



CD40106BM/CD40106BC Hex Schmitt Trigger

General Description

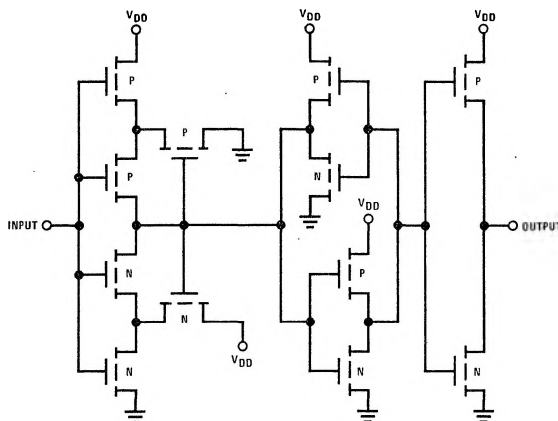
The CD40106B Hex Schmitt Trigger is a monolithic complementary MOS (CMOS) integrated circuit constructed with N and P-channel enhancement transistors. The positive and negative-going threshold voltages, V_{T+} and V_{T-} , show low variation with respect to temperature (typ 0.0005V/°C at $V_{DD} = 10V$), and hysteresis, $V_{T+} - V_{T-} \geq 0.2 V_{DD}$ is guaranteed.

All inputs are protected from damage due to static discharge by diode clamps to V_{DD} and V_{SS} .

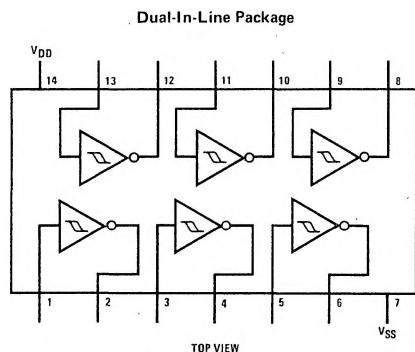
Features

- Wide supply voltage range 3V to 15V
- High noise immunity 0.7 V_{DD} (typ.)
- Low power fan out of 2 driving 74L or 1 driving 74LS
- Hysteresis 0.4 V_{DD} (typ.)
0.2 V_{DD} guaranteed
- Equivalent to MM54C14/MM74C14
- Equivalent to MC14584B

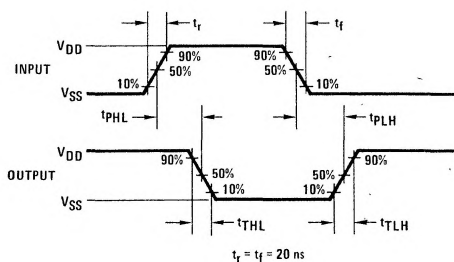
Schematic Diagram



Connection Diagram



Switching Time Waveforms



Absolute Maximum Ratings

(Notes 1 and 2)

V _{DD} dc Supply Voltage	-0.5 to +18 V _{DC}
V _{IN} Input Voltage	-0.5 to V _{DD} +0.5 V _{DC}
T _S Storage Temperature Range	-65°C to +150°C
P _D Package Dissipation	500 mW
T _L Lead Temperature (Soldering, 10 seconds)	300°C

Recommended Operating Conditions

(Note 2)

V _{DD} dc Supply Voltage	3 to 15 V _{DC}
V _{IN} Input Voltage	0 to V _{DD} V _{DC}
T _A Operating Temperature Range	-55°C to +125°C
CD40106BM	-40°C to +85°C
CD40106BC	

DC Electrical Characteristics CD40106BM (Note 2)

PARAMETER	CONDITIONS	-55°C		25°C			125°C		UNITS
		MIN	MAX	MIN	TYP	MAX	MIN	MAX	
I _{DD} Quiescent Device Current	V _{DD} = 5V		1.0			1.0		30	μA
	V _{DD} = 10V		2.0			2.0		60	μA
	V _{DD} = 15V		4.0			4.0		120	μA
V _{OL} Low Level Output Voltage	I _O < 1μA								
	V _{DD} = 5V		0.05			0.05		0.05	V
	V _{DD} = 10V		0.05			0.05		0.05	V
V _{OH} High Level Output Voltage	I _O < 1μA								
	V _{DD} = 5V	4.95		4.95	5		4.95		V
	V _{DD} = 10V	9.95		9.95	10		9.95		V
V _{T-} Negative-Going Threshold Voltage	V _{DD} = 15V	14.95		14.95	15		14.95		V
	V _{DD} = 5V, V _O = 4.5V	0.7	2.0	0.7	1.4	2.0	0.7	2.0	V
	V _{DD} = 10V, V _O = 9V	1.4	4.0	1.4	3.2	4.0	1.4	4.0	V
V _{T+} Positive-Going Threshold Voltage	V _{DD} = 15V, V _O = 13.5V	2.1	6.0	2.1	5.0	6.0	2.1	6.0	V
	V _{DD} = 5V, V _O = 0.5V	3.0	4.3	3.0	3.6	4.3	3.0	4.3	V
	V _{DD} = 10V, V _O = 1V	6.0	8.6	6.0	6.8	8.6	6.0	8.6	V
V _H Hysteresis (V _{T+} - V _{T-})	V _{DD} = 15V, V _O = 1.5V	9.0	12.9	9.0	10.0	12.9	9.0	12.9	V
	V _{DD} = 5V	1.0	3.6	1.0	2.2	3.6	1.0	3.6	V
	V _{DD} = 10V	2.0	7.2	2.0	3.6	7.2	2.0	7.2	V
I _{OL} Low Level Output Current	V _{DD} = 15V	3.0	10.8	3.0	5.0	10.8	3.0	10.8	V
	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	2.25		0.9		mA
I _{OH} High Level Output Current	V _{DD} = 15V, V _O = 1.5V	4.2		3.4	8.8		2.4		mA
	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	-2.25		-0.9		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

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 table of "Recommended Operating Conditions" and "Electrical Characteristics" provides conditions for actual device operation.

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

Note 3: 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.

DC Electrical Characteristics CD40106BC (Note 2)

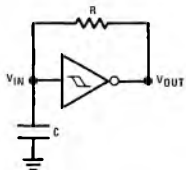
PARAMETER	CONDITIONS	-40°C		25°C			+85°C		UNITS
		MIN	MAX	MIN	TYP	MAX	MIN	MAX	
I_{DD} Quiescent Device Current	$V_{DD} = 5V$		4.0			4.0		30	μA
	$V_{DD} = 10V$		8.0			8.0		60	μA
	$V_{DD} = 15V$		16.0			16.0		120	μA
V_{OL} Low Level Output Voltage	$ I_O < 1\mu A$								
	$V_{DD} = 5V$		0.05			0.05		0.05	V
	$V_{DD} = 10V$		0.05			0.05		0.05	V
	$V_{DD} = 15V$		0.05			0.05		0.05	V
V_{OH} High Level Output Voltage	$ I_O < 1\mu A$								
	$V_{DD} = 5V$	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_{T-} Negative-Going Threshold Voltage	$V_{DD} = 5V, V_O = 4.5V$	0.7	2.0	0.7	1.4	2.0	0.7	2.0	V
	$V_{DD} = 10V, V_O = 9V$	1.4	4.0	1.4	3.2	4.0	1.4	4.0	V
	$V_{DD} = 15V, V_O = 13.5V$	2.1	6.0	2.1	5.0	6.0	2.1	6.0	V
V_{T+} Positive-Going Threshold Voltage	$V_{DD} = 5V, V_O = 0.5V$	3.0	4.3	3.0	3.6	4.3	3.0	4.3	V
	$V_{DD} = 10V, V_O = 1V$	6.0	8.6	6.0	6.8	8.6	6.0	8.6	V
	$V_{DD} = 15V, V_O = 1.5V$	9.0	12.9	9.0	10.0	12.9	9.0	12.9	V
V_H Hysteresis ($V_{T+} - V_{T-}$)	$V_{DD} = 5V$	1.0	3.6	1.0	2.2	3.6	1.0	3.6	V
	$V_{DD} = 10V$	2.0	7.2	2.0	3.6	7.2	2.0	7.2	V
	$V_{DD} = 15V$	3.0	10.8	3.0	5.0	10.8	3.0	10.8	V
I_{OL} Low Level Output Current	$V_{DD} = 5V, V_O = 0.4V$	0.52		0.44	0.88		0.36		mA
	$V_{DD} = 10V, V_O = 0.5V$	1.3		1.1	2.25		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	$V_{DD} = 5V, V_O = 4.6V$	-0.52		-0.44	-0.88		-0.36		mA
	$V_{DD} = 10V, V_O = 9.5V$	-1.3		-1.1	-2.25		-0.9		mA
	$V_{DD} = 15V, V_O = 13.5V$	-3.6		-3.0	-8.8		-2.4		mA
I_{IN} Input Current	$V_{DD} = 15V, V_{IN} = 0V$		-0.30		-10^{-5}	-0.30		-1.0	μA
	$V_{DD} = 15V, V_{IN} = 15V$		0.30		10^{-5}	0.30		1.0	μA

AC Electrical Characteristics $T_A = 25^\circ C$, $C_L = 50 pF$, $R_L = 200 k$, t_r and $t_f = 20 ns$, unless otherwise specified.

PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS
t_{PHL} or t_{PLH} Propagation Delay Time From Input To Output	$V_{DD} = 5V$		220	400	ns
	$V_{DD} = 10V$		80	200	ns
	$V_{DD} = 15V$		70	160	ns
t_{THL} or t_{TLH} Transition Time	$V_{DD} = 5V$		100	200	ns
	$V_{DD} = 10V$		50	100	ns
	$V_{DD} = 15V$		40	80	ns
C_{IN} Average Input Capacitance	Any Input		5	7.5	pF
C_{PD} Power Dissipation Capacitance	Any Gate (Note 3)		14		pF

Typical Applications

Low Power Oscillator

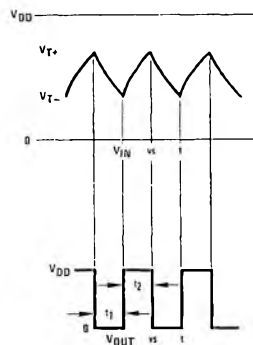


$$t_1 \approx RC \ln \frac{V_{T+}}{V_{T-}}$$

$$t_2 \approx RC \ln \frac{V_{DD} - V_{T-}}{V_{DD} - V_{T+}}$$

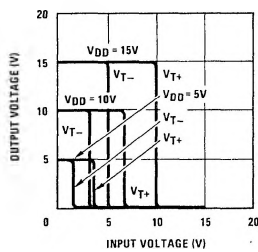
$$f \approx \frac{1}{RC \ln \frac{V_{T+}(V_{DD} - V_{T-})}{V_{T-}(V_{DD} - V_{T+})}}$$

Note: The equations assume
 $t_1 + t_2 \gg t_{pHL} + t_{pLH}$



Typical Performance Characteristics

Typical Transfer Characteristics



Guaranteed Trip Point Range

