


3-D INNOVATING PACKAGING MEMS APPLICATIONS

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PLAN

- O INTRODUCTION
- O REMINDER ON 3-D TECHNOLOGY
- O SPECIFIC NEEDS OF OPTO-ELECTRONICS COMPONENTS AND MEMS
- O PROPOSED PACKAGING FOR OPTOELECTRONICS COMPONENTS
- O PROPOSED PACKAGING FOR MEMS
- O CONCLUSIONS AND PERSPECTIVES


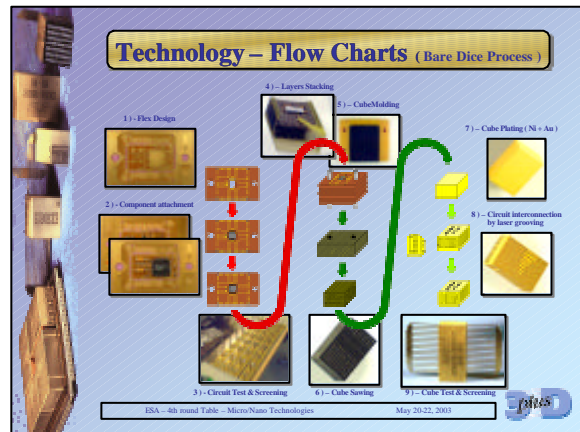
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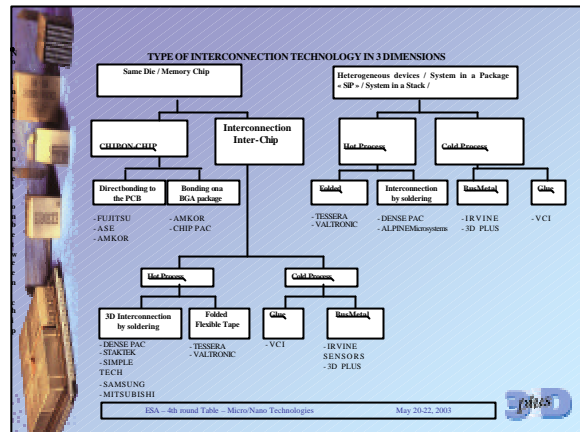



Technology – Basic Technology

- The module consists of stacked components : Memories, Processors, Converters, MEMS ...
- The module is isolated by a moulded resin.
- The module is sawn to disclose the connections.
- The module is short circuited by a plating process.
- The electrical paths are re-routed in line with the customer PCB layout, via laser etching.



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GENERIC NEEDS OF OPTO-ELECTRONICS COMPONENTS

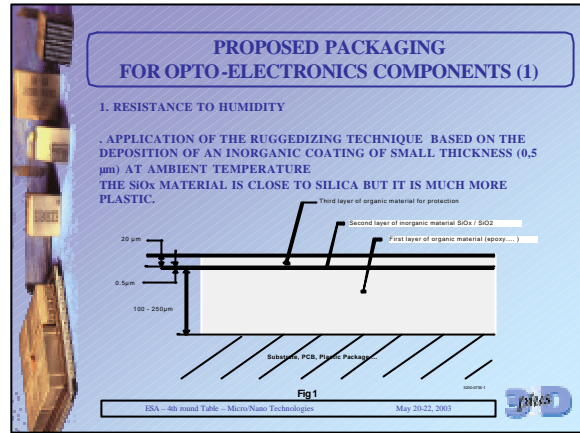
- RESISTANCE TO HUMIDITY**
TELCORDIA TESTS ARE PARTICULARLY SEVERE WITH REGARDS HUMIDITY (85°C/85 % RELATIVE HUMIDITY – 500,2000,5000 HOURS – Telcordia 1221)
- MECHANICAL CONSTRAINTS ON THE COMPONENT MUST BE CLOSE TO ZERO**
THIS ALMOST FORBIDS THE ENCAPSULATION WITH RESIN SUCH AS CURRENT PLASTIC PACKAGES
- NECESSITY TO MAINTAIN THE COMPONENT AT A CONSTANT TEMPERATURE REGULATED AT $\pm 0,1^{\circ}\text{C}$**
- NECESSITY TO INTEGRATE ASSOCIATED ELECTRONICS TO THE OPTICAL COMPONENT**

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PROPOSED PACKAGING FOR OPTO-ELECTRONICS COMPONENTS (2)

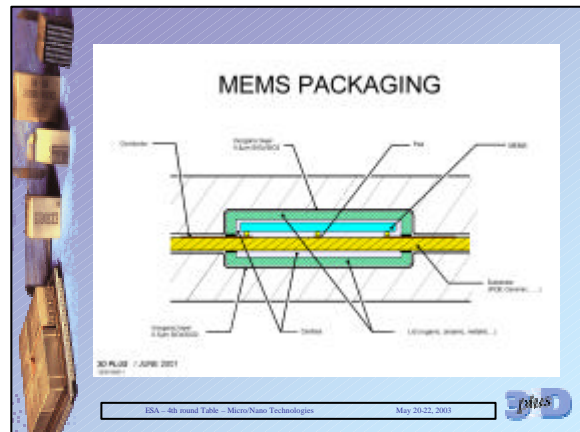
2. MECHANICAL CONSTRAINTS ON THE COMPONENT SHOULD BE CLOSE TO ZERO

USE OF THE CONCEPT OF THE OPPOSITE DOUBLE CAVITY MADE THANKS TO TWO NON- OR PLASTIC LIDS, WHICH ARE BOTH GLUED. THIS IS ONLY POSSIBLE THANKS TO THE RUGGEDIZING WHICH MAKES THE TWO GLUING RINGS AND THE LIDS HERMETIC. THE USE OF HERMETIC PACKAGES, WHICH ARE HEAVY AND EXPENSIVE IS THEREFORE NOT NECESSARY.

3. NECESSITY TO MAINTAIN THE COMPONENT AT A CONSTANT TEMPERATURE REGULATED AT +/- 0,1°C

THIS NEED FOR A VERY PRECISE TEMPERATURE REGULATION, EITHER BY HEATING THE COMPONENT OR COOLING IT, NECESSITATES AN ELECTRONICS REGULATION. THIS CAN BE ADVANTAGEDLY PLACED INSIDE ONE OF THE TWO LIDS CONSTITUTING THE PACKAGING. THE INTEGRATION OF THE ELECTRONICS WOULD NOT TAKE MORE THAN ONE OR TWO MILLIMETRES IN HEIGHT THANKS TO 3-D INTERCONNECTION.

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PROPOSED PACKAGING FOR OPTO-ELECTRONICS COMPONENTS (3)

1. NECESSITY TO INTEGRATE ASSOCIATED ELECTRONICS TO THE OPTICAL COMPONENT

. VERY OFTEN, COMPONENTS MANUFACTURERS WISH TO ASSOCIATE ELECTRONICS TO THEIR OPTICAL FUNCTIONS. HERE AGAIN, THIS ELECTRONICS COULD BE INTEGRATED IN THREE DIMENSIONS WHICH WOULD INCREASE THE THICKNESS OF ONE OF THE LIDS BY 0.8 MM PER STACKED LEVEL.

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Hermetic Component with thermal regulation and its associated electronics

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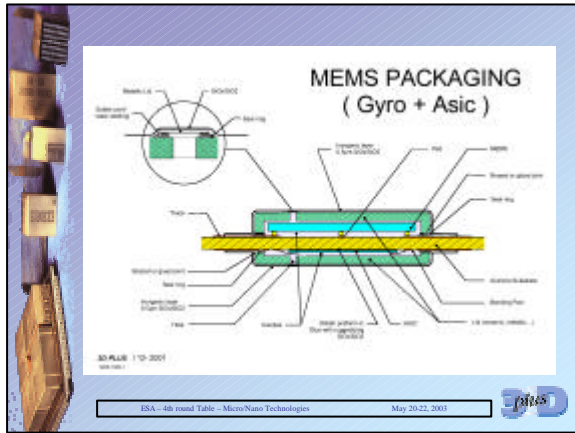
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GENERIC NEEDS AND PACKAGING SOLUTIONS FOR MEMS COMPONENTS (1)

WE MEET EXACTLY THE SAME NEEDS AS WITH THE OPTO-ELECTRONICS COMPONENTS, i.e. :

1. RESISTANCE TO HUMIDITY
 HUMIDITY HAS A CATASTROPHIC EFFECT ON THE MEMS, MAINLY BECAUSE OF THE GLUING OF THE MOBILE PARTS THROUGH SUPERFICIAL TENSION. .
2. MECHANICAL CONSTRAINTS
 MOST MEMS DO NOT STAND PLASTIC ENCAPSULATION. THIS IS WHY WE WILL USE THE PRINCIPLE OF SINGLE OR DOUBLE CAVITY.

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GENERIC NEEDS AND PACKAGING SOLUTIONS FOR MEMS COMPONENTS (2)

3. NECESSITY TO INTEGRATE ASSOCIATED ELECTRONICS TO THE MEMS

THE LEVEL OF THE OUTPUT SIGNAL OF A MEMS IS GENERALLY EXTREMELY LOW ; THIS IS WHY IT NECESSITATES AN ENCAPSULATION AND SOMETIMES A HANDLING AS CLOSE AS POSSIBLE TO IT.

THE ASSOCIATED ELECTRONICS CAN BE INTEGRATED BY STACKING COMPONENTS AS CLOSE AS POSSIBLE TO THE MEMS (MAINTAINING OF THE SIGNAL INTEGRITY)

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