

## TC74HC365AP, TC74HC365AF, TC74HC366AP, TC74HC366AF

### Hex Bus Buffer

TC74HC365AP/AF Non-Inverted (3-state)

TC74HC366AP/AF Inverted (3-state)

The TC74HC365A and TC74HC366A are high speed CMOS 3-STATE BUFFERS fabricated with silicon gate C<sup>2</sup>MOS technology.

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

The TC74HC366A is an inverting type, while the TC74HC365A is non-inverting.

All six buffers are controlled by the combination of two enable inputs ( $\overline{G1}$  and  $\overline{G2}$ ); the outputs of these buffers are enabled only when both  $\overline{G1}$  and  $\overline{G2}$  inputs held low, and at the other combinations, these outputs are disabled to the high impedance state.

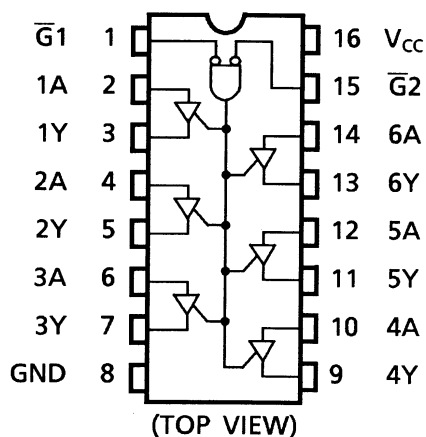
All inputs are equipped with protection circuits against static discharge or transient excess voltage.

### Features

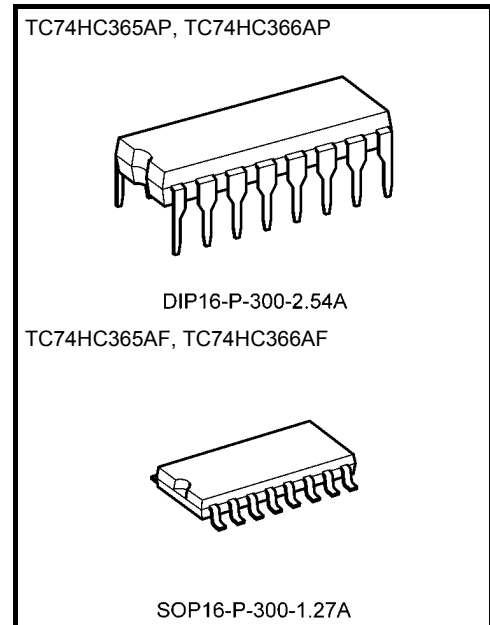
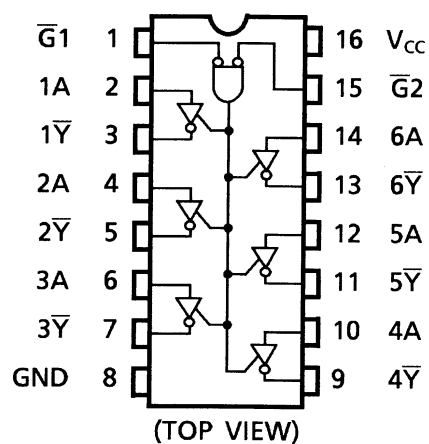
- High speed:  $t_{pd} = 9 \text{ ns}$  (typ.) at  $V_{CC} = 5 \text{ V}$
- Low power dissipation:  $I_{CC} = 4 \mu\text{A}$  (max) at  $T_a = 25^\circ\text{C}$
- High noise immunity:  $V_{NIH} = V_{NIL} = 28\% V_{CC}$  (min)
- Output drive capability: 15 LSTTL loads
- Symmetrical output impedance:  $|I_{OH}| = I_{OL} = 6 \text{ mA}$  (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 74LS365/366

### Pin Assignment

#### TC74HC365A



#### TC74HC366A

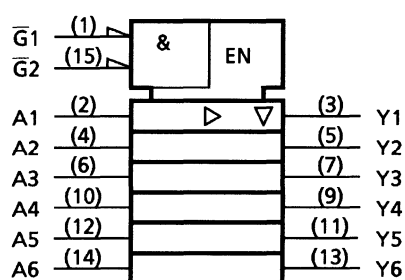


Weight	
DIP16-P-300-2.54A	: 1.00 g (typ.)
SOP16-P-300-1.27A	: 0.18 g (typ.)

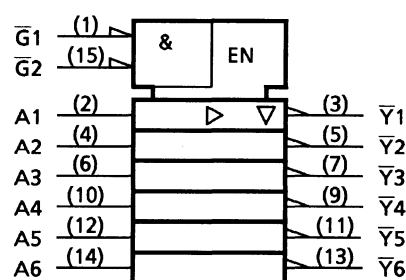
Start of commercial production  
1988-05

## IEC Logic Symbol

### TC74HC365A



### TC74HC366A



## Truth Table

Inputs			Outputs	
$\bar{G}1$	$\bar{G}2$	$A_n$	$Y_n$ (365A)	$\bar{Y}_n$ (366A)
L	L	L	L	H
L	L	H	H	L
H	X	X	Z	Z
X	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	$I_{IK}$	$\pm 20$	mA
Output diode current	$I_{OK}$	$\pm 20$	mA
DC output current	$I_{OUT}$	$\pm 35$	mA
DC $V_{CC}$ /ground current	$I_{CC}$	$\pm 75$	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	°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	$T_a = 25^\circ\text{C}$			$T_a = -40$ to $85^\circ\text{C}$		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 $V_{IL}$	$I_{OH} = -20 \mu\text{A}$	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	—	
Low-level output voltage	$V_{OL}$	$V_{IN} = V_{IH}$ or $V_{IL}$	$I_{OL} = 20 \mu\text{A}$	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	
Low-level output voltage	$V_{OL}$	$V_{IN} = V_{IH}$ or $V_{IL}$	$I_{OL} = 6 \text{ mA}$	4.5	—	0.17	0.26	—	0.33	V
				6.0	—	0.18	0.26	—	0.33	
				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	—	—	$\pm 0.5$	—	$\pm 5.0$	$\mu\text{A}$	
Input leakage current	$I_{IN}$	$V_{IN} = V_{CC}$ or GND	6.0	—	—	$\pm 0.1$	—	$\pm 1.0$	$\mu\text{A}$	
Quiescent supply current	$I_{CC}$	$V_{IN} = V_{CC}$ or GND	6.0	—	—	4.0	—	40.0	$\mu\text{A}$	

## 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	$t_{TLH}$ $t_{THL}$	—	50	2.0	—	20	60	—	75	ns
				4.5	—	6	12	—	15	
				6.0	—	5	10	—	13	
Propagation delay time	$t_{pLH}$ $t_{pHL}$	—	50	2.0	—	38	90	—	115	ns
				4.5	—	12	18	—	23	
				6.0	—	10	15	—	20	
			150	2.0	—	51	130	—	165	
				4.5	—	17	26	—	33	
				6.0	—	14	22	—	28	
Output enable time	$t_{pZL}$ $t_{pZH}$	$R_L = 1$ k $\Omega$	50	2.0	—	56	130	—	165	ns
				4.5	—	17	26	—	33	
				6.0	—	13	22	—	28	
			150	2.0	—	69	170	—	215	
				4.5	—	22	34	—	44	
				6.0	—	17	29	—	37	
Output disable time	$t_{pLZ}$ $t_{pHZ}$	$R_L = 1$ k $\Omega$	50	2.0	—	42	130	—	165	ns
				4.5	—	18	26	—	33	
				6.0	—	15	22	—	28	
Input capacitance	$C_{IN}$	—	—	—	5	10	—	10	pF	
Output capacitance	$C_{OUT}$	—	—	—	10	—	—	—	pF	
Power dissipation capacitance	$C_{PD}$ (Note)	—	—	—	25	—	—	—	pF	

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

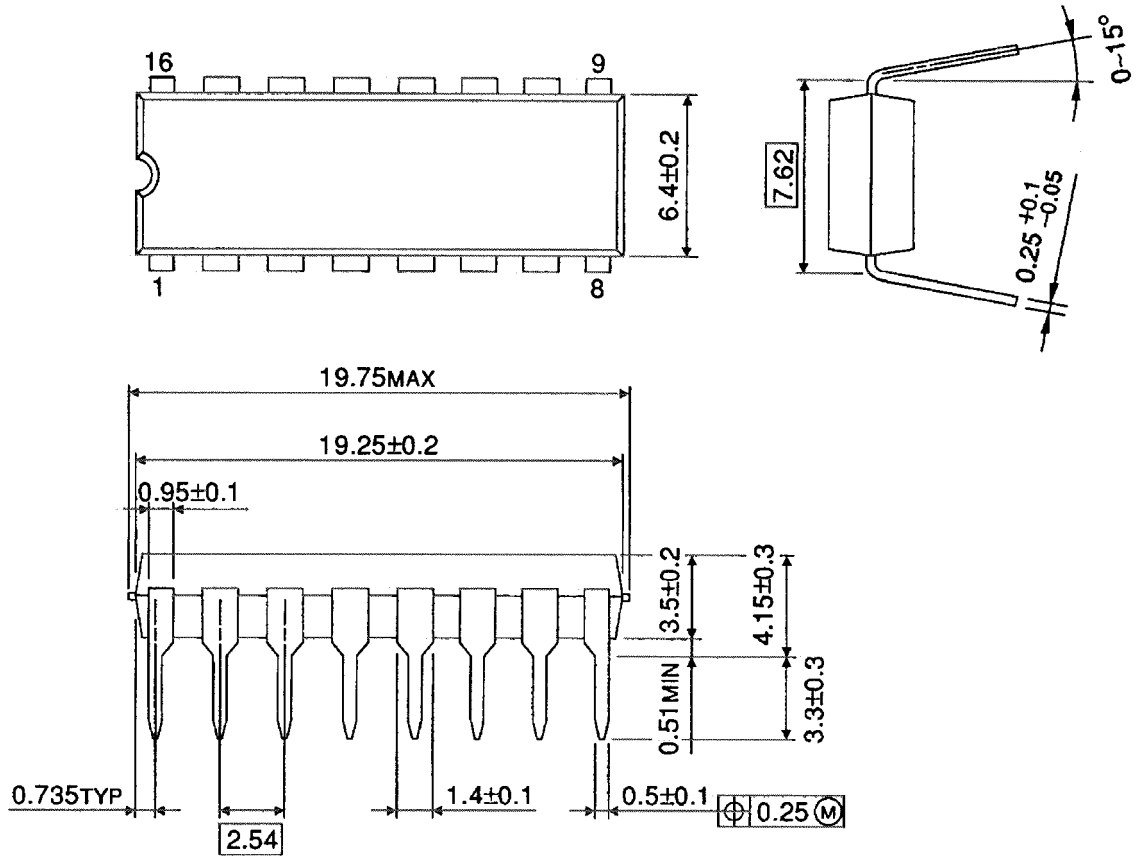
Average operating current can be obtained by the equation:

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

**Package Dimensions**

DIP16-P-300-2.54A

Unit : mm

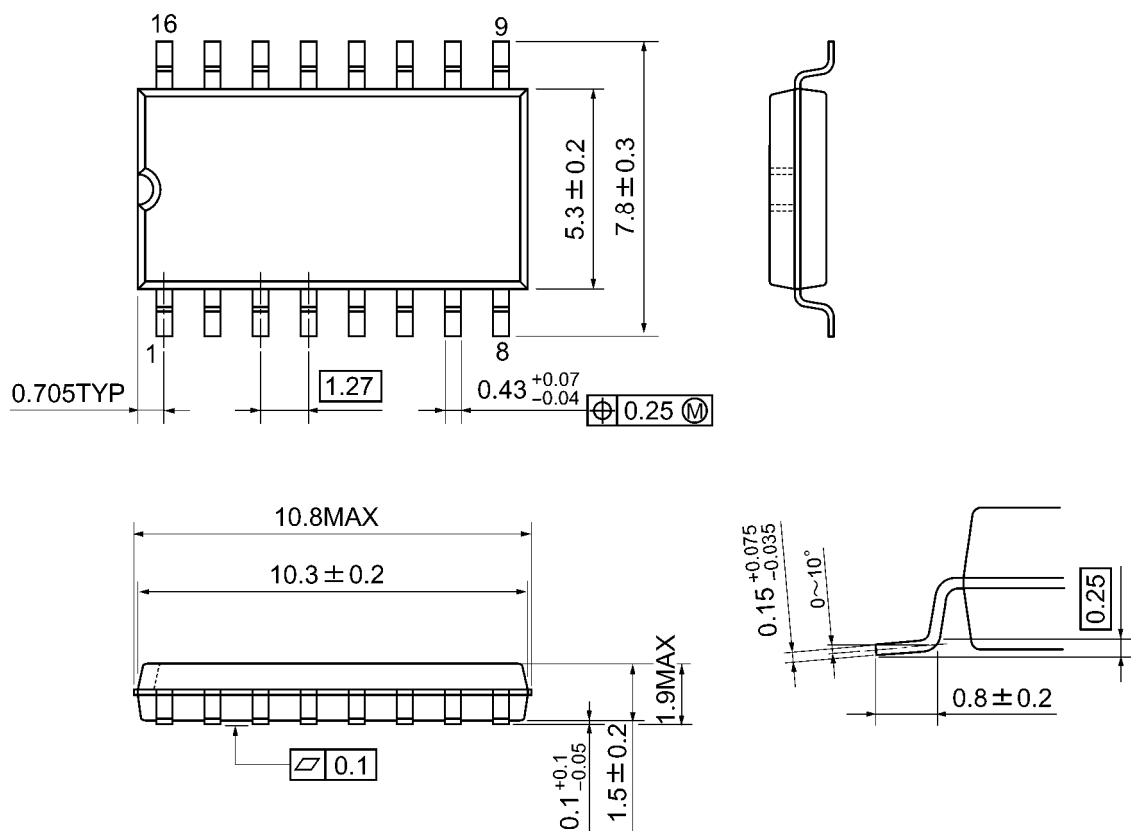


Weight: 1.00 g (typ.)

## Package Dimensions

SOP16-P-300-1.27A

Unit: mm



Weight: 0.18 g (typ.)

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