TOSHIBA CMOS Digital Integrated Circuit Silicon Monolithic

TC74HC05AP,TC74HC05AF

Hex Inverter (open drain)

The TC74HC05A is a high speed CMOS INVERTER 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 TC74HC04A, but the TC74HC05A has high performance MOS N-channel transistor (open-drain) outputs.

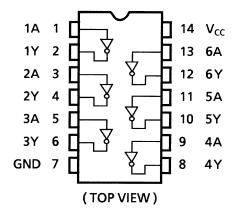
This device can, therefore, with a suitable pull-up resistors, be used in wired-AND, LED drive and other applications.

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

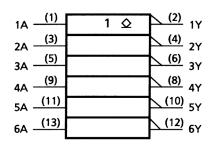
Features

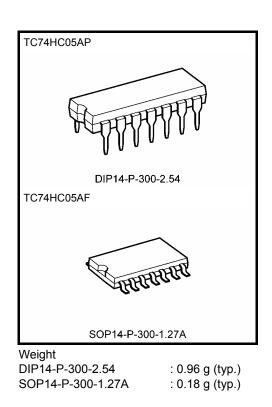
- High speed: $t_{pz} = 8 \text{ ns}$ (typ.) at $V_{CC} = 5 \text{ V}$
- Low power dissipation: $I_{CC} = 1 \ \mu A \ (max)$ at $Ta = 25^{\circ}C$
- High noise immunity: $V_{NIH} = V_{NIL} = 28\% V_{CC}$ (min)
- Output drive capability: 10 LSTTL loads
- Wide operating voltage range: V_{CC} (opr) = 2~6 V
- Open drain structure.
- Pin and function compatible with 74LS05

Pin Assignment



IEC Logic Symbol





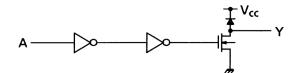
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Truth Table

А	Y
L	Z
Н	L

Z: High impedance

System Diagram (per gate)



Absolute Maximum Ratings (Note 1)

Characteristics	Symbol	Rating	Unit
Supply voltage range	V _{CC}	-0.5~7	V
DC input voltage	V _{IN}	-0.5~V _{CC} + 0.5	V
DC output voltage	V _{OUT}	-0.5~V _{CC} + 0.5	V
Input diode current	IIK	±20	mA
Output diode current	I _{OK}	±20	mA
DC output current	IOUT	+25	mA
DC V _{CC} /ground current	ICC	±50	mA
Power dissipation	PD	500 (DIP) (Note 2)/180 (SOP)	mW
Storage temperature	T _{stg}	-65~150	°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 $Ta = -40 \sim 65^{\circ}$ C. From Ta = 65 to 85° C a derating factor of -10 mW/°C shall be applied until 300 mW.

Operating Ranges (Note)

Characteristics	Symbol	Rating	Unit
Supply voltage	V _{CC}	2~6	V
Input voltage VIN		0~V _{CC}	V
Output voltage	V _{OUT}	0~V _{CC}	V
Operating temperature	T _{opr}	-40~85	°C
		0~1000 (V _{CC} = 2.0 V)	
Input rise and fall time	t _r , t _f	0~500 (V _{CC} = 4.5 V)	ns
		0~400 (V _{CC} = 6.0 V)	

Note: The operating ranges must be maintained to ensure the normal operation of the device. Unused inputs must be tied to either VCC or GND.

Electrical Characteristics

DC Characteristics

Characteristics Symbol		Test Condition		Ta = 25°C			Ta = -40~85°C			
			V _{CC} (V)	Min	Тур.	Max	Min	Max	Unit	
				2.0	1.50	_	_	1.50	_	
High-level input voltage	VIH	—		4.5	3.15	—		3.15	—	V
				6.0	4.20	—	—	4.20	—	
				2.0	_	_	0.50	_	0.50	
Low-level input V _{IL} Voltage	VIL		—	4.5	—	—	1.35	—	1.35	V
				6.0	—	—	1.80	—	1.80	
	V _{OL}	V _{IN} = V _{IH}		2.0	_	0.0	0.1	_	0.1	
			$I_{OL} = 20 \ \mu A$	4.5	—	0.0	0.1	—	0.1	
Low-level output voltage				6.0	—	0.0	0.1	_	0.1	V
			$I_{OL} = 4 \text{ mA}$	4.5	_	0.17	0.26	_	0.33	
			I _{OL} = 5.2 mA	6.0	—	0.18	0.26	—	0.33	
Output off-state	I _{OZ}	V _{IN} = V _{IH} or V _{IL} V _{OUT} = V _{CC}		6.0	_	_	±0.5	_	±5.0	μA
current	02									
Input leakage current	I _{IN}	$V_{IN} = V_{CC}$ or GND		6.0	_	_	±0.1	—	±1.0	μA
Quiescent supply current	ICC	$V_{IN} = V_{CC}$ or GND		6.0	_	_	1.0	_	10.0	μA

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

Characteristics	Symbol	Test Condition	Min	Тур.	Max	Unit
Output transition time	t _{THL}	—	_	4	8	ns
Propagation delay time	t _{pLZ}	$R_L = 1 \ k\Omega$		8	15	ns
Propagation delay time	t _{pZL}	$R_L = 1 \ k\Omega$	_	6	15	ns

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

		Test Condition		Ta = 25°C			Ta = −40~85°C		
Characteristics Symbol	Symbol		V _{CC} (V)	Min	Тур.	Max	Min	Max	Unit
			2.0	_	30	75	_	95	
Output transition time	t _{THL}	—	4.5	_	8	15	_	19	ns
			6.0	—	7	13	_	16	
			2.0	_	20	90	_	115	
Propagation delay time	t _{pLZ}	$R_L = 1 \ k\Omega$	4.5	_	11	18	_	23	ns
			6.0	—	10	15	_	20	
Propagation delay time			2.0	_	33	90	_	115	
	t _{pZL}	$R_L = 1 \ k\Omega$	4.5	—	9	18	—	23	ns
			6.0	—	7	15	—	20	
Input capacitance	CIN	_		_	5	10	_	10	pF
Output capacitance	C _{OUT}	—		_	3		_		pF
Power dissipation capacitance	C _{PD} (Note)	_		_	7	_	_	_	pF

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

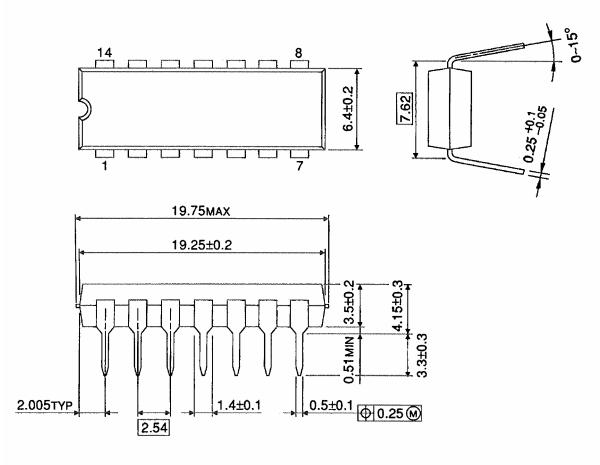
Average operating current can be obtained by the equation:

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

Package Dimensions

DIP14-P-300-2.54

Unit : mm



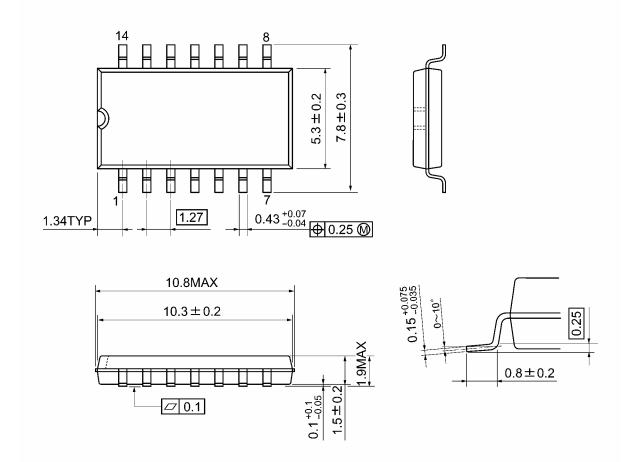
Weight: 0.96 g (typ.)

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Package Dimensions

SOP14-P-300-1.27A

Unit: mm



Weight: 0.18 g (typ.)

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20070701-EN GENERAL

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