National Semiconductor

CD4099BM/CD4099BC 8-Bit Addressable Latch

General Description

The CD4099B is an 8-bit addressable latch with three address inputs (A0-A2), an active low enable input ($\overline{E}$), active high clear input (CL), a data input (D), and eight outputs (Q0-Q7).

Data is entered into a particular bit in the latch when that bit is addressed by the address inputs and the enable ($\overline{E}$) is low. Data entry is inhibited when enable ($\overline{E}$) is high.

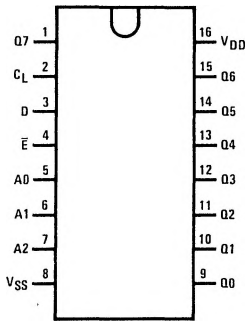
When clear (CL) and enable ($\overline{E}$) are high, all outputs are low. When clear (CL) is high and enable ($\overline{E}$) is low, the channel demultiplexing occurs. The bit that is addressed has an active output which follows the data input while all unaddressed bits are held low. When operating in the addressable latch mode ($\overline{E}$ = CL = low), changing more than one bit of the address could impose a transient wrong address. Therefore, this should only be done while in the memory mode ($\overline{E}$ = high, CL = low).

Features

- Wide supply voltage range — 3.0 V to 15 V
- High noise immunity — 0.45 V_{DD} (typ.)
- Low power TTL compatibility — fan out of 2 driving 74L or 1 driving 74LS
- Serial to parallel capability
- Storage register capability
- Random (addressable) data entry
- Active high demultiplexing capability
- Common active high clear

Connection Diagram

CD4099B
Dual-In-Line and Flat Package



TOP VIEW

Truth Table

MODE SELECTION				
$\overline{E}$	CL	ADDRESSED LATCH	UNADDRESSED LATCH	MODE
L	L	Follows Data	Holds Previous Data	Addressable Latch
H	L	Holds Previous Data	Holds Previous Data	Memory
L	H	Follows Data	Reset to "0"	Demultiplexer
H	H	Reset to "0"	Reset to "0"	Clear

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	3.0 to 15 V_{DC}
V_{IN} Input Voltage	0 to V_{DD} V_{DC}
T_A Operating Temperature Range	
CD4099BM	−55°C to +125°C
CD4099BC	−40°C to +85°C

DC Electrical Characteristics CD4099BM (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} = 5.0 V		5.0		0.02	5.0		150	μA
	V_{DD} = 10 V		10		0.02	10		300	μA
	V_{DD} = 15 V		20		0.02	20		600	μA
V_{OL} Low Level Output Voltage	$\|I_O\| \leq 1\mu A$								
	V_{DD} = 5.0 V		0.05		0	0.05		0.05	V
	V_{DD} = 10 V		0.05		0	0.05		0.05	V
	V_{DD} = 15 V		0.05		0	0.05		0.05	V
V_{OH} High Level Output Voltage	$\|I_O\| \leq 1\mu A$								
	V_{DD} = 5.0 V	4.95		4.95	5.0		4.95		V
	V_{DD} = 10 V	9.95		9.95	10		9.95		V
	V_{DD} = 15 V	14.95		14.95	15		14.95		V
V_{IL} Low Level Input Voltage	V_{DD} = 5.0 V, V_O = 0.5 V or 4.5 V		1.5		2.25	1.5		1.5	V
	V_{DD} = 10 V, V_O = 1.0 V or 9.0 V		3.0		4.5	3.0		3.0	V
	V_{DD} = 15 V, V_O = 1.5 V or 13.5 V		4.0		6.75	4.0		4.0	V
V_{IH} High Level Input Voltage	V_{DD} = 5.0 V, V_O = 0.5 V or 4.5 V	3.5		3.5	2.75		3.5		V
	V_{DD} = 10 V, V_O = 1.0 V or 9.0 V	7.0		7.0	5.5		7.0		V
	V_{DD} = 15 V, V_O = 1.5 V or 13.5 V	11.0		11.0	8.25		11.0		V
I_{OL} Low Level Output Current	V_{DD} = 5.0 V, V_O = 0.4 V	0.64		0.51	0.88		0.36		mA
	V_{DD} = 10 V, V_O = 0.5 V	1.6		1.3	2.25		0.9		mA
	V_{DD} = 15 V, V_O = 1.5 V	4.2		3.4	8.8		2.4		mA
I_{OH} High Level Output Current	V_{DD} = 5.0 V, V_O = 4.6 V	−0.64		−0.51	−0.88		−0.36		mA
	V_{DD} = 10 V, V_O = 9.5 V	−1.6		−1.3	−2.25		−0.9		mA
	V_{DD} = 15 V, V_O = 13.5 V	−4.2		−3.4	−8.8		−2.4		mA
I_{IN} Input Current	V_{DD} = 15 V, V_{IN} = 0 V		−0.1		-10^{-5}	−0.1		−1.0	μA
	V_{DD} = 15 V, V_{IN} = 15 V		0.1		10^{-5}	0.1		1.0	μA

DC Electrical Characteristics CD4099BC (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} = 5.0 V		20		0.02	20		150	μA
	V_{DD} = 10 V		40		0.02	40		300	μA
	V_{DD} = 15 V		80		0.02	80		600	μA
V_{OL} Low Level Output Voltage	$\|I_O\| \leq 1\mu A$								
	V_{DD} = 5.0 V		0.05		0	0.05		0.05	V
	V_{DD} = 10 V		0.05		0	0.05		0.05	V
	V_{DD} = 15 V		0.05		0	0.05		0.05	V
V_{OH} High Level Output Voltage	$\|I_O\| \leq 1\mu A$								
	V_{DD} = 5.0 V	4.95		4.95	5.0		4.95		V
	V_{DD} = 10 V	9.95		9.95	10		9.95		V
	V_{DD} = 15 V	14.95		14.95	15		14.95		V
V_{IL} Low Level Input Voltage	V_{DD} = 5.0 V, V_O = 0.5 or 4.5 V		1.5		2.25	1.5		1.5	V
	V_{DD} = 10 V, V_O = 1.0 V or 9.0 V		3.0		4.5	3.0		3.0	V
	V_{DD} = 15 V, V_O = 1.5 V or 13.5 V		4.0		6.75	4.0		4.0	V
V_{IH} High Level Input Voltage	V_{DD} = 5.0 V, V_O = 0.5 V or 4.5 V	3.5		3.5	2.75		3.5		V
	V_{DD} = 10 V, V_O = 1.0 V or 9.0 V	7.0		7.0	5.5		7.0		V
	V_{DD} = 15 V, V_O = 1.5 V or 13.5 V	11.0		11.0	8.25		11.0		V

DC Electrical Characteristics (cont'd) CD4099BC (Note 2)

Parameter	Conditions	−40°C		25°C			85°C		Units
		Min.	Max.	Min.	Typ.	Max.	Min.	Max.	
I_{OL} Low Level Output Current	$V_{DD}=5.0V$, $V_O=0.4V$	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	$V_{DD}=5.0V$, $V_O=4.6V$	−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	$V_{DD}=15V$, $V_{IN}=0V$		−0.30		-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 $T_A=25°C$, $C_L=50pF$, $R_L=200k$, Input $t_r=t_f=20ns$, unless otherwise noted.

Parameter	Conditions	Min.	Typ.	Max.	Units
t_{PHL}, t_{PLH} Propagation Delay Date to Output	$V_{DD}=5.0V$		200	400	ns
	$V_{DD}=10V$		75	150	ns
	$V_{DD}=15V$		50	100	ns
t_{PLH}, t_{PHL} Propagation Delay Enable to Output	$V_{DD}=5.0V$		200	400	ns
	$V_{DD}=10V$		80	160	ns
	$V_{DD}=15V$		60	120	ns
t_{PHL} Propagation Delay Clear to Output	$V_{DD}=5.0V$		175	350	ns
	$V_{DD}=10V$		80	160	ns
	$V_{DD}=15V$		65	130	ns
t_{PLH}, t_{PHL} Propagation Delay Address to Output	$V_{DD}=5.0V$		225	450	ns
	$V_{DD}=10V$		100	200	ns
	$V_{DD}=15V$		75	150	ns
t_{THL}, t_{TLH} Transition Time (Any Output)	$V_{DD}=5.0V$		100	200	ns
	$V_{DD}=10V$		50	100	ns
	$V_{DD}=15V$		40	80	ns
t_{WH}, T_{WL} Minimum Data Pulse Width	$V_{DD}=5.0V$		100	200	ns
	$V_{DD}=10V$		50	100	ns
	$V_{DD}=15V$		40	80	ns
t_{WH}, t_{WL} Minimum Address Pulse Width	$V_{DD}=5.0V$		200	400	ns
	$V_{DD}=10V$		100	200	ns
	$V_{DD}=15V$		65	125	ns
t_{WH} Minimum Clear Pulse Width	$V_{DD}=5.0V$		75	150	ns
	$V_{DD}=10V$		40	75	ns
	$V_{DD}=15V$		25	50	ns
t_{SU} Minimum Set-Up Time Data to E	$V_{DD}=5.0V$		40	80	ns
	$V_{DD}=10V$		20	40	ns
	$V_{DD}=15V$		15	30	ns
t_H Minimum Hold Time Data to E	$V_{DD}=5.0V$		60	120	ns
	$V_{DD}=10V$		30	60	ns
	$V_{DD}=15V$		25	50	ns
t_{SU} Minimum Set-Up Time Address to E	$V_{DD}=5.0V$		−15	50	ns
	$V_{DD}=10V$		0	30	ns
	$V_{DD}=15V$		0	20	ns
t_H Minimum Hold Time Address to E	$V_{DD}=5.0V$		−50	15	ns
	$V_{DD}=10V$		−20	10	ns
	$V_{DD}=15V$		−15	5	ns
C_{PD} Power Dissipation Capacitance	Per Package (Note 3)		100		pF
C_{IN} Input Capacitance	Any Input		5.0	7.5	pF

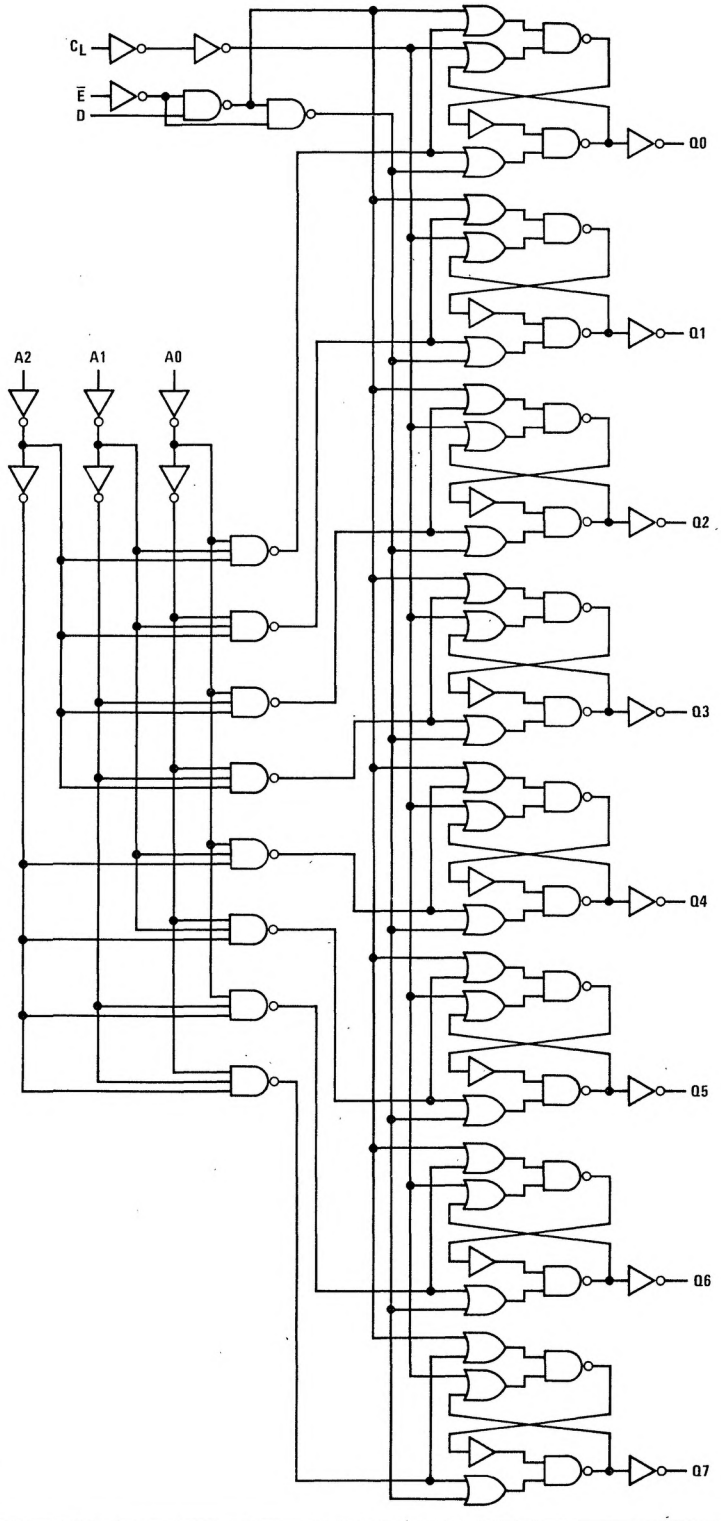
Note 1: "Absolute Maximum Ratings" are those values beyond which the safety of the device cannot be guaranteed; they are not meant to imply that the devices should be operated at these limits. The tables of "Recommended Operating Conditions" and "Electrical Characteristics" provide conditions for actual device operation.

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

Note 3: Dynamic power dissipation (P_D) is given by: $P_D=(C_{PD}+C_L)\,V_{CC}{}^2f+P_Q$; where C_L = load capacitance; f = frequency of operation; for further details, see application note AN-90, "54C/74C Family Characteristics".

Logic Diagram

CD4099B



Switching Time Waveforms