

TOSHIBA CMOS Digital Integrated Circuit Silicon Monolithic

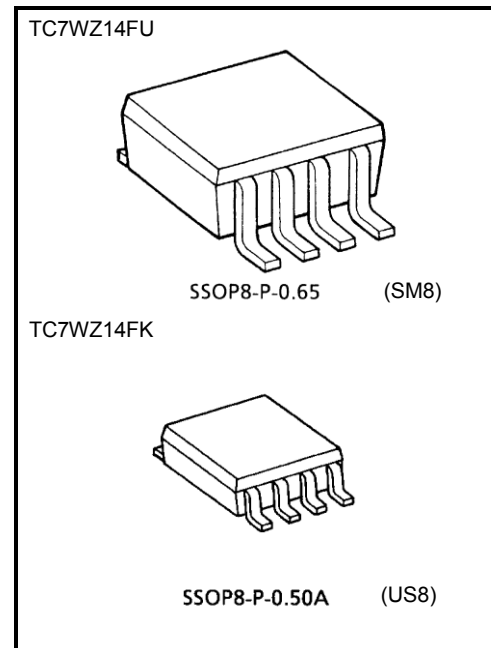
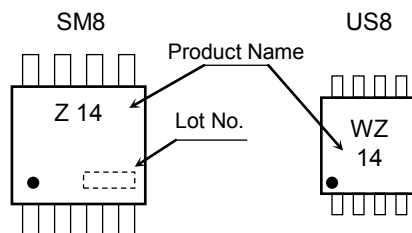
TC7WZ14FU, TC7WZ14FK

Triple Schmitt Inverter

Features

- High output current : ± 24 mA (min) at $V_{CC} = 3$ V
- Super high speed operation : $t_{pd} = 3.7$ ns (typ.)
at $V_{CC} = 5$ V, 50 pF
- Operation voltage range : $V_{CC(opr)} = 1.65$ to 5.5 V
- 5.5-V tolerant inputs
- 5.5-V power down protection outputs
- Matches the performance of TC74LCX series when operated at 3.3-V V_{CC}

Marking



Weight

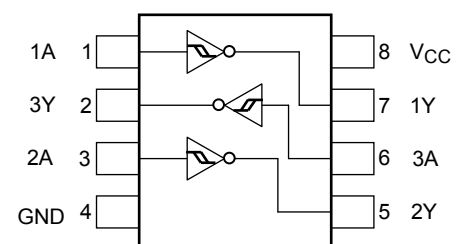
SSOP8-P-0.65 : 0.02 g (typ.)

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

Absolute Maximum Ratings ($T_a = 25^\circ\text{C}$)

Characteristics	Symbol	Rating	Unit
Supply voltage range	V_{CC}	-0.5 to 6	V
DC input voltage	V_{IN}	-0.5 to 6	V
DC output voltage	V_{OUT}	-0.5 to 6 (Note 1)	V
		-0.5 to $V_{CC}+0.5$ (Note 2)	
Input diode current	I_{IK}	-20	mA
Output diode current	I_{OK}	-20 (Note 3)	mA
DC output current	I_{OUT}	± 50	mA
DC V_{CC} /ground current	I_{CC}	± 50	mA
Power dissipation	P_D	300 (SM8) 200 (US8)	mW
Storage temperature	T_{stg}	-65 to 150	$^\circ\text{C}$
Lead temperature (10 s)	T_L	260	$^\circ\text{C}$

Pin Assignment (top view)



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).

Note 1: $V_{CC} = 0$ V

Note 2: High or Low state. Do not exceed I_{OUT} of absolute maximum ratings.

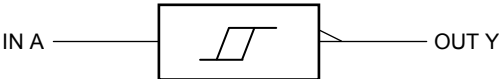
Note 3: $V_{OUT} < GND$

Start of commercial production
2003-05

Truth Table

A	Y
L	H
H	L

IEC Logic Symbol



Operating Ranges

Characteristics	Symbol	Rating	Unit
Supply voltage	V _{CC}	1.65 to 5.5	V
		1.5 to 5.5 (Note 4)	
Input voltage	V _{IN}	0 to 5.5	V
Output voltage	V _{OUT}	0 to 5.5 (Note 5)	V
		0 to V _{CC} (Note 6)	
Operating temperature	T _{opr}	−40 to 85	°C

Note 4: Data retention only
Note 5: V_{CC} = 0 V
Note 6: High or low state

Electrical Characteristics

DC Characteristics

Characteristics		Symbol	Test Condition		Ta = 25°C			Ta = -40 to 85°C		Unit
					V _{CC} (V)	Min	Typ.	Max	Min	
Threshold voltage	High-level	V _P	—	1.65	0.6	1.0	1.4	0.6	1.4	V
				1.8	0.7	1.1	1.5	0.7	1.5	
				2.3	1.0	1.4	1.8	1.0	1.8	
				3.0	1.3	1.75	2.2	1.3	2.2	
				4.5	1.9	2.45	3.1	1.9	3.1	
				5.5	2.2	2.9	3.6	2.2	3.6	
	Low-level	V _N	—	1.65	0.2	0.5	0.8	0.2	0.8	
				1.8	0.25	0.55	0.9	0.25	0.9	
				2.3	0.4	0.75	1.15	0.4	1.15	
				3.0	0.6	1.0	1.5	0.6	1.5	
				4.5	1.0	1.43	2.0	1.0	2.0	
				5.5	1.2	1.7	2.4	1.2	2.4	
Hysteresis voltage		V _H	—	1.65	0.1	0.48	0.9	0.1	0.9	
				1.8	0.15	0.54	1.0	0.15	1.0	
				2.3	0.25	0.65	1.1	0.25	1.1	
				3.0	0.4	0.77	1.2	0.4	1.2	
				4.5	0.6	1.01	1.5	0.6	1.5	
				5.5	0.7	1.18	1.7	0.7	1.7	
High-level output voltage		V _{OH}	V _{IN} = V _{IL}	I _{OH} = -100μA	1.65	1.55	1.65	—	1.55	—
					2.3	2.2	2.3	—	2.2	—
					3.0	2.9	3.0	—	2.9	—
					4.5	4.4	4.5	—	4.4	—
				I _{OH} = -4 mA	1.65	1.29	1.52	—	1.29	—
				I _{OH} = -8 mA	2.3	1.9	2.14	—	1.9	—
				I _{OH} = -16 mA	3.0	2.4	2.75	—	2.4	—
				I _{OH} = -24 mA	3.0	2.3	2.62	—	2.3	—
				I _{OH} = -32 mA	4.5	3.8	4.13	—	3.8	—
Low-level output voltage		V _{OL}	V _{IN} = V _{IH}	I _{OH} = 100 μA	1.65	—	0	0.1	—	0.1
					2.3	—	0	0.1	—	0.1
					3.0	—	0	0.1	—	0.1
					4.5	—	0	0.1	—	0.1
				I _{OH} = 4 mA	1.65	—	0.08	0.24	—	0.24
				I _{OH} = 8 mA	2.3	—	0.1	0.3	—	0.3
				I _{OH} = 6 mA	3.0	—	0.16	0.4	—	0.4
				I _{OH} = 24 mA	3.0	—	0.24	0.55	—	0.55
				I _{OH} = 32 mA	4.5	—	0.25	0.55	—	0.55
				Input leakage current		I _{IN}	V _{IN} = 5.5 V or GND	0 to 5.5	—	—
Power off leakage current		I _{OFF}	V _{IN} or V _{OUT} = 5.5 V	0.0	—	—	1	—	10	μA
Quiescent supply current		I _{CC}	V _{IN} = 5.5 V or GND	1.65 to 5.5	—	—	1	—	10	μA

AC Characteristics (input: $t_r = t_f = 3 \text{ ns}$)

Characteristics	Symbol	Test Condition	Ta = 25°C				Ta = -40 to 85°C		Unit
			VCC (V)	Min	Typ.	Max	Min	Max	
Propagation delay time	t _{pLH} t _{pHL}	C _L = 15 pF, R _L = 1 MΩ	1.80 ± 0.15	2.0	9.1	15.0	2.0	15.6	ns
			2.5 ± 0.2	1.0	5.0	9.0	1.0	9.5	
			3.3 ± 0.3	1.0	3.7	6.3	1.0	6.5	
			5.0 ± 0.5	0.5	3.1	5.2	0.5	5.5	
		C _L = 50 pF, R _L = 500 Ω	3.3 ± 0.3	1.5	4.4	7.2	1.5	7.5	
			5.0 ± 0.5	0.8	3.7	5.9	0.8	6.2	
Input capacitance	C _{IN}	—	0 to 5.5	—	3.0	—	—	pF	
Power dissipation capacitance	C _{PD}	(Note 7)	3.3	—	33	—	—	pF	
			5.5	—	43	—	—	—	

Note 7: C_{PD} is defined as the value of the internal equivalent capacitance which is calculated from the operating current consumption without load.

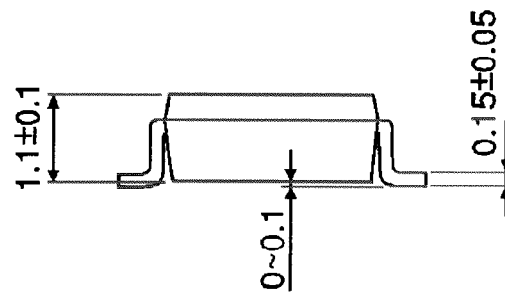
Average operating current can be obtained by the equation:

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

SSOP8-P-0.65

Technical drawing of a rectangular plate with dimensions and tolerances:

- Overall width: 4.0 ± 0.1
- Overall height: 2.9 ± 0.1
- Inner width: 2.8 ± 0.1
- Left side features:
 - Four rectangular slots, each with a width of 0.65 .
 - Spacing between slots: 0.65 .
 - Bottom slot offset from the bottom edge: 0.65 .
- Right side features:
 - Five rectangular slots, each with a width of $0.2^{+0.1}_{-0.05}$.
 - Bottom slot offset from the bottom edge: $0.2^{+0.1}_{-0.05}$.
- Labels:
 - 1: Top edge of the plate.
 - 4: Bottom edge of the plate.
 - 8: Right edge of the plate.
 - 5: Bottom edge of the plate (repeated).



2014-10-25

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