

# TC7W14F, TC7W14FU, TC7W14FK

## Schmitt Inverter

The TC7W14 is high speed C<sup>2</sup>MOS Schmitt Inverter fabricated with silicon gate C<sup>2</sup>MOS technology.

It achieves the high speed operation similar to equivalent LSTTL while maintaining the C<sup>2</sup>MOS low power dissipation.

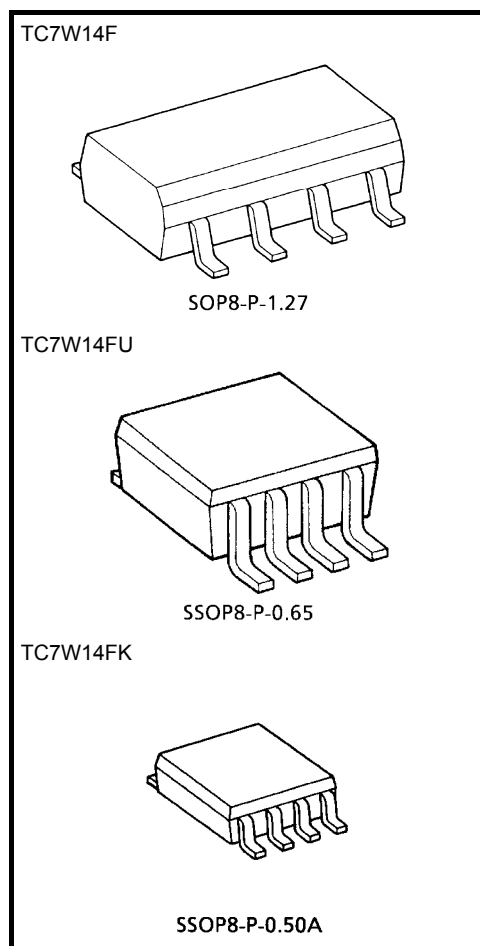
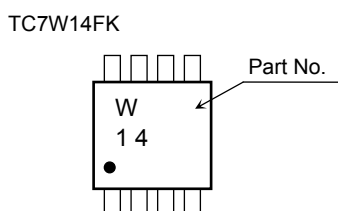
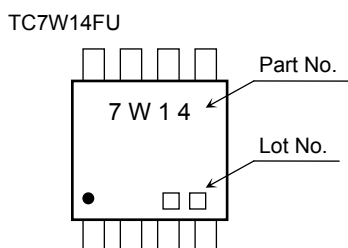
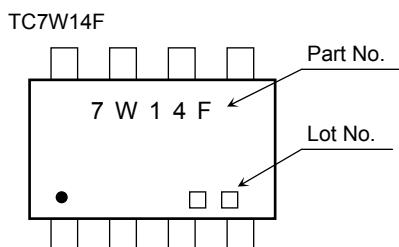
Pin configuration and function are the same as the TC7WU04 but the inputs have 25% V<sub>CC</sub> hysteresis and with its schmitt trigger function, the TC7W14 can be used as a line receivers which will receive slow input signals.

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

- SOP8-P-1.27: 0.05 g (typ.)
- SSOP8-P-0.65: 0.02 g (typ.)
- SSOP8-P-0.50A: 0.01 g (typ.)

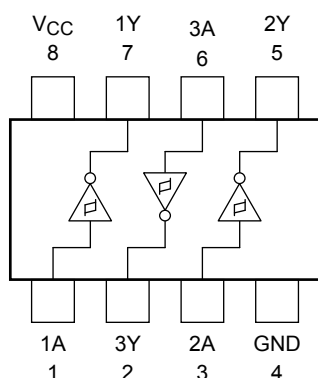
## Absolute Maximum Ratings (Ta = 25°C)

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	$I_{IK}$	$\pm 20$	mA
Output diode current	$I_{OK}$	$\pm 20$	mA
DC output current	$I_{OUT}$	$\pm 25$	mA
DC $V_{CC}$ /ground current	$I_{CC}$	$\pm 25$	mA
Power dissipation	$P_D$	300 (FM8, SM8)	mW
		200 (US8)	
Storage temperature range	$T_{stg}$	-65 to 150	°C
Lead temperature (10 s)	$T_L$	260	°C

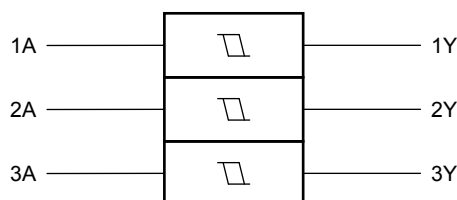
Note: Using continuously under heavy loads (e.g. the application of high temperature/current/voltage and the significant change in temperature, etc.) may cause this product to decrease in the reliability significantly even if the operating conditions (i.e. operating temperature/current/voltage, etc.) 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	$V_{CC}$ (V)	$T_a = 25^\circ\text{C}$			$T_a = -40$ to $85^\circ\text{C}$		Unit		
					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		—
	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	—	—	±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 ( $C_L = 15 \text{ pF}$ , $V_{CC} = 5 \text{ V}$ , $T_a = 25^\circ\text{C}$ )

Characteristics	Symbol	Test Condition	$T_a = 25^\circ\text{C}$			Unit
			Min	Typ.	Max	
Output transition time	$t_{TLH}$	—	—	4	8	ns
	$t_{THL}$					
Propagation delay time	$t_{pLH}$	—	—	11	21	ns
	$t_{pHL}$					

## 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 $85^\circ\text{C}$		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 (refer to test circuit).

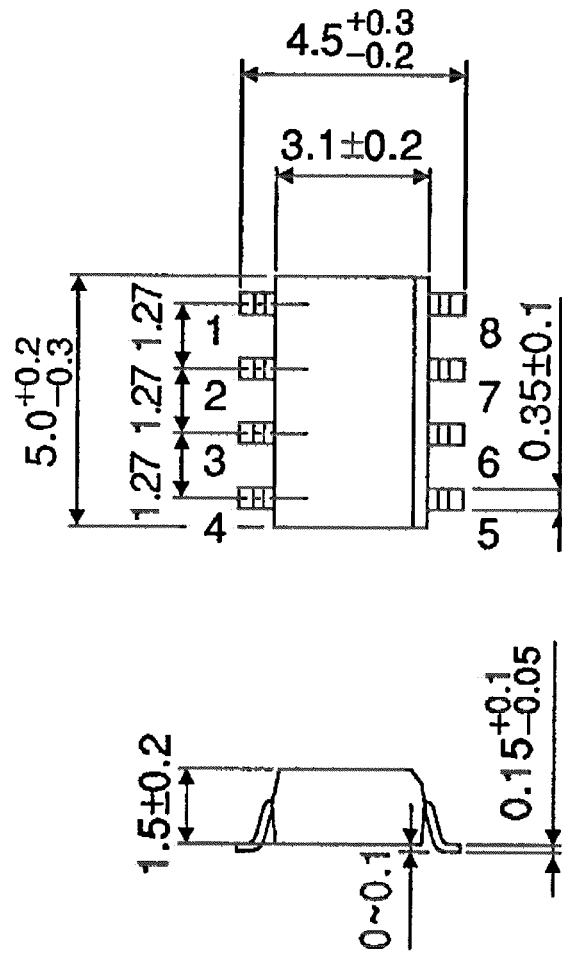
Average operating current can be obtained by the equation hereunder.

$$I_{CC}(\text{opr}) = C_{PD} \cdot V_{CC} \cdot f_{IN} + I_{CC}/2 \text{ (per gate)}$$

**Package Dimensions**

SOP8-P-1.27

Unit : mm

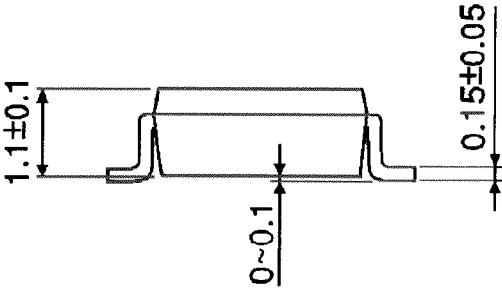
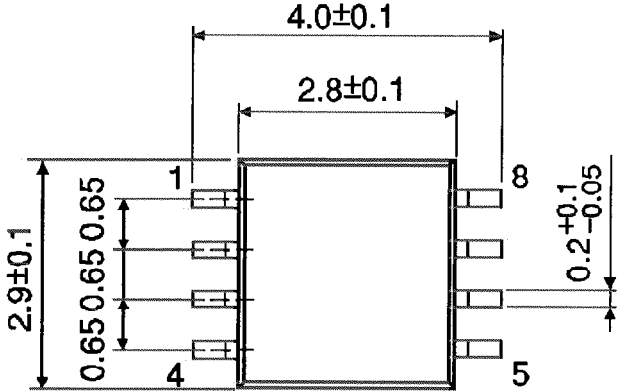


Weight: 0.05 g (typ.)

**Package Dimensions**

SSOP8-P-0.65

Unit : mm

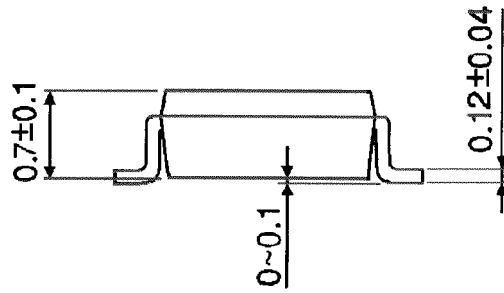
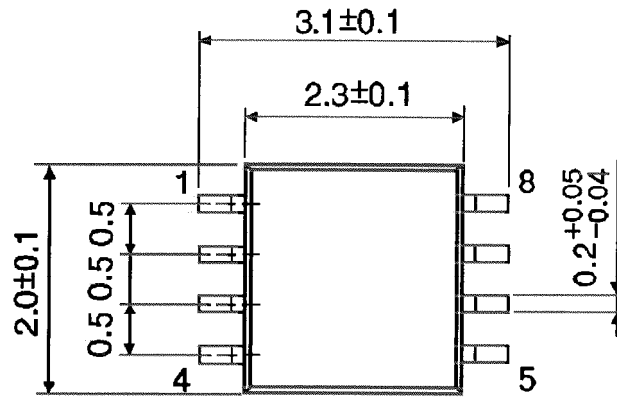


Weight: 0.02 g (typ.)

## Package Dimensions

SSOP8-P-0.50A

Unit : mm



Weight: 0.01 g (typ.)

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