

8D REPORT

Part 1 : 客訴資料 (Issue Information)

Customer	Foxconn	Receiving date	2021/02/20
Issue number	20210220-1	Customer part number	NA
Sales	Dinel	Return samples	7PCS
Model	19-137/R6GHBHC/S1906/2T(HFX)	Lot number	NA
Part number	S10B015513	Lot size	NA
Production date	NA	Defective rate	NA
Custom's Complaint	Color shift		

Date:

Date receive by EL:	4D sent out:	8D send out:	3 st revised:	4 nd revised:	Closed by customer
2021/02/20			2021/03/15	2021/03/18	

Part 2 : Report Content

D1: ESTABLISH TEAMS

Sales :	Dinel
Technology:	
Production :	
QA:	Tommy

D2: PROBLEM DESCRIPTION

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	NA

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

8D REPORT

2.1 Preliminary Sample Verification

External Visual Inspection

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:

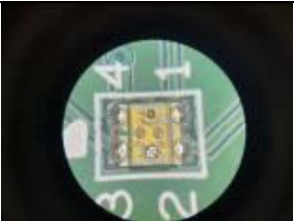
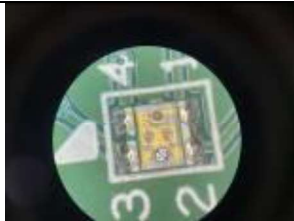
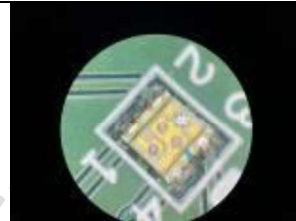
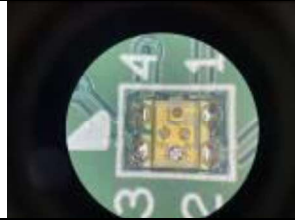
19-137R6GHBHCS19062T(HFX)色差RMA analysis		
Issue	White → Purple	White → Yellow
PCB Last 4 SN	1. 6536 2. 6672 3. 6806 4. 6933	1. 6672(X4) 2. 6672(6F) 3. 6672(6B) 4. 6691
Description of situation	1. 6536: Red pin is short with Green pin by soldring 2. 6672, 6806 and 6933 Green will not light up by digital 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

8D REPORT

Microscope Inspection

Before unsoldering pictures:

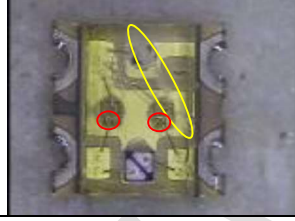
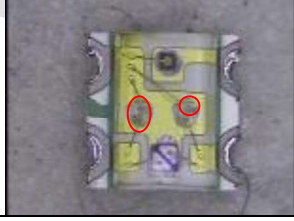
Due to rush analysis of aging, so 6933/6672-6B/6806-E3 was not shot.

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

Microscope Inspection

After unsoldering observation in microscope:

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

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

8D REPORT

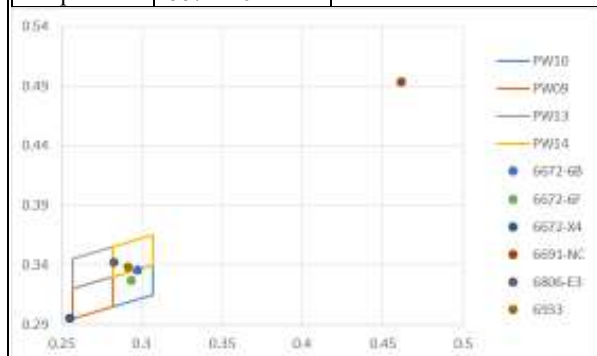
Electrical Test:

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				
		CIE X	CIE Y	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		



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
T1	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	

8D REPORT

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)	IR(uA)
Yellow	6672-6B	28.70	620.57	1.88	1↓
Yellow	6672-6F	33.13	620.27	1.89	1↓
Yellow	6672-X4	37.3	620.28	1.89	1↓
Yellow	6691-NC	31.39	620.74	1.894	1↓
Purple	6806-E3	30.77	620.02	1.87	1↓
Purple	6933	28.34	625.41	1.845	1↓
Purple	6672-Z0	NA			
G@7mA					
		IV	DW	VF	IR
Yellow	6672-6B	74.5	527.93	2.89	105uA
Yellow	6672-6F	90.1	530.17	2.98	105uA
Yellow	6672-X4	123.77	528.46	2.90	1↓
Yellow	6691-NC	59.59	528.84	2.897	105uA
Purple	6806-E3	102.45	532.71	3.069	1↓
Purple	6933	84.71	530.79	2.836	105uA
Purple	6672-Z0	NA			
B@5mA					
		IV	DW	VF	IR
Yellow	6672-6B	9.20	469.29	2.86	105uA
Yellow	6672-6F	11.06	468.26	2.88	105uA
Yellow	6672-X4	18.7	468.1	2.91	1↓
Yellow	6691-NC	NA			
Purple	6806-E3	13.09	470.60	2.887	1↓
Purple	6933	12.78	468.5	2.90	105uA
Purple	6672-Z0	NA			

Analysis:

- (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 °

8D REPORT

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 °



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 °

8D REPORT



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

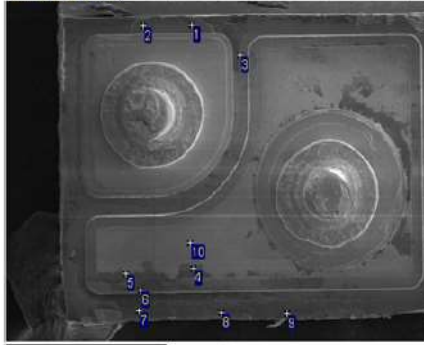
QA/QC Department

Analysis :The wafer supplier (TXXXX) determines that there is no abnormality in the bare wafer °

3/19 Chip supplier EDX analysis:

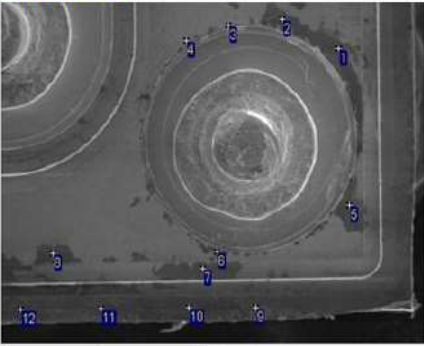
After confirmation, there are faint bright Ag elements on the top of the wafer.

OB-6672(6F)



Spectrum	C	N	O	Si	Ga	Ag	In	Total
1	4.25	16.98			78.77			100
2	3.81	15.52			80.67			100
3	3.74	14.80	3.16	0.73	76.95	0.62		100
4	2.32	3.42	25.95	1.15	2.27	0.48	64.40	100
5	3.37	2.56	25.90	1.20	2.35	0.41	64.20	100
6	7.47	13.56	3.87	0.92	74.18			100
7	13.28	13.08	9.23		64.41			100
8	5.89	15.86	1.52		76.35	0.39		100
9	65.70		22.18		12.12			100
10		3.82	23.93	0.42	2.85		68.98	100

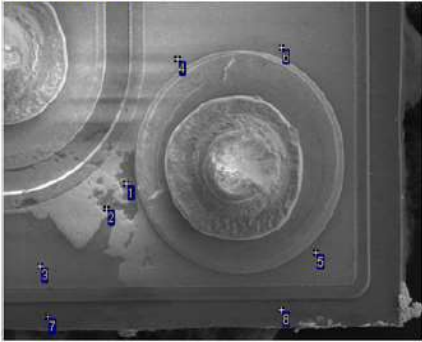
OB-6672(6F)



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

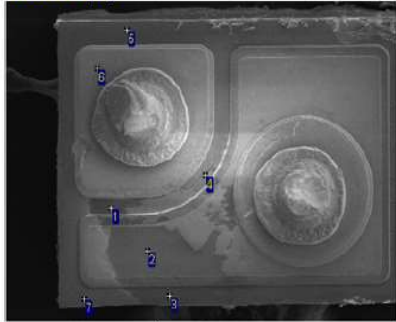
8D REPORT

OG-6672(6F)



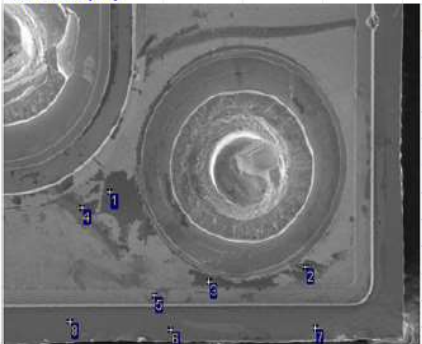
Spectrum	C	N	O	Si	Ga	Ag	In	Total
1	1.93	3.80	28.53	1.88	2.17	0.34	61.35	100
2	1.59	3.70	27.58	1.65	2.25	0.50	62.73	100
3	2.28	3.04	31.42	2.69	1.80	0.49	58.28	100
4	2.11	3.54	23.41		2.54		68.40	100
5		4.19	24.43	0.50	2.86		68.02	100
6		3.94	24.51		2.39		69.16	100
7	6.69	14.43	8.50	2.52	67.63	0.23		100
8	10.13	15.80	1.57		72.04	0.46		100

OG-6672(6F)



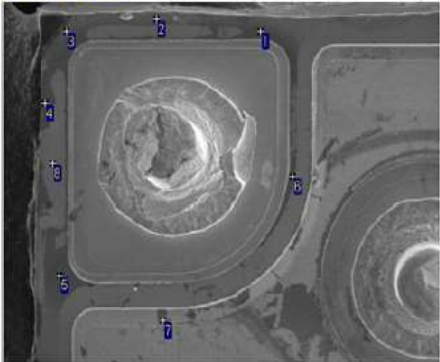
Spectrum	C	N	O	Si	Ga	Ag	In	Au	Total
1	6.45	15.66	5.47	1.63	70.48	0.30			100
2	2.16	3.08	31.83	2.75	1.85	0.39	57.94		100
3	6.60	12.32	10.00	2.87	68.21				100
4		16.74	0.99		82.27				100
5	3.70	15.28	3.22	1.03	74.81			1.96	100
6	4.01		1.24					94.74	100
7		16.33	0.88		82.44	0.35			100

OB-6672(X4)



Spectrum	C	N	O	Si	Ga	Ag	In	Total
1		3.45	25.86	0.82	1.87		68.00	100
2		3.40	27.24	0.86	2.53	0.33	65.64	100
3	66.43		33.57					100
4		4.06	25.33		2.73		67.88	100
5	4.17	17.70			78.13			100
6	4.03	17.01			78.33	0.63		100
7	4.26	17.16			78.09	0.50		100
8	3.49	18.04			78.47			100

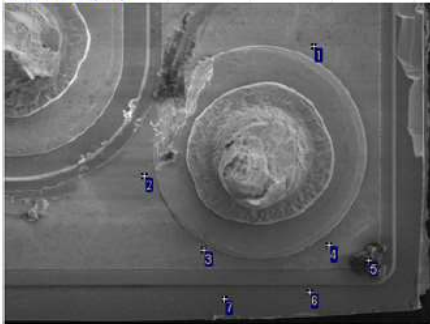
OB-6672(X4)



Spectrum	C	N	O	Si	Ga	Ag	Total
1	4.98	15.97	2.83		75.73	0.49	100
2	4.13	16.48	1.99		76.81	0.59	100
3	4.56	17.33	1.15		76.96		100
4	4.28	15.99	2.39	0.56	76.77		100
5	4.72	17.17	2.60	0.45	75.06		100
6	4.75	15.63	3.41	0.57	75.64		100
7	4.81	16.05	2.01		77.13		100
8	3.60	18.00			78.25	0.16	100

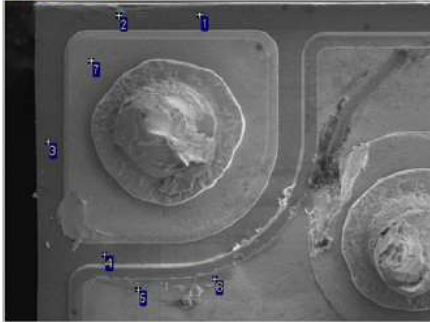
8D REPORT

OG-6672(X4)



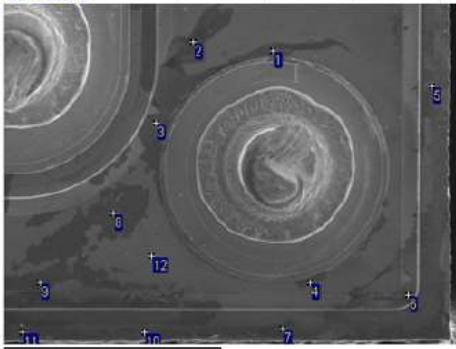
Spectrum	C	N	O	Si	Ga	Ag	In	Total
1		3.61	23.35	0.43	3.05	0.21	69.35	100
2		4.00	22.87	0.56	2.76		69.80	100
3	0.98	4.16	24.04	0.40	2.72	0.31	67.39	100
4	1.63	4.06	22.56		3.18		68.57	100
5	31.59		66.64	1.77				100
6	4.04	16.99			78.97			100
7	14.35	14.20	8.12		63.21	0.12		100

OG-6672(X4)



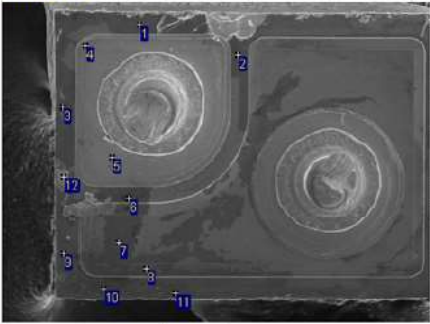
Spectrum	C	N	O	Si	Ga	Ag	In	Au	Total
1	4.17	17.39			78.00	0.44			100
2	4.16	18.99			76.86				100
3	3.23	16.62			79.57	0.58			100
4	4.68	15.81			79.51				100
5		4.04	22.85	0.62	3.31		69.18		100
6		3.81	23.46	0.53	2.26		69.94		100
7	4.50		1.13			0.25		94.12	100

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	3.96	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

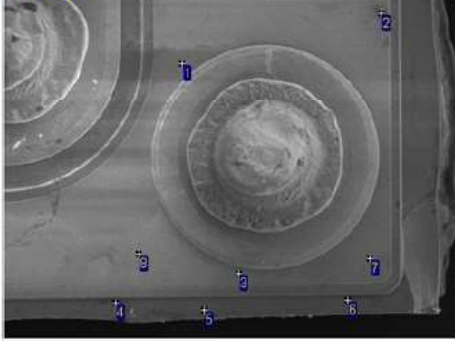
OB-6933



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		4.60					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	1.60		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

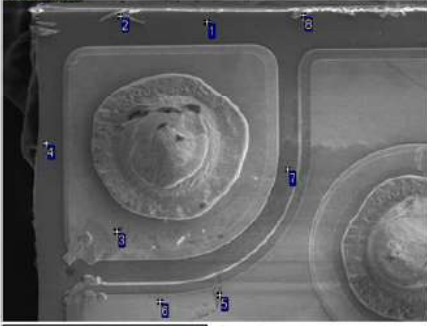
8D REPORT

OG-6933



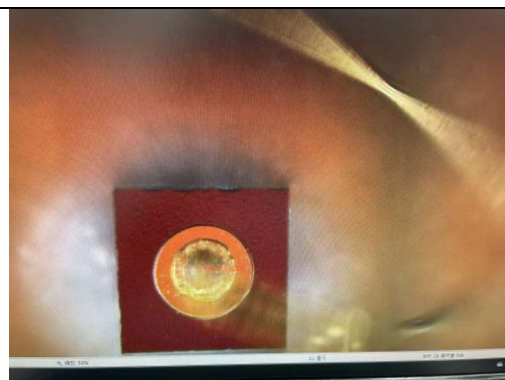
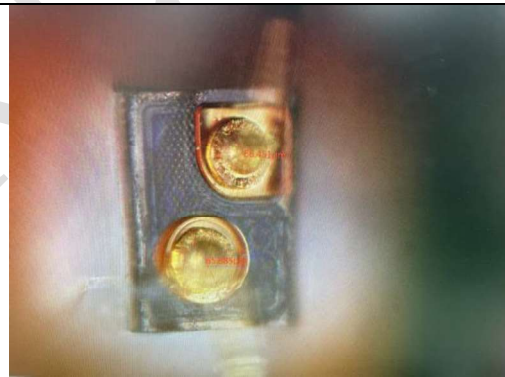
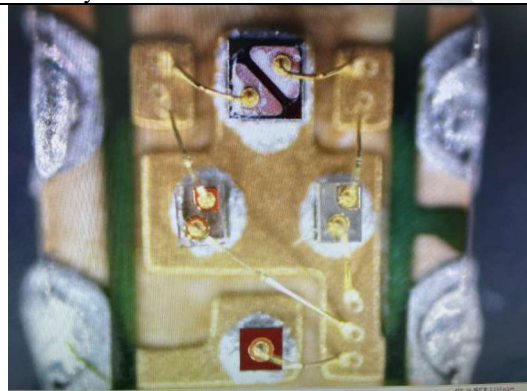
Spectrum	C	N	O	Si	Ga	Ag	In	Total
1		3.51	24.98		4.30	0.30	66.91	100
2	9.20		24.07	0.72	3.04		62.98	100
3	69.43		30.57					100
4	4.42	18.21			77.37			100
5	4.03	17.90			78.08			100
6	5.72	16.49	1.19		76.60			100
7		3.93	23.74	0.43	4.77	0.50	66.64	100
8		4.42	23.70		4.74		67.14	100

OG-6933



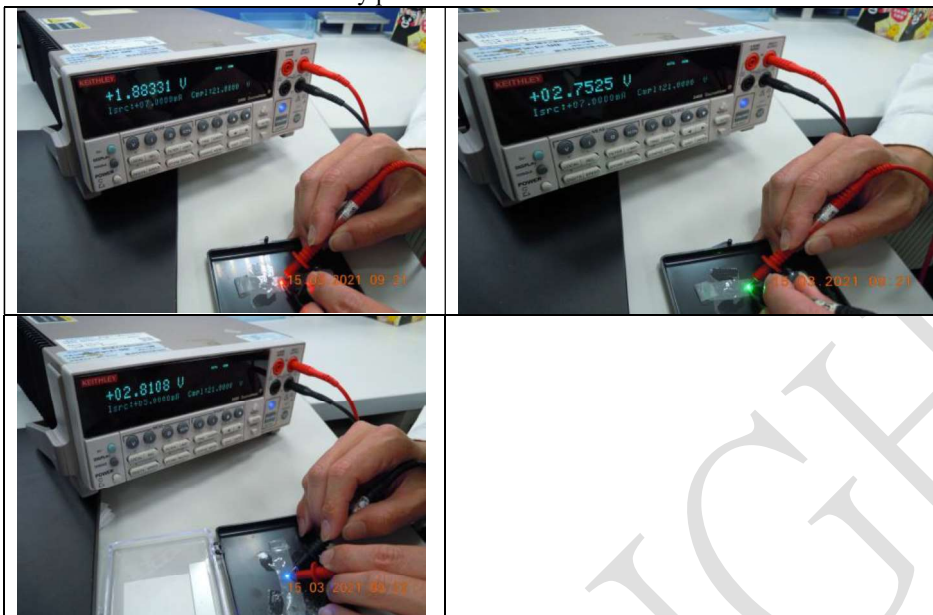
Spectrum	C	N	O	Si	Ga	Ag	In	Au	Total
1	3.95	17.45	1.42		76.99	0.19			100
2	11.13	9.69	5.85	1.69	56.66				100
3	15.11		9.64			0.19		72.40	100
4	4.08	17.59			78.33				100
5		4.27	23.79	0.46	4.36		67.13		100
6	2.23	4.80	25.32		3.38	1.52	62.76		100
7	4.82	16.95	1.56		76.38	0.28			100
8	28.52		14.27	2.85	28.21				100

No. 6672-6B Conditions after removal of glue:
No abnormality was found after DE-CAP.

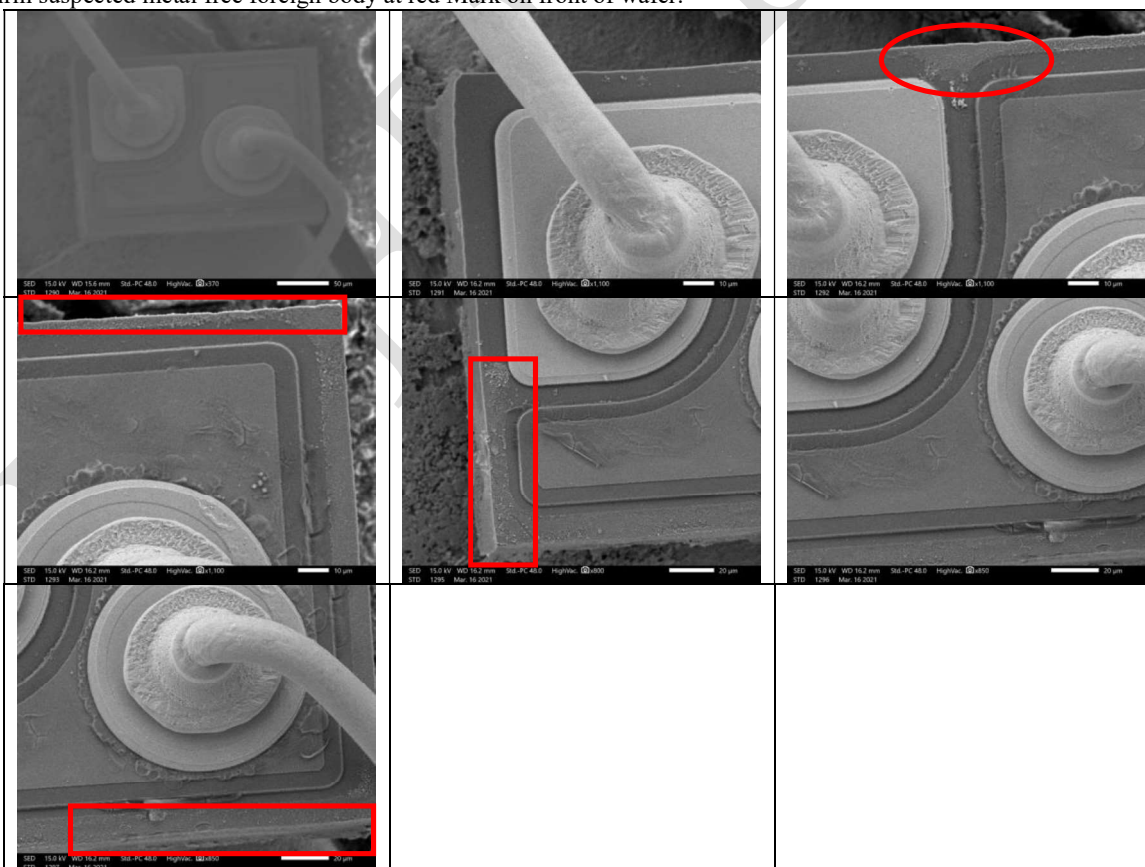


8D REPORT

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



SEM(Scanning Electron Microscope):
Confirm suspected metal free foreign body at red Mark on front of wafer.



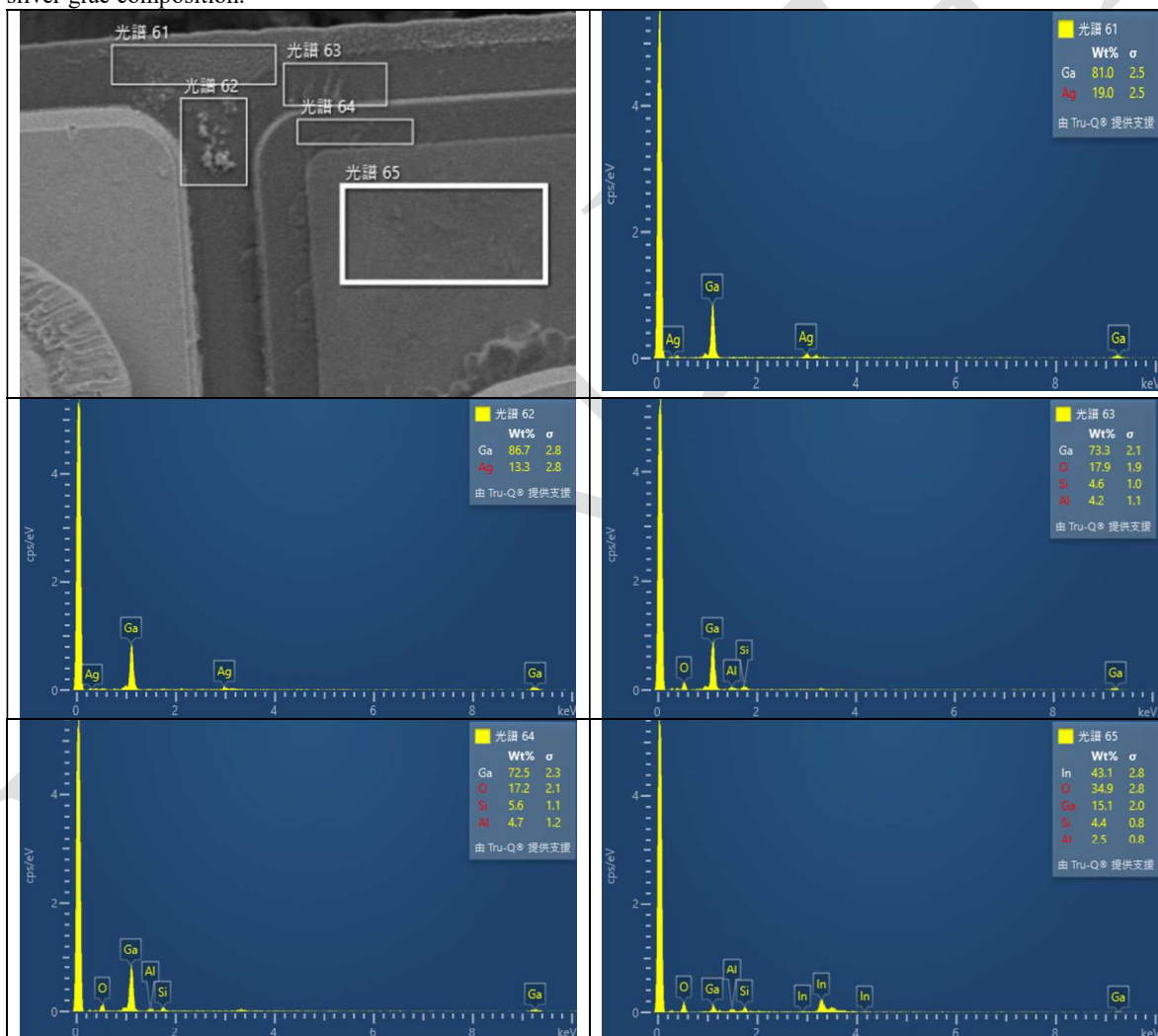
8D REPORT

Suspected metal dissociation on the wafer side (red Mark).



EDX(Energy-dispersive X-ray spectroscopy):

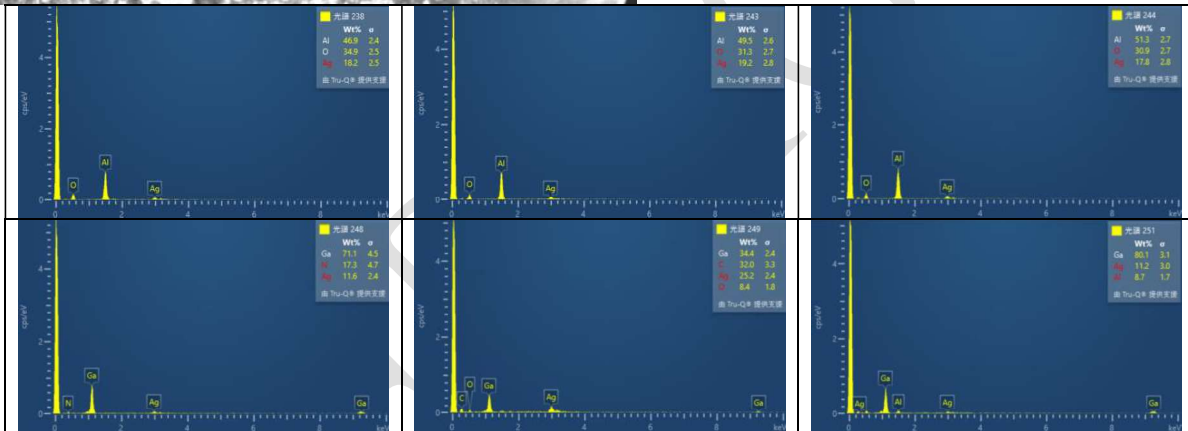
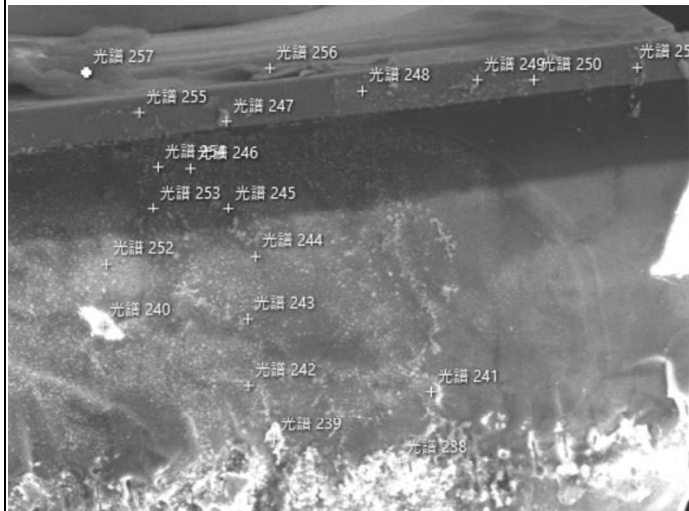
Ag, Ga, Si, Al, In after element confirmation; Among them, Ga, Al, In is the chip element /Si is the glue material /Ag is the silver glue composition.



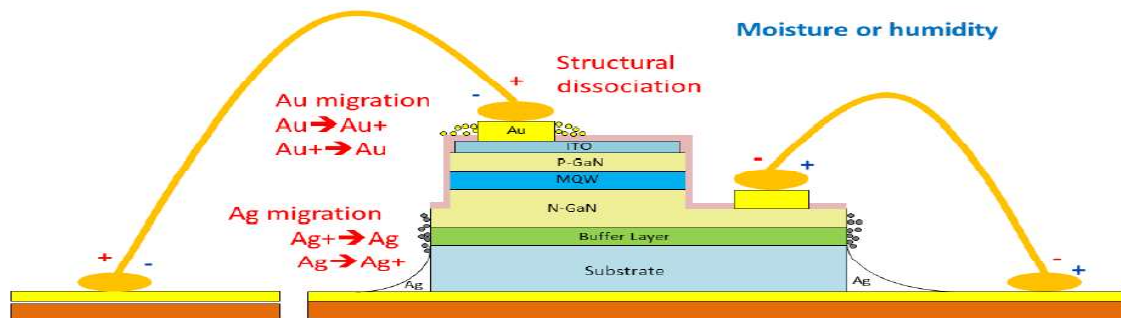
8D REPORT

Chip side EDX(Energy-dispersive X-ray spectroscopy):

According to the results of EDX, the silver glue has disintegrated into the P/N Junction on the wafer surface, causing a short circuit.



Ag Migration principle:



LED material is driven forward. When the reverse current and voltage are applied, the silver in the silver glue will be disintegrated in the form of positive ions.

It creates an environment similar to electroplating.

When the current/voltage is applied off, the silver colloidal cation migrates or precipitates along the electric field path. And then you see Ag migration.

8D REPORT

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 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. SEM(Scanning Electron Microscope) showed suspected metal dissection in the front and side of the chip.

8. The substance was confirmed by EDX(Energy-Dispersive X-Ray Spectrometry), which was confirmed to be caused by the disaggregation of silver glue to the surface of the wafer

Short circuit °

(9) Ag migration on the surface/side of the chip is the electric field effect caused by the long time moisture absorption of the packaging glue and the reverse voltage, which results in the short circuit phenomenon of P/N junction LED caused by Ag migration °

D3: CHECK INVENTORY

Action/Disposition	NA
Inspection / Buy-off result	NA

SAP

NA

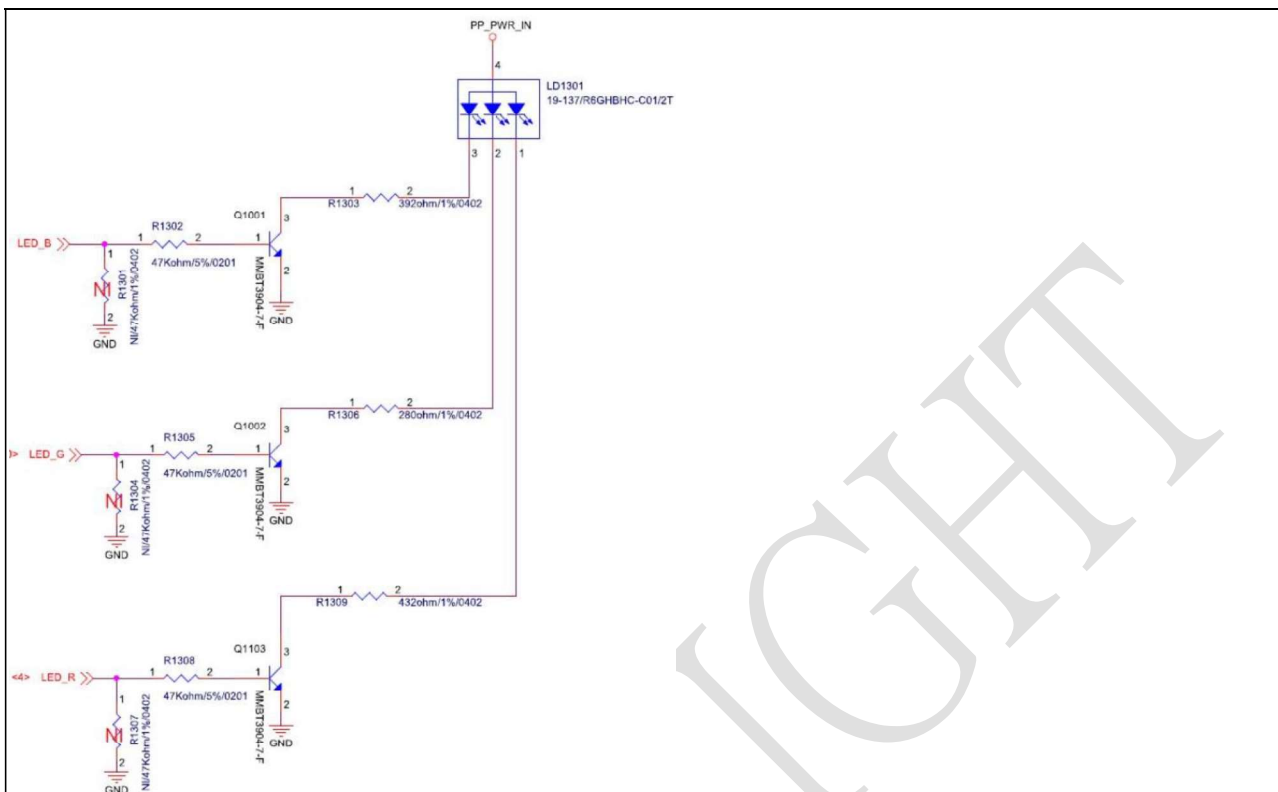
D4: CAUSE ANALYSIS

The substance was confirmed by EDX(Energy-Dispersive X-Ray Spectrometry), which was confirmed to be caused by the disaggregation of silver glue to the surface of the wafer
Short circuit.

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

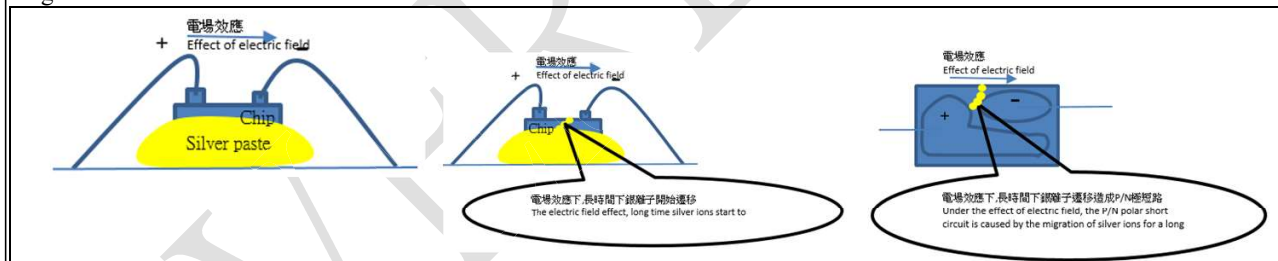
Verify that there is no reverse bias in the circuit ---- eliminate the problem of using reverse voltage °

8D REPORT



According to the EDX test results:

It is speculated that the reason may be that the amount of Silver paste is high and the migration of silver ions occurs after a long time of electric field effect.



D5: CORRECTIVE ACTION AND RECOMMENDATION