



# THE DATASHEET OF CD4041UBE



# CD4041UB Types

## CMOS Quad True/Complement Buffer

### High Voltage Types (20-Volt Rating)

■ CD4041UB types are quad true/complement buffers consisting of n- and p-channel units having low channel resistance and high current (sourcing and sinking) capability. The CD4041UB is intended for use as a buffer, line driver, or CMOS-to-TTL driver. It can be used as an ultra-low power resistor-network driver for A/D and D/A conversion, as a transmission-line driver, and in other applications where high noise immunity and low power dissipation are primary design requirements.

The CD4041UB types are supplied in 14-lead hermetic dual-in-line ceramic packages (F3A suffix), 14-lead dual-in-line plastic packages (E suffix), 14-lead small-outline packages (M, MT, M96, and NSR suffixes), and 14-lead thin shrink small-outline packages (PW and PWR suffixes).

#### MAXIMUM RATINGS, Absolute-Maximum Values:

|  |   |
|--|---|
| DC SUPPLY-VOLTAGE RANGE, ( $V_{DD}$ )<br>Voltages referenced to $V_{SS}$ Terminal) | -0.5V to +20V                                 |
| INPUT VOLTAGE RANGE, ALL INPUTS  | -0.5V to $V_{DD} + 0.5V$                      |
| DC INPUT CURRENT, ANY ONE INPUT  | $\pm 10mA$                                    |
| POWER DISSIPATION PER PACKAGE ( $P_D$ ):   |   |
| For $T_A = -55^{\circ}C$ to $+100^{\circ}C$  | 500mW   |
| For $T_A = +100^{\circ}C$ to $+125^{\circ}C$                                       | Derate Linearly at 12mW/ $^{\circ}C$ to 200mW |
| DEVICE DISSIPATION PER OUTPUT TRANSISTOR   |   |
| FOR $T_A =$ FULL PACKAGE-TEMPERATURE RANGE (All Package Types)                     | 100mW   |
| OPERATING-TEMPERATURE RANGE ( $T_A$ )  | $-55^{\circ}C$ to $+125^{\circ}C$             |
| STORAGE TEMPERATURE RANGE ( $T_{stg}$ )  | $-65^{\circ}C$ to $+150^{\circ}C$             |
| LEAD TEMPERATURE (DURING SOLDERING):   |   |
| At distance $1/16 \pm 1/32$ inch ( $1.59 \pm 0.79mm$ ) from case for 10s max       | $+265^{\circ}C$                               |

#### RECOMMENDED OPERATING CONDITIONS

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

| CHARACTERISTIC  | LIMITS |      | UNITS |
|---|--------|------|-------|
|   | Min.   | Max. |       |
| Supply-Voltage Range (For $T_A =$ Full Package-Temperature Range) | 3      | 18   | V     |

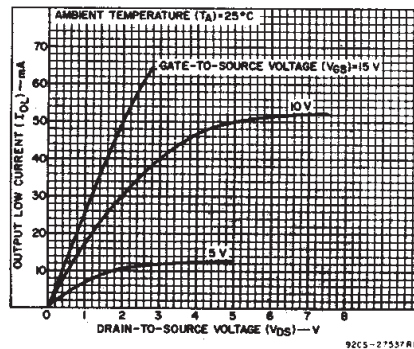


Fig.2 – Typical output low (sink) current characteristics.

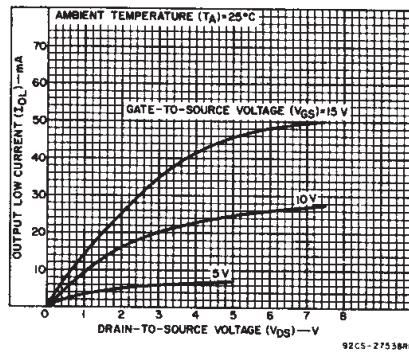


Fig.3 – Minimum low (sink) current characteristics.

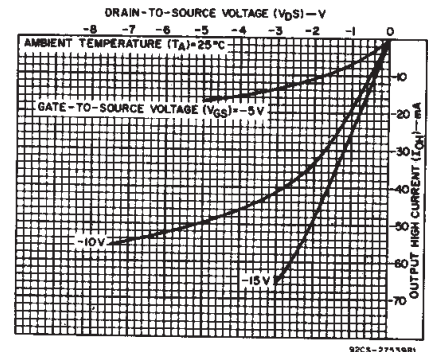


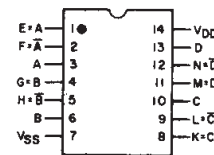
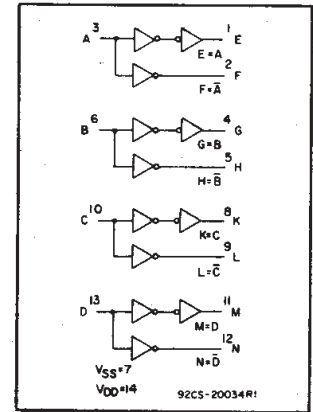
Fig.4 – Typical output high (source) current characteristics.

#### Features:

- Balanced sink and source current; approximately 4 times standard "B" drive
- Equalized delay to true and complement outputs
- 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 $^{\circ}C$
- 5-V, 10-V, and 15-V parametric ratings
- Meets all requirements of JEDEC Tentative Standard No. 13B, "Standard Specifications for Description of 'B' Series CMOS Devices"

#### Applications:

- High current source/sink driver
- CMOS-to-DTL/TTL Converter Buffer
- Display driver
- MOS clock driver
- Resistor network driver (Ladder or weighted R)
- Buffer
- Transmission line driver



92CS-20755R1

#### TOP VIEW TERMINAL ASSIGNMENT

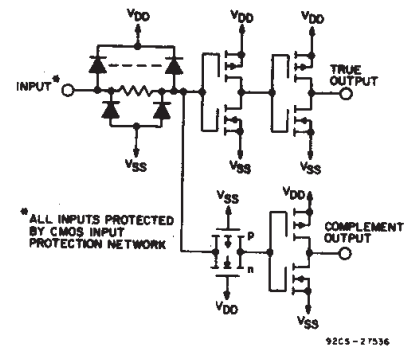


Fig.1 – Schematic diagram 1 of 4 buffers.

3  
COMMERCIAL CMOS  
HIGH VOLTAGE ICs

# CD4041UB Types

## 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<br>I <sub>DD</sub> Max.   | —                     | 0.5                    | 5                      | 1                                     | 1    | 30    | 30   | —     | 0.02              | 1    | μA    |
|  | —                     | 0.10                   | 10                     | 2                                     | 2    | 60    | 60   | —     | 0.02              | 2    |       |
|  | —                     | 0.15                   | 15                     | 4                                     | 4    | 120   | 120  | —     | 0.02              | 4    |       |
|  | —                     | 0.20                   | 20                     | 20                                    | 20   | 600   | 600  | —     | 0.04              | 20   |       |
| Output Low (Sink) Current, I <sub>OL</sub> Min.    | 0.4                   | 0.5                    | 5                      | 2.1                                   | 1.8  | 1.3   | 1.2  | 1.6   | 3.2               | —    | mA    |
|  | 0.5                   | 0.10                   | 10                     | 6.25                                  | 5.6  | 4     | 3.5  | 5     | 10                | —    |       |
|  | 1.5                   | 0.15                   | 15                     | 24                                    | 23   | 15.5  | 13   | 19    | 38                | —    |       |
|  | 4.6                   | 0.5                    | 5                      | -2.1                                  | -1.8 | -1.3  | -1.2 | -1.6  | -3.2              | —    |       |
| Output High (Source) Current, I <sub>OH</sub> Min. | 2.5                   | 0.5                    | 5                      | -8.4                                  | -6.7 | -5.3  | -4.6 | -6.4  | -12.8             | —    | mA    |
|  | 9.5                   | 0.10                   | 10                     | -6.25                                 | -5.6 | -4    | -3.5 | -5    | -10               | —    |       |
|  | 13.5                  | 0.15                   | 15                     | -24                                   | -23  | -15.5 | -13  | -19   | -38               | —    |       |
| 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    |

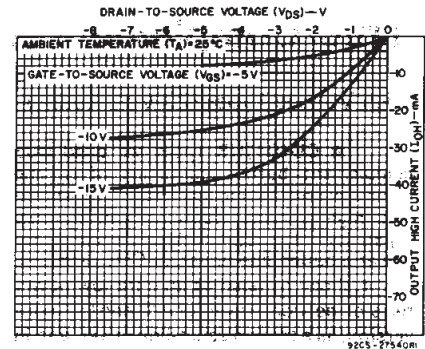


Fig. 5 - Minimum output high (source) current characteristics.

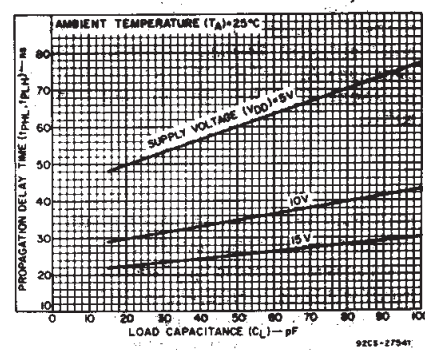


Fig. 6 - Typical propagation delay time vs. load capacitance.

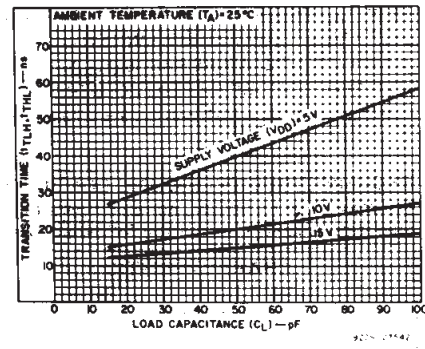


Fig. 7 - Typical transition time vs. load capacitance.

DYNAMIC ELECTRICAL CHARACTERISTICS at T<sub>A</sub> = 25°C, Input t<sub>r</sub>, t<sub>f</sub> = 20 ns, C<sub>L</sub> = 50 pF, R<sub>L</sub> = 200 kΩ

| CHARACTERISTIC  | CONDITIONS      | LIMITS                |           | UNITS |
|---|-----------------|-----------------------|-----------|-------|
|   |                 | V <sub>DD</sub> Volts | Typ. Max. |       |
| Propagation Delay Time:<br>t <sub>PHL</sub><br>t <sub>PLH</sub> | Any Input       | 5                     | 60 120    | ns    |
|   |                 | 10                    | 35 70     |       |
|   |                 | 15                    | 25 50     |       |
| Transition Time<br>t <sub>THL</sub><br>t <sub>TLH</sub>         | Any Input       | 5                     | 40 80     | ns    |
|   |                 | 10                    | 20 40     |       |
|   |                 | 15                    | 15 30     |       |
| Input Capacitance   | C <sub>IN</sub> | Any Input             | 15 22.5   | pF    |

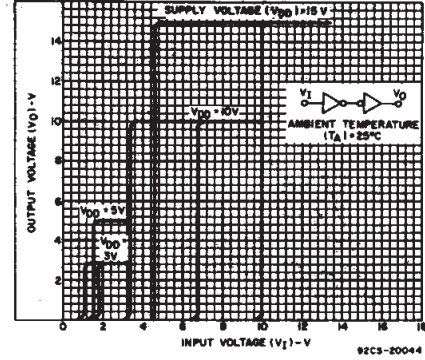


Fig. 8 - Minimum and maximum transfer characteristics - true output.

# CD4041UB Types

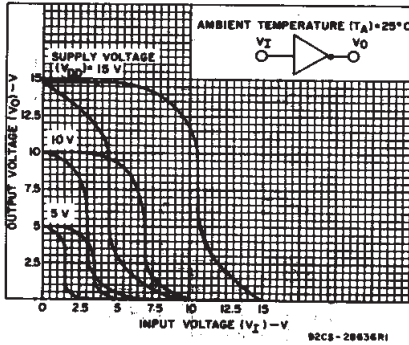


Fig. 9 - Minimum and maximum transfer characteristics - complement output.

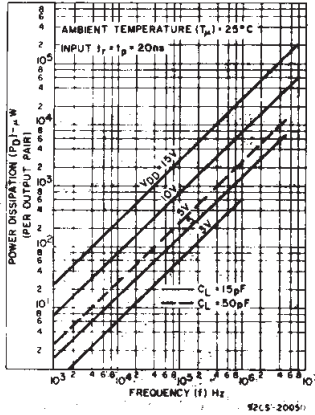


Fig. 11 - Typical power dissipation vs frequency per output pair.

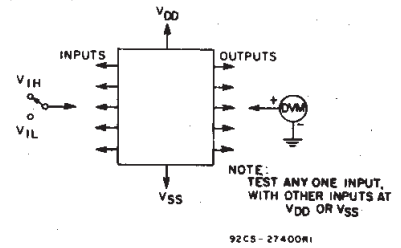


Fig. 13 - Input voltage test circuit.

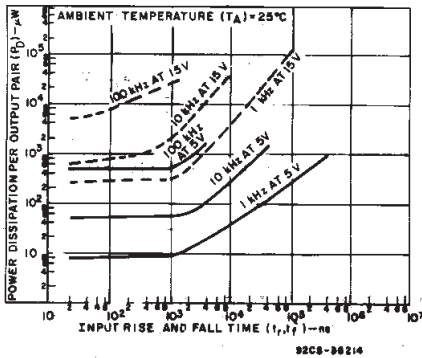


Fig. 10 - Typical power dissipation vs. input rise & fall time per output pair.

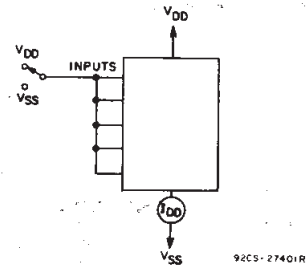


Fig. 12 - Quiescent device current test circuit.

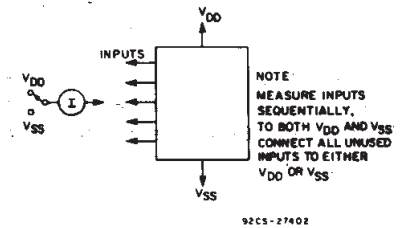
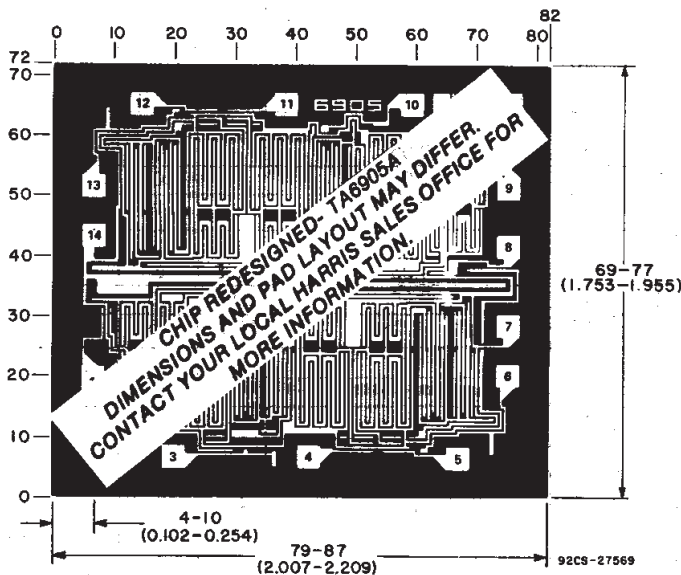


Fig. 14 - Input-leakage-current test circuit.

## Dimensions and pad layout for the CD4041UBH



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

**PACKAGING INFORMATION**

| Orderable Device | Status<br>(1) | Package Type | Package Drawing | Pins | Package Qty | Eco Plan<br>(2)         | Lead/Ball Finish<br>(6) | MSL Peak Temp<br>(3) | Op Temp (°C) | Device Marking<br>(4/5) | Samples                 |
|------------------|---------------|--------------|-----------------|------|-------------|-------------------------|-------------------------|----------------------|--------------|-------------------------|-------------------------|
| CD4041UBE        | ACTIVE        | PDIP         | N               | 14   | 25          | Green (RoHS & no Sb/Br) | CU NIPDAU               | N / A for Pkg Type   | -55 to 125   | CD4041UBE               | <a href="#">Samples</a> |
| CD4041UBF        | ACTIVE        | CDIP         | J               | 14   | 1           | TBD                     | A42                     | N / A for Pkg Type   | -55 to 125   | CD4041UBF               | <a href="#">Samples</a> |
| CD4041UBF3A      | ACTIVE        | CDIP         | J               | 14   | 1           | TBD                     | A42                     | N / A for Pkg Type   | -55 to 125   | CD4041UBF3A             | <a href="#">Samples</a> |
| CD4041UBM        | ACTIVE        | SOIC         | D               | 14   | 50          | Green (RoHS & no Sb/Br) | CU NIPDAU               | Level-1-260C-UNLIM   | -55 to 125   | CD4041UBM               | <a href="#">Samples</a> |
| CD4041UBM96      | ACTIVE        | SOIC         | D               | 14   | 2500        | Green (RoHS & no Sb/Br) | CU NIPDAU               | Level-1-260C-UNLIM   | -55 to 125   | CD4041UBM               | <a href="#">Samples</a> |
| CD4041UBMT       | ACTIVE        | SOIC         | D               | 14   | 250         | Green (RoHS & no Sb/Br) | CU NIPDAU               | Level-1-260C-UNLIM   | -55 to 125   | CD4041UBM               | <a href="#">Samples</a> |
| CD4041UBPW       | ACTIVE        | TSSOP        | PW              | 14   | 90          | Green (RoHS & no Sb/Br) | CU NIPDAU               | Level-1-260C-UNLIM   | -55 to 125   | CM041UB                 | <a href="#">Samples</a> |
| CD4041UBPWR      | ACTIVE        | TSSOP        | PW              | 14   | 2000        | Green (RoHS & no Sb/Br) | CU NIPDAU               | Level-1-260C-UNLIM   | -55 to 125   | CM041UB                 | <a href="#">Samples</a> |

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

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**OTHER QUALIFIED VERSIONS OF CD4041UB, CD4041UB-MIL :**

- Catalog: [CD4041UB](#)
- Military: [CD4041UB-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 |
|-------------|--------------|-----------------|------|------|--------------------|--------------------|---------|---------|---------|---------|--------|---------------|
| CD4041UBM96 | SOIC         | D               | 14   | 2500 | 330.0              | 16.4               | 6.5     | 9.0     | 2.1     | 8.0     | 16.0   | Q1            |
| CD4041UBMT  | SOIC         | D               | 14   | 250  | 330.0              | 16.4               | 6.5     | 9.0     | 2.1     | 8.0     | 16.0   | Q1            |
| CD4041UBPWR | TSSOP        | PW              | 14   | 2000 | 330.0              | 12.4               | 6.9     | 5.6     | 1.6     | 8.0     | 12.0   | Q1            |

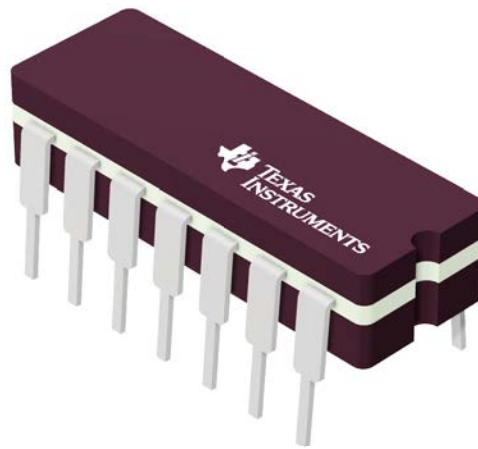
**TAPE AND REEL BOX DIMENSIONS**


\*All dimensions are nominal

| Device      | Package Type | Package Drawing | Pins | SPQ  | Length (mm) | Width (mm) | Height (mm) |
|-------------|--------------|-----------------|------|------|-------------|------------|-------------|
| CD4041UBM96 | SOIC         | D               | 14   | 2500 | 367.0       | 367.0      | 38.0        |
| CD4041UBMT  | SOIC         | D               | 14   | 250  | 210.0       | 185.0      | 35.0        |
| CD4041UBPWR | TSSOP        | PW              | 14   | 2000 | 367.0       | 367.0      | 35.0        |

J 14

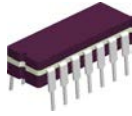
**GENERIC PACKAGE VIEW**  
**CDIP - 5.08 mm max height**  
CERAMIC DUAL IN LINE PACKAGE



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

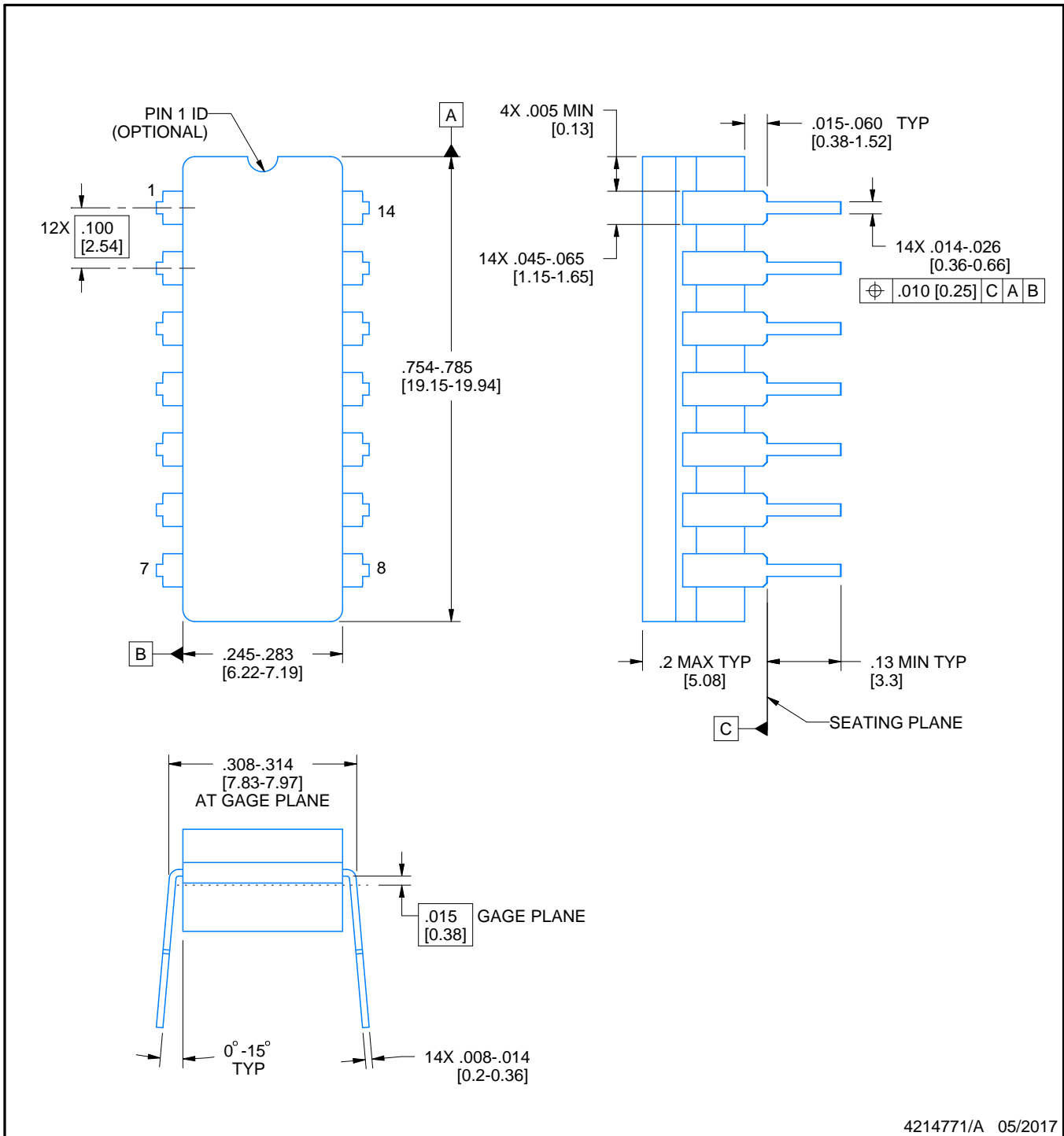
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# PACKAGE OUTLINE

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

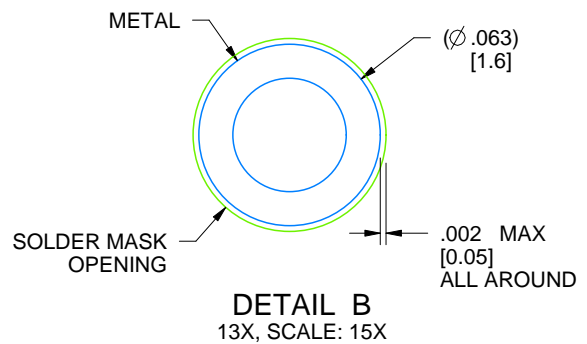
J0014A

CDIP - 5.08 mm max height

CERAMIC DUAL IN LINE PACKAGE



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

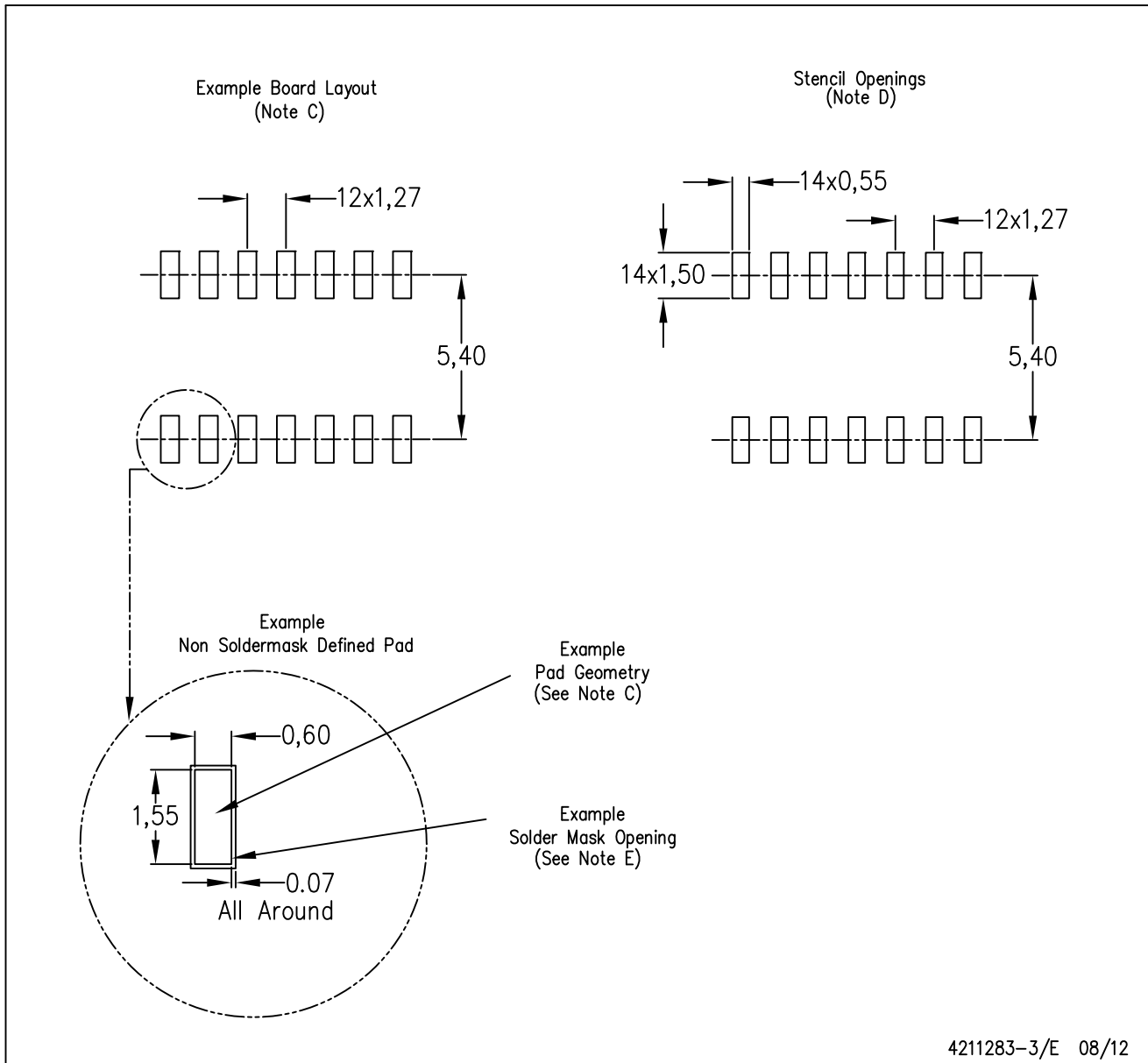


4214771/A 05/2017



D (R-PDSO-G14)

PLASTIC SMALL OUTLINE



4211283-3/E 08/12

- 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.

PW (R-PDSO-G14)

PLASTIC SMALL OUTLINE



4040064-3/G 02/11

- NOTES:
- A. All linear dimensions are in millimeters. Dimensioning and tolerancing per ASME Y14.5M-1994.
  - B. This drawing is subject to change without notice.
  - C. Body length does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed 0,15 each side.
  - D. Body width does not include interlead flash. Interlead flash shall not exceed 0,25 each side.
  - E. Falls within JEDEC MO-153

PW (R-PDSO-G14)

PLASTIC SMALL OUTLINE



4211284-2/G 08/15

- 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.
  - $\triangle C$  Falls within JEDEC MS-001, except 18 and 20 pin minimum body length (Dim A).
  - $\triangle D$  The 20 pin end lead shoulder width is a vendor option, either half or full width.

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