

# 74HC1G125; 74HCT1G125

Bus buffer/line driver; 3-state

Rev. 05 — 23 December 2005

Product data sheet

## 1. General description

The 74HC1G125; 74HCT1G125 is a high-speed, Si-gate CMOS device.

The 74HC1G125; 74HCT1G125 provides one non-inverting buffer/line driver with 3-state output. The 3-state output is controlled by the output enable input (pin  $\overline{\text{OE}}$ ). A HIGH level at pin  $\overline{\text{OE}}$  causes the output to assume a high-impedance OFF-state.

The bus driver output currents are equal compared to the 74HC125 and 74HCT125.

## 2. Features

- Wide supply voltage range from 2.0 V to 6.0 V
- Symmetrical output impedance
- High noise immunity
- Low power consumption
- Balanced propagation delays
- ESD protection:
  - ◆ HBM EIA/JESD22-A114-C exceeds 2000 V
  - ◆ MM EIA/JESD22-A115-A exceeds 200 V
- Very small 5 pins packages
- 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. Quick reference data

**Table 1:** Quick reference data

$GND = 0\text{ V}$ ;  $T_{amb} = 25\text{ }^{\circ}\text{C}$ ;  $t_r = t_f \leq 6.0\text{ ns}$ .

| Symbol                                 | Parameter                        | Conditions                                          | Min              | Typ | Max | Unit |
|----------------------------------------|----------------------------------|-----------------------------------------------------|------------------|-----|-----|------|
| <b>74HC1G125</b>                       |                                  |                                                     |                  |     |     |      |
| $t_{\text{PHL}}$ ,<br>$t_{\text{PLH}}$ | propagation delay A to Y         | $V_{\text{CC}} = 5\text{ V}$ ; $C_L = 15\text{ pF}$ | -                | 9   | -   | ns   |
| $C_i$                                  | input capacitance                |                                                     | -                | 1.5 | -   | pF   |
| $C_{\text{PD}}$                        | power dissipation<br>capacitance | $V_I = GND$ to $V_{\text{CC}}$                      | <sup>[1]</sup> - | 30  | -   | pF   |

**PHILIPS**

Table 1: Quick reference data ...continued

GND = 0 V;  $T_{amb} = 25\text{ }^{\circ}\text{C}$ ;  $t_r = t_f \leq 6.0\text{ ns}$ .

| Symbol                   | Parameter                        | Conditions                                   | Min | Typ | Max | Unit |
|--------------------------|----------------------------------|----------------------------------------------|-----|-----|-----|------|
| <b>74HCT1G125</b>        |                                  |                                              |     |     |     |      |
| $t_{PHL}$ ,<br>$t_{PLH}$ | propagation delay A to Y         | $V_{CC} = 5\text{ V}$ ; $C_L = 15\text{ pF}$ | -   | 10  | -   | ns   |
| $C_i$                    | input capacitance                |                                              | -   | 1.5 | -   | pF   |
| $C_{PD}$                 | power dissipation<br>capacitance | $V_I = \text{GND to } V_{CC} - 1.5\text{ V}$ | [1] | 27  | -   | pF   |

[1]  $C_{PD}$  is used to determine the dynamic power dissipation ( $P_D$  in  $\mu\text{W}$ ). $P_D = C_{PD} \times V_{CC}^2 \times f_i \times N + \Sigma(C_L \times V_{CC}^2 \times f_o)$  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.

## 4. Ordering information

Table 2: Ordering information

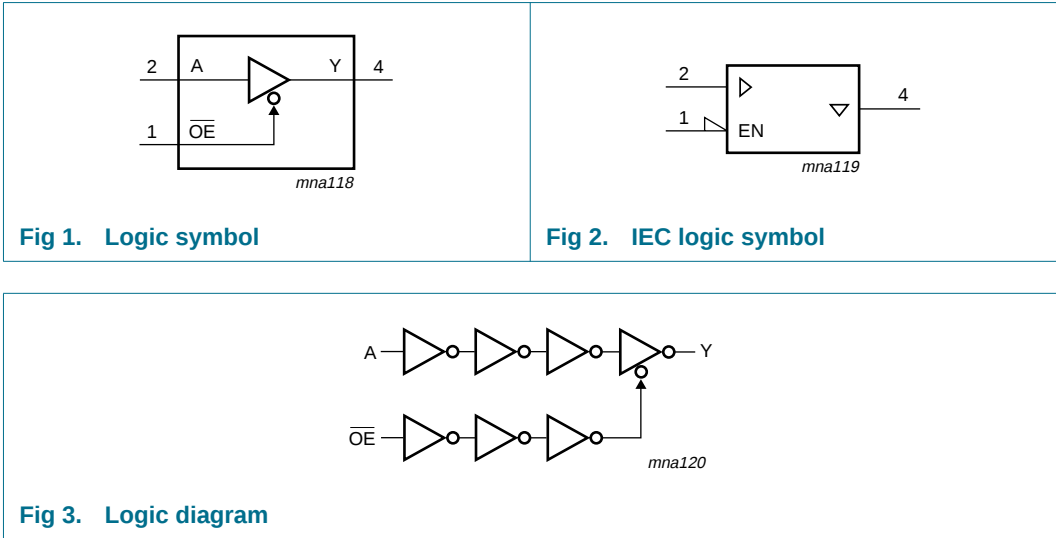
| Type number       | Package           |        |                                                                           |          |
|-------------------|-------------------|--------|---------------------------------------------------------------------------|----------|
|                   | Temperature range | Name   | Description                                                               | Version  |
| <b>74HC1G125</b>  |                   |        |                                                                           |          |
| 74HC1G125GW       | -40 °C to +125 °C | TSSOP5 | plastic thin shrink small outline package; 5 leads;<br>body width 1.25 mm | SOT353-1 |
| 74HC1G125GV       | -40 °C to +125 °C | SC-74A | plastic surface mounted package; 5 leads                                  | SOT753   |
| <b>74HCT1G125</b> |                   |        |                                                                           |          |
| 74HCT1G125GW      | -40 °C to +125 °C | TSSOP5 | plastic thin shrink small outline package; 5 leads;<br>body width 1.25 mm | SOT353-1 |
| 74HCT1G125GV      | -40 °C to +125 °C | SC-74A | plastic surface mounted package; 5 leads                                  | SOT753   |

## 5. Marking

Table 3: Marking

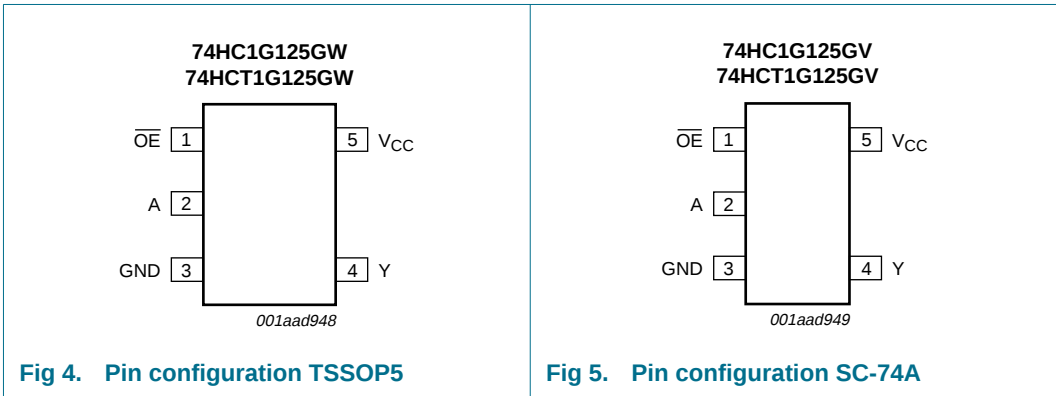
| Type number  | Marking code |
|--------------|--------------|
| 74HC1G125GW  | HM           |
| 74HC1G125GV  | H25          |
| 74HCT1G125GW | TM           |
| 74HCT1G125GV | T25          |

## 6. Functional diagram



## 7. Pinning information

### 7.1 Pinning



### 7.2 Pin description

Table 4: Pin description

| Symbol                 | Pin | Description                      |
|------------------------|-----|----------------------------------|
| $\overline{\text{OE}}$ | 1   | output enable input (active LOW) |
| A                      | 2   | data input                       |
| GND                    | 3   | ground (0 V)                     |
| Y                      | 4   | data output                      |
| V <sub>CC</sub>        | 5   | supply voltage                   |

## 8. Functional description

### 8.1 Function table

Table 5: Function table <sup>[1]</sup>

| Control | Input | Output |
|---------|-------|--------|
| 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.

## 9. Limiting values

Table 6: 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 $V_I > V_{CC} + 0.5\text{ V}$    | <sup>[1]</sup> - | ±20  | mA   |
| $I_{OK}$  | output clamping current  | $V_O < -0.5\text{ V}$ or<br>$V_O > V_{CC} + 0.5\text{ V}$ | <sup>[1]</sup> - | ±20  | mA   |
| $I_O$     | output current           | $V_O = -0.5\text{ V}$ to $(V_{CC} + 0.5\text{ V})$        | <sup>[1]</sup> - | ±35  | mA   |
| $I_{CC}$  | quiescent 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 $+125\text{ °C}$             | <sup>[2]</sup> - | 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.

## 10. Recommended operating conditions

Table 7: Recommended operating conditions

| Symbol            | Parameter                 | Conditions              | Min | Typ | Max      | Unit |
|-------------------|---------------------------|-------------------------|-----|-----|----------|------|
| <b>74HC1G125</b>  |                           |                         |     |     |          |      |
| $V_{CC}$          | supply voltage            |                         | 2.0 | 5.0 | 6.0      | V    |
| $V_I$             | input voltage             |                         | 0   | -   | $V_{CC}$ | V    |
| $V_O$             | output voltage            |                         | 0   | -   | $V_{CC}$ | V    |
| $T_{amb}$         | ambient temperature       |                         | -40 | +25 | +125     | °C   |
| $t_r, t_f$        | input rise and fall times | $V_{CC} = 2.0\text{ V}$ | -   | -   | 1000     | ns   |
|                   |                           | $V_{CC} = 4.5\text{ V}$ | -   | -   | 500      | ns   |
|                   |                           | $V_{CC} = 6.0\text{ V}$ | -   | -   | 400      | ns   |
| <b>74HCT1G125</b> |                           |                         |     |     |          |      |
| $V_{CC}$          | supply voltage            |                         | 4.5 | 5.0 | 5.5      | V    |
| $V_I$             | input voltage             |                         | 0   | -   | $V_{CC}$ | V    |
| $V_O$             | output voltage            |                         | 0   | -   | $V_{CC}$ | V    |
| $T_{amb}$         | ambient temperature       |                         | -40 | +25 | +125     | °C   |
| $t_r, t_f$        | input rise and fall times | $V_{CC} = 4.5\text{ V}$ | -   | -   | 500      | ns   |

## 11. Static characteristics

Table 8: Static characteristics 74HC1G125

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

| Symbol                                                         | Parameter                 | Conditions                                            | Min  | Typ  | Max  | Unit |
|----------------------------------------------------------------|---------------------------|-------------------------------------------------------|------|------|------|------|
| $T_{amb} = -40\text{ °C to }+85\text{ °C}$ <a href="#">[1]</a> |                           |                                                       |      |      |      |      |
| $V_{IH}$                                                       | HIGH-state input voltage  | $V_{CC} = 2.0\text{ V}$                               | 1.5  | 1.2  | -    | V    |
|                                                                |                           | $V_{CC} = 4.5\text{ V}$                               | 3.15 | 2.4  | -    | V    |
|                                                                |                           | $V_{CC} = 6.0\text{ V}$                               | 4.2  | 3.2  | -    | V    |
| $V_{IL}$                                                       | LOW-state input voltage   | $V_{CC} = 2.0\text{ V}$                               | -    | 0.8  | 0.5  | V    |
|                                                                |                           | $V_{CC} = 4.5\text{ V}$                               | -    | 2.1  | 1.35 | V    |
|                                                                |                           | $V_{CC} = 6.0\text{ V}$                               | -    | 2.8  | 1.8  | V    |
| $V_{OH}$                                                       | HIGH-state output voltage | $V_I = V_{IH}$ or $V_{IL}$                            |      |      |      |      |
|                                                                |                           | $I_O = -20\text{ }\mu\text{A}; V_{CC} = 2.0\text{ V}$ | 1.9  | 2.0  | -    | V    |
|                                                                |                           | $I_O = -20\text{ }\mu\text{A}; V_{CC} = 4.5\text{ V}$ | 4.4  | 4.5  | -    | V    |
|                                                                |                           | $I_O = -20\text{ }\mu\text{A}; V_{CC} = 6.0\text{ V}$ | 5.9  | 6.0  | -    | V    |
|                                                                |                           | $I_O = -6.0\text{ mA}; V_{CC} = 4.5\text{ V}$         | 3.84 | 4.32 | -    | V    |
|                                                                |                           | $I_O = -7.8\text{ mA}; V_{CC} = 6.0\text{ V}$         | 5.34 | 5.81 | -    | V    |
| $V_{OL}$                                                       | LOW-state output voltage  | $V_I = V_{IH}$ or $V_{IL}$                            |      |      |      |      |
|                                                                |                           | $I_O = 20\text{ }\mu\text{A}; V_{CC} = 2.0\text{ V}$  | -    | 0    | 0.1  | V    |
|                                                                |                           | $I_O = 20\text{ }\mu\text{A}; V_{CC} = 4.5\text{ V}$  | -    | 0    | 0.1  | V    |
|                                                                |                           | $I_O = 20\text{ }\mu\text{A}; V_{CC} = 6.0\text{ V}$  | -    | 0    | 0.1  | V    |
|                                                                |                           | $I_O = 6.0\text{ mA}; V_{CC} = 4.5\text{ V}$          | -    | 0.15 | 0.33 | V    |
|                                                                |                           | $I_O = 7.8\text{ mA}; V_{CC} = 6.0\text{ V}$          | -    | 0.16 | 0.33 | V    |

**Table 8:** Static characteristics 74HC1G125 ...continued

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

| Symbol                                                       | Parameter                 | Conditions                                                              | Min  | Typ | Max  | Unit    |
|--------------------------------------------------------------|---------------------------|-------------------------------------------------------------------------|------|-----|------|---------|
| $I_{LI}$                                                     | input leakage current     | $V_I = V_{CC}$ or GND; $V_{CC} = 6.0$ V                                 | -    | -   | 1.0  | $\mu$ A |
| $I_{OZ}$                                                     | OFF-state output current  | $V_I = V_{IH}$ or $V_{IL}$ ; $V_O = V_{CC}$ or GND;<br>$V_{CC} = 6.0$ V | -    | -   | 5    | $\mu$ A |
| $I_{CC}$                                                     | quiescent supply current  | $V_I = V_{CC}$ or GND; $I_O = 0$ A;<br>$V_{CC} = 6.0$ V                 | -    | -   | 10   | $\mu$ A |
| $C_i$                                                        | input capacitance         |                                                                         | -    | 1.5 | -    | pF      |
| <b><math>T_{amb} = -40</math> °C to <math>+125</math> °C</b> |                           |                                                                         |      |     |      |         |
| $V_{IH}$                                                     | HIGH-state input voltage  | $V_{CC} = 2.0$ V                                                        | 1.5  | -   | -    | V       |
|                                                              |                           | $V_{CC} = 4.5$ V                                                        | 3.15 | -   | -    | V       |
|                                                              |                           | $V_{CC} = 6.0$ V                                                        | 4.2  | -   | -    | V       |
| $V_{IL}$                                                     | LOW-state input voltage   | $V_{CC} = 2.0$ V                                                        | -    | -   | 0.5  | V       |
|                                                              |                           | $V_{CC} = 4.5$ V                                                        | -    | -   | 1.35 | V       |
|                                                              |                           | $V_{CC} = 6.0$ V                                                        | -    | -   | 1.8  | V       |
| $V_{OH}$                                                     | HIGH-state output voltage | $V_I = V_{IH}$ or $V_{IL}$                                              |      |     |      |         |
|                                                              |                           | $I_O = -20$ $\mu$ A; $V_{CC} = 2.0$ V                                   | 1.9  | -   | -    | V       |
|                                                              |                           | $I_O = -20$ $\mu$ A; $V_{CC} = 4.5$ V                                   | 4.4  | -   | -    | V       |
|                                                              |                           | $I_O = -20$ $\mu$ A; $V_{CC} = 6.0$ V                                   | 5.9  | -   | -    | V       |
|                                                              |                           | $I_O = -6.0$ mA; $V_{CC} = 4.5$ V                                       | 3.7  | -   | -    | V       |
|                                                              |                           | $I_O = -7.8$ mA; $V_{CC} = 6.0$ V                                       | 5.2  | -   | -    | V       |
| $V_{OL}$                                                     | LOW-state output voltage  | $V_I = V_{IH}$ or $V_{IL}$                                              |      |     |      |         |
|                                                              |                           | $I_O = 20$ $\mu$ A; $V_{CC} = 2.0$ V                                    | -    | -   | 0.1  | V       |
|                                                              |                           | $I_O = 20$ $\mu$ A; $V_{CC} = 4.5$ V                                    | -    | -   | 0.1  | V       |
|                                                              |                           | $I_O = 20$ $\mu$ A; $V_{CC} = 6.0$ V                                    | -    | -   | 0.1  | V       |
|                                                              |                           | $I_O = 6.0$ mA; $V_{CC} = 4.5$ V                                        | -    | -   | 0.4  | V       |
|                                                              |                           | $I_O = 7.8$ mA; $V_{CC} = 6.0$ V                                        | -    | -   | 0.4  | V       |
| $I_{LI}$                                                     | input leakage current     | $V_I = V_{CC}$ or GND; $V_{CC} = 6.0$ V                                 | -    | -   | 1.0  | $\mu$ A |
| $I_{OZ}$                                                     | OFF-state output current  | $V_I = V_{IH}$ or $V_{IL}$ ; $V_O = V_{CC}$ or GND;<br>$V_{CC} = 6.0$ V | -    | -   | 10   | $\mu$ A |
| $I_{CC}$                                                     | quiescent supply current  | $V_I = V_{CC}$ or GND; $I_O = 0$ A;<br>$V_{CC} = 6.0$ V                 | -    | -   | 20   | $\mu$ A |

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

**Table 9: Static characteristics 74HCT1G125**

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

| Symbol                                        | Parameter                           | Conditions                                                                                                             | Min  | Typ  | Max  | Unit |
|-----------------------------------------------|-------------------------------------|------------------------------------------------------------------------------------------------------------------------|------|------|------|------|
| <b>T<sub>amb</sub> = -40 °C to +85 °C [1]</b> |                                     |                                                                                                                        |      |      |      |      |
| V <sub>IH</sub>                               | HIGH-state input voltage            | V <sub>CC</sub> = 4.5 V to 5.5 V                                                                                       | 2.0  | 1.6  | -    | V    |
| V <sub>IL</sub>                               | LOW-state input voltage             | V <sub>CC</sub> = 4.5 V to 5.5 V                                                                                       | -    | 1.2  | 0.8  | V    |
| V <sub>OH</sub>                               | HIGH-state output voltage           | V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub> ; V <sub>CC</sub> = 4.5 V                                          |      |      |      |      |
|                                               |                                     | I <sub>O</sub> = -20 µA                                                                                                | 4.4  | 4.5  | -    | V    |
|                                               |                                     | I <sub>O</sub> = -6.0 mA                                                                                               | 3.84 | 4.32 | -    | V    |
| V <sub>OL</sub>                               | LOW-state output voltage            | V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub> ; V <sub>CC</sub> = 4.5 V                                          |      |      |      |      |
|                                               |                                     | I <sub>O</sub> = 20 µA                                                                                                 | -    | 0    | 0.1  | V    |
|                                               |                                     | I <sub>O</sub> = 6.0 mA                                                                                                | -    | 0.16 | 0.33 | V    |
| I <sub>LI</sub>                               | input leakage current               | V <sub>I</sub> = V <sub>CC</sub> or GND; V <sub>CC</sub> = 5.5 V                                                       | -    | -    | 1.0  | µA   |
| I <sub>OZ</sub>                               | OFF-state output current            | V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub> ; V <sub>O</sub> = V <sub>CC</sub> or GND; V <sub>CC</sub> = 5.5 V | -    | -    | 5    | µA   |
| I <sub>CC</sub>                               | quiescent supply current            | V <sub>I</sub> = V <sub>CC</sub> or GND; I <sub>O</sub> = 0 A; V <sub>CC</sub> = 6.0 V                                 | -    | -    | 10   | µA   |
| ΔI <sub>CC</sub>                              | additional quiescent supply current | V <sub>I</sub> = V <sub>CC</sub> - 2.1 V; I <sub>O</sub> = 0 A; V <sub>CC</sub> = 4.5 V to 5.5 V                       | -    | -    | 500  | µA   |
| C <sub>i</sub>                                | input capacitance                   |                                                                                                                        | -    | 1.5  | -    | pF   |
| <b>T<sub>amb</sub> = -40 °C to +125 °C</b>    |                                     |                                                                                                                        |      |      |      |      |
| V <sub>IH</sub>                               | HIGH-state input voltage            | V <sub>CC</sub> = 4.5 V to 5.5 V                                                                                       | 2.0  | -    | -    | V    |
| V <sub>IL</sub>                               | LOW-state input voltage             | V <sub>CC</sub> = 4.5 V to 5.5 V                                                                                       | -    | -    | 0.8  | V    |
| V <sub>OH</sub>                               | HIGH-state output voltage           | V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub> ; V <sub>CC</sub> = 4.5 V                                          |      |      |      |      |
|                                               |                                     | I <sub>O</sub> = -20 µA                                                                                                | 4.4  | -    | -    | V    |
|                                               |                                     | I <sub>O</sub> = -6.0 mA                                                                                               | 3.7  | -    | -    | V    |
| V <sub>OL</sub>                               | LOW-state output voltage            | V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub> ; V <sub>CC</sub> = 4.5 V                                          |      |      |      |      |
|                                               |                                     | I <sub>O</sub> = 20 µA                                                                                                 | -    | -    | 0.1  | V    |
|                                               |                                     | I <sub>O</sub> = 6.0 mA                                                                                                | -    | -    | 0.4  | V    |
| I <sub>LI</sub>                               | input leakage current               | V <sub>I</sub> = V <sub>CC</sub> or GND; V <sub>CC</sub> = 5.5 V                                                       | -    | -    | 1.0  | µA   |
| I <sub>OZ</sub>                               | OFF-state output current            | V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub> ; V <sub>O</sub> = V <sub>CC</sub> or GND; V <sub>CC</sub> = 5.5 V | -    | -    | 10   | µA   |
| I <sub>CC</sub>                               | quiescent supply current            | V <sub>I</sub> = V <sub>CC</sub> or GND; I <sub>O</sub> = 0 A; V <sub>CC</sub> = 6.0 V                                 | -    | -    | 20   | µA   |
| ΔI <sub>CC</sub>                              | additional quiescent supply current | V <sub>I</sub> = V <sub>CC</sub> - 2.1 V; I <sub>O</sub> = 0 A; V <sub>CC</sub> = 4.5 V to 5.5 V                       | -    | -    | 850  | µA   |

[1] All typical values are measured at T<sub>amb</sub> = 25 °C.

## 12. Dynamic characteristics

**Table 10: Dynamic characteristics 74HC1G125**

Voltages are referenced to GND (ground = 0 V);  $C_L = 50$  pF unless otherwise specified; for test circuit see [Figure 8](#)

| Symbol                                                           | Parameter                              | Conditions                                      | Min | Typ | Max | Unit |
|------------------------------------------------------------------|----------------------------------------|-------------------------------------------------|-----|-----|-----|------|
| <b><math>T_{amb} = -40\text{ °C to }+85\text{ °C}</math> [1]</b> |                                        |                                                 |     |     |     |      |
| $t_{PHL}$ ,<br>$t_{PLH}$                                         | propagation delay A to Y               | see <a href="#">Figure 6</a>                    |     |     |     |      |
|                                                                  |                                        | $V_{CC} = 2.0\text{ V}$                         | -   | 24  | 125 | ns   |
|                                                                  |                                        | $V_{CC} = 4.5\text{ V}$                         | -   | 10  | 25  | ns   |
|                                                                  |                                        | $V_{CC} = 5\text{ V}$ ;<br>$C_L = 15\text{ pF}$ | -   | 9   | -   | ns   |
|                                                                  |                                        | $V_{CC} = 6.0\text{ V}$                         | -   | 8   | 21  | ns   |
| $t_{PZH}$ ,<br>$t_{PZL}$                                         | 3-state output enable time<br>OE to Y  | see <a href="#">Figure 7</a>                    |     |     |     |      |
|                                                                  |                                        | $V_{CC} = 2.0\text{ V}$                         | -   | 19  | 155 | ns   |
|                                                                  |                                        | $V_{CC} = 4.5\text{ V}$                         | -   | 9   | 31  | ns   |
|                                                                  |                                        | $V_{CC} = 6.0\text{ V}$                         | -   | 7   | 26  | ns   |
| $t_{PHZ}$ ,<br>$t_{PLZ}$                                         | 3-state output disable time<br>OE to Y | see <a href="#">Figure 7</a>                    |     |     |     |      |
|                                                                  |                                        | $V_{CC} = 2.0\text{ V}$                         | -   | 18  | 155 | ns   |
|                                                                  |                                        | $V_{CC} = 4.5\text{ V}$                         | -   | 12  | 31  | ns   |
|                                                                  |                                        | $V_{CC} = 6.0\text{ V}$                         | -   | 11  | 26  | ns   |
| $C_{PD}$                                                         | power dissipation<br>capacitance       | $V_I = \text{GND to } V_{CC}$                   | [2] | -   | 30  | pF   |
| <b><math>T_{amb} = -40\text{ °C to }+125\text{ °C}</math></b>    |                                        |                                                 |     |     |     |      |
| $t_{PHL}$ ,<br>$t_{PLH}$                                         | propagation delay A to Y               | see <a href="#">Figure 6</a>                    |     |     |     |      |
|                                                                  |                                        | $V_{CC} = 2.0\text{ V}$                         | -   | -   | 150 | ns   |
|                                                                  |                                        | $V_{CC} = 4.5\text{ V}$                         | -   | -   | 30  | ns   |
|                                                                  |                                        | $V_{CC} = 6.0\text{ V}$                         | -   | -   | 26  | ns   |
| $t_{PZH}$ ,<br>$t_{PZL}$                                         | 3-state output enable time<br>OE to Y  | see <a href="#">Figure 7</a>                    |     |     |     |      |
|                                                                  |                                        | $V_{CC} = 2.0\text{ V}$                         | -   | -   | 190 | ns   |
|                                                                  |                                        | $V_{CC} = 4.5\text{ V}$                         | -   | -   | 38  | ns   |
|                                                                  |                                        | $V_{CC} = 6.0\text{ V}$                         | -   | -   | 32  | ns   |
| $t_{PHZ}$ ,<br>$t_{PLZ}$                                         | 3-state output disable time<br>OE to Y | see <a href="#">Figure 7</a>                    |     |     |     |      |
|                                                                  |                                        | $V_{CC} = 2.0\text{ V}$                         | -   | -   | 190 | ns   |
|                                                                  |                                        | $V_{CC} = 4.5\text{ V}$                         | -   | -   | 38  | ns   |
|                                                                  |                                        | $V_{CC} = 6.0\text{ V}$                         | -   | -   | 32  | ns   |

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

[2]  $C_{PD}$  is used to determine the dynamic power dissipation ( $P_D$  in  $\mu\text{W}$ ).

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

**Table 11: Dynamic characteristics 74HCT1G125**

Voltages are referenced to GND (ground = 0 V);  $C_L = 50$  pF unless otherwise specified; for test circuit see [Figure 8](#)

| Symbol                                                                                       | Parameter                                           | Conditions                                             | Min   | Typ | Max | Unit |
|----------------------------------------------------------------------------------------------|-----------------------------------------------------|--------------------------------------------------------|-------|-----|-----|------|
| <b><math>T_{amb} = -40\text{ }^{\circ}\text{C to }+85\text{ }^{\circ}\text{C}</math> [1]</b> |                                                     |                                                        |       |     |     |      |
| $t_{PHL}$ ,<br>$t_{PLH}$                                                                     | propagation delay A to Y                            | see <a href="#">Figure 6</a>                           |       |     |     |      |
|                                                                                              |                                                     | $V_{CC} = 4.5\text{ V}$                                | -     | 11  | 30  | ns   |
|                                                                                              |                                                     | $V_{CC} = 5\text{ V}; C_L = 15\text{ pF}$              | -     | 10  | -   | ns   |
| $t_{PZH}$ ,<br>$t_{PZL}$                                                                     | 3-state output enable time<br>$\overline{OE}$ to Y  | $V_{CC} = 4.5\text{ V}$ ; see <a href="#">Figure 7</a> | -     | 10  | 35  | ns   |
| $t_{PHZ}$ ,<br>$t_{PLZ}$                                                                     | 3-state output disable time<br>$\overline{OE}$ to Y | $V_{CC} = 4.5\text{ V}$ ; see <a href="#">Figure 7</a> | -     | 11  | 31  | ns   |
| $C_{PD}$                                                                                     | power dissipation<br>capacitance                    | $V_I = \text{GND to } V_{CC} - 1.5\text{ V}$           | [2] - | 27  | -   | pF   |
| <b><math>T_{amb} = -40\text{ }^{\circ}\text{C to }+125\text{ }^{\circ}\text{C}</math></b>    |                                                     |                                                        |       |     |     |      |
| $t_{PHL}$ ,<br>$t_{PLH}$                                                                     | propagation delay A to Y                            | $V_{CC} = 4.5\text{ V}$ ; see <a href="#">Figure 6</a> | -     | -   | 36  | ns   |
| $t_{PZH}$ ,<br>$t_{PZL}$                                                                     | 3-state output enable time<br>$\overline{OE}$ to Y  | $V_{CC} = 4.5\text{ V}$ ; see <a href="#">Figure 7</a> | -     | -   | 42  | ns   |
| $t_{PHZ}$ ,<br>$t_{PLZ}$                                                                     | 3-state output disable time<br>$\overline{OE}$ to Y | $V_{CC} = 4.5\text{ V}$ ; see <a href="#">Figure 7</a> | -     | -   | 38  | ns   |

[1] All typical values are measured at  $T_{amb} = 25\text{ }^{\circ}\text{C}$ .

[2]  $C_{PD}$  is used to determine the dynamic power dissipation ( $P_D$  in  $\mu\text{W}$ ).

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

13. Waveforms

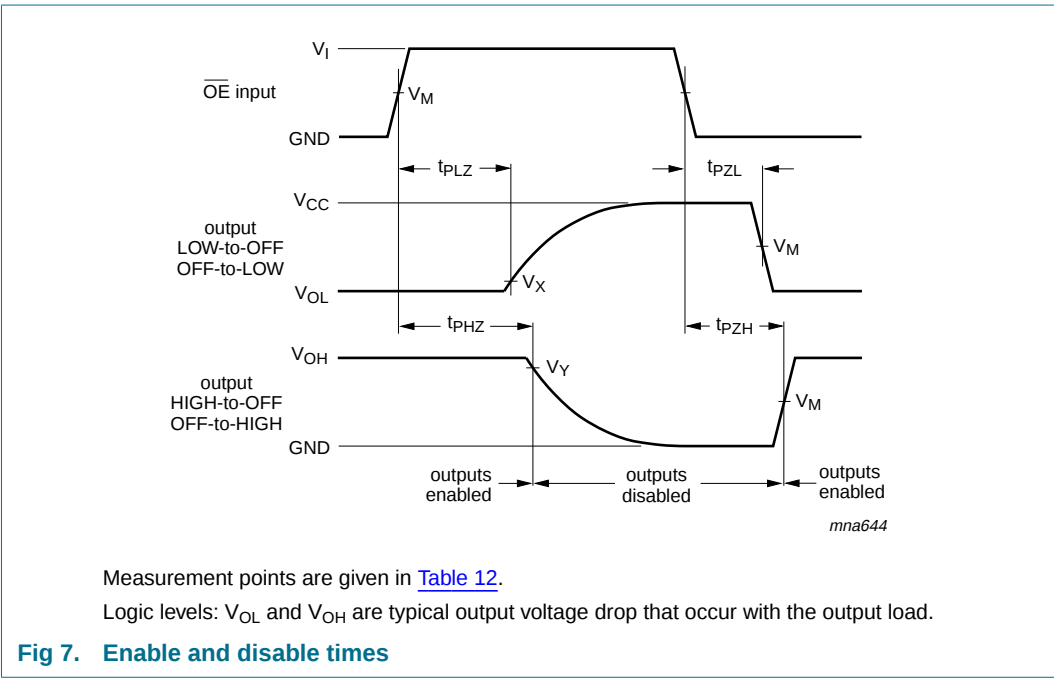
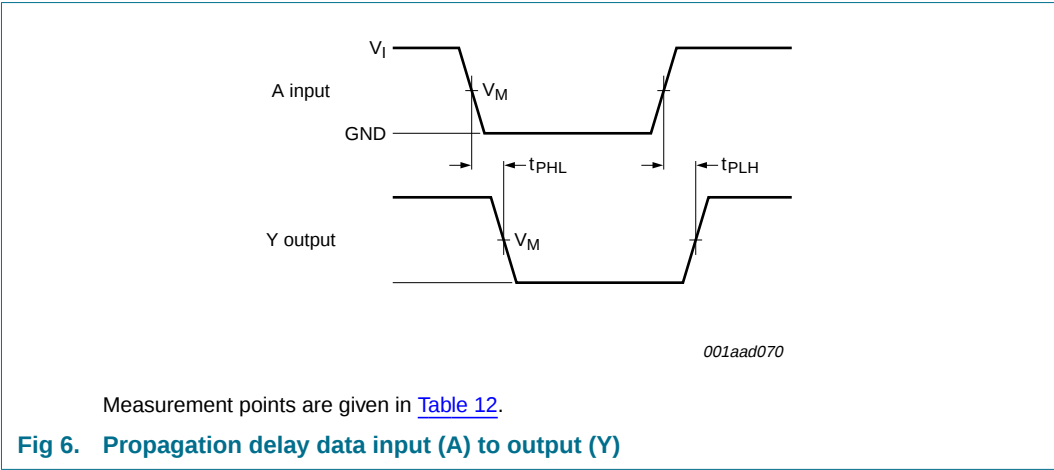


Table 12: Measurement points

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

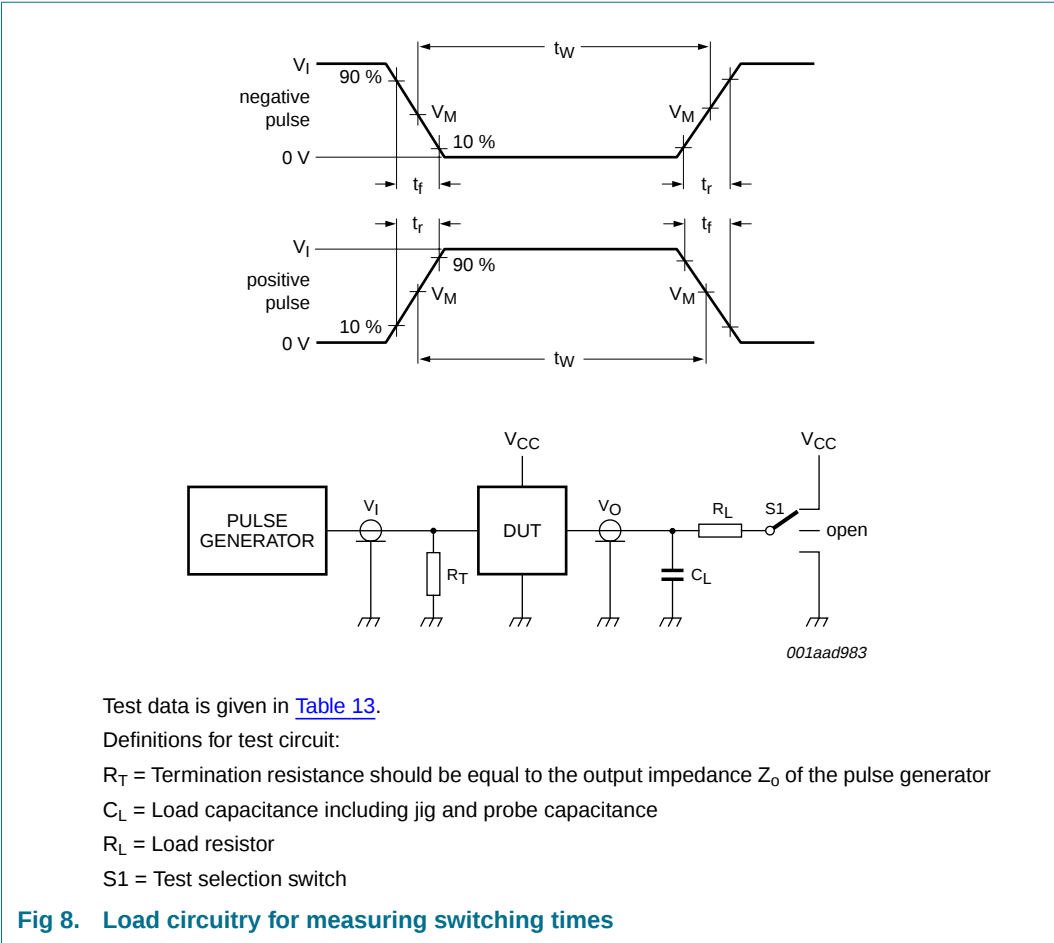


Fig 8. Load circuitry for measuring switching times

Table 13: 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 $\Omega$ | open               | GND                | $V_{CC}$           |
| 74HCT1G125 | 3 V      | 6 ns       | 15 pF, 50 pF | 1 k $\Omega$ | open               | GND                | $V_{CC}$           |

14. Package outline

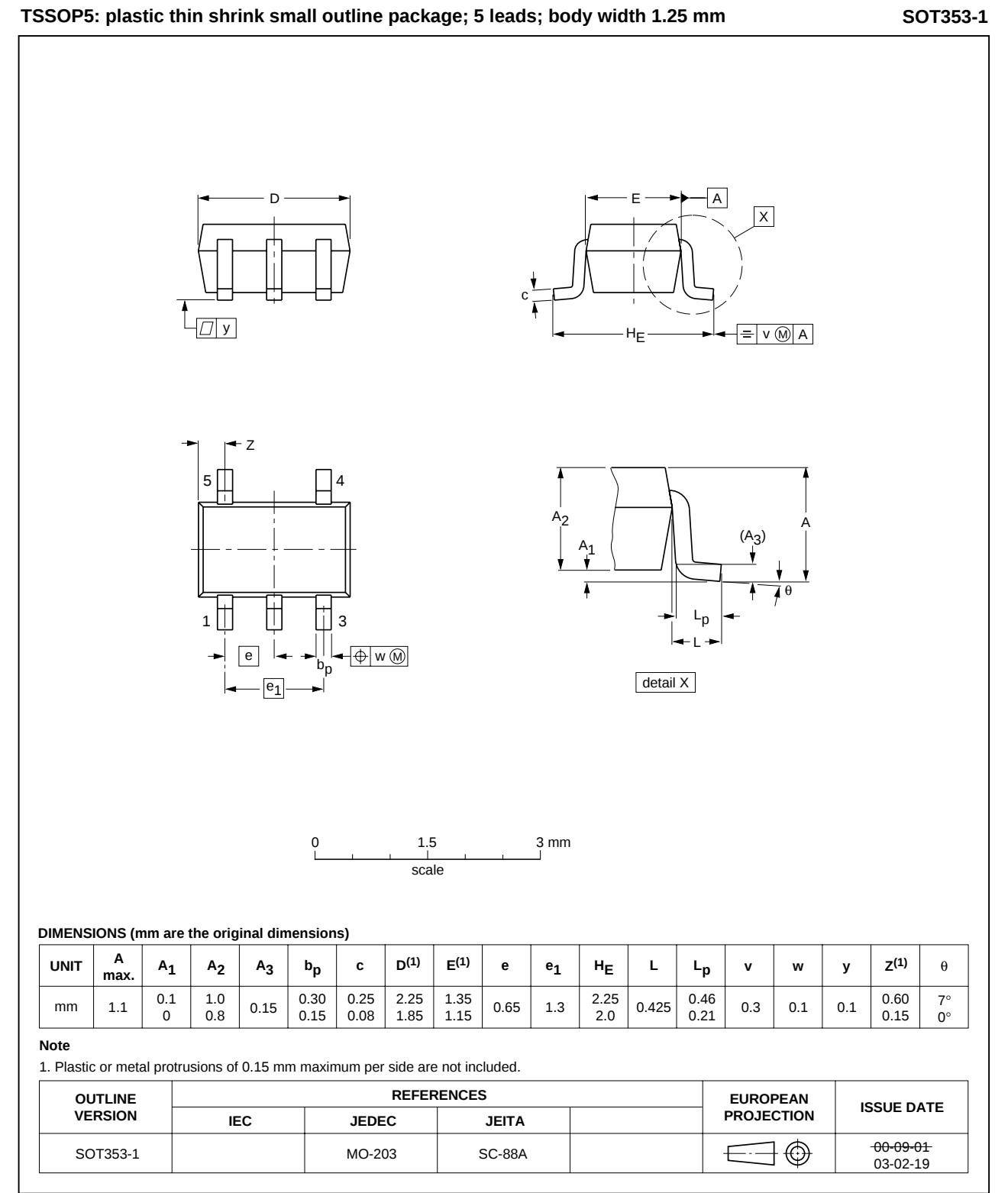


Fig 9. Package outline SOT353-1 (TSSOP5)

Plastic surface mounted package; 5 leads

SOT753

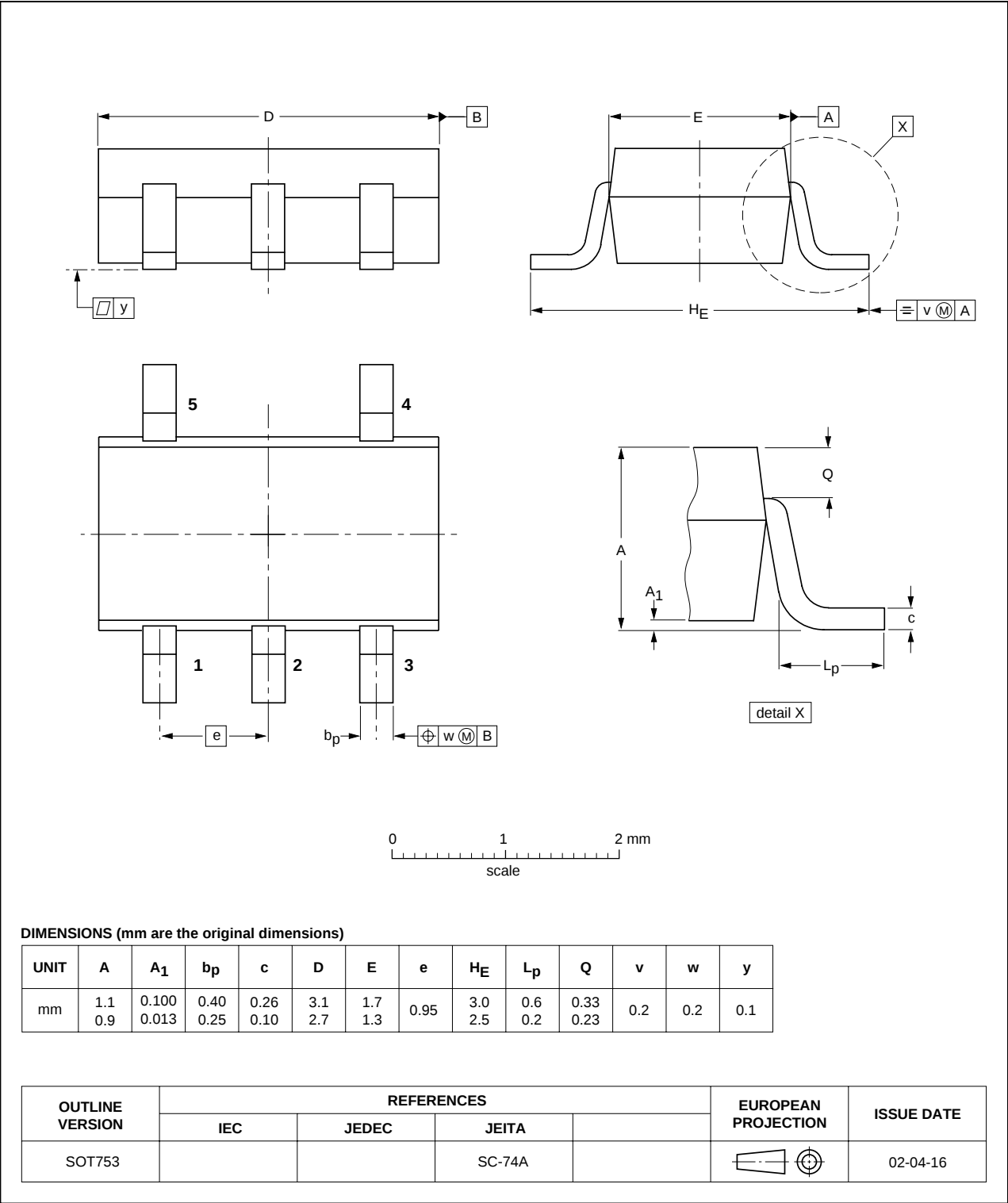


Fig 10. Package outline SOT753 (SC-74A)

## 15. Abbreviations

Table 14: Abbreviations

| Acronym | Description                             |
|---------|-----------------------------------------|
| CMOS    | Complementary Metal Oxide Semiconductor |
| ESD     | ElectroStatic Discharge                 |
| HBM     | Human Body Model                        |
| TTL     | Transistor-Transistor Logic             |
| MM      | Machine Model                           |

## 16. Revision history

Table 15: Revision history

| Document ID                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Release date | Data sheet status     | Change notice | Doc. number    | Supersedes      |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------|-----------------------|---------------|----------------|-----------------|
| 74HC_HCT1G125_5                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 20051223     | Product data sheet    | ECN05_085     | -              | 74HC_HCT1G125_4 |
| Modifications: <ul style="list-style-type: none"> <li>The format of this data sheet has been redesigned to comply with the new presentation and information standard of Philips Semiconductors.</li> <li>In <a href="#">Table 6 "Limiting values"</a> <ul style="list-style-type: none"> <li><math>I_O</math>: changed max value <math>\pm 12.5</math> into <math>\pm 35</math></li> <li><math>I_{CC}</math>: changed max value 25 into 70</li> <li><math>I_{GND}</math>: changed max value <math>-25</math> into <math>-70</math></li> </ul> </li> <li>In <a href="#">Table 8 "Static characteristics 74HC1G125"</a>; <math>T_{amb} = -40\text{ }^{\circ}\text{C}</math> to <math>+85\text{ }^{\circ}\text{C}</math> <ul style="list-style-type: none"> <li><math>V_{OH}</math>: changed condition <math>I_O = -2.0\text{ mA}</math> into <math>I_O = -6.0\text{ mA}</math> and min value from 4.13 into 3.84</li> <li><math>V_{OH}</math>: changed condition <math>I_O = -2.6\text{ mA}</math> into <math>I_O = -7.8\text{ mA}</math> and min value from 5.63 into 5.34</li> <li><math>V_{OL}</math>: changed condition <math>I_O = 2.0\text{ mA}</math> into <math>I_O = 6.0\text{ mA}</math></li> <li><math>V_{OL}</math>: changed condition <math>I_O = 2.6\text{ mA}</math> into <math>I_O = 7.8\text{ mA}</math></li> </ul> </li> <li>In <a href="#">Table 8 "Static characteristics 74HC1G125"</a>; <math>T_{amb} = -40\text{ }^{\circ}\text{C}</math> to <math>+125\text{ }^{\circ}\text{C}</math> <ul style="list-style-type: none"> <li><math>V_{OH}</math>: changed condition <math>I_O = -2.0\text{ mA}</math> into <math>I_O = -6.0\text{ mA}</math></li> <li><math>V_{OL}</math>: changed condition <math>I_O = 2.0\text{ mA}</math> into <math>I_O = 6.0\text{ mA}</math></li> </ul> </li> <li>In <a href="#">Table 9 "Static characteristics 74HCT1G125"</a>; <math>T_{amb} = -40\text{ }^{\circ}\text{C}</math> to <math>+85\text{ }^{\circ}\text{C}</math> <ul style="list-style-type: none"> <li><math>V_{OH}</math>: changed condition <math>I_O = -2.0\text{ mA}</math> into <math>I_O = -6.0\text{ mA}</math> and min value from 4.13 into 3.84</li> <li><math>V_{OL}</math>: changed condition <math>I_O = 2.0\text{ mA}</math> into <math>I_O = 6.0\text{ mA}</math> and typ value from 0.15 into 0.16</li> </ul> </li> <li>In <a href="#">Table 9 "Static characteristics 74HCT1G125"</a>; <math>T_{amb} = -40\text{ }^{\circ}\text{C}</math> to <math>+125\text{ }^{\circ}\text{C}</math> <ul style="list-style-type: none"> <li><math>V_{OH}</math>: changed condition <math>I_O = -2.0\text{ mA}</math> into <math>I_O = -6.0\text{ mA}</math></li> <li><math>V_{OL}</math>: changed condition <math>I_O = 2.0\text{ mA}</math> into <math>I_O = 6.0\text{ mA}</math></li> </ul> </li> </ul> |              |                       |               |                |                 |
| 74HC_HCT1G125_4                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 20040727     | Product specification | -             | 9397 750 13725 | 74HC_HCT1G125_3 |
| 74HC_HCT1G125_3                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 20020517     | Product specification | -             | 9397 750 09718 | 74HC_HCT1G125_2 |
| 74HC_HCT1G125_2                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 20010302     | Product specification | -             | 9397 750 07966 | 74HC_HCT1G125_1 |
| 74HC_HCT1G125_1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 19981110     | Product specification | -             | 9397 750 03693 | -               |

## 17. Data sheet status

| Level | Data sheet status <sup>[1]</sup> | Product status <sup>[2] [3]</sup> | Definition                                                                                                                                                                                                                                                                                     |
|-------|----------------------------------|-----------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| I     | Objective data                   | Development                       | This data sheet contains data from the objective specification for product development. Philips Semiconductors reserves the right to change the specification in any manner without notice.                                                                                                    |
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[3] For data sheets describing multiple type numbers, the highest-level product status determines the data sheet status.

## 18. Definitions

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