- Full-Carry Look-Ahead Across the Four Rits
- 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

	TWO	TWO	TYPICAL POWER
	8-BIT	16-BIT	DISSIPATION
TYPE	WORDS	WORDS	PER ADDER
'283	23ns	43ns	310 mW
'LS283	25ns	45ns	95 mW
'\$283	15ns	30ns	510 mW

description

The '283 and 'LS283 adders are electrically and functionally identical to the '83A and 'LS83A, respectively; only the arrangement of the terminals has been changed. The 'S283 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 '283 and '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.

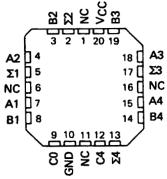
The adder logic, including the carry, is implemented in its true form. End around carry can be accomplished without the need for logic or level inversion.

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

SN54283, SN54LS283 . . . J OR W PACKAGE SN54S283 . . . J PACKAGE **SN74283...N PACKAGE** SN74LS283, SN74S283 . . . D OR N PACKAGE (TOP VIEW) 22 []1 U16 [] VCC 15 B3 14 🗌 A3 **A2** 13 **Σ3** Σ1 12 A4 **B1** 11 🗌 B4 10 🔲 Σ4 CO

SN54LS283, SN54S283 . . . FK PACKAGE (TOP VIEW)

GND



NC - No internal connection

FUNCTION TABLE

						OUT	PUT				
ŀ				WHE	N	/	WHE	N			
1	INF	TU		C0 =	٧ ا		C0 =	н/			
1				/	/ W	HEN		/ w	HEN		
				_	C	2 - L	/	(CZ +)			
A1/	B1 /	A2/	B2/	21/	Σ2/	C2/	Σ1/	Σ2/	C2/		
Z.A.	83	/ A4	284	Σ3	<u> 24</u>	<u> </u>	∠ £3	Z4	/ 04		
L	L	L	L	L	L	L	н	,L	L		
н	L	L	L	н	L	L	L	н	L		
L	н	L	L	н	L	L	L	н	L		
Н	н	L	L	l L	н	L	н	н	L		
L	L	Н	L	L	н	L	н	н	L		
Н	L	н	L	н	н	L	L	L	н		
L	н	н	L	н	н	L	L	L	н		
H	н	н	L	L	L	н	н.	L	н		
L	L	L	н	L	н	L	н	44	L		
н	L	L	н	н	н	L	L	L	н		
L	н	L	н	H	н	L	L.	L	н		
Н	н	L	н	L	L	н	н	L	н		
L	L	Н	н	L	L	н	н	L	н		
н	L	н	н	н	L	н	L	Н	н		
L	н	н	н	н	L	н	L	Н	н		
Н	н	Н	н	L	н	н	н	н	н		

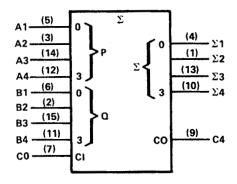
H = high level, L = low level

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.



SDLS095A - OCTOBER 1976 - REVISED MARCH 1988

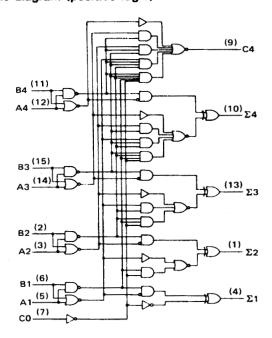
logic symbol†



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

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

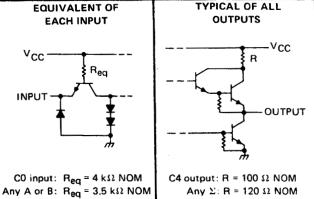
logic diagram (positive logic)



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

schematics of inputs and outputs

EQUIVALENT OF EACH INPUT v_{cc}



'LS283

EQUIVALENT OF TYPICAL OF ALL OUTPUTS **EACH INPUT** vccv_{cc} 100 Ω NOM Req INPUT OUTPUT C0 input: $R_{eq} = 17 \text{ k}\Omega \text{ NOM}$ Any A or B: $R_{eq} = 8.5 \text{ k}\Omega \text{ NOM}$

TYPICAL OF ALL OUTPUTS **EQUIVALENT OF EACH INPUT** ۷cç **50 Ω NOM** 2.8 kΩ NOM INPUT OUTPUT

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

Supply voltage, VCC (see Note 1) .																					7V
Input voltage: '283, 'S283	,								٠.								•				5.5V
'LS283	,																				7V
Interemitter voltage (see Note 2) .																					5.5V
Operating free-air temperature range:	: 1	SN5	42	33,	SN	54	LS2	283	, S	N5	452	283						5	5°(C to	125°C
	:	SN7	42	83,	SN	74	LS2	283	3, S	N7	452	283							0	°C t	o 70°C
Storage temperature range																		6	5°(Cto	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

			SN5428	3		SN7428	3	
		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	Any output except C4			-800			-800	
mightever output current, tOH	Output C4	·		-400			- 400	μА
Low level output ourrent la	Any output except C4			16			16	
Low-level output current, IOL	Output C4			8			8	mA
Operating free-air temperature, TA		55		125	0		70	°C

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

	PARAM	ETED	TEST CO	NDITIONS†		N5428	3		SN7428	3	
	ranaiv	EIEN	1EST CO	NDITIONS.	MIN	TYP‡	MAX	MIN	TYP‡	MAX	UNIT
VIH	High-level input volt	tage			2			2			V
VIL	Low-level input volt	age					0.8			0.8	V
VIK	Input clamp voltage	,	VCC = MIN,	I _I = -12 mA			-1.5			-1.5	V
Vон	High-level output vo	oltage	V _{CC} = MIN, V _{IL} = 0.8 V,		2.4	3.6		2.4	3.6	>	v
VOL	Low-level output vo	Itage	V _{CC} = MIN, V _{IL} = 0.8 V,	V _{IH} = 2 V,		0.2	0.4		0.2	0.4	v
I _I	Input current at ma input voltage	ximum	V _{CC} = MAX,	V _I = 5.5 V			1			1	mA
ŧιн	High-level input cur	rent	VCC = MAX,	V ₁ = 2.4 V			40			40	μА
IIL	Low-level input curi	rent	VCC = MAX,	V _I = 0.4 V			-1.6			-1.6	mA
los	Short-circuit	Any output except C4	Von = MAX		-20		-55	-18		-55	<u> </u>
.02	output current §	Output C4	V _{CC} = MAX		-20		-70	-18		-70	mA ·
laa	Supply surrout		V _{CC} = MAX,	All B low, other inputs at 4.5 V		56			56		
¹cc	Supply current		Outputs open	All inputs at 4.5 V		66	99		66	110	mA

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

switching characteristics, $V_{CC} = 5 \text{ V}$, $T_A = 25^{\circ}\text{C}$

PARAMETER ¶	FROM (INPUT)	TO (OUTPUT)	TEST CONDITIONS	MIN	TYP	MAX	UNIT
^t PLH	СО	A 53			14	21	!
tpHL]	Any Σ	C _L = 15 pF, R _L = 400 Ω,		12	21	ns
^t PLH	A _i or B _i	5.	See Note 3		16	24	<u> </u>
tPHL	Ai Oi Bi	Σ_{i}			16	24	ns
^t PLH	· C0				9	14	†
^t PHL	1 .00	C4	CL = 15 pF, RL = 780 Ω,		11.	16	ns
^t PLH	A. or B.	C4	See Note 3		9	14	
^t PHL	A _i or B _i	L4			11	16	ns

 $[\]P_{tPLH}$ = propagation delay time, low-to-high-level output

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



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

SOnly one output should be shorted at a time.

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

recommended operating conditions

	S	N54LS2	83	SI	N74LS2	83	Ī
	MIN	NOM	MAX	MIN	NOM	MAX	UNIT
Supply voltage, V _{CC}	4.5	5	5.5	4.75	5	5.25	V
High-level output current, IOH			-400			400	μΑ
Low-level output current, IOL			4			8	mA
Operating free-air temperature, TA	-55		125	0		70	°C

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

	DADAMET		700	T CONDITIO	auc†	SI	154LS2	83	SI	N74LS2	83	····
	PARAMET	EH	1 E 8	ST CONDITIO	NS'	MIN	TYP [‡]	MAX	MIN	TYP [‡]	MAX	UNIT
VIH	High-level input v	oltage				2			2			V
VIL	Low-level input v	oltage						0.7			0.8	٧
VIK	Input clamp volta	age	V _{CC} = MIN,	1 _j = -18 mA				-1.5			-1.5	٧
Voн	High-level output	voltage	V _{CC} = MIN, I _{OH} = -400 μA		VIL = VIL max,	2.5	3.4		2.7	3.4		v
Voi	Low-level output	voltage	V _{CC} = MIN,	V _{IH} = 2 V,	IOL = 4 mA		0.25	0.4		0.25	0.4	, , ,
VOL	Low-level output	Vortage	VıL = VıL max		IOL = 8 mA					0.35	0.5	V
	Input current at maximum	Any A or B	V MAY	V - 7V				0.2			0.2	
11	input voltage	СО	V _{CC} = MAX,	V = / V				0.1			0.1	mA
1	High-level	Any A or B	V MAY	V -07V				40			40	
ЧН	input current	CO	V _{CC} = MAX,	V ₁ = 2.7 V				20			20	μΑ
Ī	Low-level	Any A or B	V _{CC} = MAX,	V. = 0.4.V			-	-0.8			-0.8	
11L	input current	CO	VCC - MAA,	V - 0,4 V				-0.4			-0.4	mA
los	Short-circuit out	out current§	V _{CC} = MAX			-20		-100	-20		-100	mA
					All inputs grounded		22	39		22	39	
Icc	Supply current		V _{CC} = MAX, Outputs open		All B low, other inputs at 4.5 V		19	34		19	34	mA
					All inputs at 4.5 V		19	34		19	34	

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

switching characteristics, $V_{CC} = 5 \text{ V}$, $T_A = 25^{\circ} \text{ C}$

PARAMETER¶	FROM (INPUT)	TO (OUTPUT)	TEST CO	NDITIONS	MIN	TYP	MAX	UNIT
^t PLH	CO	Any Σ				16	24	
^t PHL		Any 2				15	24	ns
tPLH .	A _i or B _i	2.	1			15	24	
^t PHL	7,0,5,	Σ_{i}	$C_L = 15 pF$,	$R_L = 2 k\Omega$,		15	24	ns
tPLH .	CO	C4	See Note 3			11	17	
tPHL.		<u>س</u>				11	22	ns
[†] PLH	A _i or B _i	C4	1			11	17	
tPHL:	7 7 5 6	~				12	17	ns

[¶]tpLH = propagation delay time, low-to-high-level output

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



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

[§]Only 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

recommended operating conditions

			SN54S28	3		SN74S28	3	
		MIN	NOM	MAX	MIN	NOM	MAX	UNIT
Supply voltage, VCC		4.5	5	5.5	4.75	5	5.25	V
	Any output except C4			-1			-1	mA
High-level output current, IOH	Output C4			500			-500	μΑ
	Any output except C4			20			20	
Low-level output current, IOL	Output C4			10			10	mA
Operating free-air temperature,	T _A	-55		125	0		70	°C

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

	PARAMETER			TEST CO	ONDITIONS†	MIN	TYP†	MAX	UNIT
VIH	High-level input vo	itage				2			V
VIL	Low-level input vo	ltage						8.0	V
ViK	Input clamp voltag	je		V _{CC} = MIN,	I _I = -18 mA			-1.2	V
.,	41' 5 4		SN54S283	V _{CC} = MIN,	V _{1H} = 2 V,	2.5	3.4		
VOH	High-level output	voltage	SN74S283	VIL = 0.8 V,	I _{OH} = MAX	2.7	3.4		† ′
VOL	Low-level output v	oltage/		V _{CC} = MIN, V _{IL} = 0.8 V,	V _{IH} = 2 V, I _{OL} = MAX			0.5	V
11	Input current at m input voltage	aximum		V _{CC} = MAX,	V _I = 5.5 V			1	mA
¹ ІН	High-level input cu	irrent		V _{CC} = MAX,	V ₁ = 2.7 V			50	μА
1 ₁ L	Low-level input cu	rrent		V _{CC} = MAX,	V ₁ = 0.5 V		***************************************	-2	mA
1	Short-circuit	Any outp	out except C4			-40		-100	
los	output current§	Output C	:4	VCC = MAX		-20		-100	mA
Icc	Supply current			V _{CC} = MAX,	All B low, other inputs at 4.5 V		80		
•00	coppiy cuitelit			Outputs open	All inputs at 4.5 V		95	160	mA

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

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

PARAMETER¶	FROM (INPUT)	TO (OUTPUT)	TEST CONDITIONS	MIN	TYP	MAX	UNIT
tPLH	CO	A 53			11	18	
ФНL		Any Σ	$C_{L} = 15 pF$, $R_{L} = 280 \Omega$,		12	18	ns
ФLН	A. or P.	5.	See Note 3		12	18	
tPHL	A _i or B _i	Σί			11.5	18	ns ns
tPLH .	CO	C4			6	11	
tРHL.		C4	$C_{L} = 15 pF, R_{L} = 560 \Omega,$		7.5	11	ns
tPLH .	A. or B.	C4	See Note 3		7.5	12	
tPHL	A _i or B _i				8.5	12	ns

 $[\]P_{tPLH}$ = propagation delay time, low-to-high-level output

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



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

 $[\]S$ Only 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





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PACKAGING INFORMATION

Orderable Device	Status	Package Type	Package Drawing	Pins	Package Qty	Eco Plan	Lead finish/ Ball material	MSL Peak Temp	Op Temp (°C)	Device Marking (4/5)	Samples
5962-7604301VEA	ACTIVE	CDIP	J	16	25	Non-RoHS & Green	SNPB	N / A for Pkg Type	-55 to 125	5962-7604301VE A SNV54LS283J	Samples
76043012A	ACTIVE	LCCC	FK	20	1	Non-RoHS & Green	SNPB	N / A for Pkg Type	-55 to 125	76043012A SNJ54LS 283FK	Samples
7604301EA	ACTIVE	CDIP	J	16	1	Non-RoHS & Green	SNPB	N / A for Pkg Type	-55 to 125	7604301EA SNJ54LS283J	Samples
7604301FA	ACTIVE	CFP	W	16	1	Non-RoHS & Green	SNPB	N / A for Pkg Type	-55 to 125	7604301FA SNJ54LS283W	Samples
JM38510/31202BEA	ACTIVE	CDIP	J	16	1	Non-RoHS & Green	SNPB	N / A for Pkg Type	-55 to 125	JM38510/ 31202BEA	Samples
JM38510/31202BFA	ACTIVE	CFP	W	16	1	Non-RoHS & Green	SNPB	N / A for Pkg Type	-55 to 125	JM38510/ 31202BFA	Samples
M38510/31202BEA	ACTIVE	CDIP	J	16	1	Non-RoHS & Green	SNPB	N / A for Pkg Type	-55 to 125	JM38510/ 31202BEA	Samples
M38510/31202BFA	ACTIVE	CFP	W	16	1	Non-RoHS & Green	SNPB	N / A for Pkg Type	-55 to 125	JM38510/ 31202BFA	Samples
SN54LS283J	ACTIVE	CDIP	J	16	1	Non-RoHS & Green	SNPB	N / A for Pkg Type	-55 to 125	SN54LS283J	Samples
SN54S283J	ACTIVE	CDIP	J	16	1	Non-RoHS & Green	SNPB	N / A for Pkg Type	-55 to 125	SN54S283J	Samples
SN74LS283D	ACTIVE	SOIC	D	16	40	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	0 to 70	LS283	Samples
SN74LS283N	ACTIVE	PDIP	N	16	25	RoHS & Green	NIPDAU	N / A for Pkg Type	0 to 70	SN74LS283N	Samples
SN74LS283NE4	ACTIVE	PDIP	N	16	25	RoHS & Green	NIPDAU	N / A for Pkg Type	0 to 70	SN74LS283N	Samples
SN74LS283NSR	ACTIVE	SO	NS	16	2000	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	0 to 70	74LS283	Samples
SN74S283N	ACTIVE	PDIP	N	16	25	RoHS & Green	NIPDAU	N / A for Pkg Type 0 to 70		SN74S283N	Samples
SNJ54LS283FK	ACTIVE	LCCC	FK	20	1	Non-RoHS & Green	SNPB	N / A for Pkg Type	-55 to 125	76043012A SNJ54LS 283FK	Samples

PACKAGE OPTION ADDENDUM

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Orderable Device	Status (1)	Package Type	Package Drawing	Pins	Package Qty	Eco Plan	Lead finish/ Ball material	MSL Peak Temp	Op Temp (°C)	Device Marking (4/5)	Samples
SNJ54LS283J	ACTIVE	CDIP	J	16	1	Non-RoHS & Green	SNPB	N / A for Pkg Type	-55 to 125	7604301EA SNJ54LS283J	Samples
SNJ54LS283W	ACTIVE	CFP	W	16	1	Non-RoHS & Green	SNPB	N / A for Pkg Type	-55 to 125	7604301FA SNJ54LS283W	Samples
SNJ54S283J	ACTIVE	CDIP	J	16	1	Non-RoHS & Green	SNPB	N / A for Pkg Type	-55 to 125	SNJ54S283J	Samples

(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) RoHS: TI defines "RoHS" to mean semiconductor products that are compliant with the current EU RoHS requirements for all 10 RoHS substances, including the requirement that RoHS substance do not exceed 0.1% by weight in homogeneous materials. Where designed to be soldered at high temperatures, "RoHS" products are suitable for use in specified lead-free processes. TI may reference these types of products as "Pb-Free".

RoHS Exempt: TI defines "RoHS Exempt" to mean products that contain lead but are compliant with EU RoHS pursuant to a specific EU RoHS exemption.

Green: TI defines "Green" to mean the content of Chlorine (Cl) and Bromine (Br) based flame retardants meet JS709B low halogen requirements of <=1000ppm threshold. Antimony trioxide based flame retardants must also meet the <=1000ppm threshold requirement.

- (3) MSL, Peak Temp. The Moisture Sensitivity Level rating according to the JEDEC industry standard classifications, and peak solder temperature.
- (4) There may be additional marking, which relates to the logo, the lot trace code information, or the environmental category on the device.
- (5) Multiple Device Markings will be inside parentheses. Only one Device Marking contained in parentheses and separated by a "~" will appear on a device. If a line is indented then it is a continuation of the previous line and the two combined represent the entire Device Marking for that device.
- (6) Lead finish/Ball material Orderable Devices may have multiple material finish options. Finish options are separated by a vertical ruled line. Lead finish/Ball material values may wrap to two lines if the finish value exceeds the maximum column width.

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PACKAGE OPTION ADDENDUM

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OTHER QUALIFIED VERSIONS OF SN54LS283, SN54LS283-SP, SN54S283, SN74LS283, SN74S283:

Catalog: SN74LS283, SN54LS283, SN74S283

• Military : SN54LS283, SN54S283

• Space : SN54LS283-SP

NOTE: Qualified Version Definitions:

- Catalog TI's standard catalog product
- Military QML certified for Military and Defense Applications
- Space Radiation tolerant, ceramic packaging and qualified for use in Space-based application

PACKAGE MATERIALS INFORMATION

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TAPE AND REEL INFORMATION





A0	Dimension designed to accommodate the component width
В0	Dimension designed to accommodate the component length
K0	Dimension designed to accommodate the component thickness
W	Overall width of the carrier tape
P1	Pitch between successive cavity centers

QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE



*All dimensions are nominal

Device	Package Type	Package Drawing		SPQ	Reel Diameter (mm)	Reel Width W1 (mm)	A0 (mm)	B0 (mm)	K0 (mm)	P1 (mm)	W (mm)	Pin1 Quadrant
SN74LS283NSR	SO	NS	16	2000	330.0	16.4	8.2	10.5	2.5	12.0	16.0	Q1

PACKAGE MATERIALS INFORMATION

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*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
SN74LS283NSR	SO	NS	16	2000	356.0	356.0	35.0



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TUBE

INSTRUMENTS



*All dimensions are nominal

Device	Package Name	Package Type	Pins	SPQ	L (mm)	W (mm)	T (µm)	B (mm)
76043012A	FK	LCCC	20	1	506.98	12.06	2030	NA
7604301FA	W	CFP	16	1	506.98	26.16	6220	NA
JM38510/31202BFA	W	CFP	16	1	506.98	26.16	6220	NA
M38510/31202BFA	W	CFP	16	1	506.98	26.16	6220	NA
SN74LS283D	D	SOIC	16	40	507	8	3940	4.32
SN74LS283N	N	PDIP	16	25	506	13.97	11230	4.32
SN74LS283N	N	PDIP	16	25	506	13.97	11230	4.32
SN74LS283NE4	N	PDIP	16	25	506	13.97	11230	4.32
SN74LS283NE4	N	PDIP	16	25	506	13.97	11230	4.32
SN74S283N	N	PDIP	16	25	506	13.97	11230	4.32
SN74S283N	N	PDIP	16	25	506	13.97	11230	4.32
SNJ54LS283FK	FK	LCCC	20	1	506.98	12.06	2030	NA
SNJ54LS283W	W	CFP	16	1	506.98	26.16	6220	NA

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