Test Report

Applicant	:	**Arduino S.r.l.**
Address	:	**Via Andrea Appiani, 25** **20900 MONZA (Italy)**
Manufacturer	:	**Arduino S.r.l.**
Address	:	**Via Andrea Appiani, 25** **20900 MONZA (Italy)**
Sample Name	:	**Arduino MKR IoT Carrier**
Sample Model	:	**ABX00047**
Sample Brand	:	**Arduino**
Received Date	:	**May 10, 2021**
Testing Period	:	**May 10, 2021 ~ May 17, 2021**
Test Requested	:	**As specified by client, with reference to RoHS Directive 2011/65/EU and (EU) 2015/863 to determine the Lead (Pb), Cadmium (Cd), Mercury (Hg), Hexavalent Chromium (Cr(VI)), Polybrominated biphenyls (PBBs), Polybrominated diphenyl ethers (PBDEs), Dibutuyl Phthalate (DBP), Benzyl butyl phthalate (BBP), Bis-(2-ethyl hexyl)-phthalate (DEHP) and Diisobutyl phthalate (DIBP) content in the submitted sample.**
Test Method	:	**Please refer to next page.**
Test Results	:	**Please refer to next page(s).**
Conclusion	:	**Based on the performed tests on submitted sample(s), the results Comply with the RoHS Directive 2011/65/EU and (EU) 2015/863.**

CCIC (Shenzhen) Environmental Service Co., Ltd.

Completed by:	**Reviewed by:**	**Approved by:**
Qiumei. Chen	Andy. Zhou	Renyou. Yang
Qiumei.Chen	**Andy.Zhou**	**Renyou.Yang**

1. Test Method(s):

As requested by the client, Reference to IEC 62321-3-1-2013 (Ed1.0) Procedures for the screening analysis of Lead (Pb), Cadmium (Cd), Mercury (Hg), total Chromium (Cr), and Bromine (Br) by XRF. If the screening analysis results exceed the screening limits of IEC 62321-3-1-2013 (Ed1.0) Annex A, use the chemical methods for testing.

Table1 IEC 62321-3-1-2013 (Ed1.0) Annex A screening limits of XRF (mg/kg)

Element	Polymer	Metal	Composite Materials
Cd	BL≤ (70-3σ)< X <(130+3σ)≤ OL	BL≤ (70-3σ)< X <(130+3σ)≤ OL	LOD < X <(150+3σ)≤ OL
Pb	BL≤ (700-3σ)< X <(1300+3σ)≤ OL	BL≤ (700-3σ)< X <(1300+3σ)≤ OL	BL≤ (500-3σ)< X <(1500+3σ)≤ OL
Hg	BL≤ (700-3σ)< X <(1300+3σ)≤ OL	BL≤ (700-3σ)< X <(1300+3σ)≤ OL	BL≤ (500-3σ)< X <(1500+3σ)≤ OL
Br	BL ≤ (300-3σ)< X	Not applicable	BL≤ (250-3σ)< X
Cr	BL ≤ (700-3σ)< X	BL ≤ (700-3σ)< X	BL≤ (500-3σ)< X

BL = Less than screening limits of XRF

OL = More than screening limits of XRF

X = The results of screening analysis by XRF are within this range, requiring further chemical testing.

LOD = Limit of Detection

Table2 testing methods & Equipments

Testing Item	Testing Method	Equipment
Screening analysis by XRF		
Lead (Pb) Cadmium (Cd) Mercury (Hg) Chromium (Cr) Bromine (Br)	IEC 62321-3-1-2013 (Ed1.0)	ED-XRF
Chemical testing		
Hexavalent chromium (Cr(VI)) for plastic	IEC 62321-7-2-2017 (Ed1.0)	UV-VIS
Hexavalent chromium (Cr(VI)) for coating on metals	IEC 62321-7-1-2015 (Ed1.0)	UV-VIS
PBBs	IEC 62321-6-2015 (Ed1.0)	GC-MS
PBDEs	IEC 62321-6-2015 (Ed1.0)	GC-MS

DBP	IEC 62321-8-2017 (Ed1.0)	GC-MS
BBP	IEC 62321-8-2017 (Ed1.0)	GC-MS
DEHP	IEC 62321-8-2017 (Ed1.0)	GC-MS
DIBP	IEC 62321-8-2017 (Ed1.0)	GC-MS

2. Test Result(s):

Part No.	Part Description	Restricted Substances	Results (mg/kg)			Conclusion (P/F)	Resubmitted Date/ Source of Data
			EDXRF (P/F/D)	PHTH Screening	Chemical testing		
1	Black plastic	Cd	P	\	PBBs: ND PBDEs: ND	P	\
		Pb	P			P	
		Hg	P			P	
		Cr(VI)	P			P	
		PBBs	D			P	
		PBDEs	D			P	
		DEHP	\	P	\	P	
		DBP	\	P	\	P	
		BBP	\	P	\	P	
		DIBP	\	P	\	P	
2	Silvery metal	Cd	P	\	\	P	\
		Pb	P			P	
		Hg	P			P	
		Cr(VI)	P			P	
		PBBs	\			\	
		PBDEs	\			\	
		DEHP	\	\	\	\	
		DBP	\	\	\	\	
		BBP	\	\	\	\	
		DIBP	\	\	\	\	

Part No.	Part Description	Restricted Substances	Results (mg/kg)			Conclusion (P/F)	Resubmitted Date/ Source of Data
			EDXRF (P/F/D)	PHTH Screening	Chemical testing		
3	Black plastic	Cd	P	\	\	P	\
		Pb	P			P	
		Hg	P			P	
		Cr(VI)	P			P	
		PBBs	P			P	
		PBDEs	P			P	
		DEHP	\	P	\	P	
		DBP	\	P	\	P	
		BBP	\	P	\	P	
		DIBP	\	P	\	P	
4	Silvery metal	Cd	P	\	Cr(VI): Negative (< 0.10 μg/cm^2)	P	\
		Pb	P			P	
		Hg	P			P	
		Cr(VI)	D			P	
		PBBs	\			\	
		PBDEs	\			\	
		DEHP	\	\	\	\	
		DBP	\	\	\	\	
		BBP	\	\	\	\	
		DIBP	\	\	\	\	
5	Gray inductance	Cd	P	\	\	P	\
		Pb	P			P	
		Hg	P			P	
		Cr(VI)	P			P	
		PBBs	P			P	
		PBDEs	P			P	
		DEHP	\	P	\	P	
		DBP	\	P	\	P	
		BBP	\	P	\	P	
		DIBP	\	P	\	P	

Part No.	Part Description	Restricted Substances	Results (mg/kg)			Conclusion (P/F)	Resubmitted Date/ Source of Data
			EDXRF (P/F/D)	PHTH Screening	Chemical testing		
6	Black diode	Cd	P	\	See remark (5)	P	\
		Pb	F			P	
		Hg	P			P	
		Cr(VI)	P			P	
		PBBs	P			P	
		PBDEs	P			P	
		DEHP	\	P	\	P	
		DBP	\	P	\	P	
		BBP	\	P	\	P	
		DIBP	\	P	\	P	
7	Beige capacitor	Cd	P	\	\	P	\
		Pb	P			P	
		Hg	P			P	
		Cr(VI)	P			P	
		PBBs	P			P	
		PBDEs	P			P	
		DEHP	\	P	\	P	
		DBP	\	P	\	P	
		BBP	\	P	\	P	
		DIBP	\	P	\	P	
8	Golden metal	Cd	P	\	\	P	\
		Pb	P			P	
		Hg	P			P	
		Cr(VI)	P			P	
		PBBs	\			\	
		PBDEs	\			\	
		DEHP	\	\	\	\	
		DBP	\	\	\	\	
		BBP	\	\	\	\	
		DIBP	\	\	\	\	

Part No.	Part Description	Restricted Substances	Results (mg/kg)			Conclusion (P/F)	Resubmitted Date/ Source of Data
			EDXRF (P/F/D)	PHTH Screening	Chemical testing		
9	Beige plastic	Cd	P	\	\	P	\
		Pb	P			P	
		Hg	P			P	
		Cr(VI)	P			P	
		PBBs	P			P	
		PBDEs	P			P	
		DEHP	\	P	\	P	
		DBP	\	P	\	P	
		BBP	\	P	\	P	
		DIBP	\	P	\	P	
10	Silvery metal	Cd	P	\	\	P	\
		Pb	P			P	
		Hg	P			P	
		Cr(VI)	P			P	
		PBBs	\			\	
		PBDEs	\			\	
		DEHP	\	\	\	\	
		DBP	\	\	\	\	
		BBP	\	\	\	\	
		DIBP	\	\	\	\	
11	Silvery metal	Cd	P	\	Cr(VI): Negative (< 0.10 μg/cm^2)	P	\
		Pb	P			P	
		Hg	P			P	
		Cr(VI)	D			P	
		PBBs	\			\	
		PBDEs	\			\	
		DEHP	\	\	\	\	
		DBP	\	\	\	\	
		BBP	\	\	\	\	
		DIBP	\	\	\	\	

Part No.	Part Description	Restricted Substances	Results (mg/kg)			Conclusion (P/F)	Resubmitted Date/ Source of Data
			EDXRF (P/F/D)	PHTH Screening	Chemical testing		
12	Black plastic	Cd	P	\	\	P	\
		Pb	P			P	
		Hg	P			P	
		Cr(VI)	P			P	
		PBBs	P			P	
		PBDEs	P			P	
		DEHP	\	P	\	P	
		DBP	\	P	\	P	
		BBP	\	P	\	P	
		DIBP	\	P	\	P	
13	Silvery metal	Cd	P	\	\	P	\
		Pb	P			P	
		Hg	P			P	
		Cr(VI)	P			P	
		PBBs	\			\	
		PBDEs	\			\	
		DEHP	\	\	\	\	
		DBP	\	\	\	\	
		BBP	\	\	\	\	
		DIBP	\	\	\	\	
14	Solder	Cd	P	\	\	P	\
		Pb	P			P	
		Hg	P			P	
		Cr(VI)	P			P	
		PBBs	\			\	
		PBDEs	\			\	
		DEHP	\	\	\	\	
		DBP	\	\	\	\	
		BBP	\	\	\	\	
		DIBP	\	\	\	\	

Part No.	Part Description	Restricted Substances	Results (mg/kg)			Conclusion (P/F)	Resubmitted Date/ Source of Data
			EDXRF (P/F/D)	PHTH Screening	Chemical testing		
15	Translucent LED	Cd	P	\	\	P	\
		Pb	P			P	
		Hg	P			P	
		Cr(VI)	P			P	
		PBBs	P			P	
		PBDEs	P			P	
		DEHP	\	P	\	P	
		DBP	\	P	\	P	
		BBP	\	P	\	P	
		DIBP	\	P	\	P	
16	Black IC	Cd	P	\	Cr(VI): ND	P	\
		Pb	P			P	
		Hg	P			P	
		Cr(VI)	D			P	
		PBBs	P			P	
		PBDEs	P			P	
		DEHP	\	P	\	P	
		DBP	\	P	\	P	
		BBP	\	P	\	P	
		DIBP	\	P	\	P	
17	Golden crystal oscillator	Cd	P	\	\	P	\
		Pb	P			P	
		Hg	P			P	
		Cr(VI)	P			P	
		PBBs	P			P	
		PBDEs	P			P	
		DEHP	\	P	\	P	
		DBP	\	P	\	P	
		BBP	\	P	\	P	
		DIBP	\	P	\	P	

Part No.	Part Description	Restricted Substances	Results (mg/kg)			Conclusion (P/F)	Resubmitted Date/ Source of Data
			EDXRF (P/F/D)	PHTH Screening	Chemical testing		
18	Brown capacitor	Cd	P	\	\	P	\
		Pb	P			P	
		Hg	P			P	
		Cr(VI)	P			P	
		PBBs	P			P	
		PBDEs	P			P	
		DEHP	\	P	\	P	
		DBP	\	P	\	P	
		BBP	\	P	\	P	
		DIBP	\	P	\	P	
19	Black plastic	Cd	P	\	\	P	\
		Pb	P			P	
		Hg	P			P	
		Cr(VI)	P			P	
		PBBs	P			P	
		PBDEs	P			P	
		DEHP	\	P	\	P	
		DBP	\	P	\	P	
		BBP	\	P	\	P	
		DIBP	\	P	\	P	
20	Black PCB	Cd	P	\	PBBs: ND PBDEs: ND	P	\
		Pb	P			P	
		Hg	P			P	
		Cr(VI)	P			P	
		PBBs	D			P	
		PBDEs	D			P	
		DEHP	\	P	\	P	
		DBP	\	P	\	P	
		BBP	\	P	\	P	
		DIBP	\	P	\	P	

Part No.	Part Description	Restricted Substances	Results (mg/kg)			Conclusion (P/F)	Resubmitted Date/ Source of Data
			EDXRF (P/F/D)	PHTH Screening	Chemical testing		
21	Black plastic	Cd	P	\	\	P	\
		Pb	P			P	
		Hg	P			P	
		Cr(VI)	P			P	
		PBBs	P			P	
		PBDEs	P			P	
		DEHP	\	P	\	P	
		DBP	\	P	\	P	
		BBP	\	P	\	P	
		DIBP	\	P	\	P	
22	Silvery metal	Cd	P	\	\	P	\
		Pb	P			P	
		Hg	P			P	
		Cr(VI)	P			P	
		PBBs	\			\	
		PBDEs	\			\	
		DEHP	\	\	\	\	
		DBP	\	\	\	\	
		BBP	\	\	\	\	
		DIBP	\	\	\	\	
23	Silvery metal	Cd	P	\	\	P	\
		Pb	P			P	
		Hg	P			P	
		Cr(VI)	P			P	
		PBBs	\			\	
		PBDEs	\			\	
		DEHP	\	\	\	\	
		DBP	\	\	\	\	
		BBP	\	\	\	\	
		DIBP	\	\	\	\	

Part No.	Part Description	Restricted Substances	Results (mg/kg)			Conclusion (P/F)	Resubmitted Date/ Source of Data
			EDXRF (P/F/D)	PHTH Screening	Chemical testing		
24	Coppery metal wire	Cd	P	\	\	P	\
		Pb	P			P	
		Hg	P			P	
		Cr(VI)	P			P	
		PBBs	\			\	
		PBDEs	\			\	
		DEHP	\	\	\	\	
		DBP	\	\	\	\	
		BBP	\	\	\	\	
		DIBP	\	\	\	\	
25	Black plastic	Cd	P	\	\	P	\
		Pb	P			P	
		Hg	P			P	
		Cr(VI)	P			P	
		PBBs	P			P	
		PBDEs	P			P	
		DEHP	\	P	\	P	
		DBP	\	P	\	P	
		BBP	\	P	\	P	
		DIBP	\	P	\	P	
26	Black sponge	Cd	P	\	\	P	\
		Pb	P			P	
		Hg	P			P	
		Cr(VI)	P			P	
		PBBs	P			P	
		PBDEs	P			P	
		DEHP	\	P	\	P	
		DBP	\	P	\	P	
		BBP	\	P	\	P	
		DIBP	\	P	\	P	

Part No.	Part Description	Restricted Substances	Results (mg/kg)			Conclusion (P/F)	Resubmitted Date/ Source of Data
			EDXRF (P/F/D)	PHTH Screening	Chemical testing		
27	Brown FPC	Cd	P	\	\	P	\
		Pb	P			P	
		Hg	P			P	
		Cr(VI)	P			P	
		PBBs	P			P	
		PBDEs	P			P	
		DEHP	\	P	\	P	
		DBP	\	P	\	P	
		BBP	\	P	\	P	
		DIBP	\	P	\	P	
28	Silvery metal	Cd	P	\	Cr(VI): Negative (< 0.10 μg/cm^2)	P	\
		Pb	P			P	
		Hg	P			P	
		Cr(VI)	D			P	
		PBBs	\			\	
		PBDEs	\			\	
		DEHP	\	\	\	\	
		DBP	\	\	\	\	
		BBP	\	\	\	\	
		DIBP	\	\	\	\	
29	White plastic	Cd	P	\	\	P	\
		Pb	P			P	
		Hg	P			P	
		Cr(VI)	P			P	
		PBBs	P			P	
		PBDEs	P			P	
		DEHP	\	P	\	P	
		DBP	\	P	\	P	
		BBP	\	P	\	P	
		DIBP	\	P	\	P	

Part No.	Part Description	Restricted Substances	Results (mg/kg)			Conclusion (P/F)	Resubmitted Date/ Source of Data
			EDXRF (P/F/D)	PHTH Screening	Chemical testing		
30	Silvery plastic sheet	Cd	P	\	\	P	\
		Pb	P			P	
		Hg	P			P	
		Cr(VI)	P			P	
		PBBs	P			P	
		PBDEs	P			P	
		DEHP	\	P	\	P	
		DBP	\	P	\	P	
		BBP	\	P	\	P	
		DIBP	\	P	\	P	
31	Transparent plastic	Cd	P	\	\	P	\
		Pb	P			P	
		Hg	P			P	
		Cr(VI)	P			P	
		PBBs	P			P	
		PBDEs	P			P	
		DEHP	\	P	\	P	
		DBP	\	P	\	P	
		BBP	\	P	\	P	
		DIBP	\	P	\	P	
32	Black adhesive plastic tape	Cd	P	\	\	P	\
		Pb	P			P	
		Hg	P			P	
		Cr(VI)	P			P	
		PBBs	P			P	
		PBDEs	P			P	
		DEHP	\	\	644	P	
		DBP	\	\	ND	P	
		BBP	\	\	ND	P	
		DIBP	\	\	ND	P	

Part No.	Part Description	Restricted Substances	Results (mg/kg)			Conclusion (P/F)	Resubmitted Date/ Source of Data
			EDXRF (P/F/D)	PHTH Screening	Chemical testing		
33	Translucent plastic sheet	Cd	P	\	\	P	\
		Pb	P			P	
		Hg	P			P	
		Cr(VI)	P			P	
		PBBs	P			P	
		PBDEs	P			P	
		DEHP	\	P	\	P	
		DBP	\	P	\	P	
		BBP	\	P	\	P	
		DIBP	\	P	\	P	
34	Translucent white plastic sheet	Cd	P	\	\	P	\
		Pb	P			P	
		Hg	P			P	
		Cr(VI)	P			P	
		PBBs	P			P	
		PBDEs	P			P	
		DEHP	\	P	\	P	
		DBP	\	P	\	P	
		BBP	\	P	\	P	
		DIBP	\	P	\	P	
35	Translucent plastic sheet	Cd	P	\	\	P	\
		Pb	P			P	
		Hg	P			P	
		Cr(VI)	P			P	
		PBBs	P			P	
		PBDEs	P			P	
		DEHP	\	P	\	P	
		DBP	\	P	\	P	
		BBP	\	P	\	P	
		DIBP	\	P	\	P	

Part No.	Part Description	Restricted Substances	Results (mg/kg)			Conclusion (P/F)	Resubmitted Date/ Source of Data
			EDXRF (P/F/D)	PHTH Screening	Chemical testing		
36	Silvery glass	Cd	P	\	\	P	\
		Pb	P			P	
		Hg	P			P	
		Cr(VI)	P			P	
		PBBs	P			P	
		PBDEs	P			P	
		DEHP	\	P	\	P	
		DBP	\	P	\	P	
		BBP	\	P	\	P	
		DIBP	\	P	\	P	
37	Brown FPC	Cd	P	\	\	P	\
		Pb	P			P	
		Hg	P			P	
		Cr(VI)	P			P	
		PBBs	P			P	
		PBDEs	P			P	
		DEHP	\	P	\	P	
		DBP	\	P	\	P	
		BBP	\	P	\	P	
		DIBP	\	P	\	P	
38	White LED	Cd	P	\	\	P	\
		Pb	P			P	
		Hg	P			P	
		Cr(VI)	P			P	
		PBBs	P			P	
		PBDEs	P			P	
		DEHP	\	P	\	P	
		DBP	\	P	\	P	
		BBP	\	P	\	P	
		DIBP	\	P	\	P	

Note:

mg/kg = milligram per kilogram = ppm
ND = Not detected (<MDL)
P = PASS = Less than screening limits of XRF
F = FAIL = More than screening limits of XRF
D = DETECTED = Inconclusive
NA = Not applicable
\ = Not available

Remark:

(1) The results of XRF are only for reference.

(2) For hexavalent chromium (Cr(VI)), XRF testing result is the content of Chromium (Cr) elements; for polybrominated biphenyls (PBBs) and polybrominated diphenyl ethers (PBDEs), XRF testing result is the content of Bromine (Br) elements.

(3) Screening results of PHTH are for primary screening, and further chemical testing by GC-MS (for DBP, BBP, DEHP and DIBP) are recommended to be performed if the concentration (based on weight of a single sample) exceeds the below warning value.

TEST ITEM	Screening Limit (Unit: mg/kg)
Di-2-ethylhexyl phthalate (DEHP)	P≤600＜D
Dibutyl phthalate (DBP)	P≤600＜D
Benzylbutyl phthalate (BBP)	P≤600＜D
Diisobutyl phthalate (DIBP)	P≤600＜D

(4) According to IEC 62321-7-1-2015, three types of Cr(VI) results for coating on metals is as follows:
Sample Cr(VI) concentration is < 0.10 μg/cm^2, The coating is considered a non-Cr(VI) based coating, the sample is negative for Cr(VI);
Sample Cr(VI) concentration is between 0.10 μg/cm^2 and 0.13 μg/cm^2, The result is considered to be inconclusive, if addition samples are available, perform a total of 3 trials to increase sampling surface area, use the averaged result of the 3 trials for the final determination;
Sample Cr(VI) concentration is > 0.13 μg/cm^2, The sample coating is considered to contain Cr(VI), The sample is positive for Cr(VI).

(5) According to the declaration from client, the source of Lead in No. 6 could be from the high melting temperature type solder, while Lead in high melting temperature type solder above 85% by weight in electronic component is exempted by RoHS Directive 2011/65/EU of the European Parliament and of the council of 8 June 2011.

3. Method Detection Limit (MDL):

For XRF screening analysis (mg/kg)

Item	Pb	Cd	Hg	Br	Cr
Polymer	20	20	20	20	20
Other materials	50	50	50	50	50

For chemical testing (mg/kg)

Item	Pb	Cd	Hg	PBBs	PBDEs	DEHP	BBP	DBP	DIBP	Cr(VI)
General materials	2	2	2	5	5	50	50	50	50	See remark (2)

Remark:

(1) PBBs and PBDEs method detection limit only for one substance;

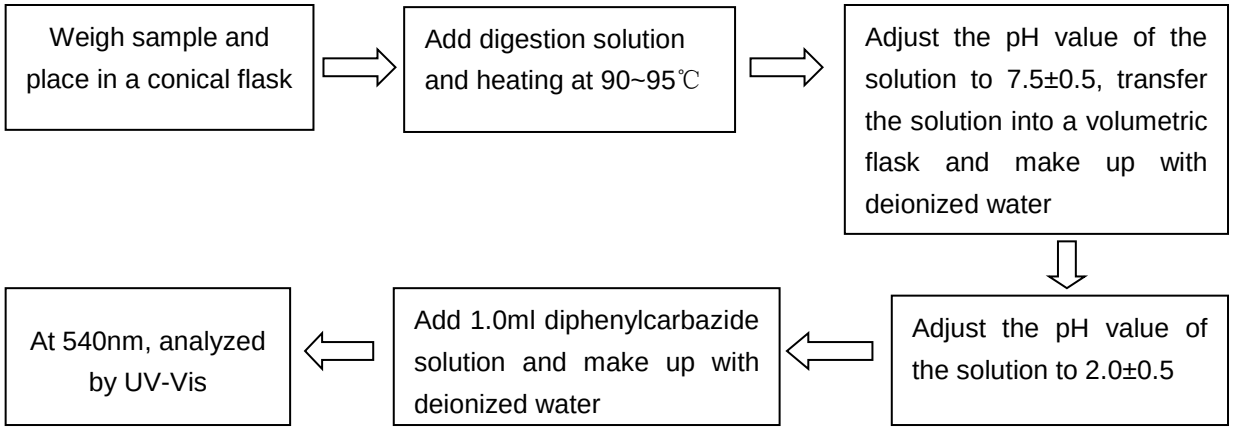
(2) MDL for polymer and Composites is 8 mg/kg, MDL for coating on metals is 0.02 μg/cm^2.

4. RoHS Requirement (mg/kg):

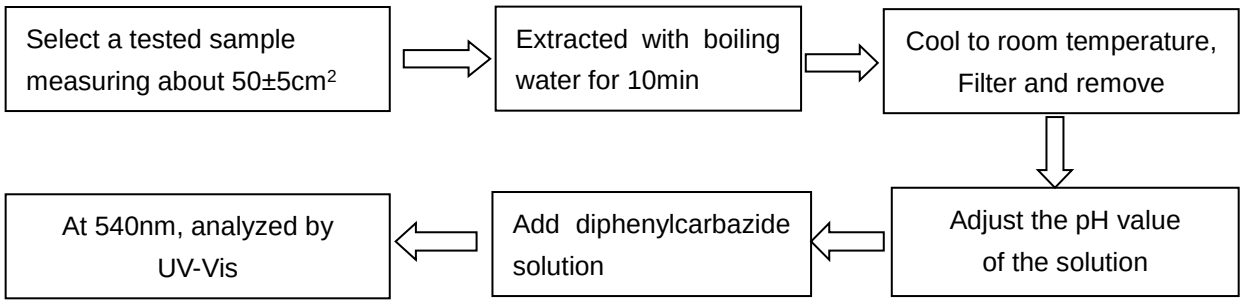
Restricted substances	Cd	Pb	Hg	Cr(VI)	PBBs	PBDEs	DEHP	BBP	DBP	DIBP
RoHS limit	100	1000	1000	1000	1000	1000	1000	1000	1000	1000

5. Chemical Test Process:

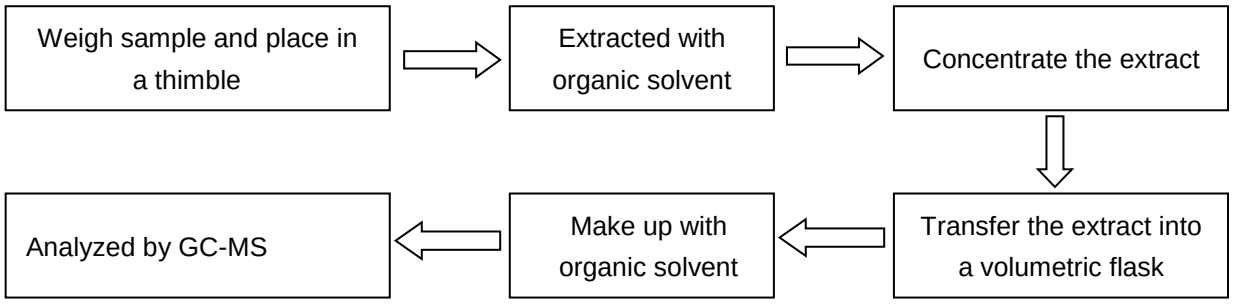
(1) Hexavalent Chromium (Cr(VI)) (Alkaline extraction)



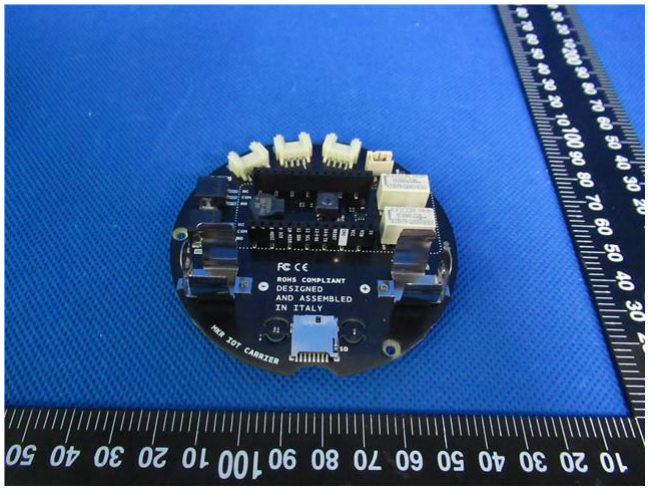
(2) Hexavalent Chromium (Cr(VI)) (Boiling water extraction)

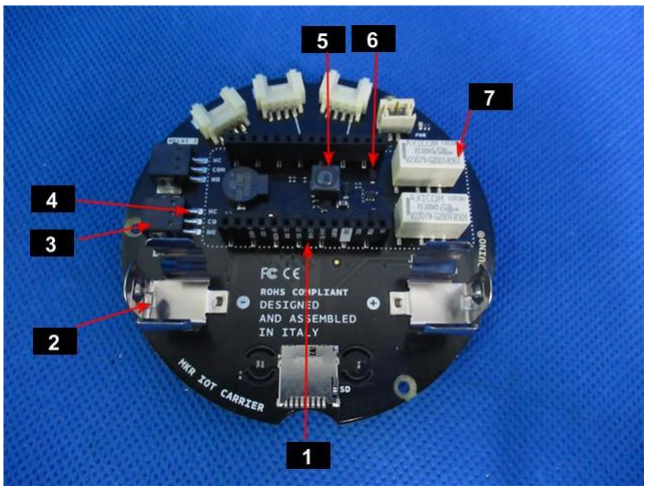


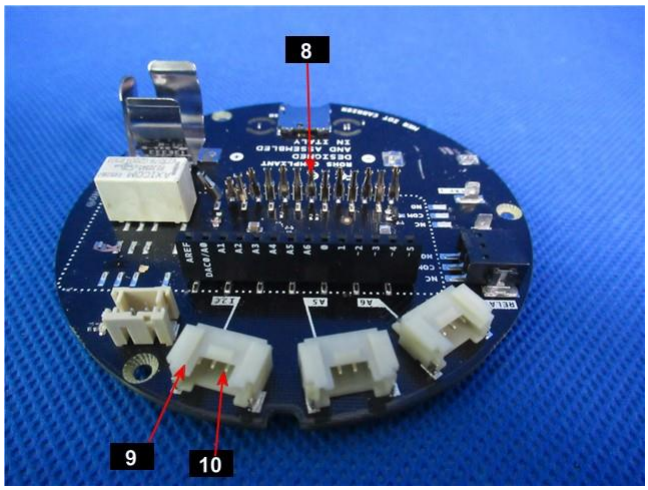
(3) PBBs /PBDEs, DEHP, BBP, DBP, DIBP



6. Appendix:



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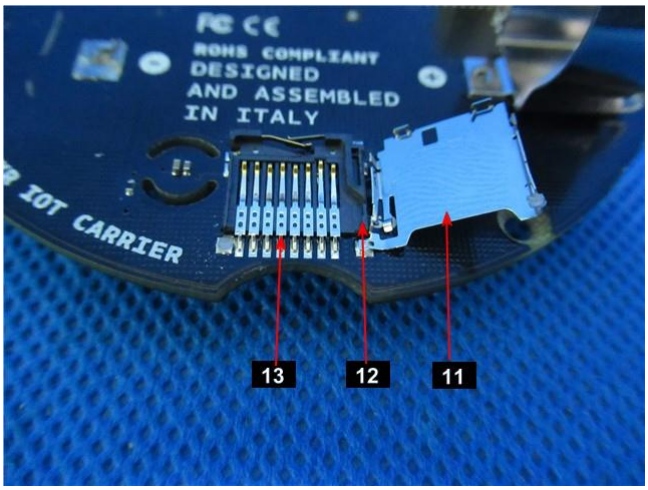
ROHS COMPLIANT
DESIGNED
AND ASSEMBLED
IN ITALY
IOT CARRIER
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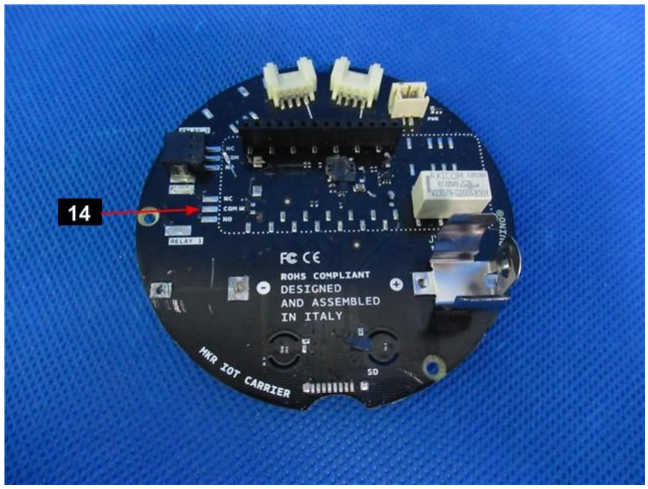
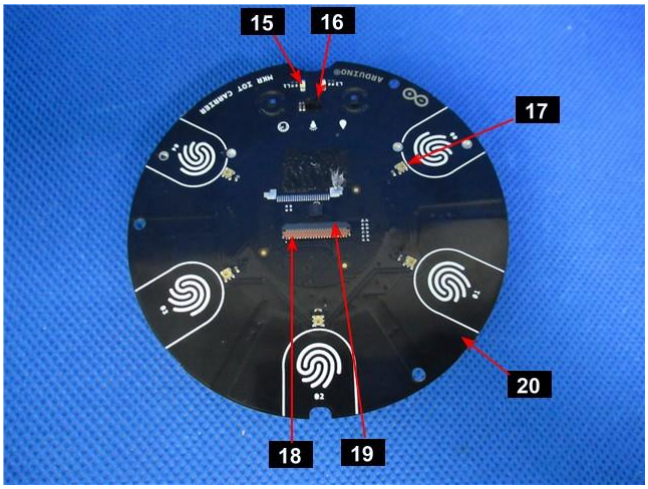

14
ROHS COMPLIANT
DESIGNED
AND ASSEMBLED
IN ITALY
MKR IOT CARRIER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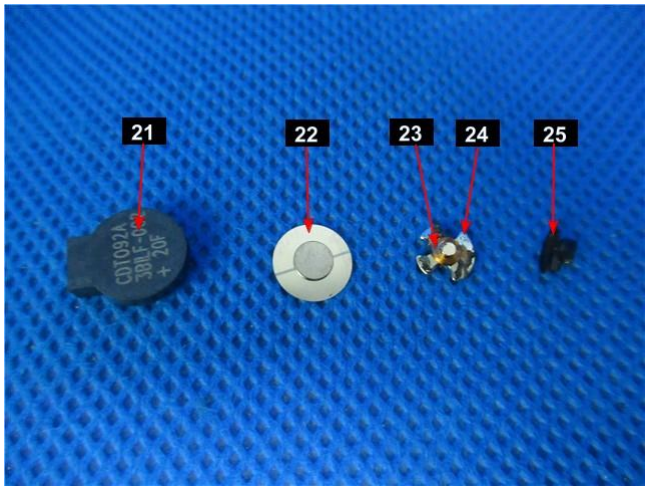
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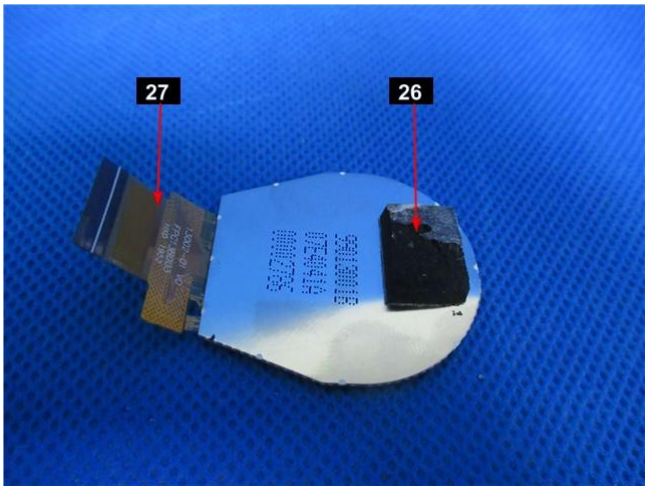
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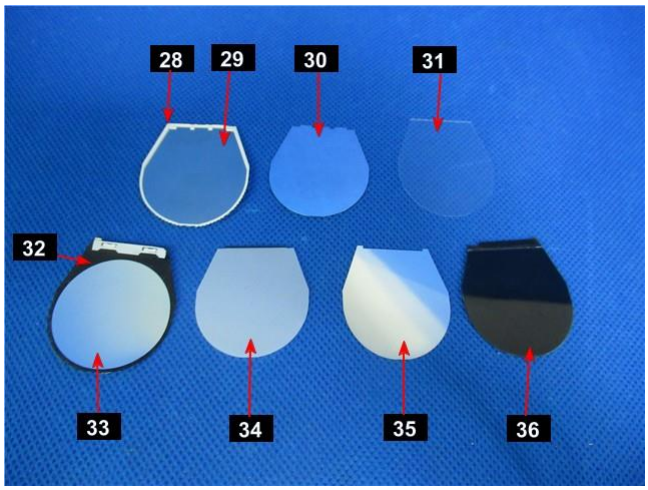

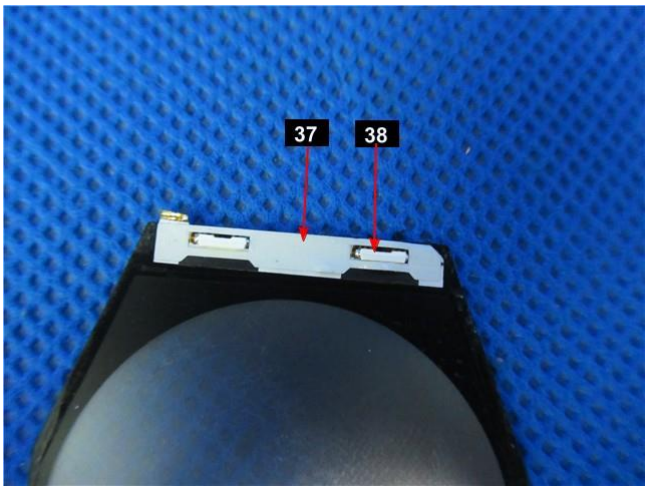

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*****End of Report*****