

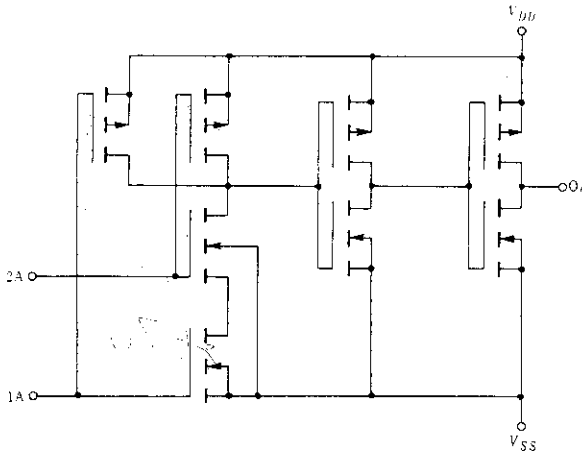
# HD14011B

## Quadruple 2-input NAND Gate

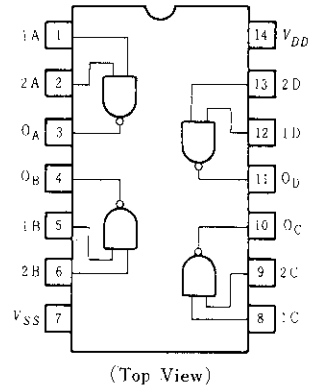
### FEATURES

- 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 CD4011B and MC14011B Series

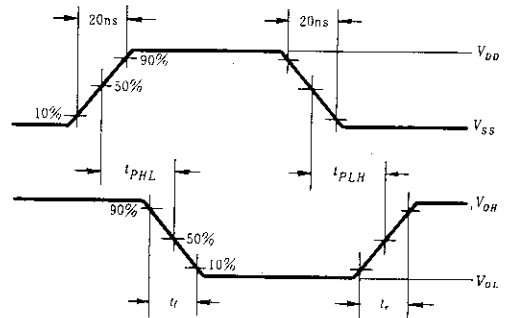
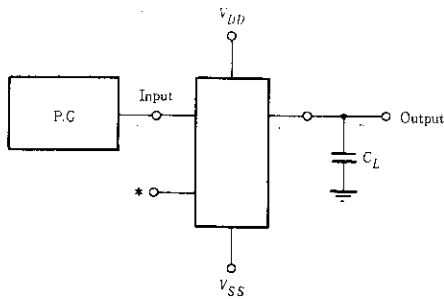
### CIRCUIT SCHEMATIC (1/4)



### PIN ARRANGEMENT



### SWITCHING TIME TEST CIRCUIT



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

**■ ELECTRICAL CHARACTERISTICS**

Characteristic	Symbol	V <sub>DD</sub> (V)	Test Conditions	-40°C		25°C			85°C		Unit
				min	max	min	typ	max	min	max	
Output Voltage	V <sub>OL</sub>	5.0	V <sub>in</sub> = V <sub>DD</sub>	-	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 <sub>OH</sub>	5.0	V <sub>in</sub> = 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 <sub>IL</sub>	5.0	V <sub>out</sub> = 4.5V	-	1.5	-	2.25	1.5	-	1.5	V
		10	V <sub>out</sub> = 9.0V	-	3.0	-	4.50	3.0	-	3.0	
		15	V <sub>out</sub> = 13.5V	-	4.0	-	6.75	4.0	-	4.0	
	V <sub>IH</sub>	5.0	V <sub>out</sub> = 0.5V	3.5	-	3.5	2.75	-	3.5	-	V
		10	V <sub>out</sub> = 1.0V	7.0	-	7.0	5.50	-	7.0	-	
		15	V <sub>out</sub> = 1.5V	11.0	-	11.0	8.25	-	11.0	-	
Output Drive Current	I <sub>OH</sub>	5.0	V <sub>OH</sub> = 2.5V	-2.5	-	-2.1	-4.2	-	-1.7	-	mA
		5.0	V <sub>OH</sub> = 4.6V	-0.52	-	-0.44	-0.88	-	-0.36	-	
		10	V <sub>OH</sub> = 9.5V	-1.3	-	-1.1	-2.25	-	-0.9	-	
	I <sub>OL</sub>	5.0	V <sub>OL</sub> = 0.4V	0.52	-	0.44	0.88	-	0.36	-	mA
		10	V <sub>OL</sub> = 0.5V	1.3	-	1.1	2.25	-	0.9	-	
		15	V <sub>OL</sub> = 1.5V	3.6	-	3.0	8.8	-	2.4	-	
Input Current	I <sub>in</sub>	15		-	±0.3	-	±0.0001	±0.3	-	±1.0	μA
Input Capacitance	C <sub>in</sub>	-	V <sub>in</sub> = 0	-	-	-	5.0	7.5	-	-	pF
Quiescent Current	I <sub>DD</sub>	5.0	Zero Signal, per Package	-	1.0	-	0.0005	1.0	-	7.5	μA
		10		-	2.0	-	0.0010	2.0	-	15.0	
		15		-	4.0	-	0.0015	4.0	-	30.0	
Total Supply Current*	I <sub>T</sub>	5.0	Dynamic + I <sub>DD</sub> , C <sub>L</sub> = 50pF	-	-	-	0.3	-	-	-	μA
		10	per Gate,	-	-	-	0.6	-	-	-	
		15	f = 1 kHz	-	-	-	0.9	-	-	-	

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

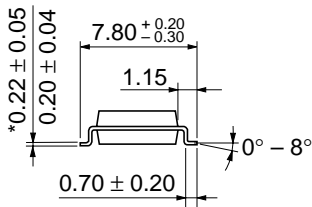
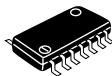
∞ V<sub>DD</sub> = 5.0V I<sub>T</sub> = 0.3μA/kHz × f + I<sub>DD</sub>/4    ∞ V<sub>DD</sub> = 10V I<sub>T</sub> = 10.6μA/kHz × f - I<sub>DD</sub>/4    ∞ V<sub>DD</sub> = 15V I<sub>T</sub> = 10.9μA/kHz × f - I<sub>DD</sub>/4

**■ SWITCHING CHARACTERISTICS (C<sub>L</sub> = 50pF, T<sub>a</sub> = 25°C)**

Characteristic	Symbol	V <sub>DD</sub> (V)	min	typ	max	Unit
Output Rise Time	t <sub>r</sub>	5.0	-	100	200	ns
		10	-	50	100	
		15	-	40	80	
Output Fall Time	t <sub>f</sub>	5.0	-	100	200	ns
		10	-	50	100	
		15	-	40	80	
Propagation Delay Time	t <sub>PLH</sub>	5.0	-	125	250	ns
		10	-	50	100	
		15	-	40	80	
	t <sub>PHL</sub>	5.0	-	125	250	ns
		10	-	50	100	
		15	-	40	80	



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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