

CD4069UB CMOS 六路逆变器

1 特性

- 标准化对称输出特性
- 中速运行: t_{PHL} 、 $t_{PLH} = 30\text{ns}$, 10V (典型值)
- 100% 测试 20V 时的静态电流
- 在全封装温度范围内, 在 18V 时的最大输入电流为 $1\mu\text{A}$, 在 18V 和 25°C 时为 100nA
- 符合 JEDEC 第 13B 号暂行标准, 《B 系列 CMOS 器件 说明规范标准》的所有要求

2 应用

- 逻辑反相
- 脉冲整形
- 振荡器
- 高输入阻抗放大器

3 说明

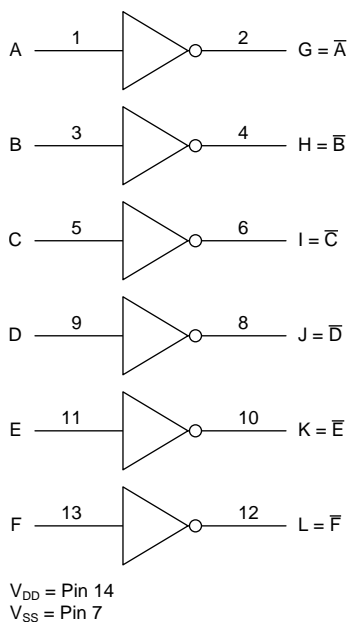
CD4069UB 器件由六个 CMOS 逆变器电路组成。这些器件可用于所有不需要电路中等功耗 TTL 驱动和逻辑电平转换功能的通用逆变器应用, 例如 CD4009 和 CD4049 六路逆变器和缓冲器。

器件信息⁽¹⁾

| 器件型号 | 封装 (引脚) | 封装尺寸 (标称值) |
|-------------|------------|------------------|
| CD4069UBE | PDIP (14) | 19.30mm x 6.35mm |
| CD4069UBF | CDIP (14) | 19.56mm x 6.67mm |
| CD4069UBM | SOIC (14) | 8.65mm x 3.91mm |
| CD4069UBNSR | SO (14) | 10.30mm x 5.30mm |
| CD4069UBPW | TSSOP (14) | 5.00mm x 4.40mm |

(1) 如需了解所有可用封装, 请参阅数据表末尾的可订购产品附录。

CD4069UB 功能框图



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4 修订历史记录

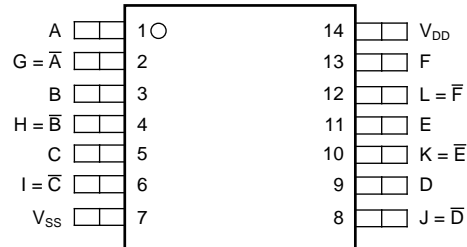
注：之前版本的页码可能与当前版本有所不同。

| Changes from Revision D (February 2016) to Revision E | Page |
|--|------|
| • 删除了“特性”部分第二条 t_{PHL} 处的“-” | 1 |
| • Corrected V_I spec MIN/MAX values in the Abs Max Ratings table | 4 |
| • Corrected parameter I_{DD} max term to I_{DD} in the Elec Characteristics table | 5 |
| • Corrected parameter I_{OL} min term to I_{OL} in the Elec Characteristics table | 5 |
| • Corrected parameter V_{OL} max term to V_{OL} in the Elec Characteristics table | 6 |
| • Corrected parameter V_{IL} max term to V_{IL} in the Elec Characteristics table | 6 |
| • Corrected parameter V_{IH} min term to V_{IH} in the Elec Characteristics table | 6 |
| • Corrected parameter I_{IN} max term to I_{IN} in the Elec Characteristics table | 7 |
| • Added Y-axis label to Figure 1 image object | 8 |
| • Changed text string from “ $-t_{PHL}$ ” to “of t_{PHL} ” in the Feature Description paragraph. | 13 |

| Changes from Revision C (August 2003) to Revision D | Page |
|---|------|
| • 添加了 ESD 额定值表、特性说明部分，器件功能模式，应用和实施部分，电源相关建议部分，布局部分，器件和文档支持部分以及机械、封装和可订购信息部分 | 1 |

5 Pin Configuration and Functions

D, J, N, NS, and PW Packages
14-Pin PDIP, CDIP, SOIC, SO, and TSSOP
Top View



Pin Functions

| PIN | | I/O | DESCRIPTION |
|---------------|-----|-----|-----------------|
| NAME | NO. | | |
| A | 1 | I | A input |
| B | 3 | I | B input |
| C | 5 | I | C input |
| D | 9 | I | D input |
| E | 11 | I | E input |
| F | 13 | I | F input |
| $G = \bar{A}$ | 2 | O | G output |
| $H = \bar{B}$ | 4 | O | H output |
| $I = \bar{C}$ | 6 | O | I output |
| $J = \bar{D}$ | 8 | O | J output |
| $K = \bar{E}$ | 10 | O | K output |
| $L = \bar{F}$ | 12 | O | L output |
| V_{DD} | 14 | — | Positive supply |
| V_{SS} | 7 | — | Negative supply |

6 Specifications

6.1 Absolute Maximum Ratings

over operating free-air temperature range (unless otherwise noted)⁽¹⁾

| | | MIN | MAX | UNIT |
|---------------------------------|---|--------------------------------|-----------------------|------|
| V _{DD} | DC supply-voltage (voltages referenced to V _{SS} terminal) | -0.5 | 20 | V |
| V _I | Input voltage, all inputs | -0.5 | V _{DD} + 0.5 | V |
| I _{IK} | DC input current, any one input | -10 | 10 | mA |
| P _D | Power dissipation per package | -55°C to 100°C | 500 | mW |
| | | 100°C to 125°C | 12 | |
| | Device dissipation per output transistor | Full range (all package types) | | 100 |
| Lead temperature ⁽²⁾ | | | 265 | °C |
| T _J | Junction temperature | | 150 | °C |
| T _{stg} | Storage temperature | -65 | 150 | °C |

- (1) Stresses beyond those listed under *Absolute Maximum Ratings* may cause permanent damage to the device. These are stress ratings only, which do not imply functional operation of the device at these or any other conditions beyond those indicated under *Recommended Operating Conditions*. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.
- (2) During soldering at distance 1/16 inch ± 1/32 inch (1.59 mm ± 0.79 mm) from case for 10 s maximum

6.2 ESD Ratings

| | | VALUE | UNIT |
|--------------------|-------------------------|--|------|
| V _(ESD) | Electrostatic discharge | Human-body model (HBM), per ANSI/ESDA/JEDEC JS-001 ⁽¹⁾ | ±500 |
| | | Charged-device model (CDM), per JEDEC specification JESD22-C101 ⁽²⁾ | ±200 |

- (1) JEDEC document JEP155 states that 500-V HBM allows safe manufacturing with a standard ESD control process.
- (2) JEDEC document JEP157 states that 250-V CDM allows safe manufacturing with a standard ESD control process.

6.3 Recommended Operating Conditions

over operating free-air temperature range (unless otherwise noted)

| | | MIN | MAX | UNIT |
|-----------------|-----------------------|-----|-----|------|
| V _{DD} | Supply voltage | 3 | 18 | V |
| T _A | Operating temperature | -55 | 125 | °C |

6.4 Thermal Information

| THERMAL METRIC ⁽¹⁾ | CD4069UB | | | | | UNIT | |
|-------------------------------|--|----------|----------|---------|------------|-------|------|
| | D (SOIC) | J (CDIP) | N (PDIP) | NS (SO) | PW (TSSOP) | | |
| | 14 PINS | 14 PINS | 14 PINS | 14 PINS | 14 PINS | | |
| R _{θJA} | Junction-to-ambient thermal resistance | 94.9 | — | 57.9 | 91.2 | 122.1 | °C/W |
| R _{θJC(top)} | Junction-to-case (top) thermal resistance | 56.4 | 28.5 | 45.5 | 48.8 | 50.8 | °C/W |
| R _{θJB} | Junction-to-board thermal resistance | 49.2 | — | 37.7 | 50 | 63.8 | °C/W |
| ψ _{JT} | Junction-to-top characterization parameter | 21.1 | — | 30.6 | 15 | 6.3 | °C/W |
| ψ _{JB} | Junction-to-board characterization parameter | 48.9 | — | 37.6 | 49.6 | 63.3 | °C/W |
| R _{θJC(bot)} | Junction-to-case (bottom) thermal resistance | N/A | N/A | N/A | N/A | N/A | °C/W |

- (1) For more information about traditional and new thermal metrics, see the *Semiconductor and IC Package Thermal Metrics* application report, [SPRA953](#).

6.5 Electrical Characteristics – Dynamic

 $T_A = 25^\circ\text{C}$; input $t_r, t_f = 20\text{ ns}$; $C_L = 50\text{ pF}$; $R_L = 200\text{ k}\Omega$ (unless otherwise noted)

| PARAMETER | TEST CONDITIONS | MIN | TYP | MAX | UNIT |
|---|-------------------|-----|-----|-----|------|
| t_{PLH}, t_{PHL} Propagation delay time | $V_{DD} (V) = 5$ | | 55 | 110 | ns |
| | $V_{DD} (V) = 10$ | | 30 | 60 | |
| | $V_{DD} (V) = 15$ | | 25 | 50 | |
| t_{THL}, t_{TLH} Transition time | $V_{DD} (V) = 5$ | | 100 | 200 | ns |
| | $V_{DD} (V) = 10$ | | 50 | 100 | |
| | $V_{DD} (V) = 15$ | | 40 | 80 | |
| C_{IN} Input capacitance | Any input | | 10 | 15 | pF |

6.6 Electrical Characteristics – Static

 $T_A = 25^\circ\text{C}$; input $t_r, t_f = 20\text{ ns}$; $C_L = 50\text{ pF}$; $R_L = 200\text{ k}\Omega$ (unless otherwise noted)

| PARAMETER | TEST CONDITIONS | MIN | TYP | MAX | UNIT |
|---|--|---------------------------|------|------|---------------|
| I_{DD} Quiescent device current | $V_{IN} = 0\text{V or } 5\text{ V}, V_{DD} = 5\text{ V}$ | $T_A = -55^\circ\text{C}$ | | 0.25 | μA |
| | | $T_A = -40^\circ\text{C}$ | | 0.25 | |
| | | $T_A = 25^\circ\text{C}$ | 0.01 | 0.25 | |
| | | $T_A = 85^\circ\text{C}$ | | 7.5 | |
| | | $T_A = 125^\circ\text{C}$ | | 7.5 | |
| | $V_{IN} = 0\text{ or } 10\text{ V}, V_{DD} = 10\text{ V}$ | $T_A = -55^\circ\text{C}$ | | 0.5 | |
| | | $T_A = -40^\circ\text{C}$ | | 0.5 | |
| | | $T_A = 25^\circ\text{C}$ | 0.01 | 0.5 | |
| | | $T_A = 85^\circ\text{C}$ | | 15 | |
| | | $T_A = 125^\circ\text{C}$ | | 15 | |
| | $V_{IN} = 0\text{ or } 15\text{ V}, V_{DD} = 15\text{ V}$ | $T_A = -55^\circ\text{C}$ | | 1 | |
| | | $T_A = -40^\circ\text{C}$ | | 1 | |
| | | $T_A = 25^\circ\text{C}$ | 0.01 | 1 | |
| | | $T_A = 85^\circ\text{C}$ | | 30 | |
| | | $T_A = 125^\circ\text{C}$ | | 30 | |
| $V_{IN} = 0\text{ or } 20\text{ V}, V_{DD} = 20\text{ V}$ | $T_A = -55^\circ\text{C}$ | | 5 | | |
| | $T_A = -40^\circ\text{C}$ | | 5 | | |
| | $T_A = 25^\circ\text{C}$ | 0.02 | 5 | | |
| | $T_A = 85^\circ\text{C}$ | | 150 | | |
| | $T_A = 125^\circ\text{C}$ | | 150 | | |
| I_{OL} Output low (sink) current | $V_O = 0.4\text{ V}, V_{IN} = 5\text{ V}, V_{DD} = 5\text{ V}$ | $T_A = -55^\circ\text{C}$ | 0.64 | | mA |
| | | $T_A = -40^\circ\text{C}$ | 0.61 | | |
| | | $T_A = 25^\circ\text{C}$ | 0.51 | 1 | |
| | | $T_A = 85^\circ\text{C}$ | 0.42 | | |
| | | $T_A = 125^\circ\text{C}$ | 0.36 | | |
| | $V_O = 0.5\text{ V}, V_{IN} = 10\text{ V}, V_{DD} = 10\text{ V}$ | $T_A = -55^\circ\text{C}$ | 1.6 | | |
| | | $T_A = -40^\circ\text{C}$ | 1.5 | | |
| | | $T_A = 25^\circ\text{C}$ | 1.3 | 2.6 | |
| | | $T_A = 85^\circ\text{C}$ | 1.1 | | |
| | | $T_A = 125^\circ\text{C}$ | 0.9 | | |
| | $V_O = 1.5\text{ V}, V_{IN} = 15\text{ V}, V_{DD} = 15\text{ V}$ | $T_A = -55^\circ\text{C}$ | 4.2 | | |
| | | $T_A = -40^\circ\text{C}$ | 4 | | |
| | | $T_A = 25^\circ\text{C}$ | 3.4 | 6.8 | |
| | | $T_A = 85^\circ\text{C}$ | 2.8 | | |
| | | $T_A = 125^\circ\text{C}$ | 2.4 | | |

Electrical Characteristics – Static (continued)
 $T_A = 25^\circ\text{C}$; input $t_r, t_f = 20\text{ ns}$; $C_L = 50\text{ pF}$; $R_L = 200\text{ k}\Omega$ (unless otherwise noted)

| PARAMETER | TEST CONDITIONS | MIN | TYP | MAX | UNIT | |
|---------------------------|---|---------------------------|-------|-------|------|------|
| I_{OH} | $V_O = 4.6\text{ V}, V_{IN} = 0\text{ V}, V_{DD} = 5\text{ V}$ | $T_A = -55^\circ\text{C}$ | | -0.64 | mA | |
| | | $T_A = -40^\circ\text{C}$ | | -0.61 | | |
| | | $T_A = 25^\circ\text{C}$ | | -0.51 | | -1 |
| | | $T_A = 85^\circ\text{C}$ | | -0.42 | | |
| | | $T_A = 125^\circ\text{C}$ | | -0.36 | | |
| | $V_O = 2.5\text{ V}, V_{IN} = 0\text{ V}, V_{DD} = 5\text{ V}$ | $T_A = -55^\circ\text{C}$ | | -2 | | -3.2 |
| | | $T_A = -40^\circ\text{C}$ | | -1.8 | | |
| | | $T_A = 25^\circ\text{C}$ | | -1.6 | | |
| | | $T_A = 85^\circ\text{C}$ | | -1.3 | | |
| | | $T_A = 125^\circ\text{C}$ | | -1.15 | | |
| | $V_O = 9.5\text{ V}, V_{IN} = 0\text{ V}, V_{DD} = 10\text{ V}$ | $T_A = -55^\circ\text{C}$ | | -1.6 | | -2.6 |
| | | $T_A = -40^\circ\text{C}$ | | -1.5 | | |
| | | $T_A = 25^\circ\text{C}$ | | -1.3 | | |
| | | $T_A = 85^\circ\text{C}$ | | -1.1 | | |
| | | $T_A = 125^\circ\text{C}$ | | -0.9 | | |
| | $V_O = 13.5\text{ V}, V_{IN} = 0\text{ V}, V_{DD} = 15\text{ V}$ | $T_A = -55^\circ\text{C}$ | | -4.2 | | -6.8 |
| $T_A = -40^\circ\text{C}$ | | | -4 | | | |
| $T_A = 25^\circ\text{C}$ | | | -3.4 | | | |
| $T_A = 85^\circ\text{C}$ | | | -2.8 | | | |
| $T_A = 125^\circ\text{C}$ | | | -2.4 | | | |
| V_{OL} | $V_{IN} = 5\text{ V}, V_{DD} = 5\text{ V}$ | $T_A = 25^\circ\text{C}$ | | 0 | 0.05 | |
| | | All other temperatures | | | 0.05 | |
| | $V_{IN} = 10\text{ V}, V_{DD} = 10\text{ V}$ | $T_A = 25^\circ\text{C}$ | | 0 | 0.05 | |
| | | All other temperatures | | | 0.05 | |
| | $V_{IN} = 15\text{ V}, V_{DD} = 15\text{ V}$ | $T_A = 25^\circ\text{C}$ | | 0 | 0.05 | |
| | | All other temperatures | | | 0.05 | |
| V_{OH} | $V_{IN} = 0\text{ V}, V_{DD} = 5\text{ V}$ | $T_A = 25^\circ\text{C}$ | 4.95 | 5 | V | |
| | | All other temperatures | 4.95 | | | |
| | $V_{IN} = 0\text{ V}, V_{DD} = 10\text{ V}$ | $T_A = 25^\circ\text{C}$ | 9.95 | 10 | | |
| | | All other temperatures | 9.95 | | | |
| | $V_{IN} = 0\text{ V}, V_{DD} = 15\text{ V}$ | $T_A = 25^\circ\text{C}$ | 14.95 | 15 | | |
| | | All other temperatures | 14.95 | | | |
| V_{IL} | $V_O = 4.5\text{ V}, V_{DD} = 5\text{ V}, \text{ all temperatures}$ | | | | 1 | |
| | $V_O = 9\text{ V}, V_{DD} = 10\text{ V}, \text{ all temperatures}$ | | | | 2 | |
| | $V_O = 13.5\text{ V}, V_{DD} = 15\text{ V}, \text{ all temperatures}$ | | | | 2.5 | |
| V_{IH} | $V_O = 0.5\text{ V}, V_{DD} = 5\text{ V}, \text{ all temperatures}$ | | 4 | | V | |
| | $V_O = 1\text{ V}, V_{DD} = 10\text{ V}, \text{ all temperatures}$ | | 8 | | | |
| | $V_O = 1.5\text{ V}, V_{DD} = 15\text{ V}, \text{ all temperatures}$ | | 12.5 | | | |

Electrical Characteristics – Static (continued)
 $T_A = 25^\circ\text{C}$; input $t_r, t_f = 20\text{ ns}$; $C_L = 50\text{ pF}$; $R_L = 200\text{ k}\Omega$ (unless otherwise noted)

| PARAMETER | | TEST CONDITIONS | MIN | TYP | MAX | UNIT | |
|-----------|---------------|---|---------------------------|-----|---------------|----------|---------------|
| I_{IN} | Input current | $V_{IN} = 0\text{ V to } 18\text{ V}, V_{DD} = 18\text{ V}$ | $T_A = -55^\circ\text{C}$ | | | ± 01 | μA |
| | | | $T_A = -40^\circ\text{C}$ | | | ± 01 | |
| | | | $T_A = 25^\circ\text{C}$ | | $\pm 10^{-5}$ | ± 1 | |
| | | | $T_A = 85^\circ\text{C}$ | | | ± 1 | |
| | | | $T_A = 125^\circ\text{C}$ | | | ± 1 | |

6.7 Typical Characteristics

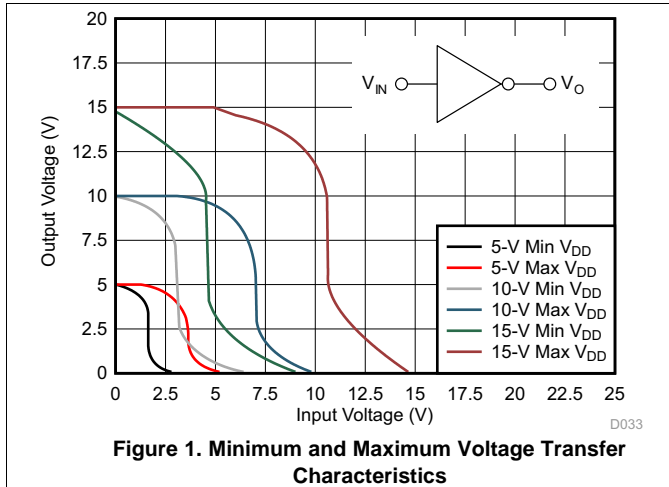


Figure 1. Minimum and Maximum Voltage Transfer Characteristics

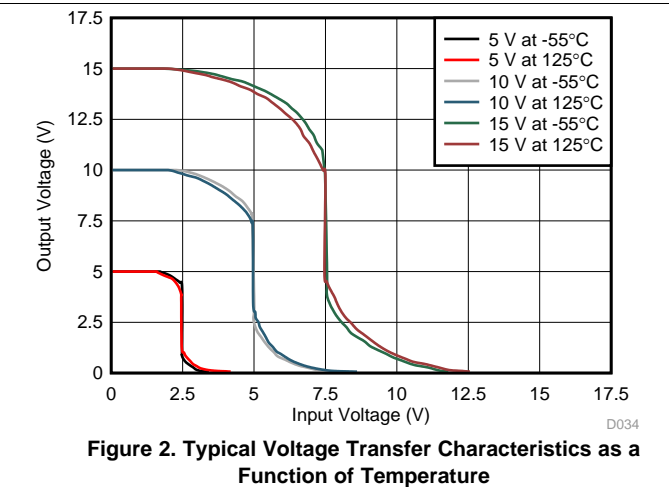


Figure 2. Typical Voltage Transfer Characteristics as a Function of Temperature

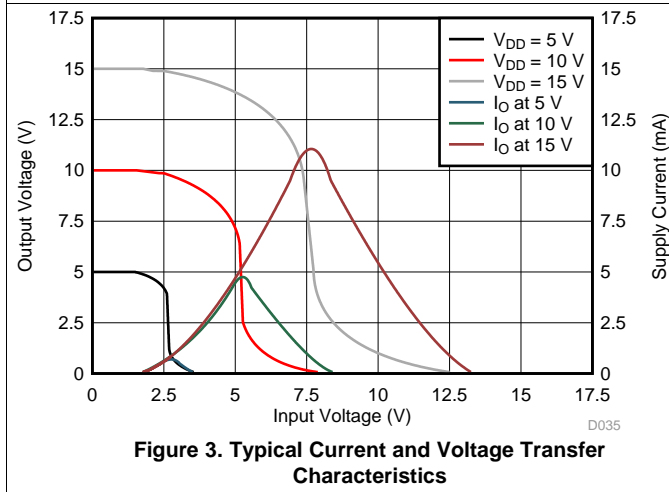


Figure 3. Typical Current and Voltage Transfer Characteristics

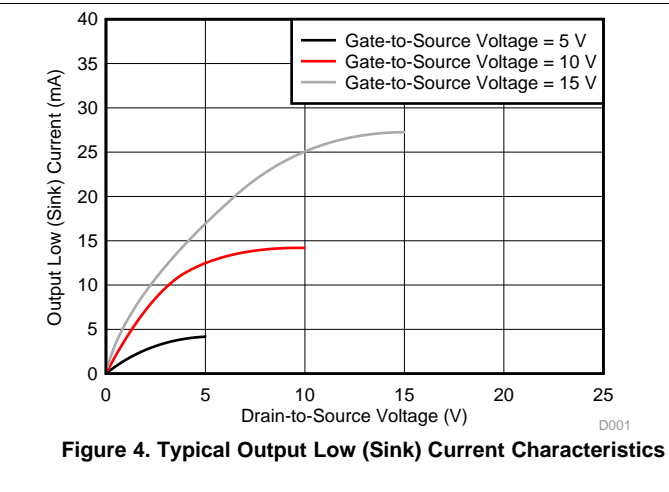


Figure 4. Typical Output Low (Sink) Current Characteristics

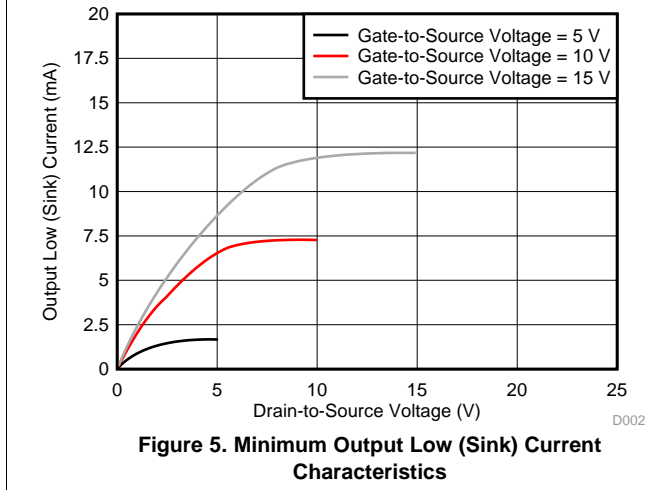


Figure 5. Minimum Output Low (Sink) Current Characteristics

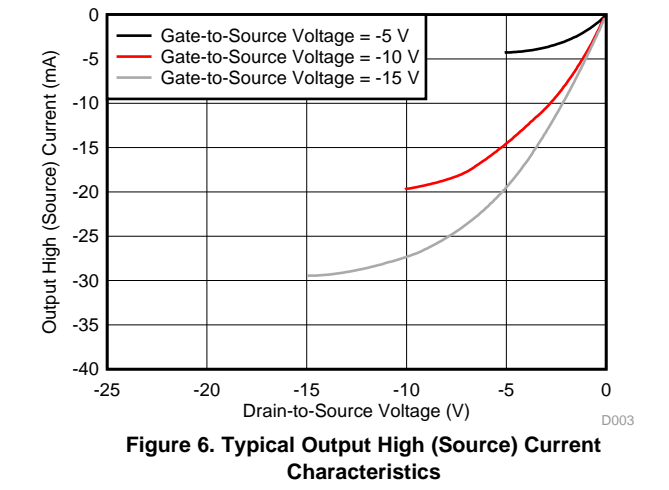
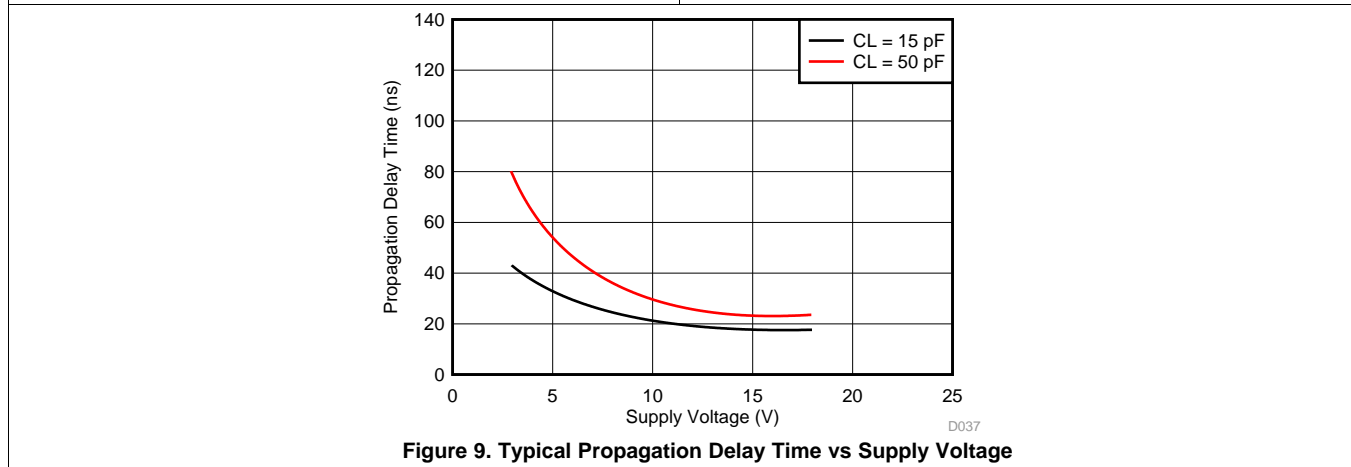
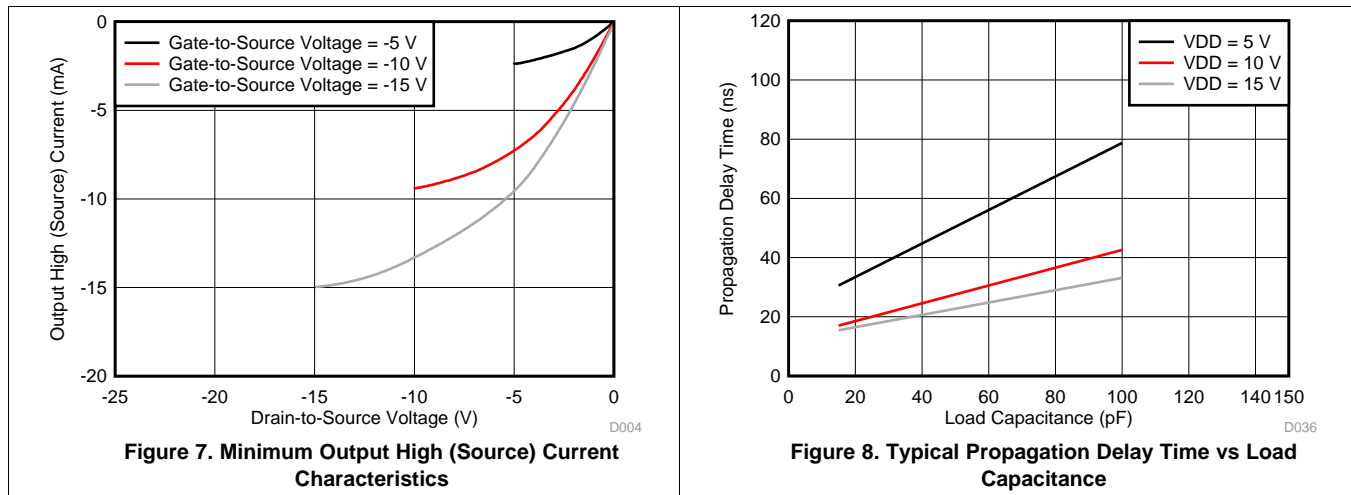


Figure 6. Typical Output High (Source) Current Characteristics

Typical Characteristics (continued)



7 Parameter Measurement Information

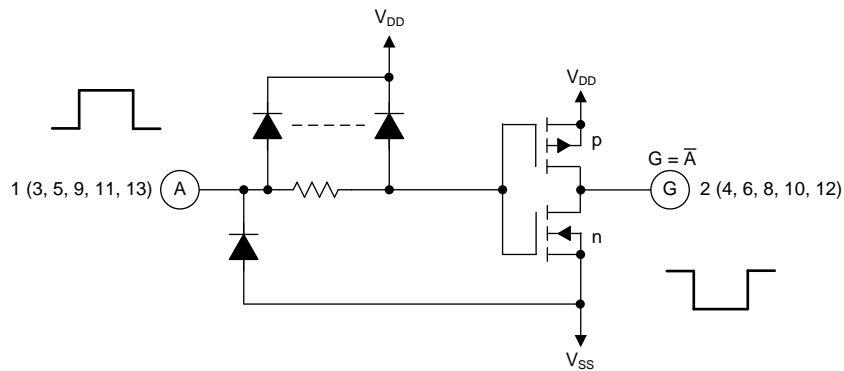


Figure 10. Schematic Diagram of One of Six Identical Inverters

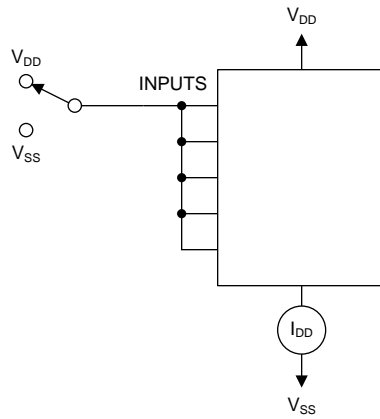


Figure 11. Quiescent Device Current Test Circuit

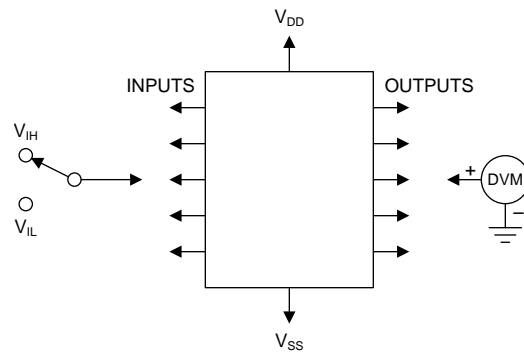


Figure 12. Noise Immunity Test Circuit

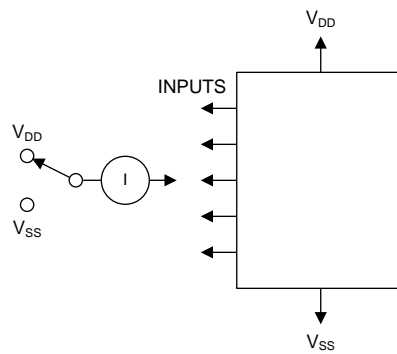


Figure 13. Input Leakage Current Test Circuit

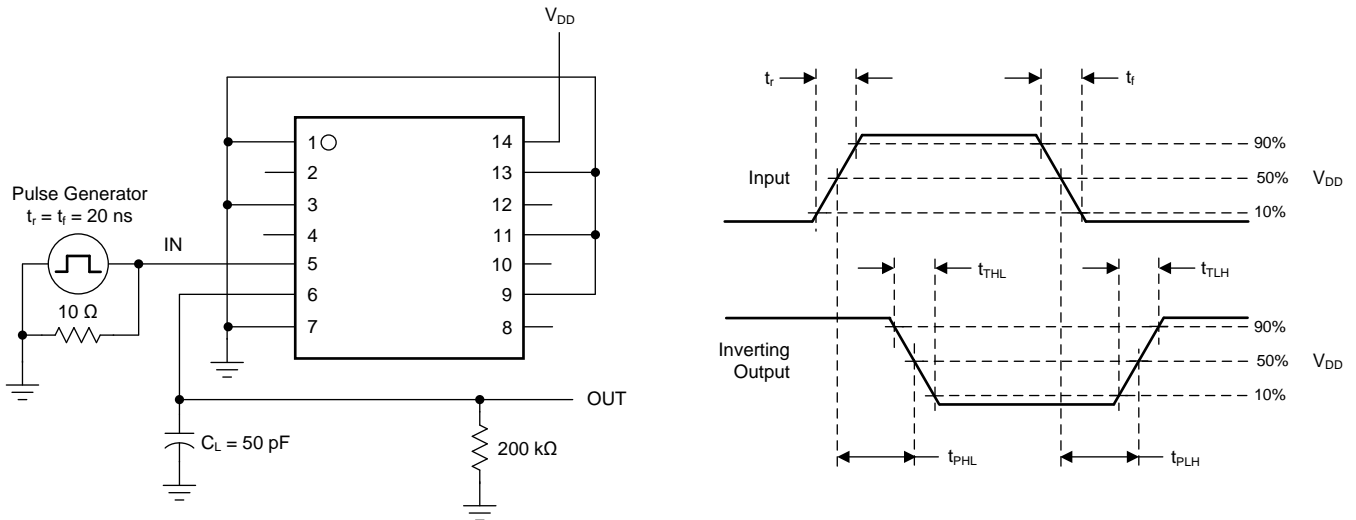


Figure 14. Dynamic Electrical Characteristics Test Circuit and Waveform

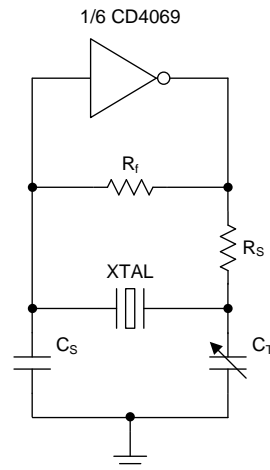


Figure 15. Typical Crystal Oscillator Circuit

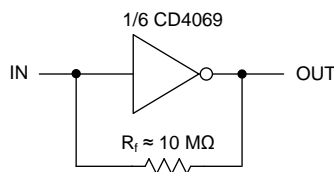


Figure 16. High-Input Impedance Amplifier

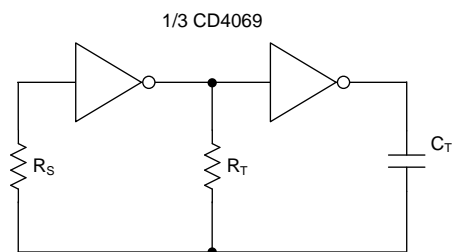
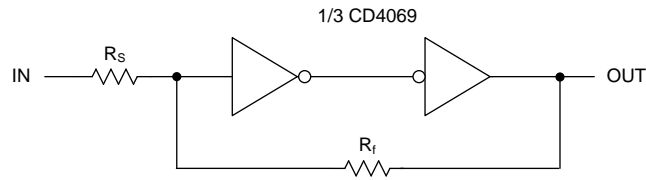


Figure 17. Typical RC Oscillator Circuit



Upper Switching Point :

$$V_P = \frac{R_S + R_f}{R_f} \times \frac{V_{DD}}{2}$$

Lower Switching Point :

$$V_N = \frac{R_f - R_S}{R_f} \times \frac{V_{DD}}{2}$$

$$R_f > R_S$$

Figure 18. Input Pulse Shaping Circuit

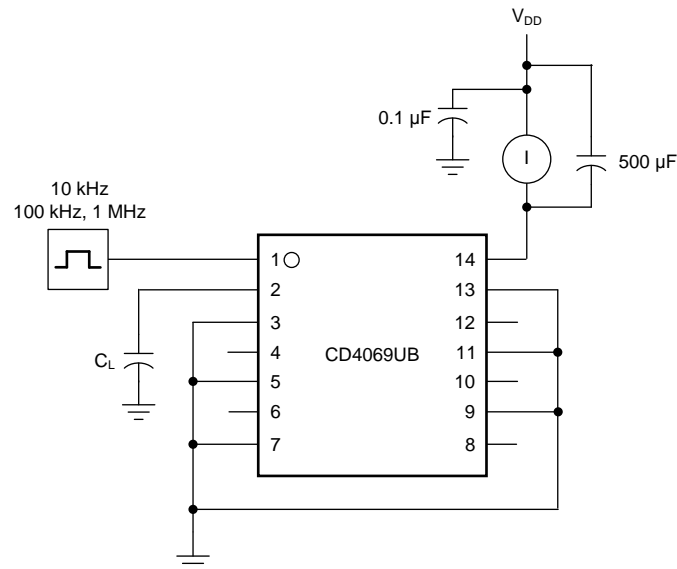


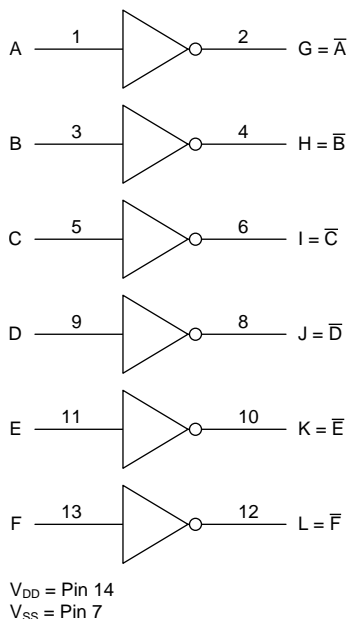
Figure 19. Dynamic Power Dissipation Test Circuit

8 Detailed Description

8.1 Overview

The CD4069UB device has six inverter circuits. The recommended operating range is from 3 V to 18 V. The CD4069UB-series types are supplied in 14-pin hermetic dual-in-line ceramic packages (F3A suffix), 14-pin dual-in-line plastic packages (E suffix), 14-pin small-outline packages (M, MT, M96, and NSR suffixes), and 14-pin thin shrink small-outline packages (PW and PWR suffixes).

8.2 Functional Block Diagram



8.3 Feature Description

CD4069UB has standardized symmetrical output characteristics and a wide operating voltage range from 3 V to 18 V with quiescent current tested at 20 V. This has a medium operation speed of t_{PHL} , $t_{PLH} = 30$ ns (typical) at 10 V. The operating temperature is from -55°C to 125°C . CD4069UB meets all requirements of JEDEC tentative standard No. 13B, *Standard Specifications for Description of B Series CMOS Devices*.

8.4 Device Functional Modes

Table 1 shows the functional modes for CD4069UB.

Table 1. Function Table

| INPUT A, B, C, D, E, F | OUTPUT G, H, I, J, K, L |
|---------------------------|----------------------------|
| H | L |
| L | H |

9 Application and Implementation

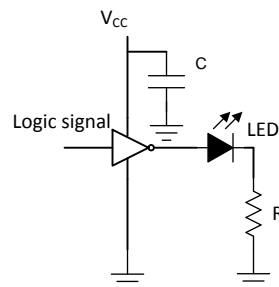
NOTE

Information in the following applications sections is not part of the TI component specification, and TI does not warrant its accuracy or completeness. TI's customers are responsible for determining suitability of components for their purposes. Customers should validate and test their design implementation to confirm system functionality.

9.1 Application Information

The CD4069UB device has a low input current of 1 μA at 18 V over full package-temperature range and 100 nA at 18 V, 25°C. This device has a wide operating voltage range from 3 V to 18 V and used in high voltage applications.

9.2 Typical Application



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Figure 20. CD4069UB Application

9.2.1 Design Requirements

The CD4069UB device is the industry's highest logic inverter operating at 18 V under recommended conditions. The lower drive capabilities makes it suitable for driving light loads like LED and greatly reduces chances of overshoots and undershoots.

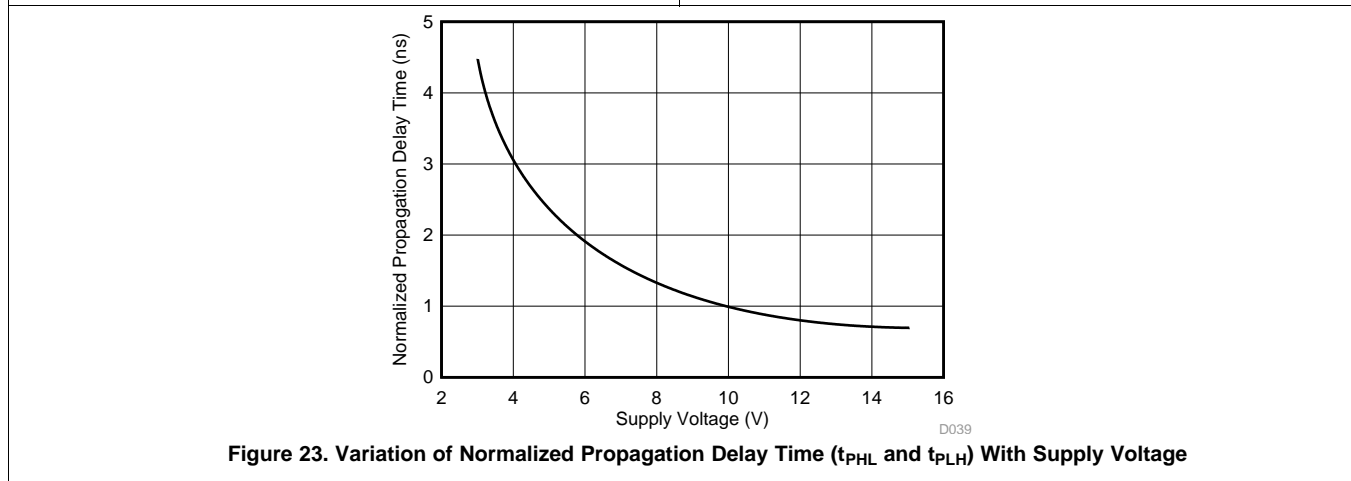
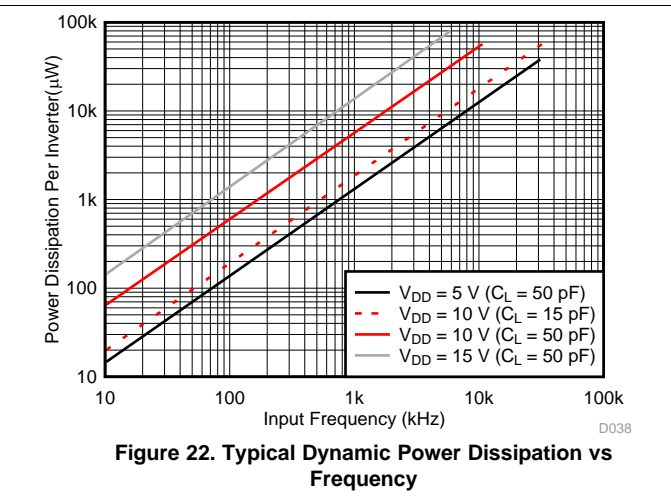
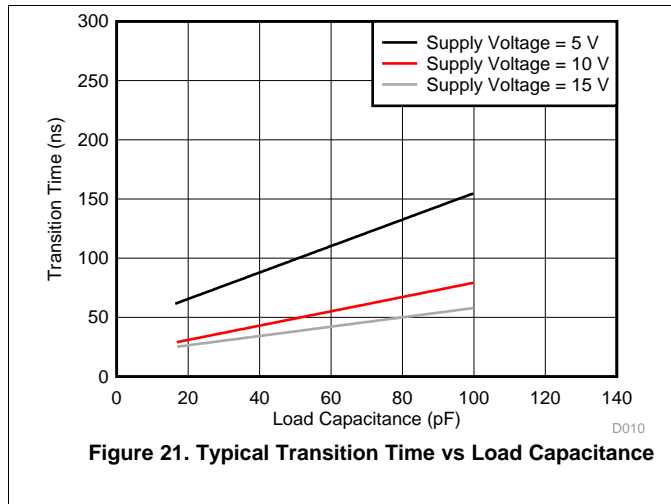
9.2.2 Detailed Design Procedure

The recommended input conditions for [Figure 20](#) includes rise time and fall time specifications (see $\Delta t/\Delta V$ in [Recommended Operating Conditions](#)) and specified high and low levels (see V_{IH} and V_{IL} in [Recommended Operating Conditions](#)). Inputs are not overvoltage tolerant and must be below V_{CC} level because of the presence of input clamp diodes to V_{CC} .

The recommended output condition for the CD4069UB application includes specific load currents. Load currents must be limited so as to not exceed the total power (continuous current through V_{CC} or GND) for the device. These limits are located in the [Absolute Maximum Ratings](#). Outputs must not be pulled above V_{CC} .

Typical Application (continued)

9.2.3 Application Curves



10 Power Supply Recommendations

The power supply can be any voltage between the minimum and maximum supply voltage rating located in [Recommended Operating Conditions](#).

Each V_{CC} pin must have a good bypass capacitor to prevent power disturbance. For devices with a single supply, TI recommends a 0.1- μF capacitor. If there are multiple V_{CC} pins, then TI recommends a 0.01- μF or 0.022- μF capacitor for each power pin. It is acceptable to parallel multiple bypass capacitors to reject different frequencies of noise. 0.1- μF and 1- μF capacitors are commonly used in parallel. The bypass capacitor must be installed as close to the power pin as possible for best results.

11 Layout

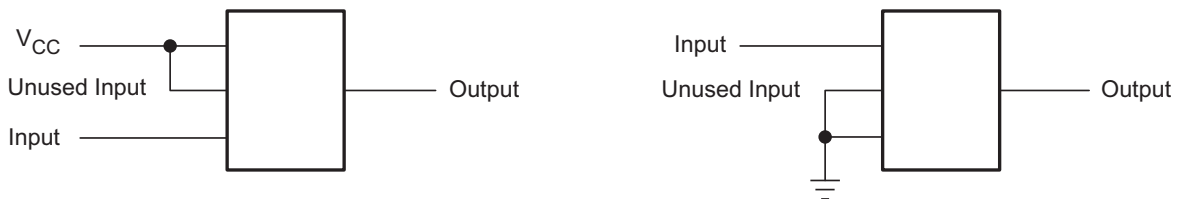
11.1 Layout Guidelines

When using multiple bit logic devices, inputs must never float.

In many cases, digital logic device functions or parts of these functions are unused (for example, when only two inputs of a triple-input and gate are used, or only 3 of the 4 buffer gates are used). Such input pins must not be left unconnected because the undefined voltages at the outside connections result in undefined operational states. This rule must be observed under all circumstances specified in the next paragraph.

All unused inputs of digital logic devices must be connected to a high or low bias to prevent them from floating. See the application note, [Implications of Slow or Floating CMOS Inputs \(SCBA004\)](#), for more information on the effects of floating inputs. The logic level must apply to any particular unused input depending on the function of the device. Generally, they are tied to GND or V_{CC} (whichever is convenient).

11.2 Layout Example



12 器件和文档支持

12.1 器件支持

12.1.1 第三方产品免责声明

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12.2 文档支持

12.2.1 相关文档

请参阅如下相关文档：

- 《CMOS 输入缓慢变化或悬空的影响》，[SCBA004](#)

12.3 社区资源

下列链接提供到 TI 社区资源的连接。链接的内容由各个分销商“按照原样”提供。这些内容并不构成 TI 技术规范，并且不一定反映 TI 的观点；请参阅 TI 的《使用条款》。

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设计支持 *TI 参考设计支持* 可帮助您快速查找有帮助的 E2E 论坛、设计支持工具以及技术支持的联系信息。

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12.5 静电放电警告



这些装置包含有限的内置 ESD 保护。存储或装卸时，应将导线一起截短或将装置放置于导电泡棉中，以防止 MOS 门极遭受静电损伤。

12.6 术语表

[SLYZ022](#) — *TI 术语表*。

这份术语表列出并解释术语、缩写和定义。

13 机械、封装和可订购信息

以下页面包含机械、封装和可订购信息。这些信息是指定器件的最新可用数据。数据如有变更，恕不另行通知，且不会对此文档进行修订。如需获取此数据表的浏览器版本，请查阅左侧的导航栏。

PACKAGING INFORMATION

| Orderable Device | Status (1) | Package Type | Package Drawing | Pins | Package Qty | Eco Plan (2) | Lead finish/ Ball material (6) | MSL Peak Temp (3) | Op Temp (°C) | Device Marking (4/5) | Samples |
|------------------|---------------|--------------|-----------------|------|-------------|------------------|--------------------------------------|----------------------|--------------|-------------------------|-------------------------|
| CD4069UBE | ACTIVE | PDIP | N | 14 | 25 | RoHS & Green | NIPDAU | N / A for Pkg Type | -55 to 125 | CD4069UBE | Samples |
| CD4069UBEE4 | ACTIVE | PDIP | N | 14 | 25 | RoHS & Green | NIPDAU | N / A for Pkg Type | -55 to 125 | CD4069UBE | Samples |
| CD4069UBF | ACTIVE | CDIP | J | 14 | 25 | Non-RoHS & Green | SNPB | N / A for Pkg Type | -55 to 125 | CD4069UBF | Samples |
| CD4069UBF3A | ACTIVE | CDIP | J | 14 | 25 | Non-RoHS & Green | SNPB | N / A for Pkg Type | -55 to 125 | CD4069UBF3A | Samples |
| CD4069UBM | ACTIVE | SOIC | D | 14 | 50 | RoHS & Green | NIPDAU | Level-1-260C-UNLIM | -55 to 125 | CD4069UBM | Samples |
| CD4069UBM96 | ACTIVE | SOIC | D | 14 | 2500 | RoHS & Green | NIPDAU SN | Level-1-260C-UNLIM | -55 to 125 | CD4069UBM | Samples |
| CD4069UBNSR | ACTIVE | SO | NS | 14 | 2000 | RoHS & Green | NIPDAU | Level-1-260C-UNLIM | -55 to 125 | CD4069UB | Samples |
| CD4069UBPWR | ACTIVE | TSSOP | PW | 14 | 2000 | RoHS & Green | NIPDAU SN | Level-1-260C-UNLIM | -55 to 125 | CM069UB | Samples |
| JM38510/17401BCA | ACTIVE | CDIP | J | 14 | 25 | Non-RoHS & Green | SNPB | N / A for Pkg Type | -55 to 125 | JM38510/ 17401BCA | Samples |
| M38510/17401BCA | ACTIVE | CDIP | J | 14 | 25 | Non-RoHS & Green | SNPB | N / A for Pkg Type | -55 to 125 | JM38510/ 17401BCA | Samples |

(1) The marketing status values are defined as follows:

ACTIVE: Product device recommended for new designs.

LIFEBUY: TI has announced that the device will be discontinued, and a lifetime-buy period is in effect.

NRND: Not recommended for new designs. Device is in production to support existing customers, but TI does not recommend using this part in a new design.

PREVIEW: Device has been announced but is not in production. Samples may or may not be available.

OBSELETE: TI has discontinued the production of the device.

(2) **RoHS:** TI defines "RoHS" to mean semiconductor products that are compliant with the current EU RoHS requirements for all 10 RoHS substances, including the requirement that RoHS substance do not exceed 0.1% by weight in homogeneous materials. Where designed to be soldered at high temperatures, "RoHS" products are suitable for use in specified lead-free processes. TI may reference these types of products as "Pb-Free".

RoHS Exempt: TI defines "RoHS Exempt" to mean products that contain lead but are compliant with EU RoHS pursuant to a specific EU RoHS exemption.

Green: TI defines "Green" to mean the content of Chlorine (Cl) and Bromine (Br) based flame retardants meet JS709B low halogen requirements of <=1000ppm threshold. Antimony trioxide based flame retardants must also meet the <=1000ppm threshold requirement.

(3) MSL, Peak Temp. - The Moisture Sensitivity Level rating according to the JEDEC industry standard classifications, and peak solder temperature.

(4) There may be additional marking, which relates to the logo, the lot trace code information, or the environmental category on the device.

(5) Multiple Device Markings will be inside parentheses. Only one Device Marking contained in parentheses and separated by a "~" will appear on a device. If a line is indented then it is a continuation of the previous line and the two combined represent the entire Device Marking for that device.

(6) Lead finish/Ball material - Orderable Devices may have multiple material finish options. Finish options are separated by a vertical ruled line. Lead finish/Ball material values may wrap to two lines if the finish value exceeds the maximum column width.

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OTHER QUALIFIED VERSIONS OF CD4069UB, CD4069UB-MIL :

- Catalog : [CD4069UB](#)
- Military : [CD4069UB-MIL](#)

NOTE: Qualified Version Definitions:

- Catalog - TI's standard catalog product
- Military - QML certified for Military and Defense Applications

TAPE AND REEL INFORMATION

QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE


*All dimensions are nominal

| Device | Package Type | Package Drawing | Pins | SPQ | Reel Diameter (mm) | Reel Width W1 (mm) | A0 (mm) | B0 (mm) | K0 (mm) | P1 (mm) | W (mm) | Pin1 Quadrant |
|-------------|--------------|-----------------|------|------|--------------------|--------------------|---------|---------|---------|---------|--------|---------------|
| CD4069UBM96 | SOIC | D | 14 | 2500 | 330.0 | 16.8 | 6.5 | 9.5 | 2.1 | 8.0 | 16.0 | Q1 |
| CD4069UBM96 | SOIC | D | 14 | 2500 | 330.0 | 16.4 | 6.5 | 9.0 | 2.1 | 8.0 | 16.0 | Q1 |
| CD4069UBNSR | SO | NS | 14 | 2000 | 330.0 | 16.4 | 8.2 | 10.5 | 2.5 | 12.0 | 16.0 | Q1 |
| CD4069UBPWR | TSSOP | PW | 14 | 2000 | 330.0 | 12.4 | 6.9 | 5.6 | 1.6 | 8.0 | 12.0 | Q1 |
| CD4069UBPWR | TSSOP | PW | 14 | 2000 | 330.0 | 12.4 | 6.9 | 5.6 | 1.6 | 8.0 | 12.0 | Q1 |

TAPE AND REEL BOX DIMENSIONS



*All dimensions are nominal

| Device | Package Type | Package Drawing | Pins | SPQ | Length (mm) | Width (mm) | Height (mm) |
|-------------|--------------|-----------------|------|------|-------------|------------|-------------|
| CD4069UBM96 | SOIC | D | 14 | 2500 | 364.0 | 364.0 | 27.0 |
| CD4069UBM96 | SOIC | D | 14 | 2500 | 356.0 | 356.0 | 35.0 |
| CD4069UBNSR | SO | NS | 14 | 2000 | 356.0 | 356.0 | 35.0 |
| CD4069UBPWR | TSSOP | PW | 14 | 2000 | 356.0 | 356.0 | 35.0 |
| CD4069UBPWR | TSSOP | PW | 14 | 2000 | 364.0 | 364.0 | 27.0 |

TUBE


*All dimensions are nominal

| Device | Package Name | Package Type | Pins | SPQ | L (mm) | W (mm) | T (μm) | B (mm) |
|-------------|--------------|--------------|------|-----|--------|--------|--------|--------|
| CD4069UBE | N | PDIP | 14 | 25 | 506 | 13.97 | 11230 | 4.32 |
| CD4069UBE | N | PDIP | 14 | 25 | 506 | 13.97 | 11230 | 4.32 |
| CD4069UBEE4 | N | PDIP | 14 | 25 | 506 | 13.97 | 11230 | 4.32 |
| CD4069UBEE4 | N | PDIP | 14 | 25 | 506 | 13.97 | 11230 | 4.32 |
| CD4069UBM | D | SOIC | 14 | 50 | 506.6 | 8 | 3940 | 4.32 |

J 14

GENERIC PACKAGE VIEW
CDIP - 5.08 mm max height
CERAMIC DUAL IN LINE PACKAGE



Images above are just a representation of the package family, actual package may vary.
Refer to the product data sheet for package details.

4040083-5/G

J0014A



PACKAGE OUTLINE

CDIP - 5.08 mm max height

CERAMIC DUAL IN LINE PACKAGE



4214771/A 05/2017

NOTES:

1. All controlling linear dimensions are in inches. Dimensions in brackets are in millimeters. Any dimension in brackets or parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.
2. This drawing is subject to change without notice.
3. This package is hermetically sealed with a ceramic lid using glass frit.
4. Index point is provided on cap for terminal identification only and on press ceramic glass frit seal only.
5. Falls within MIL-STD-1835 and GDIP1-T14.

EXAMPLE BOARD LAYOUT

J0014A

CDIP - 5.08 mm max height

CERAMIC DUAL IN LINE PACKAGE



LAND PATTERN EXAMPLE
NON-SOLDER MASK DEFINED
SCALE: 5X



4214771/A 05/2017

D (R-PDSO-G14)

PLASTIC SMALL OUTLINE



- NOTES:
- A. All linear dimensions are in inches (millimeters).
 - B. This drawing is subject to change without notice.
 - $\triangle C$ Body length does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed 0.006 (0,15) each side.
 - $\triangle D$ Body width does not include interlead flash. Interlead flash shall not exceed 0.017 (0,43) each side.
 - E. Reference JEDEC MS-012 variation AB.

D (R-PDSO-G14)

PLASTIC SMALL OUTLINE



- NOTES:
- A. All linear dimensions are in millimeters.
 - B. This drawing is subject to change without notice.
 - C. Publication IPC-7351 is recommended for alternate designs.
 - D. Laser cutting apertures with trapezoidal walls and also rounding corners will offer better paste release. Customers should contact their board assembly site for stencil design recommendations. Refer to IPC-7525 for other stencil recommendations.
 - E. Customers should contact their board fabrication site for solder mask tolerances between and around signal pads.

PW (R-PDSO-G14)

PLASTIC SMALL OUTLINE



- NOTES:
- All linear dimensions are in millimeters.
 - This drawing is subject to change without notice.
 - Publication IPC-7351 is recommended for alternate designs.
 - Laser cutting apertures with trapezoidal walls and also rounding corners will offer better paste release. Customers should contact their board assembly site for stencil design recommendations. Refer to IPC-7525 for other stencil recommendations.
 - Customers should contact their board fabrication site for solder mask tolerances between and around signal pads.

N (R-PDIP-T**)

PLASTIC DUAL-IN-LINE PACKAGE

16 PINS SHOWN



- NOTES:
- A. All linear dimensions are in inches (millimeters).
 - B. This drawing is subject to change without notice.
 - Falls within JEDEC MS-001, except 18 and 20 pin minimum body length (Dim A).
 - The 20 pin end lead shoulder width is a vendor option, either half or full width.

MECHANICAL DATA

NS (R-PDSO-G**)

PLASTIC SMALL-OUTLINE PACKAGE

14-PINS SHOWN



- NOTES:
- A. All linear dimensions are in millimeters.
 - B. This drawing is subject to change without notice.
 - C. Body dimensions do not include mold flash or protrusion, not to exceed 0,15.

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