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MIL-STD-1835A
NOTICE 1
28 February 1995

MILITARY STANDARD

MICROCIRCUIT CASE OUTLINES

TO ALL HOLDERS OF MIL-STD-1835A:

1. THE FOLLOWING PAGES OF MIL-STD-1835A HAVE BEEN REVISED AND SUPERSEDE THE PAGES LISTED:

NEW PAGE	DATE	SUPERSEDED PAGE	DATE
iv	28 February 1995	iv	1 February 1994
v	28 February 1995	v	1 February 1994
7	28 February 1995	7	1 February 1994
8	1 February 1994	8	REPRINTED WITHOUT CHANGE
13	1 February 1994	13	REPRINTED WITHOUT CHANGE
14	28 February 1995	14	1 February 1994
17	28 February 1995	17	1 February 1994
18	1 February 1994	18	REPRINTED WITHOUT CHANGE
73	1 February 1994	73	REPRINTED WITHOUT CHANGE
74	28 February 1995	74	1 February 1994
75	28 February 1995	75	1 February 1994
76	28 February 1995	76	1 February 1994
127	1 February 1994	127	REPRINTED WITHOUT CHANGE
128	28 February 1995	128	1 February 1994
129	28 February 1995	129	1 February 1994
130	28 February 1995	130	1 February 1994
131	28 February 1995	131	1 February 1994
132	28 February 1995	132	1 February 1994
133	28 February 1995	133	1 February 1994
134	28 February 1995	134	1 February 1994
135	28 February 1995	NEW	
136	28 February 1995	NEW	
137	28 February 1995	NEW	
138	28 February 1995	NEW	
139	28 February 1995	NEW	
140	28 February 1995	NEW	
141	28 February 1995	NEW	
142	28 February 1995	NEW	
143	28 February 1995	NEW	

2. *RETAIN THIS NOTICE AND INSERT BEFORE TABLE OF CONTENTS.*

3. Holders of MIL-STD-1835A will verify that page changes and additions indicated above have been entered. This notice will be retained as a check sheet. This issuance, together with appended pages, is a separate publication. Each notice is to be retained by stocking points until the military standard is completely revised or canceled.

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CONTENTS

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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).
* Z	Zig-zag	Terminals in two parallel rows oriented perpendicular to the seating plan arranged in a staggered configuration. Restrict to ZIP family.

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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 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	V, 12, A	D-6	28	18,	"	.100	none
CDIP2-T18	V, 12, C	D-6	"	18,	"	"	MS-015 AD
GDIP1-T20	R, 12, A	D-8	"	20,	.300	"	none
CDIP2-T20	R, 12, C	D-8	"	20,	"	"	MS-015 AE
GDIP1-T22	W, 12, A	D-7	"	22,	.400	"	none
CDIP2-T22	W, 12, C	D-7	"	22,	"	"	MS-015 BB
GDIP1-T24	J, 12, A	D-3	"	24,	.600	"	MO-103 AA
CDIP2-T24	J, 12, C	D-3	"	"	"	"	MS-015 CA
GDIP3-T24	L, 12, A	D-9	"	"	.300	"	MO-058 AA
CDIP4-T24	L, 12, C	D-9	"	"	"	"	MS-015 AG
GDIP5-T24	12, A	D-11	"	"	.400	"	none
CDIP6-T24	12, C	D-11	"	"	"	"	MS-015 BC
GDIP1-T28	12, A	D-10	"	28,	.600	"	MO-103 AB
CDIP2-T28	12, C	D-10	"	"	"	"	MS-015 CB
CDIP3-T28	12, C	D-15	"	"	.300	"	MS-015 AH
GDIP4-T28	12, A	D-15	"	"	"	"	MO-058 AB
GDIP1-T32	12, A	D-16	"	32,	.600	"	MS-015 CC
CDIP2-T32	12, C	D-16	"	32,	"	"	MO-103 AD
GDIP1-T40	Q, 12, A	D-5	"	40,	.600	"	MO-103 AC
CDIP2-T40	Q, 12, C	D-5	"	40,	"	"	MS-015 CE
GDIP1-T48	12, A	D-14	"	48,	"	"	none
CDIP2-T48	12, C	D-14	"	48,	"	"	MS-015 CF
GDIP1-T50	12, A	D-12	"	50,	.900	"	none
CDIP2-T50	12, C	D-12	"	50,	"	"	MS-015 DA
CDIP1-T64	12, C	D-13	"	64,	"	"	MS-015 DB
Can style 4/							
MACY1-X8	G, 13	A1	70	8		α,β 45°	MO-002 AL
MACY1-X10	I, 13	A2	65	10		α,β 36°	MO-006 AF
MACY1-X12	13	A3	65	12		α,β 30°	MO-006 AG
MACY1-X3	13	A4		3		α45°, β90°	TO-5, TO-39

See footnotes at end of table VII.

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	"	" "
CDCC1-N4	"	C-14	"	4	"	" BA
CDCC1-N6	"	C-15	"	6	"	" BB

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
			Flange mount style 4/			
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
			Dual leadless chip carrier style 4/			
CDCC1-N28	23	DL-1	20	28	.050	MO-126 AA
CDCC1-N32	23	DL-2	20	32	.050	MO-126 AB
CDCC1-N20	23	DL-3	20	20	.050	MO-126 AC
CDCC2-N20	23	DL-4	20	20	.050	MO-144 AA
CDCC1-N4	15	C-14	20	4	.050	MO-041 BA
CDCC1-N6	15	C-15	20	6	.050	MO-041 BB
			Quad leaded chip carrier style with non-conductive tie bar 4/			
CQCC2-F100	24	C-T1	20	100	.025	MO-113 AD
CQCC2-F132	24	C-T2	20	132	.025	MO-113 AC
CQCC2-F164	24	C-T3	20	164	.025	MO-113 AA
CQCC2-F172	24	C-T4	20	172	.025	MO-113 AE
CQCC2-F196	24	C-T5	20	196	.025	MO-113 AB
			Zig-zag in-line package style 4/			
CZIP1-T20	25	Z-1		20, 2.54 mm	2.54 mm	MO-176 AA
CZIP1-T24	25	Z-2		24, 2.54 mm	2.54 mm	MO-176 AB
CZIP1-T28	25	Z-3		28, 2.54 mm	2.54 mm	MO-176 AC

(Rows marked with ★ in left margin: CDCC1-N4, CDCC1-N6, Quad leaded chip carrier style header, CQCC2-F100, CQCC2-F132, CQCC2-F164, CQCC2-F172, CQCC2-F196, Zig-zag in-line package style header, CZIP1-T20, CZIP1-T24, CZIP1-T28)

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 6/	B, 11, C	F-3	22	14	.050	TO-85
GDFP5-F14 6/	A, 11, C	F-1	"	"	"	TO-86
CDFP6-F14 6/	A, 11, D	F-1	"	"	"	TO-95
CDFP5-F20 6/	S, 11, D	F-9	"	20	"	none
GDFP5-F24 6/	K, 11, C	F-6	"	24	"	MO-070 AD
CDFP6-F24 6/	K, 11, D	F-6	"	"	"	none
GDFP7-F24 6/	11, C	F-8	"	"	"	MO-019 AA
CDFP8-F24 6/	11, D	F-8	"	"	"	none
Dual-in-line package style 4/						
CDIP3-T8 7/	P, 12, B	D-4	28	8, .300	.100	none
CDIP3-T14 7/	C, 12, B	D-1	"	14, "	"	"
CDIP3-T16 7/	E, 12, B	D-2	"	16, "	"	"
CDIP3-T18 7/	V, 12, B	D-6	"	18, "	"	"
CDIP3-T20 7/	R 12, B	D-8	"	20, "	"	"
CDIP3-T22 7/	W 12, B	D-7	"	22, .400	"	"
CDIP7-T24 7/	J, 12, B	D-3	"	24, .600	"	"
CDIP8-T24 7/	L, 12, B	D-9	"	" .300	"	"
CDIP9-T24 7/	12, B	D-11	"	" .400	"	"
CDIP4-T28 7/	12, B	D-10	"	28, .600	"	"
CDIP3-T40 7/	Q, 12, B	D-5	"	40, "	"	"
CDIP3-T50 7/	12, B	D-12	"	50, .900	"	"
Single-in-line package style						
CSIP1-T3 7/	14	S1	---	3	.050	TO-260

See footnotes at end of this table.

SYMBOL	Rectangular only – variations (all dimensions shown in millimeters)														
	C-11		NOTE	C-11A		NOTE	C-12		NOTE	C-12A		NOTE
	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, square and rectangular leadless chip carrier styles – Continued.

SYMBOL	Rectangular only - variations (all dimensions shown in inches)															
	C-13		NOTE	C-13A		NOTE	*C-14		NOTE	*C-15		NOTE
	Min	Max		Min	Max		Min	Max		Min	Max	
A	.060	.120	9,13	.060	.075	9,13	.060	.120	9,13	.060	.120	9,13
A1	.050	.088		.050	.065		.050	.088		.050	.088	
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		.145	.155		.165	.175	
D1	.150 BSC			.150 BSC			.050 BSC			.100 BSC		
D2	.075 BSC		16	.075 BSC		16	.025 BSC		16	.050 BSC		16
D3	---	.305	4	---	.305	4	---	.155	4	---	.175	4
E	.420	.440		.420	.440		.215	.225		.240	.250	
E1	.250 BSC			.250 BSC								
E2	.125 BSC		16	.125 BSC		16						
E3	---	.440	4	---	.440	4	---	.225	4	---	.250	4
e	.050 BSC			.050 BSC			.050 BSC			.050 BSC		
e1	.015	---	4,12	.015	--	4,12						
h	.040 REF		10	.040 REF		10	---	---	10	---	---	10
j	.020 REF		10	.020 REF		10	---	---	10	---	---	10
L	.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	4		5	4		5	2		5,17	3		5,17
NE	6		5	6		5	0		5,17	0		5,17
N	20		5	20		5	4		5,17	6		5,17
Note	1											

FIGURE 15. <u>Ceramic, square and rectangular leadless chip carrier styles</u> - Continued.

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SYMBOL	Rectangular only - variations (all dimensions shown in millimeters)														
	C-13		NOTE	C-13A		NOTE	*C-14		NOTE	*C-15		NOTE
	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	3.05	9,13
A1	1.27	2.23		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		3.69	3.94		4.19	4.45	
D1	3.81 BSC			3.81 BSC			1.27 BSC			2.54 BSC		
D2	1.90 BSC		16	1.90 BSC		16	0.635 BSC		16	1.27 BSC		16
D3	---	7.75	4	---	7.75	4	---	3.94	4	---	4.45	4
E	10.67	11.18		10.67	11.18		5.46	5.72		6.10	6.35	
E1	6.35 BSC			6.35 BSC								
E2	3.17 BSC		16	3.17 BSC		16						
E3	---	11.18	4	---	11.18	4	---	5.72	4	---	6.35	4
e	1.27 BSC			1.27 BSC			1.27 BSC			1.27 BSC		
e1	0.38	---	4,12	0.38	---	4,12						
h	1.02 REF		10	1.02 REF		10	---	---	10	---	---	10
j	0.51 REF		10	0.51 REF		10	---	---	10	---	---	10
L	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	4		5	4		5	2		5,17	3		5,17
NE	6		5	6		5	0		5,17	0		5,17
N	20		5	20		5	4		5,17	6		5,17
Note	1											

FIGURE 15. Ceramic, 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) x (NE -2) see note 5. When this option exists, the thermal pad which is adjacent to terminal 1 shall be deleted.

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). The maximum "A" dimension is the package height before being solder dipped.

10. The corner shape (square, notch, radius, etc.) may vary at the manufacturer's option, from that shown on the drawing. The index corner shall be clearly unique.

11. See 5.2.6 and figure 8. Dimensions "B3" minimum and "L3" minimum and the appropriately derived castellation length define an unobstructed 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.

* 17. The 4 (C-14) and 6 (C-15) terminal variations have terminals on the ("D") ends of the package only. Terminal 1 for C-14 is the closest terminal to the index corner.
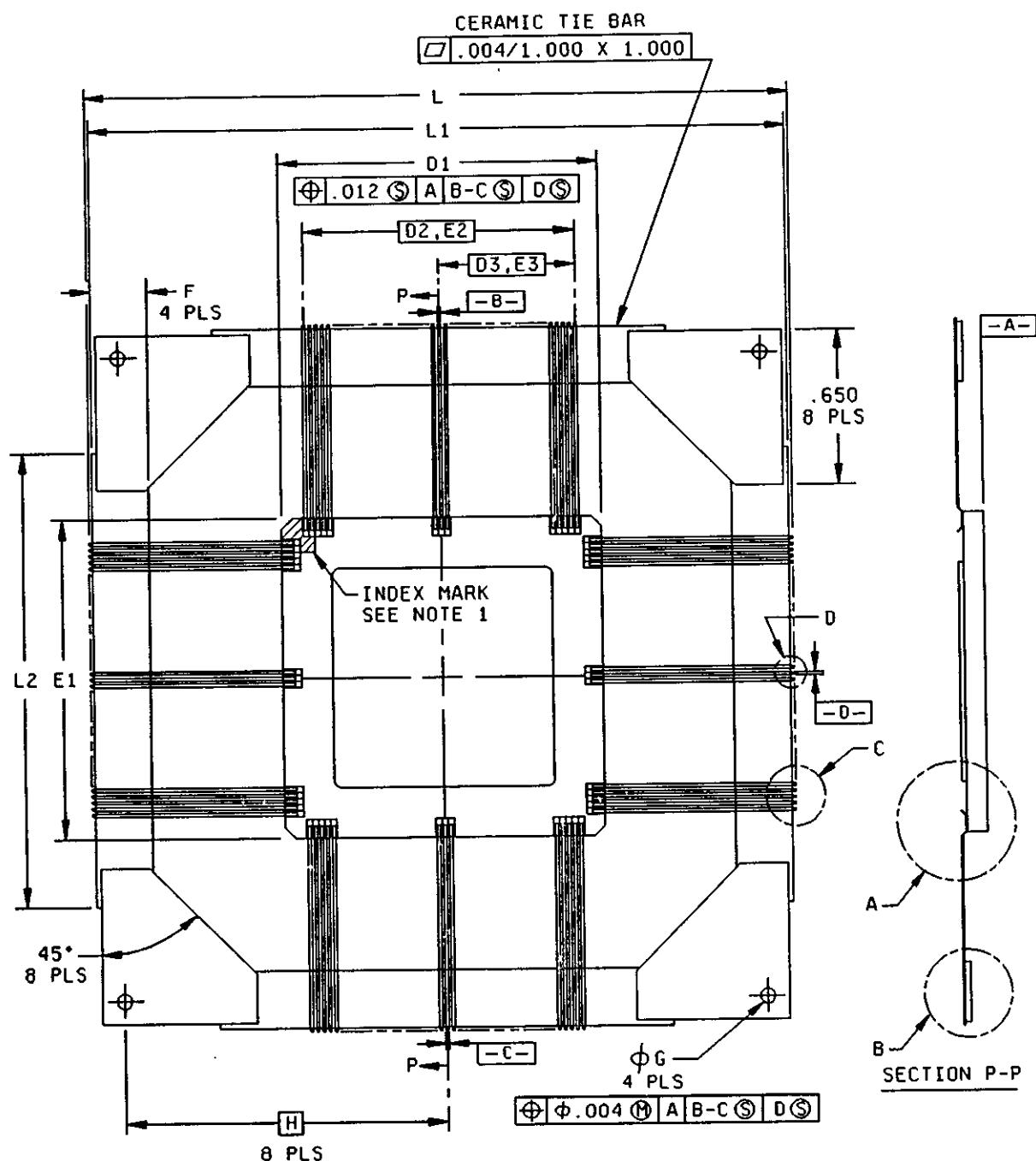
FIGURE 15. Ceramic, square and rectangular leadless chip carrier styles - Continued.

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Notes:
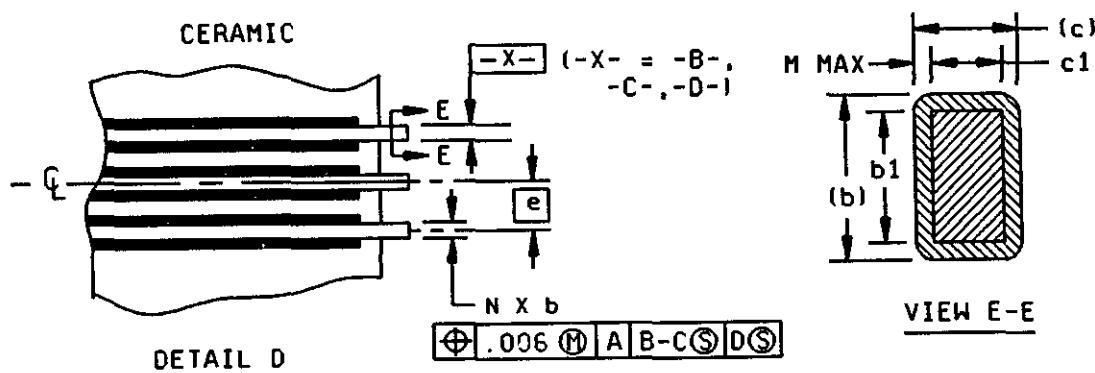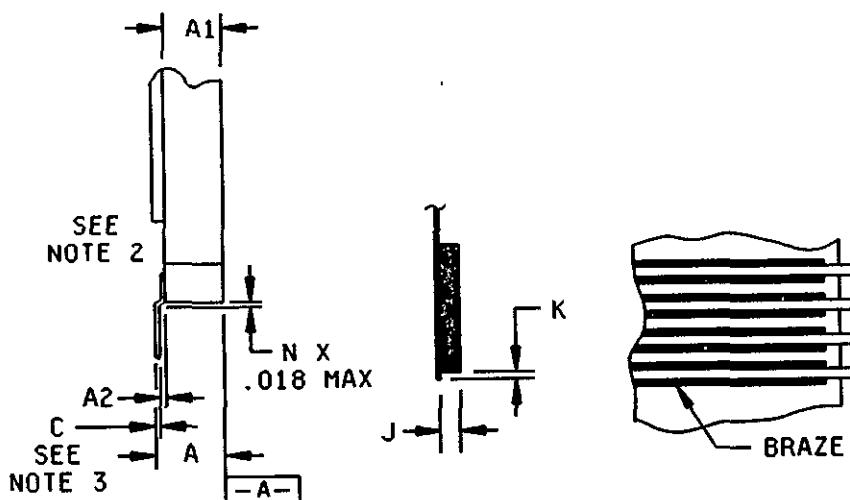
1. Controlling dimension: inch.

2. Metallized castellations shall be connected to Plane 1 terminals.

3. Index area: An identification mark shall be located adjacent to pin one within the shaded area shown. Plane 1 terminal identification may be an extension of the length of the metallized terminal which shall not be wider than the b dimension.

4. The cover shall not extend beyond the edges of the body.

5. The corner shape (square, notch, radius, etc.) may vary at the manufacturer's option.

6. N indicates total number of terminal positions.

7. Unless otherwise specified, a minimum clearance of .015 inch shall be maintained between all metallized features (e.g., lid, castellation, terminals, thermal pads, etc.).

8. Solder finish is optional with a maximum allowable thickness of .007 inch. Measurement of dimensions A, b1, and L2 may be made prior to solder application.

9. For terminal identification purposes only, terminals between N1 and N2 and between N3 and N4 are omitted if values for N1, N2, N3 and N4 are listed on the table.

FIGURE 23. <u>Dual leadless chip carrier style</u> - continued.

CERAMIC TIE BAR

| $\square$ | .004/1.000 X 1.000 |

INDEX MARK
SEE NOTE 1

SECTION P-P

LEADCOUNT SHOWN
REDUCED FOR CLARITY

* FIGURE 24. Ceramic, quad leaded chip carrier style with non-conductive tie bar.

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DETAIL A

DETAIL B

DETAIL C

DETAIL D

VIEW E-E

NOTE:
  The user's attention is called to the possibility that compliance with this figure may require use of an invention covered by patent rights; specifically, National Semiconductor, Inc. has stated that U. S. Patent No. 4,796,080 may relate to a certain implementation of this product outline. By publication of this figure, no position is taken with respect to the validity of this claim of any patent rights in connection therewith.

* FIGURE 24. Ceramic, quad leaded chip carrier style with non-conductive tie bar - continued.

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Symbol	Variations (all dimensions in inches)											
	C-T1			Note	C-T2			Note	C-T3			Note
	Min	Nom	Max		Min	Nom	Max		Min	Nom	Max	
A	.086	.101	.140	3	.086	.101	.140	3	.086	.101	.140	3
A1	.078	.086	.125		.078	.086	.125		.078	.086	.125	
A2	.006	.009	.012		.006	.009	.012		.006	.009	.012	
b	.007	---	.013		.007	---	.013		.007	---	.013	
b1	.007	---	.010	8	.007	---	.010	8	.007	---	.010	8
c	.004	---	.009		.004	---	.009		.004	---	.009	
c1	.004	---	.006	8	.004	---	.006	8	.004	---	.006	8
D1/E1	.735	.750	.765		.935	.950	.965		1.120	1.130	1.165	
D2/E2	.660 BSC				.800 BSC				1.000 BSC			
D3/E3	.330 BSC				.400 BSC				.500 BSC			
e	.025 BSC				.025 BSC				.025 BSC			
F	.425	.450	.475		.325	.350	.375		.275	.300	.325	
G	.059	.060	.061		.059	.060	.061		.059	.060	.061	
H	1.150 BSC				1.150 BSC				1.150 BSC			
J	.030	.035	.040		.030	.035	.040		.030	.035	.040	
K	---	---	.020		---	---	.020		---	---	.020	
L	2.500	---	2.540		2.500	---	2.540		2.500	---	2.540	
L1	2.485	2.500	2.505		2.485	2.500	2.505		2.485	2.500	2.505	
L2	1.480	1.500	1.520		1.480	1.500	1.520		1.480	1.500	1.520	
M	---	---	.0015	8	---	---	.0015	8	---	---	.0015	8
N	100			5	132			5	164			5
ND/NE	25			6	33			6	41			6
Note	4,7,9											

* FIGURE 24. <u>Ceramic, quad leaded chip carrier style with non-conductive tie bar</u> - continued.

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	Variations (all dimensions in millimeters)											
Symbol	C-T1			Note	C-T2			Note	C-T3			Note
	Min	Nom	Max		Min	Nom	Max		Min	Nom	Max	
A	2.18	2.57	3.56	3	2.18	2.57	3.56	3	2.18	2.57	3.56	3
A1	1.98	2.18	3.18		1.98	2.18	3.18		1.98	2.18	3.18	
A2	0.15	0.23	0.30		0.15	0.23	0.30		0.15	0.23	0.30	
b	0.18	---	0.33		0.18	---	0.33		0.18	---	0.33	
b1	0.18	---	0.25	8	0.18	---	0.25	8	0.18	---	0.25	8
c	0.10	---	0.23		0.10	---	0.23		0.10	---	0.23	
c1	0.10	---	0.15	8	0.10	---	0.15	8	0.10	---	0.15	8
D1/E1	18.67	19.05	19.43		23.75	24.13	24.51		28.45	28.70	29.59	
D2/E2	16.76 BSC				20.32 BSC				25.40 BSC			
D3/E3	8.38 BSC				10.16 BSC				12.70 BSC			
e	6.35 BSC				6.35 BSC				6.35 BSC			
F	10.80	11.43	12.07		8.26	8.89	9.53		6.99	7.62	8.26	
G	1.50	1.52	1.55		1.50	1.52	1.55		1.50	1.52	1.55	
H	29.21 BSC				29.21 BSC				29.21 BSC			
J	0.76	0.89	1.02		0.76	0.89	1.02		0.76	0.89	1.02	
K	---	---	0.51		---	---	0.51		---	---	0.51	
L	63.50	---	64.52		63.50	---	64.52		63.50	---	64.52	
L1	63.12	63.50	63.63		63.12	63.50	63.63		63.12	63.50	63.63	
L2	37.59	38.10	38.61		37.59	38.10	38.61		37.59	38.10	38.61	
M	---	---	0.04	8	---	---	0.04	8	---	---	0.04	8
N	100			5	132			5	164			5
ND/NE	25			6	33			6	41			6
Note	4,7,9											

* FIGURE 24. <u>Ceramic, quad leaded chip carrier style with non-conductive tie bar</u> - continued.

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Symbol	C-T4 Min	C-T4 Nom	C-T4 Max	Note	C-T5 Min	C-T5 Nom	C-T5 Max	Note
	Variations (all dimensions in inches)							
A	.086	.101	.140	3	.086	.101	.140	3
A1	.078	.086	.125		.078	.086	.125	
A2	.006	.009	.012		.006	.009	.012	
b	.007	---	.013		.007	---	.013	
b1	.007	---	.010	8	.007	---	.010	8
c	.004	---	.009		.004	---	.009	
c1	.004	---	.006	8	.004	---	.006	8
D1/E1	1.125	1.150	1.165		1.325	1.350	1.365	
D2/E2	1.050 BSC				1.200 BSC			
D3/E3	.525 BSC				.600 BSC			
e	.025 BSC				.025 BSC			
F	.175	.200	.225		.175	.200	.225	
G	.059	.060	.061		.059	.060	.061	
H	1.150 BSC				1.150 BSC			
J	.030	.035	.040		.030	.035	.040	
K	---	---	.020		---	---	.020	
L	2.500	---	2.540		2.500	---	2.540	
L1	2.485	2.500	2.505		2.485	2.500	2.505	
L2	1.690	1.700	1.710		1.690	1.700	1.710	
M	---	---	.0015	8	---	---	.0015	8
N	172			5	196			5
ND/NE	43			6	49			6
Note	4,7,9							

* FIGURE 24. Ceramic, quad leaded chip carrier style with non-conductive tie bar - continued.

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NOTICE 1

| Symbol | Variations (all dimensions in millimeters) | | | | | | | |
| | C-T4 | | | | C-T5 | | | |
	Min	Nom	Max	Note	Min	Nom	Max	Note
A	2.18	2.57	3.56	3	2.18	2.57	3.56	3
A1	1.98	2.18	3.18		1.98	2.18	3.18	
A2	0.15	0.23	0.30		0.15	0.23	0.30	
b	0.18	---	0.33		0.18	---	0.33	
b1	0.18	---	0.25	8	0.18	---	0.25	8
c	0.10	---	0.23		0.10	---	0.23	
c1	0.10	---	0.15	8	0.10	---	0.15	8
D1/E1	28.58	29.21	29.59		33.65	34.29	34.67	
D2/E2	26.67 BSC				30.48 BSC			
D3/E3	13.34 BSC				15.24 BSC			
e	6.35 BSC				6.35 BSC			
F	4.44	5.08	5.72		4.44	5.08	5.72	
G	1.50	1.52	1.55		1.50	1.52	1.55	
H	29.21 BSC				29.21 BSC			
J	0.76	0.89	1.02		0.76	0.89	1.02	
K	---.	---	0.51		---	---	0.51	
L	63.50	---	64.52		63.50	---	64.52	
L1	63.12	63.50	63.63		63.12	63.50	63.63	
L2	42.93	43.18	43.43		42.93	43.18	43.43	
M	---	---	0.04	8	---	---	0.04	8
N	172			5	196			5
ND/NE	43			6	49			6
Note	4,7,9							
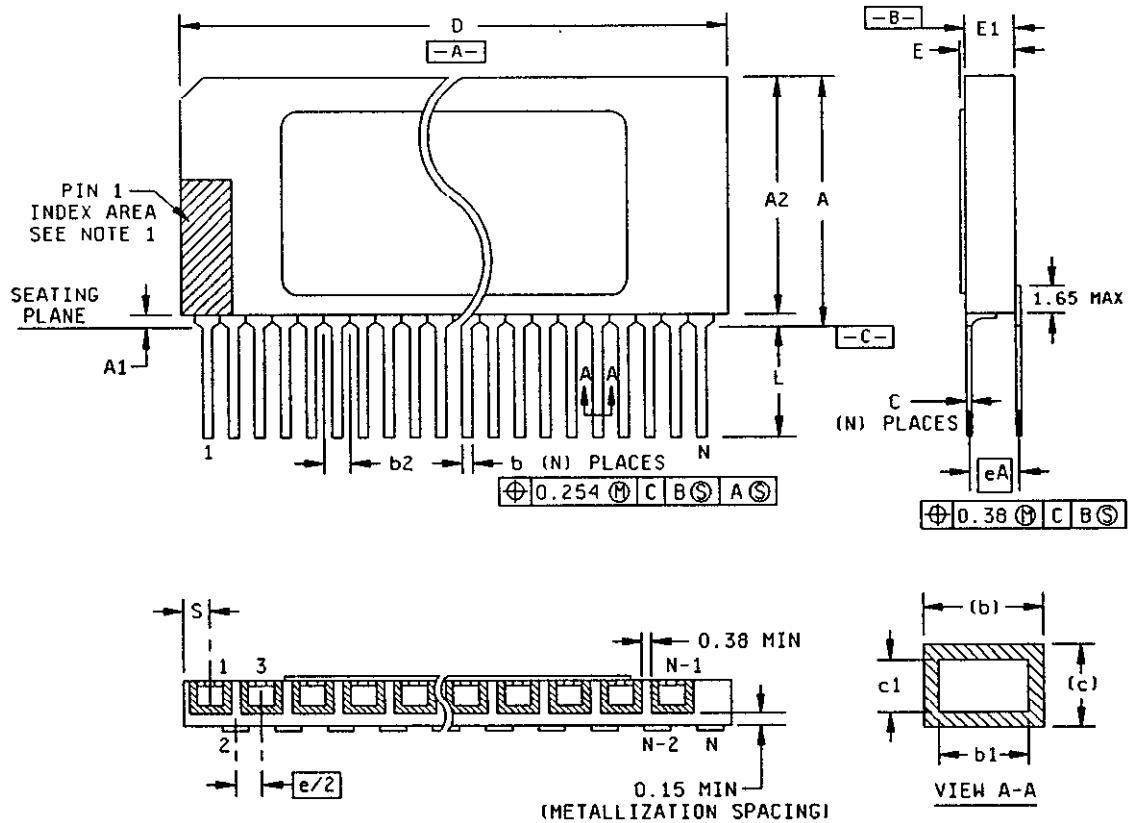
* FIGURE 24. <u>Ceramic, quad leaded chip carrier style with non-conductive tie bar</u> - continued.

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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. Dimension A and A1 do not include heat sinks or other attached features.

4. Corner chamfers and or notches are optional.

5. Dimension N: Number of terminals.

6. Dimension ND/NE: Number of terminals per package edge.

7. Controlling dimension: inch.

8. Dimensions b1 and c1 apply to base metal only, dimension M applies to the plating thickness.

9. Additional holes, slots, or tabs in the tie bar corners are optional.

* FIGURE 24. <u>Ceramic, quad leaded chip carrier style with non-conductive tie bar</u> - continued.

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*   FIGURE 25. Ceramic, zig-zag in-line package style.

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| Symbol | Variations (all dimensions in millimeters) | | | | | | | | | | | | |
| | Z-1 | | | Note | Z-2 | | | Note | Z-3 | | | Note |
	Min	Nom	Max		Min	Nom	Max		Min	Nom	Max	
A	9.30	---	11.15		11.45	---	13.35		11.45	---	13.35	
A1	0.40	---	1.50		0.40	---	1.50		0.40	---	1.50	
A2	8.90	9.25	9.65		11.05	11.45	11.85		11.05	11.45	11.85	
b	0.35	---	0.65		0.35	---	0.65		0.35	---	0.65	
b1	0.35	0.45	0.60	5	0.35	0.45	0.60	5	0.35	0.45	0.60	5
b2	0.90	---	1.65		0.90	---	1.65		0.90	---	1.65	
c	0.20	---	0.45		0.20	---	0.45		0.20	---	0.45	
c1	0.20	0.25	0.40	5	0.20	0.25	0.40	5	0.20	0.25	0.40	5
D	25.90	26.65	27.45		31.00	31.75	32.50		36.05	36.85	37.60	
E	2.40	---	3.45	7	2.40	---	3.45	7	2.40	---	3.45	7
E1	2.15	2.55	2.95		2.15	2.55	2.95		2.15	2.55	2.95	
e/2	1.27 BSC				1.27 BSC				1.27 BSC			
eA	2.54 BSC				2.54 BSC				2.54 BSC			
L	3.20	---	5.10		3.20	---	5.10		3.20	---	5.10	
S	0.90	1.25	1.65		0.90	1.25	1.65		0.90	1.25	1.65	
N	20			4	24			4	28			4
Note	1,2,3,6,8											

NOTES:

1. See table VI for descriptive type designator.

2. A lead one identification mark shall be located adjacent to lead one within the shaded area shown.

3. Corner shape (square, chamfer, radius, etc.) may vary at the manufacturers option.

4. N indicates the maximum number of leads.

5. Dimension b1 and c1 apply to base metal only.

6. 20 lead device shown for illustration purposes only.

7. Dimension E1 does not include lid thickness.

8. Nominal dimensions are the dimensions recommended for design and manufacture.

* FIGURE 25. Ceramic, zig-zag in-line package 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. no.	New descriptive package type designator		Old MIL-M-38510 appendix C type no./ config. no.	New descriptive package type designator
A1	MACY1-X8		C-J8	GQCC1-J52
A2	MACY1-X10		C-J9	CQCC2-J28
A3	MACY1-X12		C-U1	CQCC1-F84
C-1	CQCC1-N16		C-U2	CQCC1-F100
C-10	CQCC3-N18		C-U3	CQCC1-F132
C-10A	CQCC4-N18		C-U4	CQCC1-F144
C-11	CQCC3-N28		C-U5	CQCC1-F172
C-11A	CQCC4-N28		C-U6	CQCC1-F196
C-12	CQCC1-N32		D-1, 3	CDIP2-T14
C-12A	CQCC2-N32		D-1, 1	GDIP1-T14
C-13	CQCC3-N20		D-10, 3	CDIP2-T28
C-13A	CQCC4-N20		D-10, 1	GDIP1-T28
C-1A	CQCC2-N16		D-11, 3	CDIP6-T24
C-2	CQCC1-N20		D-11, 1	GDIP5-T24
C-2A	CQCC2-N20		D-12, 3	CDIP2-T50
C-3	CQCC1-N24		D-12, 1	GDIP1-T50
C-3A	CQCC2-N24		D-13, 3	CDIP1-T64
C-4	CQCC1-N28		D-14, 3	CDIP2-T48
C-4A	CQCC2-N28		D-14, 1	GDIP1-T48
C-5	CQCC1-N44		D-15, 3	CDIP3-T28
C-6	CQCC1-N52		D-15, 1	GDIP4-T28
C-7	CQCC1-N68		D-2, 3	CDIP2-T16
C-8	CQCC1-N84		D-2, 1	GDIP1-T16
C-9	CQCC1-N18		D-3, 3	CDIP2-T24
C-9A	CQCC2-N18		D-3, 1	GDIP1-T24
C-G1	GQCC1-G44		D-4, 3	CDIP2-T8
C-G2	GQCC1-G68		D-4, 1	GDIP1-T8
C-G3	GQCC1-G84		D-5, 3	CDIP2-T40
C-G7	CQCC1-G132		D-5, 1	GDIP1-T40
C-J1	GQCC1-J44		D-6, 3	CDIP2-T18
C-J10	CQCC2-J52		D-6, 1	GDIP1-T18
C-J2	GQCC1-J68		D-7, 3	CDIP2-T22
C-J3	GQCC1-J84		D-7, 1	GDIP1-T22
C-J4	CQCC2-J44		D-8, 3	CDIP2-T20
C-J5	CQCC2-J68		D-8, 1	GDIP1-T20
C-J6	CQCC2-J84		D-9, 3	CDIP4-T24
C-J7	GQCC1-J28		D-9, 1	GDIP3-T24

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TABLE VIII. Package cross-reference list - Continued.

Old MIL-M-38510 appendix C type no./ config. no.	New descriptive package type designator		Old MIL-M-38510 appendix C type no./ config. no.	New descriptive package type designator
F-10, 1	GDFP1-F18		P-AC	CMGA3-PN
F-11, 1	GDFP2-F28		P-AD	CMGA4-PN
F-11A, 2	CDFP3-F28		P-AE	CMGA5-PN
F-12, 2	CDFP4-F28		P-AF	CMGA6-PN
F-13, 1	GDFP1-F16		P-AG	CMGA7-PN
F-14, 1	GDFP2-F18		P-AH	CMGA8-PN
F-15, 1	GDFP1-F20		P-AJ	CMGA9-PN
F-16, 1	GDFP2-F24		P-AK	CMGA10-PN
F-17, 1	GDFP1-F28		P-AL	CMGA11-PN
F-2, 1	GDFP1-F14		P-AM	CMGA12-PN
F-2, 2	GDFP2-F14		P-BA	CMGA13-PN
F-2A, 2	CDFP3-F14		P-BB	CMGA14-PN
F-4, 1	GDFP1-F10		P-BC	CMGA15-PN
F-4, 2	CDFP2-F10		P-BD	CMGA16-PN
F-4A, 2	CDFP3-F10		P-BE	CMGA17-PN
F-5, 1	GDFP2-F16		P-BF	CMGA18-PN
F-5, 2	CDFP3-F16		P-BG	CMGA19-PN
F-5A, 2	CDFP4-F16		P-BH	CMGA20-PN
F-9, 1	GDFP2-F20		P-BJ	CMGA21-PN
F-9, 2	CDFP3-F20		P-BK	CMGA22-PN
F-9A, 2	CDFP4-F20		P-BL	CMGA23-PN
P-AA	CMGA1-PN		P-BM	CMGA24-PN
P-AB	CMGA2-PN			

INACTIVE			INACTIVE	
D-1, 2	CDIP3-T14		F-1, 3	GDFP5-F14
D-10, 2	CDIP4-T28		F-3, 3	GDFP4-F14
D-11, 2	CDIP9-T24		F-6, 4	CDFP6-F24
D-12, 2	CDIP3-T50		F-6, 3	GDFP5-F24
D-2, 2	CDIP3-T16		F-8, 4	CDFP8-F24
D-3, 2	CDIP7-T24		F-8, 3	GDFP7-F24
D-4, 2	CDIP3-T8		F-9, 4	CDFP5-F20
D-5, 2	CDIP3-T40			
D-6, 2	CDIP3-T18			
D-7, 2	CDIP3-T22			
D-8, 2	CDIP3-T20			
D-9, 2	CDIP8-T24			
F-1, 4	CDFP6-F14			

6.5 **Changes from previous issue.** The margin of this standard is marked with asterisks to indicate where changes (additions, modifications, corrections, deletions) from the previous issue were made. This was done as a convenience only and the Government assumes no liability whatsoever for any inaccuracies in these notations. Bidders and contractors are cautioned to evaluate the rquirements of this document based on the entire content irrespective of the marginal notations and relationship to the last previous issue.

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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

⊕ : Position.

Ⓜ : At maximum material condition.

Ⓛ : At least material condition.

Ⓢ : Regardless of feature size.

Ⓟ : Projected tolerance zone.

φ : Diameter.

e : Basic dimension.

REF: Reference dimension.

-A- : Datum feature.

⊕ .05 Ⓜ A B C : Feature control frame.

R : Radius.

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CONCLUDING MATERIAL

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Custodians:
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  Navy – EC
  Air Force – 17
  NASA – NA

Review activities:
  Army – AR, MI, PA, SM
  Navy – AS, CG, MC, OS, SH
  Air Force – 19, 85, 99

Civil Agency Coordinating Activities:
  DOT-FAA(RD-650)

Preparing activity:
  DLA – ES

(Project 5962-1401)

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NEW PAGE

STANDARDIZATION DOCUMENT IMPROVEMENT PROPOSAL

INSTRUCTIONS

1. The preparing activity must complete blocks 1, 2, 3, and 8. In block 1, both the document number and revision letter should be given.

2. The submitter of this form must complete blocks 4, 5, 6, and 7.

3. The preparing activity must provide a reply within 30 days from receipt of the form.

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I RECOMMEND A CHANGE:	1. DOCUMENT NUMBER MIL-STD-1835A, NOTICE 1	2. DOCUMENT DATE (YYMMDD) 95/02/28

3. DOCUMENT TITLE
MICROCIRCUIT CASE OUTLINES

4. NATURE OF CHANGE (Identify paragraph number and include proposed rewrite, if possible. Attach extra sheets as needed.)

5. REASON FOR RECOMMENDATION

6. SUBMITTER

a. NAME (Last, First, Middle Initial)	b. ORGANIZATION	
c. ADDRESS (Include Zip Code)	d. TELEPHONE (Include Area Code) (1) Commercial (2) AUTOVON (If applicable)	7. DATE SUBMITTED (YYMMDD)

8. PREPARING ACTIVITY

a. NAME
   Mr. Greg Pitz
	b. TELEPHONE (Include Area Code)
	(1) Commercial (2) AUTOVON
	    513-296-5377 986-5377

c. ADDRESS (Include Zip Code)
   DEFENSE ELECTRONICS SUPPLY CENTER
   DESC-ELDS
   1507 WILMINGTON PIKE
   DAYTON, OH 45444-5765
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	   5203 Leesburg Pike, Suite 1403, Falls Church, VA 22041-3466
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