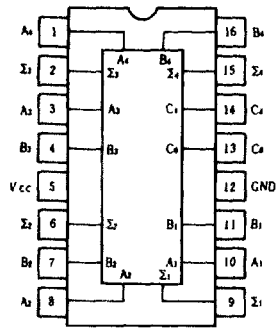
HD74HC83 ● 4-Bit Binary Full Adder (with Fast Carry)

This improved full adder performs the addition of two 4-bit binary numbers. The sum (Σ) outputs are provided for each bit and the resultant carry (C_4) is obtained from the fourth bit.

This adder features full internal look ahead across all four bit generating the carry term in ten nanoseconds typically.

This provides the system designer with partial look-ahead performance at the economy and reduced package count of a ripple-carry implementation.

■ PIN ARRANGEMENT



(Top View)

■ FEATURES

- High Speed Operation: t_{pd} (A_i or B_i to Z_i)=16ns typ. (C_L=50pF)
- High Output Current: Fanout of 10 LSTTL Loads
- Wide Operating Voltage: Vcc=2~6V
- Low Input Current: 1μA max.
- Low Quiescent Supply Current: Icc (static)=4μA max. (Ta= 25°C)

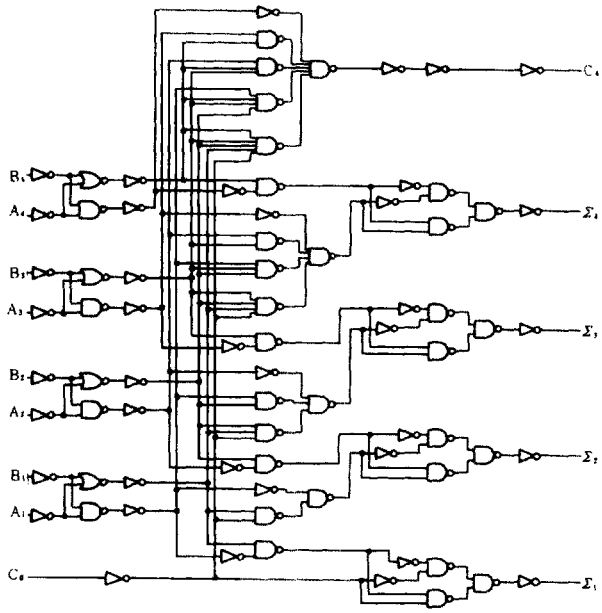
■ FUNCTION TABLE

Inputs				Outputs					
				When C_0=L			When C_0=H		
				When C_2=L			When C_2=H		
A_1 / A_3	B_1 / B_3	A_2 / A_4	B_2 / B_4	Σ_1 / Σ_3	Σ_2 / Σ_4	C_2 / C_4	Σ_1 / Σ_3	Σ_2 / Σ_4	C_2 / C_4
L	L	L	L	L	L	L	H	L	L
H	L	L	L	H	L	L	L	H	L
L	H	L	L	H	L	L	L	H	L
H	H	L	L	L	H	L	H	H	L
L	L	H	L	L	H	L	H	H	L
H	L	H	L	H	H	L	L	L	H
L	H	H	L	H	H	L	L	L	H
H	H	H	L	L	L	H	H	L	H
L	L	L	H	L	H	L	H	H	L
H	L	L	H	H	H	L	L	L	H
L	H	L	H	H	H	L	L	L	H
H	H	L	H	L	L	H	H	L	H
L	L	H	H	L	L	H	H	L	H
H	L	H	H	H	L	H	L	H	H
L	H	H	H	H	L	H	L	H	H
H	H	H	H	L	H	H	H	H	H

H; high level, L; low level, X; irrelevant

Note) Input conditions at A_1, B_1, A_2, B_2, and C_0 are used to determine outputs Σ_1 and Σ_2 and the value of the internal carry C_2.
The value at C_2, A_3, B_3, A_4, and B_4 are than used to determine outputs Σ_3, Σ_4 and C_4.

■ BLOCK DIAGRAM



■ DC CHARACTERISTICS

Item	Symbol	V_{CC} (V)	Test Conditions		$Ta=25℃$ min	$Ta=25℃$ typ	$Ta=25℃$ max	$Ta=-40\sim+85℃$ min	$Ta=-40\sim+85℃$ max	Unit
Input Voltage	V_{IH}	2.0			1.5	—	—	1.5	—	V
		4.5			3.15	—	—	3.15	—	
		6.0			4.2	—	—	4.2	—	
	V_{IL}	2.0			—	—	0.5	—	0.5	V
		4.5			—	—	1.35	—	1.35	
		6.0			—	—	1.8	—	1.8	
Output Voltage	V_{OH}	2.0	$V_{in}=V_{IH}$ or V_{IL}	$I_{OH}=-20\mu A$	1.9	2.0	—	1.9	—	V
		4.5			4.4	4.5	—	4.4	—	
		6.0			5.9	6.0	—	5.9	—	
		4.5		$I_{OH}=-4mA$	4.18	—	—	4.13	—	
		6.0		$I_{OH}=-5.2mA$	5.68	—	—	5.63	—	
	V_{OL}	2.0	$V_{in}=V_{IH}$ or V_{IL}	$I_{OL}=20\mu A$	—	0.0	0.1	—	0.1	V
		4.5			—	0.0	0.1	—	0.1	
		6.0			—	0.0	0.1	—	0.1	
		4.5		$I_{OL}=4mA$	—	—	0.26	—	0.33	
		6.0		$I_{OL}=5.2mA$	—	—	0.26	—	0.33	
Input Current	I_{in}	6.0	$V_{in}=V_{CC}$ or GND		—	—	±0.1	—	±1.0	μA
Quiescent Current	I_{CC}	6.0	$V_{in}=V_{CC}$ or GND, $I_{out}=0\mu A$		—	—	4.0	—	40	μA

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

Item	Symbol	V_{CC} (V)	Test Conditions	$Ta=25℃$ min	$Ta=25℃$ typ	$Ta=25℃$ max	$Ta=-40\sim+85℃$ min	$Ta=-40\sim+85℃$ max	Unit
Propagation Delay Time	t_{PLH} t_{PHL}	2.0	C_0 to Σ_1	—	—	150	—	190	ns
		4.5		—	19	30	—	38	
		6.0		—	—	26	—	33	
	t_{PLH} t_{PHL}	2.0	A_1 or B_1 to Σ_1	—	—	150	—	190	ns
		4.5		—	16	30	—	38	
		6.0		—	—	26	—	33	
	t_{PLH} t_{PHL}	2.0	C_0 to C_4	—	—	150	—	190	ns
		4.5		—	17	30	—	38	
		6.0		—	—	26	—	33	
	t_{PLH} t_{PHL}	2.0	A_1 or B_1 to C_4	—	—	150	—	190	ns
		4.5		—	18	30	—	38	
		6.0		—	—	26	—	33	
Output Rise/Fall Time	t_{TLH} t_{THL}	2.0		—	—	75	—	95	ns
		4.5		—	5	15	—	19	
		6.0		—	—	13	—	16	
Input Capacitance	C_{in}	—		—	5	10	—	10	pF