

TOSHIBA CMOS Digital Integrated Circuit Silicon Monolithic

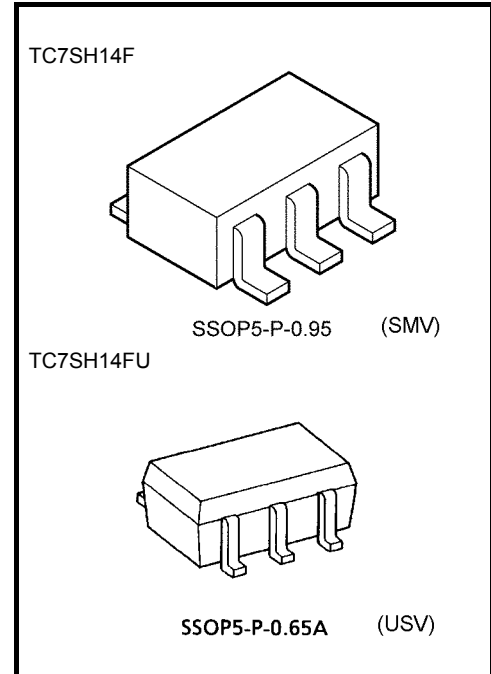
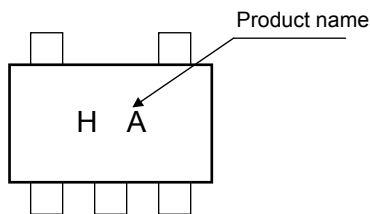
TC7SH14F, TC7SH14FU

Schmitt Inverter

Features

- High speed operation : $t_{pd} = 5.5 \text{ ns (typ.)}$
at $V_{CC} = 5 \text{ V}$, $C_L = 15 \text{ pF}$
- Low power dissipation : $I_{CC} = 2 \text{ } \mu\text{A (max)}$ at $T_a = 25^\circ\text{C}$
- High noise immunity : $V_{NIH} = V_{NIL} = 28\% V_{CC}$ (min)
- Wide operating voltage range: $V_{CC} = 2 \text{ to } 5.5 \text{ V}$
- 5.5-V tolerant input

Marking



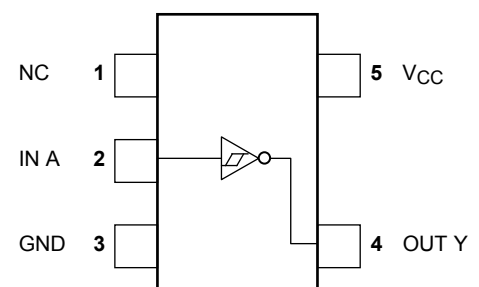
Weight

- SSOP5-P-0.95 : 0.016 g (typ.)
- SSOP5-P-0.65A : 0.006 g (typ.)

Absolute Maximum Ratings (Ta = 25°C)

Characteristics	Symbol	Rating	Unit
Supply voltage	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 $V_{CC} + 0.5$	V
Input diode current	I_{IK}	-20	mA
Output diode current	I_{OK}	± 20 (Note 1)	mA
DC output current	I_{OUT}	± 25	mA
DC V_{CC} /ground current	I_{CC}	± 50	mA
Power dissipation	P_D	200	mW
Storage temperature	T_{stg}	-65 to 150	°C
Lead temperature (10 s)	T_L	260	°C

Pin Assignment (top view)



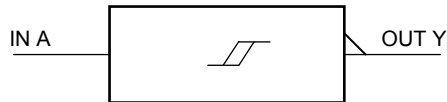
Note: Using continuously under heavy loads (e.g. the application of high temperature/current/voltage and the significant change in temperature, etc.) may cause this product to decrease in the reliability significantly even if the operating conditions (i.e. operating temperature/current/voltage, etc.)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

Note1: $V_{OUT} < GND$, $V_{OUT} > V_{CC}$

Start of commercial production
1994-03

IEC Logic Symbol



Truth Table

A	Y
L	H
H	L

Operating Ranges

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

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	
Input voltage	Positive threshold voltage	V_P	—	3.0	—	—	2.20	—	V		
				4.5	—	—	3.15	—			
				5.5	—	—	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	V	
			4.5	0.40	—	1.40	0.40	1.40			
			5.5	0.50	—	1.60	0.50	1.60			
Output voltage	High level	V_{OH}	$V_{IN} = V_{IL}$	$I_{OH} = -50 \mu A$	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	—	
				$I_{OH} = -4 mA$	3.0	2.58	—	—	2.48	—	
					4.5	3.94	—	—	3.80	—	
					5.5	—	—	—	—	—	
	Low level	V_{OL}	$V_{IN} = V_{IH}$	$I_{OL} = 50 \mu A$	2.0	—	0	0.1	—	0.1	
					3.0	—	0	0.1	—	0.1	
					4.5	—	0	0.1	—	0.1	
				$I_{OL} = 4 mA$	3.0	—	—	0.36	—	0.44	
					4.5	—	—	0.36	—	0.44	
					5.5	—	—	—	—	—	
Input leakage current		I_{IN}	$V_{IN} = 5.5 V$ or GND	0 to 5.5	—	—	± 0.1	—	± 1.0	μA	
Quiescent supply current		I_{CC}	$V_{IN} = V_{CC}$ or GND	5.5	—	—	2.0	—	20.0	μA	

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
			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	
	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 2)		—	14	—	—	—	pF	

Note 2: C_{PD} is defined as the value of the internal equivalent capacitance which is calculated from the operating current consumption without load.

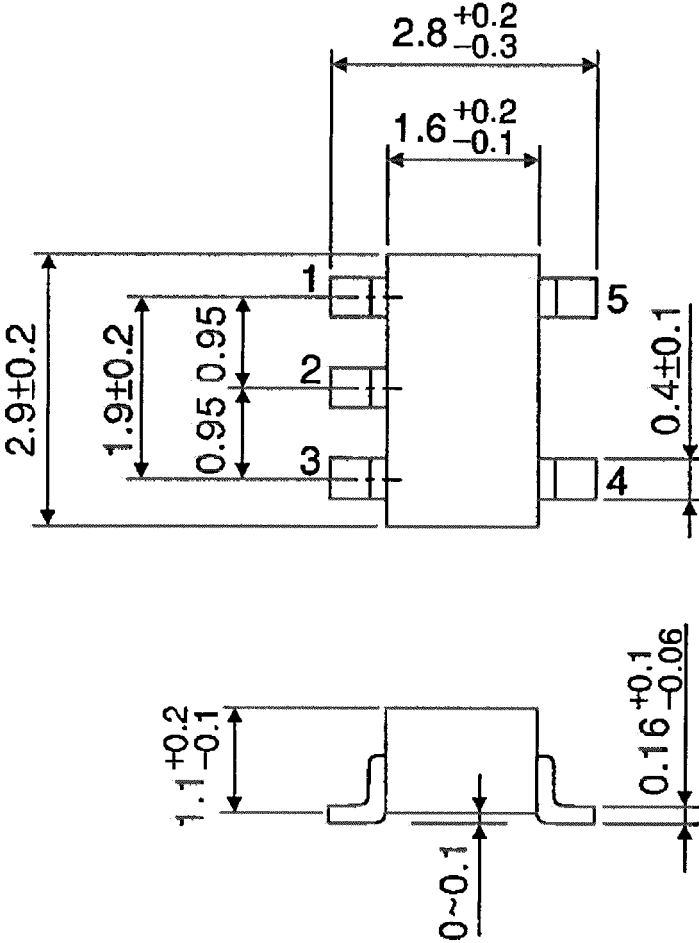
Average operating current can be obtained by the equation.

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

Package Dimensions

SSOP5-P-0.95

Unit : mm

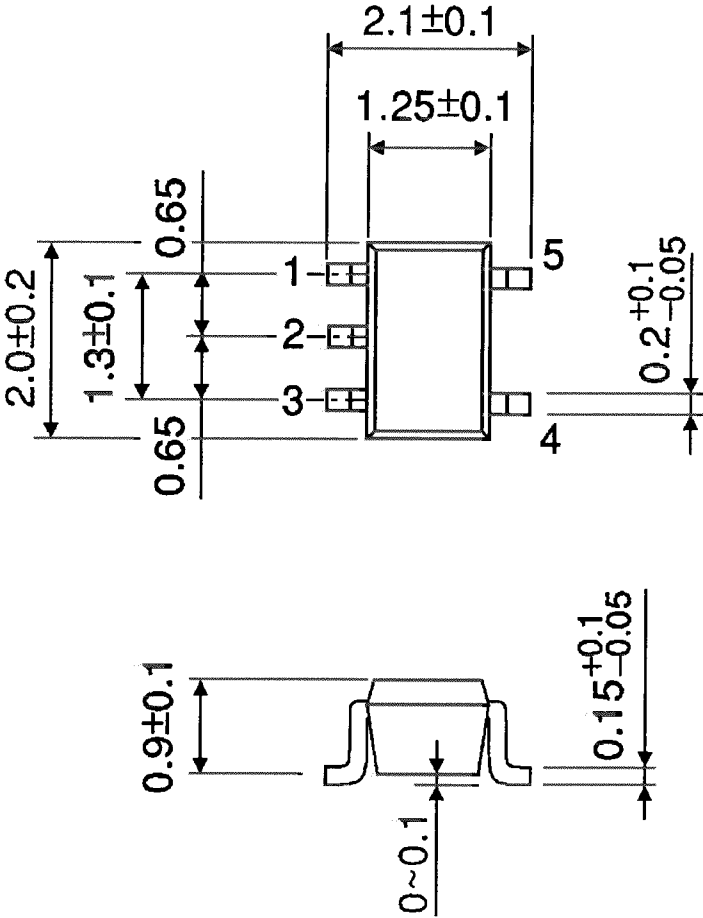


Weight: 0.016 g (typ.)

Package Dimensions

SSOP5-P-0.65A

Unit : mm



Weight: 0.006 g (typ.)

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