

SN54AS882A, SN74AS882A 32-BIT LOOK-AHEAD CARRY GENERATORS

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 'AS882A's, 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

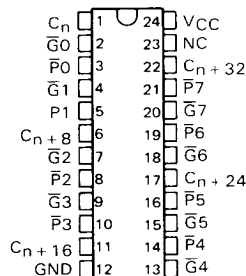
$$C_n + 8 = G_1 + P_1G_0 + P_1P_0C_n$$

$$C_n + 16 = G_3 + P_3G_2 + P_3P_2G_1 + P_3P_2P_1G_0 + P_3P_2P_1P_0C_n$$

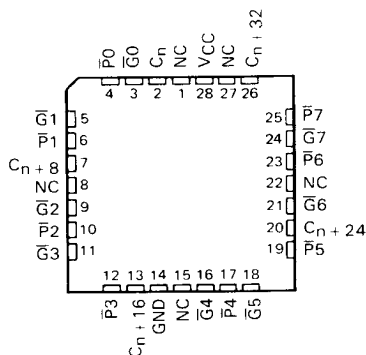
$$C_n + 24 = G_5 + P_5G_4 + P_5P_4G_3 + P_5P_4P_3G_2 + P_5P_4P_3P_2G_1 + P_5P_4P_3P_2P_1G_0 + P_5P_4P_3P_2P_1P_0C_n$$

$$C_n + 32 = G_7 + P_7G_6 + P_7P_6G_5 + P_7P_6P_5G_4 + P_7P_6P_5P_4G_3 + P_7P_6P_5P_4P_3G_2 + P_7P_6P_5P_4P_3P_2G_1 + P_7P_6P_5P_4P_3P_2P_1G_0 + P_7P_6P_5P_4P_3P_2P_1P_0C_n$$

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



SN54AS882A ... FK PACKAGE
SN74AS882A ... FN PACKAGE
(TOP VIEW)



NC No internal connection

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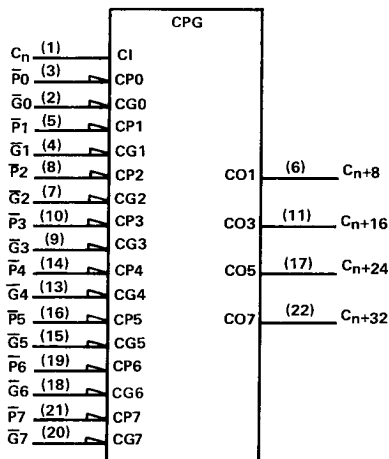
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SN54AS882A, SN74AS882A 32-BIT LOOK-AHEAD CARRY GENERATORS

logic symbol†

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†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
$\bar{G}_7$	$\bar{G}_6$	$\bar{G}_5$	$\bar{G}_4$	$\bar{G}_3$	$\bar{G}_2$	$\bar{G}_1$	$\bar{G}_0$	$\bar{P}_7$	$\bar{P}_6$	$\bar{P}_5$	$\bar{P}_4$	$\bar{P}_3$	$\bar{P}_2$	$\bar{P}_1$	$\bar{P}_0$	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	X	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
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
$\bar{G}_5$	$\bar{G}_4$	$\bar{G}_3$	$\bar{G}_2$	$\bar{G}_1$	$\bar{G}_0$	$\bar{P}_5$	$\bar{P}_4$	$\bar{P}_3$	$\bar{P}_2$	$\bar{P}_1$	$\bar{P}_0$	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	X	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
X	X	X	X	X	X	X	L	L	L	L	L	H	H
All other combinations													L

FUNCTION TABLE
FOR $C_n + 16$ OUTPUT

INPUTS									OUTPUT
$\bar{G}_3$	$\bar{G}_2$	$\bar{G}_1$	$\bar{G}_0$	$\bar{P}_3$	$\bar{P}_2$	$\bar{P}_1$	$\bar{P}_0$	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

FUNCTION TABLE
FOR $C_n + 8$ OUTPUT

INPUTS					OUTPUT
$\bar{G}_1$	$\bar{G}_0$	$\bar{P}_1$	$\bar{P}_0$	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

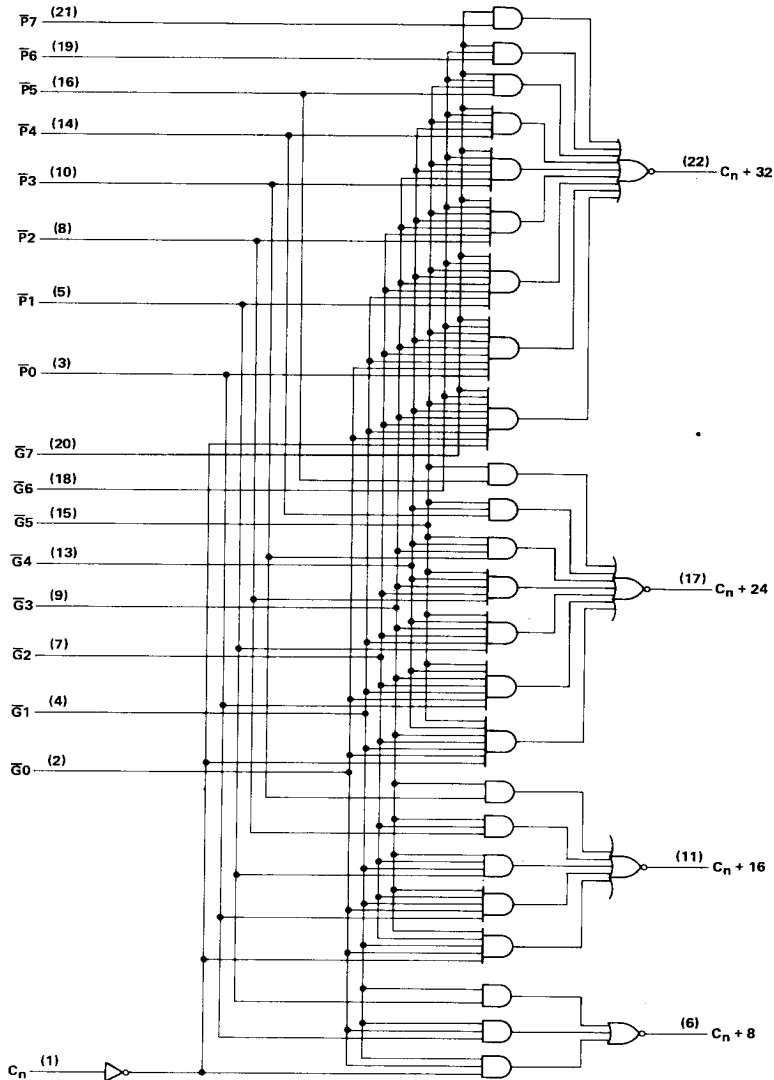
Any inputs not shown in a given table are irrelevant with respect to that output.

SN54AS882A, SN74AS882A
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logic diagram (positive logic)

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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
SN74AS822A	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 _{QH}	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

SN54AS882A, SN74AS882A
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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	$C_n, \bar{P}0, \bar{P}1$	$V_{CC} = 5.5 \text{ V}, V_I = 7 \text{ V}$			0.4			0.4	mA
	$\bar{G}0, \bar{G}6$				0.8			0.8	
	$\bar{G}1, \bar{G}2, \bar{G}4$				1.2			1.2	
	$\bar{G}3, \bar{G}5$				1.5			1.5	
	$\bar{G}7$				0.9			0.9	
	$\bar{P}2, \bar{P}3$				0.3			0.3	
	$\bar{P}4, \bar{P}5$				0.2			0.2	
	$\bar{P}6, \bar{P}7$				0.1			0.1	
I_{IH}	$C_n, \bar{P}0, \bar{P}1$	$V_{CC} = 5.5 \text{ V}, V_I = 2.7 \text{ V}$			80			80	μA
	$\bar{G}0, \bar{G}6$				160			160	
	$\bar{G}1, \bar{G}2, \bar{G}4$				240			240	
	$\bar{G}3, \bar{G}5$				300			300	
	$\bar{G}7$				180			180	
	$\bar{P}2, \bar{P}3$				60			60	
	$\bar{P}4, \bar{P}5$				40			40	
	$\bar{P}6, \bar{P}7$				20			20	
I_{IL}	$C_n, \bar{P}0, \bar{P}1$	$V_{CC} = 5.5 \text{ V}, V_I = 0.4 \text{ V}$			-2			-2	mA
	$\bar{G}0, \bar{G}6$				-4			-4	
	$\bar{G}1, \bar{G}2, \bar{G}4$				-6			-6	
	$\bar{G}3, \bar{G}5$				-7.5			-7.5	
	$\bar{G}7$				-4.5			-4.5	
	$\bar{P}2, \bar{P}3$				-1.5			-1.5	
	$\bar{P}4, \bar{P}5$				-1			-1	
	$\bar{P}6, \bar{P}7$				-0.5			-0.5	
$I_O^\ddagger$		$V_{CC} = 5.5 \text{ V}, V_O = 2.25 \text{ V}$	-30		-130	-30		-130	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
			SN54AS82A		SN74AS82A		
			MIN	MAX	MIN	MAX	
t _{PLH}	C _n	Any output	2	10	2	3	9
t _{PHL}			3	15	3	5	14
t _{PLH}	P̄ or Q̄	C _n + 8	2	8	2	3	7
t _{PHL}			2	8	2		7
t _{PLH}	P̄ or Q̄	C _n + 16	2	8	2		7
t _{PHL}			2	8	2		7
t _{PLH}	P̄ or Q̄	C _n + 24	2	8	2		7
t _{PHL}			2	11	2		10
t _{PLH}	P̄ or Q̄	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.

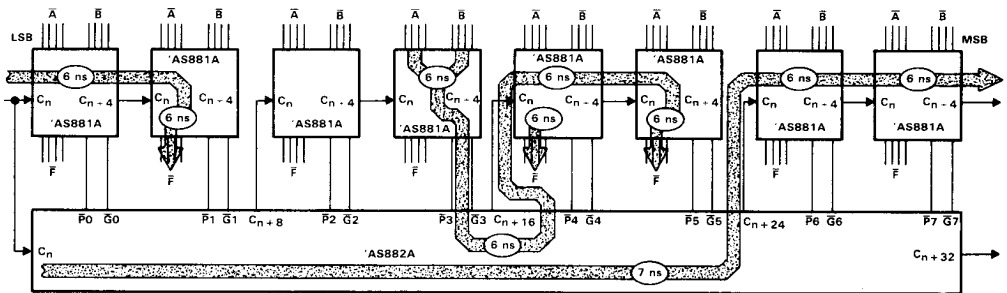


FIGURE 1

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.

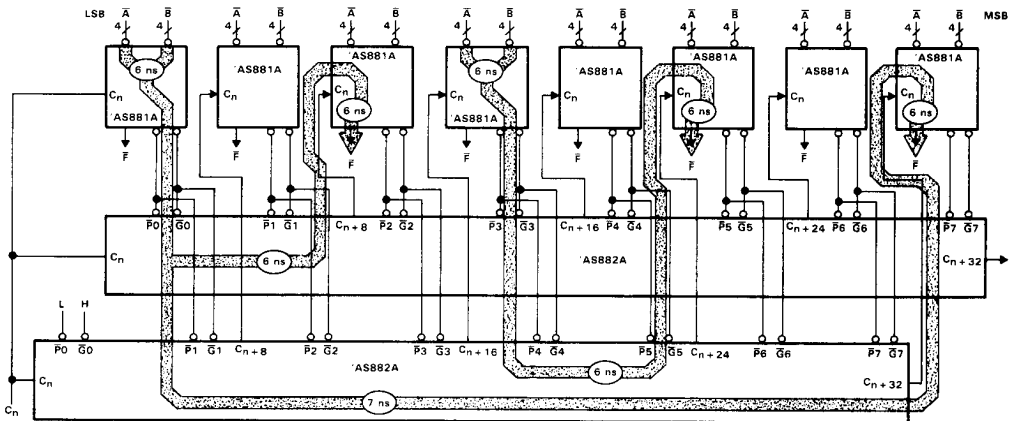


FIGURE 2