Cost effective techniques for chip delayering and in-situ depackaging

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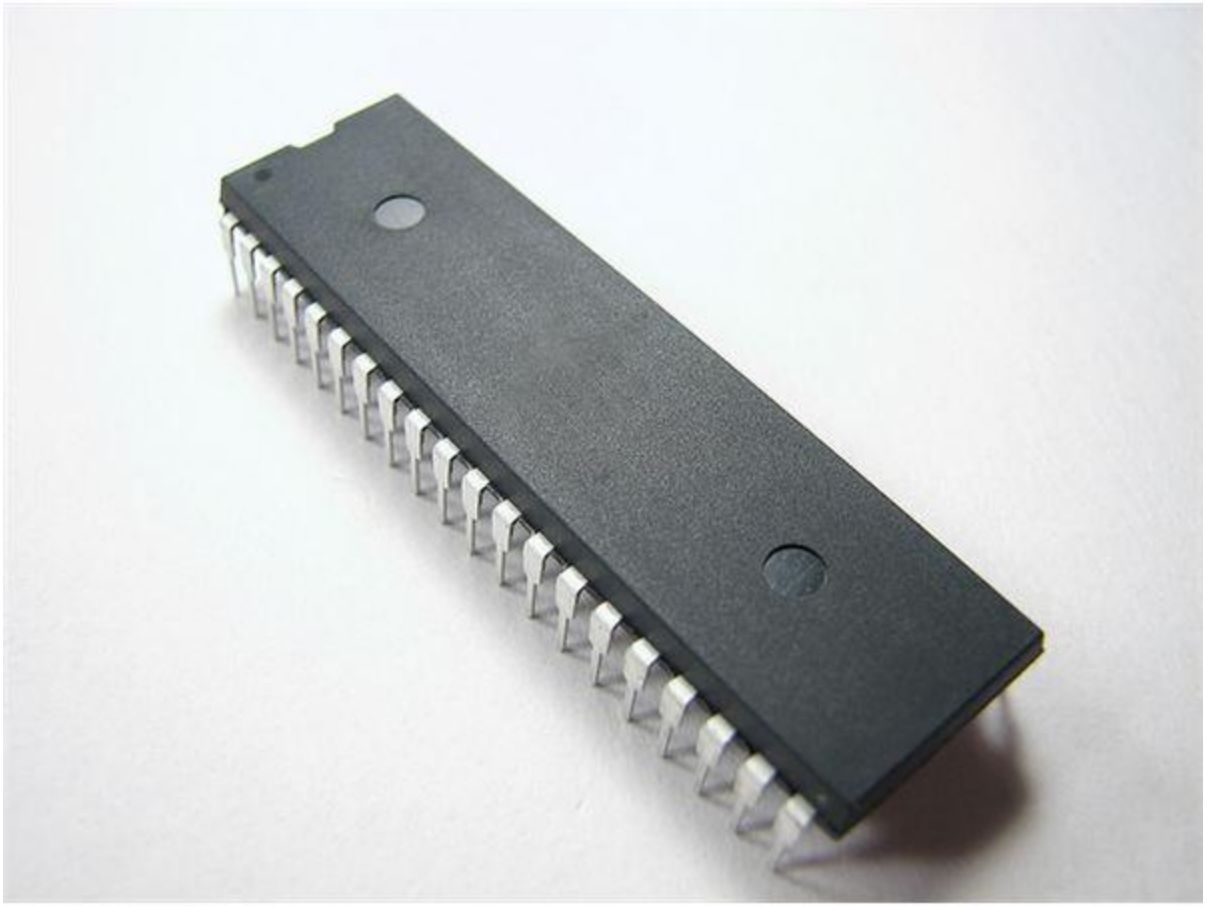
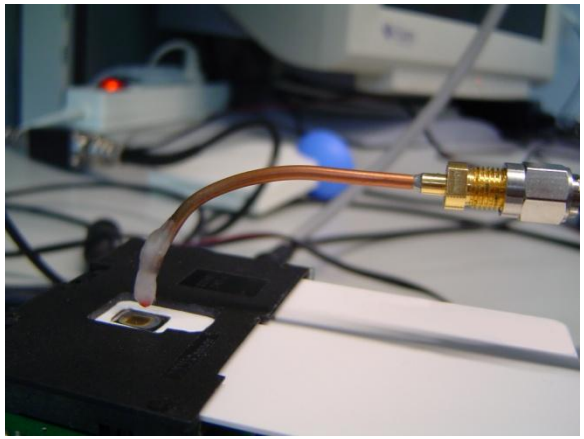
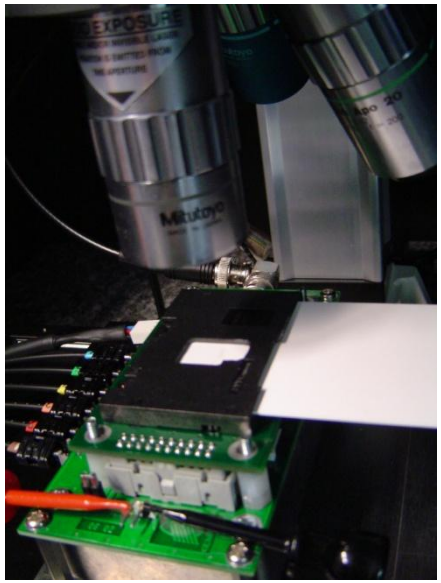
COSADE 2013

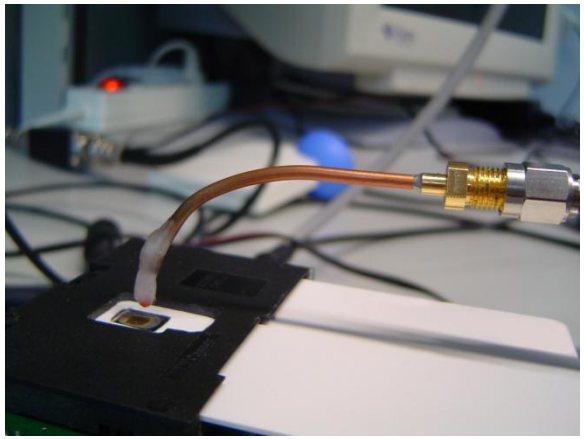
Part 1

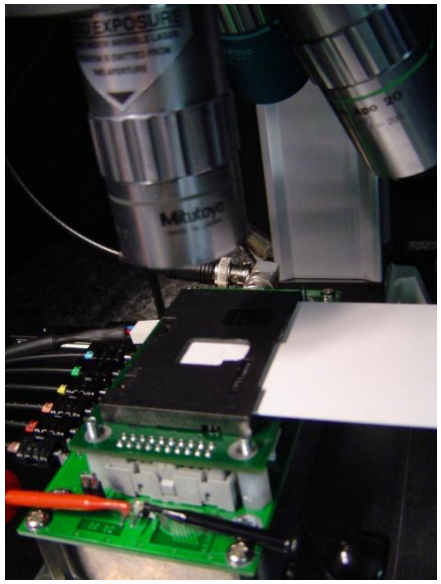
IN-SITU DECAPSULATION

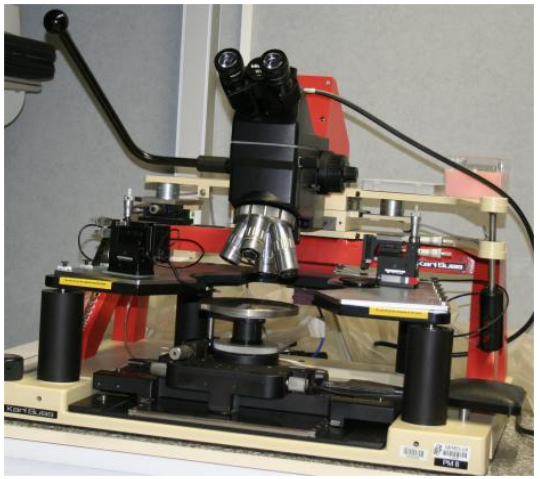


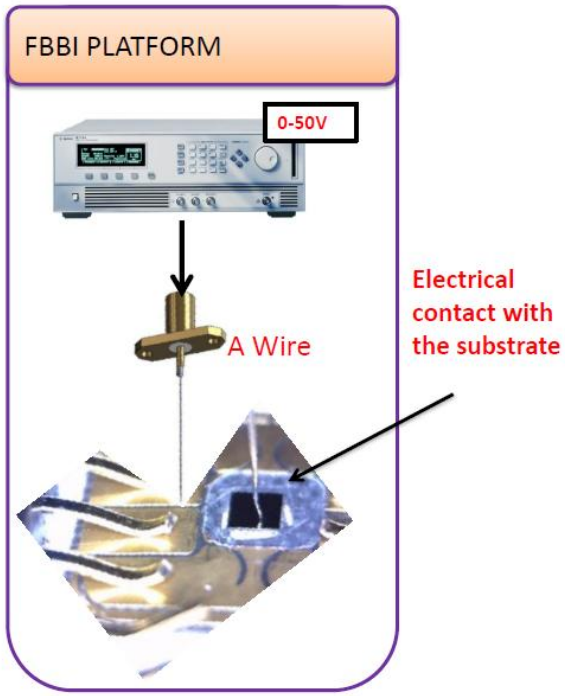



EXPOSURE
Mitutoyo









Courtesy of Ph. Maurine / LIRMM

Access to the die
Without compromising die integrity
Without compromising die bonding integrity

Access to the die Without removing the package from the system board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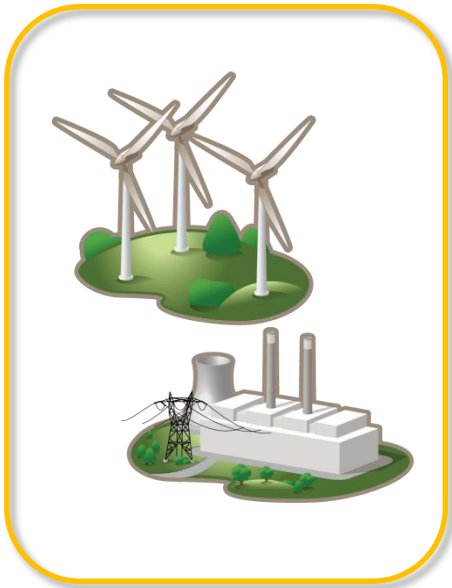


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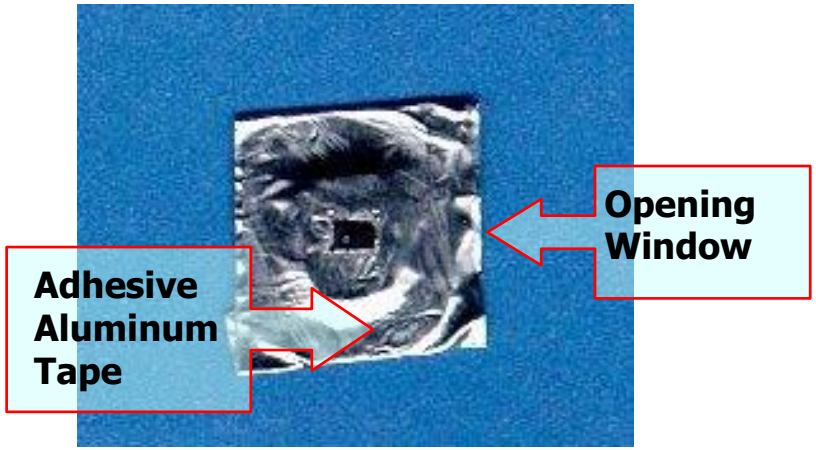
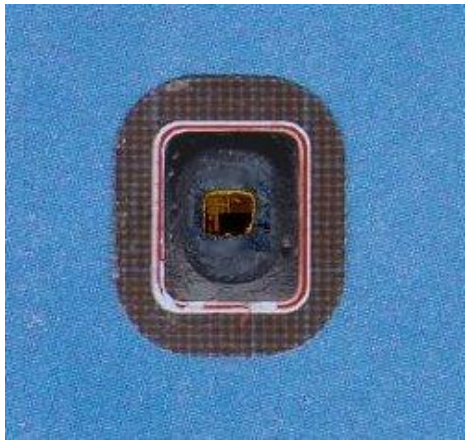
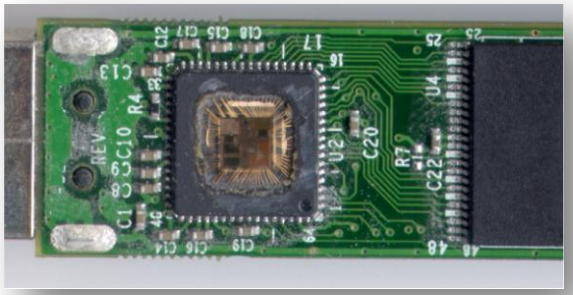
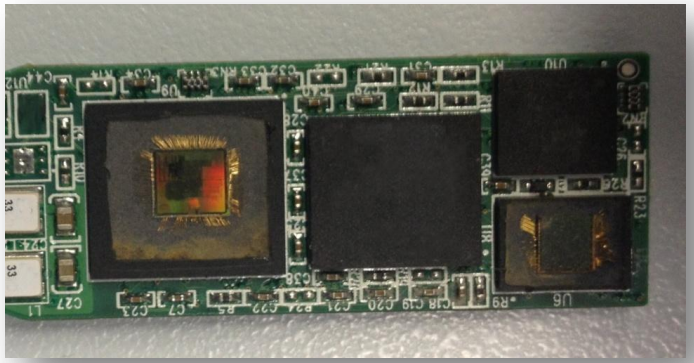
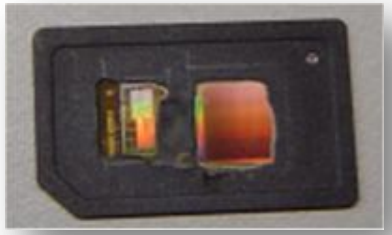

Opening
Window
Adhesive
Aluminum
Tape













In-situ depackaging summary

Pros

- Reliability
  - Single operation
  - No damage of the PCB
- Cost
  - Tools for de-soldering/soldering ***not needed***
  - Bonding equipment ***not needed***
  - Al adhesive tape
  - Hot Fuming Nitric Acid + Water (+ Acetone) + dry air (nitrogen)

Cons

- The side of the die exposed depends of the package
  - Lucky or unlucky?
  - 3D packages

Part 2

ULTRA LOW COST DELAYERING

Ultra low cost sample preparation

200K€

Ultra low cost sample preparation

Ultra low cost sample preparation

50K€

Ultra low cost sample preparation

50K€

Ultra low cost sample preparation

50K€

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50K€

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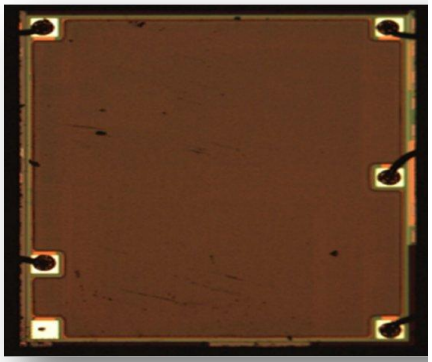

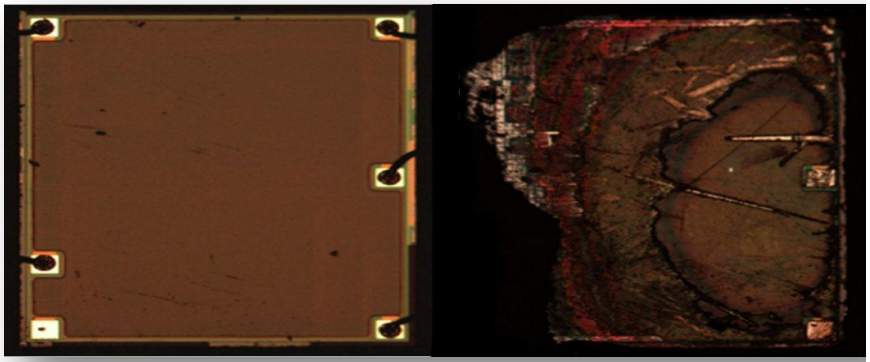

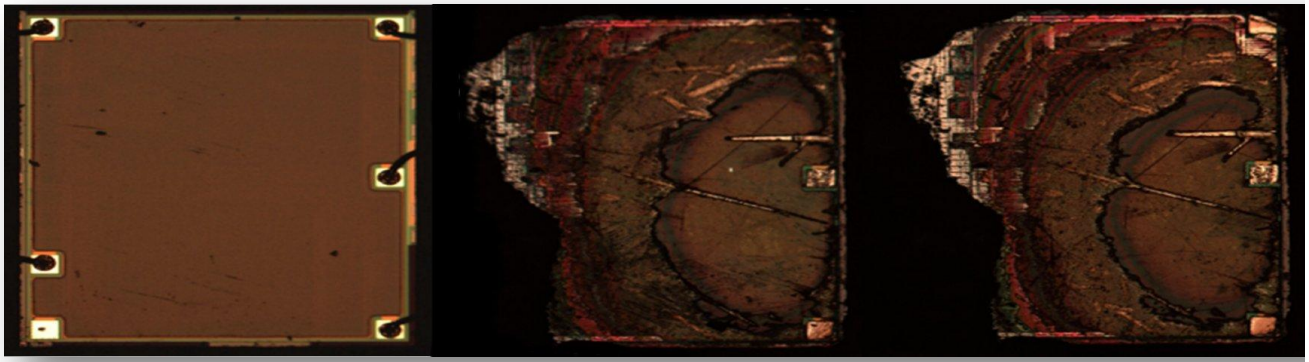

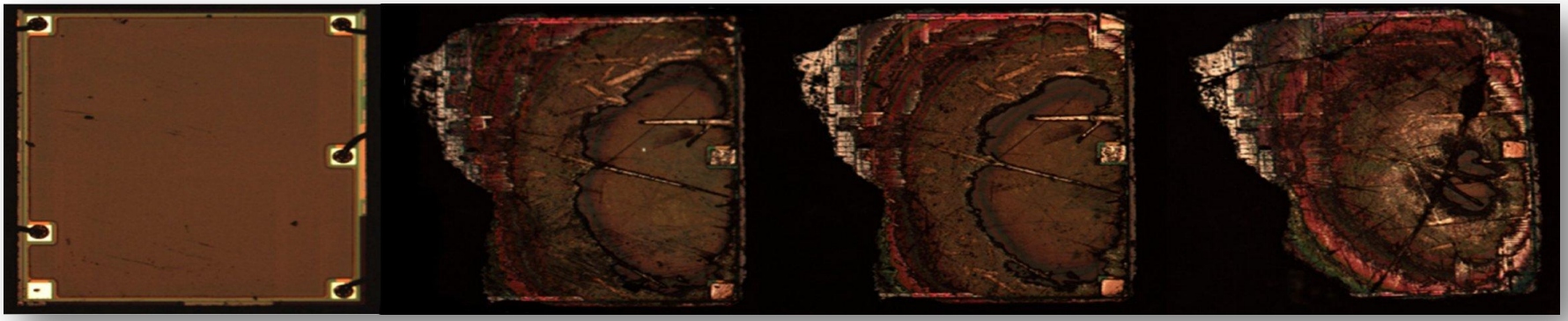


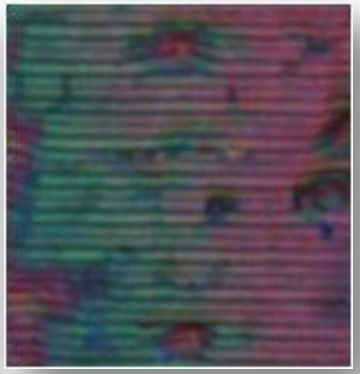

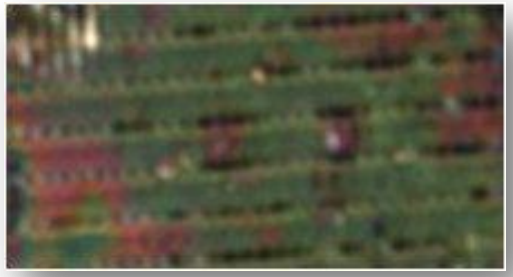

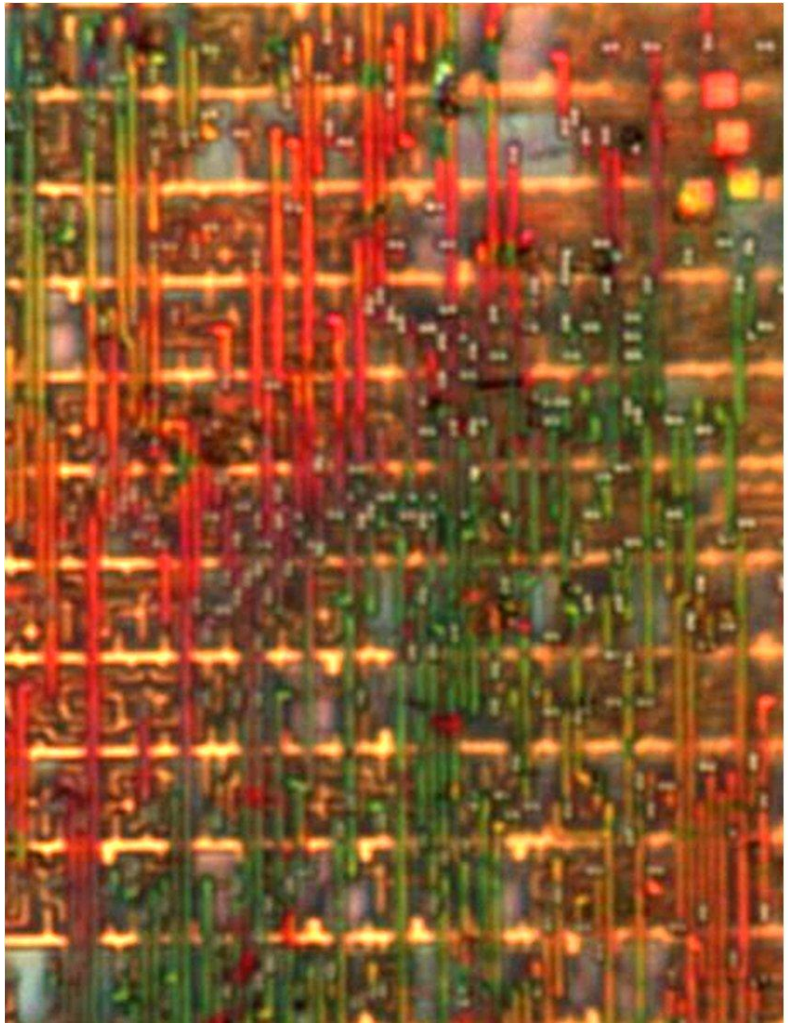

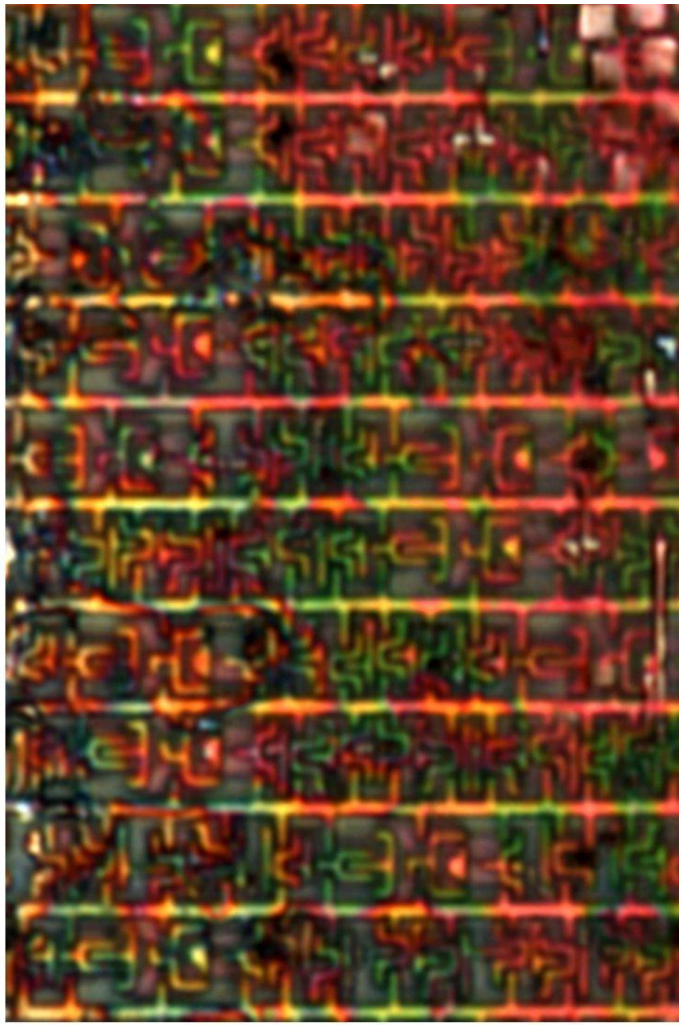

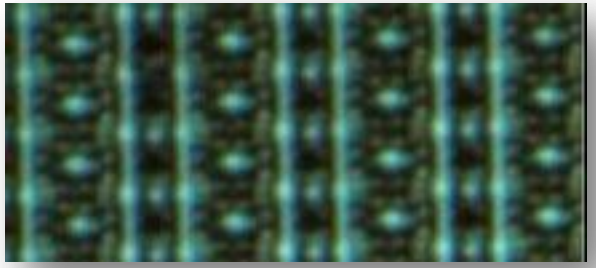

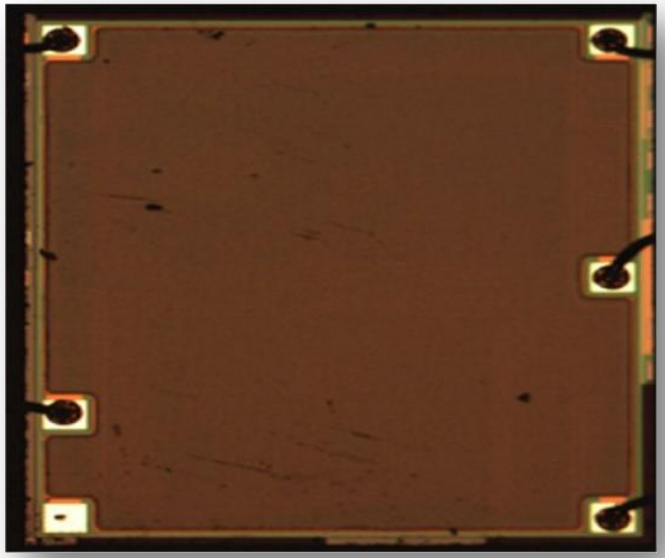

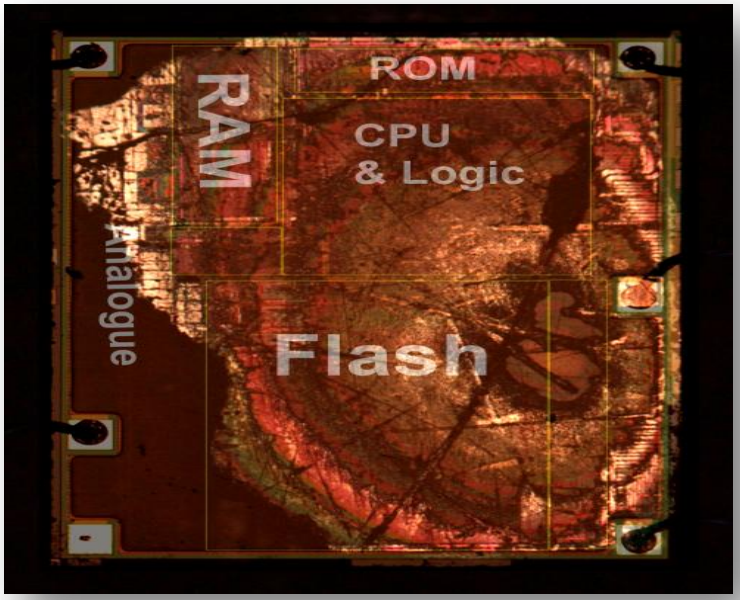
ROM
RAM
CPU
& Logic
Analogue
Flash

Ultra Low Cost Delayering (DJ, Die Jittering) Summary

- Of course, DJ sample preparation technique can be seen as a proof of concept
- But…
- It shows that very expensive equipments are not mandatory to get chip hidden data

CONCLUSION

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- Cost effective techniques could (must?) be used for improving attacks
- Low cost in-situ depackaging gives significant advantages compare to chip extraction
- Ultra low cost sample preparation could gives very interesting information

- Having inside knowledge of the attacked chip is often the first step of a successful physical attack

Conclusion

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- Low cost in-situ depackaging gives significant advantages compare to chip extraction
- Ultra low cost sample preparation could gives very interesting information

- Having inside knowledge of the attacked chip is often the first step of a successful physical attack

So, try it !


They are ready to try
THANK YOU FOR YOUR ATTENTION