HD74HC182

Look-Ahead Carry Generator

HITACHI

Description

The HD74HC182 is a high-speed Carry Lockahead Generator. It is used with the HD74HC181 4-Bit Arithmetic Logic Unit to provide high-speed lockahead over World 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 lockahead.

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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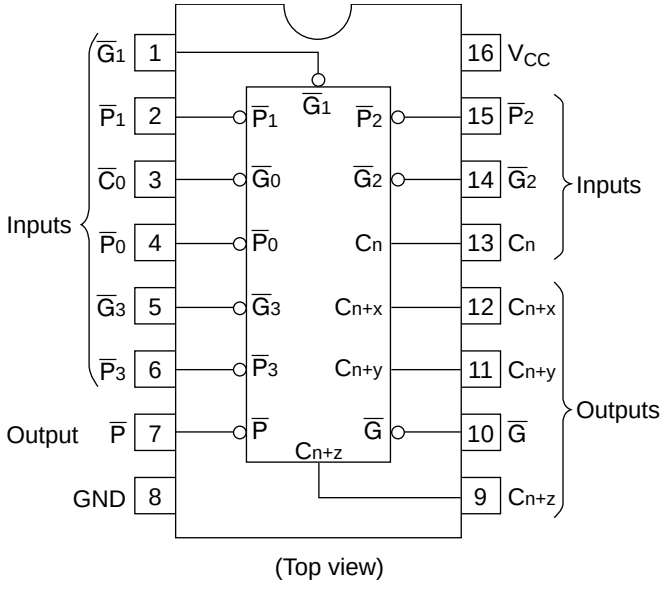
Features

- 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 µA max
- Low Quiescent Supply Current: I_{CC} (static) = 4 µA max (Ta = 25°C)

Pin Designations

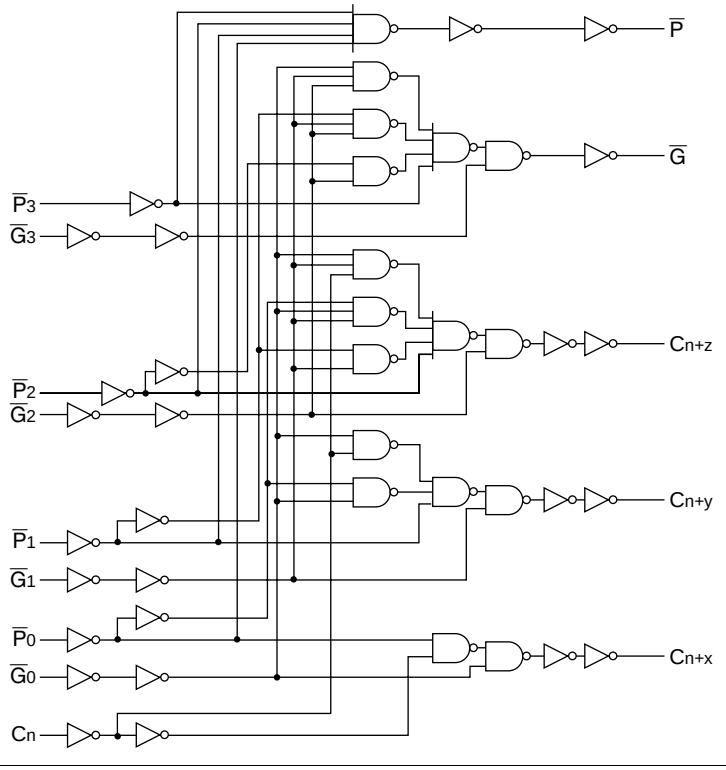
Item	Pin No.	Functions
$\overline{G_0}$, $\overline{G_1}$, $\overline{G_2}$, $\overline{G_3}$	3, 1, 14, 5	Active-low carry generate inputs
$\overline{P_0}$, $\overline{P_1}$, $\overline{P_2}$, $\overline{P_3}$	4, 2, 15, 6	Active-low carry propagate inputs
C_n	13	Carry input
C_{n+x}, C_{n+y}, C_{n+z}	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



(Top view)

Logic Diagram



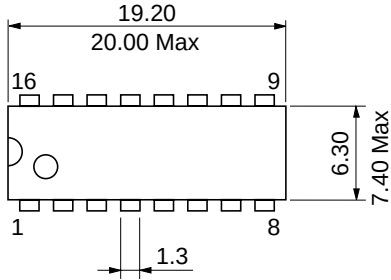
DC Characteristics

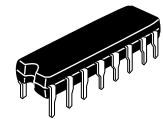
Item	Symbol	V_{CC} (V)	Ta = 25°C Min	Typ	Max	Ta = –40 to +85°C Min	Max	Unit	Test Conditions
Input voltage	V_{IH}	2.0	1.5	—	—	1.5	—	V	
		4.5	3.15	—	—	3.15	—		
		6.0	4.2	—	—	4.2	—		
	V_{IL}	2.0	—	—	0.5	—	0.5	V	
		4.5	—	—	1.35	—	1.35		
		6.0	—	—	1.8	—	1.8		
Output voltage	V_{OH}	2.0	1.9	2.0	—	1.9	—	V	Vin = V_{IH} or V_{IL} I_{OH} = –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_{OH} = –4 mA
		6.0	5.68	—	—	5.63	—		I_{OH} = –5.2 mA
	V_{OL}	2.0	—	0.0	0.1	—	0.1	V	Vin = V_{IH} or V_{IL} I_{OL} = 20 µA
		4.5	—	0.0	0.1	—	0.1		
		6.0	—	0.0	0.1	—	0.1		
		4.5	—	—	0.26	—	0.33		I_{OL} = 4 mA
		6.0	—	—	0.26	—	0.33		I_{OL} = 5.2 mA
Input current	Iin	6.0	—	—	±0.1	—	±1.0	µA	Vin = V_{CC} or GND
Quiescent supply current	I_{CC}	6.0	—	—	4.0	—	40	µA	Vin = V_{CC} or GND, Iout = 0 µA

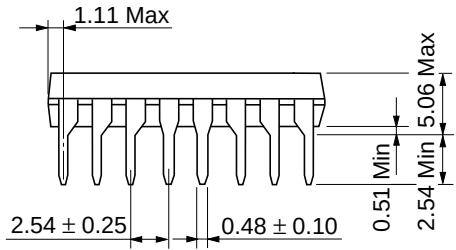
AC Characteristics (C_L = 50 pF, Input $t_r = t_f$ = 6 ns)

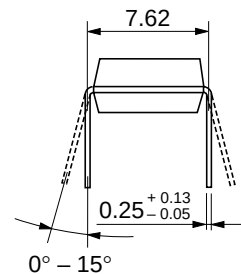
			Ta = 25°C			Ta = –40 to +85°C			
Item	**Symbol**	**V_{cc} (V)**	**Min**	**Typ**	**Max**	**Min**	**Max**	**Unit**	**Test Conditions**
Propagation delay time	t_{PLH}	2.0	—	—	140	—	175	ns	$\overline{Pn}$ to $\overline{P}$
	t_{PHL}	4.5	—	11	28	—	35		
		6.0	—	—	24	—	30		
		2.0	—	—	150	—	190	ns	Cn to output
		4.5	—	15	30	—	38		
		6.0	—	—	26	—	33		
		2.0	—	—	185	—	230	ns	$\overline{Pn}$ or $\overline{Gn}$ to output
		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	Cin	—	—	5	10	—	10	pF	

Unit: mm



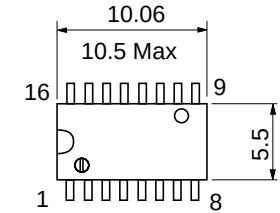


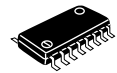


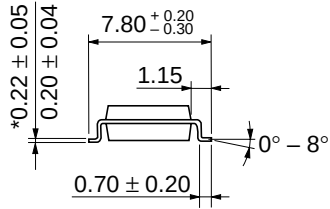


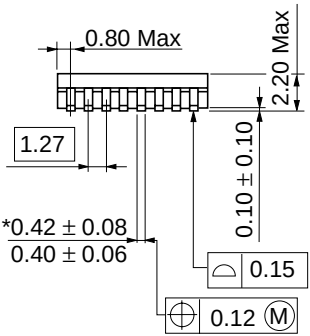
Hitachi Code	DP-16
JEDEC	Conforms
EIAJ	Conforms
Weight (reference value)	1.07 g

Unit: mm





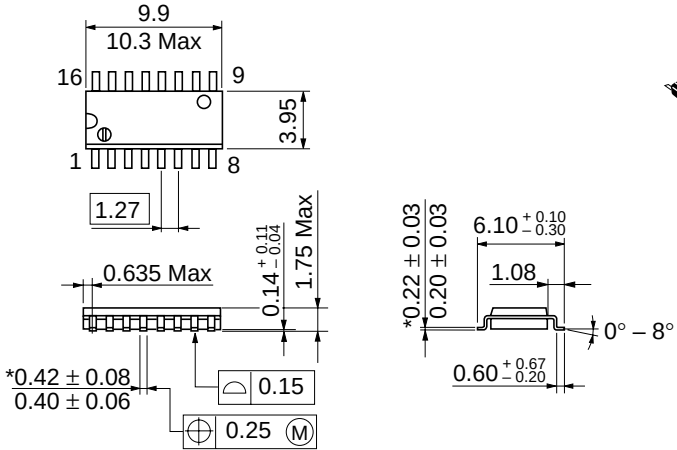




*Dimension including the plating thickness
Base material dimension

Hitachi Code	FP-16DA
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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