

CD4006BM/CD4006BC 18-Stage Static Shift Register

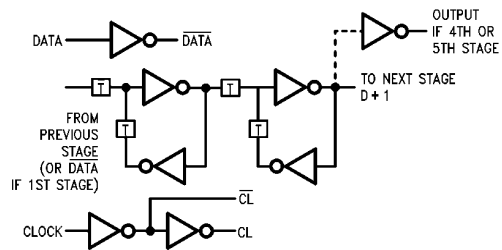
General Description

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.

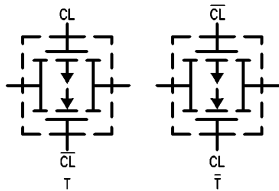
Features

- Wide supply voltage range 3.0V to 15V
- High noise immunity 0.45 V_{DD} (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 $V_{DD} = 10V$)
- Low power
- Fully static operation

Logic Diagrams

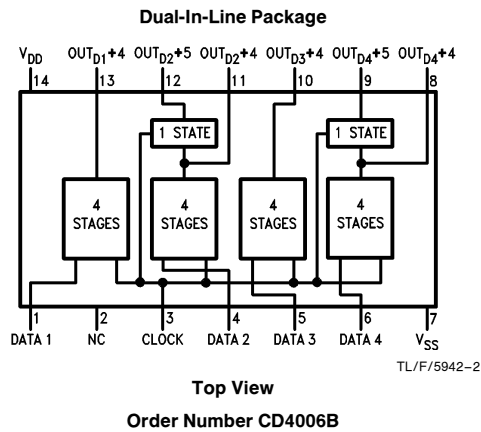


TL/F/5942-1



TL/F/5942-3

Connection Diagram



TL/F/5942-2

Top View
Order Number CD4006B

Truth Table

D	CL Δ	D+1
0		0
1		1
X		NC

TL/F/5942-4

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

Absolute Maximum Ratings (Notes 1 and 2)

If Military/Aerospace specified devices are required, please 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	μA
		$V_{DD} = 10V, V_{IN} = V_{DD}$ or V_{SS}		10		0.010	10		300	μA
		$V_{DD} = 15V, V_{IN} = V_{DD}$ or V_{SS}		20		0.015	20		600	μA
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^{-5}		-1.0		μA
		$V_{DD} = 15V, V_{IN} = 15V$		0.1		10^{-5}	0.1		1.0	μA

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	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	$V_{DD} = 5.0V$		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 _{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		4.5	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	5.5		7.0		V
		V _{DD} = 15V, V _O = 1.5V or 13.5V	11		11	8.25		11		V
I _{OL}	Low Level Output Current (Note 3)	V _{DD} = 5.0V, 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 3)	V _{IL} = 0V, V _{IH} = V _{DD}								
		V _{DD} = 5.0V, 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

AC Electrical Characteristics* CD4006BM/CD4006BC T_A = 25°C, C_L = 50 pF, unless otherwise noted

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

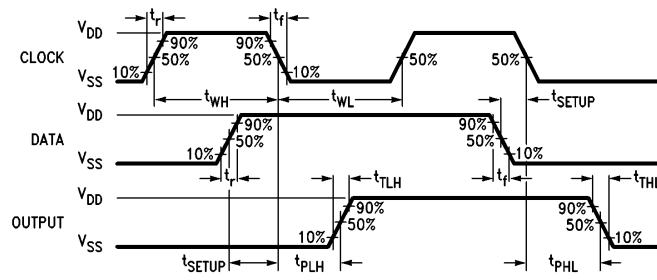
*AC Parameters are guaranteed by DC correlated testing.

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_{SS} = 0V unless otherwise specified.

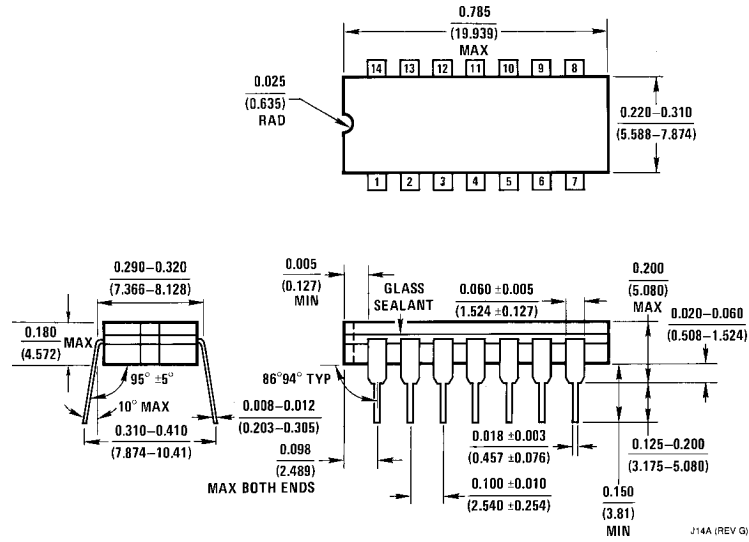
Note 3: I_{OL} and I_{OH} are tested one output at a time.

Switching Time Waveforms



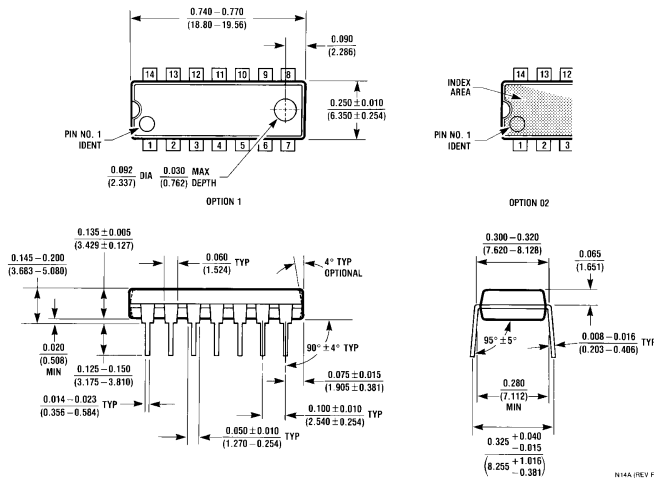
TL/F/5942-5

Physical Dimensions inches (millimeters)



Ceramic Dual-In-Line Package (J)
Order Number CD4006BMJ or CD4006BCJ
NS Package Number J14A

Physical Dimensions inches (millimeters) (Continued)



Molded Dual-In-Line Package (N)
Order Number CD4006BMN or CD4006BCN
NS Package Number N14A

LIFE SUPPORT POLICY

NATIONAL'S PRODUCTS ARE NOT AUTHORIZED FOR USE AS CRITICAL COMPONENTS IN LIFE SUPPORT DEVICES OR SYSTEMS WITHOUT THE EXPRESS WRITTEN APPROVAL OF THE PRESIDENT OF NATIONAL SEMICONDUCTOR CORPORATION. As used herein:

1. Life support devices or systems are devices or systems which, (a) are intended for surgical implant into the body, or (b) support or sustain life, and whose failure to perform, when properly used in accordance with instructions for use provided in the labeling, can be reasonably expected to result in a significant injury to the user.
2. A critical component is any component of a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.



National Semiconductor Corporation
 1111 West Bardin Road
 Arlington, TX 76017
 Tel: 1(800) 272-9959
 Fax: 1(800) 737-7018

National Semiconductor Europe
 Fax: (+49) 0-180-530 85 86
 Email: cnjwge@tevm2.nsc.com
 Deutsch Tel: (+49) 0-180-530 85 85
 English Tel: (+49) 0-180-532 78 32
 Français Tel: (+49) 0-180-532 93 58
 Italiano Tel: (+49) 0-180-534 16 80

National Semiconductor Hong Kong Ltd.
 19th Floor, Straight Block,
 Ocean Centre, 5 Canton Rd.
 Tsimshatsui, Kowloon
 Hong Kong
 Tel: (852) 2737-1600
 Fax: (852) 2736-9960

National Semiconductor Japan Ltd.
 Tel: 81-043-299-2309
 Fax: 81-043-299-2408

National does not assume any responsibility for use of any circuitry described, no circuit patent licenses are implied and National reserves the right at any time without notice to change said circuitry and specifications.