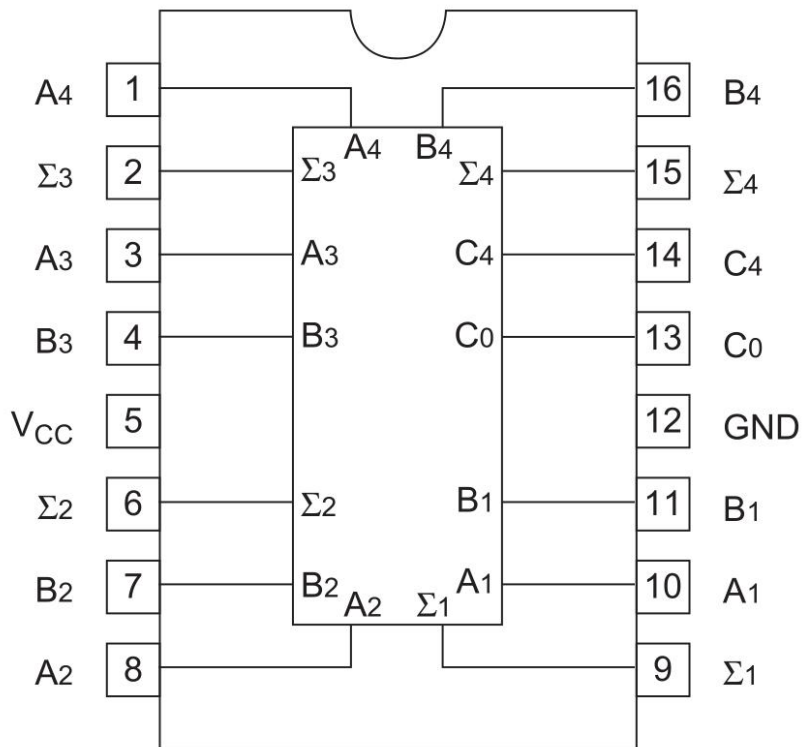


1. DESCRIPTION

This improved full adder performs the addition of two 4-bit binary numbers. 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 bit generating the carry term in ten nanoseconds typically. This provides the system designer with partial look-ahead performance at the economy and reduced package count of a ripple-carry implementation.

2. PIN CONFIGURATIONS



(Top view)

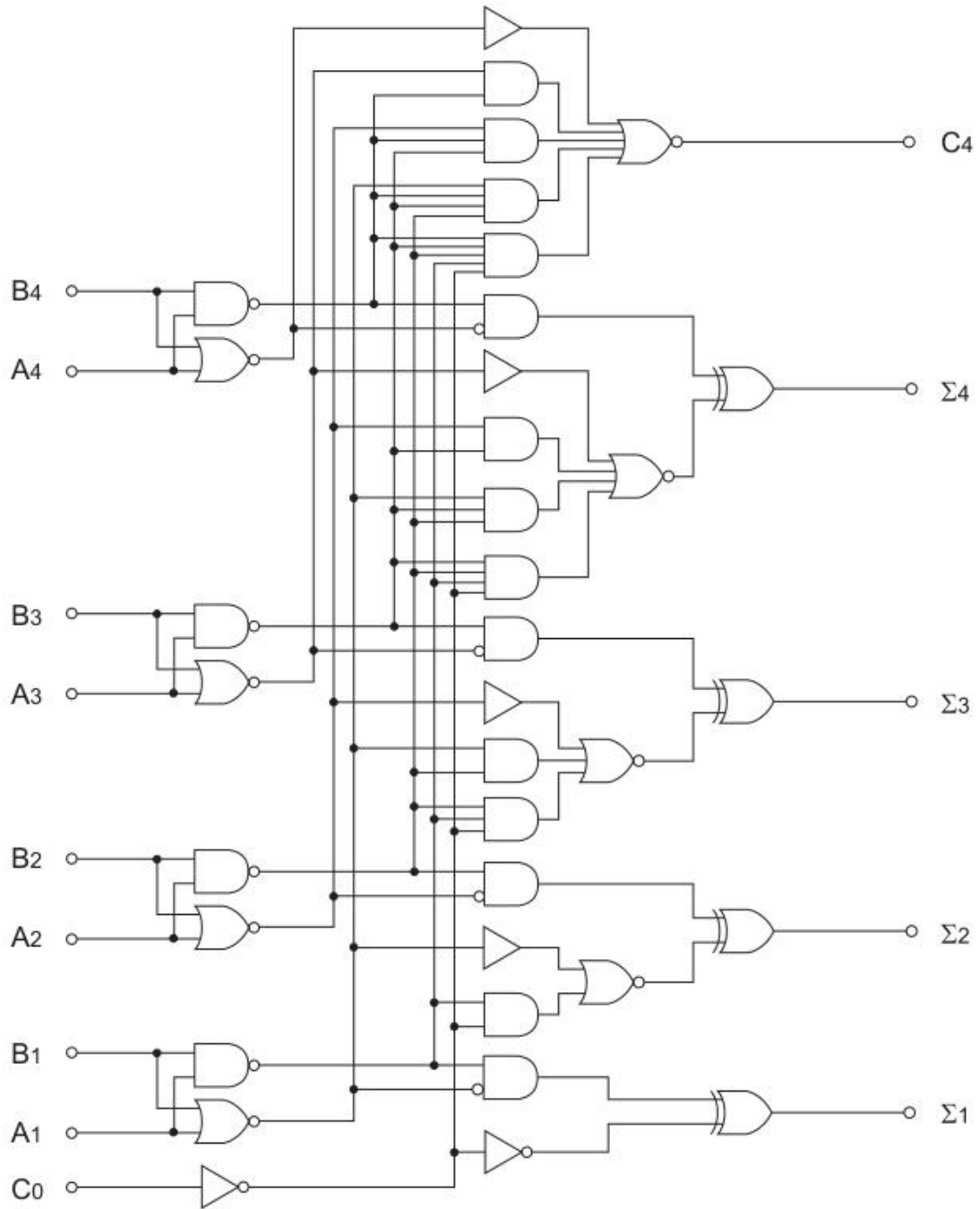
3. FUNCTION TABLE

Input				Output					
				When $C_0 = L$			When $C_0 = H$		
				When $C_2 = L$			When $C_2 = H$		
A_1	B_1	A_2	B_2	Σ_1	Σ_2	C_2	Σ_1	Σ_2	C_2
A_3	B_3	A_4	B_4	Σ_3	Σ_4	C_4	Σ_3	Σ_4	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, X; irrelevant

Note: Input conditions at $A_1, B_1, A_2, B_2,$ and C_0 are used to determine outputs Σ_1 and Σ_2 and the value of the internal carry C_2 . The value at $C_2, A_3, B_3, A_4,$ and B_4 are than used to determine outputs Σ_3, Σ_4 and C_4 .

4. LOGIC DIAGRAMS



5. ABSOLUTE MAXIMUM RATINGS

Item	Symbol	Ratings	Unit
Supply voltage	V_{CC}	7	V
Input voltage	V_{IN}	7	V
Power dissipation	P_T	400	mW
Storage temperature	T_{stg}	-65 to +150	°C

6. RECOMMENDED OPERATING CONDITIONS

Item	Symbol	Min	Typ	Max	Unit
Supply voltage	V_{CC}	4.75	5.00	5.25	V
Output current	I_{OH}	—	—	-400	μA
	I_{OL}	—	—	8	mA
Operating temperature	T_{opr}	-0		70	°C

7. ELECTRICAL CHARACTERISTICS

($T_a = -0$ to $+70$ °C)

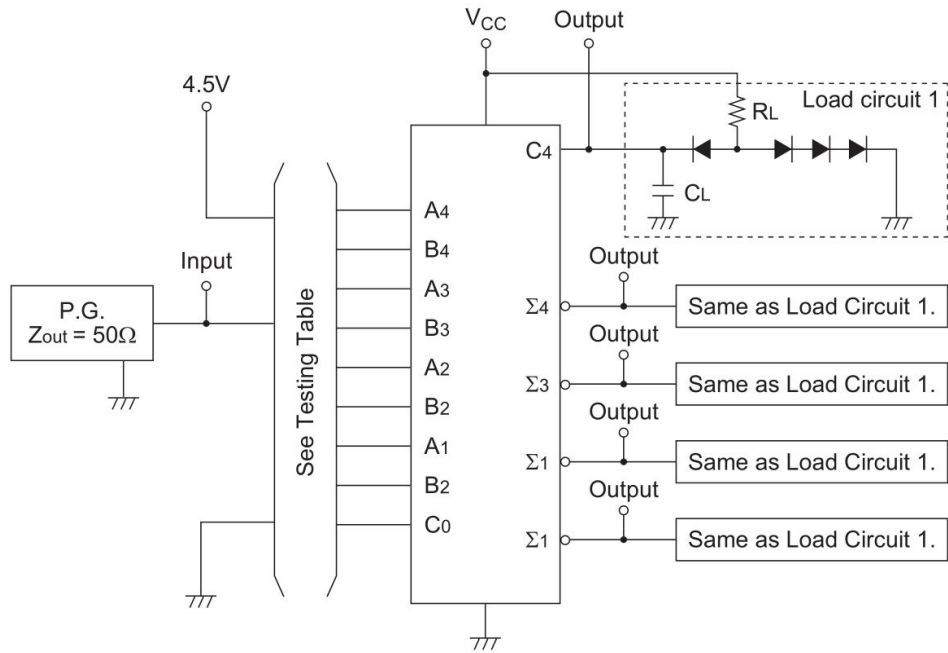
Item	Symbol	min.	typ.*	max.	Unit	Condition	
Input voltage	V_{IH}	2.0	—	—	V		
	V_{IL}	—	—	0.8	V		
Output voltage	V_{OH}	2.7	—	—	V	$V_{CC} = 4.75$ V, $V_{IH} = 2$ V, $V_{IL} = 0.8$ V, $I_{OH} = -400$ μA	
	V_{OL}	—	—	0.4	V	$I_{OL} = 4$ mA, $V_{CC} = 4.75$ V, $V_{IH} = 2$ V, $V_{IL} = 0.8$ V	
		—	—	0.5			
Input current	except C_0	I_{IH}	—	—	40	μA	$V_{CC} = 5.25$ V, $V_I = 2.7$ V
			C_0	—	—		
	except C_0	I_{IL}	—	—	-0.8	mA	$V_{CC} = 5.25$ V, $V_I = 0.4$ V
			C_0	—	—		
except C_0	I_I	—	—	0.2	mA	$V_{CC} = 5.25$ V, $V_I = 7$ V	
		C_0	—	—			0.1
Short-circuit output current	I_{OS}	-20	—	-100	mA	$V_{CC} = 5.25$ V	
Supply current	I_{CC}	—	22	39	mA	All inputs = 0 V	
		—	19	34		B input = 0.8 V, Other inputs 4.5 V	
		—	19	34		All inputs = 4.5 V	
Input clamp voltage	V_{IR}	—	—	-1.5	V	$V_{CC} = 4.75$ V, $I_{IN} = -18$ mA	

8. SWITCHING CHARACTERISTICS

($V_{CC} = 5\text{ V}$, $T_a = 25^\circ\text{C}$)

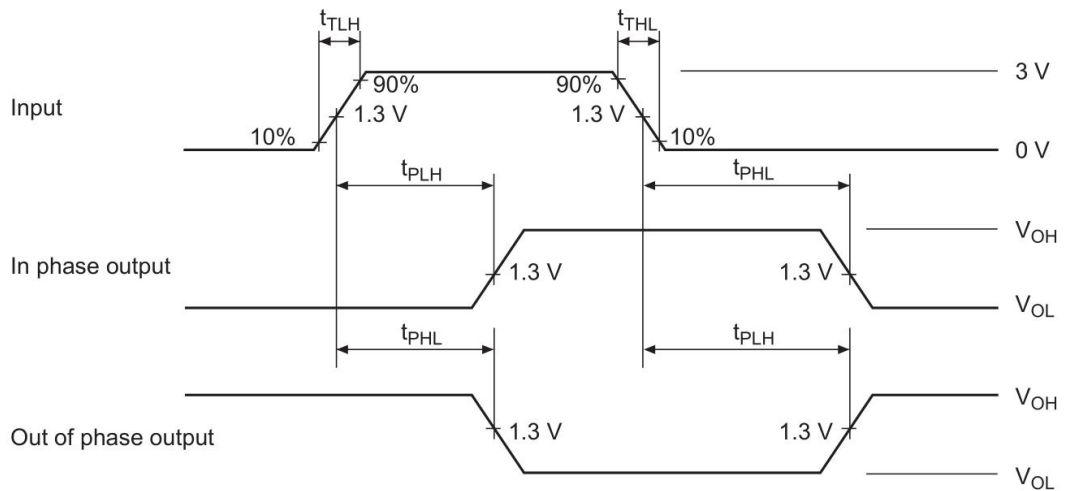
Item	Symbol	Inputs	Outputs	min.	typ.	max.	Unit	Condition
Propagation delay time	t_{PLH}	C	Σ	—	16	24	ns	$C_L = 15\text{ pF}$, $R_L = 2\text{ k}\Omega$
	t_{PHL}			—	15	24		
	t_{PLH}	A_i, B_i	Σ	—	15	24		
	t_{PHL}			—	15	24		
	t_{PLH}	C	C	—	11	17		
	t_{PHL}			—	15	22		
	t_{PLH}	A_i, B_i	C	—	11	17		
	t_{PHL}			—	12	17		

9. TESTING METHOD



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

10. WAVEFORM



Note: Input pulse; $t_{TLH} \leq 15 \text{ ns}$, $t_{THL} \leq 6 \text{ ns}$, PRR = 1 MHz, duty cycle = 50%

11. WTESTING TABLE

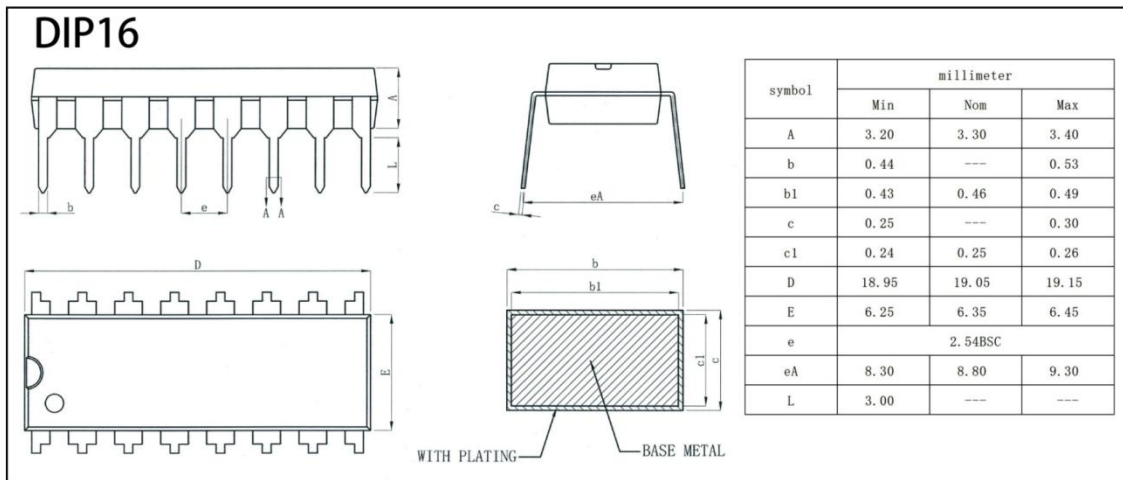
Item	From input to output	Input									Output								
		B ₄	A ₄	B ₃	A ₃	B ₂	A ₂	B ₁	A ₁	C ₀	C ₄	Σ ₄	Σ ₃	Σ ₂	Σ ₁				
t _{PLH} t _{PHL}	C ₀ → Σ _i or C ₄	GND	GND	GND	GND	GND	GND	GND	GND	GND	IN	—	—	—	—	OUT			
		GND	GND	GND	4.5 v	GND	4.5 v	GND	4.5 v	IN	IN	OUT	OUT	OUT	OUT	OUT			
	A _i or B _i → Σ _i or C ₄	GND	GND	GND	GND	GND	GND	GND	GND	GND	GND	IN	GND	—	—	—	—	OUT	
											IN	GND							
		GND	GND	GND	GND	GND	GND	GND	GND	GND	GND	GND	IN	GND	—	—	—	OUT	—
												IN	GND						
		GND	GND	GND	GND	GND	GND	GND	GND	GND	GND	GND	IN	GND	—	—	OUT	—	—
												IN	GND						
		GND	IN	GND	GND	GND	GND	GND	GND	GND	GND	GND	IN	GND	—	OUT	—	—	—
												IN	GND						
		GND	GND	GND	GND	GND	GND	GND	GND	GND	GND	4.5 v	IN	GND	—	—	—	OUT	OUT
												IN	4.5 v						
		GND	GND	GND	GND	GND	GND	GND	GND	GND	GND	4.5 v	IN	GND	—	—	OUT	OUT	—
												IN	4.5 v						
GND	GND	4.5 v	IN	GND	GND	GND	GND	GND	GND	GND	IN	GND	—	OUT	OUT	—	—		
										IN	4.5 v								
4.5 v	IN	GND	GND	GND	GND	GND	GND	GND	GND	GND	IN	GND	OUT	OUT	—	—	—		
										IN	4.5 v								

12. ORDERING INFORMATION

Ordering Information

Part Number	Device Marking	Package Type	Body size (mm)	Temperature (°C)	MSL	Transport Media	Package Quantity
XD74LS83	XD74LS83	DIP16	19.05 * 6.35	-0 to 70	MSL3	Tube 25	1000

13. DIMENSIONAL DRAWINGS



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