

TOSHIBA CMOS Digital Integrated Circuit Silicon Monolithic

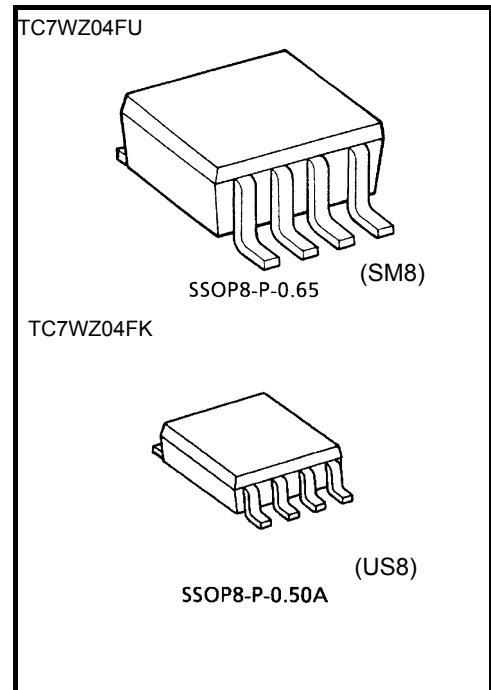
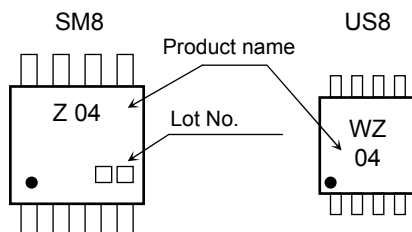
TC7WZ04FU, TC7WZ04FK

Triple Inverter

Features

- High output current: ± 24 mA (min) @ $V_{CC} = 3$ V
- Super high speed operation: $t_{pd} = 2.3$ ns (typ.)
@ $V_{CC} = 5$ 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

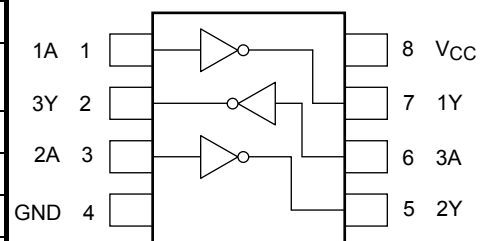


Weight
 SSOP8-P-0.65 : 0.02 g (typ.)
 SSOP8-P-0.50A : 0.01 g (typ.)

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

Characteristics	Symbol	Rating	Unit
Power supply voltage	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~ 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 (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).

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

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

Note 3: $V_{OUT} < GND$

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 1)	
Input voltage	V _{IN}	0 to 5.5	V
Output voltage	V _{OUT}	0 to 5.5 (Note 2)	V
		0 to V _{CC} (Note 3)	
Operating temperature	T _{opr}	−40 to 85	°C
Input rise and fall time	dt/dv	0 to 20 (V _{CC} = 1.80 V ± 0.15 V, 2.5 V ± 0.2 V)	ns/V
		0 to 10 (V _{CC} = 3.3 V ± 0.3 V)	
		0 to 5 (V _{CC} = 5.0 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		Ta = 25°C			Ta = −40 to 85°C		Unit	
					V _{CC} (V)	Min	Typ.	Max	Min		Max
Input voltage	High level	V _{IH}	—	1.65 to 1.95	V _{CC} × 0.75	—	—	V _{CC} × 0.75	—	V	
				2.3 to 5.5	V _{CC} × 0.7	—	—	V _{CC} × 0.7	—		
	Low level	V _{IL}	—	1.65 to 1.95	—	—	V _{CC} × 0.25	—	V _{CC} × 0.25		
				2.3 to 5.5	—	—	V _{CC} × 0.3	—	V _{CC} × 0.3		
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}	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 to 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 to 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 to 85°C		Unit
			VCC (V)	Min	Typ.	Max	Min	Max	
Propagation delay time	t _{pLH}	CL = 15 pF, RL = 1 MΩ	1.8 ± 0.15	1.8	4.4	9.5	2.0	10.0	ns
			2.5 ± 0.2	1.2	3.0	5.1	1.2	5.6	
			3.3 ± 0.3	0.8	2.2	3.4	0.8	3.8	
			5.0 ± 0.5	0.5	1.8	2.8	0.5	3.1	
	t _{pHL}	CL = 50 pF, RL = 500 Ω	3.3 ± 0.3	1.2	2.9	4.5	1.2	5.0	
			5.0 ± 0.5	0.8	2.3	3.6	0.8	4.0	
Input capacitance	CIN	—	0 to 5.5	—	3.0	—	—	pF	
Power dissipation capacitance	CPD	(Note 4)	3.3	—	18	—	—	—	pF
			5.5	—	23	—	—	—	

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

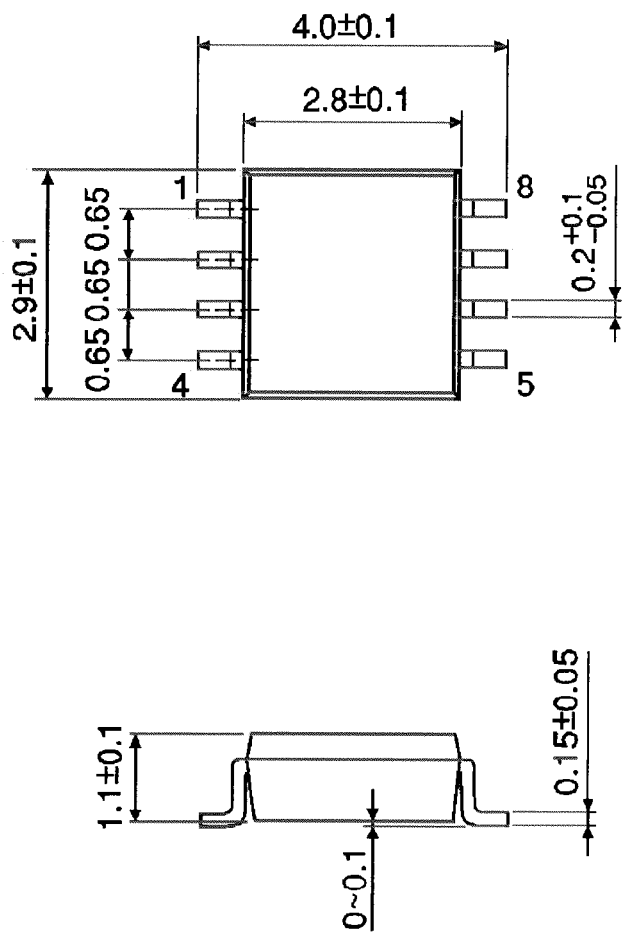
Average operating current can be obtained by the equation:

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

Package Dimensions

SSOP8-P-0.65

Unit : mm

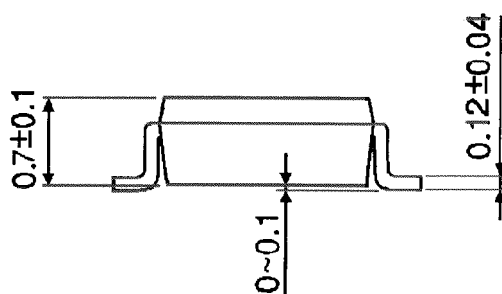
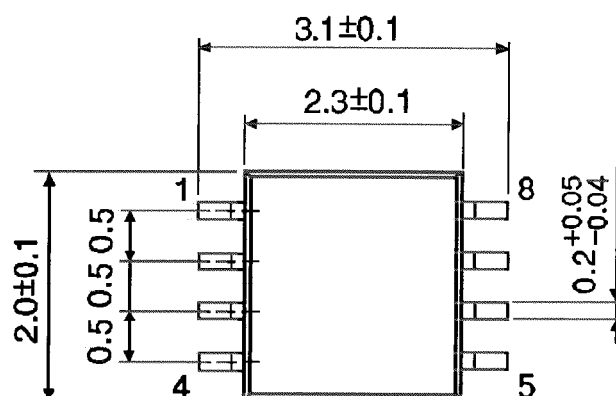


Weight: 0.02 g (typ.)

Package Dimensions

SSOP8-P-0.50A

Unit : mm



Weight: 0.01 g (typ.)

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