TOSHIBA CMOS Digital Integrated Circuit Silicon Monolithic

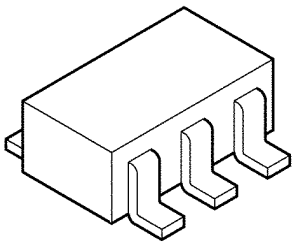
TC7SH14F, TC7SH14FU

Schmitt Inverter

Features

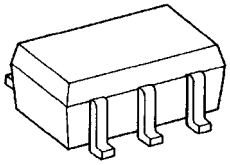
- High speed : t_{pd} = 5.5 ns (typ.) at V_{CC} = 5 V, 15 pF
- Low power dissipation : I_{CC} = 2 μA (max) at Ta = 25°C
- High noise immunity : $V_{NIH} = V_{NIL}$ = 28% V_{CC} (min)
- Wide operating voltage range: V_{CC} (opr.) = 2~5.5 V
- 5.5-V tolerant input

TC7SH14F



SSOP5-P-0.95 (SMV)

TC7SH14FU



SSOP5-P-0.65A (USV)

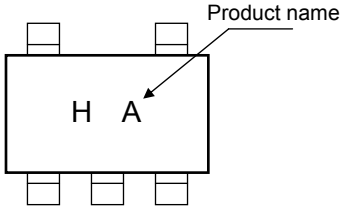
Weight
SSOP5-P-0.95 : 0.016 g (typ.)
SSOP5-P-0.65A : 0.006 g (typ.)

Absolute Maximum Ratings (Ta = 25°C)

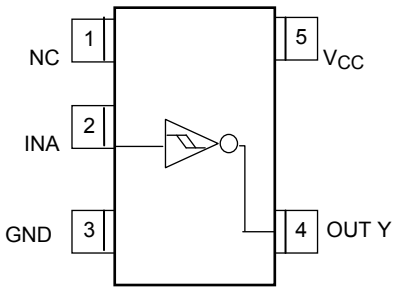
Characteristics	Symbol	Rating	Unit
Supply voltage range	V_{CC}	−0.5~7	V
DC input voltage	V_{IN}	−0.5~7	V
DC output voltage	V_{OUT}	−0.5~V_{CC} + 0.5	V
Input diode current	I_{IK}	−20	mA
Output diode current	I_{OK}	±20	mA
DC output current	I_{OUT}	±25	mA
DC V_{CC}/ground current	I_{CC}	±50	mA
Power dissipation	P_D	200	mW
Storage temperature	T_{stg}	−65~150	°C
Lead temperature (10 s)	T_L	260	°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).

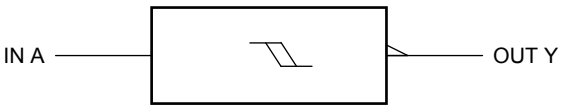
Marking



Pin Assignment (top view)



Logic Diagram



Truth Table

A	Y
L	H
H	L

Operating Ranges

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

Electrical Characteristics

DC Characteristics

Characteristics		Symbol	Test Condition			Ta = 25°C			Ta = −40~85°C		Unit
					V_{CC} (V)	Min	Typ.	Max	Min	Max	
Threshold Voltage	High level	V_P	—		3.0	—	—	2.20	—	2.20	V
					4.5	—	—	3.15	—	3.15	
					5.5	—	—	3.85	—	3.85	
	Low level	V_N	—		3.0	0.90	—	—	0.90	—	V
					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	
High-level output voltage		V_{OH}	V_{IN} = V_{IL}	I_{OH} = −50 μA	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	—	
				I_{OH} = −8 mA	4.5	3.94	—	—	3.80	—	
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		0~5.5	—	—	±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 (Input: $t_r = t_f = 3$ 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} t_{PHL}		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)			—	14	—	—	—	pF

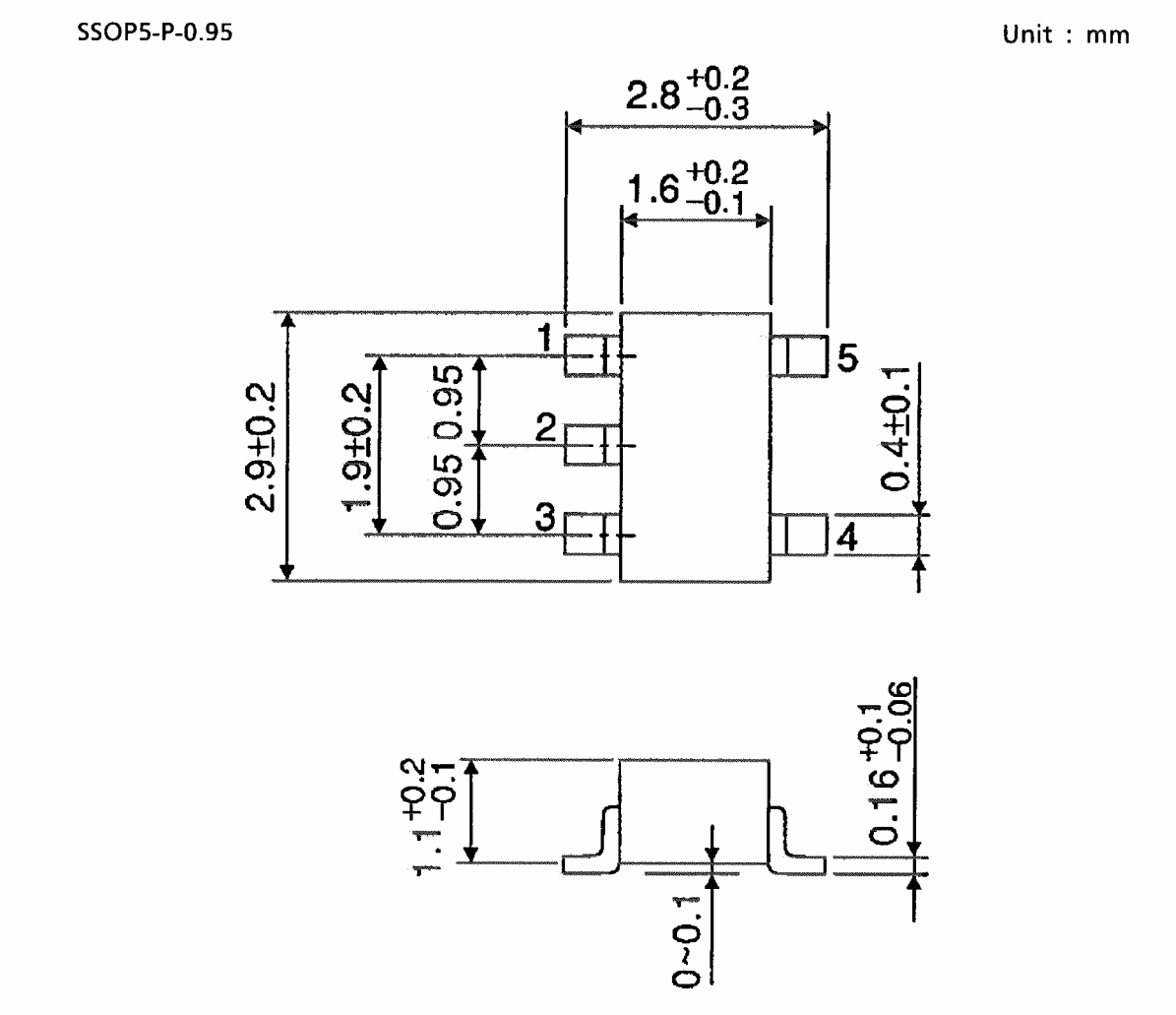
Note: C_{PD} is defined as the value of the internal equivalent capacitance which is calculated from the operating current consumption without load.

Average operating current can be obtained by the equation.

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

Package Dimensions

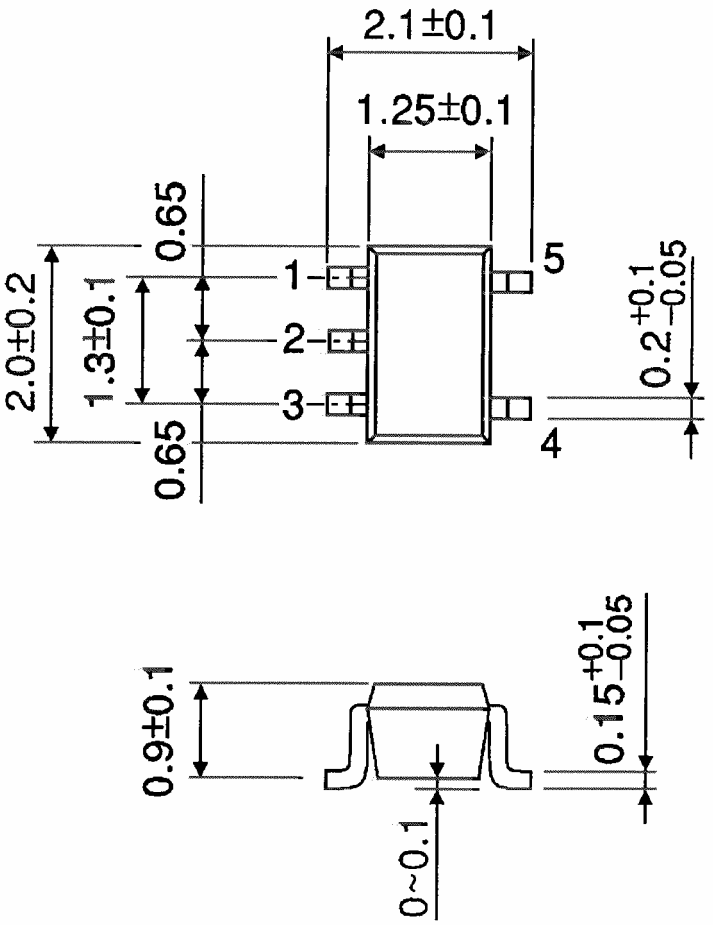
SSOP5-P-0.95 Unit : mm



Weight: 0.016 g (typ.)

Package Dimensions

SSOP5-P-0.65A Unit : mm



Weight: 0.006 g (typ.)

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20070701-EN GENERAL

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