

TOSHIBA CMOS Digital Integrated Circuit Silicon Monolithic

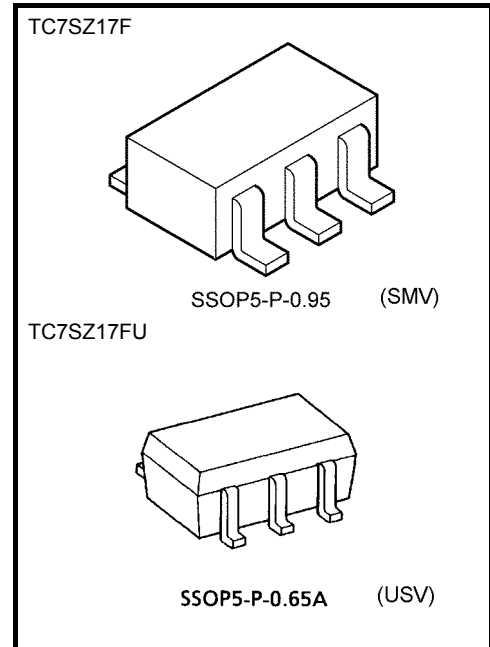
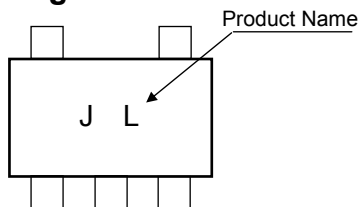
TC7SZ17F, TC7SZ17FU

Schmitt Buffer

Features

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

Marking

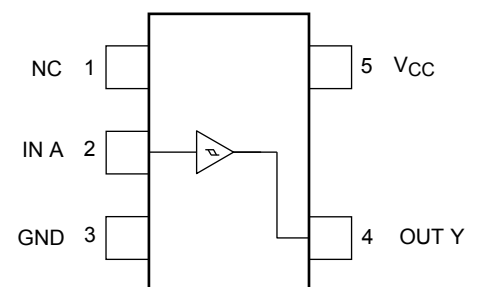


Weight:
 SSOP5-P-0.95 : 0.016 g (typ.)
 SSOP5-P-0.65A : 0.006 g (typ.)

Absolute Maximum Ratings (Ta = 25°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	200	mW
Storage temperature	T_{stg}	-65 to 150	°C
Lead temperature (10 s)	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).

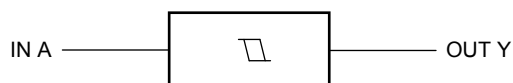
Note 1: $V_{CC} = 0\text{V}$

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

Note 3: $V_{OUT} < \text{GND}$

Start of commercial production
2009-02

IEC Logic Symbol



Truth Table

A	Y
L	L
H	H

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: $V_{CC} = 0\text{ V}$

Note 6: High or Low State

Electrical Characteristics

DC Characteristics

Characteristics	Symbol	Test Condition	$T_a = 25^\circ\text{C}$			$T_a = -40\text{ to }85^\circ\text{C}$		Unit		
			V_{CC} (V)	Min	Typ.	Max	Min		Max	
Threshold voltage	High level	—	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	0.40	0.75	1.15	0.40		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		
Hysteresis voltage	—	V_H	1.65	0.1	0.48	0.9	0.1	1.0	V	
			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		

Characteristics	Symbol	Test Condition	V _{CC} (V)	Ta = 25°C			Ta = -40 to 85°C		Unit		
				Min	Typ.	Max	Min	Max			
Output voltage	High level	V _{OH}	V _{IN} = V _P	I _{OH} = -100 μA	1.65	1.55	1.65	—	1.55	V	
					1.8	1.7	1.8	—	1.7		
					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 _N	I _{OL} = 100 μA	1.65	—	0	0.1	—		0.1
					1.8	—	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 ns)

Characteristics	Symbol	Test Condition	V _{CC} (V)	Ta = 25°C			Ta = -40 to 85°C		Unit
				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	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	
			3.3 ± 0.3	1.5	4.4	7.2	1.5	7.5	
			5.0 ± 0.5	0.5	3.7	5.9	0.8	6.2	
Input capacitance	C _{IN}	—	0 to 5.5	—	4	—	—	—	pF
Power dissipation capacitance	C _{PD}	(Note 7)	3.3	—	24	—	—	—	pF
			5.5	—	30	—	—	—	pF

Note 7: CPD is defined as the value of the internal equivalent capacitance which is Calculated from the operating current consumption without load.

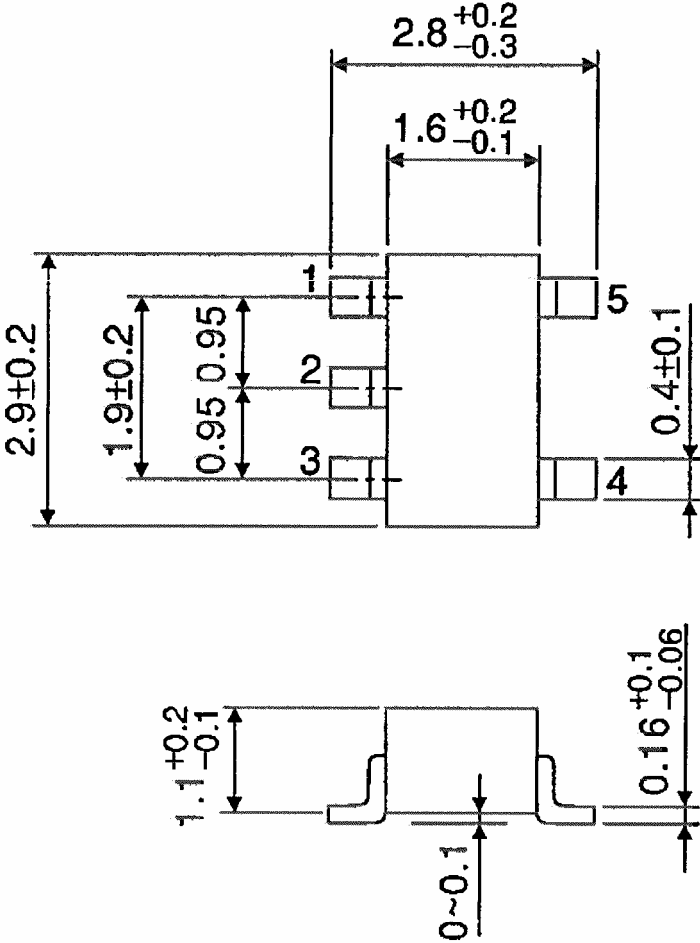
Average operating current can be obtained by the equation.

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

Package Dimensions

SSOP5-P-0.95

Unit : mm

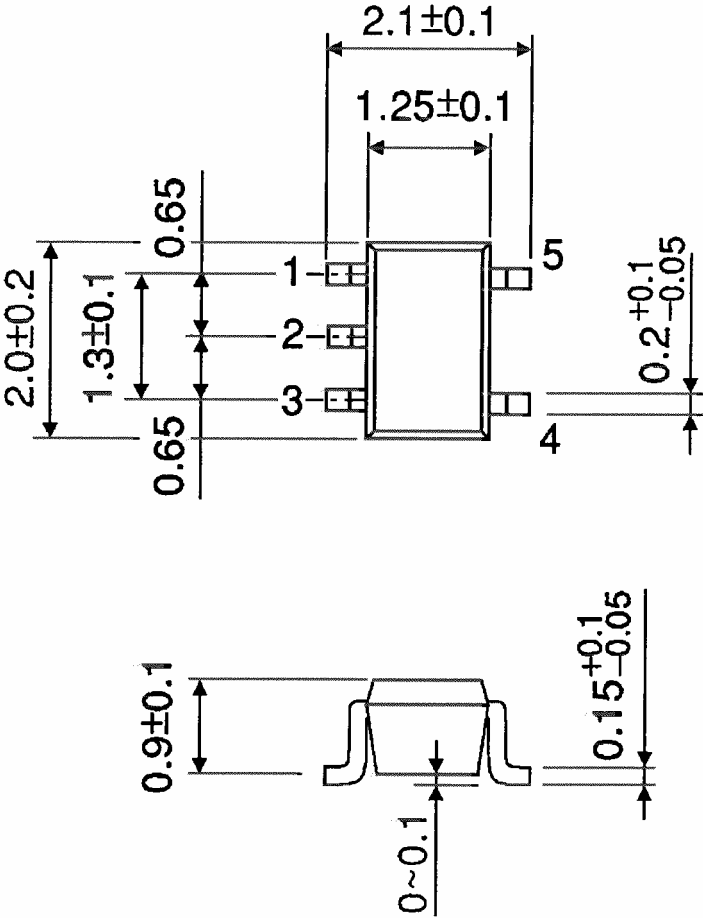


Weight: 0.016 g (typ.)

Package Dimensions

SSOP5-P-0.65A

Unit : mm



Weight: 0.006 g (typ.)

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