

TOSHIBA CMOS Digital Integrated Circuit Silicon Monolithic

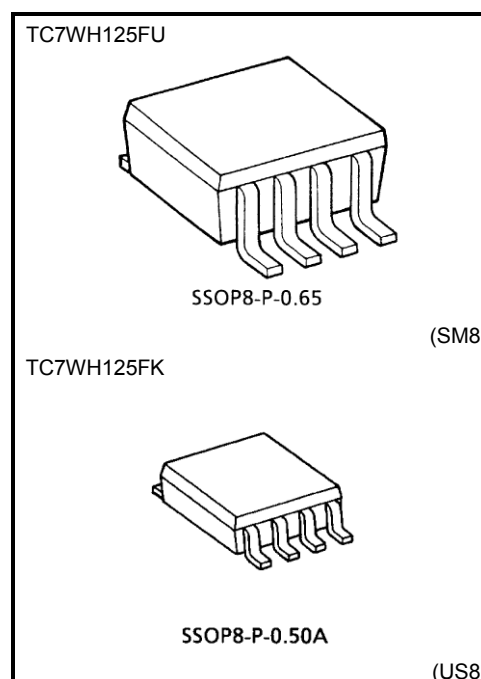
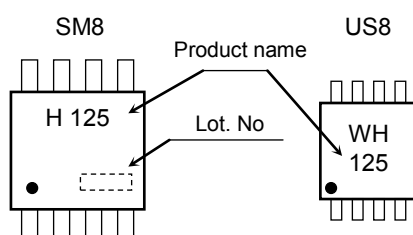
TC7WH125FU, TC7WH125FK

Dual Bus Buffer with 3-STATE Output

Features

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

Marking

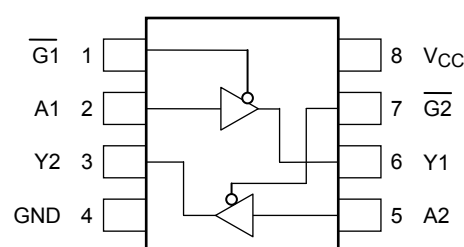


Weight
SSOP8-P-0.65 : 0.02 g (typ.)
SSOP8-P-0.50A : 0.01 g (typ.)

Absolute Maximum Ratings ($T_a = 25^\circ$ 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}	± 20 (Note 1)	mA
DC output current	I_{OUT}	± 25	mA
DC V_{CC} / GND current	I_{CC}	± 50	mA
Power dissipation	P_D	300 (SM8) 200 (US8)	mW
Storage temperature	T_{stg}	-65 to 150	$^\circ$ C
Lead temperature (10s)	T_L	260	$^\circ$ 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: $V_{OUT} < GND$, $V_{OUT} > V_{CC}$

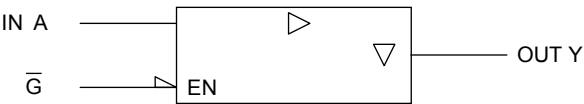
Start of commercial production
1997-02

Truth Table

\overline{G}	A	Y
H	X	Z
L	L	L
L	H	H

X: Don't Care
Z: High impedance

IEC Logic Symbol



Operating Ranges

Characteristics	Symbol	Rating	Unit
Supply voltage	V_{CC}	2.0 to 5.5	V
Input voltage	V_{IN}	0 to 5.5	V
Output voltage	V_{OUT}	0 to V_{CC}	V
Operating temperature	T_{opr}	-40 to 85	°C
Input rise and fall time	dt/dv	0 to 100 ($V_{CC}=3.3\pm0.3V$)	ns/V
		0 to 20 ($V_{CC}=5.0\pm0.5V$)	

Electrical Characteristics
DC Characteristics

Characteristics		Symbol	Test Condition		Ta = 25°C				Ta = −40 to 85°C		Unit
					V _{CC} (V)	Min	Typ.	Max	Min	Max	
Input voltage	High level	V _{IH}	—		2.0	1.5	—	—	1.5	—	V
					3.0 to 5.5	V _{CC} × 0.7	—	—	V _{CC} × 0.7	—	
	Low level	V _{IL}	—		2.0	—	—	0.5	—	0.5	
					3.0 to 5.5	—	—	V _{CC} × 0.3	—	V _{CC} × 0.3	
Output voltage	High level	V _{OH}	V _{IN} = V _{IL} or V _{IH}	I _{OH} = −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 _{OH} = −4 mA	3.0	2.58	—	—	2.48	—	
					I _{OH} = −8 mA	4.5	3.94	—	—	3.8	
	Low level	V _{OL}	V _{IN} = V _{IL}	I _{OL} = 50 μA	2.0	—	0.0	0.1	—	0.1	
					3.0	—	0.0	0.1	—	0.1	
					4.5	—	0.0	0.1	—	0.1	
				I _{OH} = −4 mA	3.0	—	—	0.36	—	0.44	
					I _{OH} = −8 mA	4.5	—	—	0.36	—	
3-state output off-state current		I _{OZ}	V _{IN} = V _{IH} or V _{IL} V _{OUT} = V _{CC} to GND		5.5	—	—	±0.25	—	±2.5	μA
Input leakage current		I _{IN}	V _{IN} = 5.5V or GND		0 to 5.5	—	—	±0.1	—	±1.0	μA
Quiescent supply current		I _{CC}	V _{IN} = V _{CC} or GND		5.5	—	—	2.0	—	20.0	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
			V _{CC} (V)	CL(pF)	Min	Typ.	Max	Min	Max	
Propagation delay time	t _{pLH} t _{pHL}		3.3±0.3	15	—	5.6	8.0	1.0	9.5	ns
				50	—	8.1	11.5	1.0	13.0	
			5.0±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 = 1 kΩ	3.3±0.3	15	—	5.4	8.0	1.0	9.5	ns
				50	—	7.9	11.5	1.0	13.0	
			5.0±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 =1 kΩ	3.3±0.3	50	—	9.5	13.2	1.0	15.0	ns
			5.0±0.5	50	—	6.1	8.8	1.0	10.0	
Output to Output Skew	t _{osLH} t _{osHL}	(Note 2)	3.3±0.3	50	—	—	1.5	—	1.5	ns
			5.0±0.5	50	—	—	1.0	—	1.0	
Input capacitance	C _{IN}				—	4	10	—	10	pF
Output capacitane	C _{OUT}				—	6	—	—	—	pF
Power dissipation capacitance	C _{PD}	(Note3)			—	14	—	—	—	pF

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

Note 3: C_{PD} is defined as the value of the internal equivalent capacitance which is calculated from the operating current consumption without load.

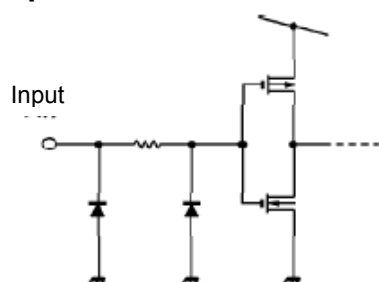
Average operating current can be obtained by the equation:

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

Noise Characteristics (Ta=25°C, Input tr= tf = 3n)

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

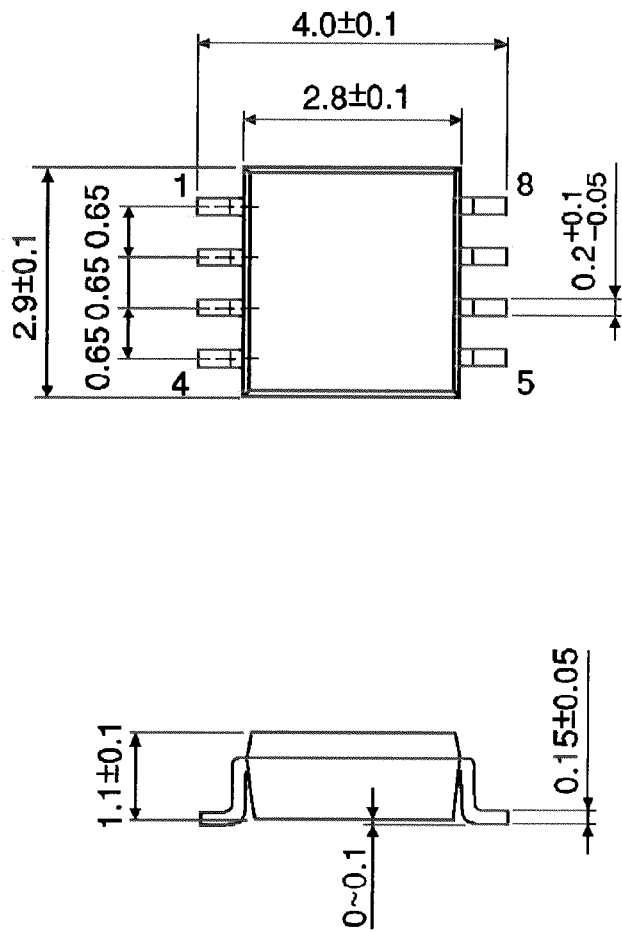
Input Equivalent Circuit



Package Dimensions

SSOP8-P-0.65

Unit : mm

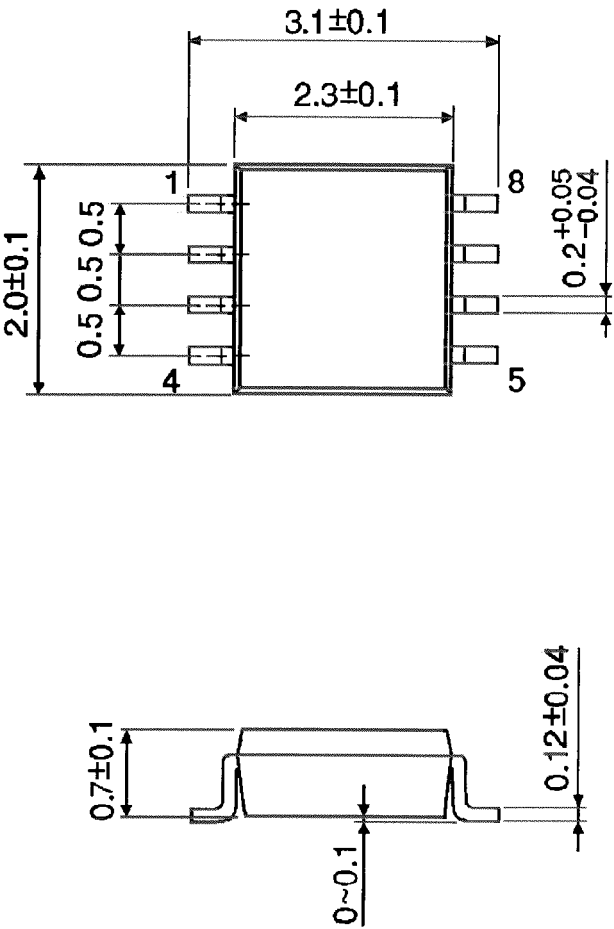


Weight: 0.02 g (typ.)

Package Dimensions

SSOP8-P-0.50A

Unit : mm



Weight: 0.01 g (typ.)

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