

# 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

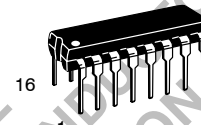
Symbol	Parameter	Min	Typ	Max	Unit
$V_{CC}$	Supply Voltage	4.75	5.0	5.25	V
$T_A$	Operating Ambient Temperature Range	0	25	70	°C
$I_{OH}$	Output Current – High			–0.4	mA
$I_{OL}$	Output Current – Low			8.0	mA



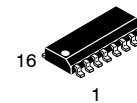
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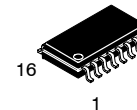
LOW  
POWER  
SCHOTTKY



PLASTIC  
N SUFFIX  
CASE 648



SOIC  
D SUFFIX  
CASE 751B



SOEIAJ  
M SUFFIX  
CASE 966

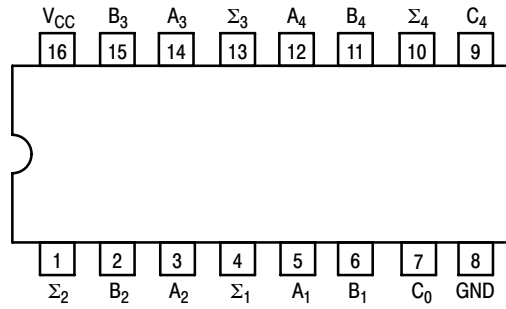
### ORDERING INFORMATION

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)



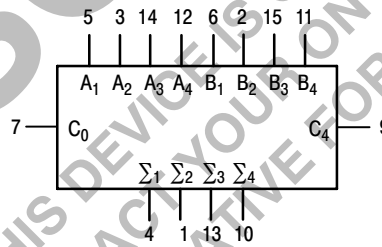
NOTE:  
The Flatpak version has the same pinouts (Connection Diagram) as the Dual In-Line Package.

PIN NAMES		LOADING (Note a)	
		HIGH	LOW
A <sub>1</sub> - A <sub>4</sub>	Operand A Inputs	1.0 U.L.	0.5 U.L.
B <sub>1</sub> - B <sub>4</sub>	Operand B Inputs	1.0 U.L.	0.5 U.L.
C <sub>0</sub>	Carry Input	0.5 U.L.	0.25 U.L.
Σ <sub>1</sub> - Σ <sub>4</sub>	Sum Outputs	10 U.L.	5 U.L.
C <sub>4</sub>	Carry Output	10 U.L.	5 U.L.

### NOTES:

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

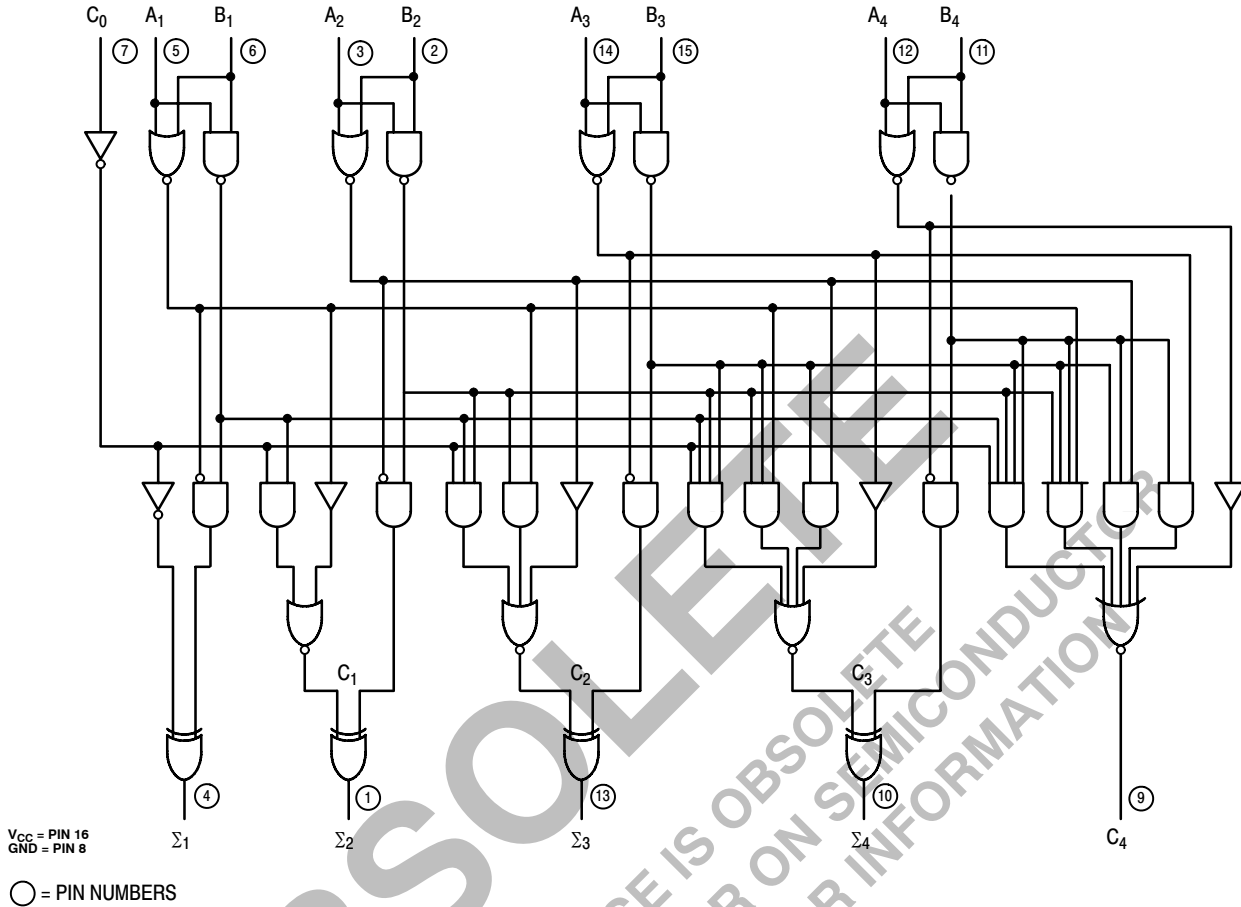
## LOGIC SYMBOL



V<sub>CC</sub> = 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
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  $C_0, A_1, B_1$ , 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	V <sub>CC</sub> = V <sub>CC</sub> MIN, V <sub>IN</sub> = V <sub>IL</sub> or V <sub>IH</sub> per Truth Table
			0.35	0.5	V	
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		
$t_{PLH}$ $t_{PHL}$	Propagation Delay, $C_0$ Input to Any $\Sigma$ 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 $\Sigma$ 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

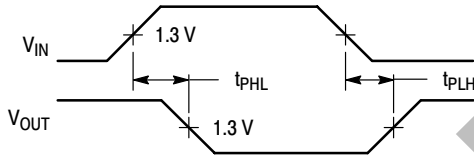


Figure 1.

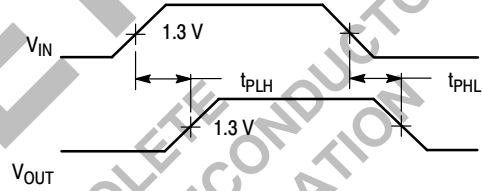
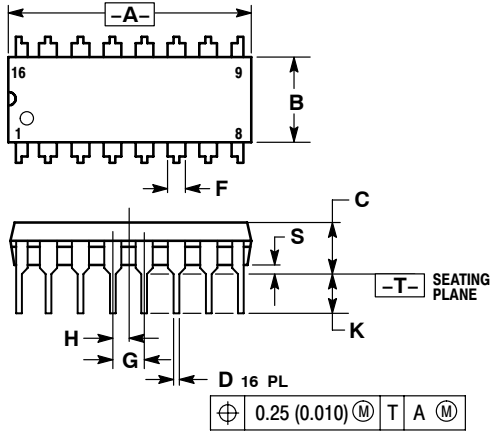


Figure 2.

# SN74LS283

## PACKAGE DIMENSIONS

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

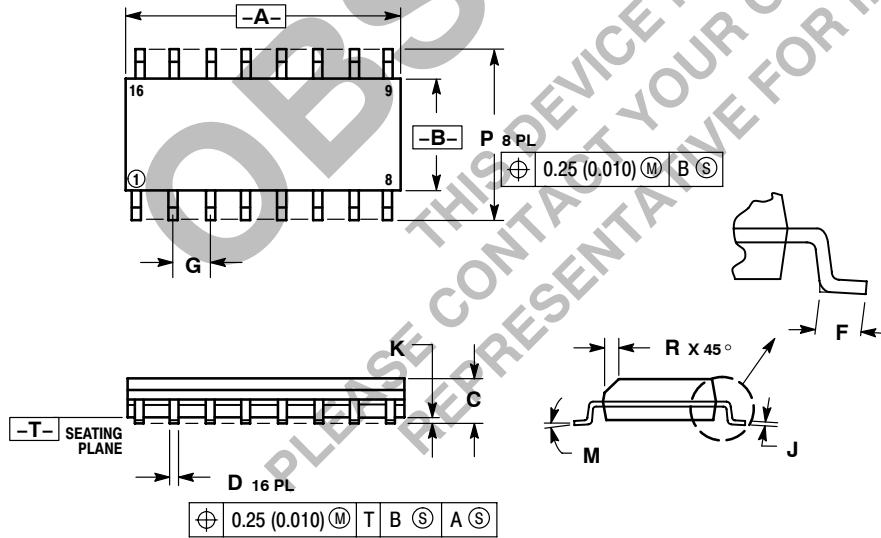


NOTES:

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

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



NOTES:

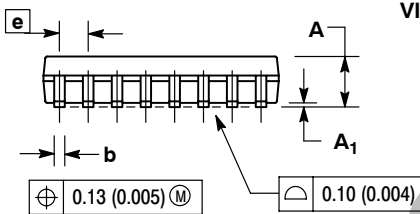
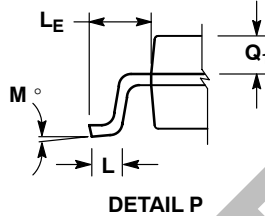
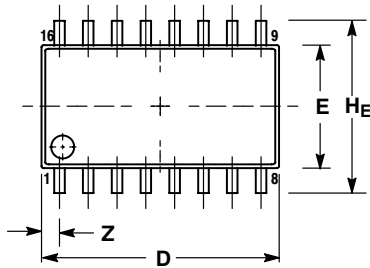
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETER.
3. DIMENSIONS A AND B DO NOT INCLUDE MOLD PROTRUSION.
4. MAXIMUM MOLD PROTRUSION 0.15 (0.006) PER SIDE.
5. DIMENSION D DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE 0.127 (0.005) TOTAL 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	
HE	7.40	8.20	0.291	0.323
L	0.50	0.85	0.020	0.033
LE	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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