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Kind regards,

Team Nexperia

74HC2G125-Q100; 74HCT2G125-Q100

Dual buffer/line driver; 3-state

Rev. 1 — 3 April 2013

Product data sheet

1. General description

The 74HC2G125-Q100; 74HC2G125-Q100 are dual buffer/line drivers with 3-state outputs controlled by the output enable inputs (nOE). Inputs include clamp diodes which enable the use of current limiting resistors to interface inputs to voltages in excess of V_{CC} .

This product has been qualified to the Automotive Electronics Council (AEC) standard Q100 (Grade 1) and is suitable for use in automotive applications.

2. Features and benefits

- Automotive product qualification in accordance with AEC-Q100 (Grade 1)
 - ◆ Specified from -40°C to $+85^{\circ}\text{C}$ and from -40°C to $+125^{\circ}\text{C}$
- Input levels:
 - ◆ For 74HC2G125-Q100: CMOS level
 - ◆ For 74HCT2G125-Q100: TTL level
- 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:
 - ◆ MIL-STD-883, method 3015 exceeds 2000 V
 - ◆ HBM JESD22-A114F exceeds 2000 V
 - ◆ MM JESD22-A115-A exceeds 200 V ($C = 200 \text{ pF}$, $R = 0 \Omega$)
- Multiple package options



3. Ordering information

Table 1. Ordering information

| Type number | Package | Temperature range | Name | Description | Version |
|-------------------|---------|-------------------|------|---|----------|
| 74HC2G125DP-Q100 | TSSOP8 | −40 °C to +125 °C | | plastic thin shrink small outline package; 8 leads; body width 3 mm; lead length 0.5 mm | SOT505-2 |
| 74HCT2G125DP-Q100 | | | | | |
| 74HC2G125DC-Q100 | VSSOP8 | −40 °C to +125 °C | | plastic very thin shrink small outline package; 8 leads; body width 2.3 mm | SOT765-1 |
| 74HCT2G125DC-Q100 | | | | | |

4. Marking

Table 2. Marking

| Type number | Marking code ^[1] |
|-------------------|-----------------------------|
| 74HC2G125DP-Q100 | H25 |
| 74HCT2G125DP-Q100 | T25 |
| 74HC2G125DC-Q100 | H25 |
| 74HCT2G125DC-Q100 | T25 |

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

5. Functional diagram

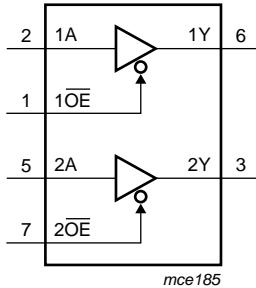


Fig 1. Logic symbol

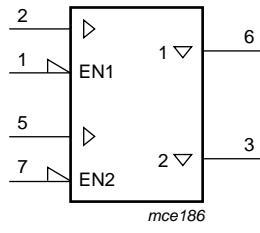


Fig 2. IEC logic symbol

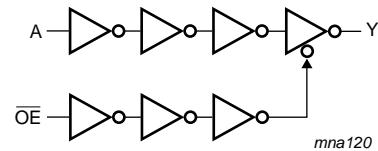


Fig 3. Logic diagram (one driver)

6. Pinning information

6.1 Pinning

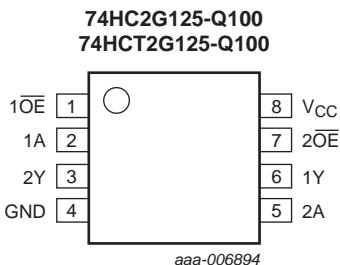


Fig 4. Pin configuration SOT505-2 (TSSOP8) and SOT765-1 (VSSOP8)

6.2 Pin description

Table 3. Pin description

| Symbol | Pin | Description |
|-----------------|------|----------------------------------|
| 1OE, 2OE | 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^[1]

| Control | Input | Output |
|---------|-------|--------|
| nOE | nA | nY |
| 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 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 |

Table 5. Limiting values ...continued

In accordance with the Absolute Maximum Rating System (IEC 60134). Voltages are referenced to GND (ground = 0 V).

| Symbol | Parameter | Conditions | Min | Max | Unit |
|------------------|-------------------------|--------------------------------------|-----|------|--------|
| 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-Q100 | | | 74HCT2G125-Q100 | | | 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 characteristicsVoltages 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-Q100 | | | | | | | | | |
| 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 |

Table 7. Static characteristics ...continuedVoltages are referenced to GND (ground = 0 V). All typical values are measured at $T_{amb} = 25^\circ\text{C}$.

| Symbol | Parameter | Conditions | $T_{amb} = -40^\circ\text{C}$ to $+85^\circ\text{C}$ | | | $T_{amb} = -40^\circ\text{C}$ to $+125^\circ\text{C}$ | | | Unit |
|----------|--------------------------|---|--|------|-----------|---|-----------|---------------|------|
| | | | Min | Typ | Max | Min | Max | | |
| V_{OL} | LOW-level output voltage | $V_I = V_{IH}$ or V_{IL} | | | | | | | |
| | | $I_O = 20 \mu\text{A}; V_{CC} = 2.0 \text{ V}$ | - | 0 | 0.1 | - | 0.1 | V | |
| | | $I_O = 20 \mu\text{A}; V_{CC} = 4.5 \text{ V}$ | - | 0 | 0.1 | - | 0.1 | V | |
| | | $I_O = 20 \mu\text{A}; V_{CC} = 6.0 \text{ V}$ | - | 0 | 0.1 | - | 0.1 | V | |
| | | $I_O = 6.0 \text{ mA}; V_{CC} = 4.5 \text{ V}$ | - | 0.15 | 0.33 | - | 0.4 | V | |
| | | $I_O = 7.8 \text{ mA}; V_{CC} = 6.0 \text{ V}$ | - | 0.16 | 0.33 | - | 0.4 | V | |
| I_I | input leakage current | $V_I = V_{CC}$ or GND; $V_{CC} = 6.0 \text{ V}$ | - | - | ± 1.0 | - | ± 1.0 | μA | |
| I_{OZ} | OFF-state output current | $V_I = V_{IH}$ or V_{IL} ; $V_O = V_{CC}$ or GND; $V_{CC} = 6.0 \text{ V}$ | - | - | ± 5.0 | - | ± 10 | μA | |
| I_{CC} | supply current | $V_I = V_{CC}$ or GND; $I_O = 0 \text{ A}$; $V_{CC} = 6.0 \text{ V}$ | - | - | 10 | - | 20 | μA | |
| C_I | input capacitance | | - | 1.0 | - | - | - | pF | |
| C_O | output capacitance | | - | 1.5 | - | - | - | pF | |

74HCT2G125-Q100

| | | | | | | | | | |
|-----------------|---------------------------|--|------|------|-----------|-----|-----------|---------------|--|
| V_{IH} | HIGH-level input voltage | $V_{CC} = 4.5 \text{ V}$ to 5.5 V | 2.0 | 1.6 | - | 2.0 | - | V | |
| V_{IL} | LOW-level input voltage | $V_{CC} = 4.5 \text{ V}$ to 5.5 V | - | 1.2 | 0.8 | - | 0.8 | V | |
| V_{OH} | HIGH-level output voltage | $V_I = V_{IH}$ or V_{IL} ; $V_{CC} = 4.5 \text{ V}$ | | | | | | | |
| | | $I_O = -20 \mu\text{A}$ | 4.4 | 4.5 | - | 4.4 | - | V | |
| | | $I_O = -6.0 \text{ mA}$ | 3.84 | 4.32 | - | 3.7 | - | V | |
| V_{OL} | LOW-level output voltage | $V_I = V_{IH}$ or V_{IL} ; $V_{CC} = 4.5 \text{ V}$ | | | | | | | |
| | | $I_O = 20 \mu\text{A}$ | - | 0 | 0.1 | - | 0.1 | V | |
| | | $I_O = 6.0 \text{ mA}$ | - | 0.16 | 0.33 | - | 0.4 | V | |
| I_I | input leakage current | $V_I = V_{CC}$ or GND; $V_{CC} = 5.5 \text{ V}$ | - | - | ± 1.0 | - | ± 1.0 | μA | |
| I_{OZ} | OFF-state output current | $V_I = V_{IH}$ or V_{IL} ; $V_O = V_{CC}$ or GND; $V_{CC} = 5.5 \text{ V}$ | - | - | ± 5.0 | - | ± 10 | | |
| I_{CC} | supply current | $V_I = V_{CC}$ or GND; $I_O = 0 \text{ A}$; $V_{CC} = 5.5 \text{ V}$ | - | - | 10 | - | 20 | μA | |
| ΔI_{CC} | additional supply current | per input; $V_{CC} = 4.5 \text{ V}$ to 5.5 V ; $V_I = V_{CC} - 2.1 \text{ V}$; $I_O = 0 \text{ A}$ | - | - | 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); $C_L = 50 \text{ pF}$ unless otherwise specified; for test circuit see [Figure 7](#).

| Symbol | Parameter | Conditions | $T_{amb} = -40^{\circ}\text{C}$ to $+85^{\circ}\text{C}$ | | $T_{amb} = -40^{\circ}\text{C}$ to $+125^{\circ}\text{C}$ | | Unit |
|------------------------|-------------------------------|---|--|--------------------|---|-----|---------|
| | | | Min | Typ ^[1] | Max | Min | |
| 74HC2G125-Q100 | | | | | | | |
| t_{pd} | propagation delay | nA to nY; see Figure 5 | [2] | | | | |
| | | $V_{CC} = 2.0 \text{ V}$ | - | 35 | 115 | - | 135 ns |
| | | $V_{CC} = 4.5 \text{ V}$ | - | 11 | 23 | - | 27 ns |
| | | $V_{CC} = 5.0 \text{ V}; C_L = 15 \text{ pF}$ | - | 10 | - | - | - ns |
| t_{en} | enable time | \overline{nOE} to nY; see Figure 6 | [2] | | | | |
| | | $V_{CC} = 2.0 \text{ V}$ | - | 40 | 115 | - | 135 ns |
| | | $V_{CC} = 4.5 \text{ V}$ | - | 11 | 23 | - | 27 ns |
| | | $V_{CC} = 6.0 \text{ V}$ | - | 8 | 20 | - | 23 ns |
| t_{dis} | disable time | \overline{nOE} to nY; see Figure 6 | [2] | | | | |
| | | $V_{CC} = 2.0 \text{ V}$ | - | 24 | 125 | - | 150 ns |
| | | $V_{CC} = 4.5 \text{ V}$ | - | 12 | 25 | - | 30 ns |
| | | $V_{CC} = 6.0 \text{ V}$ | - | 10 | 21 | - | 26 ns |
| t_t | transition time | see Figure 5 | [2] | | | | |
| | | $V_{CC} = 2.0 \text{ V}$ | - | 18 | 75 | - | 90 ns |
| | | $V_{CC} = 4.5 \text{ V}$ | - | 6 | 15 | - | 18 ns |
| | | $V_{CC} = 6.0 \text{ V}$ | - | 5 | 13 | - | 15 ns |
| C_{PD} | power dissipation capacitance | per buffer; $V_I = \text{GND}$ to V_{CC} | [3] | | | | |
| | | output enabled | - | 11 | - | - | - pF |
| | | output disabled | - | 1 | - | - | - pF |
| 74HCT2G125-Q100 | | | | | | | |
| t_{pd} | propagation delay | nA to nY; see Figure 5 | [2] | | | | |
| | | $V_{CC} = 4.5 \text{ V}$ | - | 15 | 31 | - | 38 ns |
| | | $V_{CC} = 5.0 \text{ V}; C_L = 15 \text{ pF}$ | - | 12 | - | - | - ns |
| t_{en} | enable time | \overline{nOE} to nY; see Figure 6 ; $V_{CC} = 4.5 \text{ V}$ | [2] | - | 15 | 35 | - 42 ns |
| t_{dis} | disable time | \overline{nOE} to nY; see Figure 6 ; $V_{CC} = 4.5 \text{ V}$ | [2] | - | 15 | 31 | - 38 ns |
| t_t | transition time | see Figure 5 ; $V_{CC} = 4.5 \text{ V}$ | [2] | - | 6 | 15 | - 18 ns |

Table 8. Dynamic characteristics ...continuedVoltages are referenced to GND (ground = 0 V); $C_L = 50 \text{ pF}$ unless otherwise specified; for test circuit see [Figure 7](#).

| Symbol | Parameter | Conditions | $T_{amb} = -40^{\circ}\text{C} \text{ to } +85^{\circ}\text{C}$ | | $T_{amb} = -40^{\circ}\text{C} \text{ to } +125^{\circ}\text{C}$ | | Unit |
|----------|-------------------------------|--|---|--------------------|--|-----|------|
| | | | Min | Typ ^[1] | Max | Min | |
| C_{PD} | power dissipation capacitance | per buffer; $V_I = \text{GND to } V_{CC} - 1.5 \text{ V}$ | [3] | | | | |
| | | output enabled | - | 11 | - | - | pF |
| | | output disabled | - | 1 | - | - | pF |

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

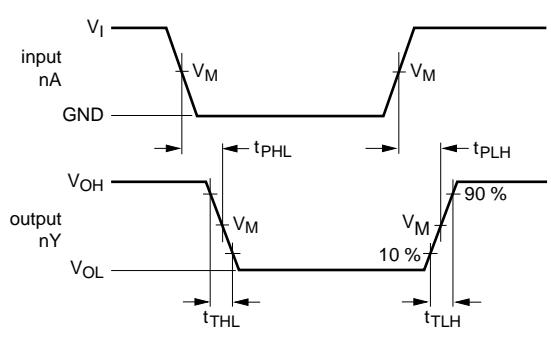
$$P_D = C_{PD} \times V_{CC}^2 \times f_i \times N + \sum(C_L \times V_{CC}^2 \times f_o) \text{ where:}$$

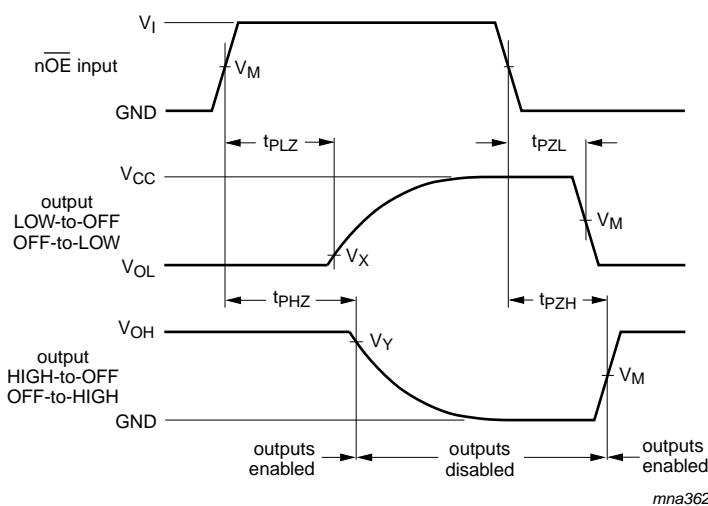
 f_i = input frequency in MHz; f_o = output frequency in MHz; C_L = output load capacitance in pF; V_{CC} = supply voltage in V;

N = number of inputs switching;

 $\sum(C_L \times V_{CC}^2 \times f_o)$ = sum of outputs.

12. Waveforms

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)**



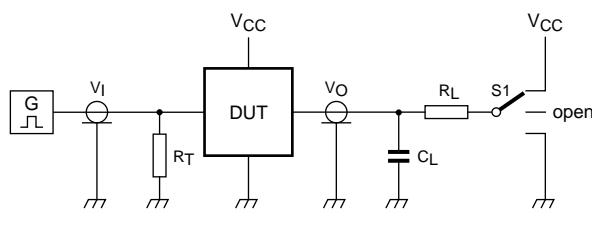
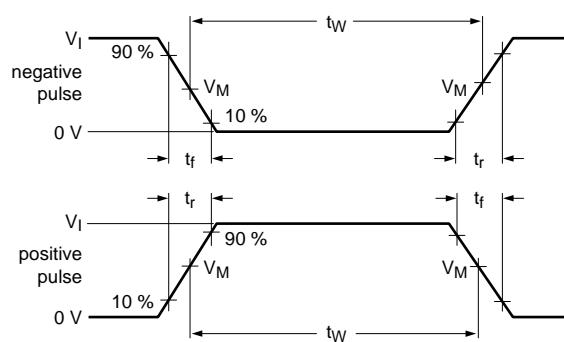
Measurement points are given in [Table 9](#).

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-Q100 | 0.5 V_{CC} | 0.5 V_{CC} | $V_{OL} + 0.3$ V | $V_{OH} - 0.3$ V |
| 74HCT2G125-Q100 | 1.3 V | 1.3 V | $V_{OL} + 0.3$ V | $V_{OH} - 0.3$ V |



001aad983

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.

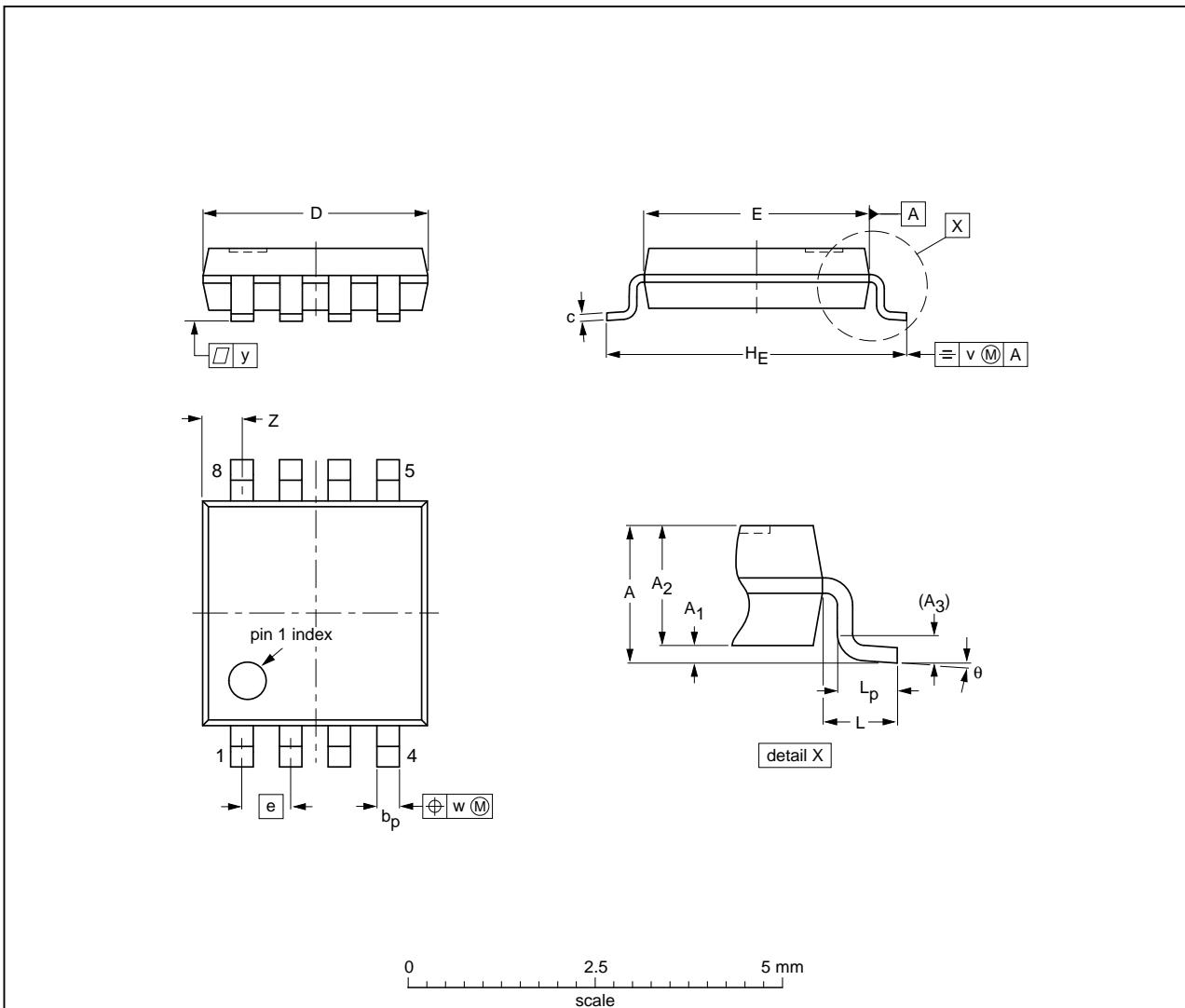
Fig 7. Test circuit for measuring switching times

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-Q100 | V_{CC} | $\leq 6 \text{ ns}$ | 15 pF, 50 pF | 1 k Ω | open | GND | V_{CC} |
| 74HCT2G125-Q100 | 3 V | $\leq 6 \text{ ns}$ | 15 pF, 50 pF | 1 k Ω | open | GND | V_{CC} |

13. 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 0.00 | 0.15 0.75 | 0.95 | 0.25 | 0.38 0.22 | 0.18 0.08 | 3.1 2.9 | 3.1 2.9 | 0.65 | 4.1 3.9 | 0.5 | 0.47 0.33 | 0.2 | 0.13 | 0.1 | 0.70 0.35 | 8° 0° |

Note

- 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

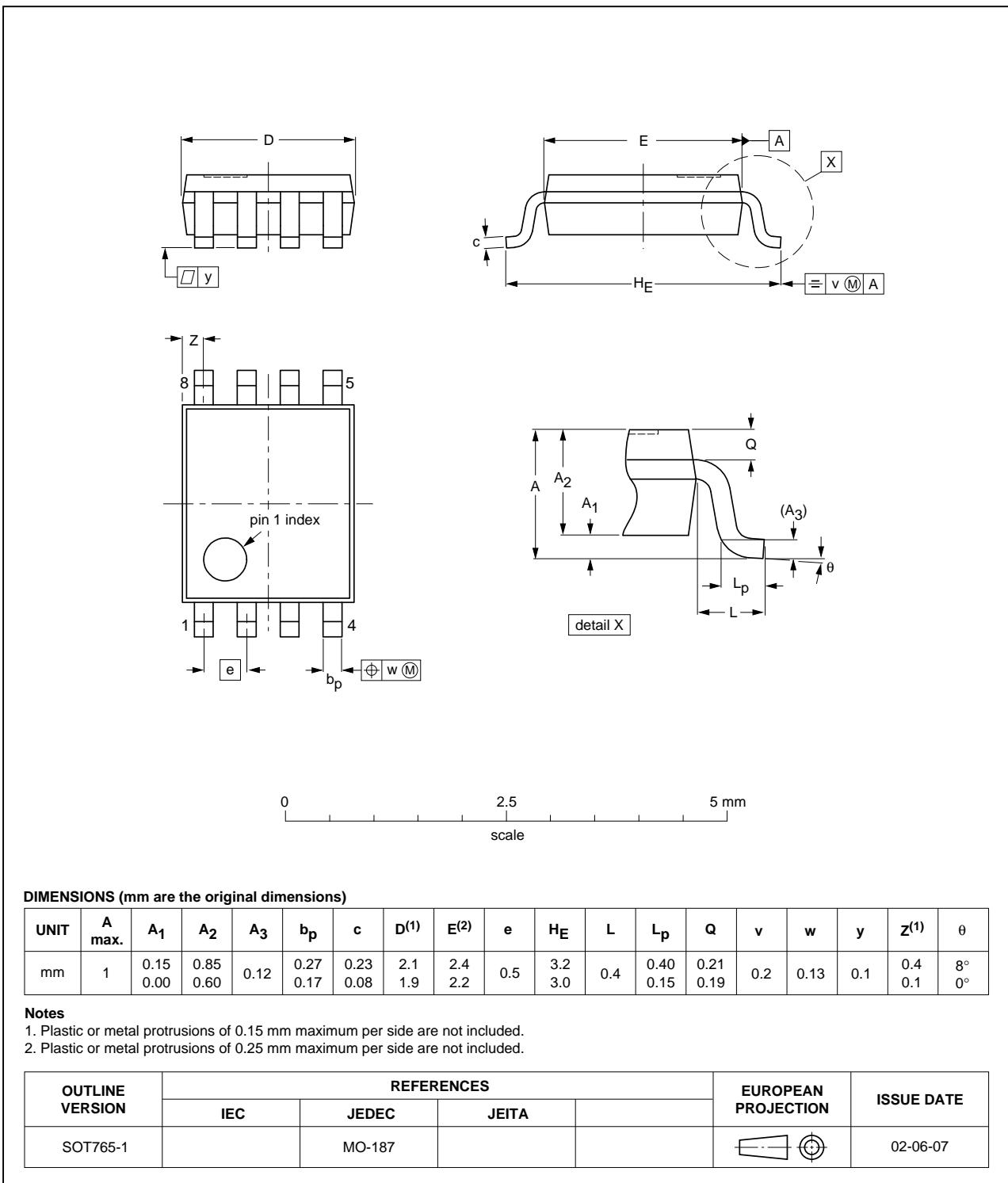


Fig 9. Package outline SOT765-1 (VSSOP8)

14. Abbreviations

Table 11. Abbreviations

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

15. Revision history

Table 12. Revision history

| Document ID | Release date | Data sheet status | Change notice | Supersedes |
|------------------------|--------------|--------------------|---------------|------------|
| 74HC_HCT2G125_Q100 v.1 | 20130403 | Product data sheet | - | - |

16. Legal information

16.1 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.nxp.com>.

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