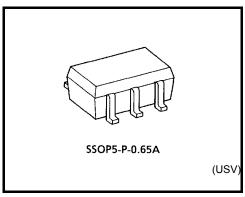
TOSHIBA CMOS Digital Integrated Circuit Silicon Monolithic

# TC7SG08FU

## 2 Input AND Gate

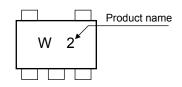
#### **Features**

- High-level output current:  $I_{OH}/I_{OL} = \pm 8$  mA (min) at  $V_{CC} = 3.0$  V
- High-speed operation:  $t_{pd} = 2.5 \text{ ns (typ.)}$ 
  - at  $V_{CC} = 3.3 \text{ V},15\text{pF}$
- Operating voltage range: V<sub>CC</sub> = 0.9~3.6 V
- 5.5-V tolerant inputs.
- 3.6-V power down protection output.

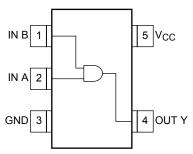


Weight: 0.006 g (typ.)

### Marking



## Pin Assignment (top view)



#### **Absolute Maximum Ratings (Ta = 25°C)**

Characteristics	Symbol	Value	Unit		
Power supply voltage	V <sub>CC</sub>	-0.5~4.6	V		
DC input voltage	V <sub>IN</sub>	-0.5~7.0	V		
DC output voltage	Vour	−0.5~ 4.6 (Note 1)	V		
DC output voltage	V <sub>OUT</sub>	-0.5~ V <sub>CC</sub> + 0.5 (Note 2)	V		
Input diode current	I <sub>IK</sub>	-20	mA		
Output diode current	lok	-20 (Note 3)	mA		
DC output current	lout	±25	mA		
DC V <sub>CC</sub> /ground current	Icc	±50	mA		
Power dissipation	PD	200	mW		
Storage temperature	T <sub>stg</sub>	-65~150	°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<sub>CC</sub> = 0V

Note 2: High or Low State. IOUT abusolute maximum rating must be observed.

Note 3: VOUT < GND

## **Truth Table**

Α	В	Y
L	L	L
L	Н	L
Н	L	L
Н	Н	Н

## **IEC Logic Symbol**



# **Operating Ranges**

Characteristics	Symbol	Value	Unit	
Power supply voltage	V <sub>CC</sub>	0.9~3.6	V	
Input voltage	V <sub>IN</sub>	0~5.5	V	
Output voltage	V	0~3.6 (Note 4)	V	
	V <sub>OUT</sub>	0~V <sub>CC</sub> (Note 5)		
Output Current		±8.0 (Note 6)		
	I <sub>OH</sub> /I <sub>OL</sub>	±4.0 (Note 7)		
		±3.0 (Note 8)	mA	
		±1.7 (Note 9)		
		±0.3 (Note 10)		
		±0.02 (Note 11)		
Operating temperature	T <sub>opr</sub>	<b>−40~85</b>	°C	
Input rise and fall time	dt/dV	0~10 (Note 12)	ns/V	

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

Note 5: High or Low state.

Note 6:  $V_{CC} = 3.0 \sim 3.6 \text{ V}$ 

Note 7:  $V_{CC} = 2.3 \sim 2.7 \text{ V}$ 

Note 8:  $V_{CC} = 1.65 \sim 1.95 \text{ V}$ 

Note 9:  $V_{CC} = 1.4 \sim 1.6 \text{ V}$ 

Note 10: V<sub>CC</sub> = 1.1~1.3 V

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

Note 12:  $V_{IN} = 0.8 \sim 2.0 \text{ V}, V_{CC} = 3.0 \text{ V}$ 

# **DC Electrical Characteristics**

Characteristics	Symbol	Toot Condition			٦	Га = 25°(		Ta = -40~85°C		Unit	
Sharaotenotios Cymbol		Test Condition		V <sub>CC</sub> (V)	Min	Тур.	Max	Min	Max	Unit	
High-level VIH input voltage			0.9	V <sub>CC</sub>		_	V <sub>CC</sub>		-		
				1.1~1.3	V <sub>CC</sub> × 0.7	_	_	V <sub>CC</sub> × 0.7		_	
	_		1.4~1.6	V <sub>CC</sub> × 0.65	_	_	V <sub>CC</sub> × 0.65	_	V		
			1.65~1.95	V <sub>CC</sub> × 0.65	_	_	V <sub>CC</sub> × 0.65	_			
				2.3~2.7	1.7		_	1.7			
				3.0~3.6	2.0		_	2.0			
				0.9			GND	_	GND		
				1.1~1.3			V <sub>CC</sub> × 0.3	_	V <sub>CC</sub> × 0.3		
Low-level	V <sub>IL</sub>		_				V <sub>CC</sub> × 0.35		V <sub>CC</sub> × 0.35	V	
input voltage							V <sub>CC</sub> × 0.35	_	V <sub>CC</sub> × 0.35		
				2.3~2.7			0.7		0.7		
				3.0~3.6			0.8		0.8		
			I <sub>OH</sub> =-0.02 mA	0.9	0.75	_	—	0.75	_		
High-level output voltage			$I_{OH} = -0.3 \text{ mA}$	1.1~1.3	V <sub>CC</sub> × 0.75		_	V <sub>CC</sub> × 0.75	I	V	
	V <sub>OH</sub>	V <sub>IN</sub> = V <sub>IH</sub>	$I_{OH} = -1.7 \text{ mA}$	1.4~1.6	V <sub>CC</sub> × 0.75	١		V <sub>CC</sub> × 0.75	١		
			$I_{OH} = -3.0 \text{ mA}$	1.65~ 1.95	V <sub>CC</sub> -0.45		_	V <sub>CC</sub> -0.45			
			$I_{OH} = -4.0 \text{ mA}$	2.3~2.7	2.0	_	_	2.0	_		
			$I_{OH} = -8.0 \text{ mA}$	3.0~3.6	2.48	_	_	2.48			
		V <sub>IN</sub> = V <sub>IH</sub> or V <sub>IL</sub>	$I_{OL} = 0.02 \text{ mA}$	0.9			0.1	_	0.1	V	
			$I_{OL} = 0.3 \text{ mA}$	1.1~1.3			V <sub>CC</sub> × 0.25	_	V <sub>CC</sub> × 0.25		
Low-level voltage	V <sub>OL</sub>		I <sub>OL</sub> = 1.7 mA	1.4~1.6		1	V <sub>CC</sub> × 0.25	_	V <sub>CC</sub> × 0.25		
			I <sub>OL</sub> = 3.0 mA	1.65~ 1.95			0.45	_	0.45		
			I <sub>OL</sub> = 4.0 mA	2.3~2.7	_	_	0.4	_	0.4		
			I <sub>OL</sub> = 8.0 mA	3.0~3.6	_		0.4	_	0.4		
Input leakage current	I <sub>IN</sub>	V <sub>IN</sub> = 0~5.5V		0~3.6	_	_	±0.1	_	±1.0	μА	
Power off leakage current	l <sub>OFF</sub>	V <sub>IN</sub> = 0~5.5V V <sub>OUT</sub> = 0~3.6V		0	_	_	1.0	_	10.0	μА	
Quiescent supply current	Icc	V <sub>IN</sub> = V <sub>CC</sub> or GND		3.6	_	_	1.0	_	10.0	μΑ	

3 2007-11-01

## AC Electrical Characteristics (input $t_r = t_f = 3$ ns)

Characteristics	Symbol	Test Condition		Ta = 25°C		Ta = -40~85°C		Unit	
Characteristics			V <sub>CC</sub> (V)	Min	Тур.	Max	Min	Max	Offic
		$C_L = 10 \text{ pF},$ $R_L = 1 \text{ M}\Omega$	0.9	_	26.9	_	_	_	
			1.1~1.3	_	10.9	20.7	1.0	38.6	
			1.4~1.6		5.9	9.6	1.0	11.3	
			1.65~ 1.95	١	4.5	7.0	1.0	7.5	
			2.3~2.7		2.9	4.4	1.0	4.9	
			3.0~3.6		2.2	3.5	1.0	4.1	
		$C_L = 15 \text{ pF},$ $R_L = 1 \text{ M}\Omega$	0.9		30.0	_	_		
	tpLH tpHL		1.1~1.3	_	12.0	24.2	1.0	42.0	
Propagation delay time			1.4~1.6	_	6.5	10.5	1.0	12.6	
			1.65~ 1.95		5.0	7.7	1.0	8.0	ns
			2.3~2.7		3.2	4.9	1.0	5.6	
			3.0~3.6		2.5	3.8	1.0	4.4	
		$C_L = 30 \text{ pF},$ $R_L = 1 \text{ M}\Omega$	0.9	_	45.0	_		_	
			1.1~1.3	_	18.0	33.4	1.0	63.2	-
			1.4~1.6	_	8.9	14.8	1.0	17.9	
			1.65~ 1.95		6.9	10.3	1.0	10.8	
			2.3~2.7	_	4.4	6.4	1.0	6.8	
			3.0~3.6	_	3.5	4.9	1.0	5.4	
Input capacitance	C <sub>IN</sub>	_	3.6		3	_	_		pF
Power dissipation capacitance	C <sub>PD</sub>	(Note 13)	0.9~3.6	_	6	_		_	pF

Note 13: C<sub>PD</sub> is defined as the value of the internal equivalent capacitance which is calculated from the operating current consumption without load.

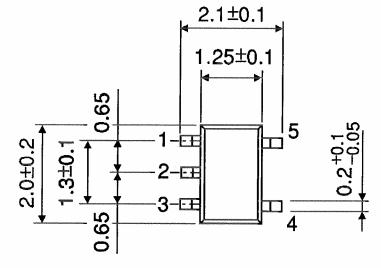
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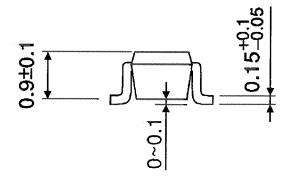
Average operating current can be obtained by the equation:

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

# **Package Dimensions**

SSOP5-P-0.65A Unit: mm





5

Weight: 0.006 g (typ.)

2007-11-01

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20070701-EN GENERAL

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