FAIRCHILD SEMICONDUCTOR™

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DM74S283
4-Bit Binary Adder with Fast Carry

General Description

These full adders perform the addition of two 4-bit binary numbers. The sum (Σ) outputs are provided for each bit and the resultant carry (C4) is obtained from the fourth bit. These adders feature full internal look ahead across all four bits. This provides the system designer with partial look-ahead performance at the economy and reduced package count of a ripple-carry implementation.

The adder logic, including the carry, is implemented in its true form meaning that the end-around carry can be accomplished without the need for logic or level inversion.

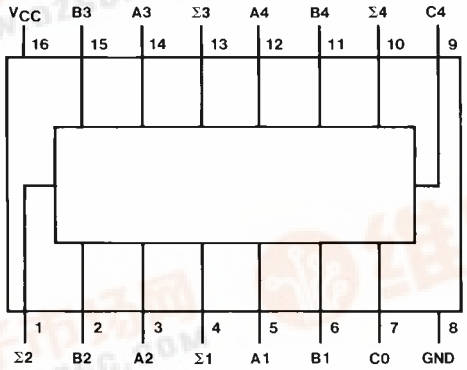
Features

- Full-carry look-ahead across the four bits
- Systems achieve partial look-ahead performance with the economy of ripple carry
- Typical add times
  - Two 8-bit words 15 ns
  - Two 16-bit words 30 ns
- Typical power dissipation 510 mW

Ordering Code:

Order Number	Package Number	Package Description
DM74S283N	N16E	16-Lead Plastic Dual-In-Line Package (PDIP), JEDEC MS-001, 0.300 Wide

Connection Diagram



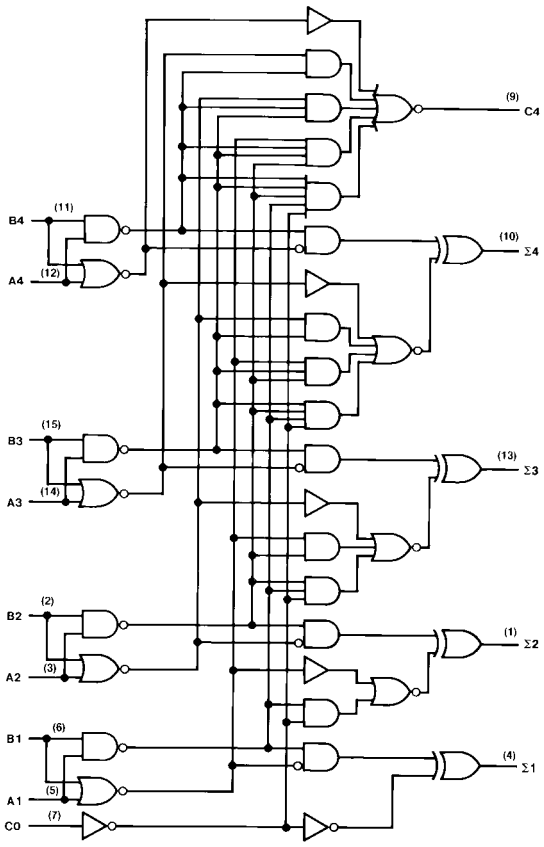
Function Table

Input				Output					
				When CO = L			When CO = H		
				When C2 = L			When C2 = H		
A1 / A3	B1 / B3	A2 / A4	B2 / B4	Σ1 / Σ3	Σ2 / Σ4	C2 / C4	Σ1 / Σ3	Σ2 / Σ4	C2 / C4
L	L	L	L	L	L	L	H	L	L
H	L	L	L	H	L	L	L	H	L
L	H	L	L	H	L	L	L	H	L
H	H	L	L	L	H	L	H	H	L
L	L	H	L	L	H	L	H	H	L
H	L	H	L	H	H	L	L	L	H
L	H	H	L	H	H	L	L	L	H
H	H	H	L	L	L	H	H	L	H
L	L	L	H	L	H	L	H	H	L
H	L	L	H	H	H	L	L	L	H
L	H	L	H	H	H	L	L	L	H
H	H	L	H	L	L	H	H	L	H
L	L	H	H	L	L	H	H	L	H
H	L	H	H	H	L	H	L	H	H
L	H	H	H	H	L	H	L	H	H
H	H	H	H	L	H	H	H	H	H

H = HIGH Level, L = LOW Level

Note: Input conditions at A1, B1, A2, B2, and C0 are used to determine outputs ∑1 and ∑2 and the value of the internal carry C2. The values at C2, A3, B3, A4, and B4 are then used to determine outputs ∑3, ∑4, and C4.

Logic Diagram



Absolute Maximum Ratings(Note 1)

Supply Voltage	7V
Input Voltage	5.5V
Operating Free Air Temperature Range	0°C to +70°C
Storage Temperature Range	−65°C to +150°C

Note 1: The "Absolute Maximum Ratings" are those values beyond which the safety of the device cannot be guaranteed. The device should not be operated at these limits. The parametric values defined in the Electrical Characteristics tables are not guaranteed at the absolute maximum ratings. The "Recommended Operating Conditions" table will define the conditions for actual device operation.

Recommended Operating Conditions

Symbol	Parameter	Min	Nom	Max	Units
V_{CC}	Supply Voltage	4.75	5	5.25	V
V_{IH}	HIGH Level Input Voltage	2			V
V_{IL}	LOW Level Input Voltage			0.8	V
I_{OH}	HIGH Level Output Current (Output C4)			−0.5	mA
	HIGH Level Output Current (Other Outputs)			−1	
I_{OL}	LOW Level Output Current (Output C4)			10	mA
	LOW Level Output Current (Other Outputs)			20	
T_A	Free Air Operating Temperature	0		70	°C

Electrical Characteristics

over recommended operating free air temperature (unless otherwise noted)

Symbol	Parameter	Conditions		Min	Typ (Note 2)	Max	Units
V_I	Input Clamp Voltage	V_{CC} = Min, I_I = −18 mA				−1.2	V
V_{OH}	HIGH Level Output Voltage	V_{CC} = Min, I_{OH} = Max V_{IL} = Max, V_{IH} = Min		2.7	3.4		V
V_{OL}	LOW Level Output Voltage	V_{CC} = Min, I_{OL} = Max V_{IH} = Min, V_{IL} = Max				0.5	V
I_I	Input Current @ Max Input Voltage	V_{CC} = Max, V_I = 5.5V				1	mA
I_{IH}	HIGH Level Input Current	V_{CC} = Max, V_I = 2.7V				50	µA
I_L	LOW Level Input Current	V_{CC} = Max, V_I = 0.5V				−2	mA
I_{OS}	Short Circuit Output Current	V_{CC} = Max (Note 3)	C4 Output	−20		−100	mA
			Other Outputs	−40		−100	
I_{CC1}	Supply Current	V_{CC} = Max (Note 4)			80	120	mA
I_{CC2}	Supply Current	V_{CC} = Max (Note 5)			95	160	mA

Note 2: All typicals are at V_{CC} = 5V, T_A = 25°C.

Note 3: Not more than one output should be shorted at a time, and the duration should not exceed one second.

Note 4: I_{CC1} is measured with all outputs OPEN, all B inputs LOW and all other inputs at 4.5V.

Note 5: I_{CC2} is measured with all outputs OPEN and all inputs at 4.5V.

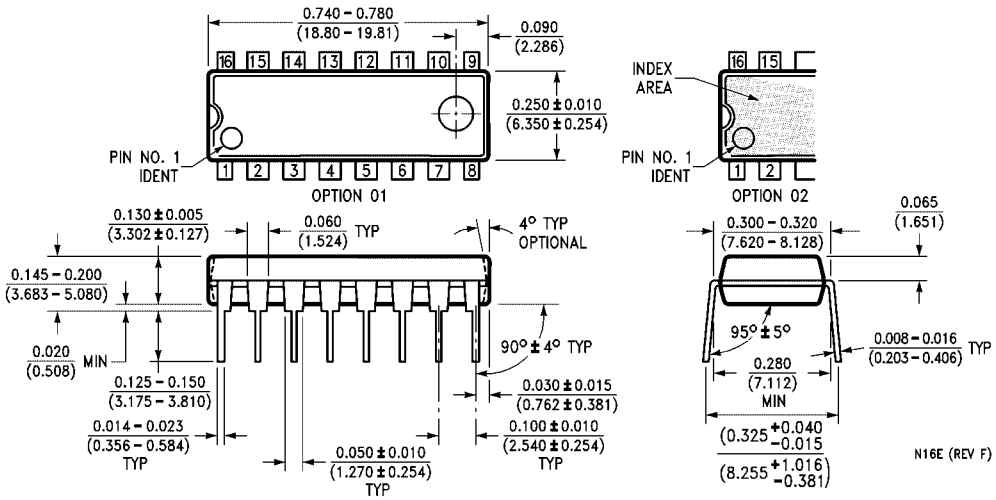
Switching Characteristics

at V_{CC} = 5V and T_A = 25°C

Symbol	Parameter	From (Input) To (Output)	R_L = 280Ω				Units
			C_L = 15 pF		C_L = 50 pF		
			Min	Max	Min	Max	
t_{PLH}	Propagation Delay Time LOW-to-HIGH Level Output	C0 to ∑1 or ∑2		18		20	ns
t_{PHL}	Propagation Delay Time HIGH-to-LOW Level Output	C0 to ∑1 or ∑2		18		20	ns
t_{PLH}	Propagation Delay Time LOW-to-HIGH Level Output	C0 to ∑3		18		20	ns
t_{PHL}	Propagation Delay Time HIGH-to-LOW Level Output	C0 to ∑3		18		20	ns
t_{PLH}	Propagation Delay Time LOW-to-HIGH Level Output	C0 to ∑4		18		20	ns
t_{PHL}	Propagation Delay Time HIGH-to-LOW Level Output	C0 to ∑4		18		20	ns
t_{PLH}	Propagation Delay Time LOW-to-HIGH Level Output	A_i, B_i to S_i		18		20	ns
t_{PHL}	Propagation Delay Time HIGH-to-LOW Level Output	A_i, B_i to S_i		18		20	ns
t_{PLH}	Propagation Delay Time LOW-to-HIGH Level Output (Note 6)	C0 to ∑4		11		15	ns
t_{PHL}	Propagation Delay Time HIGH-to-LOW Level Output (Note 6)	C0 to ∑4		11		15	ns
t_{PLH}	Propagation Delay Time LOW-to-HIGH Level Output (Note 6)	A_i, B_i to C4		12		16	ns
t_{PHL}	Propagation Delay Time HIGH-to-LOW Level Output (Note 6)	A_i, B_i to C4		12		16	ns

Note 6: R_L = 560Ω.

Physical Dimensions inches (millimeters) unless otherwise noted



16-Lead Plastic Dual-In-Line Package (PDIP), JEDEC MS-001, 0.300 Wide
Package Number N16E