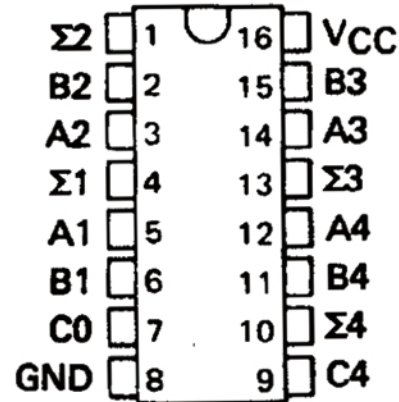- **Full-Carry Look-Ahead Across the Four Bits**
- **Systems Achieve Partial Look-Ahead Performance with the Economy of Ripple Carry**
- **Supply Voltage and Ground on Corner Pins to Simplify P-C Board Layout**

TYPICAL ADD TIMES

TYPE	TWO 8-BIT WORDS	TWO 16-BIT WORDS	TYPICAL POWER DISSIPATION PER ADDER

Σ2	1	16	VCC	
B2	2	15	B3	
A2	3	14	A3	
Σ1	4	13	Σ3	
A1	5	12	A4	
B1	6	11	B4	
C0	7	10	Σ4	
GND	8	9	C4	

description

The 'LS283 adders are electrically and functionally identical to the 'LS83 respectively; only the arrangement of the terminals has been changed. The 'LS283 high performance versions are also functionally identical.

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 in ten nanoseconds, typically, for the 'LS283, and 7.5 nanoseconds for the 'S283.
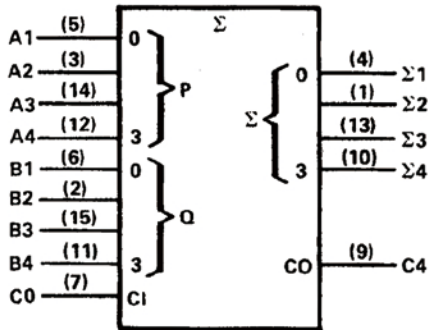This capability provides the system designer with partial look-ahead performance at the economy and reduced package count of a ripple-carry implementation.

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.

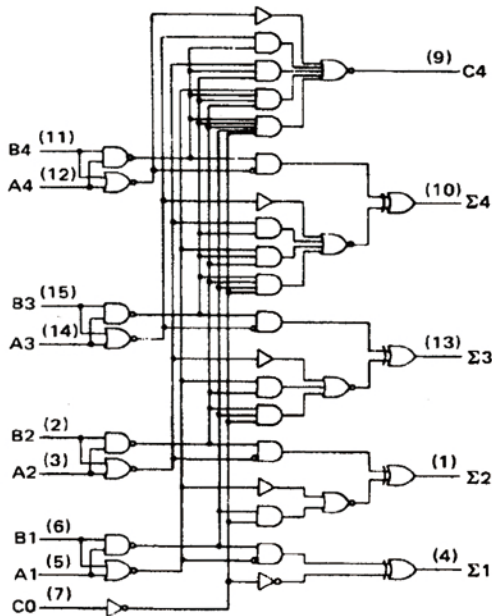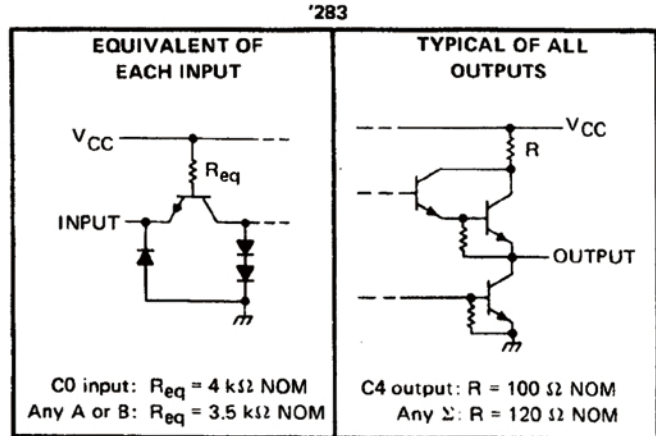Series 74S circuits are characterized for 0°C to 70°C operation.

logic symbol[†]

A1 (5)
A2 (3)
A3 (14)
A4 (12)
B1 (6)
B2 (2)
B3 (15)
B4 (11)
C0 (7)

P, Q, CI, Σ

0 (4) Σ1
0 (1) Σ2
3 (13) Σ3
3 (10) Σ4
C0 (9) C4

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

logic diagram (positive logic)

(9) C4

B4 (11)
A4 (12)
(10) Σ4

B3 (15)
A3 (14)
(13) Σ3

B2 (2)
A2 (3)
(1) Σ2

B1 (6)
A1 (5)
(4) Σ1
C0 (7)

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

schematics of inputs and outputs

'283

EQUIVALENT OF EACH INPUT	TYPICAL OF ALL OUTPUTS
V_{CC}, R_{eq}, INPUT	V_{CC}, R, OUTPUT
C0 input: R_{eq} = 4 kΩ NOM Any A or B: R_{eq} = 3.5 kΩ NOM	C4 output: R = 100 Ω NOM Any Σ: R = 120 Ω NOM

'LS283

EQUIVALENT OF EACH INPUT	TYPICAL OF ALL OUTPUTS
V_{CC}, R_{eq}, INPUT	100 Ω NOM, V_{CC}, OUTPUT
C0 input: R_{eq} = 17 kΩ NOM Any A or B: R_{eq} = 8.5 kΩ NOM	

'S283

EQUIVALENT OF EACH INPUT	TYPICAL OF ALL OUTPUTS
V_{CC}, 2.8 kΩ NOM, INPUT	50 Ω NOM, V_{CC}, OUTPUT
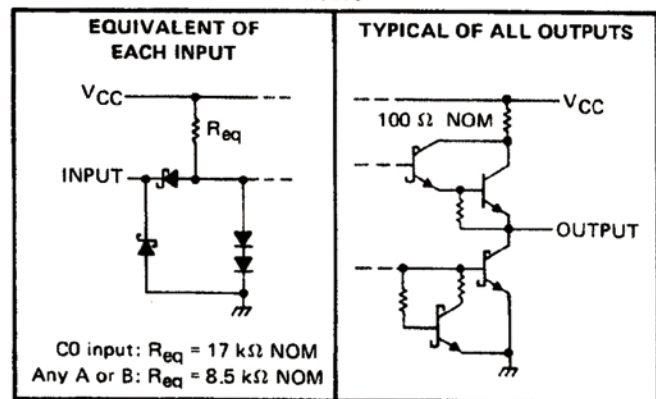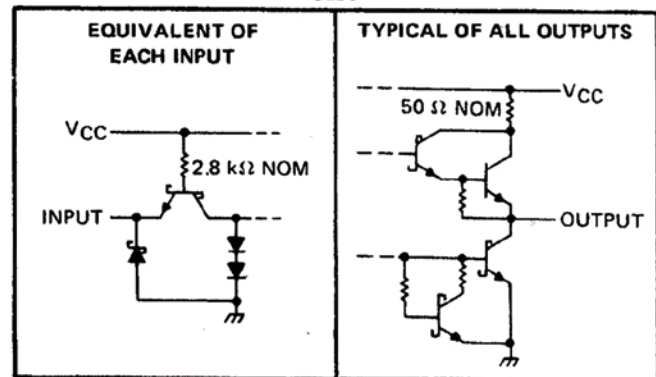
absolute maximum ratings over operating free-air temperature range (unless otherwise noted)

Supply voltage, V_{CC} (see Note 1) 7V
Input voltage: 'LS283 . . . . 7V
Interemitter voltage (see Note 2) 5.5V
Operating free-air temperature range: XD74LS283 . . . . −55°C to 125°C
Storage temperature range . . . . −65°C to 150°C

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

2. This is the voltage between two emitters of a multiple-emitter transistor. This rating applies for the '283 and 'S283 only between the following pairs: A1 and B1, A2 and B2, A3 and B3, A4 and B4.

recommended operating conditions

	XD74LS283			UNIT
	MIN	NOM	MAX	
Supply voltage, V_{CC}	4.75	5	5.25	V
High-level output current, I_{OH}			−400	μA
Low-level output current, I_{OL}			8	mA
Operating free-air temperature, T_A	0		70	°C

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

PARAMETER		TEST CONDITIONS[†]		XD74LS283			UNIT
				MIN	TYP[‡]	MAX	
V_{IH}	High-level input voltage			2			V
V_{IL}	Low-level input voltage					0.8	V
V_{IK}	Input clamp voltage	V_{CC} = MIN, I_I = −18 mA				−1.5	V
V_{OH}	High-level output voltage	V_{CC} = MIN, V_{IH} = 2 V, V_{IL} = V_{IL} max, I_{OH} = −400 μA		2.7	3.4		V
V_{OL}	Low-level output voltage	V_{CC} = MIN, V_{IH} = 2 V, V_{IL} = V_{IL} max	I_{OL} = 4 mA		0.25	0.4	V
			I_{OL} = 8 mA		0.35	0.5	
I_I	Input current at maximum input voltage	Any A or B	V_{CC} = MAX, V_I = 7 V			0.2	mA
		C0				0.1	
I_{IH}	High-level input current	Any A or B	V_{CC} = MAX, V_I = 2.7 V			40	μA
		C0				20	
I_{IL}	Low-level input current	Any A or B	V_{CC} = MAX, V_I = 0.4 V			−0.8	mA
		C0				−0.4	
I_{OS}	Short-circuit output current[§]	V_{CC} = MAX		−20		−100	mA
I_{CC}	Supply current	V_{CC} = MAX, Outputs open	All inputs grounded		22	39	mA
			All B low, other inputs at 4.5 V		19	34	
			All inputs at 4.5 V		19	34	

[†]For conditions shown as MIN or MAX, use the appropriate value specified under recommended operating conditions.
[‡]All typical values are at V_{CC} = 5 V, T_A = 25°C.
[§]Only one output should be shorted at a time and duration of the short-circuit should not exceed one second.

switching characteristics, V_{CC} = 5 V, T_A = 25°C

| PARAMETER[¶]	FROM (INPUT)	TO (OUTPUT)	TEST CONDITIONS	MIN	TYP	MAX	UNIT
t_{PLH}	C0	Any Σ			16	24	ns
t_{PHL}					15	24	
t_{PLH}	A_i or B_i	$Σ_i$			15	24	ns
t_{PHL}			C_L = 15 pF, R_L = 2 kΩ, See Note 3		15	24	
t_{PLH}	C0	C4			11	17	ns
t_{PHL}					11	22	
t_{PLH}	A_i or B_i	C4			11	17	ns
t_{PHL}					12	17	

[¶]t_{PLH} = propagation delay time, low-to-high-level output
t_{PHL} = propagation delay time, high-to-low-level output
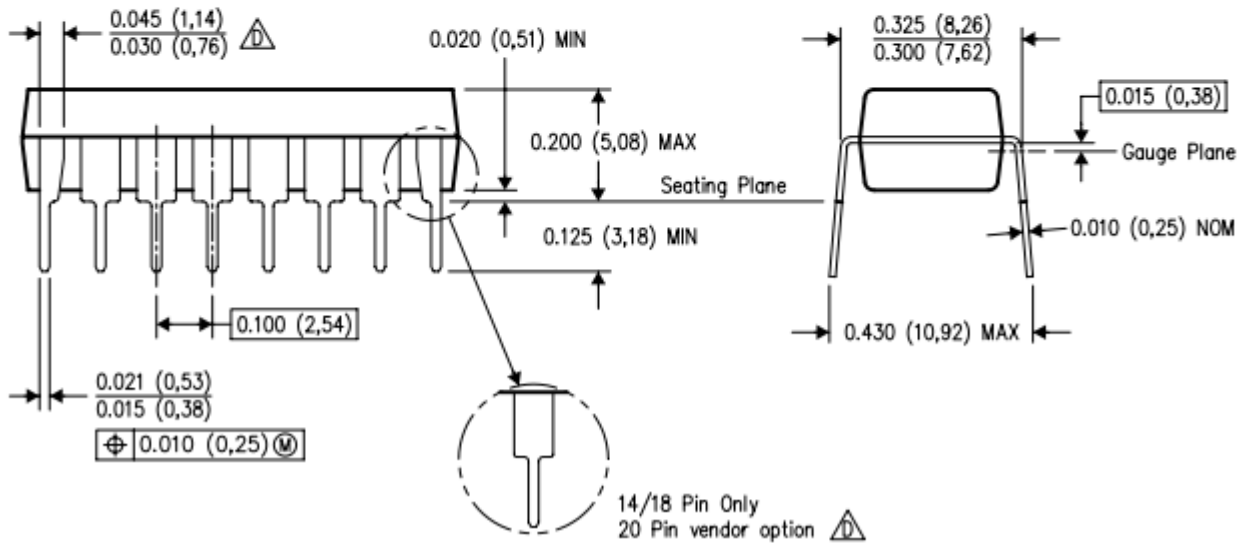NOTE 3: Load circuits and voltage waveforms are shown in Section 1.

DIP
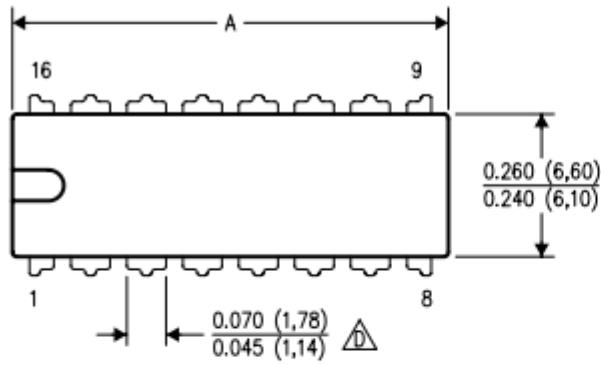
DIM \ PINS **	14	16	18	20
A MAX	0.775 (19,69)	0.775 (19,69)	0.920 (23,37)	1.060 (26,92)
A MIN	0.745 (18,92)	0.745 (18,92)	0.850 (21,59)	0.940 (23,88)
MS–001 VARIATION	AA	BB	AC	AD