

SN54ALS323, SN74ALS323
8-BIT UNIVERSAL SHIFT/STORAGE REGISTERS
WITH SYNCHRONOUS CLEAR AND 3-STATE OUTPUTS

SDAS267A – DECEMBER 1982 – REVISED DECEMBER 1994

- Multiplexed I/O Ports Provide Improved Bit Density
- Four Modes of Operation:
 - Hold (Store)
 - Shift Right
 - Shift Left
 - Load Data
- Operate With Outputs Enabled or at High Impedance
- 3-State Outputs Drive Bus Lines Directly
- Can Be Cascaded for n-Bit Word Lengths
- Synchronous Clear
- Applications:
 - Stacked or Push-Down Registers
 - Buffer Storage
 - Accumulator Registers
- Package Options Include Plastic Small-Outline (DW) Packages, Ceramic Chip Carriers (FK), and Standard Plastic (N) and Ceramic (J) 300-mil DIPs

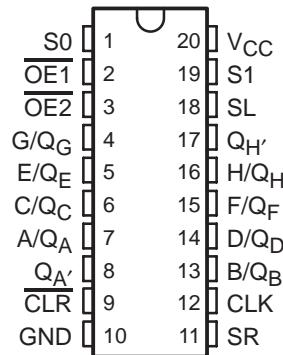
description

These 8-bit universal shift/storage registers feature multiplexed input/output (I/O) ports to achieve full 8-bit data handling in a 20-pin package. Two function-select (S0, S1) inputs and two output-enable (\overline{OE}_1 , \overline{OE}_2) inputs can be used to choose the modes of operation listed in the function table.

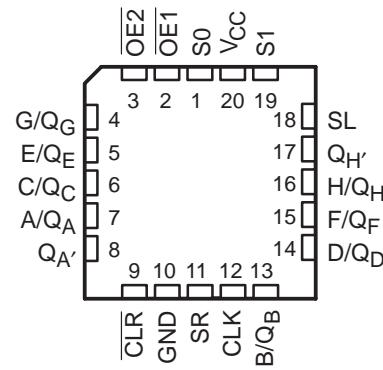
Synchronous parallel loading is accomplished by taking both S0 and S1 high. This places the 3-state outputs in the high-impedance state and permits data applied on the I/O ports to be clocked into the register. Reading out of the register can be accomplished while the outputs are enabled in any mode. Clearing occurs synchronously when the clear (CLR) input is low. Taking either \overline{OE}_1 or \overline{OE}_2 high disables the outputs but has no effect on clearing, shifting, or storing data.

The SN54ALS323 is characterized for operation over the full military temperature range of -55°C to 125°C . The SN74ALS323 is characterized for operation from 0°C to 70°C .

SN54ALS323 . . . J PACKAGE
SN74ALS323 . . . DW OR N PACKAGE
(TOP VIEW)



SN54ALS323 . . . FK PACKAGE
(TOP VIEW)



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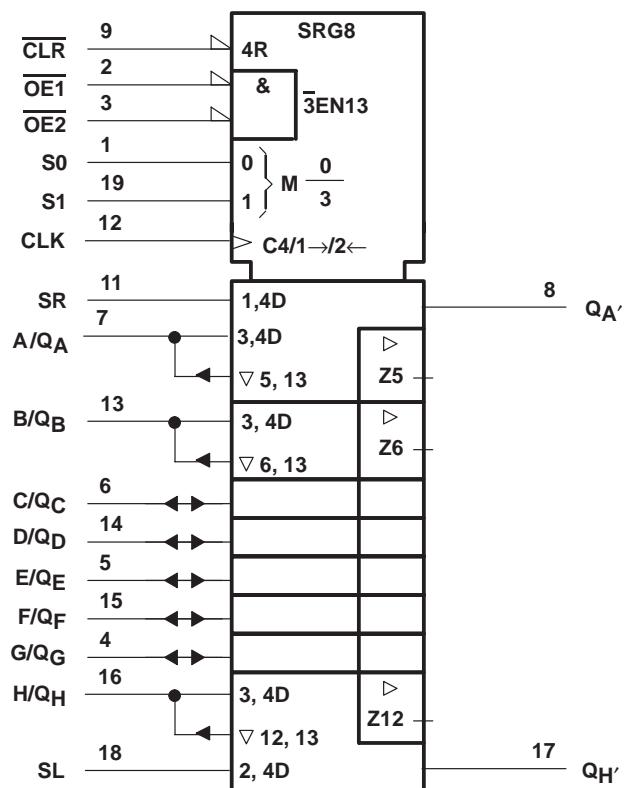
FUNCTION TABLE

MODE	INPUTS							I/O PORTS								OUTPUTS		
	CLR	S1	S0	OE1†	OE2†	CLK	SL	SR	A/Q _A	B/Q _B	C/Q _C	D/Q _D	E/Q _E	F/Q _F	G/Q _G	H/Q _H	Q _{A'}	Q _{H'}
Clear	L	X	L	L	L	↑	X	X	L	L	L	L	L	L	L	L	L	L
	L	L	X	L	L	↑	X	X	L	L	L	L	L	L	L	L	L	L
	L	H	H	X	X	↑	X	X	X	X	X	X	X	X	X	X	L	L
Hold	H	L	L	L	L	X	X	X	QA0	QB0	QC0	QD0	QE0	QF0	QG0	QH0	QA0	QH0
	H	X	X	L	L	L	X	X	QA0	QB0	QC0	QD0	QE0	QF0	QG0	QH0	QA0	QH0
Shift Right	H	L	H	L	L	↑	X	H	H	Q _{An}	Q _{Bn}	Q _{Cn}	Q _{Dn}	Q _{En}	Q _{Fn}	Q _{Gn}	H	Q _{Gn}
	H	L	H	L	L	↑	X	L	L	Q _{An}	Q _{Bn}	Q _{Cn}	Q _{Dn}	Q _{En}	Q _{Fn}	Q _{Gn}	L	Q _{Gn}
Shift Left	H	H	L	L	L	↑	H	X	QBn	QCn	QDn	QEn	QFn	QGn	QHn	H	QBn	H
	H	H	L	L	L	↑	L	X	QBn	QCn	QDn	QEn	QFn	QGn	QHn	L	QBn	L
Load	H	H	H	X	X	↑	X	X	a	b	c	d	e	f	g	h	a	h

NOTE: a . . . h = the level of the steady-state input at inputs A through H, respectively. This data is loaded into the flip-flops while the flip-flop outputs are isolated from the I/O terminals.

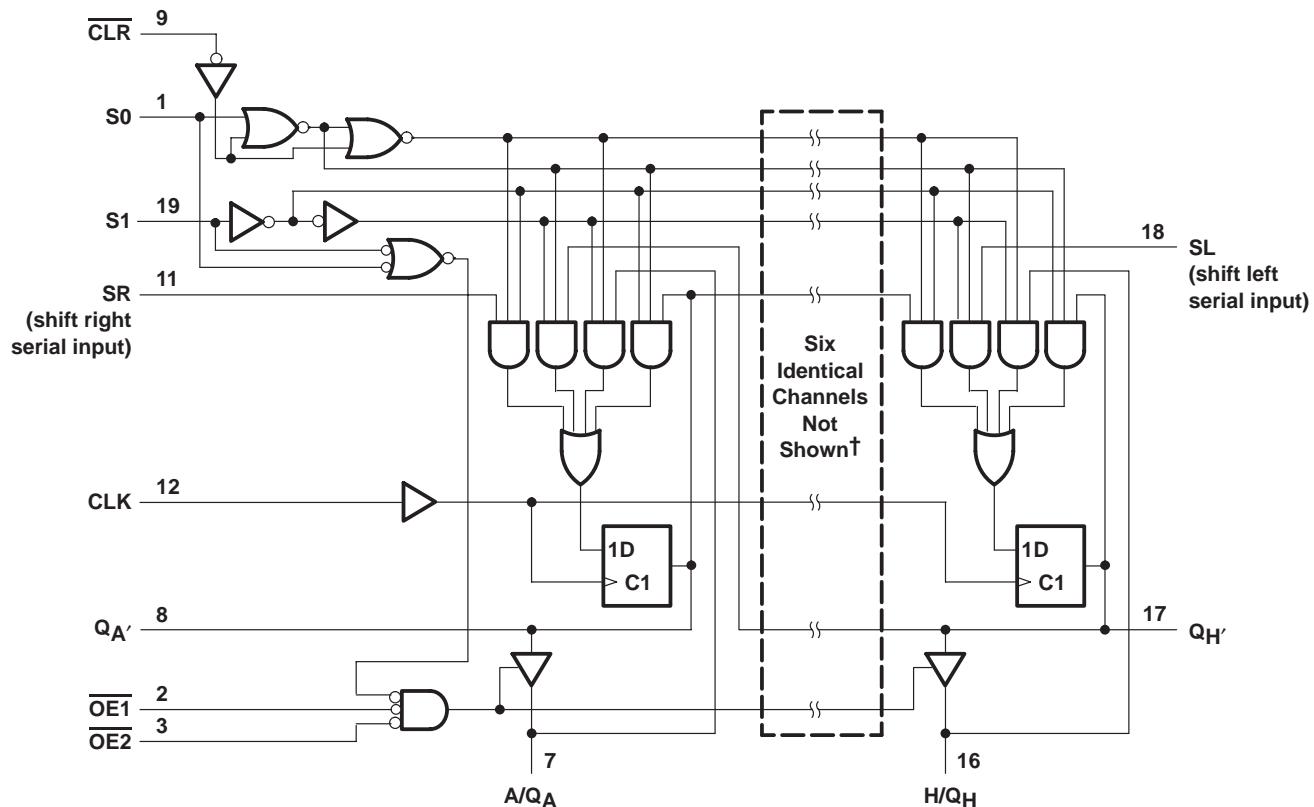
† When one or both output-enable inputs are high, the eight I/O terminals are disabled to the high-impedance state; however, sequential operation or clearing of the register is not affected.

logic symbol‡



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

logic diagram (positive logic)



† I/O ports not shown: B/Q_B (13), C/Q_C (6), D/Q_D (14), E/Q_E (5), F/Q_F (15), and G/Q_G (4).

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

Supply voltage, V _{CC}	7 V
Input voltage, V _I : All inputs	7 V
I/O ports	5.5 V
Operating free-air temperature range, T _A : SN54ALS323	-55°C to 125°C
SN74ALS323	0°C to 70°C
Storage temperature range	-65°C to 150°C

‡ Stresses beyond those listed under "absolute maximum ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated under "recommended operating conditions" is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.

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recommended operating conditions

				SN54ALS323			SN74ALS323			UNIT
				MIN	NOM	MAX	MIN	NOM	MAX	
V _{CC}	Supply voltage			4.5	5	5.5	4.5	5	5.5	V
V _{IH}	High-level input voltage			2			2			V
V _{IL}	Low-level input voltage					0.7			0.8	V
I _{OH}	High-level output current	Q _{A'} or Q _{H'}				-0.4			-0.4	mA
		Q _A thru Q _H				-1			-2.6	
I _{OL}	Low-level output current	Q _{A'} or Q _{H'}				4			8	mA
		Q _A thru Q _H				12			24	
T _A	Operating free-air temperature			-55		125	0		70	°C

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

PARAMETER	TEST CONDITIONS			SN54ALS323			SN74ALS323			UNIT
				MIN	TYP†	MAX	MIN	TYP†	MAX	
V _{IK}	V _{CC} = 4.5 V, I _I = -18 mA					-1.5			-1.5	V
V _{OH}	Any output	V _{CC} = 4.5 V to 5.5 V, I _{OH} = -0.4 mA		V _{CC} - 2			V _{CC} - 2			V
	Q _A thru Q _H	V _{CC} = 4.5 V	I _{OH} = -1 mA	2.4	3.3					
			I _{OH} = -2.6 mA				2.4	3.2		
V _{OL}	Q _{A'} or Q _{H'}	V _{CC} = 4.5 V	I _{OL} = 4 mA	0.25	0.4	0.25	0.4			V
	I _{OL} = 8 mA				0.35	0.5				
	Q _A thru Q _H	V _{CC} = 4.5 V	I _{OL} = 12 mA	0.25	0.4	0.25	0.4			
			I _{OL} = 24 mA			0.35	0.5			
I _I	A thru H	V _{CC} = 5.5 V	V _I = 5.5 V		0.1		0.1			mA
	Any others		V _I = 7 V		0.1		0.1			
I _{IH} ‡	V _{CC} = 5.5 V, V _I = 2.7 V				20		20			µA
I _{IL} ‡	S0, S1, SR, SL	V _{CC} = 5.5 V, V _I = 0.4 V		-0.2		-0.2				mA
	Any others			-0.1		-0.1				
I _{OS} §	Q _{A'} or Q _{H'}	V _{CC} = 5.5 V, V _O = 2.25 V		-15	-70	-15	-70			mA
	Q _A thru Q _H			-20	-112	-30	-112			
I _{CC}	V _{CC} = 5.5 V	Outputs high		15	28	15	28			mA
		Outputs low		22	38	22	38			
		Outputs disabled		23	40	23	40			

† All typical values are at V_{CC} = 5 V, T_A = 25°C.

‡ For I/O ports (Q_A thru Q_H), the parameters I_{IH} and I_{IL} include the off-state output current.

§ The output conditions have been chosen to produce a current that closely approximates one half of the true short-circuit output current, I_{OS}.

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timing requirements over recommended ranges of supply voltage and operating free-air temperature (unless otherwise noted)

				SN54ALS323	SN74ALS323	UNIT
		MIN	MAX	MIN	MAX	
f_{clock}		Clock frequency (at 50% duty cycle)		0	17	MHz
t_w		Pulse duration		22	16.5	ns
t_{su}	Setup time before CLK^\uparrow	S0 or S1		25	20	ns
		Serial or parallel data	High	18	16	
			Low	15	6	
		CLR active		25	20	
t_h		Inactive-state setup time before $CLK^{\uparrow\ddagger}$		CLR	18	16
t_h	Hold time after CLK^\uparrow	S0 or S1		0	0	ns
		Serial or parallel data		0	0	

[†] Inactive-state setup time is also referred to as recovery time.

switching characteristics (see Figure 1)

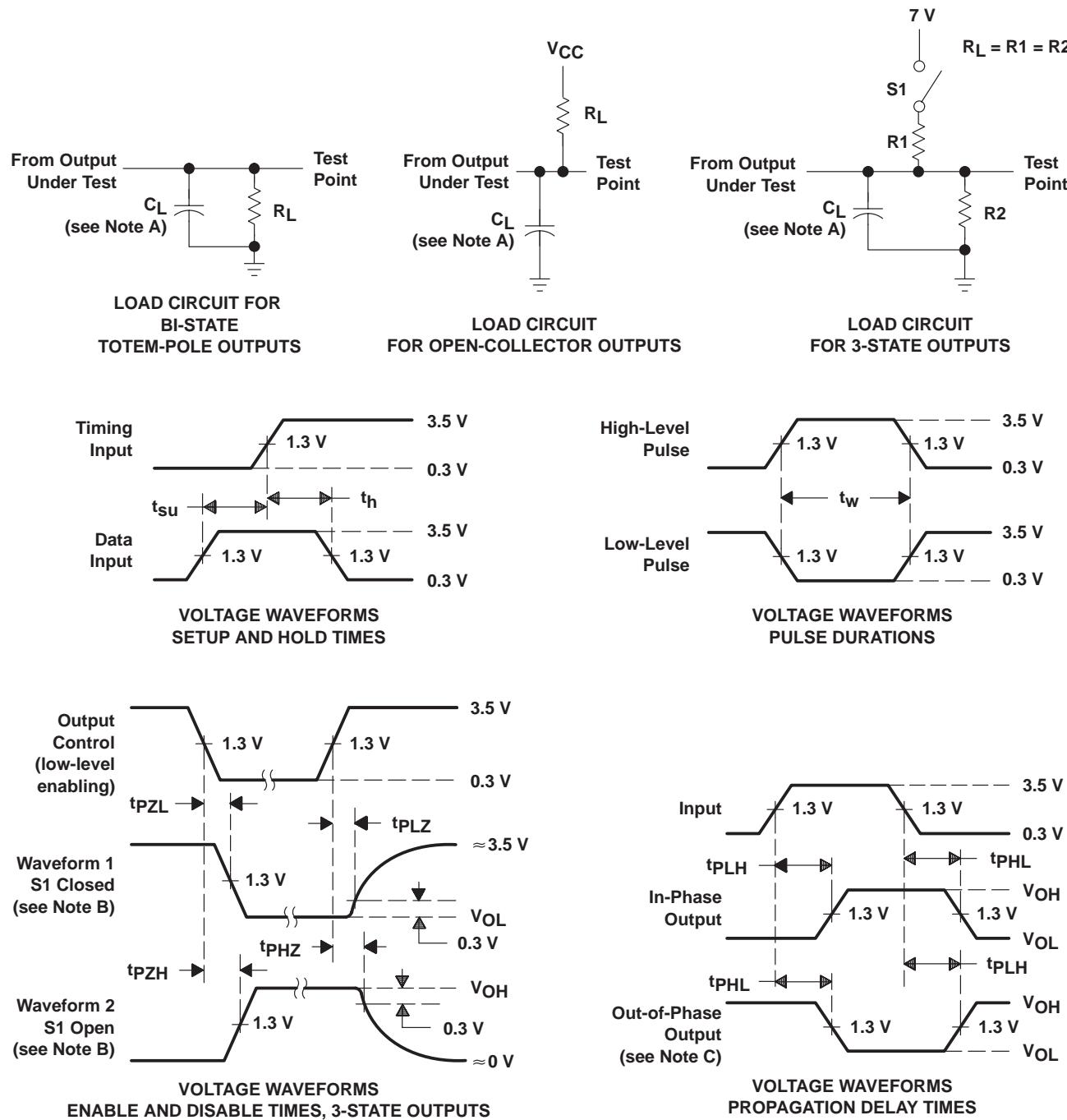
PARAMETER	FROM (INPUT)	TO (OUTPUT)	$V_{CC} = 4.5 \text{ V to } 5.5 \text{ V},$ $C_L = 50 \text{ pF},$ $R1 = 500 \Omega,$ $R2 = 500 \Omega,$ $T_A = \text{MIN to MAX}^\ddagger$		UNIT	
			SN54ALS323	SN74ALS323		
			MIN	MAX		
f_{max}			17	17	MHz	
t_{PLH}	CLK	QA thru QH	2	19	4	13
t_{PHL}			4	25	7	19
t_{PLH}	CLK	QA' or QH'	2	21	5	15
t_{PHL}			4	25	8	18
t_{PZH}	$\overline{OE1}, \overline{OE2}$	QA thru QH	5	22	6	16
t_{PZL}			6	27	8	22
t_{PZH}	S0, S1	QA thru QH	5	27	7	17
t_{PZL}			6	27	8	22
t_{PHZ}	$\overline{OE1}, \overline{OE2}$	QA thru QH	1	15	1	8
t_{PLZ}			4	38	5	15
t_{PHZ}	S0, S1	QA thru QH	1	16	1	12
t_{PLZ}			4	34	8	25

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

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**PARAMETER MEASUREMENT INFORMATION
SERIES 54ALS/74ALS AND 54AS/74AS DEVICES**



NOTES: A. C_L includes probe and jig capacitance.
 B. Waveform 1 is for an output with internal conditions such that the output is low except when disabled by the output control. Waveform 2 is for an output with internal conditions such that the output is high except when disabled by the output control.
 C. When measuring propagation delay items of 3-state outputs, switch S1 is open.
 D. All input pulses have the following characteristics: $PRR \leq 1 \text{ MHz}$, $t_r = t_f = 2 \text{ ns}$, duty cycle = 50%.
 E. The outputs are measured one at a time with one transition per measurement.

Figure 1. Load Circuits and Voltage Waveforms

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
8302102RA	ACTIVE	CDIP	J	20	1	Non-RoHS & Green	SNPB	N / A for Pkg Type	-55 to 125	8302102RA SNJ54ALS323J	Samples
8302102SA	ACTIVE	CFP	W	20	1	Non-RoHS & Green	SNPB	N / A for Pkg Type	-55 to 125	8302102SA SNJ54ALS323W	Samples
SN74ALS323N	ACTIVE	PDIP	N	20	20	RoHS & Non-Green	NIPDAU	N / A for Pkg Type	0 to 70	SN74ALS323N	Samples
SNJ54ALS323J	ACTIVE	CDIP	J	20	1	Non-RoHS & Green	SNPB	N / A for Pkg Type	-55 to 125	8302102RA SNJ54ALS323J	Samples
SNJ54ALS323W	ACTIVE	CFP	W	20	1	Non-RoHS & Green	SNPB	N / A for Pkg Type	-55 to 125	8302102SA SNJ54ALS323W	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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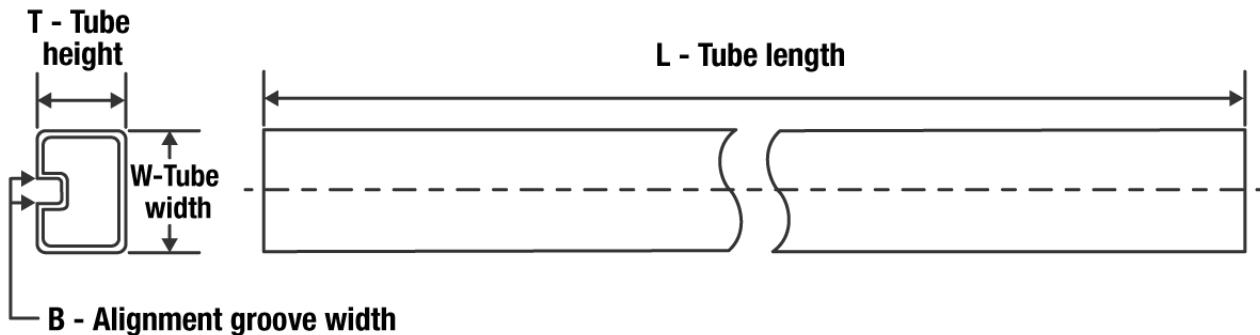
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OTHER QUALIFIED VERSIONS OF SN54ALS323, SN74ALS323 :

- Catalog: [SN74ALS323](#)
- Military: [SN54ALS323](#)

NOTE: Qualified Version Definitions:

- Catalog - TI's standard catalog product
- Military - QML certified for Military and Defense Applications

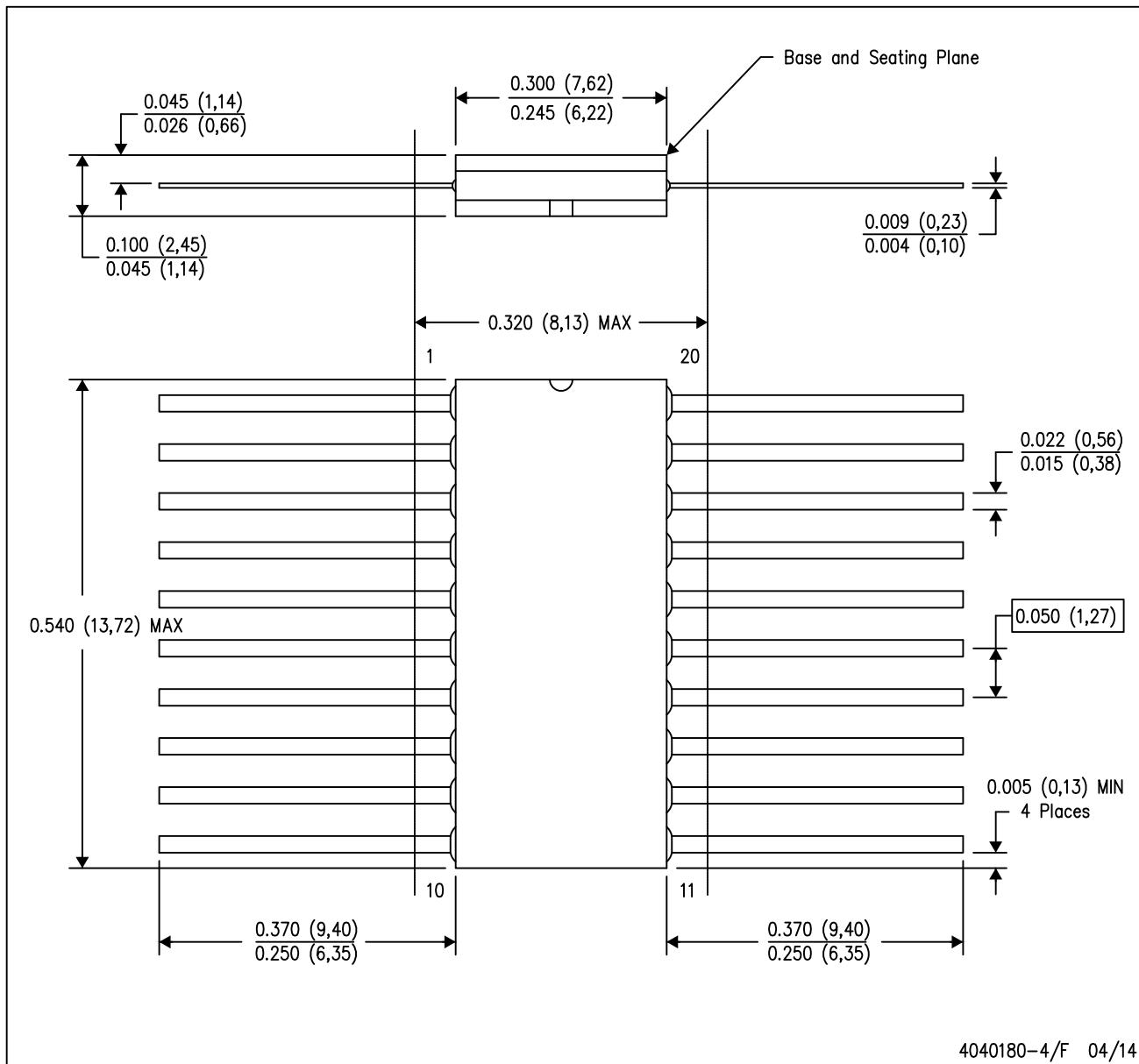
TUBE


*All dimensions are nominal

Device	Package Name	Package Type	Pins	SPQ	L (mm)	W (mm)	T (μ m)	B (mm)
SN74ALS323N	N	PDIP	20	20	506	13.97	11230	4.32

W (R-GDFP-F20)

CERAMIC DUAL FLATPACK



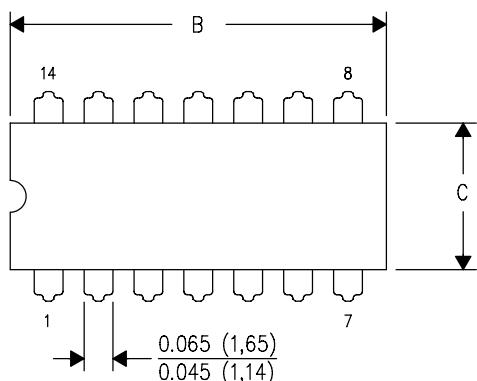
NOTES:

- A. All linear dimensions are in inches (millimeters).
- B. This drawing is subject to change without notice.
- C. This package can be hermetically sealed with a ceramic lid using glass frit.
- D. Index point is provided on cap for terminal identification only.
- E. Falls within Mil-Std 1835 GDFP2-F20

J (R-GDIP-T**)

14 LEADS SHOWN

CERAMIC DUAL IN-LINE PACKAGE



PINS ** DIM	14	16	18	20
A	0.300 (7,62) BSC	0.300 (7,62) BSC	0.300 (7,62) BSC	0.300 (7,62) BSC
B MAX	0.785 (19,94)	.840 (21,34)	0.960 (24,38)	1.060 (26,92)
B MIN	—	—	—	—
C MAX	0.300 (7,62)	0.300 (7,62)	0.310 (7,87)	0.300 (7,62)
C MIN	0.245 (6,22)	0.245 (6,22)	0.220 (5,59)	0.245 (6,22)



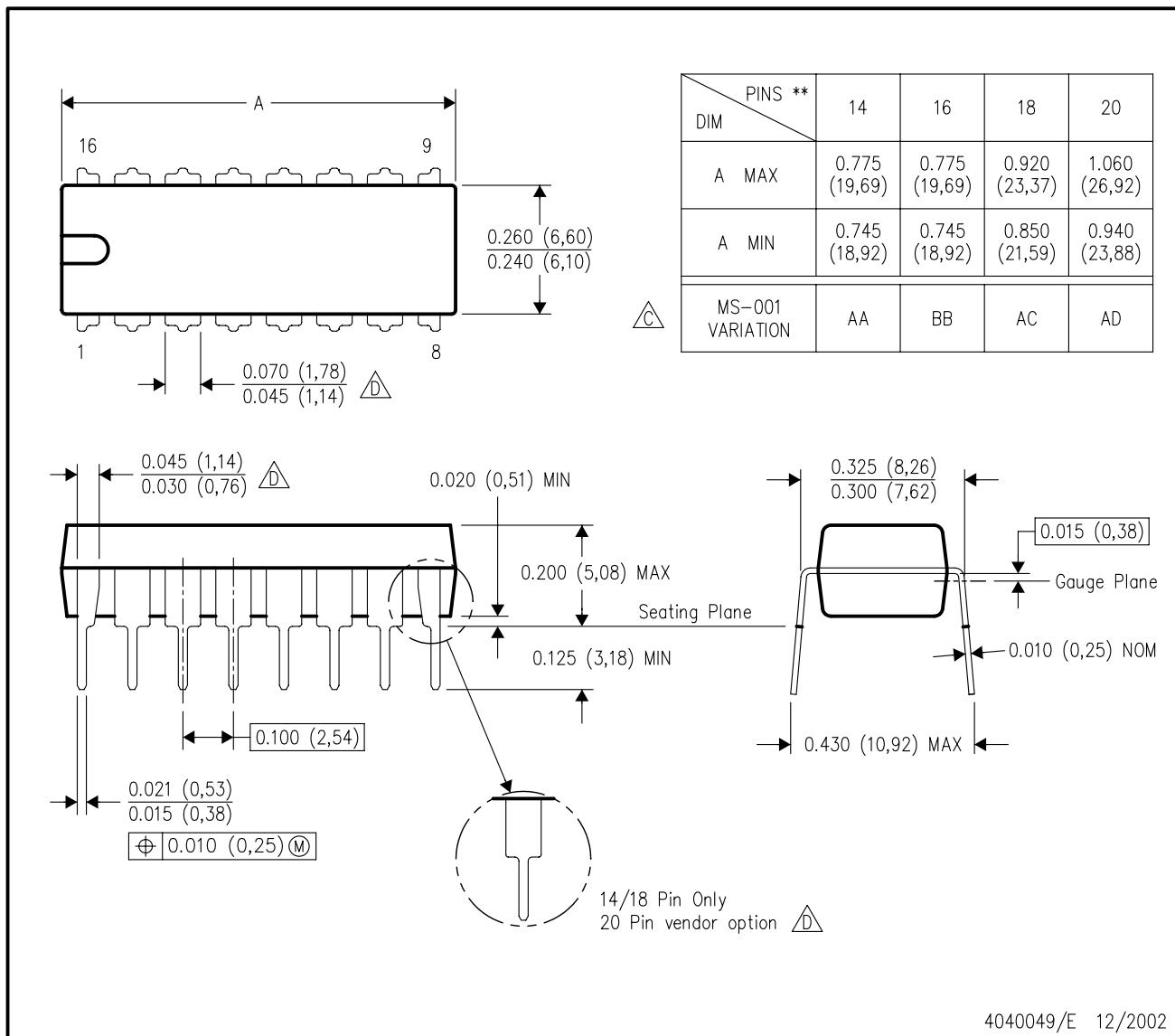
4040083/F 03/03

NOTES: A. All linear dimensions are in inches (millimeters).
B. This drawing is subject to change without notice.
C. This package is hermetically sealed with a ceramic lid using glass frit.
D. Index point is provided on cap for terminal identification only on press ceramic glass frit seal only.
E. Falls within MIL STD 1835 GDIP1-T14, GDIP1-T16, GDIP1-T18 and GDIP1-T20.

N (R-PDIP-T**)

16 PINS SHOWN

PLASTIC DUAL-IN-LINE PACKAGE



NOTES: A. All linear dimensions are in inches (millimeters).
 B. This drawing is subject to change without notice.

△ Falls within JEDEC MS-001, except 18 and 20 pin minimum body length (Dim A).

△ The 20 pin end lead shoulder width is a vendor option, either half or full width.

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