HD74AC182/HD74ACT182

Carry Lookhead Generator

HITACHI

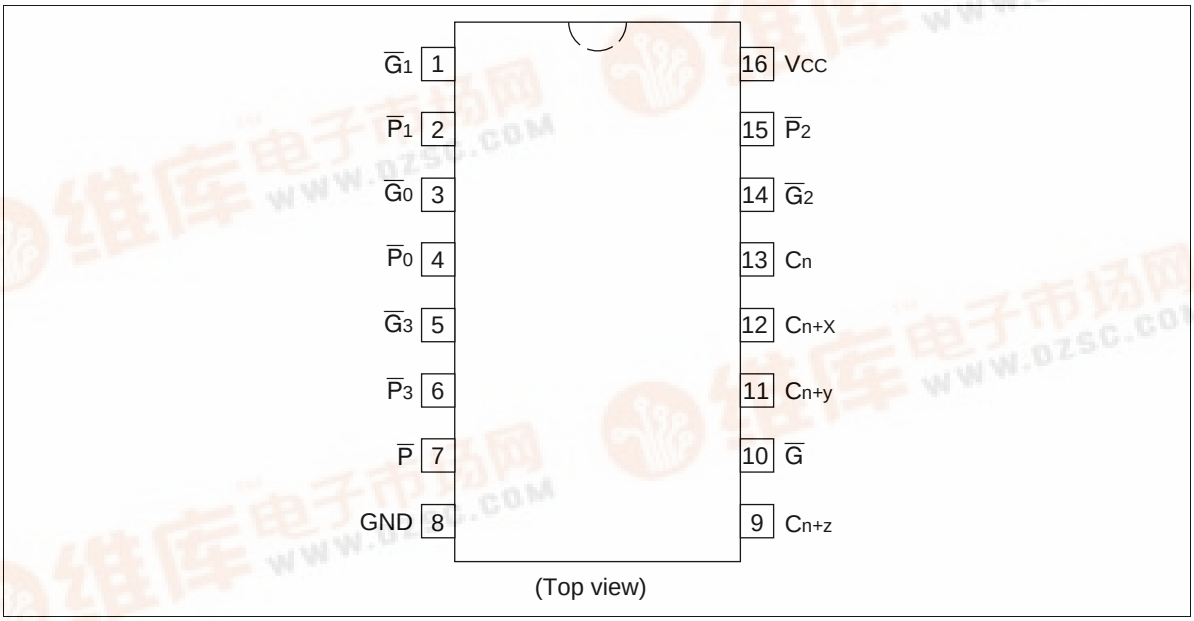
Description

The HD74AC182/HD74ACT182 is a high-speed carry lookahead generator. It is generally used with the HD74AC181 or HD74AC381 4-bit arithmetic logic unit to provide high-speed lookahead over word lengths of more than four bits.

Features

- Outputs Source/Sink 24 mA
- HD74ACT182 has TTL-Compatible Inputs

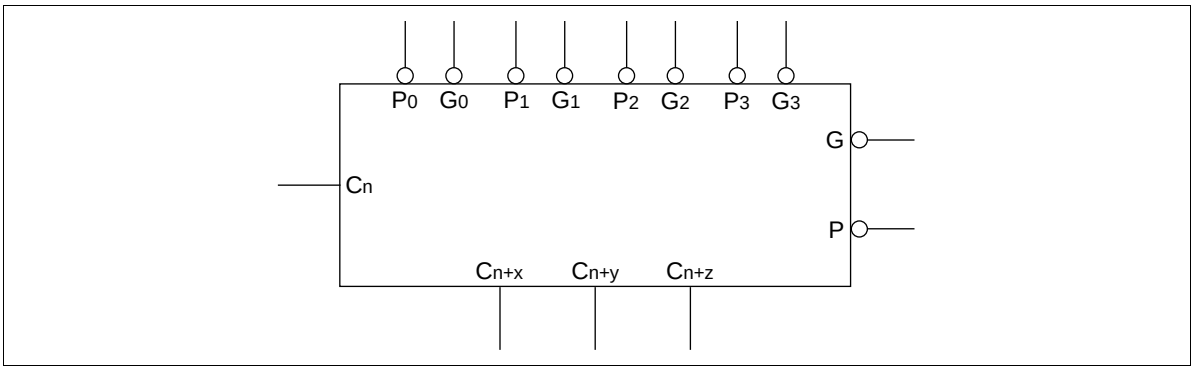
Pin Arrangement



(Top view)

Hitachi semiconductor

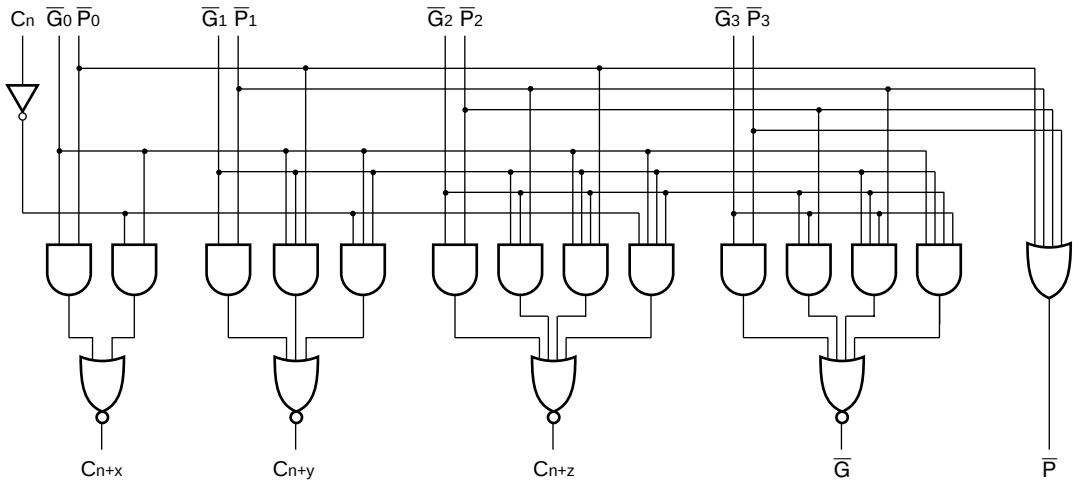
Logic Symbol



Pin Names

Cn	Carry Input
$\overline{G}_0$, $\overline{G}_2$	Carry Generate Inputs (Active Low)
$\overline{G}_1$	Carry Generate Input (Active Low)
$\overline{G}_3$	Carry Generate Input (Active Low)
$\overline{P}_0$, $\overline{P}_1$	Carry Propagate Inputs (Active Low)
$\overline{P}_2$	Carry Propagate Input (Active Low)
$\overline{P}_3$	Carry Propagate Input (Active Low)
C_{n+x} to C_{n+z}	Carry Outputs
$\overline{G}$	Carry Generate Output (Active Low)
$\overline{P}$	Carry Propagate Output (Active Low)

Logic Diagram



Please note that this diagram is provided only for the understanding of logic operations and should not be used to estimate propagation delays.

Functional Description

The HD74AC182/HD74ACT182 carry lookahead generator accepts up to four pairs of Active Low Carry Propagate ($\overline{P}_0$ to $\overline{P}_3$) and Carry Generate ($\overline{G}_0$ to $\overline{G}_3$) signals and an Active High Carry input (Cn) and provides anticipated Active High carries (C_{n+x}, C_{n+y}, C_{n+z}) across four groups of binary adders. The HD74AC182/HD74ACT182 also has Active Low Carry Propagate ($\overline{P}$) and Carry Generate ($\overline{G}$) outputs which may be used for further level of lookahead. The logic equations provided at the outputs are:

$$C_{n+x} = G_0 + P_0C_n$$
$$C_{n+y} = G_1 + P_1G_0 + P_1P_0C_n$$
$$C_{n+z} = G_2 + P_2G_1 + P_2P_1G_0 + P_2P_1P_0C_n$$
$$G = \overline{G_3 + P_3G_2 + P_3P_2G_1 + P_3P_2P_1G_0}$$
$$P = \overline{P_3P_2P_1P_0}$$

Also, the HD74AC182/HD74ACT182 can be used with binary ALUs in an active Low or active High input operand mode. The connections (Figure a) to and from the ALU to the carry lookahead generator are identical in both cases. Carries are rippled between lookahead blocks. The critical speed path follows the circled numbers. There are several possible arrangements for the carry interconnects, but all achieve about the same speed. A 28-bit ALU is formed by dropping the last HD74AC182/HD74ACT182.

Truth Table

Inputs									Outputs				
C_n	$\overline{G}_0$	$\overline{P}_0$	$\overline{G}_1$	$\overline{P}_1$	$\overline{G}_2$	$\overline{P}_2$	$\overline{G}_3$	$\overline{P}_3$	C_{n+x}	C_{n+y}	C_{n+z}	$\overline{G}$	$\overline{P}$
X	H	H							L				
L	H	X							L				
X	L	X							H				
H	X	L							H				
X	X	X	H	H						L			
X	H	H	H	X						L			
L	H	X	H	X						L			
X	X	X	L	X						H			
X	L	X	X	L						H			
H	X	L	X	L						H			
X	X	X	X	X	H	H					L		
X	X	X	H	H	H	X					L		
X	H	H	H	X	H	X					L		
L	H	X	H	X	H	X					L		
X	X	X	X	X	L	X					H		
X	X	X	L	X	X	L					H		
X	L	X	X	L	X	L					H		
H	X	L	X	L	X	L					H		
	X		X	X	X	X	H	H				H	
	X		X	X	H	H	H	X				H	
	X		H	H	H	X	H	X				H	
	H		H	X	H	X	H	X				H	
	X		X	X	X	X	L	X				L	
	X		X	X	L	X	X	L				L	
	X		L	X	X	L	X	L				L	
	L		X	L	X	L	X	L				L	
		H		X		X		X					H
		X		H		X		X					H
		X		X		H		X					H
		X		X		X		H					H
		L		L		L		L					L

H : High Voltage Level
L : Low Voltage Level
X : Immaterial

DC Characteristics (unless otherwise specified)

Item	Symbol	Max	Unit	Condition
Maximum quiescent supply current	I_{CC}	80	µA	V_{IN} = V_{CC} or ground, V_{CC} = 5.5 V, Ta = Worst case
Maximum quiescent supply current	I_{CC}	8.0	µA	V_{IN} = V_{CC} or ground, V_{CC} = 5.5 V, Ta = 25°C
Maximum I_{CC}/input (HD74ACT182)	I_{CCT}	1.5	mA	V_{IN} = V_{CC} – 2.1 V, V_{CC} = 5.5 V, Ta = Worst case

AC Characteristics: HD74AC182

			Ta = +25°C C_L = 50 pF			Ta = –40°C to +85°C C_L = 50 pF		
Item	**Symbol**	**V_{CC} (V)*[1]**	**Min**	**Typ**	**Max**	**Min**	**Max**	**Unit**
Propagation delay	t_{PLH}	3.3	1.0	8.0	10.5	1.0	11.5	ns
P_n to P		5.0	1.0	5.5	8.0	1.0	9.0	
Propagation delay	t_{PHL}	3.3	1.0	8.0	10.5	1.0	11.5	ns
P_n to P		5.0	1.0	5.5	8.0	1.0	9.0	
Propagation delay	t_{PLH}	3.3	1.0	9.5	12.0	1.0	13.0	ns
C_n to $C_{n+x, y, z}$		5.0	1.0	7.5	10.0	1.0	11.0	
Propagation delay	t_{PHL}	3.3	1.0	9.0	12.0	1.0	13.0	ns
C_n to $C_{n+x, y, z}$		5.0	1.0	7.0	10.0	1.0	11.0	
Propagation delay	t_{PLH}	3.3	1.0	10.5	13.0	1.0	14.0	ns
P_n or G_n to $C_{n+x, y, z}$		5.0	1.0	8.0	10.5	1.0	11.5	
Propagation delay	t_{PHL}	3.3	1.0	11.5	14.0	1.0	15.5	ns
P_n or G_n to $C_{n+x, y, z}$		5.0	1.0	9.0	11.5	1.0	12.5	

Note: 1. Voltage Range 3.3 is 3.3 V ± 0.3 V
Voltage Range 5.0 is 5.0 V ± 0.5 V

AC Characteristics: HD74ACT182

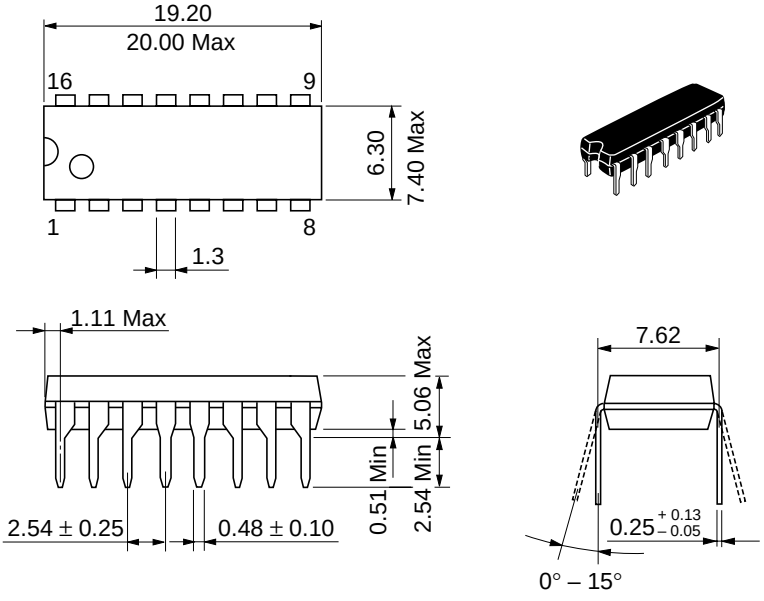
Item	Symbol	V_{CC} (V)*[1]	Ta = +25°C, C_L = 50 pF			Ta = –40°C to +85°C, C_L = 50 pF		Unit
			Min	Typ	Max	Min	Max	
Propagation delay P_n to P	t_{PLH}	5.0	1.0	7.0	9.0	1.0	10.0	ns
Propagation delay P_n to P	t_{PHL}	5.0	1.0	8.0	10.0	1.0	11.0	ns
Propagation delay C_n to $C_{n+x, y, z}$	t_{PLH}	5.0	1.0	9.0	11.0	1.0	12.0	ns
Propagation delay C_n to $C_{n+x, y, z}$	t_{PHL}	5.0	1.0	9.0	11.0	1.0	12.0	ns
Propagation delay P_n or G_n to $C_{n+x, y, z}$	t_{PLH}	5.0	1.0	9.0	11.0	1.0	12.0	ns
Propagation delay P_n or G_n to $C_{n+x, y, z}$	t_{PHL}	5.0	1.0	10.0	12.5	1.0	13.5	ns

Note: 1. Voltage Range 5.0 is 5.0 V ± 0.5 V

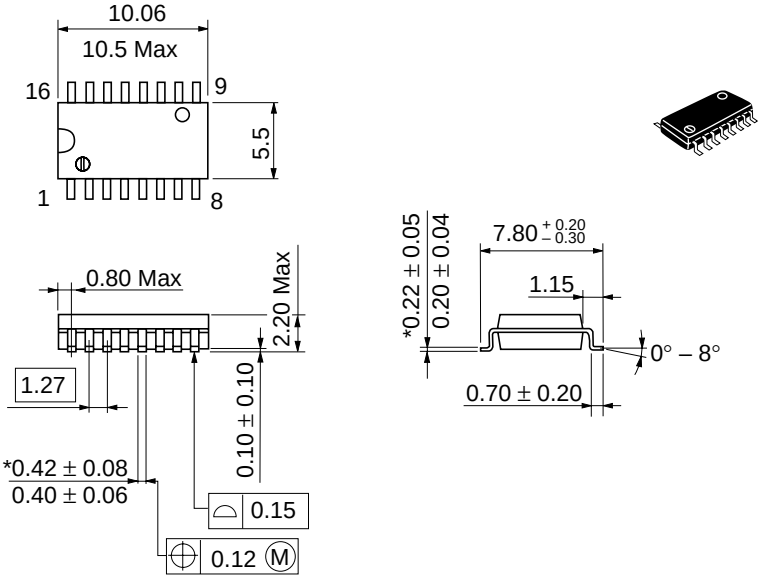
Capacitance

Item	Symbol	Typ	Unit	Condition
Input capacitance	C_{IN}	4.5	pF	V_{CC} = 5.5 V
Power dissipation capacitance	C_{PD}	50.0	pF	V_{CC} = 5.0 V

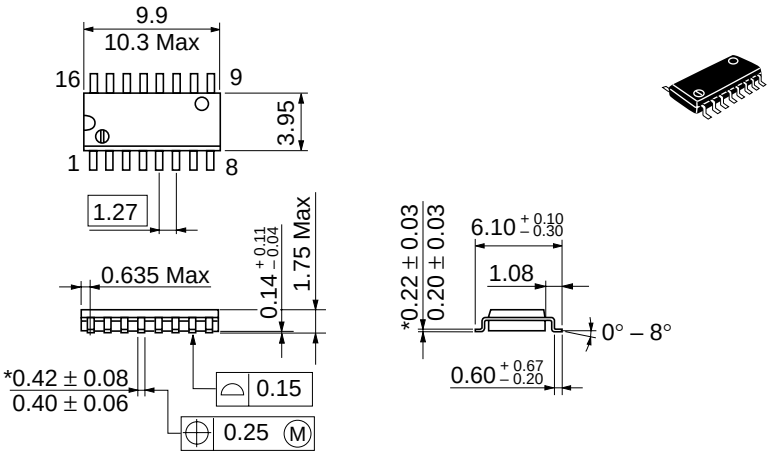
Unit: mm


19.20
20.00 Max
16
9
1
8
6.30
7.40 Max
1.3
1.11 Max
5.06 Max
2.54 Min
0.51 Min
2.54 ± 0.25
0.48 ± 0.10
7.62
0.25 + 0.13 − 0.05
0° – 15°

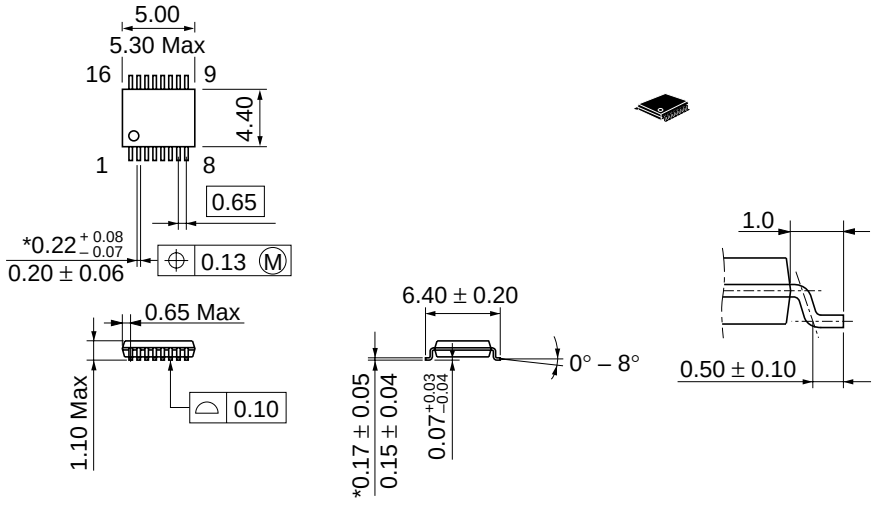
Unit: mm


10.06
10.5 Max
16
9
1
8
5.5
0.80 Max
2.20 Max
1.27
*0.42 ± 0.08
0.40 ± 0.06
0.10 ± 0.10
0.15
0.12 M
*0.22 ± 0.05
0.20 ± 0.04
7.80 +0.20 −0.30
1.15
0° – 8°
0.70 ± 0.20

Unit: mm


9.9
10.3 Max
16
9
1
8
3.95
1.27
0.635 Max
0.14 +0.11 −0.04
1.75 Max
*0.42 ± 0.08
0.40 ± 0.06
0.15
0.25 M
*0.22 ± 0.03
0.20 ± 0.03
6.10 +0.10 −0.30
1.08
0° – 8°
0.60 +0.67 −0.20

Unit: mm


5.00
5.30 Max
16
9
4.40
1
8
0.65
*0.22 +0.08 −0.07
0.20 ± 0.06
0.13 M
0.65 Max
1.10 Max
0.10
6.40 ± 0.20
0° – 8°
*0.17 ± 0.05
0.15 ± 0.04
0.07 +0.03 −0.04
1.0
0.50 ± 0.10

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