TOSHIBA CMOS Digital Integrated Circuit Silicon Monolithic

# **TC7S08F, TC7S08FU**

#### 2-Input AND Gate

#### **Features**

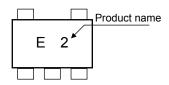
High Speed : t<sub>pd</sub> = 7ns (typ.) at V<sub>CC</sub> = 5 V
 Low power dissipation : I<sub>CC</sub> = 1 μA (max) at Ta = 25°C
 High noise immunity : V<sub>NIH</sub> = V<sub>NIL</sub> = 28% V<sub>CC</sub> (min)

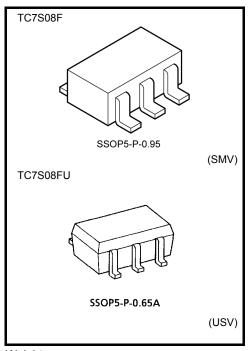
• Output drive capability : 5 LSTTL Loads

• Symmetrical Output Impedance |I<sub>OH</sub>| = I<sub>OL</sub>= 2mA (min)

Balanced propagation delays : t<sub>pLH</sub> ≒ t<sub>pHL</sub>
 Wide operating voltage range : V<sub>CC</sub> = 2 to 6 V

#### Marking





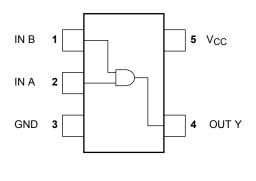
Weight

SSOP5-P-0.95 : 0.016 g (Typ.) SSOP5-P-0.65A : 0.006 g (Typ.)

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

Characteristics	Symbol	Rating	Unit
Supply voltage	V <sub>CC</sub>	−0.5 to 7.0	V
DC input voltage	V <sub>IN</sub>	–0.5 to V <sub>CC</sub> + 0.5	V
DC output voltage	V <sub>OUT</sub>	–0.5 to V <sub>CC</sub> + 0.5	V
Input diode current	I <sub>IK</sub>	±20	mA
Output diode current	lok	±20	mA
DC output current	I <sub>OUT</sub>	±12.5	mA
DC V <sub>CC</sub> /ground current	Icc	±25	mA
Power dissipation	PD	200	mW
Storage temperature	T <sub>stg</sub>	-65 to 150	°C
Lead temperature (10 s)	TL	260	°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).



# IEC Logic Symbol



## **Truth Table**

Α	В	Y
L	L	L
L	Н	L
Н	L	L
Н	Н	Н

# **Operating Ranges**

Characteristics	Symbol	Rating	Unit
Supply voltage	V <sub>CC</sub>	2.0 to 6.0	V
Input voltage	V <sub>IN</sub>	0 to V <sub>CC</sub>	V
Output voltage	V <sub>OUT</sub>	0 to V <sub>CC</sub>	V
Operating temperature	T <sub>opr</sub>	-40 to 85	°C
		0 to 1000 (V <sub>CC</sub> = 2.0 V)	
Input rise and fall time	t <sub>r</sub> , t <sub>f</sub>	0 to 500 (V <sub>CC</sub> = 4.5 V)	ns
		0 to 400 (V <sub>CC</sub> = 6.0 V)	

2



## **Electrical Characteristics**

## **DC Characteristics**

Characteristics	Symbol	Symbol Test Condition		Ta = 25°C			Ta = -40 to 85°C		Unit	
Ondiacteristics Symbol				V <sub>CC</sub> (V)	Min	Тур.	Max	Min.	Max.	Offic
High lovel			2.0	1.5	_	_	1.5	_		
High-level V <sub>IH</sub> input voltage		_		3.15	_	_	3.15	_		
input voltage				6.0	4.2	_	_	4.2	_	V
Low-level V <sub>IL</sub> input voltage		_			_	0.5	_	0.5	V	
				_	_	1.35	_	1.35		
				6.0		_	1.8	_	1.8	
Hab Local	V <sub>ОН</sub>	$V_{IN} = V_{IH}$	I <sub>OH</sub> = -20 μA	2.0	1.9	2.0	_	1.9	_	. V
				4.5	4.4	4.5	_	4.4	_	
High-level output voltage				6.0	5.9	6.0	_	5.9	_	
output voltage			$I_{OH} = -2 \text{ mA}$	4.5	4.18	4.31	_	4.13	_	
			$I_{OH} = -2.6 \text{ mA}$	6.0	5.68	5.80	_	5.63	_	
			I <sub>OL</sub> = 20 μA	2.0	_	0.0	0.1	_	0.1	
Low-level output voltage				4.5	_	0.0	0.1	_	0.1	
	$V_{OL}$	$V_{IN} = V_{IH}$		6.0	_	0.0	0.1	_	0.1	
			I <sub>OL</sub> = 2 mA	4.5	_	0.17	0.26	_	0.33	
			I <sub>OL</sub> = 2.6 mA	6.0	_	0.18	0.26	_	0.33	
Input leakage current	I <sub>IN</sub>	V <sub>IN</sub> = V <sub>CC</sub> or GND		6.0	_	_	±0.1	_	±1.0	μА
Quiescent supply current	Icc	V <sub>IN</sub> = V <sub>CC</sub> or GND		6.0	_	_	1.0	_	10.0	μΑ

Output currents are 1/2 compared to TC74HC series models.

# AC Characteristics ( $C_L$ = 15pF, $V_{CC}$ = 5V, Input: $t_r$ = $t_f$ = 6 ns)

Characteristics	Symbol	Test Condition		Unit		
		rest Condition	Min.	Тур.	Max.	Offic
Output Transition Time	t <sub>TLH</sub>		_	5	10	ns
	t <sub>THL</sub>	_				
Propagation Delay Time	t <sub>pLH</sub>			7	15	no
	t <sub>pLH</sub>	_				ns

## AC Characteristics ( $C_L$ = 50pF, Input: $t_r$ = $t_f$ = 6 ns)

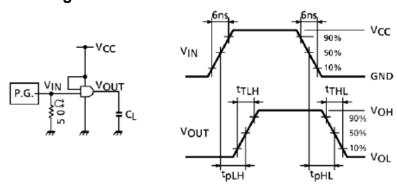
Characteristics	Symbol Test Condition		Ta = 25°C			Ta = -40 to 85°C		Unit	
	Syllibol	Test Condition	V <sub>CC</sub> (V)	Min	Тур.	Max	Min.	Max.	Offic
Output Transition Time	t	_	2.0	_	50	125	_	155	
	t <sub>TLH</sub>		4.5	_	14	25	_	31	ns
	THL		6.0	_	12	21	_	26	
Propagation delay time	t <sub>pLH</sub>	_	2.0	_	48	100	_	125	ns
			4.5	_	12	20	_	25	
		6.0	_	9	17	_	21		
Input capacitance	C <sub>IN</sub>	_		_	5	10	_	10	pF
Power dissipation capacitance	C <sub>PD</sub>		(Note 1)		10		_	_	pF

Note 1: C<sub>PD</sub> is defined as the value of the internal equivalent capacitance which is calculated from the operating current consumption without load.

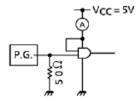
Average operating current can be obtained by the equation:

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

## **Switching Characteristics Test Circuit**



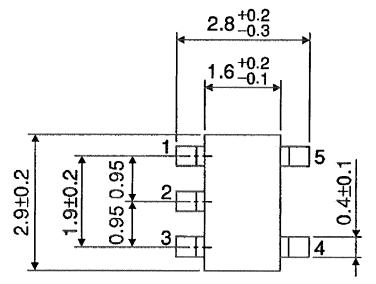
# I<sub>CC (opr.)</sub> Test Circuit

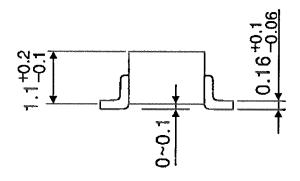


Input waveform is the same as that in case of switching characteristic test.

# **Package Dimensions**

SSOP5-P-0.95 Unit: mm



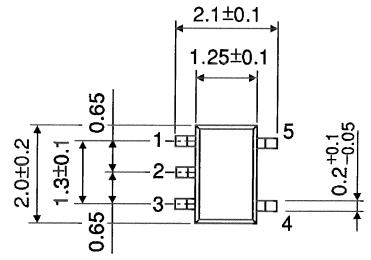


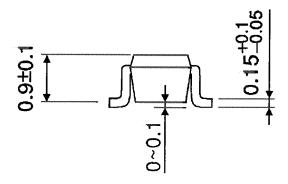
Weight: 0.016 g (typ.)

5 2009-08-05

# **Package Dimensions**

SSOP5-P-0.65A Unit: mm





Weight: 0.006 g (typ.)

6 2009-08-05

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