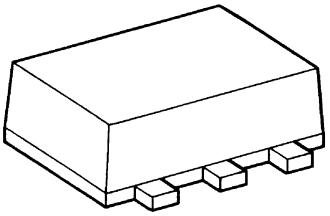
TOSHIBA CMOS Digital Integrated Circuit Silicon Monolithic

TC7SZU04AFE

Inverter

Features

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



SON5-P-0.50

Weight: 0.003 g (typ.)

Absolute Maximum Ratings (Ta = 25°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}	±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}	−65~150	°C
Lead temperature (10 s)	T_L	260	°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)	Ta = 25°C Min	Ta = 25°C Typ.	Ta = 25°C Max	Ta = −40~85°C Min	Ta = −40~85°C Max	Unit
High-level input voltage	V_{IH}	—	—		1.8	0.85 × V_{CC}	—	—	0.85 × V_{CC}	—	V
					2.3-5.5	0.8 × V_{CC}	—	—	0.8 × V_{CC}	—	
Low-level input voltage	V_{IL}	—	V_{IN} = V_{IH} or V_{IL}		1.8	—	—	0.15 × V_{CC}	—	0.15 × V_{CC}	V
					2.3-5.5	—	—	0.2 × V_{CC}	—	0.2 × V_{CC}	
High-level output voltage	V_{OH}	—	V_{IN} = V_{IL}	I_{OH} = −100 μA	1.8	1.6	1.8	—	1.6	—	V
					2.3	2.1	2.3	—	2.1	—	
					3.0	2.7	3.0	—	2.7	—	
					4.5	4.0	4.4	—	4.0	—	
			V_{IN} = GND	I_{OH} = −4 mA	2.3	1.9	2.14	—	1.9	—	
				I_{OH} = −8 mA	3.0	2.4	2.75	—	2.4	—	
				I_{OH} = −12 mA	3.0	2.3	2.61	—	2.3	—	
				I_{OH} = −16 mA	4.5	3.8	4.13	—	3.8	—	
Low-level output voltage	V_{OL}	—	V_{IN} = V_{IH}	I_{OL} = 100 μA	1.8	—	0	0.2	—	0.2	V
					2.3	—	0	0.2	—	0.2	
					3.0	—	0	0.3	—	0.3	
					4.5	—	0	0.5	—	0.5	
			V_{IN} = V_{CC}	I_{OL} = 4 mA	2.3	—	0.1	0.3	—	0.3	
				I_{OL} = 8 mA	3.0	—	0.17	0.4	—	0.4	
				I_{OL} = 12 mA	3.0	—	0.25	0.55	—	0.55	
				I_{OL} = 16 mA	4.5	—	0.26	0.55	—	0.55	
Input leakage current	I_{IN}	—	V_{IN} = 5.5 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: $t_r = t_f = 3$ ns)

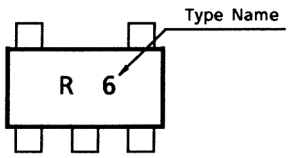
Characteristics	Symbol	Test Circuit	Test Condition		Ta = 25°C			Ta = −40~85°C		Unit
				V_{CC} (V)	Min	Typ.	Max	Min	Max	
Propagation delay time	t_{PLH} t_{PHL}	—	C_L = 15 pF, R_L = 1 MΩ	1.8	1.0	—	8.5	1.0	9.0	ns
				2.5 ± 0.2	0.8	—	6.2	0.8	6.5	
				3.3 ± 0.3	0.5	—	4.5	0.5	4.8	
				5.0 ± 0.5	0.5	—	3.9	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.

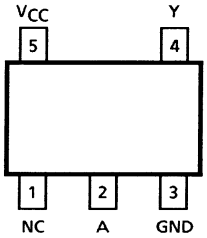
Average operating current can be obtained by the equation.

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

Marking



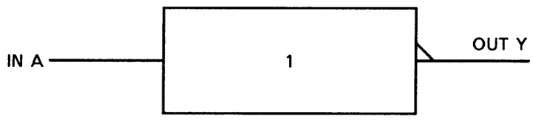
Pin Assignment (top view)



Truth Table

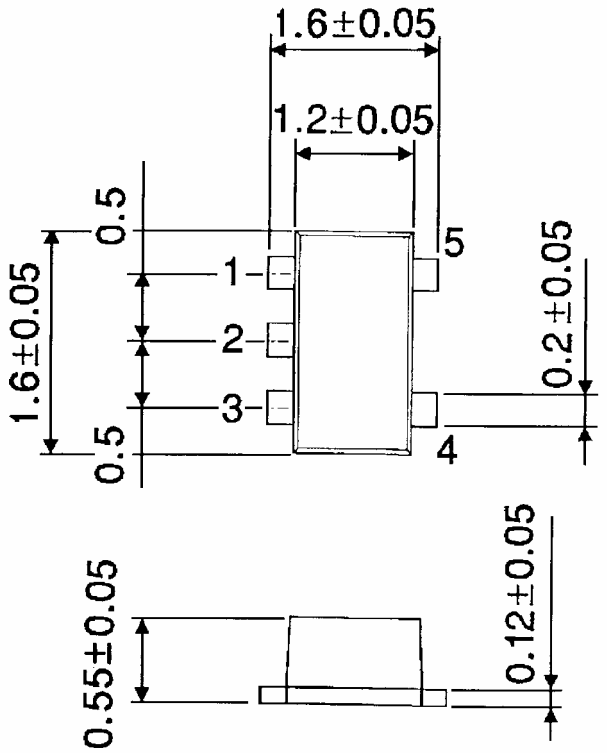
A	Y
L	H
H	L

Logic Diagram



Package Dimensions

SON5-P-0.50 Unit : mm



Weight: 0.003 g (typ.)

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20070701-EN GENERAL

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