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Manufactured Components**

Rochester branded components are manufactured using either die/wafers purchased from the original suppliers or Rochester wafers recreated from the original IP. All recreations are done with the approval of the OCM.

Parts are tested using original factory test programs or Rochester developed test solutions to guarantee product meets or exceed the OCM data sheet.

Quality Overview

- ISO-9001
- AS9120 certification
- Qualified Manufacturers List (QML) MIL-PRF-35835
 - Class Q Military
 - Class V Space Level
- Qualified Suppliers List of Distributors (QSLD)
 - Rochester is a critical supplier to DLA and meets all industry and DLA standards.

Rochester Electronics, LLC is committed to supplying products that satisfy customer expectations for quality and are equal to those originally supplied by industry manufacturers.

The original manufacturer's datasheet accompanying this document reflects the performance and specifications of the Rochester manufactured version of this device. Rochester Electronics guarantees the performance of its semiconductor products to the original OEM specifications. 'Typical' values are for reference purposes only. Certain minimum or maximum ratings may be based on product characterization, design, simulation, or sample testing.

SN54HC195, SN74HC195 4-BIT PARALLEL-ACCESS SHIFT REGISTERS

D2684, DECEMBER 1982—REVISED SEPTEMBER 1987

- Synchronous Parallel Load
- Positive-Edge-Triggered Clocking
- J and \bar{K} Inputs to First Stage
- Complementary Outputs from Last Stage
- Package Options: Plastic and Ceramic DIPs, Plastic Small-Outline Packages, and Ceramic Chip Carriers
- Dependable Texas Instruments Quality and Reliability

description

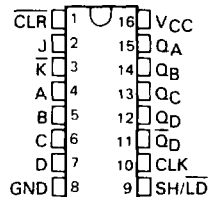
These 4-bit registers feature parallel inputs, parallel outputs, J-K serial inputs, shift/load control input, and a direct overriding clear. The registers have two modes of operation: parallel (broadside) load, and shift (in the direction Q_A and Q_D).

Parallel loading is accomplished by applying the 4-bits of data and taking the shift/load control input low. The data is loaded into the associated flip-flop and appears at the outputs after the positive transition of the clock input. During loading, serial data flow is inhibited.

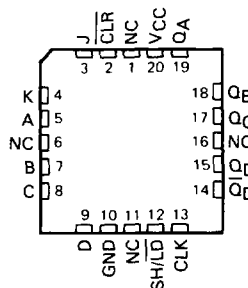
Shifting is accomplished synchronously when the shift/load control input is high. Serial data for this mode is entered at the J- \bar{K} inputs. These inputs permit the first stage to perform as a J- \bar{K} -, D-, or T-type flip-flop as shown in the function table.

The SN54HC195 is characterized for operation over the full military temperature range of -55°C to 125°C . The SN74HC195 is characterized for operation from -40°C to 85°C .

SN54HC195 . . . J PACKAGE
SN74HC195 . . . DW or N PACKAGE
(TOP VIEW)

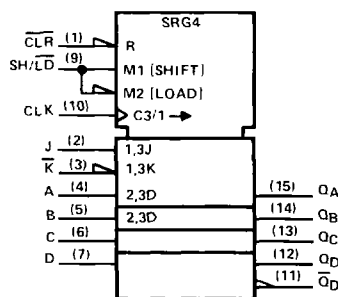


SN54HC195 . . . FK PACKAGE
(TOP VIEW)



NC—No internal connection

logic symbol†



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

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

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HC MOS Devices

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

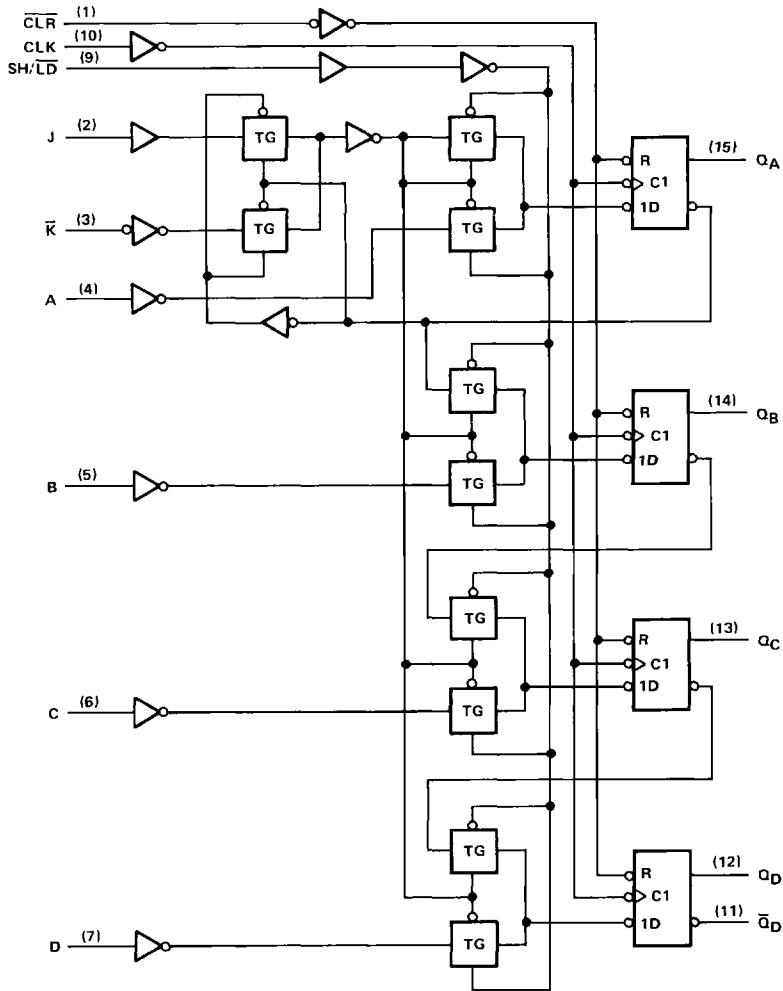
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SN54HC195, SN74HC195
4-BIT PARALLEL-ACCESS SHIFT REGISTERS

logic diagram (positive logic)



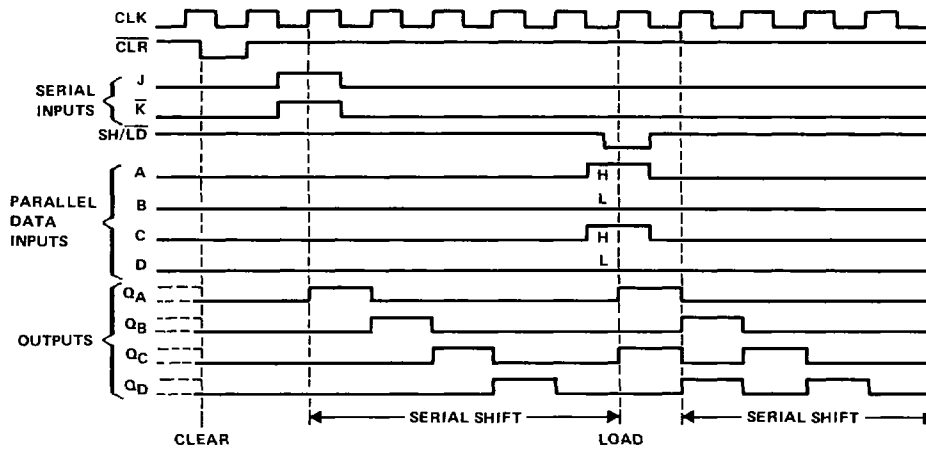
Pin numbers shown are for DW, J, and N packages.

SN54HC195, SN74HC195 4-BIT PARALLEL-ACCESS SHIFT REGISTERS

FUNCTION TABLE

| INPUTS | | INPUTS | | | | | | | | OUTPUTS | | | | |
|--------|---|--------|-------|-----|--------|---|----------|---|-----------------|-----------------|-----------------|-----------------|-----------------|----------------|
| | | CLR | SH/LD | CLK | SERIAL | | PARALLEL | | | | Q _A | Q _B | Q _C | Q _D |
| | | | J | K | A | B | C | D | | | | | | |
| L | X | X | X | X | X | X | X | X | L | L | L | L | H | \bar{d} |
| H | L | ↑ | X | X | a | b | c | d | a | b | c | d | \bar{d} | \bar{Q}_{D0} |
| H | H | L | X | X | X | X | X | X | Q _{A0} | Q _{B0} | Q _{C0} | Q _{D0} | \bar{Q}_{D0} | \bar{Q}_{D0} |
| H | H | ↑ | L | H | X | X | X | X | Q _{A0} | Q _{A0} | Q _{Bn} | Q _{Cn} | Q _{Cn} | \bar{Q}_{Cn} |
| H | H | ↑ | L | L | X | X | X | X | L | Q _{An} | Q _{Bn} | Q _{Cn} | Q _{Cn} | \bar{Q}_{Cn} |
| H | H | ↑ | H | H | X | X | X | X | H | Q _{An} | Q _{Bn} | Q _{Cn} | Q _{Cn} | \bar{Q}_{Cn} |
| H | H | ↑ | H | L | X | X | X | X | \bar{Q}_{An} | Q _{An} | Q _{Bn} | Q _{Cn} | Q _{Cn} | \bar{Q}_{Cn} |

typical clear, shift, and load sequences



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HCMOS Devices

SN54HC195, SN74HC195

4-BIT PARALLEL-ACCESS SHIFT REGISTERS

absolute maximum ratings over operating free-air temperature †

| | |
|---|----------------|
| Supply voltage, V_{CC} | -0.5 V to 7 V |
| Input clamp current, I_{IK} ($V_I < 0$ or $V_I > V_{CC}$) | ± 20 mA |
| Output clamp current, I_{OK} ($V_O < 0$ or $V_O > V_{CC}$) | ± 20 mA |
| Continuous output current, I_O ($V_O = 0$ to V_{CC}) | ± 25 mA |
| Continuous current through V_{CC} or GND pins | ± 50 mA |
| Lead temperature 1,6 mm (1/16 in) from case for 60 s: FK or J package | 300°C |
| Lead temperature 1,6 mm (1/16 in) from case for 10 s: DW or N package | 260°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.

recommended operating conditions

| | | SN54HC195 | | | SN74HC195 | | | UNIT |
|--|------------------|-----------|----------|-----|-----------|----------|-----|------|
| | | MIN | NOM | MAX | MIN | NOM | MAX | |
| V_{CC} Supply voltage | | 2 | 5 | 6 | 2 | 5 | 6 | V |
| V_{IH} High-level input voltage | $V_{CC} = 2$ V | 1.5 | | | 1.5 | | | V |
| | $V_{CC} = 4.5$ V | 3.15 | | | 3.15 | | | |
| | $V_{CC} = 6$ V | 4.2 | | | 4.2 | | | |
| V_{IL} Low-level input voltage | $V_{CC} = 2$ V | 0 | 0.3 | | 0 | 0.3 | | V |
| | $V_{CC} = 4.5$ V | 0 | 0.9 | | 0 | 0.9 | | |
| | $V_{CC} = 6$ V | 0 | 1.2 | | 0 | 1.2 | | |
| V_I Input voltage | | 0 | V_{CC} | | 0 | V_{CC} | | V |
| V_O Output voltage | | 0 | V_{CC} | | 0 | V_{CC} | | V |
| t_t Input transition (rise and fall) times | $V_{CC} = 2$ V | 0 | 1000 | | 0 | 1000 | | ns |
| | $V_{CC} = 4.5$ V | 0 | 500 | | 0 | 500 | | |
| | $V_{CC} = 6$ V | 0 | 400 | | 0 | 400 | | |
| T_A Operating free-air temperature | | -55 | 125 | | -40 | 85 | | °C |

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

| PARAMETER | TEST CONDITIONS | V_{CC} | $T_A = 25^\circ\text{C}$ | | | SN54HC195 | | SN74HC195 | | UNIT |
|-----------|---|----------|--------------------------|-----------|-----------|-----------|------------|-----------|------------|---------------|
| | | | MIN | TYP | MAX | MIN | MAX | MIN | MAX | |
| V_{OH} | $V_I = V_{IH}$ or V_{IL} , $I_{OH} = -20 \mu\text{A}$ | 2 V | 1.9 | 1.998 | | 1.9 | | 1.9 | V | |
| | | 4.5 V | 4.4 | 4.499 | | 4.4 | | 4.4 | | |
| | | 6 V | 5.9 | 5.999 | | 5.9 | | 5.9 | | |
| | $V_I = V_{IH}$ or V_{IL} , $I_{OH} = -4 \text{ mA}$ | 4.5 V | 3.98 | 4.30 | | 3.7 | | 3.84 | | |
| | $V_I = V_{IH}$ or V_{IL} , $I_{OH} = -5.2 \text{ mA}$ | 6 V | 5.48 | 5.80 | | 5.2 | | 5.34 | | |
| V_{OL} | $V_I = V_{IH}$ or V_{IL} , $I_{OL} = 20 \mu\text{A}$ | 2 V | | 0.002 | 0.1 | | 0.1 | | 0.1 | V |
| | | 4.5 V | | 0.001 | 0.1 | | 0.1 | | 0.1 | |
| | | 6 V | | 0.001 | 0.1 | | 0.1 | | 0.1 | |
| | $V_I = V_{IH}$ or V_{IL} , $I_{OL} = 4 \text{ mA}$ | 4.5 V | | 0.17 | 0.26 | | 0.4 | | 0.33 | |
| | $V_I = V_{IH}$ or V_{IL} , $I_{OL} = 5.2 \text{ mA}$ | 6 V | | 0.15 | 0.26 | | 0.4 | | 0.33 | |
| I_I | $V_I = V_{CC}$ or 0 | 6 V | | ± 0.1 | ± 100 | | ± 1000 | | ± 1000 | nA |
| I_{CC} | $V_I = V_{CC}$ or 0, $I_O = 0$ | 6 V | | | 8 | | 160 | | 80 | μA |
| C_i | | 2 to 6 V | | 3 | 10 | | 10 | | 10 | pF |

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HC MOS Devices

SN4HC195, SN74HC195 4-BIT PARALLEL-ACCESS SHIFT REGISTERS

timing requirements over recommended operating free-air temperature range (unless otherwise noted)

| | | V _{CC} | T _A = 25°C | | | SN54HC195 | | SN74HC195 | | UNIT |
|--------------------|-------------------------|---|-----------------------|-----|-----|-----------|-----|-----------|-----|------|
| | | | MIN | TYP | MAX | MIN | MAX | MIN | MAX | |
| f _{clock} | Clock frequency | 2 V | 0 | | 6 | 0 | 4.2 | 0 | 5 | MHz |
| | | 4.5 V | 0 | | 31 | 0 | 21 | 0 | 25 | |
| | | 6 V | 0 | | 36 | 0 | 25 | 0 | 29 | |
| t _w | Pulse duration | CLK high or low | 2 V | 80 | | 120 | | 100 | | ns |
| | | | 4.5 V | 16 | | 24 | | 20 | | |
| | | | 6 V | 14 | | 20 | | 17 | | |
| | | $\overline{\text{CLR}}$ low | 2 V | 80 | | 120 | | 100 | | |
| | | | 4.5 V | 16 | | 24 | | 20 | | |
| | | | 6 V | 14 | | 20 | | 17 | | |
| t _{su} | Setup time, before CLK† | SH/LD, or serial and parallel data, or CLR inactive | 2 V | 100 | | 150 | | 125 | ns | |
| | | | 4.5 V | 20 | | 30 | | 25 | | |
| | | | 6 V | 17 | | 26 | | 21 | | |
| t _h | Hold time, after CLK† | SH/LD or serial and parallel data | 2 V | 0 | | 0 | | 0 | ns | |
| | | | 4.5 V | 0 | | 0 | | 0 | | |
| | | | 6 V | 0 | | 0 | | 0 | | |

switching characteristics over recommended operating free-air temperature range (unless otherwise noted), C_L = 50 pF (see Note 1)

| PARAMETER | FROM (INPUT) | TO (OUTPUT) | V _{CC} | T _A = 25°C | | | SN54HC195 | | SN74HC195 | | UNIT |
|------------------|-------------------------|--|-----------------|-----------------------|-----|-----|-----------|-----|-----------|-----|------|
| | | | | MIN | TYP | MAX | MIN | MAX | MIN | MAX | |
| f _{max} | | | 2 V | 6 | 12 | | 4.2 | | 5 | MHz | |
| | | | 4.5 V | 31 | 50 | | 21 | | 25 | | |
| | | | 6 V | 36 | 60 | | 25 | | 29 | | |
| t _{pd} | CLK | Q _A thru Q _D or $\overline{\text{Q}}_{\text{D}}$ | 2 V | | 67 | 145 | | 220 | | 180 | ns |
| | | | 4.5 V | | 17 | 29 | | 44 | | 36 | |
| | | | 6 V | | 14 | 25 | | 37 | | 31 | |
| t _{pd} | $\overline{\text{CLR}}$ | Q _A thru Q _D or $\overline{\text{Q}}_{\text{D}}$ | 2 V | | 67 | 150 | | 225 | | 190 | ns |
| | | | 4.5 V | | 17 | 30 | | 45 | | 38 | |
| | | | 6 V | | 13 | 26 | | 38 | | 32 | |
| t _t | | Any | 2 V | | 28 | 75 | | 110 | | 95 | ns |
| | | | 4.5 V | | 8 | 15 | | 22 | | 19 | |
| | | | 6 V | | 6 | 13 | | 19 | | 16 | |

| | | | |
|-----------------|-------------------------------|--------------------------------|-----------|
| C _{pd} | Power dissipation capacitance | No load, T _A = 25°C | 65 pF typ |
|-----------------|-------------------------------|--------------------------------|-----------|

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

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HCMOS Devices