

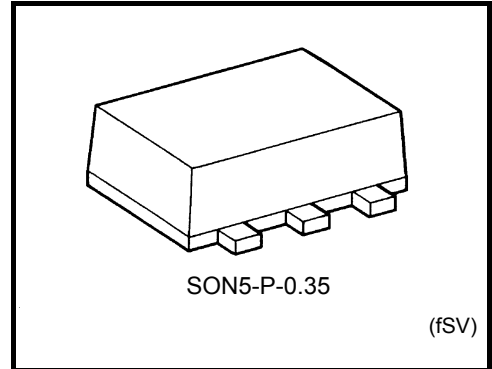
TOSHIBA CMOS Digital Integrated Circuit Silicon Monolithic

TC7SHU04FS

INVERTER (Un-Buffer)

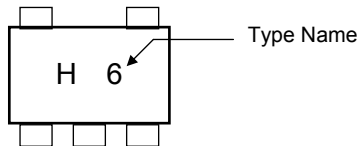
Features

- High speed: $t_{pd} = 3.5 \text{ ns (typ.)}$ at $V_{CC} = 5 \text{ V}$
- Low power dissipation: $I_{CC} = 2 \mu\text{A (max)}$ at $T_a = 25^\circ\text{C}$
- High noise immunity: $V_{NIH} = V_{NIL} = 10\% V_{CC}$ (min)
- 5.5V tolerant input.
- Wide operating voltage range: $V_{CC} \text{ (opr)} = 2\sim 5.5 \text{ V}$

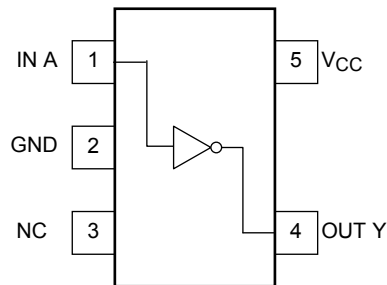


Weight : 0.001 g (Typ.)

Marking (top view)



• Pin Assignment



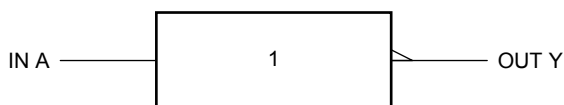
Absolute Maximum Ratings (Ta = 25°C)

Characteristics	Symbol	Rating	Unit
Supply voltage range	V _{CC}	-0.5~7.0	V
DC input voltage	V _{IN}	-0.5~7.0	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}	±25	mA
DC V _{CC} /ground current	I _{CC}	±50	mA
Power dissipation	P _D	50	mW
Storage temperature	T _{stg}	-65~150	°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).

Logic Diagram



Truth Table

A	Y
L	H
H	L

Operating Ranges

Characteristics	Symbol	Rating	Unit
Supply voltage	V _{CC}	2.0~5.5	V
Input voltage	V _{IN}	0~5.5	V
Output voltage	V _{OUT}	0~V _{CC}	V
Operating temperature	T _{opr}	-40~85	°C

Electrical Characteristics

DC Characteristics

Characteristics	Symbol	Test Condition		Ta = 25°C			Ta = -40~85°C		Unit	
				V _{CC} (V)	Min	Typ.	Max	Min		Max
High-level input voltage	V _{IH}	—		2.0	1.70	—	—	1.70	—	V
				3.0~5.5	V _{CC} × 0.8	—	—	V _{CC} × 0.8	—	
Low-level input voltage	V _{IL}	—		2.0	—	—	0.30	—	0.30	V
				3.0~5.5	—	—	V _{CC} × 0.2	—	V _{CC} × 0.2	
High-level output voltage	V _{OH}	V _{IN} = V _{IL}	I _{OH} = -50 μA	2.0	1.8	2.0	—	1.8	—	V
				3.0	2.7	3.0	—	2.7	—	
				4.5	4.0	4.5	—	4.0	—	
		V _{IN} = GND	I _{OH} = -4 mA	3.0	2.58	—	—	2.48	—	
4.5	3.94			—	—	3.80	—			
Low-level output voltage	V _{OL}	V _{IN} = V _{IH}	I _{OL} = 50 μA	2.0	—	0.0	0.2	—	0.2	V
				3.0	—	0.0	0.3	—	0.3	
				4.5	—	0.0	0.5	—	0.5	
		V _{IN} = V _{CC}	I _{OL} = 4 mA	3.0	—	—	0.36	—	0.44	
				4.5	—	—	0.36	—	0.44	
Input leakage current	I _{IN}	V _{IN} = 5.5 V or GND		0~5.5	—	—	±0.1	—	±1.0	μA
				5.5	—	—	2.0	—	20.0	
Quiescent supply current	I _{CC}	V _{IN} = V _{CC} or GND		5.5	—	—	2.0	—	20.0	μA

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

Characteristics	Symbol	Test Circuit	Test Condition		Ta = 25°C			Ta = -40~85°C		Unit	
			V _{CC} (V)	C _L (pF)	Min	Typ.	Max	Min	Max		
Propagation delay time	t _{pLH}	—	—	3.3 ± 0.3	15	—	5.0	8.9	1.0	10.5	ns
					50	—	7.5	11.4	1.0	13.0	
	t _{pHL}			5.0 ± 0.5	15	—	3.5	5.5	1.0	6.5	
					50	—	5.0	7.0	1.0	8.0	
Input capacitance	C _{IN}	—	—	—	5	10	—	10	pF		
Power dissipation capacitance	C _{PD}	—	(Note)	—	6	—	—	—	pF		

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

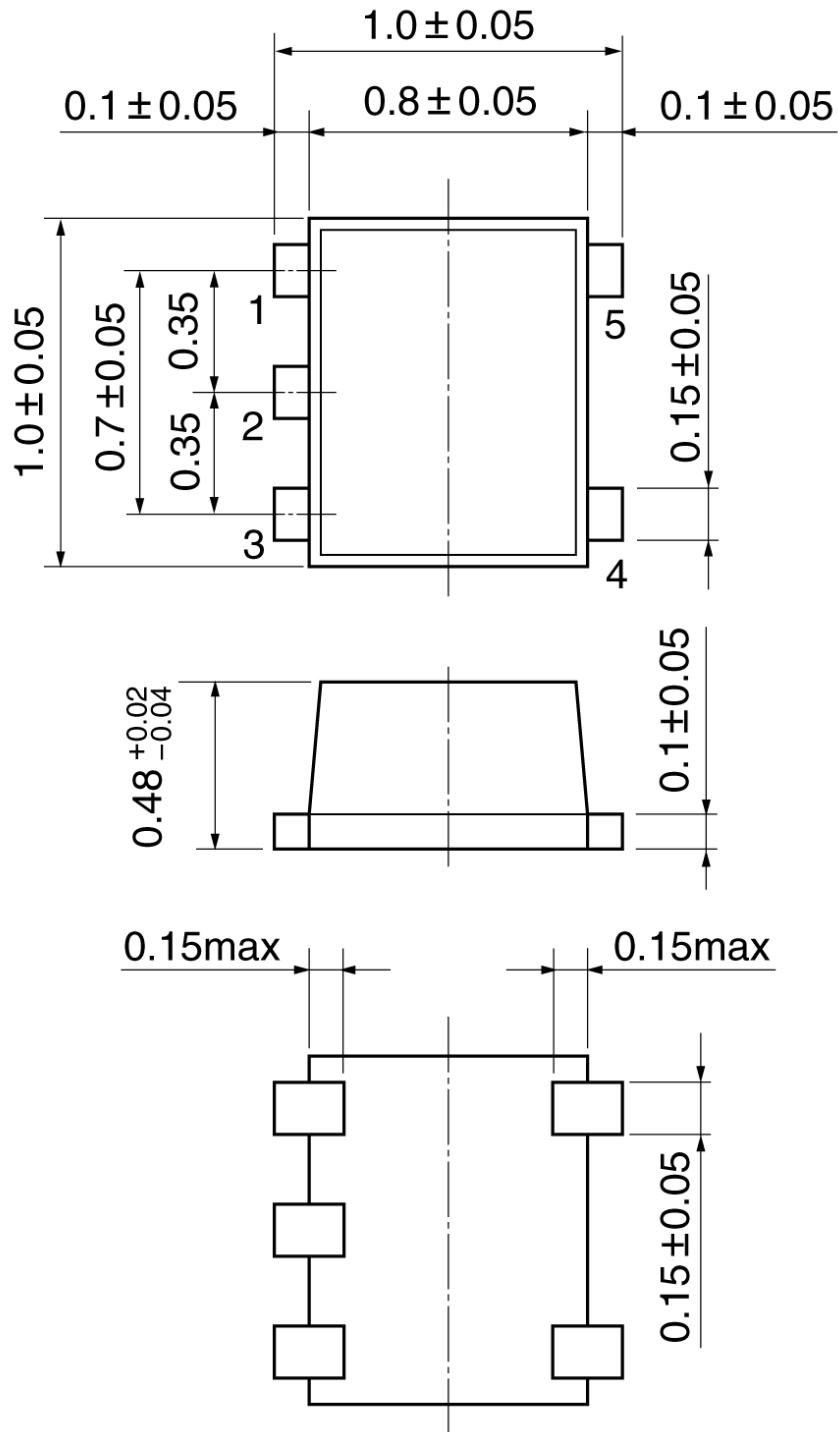
Average operating current can be obtained by the equation:

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

Package Dimensions

SON5-P-0.35

Unit:mm



Weight: 0.001 g (typ.)

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20070701-EN GENERAL

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