

TOSHIBA CMOS Digital Integrated Circuit Silicon Monolithic

TC7W14FU, TC7W14FK

Schmitt Inverter

The TC7W14 is high speed C²MOS Schmitt Inverter fabricated with silicon gate C²MOS technology.

It achieves the high speed operation similar to equivalent LSTTL while maintaining the C²MOS low power dissipation.

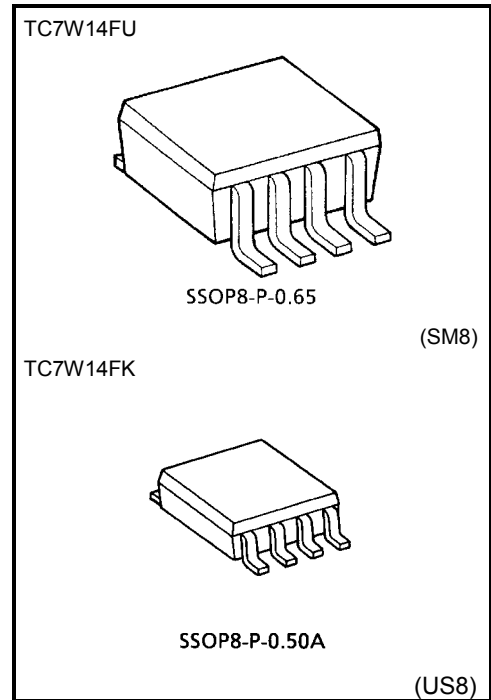
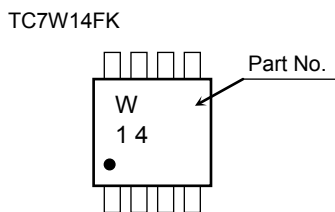
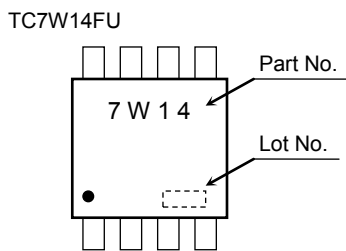
Pin configuration and function are the same as the TC7WU04 but the inputs have 25% V_{CC} hysteresis and with its Schmitt trigger function, the TC7W14 can be used as a line receivers which will receive slow input signals.

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

Features

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

Marking



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

Start of commercial production
 1992-02

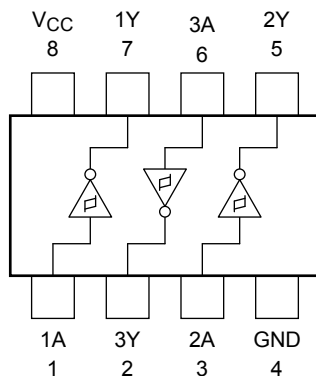
Absolute Maximum Ratings (Ta = 25°C)

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

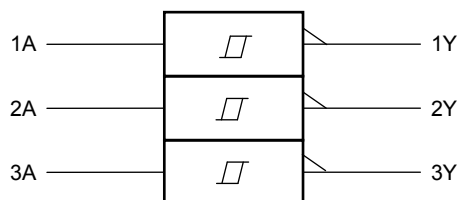
Note: Using continuously under heavy loads (e.g. the application of high temperature/current/voltage and the significant change in temperature, etc.) may cause this product to decrease in the reliability significantly even if the operating conditions (i.e. operating temperature/current/voltage, etc.) 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	$T_a = 25^\circ\text{C}$			$T_a = -40$ 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}	$V_{IN} = V_{IL}$	$I_{OH} = -20 \mu\text{A}$	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	—			
				$I_{OH} = -4 \text{ mA}$	4.5	4.18	4.31	—	4.13	—			
					$I_{OH} = -5.2 \text{ mA}$	6.0	5.68	5.80	—	5.63		—	
						Low level	V_{OL}	$V_{IN} = V_{IH}$	$I_{OL} = 20 \mu\text{A}$	2.0		—	0
	4.5	—	0	0.1						—		0.1	
	6.0	—	0	0.1	—					0.1			
	$I_{OL} = 4 \text{ mA}$	4.5	—	0.17	0.26				—	0.33			
		$I_{OL} = 5.2 \text{ mA}$	6.0	—	0.18				0.26	—		0.33	
			Input leakage current		I_{IN}				$V_{IN} = V_{CC}$ or GND	6.0		—	—
	Quiescent supply current		I_{CC}	$V_{IN} = V_{CC}$ or GND	6.0	—	—	1.0	—	10.0		μA	

AC Electrical Characteristics ($C_L = 15 \text{ pF}$, $V_{CC} = 5 \text{ V}$, $T_a = 25^\circ\text{C}$)

Characteristics	Symbol	Test Condition	$T_a = 25^\circ\text{C}$			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 ($C_L = 50 \text{ pF}$, input $t_r = t_f = 6 \text{ ns}$)

Characteristics	Symbol	Test Condition	$V_{CC} \text{ (V)}$	$T_a = 25^\circ\text{C}$			$T_a = -40$ to 85°C		Unit
				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.

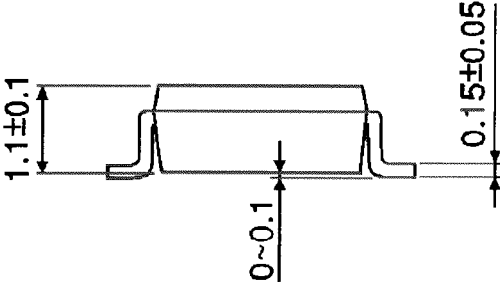
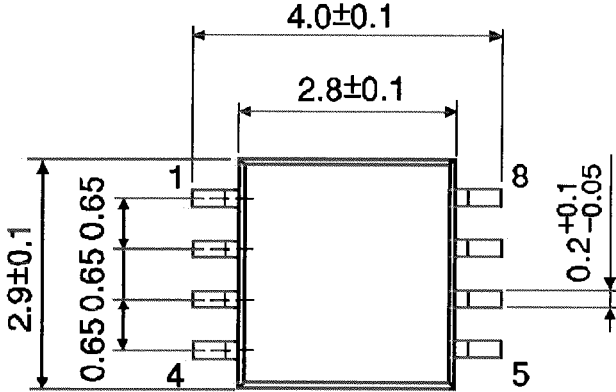
Average operating current can be obtained by the equation hereunder.

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

Package Dimensions

SSOP8-P-0.65

Unit : mm

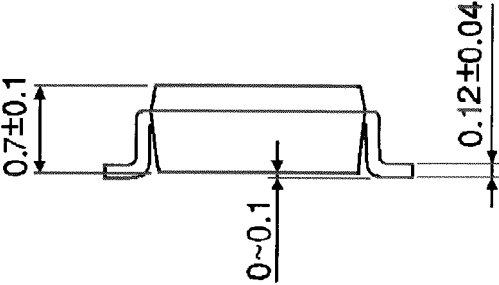
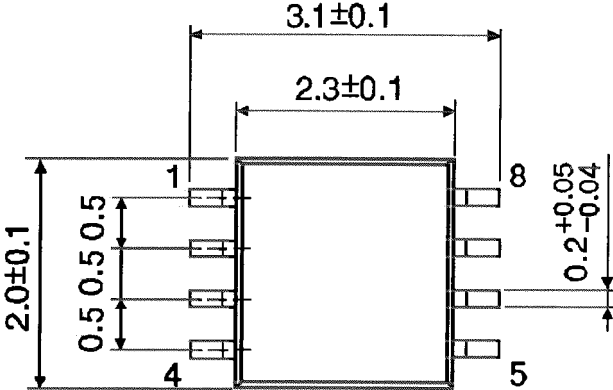


Weight: 0.02 g (typ.)

Package Dimensions

SSOP8-P-0.50A

Unit : mm



Weight: 0.01 g (typ.)

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