

TOSHIBA CMOS DIGITAL INTEGRATED CIRCUIT SILICON MONOLITHIC

# TC4SU11F

## 2 INPUT NAND GATE

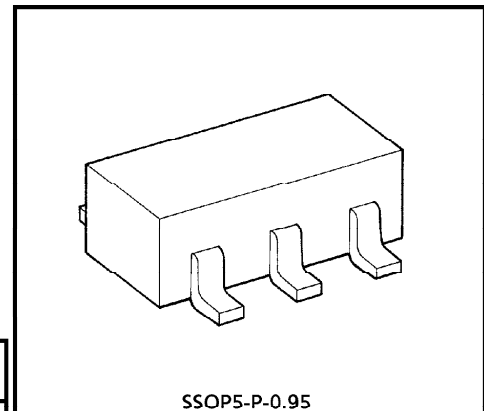
TC4SU11F is 2 input NAND gate respectively.

The internal circuit of only basic NAND circuit without the waveform shaping inverter.

Therefore, this is suitable for the applications in liner circuits such as oscillator circuits and amplifier circuits, and this has advantage in the applications of Logical processing systems with faster operating speed.

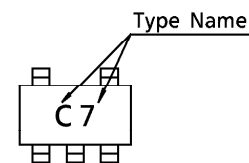
### MAXIMUM RATINGS

CHARACTERISTIC	SYMBOL	RATING	UNIT
DC Supply Voltage	$V_{DD}$	$V_{SS} - 0.5 \sim V_{SS} + 20$	V
Input Voltage	$V_{IN}$	$V_{SS} - 0.5 \sim V_{DD} + 0.5$	V
Output Voltage	$V_{OUT}$	$V_{SS} - 0.5 \sim V_{DD} + 0.5$	V
DC Input Current	$I_{IN}$	$\pm 10$	mA
Power Dissipation	$P_D$	200	mW
Operating Temperature Range	$T_{opr}$	$-40 \sim 85$	$^{\circ}\text{C}$
Storage Temperature Range	$T_{stg}$	$-65 \sim 150$	$^{\circ}\text{C}$
Lead Temperature (10s)	$T_L$	260	$^{\circ}\text{C}$

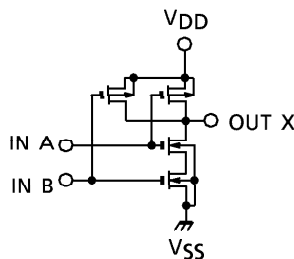


Weight : 0.016g (Typ.)

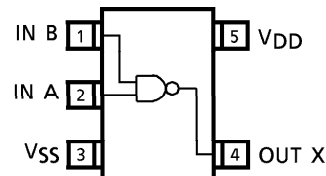
### Marking



### LOGIC DIAGRAM



### PIN ASSIGNMENT (TOP VIEW)



961001EBA2

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**RECOMMENDED OPERATING CONDITIONS ( $V_{SS} = 0V$ )**

CHARACTERISTIC	SYMBOL		MIN.	TYP.	MAX.	UNIT
DC Supply Voltage	$V_{DD}$	—	3	—	18	V
Input Voltage	$V_{IN}$	—	0	—	$V_{DD}$	V

**STATIC ELECTRICAL CHARACTERISTICS ( $V_{SS} = 0V$ )**

CHARACTERISTIC	SYM-BOL	TEST CONDITION	$V_{DD}$ (V)	-40°C		25°C			85°C		UNIT	
				MIN.	MAX.	MIN.	TYP.	MAX.	MIN.	MAX.		
High-Level Output Voltage	$V_{OH}$	$ I_{OUT}  < 1\mu A$ $V_{IN} = V_{SS}$	5	4.95	—	4.95	5.00	—	4.95	—	V	
			10	9.95	—	9.95	10.00	—	9.95	—		
			15	14.95	—	14.95	15.00	—	14.95	—		
Low-Level Output Voltage	$V_{OL}$	$ I_{OUT}  < 1\mu A$ $V_{IN} = V_{DD}$	5	—	0.05	—	0.00	0.05	—	0.05	V	
			10	—	0.05	—	0.00	0.05	—	0.05		
			15	—	0.05	—	0.00	0.05	—	0.05		
Output High Current	$I_{OH}$	$V_{OH} = 4.6V$ $V_{OH} = 2.5V$ $V_{OH} = 9.5V$ $V_{OH} = 13.5V$ $V_{IN} = V_{SS}, V_{DD}$	5	-0.61	—	-0.51	-1.0	—	-0.42	—	mA	
			5	-2.5	—	-2.1	-4.0	—	-1.7	—		
			10	-1.5	—	-1.3	-2.2	—	-1.1	—		
			15	-4.0	—	-3.4	-9.0	—	-2.8	—		
Output Low Current	$I_{OL}$	$V_{OL} = 0.4V$ $V_{OL} = 0.5V$ $V_{OL} = 1.5V$ $V_{IN} = V_{DD}$	5	0.61	—	0.51	1.2	—	0.42	—	mA	
			10	1.5	—	1.3	3.2	—	1.1	—		
			15	4.0	—	3.4	12.0	—	2.8	—		
			—	—	—	—	—	—	—	—		—
Input High Voltage	$V_{IH}$	$V_{OUT} = 0.5V$ $V_{OUT} = 1.0V$ $V_{OUT} = 1.5V$ $ I_{OUT}  < 1\mu A$	5	4.0	—	4.0	3.0	—	4.0	—	V	
			10	8.0	—	8.0	6.5	—	8.0	—		
			15	12.0	—	12.0	9.5	—	12.0	—		
			—	—	—	—	—	—	—	—		
Input Low Voltage	$V_{IL}$	$V_{OUT} = 4.5V$ $V_{OUT} = 9.0V$ $V_{OUT} = 13.5V$ $ I_{OUT}  < 1\mu A$	5	—	1.0	—	2.0	1.0	—	1.0	V	
			10	—	2.0	—	3.5	2.0	—	2.0		
			15	—	3.0	—	5.5	3.0	—	3.0		
			—	—	—	—	—	—	—	—		
Input Current	H Level	$I_{IH}$	$V_{IH} = 18V$	18	—	0.1	—	$10^{-5}$	0.1	—	1.0	$\mu A$
	L Level	$I_{IL}$	$V_{IL} = 0V$	18	—	-0.1	—	$-10^{-5}$	-0.1	—	-1.0	
Quiescent Device Current	$I_{DD}$	$V_{IN} = V_{SS}, V_{DD}$	5	—	0.25	—	0.001	0.25	—	7.5	$\mu A$	
			10	—	0.5	—	0.001	0.5	—	15		
			15	—	1.0	—	0.002	1.0	—	30		

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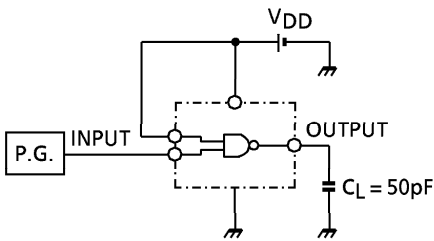
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**DYNAMIC ELECTRICAL CHARACTERISTICS** (Ta = 25°C, VSS = 0V, CL = 50pF)

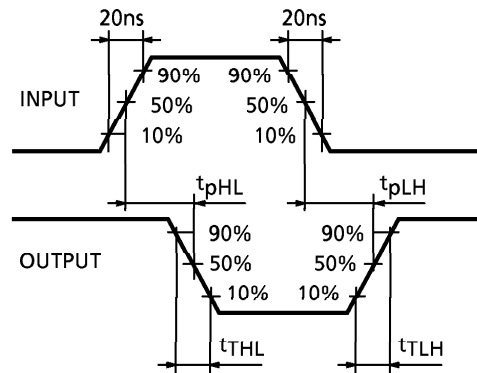
CHARACTERISTIC	SYMBOL	TEST CONDITION	VDD (V)	MIN.	TYP.	MAX.	UNIT
Output Transition Time (Low to High)	t <sub>TLH</sub>	—	5	—	70	200	ns
			10	—	35	100	
			15	—	30	80	
Output Transition Time (High to Low)	t <sub>THL</sub>	—	5	—	60	200	ns
			10	—	25	100	
			15	—	20	80	
Propagation Delay Time	t <sub>pLH</sub>	—	5	—	50	110	ns
			10	—	28	60	
			15	—	22	50	
Propagation Delay Time	t <sub>pHL</sub>	—	5	—	50	110	ns
			10	—	28	60	
			15	—	22	50	
Input Capacitance	C <sub>IN</sub>	—	—	5	7.5	pF	

**CIRCUIT AND WAVEFORM FOR MEASUREMENT OF DYNAMIC CHARACTERISTICS**

**CIRCUIT**

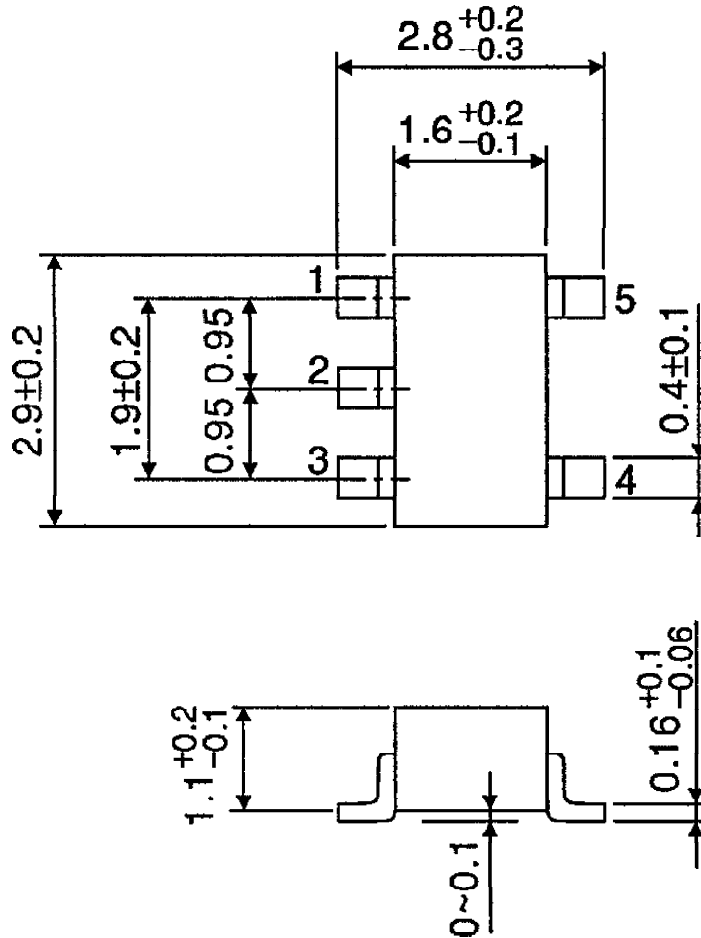


**WAVEFORM**



**OUTLINE DRAWING**  
SSOP5-P-0.95

Unit : mm



Weight : 0.016g (Typ.)