TOSHIBA CMOS Digital Integrated Circuit Silicon Monolithic

TC7W14FU, TC7W14FK

Schmitt Inverter

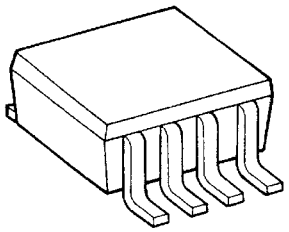
The TC7W14 is high speed C^2MOS Schmitt Inverter fabricated with silicon gate C^2MOS technology.

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

Pin configuration and function are the same as the TC7WU04 but the inputs have 25% VCC hysteresis and with its Schmitt trigger function, the TC7W14 can be used as a line receivers which will receive slow input signals.

All inputs are equipped with protection circuits against static discharge or transient excess voltage.

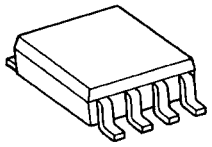
TC7W14FU



SSOP8-P-0.65

(SM8)

TC7W14FK



SSOP8-P-0.50A

(US8)

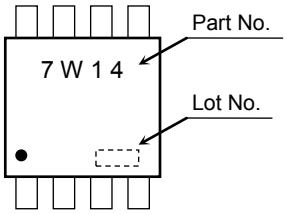
Weight
SSOP8-P-0.65: 0.02 g (typ.)
SSOP8-P-0.50A: 0.01 g (typ.)

Features

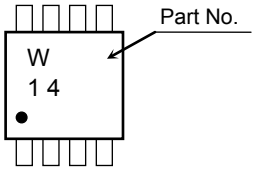
- High speed: t_{pd} = 11 ns (typ.) at V_{CC} = 5 V
- Low power dissipation: I_{CC} = 1μA (max) at Ta = 25°C
- High noise immunity: V_H = 1.1 V at V_{CC} = 5V
- Output drive capability: 10 LSTTL loads
- Symmetrical output impedance: $|I_{OH}| = I_{OL}$ = 4mA (min)
- Balanced propagation delays: $t_{pLH} \simeq t_{pHL}$
- Wide operating voltage range: V_{CC} (opr) = 2 to 6V

Marking

TC7W14FU



TC7W14FK



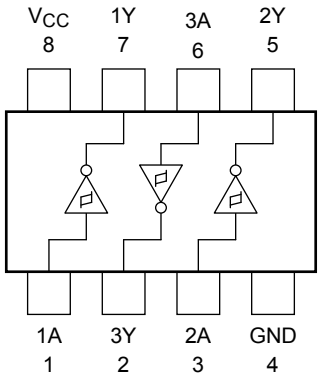
Start of commercial production
1992-02

Absolute Maximum Ratings (Ta = 25°C)

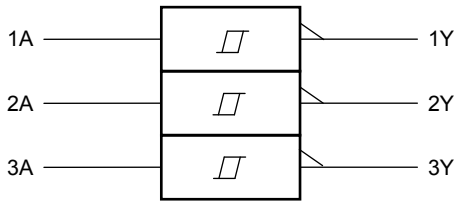
Characteristics	Symbol	Rating	Unit
Supply voltage range	V_{CC}	−0.5 to 7	V
DC input voltage	V_{IN}	−0.5 to V_{CC} + 0.5	V
DC output voltage	V_{OUT}	−0.5 to V_{CC} + 0.5	V
Input diode current	I_{IK}	±20	mA
Output diode current	I_{OK}	±20	mA
DC output current	I_{OUT}	±25	mA
DC V_{CC}/ground current	I_{CC}	±25	mA
Power dissipation	P_D	300 (SM8)	mW
		200 (US8)	
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).

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	High level	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	
	Low level	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}	$V_{IN} = V_{IL}$	I_{OH} = −20 μA	2.0	1.9	2.0	—	1.9	—	V
					4.5	4.4	4.5	—	4.4	—	
					6.0	5.9	6.0	—	5.9	—	
				I_{OH} = −4 mA	4.5	4.18	4.31	—	4.13	—	
				I_{OH} = −5.2 mA	6.0	5.68	5.80	—	5.63	—	
	Low level	V_{OL}	$V_{IN} = V_{IH}$	I_{OL} = 20 μA	2.0	—	0	0.1	—	0.1	
					4.5	—	0	0.1	—	0.1	
					6.0	—	0	0.1	—	0.1	
				I_{OL} = 4 mA	4.5	—	0.17	0.26	—	0.33	
				I_{OL} = 5.2 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

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)

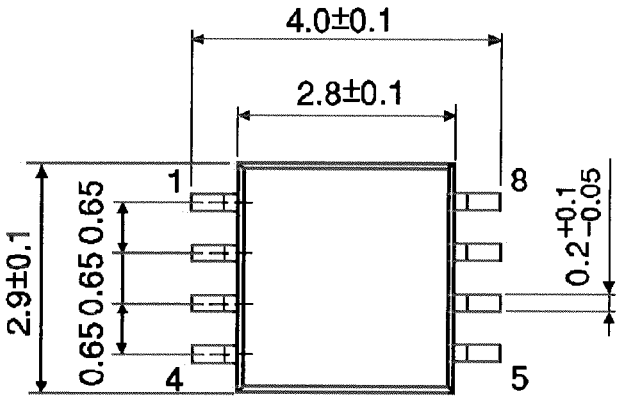
Characteristics	Symbol	Test Condition		Ta = 25°C			Ta = −40 to 85°C		Unit
			V_{CC} (V)	Min	Typ.	Max	Min	Max	
Output transition time	t_{TLH} t_{THL}	—	2.0	—	30	75	—	95	ns
			4.5	—	8	15	—	19	
			6.0	—	7	13	—	16	
Propagation delay time	t_{pLH} t_{pHL}	—	2.0	—	42	125	—	155	ns
			4.5	—	14	25	—	31	
			6.0	—	12	21	—	26	
Input capacitance	C_{IN}	—		—	5	10	—	10	pF
Power dissipation capacitance	C_{PD}	(Note)		—	28	—	—	—	pF

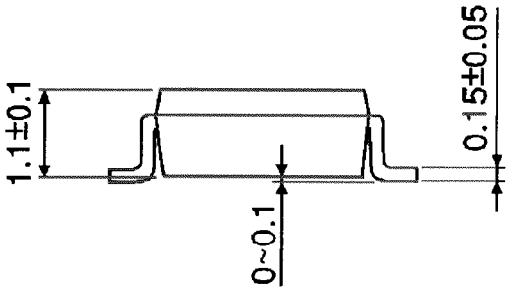
Note: C_{PD} is defined as the value of internal equivalent capacitance of IC which is calculated from the operating current consumption without load.
Average operating current can be obtained by the equation hereunder.

$I_{CC\ (opr)} = C_{PD} \cdot V_{CC} \cdot f_{IN} + I_{CC}/3$ (per gate)

Package Dimensions

SSOP8-P-0.65 Unit : mm

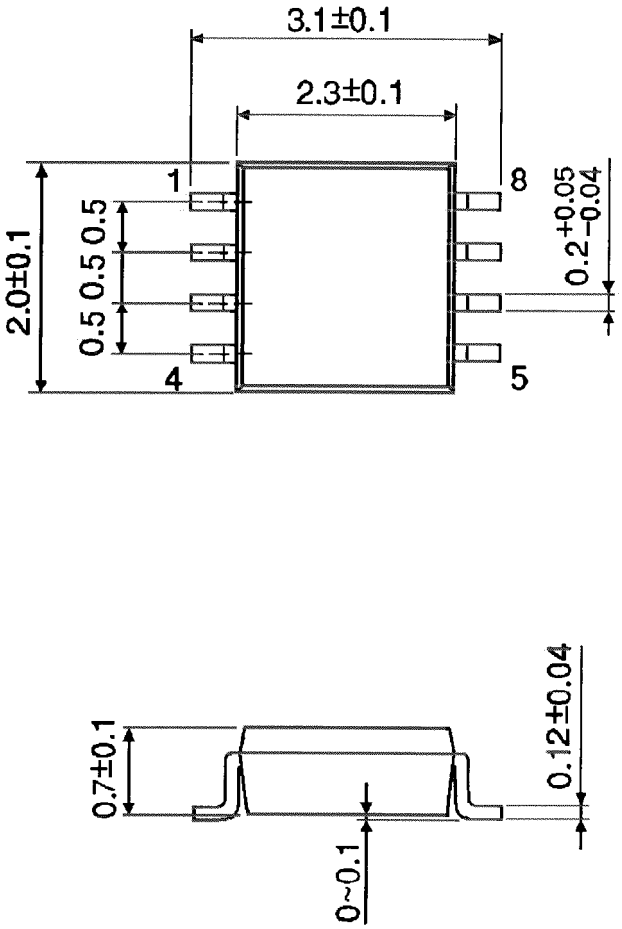




Weight: 0.02 g (typ.)

Package Dimensions

SSOP8-P-0.50A Unit : mm



Weight: 0.01 g (typ.)

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