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## 5483A

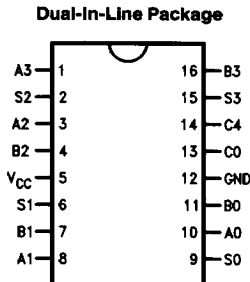
### 4-Bit Binary Full Adder with Fast Carry

#### 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.

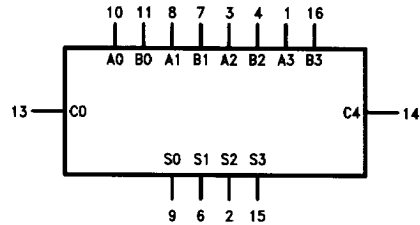
#### Connection Diagram



TL/F/9613-1

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

#### Logic Symbol



$V_{CC}$  = Pin 5  
GND = Pin 12

TL/F/9613-2

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 Outputs
$C_4$	Carry Output

#### 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
Active LOW	1	1	0	1	0	0	1	1	0	0	0	1	1	0

(10 + 9 = 19)  
(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 <sub>CC</sub>	Supply Voltage		4.5	5	5.5	V
V <sub>IH</sub>	High Level Input Voltage		2			V
V <sub>IL</sub>	Low Level Input Voltage				0.8	V
I <sub>OH</sub>	High Level Output Current				-0.8	mA
I <sub>OL</sub>	Low Level Output Current	S <sub>n</sub>			16	mA
		C <sub>4</sub>			8	
T <sub>A</sub>	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 <sub>OH</sub>	High Level Output Voltage	V <sub>CC</sub> = Min, I <sub>OH</sub> = Max, V <sub>IL</sub> = Max, V <sub>IH</sub> = Min	2.4			V
V <sub>OL</sub>	Low Level Output Voltage	V <sub>CC</sub> = Min, I <sub>OL</sub> = Max, V <sub>IH</sub> = Min, V <sub>IL</sub> = Max			0.4	V
I <sub>I</sub>	Input Current @ Max Input Voltage	V <sub>CC</sub> = Max, V <sub>I</sub> = 5.5V			1	mA
I <sub>IH</sub>	High Level Input Current	V <sub>CC</sub> = Max, V <sub>I</sub> = 2.4V			40	μA
I <sub>IL</sub>	Low Level Input Current	V <sub>CC</sub> = Max, V <sub>I</sub> = 0.4V			-1.6	mA
I <sub>OS</sub>	Short Circuit Output Current	V <sub>CC</sub> = Max (Note 2)	Outputs	-20	-55	mA
			C <sub>4</sub>	-20	-70	
I <sub>CC</sub>	Supply Current	V <sub>CC</sub> = Max			99	mA

Note 1: All typicals are at V<sub>CC</sub> = 5V, T<sub>A</sub> = 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 $V_{CC} = +5.0V, T_A = +25^\circ C$

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

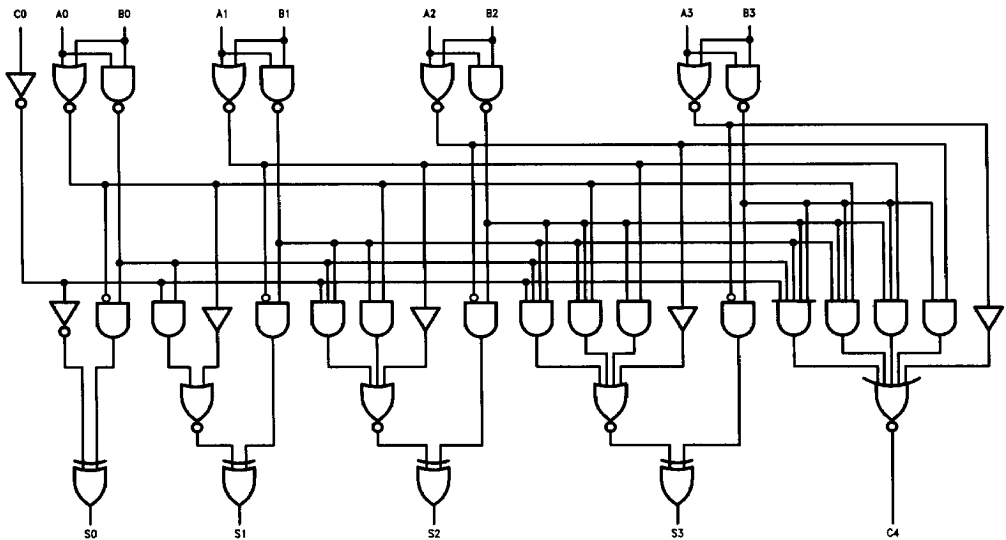
$$C_0 + (A_0 + B_0) + 2(A_1 + B_1) + 4(A_2 + B_2) + 8(A_3 + B_3) = S_0 + 2S_1 + 4S_2 + 8S_3 + 16C_4$$

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



TL/F/9613-3