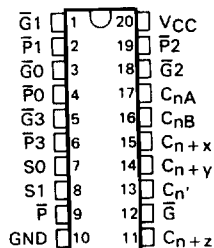


TYPES SN54AS282, SN74AS282 LOOK-AHEAD CARRY GENERATOR WITH SELECTABLE CARRY INPUTS

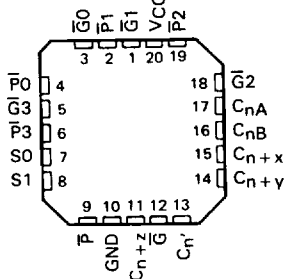
D2811, DECEMBER 1983

- Selectable Carry Inputs Version of the Popular 'S182 Allows Double Precision Carry
- Offers Carry Functions in a Compatible Form for Direct Connection to the ALU
- Cascadable to Perform Look-Ahead Across n-Bit Adders
- Package Options Include Both Plastic and Ceramic Chip Carriers in Addition to Plastic and Ceramic DIPs
- Dependable Texas Instruments Quality and Reliability

SN54AS282 . . . J PACKAGE
SN74AS282 . . . N PACKAGE
(TOP VIEW)



SN54AS282 . . . FH PACKAGE
SN74AS282 . . . FN PACKAGE
(TOP VIEW)



PIN DESIGNATIONS		
ALTERNATIVE DESIGNATIONS [†]		FUNCTION
$\bar{G}0, \bar{G}1, \bar{G}2, \bar{G}3$	$G0, G1, G2, G3$	Carry Generate Inputs
$\bar{P}0, \bar{P}1, \bar{P}2, \bar{P}3$	$P0, P1, P2, P3$	Carry Propagate Inputs
C_{nA}, C_{nB}	$\bar{C}_{nA}, \bar{C}_{nB}$	Carry Inputs
C_n	\bar{C}_n	Selected Carry
$C_{n+x}, C_{n+y}, C_{n+z}$	$\bar{C}_{n+x}, \bar{C}_{n+y}, \bar{C}_{n+z}$	Carry Outputs
\bar{G}	Y	Carry Generate Outputs
\bar{P}	X	Carry Propagate Outputs
$S0, S1$		Carry Select Inputs
V_{CC}		Supply Voltage
GND		Ground

[†] Interpretations are illustrated in connection with the Function Tables for the 'AS181A and 'AS881A.

description

The 'AS282 look-ahead carry generator is capable of anticipating a carry across four binary adders or group of adders. They are cascadable to perform full look-ahead across n-bit adders. The 'AS282 is functionally the same as the SN54AS182/SN74AS182 except that the carry input (C_n) is selected from C_{nA} , C_{nB} , and their complements \bar{C}_{nA} and \bar{C}_{nB} . The logic equations are written in terms of the selected carry C_n . This signal is also available as an output at C_n' .

When used in conjunction with the 'AS181A, 'AS881A, or 'AS888 arithmetic logic unit (ALU), this generator provides high-speed carry look-ahead capability for any word length. The 'AS282 generates the look-ahead (anticipated carry) across a group of four ALU's and, in addition, other carry across sections of four look-ahead circuits may be employed to anticipated carry across sections of four look-ahead packages up to n-bits. The method of cascading 'AS282 circuits to perform multi-level look-ahead is illustrated under typical application data.

logic equations

$$\begin{aligned}
 C_{n+x} &= G0 + P0 C_n \\
 C_{n+y} &= G1 + P1 G0 + P1 P0 C_n \\
 C_{n+z} &= G2 + P2 G1 + P2 P1 G0 + P2 P1 P0 C_n \\
 \bar{G} &= G3 + P3 G2 + P3 P2 G1 + P3 P2 P1 G0 \\
 \bar{P} &= P3 P2 P1 P0
 \end{aligned}
 \quad \text{or} \quad
 \begin{aligned}
 \bar{C}_{n+x} &= Y0 (X0 + C_n) \\
 \bar{C}_{n+y} &= Y1 [X1 + Y0 (X0 + C_n)] \\
 \bar{C}_{n+z} &= Y2 \{X2 + Y1 [X1 + Y0 (X0 + C_n)]\} \\
 Y &= Y3 (X3 + Y2) (X3 + X2 + Y1) (X3 + X2 + X1 + Y0) \\
 X &= X3 + X2 + X1 + X0
 \end{aligned}$$

TYPES SN54AS282, SN74AS282 LOOK-AHEAD CARRY GENERATOR WITH SELECTABLE CARRY INPUTS

FUNCTION TABLE FOR \bar{G} OUTPUT

INPUTS							OUTPUT
\bar{G}_3	\bar{G}_2	\bar{G}_1	\bar{G}_0	\bar{P}_3	\bar{P}_2	\bar{P}_1	\bar{G}
L	X	X	X	X	X	X	L
X	L	X	X	L	X	X	L
X	X	L	X	L	L	X	L
X	X	X	L	L	L	L	L
All other combinations							H

FUNCTION TABLE FOR \bar{P} OUTPUT

INPUTS				OUTPUT
\bar{P}_3	\bar{P}_2	\bar{P}_1	\bar{P}_0	\bar{P}
L	L	L	L	L
All other combinations				H

FUNCTION TABLE FOR C_n' OUTPUT

INPUTS		OUTPUT
S1	S0	C_n'
L	L	C_{nA}
L	H	\bar{C}_{nA}
H	L	C_{nB}
H	H	\bar{C}_{nB}

FUNCTION TABLE FOR C_{n+x} OUTPUT

INPUTS			OUTPUT
\bar{G}_0	\bar{P}_0	C_n'	C_{n+x}
L	X	X	H
X	L	H	H
All other combinations			L

FUNCTION TABLE C_{n+y} OUTPUT

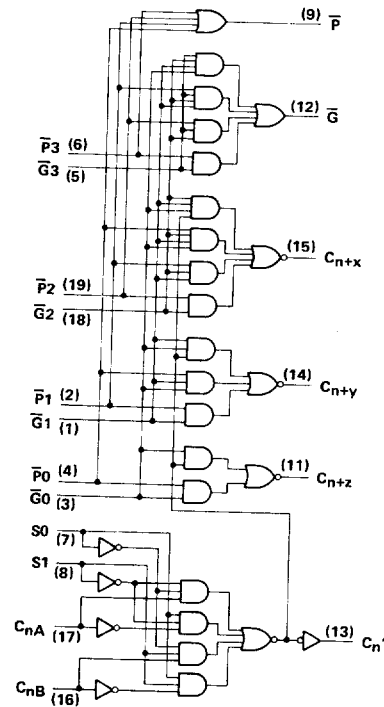
INPUTS					OUTPUT
\bar{G}_1	\bar{G}_0	\bar{P}_1	\bar{P}_0	C_n'	C_{n+y}
L	X	X	X	X	H
X	L	L	X	X	H
X	X	L	L	H	H
All other combinations					L

FUNCTION TABLE FOR C_{n+z} OUTPUT

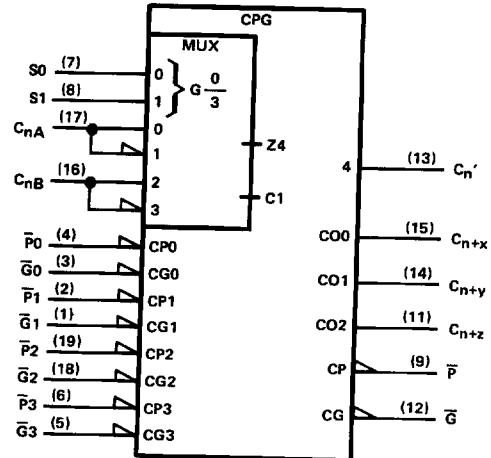
INPUTS							OUTPUT
\bar{G}_2	\bar{G}_1	\bar{G}_0	\bar{P}_2	\bar{P}_1	\bar{P}_0	C_n'	C_{n+z}
L	X	X	X	X	X	X	H
X	L	X	L	X	X	X	H
X	X	L	L	L	X	X	H
X	X	X	L	L	L	H	H
All other combinations							L

H = high-level, L = low level, X = irrelevant.
Any inputs not shown in a given table are irrelevant with respect to that output.

logic diagram (positive logic)



logic symbol



Pin numbers shown are for J and N packages.

TYPES SN54AS282, SN74AS282
LOOK-AHEAD CARRY GENERATOR WITH SELECTABLE CARRY INPUTS

absolute maximum ratings over operating free-air temperature range (unless otherwise noted)

Supply voltage, V_{CC}	7 V
Input voltage	7 V
Operating free-air temperature range: SN54AS282	-55°C to 125°C
SN74AS282	0°C to 70°C
Storage temperature range	-65°C to 150°C

recommended operating conditions

		SN54AS282			SN74AS282			UNIT
		MIN	NOM	MAX	MIN	NOM	MAX	
V_{CC}	Supply voltage	4.5	5	5.5	4.5	5	5.5	V
V_{IH}	High-level input voltage	2			2			V
V_{IL}	Low-level input voltage			0.8			0.8	V
I_{OH}	High-level output current			-2			-2	mA
I_{OL}	Low-level output current			20			20	mA
T_A	Operating free-air temperature	-55		125	0		70	°C

electrical characteristics over recommended operating free-air temperature range (unless otherwise noted)

PARAMETER	TEST CONDITIONS	SN54AS282			SN74AS282			UNIT
		MIN	TYP [†]	MAX	MIN	TYP [†]	MAX	
V_{IK}	$V_{CC} = 4.5 V, I_I = -18 mA$			-1.2			-1.2	V
V_{OH}	$V_{CC} = 4.5 V \text{ to } 5.5 V, I_{OH} = -2 mA$	$V_{CC}-2$			$V_{CC}-2$			V
V_{OL}	$V_{CC} = 4.5 V, I_{OL} = 20 mA$		0.3	0.5		0.3	0.5	V
I_I	$V_{CC} = 5.5 V, V_I = 7 V$	C_{nA}, C_{nB}		200			200	μA
		S_0, S_1, P_3		200			200	
		\overline{P}_2		300			300	
		$\overline{P}_0, \overline{P}_1, \overline{G}_3$		400			400	
		$\overline{G}_0, \overline{G}_2$		700			700	
		\overline{G}_1		800			800	
I_{IH}	$V_{CC} = 5.5 V, V_I = 2.7 V$	C_{nA}, C_{nB}		40			40	μA
		S_0, S_1, P_3		40			40	
		\overline{P}_2		60			60	
		$\overline{P}_0, \overline{P}_1, \overline{G}_3$		80			80	
		$\overline{G}_0, \overline{G}_2$		140			140	
		\overline{G}_1		160			160	
I_{IL}	$V_{CC} = 5.5 V, V_I = 0.4 V$	C_{nA}, C_{nB}		-1			-1	mA
		S_0, S_1, P_3		-1			-1	
		\overline{P}_2		-1.5			-1.5	
		$\overline{P}_0, \overline{P}_1, \overline{G}_3$		-2			-2	
		$\overline{G}_0, \overline{G}_2$		-3.5			-3.5	
		\overline{G}_1		-4			-4	
I_O^{\ddagger}	$V_{CC} = 5.5 V, V_O = 2.25 V$	-30		-112	-30		-112	mA
I_{CCH}	$V_{CC} = 5.5 V$		22			22		mA
I_{CCL}	$V_{CC} = 5.5 V$		26			26		mA

[†]All typical values are at $V_{CC} = 5 V, T_A = 25^\circ C$.

[‡]The output conditions have been chosen to produce a current that closely approximates one-half of the true short-circuit current, I_{OS} .

2
ALS AND AS CIRCUITS

TYPES SN54AS282, SN74AS282
LOOK-AHEAD CARRY GENERATOR WITH SELECTABLE CARRY INPUTS

switching characteristics (see Note 1)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	V _{CC} = 4.5 V to 5.5 V, C _L = 50 pF, R _L = 500 Ω, T _A = MIN to MAX						UNIT
			SN54AS282			SN74AS282			
			MIN	TYP†	MAX	MIN	TYP†	MAX	
t _{PLH}	S0, S1, C _{nA} , or C _{nB}	C _n		6			6		ns
t _{PHL}				6			6		
t _{PLH}	S0, S1, C _{nA} , or C _{nB}	C _{n+x} , C _{n+y} , C _{n+z}		6			6		ns
t _{PHL}				6			6		
t _{PLH}	\bar{P} or \bar{G}	C _{n+x} , C _{n+y} , C _{n+z}		5			5		ns
t _{PHL}				5			5		
t _{PLH}	\bar{P} or \bar{G}	\bar{G}		6			6		ns
t _{PHL}				5			5		
t _{PLH}	\bar{P}	\bar{P}		5			5		ns
t _{PHL}				5			5		

†All typical values are at V_{CC} = 5 V, T_A = 25°C.

NOTE 1: For load circuit and voltage waveforms, see page 1-12.

TYPICAL APPLICATION DATA

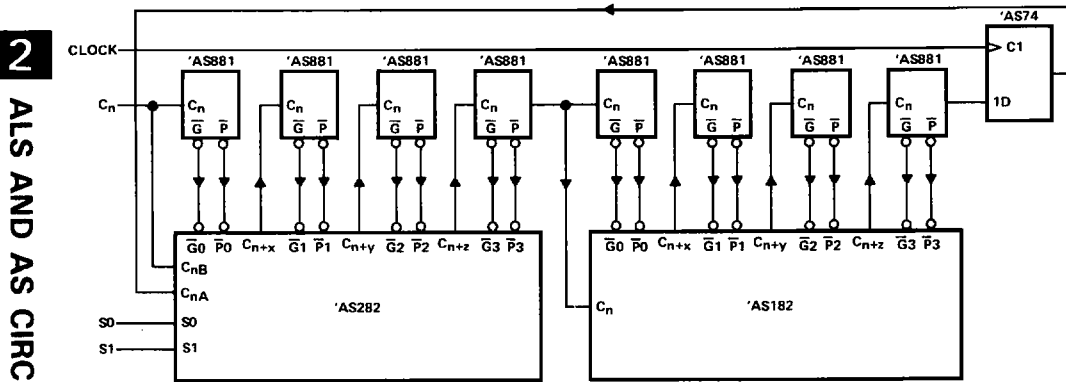


FIGURE 1—32-BIT LOOK-AHEAD CARRY WITH DOUBLE-PRECISION CARRY IN 'AS282 AND 'AS182