TOSHIBA CMOS Digital Integrated Circuit Silicon Monolithic

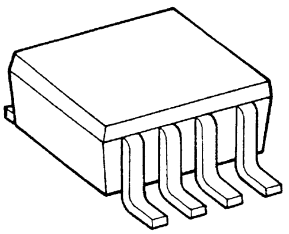
TC7WZ02FU,TC7WZ02FK

Dual 2 Input NOR Gate

Features

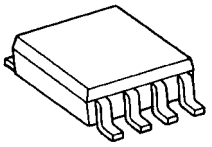
- High output drive: ±24 mA (min) at V_{CC} = 3 V
- Super high speed operation: t_{pd} = 2.4 ns (typ.) at V_{CC} = 5 V, 50 pF
- Operation voltage range: $V_{CC\ (opr)}$ = 1.65~5.5 V
- 5.5-V tolerant inputs
- 5.5-V power down protection outputs
- Matches the performance of TC74LCX series when operated at 3.3-V V_{CC}

TC7WZ02FU



SSOP8-P-0.65 (SM8)

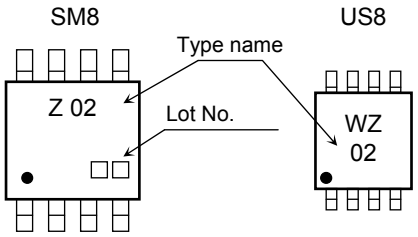
TC7WZ02FK



SSOP8-P-0.50A (US8)

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

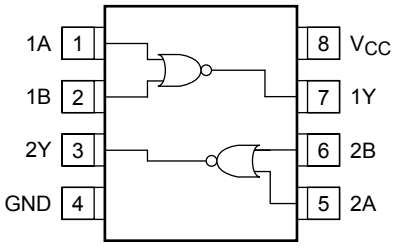
Marking



Absolute Maximum Ratings (Ta = 25°C)

Characteristics	Symbol	Rating	Unit
Power supply voltage	V_{CC}	−0.5~6	V
DC input voltage	V_{IN}	−0.5~6	V
DC output voltage	V_{OUT}	−0.5~6	V
Input diode current	I_{IK}	−20	mA
Output diode current	I_{OK}	−20	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}	−65~150	°C
Lead temperature (10s)	T_L	260	°C

Pin Assignment (top view)

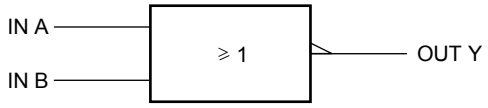


Note: Using continuously under heavy loads (e.g. the application of high temperature/current/voltage and the significant change in temperature, etc.) may cause this product to decrease in the reliability significantly even if the operating conditions (i.e. operating temperature/current/voltage, etc.) 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_{CC}	1.65~5.5	V
		1.5~5.5 (Note 1)	
Input voltage	V_{IN}	0~5.5	V
Output voltage	V_{OUT}	0~5.5 (Note 2)	V
		0~V_{CC} (Note 3)	
Operating temperature	T_{opr}	−40~85	°C
Input rise and fall time	d_t/d_v	0~20 (V_{CC} = 1.8 V ± 0.15 V, 2.5 V ± 0.2 V)	ns/V
		0~10 (V_{CC} = 3.3 V ± 0.3 V)	
		0~5 (V_{CC} = 5.5 V ± 0.5 V)	

Note 1: Data retention only

Note 2: V_{CC} = 0 V

Note 3: High or low state

Electrical Characteristics

DC Characteristics

Characteristics		Symbol	Test Condition		V_{CC} (V)	Ta = 25°C			Ta = −40~85°C		Unit
						Min	Typ.	Max	Min	Max	
Input voltage	High level	V_{IH}	—		1.65~1.95	0.75 × V_{CC}	—	—	0.75 × V_{CC}	—	V
					2.3~5.5	0.7 × V_{CC}	—	—	0.7 × V_{CC}	—	
	Low level	V_{IL}	—		1.65~1.95	—	—	0.25 × V_{CC}	—	0.25 × V_{CC}	
					2.3~5.5	—	—	0.3 × V_{CC}	—	0.3 × V_{CC}	
Output voltage	High level	V_{OH}	V_{IN} = V_{IL}	I_{OH} = −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_{OH} = −4 mA	1.65	1.29	1.52	—	1.29	—	
				I_{OH} = −8 mA	2.3	1.9	2.15	—	1.9	—	
				I_{OH} = −16 mA	3.0	2.4	2.8	—	2.4	—	
				I_{OH} = −24 mA	3.0	2.3	2.68	—	2.3	—	
				I_{OH} = −32 mA	4.5	3.8	4.2	—	3.8	—	
	Low level	V_{OL}	V_{IN} = V_{IH} or V_{IL}	I_{OL} = 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_{OL} = 4 mA	1.65	—	0.08	0.24	—	0.24	
				I_{OL} = 8 mA	2.3	—	0.1	0.3	—	0.3	
				I_{OL} = 16 mA	3.0	—	0.15	0.4	—	0.4	
				I_{OL} = 24 mA	3.0	—	0.22	0.55	—	0.55	
				I_{OL} = 32 mA	4.5	—	0.22	0.55	—	0.55	
Input leakage current		I_{IN}	V_{IN} = 5.5 V or GND		0~5.5	—	—	±1	—	±10	μA
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		1.65~5.5	—	—	1	—	10	μA

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

Characteristics	Symbol	Test Condition		Ta = 25°C			Ta = −40~85°C		Unit
			V_{CC} (V)	Min	Typ.	Max	Min	Max	
Propagation delay time	t_{pLH} t_{pHL}	C_L = 15 pF, R_L = 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_L = 50 pF, R_L = 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_{IN}	—	0~5.5	—	3.0	—	—	—	pF
Power dissipation capacitance	C_{PD}	(Note 4)	3.3	—	18	—	—	—	pF
			5.5	—	24	—	—	—	

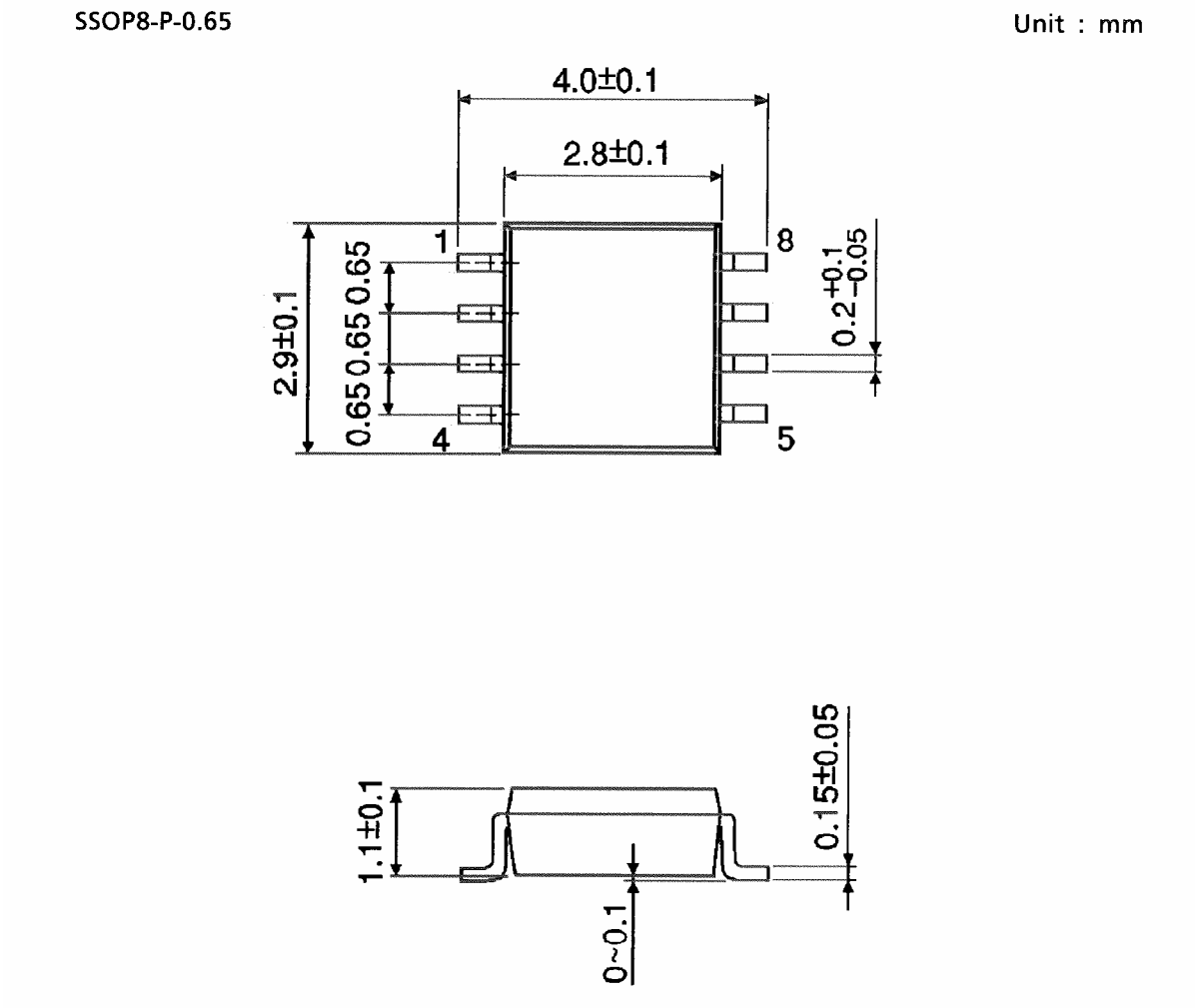
Note 4: C_{PD} is defined as the value of the internal equivalent capacitance which is calculated from the operating current consumption without load.

Average operating current can be obtained by the equation:

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

Package Dimensions

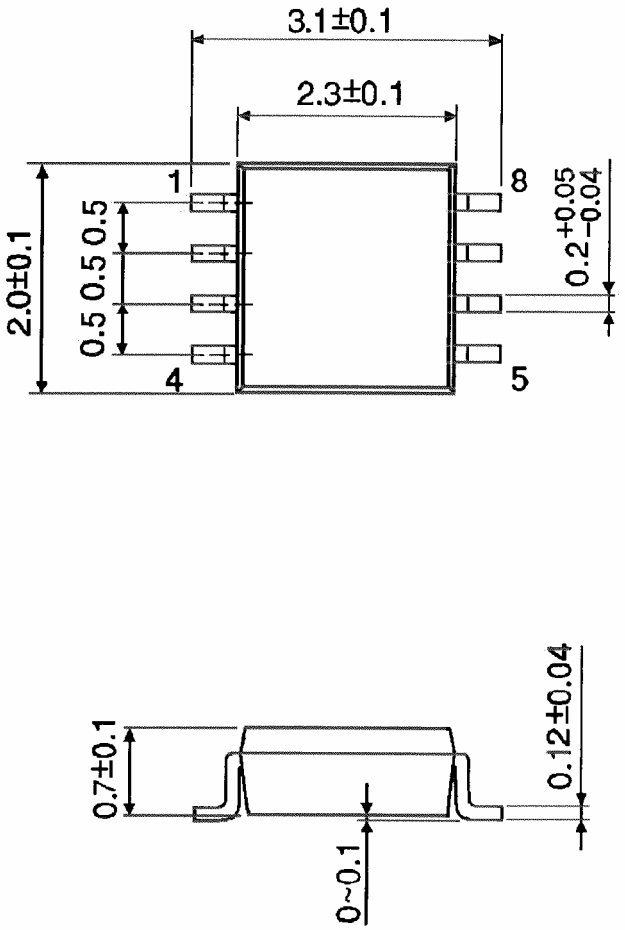
SSOP8-P-0.65 Unit : mm



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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