

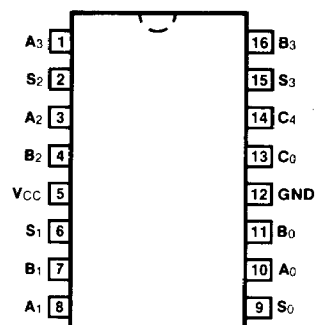
**54/7483A**  
**54LS/74LS83A**  
 4-BIT BINARY FULL ADDER  
 (With Fast Carry)

**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.

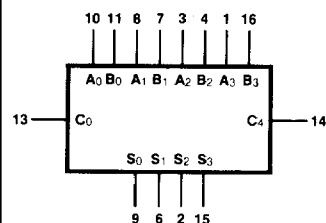
**ORDERING CODE:** See Section 9

PKGS	PIN OUT	COMMERCIAL GRADE	MILITARY GRADE	PKG TYPE
		$V_{CC} = +5.0\text{ V} \pm 5\%$ , $T_A = 0^\circ\text{C to } +70^\circ\text{C}$	$V_{CC} = +5.0\text{ V} \pm 10\%$ , $T_A = -55^\circ\text{C to } +125^\circ\text{C}$	
Plastic DIP (P)	A	7483APC, 74LS83APC		9B
Ceramic DIP (D)	A	7483ADC, 74LS83ADC	5483ADM, 54LS83ADM	6B
Flatpak (F)	A	7483AFC, 74LS83AFC	5483AFM, 54LS83AFM	4L

**CONNECTION DIAGRAM**  
**PINOUT A**



**LOGIC SYMBOL**



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

**INPUT LOADING/FAN-OUT:** See Section 3 for U.L. definitions

PIN NAMES	DESCRIPTION	54/74 (U.L.) HIGH/LOW	54/74LS (U.L.) HIGH/LOW
$A_0 - A_3$	A Operand Inputs	1.0/1.0	1.0/0.5
$B_0 - B_3$	B Operand Inputs	1.0/1.0	1.0/0.5
$C_0$	Carry Input	1.0/1.0	0.5/0.25
$S_0 - S_3$	Sum Outputs	20/10	10/5.0 (2.5)
$C_4$	Carry Output	10/5.0	10/5.0 (2.5)

**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 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 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.

**TRUTH TABLE**

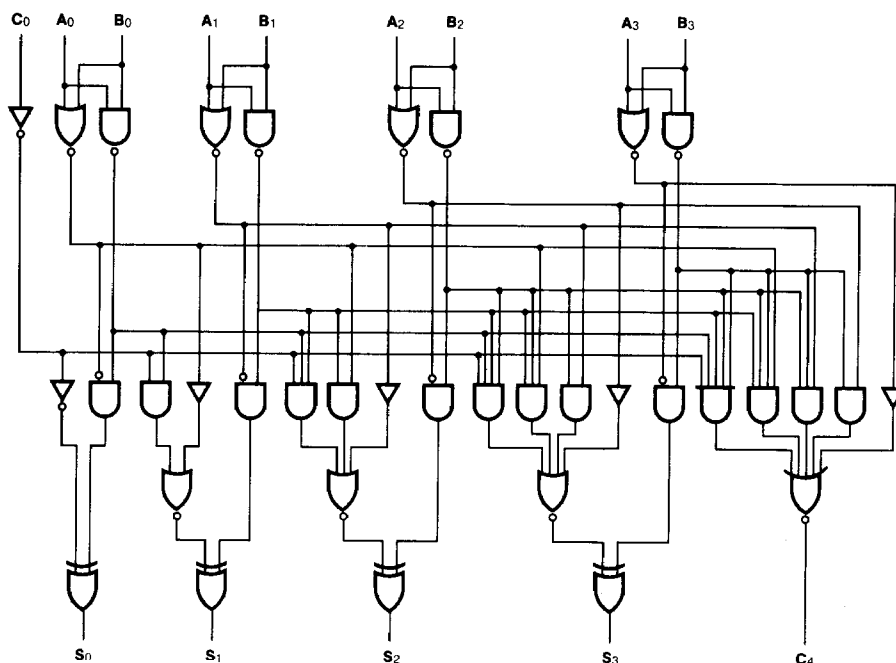
	INPUTS									OUTPUTS				
	$C_0$	$A_0$	$A_1$	$A_2$	$A_3$	$B_0$	$B_1$	$B_2$	$B_3$	$S_0$	$S_1$	$S_2$	$S_3$	$C_4$
Logic Levels	L	L	H	L	H	H	L	L	H	H	H	L	L	H
Active HIGH	0	0	1	0	1	1	0	0	1	1	1	0	0	1
Active LOW	1	1	0	1	0	0	1	1	0	0	0	1	1	0

(10 + 9 = 19)

(carry + 5 + 6 = 12)

H = HIGH Voltage Level  
L = LOW Voltage Level

**LOGIC DIAGRAM**



**DC CHARACTERISTICS OVER OPERATING TEMPERATURE RANGE** (unless otherwise specified)

SYMBOL	PARAMETER		54/74		54/74LS		UNITS	CONDITIONS
			Min	Max	Min	Max		
I <sub>OS</sub>	Output Short Circuit Current at S <sub>n</sub>	XM	-20	-55	-20	-100	mA	V <sub>CC</sub> = Max
		XC	-18	-55	-20	-100		
I <sub>OS</sub>	Output Short Circuit Current at C <sub>4</sub>	XM	-20	-70	-20	-100	mA	V <sub>CC</sub> = Max
		XC	-18	-70	-20	-100		
I <sub>CC</sub>	Power Supply Current	XM	99		39		mA	V <sub>CC</sub> = Max, Inputs = Gnd ('LS83A) Inputs = 4.5 V ('83A)
		XC	110		39			

**AC CHARACTERISTICS:** V<sub>CC</sub> = 5.0 V, T<sub>A</sub> = 25° C (See Section 3 for waveforms and load configurations)

SYMBOL	PARAMETER	54/74		54/74LS		UNITS	CONDITIONS
		C <sub>L</sub> = 15 pF R <sub>L</sub> = 400 Ω		C <sub>L</sub> = 15 pF			
		Min	Max	Min	Max		
t <sub>PLH</sub> t <sub>PHL</sub>	Propagation Delay C <sub>0</sub> to S <sub>n</sub>	21 21		24 24		ns	Figs. 3-1, 3-20
t <sub>PLH</sub> t <sub>PHL</sub>	Propagation Delay A <sub>n</sub> or B <sub>n</sub> to S <sub>n</sub>	24 24		24 24			
t <sub>PLH</sub> t <sub>PHL</sub>	Propagation Delay C <sub>0</sub> to C <sub>4</sub>	14 16		17 17		ns	Figs. 3-1, 3-5 R <sub>L</sub> = 780 Ω ('83A)
t <sub>PLH</sub> t <sub>PHL</sub>	Propagation Delay A <sub>n</sub> or B <sub>n</sub> to C <sub>4</sub>	14 16		17 17			