Technique of Defining the Electric Resistance of the IC contact Pads

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Abstract – **There are presented the technique and results of defining the electric resistance value of the IC microcontact connection contact pads.**

Keywords – **integral circuit, contact pad, resistance**

The contact pad resistance may essentially influence the flexible IC microcontact connection (MCC) resistance. Due to the nonuniformity of the current line distribution under the contact pad (CP) lead, it is not easy to define its electric resistance $R_{кп}$ [1, p127].

The CP resistance is given as a sum of two components:

$$R_{кпл} = R_{кп1} + R_{кп2}, \quad (1)$$

where $R_{кп1}$ is the resistance of the CP before-lead (by the current flow direction) area of length *a*, $R_{кп2}$ is the resistance of the CP under-lead area of length *l*. It is found by experiment that the CP area of length *c* (Fig.1) does not influence its resistance essentially.

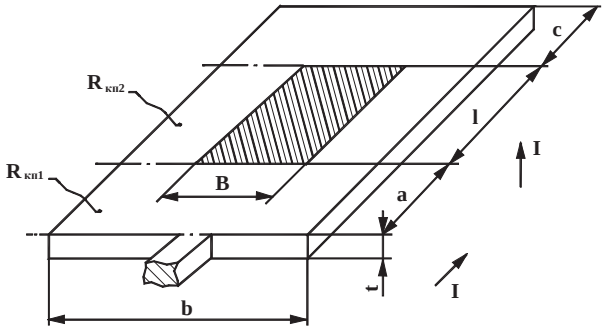

Fig.1. CP components determining its resistance:$R_{кп1}$ is the resistance which is calculated by formula (2), $R_{кп2}$ is the resistance defined by formulae (3)-(5). The area with a lead is cross-hatched; the arrows show the current flow direction.

The resistance $R_{кп1}$ component is defined by the formula:

$$R_{кп1} = \rho_2 \cdot a/b \cdot t, \quad (2)$$

where ρ_2 is the CP resistivity, *a* is the CP before-lead area length by the current flow direction, *b* and *t* are the CP width and thickness, respectively.

The $R_{кп2}$ component is found from the MCC resistance [2]:

$$R_{кп2} = \frac{R_{кпд}}{1 + \frac{r_1}{r_2}}. \quad (3)$$

where $R_{кпд}$ is the total resistance of the CP under-lead area and a deformed wire section and the CP.

Then, defining (1) the CP impedance is:

$$R_{кпл} = \frac{\rho_2 \cdot a}{b \cdot t} + \frac{R_{кпд}}{1 + \frac{r_1}{r_2}}. \quad (4)$$

When defining the MCC resistance $R_к$, it is proposed to use a more exact formula instead of the expression given in [3]:

$$R_K = \frac{r_1 + r_2}{\alpha \cdot th\alpha d}, \quad (5)$$

where $\alpha = \sqrt{y(r_1 + r_2)}$, *y* is a linear conductance of the transition layer.

To define the resistance of multilayer contact pads there are used their resistivities given. Dependence of the resistance components of the paste 3713 CP on its dimensions with a contact area with a lead of 0.1x0.1 mm is shown in (Fig.2).

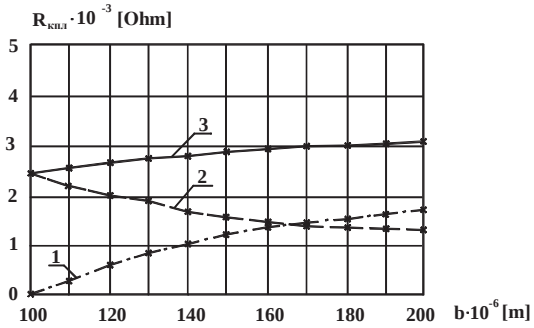

Fig.2. Change of the Resistance of the Paste 3713 CP components with the CP dimensions (1- $R_{кп1}$, 2 - $R_{кп2}$, 3 - $R_{кпл}$).

The resistances of the 0,2x0,2 mm IC contact pads defined by this technique are: Al CP – $11.6 \cdot 10^{-3}$ Ohm, Al-Ni-Au CP - $16{,}2 \cdot 10^{-3}$ Ohm, paste 3713 CP – $3.1 \cdot 10^{-3}$ Ohm.

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