

**General Information**

**1**

**Data Transmission and Control Circuits**

**2**

**Display Drivers**

**3**

**Peripheral Drivers/Power Actuators**

**4**

**Mechanical Data**

**5**

**Explanation of Logic Symbols**

**6**

# Contents

	<i>Page</i>
Ordering Instructions . . . . .	5-3
Mechanical Data . . . . .	5-5

# ORDERING INSTRUCTIONS

Electrical characteristics presented in this data book, unless otherwise noted, apply for the circuit type(s) listed in the page heading regardless of package. The availability of a circuit function in a particular package is denoted by an alphabetical reference above the pin-connection diagram(s). These alphabetical references refer to mechanical outline drawings shown in this section.

Factory orders for circuits described in this data book should include a four-part type number as explained in the following example.

EXAMPLE: SN 75189 N -00

**Prefix** \_\_\_\_\_

MUST CONTAIN TWO, THREE, OR FOUR LETTERS

- SN . . . TI Special Functions or Interface Products
- TCM . . . . . TI Telecommunication Products
- TL . . . . . TI Linear Products
- TPIC . . . . . TI Intelligent Power Products

**STANDARD SECOND-SOURCE PREFIXES**

- |   |                                 |
|---|---------------------------------|
| AM, DP, or DS . . . . . National        | MC . . . . . Motorola           |
| LT . . . . . Linear Technology          | N8T . . . . . Signetics         |
| MAX . . . . . Maxim Integrated Products | uA . . . . . Fairchild/National |

**Unique Circuit Description** \_\_\_\_\_

MUST CONTAIN THREE TO EIGHT CHARACTERS  
(From Individual Data Sheets)

- Examples:    232      75160B  
              3695     75C1154  
              75115    75ALS180

**Package** \_\_\_\_\_

MUST CONTAIN ONE OR TWO LETTERS

- D, DB, DW, FD, FK, FN, FT, HA, HB, J, JD, JG, KN, KV, N, NE, NT, P, W  
(From Pin-Connection Diagrams on Individual Data Sheet)

**Instructions (Dash No.)** \_\_\_\_\_

MUST CONTAIN TWO NUMBERS

- 00 No special instructions
- 10 Solder-dipped leads (N, NE, and NT packages only)

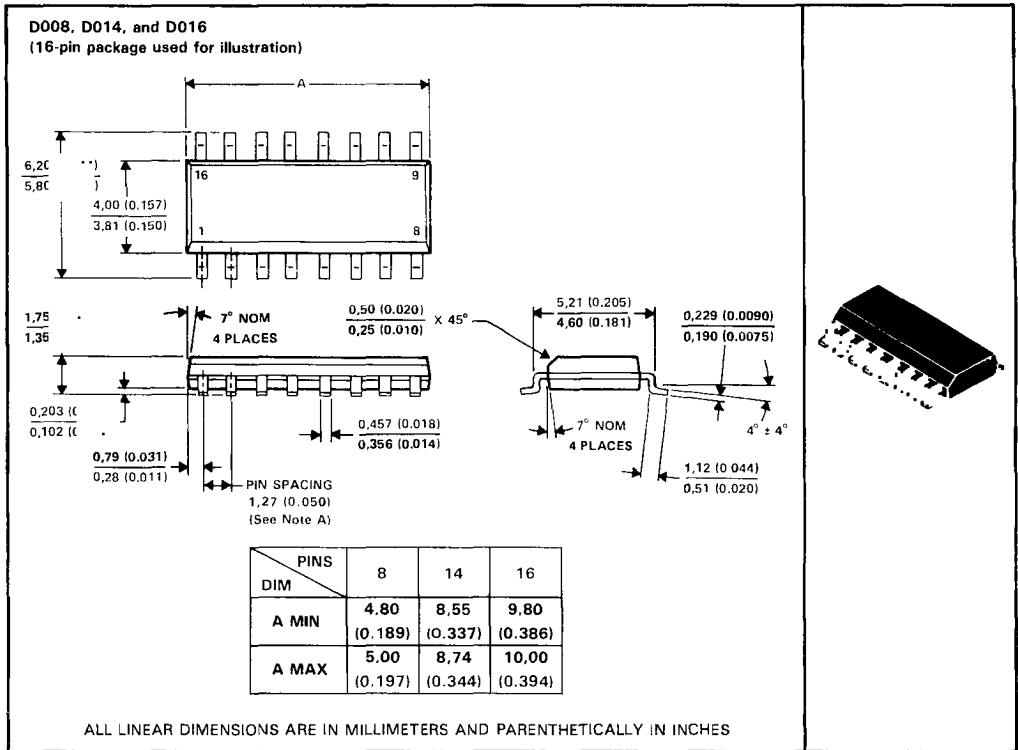
Circuits are shipped in one of the carriers below. Unless a specific method of shipment is specified by the customer (with possible additional costs), circuits will be shipped in the most practical carrier.

- |   |  |                                 |
|---|--|---------------------------------|
| Dual-In-Line (D, DB, DW, J, JD, JG, N, NE, NT, P)<br>— Slide Magazines<br>— A-Channel Plastic Tubing<br>— Sectioned Cardboard Box<br>— Individual Cardboard Box | Chip Carrier (FD, FK, FN, FT)<br>— Anti-Static Plastic Tubing<br>Flat (HA, HB, W)<br>— Wells Carrier | Power Tab (KN, KV)<br>— Sleeves |
|---|--|---------------------------------|



**D008, D014, and D016 plastic "small outline" packages**

Each of these "small outline" packages consists of a circuit mounted on a lead frame and encapsulated within a plastic compound. The compound will withstand soldering temperature with no deformation, and circuit performance characteristics will remain stable when operated in high-humidity conditions. Leads require no additional cleaning or processing when used in soldered assembly.

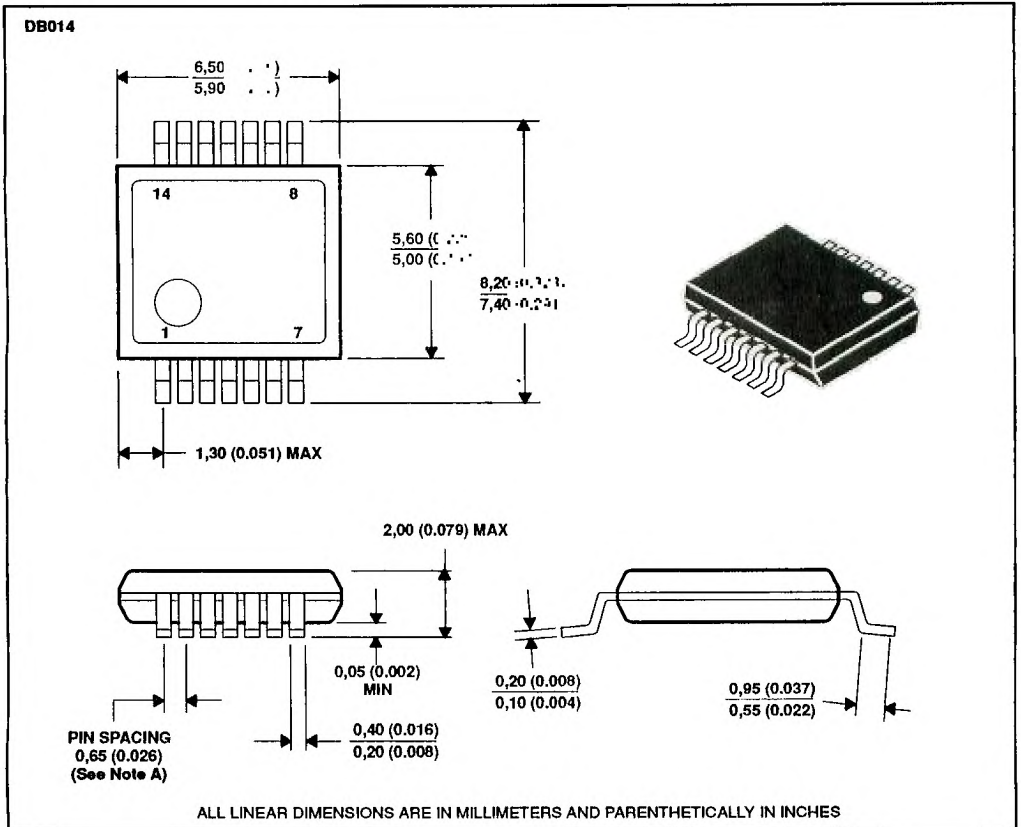


- NOTES: A. Leads are within 0,25 (0.010) radius of true position at maximum material condition.  
 B. Body dimensions do not include mold flash or protrusion.  
 C. Mold flash or protrusion shall not exceed 0,15 (0.006).  
 D. Lead tips to be planar within ±0,051 (0.002) exclusive of solder.

# MECHANICAL DATA

## DB014 "shrunk small outline" package

This "shrunk small outline" package consists of a circuit mounted on a lead frame and encapsulated within a plastic compound. The compound will withstand soldering temperature with no deformation, and circuit performance characteristics will remain stable when operated in high-humidity conditions. Leads require no additional cleaning or processing when used in soldered assembly.

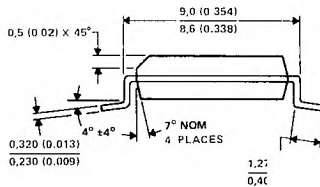
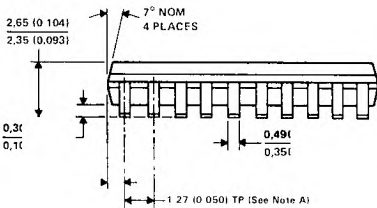
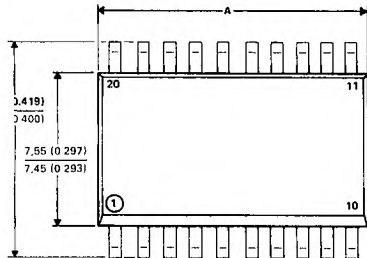


- NOTES: A. Leads are within 0,25 (0,010) radius of true position at maximum material condition.  
 B. Body dimensions do not include mold flash or protrusion.  
 C. Mold flash or protrusion shall not exceed 0,15 (0,006).  
 D. Lead tips to be planar within  $\pm 0,051$  (0,002) exclusive of solder.

DW016, DW020, DW024, and DW028 plastic "small outline" packages

Each of these "small outline" packages consists of a circuit mounted on a lead frame and encapsulated within a plastic compound. The compound will withstand soldering temperature with no deformation, and circuit performance characteristics will remain stable when operated in high-humidity conditions. Leads require no additional cleaning or processing when used in soldered assembly.

DW016, DW020, DW024, and DW028  
(20-pin package used for illustration)



PINS DIM	PINS			
	16	20	244	28†
A MIN	10,16 (0.400)	12,70 (0.500)	15,29 (0.602)	17,68 (0.696)
A MAX	10,36 (0.408)	12,90 (0.508)	15,49 (0.610)	17,88 (0.704)

ALL LINEAR DIMENSIONS ARE IN MILLIMETERS AND PARENTHETICALLY IN INCHES

†The 28-pin package drawing is presently classified as Advance Information.

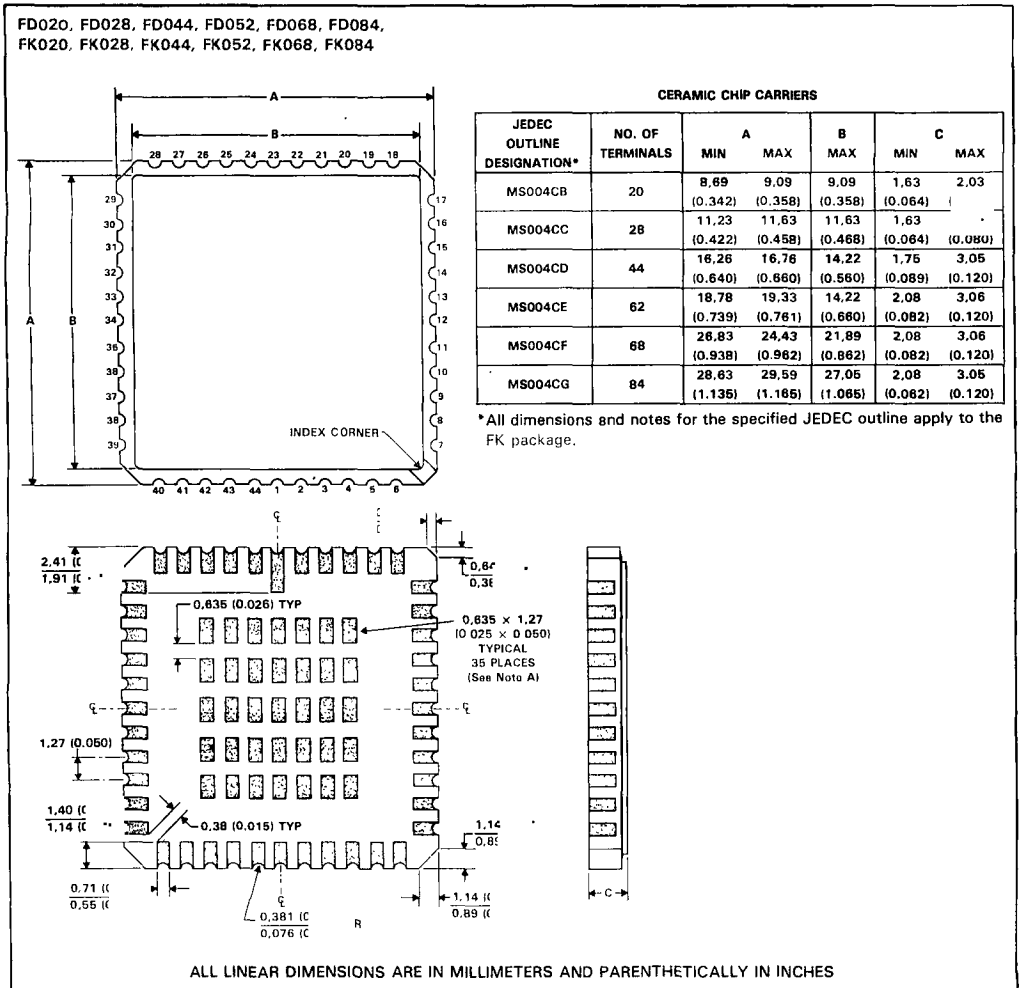
- NOTES:
- A. Leads are within 0,25 (0.010) radius of true position at maximum material condition.
  - B. Body dimensions do not include mold flash or protrusion.
  - C. Mold flash or protrusion shall not exceed 0,15 (0.006).
  - D. Lead tips to be planar within ±0,051 (0.002) exclusive of solder.

# MECHANICAL DATA

## FD020, FD028, FD044, FD052, FD068, FD084, and FK020, FK028, FK044, FK052, FK068, FK084 leadless ceramic chip carrier packages

Each of these hermetically sealed chip carrier packages has a three-layer ceramic base with a metal lid and braze seal. The packages are intended for surface mounting on solder leads on 1,27 (0.050-inch) centers. Terminals require no additional cleaning or processing when used in soldered assembly.

FK package terminal assignments conform to JEDEC standards, 1, 2, and 11.



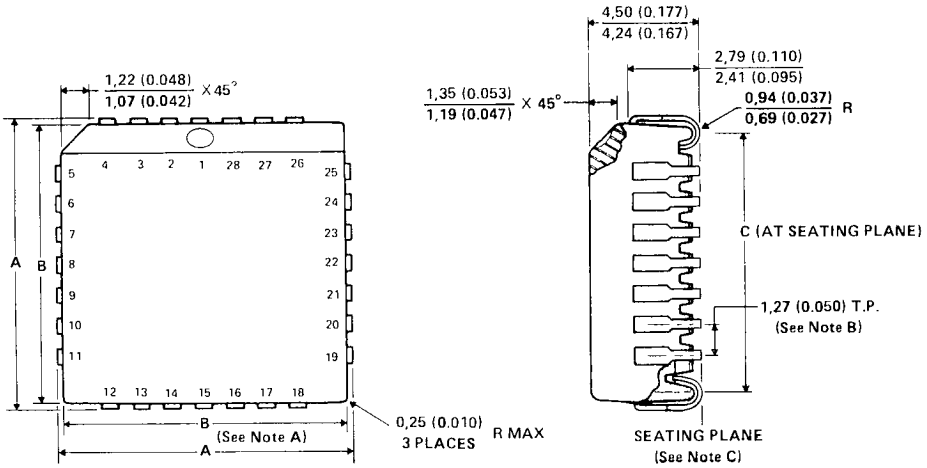
NOTE A: The checkerboard pattern is aligned vertically with the contact pads and is symmetrical horizontally as shown; it is applicable to some 44-terminal packages only.



**FN020, FN028, FN044, FN068, and FN084 plastic chip carrier packages**

Each of these chip carrier packages consists of a circuit mounted on a lead frame and encapsulated within an electrically nonconductive plastic compound. The compound withstands soldering temperatures with no deformation, and circuit performance characteristics remain stable when the devices are operated in high-humidity conditions. The packages are intended for surface mounting on solder lands on 1,27 (0.050) centers. Leads require no additional cleaning or processing when used in soldered assembly.

**FN020, FN028, FN044, FN068, and FN084**  
(28-terminal package used for illustration)



NO OF TERMINALS	A		B		C	
	MIN	MAX	MIN	MAX	MIN	MAX
20	9,78 (0.385)	10,03 (0.395)	8,89 (0.350)	9,04 (0.356)	7,87 (0.310)	8,38 (0.330)
28	12,32 (0.485)	12,57 (0.495)	11,43 (0.450)	11,58 (0.456)	10,41 (0.410)	10,92 (0.430)
44	17,40 (0.685)	17,65 (0.695)	16,51 (0.650)	16,66 (0.656)	15,49 (0.610)	16,00 (0.630)
68	25,02 (0.985)	25,27 (0.995)	24,13 (0.950)	24,33 (0.956)	23,11 (0.910)	23,62 (0.930)
84	30,10 (1.185)	30,35 (1.195)	29,21 (1.150)	29,41 (1.156)	27,69 (1.090)	28,70 (1.130)

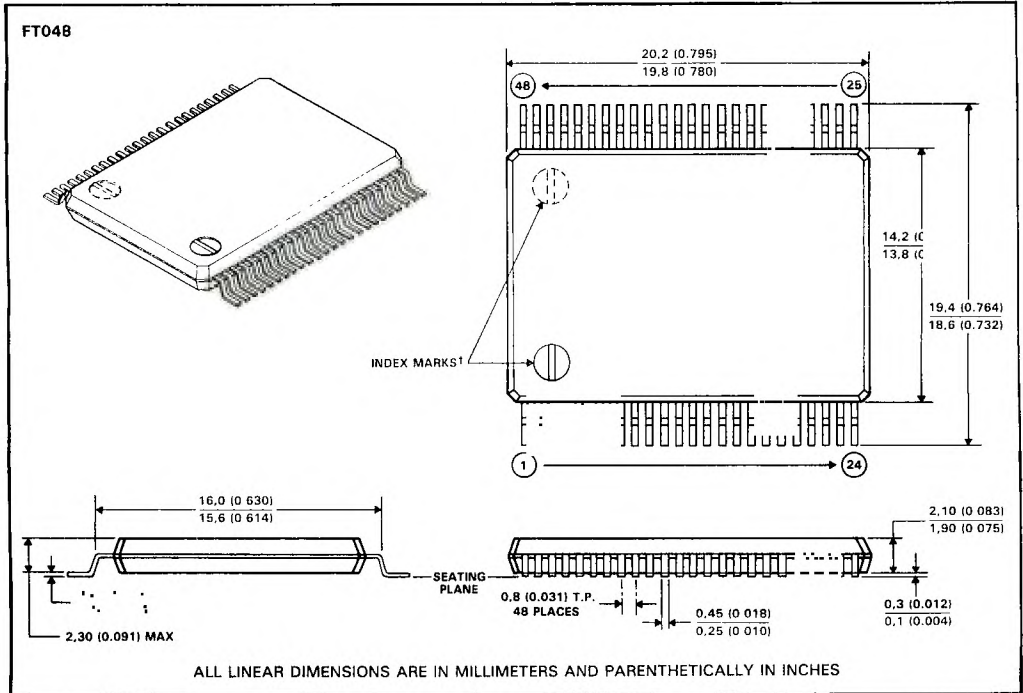
ALL LINEAR DIMENSIONS ARE IN MILLIMETERS AND PARENTHETICALLY IN INCHES

- NOTES: A. Centerline of center pin each side is within 0,10 (0.004) of package centerline as determined by dimension B.  
 B. Location of each pin is within 0,127 (0.005) of true position with respect to center pin on each side.  
 C. The lead contact points are planar within 0,10 (0.004).

# MECHANICAL DATA

## FT048

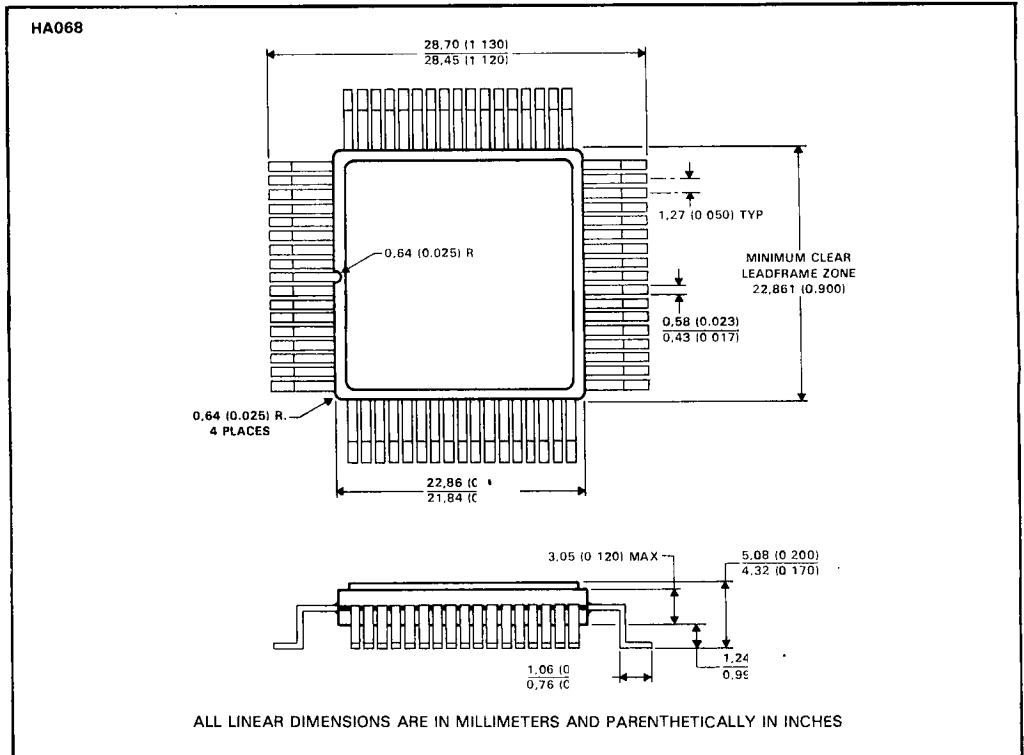
This package consists of a circuit mounted on a lead frame and encapsulated within a plastic compound. The compound will withstand soldering temperature with no deformation, and circuit performance characteristics will remain stable when operated in high-humidity conditions. Leads require no additional cleaning or processing when used in soldered assembly.



<sup>†</sup> There are two versions of the 48-lead FT package that differ in the position of the index mark in the top view. In one version, the mark is near lead 3, in the other version, it is near lead 46. Consult the individual data sheet to see which applies for a particular device type.

HA068 quadriform flat package

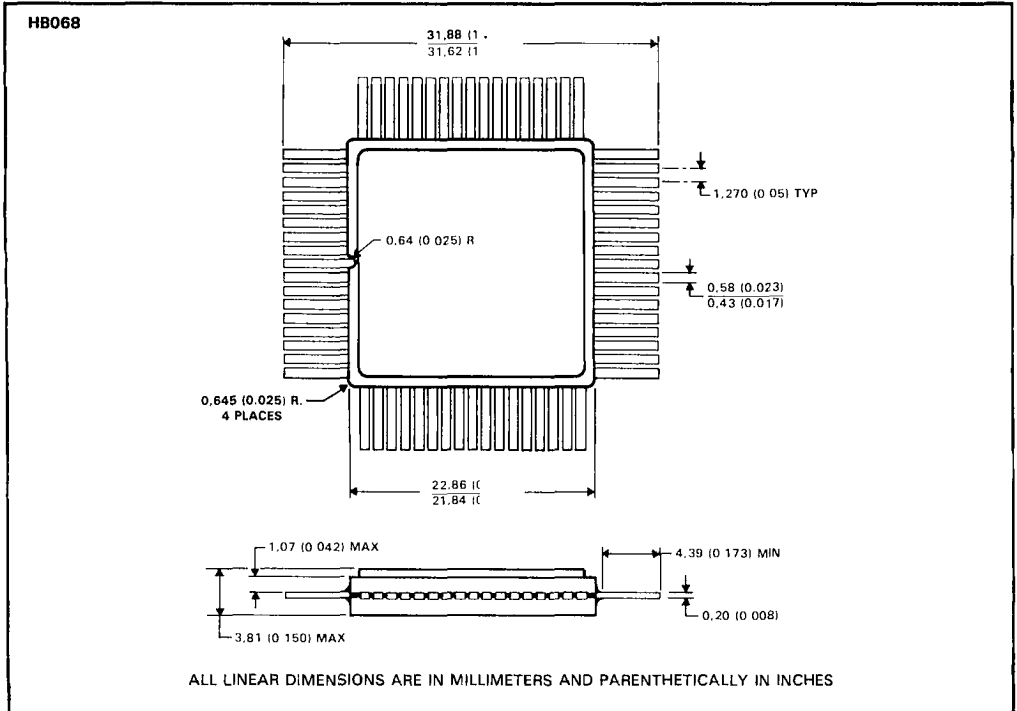
The 68-pin HA package is housed in a quadriform flat package. It is hermetically sealed with 0.05-inch-lead spacing configured with gull-wing bent leads for surface mounting capability.



# MECHANICAL DATA

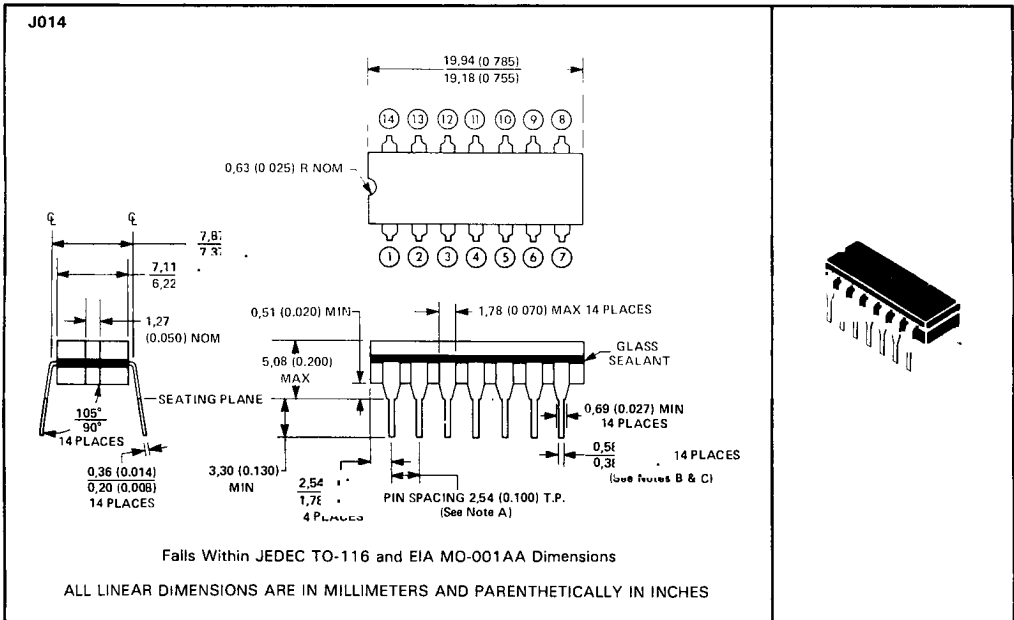
## HB068 quadriform flat package

The 68-pin HB package is housed in a quadriform flat package. It is hermetically sealed with 0.05-inch-lead spacing configured with straight leads for surface mounting capability.



**J014 ceramic dual-in-line package**

This hermetically sealed dual-in-line package consists of a ceramic base, ceramic cap, and a lead frame. Hermetic sealing is accomplished with glass. The package is intended for insertion in mounting-hole rows on 7,62 (0.300) centers. Once the leads are compressed and inserted, sufficient tension is provided to secure the package in the board during soldering. Tin-plated ("bright-dipped") leads require no additional cleaning or processing when used in soldered assembly.

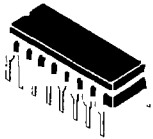
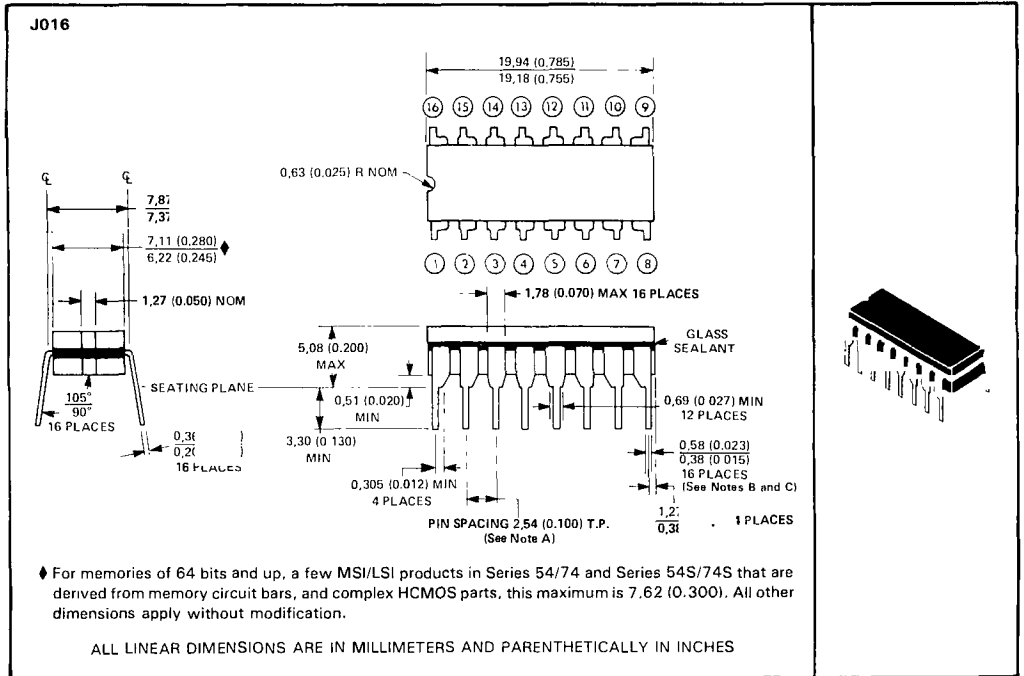


- NOTES: A. Each pin centerline is located within 0,25 (0,010) of its true longitudinal position.  
 B. This dimension does not apply for solder-dipped leads.  
 C. When solder-dipped leads are specified, dipped area of the lead extends from the lead tip to at least 0,51 (0,020) above the seating plane.

# MECHANICAL DATA

## J016 ceramic dual-in-line package

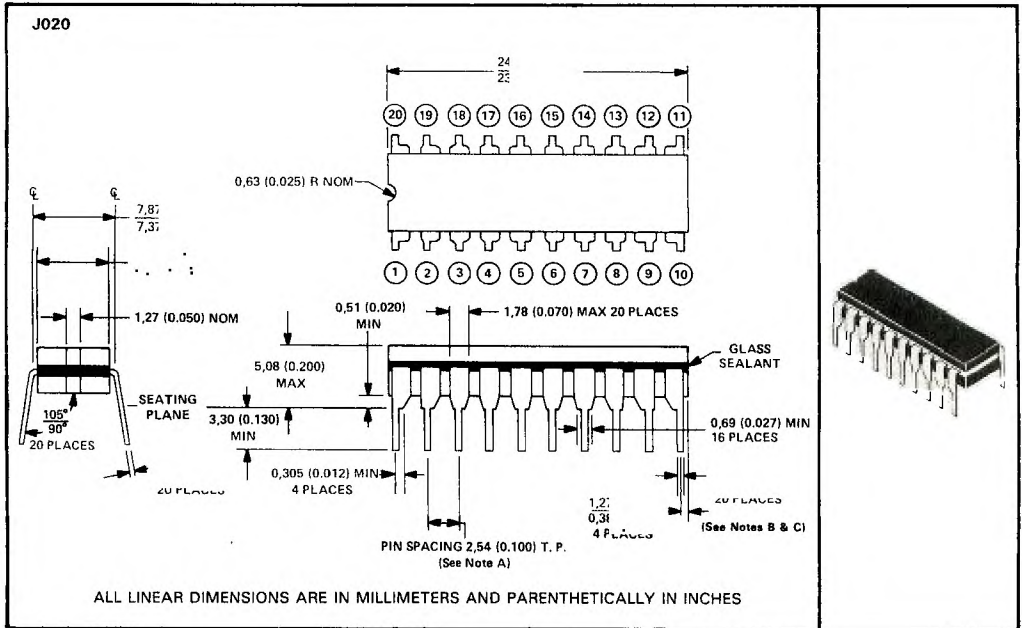
This hermetically sealed dual-in-line package consists of a ceramic base, ceramic cap, and a lead frame. Hermetic sealing is accomplished with glass. The package is intended for insertion in mounting-hole rows on 7,62 (0.300) centers. Once the leads are compressed and inserted, sufficient tension is provided to secure the package in the board during soldering. Tin-plated ("bright-dipped") leads require no additional cleaning or processing when used in soldered assembly.



- NOTES: A. Each pin centerline is located within 0,25 (0.010) of its true longitudinal position.  
 B. This dimension does not apply for solder-dipped leads.  
 C. When solder-dipped leads are specified, dipped area of the lead extends from the lead tip to at least 0,51 (0.020) above the seating plane.

**J020 ceramic dual-in-line package**

This hermetically sealed dual-in-line package consists of a ceramic base, ceramic cap, and a lead frame. Hermetic sealing is accomplished with glass. The package is intended for insertion in mounting-hole rows on 7,62 (0.300) centers. Once the leads are compressed and inserted, sufficient tension is provided to secure the package in the board during soldering. Tin-plated ("bright-dipped") leads require no additional cleaning or processing when used in soldered assembly.

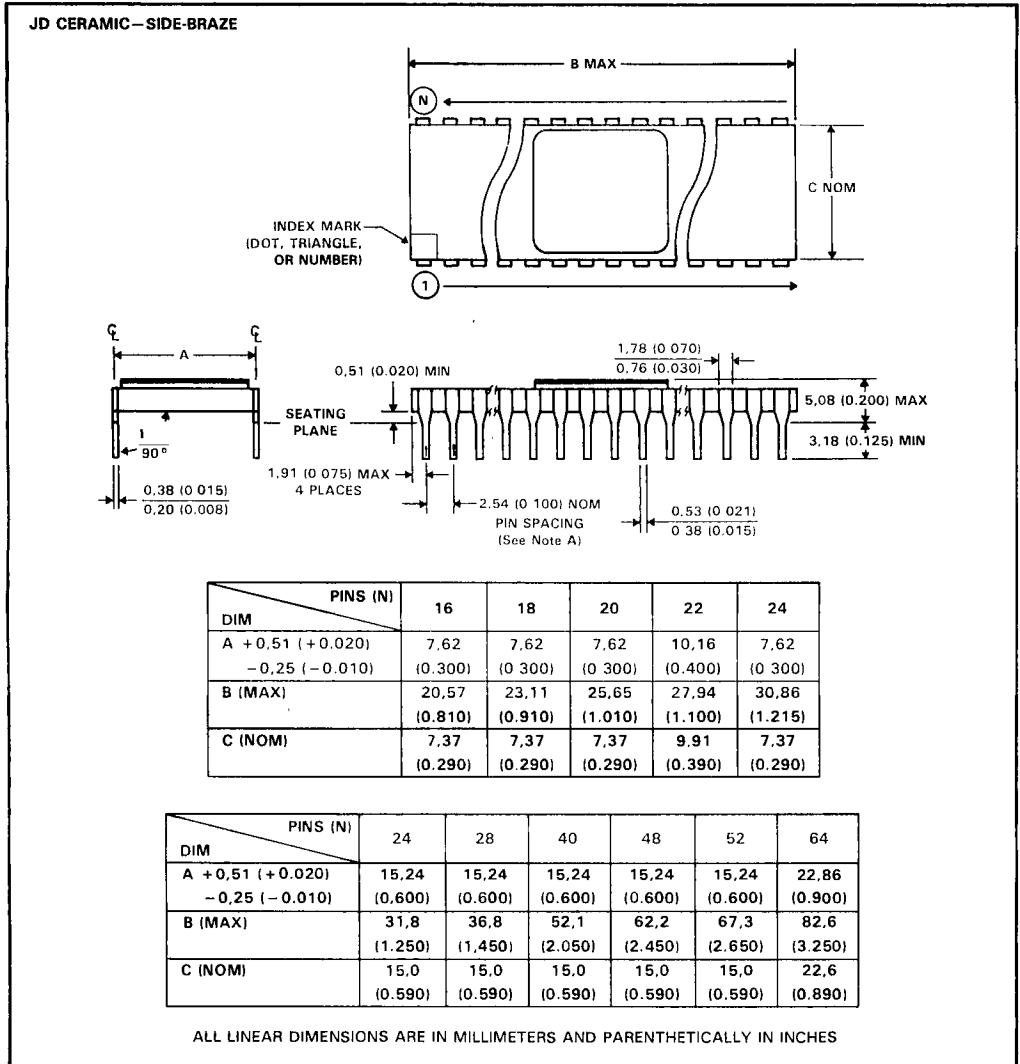


- NOTES: A. Each pin centerline is located within 0,25 (0.010) of its true longitudinal position.  
 B. This dimension does not apply for solder-dipped leads.  
 C. When solder-dipped leads are specified, dipped area of the lead extends from the lead tip to at least 0,51 (0.020) above the seating plane.

# MECHANICAL DATA

## JD ceramic side-braze dual-in-line packages

This is a hermetically sealed ceramic package with a metal cap and side-brazed tin-plated leads.

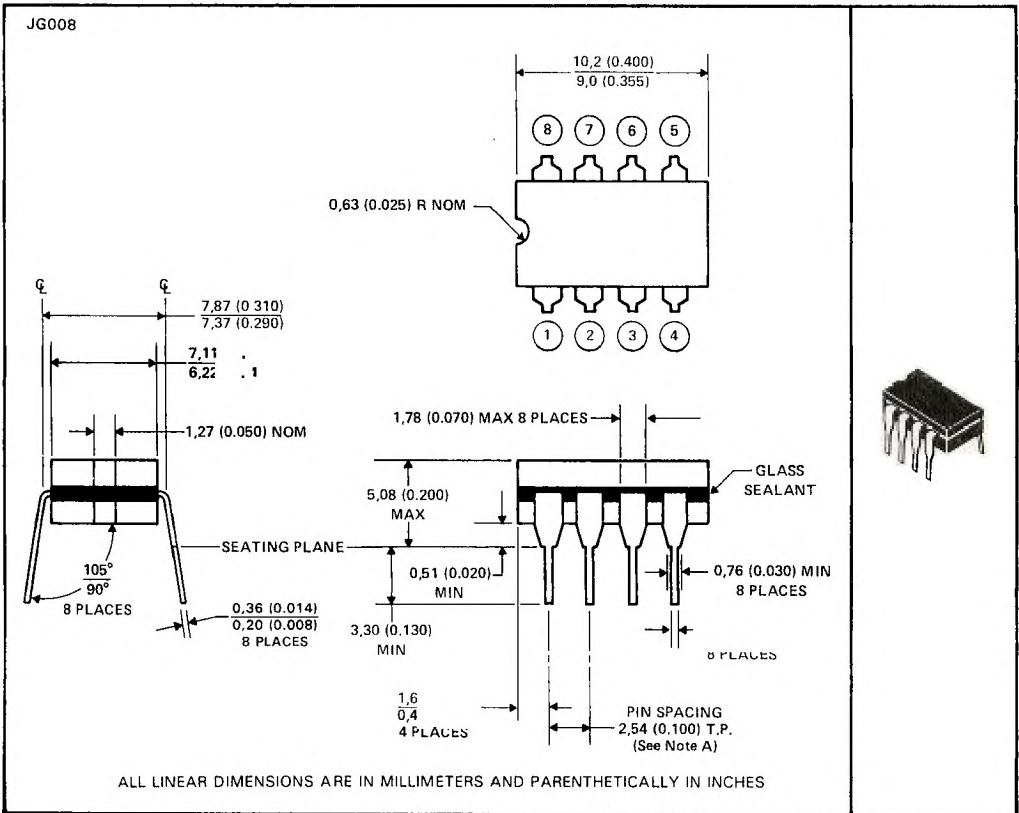


NOTE A: Each pin centerline is located within 0.25 (0.010) of its true longitudinal position.



JG008 ceramic dual-in-line package

This hermetically sealed dual-in-line package consists of a ceramic base, ceramic cap, and an 8-pin lead frame. The package is intended for insertion in mounting-hole rows 7,62 (0.300) centers (see Note A). Once the leads are compressed and inserted, sufficient tension is provided to secure the package in the board during soldering.

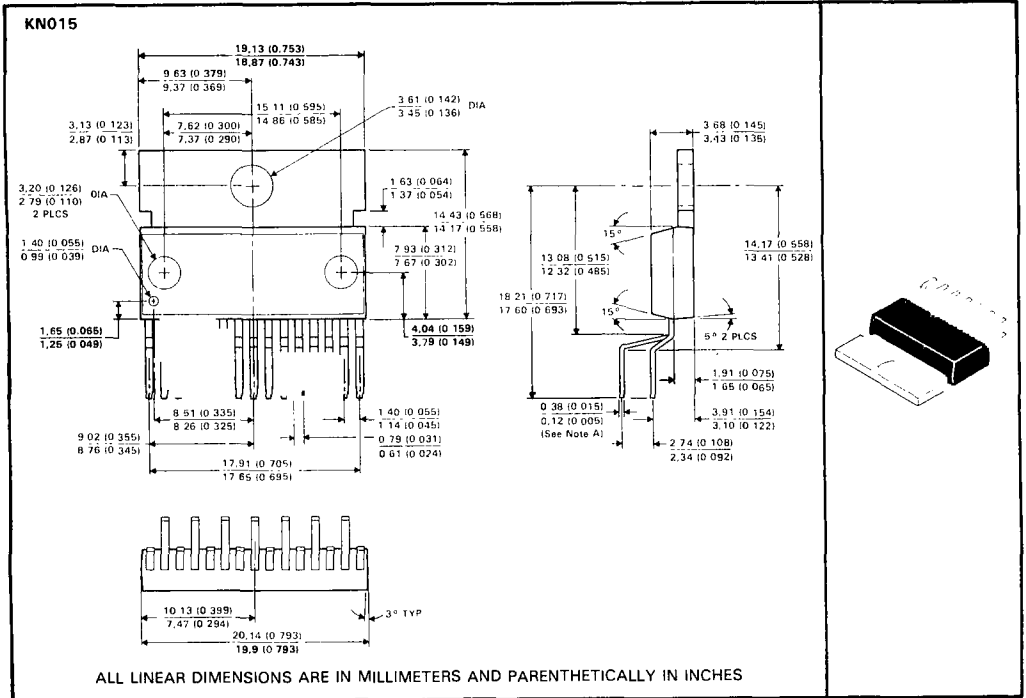


NOTE A: Each pin centerline is located within 0,25 (0.010) of its true longitudinal position.

# MECHANICAL DATA

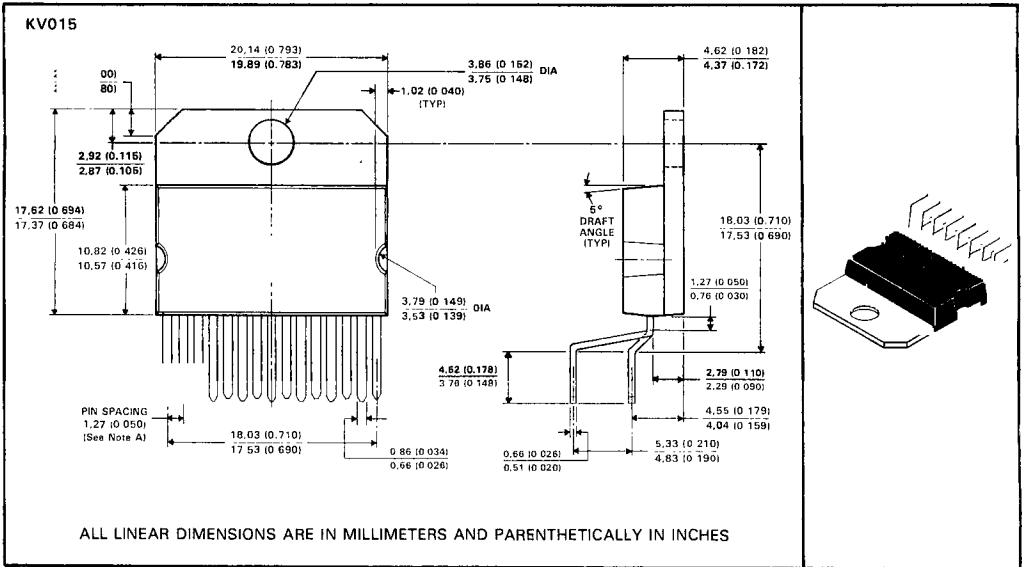
## KN015 plastic flange-mount package

This package comprises a circuit mounted on a lead frame and encapsulated within a plastic compound. The compound will withstand soldering temperature with no deformation, and circuit performance characteristics will remain stable when the package is operated under high-humidity conditions.



KV015 plastic package

This package consists of a circuit mounted on a lead frame and encapsulated within a plastic compound. The compound will withstand soldering temperature with no deformation, and circuit performance characteristics will remain stable when the package is operated under high-humidity conditions.

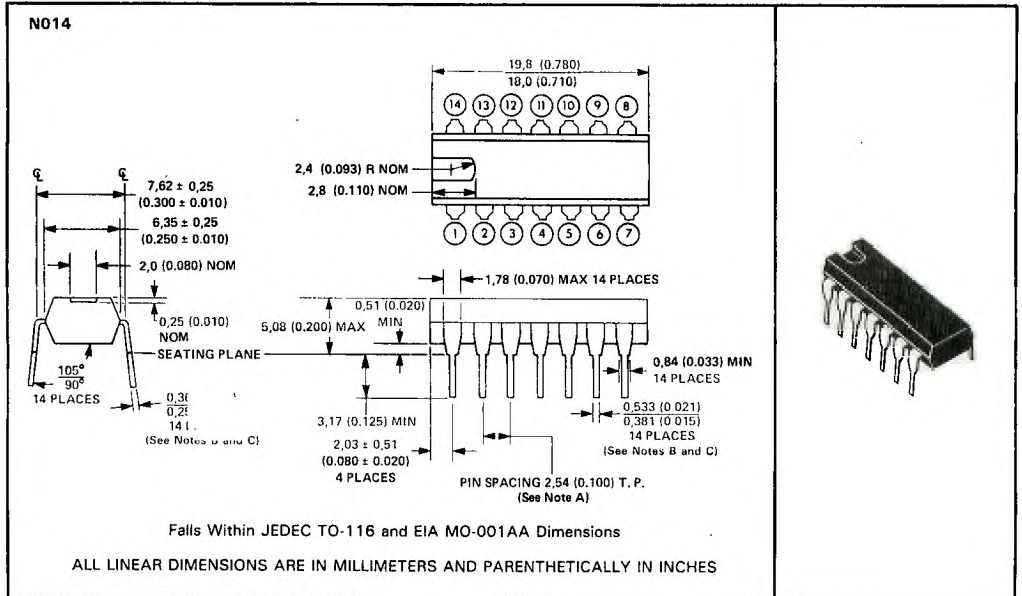


NOTE A: Leads are within 0.36 (0.014) radius of true position (T.P.) at maximum material conditions.

# MECHANICAL DATA

## N014 plastic dual-in-line package

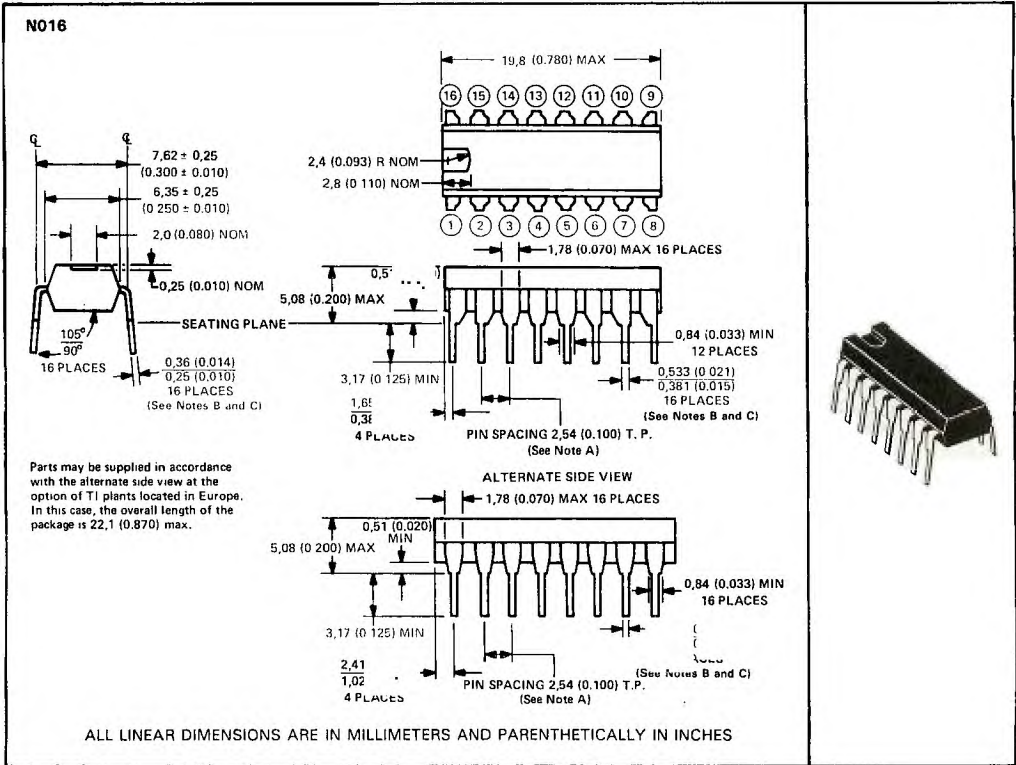
This dual-in-line package consists of a circuit mounted on a lead frame and encapsulated within a plastic compound. The compound will withstand soldering temperature with no deformation, and circuit performance characteristics will remain stable when operated in high-humidity conditions. The package is intended for insertion in mounting-hole rows on 7,62 (0.300) centers (see Note A). Once the leads are compressed and inserted, sufficient tension is provided to secure the package in the board during soldering. Leads require no additional cleaning or processing when used in soldered assembly.



- NOTES:
- Each pin centerline is located within 0,25 (0,010) of its true longitudinal position.
  - This dimension does not apply for solder-dipped leads.
  - When solder-dipped leads are specified, dipped area of the lead extends from the lead tip to at least 0,51 (0,020) above seating plane.

**N016 plastic dual-in-line package**

This dual-in-line package consists of a circuit mounted on a lead frame and encapsulated within an electrically nonconductive plastic compound. The compound will withstand soldering temperature with no deformation, and circuit performance characteristics will remain stable when operated in high-humidity conditions. The package is intended for insertion in mounting-hole rows on 7,62 (0.300) centers. Once the leads are compressed and inserted, sufficient tension is provided to secure the package in the board during soldering. Leads require no additional cleaning or processing when used in soldered assembly.

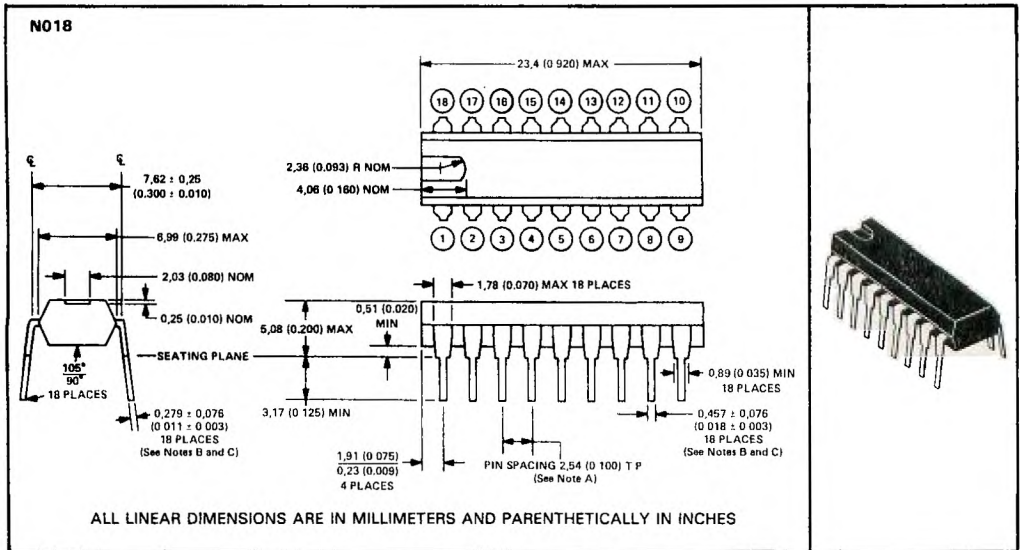


- NOTES: A. Each pin centerline is located within 0,25 (0.010) of its true longitudinal position.  
 B. This dimension does not apply for solder-dipped leads.  
 C. When solder-dipped leads are specified, dipped area of the lead extends from the lead tip to at least 0,51 (0.020) above seating plane.

# MECHANICAL DATA

## N018 plastic dual-in-line package

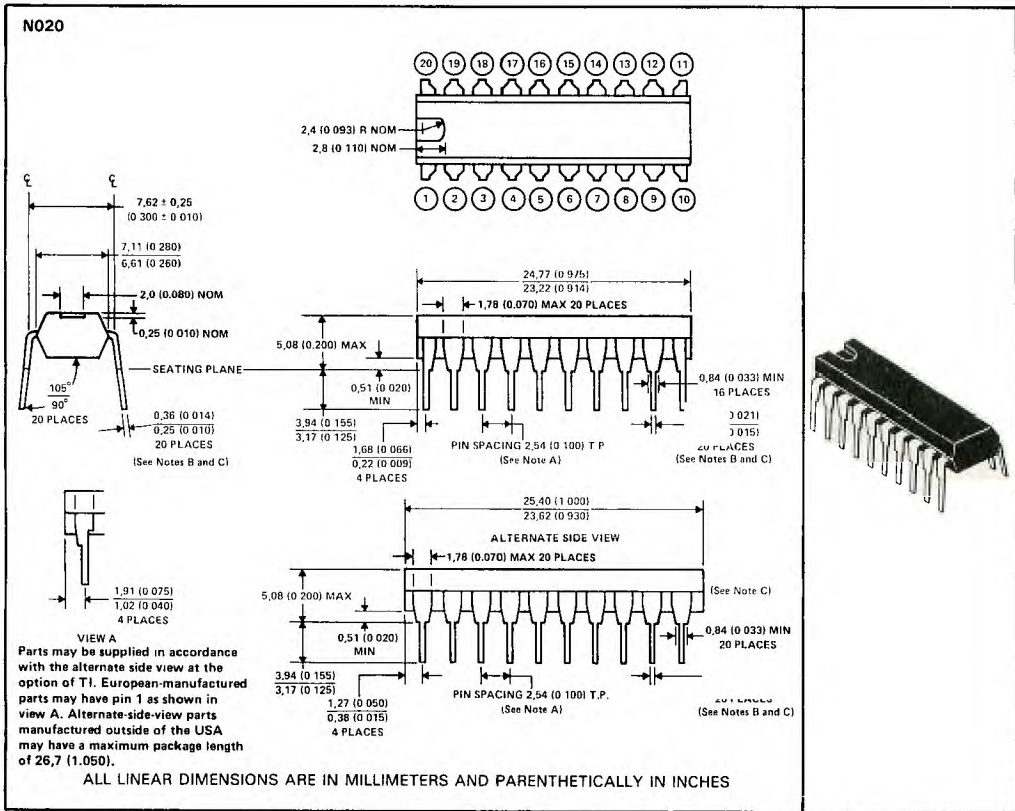
This dual-in-line package consists of a circuit mounted on a lead frame and encapsulated within an electrically nonconductive plastic compound. The compound will withstand soldering temperature with no deformation, and circuit performance characteristics will remain stable when operated in high-humidity conditions. The package is intended for insertion in mounting-hole rows on 7,62 (0.300) centers. Once the leads are compressed and inserted, sufficient tension is provided to secure the package in the board during soldering. Leads require no additional cleaning or processing when used in soldered assembly.



- NOTES:
- Each pin centerline is located within 0,25 (0.010) of its true longitudinal position.
  - This dimension does not apply for solder-dipped leads.
  - When solder-dipped leads are specified, dipped area of the lead extends from the lead tip to at least 0,51 (0.020) above seating plane.

**N020 plastic dual-in-line package**

This dual-in-line package consists of a circuit mounted on a lead frame and encapsulated within an electrically nonconductive plastic compound. The compound will withstand soldering temperature with no deformation, and circuit performance characteristics will remain stable when operated in high-humidity conditions. The package is intended for insertion in mounting-hole rows on 7,62 (0.300) centers. Once the leads are compressed and inserted, sufficient tension is provided to secure the package in the board during soldering. Leads require no additional cleaning or processing when used in soldered assembly.

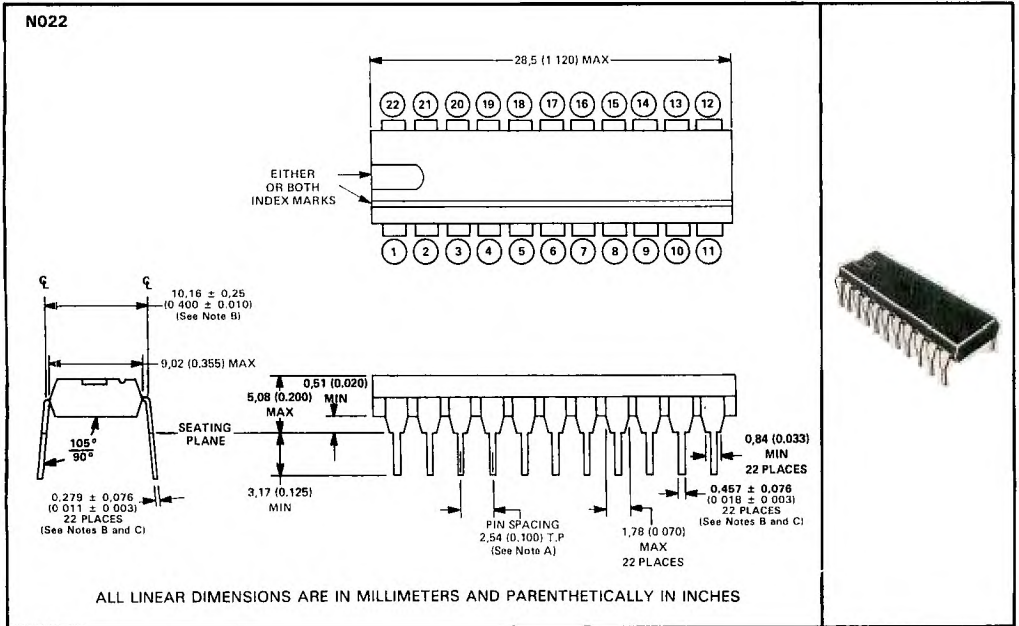


NOTES: A. Each pin centerline is located within 0,25 (0.010) of its true longitudinal position.  
 B. This dimension does not apply for solder-dipped leads.  
 C. When solder-dipped leads are specified, dipped area of the lead extends from the lead tip to at least 0,51 (0.020) above seating plane.

# MECHANICAL DATA

## N022 plastic dual-in-line package

This dual-in-line package consists of a circuit mounted on a lead frame and encapsulated within an electrically nonconductive plastic compound. The compound will withstand soldering temperature with no deformation, and circuit performance characteristics will remain stable when operated in high-humidity conditions. The package is intended for insertion in mounting-hole rows on 10,16 (0.400) centers. Once the leads are compressed and inserted, sufficient tension is provided to secure the package in the board during soldering. Leads require no additional cleaning or processing when used in soldered assembly.

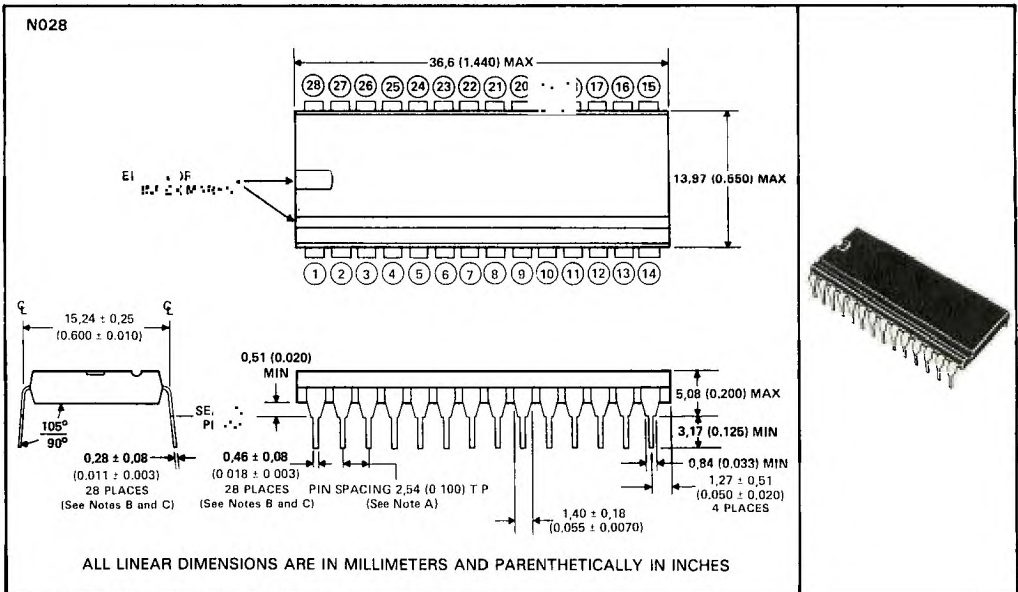


- NOTES: A. Each pin centerline is located within 0,25 (0.010) of its true longitudinal position.  
 B. This dimension does not apply for solder-dipped leads.  
 C. When solder-dipped leads are specified, dipped area of the lead extends from the lead tip to at least 0,51 (0.020) above seating plane.



**N028 plastic dual-in-line package**

This dual-in-line package consists of a circuit mounted on a lead frame and encapsulated within an electrically nonconductive plastic compound. The compound will withstand soldering temperature with no deformation, and circuit performance characteristics will remain stable when operated in high-humidity conditions. The package is intended for insertion in mounting-hole rows on 15,24 (0.600) centers. Once the leads are compressed and inserted, sufficient tension is provided to secure the package in the board during soldering. Leads require no additional cleaning or processing when used in soldered assembly.

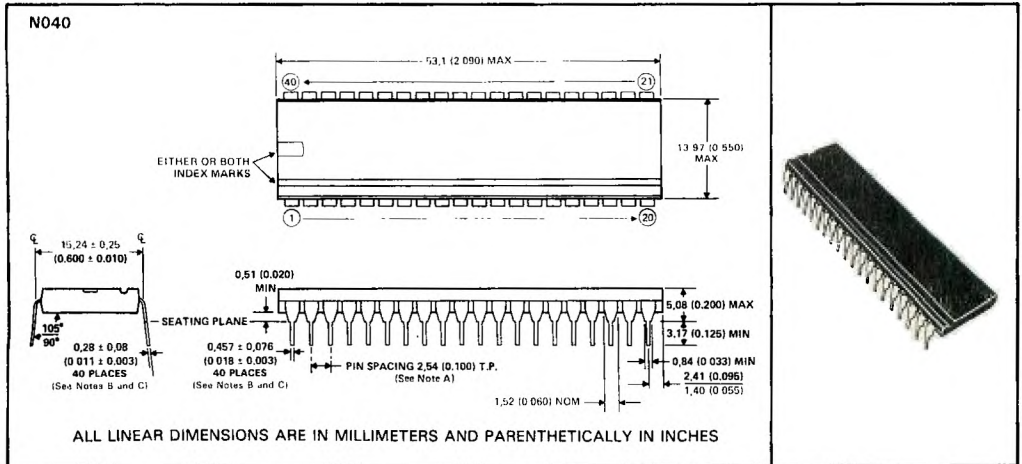


- NOTES: A. Each pin centerline is located within 0,25 (0.010) of its true longitudinal position.  
 B. This dimension does not apply for solder-dipped leads.  
 C. When solder-dipped leads are specified, dipped area of the lead extends from the lead tip to at least 0,51 (0.020) above seating plane.

# MECHANICAL DATA

## N040 plastic dual-in-line package

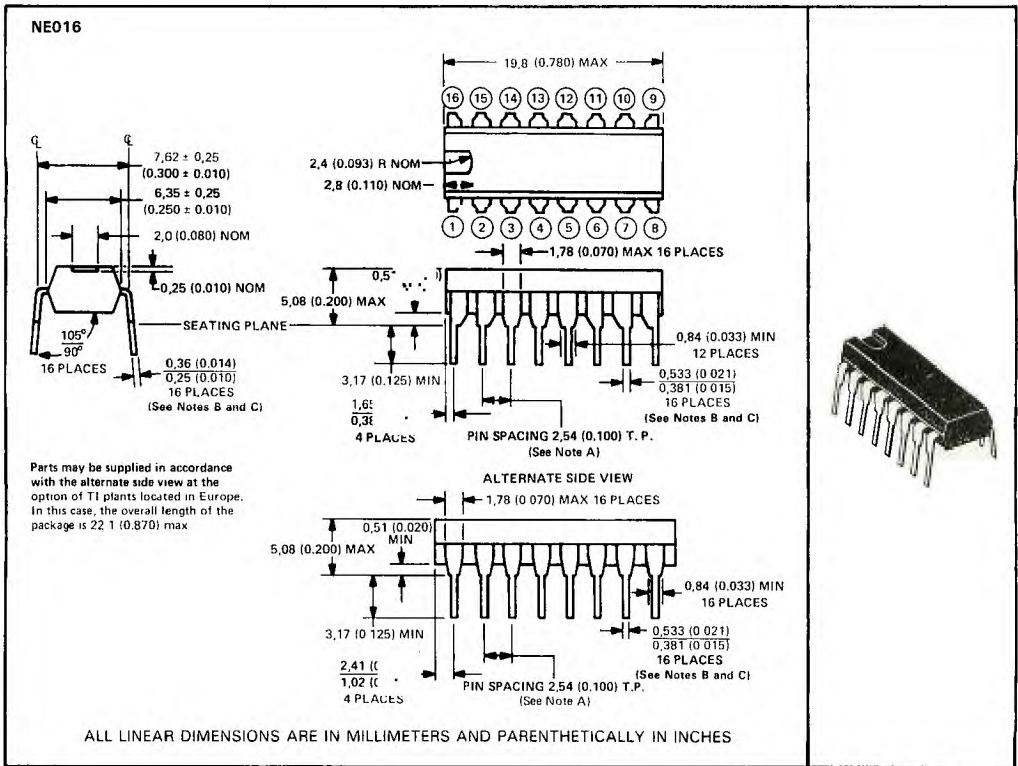
This dual-in-line package consists of a circuit mounted on a lead frame and encapsulated within an electrically nonconductive plastic compound. The compound will withstand soldering temperature with no deformation, and circuit performance characteristics will remain stable when operated in high-humidity conditions. The package is intended for insertion in mounting-hole rows on 15,24 (0.600) centers. Once the leads are compressed and inserted, sufficient tension is provided to secure the package in the board during soldering. Leads require no additional cleaning or processing when used in soldered assembly.



- NOTES: A. Each pin centerline is located within 0,25 (0.010) of its true longitudinal position.  
 B. This dimension does not apply for solder-dipped leads.  
 C. When solder-dipped leads are specified, dipped area of the lead extends from the lead tip to at least 0,51 (0.020) above seating plane.

NE016 plastic dual-in-line package

This dual-in-line package consists of a circuit mounted on a 16-pin lead frame and encapsulated within an electrically nonconductive plastic compound. The compound will withstand soldering temperature with no deformation, and circuit performance characteristics will remain stable when operated in high-humidity conditions. For better heat dissipation there are internal tabs connecting the two central leads on each side of the 16-pin package. The package is intended for insertion in mounting-hole rows on 7,62 (0.300) centers. Once the leads are compressed and inserted, sufficient tension is provided to secure the package in the board during soldering. Leads require no additional cleaning or processing when used in soldered assembly.

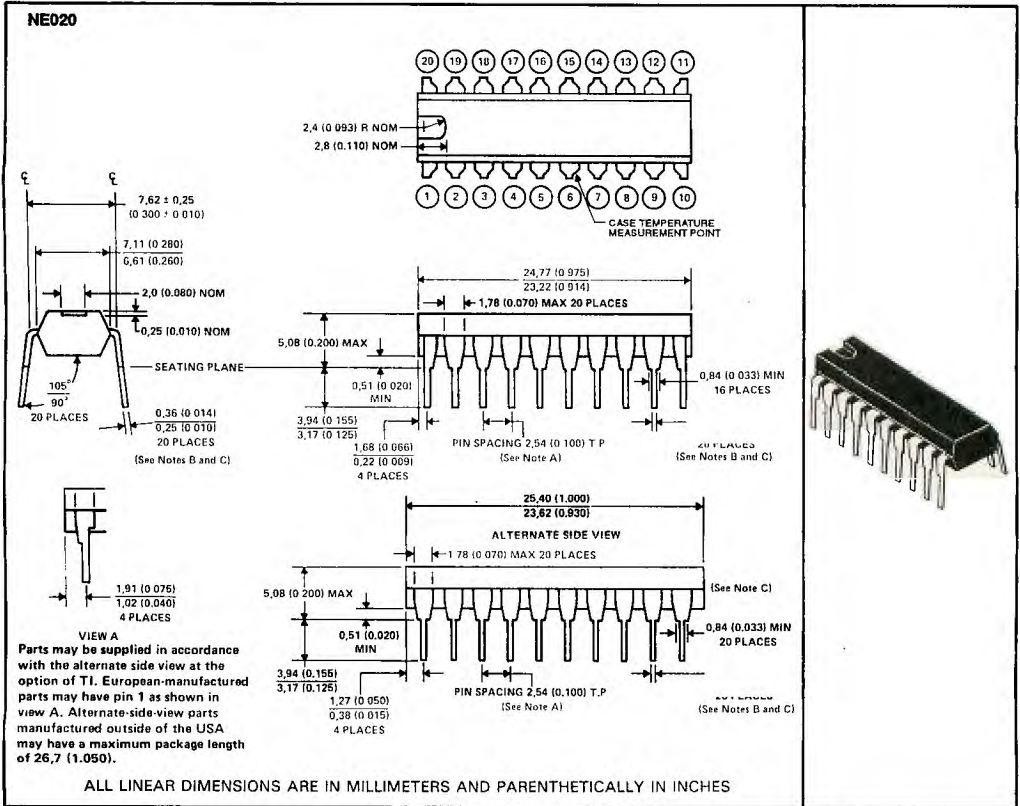


- NOTES: A. Each pin centerline is located within 0,25 (0.010) of its true longitudinal position.  
 B. This dimension does not apply for solder-dipped leads.  
 C. When solder-dipped leads are specified, dipped area of the lead extends from the lead tip to at least 0,51 (0.020) above seating plane.

# MECHANICAL DATA

## NE020 plastic dual-in-line package

This dual-in-line package consists of a circuit mounted on a lead frame and encapsulated within an electrically nonconductive plastic compound. The compound will withstand soldering temperature with no deformation, and circuit performance characteristics will remain stable when operated in high-humidity conditions. For better heat dissipation there are internal tabs connecting the two central leads on each side of the 20-pin package. The package is intended for insertion in mounting-hole rows on 7,62 (0.300) centers. Once the leads are compressed and inserted, sufficient tension is provided to secure the package in the board during soldering. Leads require no additional cleaning or processing when used in soldered assembly.

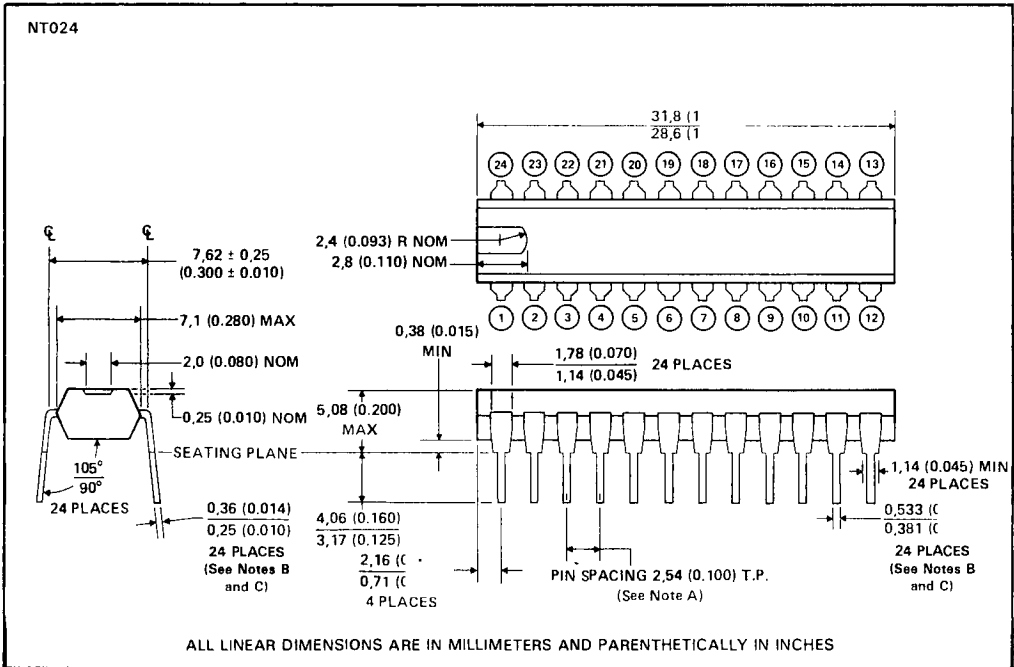


- NOTES: A. Each pin centerline is located within 0,25 (0,010) of its true longitudinal position.  
 B. This dimension does not apply for solder-dipped leads.  
 C. When solder-dipped leads are specified, dipped area of the lead extends from the lead tip to at least 0,51 (0,020) above seating plane.

**NT024 plastic dual-in-line package**

This dual-in-line package consists of a circuit mounted on a lead frame and encapsulated within an electrically nonconductive plastic compound. The compound will withstand soldering temperature with no deformation, and circuit performance characteristics will remain stable when operated in high-humidity conditions. The package is intended for insertion in mounting-hole rows on 7,62 (0.300) centers. Once the leads are compressed and inserted, sufficient tension is provided to secure the package in the board during soldering. Leads require no additional cleaning or processing when used in soldered assembly.

NOTE: For all except 24-pin packages, the letter N is used by itself since only the 24-pin package is available in more than one row-spacing. For the 24-pin package, the 7,62 (0.300) version is designated NT; the 15,24 (0.600) version is designated NW. If no second letter or row-spacing is specified, the package is assumed to have 15,24 (0.600) row-spacing.

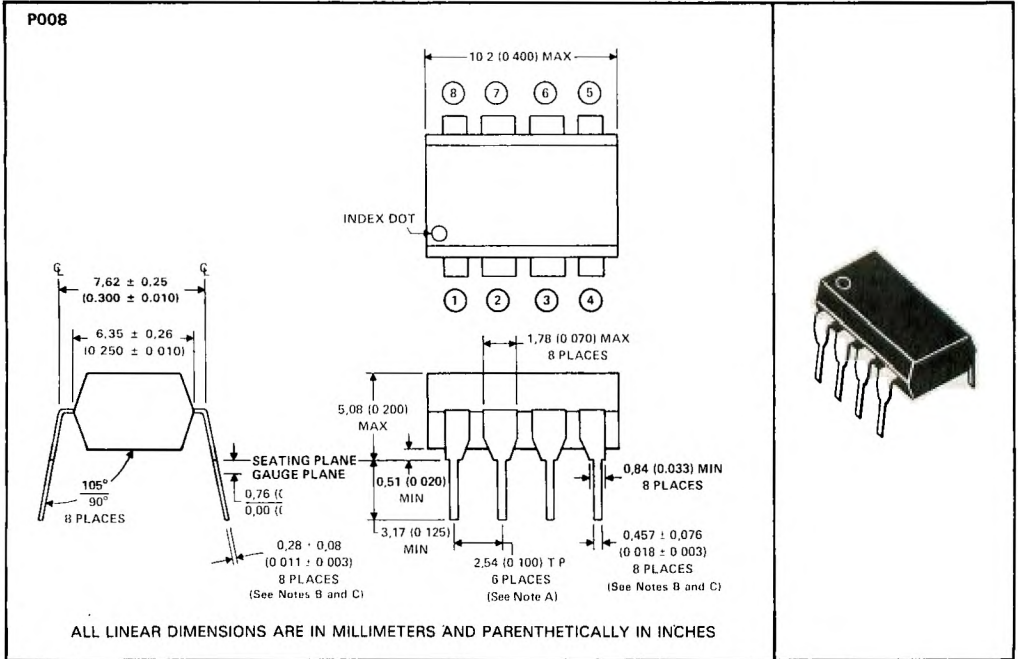


- NOTES: A. Each pin centerline is located within 0,25 (0.010) of its true longitudinal position.  
 B. This dimension does not apply for solder-dipped leads.  
 C. When solder-dipped leads are specified, dipped area of the lead extends from the lead tip to at least 0.51 (0.020) above the seating plane.

# MECHANICAL DATA

## P008 dual-in-line plastic package

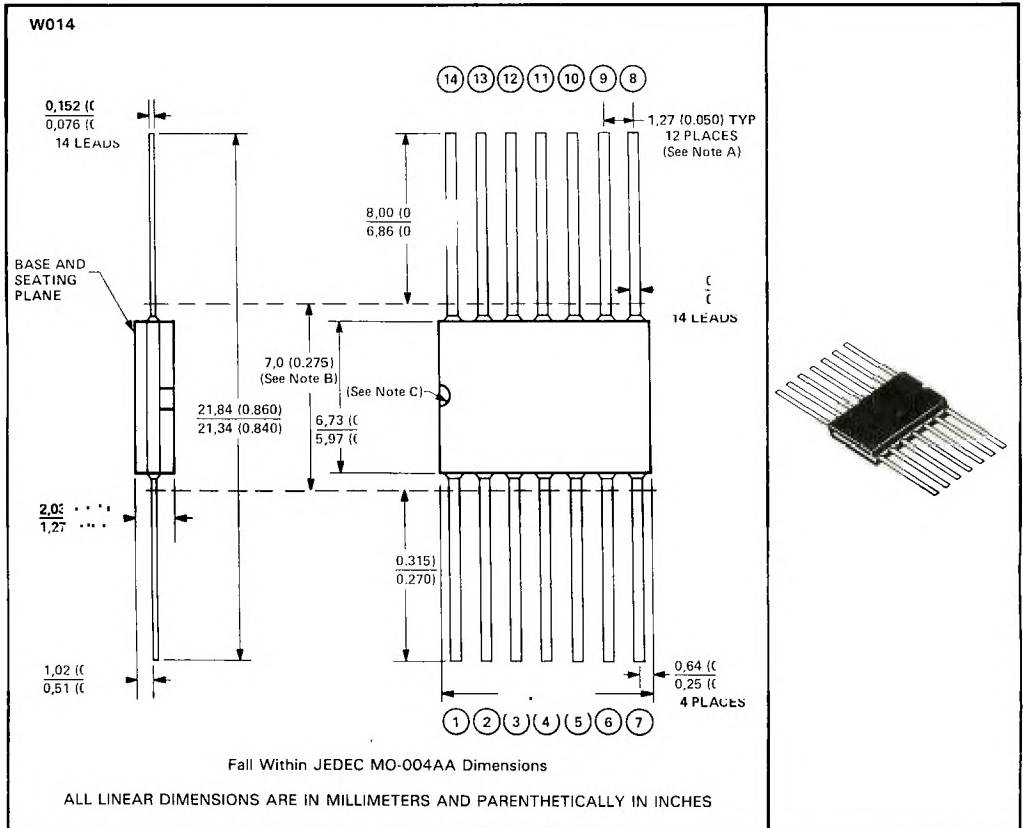
This package consists of a circuit mounted on an 8-pin lead frame and encapsulated within a plastic compound. The compound will withstand soldering temperature with no deformation, and circuit performance characteristics will remain stable when operated in high-humidity conditions. The package is intended for insertion in mounting-hole rows on 7,62 (0.300) centers (See Note A). Once the leads are compressed and inserted, sufficient tension is provided to secure the package in the board during soldering. Solder-plated leads require no additional cleaning or processing when used in soldered assembly.



- NOTES: A. Each pin centerline is located within 0.25 (0.010) of its true longitudinal position.  
 B. This dimension does not apply for solder-dipped leads.  
 C. When solder-dipped leads are specified, dipped area of the lead extends from the lead tip to at least 0.51 (0.020) above seating plane.

**W014 ceramic flat package**

This hermetically sealed flat package consists of an electrically nonconductive ceramic base and cap and a lead frame. Hermetic sealing is accomplished with glass. Leads require no additional cleaning or processing when used in soldered assembly.



- NOTES: A. Leads are within 0.13 (0.005) radius of true position (T.P.) at maximum material condition.  
 B. This dimension determines a zone within which all body and lead irregularities lie.  
 C. Index point is provided on cap for terminal identification only.