TOSHIBA CMOS Digital Integrated Circuit Silicon Monolithic

TC7S14F, TC7S14FU

Schmitt Inverter

The TC7S14 is a high speed C^2MOS Schmitt Inverter fabricated with silicon gate C^2MOS technology.

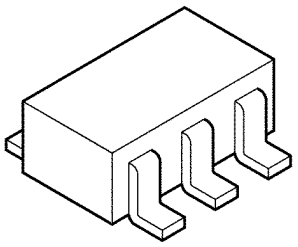
It achieves a high speed operation similar to equivalent LSTTL while maintaining the C^2MOS low power dissipation.

Pin Configuration and function are the same as the TC7SU04F but input have 25% V_{CC} hysteresis and with its schmitt trigger function, the TC7S14F can be used as line receivers which will receive slow input signal.

Input is equipped with protection circuits against static discharge or transient excess voltage.

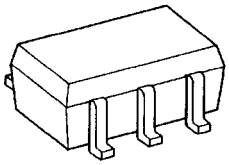
Output currents are 1/2 compared to TC74HC series models.

TC7S14F



SSOP5-P-0.95

TC7S14FU



SSOP5-P-0.65A

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

Features

- High speed: t_{pd} = 11 ns (typ.) at V_{CC} = 5 V
- Low power dissipation: I_{CC} = 1 μA (max) at Ta = 25°C
- High noise immunity: V_H = 1.1 V at V_{CC} = 5 V
- Output drive capability: 5 LSTTL loads
- Symmetrical output impedance: $|I_{OH}| = I_{OL}$ = 2 mA (min)
- Balanced propagation delays: $t_{pLH} \simeq t_{pHL}$
- Wide operating voltage range: V_{CC} (opr) = 2 to 6 V

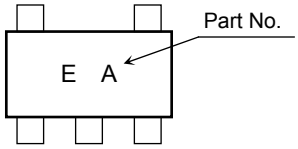
Absolute Maximum Ratings (Ta = 25°C)

Characteristics	Symbol	Rating	Unit
Supply voltage range	V_{CC}	−0.5 to 7	V
DC input voltage	V_{IN}	−0.5 to V_{CC} + 0.5	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	mA
DC output current	I_{OUT}	±12.5	mA
DC V_{CC}/ground current	I_{CC}	±25	mA
Power dissipation	P_D	200	mW
Storage temperature range	T_{stg}	−65 to 150	°C
Lead temperature (10 s)	T_L	260	°C

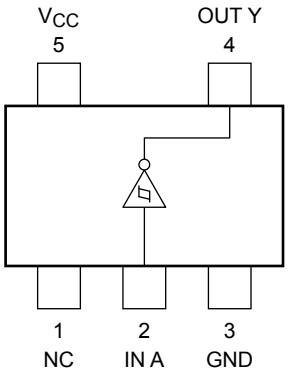
Note: Using continuously under heavy loads (e.g. the application of high temperature/current/voltage and the significant change in temperature, etc.) may cause this product to decrease in the reliability significantly even if the operating conditions (i.e. operating temperature/current/voltage, etc.)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

Start of commercial production
1991-06

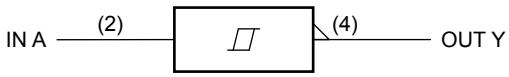
Marking



Pin Configuration (top view)



Logic Diagram



Truth Table

A	Y
L	H
H	L

Operating Ranges

Characteristics	Symbol	Rating	Unit
Supply voltage	V_{CC}	2 to 6	V
Input voltage	V_{IN}	0 to V_{CC}	V
Output voltage	V_{OUT}	0 to V_{CC}	V
Operating temperature range	T_{opr}	−40 to 85	°C

Electrical Characteristics

DC Electrical Characteristics

Characteristics		Symbol	Test Condition		Ta = 25°C				Ta = –40 to 85°C		Unit
				V_{CC} (V)	Min	Typ.	Max		Min	Max	
Threshold voltage	Positive	V_P	—	2.0	1.0	1.25	1.5		1.0	1.5	V
				4.5	2.3	2.7	3.15		2.3	3.15	
				6.0	3.0	3.5	4.2		3.0	4.2	
	Negative	V_N	—	2.0	0.3	0.65	0.9		0.3	0.9	
				4.5	1.13	1.6	2.0		1.13	2.0	
				6.0	1.5	2.3	2.6		1.5	2.6	
Hysteresis voltage		V_H	—	2.0	0.3	0.6	1.0		0.3	1.0	V
				4.5	0.6	1.1	1.4		0.6	1.4	
				6.0	0.8	1.2	1.7		0.8	1.7	
Output voltage	High level	V_{OH}	V_{IN} = V_{IL}	2.0	1.9	2.0	—		1.9	—	V
			I_{OH} = –20 μA	4.5	4.4	4.5	—		4.4	—	
				6.0	5.9	6.0	—		5.9	—	
			I_{OH} = –2 mA	4.5	4.18	4.31	—		4.13	—	
			I_{OH} = –2.6 mA	6.0	5.68	5.80	—		5.63	—	
	Low level	V_{OL}	V_{IN} = V_{IH}	2.0	—	0	0.1		—	0.1	
			I_{OL} = 20 μA	4.5	—	0	0.1		—	0.1	
				6.0	—	0	0.1		—	0.1	
			I_{OL} = 2 mA	4.5	—	0.17	0.26		—	0.33	
			I_{OL} = 2.6 mA	6.0	—	0.18	0.26		—	0.33	
Input leakage current		I_{IN}	V_{IN} = V_{CC} or GND	6.0	—	—	±0.1		—	±1.0	μA
Quiescent supply current		I_{CC}	V_{IN} = V_{CC} or GND	6.0	—	—	1.0		—	10.0	μA

Note: Output currents are 1/2 compared to TC74HC series models.

AC Electrical Characteristics (C_L = 15 pF, V_{CC} = 5 V, Ta = 25°C)

Characteristics	Symbol	Test Condition	Ta = 25°C			Unit
			Min	Typ.	Max	
Output transition time	t_{TLH} t_{THL}	—	—	4	8	ns
Propagation delay time	t_{pLH} t_{pHL}	—	—	11	21	ns

AC Electrical Characteristics (C_L = 50 pF, input $t_r = t_f$ = 6 ns)

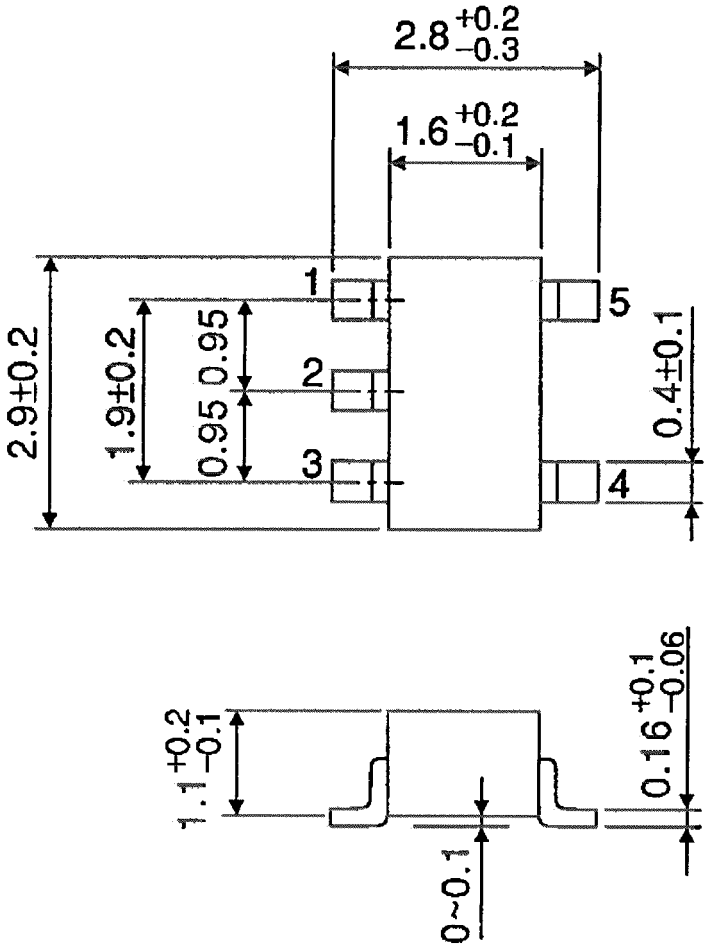
Characteristics	Symbol	Test Condition		Ta = 25°C			Ta = −40 to 85°C		Unit
			V_{CC} (V)	Min	Typ.	Max	Min	Max	
Output transition time	t_{TLH} t_{THL}	—	2.0	—	50	125	—	145	ns
			4.5	—	14	25	—	30	
			6.0	—	12	21	—	24	
Propagation delay time	t_{pLH} t_{pHL}	—	2.0	—	48	100	—	235	ns
			4.5	—	12	20	—	48	
			6.0	—	9	17	—	40	
Input capacitance	C_{IN}	—		—	5	10	—	10	pF
Power dissipation capacitance	C_{PD}	(Note)		—	28	—	—	—	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

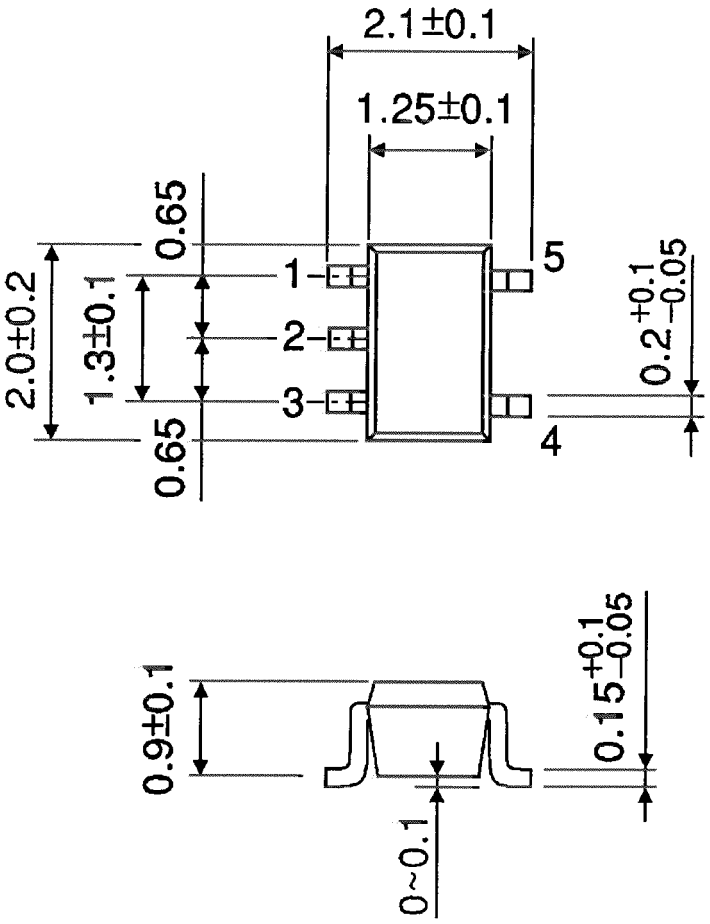


Weight: 0.016 g (typ.)

Package Dimensions

SSOP5-P-0.65A

Unit : mm



Weight: 0.006 g (typ.)

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