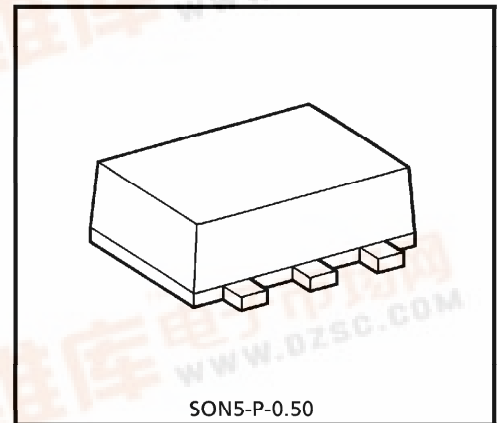


**TOSHIBA****TC7SZ02AFE**

TOSHIBA CMOS DIGITAL INTEGRATED CIRCUIT SILICON MONOLITHIC

**TC7SZ02AFE****2 INPUT NOR 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.)

**MAXIMUM RATINGS** ( $T_a = 25^\circ\text{C}$ )

CHARACTERISTIC	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	$^\circ\text{C}$

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## DC ELECTRICAL CHARACTERISTICS

CHARACTERISTIC	SYMBOL	TEST CONDITION		V <sub>CC</sub> (V)	Ta = 25°C			Ta = -40~85°C		UNIT
					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>IL</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 ELECTRICAL CHARACTERISTICS (Input  $t_r = t_f = 3\text{ ns}$ )

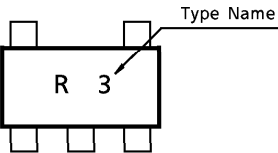
CHARACTERISTIC	SYMBOL	TEST CONDITION	Ta = 25°C				Ta = -40~85°C		UNIT
			VCC (V)	MIN.	TYP.	MAX.	MIN.	MAX.	
Propagation Delay Time	tPLH tPHL	CL = 15 pF, RL = 1 MΩ	1.8	2.0	4.4	9.5	2.0	10.0	ns
			2.5 ± 0.2	0.8	2.9	6.5	0.8	7.0	
			3.3 ± 0.3	0.5	2.3	4.5	0.5	4.7	
			5.0 ± 0.5	0.5	1.9	3.9	0.5	4.1	
		CL = 50 pF, RL = 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	CIN		0 – 5.5	—	4	—	—	pF	
Power Dissipation Capacitance	CPD	(Note 1)	3.3	—	19	—	—	pF	
			5.5	—	27	—	—		

(Note 1) : C<sub>PD</sub> is defined as the value of the internal equivalent capacitance which is calculated from the operating current consumption without load.

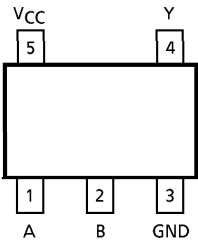
Average operating current can be obtained by the equation.

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

MARKING



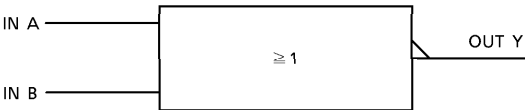
PIN ASSIGNMENT (TOP VIEW)



TRUTH TABLE

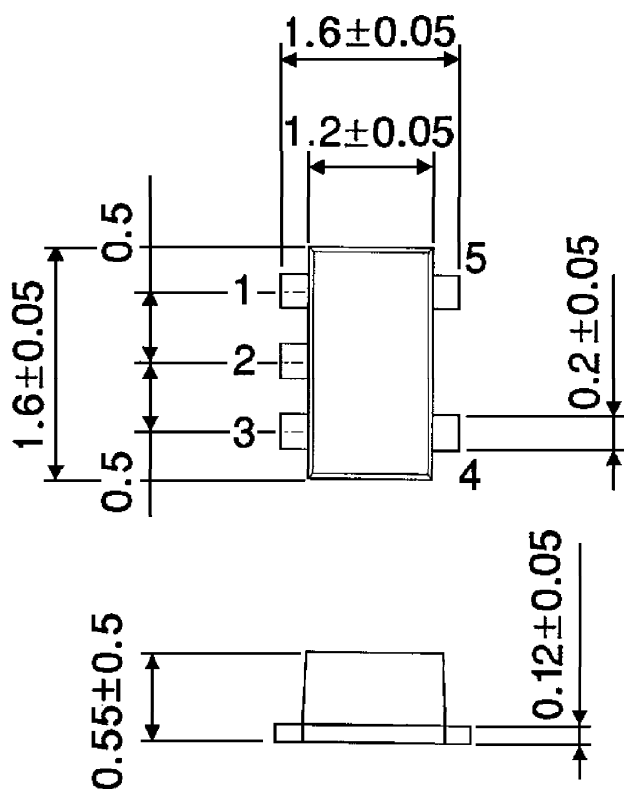
A	B	Y
L	L	H
L	H	L
H	L	L
H	H	L

LOGIC DIAGRAM



**PACKAGE DIMENSIONS**  
SON5-P-0.50

Unit : mm



Weight : 0.003 g (Typ.)