



Standard of Japan Electronics and Information Technology Industries Association

***EIAJ ED-7614***

**Tray for Quad Flat Packages**

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Prepared by  
Technical Standardization Committee on Semiconductor Device Package

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# Tray for Quad Flat Packages

## 1. Scope

This standard specified the dimensions and performance of the tray for Quad Flat Packages (here in after referred to as QFP, LQFP, TQFP).

## 2. Definition of Terms

The definitions of major terms used in this standard shall comply with **EIAJ ED-7300** “Recommended Practice on General Rules for Preparation of Outline Drawings of Semiconductor Packagesand” and **EIAJ EDR-7311** “Design Guideline of Integrated Circuits for QFP”.

New terms will be defined in the descriptions of this standard.

## 3. Tray Reference Symbol

### 3.1 Structure of Tray Reference Symbols

In this standard, the structure of tray reference symbols is defined as follows.

Symbol of QFP Tray	Symbol of QFP Types	Symbol of Reference Symbol QFP Outline dimensions
3.2 (1)	3.2 (2)	3.2 (3)
Example      TQ	Q	10x10

### 3.2 Symbol

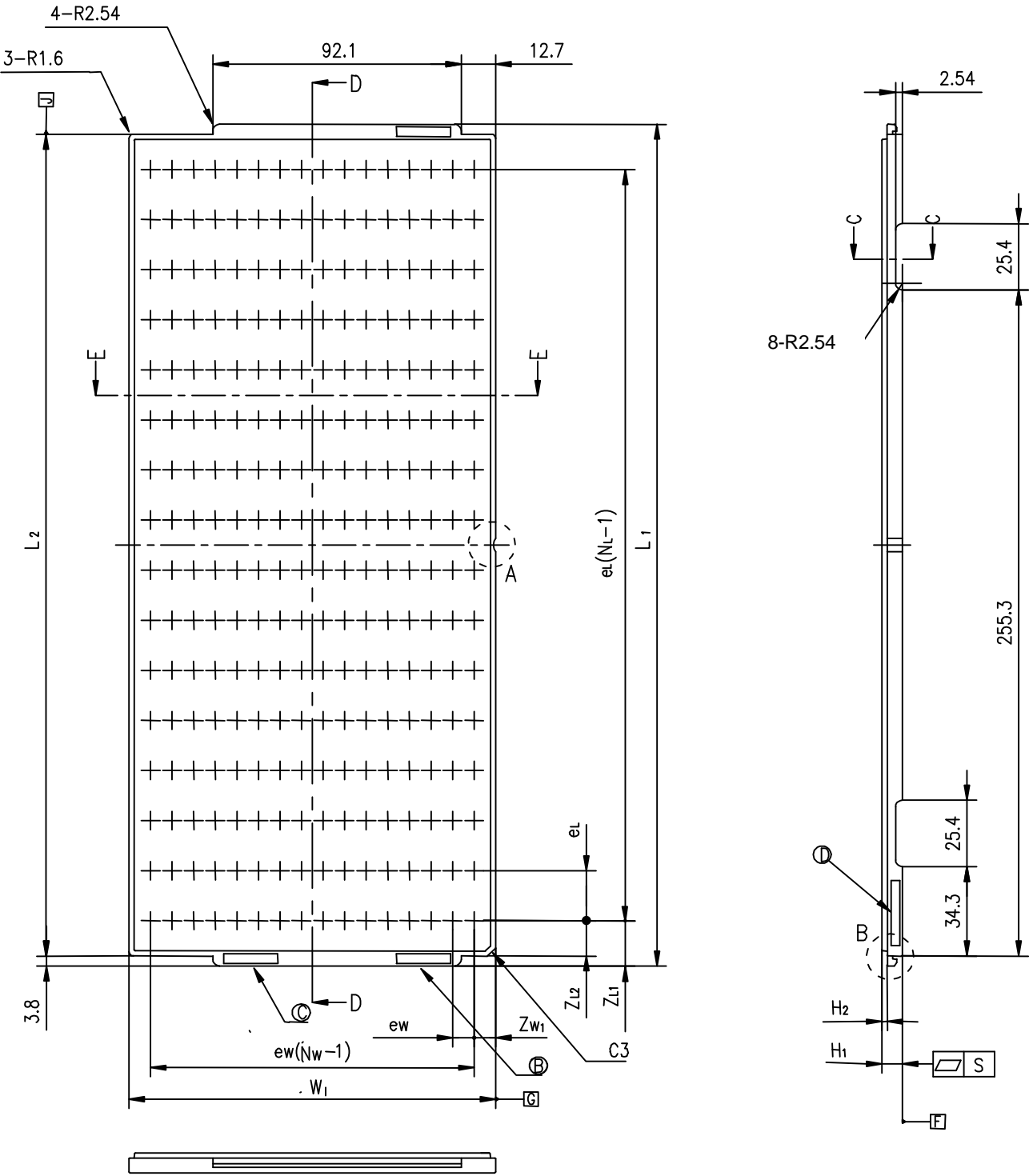
- (1) Symbols of QFP Tray is denoted as 2 large alphabetic.
- (2) Symbols of QFP packages is denoted as Q:QFP   L:LQFP   T:TQFP.
- (3) Reference Symbol of QFP Outline Dimension is denoted numerical figure as ExD.

4. Reference Symbols and Drawing

4.1 Outline Drawing

The outline drawing of the tray is shown in **Figure 1**.

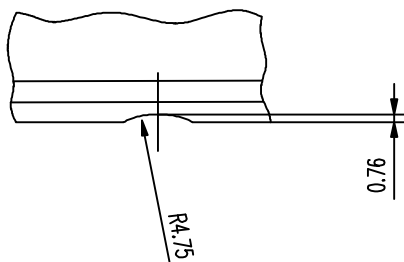
Figure 1



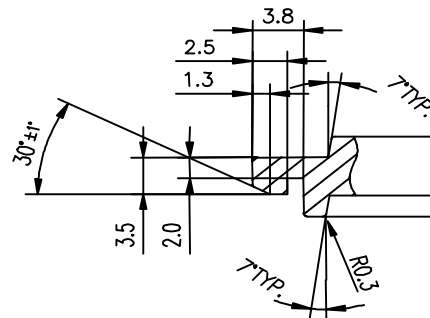
## 4.2 Detailed Cross Section

The detailed drawing of the tray cross section shall comply with **Figure 2 to 6**.

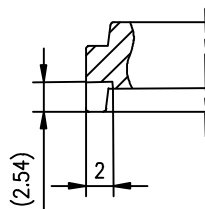
**Figure 2 Detail of A portion**



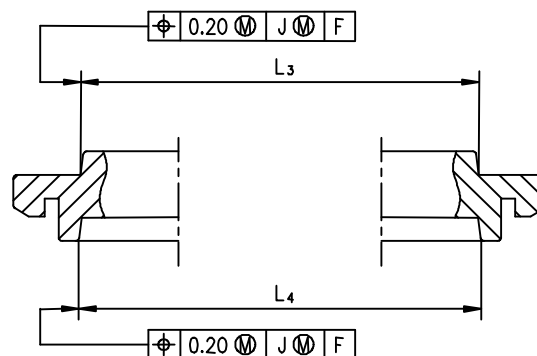
**Figure 3 Detail of B portion**



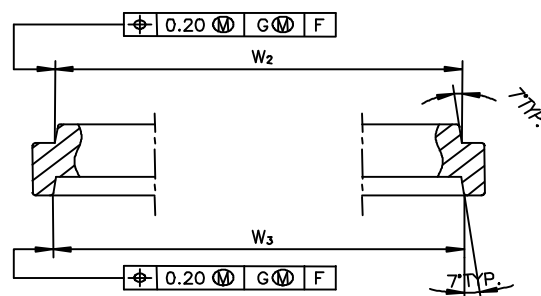
**Figure 4 Cross section of line C-C**



**Figure 5 Cross section of line D-D**



**Figure 6 Cross section of line E-E**



### 4.3 Dimension

The dimensions of the tray shall comply with **Table 1**.

**Table 1 Dimensions**

Unit:mm

Item	Reference Symbol	Standard	Recommended Value	Remarks
Nominal dimensions	E x D	<p>(1) This value is based on the nominal dimensions of the QFP placed on the tray.</p> <p>(2) The nominal dimensions of the QFP are shown below.</p> <p>QFP type</p> <p>10 x 10</p> <p>12 x 12</p> <p>14 x 14</p> <p>14 x 20</p> <p>20 x 20</p> <p>24 x 24</p> <p>28 x 28</p> <p>32 x 32</p> <p>36 x 36</p> <p>40 x 40</p> <p>(3) The nominal dimensions of the LQFP, TQFP are shown below.</p> <p>LQFP, TQFP type</p> <p>7 x 7</p> <p>10 x 10</p> <p>12 x 12</p> <p>14 x 14</p> <p>14 x 20</p> <p>16 x 16</p> <p>20 x 20</p> <p>24 x 24</p> <p>28 x 28</p>		
Width of tray	$W_1$	<p>(1) The standard value is specified as follows.</p> <p><math>W_{1nom} = 135.9</math></p> <p>(2) <math>W_1 - W_{1nom} \pm 0.4</math></p>	$W_1 = W_{1nom} \pm 0.25$	
Length of tray (including endtabs)	$L_1$	<p>(1) The standard value is specified as follows.</p> <p><math>L_{1nom} = 322.6</math></p> <p>(2) <math>L_1 - L_{1nom} \pm 0.4</math></p>	$L_1 = L_{1nom} \pm 0.25$	

Table 1(continued)

Unit:mm

Item	Reference Symbol	Standard	Recommended Value	Remarks
Length of tray (excluding endtabs)	$L_2$	(1) The standard value is specified as follows. $L_{2nom} = 315$ (2) $L_2 = L_{2nom} \pm 0.4$	$L_2 = L_{2nom} \pm 0.25$	
Thickness of tray	$H_1$	(1) The standard value is specified as follows. $H_{1nom} = 7.62$ (2) $H_1 = H_{1nom} \pm 0.13$		
Width of higher portion for stacking	$W_2$	(1) The standard value is specified as follows. $W_{2nom} = 132.08$ (2) $W_2 = W_{2nom} \pm 0.4$	$W_2 = W_{2nom}$	
Length of higher portion for stacking	$L_3$	(1) The standard value is specified as follows. $L_{3nom} = 311.15$ (2) $L_3 = L_{3nom} \pm 0.4$	$L_3 = L_{3nom}$	
Clearance between two stacked trays in direction of width	$W_3 - W_2$	(1) The standard value is specified as follows. $W_3 - W_2 = 0.13 \text{ to } 0.89$		Recommended value of $W_{3nom} = 132.59$
Clearance between two stacked trays in direction of length	$L_4 - L_3$	(1) The standard value is specified as follows. $L_4 - L_3 = 0.13 \text{ to } 0.89$		Recommended value of $L_{4nom} = 311.66$
Height of higher portion for stacking	$H_2$	(1) The standard value is specified as follows. $H_{2nom} = 1.27$ (2) $H_2 = H_{2nom} \pm 0.13$		
Warpage of tray	S	$S_{max} = 1.0$	$S_{max} = 0.8$	

#### 4.4 Positions of cells and number of cells

The standard of the positions of cells and number of cells based on the reference symbol in **Figure 1** are shown in **Table 2**.

**Table 2 Position dimensions of cells and number of cells**

Unit: mm

PKG Symbol		Position Dimension of Cells					Number of Cells		
Type	E x D	$Z_{W1nom}$ (1)	$Z_{L1nom}$ (2)	$Z_{L2nom}$ (3)	$e_{Wnom}$ (4)	$e_{Lnom}$ (5)	$N_W$	$N_L$	$N_W \times N_L$
QFP	10x10	18.30	21.05	17.25	19.86	18.70	6	16	96
	12x12	13.95	18.10	14.30	18.00	17.90	7	17	119
	14x14	15.45	21.55	17.75	21.00	21.50	6	14	84
	14x20	15.45	26.30	22.50	21.00	27.00	6	11	66
	20x20	17.55	21.60	17.80	25.20	25.40	5	12	60
	24x24	20.70	24.50	20.70	31.50	30.40	4	10	40
	28x28	30.93	31.73	27.93	37.02	37.02	3	8	24
	32x32	26.57	28.93	25.13	41.38	37.82	3	8	24
	36x36	26.40	36.50	32.70	41.60	41.60	3	7	21
	40x40	29.22	34.90	31.10	77.46	50.56	2	6	12
LQFP TQFP	7x7	11.25	14.90	11.10	12.60	12.20	10	25	250
	10x10	13.00	16.90	13.10	15.70	15.20	8	20	160
	12x12	13.95	18.10	14.30	18.00	17.90	7	17	119
	14x14	15.45	19.20	15.40	21.00	20.30	6	15	90
	14x20	15.45	21.60	17.80	21.00	25.40	6	12	72
	16x16	13.20	17.65	13.85	21.90	22.10	6	14	84
	20x20	17.55	21.60	17.80	25.20	25.40	5	12	60
	24x24	20.70	24.50	20.70	31.50	30.40	4	10	40
	28x28	19.65	32.50	28.70	32.20	32.20	4	9	36

$$(1) Z_{W1} = Z_{W1nom} \pm 0.13$$

$$(2) Z_{L1} = Z_{L1nom} \pm 0.13$$

$$(3) Z_{L2} = Z_{L2nom} \pm 0.13$$

$$(4) e_W = e_{Wnom} \pm 0.13$$

$$(5) e_L = e_{Lnom} \pm 0.13$$



#### 4.5 Location of Vacuum Pick-up Cells

The vacuum pick-up cell location based on the reference symbol in **Figure 1** are shown in **Table 3**.

**Table 3 Vacuum pick-up cell locations**

Type		Number of Cells		Vacuum Pick-up Locations	
Type	ExD	N <sub>W</sub>	N <sub>L</sub>	Center Location	Locations on Both Side (¹)
QFP	10x10	6	16	3 <sub>W</sub> ~4 <sub>W</sub> / 8 <sub>L</sub> ~9 <sub>L</sub>	3 <sub>W</sub> / 3 <sub>W</sub> , 4 <sub>W</sub> / 14 <sub>L</sub>
	12x12	7	17	3 <sub>W</sub> ~5 <sub>W</sub> / 8 <sub>L</sub> ~10 <sub>L</sub>	4 <sub>W</sub> / 2 <sub>L</sub> , 4 <sub>W</sub> / 16 <sub>L</sub>
	14x14	6	14	3 <sub>W</sub> ~4 <sub>W</sub> / 7 <sub>L</sub> ~8 <sub>L</sub>	3 <sub>W</sub> / 3 <sub>L</sub> , 4 <sub>W</sub> / 12 <sub>L</sub>
	14x20	6	11	3 <sub>W</sub> ~4 <sub>W</sub> / 6 <sub>L</sub>	3 <sub>W</sub> / 2 <sub>L</sub> , 4 <sub>W</sub> / 10 <sub>L</sub>
	20x20	5	12	2 <sub>W</sub> ~4 <sub>W</sub> / 6 <sub>L</sub> ~7 <sub>L</sub>	3 <sub>W</sub> / 2 <sub>L</sub> , 3 <sub>W</sub> / 11 <sub>L</sub>
	24x24	4	10	2 <sub>W</sub> ~3 <sub>W</sub> / 5 <sub>L</sub> ~6 <sub>L</sub>	3 <sub>W</sub> / 2 <sub>L</sub> , 3 <sub>W</sub> / 9 <sub>L</sub>
	28x28	3	8	2 <sub>W</sub> / 4 <sub>L</sub> ~5 <sub>L</sub>	2 <sub>W</sub> / 2 <sub>L</sub> , 2 <sub>W</sub> / 7 <sub>L</sub>
	32x32	3	8	2 <sub>W</sub> / 4 <sub>L</sub> ~5 <sub>L</sub>	2 <sub>W</sub> / 2 <sub>L</sub> , 2 <sub>W</sub> / 7 <sub>L</sub>
	36x36	3	7	2 <sub>W</sub> / 4 <sub>L</sub>	2 <sub>W</sub> / 2 <sub>L</sub> , 2 <sub>W</sub> / 6 <sub>L</sub>
	40x40	2	6	N/A <sup>(²)</sup>	N/A <sup>(²)</sup>
LQFP TQFP	7x7	10	25	4 <sub>W</sub> ~7 <sub>W</sub> / 12 <sub>L</sub> ~14 <sub>L</sub>	5 <sub>W</sub> / 2 <sub>L</sub> , 6 <sub>W</sub> / 24 <sub>L</sub>
	10x10	8	20	4 <sub>W</sub> ~5 <sub>W</sub> / 10 <sub>L</sub> ~11 <sub>L</sub>	4 <sub>W</sub> / 2 <sub>L</sub> , 5 <sub>W</sub> / 19 <sub>L</sub>
	12x12	7	17	3 <sub>W</sub> ~5 <sub>W</sub> / 8 <sub>L</sub> ~10 <sub>L</sub>	4 <sub>W</sub> / 2 <sub>L</sub> , 4 <sub>W</sub> / 16 <sub>L</sub>
	14x14	6	15	3 <sub>W</sub> ~4 <sub>W</sub> / 7 <sub>L</sub> ~9 <sub>L</sub>	3 <sub>W</sub> / 2 <sub>L</sub> , 4 <sub>W</sub> / 14 <sub>L</sub>
	14x20	6	12	3 <sub>W</sub> ~4 <sub>W</sub> / 6 <sub>L</sub> ~7 <sub>L</sub>	3 <sub>W</sub> / 2 <sub>L</sub> , 4 <sub>W</sub> / 11 <sub>L</sub>
	16x16	6	14	3 <sub>W</sub> ~4 <sub>W</sub> / 7 <sub>L</sub> ~8 <sub>L</sub>	3 <sub>W</sub> ~4 <sub>W</sub> / 2 <sub>L</sub> , 3 <sub>W</sub> ~4 <sub>W</sub> / 13 <sub>L</sub>
	20x20	5	12	2 <sub>W</sub> ~4 <sub>W</sub> / 6 <sub>L</sub> ~7 <sub>L</sub>	3 <sub>W</sub> / 2 <sub>L</sub> , 3 <sub>W</sub> / 11 <sub>L</sub>
	24x24	4	10	2 <sub>W</sub> ~3 <sub>W</sub> / 5 <sub>L</sub> ~6 <sub>L</sub>	2 <sub>W</sub> / 2 <sub>L</sub> , 3 <sub>W</sub> / 9 <sub>L</sub>
	28x28	4	9	2 <sub>W</sub> ~3 <sub>W</sub> / 5 <sub>L</sub>	2 <sub>W</sub> ~3 <sub>W</sub> / 2 <sub>L</sub> , 2 <sub>W</sub> ~3 <sub>W</sub> / 8 <sub>L</sub>

**Note (¹):** Option

**(²):** N/A: not applicable

## 5. Tray Marking

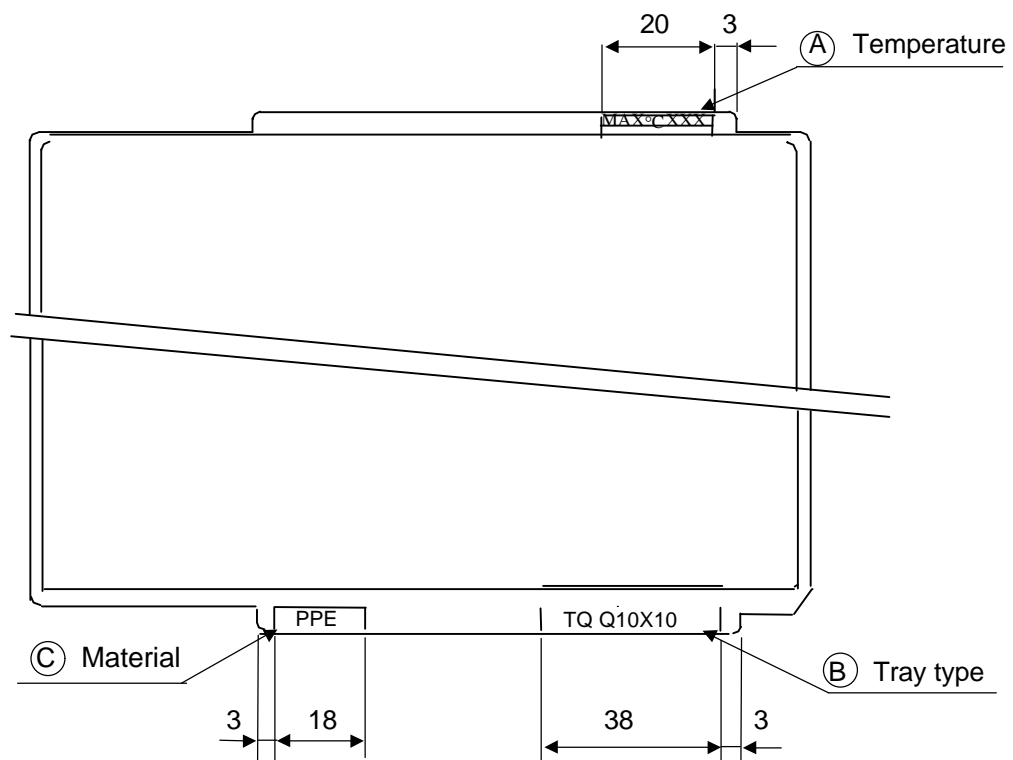
At location A in **Figure 1**, the tray maximum operating temperature is marked.

In addition, the tray type (nominal dimensions) and material are indicated in location B and C respectively

It is also allowed to indicate the tray type (nominal dimensions) at location D (See **Figure 1**) additionally.

The example of tray marking is shown in **Figure 7**.

**Figure 7**



## Explanation

### 1. Purpose

This standard was established to standardize the tray dimensions of the tray for Quad Flat Packages (here in after referred to as QFP, LQFP, TQFP).

Electronic Industries Association of Japan (EIAJ) and the Japan Electronic Development Association (JEIDA) have merged effective November 1, 2000, the Japan Electronics and Information Technology Industries Association (JEITA).

### 2. Process of Deliberation

In the previous subcommittee on packing for semiconductor device in 1995, the standardization of the dimensions of the tray for QFP, LQFP, TQFP was proposed and it was decided to deliberate the subject as a formal agenda.

After discussing many times in this the deliberation of the original plan was completed in the subcommittee on packing for semiconductor devices in March, 1997. This standard **EIAJ EDX-7614** was approved in voting result of draft in the Standardization Technical Committee on Semiconductor Device Package in April, 1997.

If a new QFP, LQFP, TQFP is developed in the future, or if a new problem is posed, these issues will be deliberated or investigated on by one, and a new standard will be added or the existing standard will be revised if necessary.

The revision of this standard for adding new tray was proposed at the Sub-committee on Packing for Semiconductor Devices held in May, 1999. Accordingly, the sub-committee made a questionnaire regarding the new tray for TQFP 16x16 on its member companies. As the result, two members proposed the same tray design for TQFP 16x16. The sub-committee decided the supplement to the standard.

For making the revision, the review of the whole standard was made. Developed through discussion and consideration by the sub-committee, this standard **EIAJ ED-7614** was approved and reviewed by the technical standardization Committee on Semiconductor Device Package in January, 2001.

The review points of **EIAJ ED-7614** in comparison with **EIAJ EDX-7614** are as follows.

- (1) The tray for TQFP 16x16 is added in the standard. (complied with **EIAJ EDR-7602**)
- (2) When we need to standardize a new tray, the pocket count, the location of end pocket and the pocket pitch of **EIAJ EDR-7602** "Design Guideline of Tray for Integrated Circuits" are preceded.
- (3) When we need to make a new tray, we shall use the dimension  $W_1$ ,  $L_1$ ,  $W_2$ ,  $L_2$ ,  $L_3$  and  $S$  in the recommended value which is equal to **EIAJ EDR-7602** standard.
- (4) The dimension " $W_3 - W_2$ " and " $L_4 - L_3$ " were changed from "0.25~0.76" to "0.13~0.89" by the review of tray design. These changes will be adopted from new tray.

### 3. Main Issues of Deliberation

The trays which had already standardized in the **EIAJ EDX-7614** are adopted in **EIAJ ED-7614**. The standard of these trays is the same as JEDEC standard CS-004B and CS-007A. The tray standard of

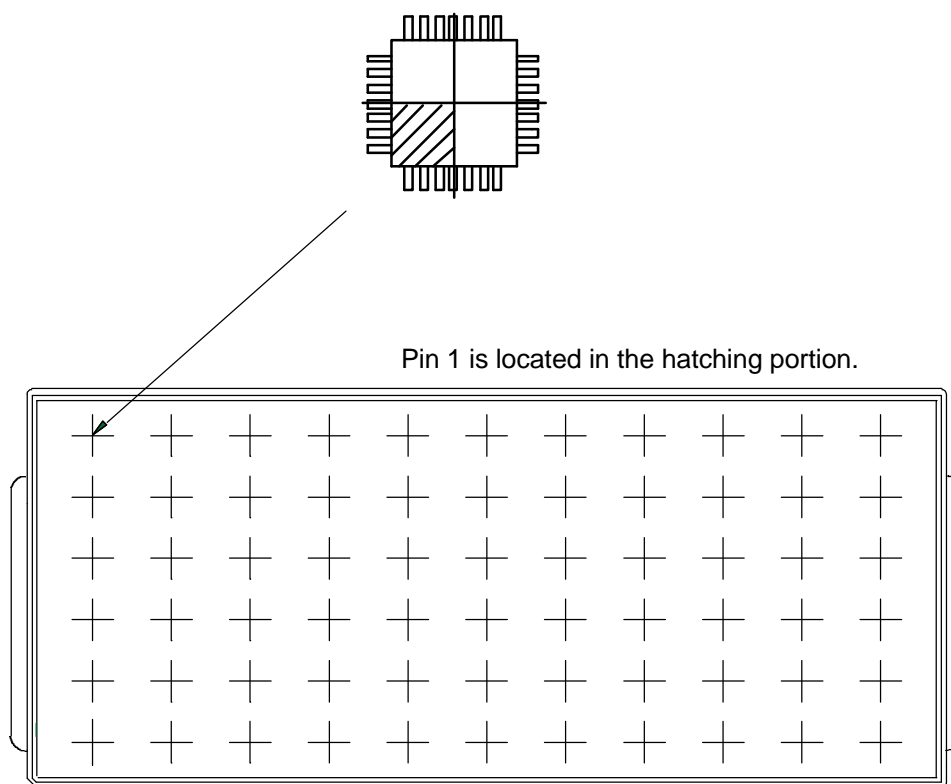
TQFP 16x16 is adopted from **EIAJ EDR-7602**. When we need to standardize a new tray, the pocket count, the location of end pocket and the pocket pitch of **EIAJ EDR-7602** "Design Guideline of Tray for Integrated Circuits" are preceded.

The subcommittee member comment that they have many original QFP trays, so they will adopt this standard when they need new tray. If significant inconvenience as a tray for QFP occurs, a meeting for improvement will be held, and the standard may be changed if required.

#### 4. Recommended Package Placing Orientation in Tray

As shown in **Additional Figure 1**, pin 1 must be located along the side of tray which has a scallop or a chamfered corner.

**Additional Figure1**



#### 5. Warpage of Tray

Though the warpage is represented as the flatness tolerance in this standard, only the periphery of the tray is defined as the tolerance zone, considering the stability of the tray when placed on a flat plate.

#### 6. Locations of Vacuum Pick Up Cells

In this standard, the vacuum pickup cells at the center are located almost at the center in the lateral direction and about 50mm from the both ends excluding the endtubs in the longitude direction.

Since a vacuum pickup error may occur vacuuming by outer if the area is 28mm x 28mm, the area is recommended to 32mm x 32mm.

## 7. Temperature Marking

Display the temperature with which the direction standard is not violated after an empty tray is heated for 48 hours continuously and then cooled. The tray is heated in hot air circulating furnace. In the furnace, the tray is placed on a flat plate. For cooling, self cooling is adopted.

## 8. Appearance of Tray

Since trays are stored in plastic film packing bags, chamfer each corner of the tray to prevent the plastic bag From being torn or broken.

## 9. Deliberation Committee

This standard was deliberated mainly by the subcommittee on Packing for Semiconductor Device in the Technical Standardization Committee on Semiconductor Device Package.

The committee members are shown below.

### <Technical Standardization Committee on Semiconductor Device Package>

Chairman	Ichiro Anjo	Elpida Memory, Inc.
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### <Sub-committee on Packing for Semiconductor Devices>

Chief	Toshiyuki Miyata	Toshiba Corp.
Vice Chief	Yukio Ando	Fujitsu Ltd.
	Munehiro Yamada	Hitachi Ltd.
Member	Hirohide Takahashi	Oki Electric Industry Co., Ltd.
	Shigenori Hamaoka	Kyushu Inoac
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