JEITA

Technical Report of Japan Electronics and Information Technology Industries Association

EIAJ EDR-7314A

Design guideline of integrated circuits for Plastic Shrink Small Outline Package (P-SSOP)

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Prepared by
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EIAJ EDR-7314A

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Design guideline of integrated circuits for Plastic Shrink Small Outline Package (P-SSOP)

1. Scope of Application

This technical report regulated outline drawings and dimensions of the Plastic Shrink Small Outline Package (herein after referred to as P-SSOP), which terminal straight pitch [e] is 1.00mm less than, among the packages classified as form B in the **EIAJ ED-7300** [Recommended practice on Standard for the preparation of outline drawings of semiconductor packages]

Note This technical report is revised and corresponds to **EIAJ ED-7311-20** [Standard of integrated circuits package (P-SSOP)] established in January 2002. The other relation standards are shown below.

EIAJ EDR-7320 [Design guideline of integrated circuits for small outline package (SOP)] established in December 1998

EIAJ ED-7311-19 [Standard of integrated circuits package (P-SOP)] established in January 2002

EIAJ EDR-7312 [Design guideline of integrated circuits for thin small outline package (type I) (TSOP I)] established in April 1996

EIAJ EDR-7313 [Design guideline of integrated circuits for thin small outline package (type II) (TSOP II)] established in April 1996

EIAJ ED-7311-1 [Standard of integrated circuits package (TSOP(1))] established in August 1997

EIAJ ED-7311-2 [Standard of integrated circuits package (TSOP(2))] established in August 1997

2. Definition of the Technical Terms

The definition of the technical terms used in this technical report is in conformity with **EIAJ ED-7300**, and the definition of technical terms appearing a new are given within the text of this standard.

3. BACKGROUND

Recently, electronic appliance become smaller and thinner, on such background it is appearance the Plastic Small Outline Package (herein after referred to as P-SOP), terminal straight pitch [e] is 1.27mm(50mil). And after that, Terminal straight pitch [e] made shrink P-SSOP also became used. This technical report intended to standardize the outer dimensions of P-SSOP and ensure compatibility between products as far as possible for standardization.

4. Definition of P-SSOP

P-SSOP is defined as Form B with L terminal in the item 6, “Outline classification of shapes of semiconductor package “ at the **EIAJ ED-7300**, and a package with formed terminals led out of longer side of itself in two directions, whose terminal pitch [e] is 1.00mm or less, are flat toward the outside of the package body for mounting on print circuits board surface. (gull wing shape lead)

5. Numbering of Terminals

Numbering of terminals complies with the **EIAJ ED-7300**.

6. Nominal Dimensions

Package width X Package length(Symbol : [E] X [D]) is applied to Nominal Dimensions.
However as the exception, old nominal dimensions is possible to use places (side by side) and it writes which Package width(Symbol : E).

7. REFERENCE CHARACTERS AND DRAWING

7.1 Outline Drawing

Figure 1

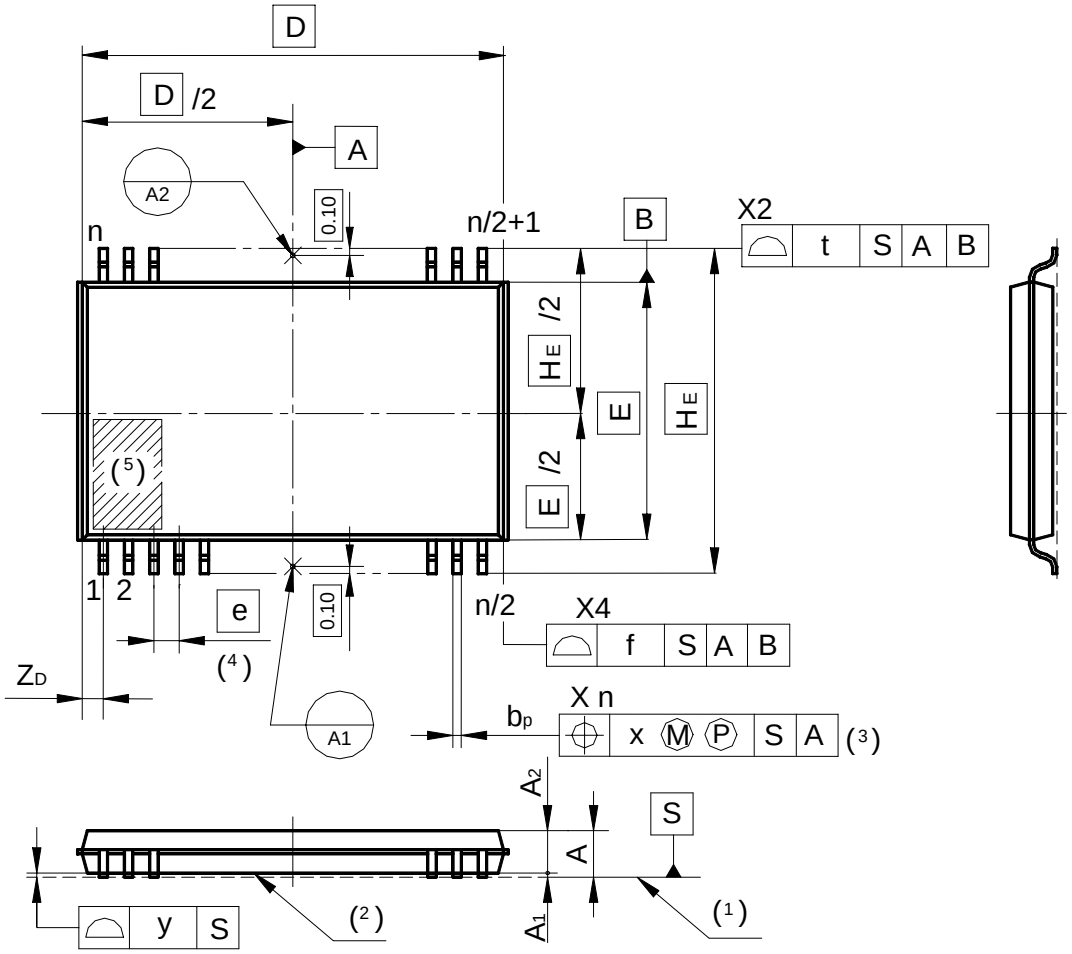
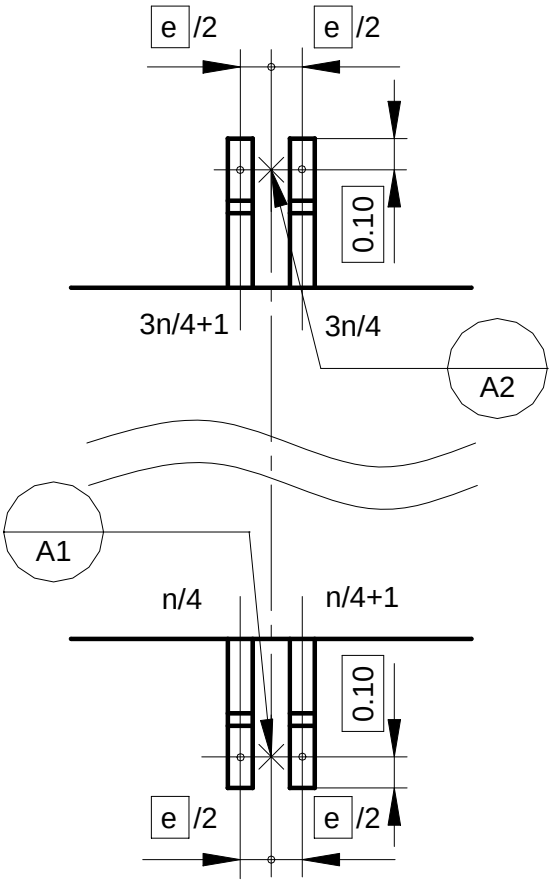


Figure 2 Detail area of datum A

For even number of terminals on a package side



For odd number of terminals on a package side

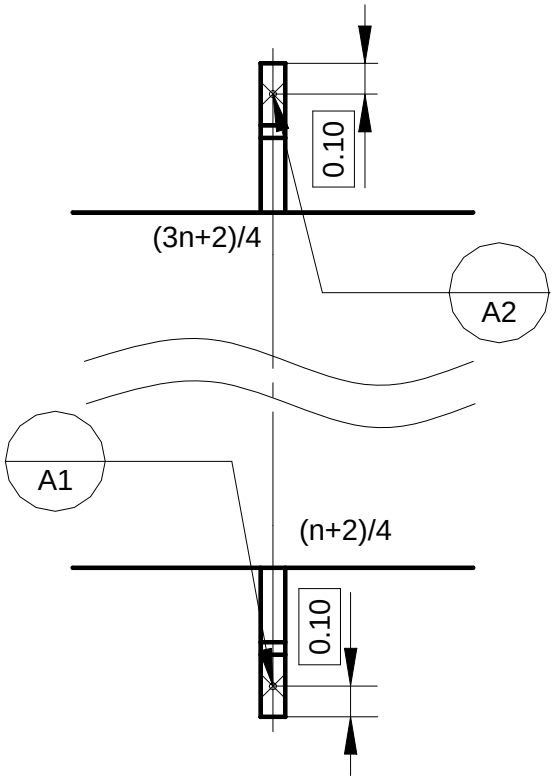
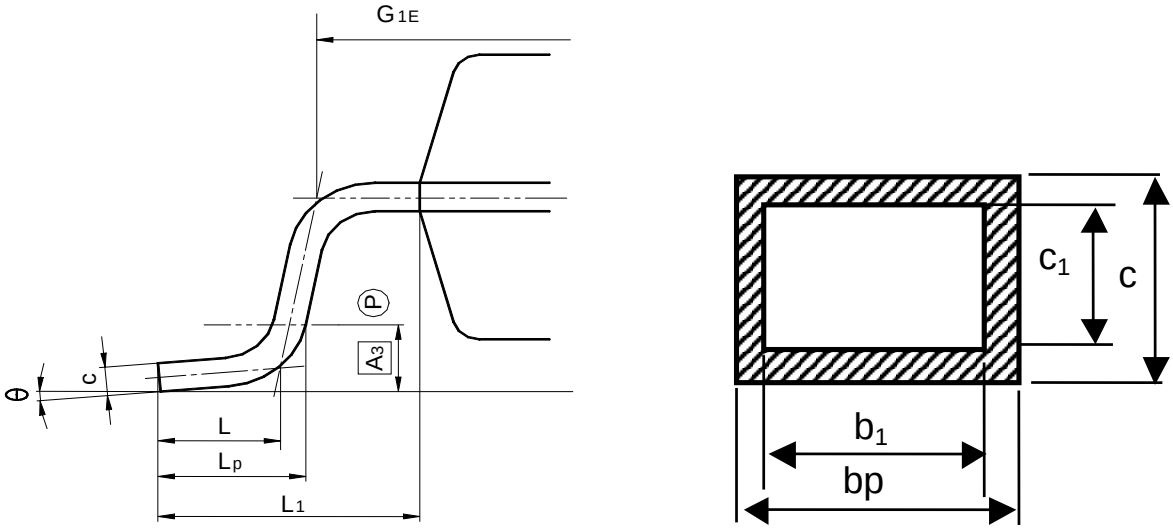


Figure 3 Detail of terminal, terminal cross section



Terminal cross section **(6)**

Notes (1) The mounting surface, with which a package is in contact.

(2) The base surface, which is in parallel with the mounting surface and links the lowest point, except the stand-off.

(3) The maximum mounting conditions apply to the positional tolerance of the terminals. (Refer **to ISO 2692/JIS B 0023**.)

(4) Specifies the true geometric position of the terminal axis.

(5) Shows the allowable position of the Index mark area, which is based on the IEC standard and basically 1/16 with package body size, however in case of small package body size, it is less than 1/4 with

(6) The dimensions of the terminal section apply to the terminal region ranges of 0.10mm and 0.25mm from the end of a terminal.

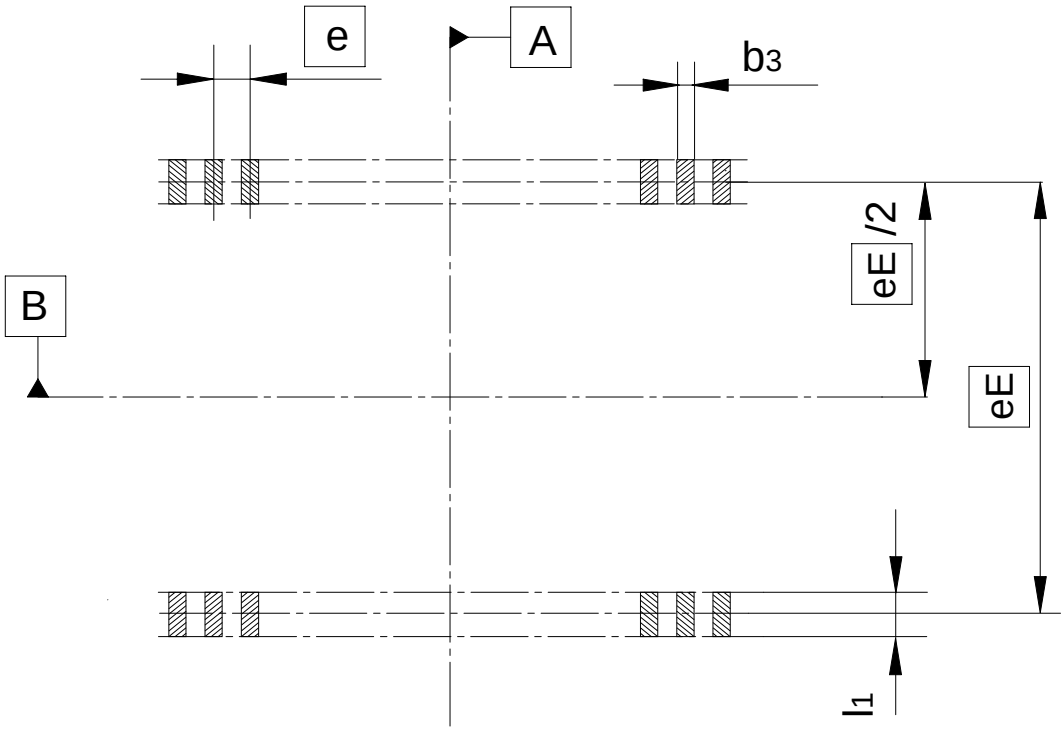
(7) Resin burrs and gate remains of the package sides with no terminals are max.0.15mm per side.

(8) Resin burrs of the terminal sides are max.0.25mm per side.

7.2 PATTERN OF TERMINAL AREAS

Pattern of terminal areas can exist is shown **Figure 4** as reference for the foot print design.

Figure 4



l1max=Lpmax+t/2

b3max=bpmax+X

eE = H_E -Lpnom

8. Outer Dimension

Table 1 below shows the standard dimensions. Combinations of the standard dimensions shown below allow a number of package variations. If a package is newly designed, their dimensions shall be selected in the **8.3 Table 2**. Number of terminal list.

8.1 GROUP 1

Table 1

Unit: mm

<table>
<tr><th>Description</th><th>Reference symbol</th><th>Standards</th><th>Recommended</th><th>Remarks</th></tr>
<tr><td>Nominal dimensions</td><td>E X D</td><td>Package width(E) X Package length(D) is applied to Nominal Dimensions.
However as the exception, old nominal dimensions is possible to use places (side by side) and it writes which Package width (Symbol : E).
Old nominal dimensions
<table>
<tr><th colspan="3">E</th></tr>
<tr><th>Group1</th><th>Group2</th><th>Group3</th></tr>
<tr><td>0020</td><td rowspan="5"></td><td rowspan="8"></td></tr>
<tr><td>0030</td></tr>
<tr><td>0044</td></tr>
<tr><td>0056</td></tr>
<tr><td>0061</td></tr>
<tr><td>(0080)</td><td>0300</td></tr>
<tr><td>(0099)</td><td>0350</td></tr>
<tr><td></td><td>0400</td></tr>
<tr><td></td><td rowspan="4"></td><td>0115</td></tr>
<tr><td></td><td>0130</td></tr>
<tr><td></td><td>0145</td></tr>
<tr><td></td><td>0160</td></tr>
</table></td><td>Old nominal dimensions which Group 1 (0080), (0099) is non-recommendation.</td><td>(1) Old nominal dimensions which Group 1, 3 are the numbers without decimal points
(2) Group 2 of numerical value are from mil systems.</td></tr>
<tr><td>Package width</td><td>E</td><td>
<table>
<tr><th colspan="3">E</th></tr>
<tr><th>Group1</th><th>Group2</th><th>Group3</th></tr>
<tr><td>2.00</td><td rowspan="5"></td><td rowspan="8"></td></tr>
<tr><td>3.00</td></tr>
<tr><td>4.40</td></tr>
<tr><td>5.60</td></tr>
<tr><td>6.10</td></tr>
<tr><td>(8.00)</td><td>7.62</td></tr>
<tr><td>(9.90)</td><td>8.89</td></tr>
<tr><td></td><td>10.16</td></tr>
<tr><td></td><td rowspan="4"></td><td>11.50</td></tr>
<tr><td></td><td>13.00</td></tr>
<tr><td></td><td>14.50</td></tr>
<tr><td></td><td>16.00</td></tr>
</table></td><td>Group 1 (8.00), (9.90) is non-recommendation.</td><td>(1) Mismatch of the upper and lower mold and gate remains and resin burrs are not included.
(2) Spec of resin burrs and gate remains are expressed in notes of reference characters and drawings, ([7]), ([8]).
(3) It is recommended that the upper and lower cavities are equal size. If they are different, the larger dimension shall be regarded as E.
(4) Combination of E and D must be selected from the same Group (1 or 2 or 3) of each list.
(5) Group 2 is same range of TSOP(2)</td></tr>
</table>

Table1 (continued)

Unit: mm

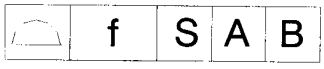
Description	Reference symbol	Standards	Recommended	Description
Package length	D	D Group1 / Group2 / Group3 2.00 3.00 3.60 5.00 6.50 7.80 9.70 / 10.79 11.00 / 12.06 12.50 / 13.33 / 13.25 14.00 / 14.60 / 14.50 (15.80) / 15.87 / 15.75 (17.00) / 17.14 / 17.00 (18.50) / 18.41 / 18.25 (20.80) / 19.68 / 19.50 20.95 / 20.75 22.22 / 22.00 23.49 / 23.25 24.76 / 24.50 26.03 / 25.75 27.30 / 27.00 28.57 / 28.25 29.50 30.75	Group1 (15.80), (17.00), (18.50), (20.80) is non-recommendation.	(1) Mismatch of the upper and lower mold and gate remains and resin burrs are not included. (2)Spec of resin burrs and gate remains are expressed in notes of reference characters and drawings, ([7]),([8]) . (3) It is recommended that the upper and lower cavities are equal size. If they are different, the larger dimension shall be regarded as D. (4) Combination of E and D must be selected from the same Group (1or2or3) of each list. (5) Group 2 is same range of TSOP(2)
Tolerance of package lateral profile	f	(1) The tolerance of terminal tip shall be specified in the outline drawing.  (2) Reference symbol f shall be replaced as below. D≦14.00, f = 0.10 D>14.00, f = 0.20	–	S and A and B is datum.
Overall width	H_E	$H_E = E + 2xL_1$	–	H_E -Lpnom= eE

Table 1 (continued)

Unit: mm

<table>
<tr><th>Description</th><th>Reference symbol</th><th>Standards</th><th>Recommended</th><th>Remarks</th></tr>
<tr><td>Package height</td><td>A_2</td><td>
<table>
<tr><th></th><th>A_2min</th><th>A_2nom</th><th>A_2max</th></tr>
<tr><td rowspan="6">Group1</td><td>0.55</td><td>0.60</td><td>0.65</td></tr>
<tr><td>0.75</td><td>0.80</td><td>0.85</td></tr>
<tr><td>0.95</td><td>1.00</td><td>1.05</td></tr>
<tr><td>1.10</td><td>1.20</td><td>1.30</td></tr>
<tr><td>1.40</td><td>1.50</td><td>1.60</td></tr>
<tr><td>1.60</td><td>1.70</td><td>1.80</td></tr>
<tr><td>Group2</td><td>1.30</td><td>1.40</td><td>1.50</td></tr>
<tr><td>Group3</td><td>1.30</td><td>1.40</td><td>1.50</td></tr>
<tr><td></td><td>2.50</td><td>2.70</td><td>2.90</td></tr>
</table>
</td><td>–</td><td>(1) Include package warp age.
(2) It must be selected from the same Group (1, 2, 3) of E/D.</td></tr>
<tr><td>Seated height</td><td>A</td><td>
<table>
<tr><th></th><th>Amax</th><th>A_2nom</th></tr>
<tr><td rowspan="6">Group1</td><td>0.80</td><td>0.60</td></tr>
<tr><td>1.00</td><td>0.80</td></tr>
<tr><td>1.20</td><td>1.00</td></tr>
<tr><td>1.45</td><td>1.20</td></tr>
<tr><td>1.75</td><td>1.50</td></tr>
<tr><td>1.95</td><td>1.70</td></tr>
<tr><td>Group2</td><td>1.65</td><td>1.40</td></tr>
<tr><td>Group3</td><td>1.65</td><td>1.40</td></tr>
<tr><td></td><td>3.05</td><td>2.70</td></tr>
</table>
</td><td>–</td><td>(1) Include package warp age.
(2) It must be selected from the same Group (1, 2, 3) of E/D.
(3) Especially, it shows SSOP, which is the thin seated height by the following name.
<table>
<tr><th>name</th><th>Amax</th><th>A_2nom</th></tr>
<tr><td>WSSOP</td><td>0.80</td><td>0.60</td></tr>
<tr><td>VSSOP</td><td>1.00</td><td>0.80</td></tr>
<tr><td>TSSOP</td><td>1.20</td><td>1.00</td></tr>
<tr><td>LSSOP</td><td>1.70</td><td>1.40</td></tr>
</table>
</td></tr>
<tr><td>Stand-off Height</td><td>A_1</td><td>
<table>
<tr><th>A_1min</th><th>A_1nom</th><th>A_1max</th></tr>
<tr><td>0.05</td><td>0.10</td><td>0.15</td></tr>
</table>
</td><td>
<table>
<tr><th>Amax</th><th>A_1max</th></tr>
<tr><td>0.80</td><td rowspan="2">0.10</td></tr>
<tr><td>1.00</td></tr>
</table>
</td><td></td></tr>
<tr><td>Standard height of soldered points</td><td>$\boxed{A_3}$</td><td>$\boxed{A_3}$ = 0.25</td><td>–</td><td></td></tr>
</table>

Table 1 (continued)

Unit: mm

Description	Reference symbol	Standards	Recomm-ended	Remarks
Length of soldered part	Lp	Lp Group 1: min=0.45, nom=0.60, max=0.75, In case of L=0.50, L_1=1.00 Group 1: min=0.15, nom=0.30, max=0.50, In case of L=0.30, L_1=0.50 Group 2: min=0.73, nom=0.88, max=1.03, In case of L=0.80, L_1=1.60 Group 3: min=1.04, nom=1.20, max=1.34, In case of L=1.20, L_1=2.20	-	(1) It must be selected from the same Group (1, 2, 3) of E/D. (2) It applies the following Lp value below E=3.00mm, Group1. Lpmin=0.15 Lpnom=0.30 Lpmax=0.50 In case of L=0.30, L_1=0.50
Angle of terminal flat portions	θ	θmin: 0°, θnom: 3°, θmax: 8°	-	
Terminal pitch	e	e 1.00 0.50 0.80 0.40 0.65 0.30	-	
Tolerance of terminal center position	x	(1) Tolerance of terminal center position shall be specified in the outline drawing. ⌖ x Ⓜ Ⓟ S A (2) Reference symbol x shall be replaced as below. e: 1.00 → x: 0.20 0.80 → 0.16 0.65 → 0.13 0.50 → 0.08 0.40 → 0.07 0.30 → 0.06	-	(1) M means the concept of the maximum material condition (MMC) and it shall be applied. (2) P is Means projected tolerance zone, it shows the range of the measurement object which guaranteeing the height of A_3

Table 1 (continued)

Unit: mm

<table>
<tr><th>Description</th><th>Reference symbol</th><th>Standards</th><th>Recommended</th><th>Remarks</th></tr>
<tr><td rowspan="2">Terminal width</td><td>b_p</td><td>
<table>
<tr><th>e</th><th>$b_p$min</th><th>$b_p$max</th></tr>
<tr><td>1.00</td><td>0.34</td><td>0.50</td></tr>
<tr><td>0.80</td><td>0.24</td><td>0.40</td></tr>
<tr><td>0.65</td><td>0.16</td><td>0.32</td></tr>
<tr><td>0.50</td><td>0.17</td><td>0.27</td></tr>
<tr><td>0.40</td><td>0.13</td><td>0.23</td></tr>
<tr><td>0.30</td><td>0.09</td><td>0.18</td></tr>
</table>
</td><td>
(1) Solder plating
<table>
<tr><th>e</th><th>$b_p$nom</th></tr>
<tr><td>1.00</td><td>0.42</td></tr>
<tr><td>0.80</td><td>0.32</td></tr>
<tr><td>0.65</td><td>0.24</td></tr>
<tr><td>0.50</td><td>0.22</td></tr>
<tr><td>0.40</td><td>0.18</td></tr>
<tr><td>0.30</td><td>0.14</td></tr>
</table>
(2) Palladium plating
<table>
<tr><th>e</th><th>$b_p$nom</th></tr>
<tr><td>1.00</td><td>0.40</td></tr>
<tr><td>0.80</td><td>0.30</td></tr>
<tr><td>0.65</td><td>0.22</td></tr>
<tr><td>0.50</td><td>0.20</td></tr>
<tr><td>0.40</td><td>0.16</td></tr>
<tr><td>0.30</td><td>0.12</td></tr>
</table>
</td><td rowspan="3">(1) b_p and c denote the terminal width and thickness with plating.
b_1 and c_1 denote the terminal width and thickness before plating.

(2) b_p,b_1,c,$c_1$apply to the ranges of 0.10-0.25 from the tip of a terminal.

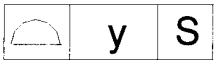
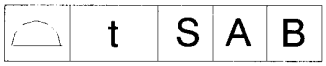
(3) The standard value of b_p,c,

Solder plating, the standard thickness of solder layer shall be, [0.010 +0.010/-0.005]

As palladium plating, it is very thin, so terminal width and thickness is,
$b_{pnom}=b_{1mom}$
$c_{nom}=c_{1nom}$</td></tr>
<tr><td>b_1</td><td>
<table>
<tr><th>e</th><th>$b_1$min</th><th>$b_1$nom</th><th>$b_1$max</th></tr>
<tr><td>1.00</td><td>0.34</td><td>0.40</td><td>0.46</td></tr>
<tr><td>0.80</td><td>0.24</td><td>0.30</td><td>0.36</td></tr>
<tr><td>0.65</td><td>0.16</td><td>0.22</td><td>0.28</td></tr>
<tr><td>0.50</td><td>0.17</td><td>0.20</td><td>0.23</td></tr>
<tr><td>0.40</td><td>0.13</td><td>0.16</td><td>0.19</td></tr>
<tr><td>0.30</td><td>0.09</td><td>0.12</td><td>0.15</td></tr>
</table>
</td><td>–</td></tr>
<tr><td rowspan="2">Terminal thickness</td><td>c</td><td>
<table>
<tr><th>$c_1$nom</th><th>cmin</th><th>cmax</th></tr>
<tr><td>0.15</td><td>0.14</td><td>0.20</td></tr>
<tr><td>0.125</td><td>0.115</td><td>0.17</td></tr>
<tr><td>0.10</td><td>0.09</td><td>0.15</td></tr>
</table>
</td><td>
(1) Solder plating
<table>
<tr><th>$c_1$nom</th><th>cnom</th></tr>
<tr><td>0.15</td><td>0.17</td></tr>
<tr><td>0.125</td><td>0.145</td></tr>
<tr><td>0.10</td><td>0.12</td></tr>
</table>
(2) Palladium plating
<table>
<tr><th>$c_1$nom</th><th>cnom</th></tr>
<tr><td>0.15</td><td>0.15</td></tr>
<tr><td>0.125</td><td>0.125</td></tr>
<tr><td>0.10</td><td>0.10</td></tr>
</table>
</td></tr>
<tr><td>c_1</td><td>
<table>
<tr><th>$c_1$min</th><th>$c_1$nom</th><th>$c_1$max</th></tr>
<tr><td>0.14</td><td>0.15</td><td>0.16</td></tr>
<tr><td>0.115</td><td>0.125</td><td>0.135</td></tr>
<tr><td>0.09</td><td>0.10</td><td>0.11</td></tr>
</table>
</td><td>–</td></tr>
</table>

Table 1 (continued)

Unit: mm

Description	Reference symbol	Standards	Recommended	Remarks
Co planarity	y	(1) The co planarity shall be specified in the outline drawing.  (2) Reference symbol y shall be replaced with any of the values shown below. e / y 1.00 / 0.10 0.80 / 0.10 0.65 / 0.10 0.50 / 0.08 0.40 / 0.08 0.30 / 0.05	–	
Positional tolerance of terminal tips	t	(1) The tolerance of the terminal tips shall be specified in the outline drawing.  (2) Reference symbol t shall be replaced with any of the values shown below. t = 0.20	–	
Number of terminal	n	The number of terminals are determined as follows. (1) Group1 (See **Table 2**) ・D≦14.00 The number of terminals obtained when $Z_D \geqq 0.10+b_{1nom}/2$ ・D>14.00 The number of terminals obtained when $Z_D \geqq 0.20+b_{1nom}/2$ (2) Group2,3 (See **Table 3,4**) ・e = 1.00,0.80,0.65,0.50 The number of terminals obtained when $Z_D \geqq 0.50$ ・e=0.40,0.30 The number of terminals obtained when $Z_D \geqq 0.20+b_{1nom}/2$	The recommended number of terminals in a package length for each terminal pitch is the maximum number that shall meet the rule given in the standards column, except number of terminals in Group1, D=12.50, D=14.00 of e=0.40. (See in **Table 2** and note)	However, terminal number n must not overlap in different package length in the same terminal pitch. And it must not overlap in different terminal pitch in the same package length.

8.2 Group 2

Table1 (continued)

Unit: mm

<table>
<tr><th>Description</th><th>Reference symbol</th><th>Standards</th><th>Recommended</th><th>Remarks</th></tr>
<tr><td>Width between first bent part of terminal</td><td>G_{1E}</td><td>
<table>
<tr><th>L_1</th><th>G_{1E}</th></tr>
<tr><td>0.50</td><td>E + 0.30</td></tr>
<tr><td>1.00</td><td>E + 0.80</td></tr>
<tr><td>1.60</td><td>E + 1.40</td></tr>
<tr><td>2.20</td><td>E + 1.80</td></tr>
</table>
</td><td>–</td><td>Nominal dimension for test socket and tray design.</td></tr>
<tr><td>Package overhang</td><td>Z_D</td><td>$Z_D = (D - (n/2-1) \times e)/2$</td><td>–</td><td></td></tr>
<tr><td>Length of flat part of terminal</td><td>L</td><td rowspan="2">
<table>
<tr><th></th><th>L_1/ L</th><th>A_2nom</th></tr>
<tr><td>Group1</td><td rowspan="5">L_1=1.00/ L=0.50</td><td>0.60</td></tr>
<tr><td></td><td>0.80</td></tr>
<tr><td></td><td>1.00</td></tr>
<tr><td></td><td>1.20</td></tr>
<tr><td></td><td>1.50</td></tr>
<tr><td></td><td>1.70</td></tr>
<tr><td>Group2</td><td rowspan="2">L_1=0.50/ L=0.30</td><td>1.40</td></tr>
<tr><td>Group3</td><td>1.40</td></tr>
<tr><td></td><td colspan="2">L_1=1.60/ L=0.80
L_1=2.20/ L=1.20</td><td>2.70</td></tr>
</table>
</td><td rowspan="2">–</td><td rowspan="2">Value of L and L_1 must be selected in the same Group (1, 2, 3) of E/D.</td></tr>
<tr><td>Terminal length</td><td>L_1</td></tr>
<tr><td>Terminal inline interval</td><td>eE</td><td>eE = H_E – Lpnom
(1) In case of SOP and SSOP and TSOP(2), eE = e_1
(2) In case of TSOP(1) , eD = e_1</td><td>–</td><td></td></tr>
</table>

8.3 Number of terminal list

Table 3 Number of terminal list (Group 1)

e	1.00		0.80		0.65		0.50		0.40		0.30	
D	n	Z_D	n	Z_D	n	Z_D	n	Z_D	n	Z_D	n	Z_D
2.00							* 8	0.25	* 10	0.20	* 12	0.25
3.00					* 8	0.525	10	0.50	* 14	0.30	16	0.45
							* 12	0.25			* 18	0.30
3.60			* 8	0.60	* 10	0.50	* 14	0.30	16	0.40	20	0.45
									* 18	0.20	* 22	0.30
5.00	8	1.00	* 12	0.50	14	0.55	18	0.50	22	0.50	26	0.70
	* 10	0.50			* 16	0.225	* 20	0.25	* 24	0.33	28	0.55
											30	0.40
											* 32	0.25
6.50	* 12	0.75	14	0.55	18	0.65	22	0.75	28	0.65	34	0.85
			* 16	0.225	* 20	0.325	24	0.50	30	0.45	36	0.70
							* 26	0.25	* 32	0.25	38	0.55
											40	0.40
											* 42	0.25
7.80	14	0.90	18	0.65	22	0.65	28	0.65	34	0.70	44	0.75
	* 16	0.40	* 20	0.325	* 24	0.325	* 30	0.40	36	0.50	46	0.60
									* 38	0.30	48	0.45
											* 50	0.30
9.70	18	0.85	22	0.65	26	0.95	32	1.10	40	1.05	52	1.10
	* 20	0.35	* 24	0.325	28	0.625	34	0.85	42	0.85	54	0.95
					* 30	0.30	36	0.60	44	0.65	56	0.80
							* 38	0.35	46	0.45	58	0.65
									* 48	0.25	60	0.50
											62	0.35
											* 64	0.20
11.00	* 22	0.50	26	0.70	32	0.625	40	0.75	50	0.70	66	0.70
			* 28	0.30	* 34	0.30	42	0.50	52	0.50	68	0.55
							* 44	0.25	* 54	0.30	70	0.40
											* 72	0.25
12.50	* 24	0.75	30	0.65	36	0.725	46	0.75	56	0.85	74	0.82
			* 32	0.25	* 38	0.40	48	0.50	58	0.65	76	0.70
							* 50	0.25	* 60	0.45	78	0.55
											80	0.40
											* 82	0.25
14.00	26	1.00	* 34	0.60	40	0.825	52	0.75	62	1.00	84	0.85
	* 28	0.50			* 42	0.50	54	0.50	64	0.80	86	0.70
							* 56	0.25	66	0.60	88	0.55
									* 68	0.40	90	0.40
											* 92	0.20
(15.80)	28	1.40	36	1.10	44	1.075	58	0.90	70	1.10	94	1.00
	30	0.90	* 38	0.70	46	0.75	60	0.65	72	0.90	96	0.85
	* 32	0.40			* 48	0.425	* 62	0.40	74	0.70	98	0.70
									76	0.50	100	0.55
									* 78	0.30	*102	0.40
(17.00)	* 34	0.50	40	0.90	50	0.70	64	0.75	78	0.90	104	0.85
			* 42	0.50	* 52	0.375	* 66	0.50	80	0.70	106	0.70
									82	0.50	108	0.55
									* 84	0.30	*110	0.40
(18.50)	* 36	0.75	44	0.85	54	0.80	68	1.00	84	1.05	112	1.00
			* 46	0.45	* 56	0.475	70	0.75	86	0.85	114	0.85
							* 72	0.50	88	0.65	116	0.70
									* 90	0.45	118	0.55
											*120	0.40
(20.80)	38	1.40	48	1.20	58	1.30	74	1.40	90	1.60		
	40	0.90	50	0.80	60	0.98	76	1.15	92	1.40		
	* 42	0.40	* 52	0.40	62	0.65	78	0.90	94	1.20		
					* 64	0.325	80	0.65	96	1.00		
							* 82	0.40	98	0.80		
									100	0.60		
									*102	0.40		

Note ([1]) $D \leq 14.00 : Z_D \geq 0.10+b_{1nom}/2$, $D > 14.00 : Z_D \geq 0.20+b_{1nom}/2$

([2]) The recommended number of terminals in a package length is the maximum number in the package length, except package length D =12.50, 14.00 for the terminal pitch of e =0.40mm. Because they are adjusted with JEDEC. (See "*" in **Table 2**)
But, it is different from the number of the maximum terminals which is found by **Note ([1]).**

8.3 Number of terminal list

Table 3 Number of terminal list (Group 2)

e	1.00		0.80		0.65		0.50		0.40		0.30	
D	n	Z_D	n	Z_D	n	Z_D	n	Z_D	n	Z_D	n	Z_D
10.79	* 20	0.895	22	1.395	28	1.17	34	1.395	44	1.195	54	1.495
			24	0.995	30	0.845	36	1.145	46	0.995	56	1.345
			* 26	0.595	* 32	0.52	38	0.895	48	0.795	58	1.195
							* 40	0.646	50	0.595	60	1.045
									* 52	0.395	62	0.895
											64	0.745
											66	0.595
											68	0.445
											* 70	0.295
12.06	22	1.03	* 28	0.83	34	0.83	42	1.03	54	0.83	72	0.78
	* 24	0.53			* 36	0.505	44	0.78	56	0.63	74	0.63
							* 46	0.53	* 58	0.43	76	0.48
											* 78	0.33
13.33	* 26	0.665	30	1.065	* 38	0.815	48	0.915	60	0.865	80	0.815
			* 32	0.665			* 50	0.665	62	0.665	82	0.665
									* 64	0.465	84	0.515
											* 86	0.365
14.60	* 28	0.80	34	0.90	40	1.125	52	1.05	66	0.90	88	0.85
			* 36	0.50	* 42	0.8	54	0.80	68	0.70	90	0.70
							* 56	0.55	70	0.50	92	0.55
									* 72	0.30	* 94	0.40
15.87	* 30	0.935	* 38	0.735	44	1.11	58	0.935	74	0.735	96	0.885
					* 46	0.785	* 60	0.685	76	0.535	98	0.735
									* 78	0.335	100	0.585
											102	0.435
											*104	0.285
17.14	32	1.07	40	0.97	48	1.095	62	1.07	80	0.77	106	0.77
	* 34	0.57	* 42	0.57	* 50	0.77	64	0.82	82	0.57	108	0.62
							* 66	0.57	* 84	0.37	110	0.47
											*112	0.32
18.41	* 36	0.705	* 44	0.805	52	1.08	68	0.955	86	0.805	114	0.805
					* 54	0.755	* 70	0.705	88	0.605	116	0.655
									* 90	0.405	118	0.505
											*120	0.355
19.68	* 38	0.84	46	1.04	56	1.065	72	1.09	92	0.84		
			* 48	0.64	* 58	0.74	74	0.84	94	0.64		
							* 76	0.59	* 96	0.44		
20.95	* 40	0.975	* 50	0.875	60	1.05	78	0.975	98	0.875		
					* 62	0.725	* 80	0.725	100	0.675		
									*102	0.475		
22.22	42	1.11	52	1.11	64	1.035	82	1.11	104	0.91		
	* 44	0.61	* 54	0.71	* 66	0.71	84	0.86	106	0.71		
							* 86	0.61	*108	0.51		
									110	0.31		
23.49	* 46	0.745	56	0.945	68	1.02	88	0.995	112	0.745		
			* 58	0.545	* 70	0.695	* 90	0.745	114	0.545		
									116	0.345		
24.76	* 48	0.88	* 60	0.78	72	1.005	92	1.13	118	0.78		
					* 74	0.68	94	0.88	120	0.58		
							* 96	0.63				
26.03	50	1.015	62	1.015	76	0.99	98	1.015				
	* 52	0.515	* 64	0.615	* 78	0.665	100	0.765				
							*102	0.515				
27.30	* 54	0.65	* 66	0.85	80	0.975	104	0.90				
					* 82	0.65	*106	0.65				
28.57	* 56	0.785	68	1.085	84	0.96	108	1.035				
			* 70	0.685	* 86	0.635	*110	0.785				

Note (1) e = 1.00, 0.80, 0.65, 0.50 : $Z_D \geq 0.50$, e = 0.40, 0.30 : $Z_D \geq 0.20+b_{1nom}/2$

(2) The recommended number of terminals in a package length is the maximum number in the package length (D). (See "*" in **Table 3**)

8.3 Number of terminal list

Table 4 Number of terminal list (Group 3)

e	1.00		0.80		0.65		0.50		0.40		0.30	
D	n	Z_D	n	Z_D	n	Z_D	n	Z_D	n	Z_D	n	Z_D
13.25	* 24	1.125	26	1.825	32	1.75	40	1.875	52	1.625	66	1.825
			28	1.425	34	1.425	42	1.625	54	1.425	68	1.675
			* 30	1.025	36	1.10	44	1.375	56	1.225	70	1.525
					* 38	0.775	46	1.125	58	1.025	72	1.375
							48	0.875	60	0.825	74	1.225
							* 50	0.625	62	0.625	76	1.075
									* 64	0.425	78	0.925
											80	0.775
											82	0.625
											84	0.475
											* 86	0.325
14.50	* 26	1.25	32	1.25	40	1.075	52	1.00	66	0.85	88	0.80
			* 34	0.85	* 42	0.75	54	0.75	68	0.65	90	0.65
							* 56	0.50	* 70	0.45	92	0.50
											* 94	0.35
15.75	28	1.375	36	1.075	44	1.05	58	0.875	72	0.875	96	0.825
	* 30	0.875	* 38	0.675	* 46	0.725	* 60	0.625	74	0.675	98	0.675
									* 76	0.475	100	0.525
											*102	0.375
17.00	* 32	1.00	* 40	0.90	48	1.025	62	1.00	78	0.90	104	0.85
					* 50	0.70	64	0.75	80	0.70	106	0.70
							* 66	0.50	82	0.50	108	0.55
									* 84	0.30	*110	0.40
18.25	* 34	1.125	42	1.125	52	1.00	68	0.875	86	0.725	112	0.875
			* 44	0.725	* 54	0.675	* 70	0.625	88	0.525	114	0.725
									* 90	0.325	116	0.575
											118	0.425
											*120	0.275
19.50	* 36	1.25	* 46	0.95	56	0.975	72	1.00	92	0.75		
					* 58	0.65	74	0.75	94	0.55		
							* 76	0.50	* 96	0.35		
20.75	38	1.375	48	1.175	60	0.95	78	0.875	98	0.775		
	* 40	0.875	* 50	0.775	* 62	0.625	* 80	0.625	100	0.575		
									*102	0.375		
22.00	* 42	1.00	* 52	1.00	64	0.925	82	1.00	104	0.80		
					* 66	0.60	84	0.75	106	0.60		
							* 86	0.50	*108	0.40		
23.25	* 44	1.125	54	1.225	68	0.90	88	0.875	110	0.825		
			* 56	0.825	* 70	0.575	* 90	0.625	112	0.625		
									*114	0.425		
24.50	* 46	1.25	56	1.45	72	0.875	92	1.00	116	0.85		
			58	1.05	* 74	0.55	94	0.75	118	0.65		
			* 60	0.65			* 96	0.50	*120	0.45		
25.75	48	1.375	* 62	0.875	76	0.85	98	0.875				
	* 50	0.875			* 78	0.525	*100	0.625				
27.00	* 52	1.00	64	1.10	80	0.825	102	1.00				
			* 66	0.70	* 82	0.50	104	0.75				
							*106	0.50				
28.25	* 54	1.125	* 68	0.925	* 84	0.80	108	0.875				
							*110	0.625				
29.50	* 56	1.25	70	1.15	86	1.10	112	1.00				
			* 72	0.75	* 88	0.775	114	0.75				
							*116	0.50				
30.75	58	1.375	72	1.375	90	1.075	118	0.875				
	* 60	0.875	* 74	0.975	* 92	0.75	*120	0.625				

Note(1) e = 1.00, 0.80, 0.65, 0.50 : $Z_D \geq 0.50$, e = 0.40, 0.30 : $Z_D \geq 0.20+b_{1nom}/2$

(2) The recommended number of terminals in a package length is the maximum number in the package length (D). (See "*" in **Table 4**)

8.4 Standard Registration

When you need to register a new outline specification on the standard, complete the appendix format 5 in Technical Standardization Committee on Semiconductor Device Package steering rule, in compliance with the Standardization Rule. In order to make a package dimension table, which come sunder Item 2, Appendix format 5, fill the dimensions marked with (レ) in the following Table.

Incidentally, it supposes that it enters package code form type according to **EIAJ ED-7303A** (Name and Code for Integrated Circuits Package).

Table 5

Serial Number				
External Type		P-OSSOPOOO-OOOO×OOOO-O.OO (P-OSSOPOOO-OOOO-O.OO)		
Reference Symbol		min	nom	max
Group 1	D		レ	
	E		レ	
	A_2	レ	レ	レ
	A			レ
	A_1	レ	レ	レ
	A_3		レ	
	b_p	レ		レ
	b_1	レ	レ	レ
	c	レ		レ
	c_1	レ	レ	レ
	θ	レ	レ	レ
	H_E		レ	
	L_p	レ	レ	レ
	e		レ(*)	
	x			レ
	y			レ
	t			レ
	f			レ
	n		レ	
Group 2	Z_D		レ	
	L		レ	
	L_1		レ	
	eE		レ	
	G_{1E}		レ	

* : Means true geometrical position

9. STANDARD PACKAGE LIST

To further clarify the combinations of part dimensions, the combinations of recommended package classifications shall be indicated as shown below as assistance in the design and development of new packages in the future.

9.1 Relation of Package width E , Body height A_{2nom}

P-SSOP(terminal pitch e =1.00 -0.30)

Package width E			Body height A_{2nom}								Remark
Group 1	Group 2	Group 3	2.70	1.70	1.50	1.40	1.20	1.00	0.80	0.60	
3.00				*SSOP			*SSOP	*TSSOP	*VSSOP	*WSSOP	L/L1= 0.30/0.50
4.40											
5.60											
6.10											
	7.62					*LSSOP		TSOP2	VSOP2		L/L1= 0.50/1.00
(8.00)				*SSOP			*SSOP	*TSSOP	*VSSOP	*WSSOP	
	8.89					*LSSOP		TSOP2	VSOP2		L/L1= 0.50/1.00
(9.90)				*SSOP			*SSOP	*TSSOP	*VSSOP	*WSSOP	
	10.16							TSOP2	VSOP2		L/L1= 0.50/1.00
		11.50	**SSOP			*LSSOP		TSOP2 L/L1= 0.50/1.00	VSOP2 L/L1= 0.50/1.00		
		13.00									
		14.50									
		16.00									

*:L/L1=0.50/1.00

**:L/L1=0.80/1.60

	Seated height Amax	Remark
LSSOP	1.70	
TSSOP	1.20	(TSOP2)
VSSOP	1.00	(VSOP2)
WSSOP	0.80	(WSOP2)

P-SOP(terminal pitch e=1.27)

Nominal dimensions		Package width	Body height A_{2nom}					Remark
eE		E max	2.70	1.70	1.50	1.40	1.20	
225mil	5.72	4.72	SOP					L/L1=0.50/1.00
300mil	7.62	6.62						
375mil	9.53	8.13						L/L1=0.80/1.60
450mil	11.43	10.03						
525mil	13.24	11.94						
600mil	15.24	13.84						

9.2 Relation of SOP, SSOP with Package length D, Package width E

Package length D \ Package width E	2.00	3.00	4.00	5.00	6.00	7.00	8.00	9.00	10.00	11.00	12.00	13.00	14.00	15.00	16.00
2.00															
3.00															
4.00															
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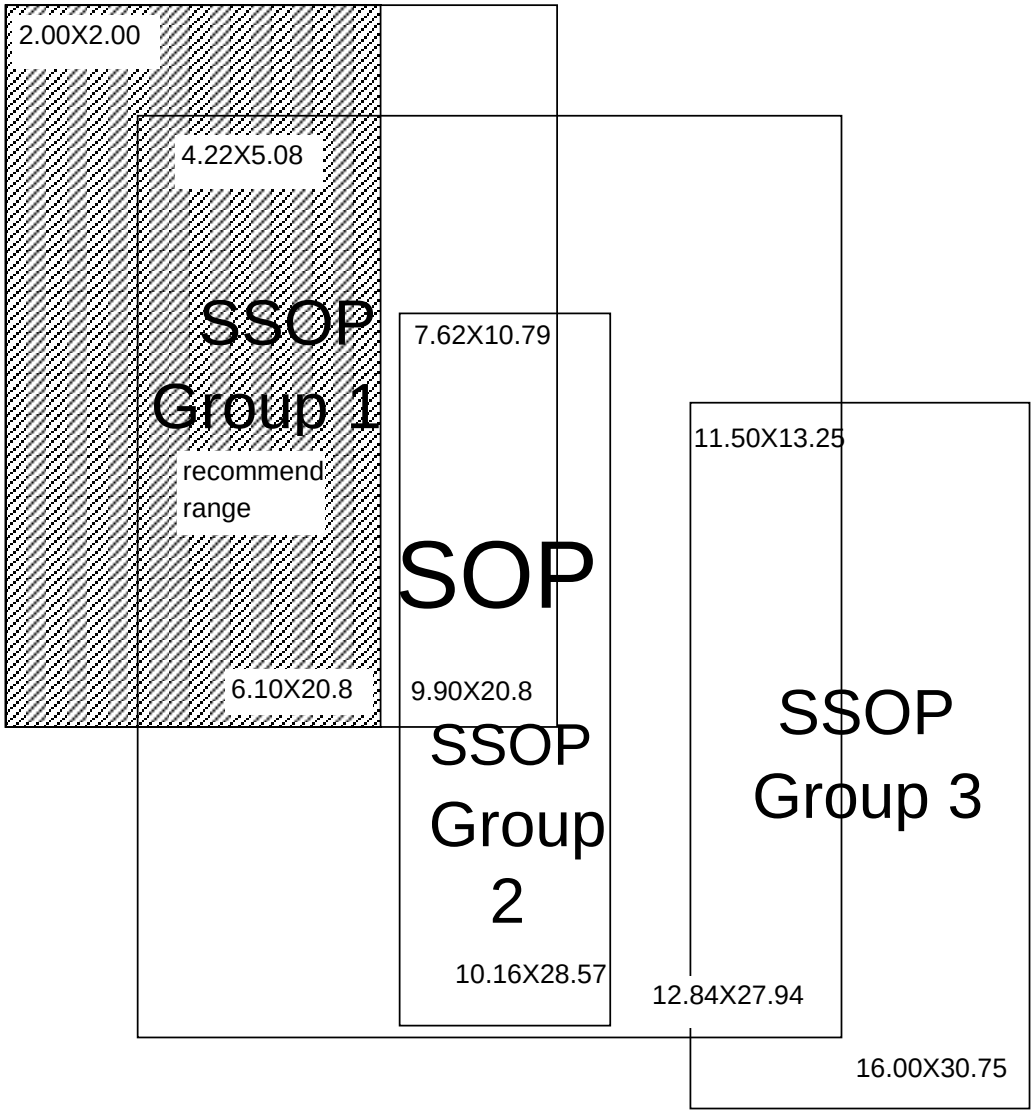


EIAJ EDR-7314A

Explanatory notes

1. PURPOSE

This technical report is intended to provide the industrial standards for shrink small outline packages(to be referred to as P-SSOP hereinafter) and the design guidelines in producing the P-SSOP and developing the automatic mounting machines and related parts.

2. PROGRESSES OF DELIBERATION

Along with a recent trend toward higher integration and higher function devices, larger dies and increase pin numbers have been requested, devices have been made smaller and lighter, and consequently, miniaturization of semiconductor packages is now indispensable. In order to meet these requests, the general rules for P-SSOP outlines, **EIAJ ED-7402-2**, were enacted and issued in February 1990 through deliberation by the Technical Committee on Semiconductor Package Outline (predecessor of Technical Standardization Committee on Semiconductor Device Package), apart from the conventional small outline packages (to be referred to as P-SOP hereinafter). After that, we examined the actually produced packages and found many inconsistencies with the general rules. Therefore, the P-SSOP General Rules Preparation Working Group in the Plastic Package Sub committee (predecessor of IC Package Sub Committee) revised them preponderantly since March 1992, and the revised rules, **EIAJ ED-7402-2A**, were enacted and issued in November 1993 through deliberation by the Special Technical Committee on Semiconductor Device Packages(predecessor of Technical Standardization Committee on Semiconductor Device Packages).

EIAJ ED-7402-2A was revised that an emphasis was placed on linking the package sizes to TSOP(2), main force of memory packages, as to large P-SSOP for memory which have been expected as future package line-up. This resulted in the general rules with two dimensional series; one is hard metric series (package width of less than 300 mil) considering actual package sizes based on the conventional **EIAJ ED-7402-2**, and soft metric series(package width of 300 mil or more) taking the thick TSOP(2) type as its concept.

Furthermore, in order to introduce postponed datum and coordinate with the JEDEC (Joint Electron Device Engineering Council) after enactment of the **EIAJ ED-7402-2A**, the Plastic Package Subcommittee(predecessor of IC Package Sub Committee) and P-SSOP Project Group started revision work since July 1995, putting emphases on review of proposed styles and clarification of location as design guide, considering standardization of the IEC(International Electro technical Commission) aiming at international standardization, as well as review of maximum number of terminals in each package length for the hard metric series and inclusion of 400 mil or more dimensions in the hard metric series for the soft metric series. And **EIAJ EDR-7314** was established in August 1996.

This technical report, **EIAJ EDR-7314A** is revised ,the revision which is in the package outline drawing form to have conformed to the IEC standard after considering a consistence with **EIAJ ED-7311-20**[Standard of integrated circuits package (P-SSOP)] which was established in December 2001 in IC Package Sub Committee.

Furthermore, it added new Seated height cord "V"(VSSOP(Very thin SSOP):Seated height A_{max}=1.00mm),and "W" (WSSOP(Very Very thin SSOP):Seated height A_{max}=0.80mm). Also, it added an equal to or less than 3.00 mm area, package width(E), the package length (D) which to think that is increased in by the production in the future. This technical report, **EIAJ EDR-7314A** is established in January 2002 in IC Package Sub Committee.

3. BASIC IDEA

(1) Datum

The datum and geometrical tolerances were adopted this technical report. In adopting the datum, we referred to the JEDEC standards for various packages, and registered packages. For the datum in package length, a point 0.10mm inside the terminal nose at the package center was set as datum target, sharing a tolerance for the terminal center position (X).

(2) Outer coating of the terminals

The terminal width and thickness, limited to solder plating. This technical report provides them for extremely thin plating such as palladium.

(3) Package outline drawing and Allowable range of soldering part of terminals

According to the IEC standard, As the rule with the terminal width (b_p) of Package outline drawing, it added to tolerance for terminal center position (X) and it gained means projected tolerance zone (P). It's meaning shows the range of the measurement object and guaranteeing the height of A_3 = 0.25. Also, it changes the symbol of Allowable range of soldering part of terminals into Terminal interval pitch(eE) from Overall width(H_E) and relation is eE = H_E – L_{pnom}.

4. BACKGROUND FOR DIMENSIONAL PROVISIONS

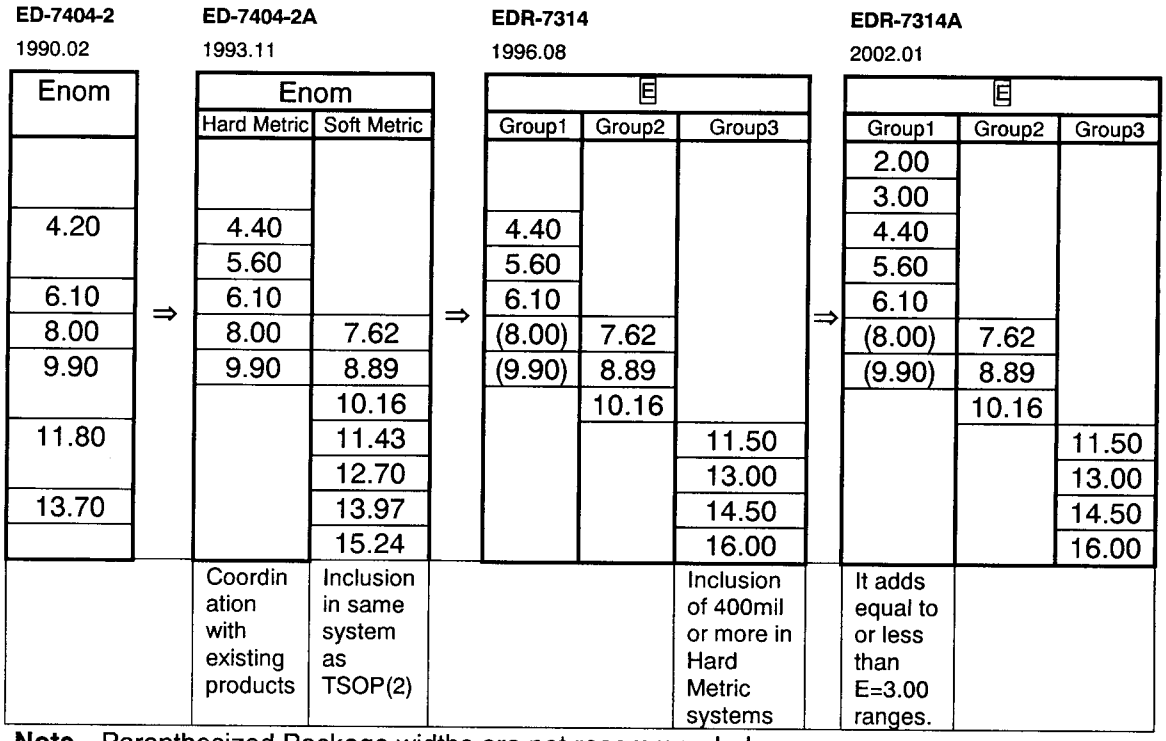
(1) Nominal dimensions

Package width X Package length(Symbol : E X D) is applied to Nominal dimensions. However as the exception, old nominal dimensions is possible to use places (side by side) and it writes which package width (Symbol : E).

(2) Package width (E)

There are two hard metric series of package widths and lengths, and one soft metric series. Each series was grouped and its combinations were limited within the same group. One of large size hard metric series is 400mil or more dimensions in the soft metric series in the old **EIAJ ED-7402-2A** newly changed to the hard metric series, as same as SOJ, TSOP(2).Although resin burr between the terminals does not directly affect an outer dimension, it must be 0.25mm at maximum on single side from a viewpoint of unification of specification with the JEDEC.

(3) Progresses of revisions Package width (Enom/ [E])



Note Parenthesized Package widths are not recommended

(4) Package length([D])

At **EIAJ EDR-7314**, along with new inclusion of nominal dimensions and package widths in the hard metric series, a new package length series was added for 400 mil or wider packages. Since the resin burr or remainder of gate at the end face directly affects an outer dimension, they must be 0.15mm at maximum on single side (same specification as the JEDEC).

EIAJ EDR-7314is added an equal to or less than 3.00 mm area, the package length ([D]) which to think that is increased in by the production in the future.

(5) Terminal width and thickness (b_p, b_1, c, c_1)

At **EIAJ EDR-7314**, In line with the QFP design guide, the minimum, normal, and maximum values for, [e] = 0.30 mm have been un-parenthesized. Also, the following ideas have been applied in order to deal with extremely thin plating (palladium) other than solder plating, for which a demand is expected to increase in the future.

Minimum value: A lower value for extremely thin plating has been adopted in orders to share the standards for solder plating and extremely thin plating.

$b_{pmin} = b_{1min}$, $c_{min} = c_{1min}$

Normal value: Divide because rough thickness values of solder plating and extremely thin plating differs from each other.

Solder plating: $b_{pnom} = b_{1nom} + 0.02$ (Plating thickness rough side 0.01)

$c_{nom} = c_{1nom} + 0.02$ (Plating thickness rough side 0.01)

Extremely thin plating: $b_{pnom} = b_{1nom}$, $c_{nom} = c_{1nom}$

Maximum value: A higher value for solder plating has been adopted in order to share the standards for solder plating and extremely thin plating.

[e] =1.00,0.80,0.65,0.50mm : Recommended values in **EIAJ EDR-7314**

[e] =0.40,0.30mm : Same values as QFP

Particularly, in case of [e] = 0.30mm for the terminal width (b_p), and c_{nom} = 0.15 or 0.10 for the terminal thickness (c), the values calculated with square root of sum of squares of material tolerance and plating tolerance was raised to 2-digit values below decimal point, considering the respective tolerances independent (in order to include the recommended values in **EIAJ EDR-7314**).

(6) Allowable value for the terminal center position (x) and co planarity of the terminal bottom face (y)

In order to coordinate as same SOP (Small Outline Package) type packages,

[e] = 1.00, 0.80, 0.65mm : the regular value have been adjusted to TSOP(2)

[e] = 0.50mm : the regular value has been coordinated with the JEDEC standard

[e] = 0.40, 0.30mm : the regular value have been coordinated QFP with gull wind lead

(7) Number of terminals(n)

This design guide has divided package lengths ([D]) into three groups, 1 through 3, according to the package width([E]) , and provided the minimum package overhangs for the respective groups to calculate the maximum number of terminals(= recommended number of terminals) in each package length. For Group1, part of the maximum numbers of terminals (= recommended numbers of terminals) differs from the maximum number of terminals calculated as described above, because it have been coordinated with the JEDEC standard.

In this design guide, the regular maximum number of terminals has been set to 120 obtained out of [e] = 0.50mm at maximum package length [D] = 30.75mm. This has been determined in order to maximally make use of the regular number of terminals at terminal linear spacing [e] = 0.50mm, which is the current mainstream, on the assumption that the SOP type package will not greatly exceed 100 pins for the moment.

(8) Package overhang(Z_D)

(a) Group1

This group, equivalent to a small package group, wants to take as many terminals as it can. Particularly in case of [D] $\leq$ 14.00mm, the distance from the terminal end at the package corner to the package end has been set to 0.10mm which is a currently possible physical limit value, and limited by;

$$Z_D \geq 0.10 + b_{1nom}/2$$

In case of [D] > 14.00mm, the distance from the terminal end at the package corner to the package end has been set to 0.20mm, considering chipping of the package, and limited by;

$$Z_D \geq 0.20 + b_{1nom}/2$$

(b) Group2, 3

Since the package width and length are the same as SOJ and TSOP(2), the number of terminals has been also limited in the same manner as in case of SOJ and TSOP(2), as far as [e]=1.00, 0.80,0.65 or 0.50mm. ($Z_D \geq$ 0.50mm) For the terminal linear spacing [e]= 0.40 or 0.30mm, which has not been provided in SOJ or TSOP(2), the same limitations as those in case of Group1, [D] > 14.00mm have been applied.

(9) Terminal flat section length, terminal length, and terminal soldering section length (L, L_1, L_p)

The old **EIAJ ED-7402-2A** uniformly provided "L/L_1 = 0.50/1.00" regardless of the package size, but later, installation strength was judged insufficient with the packages in the soft metric series(large package group). Therefore, only in case of the body height of A_2nom = 2.70mm where reduced installation strength was particularly pointed out at "L/L_1 =0.50/1.00," from old **EIAJ EDR-7314** has adopted "L/L_1 = 0.80/1.60" which has a good track record of installation strength.

EIAJ EDR-7314A

And this design guide **EIAJ EDR-7314A** is adopted "L/L_1 = 0.30/0.50" in the case below package width E =3.00mm, it corresponded to made smaller of a package.

Due to new introduction of soldering section length of Lp in the old **EIAJ ED-7402-2A** in line with the IEC format, the conventional terminal flat section length L has been changed from the foreign assurance value (dimension with tolerance) to the dimension used only for package design (dimension without tolerance), and so has the terminal length L_1 due to new introduction of the datum and geometrical tolerance in this design guide.

(10) Terminal first bent spacing (G_{1E})

From old **EIAJ EDR-7314** ,As with QFP, it was added nominal values of terminal first bent spacing for reference of test sockets and tray design.

5. PACKAGE NAMES

According to the package height code which was established in the **EIAJ ED-7303A** and IEC format, thin body type SSOP made the name which is with low seated height, It inewly added VSSOP (Very thin SSOP), WSSOP (Very Very thin SSOP) in addition to LSSOP (Low profile SSOP), TSSOP (Thin SSOP) from this design guide. Seated height (A) and (A_{2nom}) are shown below.

LSSOP(Low profile SSOP) :seated height A_{max}=1.70mm, A_{min} > 1.20mm, body height A_{2nom}=1.40mm
TSSOP(Thin SSOP) :seated height A_{max}=1.20mm, A_{min} > 1.00mm, body height A_{2nom}=1.00mm
VSSOP(Very thin SSOP) :seated height A_{max}=1.00mm, A_{min} > 0.80mm, body height A_{2nom}=0.80mm
WSSOP(Very Very thin SSOP) :seated height A_{max}=0.80mm, A_{min} > 0.65mm,
body height A_{2nom}=0.60mm

EIAJ EDR-7314A

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