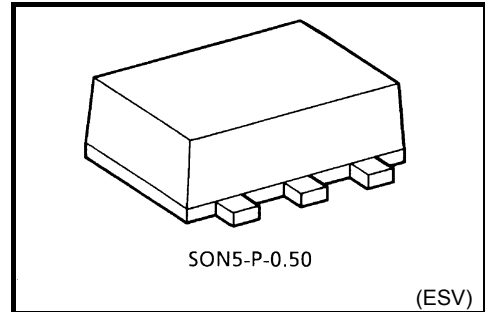


TC7SZ00FE

2-Input NAND Gate

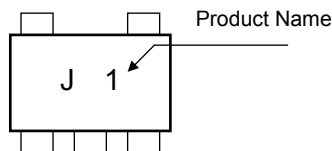
Features

- High output current : ± 24 mA (min) at $V_{CC} = 3$ V
- Super high speed operation : $t_{pd} = 2.4$ ns (typ.)
at $V_{CC} = 5$ V, 50pF
- Operating voltage range : $V_{CC} = 1.65$ to 5.5 V
- 5.5-V tolerant inputs
- 5.5-V power down protection output
- Matches the performance of TC74LCX series when operated at 3.3-V V_{CC}

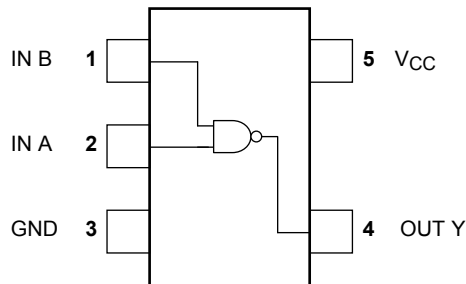


Weight: 0.003 g (typ.)

Marking



Pin Assignment (top view)



Absolute Maximum Ratings (Ta = 25°C)

Characteristics	Symbol	Rating	Unit
Supply voltage	V_{CC}	-0.5 to 6	V
DC input voltage	V_{IN}	-0.5 to 6	V
DC output voltage	V_{OUT}	-0.5 to 6 (Note 1)	V
		-0.5 to $V_{CC} + 0.5$ V (Note 2)	
Input diode current	I_{IK}	-20	mA
Output diode current	I_{OK}	-20 (Note 3)	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 to 150	°C
Lead temperature (10 s)	T_L	260	°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).

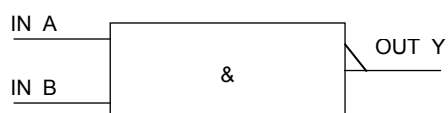
Note 1: $V_{CC} = 0$ V

Note 2: High or Low state. Do not exceed I_{OUT} of absolute maximum ratings.

Note 3: $V_{OUT} < GND$

Start of commercial production
2008-02

IEC Logic Symbol



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}	1.65 to 5.5	V
		1.5 to 5.5 (Note 4)	
Input voltage	V_{IN}	0 to 5.5	V
Output voltage	V_{OUT}	0 to 5.5 (Note 5)	V
		0 to V_{CC} (Note 6)	
Operating temperature	T_{opr}	-40 to 85	°C
Input rise and fall time	dt/dv	0 to 20 ($V_{CC} = 1.80\text{ V} \pm 0.15\text{ V}, 2.5\text{ V} \pm 0.2\text{ V}$)	ns/V
		0 to 10 ($V_{CC} = 3.3\text{ V} \pm 0.3\text{ V}$)	
		0 to 5 ($V_{CC} = 5.0\text{ V} \pm 0.5\text{ V}$)	

Note 4: Data retention only

Note 5: $V_{CC} = 0\text{ V}$

Note 6: High or Low State

Electrical Characteristics

DC Electrical Characteristics

Characteristics		Symbol	Test Condition	V _{CC} (V)	Ta = 25°C			Ta = -40 to 85°C		Unit				
					Min	Typ.	Max	Min	Max					
Input Voltage	High level	V _{IH}	—	1.65 to 1.95	V _{CC} × 0.75	—	—	V _{CC} × 0.75	—	V				
				2.3 to 5.5	V _{CC} × 0.7	—	—	V _{CC} × 0.7	—					
	Low level	V _{IL}		1.65 to 1.95	—	—	V _{CC} × 0.25	—	V _{CC} × 0.25					
				2.3 to 5.5	—	—	V _{CC} × 0.3	—	V _{CC} × 0.3					
Output voltage	High level	V _{OH}	V _{IN} = V _{IH} or V _{IL}	I _{OH} = -100 μA	1.65	1.55	1.65	—	1.55	—	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	—				
				Low level	V _{OL}	V _{IN} = V _{IH}	I _{OL} = 100 μA	1.65	—	0		0.1	—	0.1
								2.3	—	0		0.1	—	0.1
								3.0	—	0		0.1	—	0.1
								4.5	—	0		0.1	—	0.1
	I _{OH} = -4 mA	1.65					1.29	1.52	—	1.29		—		
		2.3					1.9	2.15	—	1.9		—		
		3.0					2.4	2.8	—	2.4		—		
		4.5					3.8	4.2	—	3.8		—		
	I _{OH} = -8 mA	2.3		1.9	2.15	—	1.9	—						
		3.0		2.4	2.8	—	2.4	—						
		4.5		3.8	4.2	—	3.8	—						
		I _{OH} = -16 mA		3.0	2.3	2.68	—	2.3	—					
4.5	3.8		4.2	—	3.8	—								
I _{OH} = -24 mA	3.0		2.3	2.68	—	2.3	—							
	4.5		3.8	4.2	—	3.8	—							
	I _{OH} = -32 mA	4.5	3.8	4.2	—	3.8	—							
		4.5	3.8	4.2	—	3.8	—							
I _{OL} = 4 mA		1.65	—	0.08	0.24	—	0.24							
		2.3	—	0.1	0.3	—	0.3							
	3.0	—	0.15	0.4	—	0.4								
	4.5	—	0.22	0.55	—	0.55								
I _{OL} = 8 mA	2.3	—	0.1	0.3	—	0.3								
	3.0	—	0.15	0.4	—	0.4								
	4.5	—	0.22	0.55	—	0.55								
	I _{OL} = 16 mA	3.0	—	0.15	0.4	—	0.4							
4.5		—	0.22	0.55	—	0.55								
I _{OL} = 24 mA		3.0	—	0.22	0.55	—	0.55							
		4.5	—	0.22	0.55	—	0.55							
	I _{OL} = 32 mA	4.5	—	0.22	0.55	—	0.55							
		4.5	—	0.22	0.55	—	0.55							
Input leakage current		I _{IN}	V _{IN} = 5.5 V or GND	0 to 5.5	—	—	±1	—	±10	μA				
Power off leakage current		I _{OFF}	V _{IN} or V _{OUT} = 5.5V	0.0	—	—	1	—	±10	μA				
Quiescent supply current	I _{CC}	V _{IN} = 5.5 V or GND	5.5	—	—	2	—	20	μA					

AC Characteristics (unless otherwise specified, Input: $t_r = t_f = 3$ ns)

Characteristics	Symbol	Test Condition	Ta = 25°C			Ta = -40 to 85°C		Unit	
			V _{CC} (V)	Min	Typ.	Max	Min		Max
Propagation delay time	t _{pLH}	C _L = 15 pF, R _L = 1 MΩ	1.80 ± 0.15	2.0	4.5	9.6	2.0	9.8	ns
			2.5 ± 0.2	0.8	3.2	5.3	0.8	5.7	
	t _{pHL}		3.3 ± 0.3	0.5	2.4	3.7	0.5	4.0	
	5.0 ± 0.5		0.5	1.9	2.9	0.5	3.2		
	C _L = 50 pF, R _L = 500 Ω		3.3 ± 0.3	1.5	3.0	4.6	1.5	4.9	
			5.0 ± 0.5	0.8	2.4	3.6	0.8	3.9	
Input capacitance	C _{IN}	—	0 to 5.5	—	4	—	—	pF	
Power dissipation capacitance	C _{PD}	(Note 7)	3.3	—	19	—	—	—	pF
			5.5	—	27	—	—	—	

Note 7: C_{PD} is defined as the value of the internal equivalent capacitance which is calculated from the operating current consumption without load.

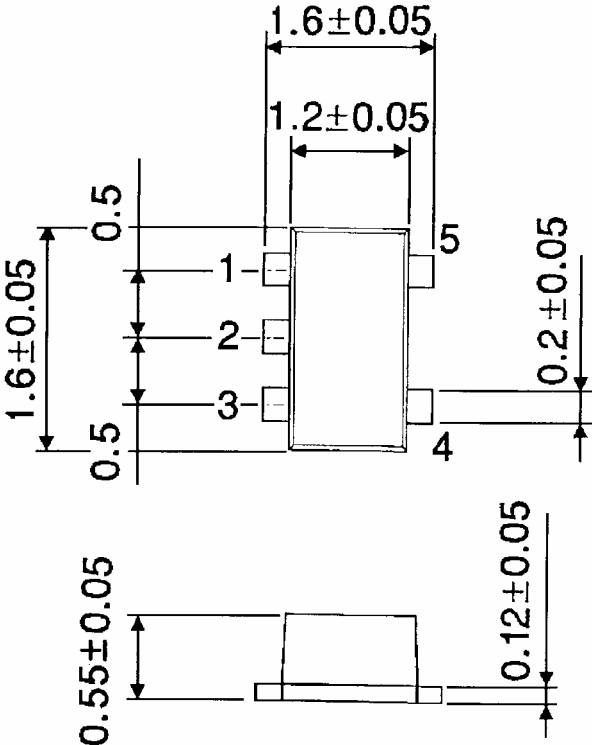
Average operating current can be obtained by the equation.

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

Package Dimensions

SON5-P-0.50

Unit : mm



Weight: 0.003 g (typ.)

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