

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

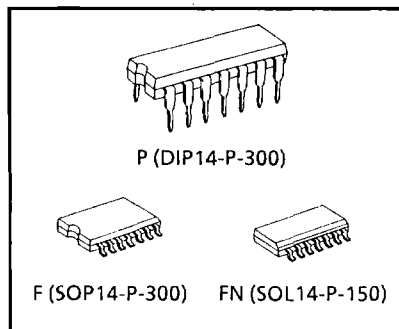
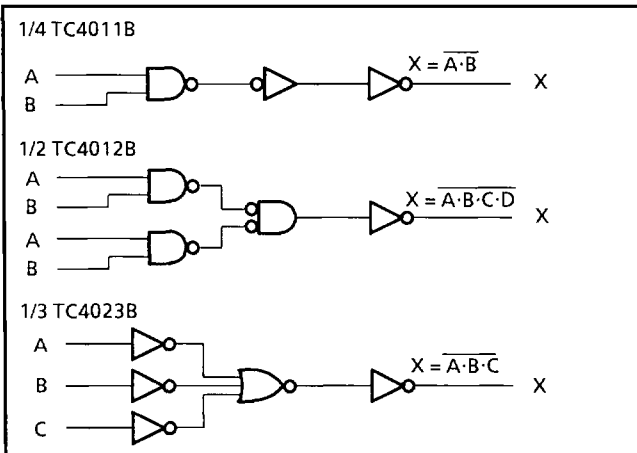
The TC4011B, TC4023B, and TC4012B are 2-input, 3-input, and 4-input positive logic NAND gates respectively.

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.

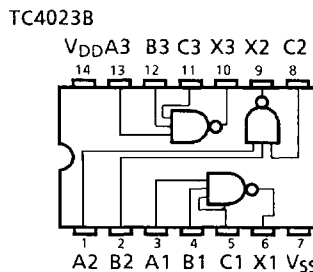
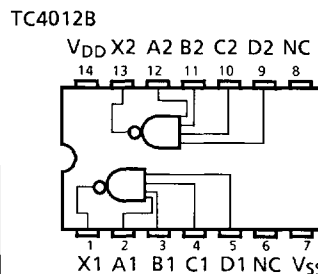
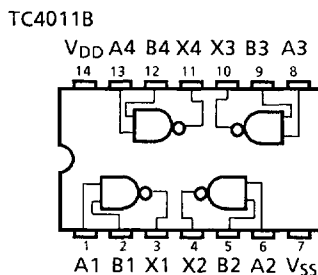
ABSOLUTE MAXIMUM RATINGS

CHARACTERISTIC	SYMBOL	RATING	UNIT
DC Supply Voltage	V _{DD}	V _{SS} - 0.5 ~ V _{SS} + 20	V
Input Voltage	V _{IN}	V _{SS} - 0.5 ~ V _{DD} + 0.5	V
Output Voltage	V _{OUT}	V _{SS} - 0.5 ~ 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 ~ 85	°C
Storage Temperature Range	T _{STG}	- 65 ~ 150	°C
Lead Temp./Time	T _{SOL}	260°C - 10sec	

LOGIC DIAGRAM



PIN ASSIGNMENT (TOP VIEW)



**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	–	V	
			10	–	0.05	–	0.00	–	0.05	–		
			15	–	0.05	–	0.00	–	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		

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

CHARACTERISTICS	SYMBOL	TEST CONDITION	V _{DD} (V)			UNITS
			5	10	15	
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

