

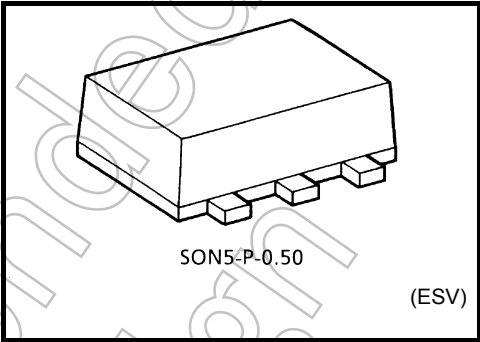
TOSHIBA CMOS Digital Integrated Circuit Silicon Monolithic

TC7SG17FE

Schmitt Buffer

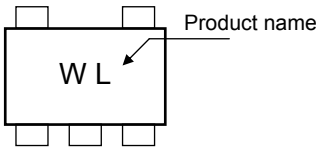
Features

- High output current : $\pm 8\text{ mA}$ (min) at $V_{CC} = 3.0\text{ V}$
- Super high speed operation : $t_{pd} = 3.7\text{ ns}$ (typ.)
at $V_{CC} = 3.3\text{ V}, 15\text{ pF}$
- Operating voltage range : $V_{CC} = 0.9\text{ to }3.6\text{ V}$
- 5.5-V tolerant input.
- 3.6-V power down protection output.

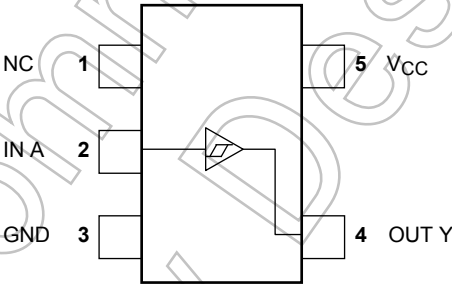


Weight: 0.003 g (typ.)

Marking



Pin Assignment (top view)



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

Characteristics	Symbol	Rating	Unit
Supply voltage	V_{CC}	-0.5 to 4.6	V
DC input voltage	V_{IN}	-0.5 to 7.0	V
DC output voltage	V_{OUT}	-0.5 to 4.6 (Note 1)	V
		-0.5 to $V_{CC} + 0.5$ (Note 2)	
Input diode current	I_{IK}	-20	mA
Output diode current	I_{OK}	-20 (Note 3)	mA
DC output current	I_{OUT}	± 25	mA
DC V_{CC} /ground current	I_{CC}	± 50	mA
Power dissipation	P_D	150	mW
Storage temperature	T_{stg}	-65 to 150	$^\circ\text{C}$

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).

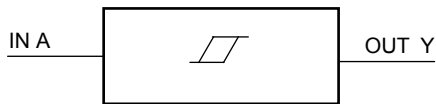
Note 1: $V_{CC} = 0\text{ V}$

Note 2: High or Low state. Do not exceed I_{OUT} of absolute maximum ratings.

Note 3: $V_{OUT} < \text{GND}$

Start of commercial production
2005-07

IEC Logic Symbol



Truth Table

A	Y
L	L
H	H

Operating Ranges

Characteristics	Symbol	Rating	Unit
Supply voltage	V_{CC}	0.9 to 3.6	V
Input voltage	V_{IN}	0 to 5.5	V
Output voltage	V_{OUT}	0 to 3.6 (Note 4)	V
		0 to V_{CC} (Note 5)	
Output Current	I_{OH}/I_{OL}	± 8.0 (Note 6)	mA
		± 4.0 (Note 7)	
		± 3.0 (Note 8)	
		± 1.7 (Note 9)	
		± 0.3 (Note 10)	
		± 0.02 (Note 11)	
Operating temperature	T_{opr}	-40 to 85	°C

Note 4: $V_{CC} = 0$ V

Note 5: High or Low state

Note 6: $V_{CC} = 3.0$ to 3.6 V

Note 7: $V_{CC} = 2.3$ to 2.7 V

Note 8: $V_{CC} = 1.65$ to 1.95 V

Note 9: $V_{CC} = 1.4$ to 1.6 V

Note 10: $V_{CC} = 1.1$ to 1.3 V

Note 11: $V_{CC} = 0.9$ V

Electrical Characteristics

DC Characteristics

Characteristics		Symbol	Test Condition	Ta = 25°C				Ta = -40 to 85°C		Unit	
				VCC (V)	Min	Typ.	Max	Min	Max		
Threshold voltage	Positive threshold voltage	VP	—	0.9	—	—	0.73	—	0.80	V	
				1.1	—	—	0.86	—	0.93		
				1.4	—	—	1.07	—	1.12		
				1.65	—	—	1.23	—	1.25		
				2.3	—	—	1.66	—	1.68		
				3.0	—	—	2.14	—	2.15		
	Negative threshold voltage	VN	—	0.9	0.18	—	—	0.07	—		
				1.1	0.26	—	—	0.18	—		
				1.4	0.36	—	—	0.31	—		
				1.65	0.45	—	—	0.41	—		
				2.3	0.69	—	—	0.64	—		
				3.0	0.96	—	—	0.91	—		
Hysteresis voltage		VH	—	0.9	0.20	—	0.38	0.15	0.53	V	
				1.1	0.25	—	0.41	0.21	0.53		
				1.4	0.35	—	0.48	0.34	0.57		
				1.65	0.42	—	0.56	0.40	0.60		
				2.3	0.60	—	0.74	0.60	0.76		
				3.0	0.79	—	0.93	0.79	0.94		
Output voltage	High level	VOH	VIN = VIH	IOH = -0.02 mA	0.9	0.75	—	—	0.75	—	V
				IOH = -0.3 mA	1.1 to 1.3	VCC × 0.75	—	—	VCC × 0.75	—	
				IOH = -1.7 mA	1.4 to 1.6	VCC × 0.75	—	—	VCC × 0.75	—	
				IOH = -3.0 mA	1.65 to 1.95	VCC -0.45	—	—	VCC -0.45	—	
				IOH = -4.0 mA	2.3 to 2.7	2.0	—	—	2.0	—	
				IOH = -8.0 mA	3.0 to 3.6	2.48	—	—	2.48	—	
	Low level	VOL	VIN = VIL	IOL = 0.02 mA	0.9	—	—	0.1	—	0.1	
				IOL = 0.3 mA	1.1 to 1.3	—	—	VCC × 0.25	—	VCC × 0.25	
				IOL = 1.7 mA	1.4 to 1.6	—	—	VCC × 0.25	—	VCC × 0.25	
				IOL = 3.0 mA	1.65 to 1.95	—	—	0.45	—	0.45	
				IOL = 4.0 mA	2.3 to 2.7	—	—	0.4	—	0.4	
				IOL = 8.0 mA	3.0 to 3.6	—	—	0.4	—	0.4	
Input leakage current		IIN	VIN = 0 to 5.5V	0 to 3.6	—	—	±0.1	—	±1.0	μA	
Power off leakage current		IOFF	VIN = 0 to 5.5V VOUT = 0 to 3.6V	0	—	—	1.0	—	10.0	μA	
Quiescent supply current		ICC	VIN = VCC or GND	3.6	—	—	1.0	—	10.0	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)	Min	Typ.	Max	Min	Max
Propagation delay time	t_{pLH} t_{pHL}	$C_L = 10$ pF, $R_L = 1$ M Ω	0.9	—	27.3	—	—	—
			1.1 to 1.3	—	13.0	22.6	1.0	35.9
			1.4 to 1.6	—	7.5	10.5	1.0	11.3
			1.65 to 1.95	—	6.0	7.8	1.0	8.2
			2.3 to 2.7	—	4.3	5.4	1.0	5.8
			3.0 to 3.6	—	3.5	4.4	1.0	4.6
		$C_L = 15$ pF, $R_L = 1$ M Ω	0.9	—	29.5	—	—	—
			1.1 to 1.3	—	14.3	25.1	1.0	41.8
			1.4 to 1.6	—	8.0	11.5	1.0	12.6
			1.65 to 1.95	—	6.3	8.4	1.0	8.7
			2.3 to 2.7	—	4.6	5.7	1.0	6.1
			3.0 to 3.6	—	3.7	4.6	1.0	5.0
		$C_L = 30$ pF, $R_L = 1$ M Ω	0.9	—	40.5	—	—	—
			1.1 to 1.3	—	19.6	35.7	1.0	58.1
			1.4 to 1.6	—	10.7	15.8	1.0	17.6
			1.65 to 1.95	—	7.8	10.7	1.0	11.7
			2.3 to 2.7	—	5.4	6.9	1.0	8.1
			3.0 to 3.6	—	4.3	5.2	1.0	6.1
Input capacitance	C_{IN}	—	3.6	—	3	—	—	pF
Power dissipation capacitance	C_{PD}	(Note 12)	0.9 to 3.6	—	7	—	—	pF

Note 12: C_{PD} is defined as the value of the internal equivalent capacitance which is calculated from the operating current consumption without load.

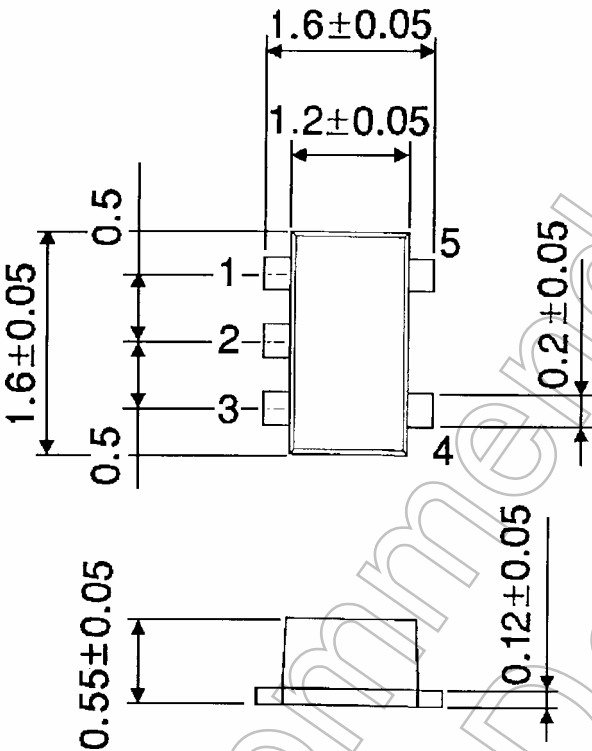
Average operating current can be obtained by the equation:

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

Package Dimensions

SON5-P-0.50

Unit : mm



Weight: 0.003 g (typ.)

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