

JEDEC DESIGN STANDARD

DESIGN REQUIREMENTS FOR OUTLINES OF SOLID STATE AND RELATED PRODUCTS

JEDEC PUBLICATION 95

DESIGN GUIDE 4.8

**PLASTIC QUAD AND DUAL INLINE,
SQUARE AND RECTANGULAR, NO-LEAD PACKAGES
(WITH OPTIONAL THERMAL ENHANCEMENTS)**

(QFN / SON)

**JEDEC
SOLID STATE TECHNOLOGY ASSOCIATION**

**Date: Sept 2006
Item: 11.2-713(S)**

Issue: C

PLASTIC NO-LEAD PACKAGES
(WITH OPTIONAL THERMAL ENHANCEMENTS.)
DESIGN REQUIREMENTS

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4.8. PLASTIC NO-LEAD PACKAGES WITH OPTIONAL THERMAL ENHANCEMENTS (QFN, SON)

This design standard applies to packages with optional thermal enhancements as well as various height profiles and pitches. Therefore, the "HP", "F", and "(T, V, W, X, U)" prefixes will not be referenced unless the detail in questions pertains only to a specific variation. (Refer to JESD-30 for formal nomenclature.)

4.8.1 Illustrations



(HVF-PSON)

(HVF-PQFN)

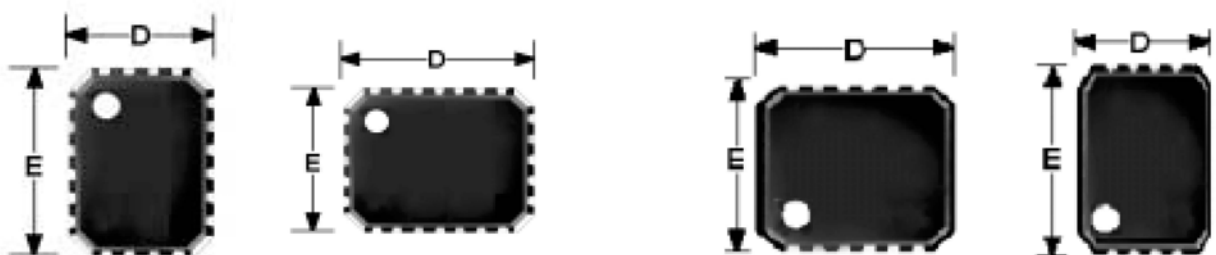
FIGURE 4.8-1a SMALL OUTLINE AND QUAD FLAT - NO LEAD PACKAGES



(Saw Singulated PQFN)

(Flange-Molded PQFN)

FIGURE 4.8-1b SAW SINGULATED AND FLANGE-MOLDED PQFN



QFN CONFIGURATIONS
(TERMINAL 1 - UPPER LEFT)

SON CONFIGURATIONS
(TERMINAL 1 - LOWER LEFT)

FIGURE 4.8-1c QFN / SON BODY SIZE CLASSIFICATION
(IN RELATION TO TERMINAL 1 INDEX AREA)

4.8.2 Package Description

Plastic Quad and Dual Inline Flat No-Lead Packages (QFN / SON) are plastic semiconductor packages with metalized terminals located on the bottom of the package body along its periphery. By design, these terminals are flush with the bottom surface of the plastic package body. Consequently, these packages are categorized as “leadless” or “no-lead”.

Quad (QFN) versions of this package have terminals on all four edges of the bottom surface of the package. The QFN can have either a square or a rectangular body as well as either symmetric or asymmetric terminal patterns. (See figure 4.8-2a for an example of a QFN with a rectangular body and a nonuniform terminal pattern). QFN versions may also have terminals placed in the corners at 45 degrees to neighboring leads (See figure 4.8-2e for an example of a QFN with a rectangular body and terminals in the corners).

Dual Inline (SON) versions have terminals on only two opposite sides of the bottom surface. The SON can have either a square or rectangular body size. (See figures 4.8-2b and 4.8-6 for examples of SON packages).

4.8.3 Concept.

This design guide defines the symbology, algorithms, and recommended dimensions and tolerances for a family of QFN and SON Packages. The guidelines are based on hard metric dimensions and adhere to the geometric dimensioning and tolerancing principles defined in ASME Y14.5M-1994.

Body size dimensions D and E are determined in relationship to the Terminal #1 index area.

For QFN, position terminal 1 perpendicular to the body edge in the upper left corner. For SON, position terminal 1 to the lower left corner. D should then be measured in the horizontal direction. Similarly, measure E in the vertical direction for both package types. (See figure 4.8-1c)

4.8.4 Recommended Outline

Refer to figures 4.8-2 thru 6 for the recommended outline format and symbology for these packages.

4.8.5 Recommended Values and Tolerances

The following table defines the symbology, algorithms, dimensions and tolerances that shall be used when preparing a QFN or SON outline.

Table 4.8-1 - Symbols, Recommended Values and Tolerances (Values in mm except as noted)

SYMBOL	DEFINITION	e	MIN	NOM	MAX	NOTES
A	Overall component height measured from the seating plane. (Datum C).		-	-	-	Refer to JEDEC Pub.95, Sec.4.3 SPP-017 for acceptable height profiles. (T, V, W or U recommended)
A1	The vertical distance from the bottom surface of the plastic body to the nearest metalized package feature.		0.00	-	0.05	(Protrusion of each metalized terminal or exposed heat feature from the plastic body.) Figures 4.8-2a/b
			0.03	-	0.13	For bumped packages only
A2	The distance from the upper surface of the terminals to the upper surface of the plastic body.		0.55	0.65 for V-profile	0.80	(Dimension is only present on Flange-type configurations.) (See Figure 4.8-2a)
			0.45	0.55 for W-profile	0.65	
			0.30	0.40 for U-profile	0.50	
			0.15	0.25 for X-profile	0.35	
A3	The distance from the seating plane to the upper surface of the terminals.			0.20 Ref.		(Dimension is only present on Flange-type configurations.) (See Figure 4.8-2a)
				0.30 Ref.		For bumped packages only
b	The width of the metalized terminals (including lead finish) exposed at the bottom surface of the package.	1.27	0.30	0.40	0.50	The terminal width is measured at the seating plane a distance of L/2 from the edge of the package body.
		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	
D	The package body dimension in the horizontal direction.		Basic Dimension Suggest D to be in increments of 0.50 mm ranging from 1.00 thru 12.00 mm			
D1	The horizontal dimension of the molded plastic body above the flange feature.		Basic Dimension D1= D - 0.25			(Dimension is only present on Flange-type configurations.) (See Figure 4.8-2a)
D2	The horizontal dimension of the exposed metal heat feature.		0.0	D2max must not violate the minimum metal separation requirement (k)		Min. value of zero applies for product built without an exposed heat feature.