

74HC1G125; 74HCT1G125

Bus buffer/line driver; 3-state

Rev. 7 — 17 January 2022

Product data sheet

1. General description

The 74HC1G125; 74HCT1G125 is a single buffer/line driver with 3-state output. Inputs include clamp diodes. This enables the use of current limiting resistors to interface inputs to voltages in excess of V_{CC} .

2. Features and benefits

- Wide supply voltage range from 2.0 V to 6.0 V
- CMOS low power dissipation
- High noise immunity
- Latch-up performance exceeds 100 mA per JESD 78 Class II Level B
- Input levels:
 - For 74HC1G125: CMOS level
 - For 74HCT1G125: TTL level
- Symmetrical output impedance
- High noise immunity
- Balanced propagation delays
- Complies with JEDEC standards:
 - JESD8C (2.7 V to 3.6 V)
 - JESD7A (2.0 V to 6.0 V)
- ESD protection:
 - HBM JESD22-A114F exceeds 2000 V
 - MM JESD22-A115-A exceeds 200 V
- Specified from $-40\text{ }^{\circ}\text{C}$ to $85\text{ }^{\circ}\text{C}$ and $-40\text{ }^{\circ}\text{C}$ to $125\text{ }^{\circ}\text{C}$

3. Ordering information

Table 1. Ordering information

| Type number | Package | | | |
|--------------|---|--------|--|----------|
| | Temperature range | Name | Description | Version |
| 74HC1G125GW | $-40\text{ }^{\circ}\text{C}$ to $+125\text{ }^{\circ}\text{C}$ | TSSOP5 | plastic thin shrink small outline package; 5 leads; body width 1.25 mm | SOT353-1 |
| 74HCT1G125GW | | | | |
| 74HC1G125GV | $-40\text{ }^{\circ}\text{C}$ to $+125\text{ }^{\circ}\text{C}$ | SC-74A | plastic surface-mounted package; 5 leads | SOT753 |
| 74HCT1G125GV | | | | |

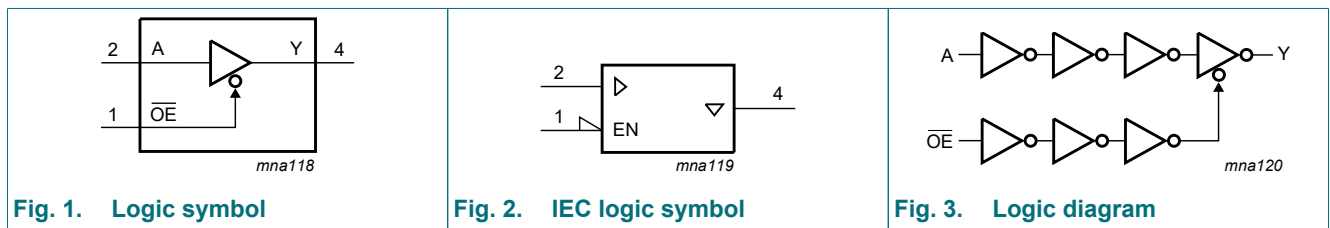
4. Marking

Table 2. Marking

| Type number | Marking code ^[1] |
|--------------|-----------------------------|
| 74HC1G125GW | HM |
| 74HCT1G125GW | TM |
| 74HC1G125GV | H25 |
| 74HCT1G125GV | T25 |

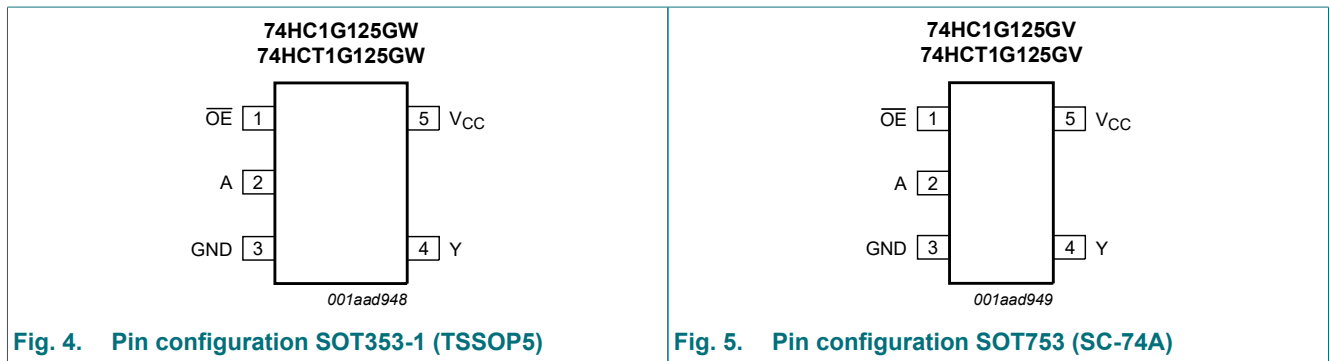
[1] The pin 1 indicator is located on the lower left corner of the device, below the marking code.

5. Functional diagram



6. Pinning information

6.1. Pinning



6.2. Pin description

Table 3. Pin description

| Symbol | Pin | Description |
|-----------------|-----|----------------------------------|
| OE | 1 | output enable input (active LOW) |
| 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.

| Control | Input | 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 |
| I_{IK} | input clamping current | $V_I < -0.5\text{ V}$ or $V_I > V_{CC} + 0.5\text{ V}$ | [1] | ±20 | mA |
| I_{OK} | output clamping current | $V_O < -0.5\text{ V}$ or $V_O > V_{CC} + 0.5\text{ V}$ | [1] | ±20 | mA |
| I_O | output current | $V_O = -0.5\text{ V}$ to $(V_{CC} + 0.5\text{ V})$ | [1] | ±35 | mA |
| I_{CC} | supply current | | - | 70 | mA |
| I_{GND} | ground current | | -70 | - | mA |
| T_{stg} | storage temperature | | -65 | +150 | °C |
| P_{tot} | total power dissipation | $T_{amb} = -40\text{ °C}$ to $+125\text{ °C}$ | [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 | 74HC1G125 | | | 74HCT1G125 | | | Unit |
|---------------------|-------------------------------------|-------------------------|-----------|------|----------|------------|------|----------|------|
| | | | Min | Typ | Max | Min | Typ | Max | |
| V_{CC} | supply voltage | | 2.0 | 5.0 | 6.0 | 4.5 | 5.0 | 5.5 | V |
| V_I | input voltage | | 0 | - | V_{CC} | 0 | - | V_{CC} | 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 | $V_{CC} = 2.0\text{ V}$ | - | - | 625 | - | - | - | ns/V |
| | | $V_{CC} = 4.5\text{ V}$ | - | 1.67 | 139 | - | 1.67 | 139 | ns/V |
| | | $V_{CC} = 6.0\text{ V}$ | - | - | 83 | - | - | - | ns/V |

10. Static characteristics

Table 7. Static characteristics 74HC1G125

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} = 2.0 V | 1.5 | 1.2 | - | 1.5 | - | V |
| | | V _{CC} = 4.5 V | 3.15 | 2.4 | - | 3.15 | - | V |
| | | V _{CC} = 6.0 V | 4.2 | 3.2 | - | 4.2 | - | V |
| V _{IL} | LOW-level input voltage | V _{CC} = 2.0 V | - | 0.8 | 0.5 | - | 0.5 | V |
| | | V _{CC} = 4.5 V | - | 2.1 | 1.35 | - | 1.35 | V |
| | | V _{CC} = 6.0 V | - | 2.8 | 1.8 | - | 1.8 | V |
| V _{OH} | HIGH-level output voltage | V _I = V _{IH} or V _{IL} | | | | | | |
| | | I _O = -20 μA; V _{CC} = 2.0 V | 1.9 | 2.0 | - | 1.9 | - | V |
| | | I _O = -20 μA; V _{CC} = 4.5 V | 4.4 | 4.5 | - | 4.4 | - | V |
| | | I _O = -20 μA; V _{CC} = 6.0 V | 5.9 | 6.0 | - | 5.9 | - | V |
| | | I _O = -6.0 mA; V _{CC} = 4.5 V | 3.84 | 4.32 | - | 3.7 | - | V |
| | | I _O = -7.8 mA; V _{CC} = 6.0 V | 5.34 | 5.81 | - | 5.2 | - | V |
| V _{OL} | LOW-level output voltage | V _I = V _{IH} or V _{IL} | | | | | | |
| | | I _O = 20 μA; V _{CC} = 2.0 V | - | 0 | 0.1 | - | 0.1 | V |
| | | I _O = 20 μA; V _{CC} = 4.5 V | - | 0 | 0.1 | - | 0.1 | V |
| | | I _O = 20 μA; V _{CC} = 6.0 V | - | 0 | 0.1 | - | 0.1 | V |
| | | I _O = 6.0 mA; V _{CC} = 4.5 V | - | 0.15 | 0.33 | - | 0.4 | V |
| | | I _O = 7.8 mA; V _{CC} = 6.0 V | - | 0.16 | 0.33 | - | 0.4 | V |
| I _I | input leakage current | V _I = V _{CC} or GND; V _{CC} = 6.0 V | - | - | 1.0 | - | 1.0 | μA |
| I _{OZ} | OFF-state output current | V _I = V _{IH} or V _{IL} ; V _O = V _{CC} or GND; V _{CC} = 6.0 V | - | - | 5 | - | 10 | μA |
| I _{CC} | supply current | V _I = V _{CC} or GND; I _O = 0 A; V _{CC} = 6.0 V | - | - | 10 | - | 20 | μA |
| C _I | input capacitance | | - | 1.5 | - | - | - | pF |

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

Table 8. Static characteristics 74HCT1G125

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} = 4.5 V to 5.5 V | 2.0 | 1.6 | - | 2.0 | - | V |
| V _{IL} | LOW-level input voltage | V _{CC} = 4.5 V to 5.5 V | - | 1.2 | 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 = -20 µA | 4.4 | 4.5 | - | 4.4 | - | V |
| | | I _O = -6.0 mA | 3.84 | 4.32 | - | 3.7 | - | V |
| V _{OL} | LOW-level output voltage | V _I = V _{IH} or V _{IL} ; V _{CC} = 4.5 V | | | | | | |
| | | I _O = 20 µA | - | 0 | 0.1 | - | 0.1 | V |
| | | I _O = 6.0 mA | - | 0.16 | 0.33 | - | 0.4 | V |
| I _I | input leakage current | V _I = V _{CC} or GND; V _{CC} = 5.5 V | - | - | 1.0 | - | 1.0 | µA |
| I _{OZ} | OFF-state output current | V _I = V _{IH} or V _{IL} ; V _O = V _{CC} or GND; V _{CC} = 5.5 V | - | - | 5 | - | 10 | µA |
| I _{CC} | supply current | V _I = V _{CC} or GND; I _O = 0 A; V _{CC} = 5.5 V | - | - | 10 | - | 20 | µA |
| ΔI _{CC} | additional supply current | V _I = V _{CC} - 2.1 V; I _O = 0 A; V _{CC} = 4.5 V to 5.5 V | - | - | 500 | - | 850 | µA |
| C _I | input capacitance | | - | 1.5 | - | - | - | pF |

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

11. Dynamic characteristics

Table 9. Dynamic characteristics

Voltages are referenced to GND (ground = 0 V); $C_L = 50$ pF unless otherwise specified; 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 | |
| 74HC1G125 | | | | | | | | |
| t_{pd} | propagation delay | A to Y; see Fig. 6 [2] | | | | | | |
| | | $V_{CC} = 2.0$ V | - | 24 | 125 | - | 150 | ns |
| | | $V_{CC} = 4.5$ V | - | 10 | 25 | - | 30 | ns |
| | | $V_{CC} = 5$ V; $C_L = 15$ pF | - | 9 | - | - | - | ns |
| | | $V_{CC} = 6.0$ V | - | 8 | 21 | - | 26 | ns |
| t_{en} | enable time | \overline{OE} to Y; see Fig. 7 [2] | | | | | | |
| | | $V_{CC} = 2.0$ V | - | 19 | 155 | - | 190 | ns |
| | | $V_{CC} = 4.5$ V | - | 9 | 31 | - | 38 | ns |
| | | $V_{CC} = 6.0$ V | - | 7 | 26 | - | 32 | ns |
| t_{dis} | disable time | \overline{OE} to Y; see Fig. 7 [2] | | | | | | |
| | | $V_{CC} = 2.0$ V | - | 18 | 155 | - | 190 | ns |
| | | $V_{CC} = 4.5$ V | - | 12 | 31 | - | 38 | ns |
| | | $V_{CC} = 6.0$ V | - | 11 | 26 | - | 32 | ns |
| C_{PD} | power dissipation capacitance | $V_I = \text{GND to } V_{CC}$ [3] | - | 30 | - | - | - | pF |
| 74HCT1G125 | | | | | | | | |
| t_{pd} | propagation delay | A to Y; see Fig. 6 [2] | | | | | | |
| | | $V_{CC} = 4.5$ V | - | 11 | 30 | - | 36 | ns |
| | | $V_{CC} = 5$ V; $C_L = 15$ pF | - | 10 | - | - | - | ns |
| t_{en} | enable time | $V_{CC} = 4.5$ V; \overline{OE} to Y; see Fig. 7 [2] | - | 10 | 35 | - | 42 | ns |
| t_{dis} | disable time | $V_{CC} = 4.5$ V; \overline{OE} to Y; see Fig. 7 [2] | - | 11 | 31 | - | 38 | ns |
| C_{PD} | power dissipation capacitance | $V_I = \text{GND to } V_{CC} - 1.5$ V [3] | - | 27 | - | - | - | pF |

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

[2] 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} .

[3] C_{PD} is used to determine the dynamic power dissipation (P_D in μ W).

$P_D = C_{PD} \times V_{CC}^2 \times f_i \times N + \Sigma(C_L \times V_{CC}^2 \times f_o)$ 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 the outputs.

11.1. Waveforms and test circuit

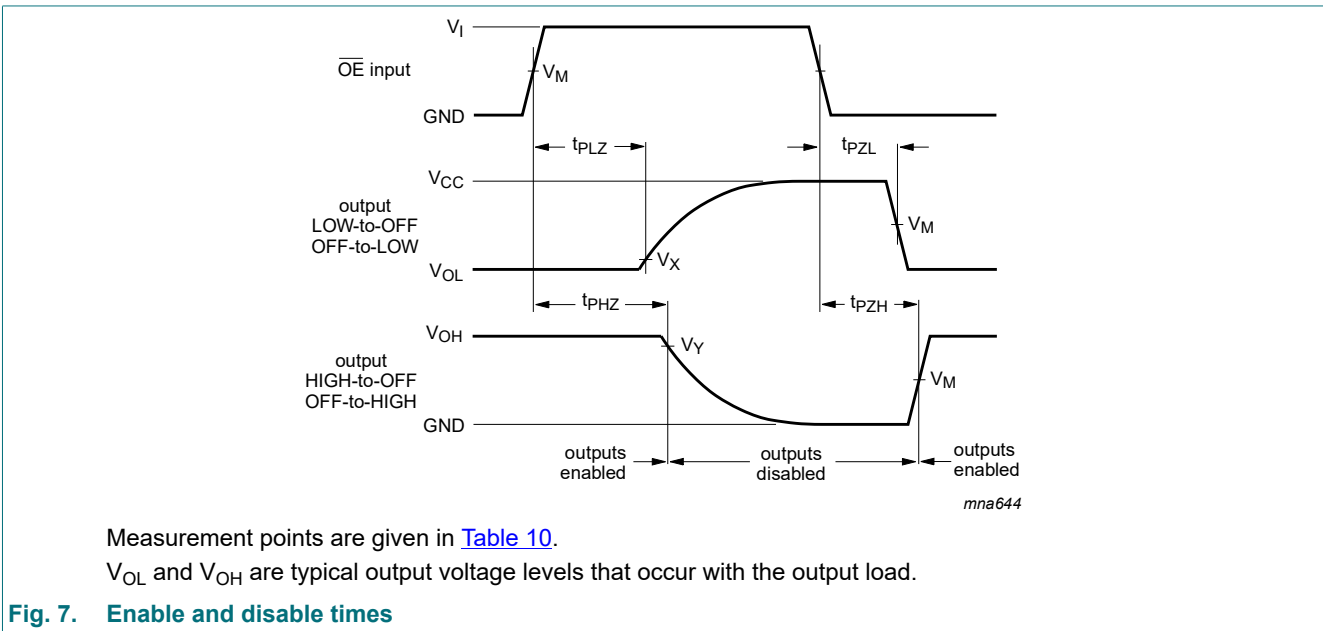
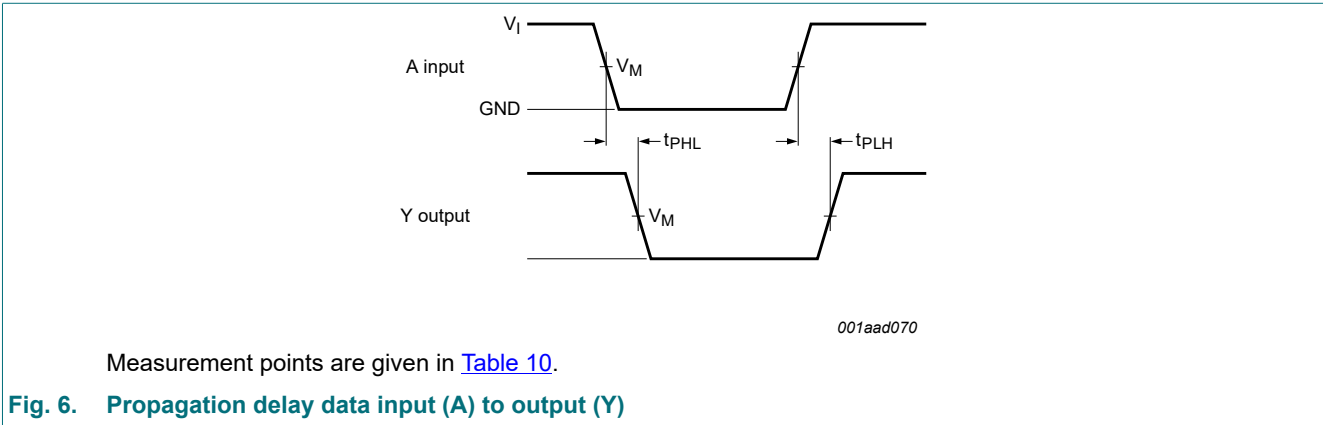


Table 10. Measurement points

| Type | Input | Output | | |
|------------|-------------|-------------|------------------|------------------|
| | V_M | V_M | V_X | V_Y |
| 74HC1G125 | $0.5V_{CC}$ | $0.5V_{CC}$ | $V_{OL} + 0.3 V$ | $V_{OH} - 0.3 V$ |
| 74HCT1G125 | 1.3 V | 1.3 V | $V_{OL} + 0.3 V$ | $V_{OH} - 0.3 V$ |

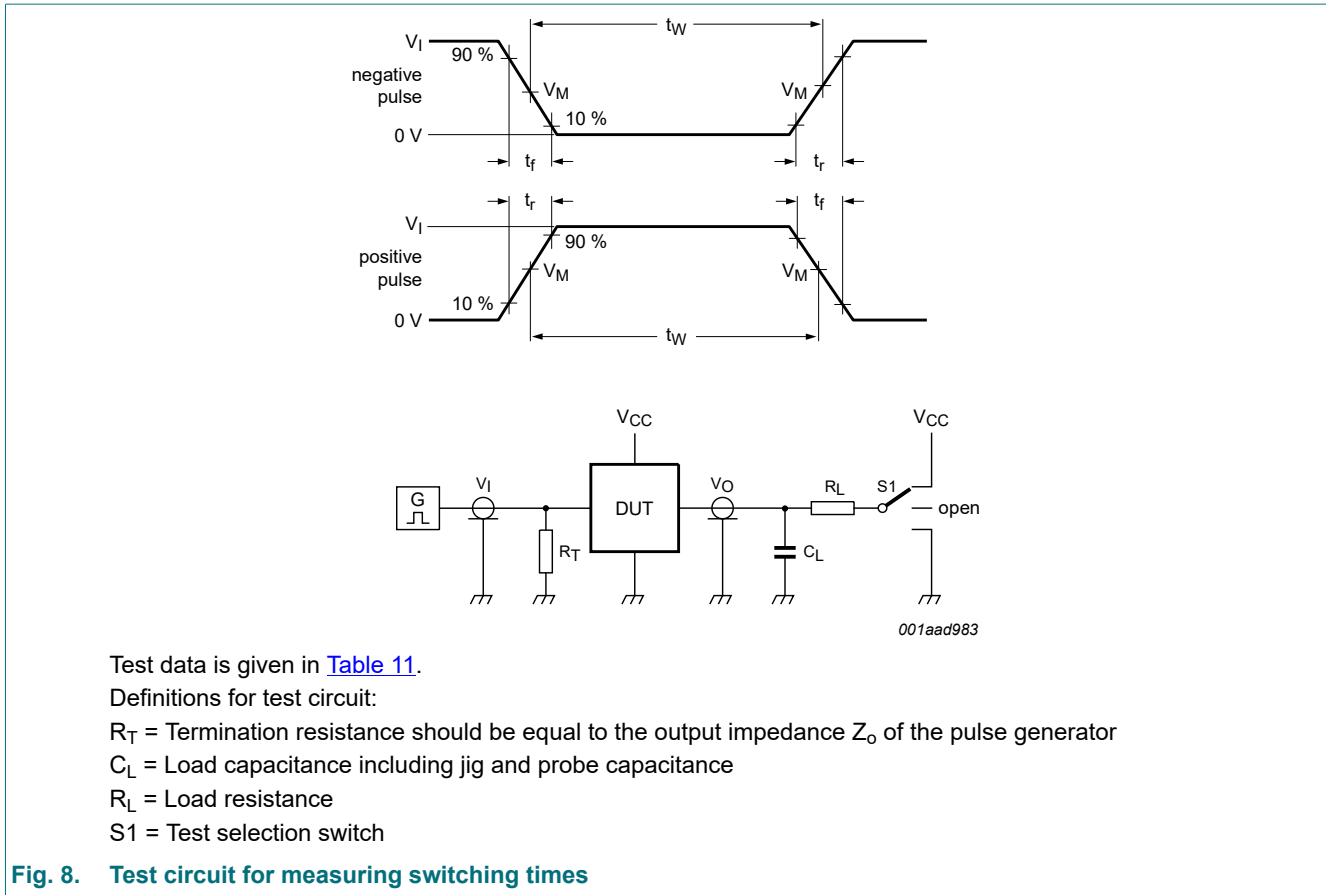


Fig. 8. Test circuit for measuring switching times

Table 11. Test data

| Type | Input | | Load | | S1 position | | |
|------------|----------|------------|--------------|--------------|--------------------|--------------------|--------------------|
| | V_I | t_r, t_f | C_L | R_L | t_{PLH}, t_{PHL} | t_{PZH}, t_{PHZ} | t_{PZL}, t_{PLZ} |
| 74HC1G125 | V_{CC} | 6 ns | 15 pF, 50 pF | 1 k Ω | open | GND | V_{CC} |
| 74HCT1G125 | 3 V | 6 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

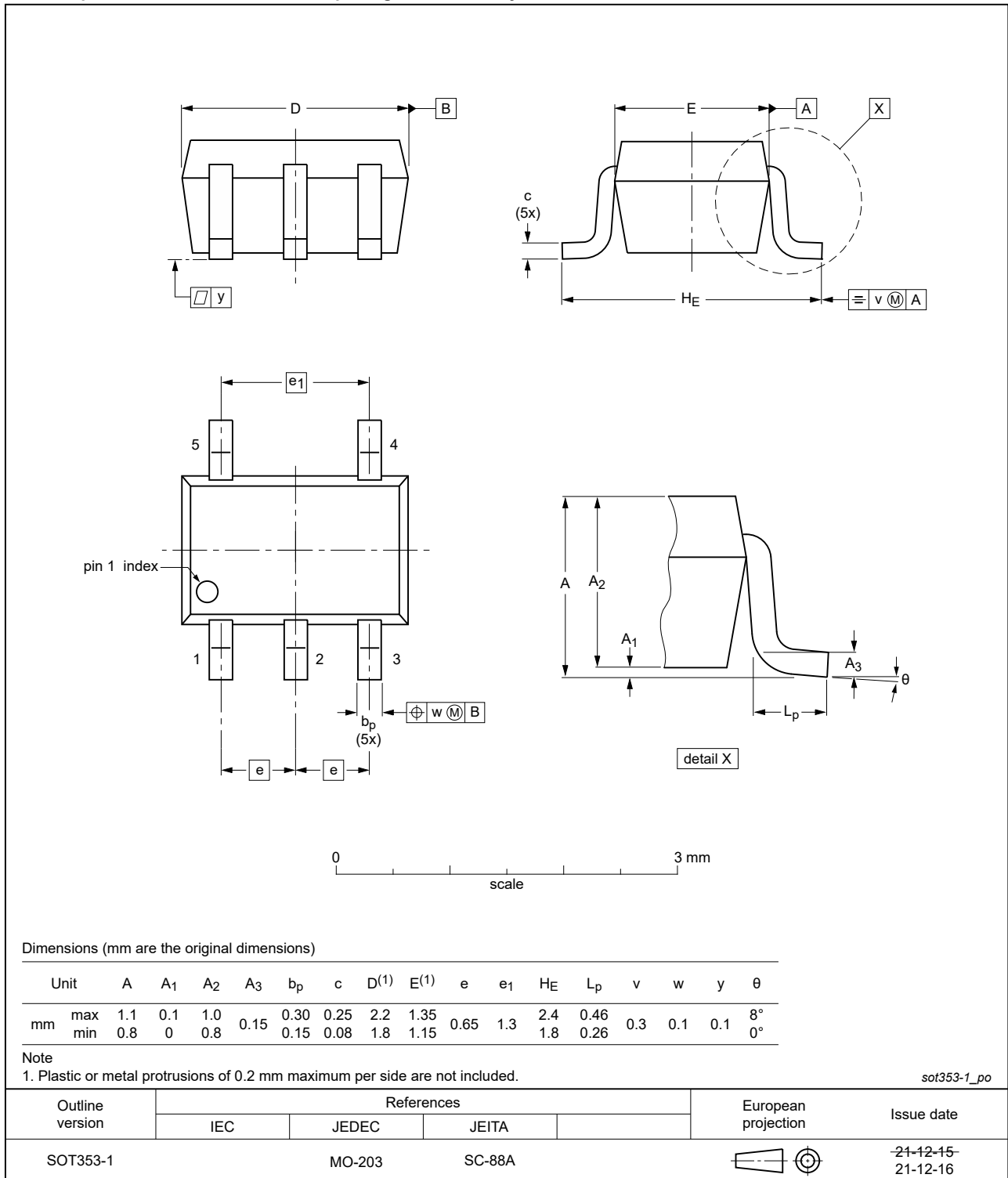


Fig. 9. Package outline SOT353-1 (TSSOP5)

Plastic surface-mounted package; 5 leads

SOT753

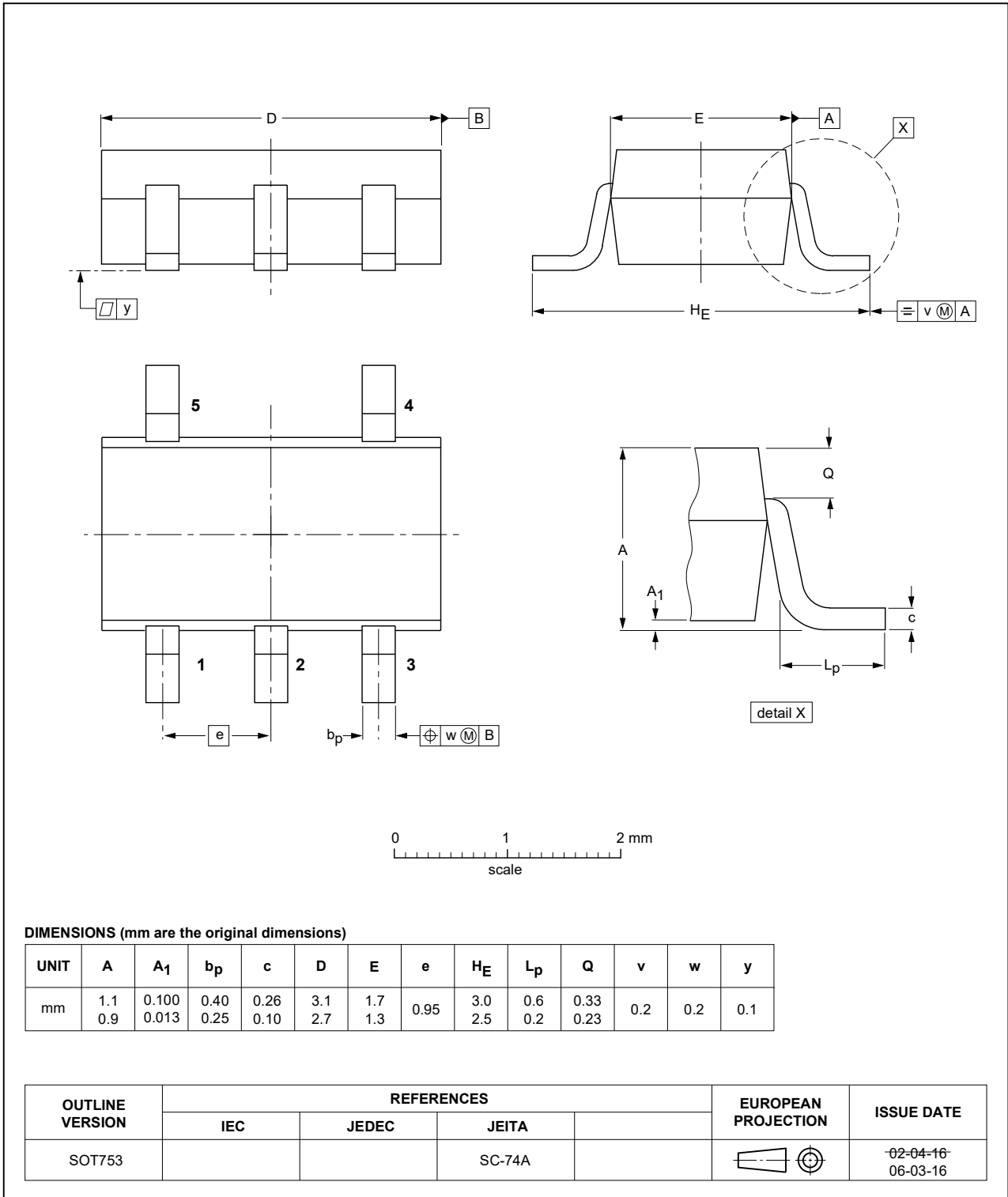


Fig. 10. Package outline SOT753 (SC-74A)

13. Abbreviations

Table 12. 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 |

14. Revision history

Table 13. Revision history

| Document ID | Release date | Data sheet status | Change notice | Supersedes |
|-------------------|---|-----------------------|---------------|-------------------|
| 74HC_HCT1G125 v.7 | 20220117 | Product data sheet | - | 74HC_HCT1G125 v.6 |
| Modifications: | <ul style="list-style-type: none"> • Section 2 updated. • Section 8: Derating values for P_{tot} total power dissipation updated. • Fig. 9: Package outline drawing SOT353-1 (TSSOP5) has changed. | | | |
| 74HC_HCT1G125 v.6 | 20170906 | Product data sheet | - | 74HC_HCT1G125 v.5 |
| 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. | | | |
| 74HC_HCT1G125 v.5 | 20051223 | Product data sheet | ECN05_085 | 74HC_HCT1G125 v.4 |
| Modifications: | <ul style="list-style-type: none"> • The format of this data sheet has been redesigned to comply with the new presentation and information standard of Philips Semiconductors. • In Table 5 Limiting values <ul style="list-style-type: none"> • I_O: changed max value ± 12.5 into ± 35 • I_{CC}: changed max value 25 into 70 • I_{GND}: changed max value -25 into -70 • In Table 7 Static characteristics 74HC1G125 <ul style="list-style-type: none"> • V_{OH}: changed condition $I_O = -2.0$ mA into $I_O = -6.0$ mA and min value from 4.13 into 3.84 • V_{OH}: changed condition $I_O = -2.6$ mA into $I_O = -7.8$ mA and min value from 5.63 into 5.34 • V_{OL}: changed condition $I_O = 2.0$ mA into $I_O = 6.0$ mA • V_{OL}: changed condition $I_O = 2.6$ mA into $I_O = 7.8$ mA • V_{OH}: changed condition $I_O = -2.0$ mA into $I_O = -6.0$ mA • V_{OL}: changed condition $I_O = 2.0$ mA into $I_O = 6.0$ mA • In Table 8 Static characteristics 74HCT1G125 <ul style="list-style-type: none"> • V_{OH}: changed condition $I_O = -2.0$ mA into $I_O = -6.0$ mA and min value from 4.13 into 3.84 • V_{OL}: changed condition $I_O = 2.0$ mA into $I_O = 6.0$ mA and typ value from 0.15 into 0.16 • V_{OH}: changed condition $I_O = -2.0$ mA into $I_O = -6.0$ mA • V_{OL}: changed condition $I_O = 2.0$ mA into $I_O = 6.0$ mA | | | |
| 74HC_HCT1G125 v.4 | 20040727 | Product specification | - | 74HC_HCT1G125 v.3 |
| 74HC_HCT1G125 v.3 | 20020517 | Product specification | - | 74HC_HCT1G125 v.2 |
| 74HC_HCT1G125 v.2 | 20010302 | Product specification | - | 74HC_HCT1G125 v.1 |
| 74HC_HCT1G125 v.1 | 19981110 | Product specification | - | - |

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".
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