FLEXIBLE AND FLEX-RIGID PRINTED CIRCUIT BOARDS BASIC CHARACTERISTICS SELECTION FOR PARAMETRIC MODEL DEVELOPMENT

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Flexible and flex-rigid printed circuit boards using in modern microsystem devices is growing. That's why requirements in terms of quality and reliability to such devices also grow. For their provision, it's necessary to take into account all the factors affect these indicators at the product design stage. These indicators can be represented as a parameters tuple on the basis of which we propose to develop a mathematical model. It will allow to simulate the product in close to real conditions.

Modern CAD systems allow to perform calculations for flexible and flex-rigid printed circuit boards analysis showed there isn't approach to automation that provides to diagnose and evaluate reliability for flexible and flex-rigid printed circuit boards. So, such automated systems and modules development is an urgent task.

For solving this problem we propose next parametric model with such set of parameters:

$$G_{FPC} =< P_t, F_{pp}, C_{bc}, S_l, V_{mat}, T_{er}, I_{con}, S_c, L_a >, \quad (1)$$

where G_{FPC} – flexible and flex-rigid printed circuit boards;

P_t – board type (types);

F_{pp} – physical characteristics;

S_l – board layers characteristics;

V_{mat} – materials characteristics;

T_{er} – electric radio elements;

I_{con} – pads type;

S_c – elements of flexible and rigid parts interface;

L_a – operating conditions.

F_{pp} – physical characteristics:

$$F_{pp} =< F_d, F_w, F_c >, \quad (2)$$

where F_d – dimensions; F_w – weight; F_c – configuration.

C_{bc} – bending characteristics:

$$C_{bc} =< C_{bcn}, C_{bcr}, C_{bcra} >, \quad (3)$$

where C_{bcn} – number of bends; C_{bcr} – the radius of curvature of bending zones; C_{bcra} – cross-sectional area of bending rotation angle.

S_l – board layers characteristics:

$$S_l =< S_{lk}, S_{lt}, S_{lf}, S_{lm} > \quad (4)$$

where S_{lk} – layers number; S_{lt} – type of electrical connection between the layers; S_{lf} – performed function; S_{lm} – production method.

V_{mat} – materials characteristics:

$$V_{mat} =< V_{base}, V_{conductor}, V_{adhesive}, V_{protection} >, \quad (4)$$

where V_{base} – the base material; $V_{conductor}$ – a conductive material layer; $V_{adhesive}$ – adhesive type; $V_{protection}$ – backsheet material.

T_{er} – electric radio elements:

$$T_{er} =< T_{et}, T_{ek}, T_{ep} > \quad (5)$$

where T_{et} – type; T_{ek} – concentration; T_{ep} – soldering technology.

S_c – elements of flexible and rigid parts interface:

$$S_c =< S_{cd}, S_{cm} > \quad (6)$$

where S_{cd} – thickening material; S_{cm} – dimensions.

L_a – operating conditions:

$$L_a =< C_l, M_e, R_a > \quad (7)$$

where C_l – climate; M_e – mechanical; R_a – radiation.

Proposed parametric model is a necessary and sufficient parameters tuple for to adequately representation the flexible and flex-rigid printed circuit boards basic properties. For each parameter description a mathematic model was developed. It allows to organize them and to develop a prediction method on the basis of the input data. This solution provides modeling time shortening because of using knowledge bases which will contain information about typical rigid and flex-rigid boards reliability. New approach using will allow to accelerate new devices release preparing process. It is planned to realize this approach in the form of reliability prediction automated system. It will have a high level adaptation for each company taking into account its features.

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