

TOSHIBA CMOS Digital Integrated Circuit Silicon Monolithic

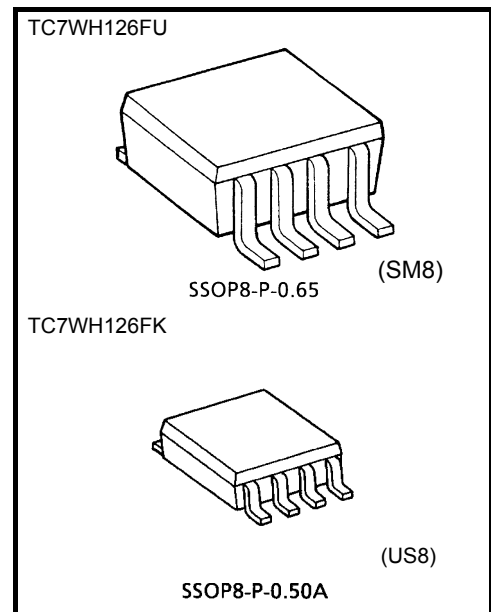
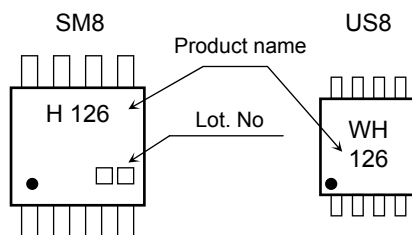
# TC7WH126FU, TC7WH126FK

Bus Buffer with 3-STATE Output

## Features

- High speed:  $t_{pd} = 3.8 \text{ ns}$  (typ.) at  $V_{CC} = 5.0 \text{ V}$ ,  $C_L = 15 \text{ pF}$
- Low power dissipation:  $I_{CC} = 2 \mu\text{A}$  (max) at  $T_a = 25^\circ\text{C}$
- High noise immunity:  $V_{NIH} = V_{NIL} = 28\% V_{CC}$  (min)
- 5.5 V tolerant inputs
- Balanced propagation delays :  $t_{pLH} \approx t_{pHL}$
- Wide operating voltage range:  $V_{CC} = 2.0$  to  $5.5 \text{ V}$
- Low Noise :  $V_{OLP} = 0.8\text{V}$  (max.)

## Marking



Weight

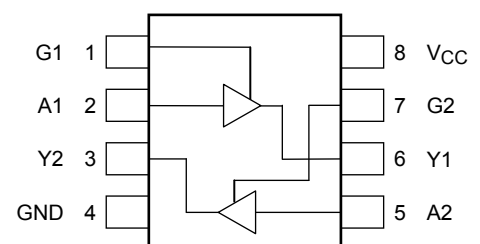
SSOP8-P-0.65 : 0.02 g (typ.)

SSOP8-P-0.50A : 0.01 g (typ.)

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

Characteristics	Symbol	Rating	Unit
Supply voltage	$V_{CC}$	-0.5 to 7.0	V
DC input voltage	$V_{IN}$	-0.5 to 7.0	V
DC output voltage	$V_{OUT}$	-0.5 to $V_{CC} + 0.5$	V
Input diode current	$I_{IK}$	-20	mA
Output diode current	$I_{OK}$	$\pm 20$ (Note1)	mA
DC output current	$I_{OUT}$	$\pm 25$	mA
DC $V_{CC}$ /ground current	$I_{CC}$	$\pm 50$	mA
Power dissipation	$P_D$	300(SM8) 200(US8)	mW
Storage temperature	$T_{stg}$	-65 to 150	$^\circ\text{C}$
Lead temperature (10 s)	$T_L$	260	$^\circ\text{C}$

## Pin Assignment (top view)

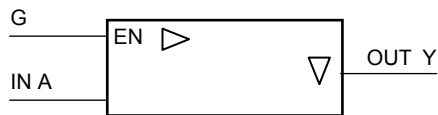


Note: Using continuously under heavy loads (e.g. the application of high temperature/current/voltage and the significant change in temperature, etc.) may cause this product to decrease in the reliability significantly even if the operating conditions (i.e. operating temperature/current/voltage, etc.) 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:  $V_{OUT} < GND, V_{OUT} > V_{CC}$

IEC Logic Symbol



Truth Table

G	A	Y
L	X	Z
H	L	L
H	H	H

X: Don't care  
Z: High impedance

Operating Ranges

Characteristics	Symbol	Rating	Unit
Supply voltage	V <sub>CC</sub>	2.0 to 5.5	V
Input voltage	V <sub>IN</sub>	0 to 5.5	V
Output voltage	V <sub>OUT</sub>	0 to V <sub>CC</sub>	V
Operating temperature	T <sub>opr</sub>	−40 to 85	°C
Input rise and fall time	dt/dv	0 to 100 ( V <sub>CC</sub> = 3.3 V ± 0.3 V )	ns/V
		0 to 20 ( V <sub>CC</sub> = 5.0V ± 0.5 V )	

**Electrical Characteristics**
**DC Characteristics**

Characteristics	Symbol	Test Condition		Ta = 25°C				Ta = -40 to 85°C		Unit
				V <sub>CC</sub> (V)	Min	Typ.	Max	Min	Max	
High-level input voltage	V <sub>IH</sub>	—		2.0	1.5	—	—	1.5	—	V
				3.0 to 5.5	V <sub>CC</sub> × 0.7	—	—	V <sub>CC</sub> × 0.7	—	
Low-level input voltage	V <sub>IL</sub>	—		2.0	—	—	0.5	—	0.5	V
				3.0 to 5.5	—	—	V <sub>CC</sub> × 0.3	—	V <sub>CC</sub> × 0.3	
High-level output voltage	V <sub>OH</sub>	V <sub>IN</sub> = V <sub>IH</sub>	I <sub>OH</sub> = -50 μA	2.0	1.9	2.0	—	1.9	—	V
				3.0	2.9	3.0	—	2.9	—	
				4.5	4.4	4.5	—	4.4	—	
			I <sub>OH</sub> = -4 mA	3.0	2.58	—	—	2.48	—	
			I <sub>OH</sub> = -8 mA	4.5	3.94	—	—	3.8	—	
Low-level output voltage	V <sub>OL</sub>	V <sub>IN</sub> = V <sub>IH</sub> or V <sub>IL</sub>	I <sub>OL</sub> = 50 μA	2.0	—	0.0	0.1	—	0.1	V
				3.0	—	0.0	0.1	—	0.1	
				4.5	—	0.0	0.1	—	0.1	
			I <sub>OL</sub> = 4 mA	3.0	—	—	0.36	—	0.44	
			I <sub>OL</sub> = 8 mA	4.5	—	—	0.36	—	0.44	
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> = V <sub>CC</sub> or GND		5.5	—	—	±0.25	—	±2.5	μA
Input leakage current	I <sub>IN</sub>	V <sub>IN</sub> = 5.5V or GND		0 to 5.5	—	—	±0.1	—	±1.0	μA
Quiescent supply current	I <sub>CC</sub>	V <sub>IN</sub> = V <sub>CC</sub> or GND		5.5	—	—	2.0	—	20.0	μA

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

Characteristics	Symbol		Test Condition		Ta = 25°C			Ta = -40 to 85°C		Unit
			V <sub>CC</sub> (V)	C <sub>L</sub> (pF)	Min	Typ.	Max	Min	Max	
Propagation delay time	$t_{pLH}$ $t_{pHL}$	—	$3.3 \pm 0.3$	15	—	5.6	8.0	1.0	9.5	ns
				50	—	8.1	11.5	1.0	13.0	
			$5.0 \pm 0.5$	15	—	3.8	5.5	1.0	6.5	
				50	—	5.3	7.5	1.0	8.5	
3-state output enable time	$t_{pZL}$ $t_{pZH}$	$R_L = 1k\Omega$	$3.3 \pm 0.3$	15	—	5.4	8.0	1.0	9.5	ns
				50	—	7.9	11.5	1.0	13.0	
			$5.0 \pm 0.5$	15	—	3.6	5.1	1.0	6.0	
				50	—	5.1	7.1	1.0	8.0	
3-state output disable time	$t_{pLZ}$ $t_{pHZ}$	$R_L = 1k\Omega$	$3.3 \pm 0.3$	50	—	9.5	13.2	1.0	15.0	ns
			$5.0 \pm 0.5$	50	—	6.1	8.8	1.0	10.0	
Output to Output Slew	$t_{osLH}$ $t_{osHL}$	(Note 2)	$3.3 \pm 0.3$	50	—	—	1.5	—	1.5	ns
			$5.0 \pm 0.5$	50	—	—	1.0	—	1.0	
Input capacitance	C <sub>IN</sub>	—			—	4	10	—	10	pF
Output capacitance	C <sub>OUT</sub>	—			—	6	—	—	—	pF
Power dissipation capacitance	C <sub>PD</sub>	(Note3)			—	15	—	—	—	pF

Note 2: Parameter guaranteed by design.  $t_{osLH} = |t_{pLHm} - t_{pLHn}|$ ,  $t_{osHL} = |t_{pHLm} - t_{pHLn}|$

Note 3: C<sub>PD</sub> is defined as the value of the internal equivalent capacitance which is calculated from the operating current consumption without load.

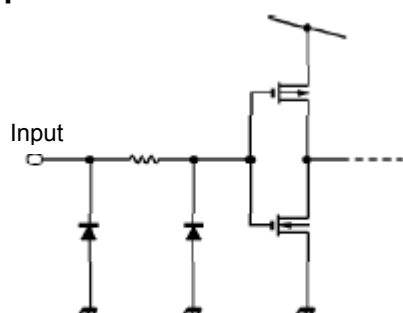
Average operating current can be obtained by the equation:

$$I_{CC(opr)} = C_{PD} \cdot V_{CC} \cdot f_{IN} + I_{CC}^{/2}$$

## Noise Characteristics (Ta=25°C, Input $t_r = t_f = 3 \text{ ns}$ )

Characteristics	Symbol	Test Condition	V <sub>CC</sub> (V)	Typ.	Limit	Unit
Quiet Output Maximum Dynamic V <sub>OL</sub>	V <sub>OLP</sub>	C <sub>L</sub> = 50pF	5.0	0.3	0.8	V
Quiet Output Minimum Dynamic V <sub>OL</sub>	V <sub>OLV</sub>	C <sub>L</sub> = 50pF	5.0	-0.3	-0.8	V
Minimum High Level Dynamic Input Voltage	V <sub>IHD</sub>	C <sub>L</sub> = 50pF	5.0	—	3.5	V
Maximum Low Level Dynamic Input Voltage	V <sub>ILD</sub>	C <sub>L</sub> = 50pF	5.0	—	1.5	V

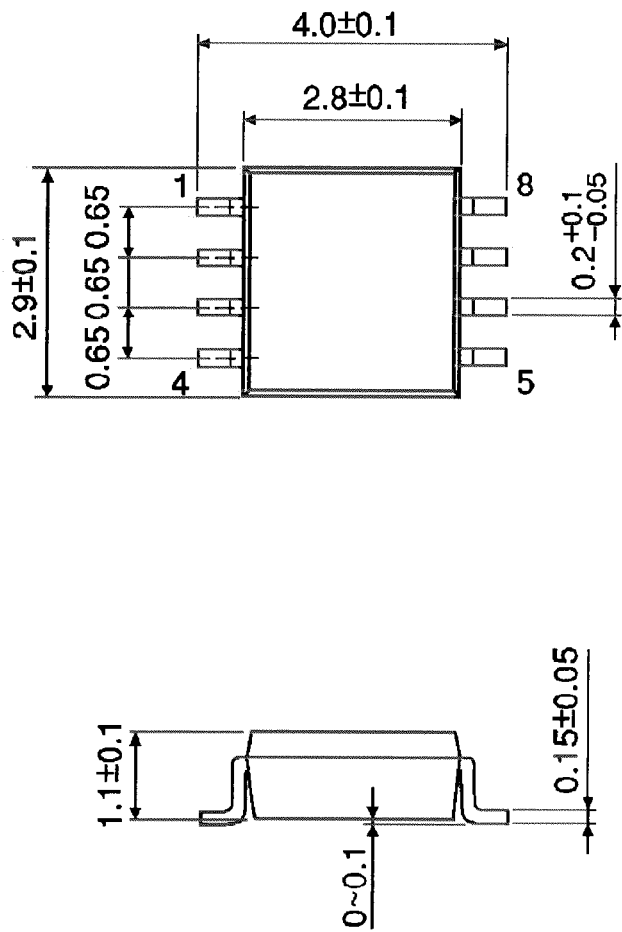
## Input Equivalent Circuit



Package Dimensions

SSOP8-P-0.65

Unit : mm

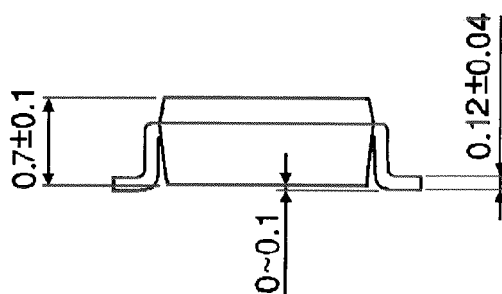
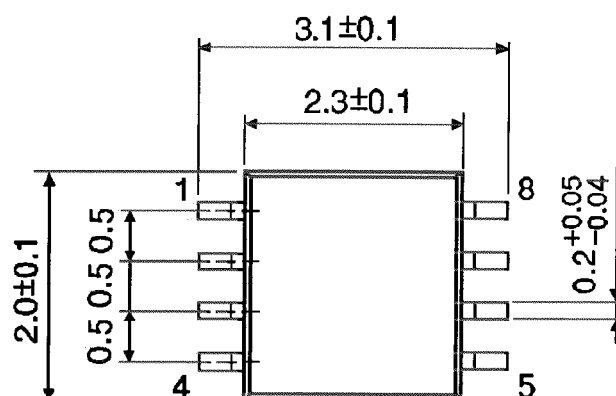


Weight: 0.02 g (typ.)

## Package Dimensions

SSOP8-P-0.50A

Unit : mm



Weight: 0.01 g (typ.)

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