Failure Analysis Report

TI Information - Selective Disclosure

Device Analysis Services

FA QEM-CCR-1710-00243
ACTION-0086323

Customer:	SERIAL SYSTEM (DSTR)	**Assy Site:**	
Customer Tracking ID:		**Fab Site:**	
Customer Part ID:		**Technology:**	C021
Customer Contact:	leizhigang	**Analyst:**	Asma Haddoud
Device Type:	TUSB4041IPAPRQ1	**TI Contact:**	Lisa Liu(CQE SZ)
		Qty Submitted:	1
Flow Type:	Customer Return	**Date Submitted:**	2017-10-13
Reviewer:		**Approval:**	Thym Legba.

Summary

Failure Analysis	**Results**
Customer Reported Failure Mode	Customer: Coagent; Failed step: NPI failure description: pin 33 and pin 34(USB1 D+/-) can not recognize US device;
TI Failure Description	
What effect does the defect or damage cause?	Leakage on pin 33.
Where and what is the defect/damage?	Silicon damage at OBIRCH site.
Did the identified physical defect/damage explain the TI reported failure mode?	Yes.

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TI Unit #	Cust. Unit #	Lot Trace Code	Symbolization	Wafer Fab Lot #	Assembly Lot #
1		73AF26W			

- **Customer Reported Problem Description:**

  Customer: Coagent;
  Failed step: NPI
  failure description:
  pin 33 and pin 34(USB1 D+/-) can not recognize US device;

- **TI Problem Description:**

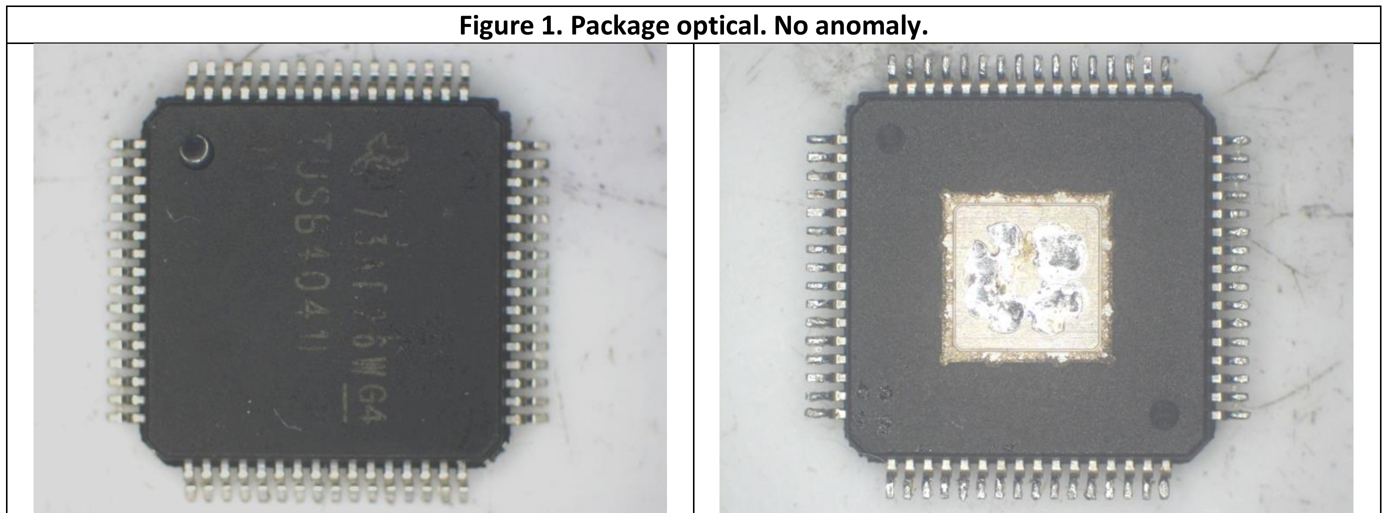
  Silicon damaged was observed;

- **Package Analysis:**

  Package inspection showed no obvious sign of: Mechanical damage, crack, delamination, bonding issue nor die attach anomaly.

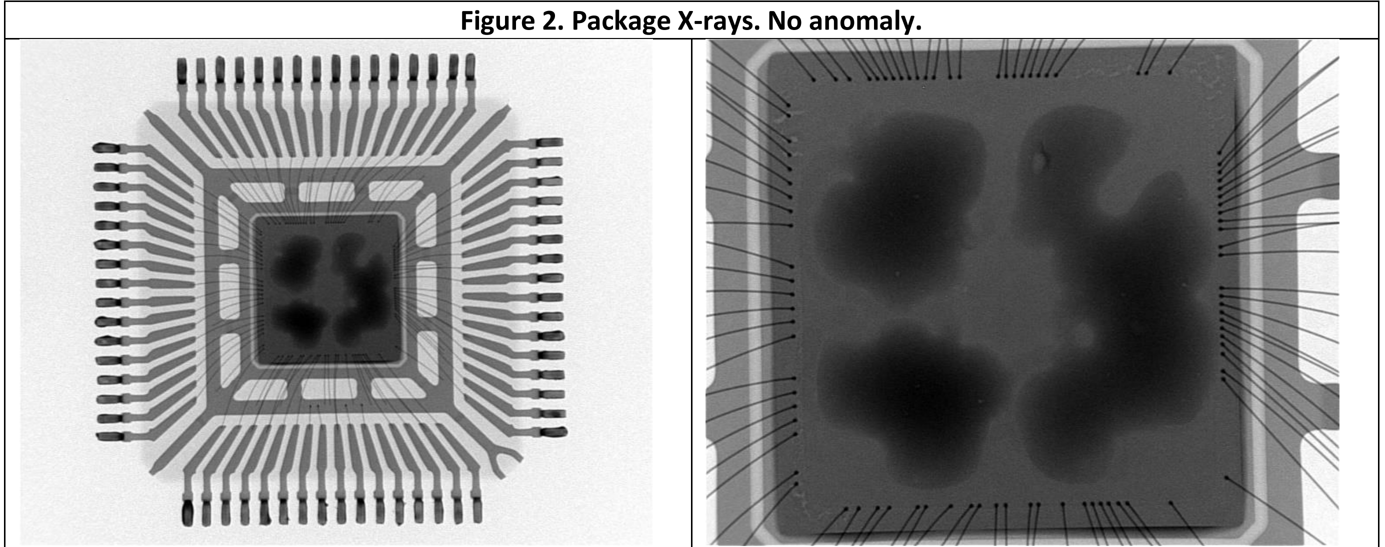
  - **External Package Examination:**

Figure 1. Package optical. No anomaly.



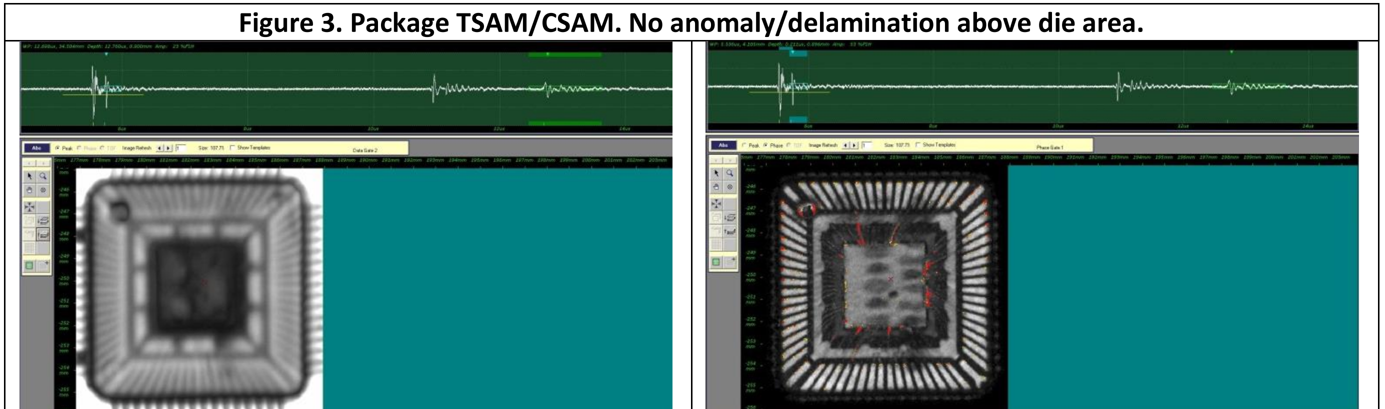
- **X-Ray Analysis:**

Figure 2. Package X-rays. No anomaly.



- **Scanning Acoustic Microscopy (SAM):**

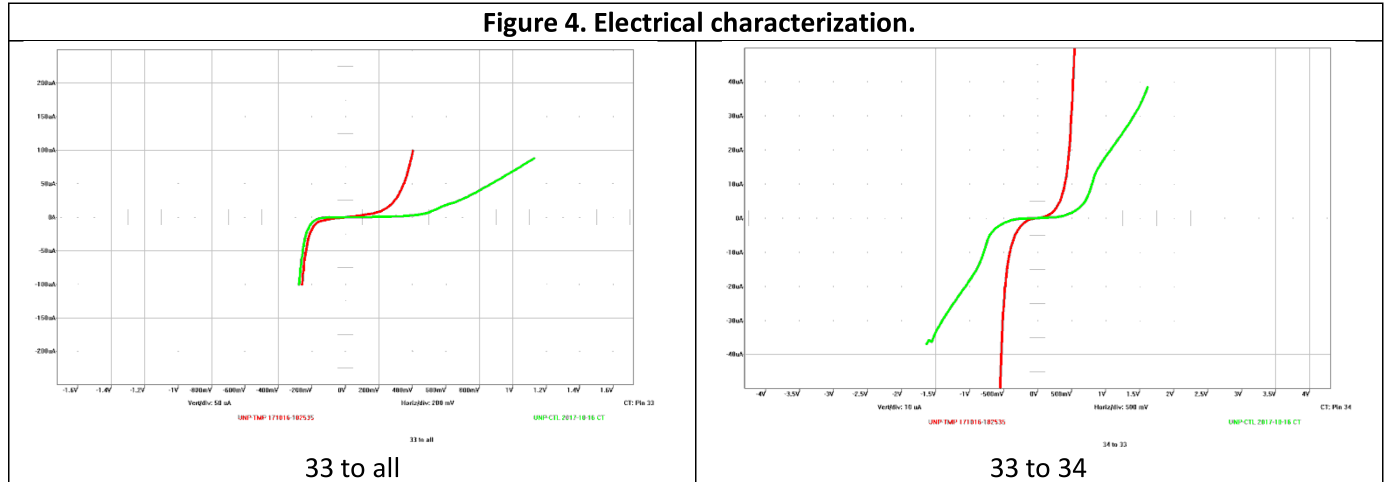
Figure 3. Package TSAM/CSAM. No anomaly/delamination above die area.



- **Electrical Characterization:**

  A basic pin to pin curve trace was performed on the RMR unit and compared to a good unit. Anomalous path was observed on pin 33 when curve traced against other pins. The pin showed a leakage through the origin.

Figure 4. Electrical characterization.

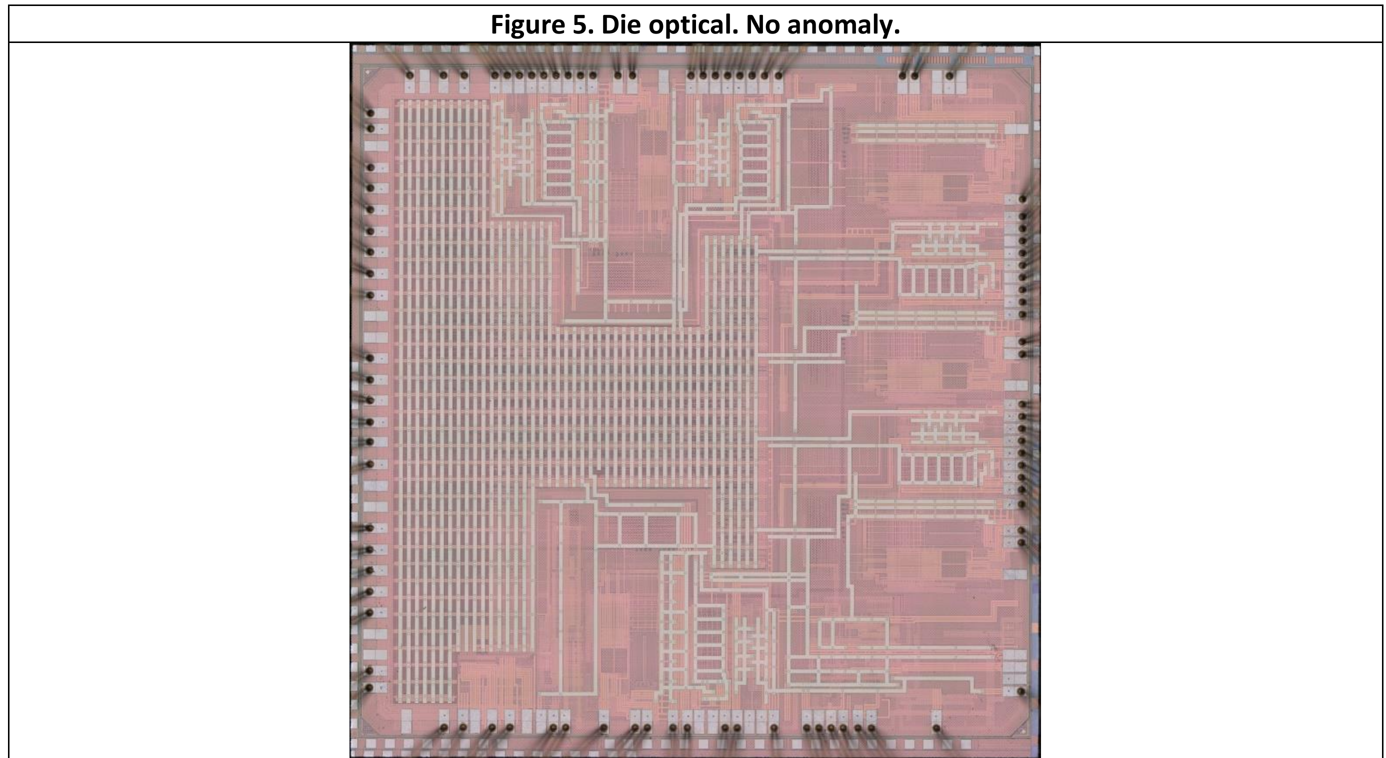


33 to all | 33 to 34

- **Decapsulation:**

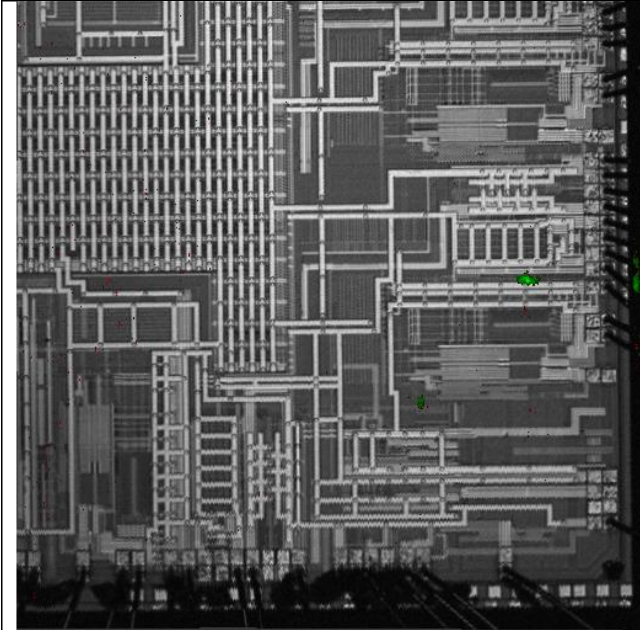
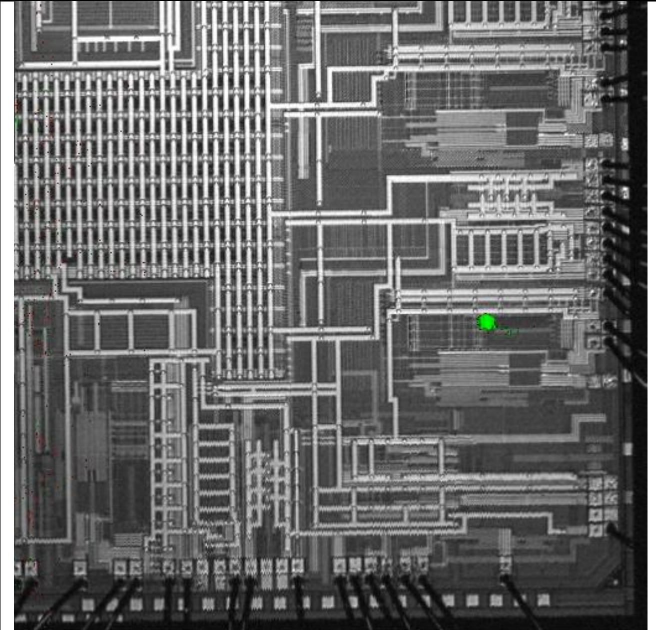
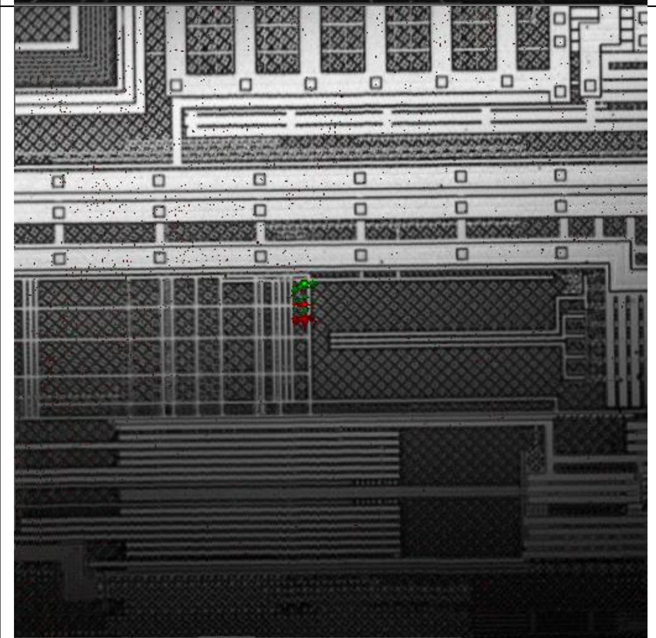
  Unit was decapsulated using laser ablation to partially expose the bond wire, then using a mixture of acids to expose the die surface. Electrical integrity of the device was maintained post decapsulation during bench testing.

Figure 5. Die optical. No anomaly.



- **Failure Isolation:**

  Optical Beam Induced Resistance Change (OBIRCH) was performed on the RMR unit and a good unit for comparison while exercising the leakage on pin 33. One additional/saturated site was observed.

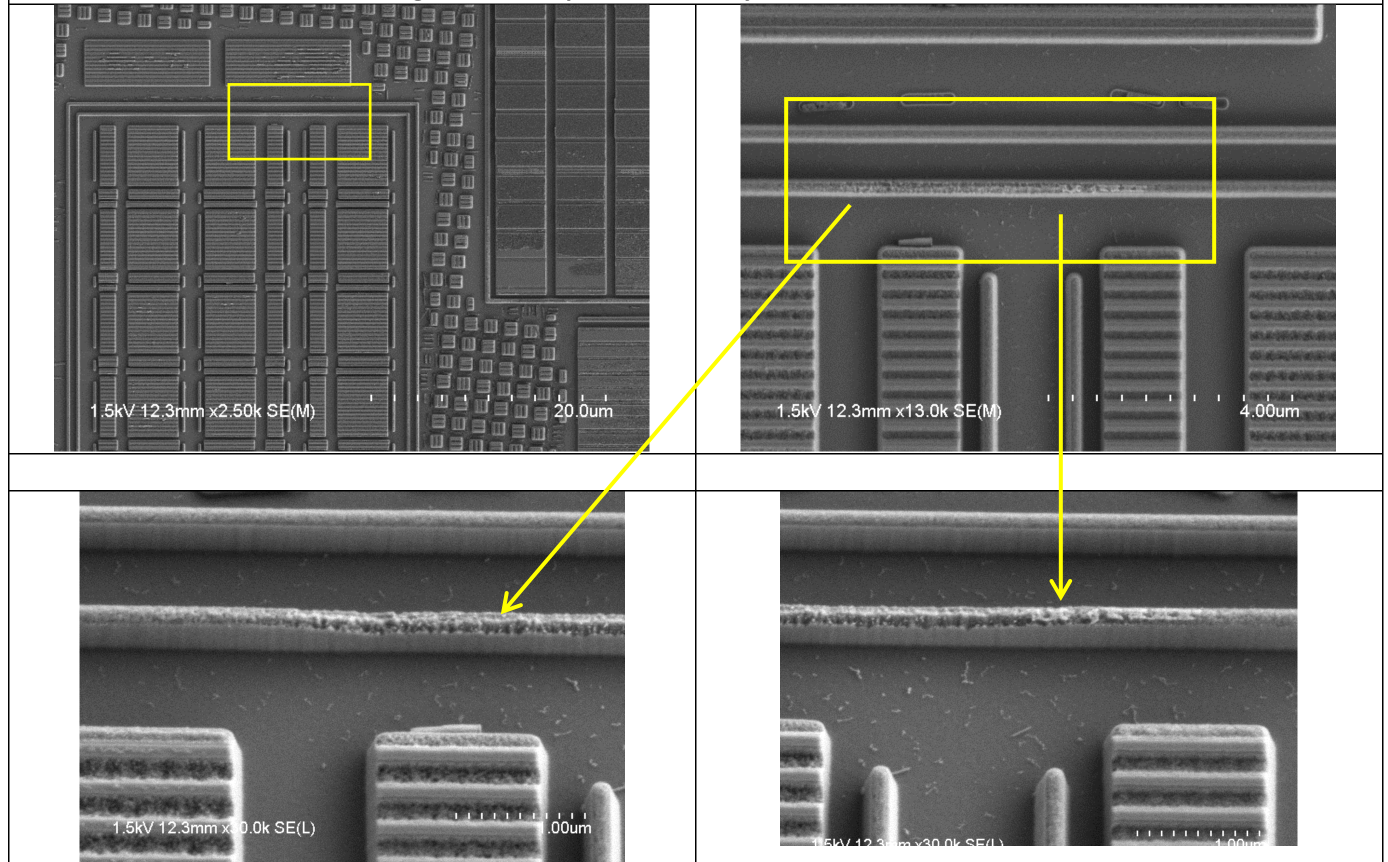
Figure 6. PEM. correlation		Figure 7. PEM. RMR.
		
		

- **Deprocessing and Visual:**

  Unit was polished mechanically, layer by layer, down to contact level for optical inspection at each level. Planarity of the die surface was compromised during polishing which made optical inspection at every level difficult in the area of interest.

  Unit was then deprocessed straight t to silicon using HF acid. Optical inspection of the die using scanning electron microscope (SEM) showed an anomaly at Silicon around OBIRCH site's area. The anomaly looks like damage from thermal stress.

Figure 8. Die optical. Anomaly observed at Silicon.



- **Conclusion:**

  Leakage on pin 33. Silicon damage at OBIRCH site.

Note 1: Due to digital image capture, the magnification is not calibrated nor is the aspect ratio maintained. Not all tools provide a means recorded in the image for calibrating the measurements. When a calibration marker is supplied in the image, the measurements may be calibrated in the direction of the marker.