

JEDEC
SOLID STATE
PRODUCT OUTLINE

THIS REGISTERED OUTLINE HAS BEEN PREPARED BY THE JEDEC JC-II
COMMITTEE AND REFLECTS A PRODUCT WITH ANTICIPATED USAGE
IN THE ELECTRONICS INDUSTRY; CHANGES ARE LIKELY TO OCCUR

THERMALLY ENHANCED PLASTIC ULTRA THIN
AND EXTRA THIN FINE PITCH
QUAD FLAT NO LEAD PACKAGE

JESD-30
DESIGNATOR
H(U,X1)F-PQFN

ISSUE
E

DATE:
June 2006

MO-248

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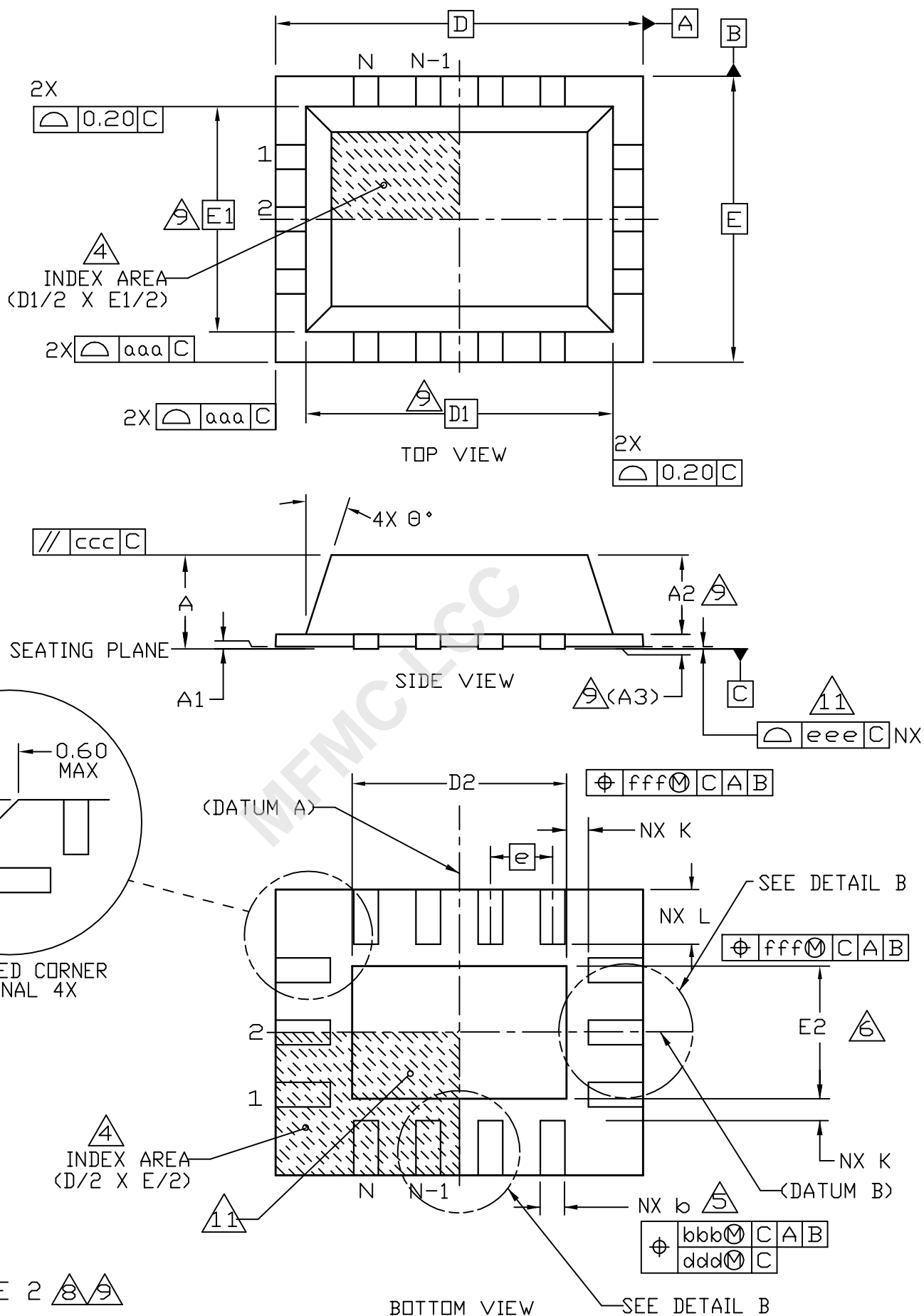
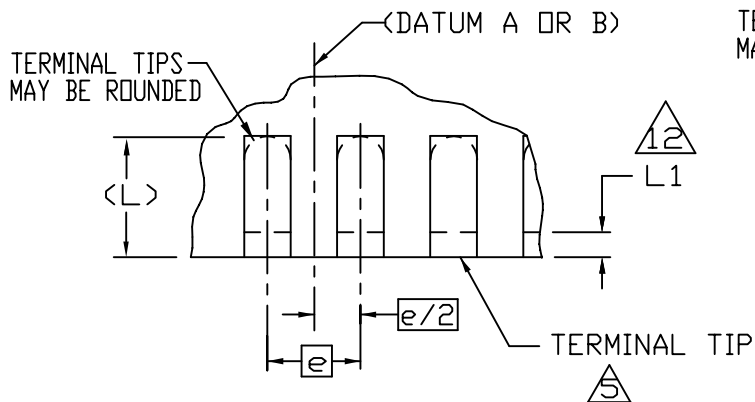
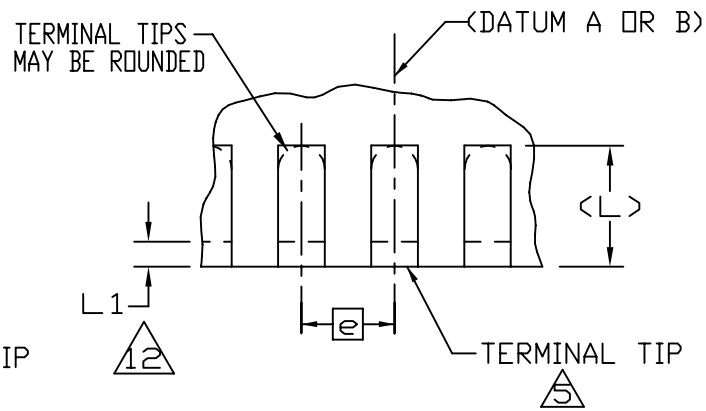


FIGURE 2 $\frac{8}{9}$



EVEN TERMINAL/SIDE



ODD TERMINAL/SIDE


DETAIL B

TABLE 1

VARIATION DESIGNATORS							
FIRST DIGIT CODE		SECOND DIGIT CODE		THIRD DIGIT CODE		FOURTH DIGIT CODE	
OVERALL HEIGHT		BODY LENGTH		BODY WIDTH		TERMINAL PITCH	
A	LETTER CODE	D	LETTER CODE	E	LETTER CODE	e	LETTER CODE
0.65 MAX	U	1.0	A	1.0	A	1.00	A
0.50 MAX	X	1.5	B	1.5	B	0.80	B
—	—	2.0	C	2.0	C	0.65	C
—	—	2.5	D	2.5	D	0.50	D
—	—	3.0	E	3.0	E	0.40	E
—	—	3.5	F	3.5	F	—	—
—	—	4.0	G	4.0	G	—	—
—	—	5.0	H	5.0	H	—	—
—	—	6.0	J	6.0	J	—	—
—	—	7.0	K	7.0	K	—	—
—	—	8.0	L	8.0	L	—	—
—	—	9.0	M	9.0	M	—	—
—	—	10.0	N	10.0	N	—	—
—	—	11.0	P	11.0	P	—	—
—	—	12.0	R	12.0	R	—	—
—	—	4.5	S	4.5	S	—	—
—	—	5.5	T	5.5	T	—	—
—	—	6.5	U	6.5	U	—	—

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TABLE 2

COMMON DIMENSIONS							
	U: ULTRA THIN			X1: EXTRA THIN			NOTE
SYMBOL	MIN	NOM	MAX	MIN	NOM	MAX	
* A	>0.50	0.60	0.65	>0.40	0.48	0.50	
A1	0	0.02	0.05	0	0.02	0.05	
A2	0.00	0.40	0.65	0.00	0.30	0.50	9
A3	—	—	0.22	—	—	0.22	
L	0.30	0.40	0.50	0.30	0.40	0.50	
L1	0.00	—	0.15	0.00	—	0.15	
θ	0°	—	12°	0°	—	12°	
K	0.20	—	—	0.20	—	—	
R	b MIN/2	—	—	b MIN/2	—	—	
NOTES	1,2						
REF	11.11-702						
ISSUE	C						

* NOTE : A IS THE CONTROLLING DIMENSION

TABLE 3

LEAD WIDTH			
b			
PITCH	MIN	NOM	MAX
1.00	0.30	0.40	0.45
0.80	0.25	0.30	0.35
0.65	0.25	0.30	0.35
0.50	0.18	0.25	0.30
0.40	0.15	0.20	0.25
NOTES	5,14		
REF	11.11-667		
ISSUE	A		

TABLE 4

TOLERANCE OF FORM & POSITION		
symbol \ pitch	0.40mm	>0.40mm
aaa	0.10	0.15
bbb	0.07	0.10
ccc	0.10	0.10
ddd	0.05	0.05
eee	0.08	0.08
fff	0.10	0.10
NOTES	1,2	
REF	11-744	
ISSUE	E	

EXAMPLE: A 20 TERMINAL PQFN WHICH IS 5mm LONG (DIMENSION D) BY 5mm WIDE (DIMENSION E) AND A 0.65mm PITCH WILL BE VARIATION HHC.

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TABLE 5A

SUMMARY TABLE



BODY SIZE	LEAD PITCH	LEAD COUNT	ULTRA THIN FQFP-N	EXTRA- THIN FQFP-N
3.00 X 3.00	0.65	12	UEEC	XEEC
	0.65	8	UEEC-1	XEEC-1
	0.50	16	UEED	XEED
	0.50	16	UEED-1	XEED-1
	0.50	12	UEED-2	XEED-2
	0.40	20	UEEE	XEEE
	0.40	16	UEEE-1	XEEE-1
4.00 X 4.00	0.65	16	UGGC	XGGC
	0.65	16	UGGC-1	XGGC-1
	0.65	12	UGGC-2	XGGC-2
	0.50	24	UGGD	XGGD
	0.50	24	UGGD-1	XGGD-1
	0.50	20	UGGD-2	XGGD-2
4.00 X 5.00	0.40	28	UGGE	XGGE
	0.50	28	UGHD	XGHD
5.00 X 5.00	0.50	24	UGHD-1	XGHD-1
	0.65	24	UHHC	XHHC
	0.65	20	UHHC-1	XHHC-1
	0.50	32	UHHD	XHHD
	0.50	32	UHHD-1	XHHD-1
	0.50	28	UHHD-2	XHHD-2
	0.40	36	UHHE	XHHE
5.00 X 6.00	0.40	40	UHHE-1	XHHE-1
5.00 X 7.00	0.65	22	UHJC	XHJC
6.00 X 6.00	0.50	38	UHKD	XHKD
	0.65	32	UJJC	XJJC
	0.65	28	UJJC-1	XJJC-1
	0.65	24	UJJC-2	XJJC-2
	0.50	40	UJJD	XJJD
	0.50	40	UJJD-1	XJJD-1
	0.50	36	UJJD-2	XJJD-2
7.00 X 7.00	0.40	48	UJJE/UJJE-1	XJJE/XJJE-1
	0.65	36	UKKC	XKKC
	0.65	32	UKKC-1	XKKC-1
	0.50	48	UKKD	XKKD
	0.50	48	UKKD-1	XKKD-1
	0.50	44	UKKD-2	XKKD-2
	0.50	40	UKKD-3	XKKD-3
	0.40	56	UKKE	XKKE

TABLE 5B

SUMMARY TABLE (CONTINUED)				
BODY SIZE	LEAD PITCH	LEAD COUNT	ULTRA THIN FQFP-N	EXTRA- THIN FQFP-N
8.00 X 8.00	0.65	44	ULLC	XLCC
	0.65	40	ULLC-1	XLCC-1
	0.65	36	ULLC-2	XLCC-2
	0.50	56	ULLD	XLLD
	0.50	52	ULLD-1	XLLD-1
	0.50	48	ULLD-2	XLLD-2
	0.40	64	ULLE	XLLE
9.00 X 9.00	0.40	68	ULLE-1	XLLE-1
	0.65	48	UMMC	XMMC
	0.65	44	UMMC-1	XMMC-1
	0.50	64	UMMD	XMMD
	0.50	60	UMMD-1	XMMD-1
	0.50	56	UMMD-2	XMMD-2
	0.40	72	UMME	XMME
	0.40	76	UMME-1	XMME-1



TABLE 6A

e=0.65 PITCH											
VARIATION		UEEC	UEEC-1	UGGC	UGGC-1	UGGC-2	UHHC	UHHC-1	UHJC	UJJC	NOTE
SYMBOL		XEEC	XEEC-1	XGGC	XGGC-1	XGGC-2	XHHC	XHHC-1	XHJC	XJJC	
D BSC		3.00	3.00	4.00	4.00	4.00	5.00	5.00	5.00	6.00	
E BSC		3.00	3.00	4.00	4.00	4.00	5.00	5.00	6.00	6.00	
D1 BSC		2.75	2.75	3.75	3.75	3.75	4.75	4.75	4.75	5.75	9
E1 BSC		2.75	2.75	3.75	3.75	3.75	4.75	4.75	5.75	5.75	9
D2	MIN	1.50	1.50	2.50	2.05	2.50	3.50	3.50	3.50	4.50	
	NOM	1.65	1.65	2.65	-	2.65	3.65	3.65	3.65	4.65	
	MAX	1.80	1.80	2.80	2.55	2.80	3.80	3.80	3.80	4.80	
E2	MIN	1.50	1.50	2.50	2.05	2.50	3.50	3.50	4.50	4.50	
	NOM	1.65	1.65	2.65	-	2.65	3.65	3.65	4.65	4.65	
	MAX	1.80	1.80	2.80	2.55	2.80	3.80	3.80	4.80	4.80	
N		12	8	16	16	12	24	20	22	32	7, 3
ND		3	2	4	4	3	6	5	5	8	6
NE		3	2	4	4	3	6	5	6	8	6
NOTES		1,2,10	1,2,10	1,2,10	1,2,10	1,2,10	1,2,10	1,2,10	1,2,10	1,2,10	
REF		11-702									
ISSUE		C									

TABLE 6B

$e=0.65$ PITCH										
VARIATION SYMBOL	UJJC-1	UJJC-2	UKKC	UKKC-1	ULLC	ULLC-1	ULLC-2	UMMC	UMMC-1	NOTE
	XJJC-1	XJJC-2	XKKC	XKKC-1	XLLC	XLLC-1	XLLC-2	XMMC	XMMC-1	
D BSC	6.00	6.00	7.00	7.00	8.00	8.00	8.00	9.00	9.00	
E BSC	6.00	6.00	7.00	7.00	8.00	8.00	8.00	9.00	9.00	
D1 BSC	5.75	5.75	6.75	6.75	7.75	7.75	7.75	8.75	8.75	9
E1 BSC	5.75	5.75	6.75	6.75	7.75	7.75	7.75	8.75	8.75	9
D2	MIN	4.50	4.50	5.50	5.50	6.50	6.50	6.50	7.50	7.50
	NOM	4.65	4.65	5.65	5.65	6.65	6.65	6.65	7.65	7.65
	MAX	4.80	4.80	5.80	5.80	6.80	6.80	6.80	7.80	7.80
E2	MIN	4.50	4.50	5.50	5.50	6.50	6.50	6.50	7.50	7.50
	NOM	4.65	4.65	5.65	5.65	6.65	6.65	6.65	7.65	7.65
	MAX	4.80	4.80	5.80	5.80	6.80	6.80	6.80	7.80	7.80
N	28	24	36	32	44	40	36	48	44	7, 3
ND	7	6	9	8	11	10	9	12	11	6
NE	7	6	9	8	11	10	9	12	11	6
NOTES	1,2,10	1,2,10	1,2,10	1,2,10	1,2,10	1,2,10	1,2,10	1,2,10	1,2,10	
REF	11-702									
ISSUE	C									

TABLE 7A

$e=0.50$ PITCH										
VARIATION SYMBOL	UEED	UEED-1	UEED-2	UGGD	UGGD-1	UGGD-2	UGHD	UGHD-1	UHHD	NOTE
	XEED	XEED-1	XEED-2	XGGD	XGGD-1	XGGD-2	XGHD	XGHD-1	XHHD	
D BSC	3.00	3.00	3.00	4.00	4.00	4.00	4.00	4.00	5.00	
E BSC	3.00	3.00	3.00	4.00	4.00	4.00	5.00	5.00	5.00	
D1 BSC	2.75	2.75	2.75	3.75	3.75	3.75	3.75	3.75	4.75	9
E1 BSC	2.75	2.75	2.75	3.75	3.75	3.75	4.75	4.75	4.75	9
D2	MIN	1.50	1.25	1.50	2.50	2.50	2.50	2.50	3.50	
	NOM	1.65	-	1.65	2.65	-	2.65	2.65	3.65	
	MAX	1.80	1.55	1.80	2.80	2.80	2.80	2.80	3.80	
E2	MIN	1.50	1.25	1.50	2.50	2.50	3.50	3.50	3.50	
	NOM	1.65	-	1.65	2.65	-	3.65	3.65	3.65	
	MAX	1.80	1.55	1.80	2.80	2.80	3.80	3.80	3.80	
N	16	16	12	24	24	20	28	24	32	7, 3
ND	4	4	3	6	6	5	6	5	8	6
NE	4	4	3	6	6	5	8	7	8	6
NOTES	1,2,10	1,2,10	1,2,10	1,2,10	1,2,10	1,2,10	1,2,10	1,2,10	1,2,10	
REF	11-702									
ISSUE	C									

TABLE 7B

$e=0.50$ PITCH										
VARIATION SYMBOL	UHHD-1	UHHD-2	UHKD	UJJD	UJJD-1	UJJD-2	UKKD	UKKD-1	UKKD-2	NOTE
	XHHD-1	XHHD-2	XHKD	XJJD	XJJD-1	XJJD-2	XKKD	XKKD-1	XKKD-2	
D BSC	5.00	5.00	5.00	6.00	6.00	6.00	7.00	7.00	7.00	
E BSC	5.00	5.00	7.00	6.00	6.00	6.00	7.00	7.00	7.00	
D1 BSC	4.75	4.75	4.75	5.75	5.75	5.75	6.75	6.75	6.75	9
E1 BSC	4.75	4.75	6.75	5.75	5.75	5.75	6.75	6.75	6.75	9
D2	MIN	3.05	3.50	3.50	4.50	4.05	4.50	5.50	5.00	5.50
	NOM	-	3.65	3.65	4.65	-	4.65	5.65	-	5.65
	MAX	3.55	3.80	3.80	4.80	4.55	4.80	5.80	5.50	5.80
E2	MIN	3.05	3.50	5.50	4.50	4.05	4.50	5.50	5.00	5.50
	NOM	-	3.65	5.65	4.65	-	4.65	5.65	-	5.65
	MAX	3.55	3.80	5.80	4.80	4.55	4.80	5.80	5.50	5.80
N	32	28	38	40	40	36	48	48	44	7, 3
ND	8	7	7	10	10	9	12	12	11	6
NE	8	7	12	10	10	9	12	12	11	6
NOTES	1,2,10	1,2,10	1,2,10	1,2,10	1,2,10	1,2,10	1,2,10	1,2,10	1,2,10	
REF	11-702									
ISSUE	C									

TABLE 7C

$e=0.50$ PITCH										
VARIATION SYMBOL	UKKD-3	ULLD	ULLD-1	ULLD-2	UMMD	UMMD-1	UMMD-2			NOTE
	XKKD-3	XLLD	XLLD-1	XLLD-2	XMMD	XMMD-1	XMMD-2			
D BSC	7.00	8.00	8.00	8.00	9.00	9.00	9.00			
E BSC	7.00	8.00	8.00	8.00	9.00	9.00	9.00			
D1 BSC	6.75	7.75	7.75	7.75	8.75	8.75	8.75			
E1 BSC	6.75	7.75	7.75	7.75	8.75	8.75	8.75			
D2	MIN	5.50	6.50	6.50	6.50	7.50	7.50	7.50		
	NOM	5.65	6.65	6.65	6.65	7.65	7.65	7.65		
	MAX	5.80	6.80	6.80	6.80	7.80	7.80	7.80		
E2	MIN	5.50	6.50	6.50	6.50	7.50	7.50	7.50		
	NOM	5.65	6.65	6.65	6.65	7.65	7.65	7.65		
	MAX	5.80	6.80	6.80	6.80	7.80	7.80	7.80		
N	40	56	52	48	64	60	56			7, 3
ND	10	14	13	12	16	15	14			6
NE	10	14	13	12	16	15	14			6
NOTES	1,2,10	1,2,10	1,2,10	1,2,10	1,2,10	1,2,10	1,2,10			
REF	11-702									
ISSUE	C									

TABLE 8A

$e=0.40$ PITCH										
SYMBOL \ VARIATION	UEEE	UEEE-1	UGGE	UHHE	UHHE-1	UJJE	UJJE-1	UKKE	ULLE	NOTE
	XEEE	XEEE-1	XGGE	XHHE	XHHE-1	XJJE	XJJE-1	XKKE	XLLE	
D BSC	3.00	3.00	4.00	5.00	5.00	6.00	6.00	7.00	8.00	
E BSC	3.00	3.00	4.00	5.00	5.00	6.00	6.00	7.00	8.00	
D1 BSC	—	2.75	3.75	4.75	—	5.75	5.75	6.75	7.75	
E1 BSC	—	2.75	3.75	4.75	—	5.75	5.75	6.75	7.75	
D2	MIN	0.95	0.95	1.95	2.95	3.45	3.95	4.45	4.95	
	NOM	1.10	1.10	2.10	3.10	3.60	4.10	4.60	5.10	
	MAX	1.25	1.25	2.25	3.25	3.75	4.25	4.75	5.25	
E2	MIN	0.95	0.95	1.95	2.95	3.45	3.95	4.45	4.95	
	NOM	1.10	1.10	2.10	3.10	3.60	4.10	4.60	5.10	
	MAX	1.25	1.25	2.25	3.25	3.75	4.25	4.75	5.25	
N	20	16	28	36	40	48	48	56	64	7, 3
ND	5	4	7	9	10	12	12	14	16	6
NE	5	4	7	9	10	12	12	14	16	6
NOTES	1,2,10	1,2,10	1,2,10	1,2,10	1,2,10	1,2,10	1,2,10	1,2,10	1,2,10	
REF	11-744	11-744	11-706	11-706	11-744	11-706	11-706	11-706	11-706	
ISSUE	E	E	D	D	E	D	D	D	D	

TABLE 8B

$e=0.40$ PITCH										
SYMBOL \ VARIATION	ULLE-1	UMME	UMME-1							NOTE
	XLLE-1	XMME	XMME-1							
D BSC	8.00	9.00	9.00							
E BSC	8.00	9.00	9.00							
D1 BSC	7.75	8.75	8.75							
E1 BSC	7.75	8.75	8.75							
D2	MIN	5.95	6.95	6.95						
	NOM	6.10	7.10	7.10						
	MAX	6.25	7.25	7.25						
E2	MIN	5.95	6.95	6.95						
	NOM	6.10	7.10	7.10						
	MAX	6.25	7.25	7.25						
N	68	72	76							7, 3
ND	17	18	19							6
NE	17	18	19							6
NOTES	1,2,10	1,2,10	1,2,10							
REF	11-744	11-706	11-744							
ISSUE	E	D	E							

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 JEDEC PUBLICATION 95 SPP-002. 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 0.15 mm AND 0.30 mm FROM THE TERMINAL TIP. IF THE TERMINAL HAS THE OPTIONAL RADIUS ON THE OTHER END OF THE TERMINAL, THE DIMENSION b SHOULD NOT BE MEASURED IN THAT RADIUS AREA.

6. D AND E REFER TO THE NUMBER OF TERMINALS ON EACH D AND E SIDE RESPECTIVELY.

7. DEPOPULATION IS POSSIBLE IN A SYMMETRICAL FASHION.

8. A 14 TERMINAL 0.50 mm PITCH 5.00 X 4.00 mm PACKAGE IS SHOWN FOR ILLUSTRATION ONLY

9. ALL VARIATIONS MAY BE CONSTRUCTED PER FIGURE 1, VARIATIONS MAY BE ALTERNATELY BE CONSTRUCTED PER FIGURE 2 IF $A2$, $D1$ & $E1$ ARE SPECIFIED IN THE DIMENSION TABLES, IN ALL CASES, THE MINIMUM " K " VALUE OF 0.20 mm APPLIES.

10. FOR A COMPLETE SET OF DIMENSIONS FOR EACH VARIATION, SEE THE INDIVIDUAL VARIATION TABLES AND THE COMMON DIMENSIONS (TABLE 2), LEAD WIDTH (TABLE 3) AND TOLERANCE OF FORM & POSITION (TABLE 4).

11. UNILATERAL COPLANARITY ZONE APPLIES TO THE EXPOSED HEAT SINK SLUG AS WELL AS THE TERMINALS.

12. DEPENDING ON THE METHOD OF LEAD TERMINATION AT THE EDGE OF THE PACKAGE, PULL BACK ($L1$) MAYBE PRESENT. L MINUS $L1$ TO BE EQUAL TO OR GREATER THAN 0.30 mm.

13. VARIOUS COMPANIES HAVE ISSUED PATENTS AND RELATED PATENT APPLICATIONS THAT MAY APPLY TO THIS REGISTRATION. IF THE CURRENT ISSUE PATENTS OR LATER PATENTS RESULTING FROM RELATED APPLICATIONS DO APPLY, THESE COMPANIES INTEND TO COMPLY WITH THE JEDEC PATENT POLICY AND LICENSE UNDER REASONABLE TERMS AND CONDITIONS THAT ARE DEMONSTRABLY FREE OF ANY UNFAIR DISCRIMINATION. REFERENCED PATENTS ARE AS FOLLOWS.

AMKOR TECHNOLOGY	U.S. PATENT - No. 5,866,939; 6,143,981; 6,281,568; 6,331,451;
	6,433,277; 6,448,633; 6,455,356; 6,469,369; 6,475,827;
	6,476,478; 6,501,161; 6,521,987; 6,525,406; 6,545,345;
	6,555,899; 6,580,159; 6,597,059; 6,605,865; 6,605,866;
	6,608,366; 6,611,047; 6,616,436; 6,627,976; 6,630,728;
	6,639,308; 6,646,339; 6,677,662; 6,667,663; 6,684,496;
	6,696,747; 6,700,187; 6,713,322; 6,730,544; 6,750,545;
	6,753,597; 6,756,658;
	6,759,737; 6,770,961; 6,777,789; 6,798,047; 6,803,645; 6,825,062;
	6,833,609; 6,841,414; 6,847,009; 6,847,103; 6,853,059; 6,853,919
	6,867,071; 6,873,032; 6,885,086; 6,893,900
ASAT	U.S. PATENTS - No. 6,229,200B1; 6,242,281B1; 6,294,100B1;
	6,545,347B2; 6,585,905B1
NATIONAL SEMICONDUCTOR	U.S. PATENT No. 6,130,473 6,589,814; 6,483,180; 6,452,255;
	6,399,415; 6,372,539; 6,551,048; 6,576,989; 6,488,107;
	6,564,447; 6,629,880;

14. WHEN MORE THAN ONE VARIATION (OPTION) EXISTS FOR THE SAME PROFILE HEIGHT, BODY SIZE (D x E), AND PITCH, THEN THOSE VARIATIONS WILL BE DENOTED BY AN ADDITIONAL DASH NUMBER (ie: -1, -2, etc.) DESIGNATOR TO IDENTIFY THEM. THE NEW VARIATIONS WOULD BE CREATED FROM ALL OR ANY OF THE FOLLOWING REASONS LEAD COUNTS, TERMINAL LENGTHS, AND OR THERMAL PAD SIZES.

Change Record

If the changes involves any words added or deleted (excluding deletion of accidentally repeated words), the change is included. Punctuation changes may or may not be included.

Initial Issue: A	Date: October 2003	Item: 11-667
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Revision History:

Issues A thru C: Detailed Revision History not Available

Issue: D	Date: May 2005	Item: 11-705
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Location	Change Description:
Tables 5a, 5b, 8	Add new variations with 0.4mm pitch

Issue: E	Date: February 2006	Item: 11-744
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Location	Change from:	Change to:
Variations & Summary tables	(ADD NEW VARIATIONS)	(U/X) EEE-1, LLE-1 AND MME-1
TABLE 8A	DELETE D1 & E1 VALUES FOR (U/X) EEE & HHE-1	
TABLE 8B	CREATE NEW TABLE FOR ADDED VARIATIONS	
PAGE 4 - TABLE 2	L1 MIN=0.03	L1 MIN=0.00
PAGE 4 - TABLE 4	NEW VALUES	aaa & bbb FOR 0.40 PITCH
PAGE 11	ADD ADDITIONAL PATENT NUMBERS	

Issue:	Date:	Item:
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Location	Change from:	Change to: