



# 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 24-lead hermetic dual-in-line ceramic packages (D and F suffixes), 24-lead dual-in-line plastic packages (E suffix), and in chip form (H suffix).

### 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):

$$1 \text{ V at } V_{DD} = 5 \text{ V}$$

$$2 \text{ V at } V_{DD} = 10 \text{ V}$$

$$2.5 \text{ V at } V_{DD} = 15 \text{ V}$$

- 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

### 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  $V_{DD} + 0.5$ 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 12mW/ $^\circ\text{C}$  to 200mW

DEVICE DISSIPATION PER OUTPUT TRANSISTOR

For  $T_A = \text{FULL PACKAGE-TEMPERATURE RANGE (All Package Types)}$  ..... 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  $+150^\circ\text{C}$

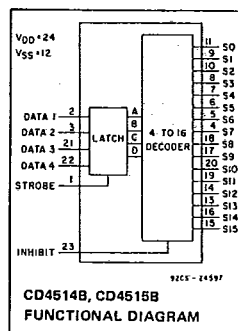
LEAD TEMPERATURE (DURING SOLDERING):

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



CD4514B, CD4515B  
FUNCTIONAL DIAGRAM

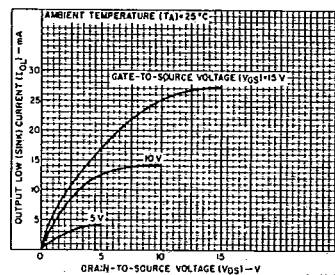


Fig. 1 - Typical output low (sink) current characteristics.

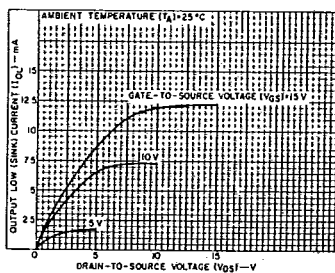


Fig. 2 - Minimum output low (sink) current characteristics.

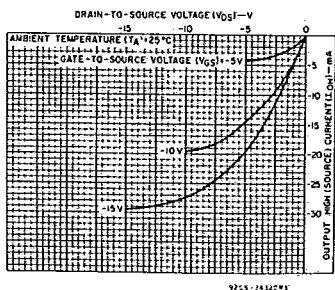


Fig. 3 - Typical output high (source) current characteristics.

COMMERCIAL CMOS  
HIGH VOLTAGE ICs

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STATIC ELECTRICAL CHARACTERISTICS

| CHARACTER-<br>ISTIC                                         | CONDITIONS            |                        |                        | LIMITS AT INDICATED TEMPERATURES (°C) |       |       |       |       |                   |      |      | UNITS |
|-------------------------------------------------------------|-----------------------|------------------------|------------------------|---------------------------------------|-------|-------|-------|-------|-------------------|------|------|-------|
|                                                             | V <sub>O</sub><br>(V) | V <sub>IN</sub><br>(V) | V <sub>DD</sub><br>(V) | +25                                   |       |       |       |       |                   |      |      |       |
|                                                             |                       |                        |                        | -55                                   | -40   | +85   | +125  | Min.  | Typ.              | Max. |      |       |
| Quiescent Device<br>Current,<br>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<br>(Sink) Current<br>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<br>(Source)<br>Current,<br>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:<br>Low-Level,<br>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:<br>High-Level,<br>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<br>Voltage,<br>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<br>Voltage,<br>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<br>I <sub>IN</sub> Max.                       | —                     | 0,18                   | 18                     | ±0.1                                  | ±0.1  | ±1    | ±1    | —     | ±10 <sup>-5</sup> | ±0.1 | μA   |       |

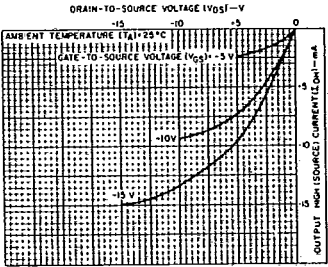


Fig. 4 - Minimum output high (source) current characteristics.

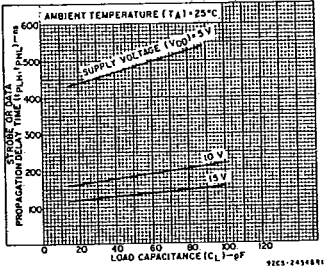


Fig. 5 - Typical strobe or data propagation delay time vs. load capacitance.

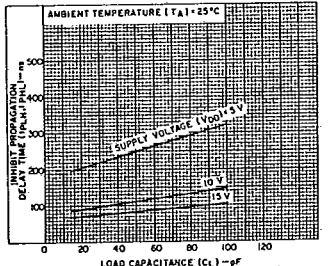


Fig. 6 - Typical inhibit propagation delay time vs. load capacitance.

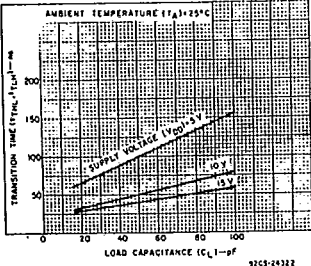


Fig. 7 - Typical low-to-high transition time vs. load capacitance.

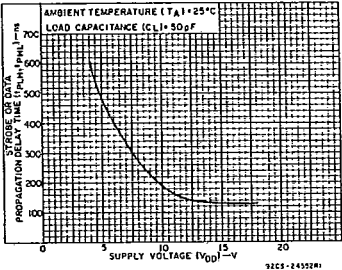


Fig. 8 - Typical strobe or data propagation delay time vs. supply voltage.

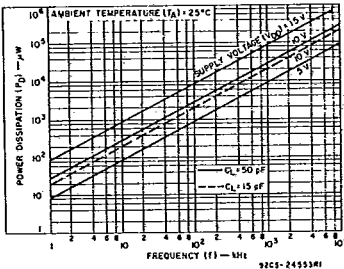


Fig. 9 - Typical power dissipation vs. frequency.

## CD4514B, CD4515B Types

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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 |
|-----------------------------------------------------------------|-----------------|---------------|------|-------|
|                                                                 |                 | $V_{DD}$<br>V | Typ. | Max.  |
| Propagation Delay Time: $t_{PHL}$ , $t_{PLH}$<br>Strobe or Data |                 | 5             | 485  | 970   |
|                                                                 |                 | 10            | 185  | 370   |
|                                                                 |                 | 15            | 135  | 270   |
| Inhibit                                                         |                 | 5             | 250  | 500   |
|                                                                 |                 | 10            | 110  | 220   |
|                                                                 |                 | 15            | 85   | 170   |
| Transition Time, $t_{TLH}$ , $t_{THL}$                          |                 | 5             | 100  | 200   |
|                                                                 |                 | 10            | 50   | 100   |
|                                                                 |                 | 15            | 40   | 80    |
| Minimum Strobe Pulse Width, $t_W$                               |                 | 5             | 125  | 250   |
|                                                                 |                 | 10            | 50   | 100   |
|                                                                 |                 | 15            | 40   | 75    |
| Minimum Data Setup Time, $t_S$                                  |                 | 5             | 75   | 150   |
|                                                                 |                 | 10            | 35   | 70    |
|                                                                 |                 | 15            | 20   | 40    |
| Input Capacitance, $C_{IN}$                                     | Any Input       | —             | 5    | 7.5   |
|                                                                 |                 |               |      | pF    |

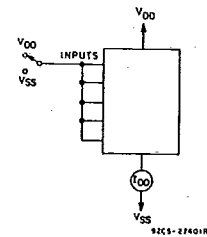


Fig. 10 - Quiescent device current test circuit.

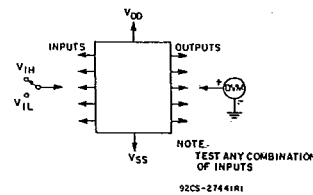


Fig. 11 - Input voltage test circuit.

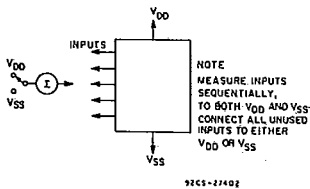


Fig. 12 - Input current test circuit.

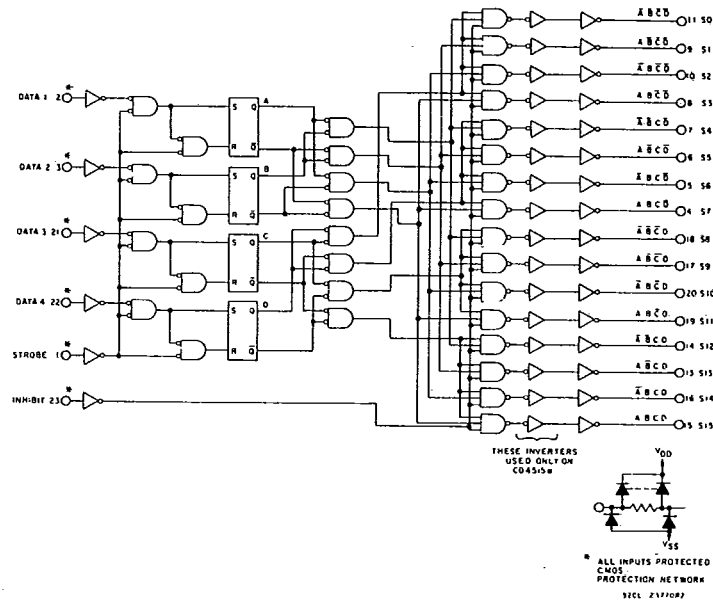


Fig. 13 - Logic diagram for CD4514B and CD4515B.

CD4514B, CD4515B Types

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| DECODE TRUTH TABLE (Strobe = 1) |                |   |   |   |                                                                        |
|---------------------------------|----------------|---|---|---|------------------------------------------------------------------------|
| INHIBIT                         | DECODER INPUTS |   |   |   | SELECTED OUTPUT<br>CD4514B = Logic 1 (High)<br>CD4515B = Logic 0 (Low) |
|                                 | D              | C | B | A |                                                                        |
| 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<br>All Outputs = 1, CD4515B                   |

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

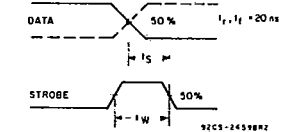
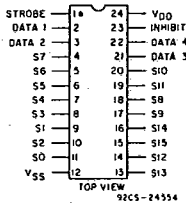
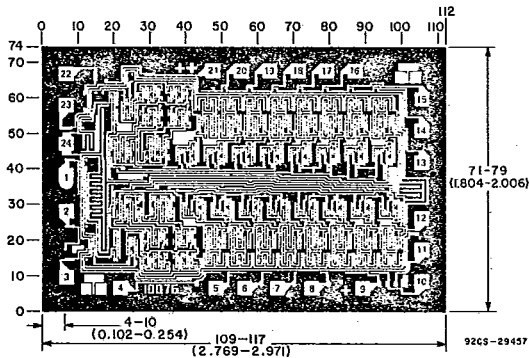


Fig. 14 — Waveforms for setup time and strobe pulse width.



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<sup>-3</sup> inch).