

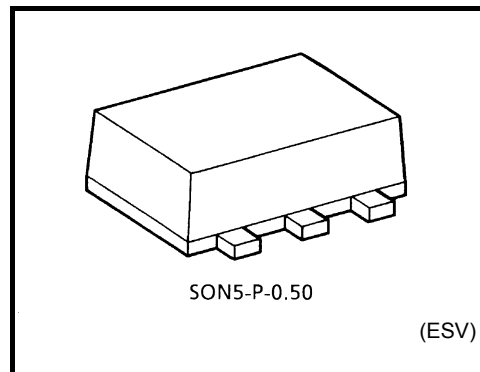
TOSHIBA CMOS Digital Integrated Circuit Silicon Monolithic

TC7SZ00AFE

2 Input NAND Gate

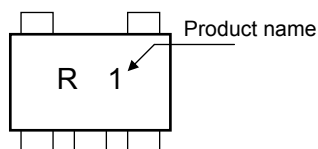
Features

- High output drive: ± 24 mA (min) at $V_{CC} = 3$ V
- Super high speed operation: $t_{PD} = 2.4$ ns (typ.)
- $t_{PD} = 2.4$ ns (typ.) at $V_{CC} = 5$ 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
- 5.5-V tolerant inputs.
- Matches the performance of TC74LCX series when operated at 3.3-V V_{CC}

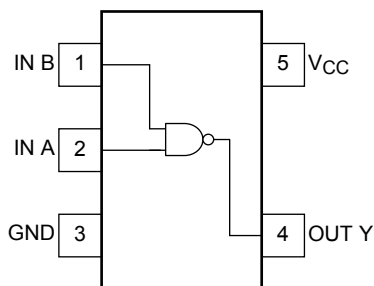


Weight: 0.003 g (typ.)

Marking



Pin Assignment (top view)



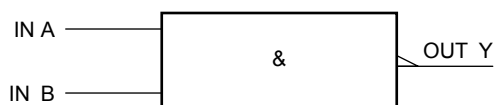
Absolute Maximum Ratings ($T_a = 25^\circ\text{C}$)

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).

Logic Diagram



Truth Table

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

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	d_t/d_v	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 Condition	Ta = 25°C				Ta = -40~85°C		Unit	
			V _{CC} (V)	Min	Typ.	Max	Min	Max		
High-level input voltage	V _{IH}	—	1.8	0.75 × V _{CC}	—	—	0.75 × V _{CC}	—	V	
			2.3-5.5	0.7 × V _{CC}	—	—	0.7 × V _{CC}	—		
Low-level input voltage	V _{IL}	—	1.8	—	—	0.25 × V _{CC}	—	0.25 × V _{CC}	V	
			2.3-5.5	—	—	0.3 × V _{CC}	—	0.3 × V _{CC}		
High-level output voltage	V _{OH}	V _{IN} = V _{IH} or V _{IL}	I _{OH} = -100 μA	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 mA	2.3	1.9	2.15	—	1.9	—	
			I _{OH} = -16 mA	3.0	2.4	2.8	—	2.4	—	
			I _{OH} = -24 mA	3.0	2.3	2.68	—	2.3	—	
Low-level output voltage	V _{OL}	V _{IN} = V _{IH}	I _{OL} = 100 μA	1.8	—	0	0.1	—	0.1	V
				2.3	—	0	0.1	—	0.1	
				3.0	—	0	0.1	—	0.1	
				4.5	—	0	0.1	—	0.1	
			I _{OL} = 8 mA	2.3	—	0.1	0.3	—	0.3	
			I _{OL} = 16 mA	3.0	—	0.15	0.4	—	0.4	
			I _{OL} = 24 mA	3.0	—	0.22	0.55	—	0.55	
			I _{OL} = 32 mA	4.5	—	0.22	0.55	—	0.55	
Input leakage current	I _{IN}	V _{IN} = 5.5 V or GND	0-5.5	—	—	±1	—	±10	μA	
Quiescent supply current	I _{CC}	V _{IN} = V _{CC} or GND	5.5	—	—	2	—	20	μA	

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

Characteristics	Symbol	Test Condition	V _{CC} (V)	Ta = 25°C			Ta = -40~85°C		Unit
				Min	Typ.	Max	Min	Max	
Propagation delay time	t _{PLH}	C _L = 15 pF, R _L = 1 MΩ	1.8	2.0	4.5	9.5	2.0	10.0	ns
			2.5 ± 0.2	0.8	3.0	6.5	0.8	7.0	
	t _{PHL}		3.3 ± 0.3	0.5	2.4	4.5	0.5	4.7	
	5.0 ± 0.5		0.5	2.0	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 2)	3.3	—	19	—	—	—	pF
			5.5	—	27	—	—	—	

Note2: C_{PD} is defined as the value of the internal equivalent capacitance which is calculated from the operating current consumption without load.

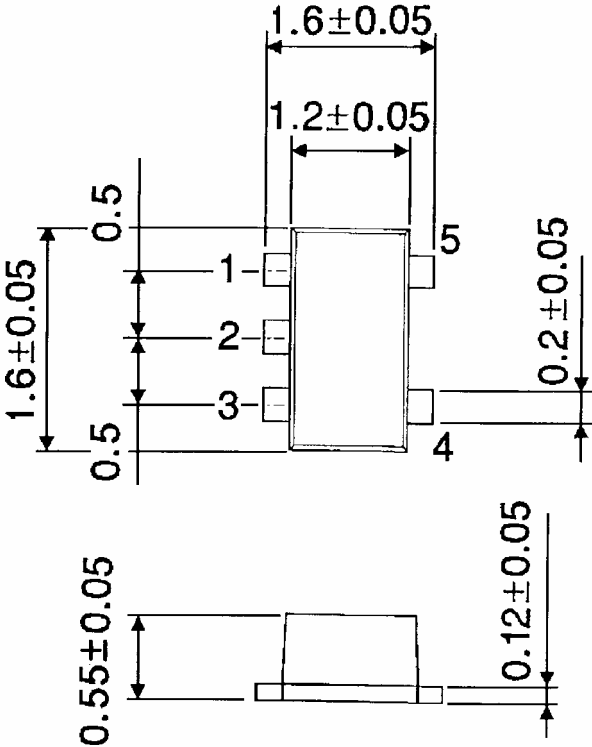
Average operating current can be obtained by the equation.

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

Package Dimensions

SON5-P-0.50

Unit : mm



Weight: 0.003 g (typ.)

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20070701-EN GENERAL

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