



Technical Report of Electronic Industries Association of Japan

***EIAJ EDR-7313***

**Design guideline of integrated circuits  
for Thin Small Outline Package (Type II)  
(TSOP(II))**

Established in April, 1996

Prepared by  
Technical Standardization Committee on Semiconductor Device Package

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**EIAJ Technical Report**  
**Design Guideline of Integrated Circuits**  
**for**  
**Thin Small Outline Package (Type II)**  
**(TSOP (II))**

**1. Scope of application**

This technical report applies to the outline drawings and dimensions of the thin small outline packages (type II) (hereinafter referred to as the TSOP (II)) which are classified as the form B under the EIAJ ED-7401A (Basic Items Related to the Rules for the Semiconductor Package Outline (Integrated circuits and Individual Semiconductors)).

**2. Terminology**

The terms used in this technical report shall conform to those defined in the EIAJ ED-7401A. The new terms not included therein shall be defined in the text of this report.

**3. History**

The "General Rules for the Outline of the Integrated Circuit" for the thin and small outline package (type II, hereinafter referred to as the TSOP (I)) was established as EIAJ ED-7402-3 in April, 1991 in order to cope with thin electronic equipment such as the memory card. However, since the leads were provided on the shorter side of the package with the TSOP (I), it was necessary to often increase the package size due to the electrode position of the LSI chip or size. Accordingly, the TSOP (II) was required in addition to the TSOP (I) that had the different lead outlet, which was established and issued as EIAJ ED-7402-4 in December, 1991.

This design guideline aims at the standardization of the outline dimensions to the fullest extent possible and to assure the compatibility among the respective products.

**4. Definition of the TSOP (I)**

A package that satisfies all the following requirements; the maximum mounting height of 1.20 mm, maximum linear distance of 1.27 mm between the pins, leads extending to the two directions from the longer sides of the package, and the leads with a flat surface extending toward outside to enable the SOJ bodysize package being mounted on the surface of the printed circuit board.

**5. Designation of the pin numbers**

The method to designate the pin numbers shall conform to the specifications included in the EIAJ ED-7401A.

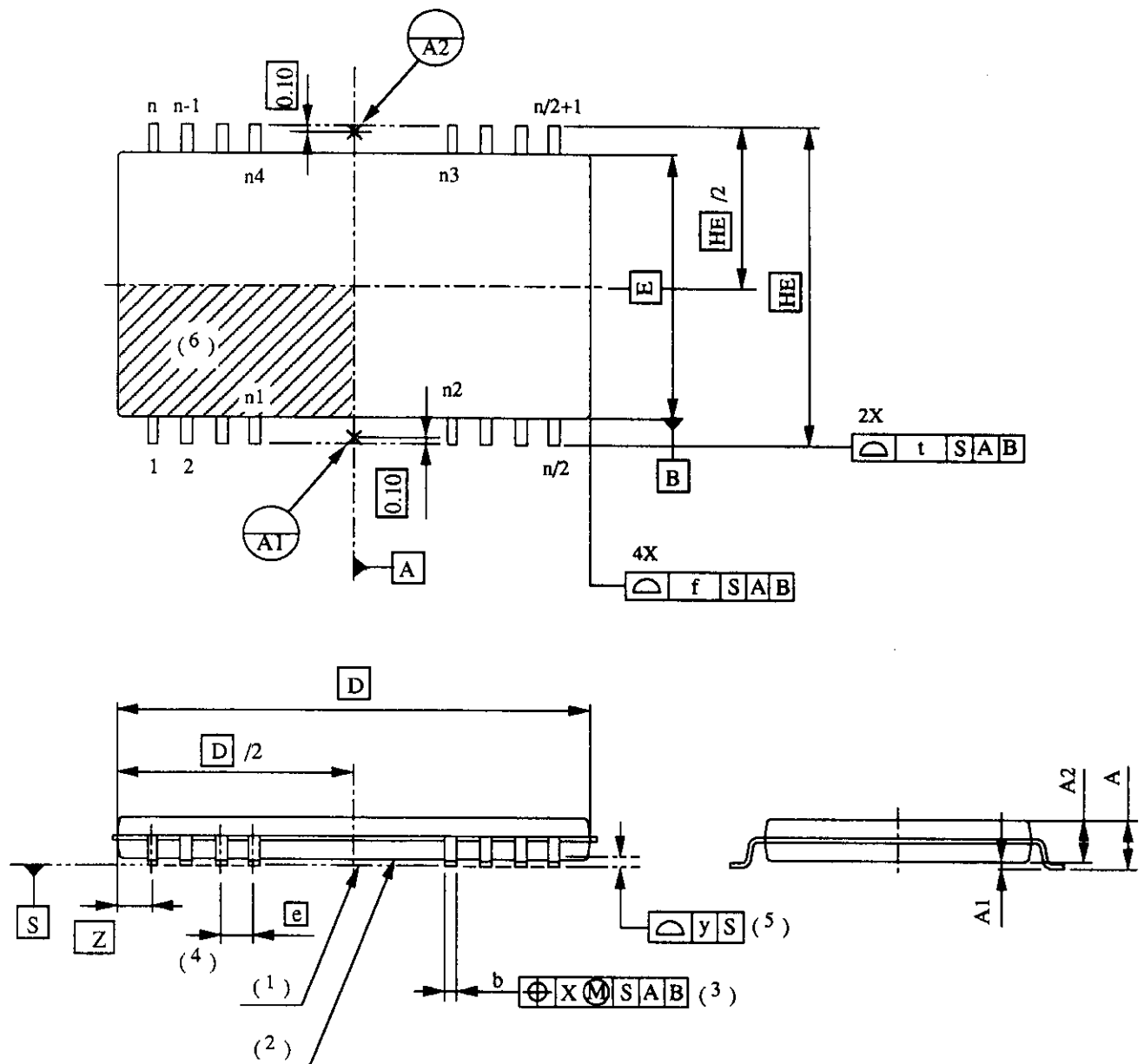
**6. Nominal dimensions**

The width dimensions of the package (Reference codes: E) shall be used as the nominal dimensions in this technical report.

## 7. REFERENCE CHARACTERS AND DRAWINGS

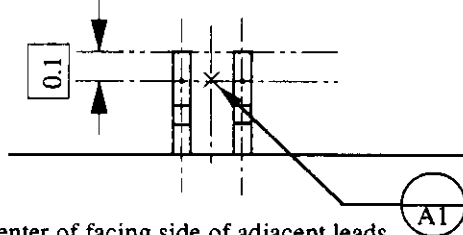
### 7.1 Outline drawings

Figure 1



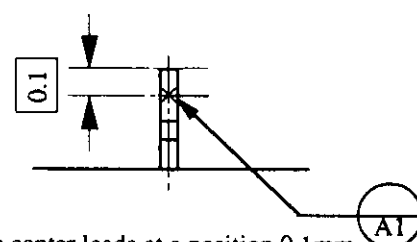
#### Definition of datum A

- (1) For even number of leads on package side.



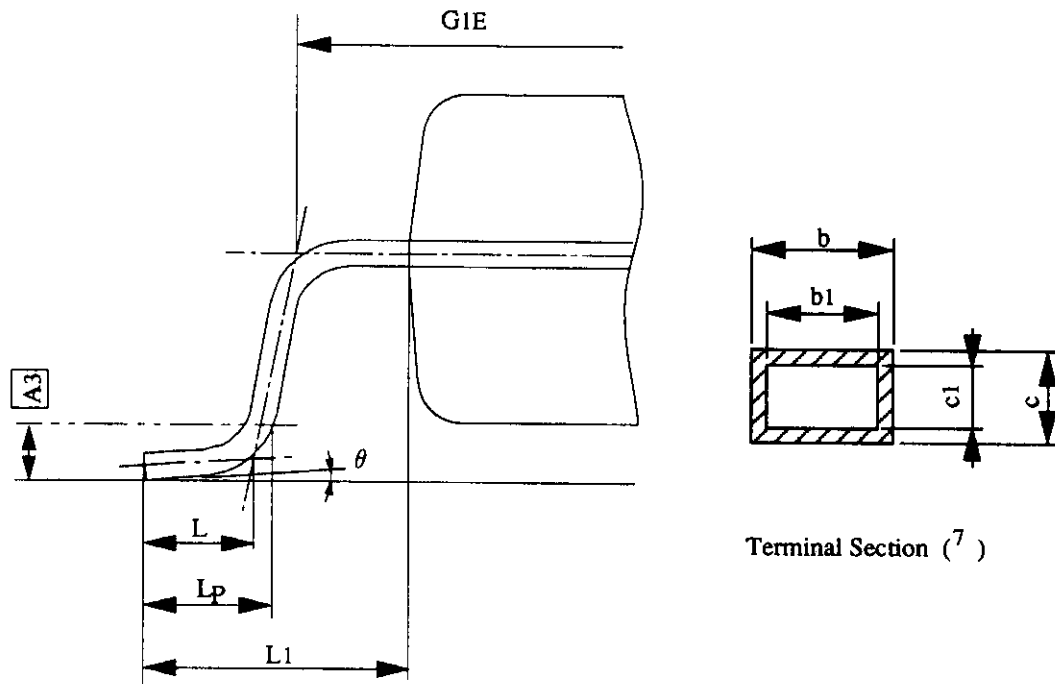
The center of facing side of adjacent leads at a position 0.1mm inside top of the leads.

- (2) For odd number of leads on a package side.



The center leads at a position 0.1mm inside top of leads.

Figure 2



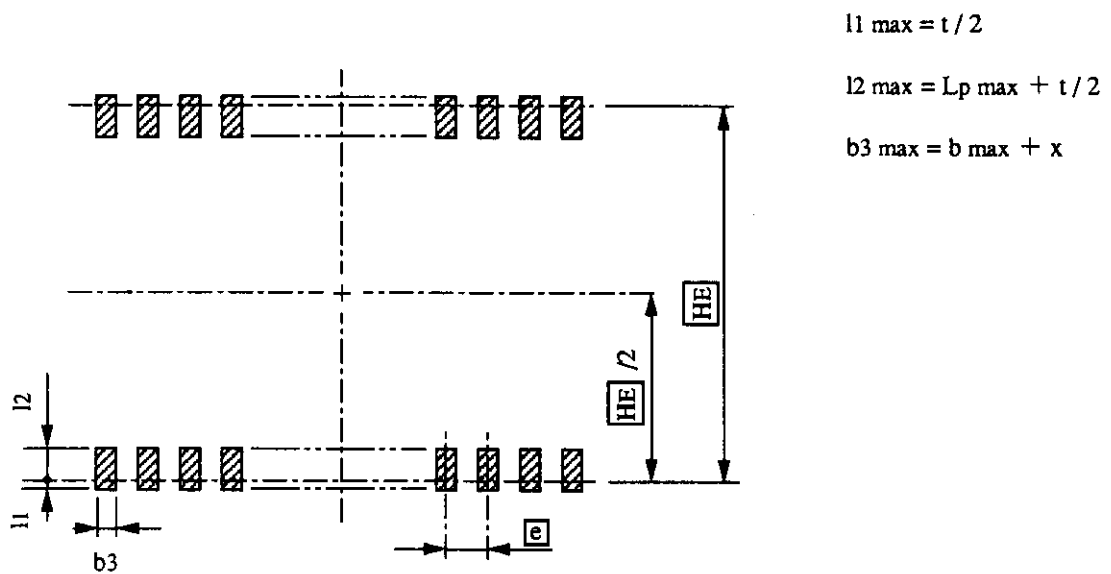
Terminal Section (7)

- Note
- (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 points, except the stand-off.
  - (3) The maximum mounting conditions apply to the positional tolerance of the terminals.  
(For the maximum body conditions, refer to ISO 2692/ JIS B 0023. )
  - (4) Specifies the true geometric position of the terminal axis.
  - (5) Specifies the vertical shift of the flat part of each terminal from the mounting surface.
  - (6) Shows the allowable position of the index mark, which must be included in the shaded area entirely.
  - (7) The dimensions of the terminal section apply to the ranges of 0.1mm and 0.25mm from the end of a terminal.

**REMARKS : RANGE WHERE TERMINALS TO BE SOLDERED EXIST**

The range where the terminals to be soldered can exit is shown in Figure 3 as reference for foot print design.

Figure 3



## 8. OUTER DIMENSION

8.1 Group 1

Table 1

Description	Symbol	Standard	Recommended Values	Remarks
Nominal dimensions	E	<p>a) Soft Metric</p> <p>E nom = 50mil × k</p> <p>k = 6,7,8</p> <p>E nom = 300mil 350mil 400mil</p> <p>b) Hard Metric</p> <p>E nom = 11.5 + 1.5 h</p> <p>h = 0,1,2,3</p> <p>E nom = 0115 0130 0145 0160</p>	_____	Less than 400mil are applied Soft Metric package. More than 11.50mm are applied Hard Metric package.
Package width	<div>E</div>	<div><div>E</div><div>7.62</div><div>8.89</div><div>10.16</div><div>11.50</div><div>13.00</div><div>14.50</div><div>16.00</div></div>	_____	(1) Mismatch of the upper and lower dies and resin burrs are not included. (2) It is recommended that upper and lower cavities be equal. If they are different, the larger dimension shall be regarded.
Package length	<div>D</div>	<p>a) Soft Metric</p> <p><div>D</div> = { (N/2-1) × <div>e</div> } + 2ZD nom</p> <p><div>e</div> = 1.27mm</p> <p>ZD nom = 0.95mm</p> <p>b) Hard Metric</p> <p><div>D</div> = { (N/2-1) × <div>e</div> } + 2ZD nom</p> <p><div>e</div> = 1.25mm</p> <p>ZD nom = 1.00mm</p>	_____	(1) Mismatch of the upper and lower dies and resin burrs are not included. (2) It is recommended that upper and lower cavities be equal. If they are different, the larger dimension shall be regarded. (3) Mold protrusion is less than 0.20mm.

Table 1 (Continued)

Unit mm

Description	Symbol	Standard	Recommended Values	Remarks						
Tolerance of package edge	f	(1) Tolerance of package edge shall be specified in the outline drawing. <div><div><div><div></div></div></div><div>f</div><div>S</div><div>A</div><div>B</div></div> (2) The symbol f shall be replaced with any of the values shown below. <div><div>f</div><div>0.20</div></div>	_____							
Package height	A2	<table><tr><td>min</td><td>nom</td><td>max</td></tr><tr><td>0.95</td><td>1.00</td><td>1.05</td></tr></table>	min	nom	max	0.95	1.00	1.05	_____	(1) Bend of package is included.
min	nom	max								
0.95	1.00	1.05								
Overall width	HE	<div>HE = E + 2L1 nom</div> <div>a) Soft Metric L1 nom = 0.80</div> <div>b) Hard Metric L1 nom = 1.00</div>	_____							
Seated height	A	<table><tr><td>min</td><td>nom</td><td>max</td></tr><tr><td></td><td></td><td>1.20</td></tr></table>	min	nom	max			1.20	_____	(1) Bend of package is included.
min	nom	max								
		1.20								
Stand-off height	A1	<table><tr><td>min</td><td>nom</td><td>max</td></tr><tr><td>0.05</td><td>0.10</td><td>0.15</td></tr></table>	min	nom	max	0.05	0.10	0.15	_____	
min	nom	max								
0.05	0.10	0.15								
Standard height of soldered points	A3	<div>A3 = 0.25</div>	_____							
Length of soldered part	Lp	<table><tr><td>min</td><td>nom</td><td>max</td></tr><tr><td>0.45</td><td>0.60</td><td>0.75</td></tr></table>	min	nom	max	0.45	0.60	0.75	_____	
min	nom	max								
0.45	0.60	0.75								

Table 1 (Continued)

Unit mm

Description	Symbol	Standard	Recommended Values	Remarks																																																																																										
Terminal width	b	<p>a) Soft Metric</p> <table><tr><th>e</th><th>min</th><th>nom</th><th>max</th></tr><tr><td>1.27</td><td>0.35</td><td></td><td>0.50</td></tr><tr><td>1.00</td><td>0.35</td><td></td><td>0.50</td></tr><tr><td>0.80</td><td>0.25</td><td></td><td>0.40</td></tr><tr><td>0.65</td><td>0.17</td><td></td><td>0.32</td></tr><tr><td>0.50</td><td>0.17</td><td></td><td>0.30</td></tr></table> <p>b) Hard Metric</p> <table><tr><th>e</th><th>min</th><th>nom</th><th>max</th></tr><tr><td>1.25</td><td>0.35</td><td></td><td>0.50</td></tr><tr><td>1.00</td><td>0.35</td><td></td><td>0.50</td></tr><tr><td>0.80</td><td>0.25</td><td></td><td>0.40</td></tr><tr><td>0.65</td><td>0.17</td><td></td><td>0.32</td></tr><tr><td>0.50</td><td>0.17</td><td></td><td>0.30</td></tr></table>	e	min	nom	max	1.27	0.35		0.50	1.00	0.35		0.50	0.80	0.25		0.40	0.65	0.17		0.32	0.50	0.17		0.30	e	min	nom	max	1.25	0.35		0.50	1.00	0.35		0.50	0.80	0.25		0.40	0.65	0.17		0.32	0.50	0.17		0.30	<p>a) Soft Metric</p> <table><tr><th>e</th><th colspan="2">b nom</th></tr><tr><th></th><th>Pb/Sn Solder plating</th><th>Pd plating</th></tr><tr><td>1.27</td><td>0.42</td><td>0.40</td></tr><tr><td>1.00</td><td>0.42</td><td>0.40</td></tr><tr><td>0.80</td><td>0.32</td><td>0.30</td></tr><tr><td>0.65</td><td>0.24</td><td>0.22</td></tr><tr><td>0.50</td><td>0.22</td><td>0.20</td></tr></table> <p>b) Hard Metric</p> <table><tr><th>e</th><th colspan="2">b nom</th></tr><tr><th></th><th>Pb/Sn Solder plating</th><th>Pd plating</th></tr><tr><td>1.25</td><td>0.42</td><td>0.40</td></tr><tr><td>1.00</td><td>0.42</td><td>0.40</td></tr><tr><td>0.80</td><td>0.32</td><td>0.30</td></tr><tr><td>0.65</td><td>0.24</td><td>0.22</td></tr><tr><td>0.50</td><td>0.22</td><td>0.20</td></tr></table>	e	b nom			Pb/Sn Solder plating	Pd plating	1.27	0.42	0.40	1.00	0.42	0.40	0.80	0.32	0.30	0.65	0.24	0.22	0.50	0.22	0.20	e	b nom			Pb/Sn Solder plating	Pd plating	1.25	0.42	0.40	1.00	0.42	0.40	0.80	0.32	0.30	0.65	0.24	0.22	0.50	0.22	0.20	<p>(1) b1 denotes the material width of a lead frame.</p> <p>(2) b denotes the width of a plated terminal.</p> <p>(3) b1 and b apply to the ranges of 0.1 and 0.25 from the end of a terminal.</p> <p>(4) Values b apply to Pb/Sn solder plated terminal. The standard thickness of the solder layer shall be 0.010+0.010 -0.005</p> <p>(5) As Pd platig, it is very thin so terminal width is b<sub>nom</sub>=b1<sub>nom</sub></p>
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Table 1 (Continued)

Unit mm

Description	Symbol	Standard	Recommended Values	Remarks																																																
Terminal thickness	c	<p>a) Soft Metric</p> <table><tr><th>e</th><th>min</th><th>nom</th><th>max</th></tr><tr><td>1.27</td><td>0.09</td><td></td><td>0.20</td></tr><tr><td>1.00</td><td>0.09</td><td></td><td>0.20</td></tr><tr><td>0.80</td><td>0.09</td><td></td><td>0.20</td></tr><tr><td>0.65</td><td>0.09</td><td></td><td>0.20</td></tr><tr><td>0.50</td><td>0.09</td><td></td><td>0.20</td></tr></table> <p>b) Hard Metric</p> <table><tr><th>e</th><th>min</th><th>nom</th><th>max</th></tr><tr><td>1.25</td><td>0.09</td><td></td><td>0.20</td></tr><tr><td>1.00</td><td>0.09</td><td></td><td>0.20</td></tr><tr><td>0.80</td><td>0.09</td><td></td><td>0.20</td></tr><tr><td>0.65</td><td>0.09</td><td></td><td>0.20</td></tr><tr><td>0.50</td><td>0.09</td><td></td><td>0.20</td></tr></table>	e	min	nom	max	1.27	0.09		0.20	1.00	0.09		0.20	0.80	0.09		0.20	0.65	0.09		0.20	0.50	0.09		0.20	e	min	nom	max	1.25	0.09		0.20	1.00	0.09		0.20	0.80	0.09		0.20	0.65	0.09		0.20	0.50	0.09		0.20	<p>(1) Pb/Sn Solder plating</p> <p>c nom = 0.170 0.145 0.120</p> <p>(2) Pd plating</p> <p>c nom = c1 nom</p>	<p>(1) c1 denotes the material width of a lead frame.</p> <p>(2) c denotes the width of a plated terminal.</p> <p>(3) c1 and c apply to the ranges of 0.1 and 0.25 from the end of a terminal.</p> <p>(4) Values c apply to Pb/Sn solder plated terminal. The standard thickness of the solder layer shall be 0.010+0.010-0.005</p> <p>(5) As Pd platig, it is very thin so terminal width is cnom = c1nom</p>
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Angle of terminal flat portions	θ	<table><tr><th>min</th><th>nom</th><th>max</th></tr><tr><td>0°</td><td>3°</td><td>8°</td></tr></table>	min	nom	max	0°	3°	8°	—																																											
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Terminal pitch	e	<p>May be selected from the following values :</p> <p>a) Soft Metric                      b) Hard Metric</p> <table><tr><td>e = 1.27</td><td>e = 1.25</td></tr><tr><td>1.00</td><td>1.00</td></tr><tr><td>0.80</td><td>0.80</td></tr><tr><td>0.65</td><td>0.65</td></tr><tr><td>0.50</td><td>0.50</td></tr></table>	e = 1.27	e = 1.25	1.00	1.00	0.80	0.80	0.65	0.65	0.50	0.50	—																																							
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Table 1 (Continued)

Unit mm

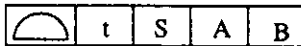
Description	Symbol	Standard	Recommended Values	Remarks																																																																																																					
Tolerance of terminal center position	x	<div>a) Soft Metric</div> <table><tr><th>e</th><th>x</th></tr><tr><td>1.27</td><td>0.25</td></tr><tr><td>1.00</td><td>0.20</td></tr><tr><td>0.80</td><td>0.16</td></tr><tr><td>0.65</td><td>0.13</td></tr><tr><td>0.50</td><td>0.10</td></tr></table> <div>b) Hard Metric</div> <table><tr><th>e</th><th>x</th></tr><tr><td>1.25</td><td>0.25</td></tr><tr><td>1.00</td><td>0.20</td></tr><tr><td>0.80</td><td>0.16</td></tr><tr><td>0.65</td><td>0.13</td></tr><tr><td>0.50</td><td>0.10</td></tr></table>	e	x	1.27	0.25	1.00	0.20	0.80	0.16	0.65	0.13	0.50	0.10	e	x	1.25	0.25	1.00	0.20	0.80	0.16	0.65	0.13	0.50	0.10	————	(1) The concept of the maximum mounting condition ( MMC ) shall be applied.																																																																													
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Coplanarity	y	<div>a) Soft Metric</div> <table><tr><th>e</th><th>y</th></tr><tr><td>1.27</td><td rowspan="5">0.10</td></tr><tr><td>1.00</td></tr><tr><td>0.80</td></tr><tr><td>0.65</td></tr><tr><td>0.50</td></tr></table> <div>b) Hard Metric</div> <table><tr><th>e</th><th>y</th></tr><tr><td>1.25</td><td>0.10</td></tr><tr><td>1.00</td><td>0.10</td></tr><tr><td>0.80</td><td>0.10</td></tr><tr><td>0.65</td><td>0.10</td></tr><tr><td>0.50</td><td>0.08</td></tr></table>	e	y	1.27	0.10	1.00	0.80	0.65	0.50	e	y	1.25	0.10	1.00	0.10	0.80	0.10	0.65	0.10	0.50	0.08	————																																																																																		
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Positional tolerance of terminal tips	t	<div>(1) The tolerance of the terminal tips shall be specified in the outline drawing.</div> <div></div> <div>(2) The character x shall be replaced with any of the values shown below.</div> <div><table><tr><td>t</td></tr><tr><td>0.20</td></tr></table></div>	t	0.20	————																																																																																																				
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Standard number of terminal	n	<div>a) Soft Metric</div> <table><tr><th rowspan="2">D</th><th colspan="5">e</th></tr><tr><th>1.27</th><th>1.00</th><th>0.80</th><th>0.65</th><th>0.50</th></tr><tr><td>10.79</td><td>16</td><td>20</td><td>26</td><td>32</td><td>40</td></tr><tr><td>12.06</td><td>18</td><td>24</td><td>28</td><td>36</td><td>46</td></tr><tr><td>13.33</td><td>20</td><td>26</td><td>32</td><td>38</td><td>50</td></tr><tr><td>14.60</td><td>22</td><td>28</td><td>36</td><td>42</td><td>56</td></tr><tr><td>15.87</td><td>24</td><td>30</td><td>38</td><td>46</td><td>60</td></tr><tr><td>17.14</td><td>26</td><td>34</td><td>42</td><td>50</td><td>66</td></tr><tr><td>18.41</td><td>28</td><td>36</td><td>44</td><td>54</td><td>70</td></tr><tr><td>19.68</td><td>30</td><td>38</td><td>48</td><td>58</td><td>76</td></tr><tr><td>20.95</td><td>32</td><td>40</td><td>50</td><td>62</td><td>80</td></tr><tr><td>22.22</td><td>34</td><td>44</td><td>54</td><td>66</td><td>86</td></tr><tr><td>23.49</td><td>36</td><td>46</td><td>58</td><td>70</td><td>90</td></tr><tr><td>24.76</td><td>38</td><td>48</td><td>60</td><td>74</td><td>96</td></tr><tr><td>26.03</td><td>40</td><td>52</td><td>64</td><td>78</td><td>102</td></tr><tr><td>27.30</td><td>42</td><td>54</td><td>66</td><td>82</td><td>106</td></tr><tr><td>28.57</td><td>44</td><td>56</td><td>70</td><td>86</td><td>112</td></tr></table>	D	e					1.27	1.00	0.80	0.65	0.50	10.79	16	20	26	32	40	12.06	18	24	28	36	46	13.33	20	26	32	38	50	14.60	22	28	36	42	56	15.87	24	30	38	46	60	17.14	26	34	42	50	66	18.41	28	36	44	54	70	19.68	30	38	48	58	76	20.95	32	40	50	62	80	22.22	34	44	54	66	86	23.49	36	46	58	70	90	24.76	38	48	60	74	96	26.03	40	52	64	78	102	27.30	42	54	66	82	106	28.57	44	56	70	86	112	————	<div>The number of terminals are set as follows:</div> <div><math>e = 1.27</math></div> <div>The maximum number of terminals on assumption that <math>Z = 0.95</math></div> <div><math>e = 1.00/0.80</math> 0.65/0.50</div> <div>The maximum number of terminals on assumption that <math>Z = 0.50</math></div>
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27.30	42	54	66	82	106																																																																																																				
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Table 2 (Continued)

Unit mm

Description	Symbol	Standard	Recommended Values	Remarks				
Standard number of terminal	n	b) Hard Metric					The nominal body overhang must be :  <div><div><div>e</div>= 1.25</div><div><div>Z</div>=1.00</div></div> <div><div>e</div>= 1.00</div> <div><div>Z</div>≥0.80</div> <div><div>e</div>= 0.80</div> <div><div>Z</div>≥0.65</div> <div><div>e</div>= 0.65</div> <div><div>Z</div>≥0.50</div> <div>0.50</div>	
		<div>D</div>	<div>Terminal Pitch</div>					
			<div>1.25</div>	<div>1.00</div>	<div>0.80</div>	<div>0.65</div>		<div>0.50</div>
		13.25	20	24	30	38		50
		14.50	22	26	34	42		56
		15.75	24	30	38	46		60
		17.00	26	32	40	50		66
		18.25	28	34	44	54		70
		19.50	30	36	46	58		76
		20.75	32	40	50	62		80
		22.00	34	42	52	66		86
		23.25	36	40	56	70		90
		24.50	38	46	60	74		96
		25.75	40	50	62	78		100
		27.00	42	52	66	82		106
		28.25	44	54	68	84		110
		29.50	46	56	72	88		116
		30.75	48	60	74	92		120

## 2. Group 2

Table 2 (Continued)

Unit mm

Description	Symbol	Standard	Recommended Values	Remarks												
Width between first bent part of terminal	G1E	<div>a) Soft Metric</div> <table><tr><td>L1 nom</td><td>G1E nom</td></tr><tr><td>0.80</td><td><div>E</div> + 0.40</td></tr></table> <div>b) Hard Metric</div> <table><tr><td>L1 nom</td><td>G1E nom</td></tr><tr><td>1.00</td><td><div>E</div> + 0.80</td></tr></table>	L1 nom	G1E nom	0.80	<div>E</div> + 0.40	L1 nom	G1E nom	1.00	<div>E</div> + 0.80	—	(1) Used for designing a test socket, tray,etc.				
L1 nom	G1E nom															
0.80	<div>E</div> + 0.40															
L1 nom	G1E nom															
1.00	<div>E</div> + 0.80															
Package over hang	<div>Z</div>	<div>Z</div> = ( <div>D</div> - ( n/2 - 1 ) × <div>e</div> ) / 2	—	(1) Resin burrs or residual gates are not included.												
Length of flat part of terminal	L	<table><tr><td>min</td><td>nom</td><td>max</td></tr><tr><td></td><td>0.50</td><td></td></tr></table>	min	nom	max		0.50		—							
min	nom	max														
	0.50															
Terminal length	L1	<div>a) Soft Metric</div> <table><tr><td>min</td><td>nom</td><td>max</td></tr><tr><td></td><td>0.80</td><td></td></tr></table> <div>b) Hard Metric</div> <table><tr><td>min</td><td>nom</td><td>max</td></tr><tr><td></td><td>1.00</td><td></td></tr></table>	min	nom	max		0.80		min	nom	max		1.00		—	
min	nom	max														
	0.80															
min	nom	max														
	1.00															

### 9. Individual standard

The format for the individual standard is shown below. The format shown below shall be used when a TSOP (I) package is to be proposed, established, or issued as an individual standard.

Serial Nuber				
External Type.		TSOP(II) XXX - P - XXXX - X.XX		
Reference Symbol		min	nom	max
Group 1	<span style="border: 1px solid black;">E</span>		✓	
	A2	✓	✓	✓
	f			✓
	<span style="border: 1px solid black;">HE</span>		✓	
	A			✓
	A1	✓	✓	✓
	<span style="border: 1px solid black;">A3</span>		✓	
	Lp	✓		✓
	b	✓		✓
	b1	✓	✓	✓
	c	✓		✓
	c1	✓		✓
	$\theta$	✓	✓	✓
	<span style="border: 1px solid black;">e</span>		✓	
	x			✓
	y			✓
	t			✓
	n		✓	
	n1		✓	
	n2		✓	
	n3		✓	
	n4		✓	
Group 2	G1E		✓	
	<span style="border: 1px solid black;">Z</span>		✓	
	L		✓	
	L1		✓	

## **Explanatory notes**

### **1. Purpose of establishment**

This technical report is established to show the design guideline when developing the industry norms and related parts for the thin small outline package type (II) (hereinafter referred to as the TSOP (II)), which is a revision of the EIAJ ED-7402-4A.

### **2. History of the review**

EIAJ ED-7402-3 has been standardized and being used for the thin and small outline package (type I) (hereinafter referred to as the TSOP (I)) for the outline of the integrated circuits to cope with thin electronic equipment such as the memory card. However, the needs for the TSOP (II) arose due to the popularization of the memory card for which it was difficult to cope with the TSOP (I).

Accordingly, a proposal to standardize the TSOP (II) was made at the first Semiconductor Outline Committee (the antecedent of the Semiconductor Package Special Committee) meeting held in 1989, and a decision was made at the same meeting to include it in the business plan for the year. As the result, a draft for the general rules was submitted by the secretary company at the second Committee meeting to commence the review thereof.

In addition, the basic dimensions, including the adoption of the nominal width as the package width, were decided in addition to the approval of the basic philosophy at the same Committee meeting.

After the reviews stated above, the final draft was approved by the ninth Semiconductor Outline Committee meeting held in 1989, which was later established and issued as the EIAJ ED-7402-4.

Thereafter, however, it was pointed out at the second Semiconductor Package Special Committee (the antecedent of Plastic Package Subcommittee) that the EIAJ ED-7402-4 established in February, 1990 was not sufficient due to the expansion in the TSOP (II) products. Accordingly, the draft was reviewed and discussed by the Plastic Package Subcommittee (the antecedent of the Plastic Package Subcommittee) meeting, approved by the ninth Semiconductor Package Special Committee meeting held in December, 1991, and issued as the EIAJ ED-7402-4A. However, since the inconsistency between the standard and the general rules became notable due to the diversifications and increased demands for the package, a proposal was made to review the standard at the seventeenth Semiconductor Package Special Committee meeting, which was decided to be reviewed by the Plastic Package Subcommittee.

Upon revision of the standard, the actual reviews were made by the Plastic Package Subcommittee (the antecedent of the Semiconductor Package Standardization Committee) newly started in April, 1995 based on the positioning of the design guideline newly established in the same period. Thereafter, the final draft of the standard was approved by the Semiconductor Package Standardization Committee during the review made in March, 1996, which was established and issued as a new design guideline.

### **3. Background for the dimensional specifications**

**3.1 Basic philosophy:** Considerations are made to assure the consistency with the JEDEC upon the revision of the standard, and to clarify its objectives being as the design guideline.

### 3.2 Dimensional background

(1) Nominal dimension and package width (E): These dimensions were decided based on the SOJ package which is compatible as the memory package. At the EIA/EIAJ/JWG2 (the technical association conference with the JEDEC) held at Kobe in May, 1993, a proposal was made by the JEDEC to adopt the hard metric group (0 or 5 at the second digit after the decimal point) as the package width for the SOJ packages. After the repeated reviews made by the EIAJ, a decision was made to adopt the hard metric group for the packages exceeding 400 mils in the width during the EIA/EIAJ task force meeting held at San Francisco in November. Then, the EIAJ made a proposal to lineup the TSOP (II) in the same philosophy as that of the SOJ at the EIA/EIAJ/JWG2 (San Diego conference) held in June, 1995, which was approved at the conference. Accordingly, the soft metric group (millimeter value converted from the inch value) is conventionally specified for the packages up to 400 mils in width and the hard metric group for those with the width of greater than 400 mils.

(2) Package length (D) and (D1): The package length (D) is calculated in order to cope with the fixed body and variable pitch. The calculation is made either using  $e = 1.27$  mm as the datum for the soft metric group or  $e = 1.25$  mm for the hard metric group which was decided at the above mentioned conference.

(3) Mounting height (A): The specification for the maximum mounting height was changed from 1.27 mm to 1.20 mm in view of the fact that the package is also used for the IC cards of JEIDA (Japan Electronic Industry Development Association) standard.

(4) Linear pin distance:  $e = 0.50$  mm was added to cope with the increased pin quantity. In addition, the linear pin distance of  $e = 1.25$  mm was adopted in place of  $e = 1.27$  mm for the hard metric group.

(5) Pin widths (b) and (b1): With regard to the surface treatment of the pin, the palladium plating (hereinafter referred to as the Pd plating) was added to the conventional solder plating which was believed to increase in the future. The "b nom" specification after the surface treatment was set to the target value of 0.01 mm for the solder plating, and the same nominal width as that of the lead frame material was adopted since the plating thickness of the Pd was as small as a few micron meters.

(6) Pin thicknesses (c) and (c1): After the review, it was noted that it was difficult to standardize the nominal pin thickness due to the actual results and variety of know-how possessed among the respective manufacturers. Accordingly, only the minimum and maximum values were specified for both c and c1.

(7) Pin length (L1), soldered length (LP), and flat pin length (L): The nominal dimension L1 of 1.00 mm was adopted for the hard metric group in view of the solderability to the board. The nominal Lp dimension of 0.60 mm was adopted which was recommended by the JEDEC. Only the nominal values were specified for L and L1 in view of the fact that the package is designed based on the Lp dimension.

#### 4. Members of discussion

This technical report has been discussed by the Prastic Package Subcommittee of Technical Standardization Committee on Semiconductor Device Package and QFP project group. The members are as shown below.

< Technical Standardization Committee on Semiconductor Device Package >  
Chairman : Hisao Kasuga                      NEC Corp.

< Prastic Package Subcommittee >

Chief :	Yasushi Otsuka	Sony Corp.
Sub-chief :	Masanori Yoshimoto	Fujitsu Ltd.
member :	Tsutomu Kashiwagi	ENPLAS Corp.
	Etsuo Yamada	OKI Electric Industry Co. , Ltd.
	Ahn Ki John	Samsung Electronics Japan Co., Ltd.
	Hideyuki Iwamura	SANYO Electric Co. , Ltd.
	Katsuyuki Tarui	SHARP Corp.
	Hideto Odagiri	SUMITOMO 3M Ltd.
	Akinori Hara	SEIKO EPSON Corp.
	Toshihiko Nojiri	Sony Corp.
	Toshiharu Sakurai	Toshiba , Corp.
	Kenji Kanesaka	Nippon Steel Semiconductor Corp.
	Masayuki Yoshida	IBM Japan , Ltd.
	Tsukasa Ito	AMP Japan , Ltd.
	Morio Nakao	Texas Instruments Japan Ltd.
	Koichi Takekawa	NEC Corp.
	Nobuo Sato	Nippon Motorola Ltd.
	Hideki Tanaka	Hitachi , Ltd.
	Osamu Hirohashi	Fuji Electric Co., Ltd.
	Shigeki Sakaguchi	Matsushita Electronics Corp.
	Yasuhito Suzuki	MITSUBISHI Electric Corp.
	Nanahiro Hayakawa	Yamaichi Electronics Co. , Ltd.
	Junji Ishida	Unitechno Inc.
	Hiromori Okumura	Rohm Co., Ltd.