

# SN54AS882A, SN74AS882A 32-BIT LOOK-AHEAD CARRY GENERATORS

SDAS235 – D2661, DECEMBER 1982 – REVISED NOVEMBER 1985

- Directly Compatible With 'AS181B, 'AS1181, 'AS881B, and 'AS1881 ALUs
- Package Options Include Plastic Small Outline Packages, Both Plastic and Ceramic Chip Carriers, and Standard Plastic and Ceramic 300-mil DIPs
- Capable of Anticipating the Carry Across a Group of Eight 4-Bit Binary Adders
- Cascadable to Perform Look-Ahead Across n-Bit Adders
- Typical Carry Time,  $C_n$  to Any  $C_{n+i}$ , is Less Than 6 ns
- Dependable Texas Instruments Quality and Reliability

## description

The 'AS882A is a high-speed look-ahead carry generator capable of anticipating the carry across a group of eight 4-bit adders permitting the designer to implement look-ahead for a 32-bit ALU with a single package or, by cascading 'AS882As, full look-ahead is possible across n-bit adders.

The SN54AS882A is characterized for operation over the full military temperature range of  $-55^{\circ}\text{C}$  to  $125^{\circ}\text{C}$ . The SN74AS882A is characterized for operation from  $0^{\circ}\text{C}$  to  $70^{\circ}\text{C}$ .

### 'AS882A LOGIC EQUATIONS

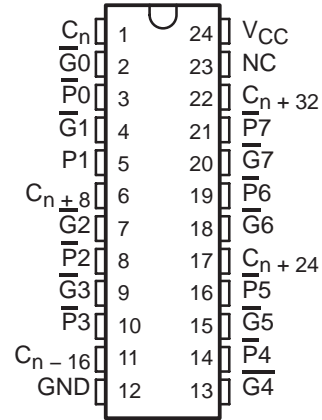
$$C_{n+8} = G1 + P1G0 + P1P0C_n$$

$$C_{n+16} = G3 + P3G2 + P3P2G1 + P3P2P1G0 + P3P2P1P0C_n$$

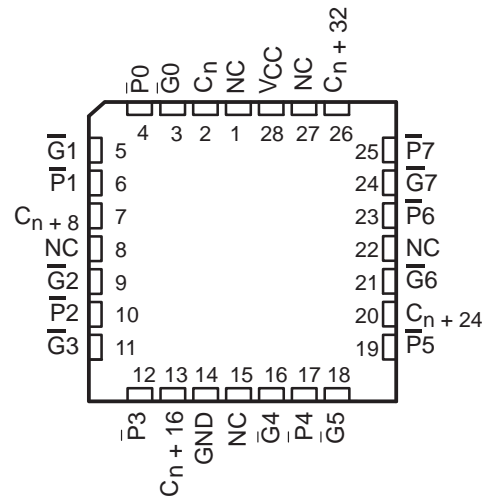
$$C_{n+24} = G5 + P5G4 + P5P4G3 + P5P4P3G2 + P5P4P3P2G1 + P5P4P3P2P1G0 + P5P4P3P2P1P0C_n$$

$$C_{n+32} = G7 + P7G6 + P7P6G5 + P7P6P5G4 + P7P6P5P4G3 + P7P6P5P4P3G2 + P7P6P5P4P3P2G1 + P7P6P5P4P3P2P1G0 + P7P6P5P4P3P2P1P0C_n$$

SN54AS882A . . . JT PACKAGE  
SN74AS882A . . . DW OR NT PACKAGE  
(TOP VIEW)



SN54AS882A . . . FK PACKAGE  
SN74AS882A . . . DW OR NT PACKAGE  
(TOP VIEW)



NC – No internal connection

PRODUCTION DATA information is current as of publication date. Products conform to specifications per the terms of Texas Instruments standard warranty. Production processing does not necessarily include testing of all parameters.



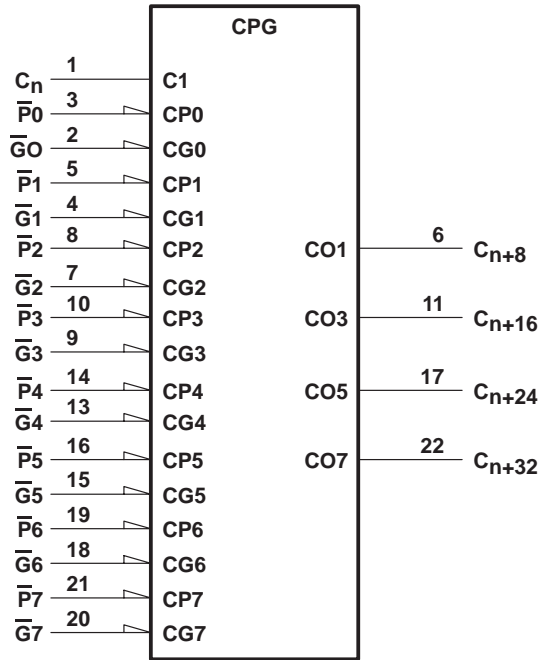
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# SN54AS882A, SN74AS882A 32-BIT LOOK-AHEAD CARRY GENERATORS

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logic symbol†



† This symbol is in accordance with ANSI/IEEE Std 91-1984 and IEC Publication 617-12.  
Pin numbers shown are for DW, JT, and NT packages.

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**FUNCTION TABLE  
FOR  $C_n + 32$  OUTPUT**

INPUTS																	OUTPUT
G7	G6	G5	G4	G3	G2	G1	G0	P7	P6	P5	P4	P3	P2	P1	P0	C <sub>n</sub>	C <sub>n + 32</sub>
L	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	H
X	L	X	X	X	X	X	X	L	X	X	X	X	X	X	X	X	H
X	X	L	X	X	X	X	X	L	L	X	X	X	X	X	X	X	H
X	X	X	L	X	X	X	X	L	L	L	X	X	X	X	X	X	H
X	X	X	X	L	X	X	X	L	L	L	L	X	X	X	X	X	H
X	X	X	X	X	L	X	X	L	L	L	L	L	X	X	X	X	H
X	X	X	X	X	X	L	X	L	L	L	L	L	L	X	X	X	H
X	X	X	X	X	X	X	L	L	L	L	L	L	L	L	X	X	H
X	X	X	X	X	X	X	X	L	L	L	L	L	L	L	L	H	H
All other combinations																	L

**FUNCTION TABLE  
FOR  $C_n + 24$  OUTPUT**

INPUTS													OUTPUT
G5	G4	G3	G2	G1	G0	P5	P4	P3	P2	P1	P0	C <sub>n</sub>	C <sub>n + 24</sub>
L	X	X	X	X	X	X	X	X	X	X	X	X	H
X	L	X	X	X	X	L	X	X	X	X	X	X	H
X	X	L	X	X	X	L	L	X	X	X	X	X	H
X	X	X	L	X	X	L	L	L	X	X	X	X	H
X	X	X	X	L	X	L	L	L	L	X	X	X	H
X	X	X	X	X	L	L	L	L	L	L	X	X	H
X	X	X	X	X	X	L	L	L	L	L	L	H	H
All other combinations													L

### Function Tables

FOR  $C_n + 16$  OUTPUT

INPUTS									OUTPUT
G3	G2	G1	G0	P3	P2	P1	P0	C <sub>n</sub>	C <sub>n + 16</sub>
L	X	X	X	X	X	X	X	X	H
X	L	X	X	L	X	X	X	X	H
X	X	L	X	L	L	X	X	X	H
X	X	X	L	L	L	L	X	X	H
X	X	X	X	L	L	L	L	H	H
All other combinations									L

FOR  $C_n + 8$  OUTPUT

INPUTS					OUTPUT
G1	G0	P1	P0	C <sub>n</sub>	C <sub>n + 8</sub>
L	X	X	X	X	H
X	L	L	X	X	H
X	X	L	L	H	H
All other combinations					L

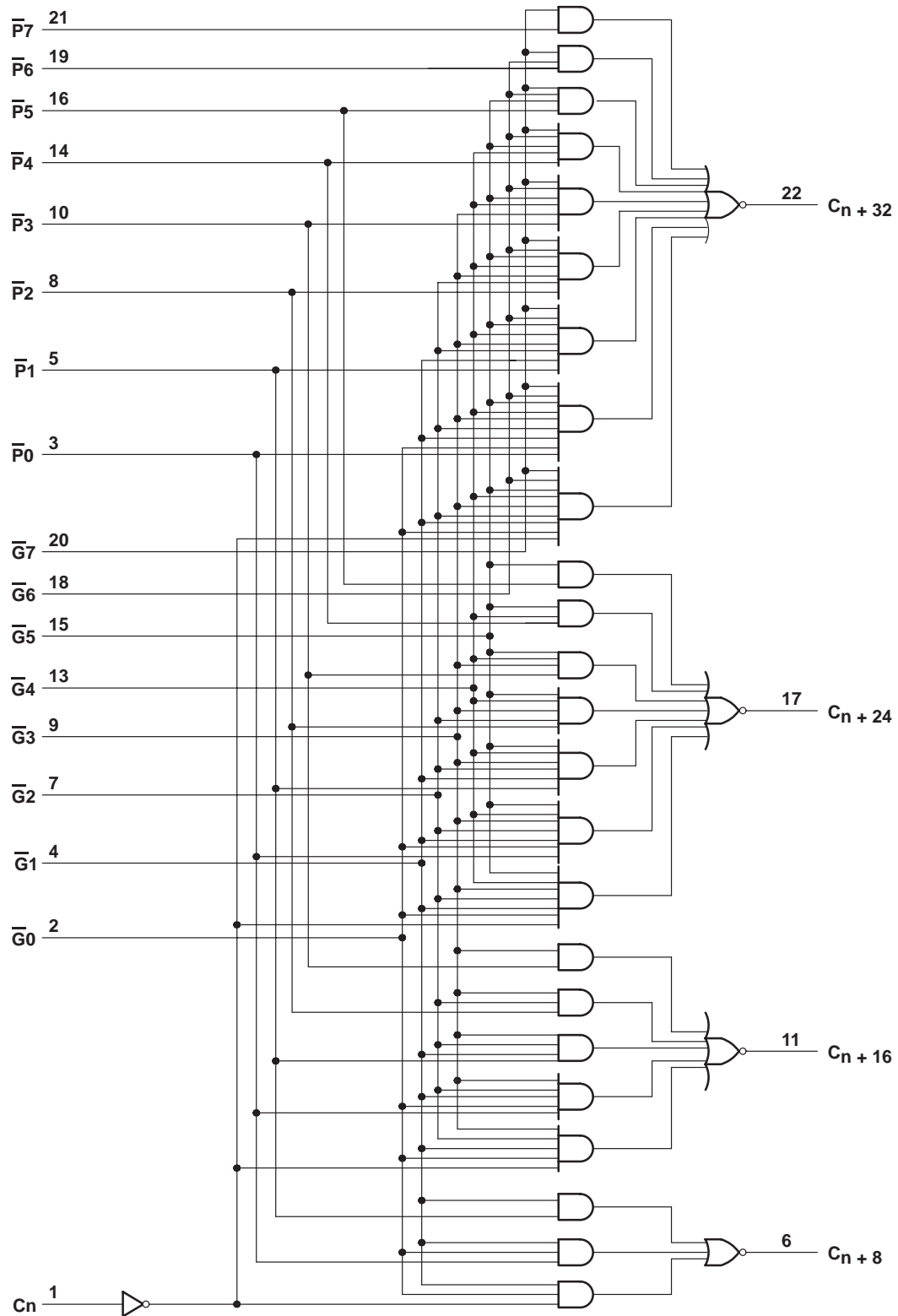
Any inputs not shown in a given table are irrelevant with respect to that output.



# SN54AS882A, SN74AS882A 32-BIT LOOK-AHEAD CARRY GENERATORS

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## logic diagram (positive logic)



Pin numbers shown are for DW, JT, and NT packages.



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# SN54AS882A, SN74AS882A 32-BIT LOOK-AHEAD CARRY GENERATORS

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

PARAMETER	TEST CONDITIONS	SN54AS882A			SN74AS882A			UNIT	
		MIN	TYP†	MAX	MIN	TYP†	MAX		
$V_{IK}$	$V_{CC} = 4.5\text{ V}$ , $I_I = -18\text{ mA}$			-1.2			-1.2	V	
$V_{OH}$	$V_{CC} = 4.5\text{ V to } 5.5\text{ V}$ , $I_{OH} = -2\text{ mA}$	$V_{CC}-2$			$V_{CC}-2$			V	
$V_{OL}$	$V_{CC} = 4.5\text{ V}$ , $I_{OL} = 20\text{ mA}$		0.3	0.5		0.3	0.5	V	
$I_I$	$C_n, \overline{P0}, \overline{P1}$	$V_{CC} = 5.5\text{ V}$ ,	$V_I = 7\text{ V}$				0.4	0.4	mA
	$\overline{G0}, \overline{G6}$						0.8	0.8	
	$\overline{G1}, \overline{G2}, \overline{G4}$						1.2	1.2	
	$\overline{G3}, \overline{G5}$						1.5	1.5	
	$\overline{G7}$						0.9	0.9	
	$\overline{P2}, \overline{P3}$						0.3	0.3	
	$\overline{P4}, \overline{P5}$						0.2	0.2	
	$\overline{P6}, \overline{P7}$						0.1	0.1	
$I_{IH}$	$C_n, \overline{P0}, \overline{P1}$	$V_{CC} = 5.5\text{ V}$ ,	$V_I = 2.7\text{ V}$				80	80	$\mu\text{A}$
	$\overline{G0}, \overline{G6}$						160	160	
	$\overline{G1}, \overline{G2}, \overline{G4}$						240	240	
	$\overline{G3}, \overline{G5}$						300	300	
	$\overline{G7}$						180	180	
	$\overline{P2}, \overline{P3}$						60	60	
	$\overline{P4}, \overline{P5}$						40	40	
	$\overline{P6}, \overline{P7}$						20	20	
$I_{IL}$	$C_n, \overline{P0}, \overline{P1}$	$V_{CC} = 5.5\text{ V}$ ,	$V_I = 0.4\text{ V}$				-2	-2	mA
	$\overline{G0}, \overline{G6}$						-4	-4	
	$\overline{G1}, \overline{G2}, \overline{G4}$						-6	-6	
	$\overline{G3}, \overline{G5}$						-7.5	-7.5	
	$\overline{G7}$						-4.5	-4.5	
	$\overline{P2}, \overline{P3}$						-1.5	-1.5	
	$\overline{P4}, \overline{P5}$						-1	-1	
	$\overline{P6}, \overline{P7}$						-0.5	-0.5	
$I_{O\ddagger}$	$V_{CC} = 5.5\text{ V}$ , $V_O = 2.25\text{ V}$		-30	-130		-30	-30	mA	
$I_{CC}$	$V_{CC} = 5.5\text{ V}$		44	70		44	70	mA	

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

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



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## switching characteristics (see Note 1)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	V <sub>CC</sub> = 4.5 V to 5.5 V, C <sub>L</sub> = 50 pF, R <sub>L</sub> = 500 Ω, T <sub>A</sub> = MIN to MAX				UNIT
			SN54AS882A		SN74AS882A		
			MIN	MAX	MIN	MAX	
t <sub>PLH</sub>	C <sub>n</sub>	Any output	2	10	2	9	ns
t <sub>PHL</sub>			3	15	3	14	
t <sub>PLH</sub>	$\bar{P}$ or $\bar{G}$	C <sub>n</sub> + 8	2	8	2	7	
t <sub>PHL</sub>			2	8	2	7	
t <sub>PLH</sub>	$\bar{P}$ or $\bar{G}$	C <sub>n</sub> + 16	2	8	2	7	
t <sub>PHL</sub>			2	8	2	7	
t <sub>PLH</sub>	$\bar{P}$ or $\bar{G}$	C <sub>n</sub> + 24	2	8	2	7	
t <sub>PHL</sub>			2	11	2	10	
t <sub>PLH</sub>	$\bar{P}$ or $\bar{G}$	C <sub>n</sub> + 32	1.5	9	2	8	
t <sub>PHL</sub>			2	13	2	12	

NOTE 1: Load circuits and voltage waveforms are shown in Section 1.

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## TYPICAL APPLICATION DATA

The application given in Figure 1 illustrates how the 'AS882A can implement look-ahead carry for a 32-bit ALU (in this case, the popular 'AS881A) with a single package. Typical carry times shown are derived using the standard Advanced Schottky load circuit.

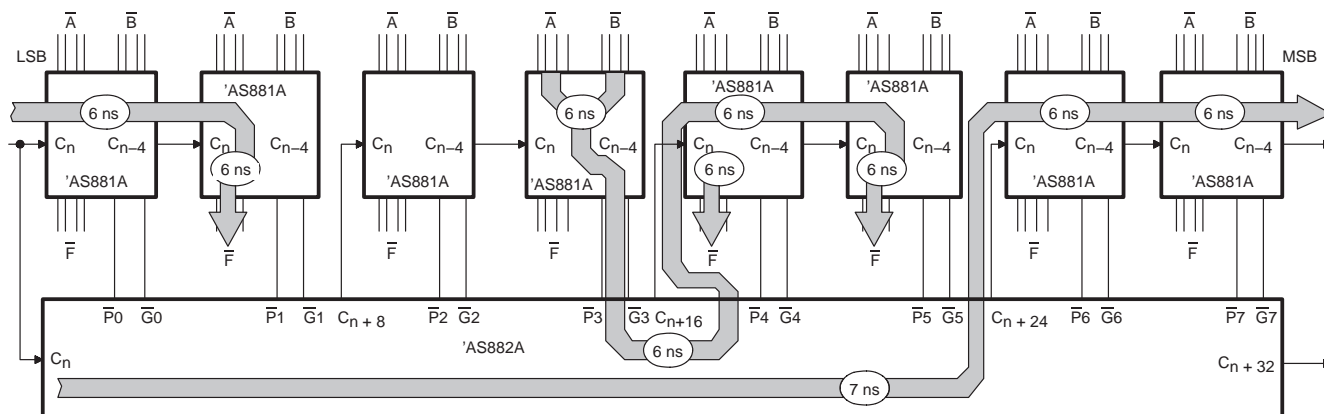


Figure 1

Likewise, Figure 2 illustrates the same 32-bit ALU using two 'AS882s. This shows the worst-case delay from LSB to MSB to be 19 ns as opposed to 25 ns in Figure 1.

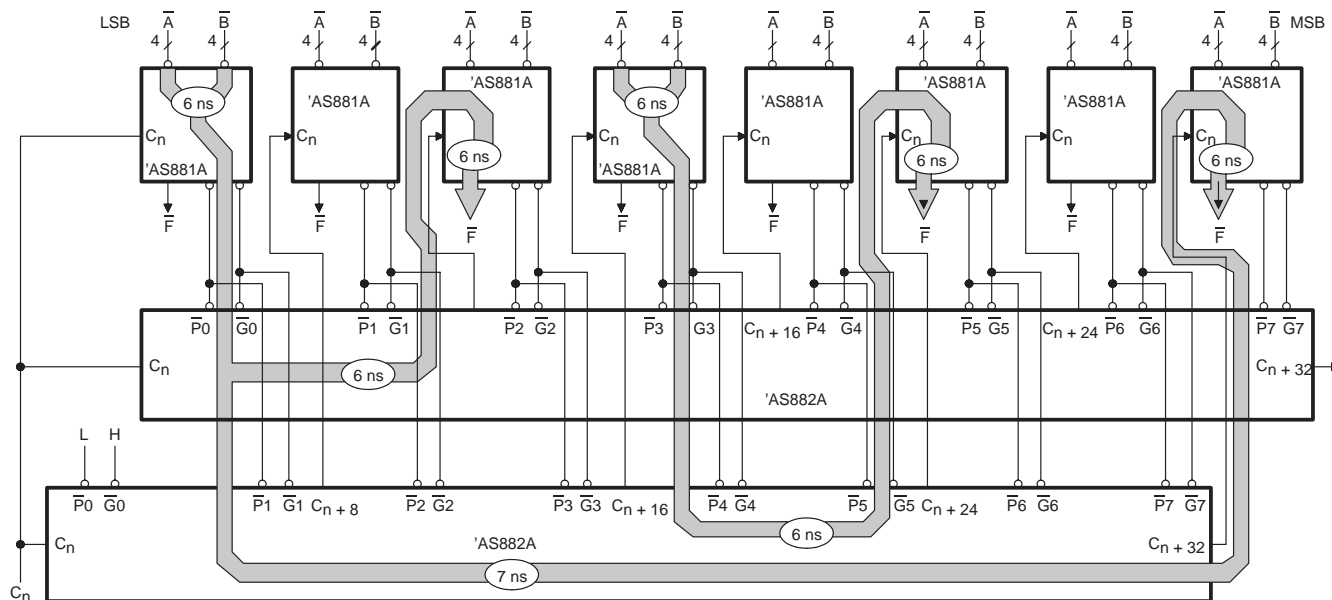


Figure 2



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### Applications

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