EIAJ

EIAJ EDX－7619

ＢＧＡ用厚形トレイ
Thick tray for Ball Grid Array packages

１９９９年１１月制定

作　成

半導体パッケージ標準化委員会
Technical Standardization Committee on Semiconductor Device Package

発　行

EIAJ EDX-7619

Provisional standard of Electronic Industries Association of Japan

Thick tray for Ball Grid Array packages

1. Scope

This provisional standard specifies the dimensions and performance of the Thick tray for Ball Grid Array packages (hereinafter referred to as BGA).

2. Definition of terms

The definitions of major terms used in this standard shall comply with **EIAJ ED-7300** "Recommended Practice on standard for the Preparation of Outline Drawings of Semiconductor Packages".
New items will be defined in the descriptions of this standard.

3. Tray Reference Symbol
3.1 Structure of Tray Reference Symbols

$$
\begin{bmatrix} \text{Symbol of BGA} \\ \text{Thick Tray} \\ \text{3.2 (1)} \end{bmatrix}
\quad
\begin{bmatrix} \text{Symbol of BGA} \\ \text{Types} \\ \text{3.2 (2)} \end{bmatrix}
\quad
\begin{bmatrix} \text{Symbols of Reference Symbol} \\ \text{BGA Outline dimensions} \\ \text{3.2 (3)} \end{bmatrix}
$$

Example

$$
\text{TTB} \quad - \quad \text{P} \quad - \quad 27 \times 27 \quad (-\text{X X X X})
$$

3.2 Symbol

(1)BGA Thick Tray Symbol : Symbol of BGA Thick tray is denoted as 3 large alphabetic letters "TTB".
(2)BGA Type Symbol : Symbols of BGA package type is denoted as P : Plastic, T : Tape.
(3)Reference Symbol of BGA : Outline dimensions is denoted Numerical Figures as $E \times D$.
If necessary, the number of balls may be denoted as " $-$ X X X X ".

4. Reference Symbols and Drawing

4.1 Outline drawing

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

Figure 1

4.2 Detailed Cross Section

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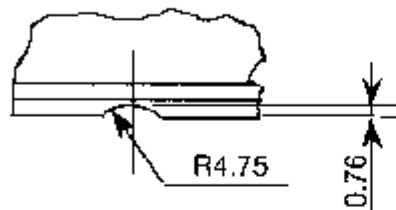
Figure 2   Detail of A portion
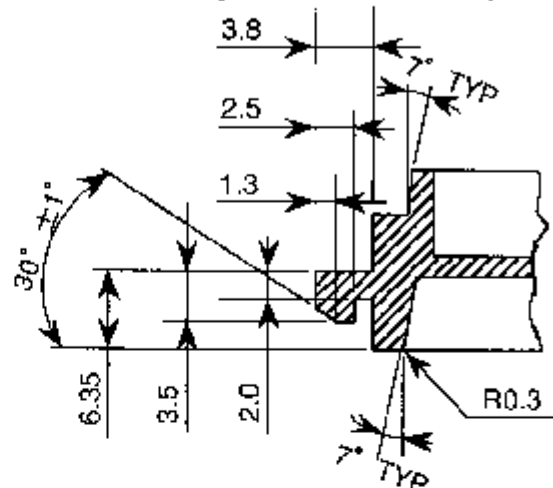

Figure 3   Detail of B portion

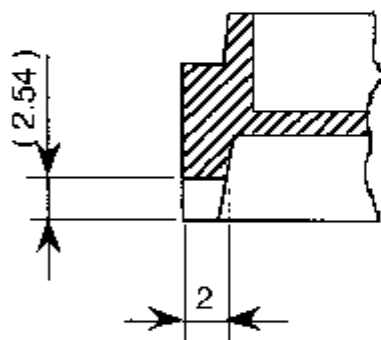### Figure 4   Cross section of line C-C
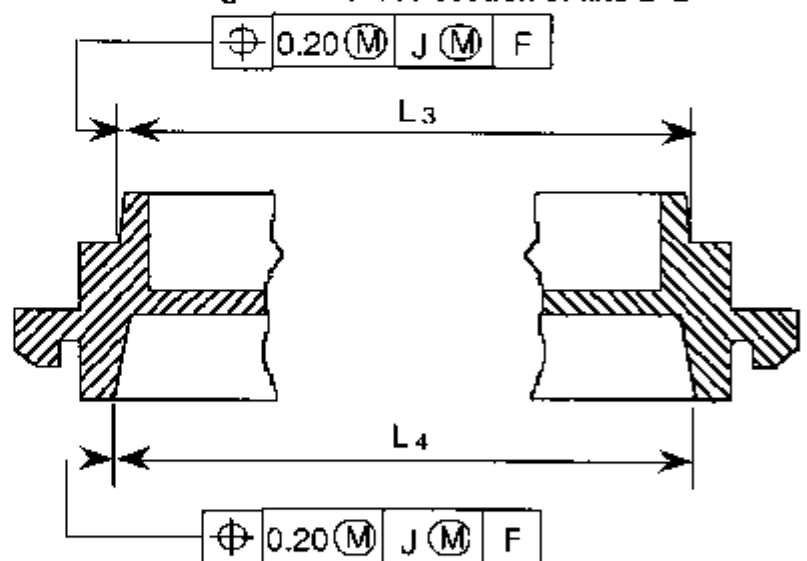

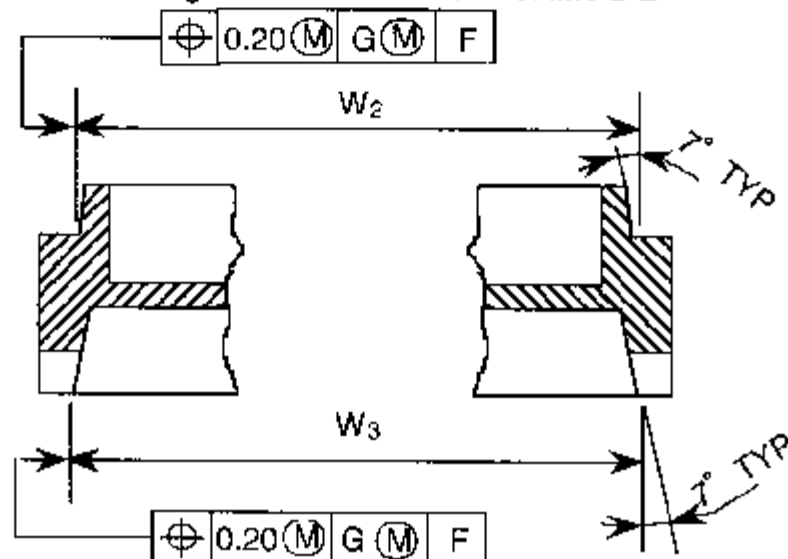### Figure 5   Cross section of line D-D

Figure 6   Cross section of line E-E

5

4.3 Demention

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

Table 1

Unit:mm

Item	Reference Symbol	Standard	Recommended Value	Remarks
Nominal dimensions	$E \times D$	(1) This Value is based on the nominal dimensions of the BGA placed on the tray. (2) The nominal dimensions of the BGA are shown below. Square type 17×17 23×23 25×25 27×27 29×29 31×31 32.5×32.5 33×33 35×35 37.5×37.5 40×40 42.5×42.5 45×45 47.5×47.5 50×50 Rectangular type 22×14 25×21 32.5×25		
Width of tray	W_1	(1) The standard value is specified as follows. $$W_{1\,nom} = 135.9$$ (2) $W_1 - W_{1\,nom} \pm 0.4$	$W_1 = W_{1\,nom}$ ± 0.25	The recommended value is a JEDEC standard value.
Length of tray (including end tabs)	L_1	(1) The standard value is specified as follows. $$L_{1\,nom} = 322.6$$ (2) $L_1 = L_{1\,nom} \pm 0.4$	$L_1 = L_{1\,nom}$ ± 0.25	The recommended value is a JEDEC standard value.
Length of tray (excluding end tabs)	L_2	(1) The standard value is specified as follows. $$L_{2\,nom} = 315$$ (2) $L_2 = L_{2\,nom} \pm 0.4$	$L_2 = L_{2\,nom}$ ± 0.25	The recommended value is a JEDEC standard value.

Table 1 (continued)

Unit:mm

Item	Reference Symbol	Standard	Recommended Value	Remarks
Thickness of tray	H_1	(1) The standard value is specified as follows. $$H_{1\,nom} = 1\,2.\,1\,9$$ (2) $H_1 = H_{1\,nom} + 0\,.\,1\,3$		
Width of higher portion for stacking	W_2	(1) The standard value is specified as follows. $$W_{2\,nom} = 1\,3\,2.\,0\,8$$ (2) $W_2 = W_{2\,nom} \pm 0\,.\,4$	$W_2 = W_{2\,nom}\ {}^{+\,0.25}_{-\,0.13}$	The recommended value is a JEDEC standard value.
Length of higher portion for stacking	L_3	(1) The standard value is specified as follows. $$L_{3\,nom} = 3\,1\,1.\,1\,5$$ (2) $L_3 = L_{3\,nom} + 0\,.\,4$	$L_3 = L_{3\,nom}\ {}^{+\,0.25}_{-\,0.13}$	The recommended value is a JEDEC standard value.
Clearance between two stacked trays in direction of width	$W_3 - W_2$	(1) The standard value is specified as follows. $$W_3 - W_2 = 0\,.\,1\,3 \text{ to } 0\,.\,8\,9$$		Recommended value of $W_{3\,nom} = 132.59$
Clearance between two stacked trays in direction of length	$L_4 - L_3$	(1) The standard value is specified as follows. $$L_4 - L_3 = 0\,.\,1\,3 \text{ to } 0\,.\,8\,9$$		Recommended value of $L_{4\,nom} = 311.66$
Height of higher portion for stacking	H_2	(1) The standard value is specified as follows. $$H_{2\,nom} = 2\,.\,0\,3$$ (2) $H_2 = H_{2\,nom} \pm 0\,.\,1\,3$		
Warpage of tray	S	$S_{max} = 1\,.\,0$	$S_{max} = 0\,.\,8\,0$	The recommended value is a JEDEC standard value.

4.4 Position dimensions of cells and number of cells

The standard of the position dimensions 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

PKG Symbol		Position dimensions of cells (Unit : mm)					Number of cells		
Type	$E \times D$	Z_{W1nom} (1)	Z_{L1nom} (2)	Z_{L2nom} (3)	e_{Lnom} (4)	e_{Wnom} (5)	N_W	N_L	$N_W \times N_L$
Square type	17×17	19.20	24.80	21.00	19.50	19.50	6	15	90
	23×23	16.95	21.05	17.25	25.50	25.50	5	12	60
	25×25	26.70	23.80	20.00	27.50	27.50	4	11	44
	27×27	24.15	29.90	26.10	29.20	29.20	4	10	40
	29×29	20.85	34.90	31.10	31.60	31.40	4	9	36
	31×31	25.05	25.70	21.90	33.90	42.90	3	9	27
	32.5×32.5	32.45	37.05	33.25	35.50	35.50	3	8	24
	33×33	32.45	37.05	33.25	35.50	35.50	3	8	24
	35×35	29.95	28.30	24.50	38.00	38.00	3	8	24
	37.5×37.5	27.95	41.30	37.50	40.00	40.00	3	7	21
	40×40	25.65	34.40	30.60	42.30	42.30	3	7	21
	42.5×42.5	26.70	47.55	43.75	45.50	82.50	2	6	12
	45×45	30.00	33.80	30.00	51.00	75.90	2	6	12
	47.5×47.5	30.00	35.05	31.25	50.50	75.90	2	6	12
	50×50	41.45	55.30	51.50	53.00	53.00	2	5	10
Recta-ngular type	22×14	11.60	28.75	24.95	24.10	16.10	8	12	96
	23×21	20.95	23.80	20.00	27.50	23.50	5	11	55
	32.5×25	26.70	37.05	33.25	35.50	27.50	4	8	32

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

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

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

PKG Symbol		Number of cells		Vacuum pick-up locations	
Type	$E \times D$	N_W	N_L	Center locations	Locations on both sides [1]
Square type	17×17	6	1 5	$(3_W \sim 4_W) / (7_L \sim 9_L)$	$3_W / 2_L,\ 4_W / 14_L$
	23×23	5	1 2	$(2_W \sim 4_W) / (6_L \sim 7_L)$	$3_W / 2_L,\ 3_W / 11_L$
	25×25	4	11	$(2_W \sim 3_W) / (5_L \sim 7_L)$	$2_W / 2_L,\ 3_W / 10_L$
	27×27	4	10	$(2_W \sim 3_W) / (5_L \sim 6_L)$	$2_W / 2_L,\ 3_W / 9_L$
	29×29	4	9	$(2_W \sim 3_W) / (4_L \sim 6_L)$	$2_W / 2_L,\ 3_W / 8_L$
	31×31	3	9	$2_W / 5_L$	$2_W / 2_L,\ 2_W / 8_L$
	32.5×32.5	3	8	$2_W / (4_L \sim 5_L)$	$2_W / 2_L,\ 2_W / 7_L$
	33×33	3	8	$2_W / (4_L \sim 5_L)$	$2_W / 2_L,\ 2_W / 7_L$
	35×35	3	8	$2_W / (4_L \sim 5_L)$	$2_W / 2_L,\ 2_W / 7_L$
	37.5×37.5	3	7	$2_W / 4_L$	$2_W / 2_L,\ 2_W / 6_L$
	40×40	3	7	$2_W / 4_L$	$2_W / 2_L,\ 2_W / 6_L$
	42.5×42.5	2	6	N/A [2]	N/A [3]
	45×45	2	6	$(1_W \sim 2_W) / (3_L \sim 4_L)$	$1_W / 1_L,\ 2_W / 6_L$
	47.5×47.5	2	6	$(1_W \sim 2_W) / (3_L \sim 4_L)$	$1_W / 1_L,\ 2_W / 6_L$
	50×50	2	5	$(1_W \sim 2_W) / 3_L$	$1_W / 1_L,\ 2_W / 5_L$
Recta-ngular type	22×14	8	1 2	$(4_W \sim 5_W) / (6_L \sim 7_L)$	$4_W / 2_L,\ 5_W / 11_L$
	25×21	5	1 1	$(2_W \sim 4_W) / 6_L$	$2_W / 2_L,\ 4_W / 10_L$
	32.5×25	4	8	$(2_W \sim 3_W) / (4_L \sim 5_L)$	$2_W / 2_L,\ 3_W / 7_L$

Note [1] Option
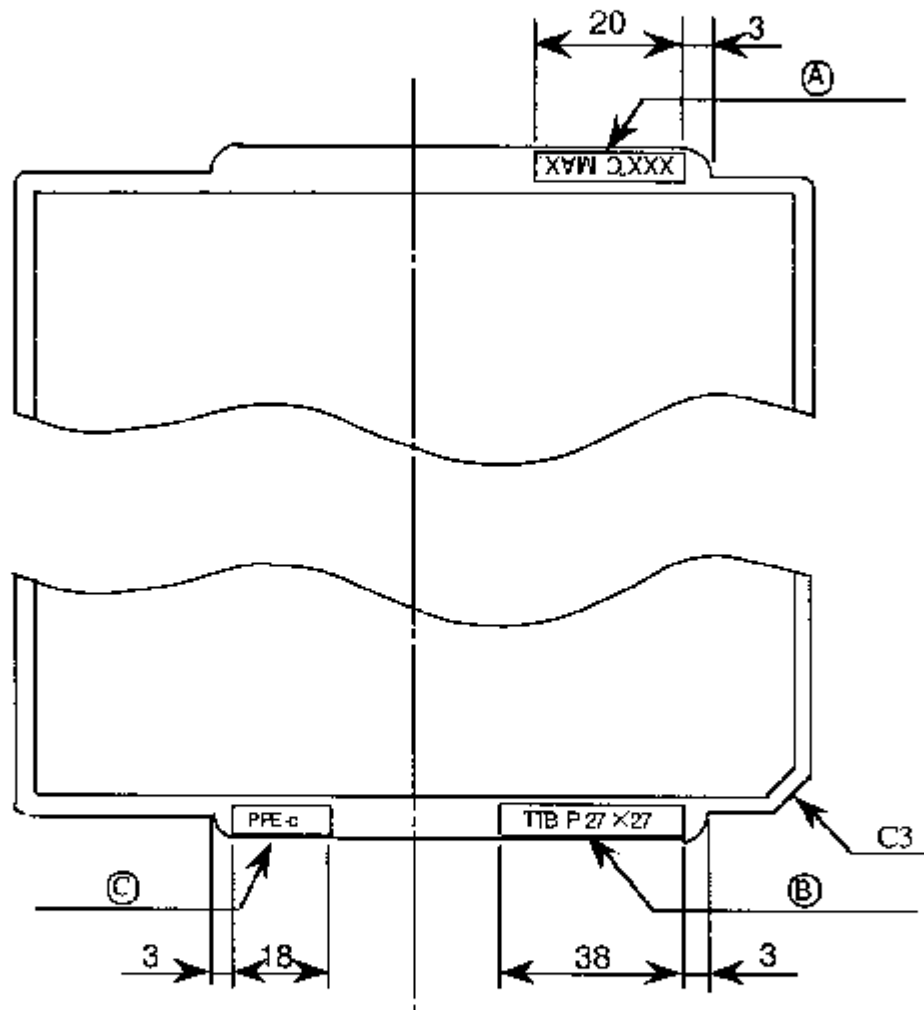
[2] Vacuum pick-up area covers 32mm × 32mm min.

[3] N/A : not applicable

5. Tray Marking

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

In addition, the tray (nominal dimensions) and material are indicated in location Ⓑ and Ⓒ respectively. It is also allowed to indicate the tray type (nominal dimensions) at location Ⓓ (See **Figure 1**) additionally.

Figure 7

Explanation

1. Purpose of establishment

This provisionalstandard was established to standardize the tray dimensions of the thick tray for Ball Grid Array packages (hereinafter referred to as BGA).

2. Process of deliberation

In the previous subcommittee on packing for semiconductor device in 1998, the standardization of the dimensions of the thick tray for BGA 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.

The standard was approved in voting result of draft in the Standardization Technical Committee on Semiconductor Device Package in December, 1999.

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

3. Main issue of deliberation

This tentative standard was decided to have the same standardization in outlines, pocket pitch etc., as the already existing BGA thick tray of EIA/JEDEC (CO-028) standard.

The subcommittee decided by questionnaire to concede the dimensions of the thick tray s which are not of JEDEC (CO-028) standard but are already existing in the market.

Regarding the BGA packages of 22×14, the position, dimensions, numbers of pocket position of vacuum pick up cell that are already standardized by **EIAJ EDX-7613**, have been adopted.

For other BGA, the dimensions shall be based on the following formula of calculation harmonized on the current deliberation by EIA/EIAJ JWG-2 meetings.

$$e_1 = Dnom + 2.40 \text{ mm}$$
$$e_w = Enom + 2.40 \text{ mm}$$
$$N_w = (W_1 - 6.4) / e_w$$
$$N_1 = (L_2 - 6.4) / e_1$$
$$Z_{w1} = [W_1 - (N_w - 1) e_w] / 2 \text{ mm}$$
$$Z_{1.2} = [L_2 - (N_1 - 1) e_1] / 2 \text{ mm}$$

Remarks 1. For values of N_1 and N_w, omit the figures below the decimal point.

2. For values of Z_{w1} and $Z_{1.2}$, round off the figures to one decimal place.

3. For values of e_{Lnom} and e_{Wnom}, raise the figures to one decimal place.

4. Recommended package placing the orientation in thick tray

As shown in **Figure 1**, pin 1 must be located along the side of thick tray which has scallop or a chamfered corner. (1 pin is in diagonally lined area.)

Additional figure 1
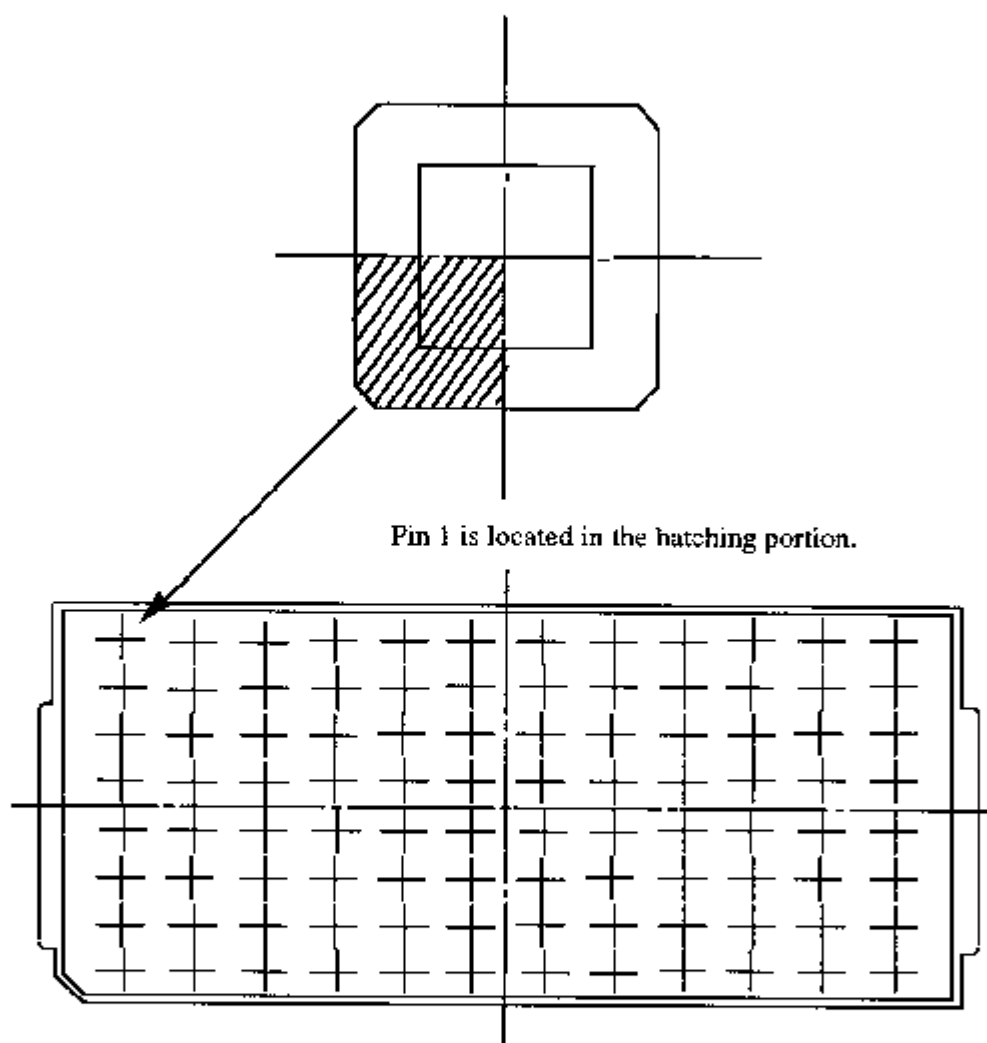
Pin 1 is located in the hatching portion.

5. Warpage of tray

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

6. Location of vacuum pickup cells

In this standard, the vacuum pickup cells at the center are located at area of minimum 32mm × 32mm. Additionally, vacuum pickup cells are located almost at the center in the lateral direction and about 50mm from both ends in the longitude direction.

When size of a pocket is big and the thick tray is of 2 rows, a vacuum pickup cell of 32mm × 32mm shall be secured at center of the thick tray. However, if a pocket is 42.5mm × 42.5mm, area of 32mm × 32mm is hard to secure and vacuum pickup shall be difficult.

7. Temperature marking

Display the temperature at which the dimension standard is not violated under following condition ; Empty tray is placed on a flat plate and is baked for 48 hours continuously in hot air circulating furnace, then the tray on the flat plate cools itself off naturally.

8. Appearance of tray

Trays are stored in plastic film packing bags, therefore, each corner of the tray is chamfered to prevent tears and damages on the plastic bags.

9. Deliberation committee

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

The Committee members are shown below.

< Standardization Technical Committee on Semiconductor Device Package >

Chairman	Shozo Minamide	Sharp Corp.

< Sub-committee on Packing for Semiconductor Devices >

Chief	Yasunori Sotokubo	Toshiba Crop.
Vice Chief	Masaaki Mukai	NEC Corp
	Usuke Enomoto	Hitachi LTD.
Member	Hirohide Takahashi	Oki Electric Industry Co.,Ltd.
	Shigenori Hamaoka	Kyushu Inoac.
	Masatomo Iwamoto	Gold Industries Co.,Ltd.
	Syouzou Yokoyama	Shinon Electric Industry Co.,Ltd..
	Hisashi Okumura	Sharp Corp.
	Ken Tamura	Shin-etsu Polymer Co.,Ltd..
	Tatsunori Suzuki	Sumitomo 3M, Ltd.
	Kazuo Yazawa	Seiko Epson Corp.
	Nobuyuki Tanaka	Sony Corp..
	Youji Hirose	Dainippon Ink and Chemical Inc.
	Hitoshi Kazama	Orient Resin Mold Co.,Ltd.
	Masatoshi Hanada	Nippo Co.,Ltd.
	Masao Sato	Nihon Garter co., Ltd.
	Yukio Ando	Fujitsu Ltd.
	Yukio Yamaguchi	Matsushita Electronics Corp.
	Yukio Yamauchi	Mitsubishi Electric Corp..
	Teruyasu Sakurai	Yayoi Corp.
	Ryo Kariya	Unitechno Inc.
	Tunemori Yamaguchi	Rohm Inc..

< Project Group on Standardization for Tray >

Leader	Masaaki Mukai	NEC Corp
Sub-Leader	Ken Tamura	Shin-etsu Polymer Co.,Ltd.
Member	Yasunori Sotokubo	Toshiba Crop.
	Usuke Enomoto	Hitachi Ltd.
	Hirohide Takahashi	Oki Electric Industry Co.,Ltd.
	Syouzou Yokoyama	Shinon Electric Industry Co.,Ltd..
	Nobuyuki Tanaka	Sony Corp.
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	Ryo Kariya	Unitechno Inc.
	Hideyasu Hashiba	Fujitsu Ltd..
	Kouji Maeda	Dainippon Ink and Chemical Inc.