

INCH - POUND

MIL-STD-1835

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MILITARY STANDARD

MICROCIRCUIT CASE OUTLINES



AMSC/NA

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MIL-STD-1835

FOREWORD

1. This military standard is approved for use by all Departments and Agencies of the Department of Defense.
2. Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: Rome Laboratory, ATTN: ERSS, Griffiss AFB, NY 13441-5700, by using the Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.
3. The Department of Defense is committed to identifying and using standard electronic parts at reasonable cost and highest reliability. The electronic package case outline is important in this context, and must be selected with this objective in mind.
4. Significant changes have occurred in the design, manufacturer, and variety of electronic device encapsulation and attachment methods. These changes are reflected in this standard with new and revised package case outlines.
5. Before the publication of this standard, electronic package case outlines were listed in appendix C to MIL-M-38510.

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1. SCOPE

1.1 Scope. This standard establishes and maintains a compilation of microelectronic package case outlines and should be useful to all levels of manufacturing that culminate in the production of reliable and logistically supportable military electronic equipment.

1.2 Purpose. The purpose of this standard is to assure complete mechanical interchangeability of all microelectronic package case outlines of a particular style and type, regardless of source, commensurate with the requirements of high density military electronic equipment manufacturing.

1.2.1 Tailoring. Some tailoring of package case outlines is to be accomplished by users of this standard. Details for tailoring are presented with each style of package case outline (when required, see 3.1.2.4 and 6.2).

1.2.2 Classification. Microelectronic package case outlines are of the styles and types identified in accordance with the descriptive designation system used herein (see 4.7). A cross-reference is included in section 6 indicating the relationship between old designations from MIL-M-38510 appendix C and the new designations used herein.

1.2.3 Package case outline presentation. All package case outlines presented in this standard are drawn in orthogonal projections. Dimensions are as shown, presented in both inch and meter units of measurement. The dimensions are labeled with the symbols listed in the appendix, (see 4.4). The drawings are intended only as illustrations of a package style. In some instances, the drawings show added detail for emphasis; in most instances, the drawings are distorted by intent.

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2. APPLICABLE DOCUMENTS

2.1 Government documents.

2.1.1 Specifications, standards, and handbooks. The following specifications, standards, and handbooks form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those listed in the issue of the Department of Defense Index of Specifications and Standards (DODISS) and supplement thereto, cited in the solicitation.

SPECIFICATIONS

MILITARY

MIL-M-38510	-	Microcircuits, General Specification for.
MIL-H-38534	-	Hybrid Microcircuits, General Specification for.
MIL-I-38535	-	Integrated circuits (Microcircuits) Manufacturing, General Specification for.

(Unless otherwise indicated, copies of federal and military specifications, standards, and handbooks are available from the Standardization Documents Order Desk, Building 4D, 700 Robbins Avenue, Philadelphia, PA 19111-5094. Not more than five items may be ordered on a single request; the invitation for bid or contract number should be cited, where applicable. Request all items by document number. For information on subscription services, direct inquiries to the above address or telephone (215) 697-3321, Inquiry Desk.)

2.2 Non-Government publications. The following documents form a part of this document to the extent specified herein. Unless otherwise specified, the issues of the documents which are indicated as DoD adopted are those listed in the issue of the DODISS cited in the solicitation. Unless otherwise specified, the issues of documents not listed in the DODISS are the issues of the documents cited in the solicitation.

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI Y14.5M-1982 - Dimensioning and Tolerancing. (DoD adopted)

(Application for copies should be addressed to the American National Standards Institute, Incorporated, 1430 Broadway, New York, NY 10018).

ELECTRONIC INDUSTRIES ASSOCIATION (EIA)

JEDEC Publication 95 - Registered and Standard Outlines for Solid State Products.

(Application for copies should be addressed to the Electronic Industries Association, 2001 Pennsylvania Avenue (9th floor) N.W., Washington, DC 20006).

(Non-Government standards and other publications are normally available from the organizations that prepare or distribute the documents. These documents may also be available in or through libraries or other informational services.)

2.3 Order of precedence. In the event of a conflict between the text of this document and the references cited herein, the text of this document takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

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3. DEFINITIONS

3.1 Definitions. For the purpose of this standard, the definitions contained in the military specifications and standards referenced in 2.1.1, and other military specifications and standards as applicable, shall apply. The following definitions shall also apply.

3.1.1 Microelectronic device case outline (package). The embodiment of the external geometric characteristics of a microelectronic device including dimensions and dimensional tolerances. Hereafter, the case outline will be referred to as a package.

3.1.2 Configuration. The relative disposition of the external elements of a package including lead form.

3.1.3 Package style. All packages whose generic design and nomenclature are identical.

3.1.4 Package type. A package with a unique case outline, configuration, materials (including bonding wire and die attach), piece parts (excluding preforms which differ only in size), and assembly processes.
1/

3.1.5 Chip carrier (CC) package. A rectangular or square package having terminals on all four sides of the package periphery.

3.1.6 Can package. A cylindrical shaped package with leads attached to one end.

3.1.7 In-Line package (IP). A rectangular package having one row (or two or more parallel rows) of terminals oriented perpendicular to the package seating plane.

3.1.8 Flat package (FP). A rectangular or square package with leads attached on two opposing sides of the package periphery.

3.1.9 Grid array (GA) package. A rectangular or square package with terminals attached perpendicular to a "major surface" in a grid matrix.

3.1.10 Index. A unique mechanical or visual (or both) package feature which (using package orientation rules in accordance with JEDEC Publication 95) identifies the location of the first terminal position, (e.g., reference mark, extended terminal, chamfer, tab, notch, flat, groove, etc.). The index location varies with different package styles, but only as specified herein.

3.1.11 Index area. The area in which all or a portion of the index must be located.

3.1.12 Base plane. The reference plane, parallel to the nominal seating plane, through the lowest plane on the body of a package.

3.1.13 Seating plane. The reference plane which designates the interface of the package terminals with the mounting surface to which the terminals are attached, (for DIP's, see 5.2.4).

3.1.14 Coplanarity. Coplanarity is the condition of two or more surfaces having all elements in one plane, (e.g., the seating plane of all the leads on a microelectronic device, see 5.2.7).

1/ This definition of package type is taken from MIL-M-38510. Note, however, that this standard does not specify package interior attributes.

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3.1.15 Dimension. A numerical value expressed in appropriate units of measure and indicated on a drawing and in other documents along with lines, symbols, and notes to define the size or geometric characteristic, or both, of a part or part feature. 2/

3.1.16 Reference dimension. A dimension, usually without tolerance, used for information purposes only. It is considered auxiliary information and does not govern production or inspection operations. A reference dimension is a repeat of a dimension or is derived from other values shown on the drawing or on related drawings. 2/

3.1.17 Basic dimension (BSC). A numerical value used to describe the theoretically exact size, profile, orientation, or location of a feature or datum target. It is the basis from which permissible variations are established by tolerances on other dimensions, in notes, or in feature control frames. 2/

3.1.18 True position. The theoretically exact location of a feature established by basic dimensions. 2/

3.1.19 Datum. A theoretically exact point, axis, or plane derived from the true geometric counterpart of a specified datum feature. A datum is the origin from which the location or geometric characteristics of features of a part are established. 2/

3.1.20 Land. A portion of a conductive pattern usually, but not exclusively, used for the connection, or attachment, or both of components.

3.1.21 Land pattern. A combination of lands intended for the mounting and interconnection of a particular component.

3.1.22 Lead position overlay. An optical gauge used to measure lead dimensions, land pattern, and other package feature-relating requirements.

3.1.23 Cavity-up, cavity-down. The orientation of the package body cavity opening, away from the seating plane for cavity-up or toward the seating plane for cavity-down (see 5.2.8).

3.1.24 Tailoring. The process by which package requirements are evaluated to determine the extent to which they are most suitable for military systems and equipment applications; and modified as permitted by this standard, and as necessary to ensure application suitability (see 6.2).

2/ From ANSI Y14.5M 1982, see 2.2.

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4. GENERAL REQUIREMENTS

4.1 Package design. Package design shall be in accordance with this standard.

4.2 Package terminal identification. Package terminal identification shall be in accordance with the applicable military detail specification.

4.3 Package index implementation. A permanent index shall be clearly visible on the top and, as an added option, bottom of a package. The index shall be used for locating terminal 1. The location of the index shall be as specified on the figures for each package style (see table VI).

4.4 Package dimensions and symbols. The package dimensions shall be in accordance with this standard. All dimensions shall apply to assembled sealed packages. Symbols and tolerances shall be interpreted in accordance with ANSI Y14.5M-1982 and this standard. Unless otherwise specified, the package design controlling dimension shall be the inch. For all new package designs after January 1, 1992, it shall be the meter.

4.5 Dimension verification. Unless otherwise specified, dimensions identified by a single symbol, which are repeated at more than 15 package locations may be verified by measurement at 15 randomly selected locations on the package. All package dimensions may be verified using calibrated gauges, overlays, or other comparative dimension verification devices. These devices shall be designed to the limits of size and relative location of package features. These devices and their application shall be subject to the approval of the qualifying activity. Recorded variables data for out of tolerance package features shall be available for review by the qualifying activity.

4.6 Package material characteristics. Package material characteristics, including internal elements that contribute to the uniqueness of a package type, shall be in accordance with the requirements of the military detail specification.

4.7 Package descriptive designation system. This standard uses a descriptive designation system to communicate package identification (see figure 1). This system describes materials, terminal location, package case outline style, lead form, terminal count, and options. A type designator has been constructed, using this system, for all packages in this standard (see tables VI and VII). The type designators for packages selected from this standard shall be referenced in applicable military detail specifications. See the example on figure 2.

4.7.1 Case outline letter/Part or Identifying Number (PIN) designator. The PIN case outline letter designator shall be as specified herein and shall be referenced in applicable military detail specifications. The case outline designator may include numbers or letters with the following limitations:

- a. The letters "I" and "O" shall not be used.
- b. The numbers "0", and "1" shall not be used.
- c. The letters X, Y, Z, U, T, M, N, and the numbers 4, 5, 6, 7, 8, and 9 are undedicated "wildcards"; they may be used repeatedly, but only one time in a single military detail specification, see the example using the letter "X" on figure 2.
- d. Blank spaces are not permitted.

4.8 Inactive for new design. The packages in table VII are inactive for new design, but are active for support of equipment existing before the first issue date of this standard. Some "Flatpack" packages listed as inactive herein, have been inactive for new design since 29 November 1986. See section 3 of MIL-M-38510 for details.

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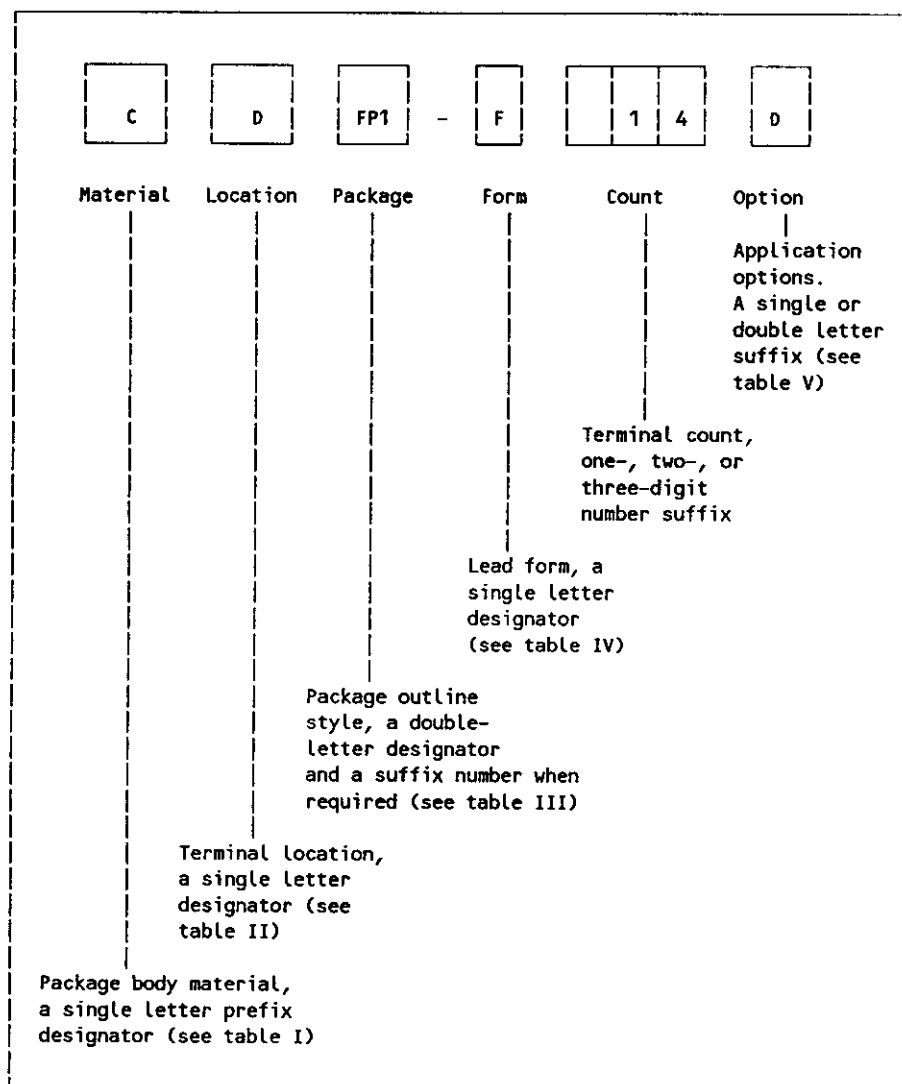


FIGURE 1. Package descriptive designation system.

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TABLE I. Predominant package body material prefixes.

Code	Material
C	Cofired ceramic, metal-seal
G	Ceramic, glass-seal
L	Glass
M	Metal
X	Other

TABLE II. Terminal location prefixes.

Code	Name	Location
A	Axial	Terminals extend from one end in the direction of the major axis of a cylindrical or elliptical package.
B	Bottom	Terminals beneath the seating plane of the package.
D	Dual	Terminals in two parallel rows oriented perpendicular or parallel to the seating plane.
M	Matrix	Terminals in 3 or more rows and columns oriented perpendicular to the seating plane, parallel to each other.
Q	Quad	Terminals on all four sides of a square or rectangular package, orientated perpendicular or parallel to the seating plane.
S	Single	Terminals are on one surface of a square or rectangular package in a single row.
X	Other	Terminal location other than those described (see table V footnotes).

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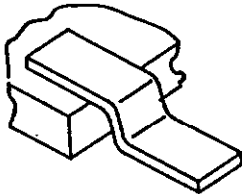
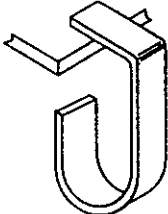
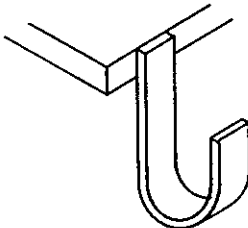
TABLE III. Package outline style codes.

Code ^{1/}	Style
CC	Chip-carrier package, square or rectangular body profile
CY	Cylinder or can package, round body profile
FM	Flange mount package, variable body profile
FP	Flat pack package, square or rectangular body profile
GA	Grid-array package, square or rectangular body profile
IP	In-line package, rectangular body profile (e.g., DIP/SIP/ZIP)
SS	Special-shape package

^{1/} The package outline style will be followed with a suffix number when additional differentiation is required.

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TABLE IV. Lead-form (or terminal shape) suffixes.

Code	Form/shape	Description
F	Flat	A nonformed flat (nonround) lead extending parallel to the seating plane.
G	Gullwing	<p>The "gullwing" lead is shaped as follows:</p> 
J	"J" bend	<p>The "J" lead is shaped as follows:</p> 
N	No lead	Metallized terminal pads located on the body of the package.
P	Pin/Peg	A tempered lead extending from the body of the package and intended for attachment to a plated through-hole in the land structure.
T	Through hole	A straight lead extending perpendicular to the seating plane.
U	"J" reversed	<p>The reversed "J" lead is shaped as follows:</p> 
X	Other	A lead form or terminal shape other than those defined.

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TABLE V. Package design options

Code	Options <u>1/</u>
A	Additional terminal pads added on the top of leadless chip carrier style packages
B	Cofired metal heat conduction pads; as specified herein or in the applicable military detail specification
C	Cavity up
D	Cavity down
E	Window lid
G, H, K, L	Other; as specified in the applicable military detail specification

NOTES:

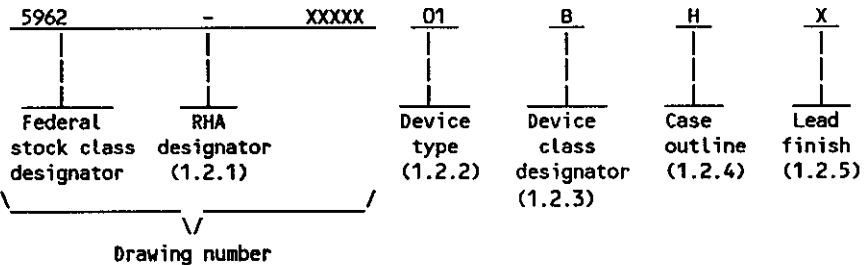
1/ When option letters G, H, K, or L are used, they delineate packages that are the same style and terminal count but not the same in other ways such as dimension variations, terminal location within a GA matrix, or any package terminal attachment positions other than as specified herein.

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1. SCOPE

1.1 Scope. This drawing forms a part of a one part - one part number. . .

1.2 Part or Identifying Number (PIN). The PIN shall be as shown in the following example:



1.2.1 Radiation hardness assurance (RHA) designator. Device classes M, B or S RHA marked devices shall meet . . .

1.2.2 Device type(s). The device type(s) shall identify the circuit function as follows:

<u>Device type</u>	<u>Generic number</u>	<u>Circuit function</u>
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1.2.3 Device class designator. The device class designator shall be a single letter identifying the product assurance level (see 6.7 herein) as follows . . .

1.2.4 Case outline(s). For device classes M, B, or S, case outline(s) shall meet the requirements of MIL-M-38510 and MIL-STD-1835, as listed below. For device classes Q or V, case outline(s) shall meet the requirements of MIL-I-38535 and MIL-STD-1835, and as listed below.

Case outline letter	MIL-STD-1835 descriptive designator	Number of terminals	Package style
F	GDFP2-F16	16	flat pack
E	CDIP2-T16	16	dual-in-line
X	CMGA2-T100	100	pin grid array
H	GDFP1-F10 or CDFP2-F10	10	flat pack

1.2.5 Lead finish. The lead finish shall be as specified in MIL-M-38510 for classes M, B, or S or MIL-I-38535 for classes Q or V. Finish letter "X" shall not be marked on the microcircuit or its packaging. The "X" designation is for use in specifications when lead finishes A, B, or C are considered acceptable and interchangeable without preference.

FIGURE 2. Example of a (scope) page from a military detail specification showing the identification/specification of case outlines (packages).

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TABLE VI. Package case outline list.

Descriptive package type designator	Case outline letter, Figure no., Configuration letter	1/ Dimensions reference letter	2/ θ_{JC} (°C/W)	Terminal count and row-to-row spacing (inch)	Terminal pitch (inch)	3/ EIA similar package designation
Flat pack style 4/						
GDFP1-F10	H, 11, A	F-4	22	10	.050	MO-092 AA
CDFP2-F10	H, 11, B	F-4	"	"	"	none
CDFP3-F10	11, B	F-4A	"	"	"	MO-098 AA
GDFP1-F14	D, 11, A	F-2	"	14	"	MO-092 AB
CDFP2-F14	D, 11, B	F-2	"	"	"	none
CDFP3-F14	11, B	F-2A	"	"	"	MO-098 AB
GDFP1-F16	11, A	F-13	"	16	"	MO-070 AA
GDFP2-F16	F, 11, A	F-5	"	"	"	MO-092 AC
CDFP3-F16	F, 11, B	F-5	"	"	"	none
CDFP4-F16	11, B	F-5A	"	"	"	MO-098 AC
GDFP1-F18	11, A	F-14	"	18	"	MO-070 AB
GDFP2-F18	11, A	F-10	"	18	"	MO-092 AD
GDFP1-F20	11, A	F-15	"	20	"	MO-070 AC
GDFP2-F20	S, 11, A	F-9	"	"	"	none
CDFP3-F20	S, 11, B	F-9	"	"	"	"
CDFP4-F20	11, B	F-9A	"	"	"	"
GDFP1-F24	11, A	F-16	"	24	"	MO-070 AD
GDFP2-F24	K, 11, A	F-6	"	"	"	"
CDFP3-F24	K, 11, B	F-6	"	"	"	none
CDFP4-F24	11, B	F-6A	"	"	"	"
GDFP1-F28	11, A	F-17	"	28	"	MO-070 AE
GDFP2-F28	11, A	F-11	"	"	"	"
CDFP3-F28	11, B	F-11A	"	"	"	none
CDFP4-F28	11, B	F-12	"	"	"	"
CDFP1-F32	11, B	F-18	"	32	"	MO-115
Dual-in-line package style 4/						
GDIP1-T8	P, 12, A	D-4	28	8, .300	.100	none
CDIP2-T8	P, 12, C	D-4	"	8, "	"	MS-015 AA
GDIP1-T14	C, 12, A	D-1	"	14, "	"	none
CDIP2-T14	C, 12, C	D-1	"	14, "	"	MS-015 AB
GDIP1-T16	E, 12, A	D-2	"	16, "	"	none
CDIP2-T16	E, 12, C	D-2	"	16, "	"	MS-015 AC

See footnotes at end of table VII.

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TABLE VI. Package case outline List - Continued.

Descriptive package type designator	Case outline letter, Figure no., Configuration letter	1/ Dimensions reference letter	2/ θ_{JC} (°C/W)	Terminal count and row-to-row spacing (inch)	Terminal pitch (inch)	3/ EIA similar package designation
Dual-in-line package style - Continued 4/						
GDIP1-T18 CDIP2-T18	V, 12, A V, 12, C	D-6 D-6	28 "	18, " 18, "	.100 "	none MS-015 AD
GDIP1-T20 CDIP2-T20	R, 12, A R, 12, C	D-8 D-8	" "	20, .300 20, "	" "	none MS-015 AE
GDIP1-T22 CDIP2-T22	W, 12, A W, 12, C	D-7 D-7	" "	22, .400 22, "	" "	none "
GDIP1-T24 CDIP2-T24 GDIP3-T24 CDIP4-T24 GDIP5-T24 CDIP6-T24	J, 12, A J, 12, C L, 12, A L, 12, C 12, A 12, C	D-3 D-3 D-9 D-9 D-11 D-11	" " " " " "	24, .600 " " " .300 " " " .400 " "	" " " " " "	" " MO-058 AA MS-015 AG " "
GDIP1-T28 CDIP2-T28 CDIP3-T28 GDIP4-T28	12, A 12, C 12, C 12, A	D-10 D-10 D-15 D-15	" " " "	28, .600 " " " .300 " "	" " " "	MO-103 AB none " "
GDIP1-T40 CDIP2-T40	Q, 12, A Q, 12, C	D-5 D-5	" "	40, .600 40, "	" "	MO-103 AC none
GDIP1-T48 CDIP2-T48	12, A 12, C	D-14 D-14	" "	48, " 48, "	" "	" "
GDIP1-T50 CDIP2-T50	12, A 12, C	D-12 D-12	" "	50, .900 50, "	" "	" "
CDIP1-T64	12, C	D-13	"	64, "	"	"
Can style 4/						
MACY1-X8 MACY1-X10 MACY1-X12 MACY1-X3	G, 13 I, 13 13 13	A1 A2 A3 A4	70 65 65	8 10 12 3	α, β 45° α, β 36° α, β 30° $\alpha 45^\circ, \beta 90^\circ$	MO-002 AL MO-006 AF MO-006 AG TO-5

See footnotes at end of table VII.

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TABLE VI. Package case outline list - Continued.

Descriptive package type designator	Case outline letter, Figure no., Configuration letter	1/ Dimensions reference letter	2/ θ_{JC} (°C/W)	Terminal count and row-to-row spacing (inch)	Terminal pitch (inch)	3/ EIA similar package designation
Square leadless chip carrier style 4/						
CQCC1-N16	15	C-1	20	16	.050	MS-004 CA
CQCC2-N16	"	C-1A	"	16	"	" "
CQCC1-N20	2, "	C-2	"	20	"	" CB
CQCC2-N20	"	C-2A	"	20	"	" "
CQCC1-N24	"	C-3	"	24	"	" CH
CQCC2-N24	"	C-3A	"	24	"	" "
CQCC1-N28	3, "	C-4	"	28	"	" CC
CQCC2-N28	"	C-4A	"	28	"	" "
CQCC1-N44	"	C-5	"	44	"	" CD
CQCC1-N52	"	C-6	"	52	"	" CE
CQCC1-N68	"	C-7	"	68	"	" CF
CQCC1-N84	"	C-8	"	84	"	" CG
Rectangular leadless chip carrier style 4/						
CQCC1-N18	15	C-9	20	18	.050	MO-042 AA
CQCC2-N18	"	C-9A	"	"	"	" "
CQCC3-N18	"	C-10	"	"	"	MO-041 AC
CQCC4-N18	"	C-10A	"	"	"	" "
CQCC3-N20	"	C-13	"	20	"	" AD
CQCC4-N20	"	C-13A	"	20	"	" "
CQCC3-N28	"	C-11	"	28	"	" AA
CQCC4-N28	"	C-11A	"	28	"	" "
CQCC1-N32	"	C-12	"	32	"	" AB
CQCC2-N32	"	C-12A	"	32	"	" "

See footnotes at end of table VII.

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TABLE VI. Package case outline list - Continued.

Descriptive package type designator	Case outline letter, Figure no., Configuration letter	1/ Dimensions reference letter	2/ θ_{JC} (°C/W)	Terminal count and row-to-row spacing (inch)	Terminal pitch (inch)	3/ EIA similar package designation
Gullwing lead chip carrier style 4/						
GQCC1-G44	16	C-G1	20	44	.050	MO-084 AB
GQCC1-G68	"	C-G2	"	68	"	" AD
GQCC1-G84	"	C-G3	"	84	"	" AE
CQCC1-G132	17	C-G7	"	132	.025	MO-104 AA
"J" lead chip carrier style 4/						
GQCC1-J28	18	C-J7	20	28	.050	MO-087 AA
CQCC2-J28	19	C-J9	"	28	"	MO-107 AA
GQCC1-J44	18	C-J1	"	44	"	MO-087 AB
CQCC2-J44	19	C-J4	"	44	"	MO-107 AB
GQCC1-J52	18	C-J8	"	52	"	MO-087 AC
CQCC2-J52	19	C-J10	"	52	"	MO-107 AC
GQCC1-J68	18	C-J2	"	68	"	MO-087 AD
CQCC2-J68	19	C-J5	"	68	"	MO-107 AD
GQCC1-J84	18	C-J3	"	84	"	MO-087 AE
CQCC2-J84	19	C-J6	"	84	"	MO-107 AE
Unformed-lead chip carrier style 4/						
CQCC1-F84	20	C-U1	20	84	.025	MO-090 AA
CQCC1-F100	"	C-U2	"	100	"	" AF
CQCC1-F132	"	C-U3	"	132	"	" AB
CQCC1-F144	"	C-U4	"	144	"	" AC
CQCC1-F172	"	C-U5	"	172	"	" AD
CQCC1-F196	"	C-U6	"	196	"	" AE

See footnotes at end of table VII.

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TABLE VI. Package case outline list - Continued.

Descriptive package type designator	Case outline letter, Figure no., Configuration letter	<u>1/</u> Dimensions reference letter	<u>2/</u> θ_{JC} (°C/W)	Terminal count and row-to-row spacing (inch)	Terminal pitch (inch)	<u>3/</u> EIA similar package designation
Grid array style <u>4/ 5/</u>						
CMGA1-PN	21	P-AA	20	81 MAX	.100	MO-067 AA
CMGA2-PN	"	P-AB	"	100 MAX	"	" AB
CMGA3-PN	"	P-AC	"	121 MAX	"	" AC
CMGA4-PN	"	P-AD	"	144 MAX	"	" AD
CMGA5-PN	"	P-AE	"	169 MAX	"	" AE
CMGA6-PN	"	P-AF	"	196 MAX	"	" AF
CMGA7-PN	"	P-AG	"	225 MAX	"	" AG
CMGA8-PN	"	P-AH	"	256 MAX	"	" AH
CMGA9-PN	"	P-AJ	"	289 MAX	"	" AJ
CMGA10-PN	"	P-AK	"	324 MAX	"	" AK
CMGA11-PN	"	P-AL	"	361 MAX	"	" AL
CMGA12-PN	"	P-AM	"	400 MAX	"	" AM
Flange mount style <u>4/</u>						
MBFM1-P2	22, A	AA		2	.430	TO-3
MBFM2-P2	22, A	AB		2	.430	TO-3
MBFM3-P2	22, A	AC		2	.430	TO-3
MBFM4-P2	22, B	AD		2	.200	TO-66
MBFM1-P15	22, C	AE		15	α, β 22.5°	MO-097

See footnotes at end of table VII.

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TABLE VII. Inactive package case outline list.
The case outlines in this table are inactive for new design.

Descriptive package type designator	Case outline letter, Figure no., Configuration letter	1/ Dimensions reference letter	2/ θ_{JC} (°C/W)	Terminal count and row-to-row spacing (inch)	Terminal pitch (inch)	3/ EIA similar package designation
Flat pack style 4/						
GDFP4-F14	B, 11, C	F-3	22	14	.050	TO-85
GDFP5-F14	A, 11, C	F-1	"	"	"	TO-86
CDFP6-F14	A, 11, D	F-1	"	"	"	TO-95
CDFP5-F20	S, 11, D	F-9	"	20	"	none
GDFP5-F24	K, 11, C	F-6	"	24	"	MO-070 AD
CDFP6-F24	K, 11, D	F-6	"	"	"	none
GDFP7-F24	11, C	F-8	"	"	"	MO-019 AA
CDFP8-F24	11, D	F-8	"	"	"	none
Dual-in-line package style 4/						
CDIP3-T8	P, 12, B	D-4	28	8, .300	.100	none
CDIP3-T14	C, 12, B	D-1	"	14, "	"	"
CDIP3-T16	E, 12, B	D-2	"	16, "	"	"
CDIP3-T18	V, 12, B	D-6	"	18, "	"	"
CDIP3-T20	R 12, B	D-8	"	20, "	"	"
CDIP3-T22	W 12, B	D-7	"	22, .400	"	"
CDIP7-T24	J, 12, B	D-3	"	24, .600	"	"
CDIP8-T24	L, 12, B	D-9	"	" .300	"	"
CDIP9-T24	12, B	D-11	"	" .400	"	"
CDIP4-T28	12, B	D-10	"	28, .600	"	"
CDIP3-T40	Q, 12, B	D-5	"	40, "	"	"
CDIP3-T50	12, B	D-12	"	50, .900	"	"
Single-in-line package style						
CSIP1-T3	14	S1	---	3	.050	TO-260

See footnotes at end of this table.

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TABLE VII. Inactive case outline list - Continued.
The case outlines in this table are inactive for new design.

Descriptive package type designator	Case outline letter, Figure no., Configuration letter	1/ Dimensions reference letter	2/ θ_{JC} (°C/W)	Terminal count and row-to-row spacing (inch)	Terminal pitch (inch)	3/ EIA similar package designation
Grid array style 4/ 5/						
CMGA13-PN	21	P-BA	20	81 MAX	.100	MO-066 AA
CMGA14-PN	"	P-BB	"	100 MAX	"	" AB
CMGA15-PN	"	P-BC	"	121 MAX	"	" AC
CMGA16-PN	"	P-BD	"	144 MAX	"	" AD
CMGA17-PN	"	P-BE	"	169 MAX	"	" AE
CMGA18-PN	"	P-BF	"	196 MAX	"	" AF
CMGA19-PN	"	P-BG	"	225 MAX	"	" AG
CMGA20-PN	"	P-BH	"	256 MAX	"	" AH
CMGA21-PN	"	P-BJ	"	289 MAX	"	" AJ
CMGA22-PN	"	P-BK	"	324 MAX	"	" AK
CMGA23-PN	"	P-BL	"	361 MAX	"	" AL
CMGA24-PN	"	P-BM	"	400 MAX	"	" AM

1/ See dimension tables herein.

2/ The "base-line" values shown are worst case (MEAN + 2 σ) for a 60 x 60 microinch microcircuit device silicon die and applicable for devices with die sizes up to 14400 square microinches. For device die sizes greater than 14400 square microinches use the following values; dual-in-line, 11°C/W; chip carrier, 10°C/W; flat pack, 10°C/W; pin grid array, 10°C/W.

3/ Caution. The Electronic Industries Association (EIA) similar package may change. The original or changed package may not satisfy military detail specification requirements or the requirements of this standard. Therefore, do not use the EIA similar package designation for item acquisition; it is for information only.

4/ Packages shall be selected from tables VI and VII by reference to the "descriptive package type designator" which, in turn, shall be referenced in military detail specifications in accordance with the example depicted in figure 2. The example shows how to integrate a descriptive designator, a case outline letter, and a PIN. There are circumstances when a package with multiple outline configurations, each identified with the same dimension reference number, will have all outline configurations considered interchangeable and acceptable without preference, see column 2 of tables VI and VII and 3.1.2. A package such as above shall be specified in military detail specifications by assigning the same case outline letter to each outline configuration, see case outline letter "H" in the figure 2 example. Conversely, when it is desired not to accept certain outline configuration combinations as interchangeable, use case outline letters X, Y, Z, U, T, M, N, and numbers 4, 5, 6, 7, 8, and 9 to differentiate configurations. These letters and numbers are also used for all the packages in this standard that do not have a dedicated case outline letter, see 4.7.1.

5/ The suffix letter "N" shall be substituted with a specified terminal count. When two or more grid array packages are used in the same military detail specification, and are identical except for pin location, each package shall be separately identified, see table V.

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5. DETAIL REQUIREMENTS

5.1 Package styles and package types. Package styles and package types are listed in tables VI and VII with brief descriptions.

5.2 Unique package features. Unique package features are depicted as follows.

5.2.1 Flat pack end leads. Flat packs which have leads extending from the ends of the body may have different lead configurations as shown on figure 3. Dimension α applies only to that portion of the lead within dimension E which bends into the body.

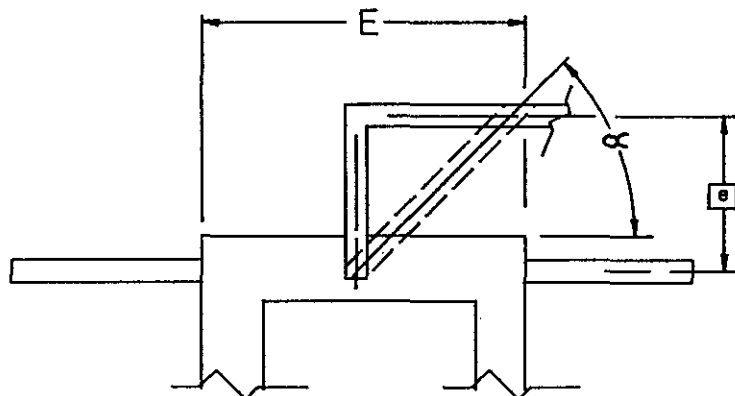
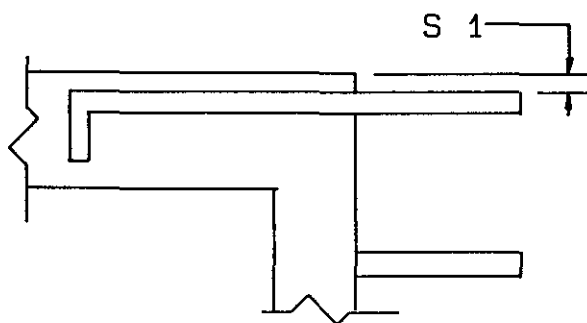
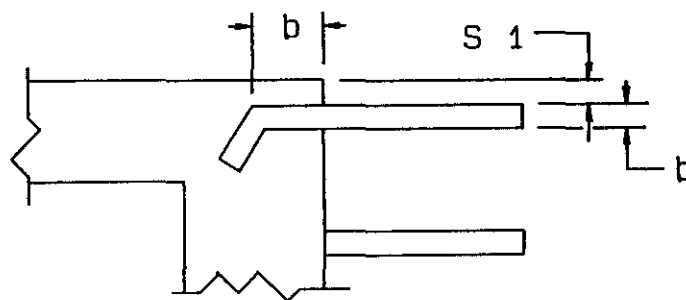


FIGURE 3. Lead bend angle.

5.2.2 Glass sealed flat pack minimum S1 dimension. The minimum limit of dimension S1 shall be either .000 (0.00 mm) or .005 (0.13 mm) depending on what lead configuration is used (see figure 4). In example A, the minimum limit is .005 (0.13 mm). In example B, if the lead bends toward the cavity within one lead width as shown, the minimum limit is .000 (0.00 mm); otherwise the criteria for example A shall apply. For metal-sealed bottom-brazed leads, dimension S1 shall be measured from the edge of the furthest extension of the metal pad or lead, whichever is closest to the corresponding edge of the package body.



Example A



Example B

FIGURE 4. Lead space from package end.

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5.2.3 DIP lead row center dimension eA. Dimension eA on DIP outlines shall be measured at the center of the lead bends (see figure 5) or at the centerline of the lead when α is 90° . For side-brazed leads, this dimension shall be measured at the centerlines of the leads.

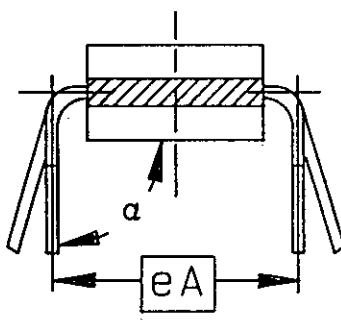


FIGURE 5. Lead row center dimension.

5.2.4 DIP dimensions L and Q. Dimensions L and Q on DIP style packages shall be measured from the lead tips and base plane to the seating plane (see figure 6). The seating plane is located at the lowest point on the lead at which the lead width exceeds .040 inch (1.02 mm) minimum excluding any half leads at the package ends. (The illustration shows a tapered lead at the seating plane, other lead shapes in this area are also acceptable, see details B, C, and D on the DIP drawings.)

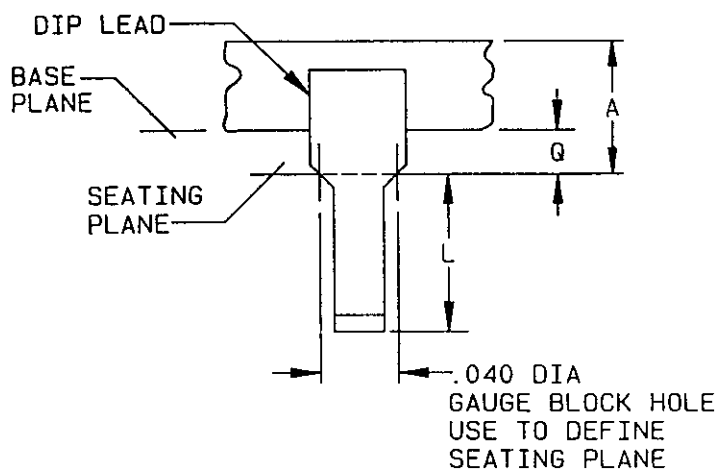


FIGURE 6. DIP standoff dimension Q.

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5.2.5 DIP end variations dimension S1. For all DIP configurations, dimension S1 shall be measured from the edge of the furthest extension of the metal pad or lead whichever is closest to the end of the body (see figure 7).

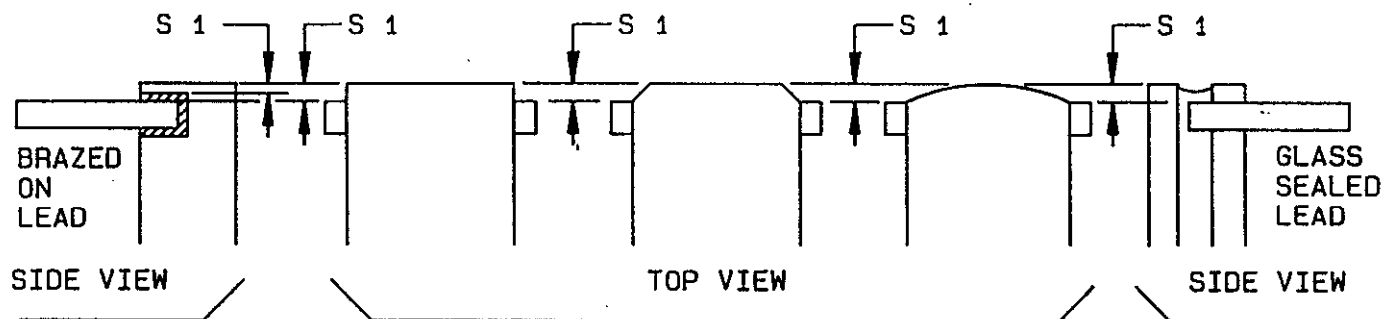


FIGURE 7. DIP package end variations.

5.2.6 Leadless chip carrier (LCC) castellation irregularities. Analysis of the chip carrier castellation by measurement requires that all surface irregularities of the castellation (the shaded area) be within dimensions L3 and B3 as delineated on figure 8. It is also required that the castellation be located within the LCC terminal pad width, exclusive of the annular ring, as shown on figure 8.

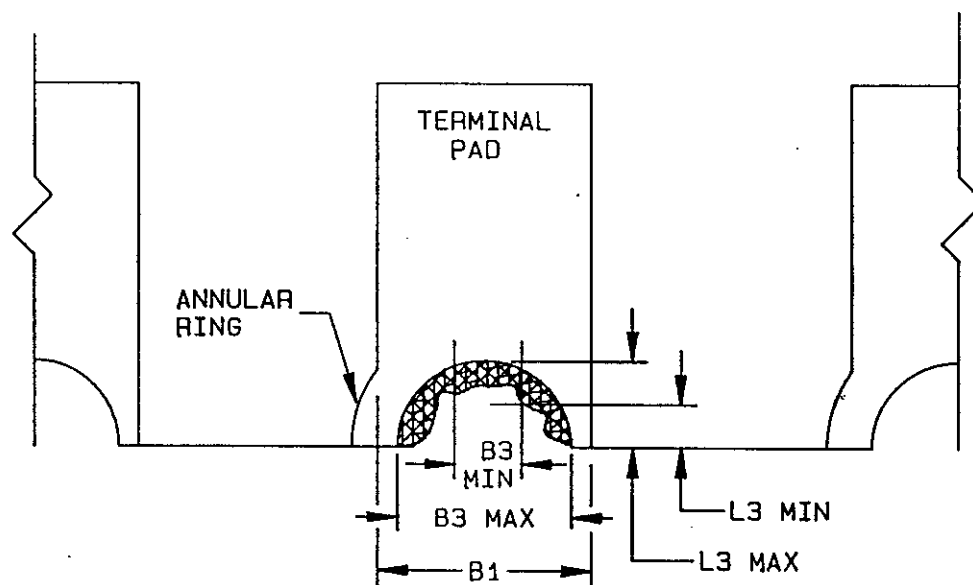


FIGURE 8. Measurement and alignment of LCC castellation.

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5.2.7 Coplanarity deviation. The coplanarity deviation of all terminal contact points, as defined by the device seating plane, shall be determined for surface mounted devices. Measurements shall be made from the device seating plane (see figure 9). Regardless of package size, any device with one or more terminals that exceed the specified coplanarity deviations shall constitute a failure.

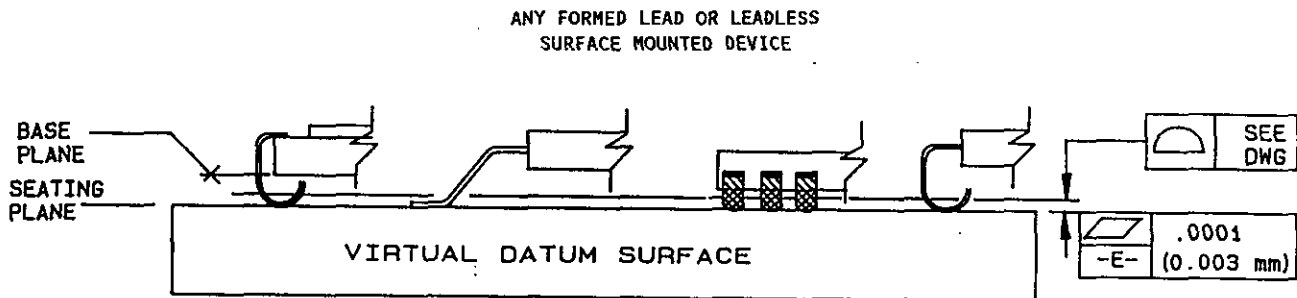


FIGURE 9. Coplanarity deviation.

5.2.8 Package cavity orientation. Unless otherwise specified herein, for most packages, cavity orientation (see figure 10) is standard in the "cavity-up" position. When a particular package style includes optional cavity orientation, such as cavity-down, the cavity-down option shall be specified by adding a suffix D to the terminal-count part of the descriptive type designator (see figure 1).

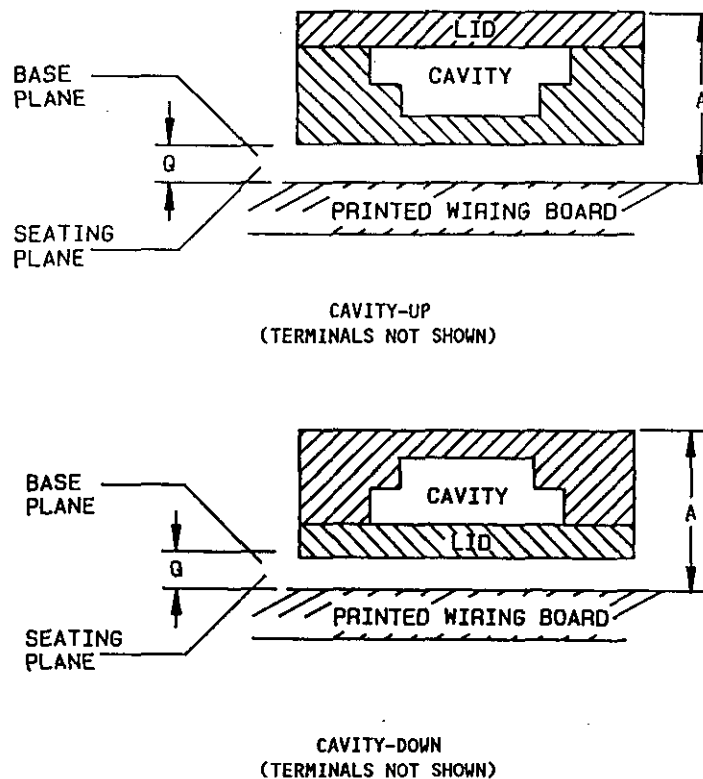
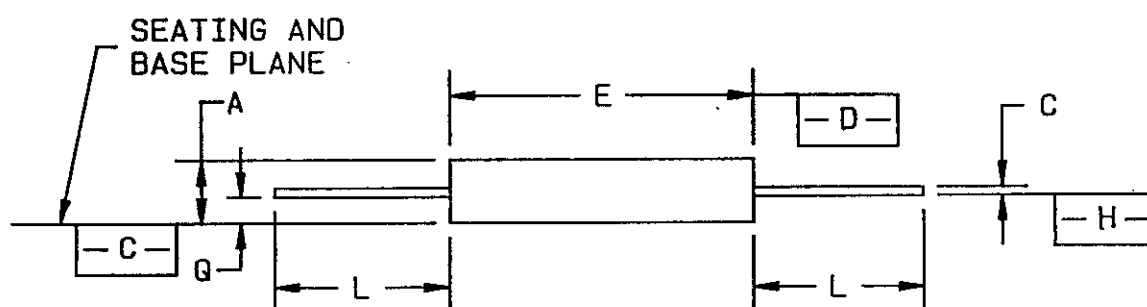
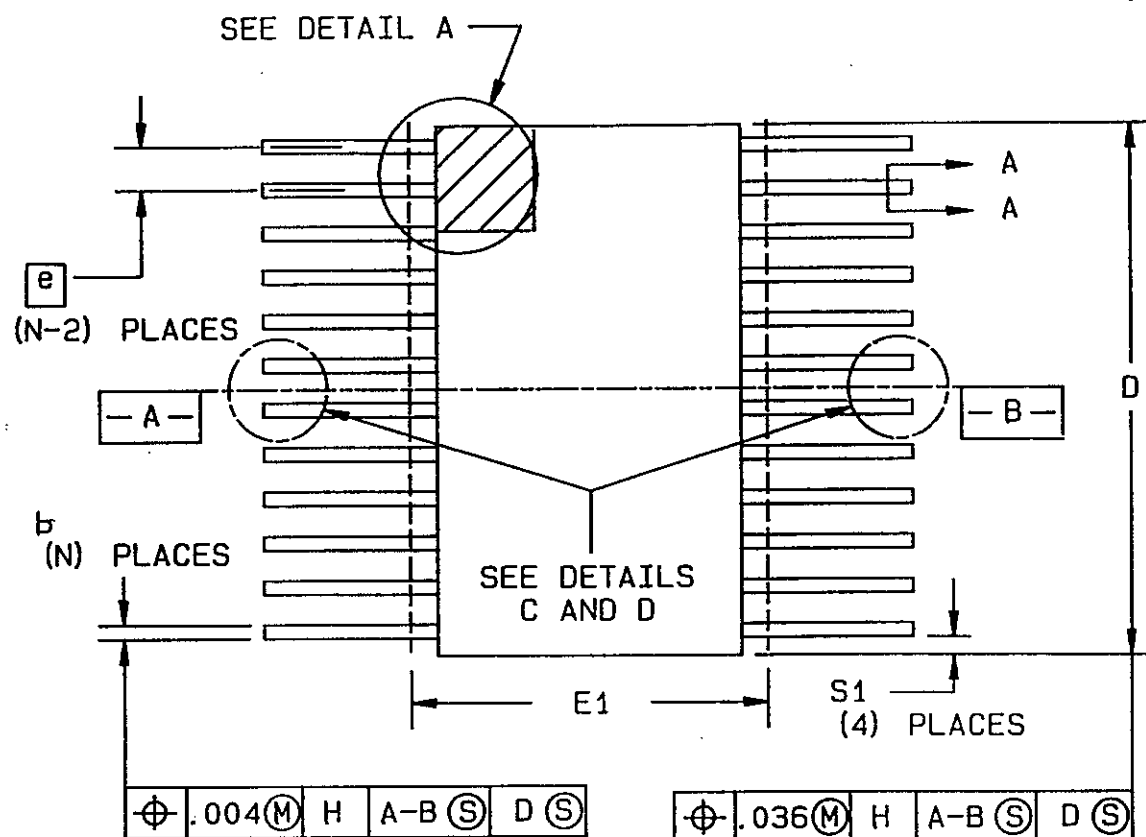


FIGURE 10. Package cavity orientation.

5.2.9 Package drawings. Detailed package drawings and dimensional requirements shall be as specified on figures 11 through 22.

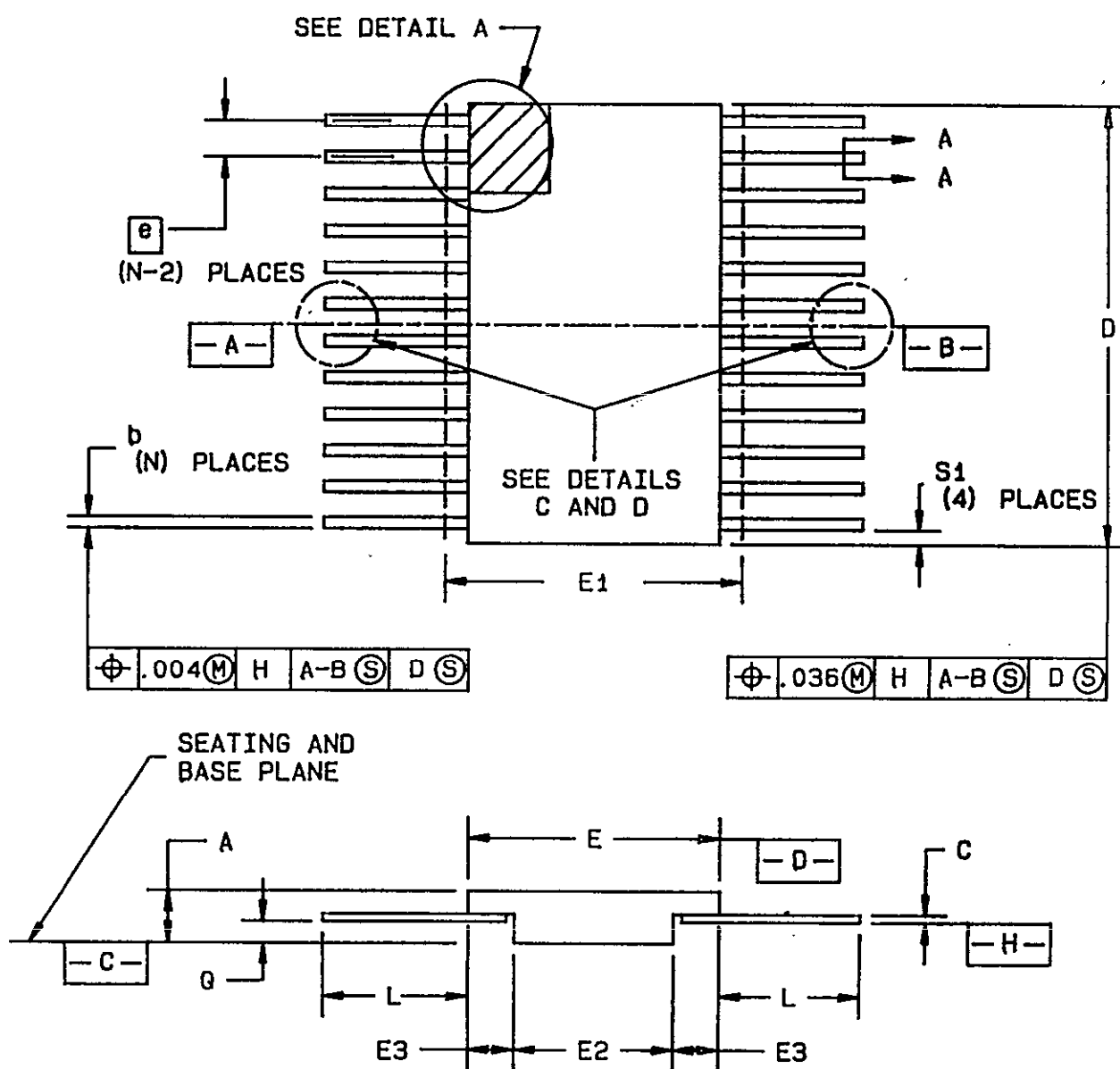
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Configuration A
Ceramic, glass sealed

FIGURE 11. Flat pack style.

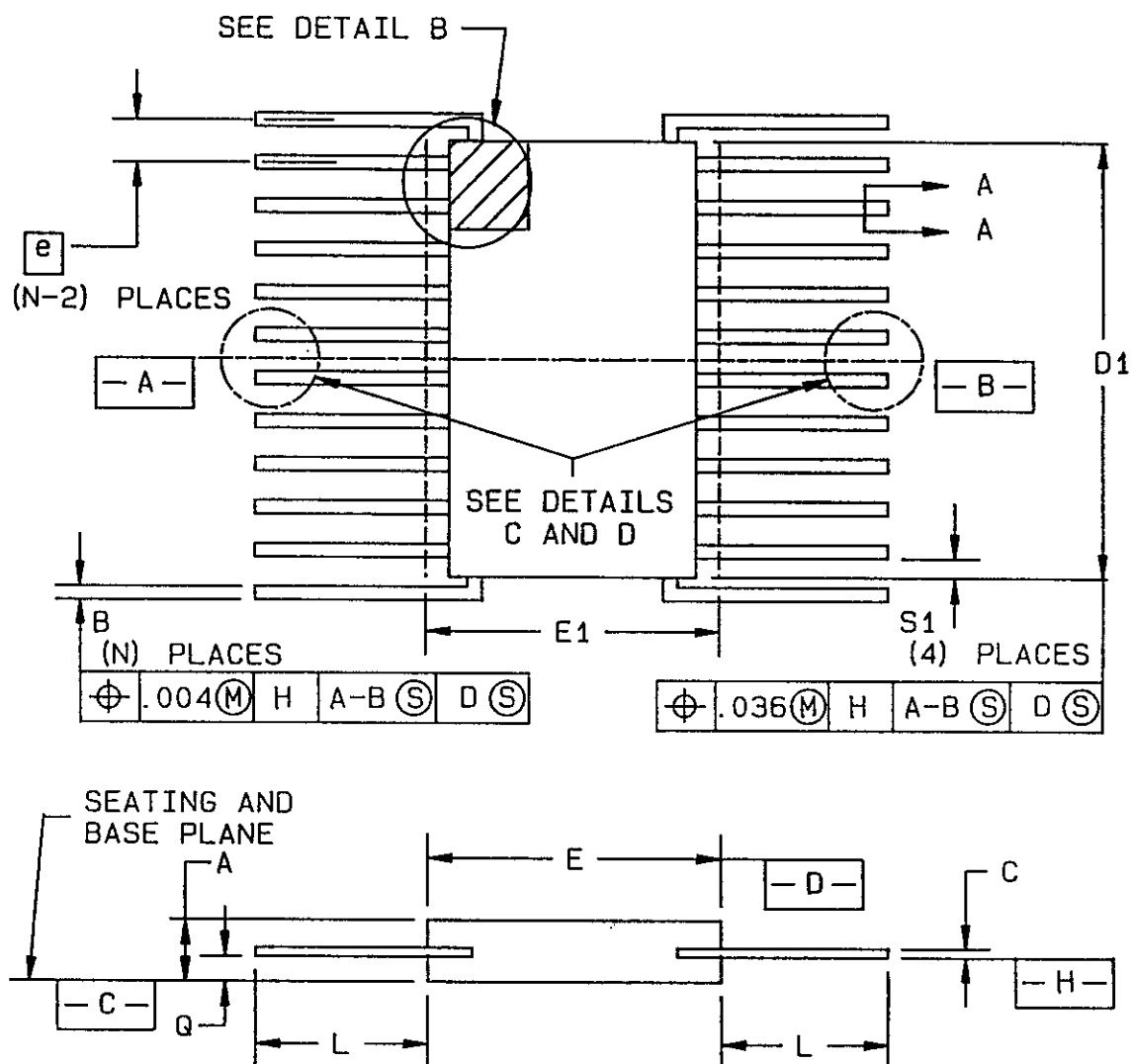
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Configuration B
Ceramic, metal-sealed, bottom-brazed leads

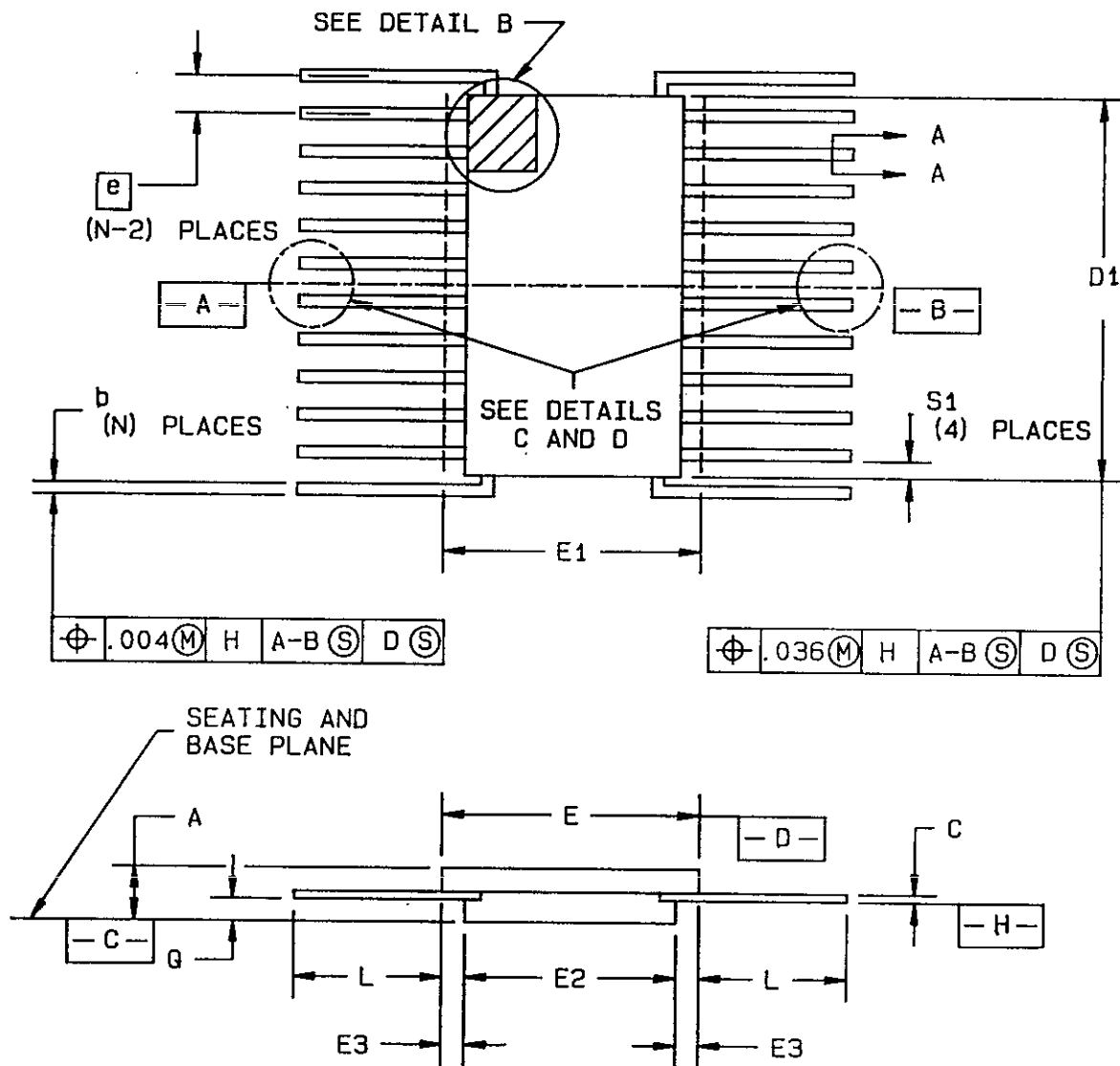
FIGURE 11. Flat pack style - Continued.

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Configuration C
 Ceramic, glass-sealed, spider leads
 FIGURE 11. Flat pack style - Continued.

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Configuration D
Ceramic, metal-sealed, bottom-brazed spider leads

FIGURE 11. Flat pack style - Continued.

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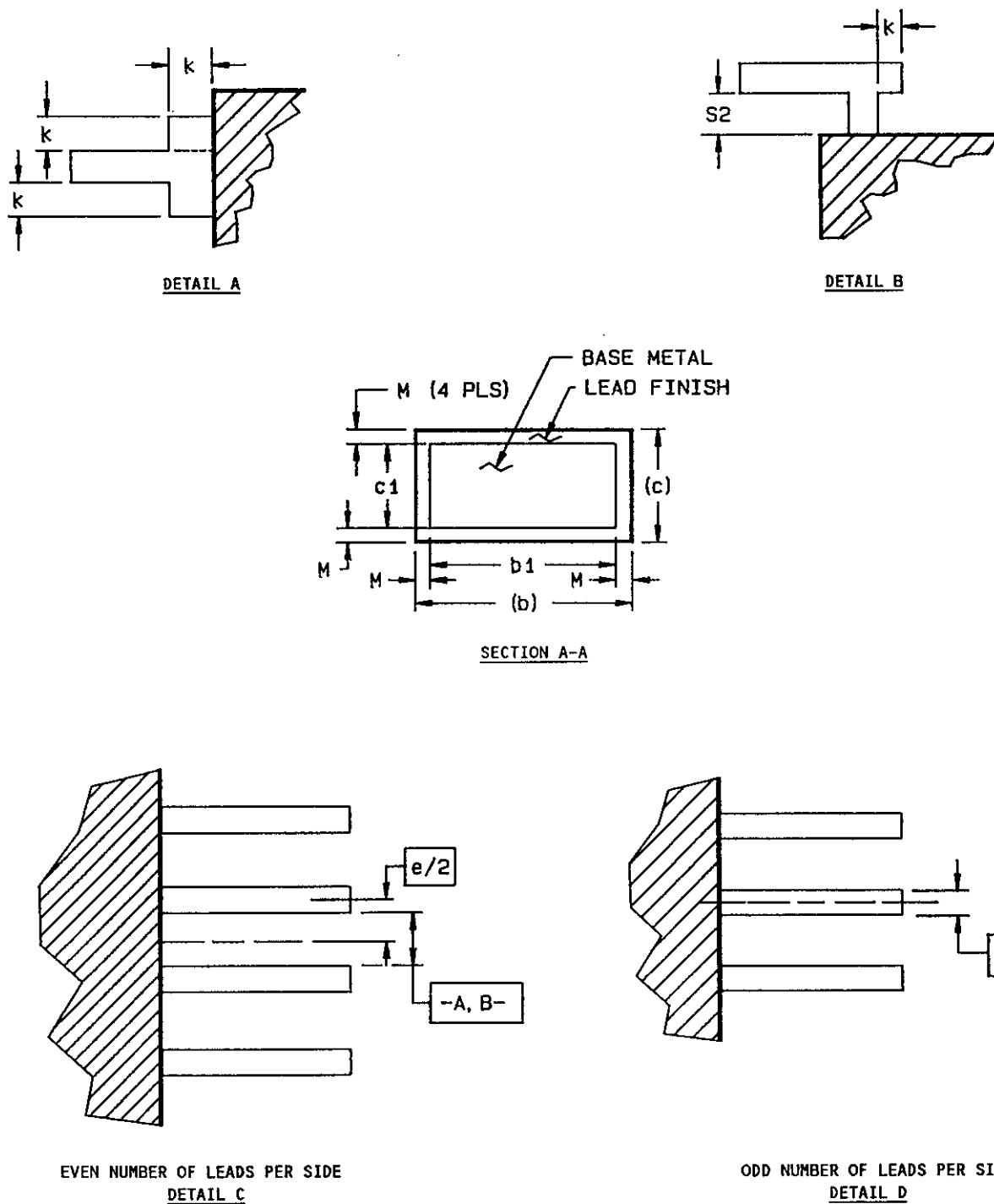


FIGURE 11. Flat pack style - Continued.

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S Y M B O L	Variations (all dimensions shown in inches)											
	F-1 Config. C,D		N O T E	F-2 Config. A,B		N O T E	F-2A Config. B		N O T E	F-3 Config. C		N O T E
	Min	Max		Min	Max		Min	Max		Min	Max	
A	.030	.085		.045	.085		.045	.115		.030	.070	
b	.010	.022		.010	.022		.015	.022		.010	.022	
b1	.010	.019		.010	.019		.015	.019		.010	.019	
c	.004	.009		.004	.009		.004	.009		.004	.009	
c1	.004	.006		.004	.006		.004	.006		.004	.006	
D				---	.390	3	---	.390	3			
D1	---	.280	3							---	.280	3
E				.235	.260		.235	.260				
E1				---	.280	3	---	.290	3			
E2	.125	---		.125	---		.125	---				
E3	.030	---	7	.030	---	7	.030	---	7			
E4	.240	.260								.120	.200	
E5	---	.280	3							---	.220	3
e	.050 BSC			.050 BSC			.050 BSC			.050 BSC		
k	.008	.015	2	.008	.015	2	.008	.015	2	.008	.015	2
L	.250	.370		.250	.370		.270	.370		.165	.390	
Q	.026	.045	11	.026	.045	11	.026	.045	11	.026	.045	11
S1	.005	---	6	.005	---	6	.005	---	6	.005	---	6
S2	.004	---	9							.004	---	9
α	30°	90°	10							30°	90°	10
M	---	.0015		---	.0015		---	.0015		---	.0015	
N	14			14			14			14		
Note	1, 12, 13											

1/ Symbols in this column that are not on a configuration drawing are not applicable to that configuration; this is further noted when a line is blank in the MIN MAX columns.

FIGURE 11. Flat pack style - Continued.

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S Y M B O L	Variations (all dimensions shown in millimeters)											
	F-1 Config. C,D		N O T E	F-2 Config. A,B		N O T E	F-2A Config. B		N O T E	F-3 Config. C		N O T E
	Min	Max		Min	Max		Min	Max		Min	Max	
A	0.76	2.16		1.14	2.16		1.14	2.92		0.76	1.78	
b	0.25	0.56		0.25	0.56		0.38	0.56		0.25	0.56	
b1	0.25	0.48		0.25	0.48		0.38	0.48		0.25	0.48	
c	0.10	0.23		0.10	0.23		0.10	0.23		0.10	0.23	
c1	0.10	0.15		0.10	0.15		0.10	0.15		0.10	0.15	
D				---	.390	3	---	.390	3			
D1	---	7.11	3							---	7.11	3
E				5.97	6.60		5.97	6.60				
E1				---	.280	3	---	.290	3			
E2	3.18	---		3.18	---		3.18	---				
E3	0.76	---	7	0.76	---	7	0.76	---	7			
E4	6.10	6.60								3.05	5.08	
E5	---	7.11	3							---	5.59	3
e	1.27 BSC			1.27 BSC			1.27 BSC			1.27 BSC		
k	0.20	0.38	2	0.20	0.38	2	0.20	0.38	2	0.20	0.38	2
L	6.35	9.40		6.35	9.40		6.86	9.40		4.19	9.91	
Q	0.66	1.14	11	0.66	1.14	11	0.66	1.14	11	0.66	1.14	11
S1	0.13	---	6	0.13	---	6	0.13	---	6	0.13	---	6
S2	0.10	---	9	---	---		---	---		0.10	---	9
α	30°	90°	10	---	---		---	---		30°	90°	10
M	---	0.04		---	0.04		---	0.04		---	0.04	
N	14			14			14			14		
Note	1, 12, 13											

1/ Symbols in this column that are not on a configuration drawing are not applicable to that configuration; this is further noted when a line is blank in the MIN MAX columns.

FIGURE 11. Flat pack style - Continued.

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S Y M B O L	Variations (all dimensions shown in inches)											
	F-4 Config. A,B		N O T E	F-4A Config. B		N O T E	F-5 Config. A,B		N O T E	F-5A Config. B		N O T E
	Min	Max		Min	Max		Min	Max		Min	Max	
A	.045	.090		.045	.115		.045	.085		.045	.115	
b	.010	.022		.015	.022		.015	.022		.015	.022	
b1	.010	.019		.015	.019		.015	.019		.015	.019	
c	.004	.009		.004	.009		.004	.009		.004	.009	
c1	.004	.006		.004	.006		.004	.006		.004	.006	
D	---	.280	3	---	.290	3	---	.440	3	---	.440	3
D1												
E	.240	.260		.240	.260		.245	.285		.245	.285	
E1	---	.300	3	---	.280	3	---	.305	3	---	.315	3
E2	.125	---		.125	---		.130	---		.130	---	
E3	.030	---	7	.030	---	7	.030	---	7	.030	---	7
E4												
E5												
e	.050 BSC			.050 BSC			.050 BSC			.050 BSC		
k	.008	.015	2	.008	.015	2	.008	.015	2	.008	.015	2
L	.250	.370		.250	.370		.250	.370		.250	.370	
Q	.026	.045	11	.026	.045	11	.026	.045	11	.026	.045	11
S1	.005	---	6	.005	---	6	.005	---	6	.005	---	6
S2												
α												
M	---	.0015		---	.0015		---	.0015		---	.0015	
N	10			10			16			16		
Note	1, 12, 13											

1/ Symbols in this column that are not on a configuration drawing are not applicable to that configuration; this is further noted when a line is blank in the MIN MAX columns.

FIGURE 11. Flat pack style - Continued.

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S Y M B O L	Variations (all dimensions shown in millimeters)											
	F-4 Config. A,B		N O T E	F-4A Config. B		N O T E	F-5 Config. A,B		N O T E	F-5A Config. B		N O T E
	Min	Max		Min	Max		Min	Max		Min	Max	
A	1.14	2.29		1.14	2.92		1.14	2.16		1.14	2.92	
b	0.25	0.56		0.25	0.56		0.38	0.56		0.25	0.56	
b1	0.25	0.48		0.25	0.48		0.38	0.48		0.25	0.48	
c	0.10	0.23		0.10	0.23		0.10	0.23		0.10	0.23	
c1	0.10	0.15		0.10	0.15		0.10	0.15		0.10	0.15	
d	---	7.11	3	---	7.37	3	---	11.18	3	---	11.18	3
D1												
E	6.10	6.60		6.10	6.60		6.22	7.75		6.22	7.24	
E1	---	7.62	3	---	7.11	3	---	7.62	3	---	8.00	3
E2	3.18	---		3.18	---		3.30	---		3.30	---	
E3	0.76	---	7	0.76	---	7	0.76	---	7	---	0.76	7
E4												
E5												
e	1.27 BSC			1.27 BSC			1.27 BSC			1.27 BSC		
k	0.20	0.38	2	0.20	0.38	2	0.20	0.38	2	0.20	0.38	2
L	6.35	9.40		6.35	9.40		6.86	9.40		4.19	9.91	
Q	0.66	1.14	11	0.66	1.14	11	0.66	1.14	11	0.66	1.14	11
S1	0.13	---	6	0.13	---	6	0.13	---	6	0.13	---	6
S2												
α												
M	---	0.04		---	0.04		---	0.04		---	0.04	
N	10			10			16			16		
Note	1, 12, 13											

1/ Symbols in this column that are not on a configuration drawing are not applicable to that configuration; this is further noted when a line is blank in the MIN MAX columns.

FIGURE 11. Flat pack style - Continued.

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S Y M B O L	Variations (all dimensions shown in inches)											
	F-6 Config. ALL		N O T E	F-6A Config. B		N O T E	F-8 Config. C,D		N O T E	F-9 Config. A,B,D		N O T E
	Min	Max		Min	Max		Min	Max		Min	Max	
A	.045	.090		.045	.115		.045	.090		.045	.100	
Ax										.068	.085	
b	.015	.022		.015	.022		.015	.022		.015	.022	
b1	.015	.019		.015	.019		.015	.019		.015	.019	
c	.004	.009		.004	.009		.004	.009		.004	.009	
c1	.004	.006		.004	.006		.004	.006		.004	.006	
D	---	.640	3	---	.640	3				---	.540	3
D1	---	.530					---	.430	3	---	.410	3
E	.300	.420		.350	.420					.245	.300	
E1	---	.440	3	---	.450	3				---	.320	3
E2	.180	---		.180	---		.125	---		.130	---	
E3	.030	---	7	.030	---	7	.030	---	7	.030	---	7
E4	.340	.375					.245	.285		.245	.300	
E5	---	.395	3				---	.305		---	.320	
e	.050 BSC			.050 BSC			.050 BSC			.050 BSC		
k	.008	.015	2	.008	.015	2	.008	.015	2	.008	.015	2
L	.250	.370		.250	.370		.250	.370		.250	.370	
Q	.026	.045	11	.026	.045	11	.026	.045	11	.026	.045	11
S1	.005	---	6	.005	---	6	.005	---	6	.005	---	6
S2	.004	---	9				.004	---	9	.004	---	9
α	30°	90°	10				30°	90°	10	30°	90°	10
M	---	.0015		---	.0015		---	.0015		---	.0015	
N	24			24			24			20		
Note	1, 12, 13											

1/ Symbols in this column that are not on a configuration drawing are not applicable to that configuration; this is further noted when a line is blank in the MIN MAX columns.

FIGURE 11. Flat pack style - Continued.

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S Y M B O L	Variations (all dimensions shown in millimeters)											
	F-6 Config. ALL		N O T E	F-6A Config. B		N O T E	F-8 Config. C,D		N O T E	F-9 Config. A,B,D		N O T E
	Min	Max		Min	Max		Min	Max		Min	Max	
A	1.14	2.29		1.14	2.92		1.14	2.29		1.14	2.92	
Ax										1.73	2.16	
b	0.38	0.56		0.38	0.56		0.38	0.56		0.38	0.56	
b1	0.38	0.48		0.38	0.48		0.38	0.48		0.38	0.48	
c	0.10	0.23		0.10	0.23		0.10	0.23		0.10	0.23	
c1	0.10	0.15		0.10	0.15		0.10	0.15		0.10	0.15	
D	---	16.26	3	---	16.26	3				---	13.72	3
D1	---	13.46	3				---	10.92	3	---	10.41	3
E	9.14	10.67		9.14	10.67					6.22	7.62	
E1	---	11.18	3	---	11.43	3				---	8.13	3
E2	4.57	---		4.57	---		3.18	---		3.30	---	
E3	0.76	---	7	0.76	---	7	0.76	---	7	0.76	---	
E4	8.64	9.53					6.22	7.24		6.22	7.62	
E5	---	10.03	3				---	7.75	3	---	8.13	3
e	1.27 BSC			1.27 BSC			1.27 BSC			1.2 BSC		
k	0.20	0.38	2	0.20	0.38	2	0.20	0.38	2	0.20	0.38	2
L	6.35	9.40		6.35	9.40		6.35	9.40		6.35	9.40	
Q	0.66	1.14	11	0.66	1.14	11	0.66	1.14	11	0.66	1.14	11
S1	0.13	---	6	0.13	---	6	0.13	---	6	0.13	---	6
S2	0.10	---	9				0.10	---		0.10	---	9
α	30°	90°	10				30°	90°	10	30°	90°	10
M	---	0.04		---	0.04		---	0.04		---	0.04	
N	24			24			24			20		
Note	1, 12, 13											

1/ Symbols in this column that are not on a configuration drawing are not applicable to that configuration; this is further noted when a line is blank in the MIN MAX columns.

FIGURE 11. Flat pack style - Continued.

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SYM- BOL	Variations (all dimensions shown in inches)											
	F-9A Config. B		NOTE	F-10 Config. A		NOTE	F-11 Config. A		NOTE	F-11A Config. B		NOTE
	Min	Max		Min	Max		Min	Max		Min	Max	
A	.045	.115		.045	.092		.045	.090		.045	.115	
b	.015	.022		.015	.022		.015	.022		.015	.022	
b1	.015	.019		.015	.019		.015	.019		.015	.019	
c	.004	.009		.004	.009		.004	.009		.004	.009	
c1	.004	.006		.004	.006		.004	.006		.004	.006	
D	---	.540	3	---	.540	3	---	.740	3	---	.740	3
D1												
E	.245	.300		.245	.370		.340	.380		.460	.520	
E1	---	.330	3	---	.390	3	---	.400	3	---	.550	3
E2	.130	---		---	---		---	---		.180	---	
E3	.030	---	7							.030	---	7
E4												
E5												
e	.050	BSC		.050	BSC		.050	BSC		.050	BSC	
k	.008	.015	2	.005	.018	2	.005	.018	2	.008	.015	2
L	.250	.370		.250	.370		.250	.370		.250	.370	
Q	.026	.045	11	.026	.045	11	.026	.045	11	.026	.045	11
S1	.000	---	6	.005	---	6	.005	---	6	.000	---	6
S2												
α												
M	---	.0015		---	.0015		---	.0015		---	.0015	
N	20			18			28			28		
Note	1, 12, 13											

1/ Symbols in this column that are not on a configuration drawing are not applicable to that configuration; this is further noted when a line is blank in the MIN MAX columns.

FIGURE 11. Flat pack style - Continued.

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S Y M B O L	Variations (all dimensions shown in millimeters)											
	F-9A Config. B		N O T E	F-10 Config. A		N O T E	F-11 Config. A		N O T E	F-11A Config. B		N O T E
	Min	Max		Min	Max		Min	Max		Min	Max	
A	1.14	2.92		1.14	2.34		1.14	2.29		1.14	2.92	
b	0.38	0.56		0.38	0.56		0.38	0.56		0.38	0.56	
b1	0.38	0.48		0.38	0.48		0.38	0.48		0.38	0.48	
c	0.10	0.23		0.10	0.23		0.10	0.23		0.10	0.23	
c1	0.10	0.15		0.10	0.15		0.10	0.15		0.10	0.15	
D	---	13.72	3	---	3.72	3	---	18.80	3	---	18.80	3
D1												
E	6.22	7.62		6.22	9.40		8.64	9.65		11.68	13.21	
E1	---	8.38	3	---	9.91	3	---	10.16	3	---	13.97	3
E2	3.30	---								4.57	---	
E3	0.76	---	7			7			7	0.76	---	7
E4												
E5												
e	1.27	BSC		1.27	BSC		1.27	BSC		1.27	BSC	
k	0.20	0.38	2	0.13	0.46	2	0.13	0.46	2	0.20	0.38	2
L	6.35	9.40		6.35	9.40		6.35	9.40		6.35	9.40	
Q	0.66	1.14	11	0.66	1.14	11	0.66	1.14	11	0.66	1.14	11
s1	0.00	---	6	0.13	---	6	0.13	---	6	0.00	---	6
α												
M	---	0.04		---	0.04		---	0.04		---	0.04	
N	20			18			28			28		
Note	1, 12, 13											

1/ Symbols in this column that are not on a configuration drawing are not applicable to that configuration; this is further noted when a line is blank in the MIN MAX columns.

FIGURE 11. Flat pack style - Continued.

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S Y M B O L	Variations (all dimensions shown in inches)											
	F-12 Config. B		N O T E	F-13 Config. A		N O T E	F-14 Config. A		N O T E	F-15 Config. A		N O T E
	Min	Max		Min	Max		Min	Max		Min	Max	
A	.090	.130		.060	.090		.060	.090		.060	.090	
b	.015	.022		.015	.022		.015	.022		.015	.022	
b1	.015	.019		.015	.019		.015	.019		.015	.019	
c	.004	.009		.004	.009		.004	.009		.004	.009	
c1	.004	.006		.004	.006		.004	.006		.004	.006	
D	---	.740	3	---	.430	3	---	.480	3	---	.530	3
D1												
E	.380	.420		.305	.355		.305	.355		.305	.355	
E1	---	.440	3	---	.375	3	---	.375	3	---	.375	3
E2	.180	---										
E3	.030	---										
E4												
E5												
e	.050 BSC			.050 BSC			.050 BSC			.050 BSC		
k	.008	.015	2	.005	.018	2	.005	.018	2	.005	.018	2
L	.250	.370		.250	.370		.250	.370		.250	.370	
Q	.026	.045	11	.026	.045	11	.026	.045	11	.026	.045	11
S1	.000	---	6	.005	---	6	.005	---	6	.005	---	6
S2												
α												
M	---	.0015		---	.0015		---	.0015		---	.0015	
N	28			16			1			20		
Note	1, 12, 13											

1/ Symbols in this column that are not on a configuration drawing are not applicable to that configuration; this is further noted when a line is blank in the MIN MAX columns.

FIGURE 11. Flat pack style - Continued.

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S Y M B O L	Variations (All dimensions shown in millimeters)											
	F-12 Config. B		N O T E	F-13 Config. A		N O T E	F-14 Config. A		N O T E	F-15 Config. A		N O T E
	Min	Max		Min	Max		Min	Max		Min	Max	
A	2.29	3.30	3	1.52	2.29	3	1.52	2.29	3	1.52	2.29	3
b	0.38	0.56		0.38	0.56		0.38	0.56		0.38	0.56	
b1	0.38	0.48		0.38	0.48		0.38	0.48		0.38	0.48	
c	0.10	0.23		0.10	0.23		0.10	0.23		0.10	0.23	
c1	0.10	0.15		0.10	0.15		0.10	0.15		0.10	0.15	
D	---	18.80	3	---	10.92	3	---	12.19	3	---	13.46	3
D1												
E	9.65	10.67		7.75	9.02		7.75	9.02		7.75	9.02	
E1	---	11.18		---	9.53		---	9.53		---	9.53	
E2	4.57	---										
E3	0.76	---										
E4												
E5												
e	1.27 BSC			1.27 BSC			1.27 BSC			1.27 BSC		
k	0.20	0.38	2	0.13	0.46	2	0.13	0.46	2	0.13	0.46	2
L	6.35	9.40		6.35	9.40		6.35	9.40		6.35	9.40	
Q	0.66	1.14		0.66	1.14		0.66	1.14		0.66	1.14	
S1	0.00	---		0.13	---		0.13	---		0.13	---	
S2												
α												
M	---	0.04		---	0.04		---	0.04		---	0.04	
N	28			16			18			20		
NOTE	1, 12, 13											

1/ Symbols in this column that are not on a configuration drawing are not applicable to that configuration; this is further noted when a line is blank in the MIN MAX columns.

FIGURE 11. Flat pack style - Continued.

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S Y M B O L	Variations (All dimensions shown in inches)									N O T E		
	F-16 Config. A		N O T E	F-17 Config. A		N O T E	F-18 Config. B					
	Min	Max		Min	Max		Min	Nom	Max			
A	.060	.090		.060	.090		.090	.107	.120			
b	.015	.022		.015	.022		.015	---	.020			
b1	.015	.019		.015	.019		.015	.017	.019			
c	.004	.009		.004	.009		.004	---	.007			
c1	.004	.006		.004	.006		.004	.005	.006			
D	---	.630	3	---	.730	3	---	---	.830	3		
D1												
E	.330	.380	3	.330	.380	3	.472	.480	.488			
E1	---	.400		---	.400		---	---	.490			
E2								.350	---		---	
E3								.030	---		---	
E4												
E5												
e	.050 BSC			.050 BSC			.050 BSC					
k	.005	.018	2	.005	.018	2	.008	.012	.015	2		
L	.250	.370	11	.250	.370	11	.270	.320	.370			
Q	.026	.045		.026	.045		.026	.035	.045			
S1	.005	---		6	.005		---	6	.005		---	---
S2												
α												
M	---	.0015		---	.0015		---	---	.0005			
N	24			28			32					
Note	1, 12, 13											

1/ Symbols in this column that are not on a configuration drawing are not applicable to that configuration; this is further noted when a line is blank in the MIN MAX columns.

FIGURE 11. Flat pack style - Continued.

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S Y M B O L	Variations (ALL dimensions shown in millimeters)										
	F-16 Config. A		N O T E	F-17 Config. A		N O T E	F-18 Config. B		Max	N O T E	
	Min	Max		Min	Max		Min	Nom			
A	1.52	2.29	3	1.52	2.29	3	2.29	2.72	3.05	3	
b	0.38	0.51		0.38	0.51		0.38	---	0.51		
b1	0.38	0.48		0.38	0.51		0.38	0.43	0.48		
c	0.10	0.23		0.10	0.23		0.10	---	0.18		
c1	0.10	0.15		0.10	0.15		0.10	0.13	0.15		
D	---	16.00	3	---	18.54	3	---	---	21.08	3	
D1											
E	8.38	9.65		8.38	9.65		11.99	12.19	12.40		
E1	---	10.16		---	10.16		---	---	12.65		7
E2							8.89	---	---		
E3					0.76	---	---				
E4											
E5											
e	1.27 BSC			1.27 BSC			1.27 BSC				
k	0.13	0.46	2	0.13	0.46	2	0.20	0.30	0.38	2	
L	6.35	9.40		6.35	9.40		6.86	8.13	9.40		
Q	0.66	1.14		0.66	1.14		0.66	0.89	1.14		11
S1	0.13	---	6	0.13	---	6	0.13	---	---		
S2											
α											
M	---	0.04		---	0.04		---	---	0.01		
N	24			28			32				
NOTE	1, 12, 13										

1/ Symbols in this column that are not on a configuration drawing are not applicable to that configuration; this is further noted when a line is blank in the MIN MAX columns.

FIGURE 11. Flat pack style - Continued.

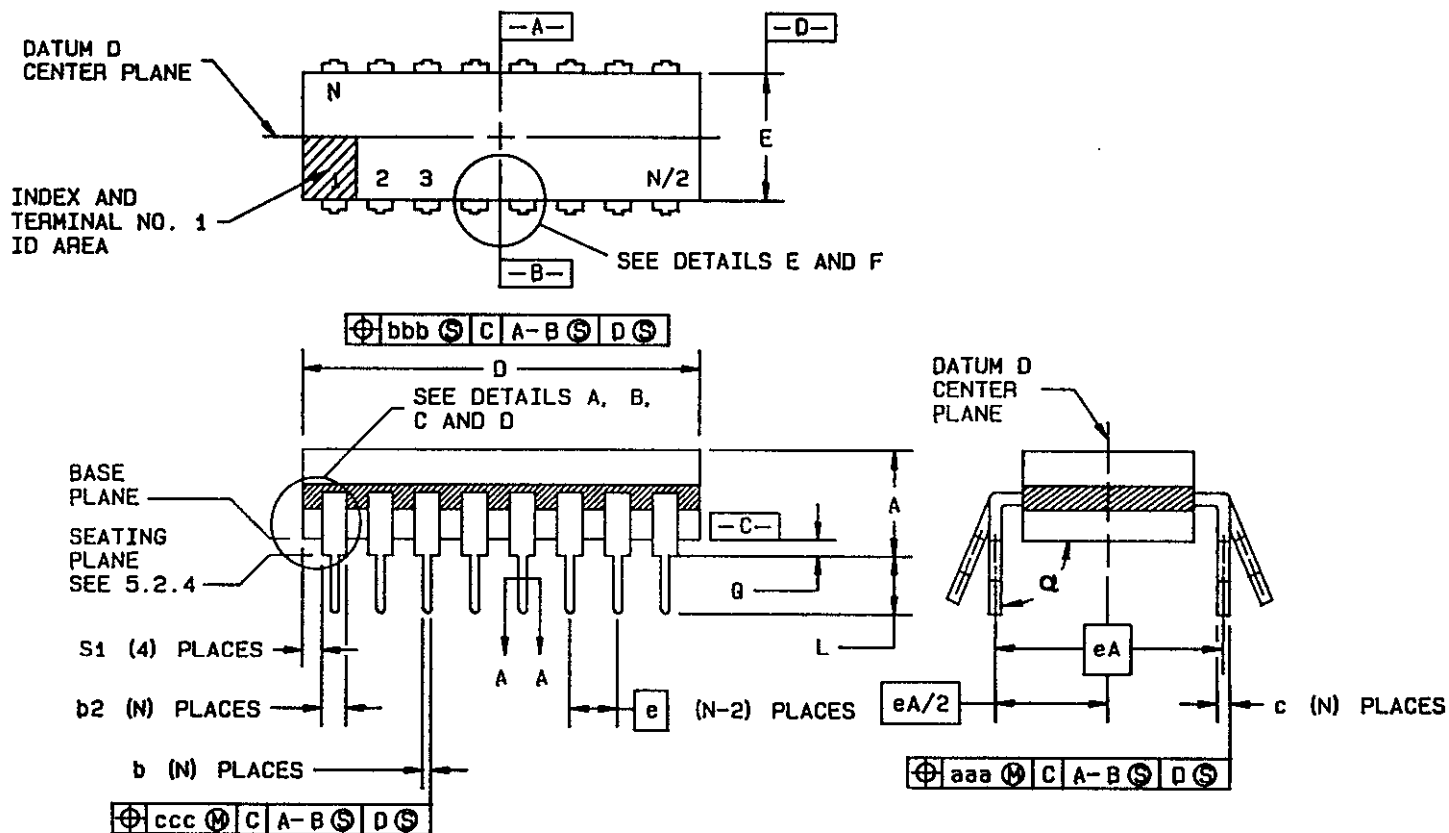
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NOTES:

1. Index area: A notch or a pin one identification mark shall be located adjacent to pin one and shall be located within the shaded area shown. The manufacturer's identification shall not be used as a pin one identification mark. Alternatively, a tab (dimension k) may be used to identify pin one. This tab may be located on either side of terminal one as shown in detail A, or it may be located on terminal one as shown in detail B.
2. If a pin one identification mark is used in addition to a tab, the limits of dimension k do not apply.
3. This dimension allows for off-center lid, meniscus, and glass overrun.
4. Dimensions b1 and c1 apply to lead base metal only. Dimension M applies to lead plating and finish thickness. The maximum limits of lead dimensions b and c or M shall be measured at the centroid of the finished lead surfaces, when solder dip or tin plate lead finish is applied.
5. N is the maximum number of terminal positions.
6. Measure dimension S1 at all four corners, see 5.2.5. There is an alternative minimum limit to dimension S1, see 5.2.2.
7. For bottom-brazed lead packages, no organic or polymeric materials shall be molded to the bottom of the package to cover the leads.
8. Optional, see note 1. If a pin one identification mark is used in addition to this tab, the minimum limit of dimension k does not apply.
9. Applies to leads exiting the end of the body (short side) and closest to the corners.
10. Lead configuration is optional within dimension E except dimensions b and c apply (see 5.2.1).
11. Dimension Q shall be measured at the point of exit (beyond the meniscus) of the lead from the body. Dimension Q minimum shall be reduced by .0015 inch (0.038 mm) maximum when solder dip lead finish is applied.
12. See tables VI and VII for descriptive type designators.
13. Configurations C and D are inactive for applications in new equipment design, see 4.8.

FIGURE 11. Flat pack style - Continued.

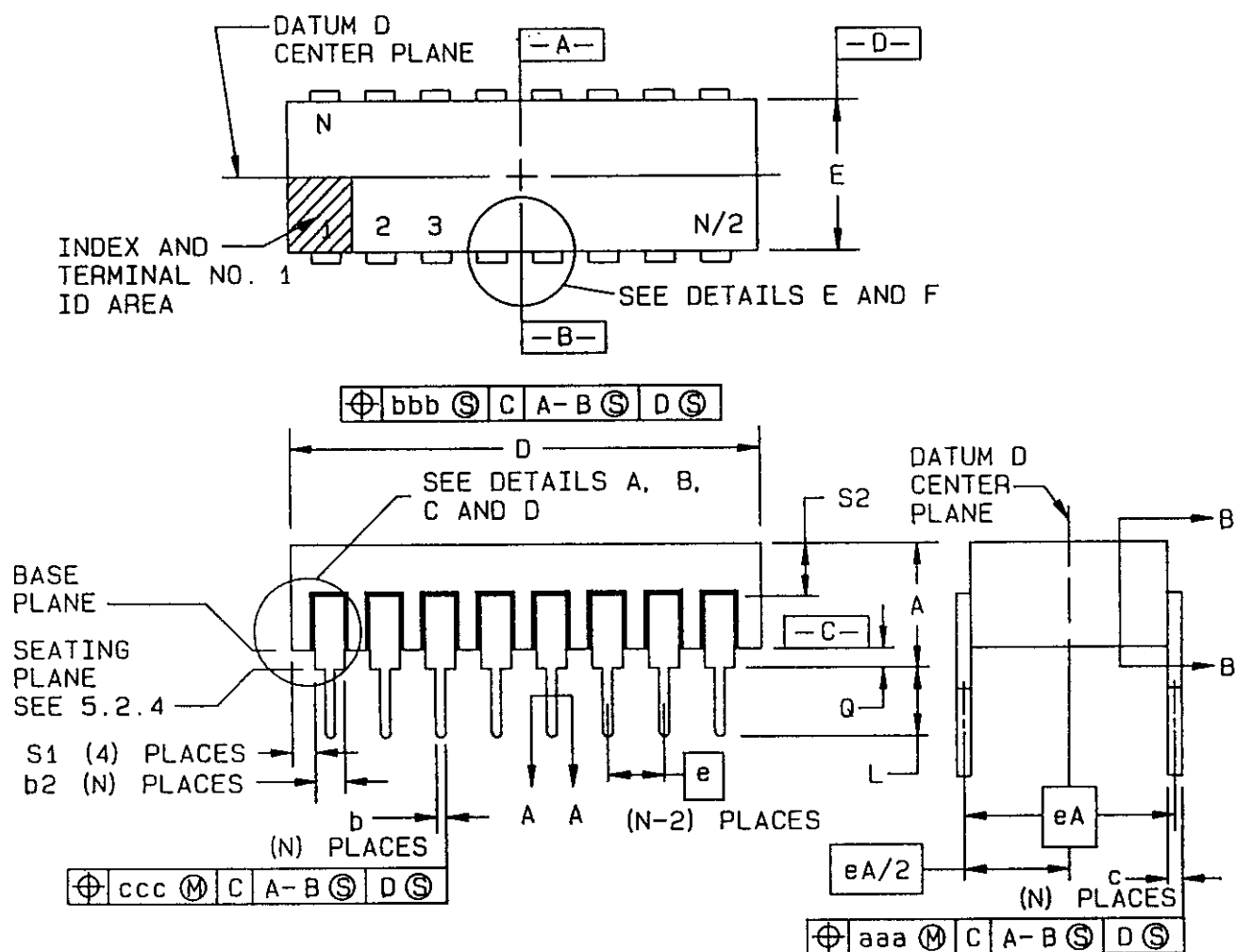
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Configuration A
Ceramic, glass-sealed

FIGURE 12. Dual-in-line package style.

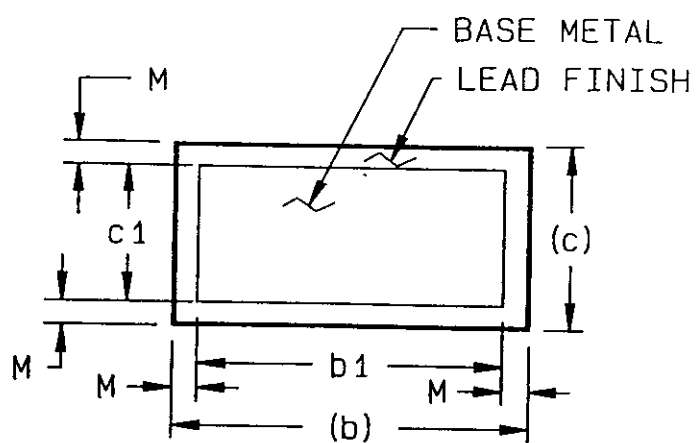
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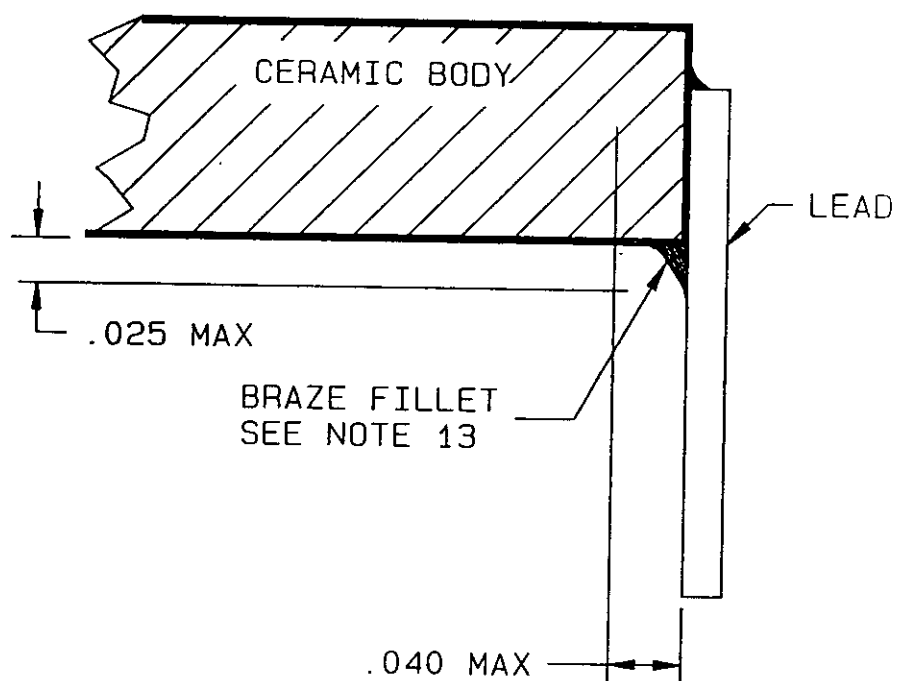
Configuration C
Ceramic, metal-sealed, side-brazed leads

FIGURE 12. Dual-in-line package style - Continued.

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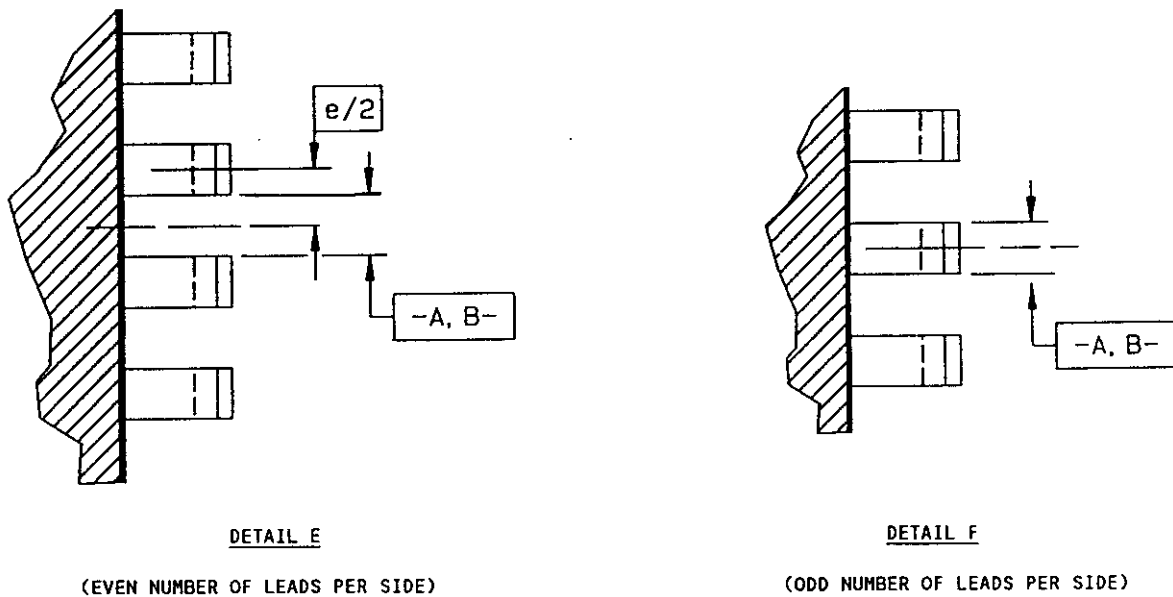
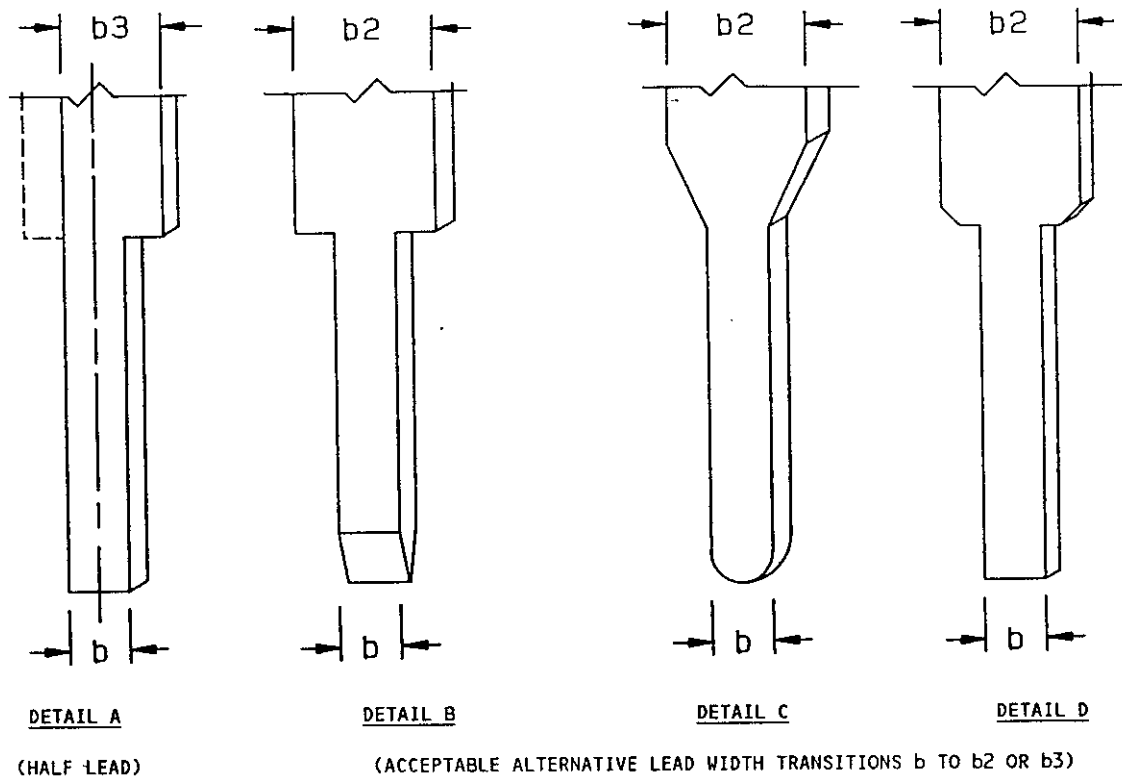
SECTION A-A



SECTION B-B

FIGURE 12. Dual-in-line package style - Continued.

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FIGURE 12. Dual-in-line package style - Continued.

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S Y M B O L	Variations (all dimensions shown in inches) 2/											
	D-1		N O T E	D-2		N O T E	D-3		N O T E	D-4		N O T E
	Min	Max		Min	Max		Min	Max		Min	Max	
A	---	.200		---	.200		---	.225		---	.200	
b	.014	.026	2	.014	.026	2	.014	.026	2	.014	.026	2
b1	.014	.023	3	.014	.023	3	.014	.023	3	.014	.023	3
b2	.045	.065	4	.045	.065	4	.045	.065	4	.045	.065	4
b3	.023	.045	5	.023	.045	5	.023	.045	5	.023	.045	5
c	.008	.018	2	.008	.018	2	.008	.018	2	.008	.018	2
c1	.008	.015	3	.008	.015	3	.008	.015	3	.008	.015	3
D	---	.785	6	---	.840	6	---	1.290	6	---	.405	6
E	.220	.310	6	.220	.310	6	.500	.610	6	.220	.310	6
E2	.100	---		.100	---		.270	---		.100	---	
E3	.050	---	7	.050	---	7	.050	---	7	.050	---	7
e	.100 BSC			.100 BSC			.100 BSC			.100 BSC		
eA	.300 BSC			.300 BSC			.600 BSC			.600 BSC		
eA/2	.150 BSC			.150 BSC			.300 BSC			.300 BSC		
L	.125	.200	8	.125	.200	8	.120	.200	8	.125	.200	8
Q	.015	.060	9	.015	.060	9	.015	.075	9	.015	.060	9
Q1	.020	---		.020	---		.020	---		.020	---	
S1	.005	---	10	.005	---	10	.005	---	10	.005	---	10
S2	.005	---	11	.005	---	11	.005	---	11	.005	---	11
α	90°	105°		90°	105°		90°	105°		90°	105°	
aaa	---	.015		---	.015		---	.015		---	.015	
bbb	---	.030		---	.030		---	.030		---	.030	
ccc	---	.010		---	.010		---	.010		---	.010	
M	---	.0015	2	---	.0015	2	---	.0015	2	---	.0015	2
N	14		12	16		12	24		12	8		12
Note	1, 14											

1/ Symbols in this column that are not on a configuration drawing are not applicable to that configuration; this is further noted when a line is blank in the MIN MAX columns.

2/ All configurations except as noted.

FIGURE 12. Dual-in-line package style - Continued.

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S Y M B O L	Variations (all dimensions shown in millimeters) 2/											
	D-1		N O T E	D-2		N O T E	D-3		N O T E	D-4		N O T E
	Min	Max		Min	Max		Min	Max		Min	Max	
A	---	5.08		---	5.08		---	5.72		---	5.08	
b	0.36	0.66	2	0.36	0.66	2	0.36	0.66	2	0.36	0.66	2
b1	0.36	0.58	3	0.36	0.58	3	0.36	0.58	3	0.36	0.58	3
b2	1.14	1.65	4	1.14	1.65	4	1.14	1.65	4	1.14	1.65	4
b3	0.58	1.14	5	0.58	1.14	5	0.58	1.14	5	0.58	1.14	5
c	0.20	0.46	2	0.20	0.46	2	0.20	0.46	2	0.20	0.46	2
c1	0.20	0.38	3	0.20	0.38	3	0.20	0.38	3	0.20	0.38	3
D	---	19.94	6	---	21.34	6	---	32.77	6	---	10.29	6
E	5.59	7.87	6	5.59	7.87	6	12.70	15.49	6	5.59	7.87	6
E2	2.54	---		2.54	---		6.86	---		2.54	---	
E3	1.27	---	7	1.27	---	7	1.27	---	7	1.27	---	7
e	2.54	BSC		2.54	BSC		2.54	BSC		2.54	BSC	
eA	7.62	BSC		7.62	BSC		15.24	BSC		7.62	BSC	
eA/2	3.81	BSC		3.81	BSC		7.62	BSC		3.81	BSC	
L	3.18	5.08	8	3.18	5.08	8	3.05	5.08	8	3.18	5.08	8
Q	0.38	1.52	9	0.38	1.52	9	0.38	1.91	9	0.38	1.52	9
Q1	0.51	---		0.51	---		0.51	---		0.51	---	
S1	0.13	---	10	0.13	---	10	0.13	---	10	0.13	---	10
S2	0.13	---	11	0.13	---	11	0.13	---	11	0.13	---	11
α	90°	105°		90°	105°		90°	105°		90°	105°	
aaa	---	0.38		---	0.38		---	0.38		---	0.38	
bbb	---	0.76		---	0.76		---	0.76		---	0.76	
ccc	---	0.25		---	0.25		---	0.25		---	0.25	
M	---	0.038	2	---	0.038	2	---	0.038	2	---	0.038	2
N	14		12	16		12	24		12	8		12
Note	1, 14											

1/ Symbols in this column that are not on a configuration drawing are not applicable to that configuration; this is further noted when a line is blank in the MIN MAX columns.

2/ All configurations except as noted.

FIGURE 12. Dual-in-line package style - Continued.

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S Y M B O L	Variations (all dimensions shown in inches) 2/											
	D-5		N O T E	D-6		N O T E	D-7		N O T E	D-8		N O T E
	Min	Max		Min	Max		Min	Max		Min	Max	
A	---	.225		---	.200		---	.225		---	.200	
b	.014	.026	2	.014	.026	2	.014	.026	2	.014	.026	2
b1	.014	.023	3	.014	.023	3	.014	.023	3	.014	.023	3
b2	.045	.065	4	.045	.065	4	.045	.065	4	.045	.065	4
b3	.023	.045	5	.023	.045	5	.023	.045	5	.023	.045	5
c	.008	.018	2	.008	.018	2	.008	.018	2	.008	.018	2
c1	.008	.015	3	.008	.015	3	.008	.015	3	.008	.015	3
D	---	2.096	6	---	.960	6	---	1.111	6	---	1.060	6
E	.510	.620	6	.220	.310	6	.350	.410	6	.220	.310	6
E2	.280	---		.100	---		.270	---		.100	---	
E3	.050	---	7	.050	---	7	.050	---	7	.050	---	7
e	.100 BSC			.100 BSC			.100 BSC			.100 BSC		
eA	.600 BSC			.300 BSC			.400 BSC			.300 BSC		
eA/2	.300 BSC			.150 BSC			.200 BSC			.150 BSC		
L	.125	.200	8	.125	.200	8	.125	.200	8	.125	.200	8
Q	.015	.070	9	.015	.070	9	.015	.070	9	.015	.070	9
Q1	.020	---		.020	---		.020	---		.020	---	
S1	.005	---	10	.005	---	10	.005	---	10	.005	---	10
S2	.005	---	11	.005	---	11	.005	---	11	.005	---	11
α	90°	105°		90°	105°		90°	105°		90°	105°	
aaa	---	.015		---	.015		---	.015		---	.015	
bbb	---	.030		---	.030		---	.030		---	.030	
ccc	---	.010		---	.010		---	.010		---	.010	
M	---	.0015	2	---	.0015	2	---	.0015	2	---	.0015	2
N	4		12	18		12	2		12	20		12
Note	1, 14											

1/ Symbols in this column that are not on a configuration drawing are not applicable to that configuration; this is further noted when a line is blank in the MIN MAX columns.

2/ All configurations except as noted.

FIGURE 12. Dual-in-line package styles - Continued.

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S Y M B O L	Variations (all dimensions shown in millimeters) 2/											
	D-5		N O T E	D-6		N O T E	D-7		N O T E	D-8		N O T E
	Min	Max		Min	Max		Min	Max		Min	Max	
A	---	5.72		---	5.08		---	5.72		---	5.08	
b	0.36	0.66	2	0.36	0.66	2	0.36	0.66	2	0.36	0.66	2
b1	0.36	0.58	3	0.36	0.58	3	0.36	0.58	3	0.36	0.58	3
b2	1.14	1.65	4	1.14	1.65	4	1.14	1.65	4	1.14	1.65	4
b3	0.58	1.14	5	0.58	1.14	5	0.58	1.14	5	0.58	1.14	5
c	0.20	0.46	2	0.20	0.46	2	0.20	0.46	2	0.20	0.46	2
c1	0.20	0.38	3	0.20	0.38	3	0.20	0.38	3	0.20	0.38	3
D	---	53.24	6	---	24.38	6	---	28.22	6	---	26.92	6
E	12.95	15.75	6	5.59	7.87	6	8.89	10.41	6	5.59	7.87	6
E2	7.11	---		2.54	---		6.86	---		2.54	---	
E3	1.27	---	7	1.27	---	7	1.27	---	7	1.27	---	7
e	2.54	BSC		2.54	BSC		2.54	BSC		2.54	BSC	
eA	7.62	BSC		7.62	BSC		15.24	BSC		7.62	BSC	
eA/2	3.81	BSC		3.81	BSC		7.62	BSC		3.81	BSC	
L	3.18	5.08	8	3.18	5.08	8	3.18	5.08	8	3.18	5.08	8
Q	0.38	1.78	9	0.38	1.78	9	0.38	1.78	9	0.38	1.78	9
Q1	0.51	---		0.51	---		0.51	---		0.51	---	
S1	0.13	---	10	0.13	---	10	0.13	---	10	0.13	---	10
S2	0.13	---	11	0.13	---	11	0.13	---	11	0.13	---	11
α	90°	105°		90°	105°		90°	105°		90°	105°	
aaa	---	0.38		---	0.38		---	0.38		---	0.38	
bbb	---	0.76		---	0.76		---	0.76		---	0.76	
ccc	---	0.25		---	0.25		---	0.25		---	0.25	
M	---	0.038	2	---	0.038	2	---	0.038	2	---	0.038	2
N	40		12	18		12	22		12	20		12
Note	1, 14											

1/ Symbols in this column that are not on a configuration drawing are not applicable to that configuration; this is further noted when a line is blank in the MIN MAX columns.

2/ All configurations except as noted.

FIGURE 12. Dual-in-line package styles - Continued.

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S Y M B O L	Variations (all dimensions shown in inches) 2/											
	D-9		N O T E	D-10		N O T E	D-11 Config. A,C		N O T E	D-12 Config. A,C		N O T E
	Min	Max		Min	Max		Min	Max		Min	Max	
A	---	.200		---	.232		---	.225		---	.225	
b	.014	.026	2	.014	.026	2	.014	.026	2	.014	.026	2
b1	.014	.023	3	.014	.023	3	.014	.023	3	.014	.023	3
b2	.045	.065	4	.045	.065	4	.045	.065	4	.045	.065	4
b3	.023	.045	5	.023	.045	5	.023	.045	5	.023	.045	5
c	.008	.018	2	.008	.018	2	.008	.018	2	.008	.018	2
c1	.008	.015	3	.008	.015	3	.008	.015	3	.008	.015	3
D	---	1.280	6	---	1.490	6	---	1.250	6	---	2.540	6
E	.220	.310	6	.500	.610	6	.350	.410	6	.870	.920	6
E2	.100	---		.270	---							
E3	.050	---	7	.050	---	7						
e	.100 BSC			.100 BSC			.100 BSC			.100 BSC		
eA	.300 BSC			.600 BSC			.400 BSC			.900 BSC		
eA/2	.150 BSC			.300 BSC			.200 BSC			.450 BSC		
L	.125	.200	8	.125	.200	8	.125	.200	8	.125	.200	8
q	.015	.060	9	.015	.060	9	.015	.060	9	.015	.070	9
q1	.020	---		.020	---							
s1	.005	---	10	.005	---	10	.005	---	10	.005	---	10
s2	.005	---	11	.005	---	11	.005	---	11	.005	---	11
α	90°	105°		90°	105°		90°	105°		90°	105°	
aaa	---	.015		---	.015		---	.015		---	.015	
bbb	---	.030		---	.030		---	.030		---	.030	
ccc	---	.010		---	.010		---	.010		---	.010	
M	---	.0015	2	---	.0015	2	---	.0015	2	---	.0015	2
N	24		12	28		12	24		12	50		12
Note	1, 14											

1/ Symbols in this column that are not on a configuration drawing are not applicable to that configuration; this is further noted when a line is blank in the MIN MAX columns.

2/ All configurations except as noted.

FIGURE 12. Dual-in-line package styles - Continued.

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S Y M B O L	Variations (all dimensions shown in millimeters) 2/											
	D-9		N O T E	D-10		N O T E	D-11 Config. A,C		N O T E	D-12 Config. A,C		N O T E
	Min	Max		Min	Max		Min	Max		Min	Max	
A	---	5.08		---	5.92		---	5.72		---	5.72	
b	0.36	0.66	2	0.36	0.66	2	0.36	0.66	2	0.36	0.66	2
b1	0.36	0.58	3	0.36	0.58	3	0.36	0.58	3	0.36	0.58	3
b2	1.14	1.65	4	1.14	1.65	4	1.14	1.65	4	1.14	1.65	4
b3	0.58	1.14	5	0.58	1.14	5	0.58	1.14	5	0.58	1.14	5
c	0.20	0.46	2	0.20	0.46	2	0.20	0.46	2	0.20	0.46	2
c1	0.20	0.38	3	0.20	0.38	3	0.20	0.38	3	0.20	0.38	3
D	---	32.51	6	---	37.85	6	---	31.75	6	---	64.52	6
E	5.59	7.87	6	12.70	15.49	6	8.89	10.41	6	22.10	23.37	6
E2	2.54	---		6.86	---							
E3	1.27	---	7	1.27	---	7						
e	2.54 BSC			2.54 BSC			2.54 BSC			2.54 BSC		
eA	7.62 BSC			15.24 BSC			10.16 BSC			22.86 BSC		
eA/2	3.81 BSC			7.62 BSC			5.08 BSC			11.83 BSC		
L	3.18	5.08	8	3.18	5.08	8	3.18	5.08	8	3.18	5.08	8
q	0.38	1.52	9	0.38	1.52	9	0.38	1.52	9	0.38	1.78	9
q1	0.51	---		0.51	---							
s1	0.13	---	10	0.13	---	10	0.13	---	10	0.13	---	10
s2	0.13	---	11	0.13	---	11	0.13	---	11	0.13	---	11
α	90°	105°		90°	105°		90°	105°		90°	105°	
aaa	---	0.38		---	0.38		---	0.38		---	0.38	
bbb	---	0.76		---	0.76		---	0.76		---	0.76	
ccc	---	0.25		---	0.25		---	0.25		---	0.25	
M	---	0.038	2	---	0.038	2	---	0.038	2	---	0.038	2
N	24		12	28		12	24		12	50		12
Note	1, 14											

1/ Symbols in this column that are not on a configuration drawing are not applicable to that configuration; this is further noted when a line is blank in the MIN MAX columns.

2/ All configurations except as noted.

FIGURE 12. Dual-in-line package styles - Continued.

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1/ Symbol	Variations (all dimensions shown in inches)								
	D-13 Config. C		Note	D-14 Config. A,C		Note	D-15 Config. A,C		Note
	Min	Max		Min	Max		Min	Max	
A	---	.225		---	.225		.130	.230	
b	.014	.026	2	.014	.026	2	.014	.026	2
b1	.014	.023	3	.014	.023	3	.014	.023	3
b2	.045	.065	4	.045	.065	4	.045	.065	4
b3	.023	.045	5	.023	.045	5	.023	.045	5
c	.008	.018	2	.008	.018	2	.008	.018	2
c1	.008	.015	3	.008	.015	3	.008	.015	3
D	---	3.24	6	---	2.435	6	---	1.485	6
E	.870	.920	6	.510	.620	6	.240	.310	6
E2									
E3									
e	.100 BSC			.100 BSC			.100 BSC		
eA	.900 BSC			.600 BSC			.300 BSC		
eA/2	.450 BSC			.300 BSC			.150 BSC		
L	.125	.200	8	.125	.200	8	.115	.200	8
Q	.015	.070	9	.015	.070	9	.015	.100	9
Q1									
S1	.005	---	10	.005	---	10	.005	---	10
S2	.005	---	11	.005	---	11	.005	---	11
α				90°	105°		90°	105°	
aaa	---	.015		---	.015		---	.015	
bbb	---	.030		---	.030		---	.030	
ccc	---	.010		---	.010		---	.010	
M	---	.0015	2	---	.0015	2	---	.0015	2
N	64		12	48		12	28		12
Note	1, 14								

1/ Symbols in this column that are not on a configuration drawing are not applicable to that configuration; this is further noted when a line is blank in the MIN MAX columns.

2/ All configurations except as noted.

FIGURE 12. Dual-in-line package styles - Continued.

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1/	Variations (all dimensions shown in millimeters)								
Symbol	D-13 Config. C		Note	D-14 Config. A,C		Note	D-15 Config. A,C		Note
	Min	Max		Min	Max		Min	Max	
A	---	5.72		---	5.72		3.30	5.84	
b	0.36	0.66	2	0.36	0.66	2	0.36	0.66	2
b1	0.36	0.58	3	0.36	0.58	3	0.36	0.58	3
b2	1.14	1.65	4	1.14	1.65	4	1.14	1.65	4
b3	0.58	1.14	5	0.58	1.14	5	0.58	1.14	5
c	0.20	0.46	2	0.20	0.46	2	0.20	0.46	2
c1	0.20	0.38	3	0.20	0.38	3	0.20	0.38	3
D	---	82.30	6	---	61.85	6	---	37.72	6
E	22.10	23.37	6	12.95	15.75	6	6.10	7.87	6
E2									
E3									
e	2.54 BSC			2.54 BSC			2.54 BSC		
eA	22.86 BSC			15.24 BSC			7.62 BSC		
eA/2	11.43 BSC			7.62 BSC			3.81 BSC		
L	3.18	5.08	8	3.18	5.08	8	2.92	5.08	8
Q	0.38	1.78	9	0.38	1.78	9	0.38	2.54	9
Q1									
S1	0.13	---	10	0.13	---	10	0.13	---	10
S2	0.13	---	11	0.13	---	11	0.13	---	11
α				90°	105°		90°	105°	
aaa	---	0.38		---	0.38		---	0.38	
bbb	---	0.76		---	0.76		---	0.76	
ccc	---	0.25		---	0.25		---	0.25	
M	---	0.038	2	---	0.038	2	---	0.038	2
N	64		12	48		12	28		12
Note	1, 14								

1/ Symbols in this column that are not on a configuration drawing are not applicable to that configuration; this is further noted when a line is blank in the MIN MAX columns.

2/ All configurations except as noted.

FIGURE 12. Dual-in-Line package styles - Continued.

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NOTES:

1. Index area: A notch or a pin one identification mark shall be located adjacent to pin one and shall be located within the shaded area shown. The manufacturer's identification shall not be used as a pin one identification mark.
2. The maximum limits of lead dimensions b and c or M shall be measured at the centroid of the finished lead surfaces, when solder dip or tin plate lead finish is applied.
3. Dimensions b1 and c1 apply to lead base metal only. Dimension M applies to lead plating and finish thickness.
4. The b2 minimum dimension of .045 inch (1.14 mm) shall be implemented one year from the date of this standard. Until that date, a minimum dimension of .038 (0.97 mm) is acceptable. See 5.2.4
5. Corner leads (1, N, N/2, and N/2+1) may be configured as shown in detail A. For this configuration dimension b3 replaces dimension b1.
6. This dimension allows for off-center lid, meniscus, and glass overrun.
7. For configuration B, no organic or polymeric materials shall be molded to the bottom of the package to cover the leads.
8. Pointed or rounded lead tips as shown in details B and C are preferred to ease insertion, but are not mandatory.
9. Dimension Q shall be measured from the seating plane to the base plane.
10. Measure dimension S1 at all four corners, see 5.2.5.
11. Measure dimension S2 from the top of the ceramic body to the nearest metallization or lead
12. N is the maximum number of terminal positions.
13. Braze fillet shall be concave. The maximum dimensions of this fillet include solder dip or tin plate lead finish, if applied.
14. See tables VI and VII for descriptive type designators.

FIGURE 12. Dual-in-line package style - Continued.

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Symbol	Variations (all dimensions shown in inches)											
	A1		Note	A2		Note	A3		Note	A4		Note
	Min	Max		Min	Max		Min	Max		Min	Max	
A	.165	.185		.165	.185		.165	.185		.240	.260	
ϕb	.016	.019	1	.016	.019	1	.016	.019	1	.016	.019	1,5
$\phi b1$	.016	.021	1	.016	.021	1	.016	.021	1	.016	.021	1,5
$\phi b2$	.016	.024		.016	.024		.016	.024		.016	.021	1,5
ϕD	.335	.375		.335	.375		.335	.375		.350	.370	
$\phi D1$	.305	.335		.305	.335		.305	.335		.315	.335	
$\phi D2$	.110	.160		.110	.160		.110	.160				2
e	.200 BSC			.230 BSC			.230 BSC			.200 BSC		
e1	.100 BSC			.115 BSC			.115 BSC			.100 BSC		
F	---	.040		---	.040		---	.040		.009	.125	
k	.027	.034		.027	.034		.027	.034		.027	.034	
k1	.027	.045	3	.027	.045	3	.027	.045	3	.029	.040	3
L	.500	.750	1	.500	.750	1	.500	.750	1	.500	.750	1
L1	---	.050	1	---	.050	1	---	.050	1	---	.050	1
L2	.250	---	1	.250	---	1	.250	---	1	.250	---	1
Q	.010	.045		.010	.045		.010	.045				2
α	45° BSC		4	36° BSC		4	30° BSC		4	45° BSC		4
β	45° BSC		4	36° BSC		4	30° BSC		4	90° BSC		4
N	8		5	10		5	12		5	3		5
Notes	6, 7, 8											

FIGURE 13. Can style - Continued.

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Symbol	Variations (all dimensions shown in millimeters)											
	A1		Note	A2		Note	A3		Note	A4		Note
	Min	Max		Min	Max		Min	Max		Min	Max	
A	4.19	4.70		4.19	4.70		4.19	4.70		6.10	6.60	
ϕb	0.41	0.48	1	0.41	0.48	1	0.41	0.48	1	0.41	0.48	1
$\phi b1$	0.41	0.53	1	0.41	0.53	1	0.41	0.53	1	0.41	0.53	1
$\phi b2$	0.41	0.61		0.41	0.61		0.41	0.61		0.41	0.61	
ϕD	8.51	9.40		8.51	9.40		8.51	9.40		8.89	9.50	
$\phi D1$	7.75	8.51		7.75	8.51		7.75	8.51		8.00	8.51	
$\phi D2$	2.79	4.06		2.79	4.06		2.79	4.06				2
e	5.08 BSC			5.84 BSC			5.84 BSC			5.08 BSC		
e1	2.54 BSC			2.92 BSC			2.92 BSC			2.54 BSC		
F	---	1.02		---	1.02		---	1.02		---	1.02	
k	0.69	0.86		0.69	0.86		0.69	0.86		0.69	0.86	
k1	0.69	1.14	3	0.69	1.14	3	0.69	1.14	3	0.69	1.14	3
L	12.70	19.05	1	12.70	19.05	1	12.70	19.05	1	12.70	19.05	1
L1	---	1.27	1	---	1.27	1	---	1.27	1	---	1.27	1
L2	6.35	---	1	6.35	---	1	6.35	---	1	6.35	---	1
Q	0.25	1.14		0.25	1.14		0.25	1.14				2
α	45° BSC		4	36° BSC		4	30° BSC		4	45° BSC		4
β	45° BSC		4	36° BSC		4	30° BSC		4	90° BSC		4
N	8		5	10		5	12		5	3		5
Notes	6, 7, 8											

FIGURE 13. Can style - Continued.

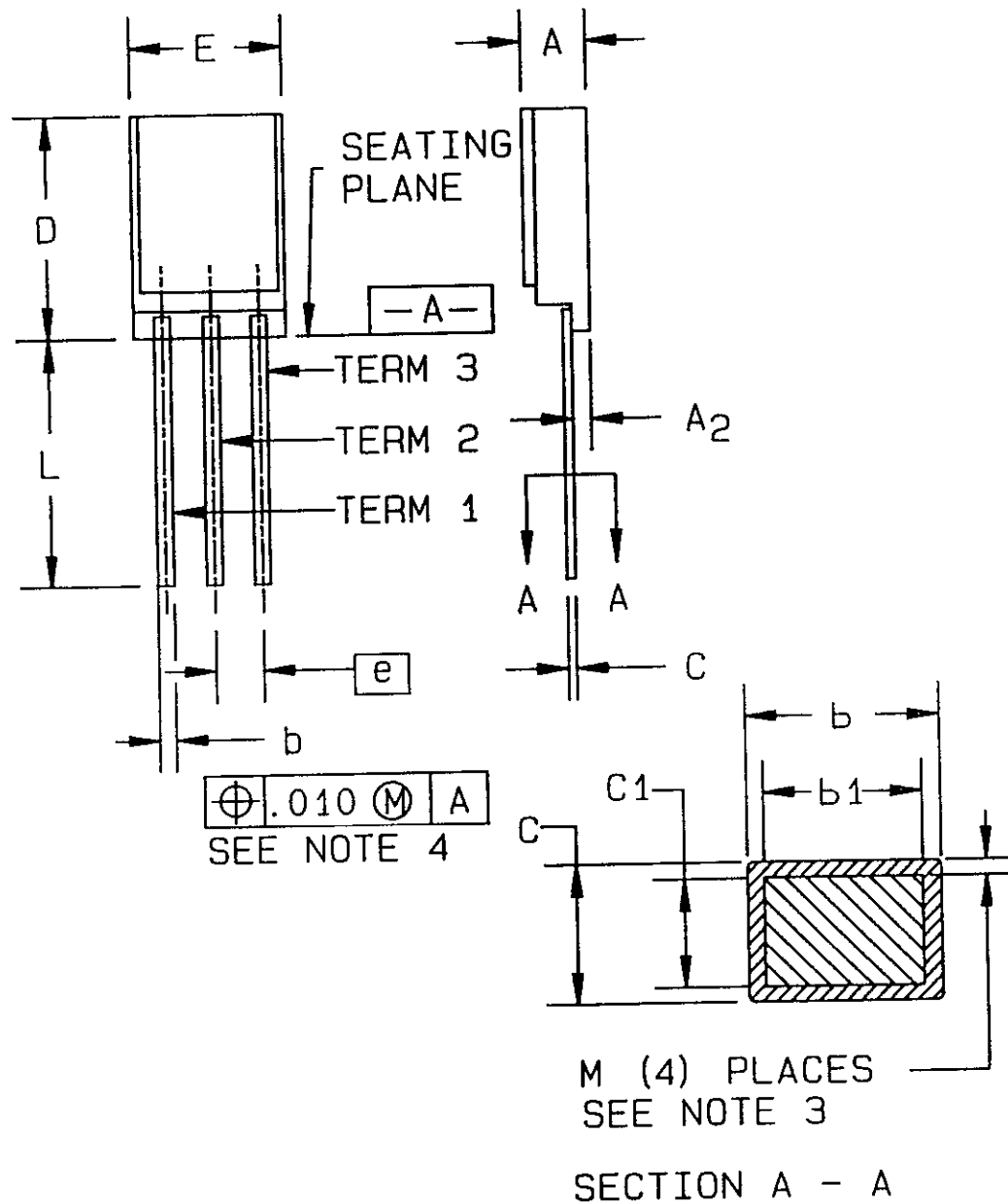
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NOTES:

1. (All leads) ϕb applies between L1 and L2. $\phi b1$ applies between L2 and .500 from the reference plane. Diameter is uncontrolled in L1 and beyond .500 from the reference plane.
2. The package feature described by dimension symbols $\phi 02$ and Q does not exist for variation A4; therefore the reference, base, and seating planes are the same for this variation.
3. Measured from maximum diameter of the product.
4. α is the basic spacing from the centerline of the tab to terminal 1 and β is the basic spacing of each lead or lead position (N -1 places) from α , looking at the bottom of the package.
5. N is the maximum number of terminal positions.
6. True position is measured in a plane .054 inch +.001 -.000 inch below the base plane.
7. This style package may be measured by direct methods or by gauge.
8. See table VI for descriptive type designators.

FIGURE 13. Can style - Continued.

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FIGURE 14. Ceramic, metal-sealed, single-in-line package style.

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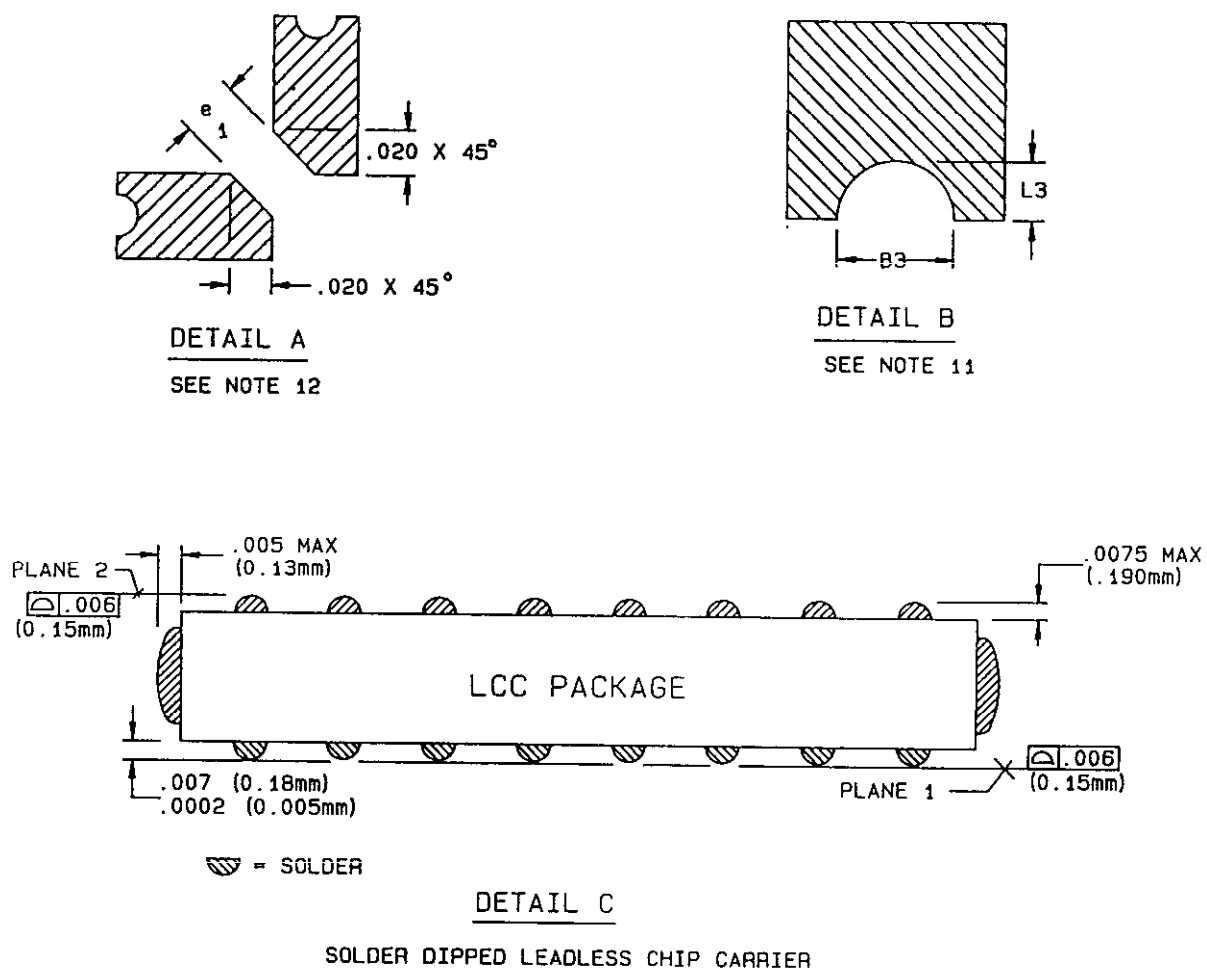
Symbol	(All dimensions in inches)				(All dimensions in millimeters)			
	S1			Note	S1			Note
	Min	Nom	Max		Min	Nom	Max	
A	.055	.060	.065		1.40	1.52	1.65	
A2	.012	.014	.018		0.30	0.36	0.46	
b	.014	---	.021	3	0.36	---	0.53	3
b1	.014	.016	.018	3	0.36	0.41	0.46	3
c	.008	---	.017		0.20	---	0.43	
c1	.008	.010	.014	3	0.20	0.25	0.36	3
D	.220	.225	.240		5.59	5.72	6.10	
e	.050 BSC				1.27 BSC			
E	.154	.160	.166		3.91	4.06	4.22	
L	.475	---	---		12.06	---	---	
M	---	---	.003	3	---	---	.08	3
Notes	1							

NOTES:

1. Dimensioning and tolerancing in accordance with ANSI Y14.5M-1982.
2. Controlling dimension, inch.
3. Maximum increase when lead finish A or B is applied.
4. The increase in the b dimension, as a result of lead finishes, does not change the positional tolerance, .010, which is applied at MMC of .018.

FIGURE 14. Ceramic, metal-sealed, single-in-line package style - Continued.

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FIGURE 15. Ceramic, metal-sealed, square and rectangular leadless chip carrier styles - Continued.

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S Y M B O L	Square only - variations (all dimensions shown in inches)											
	C-1		N O T E	C-1A		N O T E	C-2		N O T E	C-2A		N O T E
	Min	Max		Min	Max		Min	Max		Min	Max	
A	.060	.100	9,13	.060	.075	9,13	.060	.100	9,13	.060	.075	9,13
A1	.050	.088		.050	.065		.050	.088		.050	.065	
B	---	---		---	---		---	---		---	---	
B1	.022	.028	4,6, 14	.022	.028	4,6, 14	.022	.028	4,6, 14	.022	.028	4,6, 14
B2	.072 REF		7,8	.072 REF		7,8	.072 REF		7,8	.072 REF		7,8
B3	.006	.022	11	.006	.022	11	.006	.022	11	.006	.022	11
D/E	.292	.308		.292	.308		.342	.358		.342	.358	
D1/E1	.150 BSC			.150 BSC			.200 BSC			.200 BSC		
D2/E2	.075 BSC		16	.075 BSC		16	.100 BSC		16	.100 BSC		16
D3/E3	---	.308	4	---	.308	4	---	.358	4	---	.358	4
e	.050 BSC			.050 BSC			.050 BSC			.050 BSC		
e1	.015	---	4,12	.015	---	4,12	.015	---	4,12	.015	---	4,12
h	.040 REF		10	.040 REF		10	.040 REF		10	.040 REF		10
j	.020 REF		10	.020 REF		10	.020 REF		10	.020 REF		10
L	.045	.055		.045	.055		.045	.055		.045	.055	
L1	.045	.055		.045	.055		.045	.055		.045	.055	
L2	.075	.095	7,8	.075	.095	7,8	.075	.095	7,8	.075	.095	7,8
L3	.003	.015	11	.003	.015	11	.003	.015	11	.003	.015	11
ND/NE	4		5	4		5	5		5	5		5
N	16		5	16		5	20		5	20		5
Note	1											

FIGURE 15. Ceramic, metal-sealed, square and rectangular leadless chip carrier styles - Continued.

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S Y M B O L	Square only - variations (all dimensions shown in millimeters)											
	C-1		N O T E	C-1A		N O T E	C-2		N O T E	C-2A		N O T E
	Min	Max		Min	Max		Min	Max		Min	Max	
A	1.52	2.54	9,13	1.52	1.91	9,13	1.52	2.54	9,13	1.52	1.91	9,13
A1	1.27	2.23		1.27	1.65		1.27	2.23		1.27	1.65	
B	---	---		---	---		---	---		---	---	
B1	0.56	0.71	4,6, 14	0.56	0.71	4,6, 14	0.56	0.71	4,6, 14	0.56	0.71	4,6, 14
B2	1.83	REF	7,8	1.83	REF	7,8	1.83	REF	7,8	1.83	REF	7,8
B3	0.15	0.56	11	0.15	0.56	11	0.15	0.56	11	0.15	0.56	11
D/E	7.42	7.82		7.42	7.82		8.69	9.09		8.69	9.09	
D1/E1	3.81	BSC		3.81	BSC		5.08	BSC		5.08	BSC	
D2/E2	1.90	BSC	16	1.90	BSC	16	2.54	BSC	16	2.54	BSC	16
D3/E3	---	7.82	4	---	7.82	4	---	9.09	4	---	9.09	4
e	1.27	BSC		1.27	BSC		1.27	BSC		1.27	BSC	
e1	0.38	---	4,12	0.38		4,12	0.38		4,12	0.38		4,12
h	1.02	REF	10	1.02	REF	10	1.02	REF	10	1.02	REF	10
j	0.51	REF	10	0.51	REF	10	0.51	REF	10	0.51	REF	10
L	1.14	1.40		1.14	1.40		1.14	1.40		1.14	1.40	
L1	1.14	1.40		1.14	1.40		1.14	1.40		1.14	1.40	
L2	1.90	2.41	7,8	1.90	2.41	7,8	1.90	2.41	7,8	1.90	2.41	7,8
L3	0.08	0.38	11	0.08	0.38	11	0.08	0.38	11	0.08	0.38	11
ND/NE	4		5	4		5	5		5	5		5
N	16		5	16		5	20		5	20		5
Note	1											

FIGURE 15. Ceramic, metal-sealed, square and rectangular leadless chip carrier styles - Continued.

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S Y M B O L	Square only - variations (all dimensions shown in inches)											
	C-3		N O T E	C-3A		N O T E	C-4		N O T E	C-4A		N O T E
	Min	Max		Min	Max		Min	Max		Min	Max	
A	.060	.100	9,13	.060	.075	9,13	.060	.100	9,13	.060	.075	9,13
A1	.050	.088		.050	.065		.050	.088		.050	.065	
B	---	---		---	---		---	---		---	---	
B1	.022	.028	4,6, 14	.022	.028	4,6, 14	.022	.028	4,6, 14	.022	.028	4,6, 14
B2	.072	REF	7,8	.072	REF	7,8	.072	REF	7,8	.072	REF	7,8
B3	.006	.022	11	.006	.022	11	.006	.022	11	.006	.022	11
D/E	.395	.410		.395	.410		.442	.460		.442	.460	
D1/E1	.250	BSC		.250	BSC		.300	BSC		.300	BSC	
D2/E2	.125	BSC	16	.125	BSC	16	.150	BSC	16	.150	BSC	16
D3/E3	---	.410	4		.410	4	---	.460	4	---	.460	4
e	.050	BSC		.050	BSC		.050	BSC		.050	BSC	
e1	.015	---	4,12	.015	---	4,12	.015	---	4,12	.015	---	4,12
h	.040	REF	10	.040	REF	10	.040	REF	10	.040	REF	10
j	.020	REF	10	.020	REF	10	.020	REF	10	.020	REF	10
L	.045	.055		.045	.055		.045	.055		.045	.055	
L1	.045	.055		.045	.055		.045	.055		.045	.055	
L2	.075	.095	7,8	.075	.095	7,8	.075	.095	7,8	.075	.095	7,8
L3	.003	.015	11	.003	.015	11	.003	.015	11	.003	.015	11
ND/NE	6		5	6		5	7		5	7		5
N	24		5	24		5	28		5	28		5
Note	1											

FIGURE 15. Ceramic, metal-sealed, square and rectangular leadless chip carrier styles - Continued.

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S Y M B O L	Square only - variations (all dimensions shown in millimeters)											
	C-3		N O T E	C-3A		N O T E	C-4		N O T E	C-4A		N O T E
	Min	Max		Min	Max		Min	Max		Min	Max	
A	1.52	2.54	9,13	1.52	1.91	9,13	1.52	2.54	9,13	1.52	1.91	9,13
A1	1.27	2.23		1.27	1.65		1.27	2.23		1.27	1.65	
B	---	---		---	---		---	---		---	---	
B1	0.56	0.71	4,6, 14	0.56	0.71	4,6, 14	0.56	0.71	4,6, 14	0.56	0.71	4,6, 14
B2	1.83	REF	7,8	1.83	REF	7,8	1.83	REF	7,8	1.83	REF	7,8
B3	0.15	0.56	11	0.15	0.56	11	0.15	0.56	11	0.15	0.56	11
D/E	10.03	10.41		10.03	10.41		11.23	11.68		11.23	11.68	
D1/E1	6.35	BSC		6.35	BSC		7.62	BSC		7.62	BSC	
D2/E2	3.18	BSC	16	3.18	BSC	16	3.81	BSC	16	3.81	BSC	16
D3/E3	---	10.41	4	---	10.41	4	---	11.68	4	---	11.68	4
e	1.27	BSC		1.27	BSC		1.27	BSC		1.27	BSC	
e1	0.38			0.38			0.38			0.38		
h	1.02	REF	10	1.02	REF	10	1.02	REF	10	1.02	REF	10
j	0.51	REF	10	0.51	REF	10	0.51	REF	10	0.51	REF	10
L	1.14	1.40		1.14	1.40		1.14	1.40		1.14	1.40	
L1	1.14	1.40		1.14	1.40		1.14	1.40		1.14	1.40	
L2	1.90	2.41	7,8	1.90	2.41	7,8	1.90	2.41	7,8	1.90	2.41	7,8
L3	0.08	0.38	11	0.08	0.38	11	0.08	0.38	11	0.08	0.38	11
ND/NE	6		5	6		5	7		5	7		5
N	24		5	24		5	28		5	28		5
Note	1											

FIGURE 15. Ceramic, metal-sealed, square and rectangular leadless chip carrier styles - Continued.

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S Y M B O L	Square only - variations (all dimensions shown in inches)											
	C-5		N O T E	C-6		N O T E	C-7		N O T E	C-8		N O T E
	Min	Max		Min	Max		Min	Max		Min	Max	
A	.064	.120	9,13	.082	.120	9,13	.082	.120	9,13	.082	.120	9,13
A1	.054	.088		.072	.088		.072	.094		.072	.094	
B	.033	.039	6	.033	.039	6	.033	.039	6	.033	.039	6
B1	.022	.028	4,6, 14	.022	.028	4,6, 14	.022	.028	4,6, 14	.022	.028	4,6, 14
B2	.072	REF	7,8	.072	REF	7,8	.072	REF	7,8	.072	REF	7,8
B3	.006	.022	11	.006	.022	11	.006	.022	11	.006	.022	11
D/E	.640	.662		.739	.761		.938	.962		1.135	1.165	
D1/E1	.500	BSC		.600	BSC		.800	BSC		1.000	BSC	
D2/E2	.250	BSC	16	.300	BSC	16	.400	BSC	16	.500	BSC	16
D3/E3	---	.662	4	---	.662	4	---	.862	4	---	1.065	4
e	.050	BSC		.050	BSC		.050	BSC		.050	BSC	
e1	.015	---	4,12	.015	---	4,12	.015	---	4,12	.015	---	4,12
h	.040	REF	10	.040	REF	10	.040	REF	10	.040	REF	10
j	.020	REF	10	.020	REF	10	.020	REF	10	.020	REF	10
L	.045	.055		.045	.055		.045	.055		.045	.055	
L1	.045	.055		.045	.055		.045	.055		.045	.055	
L2	.075	.095	7,8	.075	.095	7,8	.075	.095	7,8	.075	.095	7,8
L3	.003	.015	11	.003	.015	11	.003	.015	11	.003	.015	11
ND/NE	11		5	13		5	17		5	21		5
N	44		5	52		5	68		5	84		5
Note	1											

FIGURE 15. Ceramic, metal-sealed, square and rectangular leadless chip carrier styles - Continued.

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S Y M B O L	Square only - variations (all dimensions shown in millimeters)											
	C-5		N O T E	C-6		N O T E	C-7		N O T E	C-8		N O T E
	Min	Max		Min	Max		Min	Max		Min	Max	
A	1.63	3.05	9,13	2.08	3.05	9,13	2.08	3.05	9,13	2.08	3.05	9,13
A1	1.37	2.24		1.83	2.24		1.83	2.39		1.83	2.39	
B	0.84	0.99	6	0.84	0.99	6	0.84	0.99	6	0.84	0.99	6
B1	0.56	0.71	4,6, 14	0.56	0.71	4,6, 14	0.56	0.71	4,6, 14	0.56	0.71	4,6, 14
B2	1.83	REF	7,8	1.83	REF	7,8	1.83	REF	7,8	1.83	REF	7,8
B3	0.15	0.56	11	0.15	0.56	11	0.15	0.56	11	0.15	0.56	11
D/E	16.26	16.81		18.77	19.33		23.83	24.43		28.83	29.59	
D1/E1	12.70	BSC		15.24	BSC		20.32	BSC		25.40	BSC	
D2/E2	6.35	BSC	16	7.62	BSC	16	10.16	BSC	16	12.70	BSC	16
D3/E3	---	16.81	4	---	16.81	4	---	21.89	4	---	27.05	4
e	1.27	BSC		1.27	BSC		1.27	BSC		1.27	BSC	
e1	0.38	---	4,12	0.38	---	4,12	0.38	---	4,12	0.38	---	4,12
h	1.02	REF	10	1.02	REF	10	1.02	REF	10	1.02	REF	10
j	0.51	REF	10	0.51	REF	10	0.51	REF	10	0.51	REF	10
L	1.14	1.40		1.14	1.40		1.14	1.40		1.14	1.40	
L1	1.14	1.40		1.14	1.40		1.14	1.40		1.14	1.40	
L2	1.90	2.41	7,8	1.90	2.41	7,8	1.90	2.41	7,8	1.90	2.41	7,8
L3	0.08	0.38	11	0.08	0.38	11	0.08	0.38	11	0.08	0.38	11
ND/NE	11		5	13		5	17		5	21		5
N	44		5	52		5	68		5	84		5
Note	1											

FIGURE 15. Ceramic, metal-sealed, square and rectangular leadless chip carrier styles - Continued.

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S Y M B O L	Rectangular only - variations (all dimensions shown in inches)											
	c-9		N O T E	c-9A		N O T E	c-10		N O T E	c-10A		N O T E
	Min	Max		Min	Max		Min	Max		Min	Max	
A	.060	.120	9,13	.060	.075	9,13	.060	.120	9,13	.060	.075	9,13
A1	.050	.088		.050	.065		.050	.088		.050	.065	
B	---	---		---	---		---	---		---		
B1	.022	.028	4,6, 14	.022	.028	4,6, 14	.022	.028	4,6, 14	.022	.028	4,6, 14
B2	.072 REF		7,8	.072 REF		7,8	.072 REF		7,8	.072 REF		7,8
B3	.006	.022	11	.006	.022	11	.006	.022	11	.006	.022	11
D	.280	.305		.280	.305		.280	.305		.280	.305	
D1	.150 BSC			.150 BSC			.150 BSC			.150 BSC		
D2	.075 BSC			.075 BSC			.075 BSC			.075 BSC		
D3	---	.305	4	---	.305	4	---	.305	4	---	.305	4
E	.345	.365		.345	.365		.417	.440		.417	.440	
E1	.200 BSC			.200 BSC			.200 BSC			.200 BSC		
E2	.100 BSC			.100 BSC			.100 BSC			.100 BSC		
E3	---	.365	4	---	.365	4	---	.440	4	---	.440	4
e	.050 BSC		4,12	.050 BSC		4,12	.050 BSC		4,12	.050 BSC		4,12
e1	.015	---		.015	---		.015	---		.015	---	
h	.040 REF			.040 REF			.040 REF			.040 REF		
j	.020 REF		10	.020 REF		10	.020 REF		10	.020 REF		10
L	.045	.055	7,8	.045	.055	7,8	.045	.055	7,8	.045	.055	7,8
L1	.045	.055		.045	.055		.075	.090		.075	.090	
L2	.075	.095		.075	.095		.075	.148		.075	.148	
L3	.003	.015	11	.003	.015	11	.003	.015	11	.003	.015	11
ND	4		5	4		5	4		5	4		5
NE	5		5	5		5	5		5	5		5
N	18		5	18		5	18		5	18		5
Note	1											

FIGURE 15. Ceramic, metal-sealed, square and rectangular leadless chip carrier styles - Continued.

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S Y M B O L	Rectangular only - variations (all dimensions shown in millimeters)											
	C-9		N O T E	C-9A		N O T E	C-10		N O T E	C-10A		N O T E
	Min	Max		Min	Max		Min	Max		Min	Max	
A	1.52	3.05	9,13	1.52	1.90	9,13	1.52	3.05	9,13	1.52	1.90	9,13
A1	1.27	2.24		1.27	1.65		1.27	2.24		1.27	1.65	
B	---	---		---	---		---	---		---	---	
B1	0.56	0.71	4,6, 14	0.56	0.71	4,6, 14	0.56	0.71	4,6, 14	0.56	0.71	4,6, 14
B2	1.83	REF	7,8	1.83	REF	7,8	1.83	REF	7,8	1.83	REF	7,8
B3	0.15	0.56	11	0.15	0.56	11	0.15	0.56	11	0.15	0.56	11
D	7.11	7.75		7.11	7.75		7.11	7.75		7.11	7.75	
D1	3.81			3.81			3.81			3.81		
D2	1.90	BSC	16	1.90	BSC	16	1.90	BSC	16	1.90	BSC	16
D3	---	7.75	4	---	7.75	4	---	7.75	4	---	7.75	4
E	8.76	9.27		8.76	9.27		10.59	11.18		10.59	11.18	
E1	5.08	BSC		5.08	BSC		5.08	BSC		5.08	BSC	
E2	2.54	BSC	16	2.54	BSC	16	2.54	BSC	16	2.54	BSC	16
E3		9.27	4		9.27	4		11.18	4		11.18	4
e	1.27	BSC		1.27	BSC		1.27	BSC		1.27	BSC	
e1	0.38	---	4,12	0.38	---	4,12	0.38	---	4,12	0.38	---	4,12
h	1.02	REF	10	1.02	REF	10	1.02	REF	10	1.02	REF	10
j	0.51	REF	10	0.51	REF	10	0.51	REF	10	0.51	REF	10
L	1.14	1.40		1.14	1.40		1.14	1.40		1.14	1.40	
L1	1.14	1.40		1.14	1.40		1.90	2.29		1.90	2.29	
L2	1.90	2.41	7,8	1.90	2.41	7,8	1.90	3.76	7,8	1.90	3.76	7,8
L3	0.08	0.38	11	0.08	0.38	11	0.08	0.38	11	0.08	0.38	11
ND	4		5	4		5	4		5	4		5
NE	5		5	5		5	5		5	5		5
N	18		5	18		5	18		5	18		5
Note	1											

FIGURE 15. Ceramic, metal-sealed, square and rectangular leadless chip carrier styles - Continued.

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S Y M B O L	Rectangular only - variations (all dimensions shown in inches)											
	C-11		N O T E	C-11A		N O T E	C-12		N O T E	C-12A		N O T E
	Min	Max		Min	Max		Min	Max		Min	Max	
A	.060	.120	9,13	.060	.075	9,13	.060	.120	9,13	.060	.075	9,13
A1	.050	.088		.050	.065		.050	.088		.050	.065	
B	---	---		---	---		---	---		---	---	
B1	.022	.028	4,6, 14	.022	.028	4,6, 14	.022	.028	4,6, 14	.022	.028	4,6, 14
B2	.072 REF		7,8	.072 REF		7,8	.072 REF		7,8	.072 REF		7,8
B3	.006	.022	11	.006	.022	11	.006	.022	11	.006	.022	11
D	.342	.358		.342	.358		.442	.458		.442	.458	
D1	.200 BSC			.200 BSC			.300 BSC			.300 BSC		
D2	.100 BSC		16	.100 BSC		16	.150 BSC		16	.150 BSC		16
D3	---	.358	4	---	.358	4	---	.458	4	---	.458	4
E	.540	.560		.540	.560		.540	.560		.540	.560	
E1	.400 BSC			.400 BSC			.400 BSC			.400 BSC		
E2	.200 BSC		16	.200 BSC		16	.200 BSC		16	.200 BSC		16
E3	---	.358	4	---	.558	4	---	.558	4	---	.558	4
e	.050 BSC			.050 BSC			.050 BSC			.050 BSC		
e1	.015	---	4,12	.015	---	4,12	.015	---	4,12	.015	---	4,12
h	.040 REF		10	.040 REF		10	.040 REF		10	.040 REF		10
j	.020 REF		10	.020 REF		10	.020 REF		10	.020 REF		10
L	.045	.055		.045	.055		.045	.055		.045	.055	
L1	.045	.055		.045	.055		.074	.055		.045	.055	
L2	.075	.095	7,8	.075	.095	7,8	.075	.095	7,8	.075	.095	7,8
L3	.003	.015	11	.003	.015	11	.003	.015	11	.003	.015	11
ND	5		5	5		5	7		5	7		5
NE	9		5	9		5	9		5	9		5
N	28		5	28		5	32		5	32		5
Note	1											

FIGURE 15. Ceramic, metal-sealed, square and rectangular leadless chip carrier styles - Continued.

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S Y M B O L	Rectangular only - variations (all dimensions shown in millimeters)											
	C-11		N O T E	C-11A		N O T E	C-12		N O T E	C-12A		N O T E
	Min	Max		Min	Max		Min	Max		Min	Max	
A	1.52	3.05	9,13	1.52	1.91	9,13	1.52	3.05	9,13	1.52	1.91	9,13
A1	1.27	2.24		1.27	1.65		1.27	2.24		1.27	1.65	
B	-	-		---	---		---	---		---	---	
B1	0.56	0.71	4,6, 14	0.56	0.71	4,6, 14	0.56	0.71	4,6, 14	0.56	0.71	4,6, 14
B2	1.83	REF	7,8	1.83	REF	7,8	1.83	REF	7,8	1.83	REF	7,8
B3	0.15	0.56	11	0.15	0.56	11	0.15	0.56	11	0.15	0.56	11
D	8.69	9.09		8.69	9.09		11.23	11.63		11.23	11.63	
D1	5.08	BSC		5.08	BSC		7.62	BSC		7.62	BSC	
D2	2.54	BSC	16	2.54	BSC	16	3.81	BSC	16	3.81	BSC	16
D3	---	9.09	4	---	9.09	4	---	11.63	4	---	11.63	4
E	13.72	14.22		13.72	14.22		13.72	14.22		13.72	14.22	
E1	10.16	BSC		10.16	BSC		10.16	BSC		10.16	BSC	
E2	5.08	BSC	16	5.08	BSC	16	5.08	BSC	16	5.08	BSC	16
E3	---	14.17	4	---	14.17	4	---	14.17	4	---	14.17	4
e	1.27	BSC		1.27	BSC		1.27	BSC		1.27	BSC	
e1	0.38		4,12	0.38		4,12	0.38		4,12	0.38		4,12
h	1.02	REF	10	1.02	REF	10	1.02	REF	10	1.02	REF	10
j	0.51	REF	10	0.51	REF	10	0.51	REF	10	0.51	REF	10
L	1.14	1.40		1.14	1.40		1.14	1.40		1.14	1.40	
L1	1.14	1.40		1.14	1.40		1.14	1.40		1.14	1.40	
L2	1.90	2.41	7,8	1.90	2.41	7,8	1.90	2.41	7,8	1.90	2.41	7,8
L3	0.08	0.38	11	0.08	0.38	11	0.08	0.38	11	0.08	0.38	11
ND	5		5	5		5	7		5	7		5
NE	9		5	9		5	9		5	9		5
N	28		5	28		5	32		5	32		5
Note	1											

FIGURE 15. Ceramic, metal-sealed, square and rectangular leadless chip carrier styles - Continued.

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Symbol	Rectangular only variations				Notes
	C-13		C-13		
	Inches		Millimeters		
	Min	Max	Min	Max	
A	.060	.120	1.52	3.05	9,13
A1	.050	.088	1.27	2.23	
B1	.022	.028	.56	.71	4,6,14
B2	.072 REF		1.83 REF		7,8
B3	.006	.022	.15	.56	11
D	.280	.305	7.11	7.75	
D1	.150 BSC		3.81 BSC		
D2	.075 BSC		1.90 BSC		16
D3	---	.305	---	7.75	4
E	.420	.440	10.67	11.18	
E1	.250 BSC		6.35 BSC		
E2	.125 BSC		3.17 BSC		16
E3	---	.440	---	11.18	4
e	.050 BSC		1.27 BSC		
e1	.015	---	.38	---	4,12
h	.040 REF		1.02 REF		10
j	.020 REF		.51 REF		10
L	.045	.055	1.14	1.40	
L1	.045	.055	1.14	1.40	
L2	.075	.095	1.90	2.41	7,8
L3	.003	.015	.08	.38	11
ND	4		4		5
NE	6		6		5
N	20		20		5
Note	1				

FIGURE 15. Ceramic, metal-sealed, square and rectangular leadless chip carrier styles - Continued.

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Symbol	Rectangular only variations				Notes
	C-13A		C-13A		
	Inches		Millimeters		
	Min	Max	Min	Max	
A	.060	.075	1.52	1.90	9,13
A1	.050	.065	1.27	1.65	
B1	.022	.028	.56	.71	4,6
B2	.072 REF		1.83 REF		7,8
B3	.006	.022	.15	.56	11
D	.280	.305	7.11	7.75	
D1	.150 BSC		3.81 BSC		
D2	.075 BSC		1.90 BSC		16
D3	---	.305	---	7.75	4
E	.420	.440	10.67	11.18	
E1	.250 BSC		6.35 BSC		
E2	.125 BSC		3.17 BSC		16
E3	---	.440	---	11.18	4
e	.050 BSC		1.27 BSC		
e1	.015	---	.38	---	4,12
h	.040 REF		1.02 REF		10
j	.020 REF		.51 REF		10
L	.045	.055	1.14	1.40	
L1	.045	.055	1.14	1.40	
L2	.075	.095	1.90	2.41	7,8
L3	.003	.015	.08	.38	11
ND	4		4		5
NE	6		6		5
N	20		20		5
Note	1				

FIGURE 15. Ceramic, metal-sealed, square and rectangular leadless chip carrier styles - Continued.

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NOTES:

1. See table VI for descriptive type designator.
2. To specify options A or B in acquisition documents, see figure 1.
3. Metallized castellations shall be connected to plane 1 terminals and extend toward plane 2 across at least two layers of ceramic or completely across all of the ceramic layers to make electrical connection with the optional plane 2 terminals.
4. Unless otherwise specified, a minimum clearance of .015 inch (0.381 mm) shall be maintained between all metallized features (e.g., lid, castellations, terminals, thermal pads, etc.).
5. Symbol "N" is the maximum number of terminals. Symbols "ND" and "NE" are the number of terminals along the sides of length "D" and "E" respectively.
6. The required plane 1 terminals and optional plane 2 terminals shall be electrically connected.
7. The index feature for terminal 1 identification, optical orientation or handling purposes, shall be within the shaded index areas shown on planes 1 and 2. Plane 1 terminal 1 identification may be an extension of the length of the metallized terminal which shall not be wider than the B_1 dimension. See note 8 for more details.
8. Plane 1 is the heat radiating surface. This surface may optionally be metallized with a checkerboard pattern of thermal conduction pads. The pad centerlines shall be aligned with the terminal centerlines. The number of pads in the pattern is determined by the following algorithm: $(ND - 2) \times (NE - 2)$ see note 5. When this option exists, the terminal 1 index feature may be additionally or alternately defined by deleting the thermal pad which is adjacent to terminal 1.
9. Dimension "A" controls the overall package thickness. When a window lid is used, dimension "A" must increase by a minimum of .010 inch (0.254 mm) and a maximum of .040 inch (1.020 mm).
10. The corner shape (square, notch, radius, etc.) may vary at the manufacturer's option, from that shown on the drawing.
11. See 5.2.6 and figure 8. Dimensions "B3" minimum and "L3" minimum and the appropriately derived castellation length define an unprotected three dimensional space traversing all of the ceramic layers in which a castellation was designed. (Castellation are required on bottom two layers, optional on top ceramic layer.) Dimensions "B3" maximum and "L3" maximum define the maximum width and depth of the castellation at any point on its surface. Measurement of these dimensions may be made prior to solder dipping.
12. Corner metallization for terminals may have a .020 inch by 45° maximum chamfer to obtain the e_1 dimension.
13. Chip carriers shall be constructed of a minimum of two ceramic layers.
14. The pad metallization, including annular ring, at the pad-to-package edge shall be within the virtual pad width established by true position dimensioning.
15. The tolerance is intended to limit package edge anomalies caused by material protrusions, such as rough ceramic, and misaligned ceramic layers.
16. When the number of terminals per side is even, datums F, G, and H are located at the terminal array centers. When the number of terminals per side is odd, datums F, G, and H are located at the centers of the center terminals.

FIGURE 15. Ceramic, metal-sealed, square and rectangular leadless chip carrier styles - Continued.

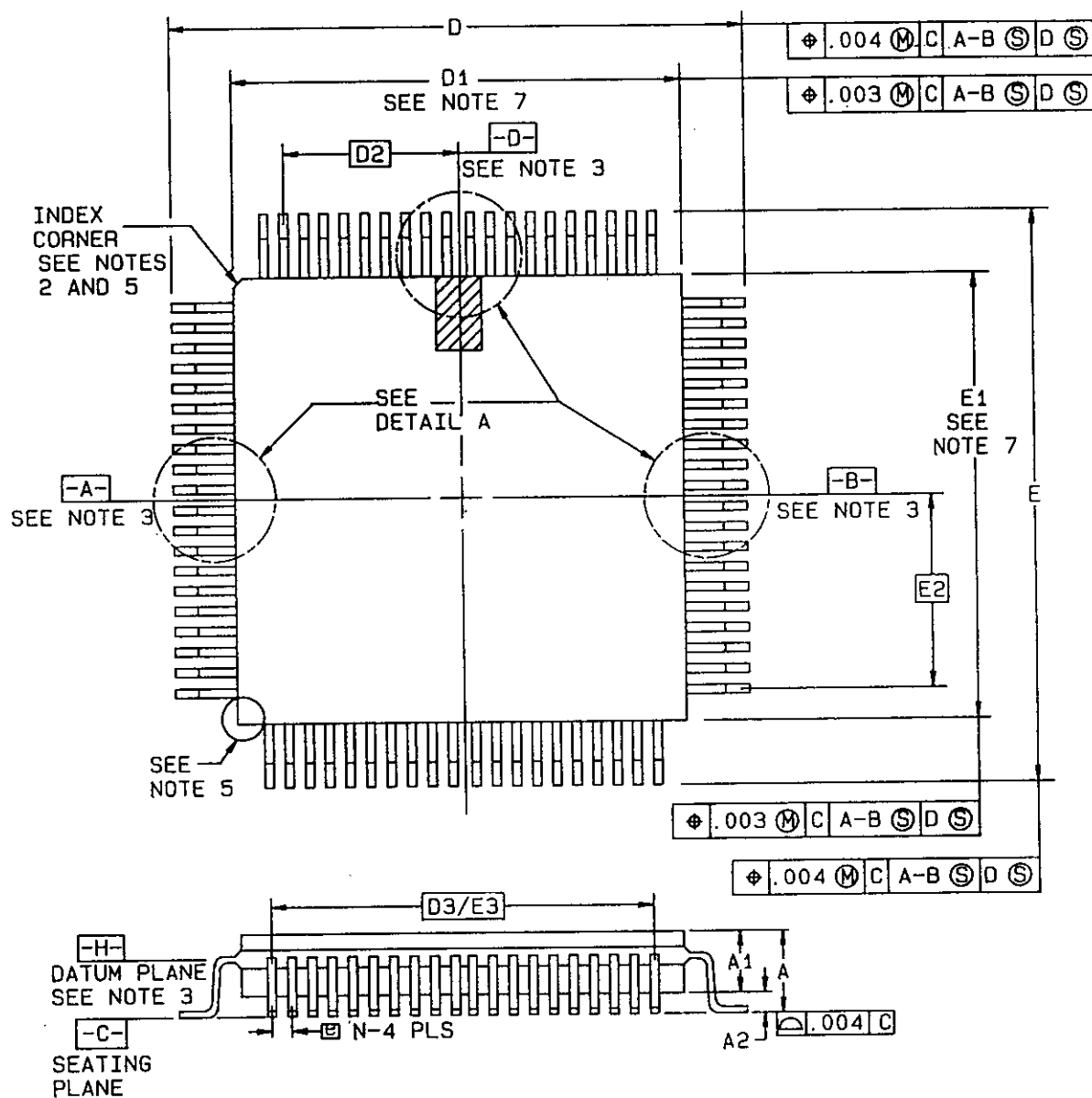
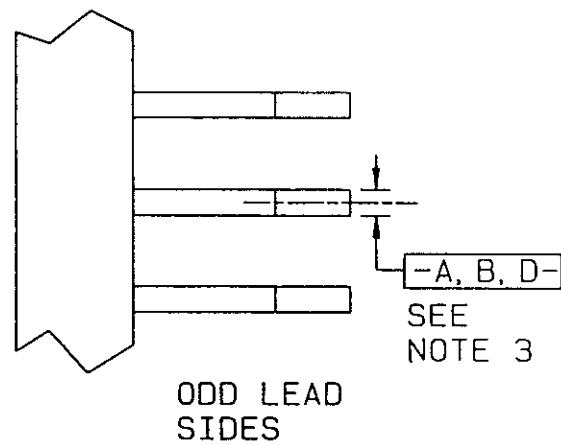
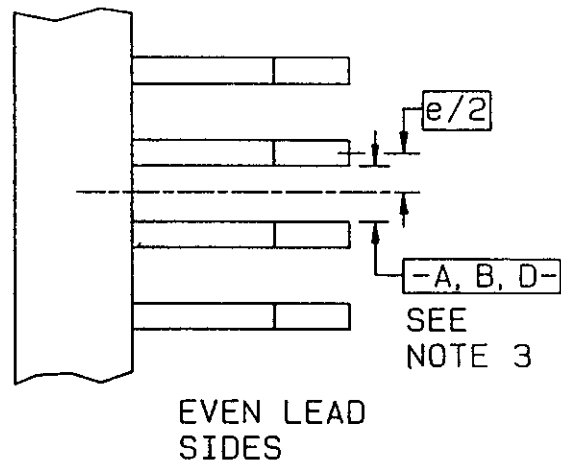


FIGURE 16. Ceramic, glass-sealed, gullwing-lead, chip carrier style.

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DETAIL A

BODY DETAIL

FIGURE 16. Ceramic, glass-sealed, gullwing-lead, chip carrier style - Continued.

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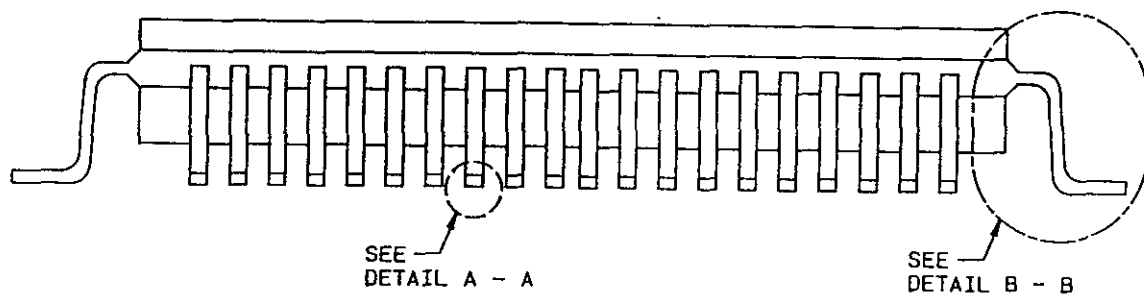
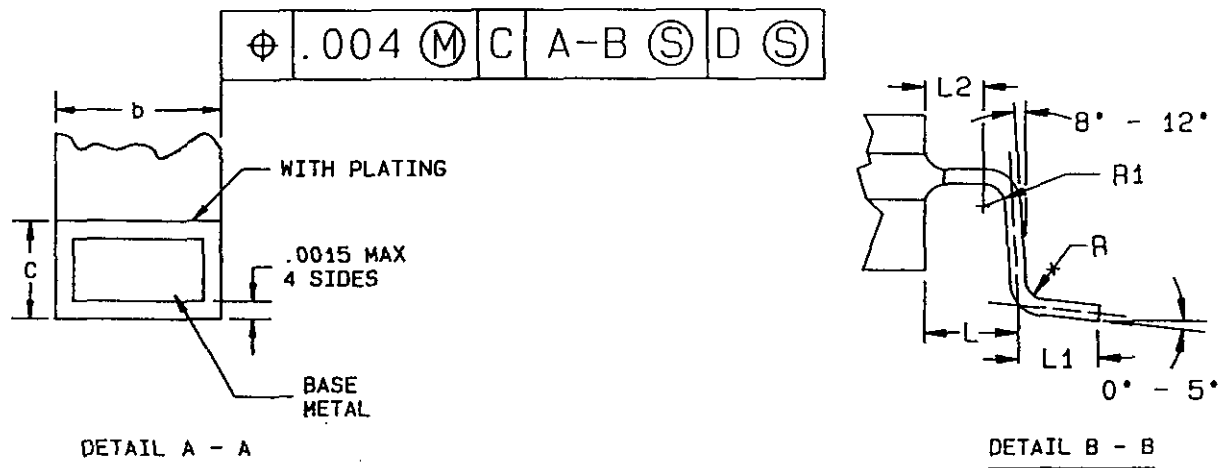


FIGURE 16. Ceramic, glass-sealed, gullwing-lead, chip carrier style - Continued.

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S Y M B O L	Variations (all dimensions shown in inches)								
	C-G1		N O T E	C-G2		N O T E	C-G3		N O T E
	Min	Max		Min	Max		Min	Max	
A	.085	.190	3,5	.085	.190	3,5	.085	.190	3,5
A1	.075	.150		.075	.150		.075	.150	
A2	.010	.040		.010	.040		.010	.040	
b	.018	.022		.018	.022		.018	.022	
c	.007	.011		.007	.011		.007	.011	
D/E	.942	.948	6	1.226	1.244	6	1.425	1.445	6
D1/E1	.642	.658		.942	.958		1.142	1.158	
D2/E2	.250 BSC			.400 BSC			.500 BSC		
D3/E3	.500 BSC			.800 BSC			1.000 BSC		
e	.050 BSC			.050 BSC			.050 BSC		
L	.140 REF			.140 REF			.140 REF		
L1	.040 | ---			.040 | ---			.040 | ---		
L2	.035 REF			.035 REF			.035 REF		
Q	.095 | .105			.095 | .105			.095 | .105		
Q1	.060 | .070			.060 | .070			.060 | .070		
Q2	NA			NA			NA		
R	.015 | ---			.015 | ---			.015 | ---		
R1	NA			NA			NA		
ND/NE	11	1,7	17	1,7	21	1,7			
N	44	1,2	68	1,2	84	1,2			
Note	8								

FIGURE 16. Ceramic, glass-sealed, gullwing-lead, chip carrier style - Continued.

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S Y M B O L	Variations (all dimensions shown in millimeters)								
	C-G1		N O T E	C-G2		N O T E	C-G3		N O T E
	Min	Max		Min	Max		Min	Max	
A	2.16	4.83	3,5	2.16	4.83	3,5	2.16	4.83	3,5
A1	1.91	3.81		1.91	3.81		1.91	3.81	
A2	0.25	1.02		0.25	1.02		0.25	1.02	
b	0.46	0.56		0.46	0.56		0.46	0.56	
c	0.19	0.28		0.19	0.28		0.19	0.28	
D/E	23.93	23.08		31.14	31.60		36.20	36.70	
D1/E1	16.31	16.71	6	23.93	24.33	6	29.01	29.41	6
D2/E2	6.35	BSC		10.16	BSC		12.70	BSC	
D3/E3	12.70	BSC		23.32	BSC		25.40	BSC	
e	1.27	BSC		1.27	BSC		1.27	BSC	
L	3.56	REF		3.56	REF		3.56	REF	
L1	1.02	| ---		1.02	| ---		1.02	| ---	
L2	0.89	REF	1,7	0.89	REF	1,7	0.89	REF	1,7
Q	2.41	| 2.67		2.41	| 2.67		2.41	| 2.67	
Q1	1.52	| 1.78		1.52	| 1.78		1.52	| 1.78	
Q2		NA			NA			NA	
R	0.38	| ---		0.38	| ---		0.38	| ---	
R1		NA			NA			NA	
ND/NE		11	1,2	17	1,2	21	1,2		
N		44		68		84			
Note	8								

FIGURE 16. Ceramic, glass-sealed, gullwing-lead, chip carrier style - Continued.

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NOTES:

1. Symbol "N" is the maximum number of terminals. Symbols "ND" and "NE" are the number of terminals along the sides of lengths "D" and "E" respectively.
2. A terminal 1 identification mark shall be located on the first side clockwise from the index corner, within the shaded area shown. Terminal numbers shall increase in a counterclockwise direction when viewed as shown. If the identification mark is not exactly adjacent to terminal 1, terminal 1 is located as follows:
 - a. If the number of terminals on a side is odd, terminal 1 is the center terminal.
 - b. If the number of terminals on a side is even, terminal 1 is the terminal which is adjacent to the centerline of the terminal array in the direction closest to the index corner.
3. When the number of terminals per side is even, datums A, B, and D are located at the terminal array centers. When the number of terminals per side is odd, datums A, B, and D are located at the centers of the center terminals. The measurement point for establishing these datums is the package/lead interface at datum plane H.
4. Dimension "A" controls the overall package height. When a window lid is used, dimension "A" must increase by a minimum of .010 inch (0.254 mm) and a maximum of .040 inch (1.020 mm).
5. Corner shape (square, notch, radius, etc.) may vary from that shown on the drawing. The index corner shall be clearly unique.
6. Chip carriers shall be constructed of a minimum of two ceramic layers.
7. This dimension allows for package edge anomalies caused by material protrusion, such as rough ceramic, misaligned ceramic layers and lids, meniscus, and glass overrun.
8. The leads on this package style shall be protected from mechanical distortion and damage such that dimensions pertaining to relative lead/body "true positions" and lead "coplanarity" are always maintained until the next higher level package attachment process is complete. Package lead protection mechanisms (tie bars, carriers, etc.) are not shown on the drawing; however, when microcircuit devices contained in this package style are shipped for use in Government equipment, or shipped directly to the Government as spare parts or mechanical qualification samples, lead protection shall be in place.
9. The quad leaded chip carrier drawings in this figure show a "gullwing" lead configuration. Two optional lead configurations can be specified; preformed "J" leads and unformed (straight) leads, see figure 1 and table V concerning how to designate an option. When either option is selected and straight leads are subsequently formed by the microcircuit device user, the resultant lead configuration shall conform to the "J" (see figure 18) or "gullwing" lead dimensions and coplanarity requirements specified in this figure.
10. See table VI for descriptive type designator.

FIGURE 16. Ceramic, glass-sealed, gullwing-lead, chip carrier style - Continued.

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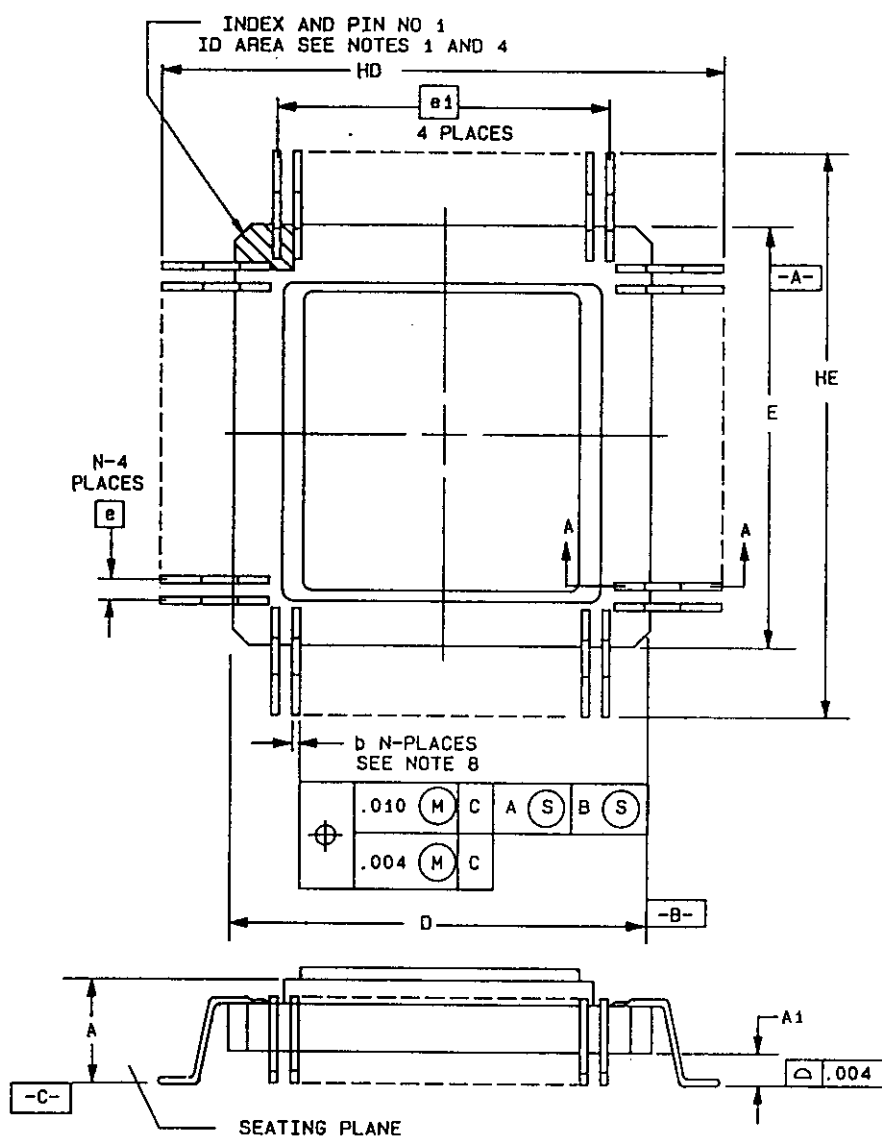


FIGURE 17. Ceramic, metal-sealed, gullwing-lead, chip carrier style.

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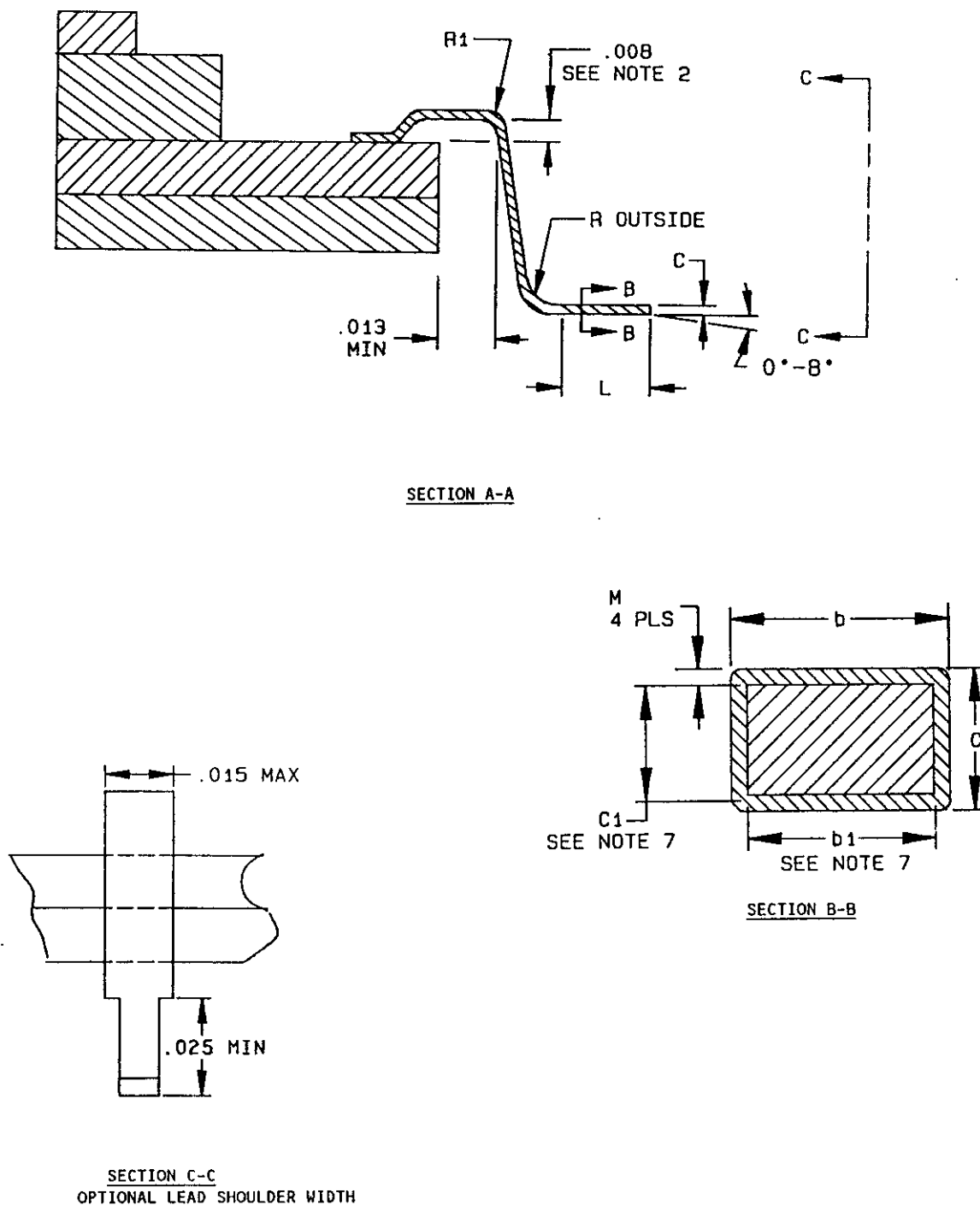


FIGURE 17. Ceramic, metal-sealed, gullwing-lead, chip carrier style - Continued.

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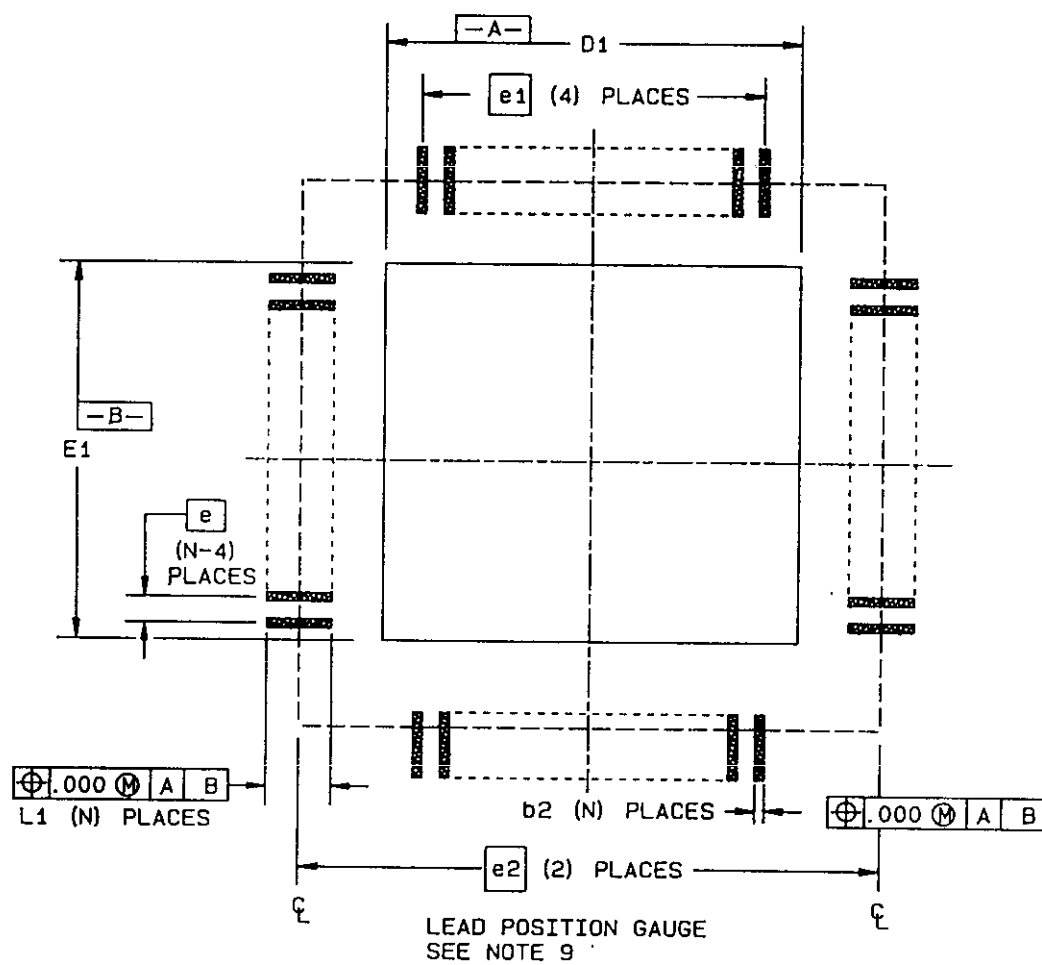


FIGURE 17. Ceramic, metal-sealed, gullwing-lead, chip carrier style - Continued.

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Symbol	Variation							
	C-G7				C-G7			
	Inches				Millimeters			
	Min	Nom	Max	Note	Min	Nom	Max	Note
A	.060	---	.140		1.52	---	3.56	
A1	.022	.030	.038		0.56	0.76	0.97	
b	.006	---	.015	7	0.15	---	0.38	7
b1	.006	---	.013	7	0.15	---	0.33	7
b2	---	---	.019		---	---	0.48	
c	.004	---	.010	7	0.10	---	0.25	7
c1	.004	---	.008	7	0.10	---	0.20	7
D/E	.935	.950	.960		23.75	24.13	24.38	
D1/E1	---	---	.970		---	---	24.64	
e	.025 BSC				0.64 BSC			
e1	.800 BSC				20.32 BSC			
e2	1.080 BSC				27.43 BSC			
HD/HE	1.074	1.080	1.086		27.28	27.43	27.58	
L	.022	.025	.028		0.56	0.64	0.71	
L1	---	---	.006		---	---	0.15	
M	---	---	.001		---	---	0.03	
N		132		4		132		4
ND/NE		33		5		33		5
R	.011	---	.017		0.28	---	0.43	
R1	.010	---	---		0.25	---	---	
Notes	8, 10				8, 10			

FIGURE 17. Ceramic, metal-sealed, gullwing-lead, chip carrier style - Continued.

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NOTES:

1. A terminal 1 identification mark shall be located at the index corner in the shaded area shown. Terminal 1 is located immediately adjacent to and counterclockwise from the index corner. Terminal numbers increase in a counterclockwise direction when viewed as shown.
2. Generic lead attach dogleg depiction. May be flat lead configuration.
3. Corner shapes (square, notch, radius, etc.) may vary from that shown on the drawing. The index corner shall be clearly unique.
4. Dimension N: Number of terminals.
5. Dimension ND/NE: Number of terminals per package edge.
6. No overhang of the lead on the braze pad is allowed.
7. Dimension b and c include lead finish; dimensions b1 and c1 apply to base metal only. Dimension M applies to plating thickness.
8. The leads of this package style shall be protected from mechanical distortion and damage such that dimensions pertaining to relative lead/body "true positions" and lead "coplanarity" are always maintained until the next higher level package attachment process is complete. Package lead protection mechanisms (tie bars, carriers, etc.) are not shown on the drawing, however when microcircuit devices contained in this package style are shipped for use in Government equipment, or shipped directly to the Government as spare parts or mechanical qualification samples, lead "true position" and "coplanarity" protection shall be in place.
9. The lead tip location may be determined with the use of the lead position gauge shown. Each lead tip and the body shall simultaneously reside within defined areas of the gauge.
10. The quad leaded chip carrier drawings in this figure show a "gullwing" lead configuration. An optional configuration can be specified; it is for unformed (straight) leads, see figure 1 and table V concerning how to designate this option. When the straight leads option is selected and the leads are subsequently formed by the microcircuit device user, the resultant lead configuration shall conform to the "gullwing" lead dimensions and coplanarity requirements specified in this figure.
11. See table VI for descriptive type designator.

FIGURE 17. Ceramic, metal-sealed, gullwing-lead, chip carrier style - Continued.

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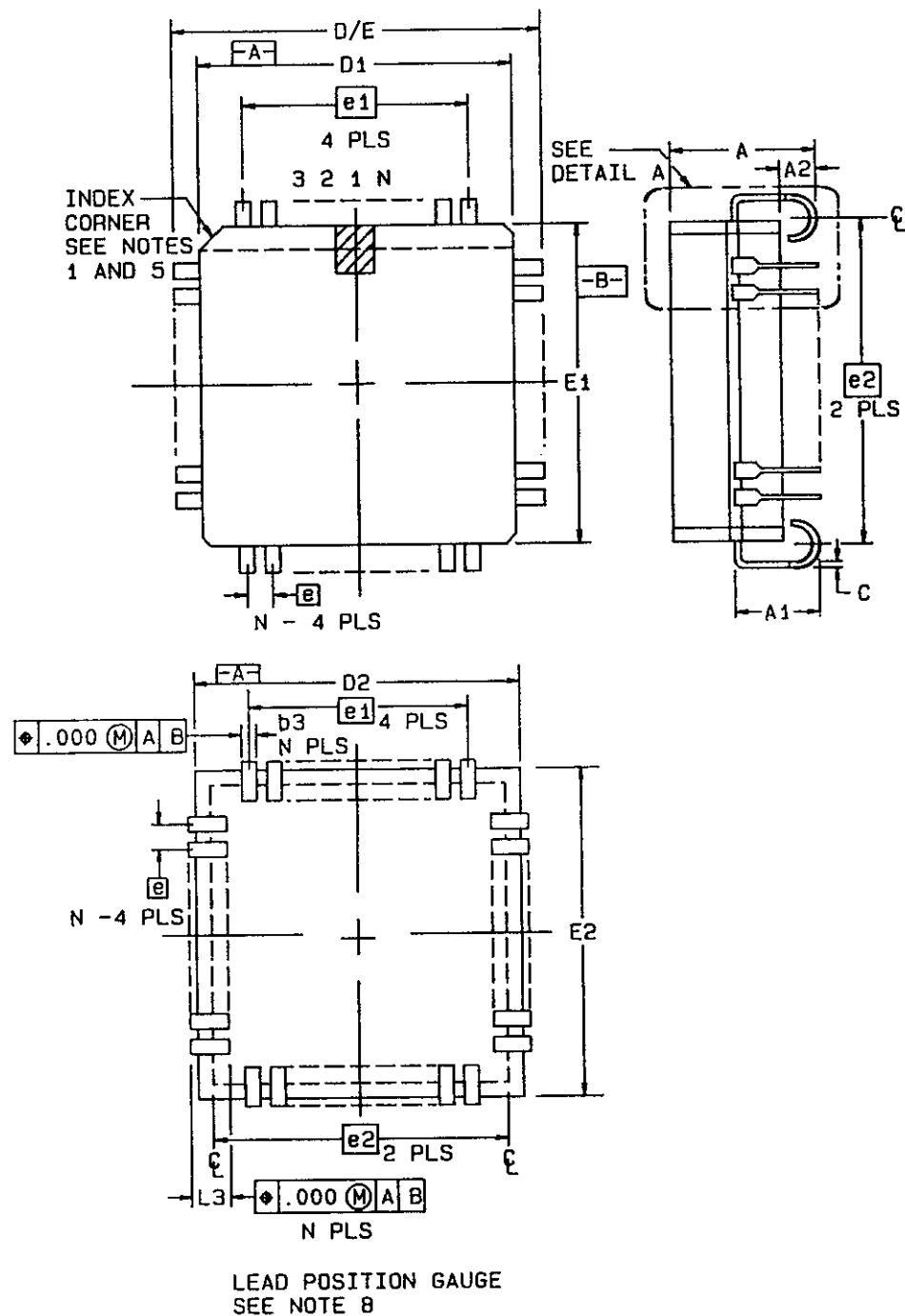
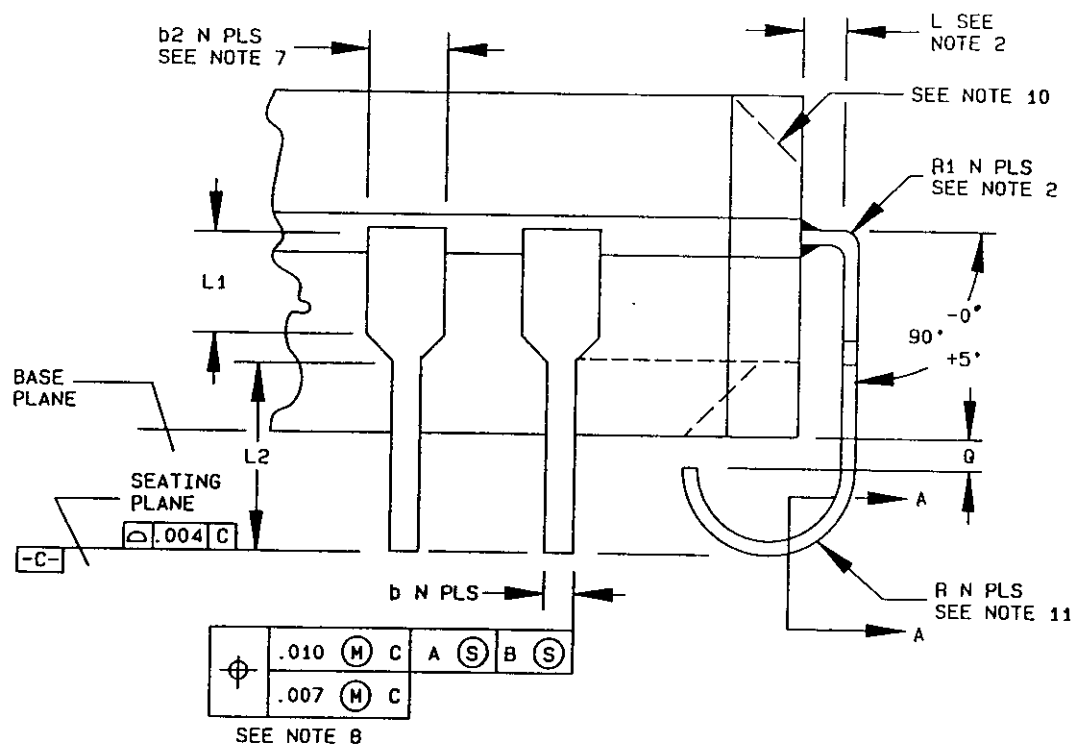
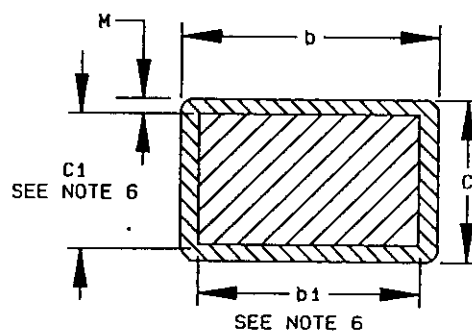


FIGURE 18. Ceramic, glass-sealed, "J" lead, chip carrier style.

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DETAIL A



SECTION A-A

FIGURE 18. Ceramic, glass-sealed, "J" lead, chip carrier style - Continued.

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S Y M B O L	Variations, all dimensions in inches											
	C-J1			N O T E	C-J2			N O T E	C-J3			N O T E
	Min	Nom	Max		Min	Nom	Max		Min	Nom	Max	
A	.155	.172	.190		.155	.172	.190		.155	.172	.190	
A1	.090	.105	.120		.090	.105	.120		.090	.105	.120	
A2	.030	---	---		.030	---	---		.030	---	---	
b	.017	---	.023	6,7	.017	---	.023	6,7	.017	---	.023	6,7
b1	.017	.019	.021	6,7	.017	.019	.021	6,7	.017	.019	.021	6,7
b2	.026	.029	.032	6,7	.026	.029	.032	6,7	.026	.029	.032	6,7
b3	---	---	.030	8	---	---	.030	8	---	---	.030	8
c	.006	---	.012	6,7	.006	---	.012	6,7	.006	---	.012	6,7
c1	.006	---	.010	6,7	.006	---	.010	6,7	.006	---	.010	6,7
D/E	.685	.690	.695		.985	.990	.995		1.185	1.990	1.195	
D1/E1	.630	.650	.656		.930	.950	.958		1.130	1.150	1.158	
D2/E2	---	---	.666		---	---	.968		---	---	1.168	
e	.050 BSC				.050 BSC				.050 BSC			
e1	.500 BSC				.800 BSC				1.000 BSC			
e2	.610 BSC				.910 BSC				1.11. BSC			
L	.010	---	---	2	.010	---	---	2	.010	---	---	2
L1	.030	---	---		.030	---	---		.030	---	---	
L2	.025	---	---		.025	---	---		.025	---	---	
L3	---	---	.022	8	---	---	.022	8	---	---	.022	2
M	---	---	.001		---	---	.001		---	---	.001	
N		44		3		68		3		84		3
ND/NE		11		4		17		4		21		4
Q	.003	---	---		.003	---	---		.003	---	---	
R	.025	---	.045	11	.025	---	.045	11	.025	---	.045	11
R1	.010	---	---		.010	---	---		.010	---	---	
Note	9											

FIGURE 18. Ceramic, glass-sealed, "J" lead, chip carrier style - Continued.

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S Y M B O L	Variations, all dimensions in millimeters											
	C-J1			N O T E	C-J2			N O T E	C-J3			N O T E
	Min	Nom	Max		Min	Nom	Max		Min	Nom	Max	
A	3.93	4.36	4.82		3.93	4.36	4.82		3.93	4.36	4.82	
A1	2.28	2.66	3.04		2.28	2.66	3.04		2.28	2.66	3.04	
A2	0.76	---	---		0.76	---	---		0.76	---	---	
b	0.43	---	0.58	6,7	0.43	---	0.58	6,7	0.43	---	0.58	6,7
b1	0.43	---	0.58	6,7	0.43	0.48	0.53	6,7	0.43	0.48	0.53	6,7
b2	0.66	0.73	0.81	6,7	0.66	0.73	0.81	6,7	0.66	0.73	0.81	6,7
b3	---	---	0.76	8	---	---	0.76	8	---	---	0.76	8
c	0.15	---	0.30	6,7	0.15	---	0.30	6,7	0.15	---	0.30	6,7
c1	0.15	---	0.25	6,7	0.15	---	0.25	6,7	0.15	---	0.25	6,7
D/E	17.39	17.52	17.65		25.01	25.14	25.27		30.09	50.54	30.35	
D1/E1	16.00	16.51	16.66		23.62	24.13	24.33		28.70	29.21	29.41	
D2/E2	---	---	16.91		---	---	24.58		---	---	29.66	
e	1.27 BSC				1.27 BSC				1.27 BSC			
e1	12.70 BSC				20.32 BSC				25.40 BSC			
e2	15.49 BSC				23.11 BSC				28.19 BSC			
L	0.25	---	---	2	0.25	---	---	2	0.25	---	---	2
L1	0.76	---	---		0.76	---	---		0.76	---	---	
L2	0.63	---	---		0.63	---	---		0.63	---	---	
L3	---	---	0.55	8	---	---	0.55	8	---	---	0.55	2
M	---	---	0.02		---	---	0.02		---	---	0.02	
N	44			3	68			3	84			3
ND/NE	11			4	17			4	21			4
Q	0.07	---	---		0.07	---	---		0.07	---	---	
R	0.63	---	1.14	11	0.63	---	1.14	11	0.63	---	1.14	11
R1	0.25	---	---		0.25	---	---		0.25	---	---	
Note	9											

FIGURE 18. Ceramic, glass-sealed, "J" lead, chip carrier style - Continued.

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Symbol	Variations, all dimensions in inches							
	C-J7				C-J8			
	Min	Nom	Max	Note	Min	Nom	Max	Note
A	.155	.172	.190		.155	.172	.190	
A1	.090	.105	.120		.090	.105	.120	
A2	.030	---	---		.030	---	---	
b	.017	---	.023	6,7	.017	---	.023	6,7
b1	.017	.019	.021	6,7	.017	.019	.021	6,7
b2	.026	.029	.032	6,7	.026	.029	.032	6,7
b3	---	---	.030	8	---	---	.030	8
c	.006	---	.012	6,7	.006	---	.012	6,7
c1	.006	---	.010	6,7	.006	---	.010	6,7
D/E	.485	.490	.495		.785	.790	.795	
D1/E1	.430	.450	.456		.730	.750	.756	
D2/E2	---	---	.456		---	---	.766	
e	.050 BSC				.050 BSC			
e1	.300 BSC				.600 BSC			
e2	.410 BSC				.710 BSC			
L	.010	---	---	2	.010	---	---	2
L1	.030	---	---		.030	---	---	
L2	.025	---	---		.025	---	---	
L3	---	---	.022	8	---	---	.022	8
M	---	---	.001		---	---	.001	
N		28		3		52		3
ND/NE		7		4		13		4
Q	.003	---	---		.003	---	---	
R	.025	---	.045	11	.025	---	.045	11
R1	.010	---	---		.010	---	---	
Note	9							

FIGURE 18. Ceramic, glass-sealed, "J" lead, chip carrier style - Continued.

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Symbol	Variations, all dimensions in millimeters							
	C-J7				C-J8			
	Min	Nom	Max	Note	Min	Nom	Max	Note
A	3.93	4.36	4.82		3.93	4.36	4.82	
A1	2.28	2.66	3.04		2.28	2.66	3.04	
A2	0.76	---	---		0.76	---	---	
b	0.43	---	0.58	6,7	0.43	---	0.58	6,7
b1	0.43	0.48	0.53	6,7	0.43	0.48	0.53	6,7
b2	0.66	0.73	0.81	6,7	0.66	0.73	0.81	6,7
b3	---	---	0.76	8	---	---	0.76	8
c	0.15	---	0.30	6,7	0.15	---	0.30	6,7
c1	0.15	---	0.25	6,7	0.15	---	0.25	6,7
D/E	12.31	12.44	12.57		19.93	20.06	20.19	
D1/E1	10.92	11.43	11.58		18.54	19.05	19.20	
D2/E2	---	---	11.83		---	---	19.45	
e	1.27 BSC				1.27 BSC			
e1	7.62 BSC				15.24 BSC			
e2	10.41 BSC				18.03 BSC			
L	0.25	---	---	2	0.25	---	---	2
L1	0.76	---	---		0.76	---	---	
L2	0.63	---	---		0.63	---	---	
L3	---	---	0.55	8	---	---	0.55	8
M	---	---	0.02		---	---	0.02	
N		28		3		52		3
ND/NE		7		4		13		4
Q	0.07	---	---		0.07	---	---	
R	0.63	---	1.14	11	0.63	---	1.14	11
R1	0.25	---	---		0.25	---	---	
Note	9							

FIGURE 18. Ceramic, glass-sealed, "J" lead, chip carrier style - Continued.

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NOTES:

1. A terminal 1 identification mark shall be located on the first side clockwise from the index corner, within the shaded area shown. Terminal numbers shall increase in a counterclockwise direction when viewed as shown. If the identification mark is not exactly adjacent to terminal 1, terminal 1 is located as follows:
 - a. If the number of terminals on a side is odd, terminal 1 is the center terminal.
 - b. If the number of terminals on a side is even, terminal 1 is the terminal which is adjacent to the centerline of the terminal array in the direction closest to the index corner.
2. This dimension delineates the minimum clearance between the inside of the lead and the body. One-half of the minimum clearance from the body establishes a limit beyond which package edge anomalies caused by material protrusion such as rough ceramic, misaligned ceramic layers, glass meniscus, or overrun shall not extend.
3. Symbol N: Number of terminals.
4. Symbols ND/NE: Number of terminals per package edge.
5. Corner shape (square, notch, radius, etc.) may vary from that shown on the drawing. The index corner shall be clearly unique.
6. Dimensions b1 and c1 apply to base metal only. Dimension M applies to plating thickness.
7. The leads on this package style shall be protected from mechanical distortion and damage such that dimensions pertaining to relative lead/body "true positions" and lead "coplanarity" are always maintained until the next higher level package attachment process is complete. Package lead protection mechanisms (tie bars, carriers, etc.) are not shown on the drawing; however, when microcircuit devices contained in this package style are shipped for use in Government equipment, or shipped directly to the Government as spare parts or mechanical qualification samples, lead protection shall be in place.
8. The location of each lead seating plane "interface area" may be determined with the use of the lead position gauge shown. The interface area of each lead and the body shall simultaneously reside within defined areas of the gauge.
9. UV window is optional. See table VI for descriptive type designator
10. Body contour along dotted lines optional.
11. The minimum arc length "AL" of radius R shall be $AL = 135 \pi R/180$.
12. The quad leaded chip carrier drawings in this figure show a "J" lead configuration. An optional configuration can be specified; it is for unformed (straight) leads, see figure 1 and table V concerning how to designate this option. When the straight leads option is selected and the leads are subsequently formed by the microcircuit device user, the resultant lead configuration shall conform to the "J" lead dimensions and coplanarity requirements specified in this figure.

FIGURE 18. Ceramic, glass-sealed, "J" lead, chip carrier style - Continued.

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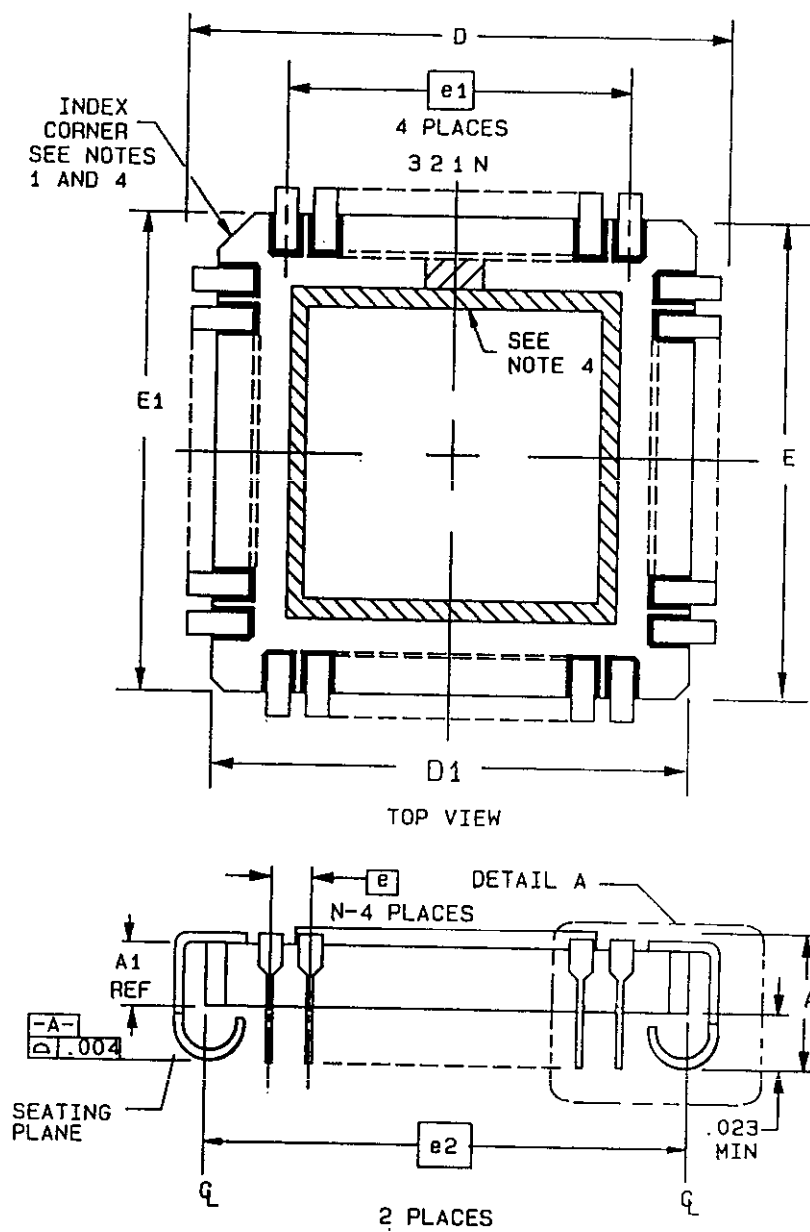


FIGURE 19. Ceramic, metal-sealed, "J" lead chip carrier style.

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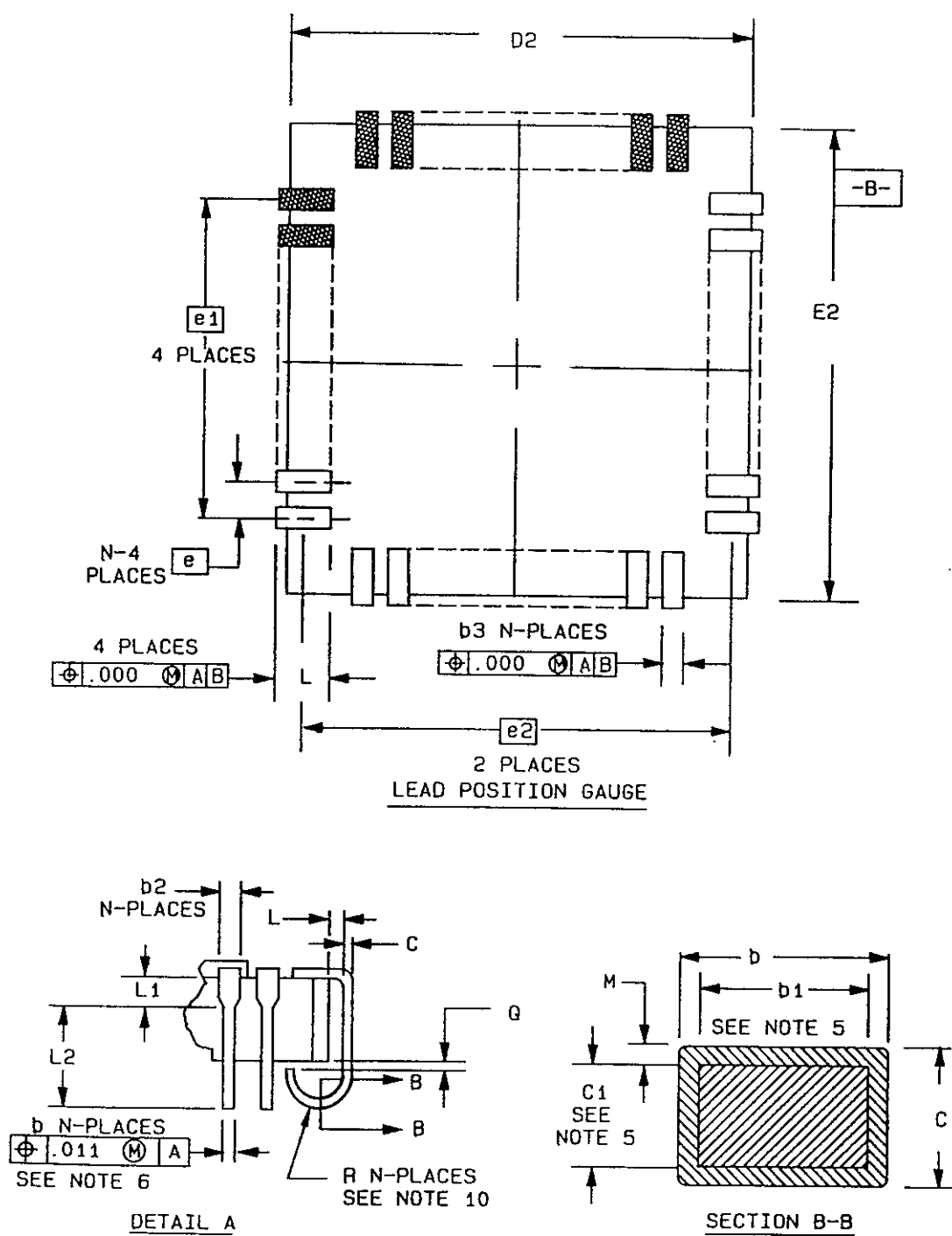


FIGURE 19. Ceramic, metal-sealed, "J" lead chip carrier style - Continued.

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S Y M B O L	Variations, all dimensions in inches											
	C-J4			N O T E	C-J5			N O T E	C-J6			N O T E
	Min	Nom	Max		Min	Nom	Max		Min	Nom	Max	
A	.115	.125	.190	8	.115	.125	.190	8	.115	.160	.190	8
A1	---	.065	---		---	.080	---		---	.080	---	
b	.013	---	.023		.013	---	.023		.013	---	.023	
b1	.013	---	.020	5	.013	---	.020	5	.013	---	.020	5
b2	.022	---	.035		.022	---	.035		.022	---	.035	
b3	---	---	.034		---	---	.034		---	---	.034	
c	.007	---	.013		.007	---	.013		.007	---	.013	
c1	.007	---	.010	5	.007	---	.010	5	.007	---	.010	5
D/E	.675	.690	.700		.975	.990	1.000		1.175	1.190	1.200	
D1/E1	.620	---	.660		.920	---	.960		1.120	---	1.165	
D2/E2	---	---	---	10	---	---	---	10	---	---	---	10
e		.050 BSC				.050 BSC				.050 BSC		
e1		.500 BSC				.800 BSC				1.000 BSC		
e2		.630 BSC				.930 BSC				1.140 BSC		
L	.005	---	---		.005	---	---		.020	---	---	
L1	.020	---	---		.020	---	---		.020	---	---	
L2	.025	---	---		.025	---	---		.025	---	---	
L3	---	---	.040		---	---	.040		---	---	.040	
M	---	---	.0015	5	---	---	.0015	5	---	---	.0015	5
N		44		2		68		2		84		2
ND/NE	---	---	---	3	---	---	---	3	---	---	---	3
Q	.003	---	---		.003	---	---		.003	---	---	
R	.020	---	.040		.020	---	.040		.020	---	.040	
Note	9											

FIGURE 19. Ceramic, metal-sealed, "J" lead, chip carrier style - Continued.

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S Y M B O L	Variations, all dimensions in millimeters											
	C-J4			N O T E	C-J5			N O T E	C-J6			N O T E
	Min	Nom	Max		Min	Nom	Max		Min	Nom	Max	
A	2.95	3.17	4.82	8	2.95	3.17	4.82	8	2.95	3.17	4.82	8
A1	---	1.65	---		---	2.03	---		---	2.03	---	
b	0.33	---	0.58		0.33	---	0.58		0.33	---	0.58	
b1	0.33	---	0.50	5	0.33	---	0.50	5	0.33	---	0.50	5
b2	0.55	---	0.88		0.55	---	0.88		0.55	---	0.88	
b3	---	---	0.86		---	---	0.86		---	---	0.86	
c	0.17	---	0.33		0.17	---	0.33		0.17	---	0.33	
c1	0.17	---	0.25	5	0.17	---	0.25	5	0.17	---	0.25	5
D/E	17.14	17.52	17.78		24.76	25.14	25.40		29.84	30.22	30.48	
D1/E1	15.74	---	16.76		.920	---	.960		28.44	---	29.59	
D2/E2	---	---	0.10	10	---	---	0.10	10	---	---	0.10	10
e	1.27 BSC				1.27 BSC				1.27 BSC			
e1	12.70 BSC				20.32 BSC				25.40 BSC			
e2	16.00 BSC				23.62 BSC				28.95 BSC			
L	0.12	---	---		0.12	---	---		0.12	---	---	
L1	0.50	---	---		0.50	---	---		0.50	---	---	
L2	0.63	---	---		0.63	---	---		0.63	---	---	
L3	---	---	1.01		---	---	1.01		---	---	1.01	
M	---	---	0.038	5	---	---	0.038	5	---	---	0.038	5
N		44		2		68		2		84		2
ND/NE		11		3		17		3		21		3
Q	0.07	---	---		0.07	---	---		0.07	---	---	
R	0.50	---	1.01		0.50	---	1.01		0.50	---	1.01	
Note	9											

FIGURE 19. Ceramic, metal-sealed, "J" lead, chip carrier style - Continued.

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Symbol	Variations, all dimensions in inches							
	C-J9				C-J10			
	Min	Nom	Max	Note	Min	Nom	Max	Note
A	.115	.125	.190	8	.115	.125	.190	8
A1	---	.060	---		---	.065	---	
B	.013	---	.023		.013	---	.023	
b1	.013	---	.020	5	.013	---	.020	
b2	.022	---	.035		.022	---	.035	
b3	---	---	.034		---	---	.034	
c	.007	---	.013		.007	---	.013	
c1	.007	---	.010	5	.007	---	.010	5
D/E	.475	.490	.500		.775	.790	.800	
D1/E1	.420	---	.460		.720	---	.760	
D2/E2	---	---	---	10	---	---	---	10
e		.050 BSC				.050 BSC		
e1		.300 BSC				.600 BSC		
e2		.430 BSC				.730 BSC		
L	.005	---	---		.005	---	---	
L1	.020	---	---		.020	---	---	
L2	.025	---	---		.025	---	---	
L3	---	---	.040		---	---	.040	
M	---	---	.0015	5	---	---	.0015	5
N		28		2		52		2
ND/NE		---		3		---		3
Q	.003	---	---		.003	---	---	
(R)	.020	---	.040		.020	---	.040	
Note	9							

FIGURE 19. Ceramic, metal-sealed, "J" lead, chip carrier style - Continued.

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Symbol	Variations, all dimensions in millimeters							
	C-J9				C-J10			
	Min	Nom	Max	Note	Min	Nom	Max	Note
A	2.95	3.17	4.82	8	2.95	3.17	4.82	8
A1	---	1.52	---		---	1.65	---	
b	0.33	---	0.58		0.33	---	0.50	
b1	.033	---	.050	5	.055	---	.088	5
b2	.055	---	.088		.055	---	.088	
b3	---	---	.086		---	---	.086	
c	.017	---	.033		.017	---	.033	
c1	.017	---	.025	5	.017	---	.025	5
D/E	12.06	12.44	12.70		12.06	20.06	20.37	
D1/E1	10.66	---	11.68		18.28	---	19.30	
D2/E2	---	---	0.10	10	---	---	0.10	10
e	1.27 BSC				1.27 BSC			
e1	7.62 BSC				15.24 BSC			
e2	10.92 BSC				18.54 BSC			
L	0.12	---	---		0.12	---	---	
L1	0.50	---	---		0.50	---	---	
L2	0.63	---	---		0.63	---	---	
L3	---	---	1.01		---	---	1.01	
M	---	---	0.038	5	---	---	0.038	5
N	28				52			
ND/NE	7				13			
Q	0.07	---	---		0.07	---	---	
R	0.50	---	10.16		0.50	---	10.16	
Note	9							

FIGURE 19. Ceramic, metal-sealed, "J" lead, chip carrier style - Continued.

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NOTES:

1. A terminal 1 identification mark shall be located on the first side clockwise from the index corner, within the shaded area shown. Terminal numbers shall increase in a counterclockwise direction when viewed as shown.

If the identification mark is not exactly adjacent to terminal 1, terminal 1 is located as follows:
 - a. If the number of terminals on a side is odd, terminal 1 is the center terminal.
 - b. If the number of terminals on a side is even, terminal 1 is the terminal which is adjacent to the centerline of the terminal array in the direction closest to the index corner.
2. Symbol N: Number of terminals.
3. Symbols ND/NE: Number of terminals per package edge. $ND/NE = \frac{N}{4}$
4. Corner shapes (square, notch, radius, etc.) may vary from that shown on the drawing. The index corner shall be clearly unique.
5. Dimensions b1 and c1 apply to base metal only. Dimension M applies to plating thickness.
6. The leads on this package style shall be protected from mechanical distortion and damage such that dimensions pertaining to relative lead/body "true positions" and lead "coplanarity" are always maintained until the next higher level package attachment process is complete. Package lead protection mechanisms (tie bars, carriers, etc.) are not shown on the drawing, however when microcircuit devices contained in this package style are shipped for use in Government equipment, or shipped directly to the Government as spare parts or mechanical qualification samples, lead protection shall be in place.
7. The location of each lead seating plane "interface area" may be determined with the use of the lead position gauge shown. The interface area of each lead and the body shall simultaneously reside within defined areas of the gauge.
8. The maximum "A" dimension allows for an EPROM window lid.
9. The quad leaded chip carrier drawings in this figure show a "J" lead configuration. An optional configuration can be specified; it is for unformed (straight) leads, see figure 1 and table V concerning how to designate this option. When the straight leads option is selected and the leads are subsequently formed by the microcircuit device user, the resultant lead configuration shall conform to the "J" lead dimensions and coplanarity requirements specified in this figure.
10. See table VI for descriptive type designator.
11. $D2/E2 = D1/E1 \text{ max } + .004 \text{ inch.}$

FIGURE 19. Ceramic, metal-sealed, "J" lead chip carrier style - Continued.

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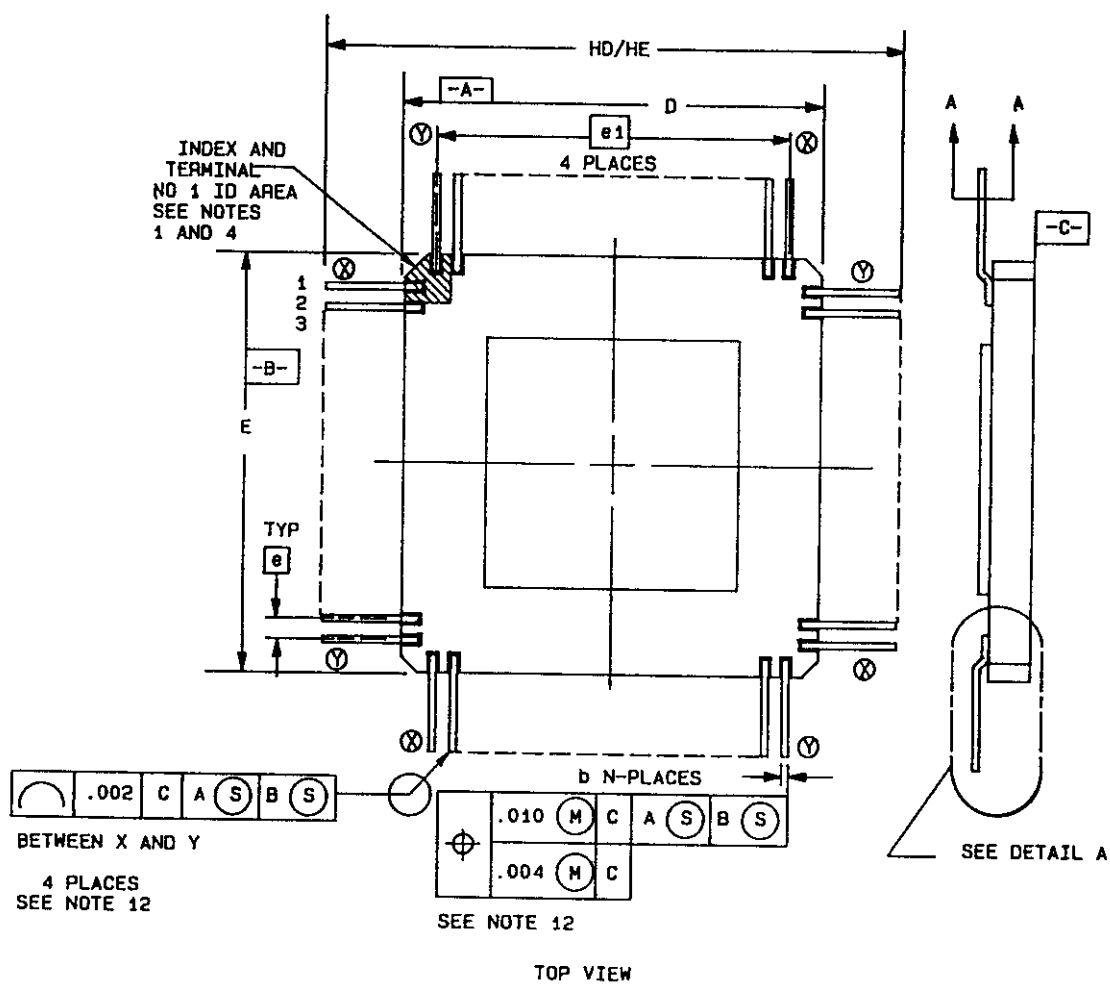


FIGURE 20. Ceramic, metal-sealed, unformed-lead, chip carrier style.

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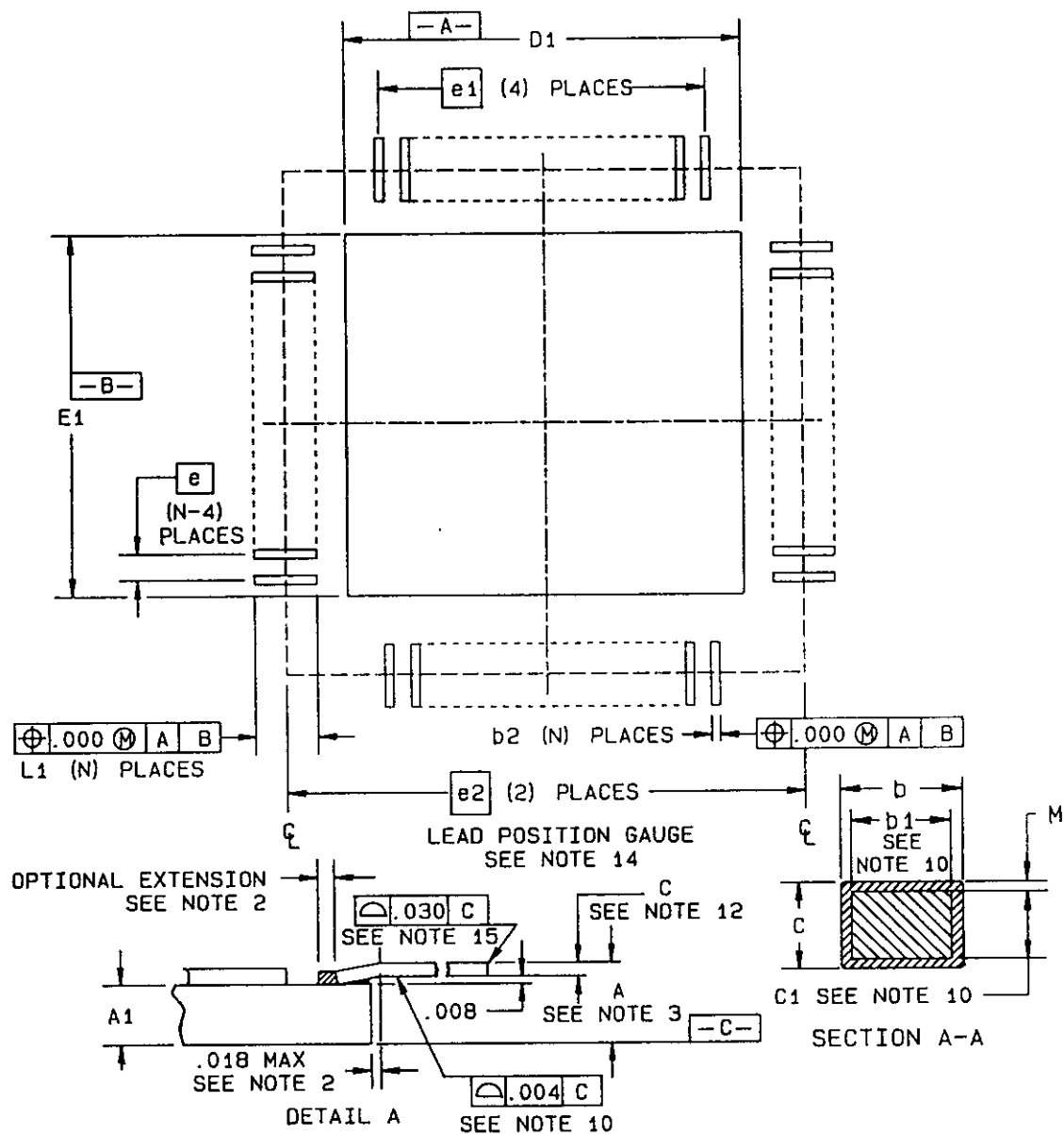


FIGURE 20. Ceramic, metal-sealed, unformed-lead, chip carrier style - Continued.

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S Y M B O L	Variations, all dimensions in inches											
	C-U1			N O T E	C-U2			N O T E	C-U3			N O T E
	Min	Nom	Max		Min	Nom	Max		Min	Nom	Max	
A	.060	---	.130	3	.060	---	.135	3	.060	---	.130	3
A1	---	---	.105		---	---	.120		---	---	.105	
b	.006	---	.014	10	.008	---	.015	10	.006	---	.015	10
b1	.006	.008	.012	10	.006	.010	.013	10	.006	.008	.013	10
b2	---	---	.016	10	---	---	.019	10	---	---	.019	10
c	.004	---	.010	10	.005	---	.011	10	.004	---	.010	10
c1	.004	.006	.008	10	.005	.007	.009	10	.004	.006	.008	10
D/E	.635	.650	.665		.735	.750	.765		.935	.950	.965	
D1/E1	---	---	.675	12	---	---	.775	12	---	---	.975	12
e	.025 BSC				.025 BSC				.025 BSC			
e1	.500 BSC				.660 BSC				.800 BSC			
e2	1.440 BSC			12	1.440 BSC			12	1.500 BSC			12
HD/HE	1.420	1.450	1.465	12	1.420	1.450	1.465	12	1.480	1.510	1.525	12
L	---	---	.023	12	---	---	.023	12	---	---	.023	12
M	---	---	.002	10	---	---	.002	10	---	---	.002	10
N	84			5	100			5	132			5
ND/NE	21			6	25			6	33			6
Note	14											

FIGURE 20. Ceramic, metal-sealed, unformed-lead, chip carrier style - continued.

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S Y M B O L	Variations, all dimensions in millimeters											
	C-U1			N O T E	C-U2			N O T E	C-U3			N O T E
	Min	Nom	Max		Min	Nom	Max		Min	Nom	Max	
A	1.52	---	3.30	3	1.52	---	3.42	3	1.52	---	3.30	3
A1	---	---	2.66		---	---	3.04		---	---	2.66	
b	0.15	---	0.35	10	0.20	---	0.38	10	0.15	---	0.38	10
b1	0.15	0.20	0.30	10	0.15	0.25	0.33	10	0.15	0.20	0.30	10
b2	---	---	0.40	10	---	---	0.48	10	---	---	0.48	10
c	0.10	---	0.25	10	0.12	---	0.27	10	0.10	---	0.25	10
c1	0.10	0.15	0.20	10	0.12	0.17	0.22	10	0.10	0.15	0.20	10
D/E	16.12	16.51	16.89		18.66	19.05	19.43		23.74	24.13	24.51	
D1/E1	---	---	17.14	12	---	---	19.68	12	---	---	24.76	12
e	0.63 BSC				0.63 BSC				0.63 BSC			
e1	12.70 BSC				15.24 BSC				20.32 BSC			
e2	13.57 BSC			12	36.57 BSC			12	1.500 BSC			
HD/HE	36.06	36.83	37.21	12	36.06	36.83	37.21	12	37.59	38.35	38.73	12
L	---	---	0.58	12	---	---	0.58	12	---	---	0.58	12
M	---	---	0.05	10	---	---	0.05	10	---	---	0.05	10
N	84			5	100			5	132			5
ND/NE	21			6	25			6	33			6
Note	14											

FIGURE 20. Ceramic, metal-sealed, unformed-lead, chip carrier style - Continued.

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S Y M B O L	Variations, all dimensions in inches											
	C-U4			N O T E	C-U5			N O T E	C-U6			N O T E
	Min	Nom	Max		Min	Nom	Max		Min	Nom	Max	
A	.060	---	.130	3	.060	---	.130	3	.060	---	.130	3
A1	---	---	.105		---	---	.105		---	---	.105	
b	.006	---	.012	10	.006	---	.012	10	.006	---	.012	10
b1	.006	.008	.010	10	.006	.008	.010	10	.006	.008	.010	10
b2	---	---	.017	10	---	---	.017	10	---	---	.017	10
c	.004	---	.010	10	.004	---	.010	10	.004	---	.010	10
c1	.004	.006	.008	10	.004	.006	.008	10	.004	.006	.008	10
D/E	1.035	1.050	1.065		1.135	1.150	1.165		1.335	1.350	1.365	
D1/E1	---	---	1.075	12	---	---	1.175	12	---	---	1.375	12
e	.025 BSC				.025 BSC				.025 BSC			
e1	.875 BSC				1.050 BSC				1.200 BSC			
e2	1.590 BSC			12	1.800 BSC			12	1.890 BSC			12
HD/HE	1.570	1.600	1.615	12	1.780	1.810	1.825	12	1.870	1.900	1.915	12
L	---	---	.023	12	---	---	.023	12	---	---	.023	12
M	---	---	---	10	---	---	---	10	---	---	---	10
N	144			5	172			5	196			5
ND/NE	36			6	43			6	49			6
Note	14											

FIGURE 20. Ceramic, metal-sealed, unformed-lead, chip carrier style - Continued.

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S Y M B O L	Variations, all dimensions in millimeters											
	C-U4			N O T E	C-U5			N O T E	C-U6			N O T E
	Min	Nom	Max		Min	Nom	Max		Min	Nom	Max	
A	1.52	---	3.30	3	1.52	---	3.30	3	1.52	---	3.30	3
A1	---	---	2.66		---	---	2.66		---	---	2.66	
b	0.15	---	0.30	10	0.15	---	0.30	10	0.15	---	0.30	10
b1	0.15	0.20	0.35	10	0.15	0.20	0.35	10	0.15	0.20	0.35	10
b2	---	---	0.43	10	---	---	0.43	10	---	---	0.43	10
c	0.10	---	0.25	10	0.10	---	0.25	10	0.10	---	0.25	10
c1	0.10	0.15	0.20	10	0.10	0.15	0.20	10	0.10	0.15	0.20	10
D/E	26.28	26.67	27.05		28.82	29.21	29.59		33.90	34.29	34.67	
D1/E1	---	---	27.30	12	---	---	29.84	12	---	---	34.92	12
e	0.63 BSC				0.63 BSC				0.63 BSC			
e1	22.22 BSC				26.67 BSC				30.48 BSC			
e2	40.38 BSC			12	45.72 BSC			12	48.00 BSC			12
HD/HE	39.87	40.64	41.02	12	45.21	45.97	46.35	12	47.49	48.26	48.64	12
L	---	---	0.58	12	---	---	0.58	12	---	---	0.58	12
M	---	---	0.05	10	---	---	0.05	10	---	---	0.05	10
N	144			5	172			5	196			5
ND/NE	36			6	43			6	49			6
Note	14											

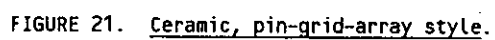
FIGURE 20. Ceramic, metal-sealed, unformed-lead, chip carrier style - Continued.

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NOTES:

1. A terminal 1 identification mark shall be located at the index corner in the shaded area shown. Terminal 1 is located immediately adjacent to and counterclockwise from the index corner. Terminal numbers increase in a counterclockwise direction when viewed as shown.
2. Generic lead attach dogleg depiction. May be flat lead configuration.
3. Includes lead attach dogleg height and lid height, whichever is greater.
4. Corner shapes (square, notch, radius, etc.) may vary from that shown on the drawing. The index corner shall be clearly unique.
5. Dimension N: Number of terminals.
6. Dimension ND/NE: Number of terminals per package edge.
7. Regardless of the virtual length, the .002 limit ensures an accurate square trim for subsequent lead forming tool registration.
8. Lead coplanarity shall be .004 inch (0.10 mm) within .050 inch (1.27 mm) from package body.
9. No overhang of the lead on the braze pad is allowed.
10. Dimensions b1 and c1 apply to base metal only. Dimension M applies to plating thickness.
11. The leads on this package style shall be protected from mechanical distortion and damage such that dimensions pertaining to relative lead/body "true positions" and lead "coplanarity" are always maintained until the next higher level package attachment process is complete. Package lead protection mechanisms (tie bars, carriers, etc.) are not shown on the drawing, however when microcircuit devices contained in this package style are shipped for use in Government equipment, or shipped directly to the Government as spare parts or mechanical qualification samples, lead "true position" and "coplanarity" protection shall be in place.
12. The lead tip location may be determined with the use of the lead position gauge shown. Each lead tip and the body shall simultaneously reside within defined areas of the gauge.
13. Lead tip coplanarity shall be .030 inch (0.76 mm) at minimum lead length.
14. See table VI for descriptive type designator.
15. The lead tip-to-tip profile is specified by this feature control frame.

20. Ceramic, metal-sealed, unformed-lead chip carrier style - Continued.



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Symbol	"Large outline" variations (all dimensions shown in inches)											
	P-AA		Note	P-AB		Note	P-AC		Note	P-AD		Note
	Min	Max		Min	Max		Min	Max		Min	Max	
D/E	.940	.980	3	1.040	1.080	3	1.140	1.180	3	1.240	1.280	3
D1/E1	.800 BSC			.900 BSC			1.000 BSC			1.100 BSC		
M	9			10			11			12		
N	---	81		---	100		---	121		---	144	
S	.000 BSC			.050 BSC			.000 BSC			.050 BSC		
Notes	1, 2, 12, 15											
Symbol	P-AE		Note	P-AF		Note	P-AG		Note	P-AH		Note
	Min	Max		Min	Max		Min	Max		Min	Max	
	D/E	1.340	1.3800	3	1.440	1.480	3	1.540	1.590	3	1.640	1.680	3
D1/E1	1.200 BSC		1.300 BSC		1.400 BSC			1.500 BSC				
M	13		14			15			16			
N	---	169	---		196	---		225	---		256	
S	.000 BSC			.050 BSC			.000 BSC			.050 BSC		
Notes	1, 2, 12, 15											
Symbol	P-AJ		Note	P-AK		Note	P-AL		Note	P-AM		Note
	Min	Max		Min	Max		Min	Max		Min	Max	
	D/E	1.732	1.780	3	1.840	1.880	3	1.940	1.980	3	2.040	2.080	3
D1/E1	1.600 BSC		1.700 BSC		1.800 BSC			1.900 BSC				
M	17		18			19			20			
N	---	289	---		324	---		361	---		400	
S	.000 BSC			.050 BSC			.000 BSC			.050 BSC		
Notes	1, 2, 12, 15											

FIGURE 21. Ceramic, pin-grid-array style - Continued.

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Symbol	"Large outline" variations (all dimensions shown in millimeters)											
	P-AA		Note	P-AB		Note	P-AC		Note	P-AD		Note
	Min	Max		Min	Max		Min	Max		Min	Max	
D/E	23.88	24.89	3	26.42	27.43	3	28.96	29.97	3	31.50	32.51	3
D1/E1	20.32 BSC			22.86 BSC			25.40 BSC			27.94 BSC		
M	9			10			11			12		
N	---	81		---	100		---	121		---	144	
S	.00 BSC			1.27 BSC			.00 BSC			1.27 BSC		
Notes	1, 2, 12, 15											
Symbol	P-AE		Note	P-AF		Note	P-AG		Note	P-AH		Note
	Min	Max		Min	Max		Min	Max		Min	Max	
	D/E	34.04	35.05	3	36.58	37.59	3	39.12	40.38	3	41.66	42.67	3
D1/E1	30.48 BSC		33.02 BSC		35.56 BSC			38.10 BSC				
M	13		14		15			16				
N	---	169	---		196	---		225	---		256	
S	.00 BSC		1.27 BSC		.00 BSC			1.27 BSC				
Notes	1, 2, 12, 15											
Symbol	P-AJ		Note	P-AK		Note	P-AL		Note	P-AM		Note
	Min	Max		Min	Max		Min	Max		Min	Max	
	D/E	44.00	45.21	3	46.74	47.75	3	49.28	50.29	3	51.82	52.83	3
D1/E1	40.64 BSC		43.18 BSC		45.72 BSC			48.26 BSC				
M	17		18		19			20				
N	---	289	---		324	---		361	---		400	
S	.00 BSC		1.27 BSC		.00 BSC			1.27 BSC				
Notes	1, 2, 12, 15											

FIGURE 21. Ceramic, pin-grid-array style - Continued.

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Symbol	"Large outline" variations (all dimensions shown in inches)											
	P-BA		Note	P-BB		Note	P-BC		Note	P-BD		Note
	Min	Max		Min	Max		Min	Max		Min	Max	
D/E	.880	.935		.980	1.035		1.080	1.135		1.180	1.235	
D1/E1	.800 BSC			.900 BSC			1.000 BSC			1.100 BSC		
M	9		3	10		3	11		3	12		3
N	---	81	4	---	100	4	---	121	4	---	144	4
S	.000 BSC			.050 BSC			.000 BSC			.050 BSC		
Notes	1, 2, 12, 15											
Symbol	P-BE		Note	P-BF		Note	P-BG		Note	P-BH		Note
	Min	Max		Min	Max		Min	Max		Min	Max	
	D/E	1.280	1.335		1.380	1.435		1.480	1.535		1.580	1.635
D1/E1	1.200 BSC			1.300 BSC			1.400 BSC			1.500 BSC		
M	13		3	14		3	15		3	16		3
N	---	169	4	---	196	4	---	225	4	---	256	4
S	.000 BSC			.050 BSC			.000 BSC			.050 BSC		
Notes	1, 2, 12, 15											
Symbol	P-BJ		Note	P-BK		Note	P-BL		Note	P-BM		Note
	Min	Max		Min	Max		Min	Max		Min	Max	
	D/E	1.680	1.735		1.780	1.835		1.980	1.935		1.980	2.035
D1/E1	1.600 BSC			1.700 BSC			1.800 BSC			1.900 BSC		
M	17		3	18		3	19		3	20		3
N	---	289	4	---	324	4	---	361	4	---	400	4
S	.000 BSC			.050 BSC			.000 BSC			.050 BSC		
Notes	1, 2, 12, 15											

FIGURE 21. Ceramic, pin-grid-array style - Continued.

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Symbol	"Large outline" variations (all dimensions shown in millimeters)											
	P-BA		Note	P-BB		Note	P-BC		Note	P-BD		Note
	Min	Max		Min	Max		Min	Max		Min	Max	
D/E	22.35	23.74	3	24.89	26.28	3	1.080	1.135	3	1.180	1.235	3
D1/E1	20.32 BSC			22.86 BSC			25.40 BSC			25.94 BSC		
M	9			10			11			12		
N	---	81		100			121			144		
S	.00 BSC			1.27 BSC			.00 BSC			1.27 BSC		
Notes	1, 2, 12, 15											
Symbol	P-BE		Note	P-BF		Note	P-BG		Note	P-BH		Note
	Min	Max		Min	Max		Min	Max		Min	Max	
	D/E	32.51	33.90	3	35.05	36.44	3	37.59	38.98	3	40.13	41.52	3
D1/E1	30.48 BSC		33.02 BSC		35.56 BSC			38.10 BSC				
M	13		14		15			16				
N	---	169	196		225			256				
S	.00 BSC		1.27 BSC		.00 BSC			1.27 BSC				
Notes	1, 2, 12, 15											
Symbol	P-BJ		Note	P-BK		Note	P-BL		Note	P-BM		Note
	Min	Max		Min	Max		Min	Max		Min	Max	
	D/E	42.67	44.06	3	45.21	46.60	3	47.75	49.14	3	50.29	51.68	3
D1/E1	40.64 BSC		43.18 BSC		45.72 BSC			48.26 BSC				
M	17		18		19			20				
N	---	289	324		361			400				
S	.00 BSC		1.27 BSC		.00 BSC			1.27 BSC				
Notes	1, 2, 12, 15											

FIGURE 21. Ceramic, pin-grid-array style - Continued.

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NOTES:

1. See table VI for descriptive type designator.
2. Refer to the appendix which lists and defines dimensioning symbols.
3. "M" represents the maximum pin matrix size.
4. "N" represents the maximum allowable number of pins. Specify in the microelectronic device acquisition document the actual number of pins needed within the maximum allowed, and the location of the pins within the matrix.
5. Dimension "A1" includes the package body and lid for both cavity-up and cavity-down configurations. The listed packages shall be identified as cavity up and optionally as cavity down in microelectronic device acquisition documents (see 5.2.8). Dimension "A1" does not include heatsinks or other attached features.
6. Standoffs are intrinsic and shall be located on the pin matrix diagonals. The seating plane is defined by the standoffs at dimensions Q or Q1.
7. Dimension "Q" applies to cavity-up configurations only. Dimension "Q1" applies to cavity-down configurations only (see reference drawing on figure 10).
8. All pins shall be on the .100" grid.
9. Datum "C" is the plane of pin to package interface for both cavity up and down configurations (see reference drawing on figure 10.)
10. Pin diameter includes solder dip or custom finishes. Pin tips shall have a radius or chamfer.
11. A pin "A1" identification shall be located at the index corner on both top and bottom surfaces of the package. The identification may be mechanical or graphical. It shall not include the manufacturer's identification. It may be different or the same on each surface.
12. Unless otherwise specified, a minimum clearance of .020 inch (0.51 mm) shall be maintained between all metallized features on the package surface.
13. Corner shape (chamfer, notch, radius, etc.) may vary from that shown on the drawing. The index corner shall be clearly unique.
14. Dimension "S" is measured with respect to datums A and B.

FIGURE 21. Ceramic, pin-grid-array style - Continued.

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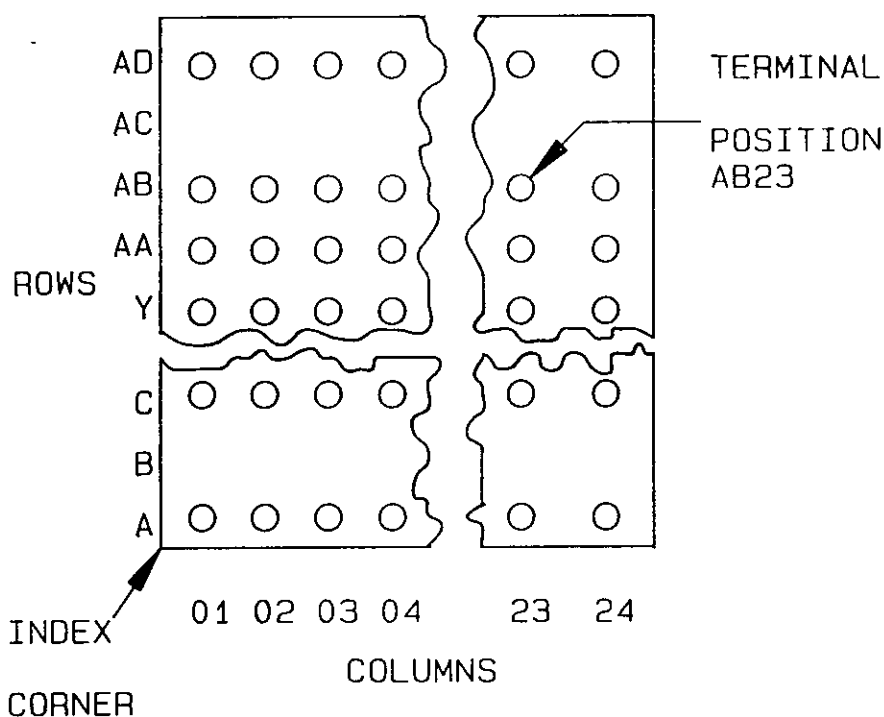
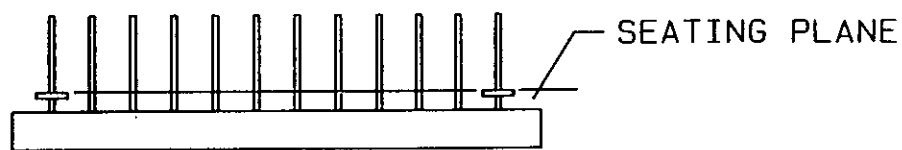
NOTES - Continued.

15. The PGA alpha numeric grid system for designating terminal positions shall be as follows:

- a. A row-column grid system shall be used to designate the terminal positions.
- b. With the package viewed looking toward the seating plane and the reference or index corner in the lower left, the rows of the array shall be designated by the letters of the alphabet excluding I, O, Q, S, X, and Z from bottom to top. For packages having more than 20 rows, the 21st row shall be designated AA, the 22nd, AB, etc. The columns of the array shall be numbered from left to right.
- c. Since this system designates terminal positions, rows or columns without terminals shall be designated the same as if terminals were present.



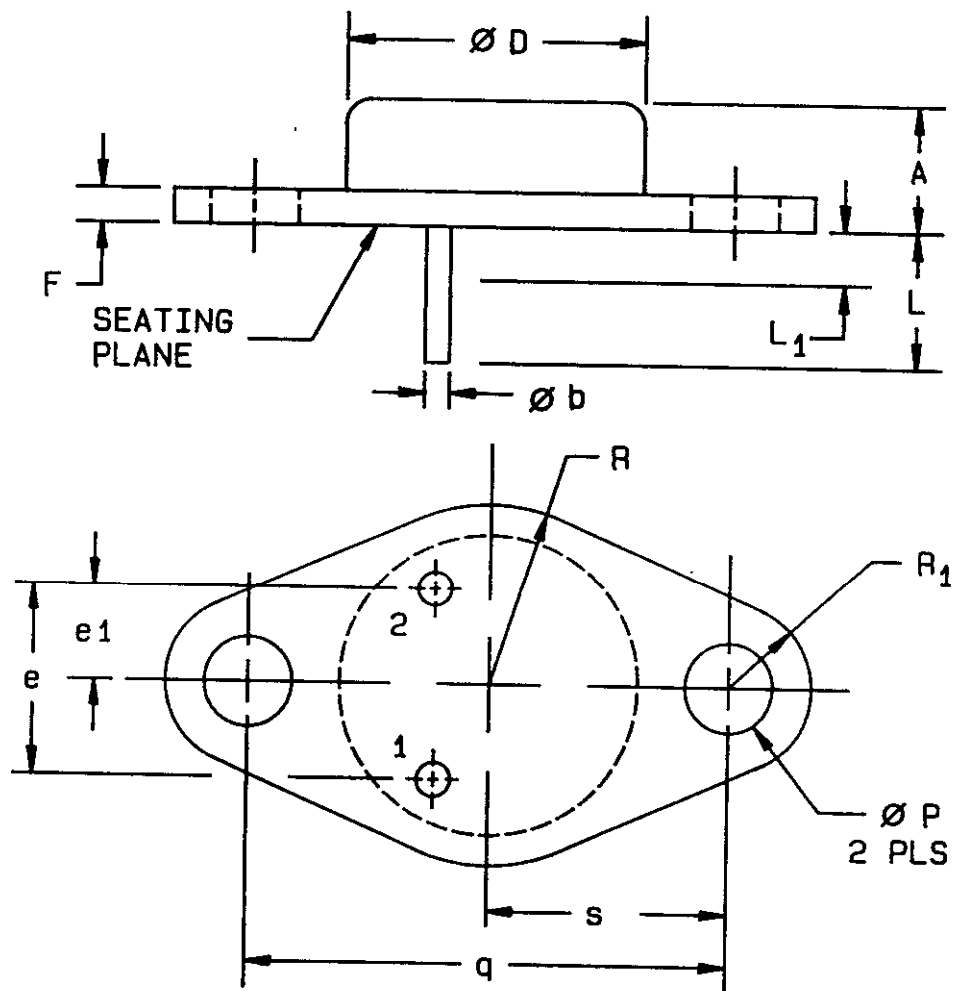
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Example of 24 x 24 terminal position array
with no terminals present in rows B and AC.
Viewed looking toward seating plane.

FIGURE 21. Ceramic, pin-grid-array style - Continued.

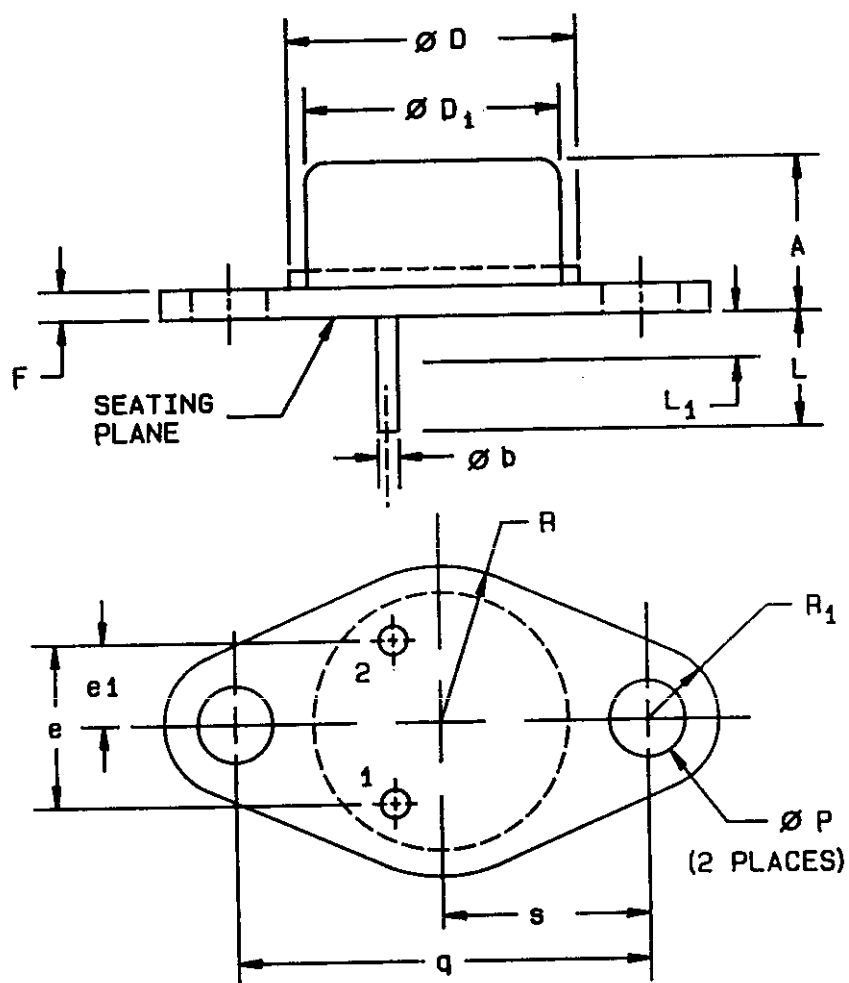
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Configuration A

FIGURE 22. Metal base flange mount style.

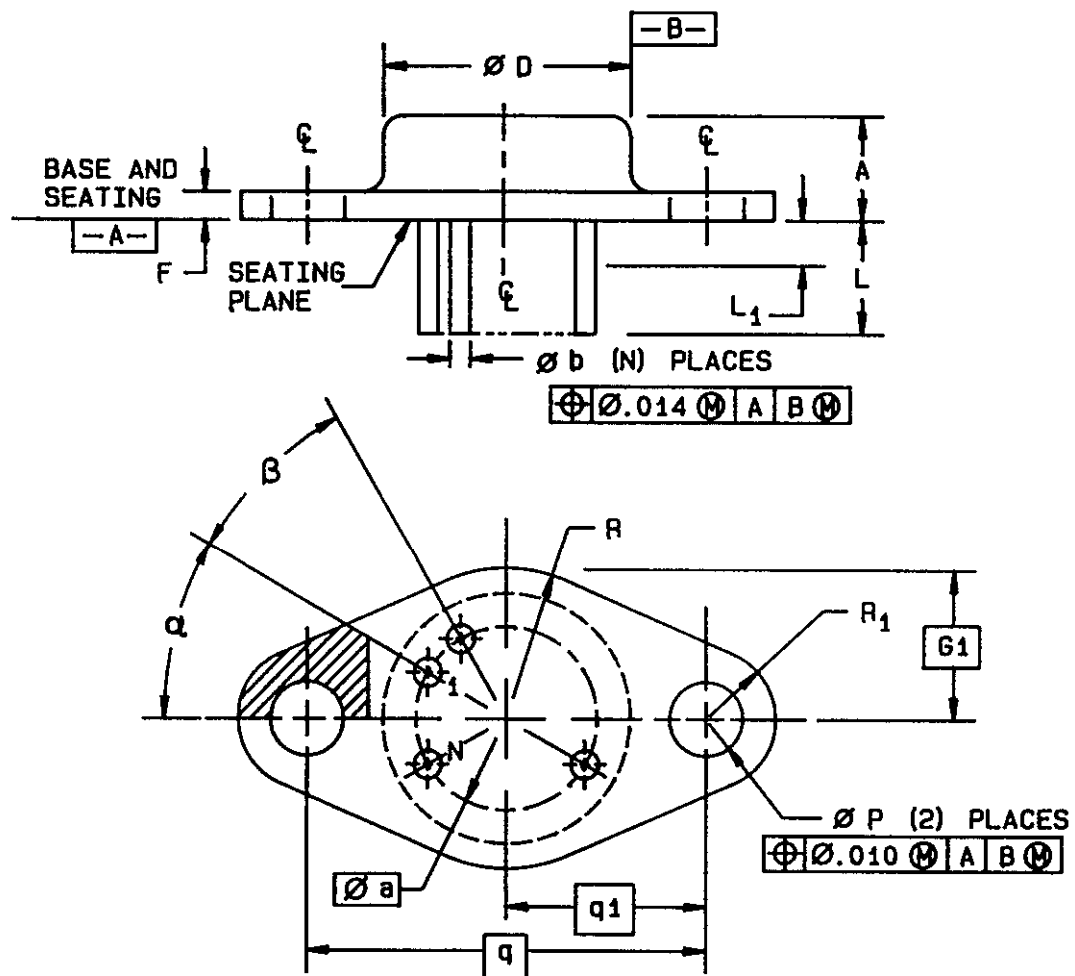
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Configuration B

FIGURE 22. Metal base flange mount style - Continued.

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Configuration C

FIGURE 22. Metal base flange mount style - Continued.

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Symbol	Variations (all dimensions shown in inches)								
	AA Config. A		Note	AB Config. A		Note	AC Config. A		Note
	Min	Max		Min	Max		Min	Max	
A	.250	.360		.250	.360		.250	.360	
ϕa									
ϕb	.038	.043	4,6	.048	.053	4,6	.058	.063	4,6
ϕD	---	.875		---	.875		---	.875	
$\phi D1$									
e	.420	.440	3	.420	.440	3	.420	.440	3
e1	.205	.225	3	.205	.225	3	.205	.225	3
F	.060	.135		.060	.135		.060	.135	
G1									
L	.312	.500		.312	.500		.312	.500	
L1	---	.050	6	---	.050	6	---	.050	6
ϕp	.151	.165	4	.151	.165	4	.151	.165	4
q	1.177	1.197		1.177	1.197		1.177	1.197	
q1									
R	.495	.525	4	.495	.525	4	.495	.525	4
R1	.131	.188	4	.131	.188	4	.131	.188	4
S	.655	.675		.655	.675		.655	.675	
α									
β									
N	2			2			2		
Note	1, 2, 5								

FIGURE 22. Metal base flange mount style - continued.

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Symbol	Variations (all dimensions shown in millimeters)								
	AA Config. A		Note	AB Config. A		Note	AC Config. A		Note
	Min	Max		Min	Max		Min	Max	
A	6.35	9.14		6.35	9.14		6.35	9.14	
ϕa									
ϕb	0.97	1.09	4,6	1.22	1.35	4,6	1.47	1.60	4,6
ϕd	---	22.22		---	22.22		---	22.22	
ϕd_1									
e	10.67	11.18	3	10.67	11.18	3	10.67	11.18	3
e1	5.21	5.72	3	5.21	5.72	3	5.21	5.72	3
F	1.52	3.43		1.52	3.43		1.52	3.43	
G1									
L	7.92	12.70		7.92	12.70		7.92	12.70	
L1	---	1.27	6	---	1.27	6	---	1.27	6
ϕp	3.84	4.19	4	3.84	4.19	4	3.84	4.19	4
q	29.90	30.40		29.90	30.40		29.90	30.40	
q1									
R	12.57	13.34	4	12.57	13.34	4	12.57	13.34	4
R1	3.33	4.78	4	3.33	4.78	4	3.33	4.78	4
S	16.64	17.15		16.64	17.15		16.64	17.15	
α									
β									
N	2			2			2		
Note	1, 2, 5								

FIGURE 22. Metal base flange mount style - continued.

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Symbol	Variations											
	AD Config. B (inches)		AD Config. B (millimeters)		Note	AE Config. C (inches)			AE Config. C (millimeters)			Note
	Min	Max	Min	Max		Min	Nom	Max	Min	Nom	Max	
A	.250	.340	6.35	8.64		.200	.220	.300	5.08	5.59	7.62	
φa						.600 BSC			15.24 BSC			
φb	.028	.034	.71	.86	4,6	.025	.030	.035	.64	.76	.89	6
φD	---	.620	---	15.74		.755	.768	.780	19.18	19.91	19.81	
φD1	.470	.500	11.94	12.70								
e	.190	.210	4.83	5.33	3							3
e1	.093	.107	2.36	2.72	3	.300 BSC			7.62 BSC			3
F	.050	.075	1.27	1.91		.085	.093	.100	2.16	2.36	2.54	
G1						.500 BSC			12.70 BSC			
L	.360	.500	9.14	12.70		.340	.380	.420	8.54	9.65	10.67	
L1	---	.050	---	1.27	6	---	---	.025	---	---	.64	6
φp	.142	.152	3.61	3.86	4	.151	.156	.161	3.84	3.96	4.09	4
q	.958	.962	24.33	24.43		1.187 BSC			30.15 BSC			
q1						.5935 BSC			15.075 BSC			3
R	---	.350	---	8.89	4	.488	.500	.512	12.40	12.70	13.00	4
R1	.115	.145	2.92	3.68	4	.160	.171	.182	4.06	4.34	4.62	4
S	.570	.590	14.48	14.99	6							6
α						22.5° BSC			22.5° BSC			
β						22.5° BSC			22.5° BSC			
N	2		2			15			15			
Note	1, 2, 5											

FIGURE 22. Metal base flange mount style - continued.

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Notes:

1. Dimensions are in inches.
2. For configuration C a terminal 1 identification mark shall be located in the shaded index area shown. Terminal 1 shall be located immediately adjacent to and clockwise from the index area. Terminal numbers shall increase in a clockwise direction when viewed as shown.
3. These dimensions should be measured at points .050 inch (1.27 mm) \pm .005 inch (0.13 mm) \pm .000 inch (0.00 mm) below seating plane. When gauge is not used, measurement will be made at the seating plane.
4. Two places.
5. The seating plane of the header shall be flat within .001 inch (0.03 mm) concave to .004 inch (0.10 mm) convex inside a .930 inch (23.62 mm) diameter circle on the center of the header and flat within .001 inch (0.03 mm) concave to .006 inch (0.15 mm) convex overall.
6. Lead diameter and glass meniscus shall not exceed twice ϕb within L1.

FIGURE 22. Metal base flange mount style - continued.

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6. NOTES

(This section contains information of a general or explanatory nature that may be helpful, but is not mandatory.)

6.1 Intended use. Packages conforming to the requirements of this standard are intended for use in military electronic equipment.

6.2 Tailoring guidance for contractual application. For purposes of this standard, tailoring refers to the selection of optional package features when they are specified on the drawing figures. For example, one may select top and bottom terminals and thermal conduction pads on certain chip carrier packages.

6.3 Subject term (key word) listing.

ANSI
Basic dimension
Ceramic
Classification
EIA
Gullwing
Interchangeability
Lead position overlay
Package style
Quad
Tailoring
Type designator

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6.4 Package cross-reference list. The following table provides a cross-references of package type numbers (and configuration numbers where applicable) that were listed in appendix C of MIL-M-38510, to the package descriptive type designators listed in this standard. Packages were deleted from appendix C of MIL-M-38510 with the publication of this standard. The appendix C numbers are in alphanumeric sequence; underlined descriptive type designators are inactive (see table VIII).

TABLE VIII. Package cross-reference list.

Old MIL-M-38510 appendix C type no./ config. ltr.	New descriptive package type designator
A1	MACY-W8
A2	MACY-W10
A3	MACY-W12
C-1	CQCC1-N16
C-10	CQCC3-N18
C-10A	CQCC4-N18
C-11	CQCC3-N28
C-11A	CQCC4-N28
C-12	CQCC1-N32
C-12A	CQCC2-N32
C-13	CQCC3-N20
C-13A	CQCC4-N20
C-1A	CQCC2-N16
C-2	CQCC1-N20
C-2A	CQCC2-N20
C-3	CQCC1-N24
C-3A	CQCC2-N24
C-4	CQCC1-N28
C-4A	CQCC2-N28
C-5	CQCC1-N44
C-6	CQCC1-N52
C-7	CQCC1-N68
C-8	CQCC1-N84
C-9	CQCC1-N18
C-9A	CQCC2-N18
C-G1	GQCC1-G44
C-G2	GQCC1-G68
C-G3	GQCC1-G84
C-G7	CQCC1-G132
C-J1	GQCC1-J44
C-J10	CQCC2-J52
C-J2	GQCC1-J68
C-J3	GQCC1-J84
C-J4	CQCC2-J44
C-J5	CQCC2-J68
C-J6	CQCC2-J84

Old MIL-M-38510 appendix C type no./ config. ltr.	New descriptive package type designator
C-J7	GQCC1-J28
C-J8	GQCC1-J52
C-J9	CQCC2-J28
C-U1	CQCC1-F84
C-U2	CQCC1-F100
C-U3	CQCC1-F132
C-U4	CQCC1-F144
C-U5	CQCC1-F172
C-U6	CQCC1-F196
D-1, C	CDIP2-T14
D-1, A	GDIP1-T14
D-10, C	CDIP2-T28
D-10, A	GDIP1-T28
D-11, C	CDIP6-T24
D-11, A	GDIP5-T24
D-12, C	CDIP2-T50
D-12, A	GDIP1-T50
D-13, C	CDIP1-T64
D-14, C	CDIP2-T48
D-14, A	GDIP1-T48
D-15, C	CDIP3-T28
D-2, C	CDIP2-T16
D-2, A	GDIP1-T16
D-3, C	CDIP2-T24
D-3, A	GDIP1-T24
D-4, C	CDIP2-T8
D-4, A	GDIP1-T8
D-5, C	CDIP2-T40
D-5, A	GDIP1-T40
D-6, C	CDIP2-T18
D-6, A	GDIP1-T18
D-7, A	GDIP1-T22
D-7, A	GDIP2-T22
D-8, C	CDIP2-T20
D-8, A	GDIP1-T20
D-9, C	CDIP4-T24
D-9, A	GDIP3-T24

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TABLE VIII. Package cross-reference list - Continued.

Old MIL-M-38510 appendix C type no./ config. ltr.	New descriptive package type designator
F-10, A	GDFP1-F18
F-11, A	GDFP2-F28
F-11A, B	CDFP3-F28
F-12, B	CDFP4-F28
F-13, A	GDFP1-F16
F-14, A	GDFP2-F18
F-15, A	GDFP1-F20
F-16, A	GDFP2-F24
F-17, A	GDFP1-F28
F-2, A	GDFP1-F14
F-2, B	GDFP2-F14
F-2A, B	CDFP3-F14
F-4, A	GDFP1-F10
F-4, B	CDFP2-F10
F-4A, B	CDFP3-F10
F-5, A	GDFP2-F16
F-5, B	CDFP3-F16

Old MIL-M-38510 appendix C type no./ config. ltr.	New descriptive package type designator
F-5A, B	CDFP4-F16
F-9, A	GDFP2-F20
F-9, B	CDFP3-F20
F-9A, B	CDFP4-F20
P-AA	CMGA1-PM
P-AB	CMGA2-PM
P-AC	CMGA3-PM
P-AD	CMGA4-PM
P-AE	CMGA5-PM
P-AF	CMGA6-PM
P-AG	CMGA7-PM
P-AH	CMGA8-PM
P-AJ	CMGA9-PM
P-AK	CMGA10-PM
P-AL	CMGA11-PM
P-AM	CMGA12-PM

INACTIVE		
D-1, B	<u>CDIP3-T14</u>	
D-10, B	<u>CDIP4-T28</u>	
D-11, B	<u>CDIP9-T24</u>	
D-12, B	<u>CDIP3-T50</u>	
D-14, B	<u>CDIP3-T48</u>	
D-2, B	<u>CDIP3-T16</u>	
D-3, B	<u>CDIP7-T24</u>	
D-4, B	<u>CDIP3-T8</u>	
D-5, B	<u>CDIP3-T40</u>	
D-6, B	<u>CDIP3-T18</u>	
D-7, B	<u>CDIP3-T22</u>	
D-8, B	<u>CDIP3-T20</u>	
D-9, B	<u>CDIP8-T24</u>	
F-1, D	<u>CDFP6-F14</u>	
F-1, C	<u>GDFP5-F14</u>	
F-3, C	<u>GDFP4-F14</u>	

INACTIVE		
F-6, D	<u>CDFP6-F24</u>	
F-6, C	<u>GDFP5-F24</u>	
F-8, D	<u>CDFP8-F24</u>	
F-8, C	<u>GDFP7-F24</u>	
F-9, D	<u>CDFP5-F20</u>	
P-BA	<u>CMGA13-PM</u>	
P-BB	<u>CMGA14-PM</u>	
P-BC	<u>CMGA15-PM</u>	
P-BD	<u>CMGA16-PM</u>	
P-BE	<u>CMGA17-PM</u>	
P-BF	<u>CMGA18-PM</u>	
P-BG	<u>CMGA19-PM</u>	
P-BH	<u>CMGA20-PM</u>	
P-BJ	<u>CMGA21-PM</u>	
P-BK	<u>CMGA22-PM</u>	
P-BL	<u>CMGA23-PM</u>	
P-BM	<u>CMGA24-PM</u>	

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APPENDIX

DIMENSIONING SYMBOLS

10. SCOPE

10.1 Scope. This appendix lists and defines the dimensioning symbols used in this standard. This appendix is not a mandatory part of this standard. The information contained herein is intended for guidance only.

20. APPLICABLE DOCUMENTS. This section is not applicable to this appendix.

30. DEFINITIONS

30.1 Dimensioning symbols. The dimensioning symbols used are as follows:

A: Body dimensions.

ϕb : Terminal lead diameters.

B: Terminal lead widths.

C: Terminal lead thicknesses.

ϕD : Body diameters.

D: Body lengths.

E: Body widths.

e: Terminal lead spacings.

F: Flange dimensions.

k: Index dimensions, length.

L: Terminal lead lengths.

Q: Standoff height. The height from the seating plane to the base plane or a reference plane parallel to the seating plane.

S: Distance between terminal leads and the body end or body center lines.

α : Angular dimensions.

h: Chamfered corner dimension.

j: Chamfered corner dimension - index.

R: Radius dimensions.

 : Straightness.

 : Flatness.

 : Profile of a line.

 : Profile of a surface.

 : Perpendicularity.

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APPENDIX

DIMENSIONING SYMBOLS - continued

\oplus : Position.

\textcircled{M} : At maximum material condition.

\textcircled{L} : At least material condition.

\textcircled{S} : Regardless of feature size.

\textcircled{P} : Projected tolerance zone.

ϕ : Diameter.

\boxed{e} : Basic dimension.

REF: Reference dimension.

$\boxed{-A-}$: Datum feature.

$\boxed{\oplus \quad 0.5 \textcircled{M} \quad A \quad B \quad C}$: Feature control frame.

R: Radius.

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