

# SN74LS283

## 4-Bit Binary Full Adder with Fast Carry

The SN74LS283 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).

### GUARANTEED OPERATING RANGES

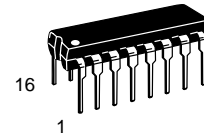
| Symbol   | Parameter                           | Min  | Typ | Max  | Unit |
|----------|-------------------------------------|------|-----|------|------|
| $V_{CC}$ | Supply Voltage                      | 4.75 | 5.0 | 5.25 | V    |
| $T_A$    | Operating Ambient Temperature Range | 0    | 25  | 70   | °C   |
| $I_{OH}$ | Output Current – High               |      |     | –0.4 | mA   |
| $I_{OL}$ | Output Current – Low                |      |     | 8.0  | mA   |



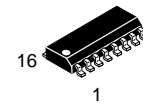
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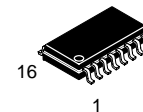
### LOW POWER SCHOTTKY



PLASTIC  
N SUFFIX  
CASE 648



SOIC  
D SUFFIX  
CASE 751B



SOEIAJ  
M SUFFIX  
CASE 966

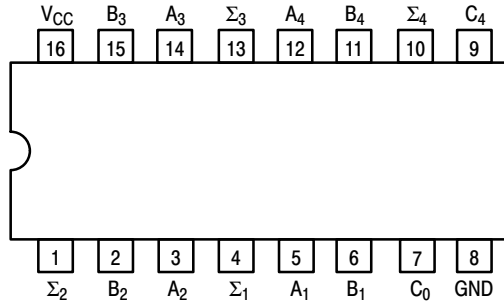
### ORDERING INFORMATION

| Device       | Package    | Shipping         |
|--------------|------------|------------------|
| SN74LS283N   | 16 Pin DIP | 2000 Units/Box   |
| SN74LS283D   | SOIC–16    | 38 Units/Rail    |
| SN74LS283DR2 | SOIC–16    | 2500/Tape & Reel |
| SN74LS283M   | SOEIAJ–16  | See Note 1       |
| SN74LS283MEL | SOEIAJ–16  | See Note 1       |

1. For ordering information on the EIAJ version of the SOIC package, please contact your local ON Semiconductor representative.

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## CONNECTION DIAGRAM DIP (TOP VIEW)



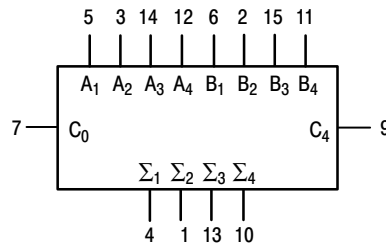
NOTE:  
The Flatpak version has the same pinouts (Connection Diagram) as the Dual In-Line Package.

| PIN NAMES             |                  | LOADING (Note a) |           |
|-----------------------|------------------|------------------|-----------|
|                       |                  | HIGH             | LOW       |
| $A_1 - A_4$           | Operand A Inputs | 1.0 U.L.         | 0.5 U.L.  |
| $B_1 - B_4$           | Operand B Inputs | 1.0 U.L.         | 0.5 U.L.  |
| $C_0$                 | Carry Input      | 0.5 U.L.         | 0.25 U.L. |
| $\Sigma_1 - \Sigma_4$ | Sum Outputs      | 10 U.L.          | 5 U.L.    |
| $C_4$                 | Carry Output     | 10 U.L.          | 5 U.L.    |

### NOTES:

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

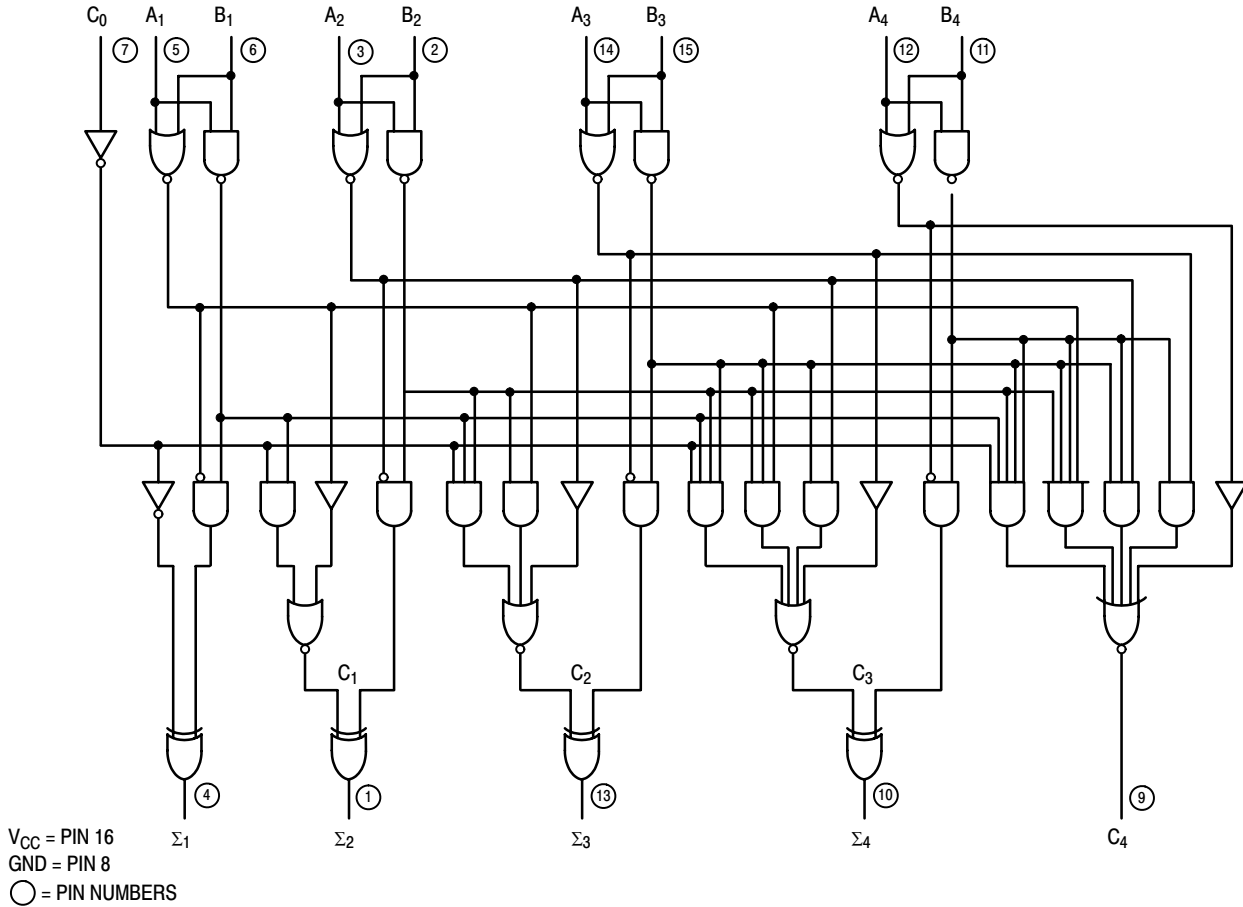
## LOGIC SYMBOL



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

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## 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:

|              | $C_0$ | $A_1$ | $A_2$ | $A_3$ | $A_4$ | $B_1$ | $B_2$ | $B_3$ | $B_4$ | $\Sigma_1$ | $\Sigma_2$ | $\Sigma_3$ | $\Sigma_4$ | $C_4$ |                |
|--------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|------------|------------|------------|------------|-------|----------------|
| 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     | (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  $C_0$ ,  $A_1$ ,  $B_1$ , can be arbitrarily assigned to pins 7, 5 or 3.

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## 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

## 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                       |                |       | 0.8  | V    | Guaranteed Input LOW Voltage for All Inputs  |
| 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                     | 2.7            | 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 |
| V <sub>OL</sub> | Output LOW Voltage                      |                | 0.25  | 0.4  | V    | I <sub>OL</sub> = 4.0 mA   |
|                 |   |                | 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 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.

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## 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

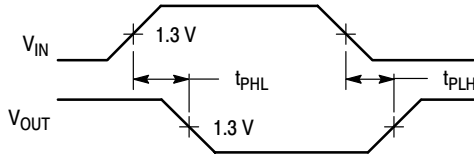


Figure 1.

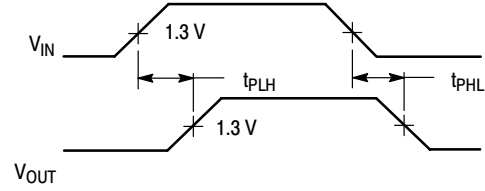
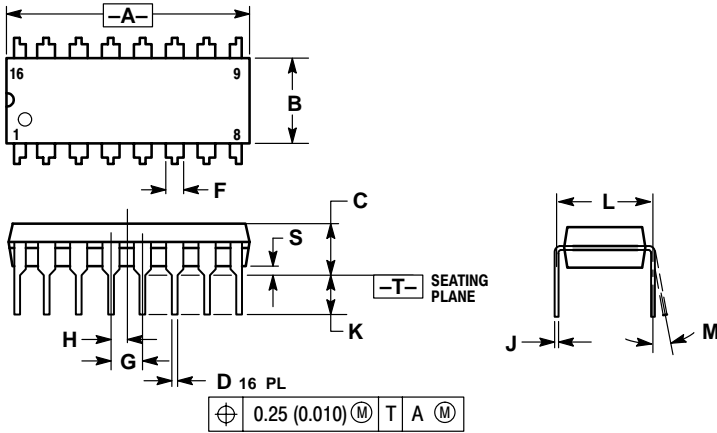


Figure 2.

# SN74LS283

## PACKAGE DIMENSIONS

### N SUFFIX PLASTIC PACKAGE CASE 648-08 ISSUE R

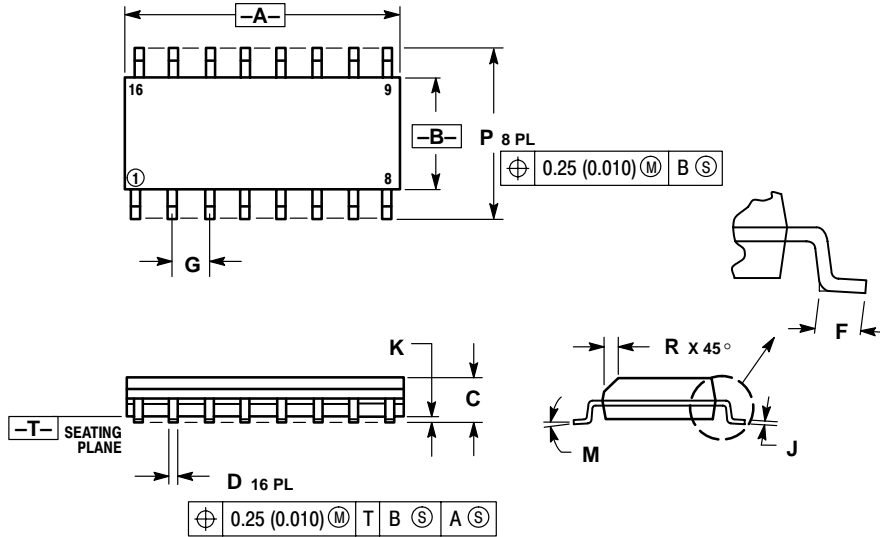


NOTES:

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. DIMENSION L TO CENTER OF LEADS WHEN FORMED PARALLEL.
4. DIMENSION B DOES NOT INCLUDE MOLD FLASH.
5. ROUNDED CORNERS OPTIONAL.

| DIM | INCHES    |       | MILLIMETERS |       |
|-----|-----------|-------|-------------|-------|
|     | MIN       | MAX   | MIN         | MAX   |
| A   | 0.740     | 0.770 | 18.80       | 19.55 |
| B   | 0.250     | 0.270 | 6.35        | 6.85  |
| C   | 0.145     | 0.175 | 3.69        | 4.44  |
| D   | 0.015     | 0.021 | 0.39        | 0.53  |
| F   | 0.040     | 0.70  | 1.02        | 1.77  |
| G   | 0.100 BSC |       | 2.54 BSC    |       |
| H   | 0.050 BSC |       | 1.27 BSC    |       |
| J   | 0.008     | 0.015 | 0.21        | 0.38  |
| K   | 0.110     | 0.130 | 2.80        | 3.30  |
| L   | 0.295     | 0.305 | 7.50        | 7.74  |
| M   | 0° 10°    |       | 0° 10°      |       |
| S   | 0.020     | 0.040 | 0.51        | 1.01  |

### D SUFFIX PLASTIC SOIC PACKAGE CASE 751B-05 ISSUE J



NOTES:

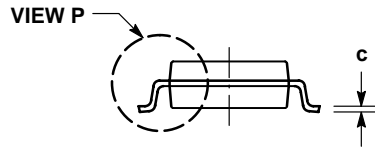
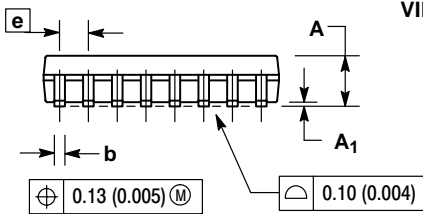
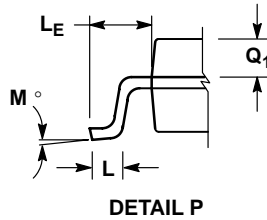
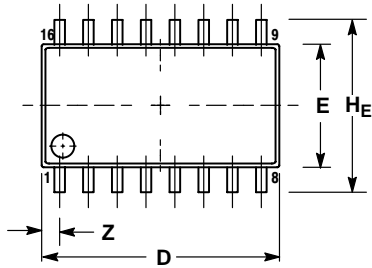
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETER.
3. DIMENSIONS A AND B DO NOT INCLUDE MOLD PROTRUSION.
4. MAXIMUM MOLD PROTRUSION 0.15 (0.006) PER SIDE.
5. DIMENSION D DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE 0.127 (0.005) TOTAL IN EXCESS OF THE D DIMENSION AT MAXIMUM MATERIAL CONDITION.

| DIM | MILLIMETERS |       | INCHES    |       |
|-----|-------------|-------|-----------|-------|
|     | MIN         | MAX   | MIN       | MAX   |
| A   | 9.80        | 10.00 | 0.386     | 0.393 |
| B   | 3.80        | 4.00  | 0.150     | 0.157 |
| C   | 1.35        | 1.75  | 0.054     | 0.068 |
| D   | 0.35        | 0.49  | 0.014     | 0.019 |
| F   | 0.40        | 1.25  | 0.016     | 0.049 |
| G   | 1.27 BSC    |       | 0.050 BSC |       |
| J   | 0.19        | 0.25  | 0.008     | 0.009 |
| K   | 0.10        | 0.25  | 0.004     | 0.009 |
| M   | 0° 7°       |       | 0° 7°     |       |
| P   | 5.80        | 6.20  | 0.229     | 0.244 |
| R   | 0.25        | 0.50  | 0.010     | 0.019 |

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## PACKAGE DIMENSIONS

**M SUFFIX**  
**SOEIAJ PACKAGE**  
**CASE 966-01**  
**ISSUE O**



**NOTES:**

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETER.
3. DIMENSIONS D AND E DO NOT INCLUDE MOLD FLASH OR PROTRUSIONS AND ARE MEASURED AT THE PARTING LINE. MOLD FLASH OR PROTRUSIONS SHALL NOT EXCEED 0.15 (0.006) PER SIDE.
4. TERMINAL NUMBERS ARE SHOWN FOR REFERENCE ONLY.
5. THE LEAD WIDTH DIMENSION (b) DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE 0.08 (0.003) TOTAL IN EXCESS OF THE LEAD WIDTH DIMENSION AT MAXIMUM MATERIAL CONDITION. DAMBAR CANNOT BE LOCATED ON THE LOWER RADIUS OR THE FOOT. MINIMUM SPACE BETWEEN PROTRUSIONS AND ADJACENT LEAD TO BE 0.46 (0.018).

| DIM            | MILLIMETERS |       | INCHES    |       |
|----------------|-------------|-------|-----------|-------|
|                | MIN         | MAX   | MIN       | MAX   |
| A              | ---         | 2.05  | ---       | 0.081 |
| A <sub>1</sub> | 0.05        | 0.20  | 0.002     | 0.008 |
| b              | 0.35        | 0.50  | 0.014     | 0.020 |
| c              | 0.18        | 0.27  | 0.007     | 0.011 |
| D              | 9.90        | 10.50 | 0.390     | 0.413 |
| E              | 5.10        | 5.45  | 0.201     | 0.215 |
| e              | 1.27 BSC    |       | 0.050 BSC |       |
| H <sub>E</sub> | 7.40        | 8.20  | 0.291     | 0.323 |
| L              | 0.50        | 0.85  | 0.020     | 0.033 |
| L <sub>E</sub> | 1.10        | 1.50  | 0.043     | 0.059 |
| M              | 0° 10°      |       | 0° 10°    |       |
| Q <sub>1</sub> | 0.70        | 0.90  | 0.028     | 0.035 |
| Z              | ---         | 0.78  | ---       | 0.031 |

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