### SN54283, SN54LS283, SN54S283, SN74283, SN74LS283, SN74S283 4-BIT BINARY FULL ADDERS WITH FAST CARRY SDLS095A – OCTOBER 1976 – REVISED MARCH 1988

- 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

түре	TWO 8-BIT WORDS	TWO 16-BIT WORDS	TYPICAL POWER DISSIPATION PER ADDER
'283	23ns	43ns	310 mW
'LS283	25ns	45ns	95 mW
ʻS283	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.

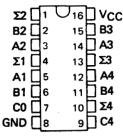
These improved full adders perform the addition of two 4-bit binary words. The sum ( $\Sigma$ ) outputs are provided for each bit and the resultant carry (C4) is obtained from the fourth bit. These adders feature full internal look-ahead across all four bits generating the carry term in ten nanoseconds, 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 а 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.

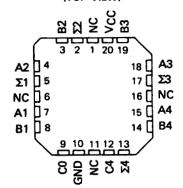
Series 54, Series 54LS, and Series 54S circuits are characterized for operation over the full temperature range of  $-55^{\circ}$ C to  $125^{\circ}$ C. Series 74, Series 74LS, and Series 74S circuits are characterized for  $0^{\circ}$ C to  $70^{\circ}$ C operation.

SN54283, SN54LS283...J OR W PACKAGE SN54S283...J PACKAGE SN74283...N PACKAGE SN74LS283, SN74S283...D OR N PACKAGE

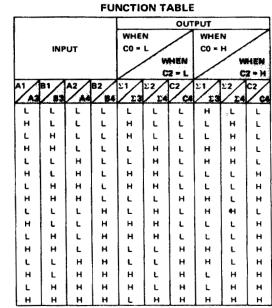
### (TOP VIEW)



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



NC - No internal connection



H = high level, L = low level

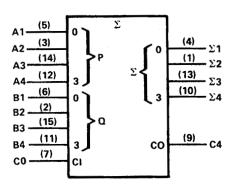
NOTE: Input conditions at A1, B1, A2, B2, and C0 are used to determine outputs Σ1 and Σ2 and the value of the internal carry C2. The values at C2, A3, B3, A4, and B4 are then used to determine outputs Σ3, Σ4, and C4.

PRODUCTION DATA information is 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.

## SN54283, SN54LS283, SN54S283, SN74283, SN74LS283, SN74S283 4-BIT BINARY FULL ADDERS WITH FAST CARRY

SDLS095A - OCTOBER 1976 - REVISED MARCH 1988

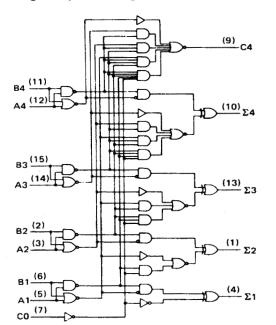
### logic symbol<sup>†</sup>

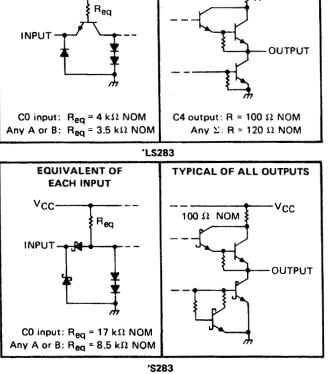


<sup>†</sup>This symbol is in accordance with ANSI/IEEE Std. 91-1984 and IEC Publication 617-12.

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

### logic diagram (positive logic)





283

TYPICAL OF ALL

OUTPUTS

R

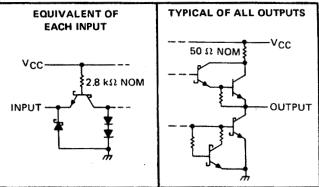
Vcc

schematics of inputs and outputs

EQUIVALENT OF

EACH INPUT

v<sub>cc</sub>



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)																					7V
Input voltage: '283, 'S283																					
'LS283																					7V
Interemitter voltage (see Note 2) .																					
Operating free-air temperature range:	5	IN5	42	83,	SN	541	_S2	283	, SI	N54	4S2	83						5	5°C	C to	125°C
																					o 70°C
Storage temperature range																		6	5° (	C to	150°C
NOTES: 1. Voltage values, except interemitter																					

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

		5	SN5428	3		SN7428	3	
	· · · · · · · · · · · · · · · · · · ·	MIN	NOM	MAX	MIN	NOM	MAX	
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	
High-level output current, IOH	Output C4	•		-400			- 400	μA
	Any output except C4			16			16	
Low-level output current, IOL	Output C4		1.11	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		SN5428	3		SN7428	3	
	FANAW		TEST CO	NDITIONS.	MIN	TYP‡	MAX	MIN	TYP‡	MAX	UNIT
VIH	High-level input volt	age			2			2			V
VIL	Low-level input volta	age					0.8	1		0.8	v
VIK	Input clamp voltage		V <sub>CC</sub> = MIN,	l <sub>l</sub> =12 mA			-1.5			-1.5	V
v <sub>он</sub>	High-level output vo	itage	V <sub>CC</sub> = MIN, V <sub>IL</sub> = 0.8 V,	V <sub>IH</sub> = 2 V, I <sub>OH</sub> = MAX	2.4	3.6		2.4	3.6	>	v
VOL	Low-level output vol	tage	V <sub>CC</sub> = MIN, V <sub>IL</sub> = 0.8 V,		· · · ·	0.2	0.4		0.2	0.4	v
4	Input current at max input voltage	limum	V <sub>CC</sub> = MAX,	V <sub>I</sub> = 5.5 V			1			1	mA
ŧн	High-level input curr	ent	V <sub>CC</sub> = MAX,	V1 = 2.4 V			40			40	μA
μL	Low-level input curr	ent	V <sub>CC</sub> = MAX,	VI = 0.4 V			-1.6			-1.6	mA
los	Short-circuit	Any output except C4	V <sub>CC</sub> = MAX		-20		-55	-18		55	<u> </u>
.02	output current §	Output C4			-20		-70	-18		70	mA ·
loo	Supply current		V <sub>CC</sub> = MAX,	All B low, other inputs at 4.5 V		56			56		
'cc			Outputs open	All inputs at 4.5 V		66	99		66	110	- mA

<sup>†</sup>For conditions shown as MIN or MAX, use the appropriate value specified under recommended operating conditions.

<sup>‡</sup>All typical values are at  $V_{CC} = 5 V$ ,  $T_A = 25$ °C.

Sonly one output should be shorted at a time.

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

PARAMETER	FROM (INPUT)	TO (OUTPUT)	TEST CONDITIONS	MIN TYP	MAX	UNIT
<sup>t</sup> PLH	со	Antis		14	21	<u> </u>
tΡΗL		Any Σ	$C_{L} = 15  pF$ , $R_{L} = 400  \Omega$ ,	12	21	ns
<sup>t</sup> PLH	Ai or Bi	5.	See Note 3	16	24	<u>†</u>
<sup>t</sup> PHL		Σį		16	24	ns
<b>TPLH</b>	- CO			9	14	<u> </u>
<sup>t</sup> PHL		C4	C <sub>L</sub> = 15 pF, R <sub>L</sub> = 780 Ω,	11	16	ns
<sup>t</sup> PLH	At or Bi	C4	See Note 3	9	14	1
<sup>t</sup> PHL	A <sub>i</sub> or B <sub>i</sub>			11	16	ns ns

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

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

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



# SN54LS283, SN74LS283 4-BIT BINARY FULL ADDERS WITH FAST CARRY

SDLS095A – OCTOBER 1976 – REVISED MARCH 1988

### recommended operating conditions

	S	N54LS2	83	S			
	MIN	NOM	MAX	MIN	NOM	MAX	UNIT
Supply voltage, V <sub>CC</sub>	4.5	5	5.5	4.75	5	5.25	V
High-level output current, IOH			-400			400	μA
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)

	PARAMET	E0			Net	SI	V54LS2	83	S	N74LS2	83	
	PARAMET	EK	I E	ST CONDITIO	NS'	MIN	TYP <sup>‡</sup>	MAX	MIN	TYP <sup>‡</sup>	MAX	UNIT
VIH	High-level input v	voltage				2			2			V
VIL	Low-level input v	oltage						0.7			0.8	V
VIK	Input clamp volta	age	V <sub>CC</sub> = MIN,	1j = -18 mA				-1.5		•	-1.5	V
VOH	High-level output	t voltage	V <sub>CC</sub> = MIN, I <sub>OH</sub> ≕400 μA		V <sub>IL</sub> = V <sub>IL</sub> max,	2.5	3.4		2.7	3.4		v
N.s.			V <sub>CC</sub> = MIN,	V <sub>IH</sub> = 2 V,	I <sub>OL</sub> = 4 mA		0.25	0.4		0.25	0.4	
VOL	Low-level output	voitage	VIL = VIL max		I <sub>OL</sub> = 8 mA					0.35	0.5	v
1.	Input current at maximum	Any A or B	V <sub>CC</sub> = MAX,	V. <b></b> 7 V				0.2			0.2	
1	input voltage	CO		V -/V				0.1			0.1	mA
1	High-level	Any A or B	Vee = MAX	V. = 27.V	•			40			40	
ЧΗ	input current	CO	V <sub>CC</sub> = MAX,	V <sub>1</sub> = 2.7 V				20			20	μA
1	Low-level	Any A or B	V <sub>CC</sub> = MAX,	V <sub>I</sub> ≖ 0.4 V				-0.8			-0.8	
11L	input current	CO		v] = 0.4 v				-0.4			0.4	mA
los	Short-circuit out	put current§	V <sub>CC</sub> ≖ MAX			-20		-100	-20		-100	mA
				<u>,</u>	All inputs grounded		22	39		22	39	
Icc	Supply current		V <sub>CC</sub> = 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	1

<sup>†</sup>For conditions shown as MIN or MAX, use the appropriate value specified under recommended operating conditions.

<sup>‡</sup>All typical values are at  $V_{CC} = 5 V$ ,  $T_A = 25^{\circ}C$ .

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

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

PARAMETER¶	FROM (INPUT)	TO (OUTPUT)	TEST COM	DITIONS	MIN	TYP	MAX	UNIT
tPLH	СО	Ant				16	24	
tPHL		Αηγ Σ				15	24	ns
tPLH .	A <sub>i</sub> or B <sub>i</sub>	Σ.	1			15	24	
<sup>t</sup> PHL		Σi	CL = 15 pF,	RL = 2 kΩ,		15	24	ns
<sup>t</sup> PLH	СО	C4	See Note 3			11	17	
<sup>t</sup> PHL		~				11	22	ns
<sup>t</sup> PLH	A <sub>i</sub> or B <sub>i</sub>	C4				11	17	
<sup>t</sup> PHL		, ~~				12	17	ns

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

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

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



### recommended operating conditions

			SN54S28	3	J.	SN74S283	3	]
		MIN	NOM	MAX	MIN	NOM	MAX	
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	1		-500	μΑ
	Any output except C4			20			20	
Low-level output current, IOL	Output C4			10			10	-  mA
Operating free-air temperature,	TA	-55		125	0		70	°C

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

	PARAMETER			TEST CO		MIN	TYPŦ	MAX	UNIT
VIH	High-level input vo	oltage				2			V
VIL	Low-level input vo	ltage						0.8	V
VIK	Input clamp voltag	ge		V <sub>CC</sub> = MIN,	l <sub>l</sub> = -18 mA			-1.2	v
			SN54S283	V <sub>CC</sub> = MIN,	V <sub>IH</sub> = 2 V,	2.5	3.4	• • • • • • • • • • • • • • • • • • • •	
VOH	High-level output	voitage	SN74S283	V <sub>IL</sub> = 0.8 V,	IOH = MAX	2.7	3.4		1 V
VOL	Low-level output v	voltage		V <sub>CC</sub> = MIN, V <sub>IL</sub> = 0.8 V,	V <sub>IH</sub> = 2 V, I <sub>OL</sub> = MAX			0.5	v
ł <sub>1</sub>	Input current at m input voltage	aximum		V <sub>CC</sub> ≖ MAX,	V <sub>I</sub> = 5.5 V			1	mA
<sup>†</sup> IH	High-level input cu	urrent		V <sub>CC</sub> = MAX,	V1 = 2.7 V			50	μA
4L	Low-level input cu	irrent		V <sub>CC</sub> = MAX,	Vi = 0.5 V			-2	mA
1	Short-circuit	Any outp	out except C4			-40		-100	1 .
IOS	output current§	Output C	4	V <sub>CC</sub> ≖ MAX		20		-100	-  mA
lcc	Supply current			V <sub>CC</sub> = MAX,	All B low, other inputs at 4.5 V		80		
100	oupply current			Outputs open	All inputs at 4.5 V		95	160	- mA

<sup>†</sup>For conditions shown as MIN or MAX, use the appropriate value specified under recommended operating conditions for the applicable device type.

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

§ 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	ТҮР	MAX	UNIT
tPLH	CO	Anu D			11	18	1
ΨHL	CU	Any Σ	$C_{L} = 15  pF, R_{L} = 280  \Omega,$		12	18	ns ns
ΨLH	At at Br	5.	See Note 3		12	18	1
<sup>t</sup> PHL	A <sub>i</sub> or B <sub>i</sub>	Σi			11.5	18	-   ns
<b>TPLH</b>	CO	C4		[	6	11	
ሞዘL	CU	C4	CL = 15 pF, RL = 560 Ω,		7.5	11	ns ns
<sup>t</sup> PLH	A. or P.	C4	See Note 3		7.5	12	
<b>tPHL</b>	A <sub>i</sub> or B <sub>i</sub>	C4			8.5	12	ns ns

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

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

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





9-Mar-2021

## **PACKAGING INFORMATION**

Orderable Device	Status (1)	Package Type	Package Drawing	Pins	Package Qty	Eco Plan (2)	Lead finish/ Ball material (6)	MSL Peak Temp (3)	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	Ν	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



9-Mar-2021

Orderable Device	Status (1)	Package Type	Package Drawing	Pins	Package Qty	Eco Plan (2)	Lead finish/ Ball material (6)	MSL Peak Temp (3)	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

<sup>(1)</sup> 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.

<sup>(2)</sup> 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 (CI) 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.

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

<sup>(4)</sup> 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.

<sup>(6)</sup> 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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9-Mar-2021

#### 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

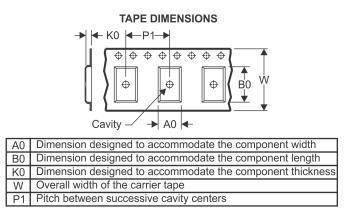
# PACKAGE MATERIALS INFORMATION

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### TAPE AND REEL INFORMATION





### QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE



1	*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

TEXAS INSTRUMENTS

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# PACKAGE MATERIALS INFORMATION

30-Dec-2020



\*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
SN74LS283NSR	SO	NS	16	2000	853.0	449.0	35.0

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