

# CD4514B, CD4515B Types

## CMOS 4-Bit Latch/4-to-16 Line Decoders

High-Voltage Types (20-Volt Rating)

CD4514B Output "High" on Select

CD4515B Output "Low" on Select

■ CD4514B and -CD4515B consist of a 4-bit strobed latch and a 4-to-16-line decoder. The latches hold the last input data presented prior to the strobe transition from 1 to 0. Inhibit control allows all outputs to be placed at 0 (CD4514B) or 1 (CD4515B) regardless of the state of the data or strobe inputs.

The decode truth table indicates all combinations of data inputs and appropriate selected outputs.

These devices are similar to industry types MC14514 and MC14515.

The CD4514B and CD4515B types are supplied in 16-lead hermetic dual-in-line ceramic packages (F3A suffix), 16-lead dual-in-line plastic packages (E suffix), and 16-lead small-outline packages (M and M96 suffixes).

### Features:

- Strobed input latch
- Inhibit control
- 100% tested for quiescent current at 20 V
- Maximum input current of 1  $\mu$ A at 18 V over full package-temperature range; 100 nA at 18 V and 25°C
- Noise margin (over 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
- Standardized, symmetrical output characteristics.
- Meets all requirements of JEDEC Tentative Standard No. 13B; "Standard Specifications for Description of 'B' Series CMOS Devices"

### Applications:

- Digital multiplexing
- Address decoding
- Hexadecimal/BCD decoding
- Program-counter decoding
- Control decoder

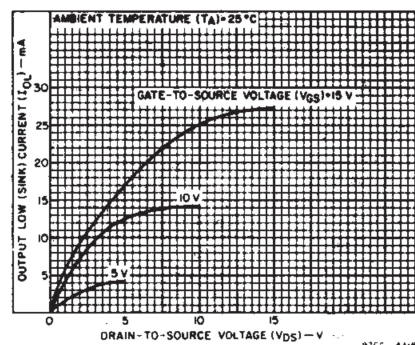
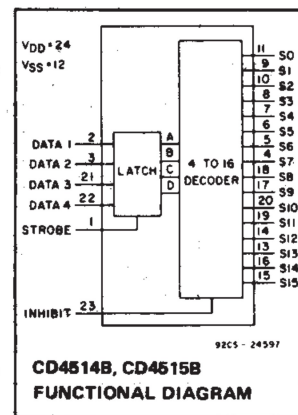


Fig. 1 – Typical output low (sink) current characteristics.

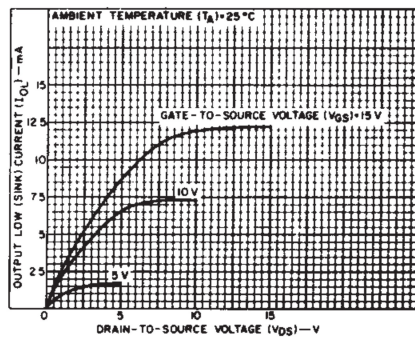


Fig. 2 – Minimum output low (sink) current characteristics.

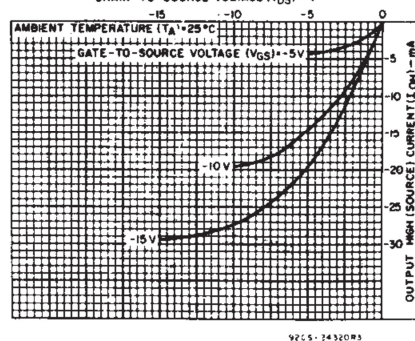


Fig. 3 – Typical output high (source) current characteristics.

### MAXIMUM RATINGS, Absolute-Maximum Values:

DC SUPPLY-VOLTAGE RANGE, ( $V_{DD}$ )	-0.5V to +20V
Voltages referenced to $V_{SS}$ Terminal	-0.5V to +20V
INPUT VOLTAGE RANGE, ALL INPUTS	-0.5V to $V_{DD} + 0.5$ V
DC INPUT CURRENT, ANY ONE INPUT	$\pm 10$ mA
POWER DISSIPATION PER PACKAGE ( $P_D$ ):	
For $T_A = -55^\circ\text{C}$ to $+100^\circ\text{C}$	500mW
For $T_A = +100^\circ\text{C}$ to $+125^\circ\text{C}$	Derate Linearly at 1.2mW/ $^\circ\text{C}$ to 200mW
DEVICE DISSIPATION PER OUTPUT TRANSISTOR	
FOR $T_A =$ FULL PACKAGE-TEMPERATURE RANGE (All Package Types)	100mW
OPERATING-TEMPERATURE RANGE ( $T_A$ )	$-55^\circ\text{C}$ to $+125^\circ\text{C}$
STORAGE TEMPERATURE RANGE ( $T_{stg}$ )	$-65^\circ\text{C}$ to $+150^\circ\text{C}$
LEAD TEMPERATURE (DURING SOLDERING):	
At distance 1/16 $\pm$ 1/32 inch (1.59 $\pm$ 0.79mm) from case for 10s max	$+265^\circ\text{C}$

### RECOMMENDED OPERATING CONDITIONS at $T_A = 25^\circ\text{C}$ , Except as Noted.

For maximum reliability, nominal operating conditions should be selected so that operation is always within the following ranges:

CHARACTERISTIC	$V_{DD}$ (V)	LIMITS		UNITS
		Min.	Max.	
Supply-Voltage Range (For $T_A =$ Full Package-Temperature Range)		3	18	V
Data Setup Time, $t_S$	5 10 15	150 70 40	— — —	ns
Strobe Pulse Width, $t_W$	5 10 15	250 100 75	— — —	ns

3  
COMMERCIAL CMOS  
HIGH VOLTAGE ICs

# CD4514B, CD4515B Types

## STATIC ELECTRICAL CHARACTERISTICS

CHARACTERISTIC	CONDITIONS			LIMITS AT INDICATED TEMPERATURES (°C)							UNITS
	V <sub>O</sub> (V)	V <sub>IN</sub> (V)	V <sub>DD</sub> (V)	-55	-40	+85	+125	+25			
								Min.	Typ.	Max.	
Quiescent Device Current, I <sub>DD</sub> 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 <sub>OL</sub> 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 <sub>OH</sub> Min.	4.6	0.5	5	-0.64	-0.61	-0.42	-0.36	-0.51	-1	-	mA
	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 <sub>OL</sub> 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 <sub>OH</sub> Min.	-	0.5	5	4.95				4.95	5	-	V
	-	0.10	10	9.95				9.95	10	-	
	-	0.15	15	14.95				14.95	15	-	
Input Low Voltage, V <sub>IL</sub> 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 <sub>IH</sub> Min.	0.5, 4.5	-	5	3.5				3.5	-	-	V
	1, 9	-	10	7				7	-	-	
	1.5, 13.5	-	15	11				11	-	-	
Input Current I <sub>IN</sub> Max.	-	0.18	18	±0.1	±0.1	±1	±1	-	±10 <sup>-5</sup>	±0.1	μA

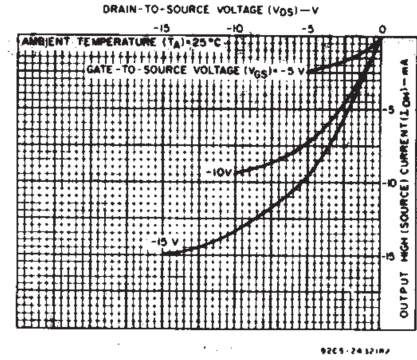


Fig. 4 - Minimum output high (source) current characteristics.

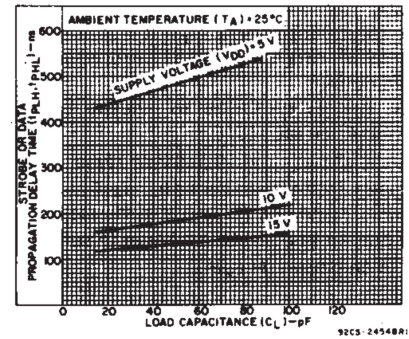


Fig. 5 - Typical strobe or data propagation delay time vs. load capacitance.

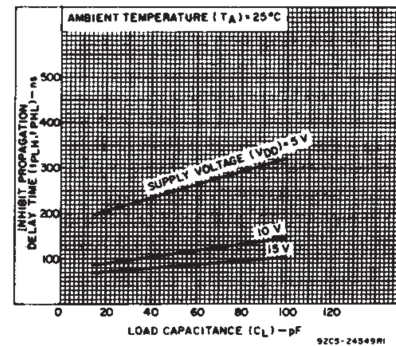


Fig. 6 - Typical inhibit propagation delay time vs. load capacitance.

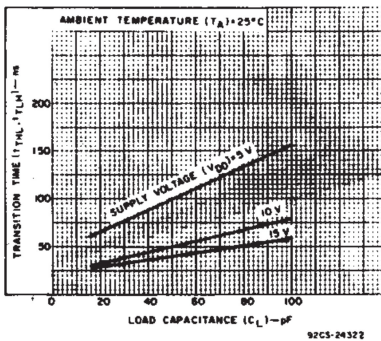


Fig. 7 - Typical low-to-high transition time vs. load capacitance.

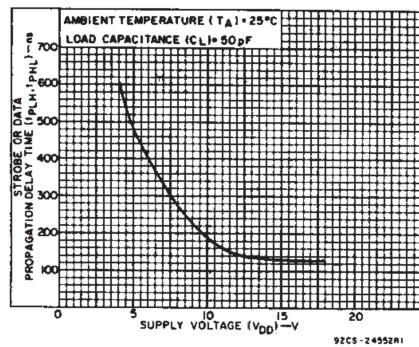


Fig. 8 - Typical strobe or data propagation delay time vs. supply voltage.

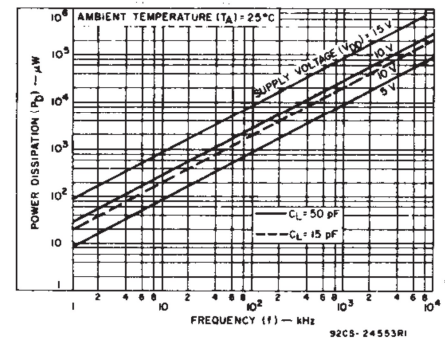


Fig. 9 - Typical power dissipation vs. frequency.

# CD4514B, CD4515B Types

DYNAMIC ELECTRICAL CHARACTERISTICS at  $T_A = 25^\circ\text{C}$ ; Input  $t_r, t_f = 20\text{ ns}$ ,  
 $C_L = 50\text{ pF}$ ,  $R_L = 200\text{ K}\Omega$

CHARACTERISTIC	TEST CONDITIONS	LIMITS		UNITS	
		$V_{DD}$ V	Typ.		Max.
Propagation Delay Time: $t_{pHL}, t_{pLH}$ Strobe or Data		5	485	970	ns
		10	185	370	
		15	135	270	
Inhibit		5	250	500	ns
		10	110	220	
		15	85	170	
Transition Time, $t_{TLH}, t_{THL}$		5	100	200	ns
		10	50	100	
		15	40	80	
Minimum Strobe Pulse Width, $t_W$		5	125	250	ns
		10	50	100	
		15	40	75	
Minimum Data Setup Time, $t_S$		5	75	150	ns
		10	35	70	
		15	20	40	
Input Capacitance, $C_{iN}$	Any Input	—	5	7.5	pF

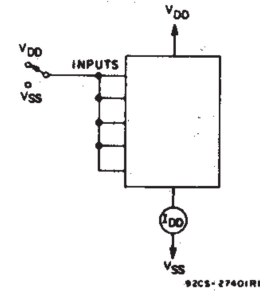


Fig. 10 — Quiescent device current test circuit.

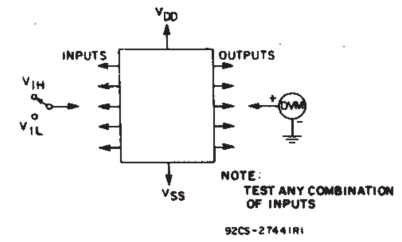


Fig. 11 — Input voltage test circuit.

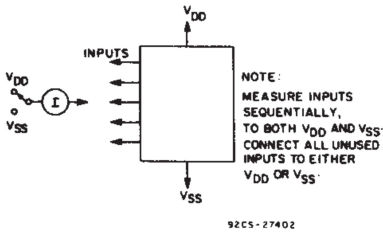


Fig. 12 — Input current test circuit.

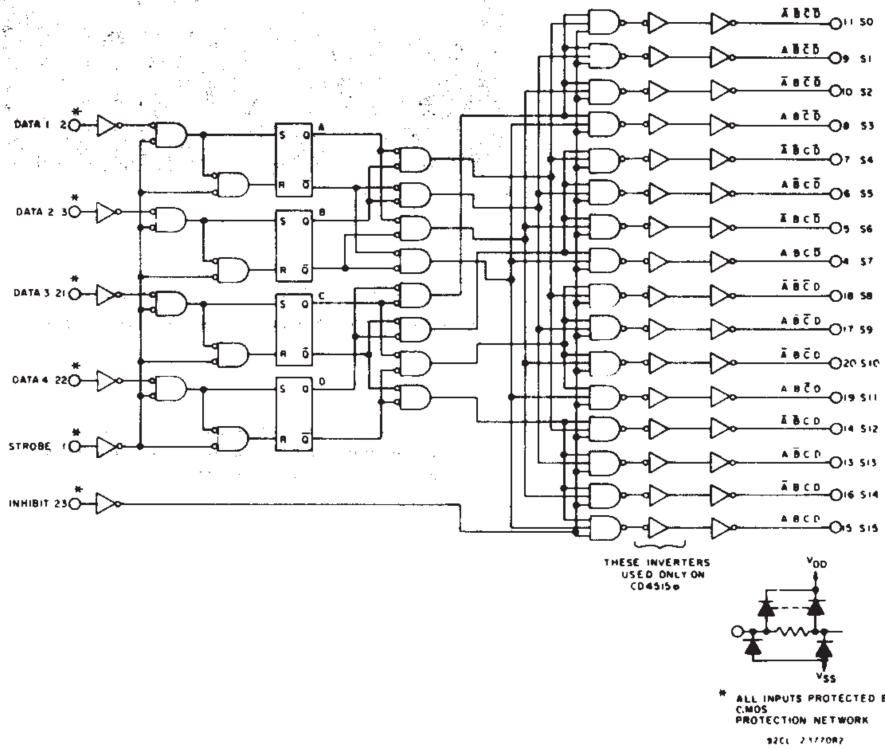


Fig. 13 — Logic diagram for CD4514B and CD4515B.

3  
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# CD4514B, CD4515B Types

DECODE TRUTH TABLE (Strobe = 1)

INHIBIT	DECODER INPUTS				SELECTED OUTPUT	
	D	C	B	A	CD4514B = Logic 1 (High)	CD4515B = Logic 0 (Low)
0	0	0	0	0	S0	
0	0	0	0	1	S1	
0	0	0	1	0	S2	
0	0	0	1	1	S3	
0	0	1	0	0	S4	
0	0	1	0	1	S5	
0	0	1	1	0	S6	
0	0	1	1	1	S7	
0	1	0	0	0	S8	
0	1	0	0	1	S9	
0	1	0	1	0	S10	
0	1	0	1	1	S11	
0	1	1	0	0	S12	
0	1	1	0	1	S13	
0	1	1	1	0	S14	
0	1	1	1	1	S15	
1	X	X	X	X	All Outputs = 0, CD4514B	All Outputs = 1, CD4515B

X = Don't Care Logic 1 = high Logic 0 = low

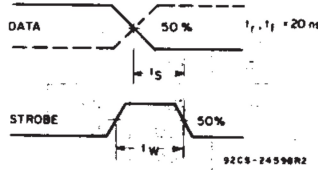
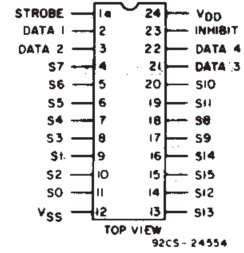
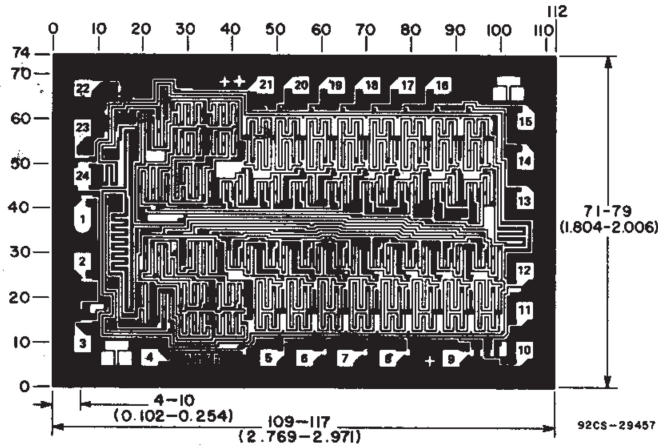


Fig. 14 — Waveforms for setup time and strobe pulse width.



CD4514B  
CD4515B

TERMINAL ASSIGNMENT



Dimensions and Pad Layout for CD4515B Chip  
(Dimensions and pad layout for the CD4514B are identical)

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