

74S182 Carry Generator

Lookahead Carry Generator
Product Specification

Logic Products

FEATURES

- Provides carry lookahead across a group of four ALU's
- Multi-level lookahead for high-speed arithmetic operation over long word lengths

DESCRIPTION

The '182 carry lookahead generator accepts up to four pairs of active LOW Carry Propagate ($\bar{P}_0, \bar{P}_1, \bar{P}_2, \bar{P}_3$) and Carry Generate ($\bar{G}_0, \bar{G}_1, \bar{G}_2, \bar{G}_3$) signals and an active HIGH Carry input (C_n) and provides anticipated active HIGH carries ($C_{n+x}, C_{n+y}, C_{n+z}$) across four groups of binary adders. The '182 also has active LOW Carry Propagate (\bar{P}) and Carry Generate (\bar{G}) outputs which may be used for further levels of lookahead.

TYPE	TYPICAL PROPAGATION DELAY	TYPICAL SUPPLY CURRENT (TOTAL)
74S182	5.8ns	69mA

ORDERING CODE

PACKAGES	COMMERCIAL RANGE $V_{CC} = 5V \pm 5\%$; $T_A = 0^\circ C$ to $+70^\circ C$
Plastic DIP	N74S182N
Plastic SO-16	N74S182D

NOTE:

For information regarding devices processed to Military Specifications, see the Signetics Military Products Data Manual.

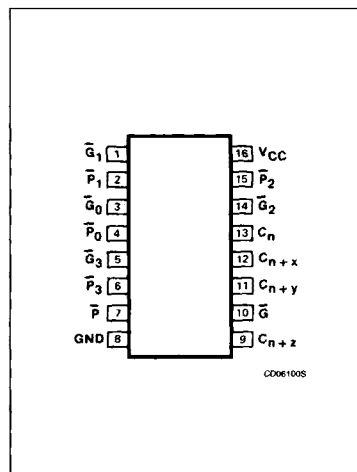
INPUT AND OUTPUT LOADING AND FAN-OUT TABLE

PINS	DESCRIPTION	74S
C_n	Input	1Sul
\bar{P}_3	Input	2Sul
\bar{P}_2	Input	3Sul
$\bar{P}_0, \bar{P}_1, \bar{G}_3$	Inputs	4Sul
\bar{G}_0, \bar{G}_2	Inputs	7Sul
\bar{G}_1	Input	8Sul
All	Outputs	10Sul

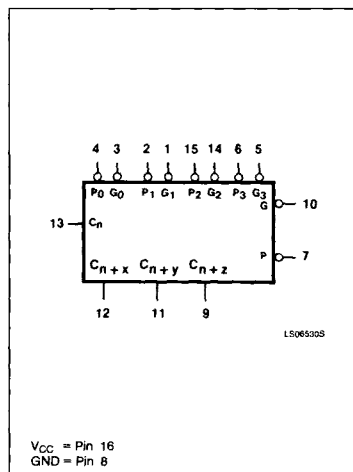
NOTE:

A 74S unit load (Sul) is $50\mu A$ I_{IH} and $-2.0mA$ I_{IL} .

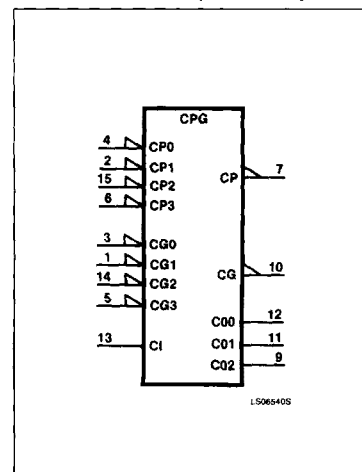
PIN CONFIGURATION



LOGIC SYMBOL



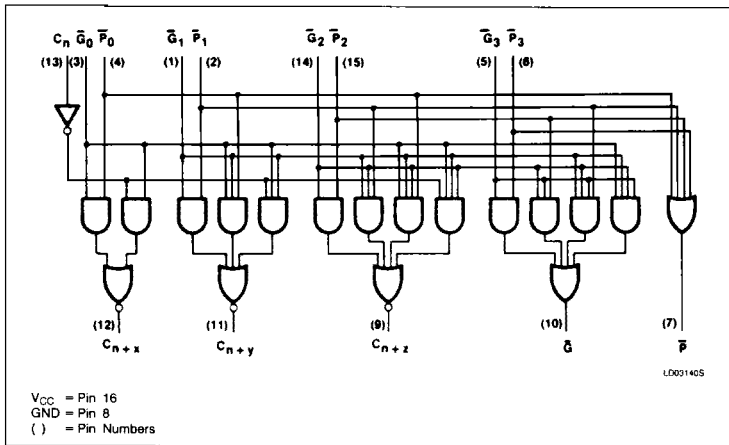
LOGIC SYMBOL (IEEE/IEC)



Carry Generator

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LOGIC DIAGRAM



The logic equations provided at the outputs are:

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

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

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

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

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

The '182 can also be used with binary ALU's in an active LOW or active HIGH input oper- and mode. The connections to and from the ALU to the carry lookahead generator are identical in both cases.

FUNCTION TABLE

INPUTS									OUTPUTS				
C_n	\bar{G}_0	\bar{P}_0	\bar{G}_1	\bar{P}_1	\bar{G}_2	\bar{P}_2	\bar{G}_3	\bar{P}_3	C_{n+x}	C_{n+y}	C_{n+z}	\bar{G}	\bar{P}
X	H	H							L				
L	H	X							L				
X	L	X							L				
H	X	L							H				
X	X	X	H	H						L			
X	H	H	H	X						L			
L	X	X	L	X						L			
X	L	X	X	L						L			
X	X	X	X	X						H			
X	X	X	L	X						L			
X	L	X	X	L						H			
H	X	L	X	L						H			
	X		X	X	X	H	H					H	
	X		X	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		X	X	L	X	X	L				L	
	X		L	X	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 = Don't care

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ABSOLUTE MAXIMUM RATINGS (Over operating free-air temperature range unless otherwise noted.)

PARAMETER		74S	UNIT
V _{CC}	Supply voltage	7.0	V
V _{IN}	Input voltage	-0.5 to +5.5	V
I _{IN}	Input current	-30 to +5	mA
V _{OUT}	Voltage applied to output in HIGH output state	-0.5 to +V _{CC}	V
T _A	Operating free-air temperature range	0 to 70	°C

RECOMMENDED OPERATING CONDITIONS

PARAMETER		74S			UNIT
		Min	Nom	Max	
V _{CC}	Supply voltage	4.75	5.0	5.25	V
V _{IH}	HIGH-level input voltage	2.0			V
V _{IL}	LOW-level input voltage			+0.8	V
I _{IK}	Input clamp current			-18	mA
I _{OH}	HIGH-level output current			-1000	μA
I _{OL}	LOW-level output current			20	mA
T _A	Operating free-air temperature	0		70	°C

DC ELECTRICAL CHARACTERISTICS (Over recommended operating free-air temperature range unless otherwise noted.)

PARAMETER	TEST CONDITIONS ¹	74S182			UNIT		
		Min	Typ ²	Max			
V _{OH}	HIGH-level output voltage	V _{CC} = MIN, V _{IH} = MIN, V _{IL} = MAX, I _{OH} = MAX		2.7	3.4	V	
V _{OL}	LOW-level output voltage	V _{CC} = MIN, V _{IH} = MIN, V _{IL} = MAX, I _{OL} = MAX				0.5	
V _{IK}	Input clamp voltage	V _{CC} = MIN, I _I = I _{IK}				-1.2	
I _I	Input current at maximum input voltage	V _{CC} = MAX, V _I = 5.5V				1.0	
I _{IH}	HIGH-level input current	V _{CC} = MAX, V _I = 2.7V	C _n input			50	μA
			\overline{P}_3 input			100	μA
			\overline{P}_2 input			150	μA
			$\overline{P}_0, \overline{P}_1, \overline{G}_3$ inputs			200	μA
			$\overline{G}_0, \overline{G}_2$ inputs			350	μA
			\overline{G}_1 input			400	μA
I _{IL}	LOW-level input current	V _{CC} = MAX, V _I = 0.5V	C _n input			-2	mA
			\overline{P}_3 input			-4	mA
			\overline{P}_2 input			-6	mA
			$\overline{P}_0, \overline{P}_1, \overline{G}_3$ inputs			-8	mA
			$\overline{G}_0, \overline{G}_2$ inputs			-14	mA
			\overline{G}_1 input			-16	mA
I _{OS}	Short-circuit output current ³	V _{CC} = MAX		-40		-100	mA
I _{CC}	Supply current ⁴ (total)	V _{CC} = MAX			69	109	mA

NOTES:

- For conditions shown as MIN or MAX, use the appropriate value specified under recommended operating conditions for the applicable type.
- All typical values are at V_{CC} = 5V, T_A = 25°C.
- I_{OS} is tested with V_{OUT} = +0.5V and V_{CC} = V_{CC} MAX + 0.5V. Not more than one output should be shorted at a time and duration of the short circuit should not exceed one second.
- I_{CC} is measured with $\overline{G}_0, \overline{G}_1$ and \overline{G}_2 inputs at 4.5V, all other inputs grounded and all outputs open.

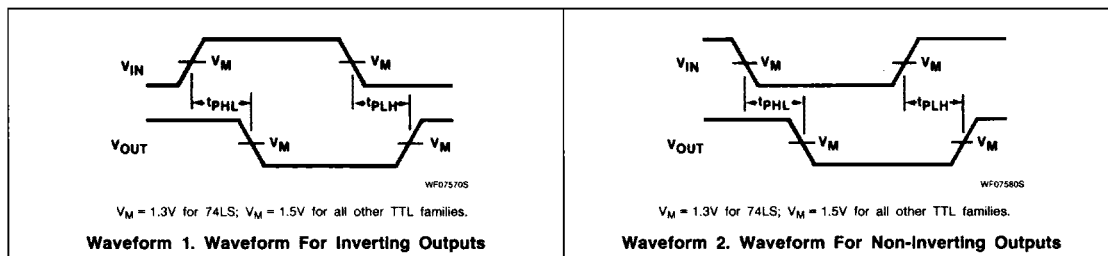
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AC ELECTRICAL CHARACTERISTICS $T_A = 25^\circ\text{C}$, $V_{CC} = 5.0\text{V}$

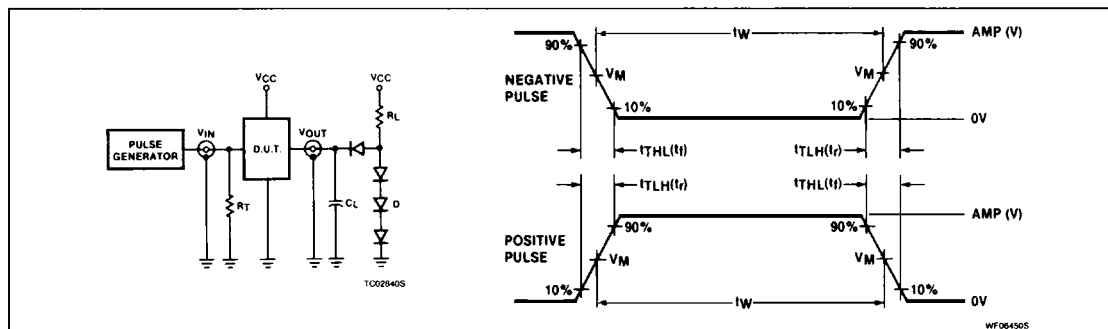
PARAMETER	TEST CONDITIONS	74S		UNIT
		$C_L = 15\text{pF}$, $R_L = 280\Omega$		
		Min	Max	
t_{PLH} t_{PHL}	Propagation delay \overline{G}_n or \overline{P}_n to any C output	Waveform 1	7.0 7.0	ns
t_{PLH} t_{PHL}	Propagation delay \overline{G}_n or \overline{P}_n to \overline{G} output	Waveform 2	7.5 10.5	ns
t_{PLH} t_{PHL}	Propagation delay \overline{P}_n to \overline{P} output	Waveform 2	6.5 10	ns
t_{PLH} t_{PHL}	Propagation delay C_n to any C output	Waveform 2	10 10.5	ns

AC WAVEFORMS



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TEST CIRCUITS AND WAVEFORMS



DEFINITIONS

R_L = Load resistor to V_{CC} ; see AC CHARACTERISTICS for value.

C_L = Load capacitance includes jig and probe capacitance; see AC CHARACTERISTICS for value.

R_T = Termination resistance should be equal to Z_{OUT} of Pulse Generators.

D = Diodes are 1N916, 1N3064, or equivalent.

t_{TLH} , t_{THL} Values should be less than or equal to the table entries.

FAMILY	INPUT PULSE REQUIREMENTS				
	Amplitude	Rep. Rate	Pulse Width	t_{TLH}	t_{THL}
74	3.0V	1MHz	500ns	7ns	7ns
74LS	3.0V	1MHz	500ns	15ns	6ns
74S	3.0V	1MHz	500ns	2.5ns	2.5ns