

## CMOS 8-Stage Presettable Synchronous Down Counters

High-Voltage Types (20-Volt Rating)

CD40102B – 2-Decade BCD Type  
CD40103B – 8-Bit Binary Type

■ CD40102B, and CD40103B consist of an 8-stage synchronous down counter with a single output which is active when the internal count is zero. The CD40102B is configured as two cascaded 4-bit BCD counters, and the CD40103B contains a single 8-bit binary counter. Each type has control inputs for enabling or disabling the clock, for clearing the counter to its maximum count, and for presetting the counter either synchronously or asynchronously. All control inputs and the CARRY-OUT/ZERO-DETECT output are active-low logic.

In normal operation, the counter is decremented by one count on each positive transition of the CLOCK. Counting is inhibited when the CARRY-IN/COUNTER ENABLE (CI/CE) input is high. The CARRY-OUT/ZERO-DETECT (CO/ZD) output goes low when the count reaches zero if the CI/CE input is low, and remains low for one full clock period.

When the SYNCHRONOUS PRESET-ENABLE (SPE) input is low, data at the JAM input is clocked into the counter on the next positive clock transition regardless of the state of the CI/CE input. When the ASYNCHRONOUS PRESET-ENABLE (APE) input is low, data at the JAM inputs is asynchronously forced into the counter regardless of the state of the SPE, CI/CE, or CLOCK inputs. JAM inputs J0-J7 represent two 4-bit BCD words for the CD40102B and a single 8-bit binary word for the CD40103B. When the CLEAR (CLR) input is low, the counter is asynchronously cleared to its maximum count (99<sub>10</sub> for the CD40102B and 255<sub>10</sub> for the CD40103B) regardless of the state of any other input. The precedence relationship between control inputs is indicated in the truth table.

If all control inputs except CI/CE are high at the time of zero count, the counters will jump to the maximum count, giving a counting sequence of 100 or 256 clock pulses long.

This causes the CO/ZD output to go low to enable the clock on each succeeding clock pulse.

The CD40102B and CD40103B may be cascaded using the CI/CE input and the CO/ZD output, in either a synchronous or ripple mode as shown in Figs.21 and 22.

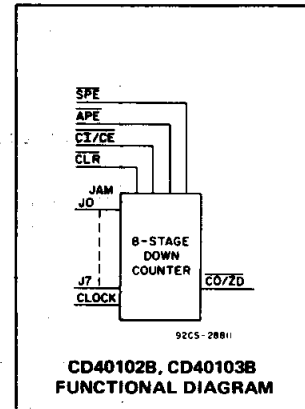
The CD40102B and CD40103B types are supplied in 16-lead dual-in-line plastic packages (E suffix), 16-lead small-outline packages (NSR suffix), and 16-lead thin shrink small-outline packages (PW and PWR suffixes). The CD40103B types also are supplied in 16-lead hermetic dual-in-line ceramic packages (F3A suffix).

### Features:

- Synchronous or asynchronous preset
- Medium-speed operation:  $f_{CL} = 3.6 \text{ MHz (typ.) @ } V_{DD} = 10 \text{ V}$
- Cascadable
- 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
- Noise margin (full package-temperature range) =  $1 \text{ V at } V_{DD} = 5 \text{ V}$   
 $2 \text{ V at } V_{DD} = 10 \text{ V}$   
 $2.5 \text{ V at } V_{DD} = 15 \text{ V}$
- Standardized, symmetrical output characteristics
- 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:

- Divide-by-"N" counters
- Programmable timers
- Interrupt timers
- Cycle/program counter



**RECOMMENDED OPERATING CONDITIONS AT  $T_A = 25^\circ\text{C}$ , Unless Otherwise Specified**  
For maximum reliability, nominal operating conditions should be selected so that operation is always within the following ranges.

| Characteristic                                                           | $V_{DD}$ | LIMITS |      | Units         |
|--------------------------------------------------------------------------|----------|--------|------|---------------|
|                                                                          |          | Min.   | Max. |               |
| Supply Voltage Range (At $T_A = \text{Full Package-Temperature Range}$ ) |          | 3      | 18   | V             |
| Clock Pulse Width, $t_W$                                                 | 5        | 300    | —    | ns            |
|                                                                          | 10       | 180    | —    |               |
|                                                                          | 15       | 80     | —    |               |
| Clear Pulse Width, $t_W$                                                 | 5        | 320    | —    | ns            |
|                                                                          | 10       | 160    | —    |               |
|                                                                          | 15       | 100    | —    |               |
| APE Pulse Width, $t_W$                                                   | 5        | 360    | —    | ns            |
|                                                                          | 10       | 160    | —    |               |
|                                                                          | 15       | 120    | —    |               |
| Clock Input Frequency, $f_{CL}$                                          | 5        | —      | 0.7  | MHz           |
|                                                                          | 10       | —      | 1.8  |               |
|                                                                          | 15       | —      | 2.4  |               |
| Clock Rise and Fall Time, $t_{rCL}, t_{fCL}$                             | 5        | —      | —    | $\mu\text{s}$ |
|                                                                          | 10       | —      | 15   |               |
|                                                                          | 15       | —      | —    |               |
| SPE Setup Time, $t_{SU}$                                                 | 5        | 280    | —    | ns            |
|                                                                          | 10       | 140    | —    |               |
|                                                                          | 15       | 100    | —    |               |
| Jam Setup Time, $t_{SU}$                                                 | 5        | 200    | —    | ns            |
|                                                                          | 10       | 80     | —    |               |
|                                                                          | 15       | 60     | —    |               |
| CI/CE Setup Time, $t_{SU}$                                               | 5        | 500    | —    | ns            |
|                                                                          | 10       | 250    | —    |               |
|                                                                          | 15       | 150    | —    |               |

## CD40102B, CD40103B Types

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

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 .....  $+265^\circ C$

### STATIC ELECTRICAL CHARACTERISTICS

| CHARACTER-<br>ISTIC                             | CONDITIONS |            |            | LIMITS AT INDICATED TEMPERATURES (°C) |       |       |       |       |                   |      | UNITS |
|-------------------------------------------------|------------|------------|------------|---------------------------------------|-------|-------|-------|-------|-------------------|------|-------|
|                                                 | VO<br>(V)  | VIN<br>(V) | VDD<br>(V) |                                       |       |       |       | +25   |                   |      |       |
|                                                 |            |            |            | -55                                   | -40   | +85   | +125  | Min.  | Typ.              | Max. |       |
| Quiescent Device<br>Current,<br>IDD Max.        | —          | 0,5        | 5          | 5                                     | 5     | 150   | 150   | —     | 0.04              | 5    | μA    |
|                                                 | —          | 0,10       | 10         | 10                                    | 10    | 300   | 300   | —     | 0.04              | 10   |       |
|                                                 | —          | 0,15       | 15         | 20                                    | 20    | 600   | 600   | —     | 0.04              | 20   |       |
|                                                 | —          | 0,20       | 20         | 100                                   | 100   | 3000  | 3000  | —     | 0.08              | 100  |       |
| Output Low<br>(Sink) Current<br>IOL 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>IOH 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>VOL 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>VOH 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<br>Voltage,<br>VIL Max.               | 0.5, 4.5   | —          | 5          | 1.5                                   |       |       |       | —     | —                 | 1.5  | V     |
|                                                 | 1, 9       | —          | 10         | 3                                     |       |       |       | —     | —                 | 3    |       |
|                                                 | 1.5, 13.5  | —          | 15         | 4                                     |       |       |       | —     | —                 | 4    |       |
| Input High<br>Voltage,<br>VIH Min.              | 0.5, 4.5   | —          | 5          | 3.5                                   |       |       |       | 3.5   | —                 | —    | V     |
|                                                 | 1, 9       | —          | 10         | 7                                     |       |       |       | 7     | —                 | —    |       |
|                                                 | 1.5, 13.5  | —          | 15         | 11                                    |       |       |       | 11    | —                 | —    |       |
| Input Current<br>IIN Max.                       | —          | 0,18       | 18         | ±0.1                                  | ±0.1  | ±1    | ±1    | —     | ±10 <sup>-5</sup> | ±0.1 | μA    |

Note 1: These parameters and limits also apply to the Synchronous Preset Mode should a Preset condition of JAM Zero on  $J_0$  to  $J_7$  exist.

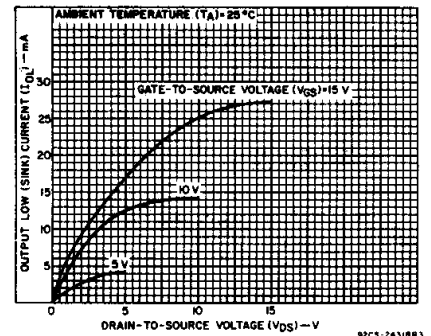


Fig. 1 - Typical output low (sink) current characteristics.

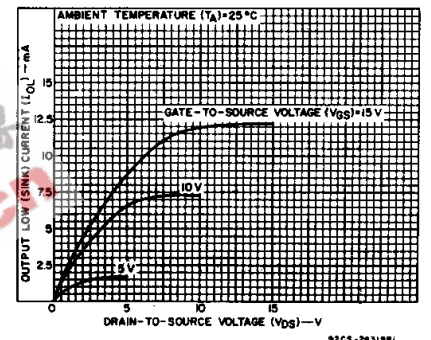


Fig. 2 - Minimum output low (sink) current characteristics.

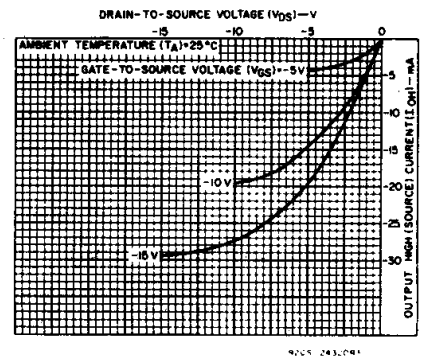


Fig. 3 - Typical output high (source) current characteristics.

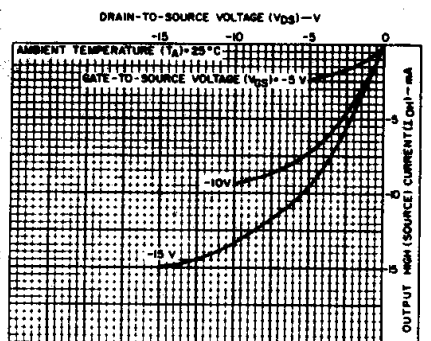


Fig. 4 - Minimum output high (source) current characteristics.

## CD40102B, CD40103B Types

DYNAMIC ELECTRICAL CHARACTERISTICS at  $T_A = 25^\circ\text{C}$ ,  $C_L = 50\text{ pF}$ ,  
Input  $t_r, t_f = 20\text{ ns}$ ,  $R_L = 200\text{ k}\Omega$

| Characteristic                                                   | Conditions<br>$V_{DD}$<br>(V) | Limits<br>All Packages |      |      | Units |
|------------------------------------------------------------------|-------------------------------|------------------------|------|------|-------|
|                                                                  |                               | Min.                   | Typ. | Max. |       |
| Propagation Delay Time ( $t_{PHL}, t_{PLH}$ ):                   |                               |                        |      |      |       |
| Clock-to-Output (See Fig. 6)                                     | 5                             | —                      | 300  | 600  | ns    |
| Note 1                                                           | 10                            | —                      | 130  | 260  |       |
|                                                                  | 15                            | —                      | 95   | 190  |       |
| Carry In/Counter Enable-to-Output                                | 5                             | —                      | 200  | 400  | ns    |
|                                                                  | 10                            | —                      | 90   | 180  |       |
|                                                                  | 15                            | —                      | 65   | 130  |       |
| Asynchronous Preset Enable-to-Output                             | 5                             | —                      | 650  | 1300 | ns    |
| Note 1                                                           | 10                            | —                      | 300  | 600  |       |
|                                                                  | 15                            | —                      | 200  | 400  |       |
| Clear-to-Output                                                  | 5                             | —                      | 375  | 750  | ns    |
|                                                                  | 10                            | —                      | 180  | 360  |       |
|                                                                  | 15                            | —                      | 100  | 200  |       |
| Transition Time ( $t_{THL}, t_{TLH}$ )                           | 5                             | —                      | 100  | 200  | ns    |
|                                                                  | 10                            | —                      | 50   | 100  |       |
|                                                                  | 15                            | —                      | 40   | 80   |       |
| Minimum Clock Pulse Width, ( $t_W$ )                             | 5                             | —                      | 150  | 300  | ns    |
|                                                                  | 10                            | —                      | 90   | 180  |       |
|                                                                  | 15                            | —                      | 40   | 80   |       |
| Minimum CLR Pulse Width ( $t_W$ )                                | 5                             | —                      | 160  | 320  | ns    |
|                                                                  | 10                            | —                      | 80   | 160  |       |
|                                                                  | 15                            | —                      | 50   | 100  |       |
| Minimum APE Pulse Width ( $t_W$ )                                | 5                             | —                      | 180  | 360  | ns    |
|                                                                  | 10                            | —                      | 80   | 160  |       |
|                                                                  | 15                            | —                      | 60   | 120  |       |
| Minimum APE Removal Time ( $t_{RM}$ )                            | 5                             | —                      | 110  | 220  | ns    |
|                                                                  | 10                            | —                      | 50   | 100  |       |
|                                                                  | 15                            | —                      | 35   | 70   |       |
| Minimum SPE Set-Up Time ( $t_{SU}$ )                             | 5                             | —                      | 140  | 280  | ns    |
|                                                                  | 10                            | —                      | 70   | 140  |       |
|                                                                  | 15                            | —                      | 50   | 100  |       |
| Minimum CI/CE Setup Time ( $t_{SU}$ )                            | 5                             | —                      | 250  | 500  | ns    |
|                                                                  | 10                            | —                      | 125  | 250  |       |
|                                                                  | 15                            | —                      | 75   | 150  |       |
| Minimum JAM Set-Up Time ( $t_{SU}$ )<br>(Synchronous presetting) | 5                             | —                      | 100  | 200  | ns    |
|                                                                  | 10                            | —                      | 40   | 80   |       |
|                                                                  | 15                            | —                      | 30   | 60   |       |
| Maximum Clock Input Frequency ( $f_{CL}$ )<br>(See Fig. 7)       | 5                             | 0.7                    | 1.4  | —    | MHz   |
|                                                                  | 10                            | 1.8                    | 3.6  | —    |       |
|                                                                  | 15                            | 2.4                    | 4.8  | —    |       |
| Input Capacitance ( $C_{IN}$ )                                   |                               | —                      | 5    | 7.5  | pF    |

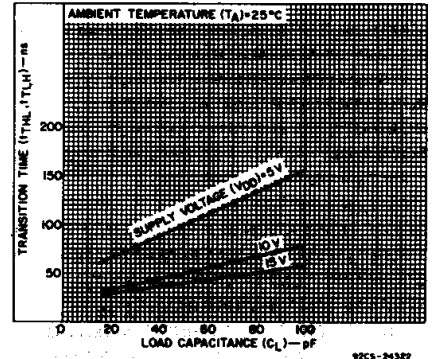


Fig. 5 - Typical transition time as a function of load capacitance.

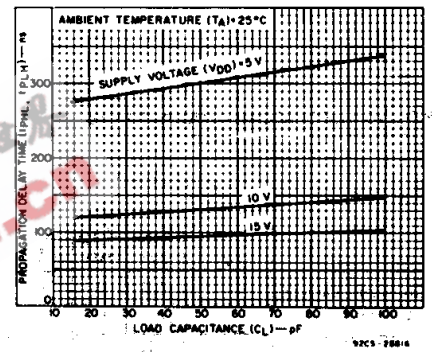


Fig. 6 - Typical propagation delay time as a function of load capacitance (clock to CO/ZD).

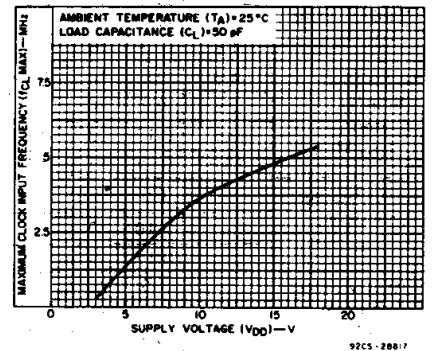


Fig. 7 - Typical maximum clock input frequency as a function of supply voltage.

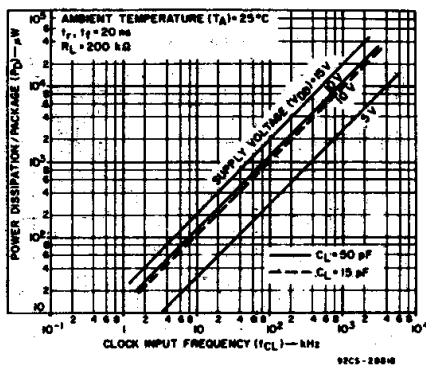


Fig. 8 - Typical dynamic power dissipation as a function of frequency.

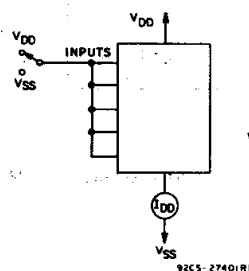


Fig. 9 - Quiescent device current test circuit.

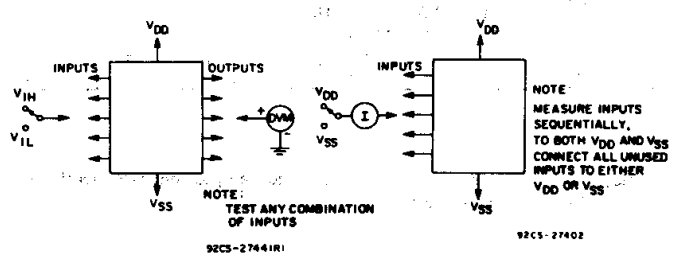


Fig. 10 - Input voltage test circuit.

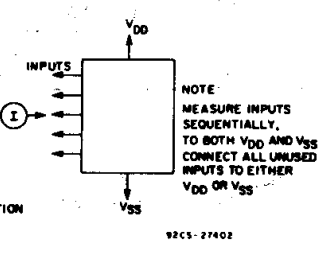


Fig. 11 - Input current test circuit.

## CD40102B, CD40103B Types

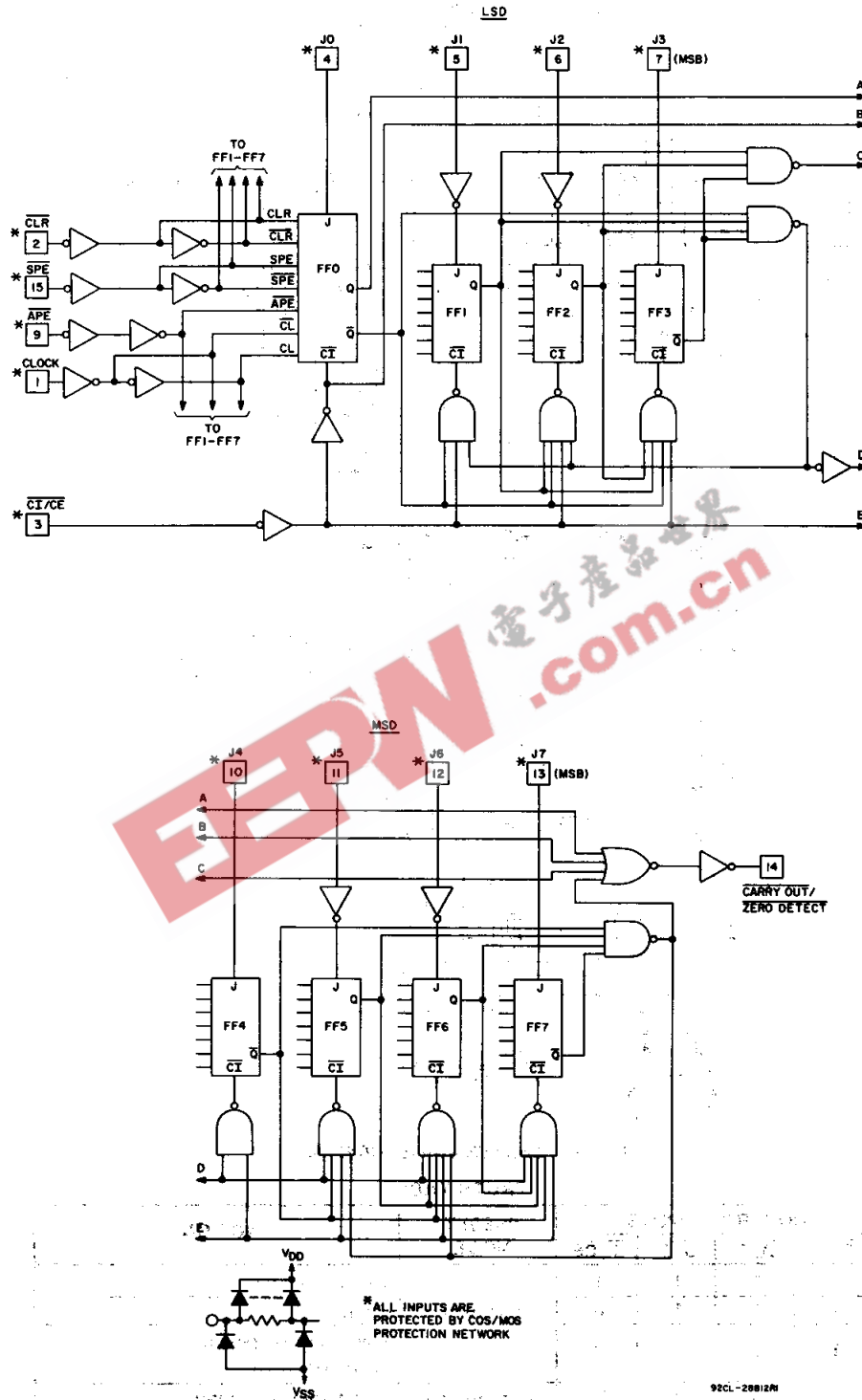


Fig. 12 — Logic diagram for CD40102B.

## CD40102B, CD40103B Types

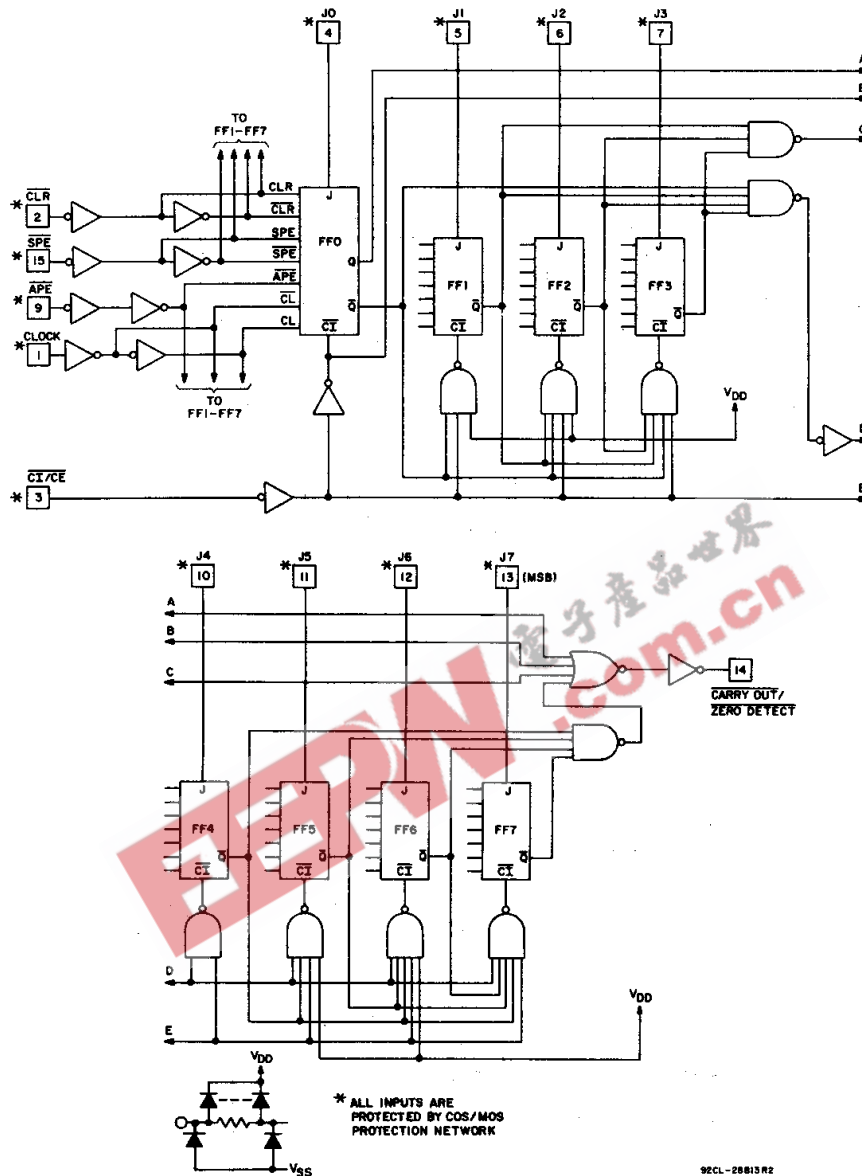


Fig. 13 — Logic diagram for CD40103B.

### TRUTH TABLE

| CONTROL INPUTS |     |     |       | PRESET MODE  | ACTION                                   |
|----------------|-----|-----|-------|--------------|------------------------------------------|
| CLR            | APE | SPE | CI/CE |              |                                          |
| 1              | 1   | 1   | 1     | Synchronous  | Inhibit counter                          |
| 1              | 1   | 1   | 0     |              | Count down*                              |
| 1              | 1   | 0   | X     |              | Preset on next positive clock transition |
| 1              | 0   | X   | X     | Asynchronous | Preset asynchronously                    |
| 0              | X   | X   | X     |              | Clear to maximum count                   |

Notes: 1. 0 = Low level  
1 = High level  
X = Don't care

2. Clock connected to clock input
3. Synchronous operation: changes occur on negative-to-positive clock transitions
4. JAM inputs: CD40102B BCD; MSD = J7, J6, J5, J4 (J7 is MSB)  
LSD = J3, J2, J1, J0 (J3 is MSB)  
CD40103B Binary; MSB = J7, LSB = J0

\*At zero count, the counters will jump to the maximum count on the next clock transition to "High."

## CD40102B, CD40103B Types

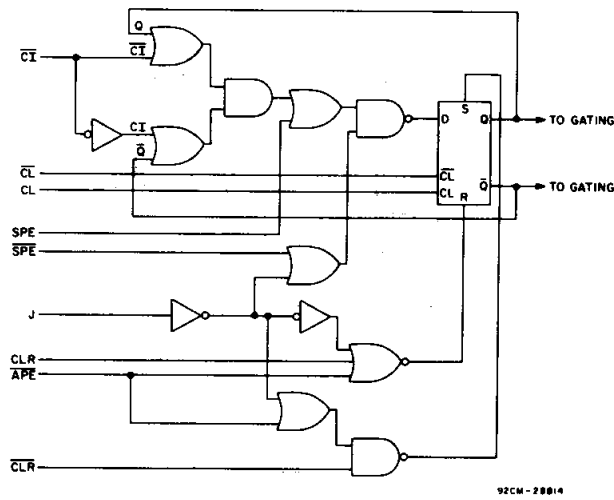


Fig. 14 - Detail logic diagram for flip-flops, FFO - FF7, used in logic diagrams for CD40102B and CD40103B.

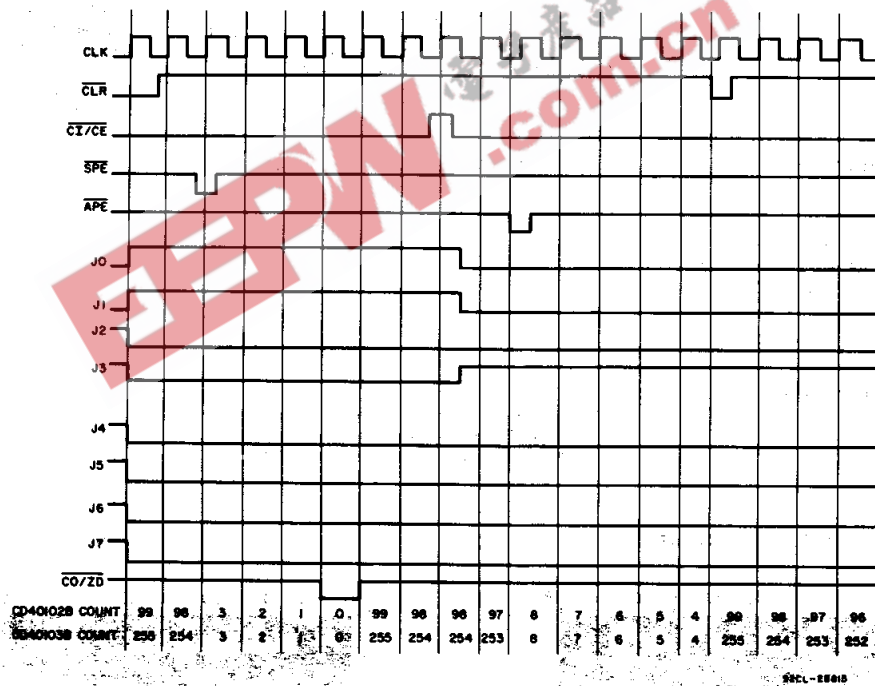
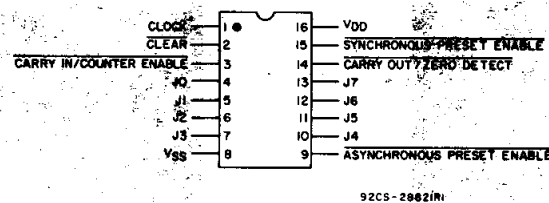


Fig. 15 - Timing diagram for CD40102B and CD40103B.



CD40102B,  
CD40103B  
TERMINAL ASSIGNMENT

## CD40102B, CD40103B Types

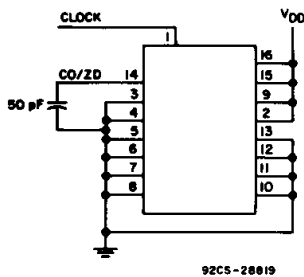


Fig. 16 - Maximum clock frequency test circuit.

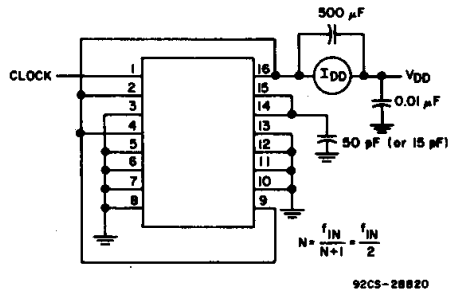


Fig. 17 - Dynamic power dissipation test circuit ( $\div 2$  mode).

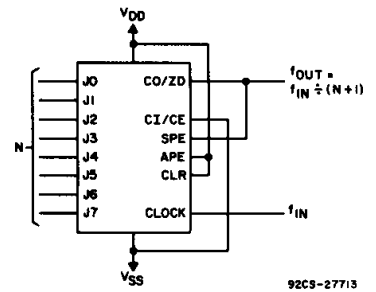


Fig. 18 - Divide-by-'N' counter.

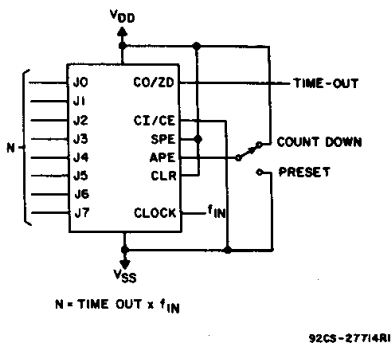


Fig. 19 - Programmable timer.

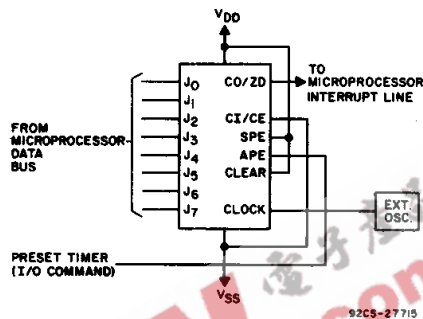


Fig. 20 - Microprocessor interrupt timer.

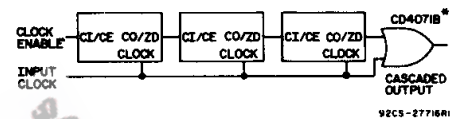


Fig. 21 - Synchronous cascading.

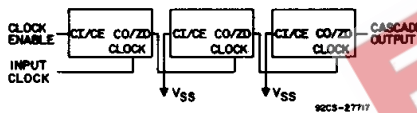
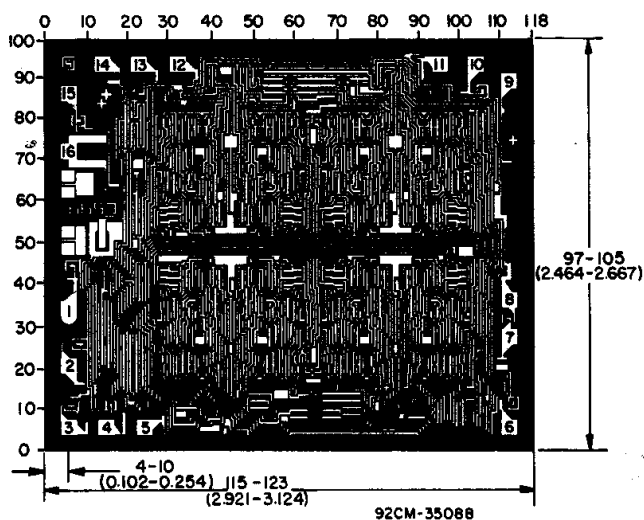


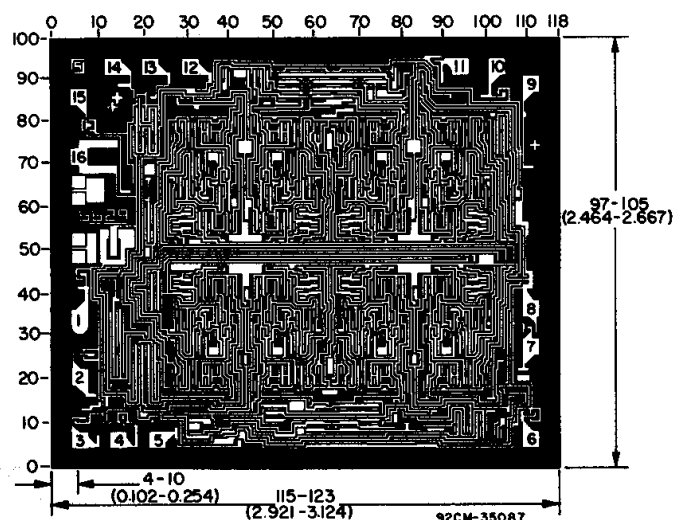
Fig. 22 - Ripple cascading.

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

Dimensions and pad layout for CD40102B.



Dimensions and pad layout for CD40103B.



**PACKAGING INFORMATION**

| Orderable Device | Status <sup>(1)</sup> | Package Type | Package Drawing | Pins | Package Qty | Eco Plan <sup>(2)</sup> | Lead/Ball Finish | MSL Peak Temp <sup>(3)</sup> |
|------------------|-----------------------|--------------|-----------------|------|-------------|-------------------------|------------------|------------------------------|
| CD40102BE        | ACTIVE                | PDIP         | N               | 16   | 25          | Pb-Free (RoHS)          | CU NIPDAU        | Level-NC-NC-NC               |
| CD40102BNSR      | ACTIVE                | SO           | NS              | 16   | 2000        | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| CD40102BNSRE4    | ACTIVE                | SO           | NS              | 16   | 2000        | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| CD40102BPW       | ACTIVE                | TSSOP        | PW              | 16   | 90          | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| CD40102BPWE4     | ACTIVE                | TSSOP        | PW              | 16   | 90          | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| CD40102BPWR      | ACTIVE                | TSSOP        | PW              | 16   | 2000        | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| CD40102BPWRE4    | ACTIVE                | TSSOP        | PW              | 16   | 2000        | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| CD40103BE        | ACTIVE                | PDIP         | N               | 16   | 25          | Pb-Free (RoHS)          | CU NIPDAU        | Level-NC-NC-NC               |
| CD40103BF        | ACTIVE                | CDIP         | J               | 16   | 1           | TBD                     | Call TI          | Level-NC-NC-NC               |
| CD40103BF3A      | ACTIVE                | CDIP         | J               | 16   | 1           | TBD                     | Call TI          | Level-NC-NC-NC               |
| CD40103BNSR      | ACTIVE                | SO           | NS              | 16   | 2000        | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| CD40103BNSRE4    | ACTIVE                | SO           | NS              | 16   | 2000        | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| CD40103BPW       | ACTIVE                | TSSOP        | PW              | 16   | 90          | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| CD40103BPWE4     | ACTIVE                | TSSOP        | PW              | 16   | 90          | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| CD40103BPWR      | ACTIVE                | TSSOP        | PW              | 16   | 2000        | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| CD40103BPWRE4    | ACTIVE                | TSSOP        | PW              | 16   | 2000        | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |

<sup>(1)</sup> 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.

**OBSOLETE:** TI has discontinued the production of the device.

<sup>(2)</sup> Eco Plan - The planned eco-friendly classification: Pb-Free (RoHS) 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.

**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)

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

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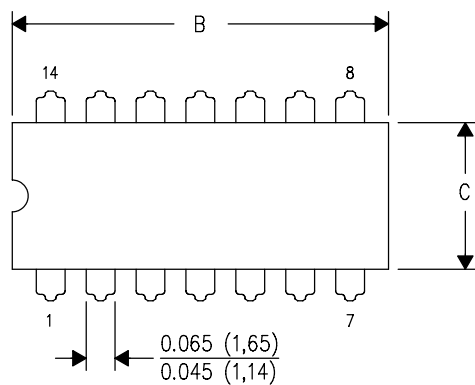
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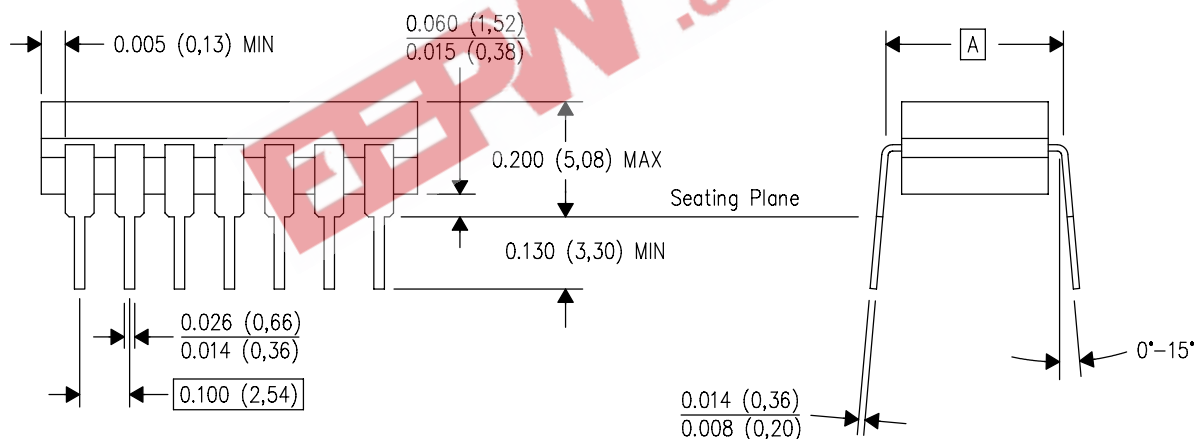
J (R—GDIP—T\*\*) (R—GDIP—T\*\*)

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

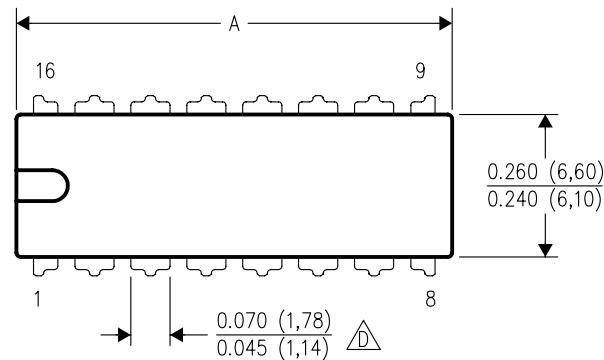
- NOTES:
- All linear dimensions are in inches (millimeters).
  - This drawing is subject to change without notice.
  - This package is hermetically sealed with a ceramic lid using glass frit.
  - Index point is provided on cap for terminal identification only on press ceramic glass frit seal only.
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

# MECHANICAL DATA

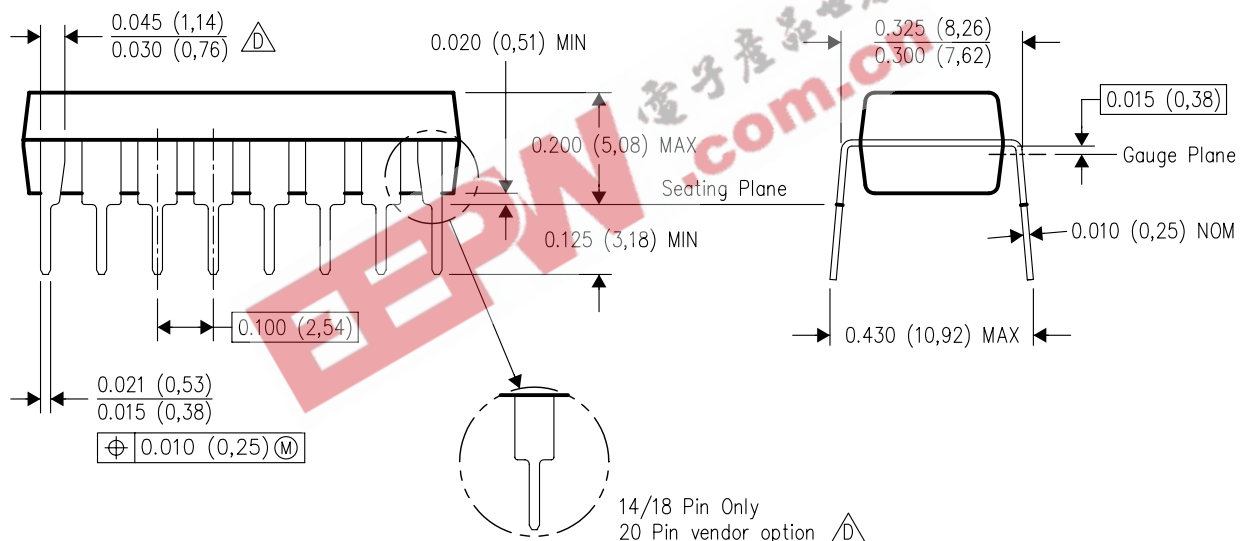
## N (R-PDIP-T\*\*)

16 PINS SHOWN

## PLASTIC DUAL-IN-LINE PACKAGE



| PINS **             | 14               | 16               | 18               | 20               |
|---------------------|------------------|------------------|------------------|------------------|
| DIM                 |                  |                  |                  |                  |
| 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

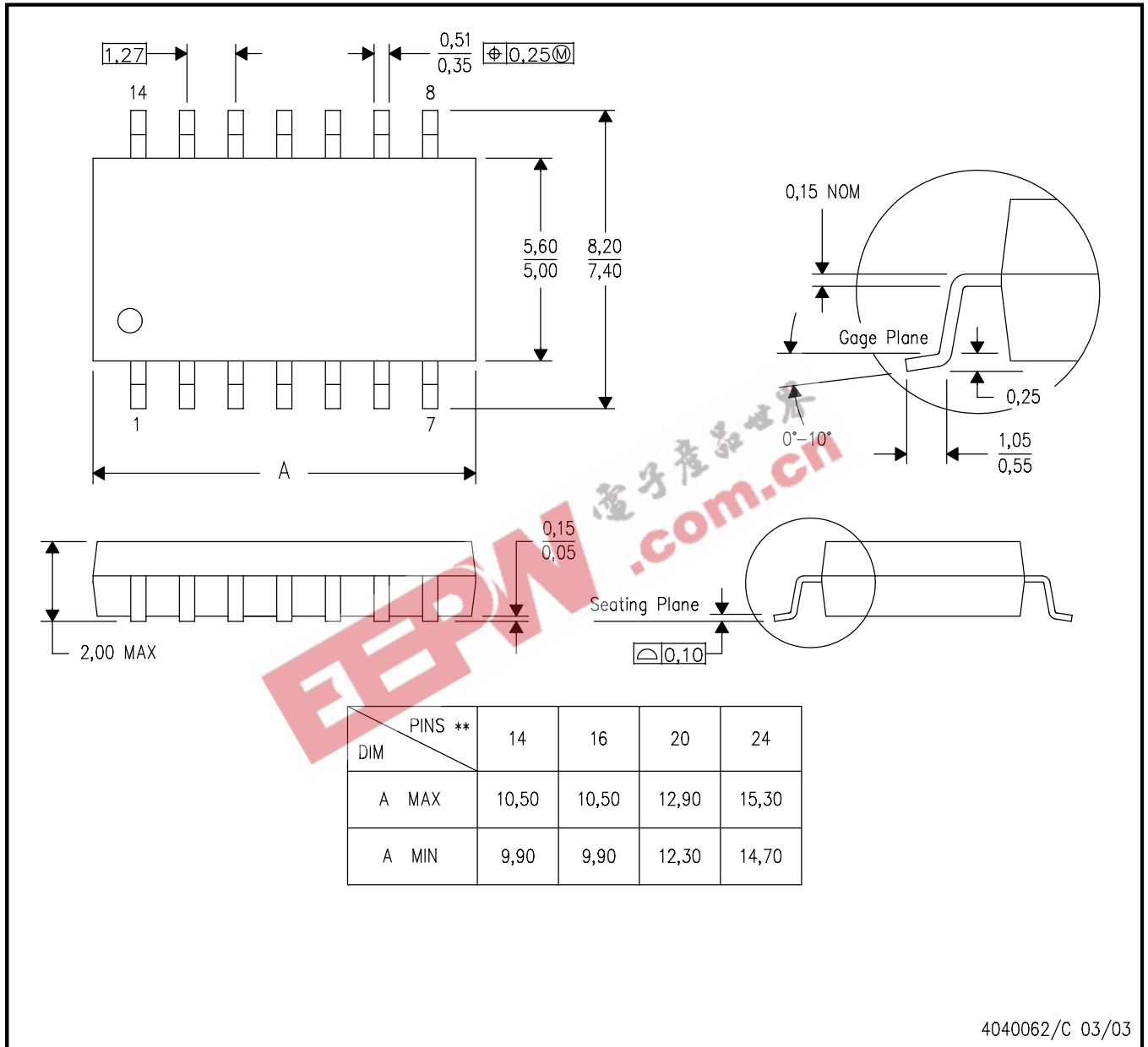
- NOTES:
- A. All linear dimensions are in inches (millimeters).
  - B. This drawing is subject to change without notice.
  - Falls within JEDEC MS-001, except 18 and 20 pin minimum body length (Dim A).
  - The 20 pin end lead shoulder width is a vendor option, either half or full width.

## MECHANICAL DATA

NS (R-PDSO-G\*\*)

PLASTIC SMALL-OUTLINE PACKAGE

14-PINS SHOWN



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

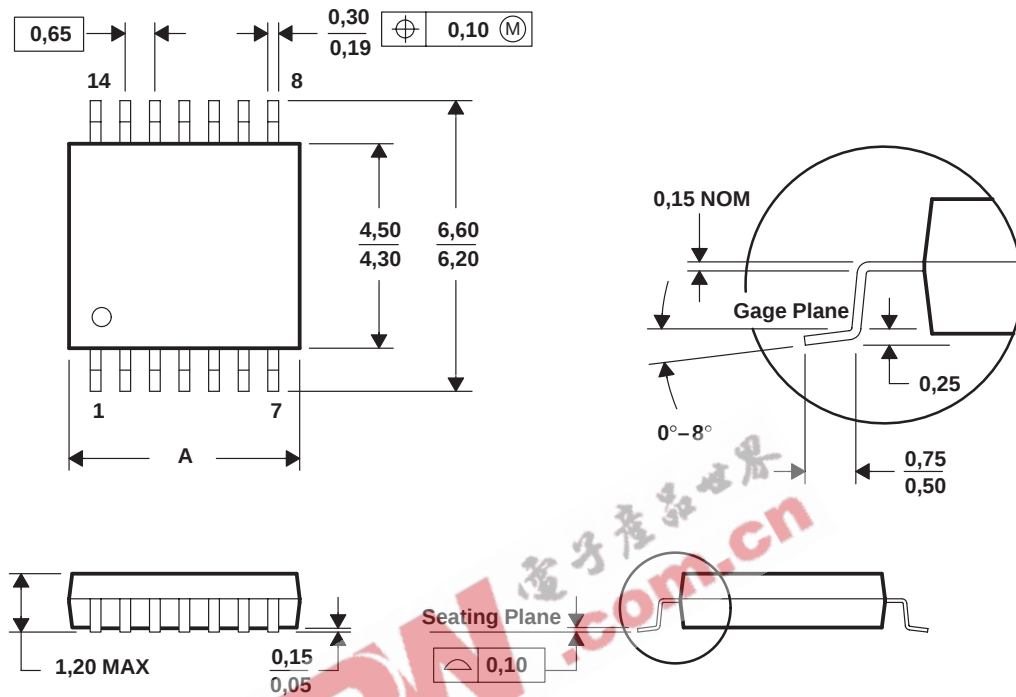
# MECHANICAL DATA

MTSS001C – JANUARY 1995 – REVISED FEBRUARY 1999

PW (R-PDSO-G\*\*)

PLASTIC SMALL-OUTLINE PACKAGE

14 PINS SHOWN



|       | PINS ** | 8    | 14   | 16   | 20   | 24   | 28   |
|-------|---------|------|------|------|------|------|------|
| DIM   |         |      |      |      |      |      |      |
| A MAX |         | 3,10 | 5,10 | 5,10 | 6,60 | 7,90 | 9,80 |
| A MIN |         | 2,90 | 4,90 | 4,90 | 6,40 | 7,70 | 9,60 |

4040064/F 01/97

- 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.  
 D. Falls within JEDEC MO-153

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Mailing Address: Texas Instruments  
Post Office Box 655303 Dallas, Texas 75265