

**CENTER OF APPLICABLE DEVELOPMENTS – BAS
PRINTED-CIRCUIT CARDS DEPARTMENT**

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Requirements to the printed-circuit cards orders

Dear clients,

To avoid misunderstanding and use the maximum of our existing production capacities and good specialists, we would like to inform you about the production parameters and characteristics, you are advised to observe upon designing and ordering manufacture at CAD-BAS, Printed-circuits cards department. Of course our team is ready to meet all your requirements, but we ask you to take into consideration the following characteristics as far as possible:

I. Technological capabilities of our manufacture

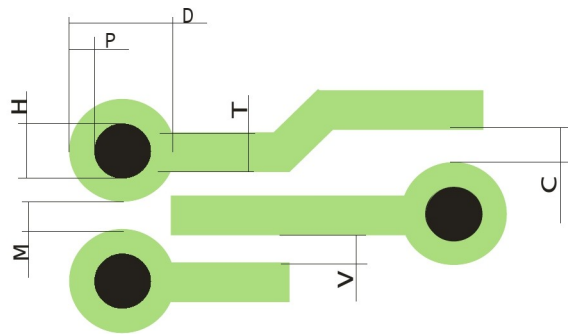


Figure 1

1. Minimal distances:

- | | |
|---|-----------------------|
| - between two neighbouring tracks /V/ | 250 ± 25 μm (200 μm)* |
| - between a track and a field /C/ | 250 ± 25 μm (200 μm)* |
| - between two fields /M/ | 250 ± 25 μm (200 μm)* |
| - between a track and a screen (testing ground) | 400 ± 25 μm (300 μm)* |

2. Minimal width of a track /T/

250 μm (200 μm)*

3. Card thickness

0.5 – 2,0 ± 0.1 mm

4. Copper foil thickness

18, 35, 70 μm

5. Minimal holes after metallization

0,35 μm

6. Minimal ring /P/

250 μm (200 μm)

7. Maximal dimensions of the printed-circuit card

300 x 450 mm

8. Minimal elongation of a track or a copper field from the card board

200 μm

9. Solder mask type

photo, two-component

- Solder mask colour

green, black, blue, white

10. Legend print type

white, yellow

9. Final treatment

Sn60Pb Rh (welding), HAL,

chemical gold

10. Mechanical treatment

milling, circular cutting

* Valid only for base copper foil 18 μm

II. Files accompanying the printed-circuit cards order

1. Files format Gerber RS274X
2. Drill files Excellon
3. Design files of programs, specialized for printed-circuit cards designing.

Note: *The company is not responsible for errors within the clients' files or such errors, received when generating Gerber RS274X due to fault of the software product, as well as for non-fulfillment of requirements in relation to the printed-circuit card higher than the below mentioned, except in the cases they were previously discussed upon receiving the order. Upon submitting the design files please specify in details all the characteristics of the printed-circuit card – number of layers for a card board, the holes before and after metallization, the transitional holes hidden under the mask or exposed etc.*

III. Base material

Usually we work with epoxy-phenolic glass FR4 having thickness of 1.5 (1.6) mm and copper foil thickness of 18 μm . The symbol for double-sided foiled epoxy-phenolic glass is FR4 is 1.6 mm 18/18, as the first cipher represents the material thickness in millimeters without the coating and the second two – the foil thickness in microns (35/0 is for one-sided foiled, 18/18 is for double-sided). It has to be taken into consideration that upon metallization the double-layered printed-circuit cards are being thickened (chemically and electro-chemically) with 25-30 μm .

The remaining base material characteristics are:

- Base material thickness – 0,5; 0,6; 0,8; 1,0; 1,5; 2,0 mm having tolerance of $\pm 10\%$. There is a possibility for other thicknesses, but they are being delivered upon agreement, for orders exceeding 1 sq.m.
- Copper foil thickness – 18; 35 and 70 μm
- Copper deposition thickness – 25-30 μm . It has to be taken into account that by one-layer cards there is no deposition of additional copper (there is no metallization)
- Dielectric permittivity at 1 MHz – $\epsilon = 4.6 - 4.9$
- Dielectric losses at 1 MHz - $\tan\delta = 0,019$
- Resistance towards current leakages – CTI degree 200
- Minimal electrical strength – 29 kV/mm.

IV. Drilling

The minimal instrument we drill the card with, is 0,4 mm. After metallization these holes become smaller in diameter with minimum 0,05 mm, namely they become 0,35 mm. The same happens with all other holes in the card. That is why it is important in the order to be mentioned whether the openings in the file are after metallization or drills are being taken into consideration.

The instruments for drilling (drills) have a step of 0,1 mm, as the biggest drill is 6,3 mm. Holes having diameter bigger than 6,3 mm are being milled. The milling cutters we are at disposal of have diameter: 0,1; 1,5; 2,0 and 2,5 mm. Usually we mill with a milling cutter having diameter of 2,5 mm.

Sometimes the constructors have to make grooving (elliptical) holes. It is being made by means of the so called operation “hole in a hole”, that is standard by the gerber commands. It has to be taken into consideration that the minimal diameter of such a hole is 1,0 mm, and the minimal ratio L/d is 2,5. The groove made can be metallized.

V. Coating types

Our standard coating is **Sn60Pb/Rh** (melted tin-lead). In addition we have possibility for HAL coating (hot leveling) and lead-free coating – chemical Nickel-gold, but only for orders over 10 billets. We can make electrochemical gold (only for couplings) only under special agreement when submitting the order.

The electrochemical copper thickness for the double-layered cards is 25-30 μm .

The melted Sn60Pb thickness is 10-15 μm .

The chemical gold thickness is around 1 μm .

VI. Protective mask

It covers the whole printed-circuit card surface except the bonding areas used for assembly. There is a possibility also other printed-circuit card parts not to be covered with a mask, if the designer has any considerations and specifies this in the order and the files created. In this way only certain track parts can be thickened with tin-lead when assembling the card. It is desirable the card opening around the field to be about 200 μm . There is a possibility the designer to close (cover with a mask) any transitional holes. They remain with a metallization and make connection between the layers, but are not accessible for soldering.

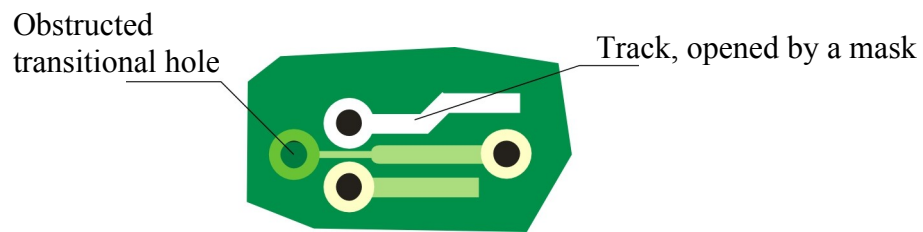


Figure 2

VII. Legend print

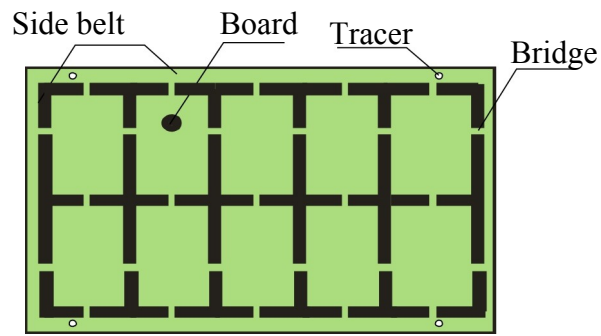
It can be in different colours – white, black, yellow etc. We have possibility to make white, black (it is made for light-coloured mask – for example white) and yellow. The legend print is placed using sieve, which causes limitations towards the print thickness – it is desirable it is thicker of or equal to 150 μm . With the purpose of achieving normal soldering the right thing subsequently to do is cleaning the legend print off the bonding areas, i.e. the designer has situated the legend in such a manner it doesn't overlap bonding areas.

VIII. Panelization

Our specialists make the cards panelization, taking into consideration the technological characteristics of our manufacturing, which are:

- The distance between the separate cards is to be not less than 2,0 mm, as the thickness of the circular cutting out being made is 2,00 mm.
- The minimal dimensions of the panel that can pass over our line are 100 x 160 mm. If you order only one card, irrespectively how small it is, we have to process billet sized 100 n 160 mm.
- You can receive the cards singly circular cut off or paneled – ready for machine assembly. The panelization for machine assembly is being made after consultation with the designer, taking into consideration the requirements of the company, which will assemble the cards.

Note: When working out panels for machine assembly the cards dimensions are considered to be the dimensions of the panel, i.e. the conveyor (bearing) belt are included within the card dimensions. For these orders there is no additional payment for the milling.



Cut-off panel with bearing belts and tracers

Figure 3

IX. Period of execution:

- | | |
|---|-----------------|
| - Standard (for orders up to 50 pcs.) | 10 working days |
| - Standard (for orders exceeding 50 pcs.) | 15 working days |
| - Quick (for orders up to 5 pcs.) | 5 working days |

Note: Specific requirements exceeding the requirements, mentioned above are to be discussed upon order acceptance and are to be calculated within the card price.