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.

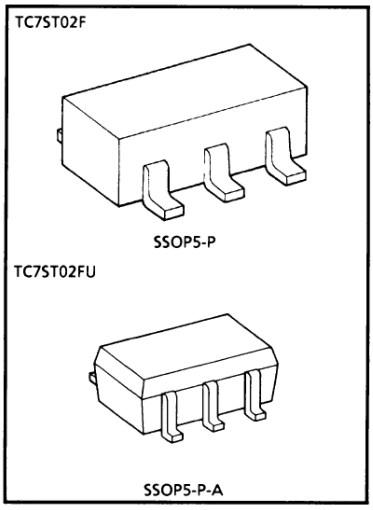
This device may be used as a level converter for interfacing TTL or NMOS to High Speed CMOS. The input are compatible with TTL, NMOS and CMOS output voltage levels.

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.



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

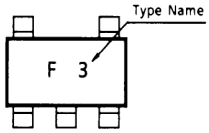
Features

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

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	°C
Lead Temperature (10s)	T_L	260	°C

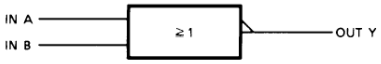
Marking



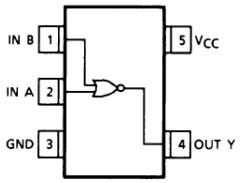
Truth Table

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

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		V_{CC} (V)	Ta = 25°C			Ta = -40~85°C		Unit
					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 = 15pF, V_{CC} = 5V, Ta = 25°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 = 50pF, Input t_r = t_f = 6ns)

Characteristic	Symbol	Test Condition		Ta = 25°C			Ta = -40~85°C		Unit
			V_{CC}	Min.	Typ.	Max.	Min.	Max	
Output Transition Time	t_{TLH} t_{THL}	–	4.5 5.5	– –	14 12	25 21	– –	31 26	ns
Propagation Delay Time	t_{pLH} t_{pHL}	–	4.5 5.5	– –	16 15	27 26	– –	34 33	ns
Input Capacitance	C_{IN}	–		–	5	10	–	10	pF
Power Dissipation Capacitance	C_{PD}	(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.
$I_{CC\ (opr)} = C_{PD} \bullet V_{CC} \bullet f_{IN} + I_{CC}$

Switching Characteristics Test Circuit