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EIAJ EDR－7327

Design guideline of integrated circuits for Single Inline Package

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Prepared by

Technical Standardization Committee on Semiconductor Device Package

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Technical Report of Japan Electronics and Information Technology Industries Association

Design guideline of integrated circuits for Single Inline Package (SIP)

1. SCOPE OF APPLICATION

This technical report regulates outline drawings and dimensions of Plastic Single Inline Package (hereinafter referred to as SIP) whose terminal pitch is 2.54mm, and 17.78mm, among the packages classified as form C in **EIAJ ED-7300** (Recommended practice on General Rule for preparing standard outline drawings (integrated circuits) of semiconductor devices)

Note This technical report is the revised edition of **EIAJ ED-7413**.

2. TERMS

The definition of the terms used in this technical report complies with **EIAJ ED-7300**. New terms define in the description of this report.

3. BACKGROUND

This technical report intended to standardize the outer dimensions of SIP, and ensure compatibility between products. It shows the standard design values on concept of the design centers as far as possible for standardization.

4. DEFINISION OF SIP

SIP is classified as FORM C in item 6 “Out line classification of the semiconductor package” of **EIAJ ED-7300**, and defined a package with T/H terminals which are led out of the longer side of itself in single direction and which are perpendicular to the surface of a PCB.

5. NUMBER OF TERMINALS

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

6. NOMINAL DIMENSIONS

The dimension of package height × package length (Symbol: A2nom × D1nom) is applied to nominal dimensions.

7. REFERENCE CHARACTERS AND DRAWING

7.1 Outline Drawings

Figure 1

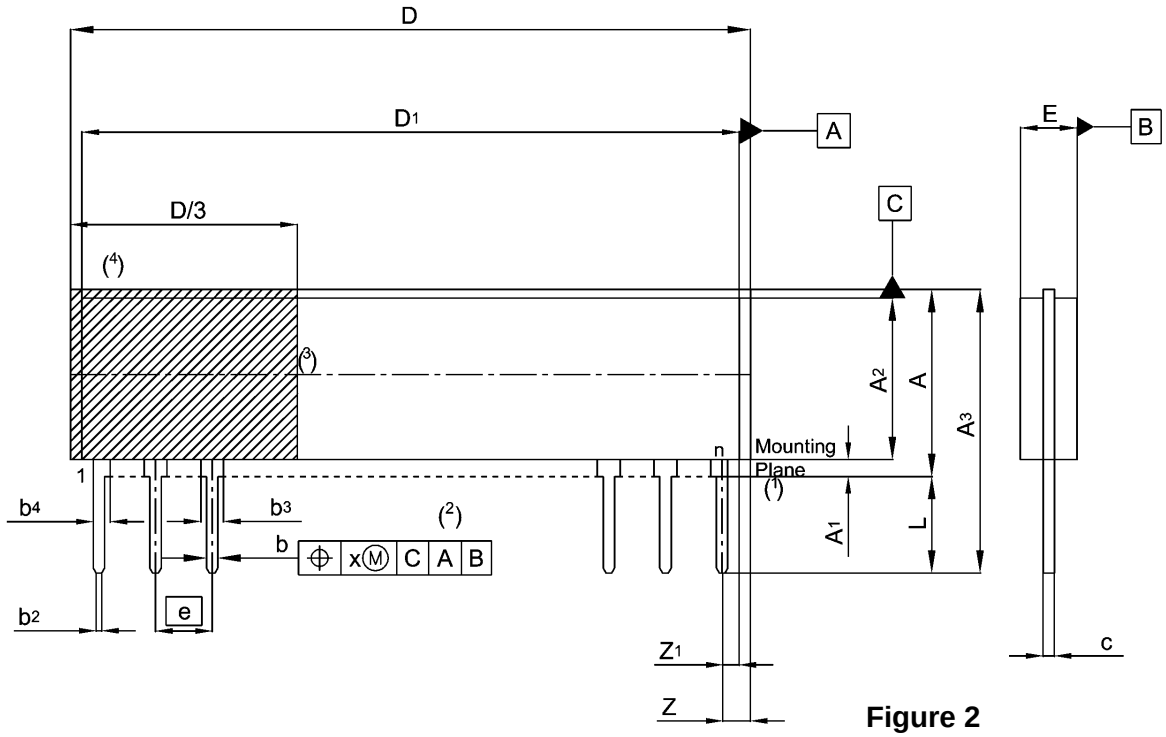
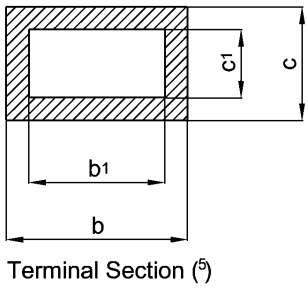


Figure 2



Terminal Section (5)

Note (1) The mounting plane is the dimension that determined when the pins are completely inserted in the holes that are sized ϕ0.8 ±0.05mm.

(2) The maximum material conditions apply to the positional tolerance of the terminals.

(3) The index mark indicates the pin NO.1. By the way, 1/2 or more of the area of this index mark must be contained within the hatched zone.

(4) The shape of the chamfer for visual index and mechanical index is arbitrary, by the shape shown in the figure below is recommended.

(5) The dimensions of terminal section apply to the ranges from 1.0mm to 1.5mm from the tip of terminals.

8. OUTER DIMENNSION

Table 1 below shows the standard dimension. Combination of the standard dimension shown below allow a number of package variation. IF packages are design newly, their dimensions shall be selected in the Table of Standard Package Dimension List in the Appendix.

8.1 Group 1

Table 1 **unit: mm**

Description	Symbol	Standard	Recommended Values	Remarks
Nominal Dimensions	$A_{2nom} \times D_{1nom}$	Package height A_{2nom} × Package length D_{1nom} is applied to Nominal dimensions		

A_{2nom}=4.58 e=2.54

n	$A_{2nom} \times D_{1nom}$	
	Z_{1nom}=0.889	Z_{1nom}=1.270
5	4.58 × 11.93	4.58 × 14.47
6	4.58 × 14.47	4.58 × 17.01
7	4.58 × 17.01	4.58 × 19.55
8	4.58 × 19.55	4.58 × 22.30
9	4.58 × 22.30	4.58 × 24.63
10	4.58 × 24.63	4.58 × 27.17
11	4.58 × 27.17	4.58 × 29.71
12	4.58 × 29.71	4.58 × 32.46
13	4.58 × 32.25	4.58 × 34.79
14	4.58 × 34.79	4.58 × 37.33

A_{2nom}=4.58 e=1.778

n	$A_{2nom} \times D_{1nom}$	
	Z_{1nom}=1.270	Z_{1nom}=2.159
5	4.58 × 9.65	4.58 × 11.43
6	4.58 × 11.43	4.58 × 13.20
7	4.58 × 13.20	4.58 × 14.98
8	4.58 × 14.98	4.58 × 16.76
9	4.58 × 16.76	4.58 × 18.54
10	4.58 × 18.54	4.58 × 20.32
11	4.58 × 20.32	4.58 × 22.09
12	4.58 × 22.09	4.58 × 23.87
13	4.58 × 23.87	4.58 × 25.65
14	4.58 × 25.65	4.58 × 27.43

A_{2nom}=7.12 e=2.54

n	$A_{2nom} \times D_{1nom}$	
	Z_{1nom}=0.889	Z_{1nom}=1.270
5	7.12 × 11.93	7.12 × 14.47
6	7.12 × 14.47	7.12 × 17.01
7	7.12 × 17.01	7.12 × 19.55
8	7.12 × 19.55	7.12 × 22.30
9	7.12 × 22.30	7.12 × 24.63
10	7.12 × 24.63	7.12 × 27.17
11	7.12 × 27.17	7.12 × 29.71
12	7.12 × 29.71	7.12 × 32.46
13	7.12 × 32.25	7.12 × 34.79
14	7.12 × 34.79	7.12 × 37.33

A_{2nom}=7.12 e=1.778

N	$A_{2nom} \times D_{1nom}$	
	Z_{1nom}=1.270	Z_{1nom}=2.159
5	7.12 × 9.65	7.12 × 11.43
6	7.12 × 11.43	7.12 × 13.20
7	7.12 × 13.20	7.12 × 14.98
8	7.12 × 14.98	7.12 × 16.76
9	7.12 × 16.76	7.12 × 18.54
10	7.12 × 18.54	7.12 × 20.32
11	7.12 × 20.32	7.12 × 22.09
12	7.12 × 22.09	7.12 × 23.87
13	7.12 × 23.87	7.12 × 25.65
14	7.12 × 25.65	7.12 × 27.43

A_{2nom}=9.66 e=2.54

N	$A_{2nom} \times D_{1nom}$	
	Z_{1nom}=0.889	Z_{1nom}=1.270
5	9.66 × 11.93	9.66 × 14.47
6	9.66 × 14.47	9.66 × 17.01
7	9.66 × 17.01	9.66 × 19.55
8	9.66 × 19.55	9.66 × 22.30
9	9.66 × 22.30	9.66 × 24.63
10	9.66 × 24.63	9.66 × 27.17
11	9.66 × 27.17	9.66 × 29.71
12	9.66 × 29.71	9.66 × 32.46
13	9.66 × 32.25	9.66 × 34.79
14	9.66 × 34.79	9.66 × 37.33

A_{2nom}=9.66 e=1.778

n	$A_{2nom} \times D_{1nom}$	
	Z_{1nom}=1.270	Z_{1nom}=2.159
5	9.66 × 9.65	9.66 × 11.43
6	9.66 × 11.43	9.66 × 13.20
7	9.66 × 13.20	9.66 × 14.98
8	9.66 × 14.98	9.66 × 16.76
9	9.66 × 16.76	9.66 × 18.54
10	9.66 × 18.54	9.66 × 20.32
11	9.66 × 20.32	9.66 × 22.09
12	9.66 × 22.09	9.66 × 23.87
13	9.66 × 23.87	9.66 × 25.65
14	9.66 × 25.65	9.66 × 27.43

Table 1 (continued) **unit: mm**

<table>
<tr><th>Description</th><th>Symbol</th><th>Standard</th><th>Recommended Values</th><th>Remarks</th></tr>
<tr><td>Seated hight</td><td>A</td><td>$A_{min}=A_{max}-1.27$
<table><tr><th>Nominal Dimension $A_2 \times D_1$</th><th>A_{min}</th><th>A_{max}</th></tr><tr><td>$4.58 \times D_1$</td><td>4.83</td><td>6.10</td></tr><tr><td>$7.12 \times D_1$</td><td>7.37</td><td>8.64</td></tr><tr><td>$9.66 \times D_1$</td><td>9.91</td><td>11.18</td></tr></table></td><td></td><td>A_{max} is included resin burrs.</td></tr>
<tr><td>Stand-off height</td><td>A_1</td><td>$A_{1min}= 0.51$
$A_{1max}=2.54$</td><td></td><td></td></tr>
<tr><td>Package height</td><td>A_2</td><td>$A_{2max}=A_{max}-0.51$
$A_{2min}=A_{min}-2.54$
<table><tr><th>Nominal Dimension $A_2 \times D_1$</th><th>A_{2min}</th><th>A_{2max}</th></tr><tr><td>$4.58 \times D_1$</td><td>3.56</td><td>5.59</td></tr><tr><td>$7.12 \times D_1$</td><td>6.10</td><td>8.13</td></tr><tr><td>$9.66 \times D_1$</td><td>8.64</td><td>10.67</td></tr></table></td><td>$A_{2nom}=4.58$
or
7.12
or
9.66</td><td>A_2 is not included resin burrs.</td></tr>
<tr><td>All Package height</td><td>A_3</td><td>$A_{3max}=A_{max}+L_{max}$
$A_{3min}=A_{min}+L_{min}$
<table><tr><th>Nominal Dimension $A_2 \times D_1$</th><th>A_{3min}</th><th>A_{3max}</th></tr><tr><td>$4.58 \times D_1$</td><td>8.84</td><td>9.91</td></tr><tr><td>$7.12 \times D_1$</td><td>11.18</td><td>12.45</td></tr><tr><td>$9.66 \times D_1$</td><td>13.72</td><td>14.99</td></tr></table></td><td></td><td></td></tr>
</table>

Table 1 (continued) **unit: mm**

<table>
<tr><th>Description</th><th>Symbol</th><th>Standard</th><th>Recommended Values</th><th>Remarks</th></tr>
<tr><td>Terminal width</td><td>b</td><td>b_{min} 0.40 | b_{max} 0.65</td><td>Solder Plating b_{nom}=0.52
Pd Plating b_{nom}=0.5</td><td></td></tr>
<tr><td></td><td>b_1</td><td>b_{1min} 0.40 | b_{1max} 0.65</td><td>b_{1nom}=0.5</td><td></td></tr>
<tr><td>Terminal end width</td><td>b_2</td><td>b_{2min} 0 | b_{2max} 0.45</td><td>b_{2nom}=0.25</td><td></td></tr>
<tr><td>Terminal shoulder width</td><td>b_3</td><td>b_{3min} 0.85 | b_{3max} 2.00</td><td>b_{3nom}=1.27</td><td></td></tr>
<tr><td></td><td>b_4</td><td>b_{4min} 0.85 | b_{4max} 2.00</td><td>b_{4nom}=1.0</td><td></td></tr>
<tr><td>Terminal thickness</td><td>c</td><td>c_{min} 0.20 | c_{max} 0.40</td><td>Solder P.c_{nom}=0.27
Pd Plating c_{nom}=0.25</td><td></td></tr>
<tr><td></td><td>c_1</td><td>C_{1min} 0.20 | C_{1max} 0.40</td><td>C_{1nom}=0.25</td><td></td></tr>
<tr><td>Terminal pitch</td><td>e</td><td>e=2.54
e=1.778</td><td></td><td></td></tr>
<tr><td>Package width</td><td>E</td><td>E_{max}=3.81</td><td>E_{nom}=2.80</td><td></td></tr>
<tr><td>Package length</td><td>D</td><td>$D_{max}=e\times(n-1)+2Z_{max}$
· e=2.54
n | D_{max} | n | D_{max}
5 | 15.24 | 10 | 27.94
6 | 17.78 | 11 | 30.48
7 | 20.32 | 12 | 33.02
8 | 22.86 | 13 | 35.56
9 | 25.40 | 14 | 38.10
· e=1.778
N | D_{max} | n | D_{max}
5 | 12.446 | 10 | 21.336
6 | 14.224 | 11 | 23.114
7 | 16.002 | 12 | 24.892
8 | 17.78 | 13 | 26.670
9 | 19.558 | 14 | 28.448</td><td>$D_{nom}=e\times(n-1)+2Z_{nom}$
e=2.54
n | D_{nom} Z_{nom}=0.991 | Z_{nom}=2.261 | | D_{nom} Z_{nom}=0.991 | Z_{nom}=2.261
5 | 12.142 | 14.682 | 10 | 24.842 | 27.382
6 | 14.682 | 17.222 | 11 | 27.382 | 29.922
7 | 17.222 | 19.762 | 12 | 29.922 | 32.462
8 | 19.762 | 22.302 | 13 | 32.462 | 35.002
9 | 22.302 | 24.842 | 14 | 35.002 | 37.542
e=1.778
 | D_{nom} Z_{nom}=1.372 | Z_{nom}=2.261 | | D_{nom} Z_{nom}=1.372 | Z_{nom}=2.261
5 | 9.856 | 11.634 | 10 | 18.746 | 20.524
6 | 11.634 | 13.412 | 11 | 20.524 | 22.302
7 | 13.412 | 15.190 | 12 | 22.302 | 24.080
8 | 15.190 | 16.969 | 13 | 24.080 | 25.858
9 | 16.968 | 18.746 | 14 | 25.858 | 27.636</td><td></td></tr>
<tr><td></td><td>D_1</td><td>$D_{1max}=e\times(n-1)+2Z_{1max}$</td><td>$D_{1nom}=e\times(n-1)+2Z_1nom$</td><td></td></tr>
</table>

Table 1 (continued) **unit: mm**

Description	Symbol	Standard	Recommended Values	Remarks
Positional tolelance of terminal	x	x=0.25		
Number of terminals	n	(a) Number of terminal are determined as follows. (b) The maximum number of pins that can be arranged within the cage body should be “n”. (c) The actual number of pins may be smaller than “n”. It must be remembered, however, that the first and the “n”th pins must exist without fail irrespective of the actual number of pins.		

8.2 Group 2

Table 2 **unit: mm**

Description	Symbol	Standard	Recommended Values	Remarks
Package overhang	Z	· e=2.54 Z_{max}=e Z_{max}=2.54 · e=1.778 Z_{max}=1.5 × e Z_{max}=2.667	Z_{nom}=0.991 or 2.261 Z_{nom}=1.372 or 2.261	
	Z_1	· e=2.54 Z_{1max}=e −0.203 Z_{1max}=2.337 · e=1.778 Z_1m_{ax}=1.5 × e −0.203 Z_{1max}=2.464	Z_{1nom}=0.889 or 2.159 Z_{1nom}=1.270 or 2.159	
Terminal length	L	L_{min}: 2.54; L_{max}: 3.90	L_{nom}=3.30	

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.

Table 2 STANDARD PACKAGE LIST

Nominal Dimensions Package height × Package length $A_{2nom} \times D_{1nom}$

n	A_{2nom}=4.58 e=2.54		A_{2nom}=4.58 e=1.778	
	Z_{1nom}=0.889	Z_{1nom}=1.270	Z_{1nom}=1.270	Z_{1nom}=2.159
5	4.58 × 11.93	4.58 × 9.65	4.58 × 9.65	4.58 × 11.43
6	4.58 × 14.47	4.58 × 11.43	4.58 × 11.43	4.58 × 13.20
7	4.58 × 17.01	4.58 × 13.20	4.58 × 13.20	4.58 × 14.98
8	4.58 × 19.55	4.58 × 14.98	4.58 × 14.98	4.58 × 16.76
9	4.58 × 22.30	4.58 × 16.76	4.58 × 16.76	4.58 × 18.54
10	4.58 × 24.63	4.58 × 18.54	4.58 × 18.54	4.58 × 20.32
11	4.58 × 27.17	4.58 × 20.32	4.58 × 20.32	4.58 × 22.09
12	4.58 × 29.71	4.58 × 22.09	4.58 × 22.09	4.58 × 23.87
13	4.58 × 32.25	4.58 × 23.87	4.58 × 23.87	4.58 × 25.65
14	4.58 × 34.79	4.58 × 25.65	4.58 × 25.65	4.58 × 27.43

Nominal Dimensions Package height × Package length $A_{2nom} \times D_{1nom}$

n	A_{2nom}=7.12 e=2.54		A_{2nom}=7.12 e=1.778	
	Z_{1nom}=0.889	Z_{1nom}=1.270	Z_{1nom}=1.270	Z_{1nom}=2.159
5	7.12 × 11.93	7.12 × 14.47	7.12 × 9.65	7.12 × 11.43
6	7.12 × 14.47	7.12 × 17.01	7.12 × 11.43	7.12 × 13.20
7	7.12 × 17.01	7.12 × 19.55	7.12 × 13.20	7.12 × 14.98
8	7.12 × 19.55	7.12 × 22.30	7.12 × 14.98	7.12 × 16.76
9	7.12 × 22.30	7.12 × 24.63	7.12 × 16.76	7.12 × 18.54
10	7.12 × 24.63	7.12 × 27.17	7.12 × 18.54	7.12 × 20.32
11	7.12 × 27.17	7.12 × 29.71	7.12 × 20.32	7.12 × 22.09
12	7.12 × 29.71	7.12 × 32.46	7.12 × 22.09	7.12 × 23.87
13	7.12 × 32.25	7.12 × 34.79	7.12 × 23.87	7.12 × 25.65
14	7.12 × 34.79	7.12 × 37.33	7.12 × 25.65	7.12 × 27.43

Nominal Dimensions Package height × Package length $A_{2nom} \times D_{1nom}$

n	A_{2nom}=9.66 e=2.54		A_{2nom}=9.66 e=1.778	
	Z_{1nom}=0.889	Z_{1nom}=1.270	Z_{1nom}=1.270	Z_{1nom}=2.159
5	9.66 × 11.93	9.66 × 14.47	9.66 × 9.65	9.66 × 11.43
6	9.66 × 14.47	9.66 × 17.01	9.66 × 11.43	9.66 × 13.20
7	9.66 × 17.01	9.66 × 19.55	9.66 × 13.20	9.66 × 14.98
8	9.66 × 19.55	9.66 × 22.30	9.66 × 14.98	9.66 × 16.76
9	9.66 × 22.30	9.66 × 24.63	9.66 × 16.76	9.66 × 18.54
10	9.66 × 24.63	9.66 × 27.17	9.66 × 18.54	9.66 × 20.32
11	9.66 × 27.17	9.66 × 29.71	9.66 × 20.32	9.66 × 22.09
12	9.66 × 29.71	9.66 × 32.46	9.66 × 22.09	9.66 × 23.87
13	9.66 × 32.25	9.66 × 34.79	9.66 × 23.87	9.66 × 25.65
14	9.66 × 34.79	9.66 × 37.33	9.66 × 25.65	9.66 × 27.43

10. STANDARD RESISTRATION

When you need to resister a new outline specification on the standard, complete the appendix format 5 in The Standardization Committee on Semiconductor Device Package steering rule, in compliance with the Standardization Rule.

In order to make a package dimension table, which comes under Item 2, Appendix format 5, fill the dimensions marked with (レ) in the following **Table 3**.

Table 3

Serial Number				
External Type		P–SIPOOO–OOOO×OOOO–O. OO		
Reference Symbol		min	nom	max
Gtoup 1	A	レ		レ
	A_1	レ		レ
	A_2	レ	レ	レ
	A_3	レ		レ
	b	レ		レ
	b_1	レ		レ
	b_2	レ		レ
	b_3	レ		レ
	b_4	レ		レ
	c	レ		レ
	c_1	レ		レ
	e		レ	
	E			レ
	D			レ
	D_1		レ	レ
	x			レ
	n		レ	
Gtoup 2	Z			レ
	Z_1			レ
	L	レ		レ

11. RERATED STANDARD

(1) EIAJ ET-9001 “Rules for the drafting and presentation of EIAJ Standards”

(2) EIAJ ED-7300 “Recommended practice on General Rules for the preparation of outline drawings of semiconductor packages”

(3) EIAJ ED-7301 “Manual for the standard of integrated circuits package”

(4) EIAJ ED-7302 “Manual for integrated circuits package design guide”

(5) EIAJ ED-7303 “Names and code for integrated circuits package”

EXPLANATORY NOTE

1. OBJECTIVES OF THE TECHNICAL REPORT

This technical report has been prepared to show the industry standard and offer design guideline when developing the Plastic Single Inline Package (hereinafter referred as SIP), and related parts.
Electronic Industries Association of Japan (EIAJ) and The Japan Electronic Development Association (JEIDA) have marged effective November 1,2000, the Japan Electronics and Information Technology Industries Association (JEITA).

2. HISTORY OF REVIEW

EIAJ ED-7413 would be abolished by the laps of ten years in 1999. Therefore, it was reviewed by Peripheral Package Subcommittee under " Technical Standardization Committee on Semiconductor Device Package" and was issued as design guideline.

3. KEY POINT FOR REVIEW

(1) Datum marking

The datum and geometrical tolerance were adopted from this technical report.

(2) Definitions of dimension

The recommended values in this technical report were adopted the values **EIAJ ED-7413** as far as possible. And a format was changed in according to **EIAJ ED-7302** "Manual for the Standard of integrated circuits package".

The dimension of package height × package length (Symbol: A2nom × D1nom)is applied to nominal dimensions. And terminal width before treatment (b1) and terminal thickness before treatment (c1) was newly shown and Pd plating is added.

(3) Standard package list

Standard package list was added in according to **EIAJ ED-7302**. The Package which were produced in 1999 were registered as standard packages.

(4) Standard registration

Standard registration list was added in according to **EIAJ ED-7302**.

4. Background for the respective dimensional rules

(1) Terminal width

b in **EIAJ ED-7413** meant terminal width after treatment so it was replaced to b_1 in this technical report. Terminal width before treatment was defined as b. Because terminal width before treatment (b_1) was added, b_1, b_2 in **EIAJ ED-7413** replace b_2, b_3 respectively. Pd plating was added to the exterior plating.

(2) Terminal thickness

c in the **EIAJ ED-7413** meant terminal thickness after treatment, so it replaced c_1 in this technical report. Terminal thickness before treatment was defined to as c. Pd plating was added to the exterior treatment. Solder dipping was deleted because of less possibility of adoption.

5. COMMITTEE MENBERS

This technical report has been discussed by the Peripheral Package Subcommittee of the Technical Standardization Committee on semiconductor Device Packages. The members are as shown below.

<Technical Standardization Committee on Semiconductor Device Packages>

Chairman	ELPIDA MEMORY, INC.	Ichiro Anjo

<Peripheral Package Subcommittee>

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