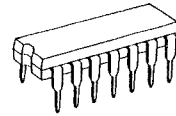


TC4011BP/BF/BFN, TC4012BP/BF TC4023BP/BF/BFN

TC4011B QUAD 2 INPUT NAND GATE
TC4012B DUAL 4 INPUT NAND GATE
TC4023B TRIPLE 3 INPUT NAND GATE

The TC4011B, TC4023B, and TC4012B are 2-input, 3-input, and 4-input positive logic NAND gates respectively.

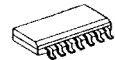
Since all the outputs of these gates are provided with the inverters as buffers, the input / output characteristics have been improved and the variation of propagation delay time due to the increase in load capacity is kept down to the minimum.



P (DIP14-P-300)



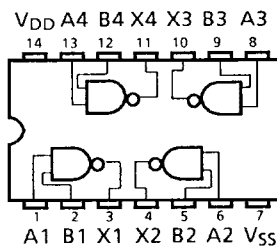
F (SOP14-P-300)



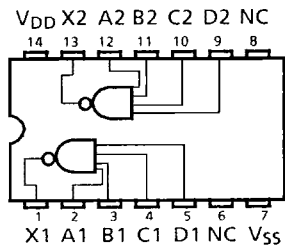
FN (SOL14-P-150)

PIN ASSIGNMENT (TOP VIEW)

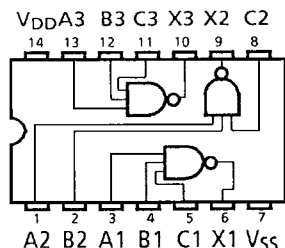
TC4011B



TC4012B



TC4023B

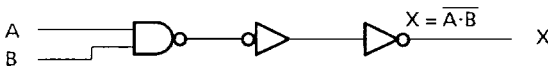


ABSOLUTE MAXIMUM RATINGS

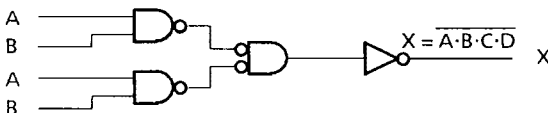
CHARACTERISTIC	SYMBOL	RATING	UNIT
DC Supply Voltage	V_{DD}	$V_{SS} - 0.5 \sim V_{SS} + 20$	V
Input Voltage	V_{IN}	$V_{SS} - 0.5 \sim V_{DD} + 0.5$	V
Output Voltage	V_{OUT}	$V_{SS} - 0.5 \sim V_{DD} + 0.5$	V
DC Input Current	I_{IN}	± 10	mA
Power Dissipation	P_D	300 (DIP) / 180 (SOIC)	mW
Operating Temperature Range	T_A	$-40 \sim 85$	$^{\circ}\text{C}$
Storage Temperature Range	T_{STG}	$-65 \sim 150$	$^{\circ}\text{C}$
Lead Temp./Time	T_{SOL}	$260^{\circ}\text{C} \cdot 10\text{sec}$	

LOGIC DIAGRAM

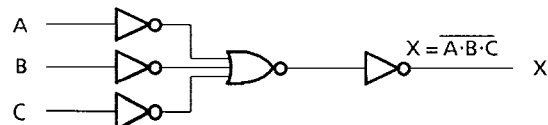
1/4 TC4011B



1/2 TC4012B



1/3 TC4023B



TC4011BP/BF/BFN, TC4012BP/BF TC4023BP/BF/BFN

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

CHARACTERISTICS	SYMBOL		MIN.	TYP.	MAX.	UNITS
DC Supply Voltage	V_{DD}		3	–	18	V
Input Voltage	V_{IN}		0	–	V_{DD}	V

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

CHARACTERISTICS	SYMBOL	TEST CONDITIONS	V_{DD} (V)	– 40°C		25°C			85°C		UNITS	
				MIN.	MAX.	MIN.	TYP.	MAX.	MIN.	MAX.		
High-Level Output Voltage	V_{OH}	$I_{OUT} < 1\mu A$ $V_{IN} = V_{SS}, V_{DD}$	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}	$I_{OUT} < 1\mu A$ $V_{IN} = V_{SS}, V_{DD}$	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}	$V_{OL} = 0.4V$ $V_{OL} = 0.5V$ $V_{OL} = 1.5V$ $V_{IN} = V_{SS}, V_{DD}$	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	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	–		
Input Low Voltage	V_{IL}	$V_{OUT} = 4.5V$ $V_{OUT} = 9.0V$ $V_{OUT} = 13.5V$ $I_{OUT} < 1\mu A$	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_{IH}	$V_{IH} = 18V$	18	–	0.1	–	10^{-5}	0.1	–	1.0	μA
	"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	μA
			10	–	0.5	–	0.001	0.5	–	–	15	
			15	–	1.0	–	0.002	1.0	–	–	30	

* All valid input combinations.

TC4011BP/BF/BFN, TC4012BP/BF TC4023BP/BF/BFN

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

CHARACTERISTICS	SYMBOL	TEST CONDITION	V _{DD} (V)	MIN.	TYP.	MAX.	UNITS
			5				
Output Transition Time (TC4012B)	t _{TLH}		5	–	80	200	ns
			10	–	50	100	
			15	–	40	80	
Output Transition Time (TC4012B)	t _{THL}		5	–	80	200	
			10	–	50	100	
			15	–	40	80	
Output Transition Time (TC4011B, TC4023B)	t _{TLH}		5	–	70	200	
			10	–	35	100	
			15	–	30	80	
Output Transition Time (TC4011B, TC4023B)	t _{THL}		5	–	70	200	
			10	–	35	100	
			15	–	30	80	
Propagation Delay Time (TC4011B)	t _{pLH}		5	–	65	200	
			10	–	30	100	
			15	–	25	80	
Propagation Delay Time (TC4011B)	t _{pHL}		5	–	65	200	
			10	–	30	100	
			15	–	25	80	
Propagation Delay Time (TC4012B)	t _{pLH}		5	–	95	250	
			10	–	45	120	
			15	–	30	90	
Propagation Delay Time (TC4012B)	t _{pHL}		5	–	95	250	
			10	–	45	120	
			15	–	30	90	
Propagation Delay Time (TC4023B)	t _{pLH}		5	–	90	250	
			10	–	45	100	
			15	–	35	80	
Propagation Delay Time (TC4023B)	t _{pHL}		5	–	90	250	
			10	–	45	100	
			15	–	35	80	
Input Capacitance	C _{IN}			–	5	7.5	pF

CIRCUIT AND WAVEFORM FOR MEASUREMENT OF DYNAMIC CHARACTERISTICS

