

74HC125D,74HC126D

1. Functional Description

- Quad Bus Buffer, Non-Inverted 3-State Outputs
- 74HC125D: Quad Bus Buffer
74HC126D: Quad Bus Buffer

2. General

The 74HC125D,74HC126D are high speed CMOS QUAD BUS BUFFERs fabricated with silicon gate C²MOS technology.

They achieve the high speed operation similar to equivalent LSTTL while maintaining the CMOS low power dissipation.

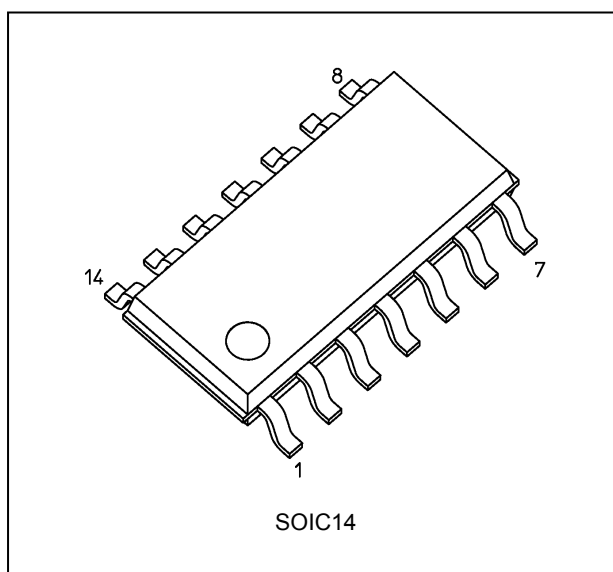
The 74HC125D requires the 3-state control input \overline{G} to be set high to place the output into the high impedance state, whereas the 74HC126D requires the control input to be set low to place the output into high impedance.

All inputs are equipped with protection circuits against static discharge or transient excess voltage.

3. Features

- (1) High speed: $t_{pd} = 10 \text{ ns}$ (typ.) at $V_{CC} = 6.0 \text{ V}$
- (2) Low power dissipation: $I_{CC} = 4.0 \mu\text{A}$ (max) at $T_a = 25^\circ\text{C}$
- (3) Balanced propagation delays: $t_{PLH} \approx t_{PHL}$
- (4) Wide operating voltage range: $V_{CC(opr)} = 2.0 \text{ to } 6.0 \text{ V}$

4. Packaging

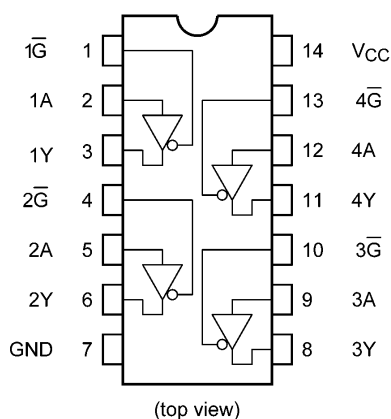


Start of commercial production

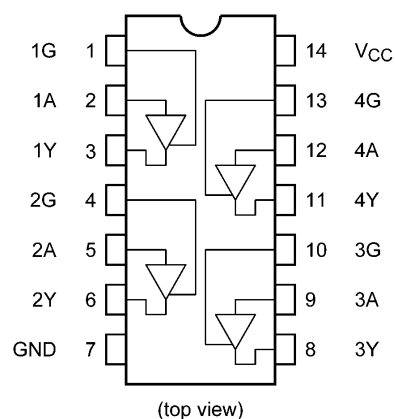
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5. Pin Assignment

74HC125D

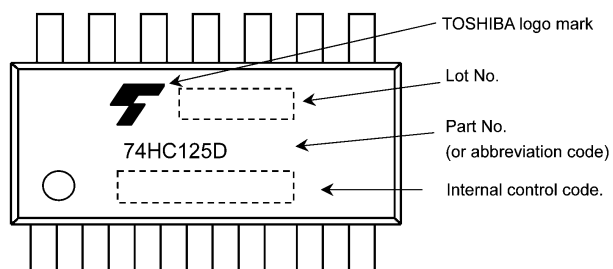


74HC126D

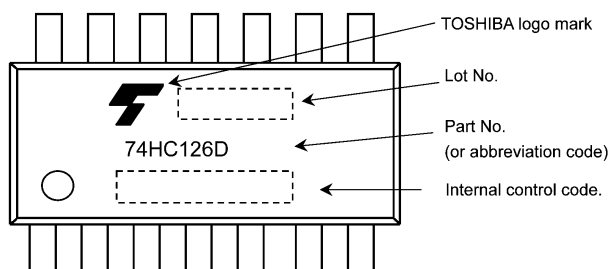


6. Marking

74HC125D

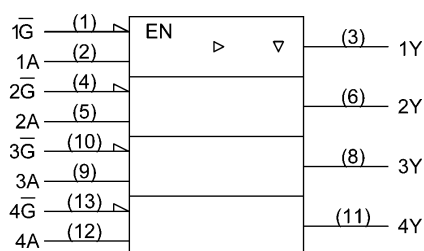


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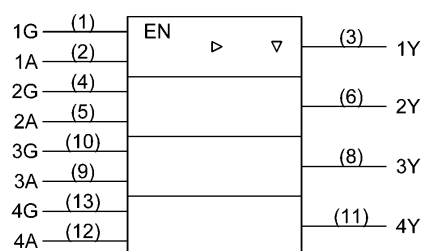


7. IEC Logic Symbol

74HC125D



74HC126D



8. Truth Table

| Input \bar{G} (74HC125D) | Input G (74HC126D) | Input A | Output Y |
|-------------------------------|-----------------------|---------|----------|
| H | L | X | Z |
| L | H | L | L |
| L | H | H | H |

X: Don't care

Z: High impedance

9. Absolute Maximum Ratings (Note)

| Characteristics | Symbol | Note | Rating | Unit |
|--------------------------|-----------|----------|------------------------|------|
| Supply voltage | V_{CC} | | -0.5 to 7.0 | V |
| Input voltage | V_{IN} | | -0.5 to $V_{CC} + 0.5$ | V |
| Output voltage | V_{OUT} | | -0.5 to $V_{CC} + 0.5$ | V |
| Input diode current | I_{IK} | | ± 20 | mA |
| Output diode current | I_{OK} | | ± 20 | mA |
| Output current | I_{OUT} | | ± 35 | mA |
| V_{CC} /ground current | I_{CC} | | ± 75 | mA |
| Power dissipation | P_D | (Note 1) | 500 | mW |
| Storage temperature | T_{stg} | | -65 to 150 | °C |

Note: Exceeding any of the absolute maximum ratings, even briefly, lead to deterioration in IC performance or even destruction.

Using continuously under heavy loads (e.g. the application of high temperature/current/voltage and the significant change in temperature, etc.) may cause this product to decrease in the reliability significantly even if the operating conditions (i.e. operating temperature/current/voltage, etc.) are within the absolute maximum ratings and the operating ranges.

Please design the appropriate reliability upon reviewing the Toshiba Semiconductor Reliability Handbook ("Handling Precautions"/"Derating Concept and Methods") and individual reliability data (i.e. reliability test report and estimated failure rate, etc).

Note 1: P_D derates linearly with -8 mW/°C above 85 °C

10. Operating Ranges (Note)

| Characteristics | Symbol | Test Condition | Rating | Unit |
|---------------------------|------------|----------------|---------------|------|
| Supply voltage | V_{CC} | — | 2.0 to 6.0 | V |
| Input voltage | V_{IN} | — | 0 to V_{CC} | V |
| Output voltage | V_{OUT} | — | 0 to V_{CC} | V |
| Operating temperature | T_{opr} | — | -40 to 125 | °C |
| Input rise and fall times | t_r, t_f | — | 0 to 50 | μs |

Note: The operating ranges must be maintained to ensure the normal operation of the device.

Unused inputs must be tied to either V_{CC} or GND.

11. Electrical Characteristics

11.1. DC Characteristics (Unless otherwise specified, $T_a = 25\text{ }^{\circ}\text{C}$)

| Characteristics | Symbol | Test Condition | | V_{CC} (V) | Min | Typ. | Max | Unit |
|--|----------|---|-----------------------------------|--------------|------|------|-----------|---------------|
| High-level input voltage | V_{IH} | — | | 2.0 | 1.50 | — | — | V |
| | | | | 4.5 | 3.15 | — | — | |
| | | | | 6.0 | 4.20 | — | — | |
| Low-level input voltage | V_{IL} | — | | 2.0 | — | — | 0.50 | V |
| | | | | 4.5 | — | — | 1.35 | |
| | | | | 6.0 | — | — | 1.80 | |
| High-level output voltage | V_{OH} | $V_{IN} = V_{IH} \text{ or } V_{IL}$ | $I_{OH} = -20\text{ }\mu\text{A}$ | 2.0 | 1.9 | 2.0 | — | V |
| | | | | 4.5 | 4.4 | 4.5 | — | |
| | | | | 6.0 | 5.9 | 6.0 | — | |
| | | | $I_{OH} = -6\text{ mA}$ | 4.5 | 4.18 | 4.31 | — | |
| | | | $I_{OH} = -7.8\text{ mA}$ | 6.0 | 5.68 | 5.80 | — | |
| Low-level output voltage | V_{OL} | $V_{IN} = V_{IH} \text{ or } V_{IL}$ | $I_{OL} = 20\text{ }\mu\text{A}$ | 2.0 | — | 0.0 | 0.1 | V |
| | | | | 4.5 | — | 0.0 | 0.1 | |
| | | | | 6.0 | — | 0.0 | 0.1 | |
| | | | $I_{OL} = 6\text{ mA}$ | 4.5 | — | 0.17 | 0.26 | |
| | | | $I_{OL} = 7.8\text{ mA}$ | 6.0 | — | 0.18 | 0.26 | |
| 3-state output OFF-state leakage current | I_{OZ} | $V_{IN} = V_{IH} \text{ or } V_{IL}$ $V_{OUT} = V_{CC} \text{ or } \text{GND}$ | | 6.0 | — | — | ± 0.5 | μA |
| Input leakage current | I_{IN} | $V_{IN} = V_{CC} \text{ or } \text{GND}$ | | 6.0 | — | — | ± 0.1 | μA |
| Quiescent supply current | I_{CC} | $V_{IN} = V_{CC} \text{ or } \text{GND}$ | | 6.0 | — | — | 4.0 | μA |

11.2. DC Characteristics (Unless otherwise specified, $T_a = -40 \text{ to } 85\text{ }^{\circ}\text{C}$)

| Characteristics | Symbol | Test Condition | | V_{CC} (V) | Min | Max | Unit |
|--|----------|---|-----------------------------------|--------------|------|-----------|---------------|
| High-level input voltage | V_{IH} | — | | 2.0 | 1.50 | — | V |
| | | | | 4.5 | 3.15 | — | |
| | | | | 6.0 | 4.20 | — | |
| Low-level input voltage | V_{IL} | — | | 2.0 | — | 0.50 | V |
| | | | | 4.5 | — | 1.35 | |
| | | | | 6.0 | — | 1.80 | |
| High-level output voltage | V_{OH} | $V_{IN} = V_{IH} \text{ or } V_{IL}$ | $I_{OH} = -20\text{ }\mu\text{A}$ | 2.0 | 1.9 | — | V |
| | | | | 4.5 | 4.4 | — | |
| | | | | 6.0 | 5.9 | — | |
| | | | $I_{OH} = -6\text{ mA}$ | 4.5 | 4.13 | — | |
| | | | $I_{OH} = -7.8\text{ mA}$ | 6.0 | 5.63 | — | |
| Low-level output voltage | V_{OL} | $V_{IN} = V_{IH} \text{ or } V_{IL}$ | $I_{OL} = 20\text{ }\mu\text{A}$ | 2.0 | — | 0.1 | V |
| | | | | 4.5 | — | 0.1 | |
| | | | | 6.0 | — | 0.1 | |
| | | | $I_{OL} = 6\text{ mA}$ | 4.5 | — | 0.33 | |
| | | | $I_{OL} = 7.8\text{ mA}$ | 6.0 | — | 0.33 | |
| 3-state output OFF-state leakage current | I_{OZ} | $V_{IN} = V_{IH} \text{ or } V_{IL}$ $V_{OUT} = V_{CC} \text{ or } \text{GND}$ | | 6.0 | — | ± 5.0 | μA |
| Input leakage current | I_{IN} | $V_{IN} = V_{CC} \text{ or } \text{GND}$ | | 6.0 | — | ± 1.0 | μA |
| Quiescent supply current | I_{CC} | $V_{IN} = V_{CC} \text{ or } \text{GND}$ | | 6.0 | — | 40.0 | μA |

11.3. DC Characteristics (Unless otherwise specified, $T_a = -40$ to $125\text{ }^\circ\text{C}$)

| Characteristics | Symbol | Test Condition | | V_{CC} (V) | Min | Max | Unit |
|--|----------|--|-----------------------------------|--------------|------|------------|---------------|
| High-level input voltage | V_{IH} | — | | 2.0 | 1.50 | — | V |
| | | | | 4.5 | 3.15 | — | |
| | | | | 6.0 | 4.20 | — | |
| Low-level input voltage | V_{IL} | — | | 2.0 | — | 0.50 | V |
| | | | | 4.5 | — | 1.35 | |
| | | | | 6.0 | — | 1.80 | |
| High-level output voltage | V_{OH} | $V_{IN} = V_{IH}$ or V_{IL} | $I_{OH} = -20\text{ }\mu\text{A}$ | 2.0 | 1.9 | — | V |
| | | | | 4.5 | 4.4 | — | |
| | | | | 6.0 | 5.9 | — | |
| | | | $I_{OH} = -6\text{ mA}$ | 4.5 | 3.7 | — | |
| | | | $I_{OH} = -7.8\text{ mA}$ | 6.0 | 5.2 | — | |
| Low-level output voltage | V_{OL} | $V_{IN} = V_{IH}$ or V_{IL} | $I_{OL} = 20\text{ }\mu\text{A}$ | 2.0 | — | 0.1 | V |
| | | | | 4.5 | — | 0.1 | |
| | | | | 6.0 | — | 0.1 | |
| | | | $I_{OL} = 6\text{ mA}$ | 4.5 | — | 0.4 | |
| | | | $I_{OL} = 7.8\text{ mA}$ | 6.0 | — | 0.4 | |
| 3-state output OFF-state leakage current | I_{OZ} | $V_{IN} = V_{IH}$ or V_{IL} $V_{OUT} = V_{CC}$ or GND | | 6.0 | — | ± 10.0 | μA |
| Input leakage current | I_{IN} | $V_{IN} = V_{CC}$ or GND | | 6.0 | — | ± 1.0 | μA |
| Quiescent supply current | I_{CC} | $V_{IN} = V_{CC}$ or GND | | 6.0 | — | 160.0 | μA |

11.4. AC Characteristics (Unless otherwise specified, $T_a = 25\text{ }^\circ\text{C}$, Input: $t_r = t_f = 6\text{ ns}$)

| Characteristics | Symbol | Note | Test Condition | C_L (pF) | V_{CC} (V) | Min | Typ. | Max | Unit |
|-------------------------------|--------------------|----------|--------------------------|------------|--------------|-----|------|-----|------|
| Output transition time | t_{TLH}, t_{THL} | | — | 50 | 2.0 | — | 20 | 60 | ns |
| | | | | | 4.5 | — | 6 | 12 | |
| | | | | | 6.0 | — | 5 | 10 | |
| Propagation delay time | t_{PLH}, t_{PHL} | | — | 50 | 2.0 | — | 30 | 90 | ns |
| | | | | | 4.5 | — | 11 | 18 | |
| | | | | | 6.0 | — | 10 | 15 | |
| | | | | 150 | 2.0 | — | 42 | 130 | |
| | | | | | 4.5 | — | 14 | 26 | |
| | | | | | 6.0 | — | 12 | 22 | |
| Output enable time | t_{PZL}, t_{PZH} | | $R_L = 1\text{ k}\Omega$ | 50 | 2.0 | — | 30 | 90 | ns |
| | | | | | 4.5 | — | 11 | 18 | |
| | | | | | 6.0 | — | 10 | 15 | |
| | | | | 150 | 2.0 | — | 42 | 130 | |
| | | | | | 4.5 | — | 14 | 26 | |
| | | | | | 6.0 | — | 12 | 22 | |
| Output disable time | t_{PLZ}, t_{PHZ} | | $R_L = 1\text{ k}\Omega$ | 50 | 2.0 | — | 24 | 100 | ns |
| | | | | | 4.5 | — | 12 | 20 | |
| | | | | | 6.0 | — | 10 | 17 | |
| Input capacitance | C_{IN} | | — | | | — | 5 | 10 | pF |
| Output capacitance | C_{OUT} | | — | | | — | 3 | — | pF |
| Power dissipation capacitance | C_{PD} | (Note 1) | — | | | — | 23 | — | pF |

Note 1: C_{PD} is defined as the value of the internal equivalent capacitance which is calculated from the operating current consumption without load. Average operating current can be obtained by the equation.

$$I_{CC(opr)} = C_{PD} \times V_{CC} \times f_{IN} + I_{CC}/4 \text{ (per gate)}$$

11.5. AC Characteristics

(Unless otherwise specified, $T_a = -40$ to 85 °C, Input: $t_r = t_f = 6$ ns)

| Characteristics | Symbol | Test Condition | C_L (pF) | V_{CC} (V) | Min | Max | Unit |
|------------------------|--------------------|--------------------------|------------|--------------|-----|-----|------|
| Output transition time | t_{TLH}, t_{THL} | — | 50 | 2.0 | — | 75 | ns |
| | | | | 4.5 | — | 15 | |
| | | | | 6.0 | — | 13 | |
| Propagation delay time | t_{PLH}, t_{PHL} | — | 50 | 2.0 | — | 115 | ns |
| | | | | 4.5 | — | 23 | |
| | | | | 6.0 | — | 20 | |
| | | | 150 | 2.0 | — | 165 | |
| | | | | 4.5 | — | 33 | |
| | | | | 6.0 | — | 28 | |
| Output enable time | t_{PZL}, t_{PZH} | $R_L = 1\text{ k}\Omega$ | 50 | 2.0 | — | 115 | ns |
| | | | | 4.5 | — | 23 | |
| | | | | 6.0 | — | 20 | |
| | | | 150 | 2.0 | — | 165 | |
| | | | | 4.5 | — | 33 | |
| | | | | 6.0 | — | 28 | |
| Output disable time | t_{PLZ}, t_{PHZ} | $R_L = 1\text{ k}\Omega$ | 50 | 2.0 | — | 125 | ns |
| | | | | 4.5 | — | 25 | |
| | | | | 6.0 | — | 21 | |
| Input capacitance | C_{IN} | — | | | — | 10 | pF |

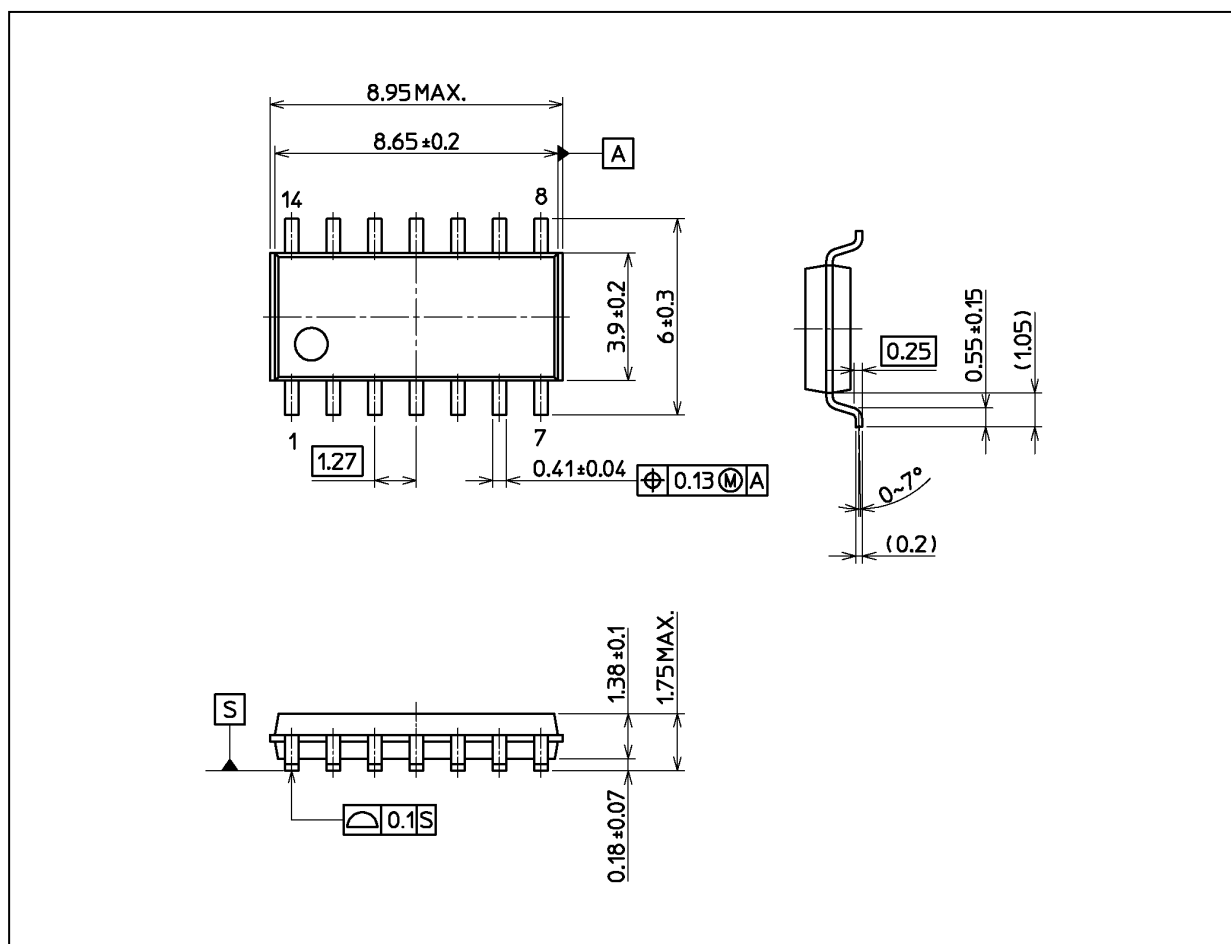
11.6. AC Characteristics

(Unless otherwise specified, $T_a = -40$ to 125 °C, Input: $t_r = t_f = 6$ ns)

| Characteristics | Symbol | Test Condition | C_L (pF) | V_{CC} (V) | Min | Max | Unit |
|------------------------|--------------------|--------------------------|------------|--------------|-----|-----|------|
| Output transition time | t_{TLH}, t_{THL} | — | 50 | 2.0 | — | 90 | ns |
| | | | | 4.5 | — | 18 | |
| | | | | 6.0 | — | 15 | |
| Propagation delay time | t_{PLH}, t_{PHL} | — | 50 | 2.0 | — | 150 | ns |
| | | | | 4.5 | — | 30 | |
| | | | | 6.0 | — | 26 | |
| | | | 150 | 2.0 | — | 195 | |
| | | | | 4.5 | — | 39 | |
| | | | | 6.0 | — | 33 | |
| Output enable time | t_{PZL}, t_{PZH} | $R_L = 1\text{ k}\Omega$ | 50 | 2.0 | — | 190 | ns |
| | | | | 4.5 | — | 38 | |
| | | | | 6.0 | — | 32 | |
| | | | 150 | 2.0 | — | 195 | |
| | | | | 4.5 | — | 39 | |
| | | | | 6.0 | — | 33 | |
| Output disable time | t_{PLZ}, t_{PHZ} | $R_L = 1\text{ k}\Omega$ | 50 | 2.0 | — | 190 | ns |
| | | | | 4.5 | — | 38 | |
| | | | | 6.0 | — | 32 | |

Package Dimensions

Unit: mm



Weight: 0.13 g (typ.)

| Package Name(s) |
|------------------|
| Nickname: SOIC14 |

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