

TOSHIBA CMOS Digital Integrated Circuit Silicon Monolithic

TC74HC4078AP, TC74HC4078AF

8-Input OR/NOR Gate

The TC74HC4078A is a high speed CMOS 8-INPUT NOR GATE fabricated with silicon gate C²MOS technology.

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

Output X is an 8-INPUT NOR, output Y is an 8-INPUT OR.

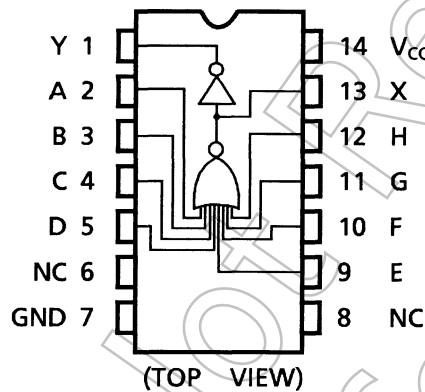
Each output has a buffer, which provide high noise immunity and stable output.

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

Features

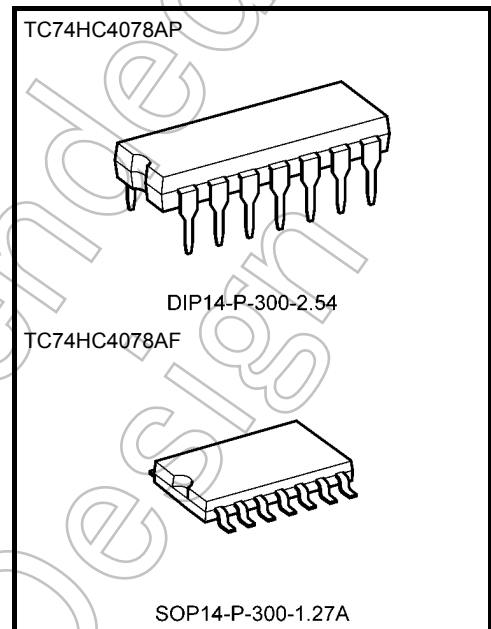
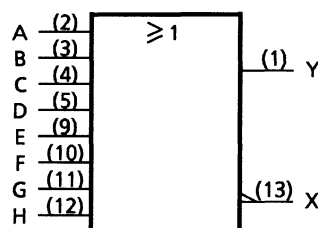
- High speed: $t_{pd} = 13 \text{ ns (typ.)}$ at $V_{CC} = 5 \text{ V}$
- Low power dissipation: $I_{CC} = 1 \mu\text{A (max)}$ at $T_a = 25^\circ\text{C}$
- High noise immunity: $V_{NIH} = V_{NIL} = 28\% V_{CC} \text{ (min)}$
- Output drive capability: 10 LSTTL loads
- Symmetrical output impedance: $|I_{OH}| = I_{OL} = 4 \text{ mA (min)}$
- Balanced propagation delays: $t_{pLH} \approx t_{pHL}$
- Wide operating voltage range: $V_{CC} \text{ (opr)} = 2 \text{ to } 6 \text{ V}$
- Pin and function compatible with 4078B

Pin Assignment



NC: No connection

IEC Logic Symbol



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

Start of commercial production
1988-11

Truth Table

Inputs A Through H	Outputs	
	X	Y
All Inputs L	H	L
All Other Combination	L	H

Absolute Maximum Ratings (Note 1)

Characteristics	Symbol	Rating	Unit
Supply voltage range	V_{CC}	-0.5 to 7	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}	± 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 to 150	$^{\circ}C$

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 $T_a = -40$ to $65^{\circ}C$. From $T_a = 65$ to $85^{\circ}C$ a derating factor of -10 mW/ $^{\circ}C$ shall be applied until 300 mW.

Operating Ranges (Note)

Characteristics	Symbol	Rating	Unit
Supply voltage	V_{CC}	2 to 6	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	$^{\circ}C$
Input rise and fall time	t_r, t_f	0 to 1000 ($V_{CC} = 2.0$ V) 0 to 500 ($V_{CC} = 4.5$ V) 0 to 400 ($V_{CC} = 6.0$ V)	ns

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	1.50	—	—	1.50	—	V	
				4.5	3.15	—	—	3.15	—		
				6.0	4.20	—	—	4.20	—		
Low-level input voltage	V _{IL}	—		2.0	—	—	0.50	—	0.50	V	
				4.5	—	—	1.35	—	1.35		
				6.0	—	—	1.80	—	1.80		
High-level output voltage	V _{OH}	V _{IN} = V _{IH} or V _{IL}	I _{OH} = -20 μA	2.0	1.9	2.0	—	1.9	—	V	
				4.5	4.4	4.5	—	4.4	—		
				6.0	5.9	6.0	—	5.9	—		
			I _{OH} = -4 mA	4.5	4.18	4.31	—	4.13	—		
				6.0	5.68	5.80	—	5.63	—		
Low-level output voltage	V _{OL}	V _{IN} = V _{IH} or V _{IL}	I _{OL} = 20 μA	2.0	—	0.0	0.1	—	0.1	V	
				4.5	—	0.0	0.1	—	0.1		
				6.0	—	0.0	0.1	—	0.1		
			I _{OL} = 4 mA	4.5	—	0.17	0.26	—	0.33		
				6.0	—	0.18	0.26	—	0.33		
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	—	—

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 _{TLH}	—	—	4	8	ns
	t _{THL}					
Propagation delay time	t _{pLH}	—	—	13	22	ns
	t _{pHL}					

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

Characteristics	Symbol	Test Condition	Ta = 25°C			Ta = -40 to 85°C		Unit	
			VCC (V)	Min	Typ.	Max	Min		Max
Output transition time	t_{TLH}	—	2.0	—	30	75	—	95	ns
	t_{THL}		4.5	—	8	15	—	19	
			6.0	—	7	13	—	16	
Propagation delay time	t_{pLH}	—	2.0	—	50	130	—	165	ns
	t_{pHL}		4.5	—	16	26	—	33	
			6.0	—	14	22	—	28	
Input capacitance	C_{IN}	—	—	5	10	—	10	pF	
Power dissipation capacitance	C_{PD}	(Note)	—	40	—	—	—	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:

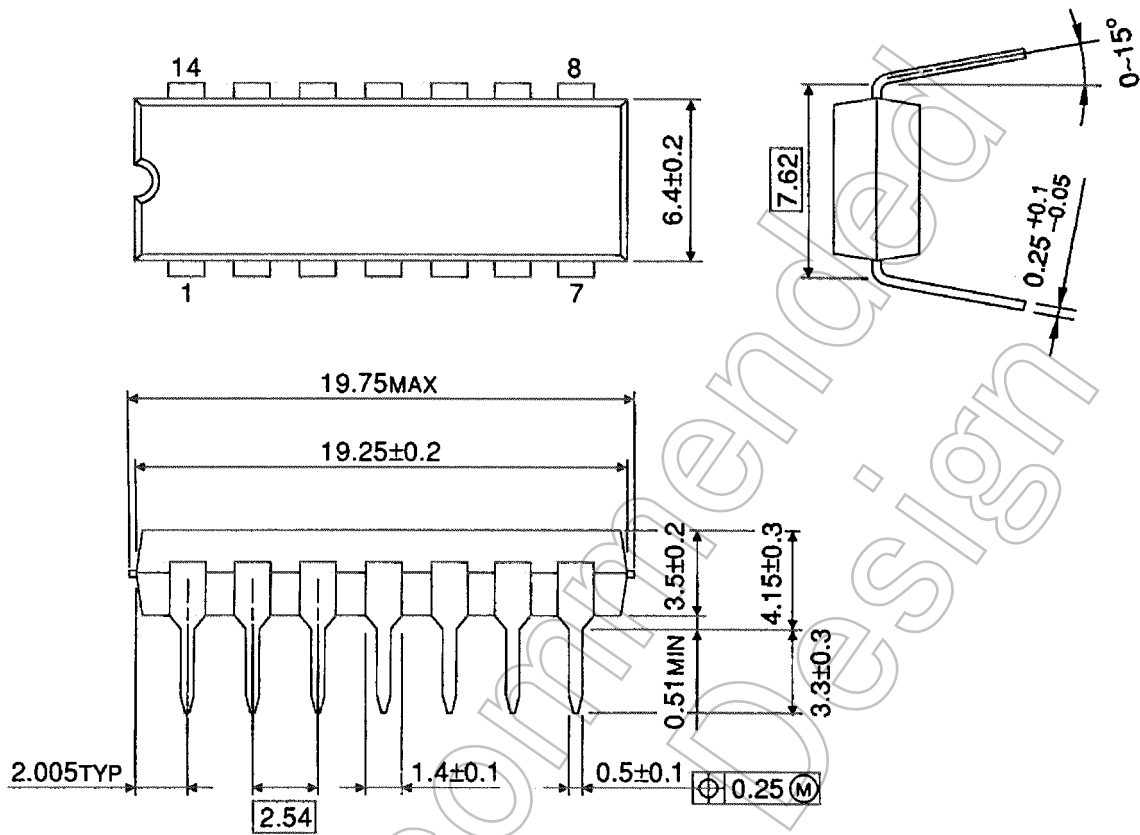
$$I_{CC} (opr) = C_{PD} \cdot V_{CC} \cdot f_{IN} + I_{CC}$$

Not Recommended for New Design

Package Dimensions

DIP14-P-300-2.54

Unit : mm



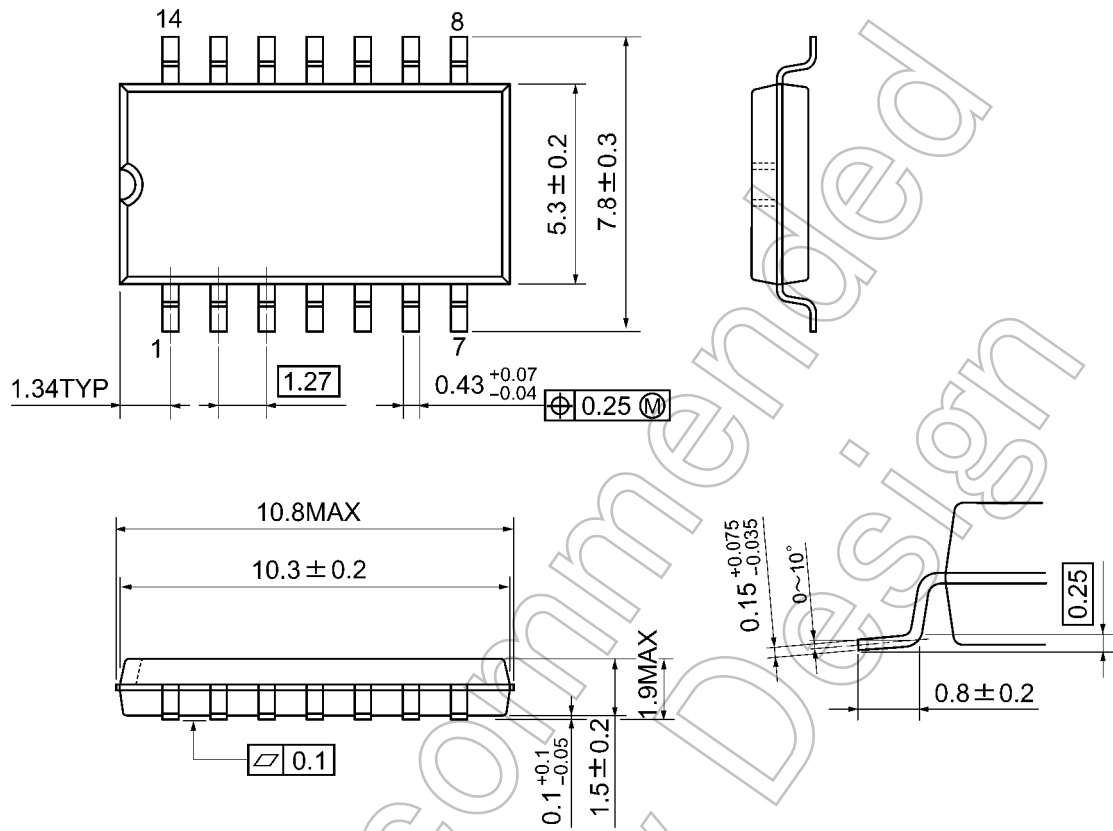
Weight: 0.96 g (typ.)

Not Recommended for New Design

Package Dimensions

SOP14-P-300-1.27A

Unit: mm



Weight: 0.18 g (typ.)

Not Recommended for New Design

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