

TOSHIBA CMOS Digital Integrated Circuit Silicon Monolithic

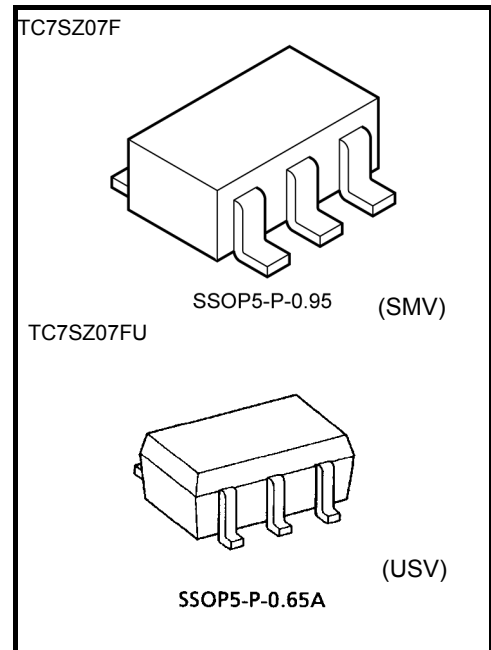
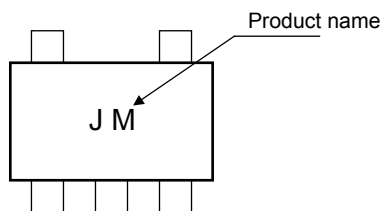
TC7SZ07F, TC7SZ07FU

NON-Inverter (Open Drain)

Features

- High output drive: 24 mA (min) at $V_{CC} = 3\text{ V}$
- Super high speed operation: $t_{pZL} = 2.3\text{ ns}$ (typ.)
at $V_{CC} = 5\text{ V}$, 50 pF
- Operation voltage range: $V_{CC}(\text{opr.}) = 1.65\text{ to }5.5\text{ V}$
- 5.5-V tolerant input
- 5.5-V power down protection output
- Matches the performance of TC74LCX series when operated at 3.3 -V V_{CC}

Marking

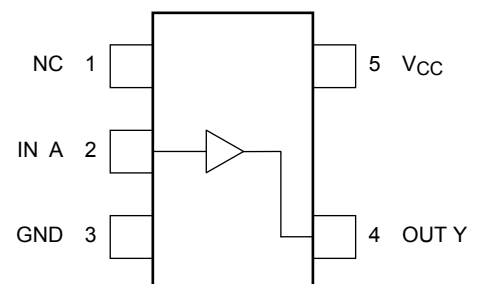


Weight
 SSOP5-P-0.95 : 0.016 g (typ.)
 SSOP5-P-0.65A: 0.006 g (typ.)

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

Characteristics	Symbol	Rating	Unit
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
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	200	mW
Storage temperature	T_{stg}	-65 to 150	$^\circ\text{C}$

Pin Assignment (top view)



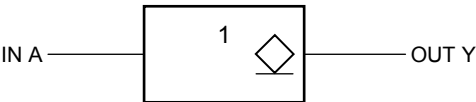
Note: Using continuously under heavy loads (e.g. the application of high temperature/current/voltage and the significant change in temperature, etc.) may cause this product to decrease in the reliability significantly even if the operating conditions (i.e. operating temperature/current/voltage, etc.) 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: Do not exceed I_{OUT} of absolute maximum ratings.

Note 2: $V_{OUT} < \text{GND}$

IEC Logic Symbol



Truth Table

A	Y
L	L
H	Z

Z: High Impedance

Operating Ranges

Characteristics	Symbol	Rating	Unit
Supply voltage	V _{CC}	1.65 to 5.5	V
		1.5 to 5.5 (Note 3)	
Input voltage	V _{IN}	0 to 5.5	V
Output voltage	V _{OUT}	0 to 5.5	V
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 3: Data retention only

Electrical Characteristics

DC Characteristics

Characteristics		Symbol	Test Condition		Ta = 25°C			Ta = −40 to 85°C		Unit	
					VCC (V)	Min	Typ.	Max	Min		Max
Input voltage	High level	VIH	—	1.65 to 1.95	VCC × 0.75	—	—	VCC × 0.75	—	V	
				2.3 to 5.5	VCC × 0.7	—	—	VCC × 0.7	—		
	Low level	VIL	—	1.65 to 1.95	—	—	VCC × 0.25	—	VCC × 0.25		
				2.3 to 5.5	—	—	VCC × 0.3	—	VCC × 0.3		
Z-state output leakage current		ILKG	VIN = VIH VOUT = 0 to 5.5 V	1.65 to 5.5	—	—	±5	—	±10	μA	
Output voltage	Low level	VOL	VIN = VIL	IOL = 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	
				IOL = 4 mA	1.65	—	0.08	0.24	—	0.24	
				IOL = 8 mA	2.3	—	0.1	0.3	—	0.3	
				IOL = 16 mA	3.0	—	0.15	0.4	—	0.4	
				IOL = 24 mA	3.0	—	0.22	0.55	—	0.55	
				IOL = 32 mA	4.5	—	0.22	0.55	—	0.55	
Input leakage current		IIN	VIN = 5.5 V or GND	0 to 5.5	—	—	±1	—	±10	μA	
Power off leakage current		IOFF	VIN or VOUT = 5.5 V	0.0	—	—	1	—	10	μA	
Quiescent supply current		ICC	VIN = 5.5 V or GND	5.5	—	—	2	—	20	μA	

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

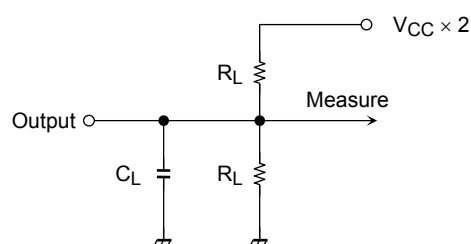
Characteristics	Symbol	Test Condition	Ta = 25°C				Ta = −40 to 85°C		Unit
			VCC (V)	Min	Typ.	Max	Min	Max	
Propagation delay time	tpZL	CL = 50 pF, RL = 500 Ω	1.80 ± 0.15	1.8	5.5	9.5	1.8	10.5	ns
			2.5 ± 0.2	1.2	3.7	5.8	1.2	6.4	
			3.3 ± 0.3	0.8	2.9	4.4	0.8	4.8	
			5.0 ± 0.5	0.5	2.3	3.5	0.5	3.9	
	tpLZ	CL = 50 pF, RL = 500 Ω	1.80 ± 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	CIN	—	0 to 5.5	—	4	—	—	pF	
Output capacitance	COUT	—	0 to 5.5	—	8	—	—	pF	
Power dissipation capacitance	CPD	(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.

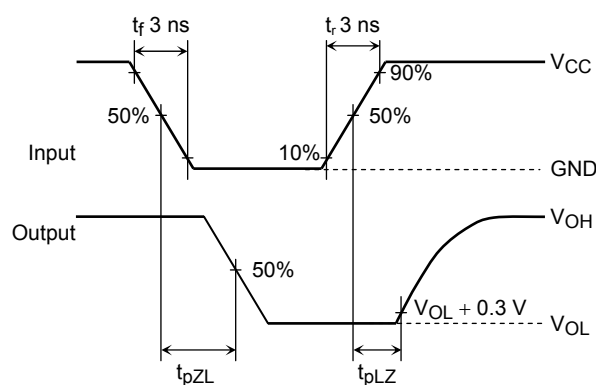
Average operating current can be obtained by the equation.

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

AC Characteristics Measurement Circuit



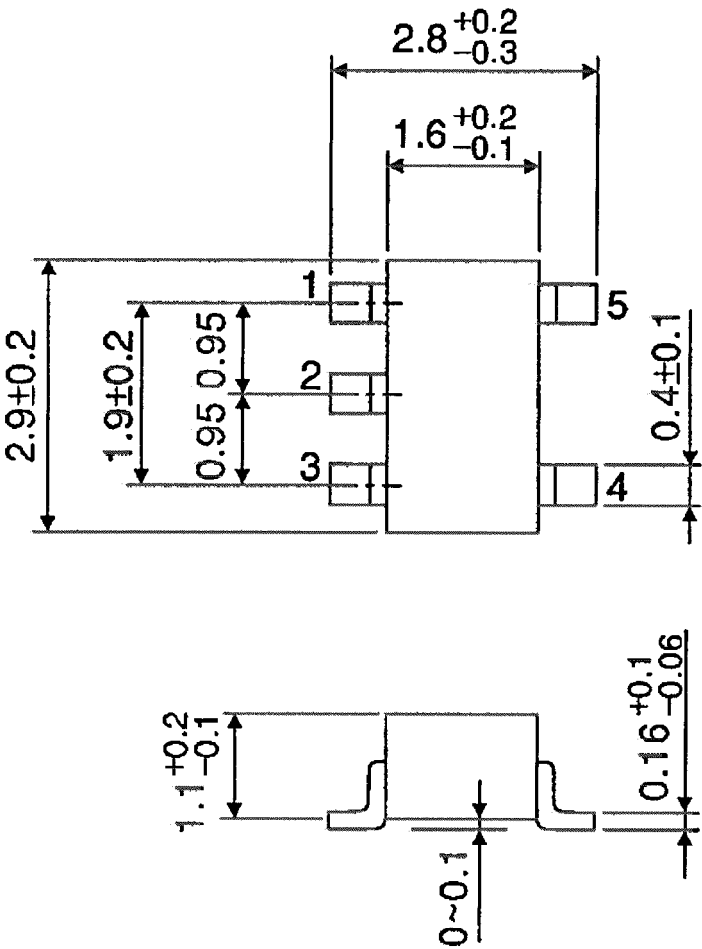
AC Waveform



Package Dimensions

SSOP5-P-0.95

Unit : mm

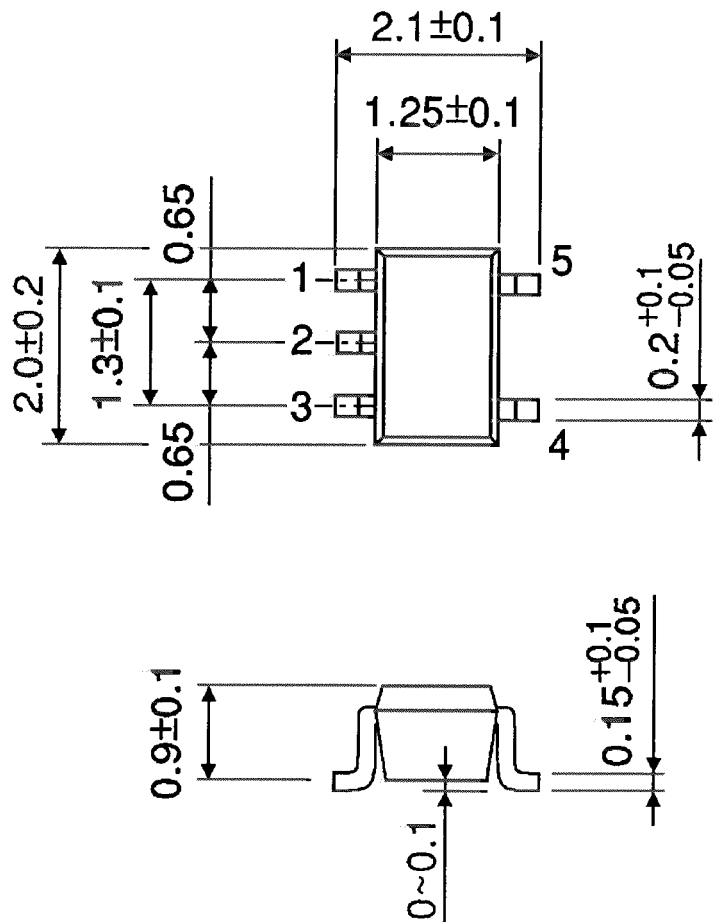


Weight: 0.016 g (typ.)

Package Dimensions

SSOP5-P-0.65A

Unit : mm



Weight: 0.006 g (typ.)

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