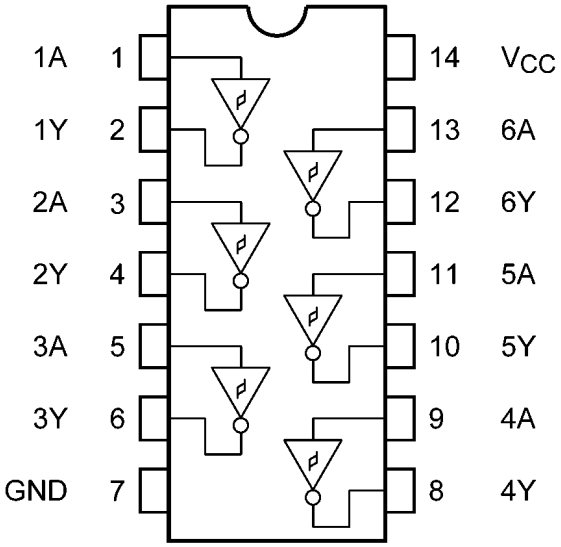
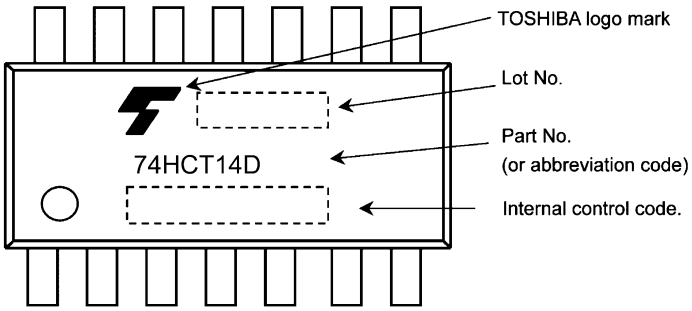
## 5. Pin Assignment

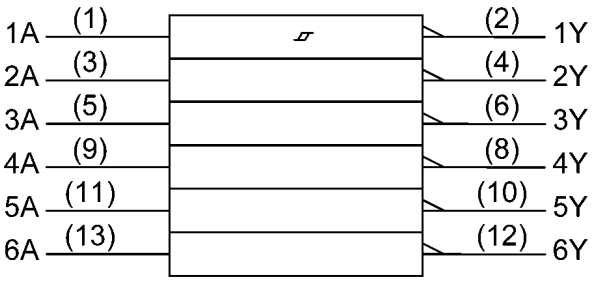



(top view)

## 6. Marking



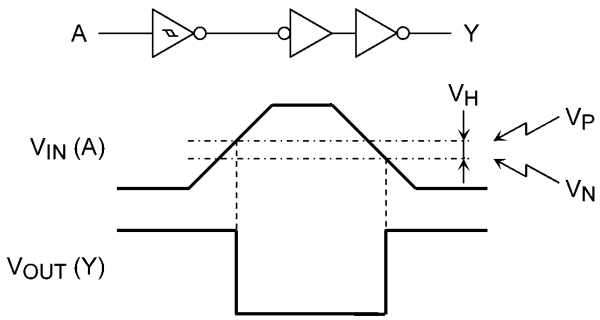

## 7. IEC Logic Symbol



## 8. Truth Table

| A | Y |
|---|---|
| L | H |
| H | L |

## 9. System Diagram, Waveform




## 10. 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 | $I_{OUT}$ | | ±25 | mA |
| $V_{CC}$/ground current | $I_{CC}$ | | ±50 | 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

## 11. Operating Ranges (Note)

| Characteristics | Symbol | Rating | Unit |
|---|---|---|---|
| Supply voltage | $V_{CC}$ | 4.5 to 5.5 | 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 |

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.

## 12. Electrical Characteristics

### 12.1. DC Characteristics (Unless otherwise specified, $T_a$ = 25 °C)

| Characteristics | Symbol | Test Condition | | $V_{CC}$ (V) | Min | Typ. | Max | Unit |
|---|---|---|---|---|---|---|---|---|
| Positive threshold voltage | $V_P$ | — | | 4.5 | 1.2 | 1.41 | 1.9 | V |
| | | | | 5.5 | 1.4 | 1.59 | 2.1 | |
| Negative threshold voltage | $V_N$ | — | | 4.5 | 0.5 | 0.85 | 1.2 | V |
| | | | | 5.5 | 0.6 | 0.99 | 1.4 | |
| Hysteresis voltage | $V_H$ | — | | 4.5 | 0.4 | 0.56 | — | V |
| | | | | 5.5 | 0.4 | 0.6 | — | |
| High-level output voltage | $V_{OH}$ | $V_{IN}$ = $V_{IH}$ or $V_{IL}$ | $I_{OH}$ = -20 μA | 4.5 | 4.4 | 4.5 | — | V |
| | | | $I_{OH}$ = -4 mA | | 3.98 | 4.32 | — | |
| Low-level output voltage | $V_{OL}$ | $V_{IN}$ = $V_{IH}$ or $V_{IL}$ | $I_{OL}$ = 20 μA | 4.5 | — | 0.0 | 0.1 | V |
| | | | $I_{OL}$ = 4 mA | | — | 0.15 | 0.26 | |
| Input leakage current | $I_{IN}$ | $V_{IN}$ = $V_{CC}$ or GND | | 5.5 | — | — | ±0.1 | μA |
| Quiescent supply current | $I_{CC}$ | $V_{IN}$ = $V_{CC}$ or GND | | 5.5 | — | — | 1.0 | μA |
| | $I_{CCT}$ | Per input: $V_{IN}$ = 0.5 V or 2.4 V<br>Other input: $V_{CC}$ or GND | | 5.5 | — | 30 | 108 | μA |

### 12.2. DC Characteristics (Unless otherwise specified, $T_a$ = -40 to 85 °C)

| Characteristics | Symbol | Test Condition | | $V_{CC}$ (V) | Min | Max | Unit |
|---|---|---|---|---|---|---|---|
| Positive threshold voltage | $V_P$ | — | | 4.5 | 1.2 | 1.9 | V |
| | | | | 5.5 | 1.4 | 2.1 | |
| Negative threshold voltage | $V_N$ | — | | 4.5 | 0.5 | 1.2 | V |
| | | | | 5.5 | 0.6 | 1.4 | |
| Hysteresis voltage | $V_H$ | — | | 4.5 | 0.4 | — | V |
| | | | | 5.5 | 0.4 | — | |
| High-level output voltage | $V_{OH}$ | $V_{IN}$ = $V_{IH}$ or $V_{IL}$ | $I_{OH}$ = -20 μA | 4.5 | 4.4 | — | V |
| | | | $I_{OH}$ = -4 mA | | 3.84 | — | |
| Low-level output voltage | $V_{OL}$ | $V_{IN}$ = $V_{IH}$ or $V_{IL}$ | $I_{OL}$ = 20 μA | 4.5 | — | 0.1 | V |
| | | | $I_{OL}$ = 4 mA | | — | 0.33 | |
| Input leakage current | $I_{IN}$ | $V_{IN}$ = $V_{CC}$ or GND | | 5.5 | — | ±1.0 | μA |
| Quiescent supply current | $I_{CC}$ | $V_{IN}$ = $V_{CC}$ or GND | | 5.5 | — | 10.0 | μA |
| | $I_{CCT}$ | Per input: $V_{IN}$ = 0.5 V or 2.4 V<br>Other input: $V_{CC}$ or GND | | 5.5 | — | 135 | μA |

## 12.3. DC Characteristics (Unless otherwise specified, $T_a$ = -40 to 125 °C)

| Characteristics | Symbol | Test Condition | | $V_{CC}$ (V) | Min | Max | Unit |
|---|---|---|---|---|---|---|---|
| Positive threshold voltage | $V_P$ | — | | 4.5 | 1.2 | 1.9 | V |
| | | | | 5.5 | 1.4 | 2.1 | |
| Negative threshold voltage | $V_N$ | — | | 4.5 | 0.5 | 1.2 | V |
| | | | | 5.5 | 0.6 | 1.4 | |
| Hysteresis voltage | $V_H$ | — | | 4.5 | 0.4 | — | V |
| | | | | 5.5 | 0.4 | — | |
| High-level output voltage | $V_{OH}$ | $V_{IN}$ = $V_{IH}$ or $V_{IL}$ | $I_{OH}$ = -20 μA | 4.5 | 4.4 | — | V |
| | | $V_{IN}$ = $V_{IH}$ or $V_{IL}$ | $I_{OH}$ = -4 mA | | 3.7 | — | |
| Low-level output voltage | $V_{OL}$ | $V_{IN}$ = $V_{IH}$ or $V_{IL}$ | $I_{OL}$ = 20 μA | 4.5 | — | 0.1 | V |
| | | $V_{IN}$ = $V_{IH}$ or $V_{IL}$ | $I_{OL}$ = 4 mA | | — | 0.4 | |
| Input leakage current | $I_{IN}$ | $V_{IN}$ = $V_{CC}$ or GND | | 5.5 | — | ±1.0 | μA |
| Quiescent supply current | $I_{CC}$ | $V_{IN}$ = $V_{CC}$ or GND | | 5.5 | — | 40.0 | μA |
| | $I_{CCT}$ | Per input: $V_{IN}$ = 0.5 V or 2.4 V<br>Other input: $V_{CC}$ or GND | | 5.5 | — | 147 | μA |

### 12.4. AC Characteristics
**(Unless otherwise specified, CL = 15 pF, $V_{CC}$ = 5 V, $T_a$ = 25 °C, Input: tr = tf = 6 ns)**

| Characteristics | Symbol | Test Condition | Min | Typ. | Max | Unit |
|---|---|---|---|---|---|---|
| Output transition time | $t_{TLH}$,$t_{THL}$ | — | — | 5 | — | ns |
| Propagation delay time | $t_{PLH}$,$t_{PHL}$ | — | — | 17 | — | ns |

### 12.5. AC Characteristics
**(Unless otherwise specified, CL = 50 pF, $T_a$ = 25 °C, Input: $t_r$ = $t_f$ = 6 ns)**

| Characteristics | Symbol | Note | $V_{CC}$ (V) | Min | Typ. | Max | Unit |
|---|---|---|---|---|---|---|---|
| Output transition time | $t_{TLH}$,$t_{THL}$ | | 4.5 | — | 8 | 15 | ns |
| | | | 5.5 | — | 7 | 14 | |
| Propagation delay time | $t_{PLH}$,$t_{PHL}$ | | 4.5 | — | 20 | 34 | ns |
| | | | 5.5 | — | 18 | 31 | |
| Input capacitance | $C_{IN}$ | | — | — | 3 | — | pF |
| Power dissipation capacitance | $C_{PD}$ | (Note 1) | — | — | 8 | — | 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.

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

### 12.6. AC Characteristics
**(Unless otherwise specified, CL = 50 pF, $T_a$ = -40 to 85 °C, Input: $t_r$ = $t_f$ = 6 ns)**

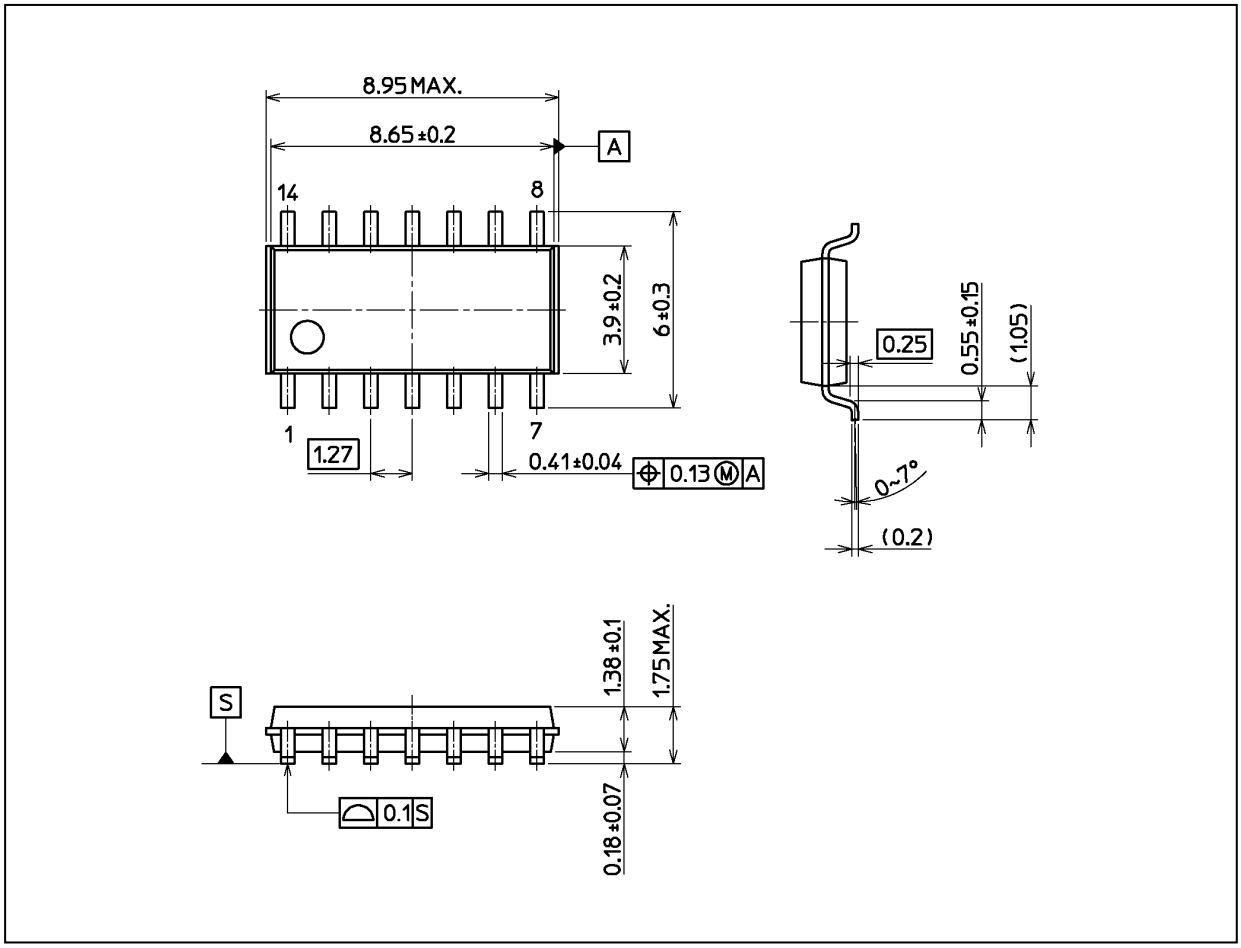
| Characteristics | Symbol | $V_{CC}$ (V) | Min | Max | Unit |
|---|---|---|---|---|---|
| Output transition time | $t_{TLH}$,$t_{THL}$ | 4.5 | — | 19 | ns |
| | | 5.5 | — | 17 | |
| Propagation delay time | $t_{PLH}$,$t_{PHL}$ | 4.5 | — | 43 | ns |
| | | 5.5 | — | 39 | |

### 12.7. AC Characteristics
**(Unless otherwise specified, CL = 50 pF, $T_a$ = -40 to 125 °C, Input: $t_r$ = $t_f$ = 6 ns)**

| Characteristics | Symbol | $V_{CC}$ (V) | Min | Max | Unit |
|---|---|---|---|---|---|
| Output transition time | $t_{TLH}$,$t_{THL}$ | 4.5 | — | 22 | ns |
| | | 5.5 | — | 21 | |
| Propagation delay time | $t_{PLH}$,$t_{PHL}$ | 4.5 | — | 51 | ns |
| | | 5.5 | — | 46 | |

## Package Dimensions

Unit: mm




Weight: 0.13 g (typ.)

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

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