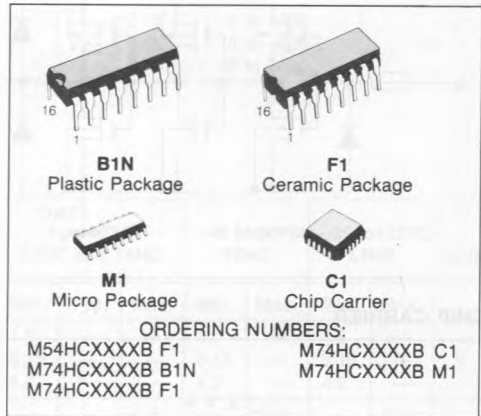


HC4049B HEX BUFFER/CONVERTER (INVERTER)
HC4050B HEX BUFFER/CONVERTER

- **HIGH SPEED**
 $t_{PD} = 10 \text{ ns (TYP.) at } V_{CC} = 5V$
- **LOW POWER DISSIPATION**
 $I_{CC} = 1 \mu\text{A (MAX.) at } T_A = 25^\circ\text{C}$
- **HIGH NOISE IMMUNITY**
 $V_{NIH} = V_{NIL} = 28\% V_{CC} \text{ (MIN.)}$
- **OUTPUT DRIVE CAPABILITY**
 15 LSTTL LOADS
- **SYMMETRICAL OUTPUT IMPEDANCE**
 $|I_{OH}| = I_{OL} = 6 \text{ mA (MIN.)}$
- **BALANCED PROPAGATION DELAYS**
 $t_{PLH} = t_{PHL}$
- **WIDE OPERATING VOLTAGE RANGE**
 $V_{CC} \text{ (OPR)} = 2V \text{ to } 6V$
- **PIN AND FUNCTION COMPATIBLE**
 WITH 4049B/4050B


DESCRIPTION

The M54/74HC4049B and the M54/74HC4050B are high speed CMOS HEX BUFFER fabricated in silicon gate C²MOS technology.

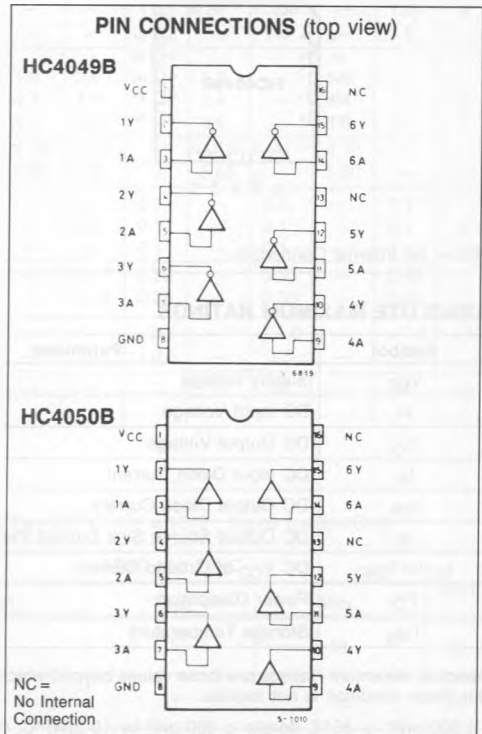
They have the same high speed performance of LSTTL combined with true CMOS low power consumption.

The M54/75HC4049B is an inverting buffer, while the M54/74HC4050B is a non-inverting buffer.

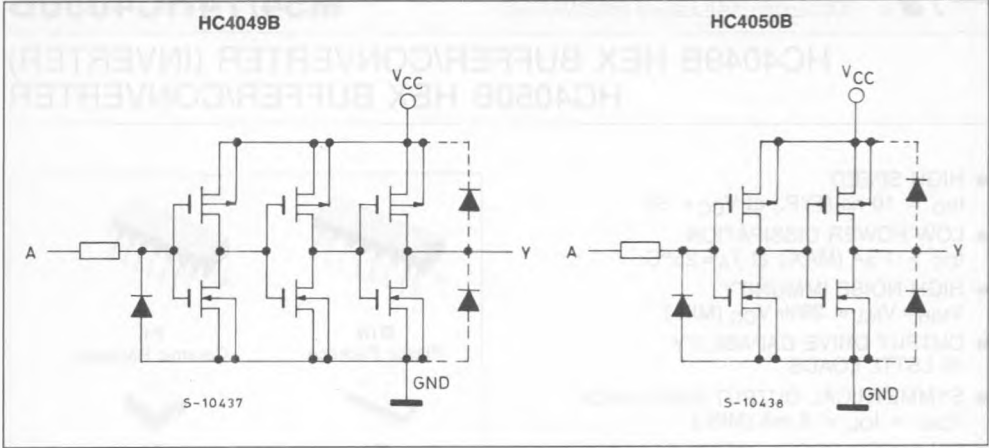
The internal circuit is composed of 3 stage or 2-stage inverters, which provides high noise immunity and a stable output.

Input protection circuits are different from those of the high speed CMOS IC's.

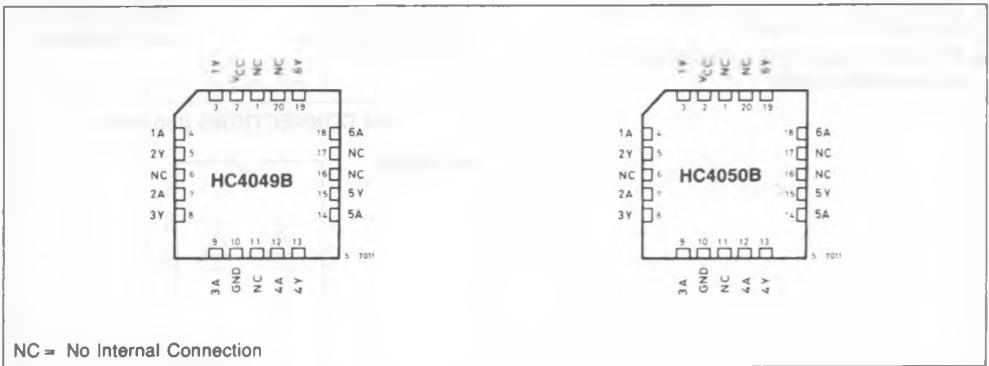
The V_{CC} side diodes are designed to allow logic-level conversion from high-level voltages (up to 15V) to low-level voltages.



CIRCUIT SCHEMATIC (Per Gate)



CHIP CARRIER



ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
V _{CC}	Supply Voltage	-0.5 to 7	V
V _I	DC Input Voltage	-0.5 to 16	V
V _O	DC Output Voltage	-0.5 to V _{CC} + 0.5	V
I _{IK}	DC Input Diode Current	± 20	mA
I _{OK}	DC Output Diode Current	± 20	mA
I _O	DC Output Source Sink Current Per Output Pin	± 35	mA
I _{CC} or I _{GND}	DC V _{CC} or Ground Current	± 70	mA
P _D	Power Dissipation	500 (*)	mW
T _{stg}	Storage Temperature	-65 to 150	°C

Absolute Maximum Ratings are those values beyond which damage to the device may occur. Functional operation under these condition is not implied.

(*) 500 mW: ≡ 65°C derate to 300 mW by 10 mW/°C: 65°C to 85°C.

RECOMMENDED OPERATING CONDITIONS

Symbol	Parameter	Value	Unit	
V_{CC}	Supply Voltage	2 to 6	V	
V_I	Input Voltage	0 to 15	V	
V_O	Output Voltage	0 to V_{CC}	V	
T_A	Operating Temperature	74HC Series 54HC Series	-40 to 85 -55 to 125	°C
t_r, t_f	Input Rise and Fall Time	V_{CC} $\left\{ \begin{array}{l} 2 \text{ V} \\ 4.5 \text{ V} \\ 6 \text{ V} \end{array} \right.$	0 to 1000 0 to 500 0 to 400	ns

DC SPECIFICATIONS

Symbol	Parameter	V_{CC}	Test Condition	$T_A = 25^\circ\text{C}$ 54HC and 74HC			$-40 \text{ to } 85^\circ\text{C}$ 74HC		$-55 \text{ to } 125^\circ\text{C}$ 54HC		Unit	
				Min.	Typ.	Max.	Min.	Max.	Min.	Max.		
V_{IH}	High Level Input Voltage	2.0		1.5	—	—	1.5	—	1.5	—	V	
		4.5		3.15	—	—	3.15	—	3.15	—		
		6.0		4.2	—	—	4.2	—	4.2	—		
V_{IL}	Low Level Input Voltage	2.0		—	—	0.5	—	0.5	—	0.5	V	
		4.5		—	—	1.35	—	1.35	—	1.35		
		6.0		—	—	1.8	—	1.8	—	1.8		
V_{OH}	High Level Output Voltage	2.0	V_I	I_O	1.9	2.0	—	1.9	—	1.9	—	V
		4.5			V_{IH}	-20 μA	4.4	4.5	—	4.4	—	
		6.0	V_{IL}	-6.0 mA	5.9	6.0	—	5.9	—	5.9	—	
		4.5			-7.8 mA	4.18	4.31	—	4.13	—	4.10	
6.0			5.68	5.8	—	5.63	—	5.60	—			
V_{OL}	Low Level Output Voltage	2.0	V_{IH}	20 μA	—	0.0	0.1	—	0.1	—	0.1	V
		4.5			—	0.0	0.1	—	0.1	—	0.1	
		6.0	V_{IL}	6.0 mA	—	0.0	0.1	—	0.1	—	0.1	
		4.5			7.8 mA	—	0.17	0.26	—	0.33	—	
6.0			—	0.18	0.26	—	0.33	—	0.40			
I_I	Input Leakage Current	6.0	$V_I = V_{CC}$ or GND $V_I = 15\text{V}$	—	—	± 0.1	—	± 1.0	—	± 1.0	μA	
		6.0		—	—	± 0.5	—	± 5	—	± 5		
I_{CC}	Quiescent Supply Current	6.0	$V_I = V_{CC}$ or GND	—	—	1	—	10	—	20	μA	

AC ELECTRICAL CHARACTERISTICS ($V_{CC} = 5\text{V}$, $T_A = 25^\circ\text{C}$, $C_L = 15\text{pF}$, Input $t_r = t_f = 6\text{ns}$)

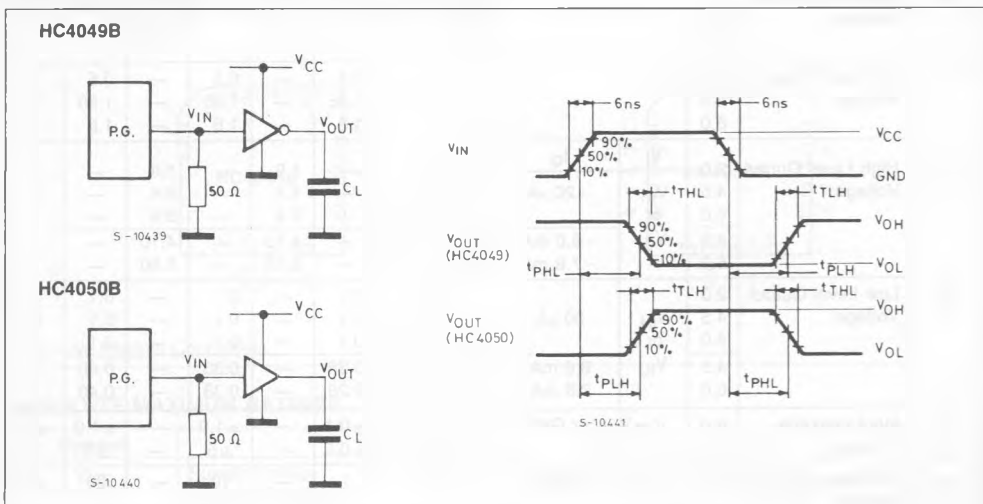
Symbol	Parameter	54HC and 74HC			Unit
		Min.	Typ.	Max.	
t_{TLH} t_{THL}	Output Transition Time		7	11	ns
t_{PLH} t_{PHL}	Propagation Delay Time		11	16	ns

AC ELECTRICAL CHARACTERISTICS (C_L = 50pF, Input t_r = t_f = 6ns)

Symbol	Parameter	V _{CC}	Test Condition	T _A = 25°C 54HC and 74HC			- 40 to 85°C 74HC		- 55 to 125°C 54HC		Unit
				Min.	Typ.	Max.	Min.	Max.	Min.	Max.	
t _{TLH} t _{THL}	Output Transition Time	2.0 4.5 6.0		— — —	24 6 5	60 12 10	— — —	75 15 13	— — —	90 18 15	ns
t _{PLH} t _{PHL}	Propagation Delay Time	2.0 4.5 6.0		— — —	44 11 9	85 17 14	— — —	105 21 19	— — —	130 26 22	ns
C _{IN}	Input Capacitance			—	5	10	—	10	—	10	pF
C _{PD} (*)	Power Dissipation Capacitance			—	25	—	—	—	—	—	pF

Note (*) C_{PD} is defined as the value of the IC's internal equivalent capacitance which is calculated from the operating current consumption without load. (Refer to Test Circuit)
 Average operating current can be obtained by the following equation.
 $I_{CC(opr)} = C_{PD} \cdot V_{CC} \cdot f_{IN} + I_{CC}/4$ (per Gate).

SWITCHING CHARACTERISTICS TEST CIRCUIT



TEST CIRCUIT I_{CC} (Opr.)

