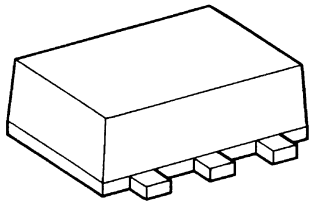
TOSHIBA CMOS Digital Integrated Circuit Silicon Monolithic

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}

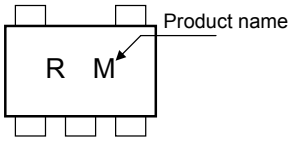


SON5-P-0.50

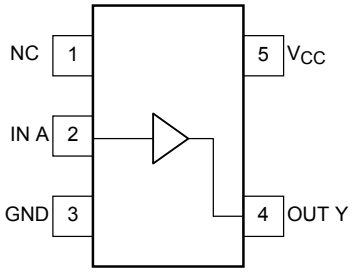
(ESV)

Weight: 0.003 g (typ.)

Marking



Pin Assignment (top view)



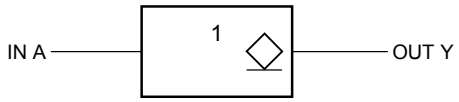
Maximum Ratings (Ta = 25°C)

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	°C
Lead temperature (10 s)	T_L	260	°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		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}	
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: $t_r = t_f = 3$ ns)

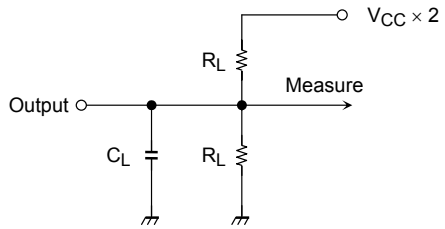
Characteristics	Symbol	Test Condition		Ta = 25°C			Ta = −40~85°C		Unit
			V_{CC} (V)	Min	Typ.	Max	Min	Max	
Propagation delay time	t_{pZL}	C_L = 50 pF, R_L = 500 Ω	1.8 ± 0.15	1.8	5.5	9.5	1.8	10.5	ns
			2.5 ± 0.2	1.2	3.7	5.8	1.2	6.4	
			3.3 ± 0.3	0.8	2.9	4.4	0.8	4.8	
			5.0 ± 0.5	0.5	2.3	3.5	0.5	3.9	
	t_{pLZ}	C_L = 50 pF, R_L = 500 Ω	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.

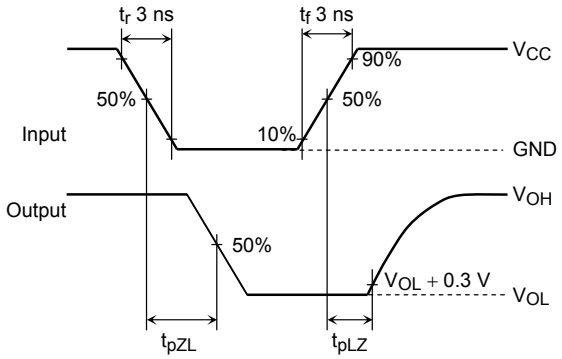
Average operating current can be obtained by the equation.

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

AC Characteristics Measurement Circuit

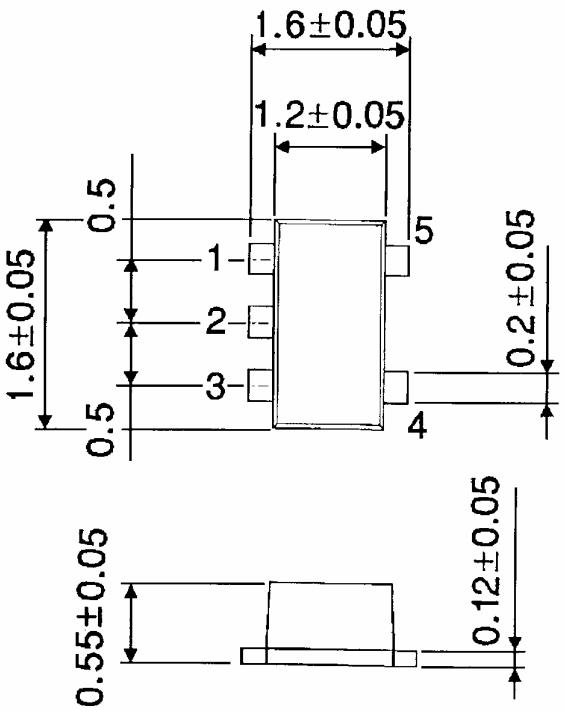


AC Waveforms



Package Dimensions

SON5-P-0.50 Unit : mm



Weight: 0.003 g (typ.)

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