

DM74S283 4-Bit Binary Adders with Fast Carry

General Description

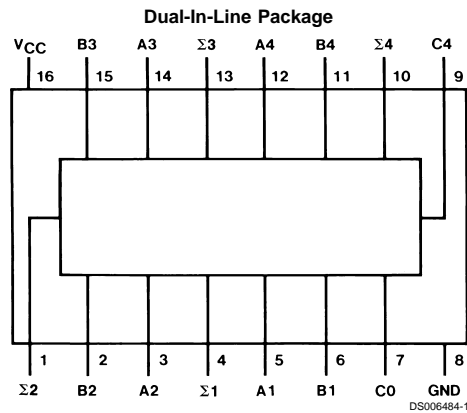
These full adders perform the addition of two 4-bit binary numbers. The sum (Σ) outputs are provided for each bit and the resultant carry (C4) is obtained from the fourth bit. These adders feature full internal look ahead across all four bits. This provides the system designer with partial look-ahead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

Connection Diagram



Absolute Maximum Ratings (Note 1)

Supply Voltage	7V	DM54S	-55°C to +125°C
Input Voltage	5.5V	DM74S	0°C to +70°C
Operating Free Air Temperature Range		Storage Temperature Range	-65°C to +150°C

Recommended Operating Conditions

Symbol	Parameter	DM54S283			DM74S283			Units
		Min	Nom	Max	Min	Nom	Max	
V _{CC}	Supply Voltage	4.5	5	5.5	4.75	5	5.25	V
V _{IH}	High Level Input Voltage	2			2			V
V _{IL}	Low Level Input Voltage			0.8			0.8	V
I _{OH}	High Level Output Current (Output C4)			-0.5			-0.5	mA
	High Level Output Current (Other Outputs)			-1			-1	
I _{OL}	Low Level Output Current (Output C4)			10			10	mA
	Low Level Output Current (Other Outputs)			20			20	
T _A	Free Air Operating Temperature	-55		125	0		70	°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" table are not guaranteed at the absolute maximum ratings. The "Recommended Operating Conditions" table will define the conditions for actual device operation.

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	DM54	2.5	3.4	V
			DM74	2.7	3.4	
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 _{IL}	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 $T_A = 25^\circ C$ (See Section 1 for Test Waveforms and Output Load)

Symbol	Parameter	From (Input) To (Output)	$R_L = 280\Omega$				Units
			$C_L = 15\text{ pF}$		$C_L = 50\text{ pF}$		
			Min	Max	Min	Max	
t_{PLH}	Propagation Delay Time Low to High Level Output	C0 to $\Sigma 1$ or $\Sigma 2$		18		20	ns
t_{PHL}	Propagation Delay Time High to Low Level Output	C0 to $\Sigma 1$ or $\Sigma 2$		18		20	ns
t_{PLH}	Propagation Delay Time Low to High Level Output	C0 to $\Sigma 3$		18		20	ns
t_{PHL}	Propagation Delay Time High to Low Level Output	C0 to $\Sigma 3$		18		20	ns
t_{PLH}	Propagation Delay Time Low to High Level Output	C0 to $\Sigma 4$		18		20	ns
t_{PHL}	Propagation Delay Time High to Low Level Output	C0 to $\Sigma 4$		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 $\Sigma 4$		11		15	ns
t_{PHL}	Propagation Delay Time High to Low Level Output (Note 6)	C0 to $\Sigma 4$		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: $R_L = 560\Omega$.

Function Table

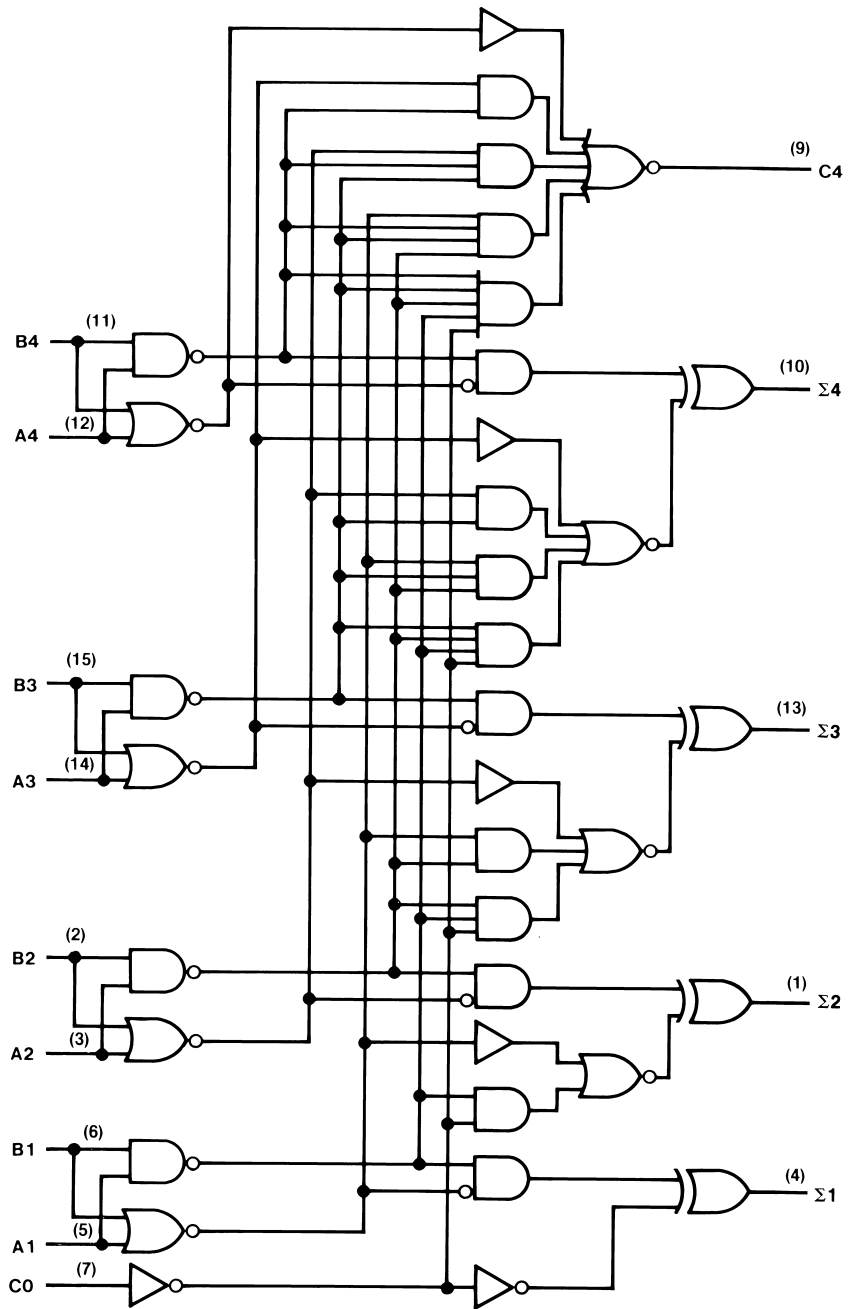
Input				Output										
				When CO = L				When CO = H						
A1	B1	A2	B2	When C2 = L				When C2 = H						
				$\Sigma 1$	$\Sigma 2$	$\Sigma 3$	$\Sigma 4$	$\Sigma 1$	$\Sigma 2$	$\Sigma 3$	$\Sigma 4$	C2	C4	
A3	B3	A4	B4	$\Sigma 1$	$\Sigma 2$	$\Sigma 3$	$\Sigma 4$	C2	$\Sigma 1$	$\Sigma 2$	$\Sigma 3$	$\Sigma 4$	C2	C4
L	L	L	L	L	L	L	L	L	H	L	L	L	L	L
H	L	L	L	H	L	L	L	L	L	H	L	L	L	L
L	H	L	L	L	L	L	L	L	L	H	L	L	L	L
H	H	L	L	L	L	L	L	L	L	H	L	L	L	L
L	L	H	L	L	L	L	L	L	L	H	L	L	L	L
H	L	H	L	L	L	L	L	L	L	H	L	L	L	L
L	H	H	L	L	L	L	L	L	L	H	L	L	L	L
H	H	H	L	L	L	L	L	L	L	H	L	L	L	L
L	L	L	H	L	L	L	L	L	L	H	L	L	L	L
H	L	L	H	L	L	L	L	L	L	H	L	L	L	L
L	H	L	H	L	L	L	L	L	L	H	L	L	L	L
H	H	L	H	L	L	L	L	L	L	H	L	L	L	L
L	L	H	H	L	L	L	L	L	L	H	L	L	L	L
H	L	H	H	L	L	L	L	L	L	H	L	L	L	L
L	H	H	H	L	L	L	L	L	L	H	L	L	L	L
H	H	H	H	L	L	L	L	L	L	H	L	L	L	L

DS006484-3

H = High Level, L = Low Level

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

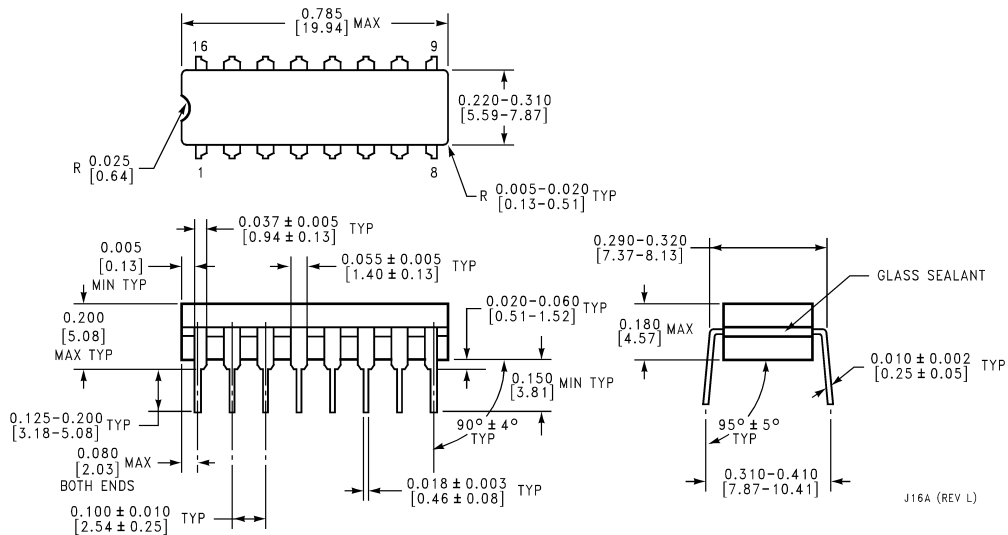
Logic Diagram



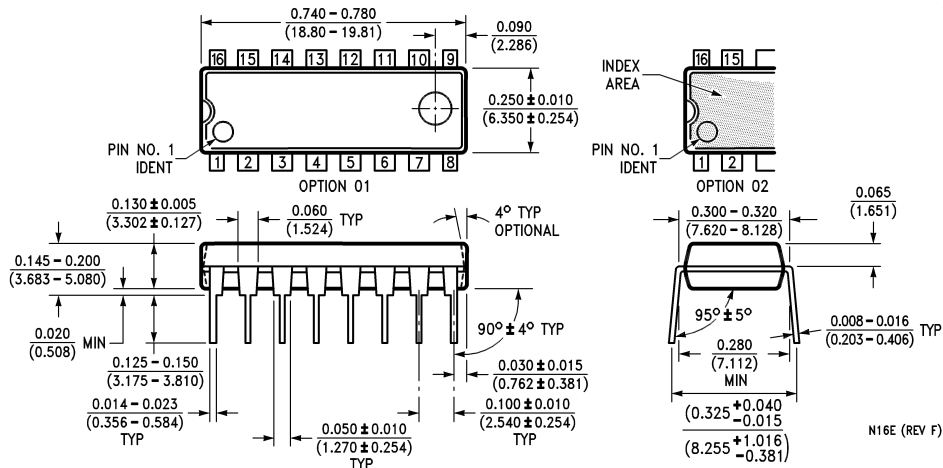
DS006484-2



Physical Dimensions inches (millimeters) unless otherwise noted



16-Lead Ceramic Dual-In-Line Package (J)
Order Number DM54S283J
Package Number J16A



16-Lead Molded Dual-In-Line Package (N)
Order Number DM74S283N
Package Number N16E

LIFE SUPPORT POLICY

FAIRCHILD'S PRODUCTS ARE NOT AUTHORIZED FOR USE AS CRITICAL COMPONENTS IN LIFE SUPPORT DEVICES OR SYSTEMS WITHOUT THE EXPRESS WRITTEN APPROVAL OF THE PRESIDENT OF FAIRCHILD SEMICONDUCTOR CORPORATION. As used herein:

1. Life support devices or systems are devices or systems which, (a) are intended for surgical implant into the body, or (b) support or sustain life, and (c) whose failure to perform when properly used in accordance with instructions for use provided in the labeling, can be reasonably expected to result in a significant injury to the user.
2. A critical component in any component of a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.

Fairchild Semiconductor Corporation Americas
Customer Response Center
Tel: 1-888-522-5372

Fairchild Semiconductor Europe
Fax: +49 (0) 1 80-530 85 86
Email: europe.support@nsc.com
Deutsch Tel: +49 (0) 8 141-35-0
English Tel: +44 (0) 1 793-85-68-56
Italy Tel: +39 (0) 2 57 5631

Fairchild Semiconductor Hong Kong Ltd.
13th Floor, Straight Block,
Ocean Centre, 5 Canton Rd.
Tsimshatsui, Kowloon
Hong Kong
Tel: +852 2737-7200
Fax: +852 2314-0061

National Semiconductor Japan Ltd.
Tel: 81-3-5620-6175
Fax: 81-3-5620-6179

www.fairchildsemi.com