MIXED FLOWING GAS TEST REPORT

Customer Company ：Apacer Technology Inc

Customer Address ：No. 32, Zhongcheng Rd., Tucheng Dist., New Taipei City 236 , Taiwan (R.O.C.)

Laboratory Address ：No.10-1, Lixing 1st Rd., East Dist., Hsinchu City 300 , Taiwan (R.O.C.)

Model Name ：SX250-M280

Date Received ：DEC 20, 2020

Date Tested ：DEC 24, 2020 ~ DEC 29, 2020

TESTING LABORATORY IS APPROVED BY:

IECQ Certificate of Approval No.: IECQ-L DEKRA 16.0002 For Independent Test Laboratory According to ISO/IEC 17025

ISO 9001 certificate is approved by TUV CERT certification body of TUV NORD Cert GmbH

WE HEREBY CERTIFY THAT:

The test(s) shown in the attachment were conducted according to the indicating procedures. We assume full responsibility for the accuracy and completeness of these tests and vouch for the qualifications of all personnel performing them.

	Name	Signature	Date
Test Engineer	Leo Yao	Leo Yao	Jan 18, 2021
Manager	Lingsing Su	lingsing Su	Jan 18, 2021

Note：

1. This report will be invalid if reproduced in part or altered in any way.
2. This report refers only to the specimen(s) submitted to test, and is invalid if used otherwise.
3. This report is ONLY valid with the examination seal and signature of this institute.
4. The tested specimen(s) will only be preserved for thirty days from the date issued, if not collected by the applicant.

宜特科技股份有限公司 報告專用章 IST INTEGRATED SERVICE TECHNOLOGY

TABLE OF CONTENTS

1. GENERAL INFORMATION

1.1 DESCRIPTION OF UNIT

SAMPLE QUANTITY：7 pcs

CUSTOMER PROVIDE INFORMATION：

SAMPLE NAME & SAMPLE QUANTITY

TV # ID	Model	P/N NO.	S/N NO.	QUANTITY
#01	SX250-M280	A52.255LHB.002NA	122048500935	1 Pcs
#02			122048500936	1 Pcs
#03			122048500937	1 Pcs
#04			122048500938	1 Pcs
#05			122048500939	1 Pcs
#06			122048500940	1 Pcs
#07			122048500941	1 Pcs

2. MIXED FLOWING GAS TEST

2.1 DESCRIPTION OF TEST EQUIPMENT

Test Equipment	Model	Brand	Calibration Date
Mixed Flowing-Gas Chamber	GH-180-VL/M	YAMASAKI	Nov 11, 2020

2.2 LABORATORY AMBIENCE CONDITION

Temperature：23 ± 5°C

Relative humidity：50 ± 10% (RH)

2.3 REFERENCE DOCUMENT

The test is based on ***iNEMI***

iNEMI condition:

Temp (°C)	RH (%)	H_2S (ppb)	Cl_2 (ppb)	NO_2 (ppb)	SO_2 (ppb)
40	70-75	1200	20	200	200

2.4 TEST SETUP AND TEST CONDITION

Test temperature：40°C

Relative humidity：75% RH

Test duration：5 days

Exchange Rate：1,500 L/hour

Gas Concentration：H_2S = 1200 ppb; Cl_2 = 20 ppb; NO_2 = 200 ppb; SO_2 = 200 ppb;

2.5 RESULTS OF TEST

Please refer to **Attachment 1** for the results of visual inspection.

** If there is no specified area from customer. We will usually selected the various components, including resistor, capacitor, IC, LED, gold finger, connector pins, PCB pad and so on, especially for the failure units with creep corrosion occurrence. (e.g. IC LeadFrame, PCB pad without soldering...)*

Please refer to **Attachment 2** for the results of functional test.

3 CORROSIVE REACTIVITY ANALYSIS

3.1 DESCRIPTION OF TEST MATERIAL

Test Material	Purity	Brand
Copper Coupon	99.99%	Surepure Chematal Inc.
Silver Coupon	99.95%	Surepure Chematal Inc.
Acetone	>99.5%	Merck Ltd.
Potassium Chloride (KCl)	>99.5%	Merck Ltd.
Silicon Carbide Grind Paper	N/A	Buehler

3.2 DESCRIPTION OF TEST EQUIPMENT

Test Equipment	Model	Brand	Calibration Date
Potentiostat/Galvanostat	VersaSTAT4	P.A.R.	May 07, 2020

3.3 LABORATORY AMBIENCE CONDITION

Temperature：23 ± 5^{o}C

Relative humidity：50% ± 10% (RH)

3.4 REFERENCE DOCUMENT

(1) Coulometric Reduction Analysis is based on ASTM B825-02: *Standard Test Method for Coulometric Reduction of Surface Films on Metallic Test Samples.*

(2) Classification of Severity Levels is based on ISA 71.04-2013:

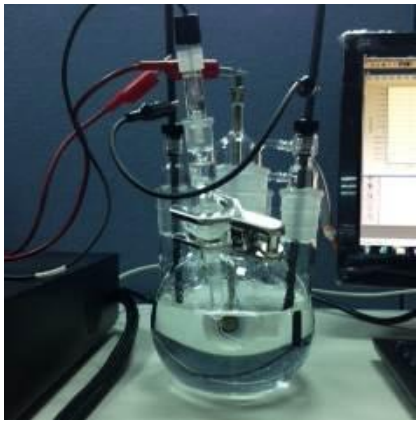
"*ISA Standard – Environmental Conditions for Process Measurement and Control Systems: Airborne Contaminants"; Instruments Society of America (ISA); 2013.*

ISA Standard 71.04-2013			
Severity Level	**Reactivity Level**	**Cu Corrosion Rate**	**Ag Corrosion Rate**
G1	Mild	< 300 Å / month	< 200 Å / month
G2	Moderate	< 1000 Å / month	
G3	**Harsh**	**< 2000 Å / month**	
GX	Severe	> 2000 Å / month	

The corrosive reaction rate will be measured in the accelerate corrosion chamber. And then the expected thickness of copper corrosion can be ensured ISA 71.04 G3 compliance for 2 years.

3.5 TEST SETUP AND ANALYSIS CONDITION

Photo and diagram of Coulometric Reduction setup as below:



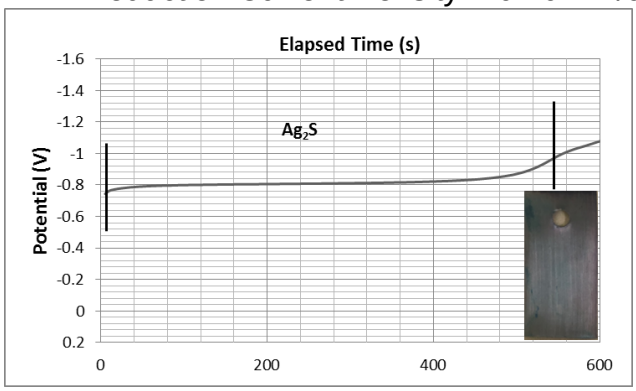
Coulometric Reduction Analysis

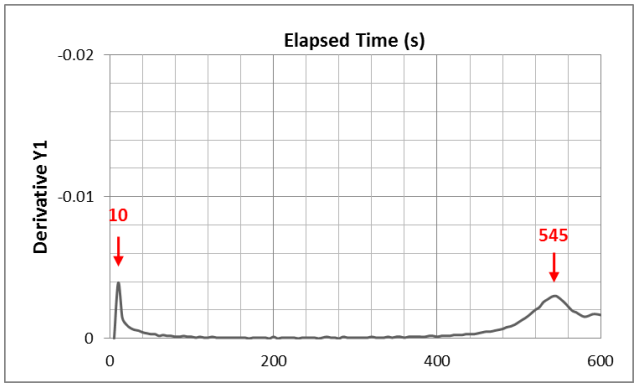
3.6 COULOMETRIC REDUCTION ANALYSIS

Corrosive Reaction Thickness Measurement

Coulometric/Cathodic Reduction Plots Analysis: Ag

Reduction Current Density: - 0.20 mA/cm^2



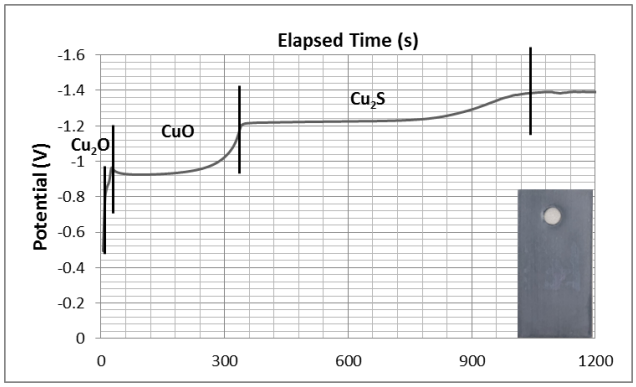


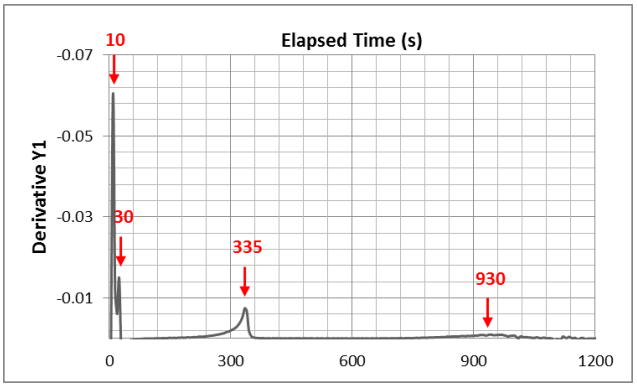
Reduction Curve **Differential Analysis**

Silver Corrosion Product	Seconds	Thickness, angstroms	Exposure Days	Silver Corrosion Rate, angstroms/day
AgCl	0	0	1	1877
Ag_2S	535	1877		

Coulometric/Cathodic Reduction Plots Analysis: Cu_Day0-Day1

Reduction Current Density: -1.00 mA/cm^2





Reduction Curve **Differential Analysis**

Copper Corrosion Product	Seconds	Thickness, angstroms	Exposure Days	Copper Corrosion Rate, angstroms/day
Cu_2O	20	247	1	10976
CuO	305	1964		
Cu_2S	595	8764		

3.7 RESULTS OF ANALYSIS

The Results of Corrosive Reaction Thickness Measurement as below (using Coulometric Reduction Analysis).**:**

Duration	Corrosive Reaction Thickness (Angstroms, Å)						
	Silver (Ag)			Copper (Cu)			
	AgCl	Ag_2S	Total Ag	Cu_2O	CuO	Cu_2S	Total Cu
Day0-Day5	0	9,385	**9,385**	1,235	9,820	43,820	**54,875**

ISA 71.04 G3 Severity Level	Expected Film Thickness for Corrosion	
	Silver (Ag)	Copper (Cu)
1-year warranty (12 months)	24,000 Å	24,000 Å
2-years warranty (24 months)	48,000 Å	48,000 Å
Accelerated Corrosion (5 days)	**9,385 Å**	**54,875 Å**
Assessed Simulation Time in G3	**0.39 year**	**2.29 year**

4. SUMMARY OF TEST

1) The results of visual inspection shown **"Passed"** in this test run. *(Criterion: Severe creep corrosion is "Failed" that bridge feature will induce electrical short)*

   ** No obvious corrosion was observed in this test run.*

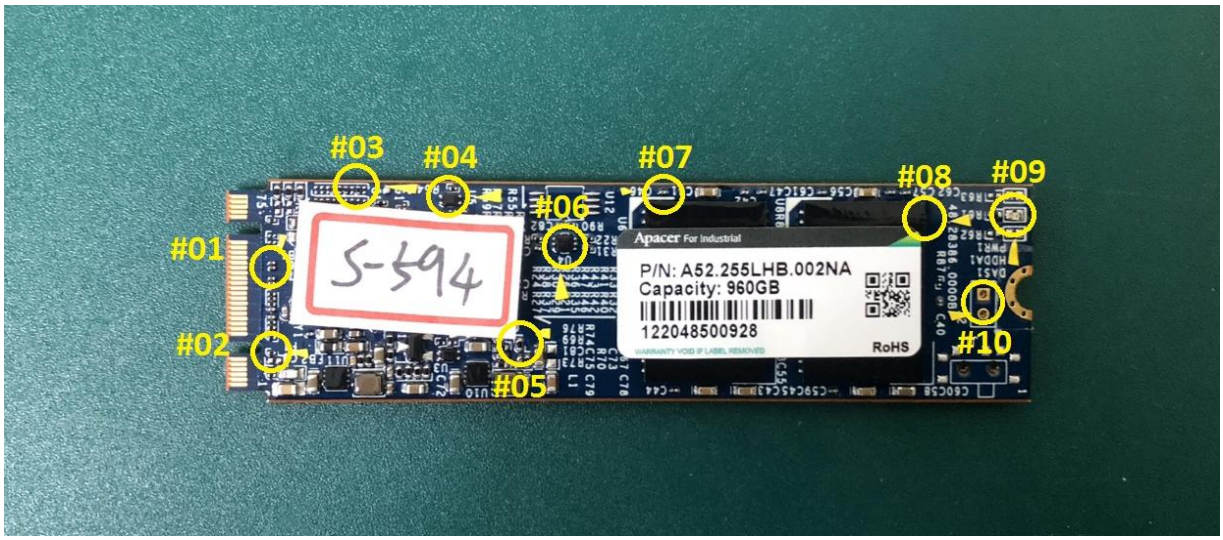
   ** However, the function test will determine the final result which is "Passed" or "Failed".*

2) The results of functional test shown "**Passed"** in this test run. *(Criterion: No performance deviations observed)*

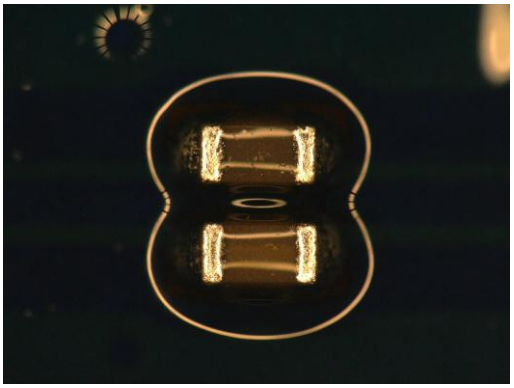
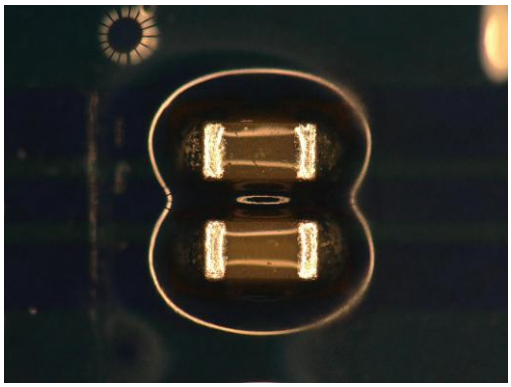
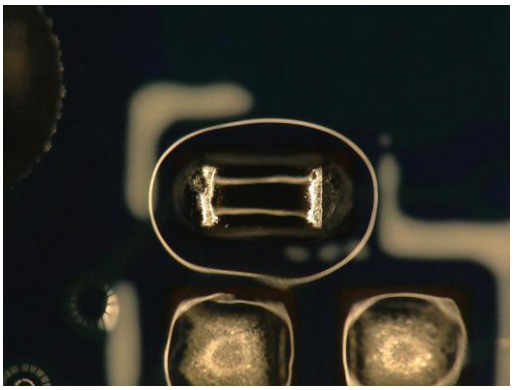
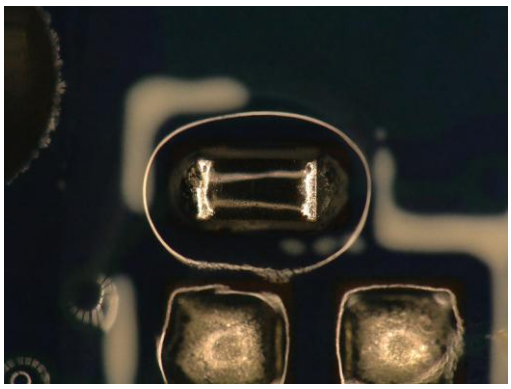
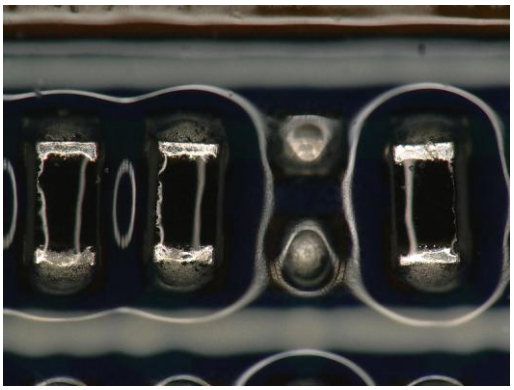
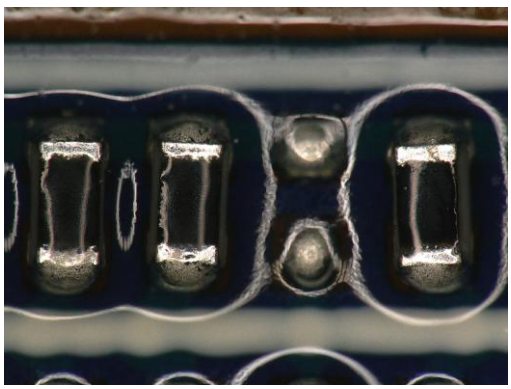
3) The corrosion thickness growth with **5 days accelerated test** can be satisfied the **ISA 71.04 G3 severity level** with **0.39-year warranty** and **2.29-year warranty** for silver and copper, respectively. **Therefore, the expected thickness of Copper corrosion can be ensured ISA 71.04 G3 compliance for 2 years in this test run**.

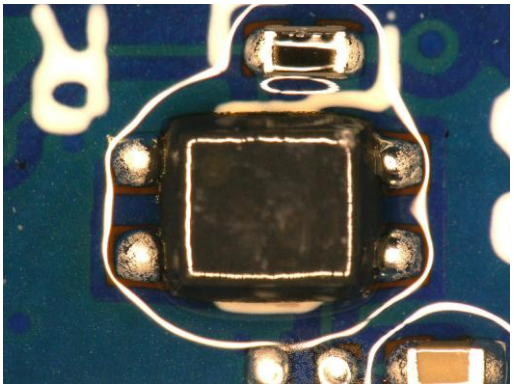
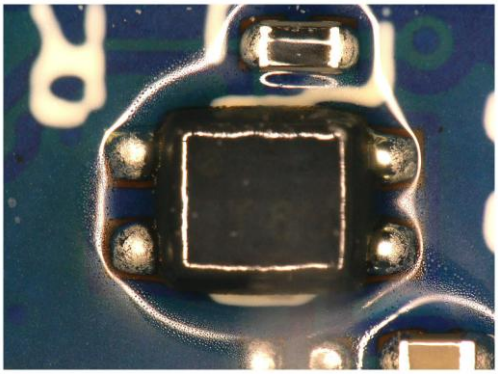
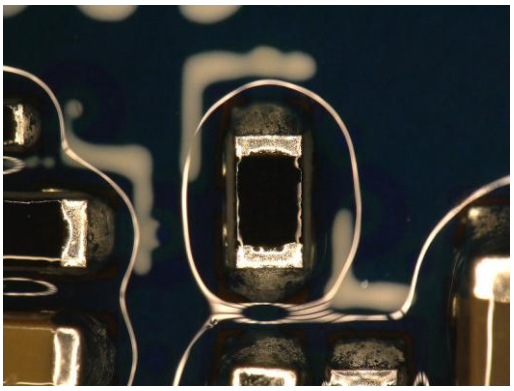
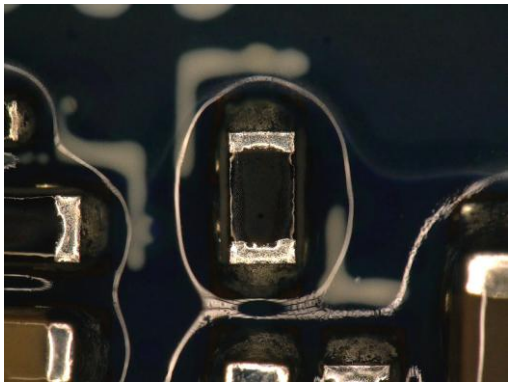
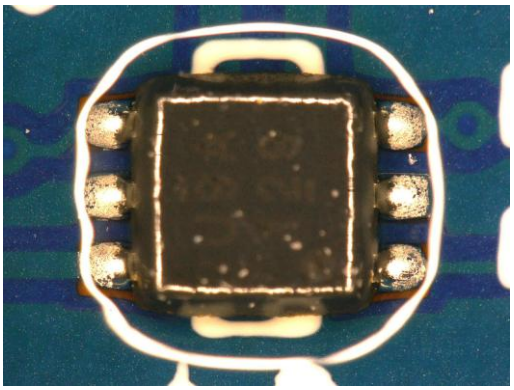
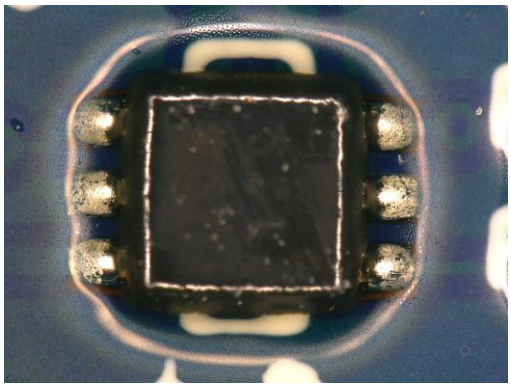
Attachment 1：

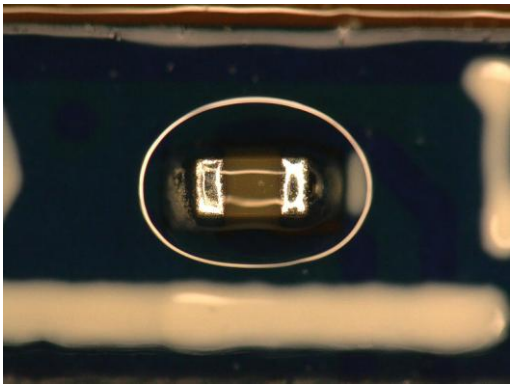
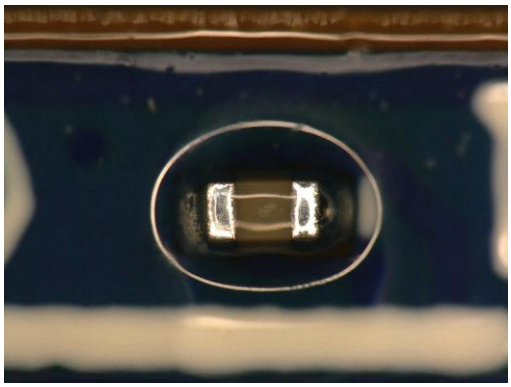
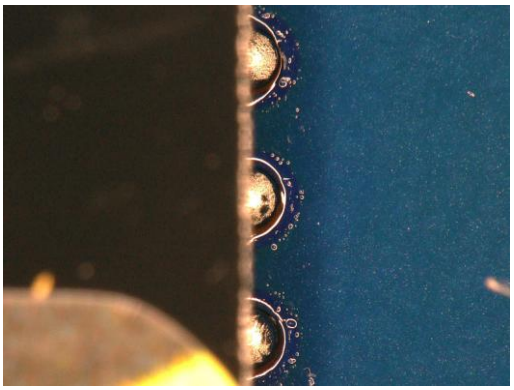
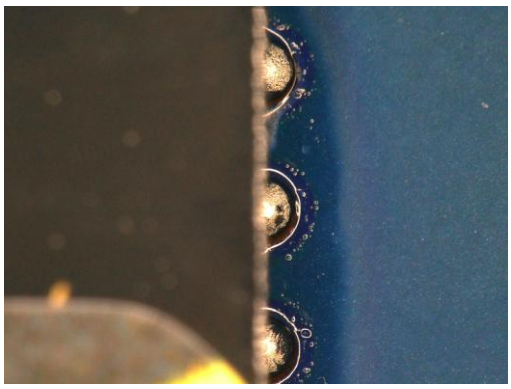
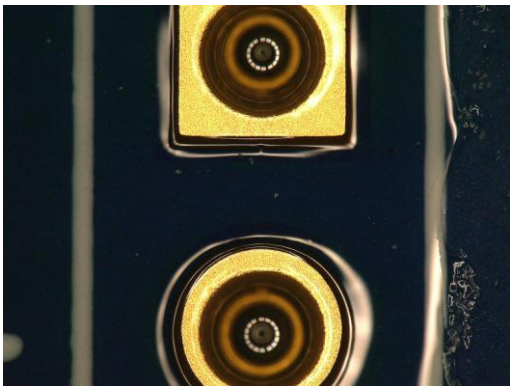
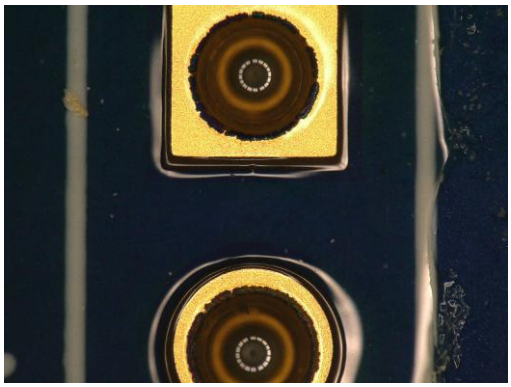
Please refer to the mapping and location of visual inspection as below:

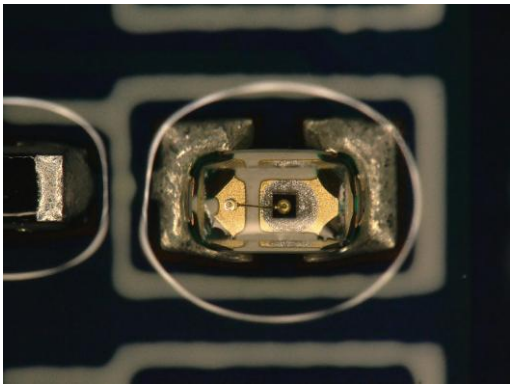
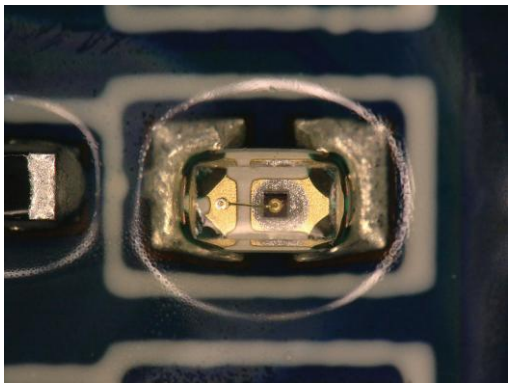


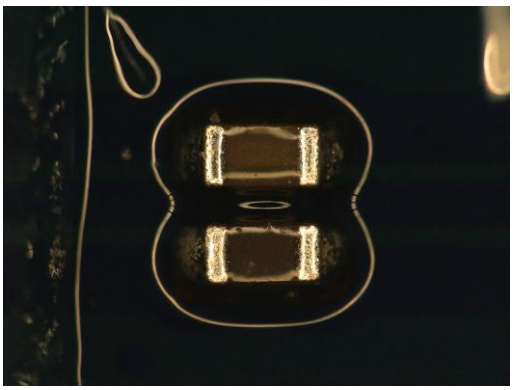
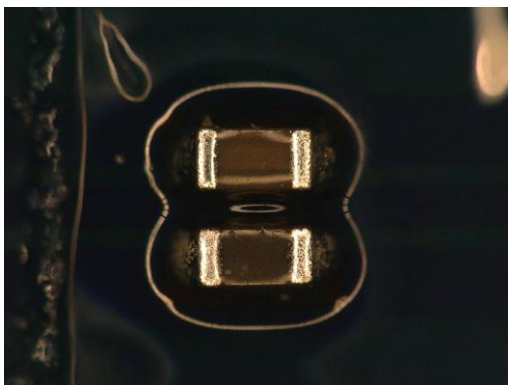
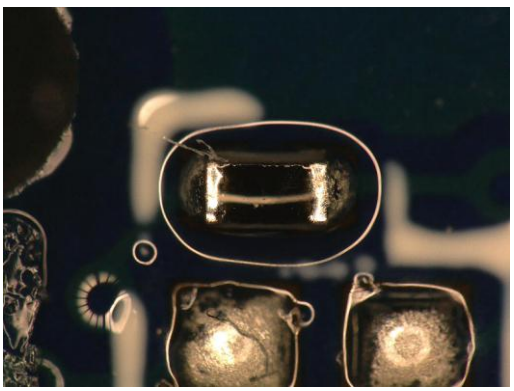
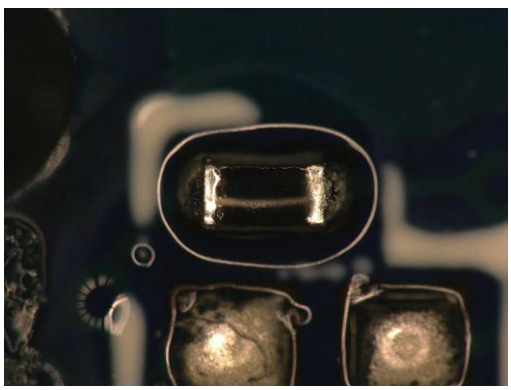
Please refer to the visual inspection in 50x-200x magnification by OM as below:

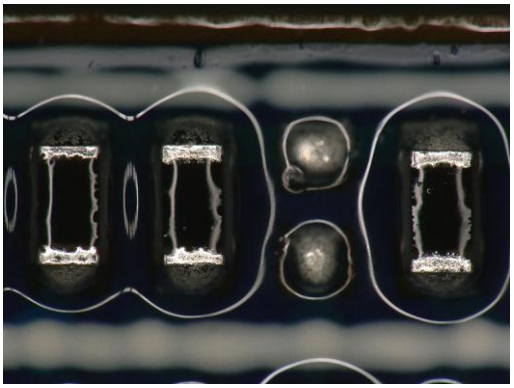
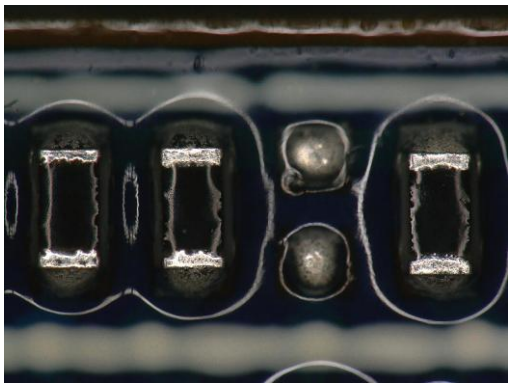
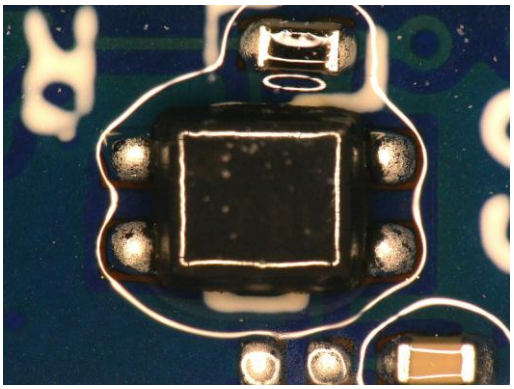
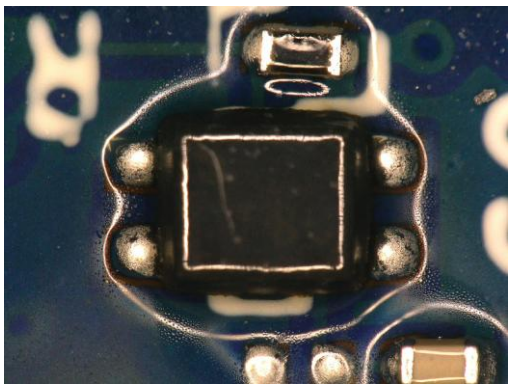
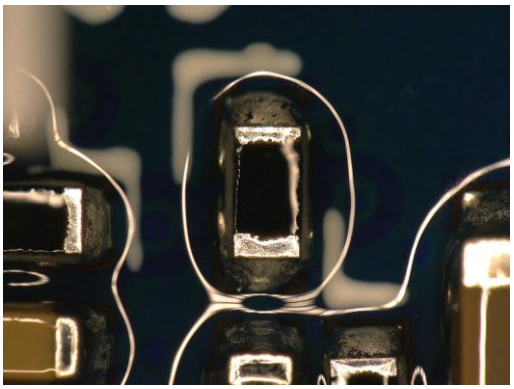
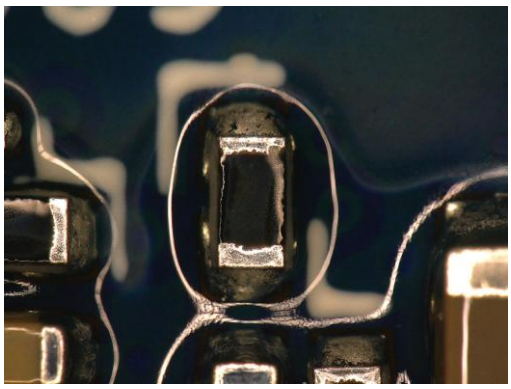
Location	Before Test (Day0)	After Test (Day5)
TV#01_01		
Results	No Corrosion	No Corrosion
TV#01_02		
Results	No Corrosion	No Corrosion
TV#01_03		
Results	No Corrosion	No Corrosion

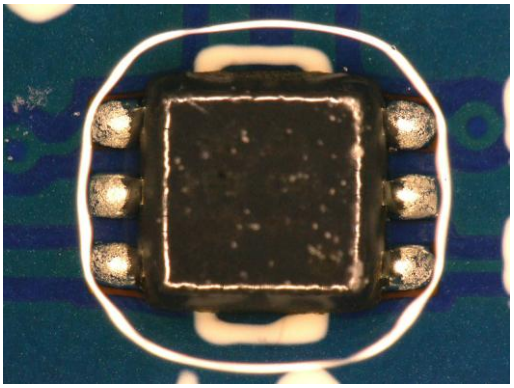
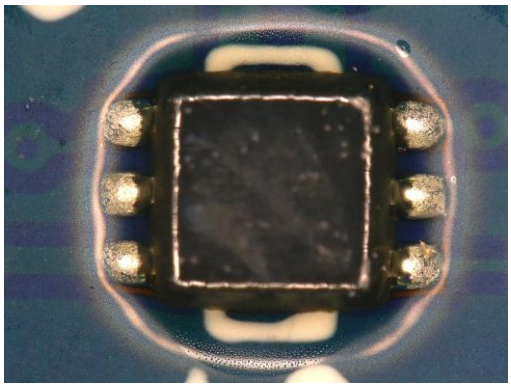
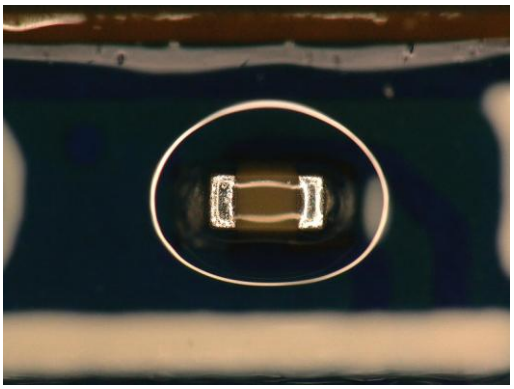
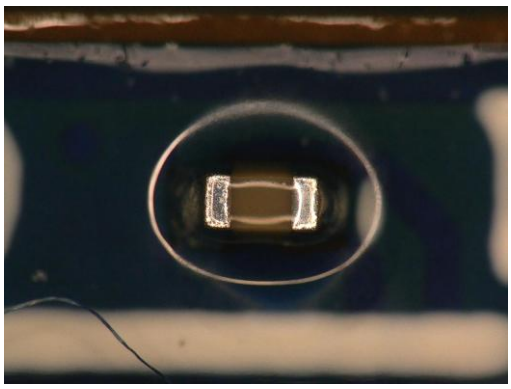
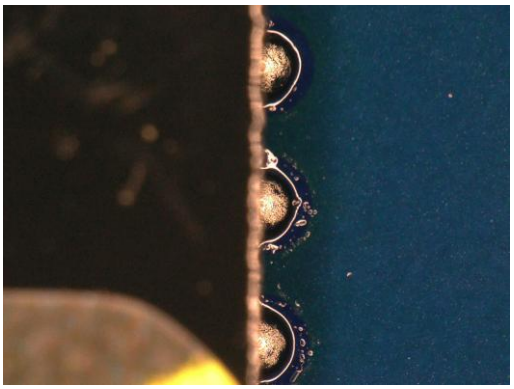
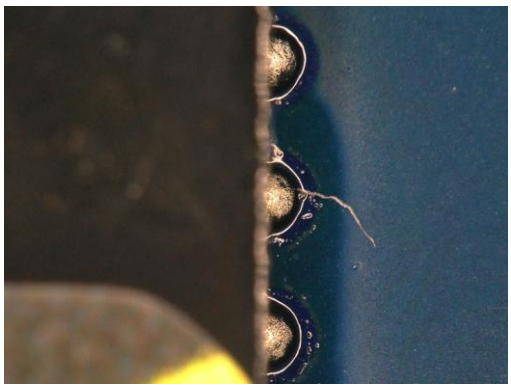
Location	Before Test (Day0)	After Test (Day5)
TV#01_04		
Results	No Corrosion	No Corrosion
TV#01_05		
Results	No Corrosion	No Corrosion
TV#01_06		
Results	No Corrosion	No Corrosion

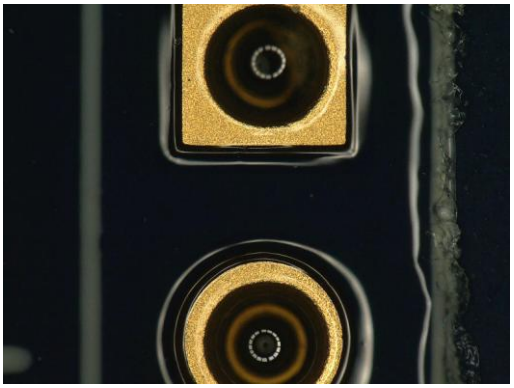
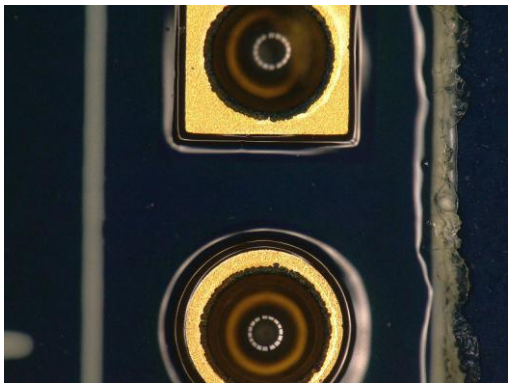
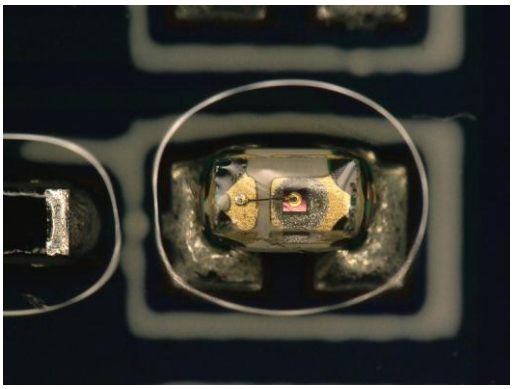
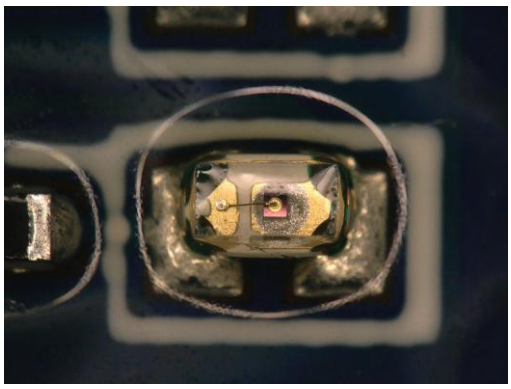
Location	Before Test (Day0)	After Test (Day5)
TV#01_07		
Results	No Corrosion	No Corrosion
TV#01_08		
Results	No Corrosion	No Corrosion
TV#01_09		
Results	No Corrosion	Pitting/Pore Corrosion

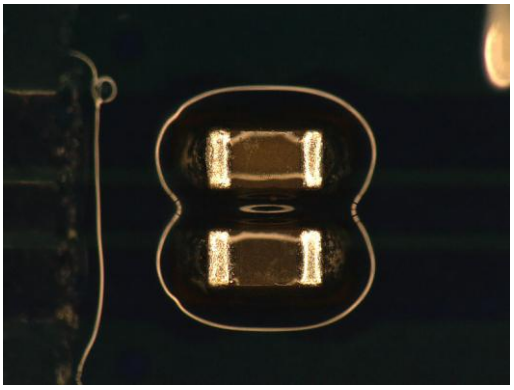
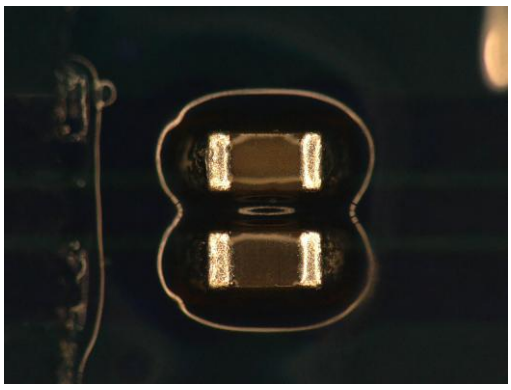
Location	Before Test (Day0)	After Test (Day5)
TV#01_10		
Results	No Corrosion	No Corrosion

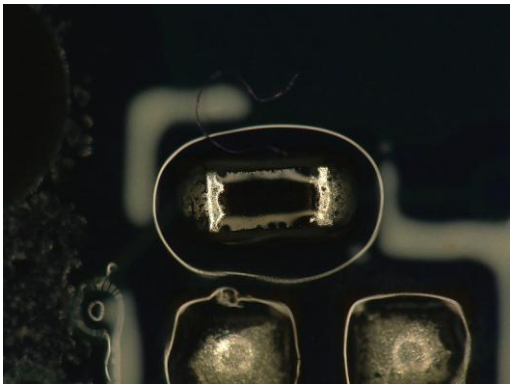
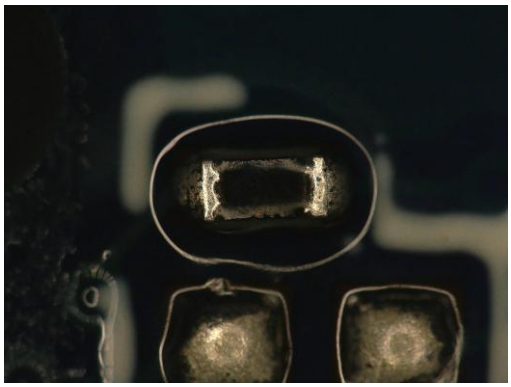
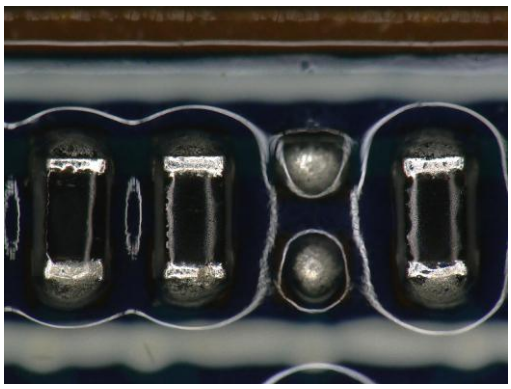
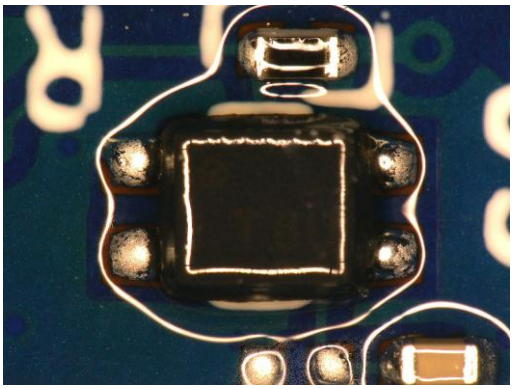
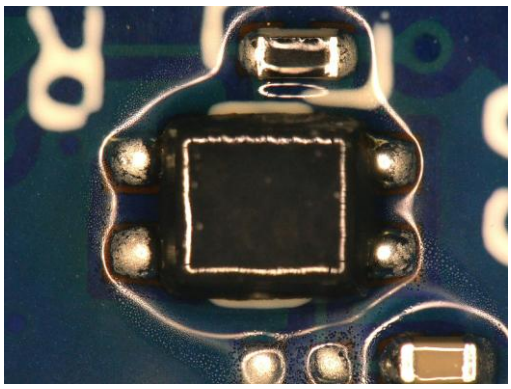
Location	Before Test (Day0)	After Test (Day5)
TV#02_01		
Results	No Corrosion	No Corrosion
TV#02_02		
Results	No Corrosion	No Corrosion

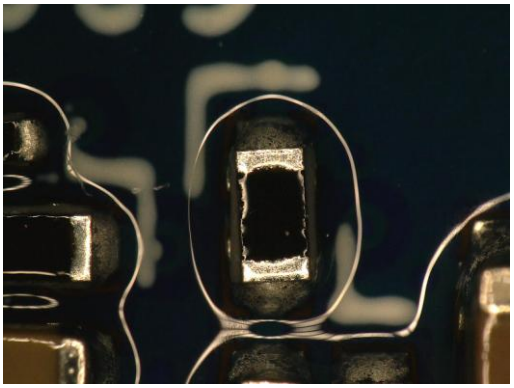
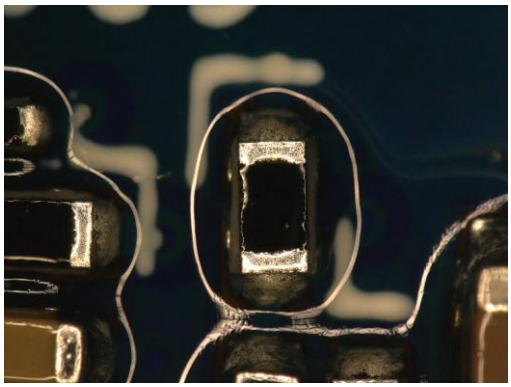
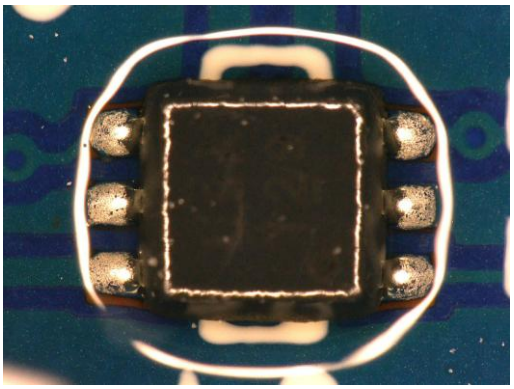
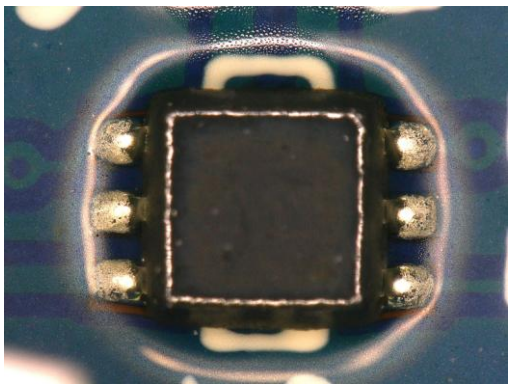
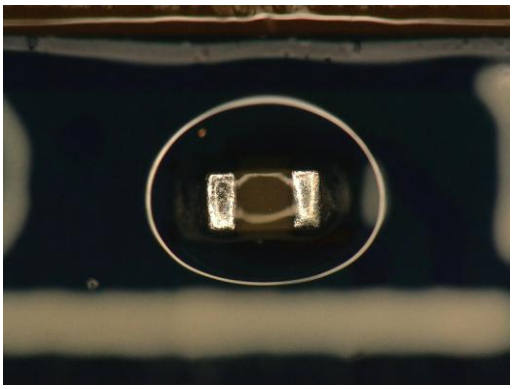
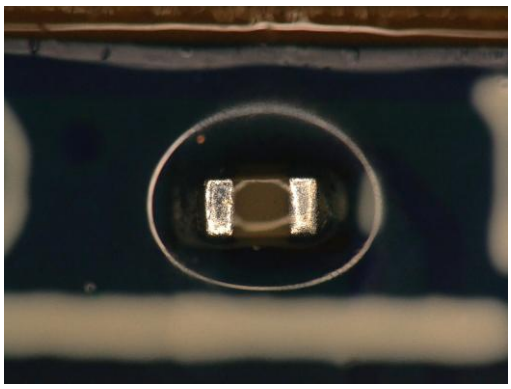
Location	Before Test (Day0)	After Test (Day5)
TV#02_03		
Results	No Corrosion	No Corrosion
TV#02_04		
Results	No Corrosion	No Corrosion
TV#02_05		
Results	No Corrosion	No Corrosion

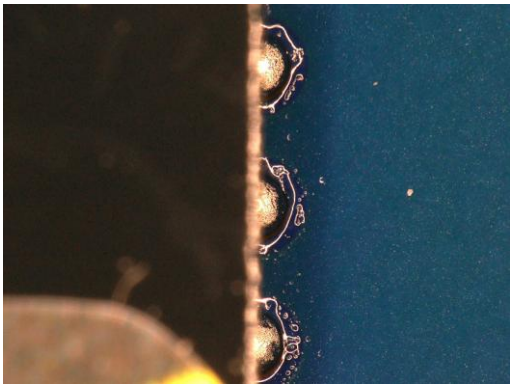
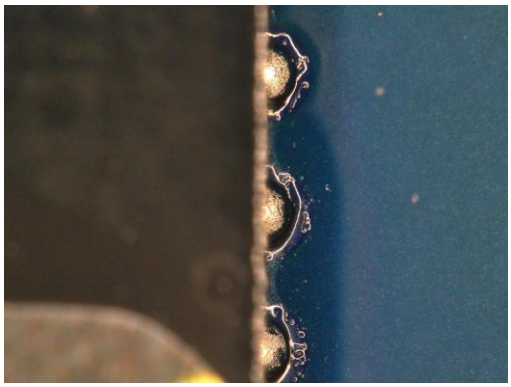
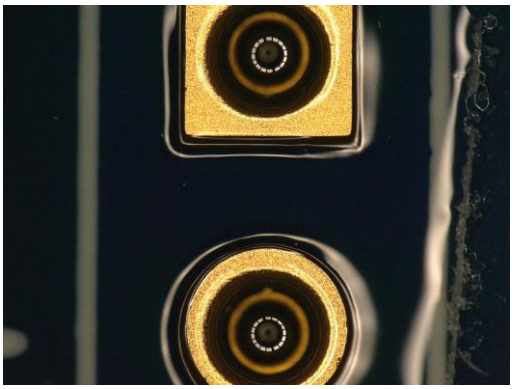
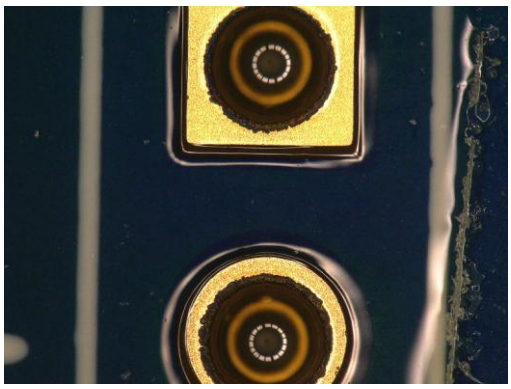
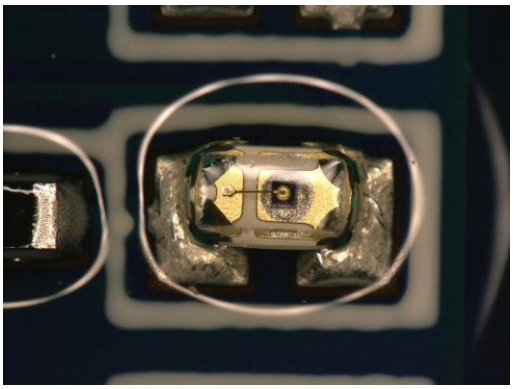
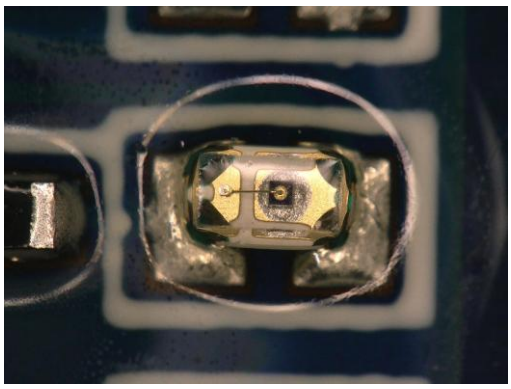
Location	Before Test (Day0)	After Test (Day5)
TV#02_06		
Results	No Corrosion	No Corrosion
TV#02_07		
Results	No Corrosion	No Corrosion
TV#02_08		
Results	No Corrosion	No Corrosion

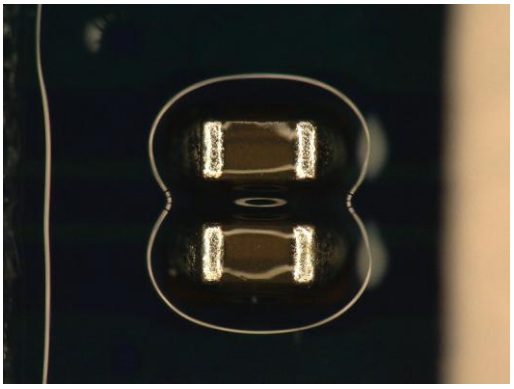
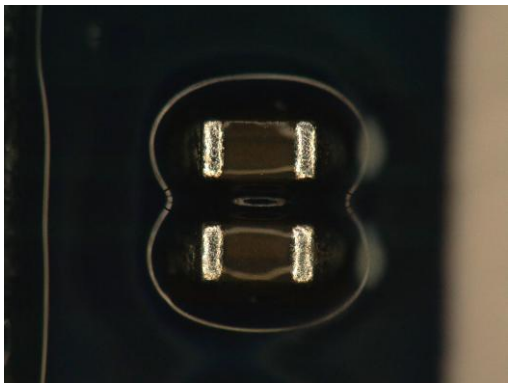
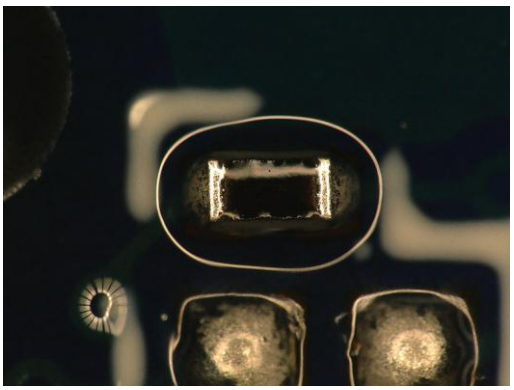
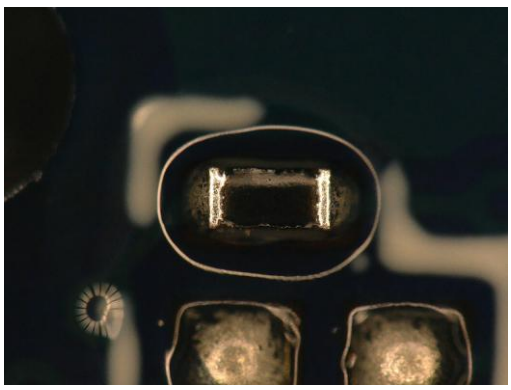
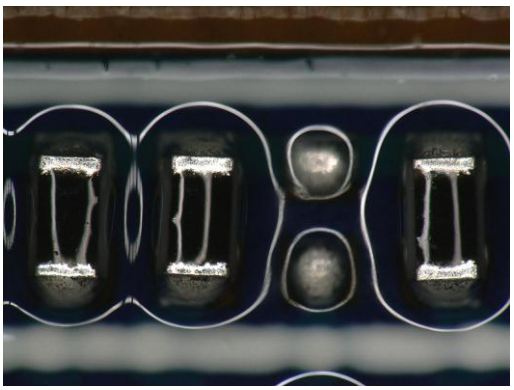
Location	Before Test (Day0)	After Test (Day5)
TV#02_09		
Results	No Corrosion	Pitting/Pore Corrosion
TV#02_10		
Results	No Corrosion	No Corrosion

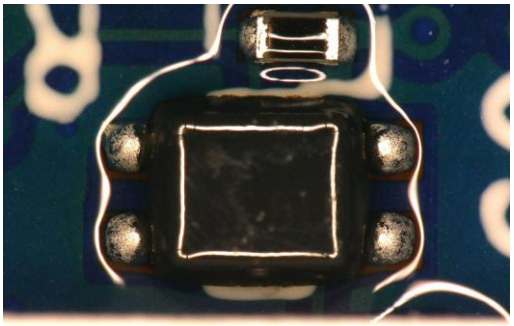
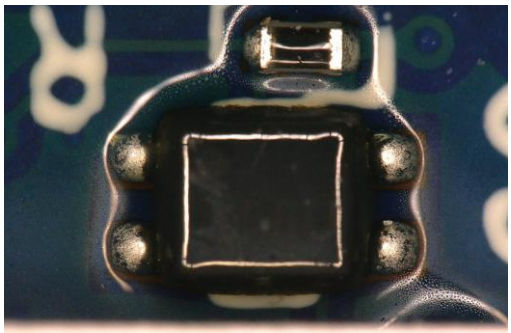
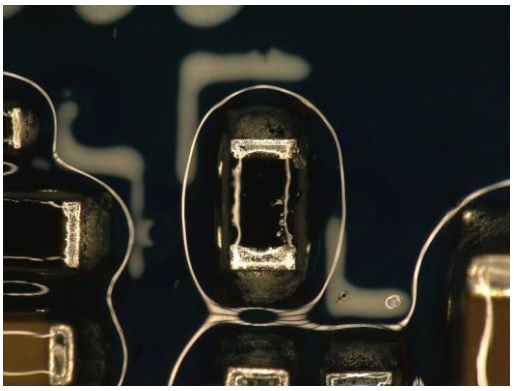
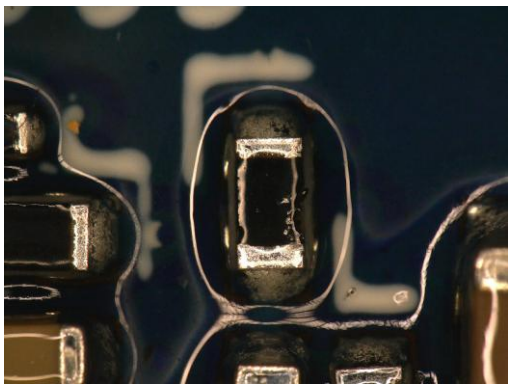
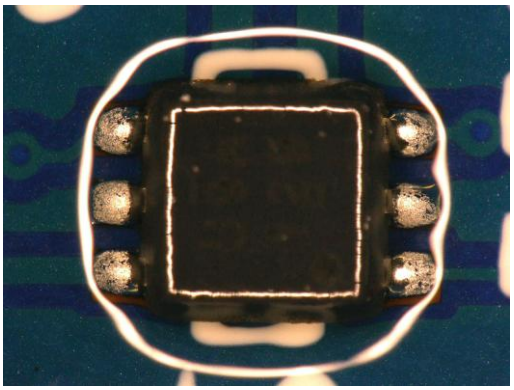
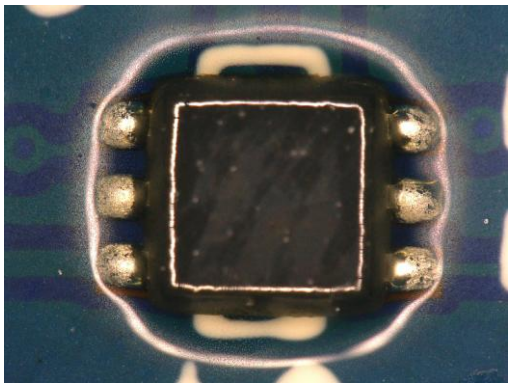
Location	Before Test (Day0)	After Test (Day5)
TV#03_01		
Results	No Corrosion	No Corrosion

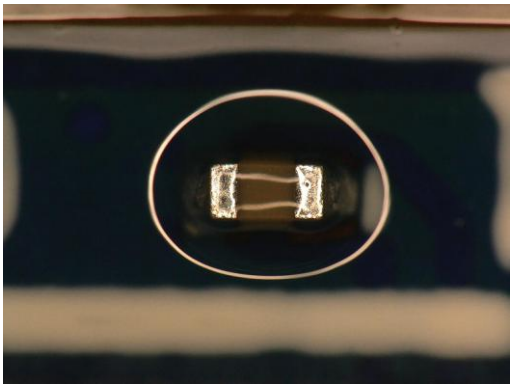
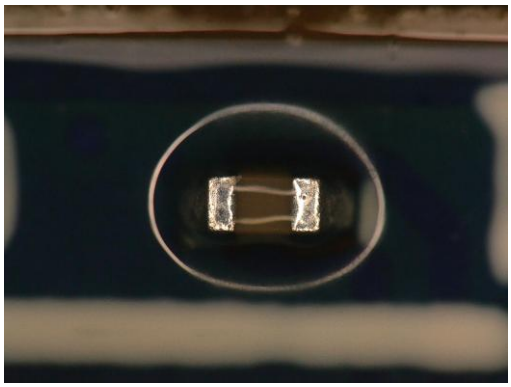
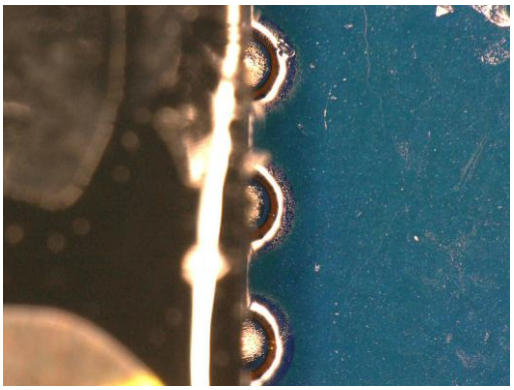
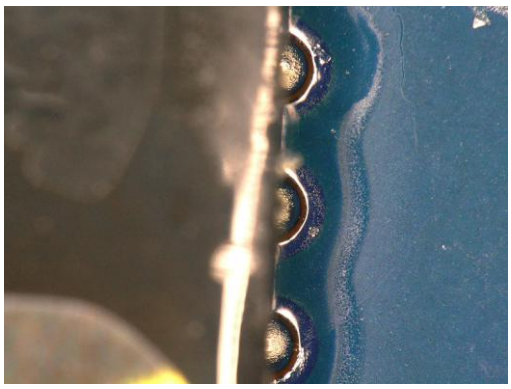
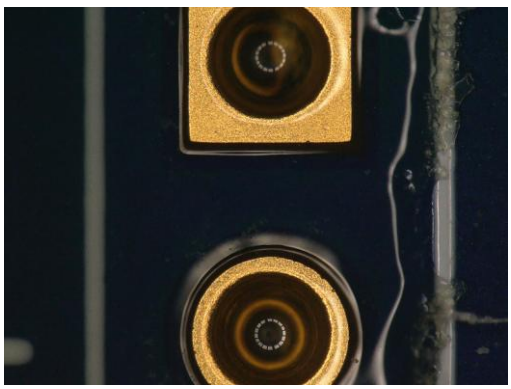
Location	Before Test (Day0)	After Test (Day5)
TV#03_02		
Results	No Corrosion	No Corrosion
TV#03_03		
Results	No Corrosion	No Corrosion
TV#03_04		
Results	No Corrosion	No Corrosion

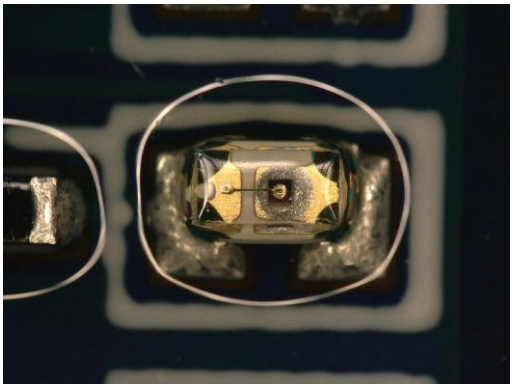
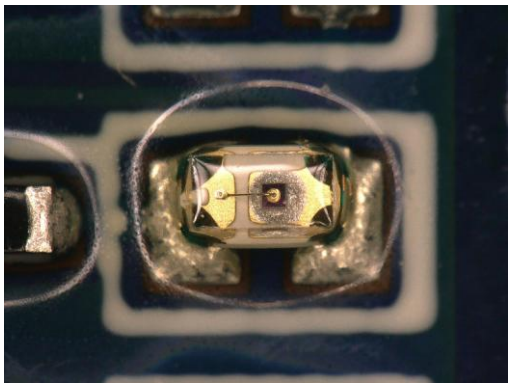
Location	Before Test (Day0)	After Test (Day5)
TV#03_05		
Results	No Corrosion	No Corrosion
TV#03_06		
Results	No Corrosion	No Corrosion
TV#03_07		
Results	No Corrosion	No Corrosion

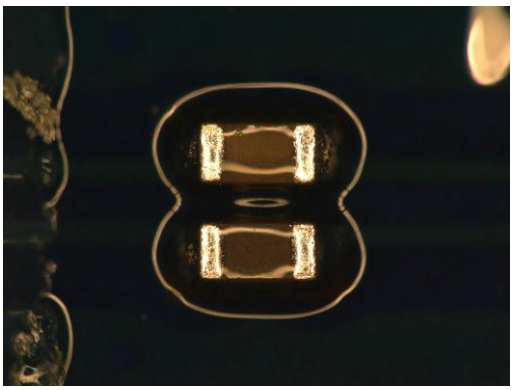
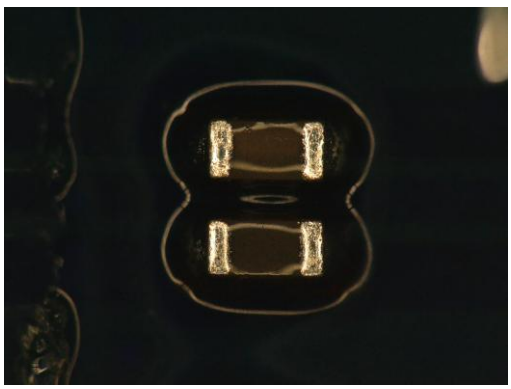
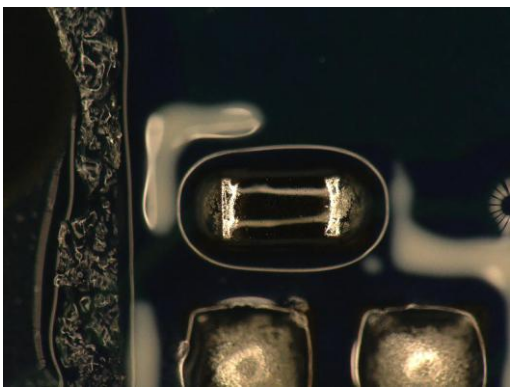
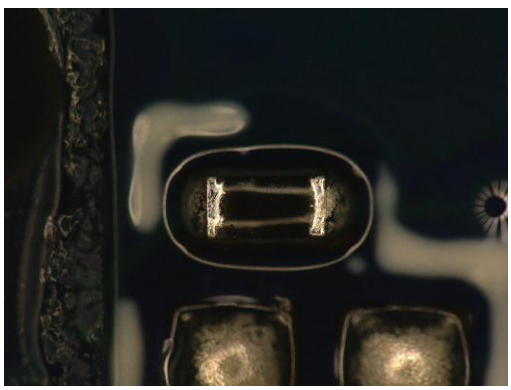
Location	Before Test (Day0)	After Test (Day5)
TV#03_08		
Results	No Corrosion	No Corrosion
TV#03_09		
Results	No Corrosion	Pitting/Pore Corrosion
TV#03_10		
Results	No Corrosion	No Corrosion

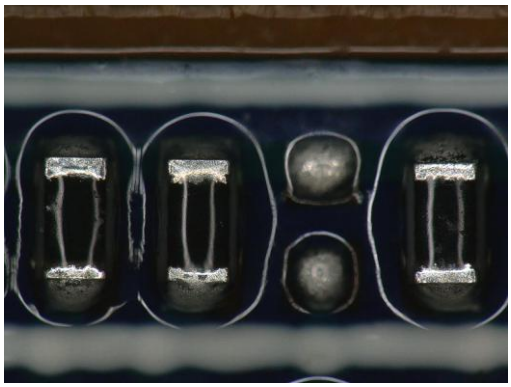
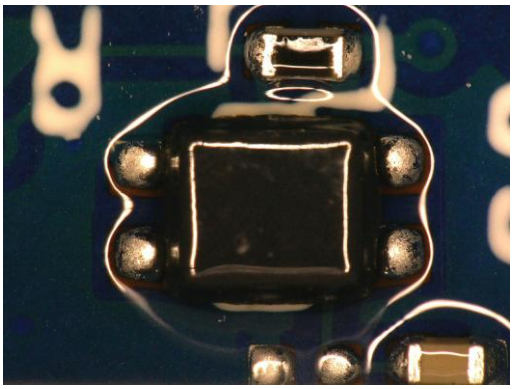
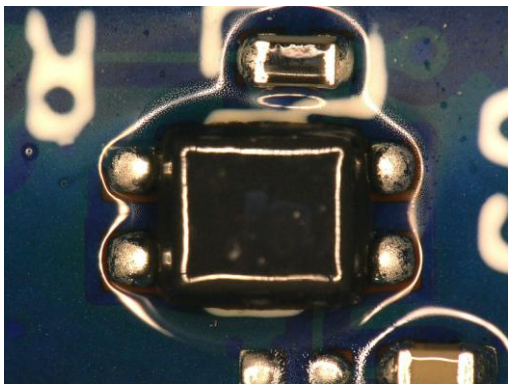
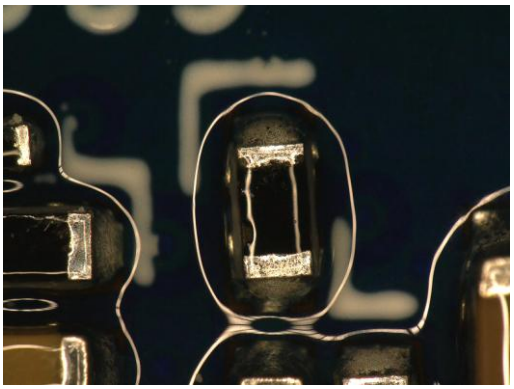
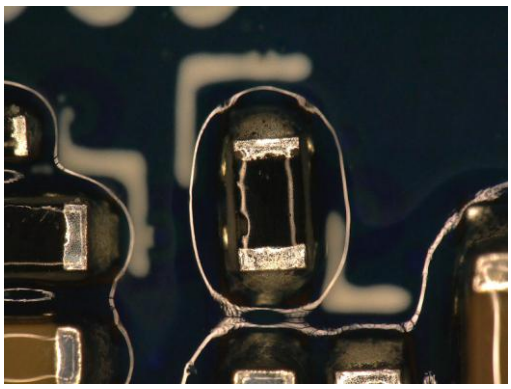
Location	Before Test (Day0)	After Test (Day5)
TV#04_01		
Results	No Corrosion	No Corrosion
TV#04_02		
Results	No Corrosion	No Corrosion
TV#04_03		
Results	No Corrosion	No Corrosion

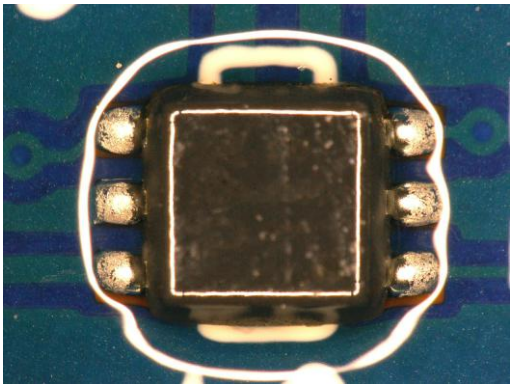
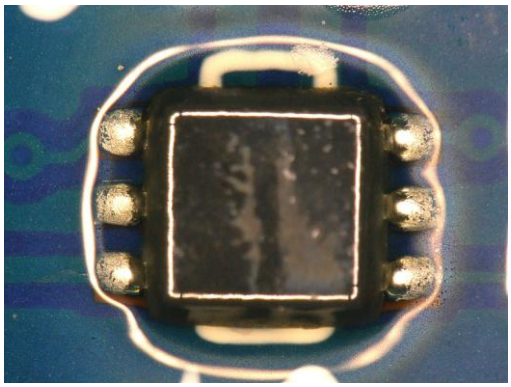
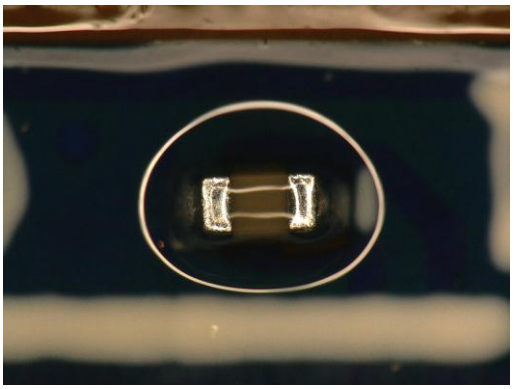
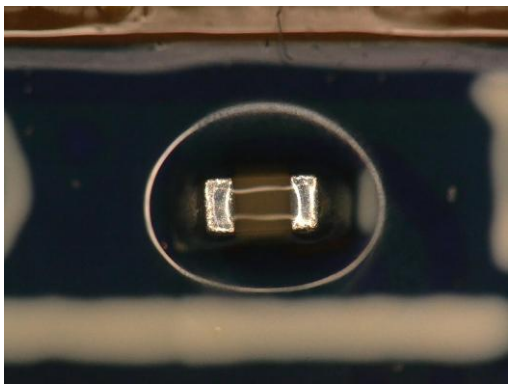
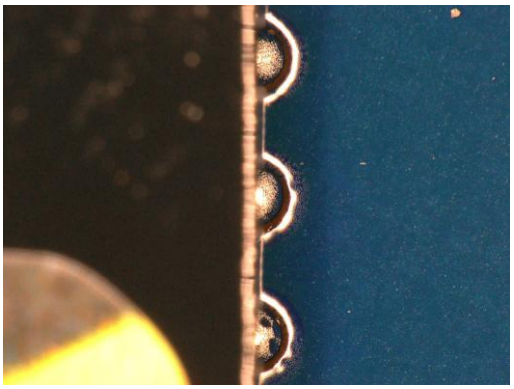
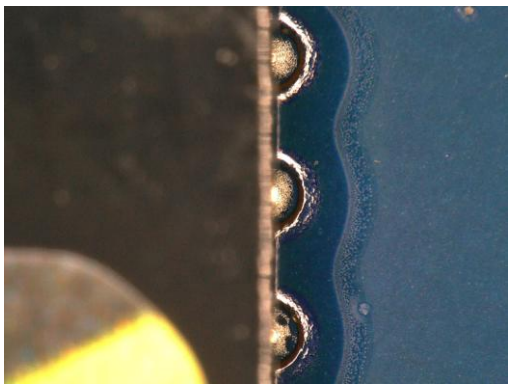
Location	Before Test (Day0)	After Test (Day5)
TV#04_04		
Results	No Corrosion	No Corrosion
TV#04_05		
Results	No Corrosion	No Corrosion
TV#04_06		
Results	No Corrosion	No Corrosion

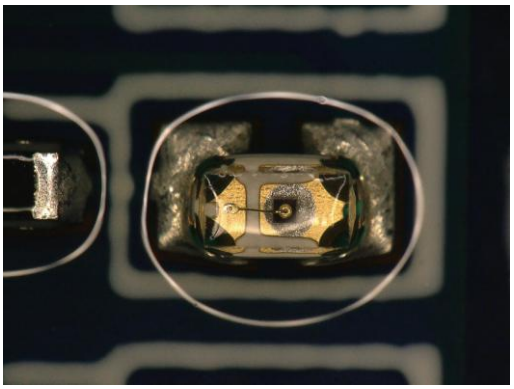
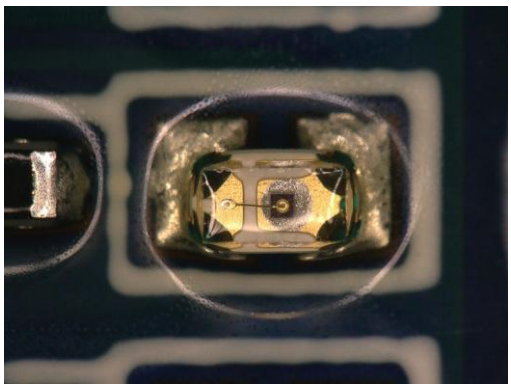
Location	Before Test (Day0)	After Test (Day5)
TV#04_07		
Results	No Corrosion	No Corrosion
TV#04_08		
Results	No Corrosion	No Corrosion
TV#04_09		
Results	No Corrosion	No Corrosion

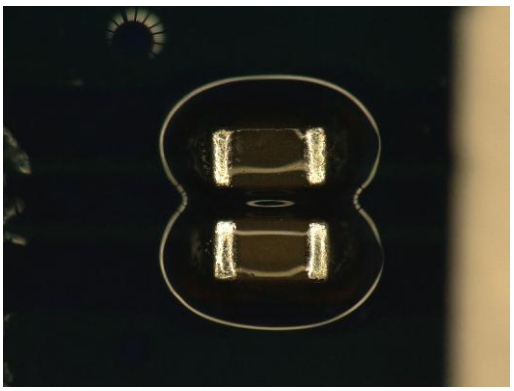
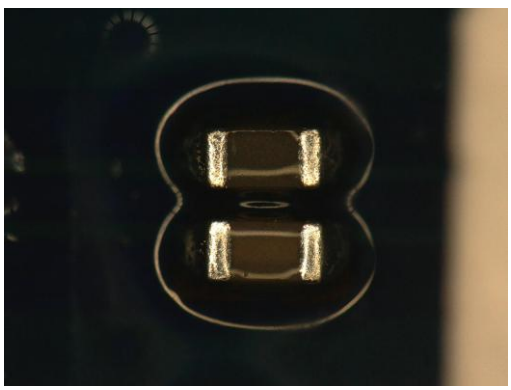
Location	Before Test (Day0)	After Test (Day5)
TV#04_10		
Results	No Corrosion	No Corrosion

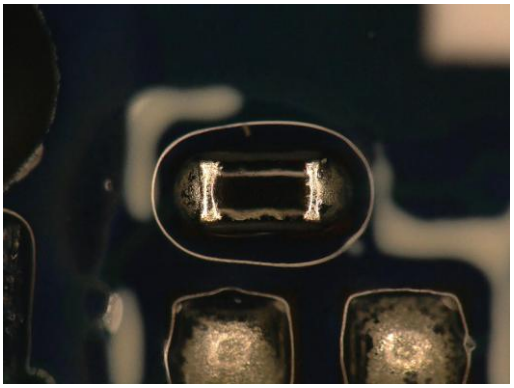
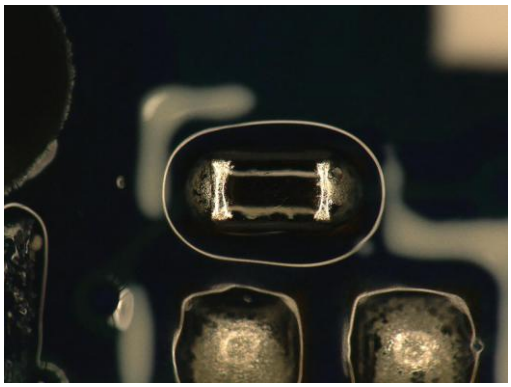
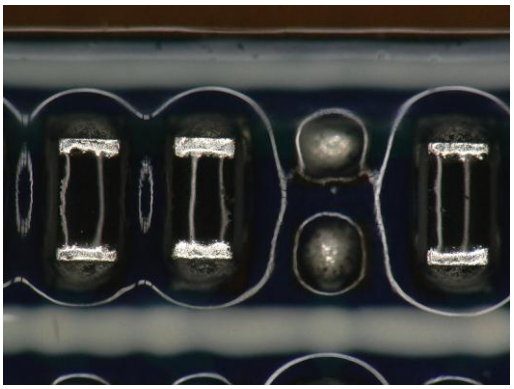
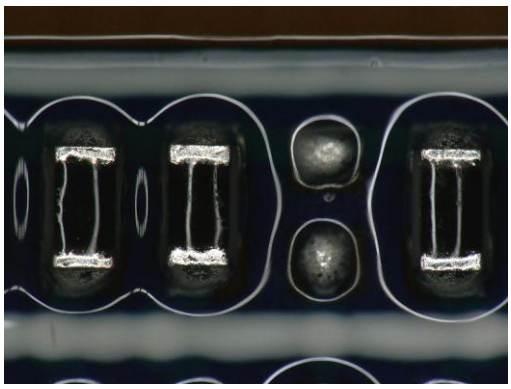
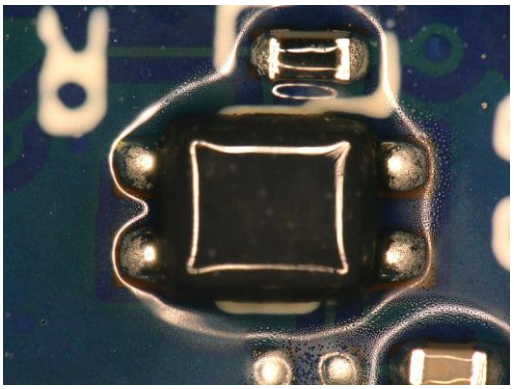
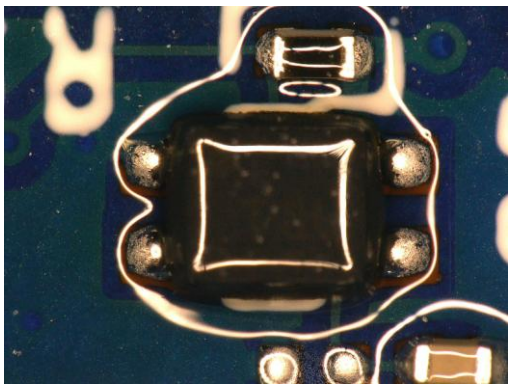
Location	Before Test (Day0)	After Test (Day5)
TV#05_01		
Results	No Corrosion	No Corrosion
TV#05_02		
Results	No Corrosion	No Corrosion

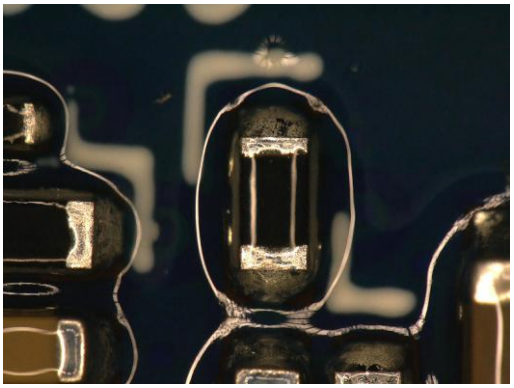
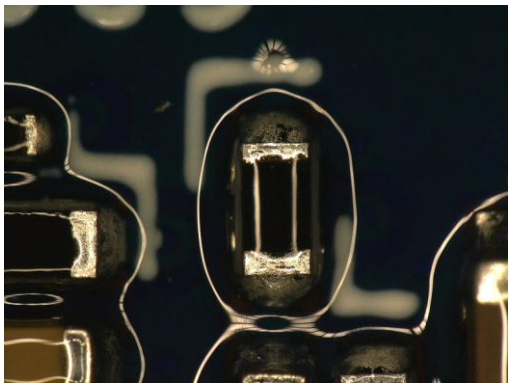
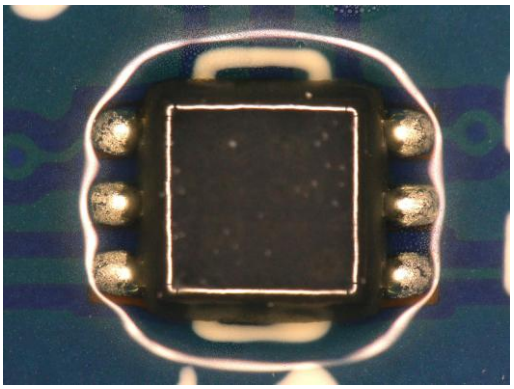
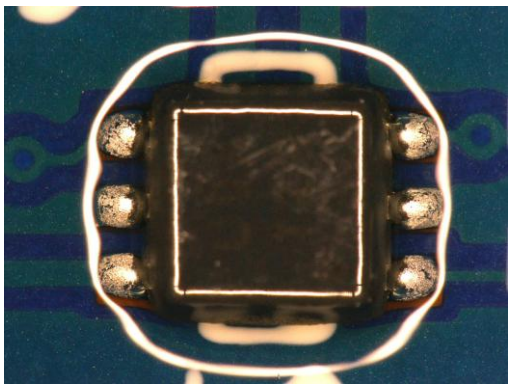
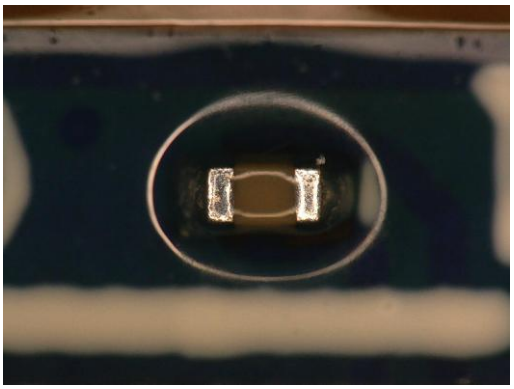
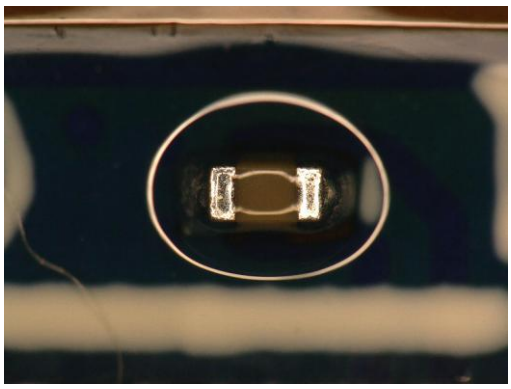
Location	Before Test (Day0)	After Test (Day5)
TV#05_03		
Results	No Corrosion	No Corrosion
TV#05_04		
Results	No Corrosion	No Corrosion
TV#05_05		
Results	No Corrosion	No Corrosion

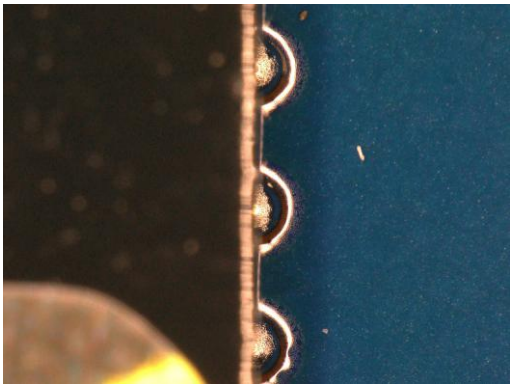
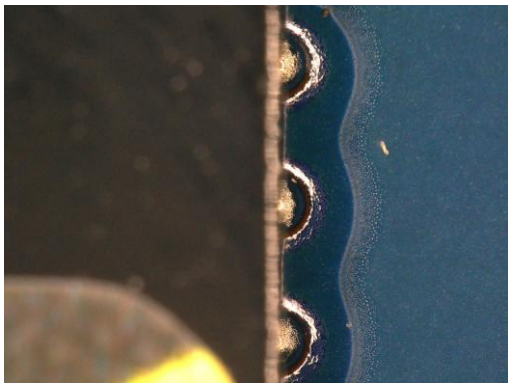
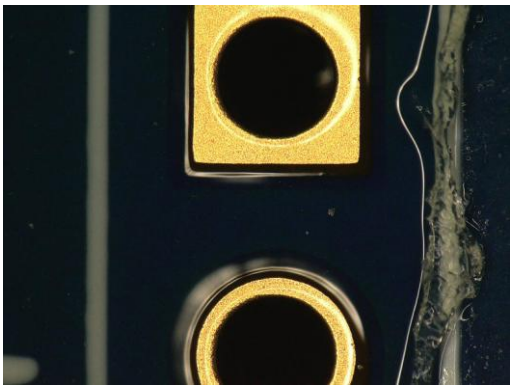
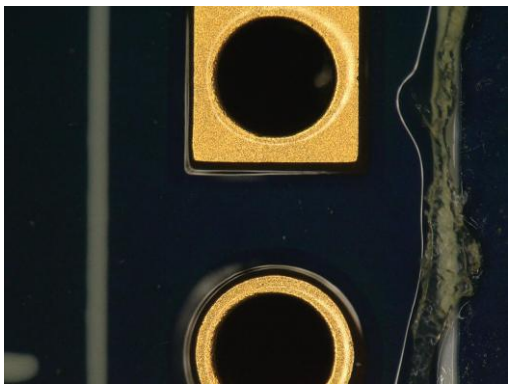
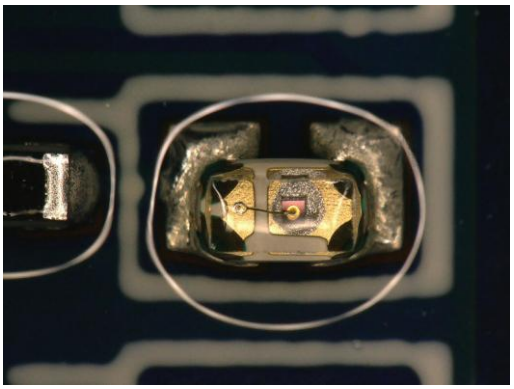
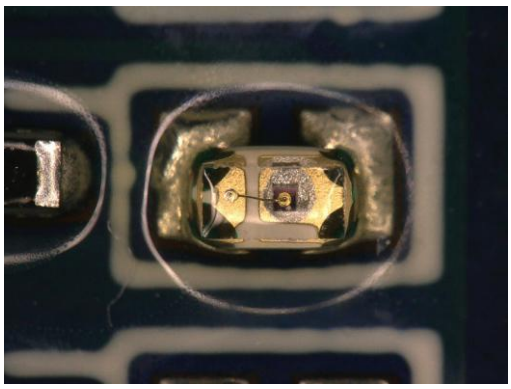
Location	Before Test (Day0)	After Test (Day5)
TV#05_06		
Results	No Corrosion	No Corrosion
TV#05_07		
Results	No Corrosion	No Corrosion
TV#05_08		
Results	No Corrosion	No Corrosion

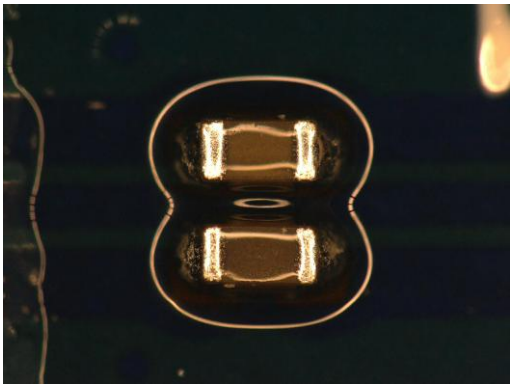
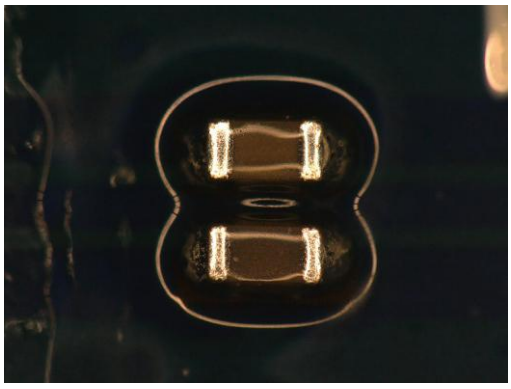
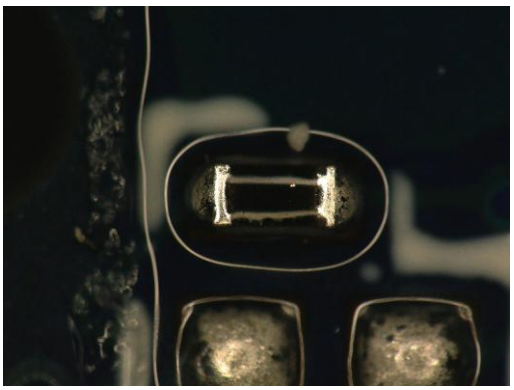
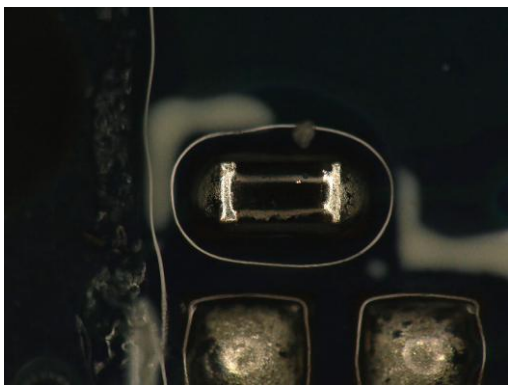
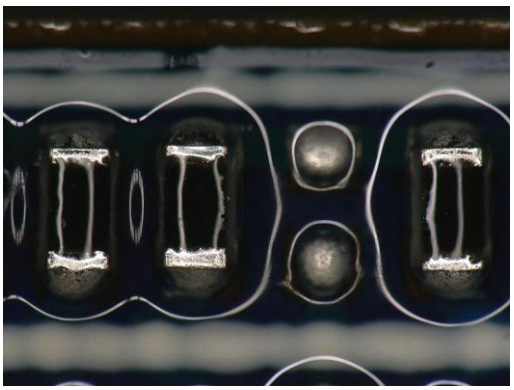
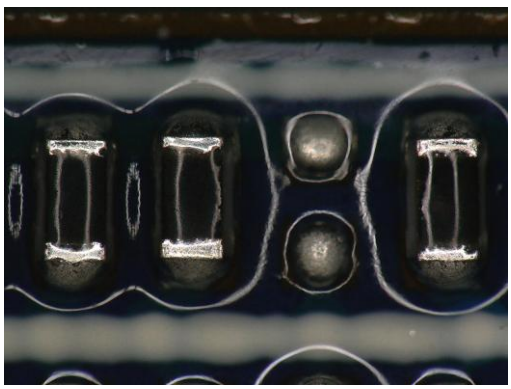
Location	Before Test (Day0)	After Test (Day5)
TV#05_09		
Results	No Corrosion	No Corrosion
TV#05_10		
Results	No Corrosion	No Corrosion

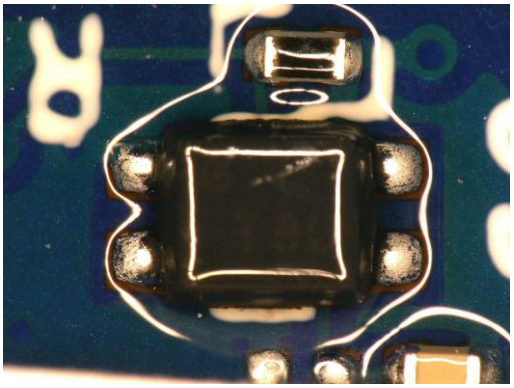
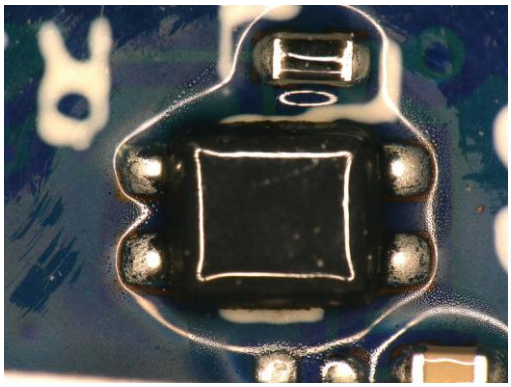
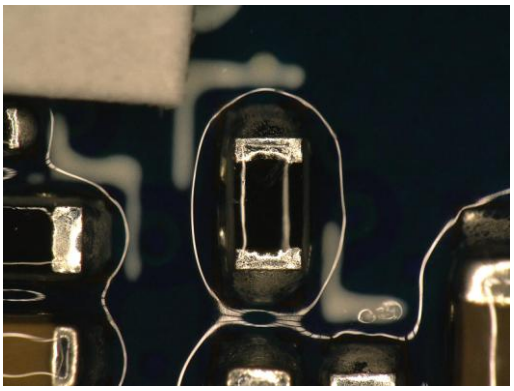
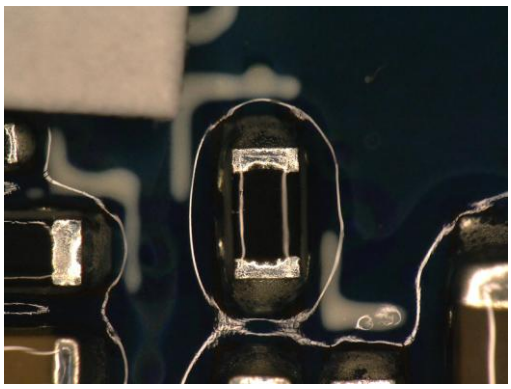
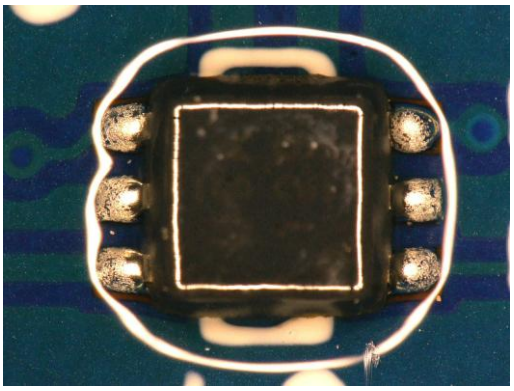
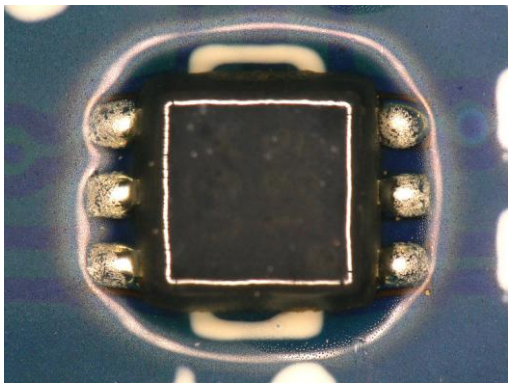
Location	Before Test (Day0)	After Test (Day5)
TV#06_01		
Results	No Corrosion	No Corrosion

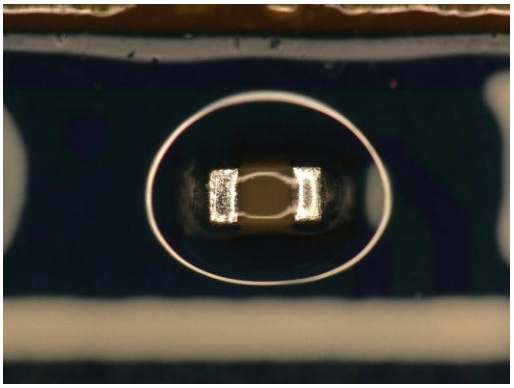
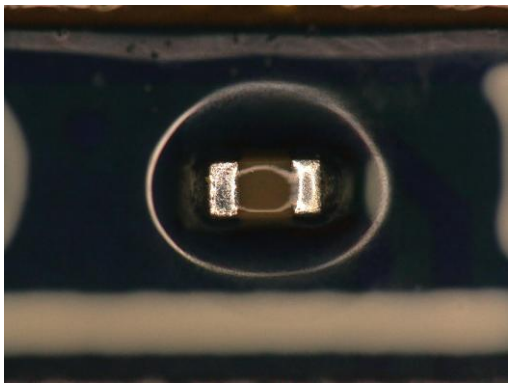
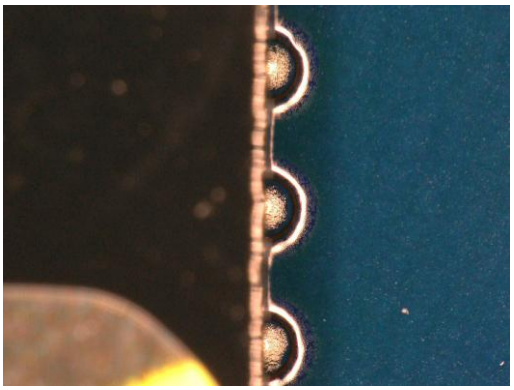
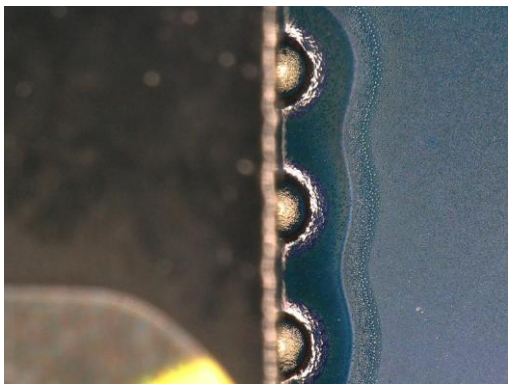
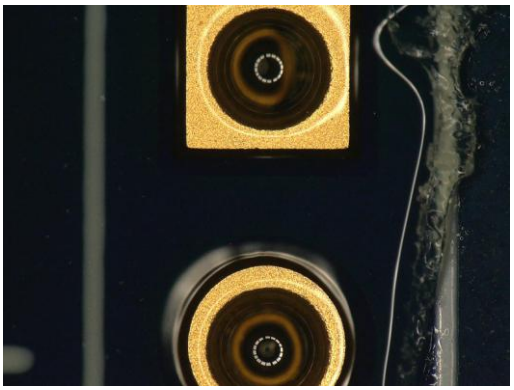
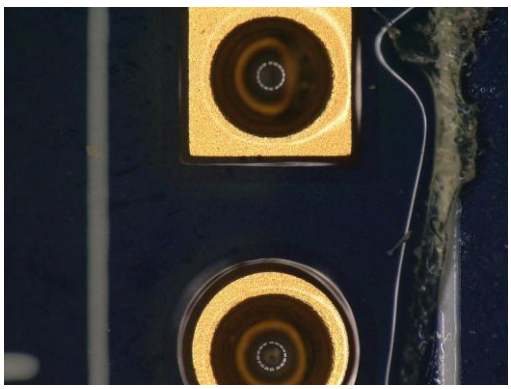
Location	Before Test (Day0)	After Test (Day5)
TV#06_02		
Results	No Corrosion	No Corrosion
TV#06_03		
Results	No Corrosion	No Corrosion
TV#06_04		
Results	No Corrosion	No Corrosion

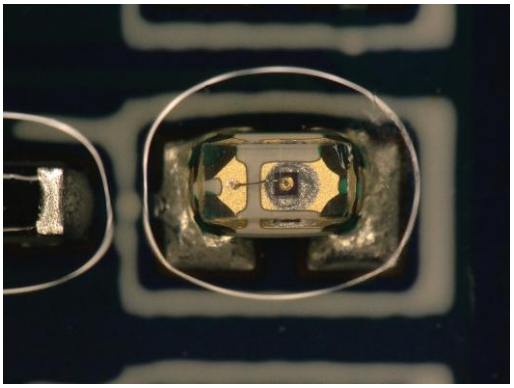
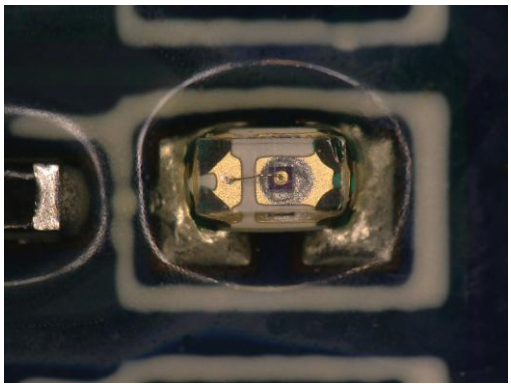
Location	Before Test (Day0)	After Test (Day5)
TV#06_05		
Results	No Corrosion	No Corrosion
TV#06_06		
Results	No Corrosion	No Corrosion
TV#06_07		
Results	No Corrosion	No Corrosion

Location	Before Test (Day0)	After Test (Day5)
TV#06_08		
Results	No Corrosion	No Corrosion
TV#06_09		
Results	No Corrosion	No Corrosion
TV#06_10		
Results	No Corrosion	No Corrosion

Location	Before Test (Day0)	After Test (Day5)
TV#07_01		
Results	No Corrosion	No Corrosion
TV#07_02		
Results	No Corrosion	No Corrosion
TV#07_03		
Results	No Corrosion	No Corrosion

Location	Before Test (Day0)	After Test (Day5)
TV#07_04		
Results	No Corrosion	No Corrosion
TV#07_05		
Results	No Corrosion	No Corrosion
TV#07_06		
Results	No Corrosion	No Corrosion

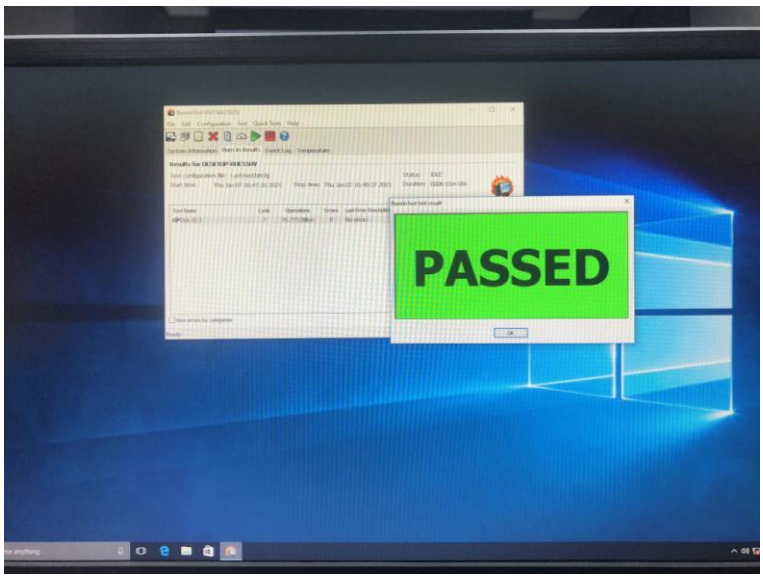
Location	Before Test (Day0)	After Test (Day5)
TV#07_07		
Results	No Corrosion	No Corrosion
TV#07_08		
Results	No Corrosion	No Corrosion
TV#07_09		
Results	No Corrosion	No Corrosion

Location	Before Test (Day0)	After Test (Day5)
TV#07_10		
Results	No Corrosion	No Corrosion

Attachment 2：

Please refer to the results of functional test after MFG test as below:

TV # ID	Model	P/N NO.	S/N NO.	Functional Test
#01	SX250-M280	A52.255LHB.002NA	122048500935	Passed
#02			122048500936	Passed
#03			122048500937	Passed
#04			122048500938	Passed
#05			122048500939	Passed
#06			122048500940	Passed
#07			122048500941	Passed



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