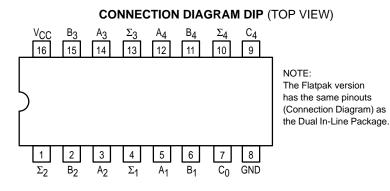


4-BIT BINARY FULL ADDER WITH FAST CARRY

The SN54/74LS283 is a high-speed 4-Bit Binary Full Adder with internal carry lookahead. It accepts two 4-bit binary words $(A_1 - A_4, B_1 - B_4)$ and a Carry Input (C₀). It generates the binary Sum outputs $(\Sigma_1 - \Sigma_4)$ and the Carry Output (C₄) from the most significant bit. The LS283 operates with either active HIGH or active LOW operands (positive or negative logic).



LOADING	(Note a	١
LUADING	(INDLE a	,

$ \begin{array}{c} A_1 - A_4 \\ B_1 - B_4 \\ C_0 \\ \Sigma_1 - \Sigma_4 \\ C_4 \end{array} $	Operand A Inputs Operand B Inputs Carry Input Sum Outputs (Note b) Carry Output (Note b)
C ₄	Carry Output (Note b)

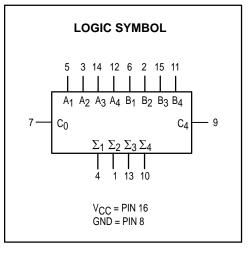
LOW
0.5 U.L.
0.5 U.L.
0.25 U.L.
5 (2.5) U.L.
5 (2.5) U.L.

SN54/74LS283

4-BIT BINARY FULL ADDER WITH FAST CARRY

LOW POWER SCHOTTKY

16 1	J SUFFIX CERAMIC CASE 620-09
16	N SUFFIX PLASTIC CASE 648-08
16 Jesteratie	D SUFFIX SOIC CASE 751B-03
ORDERING INF	ORMATION
SN54LSXXXJ SN74LSXXXN SN74LSXXXD	Ceramic Plastic SOIC



NOTES:

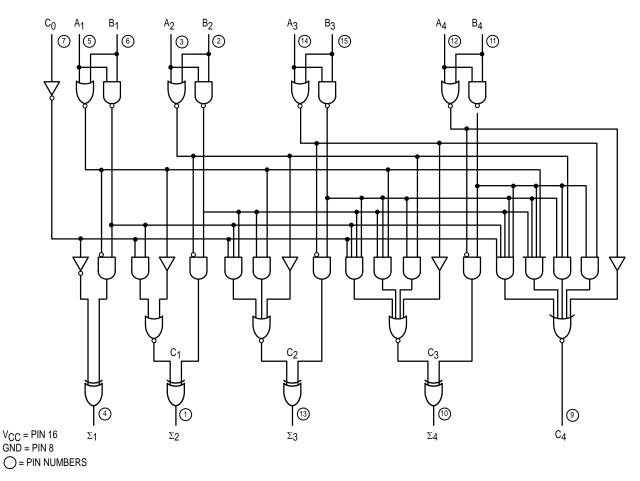
PIN NAMES

a) 1 TTL Unit Load (U.L.) = 40 μ A HIGH/1.6 mA LOW.

b) The Output LOW drive factor is 2.5 U.L. for Military (54) and 5 U.L. for Commercial

(74) Temperature Ranges.

LOGIC DIAGRAM



FUNCTIONAL DESCRIPTION

The LS283 adds two 4-bit binary words (A plus B) plus the incoming carry. The binary sum appears on the sum outputs $(\Sigma_1 - \Sigma_4)$ and outgoing carry (C4) outputs.

 $\begin{array}{l} C_0 + (A_1 + B_1) + 2(A_2 + B_2) + 4(A_3 + B_3) + 8(A_4 + B_4) = \sum_1 + 2\sum_2 \\ + 4\sum_3 + 8\sum_4 + 16C_4 \\ \\ \text{Where: (+) = plus} \end{array}$

Due to the symmetry of the binary add function the LS283 can be used with either all inputs and outputs active HIGH (positive logic) or with all inputs and outputs active LOW (negative logic). Note that with active HIGH inputs, Carry Input can not be left open, but must be held LOW when no carry in is intended.

	C ₀	A ₁	A ₂	A ₃	A ₄	В ₁	В ₂	B ₃	В4	Σ 1	Σ 2	Σ_{3}	Σ4	C4	
logic levels	L	L	Н	L	Н	Н	L	L	Н	Н	Н	L	L	Н	
Active HIGH	0	0	1	0	1	1	0	0	1	1	1	0	0	1	(10+9=19)
Active LOW	1	1	0	1	0	0	1	1	0	0	0	1	1	0	(carry+5+6=12

Interchanging inputs of equal weight does not affect the operation, thus C₀, A₁, B₁, can be arbitrarily assigned to pins 7, 5 or 3.

Example:

SN54/74LS283

FUNCTIONAL TRUTH TABLE

C (n–1)	A _n	B _n	Σn	Cn
L	L	L	L	L
L	L	н	н	L
L	Н	L	Н	L
L	Н	н	L	н
Н	L	L	Н	L
Н	L	н	L	н
Н	Н	L	L	н
Н	Н	Н	Н	н

 $C_1 - C_3$ are generated internally C_0 is an external input

 $\tilde{C_4}$ is an output generated internally

GUARANTEED OPERATING RANGES

Symbol	Parameter		Min	Тур	Max	Unit
VCC	Supply Voltage	54 74	4.5 4.75	5.0 5.0	5.5 5.25	V
т _А	Operating Ambient Temperature Range	54 74	-55 0	25 25	125 70	°C
ЮН	Output Current — High	54, 74			-0.4	mA
IOL	Output Current — Low	54 74			4.0 8.0	mA

DC CHARACTERISTICS OVER OPERATING TEMPERATURE RANGE (unless otherwise specified)

					Limits					
Symbol	Parameter			Min	Тур	Max	Unit	Tes	t Conditions	
VIH	Input HIGH Voltage			2.0			V	Guaranteed Input HIGH Voltage for All Inputs		
V	Input LOW Voltage		54			0.7	v	Guaranteed Input LOW Voltage for		
VIL	Input LOW Voltage		74			0.8	v	All Inputs		
VIK	Input Clamp Diode Volt	Input Clamp Diode Voltage			-0.65	-1.5	V	$V_{CC} = MIN, I_{IN} =$	–18 mA	
Vou	Output HIGH Voltage		54	2.5	3.5		V	$V_{CC} = MIN, I_{OH} = MAX, V_{IN} = V_{IH}$		
VOH	Oulput HIGH Voltage		74	2.7	3.5		V	or V _{IL} per Truth T	able	
			54, 74		0.25	0.4	V	I _{OL} = 4.0 mA	$V_{CC} = V_{CC} MIN,$	
VOL	Output LOW Voltage		74		0.35	0.5	V	I _{OL} = 8.0 mA	V _{IN} = V _{IL} or V _{IH} per Truth Table	
		C ₀				20	μΑ	$V_{CC} = MAX, V_{IN} = 2.7 V$ $V_{CC} = MAX, V_{IN} = 7.0 V$		
I		Any	/ A or B			40	μΑ			
ін	Input HIGH Current	C ₀				0.1	mA			
		Any	/ A or B			0.2	mA			
l		C ₀				-0.4	mA	V _{CC} = MAX, V _{IN} = 0.4 V		
μL	Input LOW Current	Any	/ A or B			-0.8	mA			
IOS	Short Circuit Current (N	(Note 1)		-20		-100	mA	V _{CC} = MAX		
ICC	Power Supply Current Total, Output HIGH				34	mA	V _{CC} = MAX			
	Total, Output LOW					39				

Note 1: Not more than one output should be shorted at a time, nor for more than 1 second.

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AC CHARACTERISTICS (T_A = 25°C, V_{CC} = 5.0 V)

			Limits			
Symbol	Parameter	Min	Тур	Max	Unit	Test Conditions
^t PLH ^t PHL	Propagation Delay, C ₀ Input to Any Σ Output		16 15	24 24	ns	
^t PLH ^t PHL	Propagation Delay, Any A or B Input to $\boldsymbol{\Sigma}$ Outputs		15 15	24 24	ns	C _L = 15 pF
^t PLH ^t PHL	Propagation Delay, C $_0$ Input to C $_4$ Output		11 11	17 22	ns	Figures 1 & 2
^t PLH ^t PHL	Propagation Delay, Any A or B Input to C_4 Output		11 12	17 17	ns	

AC WAVEFORMS

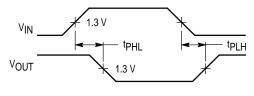


Figure 1

