SERMA TECHNOLOGIES

17-0497-200&210

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

Report performed for:

SCHLUMBERGER
26, RUE DE LA CAVÉE
BP 202
92140 CLAMART
FRANCE

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

Head quarter: 14, rue Galilée - CS 10055 - 33615 PESSAC Cedex - France
Tél: +33 (0)5.57.26.08.88 - Fax: +33 (0)5.57.26.08.98 - Email: contact@serma.com

S.A. à Directoire et Conseil de Surveillance au capital de 2.301.072 Euros
SIREN 380 712 828 - CODE APE 7219 Z

afaq ISO 9001 Qualité AFNOR CERTIFICATION

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:	Bottom:
4177-2 Logo A#427 9969	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

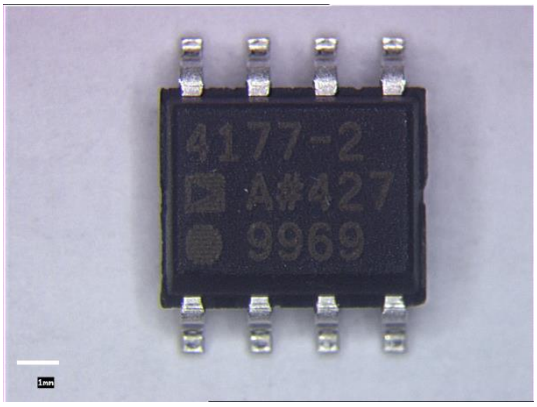
The analysis was performed on the components following this procedure

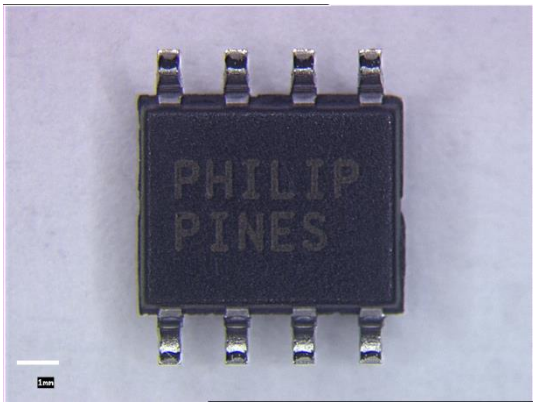
	T0 (3 parts)	After reflow (5 parts)
EXTERNAL VISUAL INSPECTION	3 parts	NP
X-RAYS INSPECTION (2 AXES)	3 parts	NP
WIRE BALL BOND CROSSECTION	1 part	NP
OPTICAL AND SEM INSPECTIONS OF SECTIONS	1 part	NP
WETTABILITY	2 parts	NP
T0 ACOUSTIC MICROSCOPY	1 part	NP
BAKING 24H AT 125°C	NP	All parts
DOUBLE SIMULATION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

NP: **N**ot **P**erformed

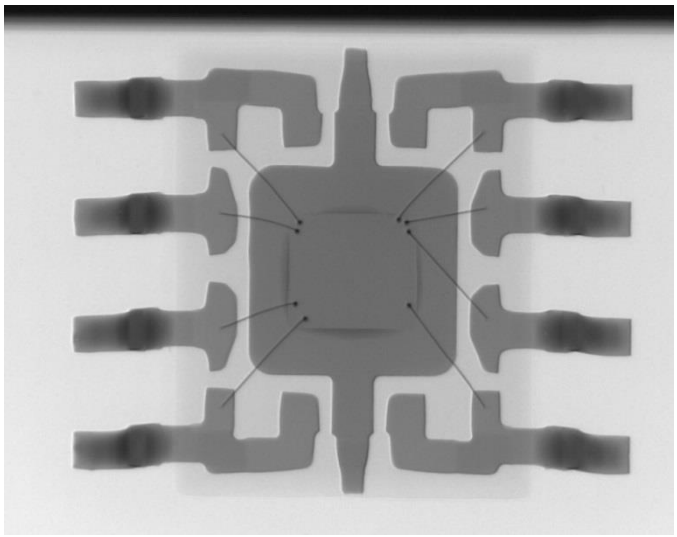
INITIAL (0H) CONTROL	**Reference** ADA4177-2 **Manuf.** ANALOG DEVICES	**Package** SOIC-8 **Wire** 8 **Date Code** -

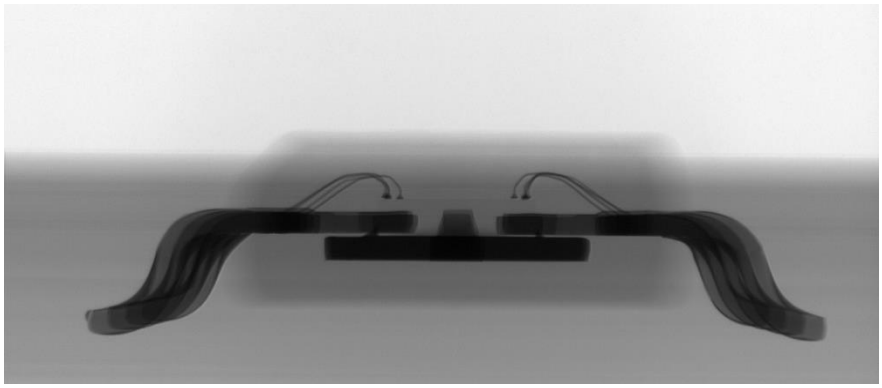
External Visual Inspection



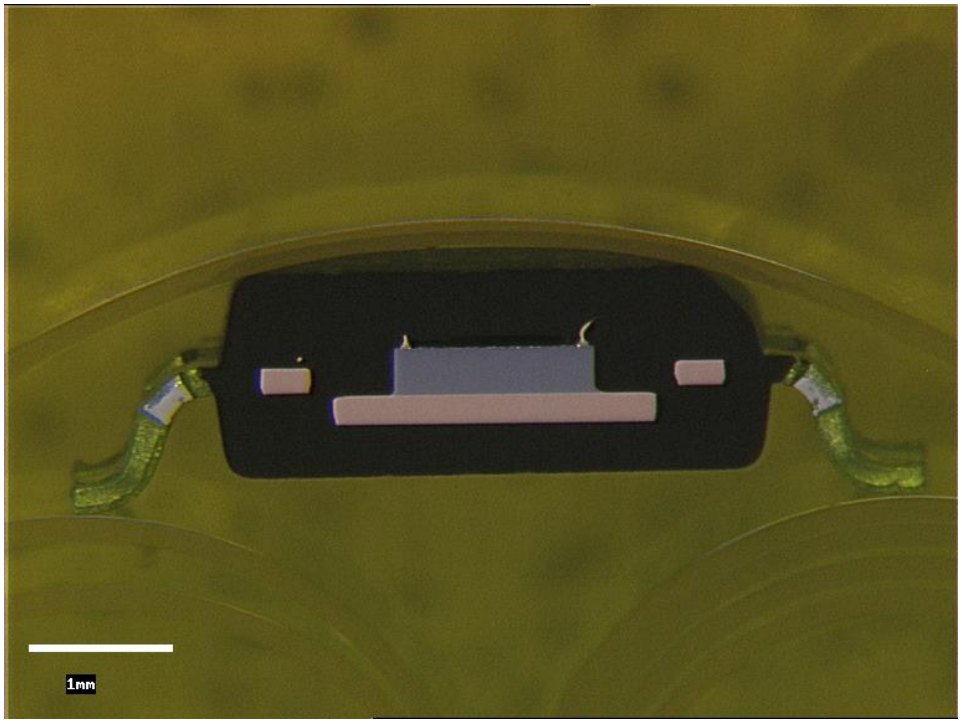
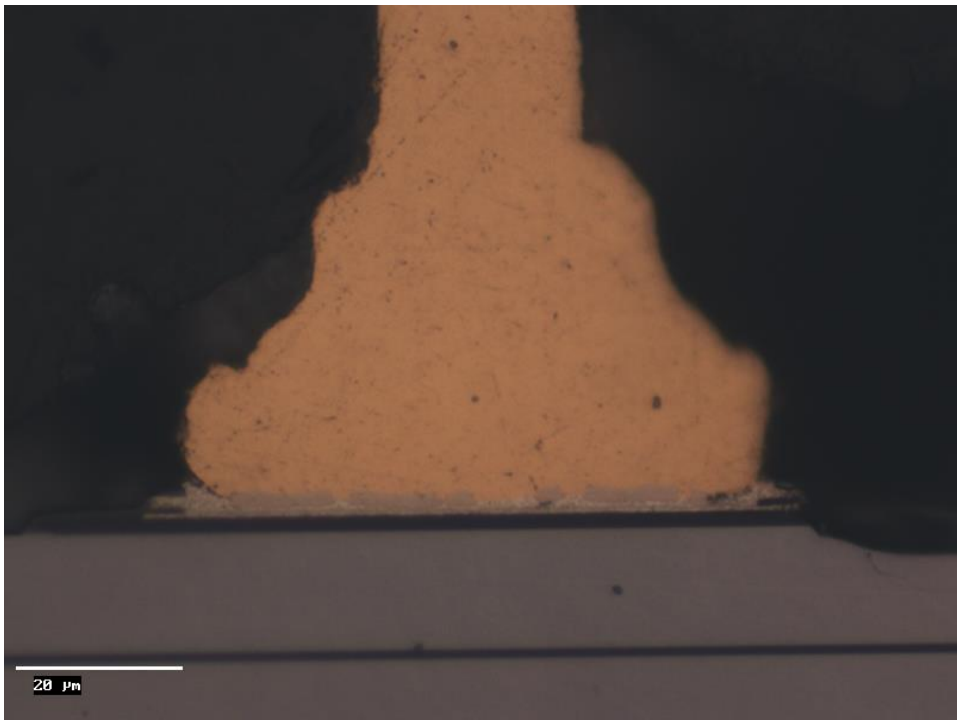


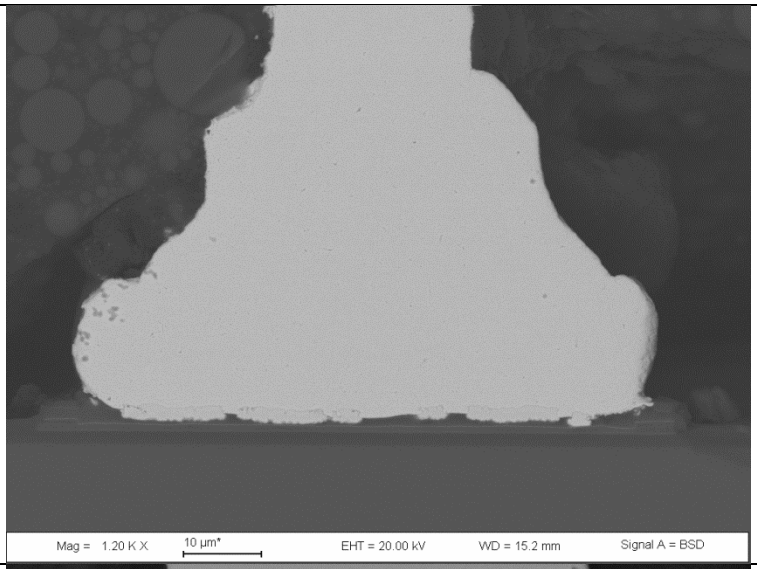
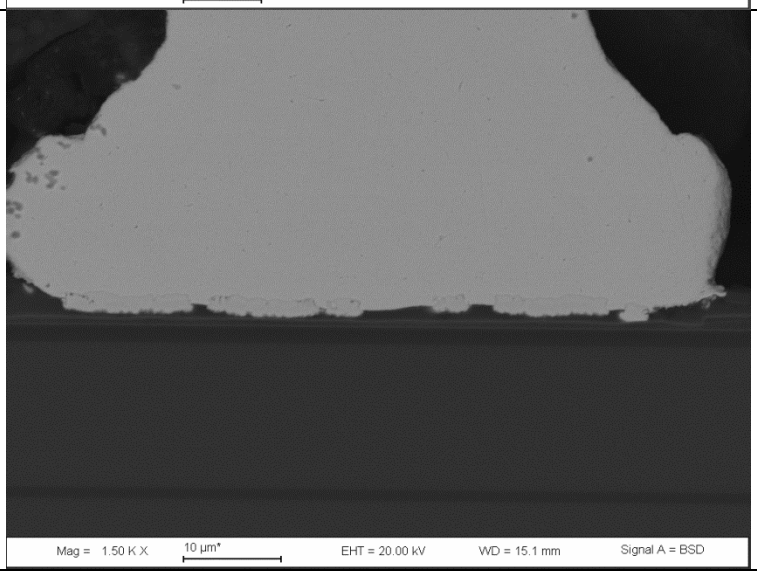
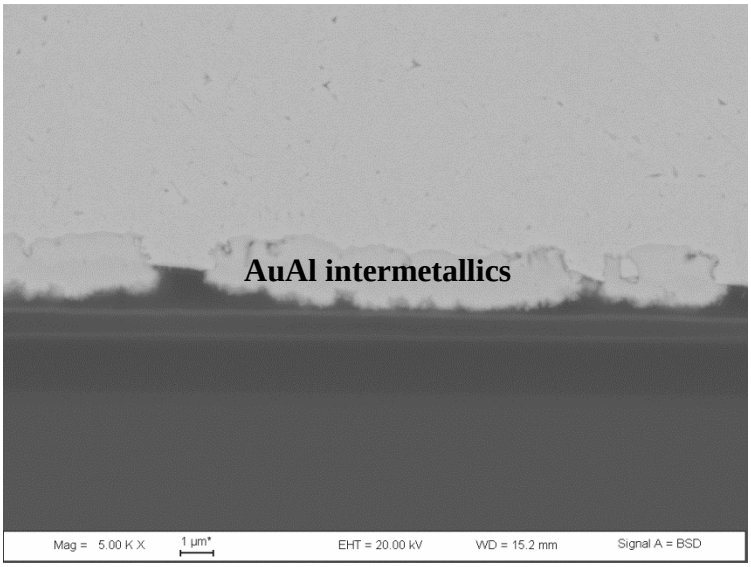
Radiography Inspection (Top and Side)

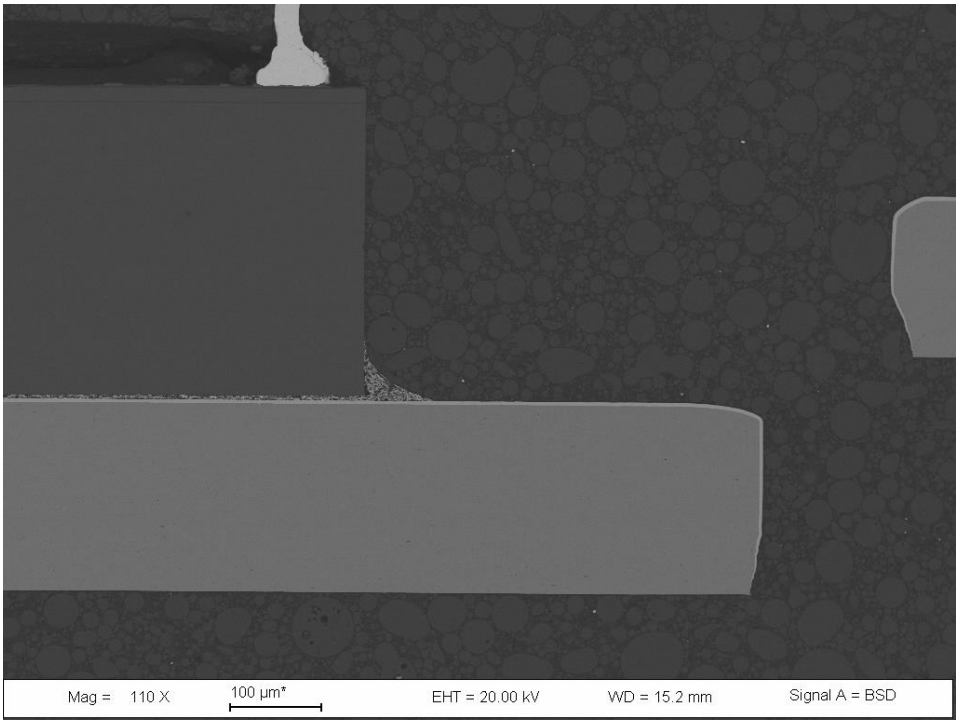
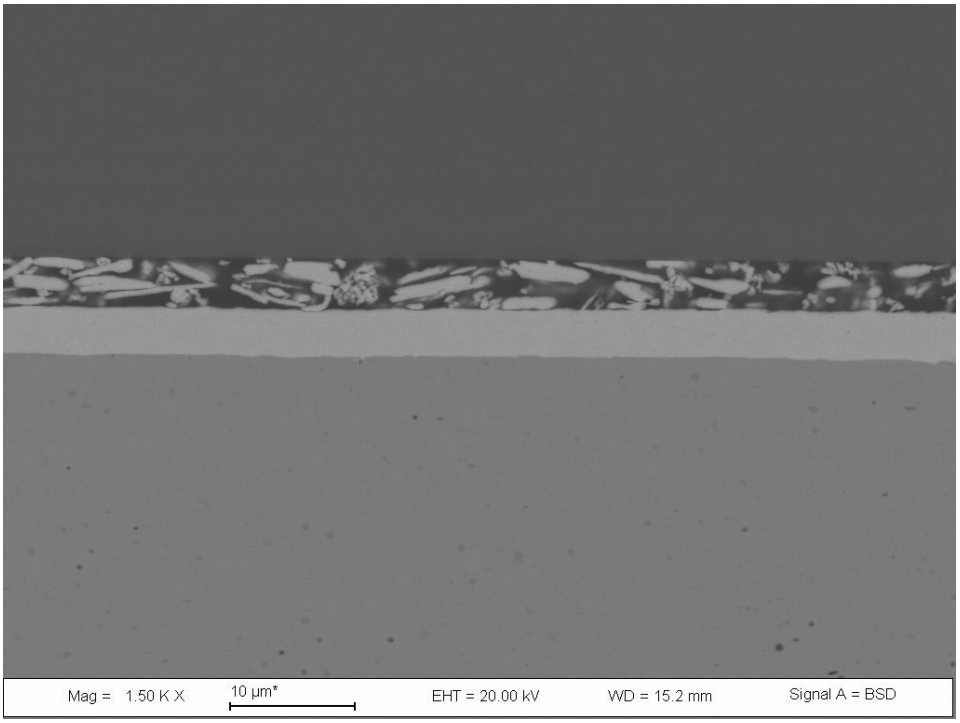


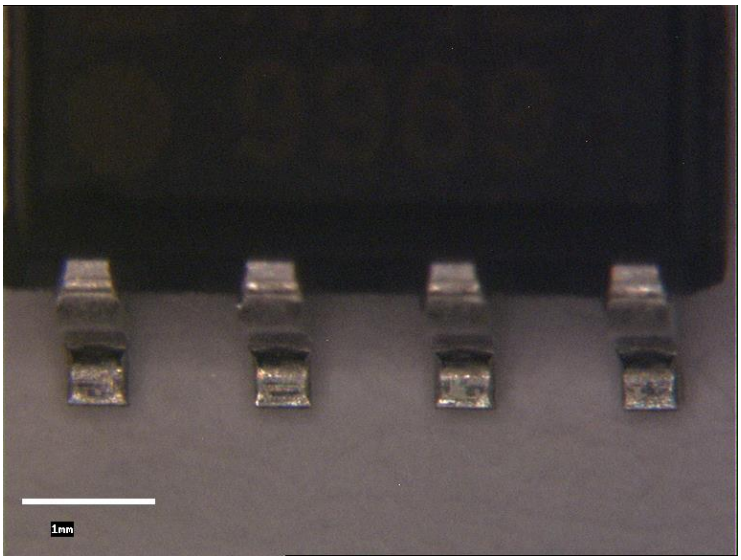
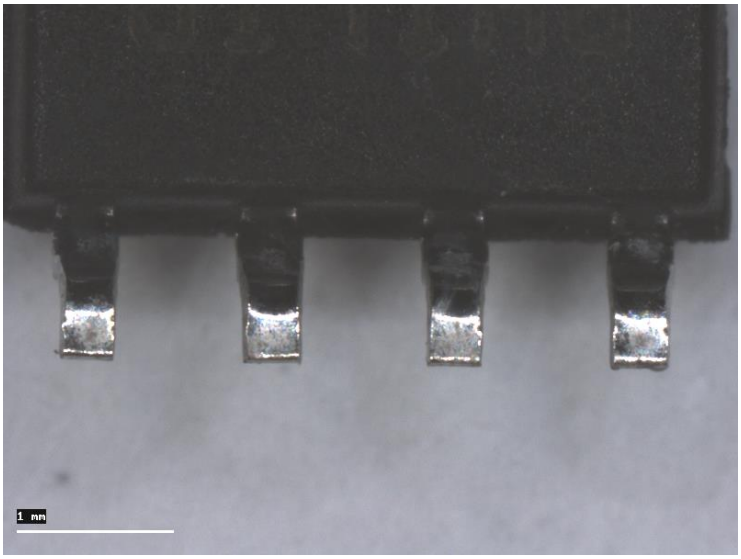


COMMENTS: None.

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

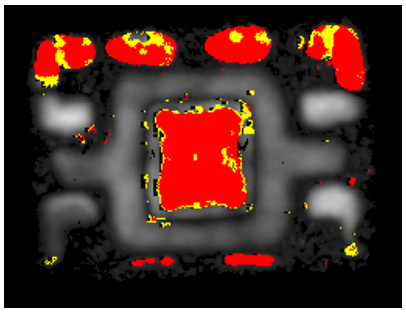
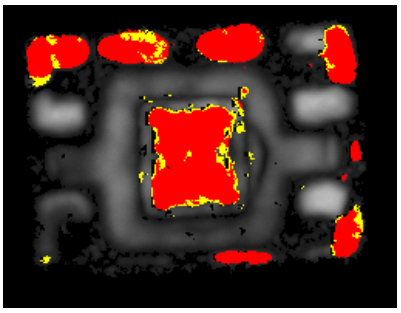
INITIAL (0H) CROSS-SECTION	**Reference** ADA4177-2 **Manuf.** ANALOG DEVICES	**Package** SOIC-8 **Wire** 8 **Date Code** -
	Cross-section Inspection	
SEM inspection SEM view of the ball bond		
SEM inspection SEM view of ball / pad interface		
SEM inspection SEM detailed view of the Au / Al interface Au/Al intermetallics ≈1.5µm		

INITIAL (0H) CROSS-SECTION	**Reference** ADA4177-2 **Manuf.** ANALOG DEVICES	**Package** SOIC-8 **Wire** 8 **Date Code** -
	Cross-section Inspection	
Cross section inspection Optical general view of the die assembly		
Cross section inspection Optical detailed view of the die attach		

INITIAL (0H) CROSS-SECTION	**Reference** ADA4177-2 **Manuf.** ANALOG DEVICES	**Package** SOIC-8 **Wire** 8 **Date Code** -
	Wettability test	
Part inspection Before wettability test		
Part inspection After wettability test		
COMMENTS :	- Before test: No abnormal aspect or coloration was observed. - 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.	

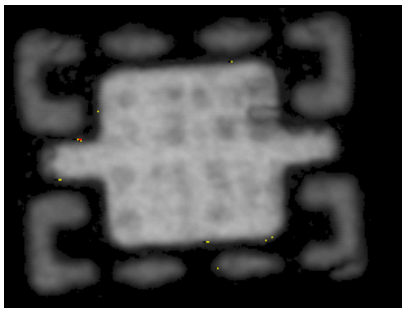
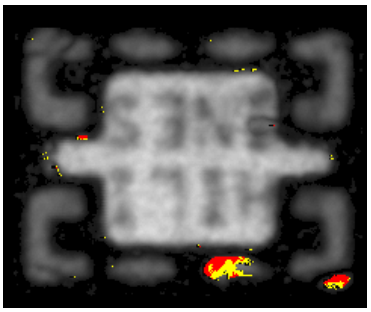
ACOUSTIC MICROSCOPY Before/after reflow and after cycling	Reference ADA4177-2 Manuf. ANALOG DEVICES	Package SOIC-8 Wire 8 Date Code -

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	-

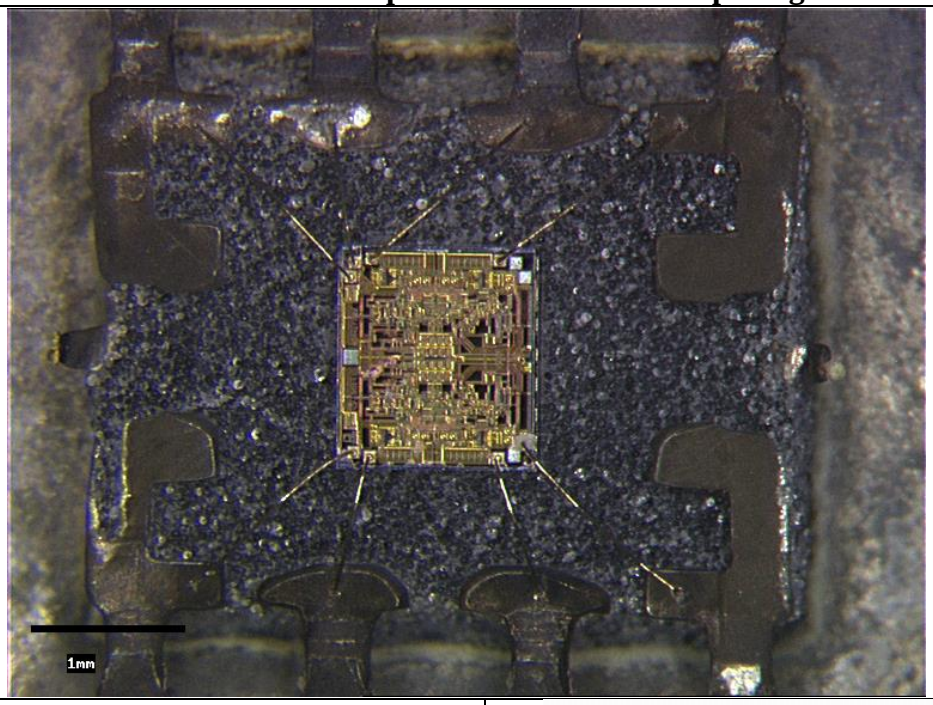
COMMENTS : **Delaminations were observed at lead/package resin interfaces in bonding areas before and after reflow.**

INITIAL (0H) OPENING & WIRE PULL TEST

Reference ADA4177-2
Manuf. ANALOG DEVICES

Package SOIC-8
Wire 8
Date Code -

Internal Visual Inspection after chemical opening



Opened Quantity
5 parts

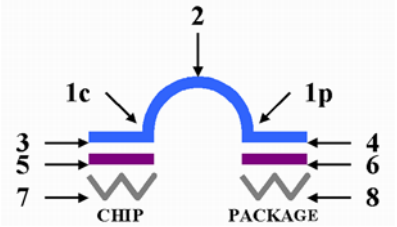
Bonding Material
Au
Wire diameter
25 µm

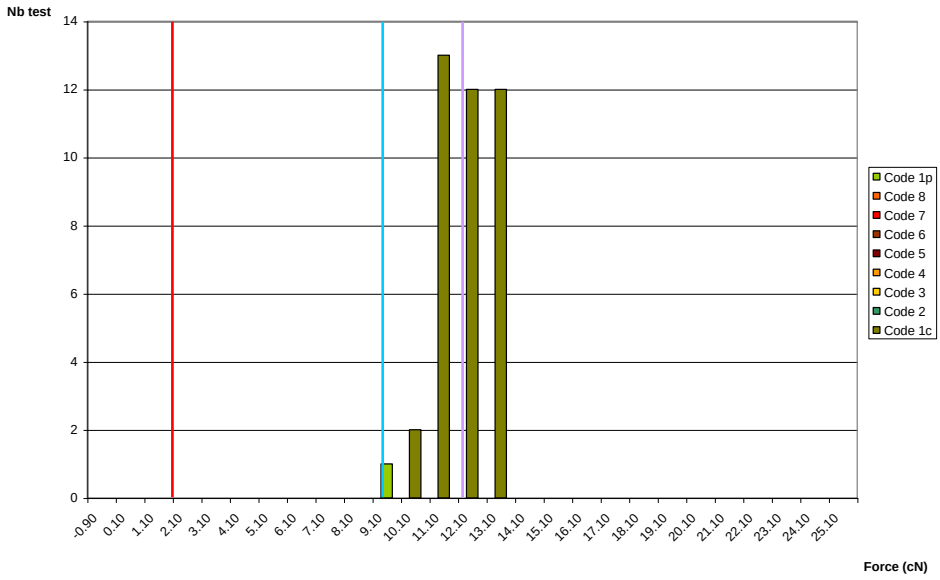
Product :	ADA4177-2
Wire type :	Au
Wire diameter :	23µm
Specification :	MIL STD 883K M2011 Cond D
Apparatus :	DAGE Serie 4000
Cartridge :	WP100
Range :	50 g
Accuracy :	'+/- 0.25 % of range
Min :	**9.70 cN**
Max :	**13.78 cN**
Mean :	**12.29 cN**
σ :	**0.94 cN**
Mean - 3 σ :	**9.47 cN**
Specified strength LIMIT :	**2.10 cN**
Number of no rupture :	**0**

Breaking codes :

CODE 1c	
Number test CODE 1c :	**39**
CODE 1p	
Number test CODE 1p :	**1**
CODE 2	
Number test CODE 2 :	**0**
CODE 3	
Number test CODE 3 :	**0**
CODE 4	
Number test CODE 4 :	**0**
CODE 5	
Number test CODE 5 :	**0**
CODE 6	
Number test CODE 6 :	**0**
CODE 7	
Number test CODE 7 :	**0**
CODE 8	
Number test CODE 8 :	**0**
Total number of tests :	**40**

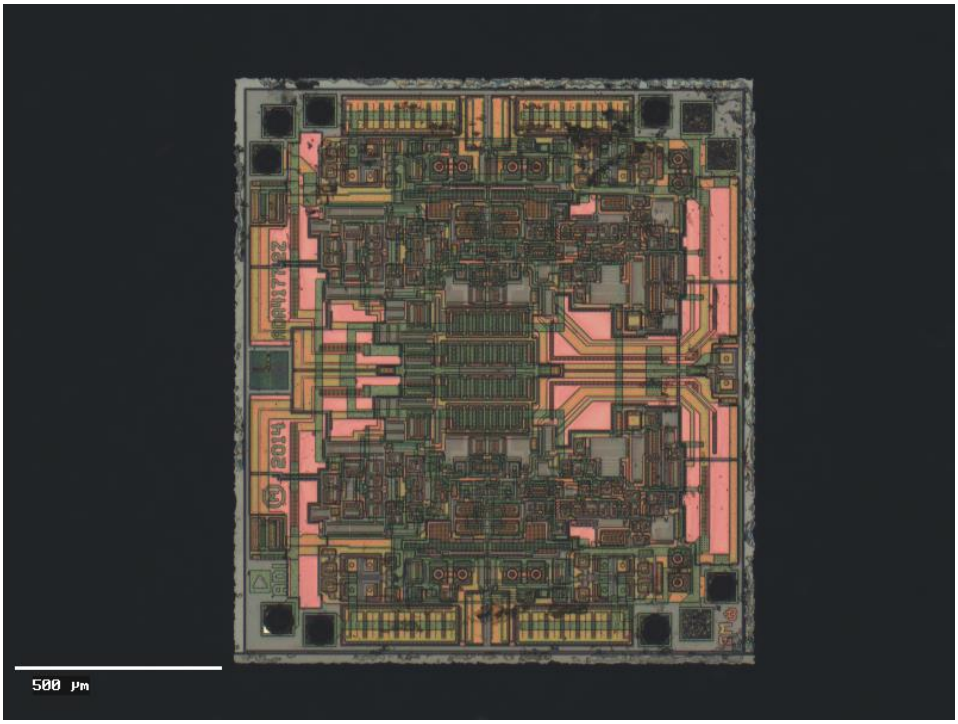
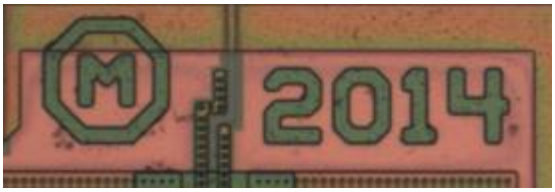
Breaking codes

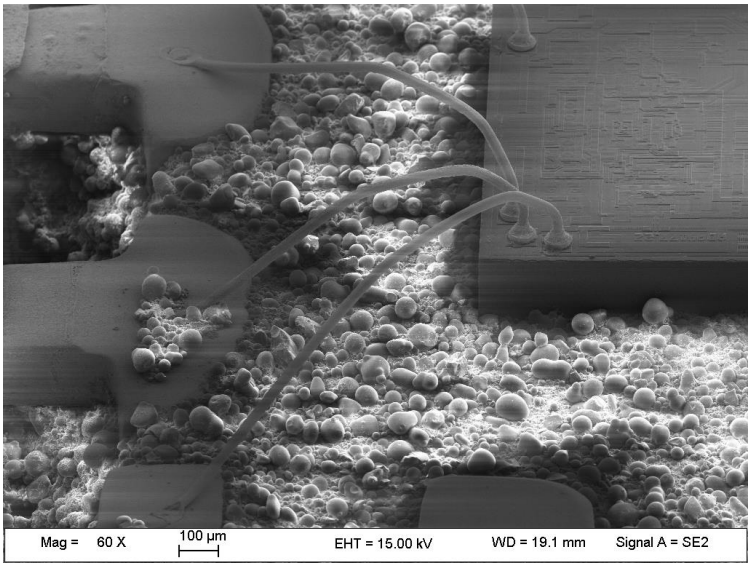
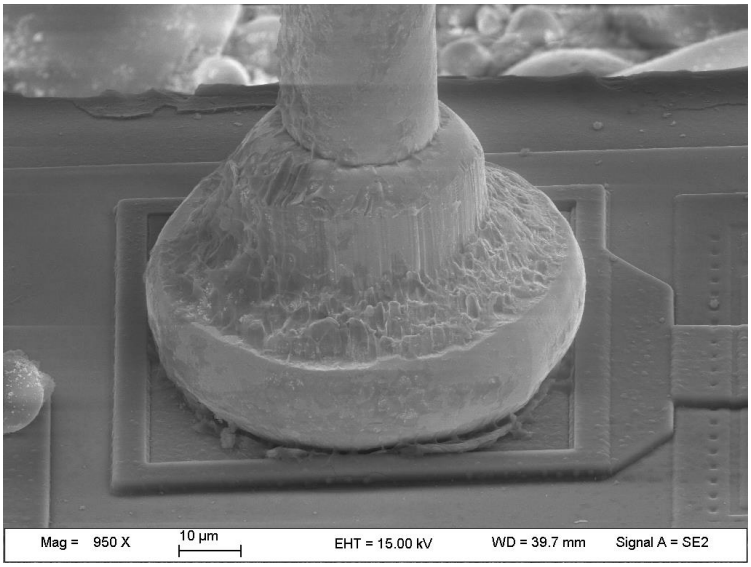
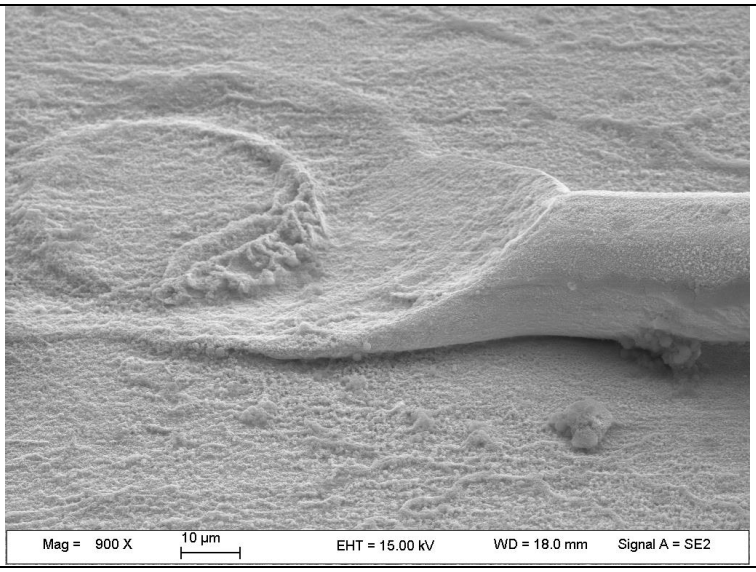


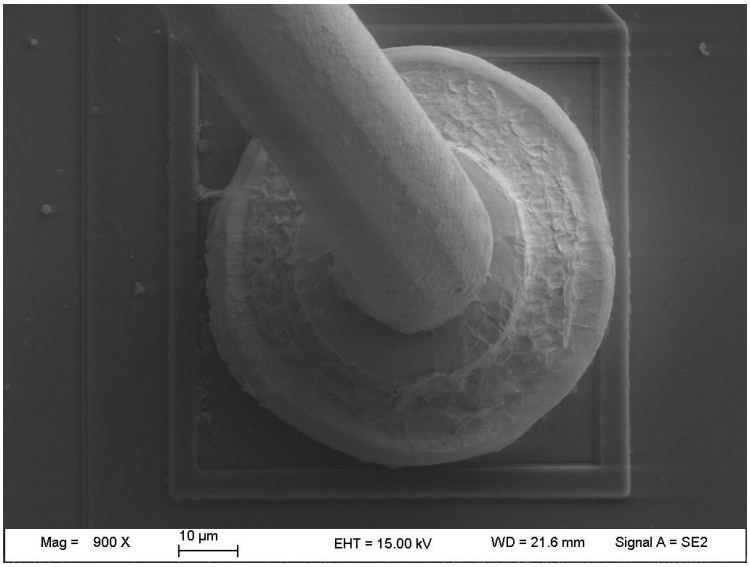
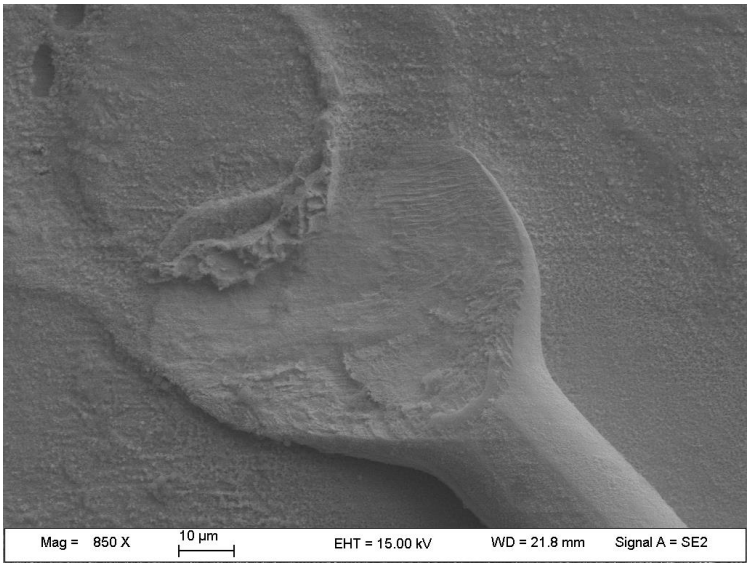


COMMENTS

Usual rupture codes (1c and/or 2 and/or 1p).
Acceptable according to the standard.

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

INITIAL (0H) OPENING	**Reference** ADA4177-2 **Manuf.** ANALOG DEVICES	**Package** SOIC-8 **Wire** 8 **Date Code** -
	Internal Visual Inspection after chemical opening	
SEM inspection SEM view of wire loop		
SEM inspection SEM view of ball bond		
SEM inspection SEM view of stitch bond		

INITIAL (0H) OPENING	**Reference** ADA4177-2 **Manuf.** ANALOG DEVICES	**Package** SOIC-8 **Wire** 8 **Date Code** -
	Internal Visual Inspection after chemical opening	
SEM inspection SEM view of ball bond centering		
SEM inspection SEM view of stitch bond centering		

Serma Technologies est un organisme indépendant dont le système qualité satisfait aux exigences des normes ISO 9001.
A ce titre, un certain nombre d'informations générales relatives aux conditions expérimentales des analyses / essais et au contenu des rapports doit être mentionné.

Serma Technologies is an independent organization which operates in conformance to requirements specified in the standards ISO 9001.
For this purpose, general information related to experimental conditions of analyses / experiments and to content of the report have to be mentioned.

RAPPORT D'ESSAI - OBJETS SOUMIS A ESSAI /
REPORT / OBJECTS SUBMITTED TO ANALYSIS

Il est important de noter que le rapport ne concerne que les objets soumis à l'essai.
It is important to notice that the report concerns only the objects submitted to analysis.

REPRODUCTION / *REPRODUCTION*

Ce rapport ne doit pas être reproduit partiellement sans l'approbation écrite du laboratoire d'essai.
This report cannot be partially reproduced without the laboratory written authorisation.

INCERTITUDE DE MESURE /
ACCURACY STATEMENT

Electriques : Les grandeurs électriques, sauf indications contraires, ne sont données qu'à titre indicatif et ne sont utilisées que pour mettre en évidence le bon ou le mauvais fonctionnement d'un composant.
Electrical : Electrical values, except in specific cases which would be mentioned, are only given as an indication of the good or wrong functioning of a component.
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 (révélations chimiques, 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.