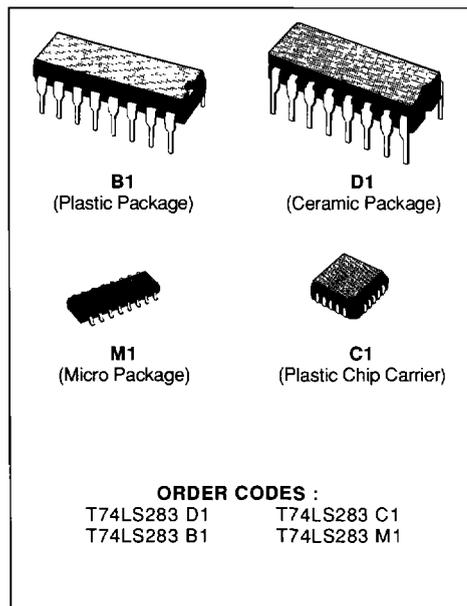
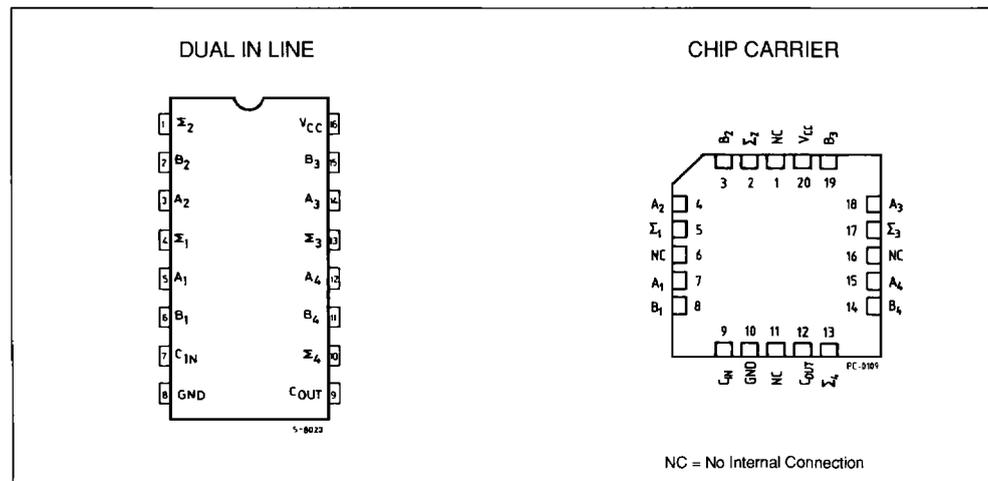


4-BIT BINARY FULL ADDER WITH FAST CARRY
DESCRIPTION

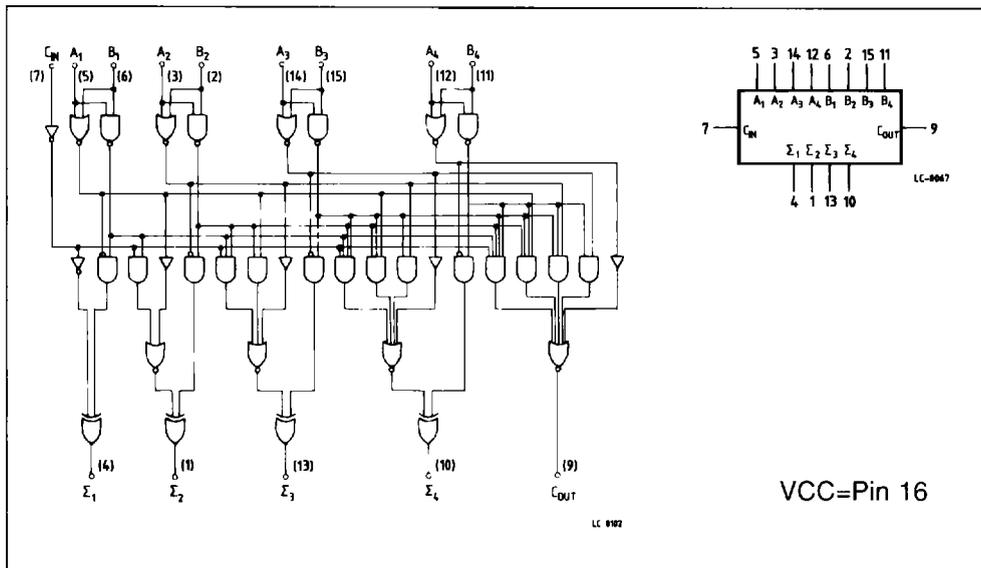
The T74LS283 is a high speed 4-bit Binary Full Adder with internal carry lookahead. It accepts two 4-bit binary words ($A_1 - A_4$, $B_1 - B_4$) and a Carry Input (C_{IN}). It generates the binary Sum outputs ($S_1 - S_4$) and the Carry Output (C_{OUT}) from the most significant bit. The LS283 operates with either active HIGH or active LOW operands (positive or negative logic).


PIN NAMES

$A_1 - A_4$	OPERAND A INPUTS
$B_1 - B_4$	OPERAND B INPUTS
C_{IN}	CARRY INPUTS
$\Sigma_1 - \Sigma_4$	SUM OUTPUTS
C_{OUT}	CARRY OUTPUTS

PIN CONNECTION (top view)


LOGIC SYMBOL AND LOGIC DIAGRAM



ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
V _{CC}	Supply Voltage	- 0.5 to 7	V
V _I	Input Voltage, Applied to Input	- 0.5 to 15	V
V _O	Output Voltage, Applied to Output	- 0.5 to 10	V
I _I	Input Current, Into Inputs	- 30 to 5	mA
I _O	Output Current, Into Outputs	50	mA

Stresses in excess of those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. This is a stress rating only and functional operation of the device at these or any other conditions in excess of those indicated in the operational sections of this specification is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

GUARANTEED OPERATING RANGE

Part Numbers	Supply Voltage			Temperature
	Min.	Typ.	Max.	
T74LS283XX	4.75 V	5.0 V	5.25 V	0 °C to + 70 °C

XX = package type.

FUNCTIONAL DESCRIPTION

The LS283 adds two 4-bits binary words (A plus B) plus the incoming carry. The binary sum appears on

the sum outputs ($\Sigma_1 - \Sigma_4$) and outgoing carry (C_{OUT}) outputs.

$$C_{IN} + (A_1 + B_1) + 2(A_2 + B_2) + 4(A_3 + B_3) + 8(A_4 + B_4) = \Sigma_1 + 2 \Sigma_2 + 4 \Sigma_3 + 8 \Sigma_4 + 16 C_{OUT}$$

Where : (+) = plus

Due to the symmetry of the binary add function the LS283 can be used with either all input and outputs active HIGH (positive logic) or with all inputs and out-

puts active LOW (negative logic). Note that with active HIGH inputs, Carry In can not be left open, but must be held LOW when no carry in is intended.

Example :

	C_{IN}	A_1	A_2	A_3	A_4	B_1	B_2	B_3	B_4	Σ_1	Σ_2	Σ_3	Σ_4	C_{OUT}
Logic Levels	L	L	H	L	H	H	L	L	H	H	H	L	L	H
Active HIGH	0	0	1	0	1	1	0	0	1	1	1	0	0	1
Active LOW	1	1	0	1	0	0	1	1	0	0	0	1	1	0

(10 + 9 = 19)

(carry + 5 + 6 = 12)

Interchanging inputs of equal weight does not affect operation, thus C_{IN} , A_1 , B_1 , can be arbitrarily assigned to pins 7, 5, or 3.

DC CHARACTERISTICS OVER OPERATING TEMPERATURE RANGE

Symbol	Parameter	Limits			Test Condition (note 1)	Unit
		Min.	Typ. (*)	Max.		
V_{IH}	Input HIGH Voltage	2.0			Guaranteed Input HIGH Voltage for All Input	V
V_{IL}	Input LOW Voltage			0.8	Guaranteed Input LOW Voltage for All Input	V
V_{CD}	Input Clamp Diode Voltage		- 0.65	- 1.5	$V_{CC} = \text{MIN}$, $I_{IN} = -18 \text{ mA}$	V
V_{OH}	Output HIGH Voltage	2.7	3.4		$V_{CC} = \text{MIN}$, $I_{OH} = - 400 \mu\text{A}$ $V_{IN} = V_{IH}$ or V_{IL} per Truth Table	V
V_{OL}	Output LOW Voltage		0.25	0.4	$I_{OL} = 4.0 \text{ mA}$, $V_{CC} = \text{MIN}$	V
			0.35	0.5	$I_{OL} = 8.0 \text{ mA}$, $V_{IN} = V_{IH}$ or V_{IL} per Truth Table	V
I_{IH}	Input HIGH Current C_{IN} Any A or B			20	$V_{CC} = \text{MAX}$, $V_{IN} = 2.7 \text{ V}$	μA
				40		
I_{IL}	Input LOW Current C_{IN} Any A or B			0.1	$V_{CC} = \text{MAX}$, $V_{IN} = 7.0 \text{ V}$	mA
				0.2		
I_{IS}	Output Short Circuit Current (note 2)			- 0.4	$V_{CC} = \text{MAX}$, $V_{IN} = 0.4 \text{ V}$	mA
				- 0.8		
I_{OS}	Output Short Circuit Current (note 2)	- 20		- 100	$V_{CC} = \text{MAX}$, $V_{IN} = 0 \text{ V}$	mA
I_{CC}	Power Supply Current		22	39	$V_{CC} = \text{MAX}$, All Inputs 0 V $V_{CC} = \text{MAX}$, A Input 4.5 V	mA
			19	34		

Notes : 1. Conditions for testing, not shown in the Table, are chosen to guarantee operation under "worst case" conditions.

2. Not more than one output should be shorted at a time.

(*) Typical values are at $V_{CC} = 5.0 \text{ V}$, $T_A = 25 \text{ }^\circ\text{C}$.

AC CHARACTERISTICS : $T_A = 25\text{ }^\circ\text{C}$

Symbol	Parameter	Limits			Test Conditions	Unit
		Min.	Typ.	Max.		
t_{PLH} t_{PHL}	Propagation Delay, C_{IN} Input to Any Σ Output		16 15	24 24	$V_{CC} = 5.0\text{ V}$ $C_L = 15\text{ pF}$ Figures 1 and 2	ns
t_{PLH} t_{PHL}	Propagation Delay, Any A or B Input to Σ Outputs		15 15	24 24		ns
t_{PLH} t_{PHL}	Propagation Delay, C_{IN} Input to C_{OUT} Output		11 11	17 22		ns
t_{PLH} t_{PHL}	Propagation Delay, Any A or B Input to C_{OUT} Output		11 12	17 17		ns

AC WAVEFORMS

Figure 1.

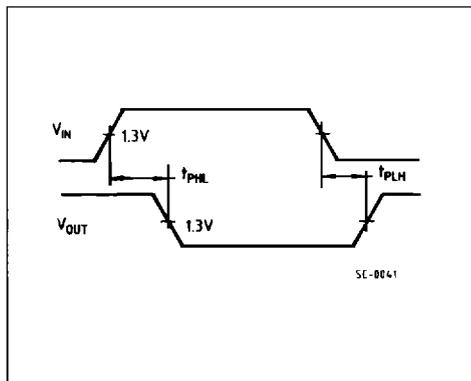


Figure 2.

