

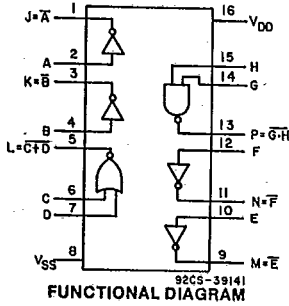
T-46-07-11



# CD4572UB Types

## CMOS Hex Gate

Four Inverters, One 2-Input NOR Gate, One 2-Input NAND Gate



**Features:**

- Pin 7 NOR input positioned adjacent to  $V_{SS}$  for easy use of gate as an inverter
- Pin 15 NAND input positioned adjacent to  $V_{DD}$  for easy use of gate as an inverter
- Standard symmetrical output characteristics
- 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
- 5-V, 10-V, and 15-V parametric ratings
- Meets all requirements of JEDEC Standard No. 13B, "Standard Specifications for Description of 'B' Series CMOS Devices"

■ CD4572UB Hex Gate provides the system designer with direct implementation of inverter, NAND, and NOR functions and supplements the existing family of CMOS gates.

The CD4572UB devices meet all requirements of JEDEC Standard No. 13B, "Standard Specifications for Description of 'B' Series CMOS Devices."

The CD4572UB types are supplied in 16-lead dual-in-line ceramic packages (D and F suffixes), a 16-lead dual-in-line plastic package (E suffix), and in chip form (H suffix).

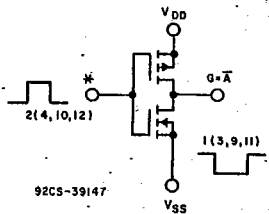
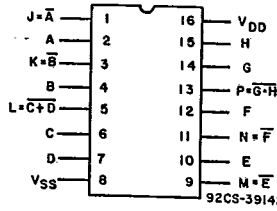
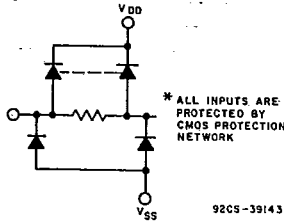


Fig. 1 - Schematic diagram of one of four identical inverters.

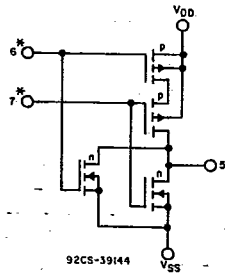


Fig. 2 - Schematic diagram for the 2-input NOR gate.

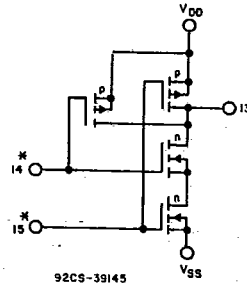


Fig. 3 - Schematic diagram for the 2-input NAND gate.

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MAXIMUM RATINGS, Absolute-Maximum Values:

|   |                                     |
|---|-------------------------------------|
| DC SUPPLY-VOLTAGE RANGE, (V <sub>DD</sub> )                             | -0.5V to +20V                       |
| Voltages referenced to V <sub>SS</sub> Terminal                         |                                     |
| INPUT VOLTAGE RANGE, ALL INPUTS   | -0.5V to V <sub>DD</sub> +0.5V      |
| DC INPUT CURRENT, ANY ONE INPUT   | ±10mA                               |
| POWER DISSIPATION PER PACKAGE (P <sub>D</sub> ):                        |                                     |
| For T <sub>A</sub> = -55°C to +100°C                                    | 500mW                               |
| For T <sub>A</sub> = +100°C to +125°C                                   | Derate Linearly at 12mW/°C to 200mW |
| DEVICE DISSIPATION PER OUTPUT TRANSISTOR                                |                                     |
| FOR T <sub>A</sub> = FULL PACKAGE-TEMPERATURE RANGE (All Package Types) | 100mW                               |
| OPERATING-TEMPERATURE RANGE (T <sub>A</sub> )                           | -55°C to +125°C                     |
| STORAGE TEMPERATURE RANGE (T <sub>stg</sub> )                           | -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                              |

RECOMMENDED OPERATING CONDITIONS

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

| CHARACTERISTIC  | LIMITS |      | UNITS |
|---|--------|------|-------|
|   | Min.   | Max. |       |
| Supply-Voltage Range (For T <sub>A</sub> =Full Package-Temperature Range) | 3      | 18   | V     |

STATIC ELECTRICAL CHARACTERISTICS

| CHARACTERISTIC                                     | 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) | -55                                   | -40   | +85   | +125  | +25   |                   |      |       |
|  |                       |                        |                        |                                       |       |       |       | Min.  | Typ.              | Max. |       |
| Quiescent Device Current, I <sub>DD</sub> Max.     | —                     | 0, 5                   | 5                      | 0.25                                  | 0.25  | 7.5   | 7.5   | —     | 0.01              | 0.25 | μA    |
|  | —                     | 0, 10                  | 10                     | 0.5                                   | 0.5   | 15    | 15    | —     | 0.01              | 0.5  |       |
|  | —                     | 0, 15                  | 15                     | 1                                     | 1     | 30    | 30    | —     | 0.01              | 1    |       |
|  | —                     | 0, 20                  | 20                     | 5                                     | 5     | 150   | 150   | —     | 0.02              | 5    |       |
| 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              | —    |       |
| 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                                     |       |       |       | —     | —                 | 1    | V     |
|  | 1, 9                  | —                      | 10                     | 2                                     |       |       |       | —     | —                 | 2    |       |
|  | 1.5, 13.5             | —                      | 15                     | 2.5                                   |       |       |       | —     | —                 | 2.5  |       |
| Input High Voltage, V <sub>IH</sub> Min.           | 0.5, 4.5              | —                      | 5                      | 4                                     |       |       |       | 4     | —                 | —    | V     |
|  | 1, 9                  | —                      | 10                     | 8                                     |       |       |       | 8     | —                 | —    |       |
|  | 1.5, 13.5             | —                      | 15                     | 12.5                                  |       |       |       | 12.5  | —                 | —    |       |
| Input Current, I <sub>IN</sub> Max.                | —                     | 0, 18                  | 18                     | ±0.1                                  | ±0.1  | ±1    | ±1    | —     | ±10 <sup>-5</sup> | ±0.1 | μA    |

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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         | SYMBOL             | TEST CONDITIONS | LIMITS |      |      | UNITS |
|------------------------|--------------------|-----------------|--------|------|------|-------|
|                        |                    | $V_{DD}$ (V)    | Min.   | Typ. | Max. |       |
| Propagation Delay Time | $t_{PHL}, t_{PLH}$ | 5               | —      | 100  | 200  | ns    |
|                        |                    | 10              | —      | 55   | 110  |       |
|                        |                    | 15              | —      | 40   | 85   |       |
| Transition Time        | $t_{THL}, t_{TLH}$ | 5               | —      | 100  | 200  | ns    |
|                        |                    | 10              | —      | 50   | 100  |       |
|                        |                    | 15              | —      | 40   | 80   |       |
| Input Capacitance      | $C_{IN}$           | Any Input       | —      | 10   | 15   | pF    |

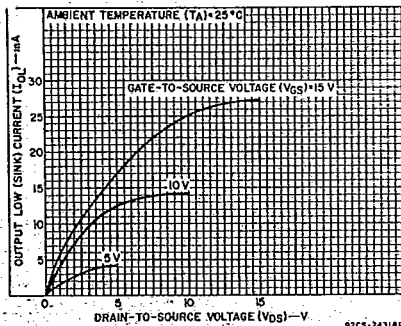


Fig. 4 - Typical output low (sink) current characteristics.

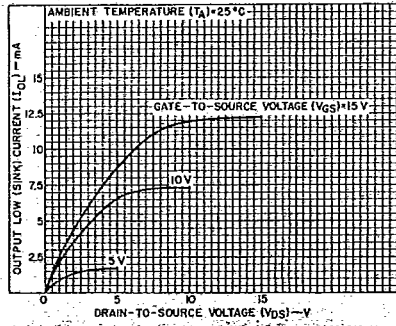


Fig. 5 - Minimum output low (sink) current characteristics.

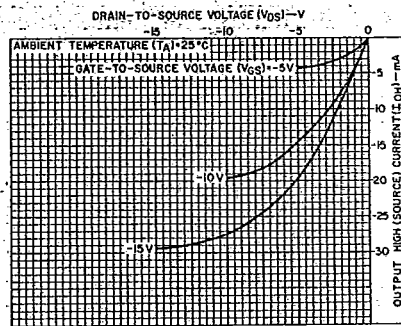


Fig. 6 - Typical output high (source) current characteristics.

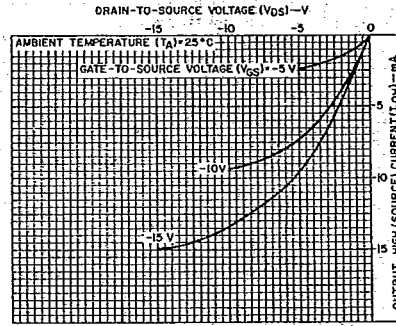


Fig. 7 - Minimum output high (source) current characteristics.

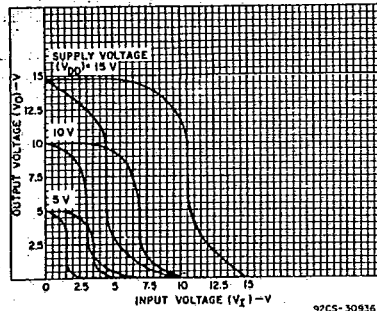


Fig. 8 - Minimum and maximum inverter voltage transfer characteristics.

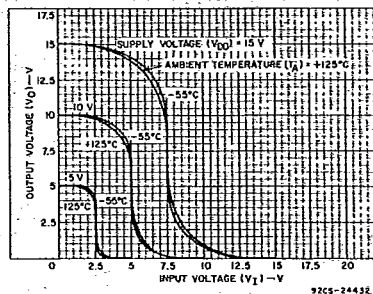


Fig. 9 - Typical inverter voltage transfer characteristics as a function of temperature.

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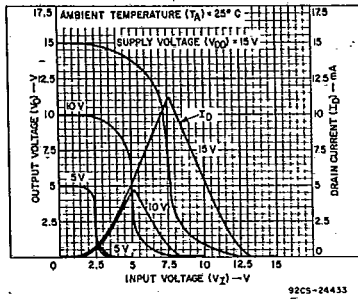


Fig. 10 - Typical inverter current and voltage transfer characteristics.

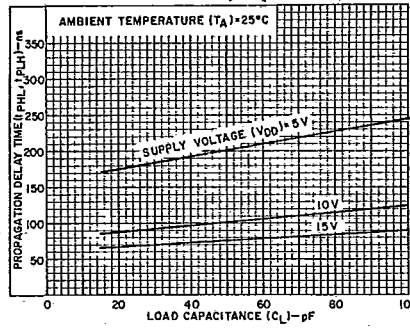


Fig. 11 - Typical propagation delay time as a function of load capacitance.

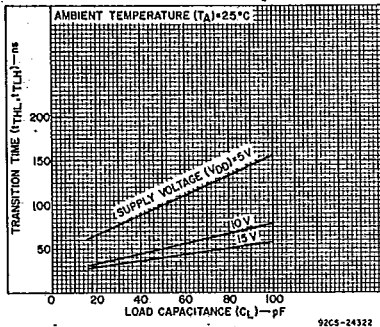


Fig. 12 - Typical transition time vs. load capacitance.

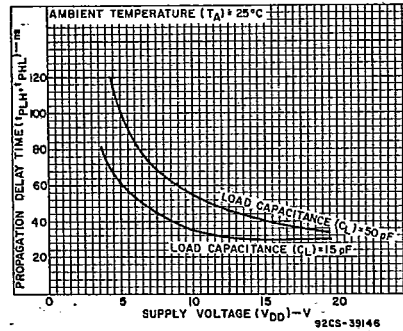


Fig. 13 - Typical propagation delay time vs. supply voltage.

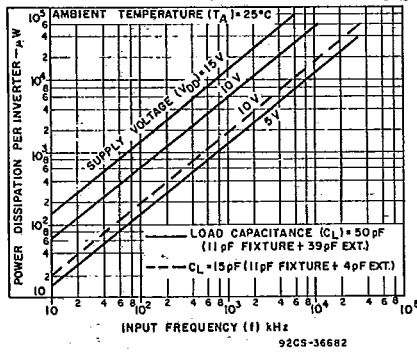


Fig. 14 - Typical dynamic power dissipation vs. frequency.

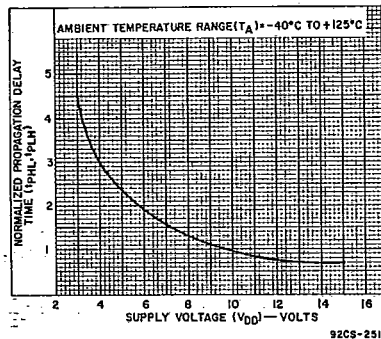


Fig. 15 - Variation of normalized propagation delay time (t<sub>PLH</sub> and t<sub>PLH</sub>) with supply voltage.

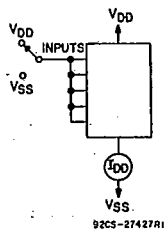


Fig. 16 - Quiescent device current test circuit.

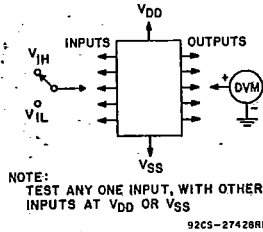


Fig. 17 - Noise immunity test circuit.

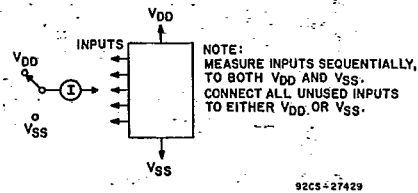


Fig. 18 - Input leakage current test circuit.

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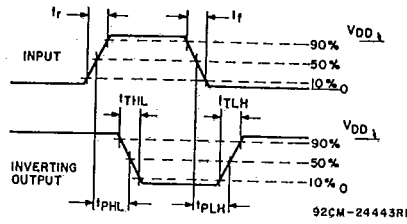
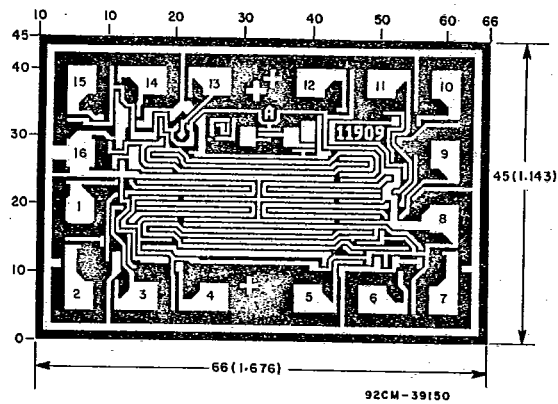


Fig. 19 - Transition times and propagation delay times, combination logic.



Dimensions and pad layout for CD4572UBH.

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

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