

GODDARD SPACE FLIGHT CENTER

Test Lab Report Summary

<i>Report Number:</i>	Q10162DPA	<i>Project:</i>	SWIFT
<i>Part Type:</i>	Microcircuit	<i>System:</i>	BAT
<i>Part Number:</i>	OP284ES	<i>Initiated Date:</i>	05/01/2001
<i>Date Code:</i>	0041	<i>Report Date:</i>	07/19/2001
<i>Manufacturer:</i>	Analog Devices	<i>Investigator:</i>	C. Greenwell (562)
<i>Generic Number:</i>	OP284	<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.

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 Manufacturer: Analog Devices

Part No: OP284ES
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Summary of Analysis:

	<i>Serial Number</i>	<u>A4</u>	<u>O17</u>	<u>P11</u>	<u>P13</u>	<u>W1</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	N/P	A	A	N/P
16. Condition of metallization _____		A	N/P	A	A	N/P
17. SEM Examination _____		A	N/P	A	A	N/P
<i>Bond Strength</i>						
18. Strength _____		A	N/P	A	A	N/P
19. Metallization adherence _____		A	N/P	A	A	N/P
<i>Die Bond Strength</i>						
20. Strength _____		N/P	N/P	N/P	N/P	N/P

SN's O17 and W1 subjected to cross-sectional examination.

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

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Appended Photographs:

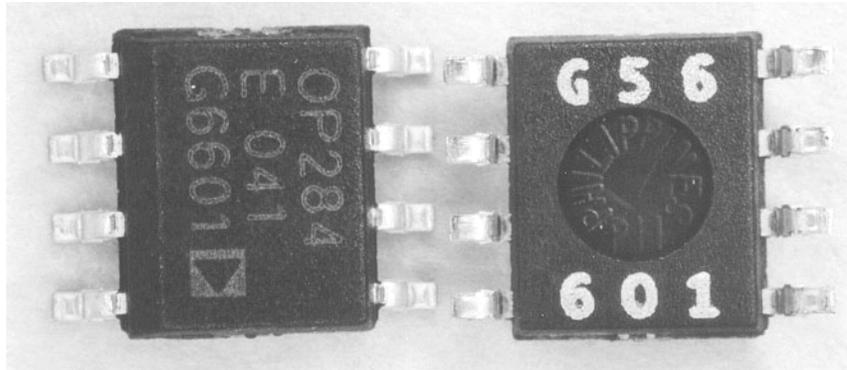


Figure 1. External top and bottom views of the OP284ES devices. Although difficult to see in this image, the bottom of the devices have embossed markings. Each device had a unique two or three character alphanumeric code that was used for reference designations during this analysis. 8X

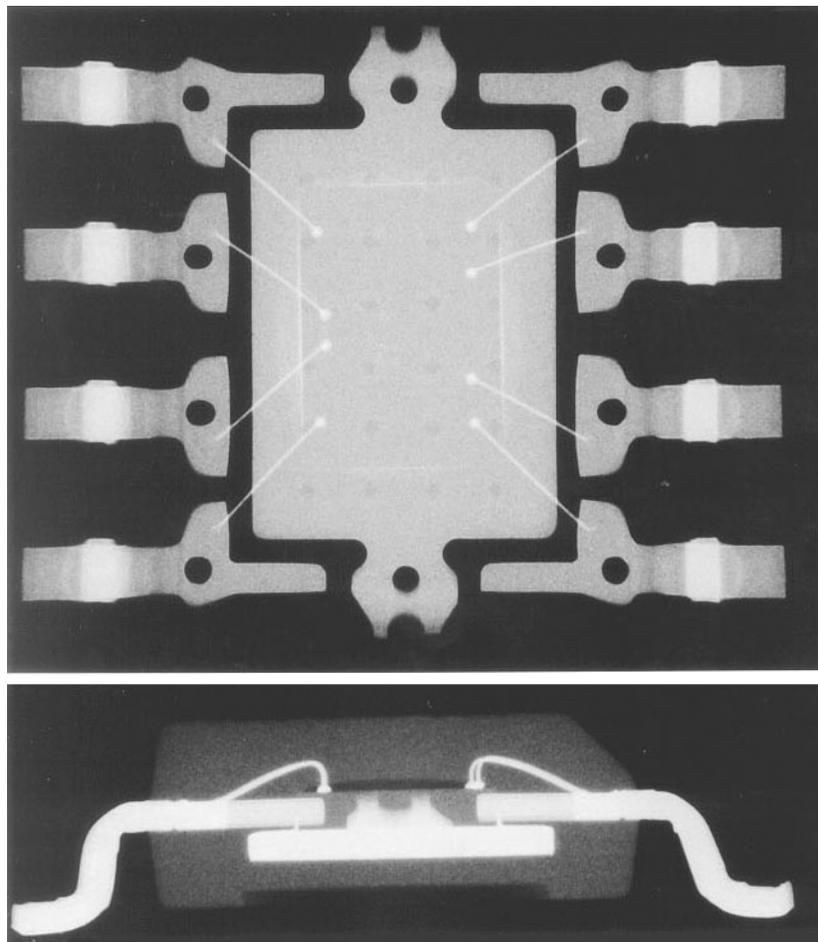


Figure 2. Top and side view radiographic images. The side view reveals a glob-top coating on the die. 16X

Appended Photographs:

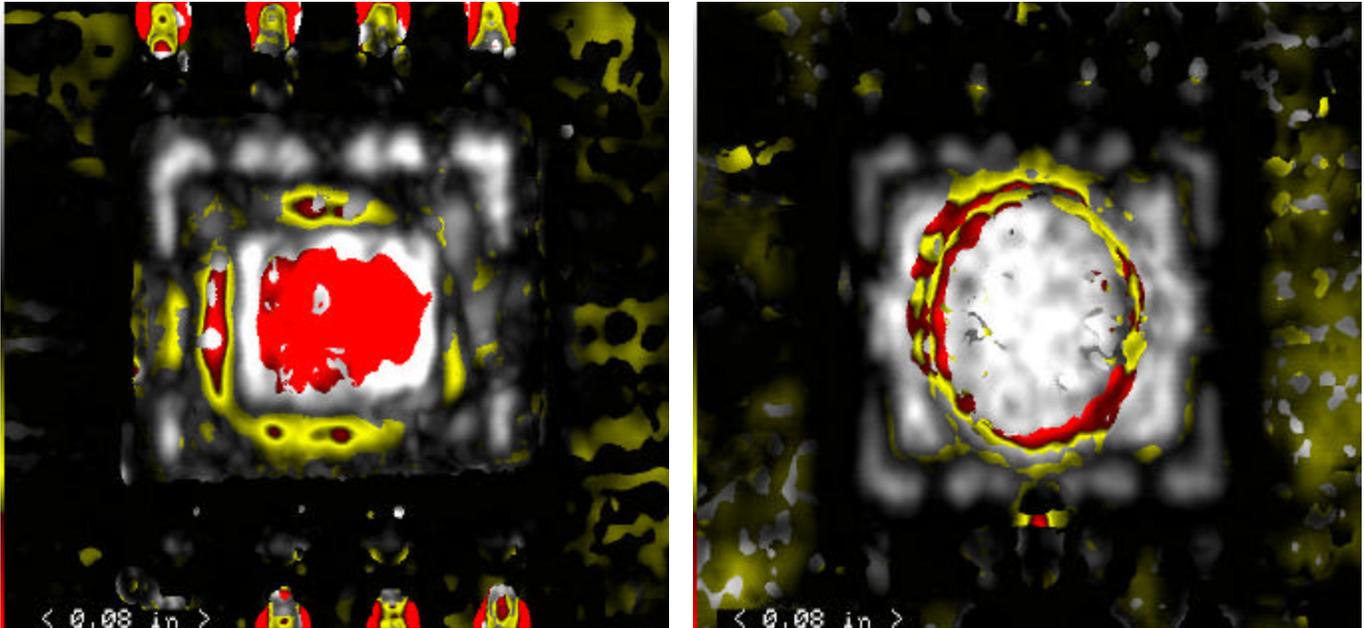


Figure 3. Top (left) and bottom C-SAM images of SN A4. Minor delaminations are indicated between the plastic and die paddle on three sides of the die in the top view image. The red area on the die surface is due to the die coat material.

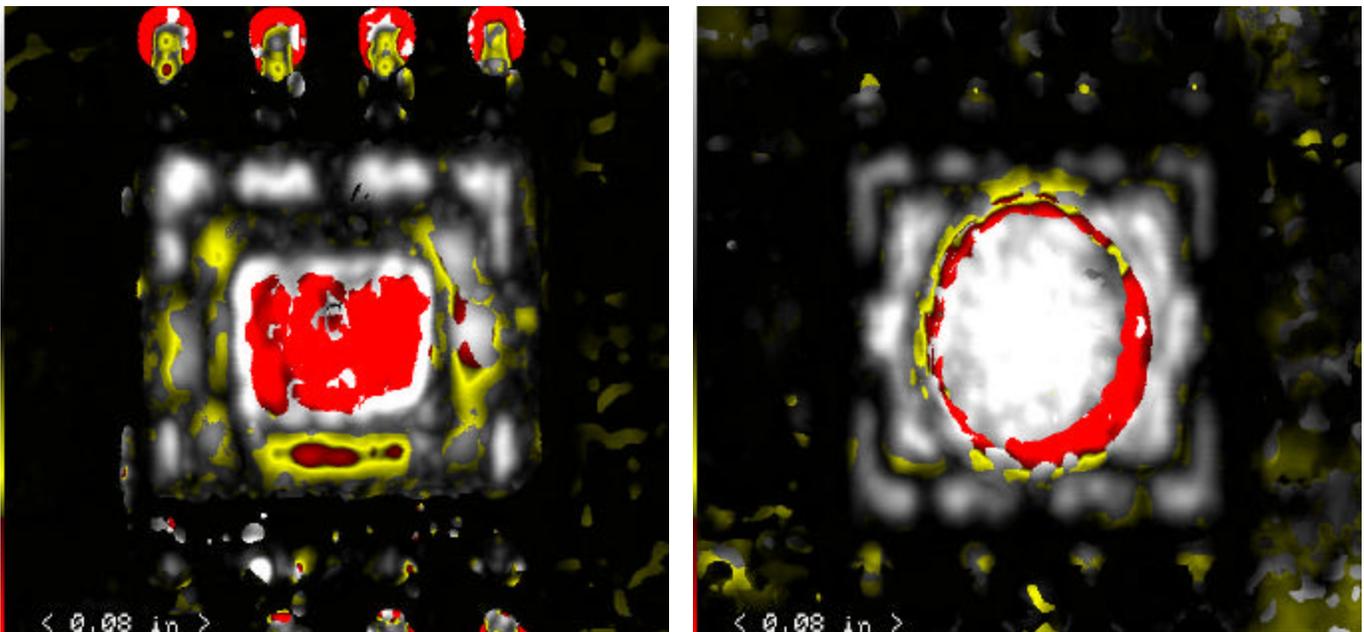


Figure 4. Top (left) and bottom C-SAM images of SN O17.

Appended Photographs:

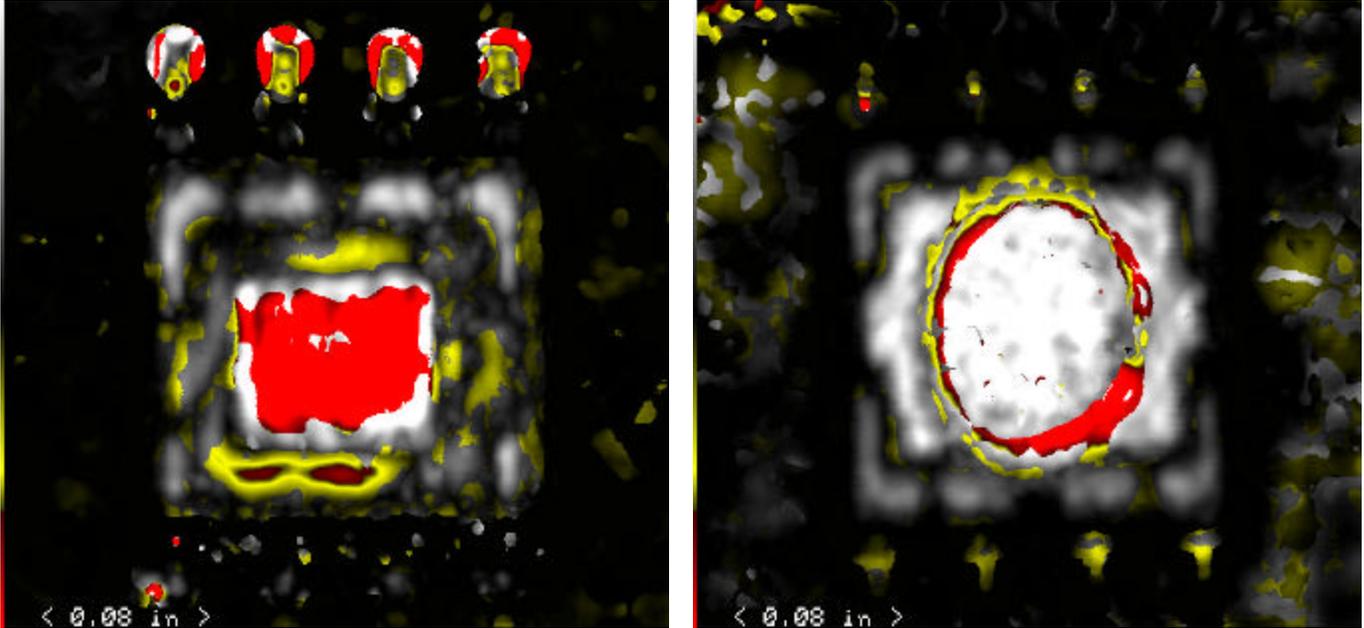


Figure 5. Top (left) and bottom C-SAM images of SN P11.

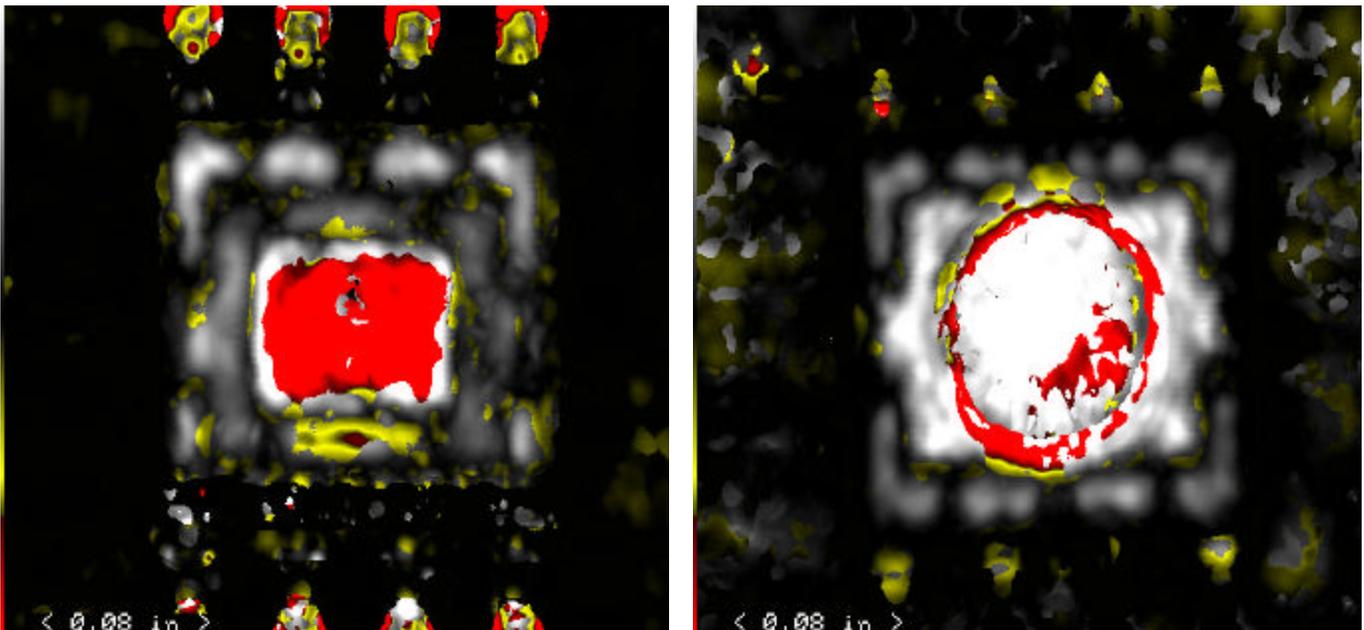


Figure 6. Top (left) and bottom C-SAM images of SN P13.

Appended Photographs:

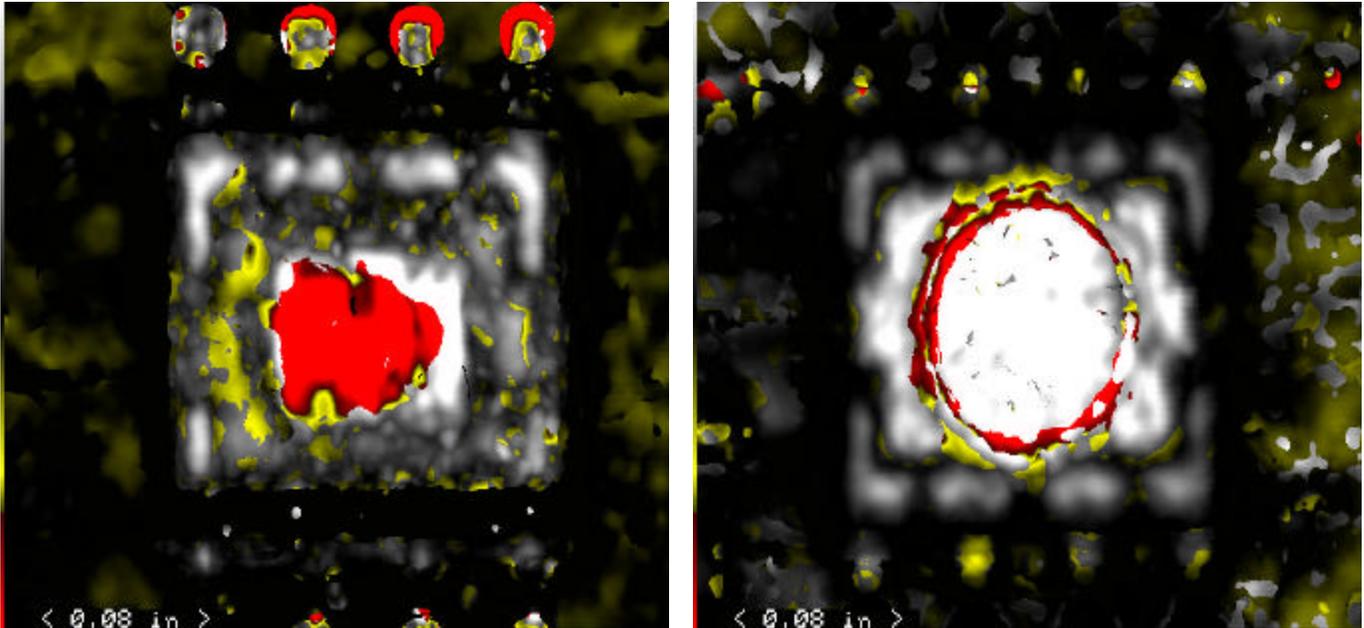


Figure 7. Top (left) and bottom C-SAM images of SN W1.

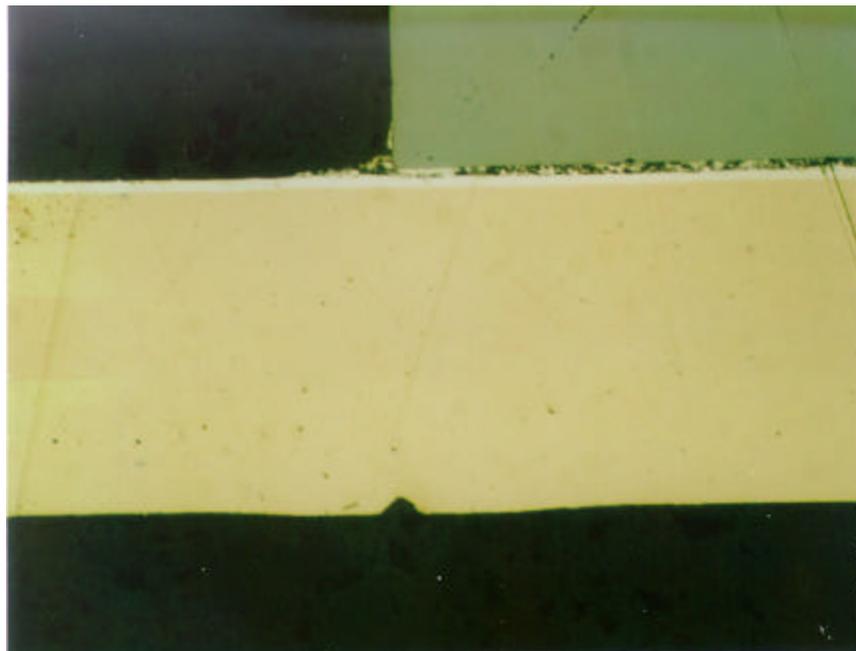


Figure 8. Cross-section image of SN O17. No delaminations or anomalies were observed, consistent with the C-SAM inspection results. $\approx 200X$.

Appended Photographs:

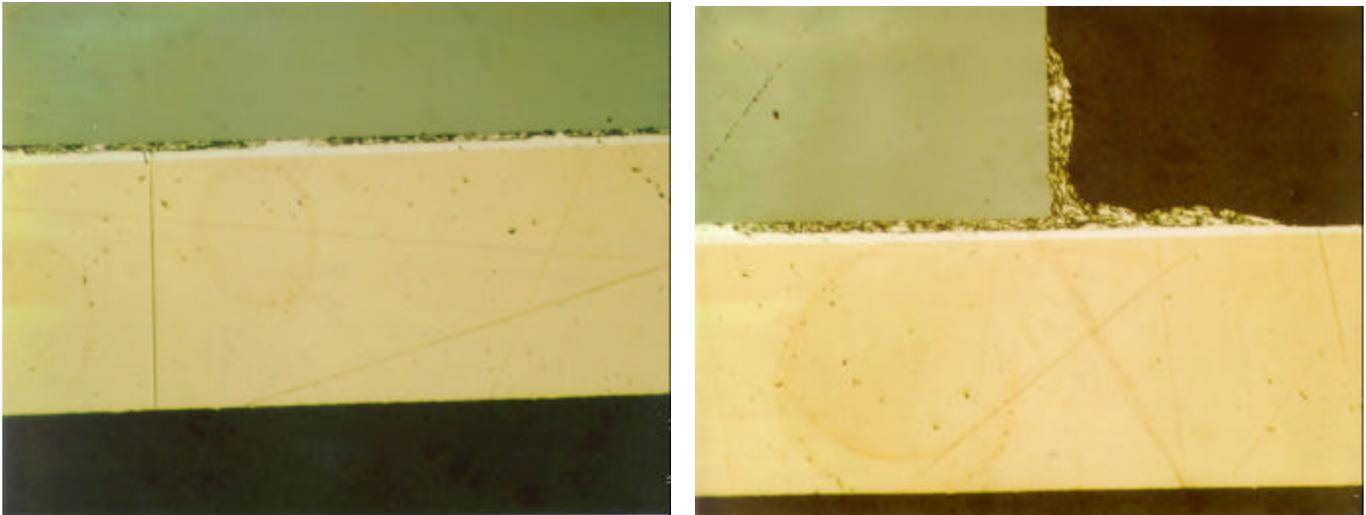


Figure 9. Cross-section images of SN W1, taken at different section planes. No delaminations or anomalies were observed. Both images $\approx 200X$.

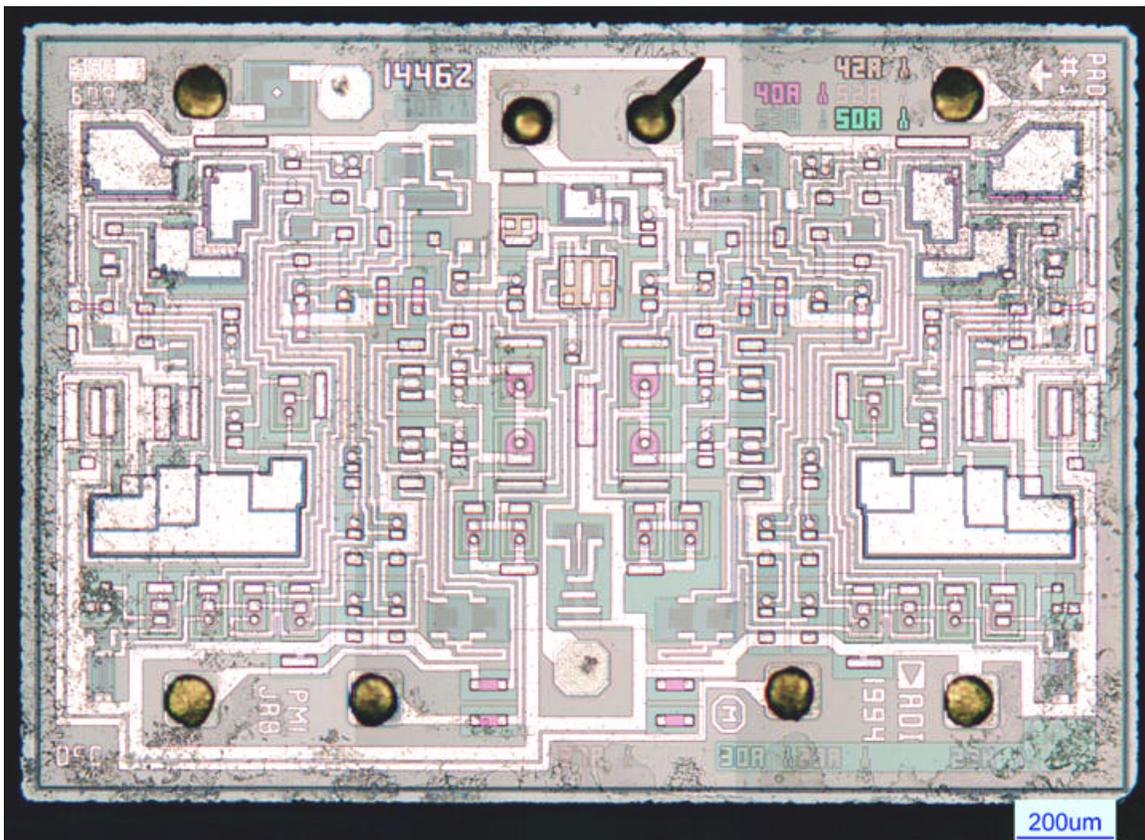


Figure 10. Overall image of OP284ES die in SN P11. Deprocessing residue is present on the die surface. The glob-top material was very difficult to remove with the available chemicals.

Appended Photographs:

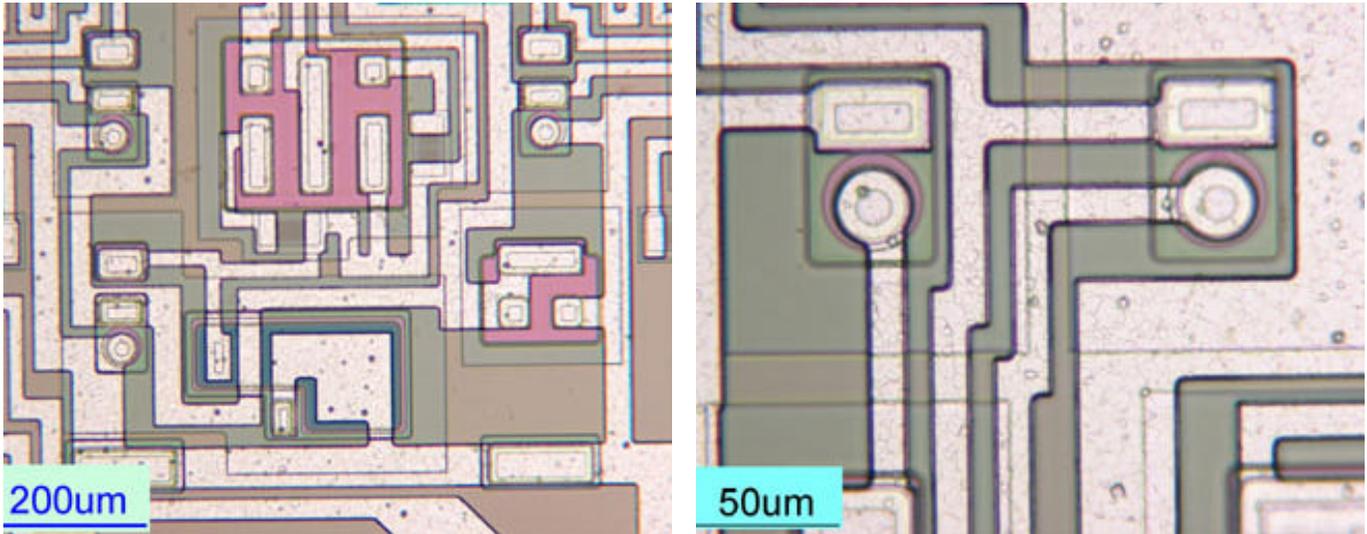


Figure 11. Optical micrograph images of SN A4 show general device features.

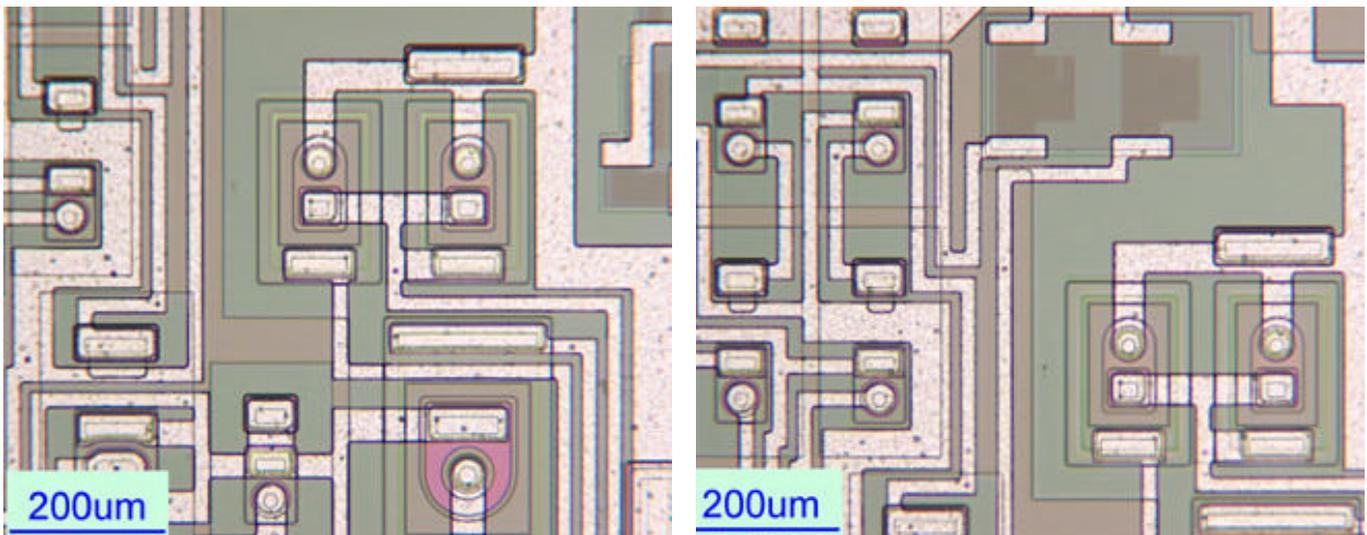


Figure 12. Optical micrograph images of SN P13 show general device features.

Appended Photographs:

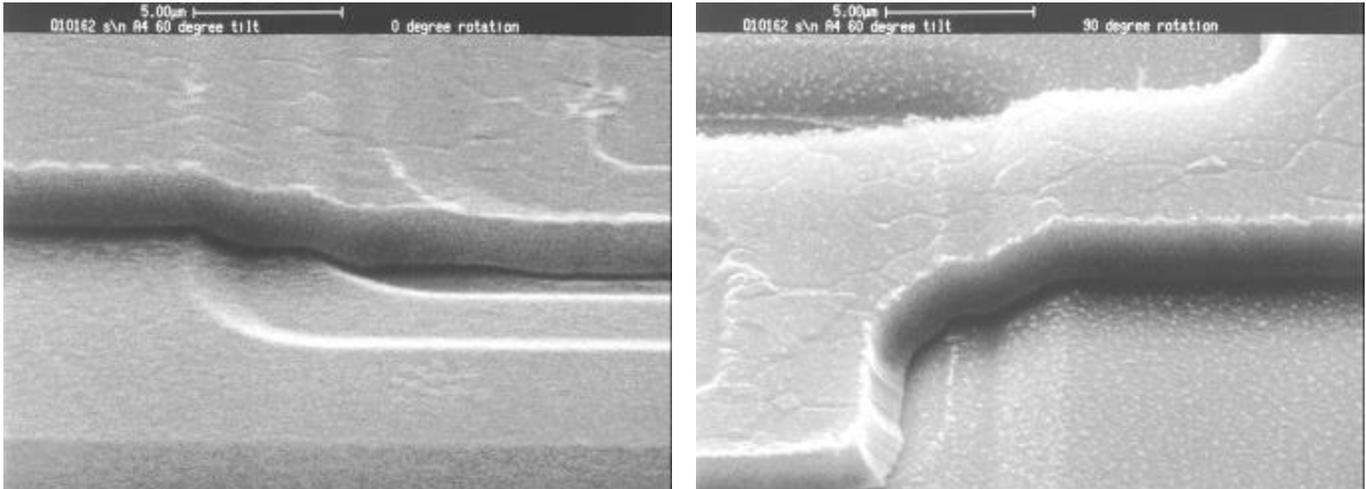


Figure 13. SEM micrographs of SN A4. The metallization has excellent step coverage.

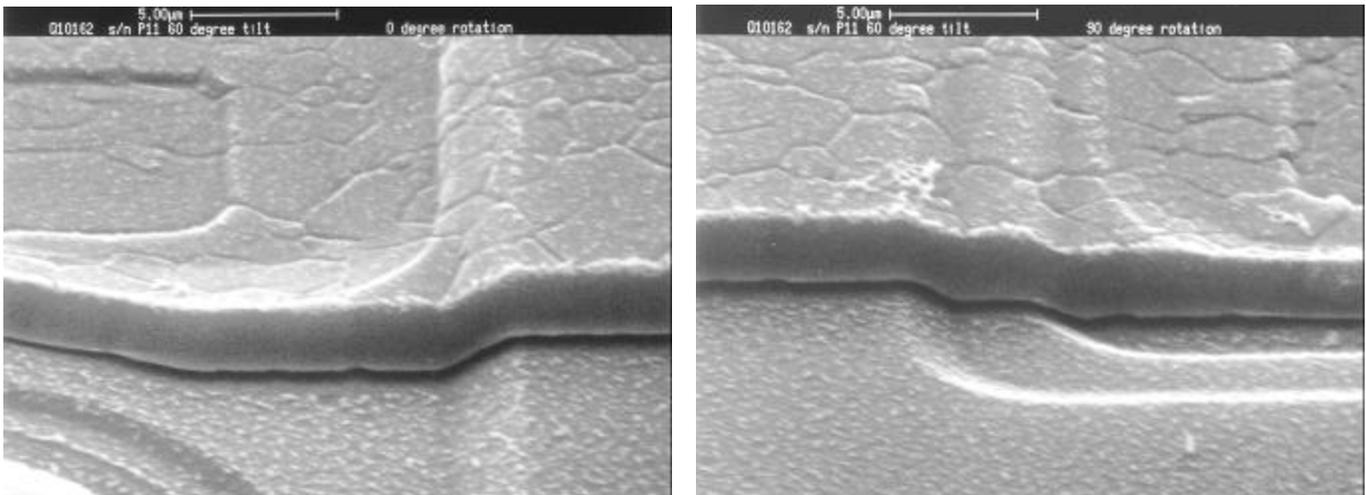


Figure 14. SEM micrographs of SN P11.

Appended Photographs:

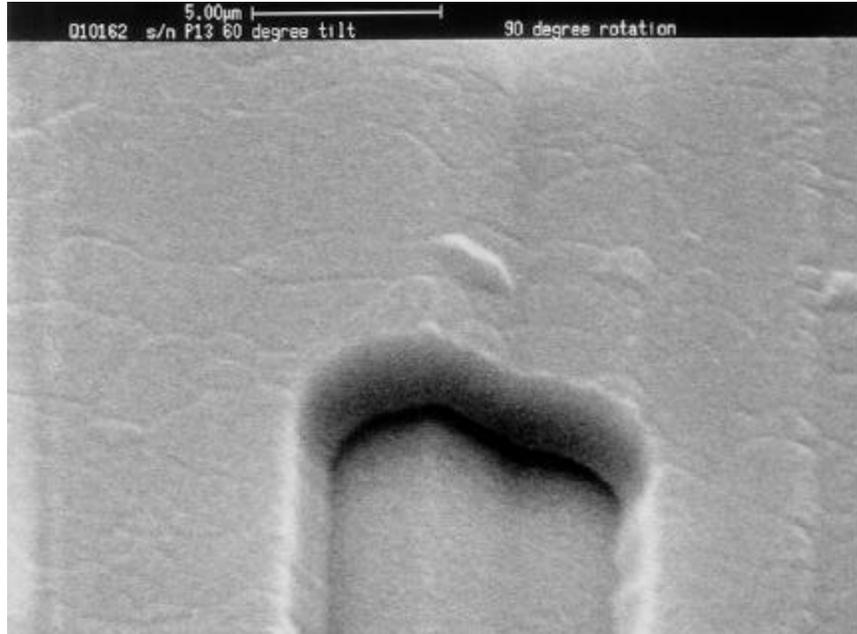


Figure 15. SEM micrograph of SN P13.

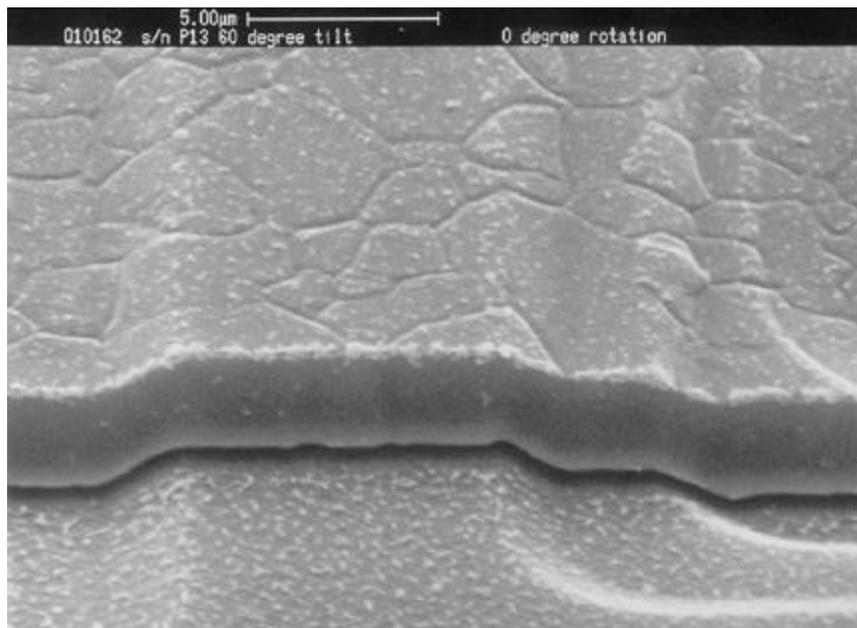


Figure 16. SEM micrographs of SN P13.