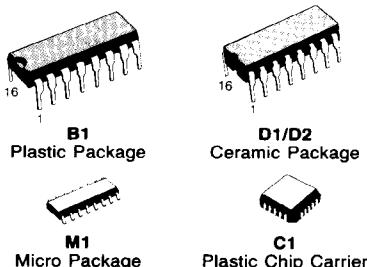




4-BIT BINARY FULL ADDER WITH FAST CARRY

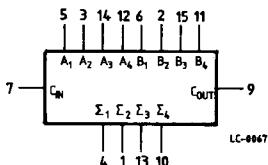
DESCRIPTION

The T54LS283/T74LS283 is a high speed 4-Bit Binary Full Adder with internal carry lookahead. It accepts two 4-bit binary words (A_1-A_4 , B_1-B_4) and a Carry Input (C_{IN}). It generates the binary Sum outputs ($\Sigma_1-\Sigma_4$) and the Carry Output (C_{OUT}) from the most significant bit. The LS283 operates with either active HIGH or active LOW operands (positive or negative logic).



ORDERING NUMBERS:
 T54LS283 D2 T74LS283 C1
 T74LS283 D1 T74LS283 M1
 T74LS283 B1

LOGIC SYMBOL



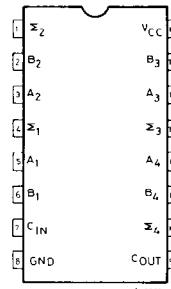
V_{CC} = Pin 16
 GND = Pin 8

PIN NAMES

A_1-A_4	Operand A Inputs
B_1-B_4	Operand B Inputs
C_{IN}	Carry Inputs
$\Sigma_1-\Sigma_4$	Sum Outputs
C_{OUT}	Carry Outputs

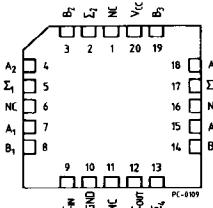
PIN CONNECTION (top view)

DUAL IN LINE



5-8023

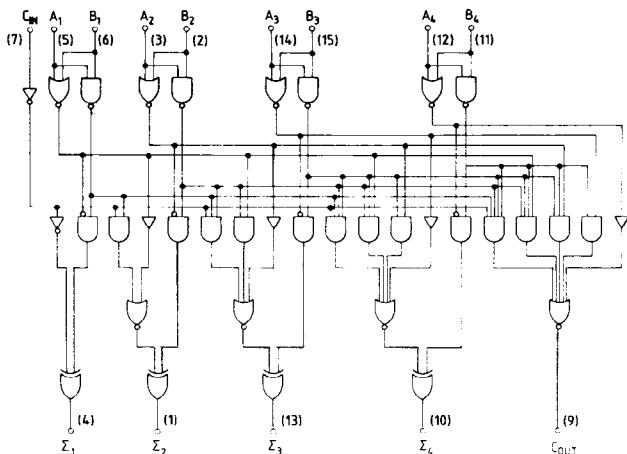
CHIP CARRIER



PC-1099

NC = No Internal Connection

LOGIC DIAGRAM



V_{CC} = Pin 16

GND = Pin 8

() = Pin numbers

LC-0102

ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
V _{CC}	Supply Voltage	- 0.5 to 7	V
V _I	Input Voltage, Applied to Input	- 0.5 to 15	V
V _O	Output Voltage, Applied to Output	- 0.5 to 10	V
I _I	Input Current, Into Inputs	- 30 to 5	mA
I _O	Output Current, Into Outputs	50	mA

Stresses in excess of those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. This is a stress rating only and functional operation of the device at these or any other conditions in excess of those indicated in the operational sections of this specification is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

GUARANTEED OPERATING RANGES

Part Numbers	Supply Voltage			Temperature
	Min	Typ	Max	
T54LS283D2	4.5 V	5.0 V	5.5 V	55°C to + 125°C
T74LS283XX	4.75 V	5.0 V	5.25 V	0°C to + 70°C

XX = package type.

FUNCTIONAL DESCRIPTION

The LS283 adds two 4-bit binary words (A plus B) plus the incoming carry. The binary sum appears

$$C_{IN} + (A_1 + B_1) + 2(A_2 + B_2) + 4(A_3 + B_3) + 8(A_4 + B_4) = \Sigma_1 + 2\Sigma_2 + 4\Sigma_3 + 8\Sigma_4 + 16C_{OUT}$$

where: (+) = plus

Due to the symmetry of the binary add function the LS283 can be used with either all input and outputs active HIGH (positive logic) or with all inputs and outputs active LOW (negative logic).

Example:

C_{IN}	A₁	A₂	A₃	A₄	B₁	B₂	B₃	B₄	Σ₁	Σ₂	Σ₃	Σ₄	C_{OUT}	
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)

Interchanging inputs of equal weight does not affect operation, thus C_{IN}, A₁, B₁, can be arbitrarily assigned to pins 7, 1 or 3.

AC WAVEFORMS

Fig. 1

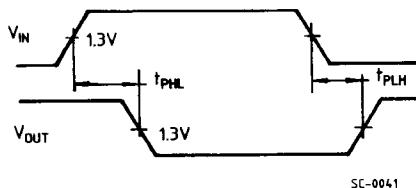
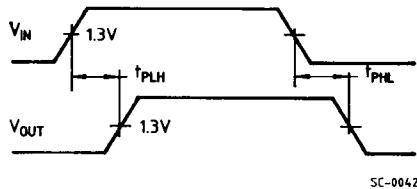


Fig. 2





DC CHARACTERISTICS OVER OPERATING TEMPERATURE RANGE

Symbol	Parameter	Limits			Test Conditions (Note 1)	Units
		Min.	Typ.	Max.		
V _{IH}	Input HIGH Voltage	2.0			Guaranteed input HIGH Voltage for all Inputs	V
V _{IL}	Input LOW Voltage	54		0.7	Guaranteed input LOW Voltage for all Inputs	V
		74		0.8		
V _{CD}	Input Clamp Diode Voltage		- 0.65	- 1.5	V _{CC} = MIN, I _{IN} = - 18mA	V
V _{OH}	Output HIGH Voltage	54	2.5	3.4	V _{CC} = MIN, I _{OH} = - 400μA, V _{IN} = V _{IH} or V _{IL} per Truth Table	V
		74	2.7	3.4		
V _{OL}	Output LOW Voltage	54,74		0.25	I _{OL} = 4.0mA	V _{CC} = MIN, V _{IN} = V _{IH} or V _{IL} per Truth Table
		74		0.35	I _{OL} = 8.0mA	
I _{IH}	Input HIGH Current C _{IN} Any A or B			20 40	V _{CC} = MAX, V _{IN} = 2.7V	μA
				0.1 0.2	V _{CC} = MAX, V _{IN} = 7.0V	mA
I _{IL}	Input LOW Current C _{IN} Any A or B			- 0.4 - 0.8	V _{CC} = MAX, V _{IN} = 0.4V	mA
I _{OS}	Output Short Circuit Current (Note 2)	- 20		- 100	V _{CC} = MAX, V _{OUT} = 0V	mA
I _{CC}	Power Supply Current		22 19	39 34	V _{CC} = MAX, All Inputs 0V V _{CC} = MAX, A Inputs = 4.5V	mA

AC CHARACTERISTICS: T_A = 25°C

Symbol	Parameter	Limits			Test Conditions	Units
		Min.	Typ.	Max.		
t _{PLH} t _{PHL}	Propagation Delay, C _{IN} Input to Any Σ Output		16 15	24 24	V _{CC} = 5.0V C _L = 15pF Figures 1 and 2	ns
t _{PLH} t _{PHL}	Propagation Delay, Any A or B Input to Σ Outputs		15 15	24 24		ns
t _{PLH} t _{PHL}	Propagation Delay, C _{IN} Input to C _{OUT} Output		11 11	17 22		ns
t _{PLH} t _{PHL}	Propagation Delay, Any A or B Input to C _{OUT} Output		11 12	17 17		ns

Notes:

- 1) Conditions for testing, not shown in the Table, are chosen to guarantee operation under "worst case" conditions
- 2) Not more than one output should be shorted at a time.
- 3) Typical values are at V_{CC} = 5.0V, T_A = 25°C