

CD4014BM/CD4014BC 8-Stage Static Shift Register

General Description

The CD4014BM/CD4014BC is an 8-stage parallel input/serial output shift register. A parallel/serial control input enables individual JAM inputs to each of 8 stages. Q outputs are available from the sixth, seventh and eighth stages. All outputs have equal source and sink current capabilities and conform to standard "B" series output drive.

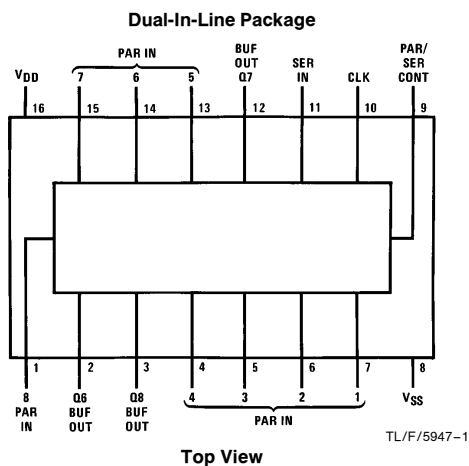
When the parallel/serial control input is in the logical "0" state, data is serially shifted into the register synchronously with the positive transition of the clock. When the parallel/serial control input is in the logical "1" state, data is jammed into each stage of the register synchronously with the positive transition of the clock.

All inputs are protected against static discharge with diodes to V_{DD} and V_{SS} .

Features

- Wide supply voltage range 3.0V to 15V
- High noise immunity 0.45 V_{DD} (typ.)
- Low power TTL compatibility Fan out of 2 driving 74L or 1 driving 74LS
- 5V–10V–15V parametric ratings
- Symmetrical output characteristics
- Maximum input leakage: 1 μA at 15V over full temperature range

Connection Diagram



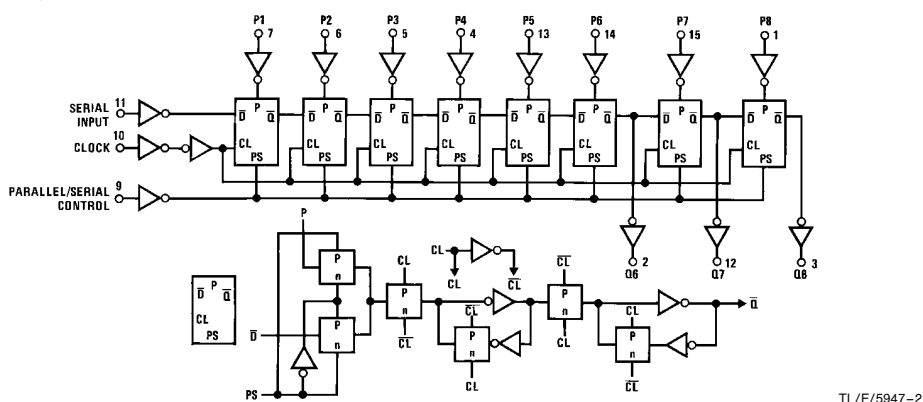
Truth Table

CL*	Serial Input	Parallel/Serial Control	PI 1	PI n	Q1 (Internal)	Qn
Level change	X	1	0	0	0	0
X = Don't care case	X	1	1	0	1	0
	X	1	0	1	0	1
	X	1	1	1	1	1
	0	0	X	X	0	Q_{n-1}
	1	0	X	X	1	Q_{n-1}
	X	X	X	X	Q_1	Q_n

No Change

Order Number CD4014B

Logic Diagram



Absolute Maximum Ratings (Notes 1 & 2)

If Military/Aerospace specified devices are required, please contact the National Semiconductor Sales Office/Distributors for availability and specifications.

Supply Voltage (V_{DD})	−0.5V to +18V
Input Voltage (V_{IN})	−0.5 to V_{DD} + 0.5V
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 (Note 2)

Supply Voltage (V_{DD})	3.0V to 15V
Input Voltage (V_{IN})	0 to V_{DD}
Operating Temperature Range (T_A)	
CD4014BM	−55°C to +125°C
CD4014BC	−40°C to +85°C

DC Electrical Characteristics CD4014BM (Note 2)

Symbol	Parameter	Conditions	−55°C		+25°C			+125°C		Units
			Min	Max	Min	Typ	Max	Min	Max	
I_{DD}	Quiescent Device Current	$V_{DD} = 5V, V_{IN} = V_{DD} \text{ or } V_{SS}$		5		0.1	5		150	μA
		$V_{DD} = 10V, V_{IN} = V_{DD} \text{ or } V_{SS}$		10		0.2	10		300	μA
		$V_{DD} = 15V, V_{IN} = V_{DD} \text{ or } V_{SS}$		20		0.3	20		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	$V_{DD} = 5V, V_O = 0.5V \text{ or } 4.5V$		1.5		2	1.5		1.5	V
		$V_{DD} = 10V, V_O = 1.0V \text{ or } 9.0V$		3.0		4	3.0		3.0	V
		$V_{DD} = 15V, V_O = 1.5V \text{ or } 13.5V$		4.0		6	4.0		4.0	V
V_{IH}	High Level Input Voltage	$V_{DD} = 5V, V_O = 0.5V \text{ or } 4.5V$	3.5		3.5	3		3.5		V
		$V_{DD} = 10V, V_O = 1.0V \text{ or } 9.0V$	7.0		7.0	6		7.0		V
		$V_{DD} = 15V, V_O = 1.5V \text{ or } 13.5V$	11.0		11.0	9		11.0		V
I_{OL}	Low Level Output Current (Note 3)	$V_{DD} = 5V, V_O = 0.4V$	0.64		0.51	0.88		0.36		mA
		$V_{DD} = 10V, V_O = 0.5V$	1.6		1.3	2.2		0.9		mA
		$V_{DD} = 15V, V_O = 1.5V$	4.2		3.4	8		2.4		mA
I_{OH}	High Level Output Current (Note 3)	$V_{DD} = 5V, V_O = 4.6V$	−0.64		−0.51	−0.88		−0.36		mA
		$V_{DD} = 10V, V_O = 9.5V$	−1.6		−1.3	−2.2		−0.9		mA
		$V_{DD} = 15V, V_O = 13.5V$	−4.2		−3.4	−8		−2.4		mA
I_{IN}	Input Current	$V_{DD} = 15V, V_{IN} = 0V$		−0.10		-10^{-5}	−0.10		−1.0	μA
		$V_{DD} = 15V, V_{IN} = 15V$		0.10		10^{-5}	0.10		1.0	μA

DC Electrical Characteristics CD4014BC (Note 2)

Symbol	Parameter	Conditions	−40°C		+25°C			+85°C		Units
			Min	Max	Min	Typ	Max	Min	Max	
I_{DD}	Quiescent Device Current	$V_{DD} = 5V, V_{IN} = V_{DD} \text{ or } V_{SS}$		20		0.1	20		150	μA
		$V_{DD} = 10V, V_{IN} = V_{DD} \text{ or } V_{SS}$		40		0.2	40		300	μA
		$V_{DD} = 15V, V_{IN} = V_{DD} \text{ or } V_{SS}$		80		0.3	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	$V_{DD} = 5V, V_O = 0.5V \text{ or } 4.5V$		1.5		2	1.5		1.5	V
		$V_{DD} = 10V, V_O = 1.0V \text{ or } 9.0V$		3.0		4	3.0		3.0	V
		$V_{DD} = 15V, V_O = 1.5V \text{ or } 13.5V$		4.0		6	4.0		4.0	V
V_{IH}	High Level Input Voltage	$V_{DD} = 5V, V_O = 0.5V \text{ or } 4.5V$	3.5		3.5	3		3.5		V
		$V_{DD} = 10V, V_O = 1.0V \text{ or } 9.0V$	7.0		7.0	6		7.0		V
		$V_{DD} = 15V, V_O = 1.5V \text{ or } 13.5V$	11.0		11.0	9		11.0		V
I_{OL}	Low Level Output Current (Note 3)	$V_{DD} = 5V, V_O = 0.4V$	0.52		0.44	0.88		0.36		mA
		$V_{DD} = 10V, V_O = 0.5V$	1.3		1.1	2.2		0.9		mA
		$V_{DD} = 15V, V_O = 1.5V$	3.6		3.0	8		2.4		mA

DC Electrical Characteristics CD4014BC (Note 2) (Continued)

Symbol	Parameter	Conditions	−40°C		+25°C			+85°C		Units
			Min	Max	Min	Typ	Max	Min	Max	
I_{OH}	High Level Output Current (Note 3)	$V_{DD} = 5V, V_O = 4.6V$	−0.52		−0.44	−0.88		−0.36		mA
		$V_{DD} = 10V, V_O = 9.5V$	−1.3		−1.1	−2.2		−0.90		mA
		$V_{DD} = 15V, V_O = 13.5V$	−3.6		−3.0	−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

AC Electrical Characteristics* $T_A = 25^\circ C$, input $t_r, t_f = 20$ ns, $C_L = 50$ pF, $R_L = 200$ k Ω

Symbol	Parameter	Conditions	Min	Typ	Max	Units
t_{PHL}, t_{PLH}	Propagation Delay Time	$V_{DD} = 5V$		200	320	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
f_{CL}	Maximum Clock Input Frequency	$V_{DD} = 5V$	2.8	4		MHz
		$V_{DD} = 10V$	6	12		MHz
		$V_{DD} = 15V$	8	16		MHz
t_W	Minimum Clock Pulse Width	$V_{DD} = 5V$		90	180	ns
		$V_{DD} = 10V$		40	80	ns
		$V_{DD} = 15V$		25	50	ns
t_{rCL}, t_{fCL}	Clock Rise and Fall Time (Note 4)	$V_{DD} = 5V$			15	μs
		$V_{DD} = 10V$			15	μs
		$V_{DD} = 15V$			15	μs
t_S	Minimum Set-Up Time (Note 6) Serial Input $t_H \geq 200$ ns	$V_{DD} = 5V$		60	120	ns
		$V_{DD} = 10V$		40	80	ns
		$V_{DD} = 15V$		30	60	ns
	Parallel Inputs $t_H \geq 200$ ns	$V_{DD} = 5V$		80	160	ns
		$V_{DD} = 10V$		40	80	ns
		$V_{DD} = 15V$		30	60	ns
	Parallel/Serial Control $t_H \geq 200$ ns	$V_{DD} = 5V$		100	200	ns
		$V_{DD} = 10V$		50	100	ns
		$V_{DD} = 15V$		40	80	ns
t_H	Minimum Hold Time Serial In, Parallel In, $t_S \geq 400$ ns Parallel/Serial Control	$V_{DD} = 5V$			0	ns
		$V_{DD} = 10V$			10	ns
		$V_{DD} = 15V$			15	ns
C_I	Average Input Capacitance (Note 5)	Any Input		5	7.5	pF
C_{PD}	Power Dissipation Capacitance (Note 5)			110		pF

*AC Parameters are guaranteed by DC correlated testing.

Note 1: "Absolute Maximum Ratings" are those values beyond which the safety of the device cannot be guaranteed. Except for "Operating Temperature Range" they are not meant to imply that the devices should be operated at these limits. The table of "Electrical Characteristics" provides conditions for actual device operation.

Note 2: $V_{SS} = 0V$ unless otherwise specified.

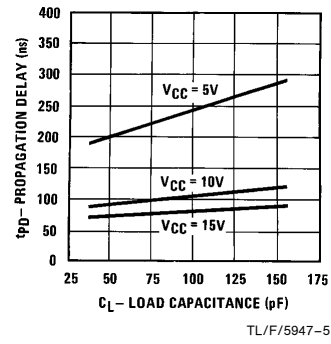
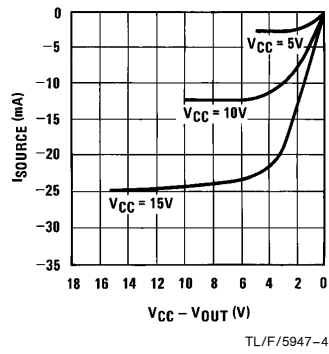
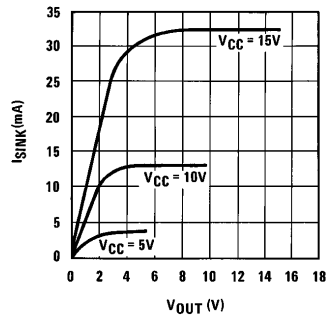
Note 3: I_{OL} and I_{OH} are tested one output at a time.

Note 4: If more than one unit is cascaded t_{rCL} should be made less than or equal to the fixed propagation delay of the output of the driving stage for the estimated capacitive load.

Note 5: C_{PD} determines the no load AC power consumption of any CMOS device. For complete explanation, see 54C/74C family characteristics application note AN-90.

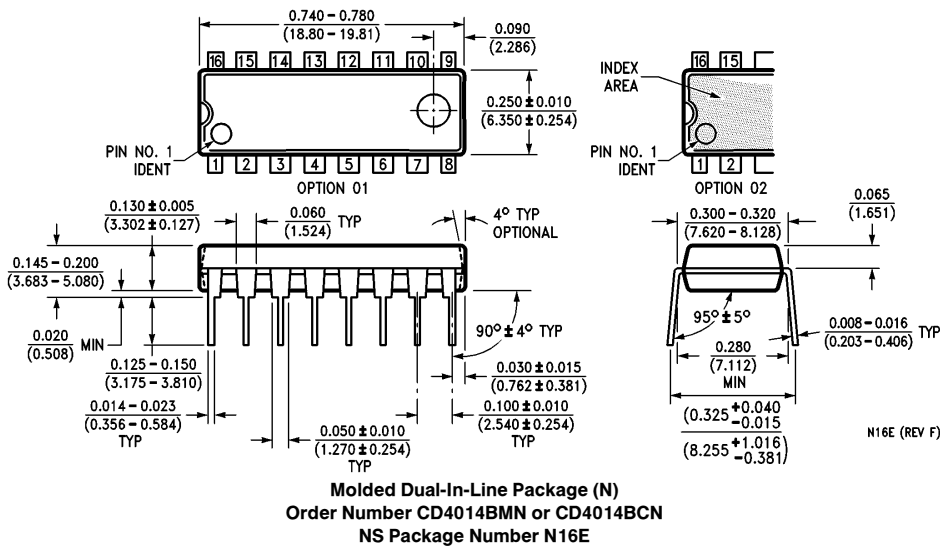
Note 6: Setup times are measured with reference to clock and a fixed hold time (t_H) as specified.

Typical Performance Characteristics



The drawing illustrates the mechanical specifications of a 16-pin DIP package. The top view shows a rectangular body with 16 pins, numbered 1 to 16. Key dimensions include a total width of 0.785" [19.94] MAX, a pin pitch of 0.037" ± 0.005 [0.94 ± 0.13] TYP, and a pin diameter of 0.010" ± 0.010 [2.54 ± 0.25] TYP. The side view shows a height of 0.220" - 0.310 [5.59 - 7.87] and a pin height of 0.180" MAX [4.57]. The end view shows a width of 0.290" - 0.320 [7.37 - 8.13] and a pin width of 0.010" ± 0.002 [0.25 ± 0.05]. The package is labeled J16A (REV L).

J16A (REV L)

Physical Dimensions inches (millimeters) (Continued)**LIFE SUPPORT POLICY**

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