

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°C to 125°C . The SN74AS882A is characterized for operation from 0°C to 70°C .

'AS882A LOGIC EQUATIONS

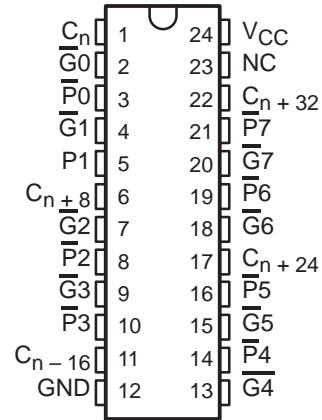
$$C_{n+8} = G1 + P1G0 + P1P0C_n$$

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

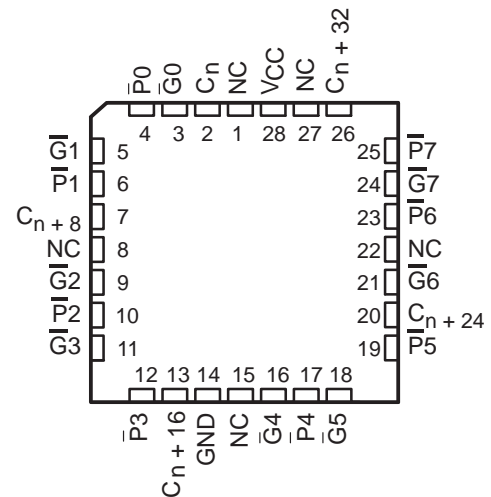
$$C_{n+24} = G5 + P5G4 + P5P4G3 + P5P4P3G2 + P5P4P3P2G1 + P5P4P3P2P1G0 + P5P4P3P2P1P0C_n$$

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

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



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

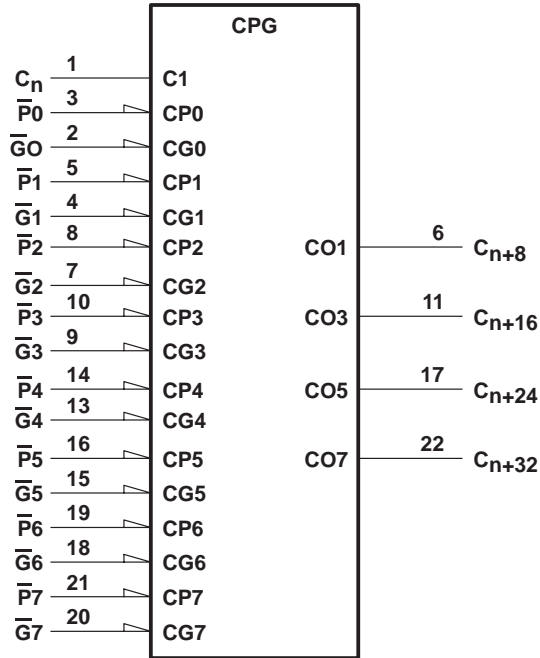


NC – No internal connection

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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_n	$C_n + 32$
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_n	$C_n + 24$
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_n	$C_n + 16$
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

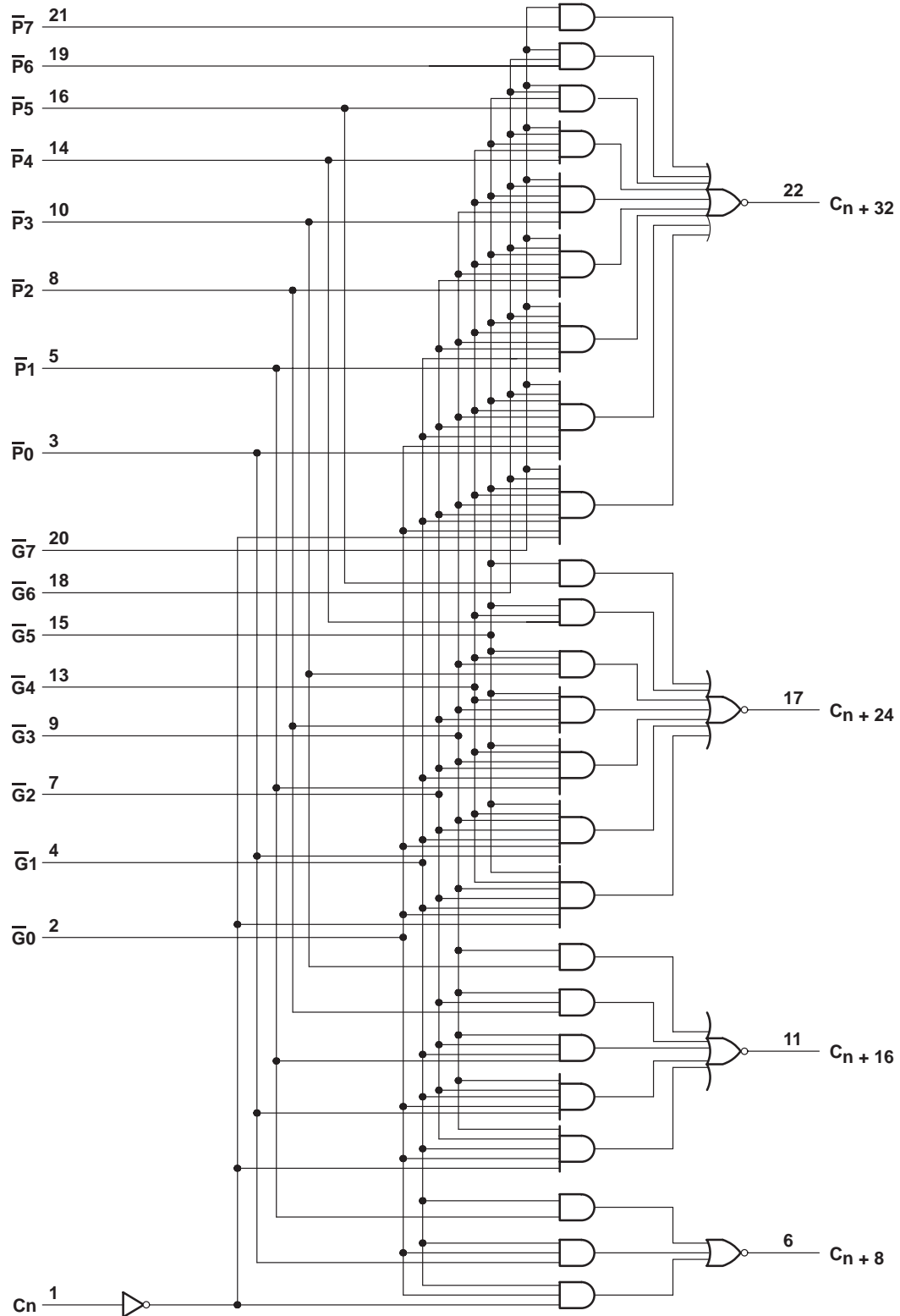
INPUTS					OUTPUT
G1	G0	P1	P0	C_n	$C_n + 8$
L	X	X	X	X	H
X	L	L	X	X	H
X	X	L	L	H	H
All other combinations					L

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

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logic diagram (positive logic)



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

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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: SN54AS882A	–55°C to 125°C
SN74AS882A	0°C to 70°C
Storage temperature range	–65°C to 150°C

recommended operating conditions

	SN54AS882A			SN74AS882A			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



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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, P_0, P_1	$V_{CC} = 5.5\text{ V}$, $V_I = 7\text{ V}$		0.4		0.4	mA	
	G_0, G_6			0.8		0.8		
	G_1, G_2, G_4			1.2		1.2		
	G_3, G_5			1.5		1.5		
	G_7			0.9		0.9		
	P_2, P_3			0.3		0.3		
	P_4, P_5			0.2		0.2		
	P_6, P_7			0.1		0.1		
I_{IH}	C_n, P_0, P_1	$V_{CC} = 5.5\text{ V}$, $V_I = 2.7\text{ V}$		80		80	μA	
	G_0, G_6			160		160		
	G_1, G_2, G_4			240		240		
	G_3, G_5			300		300		
	G_7			180		180		
	P_2, P_3			60		60		
	P_4, P_5			40		40		
	P_6, P_7			20		20		
I_{IL}	C_n, P_0, P_1	$V_{CC} = 5.5\text{ V}$, $V_I = 0.4\text{ V}$		-2		-2	mA	
	G_0, G_6			-4		-4		
	G_1, G_2, G_4			-6		-6		
	G_3, G_5			-7.5		-7.5		
	G_7			-4.5		-4.5		
	P_2, P_3			-1.5		-1.5		
	P_4, P_5			-1		-1		
	P_6, P_7			-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 _{CC} = 4.5 V to 5.5 V, C _L = 50 pF, R _L = 500 Ω, T _A = MIN to MAX				UNIT
			SN54AS882A		SN74AS882A		
			MIN	MAX	MIN	MAX	
t _{PLH}	C _n	Any output	2	10	2	9	ns
t _{PHL}			3	15	3	14	
t _{PLH}	P or G	C _n + 8	2	8	2	7	
t _{PHL}			2	8	2	7	
t _{PLH}	P or G	C _n + 16	2	8	2	7	
t _{PHL}			2	8	2	7	
t _{PLH}	P or G	C _n + 24	2	8	2	7	
t _{PHL}			2	11	2	10	
t _{PLH}	P or G	C _n + 32	1.5	9	2	8	
t _{PHL}			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.

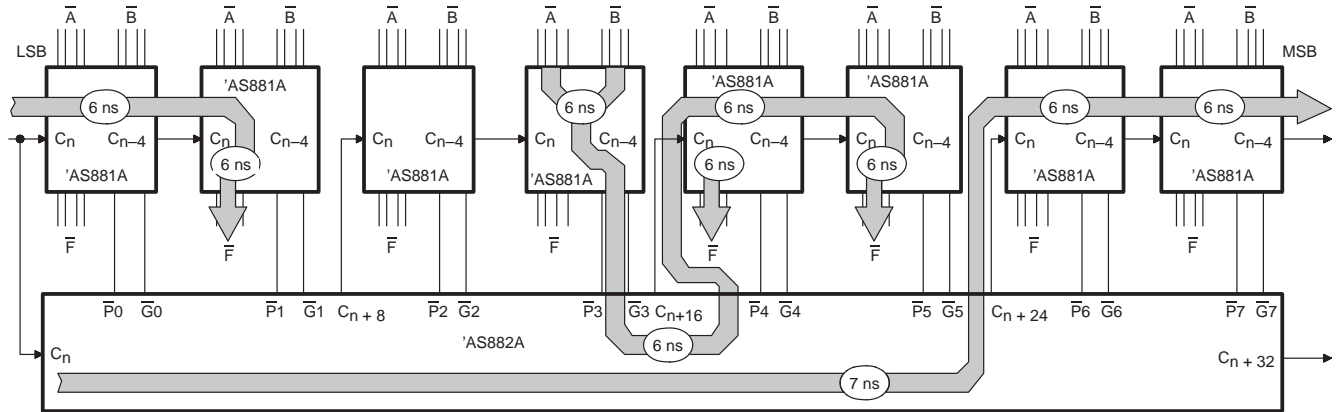


Figure 1

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.

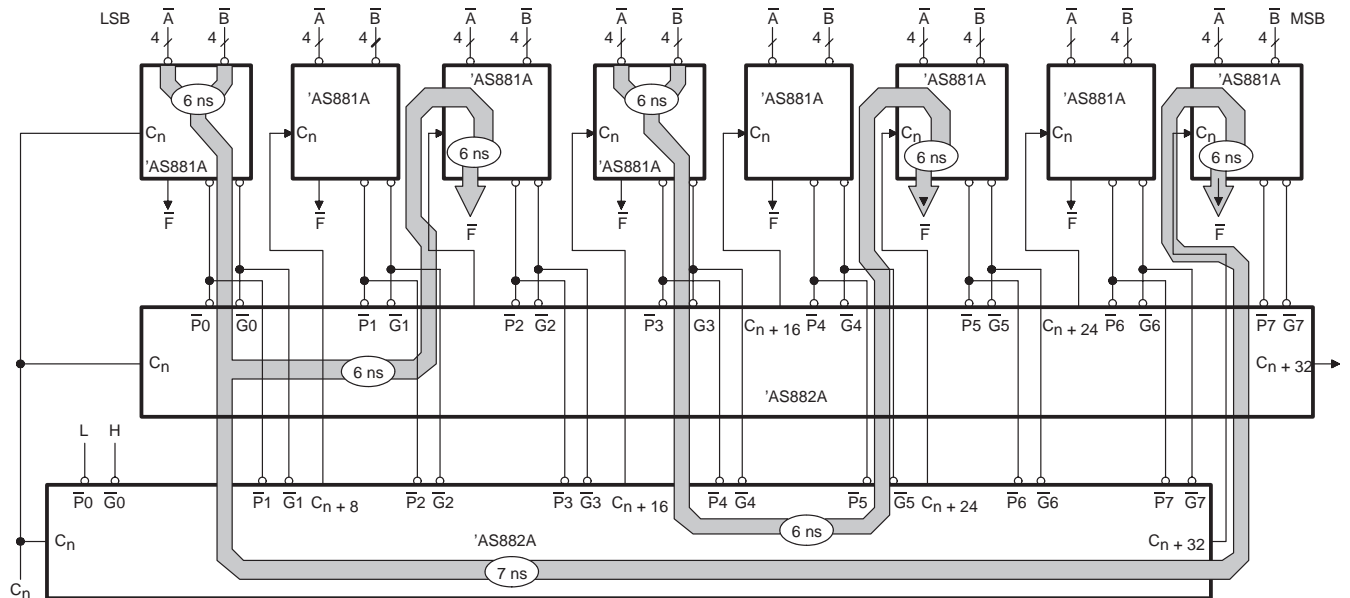


Figure 2

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