National Semiconductor

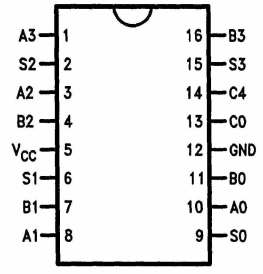
5483A
4-Bit Binary Full Adder with Fast Carry

General Description

The '83A high speed 4-bit binary full adders with internal carry lookahead accept two 4-bit binary words (A_0–A_3, B_0–B_3) and a Carry input (C_0). They generate the binary Sum outputs (S_0–S_3) and the Carry output (C_4) from the most significant bit. They operate with either HIGH or active LOW operands (positive or negative logic). The '283 is recommended for new designs since it features standard corner power pins.

Connection Diagram

Dual-In-Line Package



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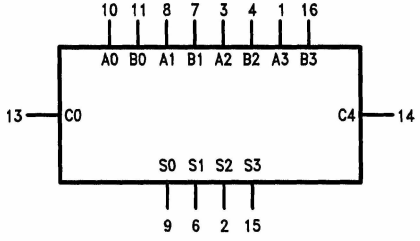
Order Number 5483ADMQB or 5483AFMQB
See NS Package Number J16A or W16A

Logic Symbol



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V_{CC} = Pin 5
GND = Pin 12

Pin Names	Description
A_0–A_3	A Operand Inputs
B_0–B_3	B Operand Inputs
C_0	Carry Input
S_0–S_3	Sum Ouputs
C_4	Carry Ouput

Truth Table

	Inputs									Outputs					
	C_0	A_0	A_1	A_2	A_3	B_0	B_1	B_2	B_3	S_0	S_1	S_2	S_3	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)

H = HIGH Voltage Level
L = LOW Voltage Level

Absolute Maximum Ratings (Note)

If Military/Aerospace specified devices are required, please contact the National Semiconductor Sales Office/Distributors for availability and specifications.

Supply Voltage	7V
Input Voltage	5.5V
Operating Free Air Temperature Range DM54	−55°C to +125°C
Storage Temperature Range	−65°C to +150°C

Note: *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.*

Recommended Operating Conditions

Symbol	Parameter		5483A			Units
			Min	Nom	Max	
V_{CC}	Supply Voltage		4.5	5	5.5	V
V_{IH}	High Level Input Voltage		2			V
V_{IL}	Low Level Input Voltage				0.8	V
I_{OH}	High Level Output Current				−0.8	mA
I_{OL}	Low Level Output Current	S_n			16	mA
		C_4			8	
T_A	Free Air Operating Temperature		−55		125	°C

Electrical Characteristics over recommended operating free air temperature range (unless otherwise noted)

Symbol	Parameter	Conditions		Min	Typ (Note 1)	Max	Units
V_I	Input Clamp Voltage	V_{CC} = Min, I_I = −18 mA				−1.5	V
V_{OH}	High Level Output Voltage	V_{CC} = Min, I_{OH} = Max, V_{IL} = Max, V_{IH} = Min		2.4			V
V_{OL}	Low Level Output Voltage	V_{CC} = Min, I_{OL} = Max, V_{IH} = Min, V_{IL} = Max				0.4	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 = 2.4V				40	μA
I_{IL}	Low Level Input Current	V_{CC} = Max, V_I = 0.4V				−1.6	mA
I_{OS}	Short Circuit Output Current	V_{CC} = Max (Note 2)	Outputs	−20		−55	mA
			C_4	−20		−70	
I_{CC}	Supply Current	V_{CC} = Max				99	mA

Note 1: All typicals are at V_{CC} = 5V, T_A = 25°C.

Note 2: Not more than one output should be shorted at a time, and the duration should not exceed one second.

Switching Characteristics $V_{CC} = +5.0V, T_A = +25°C$

Symbol	Parameter	$C_L = 15$ pF, $R_L = 400\Omega$		Units
		Min	Max	
t_{PLH} t_{PHL}	Propagation Delay C_0 to S_n		21 21	ns
t_{PLH} t_{PHL}	Propagation Delay A_n or B_n to S_n		24 24	ns
t_{PLH} t_{PHL}	Propagation Delay C_0 to C_4		14 16	ns
t_{PLH} t_{PHL}	Propagation Delay A_n or B_n to C_4		14 16	ns

Functional Description

The '83A adds two 4-bit binary words (A and B) plus the incoming carry. The binary sum appears on the sum outputs (S_0–S_3) and outgoing carry (C_4) outputs.

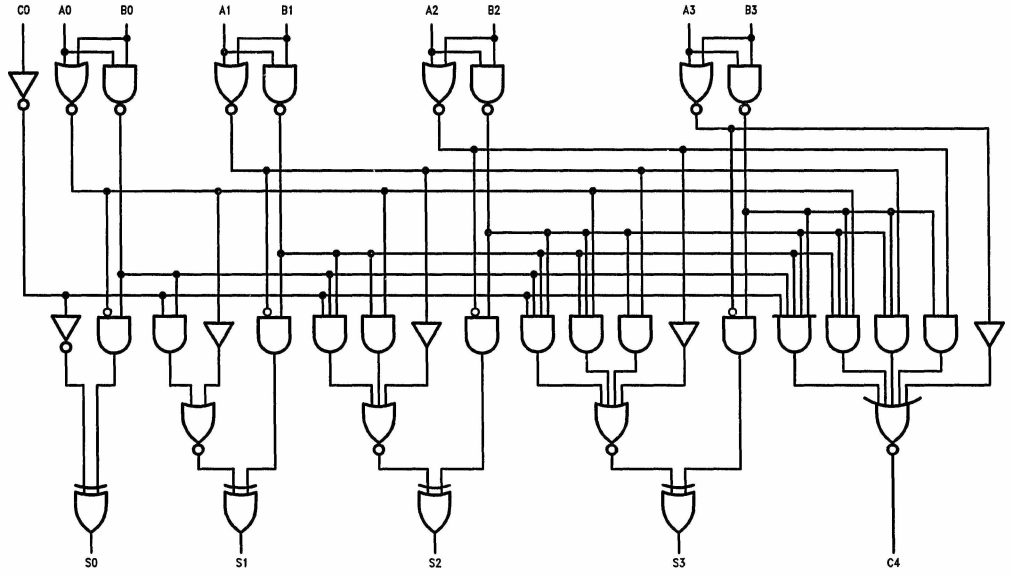
$C_0 + (A_0 + B_0) + 2(A_1 + B_1) + 4(A_2 + B_2) + 8(A_3 + B_3) = S_0 + 2S_1 + 4S_2 + 8S_3 + 16C_4$

Where: (+) = plus

Due to the symmetry of the binary add function the '83A can be used either with 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 In can not be left open, but must be held LOW when no carry in is intended.

Interchanging inputs of equal weight does not affect the operation, thus C_0, A_0, B_0 can be arbitrarily assigned to pins 10, 11, 13, etc.

Logic Diagram



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