

JIS

JAPANESE INDUSTRIAL STANDARD

**Single and double sided
printed wiring boards**

JIS C 5013—1996

Translated and Published

by

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J I S

Single and double sided printed wiring boards

C 5013-1996

1. Scope This Japanese Industrial Standard specifies single and double sided printed wiring boards mainly used for electronic equipment (hereafter referred to as "printed boards"). However, this Standard is not applicable for flexible printed wiring boards, flex-rigid printed wiring boards and metal core printed wiring boards.

Remarks 1. The following Standards are cited in this Standard :

JIS C 5001 General rules for electronic components

JIS C 5012 Test methods for printed wiring boards

JIS C 5603 Terms and definitions for printed circuits

JIS C 6482 Copper-clad laminates for printed wiring boards – Paper base, epoxy resin

JIS C 6484 Copper-clad laminates for printed wiring boards – Glass fabric base, epoxy resin

JIS C 6485 Copper-clad laminates for printed wiring boards – Paper base, phenolic resin

JIS C 6488 Copper-clad laminates for printed wiring boards – Glass cloth surfaces, cellulose paper core, epoxy resin

JIS C 6489 Copper-clad laminates for printed wiring boards – Glass cloth surfaces, nonwoven glass core, epoxy resin

JIS C 6490 Copper-clad laminates for printed wiring boards – Glass fabric base, modified and unmodified polyimide resin

JIS C 6492 Copper-clad laminates for printed wiring boards – Glass fabric base, Bismaleimide/Triazine/Epoxide

2. The International Standards corresponding to this Standard are given below.

IEC 326-3 (1991) Printed boards. Part 3: Design and use of printed boards

IEC 326-4 (1980) Printed boards. Part 4: Specification for single and double sided printed boards with plain holes

IEC 326-5 (1980) Printed boards. Part 5: Specification for single and double sided printed boards with plated-through holes

2. Definitions For the purpose of this standard, in addition to the definitions specified in JIS C 5001, and JIS C 5603, the following principal definitions apply.

(1) external dimensions This means specified shape and dimensions of printed board.

(2) sub-reference hole The elongated circular hole intended to support the function of the reference hole, used for the adjustment of longitudinal errors.

- (3) reference mark The mark attached on the corner of a printed board to determine correct position of the printed board.
- (4) component location mark The mark prepared for positioning of components in correlation with the reference mark on the printed board.
3. Classification by used materials The classification by used materials shall be as given in Table 1.

Table 1. Classification by used material

Classification	Base material
Paper base, epoxy resin printed board	As specified in JIS C 6482
Glass fabric base, epoxy resin printed board	As specified in JIS C 6484
Paper base, phenolic resin printed board	As specified in JIS C 6485
Glass cloth surfaces, cellulose paper core, epoxy resin printed board	As specified in JIS C 6488
Glass cloth surfaces, nonwoven glass core, epoxy resin printed board	As specified in JIS C 6489
Glass fabric base, modified and unmodified polyimide resin printed board.	As specified in JIS C 6490
Glass fabric base, Bismaleimide/Triazine/Epoxide printed board	As specified in JIS C 6492

4. Grades The grades which express the precision and quality of patterns on printed board dealt with in this Standard are given below.

These grades are used in such a way that a necessary grade is selected on each item to be specified.

The provisions in which no classification by grade is specified shall apply to all the classes.

Class I: Boards for which normal level quality is required.

Class II: Boards for which high quality is required.

Class III: Boards for which special high quality is required.

5. Design standard and tolerance

5.1 Grid dimensions

5.1.1 Basic grid As for grids of printed boards, the grid of metric system shall be used as the standard, and the grid of inch system shall be used only when compatibility with the traditional product is necessary.

Basic grid dimensions shall be as follows :

Grid dimension of metric system: 2.50 mm

Grid dimension of inch system: 2.54 mm

5.1.2 Auxiliary grid If grid dimension smaller than that of basic grid of 5.1.1 is necessary the following dimensions shall be used.

Grid of metric system: unit of 0.5 mm (if further smaller unit is necessary, unit of 0.05 mm shall be employed)

Grid of inch system: unit of 0.635 mm

5.2 External dimensions

5.2.1 Tolerances on external dimensions The tolerances on external dimensions shall be as specified in Table 2.

Table 2 is also applicable to the dimensions of square holes machined at the same time with the outline machining.

Table 2. Tolerances on external dimensions

External dimension	Class		
	I	II	III
Up to and including 100	± 0.4	± 0.2	± 0.1
Over 100	For a dimension exceeding 100, 0.2 shall be added per a dimensional increase up to 50.	For a dimension exceeding 100, 0.1 shall be added per a dimensional increase up to 50.	For a dimension exceeding 100, 0.05 shall be added per a dimensional increase up to 50.

Unit : mm

5.3 Total board thickness

5.3.1 Total board thickness and tolerance The tolerances on total board thickness (T) shown in Fig. 1, shall be as given in Table 3, except for the boards of 0.1 to 0.6 mm in thickness.

The tolerances on thickness of boards with a thickness of 0.1 to 0.6 mm are subjected to agreement between the parties concerned with acceptance.

Fig. 1. Total board thickness

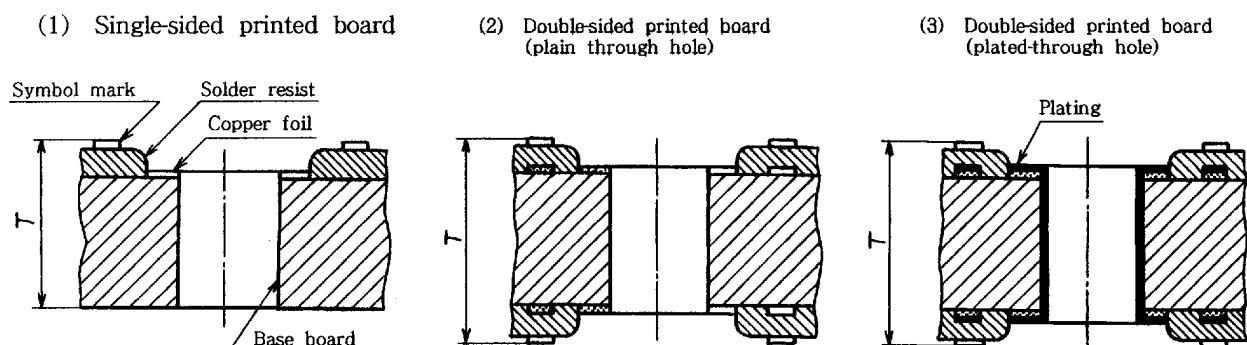


Table 3. Total Board Thickness and Tolerance

Unit : mm

Total board thickness T (1)	Single-sided printed board			Double-sided printed board (Plain through hole)			Double-sided printed board (Plated-through hole)		
	Class			Class			Class		
	I	II	III	I	II	III	I	II	III
0.8	± 0.14	± 0.10	± 0.05	$+ 0.15$	$+ 0.10$	± 0.05	$+ 0.20$	$+ 0.18$	$+ 0.15$
1.0				$- 0.10$	$- 0.08$		$- 0.10$	$- 0.08$	$- 0.05$
1.2				$+ 0.20$	$+ 0.18$	± 0.10	$+ 0.23$	$+ 0.20$	$+ 0.15$
1.6									
2.0	± 0.20	± 0.15	± 0.10				$+ 0.29$	$+ 0.25$	$+ 0.20$
2.4							$- 0.19$	$- 0.15$	$- 0.10$
3.2	—			—			$+ 0.40$	$+ 0.35$	$+ 0.30$
							$- 0.25$	$- 0.20$	$- 0.15$

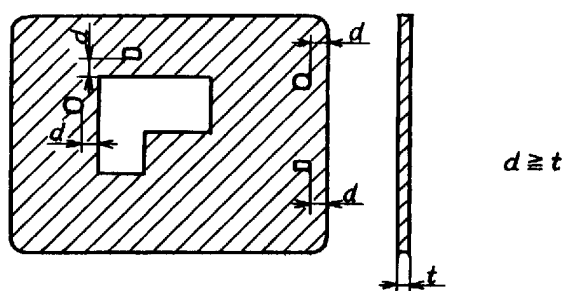
Note ⁽¹⁾ Values of total board thickness are nominal values.

Remarks: The tolerance on thickness of printed contact of edge connector terminal shall be ± 0.15 mm in the case of total board thickness 1.6 mm, in other cases tolerances are subjected to agreement between the parties concerned with acceptance.

5.4 Hole

5.4.1 Distance between hole and edge of board As shown in Fig. 2 the minimum distance (d) from inner wall of hole to the edge of a board, shall be not less than thickness (t) of the printed board.

Fig. 2. Distance between hole and edge of board



5.4.2 Position of hole It is preferable that the center of a hole lies at the intersection of grid lines (including auxiliary grid).

The allowable deviation ($|\bar{a}|$) of a hole from its position specified in the design by means of coordinates employing the reference hole as the original point shown in Fig. 3, shall be as given in Table 4. However, vias (holes for connection) are out of the subject.

Fig. 3. Position of component hole

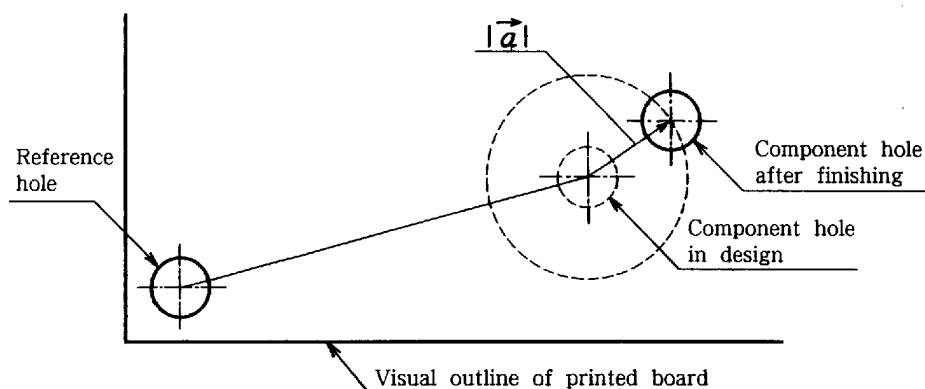


Table 4. Tolerance on position of component hole based on reference hole

Longitudinal dimension of printed board (e)	Unit : mm		
	Class		
	I	II	III
$e \leq 400$	0.25	0.15	0.10
$400 < e$	for a dimension exceeding 400, 0.05 shall be added per dimensional increase up to 100.		

5.4.3 Tolerance on diameter of component hole The tolerances on diameter of component hole shall be as given in Table 5.

Table 5. Tolerance on diameter of component hole

Classification		Unit : mm		
		Class ⁽⁴⁾		
		I	II	III
Plated through hole (t)	$0.6 \leq t < 2.0$	± 0.15	± 0.10	± 0.08
	$2.0 \leq t$ ⁽²⁾	± 0.20	± 0.15	± 0.10
Plain through hole	Single-sided ⁽³⁾	0 - 0.15	0 - 0.10	0 - 0.05
	Double-sided	± 0.15	± 0.10	± 0.05

Notes ⁽²⁾ For irregular shape holes these tolerances shall be applied regardless of existence or nonexistence of plating of through hole and diameters of holes.

⁽³⁾ Including double-sided printed board with plain through hole.

⁽⁴⁾ Class I applies to the ones coated with solder by means of solder leveller.

5.4.4 Reference hole Among the reference holes, round holes shall be as specified below.

- (1) Tolerance on position of reference hole The tolerances on position (b) of the reference hole shown in Fig. 4 shall be as given in Table 6.

Fig. 4. Tolerance on position of reference hole

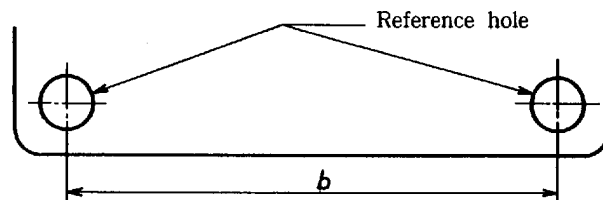


Table 6. Tolerance on position of reference hole

Distance between centers (d)	Unit : mm		
	Class		
	I	II	III
$d < 150$	± 0.10	± 0.08	± 0.05
$150 \leq d < 300$	± 0.15	± 0.10	± 0.08
$300 \leq d$	± 0.20	± 0.15	± 0.10

- (2) Tolerances on positions of reference and sub-reference holes The tolerances on position of reference hole (c_1, c_2) and position of sub-reference hole (c_3), from the respective reference positions in design shown in Fig. 5 shall be as given in Table 7.

Fig. 5. Tolerances on positions of reference and sub-reference holes

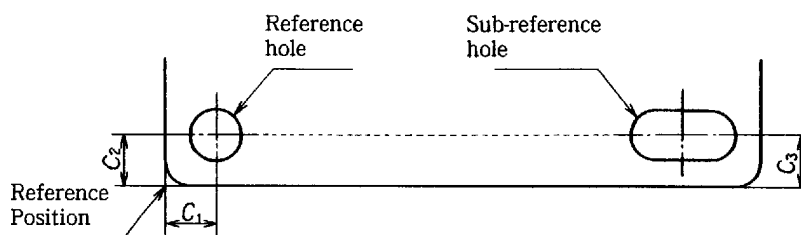


Table 7. Tolerances on positions of reference and sub-reference holes

Item	Unit : mm		
	Class		
	I	II	III
Tolerance	± 0.15		± 0.10

- (3) Tolerance on diameter of reference hole The tolerances on diameter of reference hole not plated through shall be as stated in Table 8.

Table 8. Tolerance on diameter of reference hole

Hole diameter (d)	Class		
	I	II	III
$1.0 \leq d < 2.0$	+ 0.10 0	+ 0.08 0	+ 0.06 0
$2.0 \leq d < 4.8$	+ 0.15 0	+ 0.10 0	+ 0.08 0

Unit : mm

5.5 Conductor

5.5.1 Tolerance on conductor width The tolerance, i.e. permissible deviation from the design minimum conductor width, on finished conductor width (w_t , w_b) illustrated in Fig. 6., shall be as stated in Table 9.

Fig. 6. Width and spacing of finished conductors

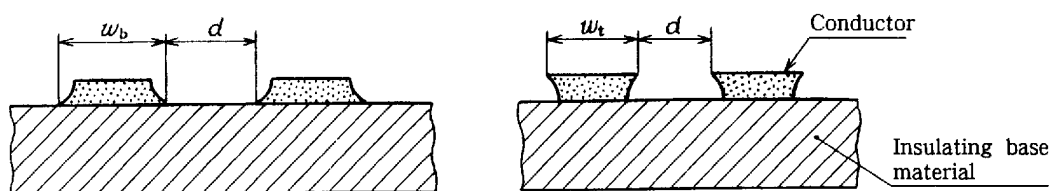


Table 9. Minimum design conductor width and tolerance on finished conductor width

Item	Class ⁽⁶⁾		
	I	II	III
Tolerance	± 0.07	± 0.05	± 0.04
(Informative) Minimum design conductor width	0.25	0.15	0.12

Unit : mm

Note ⁽⁶⁾ The classification is made aiming the minimum conductor width in the design drawing as the target.

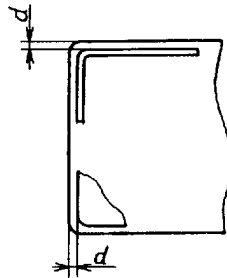
5.5.2 Conductor spacing and its tolerance The tolerance on finished value relative to design value of the minimum conductor spacing (d) as shown in Fig. 6, shall be as given in Table 10.

Table 10. Design minimum conductor spacing and tolerance on finished conductor spacing

Item	Unit : mm		
	Class		
	I	II	III
Tolerance	± 0.07	± 0.05	± 0.04
(Informative) Design minimum conductor spacing	0.25	0.15	0.13

5.5.3 Distance from conductor to edge of board As shown in Fig. 7, the distance from conductor to edge of board (d) shall be 1.25 mm or more. However, printed contacts, ground, etc. are excluded.

Fig. 7. Distance from conductor to edge of board



5.6 Lands

5.6.1 Sizes and shapes of lands The sizes and shapes of lands shall be designed by taking the requirements of 5.6.2 and of 6.1 Minimum land width into account.

5.6.2 Permissible discrepancy between centers of land and through hole The permissible discrepancy between centers of land and through hole shall be as stated in Table 11.

Table 11. Permissible discrepancy between centers of land and through-hole

Item	Unit : mm		
	Class		
	I	II	III
Permissible discrepancy	± 0.30	± 0.20	± 0.15

5.7 Printed contacts

5.7.1 Tolerance on distance between centers of printed contact The tolerance on distances between centers of printed contact ($e_1, e_2, \dots, e_n$) as shown in Fig. 8 shall be as given in Table 12.