

T-43-21

CD4000UB, CD4001UB, CD4002UB, CD4025UB Types

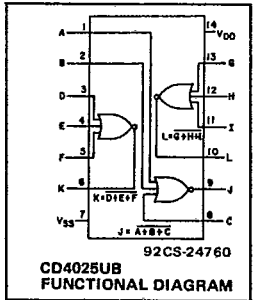
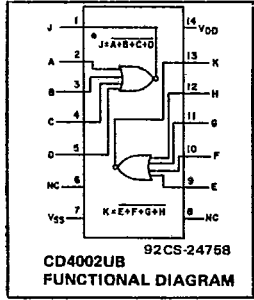
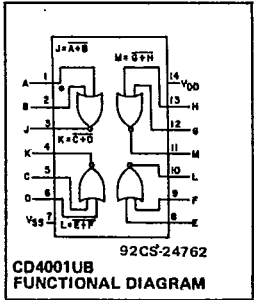
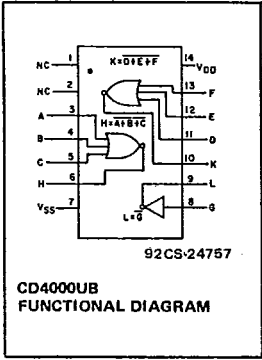
CMOS NOR Gates

High-Voltage Types (20-Volt Rating)  
Dual 3 Input  
plus Inverter—CD4000UB  
Quad 2 Input—CD4001UB  
Dual 4 Input—CD4002UB  
Triple 3 Input—CD4025UB

RCA-CD4000UB, CD4001UB, CD4002UB, and CD4025UB NOR gates provide the system designer with direct implementation of the NOR function and supplement the existing family of CMOS gates.

The CD4000UB, CD4001UB, CD4002UB, and CD4025UB types are supplied in 14-lead hermetic dual-in-line ceramic packages (D and F suffixes), 14-lead dual-in-line plastic packages (E suffix), 14-lead ceramic flat packages (K suffix), and in chip form (H suffix).

- Features:
- Propagation delay time = 30 ns (typ.) at  $C_L = 50$  pF,  $V_{DD} = 10$  V
  - Standardized symmetrical output characteristics
  - 100% tested for maximum quiescent current at 20 V
  - Meets all requirements of JEDEC Tentative Standard No. 13A, "Standard Specifications for Description of 'B' Series CMOS Devices"
  - Maximum input current of 1  $\mu$ 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



STATIC ELECTRICAL CHARACTERISTICS

| CHARACTER-<br>ISTIC                                         | CONDITIONS            |                        |                        | LIMITS AT INDICATED TEMPERATURES (°C)                                                               |       |       |       |       |                   |      | UNITS |
|-------------------------------------------------------------|-----------------------|------------------------|------------------------|-----------------------------------------------------------------------------------------------------|-------|-------|-------|-------|-------------------|------|-------|
|                                                             |                       |                        |                        | Values at -55, +25, +125 Apply to D, F, K, H Packages<br>Values at -40, +25, +85 Apply to E Package |       |       |       |       |                   |      |       |
|                                                             | 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,<br>I <sub>DD</sub> Max.        | —                     | 0.5                    | 5                      | 0.25                                                                                                | 0.25  | 7.5   | 7.5   | —     | 0.01              | 0.25 | μA    |
|                                                             | —                     | 0.10                   | 10                     | 0.5                                                                                                 | 0.5   | 15    | 15    | —     | 0.01              | 0.5  |       |
|                                                             | —                     | 0.15                   | 15                     | 1                                                                                                   | 1     | 30    | 30    | —     | 0.01              | 1    |       |
|                                                             | —                     | 0.20                   | 20                     | 5                                                                                                   | 5     | 150   | 150   | —     | 0.02              | 5    |       |
| Output Low<br>(Sink) 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 | 15                | —    |       |
| Input Low<br>Voltage,<br>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<br>Voltage,<br>V <sub>IH</sub> Min.              | 0.5                   | —                      | 5                      | 4                                                                                                   |       |       |       | 4     | —                 | —    | V     |
|                                                             | 1                     | —                      | 10                     | 8                                                                                                   |       |       |       | 8     | —                 | —    |       |
|                                                             | 1.5                   | —                      | 15                     | 12.5                                                                                                |       |       |       | 12.5  | —                 | —    |       |
| Input Current<br>I <sub>IN</sub> Max.                       | —                     | 0.18                   | 18                     | ±0.1                                                                                                | ±0.1  | ±1    | ±1    | —     | ±10 <sup>-5</sup> | ±0.1 | μA    |

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CD4000UB, CD4001UB, CD4002UB, CD4025UB Types

RECOMMENDED OPERATING CONDITIONS

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

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

MAXIMUM RATINGS, Absolute-Maximum Values:

|                                                                               |                                                      |
|-------------------------------------------------------------------------------|------------------------------------------------------|
| DC SUPPLY-VOLTAGE RANGE, ( $V_{DD}$ )                                         | -0.5 to +20 V                                        |
| (Voltages referenced to $V_{SS}$ Terminal)                                    |                                                      |
| INPUT VOLTAGE RANGE, ALL INPUTS                                               | -0.5 to $V_{DD} + 0.5$ V                             |
| DC INPUT CURRENT, ANY ONE INPUT                                               | $\pm 10$ mA                                          |
| POWER DISSIPATION PER PACKAGE ( $P_D$ ):                                      |                                                      |
| For $T_A = -40$ to $+60^\circ\text{C}$ (PACKAGE TYPE E)                       | 500 mW                                               |
| For $T_A = +60$ to $+85^\circ\text{C}$ (PACKAGE TYPE E)                       | Derate Linearly at 12 mW/ $^\circ\text{C}$ to 200 mW |
| For $T_A = -55$ to $+100^\circ\text{C}$ (PACKAGE TYPES D, F, K)               | 500 mW                                               |
| For $T_A = +100$ to $+125^\circ\text{C}$ (PACKAGE TYPES D, F, K)              | Derate Linearly at 12 mW/ $^\circ\text{C}$ to 200 mW |
| DEVICE DISSIPATION PER OUTPUT TRANSISTOR                                      |                                                      |
| FOR $T_A$ = FULL PACKAGE-TEMPERATURE RANGE (All Package Types)                | 100 mW                                               |
| OPERATING-TEMPERATURE RANGE ( $T_A$ ):                                        |                                                      |
| PACKAGE TYPES D, F, K, H                                                      | -55 to $+125^\circ\text{C}$                          |
| PACKAGE TYPE E                                                                | -40 to $+85^\circ\text{C}$                           |
| STORAGE TEMPERATURE RANGE ( $T_{stg}$ )                                       | -65 to $+150^\circ\text{C}$                          |
| LEAD TEMPERATURE (DURING SOLDERING):                                          |                                                      |
| At distance 1/16 $\pm$ 1/32 Inch (1.59 $\pm$ 0.79 mm) from case for 10 s max. | $+265^\circ\text{C}$                                 |

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

| CHARACTERISTIC                                                 | TEST CONDITIONS | ALL TYPES LIMITS         |      | UNITS |      |
|----------------------------------------------------------------|-----------------|--------------------------|------|-------|------|
|                                                                |                 | V <sub>DD</sub><br>Volts | TYP. |       | MAX. |
| Propagation Delay Time,<br>t <sub>PHL</sub> , t <sub>PLH</sub> |                 | 5                        | 60   | 120   | ns   |
|                                                                |                 | 10                       | 30   | 60    |      |
|                                                                |                 | 15                       | 25   | 50    |      |
| Transition Time,<br>t <sub>THL</sub> , t <sub>TLH</sub>        |                 | 5                        | 100  | 200   | ns   |
|                                                                |                 | 10                       | 50   | 100   |      |
|                                                                |                 | 15                       | 40   | 80    |      |
| Input Capacitance, C <sub>IN</sub>                             | Any Input       |                          | 10   | 15    | pF   |

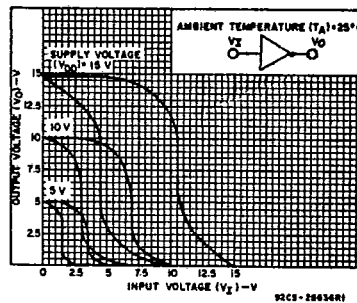


Fig. 1 - Minimum and maximum voltage transfer characteristics.

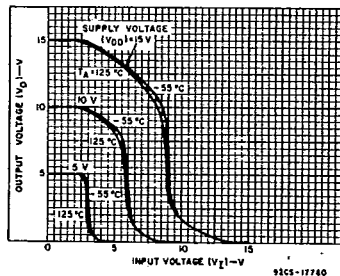


Fig. 2 - Typical voltage transfer characteristics as a function of temperature.

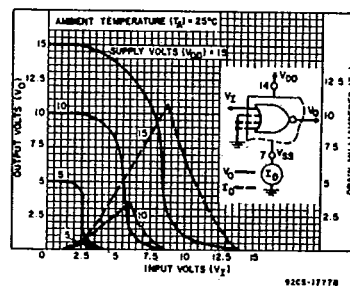


Fig. 3 - Typical current & voltage transfer characteristics.

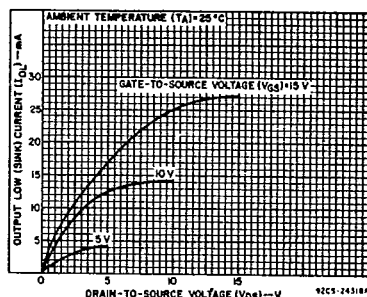


Fig. 5 - Typical output low (sink) current characteristics.

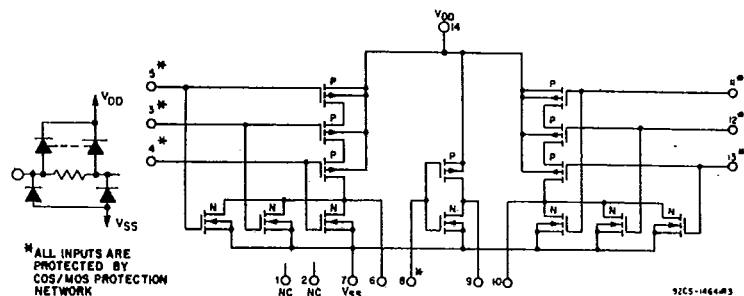


Fig. 4 - Schematic diagram for type CD4000UB.

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CD4000UB, CD4001UB, CD4002UB, CD4025UB Types

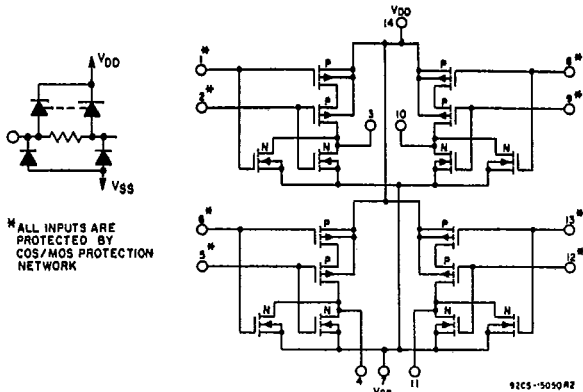


Fig. 6 - Schematic diagram for type CD4001UB.

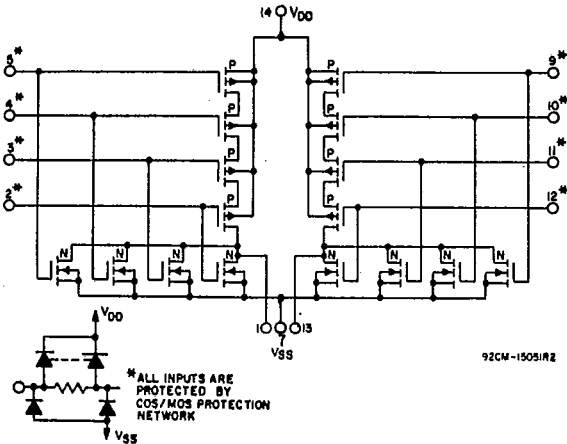


Fig. 7 - Schematic diagram for type CD4002UB.

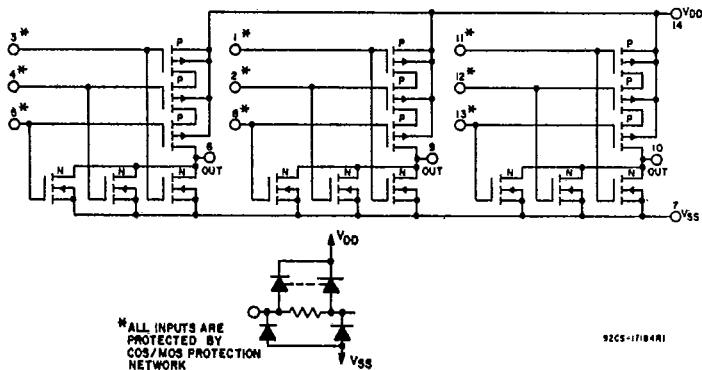


Fig. 8 - Schematic diagram for type CD4025UB.

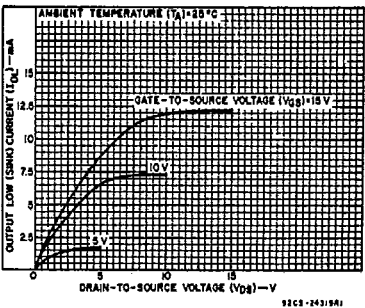


Fig. 9 - Minimum output low (sink) current characteristics.

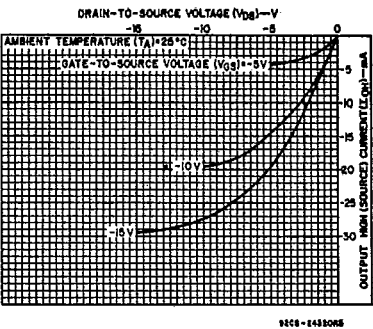


Fig. 10 - Typical output high (source) current characteristics.

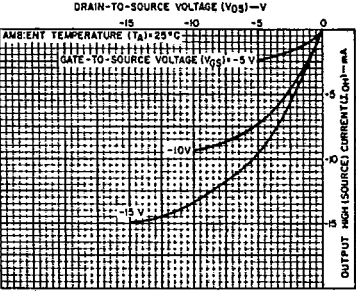


Fig. 11 - Minimum output high (source) current characteristics.

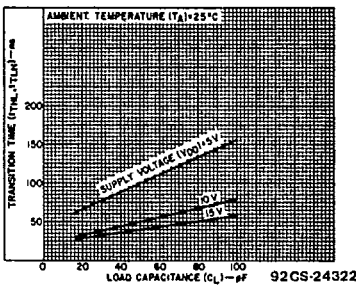


Fig. 12 - Typical transition time vs. load capacitance.

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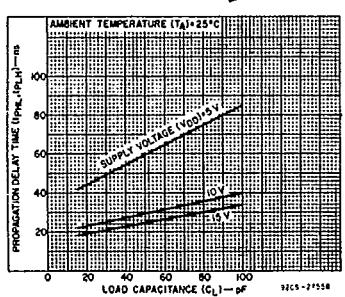


Fig. 13 - Typical propagation delay time vs. load capacitance.

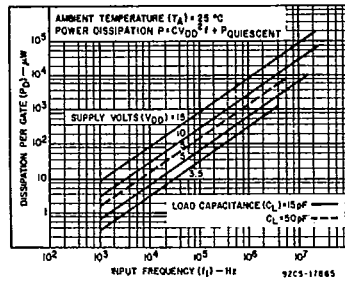


Fig. 14 - Typical power dissipation vs. frequency.

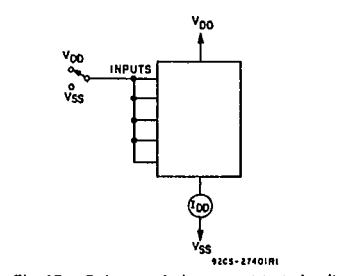


Fig. 15 - Quiescent device current test circuit.

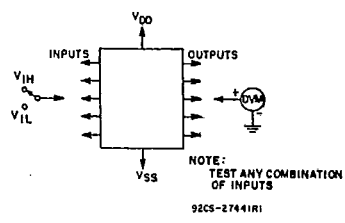


Fig. 16 - Input voltage test circuit.

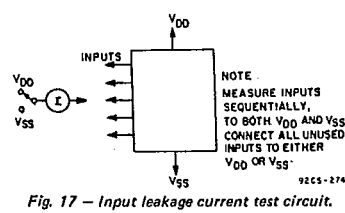
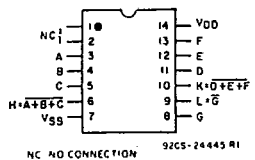
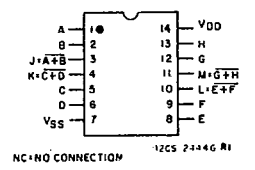


Fig. 17 - Input leakage current test circuit.

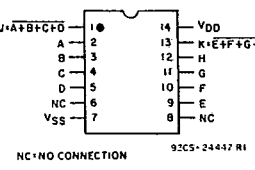
TERMINAL ASSIGNMENTS



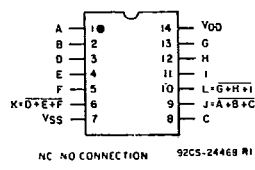
CD4000UB



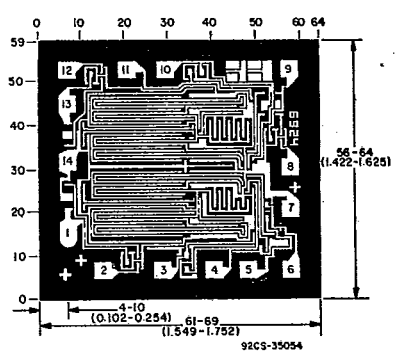
CD4001UB



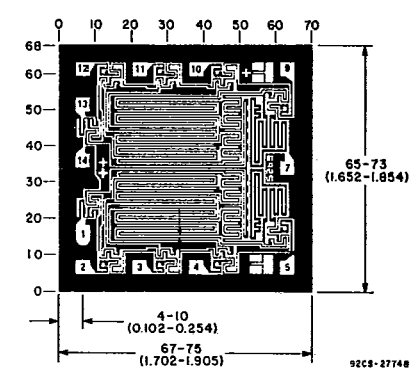
CD4002UB



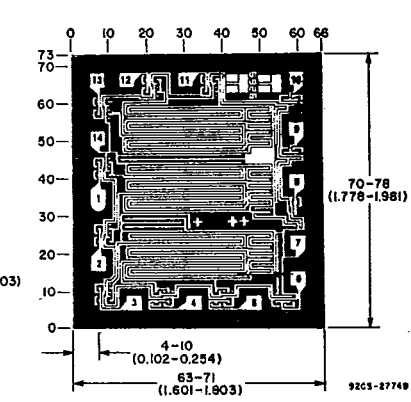
CD4025UB



CD4001UB

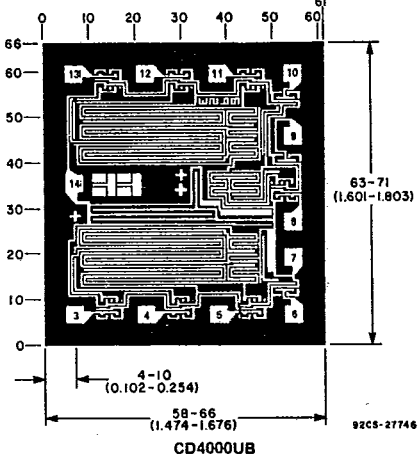


CD4002UB



CD4025UB

CHIP PHOTOGRAPHS  
Dimensions and Pad Layouts



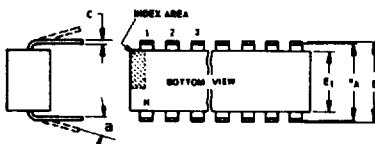
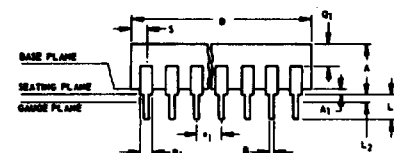
CD4000UB

Dimensions in parentheses are in millimeters and are derived from the basic inch dimensions as indicated. Grid graduations are in mils (10<sup>-3</sup> inch).

The photographs and dimensions of each CMOS chip represent a chip when it is part of the wafer. When the wafer is separated into individual chips, the angle of cleavage may vary with respect to the chip face for different chips. The actual dimensions of the isolated chip, therefore, may differ slightly from the nominal dimensions shown. The user should consider a tolerance of -3 mils to +16 mils applicable to the nominal dimensions shown.

## Dimensional Outlines

### Dual-In-Line Welded-Seal Ceramic Packages



#### NOTES:

Refer to Rules for Dimensioning (JEDEC Publication No. 95) for Axial Lead Product Outlines.

- When this device is supplied solder-dipped, the maximum lead thickness (narrow portion) will not exceed 0.013" (0.33 mm).
- Leads within 0.005" (0.12 mm) radius of True Position (TP) at gauge plane with maximum material condition and unit installed.
- $e_A$  applies in zone L<sub>2</sub> when unit installed.
- $a$  applies to spread leads prior to installation.
- N is the maximum quantity of lead positions.
- N<sub>1</sub> is the quantity of allowable missing leads.

(D) SUFFIX (JEDEC MO-001-AD)  
14-Lead Dual-In-Line Welded-Seal  
Ceramic Package

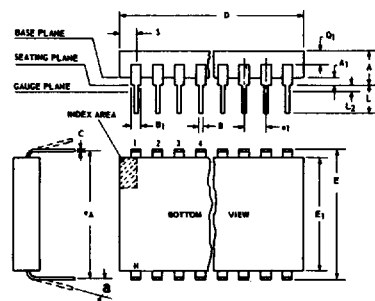
| SYMBOL         | INCHES   |       | NOTE | MILLIMETERS |       |
|----------------|----------|-------|------|-------------|-------|
|                | MIN.     | MAX.  |      | MIN.        | MAX.  |
| A              | 0.120    | 0.160 |      | 3.05        | 4.06  |
| A <sub>1</sub> | 0.020    | 0.065 |      | 0.51        | 1.65  |
| B              | 0.014    | 0.020 |      | 0.356       | 0.508 |
| B <sub>1</sub> | 0.060    | 0.065 |      | 1.27        | 1.65  |
| C              | 0.008    | 0.012 | 1    | 0.204       | 0.304 |
| D              | 0.745    | 0.770 |      | 18.93       | 19.55 |
| E              | 0.300    | 0.325 |      | 7.62        | 8.25  |
| E <sub>1</sub> | 0.240    | 0.260 |      | 6.10        | 6.60  |
| e <sub>1</sub> | 0.100 TP |       | 2    | 2.54 TP     |       |
| e <sub>A</sub> | 0.300 TP |       | 2, 3 | 7.62 TP     |       |
| L              | 0.125    | 0.150 |      | 3.18        | 3.81  |
| L <sub>2</sub> | 0.000    | 0.030 |      | 0.000       | 0.76  |
| a              | 0°       | 15°   | 4    | 0°          | 15°   |
| N              | 14       |       | 5    | 14          |       |
| N <sub>1</sub> | 0        |       | 6    | 0           |       |
| Q <sub>1</sub> | 0.050    | 0.085 |      | 1.27        | 2.15  |
| S              | 0.065    | 0.090 |      | 1.66        | 2.28  |

92SS-4411R2

(D) SUFFIX (JEDEC MO-001-AE)  
16-Lead Dual-In-Line Welded-Seal  
Ceramic Package

| SYMBOL         | INCHES   |       | NOTE | MILLIMETERS |       |
|----------------|----------|-------|------|-------------|-------|
|                | MIN.     | MAX.  |      | MIN.        | MAX.  |
| A              | 0.120    | 0.160 |      | 3.05        | 4.06  |
| A <sub>1</sub> | 0.020    | 0.065 |      | 0.51        | 1.65  |
| B              | 0.014    | 0.020 |      | 0.356       | 0.508 |
| B <sub>1</sub> | 0.035    | 0.065 |      | 0.89        | 1.65  |
| C              | 0.008    | 0.012 | 1    | 0.204       | 0.304 |
| D              | 0.745    | 0.785 |      | 18.93       | 19.93 |
| E              | 0.300    | 0.325 |      | 7.62        | 8.25  |
| E <sub>1</sub> | 0.240    | 0.260 |      | 6.10        | 6.60  |
| e <sub>1</sub> | 0.100 TP |       | 2    | 2.54 TP     |       |
| e <sub>A</sub> | 0.300 TP |       | 2, 3 | 7.62 TP     |       |
| L              | 0.125    | 0.150 |      | 3.18        | 3.81  |
| L <sub>2</sub> | 0.000    | 0.030 |      | 0.000       | 0.76  |
| a              | 0°       | 15°   | 4    | 0°          | 15°   |
| N              | 16       |       | 5    | 16          |       |
| N <sub>1</sub> | 0        |       | 6    | 0           |       |
| Q <sub>1</sub> | 0.050    | 0.085 |      | 1.27        | 2.15  |
| S              | 0.015    | 0.060 |      | 0.39        | 1.52  |

92SS-4266R5



#### NOTES:

Refer to Rules for Dimensioning (JEDEC Publication No. 95) for Axial Lead Product Outlines.

- When this device is supplied solder-dipped, the maximum lead thickness (narrow portion) will not exceed 0.013" (0.33 mm).
- Leads within 0.005" (0.12 mm) radius of True Position (TP) at gauge plane with maximum material condition and unit installed.
- $e_A$  applies in zone L<sub>2</sub> when unit installed.
- $a$  applies to spread leads prior to installation.
- N is the maximum quantity of lead positions.
- N<sub>1</sub> is the quantity of allowable missing leads.

(D) SUFFIX (JEDEC MO-015-AG)  
24-Lead Dual-In-Line Welded-Seal  
Ceramic Package

| SYMBOL         | INCHES   |       | NOTE | MILLIMETERS |       |
|----------------|----------|-------|------|-------------|-------|
|                | MIN.     | MAX.  |      | MIN.        | MAX.  |
| A              | 0.090    | 0.200 |      | 2.29        | 5.08  |
| A <sub>1</sub> | 0.020    | 0.070 |      | 0.51        | 1.78  |
| B              | 0.015    | 0.020 |      | 0.381       | 0.508 |
| B <sub>1</sub> | 0.045    | 0.055 |      | 1.143       | 1.397 |
| C              | 0.008    | 0.012 | 1    | 0.204       | 0.304 |
| D              | 1.15     | 1.22  |      | 29.21       | 30.98 |
| E              | 0.600    | 0.625 |      | 15.24       | 15.87 |
| E <sub>1</sub> | 0.480    | 0.520 |      | 12.20       | 13.20 |
| e <sub>1</sub> | 0.100 TP |       | 2    | 2.54 TP     |       |
| e <sub>A</sub> | 0.600 TP |       | 2, 3 | 15.24 TP    |       |
| L              | 0.100    | 0.180 |      | 2.54        | 4.57  |
| L <sub>2</sub> | 0.000    | 0.030 |      | 0.00        | 0.76  |
| a              | 0°       | 15°   | 4    | 0°          | 15°   |
| N              | 24       |       | 5    | 24          |       |
| N <sub>1</sub> | 0        |       | 6    | 0           |       |
| Q <sub>1</sub> | 0.020    | 0.080 |      | 0.51        | 2.03  |
| S              | 0.020    | 0.060 |      | 0.51        | 1.52  |

92CS-19948R4

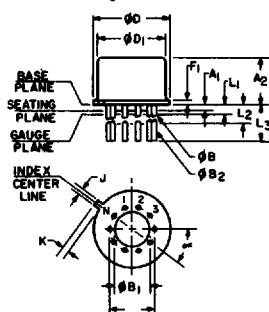
(D) SUFFIX (JEDEC MO-015-AH)  
28-Lead Dual-In-Line Welded-Seal  
Ceramic Package

| SYMBOL         | INCHES   |       | NOTE | MILLIMETERS |       |
|----------------|----------|-------|------|-------------|-------|
|                | MIN.     | MAX.  |      | MIN.        | MAX.  |
| A              | 0.090    | 0.200 |      | 2.29        | 5.08  |
| A <sub>1</sub> | 0.020    | 0.070 | 2    | 0.51        | 1.77  |
| B              | 0.015    | 0.020 |      | 0.381       | 0.508 |
| B <sub>1</sub> | 0.015    | 0.065 |      | 0.39        | 1.39  |
| C              | 0.008    | 0.012 | 1    | 0.204       | 0.304 |
| D              | 1.380    | 1.420 |      | 35.06       | 36.06 |
| E              | 0.600    | 0.625 |      | 15.24       | 15.87 |
| E <sub>1</sub> | 0.485    | 0.515 |      | 12.32       | 13.08 |
| e <sub>1</sub> | 0.100 TP |       | 2    | 2.54 TP     |       |
| e <sub>A</sub> | 0.600 TP |       | 2, 3 | 15.24 TP    |       |
| L              | 0.100    | 0.200 |      | 2.54        | 5.08  |
| L <sub>2</sub> | 0.000    | 0.030 |      | 0.00        | 0.76  |
| a              | 0°       | 15°   | 4    | 0°          | 15°   |
| N              | 28       |       | 5    | 28          |       |
| N <sub>1</sub> | 0        |       | 6    | 0           |       |
| Q <sub>1</sub> | 0.020    | 0.070 |      | 0.51        | 1.77  |
| S              | 0.040    | 0.070 |      | 1.02        | 1.77  |

92CM-20250R2

### TO-5 Style Package

(T) SUFFIX (JEDEC MO-006-AG)  
12-Lead Metal Package



92CS-19774

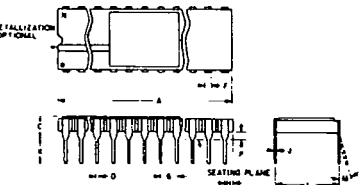
| SYMBOL          | INCHES |       | NOTE | MILLIMETERS |       |
|-----------------|--------|-------|------|-------------|-------|
|                 | MIN.   | MAX.  |      | MIN.        | MAX.  |
| a               | 0.230  |       | 2    | 5.84 TP     |       |
| A <sub>1</sub>  | 0      | 0     |      | 0           | 0     |
| A <sub>2</sub>  | 0.165  | 0.185 |      | 4.19        | 4.70  |
| ØB              | 0.016  | 0.019 | 3    | 0.407       | 0.482 |
| ØB <sub>1</sub> | 0      | 0     |      | 0           | 0     |
| ØB <sub>2</sub> | 0.016  | 0.021 | 3    | 0.407       | 0.533 |
| ØD              | 0.335  | 0.370 |      | 8.51        | 9.39  |
| ØD <sub>1</sub> | 0.305  | 0.335 |      | 7.75        | 8.50  |
| F <sub>1</sub>  | 0.020  | 0.040 |      | 0.51        | 1.01  |
| J               | 0.028  | 0.034 |      | 0.712       | 0.863 |
| k               | 0.029  | 0.045 | 4    | 0.74        | 1.14  |
| L <sub>1</sub>  | 0.000  | 0.050 | 3    | 0.00        | 1.27  |
| L <sub>2</sub>  | 0.250  | 0.500 | 3    | 6.4         | 12.7  |
| L <sub>3</sub>  | 0.500  | 0.562 | 3    | 12.7        | 14.27 |
| a               | 30° TP |       |      | 30° TP      |       |
| N               | 12     |       | 6    | 12          |       |
| N <sub>1</sub>  | 1      |       | 5    | 1           |       |

#### NOTES:

- Refer to Rules for Dimensioning Axial Lead Product Outlines.
- Leads at gauge plane within 0.007" (0.178 mm) radius of True Position (TP) at maximum material condition.
- ØB applies between L<sub>1</sub> and L<sub>2</sub>. ØB<sub>2</sub> applies between L<sub>2</sub> and 0.500" (12.70 mm) from seating plane. Diameter is uncontrolled in L<sub>1</sub> and beyond 0.500" (12.70 mm).
- Measure from Max. ØD.
- N<sub>1</sub> is the quantity of allowable missing leads.
- N is the maximum quantity of lead positions.

Dimensional Outlines (Cont'd)

DUAL-IN-LINE SIDE-BRAZED CERAMIC PACKAGES



- NOTES:
1. Leads within 0.005" (0.13 mm)-radius of True Position at maximum material condition.
  2. Dimension "L" to center of leads when formed parallel.
  3. When this device is supplied solder-dipped, the maximum lead thickness (narrow portion) will not exceed 0.013" (0.33 mm).

(D) SUFFIX  
18-Lead Dual-In-Line  
Side-Brazed Ceramic Package

| SYMBOL | INCHES |       | NOTE | MILLIMETERS |        |
|--------|--------|-------|------|-------------|--------|
|        | MIN.   | MAX.  |      | MIN.        | MAX.   |
| A      | 0.890  | 0.915 |      | 22.606      | 23.241 |
| C      | —      | 0.200 |      | —           | 5.080  |
| D      | 0.015  | 0.021 |      | 0.381       | 0.533  |
| F      | 0.054  | REF.  | 1    | 1.371       | REF.   |
| G      | 0.100  | BSC   | 1    | 2.54        | BSC    |
| H      | 0.035  | 0.065 |      | 0.889       | 1.651  |
| J      | 0.008  | 0.012 | 3    | 0.203       | 0.304  |
| K      | 0.125  | 0.150 |      | 3.175       | 3.810  |
| L      | 0.290  | 0.310 | 2    | 7.366       | 7.874  |
| M      | 0°     | 15°   |      | 0°          | 15°    |
| P      | 0.025  | 0.045 |      | 0.635       | 1.143  |
| N      | 18     |       |      | 18          |        |

92CS-27231R1

(D) SUFFIX  
22-Lead Dual-In-Line  
Side-Brazed Ceramic Package

| SYMBOL | INCHES |       | NOTE | MILLIMETERS |       |
|--------|--------|-------|------|-------------|-------|
|        | MIN.   | MAX.  |      | MIN.        | MAX.  |
| A      | 1.065  | 1.100 |      | 27.05       | 27.94 |
| C      | 0.085  | 0.145 |      | 2.16        | 3.68  |
| D      | 0.017  | 0.023 |      | 0.43        | 0.58  |
| F      | 0.040  | REF.  | 1    | 1.02        | REF.  |
| G      | 0.100  | BSC   | 1    | 2.54        | BSC   |
| H      | 0.030  | 0.070 |      | 0.76        | 1.78  |
| J      | 0.008  | 0.012 | 3    | 0.20        | 0.30  |
| K      | 0.125  | 0.175 |      | 3.18        | 4.45  |
| L      | 0.380  | 0.420 | 2    | 9.65        | 10.67 |
| M      | —      | 7°    |      | —           | 7°    |
| P      | 0.025  | 0.050 |      | 0.64        | 1.27  |
| N      | 22     |       |      | 22          |       |

92CS-26186R2

(D) SUFFIX  
24-Lead Dual-In-Line  
Side-Brazed Ceramic Package

| SYMBOL | INCHES |       | NOTE | MILLIMETERS |       |
|--------|--------|-------|------|-------------|-------|
|        | MIN.   | MAX.  |      | MIN.        | MAX.  |
| A      | 1.180  | 1.220 |      | 29.98       | 30.98 |
| C      | 0.085  | 0.145 |      | 2.16        | 3.68  |
| D      | 0.015  | 0.023 |      | 0.39        | 0.58  |
| F      | 0.040  | REF.  |      | 1.02        | REF.  |
| G      | 0.100  | BSC   | 1    | 2.54        | BSC   |
| H      | 0.030  | 0.070 |      | 0.77        | 1.77  |
| J      | 0.008  | 0.012 | 3    | 0.21        | 0.30  |
| K      | 0.125  | 0.175 |      | 3.18        | 4.44  |
| L      | 0.580  | 0.620 | 2    | 14.74       | 15.74 |
| M      | —      | 7°    |      | —           | 7°    |
| P      | 0.025  | 0.050 |      | 0.64        | 1.27  |
| N      | 24     |       |      | 24          |       |

92CS-30986R1

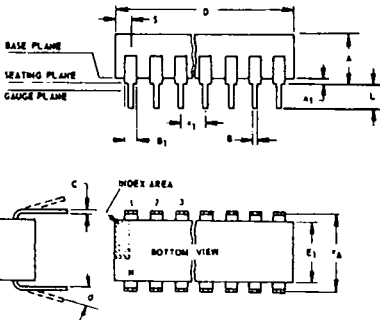
(D) SUFFIX  
40-Lead Dual-In-Line  
Side-Brazed Ceramic Package

| SYMBOL | INCHES |       | NOTE | MILLIMETERS |       |
|--------|--------|-------|------|-------------|-------|
|        | MIN.   | MAX.  |      | MIN.        | MAX.  |
| A      | 1.980  | 2.020 |      | 50.30       | 51.30 |
| C      | 0.095  | 0.155 |      | 2.43        | 3.93  |
| D      | 0.017  | 0.023 |      | 0.43        | 0.58  |
| F      | 0.050  | REF.  |      | 1.27        | REF.  |
| G      | 0.100  | BSC   | 1    | 2.54        | BSC   |
| H      | 0.030  | 0.070 |      | 0.76        | 1.78  |
| J      | 0.008  | 0.012 | 3    | 0.20        | 0.30  |
| K      | 0.125  | 0.175 |      | 3.18        | 4.45  |
| L      | 0.580  | 0.620 | 2    | 14.74       | 15.74 |
| M      | —      | 7°    |      | —           | 7°    |
| P      | 0.025  | 0.050 |      | 0.64        | 1.27  |
| N      | 40     |       |      | 40          |       |

92CM-27029R2

Dual-In-Line Plastic and Frit-Seal Ceramic Packages

(E) SUFFIX (JEDEC MO-001-AN)  
8-Lead Dual-In-Line Plastic  
(Mini-DIP) Package



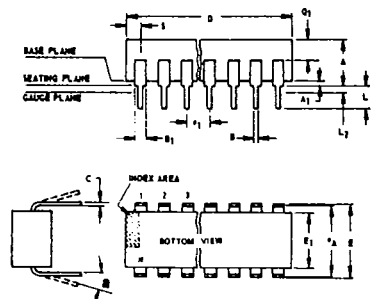
| SYMBOL         | INCHES |       | NOTE | MILLIMETERS |       |
|----------------|--------|-------|------|-------------|-------|
|                | MIN.   | MAX.  |      | MIN.        | MAX.  |
| A              | 0.155  | 0.200 |      | 3.94        | 5.08  |
| A <sub>1</sub> | 0.020  | 0.050 |      | 0.508       | 1.27  |
| B              | 0.014  | 0.020 |      | 0.356       | 0.508 |
| B <sub>1</sub> | 0.035  | 0.065 |      | 0.889       | 1.65  |
| C              | 0.008  | 0.012 | 1    | 0.203       | 0.304 |
| D              | 0.370  | 0.400 |      | 9.40        | 10.16 |
| E              | 0.300  | 0.325 |      | 7.62        | 8.25  |
| E <sub>1</sub> | 0.240  | 0.260 |      | 6.10        | 6.60  |
| e <sub>1</sub> | 0.100  | TP    | 2    | 2.54        | TP    |
| e <sub>A</sub> | 0.300  | TP    | 2, 3 | 7.62        | TP    |
| L              | 0.125  | 0.150 |      | 3.18        | 3.81  |
| L <sub>2</sub> | 0.000  | 0.030 |      | 0.000       | 0.762 |
| a              | 0      | 15    | 4    | 0           | 15    |
| N              | 8      |       | 5    | 8           |       |
| N <sub>1</sub> | 0      |       | 6    | 0           |       |
| O <sub>1</sub> | 0.040  | 0.075 |      | 1.02        | 1.90  |
| S              | 0.015  | 0.060 |      | 0.381       | 1.52  |

92CS-24026 R1

- NOTES:
- Refer to Rules for Dimensioning (JEDEC Publication No. 95) for Axial Lead Product Outlines.
1. When this device is supplied solder-dipped, the maximum lead thickness (narrow portion) will not exceed 0.013".
  2. Leads within 0.005" (0.12 mm) radius of True Position (TP) at gauge plane with maximum material condition and unit installed.
  3. e<sub>A</sub> applies in zone L<sub>2</sub> when unit installed.
  4. a applies to spread leads prior to installation.
  5. N is the maximum quantity of lead positions.
  6. N<sub>1</sub> is the quantity of allowable missing leads.

## Dimensional Outlines (Cont'd)

## Dual-In-Line Plastic and Frit-Seal Ceramic Packages (Cont'd)



## NOTES:

Refer to Rules for Dimensioning (JEDEC Publication No. 95) for Axial Lead Product Outlines.

- When this device is supplied solder dipped, the maximum lead thickness (narrow portion) will not exceed 0.013" (0.33 mm).
- Leads within 0.005" (0.12 mm) radius of True Position (TP) at gauge plane with maximum material condition and unit installed.
- $\phi A$  applies in zone L<sub>2</sub> when unit installed.
- $\phi$  applies to spread leads prior to installation.
- N is the maximum quantity of lead positions.
- N<sub>1</sub> is the quantity of allowable missing leads.

(E) and (F) SUFFIXES (JEDEC MO-001-AB)  
14-Lead Dual-In-Line Plastic or  
Frit-Seal Ceramic Package

| SYMBOL         | INCHES   |       | NOTE | MILLIMETERS |       |
|----------------|----------|-------|------|-------------|-------|
|                | MIN.     | MAX.  |      | MIN.        | MAX.  |
| A              | 0.155    | 0.200 |      | 3.94        | 5.08  |
| A <sub>1</sub> | 0.020    | 0.060 |      | 0.51        | 1.27  |
| B              | 0.014    | 0.020 |      | 0.356       | 0.508 |
| B <sub>1</sub> | 0.060    | 0.065 |      | 1.27        | 1.65  |
| C              | 0.008    | 0.012 | 1    | 0.204       | 0.304 |
| D              | 0.745    | 0.770 |      | 18.93       | 19.55 |
| E              | 0.300    | 0.325 |      | 7.62        | 8.25  |
| E <sub>1</sub> | 0.240    | 0.260 |      | 6.10        | 6.60  |
| $\phi 1$       | 0.100 TP |       | 2    | 2.54 TP     |       |
| $\phi A$       | 0.300 TP |       | 2, 3 | 7.62 TP     |       |
| L              | 0.125    | 0.150 |      | 3.18        | 3.81  |
| L <sub>2</sub> | 0.000    | 0.030 |      | 0.000       | 0.76  |
| a              | 0°       | 15°   | 4    | 0°          | 15°   |
| N              | 14       |       | 5    | 14          |       |
| N <sub>1</sub> | 0        |       | 6    | 0           |       |
| Q <sub>1</sub> | 0.040    | 0.075 |      | 1.02        | 1.90  |
| S              | 0.065    | 0.090 |      | 1.66        | 2.28  |

92SS-4296R3

(E) and (F) SUFFIXES (JEDEC MO-001-AC)  
16-Lead Dual-In-Line Plastic or  
Frit-Seal Ceramic Package

| SYMBOL         | INCHES   |       | NOTE | MILLIMETERS |       |
|----------------|----------|-------|------|-------------|-------|
|                | MIN.     | MAX.  |      | MIN.        | MAX.  |
| A              | 0.155    | 0.200 |      | 3.94        | 5.08  |
| A <sub>1</sub> | 0.020    | 0.050 |      | 0.51        | 1.27  |
| B              | 0.014    | 0.020 |      | 0.356       | 0.508 |
| B <sub>1</sub> | 0.035    | 0.065 |      | 0.89        | 1.65  |
| C              | 0.008    | 0.012 | 1    | 0.204       | 0.304 |
| D              | 0.745    | 0.785 |      | 18.93       | 19.93 |
| E              | 0.300    | 0.325 |      | 7.62        | 8.25  |
| E <sub>1</sub> | 0.240    | 0.260 |      | 6.10        | 6.60  |
| $\phi 1$       | 0.100 TP |       | 2    | 2.54 TP     |       |
| $\phi A$       | 0.300 TP |       | 2, 3 | 7.62 TP     |       |
| L              | 0.125    | 0.150 |      | 3.18        | 3.81  |
| L <sub>2</sub> | 0.000    | 0.030 |      | 0.000       | 0.76  |
| a              | 0°       | 15°   | 4    | 0°          | 15°   |
| N              | 16       |       | 5    | 16          |       |
| N <sub>1</sub> | 0        |       | 6    | 0           |       |
| Q <sub>1</sub> | 0.040    | 0.075 |      | 1.02        | 1.90  |
| S              | 0.015    | 0.060 |      | 0.39        | 1.52  |

92CM-15967R4

(E) SUFFIX  
18-Lead Dual-In-Line  
Plastic Package

| SYMBOL         | INCHES   |       | NOTE | MILLIMETERS |       |
|----------------|----------|-------|------|-------------|-------|
|                | MIN.     | MAX.  |      | MIN.        | MAX.  |
| A              | 0.155    | 0.200 |      | 3.94        | 5.08  |
| A <sub>1</sub> | 0.020    | 0.060 |      | 0.508       | 1.27  |
| B              | 0.014    | 0.020 |      | 0.356       | 0.508 |
| B <sub>1</sub> | 0.035    | 0.065 |      | 0.89        | 1.65  |
| C              | 0.008    | 0.012 | 1    | 0.204       | 0.304 |
| D              | 0.845    | 0.885 |      | 21.47       | 22.47 |
| E <sub>1</sub> | 0.240    | 0.260 |      | 6.10        | 6.60  |
| $\phi 1$       | 0.100 TP |       | 2    | 2.54 TP     |       |
| $\phi A$       | 0.300 TP |       | 2, 3 | 7.62 TP     |       |
| L              | 0.125    | 0.150 |      | 3.18        | 3.81  |
| a              | 0°       | 15°   | 4    | 0°          | 15°   |
| N              | 18       |       | 5    | 18          |       |
| N <sub>1</sub> | 0        |       | 6    | 0           |       |
| S              | 0.015    | 0.060 |      | 0.39        | 1.52  |

92CS-30630

(E) SUFFIX  
22-Lead Dual-In-Line  
Plastic Package

| SYMBOL         | INCHES   |       | NOTE | MILLIMETERS |       |
|----------------|----------|-------|------|-------------|-------|
|                | MIN.     | MAX.  |      | MIN.        | MAX.  |
| A              | 0.155    | 0.200 |      | 3.94        | 5.08  |
| A <sub>1</sub> | 0.020    | 0.050 |      | 0.508       | 1.27  |
| B              | 0.015    | 0.020 |      | 0.381       | 0.508 |
| B <sub>1</sub> | 0.035    | 0.065 |      | 0.89        | 1.65  |
| C              | 0.008    | 0.012 | 1    | 0.204       | 0.304 |
| D              |          | 1.120 |      |             | 28.44 |
| E              | 0.390    | 0.420 |      | 9.91        | 10.66 |
| E <sub>1</sub> | 0.345    | 0.355 |      | 8.77        | 9.01  |
| $\phi 1$       | 0.100 TP |       | 2    | 2.54 TP     |       |
| $\phi A$       | 0.400 TP |       | 2, 3 | 10.16 TP    |       |
| L              | 0.125    | 0.150 |      | 3.18        | 3.81  |
| L <sub>2</sub> | 0        | 0.030 |      | 0           | 0.762 |
| a              | 2°       | 15°   | 4    | 2°          | 15°   |
| N              | 22       |       | 5    | 22          |       |
| N <sub>1</sub> | 0        |       | 6    | 0           |       |
| Q <sub>1</sub> | 0.065    | 0.085 |      | 1.40        | 2.15  |
| S              | 0.015    | 0.060 |      | 0.381       | 1.27  |

92CS-30830

(F) SUFFIX (JEDEC MO-001-AG)  
16-Lead Dual-In-Line  
Frit-Seal Ceramic Package

| SYMBOL         | INCHES   |       | NOTE | MILLIMETERS |       |
|----------------|----------|-------|------|-------------|-------|
|                | MIN.     | MAX.  |      | MIN.        | MAX.  |
| A              | 0.165    | 0.210 |      | 4.20        | 5.33  |
| A <sub>1</sub> | 0.015    | 0.045 |      | 0.381       | 1.14  |
| B              | 0.015    | 0.020 |      | 0.381       | 0.508 |
| B <sub>1</sub> | 0.045    | 0.070 |      | 1.15        | 1.77  |
| C              | 0.009    | 0.011 | 1    | 0.229       | 0.279 |
| D              | 0.750    | 0.795 |      | 19.05       | 20.19 |
| E              | 0.295    | 0.325 |      | 7.50        | 8.25  |
| E <sub>1</sub> | 0.245    | 0.300 |      | 6.23        | 7.62  |
| $\phi 1$       | 0.100 TP |       | 2    | 2.54 TP     |       |
| $\phi A$       | 0.300 TP |       | 2, 3 | 7.62 TP     |       |
| L              | 0.120    | 0.160 |      | 3.05        | 4.06  |
| L <sub>2</sub> | 0.000    | 0.030 |      | 0.000       | 0.76  |
| a              | 2°       | 15°   | 4    | 2°          | 15°   |
| N              | 16       |       | 5    | 16          |       |
| N <sub>1</sub> | 0        |       | 6    | 0           |       |
| Q <sub>1</sub> | 0.050    | 0.080 |      | 1.27        | 2.03  |
| S              | 0.010    | 0.060 |      | 0.254       | 1.52  |

92CM-22284R1

(E) and (F) SUFFIXES (JEDEC MO-015-AA)  
24-Lead Dual-In-Line Plastic or  
Frit-Seal Ceramic Package

| SYMBOL         | INCHES   |       | NOTE | MILLIMETERS |       |
|----------------|----------|-------|------|-------------|-------|
|                | MIN.     | MAX.  |      | MIN.        | MAX.  |
| A              | 0.120    | 0.250 |      | 3.10        | 6.30  |
| A <sub>1</sub> | 0.020    | 0.070 |      | 0.51        | 1.77  |
| B              | 0.016    | 0.020 |      | 0.407       | 0.508 |
| B <sub>1</sub> | 0.028    | 0.070 |      | 0.72        | 1.77  |
| C              | 0.008    | 0.012 | 1    | 0.204       | 0.304 |
| D              | 1.20     | 1.29  |      | 30.48       | 32.76 |
| E              | 0.600    | 0.625 |      | 15.24       | 15.87 |
| E <sub>1</sub> | 0.515    | 0.580 |      | 13.09       | 14.73 |
| $\phi 1$       | 0.100 TP |       | 2    | 2.54 TP     |       |
| $\phi A$       | 0.600 TP |       | 2, 3 | 15.24 TP    |       |
| L              | 0.100    | 0.200 |      | 2.54        | 5.00  |
| L <sub>2</sub> | 0.000    | 0.030 |      | 0.00        | 0.76  |
| a              | 0°       | 15°   | 4    | 0°          | 15°   |
| N              | 24       |       | 5    | 24          |       |
| N <sub>1</sub> | 0        |       | 6    | 0           |       |
| Q <sub>1</sub> | 0.040    | 0.075 |      | 1.02        | 1.90  |
| S              | 0.040    | 0.100 |      | 1.02        | 2.54  |

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(E) SUFFIX  
40-Lead Dual-In-Line  
Plastic Package

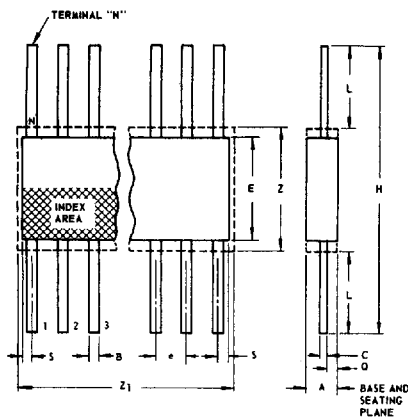
| SYMBOL         | INCHES   |       | NOTE | MILLIMETERS |       |
|----------------|----------|-------|------|-------------|-------|
|                | MIN.     | MAX.  |      | MIN.        | MAX.  |
| A              | 0.120    | 0.250 |      | 3.10        | 6.30  |
| A <sub>1</sub> | 0.020    | 0.070 |      | 0.51        | 1.77  |
| B              | 0.016    | 0.020 |      | 0.407       | 0.508 |
| B <sub>1</sub> | 0.028    | 0.070 |      | 0.72        | 1.77  |
| C              | 0.008    | 0.012 | 1    | 0.204       | 0.304 |
| D              | 2.000    | 2.090 |      | 50.80       | 53.09 |
| E <sub>1</sub> | 0.515    | 0.580 |      | 13.09       | 14.73 |
| $\phi 1$       | 0.100 TP |       | 2    | 2.54 TP     |       |
| $\phi A$       | 0.600 TP |       | 2, 3 | 15.24 TP    |       |
| L              | 0.100    | 0.200 |      | 2.54        | 5.00  |
| L <sub>2</sub> | 0.000    | 0.030 |      | 0.00        | 0.76  |
| a              | 0°       | 15°   | 4    | 0°          | 15°   |
| N              | 40       |       | 5    | 40          |       |
| N <sub>1</sub> | 0        |       | 6    | 0           |       |
| Q <sub>1</sub> | 0.065    | 0.095 |      | 1.66        | 2.41  |
| S              | 0.040    | 0.100 |      | 1.02        | 2.54  |

92CS-30959

# Dimensional Outlines (Cont'd)

## Ceramic Flat Packs

### (K) SUFFIX (JEDEC MO-004-AF) 14-Lead



| SYMBOL | INCHES   |       | NOTE | MILLIMETERS |       |
|--------|----------|-------|------|-------------|-------|
|        | MIN.     | MAX.  |      | MIN.        | MAX.  |
| A      | 0.008    | 0.100 |      | 0.21        | 2.54  |
| B      | 0.015    | 0.019 | 1    | 0.381       | 0.482 |
| C      | 0.003    | 0.006 | 1    | 0.077       | 0.152 |
| e      | 0.050 TP |       | 2    | 1.27 TP     |       |
| E      | 0.200    | 0.300 |      | 5.1         | 7.6   |
| H      | 0.600    | 1.000 |      | 15.3        | 25.4  |
| L      | 0.150    | 0.350 |      | 3.9         | 8.8   |
| N      | 14       |       | 3    | 14          |       |
| Q      | 0.005    | 0.050 |      | 0.13        | 1.27  |
| S      | 0.000    | 0.050 |      | 0.00        | 1.27  |
| Z      | 0.300    |       | 4    | 7.62        |       |
| Z1     | 0.400    |       | 4    | 10.16       |       |

92S8-4300R3

#### NOTES:

1. Refer to JEDEC Publication No. 95 for Rules for Dimensioning Peripheral Lead Outlines.
2. Leads within 0.005" (0.12 mm) radius of True Position (TP) at maximum material condition.
3. N is the maximum quantity of lead positions.
4. Z and Z1 determine a zone within which all body and lead irregularities lie.

### (K) SUFFIX (JEDEC MO-004-AG) 16-Lead

| SYMBOL | INCHES   |       | NOTE | MILLIMETERS |       |
|--------|----------|-------|------|-------------|-------|
|        | MIN.     | MAX.  |      | MIN.        | MAX.  |
| A      | 0.008    | 0.100 |      | 0.21        | 2.54  |
| B      | 0.015    | 0.019 | 1    | 0.381       | 0.482 |
| C      | 0.003    | 0.006 | 1    | 0.077       | 0.152 |
| e      | 0.050 TP |       | 2    | 1.27 TP     |       |
| E      | 0.200    | 0.300 |      | 5.1         | 7.6   |
| H      | 0.600    | 1.000 |      | 15.3        | 25.4  |
| L      | 0.150    | 0.350 |      | 3.9         | 8.8   |
| N      | 16       |       | 3    | 16          |       |
| Q      | 0.005    | 0.050 |      | 0.13        | 1.27  |
| S      | 0.000    | 0.025 |      | 0.00        | 0.63  |
| Z      | 0.300    |       | 4    | 7.62        |       |
| Z1     | 0.400    |       | 4    | 10.16       |       |

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### (K) SUFFIX 24-Lead

| SYMBOL | INCHES   |       | NOTE | MILLIMETERS |       |
|--------|----------|-------|------|-------------|-------|
|        | MIN.     | MAX.  |      | MIN.        | MAX.  |
| A      | 0.075    | 0.120 |      | 1.91        | 3.04  |
| B      | 0.018    | 0.022 | 1    | 0.458       | 0.558 |
| C      | 0.004    | 0.007 | 1    | 0.102       | 0.177 |
| e      | 0.050 TP |       | 2    | 1.27 TP     |       |
| E      | 0.600    | 0.700 |      | 15.24       | 17.78 |
| H      | 1.150    | 1.350 |      | 29.21       | 34.29 |
| L      | 0.225    | 0.325 |      | 5.72        | 8.25  |
| N      | 24       |       | 3    | 24          |       |
| Q      | 0.035    | 0.070 |      | 0.89        | 1.77  |
| S      | 0.060    | 0.110 | 1    | 1.53        | 2.79  |
| Z      | 0.700    |       | 4    | 17.78       |       |
| Z1     | 0.750    |       | 4    | 19.05       |       |

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### (K) SUFFIX 28-Lead

| SYMBOL | INCHES   |       | NOTE | MILLIMETERS |       |
|--------|----------|-------|------|-------------|-------|
|        | MIN.     | MAX.  |      | MIN.        | MAX.  |
| A      | 0.075    | 0.120 |      | 1.91        | 3.04  |
| B      | 0.018    | 0.022 | 1    | 0.458       | 0.558 |
| C      | 0.004    | 0.007 | 1    | 0.102       | 0.177 |
| e      | 0.050 TP |       | 2    | 1.27 TP     |       |
| E      | 0.600    | 0.700 |      | 15.24       | 17.78 |
| H      | 1.150    | 1.350 |      | 29.21       | 34.29 |
| L      | 0.225    | 0.325 |      | 5.72        | 8.25  |
| N      | 28       |       | 3    | 28          |       |
| Q      | 0.035    | 0.070 |      | 0.89        | 1.77  |
| S      | 0        | 0.060 | 1    | 0           | 1.53  |
| Z      | 0.700    |       | 4    | 17.78       |       |
| Z1     | 0.750    |       | 4    | 19.05       |       |

92CS-20972