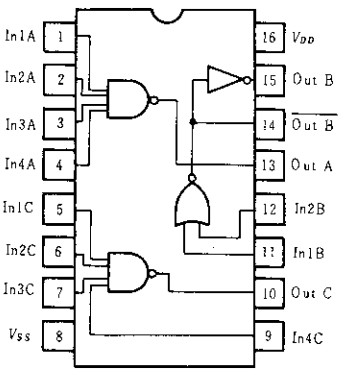
HD14501UB

Triple Gate

(Dual 4-input NAND Gate
2-input NOR/OR Gate
8-input AND/NAND Gate)

■ PIN ARRANGEMENT



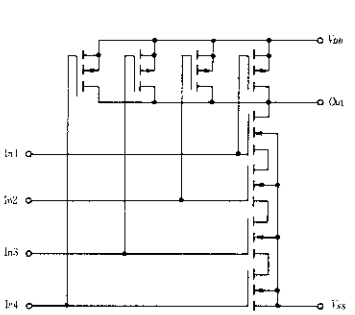
(Top View)

■ FEATURES

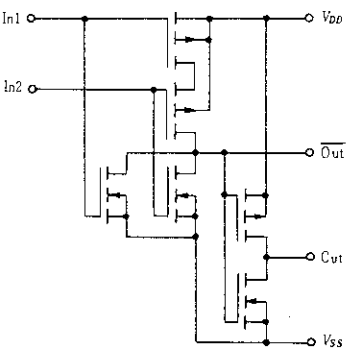
- Quiescent Current = 0.5nA typ/pkg @5V
- Noise Immunity = 45% of V_{DD} typ
- Capable of Driving One Low-power Schottky TTL Load Over the Rated Temperature Range
- Pin-for Pin Replacements for MC14501UB Series

■ CIRCUIT SCHEMATIC

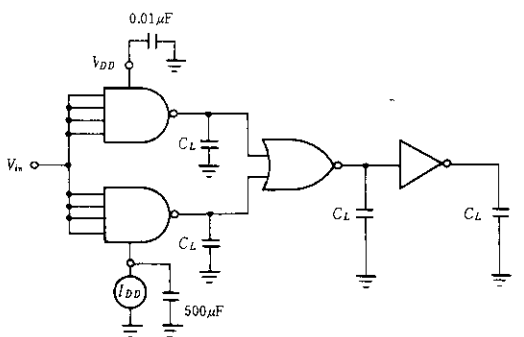
● 4-input NAND Gate

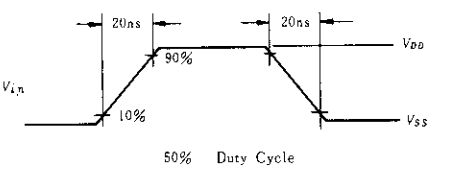


● 2-input NOR/OR Gate



■ POWER DISSIPATION TEST CIRCUIT AND WAVEFORM





50% Duty Cycle

■ELECTRICAL CHARACTERISTICS

Characteristic		Symbol	V_{DD}(V)	Test Conditions	−40°C min	−40°C max	25°C min	25°C typ	25°C max	85°C min	85°C max	Unit
Output Voltage		V_{OL}	5.0	$V_{in}=V_{DD}$ or 0	—	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	$V_{in}=0$ or V_{DD}	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	$V_{out}=4.5$ or 0.5V	—	1.0	—	2.25	1.0	—	1.0	V
			10	$V_{out}=9.0$ or 1.0V	—	2.0	—	4.50	2.0	—	2.0	
			15	$V_{out}=13.5$ or 1.5V	—	2.5	—	6.75	2.5	—	2.5	
		V_{IH}	5.0	$V_{out}=0.5$ or 4.5V	4.0	—	4.0	2.75	—	4.0	—	V
			10	$V_{out}=1.0$ or 9.0V	8.0	—	8.0	5.50	—	8.0	—	
			15	$V_{out}=1.5$ or 13.5V	12.5	—	12.5	8.25	—	12.5	—	
Output Drive Current	NAND	I_{OH}	5.0	$V_{OH}=2.5$V	−1.0	—	−0.8	−1.7	—	−0.6	—	mA
			5.0	$V_{OH}=4.6$V	−0.2	—	−0.16	−0.36	—	−0.12	—	
			10	$V_{OH}=9.5$V	−0.5	—	−0.4	−0.9	—	−0.3	—	
			15	$V_{OH}=13.5$V	−1.4	—	−1.2	−3.5	—	−1.0	—	
	NOR		5.0	$V_{OH}=2.5$V	−1.68	—	−1.4	−3.0	—	−1.05	—	
			5.0	$V_{OH}=4.6$V	−0.34	—	−0.28	−0.63	—	−0.21	—	
			10	$V_{OH}=9.5$V	−0.84	—	−0.7	−1.58	—	−0.52	—	
			15	$V_{OH}=13.5$V	−2.52	—	−2.1	−6.12	—	−1.57	—	
	NOR-Inverter		5.0	$V_{OH}=2.5$V	−2.88	—	−2.4	−5.1	—	−1.8	—	
			5.0	$V_{OH}=4.6$V	−0.58	—	−0.48	−1.08	—	−0.36	—	
			10	$V_{OH}=9.5$V	−1.44	—	−1.2	−2.7	—	−0.9	—	
			15	$V_{OH}=13.5$V	−4.32	—	−3.6	−10.5	—	−2.7	—	
	NAND	I_{OL}	5.0	$V_{OL}=0.4$V	0.52	—	0.44	0.88	—	0.36	—	mA
			10	$V_{OL}=0.5$V	1.3	—	1.1	2.25	—	0.9	—	
			15	$V_{OL}=1.5$V	3.6	—	3.0	8.8	—	2.4	—	
	NOR		5.0	$V_{OL}=0.4$V	0.79	—	0.66	1.32	—	0.54	—	
			10	$V_{OL}=0.5$V	1.98	—	1.65	3.37	—	1.36	—	
			15	$V_{OL}=1.5$V	5.4	—	4.5	13.2	—	3.57	—	
	NOR-Inverter		5.0	$V_{OL}=0.4$V	1.32	—	1.1	2.2	—	0.90	—	
			10	$V_{OL}=0.5$V	3.3	—	2.75	5.63	—	2.27	—	
			15	$V_{OL}=1.5$V	9.0	—	7.5	22.0	—	5.95	—	
Input Current		I_{in}	15		—	±0.3	—	±0.00001	±0.3	—	±1.0	μA
Input Capacitance		C_{in}		$V_{in}=0$	—	—	—	5.0	7.5	—	—	pF
Quiescent Current		I_{DD}	5.0	Zero Signal, per Package	—	0.5	—	0.0005	0.5	—	3.8	μA
			10		—	1.0	—	0.0010	1.0	—	7.5	
			15		—	2.0	—	0.0015	2.0	—	15	
Total Supply Current*		I_T	5.0	Dynamic $+I_{DD}$, per Gate $C_L=50$pF, $f=1$kHz	—	—	—	1.2	—	—	—	μA
			10		—	—	—	2.4	—	—	—	
			15		—	—	—	3.6	—	—	—	

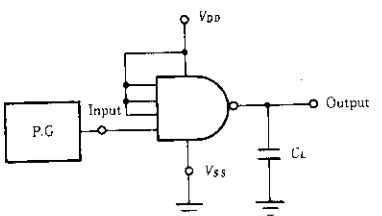
* To calculate total supply current at frequency other than 1kHz.
@$V_{DD}=5.0$V $I_T=(1.2\mu A/kHz)f+I_{DD}$, @$V_{DD}=10$V $I_T=(2.4\mu A/kHz)f+I_{DD}$, @$V_{DD}=15$V $I_T=(3.6\mu A/kHz)f+I_{DD}$

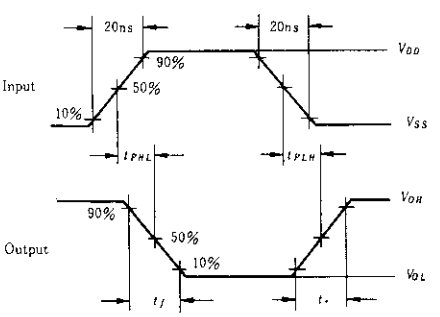
■ SWITCHING CHARACTERICS (C_L=50pF, Ta=25°C)

Characteristic		Symbol	Test Circuit	V_{DD}(V)	min	typ	max	Unit
Output Rise Time	NAND, NOR	t_r	1, 2	5.0	—	180	400	ns
				10	—	90	200	
				15	—	65	160	
	NOR-Inverter		2	5.0	—	100	200	
				10	—	50	100	
				15	—	37	80	
Output Fall Time	NAND, NOR	t_f	1, 2	5.0	—	100	200	ns
				10	—	50	100	
				15	—	37	80	
	NOR-Inverter		2	5.0	—	60	140	
				10	—	40	100	
				15	—	30	75	
Propagation Delay Time	NAND	t_{PLH}, t_{PHL}	1	5.0	—	130	300	ns
				10	—	70	175	
				15	—	50	125	
	NOR		2	5.0	—	115	250	
				10	—	65	160	
				15	—	45	100	
	NOR-Inverter		2	5.0	—	130	300	
				10	—	70	175	
				15	—	50	125	

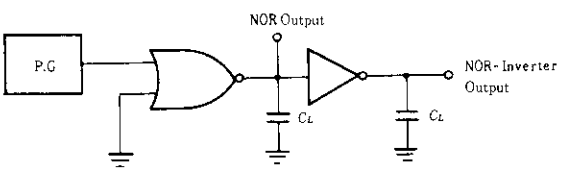
■ SWITCHING TIME TEST CIRCUIT

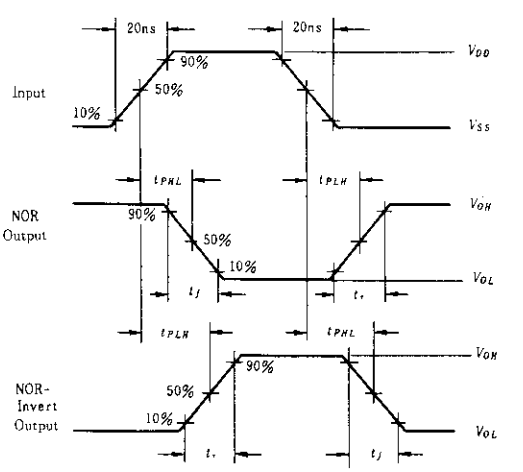
1. NAND Gate



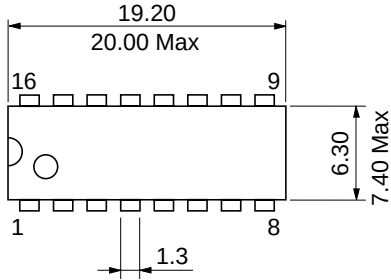


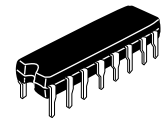
2. NOR Gate, NOR-Inverter

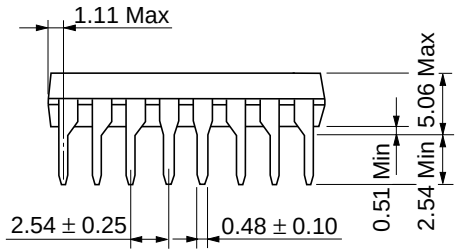


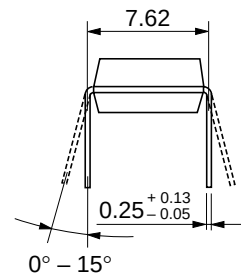


Unit: mm









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