

***17-0497-200&210***

**CONSTRUCTION ANALYSIS  
ON ADA4177-2  
MANUFACTURED BY ANALOG DEVICES  
AT T0 AND AFTER REFLOW**

**Report performed for:**

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Analysis performed in a laboratory with a Quality Management System certified AFAQ ISO 9001

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SIREN 380 712 828 - CODE APE 7219 Z

**ANALYSIS OBJECTIVE:**

- ◆ Eight ADA4177-2 from ANALOG DEVICES were submitted to SERMA Technologies laboratory for a construction analysis at T0 and after reflow.

**PRODUCT REFERENCES:**

- ◆ Reference: ADA4177-2
- ◆ Package type: 8-Lead SOIC
- ◆ Manufacturer: Analog devices
- ◆ Quantity: 8
- ◆ Markings:

Top:  
4177-2  
Logo A#427  
9969

Bottom:  
PHILIPINES

**AGEING:**

- ◆ Three parts supplied at T0.
- ◆ Double reflow simulations on five parts: Lead free profile (temperature peak = 260°C)

**RESULTS AND INTERPRETATIONS:**

- ◆ Before and after reflow, delaminations were observed at lead/resin interfaces in bonding areas during the acoustic inspection of the parts.
- ◆ After chemical opening, no assembly defect was observed; internal connections as well as die attach processes were correctly mastered.  
The wiring was performed by 25 µm diameter gold wires; wire pull results were satisfactory.
- ◆ No anomaly was observed on die surface during optical inspections.

**Performed by: J. JOURDAN**  
*Analyst*

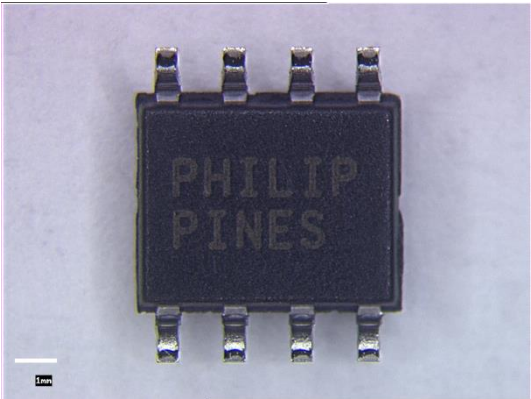
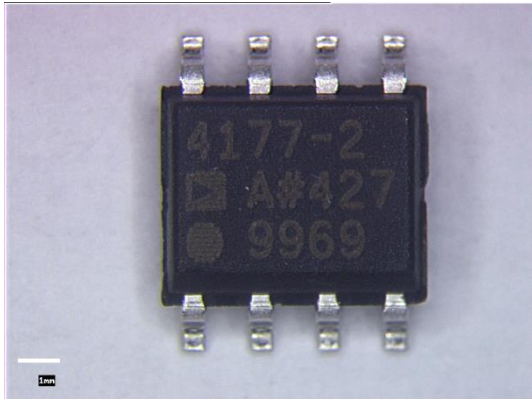
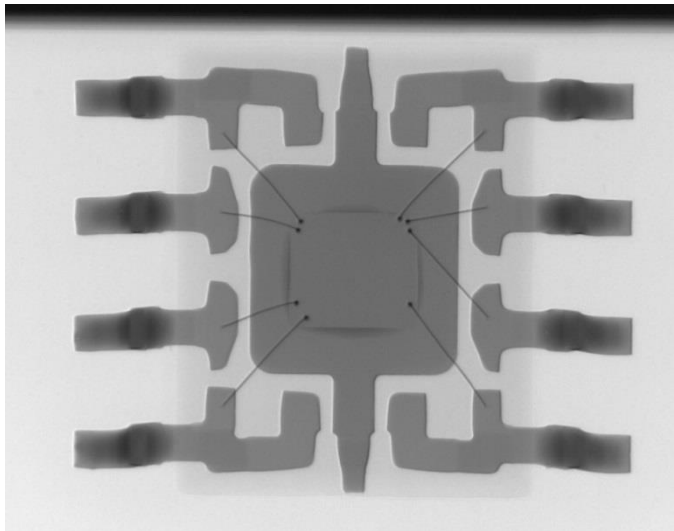
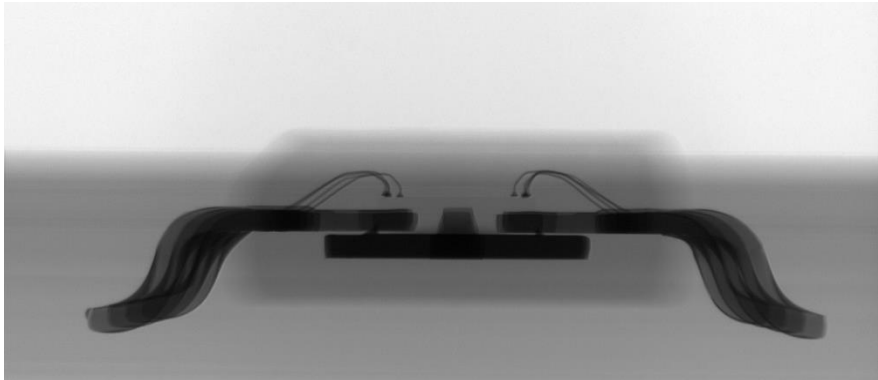
**Approved by: JM. ETCHARREN**  
*Project Manager*

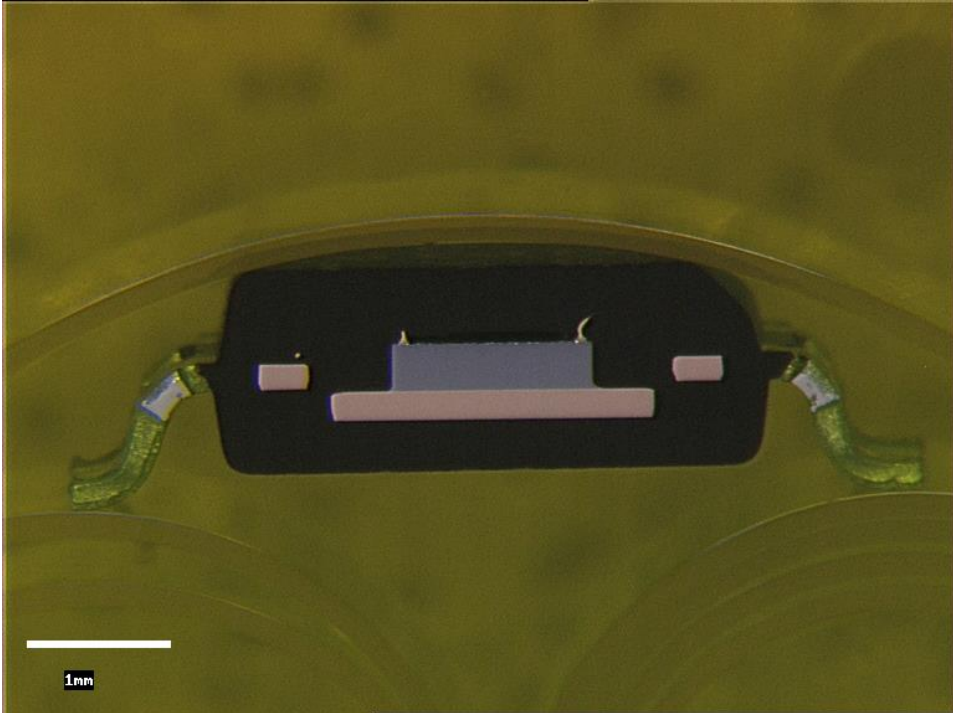
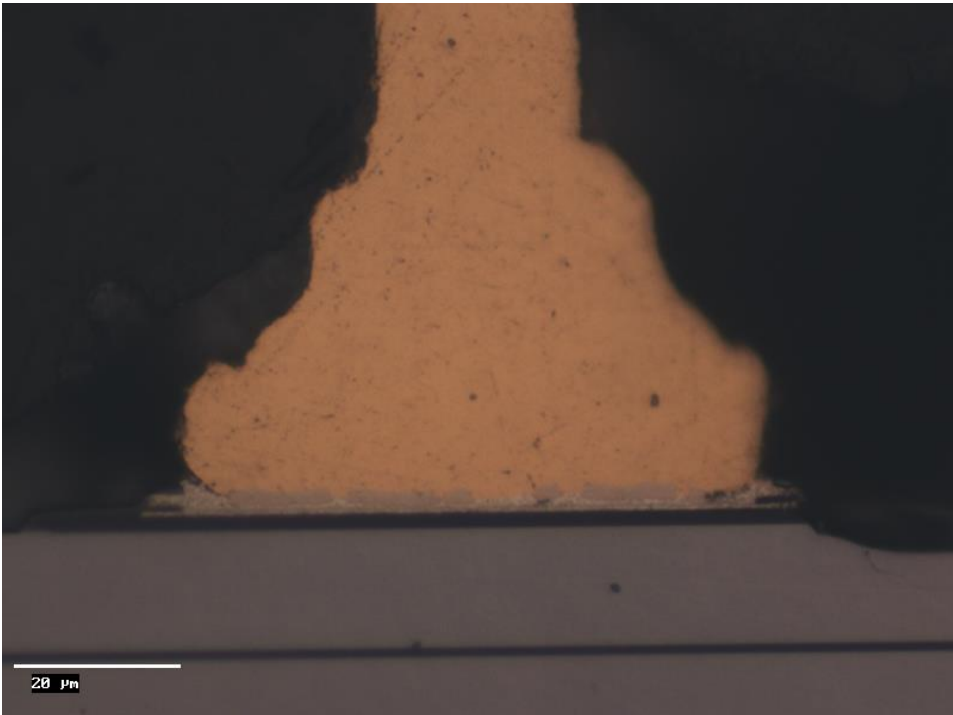
## ANALYSIS FLOW

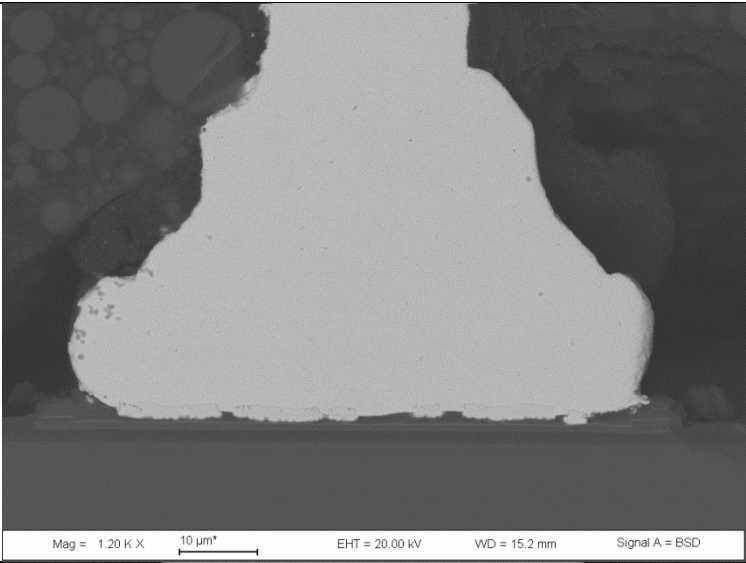
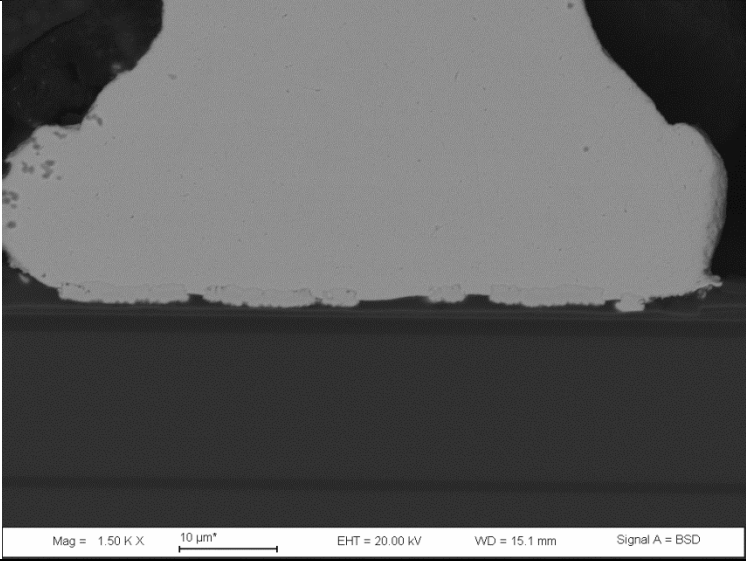
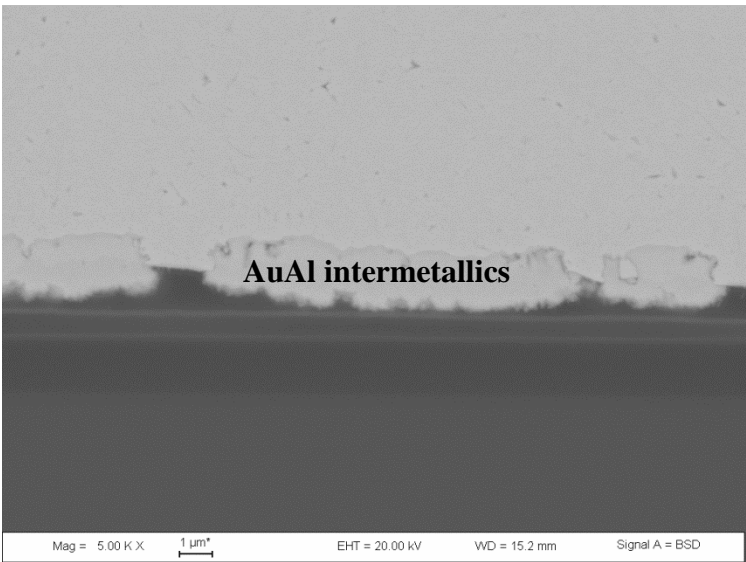
The analysis was performed on the components following this procedure

	T0 (3 parts)	After reflow (5 parts)
<b>EXTERNAL VISUAL INSPECTION</b>	3 parts	NP
<b>X-RAYS INSPECTION (2 AXES)</b>	3 parts	NP
<b>WIRE BALL BOND CROSSECTION</b>	1 part	NP
<b>OPTICAL AND SEM INSPECTIONS OF SECTIONS</b>	1 part	NP
<b>WETTABILITY</b>	2 parts	NP
<b>T0 ACOUSTIC MICROSCOPY</b>	1 part	NP
<b>BAKING 24H AT 125°C</b>	NP	All parts
<b>DOUBLE SIMULATION REFLOW PROFIL SAC</b>	NP	All parts
<b>ACOUSTIC MICROSCOPY AFTER REFLOW</b>	NP	1 part
<b>CHEMICAL OPENING AFTER REFLOW</b>	NP	5 parts
<b>OPTICAL AND SEM INSPECTIONS OF OPENED PARTS</b>	NP	1 part
<b>WIRE PULL TEST 40 WIRES</b>	NP	5 parts

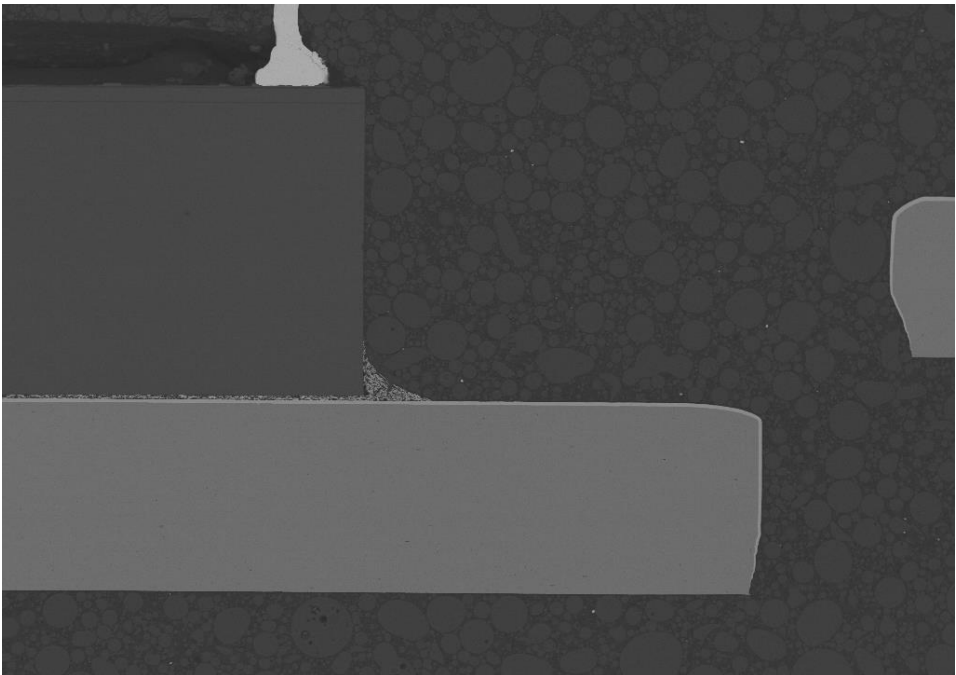
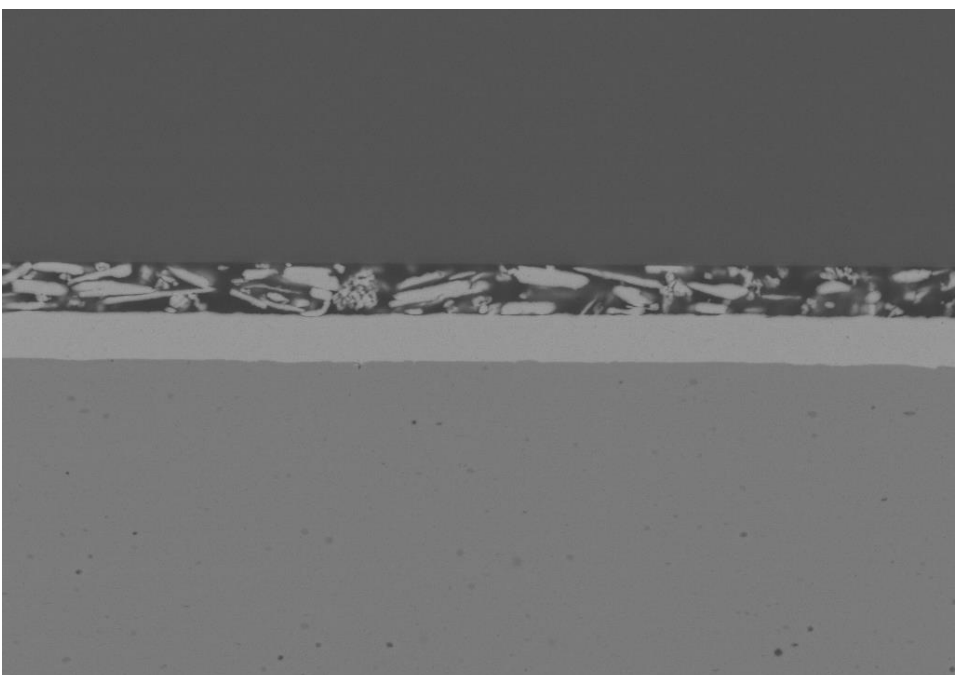
**NP: Not Performed**

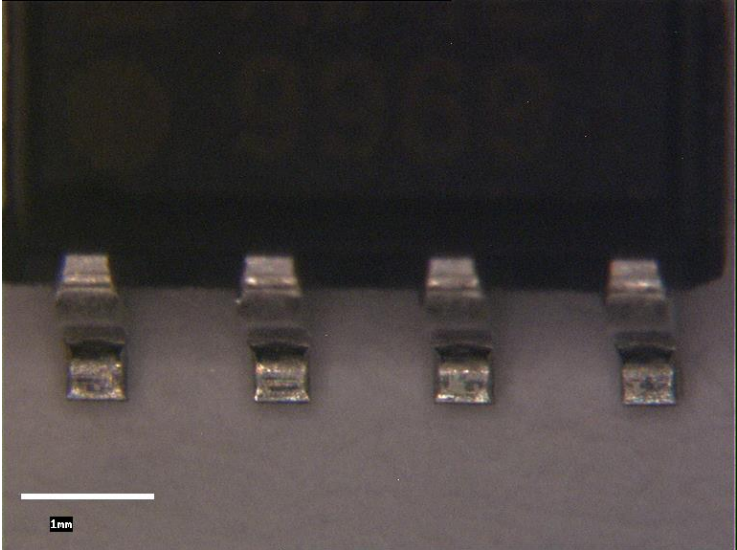
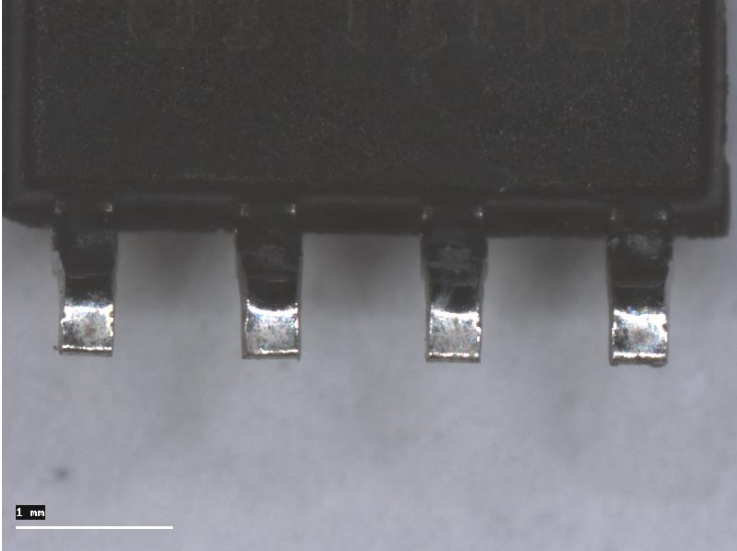
INITIAL (0H) CONTROL	Reference Manuf.	ADA4177-2 ANALOG DEVICES	Package Wire Date Code	SOIC-8 8 -
External Visual Inspection	<div></div>			
Radiography Inspection (Top and Side)				
				
COMMENTS:    None.				

<b>INITIAL (0H) CROSS-SECTION</b>	<b>Reference</b> ADA4177-2 <b>Manuf.</b> ANALOG DEVICES	<b>Package</b> SOIC-8 <b>Wire</b> 8 <b>Date Code</b> -
	<b>Cross-section Inspection</b>	
<b>Cross section inspection</b>  Optical general view of the section plane		
<b>Cross section inspection</b>  Optical view of the ball bond		

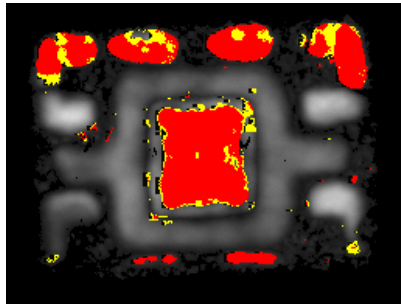
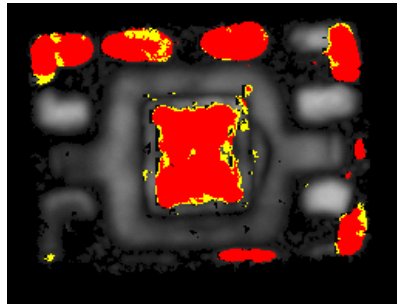
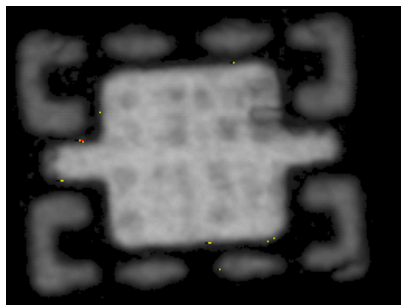
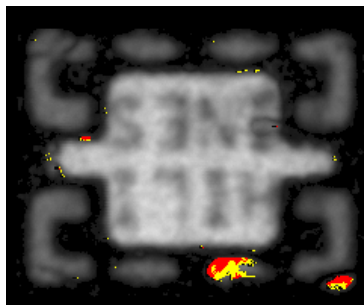
INITIAL (0H) CROSS-SECTION	Reference Manuf.	Package Wire Date Code
	ADA4177-2 ANALOG DEVICES	SOIC-8 8 -
	Cross-section Inspection	
<p><b>SEM inspection</b></p> <p>SEM view of the ball bond</p>		
<p><b>SEM inspection</b></p> <p>SEM view of ball / pad interface</p>		
<p><b>SEM inspection</b></p> <p>SEM detailed view of the Au / Al interface Au/Al intermetallics <math>\approx 1.5\mu\text{m}</math></p>		

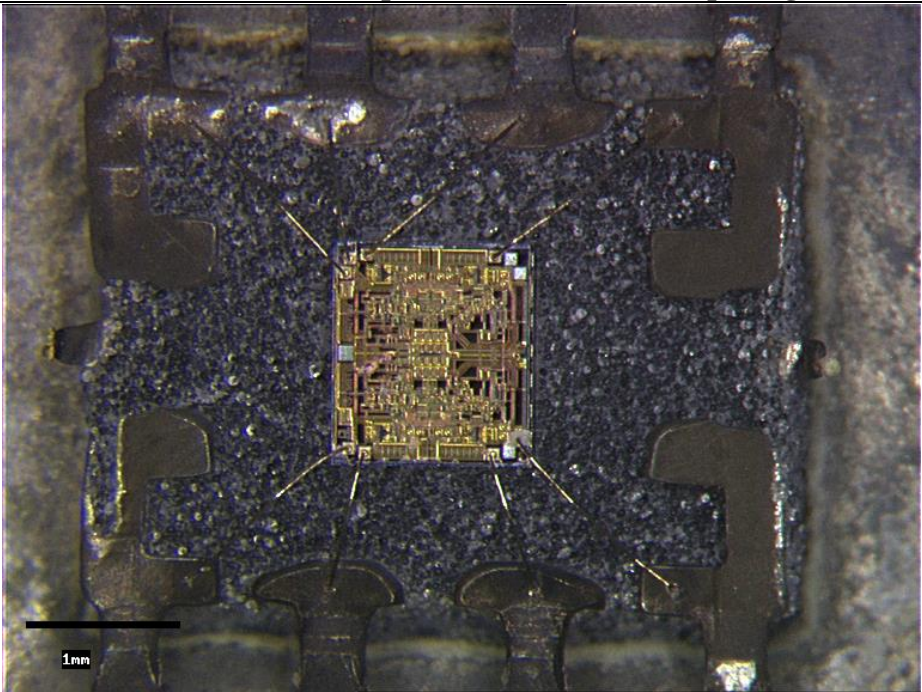
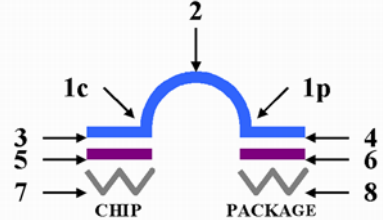
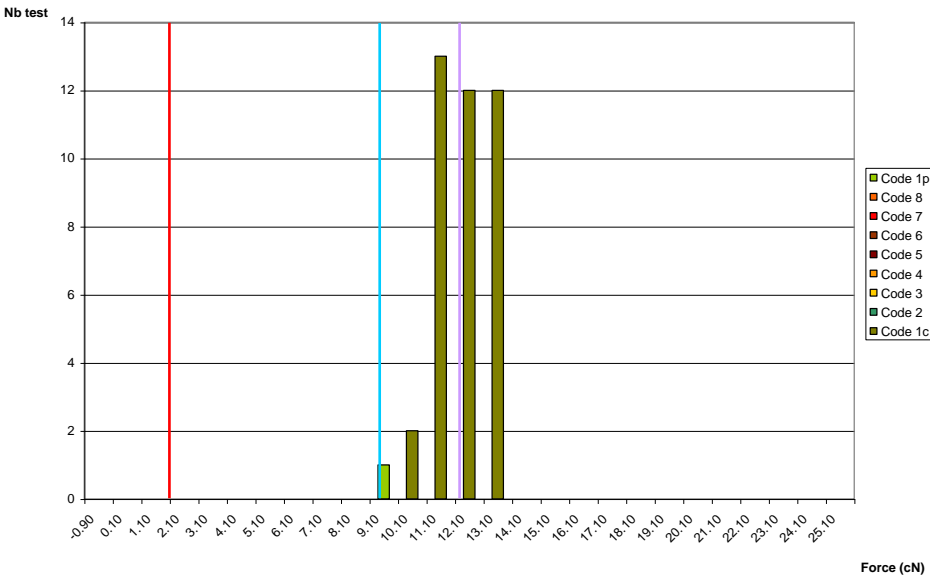


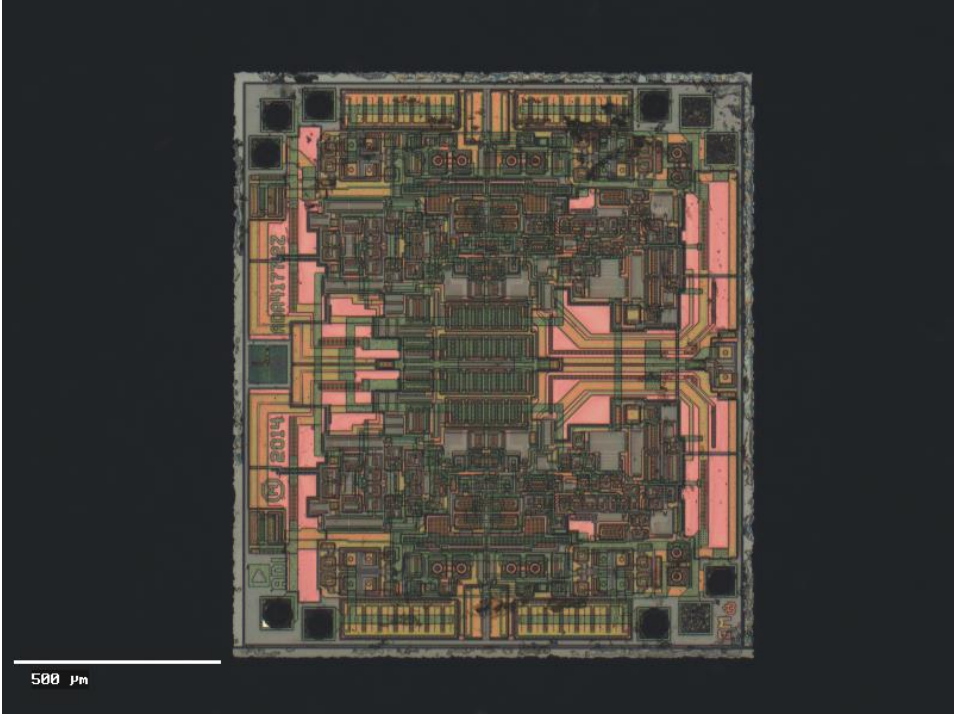
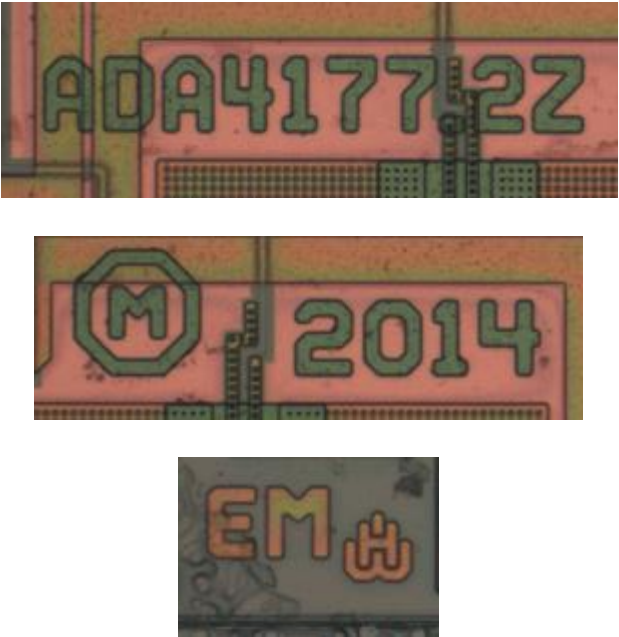
INITIAL (0H) CROSS-SECTION	Reference Manuf. ADA4177-2 ANALOG DEVICES	Package Wire Date Code SOIC-8 8 -
Cross-section inspection		
Cross section inspection  Optical general view of the die assembly		
 <p>Mag = 110 X    100 μm*    EHT = 20.00 kV    WD = 15.2 mm    Signal A = BSD</p>		
Cross section inspection  Optical detailed view of the die attach		
 <p>Mag = 1.50 K X    10 μm*    EHT = 20.00 kV    WD = 15.2 mm    Signal A = BSD</p>		

INITIAL (0H) CROSS-SECTION	Reference Manuf.	Package Wire Date Code
	ADA4177-2 ANALOG DEVICES	SOIC-8 8 -
Wettability test		
<p><b>Part inspection</b></p> <p>Before wettability test</p>		
<p><b>Part inspection</b></p> <p>After wettability test</p>		
<p><b>COMMENTS :</b></p>	<ul style="list-style-type: none"> <li>- Before test: No abnormal aspect or coloration was observed.</li> <li>- After test, visual inspection of leads revealed no unwetting, no dewetting area or pinholes. The height of solder fillet was greater than the immersion depth.</li> </ul>	

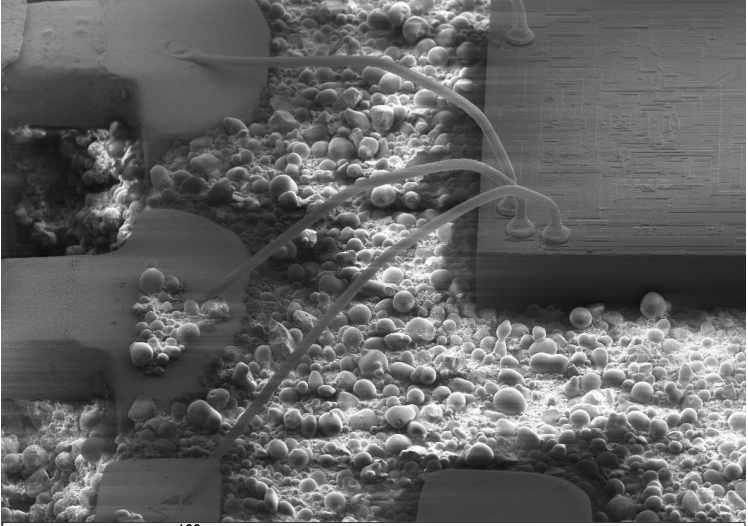
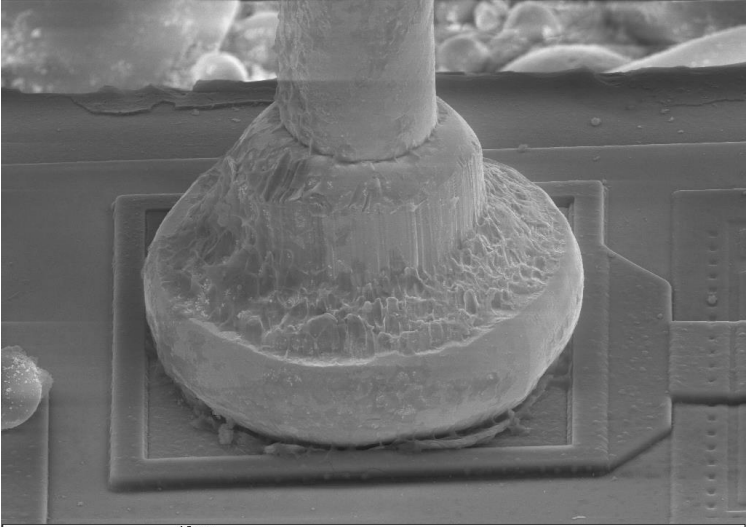
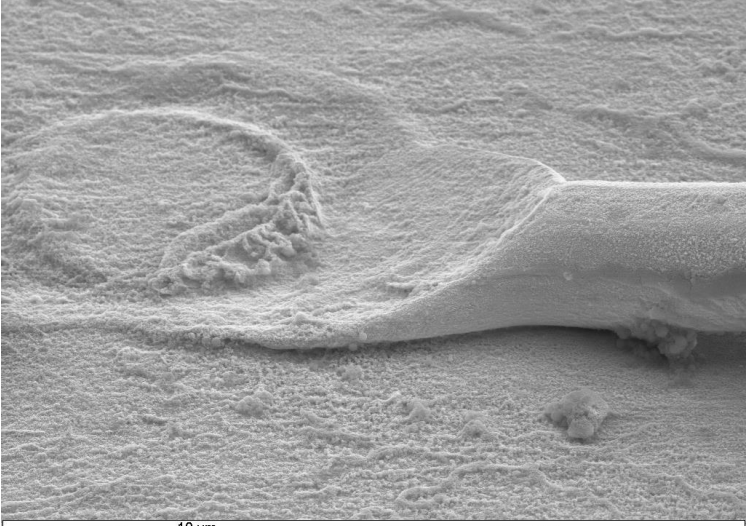



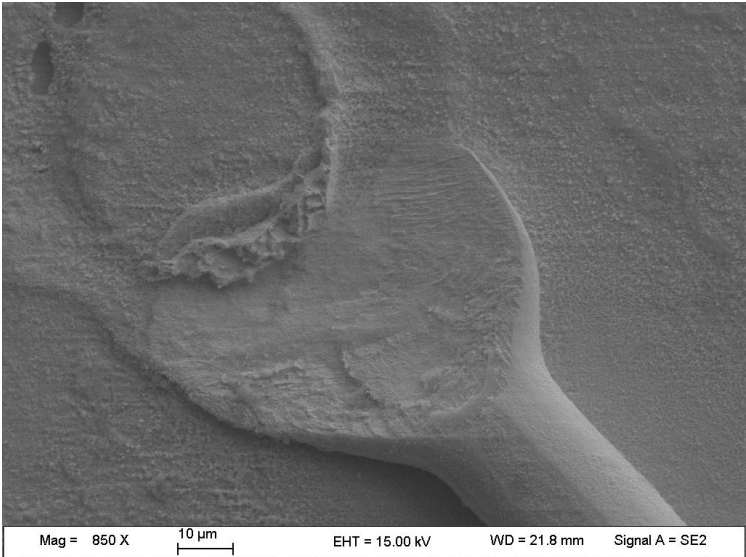
ACOUSTIC MICROSCOPY Before/after reflow and after cycling		Reference Manuf.	ADA4177-2 ANALOG DEVICES		Package Wire Date Code	SOIC-8 8 -		
ACOUSTIC MICROSCOPY INSPECTION (TOP view)								
T0				T0 (after reflow)				
								
Top	Die	Lead frame			Lead			Other (crack, void)
		Perimeter (%)	Tie bar (%)	Entire length Die to package exit, I.A.	Bonding area	Delamination (% max)	Entire length to package exit	
	T0	Die coat	0	0	No	Yes	100	Yes
T0 (after reflow)	Die coat	0	Exit	No	Yes	100	Yes	-
ACOUSTIC MICROSCOPY INSPECTION (BOTTOM view)								
T0				T0 (after reflow)				
								
Bottom	Lead frame			Lead		Other (crack, void)		
	Surface (%)	Tie bar (%)	Entire length to package exit	Delamination (% max)	Entire length to package exit			
	T0	0	0	-	0	-	-	
T0 (after reflow)	0	0	-	60	No	-		
COMMENTS :		Delaminations were observed at lead/package resin interfaces in bonding areas before and after reflow.						

<b>INITIAL (0H) OPENING &amp; WIRE PULL TEST</b>	<b>Reference</b> ADA4177-2 <b>Manuf.</b> ANALOG DEVICES	<b>Package</b> SOIC-8 <b>Wire</b> 8 <b>Date Code</b> -
<b>Internal Visual Inspection after chemical opening</b>		
<p>Opened Quantity 5 parts</p> <p>Bonding Material Au</p> <p>Wire diameter 25 <math>\mu</math>m</p>		
<p>Product : ADA4177-2          Wire type : Au          Wire diameter : 23<math>\mu</math>m          Specification : MIL STD 883K M2011 Cond D          Apparatus : DAGE Serie 4000          Cartridge : WP100          Range : 50 g          Accuracy : <math>\pm 0.25\%</math> of range          Min : 9.70 cN          Max : 13.78 cN          Mean : 12.29 cN  <math>\sigma</math> : 0.94 cN          Mean - 3 <math>\sigma</math> : 9.47 cN  <b>Specified strength LIMIT :</b> 2.10 cN          Number of no rupture : 0</p> <p><b>Breaking codes :</b></p> <p>CODE 1c          Number test CODE 1c : 39</p> <p>CODE 1p          Number test CODE 1p : 1</p> <p>CODE 2          Number test CODE 2 : 0</p> <p>CODE 3          Number test CODE 3 : 0</p> <p>CODE 4          Number test CODE 4 : 0</p> <p>CODE 5          Number test CODE 5 : 0</p> <p>CODE 6          Number test CODE 6 : 0</p> <p>CODE 7          Number test CODE 7 : 0</p> <p>CODE 8          Number test CODE 8 : 0</p> <p>Total number of tests : 40</p>	<p><b>Breaking codes</b></p>	 
<b>COMMENTS</b>	Usual rupture codes (1c and/or 2 and/or 1p). <b>Acceptable</b> according to the standard.	

<b>INITIAL (0H) OPENING</b>	<b>Reference</b> ADA4177-2 <b>Manuf.</b> ANALOG DEVICES	<b>Package</b> SOIC-8 <b>Wire</b> 8 <b>Date Code</b> -
<b>Internal Visual Inspection after chemical opening</b>		
<b>Optical inspection</b>  Optical general view of die		
<b>Optical inspection</b>  Optical detailed views of markings		



INITIAL (0H) OPENING	Reference Manuf.	ADA4177-2 ANALOG DEVICES	Package Wire Date Code	SOIC-8 8 -
	Internal Visual Inspection after chemical opening			
SEM inspection SEM view of wire loop		 <p>Mag = 60 X    100 μm    EHT = 15.00 kV    WD = 19.1 mm    Signal A = SE2</p>		
SEM inspection SEM view of ball bond		 <p>Mag = 950 X    10 μm    EHT = 15.00 kV    WD = 39.7 mm    Signal A = SE2</p>		
SEM inspection SEM view of stitch bond		 <p>Mag = 900 X    10 μm    EHT = 15.00 kV    WD = 18.0 mm    Signal A = SE2</p>		

<p><b>INITIAL (0H) OPENING</b></p>	<p><b>Reference</b> ADA4177-2  <b>Manuf.</b> ANALOG DEVICES</p>	<p><b>Package</b> SOIC-8  <b>Wire</b> 8  <b>Date Code</b> -</p>
<p><b>SEM inspection</b></p> <p>SEM view of ball bond centering</p>	<p><b>Internal Visual Inspection after chemical opening</b></p>  <p>Mag = 900 X 10 µm EHT = 15.00 kV WD = 21.6 mm Signal A = SE2</p>	
<p><b>SEM inspection</b></p> <p>SEM view of stitch bond centering</p>	 <p>Mag = 850 X 10 µm EHT = 15.00 kV WD = 21.8 mm Signal A = SE2</p>	



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Dimensionnelles : Les données dimensionnelles présentées dans ce rapport ont été relevées sur des photographies qui peuvent ou non figurer dans ce rapport. En tenant compte de toutes les incertitudes de mesures (révélation chimique, imprécisions de mesure, étalonnage de nos équipements ...), nous avons estimé les valeurs ci-dessous :

*Dimensional* : *The dimensional data reported in this analysis have been determined through photographs, which may or may not appear in this report. Given all the measure inaccuracy (chemical revelation, measure imprecision, equipment calibration...), we have provided value estimations in the table below :*

MESURE MEASUREMENT	INCERTITUDE ACCURACY STATEMENT
MICROSCOPIE OPTIQUE OPTICAL MICROSCOPY	± 5 % ± 5 %
MICROSCOPIE ELECTRONIQUE (MEB) ELECTRONIC MICROSCOPY (SEM)	± 5 % ± 5 %

Les mesures des profondeurs de jonction, ainsi que les valeurs inférieures à 0,2 µm, sont données à titre indicatif seulement.

*The junction depth measurements as well as values less than 0.2 µm are given only as an indication.*