

# GODDARD SPACE FLIGHT CENTER

## Test Lab Report Summary

<i>Report Number:</i>	Q10163	<i>Project:</i>	SWIFT
<i>Part Type:</i>	Microcircuit	<i>System:</i>	BAT
<i>Part Number:</i>	OP290GS	<i>Initiated Date:</i>	05/01/2001
<i>Date Code:</i>	9739/7P36564.2	<i>Report Date:</i>	06/21/2001
<i>Manufacturer:</i>	Analog Devices	<i>Investigator:</i>	C. Greenwell (562)
<i>Generic Number:</i>	OP290	<i>Requester:</i>	B. Meinhold (562)
<i>Purchase Spec:</i>	Commercial	<i>Approval / Date:</i>	

### Step 1: INCOMING INSPECTION

<u>Test</u>	<u>Quantity</u>	<u>Passed</u>	<u>Failed</u>
External Visual	N/A	N/A	N/A
PIND Condition A	N/A	N/A	N/A

### Step 2: DESTRUCTIVE PHYSICAL ANALYSIS

Destructive Physical Analysis (DPA) was conducted per GSFC document “Plastic Encapsulated Microcircuit (PEM) Guidelines for Screening and Qualification for Space Applications”, except that cross-section was done without dye penetrant and glassivation integrity testing was not performed.

No rejectable defects or anomalies were observed during this analysis.

GODDARD SPACE FLIGHT CENTER

Part Type: Microcircuit  
 Manufacturer: Analog Devices

Part No: OP290GS  
 Date Code: 9739/7P36564.2

## Summary of Analysis:

<i>Serial Number</i>	<u>E8</u>	<u>E10</u>	<u>F8</u>	<u>F10</u>	<u>U2</u>
<i>External Examination</i>					
1. Markings - legibility and correctness _____	A	A	A	A	A
2. Integrity of package seals _____	N/A	N/A	N/A	N/A	N/A
3. Condition of external leads and plating _____	A	A	A	A	A
4. Overall package condition _____	A	A	A	A	A
<i>Radiographic Examination</i>					
5. Die bonding material and die alignment _____	A	A	A	A	A
6. Package seal integrity _____	N/A	N/A	N/A	N/A	N/A
7. Presence of foreign material _____	A	A	A	A	A
8. Lead dress (if revealed) _____	A	A	A	A	A
<i>Acoustic Microscopy Inspection</i>					
9. Condition of material interfaces (delaminations) _____	A	A	A	A	A
10. Condition of molding material (voids, cracks) _____	A	A	A	A	A
<i>Internal Examination (including cross-section)</i>					
11. Presence of foreign material _____	A	A	A	A	A
12. Mechanical condition of die _____	A	A	A	A	A
13. Wire bonds and lead dress _____	A	A	A	A	A
14. Die bonding material _____	A	A	A	A	A
15. Condition of die surface _____	A	A	A	A	A
16. Condition of metallization _____	A	A	A	A	A
17. SEM Examination _____	A	A	N/P	N/P	A
<i>Bond Strength</i>					
18. Strength _____	A	A	N/P	N/P	A
19. Metallization adherence _____	A	A	N/P	N/P	A
<i>Die Bond Strength</i>					
20. Strength _____	N/P	N/P	N/P	N/P	N/P

SN's F8 and F10 subjected to cross-sectional examination.

(\* = Refer to comments, A = acceptable, U = unacceptable, N/A = not applicable, N/P = not performed)

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Date Code: 9739/7P36564.2

Appended Photographs:

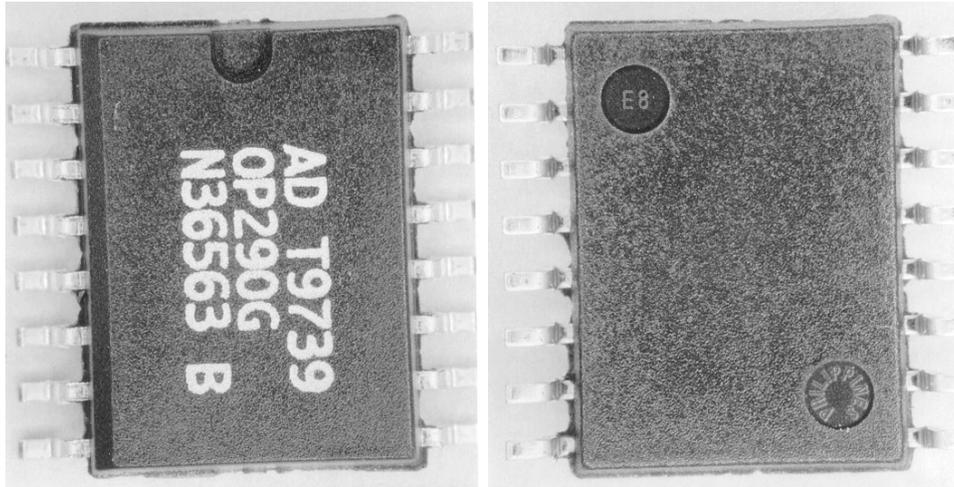


Figure 1. External top and bottom views of the OP290GS devices. Each device had a unique two or three character alphanumeric code that was used for reference designations during this analysis. 6X

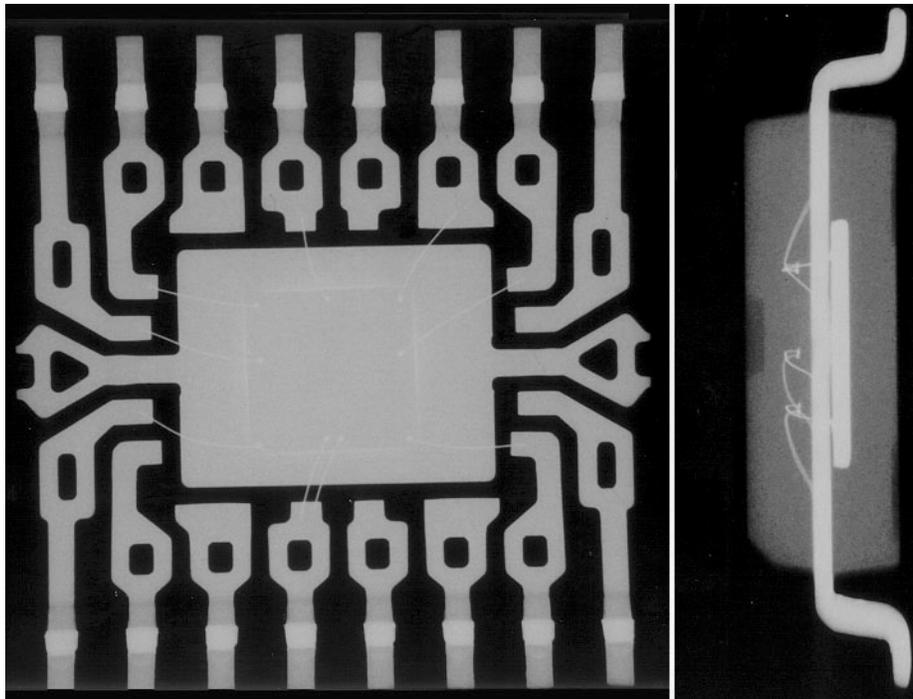


Figure 2. Top and side view radiographic images. 8X

Appended Photographs:

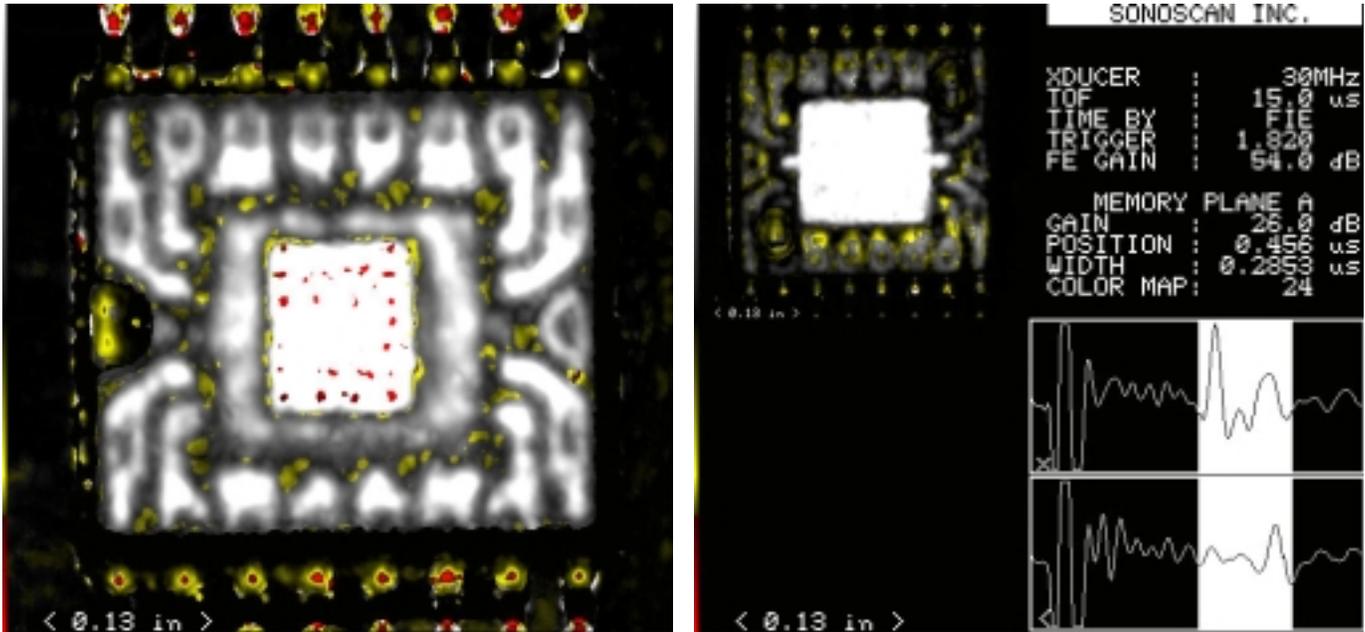


Figure 3. Top (left) and bottom C-SAM images of SN E8. Tools settings are shown for the bottom view.

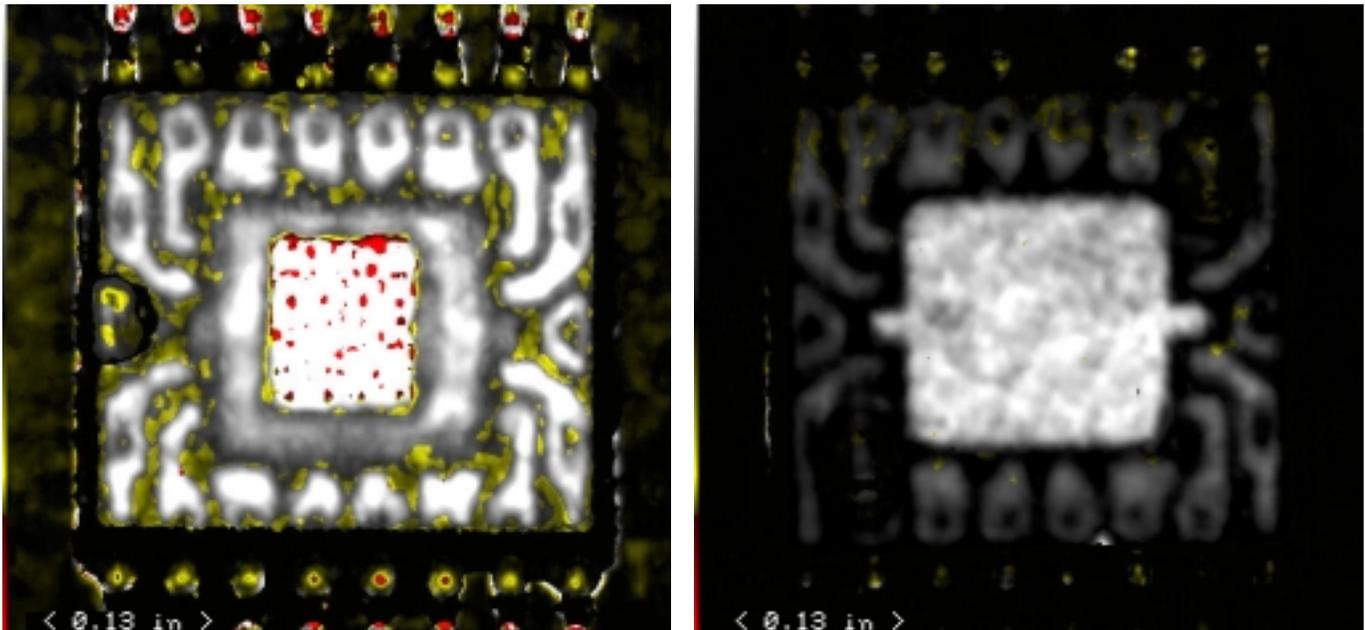


Figure 4. Top (left) and bottom C-SAM images of SN E10.

Appended Photographs:

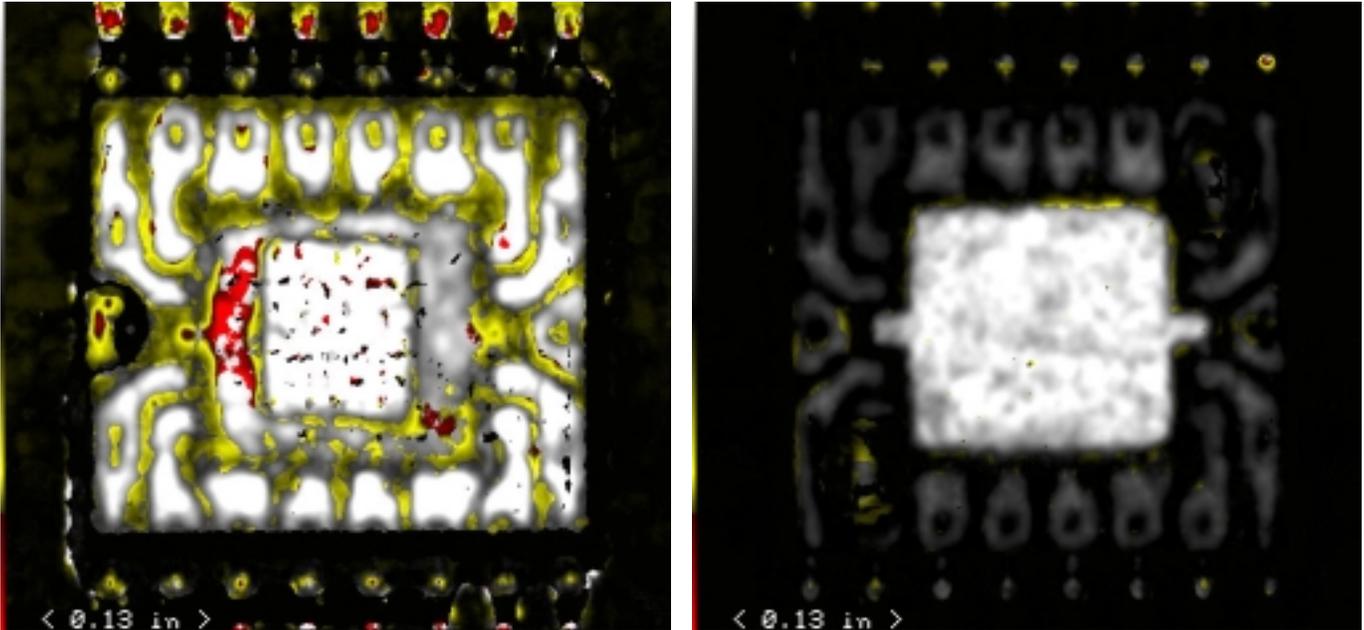


Figure 5. Top (left) and bottom C-SAM images of SN F8. The red area to the left of the die in the topside view is likely to be minor delamination between the plastic and die paddle. The speckles in the area of the die are artifact of the package surface.

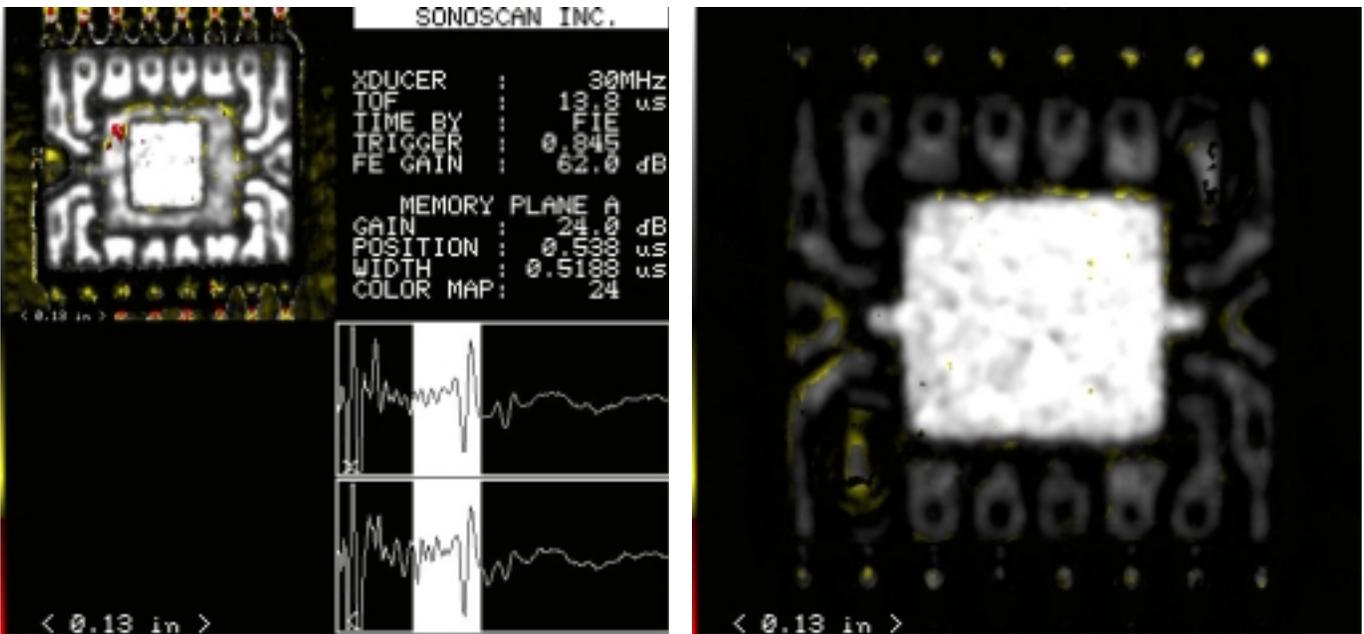


Figure 6. Top (left) and bottom C-SAM images of SN F10.

Appended Photographs:

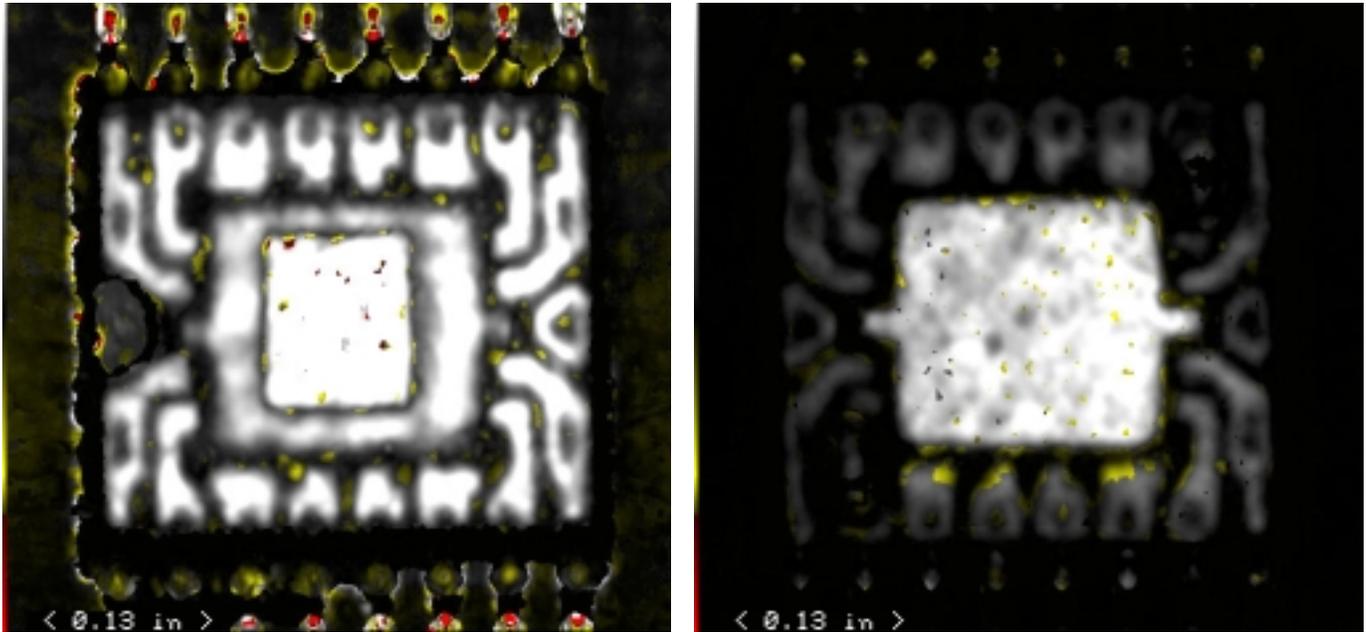


Figure 7. Top (left) and bottom C-SAM images of SN U2.

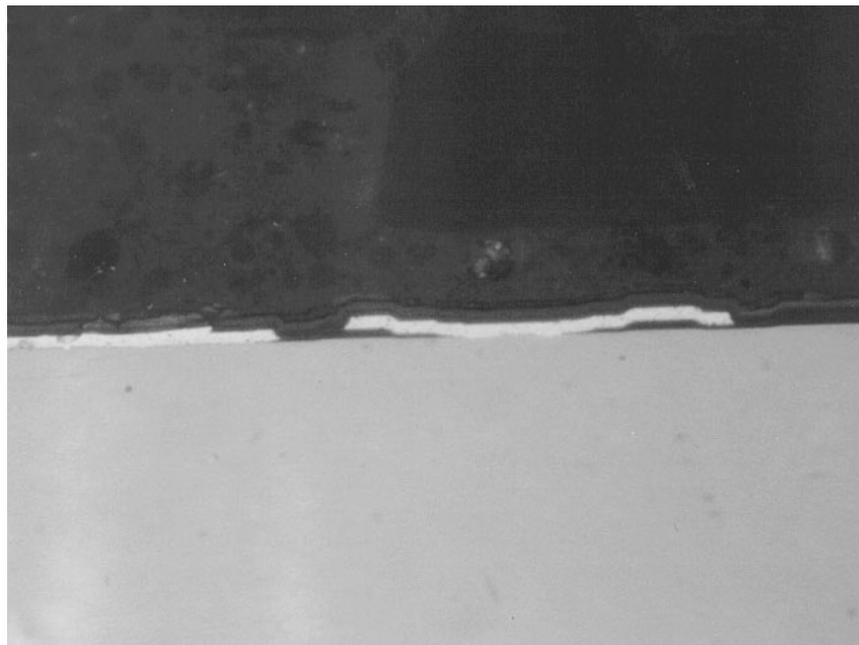


Figure 8. Cross-section images of SN F8 showing die surface and plastic interface. No delaminations or anomalies were observed, consistent with the C-SAM inspection results. 1000X

Appended Photographs:

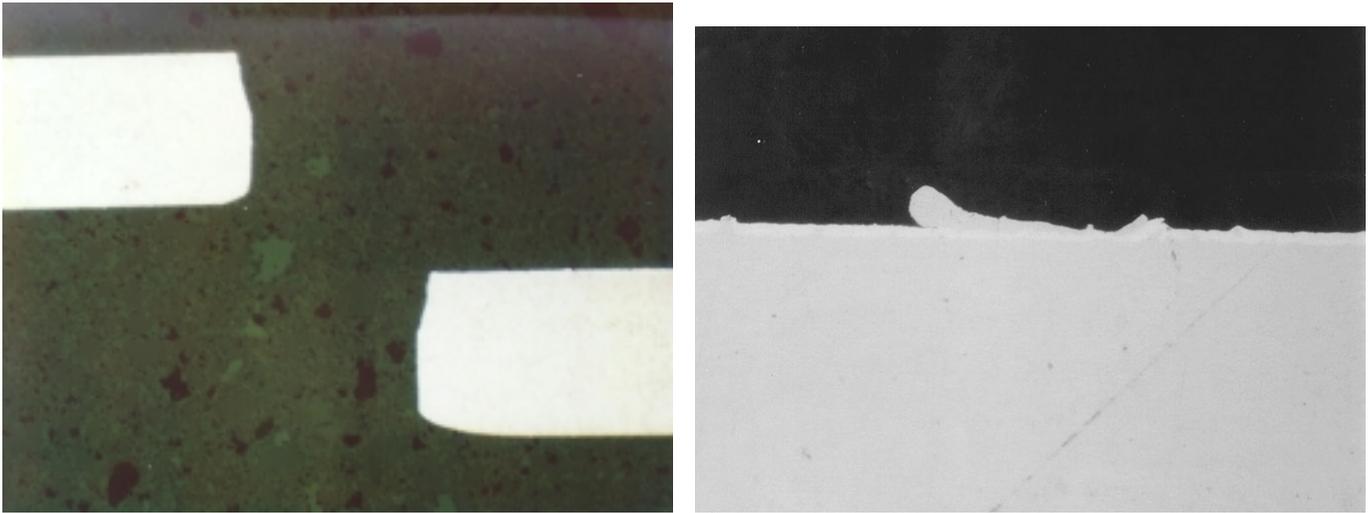


Figure 9. Cross-section images of SN F10. No delaminations or anomalies were observed. Left image  $\approx 100X$ ; right  $\approx 400X$ .

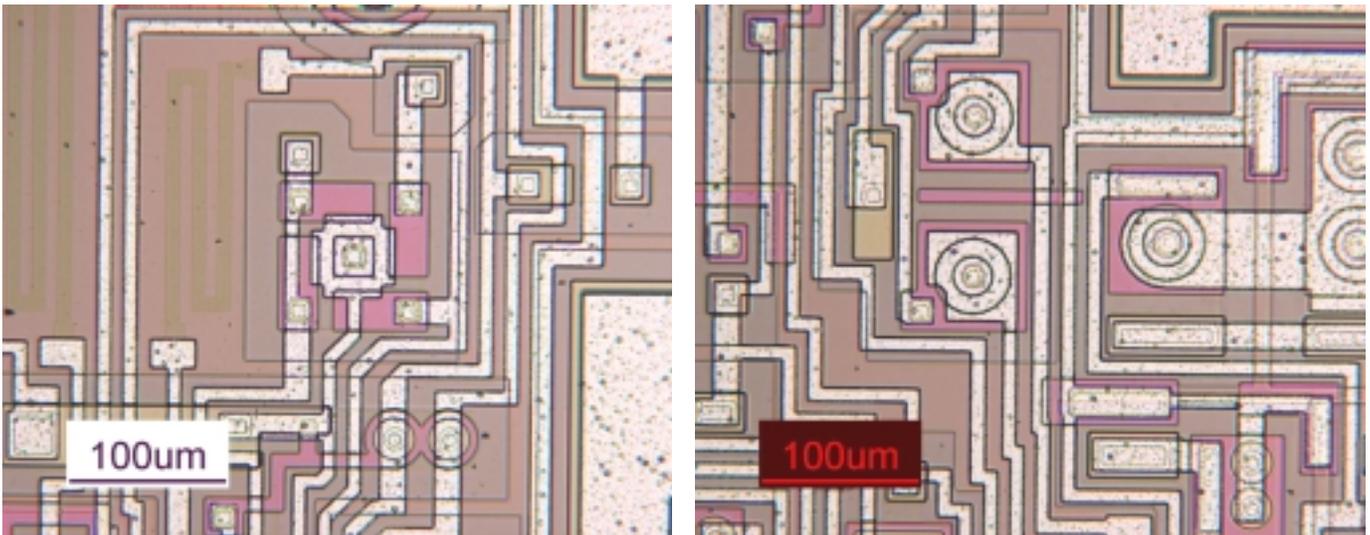


Figure 10. Optical micrograph images of SN E8 die features.

Appended Photographs:

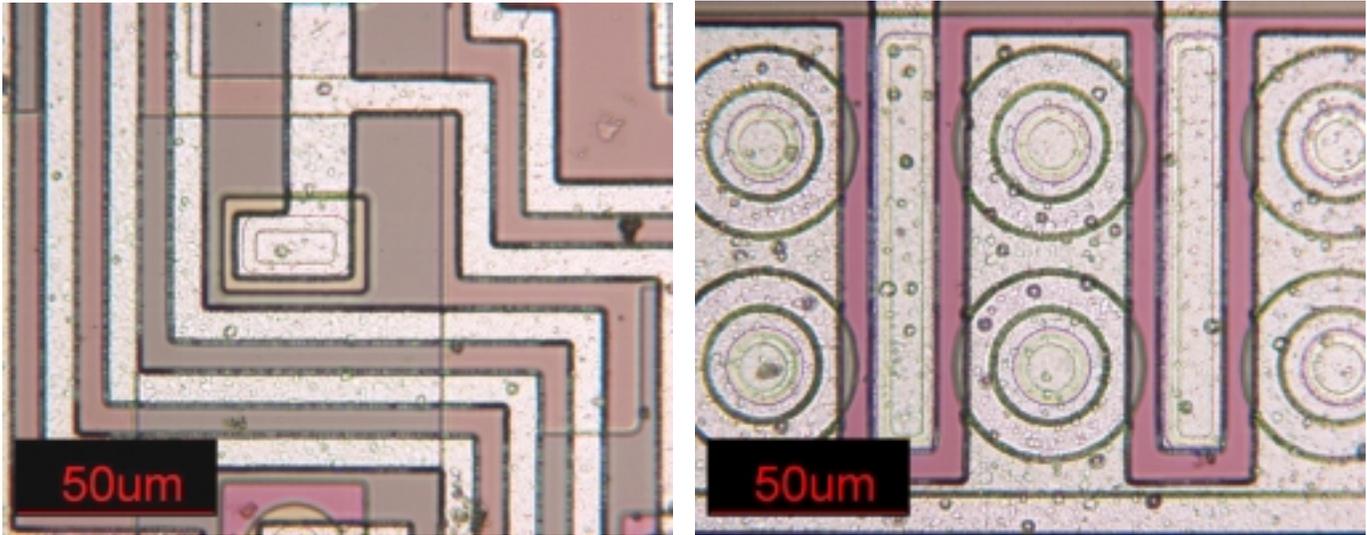


Figure 11. Optical micrograph images of SN E10 die features.

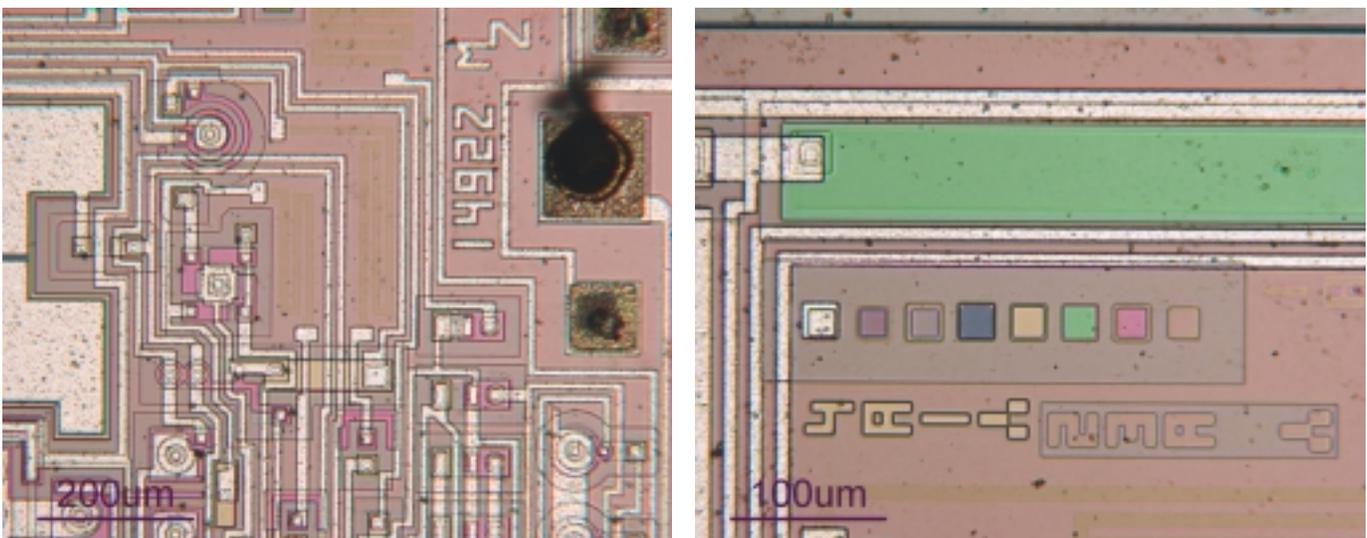


Figure 12. Optical micrograph images of SN U2 shows worst case bond placement and general device features and markings. The discolored bond pads are a result of the acid deprocessing.

Appended Photographs:

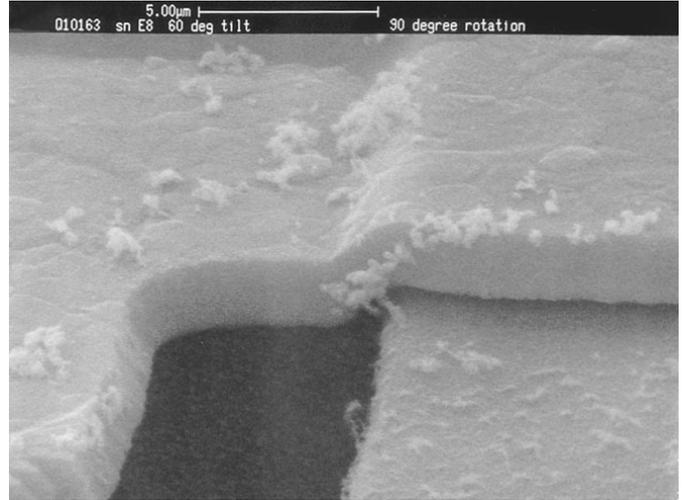
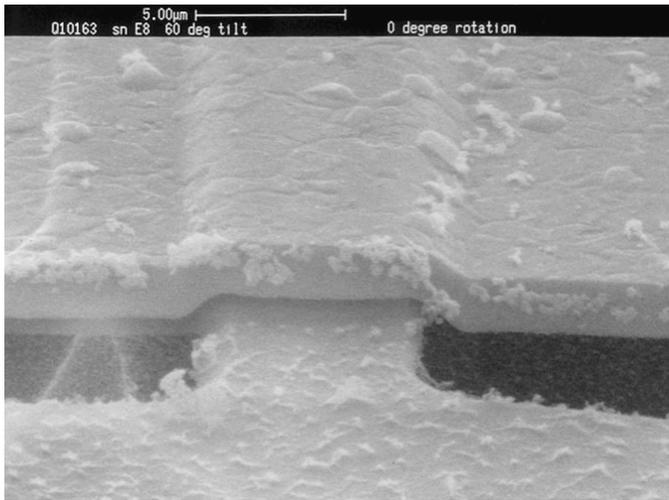


Figure 13. SEM micrographs of SN E8. The metallization has excellent step coverage.

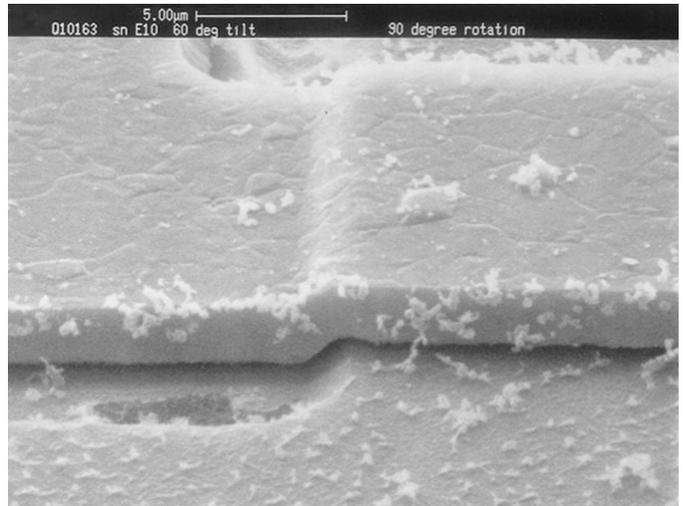
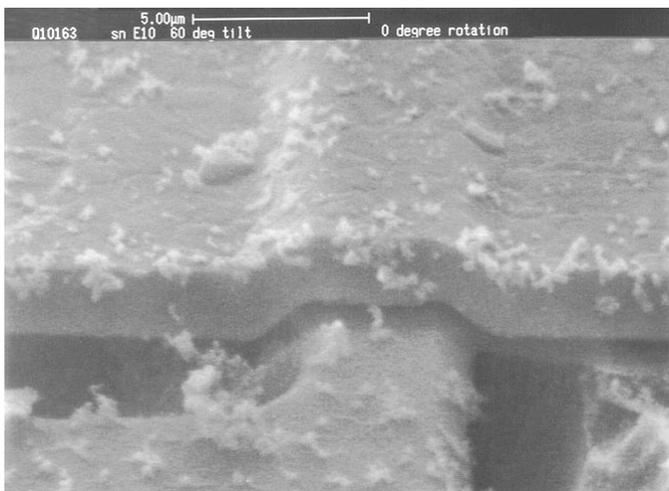


Figure 14. SEM micrographs of SN E10.

Appended Photographs:

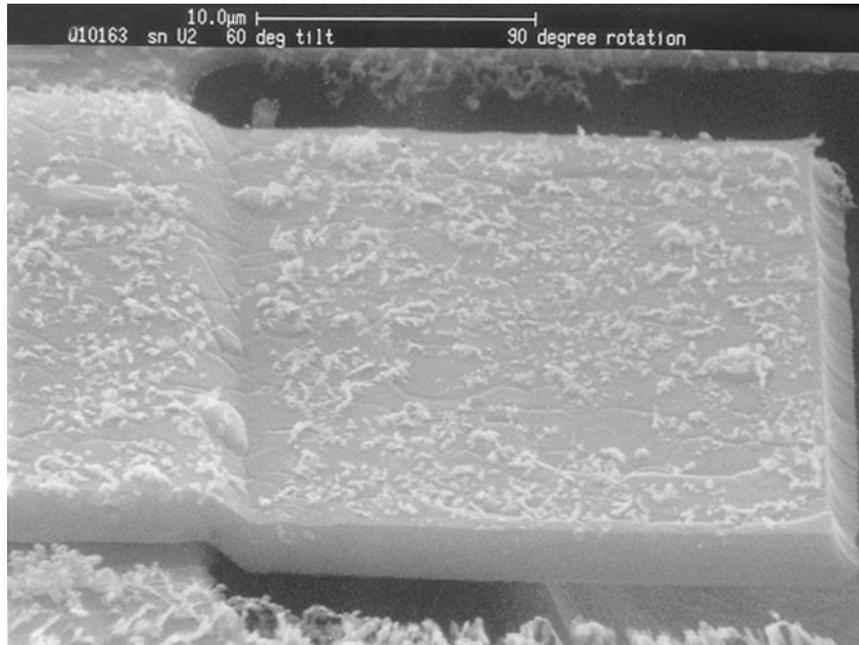


Figure 15. SEM micrograph of SN U2.

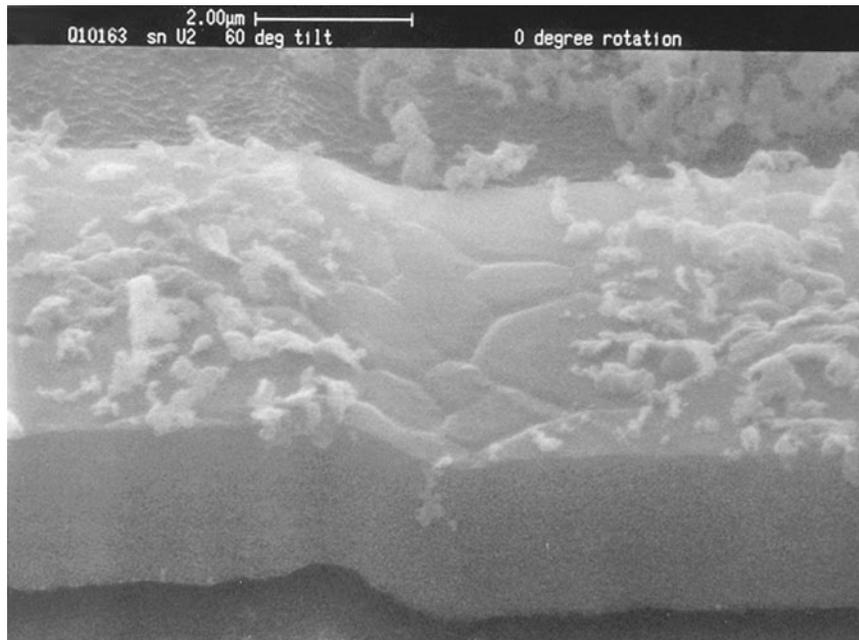


Figure 16. SEM micrograph of SN U2.