

SN54HC283, SN74HC283 4-BIT BINARY FULL ADDERS WITH FAST CARRY

D2804, MARCH 1984—REVISED SEPTEMBER 1987

- Full-Carry Look-Ahead Across the Four Bits
- Systems Achieve Partial Look-Ahead Performance with the Economy of Ripple Carry
- Supply Voltage and Ground on Corner Pins to Simplify P-C Board Layout
- Package Options Include Plastic "Small Outline" Packages, Ceramic Chip Carriers, and Standard Plastic and Ceramic 300-mil DIPs
- Dependable Texas Instruments Quality and Reliability

description

These improved full adders perform the addition of two 4-bit binary words. The sum (Σ) outputs are provided for each bit, and the resultant carry (C4) is obtained from the fourth bit.

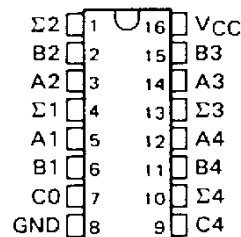
These adders feature full internal look-ahead across all four bits generating the carry term. This capability provides the system designer with partial look-ahead performance at the economy and reduced package count of a ripple-carry implementation.

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 SN54HC283 is characterized for operation over the full military temperature range of -55°C to 125°C . The SN74HC283 is characterized for operation from -40°C to 85°C .

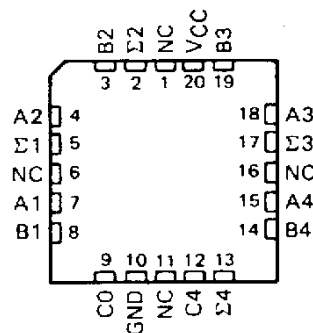
SN54HC283 . . . J PACKAGE
SN74HC283 . . . D OR N PACKAGE

(TOP VIEW)



SN54HC283 . . . FK PACKAGE

(TOP VIEW)



NC—No internal connection

PRODUCTION DATA documents contain information current as of publication date. Products conform to specifications per the terms of Texas Instruments standard warranty. Production processing does not necessarily include testing of all parameters.

TEXAS
INSTRUMENTS

POST OFFICE BOX 655012 • DALLAS, TEXAS 75265

Copyright © 1984, Texas Instruments Incorporated

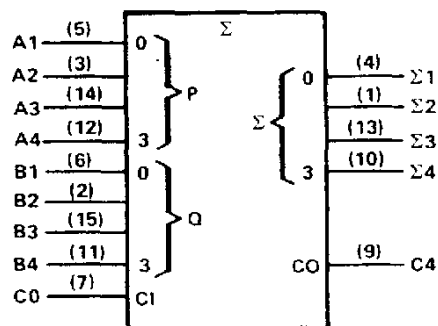
SN54HC283, SN74HC283 4-BIT BINARY FULL ADDERS WITH FAST CARRY

FUNCTION TABLE											
INPUT				OUTPUT							
				WHEN C0 = L				WHEN C0 = H			
A1	B1	A2	B2	WHEN C2 = L		WHEN C2 = H		WHEN C2 = L		WHEN C2 = H	
A3	B3	A4	B4	Σ1	Σ2	C2	Σ1	Σ2	C2	Σ1	Σ2
L	L	L	L	L	L	L	H	L	L	L	L
H	L	L	L	H	L	L	L	H	L	L	L
L	H	L	L	H	L	L	L	H	L	L	L
H	H	L	L	L	H	L	H	H	L	L	L
L	L	H	L	L	H	L	H	H	L	L	L
H	L	H	L	H	H	L	L	L	L	L	H
L	H	H	L	H	H	L	L	L	L	L	H
H	H	H	L	L	L	H	H	L	L	L	H
L	L	L	H	L	H	L	H	H	L	L	L
H	L	L	H	H	H	L	L	L	L	L	H
L	H	L	H	H	H	L	L	L	L	L	H
H	H	L	H	L	L	H	H	L	L	L	H
L	L	H	H	L	L	H	H	L	L	L	H
H	L	H	H	H	L	H	L	H	L	L	H
L	H	H	H	H	L	H	L	H	L	L	H
H	H	H	H	L	H	H	H	H	L	L	H

H = high level, L = low level

NOTE: Input conditions at A1, B1, A2, B2, and C0 are used to determine outputs Σ1 and Σ2 and the value of the internal carry C2. The values at C2, A3, B3, A4, and B4 are then used to determine outputs Σ3, Σ4, and C4.

logic symbol†

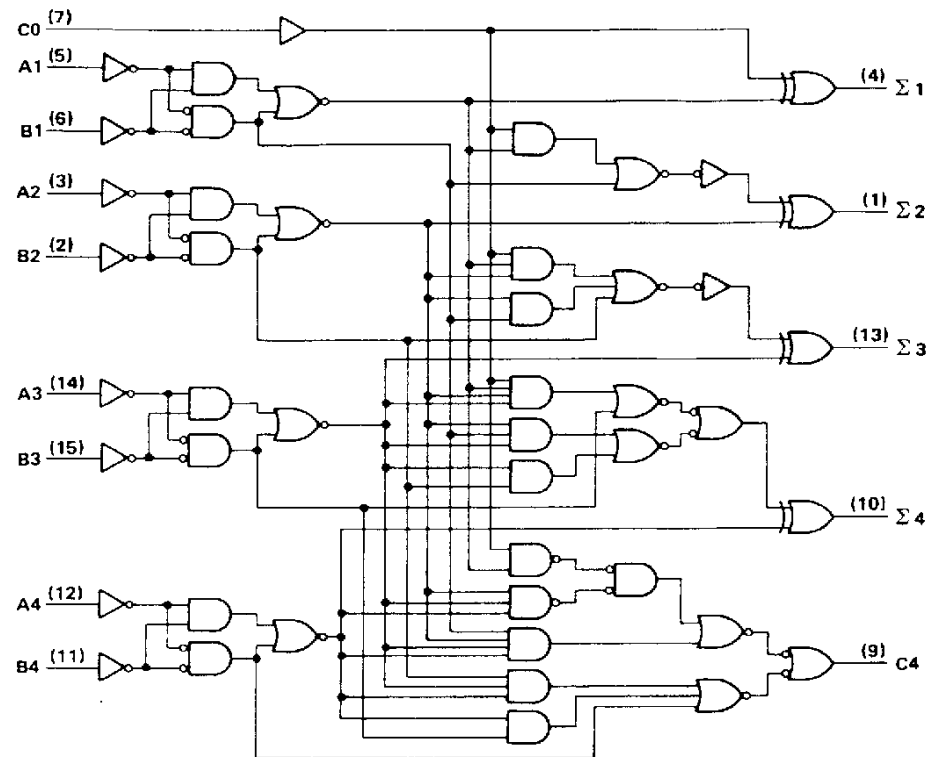


† This symbol is in accordance with ANSI/IEEE Std 91-1984 and IEC Publication 617-12.

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

SN54HC283, SN74HC283
4-BIT BINARY FULL ADDERS WITH FAST CARRY

logic diagram (positive logic)



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

TEXAS
INSTRUMENTS

POST OFFICE BOX 655012 • DALLAS, TEXAS 75265

SN54HC283, SN74HC283

4-BIT BINARY FULL ADDERS WITH FAST CARRY

absolute maximum ratings over operating free-air temperature range†

Supply voltage, V_{CC}	−0.5 V to 7 V
Input clamp current, I_{IK} ($V_I < 0$ or $V_I > V_{CC}$)	±20 mA
Output clamp current, I_{OK} ($V_O < 0$ or $V_O > V_{CC}$)	±20 mA
Continuous output current, I_O ($V_O = 0$ to V_{CC})	±25 mA
Continuous current through V_{CC} or GND pins	±50 mA
Lead temperature 1,6 mm (1/16 in) from case for 60 s: FK or J package	300°C
Lead temperature 1,6 mm (1/16 in) from case for 10 s: D or N package	260°C
Storage temperature range	−65°C to 150°C

†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.

recommended operating conditions

		SN54HC283			SN74HC283			UNIT	
		MIN	NOM	MAX	MIN	NOM	MAX		
V _{CC}	Supply voltage	2	5	6	2	5	6	V	
V _{IH}	High-level input voltage	V _{CC} = 2 V			1.5			V	
		V _{CC} = 4.5 V			3.15				
		V _{CC} = 6 V			4.2				
V _{IL}	Low-level input voltage	V _{CC} = 2 V			0	0.3	0	0.3	V
		V _{CC} = 4.5 V			0	0.9	0	0.9	
		V _{CC} = 6 V			0	1.2	0	1.2	
V _I	Input voltage	0	V _{CC}		0	V _{CC}		V	
V _O	Output voltage	0	V _{CC}		0	V _{CC}		V	
t _t	Input transition (rise and fall) times	V _{CC} = 2 V			0	1000	0	1000	ns
		V _{CC} = 4.5 V			0	500	0	500	
		V _{CC} = 6 V			0	400	0	400	
T _A	Operating free-air temperature	− 55	125		− 40	85		°C	

electrical characteristics over recommended operating free-air temperature range (unless otherwise noted)

PARAMETER	TEST CONDITIONS	V_{CC}	$T_A = 25^\circ\text{C}$			SN54HC283			SN74HC283			UNIT
			MIN	TYP	MAX	MIN	TYP	MAX	MIN	TYP	MAX	
V_{OH}	$V_I = V_{IH}$ or V_{IL} , $I_{OH} = -20 \mu\text{A}$	2 V	1.9	1.998		1.9			1.9			V
		4.5 V	4.4	4.499		4.4			4.4			
		6 V	5.9	5.999		5.9			5.9			
	$V_I = V_{IH}$ or V_{IL} , $I_{OH} = -4 \text{ mA}$	4.5 V	3.98	4.30		3.7			3.84			
V_{OL}	$V_I = V_{IH}$ or V_{IL} , $I_{OH} = -5.2 \text{ mA}$	6 V	5.48	5.80		5.2			5.34			V
	$V_I = V_{IH}$ or V_{IL} , $I_{OL} = 20 \mu\text{A}$	2 V		0.002	0.1			0.1			0.1	
		4.5 V		0.001	0.1			0.1			0.1	
		6 V		0.001	0.1			0.1			0.1	
	$V_I = V_{IH}$ or V_{IL} , $I_{OL} = 4 \text{ mA}$	4.5 V		0.17	0.26			0.4			0.33	
I_I	$V_I = V_{CC}$ or 0	6 V		±0.1	±100			±1000			±1000	nA
	$V_I = V_{CC}$ or 0, $I_O = 0$	6 V			8			160			80	μA
C_i		2 to 6 V		3	10			10			10	pF



POST OFFICE BOX 655012 • DALLAS, TEXAS 75265

SN54HC283, SN74HC283
4-BIT BINARY FULL ADDERS WITH FAST CARRY

switching characteristics over recommended operating free-air temperature range (unless otherwise noted), $C_L = 50 \text{ pF}$ (see Note 1)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	V_{CC}	$T_A = 25^\circ\text{C}$			SN54HC283		SN74HC283		UNIT
				MIN	TYP	MAX	MIN	MAX	MIN	MAX	
t_{pd}	C0	Any Σ	2 V		60	150		225		188	ns
			4.5 V		20	30		45		37	
			6 V		16	26		38		32	
t_{pd}	Ai or Bi	Σi	2 V		80	175		262		218	ns
			4.5 V		25	35		52		44	
			6 V		20	30		45		37	
t_{pd}	C0	C4	2 V		70	175		262		218	ns
			4.5 V		25	35		52		44	
			6 V		20	30		45		37	
t_{pd}	Ai or Bi	C4	2 V		90	175		262		218	ns
			4.5 V		26	35		52		44	
			6 V		21	30		45		37	
t_t		Any	2 V		28	75		110		95	ns
			4.5 V		8	15		22		19	
			6 V		6	13		19		16	

C_{pd}	Power dissipation capacitance	No load, $T_A = 25^\circ\text{C}$	90 pF typ
----------	-------------------------------	-----------------------------------	-----------

NOTE 1: Load circuit and voltage waveforms are shown in Section 1.



POST OFFICE BOX 655012 • DALLAS, TEXAS 75265

PACKAGING INFORMATION

Orderable Device	Status ⁽¹⁾	Package Type	Package Drawing	Pins	Package Qty	Eco Plan ⁽²⁾	Lead/Ball Finish	MSL Peak Temp ⁽³⁾
SN74HC283D	OBSOLETE	SOIC	D	16		TBD	Call TI	Call TI
SN74HC283DR	OBSOLETE	SOIC	D	16		TBD	Call TI	Call TI
SN74HC283N	OBSOLETE	PDIP	N	16		TBD	Call TI	Call TI

⁽¹⁾ The marketing status values are defined as follows:

ACTIVE: Product device recommended for new designs.

LIFEBUY: TI has announced that the device will be discontinued, and a lifetime-buy period is in effect.

NRND: Not recommended for new designs. Device is in production to support existing customers, but TI does not recommend using this part in a new design.

PREVIEW: Device has been announced but is not in production. Samples may or may not be available.

OBSOLETE: TI has discontinued the production of the device.

⁽²⁾ Eco Plan - The planned eco-friendly classification: Pb-Free (RoHS) or Green (RoHS & no Sb/Br) - please check <http://www.ti.com/productcontent> for the latest availability information and additional product content details.

TBD: The Pb-Free/Green conversion plan has not been defined.

Pb-Free (RoHS): TI's terms "Lead-Free" or "Pb-Free" mean semiconductor products that are compatible with the current RoHS requirements for all 6 substances, including the requirement that lead not exceed 0.1% by weight in homogeneous materials. Where designed to be soldered at high temperatures, TI Pb-Free products are suitable for use in specified lead-free processes.

Green (RoHS & no Sb/Br): TI defines "Green" to mean Pb-Free (RoHS compatible), and free of Bromine (Br) and Antimony (Sb) based flame retardants (Br or Sb do not exceed 0.1% by weight in homogeneous material)

⁽³⁾ MSL, Peak Temp. -- The Moisture Sensitivity Level rating according to the JEDEC industry standard classifications, and peak solder temperature.

Important Information and Disclaimer: The information provided on this page represents TI's knowledge and belief as of the date that it is provided. TI bases its knowledge and belief on information provided by third parties, and makes no representation or warranty as to the accuracy of such information. Efforts are underway to better integrate information from third parties. TI has taken and continues to take reasonable steps to provide representative and accurate information but may not have conducted destructive testing or chemical analysis on incoming materials and chemicals. TI and TI suppliers consider certain information to be proprietary, and thus CAS numbers and other limited information may not be available for release.

In no event shall TI's liability arising out of such information exceed the total purchase price of the TI part(s) at issue in this document sold by TI to Customer on an annual basis.

IMPORTANT NOTICE

Texas Instruments Incorporated and its subsidiaries (TI) reserve the right to make corrections, modifications, enhancements, improvements, and other changes to its products and services at any time and to discontinue any product or service without notice. Customers should obtain the latest relevant information before placing orders and should verify that such information is current and complete. All products are sold subject to TI's terms and conditions of sale supplied at the time of order acknowledgment.

TI warrants performance of its hardware products to the specifications applicable at the time of sale in accordance with TI's standard warranty. Testing and other quality control techniques are used to the extent TI deems necessary to support this warranty. Except where mandated by government requirements, testing of all parameters of each product is not necessarily performed.

TI assumes no liability for applications assistance or customer product design. Customers are responsible for their products and applications using TI components. To minimize the risks associated with customer products and applications, customers should provide adequate design and operating safeguards.

TI does not warrant or represent that any license, either express or implied, is granted under any TI patent right, copyright, mask work right, or other TI intellectual property right relating to any combination, machine, or process in which TI products or services are used. Information published by TI regarding third-party products or services does not constitute a license from TI to use such products or services or a warranty or endorsement thereof. Use of such information may require a license from a third party under the patents or other intellectual property of the third party, or a license from TI under the patents or other intellectual property of TI.

Reproduction of information in TI data books or data sheets is permissible only if reproduction is without alteration and is accompanied by all associated warranties, conditions, limitations, and notices. Reproduction of this information with alteration is an unfair and deceptive business practice. TI is not responsible or liable for such altered documentation.

Resale of TI products or services with statements different from or beyond the parameters stated by TI for that product or service voids all express and any implied warranties for the associated TI product or service and is an unfair and deceptive business practice. TI is not responsible or liable for any such statements.

Following are URLs where you can obtain information on other Texas Instruments products and application solutions:

Products		Applications	
Amplifiers	amplifier.ti.com	Audio	www.ti.com/audio
Data Converters	dataconverter.ti.com	Automotive	www.ti.com/automotive
DSP	dsp.ti.com	Broadband	www.ti.com/broadband
Interface	interface.ti.com	Digital Control	www.ti.com/digitalcontrol
Logic	logic.ti.com	Military	www.ti.com/military
Power Mgmt	power.ti.com	Optical Networking	www.ti.com/opticalnetwork
Microcontrollers	microcontroller.ti.com	Security	www.ti.com/security
		Telephony	www.ti.com/telephony
		Video & Imaging	www.ti.com/video
		Wireless	www.ti.com/wireless

Mailing Address: Texas Instruments
Post Office Box 655303 Dallas, Texas 75265

Copyright © 2005, Texas Instruments Incorporated