FAIRCHILD

SEMICONDUCTOR™

October 1987
Revised January 1999

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

Devices also available in Tape and Reel. Specify by appending the suffix letter "X" to the ordering code.
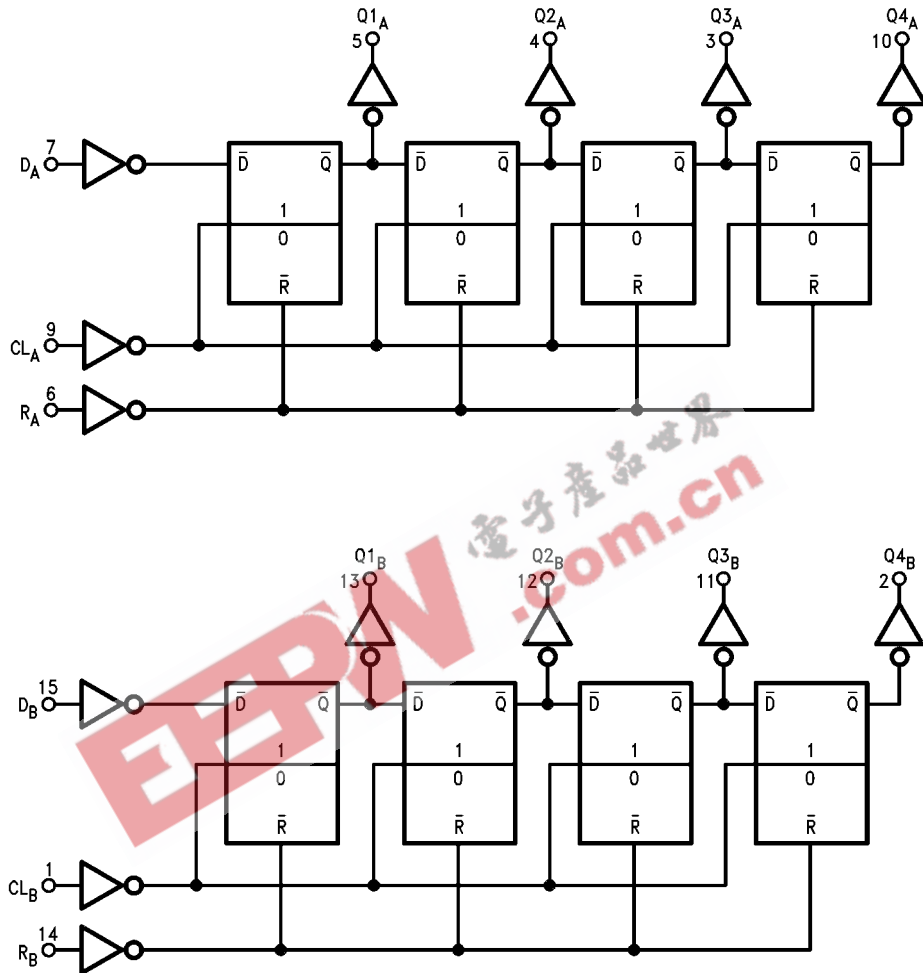
Connection Diagram

Pin Assignments for DIP and SOIC
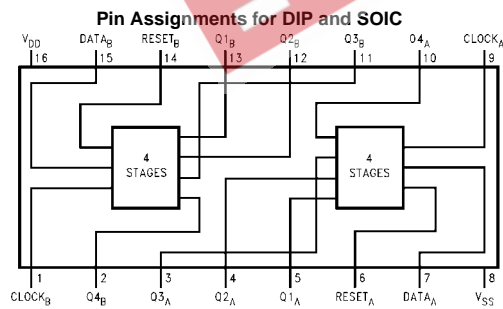
Truth Table

CL (Note 1)	D	R	Q_1	Q_n	
⌐	0	0	0	Q_{n-1}	
⌐	1	0	1	Q_{n-1}	
⌐	X	0	Q_1	Q_n	(No change)
X	X	1	0	0	

X = Don't Care Case

Note 1: Level Change

Logic Diagrams

Terminal No. 16 = V$_{DD}$
Terminal No. 8 = GND

Absolute Maximum Ratings (Note 2)

(Note 3)

DC Supply Voltage (V_{DD})	−0.5 to +18 V_{DC}
Input Voltage (V_{IN})	−0.5 to V_{DD} +0.5 V_{DC}
Storage Temperature Range (T_S)	−65°C to +150°C
Power Dissipation (P_D)	
Dual-In-Line	700 mW
Small Outline	500 mW
Lead Temperature (T_L)	
(Soldering, 10 seconds)	260°C

Recommended Operating Conditions

DC Supply Voltage (V_{DD})	+3 to +15 V_{DC}
Input Voltage (V_{IN})	0 to V_{DD} V_{DC}
Operating Temperature Range (T_A)	−40°C to +85°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 (Note 3)

Symbol	Parameter	Conditions	−40°C Min	−40°C Max	+25°C Min	+25°C Typ	+25°C Max	+85°C Min	+85°C Max	Units
I_{DD}	Quiescent Device Current	V_{DD} = 5V, V_{IN} = V_{DD} or V_{SS}		20		0.005	20		150	µA
		V_{DD} = 10V, V_{IN} = V_{DD} or V_{SS}		40		0.010	40		300	µA
		V_{DD} = 15V, V_{IN} = V_{DD} or V_{SS}		80		0.015	80		600	µA
V_{OL}	LOW Level Output Voltage	V_{DD} = 5V		0.05		0	0.05		0.05	V
		V_{DD} = 10V		0.05		0	0.05		0.05	V
		V_{DD} = 15V		0.05		0	0.05		0.05	V
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
		V_{DD} = 15V	14.95		14.95	15		14.95		V
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
		V_{DD} = 15V, V_O = 1.5V or 13.5V		4.0		6.75	4.0		4.0	V
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
		V_{DD} = 15V, V_O = 1.5V or 13.5V	11.0		11.0	8.25		11.0		V
I_{OL}	LOW Level Output Current (Note 4)	V_{DD} = 5V, V_O = 0.4V	0.52		0.44	0.88		0.36		mA
		V_{DD} = 10V, V_O = 0.5V	1.3		1.1	2.25		0.9		mA
		V_{DD} = 15V, V_O = 1.5V	3.6		3.0	8.8		2.4		mA
I_{OH}	HIGH Level Output Current (Note 4)	V_{DD} = 5V, V_O = 4.6V	−0.52		−0.44	−0.88		−0.36		mA
		V_{DD} = 10V, V_O = 9.5V	−1.3		−1.1	−2.25		−0.9		mA
		V_{DD} = 15V, V_O = 13.5V	−3.6		−3.0	−8.8		−2.4		mA
I_{IN}	Input Current	V_{DD} = 15V, V_{IN} = 0V		−0.3		$−10^{-5}$	−0.3		−1.0	µA
		V_{DD} = 15V, V_{IN} = 15V		0.3		10^{-5}	0.3		1.0	µA

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

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CD4015BC

AC Electrical Characteristics (Note 5)

T_A = 25°C, C_L = 50 pF, R_L = 200k, t_r = t_f = 20 ns, unless otherwise specified

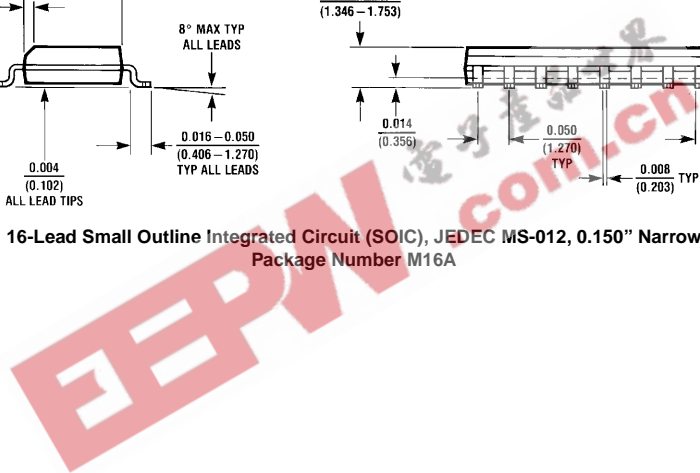| Symbol	Parameter	Conditions	Min	Typ	Max	Units
CLOCK OPERATION						
t_{PHL}, t_{PLH}	Propagation Delay Time	V_{DD} = 5V		230	350	ns
		V_{DD} = 10V		80	160	ns
		V_{DD} = 15V		60	120	ns
t_{THL}, t_{TLH}	Transition Time	V_{DD} = 5V		100	200	ns
		V_{DD} = 10V		50	100	ns
		V_{DD} = 15V		40	80	ns
t_{WL},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

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

Physical Dimensions inches (millimeters) unless otherwise noted

0.386 − 0.394
(9.804 − 10.00)

16 15 14 13 12 11 10 9

0.228 − 0.244
(5.791 − 6.198)

30°
TYP

LEAD NO.1
IDENT

1 2 3 4 5 6 7 8

0.010
(0.254) MAX

0.150 − 0.157
(3.810 − 3.988)

0.010 − 0.020
(0.254 − 0.508) ×45°

8° MAX TYP
ALL LEADS

0.008 − 0.010
(0.203 − 0.254)
TYP ALL LEADS

0.004
(0.102)
ALL LEAD TIPS

0.016 − 0.050
(0.406 − 1.270)
TYP ALL LEADS

0.053 − 0.069
(1.346 − 1.753)

0.004 − 0.010
(0.102 − 0.254)

SEATING
PLANE

0.014
(0.356)

0.050
(1.270)
TYP

0.008
(0.203) TYP

0.014 − 0.020
(0.356 − 0.508) TYP

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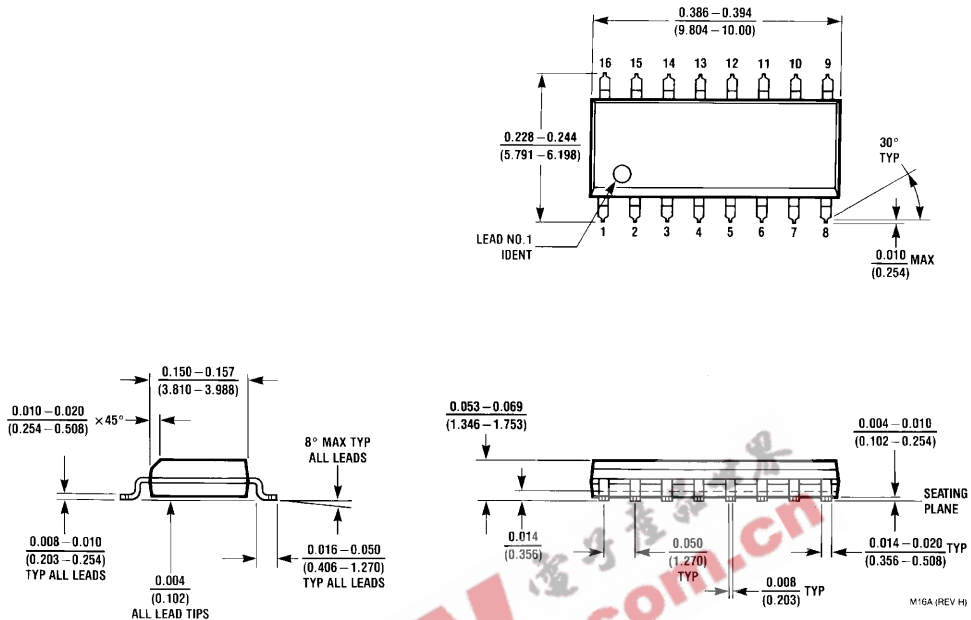
16-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-012, 0.150" Narrow
Package Number M16A

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

```
0.740 – 0.780
(18.80 – 19.81)

0.090
(2.286)

16 15 14 13 12 11 10 9

0.250 ± 0.010
(6.350 ± 0.254)

PIN NO. 1
IDENT

1  2  3  4  5  6  7  8

OPTION 01
```

```
INDEX
AREA

16 15

PIN NO. 1
IDENT

1  2

OPTION 02
```

```
0.130 ± 0.005
(3.302 ± 0.127)

0.060
(1.524) TYP

4° TYP
OPTIONAL

0.145 – 0.200
(3.683 – 5.080)

0.020
(0.508) MIN

90° ± 4° TYP

0.125 – 0.150
(3.175 – 3.810)

0.030 ± 0.015
(0.762 ± 0.381)

0.014 – 0.023
(0.356 – 0.584)
TYP

0.100 ± 0.010
(2.540 ± 0.254)
TYP

0.050 ± 0.010
(1.270 ± 0.254)
TYP
```

```
0.300 – 0.320
(7.620 – 8.128)

0.065
(1.651)

95° ± 5°

0.008 – 0.016
(0.203 – 0.406)

0.280
(7.112)
MIN

0.325 +0.040 −0.015
(8.255 +1.016 −0.381)

N16E (REV
```

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