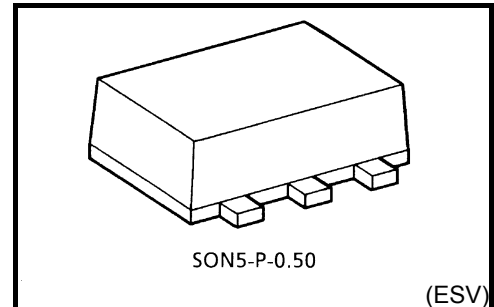


TC7SH05FE

INVERTER (Open Drain)

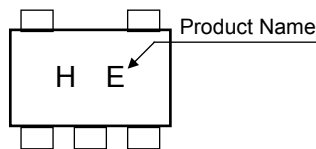
Features

- High speed: $t_{pd} = 3.7 \text{ ns (typ.)}$ at $V_{CC} = 5 \text{ V}$, 15 pF
- Low power dissipation: $I_{CC} = 2 \text{ }\mu\text{A (max)}$ at $T_a = 25^\circ\text{C}$
- Wide operating voltage range: $V_{CC} = 2 \text{ to } 5.5 \text{ V}$
- 5.5-V tolerant input
- 5.5-V power down protection output

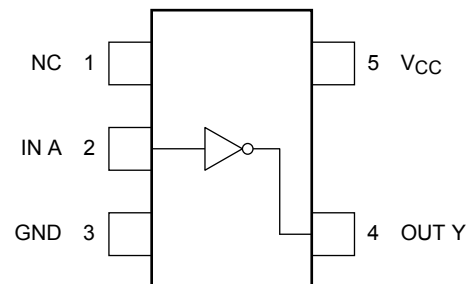


Weight : 0.003 g (typ.)

Marking



Pin Assignment (top view)



Absolute Maximum Ratings ($T_a = 25^\circ\text{C}$)

Characteristics	Symbol	Rating	Unit
Supply voltage range	V_{CC}	- 0.5 to 7	V
DC input voltage	V_{IN}	- 0.5 to 7	V
DC output voltage	V_{OUT}	- 0.5 to 7 (Note 1)	V
Input diode current	I_{IK}	- 20	mA
Output diode current	I_{OK}	- 20 (Note 2)	mA
DC output current	I_{OUT}	25	mA
DC V_{CC} /ground current	I_{CC}	± 50	mA
Power dissipation	P_D	150	mW
Storage temperature	T_{stg}	- 65 to 150	$^\circ\text{C}$

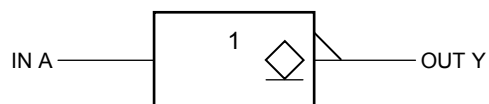
Note: Using continuously under heavy loads (e.g. the application of high temperature/current/voltage and the significant change in temperature, etc.) may cause this product to decrease in the reliability significantly even if the operating conditions (i.e. operating temperature/current/voltage, etc.) 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).

Note 1: Do not exceed I_{OUT} of absolute maximum ratings.

Note 2: $V_{OUT} < GND$

IEC Logic Symbol



Truth Table

A	Y
L	Z
H	L

Z: High impedance

Operating Ranges

Characteristics	Symbol	Rating	Unit
Supply voltage	V_{CC}	2 to 5.5	V
Input voltage	V_{IN}	0 to 5.5	V
Output voltage	V_{OUT}	0 to 5.5	V
Operating temperature	T_{opr}	- 40 to 85	°C
Input rise and fall time	dt/dv	0 to 100 ($V_{CC} = 3.3 \pm 0.3$ V)	ns/V
		0 to 20 ($V_{CC} = 5.0 \pm 0.5$ V)	

Electrical Characteristics

DC Characteristics

Characteristics	Symbol	Test Condition		Ta = 25°C			Ta = -40 to 85°C		Unit		
				V _{CC} (V)	Min	Typ.	Max	Min		Max	
High-level input voltage	V _{IH}	—		2.0	1.5	—	—	1.5	—	V	
				3.0 to 5.5	V _{CC} × 0.7	—	—	V _{CC} × 0.7	—		
Low-level input voltage	V _{IL}	—		2.0	—	—	0.5	—	0.5	V	
				3.0 to 5.5	—	—	V _{CC} × 0.3	—	V _{CC} × 0.3		
Low-level output voltage	V _{OL}	V _{IN} = V _{IH}		I _{OL} = 50 μA	2.0	—	0	0.1	—	0.1	V
					3.0	—	0	0.1	—	0.1	
					4.5	—	0	0.1	—	0.1	
				I _{OL} = 4 mA	3.0	—	—	0.36	—	0.44	
				I _{OL} = 8 mA	4.5	—	—	0.36	—	0.44	
Input leakage current	I _{IN}	V _{IN} = 5.5 V or GND		0 to 5.5	—	—	±0.1	—	±1.0	μA	
Output Z level leakage current	I _{LKG}	V _{IN} = V _{IL} V _{OUT} = 0 to 5.5V		0 to 5.5	—	—	±0.25	—	±2.5	μA	
Power-off leakage current	I _{OFF}	V _{IN} = 5.5V or V _{OUT} = 0 to 5.5V		0.0	—	—	1.0	—	10.0	μA	
Quiescent supply current	I _{CC}	V _{IN} = V _{CC} or GND		5.5	—	—	2.0	—	20	μA	

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

Characteristics	Symbol	Test Condition		Ta = 25°C			Ta = -40 to 85°C		Unit	
		VCC (V)	CL(pF)	Min	Typ.	Max	Min	Max		
Propagation delay time	t _{pZL}	RL = 1kΩ	3.3 ± 0.3	15	—	5.5	7.9	1.0	9.5	ns
			50	—	8.0	11.4	1.0	13.0		
		5.0 ± 0.5	15	—	3.7	5.5	1.0	6.5		
			50	—	5.2	7.5	1.0	8.5		
	t _{pLZ}	RL = 1kΩ	3.3 ± 0.3	15	—	5.5	7.9	1.0	9.5	
			50	—	8.0	11.4	1.0	13.0		
		5.0 ± 0.5	15	—	3.7	5.5	1.0	6.5		
			50	—	5.2	7.5	1.0	8.5		
Input capacitance	C _{IN}	—		—	4	10	—	10	pF	
Output capacitance	C _{OUT}	—		—	6	—	—	—	pF	
Power dissipation capacitance	C _{PD}	(Note3)		—	14	—	—	—	pF	

Note 3: C_{PD} is defined as the value of the internal equivalent capacitance which is calculated from the operating current consumption without load.

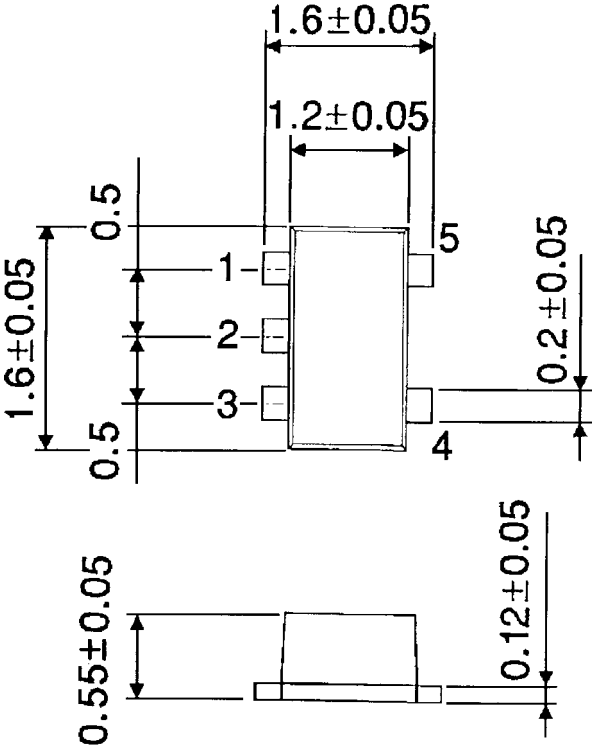
Average operating current can be obtained by the equation:

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

Package Dimensions

SON5-P-0.50

Unit : mm



Weight: 0.003 g (typ.)

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