HD74LS283 ●4-bit Binary Full Adders

The HD74LS283 adder is electrically and functionally identical to the HD74LS83A, respectively; only the arrangement of the terminals has been changed.
This improved full adder performs the addition of two 4-bit binary words.
The sum (Σ) outputs are provided for each bit and the resultant carry (C_4) is obtained from the fourth bit. This adder features full internal look-ahead across all four bits generating the carry term in then nanoseconds.
The adder logic, including the carry, is implemented in its true form.
End arround carry can be accomplished without the need for logic or level inversion.

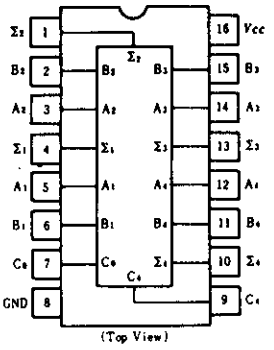
■FUNCTION TABLE

Inputs				Outputs					
				When C_0=L			When C_0=H		
				When C_2=L			When C_2=H		
A_1 / A_3	B_1 / B_3	A_2 / A_4	B_2 / B_4	Σ_1 / Σ_3	Σ_2 / Σ_4	C_2 / C_4	Σ_1 / Σ_3	Σ_2 / Σ_4	C_2 / C_4
L	L	L	L	L	L	L	H	L	L
H	L	L	L	H	L	L	L	H	L
L	H	L	L	H	L	L	L	H	L
H	H	L	L	L	H	L	H	H	L
L	L	H	L	L	H	L	H	H	L
H	L	H	L	H	H	L	L	L	H
L	H	H	L	H	H	L	L	L	H
H	H	H	L	L	L	H	H	L	H
L	L	L	H	L	H	L	H	H	L
H	L	L	H	H	H	L	L	L	H
L	H	L	H	H	H	L	L	L	H
H	H	L	H	L	L	H	H	L	H
L	L	H	H	L	L	H	H	L	H
H	L	H	H	H	L	H	L	H	H
L	H	H	H	H	L	H	L	H	H
H	H	H	H	L	H	H	H	H	H

H; high level, L; low level

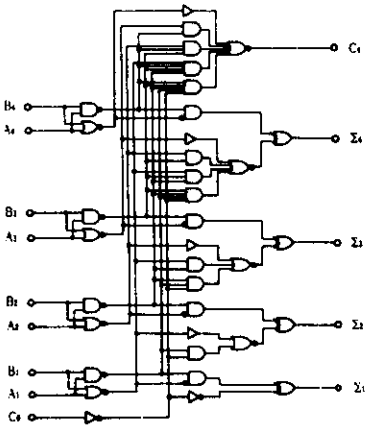
Notes) Input conditions at A_1, B_1, A_2, B_2, and C_0 are use to determine outputs Σ_1 and Σ_2 and the value of the internal carry C_2. The values at C_2, A_3, B_3, A_4, and B_4 are then used to determine outputs Σ_3, Σ_4, and C_4.

■PIN ARRANGEMENT



(Top View)

■BLOCK DIAGRAM



■ELECTRICAL CHARACTERISTICS (Ta=−20～+75°C)

Item		Symbol	Test Conditions		min	typ*	max	Unit
Input voltage		V_{IH}			2.0	—	—	V
		V_{IL}			—	—	0.8	V
Output voltage		V_{OH}	V_{CC}=4.75V, V_{IH}=2V, V_{IL}=0.8V, I_{OH}=−400μA		2.7	—	—	V
		V_{OL}	V_{CC}=4.75V, V_{IH}=2V, V_{IL}=0.8V	I_{OL}=4mA	—	—	0.4	V
				I_{OL}=8mA	—	—	0.5	
Input current	except C_0	I_{IH}	V_{CC}=5.25V, V_I=2.7V		—	—	40	μA
	C_0				—	—	20	
	except C_0	I_{IL}	V_{CC}=5.25V, V_I=0.4V		—	—	−0.8	mA
	C_0				—	—	−0.4	
	except C_0	I_I	V_{CC}=5.25V, V_I=7V		—	—	0.2	mA
	C_0				—	—	0.1	
Short-circuit output current		I_{OS}	V_{CC}=5.25V		−20	—	−100	mA
Supply current		I_{CC}	V_{CC}=5.25V	All inputs grounded	—	22	39	mA
				All B low, other inputs at 4.5V	—	19	34	
				All inputs at 4.5V	—	19	34	
Input clamp voltage		V_{IK}	V_{CC}=4.75V, I_{IN}=−18mA		—	—	−1.5	V

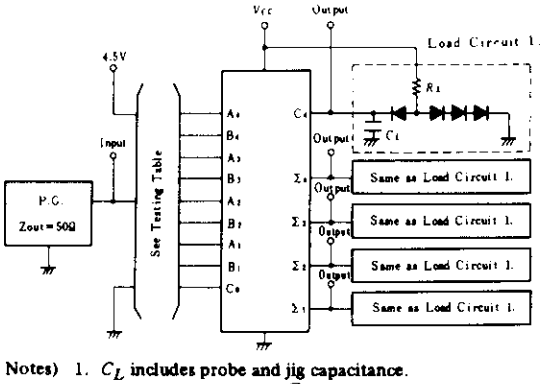
* V_{CC}=5V, Ta=25°C

■SWITCHING CHARACTERISTICS (V_{CC}=5V, Ta=25°C)

Item	Symbol	Inputs	Outputs	Test Conditions	min	typ	max	Unit
Propagation delay time	t_{PLH}	C_0	Σi	C_L=15pF, R_L=2kΩ	—	16	24	ns
	t_{PHL}				—	15	24	ns
	t_{PLH}	Ai, Bi	Σi		—	15	24	ns
	t_{PHL}				—	15	24	ns
	t_{PLH}	C_0	C_4		—	11	17	ns
	t_{PHL}				—	11	22	ns
	t_{PLH}	Ai, Bi	C_4		—	11	17	ns
	t_{PHL}				—	12	17	ns

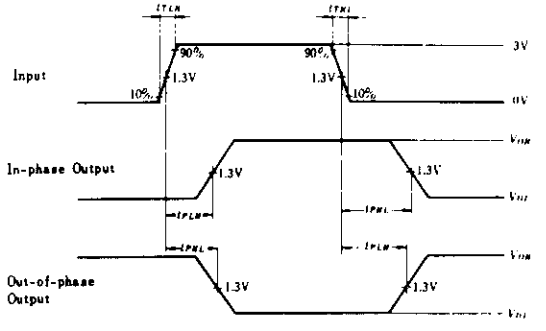
■TESTING METHOD

1) Test Circuit



Notes) 1. C_L includes probe and jig capacitance.
2. All diodes are 1S2074 Ⓗ.

Waveform

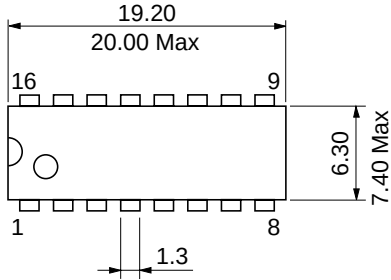


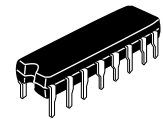
Input pulse; t_{TLH}≦15ns, t_{THL}≦6ns,
PRR=1MHz, duty cycle 50%.

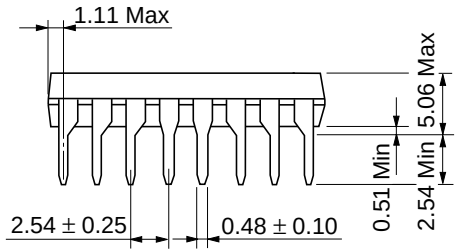
2) Testing Table

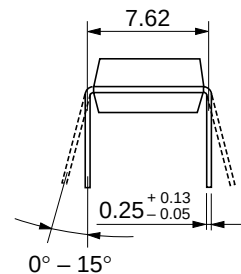
Item	From input to output	Inputs									Outputs				
		B_4	A_4	B_3	A_3	B_2	A_2	B_1	A_1	C_0	C_4	Σ_4	Σ_3	Σ_2	Σ_1
t_{PLH} t_{PHL}	Co→Σi or C_4	GND	GND	GND	GND	GND	GND	GND	GND	IN	—	—	—	—	OUT
		GND	4.5V	GND	4.5V	GND	4.5V	GND	4.5V	IN	OUT	OUT	OUT	OUT	OUT
	Ai or Bi →Σi or C_4	GND	GND	GND	GND	GND	GND	GND / IN	IN / GND	GND	—	—	—	—	OUT
		GND	GND	GND	GND	GND / IN	IN / GND	GND	GND	GND	—	—	—	OUT	—
		GND	GND	GND / IN	IN / GND	GND	GND	GND	GND	GND	—	—	OUT	—	—
		GND / IN	IN / GND	GND	GND	GND	GND	GND	GND	GND	—	OUT	—	—	—
		GND	GND	GND	GND	GND	GND	4.5V / IN	IN / 4.5V	GND	—	—	—	OUT	OUT
		GND	GND	GND	GND	4.5V / IN	IN / 4.5V	GND	GND	GND	—	—	OUT	OUT	—
		GND	GND	4.5V / IN	IN / 4.5V	GND	GND	GND	GND	GND	—	OUT	OUT	—	—
		4.5V / IN	IN / 4.5V	GND	GND	GND	GND	GND	GND	GND	OUT	OUT	—	—	—

Unit: mm



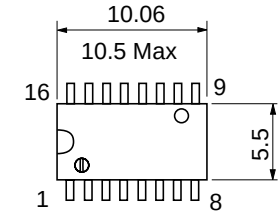


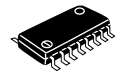


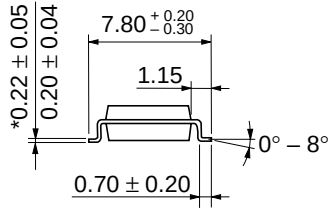


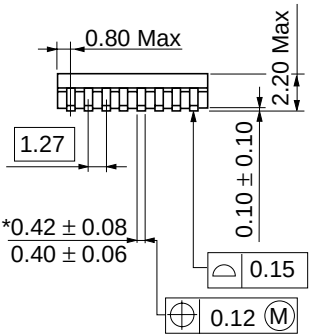
Hitachi Code	DP-16
JEDEC	Conforms
EIAJ	Conforms
Weight (reference value)	1.07 g

Unit: mm









*Dimension including the plating thickness
Base material dimension

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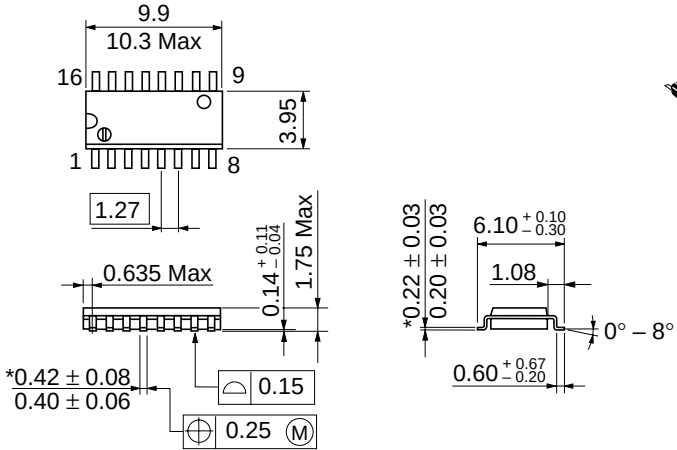
JEDEC	—
EIAJ	Conforms
Weight (reference value)	0.24 g

Unit: mm



Hitachi Code	FP-16DN
JEDEC	Conforms
EIAJ	Conforms
Weight (reference value)	0.15 g

*Dimension including the plating thickness
Base material dimension

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