

74LVC1G11

Single 3-input AND gate

Rev. 04 — 1 August 2007

Product data sheet

1. General description

The 74LVC1G11 provides a single 3-input AND gate.

The input can be driven from either 3.3 V or 5 V devices. This feature allows the use of this device in a mixed 3.3 V and 5 V environment.

Schmitt-trigger action at all inputs makes the circuit highly tolerant to slower input rise and fall time.

This device is fully specified for partial power-down applications using I_{OFF} .

The I_{OFF} circuitry disables the output, preventing the 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 inputs 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)
- ± 24 mA output drive ($V_{CC} = 3.0$ V)
- ESD protection:
 - ◆ HBM JESD22-A114E exceeds 2000 V
 - ◆ MM JESD22-A115-A exceeds 200 V
- CMOS low power consumption
- Latch-up performance exceeds 250 mA
- Direct interface with TTL levels
- Multiple package options
- Specified from -40 °C to $+85$ °C and -40 °C to $+125$ °C

3. Ordering information

Table 1. Ordering information

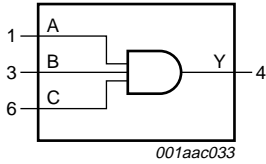
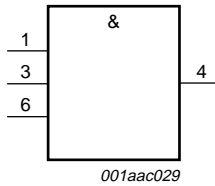
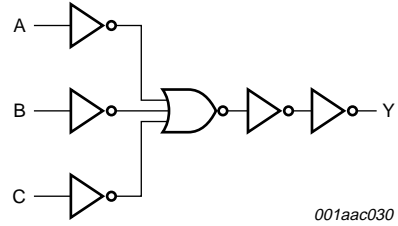
| Type number | Package | | | Version |
|-------------|-------------------|-------|---|---------|
| | Temperature range | Name | Description | |
| 74LVC1G11GW | -40 °C to +125 °C | SC-88 | plastic surface-mounted package; 6 leads | SOT363 |
| 74LVC1G11GV | -40 °C to +125 °C | SC-74 | plastic surface-mounted package (TSOP6); 6 leads | SOT457 |
| 74LVC1G11GM | -40 °C to +125 °C | XSON6 | plastic extremely thin small outline package; no leads; 6 terminals; body 1 × 1.45 × 0.5 mm | SOT886 |
| 74LVC1G11GF | -40 °C to +125 °C | XSON6 | plastic extremely thin small outline package; no leads; 6 terminals; body 1 × 1 × 0.5 mm | SOT891 |

4. Marking

Table 2. Marking

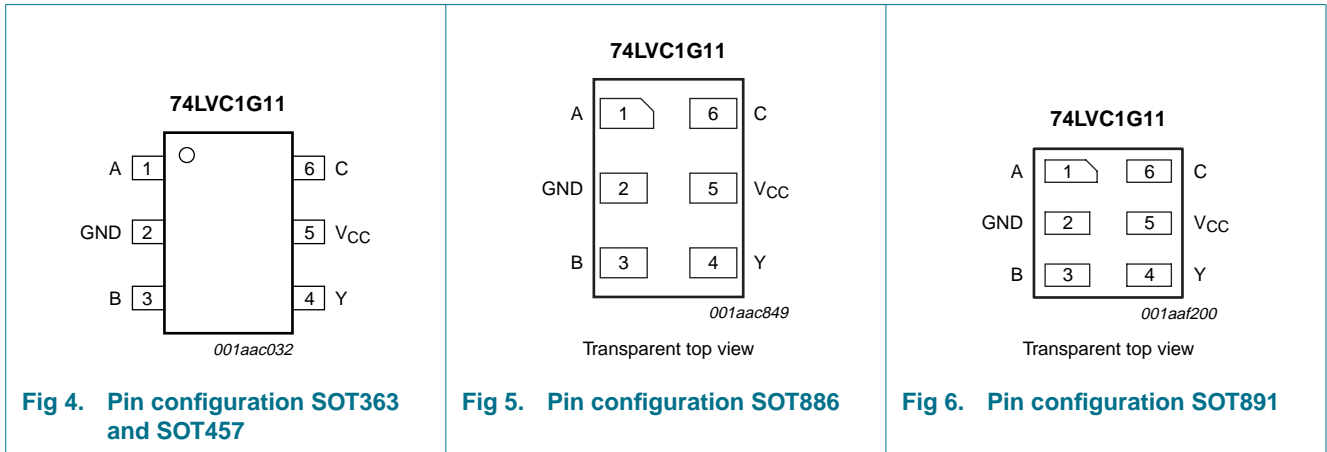
| Type number | Marking code |
|-------------|--------------|
| 74LVC1G11GW | VU |
| 74LVC1G11GV | V11 |
| 74LVC1G11GM | VU |
| 74LVC1G11GF | VU |

5. Functional diagram

| | | |
|---|---|--|
|  <p>Fig 1. Logic symbol</p> |  <p>Fig 2. IEC logic symbol</p> |  <p>Fig 3. Logic diagram</p> |
|---|---|--|

6. Pinning information

6.1 Pinning



6.2 Pin description

Table 3. Pin description

| Symbol | Pin | Description |
|-----------------|-----|----------------|
| A | 1 | data input |
| GND | 2 | ground (0 V) |
| B | 3 | data input |
| Y | 4 | data output |
| V _{CC} | 5 | supply voltage |
| C | 6 | data input |

7. Functional description

Table 4. Function table^[1]

| Input | | | Output |
|-------|---|---|--------|
| A | B | C | Y |
| H | H | H | H |
| L | X | X | L |
| X | L | X | L |
| X | X | L | L |

[1] H = HIGH voltage level;
 L = LOW voltage level;
 X = don't care.

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][2] -0.5 | $V_{CC} + 0.5$ | 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 |
| P_{tot} | total power dissipation | $T_{amb} = -40$ °C to $+125$ °C | [3] - | 250 | mW |
| T_{stg} | storage temperature | | -65 | +150 | °C |

[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.

[3] For SC-88 and SC-74 packages: above 87.5 °C the value of P_{tot} derates linearly with 4.0 mW/K.
For XSON6 packages: above 45 °C the value of P_{tot} derates linearly with 2.4 mW/K.

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 |
| $\Delta t/\Delta V$ | 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 | -40 °C to +85 °C | | | -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 | 0.65V _{CC} | - | - | 0.65V _{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 | 0.7V _{CC} | - | - | 0.7V _{CC} | - | V |
| V _{IL} | LOW-level input voltage | V _{CC} = 1.65 V to 1.95 V | - | - | 0.35V _{CC} | - | 0.35V _{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 | - | - | 0.3V _{CC} | - | 0.3V _{CC} | 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 | 1.54 | - | 0.95 | - | V |
| | | I _O = -8 mA; V _{CC} = 2.3 V | 1.9 | 2.15 | - | 1.7 | - | V |
| | | I _O = -12 mA; V _{CC} = 2.7 V | 2.2 | 2.50 | - | 1.9 | - | V |
| | | I _O = -24 mA; V _{CC} = 3.0 V | 2.3 | 2.62 | - | 2.0 | - | V |
| | | I _O = -32 mA; V _{CC} = 4.5 V | 3.8 | 4.11 | - | 3.4 | - | 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 | - | - | 0.10 | - | 0.10 | V |
| | | I _O = 4 mA; V _{CC} = 1.65 V | - | 0.07 | 0.45 | - | 0.70 | V |
| | | I _O = 8 mA; V _{CC} = 2.3 V | - | 0.12 | 0.30 | - | 0.45 | V |
| | | I _O = 12 mA; V _{CC} = 2.7 V | - | 0.17 | 0.40 | - | 0.60 | V |
| | | I _O = 24 mA; V _{CC} = 3.0 V | - | 0.33 | 0.55 | - | 0.80 | V |
| | | I _O = 32 mA; V _{CC} = 4.5 V | - | 0.39 | 0.55 | - | 0.80 | V |
| I _I | input leakage current | V _I = 5.5 V or GND; V _{CC} = 0 V to 5.5 V | - | ±0.1 | ±5 | - | ±100 | μA |
| I _{OFF} | power-off leakage current | V _I or V _O = 5.5 V; V _{CC} = 0 V | - | ±0.1 | ±10 | - | ±200 | 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 | 10 | - | 200 | μA |
| ΔI _{CC} | additional supply current | V _I = V _{CC} - 0.6 V; I _O = 0 A; V _{CC} = 2.3 V to 5.5 V; per pin | - | 5 | 500 | - | 5000 | μA |
| C _I | input capacitance | V _{CC} = 3.3 V; V _I = GND to V _{CC} | - | 4 | - | - | - | pF |

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

11. Dynamic characteristics

Table 8. Dynamic characteristics

Voltages are referenced to GND (ground = 0 V); for load 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 | A, B and C to Y; see Figure 7 ^[2] | | | | | | |
| | | V _{CC} = 1.65 V to 1.95 V | 1.5 | 4.7 | 17.2 | 1.5 | 21.5 | ns |
| | | V _{CC} = 2.3 V to 2.7 V | 1.0 | 3.0 | 6.2 | 1.0 | 7.8 | ns |
| | | V _{CC} = 2.7 V | 1.0 | 3.0 | 6.0 | 1.0 | 7.5 | ns |
| | | V _{CC} = 3.0 V to 3.6 V | 1.0 | 2.6 | 4.9 | 1.0 | 6.2 | ns |
| | | V _{CC} = 4.5 V to 5.5 V | 1.0 | 1.9 | 3.5 | 1.0 | 4.4 | ns |
| C _{PD} | power dissipation capacitance | V _I = GND to V _{CC} ; V _{CC} = 3.3 V ^[3] | - | 13 | - | - | - | 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).

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

f_i = input frequency in MHz;

f_o = output frequency in MHz;

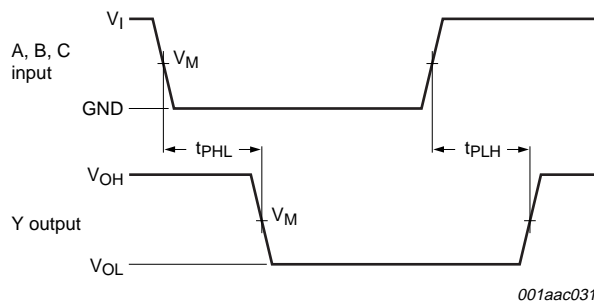
C_L = output load capacitance in pF;

V_{CC} = supply voltage in V;

N = number of inputs switching;

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

12. Waveforms



Measurement points are given in [Table 9](#).

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

Fig 7. The input (A, B, C) to output (Y) propagation delays

Table 9. Measurement points

| Supply voltage | Input | Output |
|------------------|-------------|-------------|
| V_{CC} | V_M | V_M |
| 1.65 V to 1.95 V | $0.5V_{CC}$ | $0.5V_{CC}$ |
| 2.3 V to 2.7 V | $0.5V_{CC}$ | $0.5V_{CC}$ |
| 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 | $0.5V_{CC}$ | $0.5V_{CC}$ |



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 8. Load circuit for switching times

Table 10. 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 |

13. Package outline

Plastic surface-mounted package; 6 leads

SOT363

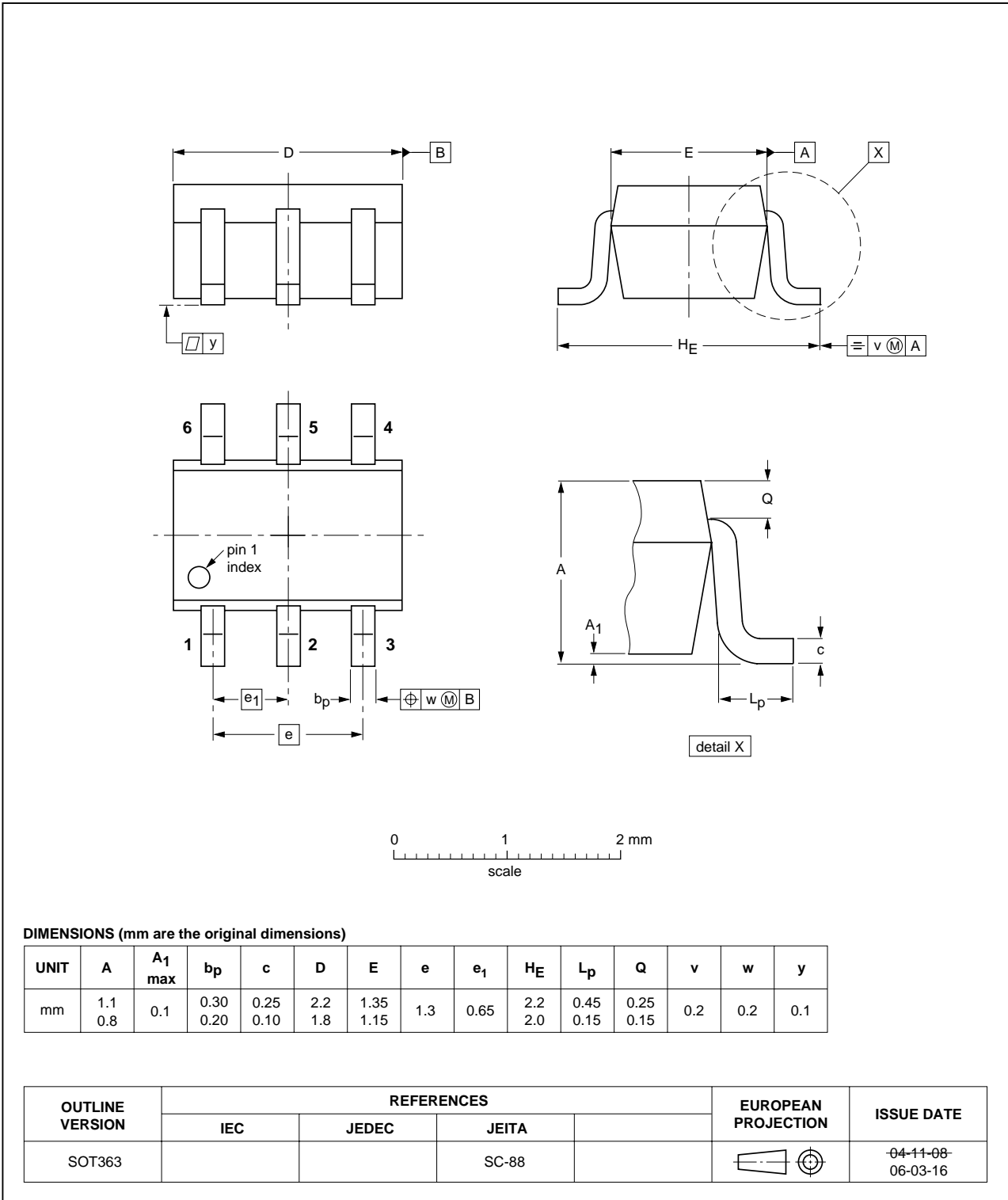


Fig 9. Package outline SOT363 (SC-88)

Plastic surface-mounted package (TSOP6); 6 leads

SOT457

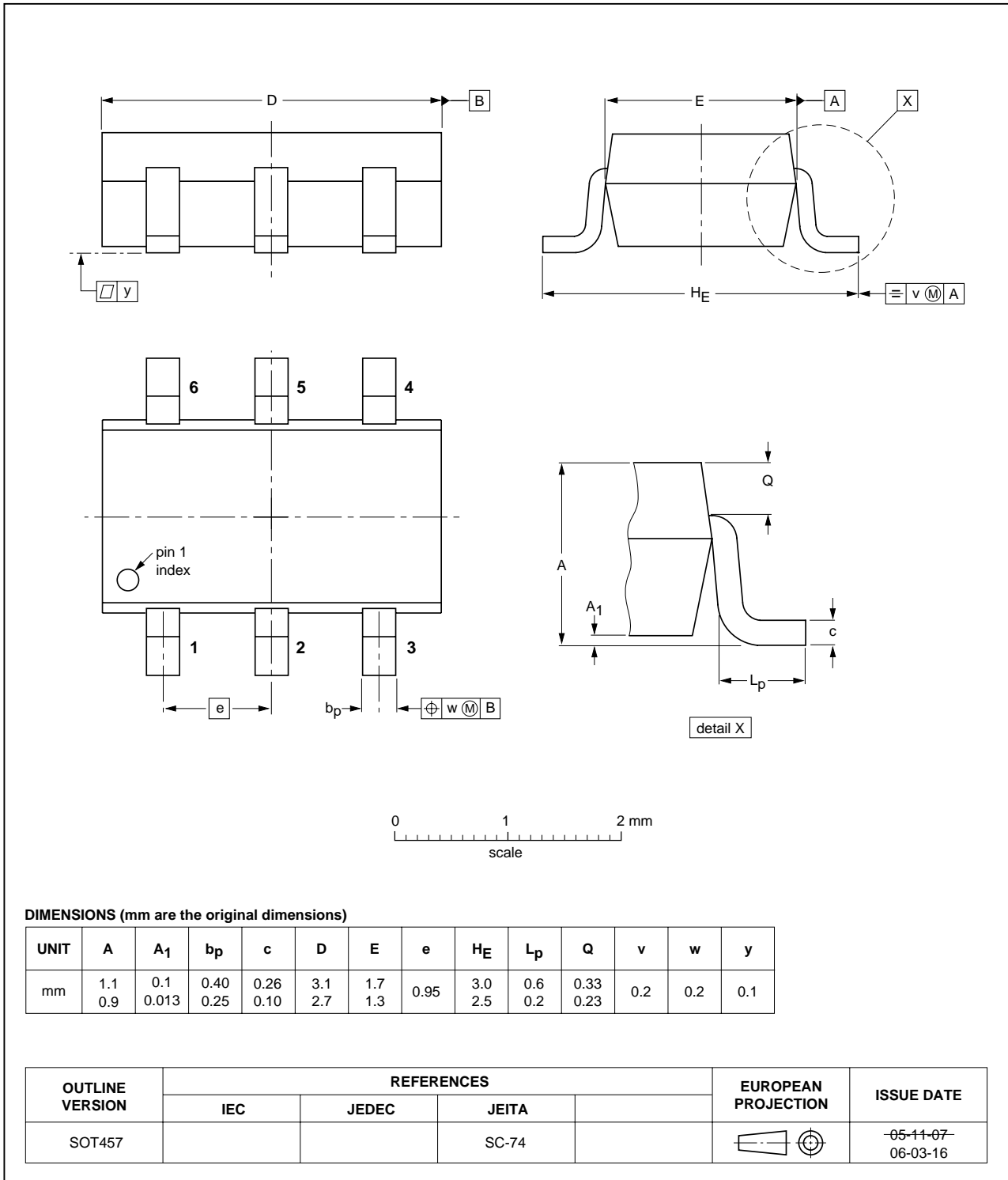


Fig 10. Package outline SOT457 (SC-74)

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

SOT886



Fig 11. Package outline SOT886 (XSON6)

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

SOT891



Fig 12. Package outline SOT891 (XSON6)

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 |
|----------------|--|--------------------|---------------|-------------|
| 74LVC1G11_4 | 20070801 | Product data sheet | - | 74LVC1G11_3 |
| Modifications: | <ul style="list-style-type: none"> The format of this data sheet has been redesigned to comply with the new identity guidelines of NXP Semiconductors. Legal texts have been adapted to the new company name where appropriate. Section 10 "Static characteristics": Changed: Conditions for input leakage current and supply current. New package outline drawing for XSON6/SOT891. | | | |
| 74LVC1G11_3 | 20060906 | Product data sheet | - | 74LVC1G11_2 |
| 74LVC1G11_2 | 20050503 | Product data sheet | - | 74LVC1G11_1 |
| 74LVC1G11_1 | 20041130 | Product data sheet | - | - |

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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. |
| 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".

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