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April 1st, 2010
Renesas Electronics Corporation

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Not recommended
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HD74HC182

Look-Ahead Carry Generator

REJ03D0586-0300

Rev.3.00

Jan 31, 2006

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

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

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

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

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

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

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.

Features

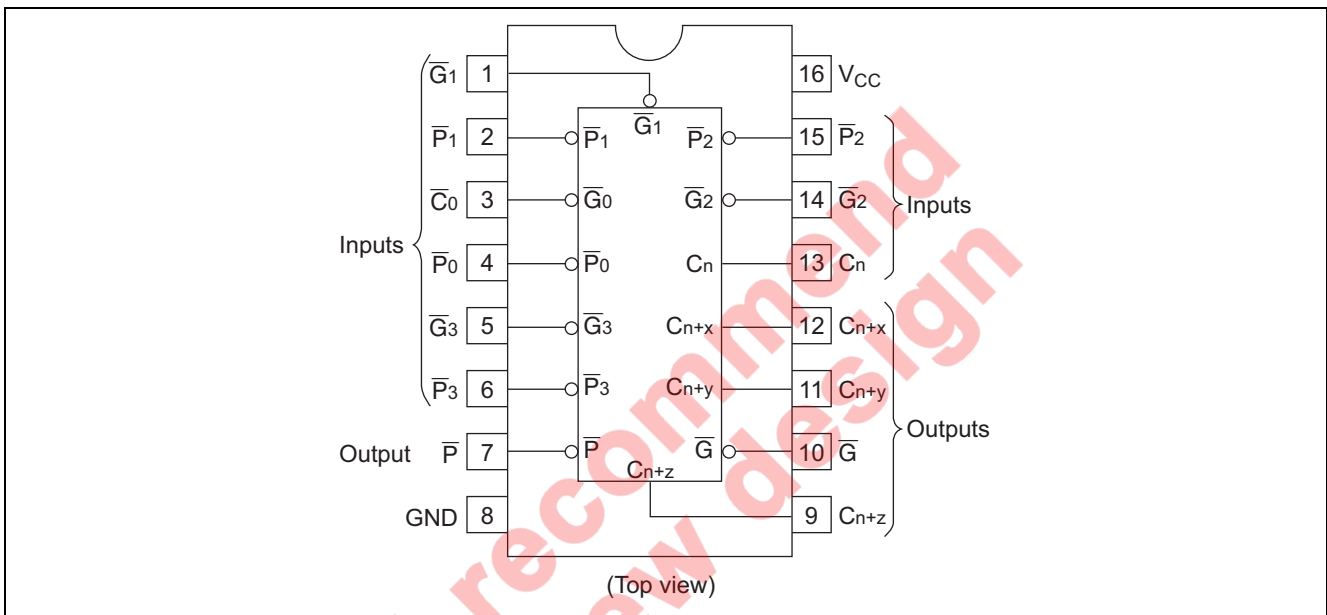
- High Speed Operation: $t_{pd} (P_n \text{ to } P) = 11 \text{ ns typ } (C_L = 50 \text{ pF})$
- High Output Current: Fanout of 10 LSTTL Loads
- Wide Operating Voltage: $V_{CC} = 2 \text{ to } 6 \text{ V}$
- Low Input Current: $1 \mu\text{A max}$
- Low Quiescent Supply Current: $I_{CC} (\text{static})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

Part Name	Package Type	Package Code (Previous Code)	Package Abbreviation	Taping Abbreviation (Quantity)
HD74HC182RPEL	SOP-16 pin (JEDEC)	PRDP0016DG-A (FP-16DNV)	RP	EL (2,500 pcs/reel)

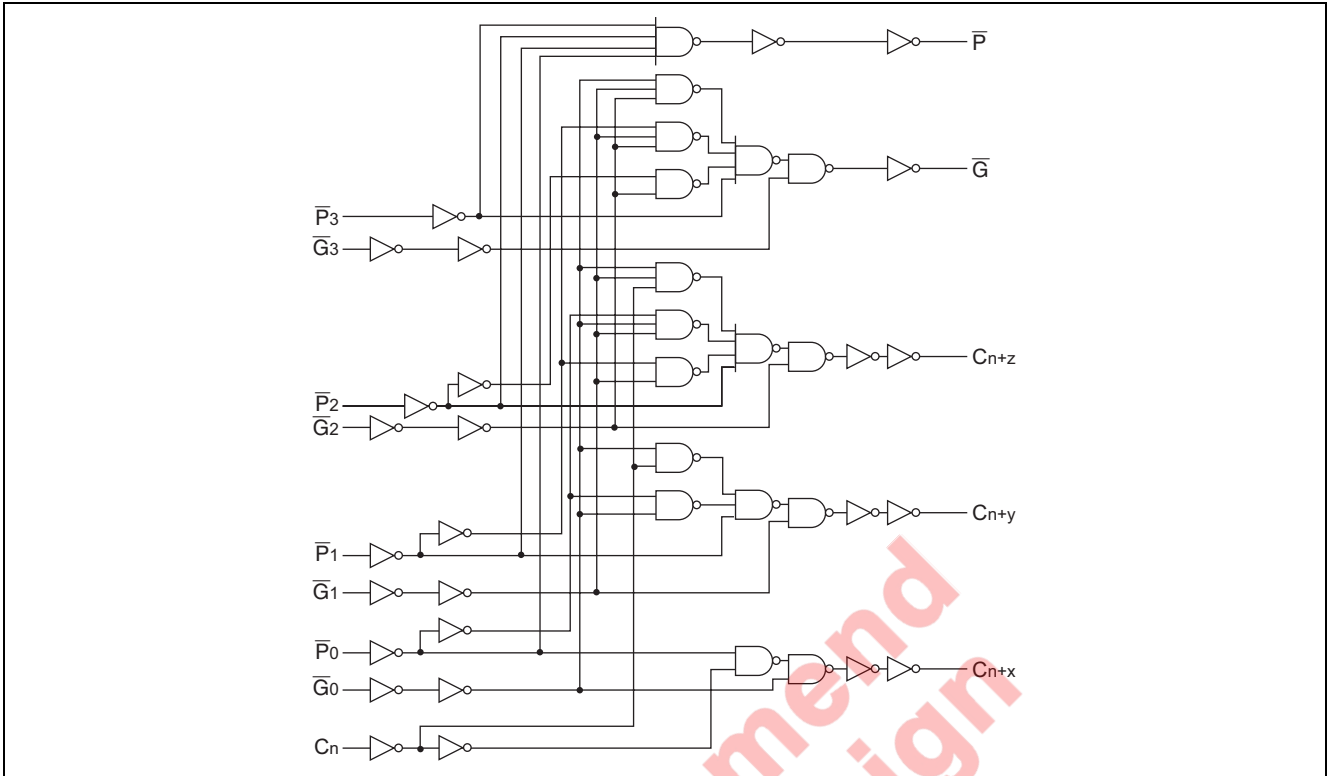
Function Table

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



Absolute Maximum Ratings

Item	Symbol	Ratings	Unit
Supply voltage range	V_{CC}	-0.5 to 7.0	V
Input / Output voltage	V_{in}, V_{out}	-0.5 to $V_{CC} + 0.5$	V
Input / Output diode current	I_{IK}, I_{OK}	± 20	mA
Output current	I_O	± 25	mA
V_{CC}, GND current	I_{CC} or I_{GND}	± 50	mA
Power dissipation	P_T	500	mW
Storage temperature	T_{stg}	-65 to +150	$^{\circ}C$

Note: The absolute maximum ratings are values, which must not individually be exceeded, and furthermore, no two of which may be realized at the same time.

Recommended Operating Conditions

Item	Symbol	Ratings	Unit	Conditions
Supply voltage	V_{CC}	2 to 6	V	
Input / Output voltage	V_{IN}, V_{OUT}	0 to V_{CC}	V	
Operating temperature	T_a	-40 to 85	$^{\circ}C$	
Input rise / fall time*1	t_r, t_f	0 to 1000	ns	$V_{CC} = 2.0 V$
		0 to 500		$V_{CC} = 4.5 V$
		0 to 400		$V_{CC} = 6.0 V$

Note: 1. This item guarantees maximum limit when one input switches.
Waveform: Refer to test circuit of switching characteristics.

Electrical Characteristics

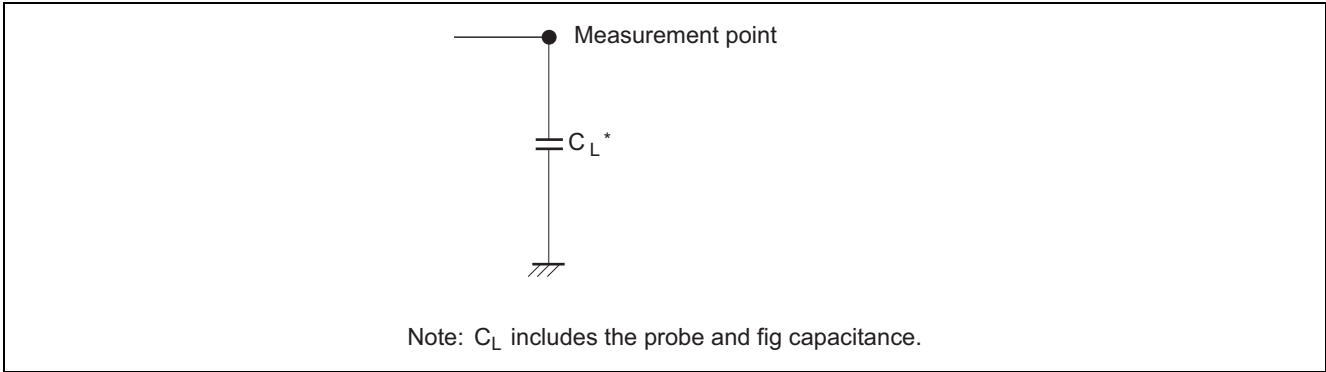
Item	Symbol	V _{CC} (V)	Ta = 25°C			Ta = -40 to +85°C		Unit	Test Conditions	
			Min	Typ	Max	Min	Max			
Input voltage	V _{IH}	2.0	1.5	—	—	1.5	—	V		
		4.5	3.15	—	—	3.15	—			
		6.0	4.2	—	—	4.2	—			
	V _{IL}	2.0	—	—	0.5	—	0.5	V		
		4.5	—	—	1.35	—	1.35			
		6.0	—	—	1.8	—	1.8			
Output voltage	V _{OH}	2.0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

Switching Characteristics

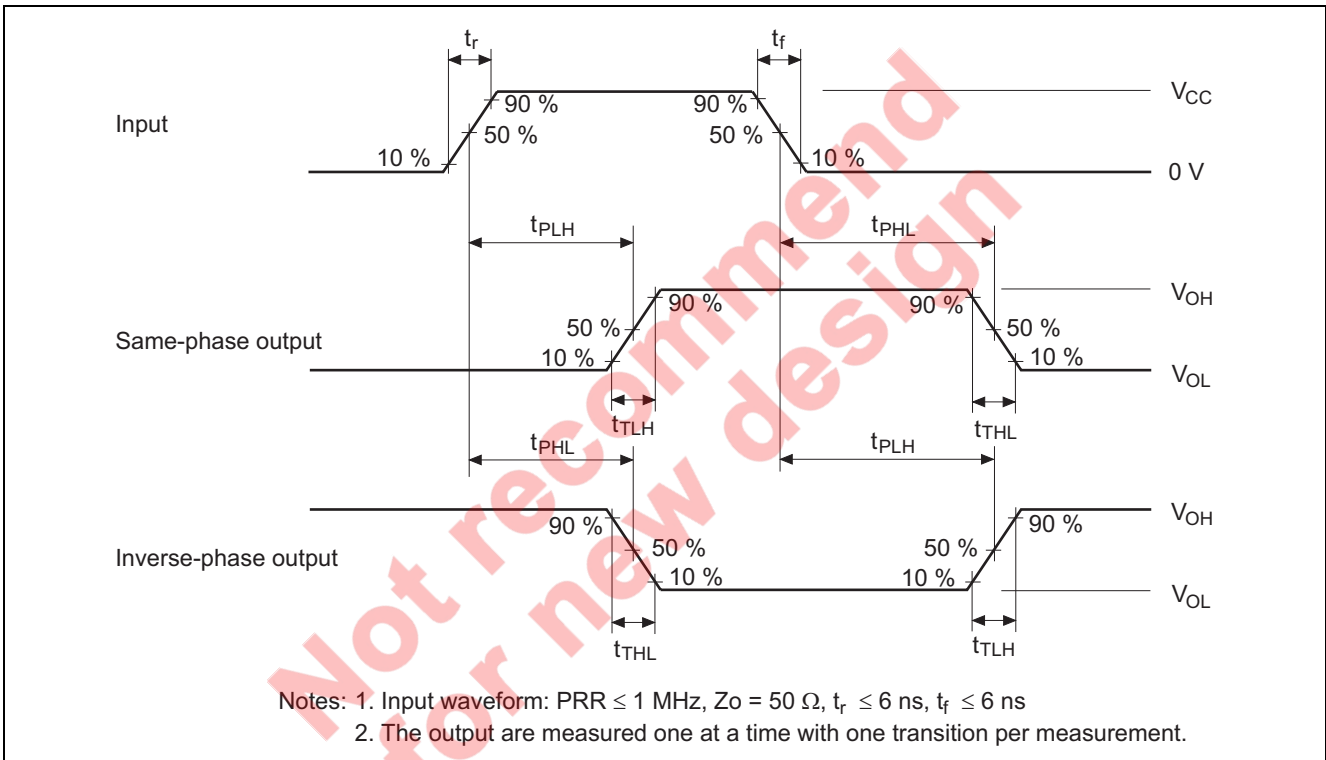
(C_L = 50 pF, Input t_r = t_f = 6 ns)

Item	Symbol	V _{CC} (V)	Ta = 25°C			Ta = -40 to +85°C		Unit	Test Conditions		
			Min	Typ	Max	Min	Max				
Propagation delay time	t _{PLH} , t _{PHL}	2.0	—	—	140	—	175	ns	P _n to P		
		4.5	—	11	28	—	35				
		6.0	—	—	24	—	30				
			2.0	—	—	150	—	190	ns	C _n to output	
			4.5	—	15	30	—	38			
			6.0	—	—	26	—	33			
			2.0	—	—	185	—	230	ns	P _n or G _n to output	
			4.5	—	17	37	—	46			
			6.0	—	—	31	—	39			
Output rise/fall time	t _{TLH} , t _{THL}	2.0	—	—	75	—	95	ns			
		4.5	—	5	15	—	19				
		6.0	—	—	13	—	16				
Input capacitance	C _{in}	—	—	5	10	—	10	pF			

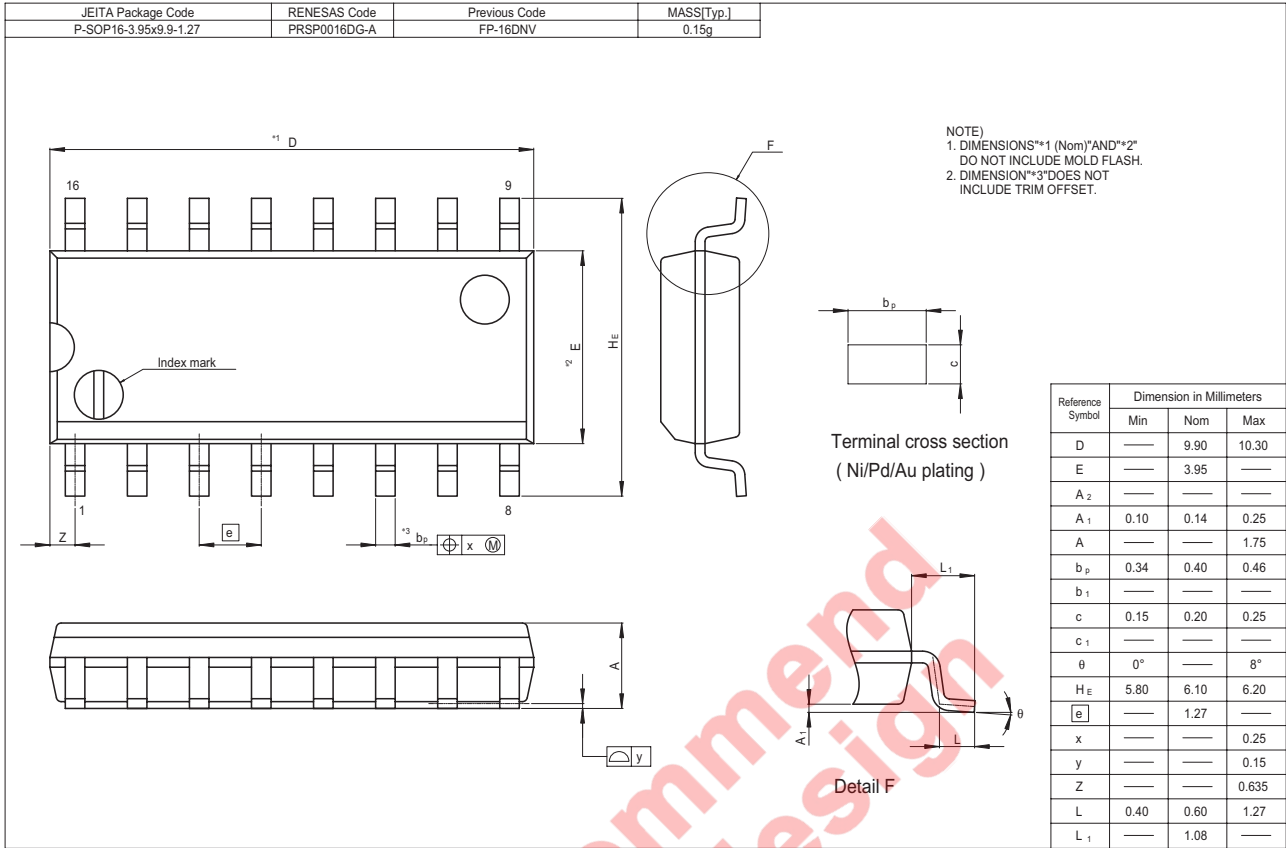
Test Circuit



Waveforms



Package Dimensions



Not recommended for new design

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Renesas Technology America, Inc.

450 Holger Way, San Jose, CA 95134-1368, U.S.A
Tel: <1> (408) 382-7500, Fax: <1> (408) 382-7501

Renesas Technology Europe Limited

Dukes Meadow, Millboard Road, Bourne End, Buckinghamshire, SL8 5FH, U.K.
Tel: <44> (1628) 585-100, Fax: <44> (1628) 585-900

Renesas Technology (Shanghai) Co., Ltd.

Unit 205, AZIA Center, No.133 Yincheng Rd (n), Pudong District, Shanghai 200120, China
Tel: <86> (21) 5877-1818, Fax: <86> (21) 6887-7898

Renesas Technology Hong Kong Ltd.

7th Floor, North Tower, World Finance Centre, Harbour City, 1 Canton Road, Tsimshatsui, Kowloon, Hong Kong
Tel: <852> 2265-6688, Fax: <852> 2730-6071

Renesas Technology Taiwan Co., Ltd.

10th Floor, No.99, Fushing North Road, Taipei, Taiwan
Tel: <886> (2) 2715-2888, Fax: <886> (2) 2713-2999

Renesas Technology Singapore Pte. Ltd.

1 Harbour Front Avenue, #06-10, Keppel Bay Tower, Singapore 098632
Tel: <65> 6213-0200, Fax: <65> 6278-8001

Renesas Technology Korea Co., Ltd.

Kukje Center Bldg. 18th Fl., 191, 2-ka, Hangang-ro, Yongsan-ku, Seoul 140-702, Korea
Tel: <82> (2) 796-3115, Fax: <82> (2) 796-2145

Renesas Technology Malaysia Sdn. Bhd

Unit 906, Block B, Menara Amcorp, Amcorp Trade Centre, No.18, Jalan Persiaran Barat, 46050 Petaling Jaya, Selangor Darul Ehsan, Malaysia
Tel: <603> 7955-9390, Fax: <603> 7955-9510