

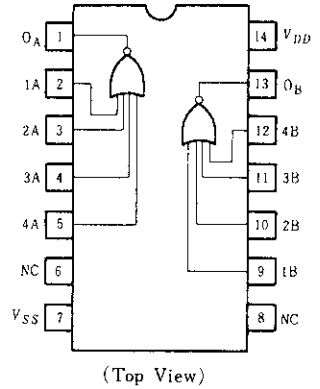
# HD14002B

## Dual 4-input NOR Gate

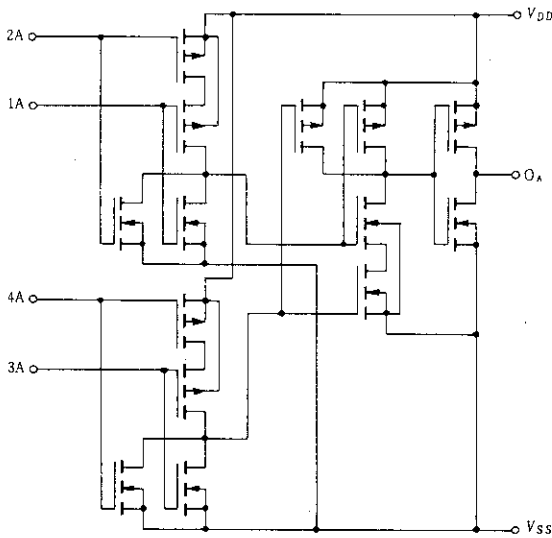
### FEATURES

- 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 CD4002B and MC14002B Series

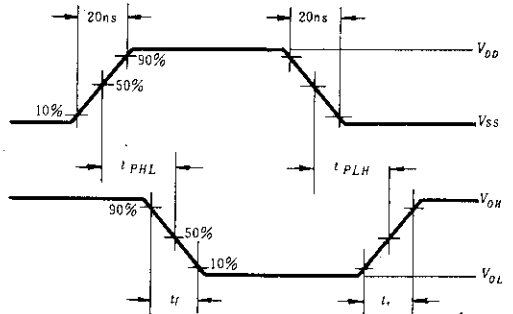
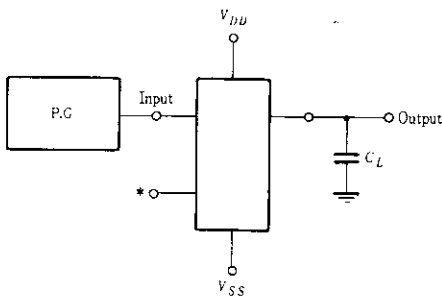
### PIN ARRANGEMENT



### CIRCUIT SCHEMATIC (1/2)



### SWITCHING TIME TEST CIRCUIT



\* All Unused inputs of OR, NOR gates must be connected to  $V_{SS}$

## 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		—	$\pm 0.3$	—	$\pm 0.0001$	$\pm 0.3$	—	$\pm 1.0$	$\mu A$
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.

⊙  $V_{DD} = 5.0V$   $I_T = (0.3\mu A/kHz) \cdot f + I_{DD}/2$     ⊙  $V_{DD} = 10V$   $I_T = 10.6\mu A/kHz \cdot f + I_{DD}/2$     ⊙  $V_{DD} = 15V$   $I_T = 10.9\mu A/kHz \cdot f + I_{DD}/2$

## 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

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