

# CD4093B Types

## CMOS Quad 2-Input NAND Schmitt Triggers

High-Voltage Types (20 Volt Rating)

■ CD4093B consists of four Schmitt-trigger circuits. Each circuit functions as a two-input NAND gate with Schmitt-trigger action on both inputs. The gate switches at different points for positive- and negative-going signals. The difference between the positive voltage ( $V_P$ ) and the negative voltage ( $V_N$ ) is defined as hysteresis voltage ( $V_H$ ) (see Fig. 2).

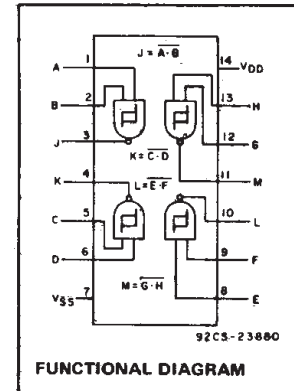
The CD4093B types are supplied in 14-lead hermetic dual-in-line ceramic packages (F3A suffix), 14-lead dual-in-line plastic packages (E suffix), 14-lead small-outline packages (M, MT, M96, and NSR suffixes), and 14-lead thin shrink small-outline packages (PW and PWR suffixes).

### Features:

- Schmitt-trigger action on each input with no external components
- Hysteresis voltage typically 0.9 V at  $V_{DD} = 5\text{ V}$  and 2.3 V at  $V_{DD} = 10\text{ V}$
- Noise immunity greater than 50%
- No limit on input rise and fall times
- Standardized, symmetrical output characteristics
- 100% tested for quiescent current at 20 V
- Maximum input current of 1  $\mu\text{A}$  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"

### Applications:

- Wave and pulse shapers
- High-noise-environment systems
- Monostable multivibrators
- Astable multivibrators
- NAND logic



### RECOMMENDED OPERATING CONDITIONS

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

| CHARACTERISTIC                                                 | MIN. | MAX. | UNITS |
|----------------------------------------------------------------|------|------|-------|
| Supply Voltage Range<br>( $T_A$ = Full Package<br>Temp. Range) | 3    | 18   | V     |

### 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  $V_{DD} + 0.5\text{ V}$

DC INPUT CURRENT, ANY ONE INPUT .....  $\pm 10\text{ mA}$

PACKAGE THERMAL IMPEDANCE,  $\theta_{JA}$  (See Note 1):

E package ..... 80°C/W

M package ..... 86°C/W

NS package ..... 76°C/W

#### DEVICE DISSIPATION PER OUTPUT TRANSISTOR

FOR  $T_A$  = FULL PACKAGE-TEMPERATURE RANGE (All Package Types) ..... 100mW

OPERATING-TEMPERATURE RANGE ( $T_A$ ) ..... -55°C to +125°C

STORAGE TEMPERATURE RANGE ( $T_{stg}$ ) ..... -65°C to +150°C

#### LEAD TEMPERATURE (DURING SOLDERING):

At distance 1/16  $\pm$  1/32 inch (1.59  $\pm$  0.79mm) from case for 10s max ..... +265°C

NOTE 1: Package thermal impedance is calculated in accordance with JESD 51-7.



\* ALL INPUTS PROTECTED BY CMOS PROTECTION NETWORK

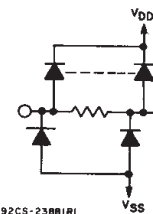


Fig. 1 – Logic diagram—1 of 4 Schmitt triggers.

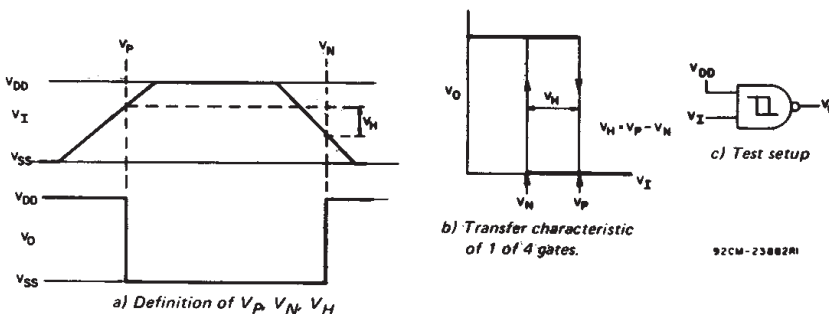


Fig. 2 – Hysteresis definition, characteristic, and test setup.

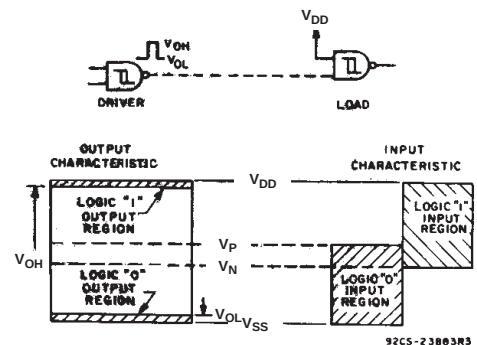


Fig. 3 – Input and output characteristics.

# CD4093B Types

## 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) | -55                                   | -40  | +85  | +125 | +25  |      |      |       |
|                                                              |                       |                        |                        |                                       |      |      |      | MIN. | TYP. | MAX. |       |
| Quiescent Device<br>Current, I <sub>DD</sub><br>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   |       |
| Positive Trigger<br>Threshold Voltage<br>V <sub>p</sub> Min. | —                     | a                      | 5                      | 2.2                                   | 2.2  | 2.2  | 2.2  | 2.2  | 2.9  | —    | V     |
|                                                              | —                     | a                      | 10                     | 4.6                                   | 4.6  | 4.6  | 4.6  | 4.6  | 5.9  | —    |       |
|                                                              | —                     | a                      | 15                     | 6.8                                   | 6.8  | 6.8  | 6.8  | 6.8  | 8.8  | —    |       |
|                                                              | —                     | b                      | 5                      | 2.6                                   | 2.6  | 2.6  | 2.6  | 2.6  | 3.3  | —    |       |
|                                                              | —                     | b                      | 10                     | 5.6                                   | 5.6  | 5.6  | 5.6  | 5.6  | 7    | —    |       |
|                                                              | —                     | b                      | 15                     | 6.3                                   | 6.3  | 6.3  | 6.3  | 6.3  | 9.4  | —    |       |
| V <sub>p</sub> Max.                                          | —                     | a                      | 5                      | 3.6                                   | 3.6  | 3.6  | 3.6  | —    | 2.9  | 3.6  | V     |
|                                                              | —                     | a                      | 10                     | 7.1                                   | 7.1  | 7.1  | 7.1  | —    | 5.9  | 7.1  |       |
|                                                              | —                     | a                      | 15                     | 10.8                                  | 10.8 | 10.8 | 10.8 | —    | 8.8  | 10.8 |       |
|                                                              | —                     | b                      | 5                      | 4                                     | 4    | 4    | 4    | —    | 3.3  | 4    |       |
|                                                              | —                     | b                      | 10                     | 8.2                                   | 8.2  | 8.2  | 8.2  | —    | 7    | 8.2  |       |
|                                                              | —                     | b                      | 15                     | 12.7                                  | 12.7 | 12.7 | 12.7 | —    | 9.4  | 12.7 |       |
| Negative Trigger<br>Threshold Voltage<br>V <sub>N</sub> Min. | —                     | a                      | 5                      | 0.9                                   | 0.9  | 0.9  | 0.9  | 0.9  | 1.9  | —    | V     |
|                                                              | —                     | a                      | 10                     | 2.5                                   | 2.5  | 2.5  | 2.5  | 2.5  | 3.9  | —    |       |
|                                                              | —                     | a                      | 15                     | 4                                     | 4    | 4    | 4    | 4    | 5.8  | —    |       |
|                                                              | —                     | b                      | 5                      | 1.4                                   | 1.4  | 1.4  | 1.4  | 1.4  | 2.3  | —    |       |
|                                                              | —                     | b                      | 10                     | 3.4                                   | 3.4  | 3.4  | 3.4  | 3.4  | 5.1  | —    |       |
|                                                              | —                     | b                      | 15                     | 4.8                                   | 4.8  | 4.8  | 4.8  | 4.8  | 7.3  | —    |       |
| V <sub>N</sub> Max.                                          | —                     | a                      | 5                      | 2.8                                   | 2.8  | 2.8  | 2.8  | —    | 1.9  | 2.8  | V     |
|                                                              | —                     | a                      | 10                     | 5.2                                   | 5.2  | 5.2  | 5.2  | —    | 3.9  | 5.2  |       |
|                                                              | —                     | a                      | 15                     | 7.4                                   | 7.4  | 7.4  | 7.4  | —    | 5.8  | 7.4  |       |
|                                                              | —                     | b                      | 5                      | 3.2                                   | 3.2  | 3.2  | 3.2  | —    | 2.3  | 3.2  |       |
|                                                              | —                     | b                      | 10                     | 6.6                                   | 6.6  | 6.6  | 6.6  | —    | 5.1  | 6.6  |       |
|                                                              | —                     | b                      | 15                     | 9.6                                   | 9.6  | 9.6  | 9.6  | —    | 7.3  | 9.6  |       |
| Hysteresis Voltage<br>V <sub>H</sub> Min.                    | —                     | a                      | 5                      | 0.3                                   | 0.3  | 0.3  | 0.3  | 0.3  | 0.9  | —    | V     |
|                                                              | —                     | a                      | 10                     | 1.2                                   | 1.2  | 1.2  | 1.2  | 1.2  | 2.3  | —    |       |
|                                                              | —                     | a                      | 15                     | 1.6                                   | 1.6  | 1.6  | 1.6  | 1.6  | 3.5  | —    |       |
|                                                              | —                     | b                      | 5                      | 0.3                                   | 0.3  | 0.3  | 0.3  | 0.3  | 0.9  | —    |       |
|                                                              | —                     | b                      | 10                     | 1.2                                   | 1.2  | 1.2  | 1.2  | 1.2  | 2.3  | —    |       |
|                                                              | —                     | b                      | 15                     | 1.6                                   | 1.6  | 1.6  | 1.6  | 1.6  | 3.5  | —    |       |
| V <sub>H</sub> Max.                                          | —                     | a                      | 5                      | 1.6                                   | 1.6  | 1.6  | 1.6  | —    | 0.9  | 1.6  | V     |
|                                                              | —                     | a                      | 10                     | 3.4                                   | 3.4  | 3.4  | 3.4  | —    | 2.3  | 3.4  |       |
|                                                              | —                     | a                      | 15                     | 5                                     | 5    | 5    | 5    | —    | 3.5  | 5    |       |
|                                                              | —                     | b                      | 5                      | 1.6                                   | 1.6  | 1.6  | 1.6  | —    | 0.9  | 1.6  |       |
|                                                              | —                     | b                      | 10                     | 3.4                                   | 3.4  | 3.4  | 3.4  | —    | 2.3  | 3.4  |       |
|                                                              | —                     | b                      | 15                     | 5                                     | 5    | 5    | 5    | —    | 3.5  | 5    |       |

<sup>a</sup> Input on terminals 1,5,8,12 or 2,6,9,13; other inputs to V<sub>DD</sub>.

<sup>b</sup> Input on terminals 1 and 2, 5 and 6, 8 and 9, or 12 and 13; other inputs to V<sub>DD</sub>.

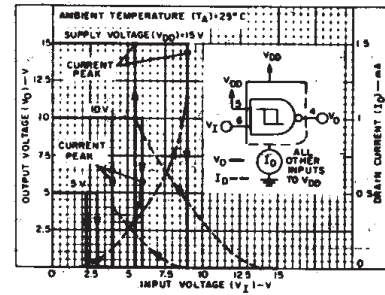


Fig. 4 — Typical current and voltage transfer characteristics.

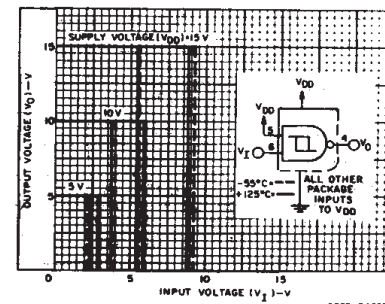


Fig. 5 — Typical voltage transfer characteristics as a function of temperature.

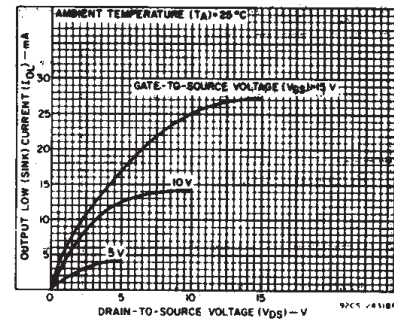


Fig. 6 — Typical output low (sink) current characteristics.

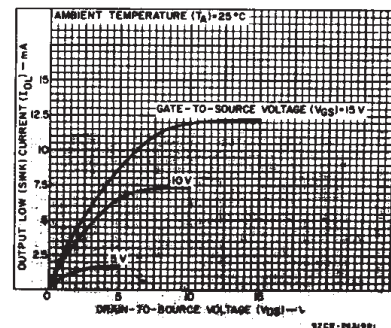


Fig. 7 — Minimum output low (sink) current characteristics.

## CD4093B Types

### STATIC ELECTRICAL CHARACTERISTICS (CONT'D)

| 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) | -55                                   | -40   | +85   | +125  | +25   |                   |      |       |
|                                                             |                       |                        |                        |                                       |       |       |       | MIN.  | TYP.              | MAX. |       |
| Output Low (Sink)<br>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 | —                 | —    |       |
| Input Current,<br>I <sub>IN</sub> Max.                      | —                     | 0.18                   | 18                     | ±0.1                                  | ±0.1  | ±1    | ±1    | —     | ±10 <sup>-5</sup> | ±0.1 | μA    |

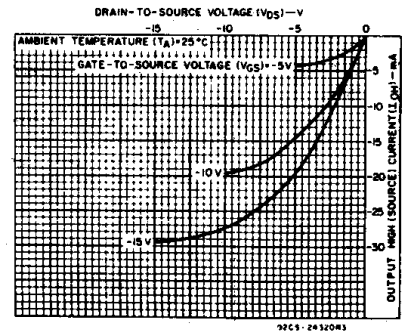


Fig. 8 — Typical output high (source) current characteristics.

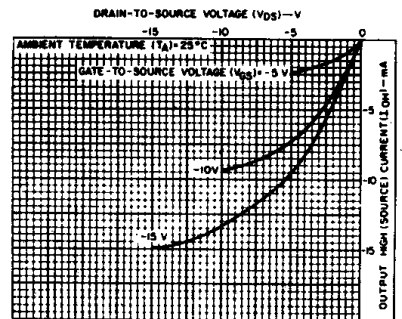


Fig. 9 — Minimum output high (source) current characteristics.

### 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 <sub>DD</sub><br>VOLTS | TYP. |       | MAX. |
| Propagation Delay Time:<br>t <sub>PHL</sub> ,<br>t <sub>PLH</sub> |                 | 5                        | 190  | 380   | ns   |
|                                                                   |                 | 10                       | 90   | 180   |      |
|                                                                   |                 | 15                       | 65   | 130   |      |
| Transition Time, t <sub>THL</sub> ,<br>t <sub>TLH</sub>           |                 | 5                        | 100  | 200   | ns   |
|                                                                   |                 | 10                       | 50   | 100   |      |
|                                                                   |                 | 15                       | 40   | 80    |      |
| Input Capacitance, C <sub>IN</sub>                                | Any Input       |                          | 5    | 7.5   | pF   |

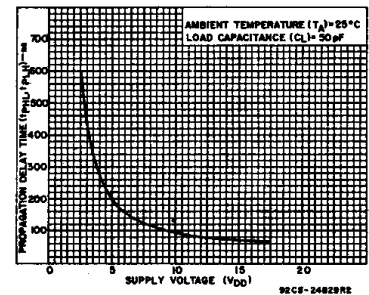


Fig. 10 — Typical propagation delay time vs. supply voltage.

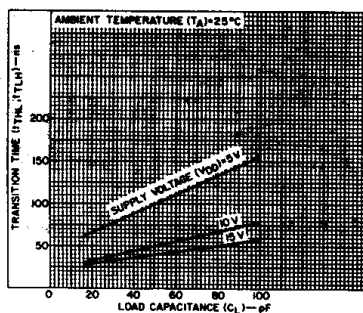


Fig. 11 — Typical transition time vs. load capacitance.

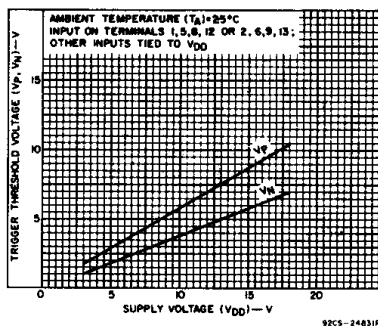


Fig. 12 — Typical trigger threshold voltage vs.  $V_{DD}$ .

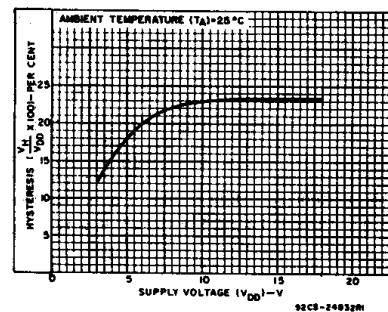


Fig. 13 — Typical per cent hysteresis vs. supply voltage.

## CD4093B Types

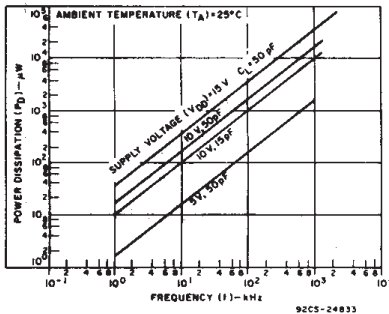


Fig. 14 - Typical power dissipation vs. frequency characteristics.

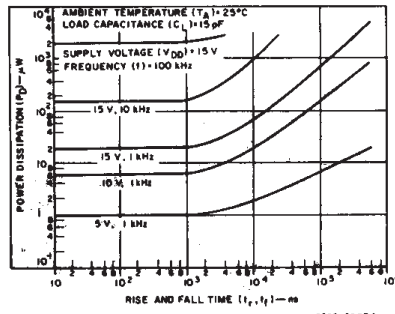


Fig. 15 - Typical power dissipation vs. rise and fall times.

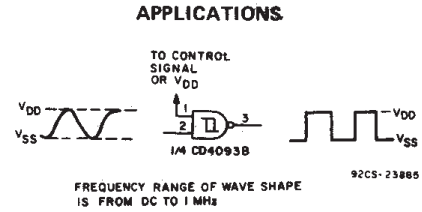


Fig. 16 - Wave shaper.

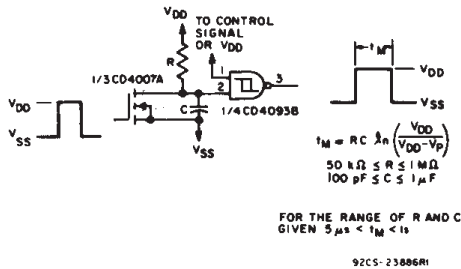


Fig. 17 - Monostable multivibrator.

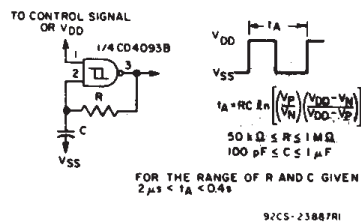


Fig. 18 - Astable multivibrator.

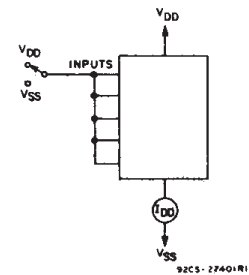


Fig. 19 - Quiescent device current test circuit.

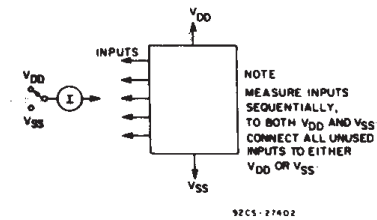


Fig. 20 - Input current test circuit.

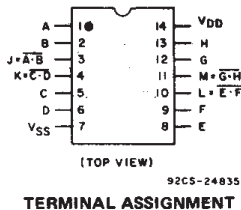


Fig. 21 - Contact Debouncer

**PACKAGING INFORMATION**

| Orderable Device | Status<br>(1) | Package Type | Package<br>Drawing | Pins | Package<br>Qty | Eco Plan<br>(2)            | Lead/Ball Finish<br>(6) | MSL Peak Temp<br>(3) | Op Temp (°C) | Device Marking<br>(4/5) | Samples                 |
|------------------|---------------|--------------|--------------------|------|----------------|----------------------------|-------------------------|----------------------|--------------|-------------------------|-------------------------|
| 7704602CA        | ACTIVE        | CDIP         | J                  | 14   | 1              | TBD                        | A42                     | N / A for Pkg Type   | -55 to 125   | 7704602CA<br>CD4093BF3A | <a href="#">Samples</a> |
| CD4093B-W        | ACTIVE        | WAFERSALE    | YS                 | 0    |                | TBD                        | Call TI                 | Call TI              |              |                         | <a href="#">Samples</a> |
| CD4093BE         | ACTIVE        | PDIP         | N                  | 14   | 25             | Pb-Free<br>(RoHS)          | CU NIPDAU               | N / A for Pkg Type   | -55 to 125   | CD4093BE                | <a href="#">Samples</a> |
| CD4093BEE4       | ACTIVE        | PDIP         | N                  | 14   | 25             | Pb-Free<br>(RoHS)          | CU NIPDAU               | N / A for Pkg Type   | -55 to 125   | CD4093BE                | <a href="#">Samples</a> |
| CD4093BF         | ACTIVE        | CDIP         | J                  | 14   | 1              | TBD                        | A42                     | N / A for Pkg Type   | -55 to 125   | CD4093BF                | <a href="#">Samples</a> |
| CD4093BF3A       | ACTIVE        | CDIP         | J                  | 14   | 1              | TBD                        | A42                     | N / A for Pkg Type   | -55 to 125   | 7704602CA<br>CD4093BF3A | <a href="#">Samples</a> |
| CD4093BM         | ACTIVE        | SOIC         | D                  | 14   | 50             | Green (RoHS<br>& no Sb/Br) | CU NIPDAU               | Level-1-260C-UNLIM   | -55 to 125   | CD4093BM                | <a href="#">Samples</a> |
| CD4093BM96       | ACTIVE        | SOIC         | D                  | 14   | 2500           | Green (RoHS<br>& no Sb/Br) | CU NIPDAU               | Level-1-260C-UNLIM   | -55 to 125   | CD4093BM                | <a href="#">Samples</a> |
| CD4093BM96E4     | ACTIVE        | SOIC         | D                  | 14   | 2500           | Green (RoHS<br>& no Sb/Br) | CU NIPDAU               | Level-1-260C-UNLIM   | -55 to 125   | CD4093BM                | <a href="#">Samples</a> |
| CD4093BM96G4     | ACTIVE        | SOIC         | D                  | 14   | 2500           | Green (RoHS<br>& no Sb/Br) | CU NIPDAU               | Level-1-260C-UNLIM   | -55 to 125   | CD4093BM                | <a href="#">Samples</a> |
| CD4093BMG4       | ACTIVE        | SOIC         | D                  | 14   | 50             | Green (RoHS<br>& no Sb/Br) | CU NIPDAU               | Level-1-260C-UNLIM   | -55 to 125   | CD4093BM                | <a href="#">Samples</a> |
| CD4093BMT        | ACTIVE        | SOIC         | D                  | 14   | 250            | Green (RoHS<br>& no Sb/Br) | CU NIPDAU               | Level-1-260C-UNLIM   | -55 to 125   | CD4093BM                | <a href="#">Samples</a> |
| CD4093BNSR       | ACTIVE        | SO           | NS                 | 14   | 2000           | Green (RoHS<br>& no Sb/Br) | CU NIPDAU               | Level-1-260C-UNLIM   | -55 to 125   | CD4093B                 | <a href="#">Samples</a> |
| CD4093BNSRG4     | ACTIVE        | SO           | NS                 | 14   | 2000           | Green (RoHS<br>& no Sb/Br) | CU NIPDAU               | Level-1-260C-UNLIM   | -55 to 125   | CD4093B                 | <a href="#">Samples</a> |
| CD4093BPW        | ACTIVE        | TSSOP        | PW                 | 14   | 90             | Green (RoHS<br>& no Sb/Br) | CU NIPDAU               | Level-1-260C-UNLIM   | -55 to 125   | CM093B                  | <a href="#">Samples</a> |
| CD4093BPWG4      | ACTIVE        | TSSOP        | PW                 | 14   | 90             | Green (RoHS<br>& no Sb/Br) | CU NIPDAU               | Level-1-260C-UNLIM   | -55 to 125   | CM093B                  | <a href="#">Samples</a> |
| CD4093BPWR       | ACTIVE        | TSSOP        | PW                 | 14   | 2000           | Green (RoHS<br>& no Sb/Br) | CU NIPDAU               | Level-1-260C-UNLIM   | -55 to 125   | CM093B                  | <a href="#">Samples</a> |

| Orderable Device | Status<br>(1) | Package Type | Package<br>Drawing | Pins | Package<br>Qty | Eco Plan<br>(2)            | Lead/Ball Finish<br>(6) | MSL Peak Temp<br>(3) | Op Temp (°C) | Device Marking<br>(4/5) | Samples                 |
|------------------|---------------|--------------|--------------------|------|----------------|----------------------------|-------------------------|----------------------|--------------|-------------------------|-------------------------|
| CD4093BPWRG4     | ACTIVE        | TSSOP        | PW                 | 14   | 2000           | Green (RoHS<br>& no Sb/Br) | CU NIPDAU               | Level-1-260C-UNLIM   | -55 to 125   | CM093B                  | <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) Eco Plan - The planned eco-friendly classification: Pb-Free (RoHS), Pb-Free (RoHS Exempt), or Green (RoHS & no Sb/Br) - please check <http://www.ti.com/productcontent> for the latest availability information and additional product content details.

**TBD:** The Pb-Free/Green conversion plan has not been defined.

**Pb-Free (RoHS):** TI's terms "Lead-Free" or "Pb-Free" mean semiconductor products that are compatible with the current RoHS requirements for all 6 substances, including the requirement that lead not exceed 0.1% by weight in homogeneous materials. Where designed to be soldered at high temperatures, TI Pb-Free products are suitable for use in specified lead-free processes.

**Pb-Free (RoHS Exempt):** This component has a RoHS exemption for either 1) lead-based flip-chip solder bumps used between the die and package, or 2) lead-based die adhesive used between the die and leadframe. The component is otherwise considered Pb-Free (RoHS compatible) as defined above.

**Green (RoHS & no Sb/Br):** TI defines "Green" to mean Pb-Free (RoHS compatible), and free of Bromine (Br) and Antimony (Sb) based flame retardants (Br or Sb do not exceed 0.1% by weight in homogeneous material)

(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 CD4093B, CD4093B-MIL :**

- Catalog: [CD4093B](#)
- Automotive: [CD4093B-Q1](#), [CD4093B-Q1](#)
- Military: [CD4093B-MIL](#)

NOTE: Qualified Version Definitions:

- Catalog - TI's standard catalog product
- Automotive - Q100 devices qualified for high-reliability automotive applications targeting zero defects
- Military - QML certified for Military and Defense Applications

**TAPE AND REEL INFORMATION**
**REEL DIMENSIONS**

**TAPE DIMENSIONS**


|    |                                                           |
|----|-----------------------------------------------------------|
| A0 | Dimension designed to accommodate the component width     |
| B0 | Dimension designed to accommodate the component length    |
| K0 | Dimension designed to accommodate the component thickness |
| W  | Overall width of the carrier tape                         |
| P1 | Pitch between successive cavity centers                   |

**TAPE AND REEL INFORMATION**

\*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 |
|------------|--------------|-----------------|------|------|--------------------|--------------------|---------|---------|---------|---------|--------|---------------|
| CD4093BM96 | SOIC         | D               | 14   | 2500 | 330.0              | 16.4               | 6.5     | 9.0     | 2.1     | 8.0     | 16.0   | Q1            |
| CD4093BMT  | SOIC         | D               | 14   | 250  | 330.0              | 16.4               | 6.5     | 9.0     | 2.1     | 8.0     | 16.0   | Q1            |
| CD4093BNSR | SO           | NS              | 14   | 2000 | 330.0              | 16.4               | 8.2     | 10.5    | 2.5     | 12.0    | 16.0   | Q1            |
| CD4093BPWR | 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) |
|------------|--------------|-----------------|------|------|-------------|------------|-------------|
| CD4093BM96 | SOIC         | D               | 14   | 2500 | 367.0       | 367.0      | 38.0        |
| CD4093BMT  | SOIC         | D               | 14   | 250  | 367.0       | 367.0      | 38.0        |
| CD4093BNSR | SO           | NS              | 14   | 2000 | 367.0       | 367.0      | 38.0        |
| CD4093BPWR | TSSOP        | PW              | 14   | 2000 | 367.0       | 367.0      | 35.0        |

J (R-GDIP-T\*\*)

14 LEADS SHOWN

# CERAMIC DUAL IN-LINE PACKAGE



| PINS **<br>DIM | 14                     | 16                     | 18                     | 20                     |
|----------------|------------------------|------------------------|------------------------|------------------------|
| A              | 0.300<br>(7,62)<br>BSC | 0.300<br>(7,62)<br>BSC | 0.300<br>(7,62)<br>BSC | 0.300<br>(7,62)<br>BSC |
| B MAX          | 0.785<br>(19,94)       | .840<br>(21,34)        | 0.960<br>(24,38)       | 1.060<br>(26,92)       |
| B MIN          | —                      | —                      | —                      | —                      |
| C MAX          | 0.300<br>(7,62)        | 0.300<br>(7,62)        | 0.310<br>(7,87)        | 0.300<br>(7,62)        |
| C MIN          | 0.245<br>(6,22)        | 0.245<br>(6,22)        | 0.220<br>(5,59)        | 0.245<br>(6,22)        |



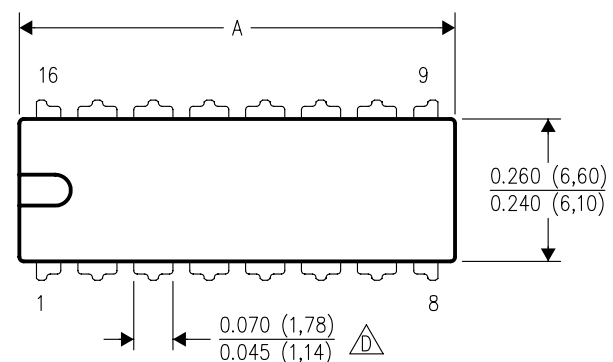
4040083/F 03/03

- NOTES:
- A. All linear dimensions are in inches (millimeters).
  - B. This drawing is subject to change without notice.
  - C. This package is hermetically sealed with a ceramic lid using glass frit.
  - D. Index point is provided on cap for terminal identification only on press ceramic glass frit seal only.
  - E. Falls within MIL STD 1835 GDIP1-T14, GDIP1-T16, GDIP1-T18 and GDIP1-T20.

N (R-PDIP-T\*\*)

16 PINS SHOWN

## PLASTIC DUAL-IN-LINE PACKAGE



| PINS **<br>DIM      | 14               | 16               | 18               | 20               |
|---------------------|------------------|------------------|------------------|------------------|
| A MAX               | 0.775<br>(19,69) | 0.775<br>(19,69) | 0.920<br>(23,37) | 1.060<br>(26,92) |
| A MIN               | 0.745<br>(18,92) | 0.745<br>(18,92) | 0.850<br>(21,59) | 0.940<br>(23,88) |
| MS-001<br>VARIATION | AA               | BB               | AC               | AD               |



4040049/E 12/2002

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.

D (R-PDSO-G14)

PLASTIC SMALL OUTLINE



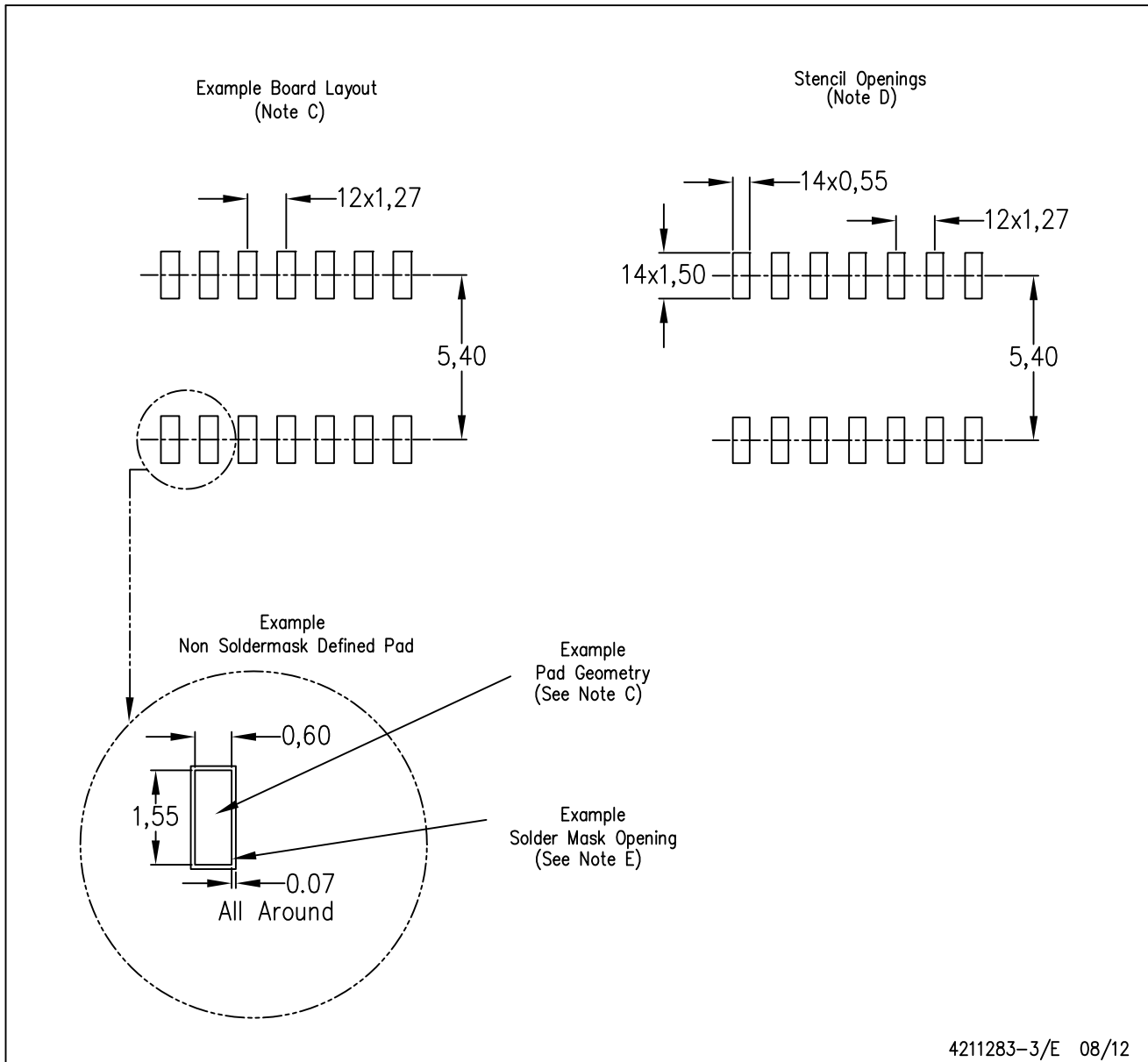
4040047-5/M 06/11

NOTES:

- A. All linear dimensions are in inches (millimeters).
- 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 0.006 (0,15) each side.
- 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)

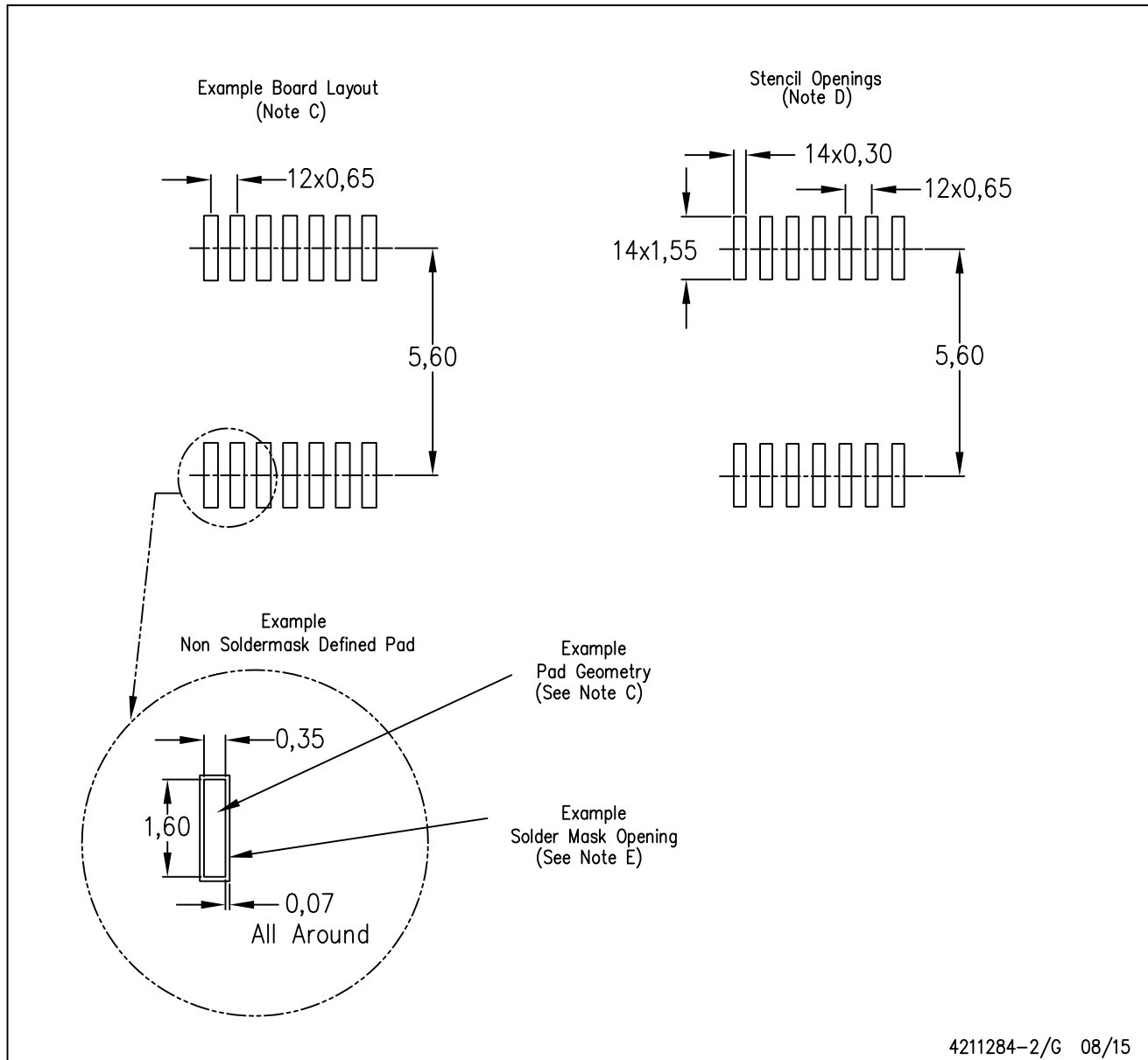
PLASTIC SMALL OUTLINE



- NOTES:
- 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



- 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.

# 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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|                               |                                                                                          |
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