

2-Input NOR Gate

The TC7S02 is a high speed CMOS 2-input NOR 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.

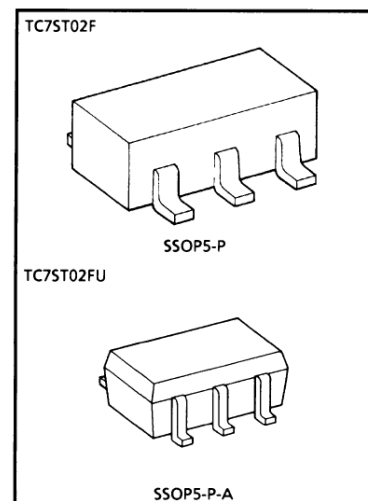
Some AC electrical characteristic is different from TC74HCT series models.

Features

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

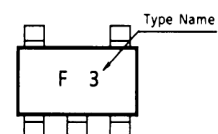
Maximum Ratings

Characteristics	Symbol	Condition	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	I_{IK}	± 20	mA
Output Diode Current	I_{OK}	± 20	mA
DC Output Current	I_{OUT}	± 12.5	mA
DC V_{CC} / Ground Current	I_{CC}	± 25	mA
Power Dissipation	P_D	200	mW
Storage Temperature	T_{stg}	-65~150	$^\circ\text{C}$
Lead Temperature (10s)	T_L	260	$^\circ\text{C}$



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

Marking



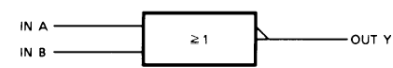
Truth Table

A	B	Y
L	L	H
L	H	L
H	L	L
H	H	L

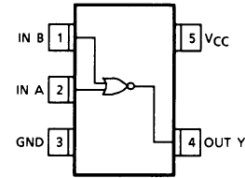
The information contained here is subject to change without notice.

The information contained herein is presented only as guide for the applications of our products. No responsibility is assumed by TOSHIBA for any infringements of patents or other rights of the third parties which may result from its use. No license is granted by implication or otherwise under any patent or patent rights of TOSHIBA or others. These TOSHIBA products are intended for usage in general electronic equipments (office equipment, communication equipment, measuring equipment, domestic electrification, etc.) Please make sure that you consult with us before you use these TOSHIBA products in equipments which require high quality and/or reliability, and in equipments which could have major impact to the welfare of human life (atomic energy control, spaceship, traffic signal, combustion control, all types of safety devices, etc.). TOSHIBA cannot accept liability to any damage which may occur in case these TOSHIBA products were used in the mentioned equipments without prior consultation with TOSHIBA.

Logic Diagram



Pin Assignment (Top View)



Recommended Operating Conditions

Characteristics	Symbol	Condition	Unit
Supply Voltage	V _{CC}	4.5~5.5	V
Input Voltage	V _{IN}	0~V _{CC}	V
Output Voltage	V _{OUT}	0~V _{CC}	V
Operating Temperature	T _{opr}	-40~85	°C
Input Rise and Fall Time	t _r , t _f	0~ 500 (V _{CC} = 5.0V)	ns

DC Electrical Characteristics

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

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

Characteristic	Symbol	Test Condition	Min.	Typ.	Max.	Unit
Output Transition Time	t_{TLH} t_{THL}	—	—	5	10	ns
Propagation Delay Time	t_{pLH} t_{pHL}	—	—	10	17	ns

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

Characteristic	Symbol	Test Condition		Ta = 25°C			Ta = -40~85°C		Unit
			VCC	Min.	Typ.	Max.	Min.	Max	
Output Transition Time	tTLH tTHL	—	4.5 5.5	— —	14 12	25 21	— —	31 26	ns
Propagation Delay Time	tPLH tPHL	—	4.5 5.5	— —	16 15	27 26	— —	34 33	ns
Input Capacitance	CIN	—		—	5	10	—	10	pF
Power Dissipation Capacitance	CPD	(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.

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

Switching Characteristics Test Circuit