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# HD74HC182

## Look-Ahead Carry Generator

# HITACHI

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### Description

The HD74HC182 is a high-speed Carry Lookahead Generator. It is used with the HD74HC181 4-Bit Arithmetic Logic Unit to provide high-speed lookahead over Word lengths of more than four bits. The device accepts up to four pairs of active-low Carry Propagate ( $\overline{P}_0, \overline{P}_1, \overline{P}_2, \overline{P}_3$ ) and Carry Generate ( $\overline{G}_0, \overline{G}_1, \overline{G}_2, \overline{G}_3$ ) signals and an active-high carries ( $C_{n+x}, C_{n+y}, C_{n+z}$ ) across four groups of binary adders. The HD74HC182 also has active-low Carry Propagate ( $\overline{P}$ ) and Carry Generate ( $\overline{G}$ ) outputs which may be used for further levels of lookahead.

The logic equations provided at the outputs are:

$$\overline{C}_{n+x} = \overline{Y_0 (X_0 + C_n)}$$

$$\overline{C}_{n+y} = \overline{Y_1 \{X_1 + Y_0 (X_0 + C_n)\}}$$

$$\overline{C}_{n+z} = \overline{Y_2 [X_2 + Y_1 \{X_1 + Y_0 (X_0 + C_n)\}]}$$

$$Y = Y_3 (X_3 + Y_2) (X_3 + X_2 + Y_1) (X_3 + X_2 + X_1 + Y_0)$$

$$X = X_3 + X_2 + X_1 + X_0$$

or

$$C_{n+x} = G_0 + P_0 C_n$$

$$C_{n+y} = G_1 + P_1 G_0 + P_1 P_0 C_n$$

$$C_{n+z} = G_2 + P_2 G_1 + P_2 P_1 G_0 + P_2 P_1 P_0 C_n$$

$$G = \overline{G_3 + P_3 G_2 + P_3 P_2 G_1 + P_3 P_2 P_1 G_0}$$

$$\overline{P} = \overline{P_3 P_2 P_1 P_0}$$

Also, the HD74HC182 can be used with binary ALUs in an active-low or active-high input operand mode. The connections to and from the ALU to the carry lookahead generator are identical in both cases.

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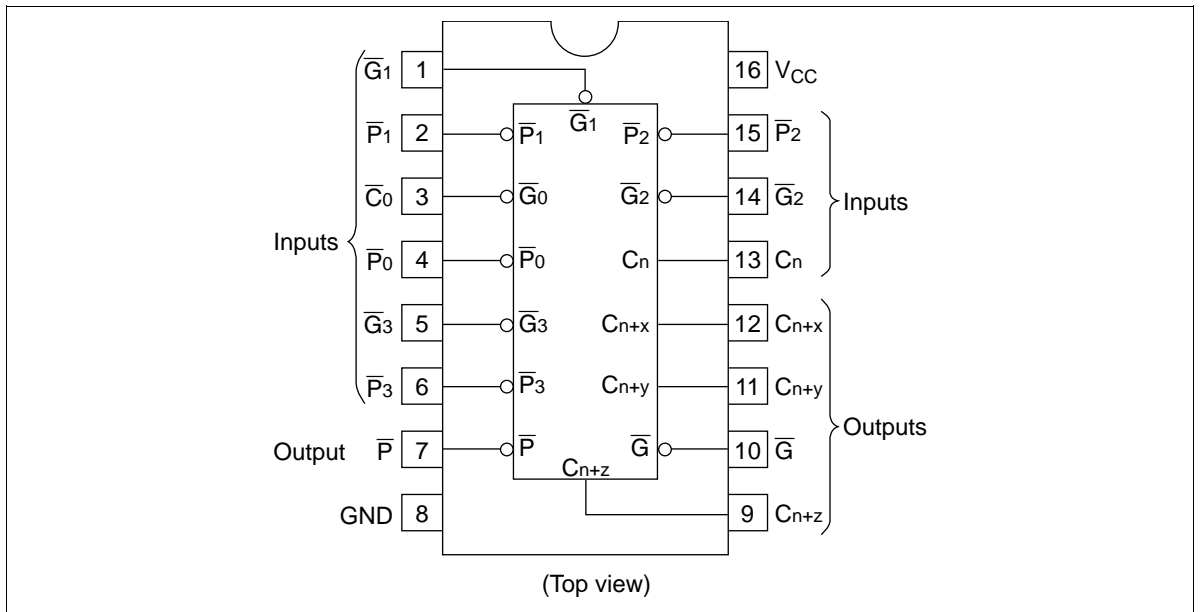
## Features

- High Speed Operation:  $t_{pd}$  (Pn to P) = 11 ns typ ( $C_L = 50$  pF)
- High Output Current: Fanout of 10 LSTTL Loads
- Wide Operating Voltage:  $V_{CC} = 2$  to 6 V
- Low Input Current: 1  $\mu$ A max
- Low Quiescent Supply Current:  $I_{CC}$  (static) = 4  $\mu$ A max ( $T_a = 25^\circ\text{C}$ )

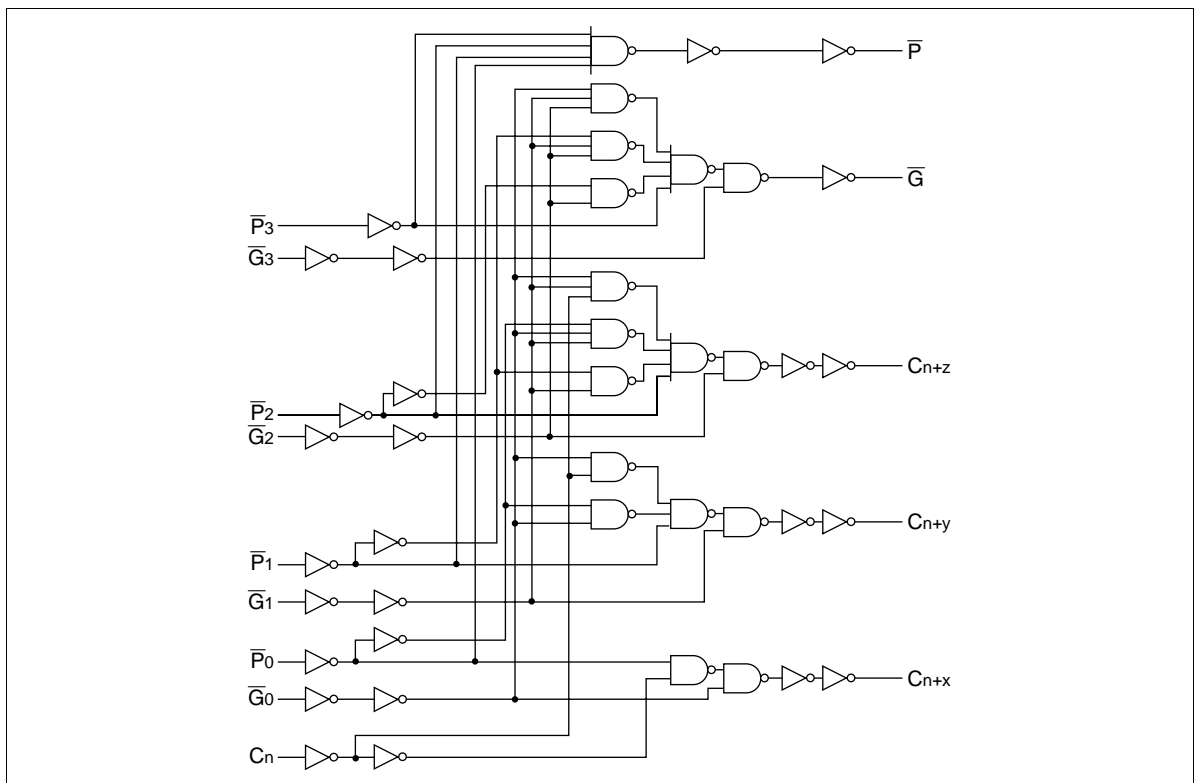
## Pin Designations

Item	Pin No.	Functions
$\overline{G}_0, \overline{G}_1, \overline{G}_2, \overline{G}_3$	3, 1, 14, 5	Active-low carry generate inputs
$\overline{P}_0, \overline{P}_1, \overline{P}_2, \overline{P}_3$	4, 2, 15, 6	Active-low carry propagate inputs
$C_n$	13	Carry input
$C_{n+x}, C_{n+y}, C_{n+z}$	12, 11, 9	Carry outputs
$\overline{G}$	10	Active-low carry propagate output
$\overline{P}$	7	Active-low carry propagate output
$V_{CC}$	16	Supply voltage
GND	8	Ground

Pin Arrangement



Logic Diagram



# HD74HC182

## DC Characteristics

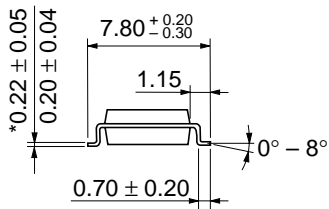
Item	Symbol	V <sub>CC</sub> (V)	Ta = 25°C			Ta = -40 to +85°C		Unit	Test Conditions	
			Min	Typ	Max	Min	Max			
Input voltage	V <sub>IH</sub>	2.0	1.5	—	—	1.5	—	V		
		4.5	3.15	—	—	3.15	—			
		6.0	4.2	—	—	4.2	—			
	V <sub>IL</sub>	2.0	—	—	0.5	—	0.5			V
		4.5	—	—	1.35	—	1.35			
		6.0	—	—	1.8	—	1.8			
Output voltage	V <sub>OH</sub>	2.0	1.9	2.0	—	1.9	—	V	Vin = V <sub>IH</sub> or V <sub>IL</sub> I <sub>OH</sub> = -20 μA	
		4.5	4.4	4.5	—	4.4	—			
		6.0	5.9	6.0	—	5.9	—			
		4.5	4.18	—	—	4.13	—			I <sub>OH</sub> = -4 mA
		6.0	5.68	—	—	5.63	—			I <sub>OH</sub> = -5.2 mA
		V <sub>OL</sub>	2.0	—	0.0	0.1	—			0.1
	4.5		—	0.0	0.1	—	0.1			
	6.0		—	0.0	0.1	—	0.1			
	4.5		—	—	0.26	—	0.33	I <sub>OL</sub> = 4 mA		
	6.0		—	—	0.26	—	0.33	I <sub>OL</sub> = 5.2 mA		
	6.0		—	—	±0.1	—	±1.0	μA	Vin = V <sub>CC</sub> or GND	
	Quiescent supply current	I <sub>CC</sub>	6.0	—	—	4.0	—	40	μA	Vin = V <sub>CC</sub> or GND, I <sub>out</sub> = 0 μA

AC Characteristics ( $C_L = 50 \text{ pF}$ , Input  $t_r = t_f = 6 \text{ ns}$ )

Item	Symbol	$V_{CC}$ (V)	$T_a = 25^\circ\text{C}$		$T_a = -40 \text{ to } +85^\circ\text{C}$		Unit	Test Conditions	
			Min	Typ	Max	Min			Max
Propagation delay time	$t_{PLH}$	2.0	—	—	140	—	175	ns	$\overline{Pn}$ to $\overline{P}$
		4.5	—	11	28	—	35		
		6.0	—	—	24	—	30		
	$t_{PHL}$	2.0	—	—	150	—	190	ns	Cn to output
		4.5	—	15	30	—	38		
		6.0	—	—	26	—	33		
		2.0	—	—	185	—	230		
		4.5	—	17	37	—	46		
		6.0	—	—	31	—	39		
Output rise/fall time	$t_{TLH}$	2.0	—	—	75	—	95	ns	
	$t_{THL}$	4.5	—	5	15	—	19		
		6.0	—	—	13	—	16		
Input capacitance	$C_{in}$	—	—	5	10	—	10	pF	



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



\*Dimension including the plating thickness  
 Base material dimension

Hitachi Code	FP-16DA
JEDEC	—
EIAJ	Conforms
Weight (reference value)	0.24 g



\*Dimension including the plating thickness  
Base material dimension

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



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