

# 74LVC1G11-Q100

## Single 3-input AND gate

Rev. 2 — 7 December 2016

Product data sheet

## 1. General description

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The 74LVC1G11-Q100 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.

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

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- Automotive product qualification in accordance with AEC-Q100 (Grade 1)
  - ◆ Specified from  $-40\text{ }^{\circ}\text{C}$  to  $+85\text{ }^{\circ}\text{C}$  and from  $-40\text{ }^{\circ}\text{C}$  to  $+125\text{ }^{\circ}\text{C}$
- 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)
- $\pm 24\text{ mA}$  output drive ( $V_{CC} = 3.0\text{ V}$ )
- ESD protection:
  - ◆ MIL-STD-883, method 3015 exceeds 2000 V
  - ◆ HBM JESD22-A114F exceeds 2000 V
  - ◆ MM JESD22-A115-A exceeds 200 V ( $C = 200\text{ pF}$ ,  $R = 0\text{ }\Omega$ )
- CMOS low power consumption
- Latch-up performance exceeds 250 mA
- Direct interface with TTL levels
- Multiple package options

3. Ordering information

Table 1. Ordering information

| Type number      | Package           |       |                                                  |         |
|------------------|-------------------|-------|--------------------------------------------------|---------|
|                  | Temperature range | Name  | Description                                      | Version |
| 74LVC1G11GW-Q100 | −40 °C to +125 °C | SC-88 | plastic surface-mounted package; 6 leads         | SOT363  |
| 74LVC1G11GV-Q100 | −40 °C to +125 °C | SC-74 | plastic surface-mounted package (TSOP6); 6 leads | SOT457  |

4. Marking

Table 2. Marking

| Type number      | Marking code <sup>[1]</sup> |
|------------------|-----------------------------|
| 74LVC1G11GW-Q100 | VU                          |
| 74LVC1G11GV-Q100 | V11                         |

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

5. Functional diagram

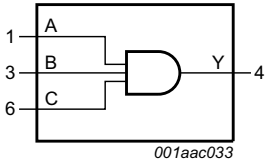


Fig 1. Logic symbol

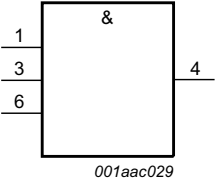


Fig 2. IEC logic symbol

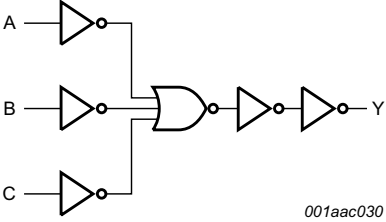
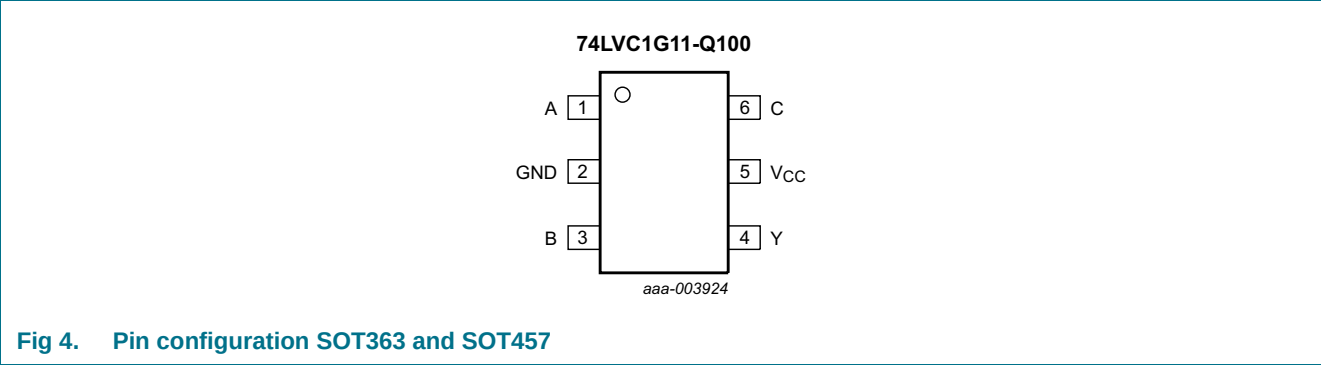


Fig 3. Logic diagram

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 <sub>CC</sub> | 5   | supply voltage |
| C               | 6   | data input     |

7. Functional description

Table 4. Function table<sup>[1]</sup>

| 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       | -    | $\pm 50$       | 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 $V_{CC}$             | -    | $\pm 50$       | 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] | -    | 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.

## 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 <sup>[1]</sup> | Max                 | Min                   | Max                 |      |
| V <sub>IH</sub>  | HIGH-level input voltage  | 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>CC</sub> = 4.5 V to 5.5 V                                                                          | 0.7V <sub>CC</sub>    | -                  | -                   | 0.7V <sub>CC</sub>    | -                   | V    |
| V <sub>IL</sub>  | LOW-level input voltage   | 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>CC</sub> = 4.5 V to 5.5 V                                                                          | -                     | -                  | 0.3V <sub>CC</sub>  | -                     | 0.3V <sub>CC</sub>  | 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 5.5 V                                               | V <sub>CC</sub> – 0.1 | -                  | -                   | V <sub>CC</sub> – 0.1 | -                   | V    |
|                  |                           | I <sub>O</sub> = –4 mA; V <sub>CC</sub> = 1.65 V                                                          | 1.2                   | 1.54               | -                   | 0.95                  | -                   | V    |
|                  |                           | I <sub>O</sub> = –8 mA; V <sub>CC</sub> = 2.3 V                                                           | 1.9                   | 2.15               | -                   | 1.7                   | -                   | V    |
|                  |                           | I <sub>O</sub> = –12 mA; V <sub>CC</sub> = 2.7 V                                                          | 2.2                   | 2.50               | -                   | 1.9                   | -                   | V    |
|                  |                           | I <sub>O</sub> = –24 mA; V <sub>CC</sub> = 3.0 V                                                          | 2.3                   | 2.62               | -                   | 2.0                   | -                   | V    |
|                  |                           | I <sub>O</sub> = –32 mA; V <sub>CC</sub> = 4.5 V                                                          | 3.8                   | 4.11               | -                   | 3.4                   | -                   | 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 5.5 V                                                | -                     | -                  | 0.10                | -                     | 0.10                | V    |
|                  |                           | I <sub>O</sub> = 4 mA; V <sub>CC</sub> = 1.65 V                                                           | -                     | 0.07               | 0.45                | -                     | 0.70                | V    |
|                  |                           | I <sub>O</sub> = 8 mA; V <sub>CC</sub> = 2.3 V                                                            | -                     | 0.12               | 0.30                | -                     | 0.45                | V    |
|                  |                           | I <sub>O</sub> = 12 mA; V <sub>CC</sub> = 2.7 V                                                           | -                     | 0.17               | 0.40                | -                     | 0.60                | V    |
|                  |                           | I <sub>O</sub> = 24 mA; V <sub>CC</sub> = 3.0 V                                                           | -                     | 0.33               | 0.55                | -                     | 0.80                | V    |
|                  |                           | I <sub>O</sub> = 32 mA; V <sub>CC</sub> = 4.5 V                                                           | -                     | 0.39               | 0.55                | -                     | 0.80                | V    |
| I <sub>I</sub>   | input leakage current     | V <sub>I</sub> = 5.5 V or GND; V <sub>CC</sub> = 0 V to 5.5 V                                             | -                     | ±0.1               | ±1                  | -                     | ±1                  | µA   |
| I <sub>OFF</sub> | power-off leakage current | V <sub>I</sub> or V <sub>O</sub> = 5.5 V; V <sub>CC</sub> = 0 V                                           | -                     | ±0.1               | ±2                  | -                     | ±2                  | µA   |
| I <sub>CC</sub>  | supply current            | V <sub>I</sub> = 5.5 V or GND; I <sub>O</sub> = 0 A; V <sub>CC</sub> = 1.65 V to 5.5 V                    | -                     | 0.1                | 4                   | -                     | 4                   | µA   |
| ΔI <sub>CC</sub> | additional supply current | V <sub>I</sub> = V <sub>CC</sub> – 0.6 V; I <sub>O</sub> = 0 A; V <sub>CC</sub> = 2.3 V to 5.5 V; per pin | -                     | 5                  | 500                 | -                     | 500                 | µA   |
| C <sub>I</sub>   | input capacitance         | V <sub>CC</sub> = 3.3 V; V <sub>I</sub> = GND to V <sub>CC</sub>                                          | -                     | 4                  | -                   | -                     | -                   | pF   |

[1] All typical values are measured at T<sub>amb</sub> = 25 °C.

11. Dynamic characteristics

Table 8. Dynamic characteristics

Voltages are referenced to GND (ground = 0 V); for test circuit see [Figure 6](#).

| Symbol          | Parameter                     | Conditions                                                                       | −40 °C to +85 °C |                    |      | −40 °C to +125 °C |      | Unit |
|-----------------|-------------------------------|----------------------------------------------------------------------------------|------------------|--------------------|------|-------------------|------|------|
|                 |                               |                                                                                  | Min              | Typ <sup>[1]</sup> | Max  | Min               | Max  |      |
| t <sub>pd</sub> | propagation delay             | A, B and C to Y; see <a href="#">Figure 5</a> <sup>[2]</sup>                     |                  |                    |      |                   |      |      |
|                 |                               | V <sub>CC</sub> = 1.65 V to 1.95 V                                               | 1.5              | 4.7                | 17.2 | 1.5               | 21.5 | ns   |
|                 |                               | V <sub>CC</sub> = 2.3 V to 2.7 V                                                 | 1.0              | 3.0                | 6.2  | 1.0               | 7.8  | ns   |
|                 |                               | V <sub>CC</sub> = 2.7 V                                                          | 1.0              | 3.0                | 6.0  | 1.0               | 7.5  | ns   |
|                 |                               | V <sub>CC</sub> = 3.0 V to 3.6 V                                                 | 1.0              | 2.6                | 4.9  | 1.0               | 6.2  | ns   |
|                 |                               | V <sub>CC</sub> = 4.5 V to 5.5 V                                                 | 1.0              | 1.9                | 3.5  | 1.0               | 4.4  | ns   |
| C <sub>PD</sub> | power dissipation capacitance | V <sub>I</sub> = GND to V <sub>CC</sub> ; V <sub>CC</sub> = 3.3 V <sup>[3]</sup> | -                | 13                 | -    | -                 | -    | pF   |

- [1] Typical values are measured at T<sub>amb</sub> = 25 °C and V<sub>CC</sub> = 1.8 V, 2.5 V, 2.7 V, 3.3 V and 5.0 V respectively.
- [2] t<sub>pd</sub> is the same as t<sub>PLH</sub> and t<sub>PHL</sub>.
- [3] C<sub>PD</sub> is used to determine the dynamic power dissipation (P<sub>D</sub> in μW).  
P<sub>D</sub> = C<sub>PD</sub> × V<sub>CC</sub><sup>2</sup> × f<sub>i</sub> × N + Σ(C<sub>L</sub> × V<sub>CC</sub><sup>2</sup> × f<sub>o</sub>) 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 V;  
N = number of inputs switching;  
Σ(C<sub>L</sub> × V<sub>CC</sub><sup>2</sup> × f<sub>o</sub>) = sum of the outputs.

12. Waveforms

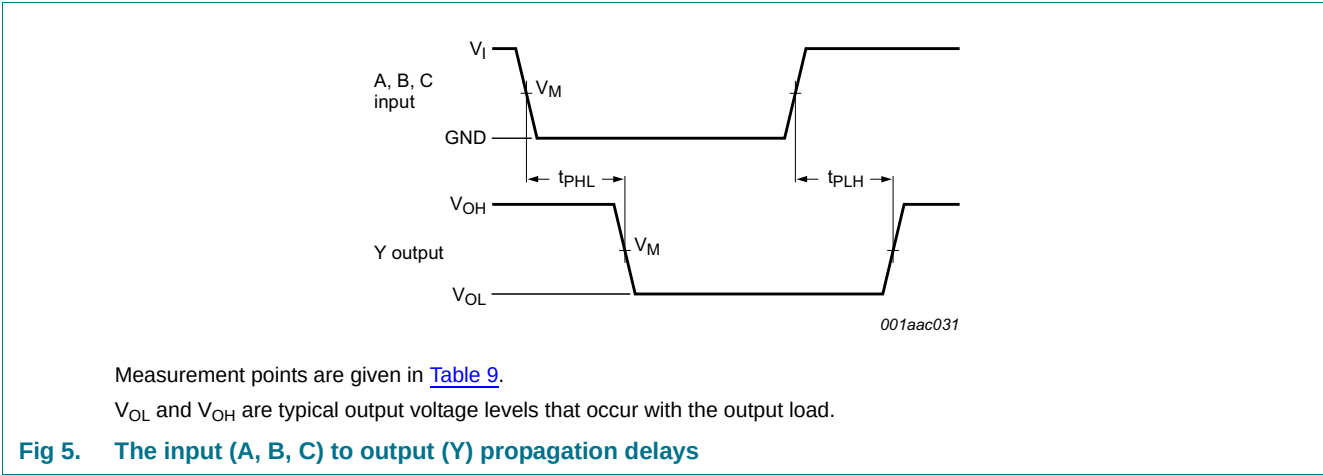
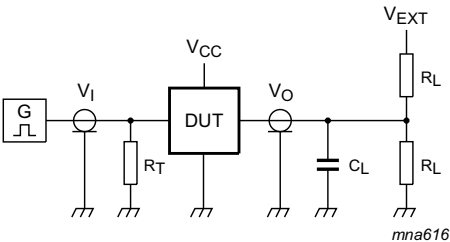


Table 9. Measurement points

| Supply voltage   | Input              | Output             |
|------------------|--------------------|--------------------|
| V <sub>CC</sub>  | V <sub>M</sub>     | V <sub>M</sub>     |
| 1.65 V to 1.95 V | 0.5V <sub>CC</sub> | 0.5V <sub>CC</sub> |
| 2.3 V to 2.7 V   | 0.5V <sub>CC</sub> | 0.5V <sub>CC</sub> |
| 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 <sub>CC</sub> | 0.5V <sub>CC</sub> |



Test data is given in [Table 10](#).  
Definitions for test circuit:  
R<sub>L</sub> = Load resistance.  
C<sub>L</sub> = Load capacitance including jig and probe capacitance.  
R<sub>T</sub> = Termination resistance should be equal to the output impedance Z<sub>o</sub> of the pulse generator.  
V<sub>EXT</sub> = External voltage for measuring switching times.

Fig 6. Test circuit for measuring switching times

Table 10. Test data

| Supply voltage   | Input           |                                 | Load           |                | V <sub>EXT</sub>                    |
|------------------|-----------------|---------------------------------|----------------|----------------|-------------------------------------|
| V <sub>CC</sub>  | V <sub>I</sub>  | t <sub>r</sub> = t <sub>f</sub> | C <sub>L</sub> | R <sub>L</sub> | t <sub>PLH</sub> , t <sub>PHL</sub> |
| 1.65 V to 1.95 V | V <sub>CC</sub> | ≤ 2.0 ns                        | 30 pF          | 1 kΩ           | open                                |
| 2.3 V to 2.7 V   | V <sub>CC</sub> | ≤ 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 <sub>CC</sub> | ≤ 2.5 ns                        | 50 pF          | 500 Ω          | open                                |

13. Package outline

Plastic surface-mounted package; 6 leads

SOT363

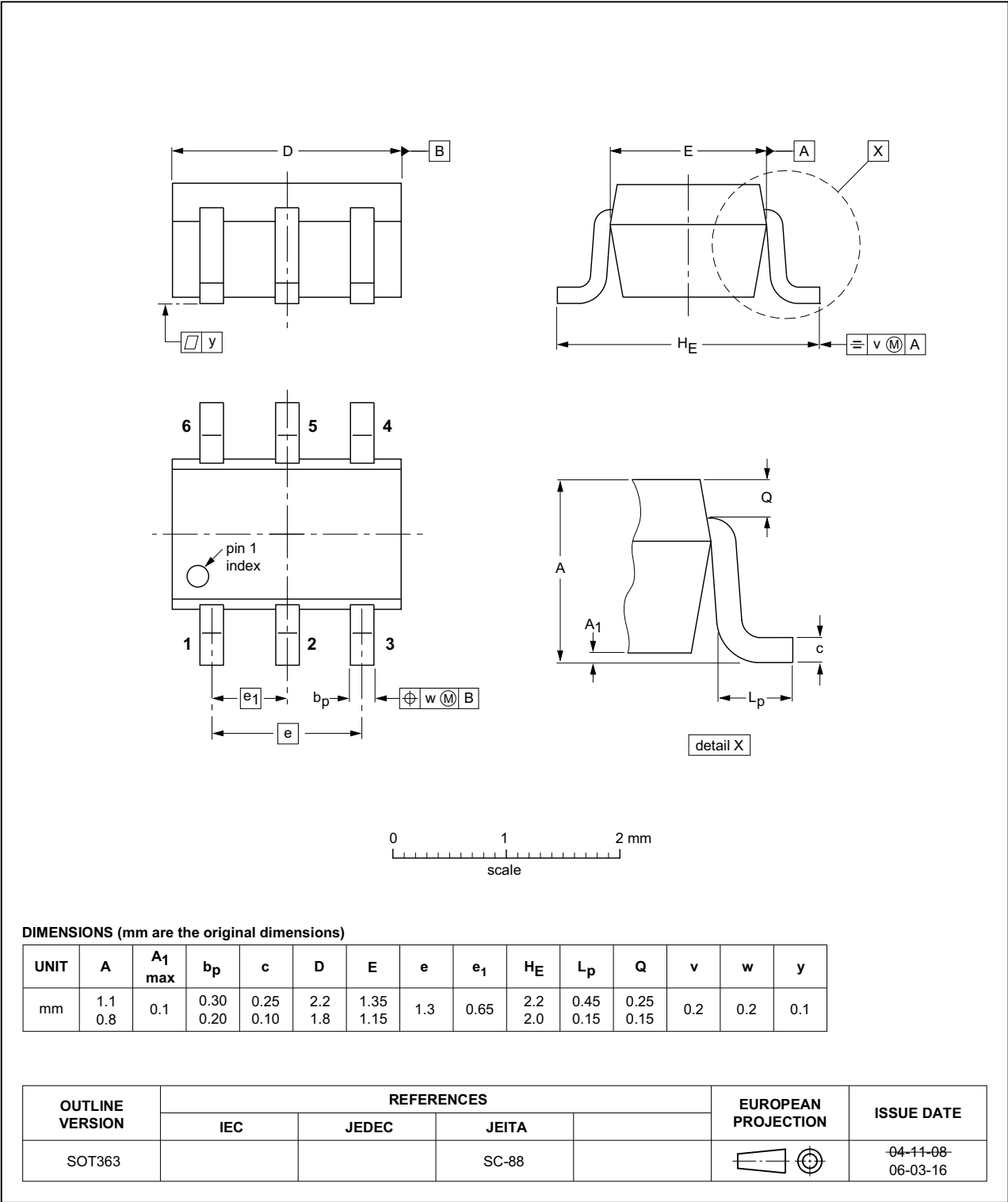


Fig 7. Package outline SOT363 (SC-88)



Plastic surface-mounted package (TSOP6); 6 leads

SOT457

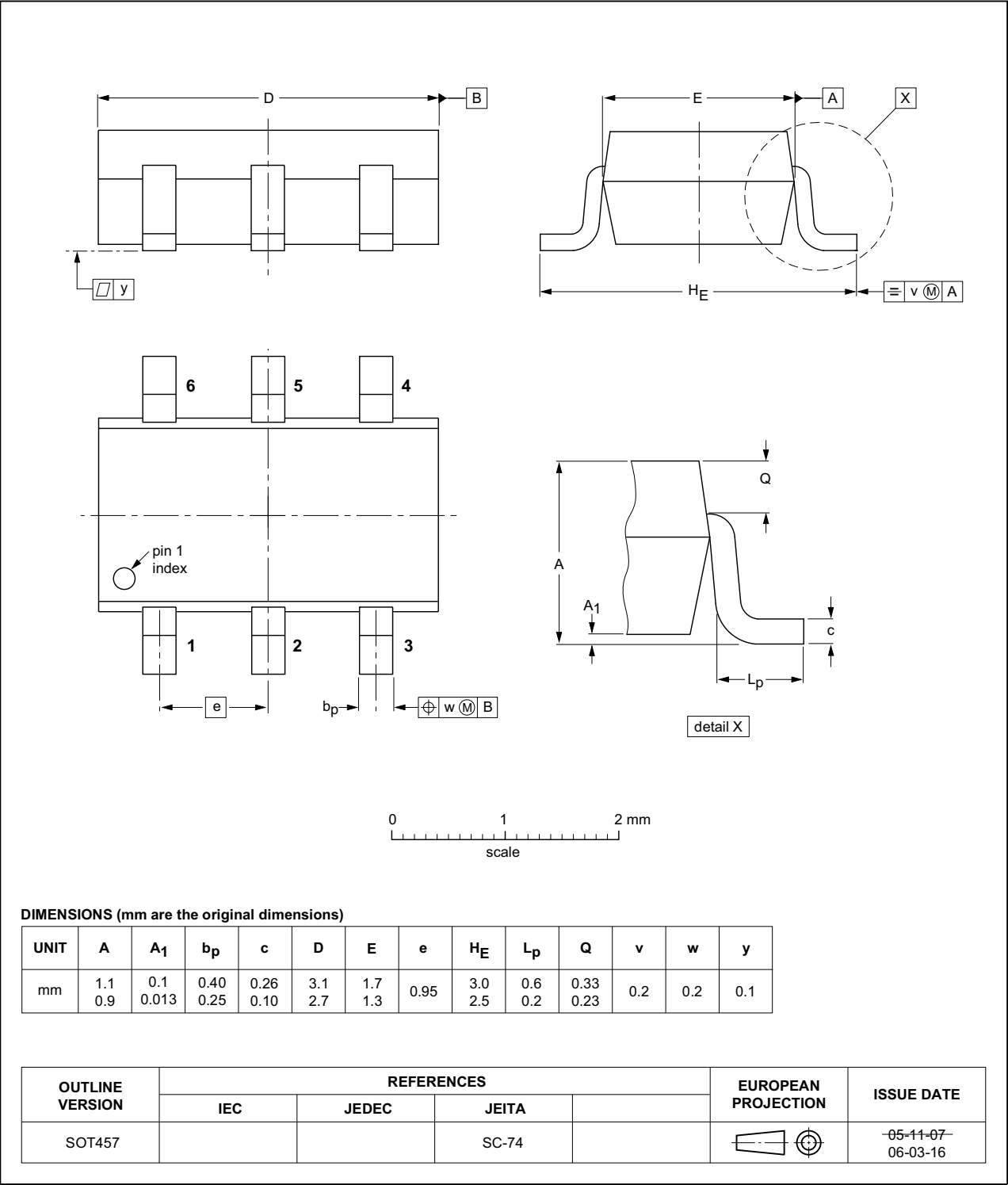


Fig 8. Package outline SOT457 (SC-74)

## 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             |
| MIL     | Military                                |

## 15. Revision history

Table 12. Revision history

| Document ID        | Release date                                                                                        | Data sheet status  | Change notice | Supersedes         |
|--------------------|-----------------------------------------------------------------------------------------------------|--------------------|---------------|--------------------|
| 74LVC1G11_Q100 v.2 | 20161207                                                                                            | Product data sheet | -             | 74LVC1G11_Q100 v.1 |
| Modifications:     | • <a href="#">Table 7</a> : The maximum limits for leakage current and supply current have changed. |                    |               |                    |
| 74LVC1G11_Q100 v.1 | 20120813                                                                                            | Product data sheet | -             | -                  |

## 16. Legal information

### 16.1 Data sheet status

| Document status <sup>[1][2]</sup> | Product status <sup>[3]</sup> | 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 URL <http://www.nexperia.com>.

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## 17. Contact information

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For more information, please visit: <http://www.nexperia.com>

For sales office addresses, please send an email to: [salesaddresses@nexperia.com](mailto:salesaddresses@nexperia.com)

## 18. Contents

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|           |                                               |           |
|-----------|-----------------------------------------------|-----------|
| <b>1</b>  | <b>General description</b> .....              | <b>1</b>  |
| <b>2</b>  | <b>Features and benefits</b> .....            | <b>1</b>  |
| <b>3</b>  | <b>Ordering information</b> .....             | <b>2</b>  |
| <b>4</b>  | <b>Marking</b> .....                          | <b>2</b>  |
| <b>5</b>  | <b>Functional diagram</b> .....               | <b>2</b>  |
| <b>6</b>  | <b>Pinning information</b> .....              | <b>3</b>  |
| 6.1       | Pinning .....                                 | 3         |
| 6.2       | Pin description .....                         | 3         |
| <b>7</b>  | <b>Functional description</b> .....           | <b>3</b>  |
| <b>8</b>  | <b>Limiting values</b> .....                  | <b>4</b>  |
| <b>9</b>  | <b>Recommended operating conditions</b> ..... | <b>4</b>  |
| <b>10</b> | <b>Static characteristics</b> .....           | <b>5</b>  |
| <b>11</b> | <b>Dynamic characteristics</b> .....          | <b>6</b>  |
| <b>12</b> | <b>Waveforms</b> .....                        | <b>6</b>  |
| <b>13</b> | <b>Package outline</b> .....                  | <b>8</b>  |
| <b>14</b> | <b>Abbreviations</b> .....                    | <b>10</b> |
| <b>15</b> | <b>Revision history</b> .....                 | <b>10</b> |
| <b>16</b> | <b>Legal information</b> .....                | <b>11</b> |
| 16.1      | Data sheet status .....                       | 11        |
| 16.2      | Definitions .....                             | 11        |
| 16.3      | Disclaimers .....                             | 11        |
| 16.4      | Trademarks .....                              | 12        |
| <b>17</b> | <b>Contact information</b> .....              | <b>12</b> |
| <b>18</b> | <b>Contents</b> .....                         | <b>13</b> |