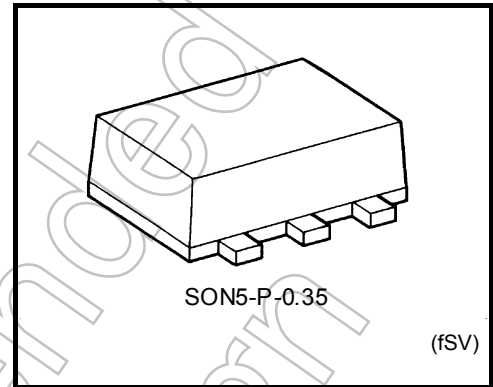


# TC7SH05FS

INVERTER (Open Drain)

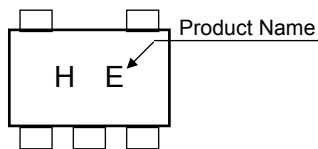
## Features

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

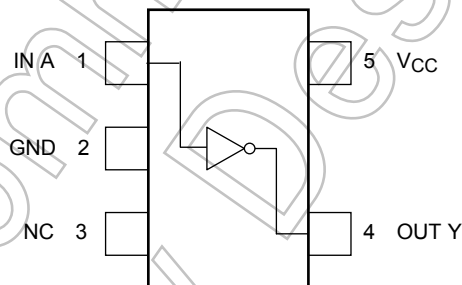


Weight : 0.001 g (typ.)

## 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	$I_{CC}$	$\pm 50$	mA
Power dissipation	$P_D$	50	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.

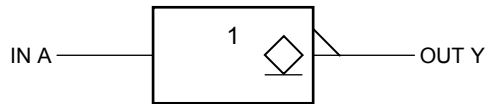
Please design the appropriate reliability upon reviewing the Toshiba Semiconductor Reliability Handbook ("Handling Precautions"/"Derating Concept and Methods") and individual reliability data (i.e. reliability test report and estimated failure rate, etc).

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

Note 2:  $V_{OUT} < \text{GND}$

Start of commercial production  
2008-02

**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 ( $V_{CC} = 5 \pm 0.5$ V)	

Not Recommended for New Design

**Electrical Characteristics**

**DC Characteristics**

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

Not Recommended for New Design

**AC Characteristics (unless otherwise specified, Input:  $t_r = t_f = 3$  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 <sub>pZL</sub>	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 <sub>pLZ</sub>	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 <sub>IN</sub>	—		—	4	10	—	10	pF	
Output capacitance	C <sub>OUT</sub>	—		—	6	—	—	—	pF	
Power dissipation capacitance	C <sub>PD</sub>	(Note 3)		—	14	—	—	—	pF	

Note 3: 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:

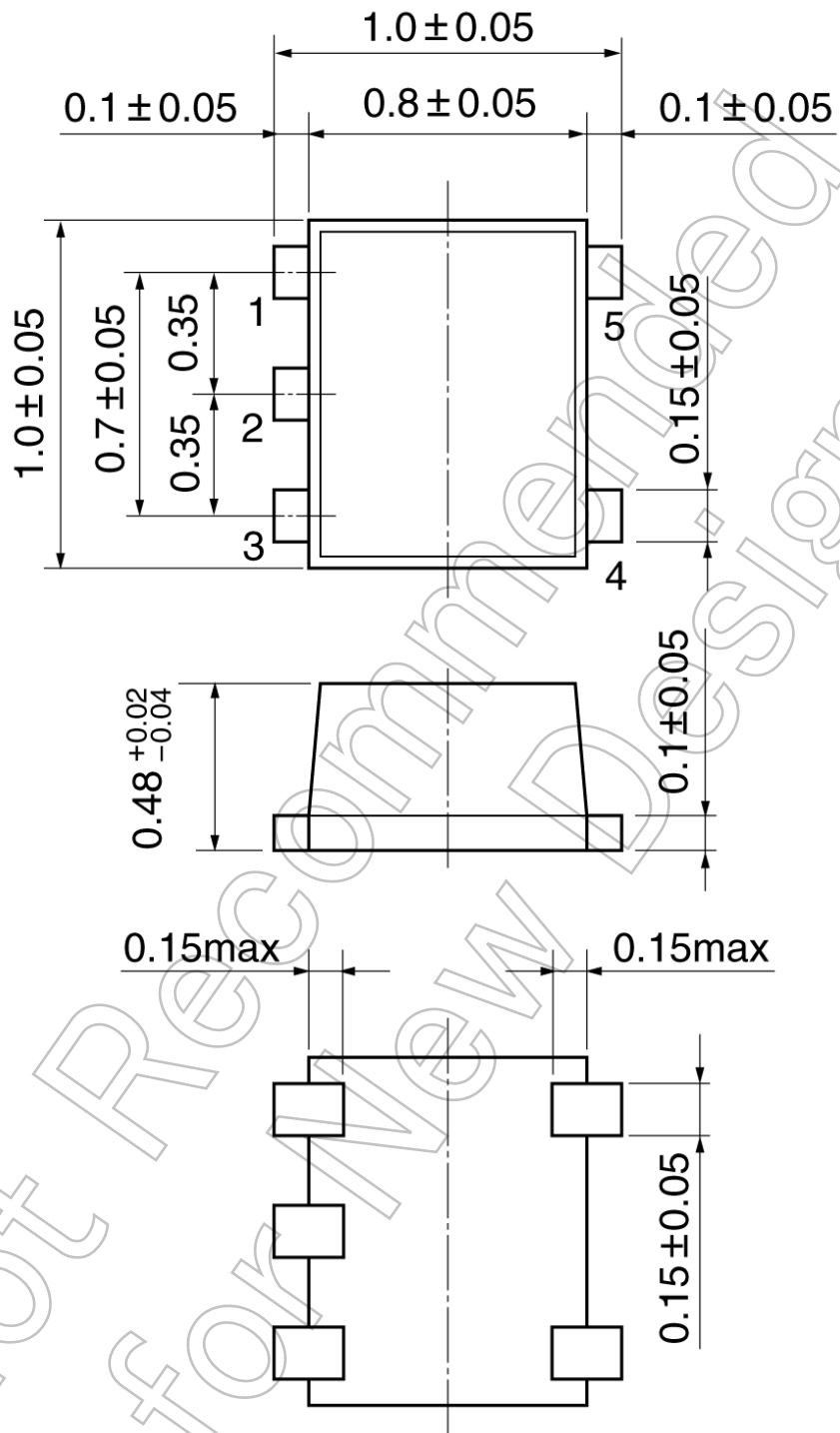
$$I_{CC (opr.)} = C_{PD} \cdot V_{CC} \cdot f_{IN} + I_{CC}$$

Not Recommended for New Design

## Package Dimensions

SON5-P-0.35

Unit: mm



Weight: 0.001 g (typ.)

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