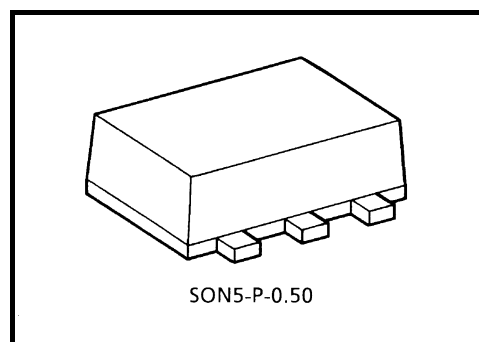


# TC7SZ32AFE

## 2 Input OR Gate

### Features

- High output drive:  $\pm 24$  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:  $\pm 500$  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  $\pm 0.2$  V: 0~20 ns/V  
@ $V_{CC} = 3.3$  V  $\pm 0.3$  V: 0~10 ns/V  
@ $V_{CC} = 5.5$  V  $\pm 0.5$  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	$I_{IK}$	$\pm 20$	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	$T_{stg}$	$-65 \sim 150$	$^\circ\text{C}$
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	$V_{OH}$	—	$V_{IN} = V_{IH} \text{ or } V_{IL}$	$I_{OH} = -100\text{ }\mu\text{A}$	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	$V_{OL}$	—	$V_{IN} = V_{IL}$	$I_{OL} = 100\text{ }\mu\text{A}$	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	—	—	$\pm 1$	—	$\pm 10$	$\mu\text{A}$
Quiescent supply current	$I_{CC}$	—	$V_{IN} = V_{CC} \text{ or GND}$	5.5	—	—	2	—	20	$\mu\text{A}$

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

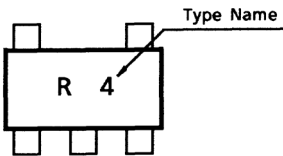
Characteristics	Symbol	Test Circuit	Test Condition	V <sub>CC</sub> (V)	Ta = 25°C			Ta = -40~85°C		Unit
					Min	Typ.	Max	Min	Max	
Propagation delay time	t <sub>PLH</sub> t <sub>PHL</sub>	—	C <sub>L</sub> = 15 pF, R <sub>L</sub> = 1 MΩ	1.8	2.0	4.6	10.0	2.0	10.5	ns
				2.5 ± 0.2	0.8	3.0	7.0	0.8	7.5	
				3.3 ± 0.3	0.5	2.4	4.7	0.5	5.0	
				5.0 ± 0.5	0.5	1.9	4.1	0.5	4.4	
			C <sub>L</sub> = 50 pF, R <sub>L</sub> = 500 Ω	3.3 ± 0.3	1.5	3.0	5.2	1.5	5.5	
				5.0 ± 0.5	0.8	2.4	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)	3.3	—	19	—	—	—	pF
				5.5	—	27	—	—	—	

Note: C<sub>PD</sub> is defined as the value of the internal equivalent capacitance which is calculated from the operating current consumption without load.

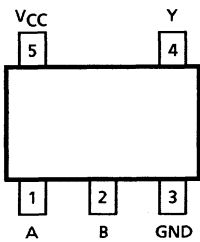
Average operating current can be obtained by the equation.

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

Marking



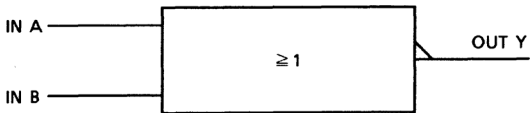
Pin Assignment (top view)



Truth Table

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

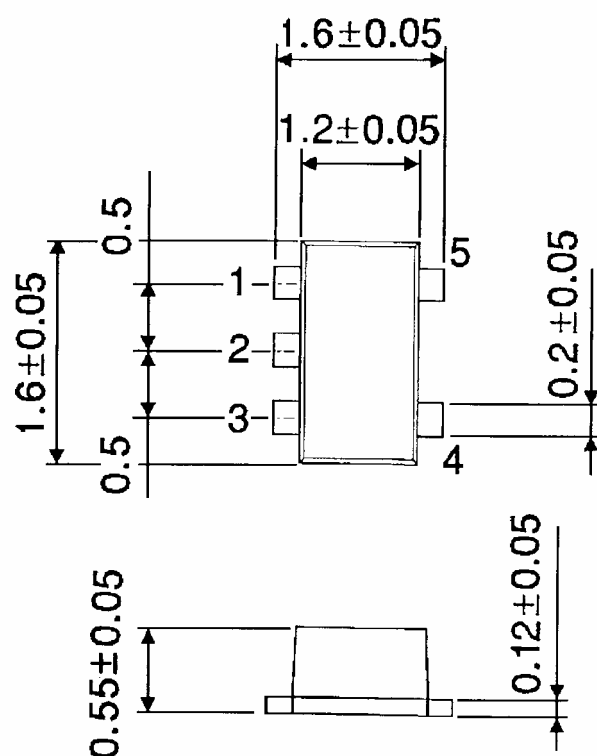
Logic Diagram



## Package Dimensions

SON5-P-0.50

Unit : mm



Weight: 0.003 g (typ.)

**RESTRICTIONS ON PRODUCT USE**

20070701-EN GENERAL

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