CD4099B Types

CMOS 8-Bit Addressable Latch

High-Voltage Types (20-Volt Rating)

■ CD4099B 8-bit addressable latch is a serial-input, parallel-output storage register that can perform a variety of functions.

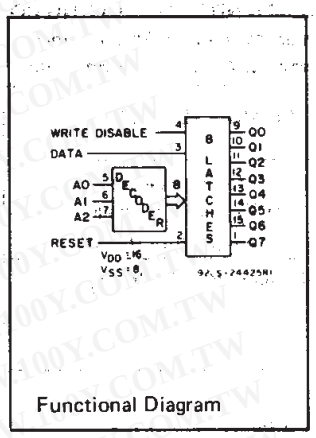
Data are inputted to a particular bit in the latch when that bit is addressed (by means of inputs A0, A1, A2) and when WRITE DISABLE is at a low level. When WRITE DISABLE is high, data entry is inhibited; however, all 8 outputs can be continuously read independent of WRITE DISABLE and address inputs.

A master RESET input is available, which resets all bits to a logic "0" level when RESET and WRITE DISABLE are at a high level. When RESET is at a high level, and WRITE DISABLE is at a low level, the latch acts as a 1-of-8 demultiplexer; the bit that is addressed has an active output which follows the data input, while all unaddressed bits are held to a logic "0" level.

The CD4099B types are supplied in 16-lead hermetic ceramic dual-in-line packages (D and F suffixes), 16-lead plastic dual-in-line packages (E suffix), and in chip form (H suffix).

Features:

- Serial data input
- Active parallel output
- Storage register capability
- Master clear
- Can function as demultiplexer
- Standardized, symmetrical output characteristics
- 100% tested for quiescent current at 20 V
- Maximum input current of 1 μA at 18 V (full package-temperature range), 100 nA at 18 V and 25°C
- Noise margin (full package-temperature range) = 1 V at V_{DD} = 5 V, 2 V at V_{DD} = 10 V, 2.5 V at V_{DD} = 15 V
- 5-V, 10-V, and 15-V parametric ratings
- Meets all requirements of JEDEC Tentative Standard No. 13B, "Standard Specifications for Description of 'B' Series CMOS Devices"



Functional Diagram

Applications:

- Multi-line decoders
- A/D converters

MAXIMUM RATINGS, *Absolute-Maximum Values:*

DC SUPPLY-VOLTAGE RANGE, (V_{DD})
(Voltages referenced to V_{SS} Terminal) ..... -0.5V to +20V
INPUT VOLTAGE RANGE, ALL INPUTS ..... -0.5V to V_{DD} +0.5V
DC INPUT CURRENT, ANY ONE INPUT ..... ±10mA
POWER DISSIPATION PER PACKAGE (P_D):
For T_A = -55°C to +100°C 500mW
For T_A = +100°C to +125°C ..... Derate Linearity at 12mW/°C to 200mW
DEVICE DISSIPATION PER OUTPUT TRANSISTOR
FOR T_A = FULL PACKAGE-TEMPERATURE RANGE (All Package Types) 100mW
OPERATING-TEMPERATURE RANGE (T_A) ..... -55°C to +125°C
STORAGE TEMPERATURE RANGE (T_{stg}) ..... -65°C to +150°C
LEAD TEMPERATURE (DURING SOLDERING):
At distance 1/16 ± 1/32 inch (1.59 ± 0.79mm) from case for 10s max ..... +265°C

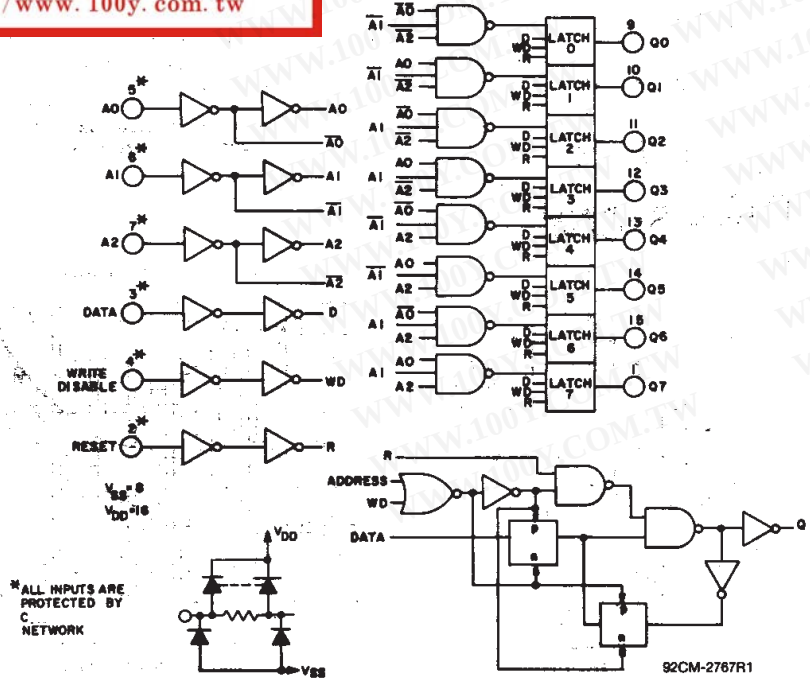
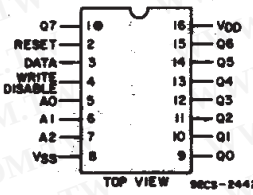


Fig. 1 — Logic diagram of CD4099B and detail of 1 of 8 latches.



TERMINAL ASSIGNMENT

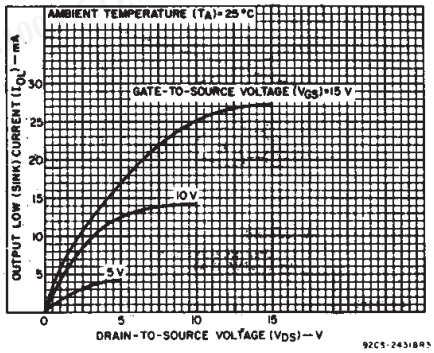


Fig. 2 — Typical output low (sink) current characteristics.

RECOMMENDED OPERATING CONDITIONS *at T_A = 25° C (Unless otherwise specified)*
For maximum reliability, nominal operating conditions should be selected so that operation is always within the following ranges.

CHARACTERISTIC	SEE FIG. 15*	V_{DD} (V)	LIMITS MIN.	LIMITS MAX.	UNITS
Supply Voltage Range: (At T_A = Full Package Temperature Range)			3	18	V
Minimum Pulse Width, t_W Data	4	5	200	–	ns
		10	100	–	
		15	80		
Address	8	5	400	–	
		10	200	–	
		15	125	–	
Reset	5	5	150	–	
		10	75	–	
		15	50	–	
Setup Time, t_S Data to WRITE DISABLE	6	5	100	–	ns
		10	50	–	
		15	35	–	
Hold Time, t_H Data to WRITE DISABLE	7	5	150	–	ns
		10	75	–	
		15	50	–	

* Circled numbers refer to times indicated on master timing diagram.

Note: In addition to the above characteristics, a WRITE DISABLE ON time (the time that WRITE DISABLE is at a high level) must be observed during an address change for the total time that the external address lines A0, A1, and A2 are settling to a stable level, to prevent a wrong cell from being addressed (see Fig. 3).

MODE SELECTION			
WD	R	ADDRESSED LATCH	UNADDRESSED LATCH
0	0	Follows Data	Holds Previous State
0	1	Follows Data (Active High 8-Channel Demultiplexer)	Reset to "0"
1	0	Holds Previous State	
1	1	Reset to "0"	Reset to "0"

WD = WRITE DISABLE R = RESET

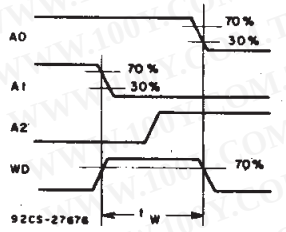


Fig. 3 — Definition of WRITE DISABLE ON time.

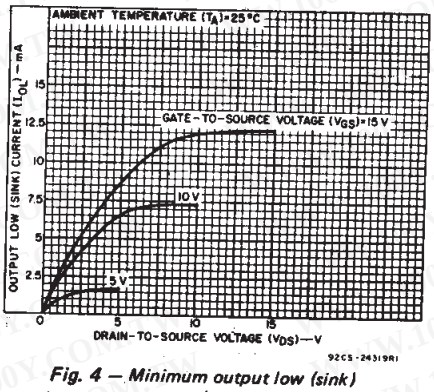


Fig. 4 — Minimum output low (sink) current characteristics.

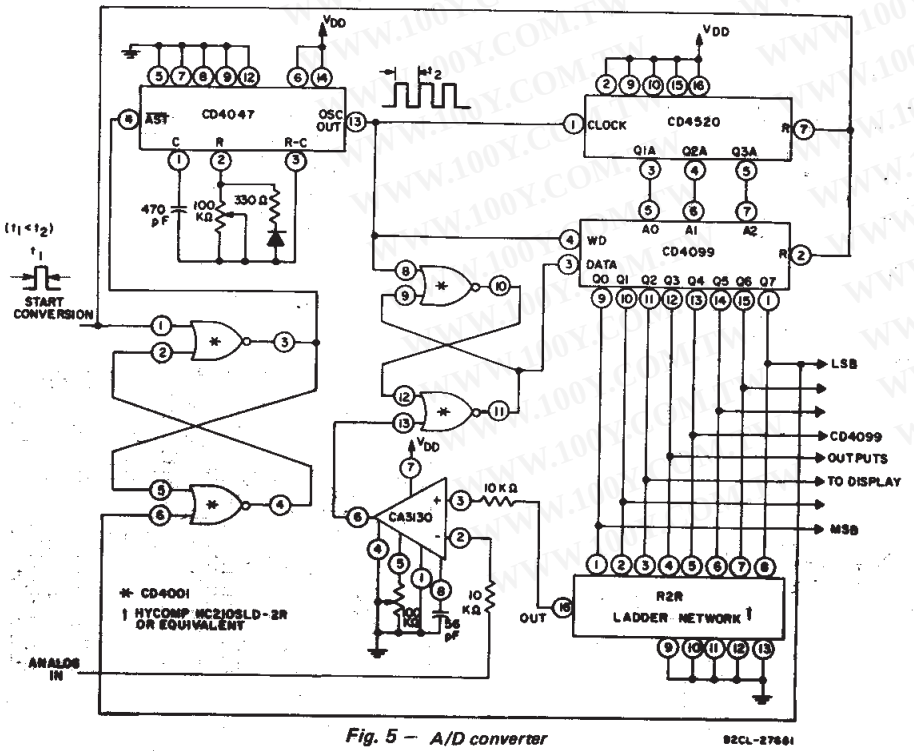


Fig. 5 — A/D converter

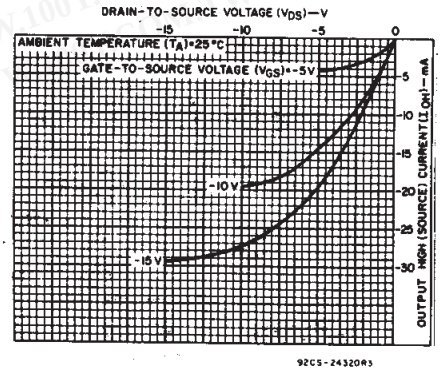
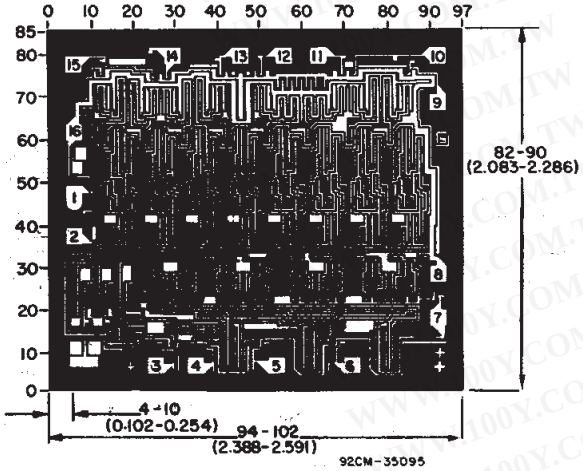


Fig. 6 — Typical output high (source) current characteristics.

STATIC ELECTRICAL CHARACTERISTICS

CHARACTERISTIC	CONDITIONS			LIMITS AT INDICATED TEMPERATURES (°C)							UNITS
								+25			
	V_O (V)	V_{IN} (V)	V_{DD} (V)	−55	−40	+85	+125	Min.	Typ.	Max.	
Quiescent Device Current, I_{DD} Max.	–	0,5	5	5	5	150	150	–	0.04	5	μA
	–	0,10	10	10	10	300	300	–	0.04	10	
	–	0,15	15	20	20	600	600	–	0.04	20	
	–	0,20	20	100	100	3000	3000	–	0.08	100	
Output Low (Sink) Current I_{OL} Min.	0.4	0,5	5	0.64	0.61	0.42	0.36	0.51	1	–	mA
	0.5	0,10	10	1.6	1.5	1.1	0.9	1.3	2.6	–	
	1.5	0,15	15	4.2	4	2.8	2.4	3.4	6.8	–	
Output High (Source) Current, I_{OH} Min.	4.6	0,5	5	−0.64	−0.61	−0.42	−0.36	−0.51	−1	–	
	2.5	0,5	5	−2	−1.8	−1.3	−1.15	−1.6	−3.2	–	
	9.5	0,10	10	−1.6	−1.5	−1.1	−0.9	−1.3	−2.6	–	
	13.5	0,15	15	−4.2	−4	−2.8	−2.4	−3.4	−6.8	–	
Output Voltage: Low-Level, V_{OL} Max.	–	0,5	5	0.05				–	0	0.05	V
	–	0,10	10	0.05				–	0	0.05	
	–	0,15	15	0.05				–	0	0.05	
Output Voltage: High-Level, V_{OH} Min.	–	0,5	5	4.95				4.95	5	–	
	–	0,10	10	9.95				9.95	10	–	
	–	0,15	15	14.95				14.95	15	–	
Input Low Voltage, V_{IL} Max.	0.5, 4.5	–	5	1.5				–	–	1.5	V
	1, 9	–	10	3				–	–	3	
	1.5,13.5	–	15	4				–	–	4	
Input High Voltage, V_{IH} Min.	0.5, 4.5	–	5	3.5				3.5	–	–	
	1, 9	–	10	7				7	–	–	
	1.5,13.5	–	15	11				11	–	–	
Input Current I_{IN} Max.	–	0,18	18	±0.1	±0.1	±1	±1	–	$\pm 10^{-5}$	±0.1	μA



CD4099BH
DIMENSIONS AND PAD LAYOUT

Dimensions in parentheses are in millimeters and are derived from the basic inch dimensions as indicated. Grid graduations are in mils (10^{-3} inch).

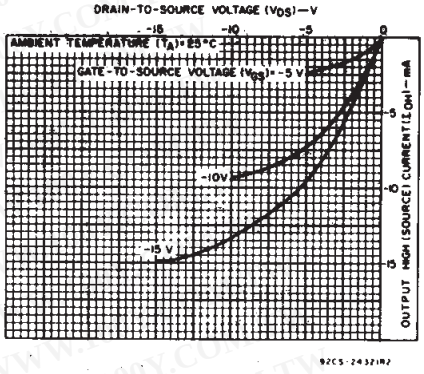


Fig.7 – Minimum output high (source) current characteristics.

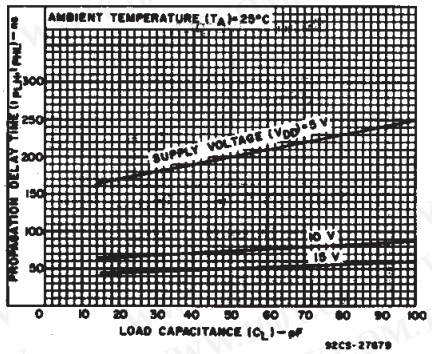


Fig. 8 – Typical propagation delay time (data to Qn) vs. load capacitance.

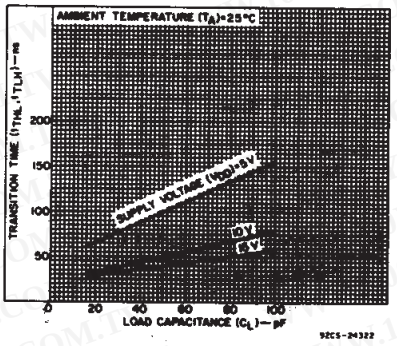


Fig. 9 – Typical transition time vs. load capacitance.

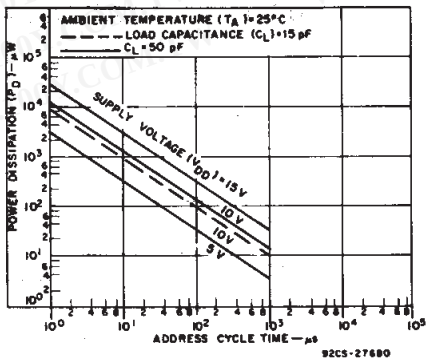


Fig.10 – Typical dynamic power dissipation vs. address cycle time.

DYNAMIC ELECTRICAL CHARACTERISTICS *at T_A = 25° C, C_L = 50 pF, Input t_r, t_f = 20 ns, R_L = 200 KΩ*

CHARACTERISTIC	CONDITIONS SEE FIG.15*	V_{DD} (V)	LIMITS ALL PACKAGE TYPES TYP.	MAX.	UNITS
Propagation Delay: t_{PLH}, t_{PHL} Data to Output,	①	5	200	400	ns
		10	75	150	
		15	50	100	
WRITE DISABLE to Output, t_{PLH}, t_{PHL}	②	5	200	400	
		10	80	160	
		15	60	120	
Reset to Output, t_{PHL}	③	5	175	350	
		10	80	160	
		15	65	130	
Address to Output, t_{PLH}, t_{PHL}	⑨	5	225	450	
		10	100	200	
		15	75	150	
Transition Time, t_{THL}, t_{TLH} (Any Output)		5	100	200	ns
		10	50	100	
		15	40	80	
Minimum Pulse Width, t_W Data	④	5	100	200	ns
		10	50	100	
		15	40	80	
Address	⑧	5	200	400	ns
		10	100	200	
		15	65	125	
Reset	⑤	5	75	150	ns
		10	40	75	
		15	25	50	
Minimum Setup Time, t_S Data to WRITE DISABLE	⑥	5	50	100	ns
		10	25	50	
		15	20	35	
Minimum Hold Time, t_H Data to WRITE DISABLE	⑦	5	75	150	ns
		10	40	75	
		15	25	50	
Input Capacitance, C_{IN}	Any Input		5	7.5	pF

*Circled numbers refer to times indicated on master timing diagram.

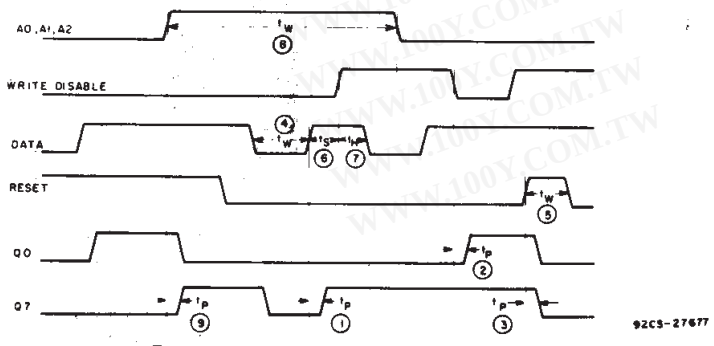


Fig. 15 — Master timing diagram.

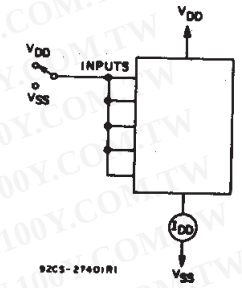


Fig. 11 — Quiescent device current test circuit.

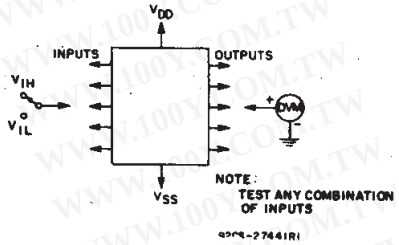


Fig. 12 — Input voltage test circuit.

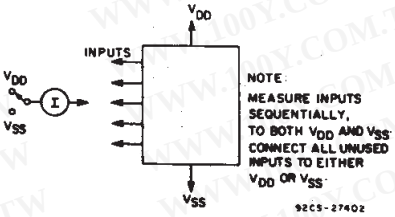


Fig. 13 — Input current test circuit.

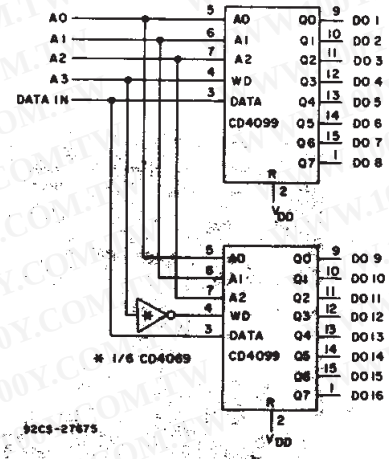


Fig. 14 — 1 of 16 decoder/demultiplexer.

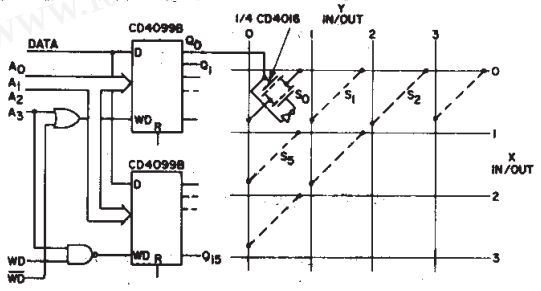


Fig. 16 — Multiple selection decoding — 4 x 4 crosspoint switch.

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