

74AHC1G125-Q100; 74AHCT1G125-Q100

Bus buffer/line driver; 3-state

Rev. 4 — 11 January 2022

Product data sheet

1. General description

The 74AHC1G125-Q100/74AHCT1G125-Q100 is a single buffer/line driver with 3-state output. Inputs are overvoltage tolerant. This feature allows the use of these devices as translators in mixed voltage environments.

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 -40 °C to +125 °C
- Wide supply voltage range from 2.0 V to 5.5 V
- Overvoltage tolerant inputs to 5.5 V
- High noise immunity
- Symmetrical output impedance
- CMOS low power dissipation
- Latch-up performance exceeds 100 mA per JESD 78 Class II Level A
- Balanced propagation delays
- Input levels:
 - For 74AHC1G125-Q100: CMOS level
 - For 74AHCT1G125-Q100: TTL level
- 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)

3. Ordering information

Table 1. Ordering information

| Type number | Package | | | |
|--------------------|-------------------|--------|---|----------|
| | Temperature range | Name | Description | Version |
| 74AHC1G125GW-Q100 | -40 °C to +125 °C | TSSOP5 | plastic thin shrink small outline package; 5 leads; body width 1.25 mm | SOT353-1 |
| 74AHCT1G125GW-Q100 | | | | |
| 74AHC1G125GV-Q100 | -40 °C to +125 °C | SC-74A | plastic surface-mounted package; 5 leads | SOT753 |
| 74AHCT1G125GV-Q100 | | | | |

4. Marking

Table 2. Marking codes

| Type number | Marking [1] |
|--------------------|-------------|
| 74AHC1G125GW-Q100 | AM |
| 74AHCT1G125GW-Q100 | CM |
| 74AHC1G125GV-Q100 | A25 |
| 74AHCT1G125GV-Q100 | C25 |

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

5. Functional diagram

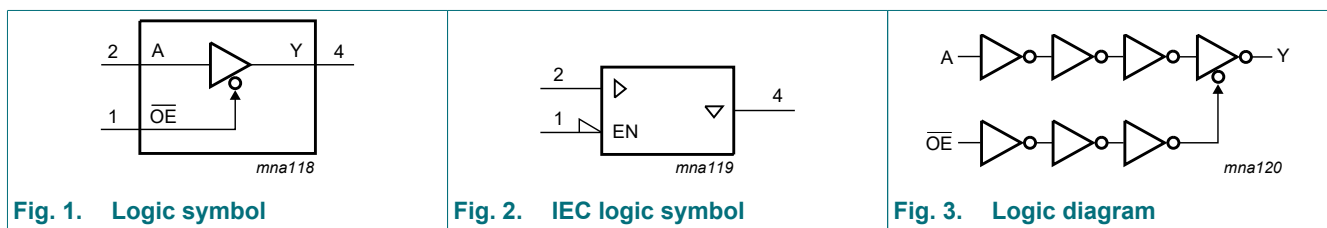


Fig. 1. Logic symbol

Fig. 2. IEC logic symbol

Fig. 3. Logic diagram

6. Pinning information

6.1. Pinning

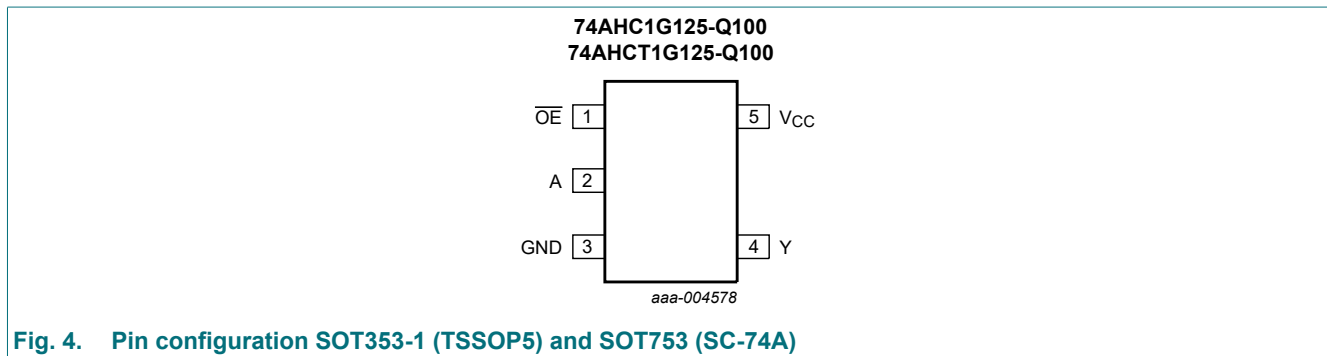


Fig. 4. Pin configuration SOT353-1 (TSSOP5) and SOT753 (SC-74A)

6.2. Pin description

Table 3. Pin description

| Symbol | Pin | Description |
|------------------------|-----|---------------------|
| $\overline{\text{OE}}$ | 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

H = HIGH voltage level; L = LOW voltage level; X = don't care; Z = high-impedance OFF-state

| Inputs | | Output |
|--------|---|--------|
| OE | A | Y |
| L | L | L |
| L | H | H |
| H | X | Z |

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 | +7.0 | V |
| V_I | input voltage | | -0.5 | +7.0 | V |
| I_{IK} | input clamping current | $V_I < -0.5$ V [1] | -20 | - | mA |
| I_{OK} | output clamping current | $V_O < -0.5$ V or $V_O > V_{CC} + 0.5$ V [1] | - | ± 20 | mA |
| I_O | output current | -0.5 V $< V_O < V_{CC} + 0.5$ V | - | ± 25 | mA |
| I_{CC} | supply current | | - | 75 | mA |
| I_{GND} | ground current | | -75 | - | mA |
| T_{stg} | storage temperature | | -65 | +150 | °C |
| P_{tot} | total power dissipation | $T_{amb} = -40$ °C to +125 °C [2] | - | 250 | mW |

[1] The 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.

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

9. Recommended operating conditions

Table 6. Recommended operating conditions

Voltages are referenced to GND (ground = 0 V).

| Symbol | Parameter | Conditions | 74AHC1G125-Q100 | | | 74AHCT1G125-Q100 | | | Unit |
|---------------------|-------------------------------------|------------------------------|-----------------|-----|----------|------------------|-----|----------|------|
| | | | Min | Typ | Max | Min | Typ | Max | |
| V_{CC} | supply voltage | | 2.0 | 5.0 | 5.5 | 4.5 | 5.0 | 5.5 | V |
| V_I | input voltage | | 0 | - | 5.5 | 0 | - | 5.5 | V |
| V_O | output voltage | | 0 | - | V_{CC} | 0 | - | V_{CC} | V |
| T_{amb} | ambient temperature | | -40 | +25 | +125 | -40 | +25 | +125 | °C |
| $\Delta t/\Delta V$ | input transition rise and fall rate | $V_{CC} = 3.3$ V ± 0.3 V | - | - | 100 | - | - | - | ns/V |
| | | $V_{CC} = 5.0$ V ± 0.5 V | - | - | 20 | - | - | 20 | ns/V |

10. Static characteristics

Table 7. Static characteristics

Voltages are referenced to GND (ground = 0 V).

| Symbol | Parameter | Conditions | 25 °C | | | -40 °C to +85 °C | | -40 °C to +125 °C | | Unit |
|-------------------------|---------------------------|--|-------|-----|------|------------------|------|-------------------|------|------|
| | | | Min | Typ | Max | Min | Max | Min | Max | |
| 74AHC1G125-Q100 | | | | | | | | | | |
| V _{IH} | HIGH-level input voltage | V _{CC} = 2.0 V | 1.5 | - | - | 1.5 | - | 1.5 | - | V |
| | | V _{CC} = 3.0 V | 2.1 | - | - | 2.1 | - | 2.1 | - | V |
| | | V _{CC} = 5.5 V | 3.85 | - | - | 3.85 | - | 3.85 | - | V |
| V _{IL} | LOW-level input voltage | V _{CC} = 2.0 V | - | - | 0.5 | - | 0.5 | - | 0.5 | V |
| | | V _{CC} = 3.0 V | - | - | 0.9 | - | 0.9 | - | 0.9 | V |
| | | V _{CC} = 5.5 V | - | - | 1.65 | - | 1.65 | - | 1.65 | V |
| V _{OH} | HIGH-level output voltage | V _I = V _{IH} or V _{IL} | | | | | | | | |
| | | I _O = -50 µA; V _{CC} = 2.0 V | 1.9 | 2.0 | - | 1.9 | - | 1.9 | - | V |
| | | I _O = -50 µA; V _{CC} = 3.0 V | 2.9 | 3.0 | - | 2.9 | - | 2.9 | - | V |
| | | I _O = -50 µA; V _{CC} = 4.5 V | 4.4 | 4.5 | - | 4.4 | - | 4.4 | - | V |
| | | I _O = -4.0 mA; V _{CC} = 3.0 V | 2.58 | - | - | 2.48 | - | 2.40 | - | V |
| | | I _O = -8.0 mA; V _{CC} = 4.5 V | 3.94 | - | - | 3.8 | - | 3.70 | - | V |
| V _{OL} | LOW-level output voltage | V _I = V _{IH} or V _{IL} | | | | | | | | |
| | | I _O = 50 µA; V _{CC} = 2.0 V | - | 0 | 0.1 | - | 0.1 | - | 0.1 | V |
| | | I _O = 50 µA; V _{CC} = 3.0 V | - | 0 | 0.1 | - | 0.1 | - | 0.1 | V |
| | | I _O = 50 µA; V _{CC} = 4.5 V | - | 0 | 0.1 | - | 0.1 | - | 0.1 | V |
| | | I _O = 4.0 mA; V _{CC} = 3.0 V | - | - | 0.36 | - | 0.44 | - | 0.55 | V |
| | | I _O = 8.0 mA; V _{CC} = 4.5 V | - | - | 0.36 | - | 0.44 | - | 0.55 | V |
| I _{OZ} | OFF-state output current | V _I = V _{CC} or GND; V _{CC} = 5.5 V | - | - | 0.25 | - | 2.5 | - | 10 | µA |
| I _I | input leakage current | V _I = 5.5 V or GND; V _{CC} = 0 V to 5.5 V | - | - | 0.1 | - | 1.0 | - | 2.0 | µA |
| I _{CC} | supply current | V _I = V _{CC} or GND; I _O = 0 A; V _{CC} = 5.5 V | - | - | 1.0 | - | 10 | - | 40 | µA |
| C _I | input capacitance | | - | 1.5 | 10 | - | 10 | - | 10 | pF |
| 74AHCT1G125-Q100 | | | | | | | | | | |
| V _{IH} | HIGH-level input voltage | V _{CC} = 4.5 V to 5.5 V | 2.0 | - | - | 2.0 | - | 2.0 | - | V |
| V _{IL} | LOW-level input voltage | V _{CC} = 4.5 V to 5.5 V | - | - | 0.8 | - | 0.8 | - | 0.8 | V |
| V _{OH} | HIGH-level output voltage | V _I = V _{IH} or V _{IL} ; V _{CC} = 4.5 V | | | | | | | | |
| | | I _O = -50 µA | 4.4 | 4.5 | - | 4.4 | - | 4.4 | - | V |
| | | I _O = -8.0 mA | 3.94 | - | - | 3.8 | - | 3.70 | - | V |
| V _{OL} | LOW-level output voltage | V _I = V _{IH} or V _{IL} ; V _{CC} = 4.5 V | | | | | | | | |
| | | I _O = 50 µA | - | 0 | 0.1 | - | 0.1 | - | 0.1 | V |
| | | I _O = 8.0 mA | - | - | 0.36 | - | 0.44 | - | 0.55 | V |

| Symbol | Parameter | Conditions | 25 °C | | | -40 °C to +85 °C | | -40 °C to +125 °C | | Unit |
|------------------|---------------------------|--|-------|-----|------|------------------|-----|-------------------|-----|------|
| | | | Min | Typ | Max | Min | Max | Min | Max | |
| I _{oz} | OFF-state output current | V _I = V _{CC} or GND; V _{CC} = 5.5 V | - | - | 0.25 | - | 2.5 | - | 10 | µA |
| I _I | input leakage current | V _I = 5.5 V or GND; V _{CC} = 0 V to 5.5 V | - | - | 0.1 | - | 1.0 | - | 2.0 | µA |
| I _{CC} | supply current | V _I = V _{CC} or GND; I _O = 0 A; V _{CC} = 5.5 V | - | - | 1.0 | - | 10 | - | 40 | µA |
| ΔI _{CC} | additional supply current | per input pin; V _I = 3.4 V; other inputs at V _{CC} or GND; I _O = 0 A; V _{CC} = 5.5 V | - | - | 1.35 | - | 1.5 | - | 1.5 | mA |
| C _I | input capacitance | | - | 1.5 | 10 | - | 10 | - | 10 | pF |

11. Dynamic characteristics

Table 8. Dynamic characteristics

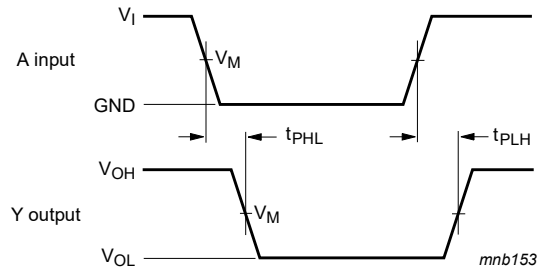
GND = 0 V; For test circuit see Fig. 7.

| Symbol | Parameter | Conditions | 25 °C | | | -40 °C to +85 °C | | -40 °C to +125 °C | | Unit |
|------------------------|-------------------------------|--|-------|-----|------|------------------|------|-------------------|------|------|
| | | | Min | Typ | Max | Min | Max | Min | Max | |
| 74AHC1G125-Q100 | | | | | | | | | | |
| t _{pd} | propagation delay | A to Y; see Fig. 5 [1] | | | | | | | | |
| | | V _{CC} = 3.0 V to 3.6 V; C _L = 15 pF [2] | - | 4.7 | 8.0 | 1.0 | 9.5 | 1.0 | 11.5 | ns |
| | | V _{CC} = 3.0 V to 3.6 V; C _L = 50 pF [2] | - | 6.6 | 11.5 | 1.0 | 13.0 | 1.0 | 14.5 | ns |
| | | V _{CC} = 4.5 V to 5.5 V; C _L = 15 pF [3] | - | 3.4 | 5.5 | 1.0 | 6.5 | 1.0 | 7.0 | ns |
| t _{en} | enable time | OE to Y; see Fig. 6 [1] | | | | | | | | |
| | | V _{CC} = 3.0 V to 3.6 V; C _L = 15 pF [2] | - | 5.0 | 8.0 | 1.0 | 9.5 | 1.0 | 11.5 | ns |
| | | V _{CC} = 3.0 V to 3.6 V; C _L = 50 pF [2] | - | 6.9 | 11.5 | 1.0 | 13.0 | 1.0 | 14.5 | ns |
| | | V _{CC} = 4.5 V to 5.5 V; C _L = 15 pF [3] | - | 3.6 | 5.1 | 1.0 | 6.0 | 1.0 | 6.5 | ns |
| | | V _{CC} = 4.5 V to 5.5 V; C _L = 50 pF [3] | - | 4.9 | 7.5 | 1.0 | 8.5 | 1.0 | 9.5 | ns |
| t _{dis} | disable time | OE to Y; see Fig. 6 [1] | | | | | | | | |
| | | V _{CC} = 3.0 V to 3.6 V; C _L = 15 pF [2] | - | 6.0 | 9.7 | 1.0 | 11.5 | 1.0 | 12.5 | ns |
| | | V _{CC} = 3.0 V to 3.6 V; C _L = 50 pF [2] | - | 8.3 | 13.2 | 1.0 | 15.0 | 1.0 | 16.5 | ns |
| | | V _{CC} = 4.5 V to 5.5 V; C _L = 15 pF [3] | - | 4.1 | 6.8 | 1.0 | 8.0 | 1.0 | 8.5 | ns |
| | | V _{CC} = 4.5 V to 5.5 V; C _L = 50 pF [3] | - | 5.7 | 8.8 | 1.0 | 10.0 | 1.0 | 11.0 | ns |
| C _{PD} | power dissipation capacitance | per buffer; C _L = 50 pF; f = 1 MHz; V _I = GND to V _{CC} [4] | - | 9 | - | - | - | - | - | pF |

| Symbol | Parameter | Conditions | 25 °C | | | -40 °C to +85 °C | | -40 °C to +125 °C | | Unit |
|-------------------------|-------------------------------|--|-------|-----|-----|------------------|------|-------------------|------|------|
| | | | Min | Typ | Max | Min | Max | Min | Max | |
| 74AHCT1G125-Q100 | | | | | | | | | | |
| t _{pd} | propagation delay | A to Y; see Fig. 5 [1] | | | | | | | | |
| | | V _{CC} = 4.5 V to 5.5 V; C _L = 15 pF [3] | - | 3.4 | 5.5 | 1.0 | 6.5 | 1.0 | 7.0 | ns |
| | | V _{CC} = 4.5 V to 5.5 V; C _L = 50 pF [3] | - | 4.8 | 7.5 | 1.0 | 8.5 | 1.0 | 9.5 | ns |
| t _{en} | enable time | \overline{OE} to Y; see Fig. 6 [1] | | | | | | | | |
| | | V _{CC} = 4.5 V to 5.5 V; C _L = 15 pF [3] | - | 3.9 | 5.1 | 1.0 | 6.0 | 1.0 | 6.5 | ns |
| | | V _{CC} = 4.5 V to 5.5 V; C _L = 50 pF [3] | - | 5.1 | 7.5 | 1.0 | 8.5 | 1.0 | 9.5 | ns |
| t _{dis} | disable time | \overline{OE} to Y; see Fig. 6 [1] | | | | | | | | |
| | | V _{CC} = 4.5 V to 5.5 V; C _L = 15 pF [3] | - | 4.5 | 6.8 | 1.0 | 8.0 | 1.0 | 8.5 | ns |
| | | V _{CC} = 4.5 V to 5.5 V; C _L = 50 pF [3] | - | 6.1 | 8.8 | 1.0 | 10.0 | 1.0 | 11.0 | ns |
| C _{PD} | power dissipation capacitance | per buffer; C _L = 50 pF; f = 1 MHz; V _I = GND to V _{CC} [4] | - | 11 | - | - | - | - | - | pF |

- [1] t_{pd} is the same as t_{PLH} and t_{PHL}.
t_{en} is the same as t_{PZL} and t_{PZH}.
t_{dis} is the same as t_{PLZ} and t_{PHZ}.
- [2] Typical values are measured at V_{CC} = 3.3 V.
- [3] Typical values are measured at V_{CC} = 5.0 V.
- [4] C_{PD} is used to determine the dynamic power dissipation P_D (μW).
 $P_D = C_{PD} \times V_{CC}^2 \times f_i + \sum(C_L \times V_{CC}^2 \times f_o)$ 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.

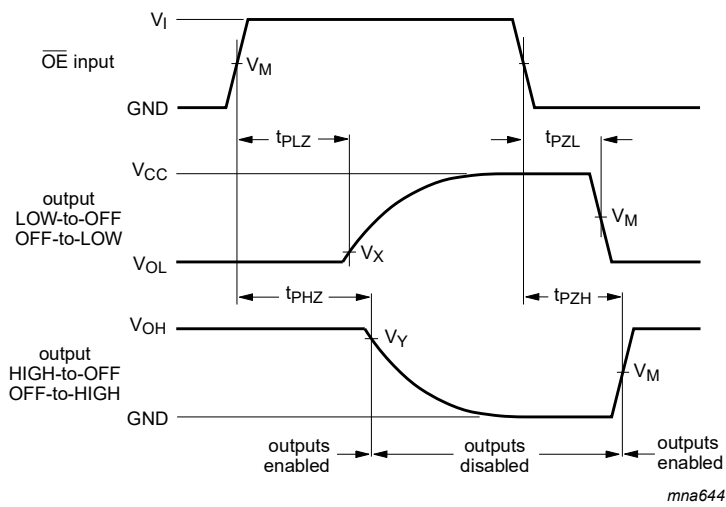
11.1. Waveforms and test circuit



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 delays



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. Enable and disable times

Table 9. Measurement point

| Type | Inputs | | Output | | |
|------------------|-----------------|---------------------|---------------------|--------------------------|--------------------------|
| | V_I | V_M | V_M | V_X | V_Y |
| 74AHC1G125-Q100 | GND to V_{CC} | $0.5 \times V_{CC}$ | $0.5 \times V_{CC}$ | $V_{OL} + 0.3 \text{ V}$ | $V_{OH} - 0.3 \text{ V}$ |
| 74AHCT1G125-Q100 | GND to 3.0 V | 1.5 V | $0.5 \times V_{CC}$ | $V_{OL} + 0.3 \text{ V}$ | $V_{OH} - 0.3 \text{ V}$ |

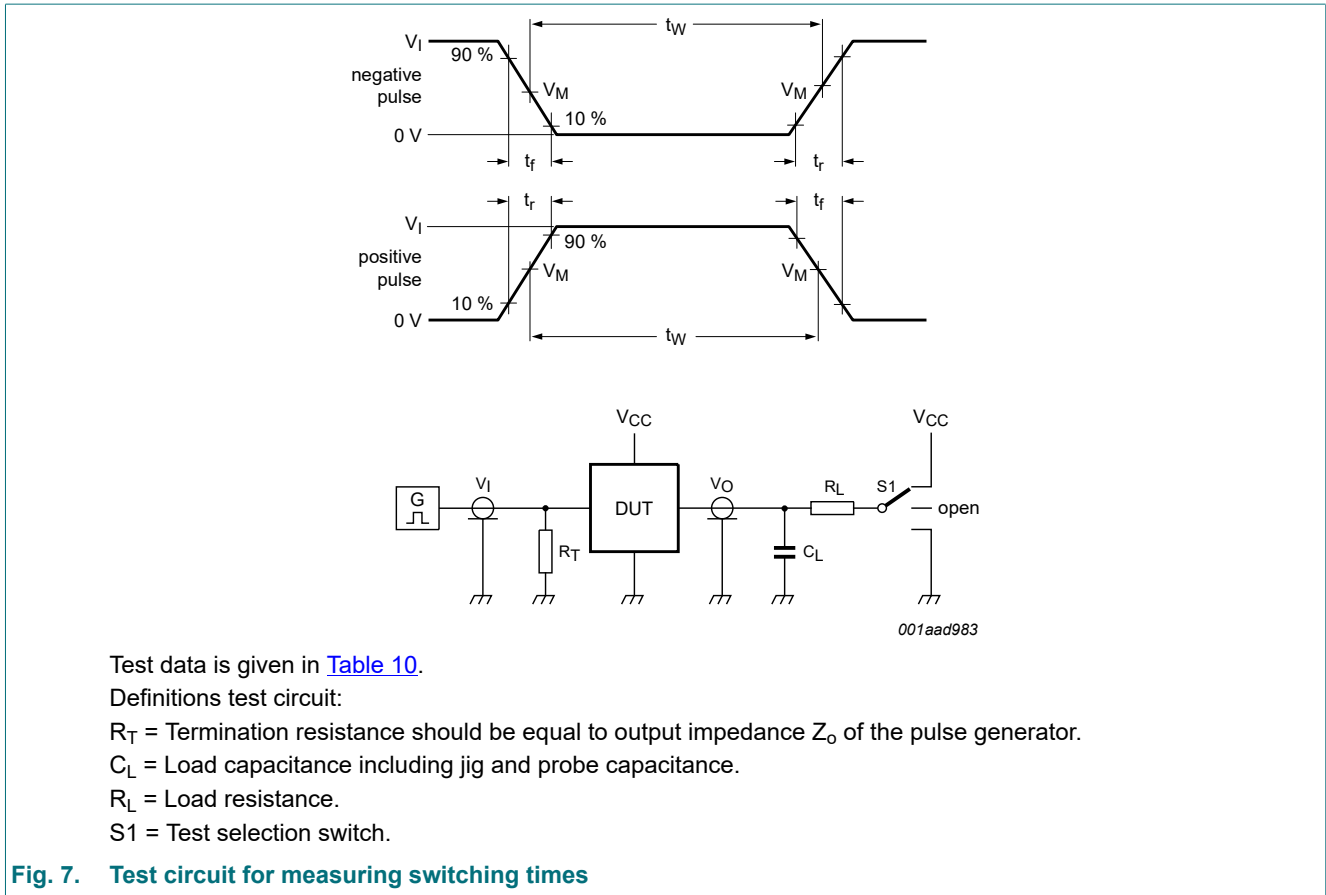


Fig. 7. Test circuit for measuring switching times

Table 10. Test data

| Type | Input | | Load | | S1 position | | |
|------------------|----------|-------------|--------------|--------------|--------------------|--------------------|--------------------|
| | V_I | t_r, t_f | C_L | R_L | t_{PHL}, t_{PLH} | t_{PZH}, t_{PHZ} | t_{PZL}, t_{PLZ} |
| 74AHC1G125-Q100 | V_{CC} | ≤ 3 ns | 15 pF, 50 pF | 1 k Ω | open | GND | V_{CC} |
| 74AHCT1G125-Q100 | 3 V | ≤ 3 ns | 15 pF, 50 pF | 1 k Ω | open | GND | V_{CC} |

12. Package outline

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

SOT353-1

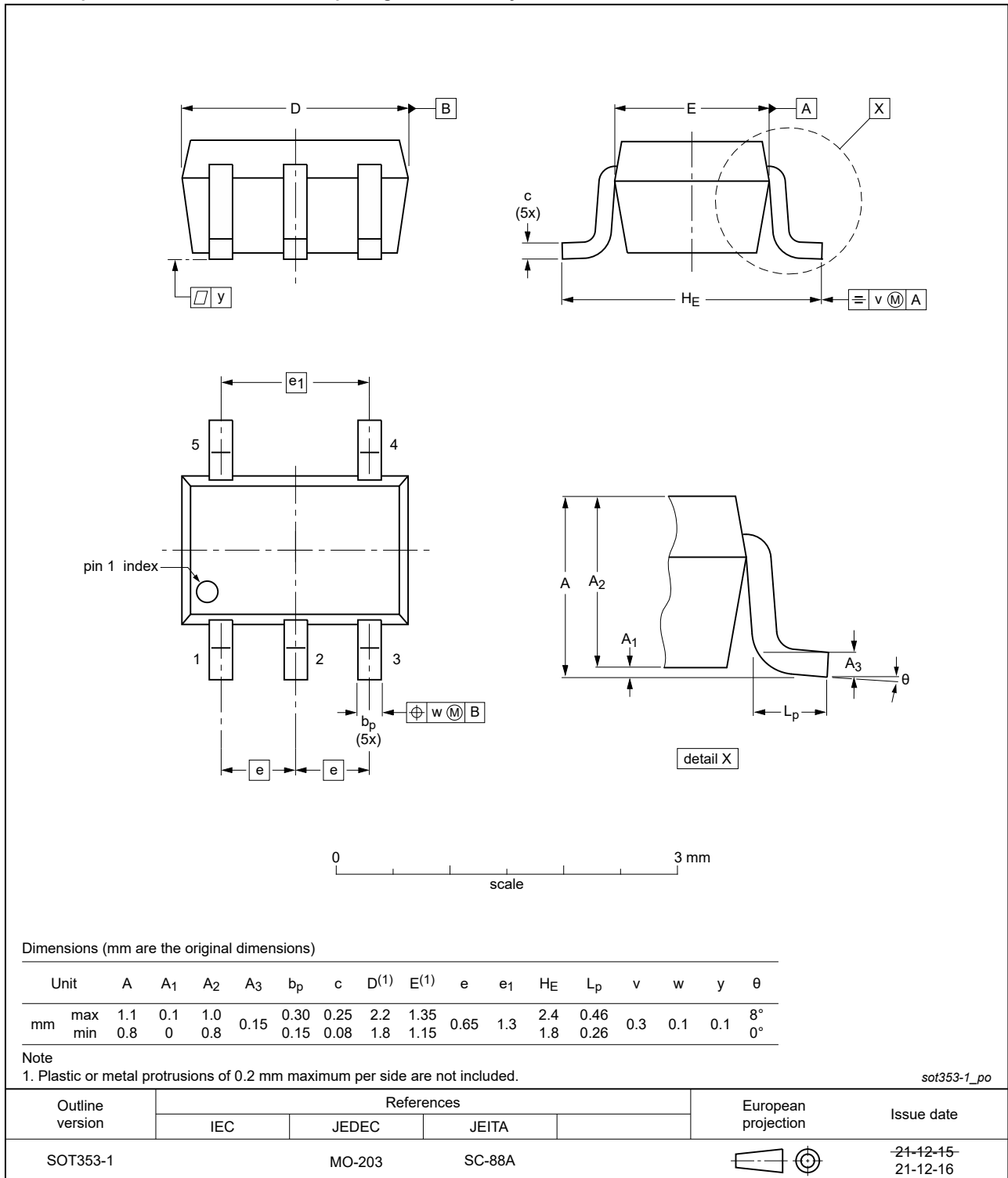


Fig. 8. Package outline SOT353-1 (TSSOP5)

Plastic surface-mounted package; 5 leads

SOT753

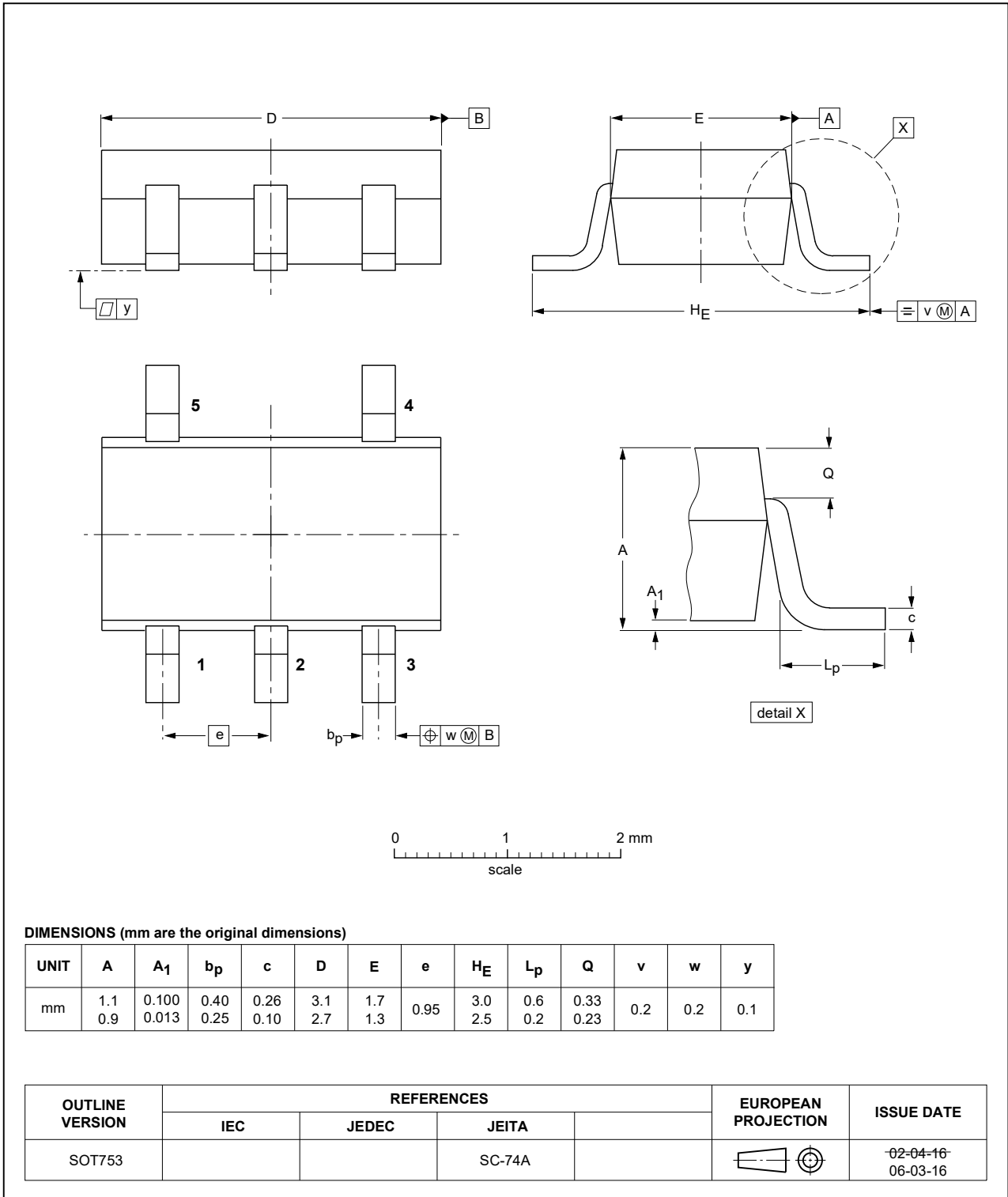


Fig. 9. Package outline SOT753 (SC-74A)

13. Abbreviations

Table 11. Abbreviations

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

14. Revision history

Table 12. Revision history

| Document ID | Release date | Data sheet status | Change notice | Supersedes |
|--------------------------|---|--------------------|---------------|--------------------------|
| 74AHC_AHCT1G125_Q100 v.4 | 20220111 | Product data sheet | - | 74AHC_AHCT1G125_Q100 v.3 |
| Modifications: | <ul style="list-style-type: none"> Fig. 8: Package outline drawing SOT353-1(TSSOP5) has changed | | | |
| 74AHC_AHCT1G125_Q100 v.3 | 20201013 | Product data sheet | - | 74AHC_AHCT1G125_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. Section 1 and Section 2 updated. Table 5: Derating values for P_{tot} total power dissipation updated. | | | |
| 74AHC_AHCT1G125_Q100 v.2 | 20121019 | Product data sheet | - | 74AHC_AHCT1G125_Q100 v.1 |
| Modifications: | <ul style="list-style-type: none"> Section 2: ESD protection CDM JESD22-C101E changed to MIL-STD-833. | | | |
| 74AHC_AHCT1G125_Q100 v.1 | 20120807 | Product data sheet | - | - |

15. 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. |

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- [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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