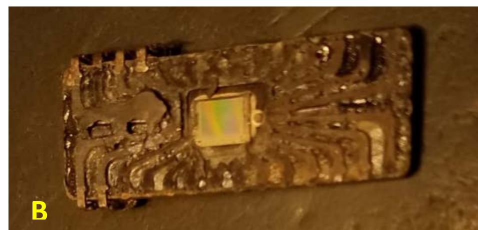
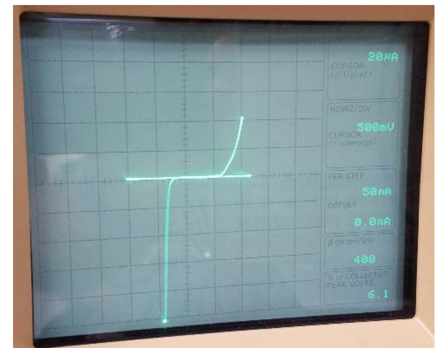
11-July-2017

RE: Microchip Memory Products Division evaluation of two AT28HV256 devices to harvest data from those devices.

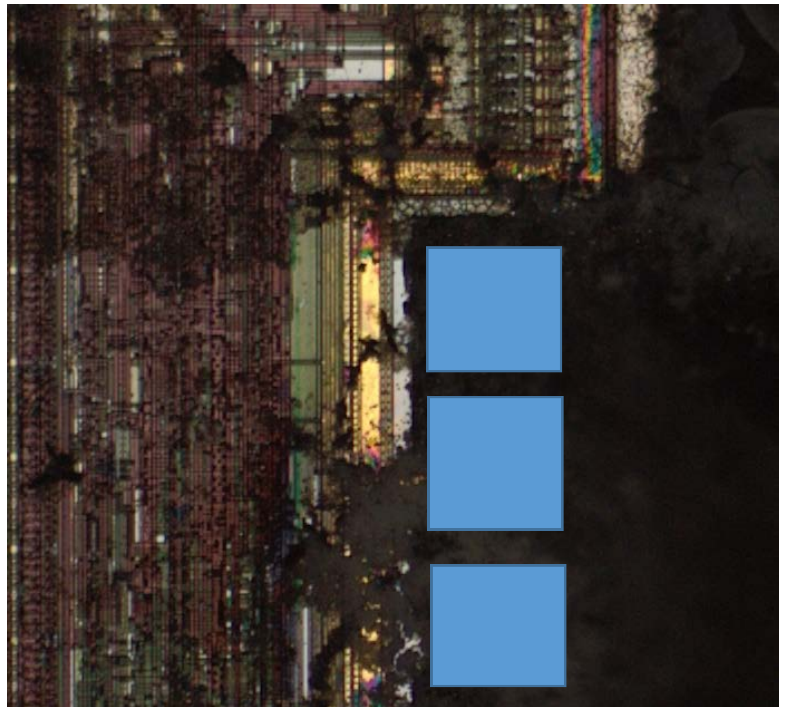
David Studtmann from Honeywell Aerospace in Phoenix signed into Microchip Fab 5 site at 0804MDT. The evidence was retrieved from secure storage still sealed as shipped from Honeywell. We opened the sealed box and took pictures of the devices as received.





Sample A was curve traced to determine correlation to the Honeywell observation of no device ID in their Data I/O EEPROM reader. A KGD (known Good Device) was curve traced first to make the curved line showing the ESD protection diode break over that occurs at -0.3Vdc and the turn on of the CMOS circuitry that occurs at +0.7Vdc. Sample A device made a horizontal line. A horizontal line means the circuit is open and no current can flow. The Microchip open observation correlates to the Honeywell open observation on Sample A.

Sample A was de-lidded to determine if ground or Vcc bond wires were compromised. Once open, many bond wires were gone. Sample A was exposed to sufficient heat to reflow the frit that seals the ceramic DIP package halves together (>410°C). The frit has covered numerous bod pads preventing any connection to those signals. The blue squares represent the die bond pads that are covered with frit that reflowed. Attempts were made to remove the frit encroachment over the die to no avail. Lack of connection to die bond pads prevents the harvesting of data from this device. Other issues compromising die operation were also observed; missing top metal, cracks in the die, exposed barrier metal. This die is damaged too severely to allow data recovery for this device.



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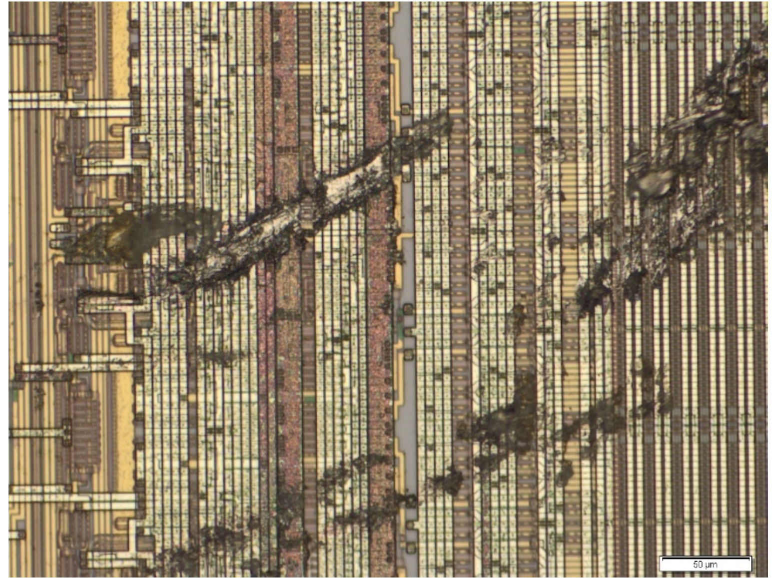
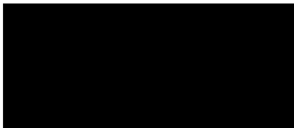
Sample B exhibited a large scratch through the passivation (barrier glass over die) that has cut more than 18 parallel distribution circuits to the NVM array. This scratch is too severe to allow FIB (focused ion beam) repair of the 18 signals in question. There are other issues compromising die operation; frit encroachment over die bond pads from excessive heat, missing top metal, cracks in the die, exposed barrier metal. This die is damaged too severely to allow data recovery for this device.



CONCLUSION:

The two samples received were too severely damaged to facilitate read back of their NVM array contents. These devices experienced temperatures above 410°C to cause the ceramic device package frit to reflow. The spots of missing top metal (Al) are where the Aluminum vaporized and cracked the passivation due to pressure indicate exposures above 660°C. The mechanical damage and the heat damage to the die inside these two devices resulted in the devices being non-operational.



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