TOSHIBA CMOS Digital Integrated Circuit Silicon Monolithic

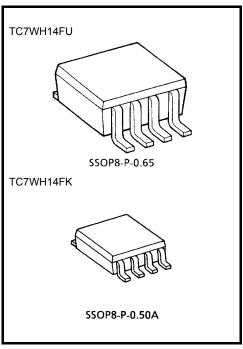
TC7WH14FU,TC7WH14FK

Triple Schmitt Inverter

The TC7WH14 is an advanced high speed CMOS Schmitt Inverter fabricated with silicon gate CMOS technology. It achieves the high speed operation similar to equivalent Bipolar Schottky TTL while maintaining the CMOS low power dissipation. Pin configuration and function are the same as the TC7SH14 but the inputs have hysteresis and with its schmitt trigger function, the TC7WH14 can be used as a line receivers which will receive slow input signals. An input protection circuit ensures that 0 to 7 V can be applied to the input pins without regard to the supply voltage. This device can be used to interface 5 V to 3 V systems and two supply systems such as battery back up. This circuit prevents device destruction due to mismatched supply and input voltages.

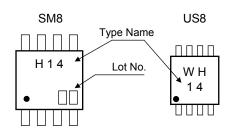
Features

- High speed: $t_{pd} = 5.5 \text{ ns (typ.)}$ at $V_{CC} = 5 \text{ V}$
- Low power dissipation: $I_{CC} = 2 \mu A \text{ (max)}$ at $T_a = 25 \text{°C}$
- High noise immunity: $V_{NIH} = V_{NIL} = 28\% V_{CC}$ (min)
- 5.5-V Tolerant inputs.
- Balanced propagation delays: $t_{pLH} \simeq t_{pHL}$
- Wide operating voltage range: V_{CC} (opr) = $2 \sim 5.5 \text{ V}$

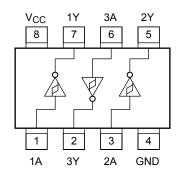


Weight SSOP8-P-0.65: 0.02 g (typ.) SSOP8-P-0.50A: 0.01 g (typ.)

Marking



Pin Assignment (top view)



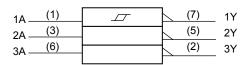
Absolute Maximum Ratings (Ta = 25°C)

Characteristics	Symbol	Rating	Unit
Supply voltage range	V_{CC}	-0.5~7.0	V
DC input voltage	V _{IN}	-0.5~7.0	V
DC output voltage	V _{OUT}	-0.5~V _{CC} + 0.5	V
Input diode current	I _{IK}	-20	mA
Output diode current	lok	±20	mA
DC output current	lout	±25	mA
DC V _{CC} /ground current	I _{CC}	±50	mA
Power dissipation	D-	300 (SM8)	mW
	P _D	200 (US8)	IIIVV
Storage temperature	T _{stg}	-65~150	°C
Lead temperature (10 s)	TL	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).

IEC Logic Symbol



Truth Table

Α	Υ
L	Н
Н	L

Operating Ranges

Characteristics	Symbol	Rating	Unit
Supply voltage	V_{CC}	2.0~5.5	V
Input voltage	V _{IN}	0~5.5	V
Output voltage	V _{OUT}	0~V _{CC}	V
Operating temperature	T _{opr}	-40~85	°C

2



Electrical Characteristics

DC Characteristics

Characteristics Symbol Test Condition			Ta = 25°C			Ta = -40~85°C		Unit			
Characte	ensucs	Symbol			V _{CC} (V)	Min	Тур.	Max	Min	Max	Offic
Positive			_		3.0	_	_	2.20	_	2.20	
threshold	V_{P}	4.5			_	_	3.15	_	3.15		
Input voltage	voltage				5.5		_	3.85	_	3.85	V
input voitage	Negative				3.0	0.90	_	_	0.90	_	v
	threshold	V _N	_		4.5	1.35	_	_	1.35	_	
	voltage					1.65	_	_	1.65	_	
					3.0	0.30	_	1.20	0.30	1.20	
Hysteresis	Hysteresis voltage V _I			_	4.5	0.40	_	1.40	0.40	1.40	V
					5.5	0.50	_	1.60	0.50	1.60	
		igh level V _{OH}	V _{IN} =V _{IL}	I _{OH} = -50 μA	2.0	1.9	2.0	_	1.9	_	_
					3.0	2.9	3.0	_	2.9	_	
	High level				4.5	4.4	4.5	_	4.4	_	
				I _{OH} = -4 mA	3.0	2.58	_	_	2.48	_	
Output voltage				$I_{OH} = -8 \text{ mA}$	4.5	3.94	_	_	3.80	_	V
Output voltage	Output voltage				2.0	_	0	0.1	_	0.1	v
Low level			$V_{IN} = V_{IH}$	$I_{OL} = 50 \mu A$	3.0	_	0	0.1	_	0.1	
	Low level	Low level V _{OL}			4.5	_	0	0.1	_	0.1	
				I _{OL} = 4 mA	3.0		_	0.36	_	0.44	
				$I_{OL} = 8 \text{ mA}$	4.5		_	0.36	_	0.44	
Input leakag	je current	I _{IN}	V _{IN} = 5.5 V or GND		0~5.5		_	±0.1	_	±1.0	μΑ
Quiescent sup	oply current	Icc	V _{IN} = V _{CC} or GND		5.5	_	_	2.0	_	20.0	μА

AC Characteristics (input: $t_r = t_f = 3$ ns)

Characteristics	Symbol	٦	Test Condition		Ta = 25°C			Ta = -40~85°C		Unit
			V _{CC} (V)	C _L (pF)	Min	Тур.	Max	Min	Max	Offic
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	
Power dissipation capacitance	C _{PD}			(Note)		21		_	_	

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

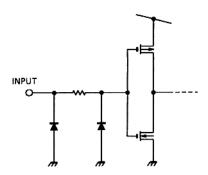
Average operating current can be obtained by the equation:

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

Noise Characteristics (Ta = 25°C, input: $t_r = t_f = 3$ ns)

Characteristics	Symbol	Test Condition	V _{CC} (V)	Тур.	Limit	Unit
Quiet output maximum dynamic V _{OL}	V _{OLP}	C _L = 50 pF	5.0	0.3	0.8	V
Quiet output minimum dynamic V _{OL}	V _{OLV}	C _L = 50 pF	5.0	-0.3	-0.8	V
Minimum high level dynamic input voltage	V _{IHD}	C _L = 50 pF	5.0	_	3.5	V
Maximum low level dynamic input voltage	V _{ILD}	C _L = 50 pF	5.0	_	1.5	V

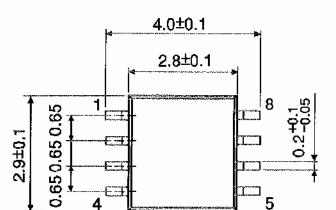
Input Equivalent Circuit

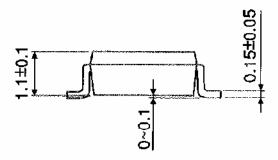


Unit: mm

Package Dimensions

SSOP8-P-0.65





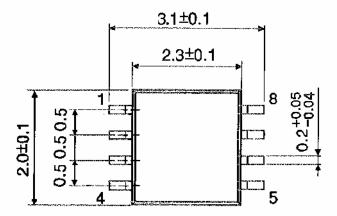
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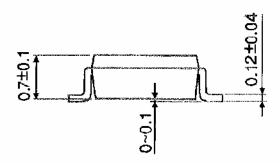
Weight: 0.02 g (typ.)

Package Dimensions

TOSHIBA

SSOP8-P-0.50A Unit: mm





6

Weight: 0.01 g (typ.)

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20070701-EN GENERAL

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