FAIRCHILD SEMICONDUCTOR™

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# CD4069UBC
# Inverter Circuits

## General Description

The CD4069UB consists of six inverter circuits and is manufactured using complementary MOS (CMOS) to achieve wide power supply operating range, low power consumption, high noise immunity, and symmetric controlled rise and fall times.

This device is intended for all general purpose inverter applications where the special characteristics of the MM74C901, MM74C907, and CD4049A Hex Inverter/Buffers are not required. In those applications requiring larger noise immunity the MM74C14 or MM74C914 Hex Schmitt Trigger is suggested.

All inputs are protected from damage due to static discharge by diode clamps to $V_{DD}$ and $V_{SS}$.

## Features

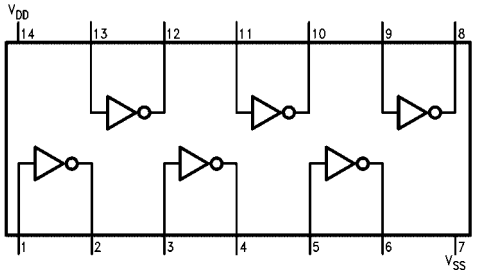
- Wide supply voltage range: 3.0V to 15V
- High noise immunity: 0.45 $V_{DD}$ typ.
- Low power TTL compatibility: Fan out of 2 driving 74L or 1 driving 74LS
- Equivalent to MM74C04

## Ordering Code:

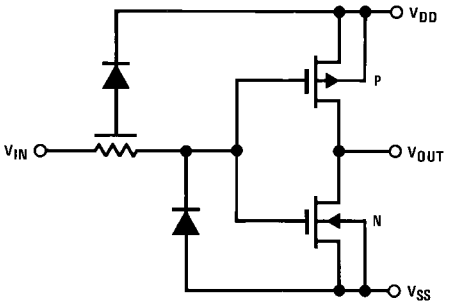
| Order Number | Package Number | Package Description |
|---|---|---|
| CD4069UBCM | M14A | 14-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-012, 0.150" Narrow |
| CD4069UBCSJ | M14D | 14-Lead Small Outline Package (SOP), EIAJ TYPE II, 5.3mm Wide |
| CD4069UBCN | N14A | 14-Lead Plastic Dual-In-Line Package (PDIP), JEDEC MS-001, 0.300" Wide |

Device also available in Tape and Reel. Specify by appending suffix "X" to the ordering code.

## Connection Diagram




## Schematic Diagram



## Absolute Maximum Ratings (Note 1)

(Note 2)

| | |
|---|---|
| DC Supply Voltage ($V_{DD}$) | −0.5V to +18 $V_{DC}$ |
| Input Voltage ($V_{IN}$) | −0.5V to $V_{DD}$ +0.5 $V_{DC}$ |
| Storage Temperature Range ($T_S$) | −65°C to +150°C |
| Power Dissipation ($P_D$) | |
| Dual-In-Line | 700 mW |
| Small Outline | 500 mW |
| Lead Temperature ($T_L$) | |
| (Soldering, 10 seconds) | 260°C |

## Recommended Operating Conditions (Note 2)

| | |
|---|---|
| DC Supply Voltage ($V_{DD}$) | 3V to 15$V_{DC}$ |
| Input Voltage ($V_{IN}$) | 0V to $V_{DD}$ $V_{DC}$ |
| Operating Temperature Range ($T_A$) | −55°C to +125°C |

**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 table of "Recommended Operating Conditions" and Electrical Characteristics table provide conditions for actual device operation.

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

## DC Electrical Characteristics (Note 3)

| Symbol | Parameter | Conditions | −55°C | | +25°C | | | +125°C | | Units |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Min | Max | Min | Typ | Max | Min | Max | |
| $I_{DD}$ | Quiescent Device Current | $V_{DD}$ = 5V, $V_{IN}$ = $V_{DD}$ or $V_{SS}$ | | 0.25 | | | 0.25 | | 7.5 | µA |
| | | $V_{DD}$ = 10V, $V_{IN}$ = $V_{DD}$ or $V_{SS}$ | | 0.5 | | | 0.5 | | 15 | |
| | | $V_{DD}$ = 15V, $V_{IN}$ = $V_{DD}$ or $V_{SS}$ | | 1.0 | | | 1.0 | | 30 | |
| $V_{OL}$ | LOW Level Output Voltage | $\|I_O\|$ < 1 µA | | | | | | | | |
| | | $V_{DD}$ = 5V | | 0.05 | | 0 | 0.05 | | 0.05 | V |
| | | $V_{DD}$ = 10V | | 0.05 | | 0 | 0.05 | | 0.05 | |
| | | $V_{DD}$ = 15V | | 0.05 | | 0 | 0.05 | | 0.05 | |
| $V_{OH}$ | HIGH Level Output Voltage | $\|I_O\|$ < 1 µA | | | | | | | | |
| | | $V_{DD}$ = 5V | 4.95 | | 4.95 | 5 | | 4.95 | | V |
| | | $V_{DD}$ = 10V | 9.95 | | 9.95 | 10 | | 9.95 | | |
| | | $V_{DD}$ = 15V | 14.95 | | 14.95 | 15 | | 14.95 | | |
| $V_{IL}$ | LOW Level Input Voltage | $\|I_O\|$ < 1 µA | | | | | | | | |
| | | $V_{DD}$ = 5V, $V_O$ = 4.5V | | 1.0 | | | 1.0 | | 1.0 | V |
| | | $V_{DD}$ = 10V, $V_O$ = 9V | | 2.0 | | | 2.0 | | 2.0 | |
| | | $V_{DD}$ = 15V, $V_O$ = 13.5V | | 3.0 | | | 3.0 | | 3.0 | |
| $V_{IH}$ | HIGH Level Input Voltage | $\|I_O\|$ < 1 µA | | | | | | | | |
| | | $V_{DD}$ = 5V, $V_O$ = 0.5V | 4.0 | | 4.0 | | | 4.0 | | V |
| | | $V_{DD}$ = 10V, $V_O$ = 1V | 8.0 | | 8.0 | | | 8.0 | | |
| | | $V_{DD}$ = 15V, $V_O$ = 1.5V | 12.0 | | 12.0 | | | 12.0 | | |
| $I_{OL}$ | LOW Level Output Current (Note 4) | $V_{DD}$ = 5V, $V_O$ = 0.4V | 0.64 | | 0.51 | 0.88 | | 0.36 | | mA |
| | | $V_{DD}$ = 10V, $V_O$ = 0.5V | 1.6 | | 1.3 | 2.25 | | 0.9 | | |
| | | $V_{DD}$ = 15V, $V_O$ = 1.5V | 4.2 | | 3.4 | 8.8 | | 2.4 | | |
| $I_{OH}$ | HIGH Level Output Current (Note 4) | $V_{DD}$ = 5V, $V_O$ = 4.6V | −0.64 | | −0.51 | −0.88 | | −0.36 | | mA |
| | | $V_{DD}$ = 10V, $V_O$ = 9.5V | −1.6 | | −1.3 | −2.25 | | −0.9 | | |
| | | $V_{DD}$ = 15V, $V_O$ = 13.5V | −4.2 | | −3.4 | −8.8 | | −2.4 | | |
| $I_{IN}$ | Input Current | $V_{DD}$ = 15V, $V_{IN}$ = 0V | | −0.1 | | $-10^{-5}$ | −0.1 | | −1.0 | µA |
| | | $V_{DD}$ = 15V, $V_{IN}$ = 15V | | 0.1 | | $10^{-5}$ | 0.1 | | 1.0 | |

**Note 3:** $V_{SS}$ = 0V unless otherwise specified.

**Note 4:** $I_{OH}$ and $I_{OL}$ are tested one output at a time.

## AC Electrical Characteristics (Note 5)

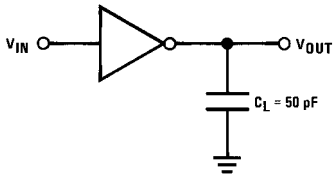
$T_A = 25°C$, $C_L = 50$ pF, $R_L = 200$ kΩ, $t_r$ and $t_f \leq 20$ ns, unless otherwise specified

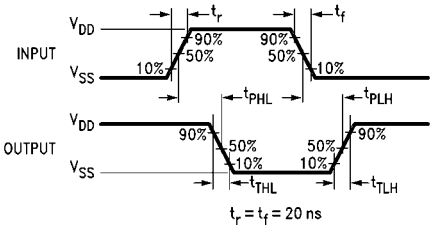
| Symbol | Parameter | Conditions | Min | Typ | Max | Units |
|---|---|---|---|---|---|---|
| $t_{PHL}$ or $t_{PLH}$ | Propagation Delay Time from | $V_{DD} = 5V$ | | 50 | 90 | |
| | Input to Output | $V_{DD} = 10V$ | | 30 | 60 | ns |
| | | $V_{DD} = 15V$ | | 25 | 50 | |
| $t_{THL}$ or $t_{TLH}$ | Transition Time | $V_{DD} = 5V$ | | 80 | 150 | |
| | | $V_{DD} = 10V$ | | 50 | 100 | ns |
| | | $V_{DD} = 15V$ | | 40 | 80 | |
| $C_{IN}$ | Average Input Capacitance | Any Gate | | 6 | 15 | pF |
| $C_{PD}$ | Power Dissipation Capacitance | Any Gate (Note 6) | | 12 | | pF |

**Note 5:** AC Parameters are guaranteed by DC correlated testing.

**Note 6:** $C_{PD}$ determines the no load AC power consumption of any CMOS device. For complete explanation, see Family Characteristics application note—AN-90.

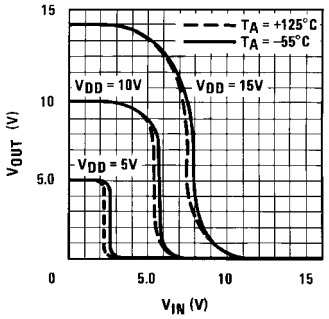
## AC Test Circuits and Switching Time Waveforms



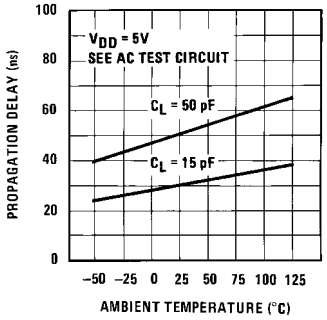



## Typical Performance Characteristics

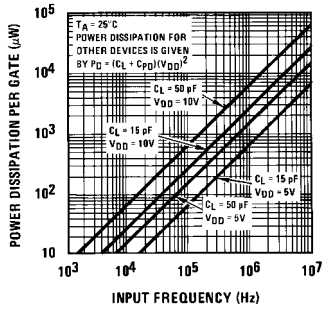
**Gate Transfer Characteristics**



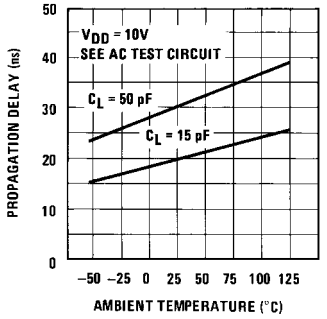

**Propagation Delay vs. Ambient Temperature**



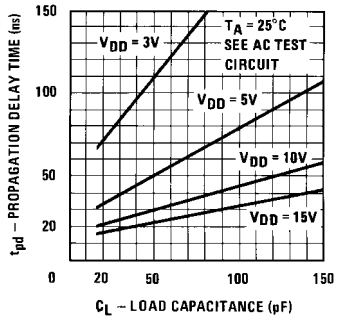

**Power Dissipation vs. Frequency**



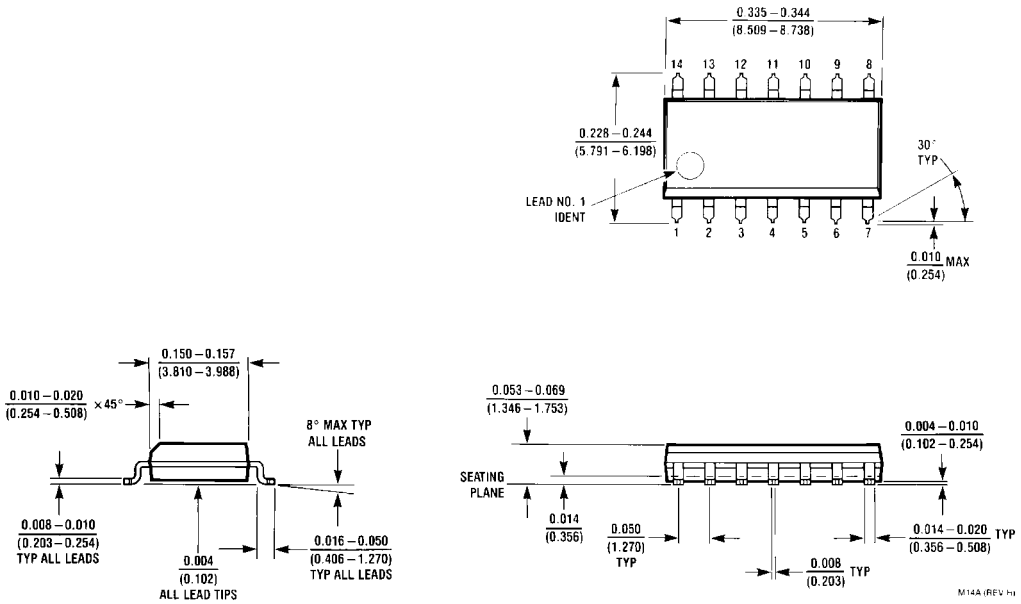

**Propagation Delay vs. Ambient Temperature**




**Propagation Delay Time vs. Load Capacitance**

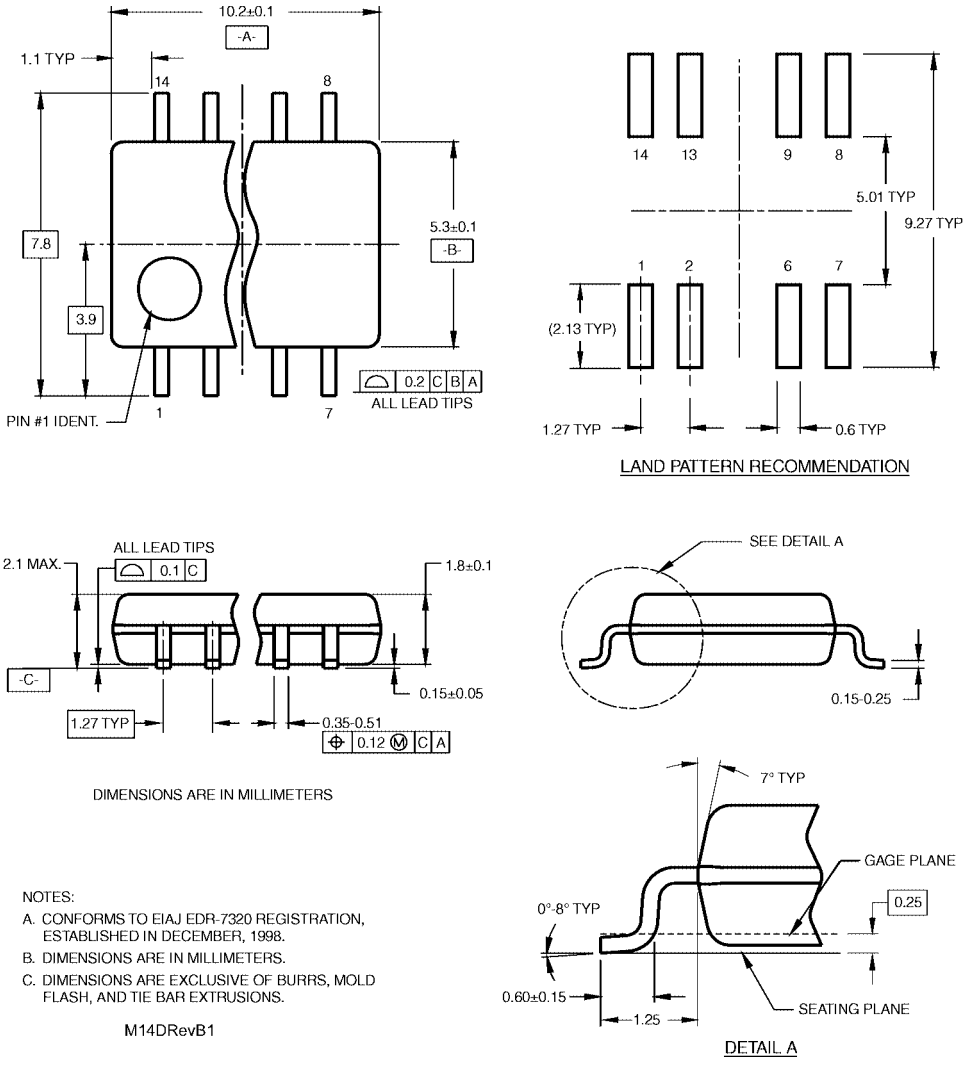


## Physical Dimensions inches (millimeters) unless otherwise noted




**14-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-012, 0.150" Narrow**
**Package Number M14A**

## Physical Dimensions inches (millimeters) unless otherwise noted (Continued)




NOTES:

A. CONFORMS TO EIAJ EDR-7320 REGISTRATION, ESTABLISHED IN DECEMBER, 1998.

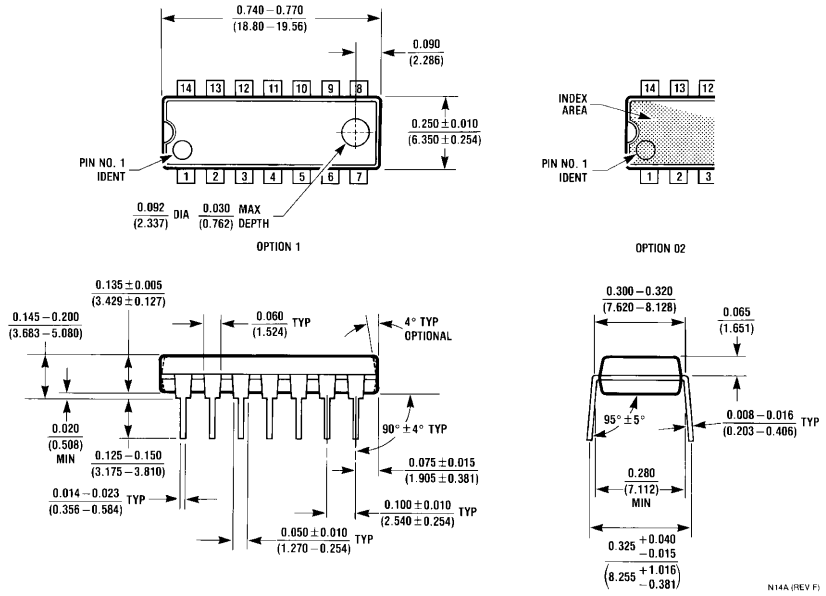
B. DIMENSIONS ARE IN MILLIMETERS.

C. DIMENSIONS ARE EXCLUSIVE OF BURRS, MOLD FLASH, AND TIE BAR EXTRUSIONS.

M14DRevB1

**14-Lead Small Outline Package (SOP), EIAJ TYPE II, 5.3mm Wide**
**Package Number M14D**

## Physical Dimensions inches (millimeters) unless otherwise noted (Continued)




**14-Lead Plastic Dual-In-Line Package (PDIP), JEDEC MS-001, 0.300" Wide**
**Package Number N14A**



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2. A critical component in any component of a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.

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