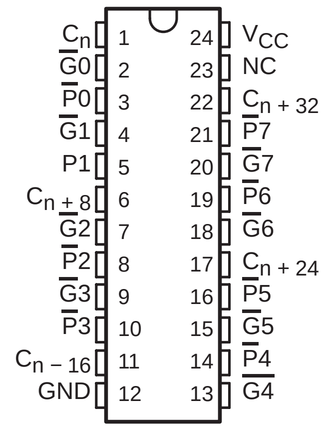
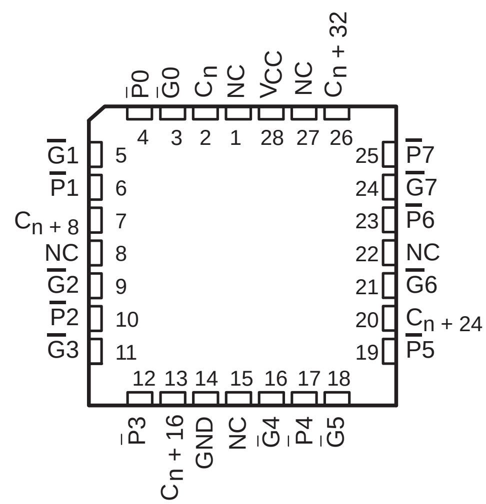
SDAS235 − D2661, DECEMBER 1982 − REVISED NOVEMBER 1985

- **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**

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



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



NC − No internal connection

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

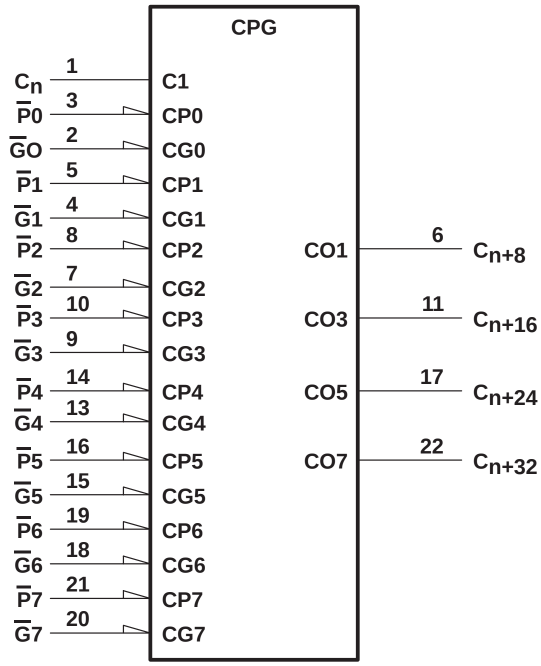
$$C_{n+8} = G1 + P1G0 + P1P0C_n$$

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

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

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

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.

FUNCTION TABLE
FOR C_{n+32} OUTPUT

INPUTS																	OUTPUT
$\overline{G7}$	$\overline{G6}$	$\overline{G5}$	$\overline{G4}$	$\overline{G3}$	$\overline{G2}$	$\overline{G1}$	$\overline{G0}$	$\overline{P7}$	$\overline{P6}$	$\overline{P5}$	$\overline{P4}$	$\overline{P3}$	$\overline{P2}$	$\overline{P1}$	$\overline{P0}$	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
$\overline{G5}$	$\overline{G4}$	$\overline{G3}$	$\overline{G2}$	$\overline{G1}$	$\overline{G0}$	$\overline{P5}$	$\overline{P4}$	$\overline{P3}$	$\overline{P2}$	$\overline{P1}$	$\overline{P0}$	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

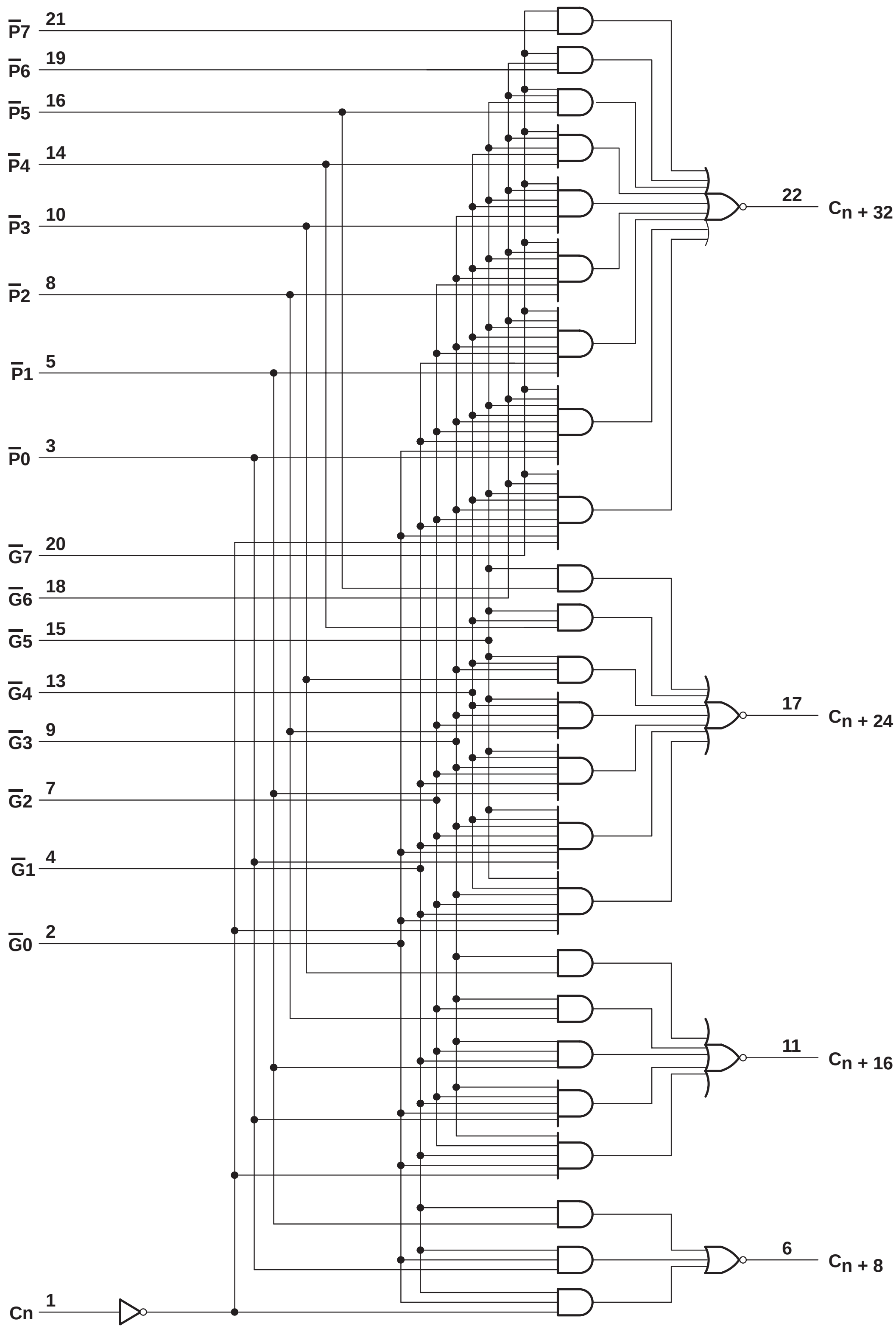
INPUTS									OUTPUT
$\overline{G3}$	$\overline{G2}$	$\overline{G1}$	$\overline{G0}$	$\overline{P3}$	$\overline{P2}$	$\overline{P1}$	$\overline{P0}$	C_n	C_{n+16}
L	X	X	X	X	X	X	X	X	H
X	L	X	X	L	X	X	X	X	H
X	X	L	X	L	L	X	X	X	H
X	X	X	L	L	L	L	X	X	H
X	X	X	X	L	L	L	L	H	H
All other combinations									L

FOR C_{n+8} OUTPUT

INPUTS					OUTPUT
$\overline{G1}$	$\overline{G0}$	$\overline{P1}$	$\overline{P0}$	C_n	C_{n+16}
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.

logic diagram (positive logic)



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

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

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 V,	I_I = −18 mA			−1.2			−1.2	V
V_{OH}		V_{CC} = 4.5 V 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	C_n, $\overline{P}0$, $\overline{P}1$	V_{CC} = 5.5 V,	V_I = 7 V			0.4			0.4	mA
	$\overline{G}0$, $\overline{G}6$					0.8			0.8	
	$\overline{G}1$, $\overline{G}2$, $\overline{G}4$					1.2			1.2	
	$\overline{G}3$, $\overline{G}5$					1.5			1.5	
	$\overline{G}7$					0.9			0.9	
	$\overline{P}2$, $\overline{P}3$					0.3			0.3	
	$\overline{P}4$, $\overline{P}5$					0.2			0.2	
	$\overline{P}6$, $\overline{P}7$					0.1			0.1	
I_{IH}	C_n, $\overline{P}0$, $\overline{P}1$	V_{CC} = 5.5 V,	V_I = 2.7 V			80			80	μA
	$\overline{G}0$, $\overline{G}6$					160			160	
	$\overline{G}1$, $\overline{G}2$, $\overline{G}4$					240			240	
	$\overline{G}3$, $\overline{G}5$					300			300	
	$\overline{G}7$					180			180	
	$\overline{P}2$, $\overline{P}3$					60			60	
	$\overline{P}4$, $\overline{P}5$					40			40	
	$\overline{P}6$, $\overline{P}7$					20			20	
I_{IL}	C_n, $\overline{P}0$, $\overline{P}1$	V_{CC} = 5.5 V,	V_I = 0.4 V			−2			−2	mA
	$\overline{G}0$, $\overline{G}6$					−4			−4	
	$\overline{G}1$, $\overline{G}2$, $\overline{G}4$					−6			−6	
	$\overline{G}3$, $\overline{G}5$					−7.5			−7.5	
	$\overline{G}7$					−4.5			−4.5	
	$\overline{P}2$, $\overline{P}3$					−1.5			−1.5	
	$\overline{P}4$, $\overline{P}5$					−1			−1	
	$\overline{P}6$, $\overline{P}7$					−0.5			−0.5	
I_O‡		V_{CC} = 5.5 V,	V_O = 2.25 V	−30		−130	−30		−30	mA
I_{CC}		V_{CC} = 5.5 V			44	70		44	70	mA

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

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}	$\overline{P}$ or $\overline{G}$	C_n + 8	2	8	2	7	
t_{PHL}			2	8	2	7	
t_{PLH}	$\overline{P}$ or $\overline{G}$	C_n + 16	2	8	2	7	
t_{PHL}			2	8	2	7	
t_{PLH}	$\overline{P}$ or $\overline{G}$	C_n + 24	2	8	2	7	
t_{PHL}			2	11	2	10	
t_{PLH}	$\overline{P}$ or $\overline{G}$	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.

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.

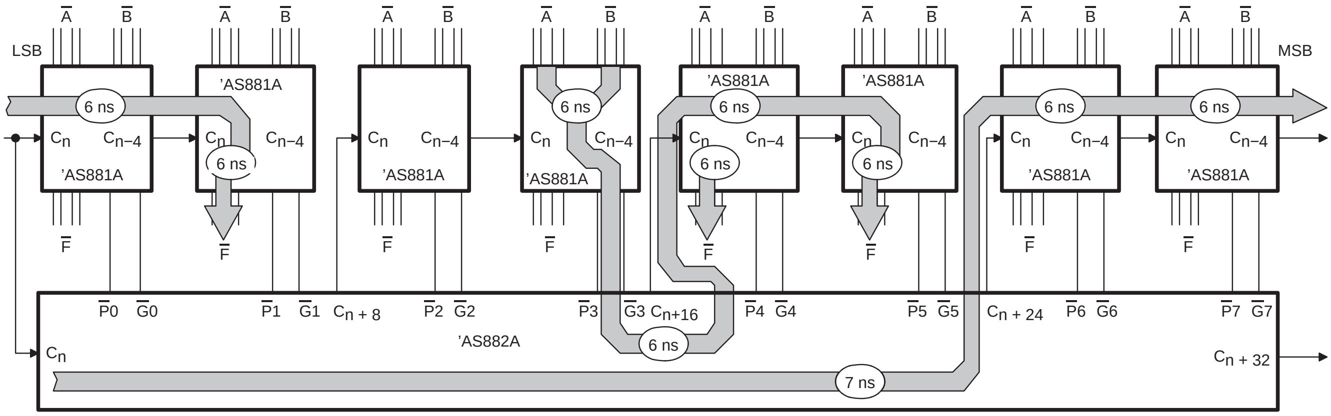


Figure 1

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.

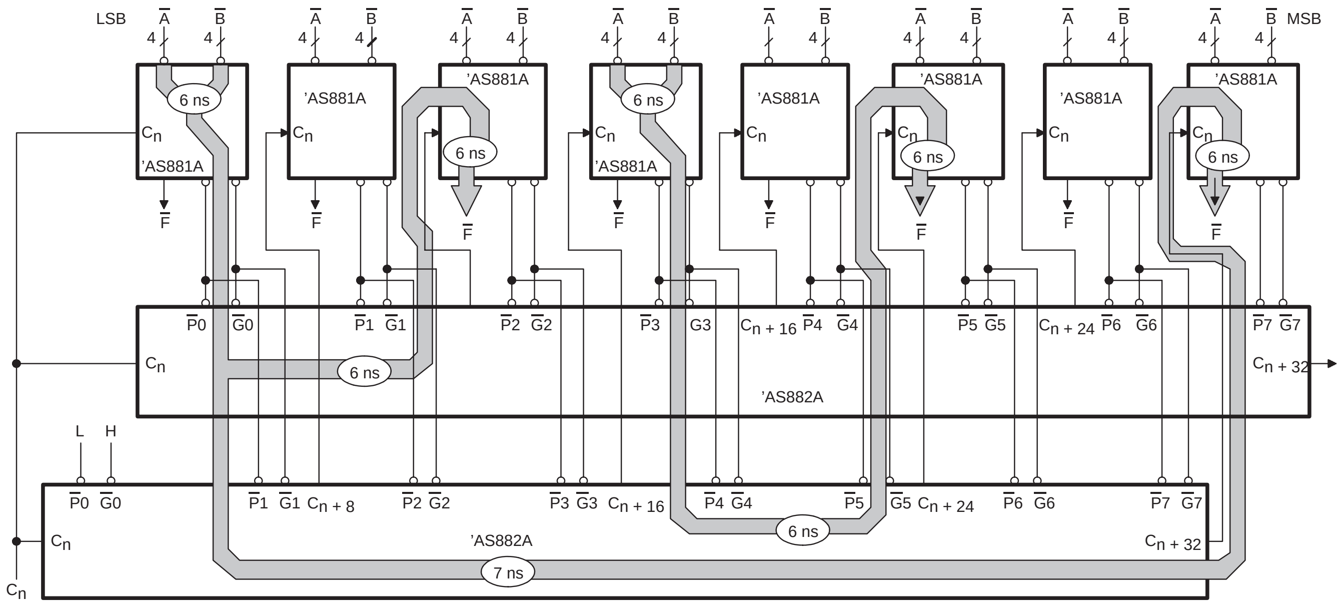


Figure 2

TEXAS INSTRUMENTS
POST OFFICE BOX 655303 ● DALLAS, TEXAS 75265
POST OFFICE BOX 1443 ● HOUSTON, TEXAS 77001