

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 |

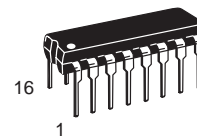


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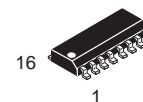
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<http://onsemi.com>

LOW POWER SCHOTTKY



PLASTIC
N SUFFIX
CASE 648



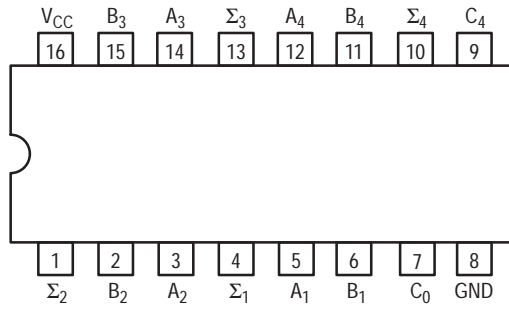
SOIC
D SUFFIX
CASE 751B

ORDERING INFORMATION

| Device | Package | Shipping |
|------------|------------|------------------|
| SN74LS283N | 16 Pin DIP | 2000 Units/Box |
| SN74LS283D | 16 Pin | 2500/Tape & Reel |

SN74LS283

CONNECTION DIAGRAM DIP (TOP VIEW)



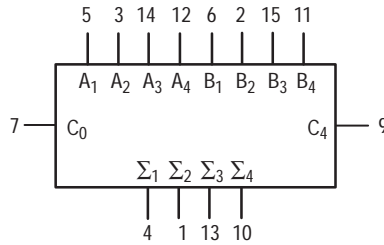
NOTE:
The Flatpak version has the same pinouts (Connection Diagram) as the Dual In-Line Package.

| 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 μ A HIGH/1.6 mA LOW.

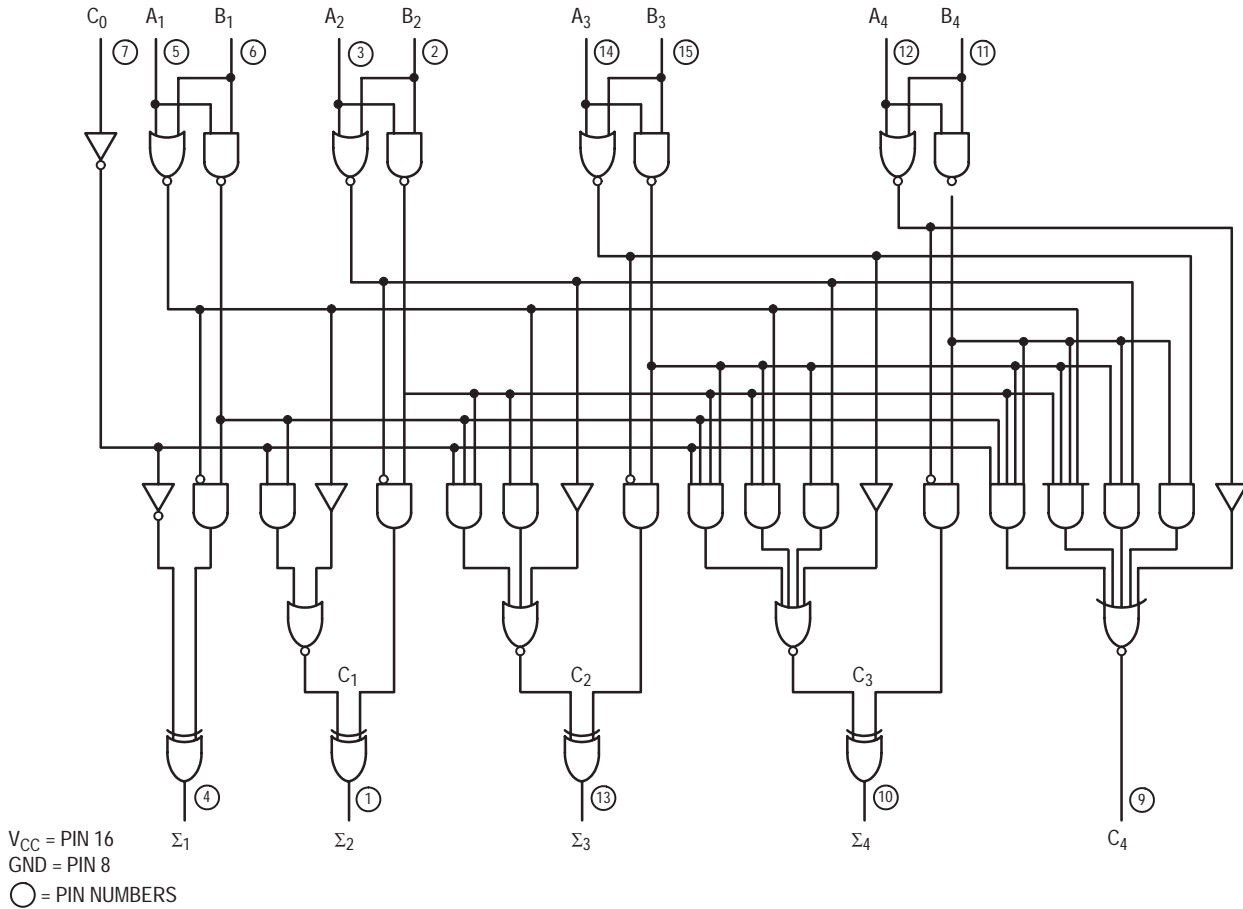
LOGIC SYMBOL



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 | Σ_1 | Σ_2 | Σ_3 | Σ_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 _n | B _n | Σ _n | C _n |
|---------|----------------|----------------|----------------|----------------|
| 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 |

C₁ – C₃ are generated internally
 C₀ is an external input
 C₄ is an output generated internally

DC CHARACTERISTICS OVER OPERATING TEMPERATURE RANGE (unless otherwise specified)

| Symbol | Parameter | Limits | | | Unit | Test Conditions |
|-----------------|---|----------------|-------|------|------|--|
| | | Min | Typ | Max | | |
| V _{IH} | Input HIGH Voltage | 2.0 | | | V | Guaranteed Input HIGH Voltage for All Inputs |
| V _{IL} | Input LOW Voltage | | | 0.8 | V | Guaranteed Input LOW Voltage for All Inputs |
| V _{IK} | Input Clamp Diode Voltage | | -0.65 | -1.5 | V | V _{CC} = MIN, I _{IN} = -18 mA |
| V _{OH} | Output HIGH Voltage | 2.7 | 3.5 | | V | V _{CC} = MIN, I _{OH} = MAX, V _{IN} = V _{IH} or V _{IL} per Truth Table |
| V _{OL} | Output LOW Voltage | | 0.25 | 0.4 | V | I _{OL} = 4.0 mA |
| | | | 0.35 | 0.5 | V | I _{OL} = 8.0 mA |
| I _{IH} | Input HIGH Current | C ₀ | | 20 | μA | V _{CC} = MAX, V _{IN} = 2.7 V |
| | | Any A or B | | 40 | μA | |
| | | C ₀ | | 0.1 | mA | V _{CC} = MAX, V _{IN} = 7.0 V |
| | | Any A or B | | 0.2 | mA | |
| I _{IL} | Input LOW Current | C ₀ | | -0.4 | mA | V _{CC} = MAX, V _{IN} = 0.4 V |
| | | Any A or B | | -0.8 | mA | |
| I _{OS} | Short Circuit Current (Note 1) | -20 | | -100 | mA | V _{CC} = MAX |
| I _{CC} | 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 ($T_A = 25^\circ\text{C}$, $V_{CC} = 5.0\text{ V}$)

| Symbol | Parameter | Limits | | | Unit | Test Conditions |
|------------------------|---|--------|----------|----------|------|---------------------------------------|
| | | Min | Typ | Max | | |
| t_{PLH} t_{PHL} | Propagation Delay, C_0 Input to Any Σ Output | | 16 15 | 24 24 | ns | $C_L = 15\text{ pF}$ Figures 1 & 2 |
| 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_0 Input to C_4 Output | | 11 11 | 17 22 | ns | |
| t_{PLH} t_{PHL} | Propagation Delay, Any A or B Input to C_4 Output | | 11 12 | 17 17 | ns | |

AC WAVEFORMS

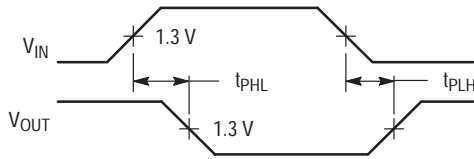


Figure 1.

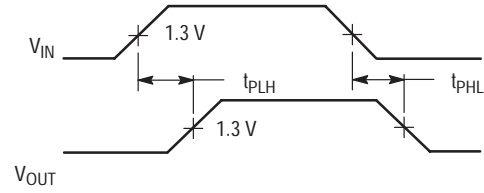
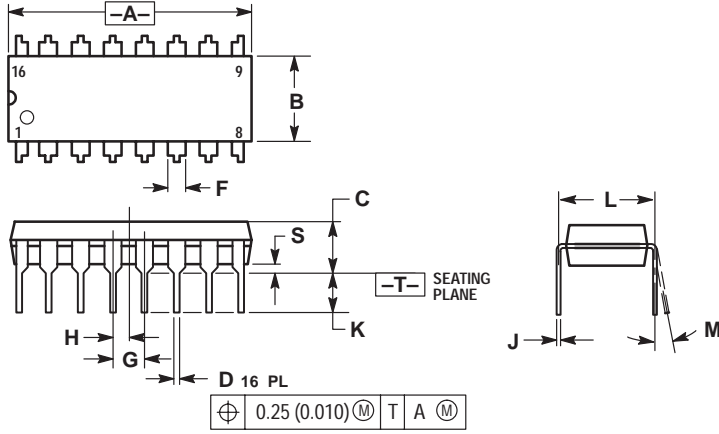


Figure 2.

SN74LS283

PACKAGE DIMENSIONS

N SUFFIX
PLASTIC PACKAGE
CASE 648-08
ISSUE R



NOTES:

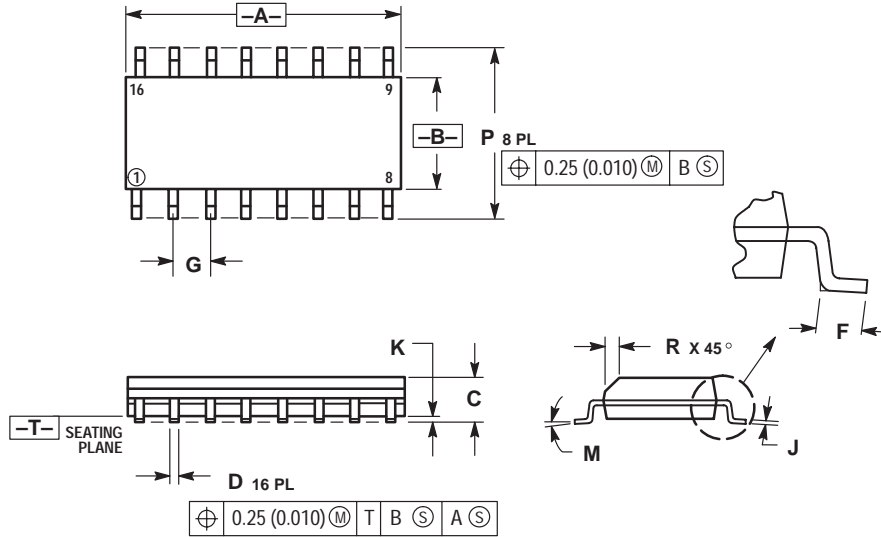
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. DIMENSION L TO CENTER OF LEADS WHEN FORMED PARALLEL.
4. DIMENSION B DOES NOT INCLUDE MOLD FLASH.
5. ROUNDED CORNERS OPTIONAL.

| 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 |

SN74LS283

PACKAGE DIMENSIONS


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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