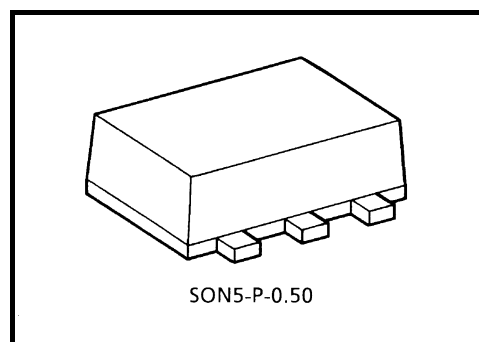


TC7SZU04AFE

Inverter

Features

- High output drive: ± 16 mA (typ.)
@ $V_{CC} = 3$ V
- Low quiescent power: $I_{CC} < 2$ μ A (max)
@ $V_{CC} = 5.5$ V, $T_a = 25^\circ\text{C}$
- Operation voltage range: $V_{CC}(\text{opr}) = 1.8 \sim 5.5$ V
- Supply voltage data retention: $V_{CC} = 1.5 \sim 5.5$ V
- Latch-up performance: ± 500 mA
- ESD performance: Human body model $> \pm 2000$ V
Machine model $> \pm 200$ V
- Power down protection is provided on all inputs.



SON5-P-0.50

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}	± 20	mA
Output diode current	I_{OK}	± 20	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}	$-65 \sim 150$	$^\circ\text{C}$
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

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	$0.85 \times V_{CC}$	—	—	$0.85 \times V_{CC}$	—	V
				2.3-5.5	$0.8 \times V_{CC}$	—	—	$0.8 \times V_{CC}$	—	
Low-level input voltage	V_{IL}	—	$V_{IN} = V_{IH}$ or V_{IL}	1.8	—	—	$0.15 \times V_{CC}$	—	$0.15 \times V_{CC}$	V
				2.3-5.5	—	—	$0.2 \times V_{CC}$	—	$0.2 \times V_{CC}$	
High-level output voltage	V_{OH}	—	$V_{IN} = V_{IL}$	$I_{OH} = -100 \mu\text{A}$	1.8	1.6	1.8	—	1.6	V
				$I_{OH} = -100 \mu\text{A}$	2.3	2.1	2.3	—	2.1	
				$I_{OH} = -100 \mu\text{A}$	3.0	2.7	3.0	—	2.7	
				$I_{OH} = -100 \mu\text{A}$	4.5	4.0	4.4	—	4.0	
			$V_{IN} = \text{GND}$	$I_{OH} = -4 \text{ mA}$	2.3	1.9	2.14	—	1.9	
				$I_{OH} = -8 \text{ mA}$	3.0	2.4	2.75	—	2.4	
				$I_{OH} = -12 \text{ mA}$	3.0	2.3	2.61	—	2.3	
				$I_{OH} = -16 \text{ mA}$	4.5	3.8	4.13	—	3.8	
Low-level output voltage	V_{OL}	—	$V_{IN} = V_{IH}$	$I_{OL} = 100 \mu\text{A}$	1.8	—	0	0.2	—	V
				$I_{OL} = 100 \mu\text{A}$	2.3	—	0	0.2	—	
				$I_{OL} = 100 \mu\text{A}$	3.0	—	0	0.3	—	
				$I_{OL} = 100 \mu\text{A}$	4.5	—	0	0.5	—	
			$V_{IN} = V_{CC}$	$I_{OL} = 4 \text{ mA}$	2.3	—	0.1	0.3	—	
				$I_{OL} = 8 \text{ mA}$	3.0	—	0.17	0.4	—	
				$I_{OL} = 12 \text{ mA}$	3.0	—	0.25	0.55	—	
				$I_{OL} = 16 \text{ mA}$	4.5	—	0.26	0.55	—	
Input leakage current	I_{IN}	—	$V_{IN} = 5.5 \text{ V}$ or GND	0-5.5	—	—	± 1	—	± 10	μA
Quiescent supply current	I_{CC}	—	$V_{IN} = V_{CC}$ or GND	5.5	—	—	2	—	20	μA

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

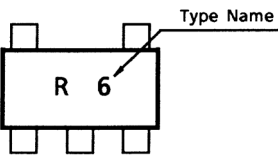
Characteristics	Symbol	Test Circuit	Test Condition	V _{CC} (V)	Ta = 25°C			Ta = -40~85°C		Unit
					Min	Typ.	Max	Min	Max	
Propagation delay time	t _{PLH} t _{PHL}	—	C _L = 15 pF, R _L = 1 MΩ	1.8	1.0	—	8.5	1.0	9.0	ns
				2.5 ± 0.2	0.8	—	6.2	0.8	6.5	
				3.3 ± 0.3	0.5	—	4.5	0.5	4.8	
				5.0 ± 0.5	0.5	—	3.9	0.5	4.1	
			C _L = 50 pF, R _L = 500 Ω	3.3 ± 0.3	1.0	—	6.0	1.0	6.5	
				5.0 ± 0.5	0.8	—	5.0	0.8	5.5	
Input capacitance	C _{IN}	—	—	0-5.5	—	5	—	—	—	pF
Power dissipation capacitance	C _{PD}	—	(Note)	3.3	—	9	—	—	—	pF
				5.5	—	25	—	—	—	

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

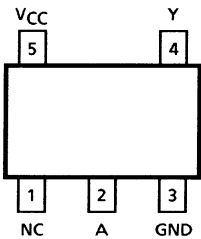
Average operating current can be obtained by the equation.

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

Marking



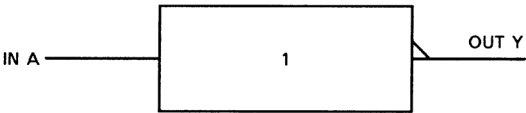
Pin Assignment (top view)



Truth Table

A	Y
L	H
H	L

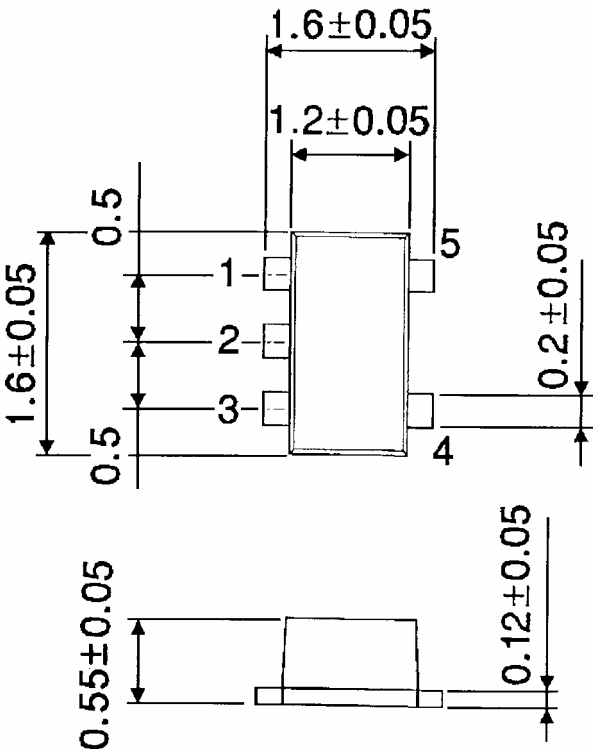
Logic Diagram



Package Dimensions

SON5-P-0.50

Unit : mm



Weight: 0.003 g (typ.)

RESTRICTIONS ON PRODUCT USE

20070701-EN GENERAL

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