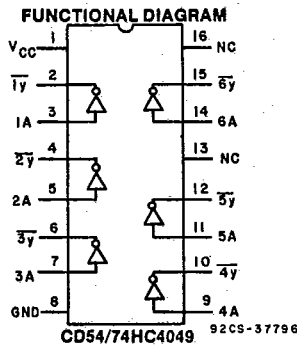


**CD54/74HC4049  
CD54/74HC4050**

File No. 1543

**High-Speed CMOS Logic**



**Hex Buffers, Inverting and Non-Inverting**

**Type Features**

- Typical propagation delay = 6 ns @  $V_{CC} = 5V, C_L = 15pF, T_A = 25^\circ C$
- High-to-low voltage level converter for up to  $V_i = 16V$

**Family Features**

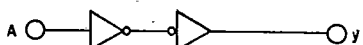
- Fanout (Over Temperature Range):  
Standard Outputs - 10 LSTTL Loads  
Bus Driver Outputs - 15 LSTTL Loads
- Wide Operating Temperature Range:  
CD74HC/HCT:  $-40$  to  $+85^\circ C$
- Balanced Propagation and Transition Times
- Significant Power Reduction Compared to LSTTL Logic ICs
- Alternate Source is Phillips/Sigmetics
- CD54HC/CD74HC Types:  
2 to 6 V Operation  
High Noise Immunity:  $N_{IL} = 30\% V_{CC}, N_{IH} = 30\% V_{CC}; @ V_{CC} = 5V$

The RCA-CD54/74HC4049 and CD54/74HC4050 are fabricated with high-speed silicon gate technology. They have a modified input protection structure that enables these parts to be used as logic level translators which will convert high-level logic to a low-level logic while operating off the low-level logic supply. For example, 0-V to 15-V input logic levels can be down-converted to 0-V to 5-V logic levels. The modified input protection structure protects the input from both positive and negative electrostatic discharge. These parts can also be used as simple buffers or inverters without level translation. The CD54/74HC4049 and CD54/74HC4050 are enhanced versions of equivalent CMOS types.

The CD54HC4049 and CD54/74HC4050 are supplied in 16-lead hermetic dual-in-line ceramic packages (F suffix) and in 16-lead dual-in-line plastic packages (E suffix) and in 16-lead dual-in-line surface mount plastic packages (M suffix). Both types are also available in chip form (H suffix).



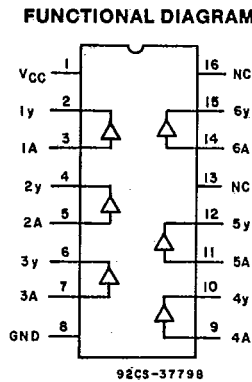
HC4049



HC4050

92CS-37797

LOGIC DIAGRAMS



CD54/74HC4050

HARRIS SEMICONDUCTOR SECTOR 27E D 430227J 00J79J7 0 HAS

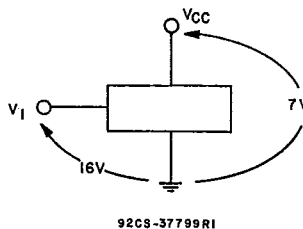
**CD54/74HC4049**  
**CD54/74HC4050**

HARRIS SEMICOND SECTOR 27E D ■ 4302271 0017918 2 ■ HAS

**MAXIMUM RATINGS, Absolute-Maximum Values:**

DC SUPPLY-VOLTAGE, ( $V_{CC}$ )	.....	-0.5 to +7 V
DC INPUT VOLTAGE, ( $V_i$ )	.....	-0.5 to +16 V
(Voltages referenced to ground)		
DC INPUT DIODE CURRENT, $I_{iK}$ (FOR $V_i < -0.5$ V)	.....	-20 mA
DC OUTPUT DIODE CURRENT, $I_{oK}$ (FOR $V_o < -0.5$ V OR $V_o > V_{CC} + 0.5$ V)	.....	±20 mA
DC DRAIN CURRENT, PER OUTPUT ( $I_o$ ) (FOR $-0.5$ V < $V_o$ < $V_{CC} + 0.5$ V)	.....	±25 mA
DC $V_{CC}$ OR GROUND CURRENT ( $I_{CC}$ )	.....	±50 mA
<b>POWER DISSIPATION PER PACKAGE (<math>P_o</math>):</b>		
For $T_A = -40$ to $+60^\circ$ C (PACKAGE TYPE E)	.....	500 mW
For $T_A = +60$ to $+85^\circ$ C (PACKAGE TYPE E)	.....	Derate Linearly at 8 mW/ $^\circ$ C to 300 mW
For $T_A = -55$ to $+100^\circ$ C (PACKAGE TYPE F, H)	.....	500 mW
For $T_A = +100$ to $+125^\circ$ C (PACKAGE TYPE F, H)	.....	Derate Linearly at 8 mW/ $^\circ$ C to 300 mW
For $T_A = -40$ to $+70^\circ$ C (PACKAGE TYPE M)	.....	400 mW
For $T_A = +70$ to $+125^\circ$ C (PACKAGE TYPE M)	.....	Derate Linearly at 6 mW/ $^\circ$ C to 70 mW
<b>OPERATING-TEMPERATURE RANGE (<math>T_A</math>):</b>		
PACKAGE TYPE F, H	.....	-55 to $+125^\circ$ C
PACKAGE TYPE E, M	.....	-40 to $+85^\circ$ C
STORAGE TEMPERATURE ( $T_{stg}$ )	.....	-65 to $+150^\circ$ C
<b>LEAD TEMPERATURE (DURING SOLDERING):</b>		
At distance $1/16 \pm 1/32$ in. ( $1.59 \pm 0.79$ mm) from case for 10 s max.	.....	$+265^\circ$ C
Unit inserted into a PC Board (min. thickness $1/16$ in., 1.59 mm)	.....	
with solder contacting lead tips only	.....	$+300^\circ$ C

**Voltage Relationships:**  
**(Maximum Positive Limits)**



**RECOMMENDED OPERATING CONDITIONS**

For maximum reliability, nominal operating conditions should be selected so that operation is always within the following ranges:

CHARACTERISTIC	LIMITS		UNITS
	MIN.	MAX.	
Supply-Voltage Range (For $T_A$ =Full Package Temperature Range) $V_{CC}$ .*			
CD54/74HC Types	2	6	V
DC Output Voltage, $V_o$	0	$V_{CC}$	V
DC Input Voltage ( $V_i$ )	0	15	V
Operating Temperature, $T_A$ :			
CD74 Types	-40	+85	$^\circ$ C
CD54 Types	-55	+125	
Input Rise and Fall Times, $t_r, t_f$ :			
at 2 V	0	1000	ns
at 4.5 V	0	500	
at 6 V	0	400	

\*Unless otherwise specified, all voltages are referenced to Ground.

**CD54/74HC4049**  
**CD54/74HC4050**

**STATIC ELECTRICAL CHARACTERISTICS**

CHARACTERISTIC	CD54/74HC4049, CD54/74HC4050										UNITS
	TEST CONDITIONS			74HC/54HC SERIES			74HC SERIES		54HC SERIES		
	V <sub>I</sub> V	I <sub>O</sub> mA	V <sub>CC</sub> V	+25°C			-40/ +85°C		-55/ +125°C		
				Min.	Typ.	Max.	Min.	Max.	Min.	Max.	
High-Level Input Voltage V <sub>IH</sub>			2	1.5	—	—	1.5	—	1.5	—	V
			4.5	3.15	—	—	3.15	—	3.15	—	
			6	4.2	—	—	4.2	—	4.2	—	
Low-Level Input Voltage V <sub>IL</sub>			2	—	—	0.5	—	0.5	—	0.5	V
			4.5	—	—	1.35	—	1.35	—	1.35	
			6	—	—	1.8	—	1.8	—	1.8	
High-Level Output Voltage V <sub>OH</sub> CMOS Loads	V <sub>IL</sub> or V <sub>IH</sub>	-0.02	2	1.9	—	—	1.9	—	1.9	—	V
			4.5	4.4	—	—	4.4	—	4.4	—	
			6	5.9	—	—	5.9	—	5.9	—	
TTL Loads (Standard Output)	V <sub>IL</sub> or V <sub>IH</sub>	-4	4.5	3.98	—	—	3.84	—	3.7	—	V
		-5.2	6	5.48	—	—	5.34	—	5.2	—	
Low-Level Output Voltage V <sub>OL</sub> CMOS Loads	V <sub>IL</sub> or V <sub>IH</sub>	0.02	2	—	—	0.1	—	0.1	—	0.1	V
			4.5	—	—	0.1	—	0.1	—	0.1	
			6	—	—	0.1	—	0.1	—	0.1	
TTL Loads (Standard Output)	V <sub>IL</sub> or V <sub>IH</sub>	4	4.5	—	—	0.26	—	0.33	—	0.4	V
		5.2	6	—	—	0.26	—	0.33	—	0.4	
Input Leakage Current I <sub>I</sub>	V <sub>CC</sub> or Gnd		6	—	—	±0.1	—	±1	—	±1	μA
	15		6	—	—	±0.5	—	±5	—	±5	
Quiescent Device Current I <sub>CC</sub>	15 or Gnd	0	6	—	—	2	—	20	—	40	μA

**SWITCHING CHARACTERISTICS (V<sub>CC</sub>=5 V, T<sub>A</sub>=25°C, Input t<sub>r</sub>,t<sub>f</sub>=6 ns)**

CHARACTERISTIC	SYMBOL	54HC AND 74HC	
		TYPICAL	UNITS
Propagation Delay, Data Input to Output (C <sub>L</sub> = 15 pF)	HC4049 HC4050	t <sub>PLH</sub> , t <sub>PHL</sub>	6 ns
Power Dissipation Capacitance*		C <sub>PD</sub>	35 pF

\*C<sub>PD</sub> is used to determine the dynamic power consumption, per inverter

P<sub>D</sub> = V<sub>CC</sub><sup>2</sup> f<sub>i</sub>(C<sub>PD</sub> + C<sub>L</sub>) where: f<sub>i</sub> = input frequency  
C<sub>L</sub> = output load capacitance  
V<sub>CC</sub> = supply voltage

**SWITCHING CHARACTERISTICS (C<sub>L</sub> = 50 pF, Input t<sub>r</sub>,t<sub>f</sub> = 6 ns)**

CHARACTERISTIC	SYMBOL	V <sub>CC</sub>	25°C		-40°C to +85°C		-55°C to +125°C		UNITS
			HC		74HC		54HC		
			Min.	Max.	Min.	Max.	Min.	Max.	
Propagation Delay nA to nY HC4049 nA to nY HC4050	t <sub>PLH</sub> , t <sub>PHL</sub>	2	—	85	—	105	—	130	ns
		4.5	—	17	—	21	—	26	
		6	—	14	—	18	—	22	
Transition Time	t <sub>TLH</sub> , t <sub>THL</sub>	2	—	75	—	95	—	110	ns
		4.5	—	15	—	19	—	22	
		6	—	13	—	16	—	19	
Input Capacitance	C <sub>I</sub>	—	—	10	—	10	—	10	pF

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CD54/74HC4049  
CD54/74HC4050

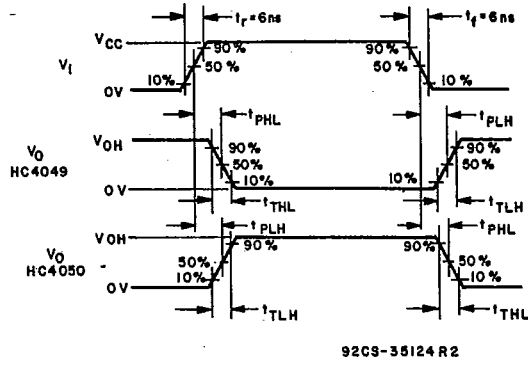


Fig. 1 - Transition times and propagation delay times, combination logic.