

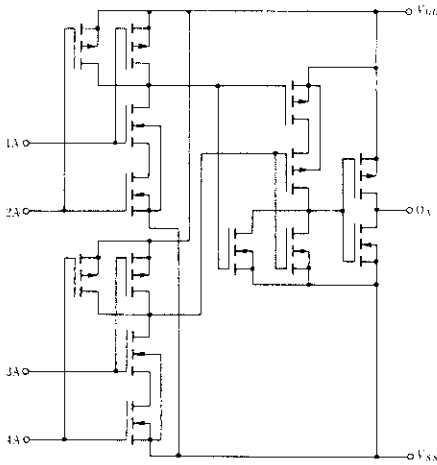
# HD14012B

## Dual 4-input NAND Gate

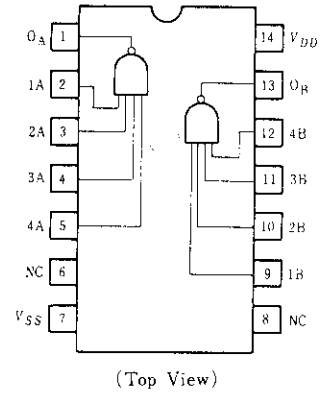
### FEATURES

- Quiescent Current = 0.5nA typ/pkg @5V
- Noise Immunity = 45% of  $V_{DD}$  typ
- Capable of Driving One Low-power Schottky TTL Load Over the Rated Temperature Range
- Pin-for Pin Replacements for CD4012B and MC14012B Series

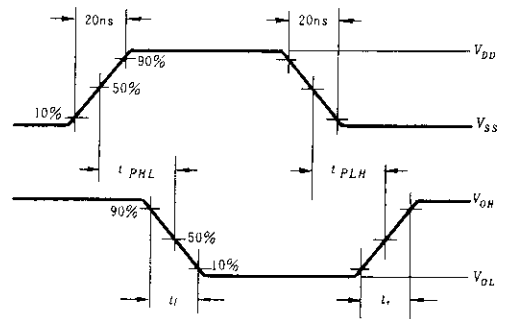
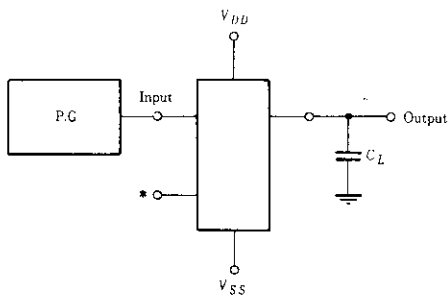
### CIRCUIT SCHEMATIC (1/2)



### PIN ARRANGEMENT



### SWITCHING TIME TEST CIRCUIT



\* All unused inputs of AND, NAND gates must be connected to  $V_{DD}$ .

■ ELECTRICAL CHARACTERISTICS

Characteristic	Symbol	$V_{DD}(V)$	Test Conditions	-40°C		25°C			85°C		Unit
				min	max	min	typ	max	min	max	
Output Voltage	$V_{OL}$	5.0	$V_{in} = V_{DD}$	-	0.05	-	0	0.05	-	0.05	V
		10		-	0.05	-	0	0.05	-	0.05	
		15		-	0.05	-	0	0.05	-	0.05	
	$V_{OH}$	5.0	$V_{in} = 0$	4.95	-	4.95	5.0	-	4.95	-	V
		10		9.95	-	9.95	10	-	9.95	-	
		15		14.95	-	14.95	15	-	14.95	-	
Input Voltage	$V_{IL}$	5.0	$V_{out} = 4.5V$	-	1.5	-	2.25	1.5	-	1.5	V
		10	$V_{out} = 9.0V$	-	3.0	-	4.50	3.0	-	3.0	
		15	$V_{out} = 13.5V$	-	4.0	-	6.75	4.0	-	4.0	
	$V_{IH}$	5.0	$V_{out} = 0.5V$	3.5	-	3.5	2.75	-	3.5	-	V
		10	$V_{out} = 1.0V$	7.0	-	7.0	5.50	-	7.0	-	
		15	$V_{out} = 1.5V$	11.0	-	11.0	8.25	-	11.0	-	
Output Drive Current	$I_{OH}$	5.0	$V_{OH} = 2.5V$	-2.5	-	-2.1	-4.2	-	-1.7	-	mA
		5.0	$V_{OH} = 4.6V$	-0.52	-	-0.44	-0.88	-	-0.36	-	
		10	$V_{OH} = 9.5V$	-1.3	-	-1.1	-2.25	-	-0.9	-	
	$I_{OL}$	15	$V_{OH} = 13.5V$	-3.6	-	-3.0	-8.8	-	-2.4	-	
		5.0	$V_{OL} = 0.4V$	0.52	-	0.44	0.88	-	0.36	-	mA
		10	$V_{OL} = 0.5V$	1.3	-	1.1	2.25	-	0.9	-	
15	$V_{OL} = 1.5V$	3.6	-	3.0	8.8	-	2.4	-			
Input Current	$I_{in}$	15		-	$\pm 0.3$	-	$\pm 0.00001$	$\pm 0.3$	-	$\pm 1.0$	$\mu A$
Input Capacitance	$C_{in}$	-	$V_{in} = 0$	-	-	-	5.0	7.5	-	-	pF
Quiescent Current	$I_{DD}$	5.0	Zero Signal, per Package	-	1.0	-	0.0005	1.0	-	7.5	$\mu A$
		10		-	2.0	-	0.0010	2.0	-	15.0	
		15		-	4.0	-	0.0015	4.0	-	30.0	
Total Supply Current*	$I_T$	5.0	Dynamic + $I_{DD}$ , $C_L = 50pF$ per Gate, $f = 1kHz$	-	-	-	0.3	-	-	-	$\mu A$
		10		-	-	-	0.6	-	-	-	
		15		-	-	-	0.9	-	-	-	

\* To calculate total supply current at frequency other than 1kHz.

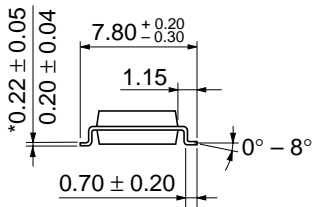
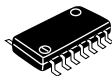
$\mu V_{DD} = 5.0V$   $I_T = 0.3\mu A/kHz \cdot f + I_{DD}/2$     $\mu V_{DD} = 10V$   $I_T = 0.6\mu A/kHz \cdot f + I_{DD}/2$     $\mu V_{DD} = 15V$   $I_T = 0.9\mu A/kHz \cdot f + I_{DD}/2$

■ SWITCHING CHARACTERISTICS ( $C_L = 50pF$ ,  $T_a = 25^\circ C$ )

Characteristic	Symbol	$V_{DD}(V)$	min	typ	max	Unit
Output Rise Time	$t_r$	5.0	-	100	200	ns
		10	-	50	100	
		15	-	40	80	
Output Fall Time	$t_f$	5.0	-	100	200	ns
		10	-	50	100	
		15	-	40	80	
Propagation Delay Time	$t_{PLH}$	5.0	-	160	320	ns
		10	-	65	130	
		15	-	50	100	
	$t_{PHL}$	5.0	-	160	320	ns
		10	-	65	130	
		15	-	50	100	



Hitachi Code	DP-14
JEDEC	Conforms
EIAJ	Conforms
Weight (reference value)	0.97 g



Hitachi Code	FP-14DA
JEDEC	—
EIAJ	Conforms
Weight (reference value)	0.23 g

\*Dimension including the plating thickness  
Base material dimension



Hitachi Code	FP-14DN
JEDEC	Conforms
EIAJ	Conforms
Weight (reference value)	0.13 g

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