EIAJ EDR-7311A

JEITA

Technical Report of Japan Electronics and Information Technology Industries Association

EIAJ EDR-7311A

Design guideline of integrated circuits for Plastic Quad Flat Package (P-QFP)

Established in April, 1996
Revised in April, 2002

Prepared by
Technical Standardization Committee on Semiconductor Device Package

Published by
Japan Electronics and Information Technology Industries Association

11, Kanda-Surugadai 3-chome, Chiyoda-ku, Tokyo 101-0062, Japan
Printed in Japan

Translation without guarantee in the event of any doubt arising, the original standard in Japanese is to be evidence.

JEITA standards are established independently to any existing patents on the products, materials or processes they cover.
JEITA assumes absolutely no responsibility toward parties applying these standards or toward patent owners.

EIAJ EDR-7311A

Japan Electronics and Information Technology Industries Association

Design guideline of integrated circuits for Plastic Quad Flat Package (P-QFP)

1. SCOPE OF APPLICATION

This technical report regulated outline drawings and dimensions of the Plastic Quad Flat Package (hereinafter referred to as P-QFP), which 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), especially plastic packages whose terminal pitch e is 0.30(mm) to 1.00(mm).

Note: This technical report corresponds to **EIAJ ED-7311A** (Standard of integrated circuits package (P- QFP)) established in May 1997, revised in April 2002.

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 appliances become smaller and their functions are diversified, and the terminals integrated circuits increase. On such background, P-QFP is increasing rapidly. Moreover, LQFP which package seated height (A) is equal to or less than 1.70mm, and TQFP which package seated height (A) is equal to or less than 1.20mm and so on, become the mainstream of the development and the production because it corresponds to become electronic equipment thinner. This standard intended to standardize the outer dimensions of P-QFP and ensure compatibility between products as far as possible for standardization.

4. DEFINITION OF P-QFP

P-QFP is defined as Form B with L terminal in the item 6, “Outline classification of shapes of semiconductor package “ at **EIAJ ED-7300**, and whose terminal pitch e is 0.30(mm) to 1.00(mm). P-QFP is defined a package with formed terminals which are led out of itself in 4 directions and are flat toward the outside in junctions outside the package body (gull wing shape lead) for mounting on Print Circuit Board surface.

5. NUMBERING OF TERMINALS

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

6. NOMINAL DIMENSIONS

Width X Package length(Symbol : E X D) is applied to Nominal Dimensions.

7. REFERENCE CHARACTERS AND DRAWINGS

7.1 Outline drawings

Figure 1

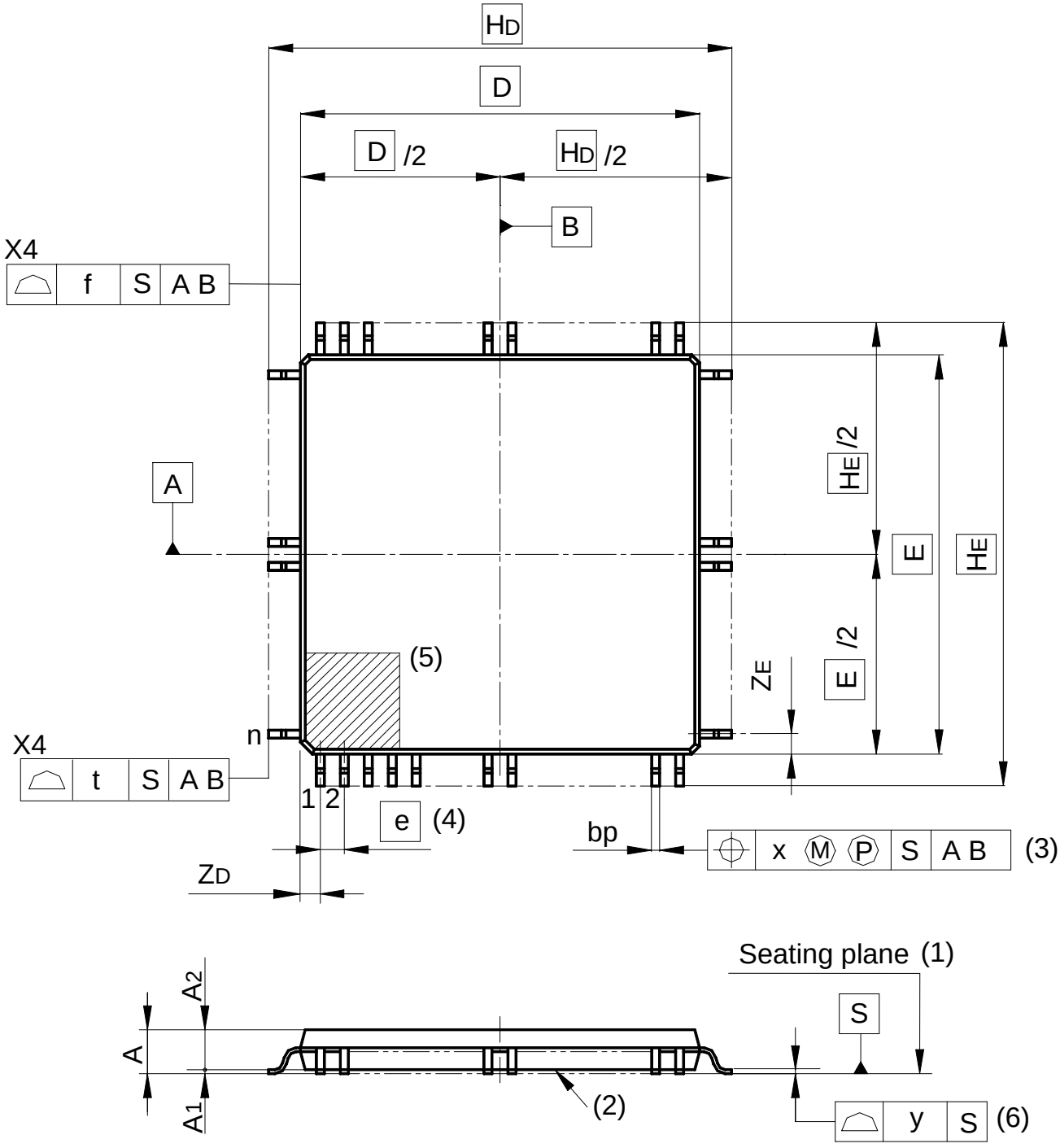
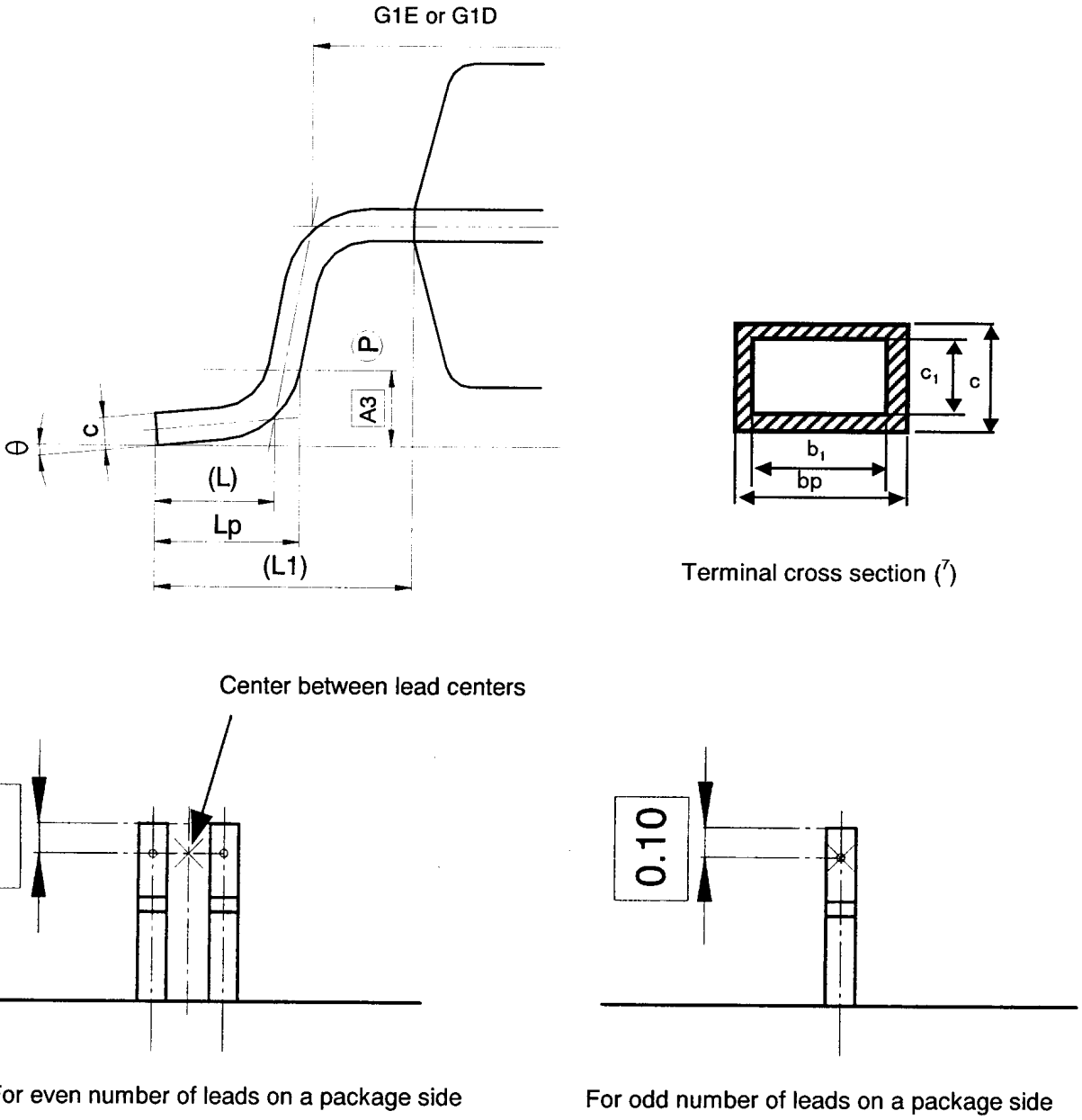


Figure 2



Note:

(1) The seating plane, with which a package is in contact.

(2) The base surface, which is in parallel with the seating plane and links the lowest point, except the standoff.

(3) The maximum material requirements 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 basically 1/16 with package body size, however in case of small package body size, it is less than 1/4 with package body size, It must be included in the shaded area entirely.

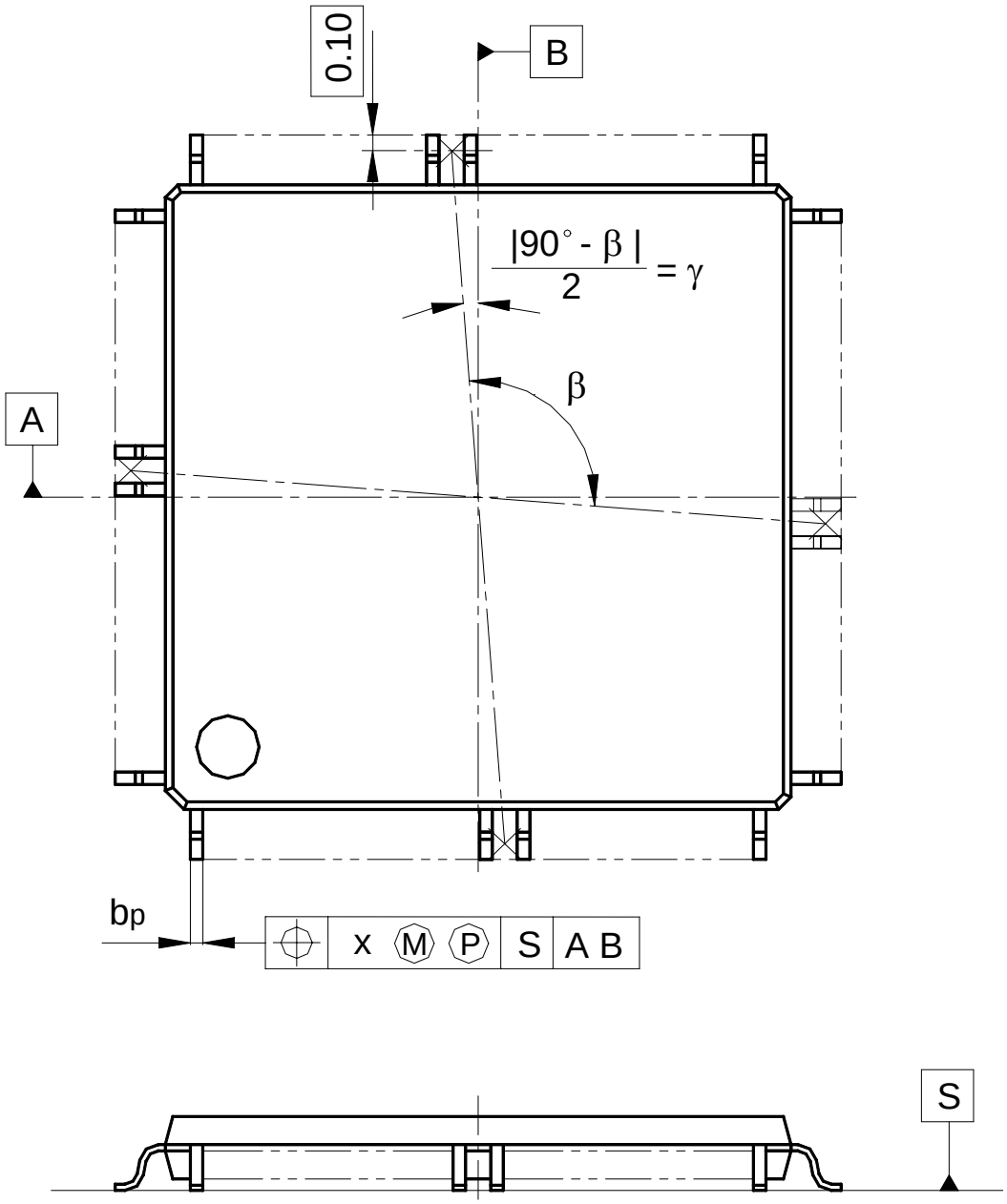
(6) Specifies the vertical shift of the flat part of each terminal form the mounting surface.

(7) The dimensions of the terminal section apply to the ranges of 0.10mm - 0.25mm from the end of a terminal.

7.2 Datum of lead position

The datum of the lead position accuracy shall be defined as follow.

Figure 3

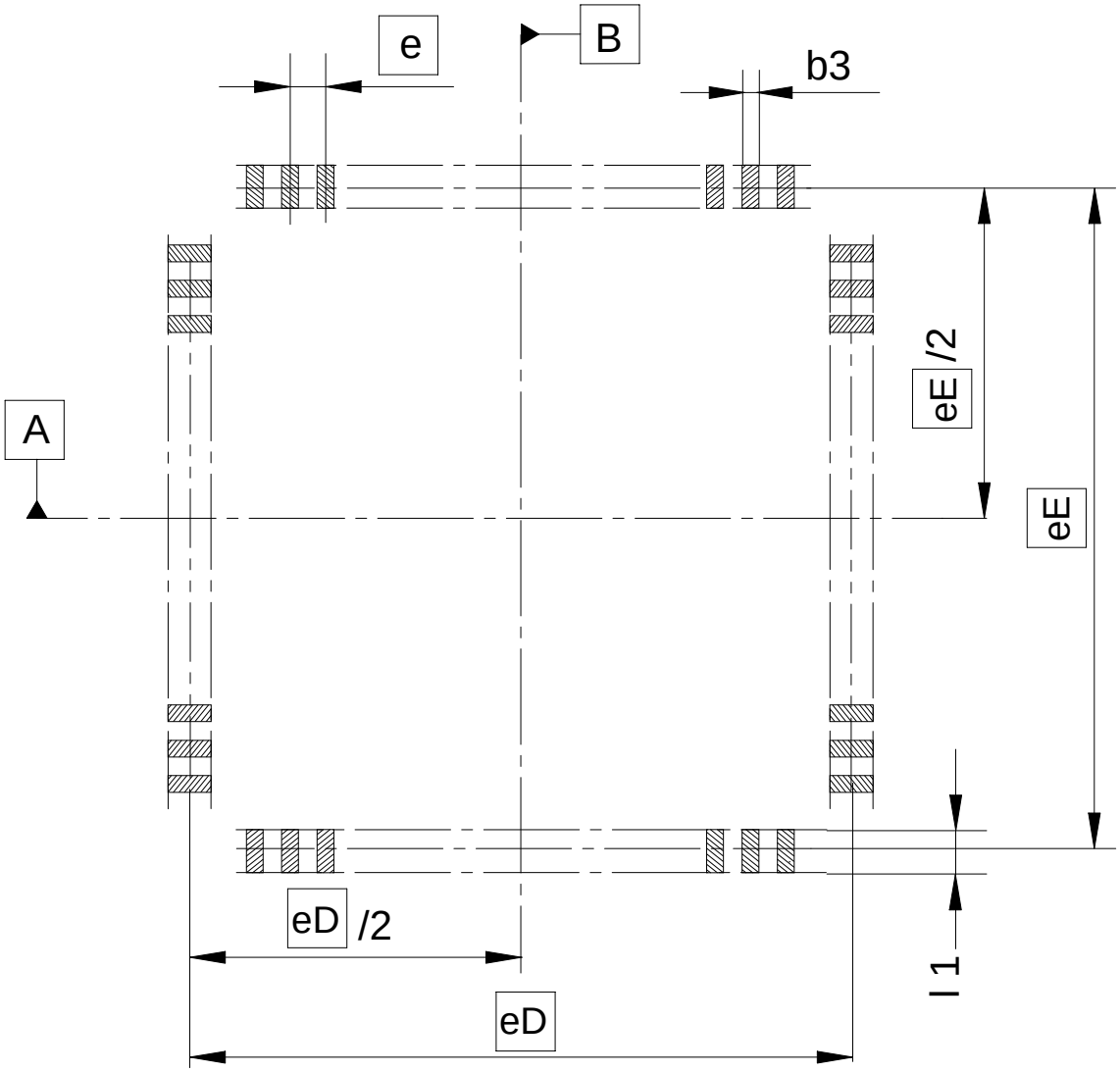


It connects respectively the center which is opposite to each side of package, it finds the angle ß to accomplish, mixing. It looks for as it divides |90° - ß | which difference between the ß and 90°, to each side equally a orthogonal axis. It defined datum lines A , B of package.

REMARKS: Range where pattern of terminal position areas exist

Range where pattern of terminal position areas exist is shown in **Figure 4** as reference for foot pattern design.

Figure 4



l1 max = Lp max + t

b3 max = bp max + X

eE = H_E – Lp nom

eD = H_D – Lp nom

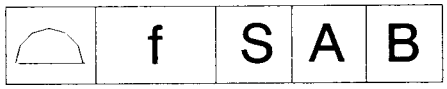
8. OUTER DIMENSION

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 Table or Standard Package Dimension List in the **Appendix 9**.

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>ExD</td><td>Package width(E) x Package length(D) is applied to Nominal dimensions.</td><td>ExD makes an integer value.</td><td></td></tr>
<tr><td>Package width</td><td>E</td><td rowspan="2"><table><tr><th colspan="2">E X D</th></tr><tr><th>Square type</th><th>Rectangle type</th></tr><tr><td>5X5</td><td>14X20</td></tr><tr><td>7X7</td><td>28X40</td></tr><tr><td>10X10</td><td></td></tr><tr><td>12X12</td><td></td></tr><tr><td>14X14</td><td></td></tr><tr><td>16X16</td><td></td></tr><tr><td>18X18</td><td></td></tr><tr><td>20X20</td><td></td></tr><tr><td>24X24</td><td></td></tr><tr><td>28X28</td><td></td></tr><tr><td>32X32</td><td></td></tr><tr><td>36X36</td><td></td></tr><tr><td>40X40</td><td></td></tr></table></td><td rowspan="2">E x D makes an integer value.</td><td rowspan="2">(1) Square type line-up, Less than E x D = 10.00x10.00mm is 2 kinds, E x D = 5.00x5.00mm and 7.00x7.00mm. The range ExD = 10.00x10.00mm ~20.00x20.00mm is 2.00mm step. The range on E x D = 20.00x20.00mm is 4.00mm step. Rectangle type line-up is 2 kinds , E x D = 14.00 x 20.00mm and 28.00 x 40.00mm.
(2) Exclude resin burr.</td></tr>
<tr><td>Package length</td><td>D</td></tr>
<tr><td>Tolerance of package lateral profile</td><td>f</td><td>(1) Tolerance of package lateral profile shall be specified in the outline drawing.
 

(2) Reference symbol “ f ” shall be replaced as below.
f = 0.20</td><td>–</td><td>Exclude resin burr.</td></tr>
<tr><td>Overall width</td><td>H_E</td><td>$H_E = E + 2xL_1$</td><td>–</td><td>H_E -Lpnom= eE</td></tr>
<tr><td>Overall length</td><td>H_D</td><td>$H_D = D + 2xL_1$</td><td>–</td><td>H_D -Lpnom= eD</td></tr>
</table>

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>Seated height</td>
<td>A</td>
<td>
<table>
<tr><th>Name</th><th colspan="2">A_2 nom</th><th>A min</th><th>A max</th></tr>
<tr><td rowspan="8">QFP</td><td rowspan="2">3.80</td><td>H</td><td>-</td><td>4.50</td></tr>
<tr><td>L</td><td>-</td><td>4.40</td></tr>
<tr><td rowspan="2">3.40</td><td>H</td><td>-</td><td>4.10</td></tr>
<tr><td>L</td><td>-</td><td>3.85</td></tr>
<tr><td rowspan="2">2.70</td><td>H</td><td>-</td><td>3.40</td></tr>
<tr><td>L</td><td>-</td><td>3.15</td></tr>
<tr><td rowspan="2">2.00</td><td>H</td><td>-</td><td>2.70</td></tr>
<tr><td>L</td><td>-</td><td>2.45</td></tr>
<tr><td>LQFP</td><td colspan="2">1.40</td><td>>1.20</td><td>≤1.70</td></tr>
<tr><td>TQFP</td><td colspan="2">1.00</td><td>>1.00</td><td>≤1.20</td></tr>
<tr><td>VQFP</td><td colspan="2">0.80</td><td>>0.80</td><td>≤1.00</td></tr>
<tr><td>WQFP</td><td colspan="2">0.60</td><td>>0.65</td><td>≤0.80</td></tr>
</table>
H: High standoff
L: Low standoff
</td>
<td>–</td>
<td>(1) Include package warp age

(2) Especially, it shows QFP, 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>LQFP</td><td>1.70</td><td>1.40</td></tr>
<tr><td>TQFP</td><td>1.20</td><td>1.00</td></tr>
<tr><td>VQFP</td><td>1.00</td><td>0.80</td></tr>
<tr><td>WQFP</td><td>0.80</td><td>0.60</td></tr>
</table>
</td>
</tr>
<tr>
<td>Stand-off height</td>
<td>A_1</td>
<td>
<table>
<tr><th colspan="2">Name</th><th>A max</th><th>A_1min</th><th>A_1nom</th><th>A_1max</th></tr>
<tr><td rowspan="2">QFP</td><td>H</td><td rowspan="2">-</td><td>0.00</td><td>0.40</td><td>0.50</td></tr>
<tr><td>L</td><td>0.00</td><td>0.10</td><td>0.25</td></tr>
<tr><td colspan="2">LQFP</td><td>1.70</td><td rowspan="4">0.05</td><td rowspan="4">0.10</td><td rowspan="4">0.15</td></tr>
<tr><td colspan="2">TQFP</td><td>1.20</td></tr>
<tr><td colspan="2">VQFP</td><td>1.00</td></tr>
<tr><td colspan="2">WQFP</td><td>0.80</td></tr>
</table>
H: High standoff
L: Low standoff
</td>
<td>The following A_1max value is recommended by VQFP, WQFP.
<table>
<tr><th>Amax</th><th>A_1max</th></tr>
<tr><td>1.00</td><td rowspan="2">0.10</td></tr>
<tr><td>0.80</td></tr>
</table>
</td>
<td></td>
</tr>
<tr>
<td>Package height</td>
<td>A_2</td>
<td>
<table>
<tr><th>Name</th><th>A_2min</th><th>A_2nom</th><th>A_2max</th></tr>
<tr><td rowspan="4">QFP</td><td>3.60</td><td>3.80</td><td>4.00</td></tr>
<tr><td>3.20</td><td>3.40</td><td>3.60</td></tr>
<tr><td>2.50</td><td>2.70</td><td>2.90</td></tr>
<tr><td>1.80</td><td>2.00</td><td>2.20</td></tr>
<tr><td>LQFP</td><td>1.35</td><td>1.40</td><td>1.55</td></tr>
<tr><td>TQFP</td><td>0.95</td><td>1.00</td><td>1.05</td></tr>
<tr><td>VQFP</td><td>0.75</td><td>0.80</td><td>0.85</td></tr>
<tr><td>WQFP</td><td>0.55</td><td>0.60</td><td>0.65</td></tr>
</table>
</td>
<td>–</td>
<td>(1) Include package warp age</td>
</tr>
<tr>
<td>Standard height of soldered points</td>
<td>A_3</td>
<td>A_3 = 0.25</td>
<td>–</td>
<td></td>
</tr>
</table>

Table1 (continued)

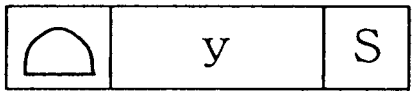
Unit: mm

<table>
<tr><th>Description</th><th>Reference symbol</th><th>Standards</th><th>Recommended</th><th>Remarks</th></tr>
<tr><td rowspan="2">Terminal width</td><td>b_P</td><td>(1) b_P shows terminal width after plating.
<table><tr><th>e</th><th>$b_p$min</th><th>$b_p$nom</th><th>$b_p$max</th></tr><tr><td>1.00</td><td>0.34</td><td>-</td><td>0.50</td></tr><tr><td>0.80</td><td>0.29</td><td>-</td><td>0.45</td></tr><tr><td>0.65</td><td>0.22</td><td>-</td><td>0.40</td></tr><tr><td>0.50</td><td>0.17</td><td>-</td><td>0.27</td></tr><tr><td>0.40</td><td>0.13</td><td>-</td><td>0.23</td></tr><tr><td>0.30</td><td>0.09</td><td>-</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>0.37</td></tr><tr><td>0.65</td><td>0.32</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>0.12</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>0.35</td></tr><tr><td>0.65</td><td>0.30</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>0.14</td></tr></table></td><td rowspan="2">(1) It follows **IEC 60191-6-1**.
(2) b_P , b_1 apply to the ranges of 0.10 - 0.25mm from the tip of a terminal.
(3) 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 $b_P$nom=$b_1$nom.</td></tr>
<tr><td>b_1</td><td>(1) b_1 shows material width of the lead frame.
<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>0.37</td><td>0.40</td><td>0.43</td></tr><tr><td>0.80</td><td>0.28</td><td>0.35</td><td>0.38</td></tr><tr><td>0.65</td><td>0.23</td><td>0.30</td><td>0.33</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>0.11</td><td>0.14</td><td>0.17</td></tr></table></td><td>-</td></tr>
<tr><td rowspan="2">Terminal thickness</td><td>c</td><td>(1) c shows terminal thickness after plating.
<table><tr><th>$c_1$nom</th><th>c min</th><th>c max</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>0.175</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>c nom</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
c nom = c_1 nom</td><td rowspan="2">(1) It follows **IEC 60191-6-1**.
(2) c, c_1 apply to the ranges of 0.10 - 0.25mm from the tip of a terminal.
(3) 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 c nom = $c_1$nom.</td></tr>
<tr><td>c_1</td><td>(1) c_1 shows material thickness of the lead frame.
<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>

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>Terminal pitch</td><td>e</td><td><table><tr><th>e</th></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><tr><td>0.40</td></tr><tr><td>0.30</td></tr></table></td><td>–</td><td></td></tr>
<tr><td>Tolerance of terminal center position</td><td>X</td><td>(1) Tolerance of terminal center position shall be specified in the outline drawing.
 

(2) Reference symbol “ X ” shall be replaced as below.<table><tr><th>e</th><th>X</th></tr><tr><td>1.00</td><td>0.20</td></tr><tr><td>0.80</td><td>0.20</td></tr><tr><td>0.65</td><td>0.13</td></tr><tr><td>0.50</td><td>0.08</td></tr><tr><td>0.40</td><td>0.07</td></tr><tr><td>0.30</td><td>0.06</td></tr></table></td><td>–</td><td>(1) It follows IEC 60191-6-1. (The result to have attempted a consistence with the JEDEC standard) In case of e = 0.80, X = 0.20 (SSOP, In case of e = 0.80, X = 0.16)
(2) M means the concept of the maximum material requirements and it shall be applied.
(3) P is Means projected tolerance zone, it shows the range of the measurement object which guaranteeing the height of A_3</td></tr>
<tr><td>Co planarity</td><td>y</td><td>(1) Co planarity shall be specified in the outline drawing.
 

(2) Reference symbol “ y ” shall be replaced as below.<table><tr><th>e</th><th>y</th></tr><tr><td>1.00</td><td rowspan="3">0.10</td></tr><tr><td>0.80</td></tr><tr><td>0.65</td></tr><tr><td>0.50</td><td rowspan="2">0.08</td></tr><tr><td>0.40</td></tr><tr><td>0.30</td><td>0.05</td></tr></table></td><td>–</td><td>(1) It follows IEC 60191-6-1.</td></tr>
</table>

Table1 (continued)

Unit: mm

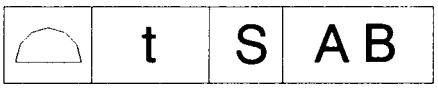
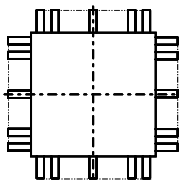
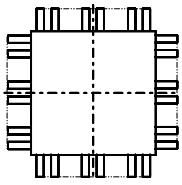
<table>
<tr><th>Description</th><th>Reference symbol</th><th>Standards</th><th>Recommended</th><th>Remarks</th></tr>
<tr><td>Positional tolerance of terminal tips</td><td>t</td><td>(1) Positional tolerance of terminal tips shall be specified in the outline drawing.
 
(2) Reference symbol “ t ” shall be replaced as below.
<table><tr><td>Name</td><td>t</td></tr><tr><td>QFP</td><td>0.25</td></tr><tr><td>LQFP</td><td rowspan="4">0.20</td></tr><tr><td>TQFP</td></tr><tr><td>VQFP</td></tr><tr><td>WQFP</td></tr></table></td><td>–</td><td></td></tr>
<tr><td>Length of soldered part</td><td>Lp</td><td><table><tr><td>L_1 nom</td><td>Lp min</td><td>Lp nom</td><td>Lp max</td></tr><tr><td>1.60</td><td>0.73</td><td>0.88</td><td>1.03</td></tr><tr><td>1.30</td><td rowspan="2">0.45</td><td rowspan="2">0.60</td><td rowspan="2">0.75</td></tr><tr><td>1.00</td></tr></table>
<table><tr><td></td><td></td><td></td><td colspan="6">e</td></tr><tr><td>A2nom</td><td colspan="2">Amax</td><td>1.00</td><td>0.80</td><td>0.65</td><td>0.50</td><td>0.40</td><td>0.30</td></tr><tr><td rowspan="2">3.80</td><td>H</td><td>4.50</td><td rowspan="8" colspan="3">Lp min=0.73
Lp nom=0.88
Lp max=1.03</td><td rowspan="12" colspan="3">Lp min=0.45
Lp nom=0.60
Lp max=0.75</td></tr><tr><td>L</td><td>4.40</td></tr><tr><td rowspan="2">3.40</td><td>H</td><td>4.10</td></tr><tr><td>L</td><td>3.85</td></tr><tr><td rowspan="2">2.70</td><td>H</td><td>3.40</td></tr><tr><td>L</td><td>3.15</td></tr><tr><td rowspan="2">2.00</td><td>H</td><td>2.70</td></tr><tr><td>L</td><td>2.45</td></tr><tr><td>1.40</td><td colspan="2">1.70</td><td colspan="3" rowspan="4"></td></tr><tr><td>1.00</td><td colspan="2">1.20</td></tr><tr><td>0.80</td><td colspan="2">0.10</td></tr><tr><td>0.60</td><td colspan="2">0.80</td></tr></table></td><td>–</td><td>(1) It follows IEC 60191-6-1.</td></tr>
<tr><td>Angle of terminal fiat portions</td><td>θ</td><td><table><tr><td>θ min</td><td>θ nom</td><td>θ max</td></tr><tr><td>0°</td><td>3°</td><td>8°</td></tr></table></td><td>–</td><td>(1) It follows IEC 60191-6-1.</td></tr>
</table>

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>Number of terminal</td><td>n</td><td>
<table>
<tr><th rowspan="2">ExD</th><th colspan="6">e</th></tr>
<tr><th>1.00</th><th>0.80</th><th>0.65</th><th>0.50</th><th>0.40</th><th>0.30</th></tr>
<tr><td>5X5</td><td></td><td></td><td></td><td>32</td><td>40</td><td></td></tr>
<tr><td>7X7</td><td></td><td>32</td><td>40</td><td>48</td><td>64</td><td>80</td></tr>
<tr><td>10X10</td><td>36</td><td>44</td><td>52</td><td>64</td><td>80</td><td>120</td></tr>
<tr><td>12X12</td><td></td><td>48</td><td>64</td><td>80</td><td>100</td><td>144</td></tr>
<tr><td>14X14</td><td>52</td><td>64</td><td>80</td><td>100</td><td>120</td><td>168</td></tr>
<tr><td>16X16</td><td></td><td></td><td></td><td>120</td><td>144</td><td>184</td></tr>
<tr><td>18X18</td><td></td><td></td><td>100</td><td>128</td><td>160</td><td>216</td></tr>
<tr><td>20X20</td><td>76</td><td>88</td><td>112</td><td>144</td><td>176</td><td>240</td></tr>
<tr><td>24X24</td><td></td><td></td><td></td><td>176</td><td>216</td><td>296</td></tr>
<tr><td>28X28</td><td></td><td>128</td><td>160</td><td>208</td><td>256</td><td>344</td></tr>
<tr><td>32X32</td><td></td><td></td><td>184</td><td>240</td><td>296</td><td></td></tr>
<tr><td>36X36</td><td></td><td></td><td></td><td>272</td><td>336</td><td></td></tr>
<tr><td>40X40</td><td></td><td></td><td>232</td><td>304</td><td>376</td><td></td></tr>
<tr><td>14X20</td><td>64</td><td>80</td><td>100</td><td>128</td><td></td><td></td></tr>
<tr><td>28X40</td><td></td><td></td><td></td><td>256</td><td></td><td></td></tr>
</table>
</td><td>The combination of the package seated height (A_2) and the standoff (A_1) of each number of terminals refers to 9. Standard package List.</td><td></td></tr>
<tr><td>Terminal layout</td><td></td><td>
<table>
<tr><th>e</th><th>EXD</th><th>Terminal layout</th></tr>
<tr><td>1.00</td><td>All type of EXD</td><td rowspan="4"> 
Odd number of terminals for each package side.</td></tr>
<tr><td>0.80</td><td>10X10 only</td></tr>
<tr><td>0.65</td><td>10X10 only</td></tr>
<tr><td>0.50</td><td>14X14 only</td></tr>
<tr><td>0.40</td><td>12X12 only</td><td></td></tr>
<tr><td>0.80</td><td>All type of EXD except 10X10</td><td rowspan="5"> 
Even number of terminals for each package side.</td></tr>
<tr><td>0.65</td><td>All type of EXD except 10X10</td></tr>
<tr><td>0.50</td><td>All type of EXD except 14X14</td></tr>
<tr><td>0.40</td><td>All type of EXD except 10X10</td></tr>
<tr><td>0.30</td><td>All type of EXD</td></tr>
</table>
</td><td>–</td><td>(1) In case of odd number of terminals for each package side, package center and the terminal center become identical.

(2) In case of even number of terminals for each package side, package center and the terminal center become shifts e / 2.</td></tr>
</table>

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 rowspan="2">Between first bent part of terminal</td><td>G_{1E}</td><td><table><tr><th>L_1nom</th><th>G_{1E}nom</th></tr><tr><td>1.00</td><td>E +0.80</td></tr><tr><td>1.30</td><td rowspan="2">E +1.40</td></tr><tr><td>1.60</td></tr></table></td><td>–</td><td rowspan="2">Dimension for test socket and tray design.</td></tr>
<tr><td>G_{1D}</td><td><table><tr><th>L_1nom</th><th>G_{1D}nom</th></tr><tr><td>1.00</td><td>E +0.80</td></tr><tr><td>1.30</td><td rowspan="2">E +1.40</td></tr><tr><td>1.60</td></tr></table></td><td>–</td></tr>
<tr><td rowspan="2">Package overhang</td><td>Z_E</td><td>$Z_E = (E – (nE – 1)x e) / 2$

nE : The number of terminals along a widthwise side of a package.</td><td>–</td><td rowspan="2">Exclude resin burrs and gate remains.</td></tr>
<tr><td>Z_D</td><td>$Z_D = (E – (nD – 1)x e) / 2$

nD : The number of terminals along a lengthwise side of a package</td><td>–</td></tr>
<tr><td rowspan="2">Terminal inline interval</td><td>eE</td><td>$eE = E – L_p$nom</td><td>–</td><td rowspan="2"></td></tr>
<tr><td>eD</td><td>$eD = D – L_p$nom</td><td>–</td></tr>
</table>

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>Length of flat part of terminal</td><td>L</td><td>L nom defined as follows.
<table>
<tr><th rowspan="2">A2nom</th><th colspan="2" rowspan="2">Amax</th><th colspan="6">e</th></tr>
<tr><th>1.00</th><th>0.80</th><th>0.65</th><th>0.50</th><th>0.40</th><th>0.30</th></tr>
<tr><td rowspan="2">3.80</td><td>H</td><td>4.50</td><td colspan="3" rowspan="8">L nom=0.80</td><td colspan="3" rowspan="8">L nom=0.50</td></tr>
<tr><td>L</td><td>4.40</td></tr>
<tr><td rowspan="2">3.40</td><td>H</td><td>4.10</td></tr>
<tr><td>L</td><td>3.85</td></tr>
<tr><td rowspan="2">2.70</td><td>H</td><td>3.40</td></tr>
<tr><td>L</td><td>3.15</td></tr>
<tr><td rowspan="2">2.00</td><td>H</td><td>2.70</td></tr>
<tr><td>L</td><td>2.45</td></tr>
<tr><td>1.40</td><td colspan="2">1.70</td><td colspan="6" rowspan="4"></td></tr>
<tr><td>1.00</td><td colspan="2">1.20</td></tr>
<tr><td>0.80</td><td colspan="2">0.10</td></tr>
<tr><td>0.60</td><td colspan="2">0.80</td></tr>
</table></td><td>–</td><td rowspan="2">(1) L_p, L, L_1 are combines with the size rule value of each part and it recommends.

(2) It follows **IEC 60191-6-1**.</td></tr>
<tr><td>Terminal length</td><td>L_1</td><td>L_1 nom defined as follows.
<table>
<tr><th rowspan="2">A_2nom</th><th colspan="2" rowspan="2">Amax</th><th colspan="6">e</th></tr>
<tr><th>1.00</th><th>0.80</th><th>0.65</th><th>0.50</th><th>0.40</th><th>0.30</th></tr>
<tr><td rowspan="2">3.80</td><td>H</td><td>4.50</td><td colspan="3" rowspan="8">L_1 nom=1.60</td><td colspan="3">L_1 nom=1.30</td></tr>
<tr><td>L</td><td>4.40</td></tr>
<tr><td rowspan="2">3.40</td><td>H</td><td>4.10</td></tr>
<tr><td>L</td><td>3.85</td></tr>
<tr><td rowspan="2">2.70</td><td>H</td><td>3.40</td><td colspan="3" rowspan="5">L_1 nom=1.00</td></tr>
<tr><td>L</td><td>3.15</td></tr>
<tr><td rowspan="2">2.00</td><td>H</td><td>2.70</td></tr>
<tr><td>L</td><td>2.45</td></tr>
<tr><td>1.40</td><td colspan="2">1.70</td></tr>
<tr><td>1.00</td><td colspan="2">1.20</td><td colspan="6" rowspan="3"></td></tr>
<tr><td>0.80</td><td colspan="2">0.10</td></tr>
<tr><td>0.60</td><td colspan="2">0.80</td></tr>
</table></td><td>–</td></tr>
</table>

9. Standard package List

To further clarifies 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 package in the future.

Table 2 Standard package List

Unit:mm

E x D	Terminal pitch e					
	1.00	0.80	0.65	0.50	0.40	0.30
5x5				32 -1.40-0.10 -1.00-0.10 -0.80-0.10 -0.60-0.10	40 -1.40-0.10 -1.00-0.10 -0.80-0.10 -0.60-0.10	
7x7		32 -1.40-0.10 -1.00-0.10	40 -1.40-0.10 -1.00-0.10 -0.80-0.10 -0.60-0.10	48 -1.40-0.10 -1.00-0.10 -0.80-0.10 -0.60-0.10	64 -1.40-0.10 -1.00-0.10 -0.80-0.10 -0.60-0.10	80 -1.40-0.10 -1.00-0.10 -0.80-0.10 -0.60-0.10
10x10	36 -2.00-0.10	44 -2.00-0.10 -1.40-0.10 -1.00-0.10	52 -2.00-0.10 -1.40-0.10 -1.00-0.10 -0.80-0.10 -0.60-0.10	64 -1.40-0.10 -1.00-0.10 -0.80-0.10 -0.60-0.10	80 -1.40-0.10 -1.00-0.10 -0.80-0.10 -0.60-0.10	120 -1.40-0.10 -1.00-0.10 -0.80-0.10 -0.60-0.10
12x12		48 -2.00-0.10	64 -1.40-0.10 -1.00-0.10 -0.80-0.10 -0.60-0.10	80 -1.40-0.10 -1.00-0.10 -0.80-0.10 -0.60-0.10	100 -1.40-0.10 -1.00-0.10 -0.80-0.10 -0.60-0.10	144 -1.40-0.10 -1.00-0.10 -0.80-0.10 -0.60-0.10
14x14	52 -2.70-0.10	64 -2.70-0.10 -2.00-0.10 -1.40-0.10 -1.00-0.10	80 -2.70-0.10 -2.00-0.10 -1.40-0.10 -1.00-0.10 -0.80-0.10 -0.60-0.10	100 -2.70-0.10 -2.00-0.10 -1.40-0.10 -1.00-0.10 -0.80-0.10 -0.60-0.10	120 -2.70-0.10 -2.00-0.10 -1.40-0.10 -1.00-0.10 -0.80-0.10 -0.60-0.10	168 -2.70-0.10 -2.00-0.10 -1.40-0.10 -1.00-0.10 -0.80-0.10 -0.60-0.10
16x16				120 -1.40-0.10 -1.00-0.10	144 -1.40-0.10 -1.00-0.10	184 -1.40-0.10 -1.00-0.10
18x18			100 -1.40-0.10 -1.00-0.10	128 -1.40-0.10 -1.00-0.10	160 -1.40-0.10 -1.00-0.10	216 -1.40-0.10 -1.00-0.10
20x20	76 -2.70-0.10 -2.70-0.40	88 -2.70-0.10 -2.70-0.40	112 -2.70-0.10 -2.70-0.40	144 -2.70-0.10 -2.70-0.40 -1.40-0.10 -1.00-0.10	176 -2.70-0.10 -2.70-0.40 -1.40-0.10 -1.00-0.10	240 -2.70-0.10 -1.40-0.10
24x24				176 -3.40-0.10 -3.40-0.40 -1.40-0.10 -1.00-0.10	216 -3.40-0.10 -3.40-0.40 -1.40-0.10 -1.00-0.10	296 -1.40-0.10
28x28		128 -3.40-0.10 -3.40-0.40	160 -3.40-0.10 -3.40-0.40 -1.40-0.10	208 -3.40-0.10 -3.40-0.40 -1.40-0.10	256 -3.40-0.10 -3.40-0.40 -1.40-0.10	344 -1.40-0.10
32x32			184 -3.40-0.40	240 -3.40-0.40	296 -3.40-0.40	
36x36				272 -3.80-0.40	336 -3.80-0.40	
40x40			232 -3.80-0.40	304 -3.80-0.40	376 -3.80-0.40	
14x20	64 -2.70-0.10	80 -2.70-0.10	100 -2.70-0.10 -1.40-0.10	128 -2.70-0.10 -1.40-0.10		
28x40				256 -3.80-0.40		

Note: The numerical value in the table shows [Number of terminal (n) - Seated height (A_2) - Standoff (A_1)]

10. 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 under 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-7303B** (Name and Code for Integrated Circuits Package).

Table 3

Serial Number				
External Type (The previous description)		P-OQFPOOO-OOOO×OOOO-O. OO (P-OQFPOOO-OOOO-O. OO)		
Reference Symbol		min	nom	max
Group1	E		レ	
	D		レ	
	A_2	レ	レ	レ
	HD		レ	
	HE		レ	
	f			レ
	A			レ
	A_1	レ		
	A_3		レ	
	L_p	レ	レ	レ
	b_p	レ		レ
	b_1	レ	レ	レ
	c	レ		レ
	c_1	レ		レ
	e		レ(*)	
	θ	レ	レ	レ
	X			レ
	y			レ
	t			レ
	n		レ	
Group2	G1D		レ	
	G1E		レ	
	ZD		レ	
	ZE		レ	
	L		レ	
	L_1		レ	

(*) Means true geometrical position

EXPLANATORY NOTES

1. Objective of establishment

This technical report accounts for the industrial standard of Plastic Quad Flat Package (herein after referred to as P- QFP). It was established to provide the design guideline of P- QFP when it is made in to product or when Automatic mounting machinery and associated parts are developed.

2. History of review

As the P-QFP relation standard, the following standard exists and results in the today.

(1) EIAJ IC-74-4 (General rules for the preparation of outline drawings of integrated circuits, Quad Flat Package)

It began a deliberation from October 1984 in Technical Committee on Semiconductor Package Outlines (currently, Technical Standardization Committee on Semiconductor Device Package) and it was established in June 1986. Terminal pitch e defined equal to or more than 0.65 mm and package width (E_{nom}) x package length (D_{nom}) defined equal to or less than 32.00x32.00mm of P-QFP. It is in 1976 that P-QFP was used first. P-QFP. Then, the terminal shape was flat and the terminal length designs at 3.00 mm and it was mounted solder with hand. After that, the JISSO technology of way to mounting package progressed, and

(a) The gull wing shape from the flat by the terminal shape.

(b) The way of JISSO technology automatically from hand.

(c) Terminal pitch e becomes fine pitch from 0.80 mm to 0.65 mm.

In such, As for P-QFP, the effectively is admission as the thin package and numerous pin which over 100 pins from 40 pins. It made that a package outline was standardized and to attempt to promote to the sharing of an automatic mounting machinery and a tray, a socket to be urgent business and **EIAJ IC-74-4** was established.

(2) EIAJ ED-7404 (General rules for the preparation of outline drawings of integrated circuits, Quad Flat Package)

It began a deliberation from 1988 in Technical Committee on Semiconductor Package Outlines and it was established in January 1990. It changes **EIAJ IC-74-4**, Terminal pitch e defined equal to or more than 0.65 mm and package width (E_{nom}) x package length (D_{nom}) defined 5.00x5.00mm ~ 44.00x44.00mm of P-QFP.(Those days, 6.00x6.00mm, 44.00x44.00mm, 5.00x7.00mm, 7.00x10.00mm, 10.00x14.00mm, 20.00x28.00mm and so on existed but they were deleted in **EIAJ ED-7404A**.)

(3) EIAJ ED-7404-1 (General rules for the preparation of outline drawings of integrated circuits, Quad Flat Package (Fine pitch))

It began a deliberation in Technical Committee on Semiconductor Package Outlines (currently, Technical Standardization Committee on Semiconductor Device Package) and it was established in January 1989. Terminal pitch e of P-QFP defined less than 0.65 mm from equal to or more than 0.30mm.

(4) EIAJ ED-7404A (General rules for the preparation of outline drawings of integrated circuits, Quad Flat Package)

It began a deliberation in Technical Committee on Semiconductor Package Outlines and it was established in April 1994. It combined both **EIAJ ED-7404** and **EIAJ ED-7404-1** general rules of outline drawings and it squeezed each rule value, a combination.

(5) EIAJ ED-7401-4 (Method of measuring semiconductor device package dimensions (Integrated Circuit))

It began a deliberation from February, 1992 in the semiconductor common standard WG and Fine pitch WG (it establishes from April, 1993 to March, 1995) which were under Technical Committee on Semiconductor Package Outlines and it was established in May 1995. It made the datum line and the base surface to display in the package drawing, a definition, and a way of measuring with each size tolerance clear.

(6) EIAJ EDR-7311 (Design guideline of integrated circuits for Quad Flat Package)

It began a deliberation in the Fine pitch WG (it establishes from April, 1993 to March, 1995) and then from April, 1995 it continuation deliberation in the Plastic Package Subcommittee (currently, Integrated Circuits Package Subcommittee) which were under Technical Committee on Semiconductor Package Outlines and it was established in April 1996. In case of reconsideration work, It exchanged an opinion form JC-11 which takes charge of the standardization of the integrated circuit package outline in Joint Electron Device Engineering Council (hereinafter referred to as JEDEC), And it attempted the consistence of both. **EIAJ EDR-7311** was based on **EIAJ ED-7404A** and it applied a datum display to the package outline that was made the end sending it while the contents of **EIAJ ED-7404A**. Also, it defined the specification of the part size such as the terminal part, too. The datum display must make a definition with each size tolerance clear from the situation which can demand the control of the size tolerance of the package outline form as the package of the electronic devices becomes high density. It made a definition with each size tolerance clear in displaying the datum line and the base surface, which the case needs in the package drawing. Also, it carried a definition with deliberation process and each size about the display of the datum on **EIAJ ED-7401-4** (Method of measuring semiconductor device package dimensions (Integrated Circuit)). As the match to that the standardization which is international is moreover done, As the consideration when implementing a standardization proposal by SC47D/WG1 which takes charge of the standardization of the semiconductor package outline form in International Electro technical Commission (hereinafter referred to as IEC), According to the IEC format, we placed in the design guideline as the classification.

(7) EIAJ ED-7311 (Standard of integrated circuits package (QFP))

It began a deliberation in the Plastic Package Subcommittee (currently, Integrated Circuits Package Subcommittee), which was under Technical Standardization Committee on Semiconductor Device Package, and it was established in May 1997. As the match to that the standardization that is international is moreover done, the consideration when implementing a standardization proposal by SC47D/WG1, which takes charge of the standardization of the semiconductor package outline form in IEC, According to the IEC format, we placed in the Standard of integrated circuits package as the classification.

(8) EIAJ EDR-7311A (Design guideline of integrated circuits for Quad Flat Package (P-QFP))

This technical report **EIAJ EDR-7311A** was a deliberation in the Integrated Circuits Package Subcommittee, which was under Technical Standardization Committee on Semiconductor Device Package, and it was established in April 2002. While conforming in the package seated height code of IEC standard (Amendment 1 to **IEC 60191-4**, Ed.2 (establishment in 2002)) and the IEC global drawing format (Revision of **IEC 60191-6** Global drawing format (establishment schedule in 2002)) (here in after referred toas IEC global drawing format) that standardization was done in IEC, SC47D/WG2. And it took in the result, which received more comments than every country at the stage, which does the work that makes **EIAJ EDR-7311** a base and standardizes **IEC 60191-6-9** General Guidelines for P-QFP in IEC, SC47D/WG1 to this standard.

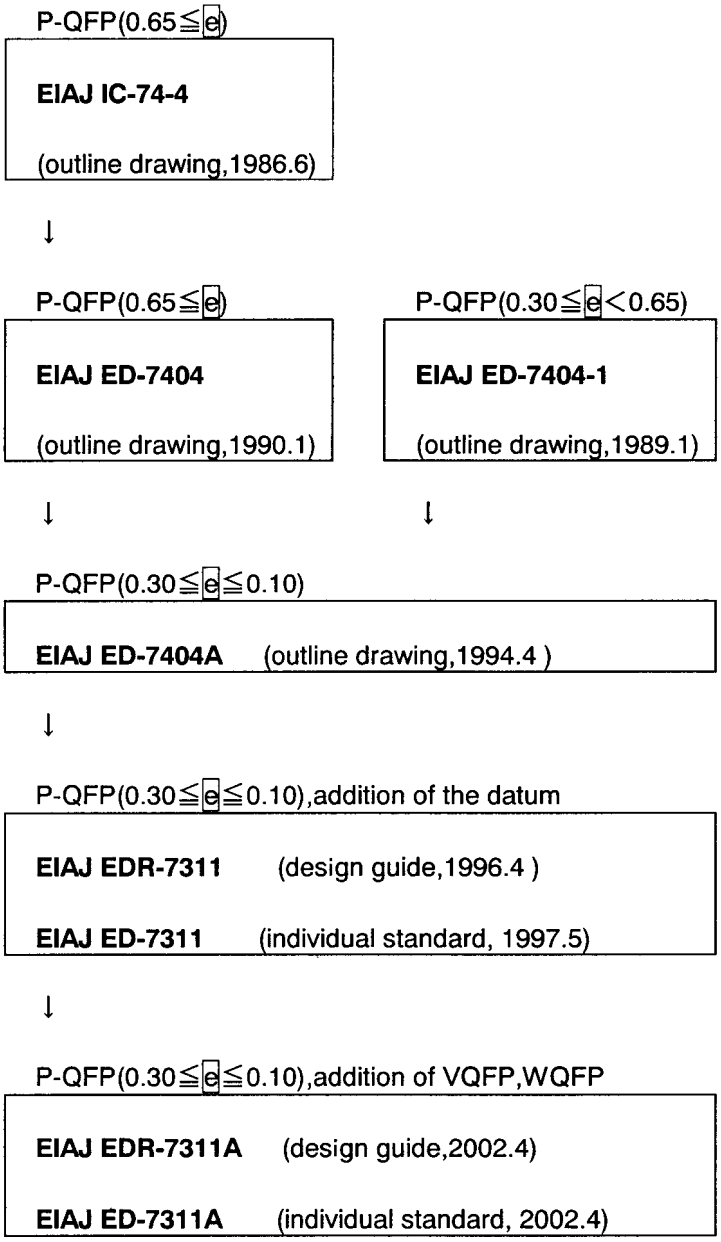
Especially, it corresponding to making electronic equipment thinner which representative making a mobile phone and thin type notebook PC, The standardization of the thin package range that package seated height (A) is equal to or less than 1.00 mm precedes in P-SSOP and a non lead package which P-QFN, P-SON, P-SSOP that P-QFP has gull wing lead having to do with isomorphism, and P-QFP was admitted to be urgent business and revised. The datum display by the package outline drawing that was established in the past in IEC was a body edge datum. However, the present situation, the recognition way of the electronic device of the automatic mounting machinery is claim when they are a lead datum. IEC global drawing format, which carried forward establishment newly, and the package outline, is lead center datum. This time, **EIAJ EDR-7311A** adjusted a datum notation way with IEC global drawing format (Revision of **IEC 60191-6** Global drawing format (establishment schedule in 2002)).

(9) EIAJ ED-7311A (Standard of integrated circuits package (P-QFP))

EIAJ ED-7311A is the related of this technical report **EIAJ EDR-7311A**, and **EIAJ ED-7311A** corresponding to the establishment **EIAJ EDR-7311A**. **EIAJ ED-7311A** was deliberation in the Integrated Circuits Package Subcommittee, which was under Technical Standardization Committee on Semiconductor Device Package, And it was established in April 2002. It's form, which follows IEC global drawing format. And it was deliberated and was established in April 2002. The seated height that A=1.00mm or less (VQFP) and =0.80mm or less (WQFP) are added which range of body size is 14.00 x 14.00mm or less.

The elapse of the deliberation of this standard is shown in **Explanation table 1** with the flow chart.

Explanation table 1



3. BASIC IDEA

(1) Datum

Based on IEC global drawing format, this technical report **EIAJ EDR-7311A** adopts a datum, a geometrical tolerance and the point of view. In case of adoption of the datum, it is reference in the JEDEC standard, the registration package of the various packages. As for the datum, it attempted to sharing positional tolerance of terminal center (x) and it set the point datum target A, B which moved from the terminal tip of the package central part inside 0.10mm (See figure1). At former **EIAJ EDR-7311**, (a) As the standard which defines dimensional tolerance of the package body, it prescribes A, B, C in the package center in the datum surface, and it made foundation of the terminal (0.10 mm position from the resin) base point of the package center part for which it is difficult to undergo influence by the loose element such as the terminal transformation. By the one, (b) The relative position of the terminal part to the mount pad on the print circuit board, and it defines a datum surface as the package center A1, C1 and it is a base point in the terminal tip (0.10 mm inside from the lead tip) of the package center. As for the JEDEC standard, when defining dimensional tolerance of the package, positional tolerance] of terminal center (x) sets a datum surface based on the foundation of the terminal. However, JEDEC standard, too, is based on the IEC standard like this technical report **EIAJ EDR-7311A** and to be adopted is wanted the identical point of view and the notation.

(2) Position rule in the terminal

It added means projected tolerance zone (P) to positional tolerance of terminal center (x) as the rule of terminal width (b_p) following IEC global drawing format (Revision of **IEC 60191-6** Global drawing format (establishment schedule in 2002)). Guaranteeing the height of showing A_3 =0.25mm in the range of the measurement object by the meaning.

(3) Range where pattern of terminal position areas exist, reference symbol

At former **EIAJ ED-7311**, as become a reference for foot pattern design, it showed range where pattern of terminal position areas exist and reference symbol are using H_E (overall width) and H_D (overall length). However, according to IEC global drawing format (Revision of **IEC 60191-6** Global drawing format (establishment schedule in 2002)), this technical report **EIAJ EDR-7311A** changed reference symbol are using into eE, eD (terminal interval pitch). It were eE = H_E – $L_p$nom, eD = H_D – $L_p$nom. Length of range where pattern of terminal position areas exist (l1 max) prescribes l1 max = Lp max + t. Width of range where pattern of terminal position areas exist (b3 max) prescribes b3 max = bp max + X.

(4) The package name

Package height code which according to the IEC standard (Amendment 1 to **IEC 60191-4**, Ed.2 (establishment in 2001)) and **EIAJ ED-7303B** (Name and Code for Integrated Circuits Package), It added VQFP(Very thin QFP) and WQFP(Very Very thin QFP) in addition to the name which is thin type QFP with low package seated height, LQFP (Low profile QFP) and TQFP(Thin QFP). Each package seated height A, package height A_{2nom} is shown below.

LQFP (Low profile QFP) :seated height A_{max}=1.70mm, A_{min}>1.20mm, body height A_{2nom}=1.40mm

TQFP (Thin QFP) :seated height A_{max}=1.20mm, A_{min}>1.00mm, body height A_{2nom}=1.00mm

VQFP (Very thin QFP) :seated height A_{max}=1.00mm, A_{min}>0.80mm, body height A_{2nom}=0.80mm

WQFP (Very Very thin QFP) :seated height A_{max}=0.80mm, A_{min}>0.65mm, body height A_{2nom}=0.60mm

Explanation table 2 Repartition of the package name

<table>
<tr><td colspan="3" rowspan="2"></td><td rowspan="2"></td><td colspan="6">Terminal pitch e</td></tr>
<tr><td>A_2nom</td><td colspan="2">A_1max</td><td>Amax</td><td>1.00</td><td>0.80</td><td>0.65</td><td>0.50</td><td>0.40</td><td>0.30</td></tr>
<tr><td rowspan="2">3.80</td><td>H</td><td>0.50</td><td>4.50</td><td colspan="6" rowspan="8">QFP</td></tr>
<tr><td>L</td><td>0.25</td><td>4.40</td></tr>
<tr><td rowspan="2">3.40</td><td>H</td><td>0.50</td><td>4.10</td></tr>
<tr><td>L</td><td>0.25</td><td>3.85</td></tr>
<tr><td rowspan="2">2.70</td><td>H</td><td>0.50</td><td>3.40</td></tr>
<tr><td>L</td><td>0.25</td><td>3.15</td></tr>
<tr><td rowspan="2">2.00</td><td>H</td><td>0.50</td><td>2.70</td></tr>
<tr><td>L</td><td>0.25</td><td>2.45</td></tr>
<tr><td>1.40</td><td colspan="2">0.15</td><td>1.70</td><td colspan="6">LQFP</td></tr>
<tr><td>1.00</td><td colspan="2">0.15</td><td>1.20</td><td colspan="6">TQFP</td></tr>
<tr><td>0.80</td><td colspan="2">0.15</td><td>1.00</td><td colspan="6">VQFP</td></tr>
<tr><td>0.60</td><td colspan="2">0.15</td><td>0.80</td><td colspan="6">WQFP</td></tr>
</table>

L: Low standoff

H: High standoff

(5) Standard package List

Combinations of the standard dimensions shown allow a number of package variations. If a package is newly designed, their dimensions shall be selected in the Standard Package Dimension List. Standard Package Dimension List showed number of the terminal (n), package height (A_{2nom}), standoff ($A_{1\ nom}$), which according to Nominal dimension (ExD) and terminal pitch (e). Also, there was a comment in the stage of the IEC standardization from USA, from this technical report **EIAJ EDR-7311A** added combination of E x D=14.00 x 14.00mm, package height A_2nom=2.00mm.

4. BACKGROUND FOR DIMENSIONAL PROVISIONS

(1) Nominal dimension (ExD)

Package overall width (H_E), and Package overall length (H_D) changes because several rule exists with terminal part length (L, L_1). Therefore, it made Package width (E), and Package length(D) which it is possible to show quantitatively a calling Nominal dimension (ExD). It prescribes ExD range from 5.00x5.00 to 40.00x40.00mm. The square type, less than ExD=10.00x10.00mm are 2 kinds of ExD=5.00x5.00mm and 7.00x7.00mm. It is 2.00mm step for ExD=10.00x10.00~20.00x 20.00mm (ExD=16.00x16.00mm and 18.00x18.00mm were added at former **EIAJ EDR-7311**), and 4.00mm step for more and above ExD=20.00x20.00mm. The rectangle type, there are 2 kinds, ExD=14.00x20.00mm and 28.00x40.00mm. rectangle type, the aspect ratio is 1: $\sqrt{2}$ which approximate prime 5, 7 and one side of the package body is even number time.

(2) Overall width (H_E), Overall length (H_D)

It showed overall width (H_E) and overall length (H_D) by true geometrical position and positional tolerance of terminal tips was shown reference symbol in "t". It defines H_E = E + $2L_1$nom, H_D = D + $2L_1$nom. L_1 is terminal length. E and D are package body size. Tolerance of package lateral profile was shown reference symbol in "f".

(3) Package Seated height (A)

At former **EIAJ EDR-7311**, QFP's package height (A_2) which equal to or more than 3.00mm range is defined A_2nom=3.40mm, 3.80mm. It attempted a consistence with the JEDEC standard. Also, thin package was prescribed in TQFP (Amax=1.20mm). In this technical report **EIAJ EDR-7311A**, The rule in the range with the lower package seated height (A) needed and added VQFP (Amax=1.00mm), WQFP (Amax=0.80mm) newly.

(4) Standoff height (A_1)

From former **EIAJ EDR-7311**, QFP prescribes 2 kinds standoff that low standoff (A_1max= 0.25mm) and high standoff (A_1max=0.50mm), considering JISSO quality (The package warp age, the wash after mounting device on print circuit board and so on). Thin package LQFP, TQFP prescribes A_1min=0.05mm to show that the package body base and the lead are not an identical surface. And it defined A_1nom=0.10mm, A_1max=0.15mm to utilize the characteristic of thin package. At this technical report **EIAJ EDR-7311A**, It added VQFP, WQFP with newly low package seated height (A) and it defined A_1min=0.05mm, A_1nom=0.10mm, A_1max=0.15mm, likewise.

(5) Package height (A_2)

At former **EIAJ EDR-7311**, QFP's package height (A_2) which equal to or more than 3.00mm range is defined A_2nom=3.40mm, 3.80mm, and thin package was defined LQFP (A_2nom=1.40mm), TQFP (Amax=1.20mm). It attempted a consistence with the JEDEC standard. At this technical report **EIAJ EDR-7311A**, It added VQFP, WQFP (Amax=0.80,0.60mm) with newly low package height (A_2).

EIAJ EDR-7311A

(6) Standard height of soldered points (A_3)

Receiving that to prescribe Length of the soldered part in “Lp” in IEC was fixed. From former **EIAJ ED-7404A**, as the adoption of “Lp” and rule with the shape height of filet where a terminal was soldered which standard height of soldered points (A_3 =0.25mm). It is established in October 2001 as **IEC** Publication **60191-6-1**, Design Guide for Gull-wing Lead Terminals as the standard, which is related with these contents.

(7) Terminal width (bp ,b_1)

When maintaining the consistency with the JEDEC standard at former **EIAJ EDR-7311** and in case of terminal pitch being e =0.50mm, it unified a terminal width range (bp min =0.17mm , bp nom =0.22mm, bp max =0.27mm)with the providing of 2 kinds to it to 1 kind. And in case of terminal pitch being e =0.40mm, It made from bp max =0.215mm to bp max =0.23mm. To attempt compatible to the extremely thin plating (palladium) and except the solder plating, it defined that the material of terminal width (b_1 nom) and the terminal width after plating (bp nom) were equal. It is established in October 2001 as **IEC** Publication **60191-6-1**, Design Guide for Gull-wing Lead Terminals as the standard, which is related with these contents.

(8) Thickness of terminal (c ,c_1)

At former **EIAJ EDR-7311**, it set a size to it every thickness of the material (c_1). However, it deleted c_1 nom value and it attempted a consistence with the JEDEC standard in making one. To attempt compatible to the extremely thin plating (palladium) and except the solder plating, it defined that the material of terminal thickness (c_1 nom) and the terminal thickness after plating (c nom) were equal. It is established in October 2001 as **IEC** Publication **60191-6-1**, Design Guide for Gull-wing Lead Terminals as the standard, which is related with these contents.

(9) Terminal pitch (e)

Terminal pitch (e) defined 6 kinds, 1.00mm, 0.80mm, 0.65mm, 0.50mm, 0.40mm, 0.30mm. There is a comment that terminal pitch e =0.30mm is not reasonable in the stage of the **IEC** standardization (**60191-6-9** General Guidelines for P-QFP) from USA and Korea. However, several companies in Japan did insisting, standardization as the present situation when there was success, production results in the development already.

(10) Terminal interval pitch (eD , eE)

As reference for foot pattern design of the electronic device at the print circuit board. It defined terminal interval pitch (eD , eE) and it made eD = D – Lpnom, eE = E – Lpnom.

(11) Positional tolerance of terminal center (x)

First, at former **EIAJ IC-74-4**, As the point of view with the permission value of positional tolerance of terminal center (x), Insertion pin type(for example DIP) made $x \leq e / 10$, and Surface mount device type(for example QFP) made $x \leq e / 5$. At former **EIAJ EDR-7311**, in case of terminal pitch being e =0.80mm, it was changed from X=0.16mm to X=0.20mm. And in case of terminal pitch being e =0.40mm, it was changed from X=0.105mm to X=0.07mm. It attempted a consistence with the JEDEC standard. It is established in October 2001 as **IEC** Publication **60191-6-1**, Design Guide for Gull-wing Lead Terminals as the standard, which is related with these contents.

(12) Terminal co planarity (y)

When terminal pitch (e) is 0.50 mm in former **EIAJ EDR-7311**, It changed from y=0.10mm to y=0.08mm and it attempted a consistence with the JEDEC standard. It is established in October 2001 as **IEC** Publication **60191-6-1**, Design Guide for Gull-wing Lead Terminals as the standard, which is related with these contents.

(13) Angle of terminal fiat portions (θ)

At first, at former **EIAJ IC-74-4**, The negative value, too, was permissible by θmin, but at former **EIAJ ED-7404**, it was prescribed with θmin=0°, θnom =3°, θmax=10°. After that, the θmax value is change from 10° to 8° at former **EIAJ EDR-7311**. It was prescribed θmin=0°, θnom =3°, θmax=8°. It is established in October 2001 as **IEC** Publication **60191-6-1**, Design Guide for Gull-wing Lead Terminals as the standard, which is related with these contents.

(14) Number of terminal (n)

After considering package overhang (Z_E, Z_D), It fixed number of terminal (n) as package outline which it is possible to realize with each package body size (E, D) and terminal pitch (e). It defined number of terminal (n) which is prescribed that these are shown in the standard package list. It thinks the 0.575mm minimum value of package overhang (Z_E, Z_D), when prescribing the number of the terminal (n). In the individual standard **EIAJ ED-7311A**, as for the minimum value of the package overhang (ZE, ZD), 0.50 mm are registered(for example E × D=7.00 × 7.00mm, e=0.40, n=64).

(15) Terminal layout

Terminal layout is prescribed by each package body size (E, D) and terminal pitch (e). In case of odd number of terminals for each package side, package center and the terminal center become identical. In case of even number of terminals for each package side, package center and the terminal center become shifts e / 2. It thinks that to prescribe a terminal arrangement in this way contributes mainly for a socket to be standardized and to common-ize a foot pattern design, too.

(16) Length of the soldered part (Lp)

To prescribe Length of the soldered part (Lp) in IEC was fixed and it adopted from former **EIAJ ED-7404A**. As for Length of the soldered part (Lp), Length of flat part of terminal (L) which was made the index of the terminal shape cancels the point that it is difficult to measure on the fruit product, and the measurement was possible and provided in the point of view that the length size of the filet shape which exerts influence by the reliability of the soldering becomes Length of the soldered part (Lp). Standard height of soldered points (A_3) with the rule of Length of the soldered part (Lp), was prescribed too. It is established in October 2001 as **IEC** Publication **60191-6-1**, Design Guide for Gull-wing Lead Terminals as the standard, which is related with these contents.

EIAJ EDR-7311A

(17) Terminal length (L_1)

At former **EIAJ EDR-7311**, it placed registration for IEC, which is an international standard in the principal objective, and it attempted a consistence with the JEDEC standard. However, un-coordinated point like the following explanation table was left. In such situation, there is a comment that terminal pitch e =0.30mm is not reasonable in the stage of the **IEC** standardization (**60191-6-9** General Guidelines for P-QFP) from USA and Korea. However, several companies in Japan did insisting, standardization as the present situation when there was success, production results in the development already. Also, in this technical report **EIAJ EDR-7311A**, it added package height A_2nom=0.60, 0.80mm newly. A rule is shown below Terminal length (L_1), **Explanation table 3 – 1** is **EIAJ EDR-7311A**, **Explanation table 3 – 2** is JEDEC standard, **Explanation table 3 – 3** is **IEC** standard (**60191-6-9** General Guidelines for P-QFP)

Explanation table 3 -1

	Package height (A_2nom)							
	JEITA (**EIAJ EDR-7311A**)							
e	0.60	0.80	1.00	1.40	2.00	2.70	3.40	3.80
1.00	L_1nom=1.00				L_1nom=1.60			
0.80								
0.65								
0.50							L_1nom =1.30	
0.40								
0.30								

Explanation table 3 - 2

	Package height (A_2nom)					
	JEDEC					
e	1.00	1.40	2.00	2.70	3.40	3.80
1.00	L_1nom =1.00		L_1nom=1.60			
0.80						
0.65						
0.50			L_1nom=1.30			
0.40						
0.30	This range is not in the rule.					

It adds newly, A_2nom=0.60, 0.80.

Explanation table 3 - 3

	Package height (A_2nom)					
	IEC (**60191-6-9**)					
e	1.00	1.40	2.00	2.70	3.40	3.80
1.00	L_1nom=1.00		L_1nom=1.60			
0.80						
0.65						
0.50					L_1nom =1.30	
0.40						
0.30						

(18) Package overhang (Z_E, Z_D)

At former **EIAJ EDR-7311**, the package overhang was true geometrical position Z_E , Z_D . When there was comment from Holland that contradiction of the notation of the package outline drawing in the stage of the **IEC** standardization (**60191-6-9** General Guidelines for P-QFP). In this technical report **EIAJ EDR-7311A**, it didn't make a true notation Z_E, Z_D.

(19) Between first bent part of terminal (G_{1E} , G_{1D})

Like P-SOP, as the test socket and tray design reference business, it added between first bent part of terminal from former **EIAJ ED-7404A**.

5. COMMITTEE MEMBERS

The IC Package Sub-committee of the Technical Standardization Committee on Semiconductor Device Packages has mainly deliberated this standard.

The sub-committee members are shown below.

<Technical Standardization Committee on Semiconductor Device Package>

Chairman	SONY CORP.	Kazuo Nishiyama

< IC Package Sub-committee>

Chief	MITSUBISHI ELECTRIC CORP.	Kazuya Fukuhara
Co- chief	HITACHI LTD.	Yoshinori Miyaki
	FUJITSU LTD.	Hiroshi Inoue
	TOSHIBA CORP.	Yasuhiro Koshio
	MATSUSHITA ELECTRIC INDUSTRIAL CO., LTD.	Tomoki Tamaki
Members	AMKOR THECHNOLOGY JAPAN. INC	Naomichi Shoji
	ELPIDA MEMORY, INC.	Fumitake Okutsu
	ENPLAS CORP.	Hisao Ohshima
	OKI ELECTRIC INDUSTRY CO., LTD.	Yoshihiko Ino
	KYOCERA CORP.	Akihiro Funahashi
	SANYO ELECTRIC CORP.	Hideyuki Iwamura
	SANYO ELECTRIC CORP.	Kiyoshi Mita
	SUMITOMO 3M CORP.	Akiko Tsubota
	SEIKO EPSON CORP.	Yoshiaki Emoto
	SONY CORP.	Hiroshi Abe
	NEC CORP.	Kenichi Kurihara
	NEC CORP.	Kaoru Sonobe
	IBM JAPAN CORP.	Tsuneo Kobayashi
	TEXAS INSTRUMENTS JAPAN LTD.	Takayuki Ohuchida
	HITACHI CABLE LTD.	Tadashi Kawanobe
	FUJITSU LTD.	Kaoru Tachibana
	FUJI ELECTRIC CO., LTD.	Osamu Hirohashi
	MELCO INC.	Tsuneo Watanabe
	YAMAICHI ELECTRIC CO., LTD.	Noriyuki Matsuoka
	UNITECHNO INC.	Hitoshi Matsunaga
	ROHM CO., LTD.	Sadamasa Fujii
Special Members	SHIN-ETSU POLYMER	Ken Tamura
	TOYOJUSHI CO., LTD.	Hitoshi Kazama

<Project Group>

Leader	MATSUSHITA ELECTRIC INDUSTRIAL CO., LTD.	Toshiyuki Fukuda
	SANYO ELECTRIC CORP.	Hideyuki Iwamura
	TOSHIBA CORP.	Yasuhiro Koshio