

## CD4015BC Dual 4-Bit Static Shift Register

### General Description

The CD4015BC contains two identical, 4-stage, serial-input/parallel-output registers with independent "Data", "Clock," and "Reset" inputs. The logic level present at the input of each stage is transferred to the output of that stage at each positive-going clock transition. A logic high on the "Reset" input resets all four stages covered by that input. All inputs are protected from static discharge by a series resistor and diode clamps to  $V_{DD}$  and  $V_{SS}$ .

### Features

- Wide supply voltage range: 3.0V to 18V
- High noise immunity:  $0.45 V_{DD}$  (typ.)
- Low power TTL: Fan out of 2 driving 74L compatibility: or 1 driving 74LS
- Medium speed operation: 8 MHz (typ.) clock rate
- Fully static design: @  $V_{DD} - V_{SS} = 10V$

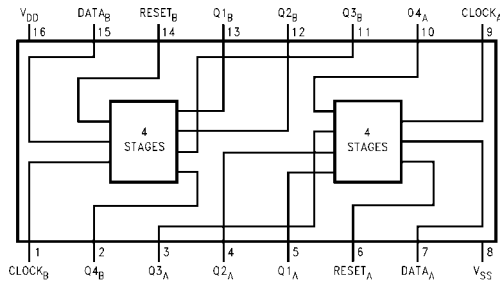
### Applications

- Serial-input/parallel-output data queueing
- Serial to parallel data conversion
- General purpose register

### Ordering Code:

| Order Number | Package Number | Package Description  |
|--------------|----------------|--|
| CD4015BCM    | M16A           | 16-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-012, 0.150" Narrow |
| CD4015BCN    | N16E           | 16-Lead Plastic Dual-In-Line Package (PDIP), JEDEC MS-001, 0.300" Wide       |

### Connection Diagram



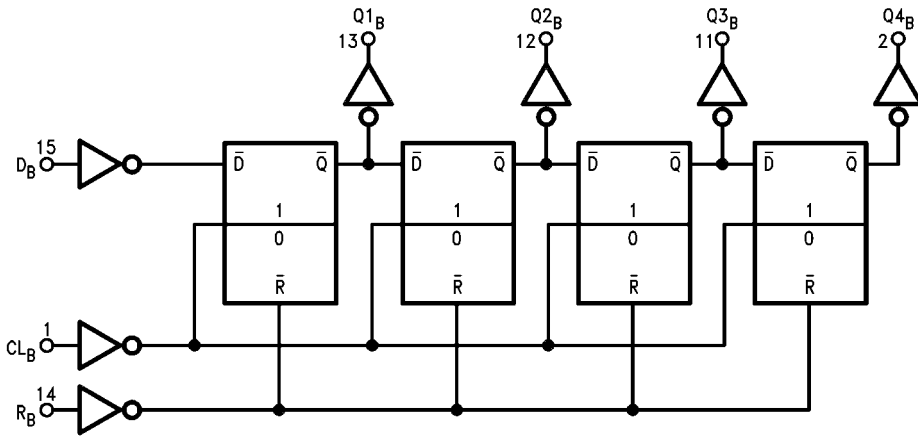
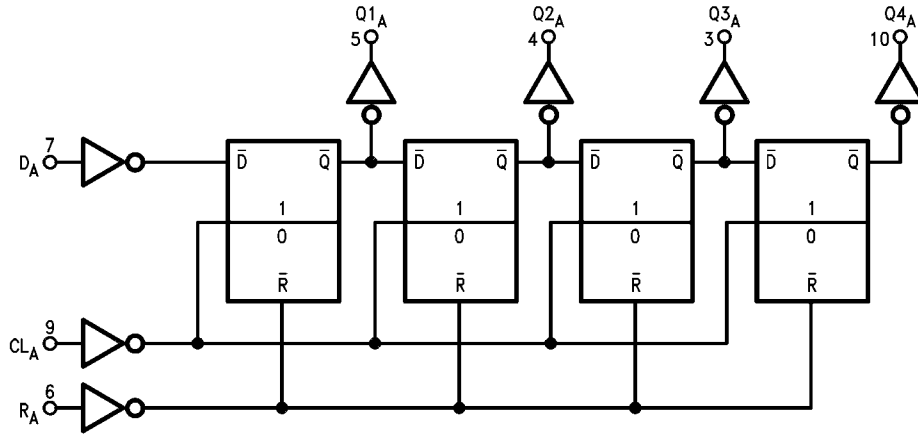
### Truth Table

| CL (Note 1) | D | R | Q <sub>1</sub> | Q <sub>n</sub>   |             |
|-------------|---|---|----------------|------------------|-------------|
| ↘           | 0 | 0 | 0              | Q <sub>n-1</sub> | (No change) |
| ↗           | 1 | 0 | 1              | Q <sub>n-1</sub> |             |
| ↖           | X | 0 | Q <sub>1</sub> | Q <sub>n</sub>   |             |
| X           | X | 1 | 0              | 0                |             |

X = Don't Care Case

Note 1: Level Change

Logic Diagrams



Terminal No. 16 = V<sub>DD</sub>  
 Terminal No. 8 = GND

| Absolute Maximum Ratings <sup>(Note 2)</sup> |                               | Recommended Operating Conditions      |                      |
|--|-------------------------------|---------------------------------------|----------------------|
| <sup>(Note 3)</sup>                          |                               |                                       |                      |
| DC Supply Voltage ( $V_{DD}$ )               | -0.5 to +18 $V_{DC}$          | DC Supply Voltage ( $V_{DD}$ )        | +3 to +15 $V_{DC}$   |
| Input Voltage ( $V_{IN}$ )                   | -0.5 to $V_{DD} + 0.5 V_{DC}$ | Input Voltage ( $V_{IN}$ )            | 0 to $V_{DD} V_{DC}$ |
| Storage Temperature Range ( $T_S$ )          | -65°C to +150°C               | Operating Temperature Range ( $T_A$ ) | -55°C to +125°C      |
| Power Dissipation ( $P_D$ )                  |                               |                                       |                      |
| Dual-In-Line                                 | 700 mW                        |                                       |                      |
| Small Outline                                | 500 mW                        |                                       |                      |
| Lead Temperature ( $T_L$ )                   |                               |                                       |                      |
| (Soldering, 10 seconds)                      | 260°C                         |                                       |                      |

**Note 2:** "Absolute Maximum Ratings" are those values beyond which the safety of the device cannot be guaranteed; they are not meant to imply that the devices should be operated at these limits. The tables of "Recommended Operating Conditions" and "Electrical Characteristics" provide conditions for actual device operation.

**Note 3:**  $V_{SS} = 0V$  unless otherwise specified.

### DC Electrical Characteristics <sup>(Note 3)</sup>

| Symbol   | Parameter                          | Conditions                                  | -55°C             |      | +25°C |            |      | +125°C |      | Units   |      |
|----------|------------------------------------|---|-------------------|------|-------|------------|------|--------|------|---------|------|
|          |                                    |   | Min               | Max  | Min   | Typ        | Max  | Min    | Max  |         |      |
| $I_{DD}$ | Quiescent Device Current           | $V_{DD} = 5V, V_{IN} = V_{DD}$ or $V_{SS}$  |                   | 5    |       | 0.005      | 5    |        | 150  | $\mu A$ |      |
|          |                                    | $V_{DD} = 10V, V_{IN} = V_{DD}$ or $V_{SS}$ |                   | 10   |       | 0.010      | 10   |        | 300  |         |      |
|          |                                    | $V_{DD} = 15V, V_{IN} = V_{DD}$ or $V_{SS}$ |                   | 20   |       | 0.015      | 20   |        | 600  |         |      |
| $V_{OL}$ | LOW Level Output Voltage           | $V_{DD} = 5V$                               |                   | 0.05 |       | 0          | 0.05 |        | 0.05 | V       |      |
|          |                                    | $V_{DD} = 10V$                              | $ I_O  < 1 \mu A$ |      | 0.05  |            | 0    | 0.05   |      |         | 0.05 |
|          |                                    | $V_{DD} = 15V$                              |                   |      | 0.05  |            | 0    | 0.05   |      |         | 0.05 |
| $V_{OH}$ | HIGH Level Output Voltage          | $V_{DD} = 5V$                               | 4.95              |      | 4.95  | 5          |      | 4.95   |      | V       |      |
|          |                                    | $V_{DD} = 10V$                              | 9.95              |      | 9.95  | 10         |      | 9.95   |      |         |      |
|          |                                    | $V_{DD} = 15V$                              | 14.95             |      | 14.95 | 15         |      | 14.95  |      |         |      |
| $V_{IL}$ | LOW Level Input Voltage            | $V_{DD} = 5V, V_O = 0.5V$ or $4.5V$         |                   | 1.5  |       | 2.25       | 1.5  |        | 1.5  | V       |      |
|          |                                    | $V_{DD} = 10V, V_O = 1.0V$ or $9.0V$        |                   | 3.0  |       | 4.50       | 3.0  |        | 3.0  |         |      |
|          |                                    | $V_{DD} = 15V, V_O = 1.5V$ or $13.5V$       |                   | 4.0  |       | 6.75       | 4.0  |        | 4.0  |         |      |
| $V_{IH}$ | HIGH Level Input Voltage           | $V_{DD} = 5V, V_O = 0.5V$ or $4.5V$         | 3.5               |      | 3.5   | 2.75       |      | 3.5    |      | V       |      |
|          |                                    | $V_{DD} = 10V, V_O = 1.0V$ or $9.0V$        | 7.0               |      | 7.0   | 5.50       |      | 7.0    |      |         |      |
|          |                                    | $V_{DD} = 15V, V_O = 1.5V$ or $13.5V$       | 11.0              |      | 11.0  | 8.25       |      | 11.0   |      |         |      |
| $I_{OL}$ | LOW Level Output Current (Note 4)  | $V_{DD} = 5V, V_O = 0.4V$                   | 0.64              |      | 0.51  | 0.88       |      | 0.36   |      | mA      |      |
|          |                                    | $V_{DD} = 10V, V_O = 0.5V$                  | 1.6               |      | 1.3   | 2.25       |      | 0.9    |      |         |      |
|          |                                    | $V_{DD} = 15V, V_O = 1.5V$                  | 4.2               |      | 3.4   | 8.8        |      | 2.4    |      |         |      |
| $I_{OH}$ | HIGH Level Output Current (Note 4) | $V_{DD} = 5V, V_O = 4.6V$                   | -0.64             |      | -0.51 | -0.88      |      | -0.36  |      | mA      |      |
|          |                                    | $V_{DD} = 10V, V_O = 9.5V$                  | -1.6              |      | -1.3  | -2.25      |      | -0.9   |      |         |      |
|          |                                    | $V_{DD} = 15V, V_O = 13.5V$                 | -4.2              |      | -3.4  | -8.8       |      | -2.4   |      |         |      |
| $I_{IN}$ | Input Current                      | $V_{DD} = 15V, V_{IN} = 0V$                 |                   | -0.1 |       | $-10^{-5}$ | -0.1 |        | -1.0 | $\mu A$ |      |
|          |                                    | $V_{DD} = 15V, V_{IN} = 15V$                |                   | 0.1  |       | $10^{-5}$  | 0.1  |        | 1.0  |         |      |

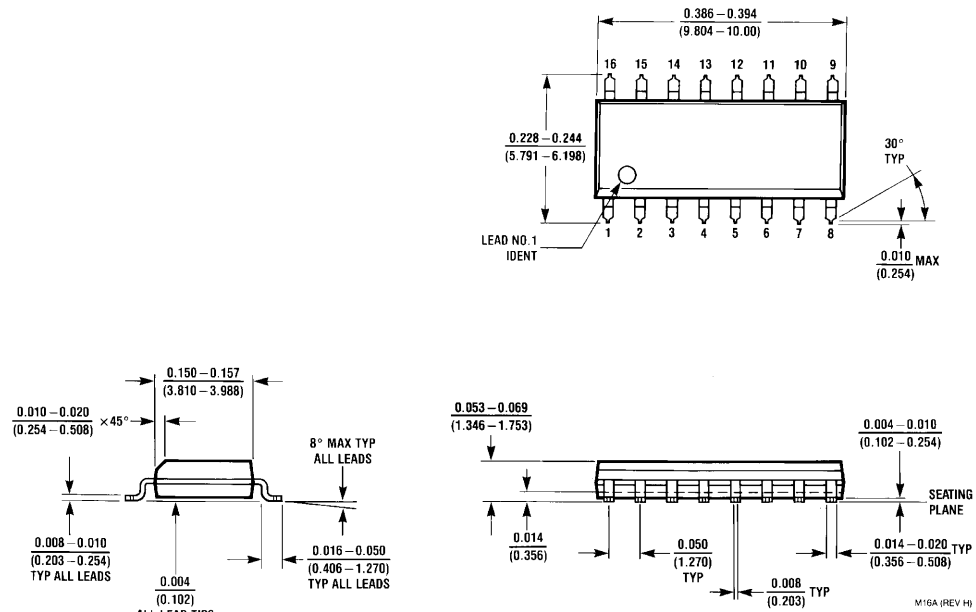
**Note 4:**  $I_{OH}$  and  $I_{OL}$  are tested one output at a time.

**AC Electrical Characteristics** (Note 5)T<sub>A</sub> = 25°C, C<sub>L</sub> = 50 pF, R<sub>L</sub> = 200k, t<sub>r</sub> = t<sub>f</sub> = 20 ns, unless otherwise specified

| Symbol                              | Parameter                 | Conditions   | Min           | Typ              | Max               | Units |
|-------------------------------------|---------------------------|--|---------------|------------------|-------------------|-------|
| <b>CLOCK OPERATION</b>              |                           |  |               |                  |                   |       |
| t <sub>PHL</sub> , t <sub>PLH</sub> | Propagation Delay Time    | V <sub>DD</sub> = 5V<br>V <sub>DD</sub> = 10V<br>V <sub>DD</sub> = 15V |               | 230<br>80<br>60  | 350<br>160<br>120 | ns    |
| t <sub>THL</sub> , t <sub>TLH</sub> | Transition Time           | V <sub>DD</sub> = 5V<br>V <sub>DD</sub> = 10V<br>V <sub>DD</sub> = 15V |               | 100<br>50<br>40  | 200<br>100<br>80  | ns    |
| t <sub>WL</sub> , t <sub>WM</sub>   | Minimum Clock Pulse-Width | V <sub>DD</sub> = 5V<br>V <sub>DD</sub> = 10V<br>V <sub>DD</sub> = 15V |               | 160<br>60<br>50  | 250<br>110<br>85  | ns    |
| t <sub>rCL</sub> , t <sub>fCL</sub> | Clock Rise and Fall Time  | V <sub>DD</sub> = 5V<br>V <sub>DD</sub> = 10V<br>V <sub>DD</sub> = 15V |               |                  | 15<br>15<br>15    | μs    |
| t <sub>SU</sub>                     | Minimum Data Set-Up Time  | V <sub>DD</sub> = 5V<br>V <sub>DD</sub> = 10V<br>V <sub>DD</sub> = 15V |               | 50<br>20<br>15   | 100<br>40<br>30   | μs    |
| f <sub>CL</sub>                     | Maximum Clock Frequency   | V <sub>DD</sub> = 5V<br>V <sub>DD</sub> = 10V<br>V <sub>DD</sub> = 15V | 2<br>4.5<br>6 | 3.5<br>8<br>11   |                   | MHz   |
| C <sub>IN</sub>                     | Input Capacitance         | Clock Input<br>Other Inputs  |               | 7.5<br>5         | 10<br>7.5         | pF    |
| <b>RESET OPERATION</b>              |                           |  |               |                  |                   |       |
| t <sub>PHL(R)</sub>                 | Propagation Delay Time    | V <sub>DD</sub> = 5V<br>V <sub>DD</sub> = 10V<br>V <sub>DD</sub> = 15V |               | 200<br>100<br>80 | 400<br>200<br>160 | ns    |
| t <sub>WH(R)</sub>                  | Minimum Reset Pulse Width | V <sub>DD</sub> = 5V<br>V <sub>DD</sub> = 10V<br>V <sub>DD</sub> = 15V |               | 135<br>40<br>30  | 250<br>80<br>60   | ns    |

**Note 5:** AC Parameters are guaranteed by DC correlated testing.

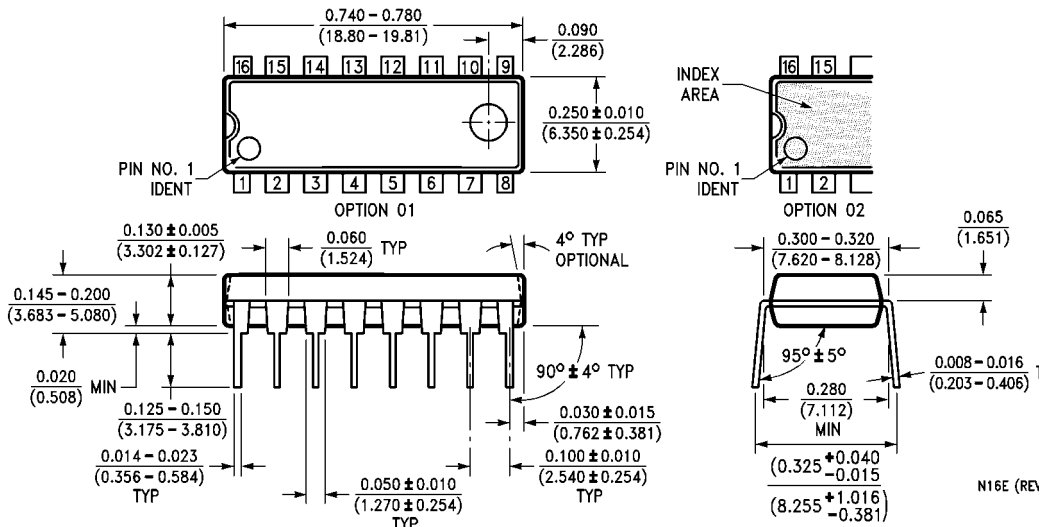
**Physical Dimensions** inches (millimeters) unless otherwise noted



**16-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-012, 0.150" Narrow Package Number M16A**

M16A (REV H)

**Physical Dimensions** inches (millimeters) unless otherwise noted (Continued)



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

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