# QUADRUPLE 3-STATE BUFFERS OE LOW

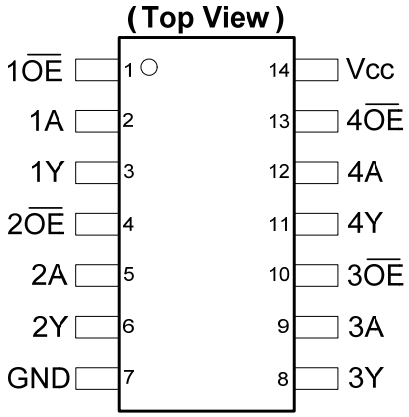
## Description

The 74HC125 provides provides four independent buffer gates with 3-state outputs. Each buffer has a separate enable pin that if driven with a high logic level places the corresponding output in the high impedance state. The device is designed for operation with a power supply range of 2.0V to 6.0V.

## Features

- Wide Supply Voltage Range from 2.0V to 6.0V
- Sinks or sources 4mA at $V_{CC}$ = 4.5V
- CMOS low power consumption
- Schmitt Trigger Action at All Inputs
- ESD Protection Exceeds JESD 22
  - 200-V Machine Model (A115-A)
  - 2000-V Human Body Model (A114-A)
  - Exceeds 1000-V Charged Device Model (C101C)
- Range of Package Options SO-14 and TSSOP-14
- **Totally Lead-Free & Fully RoHS Compliant (Notes 1 & 2)**
- **Halogen and Antimony Free. "Green" Device (Note 3)**

## Pin Assignments




**SO-14 / TSSOP-14**

## Applications

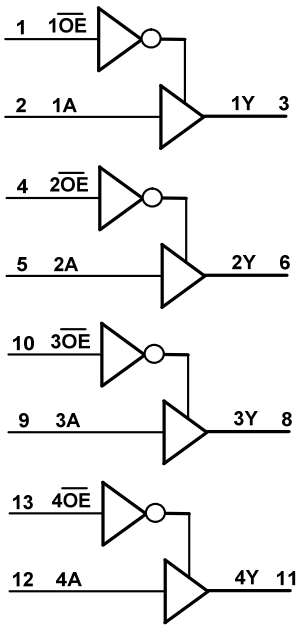
- General Purpose Logic
- Wide array of products such as:
  - PCs, Networking, Notebooks, Netbooks
  - Computer Peripherals, Hard Drives, CD/DVD ROM
  - TV, DVD, DVR, Set Top Box

Notes:
1. No purposely added lead. Fully EU Directive 2002/95/EC (RoHS) & 2011/65/EU (RoHS 2) compliant.
2. See http://www.diodes.com for more information about Diodes Incorporated's definitions of Halogen- and Antimony-free, "Green" and Lead-free.
3. Halogen- and Antimony-free "Green" products are defined as those which contain <900ppm bromine, <900ppm chlorine (<1500ppm total Br + Cl) and <1000ppm antimony compounds.

## Pin Descriptions

| Pin Number | Pin Name | Function |
|---|---|---|
| 1 | $1\overline{OE}$ | Data Enable Input (active low) |
| 2 | 1A | Data Input |
| 3 | 1Y | Data Output |
| 4 | $2\overline{OE}$ | Data Enable Input (active low) |
| 5 | 2A | Data Input |
| 6 | 2Y | Data Output |
| 7 | GND | Ground |
| 8 | 3Y | Data Output |
| 9 | 3A | Data Input |
| 10 | $3\overline{OE}$ | Data Enable Input (active low) |
| 11 | 4Y | Data Outp |
| 12 | 4A | Data Input |
| 13 | $4\overline{OE}$ | Data Enable Input (active low) |
| 14 | $V_{CC}$ | Supply Voltage |

## Logic Diagram




## Function Table

| Inputs | | Output |
|---|---|---|
| $\overline{OE}$ | A | Y |
| L | H | H |
| L | L | L |
| H | X | Z |

## Absolute Maximum Ratings (Note 4) (@$T_A$ = +25°C, unless otherwise specified.)

| Symbol | Description | Rating | Unit |
|---|---|---|---|
| ESD HBM | Human Body Model ESD Protection | 2 | KV |
| ESD CDM | Charged Device Model ESD Protection | 1 | KV |
| ESD MM | Machine Model ESD Protection | 200 | V |
| $V_{CC}$ | Supply Voltage Range | -0.5 to +7.0 | V |
| $V_I$ | Input Voltage Range note 3) | -0.5 to +7.0 | V |
| $I_{IK}$ | Input Clamp Current $V_I$ < -0.5V or Vi > $V_{CC}$ +0.5V | ±20 | mA |
| $I_{OK}$ | Output Clamp Current $V_O$ < -0.5V or $V_O$ > $V_{CC}$ +0.5V | ±20 | mA |
| $I_O$ | Continuous Output Current -0.5V < $V_O$ $V_{CC}$ +0.5V | +/- 25 | mA |
| $I_{CC}$ | Continuous Current Through $V_{CC}$ | 50 | mA |
| $I_{GND}$ | Continuous Current Through GND | -50 | mA |
| $T_J$ | Operating Junction Temperature | -40 to +150 | °C |
| $T_{STG}$ | Storage Temperature | -65 to +150 | °C |
| $P_{TOT}$ | Total Power Dissipation | 500 | mW |

Notes: 4. Stresses beyond the absolute maximum may result in immediate failure or reduced reliability. These are stress values and device operation should be within recommend values.
5. Input Voltage cannot exceed $V_{CC}$ to the extent the Maximum clamp current is exceeded.

## Recommended Operating Conditions (Note 6) (@$T_A$ = +25°C, unless otherwise specified.)

| Symbol | Parameter | Conditions | Min | Max | Unit |
|---|---|---|---|---|---|
| $V_{CC}$ | Supply Voltage | | 2.0 | 6.0 | V |
| $V_I$ | Input Voltage | | 0 | $V_{CC}$ | V |
| $V_O$ | Output Voltage | | 0 | $V_{CC}$ | V |
| Δt/ΔV | Input Transition Rise or Fall Rate | $V_{CC}$ = 2.0V | | 625 | ns/V |
| | | $V_{CC}$ = 4.5V | | 140 | |
| | | $V_{CC}$ = 6.0V | | 85 | |
| $T_A$ | Operating Free-Air Temperature | | -40 | +125 | °C |

Note: 6. Unused inputs should be held at $V_{CC}$ or Ground.

## Electrical Characteristics (@$T_A$ = +25°C, unless otherwise specified.)

| Symbol | Parameter | Test Conditions | $V_{CC}$ | $T_A$ = -40°C to +85°C | | $T_A$ = -40°C to +125°C | | Unit |
|---|---|---|---|---|---|---|---|---|
| | | | | Min | Max | Min | Max | |
| $V_{IH}$ | High-level Input Voltage | | 2.0V | 1.5 | | 1.5 | | V |
| | | | 4.5V | 3.15 | | 3.15 | | |
| | | | 6.0V | 4.2 | | 4.2 | | |
| $V_{IL}$ | Low-level Input voltage | | 2.0V | | 0.5 | | 0.5 | V |
| | | | 4.5V | | 1.35 | | 1.35 | |
| | | | 6.0V | | 1.8 | | 1.8 | |
| $V_{OH}$ | High-level Output Voltage | $I_{OH}$ = -20μA | 2.0V | 1.9 | | 1.9 | | V |
| | | $I_{OH}$ = -20μA | 4.5V | 4.4 | | 4.4 | | |
| | | $I_{OH}$ = -20μA | 6.0V | 5.9 | | 5.9 | | |
| | | $I_{OH}$ = -4.0mA | 4.5V | 3.84 | | 3.7 | | |
| | | $I_{OH}$ = -5.2mA | 6.0V | 5.34 | | 5.2 | | |
| $V_{OL}$ | Low-level Output Voltage | $I_{OL}$ = 20μA | 2.0V | | 0.1 | | 0.1 | V |
| | | $I_{OL}$ = 20μA | 4.5V | | 0.1 | | 0.1 | |
| | | $I_{OL}$ = 20μA | 6.0V | | 0.1 | | 0.1 | |
| | | $I_{OL}$ = 4mA | 4.5V | | 0.33 | | 0.44 | |
| | | $I_{OL}$ = 5.2mA | 6.0V | | 0.33 | | 0.44 | |
| $I_{OZ}$ | Z State Leakage Current | $V_O$ = 0 to 6.0V<br>$V_I$ = GND or 6.0V | 6.0V | | ± 5.0 | | ± 10 | μA |
| $I_I$ | Input Current | $V_I$ = GND to 5.5V | 6.0V | | ± 1 | | ± 1 | μA |
| $I_{CC}$ | Supply Current | $V_I$ = GND or $V_{CC}$, $I_O$ = 0 | 6.0V | | 20 | | 40 | μA |

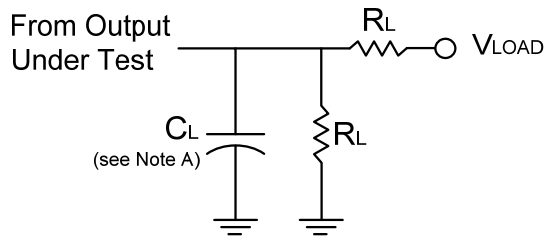
## Switching Characteristics

| Symbol | Parameter | Test Conditions | $V_{CC}$ | $T_A$ = +25°C | | | -40°C to +85°C | -40°C to +125°C | Unit |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Min | Typ. | Max | Max | Max | |
| $t_{PD}$ | Propagation Delay $A_N$ to $Y_N$ | Figure 1<br>$C_L$ = 50 pF | 2.0V | — | 30 | 100 | 125 | 150 | ns |
| | | | 4.5V | — | 11 | 20 | 25 | 30 | |
| | | | 6.0V | — | 9 | 17 | 21 | 26 | |
| $t_{EN}$ | Enable Time $\overline{OE}_N$ to $Y_N$ | Figure 1<br>$C_L$ = 50 pF | 2.0V | — | 41 | 125 | 155 | 190 | ns |
| | | | 4.5V | — | 15 | 25 | 31 | 38 | |
| | | | 6.0V | — | 12 | 21 | 26 | 32 | |
| $t_{DIS}$ | Disable Time $\overline{OE}$ to $Y_N$ | Figure 1<br>$C_L$ = 50 pF | 2.0V | — | 41 | 125 | 155 | 190 | ns |
| | | | 4.5V | — | 15 | 25 | 31 | 38 | |
| | | | 6.0V | — | 12 | 21 | 26 | 32 | |
| $t_t$ | Transition time | Figure 1<br>$C_L$ = 50 pF | 2.0V | — | 14 | 60 | 75 | 90 | ns |
| | | | 4.5V | — | 5 | 12 | 15 | 18 | |
| | | | 6.0V | — | 4 | 10 | 13 | 15 | |

## Operating Characteristics (@$T_A$ = +25°C, unless otherwise specified.)

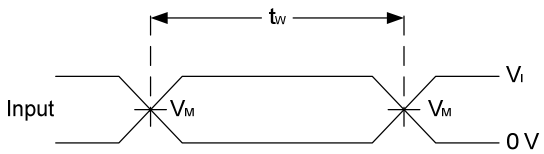
| Parameter | | Test Conditions | $V_{CC}$ = 6V | Unit |
|---|---|---|---|---|
| | | | Typ | |
| $C_{pd}$ | Power Dissipation Capacitance per Gate | f = 1MHz | 22 | pF |
| $C_I$ | Input Capacitance | $V_I$ = $V_{CC}$ – or GND | 4 | pF |

## Parameter Measurement Information

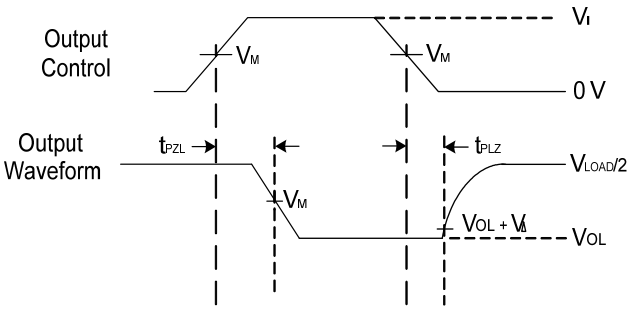



| TEST | Condition |
|---|---|
| $t_{PLZ}$ (see Notes D and E) | Vload |
| $t_{PZL}$(see Notes D and F) | Vload |

| $V_{CC}$ | Inputs | | $V_M$ | $V_{LOAD}$ | $C_L$ | $R_L$ | $V\Delta$ |
|---|---|---|---|---|---|---|---|
| | $V_I$ | $t_r/t_f$ | | | | | |
| 2.0V to 6.0V | $V_{CC}$ | ≤3ns | $V_{CC}/2$ | 2 X $V_{CC}$ | 15,50 pF | 2 KΩ | 10% of $V_{CC}$ |




**Voltage Waveform**
**Pulse Duration**

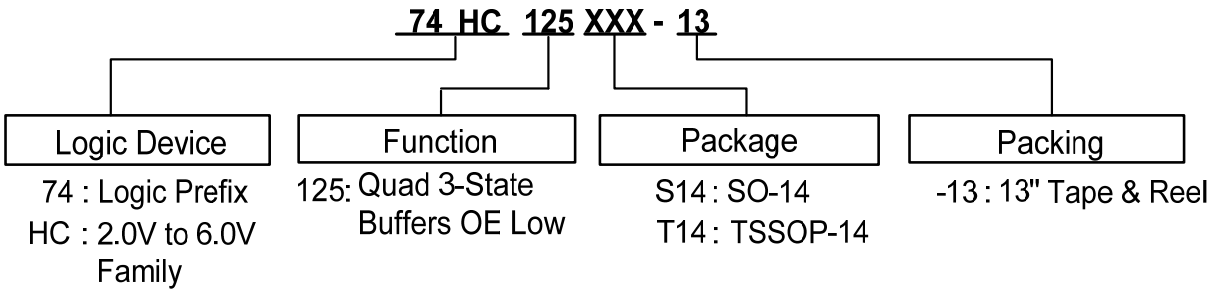



**Voltage Waveform**
**Propagation Delay Times**

**Figure 1 Load Circuit and Voltage Waveforms**

Notes: A. Includes test lead and test apparatus capacitance.
B. All pulses are supplied at pulse repetition rate ≤ 1 MHz.
C. The inputs are measured one at a time with one transition per measurement.
D. For the 3 state device $t_{PLZ}$ and $t_{PZL}$ are the same as $t_{PD}$.
E. $t_{PZL}$ is measured at $V_M$.
D. $t_{PLZ}$ is measured at $V_{OL}$ +$V_\Delta$.

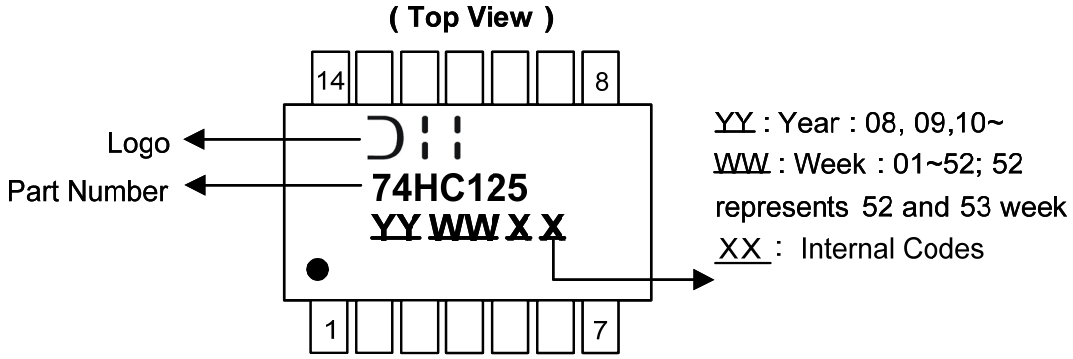
## Ordering Information




| Device | Package Code | Packaging | 7" Tape and Reel | |
|---|---|---|---|---|
| | | | Quantity | Part Number Suffix |
| 74HC125S14-13 | S14 | SO-14 | 2500/Tape & Reel | -13 |
| 74HC125T14-13 | T14 | TSSOP-14 | 2500/Tape & Reel | -13 |

## Marking Information

**(1) SO-14, TSSOP-14**

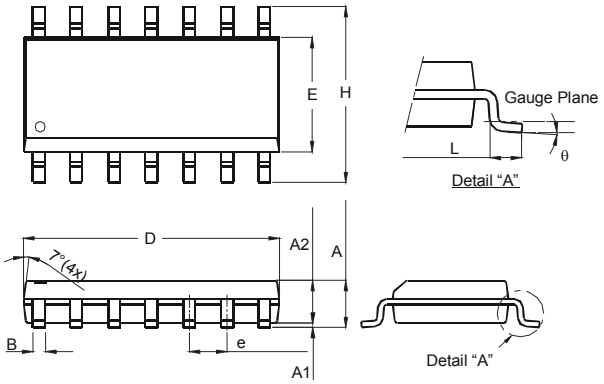



| Part Number | Package |
|---|---|
| 74HC125S14 | SO-14 |
| 74HC125T14 | TSSOP-14 |

## Package Outline Dimensions (All dimensions in mm.)

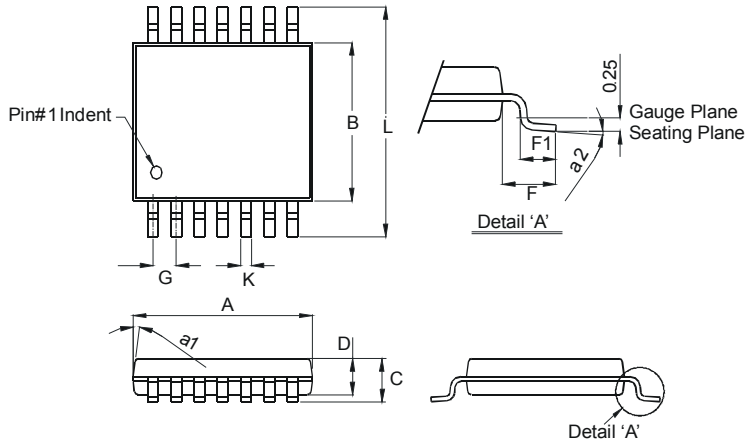
Please see AP02002 at http://www.diodes.com/datasheets/ap02002.pdf for latest version.

**Package Type: SO-14**




| SO-14 | | |
|---|---|---|
| **Dim** | **Min** | **Max** |
| **A** | 1.47 | 1.73 |
| **A1** | 0.10 | 0.25 |
| **A2** | 1.45 Typ | |
| **B** | 0.33 | 0.51 |
| **D** | 8.53 | 8.74 |
| **E** | 3.80 | 3.99 |
| **e** | 1.27 Typ | |
| **H** | 5.80 | 6.20 |
| **L** | 0.38 | 1.27 |
| **θ** | 0° | 8° |
| **All Dimensions in mm** | | |

**Package Type: TSSOP-14**

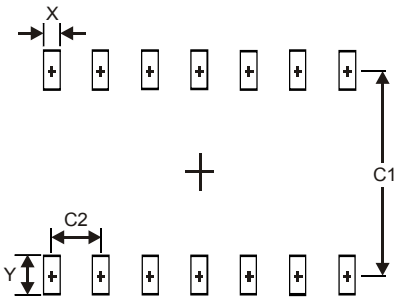



| TSSOP-14 | | |
|---|---|---|
| **Dim** | **Min** | **Max** |
| **a1** | 7° (4X) | |
| **a2** | 0° | 8° |
| **A** | 4.9 | 5.10 |
| **B** | 4.30 | 4.50 |
| **C** | — | 1.2 |
| **D** | 0.8 | 1.05 |
| **F** | 1.00 Typ | |
| **F1** | 0.45 | 0.75 |
| **G** | 0.65 Typ | |
| **K** | 0.19 | 0.30 |
| **L** | 6.40 Typ | |
| **All Dimensions in mm** | | |

## Suggested Pad Layout

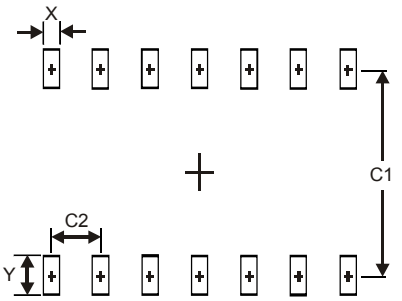
Please see AP02001 at http://www.diodes.com/datasheets/ap02001.pdf for latest version.

**Package Type: SO-14**




| Dimensions | Value (in mm) |
|---|---|
| X | 0.60 |
| Y | 1.50 |
| C1 | 5.4 |
| C2 | 1.27 |

**Package Type: TSSOP-14**




| Dimensions | Value (in mm) |
|---|---|
| X | 0.45 |
| Y | 1.45 |
| C1 | 5.9 |
| C2 | 0.65 |

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