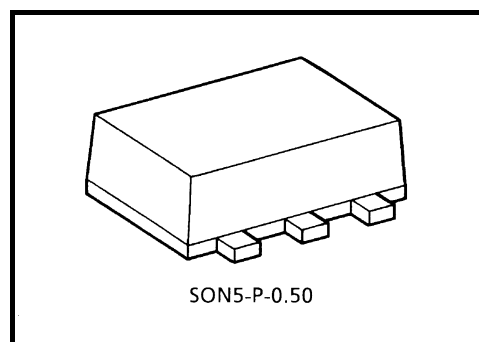


TC7SZ02AFE

2 Input NOR Gate

Features

- High output drive: ± 24 mA (typ.)
@ $V_{CC} = 3$ V
- Super high speed operation: t_{PD} 2.4 ns (typ.)
@ $V_{CC} = 5$ V, 50 pF
- Operation voltage range: $V_{CC} (opr) = 1.8 \sim 5.5$ V
- Supply voltage data retention: $V_{CC} = 1.5 \sim 5.5$ V
- Latch-up performance: ± 500 mA
- ESD performance: Human body model $> \pm 2000$ V
Machine model $> \pm 200$ V
- Power down protection is provided on all inputs.
- Matches the performance of TC74LCX series when operated at 3.3 V V_{CC}
- Input rise and fall time (t_r , t_f) (recommended operation condition)
@ $V_{CC} = 1.8$ V, 2.5 V ± 0.2 V: 0~20 ns/V
@ $V_{CC} = 3.3$ V ± 0.3 V: 0~10 ns/V
@ $V_{CC} = 5.5$ V ± 0.5 V: 0~5 ns/V



Weight: 0.003 g (typ.)

Absolute Maximum Ratings ($T_a = 25^\circ\text{C}$)

Characteristics	Symbol	Rating	Unit
Supply voltage range	V_{CC}	$-0.5 \sim 6$	V
DC input voltage	V_{IN}	$-0.5 \sim 6$	V
DC output voltage	V_{OUT}	$-0.5 \sim V_{CC} + 0.5$	V
Input diode current	I_{IK}	± 20	mA
Output diode current	I_{OK}	± 20	mA
DC output current	I_{OUT}	± 50	mA
DC V_{CC} /ground current	I_{CC}	± 50	mA
Power dissipation	P_D	150	mW
Storage temperature	T_{stg}	$-65 \sim 150$	$^\circ\text{C}$
Lead temperature (10 s)	T_L	260	$^\circ\text{C}$

Note: 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).

Operating Ranges

Characteristics	Symbol	Rating	Unit
Supply voltage	V_{CC}	1.8~5.5	V
		1.5~5.5 (Note 1)	
Input voltage	V_{IN}	0~5.5	V
Output voltage	V_{OUT}	0~ V_{CC}	V
Operating temperature	T_{opr}	-40~85	°C
Input rise and fall time	dt/dv	0~20 ($V_{CC} = 1.8\text{ V}, 2.5\text{ V} \pm 0.2\text{ V}$)	ns/V
		0~10 ($V_{CC} = 3.3\text{ V} \pm 0.3\text{ V}$)	
		0~5 ($V_{CC} = 5.5\text{ V} \pm 0.5\text{ V}$)	

Note 1: Data retention only.

Electrical Characteristics

DC Characteristics

Characteristics	Symbol	Test Circuit	Test Condition	V_{CC} (V)	$T_a = 25^\circ\text{C}$			$T_a = -40\sim 85^\circ\text{C}$		Unit
					Min	Typ.	Max	Min	Max	
High-level input voltage	V_{IH}	—	—	1.8	$0.75 \times V_{CC}$	—	—	$0.75 \times V_{CC}$	—	V
				2.3-5.5	$0.7 \times V_{CC}$	—	—	$0.7 \times V_{CC}$	—	
Low-level input voltage	V_{IL}	—	—	1.8	—	—	$0.25 \times V_{CC}$	—	$0.25 \times V_{CC}$	V
				2.3-5.5	—	—	$0.3 \times V_{CC}$	—	$0.3 \times V_{CC}$	
High-level output voltage	V_{OH}	—	$V_{IN} = V_{IL}$	$I_{OH} = -100\text{ }\mu\text{A}$	1.8	1.7	1.8	—	1.7	V
					2.3	2.2	2.3	—	2.2	
					3.0	2.9	3.0	—	2.9	
					4.5	4.4	4.5	—	4.4	
				$I_{OH} = -8\text{ mA}$	2.3	1.9	2.15	—	1.9	
					3.0	2.4	2.8	—	2.4	
					3.0	2.3	2.68	—	2.3	
Low-level output voltage	V_{OL}	—	$V_{IN} = V_{IH} \text{ or } V_{IL}$	$I_{OL} = 100\text{ }\mu\text{A}$	1.8	—	0	0.1	—	V
					2.3	—	0	0.1	—	
					3.0	—	0	0.1	—	
					4.5	—	0	0.1	—	
				$I_{OL} = 8\text{ mA}$	2.3	—	0.1	0.3	—	
					3.0	—	0.15	0.4	—	
					3.0	—	0.22	0.55	—	
					4.5	—	0.22	0.55	—	
Input leakage current	I_{IN}	—	$V_{IN} = 5.5\text{ V or GND}$	0-5.5	—	—	± 1	—	± 10	μA
Quiescent supply current	I_{CC}	—	$V_{IN} = V_{CC} \text{ or GND}$	5.5	—	—	2	—	20	μA

AC Characteristics (input: $t_r = t_f = 3\text{ ns}$)

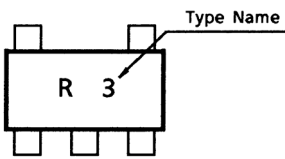
Characteristics	Symbol	Test Circuit	Test Condition	V _{CC} (V)	Ta = 25°C			Ta = -40~85°C		Unit
					Min	Typ.	Max	Min	Max	
Propagation delay time	t _{PLH} t _{PHL}	—	C _L = 15 pF, R _L = 1 MΩ	1.8	2.0	4.4	9.5	2.0	10.0	ns
				2.5 ± 0.2	0.8	2.9	6.5	0.8	7.0	
				3.3 ± 0.3	0.5	2.3	4.5	0.5	4.7	
				5.0 ± 0.5	0.5	1.9	3.9	0.5	4.1	
			C _L = 50 pF, R _L = 500 Ω	3.3 ± 0.3	1.5	2.9	5.0	1.5	5.2	
				5.0 ± 0.5	0.8	2.4	4.3	0.8	4.5	
Input capacitance	C _{IN}	—	—	0-5.5	—	4	—	—	—	pF
Power dissipation capacitance	C _{PD}	—	(Note)	3.3	—	19	—	—	—	pF
				5.5	—	27	—	—	—	

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

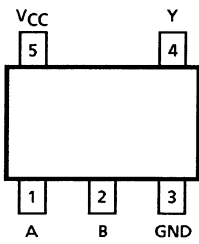
Average operating current can be obtained by the equation.

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

Marking



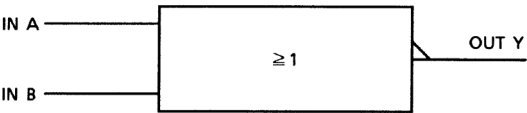
Pin Assignment (top view)



Truth Table

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

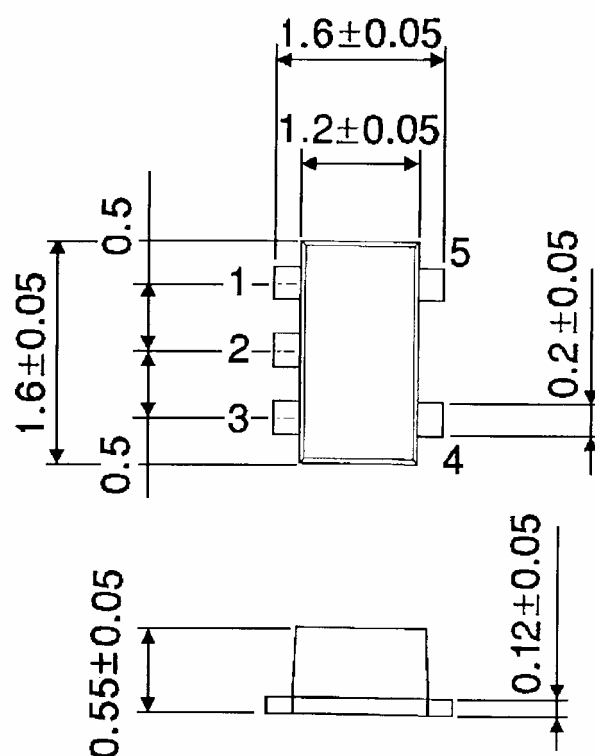
Logic Diagram



Package Dimensions

SON5-P-0.50

Unit : mm



Weight: 0.003 g (typ.)

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20070701-EN GENERAL

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