

# SN54F283, SN74F283 4-BIT BINARY FULL ADDERS WITH FAST CARRY

SDFS069A – D2932, MARCH 1987 – REVISED OCTOBER 1993

- Full-Carry Look-Ahead Across the Four Bits
- Systems Achieve Partial Look-Ahead Performance With the Economy of Ripple Carry
- Package Options Include Plastic Small-Outline Packages, Ceramic Chip Carriers, and Standard Plastic and Ceramic 300-mil DIPs

## description

The 'F283 is a full adder that performs the addition of two 4-bit binary words. The sum ( $\Sigma$ ) outputs are provided for each bit and the resultant carry (C4) output is obtained from the fourth bit.

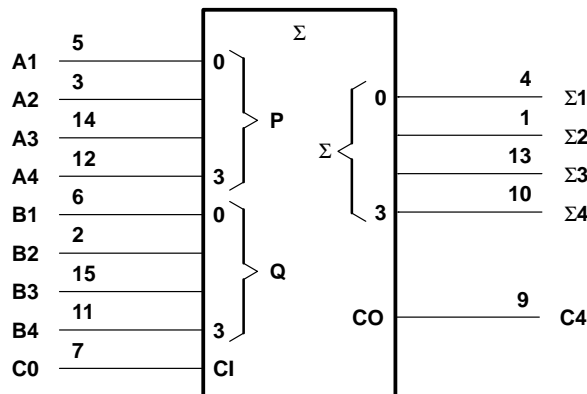
The device features full internal look-ahead across all four bits generating the carry term C4 in typically 5.7 ns. This capability provides the system designer with partial look-ahead performance at the economy and reduced package count of a ripple-carry implementation.

The adder logic, including the carry, is implemented in its true form. End-around carry can be accomplished without the need for logic or level inversion.

The 'F283 can be used with either all-active-high (positive logic) or all-active-low (negative logic) operands.

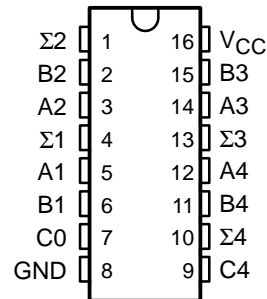
The SN54F283 is characterized for operation over the full military temperature range of  $-55^{\circ}\text{C}$  to  $125^{\circ}\text{C}$ . The SN74F283 is characterized for operation from  $0^{\circ}\text{C}$  to  $70^{\circ}\text{C}$ .

## logic symbol†

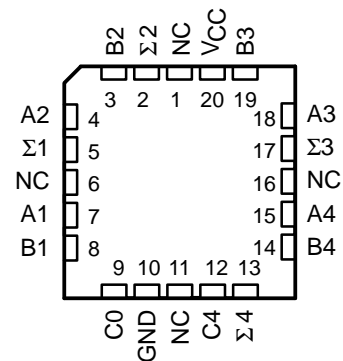


† This symbol is in accordance with ANSI/IEEE Std 91-1984 and IEC Publication 617-12. Pin numbers shown are for the D, J, and N packages.

SN54F283 . . . J PACKAGE  
SN74F283 . . . D OR N PACKAGE  
(TOP VIEW)



SN54F283 . . . FK PACKAGE  
(TOP VIEW)

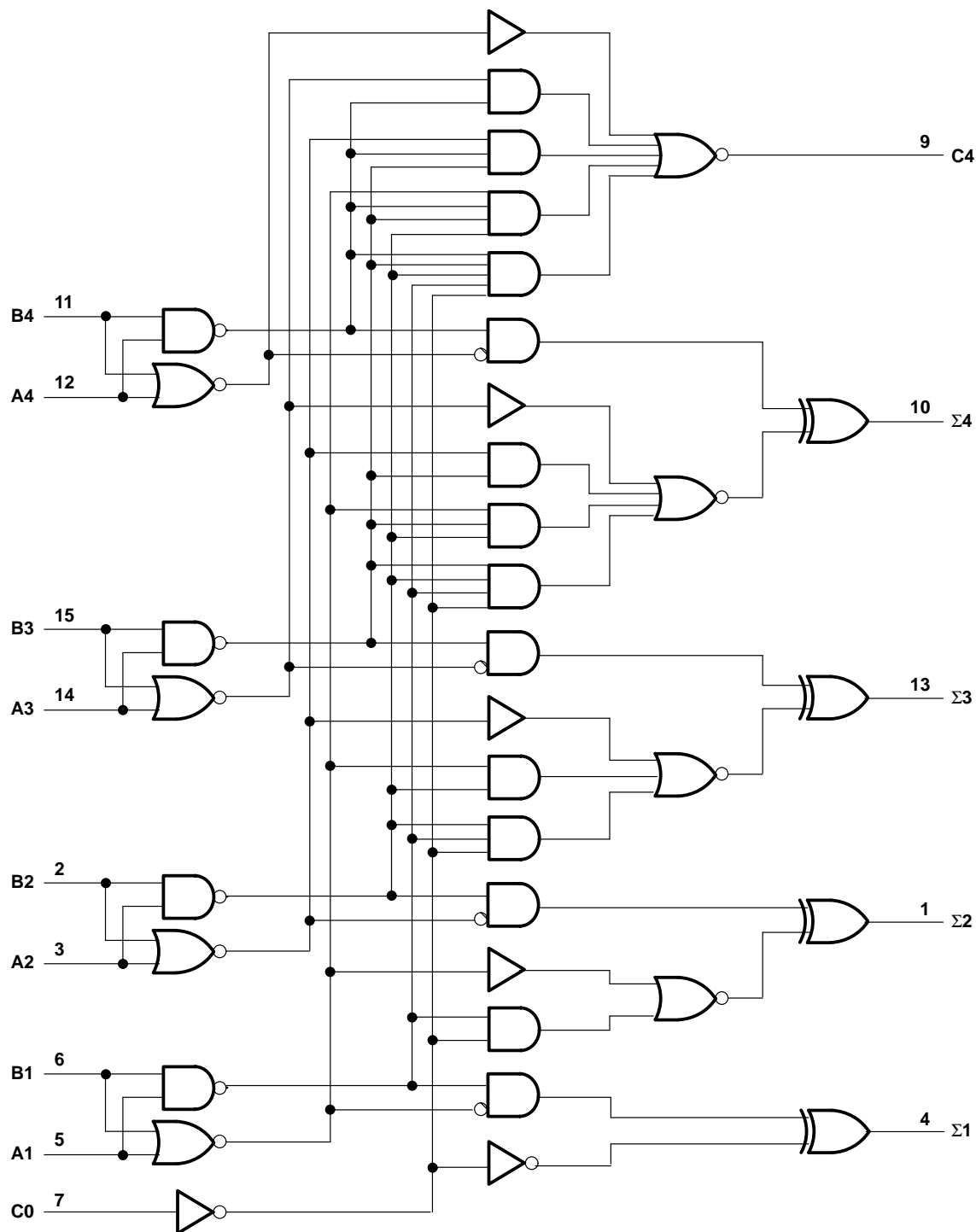


NC – No internal connection

# SN54F283, SN74F283 4-BIT BINARY FULL ADDERS WITH FAST CARRY

SDFS069A – D2932, MARCH 1987 – REVISED OCTOBER 1993

logic diagram (positive logic)



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

**SN54F283, SN74F283**  
**4-BIT BINARY FULL ADDERS**  
**WITH FAST CARRY**

SDFS069A – D2932, MARCH 1987 – REVISED OCTOBER 1993

**FUNCTION TABLE**

INPUTS				OUTPUTS					
				WHEN C0 = L			WHEN C0 = H		
				WHEN C2 = L			WHEN C2 = H		
A1	B1	A2	B2	$\Sigma 1$	$\Sigma 2$	C2	$\Sigma 1$	$\Sigma 2$	C2
A3	B3	A4	B4	$\Sigma 3$	$\Sigma 4$	C4	$\Sigma 3$	$\Sigma 4$	C4
L	L	L	L	L	L	L	H	L	L
H	L	L	L	H	L	L	L	H	L
L	H	L	L	H	L	L	L	H	L
H	H	L	L	L	H	L	H	H	L
L	L	H	L	L	H	L	H	H	L
H	L	H	L	H	H	L	L	L	H
L	H	H	L	H	H	L	L	L	H
H	H	H	L	L	L	H	H	L	H
L	L	L	H	L	H	L	H	H	L
H	L	L	H	H	H	L	L	L	H
L	H	L	H	H	H	L	L	L	H
H	H	L	H	L	L	H	H	L	H
L	L	H	H	L	L	H	H	L	H
H	L	H	H	H	L	H	L	H	H
L	H	H	H	H	L	H	L	H	H
H	H	H	H	L	H	H	H	H	H

NOTE: Input conditions at A1, B1, A2, B2, and C0 are used to determine outputs  $\Sigma 1$  and  $\Sigma 2$  and the value of the internal carry C2. The values at C2, A3, B3, A4, and B4 are then used to determine outputs  $\Sigma 3$ ,  $\Sigma 4$ , and C4.

**absolute maximum ratings over operating free-air temperature range (unless otherwise noted)<sup>†</sup>**

Supply voltage range, $V_{CC}$	–0.5 V to 7 V
Input voltage range (see Note 1)	–1.2 V to 7 V
Input current range	–30 mA to 5 mA
Voltage range applied to any output in the high state	–0.5 V to $V_{CC}$
Current into any output in the low state	40 mA
Operating free-air temperature range: SN54F283	–55°C to 125°C
SN74F283	0°C to 70°C
Storage temperature range	–65°C to 150°C

<sup>†</sup> Stresses beyond those listed under “absolute maximum ratings” may cause permanent damage to the device. These are stress ratings only and functional operation of the device at these or any other conditions beyond those indicated under “recommended operating conditions” is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.

NOTE 1: The input voltage ratings may be exceeded provided the input current ratings are observed.

# SN54F283, SN74F283

## 4-BIT BINARY FULL ADDERS

### WITH FAST CARRY

SDFS069A – D2932, MARCH 1987 – REVISED OCTOBER 1993

#### recommended operating conditions

		SN54F283			SN74F283			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
$I_{IK}$	Input clamp current			–18			–18	mA
$I_{OH}$	High-level output current			–1			–1	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		SN54F283			SN74F283			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
$V_{OH}$	$V_{CC} = 4.5\text{ V}$ , $I_{OH} = -1\text{ mA}$		2.5	3.4		2.5	3.4		V
	$V_{CC} = 4.75\text{ V}$ , $I_{OH} = -1\text{ mA}$					2.7			
$V_{OL}$	$V_{CC} = 4.5\text{ V}$ , $I_{OL} = 20\text{ mA}$			0.3	0.5		0.3	0.5	V
$I_I$	$V_{CC} = 5.5\text{ V}$ , $V_I = 7\text{ V}$				0.1			0.1	mA
$I_{IH}$	$V_{CC} = 5.5\text{ V}$ , $V_I = 2.7\text{ V}$				20			20	μA
$I_{IL}$	Any A or B C0	$V_{CC} = 5.5\text{ V}$ , $V_I = 0.5\text{ V}$			–1.2			–1.2	mA
					–0.6			–0.6	
$I_{OS}‡$	$V_{CC} = 5.5\text{ V}$ , $V_O = 0$		–60		–150	–60		–150	mA
$I_{CC}$	$V_{CC} = 5.5\text{ V}$ , $V_I = 4.5\text{ V}$			36	55		36	55	mA

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

‡ Not more than one output should be shorted at a time, and the duration of the short circuit should not exceed one second.

#### switching characteristics (see Note 2)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	V <sub>CC</sub> = 5 V, C <sub>L</sub> = 50 pF, R <sub>L</sub> = 500 Ω, T <sub>A</sub> = 25°C			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
			'F283			SN54F283		SN74F283		
			MIN	TYP	MAX	MIN	MAX	MIN	MAX	
t <sub>PLH</sub>	C0	Σ	2.7	6.6	9.5	2.7	14	2.7	10.5	ns
t <sub>PHL</sub>			3.2	6.6	9.5	3.2	14	3.2	10.5	
t <sub>PLH</sub>	A or B	Σ	3.2	6.6	9.5	3.2	14	3.2	10.5	ns
t <sub>PHL</sub>			2.7	6.6	9.5	2.7	14	2.7	10.5	
t <sub>PLH</sub>	C0	C4	2.7	5.3	7.5	2.7	10.5	2.7	8.5	ns
t <sub>PHL</sub>			2.2	5	7	2.2	10	2.2	8	
t <sub>PLH</sub>	A or B	C4	2.7	5.3	7.5	2.7	10.5	2.7	8.5	ns
t <sub>PHI</sub>			2.2	4.9	7	2.2	10	2.2	8	

§ For conditions shown as MIN or MAX, use the appropriate value specified under recommended operating conditions.

NOTE 2: Load circuits and waveforms are shown in Section 1.



## **IMPORTANT NOTICE**

Texas Instruments (TI) reserves the right to make changes to its products or to discontinue any semiconductor product or service without notice, and advises its customers to obtain the latest version of relevant information to verify, before placing orders, that the information being relied on is current.

TI warrants performance of its semiconductor products and related software to the specifications applicable at the time of sale in accordance with TI's standard warranty. Testing and other quality control techniques are utilized to the extent TI deems necessary to support this warranty. Specific testing of all parameters of each device is not necessarily performed, except those mandated by government requirements.

Certain applications using semiconductor products may involve potential risks of death, personal injury, or severe property or environmental damage ("Critical Applications").

**TI SEMICONDUCTOR PRODUCTS ARE NOT DESIGNED, INTENDED, AUTHORIZED, OR WARRANTED TO BE SUITABLE FOR USE IN LIFE-SUPPORT APPLICATIONS, DEVICES OR SYSTEMS OR OTHER CRITICAL APPLICATIONS.**

Inclusion of TI products in such applications is understood to be fully at the risk of the customer. Use of TI products in such applications requires the written approval of an appropriate TI officer. Questions concerning potential risk applications should be directed to TI through a local SC sales office.

In order to minimize risks associated with the customer's applications, adequate design and operating safeguards should be provided by the customer to minimize inherent or procedural hazards.

TI assumes no liability for applications assistance, customer product design, software performance, or infringement of patents or services described herein. Nor does TI warrant or represent that any license, either express or implied, is granted under any patent right, copyright, mask work right, or other intellectual property right of TI covering or relating to any combination, machine, or process in which such semiconductor products or services might be or are used.