



DESIGN REQUIREMENTS FOR OUTLINES OF SOLID STATE AND RELATED PRODUCTS

JEDEC PUBLICATION 95 (JEP95) DESIGN GUIDE 4.20

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

SMALL SCALE (QFN/SON)

JEDEC SOLID STATE TECHNOLOGY ASSOCIATION

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CONTENTS

	Page
4.20. Scope	4.20-2
4.20.1 Illustrations	4.20-2
4.20.2 Package Description	4.20-3
4.20.3 Design Guide Concept	4.20-3
4.20.4 Recommended Package Outline and nomenclature.	4.20-3
4.20.5 Recommended Dimensional Values and Tolerances	4.20-4
4.20.6 Detailed Notes	4.20-10
Tables	
4.20-1 Symbols, Recommended Dimensional Values, and Tolerances for QFN / SON Packages	4.20-4, 5 & 6
Figures	
4.20-1a SON and QFN illustrations	4.20-2
4.20-1b Saw-Singulated vs Flange-molded Package isometric illustrations	4.20-2
4.20-1c Location of terminal 1 in relation to dimensions D and E	4.20-2
4.20-2a QFN dimensional scheme	4.20-7
4.20-2b SON dimensional scheme	4.20-8
4.20-2c Terminal details	4.20-8
4.20-3 Optional terminal #1 identifiers	4.20-9
4.20-4 Alternative SON numbering scheme	4.20-9
4.20-5 Documentation example of a depopulated QFN	4.20-10

4.20 SCOPE

This design standard applies to packages with optional thermal enhancements as well as various height profiles and pitches. Therefore, the "HP", "F", and "(W, U, X1, X2)" prefixes will not be referenced unless the detail in questions pertains only to a specific variation. (Refer to JESD-30 for formal nomenclature.)

4.20.1 Illustrations

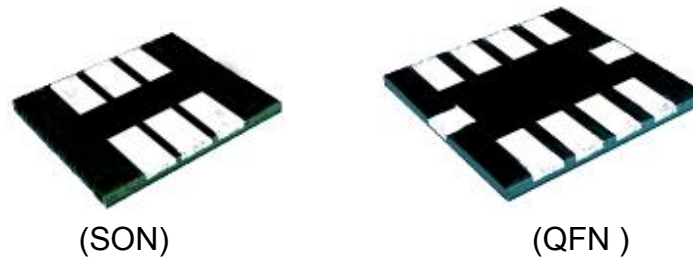


FIGURE 4.20-1a — SMALL OUTLINE AND QUAD FLAT -NO LEAD PACKAGES

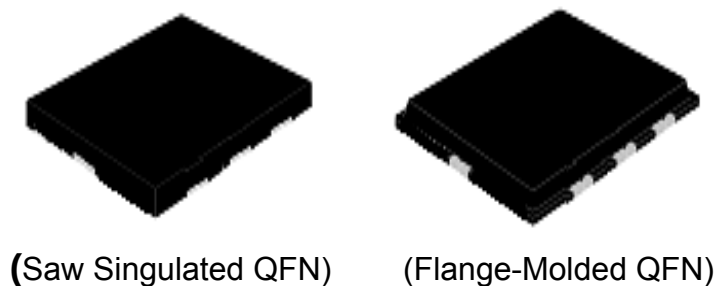


FIGURE 4.20-1b — SAW SINGULATED AND FLANGE-MOLDED QFN

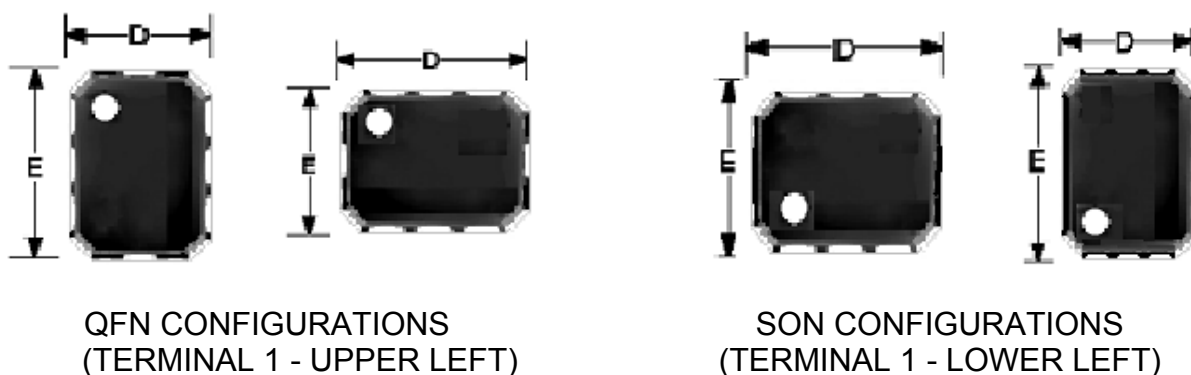


**FIGURE 4.20-1c — QFN/SON BODY SIZE CLASSIFICATION
(IN RELATION TO TERMINAL 1 INDEX AREA)**

4.20.2 Package Description

This Design Guide relates to Small Scale Plastic Quad and Dual Inline Flat No-Lead Packages (QFN/SON) are plastic semiconductor packages with metallized terminals located on the bottom of the package body along its periphery. By design, these terminals are essentially flush with the bottom surface of the plastic package body. Consequently, these packages are categorized as “leadless” or “no-lead”. Small Scale packages have body size increments of 0.1 mm, and typically have a body size less than 4.0 mm x 4.0 mm.

Quad (QFN) versions of this package have terminals on all four sides of the bottom surface of the package. The QFN can have either a square or rectangular body. (See Figure 4.20-2a for an example of a QFN with a rectangular body and a uniform terminal pattern.)

Dual Inline (SON) versions generally have two opposite sides depopulated. The SON can also have either a square or rectangular body size. (See Figure 4.20-2b for an example of an SON package)

4.20.3 Design Guide Concept

This design guide defines the symbology, definitions, algorithms, recommended dimensions and tolerances for a family of Small Scale (SS) QFN and SON Packages. The guidelines defined 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 to 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 4.20-1c)

4.20.4 Recommended Package Outline

Refer to Figure 4.20-2 thru Figure 4.20-6 for the recommended outline format and symbology for these packages. If there are multiple variations in one package registration, these variations should use the following nomenclature: “**ADEe - x**”

- where
- A**= Package height designator W,U,X (per SPP-017)
 - D and E**= Package perimeter dimensions in the xy directions
named alphabetically (A, B, C, etc...)
 - e**= Terminal pitch (C = 0.65, D = 0.50, E = 0.40, F = 0.35, etc) (All pitch designators need to be constant across all QFN package outlines to avoid user misunderstanding.
 - x**= exposed pad (or other) variations per terminal count stated numerically (1,2,3...)

4.20.5 Recommended Dimensional Values and Tolerances

Table 4.20-1 defines the recommended symbology to be used, and provides recommended values, algorithms dimensions and tolerances that shall be used when preparing a QFN or SON outline.

TABLE 4.20-1 — 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).	W				Refer to JESD 30 for acceptable height profiles. W, U, X1, X2 shall apply to this design guide	
		U					
		X1					
		X2					
A1	The vertical distance from the bottom surface of the plastic body to the nearest metallized package feature.		0.00	-	0.05	(Protrusion of each metallized terminal or exposed heat feature from the plastic body.). See Figure 4.20-2a and Figure 4.20-2b	
A2	The distance from the upper surface of the terminals to the upper surface of the plastic body.		0.45	0.55	0.65	W	Dimension is only present on Flange-type configurations. See Figure 4.20-2a
			0.30	0.40	0.50	U	
			0.15	0.25	0.35	X	
A3	The distance from the seating plane to the upper surface of the terminals.		--	--	0.22	Dimension is only present on Flange-type configurations. See Figure 4.20-2a	
b	The width of the metallized terminals (including lead finish) exposed at the bottom surface of the package	0.65	0.25	0.30	0.35	The terminal width is measured at the seating plane a distance of L/2 from the edge of the package body	
		0.50	0.25	0.30	0.35		
			0.20	0.25	0.30		
			0.15	0.20	0.25		
		0.40	0.15	0.20	0.25		
0.35	0.14	0.17	0.20				
D	The package body dimension measured in the horizontal direction.		Basic Dimension D must be in increments of 0.10 mm.			This dimension is typically ≤ 4 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 4.20-2a	
D2	The horizontal dimension of the exposed metal heat feature.		0.00	Max value must not violate the minimum metal separation requirement (k)		Must comply with JEP95, Sect. 3.0, SPP-022 on Package Thermal Pad Requirements	