

TC74AC00P, TC74AC00F, TC74AC00FT

Quad 2-Input NAND Gate

The TC74AC00 is an advanced high speed CMOS 2-INPUT NAND GATE fabricated with silicon gate and double-layer metal wiring C²MOS technology.

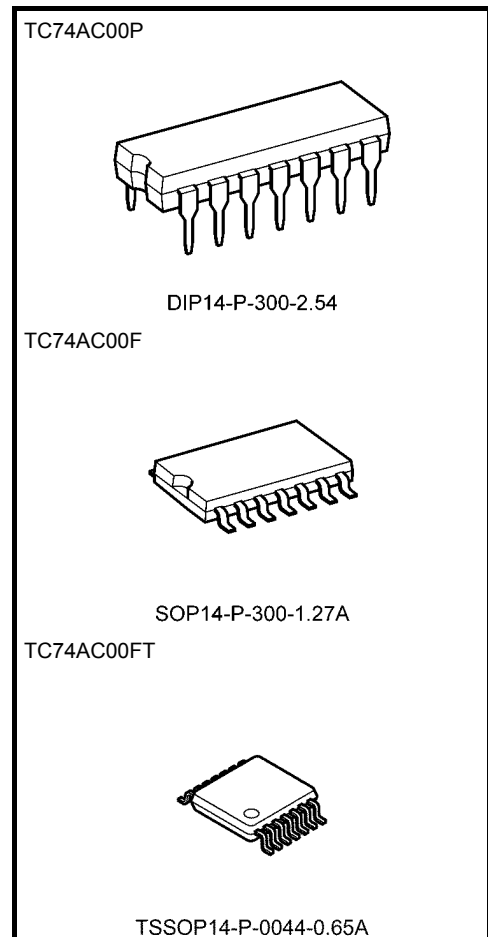
It achieves the high speed operation similar to equivalent Bipolar Schottky TTL while maintaining the CMOS low power dissipation.

The internal circuit is composed of 3 stages including buffer output, which provide high noise immunity and stable output.

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

Features

- High speed: $t_{pd} = 3.8 \text{ ns (typ.)}$ at $V_{CC} = 5 \text{ V}$
- Low power dissipation: $I_{CC} = 4 \text{ } \mu\text{A (max)}$ at $T_a = 25^\circ\text{C}$
- High noise immunity: $V_{NIH} = V_{NIL} = 28\% V_{CC} \text{ (min)}$
- Symmetrical output impedance:
 $|I_{OH}| = I_{OL} = 24 \text{ mA (min)}$
 Capability of driving $50 \text{ } \Omega$ transmission lines.
- Balanced propagation delays: $t_{pLH} \approx t_{pHL}$
- Wide operating voltage range: $V_{CC} \text{ (opr)} = 2 \text{ V to } 5.5 \text{ V}$
- Pin and function compatible with 74F00

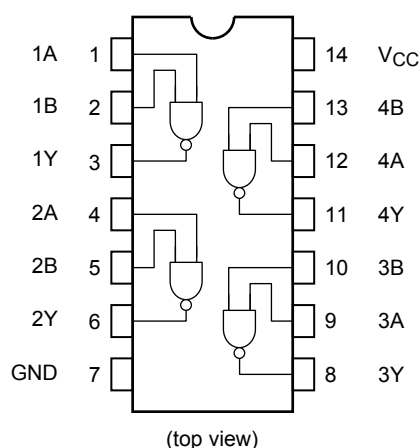


Weight

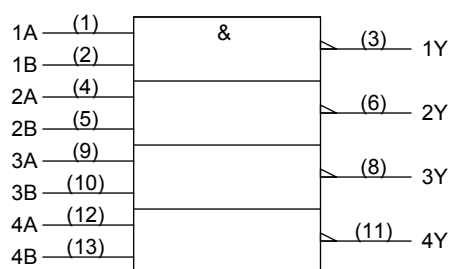
DIP14-P-300-2.54	: 0.96 g (typ.)
SOP14-P-300-1.27A	: 0.18 g (typ.)
TSSOP14-P-0044-0.65A	: 0.06 g (typ.)

Start of commercial production
1986-05

Pin Assignment



IEC Logic Symbol



Truth Table

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

Absolute Maximum Ratings (Note 1)

Characteristics	Symbol	Rating	Unit
Supply voltage range	V_{CC}	-0.5 to 7.0	V
DC input voltage	V_{IN}	-0.5 to $V_{CC} + 0.5$	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}	± 50	mA
DC output current	I_{OUT}	± 50	mA
DC V_{CC} /ground current	I_{CC}	± 100	mA
Power dissipation	P_D	500 (DIP) (Note 2)/180 (SOP/TSSOP)	mW
Storage temperature	T_{stg}	-65 to 150	°C

Note 1: 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 2: 500 mW in the range of $T_a = -40^{\circ}\text{C}$ to 65°C . From $T_a = 65^{\circ}\text{C}$ to 85°C a derating factor of $-10 \text{ mW}/^{\circ}\text{C}$ should be applied up to 300 mW.

Operating Ranges (Note)

Characteristics	Symbol	Rating	Unit
Supply voltage	V_{CC}	2.0 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 85	°C
Input rise and fall time	dt/dV	0 to 100 ($V_{CC} = 3.3 \pm 0.3$ V) 0 to 20 ($V_{CC} = 5 \pm 0.5$ V)	ns/V

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
High-level input voltage	V_{IH}	—		2.0 3.0 5.5	1.50 2.10 3.85	— — —	— — —	1.50 2.10 3.85	V
Low-level input voltage	V_{IL}	—		2.0 3.0 5.5	— — —	— — —	0.50 0.90 1.65	— — 1.65	V
High-level output voltage	V_{OH}	$V_{IN} = V_{IH}$ or V_{IL}	$I_{OH} = -50 \mu A$	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	3.0	2.58	—	—	2.48	
			$I_{OH} = -24$ mA	4.5	3.94	—	—	3.80	
			$I_{OH} = -75$ mA (Note)	5.5	—	—	—	3.85	
Low-level output voltage	V_{OL}	$V_{IN} = V_{IH}$	$I_{OL} = 50 \mu A$	2.0 3.0 4.5	— — —	0.0 0.0 0.0	0.1 0.1 0.1	— — —	V
			$I_{OL} = 12$ mA	3.0	—	—	0.36	—	
			$I_{OL} = 24$ mA	4.5	—	—	0.36	—	
			$I_{OL} = 75$ mA (Note)	5.5	—	—	—	—	
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	—	—	4.0	—	μA

Note: This spec indicates the capability of driving 50 Ω transmission lines.
One output should be tested at a time for a 10 ms maximum duration.

AC Characteristics ($C_L = 50 \text{ pF}$, $R_L = 500 \Omega$, input: $t_r = t_f = 3 \text{ ns}$)

Characteristics	Symbol	Test Condition	Ta = 25°C			Ta = -40 to 85°C		Unit
			V _{CC} (V)	Min	Typ.	Max	Min	Max
Propagation delay time	t _{pLH}	—	3.3 ± 0.3	—	6.6	11.2	1.0	12.9
	t _{pHL}		5.0 ± 0.5	—	4.9	7.0	1.0	8.0
Input capacitance	C _{IN}	—	—	—	5	10	—	10
Power dissipation capacitance	C _{PD}	(Note)	—	—	68	—	—	—

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:

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

Package Dimensions

DIP14-P-300-2.54

Unit : mm

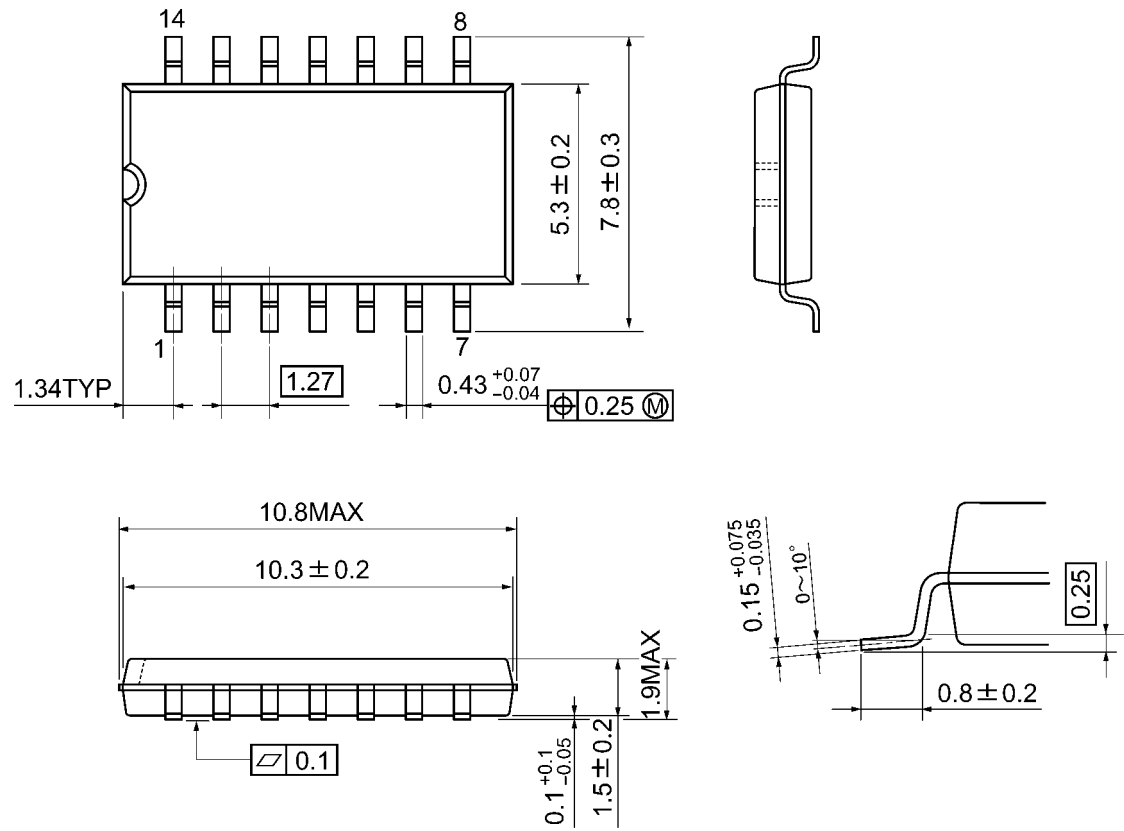


Weight: 0.96 g (typ.)

Package Dimensions

SOP14-P-300-1.27A

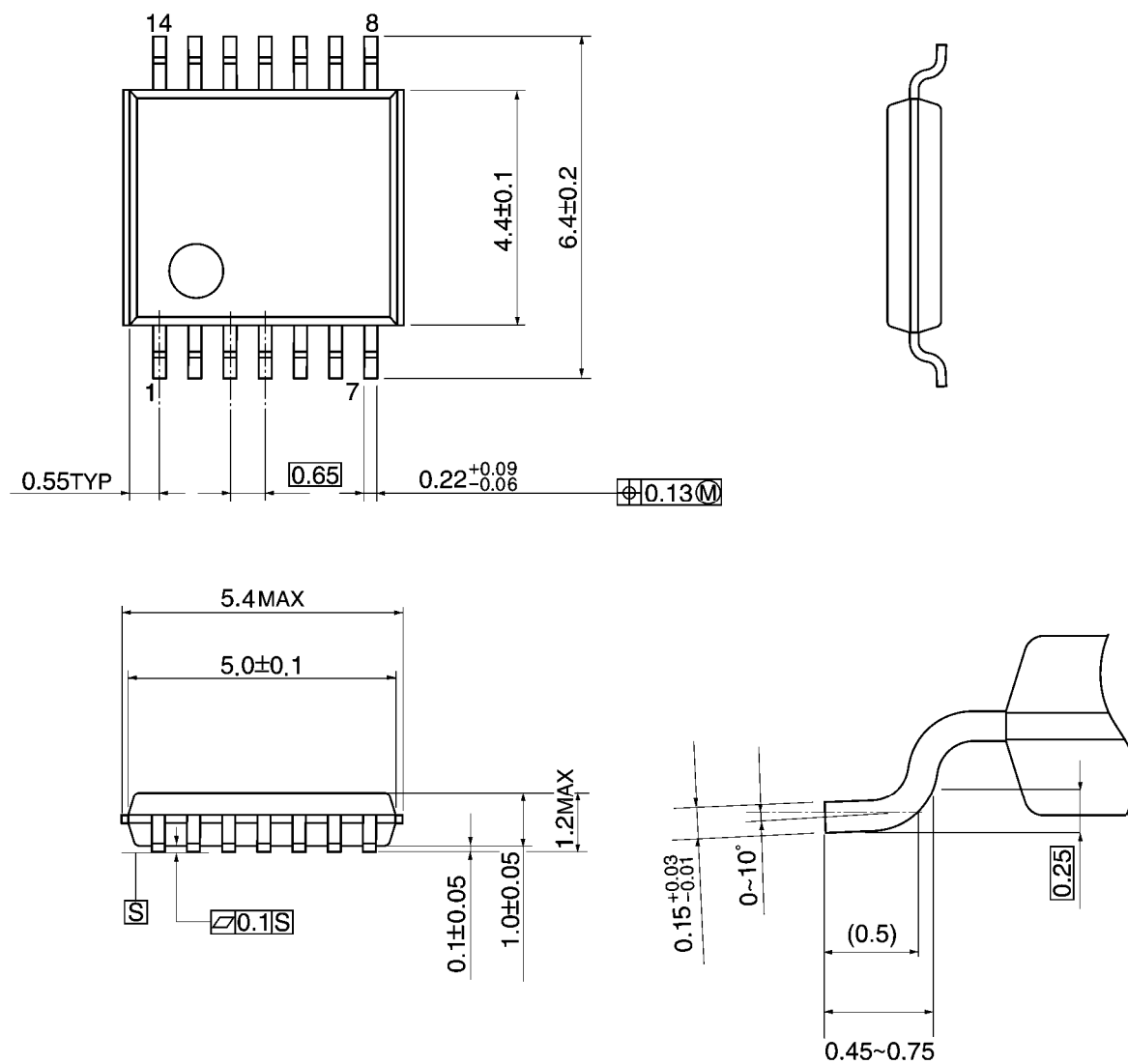
Unit: mm



Weight: 0.18 g (typ.)

TSSOP14-P-0044-0.65A

Unit: mm



Weight: 0.06 g (typ.)

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