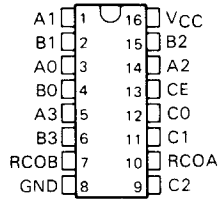
SN54AS264, SN74AS264
LOOK-AHEAD CARRY GENERATORS FOR COUNTERS

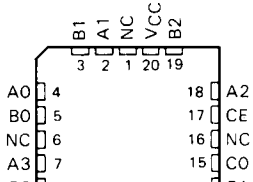
D2824, DECEMBER 1983—REVISED MAY 1986

- **Performs Look-Ahead Carry Across n-Bit Counters**
- **Accommodates Active-High or Active-Low Carry**
- **Package Options Include Plastic "Small Outline" Packages, Ceramic Chip Carriers, and Standard Plastic and Ceramic 300-mil DIPs**
- **Improves Cascaded Counters System Performance**
- **Dependable Texas Instruments Quality and Reliability**

SN54AS264 . . . J PACKAGE
SN74AS264 . . . D OR N PACKAGE
(TOP VIEW)



SN54AS264 . . . FK PACKAGE
(TOP VIEW)



NC – No internal connection

description

This look-ahead generator was designed specifically to perform a carry-anticipate across any number of n-bit counters,thus increasing system clock frequency. A carry enable CE, and carry outputs RCOA and RCOB are provided for n-bit cascading.

The counter can be used with either active-high-carry or active-low-carry counters. For active-high-carry counters, CE is active high, the A set of inputs and output RCOA are used, and the B set of inputs are connected to a low logic level. For active-low-carry counters, CE is active low, the B set of inputs and output RCOB are used, and the A set of inputs are connected to a high logic level. See Figures 1 and 2 for typical applications.

The SN54AS264 is characterized for operation over the full military temperature range of −55°C to 125°C. The SN74AS264 is characterized for operation in the temperature range of 0°C to 70°C.

positive logic equations

ACTIVE-HIGH-CARRY COUNTERS
(CE is high, all B inputs are low)

$C0 = A0$
$C1 = A0 \cdot A1$
$C2 = A0 \cdot A1 \cdot A2$
$RCOA = A0 \cdot A1 \cdot A2 \cdot A3$
RCOB is high

ACTIVE-LOW-CARRY COUNTERS
(CE is low, all A inputs are high)

$C0 = \overline{B0}$
$C1 = \overline{B0 \cdot B1}$
$C2 = \overline{B0 \cdot B1 \cdot B2}$
$RCOA = \overline{B1 \cdot B2 \cdot B3}$
$RCOB = \overline{B0 \cdot B1 \cdot B2 \cdot B3}$

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FUNCTION TABLE FOR C0 OUTPUT

INPUTS			OUTPUT
A0	B0	CE	C0
H	H	X	H
H	X	H	H
L	X	X	L
X	L	L	L

FUNCTION TABLE FOR C1 OUTPUT

INPUTS					OUTPUT
A1	A0	B1	B0	CE	C1
H	X	H	X	X	H
H	H	X	H	X	H
H	H	X	X	H	H
L	X	X	X	X	L
X	L	L	X	X	L
X	X	L	L	L	L

FUNCTION TABLE FOR C2 OUTPUT

INPUTS							OUTPUT
A2	A1	A0	B2	B1	B0	CE	C2
H	X	X	H	X	X	X	H
H	H	X	X	H	X	X	H
H	H	H	X	X	H	X	H
H	H	H	X	X	X	H	H
L	X	X	X	X	X	X	L
X	L	X	L	X	X	X	L
X	X	L	L	L	X	X	L
X	X	X	L	L	L	L	L

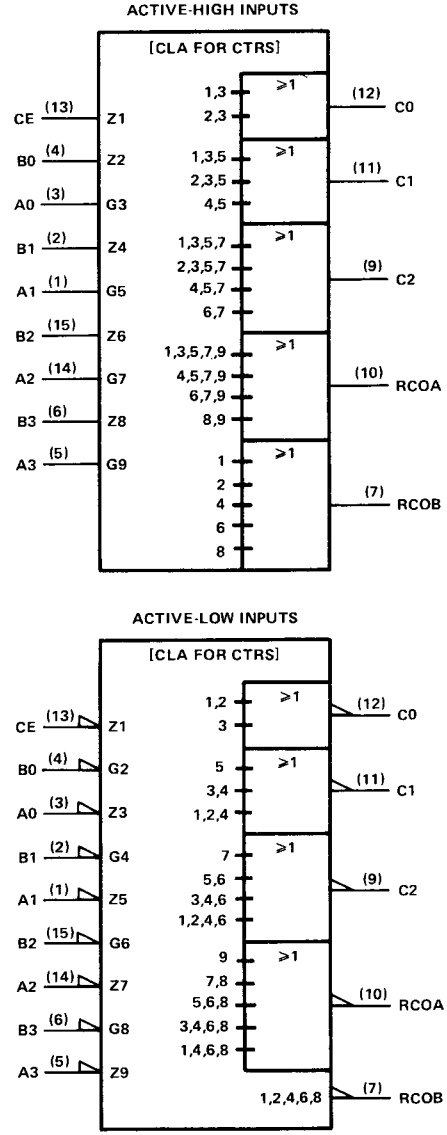
FUNCTION TABLE FOR RCOA OUTPUT

INPUTS								OUTPUT
A3	A2	A1	A0	B3	B2	B1	CE	RCOA
H	X	X	X	H	X	X	X	H
H	H	X	X	X	H	X	X	H
H	H	H	X	X	X	H	X	H
H	H	H	H	X	X	X	H	H
L	X	X	X	X	X	X	X	L
X	L	X	X	L	X	X	X	L
X	X	L	X	L	L	X	X	L
X	X	X	L	L	L	L	X	L
X	X	X	X	L	L	L	L	L

FUNCTION TABLE FOR RCOB OUTPUT

INPUTS					OUTPUT
B3	B2	B1	B0	CE	RCOB
H	X	X	X	X	H
X	H	X	X	X	H
X	X	H	X	X	H
X	X	X	H	X	H
X	X	X	X	H	H
L	L	L	L	L	L

logic symbols†



† These symbols are in accordance with ANSI/IEEE Std 91-1984 and IEC Publication 617-12.
Pin numbers shown are for D, J, and N packages.

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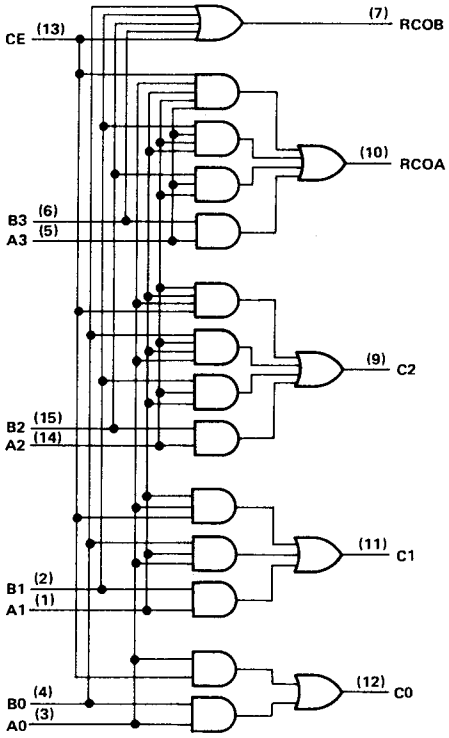
logic diagram (positive logic)



Pin numbers shown are for D, J, and N packages.

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

Supply voltage, V_{CC} . . . . . 7 V
Input voltage . . . . . 7 V
Operating free-air temperature range: SN54AS264 . . . . . −55°C to 125°C
SN74AS264 . . . . . 0°C to 70°C
Storage temperature range . . . . . −65°C to 150°C

recommended operating conditions

		SN54AS264			SN74AS264			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		SN54AS264			SN74AS264			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	CE	V_{CC} = 5.5 V,	V_I = 7 V			500			500	μA
	A0, A2					700			700	
	A1					800			800	
	A3, B0, B1					400			400	
	B2					300			300	
	B3					200			200	
I_{IH}	CE	V_{CC} = 5.5 V,	V_I = 2.7 V			100			100	μA
	A0, A2					140			140	
	A1					160			160	
	A3, B0, B1					80			80	
	B2					60			60	
	B3					40			40	
I_{IL}	CE	V_{CC} = 5.5 V,	V_I = 0.4 V			−2.5			−2.5	mA
	A0					−3.5			−3.5	
	A1, A2					−4			−4	
	A3, B0, B1					−2			−2	
	B2					−1			−1	
	B3					−1.5			−1.5	
I_O‡		V_{CC} = 5.5 V	V_O = 2.25 V	−30		−112	−30		−112	mA
I_{CCH}		V_{CC} = 5.5 V			26			26		mA
I_{CCL}					28			28		

†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 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 = 50 Ω, T_A = MIN to MAX						UNIT
			SN54AS264			SN74AS264			
			MIN	TYP†	MAX	MIN	TYP†	MAX	
t_{PLH}	CE	C0, C1, C2		6			6		ns
t_{PHL}				5			5		
t_{PLH}	An or Bn	C0, C1, C2		5			5		ns
t_{PHL}				5			5		
t_{PLH}	An, Bn, or CE	RCOA		5			5		ns
t_{PHL}				5			5		
t_{PLH}	Bn or CE	RCOB		5			5		ns
t_{PHL}				5			5		

†All typical values are at V_{CC} = 5 V, T_A = 25°C.
NOTE 1: Load circuit and voltage waveforms are shown in Section 1.

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TYPICAL APPLICATION INFORMATION

The circuit shown in Figure 1 illustrates how the 'AS264 can implement look-ahead carry for the active-high-carry 'AS163, while Figure 2 shows the look-ahead carry for the active-low-carry 'AS169.

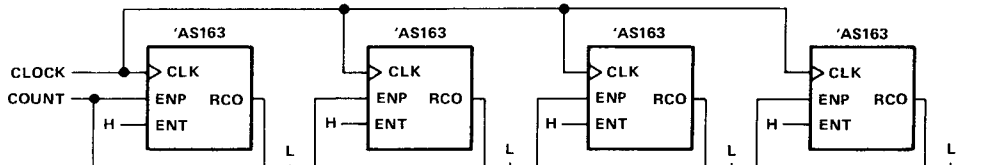

FIGURE 1–ACTIVE-HIGH-CARRY

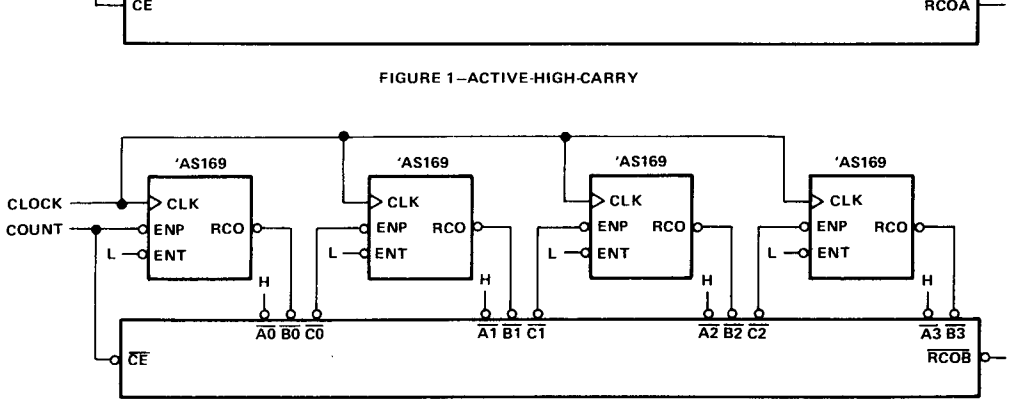

FIGURE 2–ACTIVE-LOW-CARRY