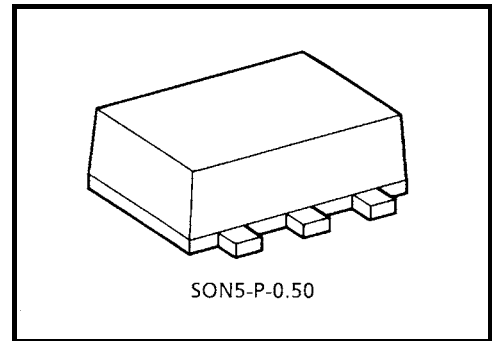


# TC7SH04FE

## INVERTER

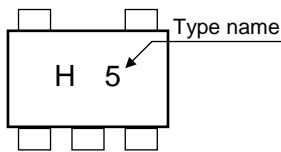
### Features

- Super high speed operation :  $t_{PD} = 3.8 \text{ ns (typ.)}$   
@  $V_{CC} = 5 \text{ V}$
- Low power dissipation :  $I_{CC} = 2 \mu\text{A (Max.)}$   
@  $T_a = 25^\circ\text{C}$
- High noise immunity :  $V_{NIH} = V_{NIH}$   
 $= 28\% V_{CC} \text{ (Min.)}$
- 5.5V tolerant input.
- Wide operation voltage range :  $V_{CC} \text{ (opr)} = 2\sim 5.5 \text{ V}$

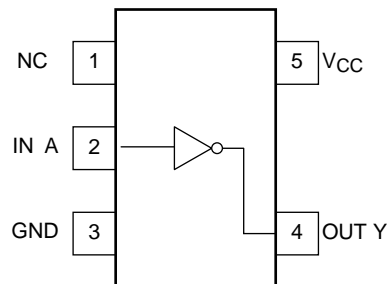


Weight: 0.003 g (typ.)

### Marking



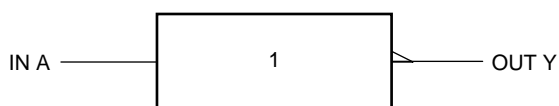
### Pin Assignment (top view)



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

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

## Logic Diagram



## Truth Table

A	Y
L	H
H	L

## Recommended Operating Conditions

Characteristics	Symbol	Rating	Unit
Supply voltage	$V_{CC}$	2~5.5	V
Input voltage	$V_{IN}$	0~5.5	V
Output voltage	$V_{OUT}$	0~ $V_{CC}$	V
Operating temperature	$T_{opr}$	-40~85	°C
Input rise and fall time	dt/dv	0~100 ( $V_{CC} = 3.3 V \pm 0.3 V$ )	ns/V
		0~20 ( $V_{CC} = 5 V \pm 0.5 V$ )	

## Electrical Characteristics

### DC Characteristics

Characteristics	Symbol	Test Circuit	Test Condition	$T_a = 25^\circ\text{C}$			$T_a = -40\sim 85^\circ\text{C}$		Unit			
				$V_{CC}$ (V)	Min	Typ.	Max	Min		Max		
High-level input voltage	$V_{IH}$	—	—	2.0	1.5	—	—	1.5	—	V		
				3.0~5.5	$V_{CC} \times 0.7$	—	—	$V_{CC} \times 0.7$	—			
Low-level input voltage	$V_{IL}$	—	—	2.0	—	—	0.5	—	0.5	V		
				3.0~5.5	—	—	$V_{CC} \times 0.3$	—	$V_{CC} \times 0.3$			
High-level output voltage	$V_{OH}$	—	$V_{IN} = V_{IL}$	$I_{OH} = -50 \mu\text{A}$	2.0	1.9	2.0	—	1.9	—	V	
					3.0	2.9	3.0	—	2.9	—		
					4.5	4.4	4.5	—	4.4	—		
					$I_{OH} = -4 \text{ mA}$	3.0	2.58	—	—	2.48		—
					$I_{OH} = -8 \text{ mA}$	4.5	3.94	—	—	3.80		—
Low-level output voltage	$V_{OL}$	—	$V_{IN} = V_{IH}$	$I_{OL} = 50 \mu\text{A}$	2.0	—	0	0.1	—	0.1	V	
					3.0	—	0	0.1	—	0.1		
					4.5	—	0	0.1	—	0.1		
					$I_{OL} = 4 \text{ mA}$	3.0	—	—	0.36	—		0.44
					$I_{OL} = 8 \text{ mA}$	4.5	—	—	0.36	—		0.44
Input leakage current	$I_{IN}$	—	$V_{IN} = 5.5 \text{ V or GND}$	0~5.5	—	—	$\pm 0.1$	—	$\pm 1.0$	$\mu\text{A}$		
Quiescent supply current	$I_{CC}$	—	$V_{IN} = V_{CC} \text{ or GND}$	5.5	—	—	2.0	—	20.0	$\mu\text{A}$		

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

Characteristics	Symbol	Test Condition		Ta = 25°C			Ta = -40~85°C		Unit
		V <sub>CC</sub> (V)	C <sub>L</sub> (pF)	Min	Typ.	Max	Min	Max	
Propagation delay time	t <sub>PLH</sub>	3.3 ± 0.3	15	—	5.0	7.1	1.0	8.5	ns
			50	—	7.5	10.6	1.0	12.0	
	t <sub>PHL</sub>	5.0 ± 0.5	15	—	3.8	5.5	1.0	6.5	
			50	—	5.3	7.5	1.0	8.5	
Input capacitance	C <sub>IN</sub>			—	4	10	—	10	pF
Power dissipation capacitance	C <sub>PD</sub>	(Note)		—	13	—	—	—	pF

Note: C<sub>PD</sub> is defined as the value of the internal equivalent capacitance which is calculated from the operating current consumption without load.

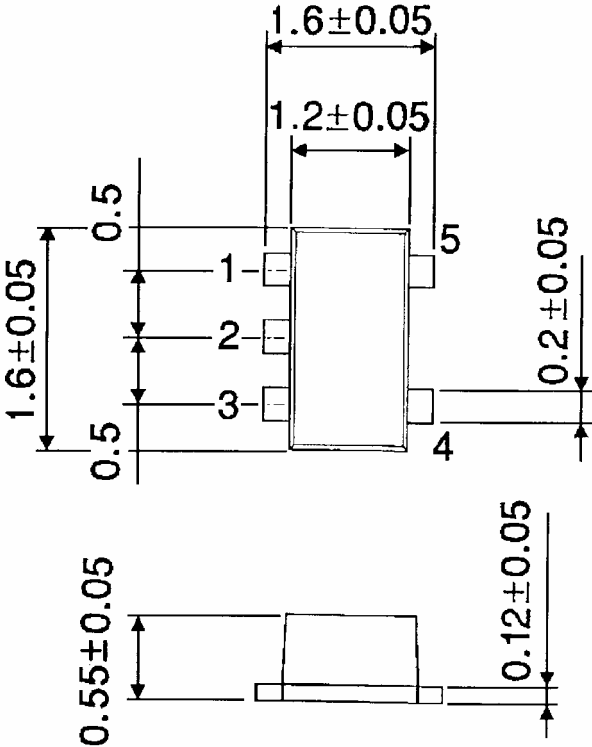
Average operating current can be obtained by the equation.

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

**Package Dimensions**

SON5-P-0.50

Unit : mm



Weight: 0.003 g (typ.)

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