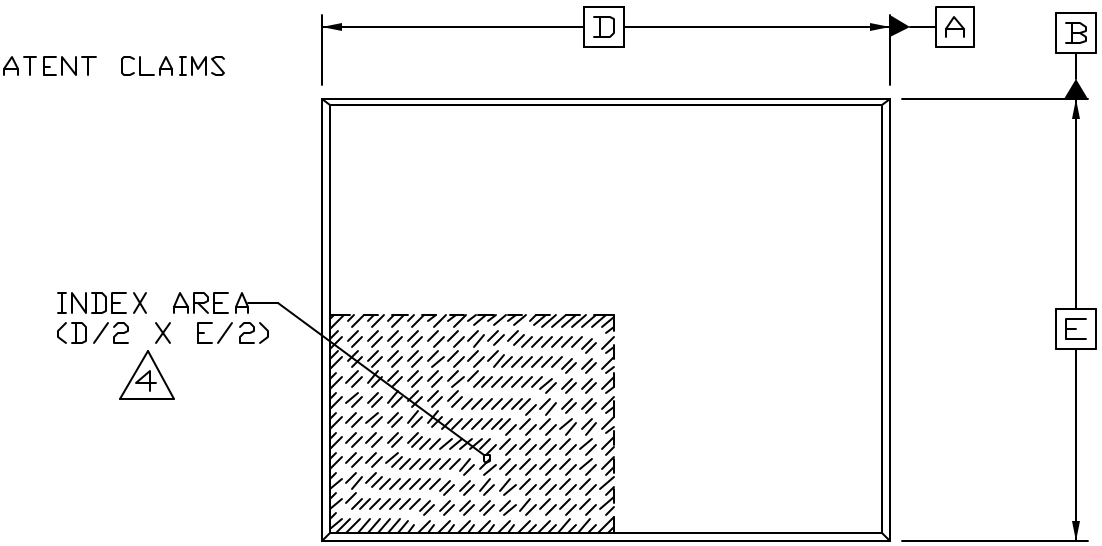
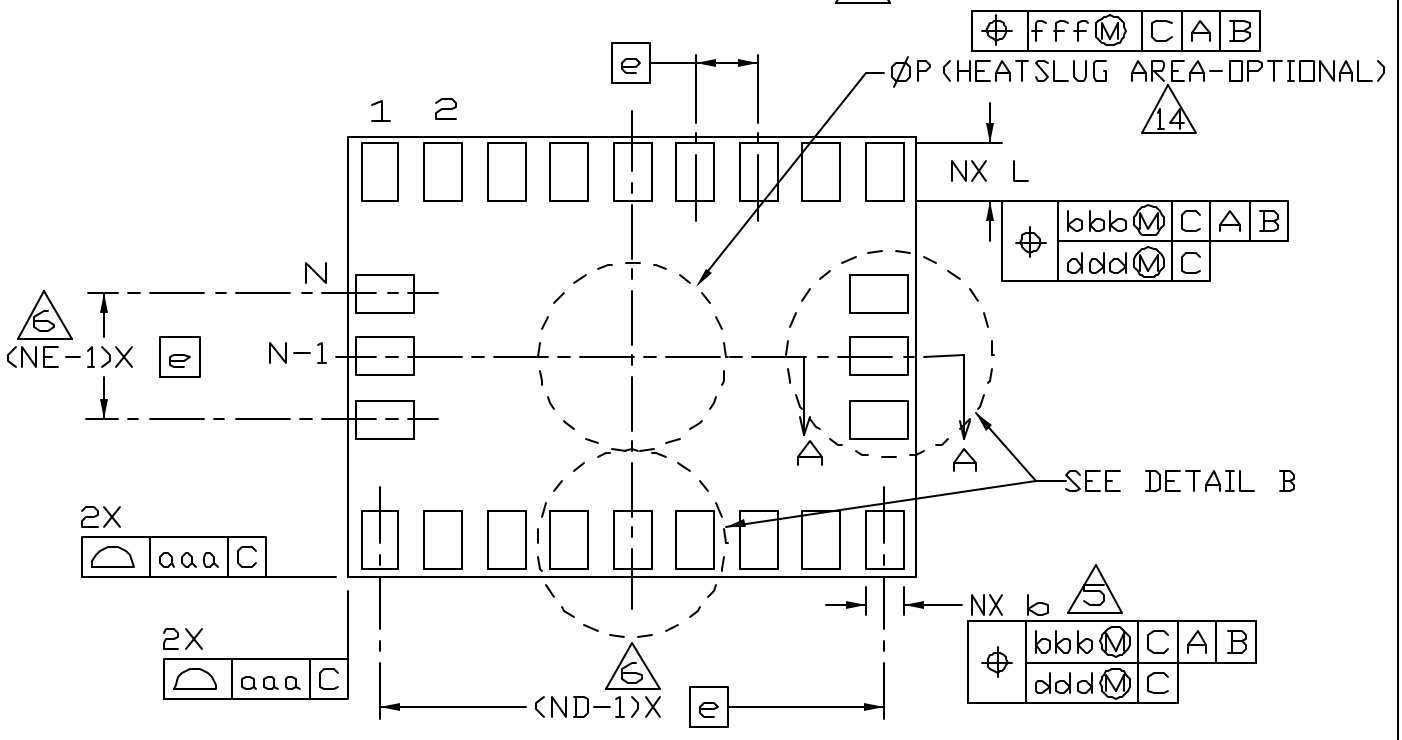
15 PATENT CLAIMS

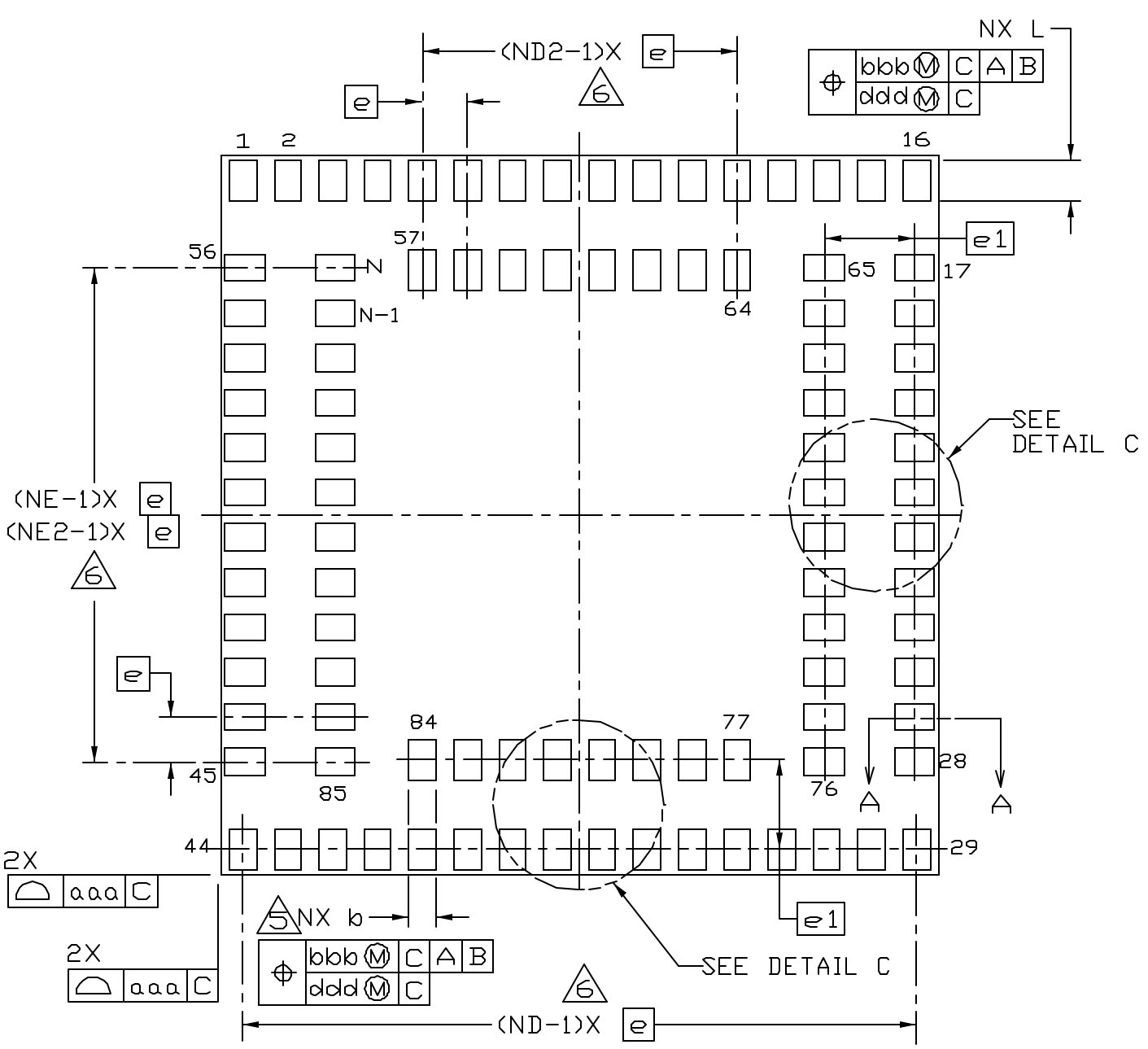


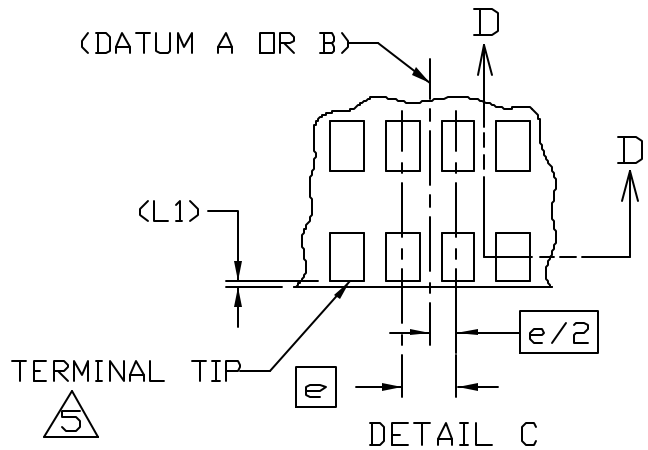
SINGLE ROW OPTION 9



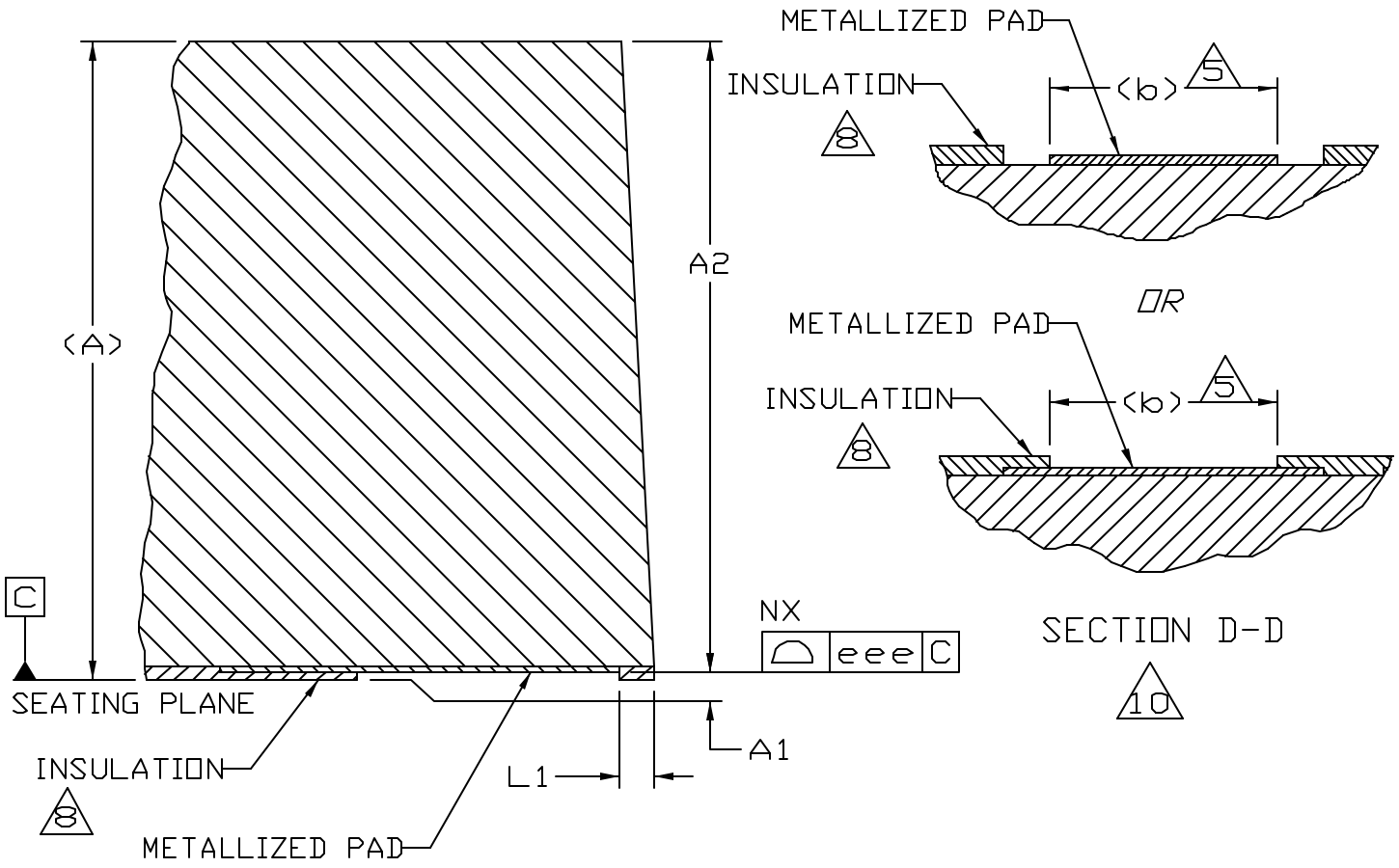
JEDEC SOLID STATE PRODUCT OUTLINE	*THIS REGISTERED OUTLINE HAS BEEN PREPARED BY THE JEDEC JC-II COMMITEE AND REFLECTS A PRODUCT WITH ANTICIPATED USAGE IN THE ELECTRONICS INDUSTRY; CHANGES ARE LIKELY TO OCCUR*				
THERMALLY ENHANCED PLASTIC THIN FINE PITCH QUAD FLAT NO LEAD PACKAGE	JESD-30 DESIGNATOR HP-TFQFP-N	ISSUE C	DATE NOV. 2001	MO-208	SHEET 1 OF 9

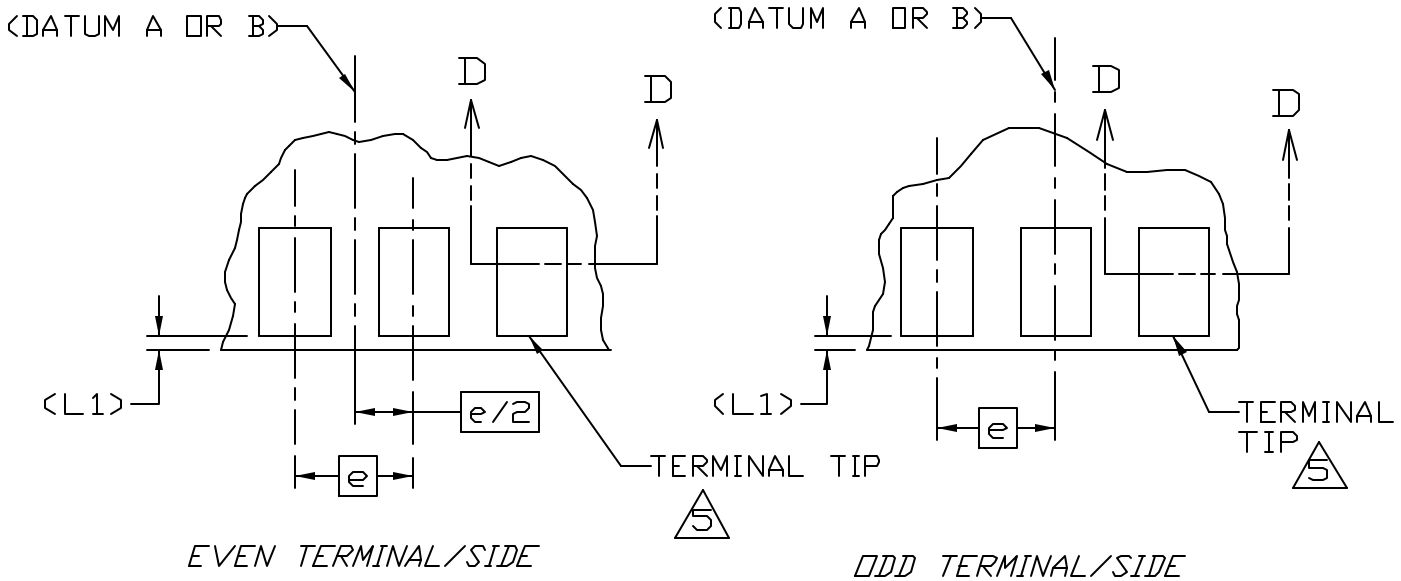
DOUBLE ROW OPTION 9





JEDEC SOLID STATE PRODUCT LINE	THERMALLY ENHANCED PLASTIC THIN FINE PITCH QUAD FLAT NO LEAD PACKAGE	ISSUE C	DATE NOV. 2001	MO-208	SHEET 2 OF 9

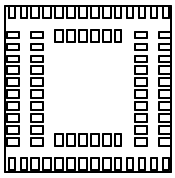




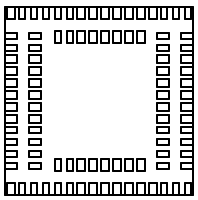
DETAIL B

JEDEC SOLID STATE PRODUCT LINE	THERMALLY ENHANCED PLASTIC THIN FINE PITCH QUAD FLAT NO LEAD PACKAGE	ISSUE C	DATE NOV. 2001	MO-208	SHEET 3 OF 9

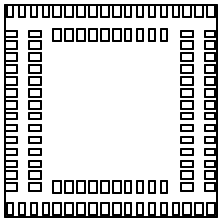
DOUBLE ROW OPTIONS



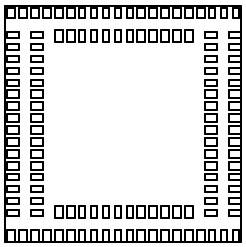
7 X 7



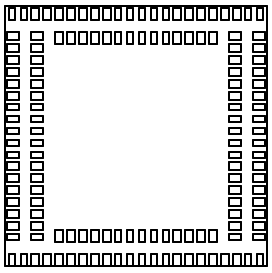
8 X 8



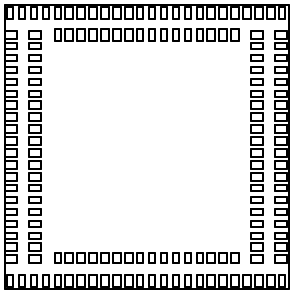
9 X 9



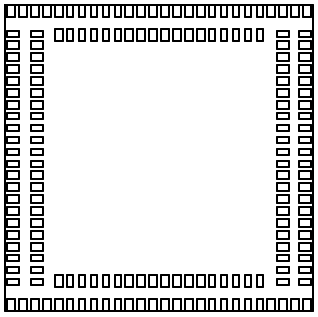
10 X 10



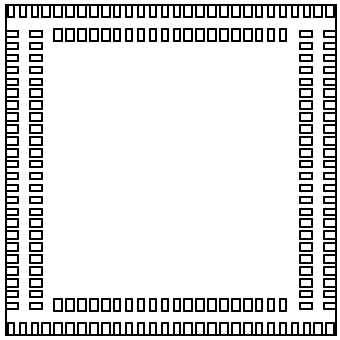
11 X 11



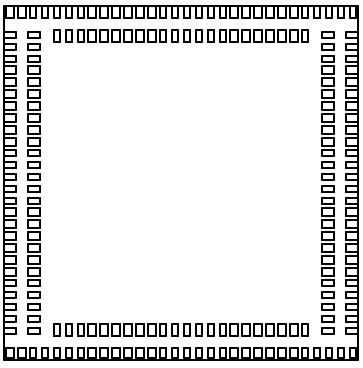
12 X 12



13 X 13



14 X 14



15 X 15

JEDEC SOLID STATE PRODUCT LINE	THERMALLY ENHANCED PLASTIC THIN FINE PITCH QUAD FLAT NO LEAD PACKAGE	ISSUE C	DATE NOV. 2001	MO-208	SHEET 4 OF 9

VARIATION DESIGNATORS

FIRST DIGIT CODE		SECOND DIGIT CODE		THIRD DIGIT CODE		FOURTH DIGIT CODE		FIFTH DIGIT CODE	
BODY LENGTH		*BODY WIDTH*		*TERMINAL PITCH*		*No.OF ROW/COLUMN*		*HEAT SLUG*	
D	CODE	E	CODE	e	CODE	—	CODE	—	CODE
2.50	A	2.50	A	1.25	A	1	A	NO HEAT SLUG	—
3.00	B	3.00	B	1.00	B	2	B	HEAT SLUG	-H
3.50	C	3.50	C	0.80	C	—	—	—	—
4.00	D	4.00	D	0.65	D	—	—	—	—
4.50	E	4.50	E	0.50	E	—	—	—	—
5.00	F	5.00	F	—	—	—	—	—	—
5.50	G	5.50	G	—	—	—	—	—	—
6.00	H	6.00	H	—	—	—	—	—	—
6.50	J	6.50	J	—	—	—	—	—	—
7.00	K	7.00	K	—	—	—	—	—	—
7.50	L	7.50	L	—	—	—	—	—	—
8.00	M	8.00	M	—	—	—	—	—	—
9.00	N	9.00	N	—	—	—	—	—	—
10.00	P	10.00	P	—	—	—	—	—	—
11.00	R	11.00	R	—	—	—	—	—	—
12.00	T	12.00	T	—	—	—	—	—	—
13.00	U	13.00	U	—	—	—	—	—	—
14.00	V	14.00	V	—	—	—	—	—	—
15.00	W	15.00	W	—	—	—	—	—	—

COMMON DIMENSIONS

SYMBOL	*MIN*	*NOM*	*MAX*	NOTE
A	—	—	1.20	
A1	0	—	0.05	
A2	0.90	—	1.15	
b	0.25	0.30	0.33	5
L1	0	—	0.10	
θ	0°	—	8°	
NOTES		1,2		
REF	11-599			
ISSUE	C			

GEOMETRIC TOLERANCES

SYMBOL	*TOL*
aaa	0.10
bbb	0.10
ccc	0.10
ddd	0.08
eee	0.08
fff	0.10
NOTES	1,2
REF	11-599
ISSUE	C

EXAMPLE: A 16 TERMINAL P-TFQFN WHICH IS 3.50 mm LONG (DIMENSION D) BY 3.50 mm WIDE (DIMENSION E), 0.50 mm PITCH AND NO HEAT SLUG WILL BE OPTION CCEA-2.

THE -1 AND -2 ETC, AFTER THE VARIATION REFERS TO DEPOPULATION WITHIN THE SAME BODY SIZE.

SINGLE ROW VARIATIONS

SYMBOL	AAEA		BBEA		CCEA-1		CCEA-2 11	
	VALUE	NOTE	*VALUE*	NOTE	*VALUE*	NOTE	*VALUE*	NOTE
D	2.50 BSC		3.00 BSC		3.50 BSC		3.50 BSC	
E	2.50 BSC		3.00 BSC		3.50 BSC		3.50 BSC	
N	8	7	12	3	20	3	16	7
ND	4	6	4	6	7	6	5	6
NE	0	6	2	6	3	6	3	6
e	0.50 BSC		0.50 BSC		0.50 BSC		0.50 BSC	
Øp	MIN. —	MAX. —	MIN. —	MAX. —	MIN. —	MAX. —	MIN. —	MAX. —
L	0.40	0.60	0.40	0.60	0.40	0.60	0.40	0.60
NOTES	1,2		1,2		1,2		1,2	
REF	11-506		11-506		11-506,11-542		11-506	
ISSUE	A		A		A/B		A	

SINGLE ROW VARIATIONS

SYMBOL	DDEA-H		ECEA-1		ECEA-2 12		FFEA-H	
	VALUE	NOTE	*VALUE*	NOTE	*VALUE*	NOTE	*VALUE*	NOTE
D	4.00 BSC		4.50 BSC		4.50 BSC		5.00 BSC	
E	4.00 BSC		3.50 BSC		3.50 BSC		5.00 BSC	
N	24	3	24	3	20	7	32	3
ND	5	6	9	6	7	6	7	6
NE	7	6	3	6	3	6	9	6
e	0.50 BSC		0.50 BSC		0.50 BSC		0.50 BSC	
Øp	MIN. 1.45	MAX. 1.55	MIN. —	MAX. —	MIN. —	MAX. —	MIN. 1.95	MAX. 2.05
L	0.31	0.45	0.40	0.60	0.40	0.60	0.31	0.45
NOTES	1,2		1,2		1,2		1,2	
REF	11-599		11-506		11-506		11-599	
ISSUE	C		A		A		C	

SINGLE ROW VARIATIONS

SYMBOL	GEEA		HHEA-H		KFEA		KKEA	
	VALUE	NOTE	*VALUE*	NOTE	*VALUE*	NOTE	*VALUE*	NOTE
D	5.50 BSC		6.00 BSC		6.50 BSC		7.00 BSC	
E	4.50 BSC		6.00 BSC		5.50 BSC		7.00 BSC	
N	32	3	40	3	40	3	48	3
ND	7	6	9	6	9	6	10	6
NE	9	6	11	6	11	6	14	6
e	0.50 BSC		0.50 BSC		0.50 BSC		0.50 BSC	
Øp	MIN. —	MAX. —	MIN. 2.95	MAX. 3.05	MIN. —	MAX. —	MIN. —	MAX. —
L	0.40	0.60	0.31	0.45	0.40	0.60	0.40	0.60
NOTES	1,2		1, 2		1,2,13		1,2,13	
REF	11-506,11-542				11-542		11-542	
ISSUE	A/B		C		B		B	

SINGLE ROW VARIATIONS

SYMBOL	KKEA-H		LGE		MMEA		MMEA-H	
	VALUE	NOTE	*VALUE*	NOTE	*VALUE*	NOTE	*VALUE*	NOTE
D	7.00 BSC				8.00 BSC		8.00 BSC	
E	7.00 BSC				8.00 BSC		8.00 BSC	
N	48	3			56	3	56	3
ND	11	6			12	6	13	6
NE	13	6			16	6	15	6
e	0.50 BSC				0.50 BSC		0.50 BSC	
Øp	MIN. MAX.				MIN. MAX.		MIN. MAX.	
	4.40 4.50				— —		5.35 5.45	
L	0.31 0.45				0.40 0.60		0.31 0.45	
NOTES	1,2		13		1,2		1,2	
REF	11-599		11-506		11-542		11-599	
ISSUE	C		A		B		C	

SINGLE ROW VARIATIONS

SYMBOL	NJE		NNEA		NNEA-H		PPEA	
		NOTE	*VALUE*	NOTE	*VALUE*	NOTE	*VALUE*	NOTE
D			9.00 BSC		9.00 BSC		10.00 BSC	
E			9.00 BSC		9.00 BSC		10.00 BSC	
N			64	3	64	3	72	3
ND			14	6	15	6	16	6
NE			18	6	17	6	20	6
e			0.50 BSC		0.50 BSC		0.50 BSC	
Øp			MIN. MAX.		MIN. MAX.		MIN. MAX.	
			— —		6.95 7.05		— —	
L			0.40 0.60		0.31 0.45		0.40 0.60	
NOTES	13		1,2		1,2		1,2	
REF	11-506		11-542		11-599		11-542	
ISSUE	A		B		C		B	

SINGLE ROW VARIATIONS

SYMBOL	PPEA-H							
	VALUE	NOTE						
D	10.00 BSC							
E	10.00 BSC							
N	72	3						
ND	17	6						
NE	19	6						
e	0.50BSC							
Øp	MIN. MAX.							
	7.15 7.25							
L	0.31 0.45							
NOTES	1, 2							
REF	11-599							
ISSUE	C							

DOUBLE ROW VARIATIONS

SYMBOL	KKEB			MMEB			NNEB			PPEB		
	VALUE		NOTE	*VALUE*		NOTE	*VALUE*		NOTE	*VALUE*		NOTE
D	7.00 BSC			8.00 BSC			9.00 BSC			10.00 BSC		
E	7.00 BSC			8.00 BSC			9.00 BSC			10.00 BSC		
N	80		3	96		3	112		3	128		3
ND	14		6	16		6	18		6	20		6
ND2	6		6	8		6	10		6	12		6
NE	10		6	12		6	14		6	16		6
NE2	10		6	12		6	14		6	16		6
e	0.50 BSC			0.50 BSC			0.50 BSC			0.50 BSC		
e1	1.00 BSC			1.00 BSC			1.00 BSC			1.00 BSC		
ØP	MIN.	MAX.		MIN.	MAX.		MIN.	MAX.		MIN.	MAX.	
	—	—		—	—		—	—		—	—	
L	0.40	0.60		0.40	0.60		0.40	0.60		0.40	0.60	
NOTES	1,2			1,2			1,2			1,2		
REF	11-542			11-542			11-542			11-542		
ISSUE	B			B			B			B		

DOUBLE ROW VARIATIONS

SYMBOL	RREB			TTEB			UUEB			VVEB		
	VALUE		NOTE	*VALUE*		NOTE	*VALUE*		NOTE	*VALUE*		NOTE
D	11.00 BSC			12.00 BSC			13.00 BSC			14.00 BSC		
E	11.00 BSC			12.00 BSC			13.00 BSC			14.00 BSC		
N	144		3	164		3	176		3	192		3
ND	22		6	24		6	26		6	28		6
ND2	14		6	16		6	18		6	20		6
NE	18		6	20		6	22		6	24		6
NE2	18		6	20		6	22		6	24		6
e	0.50 BSC			0.50 BSC			0.50 BSC			0.50 BSC		
e1	1.00 BSC			1.00 BSC			1.00 BSC			1.00 BSC		
ØP	MIN.	MAX.		MIN.	MAX.		MIN.	MAX.		MIN.	MAX.	
	—	—		—	—		—	—		—	—	
L	0.40	0.60		0.40	0.60		0.40	0.60		0.40	0.60	
NOTES	1,2			1,2			1,2			1,2		
REF	11-542			11-542			11-542			11-542		
ISSUE	B			B			B			B		

DOUBLE ROW VARIATIONS

SYMBOL	WWEB											
	VALUE		NOTE	*VALUE*		NOTE	*VALUE*		NOTE	*VALUE*		NOTE
D	15.00 BSC											
E	15.00 BSC											
N	208		3									
ND	30		6									
ND2	22		6									
NE	26		6									
NE2	26		6									
e	0.50 BSC											
e1	1.00 BSC											
ØP	MIN.	MAX.										
	—	—										
L	0.40	0.60										
NOTES	1,2											
REF	11-542											
ISSUE	B											

NOTES:

1. DIMENSIONING AND TOLERANCING CONFORM TO ASME Y14.5M-1994.

2. ALL DIMENSIONS ARE IN MILLIMETERS, θ IS IN DEGREES.

3. N IS THE TOTAL NUMBER OF TERMINALS.

4. THE TERMINAL #1 IDENTIFIER AND TERMINAL NUMBERING CONVENTION SHALL CONFORM TO JESD 95-1 SPP-012. DETAILS OF TERMINAL #1 IDENTIFIER ARE OPTIONAL, BUT MUST BE LOCATED WITHIN THE ZONE INDICATED. THE TERMINAL #1 IDENTIFIER MAY BE EITHER A MOLD OR MARKED FEATURE.

5. DIMENSION b APPLIES TO METALLIZED TERMINAL AND IS MEASURED BETWEEN 0 AND 0.25 mm FROM TERMINAL TIP.

6. ND, ND2, NE AND NE2 REFER TO THE MAXIMUM NUMBER OF TERMINALS ON EACH D AND E SIDE RESPECTIVELY.

7. DEPOPULATION IS POSSIBLE IN A SYMMETRICAL FASHION.

8. INSULATION THICKNESS, CLEARANCE OF OVERLAP ARE USER DEFINED.

9. VARIATIONS ECEA-1 AND MMEBA ARE SHOWN FOR ILLUSTRATION ONLY.

10. INSULATION NOT COMPLETELY SHOWN FOR REASONS OF CLARITY.

11. VARIATION CCEA-2 IS THE DEPOPULATED VERSION OF THE CCEA-1 (20 TERMINALS).
TERMINALS 1,7,11 AND 17 ARE REMOVED FROM THIS VARIATION.

12. VARIATION ECEA-2 IS THE DEPOPULATED VERSION OF THE ECEA-1 (24 TERMINALS).
TERMINALS 1,9,13 AND 21 ARE REMOVED FROM THIS VARIATION.

13. VARIATIONS KFEA AND KKEA ARE RECOMMENDED TO REPLACE VARIATIONS LGE AND NJE IN ISSUE A FOR PACKAGE SIZE REDUCTION.

14. A HEATSLUG MAYBE INCORPORATED IN THIS AREA FOR ALL BODY SIZES. HEAT SLUG SIZE AND GEOMETRY SHOULD BE DESIGNED TO FACILITATE UNIFORM SOLDER PASTE DEPOSITION, MINIMIZED SOLDER VOIDING AND THERMALLY INDUCED STRESSES.

15. CONEXANT SYSTEMS INC. HAS STATED THAT THERE ARE PATENTS PENDING AND NATIONAL SEMICONDUCTOR HAS BEEN ISSUED PATENT 6,140,708 WHICH MAY RELATE TO CERTAIN IMPLEMENTATION OF THIS PACKAGE OUTLINE.