

Comparative Analysis of Microwave Power Limiters Made by Different Microelectronic Technologies

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Abstract - The results of the study of characteristics of S-band (2 ... 4GHz) power limiters made with thin-film and thick-film technology modernized using photopolymerized technology paste are presented.

Keywords - production technology, photosensitive paste, microwave power limiter.

In comparison with thin-film technology the introduction of modernized thick-film methods of manufacturing microwave devices allows to avoid expensive vacuum processes [1, 2]. Among the various semiconductor pastes used for manufacture of microwave devices, advantage of photopolymerized pastes is the fact that conductors based on them have smooth and flat surface with very high accuracy of reproduction of geometrical sizes [2, 3]. This makes parameters of thick-film microwave devices comparable with similar parameters of thin-film ones or even equal to them.

Comparative study was carried out for three boards of thick-film power limiter of S-band made of a ceramic substrate BK100-1 of size 48x30x1 mm (Fig. 1) and similar boards made by thin-film technology.



Fig.1. Plate of power limiter of S-band with microstrip elements made from photopolymerized paste 1785 on poli-coat substrate.

For the first group of boards microstrip elements, connecting conductors and contact plates made from photopolymerized paste 1785 were manufactured on the face surface of the substrate [2], while on the back side a screen with silver paste organometallic 4783 resided. Applied layers of pastes 1785 and 4783 were burned off separately in CK-10 furnace at the temperature 830°C.

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The second group of power limiter's circuit boards was manufactured by standard thin-film technology with copper-silver microstrip elements on substrates which had the same size and type that similar boards from the first group.

Resistance of the square of the conductive film of pastes 1785 after burning off was within 0.003 ... 0.004 ohms / square. Roughness of microstrip edge defined in ten places by UIM-23 microscope was within ± 10 microns. Contact plates of photopolymerized stood triple control soldering over with solder alloy ПОСК50-18 by reinstallation of 2A522A diodes. For the purpose of comparative analysis the coefficient of voltage standing wave (VSWR) and magnitude of loss of the manufactured thin-film and thick-film samples of power limiter boards were determined. The results are presented in Table 1.

Table 1
Comparative characteristics of thin-film and thick-film samples of microwave power limiters boards

Type of plate	VSWR	Value of losses dB
Thin-film plates	1.5	≤ 0.8
Thick-film plates	1.5	≤ 0.7

Analysis of parameters of microwave power limiters made by standard thin-film technology and thick-film technology using photopolymerized paste 1785 listed in Table 1 shows that they are identical and in technically based cases thin-film and modernized thick-film techniques of manufacturing microwave boards can replace or complement each other.

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