CMOS Digital Integrated Circuits Silicon Monolithic

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^2MOS 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% VCC 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) High speed: t_{pd} = 11 ns (typ.) at V_{CC} = 5 V

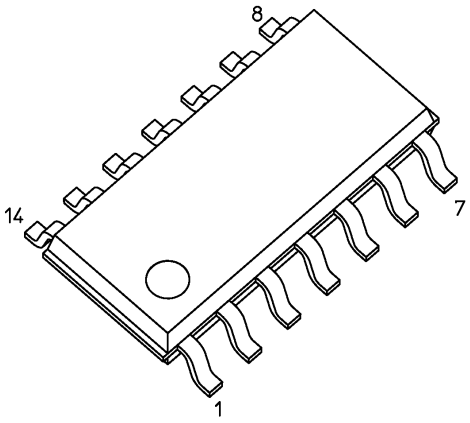
(2) Low power dissipation: I_{CC} = 1.0 μA (max) at T_a = 25 °C

(3) High noise immunity: V_H = 1.1 V (typ.) at V_{CC} = 4.5 V

(4) Balanced propagation delays: $t_{PLH} \approx t_{PHL}$

(5) Wide operating voltage range: $V_{CC(opr)}$ = 2.0 to 6.0 V

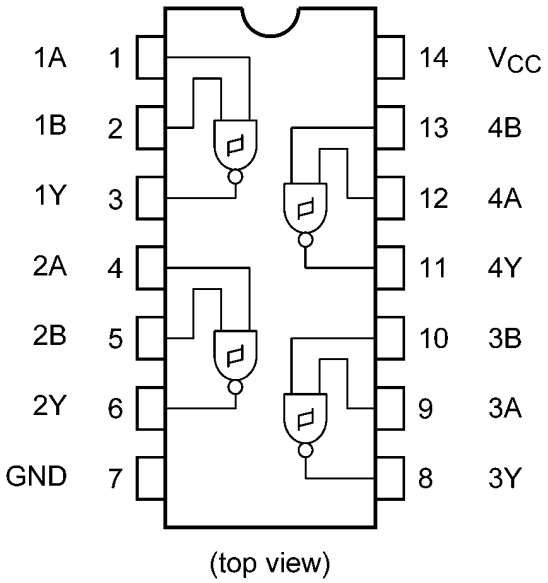
4. Packaging



SOIC14

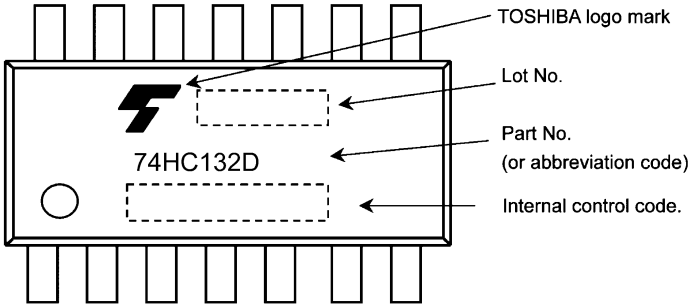
Start of commercial production
2016-04

5. Pin Assignment

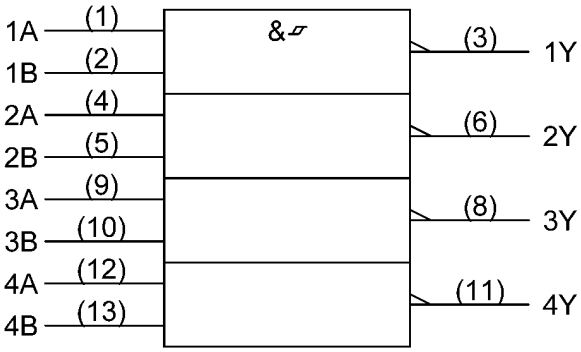


(top view)

6. Marking



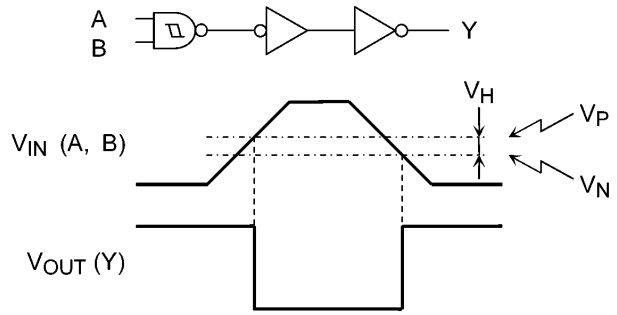
7. IEC Logic Symbol



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	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	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).

11. Operating Ranges (Note)

Characteristics	Symbol	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 85	°C

Note: The operating ranges are required 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	—		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 μA	2.0	1.9	2.0	—	V
				4.5	4.4	4.5	—	
				6.0	5.9	6.0	—	
			I_{OH} = -4 mA	4.5	4.18	4.31	—	
			I_{OH} = -5.2 mA	6.0	5.68	5.80	—	
Low-level output voltage	V_{OL}	V_{IN} = V_{IH}	I_{OL} = 20 μA	2.0	—	0.0	0.1	V
				4.5	—	0.0	0.1	
				6.0	—	0.0	0.1	
			I_{OL} = 4 mA	4.5	—	0.17	0.26	
			I_{OL} = 5.2 mA	6.0	—	0.18	0.26	
Input leakage current	I_{IN}	V_{IN} = V_{CC} or GND		6.0	—	—	±0.1	μA
Quiescent supply current	I_{CC}	V_{IN} = V_{CC} or GND		6.0	—	—	1.0	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	—		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 μA	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 μA	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	—	±1.0	μA
Quiescent supply current	I_{CC}	V_{IN} = V_{CC} or GND		6.0	—	10.0	μA

12.3. 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}	—	—	4	8	ns
Propagation delay time	t_{PLH},t_{PHL}	—	—	11	18	ns

12.4. 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}		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.

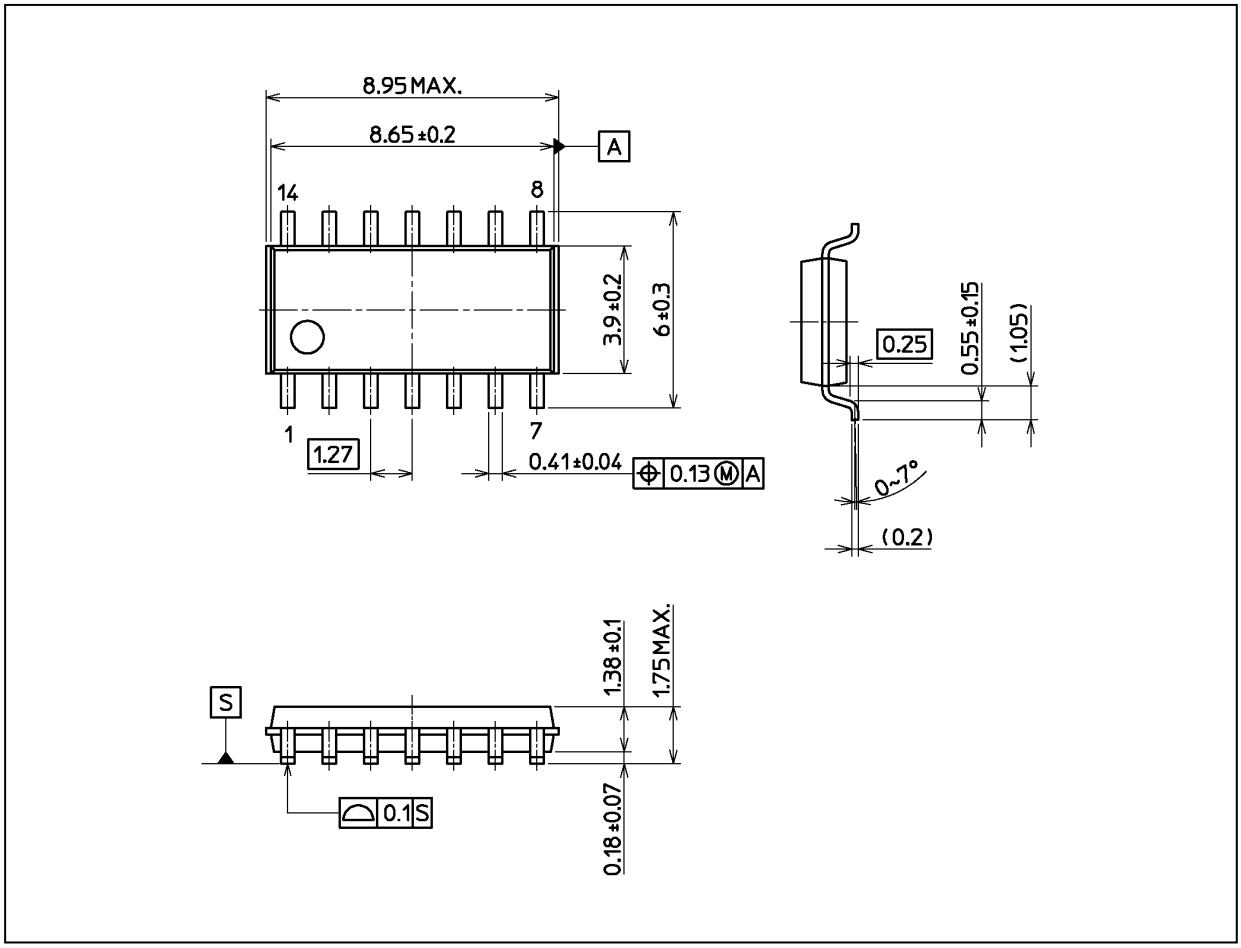
$I_{CC(opr)} = C_{PD} \times V_{CC} \times f_{IN} + I_{CC}/4$ (per gate)

12.5. 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}	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	

Package Dimensions

Unit: mm



Weight: 0.13 g (typ.)

Package Name(s)
Nickname: SOIC14

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