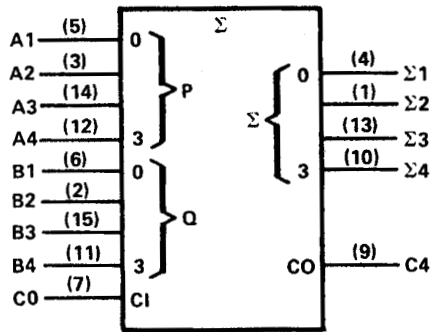


SN54283, SN54LS283, SN54S283, SN74283, SN74LS283, SN74S283 4-BIT BINARY FULL ADDERS WITH FAST CARRY

SDLS095A - OCTOBER 1976 - REVISED MARCH 1988

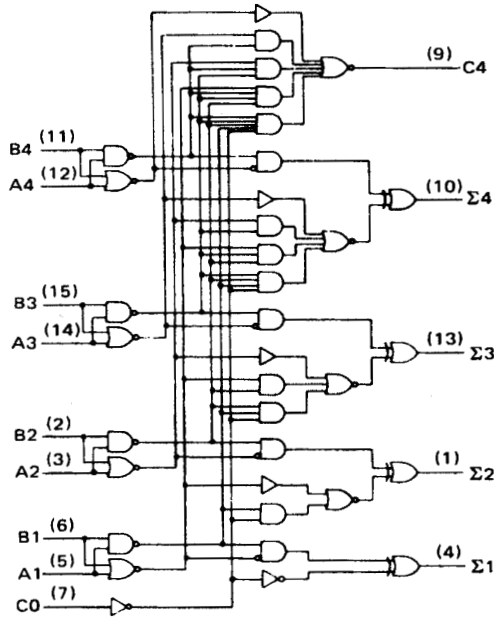
logic symbol†



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

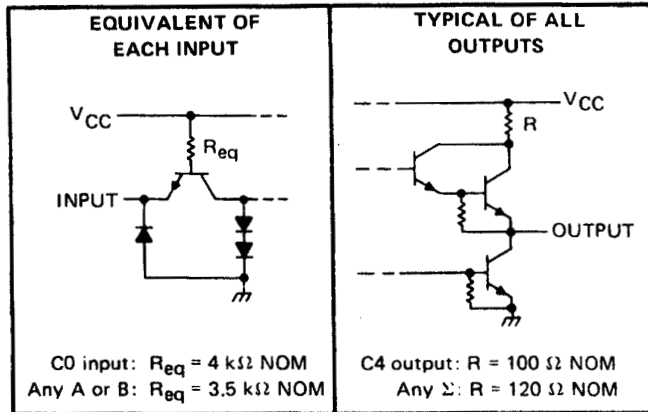
Pin numbers shown are for D, J, N, and W packages.

logic diagram (positive logic)

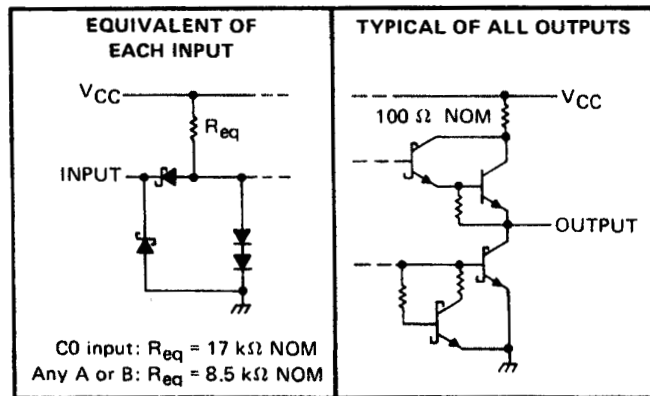


Pin numbers shown are for D, J, N, and W packages.

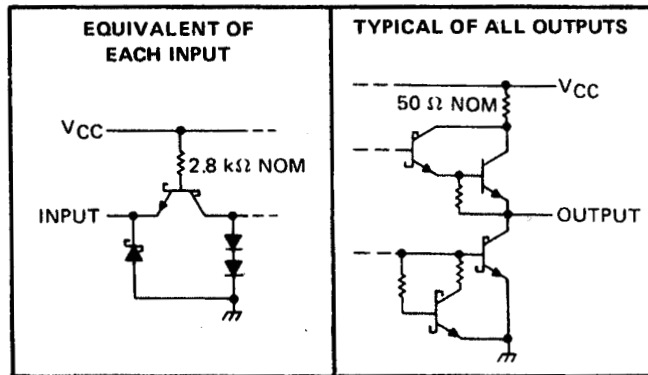
schematics of inputs and outputs '283



'LS283



'S283



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

Supply voltage, V_{CC} (see Note 1)	7V
Input voltage: '283, 'S283	5.5V
'LS283	7V
Interemitter voltage (see Note 2)	5.5V
Operating free-air temperature range: SN54283, SN54LS283, SN54S283	-55°C to 125°C
SN74283, SN74LS283, SN74S283	0°C to 70°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.

SN54283, SN74283

4-BIT BINARY FULL ADDERS WITH FAST CARRY

SDLS095A - OCTOBER 1976 - REVISED MARCH 1988

recommended operating conditions

		SN54283			SN74283			UNIT
		MIN	NOM	MAX	MIN	NOM	MAX	
Supply Voltage, V_{CC}		4.5	5	5.5	4.75	5	5.25	V
High-level output current, I_{OH}	Any output except C4	-800			-800			μ A
	Output C4	-400			-400			
Low-level output current, I_{OL}	Any output except C4	16			16			mA
	Output C4	8			8			
Operating free-air temperature, T_A		-55	125		0	70		$^{\circ}$ C

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

PARAMETER		TEST CONDITIONS [†]	SN54283			SN74283			UNIT
			MIN	TYP [‡]	MAX	MIN	TYP [‡]	MAX	
V_{IH}	High-level input voltage		2			2			V
V_{IL}	Low-level input voltage		0.8			0.8			V
V_{IK}	Input clamp voltage	$V_{CC} = \text{MIN}, I_I = -12 \text{ mA}$	-1.5			-1.5			V
V_{OH}	High-level output voltage	$V_{CC} = \text{MIN}, V_{IH} = 2 \text{ V}, V_{IL} = 0.8 \text{ V}, I_{OH} = \text{MAX}$	2.4	3.6		2.4	3.6		V
V_{OL}	Low-level output voltage	$V_{CC} = \text{MIN}, V_{IH} = 2 \text{ V}, V_{IL} = 0.8 \text{ V}, I_{OL} = \text{MAX}$		0.2	0.4		0.2	0.4	V
I_I	Input current at maximum input voltage	$V_{CC} = \text{MAX}, V_I = 5.5 \text{ V}$	1			1			mA
I_{IH}	High-level input current	$V_{CC} = \text{MAX}, V_I = 2.4 \text{ V}$	40			40			μ A
I_{IL}	Low-level input current	$V_{CC} = \text{MAX}, V_I = 0.4 \text{ V}$	-1.6			-1.6			mA
I_{OS}	Short-circuit output current \S	Any output except C4	-20			-18			mA
		Output C4	-20			-18			
I_{CC}	Supply current	$V_{CC} = \text{MAX},$ Outputs open	All B low, other inputs at 4.5 V		56		56		mA
			All inputs at 4.5 V		66	99	66	110	

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

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

\S Only one output should be shorted at a time.

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}	C0	Any Σ	$C_L = 15 \text{ pF}, R_L = 400 \Omega,$ See Note 3	14	21	ns	
t_{PHL}				12	21		
t_{PLH}	A_i or B_i	Σ_i		16	24	ns	
t_{PHL}				16	24		
t_{PLH}	C0	C4	$C_L = 15 \text{ pF}, R_L = 780 \Omega,$ See Note 3	9	14	ns	
t_{PHL}				11	16		
t_{PLH}	A_i or B_i	C4		9	14	ns	
t_{PHL}				11	16		

[¶] 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.



SN54LS283, SN74LS283

4-BIT BINARY FULL ADDERS WITH FAST CARRY

SDLS095A – OCTOBER 1976 – REVISED MARCH 1988

recommended operating conditions

	SN54LS283			SN74LS283			UNIT
	MIN	NOM	MAX	MIN	NOM	MAX	
Supply voltage, V_{CC}	4.5	5	5.5	4.75	5	5.25	V
High-level output current, I_{OH}			-400			-400	μ A
Low-level output current, I_{OL}			4			8	mA
Operating free-air temperature, T_A	-55		125	0		70	$^{\circ}$ C

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

PARAMETER		TEST CONDITIONS [†]	SN54LS283		SN74LS283		UNIT	
			MIN	TYP [‡]	MAX	MIN		TYP [‡]
V_{IH}	High-level input voltage		2		2		V	
V_{IL}	Low-level input voltage			0.7		0.8	V	
V_{IK}	Input clamp voltage	$V_{CC} = \text{MIN}, I_I = -18 \text{ mA}$		-1.5		-1.5	V	
V_{OH}	High-level output voltage	$V_{CC} = \text{MIN}, V_{IH} = 2 \text{ V}, V_{IL} = V_{IL \text{ max}}, I_{OH} = -400 \mu\text{A}$	2.5	3.4	2.7	3.4	V	
V_{OL}	Low-level output voltage	$V_{CC} = \text{MIN}, V_{IH} = 2 \text{ V}, V_{IL} = V_{IL \text{ max}}$	$I_{OL} = 4 \text{ mA}$	0.25	0.4	0.25	0.4	V
			$I_{OL} = 8 \text{ mA}$			0.35	0.5	
I_I	Input current at maximum input voltage	Any A or B	$V_{CC} = \text{MAX}, V_I = 7 \text{ V}$				0.2	0.2
		C0						
I_{IH}	High-level input current	Any A or B	$V_{CC} = \text{MAX}, V_I = 2.7 \text{ V}$				40	40
		C0						
I_{IL}	Low-level input current	Any A or B	$V_{CC} = \text{MAX}, V_I = 0.4 \text{ V}$				-0.8	-0.8
		C0						
I_{OS}	Short-circuit output current [§]	$V_{CC} = \text{MAX}$	-20	-100	-20	-100	mA	
I_{CC}	Supply current	$V_{CC} = \text{MAX},$ Outputs open	All inputs grounded	22	39	22	39	mA
			All B low, other inputs at 4.5 V	19	34	19	34	
			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.

[‡]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.

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}	C0	Any Σ	$C_L = 15 \text{ pF},$ See Note 3	$R_L = 2 \text{ k}\Omega,$	16	24	ns	
t_{PHL}					15	24		
t_{PLH}	A_i or B_i	Σ_i			15	24	ns	
t_{PHL}					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.



SN54S283, SN74S283 4-BIT BINARY FULL ADDERS WITH FAST CARRY

SDLS095A - OCTOBER 1976 - REVISED MARCH 1988

recommended operating conditions

		SN54S283			SN74S283			UNIT	
		MIN	NOM	MAX	MIN	NOM	MAX		
Supply voltage, V_{CC}		4.5	5	5.5	4.75	5	5.25	V	
High-level output current, I_{OH}	Any output except C4	-1			-1			mA	
	Output C4	-500			-500			μ A	
Low-level output current, I_{OL}	Any output except C4	20			20			mA	
	Output C4	10			10				
Operating free-air temperature, T_A		-55			0			70	$^{\circ}$ C

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

PARAMETER		TEST CONDITIONS [†]	MIN	TYP [‡]	MAX	UNIT	
V_{IH}	High-level input voltage		2			V	
V_{IL}	Low-level input voltage				0.8	V	
V_{IK}	Input clamp voltage	$V_{CC} = \text{MIN}$, $I_I = -18 \text{ mA}$			-1.2	V	
V_{OH}	High-level output voltage	SN54S283 $V_{CC} = \text{MIN}$, $V_{IH} = 2 \text{ V}$,	2.5	3.4		V	
		SN74S283 $V_{IL} = 0.8 \text{ V}$, $I_{OH} = \text{MAX}$	2.7	3.4			
V_{OL}	Low-level output voltage	$V_{CC} = \text{MIN}$, $V_{IH} = 2 \text{ V}$, $V_{IL} = 0.8 \text{ V}$, $I_{OL} = \text{MAX}$			0.5	V	
I_I	Input current at maximum input voltage	$V_{CC} = \text{MAX}$, $V_I = 5.5 \text{ V}$			1	mA	
I_{IH}	High-level input current	$V_{CC} = \text{MAX}$, $V_I = 2.7 \text{ V}$			50	μ A	
I_{IL}	Low-level input current	$V_{CC} = \text{MAX}$, $V_I = 0.5 \text{ V}$			-2	mA	
I_{OS}	Short-circuit output current [§]	Any output except C4 Output C4	$V_{CC} = \text{MAX}$		-40	-100	mA
					-20	-100	
I_{CC}	Supply current	$V_{CC} = \text{MAX}$, Outputs open	All B low, other inputs at 4.5 V		80		mA
			All inputs at 4.5 V		95	160	

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

[‡]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.

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}	C0	Any Σ	$C_L = 15 \text{ pF}$, $R_L = 280 \Omega$, See Note 3		11	18	ns
t_{PHL}					12	18	
t_{PLH}	A_i or B_i	Σ_i			12	18	ns
t_{PHL}					11.5	18	
t_{PLH}	C0	C4	$C_L = 15 \text{ pF}$, $R_L = 560 \Omega$, See Note 3		6	11	ns
t_{PHL}					7.5	11	
t_{PLH}	A_i or B_i	C4			7.5	12	ns
t_{PHL}					8.5	12	

[†] 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.



PACKAGING INFORMATION

Orderable part number	Status (1)	Material type (2)	Package Pins	Package qty Carrier	RoHS (3)	Lead finish/ Ball material (4)	MSL rating/ Peak reflow (5)	Op temp (°C)	Part marking (6)
5962-7604301VEA	Active	Production	CDIP (J) 16	25 TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	5962-7604301VE A SNV54LS283J
5962-7604301VEA.A	Active	Production	CDIP (J) 16	25 TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	5962-7604301VE A SNV54LS283J
76043012A	Active	Production	LCCC (FK) 20	55 TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	76043012A SNJ54LS 283FK
7604301EA	Active	Production	CDIP (J) 16	25 TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	7604301EA SNJ54LS283J
7604301FA	Active	Production	CFP (W) 16	25 TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	7604301FA SNJ54LS283W
JM38510/31202BEA	Active	Production	CDIP (J) 16	25 TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	JM38510/ 31202BEA
JM38510/31202BEA.A	Active	Production	CDIP (J) 16	25 TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	JM38510/ 31202BEA
JM38510/31202BFA	Active	Production	CFP (W) 16	25 TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	JM38510/ 31202BFA
JM38510/31202BFA.A	Active	Production	CFP (W) 16	25 TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	JM38510/ 31202BFA
M38510/31202BEA	Active	Production	CDIP (J) 16	25 TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	JM38510/ 31202BEA
M38510/31202BFA	Active	Production	CFP (W) 16	25 TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	JM38510/ 31202BFA
SN54LS283J	Active	Production	CDIP (J) 16	25 TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	SN54LS283J
SN54LS283J.A	Active	Production	CDIP (J) 16	25 TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	SN54LS283J
SN54S283J	Active	Production	CDIP (J) 16	25 TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	SN54S283J
SN54S283J.A	Active	Production	CDIP (J) 16	25 TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	SN54S283J
SN74LS283D	Active	Production	SOIC (D) 16	40 TUBE	Yes	NIPDAU	Level-1-260C-UNLIM	0 to 70	LS283
SN74LS283D.A	Active	Production	SOIC (D) 16	40 TUBE	Yes	NIPDAU	Level-1-260C-UNLIM	0 to 70	LS283
SN74LS283N	Active	Production	PDIP (N) 16	25 TUBE	Yes	NIPDAU	N/A for Pkg Type	0 to 70	SN74LS283N
SN74LS283N.A	Active	Production	PDIP (N) 16	25 TUBE	Yes	NIPDAU	N/A for Pkg Type	0 to 70	SN74LS283N

Orderable part number	Status (1)	Material type (2)	Package Pins	Package qty Carrier	RoHS (3)	Lead finish/ Ball material (4)	MSL rating/ Peak reflow (5)	Op temp (°C)	Part marking (6)
SN74LS283NE4	Active	Production	PDIP (N) 16	25 TUBE	Yes	NIPDAU	N/A for Pkg Type	0 to 70	SN74LS283N
SN74LS283NSR	Active	Production	SOP (NS) 16	2000 LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	0 to 70	74LS283
SN74LS283NSR.A	Active	Production	SOP (NS) 16	2000 LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	0 to 70	74LS283
SN74S283N	Active	Production	PDIP (N) 16	25 TUBE	Yes	NIPDAU	N/A for Pkg Type	0 to 70	SN74S283N
SN74S283N.A	Active	Production	PDIP (N) 16	25 TUBE	Yes	NIPDAU	N/A for Pkg Type	0 to 70	SN74S283N
SNJ54LS283FK	Active	Production	LCCC (FK) 20	55 TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	76043012A SNJ54LS 283FK
SNJ54LS283FK.A	Active	Production	LCCC (FK) 20	55 TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	76043012A SNJ54LS 283FK
SNJ54LS283J	Active	Production	CDIP (J) 16	25 TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	7604301EA SNJ54LS283J
SNJ54LS283J.A	Active	Production	CDIP (J) 16	25 TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	7604301EA SNJ54LS283J
SNJ54LS283W	Active	Production	CFP (W) 16	25 TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	7604301FA SNJ54LS283W
SNJ54LS283W.A	Active	Production	CFP (W) 16	25 TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	7604301FA SNJ54LS283W
SNJ54S283J	Active	Production	CDIP (J) 16	25 TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	SNJ54S283J
SNJ54S283J.A	Active	Production	CDIP (J) 16	25 TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	SNJ54S283J

(1) **Status:** For more details on status, see our [product life cycle](#).

(2) **Material type:** When designated, preproduction parts are prototypes/experimental devices, and are not yet approved or released for full production. Testing and final process, including without limitation quality assurance, reliability performance testing, and/or process qualification, may not yet be complete, and this item is subject to further changes or possible discontinuation. If available for ordering, purchases will be subject to an additional waiver at checkout, and are intended for early internal evaluation purposes only. These items are sold without warranties of any kind.

(3) **RoHS values:** Yes, No, RoHS Exempt. See the [TI RoHS Statement](#) for additional information and value definition.

(4) **Lead finish/Ball material:** Parts 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.

(5) **MSL rating/Peak reflow:** The moisture sensitivity level ratings and peak solder (reflow) temperatures. In the event that a part has multiple moisture sensitivity ratings, only the lowest level per JEDEC standards is shown. Refer to the shipping label for the actual reflow temperature that will be used to mount the part to the printed circuit board.

(6) **Part marking:** There may be an additional marking, which relates to the logo, the lot trace code information, or the environmental category of the part.

Multiple part markings will be inside parentheses. Only one part marking contained in parentheses and separated by a "~" will appear on a part. If a line is indented then it is a continuation of the previous line and the two combined represent the entire part marking for that device.

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.

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

TAPE AND REEL INFORMATION

QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE


*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Reel Diameter (mm)	Reel Width W1 (mm)	A0 (mm)	B0 (mm)	K0 (mm)	P1 (mm)	W (mm)	Pin1 Quadrant
SN74LS283NSR	SOP	NS	16	2000	330.0	16.4	8.1	10.4	2.5	12.0	16.0	Q1

TAPE AND REEL BOX DIMENSIONS


*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
SN74LS283NSR	SOP	NS	16	2000	353.0	353.0	32.0

TUBE


*All dimensions are nominal

Device	Package Name	Package Type	Pins	SPQ	L (mm)	W (mm)	T (μm)	B (mm)
76043012A	FK	LCCC	20	55	506.98	12.06	2030	NA
7604301FA	W	CFP	16	25	506.98	26.16	6220	NA
JM38510/31202BFA	W	CFP	16	25	506.98	26.16	6220	NA
JM38510/31202BFA.A	W	CFP	16	25	506.98	26.16	6220	NA
M38510/31202BFA	W	CFP	16	25	506.98	26.16	6220	NA
SN74LS283D	D	SOIC	16	40	507	8	3940	4.32
SN74LS283D.A	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
SN74LS283N.A	N	PDIP	16	25	506	13.97	11230	4.32
SN74LS283N.A	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
SN74S283N.A	N	PDIP	16	25	506	13.97	11230	4.32
SN74S283N.A	N	PDIP	16	25	506	13.97	11230	4.32
SNJ54LS283FK	FK	LCCC	20	55	506.98	12.06	2030	NA
SNJ54LS283FK.A	FK	LCCC	20	55	506.98	12.06	2030	NA
SNJ54LS283W	W	CFP	16	25	506.98	26.16	6220	NA
SNJ54LS283W.A	W	CFP	16	25	506.98	26.16	6220	NA

IMPORTANT NOTICE AND DISCLAIMER

TI PROVIDES TECHNICAL AND RELIABILITY DATA (INCLUDING DATASHEETS), DESIGN RESOURCES (INCLUDING REFERENCE DESIGNS), APPLICATION OR OTHER DESIGN ADVICE, WEB TOOLS, SAFETY INFORMATION, AND OTHER RESOURCES "AS IS" AND WITH ALL FAULTS, AND DISCLAIMS ALL WARRANTIES, EXPRESS AND IMPLIED, INCLUDING WITHOUT LIMITATION ANY IMPLIED WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE OR NON-INFRINGEMENT OF THIRD PARTY INTELLECTUAL PROPERTY RIGHTS.

These resources are intended for skilled developers designing with TI products. You are solely responsible for (1) selecting the appropriate TI products for your application, (2) designing, validating and testing your application, and (3) ensuring your application meets applicable standards, and any other safety, security, regulatory or other requirements.

These resources are subject to change without notice. TI grants you permission to use these resources only for development of an application that uses the TI products described in the resource. Other reproduction and display of these resources is prohibited. No license is granted to any other TI intellectual property right or to any third party intellectual property right. TI disclaims responsibility for, and you fully indemnify TI and its representatives against any claims, damages, costs, losses, and liabilities arising out of your use of these resources.

TI's products are provided subject to [TI's Terms of Sale](#), [TI's General Quality Guidelines](#), or other applicable terms available either on ti.com or provided in conjunction with such TI products. TI's provision of these resources does not expand or otherwise alter TI's applicable warranties or warranty disclaimers for TI products. Unless TI explicitly designates a product as custom or customer-specified, TI products are standard, catalog, general purpose devices.

TI objects to and rejects any additional or different terms you may propose.

Copyright © 2025, Texas Instruments Incorporated

Last updated 10/2025