

TOSHIBA CMOS Digital Integrated Circuit Silicon Monolithic

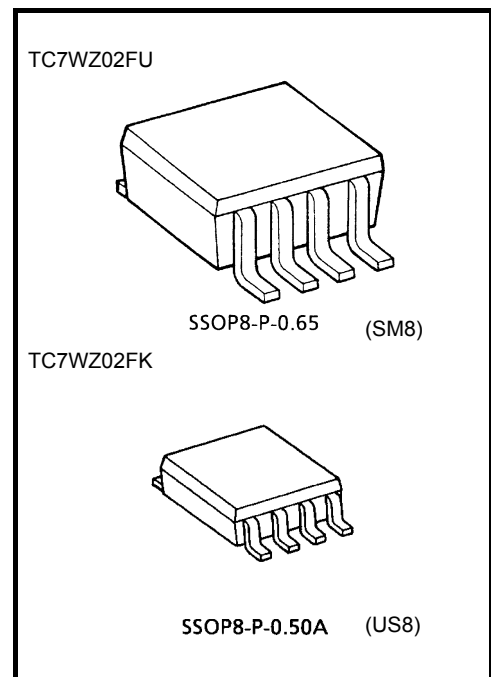
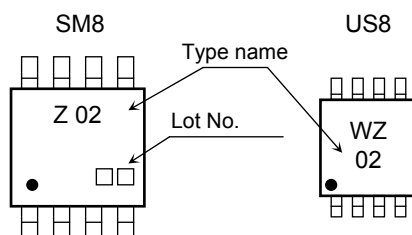
# TC7WZ02FU, TC7WZ02FK

Dual 2 Input NOR Gate

## Features

- High output drive:  $\pm 24$  mA (min) at  $V_{CC} = 3$  V
- Super high speed operation:  $t_{pd} = 2.4$  ns (typ.)  
at  $V_{CC} = 5$  V, 50 pF
- Operation voltage range:  $V_{CC} (opr) = 1.65 \sim 5.5$  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

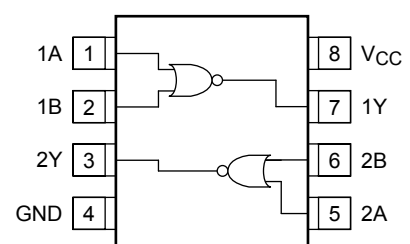


Weight  
 SSOP8-P-0.65 : 0.02 g (typ.)  
 SSOP8-P-0.50A : 0.01 g (typ.)

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

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

## Pin Assignment (top view)



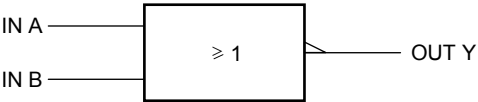
**Note:** Using continuously under heavy loads (e.g. the application of high temperature/current/voltage and the significant change in temperature, etc.) may cause this product to decrease in the reliability significantly even if the operating conditions (i.e. operating temperature/current/voltage, etc.) 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).

Truth Table

A	B	Y
L	L	H
L	H	L
H	L	L
H	H	L

Logic Diagram



Operating Ranges

Characteristics	Symbol	Rating	Unit
Supply voltage	V <sub>CC</sub>	1.65~5.5	V
		1.5~5.5 (Note 1)	
Input voltage	V <sub>IN</sub>	0~5.5	V
Output voltage	V <sub>OUT</sub>	0~5.5 (Note 2)	V
		0~V <sub>CC</sub> (Note 3)	
Operating temperature	T <sub>opr</sub>	-40~85	°C
Input rise and fall time	d <sub>t</sub> /d <sub>v</sub>	0~20 (V <sub>CC</sub> = 1.8 V ± 0.15 V, 2.5 V ± 0.2 V)	ns/V
		0~10 (V <sub>CC</sub> = 3.3 V ± 0.3 V)	
		0~5 (V <sub>CC</sub> = 5.5 V ± 0.5 V)	

- Note 1: Data retention only
- Note 2: V<sub>CC</sub> = 0 V
- Note 3: High or low state

**Electrical Characteristics**
**DC Characteristics**

Characteristics		Symbol	Test Condition		Ta = 25°C				Ta = -40~85°C		Unit
					V <sub>CC</sub> (V)	Min	Typ.	Max	Min	Max	
Input voltage	High level	V <sub>IH</sub>	—	1.65~1.95	0.75 × V <sub>CC</sub>	—	—	0.75 × V <sub>CC</sub>	—	V	
				2.3~5.5	0.7 × V <sub>CC</sub>	—	—	0.7 × V <sub>CC</sub>	—		
	Low level	V <sub>IL</sub>	—	1.65~1.95	—	—	0.25 × V <sub>CC</sub>	—	0.25 × V <sub>CC</sub>		
				2.3~5.5	—	—	0.3 × V <sub>CC</sub>	—	0.3 × V <sub>CC</sub>		
Output voltage	High level	V <sub>OH</sub>	V <sub>IN</sub> = V <sub>IL</sub>	I <sub>OH</sub> = -100 μA	1.65	1.55	1.65	—	1.55	—	V
					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 <sub>OH</sub> = -4 mA	1.65	1.29	1.52	—	1.29	—	
				I <sub>OH</sub> = -8 mA	2.3	1.9	2.15	—	1.9	—	
				I <sub>OH</sub> = -16 mA	3.0	2.4	2.8	—	2.4	—	
				I <sub>OH</sub> = -24 mA	3.0	2.3	2.68	—	2.3	—	
				I <sub>OH</sub> = -32 mA	4.5	3.8	4.2	—	3.8	—	
	Low level	V <sub>OL</sub>	V <sub>IN</sub> = V <sub>IH</sub> or V <sub>IL</sub>	I <sub>OL</sub> = 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 <sub>OL</sub> = 4 mA	1.65	—	0.08	0.24	—	0.24	
				I <sub>OL</sub> = 8 mA	2.3	—	0.1	0.3	—	0.3	
				I <sub>OL</sub> = 16 mA	3.0	—	0.15	0.4	—	0.4	
				I <sub>OL</sub> = 24 mA	3.0	—	0.22	0.55	—	0.55	
				I <sub>OL</sub> = 32 mA	4.5	—	0.22	0.55	—	0.55	
Input leakage current		I <sub>IN</sub>	V <sub>IN</sub> = 5.5 V or GND		0~5.5	—	—	±1	—	±10	μA
Power off leakage current		I <sub>OFF</sub>	V <sub>IN</sub> or V <sub>OUT</sub> = 5.5 V		0.0	—	—	1	—	10	μA
Quiescent supply current		I <sub>CC</sub>	V <sub>IN</sub> = 5.5 V or GND		1.65~5.5	—	—	1	—	10	μA

AC Characteristics (unless otherwise specified, Input:  $t_r = t_f = 3 \text{ ns}$ )

Characteristics	Symbol	Test Condition	Ta = 25°C				Ta = -40~85°C		Unit
			V <sub>CC</sub> (V)	Min	Typ.	Max	Min	Max	
Propagation delay time	t <sub>pLH</sub> t <sub>pHL</sub>	C <sub>L</sub> = 15 pF, R <sub>L</sub> = 1 MΩ	1.8 ± 0.15	2.0	5.4	9.8	2.0	10.0	ns
			2.5 ± 0.2	1.2	3.3	5.4	1.2	5.8	
			3.3 ± 0.3	0.8	2.5	3.8	0.8	4.1	
			5.0 ± 0.5	0.5	2.0	3.0	0.5	3.3	
		C <sub>L</sub> = 50 pF, R <sub>L</sub> = 500 Ω	3.3 ± 0.3	1.2	3.1	4.6	1.2	5.0	
			5.0 ± 0.5	0.8	2.4	3.7	0.8	4.0	
Input capacitance	C <sub>IN</sub>	—	0~5.5	—	3.0	—	—	—	pF
Power dissipation capacitance	C <sub>PD</sub>	(Note 4)	3.3	—	18	—	—	—	pF
			5.5	—	24	—	—	—	

Note 4: C<sub>PD</sub> is defined as the value of the internal equivalent capacitance which is calculated from the operating current consumption without load.

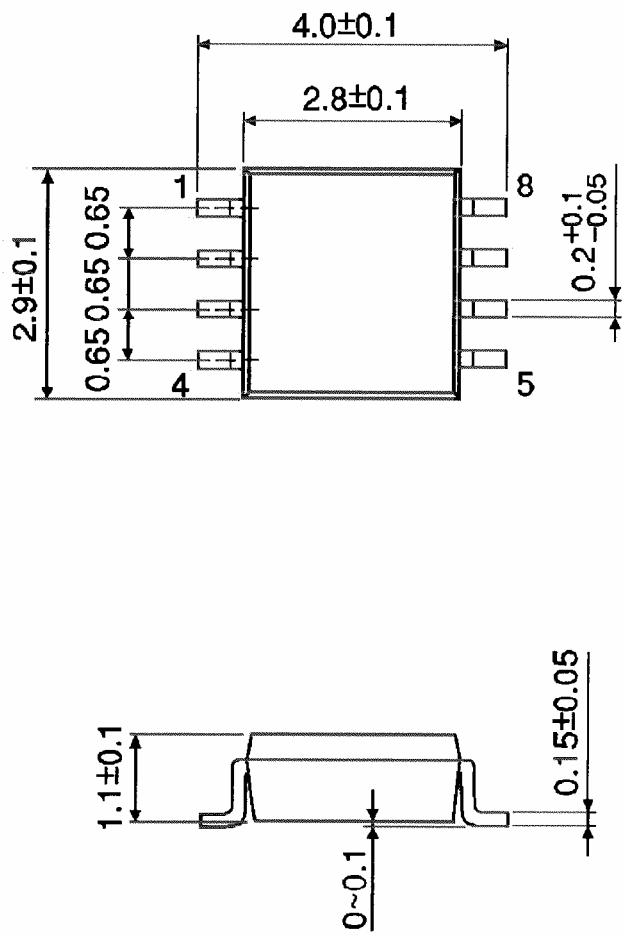
Average operating current can be obtained by the equation:

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

Package Dimensions

SSOP8-P-0.65

Unit : mm

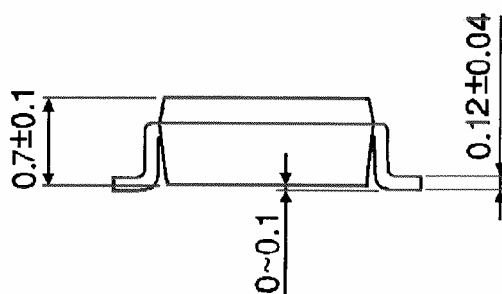
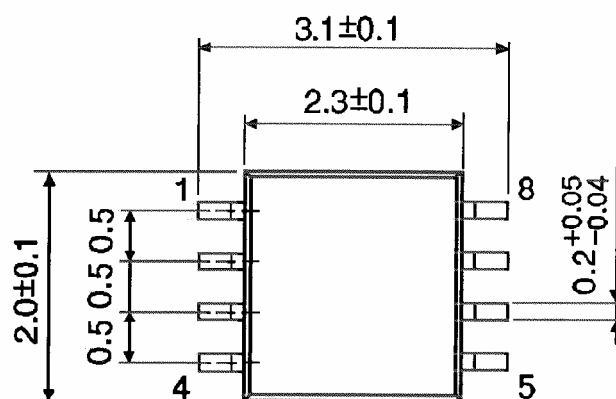


Weight: 0.02 g (typ.)

## Package Dimensions

SSOP8-P-0.50A

Unit : mm



Weight: 0.01 g (typ.)

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20070701-EN GENERAL

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