



# CD4006BM/CD4006BC 18-Stage Static Shift Register

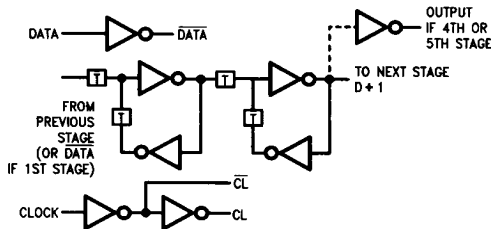
## General Description

The CD4006BM/CD4006BC 18-stage static shift register is comprised of four separate shift register sections, two sections of four stages and two sections of five stages. Each section has an independent data input. Outputs are available at the fourth stage and the fifth stage of each section. A common clock signal is used for all stages. Data is shifted to the next stage on the negative-going transition of the clock. Through appropriate connections of inputs and outputs, multiple register sections of 4, 5, 8, and 9 stages, or single register sections of 10, 12, 13, 14, 16, 17, and 18 stages can be implemented using one package.

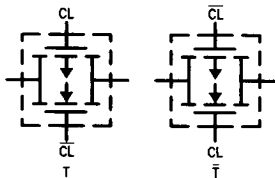
## Features

- Wide supply voltage range 3.0V to 15V
- High noise immunity 0.45 V<sub>DD</sub> (typ.)
- Low power TTL compatibility fan out of 2 driving 74L or 1 driving 74LS
- Low clock input capacitance 6 pF (typ.)
- Medium speed 10 MHz (typ.) (with V<sub>DD</sub> = 10V)
- Low power
- Fully static operation

## Logic Diagrams

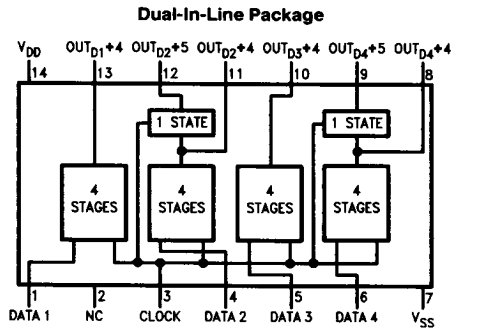


TL/F/5942-1



TL/F/5942-3

## Connection Diagram



TL/F/5942-2

### Top View

### Order Number CD4006B\*

\*Please look into Section 8, Appendix D for availability of various package types.

## Truth Table

D	CL <sup>Δ</sup>	D+1
0		0
1		1
X		NC

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X = Don't care  
 Δ = Level change  
 NC = No change

**Absolute Maximum Ratings** (Notes 1 and 2)

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

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** (Note 2)

DC Supply Voltage ( $V_{DD}$ )	+3.0V to +15V
Input Voltage ( $V_{IN}$ )	0V to $V_{DD}$ $V_{DC}$
Operating Temperature Range ( $T_A$ )	
CD4006BM	-55°C to +125°C
CD4006BC	-40°C to +85°C

**DC Electrical Characteristics** CD4006BM (Note 2)

Symbol	Parameter	Conditions	-55°C		+25°C			+125°C		Units
			Min	Max	Min	Typ	Max	Min	Max	
$I_{DD}$	Quiescent Device Current	$V_{DD} = 5.0V, V_{IN} = V_{DD}$ or $V_{SS}$		5.0		0.005	5.0	150	$\mu A$	
		$V_{DD} = 10V, V_{IN} = V_{DD}$ or $V_{SS}$		10		0.010	10	300	$\mu A$	
		$V_{DD} = 15V, V_{IN} = V_{DD}$ or $V_{SS}$		20		0.015	20	600	$\mu A$	
$V_{OL}$	Low Level Output Voltage	$V_{DD} = 5.0V$		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	$V_{DD} = 5.0V$	4.95		4.95	5.0	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	$V_{DD} = 5.0V, V_O = 0.5V$ 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	$V_{DD} = 5.0V, V_O = 0.5V$ 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 3)	$V_{DD} = 5.0V, V_O = 0.4V$	0.64		0.51	0.88	0.36		mA	
		$V_{DD} = 10V, V_O = 0.5V$	1.6		1.3	2.25	0.9		mA	
		$V_{DD} = 15V, V_O = 1.5V$	4.2		3.4	8.8	2.4		mA	
$I_{OH}$	High Level Output Current (Note 3)	$V_{DD} = 5.0V, V_O = 4.6V$	-0.64		-0.51	-0.88	-0.36		mA	
		$V_{DD} = 10V, V_O = 9.5V$	-1.6		-1.3	-2.25	-0.9		mA	
		$V_{DD} = 15V, V_O = 13.5V$	-4.2		-3.4	-8.8	-2.4		mA	
$I_{IN}$	Input Current	$V_{DD} = 15V, V_{IN} = 0V$	-0.1		-0.1	-10 <sup>-5</sup>	-1.0		$\mu A$	
		$V_{DD} = 15V, V_{IN} = 15V$		0.1		10 <sup>-5</sup>	0.1	1.0	$\mu A$	

**DC Electrical Characteristics** CD4006BC (Note 2)

Symbol	Parameter	Conditions	-40°C		+25°C			+85°C		Units
			Min	Max	Min	Typ	Max	Min	Max	
$I_{DD}$	Quiescent Device Current	$V_{DD} = 5.0V, V_{IN} = V_{DD}$ or $V_{SS}$		20		0.005	20	150	$\mu A$	
		$V_{DD} = 10V, V_{IN} = V_{DD}$ or $V_{SS}$		40		0.010	40	300	$\mu A$	
		$V_{DD} = 15V, V_{IN} = V_{DD}$ or $V_{SS}$		80		0.015	80	600	$\mu A$	
$V_{OL}$	Low Level Output Voltage	$V_{DD} = 5.0V$		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	$V_{DD} = 5.0V$	4.95		4.95	5.0	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	

## DC Electrical Characteristics CD4006BC (Note 2) (Continued)

Symbol	Parameter	Conditions	-40°C		+25°C			+85°C		Units
			Min	Max	Min	Typ	Max	Min	Max	
V <sub>IL</sub>	Low Level Input Voltage	V <sub>DD</sub> = 5.0V, V <sub>O</sub> = 0.5V or 4.5V		1.5		2.25	1.5		1.5	V
		V <sub>DD</sub> = 10V, V <sub>O</sub> = 1.0V or 9.0V		3.0		4.5	3.0		3.0	V
		V <sub>DD</sub> = 15V, V <sub>O</sub> = 1.5V or 13.5V		4.0		6.75	4.0		4.0	V
V <sub>IH</sub>	High Level Input Voltage	V <sub>DD</sub> = 5.0V, V <sub>O</sub> = 0.5V or 4.5V	3.5		3.5	2.75		3.5		V
		V <sub>DD</sub> = 10V, V <sub>O</sub> = 1.0V or 9.0V	7.0		7.0	5.5		7.0		V
		V <sub>DD</sub> = 15V, V <sub>O</sub> = 1.5V or 13.5V	11		11	8.25		11		V
I <sub>OL</sub>	Low Level Output Current (Note 3)	V <sub>DD</sub> = 5.0V, V <sub>O</sub> = 0.4V	0.52		0.44	0.88		0.36		mA
		V <sub>DD</sub> = 10V, V <sub>O</sub> = 0.5V	1.3		1.1	2.25		0.9		mA
		V <sub>DD</sub> = 15V, V <sub>O</sub> = 1.5V	3.6		3.0	8.8		2.4		mA
I <sub>OH</sub>	High Level Output Current (Note 3)	V <sub>IL</sub> = 0V, V <sub>IH</sub> = V <sub>DD</sub>								
		V <sub>DD</sub> = 5.0V, V <sub>O</sub> = 4.6V	-0.52		-0.44	-0.88		-0.36		mA
		V <sub>DD</sub> = 10V, V <sub>O</sub> = 9.5V	-1.3		-1.1	-2.25		-0.9		mA
		V <sub>DD</sub> = 15V, V <sub>O</sub> = 13.5V	-3.6		-3.0	-8.8		-2.4		mA
I <sub>IN</sub>	Input Current	V <sub>DD</sub> = 15V, V <sub>IN</sub> = 0V		-0.3		-10 <sup>-5</sup>	-0.3		-1.0	μA
		V <sub>DD</sub> = 15V, V <sub>IN</sub> = 15V		0.3		10 <sup>-5</sup>	0.3		1.0	μA

## AC Electrical Characteristics\* CD4006BM/CD4006BC T<sub>A</sub> = 25°C, C<sub>L</sub> = 50 pF, unless otherwise noted

Symbol	Parameter	Conditions	Min	Typ	Max	Units
t <sub>PLH</sub> , t <sub>PHL</sub>	Propagation Delay Time (t <sub>PLH</sub> = t <sub>PHL</sub> )	V <sub>DD</sub> = 5.0V		200	400	ns
		V <sub>DD</sub> = 10V		100	200	ns
		V <sub>DD</sub> = 15V		80	150	ns
t <sub>TLH</sub> , t <sub>THL</sub>	Transition Time (t <sub>TLH</sub> = t <sub>THL</sub> )	V <sub>DD</sub> = 5.0V		100	200	ns
		V <sub>DD</sub> = 10V		50	100	ns
		V <sub>DD</sub> = 15V		40	80	ns
t <sub>WL</sub> , t <sub>WH</sub>	Minimum Clock Pulse Width (t <sub>WL</sub> = t <sub>WH</sub> )	V <sub>DD</sub> = 5.0V		100	200	ns
		V <sub>DD</sub> = 10V		45	100	ns
		V <sub>DD</sub> = 15V		35	70	ns
t <sub>RCL</sub> , t <sub>FCL</sub>	Clock Rise and Fall Time (t <sub>RCL</sub> = t <sub>FCL</sub> )	V <sub>DD</sub> = 5.0V			15	μs
		V <sub>DD</sub> = 10V			15	μs
		V <sub>DD</sub> = 15V			15	μs
t <sub>SU</sub>	Minimum Set-Up Time	V <sub>DD</sub> = 5.0V		50	100	ns
		V <sub>DD</sub> = 10V		25	50	ns
		V <sub>DD</sub> = 15V		20	40	ns
t <sub>H</sub>	Minimum Hold Time	V <sub>DD</sub> = 5.0V		55	110	ns
		V <sub>DD</sub> = 10V		35	70	ns
		V <sub>DD</sub> = 15V		30	60	ns
f <sub>CL</sub>	Maximum Clock Frequency	V <sub>DD</sub> = 5.0V	2.5	5.0		MHz
		V <sub>DD</sub> = 10V	5.0	12		MHz
		V <sub>DD</sub> = 15V	7.0	16		MHz
C <sub>L</sub>	Input Capacitance	Data Input		5.0		pF
		CLK Input		7.5		pF

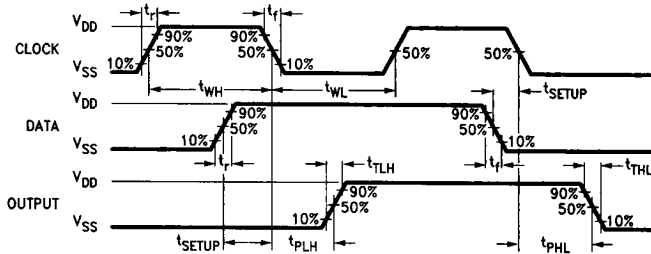
\*AC Parameters are guaranteed by DC correlated testing.

**Note 1:** "Absolute Maximum Ratings" are those values beyond which the safety of the device cannot be guaranteed; 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 2:** V<sub>SS</sub> = 0V unless otherwise specified.

**Note 3:** I<sub>OL</sub> and I<sub>OH</sub> are tested one output at a time.

# Switching Time Waveforms



TL/F/5942-5