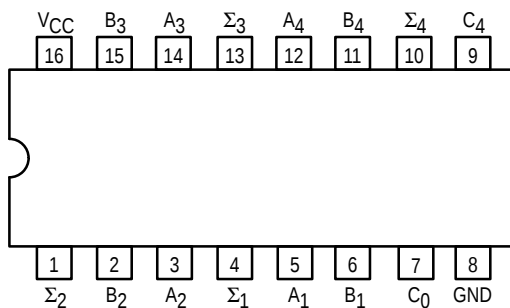




# 4-BIT BINARY FULL ADDER WITH FAST CARRY

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 ( $C_0$ ). It generates the binary Sum outputs ( $\Sigma_1-\Sigma_4$ ) and the Carry Output ( $C_4$ ) from the most significant bit. The LS283 operates with either active HIGH or active LOW operands (positive or negative logic).

CONNECTION DIAGRAM DIP (TOP VIEW)



NOTE:  
The Flatpak version has the same pinouts (Connection Diagram) as the Dual In-Line Package.

## PIN NAMES

|                     |                       |
|---------------------|-----------------------|
| $A_1-A_4$           | Operand A Inputs      |
| $B_1-B_4$           | Operand B Inputs      |
| $C_0$               | Carry Input           |
| $\Sigma_1-\Sigma_4$ | Sum Outputs (Note b)  |
| $C_4$               | Carry Output (Note b) |

## NOTES:

- a) 1 TTL Unit Load (U.L.) = 40  $\mu$ 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.

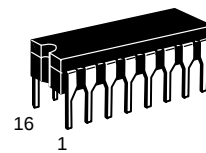
## LOADING (Note a)

| HIGH     | LOW          |
|----------|--------------|
| 1.0 U.L. | 0.5 U.L.     |
| 1.0 U.L. | 0.5 U.L.     |
| 0.5 U.L. | 0.25 U.L.    |
| 10 U.L.  | 5 (2.5) U.L. |
| 10 U.L.  | 5 (2.5) U.L. |

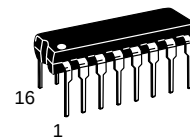
## SN54/74LS283

### 4-BIT BINARY FULL ADDER WITH FAST CARRY

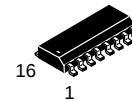
#### LOW POWER SCHOTTKY



**J SUFFIX**  
CERAMIC  
CASE 620-09



**N SUFFIX**  
PLASTIC  
CASE 648-08

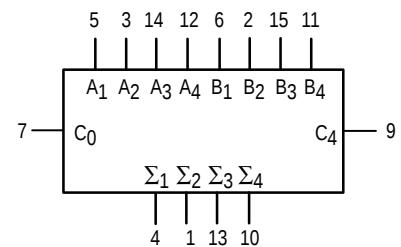


**D SUFFIX**  
SOIC  
CASE 751B-03

## ORDERING INFORMATION

|            |         |
|------------|---------|
| SN54LSXXXJ | Ceramic |
| SN74LSXXXN | Plastic |
| SN74LSXXXD | SOIC    |

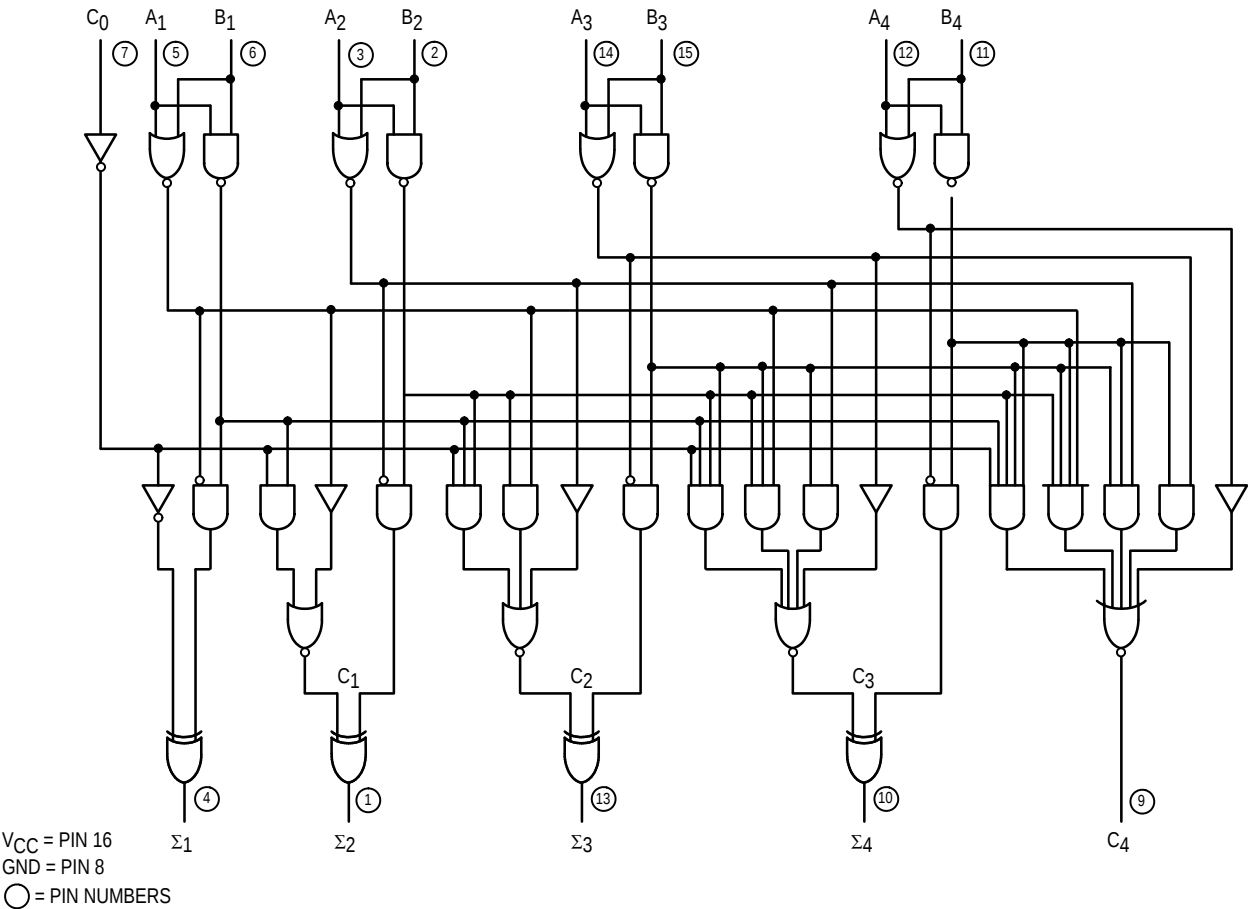
## LOGIC SYMBOL



$V_{CC}$  = PIN 16  
GND = PIN 8

SN54/74LS283

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 ( $C_4$ ) outputs.

$C_0 + (A_1 + B_1) + 2(A_2 + B_2) + 4(A_3 + B_3) + 8(A_4 + B_4) = \Sigma_1 + 2\Sigma_2 + 4\Sigma_3 + 8\Sigma_4 + 16C_4$

Where: (+) = plus

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.

Example:

|              | C <sub>0</sub> | A <sub>1</sub> | A <sub>2</sub> | A <sub>3</sub> | A <sub>4</sub> | B <sub>1</sub> | B <sub>2</sub> | B <sub>3</sub> | B <sub>4</sub> | Σ <sub>1</sub> | Σ <sub>2</sub> | Σ <sub>3</sub> | Σ <sub>4</sub> | C <sub>4</sub> |
|--------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|
| 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 the operation, thus C<sub>0</sub>, A<sub>1</sub>, B<sub>1</sub>, can be arbitrarily assigned to pins 7, 5 or 3.

# SN54/74LS283

FUNCTIONAL TRUTH TABLE

| C (n-1) | A <sub>n</sub> | B <sub>n</sub> | Σ <sub>n</sub> | C <sub>n</sub> |
|---------|----------------|----------------|----------------|----------------|
| L       | L              | L              | L              | L              |
| L       | L              | H              | H              | L              |
| L       | H              | L              | H              | L              |
| L       | H              | H              | L              | H              |
| H       | L              | L              | H              | L              |
| H       | L              | H              | L              | H              |
| H       | H              | L              | L              | H              |
| H       | H              | H              | H              | H              |

C<sub>1</sub> – C<sub>3</sub> are generated internally  
C<sub>0</sub> is an external input  
C<sub>4</sub> is an output generated internally

## GUARANTEED OPERATING RANGES

| Symbol          | Parameter                           |          | Min         | Typ        | Max         | Unit |
|-----------------|-------------------------------------|----------|-------------|------------|-------------|------|
| V <sub>CC</sub> | Supply Voltage                      | 54<br>74 | 4.5<br>4.75 | 5.0<br>5.0 | 5.5<br>5.25 | V    |
| T <sub>A</sub>  | Operating Ambient Temperature Range | 54<br>74 | –55<br>0    | 25<br>25   | 125<br>70   | °C   |
| I <sub>OH</sub> | Output Current — High               | 54, 74   |             |            | –0.4        | mA   |
| I <sub>OL</sub> | Output Current — Low                | 54<br>74 |             |            | 4.0<br>8.0  | mA   |

## DC CHARACTERISTICS OVER OPERATING TEMPERATURE RANGE (unless otherwise specified)

| Symbol          | Parameter                                  |                | Limits |       |      | Unit | Test Conditions                                                                                                    |
|-----------------|--------------------------------------------|----------------|--------|-------|------|------|--------------------------------------------------------------------------------------------------------------------|
|                 |                                            |                | Min    | Typ   | Max  |      |                                                                                                                    |
| V <sub>IH</sub> | Input HIGH Voltage                         |                | 2.0    |       |      | V    | Guaranteed Input HIGH Voltage for All Inputs                                                                       |
| V <sub>IL</sub> | Input LOW Voltage                          | 54             |        |       | 0.7  | V    | Guaranteed Input LOW Voltage for All Inputs                                                                        |
|                 |                                            | 74             |        |       | 0.8  |      |                                                                                                                    |
| V <sub>IK</sub> | Input Clamp Diode Voltage                  |                |        | –0.65 | –1.5 | V    | V <sub>CC</sub> = MIN, I <sub>IN</sub> = –18 mA                                                                    |
| V <sub>OH</sub> | Output HIGH Voltage                        | 54             | 2.5    | 3.5   |      | V    | V <sub>CC</sub> = MIN, I <sub>OH</sub> = MAX, V <sub>IN</sub> = V <sub>IH</sub> or V <sub>IL</sub> per Truth Table |
|                 |                                            | 74             | 2.7    | 3.5   |      | V    |                                                                                                                    |
| V <sub>OL</sub> | Output LOW Voltage                         | 54, 74         |        | 0.25  | 0.4  | V    | I <sub>OL</sub> = 4.0 mA                                                                                           |
|                 |                                            | 74             |        | 0.35  | 0.5  | V    | I <sub>OL</sub> = 8.0 mA                                                                                           |
| I <sub>IH</sub> | Input HIGH Current                         | C <sub>0</sub> |        |       | 20   | μA   | V <sub>CC</sub> = MAX, V <sub>IN</sub> = 2.7 V                                                                     |
|                 |                                            | Any A or B     |        |       | 40   | μA   |                                                                                                                    |
|                 |                                            | C <sub>0</sub> |        |       | 0.1  | mA   | V <sub>CC</sub> = MAX, V <sub>IN</sub> = 7.0 V                                                                     |
|                 |                                            | Any A or B     |        |       | 0.2  | mA   |                                                                                                                    |
| I <sub>IL</sub> | Input LOW Current                          | C <sub>0</sub> |        |       | –0.4 | mA   | V <sub>CC</sub> = MAX, V <sub>IN</sub> = 0.4 V                                                                     |
|                 |                                            | Any A or B     |        |       | –0.8 | mA   |                                                                                                                    |
| I <sub>OS</sub> | Short Circuit Current (Note 1)             |                | –20    |       | –100 | mA   | V <sub>CC</sub> = MAX                                                                                              |
| I <sub>CC</sub> | Power Supply Current<br>Total, Output HIGH |                |        |       | 34   | mA   | V <sub>CC</sub> = MAX                                                                                              |
|                 | Total, Output LOW                          |                |        |       | 39   |      |                                                                                                                    |

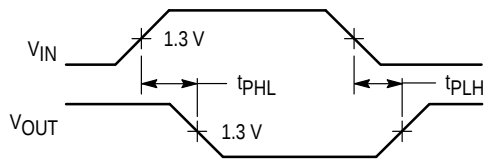
Note 1: Not more than one output should be shorted at a time, nor for more than 1 second.

# SN54/74LS283

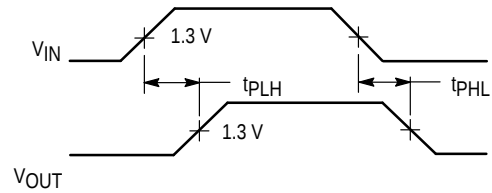
**AC CHARACTERISTICS** ( $T_A = 25^\circ\text{C}$ ,  $V_{CC} = 5.0\text{ V}$ )

| Symbol                 | Parameter                                               | Limits |          |          | Unit | Test Conditions                       |
|------------------------|---------------------------------------------------------|--------|----------|----------|------|---------------------------------------|
|                        |                                                         | Min    | Typ      | Max      |      |                                       |
| $t_{PLH}$<br>$t_{PHL}$ | Propagation Delay, $C_0$ Input to Any $\Sigma$ Output   |        | 16<br>15 | 24<br>24 | ns   | $C_L = 15\text{ pF}$<br>Figures 1 & 2 |
| $t_{PLH}$<br>$t_{PHL}$ | Propagation Delay, Any A or B Input to $\Sigma$ Outputs |        | 15<br>15 | 24<br>24 | ns   |                                       |
| $t_{PLH}$<br>$t_{PHL}$ | Propagation Delay, $C_0$ Input to $C_4$ Output          |        | 11<br>11 | 17<br>22 | ns   |                                       |
| $t_{PLH}$<br>$t_{PHL}$ | Propagation Delay, Any A or B Input to $C_4$ Output     |        | 11<br>12 | 17<br>17 | ns   |                                       |

## AC WAVEFORMS



**Figure 1**



**Figure 2**