TOSHIBA CMOS Digital Integrated Circuit Silicon Monolithic

TC74VHC132F, TC74VHC132FK

Quad 2-Input Schmitt NAND Gate

The TC74VHC132 is an advanced high speed CMOS 2-Input Schmitt NAND Gate fabricated with silicon gate C^2MOS technology.

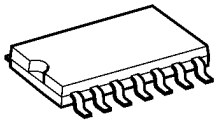
It achieves the high speed operation similar to equivalent Bipolar Schottky TTL while maintaining the CMOS low power dissipation.

Pin configuration and function are the same as the TC74VHC00 but the inputs have hysteresis and with its schmitt trigger function, the TC74VHC132 can be used as a line receivers which will receive slow input signals.

An input protection circuit ensures that 0 to 5.5 V can be applied to the input pins without regard to the supply voltage. This device can be used to interface 5 V to 3 V systems and two supply systems such as battery back up.

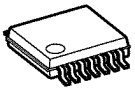
This circuit prevents device destruction due to mismatched supply and input voltages.

TC74VHC132F



SOP14-P-300-1.27A

TC74VHC132FK



VSSOP14-P-0030-0.50

Weight

SOP14-P-300-1.27A : 0.18 g (typ.)

VSSOP14-P-0030-0.50 : 0.02 g (typ.)

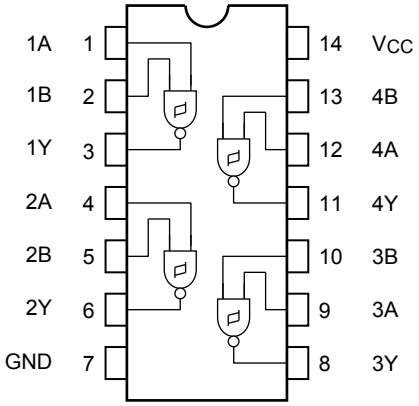
Features

- High speed: t_{pd} = 4.9 ns (typ.) at V_{CC} = 5 V
- Low power dissipation: I_{CC} = 2 μA (max) at Ta = 25°C
- Power down protection is provided on all inputs.
- Balanced propagation delays: $t_{pLH} \simeq t_{pHL}$
- Wide operating voltage range: $V_{CC\ (opr)}$ = 2 to 5.5 V
- Low noise: V_{OLP} = 0.8 V (max)
- Pin and function compatible with 74ALS132

Start of commercial production

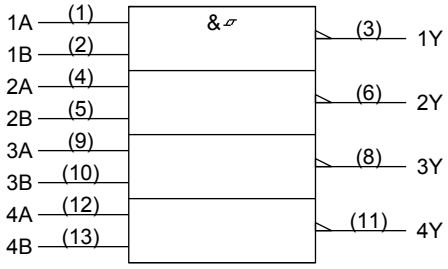
1992-05

Pin Assignment



(top view)

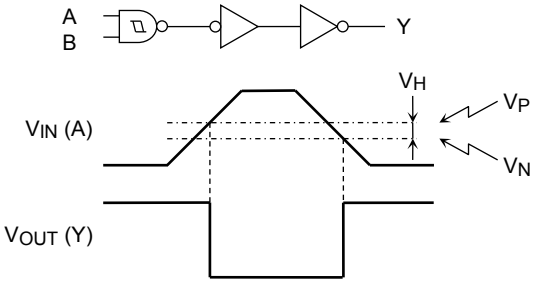
IEC Logic Symbol



Truth Table

A	B	Y
L	L	H
L	H	H
H	L	H
H	H	L

System Diagram, Waveform



Absolute Maximum Ratings (Note)

Characteristics	Symbol	Rating	Unit
Supply voltage range	V_{CC}	−0.5 to 7.0	V
DC input voltage	V_{IN}	−0.5 to 7.0	V
DC 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
DC output current	I_{OUT}	±25	mA
DC V_{CC}/ground current	I_{CC}	±50	mA
Power dissipation	P_D	180	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).

Operating Ranges (Note)

Characteristics	Symbol	Rating	Unit
Supply voltage	V_{CC}	2.0 to 5.5	V
Input voltage	V_{IN}	0 to 5.5	V
Output voltage	V_{OUT}	0 to V_{CC}	V
Operating temperature	T_{opr}	−40 to 85	°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.

Electrical Characteristics

DC Characteristics

Characteristics	Symbol	Test Condition		Ta = 25°C			Ta = −40 to 85°C		Unit
			V_{CC} (V)	Min	Typ.	Max	Min	Max	
Positive threshold voltage	V_P	—	3.0 4.5 5.5	— — —	— — —	2.20 3.15 3.85	— — —	2.20 3.15 3.85	V
Negative threshold voltage	V_N	—	3.0 4.5 5.5	0.90 1.35 1.65	— — —	— — —	0.90 1.35 1.65	— — —	V
Hysteresis output voltage	V_H	—	3.0 4.5 5.5	0.30 0.40 0.50	— — —	1.20 1.40 1.60	0.30 0.40 0.50	1.20 1.40 1.60	V
High-level output voltage	V_{OH}	V_{IN} = V_{IH} or V_{IL}	I_{OH} = −50 μA	2.0 3.0 4.5	1.9 2.9 4.4	2.0 3.0 4.5	— — —	1.9 2.9 4.4	— — —	V
			I_{OH} = −4 mA I_{OH} = −8 mA	3.0 4.5	2.58 3.94	— —	— —	2.48 3.80	— —	
Low-level output voltage	V_{OL}	V_{IN} = V_{IH}	I_{OL} = 50 μA	2.0 3.0 4.5	— — —	0.0 0.0 0.0	0.1 0.1 0.1	— — —	0.1 0.1 0.1	V
			I_{OL} = 4 mA I_{OL} = 8 mA	3.0 4.5	— —	— —	0.36 0.36	— —	0.44 0.44	
Input leakage current	I_{IN}	V_{IN} = 5.5 V or GND		0 to 5.5	—	—	±0.1	—	±1.0	μA
Quiescent supply current	I_{CC}	V_{IN} = V_{CC} or GND		5.5	—	—	2.0	—	20.0	μA

AC Characteristics (input: t_r = t_f = 3 ns)

Characteristics	Symbol	Test Condition			Ta = 25°C			Ta = −40 to 85°C		Unit
			V_{CC} (V)	C_L (pF)	Min	Typ.	Max	Min	Max	
Propagation delay time	t_{pLH} t_{pHL}	—	3.3 ± 0.3	15	—	7.6	11.9	1.0	14.0	ns
				50	—	10.1	15.4	1.0	17.5	
			5.0 ± 0.5	15	—	4.9	7.7	1.0	9.0	
				50	—	6.4	9.7	1.0	11.0	
Input capacitance	C_{IN}	—			—	4	10	—	10	pF
Power dissipation capacitance	C_{PD}	(Note)			—	16	—	—	—	pF

Note: C_{PD} is defined as the value of the internal equivalent capacitance which is calculated from the operating current consumption without load.

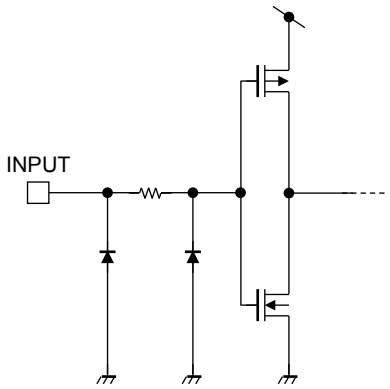
Average operating current can be obtained by the equation:

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

Noise Characteristics (input: $t_r = t_f = 3$ ns)

Characteristics	Symbol	Test Condition	Ta = 25°C		Unit
		V_{CC} (V)	Typ.	Max	
Quiet output maximum dynamic V_{OL}	V_{OLP}	C_L = 50 pF	5.0	0.3	0.8	V
Quiet output minimum dynamic V_{OL}	V_{OLV}	C_L = 50 pF	5.0	−0.3	−0.8	V
Minimum high level dynamic input voltage	V_{IHD}	C_L = 50 pF	5.0	—	3.5	V
Maximum low level dynamic input voltage	V_{ILD}	C_L = 50 pF	5.0	—	1.5	V

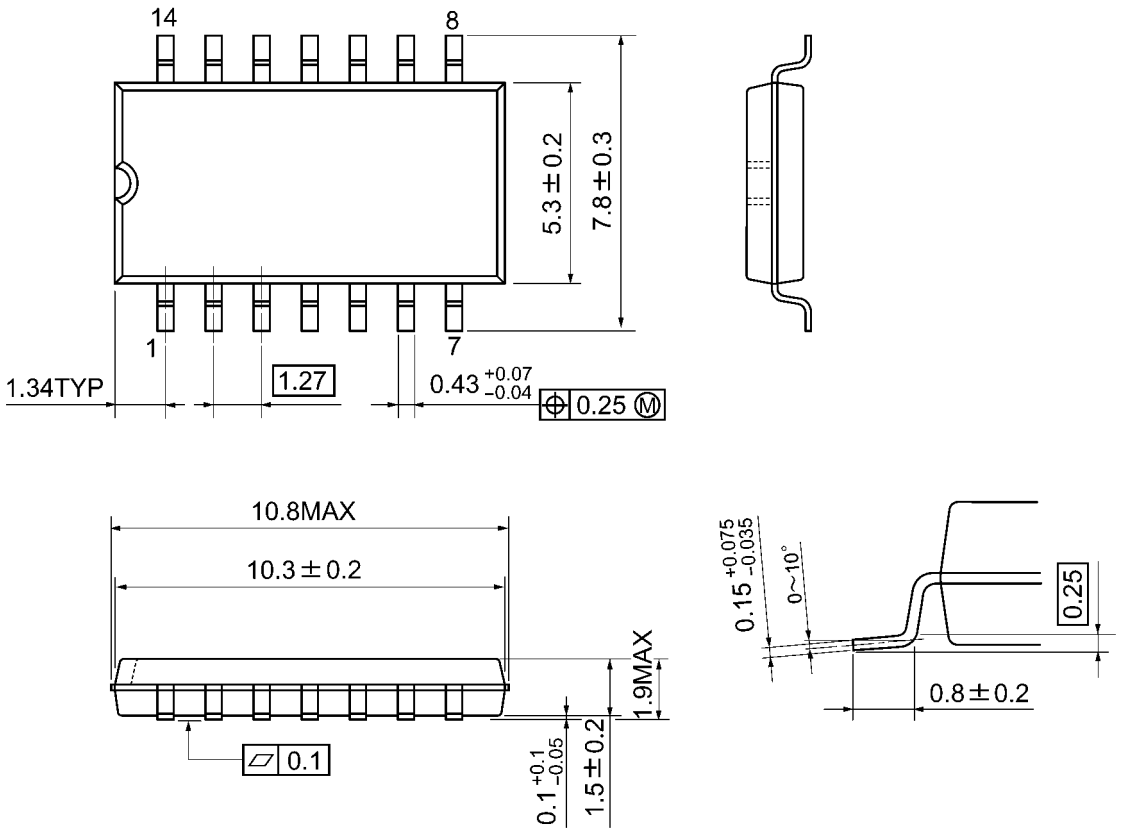
Input Equivalent Circuit



Package Dimensions

SOP14-P-300-1.27A

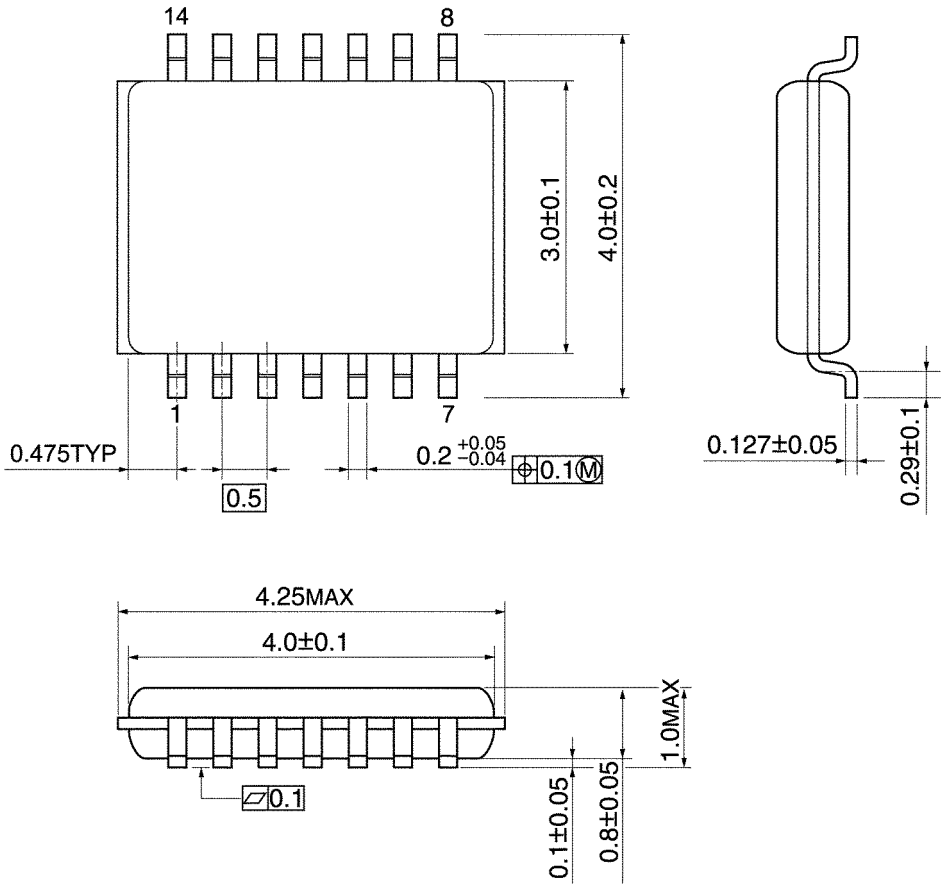
Unit: mm



Weight: 0.18 g (typ.)

Package Dimensions

VSSOP14-P-0030-0.50 Unit: mm



Weight: 0.02 g (typ.)

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