- Full-Carry Look-Ahead across the Four Bits
- Systems Achieve Partial Look-Ahead Performance with the Economy of Ripple Carry
- SN54283/SN74283 and SN54LS283/SN74LS283
 Are Recommended For New Designs as They
 Feature Supply Voltage and Ground on Corner
 Pins to Simplify Board Layout

	TYPICAL A	ADD TIMES	TV01041 0011100
TYPE	TWO	TWO	TYPICAL POWER
ITPE	8-BIT	16-8IT	DISSIPATION PER
	WORDS	WORDS	4-BIT ADDER
'83A	23 ns	43 ns	310 mW
'LS83A	25 ns	45 ns	95 mW

description

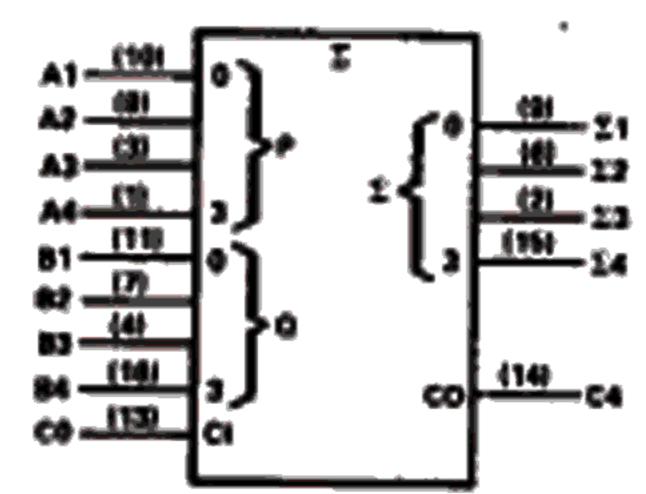
These improved full adders perform the addition of two 4-bit binary numbers. The sum (Σ) outputs are provided for each bit and the resultant carry (C4) is obtained from the fourth bit. These adders feature full internal look ahead across all four bits generating the carry term in ten nanoseconds typically. This 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 meaning that the end-around carry can be accomplished without the need for logic or level inversion.

Designed for medium-speed applications, the circuits utilize transistor-transistor logic that is compatible with most other TTL families and other saturated low-level logic families.

Series 54 and 54LS circuits are characterized for operation over the full military temperature range of -55°C to 125°C, and Series 74 and 74LS circuits are characterized for operation from 0°C to 70°C.

logic symbol†



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

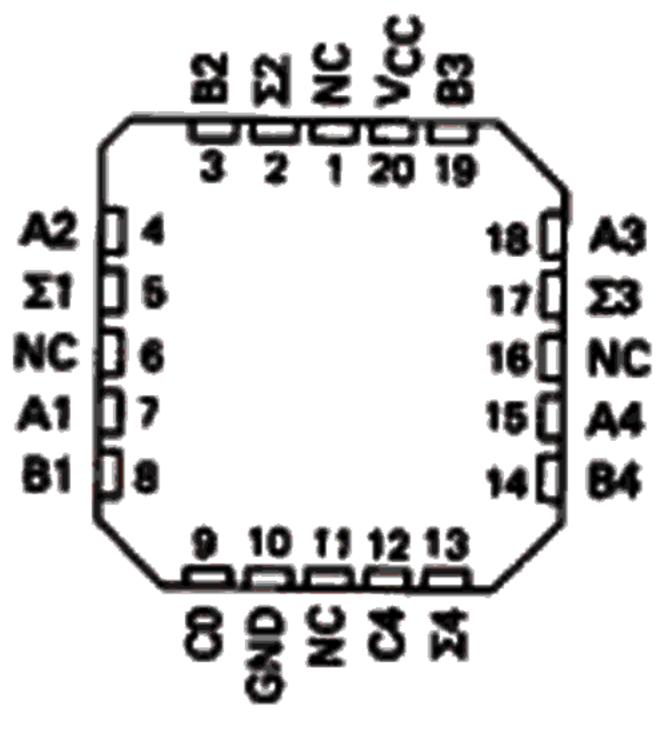
PRODUCTION DATA documents contain information current on of publication date. Products conform to

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

SN7483A . . . N PACKAGE SN74LS83A . . . D OR N PACKAGE (TOP VIEW)

A4	ਰਜਾਹ	ᅏ	B4
Σ3	□2	15	Σ4
A3	∏ 3	14	C4
B3	□ 4	13	CO
Vcc	∏ 6	12	GND
Σ2	∐ 6	11	B1
B2 (٦,	10	A1
A2 (⊒ 8	9	Σ1

SN54LS83A . . . FK PACKAGE (TOP VIEW)



NC - No internal connection

FUNCTION TABLE

]					-	OU	TPUT						
					WHI	IN		WHIE	M					
	f	IN	PUT		co •			T	CO - H					
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					l /		cinic.		ASSESSED FOR THE PARTY OF THE P					
		E.				القنانع	386			S-H				
	~ /	~ /_	 ^3 /	F */	~	F*/	lcs/	F 1/4	22/					
				<u> </u>		L. E		451		65				
	L	L	L	L	L	L	L	н	L	L				
	н	L	l L	L	н		L	L	н	l e i				
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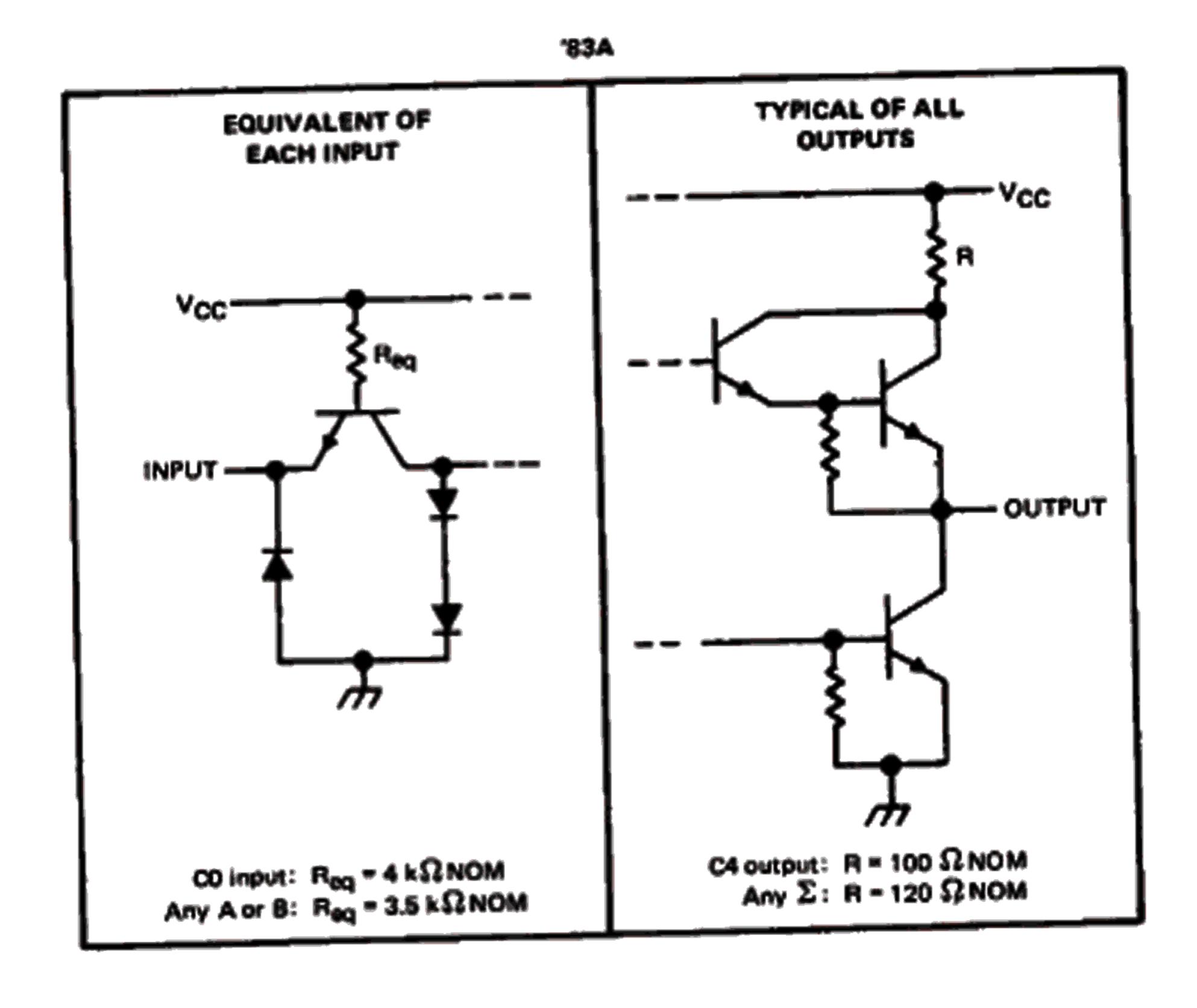
H = high level, L = low level

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

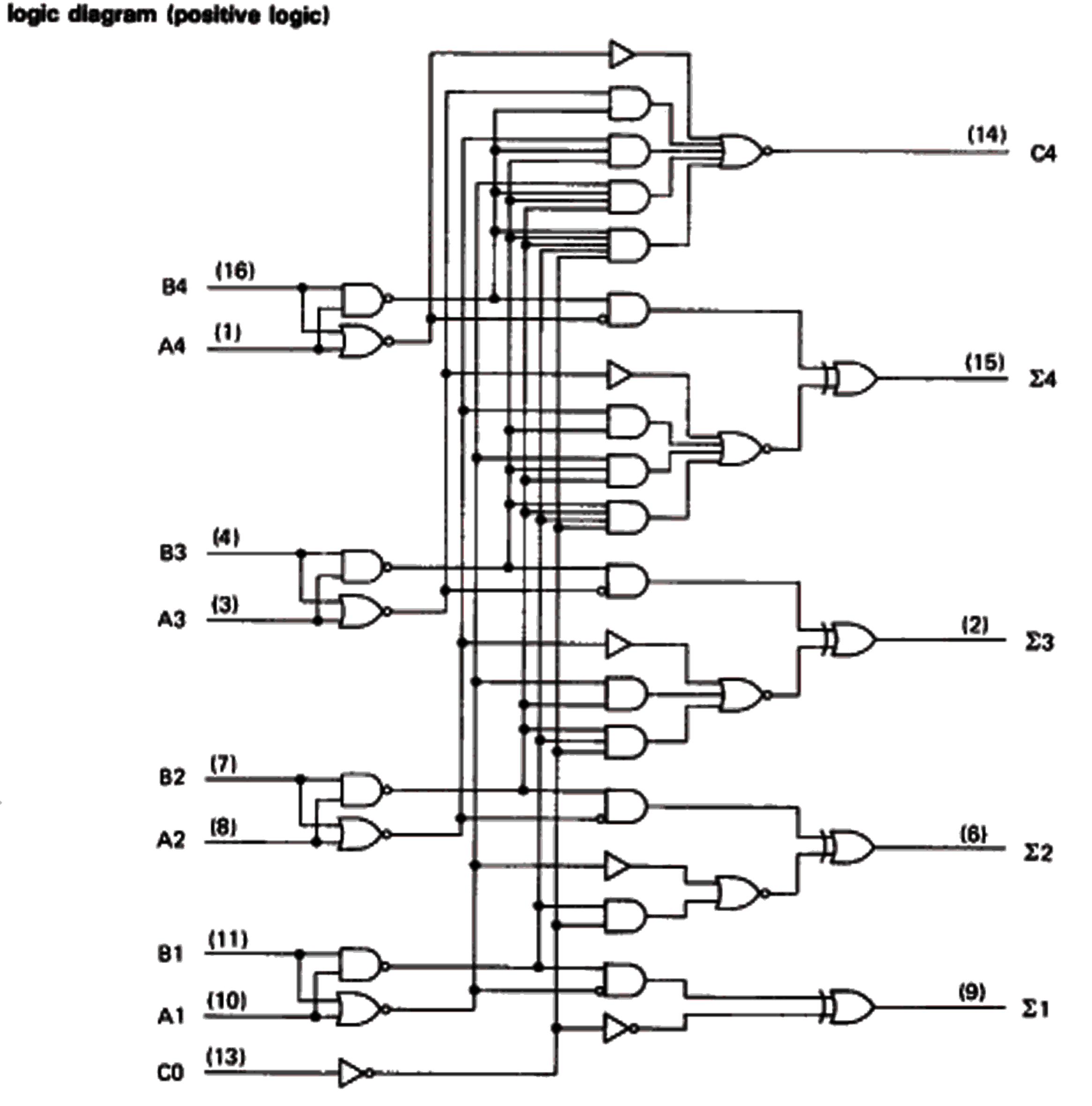
TEXAS TEXAS INSTRUMENTS

2-257

schematics of inputs and outputs



CO input: Req = 17 kΩ NOM
Any A or B: Req = 8.5 kΩ NOM



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

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

Supply voltage, VCC (see Note 1)																									7 V
Input voltage: '83A	•	•									*	*					a							5.	5 V
'LS83A	•								*								*							,	7 V
Interemitter voitage (see Note 2)		k 10							•															5.	5 V
Operating free-air temperature range:	a (SN	54	8	3A	, S	N5	41	_SE	33/	A.										55	°C	to:	12	5°C
		SN	74	8	3A	, S	N7	4Į	_SE	33/	4										(0°	C 1	07	0°C
Storage temperature range					4									*						-	65	°C	: ta	15	o°C

NOTES: 1. Voltage values, except interemitter voltage, are with respect to network ground terminal.

7. This is the voltage between two emitters of a multiple-emitter transistor. This rating applies for the '83A only between the following pairs: A1 and B1, A2 and B2, A3 and B3, A4 and B4.

recommended operating conditions

				A.	w	דומט		
		MIN	NOM	MAX	MIN	NOM	MAX	
		4.5	5	5.5	4.75	5	5.25	V
Supply Voltage, VCC	Any output except C4			-800			-800	Αμ
High-level output current, IOH	Output C4			-400			400	
	Any output except C4			16			16_	mA
Low-level output current, IOL	Output C4			8			8	
Operating free-air temperature, TA		55		125	0		70	-c

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

						N5483	\		UNIT		
	PARAM	ETER	TEST CON	IDITIONS	MIN	TYP‡	MAX	MIN	TYP#	MAX	
					2			2			٧
VIH	High-level input volt					0.8			0.8	٧	
VIL	Low-level input volt	ege	1400 - 10101	I ₁ = -12 mA			-1.5			-1.5	٧
VIK	Input clamp voltage		***								
			VCC - MIN.	VIH - 2 V.	2.4	3.4		2.4	3.4		V
VOH	High-level output vo	Itage	VIL = 0.8 V.	IOH - MAX							
			VCC - MIN,	VIH = 2 V.		0.2	0.4	1	0.2	0.4	v
VOL	Low-level autput vo	ltage	VIL - 0.8 V.			V.2					<u> </u>
	Input current at ma	ximum	VCC - MAX,				1	ì		1	mA.
t ₁	input voltage										H.A
luce	High-level input our	rent	VCC - MAX,	V ₁ = 2.4 V			40	1		40	μA —A
IH.	Low-level input cur		VCC - MAX.	V1 - 0.4 V			-1.6			-1.6	mA
JIL.	Short-circuit	Any output except C4			-20		-55	-18		-55	- MA
108		Output C4	VCC ® MAX		-20		-70	-18		~70	
	output current 5	Output O4		All B low, other	T^{-}	56			56		
			VCC - MAX,	inputs at 4.5 V		- 50					- ma
1cc	Supply current		Outputs open		T	66	99		66	110	1
	\ \tag{\tag{\tag{\tag{\tag{\tag{\tag{			4.5 V	1 .	00		<u> </u>			<u> </u>

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

switching characteristics, VCC = 5 V, TA = 25°C

	FROM (INPUT)	TO (OUTPUT)	TEST CONDITIONS	MIN	TYP	MAX	רואט
PARAMETER	FROM WHAT O !					21	
1PLH	CO CO	Any ≚	Any Σ CL = 15 pF, RL = 400 Ω.		12	21	ns
tPHL			See Note 3	<u> </u>	16	24	
tPLH	A; or B;	$\Sigma_{\mathbf{k}}$	366 14011 2	-	16	24	ns.
tPHL				+-	9	14	t^-
ФГН	co	C4	CL = 15 pF, RL = 780 \Quad \Quad \text{.}		11	16	ns ns
tPHL			See Note 3	—	9	14	1
TPLH	A _i or B _i	C4	See Moters	-	11	16	ns
tPHL.							

TtpLH = propagation delay time, low-to-high-level output

NOTE 3: Load circuits and voltage waveforms are shown in Section 1.



^{\$}An typical values are at VCC = 5 V, TA = 25°C.

Sonly one output should be shorted at a time.

tPHL = propagation delay time, high-to-low-level output

recommended operating conditions

	S	N54L88	3A	SI			
	MIN	NOM	MAX	MIN	NOM	MAX	UNIT
Supply voltage, VCC	4.5	5	5.5	4.75	5	5.25	v
High-level output current, IOH			-400			-400	μА
Low-level output current, IQL			4			8	mA
Operating free-air temperature, TA	-65		125	0		70	°C

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

	PARAMET	ER	TE	ST CONDITIO	wet	SI	V54LS8	3A	St	174LS8	3A	
		`		31 CONDITIO	JI43	MIN	TYP	MAX	MIN	TYP\$	MAX	UNIT
VIH	High-level input					2			2			V
VIL	Low-level input	/oltage						0.7		<u> </u>	0.8	V
VIK	Input clemp volt	age	VCC = MIN,					-1.5			-1.5	V
νон	High-level outpu	t voltage	VCC = MIN, IOH = -400 #A	I _{OH} = -400 µA			3.4		2.7	3.4	<u>, : ==</u> .	v
Voi	Low-level output	voltana	VCC - MIN,	VIH = 2 V.	lot = 4 mA		0.25	0.4		0.25	0.4	
-00	COTT ICTCI COIPCI	· · · · · · · · · · · · · · · · · · ·	VIL = VIL mex		IOL = 8 mA					0.35	0.5	'
	Input current at maximum	Any A or B	VCC - MAX.					0.2			0.2	_
Ľ.	input voltage	CO	VCC - mon,	A1 - 1 A				0.1			0.1	mA
411	High-level	Any A or B	V	V 2 7 V			***	40		 	40	
1177	input current	CO	VCC = MAX.	V ₁ = 2.7 V				20			20	μА
11L	Low-level	Any A or B	VCC - MAX.	V 0 4 V				-0.8			-0.8	
7.	input current	CO	YCC - IMMAA,	V _I = 0.4 V			****	-0.4			-0.4	ma.
los	Short-circuit out	put current \$	VCC = MAX			-20		-100	-20		-100	mA
					All inputs grounded		22	39		22	39	
Icc	Supply current		VCC = MAX, Outputs open	·			19	34		19	34	mA
							19	34		19	34	

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

switching characteristics, VCC = 5 V, TA = 25°C

PARAMETER	FROM (INPUT)	TO (OUTPUT)	MIN	TYP	MAX	UNIT		
†PLH	CO	A \				16	24	
TPHL		Any ∑				15	24	ns
[‡] PLH	A _i or B _i	V.,	1			15	24	
tPHL_	7,0,0,	$\Sigma_{\mathbf{i}}$	CL = 15 pF.	RL = 2 ks2,		15	24	ns
^T PLH	CO	C4	See Note 3			11	17	
tPHL.		~				15	22	ns
tPLH .	A . a . B .	C4				11	17	_
TPHL	A _i or B _i	Ç4			<u> </u>	12	17	ns

TIPLH - propagation delay time, low-to-high-level output



All typical values are at VCC = 5 V, TA - 26 C.

RONLY one output should be shorted at a time, and duration of the short-circuit should not exceed one second,

tpHL = propagation delay time, high-to-low-level output

NOTE 3: Load circuits and voltage waveforms are shown in Section 1.

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