | 0.88 | V | |

[1] All typical values are measured at $T_{amb} = 25 \text{ }^\circ\text{C}$.

10.2. Transfer characteristic waveforms

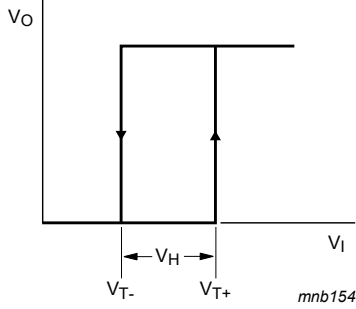


Fig. 6. Transfer characteristic

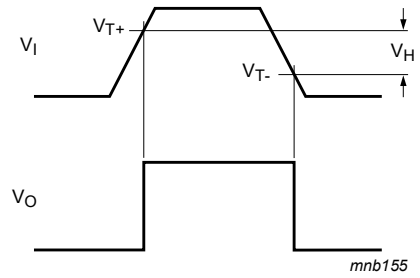
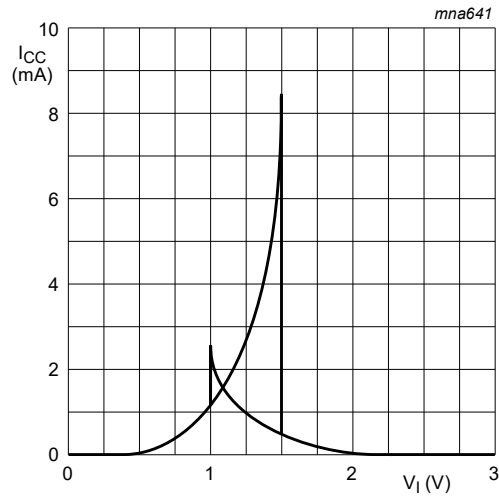


Fig. 7. Definitions of V_{T+} , V_{T-} and V_H



$V_{CC} = 3.0 \text{ V}$

Fig. 8. Typical transfer characteristics

11. Dynamic characteristics

Table 9. Dynamic characteristics

Voltages are referenced to GND (ground = 0 V). For test circuit see Fig. 10.

| Symbol | Parameter | Conditions | -40 °C to +85 °C | | | -40 °C to +125 °C | | Unit |
|-----------------|-------------------------------|--|------------------|--------|------|-------------------|------|------|
| | | | Min | Typ[1] | Max | Min | Max | |
| t _{pd} | propagation delay | A to Y; see Fig. 9 [2] | | | | | | |
| | | V _{CC} = 1.65 V to 1.95 V | 1.0 | 4.1 | 11.0 | 1.0 | 14.0 | ns |
| | | V _{CC} = 2.3 V to 2.7 V | 0.7 | 2.8 | 6.5 | 0.7 | 8.5 | ns |
| | | V _{CC} = 2.7 V | 0.7 | 3.2 | 6.5 | 0.7 | 8.5 | ns |
| | | V _{CC} = 3.0 V to 3.6 V | 0.7 | 3.0 | 5.5 | 0.7 | 7.0 | ns |
| | | V _{CC} = 4.5 V to 5.5 V | 0.7 | 2.2 | 5.0 | 0.7 | 6.5 | ns |
| C _{PD} | power dissipation capacitance | V _I = GND to V _{CC} ; V _{CC} = 3.3 V [3] | - | 16.6 | - | - | - | pF |

[1] Typical values are measured at T_{amb} = 25 °C and V_{CC} = 1.8 V, 2.5 V, 2.7 V, 3.3 V and 5.0 V respectively.

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

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

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

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;

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

11.1. Waveform and test circuit

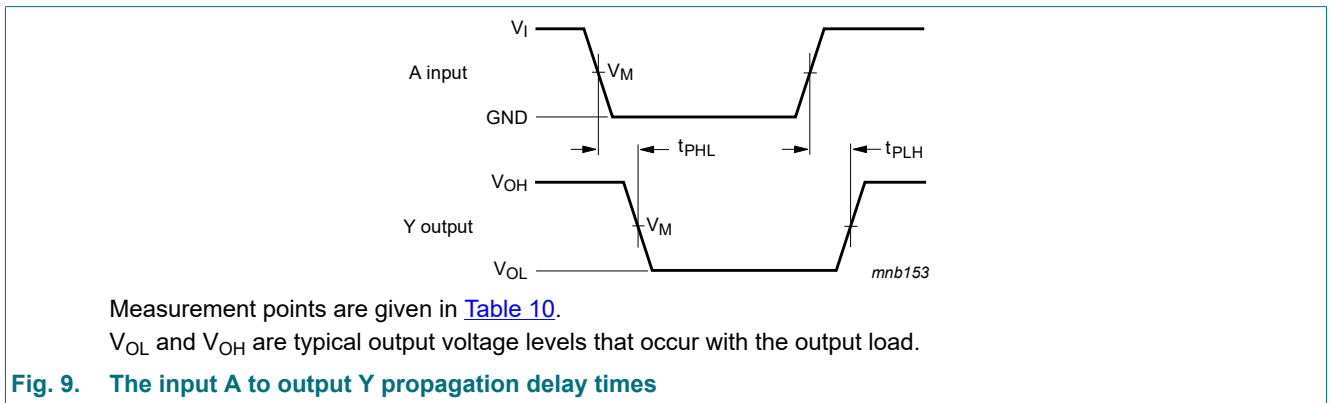
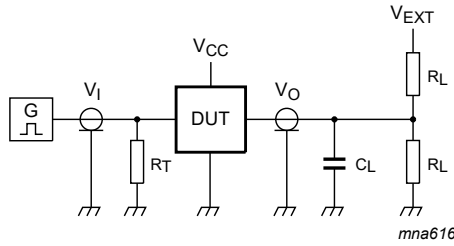


Table 10. Measurement points

| Supply voltage | Input | Output |
|------------------|-----------------------|-----------------------|
| V _{CC} | V _M | V _M |
| 1.65 V to 1.95 V | 0.5 × V _{CC} | 0.5 × V _{CC} |
| 2.3 V to 2.7 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 |
| 4.5 V to 5.5 V | 0.5 × V _{CC} | 0.5 × V _{CC} |



Test data is given in [Table 11](#).

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;

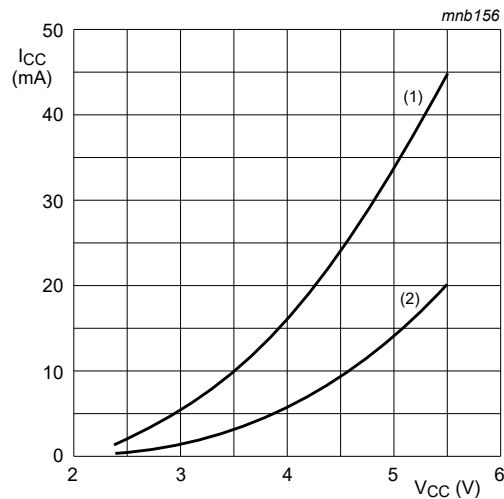
V_{EXT} = External voltage for measuring switching times.

Fig. 10. Test circuit for measuring switching times

Table 11. Test data

| Supply voltage | Input | | Load | | V_{EXT} |
|------------------|----------|---------------|-------|--------------|--------------------|
| V_{CC} | V_I | $t_r = t_f$ | C_L | R_L | t_{PLH}, t_{PHL} |
| 1.65 V to 1.95 V | V_{CC} | ≤ 2.0 ns | 30 pF | 1 k Ω | open |
| 2.3 V to 2.7 V | V_{CC} | ≤ 2.0 ns | 30 pF | 500 Ω | open |
| 2.7 V | 2.7 V | ≤ 2.5 ns | 50 pF | 500 Ω | open |
| 3.0 V to 3.6 V | 2.7 V | ≤ 2.5 ns | 50 pF | 500 Ω | open |
| 4.5 V to 5.5 V | V_{CC} | ≤ 2.5 ns | 50 pF | 500 Ω | open |

12. Application information



Linear change of V_I between 0.8 V to 2.0 V.

(1) Positive-going edge

(2) Negative-going edge

Fig. 11. Average supply current as a function of supply voltage

13. Package outline

TSSOP5: plastic thin shrink small outline package; 5 leads; body width 1.25 mm

SOT353-1

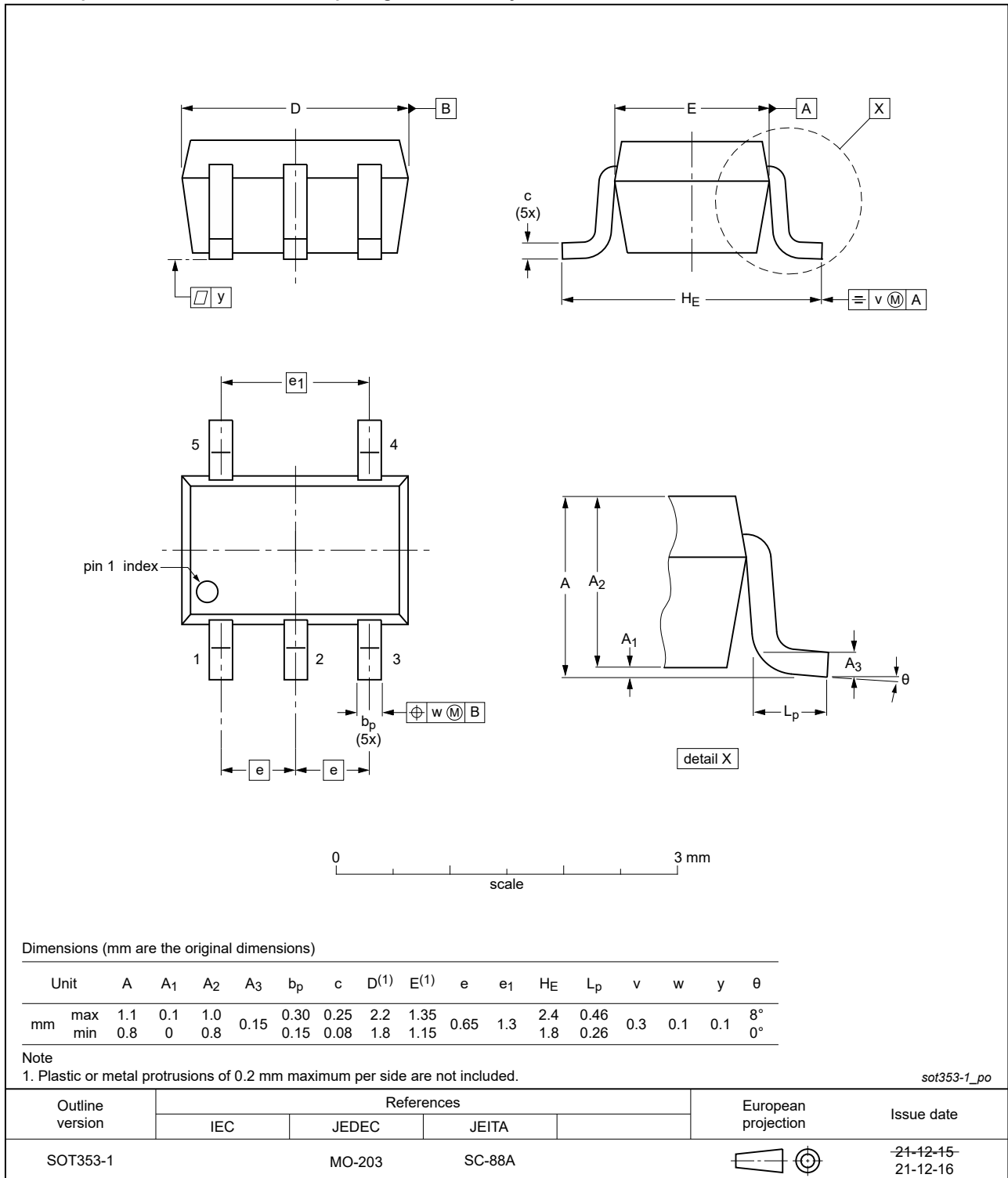


Fig. 12. Package outline SOT353-1 (TSSOP5)

Plastic surface-mounted package; 5 leads

SOT753

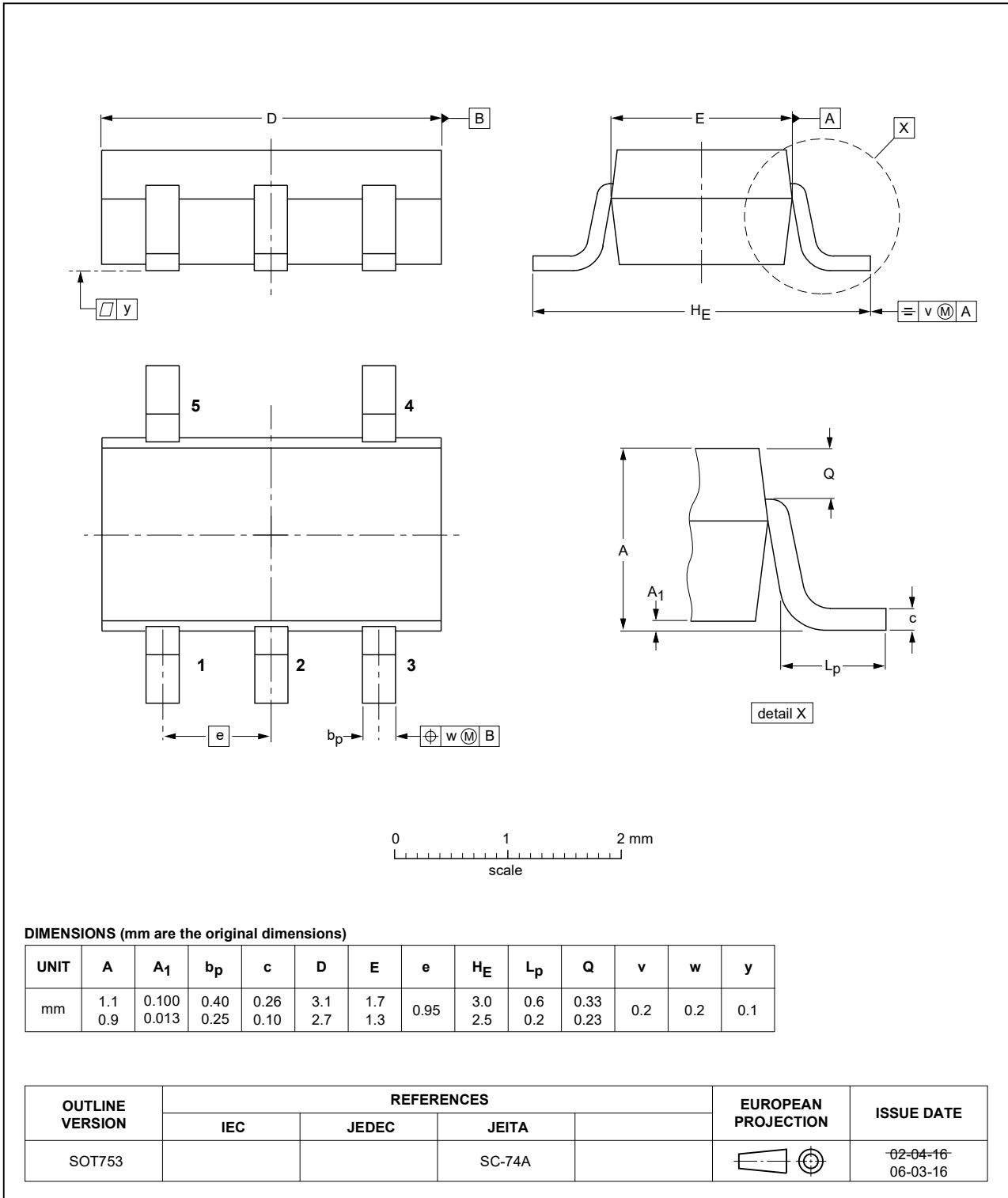


Fig. 13. Package outline SOT753 (SC-74A)

XSON6: plastic extremely thin small outline package; no leads; 6 terminals; body 1 x 1.45 x 0.5 mm

SOT886

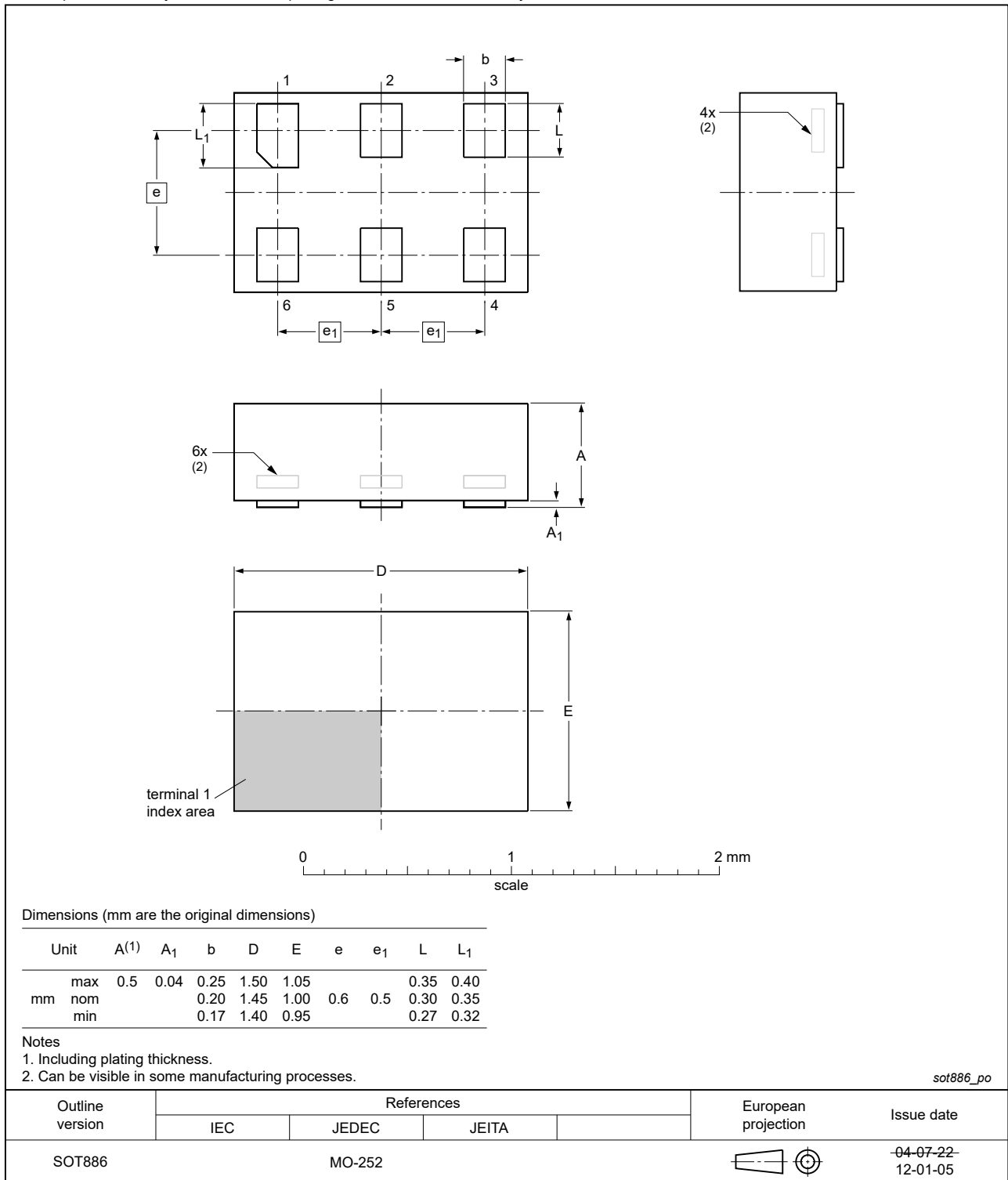


Fig. 14. Package outline SOT886 (XSON6)

14. Abbreviations

Table 12. Abbreviations

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

15. Revision history

Table 13. Revision history

| Document ID | Release date | Data sheet status | Change notice | Supersedes |
|--------------------|---|--------------------|---------------|--------------------|
| 74LVC1G17_Q100 v.6 | 20230815 | Product data sheet | - | 74LVC1G17_Q100 v.5 |
| Modifications: | <ul style="list-style-type: none"> Section 2: ESD specification updated according to the latest JEDEC standard. | | | |
| 74LVC1G17_Q100 v.5 | 20220114 | Product data sheet | - | 74LVC1G17_Q100 v.4 |
| Modifications: | <ul style="list-style-type: none"> Fig. 12: Package outline drawing for SOT353-1 (TSSOP5) has changed. | | | |
| 74LVC1G17_Q100 v.4 | 20210504 | Product data sheet | - | 74LVC1G17_Q100 v.3 |
| Modifications: | <ul style="list-style-type: none"> Section 1 and Section 2 updated. Table 5: Derating values for P_{tot} total power dissipation updated. | | | |
| 74LVC1G17_Q100 v.3 | 20190128 | Product data sheet | - | 74LVC1G17_Q100 v.2 |
| 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 74LVC1G17GM-Q100 (SOT886) added. | | | |
| 74LVC1G17_Q100 v.2 | 20161209 | Product data sheet | - | 74LVC1G17_Q100 v.1 |
| Modifications: | <ul style="list-style-type: none"> Table 7: The maximum limits for leakage current and supply current have changed. | | | |
| 74LVC1G17_Q100 v.1 | 20120709 | Product data sheet | - | - |

16. 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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