

TC74HC03AP, TC74HC03AF, TC74HC03AFN

Quad 2-Input NAND Gate (open drain)

The TC74HC03A is a high speed CMOS 2-INPUT NAND GATE fabricated with silicon gate C²MOS technology.

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

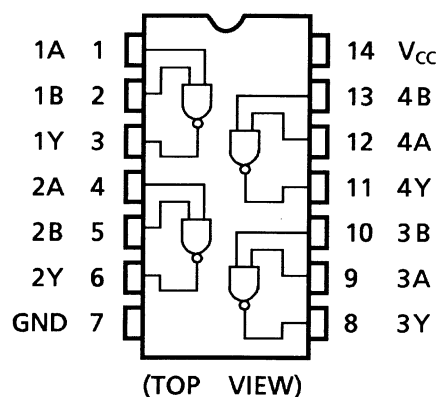
Pin configuration and function are the same as the TC74HC00A. But the TC74HC03A has, as its outputs, high performance MOS N-channel transistors. (open-drain outputs) This device can, therefore, with a suitable pull-up resistors, be used in wired-AND, LED driver and other application.

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

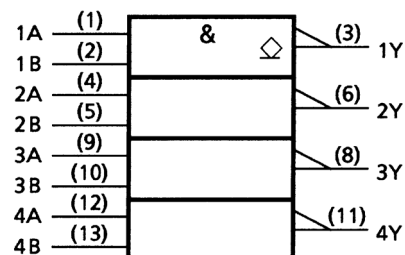
Features

- High speed: $t_{pZ} = 5 \text{ ns}$ (typ.) at $V_{CC} = 5 \text{ V}$
- Low power dissipation: $I_{CC} = 1 \mu\text{A}$ (max) at $T_a = 25^\circ\text{C}$
- High noise immunity: $V_{NIH} = V_{NIL} = 28\% V_{CC}$ (min)
- Output drive capability: 10 LSTTL loads
- Wide operating voltage range: $V_{CC} (\text{opr}) = 2 \sim 6 \text{ V}$
- Open drain structure
- Pin and function compatible with 74LS03

Pin Assignment

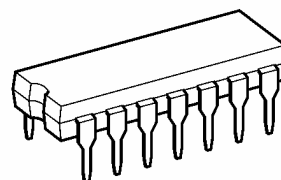


IEC Logic Symbol



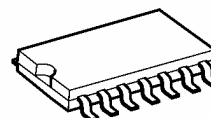
Note: xxxFN (JEDEC SOP) is not available in Japan.

TC74HC03AP

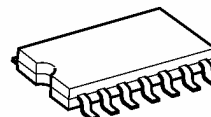


DIP14-P-300-2.54

TC74HC03AF



SOP14-P-300-1.27A



SOP14-P-300-1.27

TC74HC03AFN



SOL14-P-150-1.27

Weight

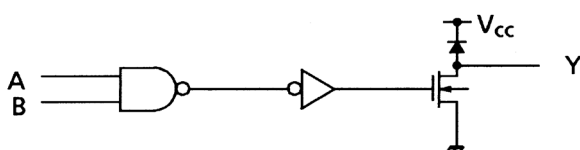
DIP14-P-300-2.54	: 0.96 g (typ.)
SOP14-P-300-1.27A	: 0.18 g (typ.)
SOP14-P-300-1.27	: 0.18 g (typ.)
SOL14-P-150-1.27	: 0.12 g (typ.)

Truth Table

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

Z: High impedance

System Diagram (per gate)



Absolute Maximum Ratings (Note 1)

Characteristics	Symbol	Rating	Unit
Supply voltage range	V_{CC}	$-0.5 \sim 7$	V
DC input voltage	V_{IN}	$-0.5 \sim V_{CC} + 0.5$	V
DC output voltage	V_{OUT}	$-0.5 \sim V_{CC} + 0.5$	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	500 (DIP) (Note 2)/180 (SOP)	mW
Storage temperature	T_{stg}	$-65 \sim 150$	$^{\circ}\text{C}$

Note 1: Exceeding any of the absolute maximum ratings, even briefly, lead to deterioration in IC performance or even destruction.

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

Recommended Operating Conditions (Note)

Characteristics	Symbol	Rating	Unit
Supply voltage	V_{CC}	2~6	V
Input voltage	V_{IN}	$0 \sim V_{CC}$	V
Output voltage	V_{OUT}	$0 \sim V_{CC}$	V
Operating temperature	T_{opr}	$-40 \sim 85$	$^{\circ}\text{C}$
Input rise and fall time	t_r, t_f	0~1000 ($V_{CC} = 2.0 \text{ V}$) 0~500 ($V_{CC} = 4.5 \text{ V}$) 0~400 ($V_{CC} = 6.0 \text{ V}$)	ns

Note: The recommended operating conditions are required 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		V _{CC} (V)	Ta = 25°C			Ta = -40~85°C		Unit
					Min	Typ.	Max	Min	Max	
High-level input voltage	V _{IH}	—		2.0 4.5 6.0	1.50 3.15 4.20	— — —	— — —	1.50 3.15 4.20	— — —	V
Low-level input voltage	V _{IL}	—		2.0 4.5 6.0	— — —	— — —	0.50 1.35 1.80	— — —	0.50 1.35 1.80	V
Low-level output voltage	V _{OL}	V _{IN} = V _{IH} or V _{IL}	I _{OL} = 20 μA	2.0 4.5 6.0	— — —	0.0 0.0 0.0	0.1 0.1 0.1	— — —	0.1 0.1 0.1	V
			I _{OL} = 4 mA	4.5 6.0	— —	0.17 0.18	0.26 0.26	— —	0.33 0.33	
			I _{OL} = 5.2 mA							
Output off-state current	I _{OZ}	V _{IN} = V _{IH} or V _{IL} V _{OUT} = V _{CC}		6.0	—	—	±0.5	—	±5.0	μA
Input leakage current	I _{IN}	V _{IN} = V _{CC} or GND		6.0	—	—	±0.1	—	±1.0	μA
Quiescent supply current	I _{CC}	V _{IN} = V _{CC} or GND		6.0	—	—	1.0	—	10.0	μA

AC Characteristics (C_L = 15 pF, V_{CC} = 5 V, Ta = 25°C, input: t_r = t_f = 6 ns)

Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Output transition time	t _{THL}	—	—	4	8	ns
Propagation delay time	t _{pLZ}	R _L = 1 kΩ	—	5	12	ns
Propagation delay time	t _{pZL}	R _L = 1 kΩ	—	5	12	ns

AC Characteristics ($C_L = 50 \text{ pF}$, input: $t_r = t_f = 6 \text{ ns}$)

Characteristics	Symbol	Test Condition	V_{CC} (V)	$T_a = 25^\circ\text{C}$			$T_a = -40\sim 85^\circ\text{C}$		Unit
				Min	Typ.	Max	Min	Max	
Output transition time	t_{THL}	—	2.0	—	30	75	—	95	ns
			4.5	—	8	15	—	19	
			6.0	—	7	13	—	16	
Propagation delay time	t_{pLZ}	$R_L = 1 \text{ k}\Omega$	2.0	—	20	75	—	95	ns
			4.5	—	10	15	—	19	
			6.0	—	9	13	—	16	
Propagation delay time	t_{pZL}	$R_L = 1 \text{ k}\Omega$	2.0	—	24	75	—	95	ns
			4.5	—	8	15	—	19	
			6.0	—	7	13	—	16	
Input capacitance	C_{IN}	—	—	—	5	10	—	10	pF
Output capacitance	C_{OUT}	—	—	—	3	—	—	—	pF
Power dissipation capacitance	C_{PD} (Note)	—	—	—	5	—	—	—	pF

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

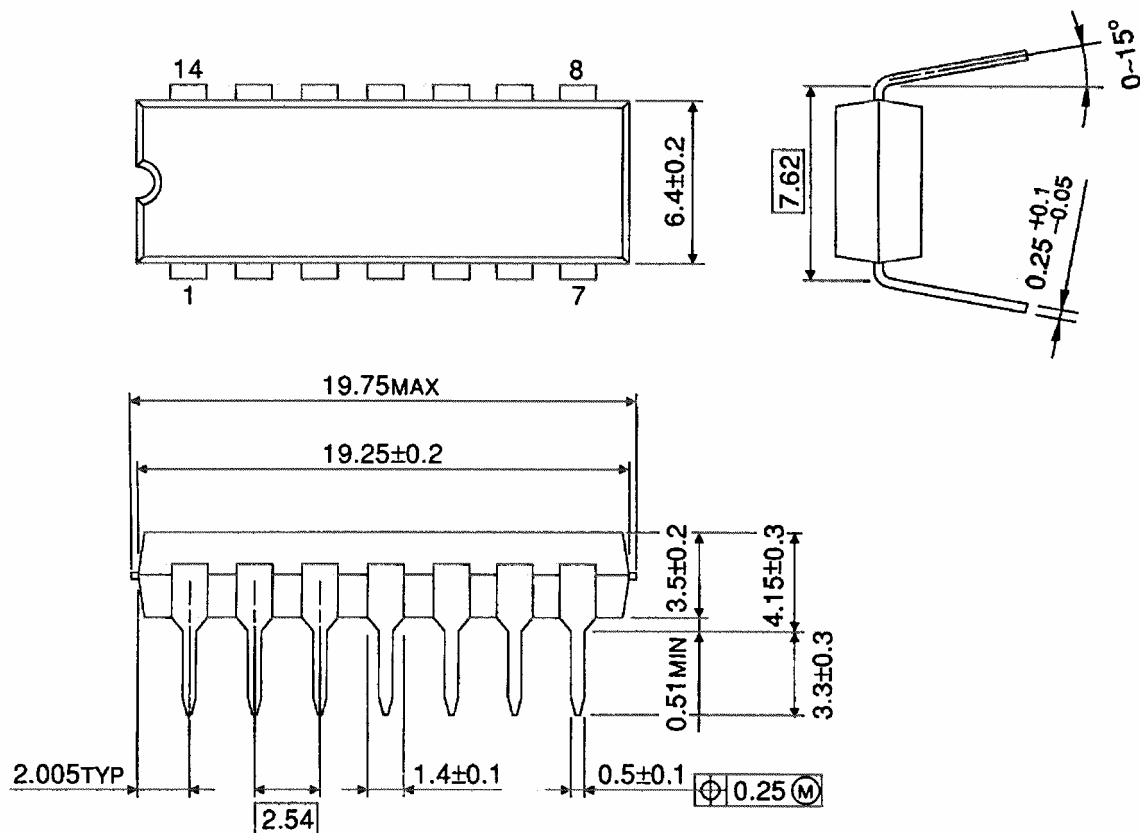
Average operating current can be obtained by the equation:

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

Package Dimensions

DIP14-P-300-2.54

Unit : mm

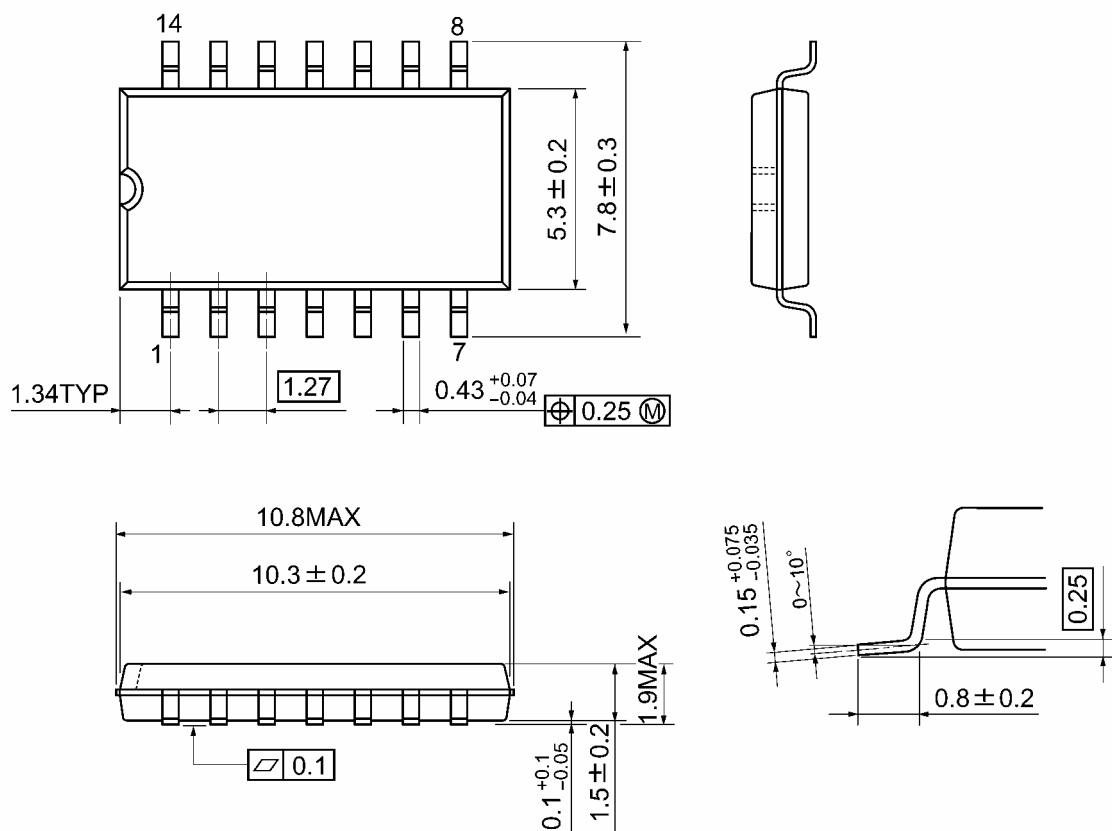


Weight: 0.96 g (typ.)

Package Dimensions

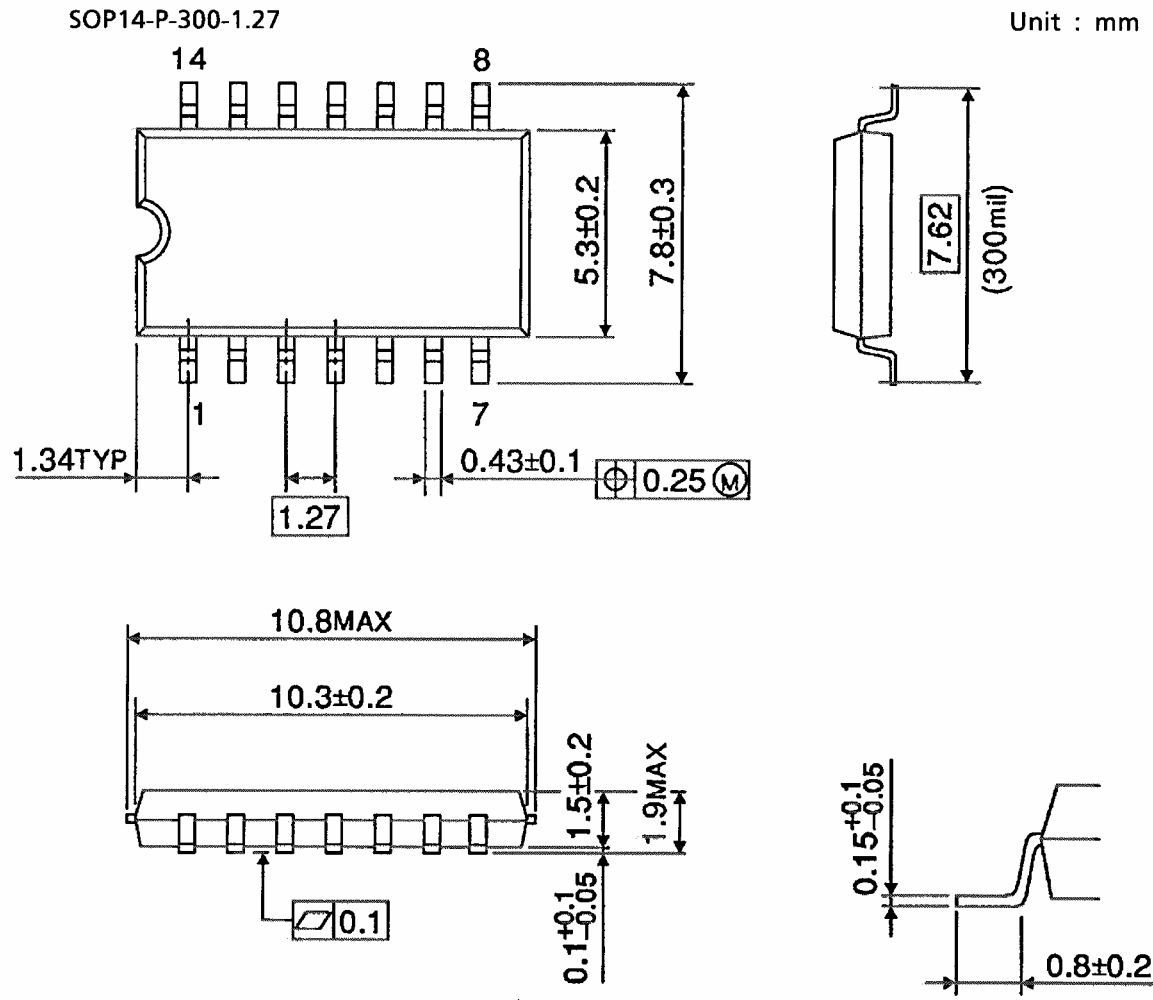
SOP14-P-300-1.27A

Unit: mm



Weight: 0.18 g (typ.)

Package Dimensions

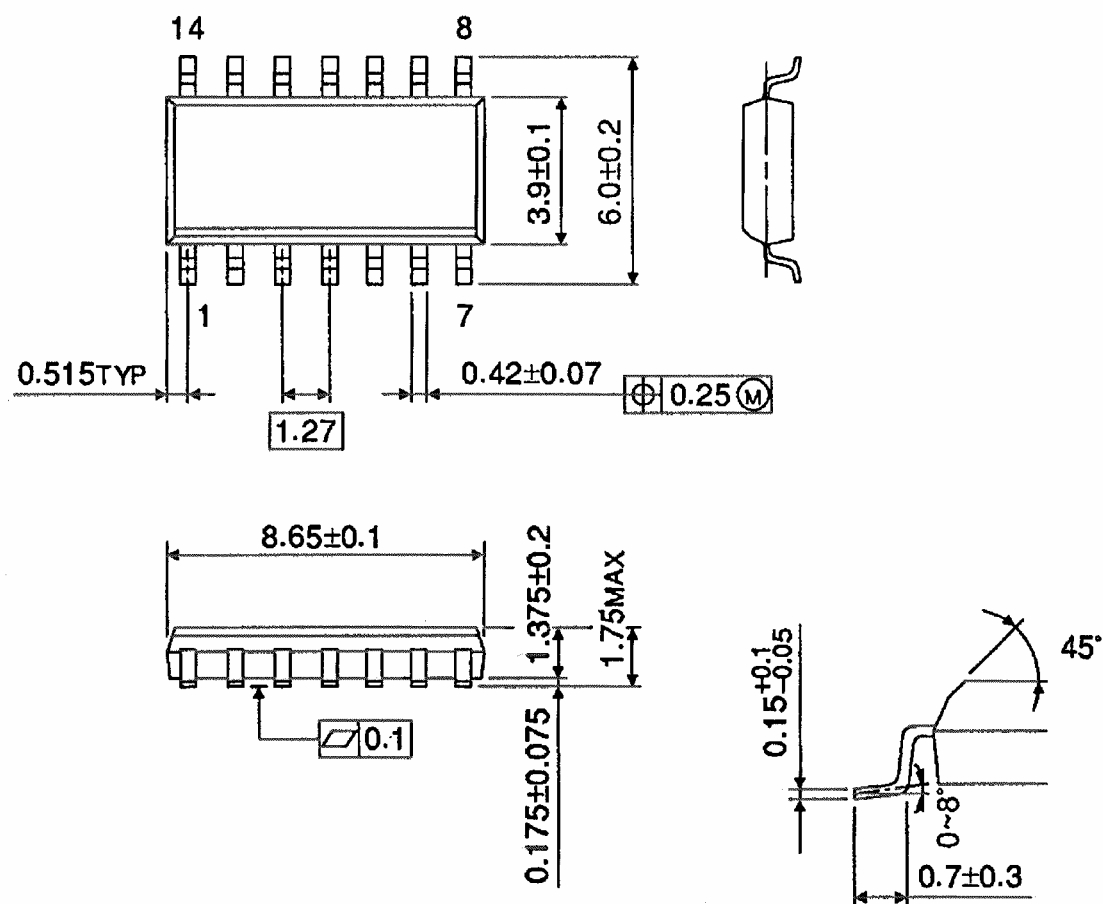


Weight: 0.18 g (typ.)

Package Dimensions (Note)

SOL14-P-150-1.27

Unit : mm



Note: This package is not available in Japan.

Weight: 0.12 g (typ.)

Note: Lead (Pb)-Free Packages**DIP14-P-300-2.54 SOP14-P-300-1.27A SOL14-P-150-1.27****RESTRICTIONS ON PRODUCT USE**

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