

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 (Σ_1 – Σ_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

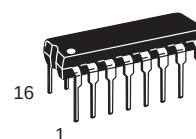


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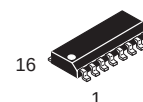
Formerly a Division of Motorola

<http://onsemi.com>

LOW POWER SCHOTTKY



PLASTIC
N SUFFIX
CASE 648



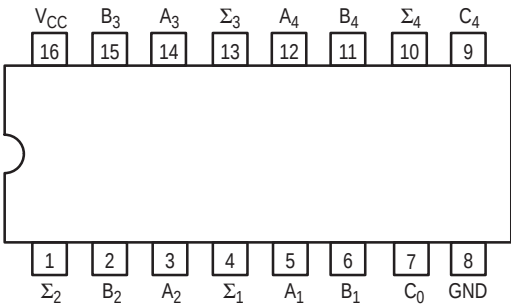
SOIC
D SUFFIX
CASE 751B

ORDERING INFORMATION

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

SN74LS283

CONNECTION DIAGRAM DIP (TOP VIEW)

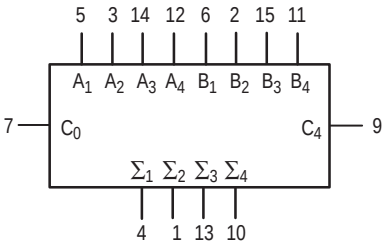


NOTE:
The Flatpak version has the same pinouts (Connection Diagram) as the Dual In-Line Package.

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.
Σ ₁ – Σ 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 μA HIGH/1.6 mA LOW.

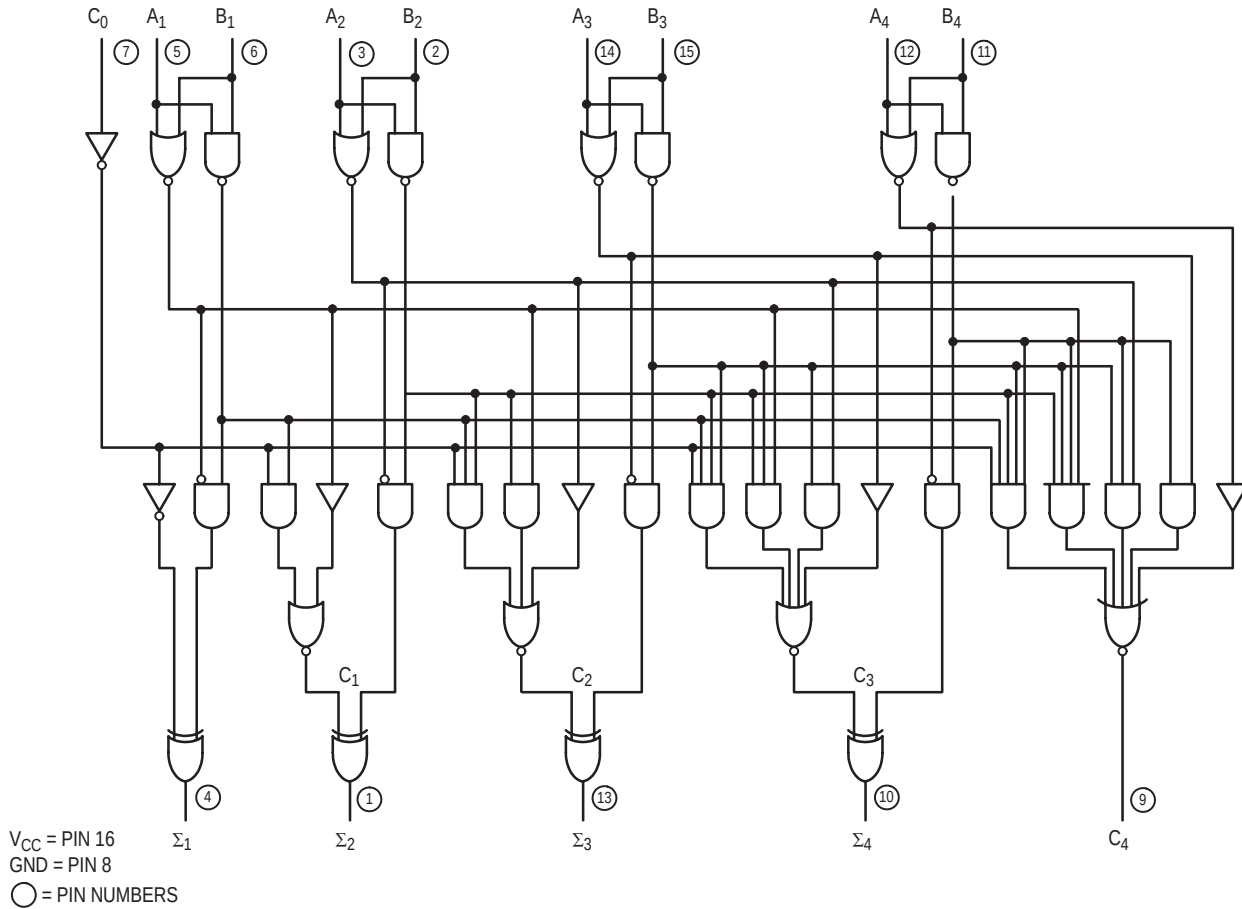
LOGIC SYMBOL



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	V _{CC} = V _{CC} MIN, V _{IN} = V _{IL} or V _{IH} per Truth Table
				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°C, V_{CC} = 5.0 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 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

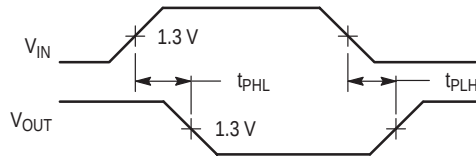


Figure 1.

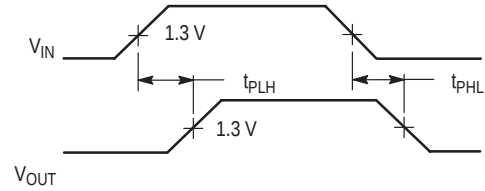
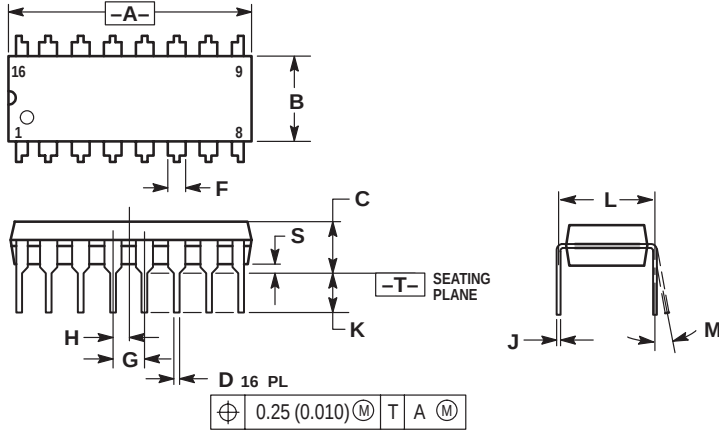


Figure 2.

SN74LS283

PACKAGE DIMENSIONS

N SUFFIX
PLASTIC PACKAGE
CASE 648-08
ISSUE R



NOTES:

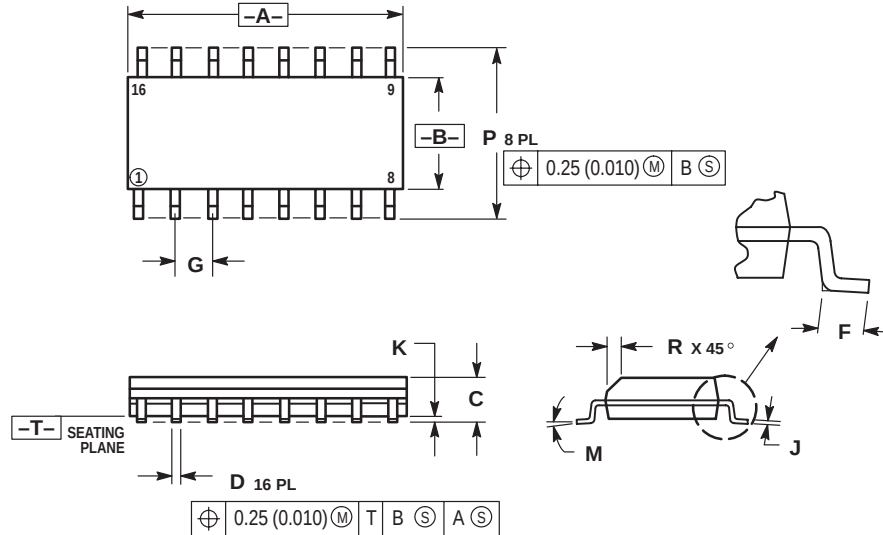
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. DIMENSION L TO CENTER OF LEADS WHEN FORMED PARALLEL.
4. DIMENSION B DOES NOT INCLUDE MOLD FLASH.
5. ROUNDED CORNERS OPTIONAL.

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

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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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