National Semiconductor

# 54LS273/DM74LS273
# 8-Bit Register with Clear

## General Description

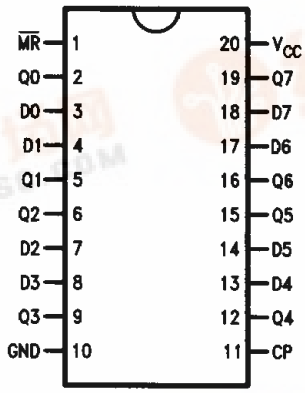
The 'LS273 is a high speed 8-bit register, consisting of eight D-type flip-flops with a common Clock and an asynchronous active LOW Master Reset. This device is supplied in a 20-pin package featuring 0.3 inch row spacing.

## Features

- Edge-triggered
- 8-bit high speed register
- Parallel in and out
- Common clock and master reset

## Connection Diagram

**Dual-In-Line Package**




TL/F/9825–1

**Order Number 54LS273DMQB, 54LS273FMQB, 54LS273LMQB, DM74LS273M or DM74LS273N**
**See NS Package Number E20A, J20A, M20B, N20A or W20A**

| Pin Names | Description |
|---|---|
| CP | Clock Pulse Input (Active Rising Edge) |
| D0–D7 | Data Inputs |
| $\overline{MR}$ | Asynchronous Master Reset Input (Active LOW) |
| Q0–Q7 | Flip-Flop Outputs |

## Absolute Maximum Ratings (Note)

**If Military/Aerospace specified devices are required, please contact the National Semiconductor Sales Office/Distributors for availability and specifications.**

| | |
|---|---|
| Supply Voltage | 7V |
| Input Voltage | 7V |
| Operating Free Air Temperature Range | |
| 54LS | −55°C to +125°C |
| DM74LS | 0°C to +70°C |
| Storage Temperature Range | −65°C to +150°C |

Note: *The "Absolute Maximum Ratings" are those values beyond which the safety of the device cannot be guaranteed. The device should not be operated at these limits. The parametric values defined in the "Electrical Characteristics" table are not guaranteed at the absolute maximum ratings. The "Recommended Operating Conditions" table will define the conditions for actual device operation.*

## Recommended Operating Conditions

| Symbol | Parameter | 54LS273 | | | DM74LS273 | | | Units |
|---|---|---|---|---|---|---|---|---|
| | | 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 |
| $I_{OH}$ | High Level Output Current | | | −0.4 | | | −0.4 | mA |
| $I_{OL}$ | Low Level Output Current | | | 4 | | | 8 | mA |
| $T_A$ | Free Air Operating Temperature | −55 | | 125 | 0 | | 70 | °C |
| $t_s(H)$<br>$t_s(L)$ | Setup Time HIGH or LOW<br>$D_n$ to CP | 15<br>15 | | | 15<br>15 | | | ns |
| $t_h(H)$<br>$t_h(L)$ | Hold Time HIGH or LOW<br>$D_n$ to CP | 5<br>5 | | | 5<br>5 | | | ns |
| $t_w(H)$<br>$t_w(L)$ | CP Pulse Width HIGH or LOW | 20<br>20 | | | 20<br>20 | | | ns |
| $t_w(L)$ | $\overline{MR}$ Pulse Width LOW | 20 | | | 20 | | | ns |
| $t_{rec}$ | Recovery Time<br>$\overline{MR}$ to CP | 15 | | | 15 | | | ns |

## Electrical Characteristics

Over recommended operating free air temperature range (unless otherwise noted)

| Symbol | Parameter | Conditions | | Min | Typ (Note 1) | Max | Units |
|---|---|---|---|---|---|---|---|
| $V_I$ | Input Clamp Voltage | $V_{CC}$ = Min, $I_I$ = −18 mA | | | | −1.5 | V |
| $V_{OH}$ | High Level Output Voltage | $V_{CC}$ = Min, $I_{OH}$ = Max, $V_{IL}$ = Max | 54LS | 2.5 | | | V |
| | | | DM74 | 2.7 | 3.4 | | |
| $V_{OL}$ | Low Level Output Voltage | $V_{CC}$ = Min, $I_{OL}$ = Max, $V_{IH}$ = Min | 54LS | | | 0.4 | V |
| | | | DM74 | | 0.35 | 0.5 | |
| | | $I_{OL}$ = 4 mA, $V_{CC}$ = Min | DM74 | | 0.25 | 0.4 | |
| $I_I$ | Input Current @ Max Input Voltage | $V_{CC}$ = Max, $V_I$ = 10V | | | | 0.1 | mA |
| $I_{IH}$ | High Level Input Current | $V_{CC}$ = Max, $V_I$ = 2.7V | | | | 20 | μA |
| $I_{IL}$ | Low Level Input Current | $V_{CC}$ = Max, $V_I$ = 0.4V | | | | −0.4 | mA |
| $I_{OS}$ | Short Circuit Output Current | $V_{CC}$ = Max (Note 2) | 54LS | −20 | | −100 | mA |
| | | | DM74 | −20 | | −100 | |
| $I_{CC}$ | Supply Current | $V_{CC}$ = Max | | | | 27 | mA |

**Note 1:** All typicals are at $V_{CC}$ = 5V, $T_A$ = 25°C.

**Note 2:** Not more than one output should be shorted at a time, and the duration should not exceed one second.

## Switching Characteristics

$V_{CC}$ = +5.0V, $T_A$ = +25°C (See Section 1 for waveforms and load configurations)

| Symbol | Parameter | $C_L$ = 15 pF | | | | Units |
|---|---|---|---|---|---|---|
| | | 54LS | | DM74LS | | |
| | | | | $R_L$ = 2 kΩ | | |
| | | Min | Max | Min | Max | |
| $f_{max}$ | Maximum Clock Frequency | 30 | | 30 | | MHz |
| $t_{PLH}$ | Propagation Delay CP to $Q_n$ | | 32 | | 24 | ns |
| $t_{PHL}$ | | | 32 | | 24 | |
| $t_{PLH}$ | Propagation Delay $\overline{MR}$ to $Q_n$ | | 32 | | 27 | ns |

## Functional Description

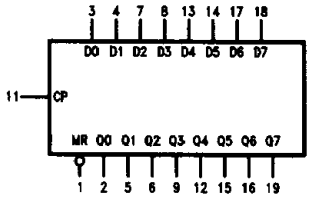
The 'LS273 is an 8-bit parallel register with a common Clock and common Master Reset. When the $\overline{MR}$ input is LOW, the Q outputs are LOW, independent of the other inputs. Information meeting the setup and hold time requirements of the D inputs is transferred to the Q outputs on the LOW-to-HIGH transition of the clock input.

## Truth Table

| Inputs MR | Inputs CP | Inputs $D_n$ | Outputs $Q_n$ |
|---|---|---|---|
| L | X | X | L |
| H | ↗ | H | H |
| H | ↗ | L | L |

H = HIGH Voltage Level
L = LOW Voltage Level
X = Immaterial

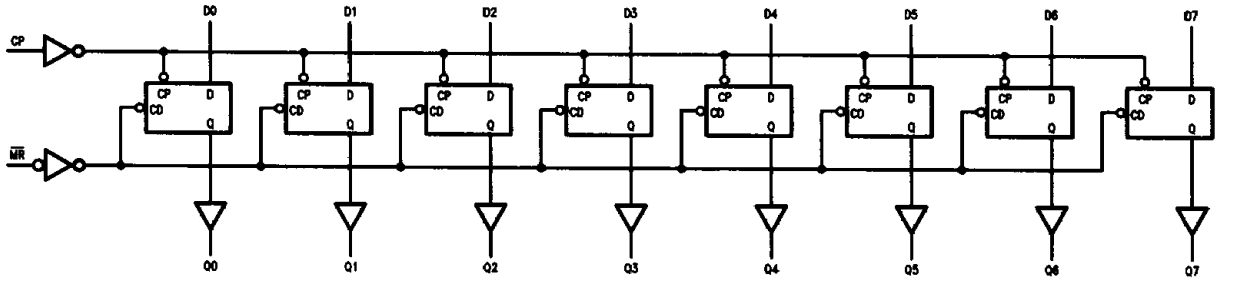
## Logic Symbol




TL/F/9825–2

$V_{CC}$ = Pin 20
GND = Pin 10

## Logic Diagram




TL/F/9825–3