### **CMOS DIGITAL INTEGRATED CIRCUIT**

### 2-Input NAND Gate

The TC7S00 is a high speed CMOS 2-input NAND Gate fabricated with silicon gate CMOS technology.

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

This device may be used as a level converter for interfacing TTL or NMOS to High Speed CMOS. The input are compatible with TTL, NMOS and CMOS output voltage levels.

The internal circuit is composed of 3-stages including buffer output, which provide high noise immunity and stable output.

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

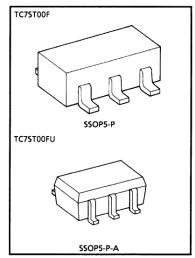
Output currents are 1/2 compared to TC74HC series models. Some AC electrical characteristic is different from TC74HCT series models.

#### **Features**

- High speed
  - $t_{pd}$  = 10ns (Typ.) at  $V_{CC}$  = 5V
- Low Power Dissipation
  - $I_{CC} = 1 \mu A \text{ (Max.)} \text{ at Ta} = 25 ^{\circ} \text{C}$
- Compatible with TTL outputs
  - $V_{IL} = 0.8V$  (Max.),  $V_{IH} = 2.0V$  (Min.)
- Output Drive Capability
  - 5 LSTTL Loads
- Symmetrical Output Impedance
  - $II_{OH}I = I_{OL} = 2mA$

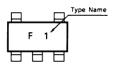
#### **Maximum Ratings**

Characteristics	Symbol	Condition	Unit
Supply Voltage Range	V <sub>CC</sub>	-0.5~7	V
DC Input Voltage	V <sub>IN</sub>	-0.5~V <sub>CC</sub> + 0.5	V
DC Output Voltage	V <sub>OUT</sub>	-0.5~V <sub>CC</sub> + 0.5	V
Input Diode Current	I <sub>IK</sub>	±20	mA
Output Diode Current	I <sub>OK</sub>	±20	mA
DC Output Current	I <sub>OUT</sub>	±12.5	mA
DC V <sub>CC</sub> / Ground Current	I <sub>CC</sub>	±25	mA
Power Dissipation	P <sub>D</sub>	200	mW
Storage Temperature	T <sub>stg</sub>	-65~150	°C
Lead Temperature (10s)	T <sub>L</sub>	260	°C



Weight SSOP5-P : 0.016g (Typ.) SSOP5-P-A : 0.006g (Typ.)

### Marking



**Truth Table** 

Α	В	Υ
L	L	Н
L	Н	Н
Н	L	Н
Н	Н	L

The information contained here is subject to change without notice.

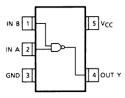
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## **Logic Diagram**



# Pin Assignment (Top View)



## **Recommended Operating Conditions**

Characteristics	Symbol	Symbol Condition	
Supply Voltage	V <sub>CC</sub>	4.5~5.5	V
Input Voltage	V <sub>IN</sub>	0~V <sub>CC</sub>	V
Output Voltage	V <sub>OUT</sub>	0~V <sub>CC</sub>	V
Operating Temperature	T <sub>opr</sub>	-40~85	°C
Input Rise and Fall Time	t <sub>r</sub> , t <sub>f</sub>	0~ 500 (V <sub>CC</sub> = 5.0V)	ns

### **DC Electrical Characteristics**

				Ta = 25°C			Ta = -40~85°C			
Characteristic	Symbol Test Condition		V <sub>CC</sub> (V)	Min.	Тур.	Max.	Min.	Max	Unit	
High-Level Input Voltage	V <sub>IH</sub>	_		4.5~ 5.5	2.0	_	-	2.0	_	V
Low-Level Input Voltage	V <sub>IL</sub>	-		4.5~ 5.5	-	_	0.8	_	0.8	V
High-Level Output Voltage	V <sub>OH</sub>	V <sub>IN</sub> = V <sub>IH</sub> or V <sub>IL</sub>	I <sub>OH</sub> = -20 μA	4.5	4.4	4.5	_	4.4	_	V
			I <sub>OH</sub> = -2mA	4.5	4.18	4.31	_	4.13	_	
Low-Level Output Voltage	Low-Level Output Voltage V <sub>OL</sub>	V <sub>IN</sub> = V <sub>IH</sub> or V <sub>IL</sub>	I <sub>OL</sub> = 20 μA	4.5	_	0.0	0.1	-	0.1	V
Low-Level Output voltage			I <sub>OL</sub> = 2mA	4.5	_	0.17	0.26	_	0.33	1
Input Leakage Current	I <sub>IN</sub>	$V_{IN} = V_{CC}$ or GND		5.5	_	_	±0.1	_	±0.1	μΑ
	I <sub>CC</sub>	$V_{IN} = V_{CC}$ or GND		5.5	_	_	1.0	_	10.0	μΑ
Quiescent Supply Current	I <sub>C</sub>	Per Input	:: V <sub>IN</sub> = 0.5V or 2.4V	5.5	-	_	2.0	_	2.9	mA

Output currents are 1/2 compared to TC74HC series models. Some AC electrical characteristic is different from TC74HC series models.

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# AC Electrical Characteristics ( $C_L = 15pF, V_{CC} = 5V, Ta = 25^{\circ}C$ )

Characteristic	Symbol	Test Condition	Min.	Typ.	Max.	Unit
Output Transition Time	t <sub>TLH</sub> t <sub>THL</sub>	_	-	5	10	ns
Propagation Delay Time	t <sub>pLH</sub> t <sub>pHL</sub>	-	-	10	17	ns

# AC Electrical Characteristics ( $C_L = 50pF$ , Input $t_r = t_f = 6ns$ )

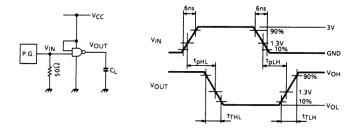
Characteristic	Symbol	Test Condition		Ta = 25°C			Ta = -4	Unit	
			V <sub>CC</sub>	Min.	Тур.	Max.	Min.	Max	
Output Transition Time	t <sub>TLH</sub> t <sub>THL</sub>	_	4.5 5.5	_ _	14 12	25 21	- -	31 26	ns
Propagation Delay Time	t <sub>pLH</sub> t <sub>pHL</sub>	_	45. 5.5	_ _	17 15	29 26	_ _	36 33	ns
Input Capacitance	C <sub>IN</sub>	_	•	_	5	10	_	10	pF
Power Dissipation Capacitance	C <sub>PD</sub>	(Note 1)		_	10	_	_	_	pF

Note 1:  $C_{PD}$  defined as the value of internal equivalent capacitance of IC which is calculated from the operating current consumption without load.

Average operating current can be obtained by the equation hereunder.

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

# **Switching Characteristics Test Circuit**



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