

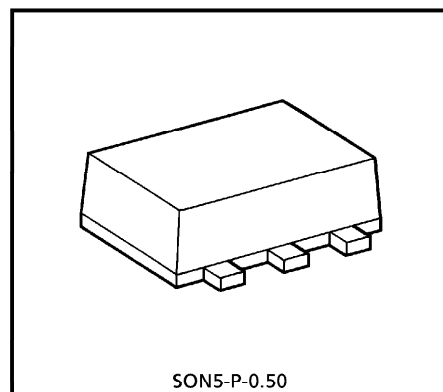
TENTATIVE  
(UNDER DEVELOPMENT) TOSHIBA CMOS DIGITAL INTEGRATED CIRCUIT SILICON MONOLITHIC

# TC7SZ04AFE

## INVERTER

### 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 (Ta = 25°C)

CHARACTERISTIC	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	$I_{IK}$	$\pm 20$	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	$T_{stg}$	-65~150	°C
Lead Temperature (10 s)	$T_L$	260	°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	—	—	0.75	—	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>	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		

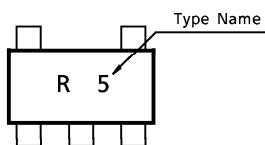
**AC ELECTRICAL CHARACTERISTICS** (Input  $t_r = t_f = 3 \text{ ns}$ )

CHARACTERISTIC	SYMBOL	TEST CONDITION	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	4.4	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	2.1	4.5	0.5	4.7	
			5.0 ± 0.5	0.5	1.8	3.9	0.5	4.1	
		C <sub>L</sub> = 50 pF, R <sub>L</sub> = 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 <sub>IN</sub>		0 - 5.5	—	4	—	—	pF	
Power Dissipation Capacitance	C <sub>PD</sub>	(Note 1)	3.3	—	21	—	—	pF	
			5.5	—	34	—	—		

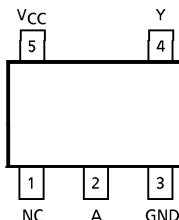
(Note 1) : C<sub>PD</sub> is defined as the value of the internal equivalent capacitance which is calculated from the operating current consumption without load.  
Average operating current can be obtained by the equation.

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

**MARKING**



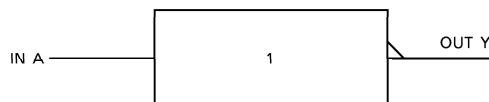
**PIN ASSIGNMENT (TOP VIEW)**



**TRUTH TABLE**

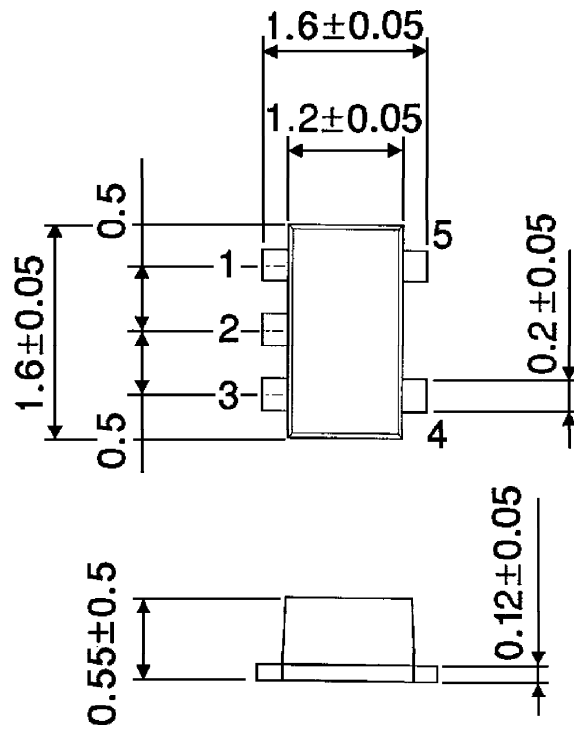
A	Y
L	H
H	L

**LOGIC DIAGRAM**



OUTLINE DRAWING  
SON5-P-0.50

Unit : mm



Weight : 0.003 g (Typ.)