# 74LVC1G126-Q100

## Bus buffer/line driver; 3-state

Rev. 1 — 1 October 2012 Product data sheet

## 1. General description

The 74LVC1G126-Q100 provides one non-inverting buffer/line driver with 3-state output. The 3-state output is controlled by the output enable input (OE). A LOW-level at pin OE causes the output to assume a high-impedance OFF-state.

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.

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

- 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
- 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)
  - JESD8B/JESD36 (2.7 V to 3.6 V)
- ±24 mA output drive ($V_{CC}$ = 3.0 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 pF, R = 0 Ω)
- CMOS low power consumption
- Inputs accept voltages up to 5 V
- 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 |
| 74LVC1G126GW-Q100 | −40 °C to +125 °C | TSSOP5 | plastic thin shrink small outline package; 5 leads; body width 1.25 mm | SOT353-1 |
| 74LVC1G126GV-Q100 | −40 °C to +125 °C | SC-74A | plastic surface-mounted package; 5 leads | SOT753 |

# 4. Marking

**Table 2. Marking codes**

| Type number | Marking[1] |
|---|---|
| 74LVC1G126GW-Q100 | VN |
| 74LVC1G126GV-Q100 | V26 |

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

# 5. Functional diagram

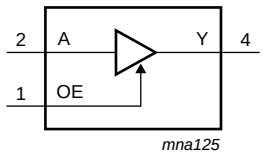



**Fig 1. Logic symbol**

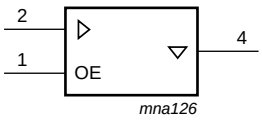



**Fig 2. IEC logic symbol**

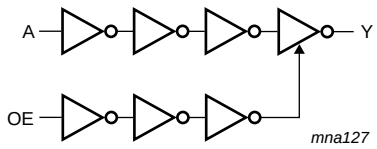



**Fig 3. Logic diagram**

# 6. Pinning information

## 6.1 Pinning

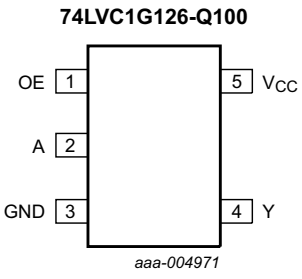



**Fig 4. Pin configuration SOT353-1 and SOT753**

### 6.2 Pin description

**Table 3. Pin description**

| Symbol | Pin | Description |
|---|---|---|
| OE | 1 | output enable input |
| A | 2 | data input |
| GND | 3 | ground (0 V) |
| Y | 4 | data output |
| $V_{CC}$ | 5 | supply voltage |

## 7. Functional description

**Table 4. Function table[1]**

| Input | | Output |
|---|---|---|
| **OE** | **A** | **Y** |
| H | L | L |
| H | H | H |
| L | 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 | 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 TSSOP5 and SC-74A 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 |
| | | $V_{CC}$ = 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[1] | Max | Unit |
|---|---|---|---|---|---|---|
| **$T_{amb}$ = –40 °C to +85 °C** | | | | | | |
| $V_{IH}$ | HIGH-level input voltage | $V_{CC}$ = 1.65 V to 1.95 V | 0.65 × $V_{CC}$ | - | - | 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 | 0.7 × $V_{CC}$ | - | - | V |
| $V_{IL}$ | LOW-level input voltage | $V_{CC}$ = 1.65 V to 1.95 V | - | - | 0.35 × $V_{CC}$ | 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 | - | - | 0.3 × $V_{CC}$ | V |
| $V_{OL}$ | LOW-level output voltage | $V_I$ = $V_{IH}$ or $V_{IL}$ | | | | |
| | | $V_{CC}$ = 1.65 V to 5.5 V; $I_O$ = 100 μA | - | - | 0.1 | V |
| | | $V_{CC}$ = 1.65 V; $I_O$ = 4 mA | - | - | 0.45 | V |
| | | $V_{CC}$ = 2.3 V; $I_O$ = 8 mA | - | - | 0.3 | V |
| | | $V_{CC}$ = 2.7 V; $I_O$ = 12 mA | - | - | 0.4 | V |
| | | $V_{CC}$ = 3.0 V; $I_O$ = 24 mA | - | - | 0.55 | V |
| | | $V_{CC}$ = 4.5 V; $I_O$ = 32 mA | - | - | 0.55 | V |
| $V_{OH}$ | HIGH-level output voltage | $V_I$ = $V_{IH}$ or $V_{IL}$ | | | | |
| | | $V_{CC}$ = 1.65 V to 5.5 V; $I_O$ = –100 μA | $V_{CC}$ – 0.1 | - | - | V |
| | | $V_{CC}$ = 1.65 V; $I_O$ = –4 mA | 1.2 | - | - | V |
| | | $V_{CC}$ = 2.3 V; $I_O$ = –8 mA | 1.9 | - | - | V |
| | | $V_{CC}$ = 2.7 V; $I_O$ = –12 mA | 2.2 | - | - | V |
| | | $V_{CC}$ = 3.0 V; $I_O$ = –24 mA | 2.3 | - | - | V |
| | | $V_{CC}$ = 4.5 V; $I_O$ = –32 mA | 3.8 | - | - | V |
| $I_I$ | input leakage current | $V_{CC}$ = 0 V to 5.5 V; $V_I$ = 5.5 V or GND | - | ±0.1 | ±5 | μA |
| $I_{OZ}$ | OFF-state output current | $V_{CC}$ = 3.6 V; $V_I$ = $V_{IH}$ or $V_{IL}$; $V_O$ = 5.5 V or GND | - | ±0.1 | ±10 | μA |

**Table 7. Static characteristics** *…continued*

*At recommended operating conditions; voltages are referenced to GND (ground = 0 V).*

| Symbol | Parameter | Conditions | Min | Typ[1] | Max | Unit |
|---|---|---|---|---|---|---|
| $I_{OFF}$ | power-off leakage current | $V_{CC}$ = 0 V; $V_I$ or $V_O$ = 5.5 V | - | ±0.1 | ±10 | 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 | 10 | μA |
| $\Delta I_{CC}$ | additional supply current | per pin; $V_{CC}$ = 2.3 V to 5.5 V; $V_I$ = $V_{CC}$ − 0.6 V; $I_O$ = 0 A | - | 5 | 500 | μA |
| $C_I$ | input capacitance | | - | 5 | - | pF |
| **$T_{amb}$ = –40 °C to +125 °C** | | | | | | |
| $V_{IH}$ | HIGH-level input voltage | $V_{CC}$ = 1.65 V to 1.95 V | 0.65 × $V_{CC}$ | - | - | 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 | 0.7 × $V_{CC}$ | - | - | V |
| $V_{IL}$ | LOW-level input voltage | $V_{CC}$ = 1.65 V to 1.95 V | - | - | 0.35 × $V_{CC}$ | 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 | - | - | 0.3 × $V_{CC}$ | V |
| $V_{OL}$ | LOW-level output voltage | $V_I$ = $V_{IH}$ or $V_{IL}$ | | | | |
| | | $V_{CC}$ = 1.65 V to 5.5 V; $I_O$ = 100 μA | - | - | 0.1 | V |
| | | $V_{CC}$ = 1.65 V; $I_O$ = 4 mA | - | - | 0.70 | V |
| | | $V_{CC}$ = 2.3 V; $I_O$ = 8 mA | - | - | 0.45 | V |
| | | $V_{CC}$ = 2.7 V; $I_O$ = 12 mA | - | - | 0.60 | V |
| | | $V_{CC}$ = 3.0 V; $I_O$ = 24 mA | - | - | 0.80 | V |
| | | $V_{CC}$ = 4.5 V; $I_O$ = 32 mA | - | - | 0.80 | V |
| $V_{OH}$ | HIGH-level output voltage | $V_I$ = $V_{IH}$ or $V_{IL}$ | | | | |
| | | $V_{CC}$ = 1.65 V to 5.5 V; $I_O$ = –100 μA | $V_{CC}$ − 0.1 | - | - | V |
| | | $V_{CC}$ = 1.65 V; $I_O$ = –4 mA | 0.95 | - | - | V |
| | | $V_{CC}$ = 2.3 V; $I_O$ = –8 mA | 1.7 | - | - | V |
| | | $V_{CC}$ = 2.7 V; $I_O$ = –12 mA | 1.9 | - | - | V |
| | | $V_{CC}$ = 3.0 V; $I_O$ = –24 mA | 2.0 | - | - | V |
| | | $V_{CC}$ = 4.5 V; $I_O$ = –32 mA | 3.4 | - | - | V |
| $I_I$ | input leakage current | $V_{CC}$ = 0 V to 5.5 V; $V_I$ = 5.5 V or GND | - | - | ±100 | μA |
| $I_{OZ}$ | OFF-state output current | $V_{CC}$ = 3.6 V; $V_I$ = $V_{IH}$ or $V_{IL}$; $V_O$ = 5.5 V or GND | - | - | ±200 | μA |
| $I_{OFF}$ | power-off leakage current | $V_{CC}$ = 0 V; $V_I$ or $V_O$ = 5.5 V | - | - | ±200 | 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 | - | - | 200 | μA |
| $\Delta I_{CC}$ | additional supply current | per pin; $V_{CC}$ = 2.3 V to 5.5 V; $V_I$ = $V_{CC}$ − 0.6 V; $I_O$ = 0 A | - | - | 5000 | μA |

[1] All 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 7.*

| 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 Figure 5 | [2] | | | | | | |
| | | $V_{CC}$ = 1.65 V to 1.95 V | | 1.0 | 3 | 8.0 | 1.0 | 10.5 | ns |
| | | $V_{CC}$ = 2.3 V to 2.7 V | | 0.5 | 2.1 | 5.5 | 0.5 | 7 | ns |
| | | $V_{CC}$ = 2.7 V | | 0.5 | 2.3 | 5.5 | 0.5 | 7 | ns |
| | | $V_{CC}$ = 3.0 V to 3.6 V | | 0.5 | 2.0 | 4.5 | 0.5 | 6 | ns |
| | | $V_{CC}$ = 4.5 V to 5.5 V | | 0.5 | 1.7 | 4.0 | 0.5 | 5.5 | ns |
| $t_{en}$ | enable time | OE to Y; see Figure 6 | [3] | | | | | | |
| | | $V_{CC}$ = 1.65 V to 1.95 V | | 1.0 | 3.2 | 9.4 | 1.0 | 12 | ns |
| | | $V_{CC}$ = 2.3 V to 2.7 V | | 0.5 | 2.2 | 6.6 | 0.5 | 8.5 | ns |
| | | $V_{CC}$ = 2.7 V | | 0.5 | 2.4 | 6.6 | 0.5 | 8.5 | ns |
| | | $V_{CC}$ = 3.0 V to 3.6 V | | 0.5 | 2.1 | 5.3 | 0.5 | 7 | ns |
| | | $V_{CC}$ = 4.5 V to 5.5 V | | 0.5 | 1.6 | 5.0 | 0.5 | 6.5 | ns |
| $t_{dis}$ | disable time | OE to Y; see Figure 6 | [4] | | | | | | |
| | | $V_{CC}$ = 1.65 V to 1.95 V | | 1.0 | 4.3 | 9.2 | 1.0 | 12 | ns |
| | | $V_{CC}$ = 2.3 V to 2.7 V | | 0.5 | 2.7 | 5.5 | 0.5 | 7 | ns |
| | | $V_{CC}$ = 2.7 V | | 0.5 | 3.4 | 5.5 | 0.5 | 7 | ns |
| | | $V_{CC}$ = 3.0 V to 3.6 V | | 0.5 | 3.0 | 5.5 | 0.5 | 7 | ns |
| | | $V_{CC}$ = 4.5 V to 5.5 V | | 0.5 | 2.2 | 4.2 | 0.5 | 5.5 | ns |
| $C_{PD}$ | power dissipation capacitance | per buffer; $V_I$ = GND to $V_{CC}$ | [5] | | | | | | |
| | | output enabled | | - | 25 | - | - | - | pF |
| | | output disabled | | - | 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.

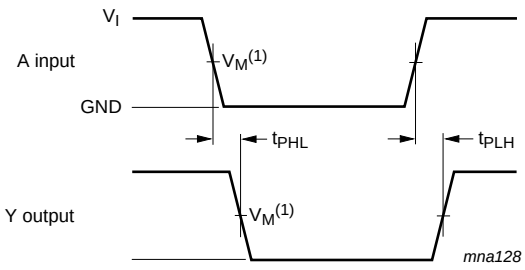
[2] $t_{pd}$ is the same as $t_{PLH}$ and $t_{PHL}$

[3] $t_{en}$ 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).
$P_D = C_{PD} \times V_{CC}^2 \times f_i \times N + \Sigma(C_L \times V_{CC}^2 \times f_o)$ 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;
$\Sigma(C_L \times V_{CC}^2 \times f_o)$ = sum of outputs.

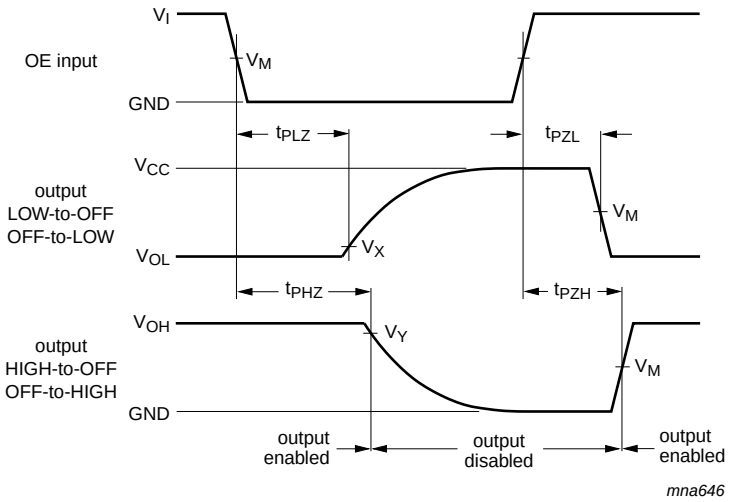
## 12. Waveforms




Measurement points are given in Table 9.

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

**Fig 5. Input A to output Y propagation delay times**



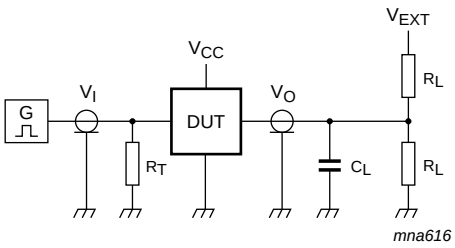

Measurement points are given in Table 9.

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

**Fig 6. 3-state 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:

$R_L$ = 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.

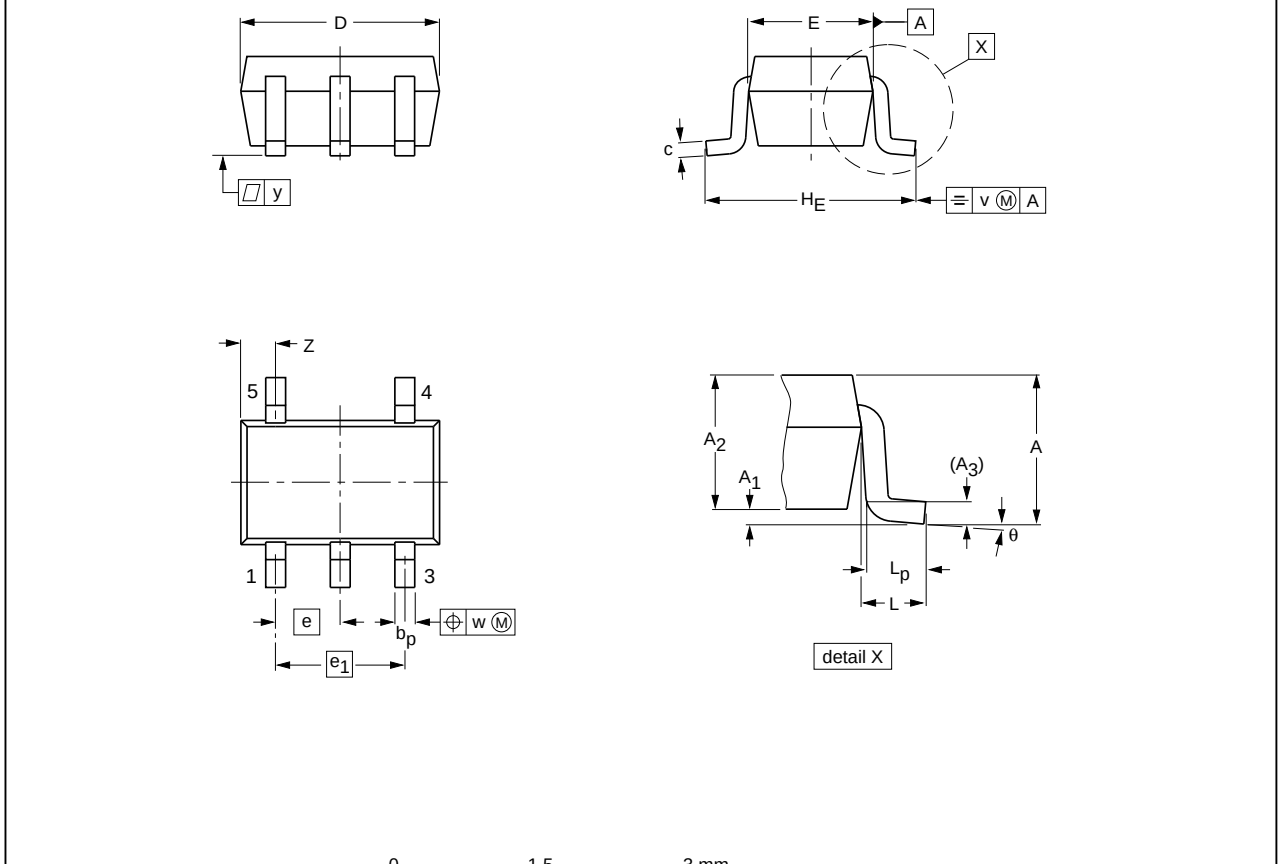
**Fig 7. Test circuit for measuring switching times**

**Table 10. Test data**

| Supply voltage | Input | | Load | | $V_{EXT}$ | | |
|---|---|---|---|---|---|---|---|
| $V_{CC}$ | $V_I$ | $t_r$, $t_f$ | $C_L$ | $R_L$ | $t_{PLH}$, $t_{PHL}$ | $t_{PZH}$, $t_{PHZ}$ | $t_{PZL}$, $t_{PLZ}$ |
| 1.65 V to 1.95 V | $V_{CC}$ | ≤ 2.0 ns | 30 pF | 1 kΩ | 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

**TSSOP5: plastic thin shrink small outline package; 5 leads; body width 1.25 mm** **SOT353-1**




**DIMENSIONS (mm are the original dimensions)**

| UNIT | A max. | $A_1$ | $A_2$ | $A_3$ | $b_p$ | c | $D^{(1)}$ | $E^{(1)}$ | e | $e_1$ | $H_E$ | L | $L_p$ | v | w | y | $Z^{(1)}$ | θ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| mm | 1.1 | 0.1<br>0 | 1.0<br>0.8 | 0.15 | 0.30<br>0.15 | 0.25<br>0.08 | 2.25<br>1.85 | 1.35<br>1.15 | 0.65 | 1.3 | 2.25<br>2.0 | 0.425 | 0.46<br>0.21 | 0.3 | 0.1 | 0.1 | 0.60<br>0.15 | 7°<br>0° |

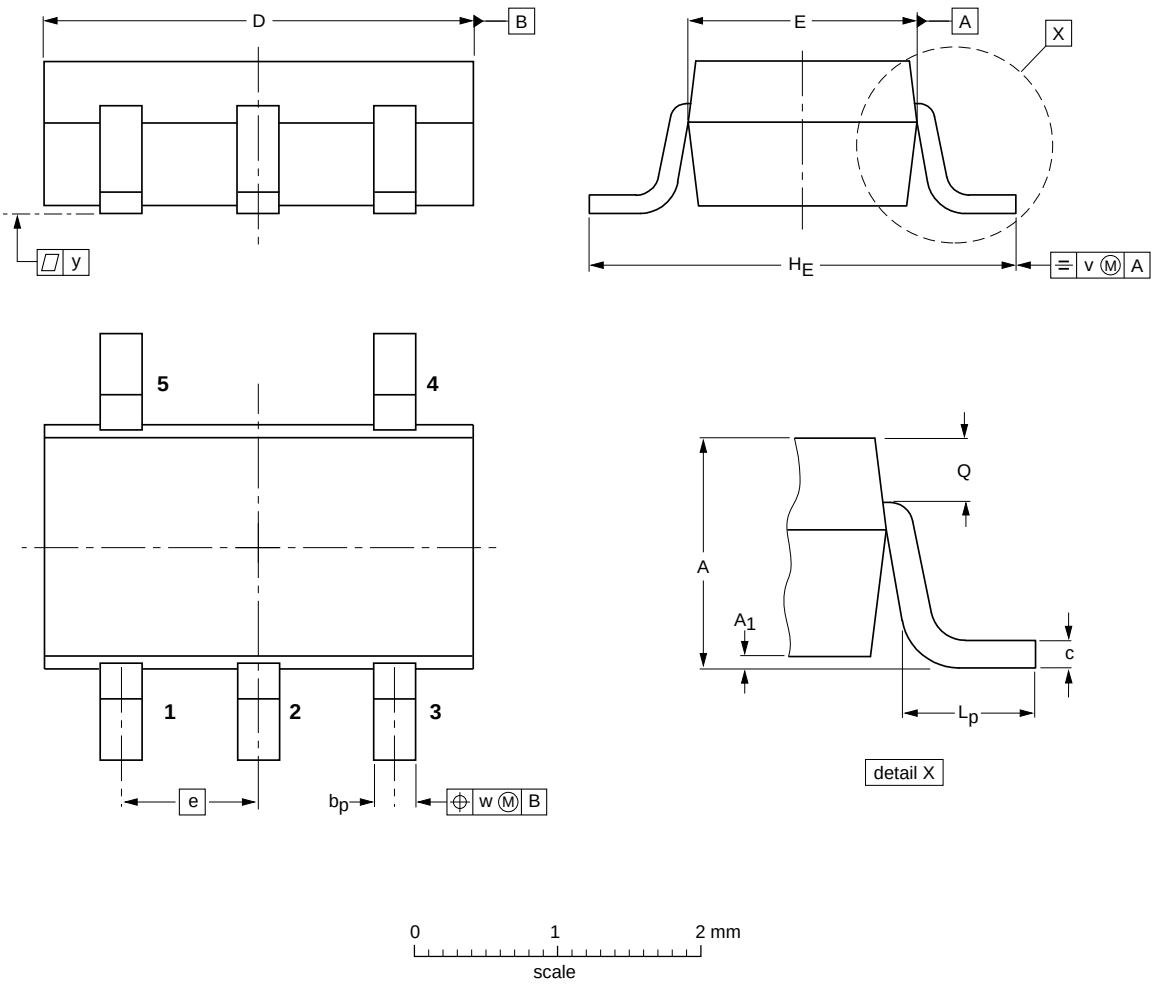
**Note**

1. Plastic or metal protrusions of 0.15 mm maximum per side are not included.

| OUTLINE VERSION | REFERENCES | | | | EUROPEAN PROJECTION | ISSUE DATE |
|---|---|---|---|---|---|---|
| | IEC | JEDEC | JEITA | | | |
| SOT353-1 | | MO-203 | SC-88A | | | ~~00-09-01~~<br>03-02-19 |

**Fig 8. Package outline SOT353-1 (TSSOP5)**

**Plastic surface-mounted package; 5 leads** **SOT753**




**DIMENSIONS (mm are the original dimensions)**

| UNIT | A | $A_1$ | $b_p$ | c | D | E | e | $H_E$ | $L_p$ | Q | v | w | y |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| mm | 1.1<br>0.9 | 0.100<br>0.013 | 0.40<br>0.25 | 0.26<br>0.10 | 3.1<br>2.7 | 1.7<br>1.3 | 0.95 | 3.0<br>2.5 | 0.6<br>0.2 | 0.33<br>0.23 | 0.2 | 0.2 | 0.1 |

| OUTLINE VERSION | REFERENCES | | | | EUROPEAN PROJECTION | ISSUE DATE |
|---|---|---|---|---|---|---|
| | IEC | JEDEC | JEITA | | | |
| SOT753 | | | SC-74A | | | ~~02-04-16~~<br>06-03-16 |

**Fig 9. Package outline SOT753 (SC-74A)**

## 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 |
|---|---|---|---|---|
| 74LVC1G126_Q100 v.1 | 20121001 | Product data sheet | - | - |

# 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. |
| 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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## 18. Contents





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