

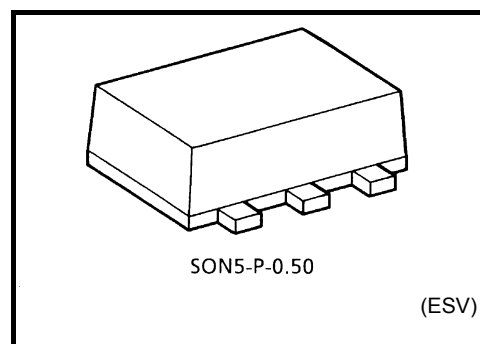
TOSHIBA CMOS Digital Integrated Circuit Silicon Monolithic

# TC7SZ08AFE

## 2 Input AND Gate

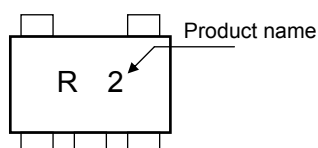
### Features

- High output drive:  $\pm 24$  mA (min)  
at  $V_{CC} = 3$  V
- Super high speed operation:  $t_{pd}$  2.7 ns (typ.)  
at  $V_{CC} = 5$  V, 50 pF
- Operation voltage range:  $V_{CC}$  (opr.) = 1.8~5.5 V
- Supply voltage data retention:  $V_{CC} = 1.5$ ~5.5 V
- 5.5-V tolerant inputs
- Matches the performance of TC74LCX series when operated at 3.3 -V  $V_{CC}$

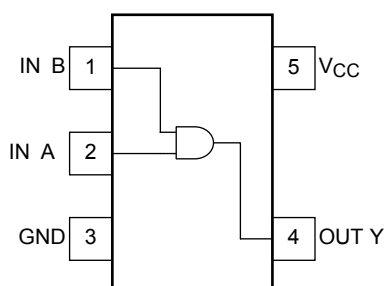


Weight: 0.003 g (typ.)

### Marking



### Pin Assignment (top view)



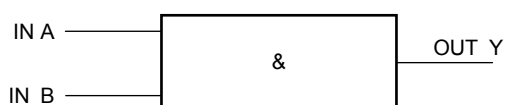
### Absolute Maximum Ratings ( $T_a = 25^\circ\text{C}$ )

Characteristics	Symbol	Rating	Unit
Supply voltage range	$V_{CC}$	-0.5~6	V
DC input voltage	$V_{IN}$	-0.5~6	V
DC output voltage	$V_{OUT}$	-0.5~ $V_{CC} + 0.5$	V
Input diode current	$I_{IK}$	-20	mA
Output diode current	$I_{OK}$	$\pm 20$	mA
DC output current	$I_{OUT}$	$\pm 50$	mA
DC $V_{CC}$ /ground current	$I_{CC}$	$\pm 50$	mA
Power dissipation	$P_D$	150	mW
Storage temperature	$T_{stg}$	-65~150	$^\circ\text{C}$
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	L
L	H	L
H	L	L
H	H	H

## 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 <sub>CC</sub> (V)	Min	Typ.	Max	Min		Max
High-level input voltage	V <sub>IH</sub>	—		1.8	0.75 × V <sub>CC</sub>	—	—	0.75 × V <sub>CC</sub>	—	V
				2.3-5.5	0.7 × V <sub>CC</sub>	—	—	0.7 × V <sub>CC</sub>	—	
Low-level input voltage	V <sub>IL</sub>	—		1.8	—	—	0.25 × V <sub>CC</sub>	—	0.25 × V <sub>CC</sub>	V
				2.3-5.5	—	—	0.3 × V <sub>CC</sub>	—	0.3 × V <sub>CC</sub>	
High-level output voltage	V <sub>OH</sub>	V <sub>IN</sub> = V <sub>IH</sub>	I <sub>OH</sub> = -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 <sub>OH</sub> = -8 mA	2.3	1.9	2.15	—	1.9	—	
			I <sub>OH</sub> = -16 mA	3.0	2.4	2.8	—	2.4	—	
			I <sub>OH</sub> = -24 mA	3.0	2.3	2.68	—	2.3	—	
			I <sub>OH</sub> = -32 mA	4.5	3.8	4.2	—	3.8	—	
Low-level output voltage	V <sub>OL</sub>	V <sub>IN</sub> = V <sub>IH</sub> or V <sub>IL</sub>	I <sub>OL</sub> = 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 <sub>OL</sub> = 8 mA	2.3	—	0.1	0.3	—	0.3	
			I <sub>OL</sub> = 16 mA	3.0	—	0.15	0.4	—	0.4	
			I <sub>OL</sub> = 24 mA	3.0	—	0.22	0.55	—	0.55	
			I <sub>OL</sub> = 32 mA	4.5	—	0.22	0.55	—	0.55	
Input leakage current	I <sub>IN</sub>	V <sub>IN</sub> = 5.5 V or GND	0-5.5	—	—	±1	—	±10	μA	
Quiescent supply current	I <sub>CC</sub>	V <sub>IN</sub> = V <sub>CC</sub> or GND	5.5	—	—	2	—	20	μA	

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

Characteristics	Symbol	Test Condition	Ta = 25°C				Ta = -40~85°C		Unit
			VCC (V)	Min	Typ.	Max	Min	Max	
Propagation delay time	t <sub>pLH</sub> t <sub>pHL</sub>	C <sub>L</sub> = 15 pF, R <sub>L</sub> = 1 MΩ	1.8	2.0	5.2	9.5	2.0	10.5	ns
			2.5 ± 0.2	0.8	3.4	7.0	0.8	7.5	
			3.3 ± 0.3	0.5	2.6	4.7	0.5	5.0	
			5.0 ± 0.5	0.5	2.2	4.1	0.5	4.4	
		C <sub>L</sub> = 50 pF, R <sub>L</sub> = 500 Ω	3.3 ± 0.3	1.5	3.3	5.2	1.5	5.5	
			5.0 ± 0.5	0.8	2.7	4.5	0.8	4.8	
Input capacitance	C <sub>IN</sub>	—	0-5.5	—	4	—	—	pF	
Power dissipation capacitance	C <sub>PD</sub>	(Note 2)	3.3	—	19	—	—	—	pF
			5.5	—	26	—	—	—	

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

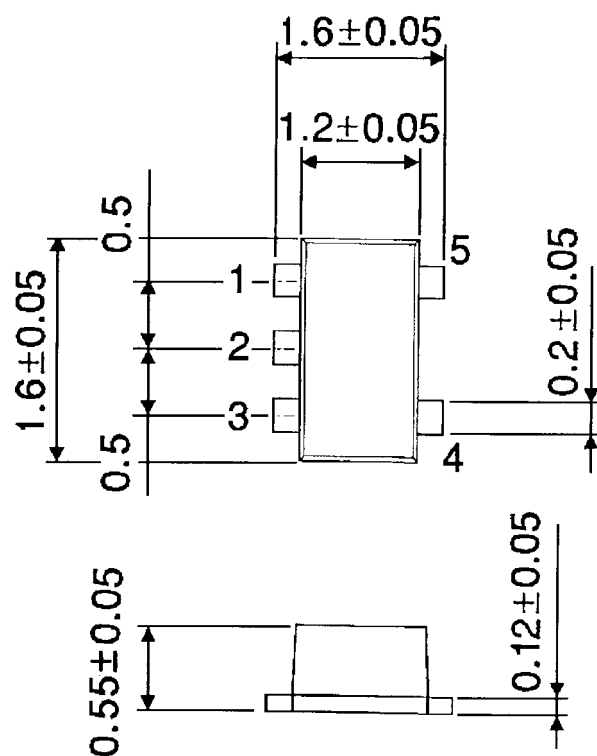
Average operating current can be obtained by the equation.

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

## Package Dimensions

SON5-P-0.50

Unit : mm



Weight: 0.003 g (typ.)

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