

## CD4007M/CD4007C Dual Complementary Pair Plus Inverter

### General Description

The CD4007M/CD4007C consists of three complementary pairs of N- and P-channel enhancement mode MOS transistors suitable for series/shunt applications. All inputs are protected from static discharge by diode clamps to  $V_{DD}$  and  $V_{SS}$ .

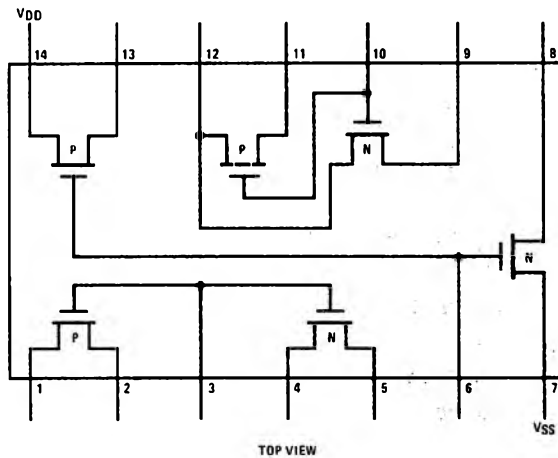
For proper operation the voltages at all pins must be constrained to be between  $V_{SS} - 0.3V$  and  $V_{DD} + 0.3V$  at all times.

### Features

- Wide supply voltage range
- High noise immunity

3.0V to 15V  
0.45  $V_{CC}$  (typ.)

### Connection Diagram



Note: All P-channel substrates are connected to  $V_{DD}$  and all N-channel substrates are connected to  $V_{SS}$ .

## Absolute Maximum Ratings (Note 1)

Voltage at Any Pin  $V_{SS} - 0.3V$  to  $V_{DD} + 0.3V$   
 Operating Temperature Range  
 CD4007M  $-55^{\circ}C$  to  $+125^{\circ}C$   
 CD4007C  $-40^{\circ}C$  to  $+85^{\circ}C$

Storage Temperature Range  $-65^{\circ}C$  to  $+150^{\circ}C$   
 Package Dissipation 500 mW  
 Operating  $V_{DD}$  Range  $V_{SS} + 3.0V$  to  $V_{SS} + 15V$   
 Lead Temperature (Soldering, 10 seconds)  $300^{\circ}C$

## DC Electrical Characteristics — CD4007M

Parameter	Conditions	Limits									Units
		$-55^{\circ}C$			$25^{\circ}C$			$125^{\circ}C$			
		Min.	Typ.	Max.	Min.	Typ.	Max.	Min.	Typ.	Max.	
$I_L$ Quiescent Device Current	$V_{DD} = 5.0V$ $V_{DD} = 10V$			0.05		0.001	0.05			3.0	$\mu A$
				0.1		0.001	0.1			6.0	$\mu A$
$P_D$ Quiescent Device Dissipation/Package	$V_{DD} = 5.0V$ $V_{DD} = 10V$			0.25		0.005	0.25			15	$\mu W$
				1.0		0.001	1.0			60	$\mu W$
$V_{OL}$ Output Voltage Low Level	$V_{DD} = 5.0V$ $V_{DD} = 10V$			0.05		0	0.05			0.05	V
				0.05		0	0.05			0.05	V
$V_{OH}$ Output Voltage High Level	$V_{DD} = 5.0V$ $V_{DD} = 10V$	4.95			4.95	5.0		4.95			V
		9.95			9.95	10		9.95			V
$V_{NL}$ Noise Immunity (All inputs)	$V_{DD} = 5.0V, V_O = 3.6V$ $V_{DD} = 10V, V_O = 7.2V$	1.5			1.5	2.25		1.4			V
		3.0			3.0	4.5		2.9			V
$V_{NH}$ Noise Immunity (All inputs)	$V_{DD} = 5.0V, V_O = 0.95V$ $V_{DD} = 10V, V_O = 2.9V$	1.4			1.5	2.25		1.5			V
		2.9			3.0	4.5		3.0			V
$I_{DN}$ Output Drive Current N-Channel	$V_{DD} = 5.0V, V_O = 0.4V, V_I = V_{DD}$ $V_{DD} = 10V, V_O = 0.5V, V_I = V_{DD}$	0.75			0.6	1.0		0.4			mA
		1.6			1.3	2.5		0.95			mA
$I_{DP}$ Output Drive Current P-Channel	$V_{DD} = 5.0V, V_O = 2.5V, V_I = V_{SS}$ $V_{DD} = 10V, V_O = 9.5V, V_I = V_{SS}$	-1.75			-1.4	-4.0		-1.0			mA
		-1.35			-1.1	-2.5		-0.75			mA
$I_I$ Input Current						10					pA

## DC Electrical Characteristics — CD4007C

Parameter	Conditions	Limits									Units
		$-40^{\circ}C$			$25^{\circ}C$			$85^{\circ}C$			
		Min.	Typ.	Max.	Min.	Typ.	Max.	Min.	Typ.	Max.	
$I_L$ Quiescent Device Current	$V_{DD} = 5.0V$ $V_{DD} = 10V$			0.5		0.005	0.5			15	$\mu A$
				1.0		0.005	1.0			30	$\mu A$
$P_D$ Quiescent Device Dissipation/Package	$V_{DD} = 5.0V$ $V_{DD} = 10V$			2.5		0.025	2.5			75	$\mu W$
				10		0.05	10			300	$\mu W$
$V_{OL}$ Output Voltage Low Level	$V_{DD} = 5.0V$ $V_{DD} = 10V$			0.05		0	0.01			0.05	V
				0.05		0	0.01			0.05	V
$V_{OH}$ Output Voltage High Level	$V_{DD} = 5.0V$ $V_{DD} = 10V$	4.95			4.95	5.0		4.95			V
		9.95			9.95	10		9.95			V
$V_{NL}$ Noise Immunity (All inputs)	$V_{DD} = 5.0V, V_O = 3.6V$ $V_{DD} = 10V, V_O = 7.2V$	1.5			1.5	2.25		1.4			V
		3.0			3.0	4.5		2.9			V
$V_{NH}$ Noise Immunity (All inputs)	$V_{DD} = 5.0V, V_O = 0.95V$ $V_{DD} = 10V, V_O = 2.9V$	1.4			1.5	2.25		1.5			V
		2.9			3.0	4.5		3.0			V
$I_{DN}$ Output Drive Current N-Channel	$V_{DD} = 5.0V, V_O = 0.4V, V_I = V_{DD}$ $V_{DD} = 10V, V_O = 0.5V, V_I = V_{DD}$	0.35			0.3	1.0		0.24			mA
		1.2			1.0	2.5		0.8			mA
$I_{DP}$ Output Drive Current P-Channel	$V_{DD} = 5.0V, V_O = 2.5V, V_I = V_{SS}$ $V_{DD} = 10V, V_O = 9.5V, V_I = V_{SS}$	-1.3			-1.1	-4.0		-0.9			mA
		-0.65			-0.55	-2.5		-0.45			mA
$I_I$ Input Current						10					pA

**Note 1:** This device should not be connected to circuits with the power on because high transient voltages may cause permanent damage.

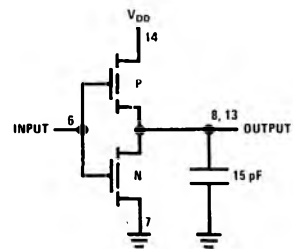
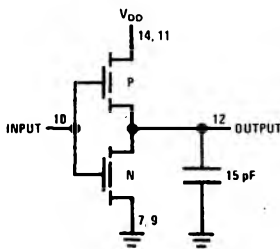
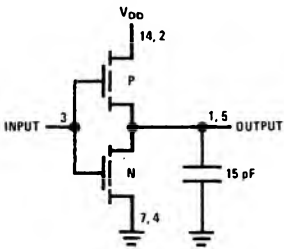
**AC Electrical Characteristics** — CD4007M  $T_A = 25^\circ\text{C}$  and  $C_L = 15\text{ pF}$  and rise and fall times = 20 ns.  
 Typical temperature coefficient for all values of  $V_{DD} = 0.3\%/^\circ\text{C}$

Parameter	Conditions	Min.	Typ.	Max.	Units
$t_{PLH} = t_{PHL}$ Propagation Delay Time	$V_{DD} = 5.0\text{V}$ $V_{DD} = 10\text{V}$		35 20	60 40	ns
$t_{TLH} = t_{THL}$ Transition Time	$V_{DD} = 5.0\text{V}$ $V_{DD} = 10\text{V}$		50 30	75 40	ns
$C_i$ Input Capacitance	Any Input		5.0		pF

**AC Electrical Characteristics** CD4007C  $T_A = 25^\circ\text{C}$  and  $C_L = 15\text{ pF}$  and rise and fall times = 20 ns.  
 Typical temperature coefficient for all values of  $V_{DD} = 0.3\%/^\circ\text{C}$

Parameter	Conditions	Min.	Typ.	Max.	Units
$t_{PLH} = t_{PHL}$ Propagation Delay Time	$V_{DD} = 5.0\text{V}$ $V_{DD} = 10\text{V}$		35 20	75 50	ns
$t_{TLH} = t_{THL}$ Transition Time	$V_{DD} = 5.0\text{V}$ $V_{DD} = 10\text{V}$		50 30	100 50	ns
$C_i$ Input Capacitance	Any Input		5		pF

**AC Test Circuits**



**Switching Time Waveforms**

