

SN54273, SN54LS273, SN74273, SN74LS273 OCTAL D-TYPE FLIP-FLOP WITH CLEAR

SDLS090 – OCTOBER 1976 – REVISED MARCH 1988

- Contains Eight Flip-Flops With Single-Rail Outputs
- Buffered Clock and Direct Clear Inputs
- Individual Data Input to Each Flip-Flop
- Applications Include:
 - Buffer/Storage Registers
 - Shift Registers
 - Pattern Generators

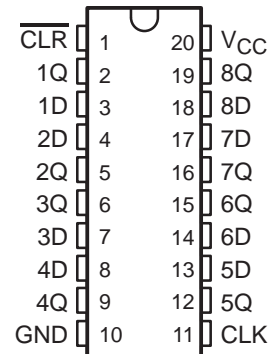
description

These monolithic, positive-edge-triggered flip-flops utilize TTL circuitry to implement D-type flip-flop logic with a direct clear input.

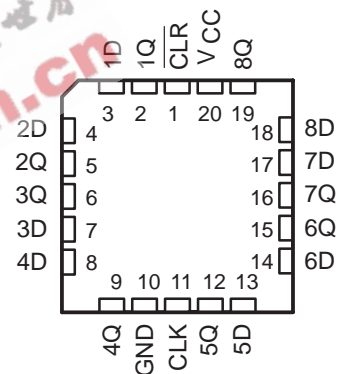
Information at the D inputs meeting the setup time requirements is transferred to the Q outputs on the positive-going edge of the clock pulse. Clock triggering occurs at a particular voltage level and is not directly related to the transition time of the positive-going pulse. When the clock input is at either the high or low level, the D input signal has no effect at the output.

These flip-flops are guaranteed to respond to clock frequencies ranging from 0 to 30 megahertz while maximum clock frequency is typically 40 megahertz. Typical power dissipation is 39 milliwatts per flip-flop for the '273 and 10 milliwatts for the 'LS273.

SN54273, SN74LS273 . . . J OR W PACKAGE
SN74273 . . . N PACKAGE
SN74LS273 . . . DW OR N PACKAGE
(TOP VIEW)



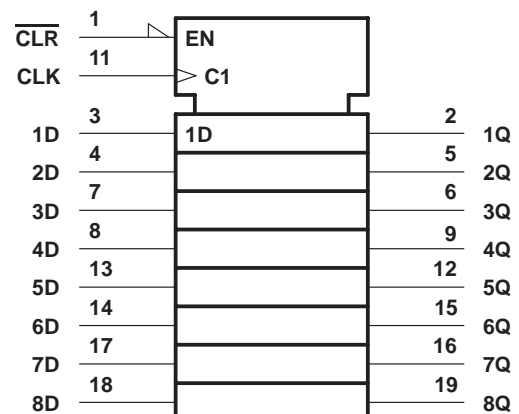
SN54LS273 . . . FK PACKAGE
(TOP VIEW)



FUNCTION TABLE
(each flip-flop)

| INPUTS | | | OUTPUT Q |
|--------|-------|---|----------------|
| CLEAR | CLOCK | D | |
| L | X | X | L |
| H | ↑ | H | H |
| H | ↑ | L | L |
| H | L | X | Q ₀ |

logic symbol†

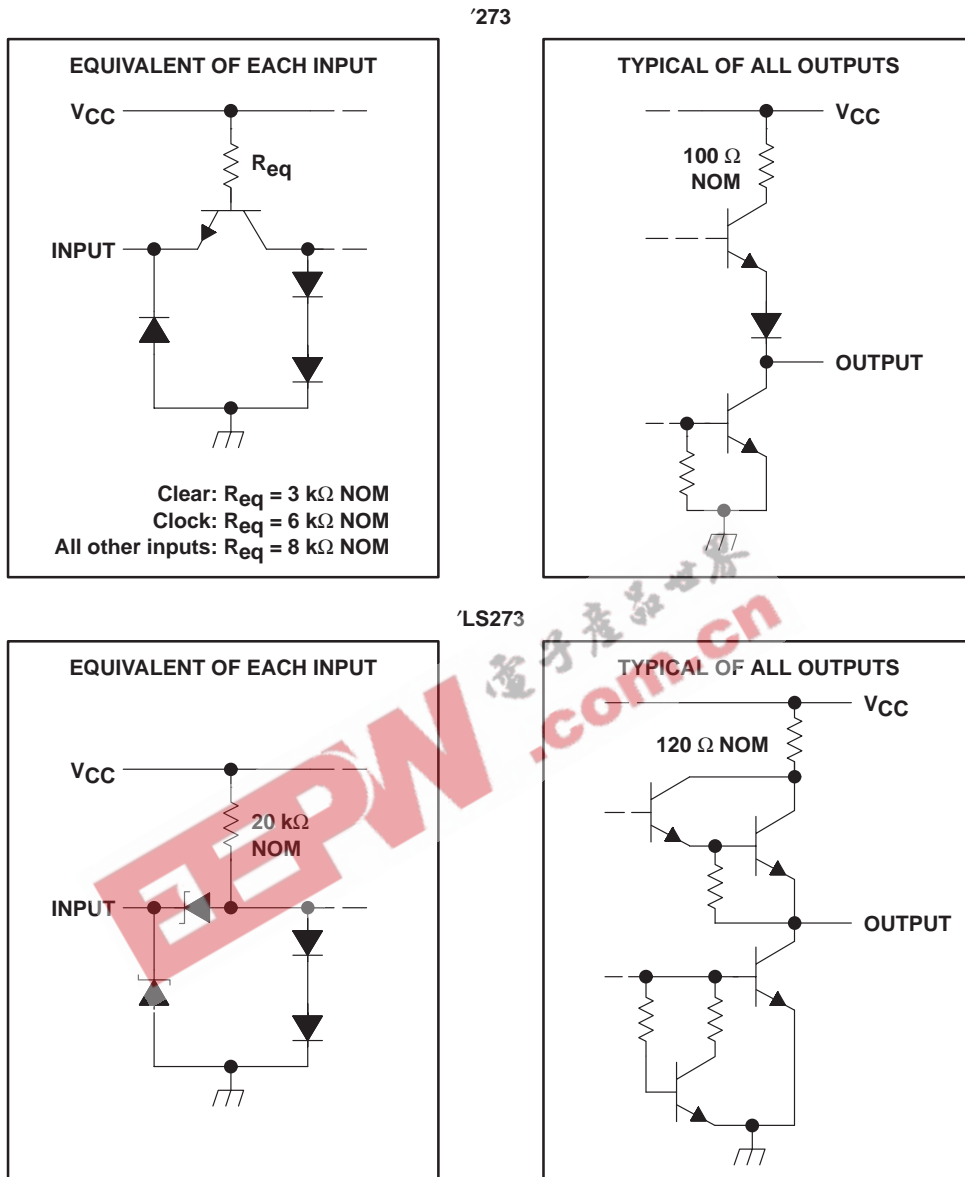


† This symbol is in accordance with ANSI/IEEE Std. 91-1984 and IEC Publication 617-12. Pin numbers shown are for the DW, J, N, and W packages.

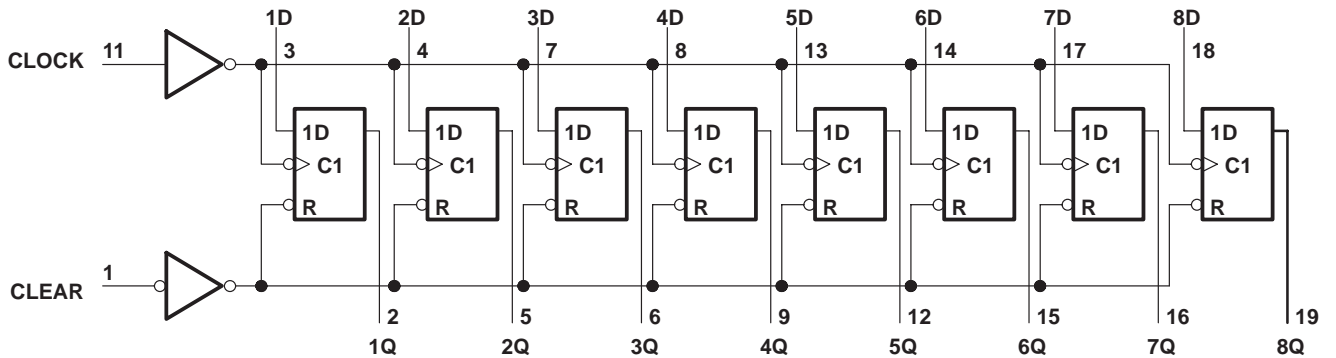
SN54273, SN54LS273, SN74273, SN74LS273 OCTAL D-TYPE FLIP-FLOP WITH CLEAR

SDLS090 – OCTOBER 1976 – REVISED MARCH 1988

schematics of inputs and outputs



logic diagram (positive logic)



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

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SDLS090 – OCTOBER 1976 – REVISED MARCH 1988

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

| | |
|---|----------------|
| Supply voltage, V_{CC} (see Note 1) | 7 V |
| Input voltage | 5.5 V |
| Operating free-air temperature range, T_A : SN54273 | -55°C to 125°C |
| SN74273 | 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

| | SN54273 | | | SN74273 | | | 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} | | | -800 | | | -800 | μ A |
| Low-level output current, I_{OL} | | | 16 | | | 16 | mA |
| Clock frequency, f_{clock} | 0 | | 30 | 0 | | 30 | MHz |
| Width of clock or clear pulse, t_w | 16.5 | | | 16.5 | | | ns |
| Setup time, t_{su} | Data input | 20 \uparrow | | 20 \uparrow | | | ns |
| | Clear inactive state | 25 \uparrow | | 25 \uparrow | | | |
| Data hold time, t_h | | 5 \uparrow | | 5 \uparrow | | | ns |
| Operating free-air temperature, T_A | -55 | | 125 | 0 | | 70 | °C |

\uparrow The arrow indicates that the rising edge of the clock pulse is used for reference.

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

| PARAMETER | | TEST CONDITIONS \dagger | MIN | TYP \ddagger | MAX | UNIT |
|-----------|--|--|--|----------------|------|---------|
| V_{IH} | High-level input voltage | | 2 | | | V |
| V_{IL} | Low-level input voltage | | | | 0.8 | V |
| V_{IK} | Input clamp voltage | $V_{CC} = \text{MIN}$, $I_I = -12 \text{ mA}$ | | | -1.5 | V |
| V_{OH} | High-level output voltage | $V_{CC} = \text{MIN}$, $V_{IL} = 0.8 \text{ V}$, $V_{IH} = 2 \text{ V}$, $I_{OH} = -800 \mu\text{A}$ | 2.4 | 3.4 | | V |
| V_{OL} | Low-level output voltage | $V_{CC} = \text{MIN}$, $V_{IL} = 0.8 \text{ V}$, $V_{IH} = 2 \text{ V}$, $I_{OH} = 16 \text{ mA}$ | | | 0.4 | V |
| I_I | Input current at maximum input voltage | $V_{CC} = \text{MAX}$, $V_I = 5.5 \text{ V}$ | | | 1 | mA |
| I_{IH} | High-level input current | Clear | | | 80 | μ A |
| | | Clock or D | $V_{CC} = \text{MAX}$, $V_I = 2.4 \text{ V}$ | | 40 | |
| I_{IL} | Low-level input current | Clear | | | -3.2 | mA |
| | | Clock or D | $V_{CC} = \text{MAX}$, $V_I = 0.4 \text{ V}$ | | -1.6 | |
| I_{OS} | Short-circuit output current \S | $V_{CC} = \text{MAX}$ | -18 | | -57 | mA |
| I_{CC} | Supply current | $V_{CC} = \text{MAX}$, See Note 2 | | 62 | 94 | mA |

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

\ddagger All typical values are at $V_{CC} = 5 \text{ V}$, $T_A = 25^\circ\text{C}$.

\S Not more than one output should be shorted at a time.

NOTE 2: With all outputs open and 4.5 V applied to all data and clear inputs, I_{CC} is measured after a momentary ground, then 4.5 V, is applied to clock.

SN54273, SN54LS273, SN74273, SN74LS273 OCTAL D-TYPE FLIP-FLOP WITH CLEAR

SDLS090 – OCTOBER 1976 – REVISED MARCH 1988

switching characteristics, $V_{CC} = 5\text{ V}$, $T_A = 25^\circ\text{C}$

| PARAMETER | TEST CONDITIONS | MIN | TYP | MAX | UNIT |
|---|---|-----|-----|-----|------|
| f_{\max} Maximum clock frequency | $C_L = 15\text{ pF}$, $R_L = 400\ \Omega$, See Note 3 | 30 | 40 | | MHz |
| t_{PHL} Propagation delay time, high-to-low-level output from clear | | | 18 | 27 | ns |
| t_{PLH} Propagation delay time, low-to-high-level output from clock | | | 17 | 27 | ns |
| t_{PHL} Propagation delay time, high-to-low-level output from clock | | | 18 | 27 | ns |

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

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, T_A : SN54LS273 | -55°C to 125°C |
| SN74LS273 | 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

| | SN54LS273 | | | SN74LS273 | | | 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 or clear pulse, t_w | 20 | | | 20 | | | ns |
| Setup time, t_{su} | Data input | 20 \uparrow | | 20 \uparrow | | | ns |
| | Clear inactive state | 25 \uparrow | | 25 \uparrow | | | |
| Data hold time, t_h | 5 \uparrow | | | 5 \uparrow | | | ns |
| Operating free-air temperature, T_A | -55 | | 125 | 0 | | 70 | $^\circ\text{C}$ |

\uparrow The arrow indicates that the rising edge of the clock pulse is used for reference.

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SDLS090 – OCTOBER 1976 – REVISED MARCH 1988

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

| PARAMETER | TEST CONDITIONS† | SN54LS273 | | | SN74LS273 | | | 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 _{IH} = 2 V, V _{IL} = V _{ILmax} , 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} = V _{ILmax} , I _{OL} = 4 mA | 0.25 | 0.4 | | 0.25 | 0.4 | | V |
| | | | | | 0.35 | 0.5 | | |
| I _I Input current at maximum input voltage | V _{CC} = MAX, V _I = 7 V | | | 0.1 | | | 0.1 | mA |
| I _{IH} High-level input current | V _{CC} = MAX, V _I = 2.7 V | | | 20 | | | 20 | μA |
| I _{IL} Low-level input current | V _{CC} = MAX, V _I = 0.4 V | | | -0.4 | | | -0.4 | mA |
| I _{OS} Short-circuit output current§ | V _{CC} = MAX | -20 | | -100 | -20 | | -100 | mA |
| I _{CC} Supply current | V _{CC} = MAX, See Note 2 | | 17 | 27 | | 17 | 27 | 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 short circuit should not exceed one second.

NOTE 2: With all outputs open and 4.5 V applied to all data and clear inputs, I_{CC} is measured after a momentary ground, then 4.5 V, is applied to clock.

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

| PARAMETER | TEST CONDITIONS | MIN | TYP | MAX | UNIT |
|--|---|-----|-----|-----|------|
| f _{max} Maximum clock frequency | C _L = 15 pF, R _L = 2 kΩ, See Note 3 | 30 | 40 | | MHz |
| t _{PHL} Propagation delay time, high-to-low-level output from clear | | | 18 | 27 | ns |
| t _{PLH} Propagation delay time, low-to-high-level output from clock | | | 17 | 27 | ns |
| t _{PHL} Propagation delay time, high-to-low-level output from clock | | | 18 | 27 | ns |

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

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