

TOSHIBA CMOS Digital Integrated Circuit Silicon Monolithic

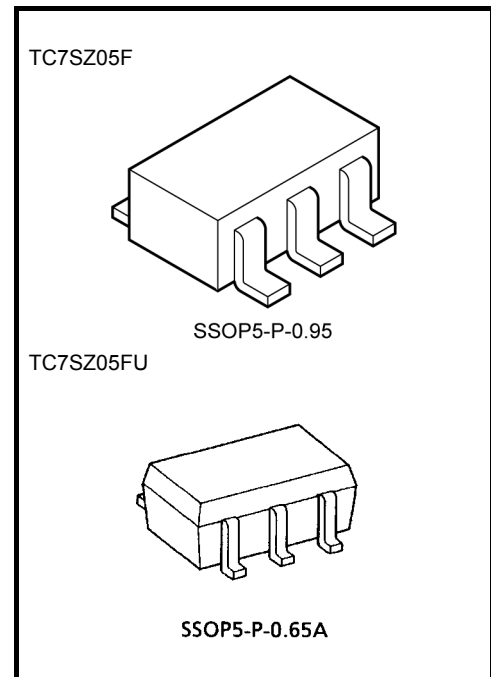
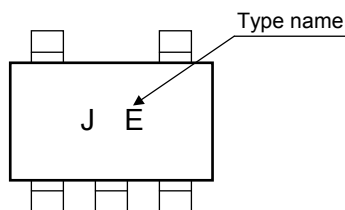
TC7SZ05F, TC7SZ05FU

Inverter (Open Drain)

Features

- High output drive: 24 mA (min) @V_{CC} = 3 V
- Super high speed operation:
 $t_{pz} = 1.9 \text{ ns (typ.) @ } V_{CC} = 5 \text{ V, } 50 \text{ pF}$
- Operation voltage range: V_{CC (opr)} = 1.80~5.5 V
- 5.5V tolerant input.
- Power down protection is provided on output.
- Matches the performance of TC74LCX series when operated at 3.3 V V_{CC}.

Marking

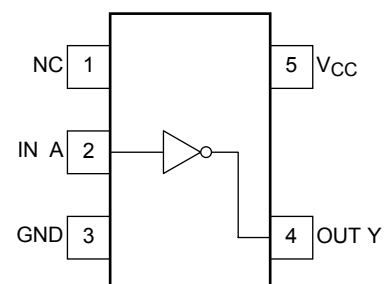


Weight
 SSOP5-P-0.95 : 0.016 g (typ.)
 SSOP5-P-0.65A : 0.006 g (typ.)

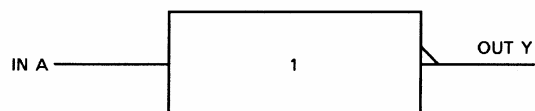
Maximum Ratings (Ta = 25°C)

Characteristics	Symbol	Rating	Unit
Power supply voltage	V _{CC}	-0.5~6	V
DC input voltage	V _{IN}	-0.5~6	V
DC output voltage	V _{OUT}	-0.5~6	V
Input diode current	I _{IK}	-20	mA
Output diode current	I _{OK}	-20	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}	-65~150	°C
Lead temperature (10s)	T _L	260	°C

Pin Assignment (top view)



Logic Diagram



Truth Table

A	Y
L	*Z
H	L

*: High impedance

Recommended Operating Conditions

Characteristics	Symbol	Rating	Unit
Supply voltage	V_{CC}	1.8~5.5	V
		1.5~5.5 (Note 1)	
Input voltage	V_{IN}	0~5.5	V
Output voltage	V_{OUT}	0~5.5 (Note 2)	V
		0~ V_{CC} (Note 3)	
Operating temperature	T_{opr}	-40~85	°C
Input rise and fall time	dt/dv	0~20 ($V_{CC} = 1.8\text{ V}, 2.5\text{ V} \pm 0.2\text{ V}$)	ns/V
		0~10 ($V_{CC} = 3.3\text{ V} \pm 0.3\text{ V}$)	
		0~5 ($V_{CC} = 5.5\text{ V} \pm 0.5\text{ V}$)	

Note 1: Data retention only

Note 2: OFF state

Note 3: Low state

Electrical Characteristics

DC Characteristics

Characteristics		Symbol	Test Condition		Ta = 25°C				Ta = -40~85°C		Unit	
					VCC (V)	Min	Typ.	Max	Min	Max		
Input voltage	High level	VIH	—	1.8	VCC × 0.75	—	—	VCC × 0.75	—	V		
				2.3~5.5	VCC × 0.7	—	—	VCC × 0.7	—			
	Low level	VIL	—	1.8	—	—	VCC × 0.25	—	VCC × 0.25			
				2.3~5.5	—	—	VCC × 0.3	—	VCC × 0.3			
High level Output leakage		ILKG	VIN = VIL	1.8~5.5	—	—	±5	—	±10	μA		
Output voltage	VOL	VOL	VIN = VIH	IOL = 100 μA	1.8	—	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 = 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	0~5.5	—	—	±1	—	±10	μA		
Power off leakage current		IOFF	VIN or VOUT = 5.5 V	0.0	—	—	1	—	10	μA		
Quiescent supply current		ICC	VIN = VCC or GND	5.5	—	—	2	—	20	μA		

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

Characteristics	Symbol	Test Condition	Ta = 25°C				Ta = -40~85°C		Unit
			VCC (V)	Min	Typ.	Max	Min	Max	
Propagation delay time	tpZL	CL = 50 pF, RL = 500 Ω	1.8	1.5	4.6	10.5	1.5	11.0	ns
			2.5 ± 0.2	0.8	3.0	7.0	0.8	7.5	
			3.3 ± 0.3	0.8	2.4	5.0	0.8	5.2	
			5.0 ± 0.5	0.5	1.9	4.3	0.5	4.5	
	tpLZ	CL = 50 pF, RL = 500 Ω	1.8	1.5	4.1	10.5	1.5	11.0	ns
			2.5 ± 0.2	0.8	2.5	7.0	0.8	7.5	
			3.3 ± 0.3	0.8	2.1	5.0	0.8	5.2	
			5.0 ± 0.5	0.5	1.2	4.3	0.5	4.5	
Input capacitance	CIN	—	0~5.5	—	4	—	—	pF	
Power dissipation capacitance	CPD	(Note 4)	3.3	—	3.6	—	—	—	pF
			5.5	—	6.5	—	—	—	

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

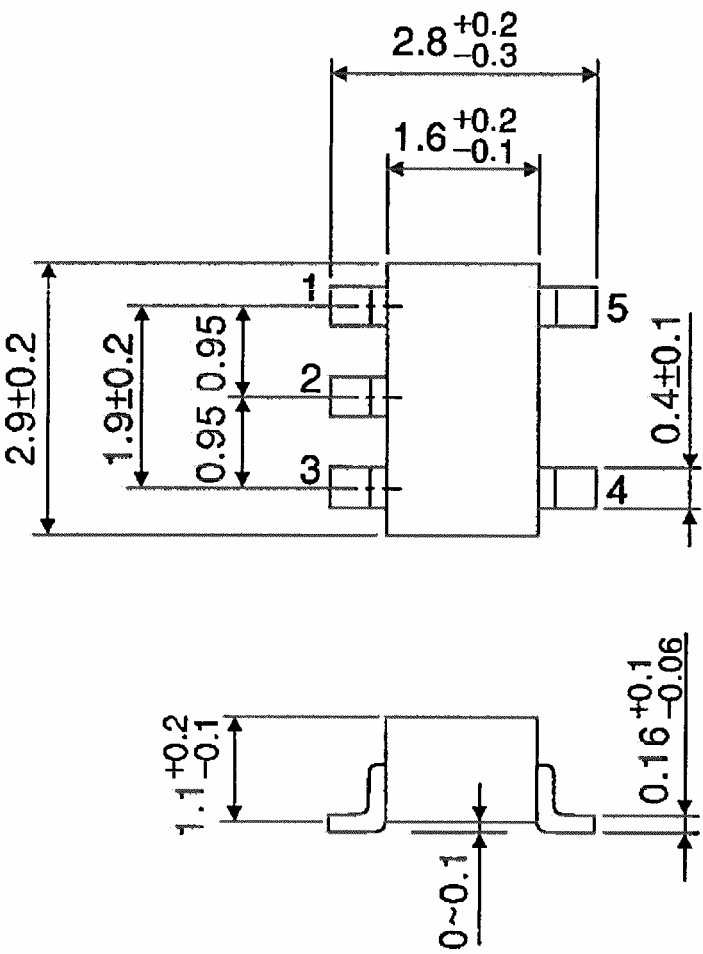
Average operating current can be obtained by the equation:

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

Package Dimensions

SSOP5-P-0.95

Unit : mm

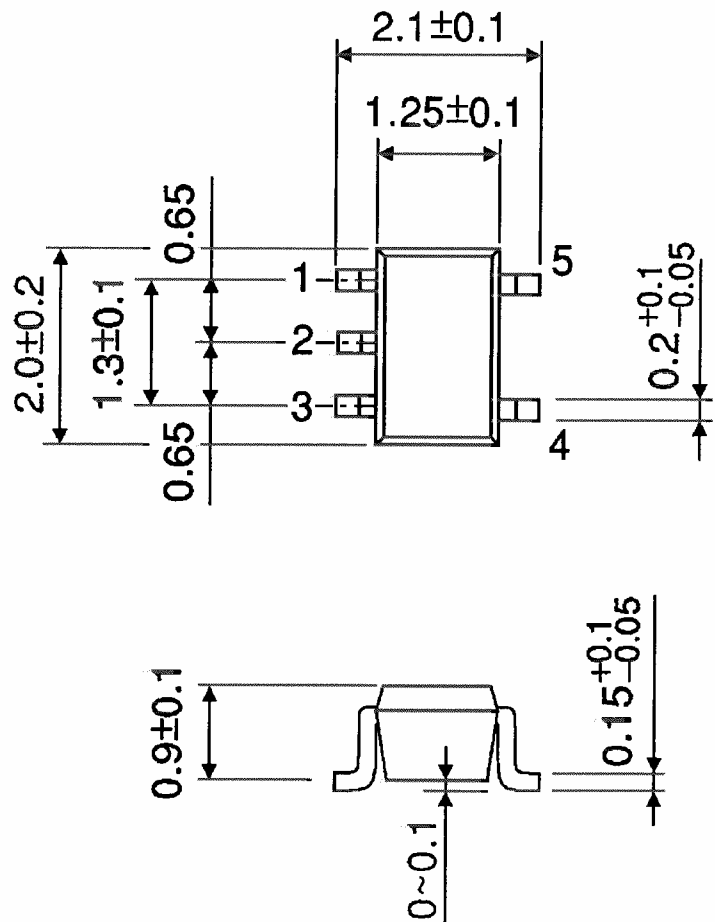


Weight: 0.016 g (typ.)

Package Dimensions

SSOP5-P-0.65A

Unit : mm



Weight: 0.006 g (typ.)

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