

# SN54LS595, SN54LS596, SN74LS595, SN74LS596 8-BIT SHIFT REGISTERS WITH OUTPUT LATCHES

SDLS006

D2634, JANUARY 1981 . REVISED MARCH 1988

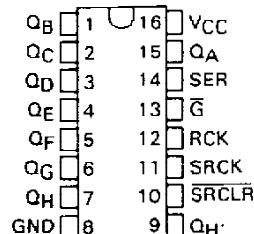
- 8-Bit Serial-In, Parallel-Out Shift Registers with Storage
- Choice of 3-State ('LS595) or Open-Collector ('LS596) Parallel Outputs
- Shift Register Has Direct Clear
- Accurate Shift Frequency:  
DC to 20 MHz

## description

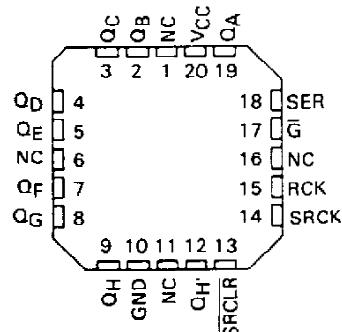
These devices each contain an 8-bit serial-in, parallel-out shift register that feeds an 8-bit D-type storage register. The storage register has parallel 3-state ('LS595) or open-collector ('LS596) outputs. Separate clocks are provided for both the shift register and the storage register. The shift register has a direct-overriding clear, serial input, and serial output pins for cascading.

Both the shift register and storage register clocks are positive-edge triggered. If the user wishes to connect both clocks together, the shift register state will always be one clock pulse ahead of the storage register.

SN54LS595, SN54LS596 . . . J OR W PACKAGE  
SN74LS595, SN74LS596 . . . N PACKAGE  
(TOP VIEW)

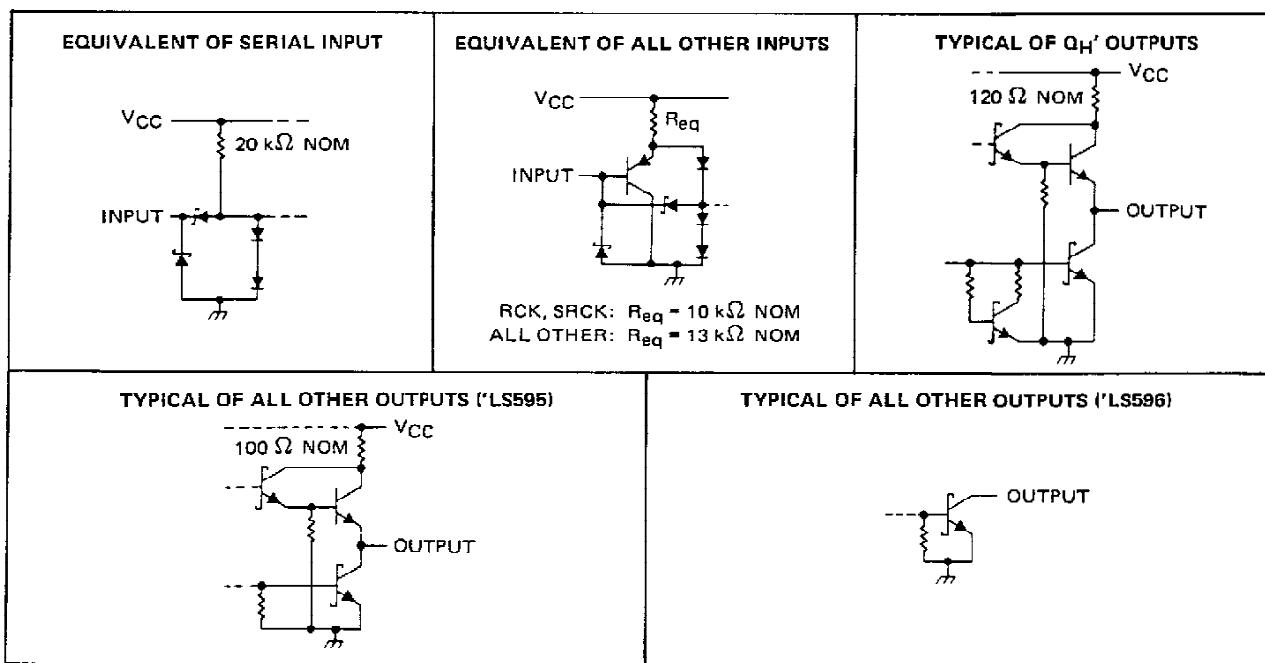


SN54LS595, SN54LS596 . . . FK PACKAGE  
(TOP VIEW)



NC - No internal connection

## schematics of inputs and outputs



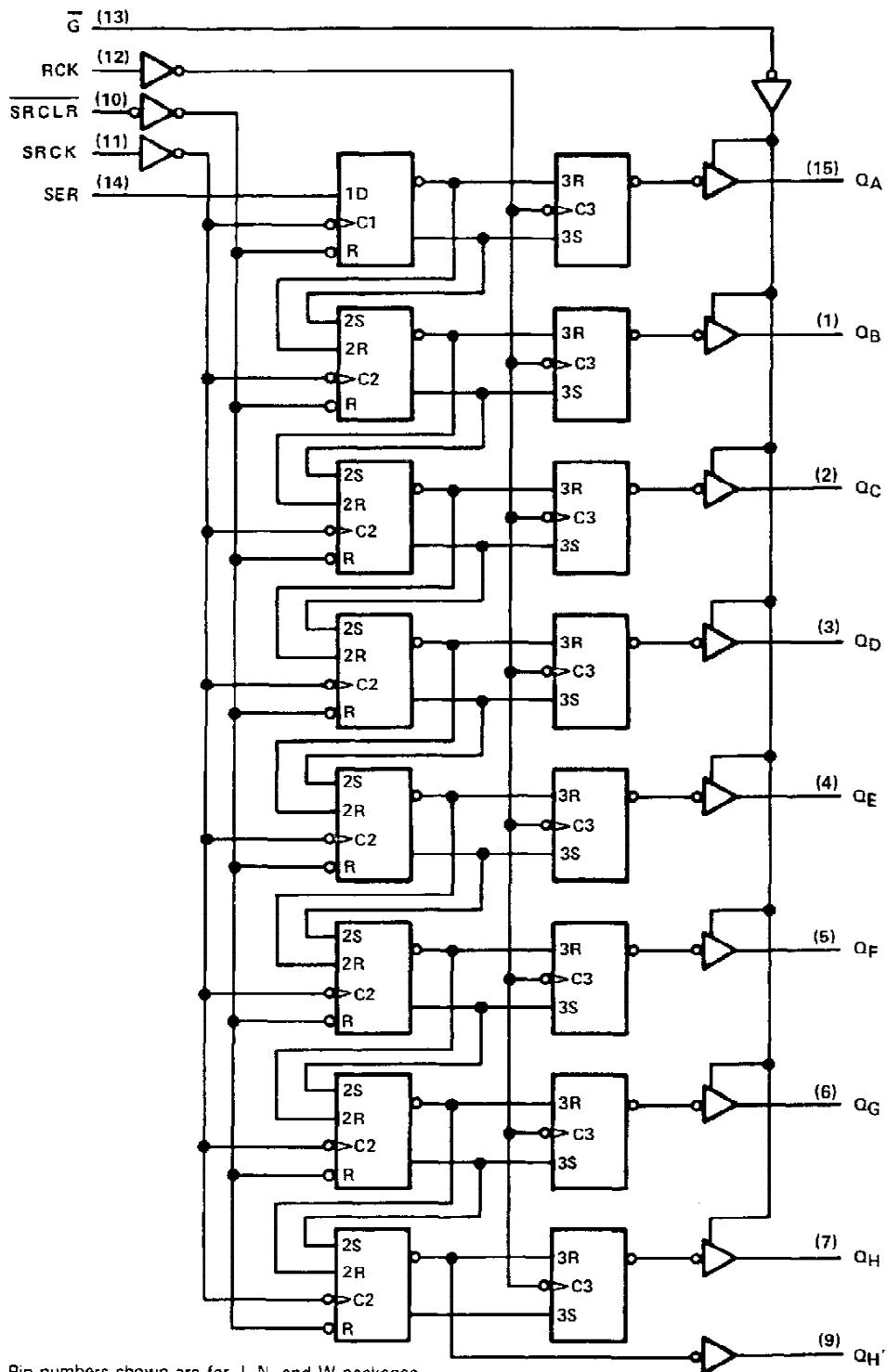
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TEXAS  
INSTRUMENTS

POST OFFICE BOX 656012 • DALLAS, TEXAS 75265

**SN54LS595, SN54LS596, SN74LS595, SN74LS596**  
8-BIT SHIFT REGISTERS WITH OUTPUT LATCHES

logic diagram (positive logic)



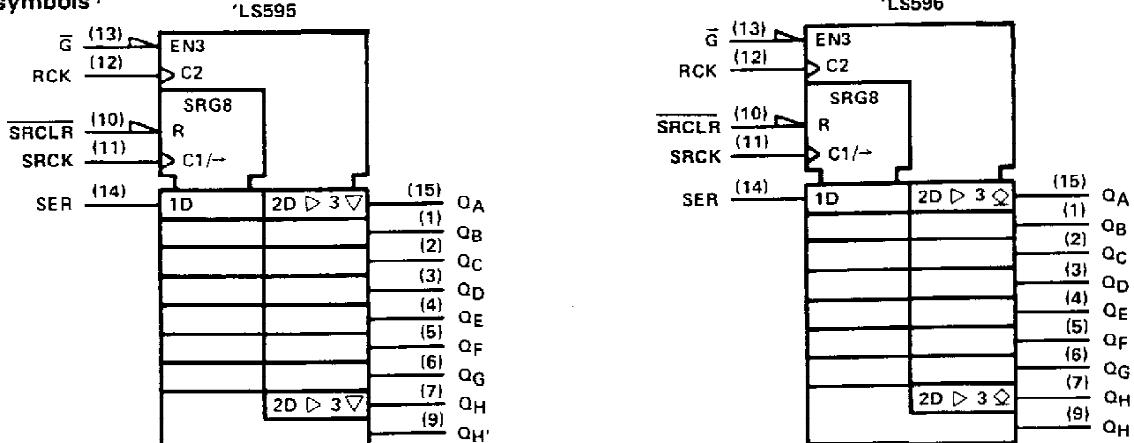
Pin numbers shown are for J, N, and W packages.

TEXAS  
INSTRUMENTS

POST OFFICE BOX 556012 • DALLAS, TEXAS 75265

# SN54LS595, SN54LS596, SN74LS595, SN74LS596 8-BIT SHIFT REGISTERS WITH OUTPUT LATCHES

**logic symbols<sup>†</sup>**



<sup>†</sup>These symbols are in accordance with ANSI/IEEE Std. 91-1984 and IEC Publication 617-12.  
Pin numbers shown are for J, N, and W packages.

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

Supply voltage, $V_{CC}$ (see Note 1)	.....	7 V
Input voltage	.....	7 V
Off-state output voltage	.....	5.5 V
Operating free-air temperature range: SN54LS595, SN54LS596	.....	-55°C to 125°C
SN74LS595, SN74LS596	.....	0°C to 70°C
Storage temperature range	.....	-65°C to 150°C

NOTE 1: Voltage values are with respect to the network ground terminal.

## recommended operating conditions

		SN54LS'			SN74LS'			UNIT
		MIN	NOM	MAX	MIN	NOM	MAX	
$V_{CC}$	Supply voltage	4.5	5	5.5	4.75	5	5.25	V
$V_{IH}$	High-level input voltage	2			2			V
$V_{IL}$	Low-level input voltage			0.7			0.8	V
$V_{OH}$	High-level output voltage	$Q_A$ thru $Q_H$ , 'LS596 only		5.5			5.5	V
$I_{OH}$	High-level output current	$Q_H'$		-1			-1	
		$Q_A$ thru $Q_H$ , 'LS595 only		-1			-2.6	mA
$I_{OL}$	Low-level output current	$Q_H'$		8			16	
		$Q$		12			24	mA
$f_{SRCK}$	Shift clock frequency	0	20	0	0	20	0	MHz
$t_{w(SRCK)}$	Duration of shift clock pulse	25			25			ns
$t_{w(RCK)}$	Duration of register clock pulse	20			20			ns
$t_{w(SRCLR)}$	Duration of shift clear pulse, low level	20			20			ns
$t_{SU}$	Setup time	$SRCLR$ inactive before $SRCK \uparrow$		20			20	
		$SER$ before $SRCK \uparrow$		20			20	
		$SRCK \uparrow$ before $RCK \uparrow$ (see Note 2)		40			40	
		$SRCLR$ low before $RCK \uparrow$		40			40	
$t_h$	Hold time	$SER$ after $SRCK \uparrow$		0			0	ns
$T_A$	Operating free-air temperature	-55		125	0		70	°C

NOTE 2: This setup time ensures the register will see stable data from the shift-register outputs. The clocks may be connected together, in which case the storage register state will be one clock pulse behind the shift register.

  
**TEXAS  
INSTRUMENTS**

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**SN54LS595, SN54LS596, SN74LS595, SN74LS596**  
**8-BIT SHIFT REGISTERS WITH OUTPUT LATCHES**

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

PARAMETER	TEST CONDITIONS <sup>†</sup>	SN54LS <sup>*</sup>			SN74LS <sup>*</sup>			UNIT	
		MIN	TYP <sup>‡</sup>	MAX	MIN	TYP <sup>‡</sup>	MAX		
V <sub>IK</sub>	V <sub>CC</sub> = MIN, I <sub>I</sub> = -18 mA			-1.5			-1.5	V	
V <sub>OH</sub>	'LS595 Q Q <sub>H</sub> '	V <sub>CC</sub> = MIN, V <sub>IH</sub> = 2 V, V <sub>IL</sub> = MAX	I <sub>OH</sub> = -1 mA	2.4	3.2			V	
			I <sub>OH</sub> = -2.6 mA			2.4	3.1		
			I <sub>OH</sub> = -1 mA	2.4	3.2	2.4	3.2		
I <sub>OH</sub>	'LS596 Q	V <sub>CC</sub> = MIN, V <sub>IH</sub> = 2 V, V <sub>IL</sub> = MAX, V <sub>OH</sub> = 5.5 V			0.1		0.1	mA	
V <sub>OL</sub>	Q Q <sub>H</sub> '	V <sub>CC</sub> = MIN, V <sub>IH</sub> = 2 V, V <sub>IL</sub> = MAX	I <sub>OL</sub> = 12 mA	0.25	0.4	0.25	0.4	V	
			I <sub>OL</sub> = 24 mA			0.35	0.5		
			I <sub>OL</sub> = 8 mA	0.25	0.4	0.25	0.4		
			I <sub>OL</sub> = 16 mA			0.35	0.5		
I <sub>OZH</sub>	'LS595 Q	V <sub>CC</sub> = MAX, V <sub>IH</sub> = 2 V, V <sub>IL</sub> = MAX, V <sub>OH</sub> = 2.7 V			20		20	μA	
I <sub>OZL</sub>	'LS595 Q	V <sub>CC</sub> = MAX, V <sub>IH</sub> = 2 V, V <sub>IL</sub> = MAX, V <sub>OH</sub> = 0.4 V			-20		-20	μA	
I <sub>I</sub>		V <sub>CC</sub> = MAX, V <sub>I</sub> = 7 V			0.1		0.1	mA	
I <sub>IH</sub>		V <sub>CC</sub> = MAX, V <sub>I</sub> = 2.7 V			20		20	μA	
I <sub>IL</sub>	SER	V <sub>CC</sub> = MAX, V <sub>I</sub> = 0.4 V			-0.4		-0.4	mA	
	All others				-0.2		-0.2		
I <sub>OS</sub> <sup>§</sup>	'LS595 Q Q <sub>H</sub> '	V <sub>CC</sub> = MAX, V <sub>O</sub> = 0 V	-30	-130	-30	-130		mA	
			-20	-100	-20	-100			
'CCH	'LS595	V <sub>CC</sub> = MAX, All possible inputs grounded, All outputs open			33	50	33	50	mA
	'LS596				30	45	30	45	
	'LS595				42	65	42	65	
	'LS596				36	55	36	55	
	'CCZ				44	65	44	65	

<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<sub>CC</sub> = 5 V, T<sub>A</sub> = 25°C.

<sup>§</sup> Not more than one output should be shorted at a time, and duration of the short-circuit should not exceed one second.



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**SN54LS595, SN54LS596, SN74LS595, SN74LS596  
8-BIT SHIFT REGISTERS WITH OUTPUT LATCHES**

switching characteristics,  $V_{CC} = 5 \text{ V}$ ,  $T_A = 25^\circ\text{C}$  (see note 3)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	TEST CONDITIONS	'LS595			'LS596			UNIT
				MIN	TYP	MAX	MIN	TYP	MAX	
$t_{PLH}$	SRCK $\uparrow$	$Q_H'$	$R_L = 1\text{k}\Omega$ , $C_L = 30 \text{ pF}$	12	18		14	21		ns
$t_{PHL}$				17	25		20	30		ns
$t_{PLH}$	RCK $\uparrow$	$Q_A$ thru $Q_H$	$R_L = 667 \Omega$ , $C_L = 45 \text{ pF}$	12	18		28	42		ns
$t_{PHL}$				24	35		24	35		ns
$t_{PZH}$	$\bar{G} \downarrow$	$Q_A$ thru $Q_H$	$R_L = 667 \Omega$ , $C_L = 45 \text{ pF}$	20	30					ns
$t_{PZL}$				25	38					ns
$t_{PHZ}$	$\bar{G} \uparrow$	$Q_A$ thru $Q_H$	$R_L = 667 \Omega$ , $C_L = 5 \text{ pF}$	20	30					ns
$t_{PLZ}$				25	38					ns
$t_{PLH}$	$\bar{G} \uparrow$	$Q_A$ thru $Q_H$	$R_L = 667 \Omega$ , $C_L = 45 \text{ pF}$				40	60		ns
$t_{PHL}$	$\bar{G} \downarrow$	$Q_A$ thru $Q_H$					25	38		ns
$t_{PHL}$	$\overline{\text{SRCLR}} \downarrow$	$Q_H'$	$R_L = 1\text{k}\Omega$ , $C_L = 30 \text{ pF}$	24	35		24	35		ns

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



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**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)
5962-8671701EA	Active	Production	CDIP (J)   16	25   TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	5962-8671701EA SNJ54LS595J
5962-8671701FA	Active	Production	CFP (W)   16	25   TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	5962-8671701FA SNJ54LS595W
5962-8671701FA	Active	Production	CFP (W)   16	25   TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	5962-8671701FA SNJ54LS595W
SN54LS595J	Active	Production	CDIP (J)   16	25   TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	SN54LS595J
SN54LS595J	Active	Production	CDIP (J)   16	25   TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	SN54LS595J
SN54LS595J.A	Active	Production	CDIP (J)   16	25   TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	SN54LS595J
SN54LS595J.A	Active	Production	CDIP (J)   16	25   TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	SN54LS595J
SN74LS595D	Obsolete	Production	SOIC (D)   16	-	-	Call TI	Call TI	0 to 70	LS595
SN74LS595D	Obsolete	Production	SOIC (D)   16	-	-	Call TI	Call TI	0 to 70	LS595
SN74LS595DR	Active	Production	SOIC (D)   16	2500   LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	0 to 70	LS595
SN74LS595DR	Active	Production	SOIC (D)   16	2500   LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	0 to 70	LS595
SN74LS595DR.A	Active	Production	SOIC (D)   16	2500   LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	0 to 70	LS595
SN74LS595DR.A	Active	Production	SOIC (D)   16	2500   LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	0 to 70	LS595
SN74LS595N	Active	Production	PDIP (N)   16	25   TUBE	Yes	NIPDAU	N/A for Pkg Type	0 to 70	SN74LS595N
SN74LS595N	Active	Production	PDIP (N)   16	25   TUBE	Yes	NIPDAU	N/A for Pkg Type	0 to 70	SN74LS595N
SN74LS595N.A	Active	Production	PDIP (N)   16	25   TUBE	Yes	NIPDAU	N/A for Pkg Type	0 to 70	SN74LS595N
SN74LS595N.A	Active	Production	PDIP (N)   16	25   TUBE	Yes	NIPDAU	N/A for Pkg Type	0 to 70	SN74LS595N
SNJ54LS595J	Active	Production	CDIP (J)   16	25   TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	5962-8671701EA SNJ54LS595J
SNJ54LS595J	Active	Production	CDIP (J)   16	25   TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	5962-8671701EA SNJ54LS595J
SNJ54LS595J.A	Active	Production	CDIP (J)   16	25   TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	5962-8671701EA SNJ54LS595J
SNJ54LS595J.A	Active	Production	CDIP (J)   16	25   TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	5962-8671701EA SNJ54LS595J
SNJ54LS595W	Active	Production	CFP (W)   16	25   TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	5962-8671701EA SNJ54LS595W

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)
SNJ54LS595W	Active	Production	CFP (W)   16	25   TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	5962-8671701FA SNJ54LS595W
SNJ54LS595W.A	Active	Production	CFP (W)   16	25   TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	5962-8671701FA SNJ54LS595W
SNJ54LS595W.A	Active	Production	CFP (W)   16	25   TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	5962-8671701FA SNJ54LS595W

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

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

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

<sup>(4)</sup> **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.

<sup>(5)</sup> **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.

<sup>(6)</sup> **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.

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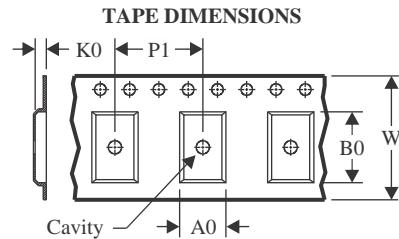
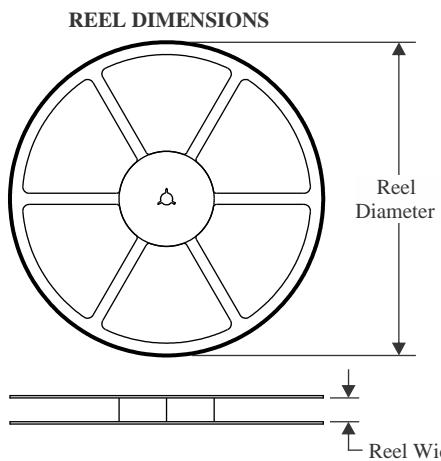
**OTHER QUALIFIED VERSIONS OF SN54LS595, SN74LS595 :**

- Catalog : [SN74LS595](#)

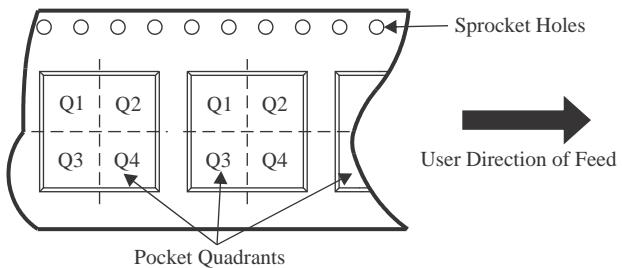
- Military : [SN54LS595](#)

NOTE: Qualified Version Definitions:

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

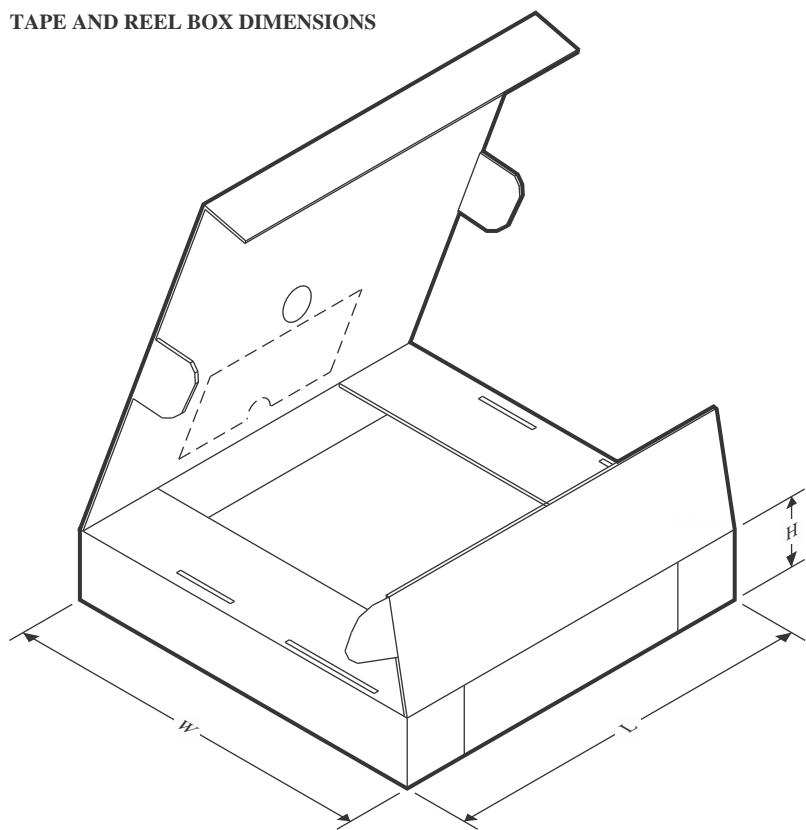
**TAPE AND REEL INFORMATION**

A0	Dimension designed to accommodate the component width
B0	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**

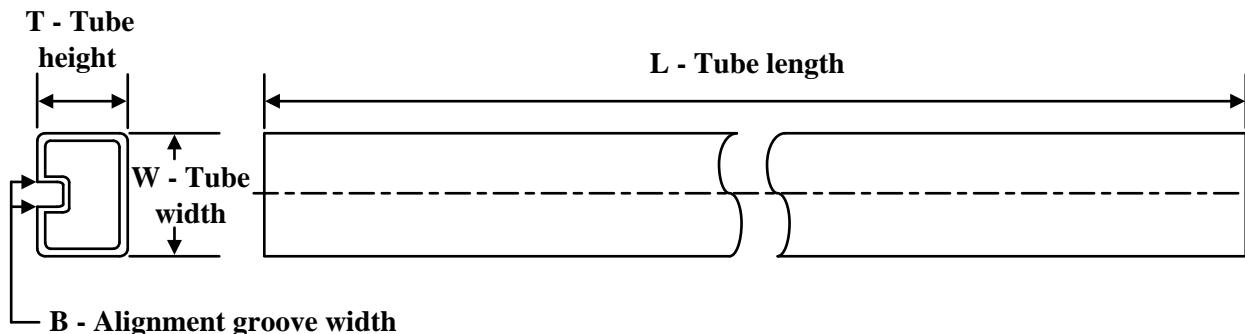
\*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Reel Diameter (mm)	Reel Width W1 (mm)	A0 (mm)	B0 (mm)	K0 (mm)	P1 (mm)	W (mm)	Pin1 Quadrant
SN74LS595DR	SOIC	D	16	2500	330.0	16.4	6.5	10.3	2.1	8.0	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)
SN74LS595DR	SOIC	D	16	2500	340.5	336.1	32.0

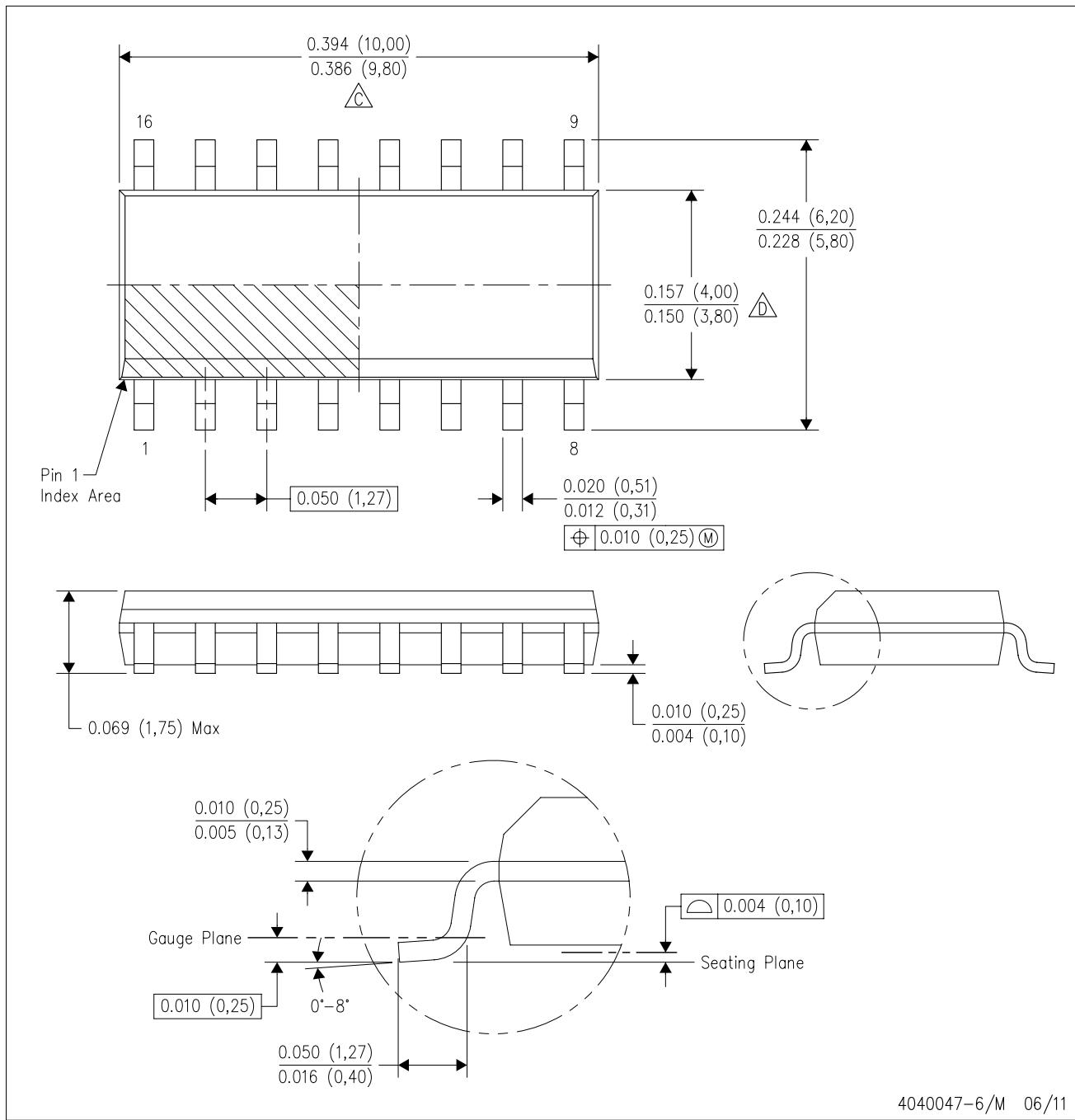
**TUBE**


\*All dimensions are nominal

Device	Package Name	Package Type	Pins	SPQ	L (mm)	W (mm)	T ( $\mu$ m)	B (mm)
5962-8671701FA	W	CFP	16	25	506.98	26.16	6220	NA
SN74LS595N	N	PDIP	16	25	506	13.97	11230	4.32
SN74LS595N	N	PDIP	16	25	506	13.97	11230	4.32
SN74LS595N.A	N	PDIP	16	25	506	13.97	11230	4.32
SN74LS595N.A	N	PDIP	16	25	506	13.97	11230	4.32
SNJ54LS595W	W	CFP	16	25	506.98	26.16	6220	NA
SNJ54LS595W.A	W	CFP	16	25	506.98	26.16	6220	NA

D (R-PDSO-G16)

PLASTIC SMALL OUTLINE



NOTES: A. All linear dimensions are in inches (millimeters).

B. This drawing is subject to change without notice.

C Body length does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed 0.006 (0,15) each side.

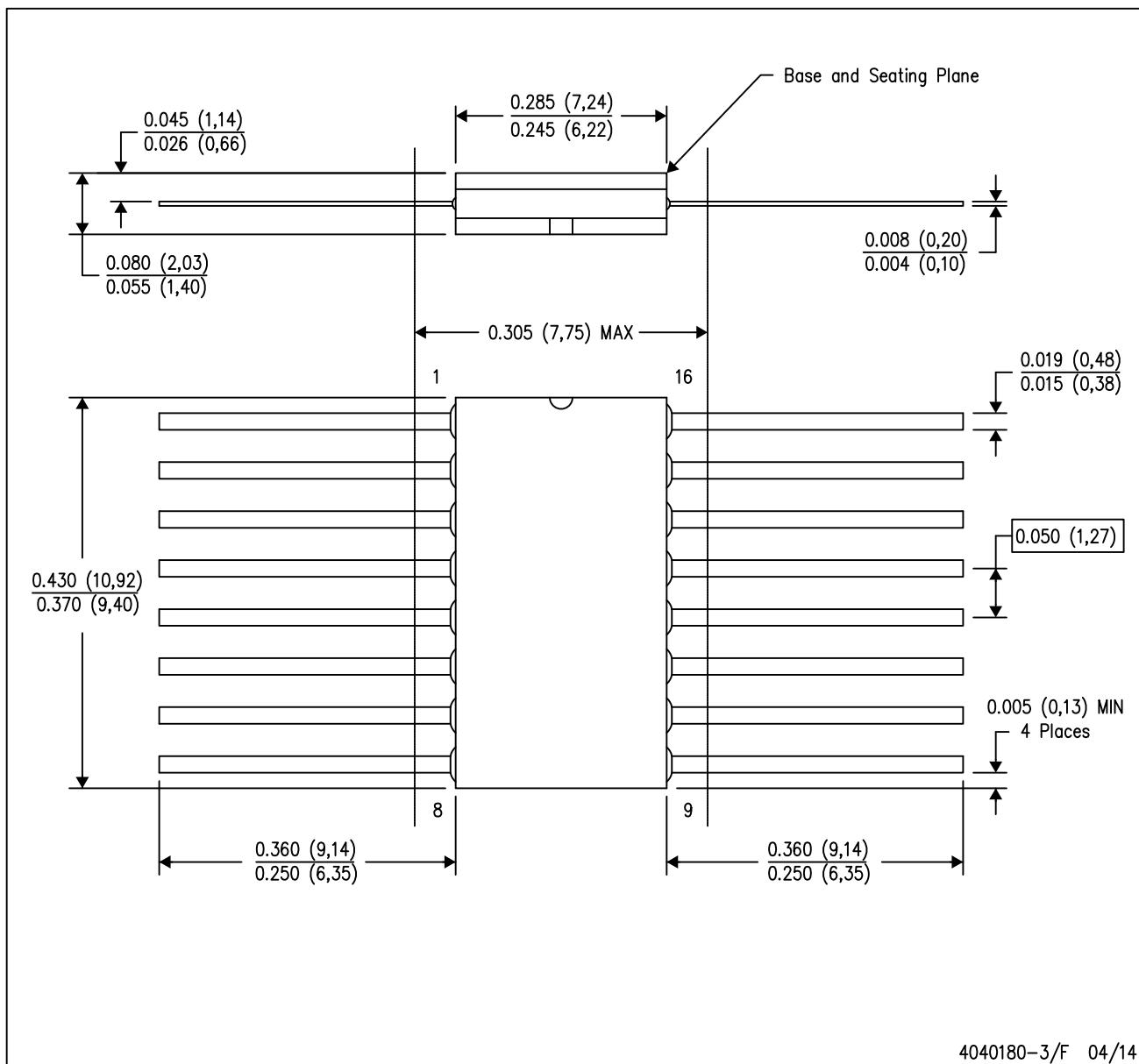
D Body width does not include interlead flash. Interlead flash shall not exceed 0.017 (0,43) each side.  
E. Reference JEDEC MS-012 variation AC.

4040047-6/M 06/11

## MECHANICAL DATA

W (R-GDFP-F16)

## CERAMIC DUAL FLATPACK



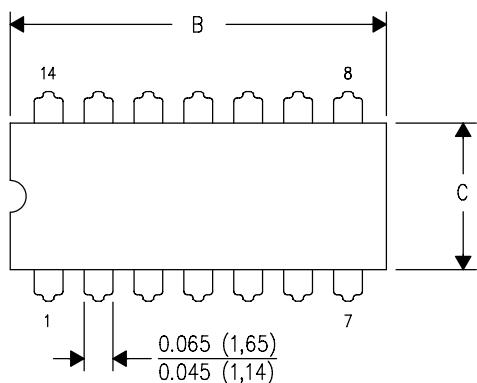
NOTES:

- 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-F16

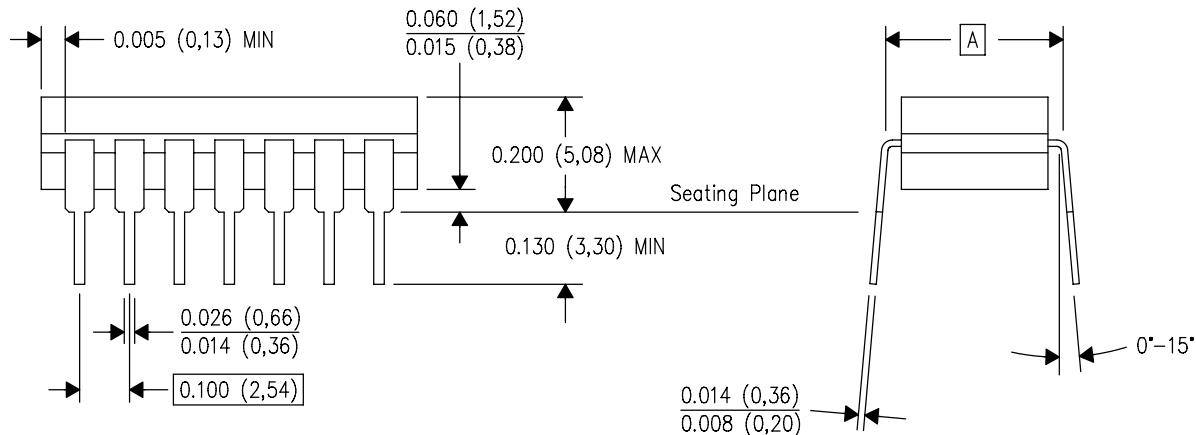
J (R-GDIP-T\*\*)

14 LEADS SHOWN

CERAMIC DUAL IN-LINE PACKAGE



PINS **\nDIM	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)



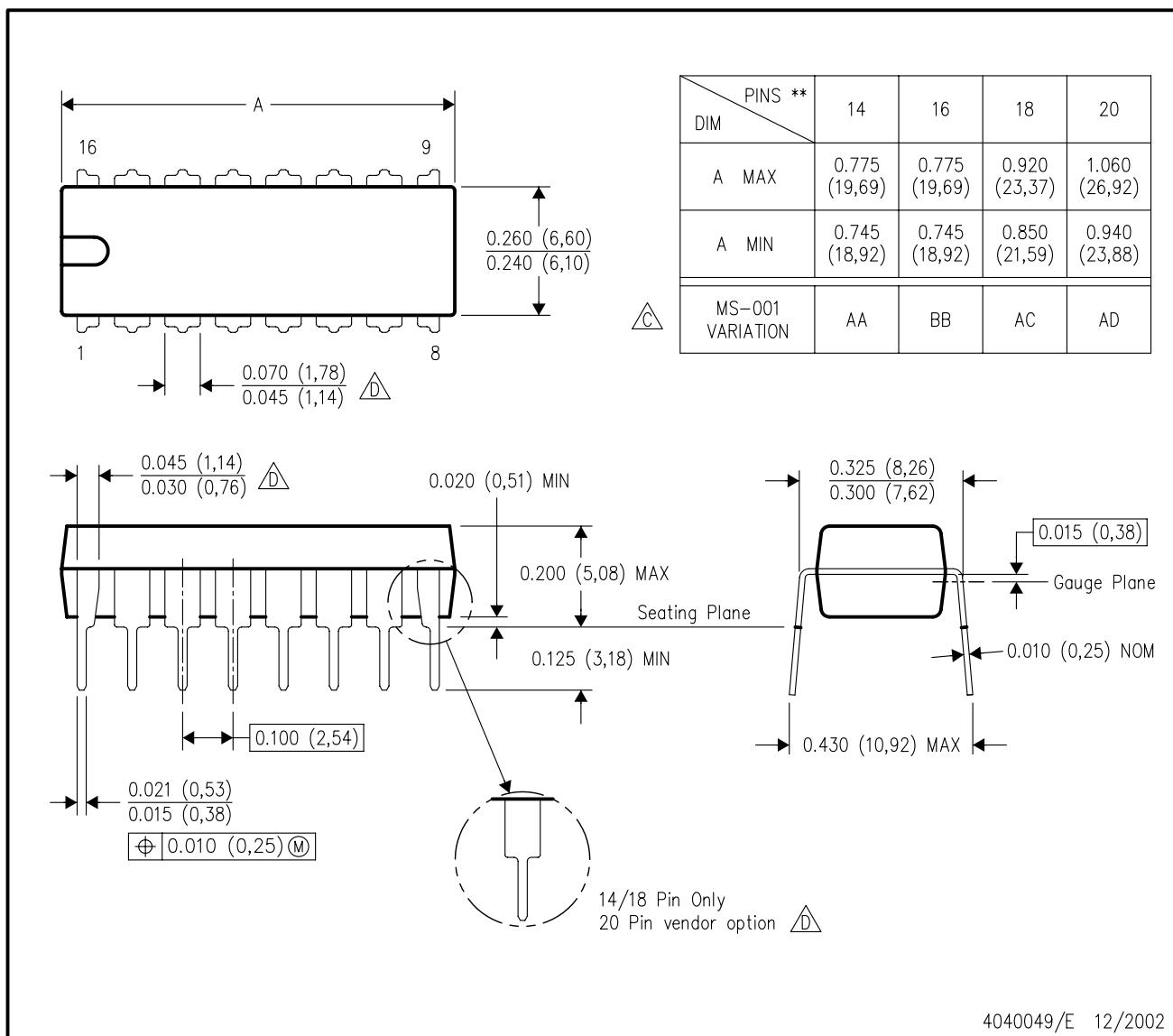
4040083/F 03/03

- 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



4040049/E 12/2002

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

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

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

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