

8D REPORT

Part 1 : 客訴資料 (Issue Information)

客戶名稱 Customer	Foxconn	收件日 Receiving date	2021/02/20
客訴編號 Issue number	20210220-1	客戶料號 Customer part number	NA
業務 Sales	Dinel	樣本數 Return samples	7PCS
機種 Model	19-137/R6GHBHC/S1906/2T(HFX)	批號 Lot number	NA
料號 Part number	S10B015513	批量 Lot size	NA
製造日期碼 Production date	NA	不良率 Defective rate	800pcs/1,000,000pcs=0.08%
客戶反應問題 Custom's Complaint	Color shift		

Date:

(客訴日期) Date receive by EL:	(4D 回覆日期) 4D sent out:	(8D 回覆日期) 8D send out:	(第九次修改) 9 st revised:	(第十次修改) 10 nd revised:	(結案日期) Closed by customer
2021/02/20			2021/04/24	2021/04/30	

Part 2 : 報告內容 (Report Content)

D1: ESTABLISH TEAMS (組成小組)	
業務 (Sales):	Dinel
技術單位 (Technology):	
產線 (Production):	
品保 (QA):	Tommy

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D2: PROBLEM DESCRIPTION (問題敘述)

Customer information

Information related to the occurrence of client defects	Instructions
What happened?	Color shift
Why is it a problem?	Color shift was found in end user
When it happened?	2021/02/18
Who detected the problem?	End user
Where detected?	End user's module
How detected?	Visual observation
How many fail quantity? Fail quantity/ Input quantity/Fail rate	800pcs/1,000,000pcs=0.08%

Everlight information

Trouble spots	Phenomenon that
What symptom do EL see on our parts?	Color shift
Was parts reworked by EL?	NO
When was it manufactured at EL?	NA
Which machine?	NA
Can EL detect the defect with present process?	NA
Is this a repeated complaint?	Not enough information

2.1 Preliminary Sample Verification

7PCB client feedback received OTT box light panel

Due to rush analysis of aging, so 6933 was not shot.

Customer feedback 7PCB OTT module, picture as show in below:

6672-6B	6772-6F	6672-X4	6672-Z0
			
6691-NC	6806-E3	6933	
		NA	

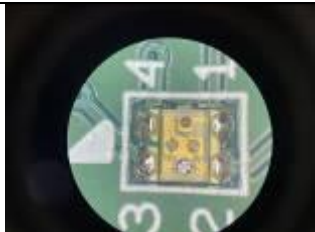
customer feedback information as list:

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19-137R6GHBHCS19062T(HFX)色差RMA analysis		
Issue	White → Purple	White → Yellow
PCB Lot 4 SN	1. 6536 2. 6672 3. 6806 4. 6933	1. 6672(X4) 2. 6672(6F) 3. 6672(6B) 4. 6691
Description of situation	1. 6536: Red pin is short with Green pin by soldering 2. 6672, 6806 and 6933 Green will not light up by digital meter	1. 6672(X4): Blue is more dark 2. 6672(6B): Green is more dark 3. 6672(6F), 6672(6B) and 6691 Blue will not light up by digital meter
Analysis Steps	1. LED check by eyes: →6536: is fail(Red pin short to Green pin) 2. confirm whether RGB is shorted each other →6536: is fail(Red pin short to Green pin) 3. confirm whether RGB is shorted to GND →4pcs is pass 4. power up by digital meter and confirm RGB is light up →6672, 6806, 6933 Green is not light up 5. confirm LED circuit parts is workable →4pcs is pass	1. LED check by eyes: →4pcs is pass 2. confirm whether RGB is shorted each other →4pcs is pass 3. confirm whether RGB is shorted to GND →4pcs is pass 4. power up by digital meter and confirm RGB is light up →6672(X4): Blue is more dark than others →6672(6B): Green is also more dark than others →6672(6F), 6672(6B) and 6691 Blue is not light up 5. confirm LED circuit parts is workable →4pcs is pass

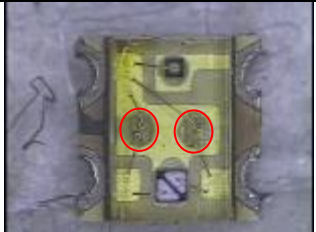
Before unsoldering pictures:

Due to rush analysis of aging, so 6933/6672-6B/6806-E3 was not shot.

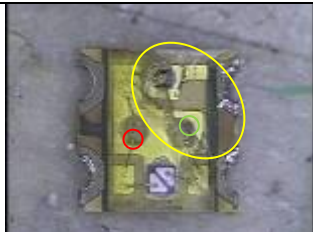
6672-6B	6672-6F	6672-X4	6672-Z0
NA			
6691-NC	6806-E3	6933	
	NA	NA	

After unsoldering observation in microscope

There are some epoxy resin color turn to yellowish, because of the heat in the unsoldering process.

6672-6B	6672-6F	6672-X4	6672-Z0
G/B chip pad color is abnormal(red frame) The epoxy scratch mark is cause in the unsoldering process.(yellow frame)	G/B chip pad color is abnormal(red frame)	G/B chip pad color is abnormal(red frame)	The epoxy resin is damage due to unsoldering time too much.
			

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6691-NC The epoxy scratch mark is cause in the unsoldering process.(yellow frame) G chip pad color is abnormal(red frame) The epoxy resin broken in the unsoldering process, and B chip golden wire was damaged in the same time.	6806-E3 The epoxy scratch mark is cause in the unsoldering process.(yellow frame)	6933 G chip pad color is abnormal(red frame)	
			

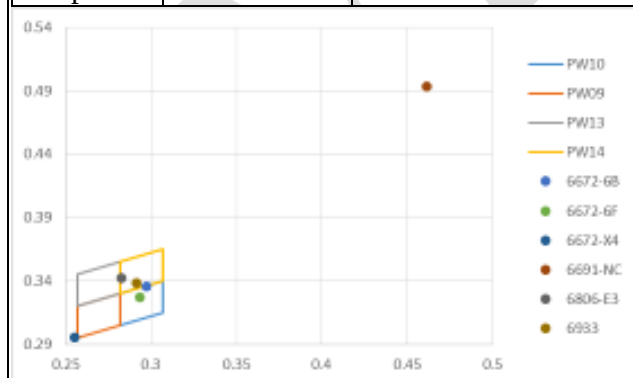
Electrical Test :

6691-NC CIE is not in the spec. 6672-Z0 is broken, can't be measured.

The blending brightness is all below the shipping Spec °

The red Mark part is out of specification.

		W		
		CIEX	CIEY	MIV
Yellow	6672-6B	0.29733	0.33592	108.7
Yellow	6672-6F	0.29377	0.32713	131.5
Yellow	6672-X4	0.25554	0.29556	176.02
Yellow	6691-NC	0.46149	0.49339	89.39
Purple	6806-E3	0.28272	0.34231	143.45
Purple	6933	0.29147	0.33847	117.63
Purple	6672-Z0	NA		



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DATASHEET
SMD • B
19-137/R6GHBHC/S1906/2T

EVERLIGHT

Bin Range of Luminous Intensity

Bin Code	Min	Max	Unit	Condition
S1	180.0	225.0	mcd	R6 : IF=7.0mA
S2	225.0	285.0		GH : IF=7.0mA
I1	285.0	360.0		BH : IF=5.0mA

DATASHEET
SMD • B
19-137/R6GHBHC/S1906/2T

EVERLIGHT

Bin Code	CIE_x	CIE_y	Condition
PW09	0.257	0.295	R6 : IF=7.0mA GH : IF=7.0mA BH : IF=5.0mA
	0.257	0.320	
	0.282	0.330	
	0.282	0.305	
PW 10	0.282	0.305	
	0.282	0.330	
	0.307	0.340	
	0.307	0.315	
PW13	0.257	0.320	
	0.257	0.345	
	0.282	0.355	
	0.282	0.330	
PW14	0.282	0.330	
	0.282	0.355	
	0.307	0.365	
	0.307	0.340	

There was no abnormality after red light measurement
Green light number :6672-6B/6672-6F/6691-NC/6933 Low brightness
Blue light number :6672-6B/6672-6F/6933 Low brightness
The red Mark part is out of specification.

R@7mA				
		IV(mcd)	DW(nm)	VF(V)
Yellow	6672-6B	28.70	620.57	1.88
Yellow	6672-6F	33.13	620.27	1.89
Yellow	6672-X4	37.3	620.28	1.89
Yellow	6691-NC	31.39	620.74	1.894
Purple	6806-E3	30.77	620.02	1.87
Purple	6933	28.34	625.41	1.845
Purple	6672-Z0	NA		
G@7mA				
		IV	DW	VF
Yellow	6672-6B	74.5	527.93	2.89
Yellow	6672-6F	90.1	530.17	2.98
Yellow	6672-X4	123.77	528.46	2.90
Yellow	6691-NC	59.59	528.84	2.897
Purple	6806-E3	102.45	532.71	3.069
Purple	6933	84.71	530.79	2.836
Purple	6672-Z0	NA		

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B@5mA				
		IV	DW	VF
Yellow	6672-6B	9.20	469.29	2.86
Yellow	6672-6F	11.06	468.26	2.88
Yellow	6672-X4	18.7	468.1	2.91
Yellow	6691-NC	NA		
Purple	6806-E3	13.09	470.60	2.887
Purple	6933	12.78	468.5	2.90
Purple	6672-Z0	NA		

Electro-Optical Characteristics (Ta=25°C)

Parameter	Symbol	Code	Min.	Typ.	Max.	Unit	Condition
Luminous Intensity	I _v	R	28.5	----	72.0	mcd	R6 : IF=7mA
		G	112.0	----	285.0	mcd	GH : IF=7mA
		B	14.5	----	36.0	mcd	BH : IF=5mA
		Mix*	180.0	----	360.0	mcd	
Viewing Angle	2θ _{1/2}		100	120	140	Deg	
Peak Wavelength	λ _p	R6	----	632			
		GH	----	518		nm	
		BH	----	468			
Dominant Wavelength	λ _d	R6	616	----	632		R6 : IF=7mA
		GH	515	----	535	nm	GH : IF=7mA
		BH	460	----	475		BH : IF=5mA
Forward Voltage	V _F	R6	1.6	----	2.2		
		GH	2.5	----	3.3	V	
		BH	2.4	----	3.2		

分析小結:

- (1) Under the microscope, it was confirmed that the four PIN side colloid of the unsoldered material all had discoloration under heat.
- (2) Blackening of 6672-6B/6672-6F/6672-X4/6691-NC/6933 G/B PAD was confirmed under microscope.
- (3) The blending brightness is all below the shipping Spec °
- (4) There was no abnormality after red light measurement
- (5) Green light number :6672-6B/6672-6F/6691-NC/6933 Low brightness
- (6) Blue light number :6672-6B/6672-6F/6933 Low brightness
- (7) Because the blue/green light chip PAD has seen discoloration, suspected by the overcurrent/overvoltage impact burned marks; So forward the chip supplier (Txxxx) analysis.

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Chip supplier confirmation information:

Customer Everlight reported that our OB/OG products were packaged in 19-137 finished products and sent to the end customer

Abnormal light color caused by dead light and faint brightness when using, provide defective sample SMD 3 EA. For analysis.



The customer (Everlight) provides an abnormal SMD sample of 3 eA. The appearance is as follows. Each SMD package contains an RGB chip and a Zener 1 eA each °

The surface of 6672(X4) was transparent, the surface of OG wafer N-pad had a more affectionate color, and the surface of 6672(6F) and 6933 samples was yellow °

Keithley source meter was used to test the sample. Due to the inclusion of Zener diode relationship, the reverse current was relatively high. However, no obvious abnormality was found in the voltage, and the bare crystal state would be reconfirmed °

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Sample	6672(X4)	6672(6F)	6933
SMD			
OB			
OG			

6672(X4)		
NO.	OB	OG
Vf (5 mA)	2.89	2.78
Ir (-7V)	100	100
6672(6F)		
NO.	OB	OG
Vf (5 mA)	2.84	2.85
Ir (-7V)	100	100
6933		
NO.	OB	OG
Vf (5 mA)	2.82	2.67
Ir (-7V)	100	100

QA/QC Department

After chemically de-caping the sample, OB/OG wafers were removed and the appearance was examined by microscope as follows. Except for part of the residue, no obvious abnormality was found in the naked crystal appearance after disassembly, and no darker color was observed on the electrode surface before disassembly. After the bare crystal was tested by our company's automatic testing machine, the voltage was within the normal specification range, and there was no high leakage problem, so it was determined that there was no failure of the chip itself.

Sample	6672(X4)	6672(6F)	6933
OB			
OG			

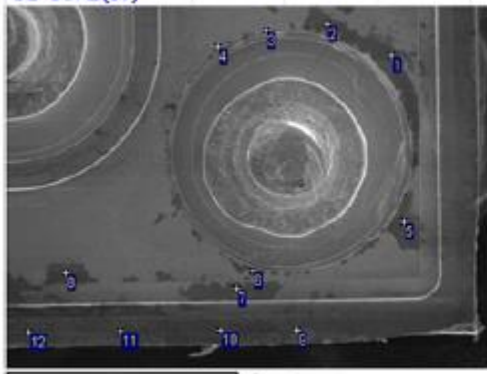
Sample	Chip	Vf (V)	Ir (uA)	Iv (mcd)	Wd (nm)
6672(6F)	OB	2.89	0.00	15.7	468.0
	OG	3.18	0.01	197.4	522.7
6672(X4)	OB	2.90	0.00	19.9	468.4
	OG	3.10	0.00	197.8	521.8
6933	OB	2.87	0.01	15.9	467.8
	OG	3.09	0.01	201.4	522.5

QA/QC Department

The wafer supplier (TXXXX) determines that there is no abnormality in the bare wafer °
 3/19 Chip supplier EDX analysis:
 After confirmation, there are faint bright Ag elements on the top of the wafer.

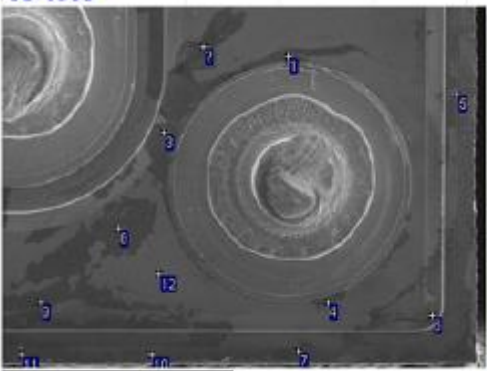
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OB-6672(6F)



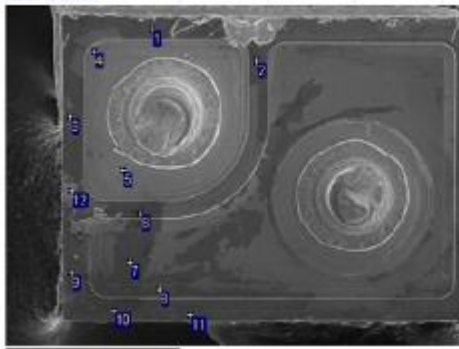
Spectrum	C	N	O	Si	Ga	Ag	In	Total
1		2.74	29.36	2.39	3.04		62.47	100
2	1.92	3.53	26.19	1.19	3.08		64.09	100
3	5.28		27.61	1.48	3.16	0.72	61.75	100
4		3.68	23.77	0.64	3.30		68.61	100
5		3.01	26.59	1.10	3.44		65.86	100
6	65.17		34.83					100
7	100.00							100
8		1.78	25.19	0.95	2.47	0.24	69.38	100
9	5.00	15.29	2.79	0.54	69.62	6.76		100
10	100.00							100
11	5.88	16.34	1.88		75.89			100
12	9.18	15.85	1.73		70.74	2.50		100

OB-6933



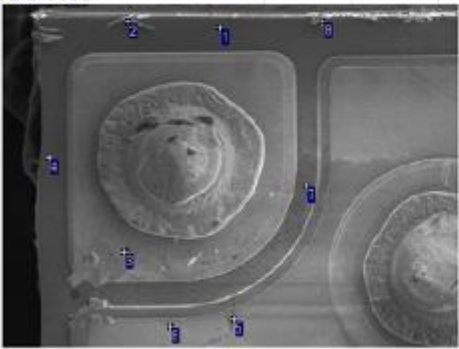
Spectrum	C	N	O	Si	Ga	Ag	In	Total
1	1.91	3.37	28.16	2.53	2.24	0.81	60.98	100
2	2.27	3.44	25.77	1.90	2.18	0.68	63.76	100
3	5.01	14.40	3.67	1.52	75.40			100
4	1.09	3.74	25.85	1.16	2.60		65.56	100
5	4.00	16.68	0.87		78.45			100
6	3.95	16.31	1.45		76.69	0.13	1.46	100
7	69.62		30.38					100
8		3.28	25.33	1.03	2.99		67.38	100
9	2.57	3.08	26.41	1.84	2.22	0.99	62.89	100
10	5.40	16.40	1.88		73.06	3.26		100
11	7.58	15.51	1.20		68.02	7.69		100
12		3.74	24.33	0.59	3.12		68.21	100

OB-6933



Spectrum	C	N	O	Si	Ga	Ag	In	Au	Total
1	4.88	15.54	4.00	0.52	75.06				100
2	5.15	15.68	4.70	0.79	73.49	0.19			100
3	4.94	15.67	3.63	0.70	74.35	0.71			100
4	4.71		4.50					90.69	100
5	66.00		34.00						100
6	19.77	15.82	8.20	1.21	55.00				100
7	1.70	3.91	26.13	1.20	2.46	0.63	63.97		100
8	5.57	14.93	2.52	0.70	76.16	0.12			100
9	6.62	16.03	1.50		75.08	0.67			100
10	8.80	15.27	1.34		73.60	0.99			100
11	6.44	16.51	1.13		74.63	1.29			100
12	28.28		47.06	0.69	23.97				100

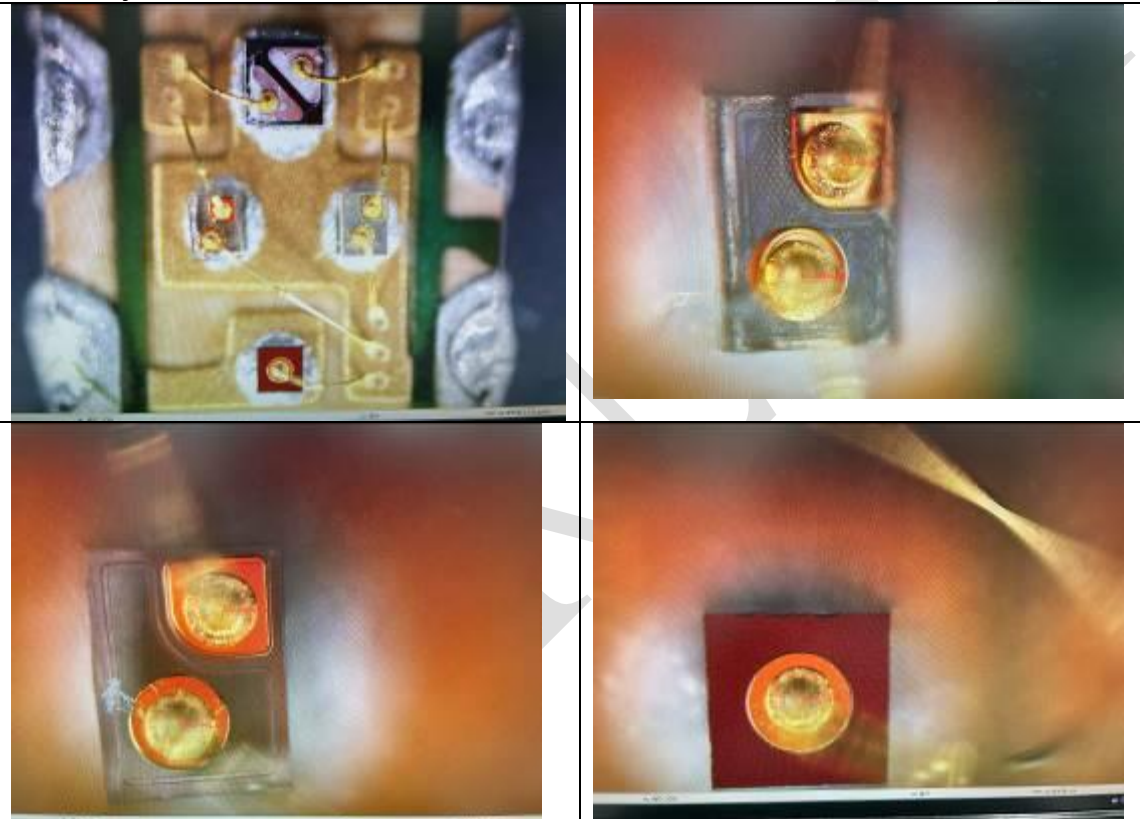
OG-6933



Spectrum	C	N	O	Si	Ga	Ag	In	Au	Total
1	3.95	17.45	1.42		76.99	0.19			100
2	11.13	9.69	5.85	1.69	56.66				100
3	15.11		9.64			0.19		72.40	100
4	4.08	17.59			78.33				100
5		4.27	23.79	0.46	4.36		57.13		100
6	2.23	4.80	25.32		3.38	1.52	62.76		100
7	4.82	16.95	1.56		76.38	0.28			100
8	28.52		14.27	2.85	28.21				100

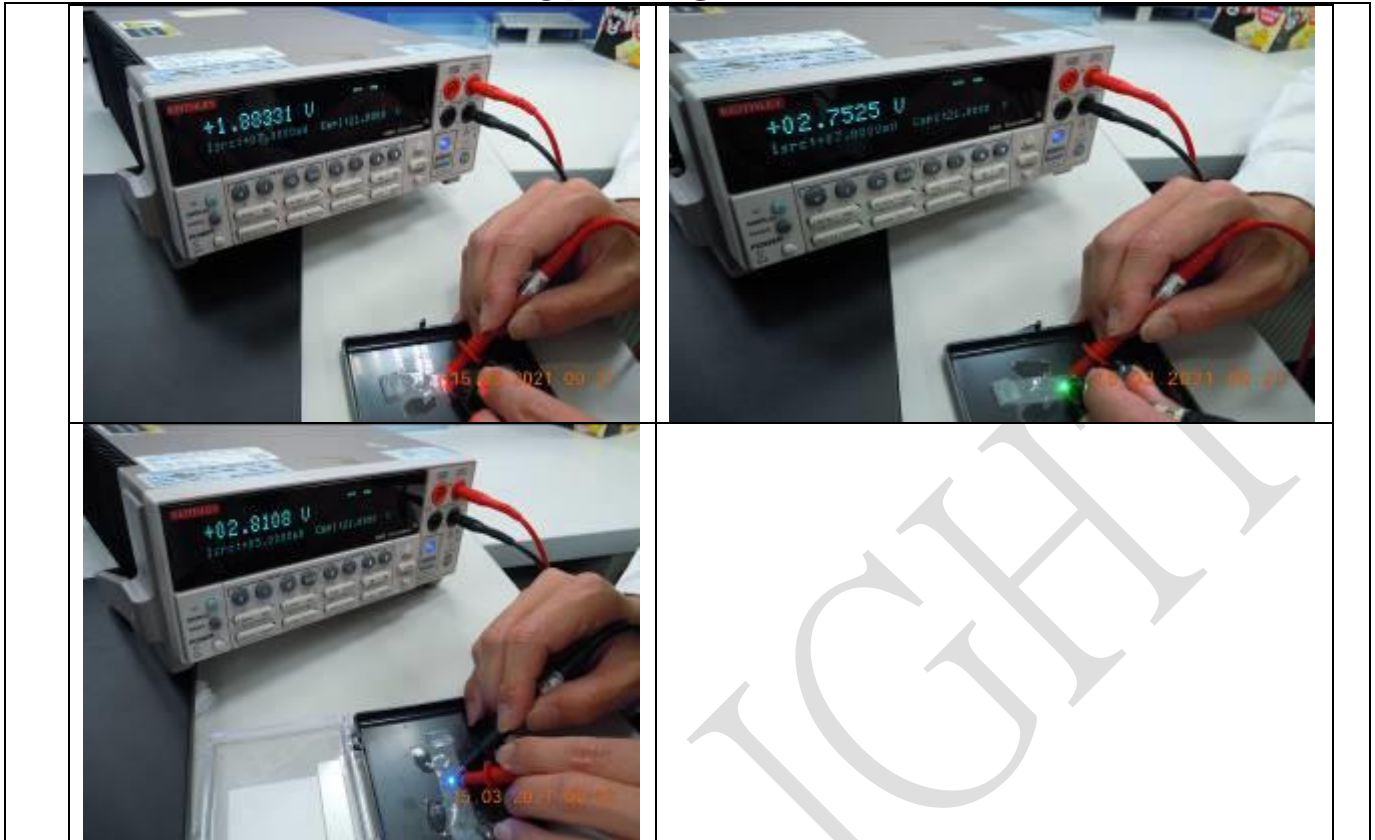
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No abnormality was found after DE-CAP.



Bare crystal light to confirm the wafer condition:
Light to confirm no electrical abnormality problem.

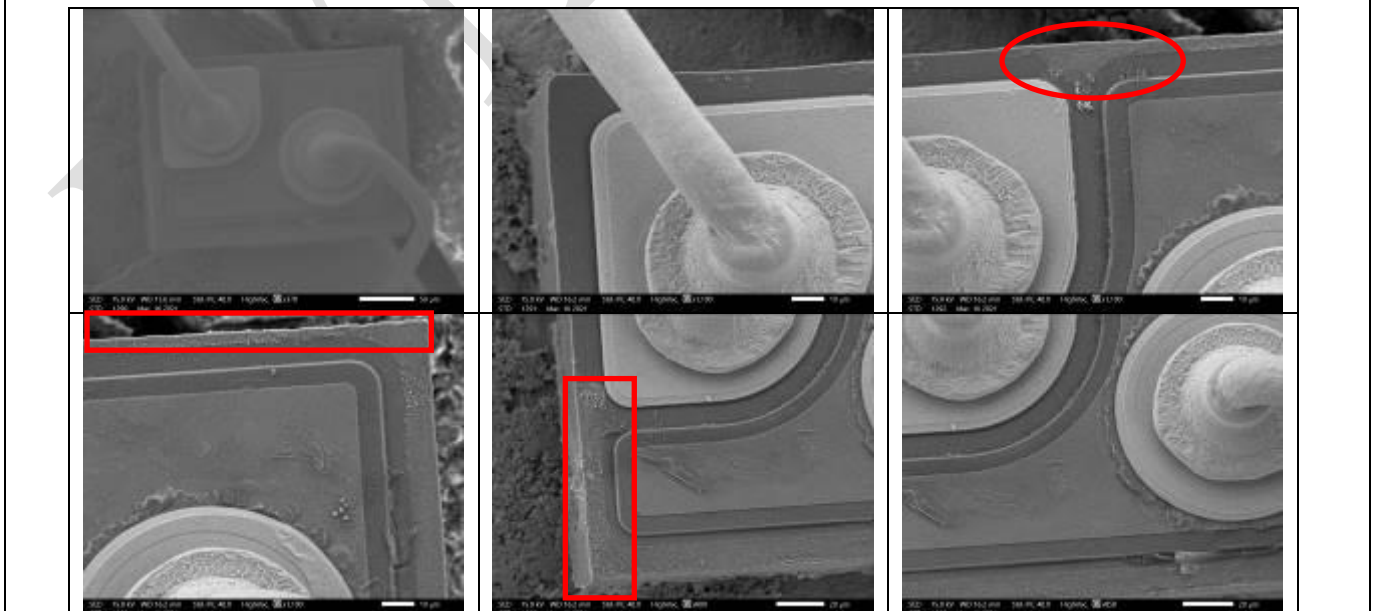
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The 6806 cannot be measured because of the shift of wafer after DE-CAP/the broken wire by mistake.

SEM(Scanning Electron Microscope)
6672-6B:

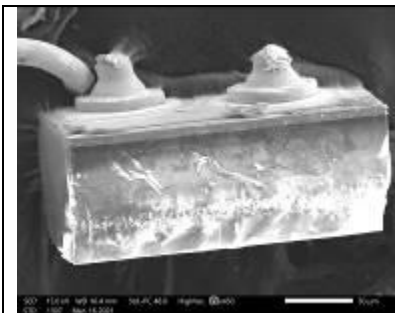
Confirm suspected foreign body on red Mark on front of chip °



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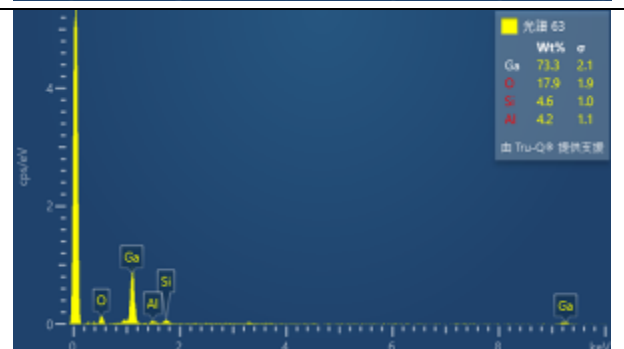
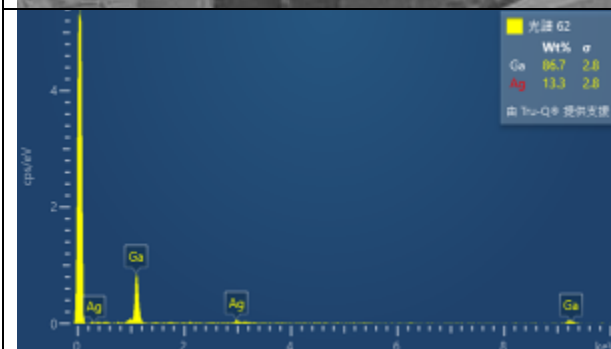
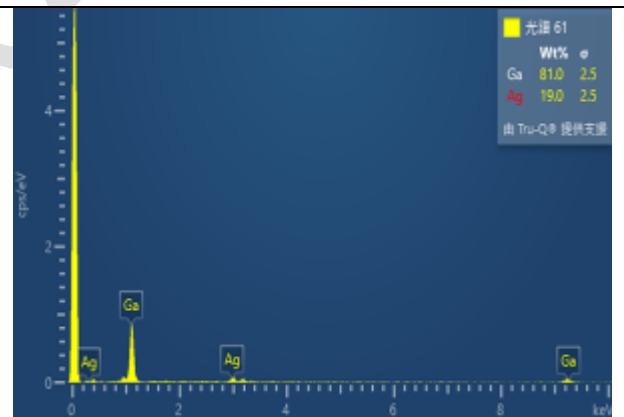
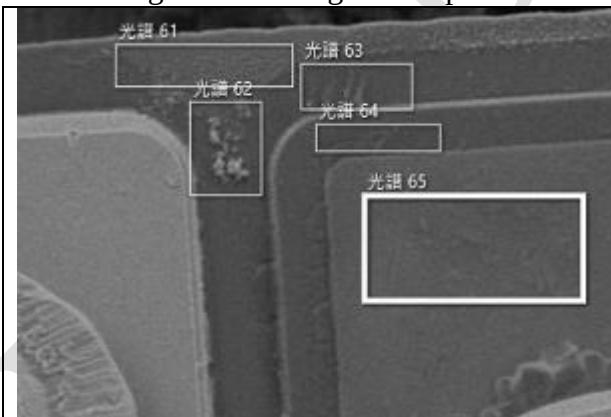


Suspected metal attachment on wafer side (red Mark) °

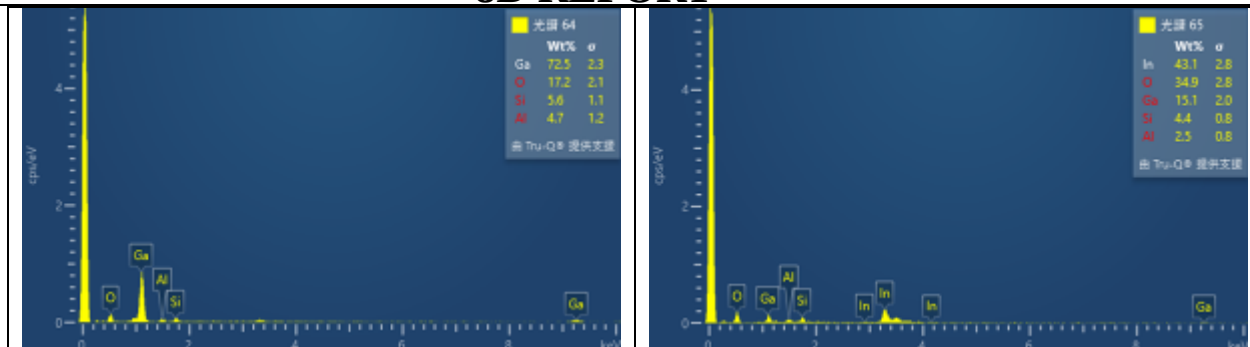


Energy-dispersive X-ray spectroscopy:

Ag, Ga, Si, Al, In after element confirmation; Among them, Ga, Al, In is the chip element /Si is the glue material /Ag is the silver glue composition.

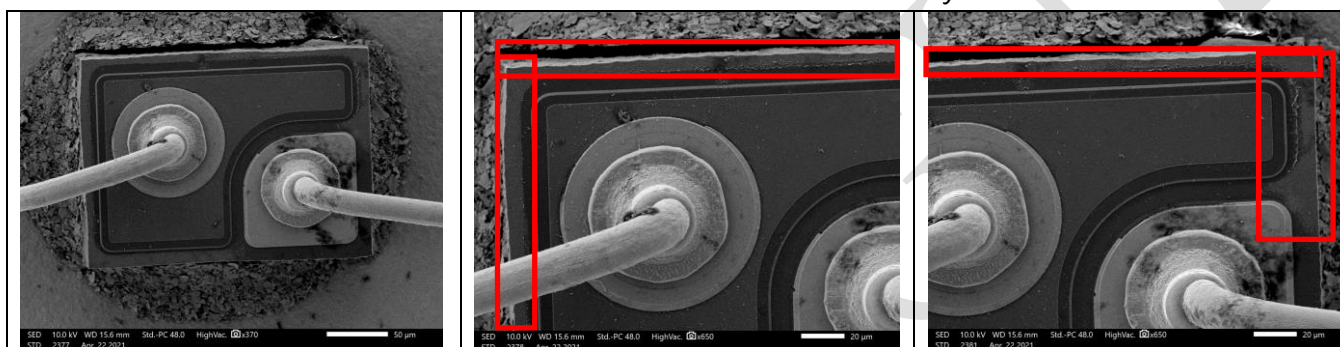


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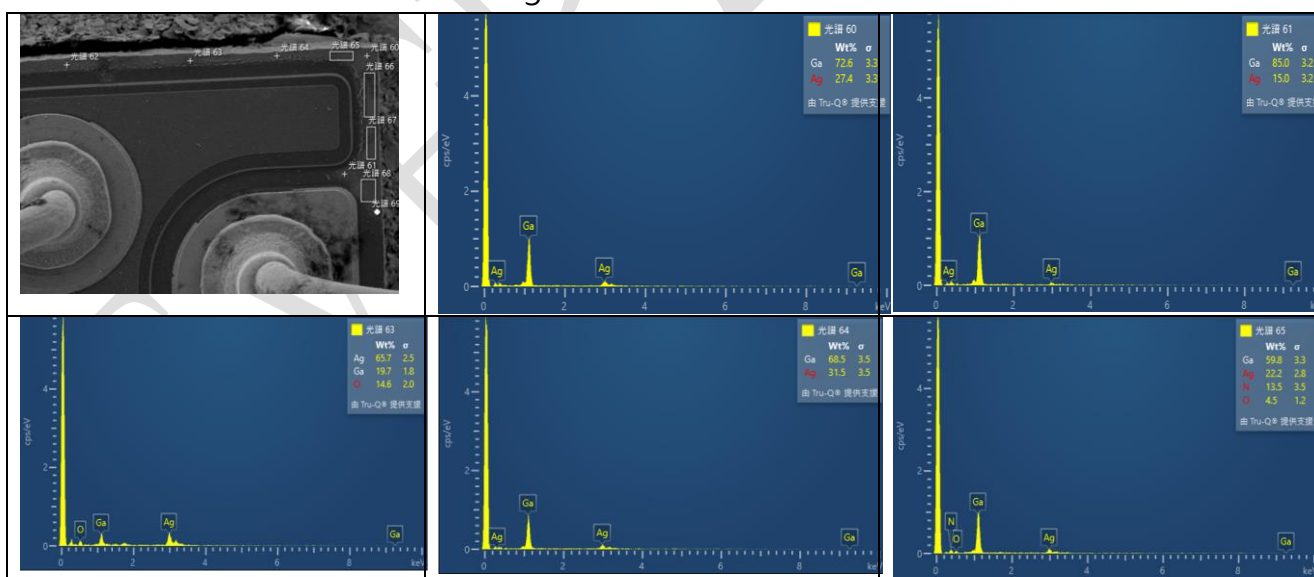


6691

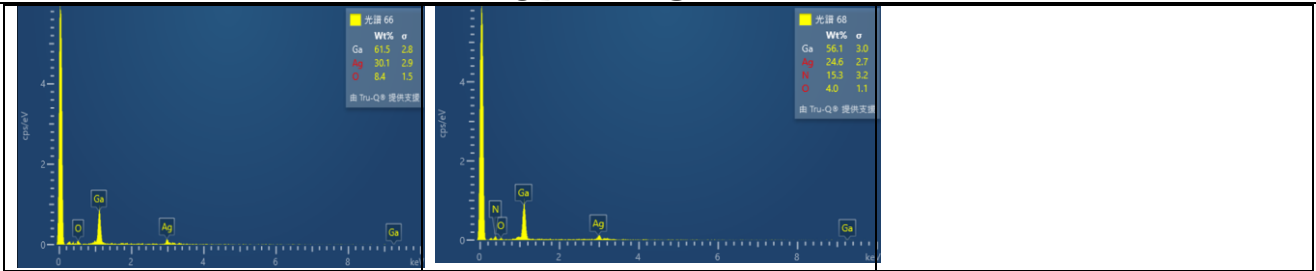
The adhesion material around the wafer surface was observed by SEM.



EDX confirmed the substance was Ag

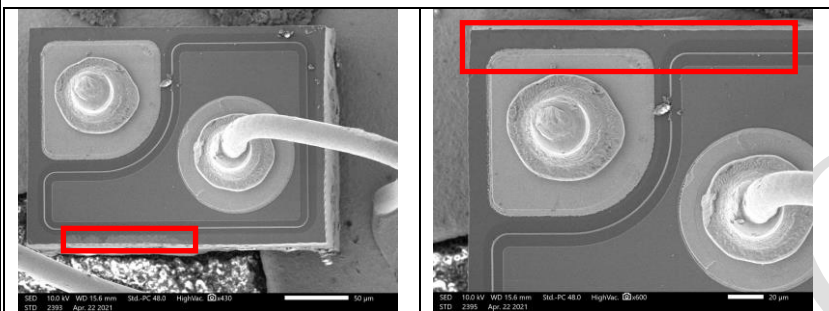


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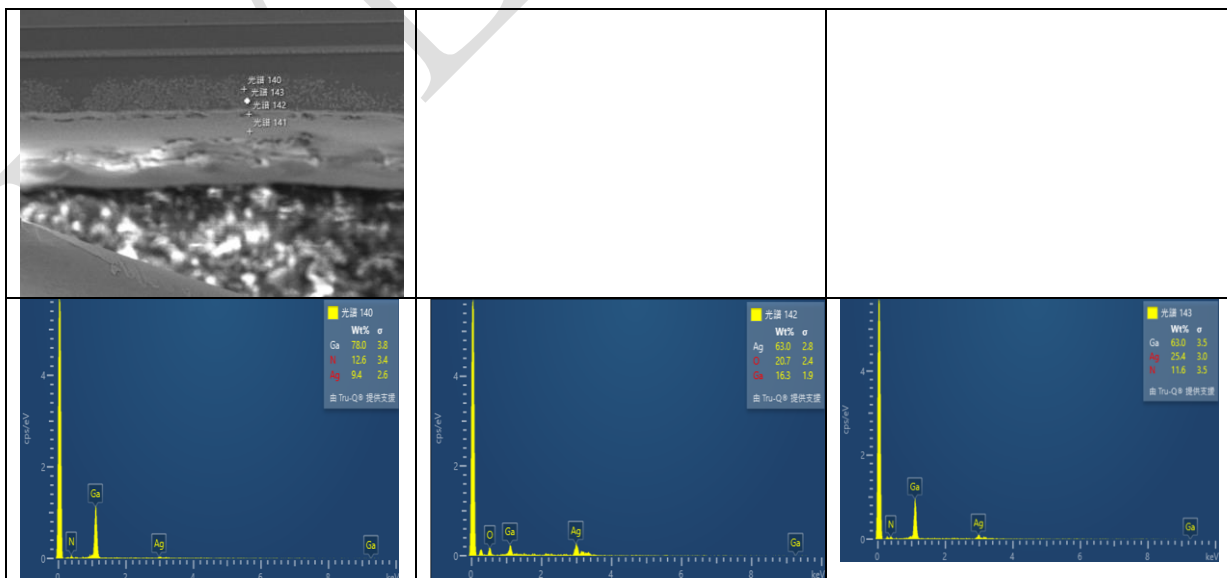
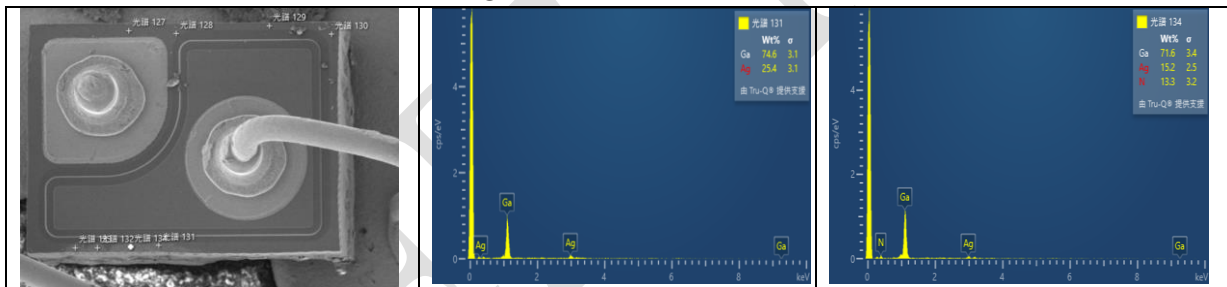


6806:

The adhesion material around the wafer surface was observed by SEM.

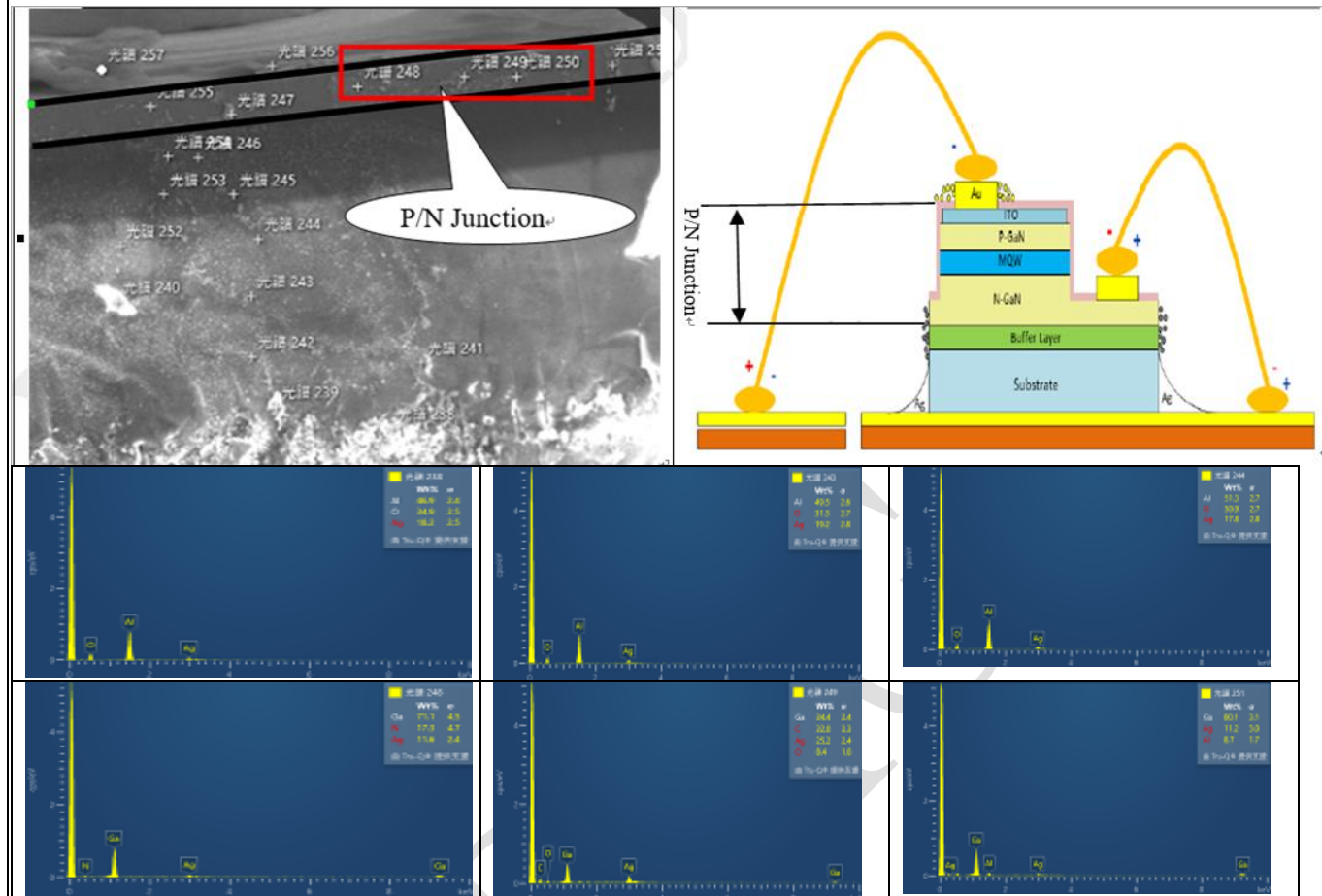


EDX confirmed the substance was Ag



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According to the results of EDX, the short circuit was caused by the adhesion of silver glue to the P/N Junction on the wafer surface.



Analysis conclusion:

(1) Analysis result show in following list

	Epoxy Crack	R-Pad colors are different	G- Pad colors are different	B- Pad colors are different
6672-6B	V		V	V
6672-6F			V	V
6672-X4			V	V
6672-Z0	V			
6691-NC	V		V	
6806-E3	V			
6933			V	V

(2) Electrical test shows the white light luminous intensity is decay. G/B chip pad color is abnormal, and

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IR (leak current) is found.
(3)6672-X4(yellow)/6672-6F(yellow)/6933(Purple) feedback to chip supplier confirm .
(4)3/3 chip supplier confirmed and replied that there was no abnormality in bare crystal.
(5)After selecting 6672-6B, the internal situation was confirmed and no abnormality was found.
(6)The electrical properties of bare crystal were not abnormal.
(7)The material was confirmed by EDX(Energy-Dispersive X-Ray Spectrometer), which confirmed that the silver powder of the silver glue was attached to the P/N Junction causing a leakage current condition.

D3: CHECK INVENTORY (庫存對策)

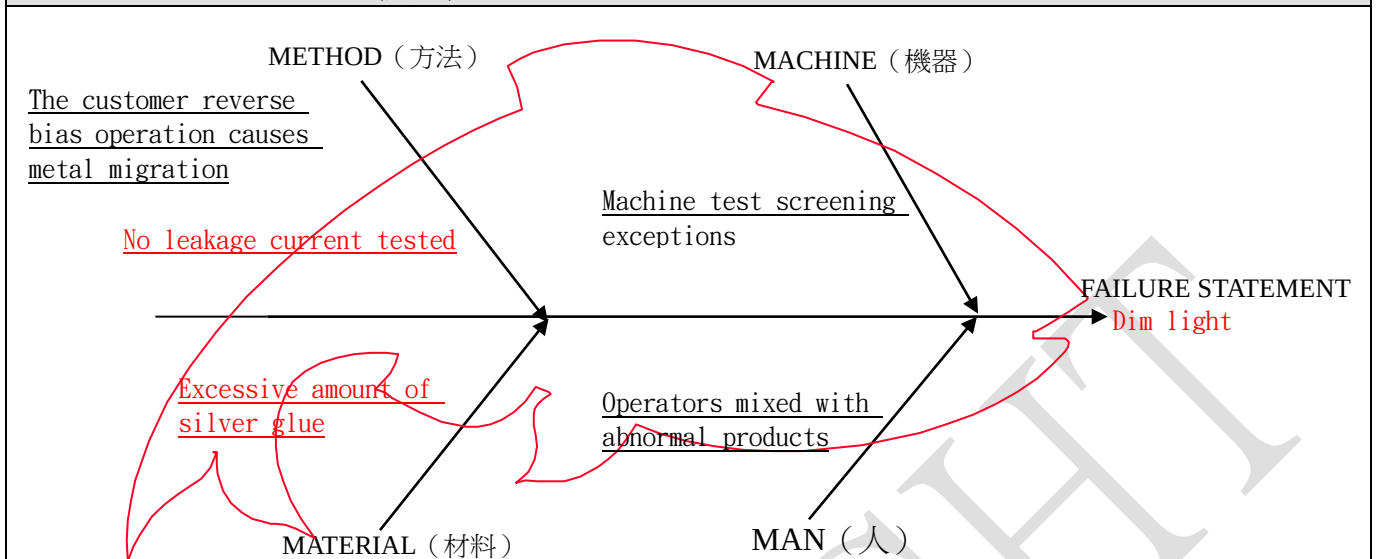
Action/Disposition	CW21040014
Inspection / Buy-off result	In the screen

SAP

NA

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D4: CAUSE ANALYSIS (真因)



Root Cause Verification:

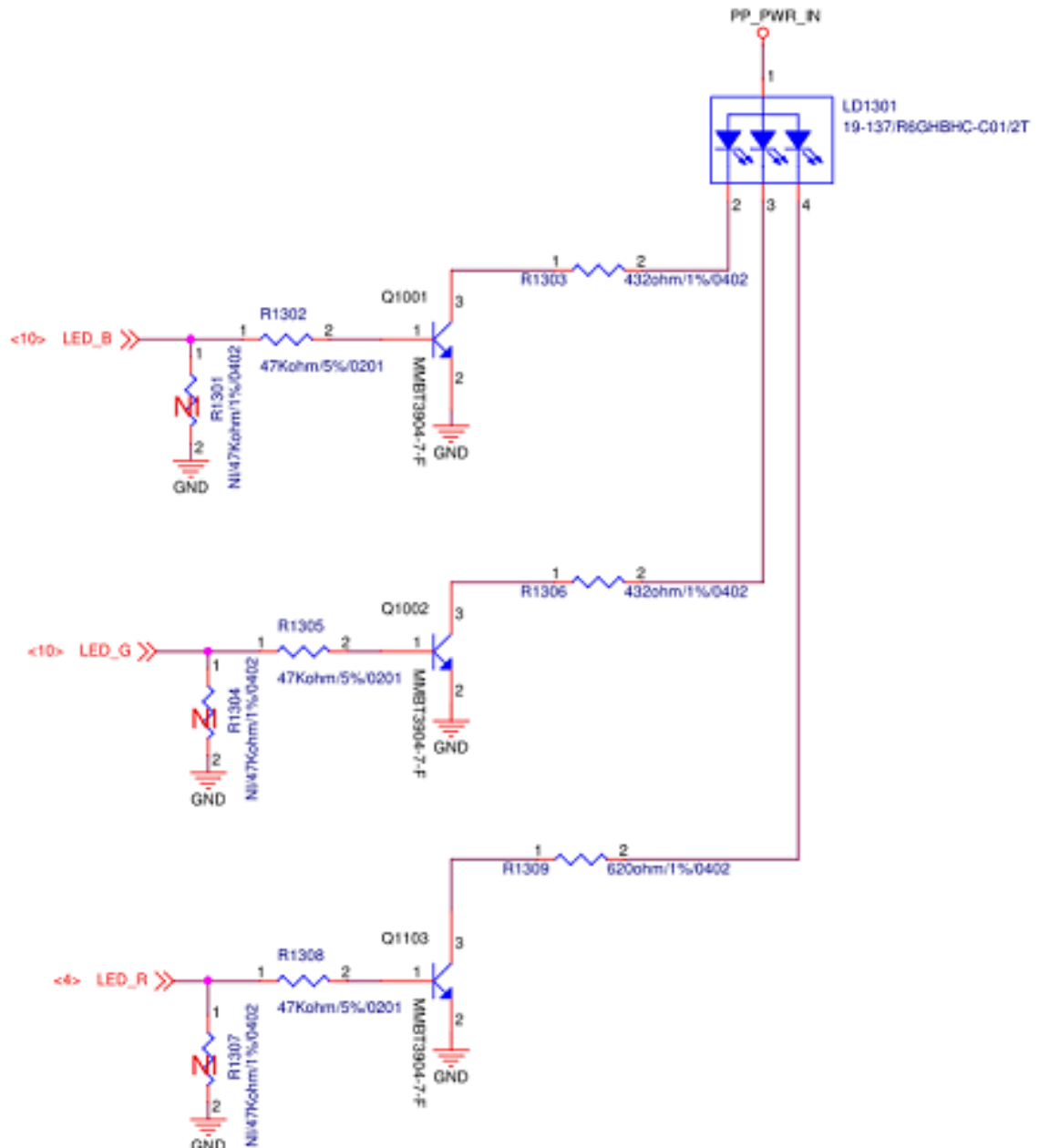
Factor/Contributor (可能的因素)	Defect factors (可能因素產生的結果)	Current Controls (目前的處理方式)	Remarks (補充說明)
Machine test screening exceptions for color shift	Not consistent with the outgoing photoelectric characteristics The client cannot be used after loading	With the customer complaint phenomenon does not agree	Exclude
No leakage current tested	Dim light	The part has a zener diode that cannot measure the leakage current	Root Cause
The customer reverse bias operation causes metal migration	metal migration	FAE and customer R&D confirm no reverse bias operation	Exclude
Excessive amount of silver glue	Dim light	controlled small current screening of abnormal products	Root Cause
Operators mixed with abnormal products	Not consistent with the outgoing photoelectric characteristics The client cannot be used after loading	With the customer complaint phenomenon does not agree	Exclude

8D REPORT

Analysis conclusion:

EL_FAE and Foxconn discuss the design of the circuit. The circuit is as follows:

Verify that there is no reverse bias in the circuit ---- eliminate the problem of using reverse voltage ◦



Cause: The possible reason is that the volume of solder paste is higher, and it close with the P/N Junction area causing a small leakage current condition.

Reason of outflow: The product has an Zener diode. The leakage current of the chip end cannot be tested during the electrical test in the factory, resulting in such abnormal loss.

8D REPORT

D5: CORRECTIVE ACTION AND RECOMMENDATION (改善對策及建議)

5.1 Corrective Action To Root Cause

Short-term approach:

G/B chip test machine small current value strict card control °

Before	After
10uA	1uA
1.8~2.4 V	2.0~2.4 V

Verify the low current mechanism:

On-line screening of abnormal materials - Zener gold wire pick out - measuring whether there is leakage current RGB chip.

Change the cleaning frequency of glue-stained pin to clean the glue needle after glue-stained 15K.



It is expected that the R & D terminal will assist in evaluating the solution of changing the bottom solid crystal adhesive into insulating adhesive.

The estimated time schedule of the R&D side is as follows:

Issue trial production order/material requisition-4/12

The trial production of the project was completed-4/21

Send sample customer-4/23

Provide project trial production report-4/28

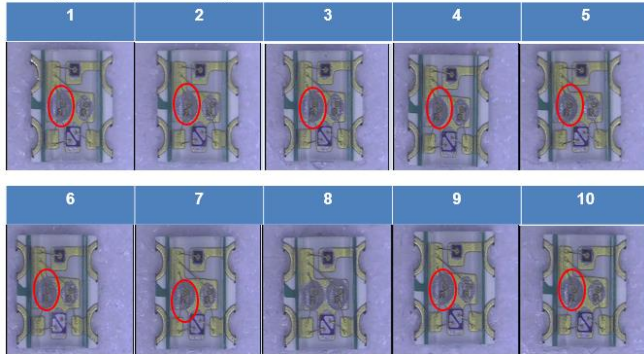
Reliability Analysis Report-5/20

D6: IMPLEMENT CORRECTIVE ACTIONS (執行改善對策並驗證有效性)

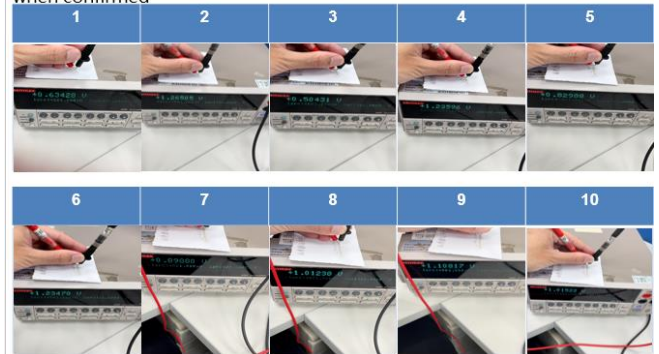
8D REPORT

6.1 Corrective Action To Root Cause : (真因之執行改善對策並驗證有效性)

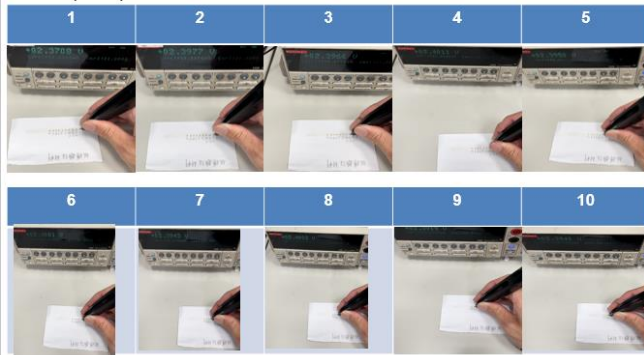
Take 10PCS for analysis and measurement to confirm the appearance as follows:
Blue chip bottom glue amount is more than green chip (No.8
blue/green chip bottom glue amount is No difference



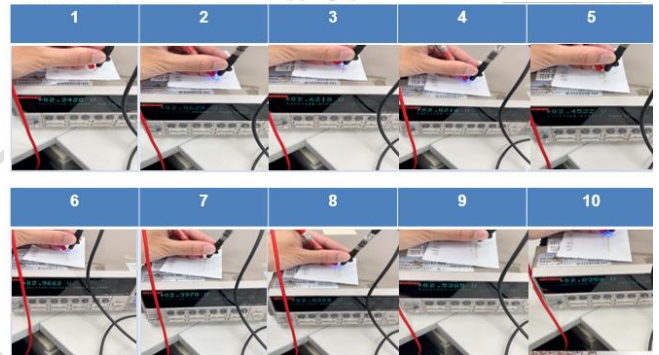
Take 10PCS for analysis and measurement to confirm the value of 1uA as follows:
Small current (1uA) of materials numbered 1 to 10 were all lower than 2V
when confirmed



Take 10PCS for analysis and measurement to confirm the values of 10uA as follows:
No short circuit electrical property was found under the confirmation of low
current (10uA) of materials numbered 1-10.

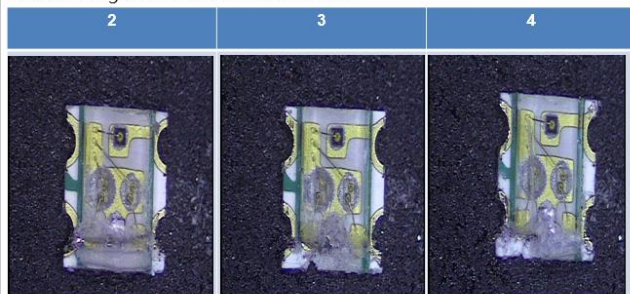


Take 10PCS for analysis and measurement to confirm the values of 5mA as follows:
2/3/4/5/6/8/9/10 in line with shipping specifications



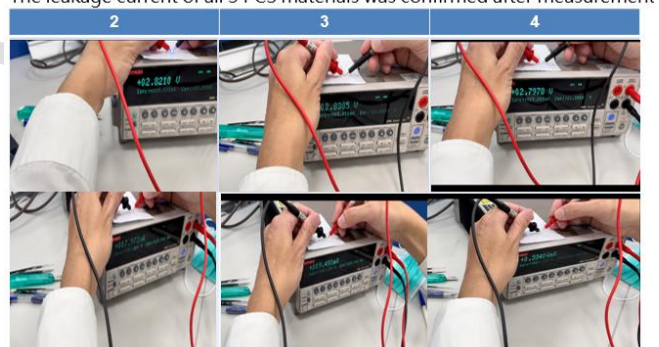
Take 3pcs of them and cut off the Zener gold wire. Appears:

Cut off the gold wire inside the material.



Take 3pcs of them and cut off the Zener gold wire to test the forward voltage
and leakage current:

The leakage current of all 3 PCS materials was confirmed after measurement



Follow-up verification practices:

After taking other tests, 30pcs of materials were screened
High temperature (60 ° C)/ current (R/G/B:7/7/5) mixed white light
acceleration simulation experiment, lit up 168HR
It is expected to ask my colleagues to help confirm the lighting
situation every day.

AF	5.8055				
EA	0.43				
K	0.00008621				
n	電壓/電流			溫度	
	加速	正常	正常	加速	
	V _A	V _U	T _U	T _A	
1	5	5	25	60	
原始時間/測試時間					
24	139.3319				
48	278.6637				
72	417.9956				
96	557.3274				
120	696.6593				
144	835.9911				
168	975.3230				
192	1114.6548				
216	1253.9867				
240	1393.3185				
264	1532.6504				
288	1671.9822				
312	1811.3141				

複合模式介紹

■ 若活化能已知, 加速變數為溫度與電壓時, 可
採用複合模式計算加速因子

■ 加速因子公式:

$$AF = \left(\frac{V_A}{V_U} \right)^n \times e^{\frac{EA}{K} \left(\frac{1}{T_U} - \frac{1}{T_A} \right)}$$

- EA : Activation Energy (活化能)
- K : Boltzmann Constant (玻茲曼常數)
- T_U : 正常操作溫度
- T_A : 加速試驗溫度
- V_U : 正常操作電壓
- V_A : 加速試驗電壓
- n : 模式參數

4/29- Start testing

5/7-168HR

5/10- Measurement of electrical properties after
168HR

5/12 - give information

8D REPORT

D7: PREVENT RECURRENCE (系統預防對策)Is FMEA revision required/是否需修改 FMEA ? ☐No ; ☐Yes , FMEA document No.: _____Is Control Plan revision required/是否需修改 Control Plan ? ☐No ; ☐Yes , CP document No.: _____Is SOP revision required/是否需修改 SOP? ☐No ; ☐Yes , SOP document No.: _____Is SPEC of Process revision required/是否需修改制規 ? ☐No ; ☒Yes , SPEC document No.: _[ASE-0019177](#)**D8: TEAM MEMBER CONFIRM AND EFFECTUAL (小組確認對策及效果)**

Champion (指導員): 李旭文 Van Lee

Team Leader (負責人): 蕭翔駿

Members (小組成員): 蕭翔駿、黃瑋倫、李育達、劉育傑

CUSTOMER COMMENT (客戶意見)☐ Satisfaction (滿意)☐ Dissatisfaction (不滿意)

Dissatisfaction Reason and Suggestion : (不滿意理由及意見)