

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

SDLS006

D2634, JANUARY 1981 (REVISED MARCH 1988)

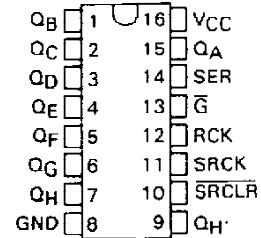
- 8-Bit Serial-In, Parallel-Out Shift Registers with Storage
- Choice of 3-State ('LS595) or Open-Collector ('LS596) Parallel Outputs
- Shift Register Has Direct Clear
- Accurate Shift Frequency: DC to 20 MHz

description

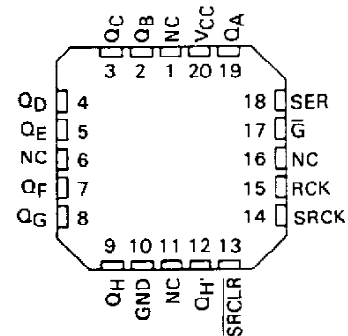
These devices each contain an 8-bit serial-in, parallel-out shift register that feeds an 8-bit D-type storage register. The storage register has parallel 3-state ('LS595) or open-collector ('LS596) outputs. Separate clocks are provided for both the shift register and the storage register. The shift register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



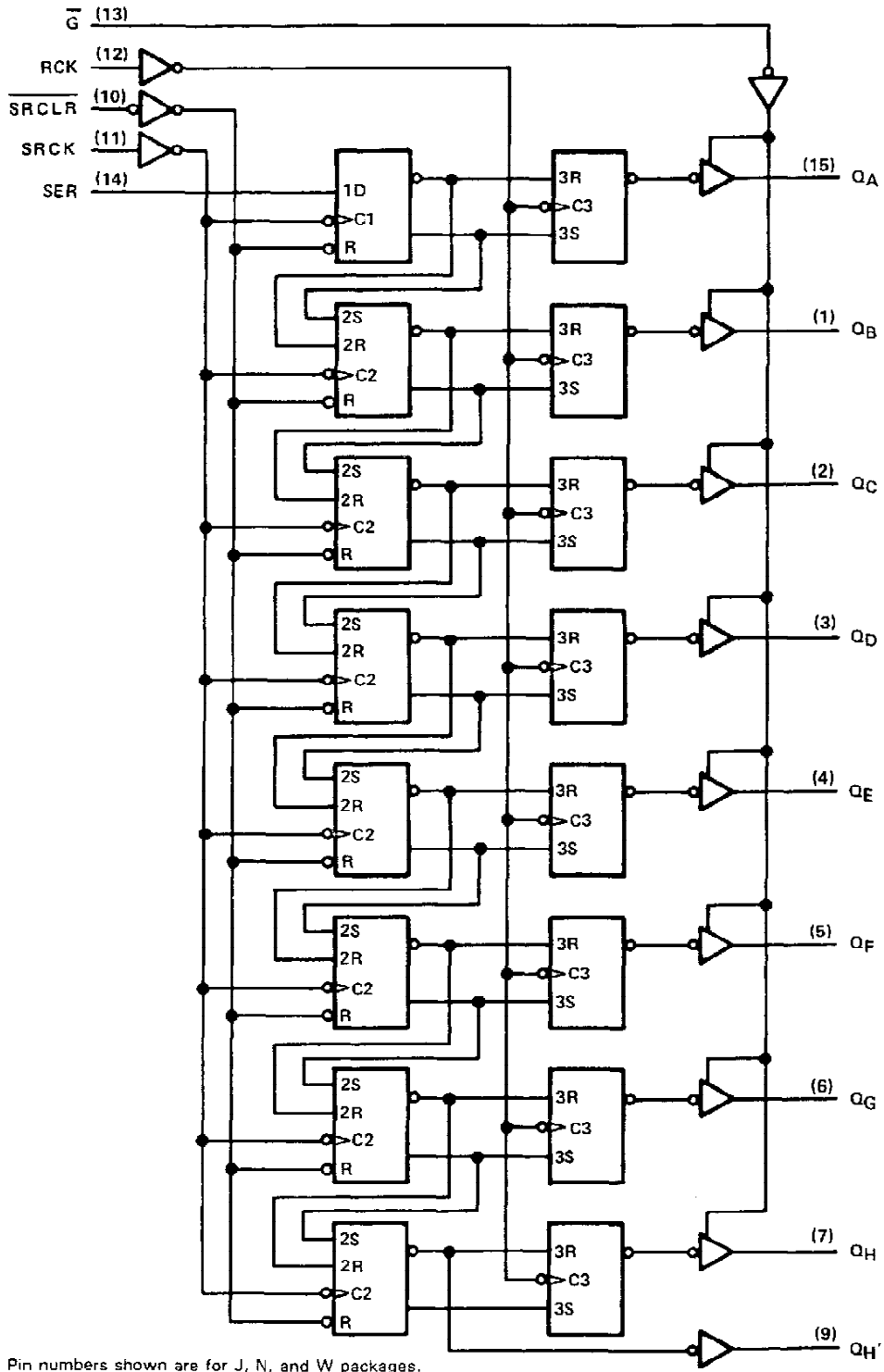
PRODUCTION DATA documents contain information current as of publication date. Products conform to specifications per the terms of Texas Instruments standard warranty. Production processing does not necessarily include testing of all parameters.

TEXAS
INSTRUMENTS

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

logic diagram (positive logic)



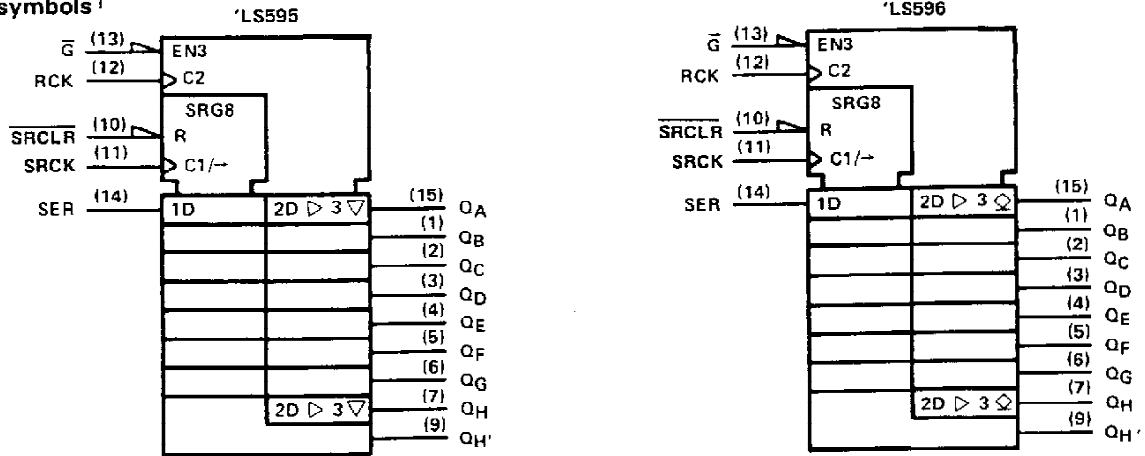
Pin numbers shown are for J, N, and W packages.



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

logic symbols †



†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 | | | 5.5 | | | 5.5 | V |
| I_{OH} | High-level output current | | | -1 | | | -1 | mA |
| | | | | -1 | | | -2.6 | |
| I_{OL} | Low-level output current | | | 8 | | | 16 | mA |
| | | | | 12 | | | 24 | |
| | | | | | | | | |
| f_{SRCK} | Shift clock frequency | 0 | | 20 | 0 | | 20 | 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 † | | 20 | 20 | | ns | |
| | | SER before SRCK † | | 20 | 20 | | | |
| | | SRCK † before RCK † (see Note 2) | | 40 | 40 | | | |
| | | SRCLR low before RCK † | | 40 | 40 | | | |
| t_h | Hold time | 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.

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

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

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

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

TEXAS
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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 ↑ | 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 ↑ | 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} | \overline{G} ↓ | Q_A thru Q_H | | | 20 | 30 | | | | ns |
| t_{PZL} | | | | | 25 | 38 | | | | ns |
| t_{PHZ} | \overline{G} ↑ | Q_A thru Q_H | $R_L = 667\ \Omega$, $C_L = 5\text{ pF}$ | | 20 | 30 | | | | ns |
| t_{PLZ} | | | | | 25 | 38 | | | | ns |
| t_{PLH} | \overline{G} ↑ | Q_A thru Q_H | $R_L = 667\ \Omega$, $C_L = 45\text{ pF}$ | | | | | 40 | 60 | ns |
| t_{PHL} | \overline{G} ↓ | Q_A thru Q_H | | | | | | 25 | 38 | ns |
| t_{PHL} | SRCLR ↓ | 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.

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 |
|------------------|---------------|--------------|-----------------|------|-------------|------------------|--------------------------------------|----------------------|--------------|-------------------------------|-------------------------|
| 5962-8671701EA | ACTIVE | CDIP | J | 16 | 1 | Non-RoHS & Green | SNPB | N / A for Pkg Type | -55 to 125 | 5962-8671701EA SNJ54LS595J | Samples |
| 5962-8671701FA | ACTIVE | CFP | W | 16 | 1 | Non-RoHS & Green | SNPB | N / A for Pkg Type | -55 to 125 | 5962-8671701FA SNJ54LS595W | Samples |
| 5962-8671701FA | ACTIVE | CFP | W | 16 | 1 | Non-RoHS & Green | SNPB | N / A for Pkg Type | -55 to 125 | 5962-8671701FA SNJ54LS595W | Samples |
| SN54LS595J | ACTIVE | CDIP | J | 16 | 1 | Non-RoHS & Green | SNPB | N / A for Pkg Type | -55 to 125 | SN54LS595J | Samples |
| SN54LS595J | ACTIVE | CDIP | J | 16 | 1 | Non-RoHS & Green | SNPB | N / A for Pkg Type | -55 to 125 | SN54LS595J | Samples |
| SN74LS595D | ACTIVE | SOIC | D | 16 | 40 | RoHS & Green | NIPDAU | Level-1-260C-UNLIM | 0 to 70 | LS595 | Samples |
| SN74LS595D | ACTIVE | SOIC | D | 16 | 40 | RoHS & Green | NIPDAU | Level-1-260C-UNLIM | 0 to 70 | LS595 | Samples |
| SN74LS595DG4 | ACTIVE | SOIC | D | 16 | 40 | RoHS & Green | NIPDAU | Level-1-260C-UNLIM | 0 to 70 | LS595 | Samples |
| SN74LS595DG4 | ACTIVE | SOIC | D | 16 | 40 | RoHS & Green | NIPDAU | Level-1-260C-UNLIM | 0 to 70 | LS595 | Samples |
| SN74LS595DR | ACTIVE | SOIC | D | 16 | 2500 | RoHS & Green | NIPDAU | Level-1-260C-UNLIM | 0 to 70 | LS595 | Samples |
| SN74LS595DR | ACTIVE | SOIC | D | 16 | 2500 | RoHS & Green | NIPDAU | Level-1-260C-UNLIM | 0 to 70 | LS595 | Samples |
| SN74LS595N | ACTIVE | PDIP | N | 16 | 25 | RoHS & Green | NIPDAU | N / A for Pkg Type | 0 to 70 | SN74LS595N | Samples |
| SN74LS595N | ACTIVE | PDIP | N | 16 | 25 | RoHS & Green | NIPDAU | N / A for Pkg Type | 0 to 70 | SN74LS595N | Samples |
| SN74LS596N | ACTIVE | PDIP | N | 16 | 25 | RoHS & Green | NIPDAU | N / A for Pkg Type | 0 to 70 | SN74LS596N | Samples |
| SN74LS596N | ACTIVE | PDIP | N | 16 | 25 | RoHS & Green | NIPDAU | N / A for Pkg Type | 0 to 70 | SN74LS596N | Samples |
| SNJ54LS595J | ACTIVE | CDIP | J | 16 | 1 | Non-RoHS & Green | SNPB | N / A for Pkg Type | -55 to 125 | 5962-8671701EA SNJ54LS595J | Samples |
| SNJ54LS595J | ACTIVE | CDIP | J | 16 | 1 | Non-RoHS & Green | SNPB | N / A for Pkg Type | -55 to 125 | 5962-8671701EA SNJ54LS595J | Samples |
| SNJ54LS595W | ACTIVE | CFP | W | 16 | 1 | Non-RoHS & Green | SNPB | N / A for Pkg Type | -55 to 125 | 5962-8671701FA SNJ54LS595W | Samples |

| 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 |
|------------------|---------------|--------------|--------------------|------|----------------|---------------------|--------------------------------------|----------------------|--------------|-------------------------------|---------|
| SNJ54LS595W | ACTIVE | CFP | W | 16 | 1 | Non-RoHS & Green | SNPB | N / A for Pkg Type | -55 to 125 | 5962-8671701FA SNJ54LS595W | 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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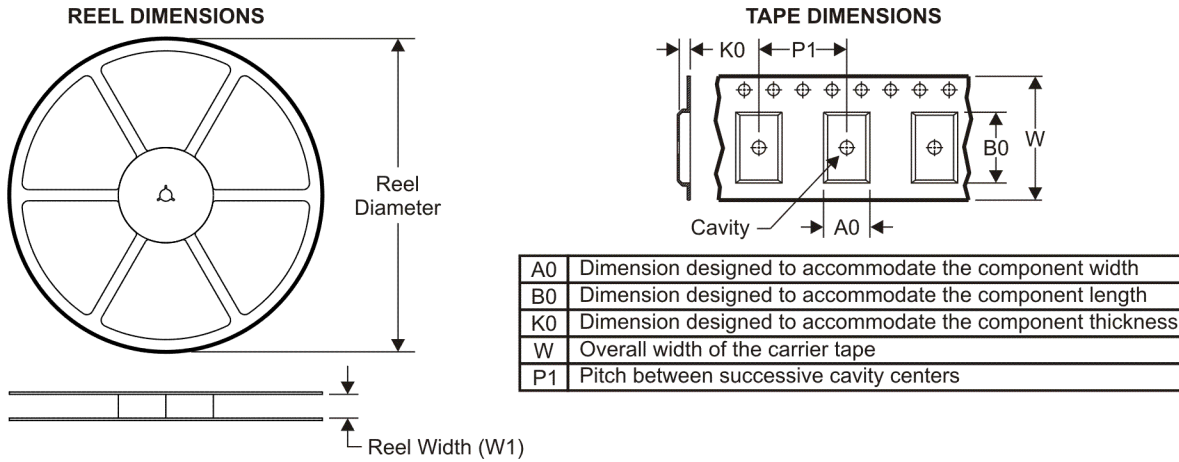
OTHER QUALIFIED VERSIONS OF SN54LS595, SN74LS595 :

- Catalog: [SN74LS595](#)
- Military: [SN54LS595](#)

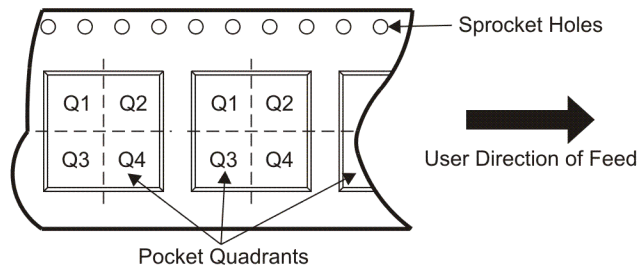
NOTE: Qualified Version Definitions:

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

TAPE AND REEL INFORMATION



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 | 333.2 | 345.9 | 28.6 |

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.

D (R-PDSO-G16)

PLASTIC SMALL OUTLINE



- NOTES:
- All linear dimensions are in millimeters.
 - This drawing is subject to change without notice.
 - Publication IPC-7351 is recommended for alternate designs.
 - Laser cutting apertures with trapezoidal walls and also rounding corners will offer better paste release. Customers should contact their board assembly site for stencil design recommendations. Refer to IPC-7525 for other stencil recommendations.
 - Customers should contact their board fabrication site for solder mask tolerances between and around signal pads.

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



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

N (R-PDIP-T**)

PLASTIC DUAL-IN-LINE PACKAGE

16 PINS SHOWN



- 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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