

## DM74LS503

### 8-Bit Successive Approximation Register (with Expansion Control)

#### General Description

The DM74LS503 register has an active LOW Enable ( $\bar{E}$ ) input that is used in cascading two or more packages for longer word lengths. A HIGH signal on  $\bar{E}$ , after a START operation, forces Q7 HIGH and prevents the device from accepting serial data. With the  $\bar{E}$  input of an DM74LS503 connected to the  $\overline{CC}$  output of a preceding (more significant) device, the DM74LS503 will be inhibited until the preceding device is filled, causing its  $\overline{CC}$  output to go LOW. This LOW signal then enables the DM74LS503 to accept the serial data on subsequent clocks.

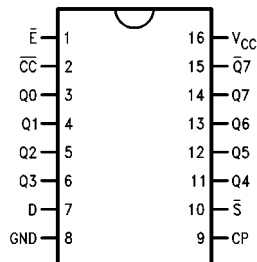
#### Features

- Performs serial-to-parallel conversion
- Expansion control for longer words
- Storage and control for successive approximation A to D conversion
- Low power Schottky version of 2503

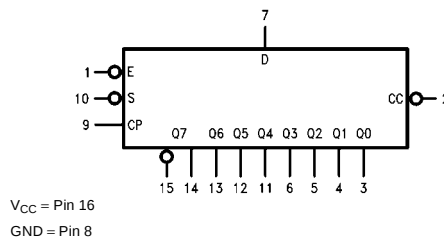
#### Ordering Code:

| Order Number | Package Number | Package Description                                                   |
|--------------|----------------|-----------------------------------------------------------------------|
| DM74LS503N   | N16E           | 16-Lead Plastic Dual-In-Line Package (PDIP), JEDEC MS-001, 0.300 Wide |

#### Connection Diagram



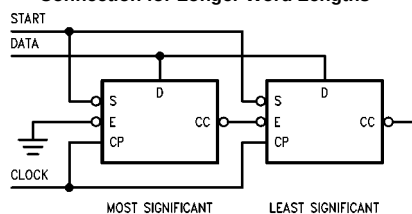
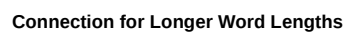
#### Logic Symbol



#### Pin Descriptions

| Pin Names       | Description                             |
|-----------------|-----------------------------------------|
| D               | Serial Data Input                       |
| $\bar{S}$       | Start Input (Active LOW)                |
| CP              | Clock Pulse Input (Active Rising Edge)  |
| $\bar{E}$       | Conversion Enable Input (Active LOW)    |
| $\overline{CC}$ | Conversion Complete Output (Active LOW) |
| Q0–Q7           | Parallel Register Outputs               |
| $\bar{Q}7$      | Complement of Q7 Output                 |

DM74LS503 8-Bit Successive Approximation Register



**Absolute Maximum Ratings**(Note 1)

|                                      |                 |
|--------------------------------------|-----------------|
| Supply Voltage                       | 7V              |
| Input Voltage                        | 7V              |
| Operating Free Air Temperature Range | 0°C to +70°C    |
| Storage Temperature Range            | –65°C to +150°C |

**Note 1:** 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 tables 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                      | Min  | Nom | Max  | Units |
|--------------------|--------------------------------|------|-----|------|-------|
| V <sub>CC</sub>    | Supply Voltage                 | 4.75 | 5   | 5.25 | V     |
| V <sub>IH</sub>    | HIGH Level Input Voltage       | 2    |     |      | V     |
| V <sub>IL</sub>    | LOW Level Input Voltage        |      |     | 0.8  | V     |
| I <sub>OH</sub>    | HIGH Level Output Voltage      |      |     | –0.4 | mA    |
| I <sub>OL</sub>    | LOW Level Output Current       |      |     | 8    | mA    |
| T <sub>A</sub>     | Free Air Operating Temperature | 0    |     | 70   | °C    |
| t <sub>S</sub> (H) | Setup Time HIGH or LOW         | 16   |     |      | ns    |
| t <sub>S</sub> (L) | $\bar{S}$ to CP                | 16   |     |      |       |
| t <sub>H</sub> (H) | Hold Time HIGH or LOW          | 0    |     |      | ns    |
| t <sub>H</sub> (L) | $\bar{S}$ to CP                | 0    |     |      |       |
| t <sub>S</sub> (H) | Setup Time HIGH or LOW         | 8    |     |      | ns    |
| t <sub>S</sub> (L) | D to CP                        | 8    |     |      |       |
| t <sub>H</sub> (H) | Hold Time HIGH or LOW          | 10   |     |      | ns    |
| t <sub>H</sub> (L) | D to CP                        | 10   |     |      |       |
| t <sub>W</sub> (H) | CP Pulse Width HIGH or LOW     | 46   |     |      | ns    |
| t <sub>W</sub> (L) |                                | 46   |     |      |       |

**Electrical Characteristics**

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

| Symbol          | Parameter                         | Conditions                                                          | Min | Typ<br>(Note 2) | Max  | Units |
|-----------------|-----------------------------------|---------------------------------------------------------------------|-----|-----------------|------|-------|
| V <sub>I</sub>  | Input Clamp Voltage               | V <sub>CC</sub> = Min, I <sub>I</sub> = –18 mA                      |     |                 | –1.5 | V     |
| V <sub>OH</sub> | HIGH Level Output Voltage         | V <sub>CC</sub> = Min, I <sub>OH</sub> = Max, V <sub>IL</sub> = Max | 2.7 |                 |      | V     |
| V <sub>OL</sub> | LOW Level Output Voltage          | V <sub>CC</sub> = Min, I <sub>OL</sub> = Max, V <sub>IH</sub> = Min |     |                 | 0.5  | V     |
|                 |                                   | I <sub>OL</sub> = 4 mA, V <sub>CC</sub> = Min                       |     |                 | 0.4  |       |
| I <sub>I</sub>  | Input Current @ Max Input Voltage | V <sub>CC</sub> = Max, V <sub>I</sub> = 7V<br>V <sub>I</sub> = 10V  |     |                 | 0.1  | mA    |
| I <sub>IH</sub> | HIGH Level Input Current          | V <sub>CC</sub> = Max, V <sub>I</sub> = 2.7V                        |     |                 | 20   | μA    |
| I <sub>IL</sub> | LOW Level Input Current           | V <sub>CC</sub> = Max, V <sub>I</sub> = 0.4V                        |     |                 | –0.8 | mA    |
| I <sub>OS</sub> | Short Circuit Output Current      | V <sub>CC</sub> = Max (Note 3)                                      | –20 |                 | –100 | mA    |
| I <sub>CC</sub> | Supply Current                    | V <sub>CC</sub> = Max                                               |     |                 | 65   | mA    |

**Note 2:** All typicals are at V<sub>CC</sub> = 5V, T<sub>A</sub> = 25°C.

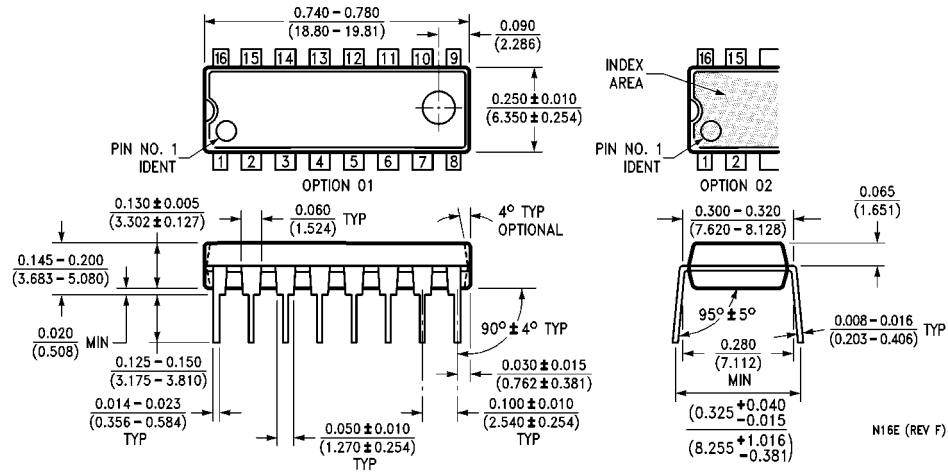
**Note 3:** Not more than one output should be shorted at a time, and the duration should not exceed one second.

**Switching Characteristics**

V<sub>CC</sub> = +5.0V, T<sub>A</sub> = +25°C

| Symbol           | Parameter               | R <sub>L</sub> = 2 kΩ, C <sub>L</sub> = 15 pF |     | Units |
|------------------|-------------------------|-----------------------------------------------|-----|-------|
|                  |                         | Min                                           | Max |       |
| f <sub>MAX</sub> | Maximum Count Frequency | 15                                            |     | MHz   |
| t <sub>PLH</sub> | Propagation Delay       |                                               | 35  | ns    |
| t <sub>PHL</sub> | CP to Qn or CC          |                                               | 25  |       |
| t <sub>PLH</sub> | Propagation Delay       |                                               | 20  | ns    |
| t <sub>PHL</sub> | $\bar{E}$ to Q7         |                                               | 24  |       |

## Physical Dimensions inches (millimeters) unless otherwise noted



16-Lead Plastic Dual-In-Line Package (PDIP), JEDEC MS-001, 0.300 Wide Package Number N16E

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