

TOSHIBA CMOS Digital Integrated Circuit Silicon Monolithic

TC74HC367AP, TC74HC367AF TC74HC368AP, TC74HC368AF

Hex Bus Buffer

TC74HC367AP/AF	Non-Inverted (3-state)
TC74HC368AP/AF	Inverted (3-state)

The TC74HC367A and TC74HC368A are high speed CMOS 3-STATE BUS BUFFERS fabricated with silicon gate C²MOS technology.

They achieve the high speed operation similar to equivalent LSTTL while maintaining the CMOS low power dissipation.

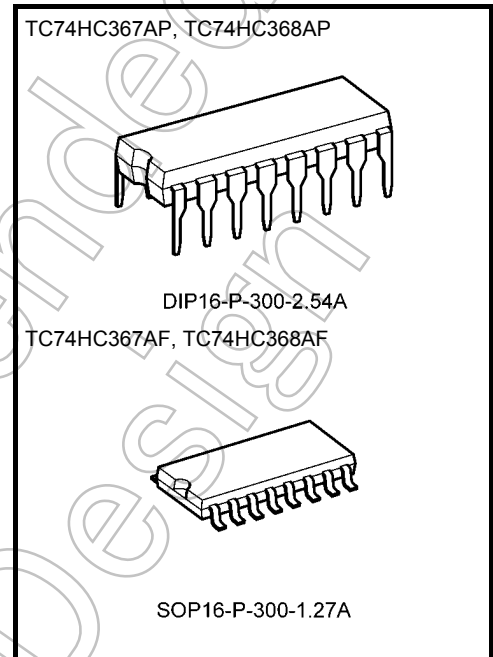
They contain six buffers; four buffers are controlled by an enable input ($\overline{G1}$), and the other two buffers are controlled by another enable input ($\overline{G2}$). The outputs of each buffer group are enabled when $\overline{G1}$ and/or $\overline{G2}$ inputs are held low; if held high, these outputs are in a high impedance state.

The TC74HC367A is a non-inverting output type, while the TC74HC368A is an inverting output type.

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

Features

- High speed: $t_{pd} = 11 \text{ ns (typ.)}$ at $V_{CC} = 5 \text{ V}$
- Low power dissipation: $I_{CC} = 4 \mu\text{A (max)}$ at $T_a = 25^\circ\text{C}$
- High noise immunity: $V_{NIH} = V_{NIL} = 28\% V_{CC}$ (min)
- Output drive capability: 15 LSTTL loads
- Symmetrical output impedance: $|I_{OH}| = I_{OL} = 6 \text{ mA}$
- 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 74LS367/368

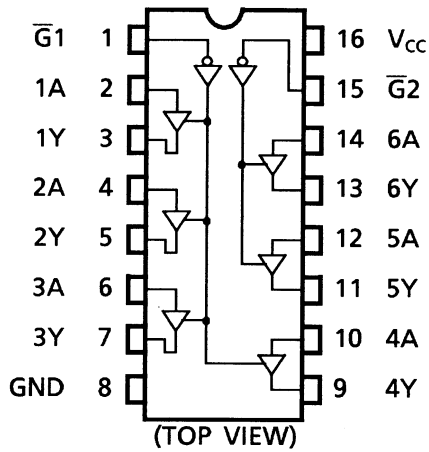


Weight	
DIP16-P-300-2.54A	: 1.00 g (typ.)
SOP16-P-300-1.27A	: 0.18 g (typ.)

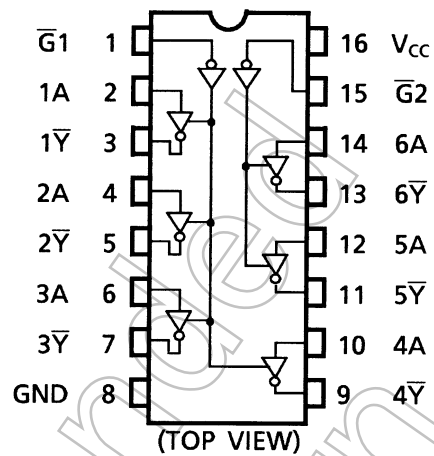
Start of commercial production
1987-11

Pin Assignment

TC74HC367A



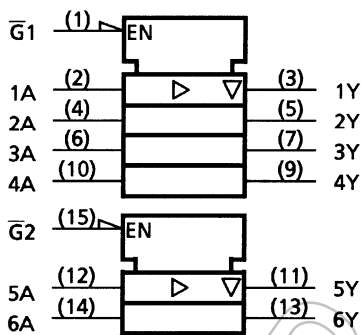
TC74HC368A



IEC Logic Symbol

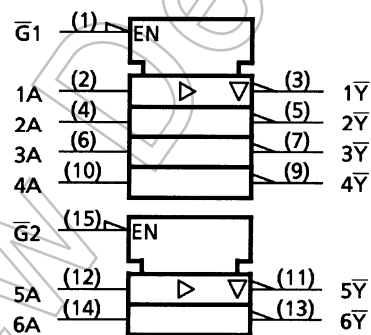
TC74HC367A

HEX BUS BUFFER
(3 - STATE)



TC74HC368A

HEX BUS BUFFER
(3 - STATE / INV.)



Truth Table

Inputs		Outputs	
\bar{G}	A_n	Y (367A)	\bar{Y} (368A)
L	L	L	H
L	H	H	L
H	X	Z	Z

X: Don't care

Z: High impedance

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}	± 35	mA
DC V_{CC} /ground current	I_{CC}	± 75	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			
				VCC (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} = -6 mA		4.5	4.18	4.31	—	4.13	—	
						I _{OH} = -7.8 mA		6.0	5.68	5.80	—	
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} = 6 mA		4.5	—	0.17	0.26	—	0.33	
				I _{OL} = 7.8 mA		6.0	—	0.18	0.26	—	0.33	
3-state output off-state current	I _{OZ}	V _{IN} = V _{IH} or V _{IL} V _{OUT} = V _{CC} or GND		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	—	—	4.0	—	40.0	μA		

Not Recommended for New Design

AC Characteristics (input: $t_r = t_f = 6$ ns)

Characteristics	Symbol	Test Condition			Ta = 25°C			Ta = -40 to 85°C		Unit		
		CL (pF)	VCC (V)		Min	Typ.	Max	Min	Max			
Output transition time	t_{TLH}	—	50	2.0	—	25	60	—	75	ns		
	t_{THL}			4.5	—	7	12	—	15			
				6.0	—	6	10	—	13			
Propagation delay time	t_{pLH}	—	50	2.0	—	36	95	—	120	ns		
				4.5	—	12	19	—	24			
				6.0	—	10	16	—	20			
	150		2.0	—	40	130	—	165				
			4.5	—	16	26	—	33				
			6.0	—	14	22	—	28				
Output enable time	t_{pZL}	$R_L = 1$ k Ω	50	2.0	—	36	120	—	150	ns		
				4.5	—	12	24	—	30			
				6.0	—	10	20	—	26			
	150		2.0	—	40	160	—	200				
			4.5	—	16	32	—	40				
			6.0	—	14	27	—	34				
Output disable time	t_{pLZ}	$R_L = 1$ k Ω	50	2.0	—	35	120	—	150	ns		
				4.5	—	15	24	—	30			
				6.0	—	13	20	—	26			
Input capacitance	C_{IN}					—	5	10	—		10	pF
						—	10	—	—		—	
						—	—	—	—		—	
Output capacitance	C_{OUT}				—	—	—	—	—	pF		
					—	—	—	—	—			
Power dissipation capacitance	C_{PD} (Note)	TC74HC367A			—	36	—	—	—	pF		
		TC74HC368A			—	30	—	—	—			

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

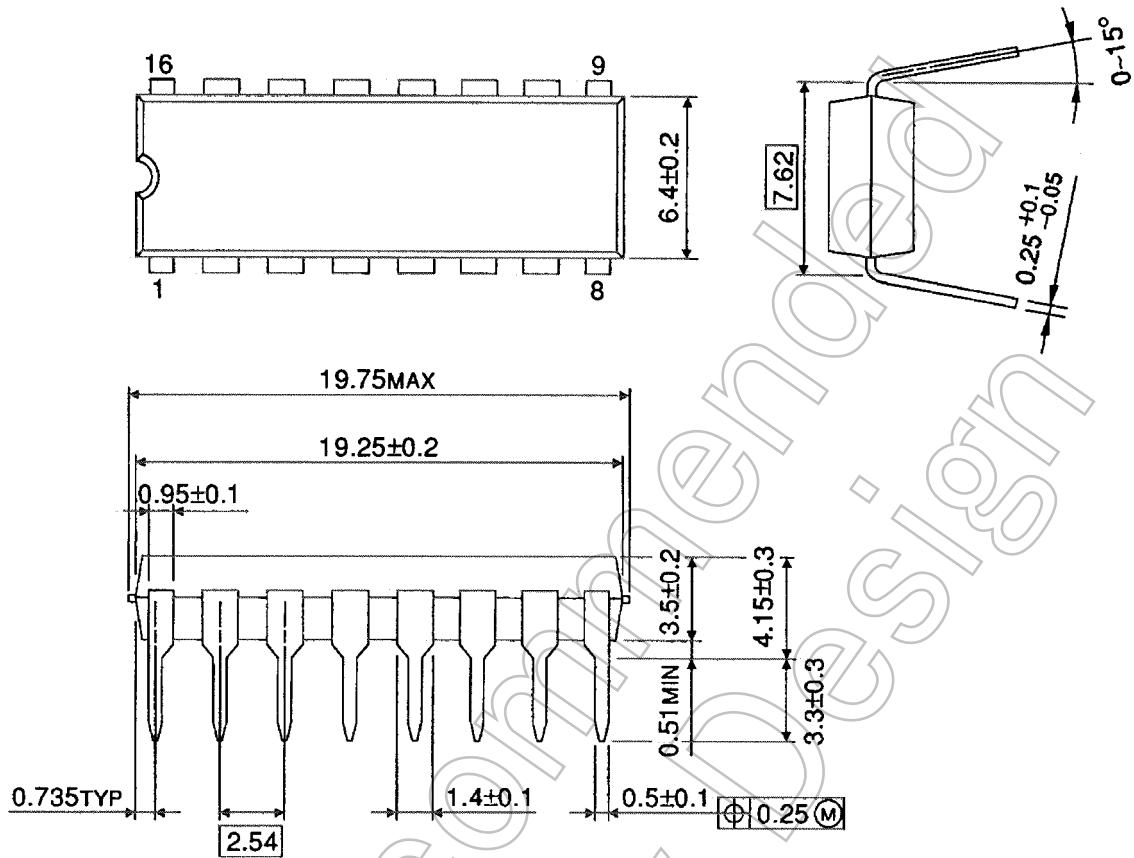
Average operating current can be obtained by the equation:

$$I_{CC} (opr) = C_{PD} \cdot V_{CC} \cdot f_{IN} + I_{CC}/6 \text{ (per bit)}$$

Package Dimensions

DIP16-P-300-2.54A

Unit : mm



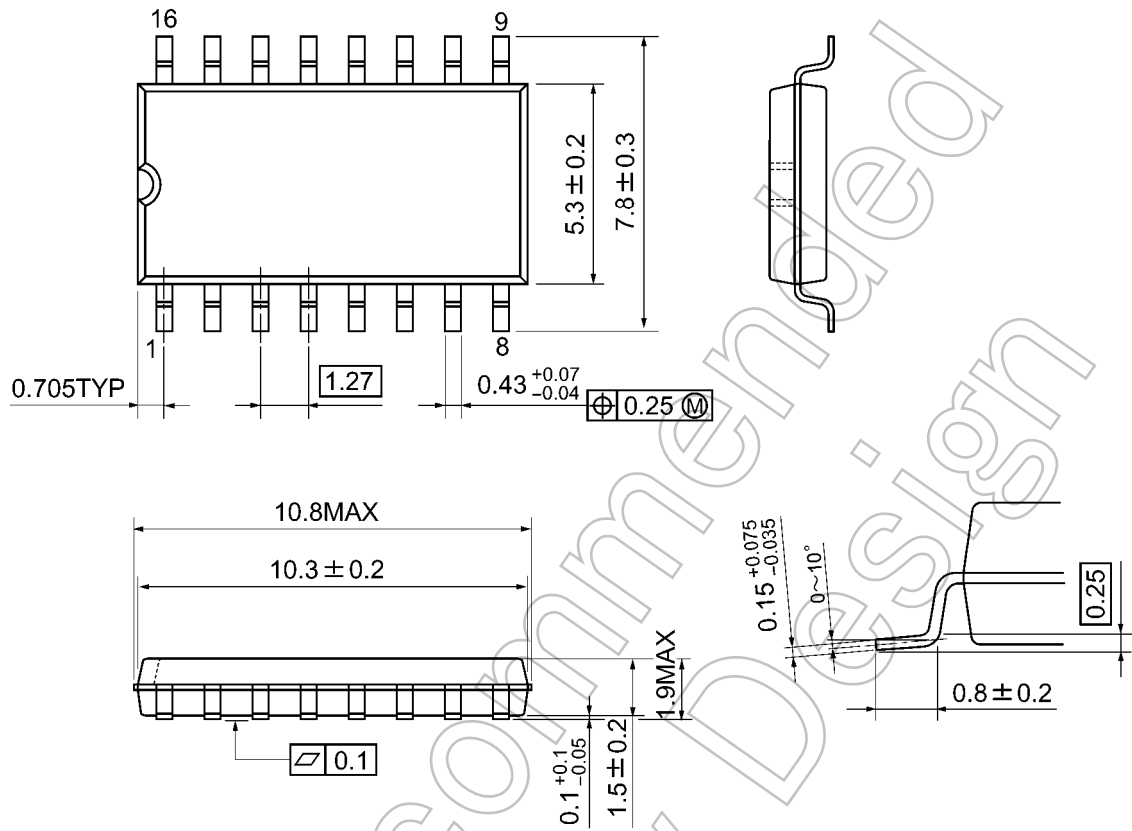
Weight: 1.00 g (typ.)

Not Recommended for New Design

Package Dimensions

SOP16-P-300-1.27A

Unit: mm



Weight: 0.18 g (typ.)

Not Recommended for New Design

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