

# 74HC132D

## 1. Functional Description

- Quad 2-Input Schmitt NAND Gate

## 2. General

The 74HC132D is a high speed CMOS 2-INPUT NAND SCHMITT TRIGGER GATE fabricated with silicon gate C<sup>2</sup>MOS technology.

It achieves the high speed operation similar to equivalent LSTTL while maintaining the CMOS low power dissipation.

Pin configuration and function are the same as the 74HC00D but the inputs have 25% V<sub>CC</sub> hysteresis and with its schmitt trigger inputs, the 74HC132D can be used as a line receiver for slow input signals.

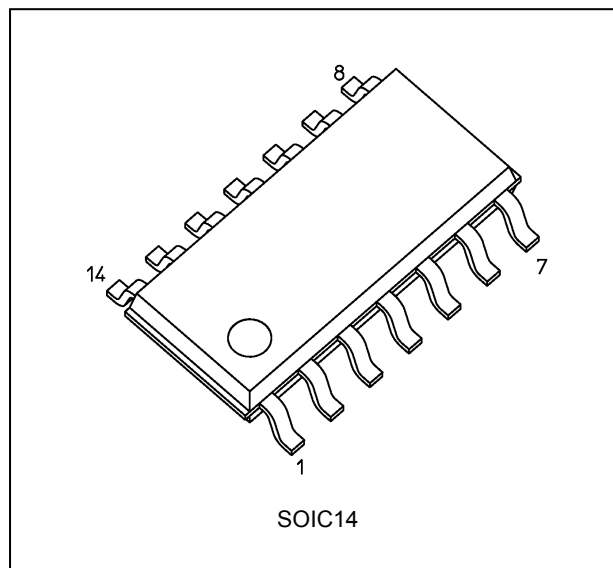
All inputs are equipped with protection circuits against static discharge or transient excess voltage.

## 3. Features

- (1) Wide operating temperature range: T<sub>opr</sub> = -40 to 125 °C (Note 1)
- (2) High speed: t<sub>pd</sub> = 11 ns (typ.) at V<sub>CC</sub> = 5 V
- (3) Low power dissipation: I<sub>CC</sub> = 1.0 μA (max) at T<sub>a</sub> = 25 °C
- (4) High noise immunity: V<sub>H</sub> = 1.1 V (typ.) at V<sub>CC</sub> = 4.5 V
- (5) Balanced propagation delays: t<sub>PLH</sub> ≈ t<sub>PHL</sub>
- (6) Wide operating voltage range: V<sub>CC(opr)</sub> = 2.0 to 6.0 V

Note 1: Operating Range spec of T<sub>opr</sub> = -40 °C to 125 °C is applicable only for the products which manufactured after July 2020.

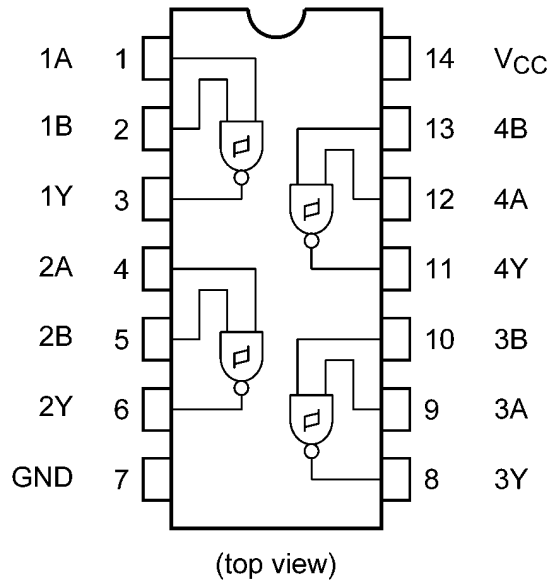
## 4. Packaging



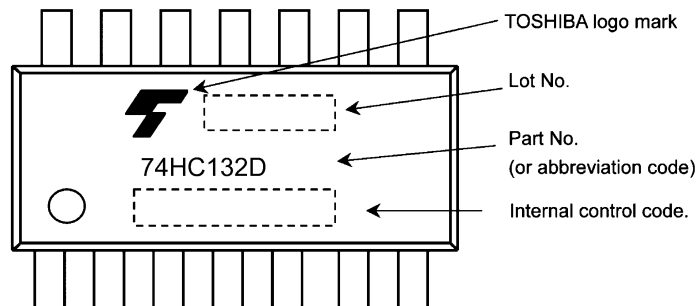
Start of commercial production

2020-07

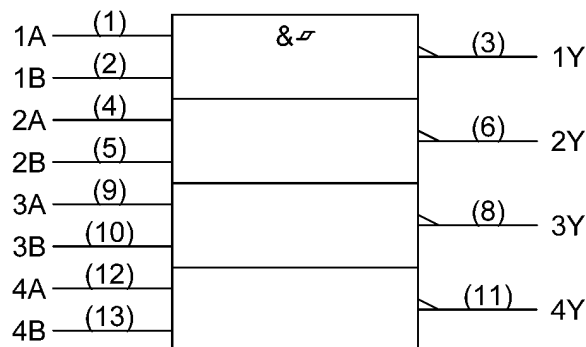
### 5. Pin Assignment



### 6. Marking



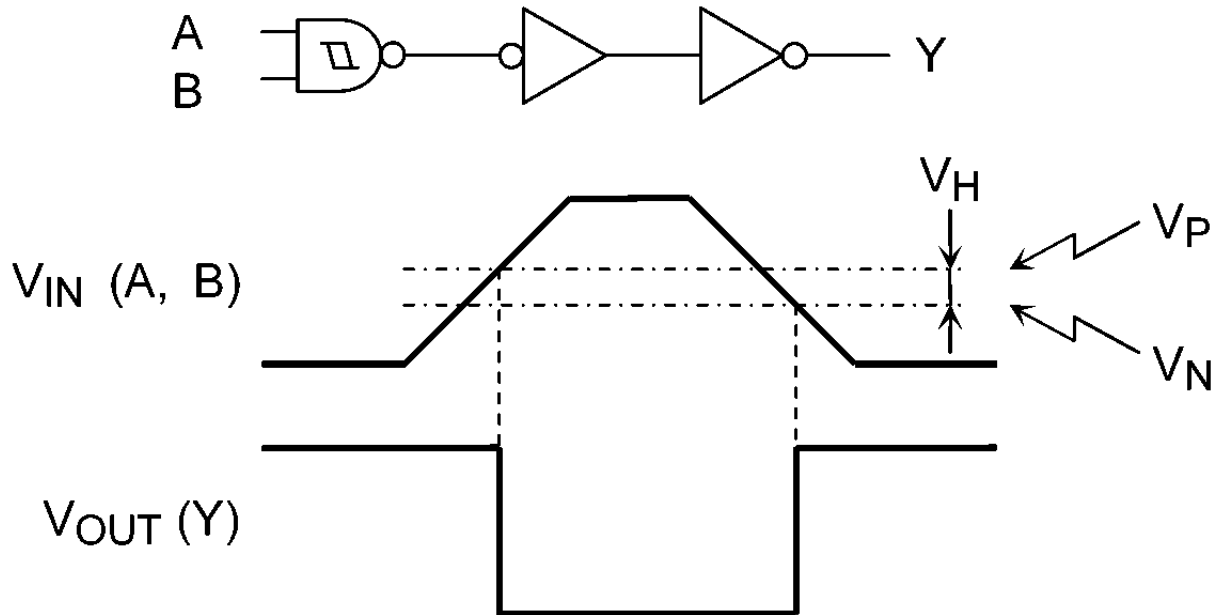
### 7. IEC Logic Symbol



## 8. Truth Table

A	B	Y
L	L	H
L	H	H
H	L	H
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	$I_{IK}$		$\pm 20$	mA
Output diode current	$I_{OK}$		$\pm 20$	mA
Output current	$I_{OUT}$		$\pm 25$	mA
$V_{CC}$ /ground current	$I_{CC}$		$\pm 50$	mA
Power dissipation	$P_D$	(Note 1)	500	mW
Storage temperature	$T_{stg}$		-65 to 150	$^{\circ}C$

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  $-8 \text{ mW}/^{\circ}C$  above  $85 \text{ }^{\circ}C$

### 11. Operating Ranges (Note)

Characteristics	Symbol	Test Condition	Note	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	$T_{opr}$	—	(Note 1)	-40 to 125	°C

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

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

Note 1: Operating Range spec of  $T_{opr} = -40\text{ °C}$  to  $125\text{ °C}$  is applicable only for the products which manufactured after July 2020.

### 12. Electrical Characteristics

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

Characteristics	Symbol	Test Condition	$V_{CC}$ (V)	Min	Typ.	Max	Unit	
Positive threshold voltage	$V_P$	—	2.0	1.00	1.25	1.50	V	
			4.5	2.30	2.70	3.15		
			6.0	3.00	3.50	4.20		
Negative threshold voltage	$V_N$	—	2.0	0.30	0.65	0.90	V	
			4.5	1.13	1.60	2.00		
			6.0	1.50	2.30	2.60		
Hysteresis voltage	$V_H$	—	2.0	0.3	0.6	1.0	V	
			4.5	0.6	1.1	1.4		
			6.0	0.8	1.2	1.7		
High-level output voltage	$V_{OH}$	$V_{IN} = V_{IH}$ 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	—	
			$I_{OH} = -4\text{ mA}$	4.5	4.18	4.31	—	
Low-level output voltage	$V_{OL}$	$V_{IN} = V_{IH}$	$I_{OL} = 20\text{ }\mu\text{A}$	2.0	—	0.0	0.1	V
				4.5	—	0.0	0.1	
				6.0	—	0.0	0.1	
			$I_{OL} = 4\text{ mA}$	4.5	—	0.17	0.26	
		$I_{OL} = 5.2\text{ mA}$	6.0	—	0.18	0.26		
Input leakage current	$I_{IN}$	$V_{IN} = V_{CC}$ or GND	6.0	—	—	$\pm 0.1$	$\mu\text{A}$	
Quiescent supply current	$I_{CC}$	$V_{IN} = V_{CC}$ or GND	6.0	—	—	1.0	$\mu\text{A}$	

### 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	$V_P$	—	2.0	1.00	1.50	V	
			4.5	2.30	3.15		
			6.0	3.00	4.20		
Negative threshold voltage	$V_N$	—	2.0	0.30	0.90	V	
			4.5	1.13	2.00		
			6.0	1.50	2.60		
Hysteresis voltage	$V_H$	—	2.0	0.3	1.0	V	
			4.5	0.6	1.4		
			6.0	0.8	1.7		
High-level output voltage	$V_{OH}$	$V_{IN} = V_{IH}$ or $V_{IL}$	$I_{OH} = -20 \mu A$	2.0	1.9	—	V
				4.5	4.4	—	
				6.0	5.9	—	
			$I_{OH} = -4$ mA	4.5	4.13	—	
			$I_{OH} = -5.2$ mA	6.0	5.63	—	
Low-level output voltage	$V_{OL}$	$V_{IN} = V_{IH}$	$I_{OL} = 20 \mu A$	2.0	—	0.1	V
				4.5	—	0.1	
				6.0	—	0.1	
			$I_{OL} = 4$ mA	4.5	—	0.33	
			$I_{OL} = 5.2$ mA	6.0	—	0.33	
Input leakage current	$I_{IN}$	$V_{IN} = V_{CC}$ or GND	6.0	—	$\pm 1.0$	$\mu A$	
Quiescent supply current	$I_{CC}$	$V_{IN} = V_{CC}$ or GND	6.0	—	10.0	$\mu A$	

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

Characteristics	Symbol	Test Condition	$V_{CC}$ (V)	Min	Max	Unit	
Positive threshold voltage	$V_P$	—	2.0	1.00	1.50	V	
			4.5	2.30	3.15		
			6.0	3.00	4.20		
Negative threshold voltage	$V_N$	—	2.0	0.30	0.90	V	
			4.5	1.13	2.00		
			6.0	1.50	2.60		
Hysteresis voltage	$V_H$	—	2.0	0.30	1.00	V	
			4.5	0.60	1.40		
			6.0	0.80	1.70		
High-level output voltage	$V_{OH}$	$V_{IN} = V_{IH}$ or $V_{IL}$	$I_{OH} = -20 \mu A$	2.0	1.9	—	V
				4.5	4.4	—	
				6.0	5.9	—	
			$I_{OH} = -4$ mA	4.5	3.7	—	
			$I_{OH} = -5.2$ mA	6.0	5.2	—	
Low-level output voltage	$V_{OL}$	$V_{IN} = V_{IH}$	$I_{OL} = 20 \mu A$	2.0	—	0.1	V
				4.5	—	0.1	
				6.0	—	0.1	
			$I_{OL} = 4$ mA	4.5	—	0.4	
			$I_{OL} = 5.2$ mA	6.0	—	0.4	
Input leakage current	$I_{IN}$	$V_{IN} = V_{CC}$ or GND	6.0	—	$\pm 1.0$	$\mu A$	
Quiescent supply current	$I_{CC}$	$V_{IN} = V_{CC}$ or GND	6.0	—	20.0	$\mu A$	

Note: Operating Range spec of  $T_{opr} = -40$  °C to  $125$  °C is applicable only for the products which manufactured after July 2020.

### 12.4. AC Characteristics

(Unless otherwise specified,  $C_L = 15 \text{ pF}$ ,  $V_{CC} = 5 \text{ V}$ ,  $T_a = 25 \text{ }^\circ\text{C}$ , Input:  $t_r = t_f = 6 \text{ ns}$ )

Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Output transition time	$t_{TLH}, t_{THL}$	—	—	4	8	ns
Propagation delay time	$t_{PLH}, t_{PHL}$	—	—	11	18	ns

### 12.5. AC Characteristics

(Unless otherwise specified,  $C_L = 50 \text{ pF}$ ,  $T_a = 25 \text{ }^\circ\text{C}$ , Input:  $t_r = t_f = 6 \text{ ns}$ )

Characteristics	Symbol	Note	$V_{CC}$ (V)	Min	Typ.	Max	Unit
Output transition time	$t_{TLH}, t_{THL}$		2.0	—	30	75	ns
			4.5	—	8	15	
			6.0	—	7	13	
Propagation delay time	$t_{PLH}, t_{PHL}$		2.0	—	42	110	ns
			4.5	—	14	22	
			6.0	—	12	19	
Input capacitance	$C_{IN}$		—	—	5	—	pF
Power dissipation capacitance	$C_{PD}$	(Note 1)	—	—	29	—	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.

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

### 12.6. AC Characteristics

(Unless otherwise specified,  $C_L = 50 \text{ pF}$ ,  $T_a = -40 \text{ to } 85 \text{ }^\circ\text{C}$ , Input:  $t_r = t_f = 6 \text{ ns}$ )

Characteristics	Symbol	$V_{CC}$ (V)	Min	Max	Unit
Output transition time	$t_{TLH}, t_{THL}$	2.0	—	95	ns
		4.5	—	19	
		6.0	—	16	
Propagation delay time	$t_{PLH}, t_{PHL}$	2.0	—	140	ns
		4.5	—	28	
		6.0	—	24	

### 12.7. AC Characteristics (Note)

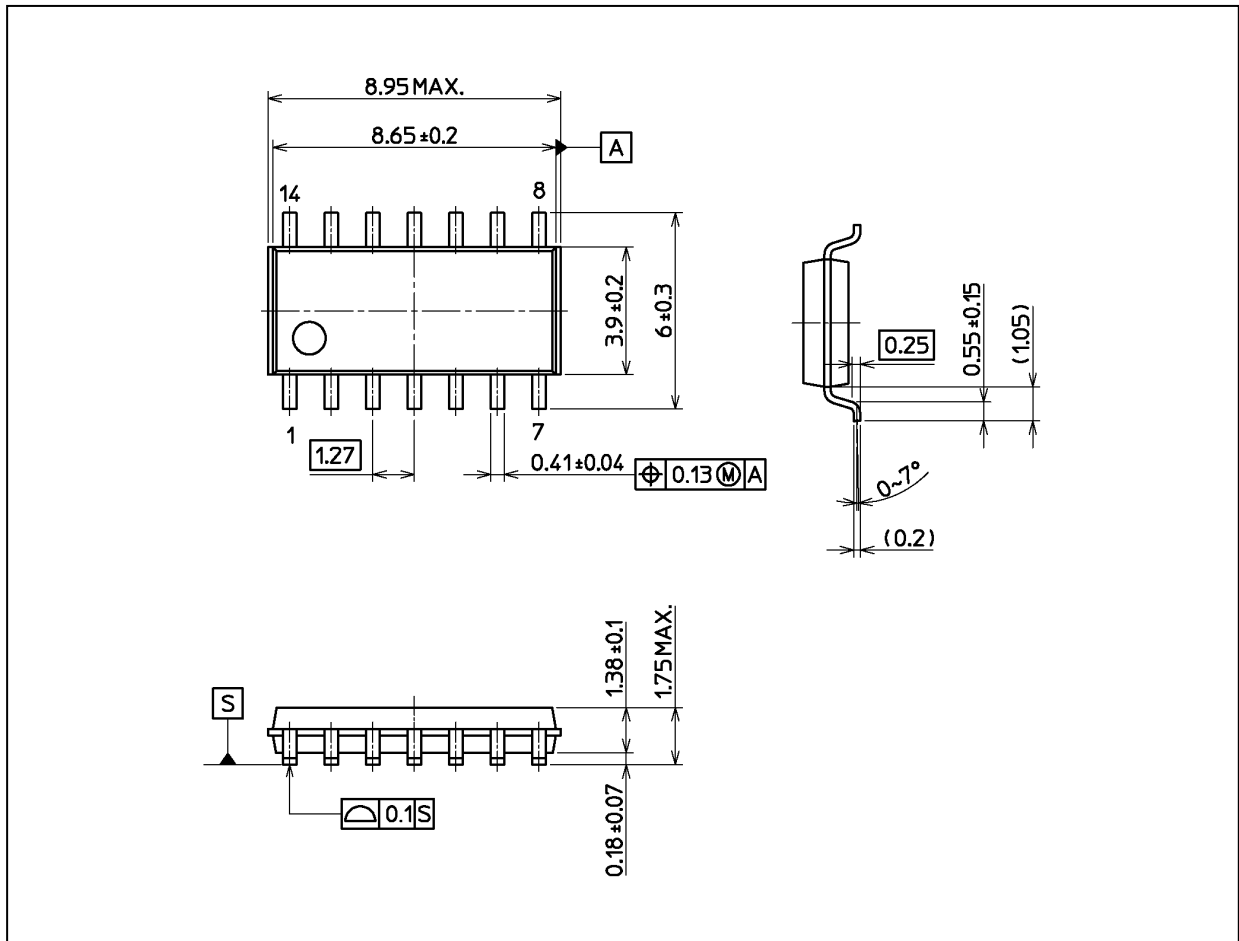
(Unless otherwise specified,  $C_L = 50 \text{ pF}$ ,  $T_a = -40 \text{ to } 125 \text{ }^\circ\text{C}$ , Input:  $t_r = t_f = 6 \text{ ns}$ )

Characteristics	Symbol	$V_{CC}$ (V)	Min	Max	Unit
Output transition time	$t_{TLH}, t_{THL}$	2.0	—	110	ns
		4.5	—	22	
		6.0	—	18	
Propagation delay time	$t_{PLH}, t_{PHL}$	2.0	—	160	ns
		4.5	—	32	
		6.0	—	28	

Note: Operating Range spec of  $T_{opr} = -40 \text{ }^\circ\text{C}$  to  $125 \text{ }^\circ\text{C}$  is applicable only for the products which manufactured after July 2020.

### Package Dimensions

Unit: mm



Weight: 0.13 g (typ.)

Package Name(s)
Nickname: SOIC14

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