# 74LVC11

## Triple 3-input AND gate

Rev. 10 — 12 February 2024 Product data sheet

## 1. General description

The 74LVC11 provides three 3-input AND functions.

## 2. Features and benefits

- Wide supply voltage range from 1.2 V to 3.6 V
- Inputs accept voltages up to 5.5 V
- CMOS low power consumption
- Direct interface with TTL levels
- Complies with JEDEC standard:
  - JESD8-7A (1.65 V to 1.95 V)
  - JESD8-5A (2.3 V to 2.7 V)
  - JESD8-C/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
- 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 |
| 74LVC11D | -40 °C to +125 °C | SO14 | plastic small outline package; 14 leads; body width 3.9 mm | SOT108-1 |
| 74LVC11PW | -40 °C to +125 °C | TSSOP14 | plastic thin shrink small outline package; 14 leads; body width 4.4 mm | SOT402-1 |
| 74LVC11BQ | -40 °C to +125 °C | DHVQFN14 | plastic dual in-line compatible thermal enhanced very thin quad flat package; no leads; 14 terminals; body 2.5 × 3 × 0.85 mm | SOT762-1 |

## 4. Functional diagram

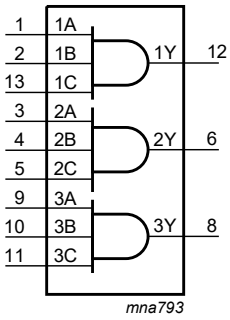



Fig. 1. Logic symbol

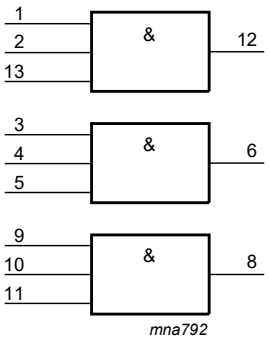



Fig. 2. IEC logic symbol

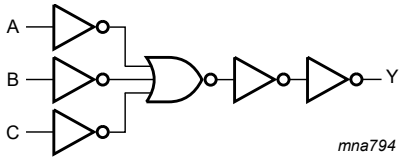



Fig. 3. Logic diagram for one gate

## 5. Pinning information

### 5.1. Pinning

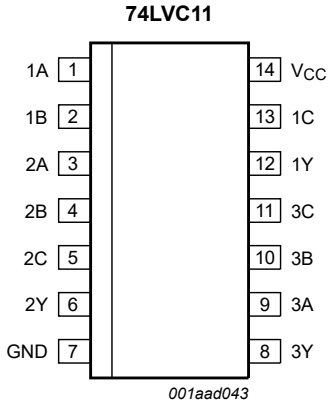



Fig. 4. Pin configuration for SOT108-1 (SO14)

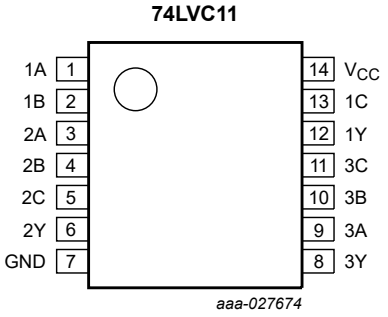
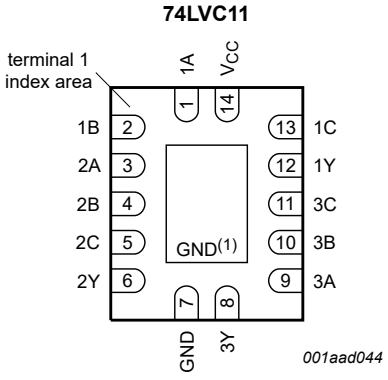



Fig. 5. Pin configuration for SOT402-1 (TSSOP14)




Transparent top view

(1) This is not a ground pin. There is no electrical or mechanical requirement to solder the pad. In case soldered, the solder land should remain floating or connected to GND.

Fig. 6. Pin configuration for SOT762-1 (DHVQFN14)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### 5.2. Pin description

**Table 2. Pin description**

| Symbol | Pin | Description |
|---|---|---|
| 1A, 2A, 3A | 1, 3, 9 | data input |
| 1B, 2B, 3B | 2, 4, 10 | data input |
| 1C, 2C, 3C | 13, 5, 11 | data input |
| 1Y, 2Y, 3Y | 12, 6, 8 | data output |
| GND | 7 | ground (0 V) |
| $V_{CC}$ | 14 | supply voltage |

## 6. Functional description

**Table 3. Function selection**

*H = HIGH voltage level; L = LOW voltage level; X = don't care*

| Input | | | Output |
|---|---|---|---|
| **nA** | **nB** | **nC** | **nY** |
| L | X | X | L |
| X | L | X | L |
| X | X | L | L |
| H | H | H | H |

## 7. Limiting values

**Table 4. 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 | [2] | -0.5 | $V_{CC}$ + 0.5 | 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] | - | 500 | mW |
| $T_{stg}$ | storage temperature | | -65 | +150 | °C |

[1] The minimum input voltage ratings may be exceeded if the input current ratings are observed.
[2] The output voltage ratings may be exceeded if the output current ratings are observed.
[3] For SOT108-1 (SO14) package: $P_{tot}$ derates linearly with 10.1 mW/K above 100 °C.
For SOT402-1 (TSSOP14) package: $P_{tot}$ derates linearly with 7.3 mW/K above 81 °C.
For SOT762-1 (DHVQFN14) package: $P_{tot}$ derates linearly with 9.6 mW/K above 98 °C.


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# 8. Recommended operating conditions

**Table 5. Recommended operating conditions**

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| $V_{CC}$ | supply voltage | | 1.65 | - | 3.6 | V |
| | | functional | 1.2 | - | - | V |
| $V_I$ | input voltage | | 0 | - | 5.5 | V |
| $V_O$ | output voltage | | 0 | - | $V_{CC}$ | V |
| $T_{amb}$ | ambient temperature | | -40 | - | +125 | °C |
| Δt/ΔV | input transition rise and fall rate | $V_{CC}$ = 1.65 V to 2.7 V | 0 | - | 20 | ns/V |
| | | $V_{CC}$ = 2.7 V to 3.6 V | 0 | - | 10 | ns/V |

# 9. Static characteristics

**Table 6. 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 | $V_{CC}$ = 1.2 V | 1.08 | - | - | 1.08 | - | V |
| | | $V_{CC}$ = 1.65 V to 1.95 V | 0.65x$V_{CC}$ | - | - | 0.65x$V_{CC}$ | - | 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 |
| $V_{IL}$ | LOW-level input voltage | $V_{CC}$ = 1.2 V | - | - | 0.12 | - | 0.12 | V |
| | | $V_{CC}$ = 1.65 V to 1.95 V | - | - | 0.35x$V_{CC}$ | - | 0.35x$V_{CC}$ | 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 |
| $V_{OH}$ | HIGH-level output voltage | $V_I$ = $V_{IH}$ or $V_{IL}$ | | | | | | |
| | | $I_O$ = -100 µA; $V_{CC}$ = 1.65 V to 3.6 V | $V_{CC}$-0.2 | - | - | $V_{CC}$-0.3 | - | V |
| | | $I_O$ = -4 mA; $V_{CC}$ = 1.65 V | 1.2 | - | - | 1.05 | - | V |
| | | $I_O$ = -8 mA; $V_{CC}$ = 2.3 V | 1.8 | - | - | 1.65 | - | V |
| | | $I_O$ = -12 mA; $V_{CC}$ = 2.7 V | 2.2 | - | - | 2.05 | - | V |
| | | $I_O$ = -18 mA; $V_{CC}$ = 3.0 V | 2.4 | - | - | 2.25 | - | V |
| | | $I_O$ = -24 mA; $V_{CC}$ = 3.0 V | 2.2 | - | - | 2.0 | - | V |
| $V_{OL}$ | LOW-level output voltage | $V_I$ = $V_{IH}$ or $V_{IL}$ | | | | | | |
| | | $I_O$ = 100 µA; $V_{CC}$ = 1.65 V to 3.6 V | - | - | 0.2 | - | 0.3 | V |
| | | $I_O$ = 4 mA; $V_{CC}$ = 1.65 V | - | - | 0.45 | - | 0.65 | V |
| | | $I_O$ = 8 mA; $V_{CC}$ = 2.3 V | - | - | 0.6 | - | 0.8 | V |
| | | $I_O$ = 12 mA; $V_{CC}$ = 2.7 V | - | - | 0.4 | - | 0.6 | V |
| | | $I_O$ = 24 mA; $V_{CC}$ = 3.0 V | - | - | 0.55 | - | 0.8 | V |
| $I_I$ | input leakage current | $V_{CC}$ = 3.6 V; $V_I$ = 5.5 V or GND | - | ±0.1 | ±5 | - | ±20 | µA |
| $I_{CC}$ | supply current | $V_{CC}$ = 3.6 V; $V_I$ = $V_{CC}$ or GND; $I_O$ = 0 A | - | 0.1 | 10 | - | 40 | µA |
| $ΔI_{CC}$ | additional supply current | per input pin; $V_{CC}$ = 2.7 V to 3.6 V; $V_I$ = $V_{CC}$ - 0.6 V; $I_O$ = 0 A | - | 5 | 500 | - | 5000 | µA |


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| Symbol | Parameter | Conditions | -40 °C to +85 °C | | | -40 °C to +125 °C | | Unit |
|---|---|---|---|---|---|---|---|---|
| | | | Min | Typ[1] | Max | Min | Max | |
| $C_I$ | input capacitance | $V_{CC}$ = 0 V to 3.6 V; $V_I$ = GND to $V_{CC}$ | - | 5.0 | - | - | - | pF |

[1] All typical values are measured at $V_{CC}$ = 3.3 V (unless stated otherwise) and $T_{amb}$ = 25 °C.

# 10. Dynamic characteristics

**Table 7. Dynamic characteristics**

*Voltages are referenced to GND (ground = 0 V). For test circuit see Fig. 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, nB, nC to nY; see Fig. 7 [2] | | | | | | |
| | | $V_{CC}$ = 1.2 V | - | 14.0 | - | - | - | ns |
| | | $V_{CC}$ = 1.65 V to 1.95 V | 1.0 | 4.7 | 12.2 | 1.0 | 14.1 | ns |
| | | $V_{CC}$ = 2.3 V to 2.7 V | 1.5 | 2.8 | 6.9 | 1.5 | 8.0 | ns |
| | | $V_{CC}$ = 2.7 V | 1.5 | 2.9 | 7.0 | 1.5 | 8.1 | ns |
| | | $V_{CC}$ = 3.0 V to 3.6 V | 1.5 | 2.5 | 6.2 | 1.5 | 7.2 | ns |
| $C_{PD}$ | power dissipation capacitance | per gate; $V_I$ = GND to $V_{CC}$ [3] | | | | | | |
| | | $V_{CC}$ = 1.65 V to 1.95 V | - | 3.1 | - | - | - | pF |
| | | $V_{CC}$ = 2.3 V to 2.7 V | - | 6.2 | - | - | - | pF |
| | | $V_{CC}$ = 3.0 V to 3.6 V | - | 9.0 | - | - | - | pF |

[1] Typical values are measured at $T_{amb}$ = 25 °C and $V_{CC}$ = 1.2 V, 1.8 V, 2.5 V, 2.7 V, and 3.3 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).
$P_D = C_{PD} \times V_{CC}^2 \times f_i \times N + \Sigma(C_L \times V_{CC}^2 \times f_o)$ 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 Volts
N = number of inputs switching
$\Sigma(C_L \times V_{CC}^2 \times f_o)$ = sum of the outputs


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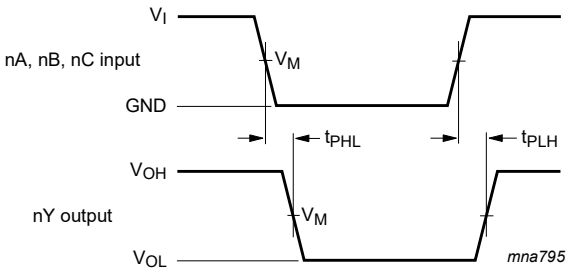
## 10.1. Waveforms and test circuit

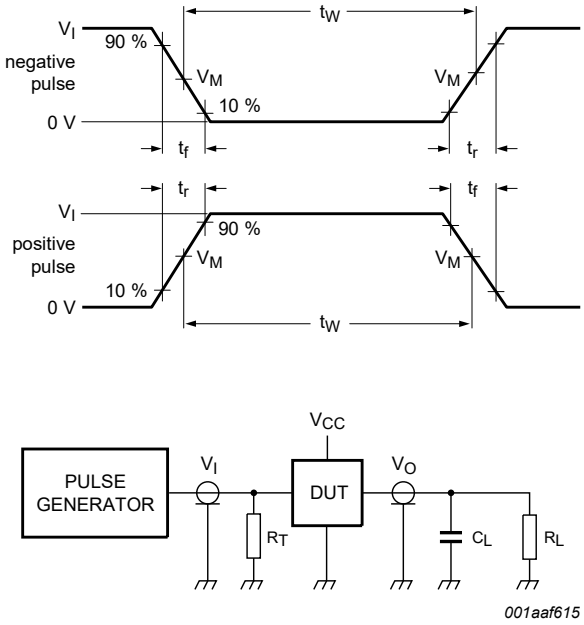



$V_M$ = 1.5 V at $V_{CC}$ ≥ 2.7 V.

$V_M$ = 0.5 x $V_{CC}$ at $V_{CC}$ < 2.7 V.

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

**Fig. 7. Input (nA, nB and nC) to output (nY) propagation delays**




Test data is given in Table 8.

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 output impedance $Z_o$ of the pulse generator.

**Fig. 8. Test circuit for measuring switching times**

**Table 8. Test data**

| Supply voltage | Input | | Load | |
|---|---|---|---|---|
| | $V_I$ | $t_r$, $t_f$ | $C_L$ | $R_L$ |
| 1.2 V | $V_{CC}$ | ≤ 2 ns | 30 pF | 1 kΩ |
| 1.65 V to 1.95 V | $V_{CC}$ | ≤ 2 ns | 30 pF | 1 kΩ |
| 2.3 V to 2.7 V | $V_{CC}$ | ≤ 2 ns | 30 pF | 500 Ω |
| 2.7 V | 2.7 V | ≤ 2.5 ns | 50 pF | 500 Ω |
| 3.0 V to 3.6 V | 2.7 V | ≤ 2.5 ns | 50 pF | 500 Ω |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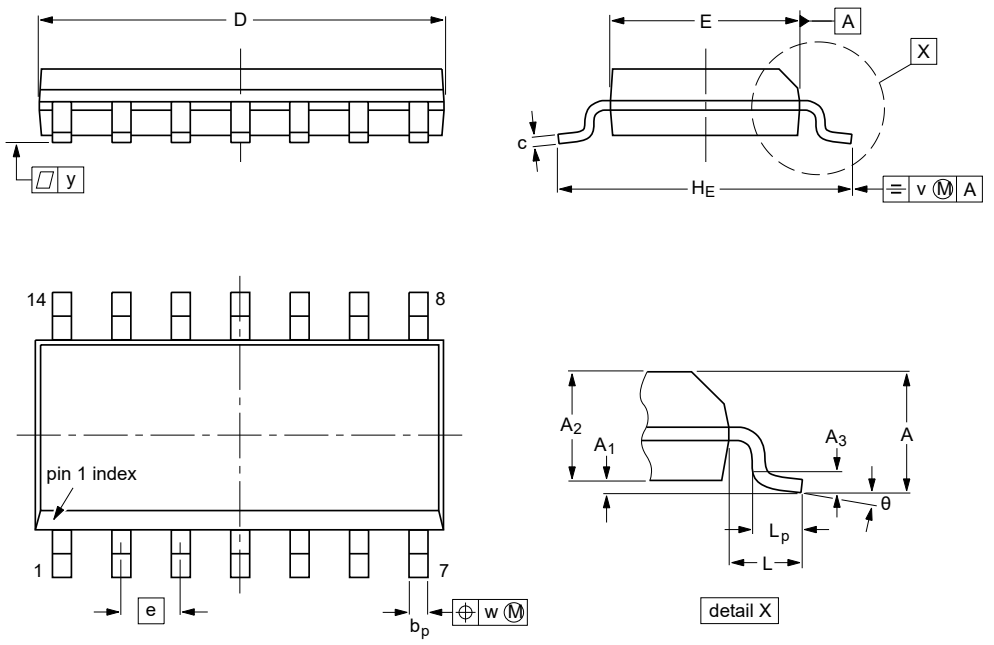
# 11. Package outline

**SO14: plastic small outline package; 14 leads; body width 3.9 mm** **SOT108-1**




Dimensions (inch dimensions are derived from the original mm dimensions)

| Unit | | A | $A_1$ | $A_2$ | $A_3$ | $b_p$ | c | $D^{(1)}$ | $E^{(1)}$ | e | $H_E$ | L | $L_p$ | v | w | y | θ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| mm | max | 1.75 | 0.25 | | | 0.51 | 0.25 | 8.75 | 4.0 | | 6.2 | | 1.27 | | | | 8° |
| | nom | | | | 0.25 | | | | | 1.27 | | 1.05 | | 0.2 | 0.25 | 0.1 | |
| | min | | 0.10 | 1.25 | | 0.31 | 0.10 | 8.55 | 3.8 | | 5.8 | | 0.4 | | | | 0° |
| inches | max | 0.069 | 0.010 | | | 0.020 | 0.010 | 0.344 | 0.16 | | 0.244 | | 0.05 | | | | 8° |
| | nom | | | | 0.01 | | | | | 0.05 | | 0.041 | | 0.008 | 0.01 | 0.004 | |
| | min | | 0.004 | 0.049 | | 0.012 | 0.004 | 0.337 | 0.15 | | 0.228 | | 0.016 | | | | 0° |

Note
1. Plastic or metal protrusions of 0.15 mm (0.006 inch) maximum per side are not included.

*sot108-1_po*

| Outline version | References | | | | European projection | Issue date |
|---|---|---|---|---|---|---|
| | IEC | JEDEC | JEITA | | | |
| SOT108-1 | | MS-012 | | | | ~~03-02-19~~ 23-10-27 |

**Fig. 9. Package outline SOT108-1 (SO14)**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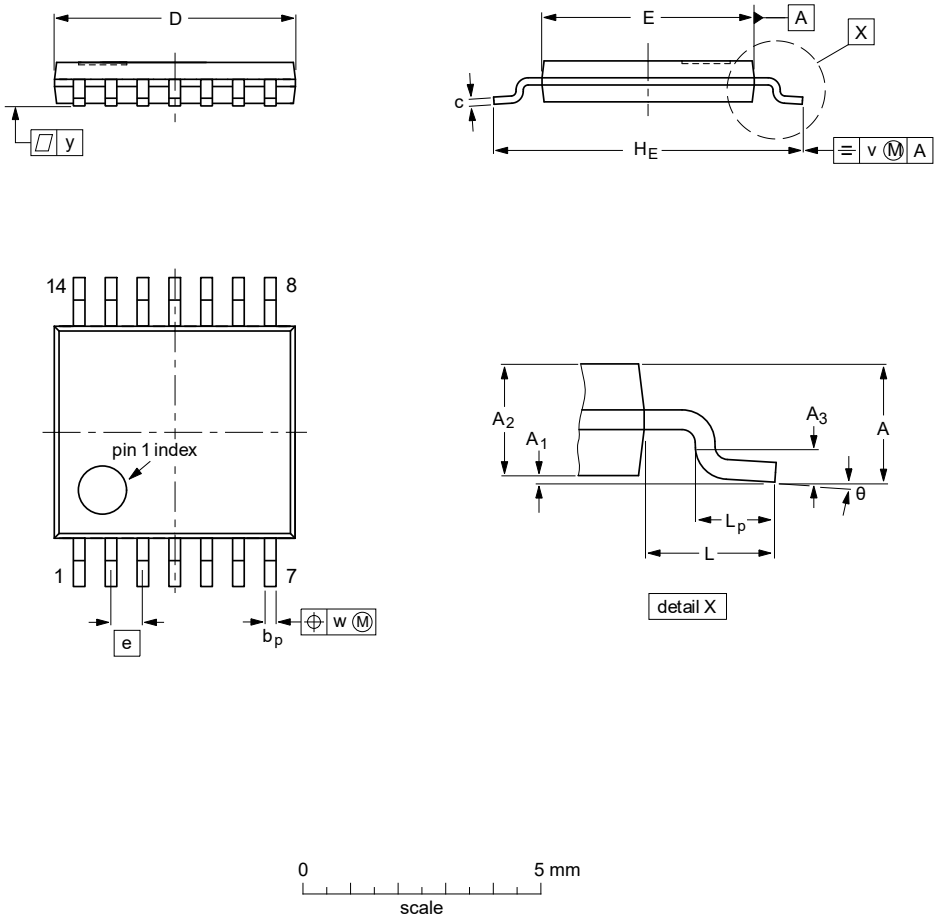
**TSSOP14: plastic thin shrink small outline package; 14 leads; body width 4.4 mm** **SOT402-1**




Dimensions (mm are the original dimensions)

| Unit | | A | $A_1$ | $A_2$ | $A_3$ | $b_p$ | c | $D^{(1)}$ | $E^{(2)}$ | e | $H_E$ | L | $L_p$ | v | w | y | θ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| mm | max | 1.20 | 0.15 | 1.05 | | 0.30 | 0.2 | 5.1 | 4.5 | | 6.6 | | 0.75 | | | | 8° |
| | nom | | | | 0.25 | | | | | 0.65 | | 1 | | 0.2 | 0.1 | 0.1 | |
| | min | | 0.05 | 0.80 | | 0.19 | 0.09 | 4.9 | 4.3 | | 6.2 | | 0.45 | | | | 0° |

Note
1. Plastic or metal protrusions of 0.15 mm maximum per side are not included.
2. Plastic interlead protrusions of 0.25 mm maximum per side are not included.

*sot402-1_po*

| Outline version | References | | | | European projection | Issue date |
|---|---|---|---|---|---|---|
| | IEC | JEDEC | JEITA | | | |
| SOT402-1 | | MO-153 | | | | ~~03-02-18~~ 23-10-27 |

**Fig. 10. Package outline SOT402-1 (TSSOP14)**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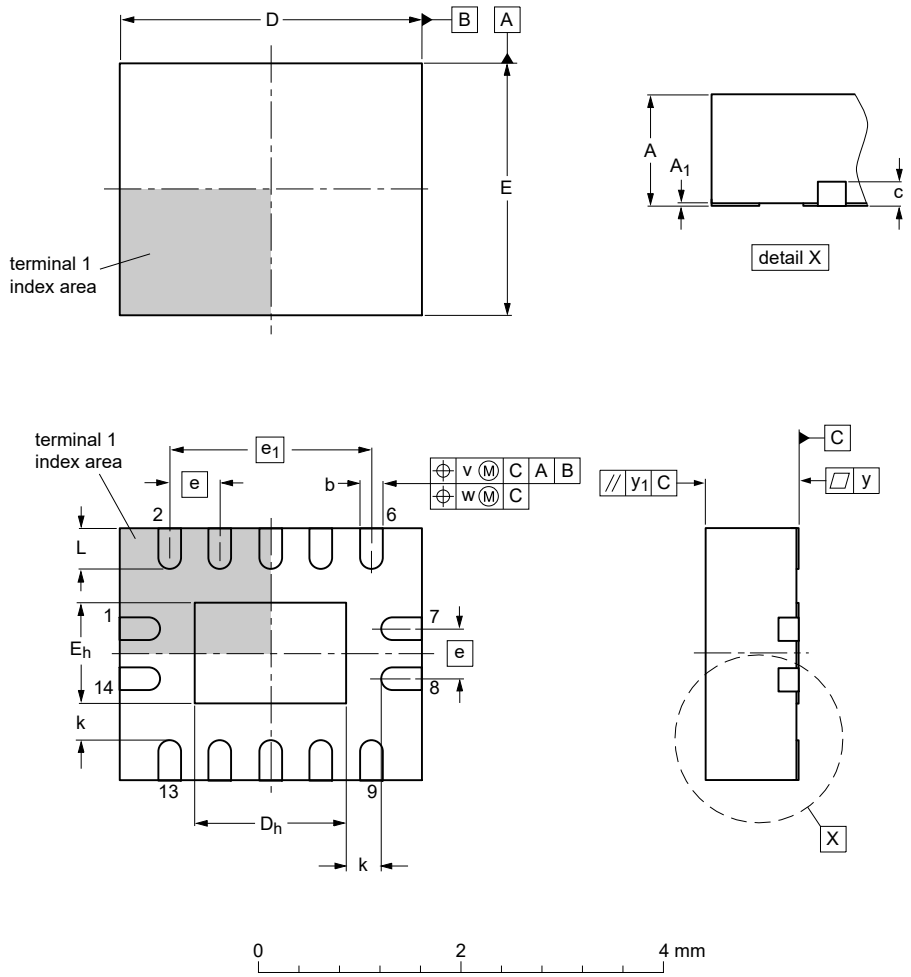
**DHVQFN14: plastic dual in-line compatible thermal enhanced very thin quad flat package; no leads; 14 terminals; body 2.5 x 3 x 0.85 mm** **SOT762-1**




Dimensions (mm are the original dimensions)

| Unit | | $A^{(1)}$ | $A_1$ | b | c | $D^{(1)}$ | $D_h$ | $E^{(1)}$ | $E_h$ | e | $e_1$ | k | L | v | w | y | $y_1$ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | max | 1 | 0.05 | 0.30 | | 3.1 | 1.65 | 2.6 | 1.15 | | | | 0.5 | | | | |
| mm | nom | | 0.02 | 0.25 | 0.2 | 3.0 | 1.50 | 2.5 | 1.00 | 0.5 | 2 | | 0.4 | 0.1 | 0.05 | 0.05 | 0.1 |
| | min | | 0.00 | 0.18 | | 2.9 | 1.35 | 2.4 | 0.85 | | | 0.2 | 0.3 | | | | |

Note

1. Plastic or metal protrusions of 0.075 mm maximum per side are not included.

*sot762-1_po*

| Outline version | References | | | | European projection | Issue date |
|---|---|---|---|---|---|---|
| | IEC | JEDEC | JEITA | | | |
| SOT762-1 | | MO-241 | | | | ~~15-04-10~~ 15-05-05 |

**Fig. 11. Package outline SOT762-1 (DHVQFN14)**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## 12. Abbreviations

**Table 9. 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 |

## 13. Revision history

**Table 10. Revision history**

| Document ID | Release date | Data sheet status | Change notice | Supersedes |
|---|---|---|---|---|
| 74LVC11 v.10 | 20240212 | Product data sheet | - | 74LVC11 v.9 |
| Modifications: | • Fig. 9, Fig. 10: Aligned SO and TSSOP package outline drawings to JEDEC MS-012 and MO-153. | | | |
| 74LVC11 v.9 | 20230802 | Product data sheet | - | 74LVC11 v.8 |
| Modifications: | • Section 2: ESD specification updated according to the latest JEDEC standard. | | | |
| 74LVC11 v.8 | 20200113 | Product data sheet | - | 74LVC11 v.7 |
| Modifications: | • Table 4: Derating values for $P_{tot}$ total power dissipation updated. | | | |
| 74LVC11 v.7 | 20171110 | Product data sheet | - | 74LVC11 v.6 |
| Modifications: | • The format of this data sheet has been redesigned to comply with the identity guidelines of Nexperia.<br>• Legal texts have been adapted to the new company name where appropriate. | | | |
| 74LVC11 v.6 | 20111117 | Product data sheet | - | 74LVC11 v.5 |
| Modifications: | • Legal pages updated.<br>• Table 6, bodyrow $\Delta I_{CC}$: condition $V_{CC}$ changed. | | | |
| 74LVC11 v.5 | 20111025 | Product data sheet | - | 74LVC11 v.4 |
| 74LVC11 v.4 | 20040113 | Product specification | - | 74LVC11 v.3 |
| 74LVC11 v.3 | 19980428 | Product specification | - | 74LVC11 v.2 |
| 74LVC11 v.2 | 19980428 | Product specification | - | 74LVC11 v.1 |
| 74LVC11 v.1 | - | - | - | - |


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# 14. 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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