PACKAGING ON LTCC: MICRORELAY AND RFID

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Summary: *We present the first results of MEMS packaging integrated with LTCC (Low Temperature Co-fired Ceramics) technology. Two cases were implemented: a packaging of a MEMS microrelay with lateral contact structures driven by electrostatic actuators, and an integrated antenna for commercial RFID (Radio Frequency Identification), which is under development.*

Keywords: *MEMS packaging, LTCC, microrelay, RFID*

1. INTRODUCTION

Low Temperature Co-fired Ceramic (LTCC) is well known as an appropriate material for multilayer packaging. This material joined to thick film technology results in an interesting field for MEMS applications.

LTCC tape materials for 3D structures using multi-layer have many benefits for packaging silicon based MEMS components. Cavities structures, in which the MEMS can be bonded and hermetically sealed, and a good match of thermal coefficient of expansion (TCE) between ceramic and Si are some advantages of LTCC technology [1].

In this work we present LTCC packaging for two different applications, a MEMS microrelay developed on epitaxied SOI [2] and antennas for commercial Radio Frequency Identification (RFID).

2. EXPERIMENTAL

Two models of packaging for the SOI microrelay prototypes were performed: a top contact design with all electrical connections at one side of the packaging, and a bottom contact design using through holes. Twelve layers were necessary to achieve a properly package.

DuPont LTCC Green Tape 951 AT and DuPont 6148 silver thick film paste were used, with screen printing technique. Cavities and through holes were done and separately lamination steps were performed in order to obtain an appropriate structure. Lamination pressure was of 1 $kg.mm^{-2}$ at a temperature of 100°C, applied during 3 minutes for each lamination procedure. Typical firing profile for LTCC was applied and a shrinkage value of 14% in x-y direction was obtained.

MEMS microrelay dies were attached to LTCC package with Dow Corning 7920 material. Fig.1 shows first prototypes of MEMS packages obtained with LTCC multilayer ceramic technology.

Two models of LTCC integrated antennas for commercial RFID were designed. EM-Microelectronic devices for low (125 kHz) and high (13.56 MHz) frequencies were used. First antenna, named *multi loop (ML)*, is a 2D-structure flat square spiral coil. The other design, named *uni loop (UL),* is a multi layer square loop in a 3D-structure. Fig. 2 shows a *ML* antenna, at left, and a *UL* with 2nd level packaging (right).

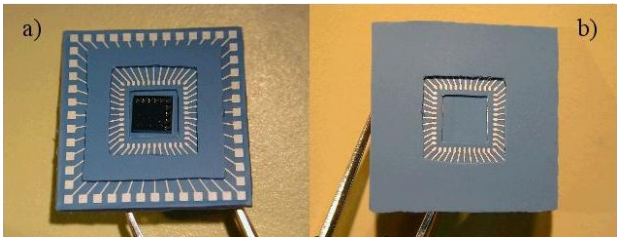

Fig.1: MEMS microrelays prototypes into LTCC package. a) Top connection design. b) Bottom connection design

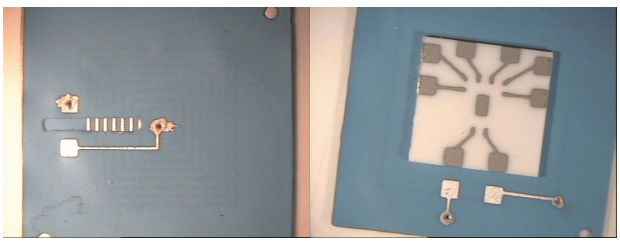

Fig.2: ML and UL antenna with RFID 2nd level packaging

3. CONCLUSIONS

Two examples of LTCC packaging application were performed. Microrelay prototypes with different geometrical connections were presented. Two antennas for RFID application are under development.

4. REFERENCES

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