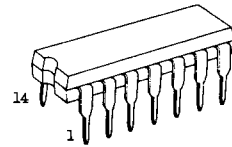


# TC7400BP

C<sup>2</sup>MOS DIGITAL INTEGRATED CIRCUIT  
SILICON MONOLITHIC

## TC7400BP QUAD 2-INPUT POSITIVE NAND GATE

TC7400BP is two input positive logic NAND gate. Since all the outputs of this gate are equipped with buffers which consist of inverters, the input/output transmission characteristic has been improved and the variation of transmission time caused by increase of load capacity has been kept minimum.



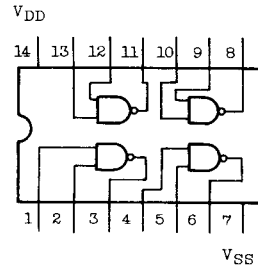
DIP 14 (3D14A-P)

### ABSOLUTE MAXIMUM RATINGS

CHARACTERISTIC	SYMBOL	RATING	UNIT
DC Supply Voltage	V <sub>DD</sub>	V <sub>SS</sub> -0.5 ~ V <sub>SS</sub> +20	V
Input Voltage	V <sub>IN</sub>	V <sub>SS</sub> -0.5 ~ V <sub>DD</sub> +0.5	V
Output Voltage	V <sub>OUT</sub>	V <sub>SS</sub> -0.5 ~ V <sub>DD</sub> +0.5	V
DC Input Current	I <sub>IN</sub>	±10	mA
Power Dissipation	P <sub>D</sub>	300	mW
Storage Temperature Range	T <sub>stg</sub>	-65 ~ 150	°C
Lead Temp./Time	T <sub>sol</sub>	260°C · 10sec	

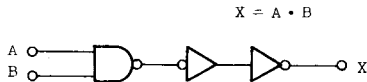
### PIN ASSIGNMENT

TC7400BP



### LOGIC DIAGRAM

1/4 TC7400BP



RECOMMENDED OPERATING CONDITIONS (V<sub>SS</sub>=0V)

CHARACTERISTIC	SYMBOL	MIN.	TYP.	MAX.	UNIT
Supply Voltage	V <sub>DD</sub>	3	-	18	V
Input Voltage	V <sub>IN</sub>	0	-	V <sub>DD</sub>	V
Operating Temp.	Topr	-40	-	85	°C

ELECTRICAL CHARACTERISTICS (V<sub>SS</sub>=0V)

CHARACTERISTIC	SYMBOL	TEST CONDITIONS	V <sub>DD</sub> (V)	-40°C		25°C			85°C		UNIT	
				MIN.	MAX.	MIN.	TYP.	MAX.	MIN.	MAX.		
"H" Level Output Voltage	V <sub>OH</sub>	I <sub>OUT</sub>   < 1μA V <sub>IN</sub> = V <sub>SS</sub> , V <sub>DD</sub>	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	-		
"L" Level Output Voltage	V <sub>OL</sub>	I <sub>OUT</sub>   < 1μA V <sub>IN</sub> = V <sub>DD</sub>	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		
"H" Level Output Current	I <sub>OH</sub>	V <sub>OH</sub> = 4.6V V <sub>OH</sub> = 9.5V V <sub>OH</sub> = 13.5V V <sub>IN</sub> = V <sub>SS</sub> , V <sub>DD</sub>	5	-0.2	-	-0.16	-0.5	-	-0.12	-	mA	
			10	-0.5	-	-0.4	-1.2	-	-0.3	-		
			15	-1.4	-	-1.2	-6.0	-	-1.0	-		
"L" Level Output Current	I <sub>OL</sub>	V <sub>OL</sub> = 0.4V V <sub>OL</sub> = 0.5V V <sub>OL</sub> = 1.5V V <sub>IN</sub> = V <sub>DD</sub>	5	0.52	-	0.44	1.5	-	0.36	-	mA	
			10	1.3	-	1.0	3.5	-	0.9	-		
			15	3.6	-	3.0	15	-	2.4	-		
"H" Level Input Voltage	V <sub>IH</sub>	V <sub>OUT</sub> =0.5V, 4.5V V <sub>OUT</sub> =1.0V, 9.0V V <sub>OUT</sub> =1.5V, 13.5V  I <sub>OUT</sub>   < 1μA	5	3.5	-	3.5	2.75	-	3.5	-	V	
			10	7.0	-	7.0	5.5	-	7.0	-		
			15	11.0	-	11.0	8.25	-	11.0	-		
"L" Level Input Voltage	V <sub>IL</sub>	V <sub>OUT</sub> = 4.5V V <sub>OUT</sub> = 9.0V V <sub>OUT</sub> = 13.5V  I <sub>OUT</sub>   < 1μA	5	-	1.5	-	2.25	1.5	-	1.5	V	
			10	-	3.0	-	4.5	3.0	-	3.0		
			15	-	4.0	-	6.75	4.0	-	4.0		
Input Current	"H" Level	I <sub>IH</sub>	V <sub>IH</sub> = 18V	18	-	0.3	-	10 <sup>-5</sup>	0.3	-	1.0	μA
	"L" Level	I <sub>IL</sub>	V <sub>IL</sub> = 0V	18	-	-0.3	-	-10 <sup>-5</sup>	-0.3	-	-1.0	
Quiescent Supply Current	I <sub>DD</sub>	V <sub>IN</sub> = V <sub>SS</sub> , V <sub>DD</sub> *	5	-	1.0	-	0.001	1.0	-	7.5	μA	
			10	-	2.0	-	0.001	2.0	-	15		
			15	-	4.0	-	0.002	4.0	-	30		

\* All valid input combinations

SWITCHING CHARACTERISTICS (T<sub>a</sub>=25°C, V<sub>SS</sub>=0V, C<sub>L</sub>=50pF)

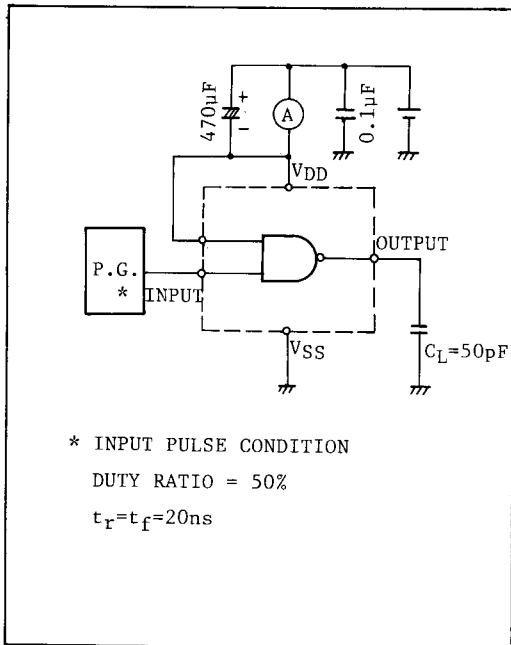
CHARACTERISTIC	SYMBOL	TEST CONDITIONS	V <sub>DD</sub> (V)	MIN.	TYP.	MAX.	UNIT
Output Rise Time	t <sub>TLH</sub>		5	-	130	400	ns
			10	-	65	200	
			15	-	50	160	
Output Fall Time	t <sub>THL</sub>		5	-	100	200	ns
			10	-	50	100	
			15	-	40	80	

# TC7400BP

SWITCHING CHARACTERISTICS (Ta=25°C, VSS=0V, CL=50pF)

CHARACTERISTIC	SYMBOL	TEST CONDITIONS	VDD(V)	MIN.	TYP.	MAX.	UNIT
TC7400BP	(Low-High) Propagation Delay Time	t <sub>pLH</sub>	5	-	140	300	ns
			10	-	60	150	
			15	-	50	125	
	(High-Low) Propagation Delay Time	t <sub>pHL</sub>	5	-	180	300	
			10	-	80	150	
			15	-	60	125	
Input Capacitance	C <sub>IN</sub>		-	5	7.5	pF	

## I<sub>T</sub> TEST CIRCUIT



## SWITCHING TIME TEST CIRCUIT AND WAVEFORM

