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October 1987  
Revised January 2004

## 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: @  $V_{DD} - V_{SS} = 10V$

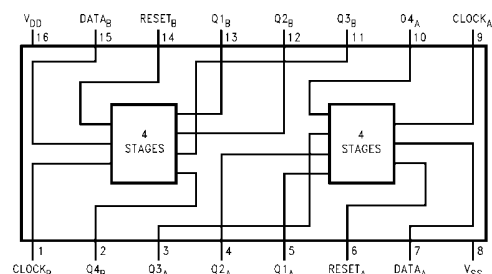
### Applications

- Serial-input/parallel-output data queuing
- 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



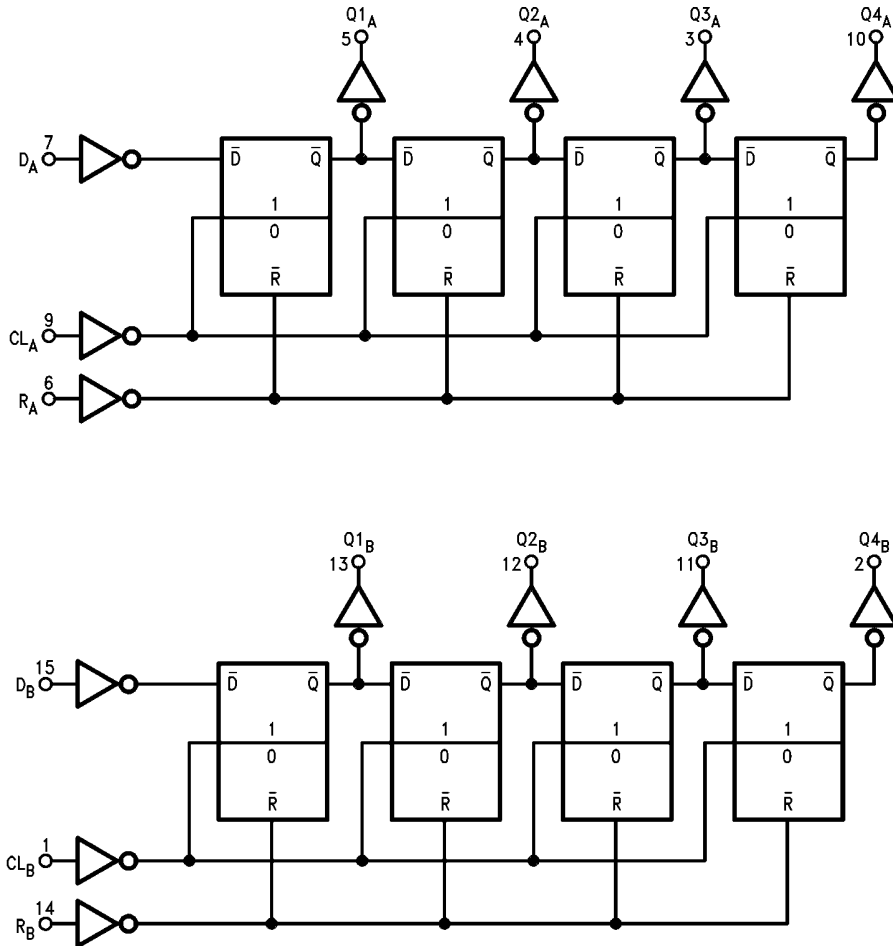
### Truth Table

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

X = Don't Care Case  
**Note 1:** Level Change

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**Logic Diagrams**



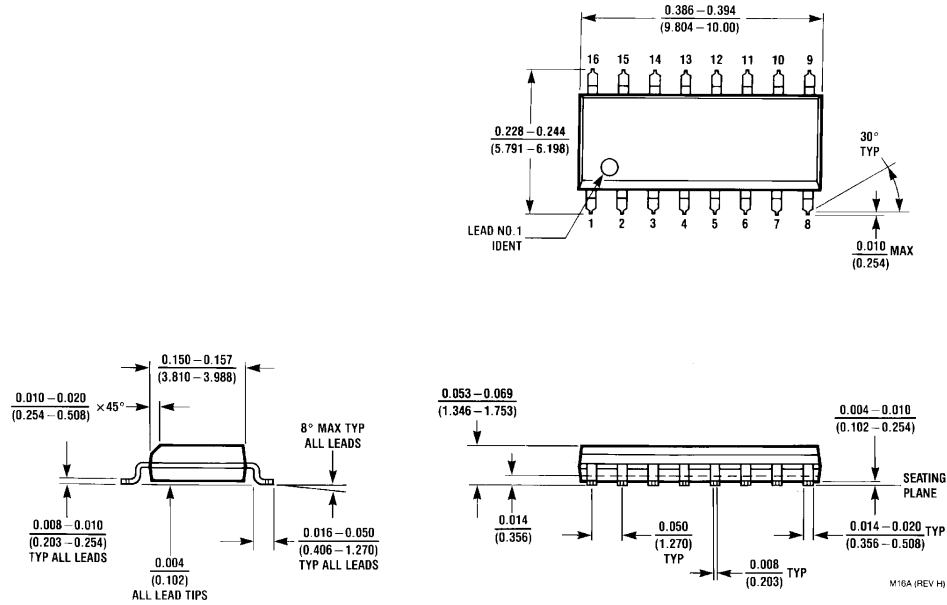
Terminal No. 16 =  $V_{DD}$   
 Terminal No. 8 = GND

Absolute Maximum Ratings (Note 2)		Recommended Operating Conditions								
(Note 3)										
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									
<p><b>Note 2:</b> "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.</p> <p><b>Note 3:</b> <math>V_{SS} = 0V</math> unless otherwise specified.</p>										
DC Electrical Characteristics (Note 3)										
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	
<p><b>Note 4:</b> <math>I_{OH}</math> and <math>I_{OL}</math> are tested one output at a time.</p>										

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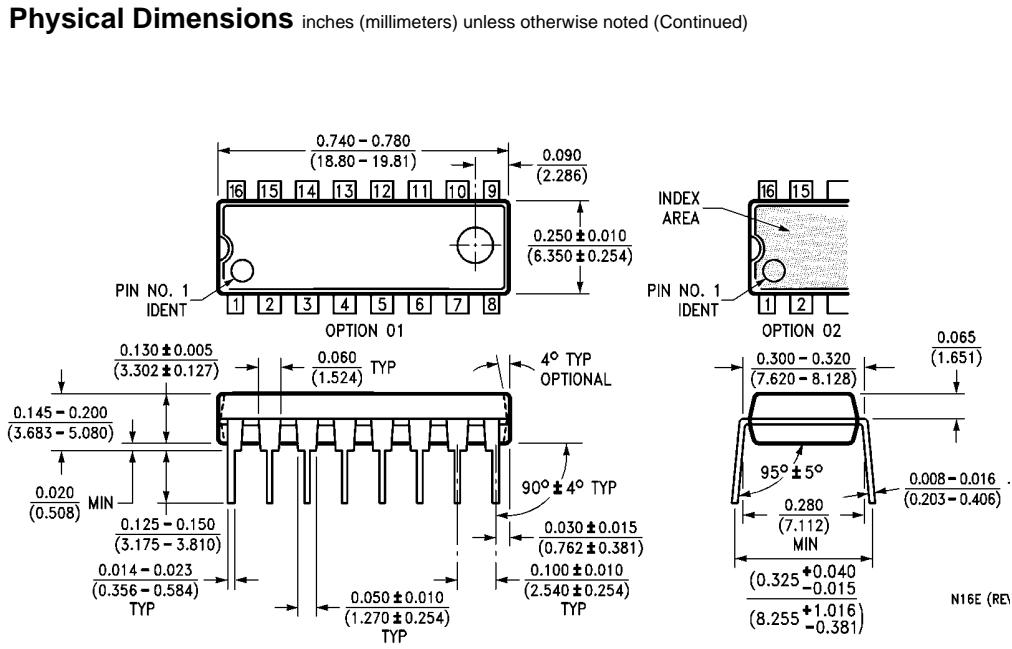
<b>AC Electrical Characteristics</b> (Note 5)						
T <sub>A</sub> = 25°C, C <sub>L</sub> = 50 pF, R <sub>L</sub> = 200k, t <sub>r</sub> = t <sub>f</sub> = 20 ns, unless otherwise specified						
Symbol	Parameter	Conditions	Min	Typ	Max	Units
<b>CLOCK OPERATION</b>						
t <sub>PHL</sub> , t <sub>PLH</sub>	Propagation Delay Time	V <sub>DD</sub> = 5V V <sub>DD</sub> = 10V V <sub>DD</sub> = 15V		230 80 60	350 160 120	ns
t <sub>THL</sub> , t <sub>TLH</sub>	Transition Time	V <sub>DD</sub> = 5V V <sub>DD</sub> = 10V V <sub>DD</sub> = 15V		100 50 40	200 100 80	ns
t <sub>WL</sub> , t <sub>WM</sub>	Minimum Clock Pulse-Width	V <sub>DD</sub> = 5V V <sub>DD</sub> = 10V V <sub>DD</sub> = 15V		160 60 50	250 110 85	ns
t <sub>rCL</sub> , t <sub>fCL</sub>	Clock Rise and Fall Time	V <sub>DD</sub> = 5V V <sub>DD</sub> = 10V V <sub>DD</sub> = 15V			15 15 15	μs
t <sub>SU</sub>	Minimum Data Set-Up Time	V <sub>DD</sub> = 5V V <sub>DD</sub> = 10V V <sub>DD</sub> = 15V		50 20 15	100 40 30	μs
f <sub>CL</sub>	Maximum Clock Frequency	V <sub>DD</sub> = 5V V <sub>DD</sub> = 10V V <sub>DD</sub> = 15V	2 4.5 6	3.5 8 11		MHz
C <sub>IN</sub>	Input Capacitance	Clock Input Other Inputs		7.5 5	10 7.5	pF
<b>RESET OPERATION</b>						
t <sub>PHL(R)</sub>	Propagation Delay Time	V <sub>DD</sub> = 5V V <sub>DD</sub> = 10V V <sub>DD</sub> = 15V		200 100 80	400 200 160	ns
t <sub>WH(R)</sub>	Minimum Reset Pulse Width	V <sub>DD</sub> = 5V V <sub>DD</sub> = 10V V <sub>DD</sub> = 15V		135 40 30	250 80 60	ns
<b>Note 5:</b> 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**

CD4015BC Dual 4-Bit Static Shift Register



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