REPORT No.: SZ23110275R01

TEST REPORT

Applicant	:	Seeed Technology Co., Ltd
Product Name	:	Seeed Studio XIAO ESP32S3 Sense
Model Name	:	XIAO-ESP32-S3-Sense
Brand Name	:	Seeed Studio
Test Request	:	With reference to RoHS Directive 2015/863/EU amending 2011/65/EU
Receipt Date	:	2023-11-24
Test Date	:	2023-11-24 to 2023-11-29
Issue Date	:	2023-12-07
Conclusion	:	Based on the performed tests on submitted sample(s), the results of Lead, Mercury, Cadmium, Hexavalent chromium, Polybrominated biphenyls (PBBs),Polybrominated diphenyl ethers (PBDEs) and Phthalates such as Bis (2-ethylhexyl) phthalate (DEHP), Dibutyl phthalate (DBP), Butyl benzyl Phthalate (BBP), Diisobutyl phthalate (DIBP) comply with the limits as set by RoHS Directive (EU) 2015/863 amending Annex II to Directive 2011/65/EU.

Edited by : Tao Qing

Tao Qing (Rapporteur)

Approved by : Kenny Li

Kenny Li (Supervisor)

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MORLAB

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DIRECTORY

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Change History		
Version	**Date**	**Reason for Change**
1.0	2023-12-07	First edition

1.Applicant Information

Applicant	:	Seeed Technology Co., Ltd
Applicant Address	:	9F, G3 Building, TCL International E City, Zhongshanyuan Road, Nanshan District, Shenzhen, Guangdong Province, P.R.C
Manufacturer	:	Seeed Technology Co., Ltd
Manufacturer Address	:	9F, G3 Building, TCL International E City, Zhongshanyuan Road, Nanshan District, Shenzhen, Guangdong Province, P.R.C

2. Test Methods

(1) There are the results on total Br while test items on restricted substances are PBBs and PBDEs. There are the results on total Cr while test items on restricted substances Cr(VI).

(2) Results are obtained by EDXRF for primary screening, and further chemical testing by ICP-OES (for Cd, Pb, Hg), UV-Vis (for Cr(VI) and GC-MS (for PBBs, PBDEs) is recommended to be performed, if the concentration exceeds the below warning value according to IEC62321-3-1:2013 (unit: mg/kg).

Element	Polymers	Metals	Composite Materials
Cd	P≤70-3σ＜D＜130+3σ≤F	P≤70-3σ＜D＜130+3σ≤F	P≤50-3σ＜D＜150+3σ≤F
Pb	P≤700-3σ＜D＜1300+3σ≤F	P≤700-3σ＜D＜1300+3σ≤F	P≤500-3σ＜D＜1500+3σ≤F
Hg	P≤700-3σ＜D＜1300+3σ≤F	P≤700-3σ＜D＜1300+3σ≤F	P≤500-3σ＜D＜1500+3σ≤F
Br	P≤300-3σ＜D	---	P≤250-3σ＜D
Cr	P≤700-3σ＜D	P≤700-3σ＜D	P≤500-3σ＜D

(a) P = Below Limit, F = Over Limit, D = Inconclusive, LOD = Limit of Detection, “---” = Not regulated.

(b) The XRF screening test for RoHS elements - the reading may be different to actual content in the sample be of non-uniformity composition.

(3) Chemical Test

Unit and MDL in wet chemical test.

Test Item	Procedure	Apparatus	MDL
Hg	IEC 62321-4:2013+AMD1:2017	ICP-OES	10 mg/kg
Cd & Pb	IEC 62321-5:2013	AAS or ICP-OES	10 mg/kg
Cr^{6+}	IEC 62321-7-2:2017(For Polymer and Electronics)	UV-VIS	10 mg/kg
	IEC 62321-7-1:2015▲(For Plating on Metals)		0.10 ug/cm^2
PBBs	IEC 62321-6:2015	GC-MS	100 mg/kg
PBDEs	IEC 62321-6:2015	GC-MS	100 mg/kg
DEHP	IEC 62321-8:2017	GC-MS	100 mg/kg
BBP	IEC 62321-8:2017	GC-MS	100 mg/kg
DBP	IEC 62321-8:2017	GC-MS	100 mg/kg
DIBP	IEC 62321-8:2017	GC-MS	100 mg/kg

(c) The MDL for single compound of PBBs and PBDEs is 100 mg/kg.

(d) MDL of Cr(VI) for polymer and composite sample is 10 mg/kg.

(e) MDL of Cr(VI) for metal sample is 0.10 ug/cm^2.

(f) mg/kg = ppm, N.D. = Not Detected (< MDL), "---" = Not Conducted.

(g)▲= a. The sample is negative for Cr^{6+} - the Cr^{6+} concentration is below the limit 0.10 ug/cm^2. The coating is considered a non-Cr^{6+} based coating.

b. The sample is positive for Cr^{6+} - the Cr^{6+} concentration is greater than 0.13 ug/cm^2. The sample coating is considered to contain Cr^{6+}.

c. The result between 0.10 ug/cm^2 and 0.13 ug/cm^2 is considered to be inconclusive unavoidable coating variations may influence the determination.

(h) When the test result is a critical value,we will use the measurement uncertainty give the judgment result based on the 95% Confidence intervals .

(4) The maximum permissible limit is quoted from the document (EU) 2015/863 amending ROHS Directive 2011/65/EU Annex II:

RoHS Restricted Substances	Maximum Concentration Value (mg/kg) (by weight in homogenous materials)
Lead (Pb)	1000
Cadmium (Cd)	100
Mercury (Hg)	1000
Hexavalent chromium (Cr(VI))	1000
Polybrominated biphenyls (PBBs)	1000
Polybrominated diphenyl ethers (PBDEs)	1000
Bis (2-ethylhexyl) phthalate (DEHP)	1000
Dibutyl phthalate (DBP)	1000
Benzyl butyl phthalate (BBP)	1000
Diisobutyl phthalate (DIBP)	1000

3. Test Results and Sample Description

The results of XRF screening and chemical test (Unit: mg/kg)

Part No.	Description	Material	X-ray Screening		Results of Chemical Test	Conclusion on RoHS EU	Sample Resubmitted
			Element	Data			
A-1	Golden Metal Head	Metal	Pb	P	---	Comply	/
			Cd	P	---		
			Hg	P	---		
			Cr	P	---		
			Br	---	---		
			Cr^{6+}	---	---		
			PBBs	---	---		
			PBDEs	---	---		
			DBP	---	---		
			BBP	---	---		
			DEHP	---	---		
			DIBP	---	---		
A-2	Black Plastic Wire Jacket	Polymer	Pb	P	---	Comply	/
			Cd	P	---		
			Hg	P	---		
			Cr	P	---		
			Br	P	---		
			Cr^{6+}	---	---		
			PBBs	---	---		
			PBDEs	---	---		
			DBP	---	N.D.		
			BBP	---	N.D.		
			DEHP	---	N.D.		
			DIBP	---	N.D.		
A-3	Silvery Metal Mesh	Metal	Pb	P	---	Comply	/
			Cd	P	---		
			Hg	P	---		
			Cr	P	---		
			Br	---	---		
			Cr^{6+}	---	---		
			PBBs	---	---		
			PBDEs	---	---		
			DBP	---	---		
			BBP	---	---		
			DEHP	---	---		
			DIBP	---	---		
A-4	Transparent Plastic Wire Jacket	Polymer	Pb	P	---	Comply	/
			Cd	P	---		
			Hg	P	---		
			Cr	P	---		
			Br	P	---		
			Cr^{6+}	---	---		
			PBBs	---	---		
			PBDEs	---	---		
			DBP	---	N.D.		
			BBP	---	N.D.		
			DEHP	---	N.D.		
			DIBP	---	N.D.		

Part No.	Description	Material	X-ray Screening		Results of Chemical Test	Conclusion on RoHS EU	Sample Resubmitted
			Element	Data			
A-5	Silvery Metal Wire Core	Metal	Pb	P	---	Comply	/
			Cd	P	---		
			Hg	P	---		
			Cr	P	---		
			Br	---	---		
			Cr^{6+}	---	---		
			PBBs	---	---		
			PBDEs	---	---		
			DBP	---	---		
			BBP	---	---		
			DEHP	---	---		
			DIBP	---	---		
A-6	Black FPC	Composite	Pb	P	---	Comply	/
			Cd	P	---		
			Hg	P	---		
			Cr	P	---		
			Br	P	---		
			Cr^{6+}	---	---		
			PBBs	---	---		
			PBDEs	---	---		
			DBP	---	N.D.		
			BBP	---	N.D.		
			DEHP	---	N.D.		
			DIBP	---	N.D.		
A-7	Silvery Soldering Tin	Metal	Pb	P	---	Comply	/
			Cd	P	---		
			Hg	P	---		
			Cr	P	---		
			Br	---	---		
			Cr^{6+}	---	---		
			PBBs	---	---		
			PBDEs	---	---		
			DBP	---	---		
			BBP	---	---		
			DEHP	---	---		
			DIBP	---	---		
A-8	Black Stick Adhesive	Composite	Pb	P	---	Comply	/
			Cd	P	---		
			Hg	P	---		
			Cr	P	---		
			Br	P	---		
			Cr^{6+}	---	---		
			PBBs	---	---		
			PBDEs	---	---		
			DBP	---	N.D.		
			BBP	---	N.D.		
			DEHP	---	N.D.		
			DIBP	---	N.D.		

Part No.	Description	Material	X-ray Screening		Results of Chemical Test	Conclusion on RoHS EU	Sample Resubmitted
			Element	Data			
A-9	Transparent Glass	Composite	Pb	P	---	Comply	/
			Cd	P	---		
			Hg	P	---		
			Cr	P	---		
			Br	P	---		
			Cr^{6+}	---	---		
			PBBs	---	---		
			PBDEs	---	---		
			DBP	---	N.D.		
			BBP	---	N.D.		
			DEHP	---	N.D.		
			DIBP	---	N.D.		
A-10	Red Glass Wafer	Composite	Pb	P	---	Comply	/
			Cd	P	---		
			Hg	P	---		
			Cr	P	---		
			Br	P	---		
			Cr^{6+}	---	---		
			PBBs	---	---		
			PBDEs	---	---		
			DBP	---	N.D.		
			BBP	---	N.D.		
			DEHP	---	N.D.		
			DIBP	---	N.D.		
A-11	Black Plastic	Polymer	Pb	P	---	Comply	/
			Cd	P	---		
			Hg	P	---		
			Cr	P	---		
			Br	P	---		
			Cr^{6+}	---	---		
			PBBs	---	---		
			PBDEs	---	---		
			DBP	---	N.D.		
			BBP	---	N.D.		
			DEHP	---	N.D.		
			DIBP	---	N.D.		
A-12	White Plastic	Polymer	Pb	P	---	Comply	/
			Cd	P	---		
			Hg	P	---		
			Cr	P	---		
			Br	P	---		
			Cr^{6+}	---	---		
			PBBs	---	---		
			PBDEs	---	---		
			DBP	---	N.D.		
			BBP	---	N.D.		
			DEHP	---	N.D.		
			DIBP	---	N.D.		

Part No.	Description	Material	X-ray Screening		Results of Chemical Test	Conclusion on RoHS EU	Sample Resubmitted
			Element	Data			
A-13	Yellow FPC	Composite	Pb	P	---	Comply	/
			Cd	P	---		
			Hg	P	---		
			Cr	D	---		
			Br	P	---		
			Cr^{6+}	---	N.D.		
			PBBs	---	---		
			PBDEs	---	---		
			DBP	---	N.D.		
			BBP	---	N.D.		
			DEHP	---	N.D.		
			DIBP	---	N.D.		
A-14	Black IC	Composite	Pb	P	---	Comply	/
			Cd	P	---		
			Hg	P	---		
			Cr	D	---		
			Br	P	---		
			Cr^{6+}	---	N.D.		
			PBBs	---	---		
			PBDEs	---	---		
			DBP	---	N.D.		
			BBP	---	N.D.		
			DEHP	---	N.D.		
			DIBP	---	N.D.		
A-15	Silvery Metal Sheet	Metal	Pb	P	---	Comply	/
			Cd	P	---		
			Hg	P	---		
			Cr	D	---		
			Br	---	---		
			Cr^{6+}	---	Negative		
			PBBs	---	---		
			PBDEs	---	---		
			DBP	---	---		
			BBP	---	---		
			DEHP	---	---		
			DIBP	---	---		
A-16	Black Plastic	Polymer	Pb	P	---	Comply	/
			Cd	P	---		
			Hg	P	---		
			Cr	P	---		
			Br	P	---		
			Cr^{6+}	---	---		
			PBBs	---	---		
			PBDEs	---	---		
			DBP	---	N.D.		
			BBP	---	N.D.		
			DEHP	---	N.D.		
			DIBP	---	N.D.		

Part No.	Description	Material	X-ray Screening		Results of Chemical Test	Conclusion on RoHS EU	Sample Resubmitted
			Element	Data			
A-17	Silvery Metal Pin	Metal	Pb	P	---	Comply	/
			Cd	P	---		
			Hg	P	---		
			Cr	P	---		
			Br	---	---		
			Cr^{6+}	---	---		
			PBBs	---	---		
			PBDEs	---	---		
			DBP	---	---		
			BBP	---	---		
			DEHP	---	---		
			DIBP	---	---		
A-18	Silvery Metal	Metal	Pb	P	---	Comply	/
			Cd	P	---		
			Hg	P	---		
			Cr	D	---		
			Br	---	---		
			Cr^{6+}	---	Negative		
			PBBs	---	---		
			PBDEs	---	---		
			DBP	---	---		
			BBP	---	---		
			DEHP	---	---		
			DIBP	---	---		
A-19	Silvery Metal Pin	Metal	Pb	P	---	Comply	/
			Cd	P	---		
			Hg	P	---		
			Cr	P	---		
			Br	---	---		
			Cr^{6+}	---	---		
			PBBs	---	---		
			PBDEs	---	---		
			DBP	---	---		
			BBP	---	---		
			DEHP	---	---		
			DIBP	---	---		
A-20	Grey Plastic	Polymer	Pb	P	---	Comply	/
			Cd	P	---		
			Hg	P	---		
			Cr	P	---		
			Br	P	---		
			Cr^{6+}	---	---		
			PBBs	---	---		
			PBDEs	---	---		
			DBP	---	N.D.		
			BBP	---	N.D.		
			DEHP	---	N.D.		
			DIBP	---	N.D.		

Part No.	Description	Material	X-ray Screening		Results of Chemical Test	Conclusion on RoHS EU	Sample Resubmitted
			Element	Data			
A-21	Black Plastic	Polymer	Pb	P	---	Comply	/
			Cd	P	---		
			Hg	P	---		
			Cr	P	---		
			Br	P	---		
			Cr^{6+}	---	---		
			PBBs	---	---		
			PBDEs	---	---		
			DBP	---	N.D.		
			BBP	---	N.D.		
			DEHP	---	N.D.		
			DIBP	---	N.D.		
A-22	Silvery Metal Pin	Metal	Pb	P	---	Comply	/
			Cd	P	---		
			Hg	P	---		
			Cr	P	---		
			Br	---	---		
			Cr^{6+}	---	---		
			PBBs	---	---		
			PBDEs	---	---		
			DBP	---	---		
			BBP	---	---		
			DEHP	---	---		
			DIBP	---	---		
A-23	White Plastic	Polymer	Pb	P	---	Comply	/
			Cd	P	---		
			Hg	P	---		
			Cr	P	---		
			Br	P	---		
			Cr^{6+}	---	---		
			PBBs	---	---		
			PBDEs	---	---		
			DBP	---	N.D.		
			BBP	---	N.D.		
			DEHP	---	N.D.		
			DIBP	---	N.D.		
A-24	Black IC	Composite	Pb	P	---	Comply	/
			Cd	P	---		
			Hg	P	---		
			Cr	P	---		
			Br	P	---		
			Cr^{6+}	---	---		
			PBBs	---	---		
			PBDEs	---	---		
			DBP	---	N.D.		
			BBP	---	N.D.		
			DEHP	---	N.D.		
			DIBP	---	N.D.		

Part No.	Description	Material	X-ray Screening		Results of Chemical Test	Conclusion on RoHS EU	Sample Resubmitted
			Element	Data			
A-25	Black PCB	Composite	Pb	P	---	Comply	/
			Cd	P	---		
			Hg	P	---		
			Cr	P	---		
			Br	D	---		
			Cr^{6+}	---	---		
			PBBs	---	N.D.		
			PBDEs	---	N.D.		
			DBP	---	N.D.		
			BBP	---	N.D.		
			DEHP	---	N.D.		
			DIBP	---	N.D.		
A-26	Silvery Soldering Tin	Metal	Pb	P	---	Comply	/
			Cd	P	---		
			Hg	P	---		
			Cr	P	---		
			Br	---	---		
			Cr^{6+}	---	---		
			PBBs	---	---		
			PBDEs	---	---		
			DBP	---	---		
			BBP	---	---		
			DEHP	---	---		
			DIBP	---	---		
A-27	White Plastic Label With Black Printing	Composite	Pb	P	---	Comply	/
			Cd	P	---		
			Hg	P	---		
			Cr	P	---		
			Br	P	---		
			Cr^{6+}	---	---		
			PBBs	---	---		
			PBDEs	---	---		
			DBP	---	N.D.		
			BBP	---	N.D.		
			DEHP	---	N.D.		
			DIBP	---	N.D.		
A-28	Silvery Metal Shielding Case	Metal	Pb	P	---	Comply	/
			Cd	P	---		
			Hg	P	---		
			Cr	P	---		
			Br	---	---		
			Cr^{6+}	---	---		
			PBBs	---	---		
			PBDEs	---	---		
			DBP	---	---		
			BBP	---	---		
			DEHP	---	---		
			DIBP	---	---		

Part No.	Description	Material	X-ray Screening		Results of Chemical Test	Conclusion on RoHS EU	Sample Resubmitted
			Element	Data			
A-29	Black IC	Composite	Pb	P	---	Comply	/
			Cd	P	---		
			Hg	P	---		
			Cr	P	---		
			Br	P	---		
			Cr^{6+}	---	---		
			PBBs	---	---		
			PBDEs	---	---		
			DBP	---	N.D.		
			BBP	---	N.D.		
			DEHP	---	N.D.		
			DIBP	---	N.D.		
A-30	Black IC	Composite	Pb	P	---	Comply	/
			Cd	P	---		
			Hg	P	---		
			Cr	P	---		
			Br	P	---		
			Cr^{6+}	---	---		
			PBBs	---	---		
			PBDEs	---	---		
			DBP	---	N.D.		
			BBP	---	N.D.		
			DEHP	---	N.D.		
			DIBP	---	N.D.		
A-31	Black Press Interface	Composite	Pb	P	---	Comply	/
			Cd	P	---		
			Hg	P	---		
			Cr	P	---		
			Br	P	---		
			Cr^{6+}	---	---		
			PBBs	---	---		
			PBDEs	---	---		
			DBP	---	N.D.		
			BBP	---	N.D.		
			DEHP	---	N.D.		
			DIBP	---	N.D.		
A-32	Silvery Metal	Metal	Pb	P	---	Comply	/
			Cd	P	---		
			Hg	P	---		
			Cr	D	---		
			Br	---	---		
			Cr^{6+}	---	Negative		
			PBBs	---	---		
			PBDEs	---	---		
			DBP	---	---		
			BBP	---	---		
			DEHP	---	---		
			DIBP	---	---		

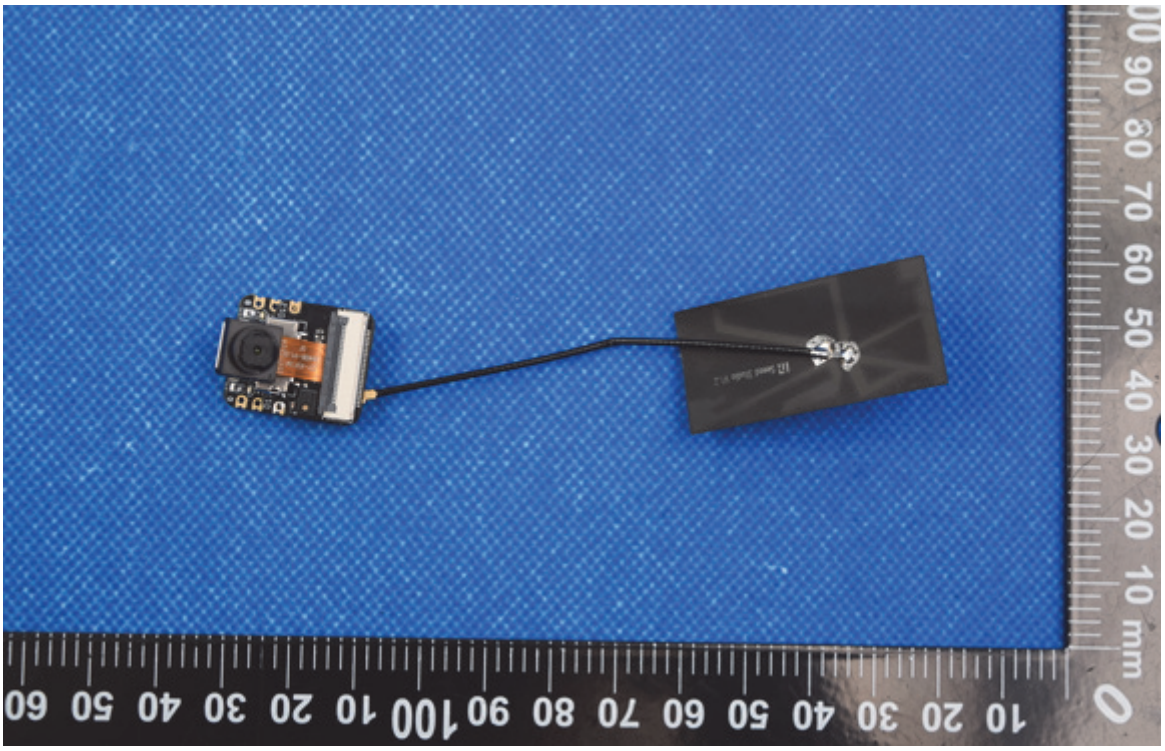
Part No.	Description	Material	X-ray Screening		Results of Chemical Test	Conclusion on RoHS EU	Sample Resubmitted
			Element	Data			
A-33	Black Plastic	Polymer	Pb	P	---	Comply	/
			Cd	P	---		
			Hg	P	---		
			Cr	D	---		
			Br	P	---		
			Cr^{6+}	---	N.D.		
			PBBs	---	---		
			PBDEs	---	---		
			DBP	---	N.D.		
			BBP	---	N.D.		
			DEHP	---	N.D.		
			DIBP	---	N.D.		
A-34	Golden Metal Pin	Metal	Pb	P	---	Comply	/
			Cd	P	---		
			Hg	P	---		
			Cr	D	---		
			Br	---	---		
			Cr^{6+}	---	Negative		
			PBBs	---	---		
			PBDEs	---	---		
			DBP	---	---		
			BBP	---	---		
			DEHP	---	---		
			DIBP	---	---		
A-35	Black PCB	Composite	Pb	P	---	Comply	/
			Cd	P	---		
			Hg	P	---		
			Cr	P	---		
			Br	D	---		
			Cr^{6+}	---	---		
			PBBs	---	N.D.		
			PBDEs	---	N.D.		
			DBP	---	N.D.		
			BBP	---	N.D.		
			DEHP	---	N.D.		
			DIBP	---	N.D.		
A-36	Silvery Soldering Tin	Metal	Pb	P	---	Comply	/
			Cd	P	---		
			Hg	P	---		
			Cr	P	---		
			Br	---	---		
			Cr^{6+}	---	---		
			PBBs	---	---		
			PBDEs	---	---		
			DBP	---	---		
			BBP	---	---		
			DEHP	---	---		
			DIBP	---	---		

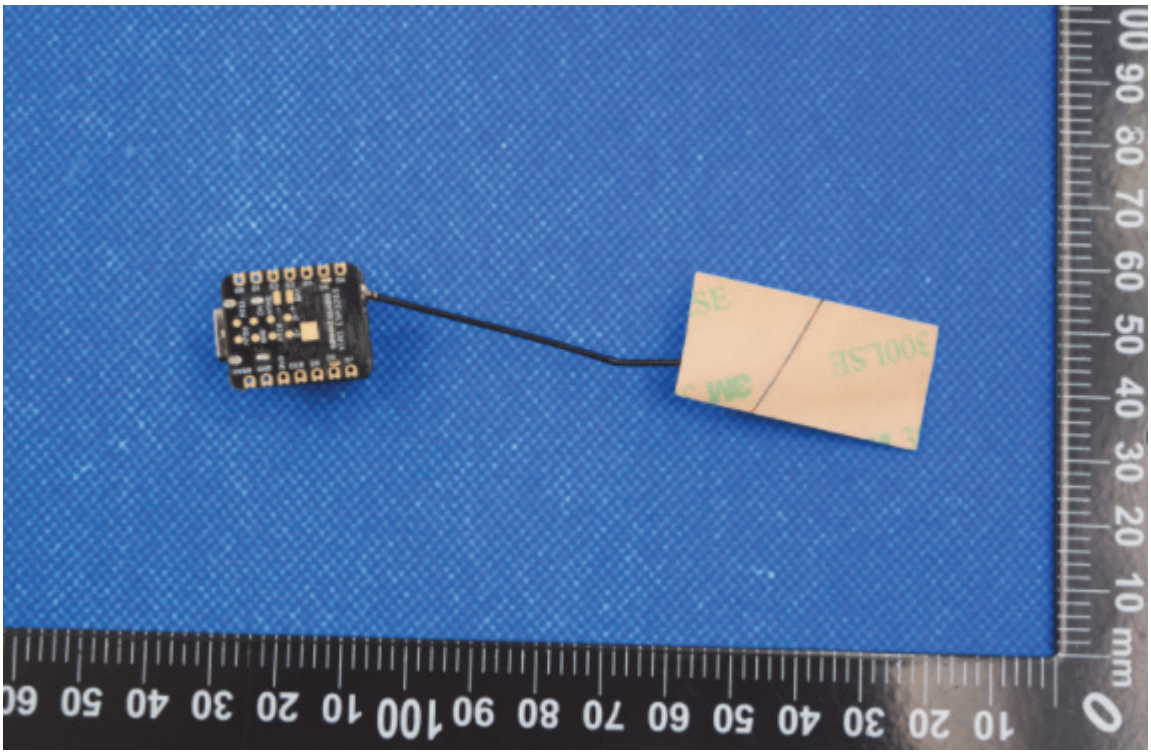
Part No.	Description	Material	X-ray Screening		Results of Chemical Test	Conclusion on RoHS EU	Sample Resubmitted
			Element	Data			
A-37	Black Diode	Composite	Pb	P	---	Comply	/
			Cd	P	---		
			Hg	P	---		
			Cr	D	---		
			Br	P	---		
			Cr^{6+}	---	N.D.		
			PBBs	---	---		
			PBDEs	---	---		
			DBP	---	N.D.		
			BBP	---	N.D.		
			DEHP	---	N.D.		
			DIBP	---	N.D.		

Remark：

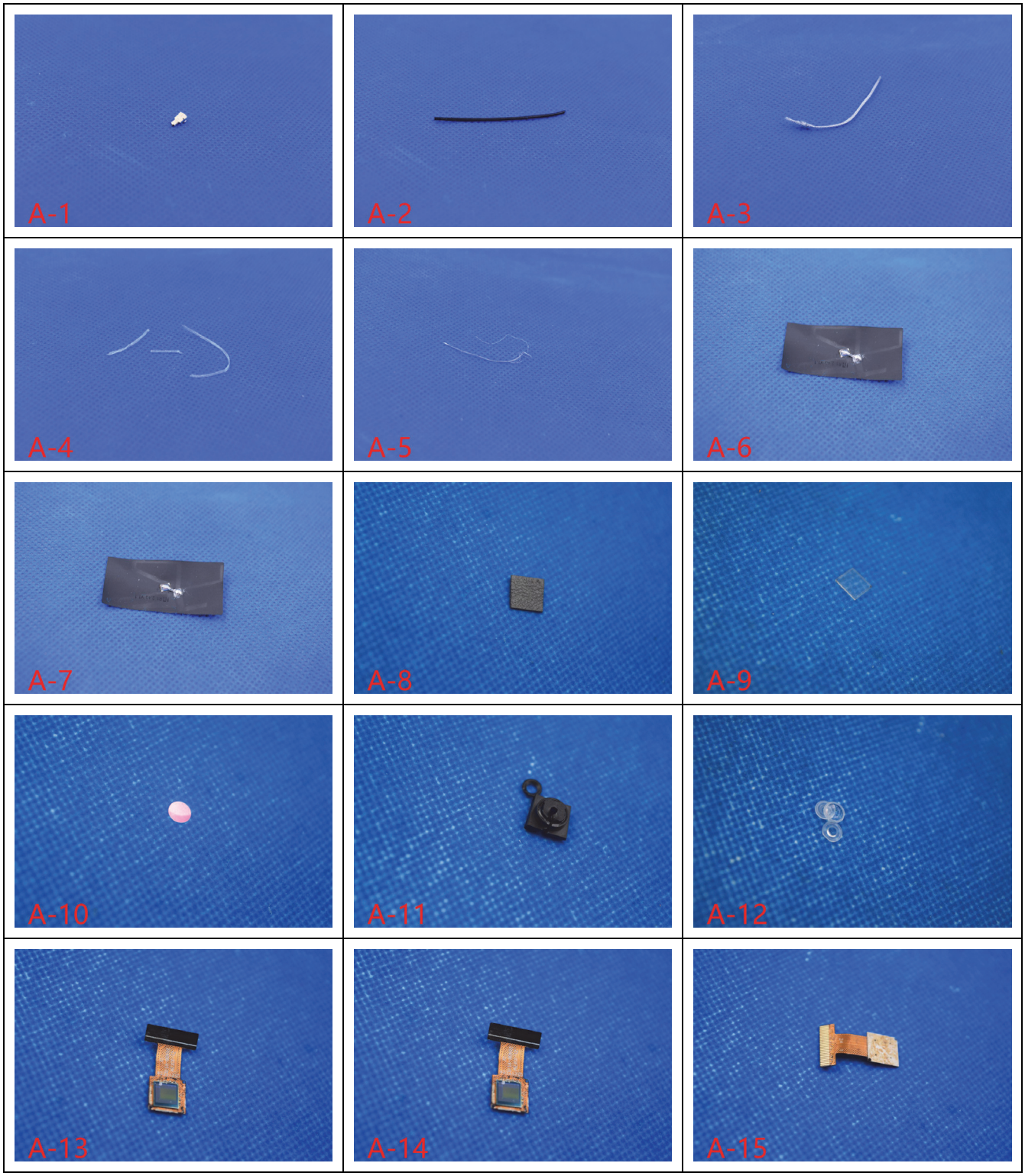
As requested by the client, test results and photos of the tested components except (A-1~A-7) are quoted from test report SZ23030453R01 dated on Apr.19, 2023.

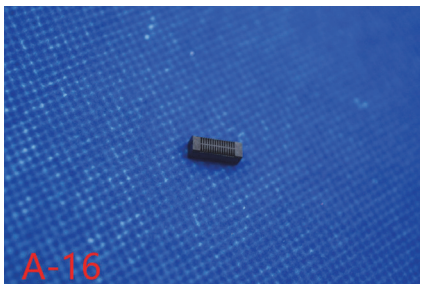
Annex A Photo of Sample



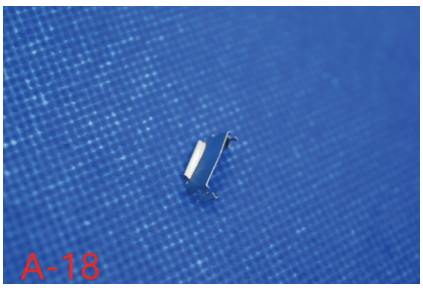


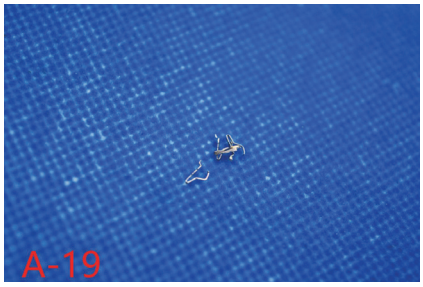
Annex B Photo of Test Part

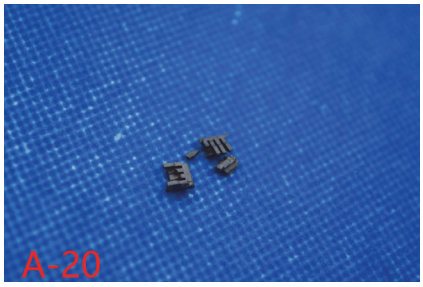



A-16


A-17

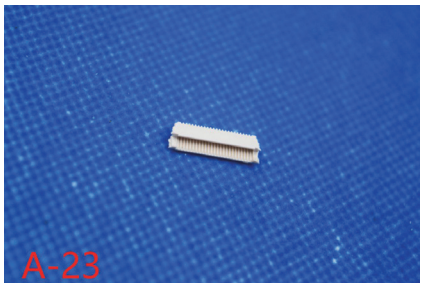

A-18


A-19

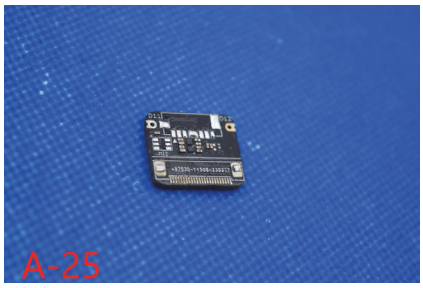

A-20

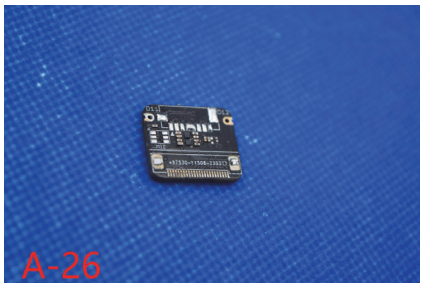

A-21


A-22

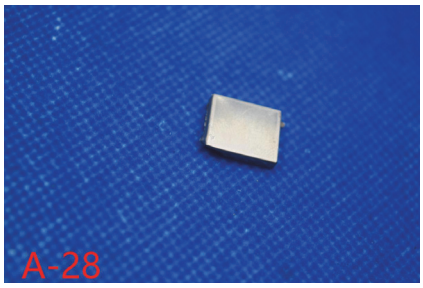

A-23

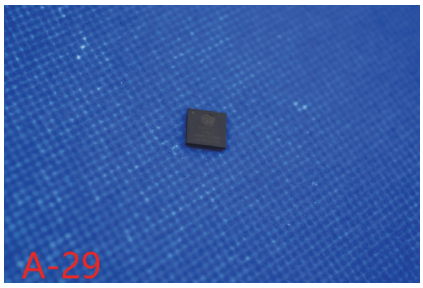

A-24

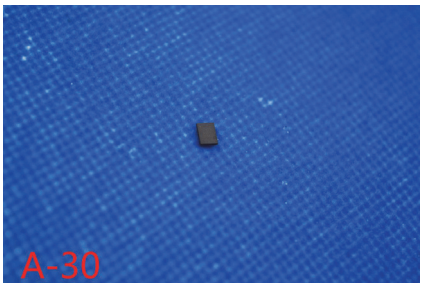

A-25

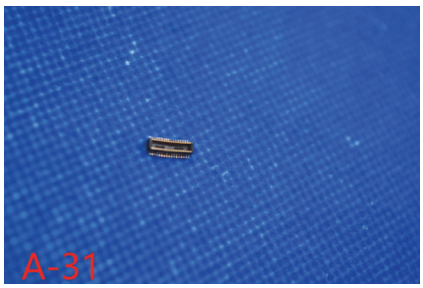

A-26

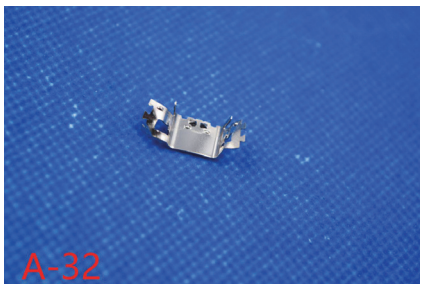

A-27

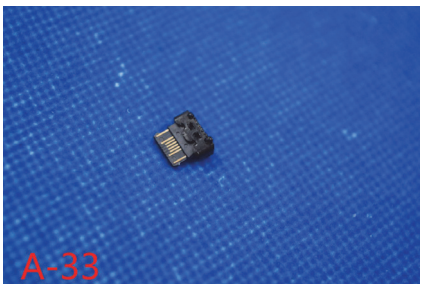

A-28

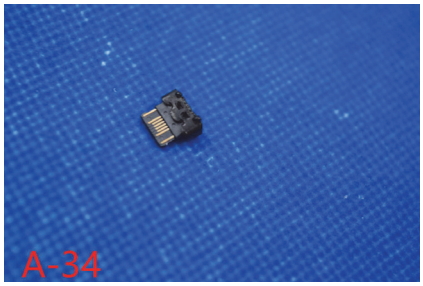

A-29

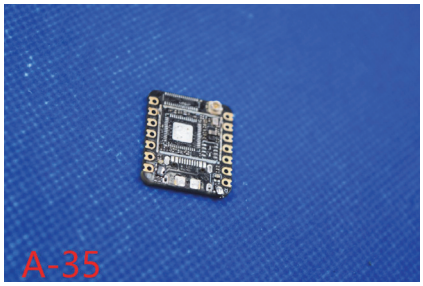

A-30

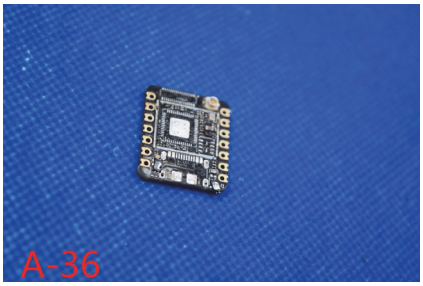

A-31


A-32


A-33


A-34


A-35


A-36


A-37

Annex C General Information

1.1 Identification of the Responsible Testing Laboratory

Laboratory Name:	Shenzhen Morlab Communications Technology Co., Ltd.
Laboratory Address:	FL.1-3, Building A, FeiYang Science Park, No.8 LongChang Road, Block67, BaoAn District, ShenZhen , GuangDong Province, P. R. China
Accredited Testing Laboratory:	CNAS No. L3572 (Shenzhen Morlab Communications Technology Co., Ltd.)
Telephone:	+86 755 36698555
Facsimile:	+86 755 36698525

1.2 Identification of the Responsible Testing Location

Name:	Shenzhen Morlab Communications Technology Co., Ltd.
Address:	FL.1-3, Building A, FeiYang Science Park, No.8 LongChang Road, Block67, BaoAn District, ShenZhen , GuangDong Province, P. R. China

1.3 Test Equipment Utilized

No.	Equipment Name	Serial No.	Type	Manufacturer	Cal.Date	Cal.Due Date
1	X-Ray Fluorescence Spectroscopy(XRF)	100180017-00406A	EDX-1800B	Skyray	2023.03.30	2024.03.29
2	X-Ray Fluorescence Spectroscopy(XRF)	100180017-01151A	EDX-1800B	Skyray	2023.07.04	2024.07.03
3	Gas Chromatography-Mass Spectrometer (GC-MS)	CN10617090	6890-5975I	Agilent	2023.02.09	2025.02.08
4	Ultraviolet and visible spectr -ophotometry (UV-Vis)	723S18011	DP-733S	Delp	2023.06.27	2024.06.26
5	Inductive Coupled Plasma Emission Spectrometer (ICP-OES)	IC72DC160825	ICAP7200	Thermo	2023.02.09	2025.02.08
6	Gas Chromatography-Mass Spectrometer (GC-MS)	C70504400059SA	QP2010 PLus	SHIMADZU	2023.02.09	2025.02.08
7	Gas Chromatography-Mass Spectrometer (GC-MS)	021745700818SA	QP2020 NX	SHIMADZU	2023.09.19	2025.09.18

***** END OF REPORT *****