TOSHIBA CMOS Digital Integrated Circuit Silicon Monolithic

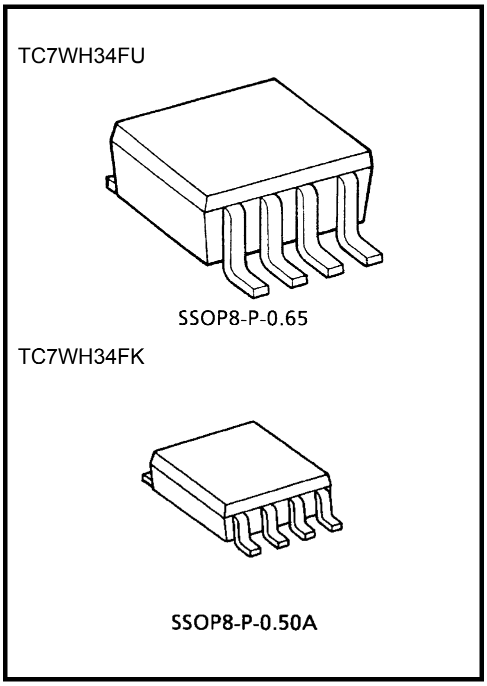
TC7WH34FU,TC7WH34FK

Triple Non-Inverter

The TC7WH34 is an advanced high speed CMOS Non-Inverter fabricated with silicon gate CMOS technology.

It achieves the high speed operation similar to equivalent Bipolar Schottky TTL while maintaining the CMOS low power dissipation. The internal circuit is composed of 3 stages including buffer output, which provide high noise immunity and stable output. An input protection circuit ensures that 0 to 7 V can be applied to the input pins without regard to the supply voltage.

This device can be used to interface 5 V to 3 V systems and two supply systems such as battery back up. This circuit prevents device destruction due to mismatched supply and input voltages.



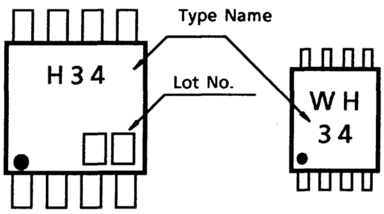
Weight
SSOP8-P-0.65: 0.02 g (typ.)
SSOP8-P-0.50A: 0.01 g (typ.)

Features

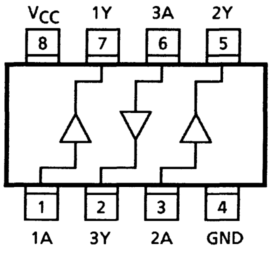
- High speed: t_{pd} = 3.8 ns (typ.) at V_{CC} = 5 V
- Low power dissipation: I_{CC} = 2 μA (max) at Ta = 25°C
- High noise immunity: $V_{NIH} = V_{NIL}$ = 28% V_{CC} (min)
- 5.5-V Tolerant inputs.
- Balanced propagation delays: $t_{pLH} \simeq t_{pHL}$
- Wide operating voltage range: V_{CC} (opr) = 2~5.5 V

Marking

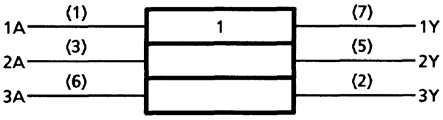
TC7WH34FU **TC7WH34FK**



Pin Assignment (top view)



Logic Diagram



Truth Table

A	Y
L	L
H	H

Absolute Maximum Ratings (Ta = 25°C)

Characteristics	Symbol	Rating	Unit
Supply voltage range	V_{CC}	−0.5~7.0	V
DC input voltage	V_{IN}	−0.5~7.0	V
DC output voltage	V_{OUT}	−0.5~V_{CC} + 0.5	V
Input diode current	I_{IK}	−20	mA
Output diode current	I_{OK}	±20	mA
DC output current	I_{OUT}	±25	mA
DC V_{CC}/ground current	I_{CC}	±50	mA
Power dissipation	P_D	300 (TC7WH34FU)	mW
		200 (TC7WH34FK)	
Storage temperature	T_{stg}	−65~150	°C
Lead temperature (10 s)	T_L	260	°C

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).

Operating Ranges

Characteristics	Symbol	Rating	Unit
Supply voltage	V_{CC}	2.0~5.5	V
Input voltage	V_{IN}	0~5.5	V
Output voltage	V_{OUT}	0~V_{CC}	V
Operating temperature	T_{opr}	−40~85	°C
Input rise and fall time	dt/dv	0~100 (V_{CC} = 3.3 ± 0.3 V)	ns/V
		0~20 (V_{CC} = 5 ± 0.5 V)	

Electrical Characteristics

DC Characteristics

Characteristics	Symbol	Test Condition			Ta = 25°C			Ta = –40~85°C		Unit
				V_{CC} (V)	Min	Typ.	Max	Min	Max	
High-level input voltage	V_{IH}	—		2.0	1.50	—	—	1.50	—	V
				3.0~ 5.5	V_{CC} × 0.7	—	—	V_{CC} × 0.7	—	
Low-level input voltage	V_{IL}	—		2.0	—	—	0.50	—	0.50	V
				3.0~ 5.5	—	—	V_{CC} × 0.3	—	V_{CC} × 0.3	
High-level output voltage	V_{OH}	$V_{IN} = V_{IH}$	$I_{OH} = -50\ \mu A$	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	—	—	3.80	—	
Low-level output voltage	V_{OL}	$V_{IN} = V_{IL}$	$I_{OL} = 50\ \mu A$	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	
			$I_{OL} = 4$ mA	3.0	—	—	0.36	—	0.44	
			$I_{OL} = 8$ mA	4.5	—	—	0.36	—	0.44	
Input leakage current	I_{IN}	$V_{IN} = 5.5$ V or GND		0~ 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 (input: $t_r = t_f = 3$ ns)

Characteristics	Symbol	Test Condition			Ta = 25°C			Ta = –40~85°C		Unit
			V_{CC} (V)	C_L (pF)	Min	Typ.	Max	Min	Max	
Propagation delay time	t_{pLH} t_{pHL}	—	3.3 ± 0.3	15	—	5.0	7.1	1.0	8.5	ns
				50	—	7.5	10.6	1.0	12.0	
			5.0 ± 0.5	15	—	3.8	5.5	1.0	6.5	
				50	—	5.3	7.5	1.0	8.5	
Input capacitance	C_{IN}	—			—	4	10	—	10	pF
Power dissipation capacitance	C_{PD}	(Note)			—	18	—	—	—	pF

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

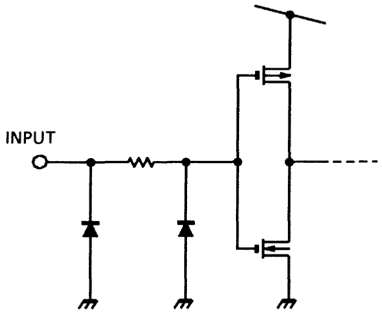
Average operating current can be obtained by the equation:

$$I_{CC\ (opr)} = C_{PD} \cdot V_{CC} \cdot f_{IN} + I_{CC}/3$$

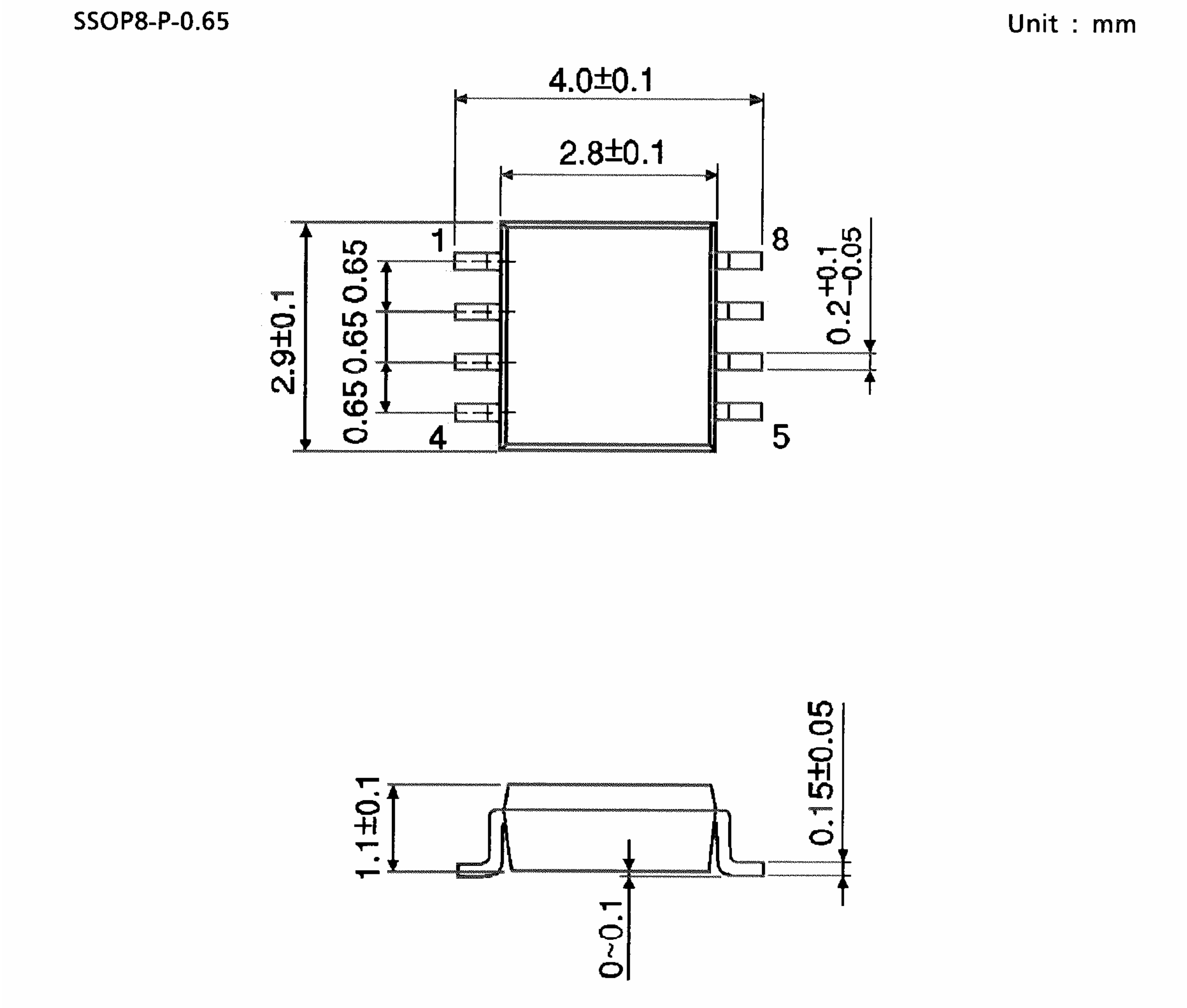
Noise Characteristics (Ta = 25°C, input: $t_r = t_f = 3$ ns)

Characteristics	Symbol	Test Condition		Typ.	Limit	Unit
			V_{CC} (V)			
Quiet output maximum dynamic V_{OL}	V_{OLP}	$C_L = 50$ pF	5.0	0.3	0.8	V
Quiet output minimum dynamic V_{OL}	V_{OLV}	$C_L = 50$ pF	5.0	−0.3	−0.8	V
Minimum high level dynamic input voltage	V_{IHD}	$C_L = 50$ pF	5.0	—	3.5	V
Maximum low level dynamic input voltage	V_{ILD}	$C_L = 50$ pF	5.0	—	1.5	V

Input Equivalent Circuit

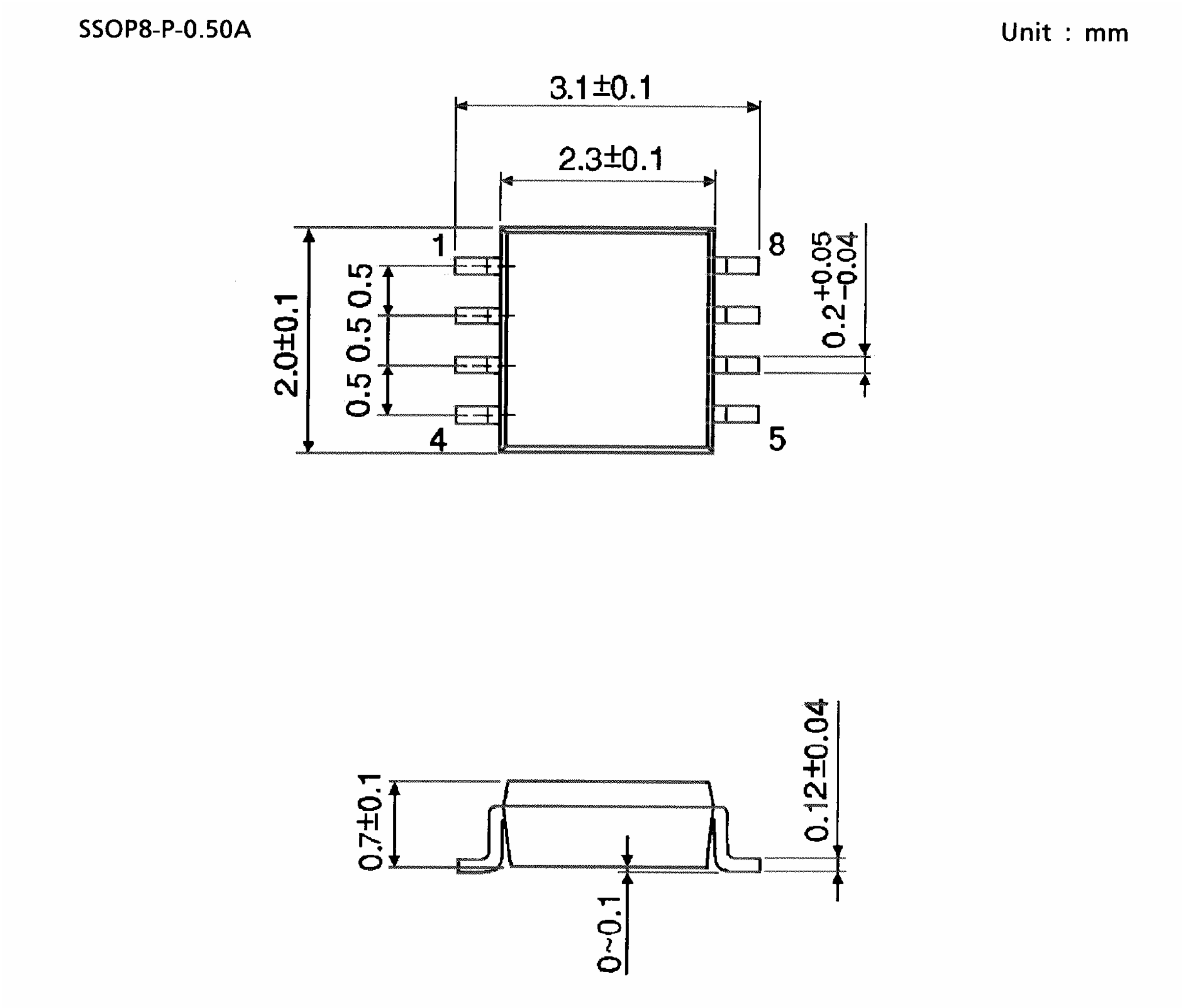


Package Dimensions



Weight: 0.02 g (typ.)

Package Dimensions



Weight: 0.01 g (typ.)

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20070701-EN GENERAL

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