

74HC1G125; 74HCT1G125

Bus buffer/line driver; 3-state

Rev. 6 — 6 September 2017

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
- Input levels:
 - For 74HC1G125: CMOS level
 - For 74HCT1G125: TTL level
- Low power dissipation
- Symmetrical output impedance
- High noise immunity
- Balanced propagation delays
- ESD protection
 - HBM EIA/JESD22-A114-C exceeds 2000V
 - MM EIA/JESD22-A115-A exceeds 200V
- 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 | | | Version |
|--------------|---|--------|--|----------|
| | Temperature range | Name | Description | |
| 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 |

nexperia

| Type number | Marking code ^[1] |
|--------------|-----------------------------|
| 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

mna118

mna119

mna120

Figure 1. Logic symbol

Figure 2. IEC logic symbol

Figure 3. Logic diagram

6 Pinning information

6.1 Pinning

74HC1G125GW
74HCT1G125GW

001aad948

74HC1G125GV
74HCT1G125GV

001aad949

Figure 4. Pin configuration TSSOP5

Figure 5. Pin configuration SC-74A

6.2 Pin description

Table 3. Pin description

| Symbol | Pin | Description |
|-----------------|-----|----------------------------------|
| \overline{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 ^[1]

| Control | Input | Output |
|-----------------|-------|--------|
| \overline{OE} | A | Y |
| L | L | L |
| L | H | H |
| H | 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 | +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] | - | 200 | mW |

[1] The input and output voltage ratings may be exceeded if the input and output current ratings are observed.

[2] Above 55 °C the value of P_{tot} derates linearly with 2.5 mW/K.

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 | T _{amb} = -40 °C to +85 °C | | | T _{amb} = -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 |
| 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 _{CC} | supply current | V _I = V _{CC} or GND; I _O = 0 A; V _{CC} = 6.0 V | - | - | 10 | - | 20 | μA |
| | | | - | - | 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 | T _{amb} = -40 °C to +85 °C | | | T _{amb} = -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 [Figure 8](#)

| Symbol | Parameter | Conditions | $T_{amb} = -40$ °C to $+125$ °C | | | | Unit |
|-------------------|-------------------------------|---|---------------------------------|--------------------|---------------|----------------|------|
| | | | Min | Typ ^[1] | Max +85 °C | Max +125 °C | |
| 74HC1G125 | | | | | | | |
| t_{pd} | propagation delay | A to Y; see Figure 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 Figure 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 Figure 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 Figure 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 Figure 7 ^[2] | - | 10 | 35 | 42 | ns |
| t_{dis} | disable time | $V_{CC} = 4.5$ V; \overline{OE} to Y; see Figure 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

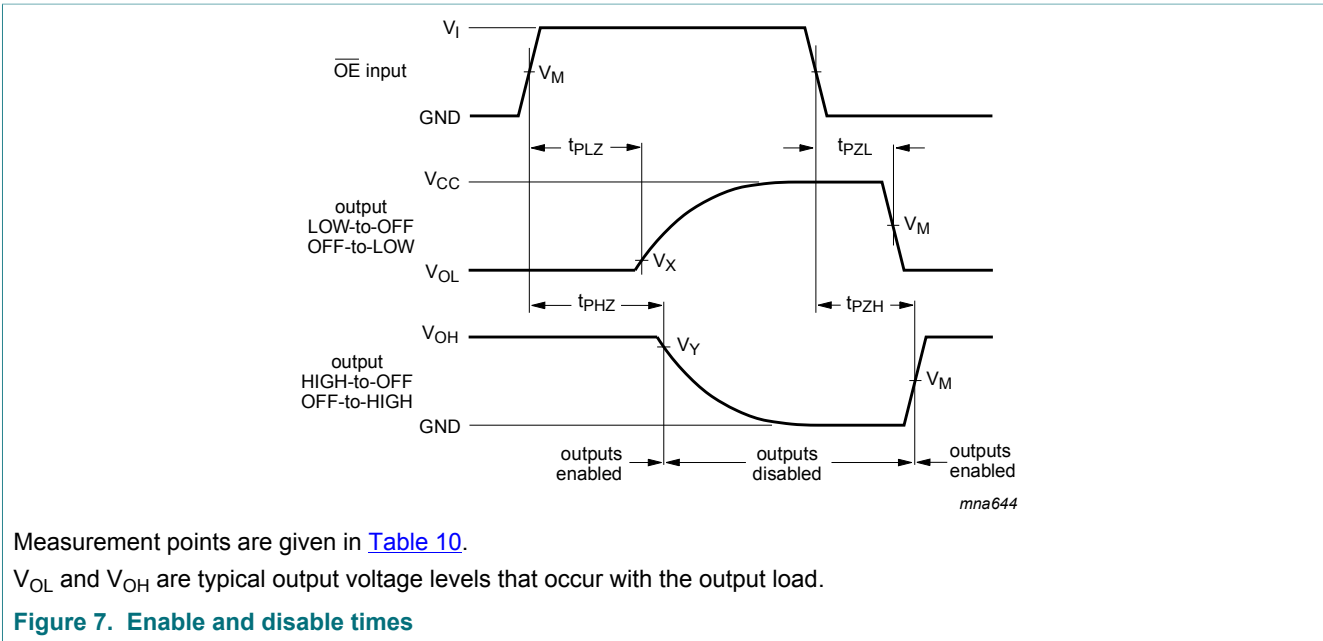
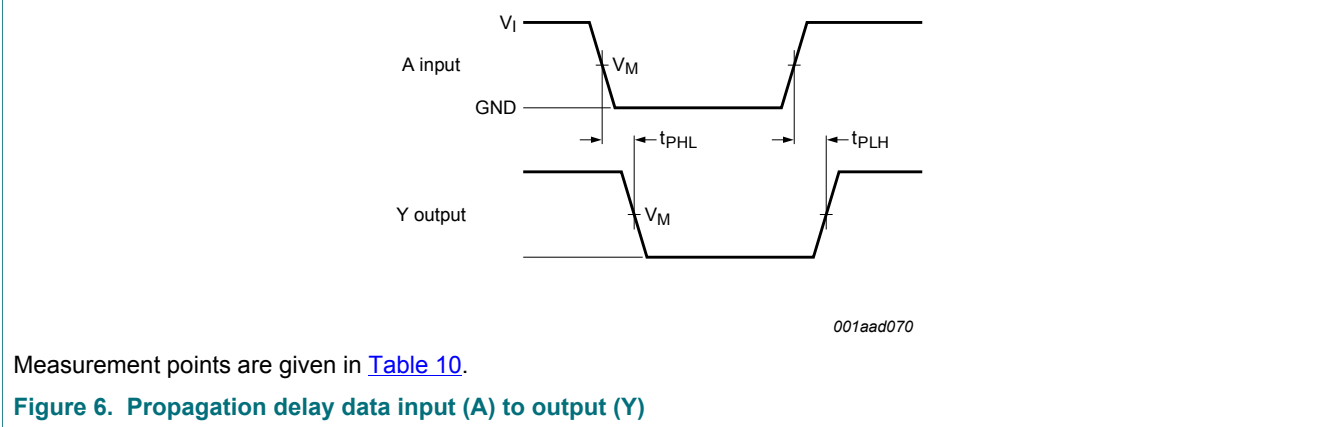


Table 10. Measurement points

| 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 | $V_{OL} + 0.3 V$ | $V_{OH} - 0.3 V$ |

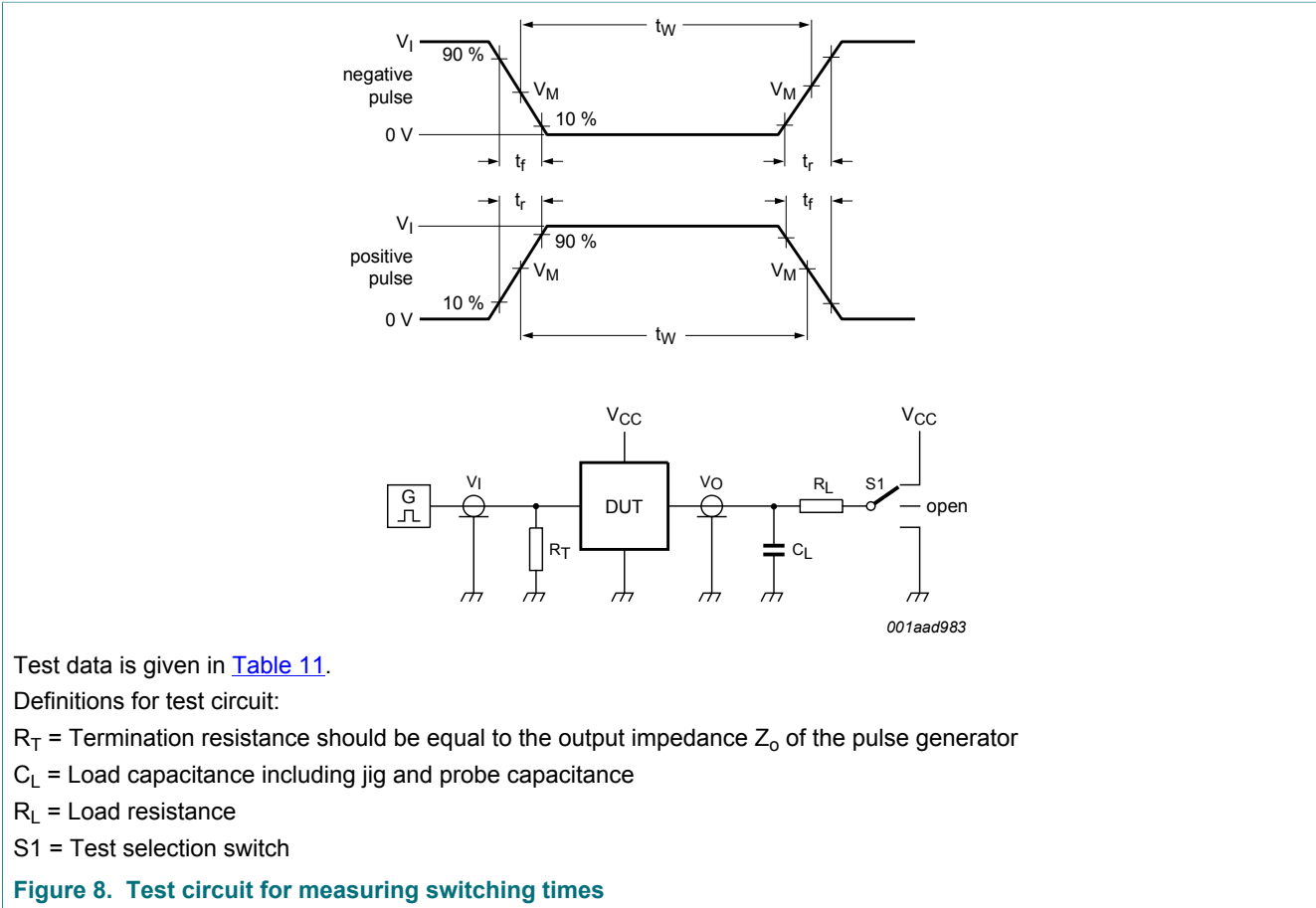


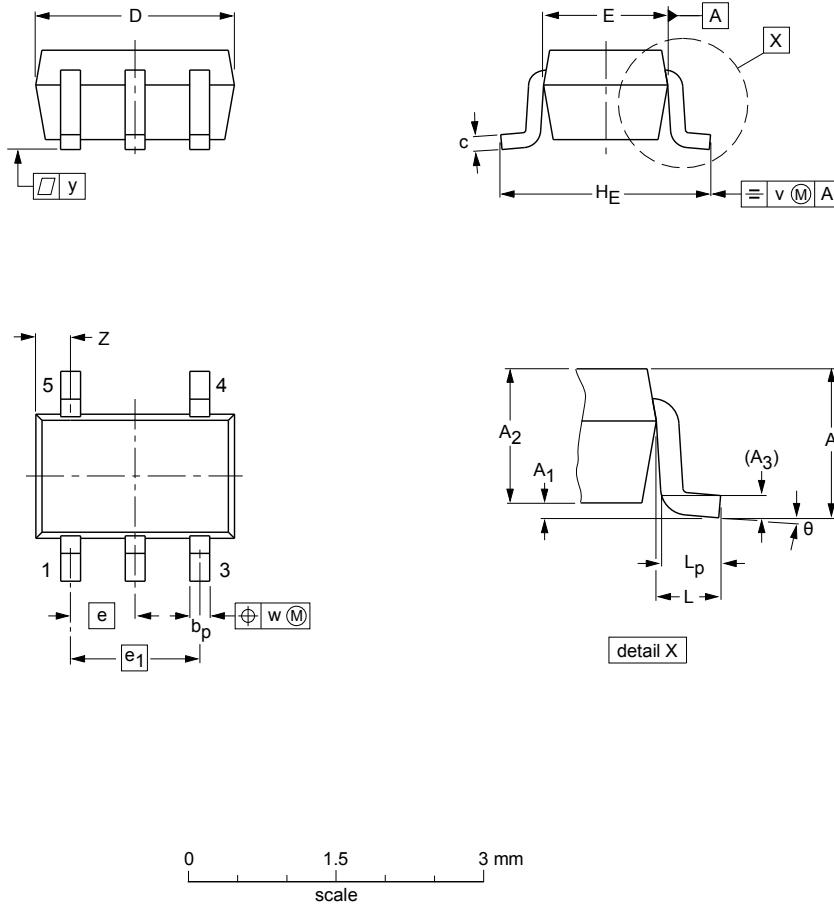
Table 11. Test data

| 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



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 0 | 1.0 0.8 | 0.15 | 0.30 0.15 | 0.25 0.08 | 2.25 1.85 | 1.35 1.15 | 0.65 | 1.3 | 2.25 2.0 | 0.425 | 0.46 0.21 | 0.3 | 0.1 | 0.1 | 0.60 0.15 | 7° 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 03-02-19 |

Figure 9. Package outline SOT353-1 (TSSOP5)

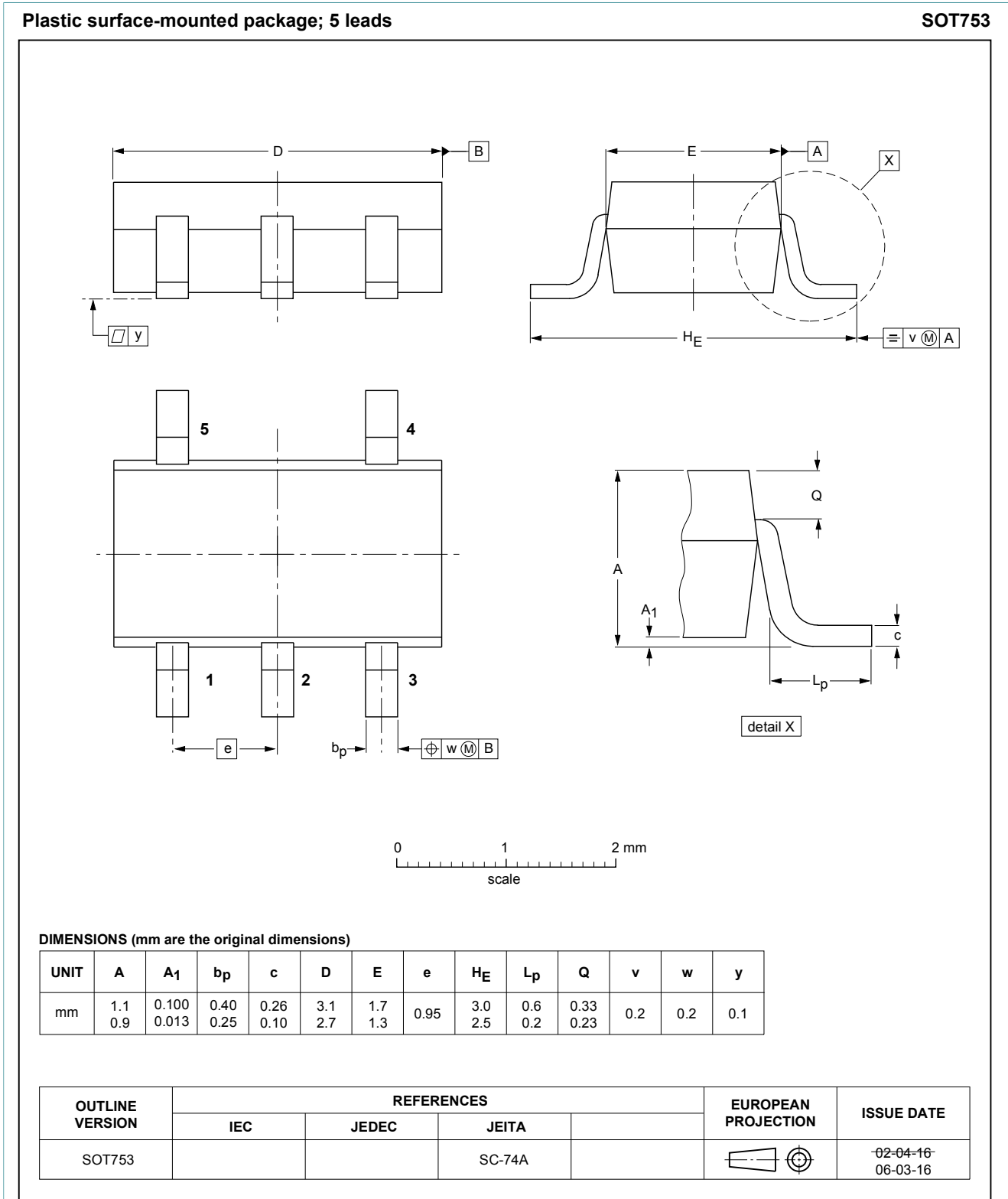


Figure 10. Package outline SOT753 (SC-74A)

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.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

15.1 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".

[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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