

CD4014/CD4021 CMOS 8-Stage Static Shift Registers

1. General Description

1.1 Description

CD4014:

Synchronous Parallel or Serial Input/Serial Output

CD4021:

Asynchronous Parallel Input or Synchronous Serial Input/Serial Output

CD4014 and CD4021 series types are 8-stage parallel or serial-input/serial output registers having common CLOCK and PARALLEL/SERIAL CONTROL inputs, a single SERIAL data input, and individual parallel "JAM" inputs to each register stage. Each register stage is a D-type, master-slave flip-flop. In addition to an output from stage 8, "Q" outputs are also available

from stages 6 and 7. Parallel as well as serial entry is made into the register synchronously with the positive clock line transition in the CD4014. In the CD4021 serial entry is synchronous with the clock but parallel entry is asynchronous. In both types, entry is controlled by the PARALLEL/SERIAL CONTROL input. When the PARALLEL/SERIAL CONTROL input is low, data is serially shifted into the 8-stage register synchronously with the positive transition of the clock line. When the PARALLEL/SERIAL CONTROL input is high, data is jammed into the 8-stage register via the parallel input lines and synchronous with the positive transition of the

clock line. In the CD4021, the CLOCK input of the internal stage is "forced" when asynchronous parallel entry is made. Register expansion using multiple packages is permitted.

1.2 Features

- Fully Static Operation
- 8 Master-Slave flip-flops plus output buffering and control gating
- 100% tested for quiescent current at 18V
- Standardized symmetrical output characteristics
- Maximum input current of 1μA at 18V and 25°C
- 5V, 10V, and 15V parametric ratings

1.3 Device Information

PART NUMBER	PACKAGE
CD4014 CD4021	DIP
	SOP
	TSSOP

2. Pin Description and Functional Diagram

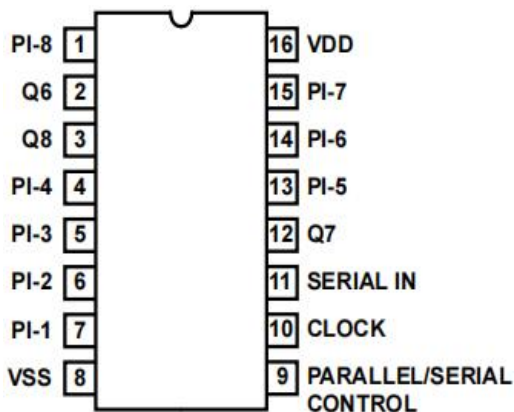


Figure 2.1 Top View

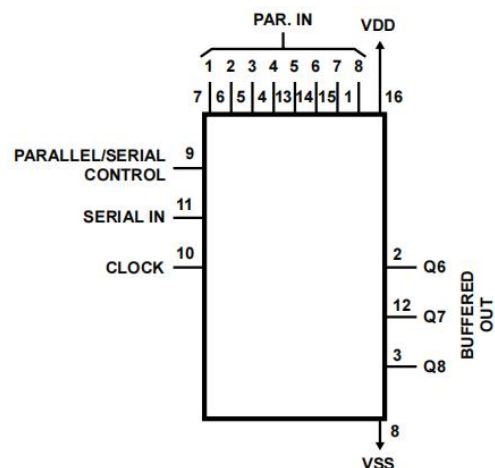


Figure 2.2 Functional Diagram

PIN No.	NAME	I/O	FUNCTION
1	PI-8		Parallel Data Input
2	Q6		Buffered Parallel Output from The Last Three Stages
3	Q8		Buffered Parallel Output from The Last Three Stages
4	PI-4		Parallel Data Input
5	PI-3		Parallel Data Input
6	PI-2		Parallel Data Input
7	PI-1		Parallel Data Input
8	VSS		Ground
9	PARALLEL/SERIAL CONTROL		Parallel Load Input
10	CLOCK		Clock Input
11	SERIAL IN		Serial Data Input
12	Q7		Buffered Parallel Output from The Last Three Stages
13	PI-5		Parallel Data Input
14	PI-6		Parallel Data Input
15	PI-7		Parallel Data Input
16	VDD		Supply Voltage

3. System Diagram

3.1 Logic Diagram

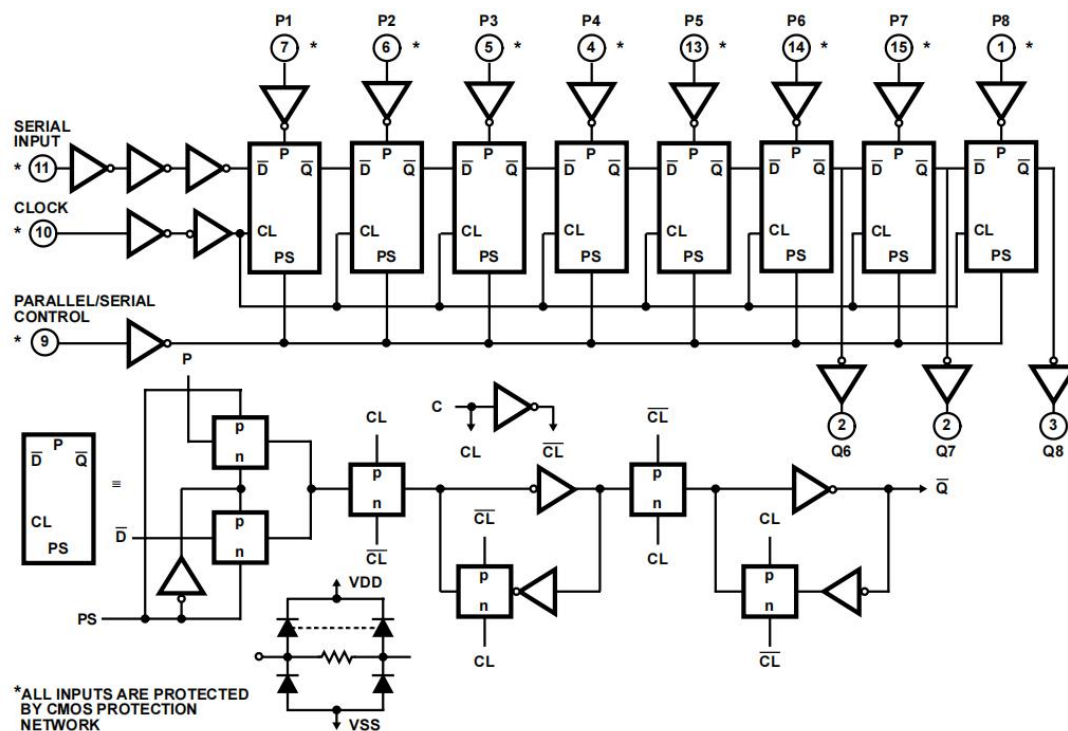


Figure 3.1: CD4014 Logic Diagram

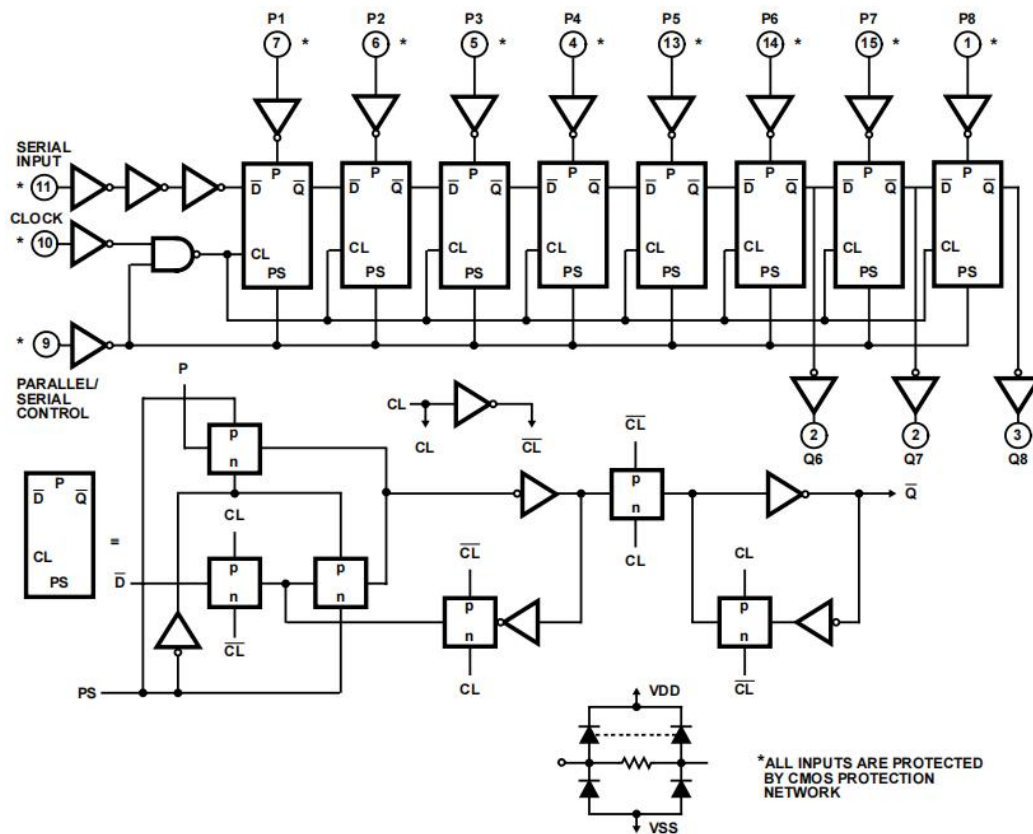


Figure 3.2: CD4021 Logic Diagram

3.2 Truth Table

CD4014						
Input					Output	
Clock	Serial Input	Parallel/Serial Control	PI-1	PI-n	Q1 (Internal)	Qn
↑	X	1	0	0	0	0
↑	X	1	1	0	1	0
↑	X	1	0	1	0	1
↑	X	1	1	1	1	1
↑	0	0	X	X	0	Qn-1
↑	1	0	X	X	1	Qn-1
↓	X	X	X	X	Q1	Qn

X = Don't Care, 1 ≡ High State, 0 ≡ Low State, ↑=positive-going transition, ↓=negative-going transition



CD4021						
Input					Output	
Clock	Serial Input	Parallel/Serial Control	PI-1	PI-n	Q1 (Internal)	Qn
X	X	1	0	0	0	0
X	X	1	0	1	0	1
X	X	1	1	0	1	0
X	X	1	1	1	1	1
↑	0	0	X	X	0	Qn-1
↑	1	0	X	X	1	Qn-1
↓	X	0	X	X	Q1	Qn

X = Don't Care 1 ≡ High State 0 ≡ Low State, ↑=positive-going transition, ↓=negative-going transition

4. Specifications

4.1 Absolute Maximum Ratings

Symbol	Parameter	MIN	MAX	Unit
V _{DD}	DC Supply Voltage Range (Voltage Referenced to VSS Terminals)	-0.5	20	V
V _I	Input Voltage Range, All Inputs	0.5	V _{DD} +0.5	V
P _D	Power Dissipation		500	mW
T _J	Junction Temperature		125	°C
T _{OP}	Operating Temperature	-40	85	°C

Absolute maximum ratings are those values beyond which the device could be permanently damaged. These are stress ratings only, which do not imply functional operation of the device at these or any other conditions beyond those indicated under Recommended Operating Conditions.



4.2 Electrical Characteristics

4.2.1 DC Specifications

($T_a=25^{\circ}\text{C}$, voltages are referenced to VSS (ground=0V), unless otherwise specified)

Symbol	Parameter	Test Condition			MIN	TYP	MAX	Unit
		VO	VIN	VDD				
I _{DD}	Supply Current	--	0,5	5	--	0	1	uA
		--	0,10	10	--	0	1	uA
		--	0,18	18	--	0	1	uA
I _{OL}	Low Level Output Current	0.4	0,5	5	1.5	3	--	mA
		0.5	0,10	10	4	8	--	mA
		1.5	0,15	15	15	30	--	mA
I _{OH}	High Level Output Current	4.6	0,5	5	-1	-2	--	mA
		2.5	0,5	5	-4	-8	--	mA
		9.5	0,10	10	-2	-4	--	mA
		13.5	0,15	15	-7	-15	--	mA
V _{OL}	Low Level Output Voltage	--	0,5	5	--	0	0.05	V
		--	0,10	10	--	0	0.05	V
		--	0,15	15	--	0	0.05	V
V _{OH}	High Level Output Voltage	--	0,5	5	4.95	5	--	V
		--	0,10	10	9.95	10	--	V
		--	0,15	15	14.95	15	--	V
V _{IL}	Low Level Input Voltage	0.5,4.5	--	5	--	--	1.5	V
		1,9	--	10	--	--	3	V
		1.5,13.5	--	15	--	--	4	V
V _{IH}	High Level Input Voltage	0.5,4.5	--	5	3.5	--	--	V
		1,9	--	10	7	--	--	V
		1.5,13.5	--	15	11	--	--	V
I _{IN}	Input Leakage Current	--	0,18	18	--	0	±1	uA

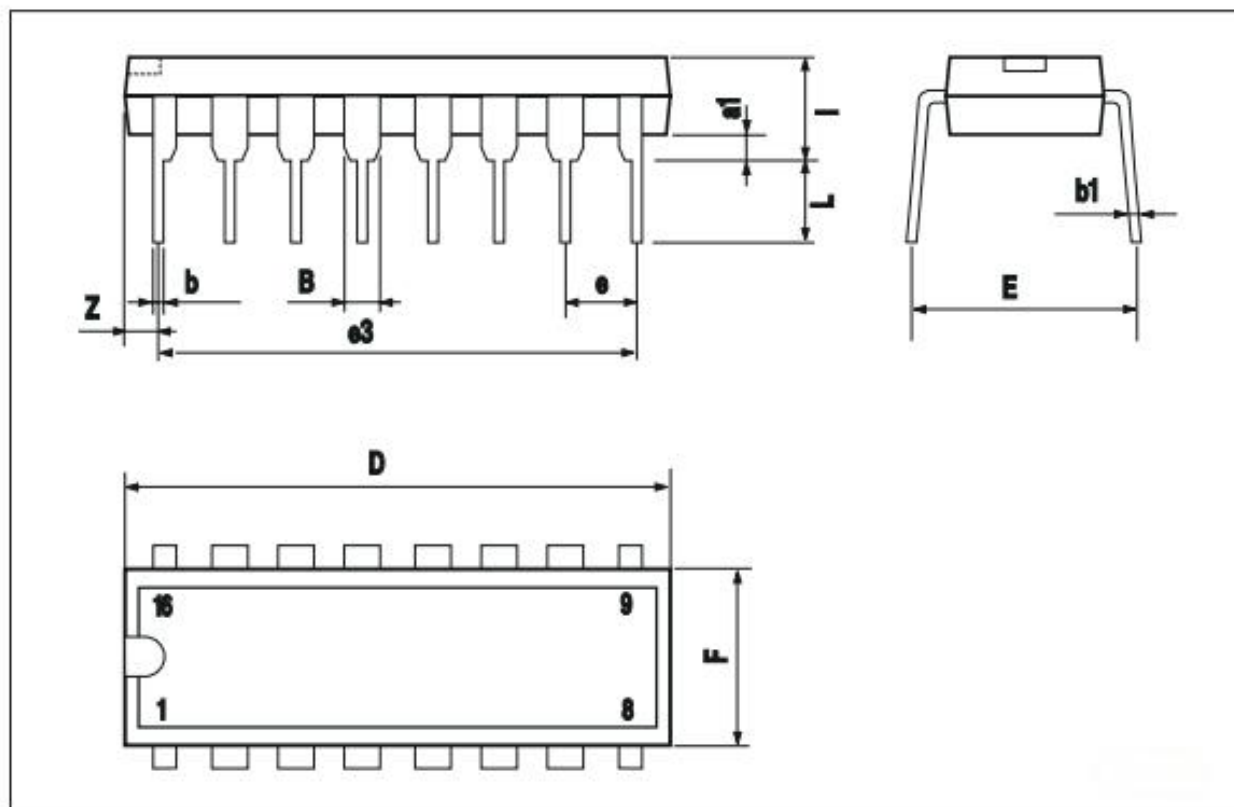
5. Ordering Information

Orderable Device	Package Type	Pins	Packing	Package Qty
CD4014ND16ATBE	DIP	16	Tube	25
CD4014NS16ARDQ	SOP	16	Tape & Reel	4000
CD4014TS16ARDQ	TSSOP	16	Tape & Reel	4000
CD4021ND16ATBE	DIP	16	Tube	25
CD4021NS16ARDQ	SOP	16	Tape & Reel	4000
CD4021TS16ARDQ	TSSOP	16	Tape & Reel	4000

6. Package Information

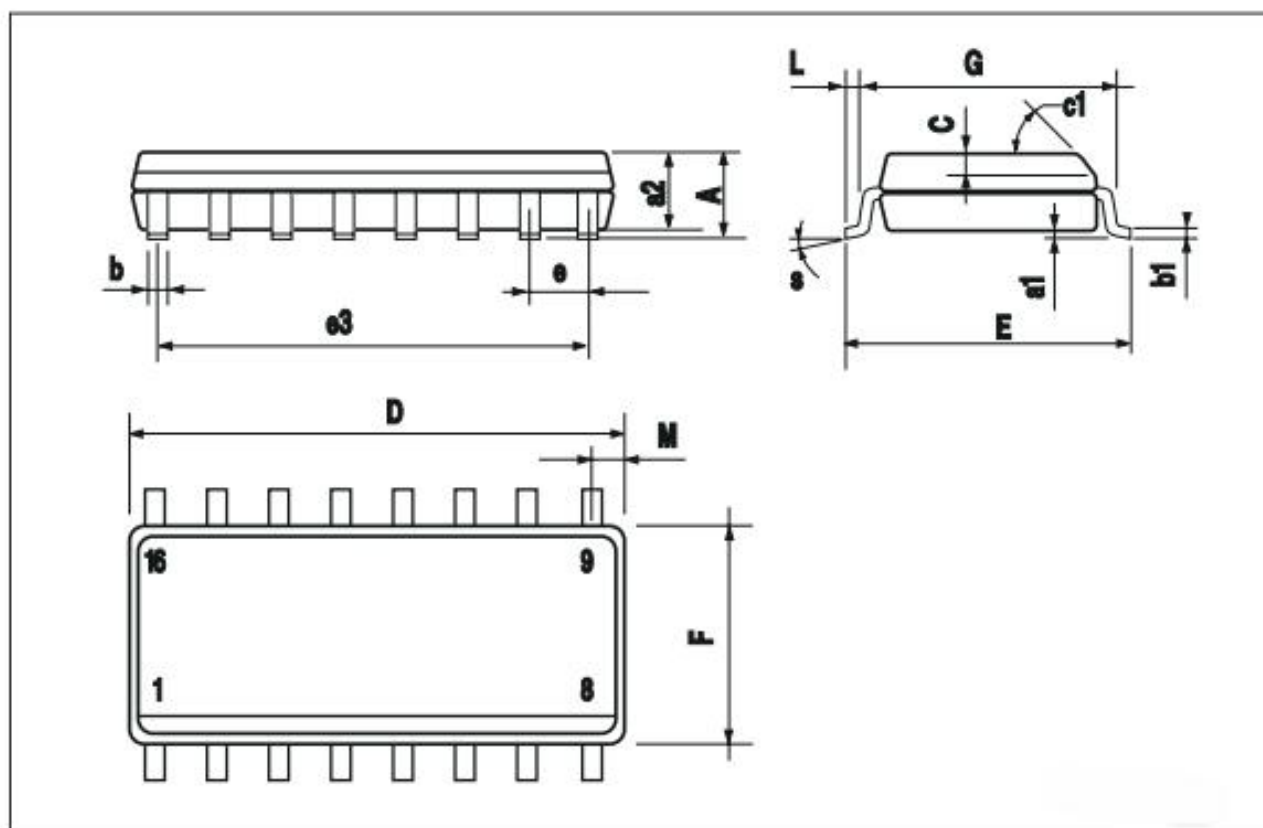
6.1 DIP16

Dim.	mm.			inch.		
	Min.	Typ.	Max.	Min.	Typ.	Max.
a1	0.51			0.020		
B	0.77		1.65	0.030		0.065
b		0.5			0.020	
b1		0.25			0.010	
D			20			0.787
E		8.5			0.335	
e		2.54			0.100	
e3		17.78			0.700	
F			7.1			0.280
I			5.1			0.201
L		3.3			0.130	
Z			1.27			0.050



6.2 SOP16

Dim.	mm.			inch.		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A			1.75			0.068
a1	0.1		0.25	0.004		0.010
a2			1.64			0.063
b	0.35		0.46	0.013		0.018
b1	0.19		0.25	0.007		0.010
C		0.5			0.019	
c1	45° (typ.)					
D	9.8		10	0.385		0.393
E	5.8		6.2	0.228		0.244
e		1.27			0.050	
e3		8.89			0.350	
F	3.8		4.0	0.149		0.157
G	4.6		5.3	0.181		0.208
L	0.5		1.27	0.019		0.050
M			0.62			0.024
S	8° (max.)					



6.3 TSSOP16

Dim.	mm.			inch.		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A			1.2			0.047
A1	0.05		0.15	0.002	0.004	0.006
A2	0.8	1	1.05	0.031	0.039	0.041
b	0.19		0.30	0.007		0.012
c	0.09		0.20	0.004		0.0079
D	4.9	5	5.1	0.193	0.197	0.201
E	6.2	6.4	6.6	0.244	0.252	0.260
E1	4.3	4.4	4.48	0.169	0.173	0.176
e		0.65 BSC			0.0256 BSC	
K	0°		8°	0°		8°
L	0.45	0.60	0.75	0.018	0.024	0.030

