# TYPES SN54LS396, SN74LS396
# OCTAL STORAGE REGISTERS

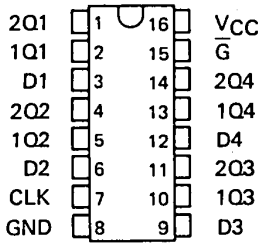
D2329, MARCH 1977—PREVISED DECEMBER 1983

- Parallel Access
- Typical Propagation Delay Time . . . 20 ns
- Typical Power Dissipation . . . 120 mW
- Applications:
  N-Bit Storage Files
  Hex/BCD Serial-To-Parallel Converters

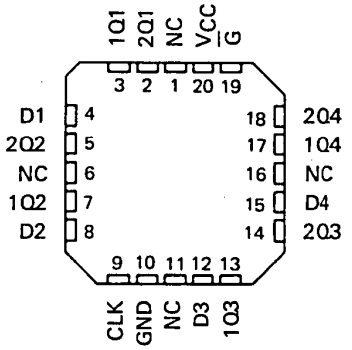
## description

These octal registers are organized as two 4-bit bytes of storage. Upon application of a positive-going clock signal, the information stored in byte 1 is transferred into byte 2 as a new 4-bit byte is loaded into the byte 1 location via the four data lines. The full 8-bit word is available at the outputs after two clock cycles. Both the clock and the strobe lines are fully buffered.

SN54LS396 . . . J OR W PACKAGE
SN74LS396 . . . D, J OR N PACKAGE
(TOP VIEW)

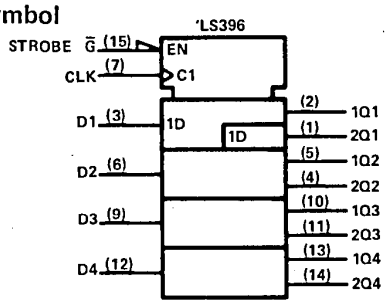



SN54LS396 . . . FK PACKAGE
SN74LS396 . . . FN PACKAGE
(TOP VIEW)




NC - No internal connection

## logic symbol



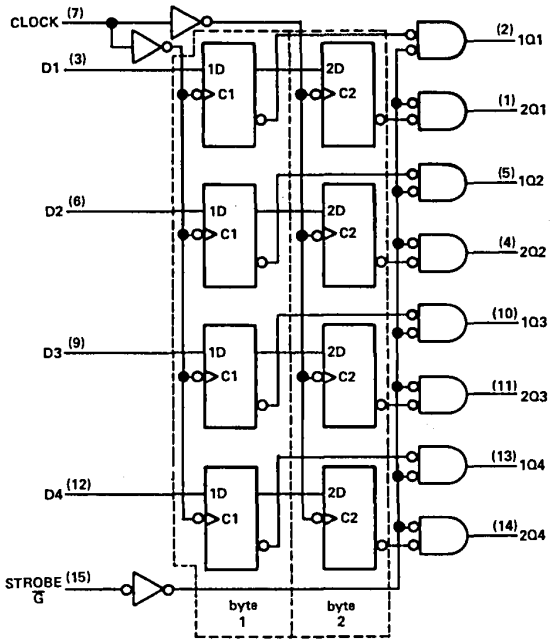

Pin numbers shown on logic notation are for D, J or N packages.

FUNCTION TABLE

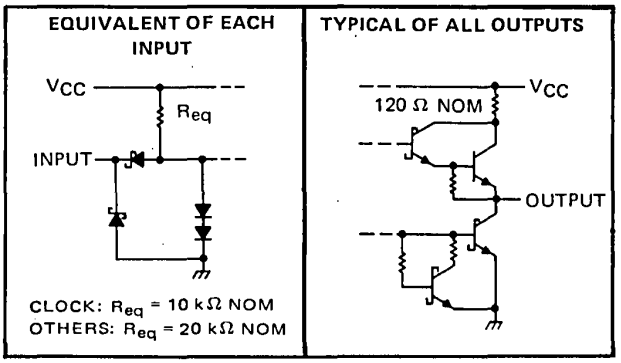
| INPUTS | | | | | | OUTPUTS | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| STROBE $\overline{G}$ | CLOCK | DATA | | | | BYTE 1 | | | | BYTE 2 | | | |
| | | D1 | D2 | D3 | D4 | 1Q1 | 1Q2 | 1Q3 | 1Q4 | 2Q1 | 2Q2 | 2Q3 | 2Q4 |
| H | X | X | X | X | X | L | L | L | L | L | L | L | L |
| L | ↑ | a | b | c | d | a | b | c | d | $1Q1_n$ | $1Q2_n$ | $1Q3_n$ | $1Q4_n$ |

H = high level (steady state), L = low level (steady state), X = irrelevant (any input, including transitions)
↑ = transition from low to high level
$1Q1_n$, $1Q2_n$, $1Q3_n$, $1Q4_n$ = the level of 1Q1, 1Q2, 1Q3, and 1Q4, respectively, before the most recent ↑ transition of the clock.

## logic diagram




## schematics of inputs and outputs




Pin numbers shown on logic notation are for D, J or N packages.

3 TTL DEVICES

## 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
Operating free-air temperature range: SN54LS396 . . . . . −55°C to 125°C
SN74LS396 . . . . . 0°C to 70°C
Storage temperature range . . . . . −65°C to 150°C

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

## recommended operating conditions

| | SN54LS396 | | | SN74LS396 | | | 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 | μA |
| Low-level output current, $I_{OL}$ | | | 4 | | | 8 | mA |
| Clock frequency, $f_{clock}$ | 0 | | 30 | 0 | | 30 | MHz |
| Width of clock pulse, $t_w$ | 20 | | | 20 | | | ns |
| Setup time, $t_{su}$ | 20 | | | 20 | | | ns |
| Hold time, $t_h$ | 5 | | | 5 | | | ns |
| Operating free-air temperature, $T_A$ | −55 | | 125 | 0 | | 70 | °C |



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

| PARAMETER | | | TEST CONDITIONS† | | SN54LS396 | | | SN74LS396 | | | UNIT |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | MIN | TYP‡ | MAX | MIN | TYP‡ | MAX | |
| $V_{IH}$ | High-level input voltage | | | | 2 | | | 2 | | | V |
| $V_{IL}$ | Low-level input voltage | | | | | | 0.7 | | | 0.8 | V |
| $V_{IK}$ | Input clamp voltage | | $V_{CC}$ = MIN, | $I_I$ = −18 mA | | | −1.5 | | | −1.5 | V |
| $V_{OH}$ | High-level output voltage | | $V_{CC}$ = MIN, $V_{IL}$ = MAX, | $V_{IH}$ = 2 V, $I_{OH}$ = −400 μA | 2.5 | 3.4 | | 2.7 | 3.4 | | V |
| $V_{OL}$ | Low-level output voltage | | $V_{CC}$ = MIN, $V_{IH}$ = 2 V, $V_{IL}$ = MAX | $I_{OL}$ = 4 mA | | 0.25 | 0.4 | | 0.25 | 0.4 | V |
| | | | | $I_{OL}$ = 8 mA | | | | | 0.35 | 0.5 | |
| $I_I$ | Input current at maximum input voltage | Clock input | $V_{CC}$ = MAX, | $V_I$ = 7 V | | | 0.2 | | | 0.2 | mA |
| | | Other inputs | | | | | 0.1 | | | 0.1 | |
| $I_{IH}$ | High-level input current | Clock input | $V_{CC}$ = MAX, | $V_I$ = 2.7 V | | | 40 | | | 40 | μA |
| | | Other inputs | | | | | 20 | | | 20 | |
| $I_{IL}$ | Low-level input current | Clock input | $V_{CC}$ = MAX, | $V_I$ = 0.4 V | | | −0.8 | | | −0.8 | mA |
| | | Other inputs | | | | | −0.4 | | | −0.4 | |
| $I_{OS}$ | Short-circuit output current§ | | $V_{CC}$ = MAX | | −20 | | −100 | −20 | | −100 | mA |
| $I_{CC}$ | Supply current | | $V_{CC}$ = MAX, | See Note 2 | | 24 | 40 | | 24 | 40 | mA |

†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.
NOTE 2: $I_{CC}$ is measured with 4.5 V applied to all inputs and all outputs open.

## switching characteristics, $V_{CC}$ = 5 V, $T_A$ = 25°C

| PARAMETER | | TEST CONDITIONS | MIN | TYP | MAX | UNIT |
|---|---|---|---|---|---|---|
| $t_{PLH}$ | Propagation delay time, low-to-high-level output from clock | $C_L$ = 15 pF, $R_L$ = 2 kΩ, See Note 3 | | 20 | 30 | ns |
| $t_{PHL}$ | Propagation delay time, high-to-low-level output from clock | | | 20 | 30 | |
| $t_{PLH}$ | Propagation delay time, low-to-high-level output from strobe | | | 20 | 30 | ns |
| $t_{PHL}$ | Propagation delay time, high-to-low-level output from strobe | | | 20 | 30 | |

NOTE 3: See General Information Section for load circuits and voltage waveforms.