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SEMICONDUCTOR

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

October 1987

Revised January 2004

Fully static design: $@V_{DD} - V_{SS} = 10V$

Applications

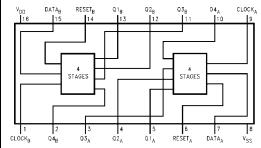
- Serial-input/parallel-output data queueing
- Serial to parallel data conversion
- General purpose register

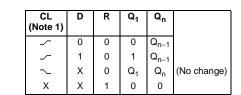
Ordering Code:

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



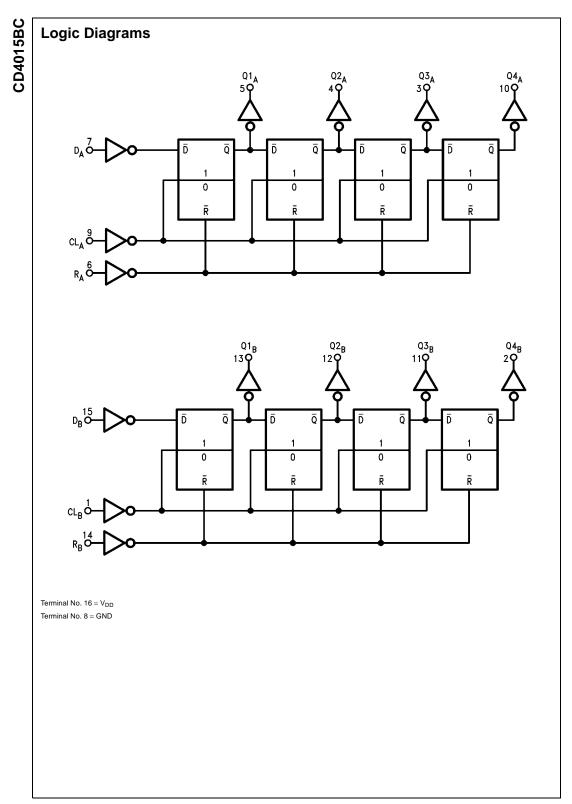


X = Don't Care Case

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Note 1: Level Change



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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)	$-65^{\circ}C$ to $+150^{\circ}C$
Power Dissipation (P _D)	
Dual-In-Line	700 mW
Small Outline	500 mW
Lead Temperature (TL)	
(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)	$-55^{\circ}C$ to $+125^{\circ}C$

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.

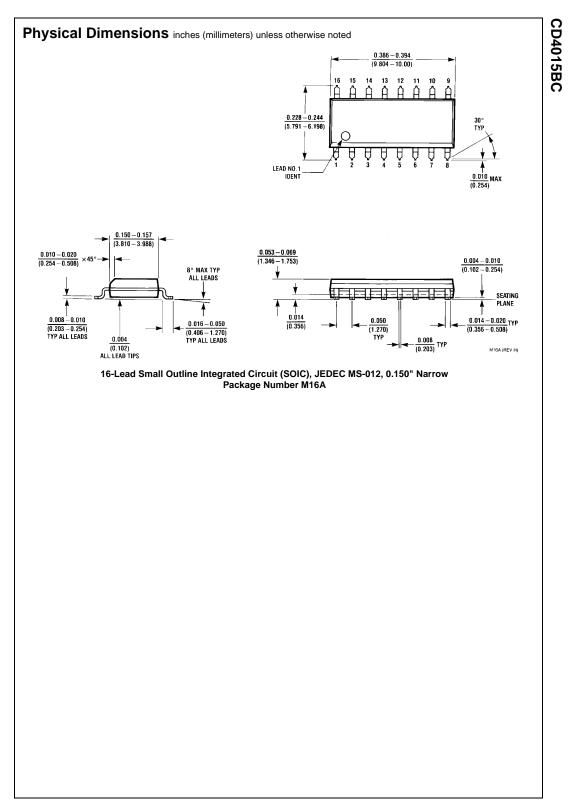
Note 3: $V_{\mbox{\scriptsize SS}}=0V$ unless otherwise specified.

DC Electrical Characteristics (Note 3)

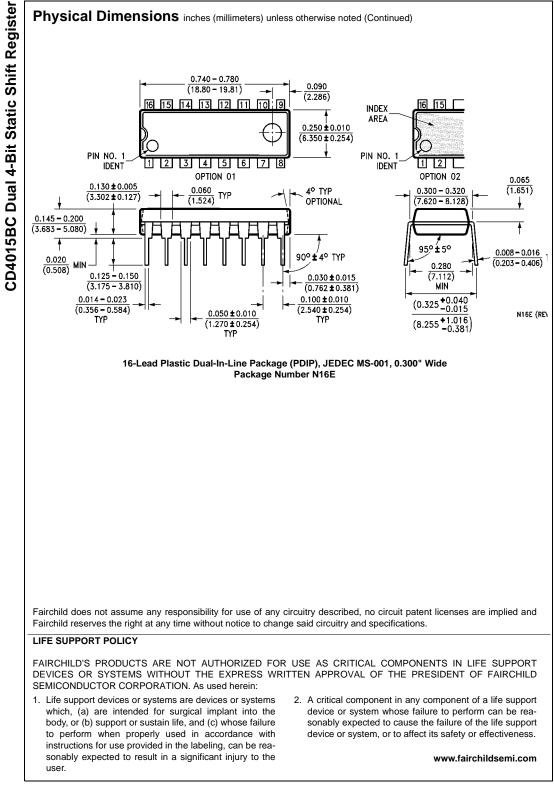
Symbol	Parameter	Conditions	-5	5°C		+25°C		+12	5°C	Units
Symbol	Farameter	Conditions	Min	Max	Min	Тур	Max	Min	Max	Units
I _{DD}	Quiescent Device	$V_{DD} = 5V, V_{IN} = V_{DD} \text{ or } V_{SS}$		5		0.005	5		150	
	Current	$V_{DD} = 10V$, $V_{IN} = V_{DD}$ or V_{SS}		10		0.010	10		300	μA
		V_{DD} = 15V, V_{IN} = V_{DD} or V_{SS}		20		0.015	20		600	
V _{OL}	LOW Level	$V_{DD} = 5V$		0.05		0	0.05		0.05	
	Output Voltage	$V_{DD} = 10V \qquad I_O < 1 \ \mu A$		0.05		0	0.05		0.05	V
		$V_{DD} = 15V$		0.05		0	0.05		0.05	
V _{OH}	HIGH Level	$V_{DD} = 5V$	4.95		4.95	5		4.95		
	Output Voltage	$V_{DD} = 10V \qquad I_O < 1 \ \mu A$	9.95		9.95	10		9.95		V
		$V_{DD} = 15V$	14.95		14.95	15		14.95		
VIL	LOW Level	$V_{DD} = 5V, V_{O} = 0.5V \text{ or } 4.5V$		1.5		2.25	1.5		1.5	
	Input Voltage	$V_{DD} = 10V, V_{O} = 1.0V \text{ or } 9.0V$		3.0		4.50	3.0		3.0	V
		$V_{DD} = 15V, V_O = 1.5V \text{ or } 13.5V$		4.0		6.75	4.0		4.0	
V _{IH}	HIGH Level	$V_{DD} = 5V, V_{O} = 0.5V \text{ or } 4.5V$	3.5		3.5	2.75		3.5		
	Input Voltage	$V_{DD} = 10V, V_{O} = 1.0V \text{ or } 9.0V$	7.0		7.0	5.50		7.0		V
		$V_{DD} = 15V, V_O = 1.5V \text{ or } 13.5V$	11.0		11.0	8.25		11.0		
I _{OL}	LOW Level Output	$V_{DD} = 5V, V_{O} = 0.4V$	0.64		0.51	0.88		0.36		
	Current (Note 4)	$V_{DD} = 10V, V_{O} = 0.5V$	1.6		1.3	2.25		0.9		mA
		$V_{DD} = 15V, V_O = 1.5V$	4.2		3.4	8.8		2.4		
I _{OH}	HIGH Level Output	$V_{DD} = 5V, V_{O} = 4.6V$	-0.64		-0.51	-0.88		-0.36		
	Current (Note 4)	$V_{DD} = 10V, V_{O} = 9.5V$	-1.6		-1.3	-2.25		-0.9		mA
		$V_{DD} = 15V, V_{O} = 13.5V$	-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	
		V _{DD} = 15V, V _{IN} = 15V		0.1		10 ⁻⁵	0.1		1.0	μA

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

		Conditions	50 pF, R _L = 200k, t _r = t _f = 20 n Parameter	Symbol
		Conduction		-
$ \begin{array}{ c c c c c c c c c c c c c c c c c c c$	230 350	V _{DD} = 5V		
VDD = 15V 60 120 trHL, tLH Transition Time VDD = 5V VDD = 10V VDD = 15V 100 200 VDD = 10V VDD = 15V 40 80 tWL, tWM Minimum Clock VDD = 5V VDD = 10V 60 110 tWL, twm Minimum Clock VDD = 5V VDD = 15V 60 110 trCL, ticL Clock Rise and VDD = 5V VDD = 15V 50 85 trCL, ticL Clock Rise and VDD = 5V VDD = 15V 15 15 tSU Minimum Data VDD = 5V VDD = 15V 20 40 VDD = 15V 15 30 100 20 fcL Maximum Clock VDD = 5V 2 3.5 15 tSU Minimum Clock VDD = 5V 2 3.5 100 fcL Maximum Clock VDD = 5V 2 3.5 10 fcL Maximum Clock VDD = 10V 4.5 8 100 200 400 VDD = 15V 6 11 100 200 400				FILE FEIT
$ \begin{array}{c c c c c c c c c c c c c c c c c c c $				
$ \begin{array}{ c c c c c c c } & V_{DD} = 10V & & & & 50 & 100 & & & & & & & & & & & & & & & & $			Transition Time	t _{THI} , t _{TIH}
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	50 100 n			
	40 80			
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	160 250		Minimum Clock	t _{WL} , t _{WM}
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	60 110 n	$V_{DD} = 10V$	Pulse-Width	
$ \begin{array}{c c c c c c c c c c c c c } Fall Time & V_{DD} = 10V & & & & & 15 & & & 15 & & & & 15 & & & &$	50 85	$V_{DD} = 15V$		
$\begin{tabular}{ c c c c c c c } \hline V_{DD} = 15V & V_{DD} = 5V & $50 & 100 \\ V_{DD} = 10V & $20 & 40 & V_{DD} = 10V & $15 & 30 & V_{DD} = 15V & $15 & $30 & V_{DD} = 15V & $2 & $3.5 & V_{DD} = 10V & $4.5 & $8 & V_{DD} = 15V & $6 & 11 & V_{DD} = 15V & $6 & $11 & V_{DD} = $15V & $10 & $5 & $7.5 & $10 & 0 & 0 & $100 & $200 & V_{DD} = $15V & 0 & $110 & $200 & $400 & V_{DD} = $15V & $100 & $200 & $400 & V_{DD} = $15V & $110 & $200 & $400 & V_{DD} = $15V & $110 & $250 & $160 & $160 & $160 & V_{DD} = $15V & $135 & $250 & $100 & 0 & $100 & 0 & 0 & $100 & $$	15	$V_{DD} = 5V$	Clock Rise and	t _{rCL} , t _{fCL}
	15 μ	$V_{DD} = 10V$	Fall Time	
$\begin{array}{c c c c c c c c c c } & Set-Up Time & V_{DD} = 10V & & & & & & & & & & & & & & & & & & &$	15	$V_{DD} = 15V$		
$\begin{tabular}{ c c c c c c c } \hline & V_{DD} = 15V & & & & & 15 & & 30 \\ \hline f_{CL} & & Maximum Clock & V_{DD} = 5V & & & 2 & & 3.5 & & & & & & & & & & & & & & & & & & &$	50 100	$V_{DD} = 5V$	Minimum Data	t _{SU}
$ \begin{tabular}{ c c c c c c c c c c } \hline f_{CL} & Maximum Clock & V_{DD} = 5V & 2 & 3.5 \\ \hline Frequency & V_{DD} = 10V & 4.5 & 8 & \\ \hline V_{DD} = 15V & 6 & 11 & \\ \hline \hline C_{IN} & Input Capacitance & Clock Input & 7.5 & 10 & \\ \hline Other Inputs & 5 & 7.5 & \\ \hline \hline RESET OPERATION & & & & & & & & \\ \hline t_{PHL(R)} & Propagation Delay Time & V_{DD} = 5V & & & & & & & & & & \\ \hline t_{WH(R)} & Minimum Reset & V_{DD} = 5V & & & & & & & & & & & & & & & \\ \hline W_{H(R)} & Minimum Reset & V_{DD} = 5V & & & & & & & & & & & & & & & & & & $	20 40 μ	$V_{DD} = 10V$	Set-Up Time	
$\begin{tabular}{ c c c c c c } \hline Frequency & V_{DD} = 10V & 4.5 & 8 & & & & & & & & & & & & & & & & & $	15 30	$V_{DD} = 15V$		
$\begin{tabular}{ c c c c c c } \hline V_{DD} = 15V & 6 & 11 \\ \hline V_{DD} = 15V & 6 & 11 \\ \hline C_{IN} & $Input Capacitance & $Clock Input & 7.5 & 10 \\ $Other Inputs & 5 & 7.5 \\ \hline \hline $RESET OPERATION$ \\ \hline $terms Input Capacitan Delay Time & V_{DD} = $5V & 10 & 200 & 400 \\ V_{DD} = $10V & 100 & 200 & 400 \\ V_{DD} = $15V & 80 & 160 \\ \hline $t_{WH(R)}$ & $Minimum Reset & V_{DD} = $5V & 135 & 250 \\ $Pulse Width & V_{DD} = $15V & 40 & 80 & 60 \\ \hline V_{DD} = $15V & 30 & 60 \\ \hline V_{DD} = $15V$ & 30 & 60 \\ \hline V_{DD} = $15V$ & $15V$	2 3.5		Maximum Clock	f _{CL}
$\begin{tabular}{ c c c c c c } \hline C_{\text{IN}} & & & & & & & & & & & & & & & & & & $	4.5 8 MI		Frequency	
$\begin{tabular}{ c c c c c c c c c c c c c c c c c c c$	6 11			
RESET OPERATION tpHL(R) Propagation Delay Time V_DD = 5V V_DD = 10V V_DD = 15V 200 100 400 200 80 twH(R) Minimum Reset V_DD = 5V V_DD = 15V 135 250 twH(R) Minimum Reset V_DD = 10V V_DD = 15V 40 80 vDD = 15V 30 60	D		Input Capacitance	C _{IN}
	5 7.5	Other Inputs		
VDD = 10V 100 200 VDD = 15V 80 160 tWH(R) Minimum Reset VDD = 5V 135 250 Pulse Width VDD = 10V 40 80 VDD = 15V 30 60				RESET OPERAT
VDD = 15V 80 160 tWH(R) Minimum Reset VDD = 5V 135 250 Pulse Width VDD = 10V 40 80 VDD = 15V 30 60			Propagation Delay Time	t _{PHL(R)}
tWH(R) Minimum Reset V_{DD} = 5V 135 250 Pulse Width V_{DD} = 10V 40 80 V_{DD} = 15V 30 60				
Pulse Width $V_{DD} = 10V$ 40 80 $V_{DD} = 15V$ 30 60				
V _{DD} = 15V 30 60				t _{WH(R)}
			Pulse Width	
Note 5: AC Parameters are guaranteed by DC correlated testing.	30 60			



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