

TOSHIBA CMOS Digital Integrated Circuit Silicon Monolithic

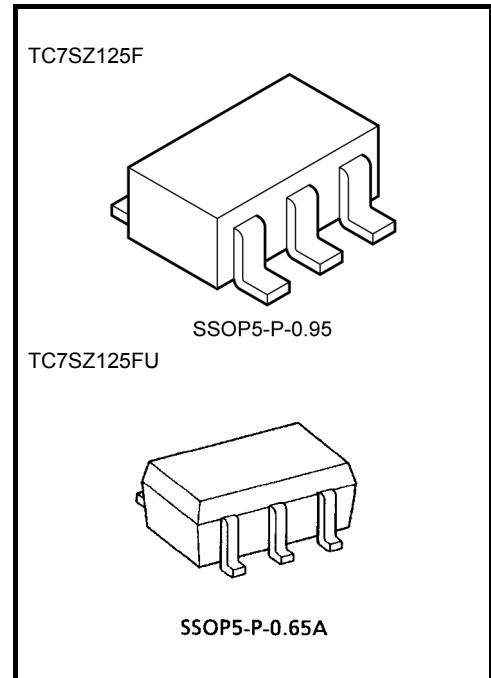
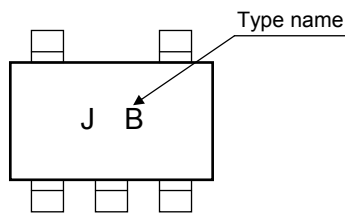
# TC7SZ125F, TC7SZ125FU

Bus Buffer 3-State Output

## Features

- High output drive:  $\pm 24$  mA (min) @  $V_{CC} = 3$  V
- Super high speed operation:  
 $t_{pd}$  2.6 ns (typ.) @  $V_{CC} = 5$  V, 50 pF
- Operation voltage range:  $V_{CC} (opr) = 1.8 \sim 5.5$  V
- Power down protection is provided on all inputs and outputs.
- Matches the performance of TC74LCX series when operated at 3.3 V  $V_{CC}$ .

## Marking

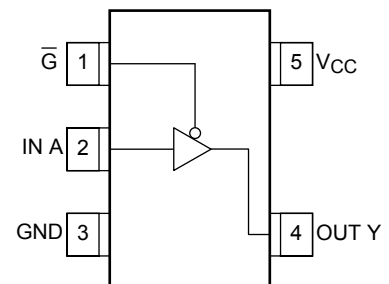


Weight  
 SSOP5-P-0.95 : 0.016 g (typ.)  
 SSOP5-P-0.65A : 0.006 g (typ.)

## Absolute Maximum Ratings (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	$I_{IK}$	$\pm 20$	mA
Output diode current	$I_{OK}$	$\pm 20$	mA
DC output current	$I_{OUT}$	$\pm 50$	mA
DC $V_{CC}$ /ground current	$I_{CC}$	$\pm 50$	mA
Power dissipation	$P_D$	200	mW
Storage temperature	$T_{stg}$	-65~150	°C
Lead temperature (10s)	$T_L$	260	°C

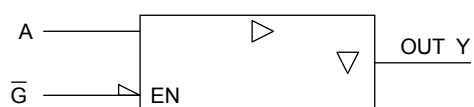
## Pin Assignment (top view)



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).

## Logic Diagram



## Truth Table

Input		Output
A	$\bar{G}$	Y
X	H	Z
L	L	L
H	L	H

X: Don't Care  
Z: High Impedance

## Operating Ranges

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

Note 3: H and Low state

## Electrical Characteristics

### DC Characteristics

Characteristics		Symbol	Test Condition		Ta = 25°C			Ta = -40~85°C		Unit		
					V <sub>CC</sub> (V)	Min	Typ.	Max	Min		Max	
Input voltage	High level	V <sub>IH</sub>	—	1.8	0.88 × V <sub>CC</sub>	—	—	0.88 × V <sub>CC</sub>	—	V		
				2.3~5.5	0.75 × V <sub>CC</sub>	—	—	0.75 × V <sub>CC</sub>	—			
	Low level	V <sub>IL</sub>	—	1.8	—	—	0.12 × V <sub>CC</sub>	—	0.12 × V <sub>CC</sub>			
				2.3~5.5	—	—	0.25 × V <sub>CC</sub>	—	0.25 × V <sub>CC</sub>			
Output voltage	High level	V <sub>OH</sub>	V <sub>IN</sub> = V <sub>IH</sub>	I <sub>OH</sub> = -100 μA	1.8	1.7	1.8	—	1.7	—	V	
					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 <sub>OH</sub> = -8 mA	2.3	1.9	2.15	—	1.9	—		
					I <sub>OH</sub> = -16 mA	3.0	2.4	2.8	—	2.4		—
					I <sub>OH</sub> = -24 mA	3.0	2.3	2.68	—	2.3		—
					I <sub>OH</sub> = -32 mA	4.5	3.8	4.2	—	3.8		—
	Low level	V <sub>OL</sub>	V <sub>IN</sub> = V <sub>IL</sub>	I <sub>OL</sub> = 100 μA	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 <sub>OL</sub> = 8 mA	2.3	—	0.1	0.3	—	0.3		
					I <sub>OL</sub> = 16 mA	3.0	—	0.15	0.4	—		0.4
I <sub>OL</sub> = 24 mA	3.0	—	0.22	0.55	—	0.55						
	I <sub>OL</sub> = 32 mA	4.5	—	0.22	0.55	—	0.55					
Input leakage current		I <sub>IN</sub>	V <sub>IN</sub> = 5.5 V or GND	0~5.5	—	—	±1	—	±10	μA		
3-state output off-state current		I <sub>OZ</sub>	V <sub>IN</sub> = V <sub>IH</sub> or V <sub>IL</sub> V <sub>OUT</sub> = 0~5.5 V	1.8~5.5	—	—	±1	—	±10	μA		
Power off leakage current		I <sub>OFF</sub>	V <sub>IN</sub> or V <sub>OUT</sub> = 5.5 V	0.0	—	—	1	—	10	μA		
Quiescent supply current		I <sub>CC</sub>	V <sub>IN</sub> = V <sub>CC</sub> or GND	5.5	—	—	2	—	20	μA		

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

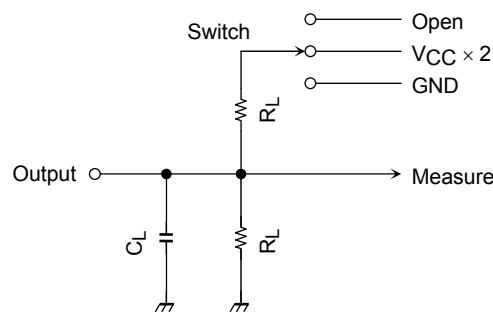
Characteristics	Symbol	Test Condition	Ta = 25°C			Ta = -40~85°C		Unit			
			VCC (V)	Min	Typ.	Max	Min		Max		
Propagation delay time	$t_{pLH}$	$C_L = 15$ pF, $R_L = 1$ M $\Omega$	1.8	2.0	5.3	11.0	2.0	11.5	ns		
			$2.5 \pm 0.2$	0.8	3.4	7.5	0.8	8.0			
	$t_{pHL}$		$3.3 \pm 0.3$	0.5	2.5	5.2	0.5	5.5			
			$5.0 \pm 0.5$	0.5	2.1	4.5	0.5	4.8			
				$C_L = 50$ pF, $R_L = 500$ $\Omega$	$3.3 \pm 0.3$	1.5	3.2	5.7		1.5	6.0
					$5.0 \pm 0.5$	0.8	2.6	5.0		0.8	5.3
Output enable time	$t_{pZL}$ $t_{pZH}$	$C_L = 50$ pF, $R_L = 500$ $\Omega$	1.8		2.0	7.0	12.5	2.0	13.0	ns	
			$2.5 \pm 0.2$		1.5	4.6	8.5	1.5	9.0		
			$3.3 \pm 0.3$		1.5	3.5	6.2	1.5	6.5		
			$5.0 \pm 0.5$		0.8	2.8	5.5	0.8	5.8		
Output disable time	$t_{pLZ}$ $t_{pHZ}$	$C_L = 50$ pF, $R_L = 500$ $\Omega$	1.8	2.0	5.4	11.0	2.0	12.0	ns		
			$2.5 \pm 0.2$	1.5	3.5	8.0	1.5	8.5			
			$3.3 \pm 0.3$	1.0	2.8	5.7	1.0	6.0			
			$5.0 \pm 0.5$	0.5	2.1	4.7	0.5	5.0			
Input capacitance	$C_{IN}$	—	0~5.5	—	4	—	—	—	pF		
Power dissipation capacitance	$C_{PD}$	(Note 4)	3.3	—	17	—	—	—	pF		
			5.5	—	24	—	—	—			

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:

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

## AC Characteristics Measurement Circuit

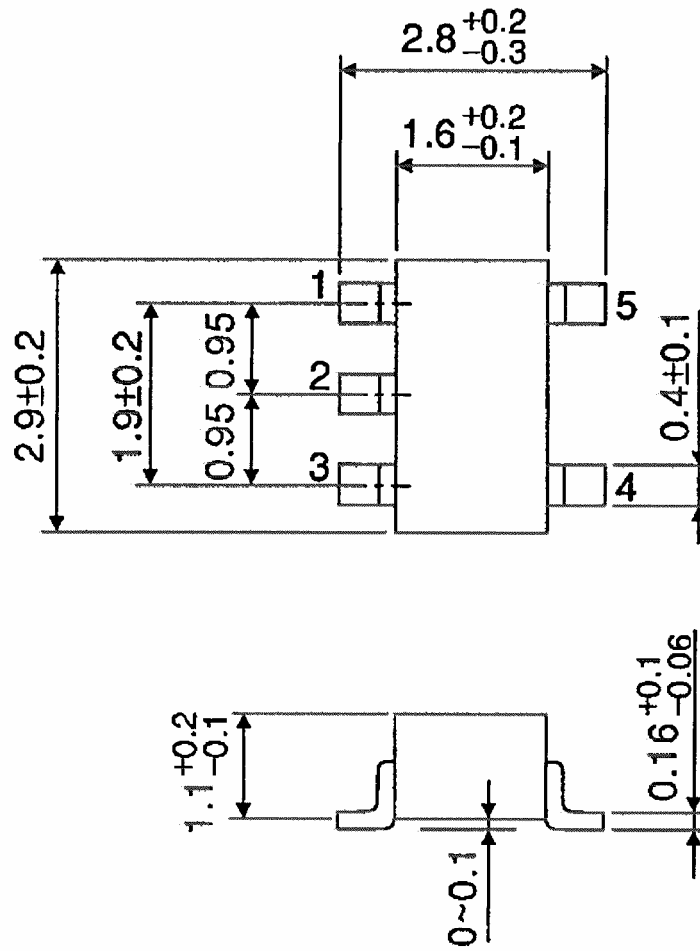


Characteristics	Switch
$t_{pLH}$ , $t_{pHL}$	Open
$t_{pLZ}$ , $t_{pZL}$	$V_{CC} \times 2$
$t_{pHZ}$ , $t_{pZH}$	GND

## Package Dimensions

SSOP5-P-0.95

Unit : mm

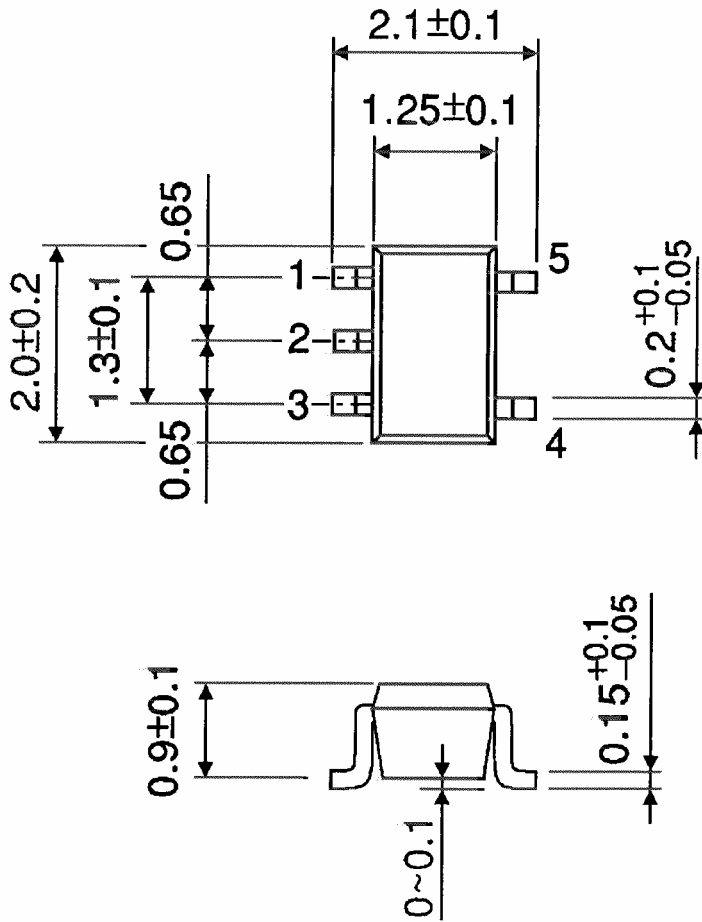


Weight: 0.016 g (typ.)

## Package Dimensions

SSOP5-P-0.65A

Unit : mm



Weight: 0.006 g (typ.)

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20070701-EN GENERAL

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