

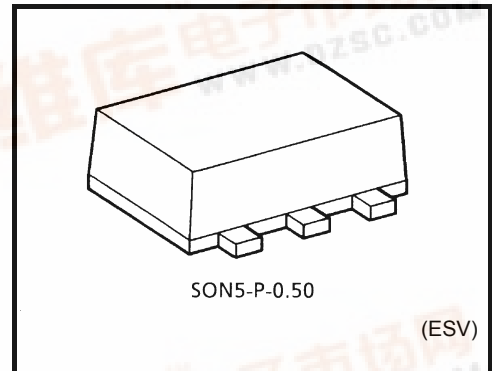
TOSHIBA CMOS Digital Integrated Circuit Silicon Monolithic

TC7SZ07AFE

NON-Inverter (Open Drain)

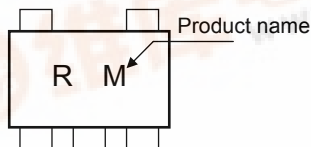
Features

- High output drive: ± 24 mA (min)
at $V_{CC} = 3$ V
- Super high speed operation: t_{pZL} 2.3 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}

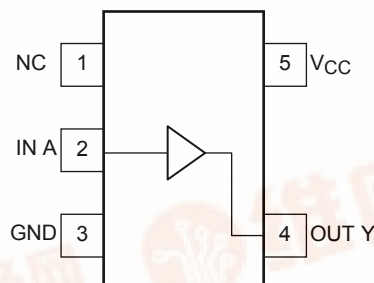


Weight: 0.003 g (typ.)

Marking



Pin Assignment (top view)



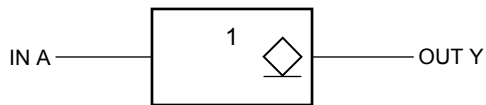
Maximum Ratings ($T_a = 25^\circ\text{C}$)

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

Note 1: I_{OUT} absolute maximum rating must be observed

Note 2: $V_{OUT} < GND$

Logic Diagram



Truth Table

A	Y
L	L
H	Z

Z: High impedance

Recommended Operating Conditions

Characteristics	Symbol	Rating	Unit
Supply voltage	V _{CC}	1.65~5.5	V
		1.5~5.5 (Note 3)	
Input voltage	V _{IN}	0~5.5	V
Output voltage	V _{OUT}	0~V _{CC}	V
Operating temperature	T _{opr}	-40~85	°C
Input rise and fall time	d _t /d _v	0~20 (V _{CC} = 1.8 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 3: Data retention only

Electrical Characteristics

DC Characteristics

Characteristics		Symbol	Test Condition		Ta = 25°C			Ta = -40~85°C		Unit	
					V _{CC} (V)	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}		
Z-state output leakage current		I _{LKG}	V _{IN} = V _{IH} V _{OUT} = 0~5.5 V	1.65~5.5	—	—	±5	—	±10	μA	
Output voltage	Low level	V _{OL}	V _{IN} = V _{IL}	I _{OL} = 100 μA	1.65	—	0	0.1	—	0.1	V
					2.3	—	0	0.1	—	0.1	
					3.0	—	0	0.1	—	0.1	
					4.5	—	0	0.1	—	0.1	
				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	5.5	—	—	2	—	20	μA	

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

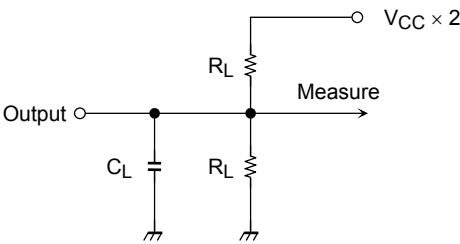
Characteristics	Symbol	Test Condition	$V_{CC} \text{ (V)}$	$T_a = 25^\circ\text{C}$			$T_a = -40 \sim 85^\circ\text{C}$		Unit
				Min	Typ.	Max	Min	Max	
Propagation delay time	t_{pZL}	$C_L = 50 \text{ pF}, R_L = 500 \Omega$	1.8 ± 0.15	1.8	5.5	9.5	1.8	10.5	ns
			2.5 ± 0.2	1.2	3.7	5.8	1.2	6.4	
			3.3 ± 0.3	0.8	2.9	4.4	0.8	4.8	
			5.0 ± 0.5	0.5	2.3	3.5	0.5	3.9	
	t_{pLZ}	$C_L = 50 \text{ pF}, R_L = 500 \Omega$	1.8 ± 0.15	1.8	4.3	9.5	1.8	10.5	
			2.5 ± 0.2	1.2	2.8	5.8	1.2	6.4	
			3.3 ± 0.3	0.8	2.1	4.4	0.8	4.8	
			5.0 ± 0.5	0.5	1.4	3.5	0.5	3.9	
Input capacitance	C_{IN}	—	0~5.5	—	4	—	—	—	pF
Output capacitance	C_{OUT}	—	0~5.5	—	8	—	—	—	pF
Power dissipation capacitance	C_{PD}	(Note 4)	3.3	—	20	—	—	—	pF
			5.5	—	26	—	—	—	

Note4: C_{PD} is defined as the value of the internal equivalent capacitance which is calculated from the operating current consumption without load.

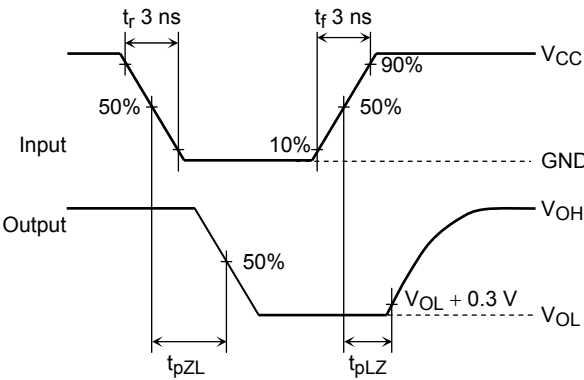
Average operating current can be obtained by the equation.

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

AC Characteristics Measurement Circuit



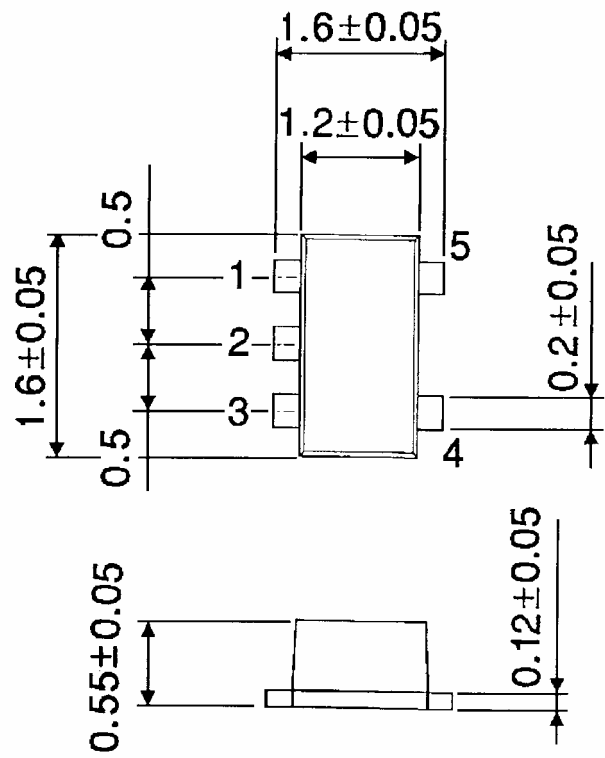
AC Waveforms



Package Dimensions

SON5-P-0.50

Unit : mm



Weight: 0.003 g (typ.)

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