# 74HC2G125; 74HCT2G125

## Dual buffer/line driver; 3-state

Rev. 6 — 1 November 2018 Product data sheet

## 1. General description

The 74HC2G125; 74HC2G125 are dual buffer/line drivers with 3-state outputs controlled by the output enable inputs ($n\overline{OE}$). Inputs include clamp diodes which enable 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 74HC2G125: CMOS level
  - For 74HCT2G125: TTL level
- Symmetrical output impedance
- High noise immunity
- Low power dissipation
- Balanced propagation delays
- ESD protection:
  - HBM JESD22-A114F exceeds 2 000 V
  - MM JESD22-A115-A exceeds 200 V
- Multiple package options
- Specified from -40 °C to +85 °C and -40 °C to +125 °C

## 3. Ordering information

**Table 1. Ordering information**

| Type number | Package | | | |
|---|---|---|---|---|
| | Temperature range | Name | Description | Version |
| 74HC2G125DP | -40 °C to +125 °C | TSSOP8 | plastic thin shrink small outline package; 8 leads; body width 3 mm; lead length 0.5 mm | SOT505-2 |
| 74HCT2G125DP | | | | |
| 74HC2G125DC | -40 °C to +125 °C | VSSOP8 | plastic very thin shrink small outline package; 8 leads; body width 2.3 mm | SOT765-1 |
| 74HCT2G125DC | | | | |

## 4. Marking

**Table 2. Marking codes**

| Type number | Marking code[1] |
|---|---|
| 74HC2G125DP | H25 |
| 74HCT2G125DP | T25 |
| 74HC2G125DC | H25 |
| 74HCT2G125DC | T25 |

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

nexperia

# 5. Functional diagram

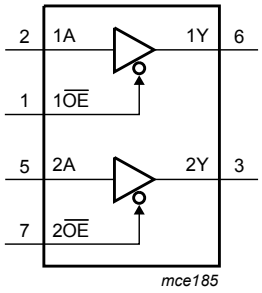



Fig. 1. Logic symbol

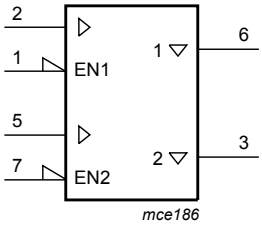



Fig. 2. IEC logic symbol

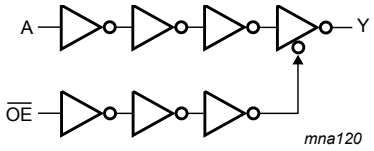



Fig. 3. Logic diagram (one driver)

# 6. Pinning information

## 6.1. Pinning

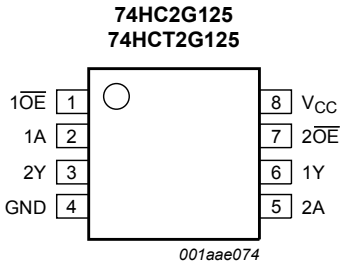



Fig. 4. Pin configuration SOT505-2 (TSSOP8) and SOT765-1 (VSSOP8)

## 6.2. Pin description

Table 3. Pin description

| Symbol | Pin | Description |
|---|---|---|
| $1\overline{OE}$, $2\overline{OE}$ | 1, 7 | output enable input (active LOW) |
| 1A, 2A | 2, 5 | data input |
| GND | 4 | ground (0 V) |
| 1Y, 2Y | 6, 3 | data output |
| $V_{CC}$ | 8 | 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 |
|---|---|---|
| **$n\overline{OE}$** | **nA** | **nY** |
| 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 | $V_I < -0.5$ V or $V_I > V_{CC} + 0.5$ V | [1] | - | ±20 | mA |
| $I_{OK}$ | output clamping current | $V_O < -0.5$ V or $V_O > V_{CC} + 0.5$ V | [1] | - | ±20 | mA |
| $I_O$ | output current | $V_O = -0.5$ V to $(V_{CC} + 0.5$ 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 °C to +125 °C | [2] | - | 300 | mW |

[1] The input and output voltage ratings may be exceeded if the input and output current ratings are observed.
[2] For TSSOP8 package: above 55 °C the value of $P_{tot}$ derates linearly with 2.5 mW/K.
For VSSOP8 package: above 110 °C the value of $P_{tot}$ derates linearly with 8 mW/K.

# 9. Recommended operating conditions

**Table 6. Recommended operating conditions**

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

| Symbol | Parameter | Conditions | 74HC2G125 | | | 74HCT2G125 | | | 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 |
| Δt/ΔV | input transition rise and fall rate | $V_{CC}$ = 2.0 V | - | - | 625 | - | - | - | ns/V |
| | | $V_{CC}$ = 4.5 V | - | 1.67 | 139 | - | 1.67 | 139 | ns/V |
| | | $V_{CC}$ = 6.0 V | - | - | 83 | - | - | - | ns/V |

# 10. Static characteristics

**Table 7. Static characteristics**

*Voltages are referenced to GND (ground = 0 V). All typical values are measured at $T_{amb}$ = 25 °C.*

| Symbol | Parameter | Conditions | $T_{amb}$ = -40 °C to +85 °C | | | $T_{amb}$ = -40 °C to +125 °C | | Unit |
|---|---|---|---|---|---|---|---|---|
| | | | Min | Typ | Max | Min | Max | |
| **74HC2G125** | | | | | | | | |
| $V_{IH}$ | 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 | - | - | ±5.0 | - | ±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 | | - | 1.0 | - | - | - | pF |
| $C_O$ | output capacitance | | - | 1.5 | - | - | - | pF |
| **74HCT2G125** | | | | | | | | |
| $V_{IH}$ | 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 |

| Symbol | Parameter | Conditions | $T_{amb}$ = -40 °C to +85 °C | | | $T_{amb}$ = -40 °C to +125 °C | | Unit |
|---|---|---|---|---|---|---|---|---|
| | | | Min | Typ | Max | Min | Max | |
| $I_{OZ}$ | OFF-state output current | $V_I = V_{IH}$ or $V_{IL}$; $V_O = V_{CC}$ or GND; $V_{CC}$ = 5.5 V | - | - | ±5.0 | - | ±10 | µA |
| $I_{CC}$ | supply current | $V_I = V_{CC}$ or GND; $I_O$ = 0 A; $V_{CC}$ = 5.5 V | - | - | 10 | - | 20 | µA |
| $\Delta I_{CC}$ | additional supply current | per input; $V_{CC}$ = 4.5 V to 5.5 V; $V_I = V_{CC}$ - 2.1 V; $I_O$ = 0 A | - | - | 375 | - | 410 | µA |
| $C_I$ | input capacitance | | - | 1.0 | - | - | - | pF |
| $C_O$ | output capacitance | | - | 1.5 | - | - | - | pF |

## 11. Dynamic characteristics

**Table 8. Dynamic characteristics**

*Voltages are referenced to GND (ground = 0 V); $C_L$ = 50 pF unless otherwise specified; for test circuit see Fig. 7.*

| Symbol | Parameter | Conditions | $T_{amb}$ = -40 °C to +85 °C | | | $T_{amb}$ = -40 °C to +125 °C | | Unit |
|---|---|---|---|---|---|---|---|---|
| | | | Min | Typ [1] | Max | Min | Max | |
| **74HC2G125** | | | | | | | | |
| $t_{pd}$ | propagation delay | nA to nY; see Fig. 5 [2] | | | | | | |
| | | $V_{CC}$ = 2.0 V | - | 35 | 115 | - | 135 | ns |
| | | $V_{CC}$ = 4.5 V | - | 11 | 23 | - | 27 | ns |
| | | $V_{CC}$ = 5.0 V; $C_L$ = 15 pF | - | 10 | - | - | - | ns |
| | | $V_{CC}$ = 6.0 V | - | 8 | 20 | - | 23 | ns |
| $t_{en}$ | enable time | $n\overline{OE}$ to nY; see Fig. 6 [2] | | | | | | |
| | | $V_{CC}$ = 2.0 V | - | 40 | 115 | - | 135 | ns |
| | | $V_{CC}$ = 4.5 V | - | 11 | 23 | - | 27 | ns |
| | | $V_{CC}$ = 6.0 V | - | 8 | 20 | - | 23 | ns |
| $t_{dis}$ | disable time | $n\overline{OE}$ to nY; see Fig. 6 [2] | | | | | | |
| | | $V_{CC}$ = 2.0 V | - | 24 | 125 | - | 150 | ns |
| | | $V_{CC}$ = 4.5 V | - | 12 | 25 | - | 30 | ns |
| | | $V_{CC}$ = 6.0 V | - | 10 | 21 | - | 26 | ns |
| $t_t$ | transition time | see Fig. 5 [2] | | | | | | |
| | | $V_{CC}$ = 2.0 V | - | 18 | 75 | - | 90 | ns |
| | | $V_{CC}$ = 4.5 V | - | 6 | 15 | - | 18 | ns |
| | | $V_{CC}$ = 6.0 V | - | 5 | 13 | - | 15 | ns |
| $C_{PD}$ | power dissipation capacitance | per buffer; $V_I$ = GND to $V_{CC}$ [3] | | | | | | |
| | | output enabled | - | 11 | - | - | - | pF |
| | | output disabled | - | 1 | - | - | - | pF |

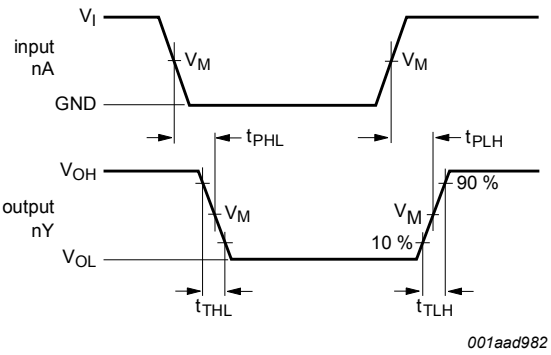
| Symbol | Parameter | Conditions | $T_{amb}$ = -40 °C to +85 °C | | | $T_{amb}$ = -40 °C to +125 °C | | Unit |
|---|---|---|---|---|---|---|---|---|
| | | | Min | Typ [1] | Max | Min | Max | |
| **74HCT2G125** | | | | | | | | |
| $t_{pd}$ | propagation delay | nA to nY; see Fig. 5 [2] | | | | | | |
| | | $V_{CC}$ = 4.5 V | - | 15 | 31 | - | 38 | ns |
| | | $V_{CC}$ = 5.0 V; $C_L$ = 15 pF | - | 12 | - | - | - | ns |
| $t_{en}$ | enable time | $n\overline{OE}$ to nY; see Fig. 6;$V_{CC}$ = 4.5 V [2] | - | 15 | 35 | - | 42 | ns |
| $t_{dis}$ | disable time | $n\overline{OE}$ to nY; see Fig. 6;$V_{CC}$ = 4.5 V [2] | - | 15 | 31 | - | 38 | ns |
| $t_t$ | transition time | see Fig. 5; $V_{CC}$ = 4.5 V [2] | - | 6 | 15 | - | 18 | ns |
| $C_{PD}$ | power dissipation capacitance | per buffer; $V_I$ = GND to $V_{CC}$ - 1.5 V [3] | | | | | | |
| | | output enabled | - | 11 | - | - | - | pF |
| | | output disabled | - | 1 | - | - | - | 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 $t_{PHZ}$.
$t_t$ is the same as $t_{THL}$ and $t_{TLH}$.

[3] $C_{PD}$ is used to determine the dynamic power dissipation ($P_D$ in µW).
$P_D = C_{PD} \times V_{CC}^2 \times f_i \times N + \Sigma(C_L \times V_{CC}^2 \times f_o)$ where:
$f_i$ = input frequency in MHz;
$f_o$ = output frequency in MHz;
$C_L$ = output load capacitance in pF;
$V_{CC}$ = supply voltage in V;
N = number of inputs switching;
$\Sigma(C_L \times V_{CC}^2 \times f_o)$ = sum of outputs.

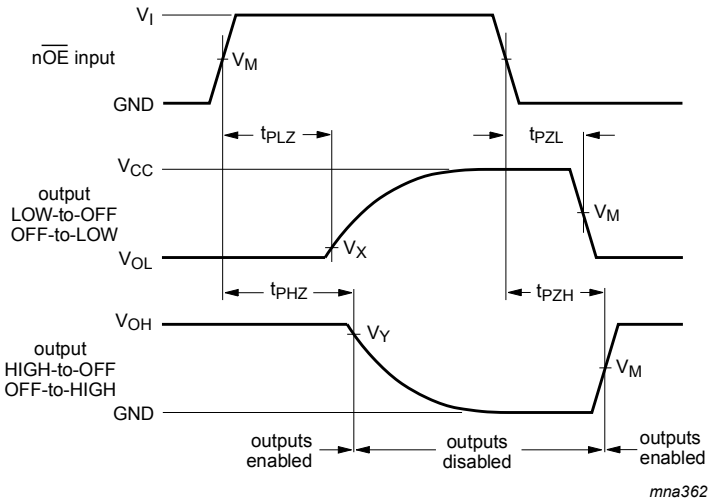
## 11.1. Waveforms and test circuit




Measurement points are given in Table 9.

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

**Fig. 5. Propagation delays data input (nA) to output (nY)**



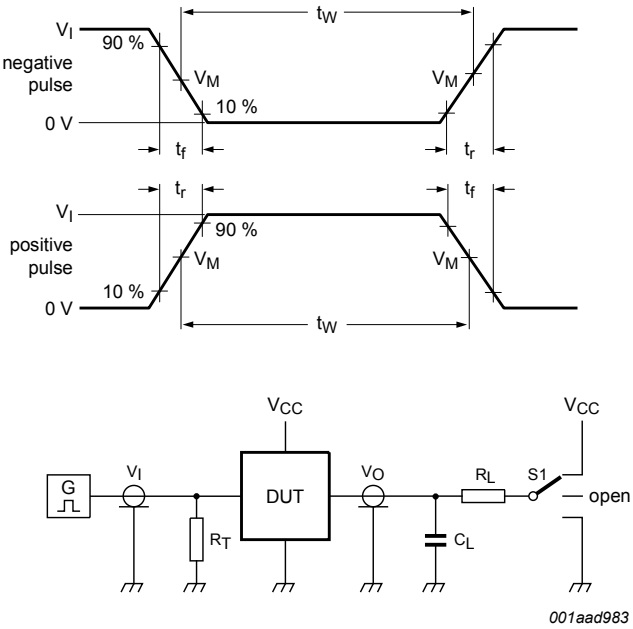

Measurement points are given in Table 9.

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

**Fig. 6. Enable and disable times**

**Table 9. Measurement points**

| Type | Input | Output | | |
|---|---|---|---|---|
| | $V_M$ | $V_M$ | $V_X$ | $V_Y$ |
| 74HC2G125 | $0.5V_{CC}$ | $0.5V_{CC}$ | $V_{OL}$ + 0.3 V | $V_{OH}$ - 0.3 V |
| 74HCT2G125 | 1.3 V | 1.3 V | $V_{OL}$ + 0.3 V | $V_{OH}$ - 0.3 V |




Test data is given in Table 10.

Definitions test circuit:

$R_T$ = Termination resistance should be equal to output impedance $Z_o$ of the pulse generator.

$C_L$ = Load capacitance including jig and probe capacitance.

$R_L$ = Load resistance.

S1 = Test selection switch.

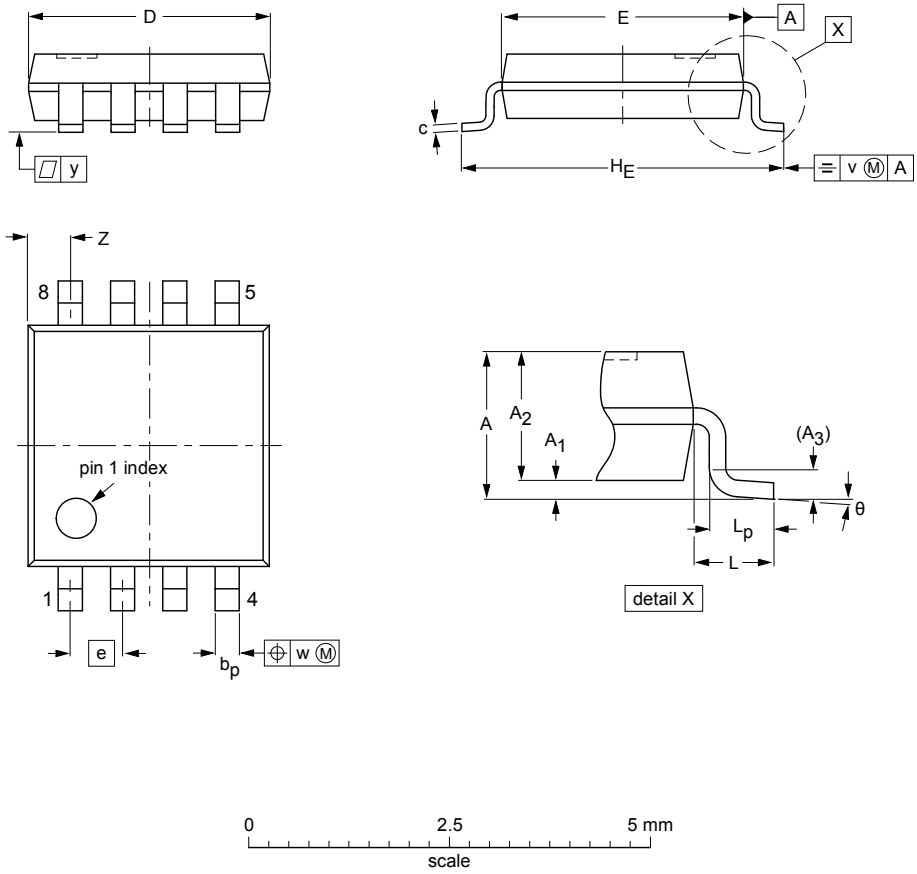
**Fig. 7. Test circuit for measuring switching times**

**Table 10. Test data**

| Type | Input | | Load | | S1 position | | |
|---|---|---|---|---|---|---|---|
| | $V_I$ | $t_r$, $t_f$ | $C_L$ | $R_L$ | $t_{PHL}$, $t_{PLH}$ | $t_{PZH}$, $t_{PHZ}$ | $t_{PZL}$, $t_{PLZ}$ |
| 74HC2G125 | $V_{CC}$ | ≤ 6 ns | 15 pF, 50 pF | 1 kΩ | open | GND | $V_{CC}$ |
| 74HCT2G125 | 3 V | ≤ 6 ns | 15 pF, 50 pF | 1 kΩ | open | GND | $V_{CC}$ |

## 12. Package outline

**TSSOP8: plastic thin shrink small outline package; 8 leads; body width 3 mm; lead length 0.5 mm SOT505-2**




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

| UNIT | A max. | $A_1$ | $A_2$ | $A_3$ | $b_p$ | c | $D^{(1)}$ | $E^{(1)}$ | e | $H_E$ | L | $L_p$ | v | w | y | $Z^{(1)}$ | θ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| mm | 1.1 | 0.15<br>0.00 | 0.95<br>0.75 | 0.25 | 0.38<br>0.22 | 0.18<br>0.08 | 3.1<br>2.9 | 3.1<br>2.9 | 0.65 | 4.1<br>3.9 | 0.5 | 0.47<br>0.33 | 0.2 | 0.13 | 0.1 | 0.70<br>0.35 | 8°<br>0° |

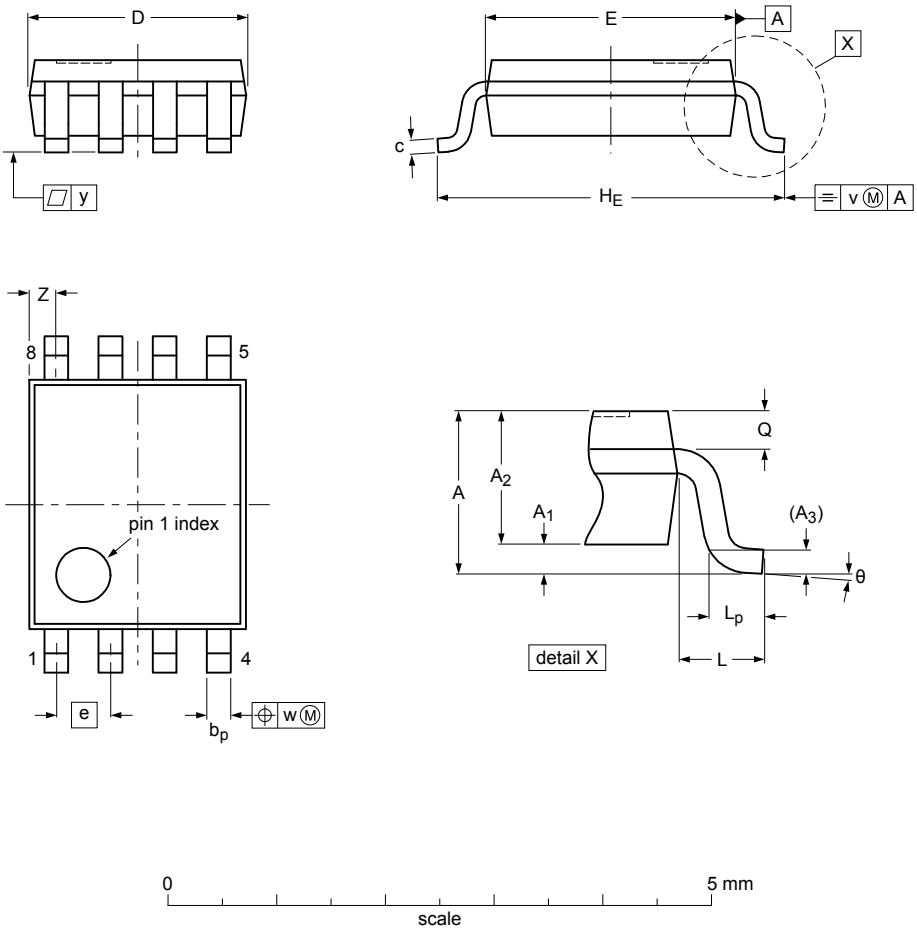
**Note**

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

| OUTLINE VERSION | REFERENCES | | | | EUROPEAN PROJECTION | ISSUE DATE |
|---|---|---|---|---|---|---|
| | IEC | JEDEC | JEITA | | | |
| SOT505-2 | | - - - | | | | 02-01-16 |

**Fig. 8. Package outline SOT505-2 (TSSOP8)**

**VSSOP8: plastic very thin shrink small outline package; 8 leads; body width 2.3 mm** **SOT765-1**




Dimensions (mm are the original dimensions)

| Unit | A max. | $A_1$ | $A_2$ | $A_3$ | $b_p$ | c | $D^{(1)}$ | $E^{(2)}$ | e | $H_E$ | L | $L_p$ | Q | v | w | y | $Z^{(1)}$ | θ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| mm max | 1 | 0.15 | 0.85 | 0.12 | 0.27 | 0.23 | 2.1 | 2.4 | 0.5 | 3.2 | 0.4 | 0.40 | 0.21 | 0.2 | 0.08 | 0.1 | 0.4 | 8° |
| nom | | | | | | | | | | | | | | | | | | |
| min | | 0.00 | 0.60 | | 0.17 | 0.08 | 1.9 | 2.2 | | 3.0 | | 0.15 | 0.19 | | | | 0.1 | 0° |

Note
1. Plastic or metal protrusions of 0.15 mm maximum per side are not included.
2. Plastic or metal protrusions of 0.25 mm maximum per side are not included.

*sot765-1_po*

| Outline version | References | | | | European projection | Issue date |
|---|---|---|---|---|---|---|
| | IEC | JEDEC | JEITA | | | |
| SOT765-1 | | MO-187 | | | | ~~07-06-02~~ 16-05-31 |

**Fig. 9. Package outline SOT765-1 (VSSOP8)**

## 13. Abbreviations

**Table 11. Abbreviations**

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

## 14. Revision history

**Table 12. Revision history**

| Document ID | Release date | Data sheet status | Change notice | Supersedes |
|---|---|---|---|---|
| 74HC_HCT2G125 v.6 | 20181101 | Product data sheet | - | 74HC_HCT2G125 v.5 |
| Modifications: | • The format of this data sheet has been redesigned to comply with the identity guidelines of Nexperia.<br>• Legal texts have been adapted to the new company name where appropriate.<br>• Type numbers 74HC2G125GD and 74HCT2G125GD (SOT996-2/XSON8) removed. | | | |
| 74HC_HCT2G125 v.5 | 20140317 | Product data sheet | - | 74HC_HCT2G125 v.4 |
| Modifications: | • For type numbers 74HC2G125GD and 74HCT2G125GD XSON8U has changed to XSON8. | | | |
| 74HC_HCT2G125 v.4 | 20080704 | Product data sheet | - | 74HC_HCT2G125 v.3 |
| 74HC_HCT2G125 v.3 | 20060102 | Product data sheet | - | 74HC_HCT2G125 v.2 |
| 74HC_HCT2G125 v.2 | 20030303 | Product specification | - | 74HC_HCT2G125 v.1 |
| 74HC_HCT2G125 v.1 | 20030131 | 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. |

[1] Please consult the most recently issued document before initiating or completing a design.
[2] The term 'short data sheet' is explained in section "Definitions".
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