

Standard of Japan Electronics and Information Technology Industries Association

EIAJ ED-7611

Tray for Thin Small Outline Packages

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Technical Standardization Committee on Semiconductor Device Package

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Tray for Thin Small Outline Packages

1. Scope

This standard specifies the dimensions and performance of the tray for thin small outline Packages (hereinafter referred to as TSOP).

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 Packages" and **EIAJ EDR-7312** "Design guideline of integrated circuits for thin small outline package (type1)" and **EIAJ EDR-7313** "Design guideline of integrated circuits for thin small outline package (type 2)". 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.

<div>Symbol of TSOP Tray 3.2 (1)</div>	<div>Symbols of TSOP Outline 3.2 (2)</div>	<div>Symbols of Reference Symbol TSOP Outline dimensions 3.2 (3)</div>
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Example

TT	1	8 x 12.4
TT	2	10.16 x 20.95

3.2 Symbol

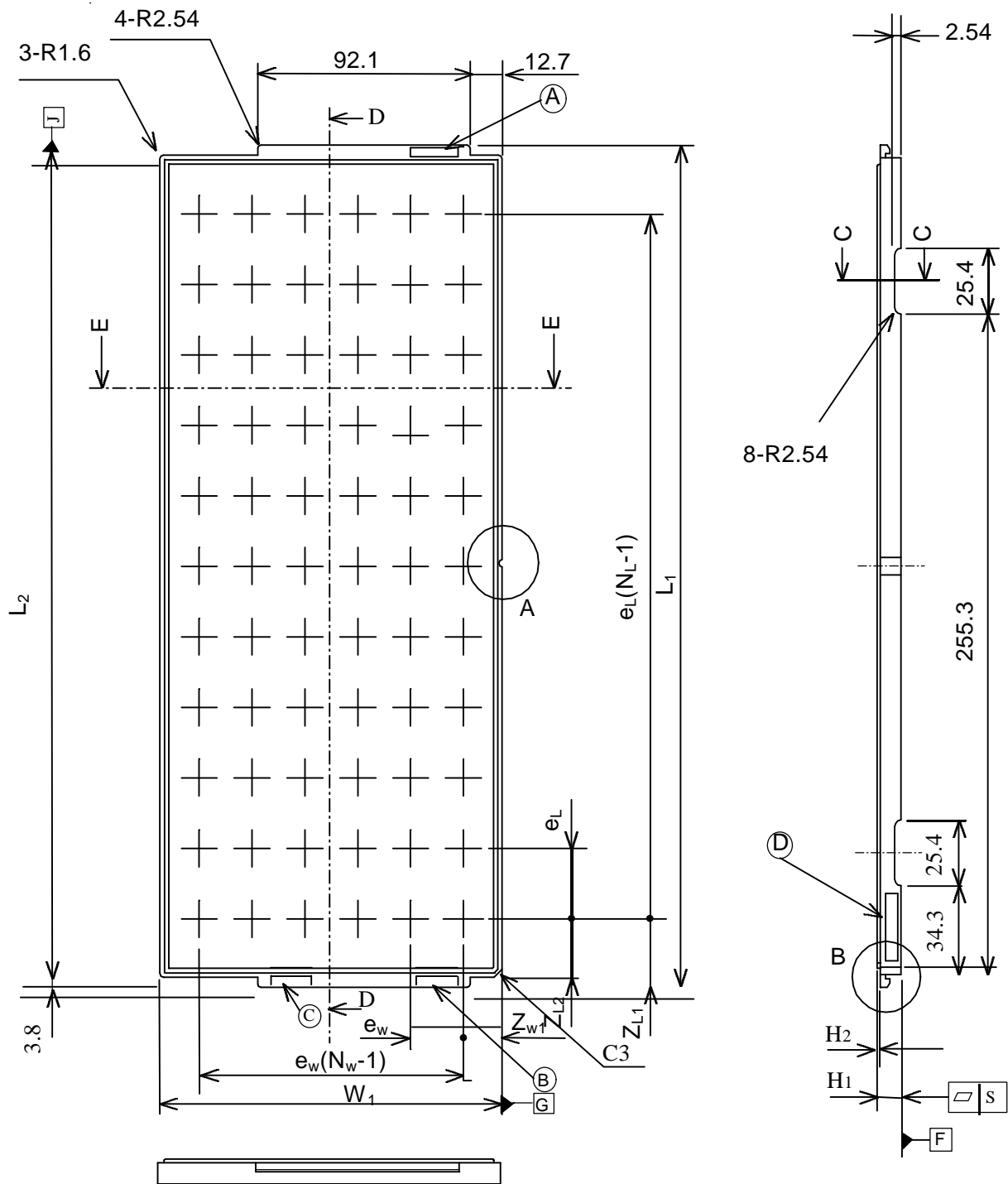
- (1) Symbols of TSOP Tray is denoted as 2 large alphabetic letters "TT".
- (2) Symbol of TSOP Types are denoted numerical figures as "1", "2" .
- (3) Reference symbol of TSOP outline dimension is denoted numerical figure as E x D.

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 **Figures 2 to 6**.

Figure 2 Detail of A portion

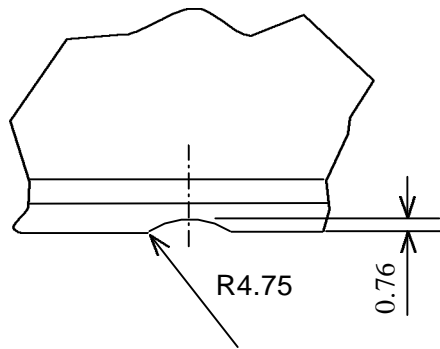


Figure 3 Detail of B portion

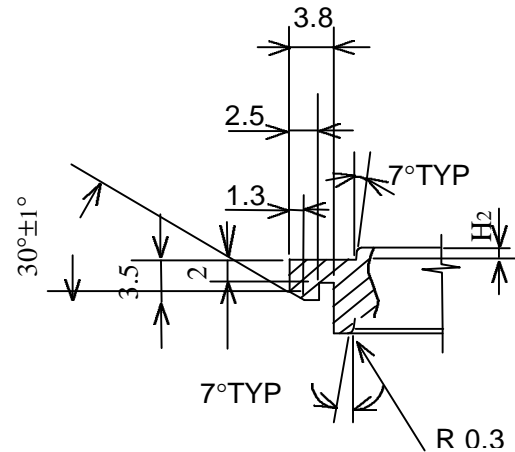


Figure 4 Cross section of line C-C

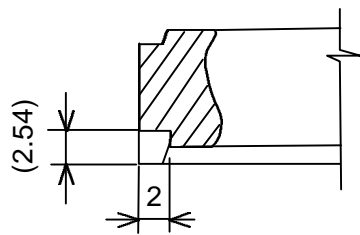


Figure 5 Cross section of line D-D

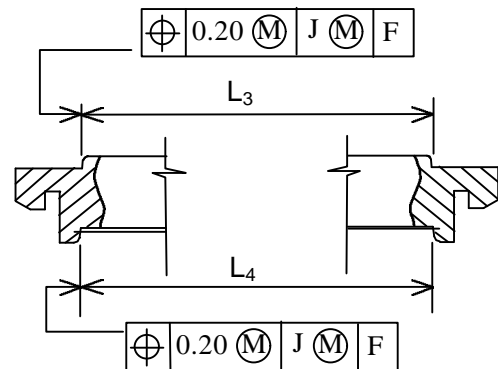
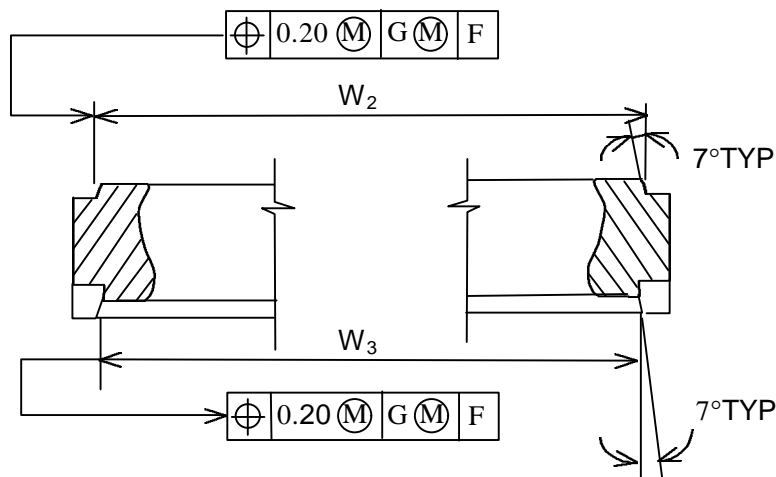


Figure 6 Cross section of line E-E



EIAJ ED-7611

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 TSOP placed on the tray.</p> <p>(2) The nominal dimensions of the TSOP type 1 are shown below.</p> <p>6 x 12.4</p> <p>6 x 14.4</p> <p>6 x 16.4</p> <p>6 x 18.4</p> <p>8 x 12.4</p> <p>8 x 14.4</p> <p>8 x 16.4</p> <p>8 x 18.4</p> <p>10 x 12.4</p> <p>10 x 14.4</p> <p>10 x 16.4</p> <p>10 x 18.4</p> <p>12 x 12.4</p> <p>12 x 14.4</p> <p>12 x 16.4</p> <p>12 x 18.4</p> <p>14 x 18.4</p> <p>(3) The nominal dimensions of the TSOP type 2 are shown below.</p> <p>7.62(300)</p> <p>x 17.14</p> <p>x 18.41</p> <p>10.16(400)</p> <p>x 18.41</p> <p>x 20.95</p> <p>x 22.22</p> <p>x 23.49</p> <p>x 26.03</p> <p>x 28.57</p>		

Table 1 (Continued)

Unit:mm

Item	Reference Symbol	Standard	Recommended Value	Remarks
Width of tray	W_1	(1) The standard value is specified as follows. $W_{1nom}=135.9$ (2) $W_1=W_{1nom}\pm 0.4$	$W_1=W_{1nom}\pm 0.25$	
Length of tray (including endtabs)	L_1	(1) The standard value is specified as follows. $L_{1nom} = 322.6$ (2) $L_1 = L_{1nom}\pm 0.4$	$L_1 = L_{1nom}\pm 0.25$	
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. $W_3-W_2=0.13$ 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. $L_4-L_3=0.13$ 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	$S_{max}=1.0$	$S_{max}=0.8$	

EIAJ ED-7611

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 dimensions of cells					Number of cells		
Type	E x D(H _D)	Z _{W1nom} (1)	Z _{L1nom} (2)	Z _{L2nom} (3)	e _{Wnom} (4)	e _{Lnom} (5)	N _w	N _L	N _w x N _L
1	6 x 12.4(14)	8.70	18.80	15.00	7.90	19.00	16	16	256
	6 x 14.4(16)	8.70	17.80	14.00	7.90	20.50	16	15	240
	6 x 16.4(18)	8.70	20.30	16.50	7.90	23.50	16	13	208
	6 x 18.4(20)	8.70	21.05	17.25	7.90	25.50	16	12	192
	8 x 12.4(14)	8.85	18.80	15.00	9.85	19.00	13	16	208
	8 x 14.4(16)	8.85	17.80	14.00	9.85	20.50	13	15	195
	8 x 16.4(18)	8.85	20.30	16.50	9.85	23.50	13	13	169
	8 x 18.4(20)	8.85	18.30	14.50	9.85	26.00	13	12	156
	10 x 12.4(14)	14.40	18.80	15.00	11.90	19.00	10	16	160
	10 x 14.4(16)	14.40	17.80	14.00	11.90	20.50	10	15	150
	10 x 16.4(18)	14.40	20.30	16.50	11.90	23.50	10	13	130
	10 x 18.4(20)	14.40	21.05	17.25	11.90	25.50	10	12	120
	12 x 12.4(14)	15.80	18.80	15.00	14.90	19.00	8	16	128
	12 x 14.4(16)	15.80	17.80	14.00	14.90	20.50	8	15	120
	12 x 16.4(18)	15.80	20.30	16.50	14.90	23.50	8	13	104
	12 x 18.4(20)	15.80	21.05	17.25	14.90	25.50	8	12	96
	14 x 18.4(20)	18.15	23.90	20.10	16.60	22.90	7	13	91
2	7.62 x17.14	12.30	17.75	13.95	11.13	19.14	11	16	176
	7.62 x18.41	12.30	18.36	14.56	11.13	20.42	11	15	165
	10.16 x18.41	13.27	18.36	14.56	13.67	20.42	9	15	135
	10.16 x20.95	13.27	23.54	19.74	13.67	22.96	9	13	117
	10.16 x22.22	12.00	25.50	21.70	14.00	24.70	9	12	108
	10.16 x22.22	13.27	19.40	15.60	13.67	25.80	9	12	108
	10.16 x23.49	13.27	19.40	15.60	13.67	25.80	9	12	108
	10.16 x26.03	13.27	20.30	16.50	13.67	28.20	9	11	99
	10.16 x28.57	13.27	21.80	18.00	13.67	31.00	9	10	90

Note(1) $Z_{W1}=Z_{W1nom}\pm0.13$ **(2)** $Z_{L1}=Z_{L1nom}\pm0.13$ **(3)** $Z_{L2}=Z_{L2nom}\pm0.13$

(4) $e_W=e_{Wnom}\pm0.13$ **(5)** $e_L=e_{Lnom}\pm0.13$

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 x D(H _D)	N _W	N _L	Center locations	Locations on both sides ⁽¹⁾
1	6 x 12.4(14)	16	16	7 _W ~10 _W /8 _L , 7 _W ~10 _W /9 _L	3 _W ~4 _W /3 _L , 13 _W ~14 _W /14 _L
	6 x 14.4(16)	16	15	7 _W ~10 _W /7 _L , 7 _W ~10 _W /8 _L , 7 _W ~10 _W /9 _L	3 _W ~4 _W /3 _L , 13 _W ~14 _W /13 _L
	6 x 16.4(18)	16	13	7 _W ~10 _W /6 _L , 7 _W ~10 _W /7 _L , 7 _W ~10 _W /8 _L	3 _W ~4 _W /2 _L , 13 _W ~14 _W /12 _L
	6 x 18.4(20)	16	12	7 _W ~10 _W /6 _L , 7 _W ~10 _W /7 _L	3 _W ~4 _W /2 _L , 13 _W ~14 _W /11 _L
	8 x 12.4(14)	13	16	6 _W ~8 _W /8 _L , 6 _W ~8 _W /9 _L	3 _W ~4 _W /3 _L , 10 _W ~11 _W /14 _L
	8 x 14.4(16)	13	15	6 _W ~8 _W /7 _L , 6 _W ~8 _W /8 _L , 6 _W ~8 _W /9 _L	3 _W ~4 _W /2 _L , 10 _W ~11 _W /14 _L
	8 x 16.4(18)	13	13	6 _W ~8 _W /6 _L , 6 _W ~8 _W /7 _L , 6 _W ~8 _W /8 _L	3 _W ~4 _W /2 _L , 10 _W ~11 _W /12 _L
	8 x 18.4(20)	13	12	6 _W ~8 _W /6 _L , 6 _W ~8 _W /7 _L	3 _W ~4 _W /2 _L , 10 _W ~11 _W /11 _L
	10 x 12.4(14)	10	16	4 _W ~7 _W /8 _L , 4 _W ~7 _W /9 _L	2 _W ~3 _W /3 _L , 8 _W ~9 _W /14 _L
	10 x 14.4(16)	10	15	4 _W ~7 _W /7 _L , 4 _W ~7 _W /8 _L , 4 _W ~7 _W /9 _L	2 _W ~3 _W /2 _L , 8 _W ~9 _W /14 _L
	10 x 16.4(18)	10	13	4 _W ~7 _W /6 _L , 4 _W ~7 _W /7 _L , 4 _W ~7 _W /8 _L	2 _W ~3 _W /2 _L , 8 _W ~9 _W /12 _L
	10 x 18.4(20)	10	12	4 _W ~7 _W /6 _L , 4 _W ~7 _W /7 _L	2 _W ~3 _W /2 _L , 8 _W ~9 _W /11 _L
	12 x 12.4(14)	8	16	4 _W ~5 _W /8 _L , 4 _W ~5 _W /9 _L	2 _W ~3 _W /3 _L , 6 _W ~7 _W /14 _L
	12 x 14.4(16)	8	15	4 _W ~5 _W /7 _L , 4 _W ~5 _W /8 _L , 4 _W ~5 _W /9 _L	2 _W ~3 _W /2 _L , 6 _W ~7 _W /14 _L
	12 x 16.4(18)	8	13	4 _W ~5 _W /6 _L , 4 _W ~5 _W /7 _L , 4 _W ~5 _W /8 _L	2 _W ~3 _W /2 _L , 6 _W ~7 _W /12 _L
	12 x 18.4(20)	8	12	4 _W ~5 _W /6 _L , 4 _W ~5 _W /7 _L	2 _W ~3 _W /2 _L , 6 _W ~7 _W /11 _L
	14 x 18.4(20)	7	13	3 _W ~5 _W /6 _L , 3 _W ~5 _W /7 _L , 3 _W ~5 _W /8 _L	2 _W ~3 _W /2 _L , 5 _W ~6 _W /12 _L
2	7.62 x 17.14	11	16	5 _W ~7 _W /8 _L , 5 _W ~7 _W /9 _L	3 _W ~4 _W /3 _L , 8 _W ~9 _W /14 _L
	7.62 x 18.41	11	15	5 _W ~7 _W /7 _L , 5 _W ~7 _W /8 _L , 5 _W ~7 _W /9 _L	3 _W ~4 _W /3 _L , 8 _W ~9 _W /13 _L
	10.16 x 18.41	9	15	4 _W ~6 _W /7 _L , 4 _W ~6 _W /8 _L , 4 _W ~6 _W /9 _L	3 _W ~4 _W /3 _L , 6 _W ~7 _W /13 _L
	10.16 x 20.95	9	13	4 _W ~6 _W /6 _L , 4 _W ~6 _W /7 _L , 4 _W ~6 _W /8 _L	3 _W ~4 _W /2 _L , 6 _W ~7 _W /12 _L
	10.16 x 22.22	9	12	4 _W ~6 _W /6 _L , 4 _W ~6 _W /7 _L	3 _W ~4 _W /2 _L , 6 _W ~7 _W /11 _L
	10.16 x 22.22	9	12	4 _W ~6 _W /6 _L , 4 _W ~6 _W /7 _L	3 _W ~4 _W /2 _L , 6 _W ~7 _W /11 _L
	10.16 x 23.49	9	12	4 _W ~6 _W /6 _L , 4 _W ~6 _W /7 _L	3 _W ~4 _W /2 _L , 6 _W ~7 _W /11 _L
	10.16 x 26.03	9	11	4 _W ~6 _W /6 _L	3 _W ~4 _W /2 _L , 6 _W ~7 _W /10 _L
	10.16 x 28.57	9	10	4 _W ~6 _W /5 _L , 4 _W ~6 _W /6 _L	3 _W ~4 _W /2 _L , 6 _W ~7 _W /9 _L

Note ⁽¹⁾ : Option

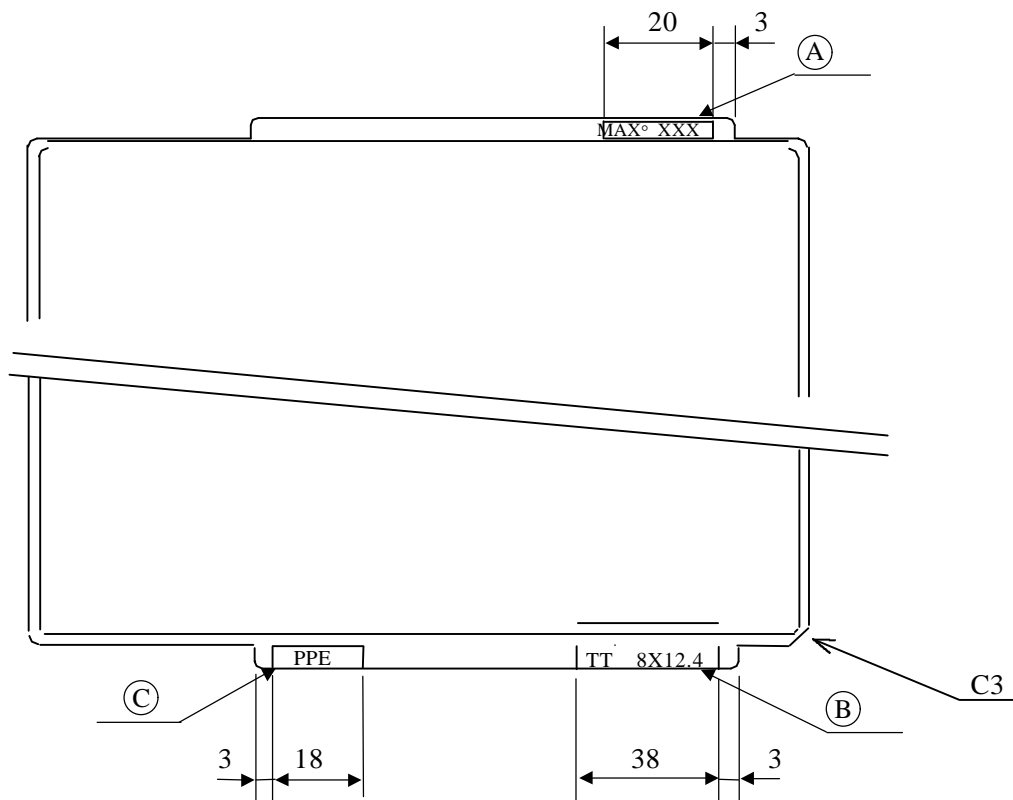
5. Tray Marking

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

In addition, the tray type(nominal dimensions) and material are indicated in location ② and ③ respectively. It is also allowed to indicate the tray type(nominal dimensions) at location ④ (See **Figure 1**) additionally.

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

Figure 7



Explanation

1. Purpose of establishment

This standard was established to standardize the tray dimensions of the tray for TSOP.

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 1990, the standardization of the dimensions of the tray for TSOP 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.

After the provisional standard **EIAJ EDX-7611** was approved and established in voting result of draft in the Standardization Technical Committee on Semiconductor Device Package in December 1994, the review work of this provisional standard was initiated at the subcommittee on Packing for Semiconductor Devices held in May, 1999. The subcommittee made a questionnaire regarding the new tray for TSOP. Developed through discussion and consideration by the subcommittee, this standard was approved and established by the Technical Standardization Committee on Semiconductor Device Package on March 2001.

If a new TSOP 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 review points are as follow.

(1) The new trays as follow are added in the standard.

Type1 6x16, 6x18, 6x20, 8x16, 8x18, 10x16, 10x18, 12x14, 14x20

Type2 10.16x22.22, 10.16x26.03, 10.16x28.57

Remarks: Though **EIAJ** had established provisional standard of pocket pitch that was calculated for TSOP type2 10.16x22.22, **JEDEC** established standard of pocket pitch that was combined pitch data of another package. Therefore the subcommittee on Packing for Semiconductor Devices decided to adopt both pocket pitch.

(2) The old trays as follow are deleted from the provisional standard.

Type2 7.62x14.60, 10.16x19.68, 11.43x20.95, 11.43x26.03, 12.70x22.22, 12.70x24.76, 12.70x26.03, 13.97x19.68, 13.97x23.49, 13.97x26.03, 13.97x28.57, 15.24x22.22

Remarks: These are no registration in **EIAJ EDR-7313** standard or **JEDEC** standard(**CS-005**).

Therefore the subcommittee on Packing for Semiconductor Devices decided to delete.

(3) The old trays as follow are changed.

Type2 7.62x18.41, 10.16x23.49

Remarks: **EIAJ** and **JEDEC** overlapped registration. Therefore the subcommittee on Packing for Semiconductor Devices decided to adopt **JEDEC** standard.

(4) Unit for the reference symbol of the package were replaced from “ mil” to “ mm” for SI.

(5) After this revision, when we need to standardize a new tray, the pocket count, the location of the end pocket and the pocket pitch of **EIAJ EDR-7602”** Design Guideline of Tray for Integrated

Circuit" are proceeded.

(6) 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.

(7) 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 guide. These changes will be adopted from new tray.

3. Main issues of deliberation

The draft of tray standard was made on Sep. 1991, referring to the **JEDEC** interim standard. The draft contained the deletion of endtab and standerdization of pocket pitch and were diffe from **JEDEC** standard. In the **JWG-2** meeting on April 1991, July 1992 and April 1993, it was discussed mutually and harmonaized. As a result, the dimensions of trays were conceded with that in the standard **JEDEC (CO-020,CS-005)** which are already deliberated outlines, pocket pitch, etc.

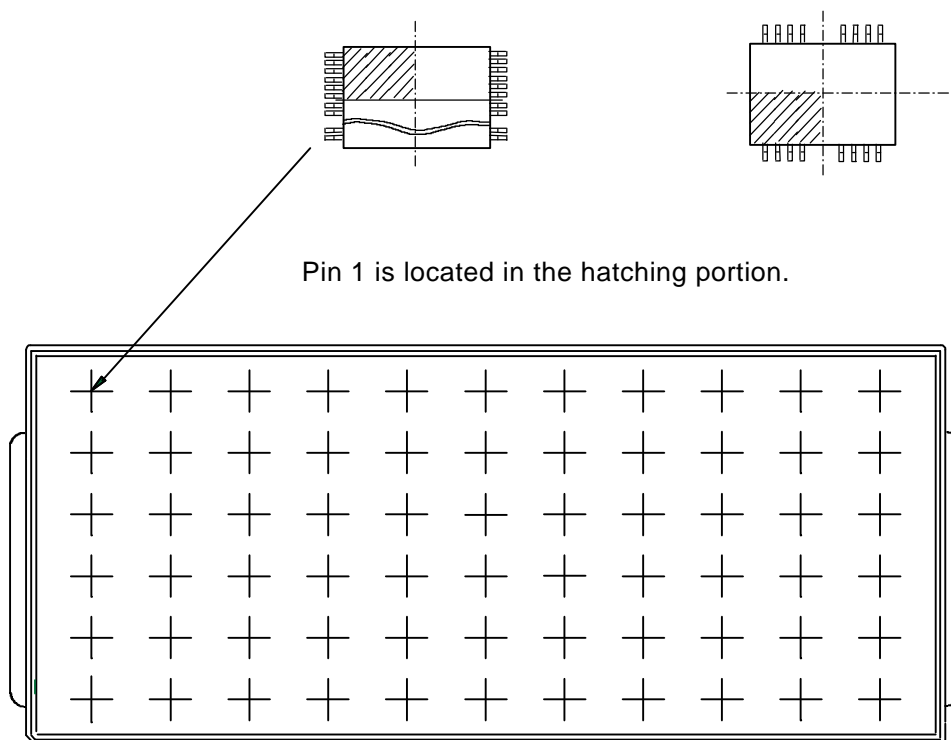
Moreover, the tray types used in market were adopted in this standard. The committee member comment that they have many original TSOP trays, so they will adopt this standard when they make new trays.

If significant inconvenience as a tray for TSOP occur, a meeting for improvement will be held, and the standard may be changed if required.

4. Recommended package placing the 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 figure 1



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 pick up cells at the center are located within the located almost at the center in the lateral direction and about 50 mm from the both ends excluding the endtabs in the longitude direction.

Remarks: Since an vacuum pick up error may be occur by vacuuming outer if the area is 28 mm x 28 mm, the area is recommended to 32 mm x 32 mm.

7. Temperature marking

Display the temperature with which the dimension 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 often 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 Standardization Technical 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>

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Vice Chief	Yukio Ando	Fujitsu Ltd.
	Hiromichi Suzuki	Hitachi Ltd.
Member	Hirohide Takahashi	Oki Electric Industry Co., Ltd.
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