

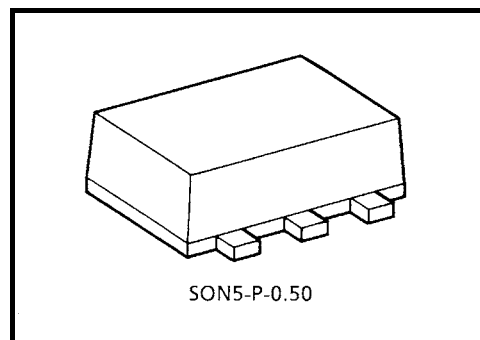
TOSHIBA CMOS Digital Integrated Circuit Silicon Monolithic

TC7SH14FE

SCHMITT INVERTER

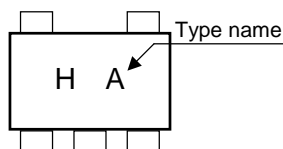
Features

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

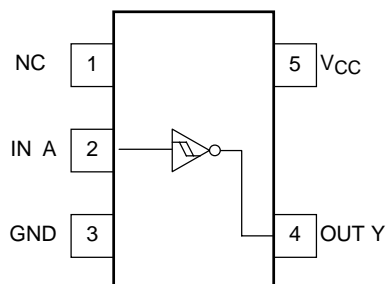


Weight: 0.003 g (typ.)

Marking



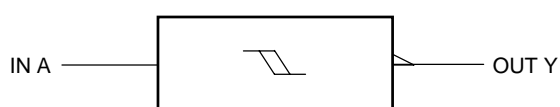
Pin Assignment (top view)



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

Characteristics	Symbol	Rating	Unit
Supply voltage range	V_{CC}	$-0.5 \sim 7$	V
DC input voltage	V_{IN}	$-0.5 \sim 7$	V
DC output voltage	V_{OUT}	$-0.5 \sim V_{CC} + 0.5$	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	150	mW
Storage temperature	T_{stg}	$-65 \sim 150$	$^\circ\text{C}$

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 ($V_{CC} = 3.3 \text{ V} \pm 0.3 \text{ V}$)	ns/V
		0~20 ($V_{CC} = 5 \text{ V} \pm 0.5 \text{ V}$)	

Electrical Characteristics

DC Characteristics

Characteristics	Symbol	Test Condition		Ta = 25°C			Ta = -40~85°C		Unit
				V_{CC} (V)	Min	Typ.	Max	Min	Max
Positive Threshold Voltage	V_P	—	—	3.0	—	—	2.20	—	2.20
				4.5	—	—	3.15	—	3.15
				5.5	—	—	3.85	—	3.85
Negative Threshold Voltage	V_N	—	—	3.0	0.90	—	—	0.90	—
				4.5	1.35	—	—	1.35	—
				5.5	1.65	—	—	1.65	—
Hysteresis Voltage	V_H	—	—	3.0	0.30	—	1.20	0.30	1.20
				4.5	0.40	—	1.40	0.40	1.40
				5.5	0.50	—	1.60	0.50	1.60
High-level output voltage	V_{OH}	$V_{IN} = V_{IL}$	$I_{OH} = -50 \mu\text{A}$	2.0	1.9	2.0	—	1.9	—
				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
				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	—	—	± 0.1	—	± 1.0
Quiescent supply current	I_{CC}	$V_{IN} = V_{CC} \text{ or GND}$		5.5	—	—	2.0	—	20.0

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

Characteristics	Symbol	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	—	8.3	12.8	1.0	15.0	ns
			50	—	10.8	16.3	1.0	18.5	
	t _{PHL}	5.0 ± 0.5	15	—	5.5	8.6	1.0	10.0	
			50	—	7.0	10.6	1.0	12.0	
Input capacitance	C _{IN}			—	4	10	—	10	pF
Power dissipation capacitance	C _{PD}	(Note)		—	14	—	—	—	pF

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

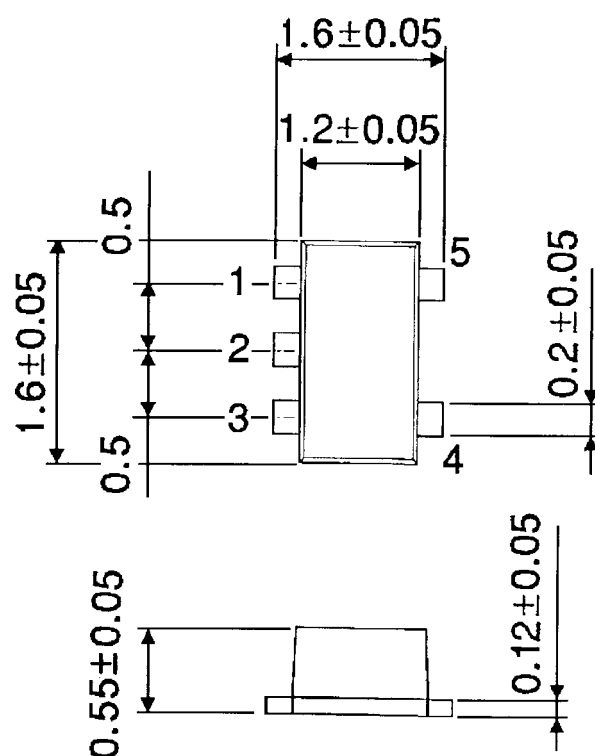
Average operating current can be obtained by the equation.

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

Package Dimensions

SON5-P-0.50

Unit : mm



Weight: 0.003 g (typ.)

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