

Test Report

No. SZARR181025011-01

Date: Oct. 31, 2018

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Applicant : Shanghai Wenheng Electronics Technology Co., Ltd.
Address : Room 611,Building5, Xizi International Center No.898 Xiuwen Street,Minhang District,ShangHai
The submitted sample and sample information was/were submitted and identified by/on the behalf of the client
Sample name : LoRa Module
Model No. : WH-L101 (main test) , WH-L100, WH-L102, WH-L103, WH-L104, WH-L105, WH-L106, WH-L107, WH-L108, WH-L109, WH-L200, WH-L201, WH-L202, WH-L203, WH-L204, WH-L205, WH-L206, WH-L207, WH-L208, WH-L209, WH-LR30, WH-LR31, WH-LR32, WH-LR33, WH-LR34, WH-LR35, WH-LR36, WH-LR37, WH-LR38, WH-LR39
Manufacturer : Shanghai Wenheng Electronics Technology Co., Ltd.
Address : Room 611,Building5, Xizi International Center No.898 Xiuwen Street,Minhang District,ShangHai
Supplier : Shanghai Wenheng Electronics Technology Co., Ltd.
Address : Room 611,Building5, Xizi International Center No.898 Xiuwen Street,Minhang District,ShangHai
Sample received date : Oct. 25, 2018
Testing period : Oct. 25, 2018 to Oct. 31, 2018
Test requested : 1. As specified by client, to screen Lead(Pb), Cadmium(Cd), Mercury(Hg), Chromium(Cr) and Bromine(Br) in the submitted sample(s) by XRF.
2. As specified by client, when screening results exceed the XRF screening limit in IEC 62321-3-1:2013, further use of chemical methods are required to test the Lead(Pb), Cadmium(Cd), Mercury(Hg), Hexavalent Chromium(Cr(VI)), Polybrominated Biphenyls(PBBs), Polybrominated Diphenyl Ethers(PBDEs) in the submitted samples in accordance with the RoHS Directive 2011/65/EU.

Test Method: Please refer to the following page(s).

Test Result(s): Please refer to the following page(s).

Tested by

Liqing Yang

Liqing Yang

Test engineer

Reviewed by

Niki You

Niki You

Test engineer

Approved by

Leo Li

Leo Li

Authorized signatory



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Test Method:

A. Screening test by XRF spectroscopy

XRF screening limits in mg/kg for regulated elements according to IEC 62321-3-1:2013.

Element	Limit of IEC 62321-3-1:2013. Unit (mg/kg)		MDL	
	Polymers and metals	Composite material	Polymers	Other material
Pb	$BL \leq (700-3\sigma) < X < (1300+3\sigma)$ $\leq OL$	$BL \leq (500-3\sigma) < X < (1500+3\sigma)$ $\leq OL$	10 mg/kg	50 mg/kg
Cd	$BL \leq (70-3\sigma) < X < (130+3\sigma)$ $\leq OL$	$LOD \leq (50-3\sigma) < X < (150+3\sigma)$ $\leq OL$	10 mg/kg	50 mg/kg
Hg	$BL \leq (700-3\sigma) < X < (1300+3\sigma)$ $\leq OL$	$BL \leq (500-3\sigma) < X < (1500+3\sigma)$ $\leq OL$	10 mg/kg	50 mg/kg
Cr	$BL \leq (700-3\sigma) < X$	$BL \leq (500-3\sigma) < X$	10 mg/kg	50 mg/kg
Br	$BL \leq (300-3\sigma) < X$	$BL \leq (250-3\sigma) < X$	10 mg/kg	50 mg/kg

Note:

- BL = Under the XRF screening limit
- OL = Further chemical test will be conducted while result is above the screening limit
- X= The symbol "X" marks the region where further investigation is necessary
- 3σ= The reproducibility of analytical instruments
- LOD= Detection limit

B. Chemical Test

Test Item(s)	Test Method	Measured Equipment(s)	MDL	Limit
Lead (Pb)	IEC 62321-5:2013 Ed.1.0	ICP-OES	2 mg/kg	1000 mg/kg
Cadmium (Cd)	IEC 62321-5:2013 Ed.1.0	ICP-OES	2 mg/kg	100 mg/kg
Mercury (Hg)	IEC 62321-4:2013+AMD1:2017	ICP-OES	2 mg/kg	1000 mg/kg
Hexavalent Chromium Cr(VI)	IEC 62321-7-1:2015 Ed.1.0	UV-VIS	/	1000 mg/kg
	IEC 62321-7-2:2017 Ed.1.0	UV-VIS	2 mg/kg	1000 mg/kg
Polybrominated Biphenyls (PBBs)	IEC 62321-6:2015 Ed.1.0	GC-MS	5 mg/kg	1000 mg/kg
Polybrominated Diphenyl Ethers (PBDEs)	IEC 62321-6:2015 Ed.1.0	GC-MS	5 mg/kg	1000 mg/kg



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Test Results:

Sample No.	Sample Description	Tested Items	XRF Screening Test Unit (mg/kg)	Chemical Test Unit (mg/kg)	Conclusion
1	Blue label sticker	Pb	BL	/	PASS
		Cd	BL	/	
		Hg	BL	/	
		Cr(Cr(VI))	BL	/	
		Br(PBBs&PBDEs)	BL	/	
2	Silvery metal cover	Pb	BL	/	PASS
		Cd	BL	/	
		Hg	BL	/	
		Cr(Cr(VI))	BL	/	
		Br(PBBs&PBDEs)	/	/	
3	Chip resistor	Pb	BL	/	PASS
		Cd	LOD	/	
		Hg	BL	/	
		Cr(Cr(VI))	BL	/	
		Br(PBBs&PBDEs)	BL	/	
4	Soldering tin	Pb	BL	/	PASS
		Cd	BL	/	
		Hg	BL	/	
		Cr(Cr(VI))	BL	/	
		Br(PBBs&PBDEs)	/	/	
5	Chip capacitor	Pb	BL	/	PASS
		Cd	LOD	/	
		Hg	BL	/	
		Cr(Cr(VI))	BL	/	
		Br(PBBs&PBDEs)	BL	/	
6	Crystal oscillator	Pb	BL	/	PASS
		Cd	LOD	/	
		Hg	BL	/	
		Cr(Cr(VI))	BL	/	
		Br(PBBs&PBDEs)	/	/	



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Sample No.	Sample Description	Tested Items	XRF Screening Test Unit (mg/kg)	Chemical Test Unit (mg/kg)	Conclusion
7	IC	Pb	BL	/	PASS
		Cd	LOD	/	
		Hg	BL	/	
		Cr(Cr(VI))	BL	/	
		Br(PBBs&PBDEs)	BL	/	
8	Audion	Pb	BL	/	PASS
		Cd	LOD	/	
		Hg	BL	/	
		Cr(Cr(VI))	BL	/	
		Br(PBBs&PBDEs)	BL	/	
9	PCB	Pb	BL	/	PASS
		Cd	LOD	/	
		Hg	BL	/	
		Cr(Cr(VI))	BL	/	
		Br(PBBs&PBDEs)	X	N.D.	

Note:

- The screening results are only used for reference.
- When conducting the test for PBBs&PBDEs, XRF was introduced to screen Br Exclusively; When conducting the test for Hexavalent Chromium, XRF was introduced to screen Chromium exclusively.
- MDL = Method Detection Limit
- N.D. = Not Detected (<MDL)
- mg/kg = ppm = parts per million
- Negative = Absence of Cr(VI) , the detected Cr(VI) concentration in the boiling water extraction solution is less than 0.10ug/cm².
- Positive = Presence of Cr(VI), the detected Cr(VI) concentration in the boiling water extraction solution is equal to or greater than 0.13ug/cm².



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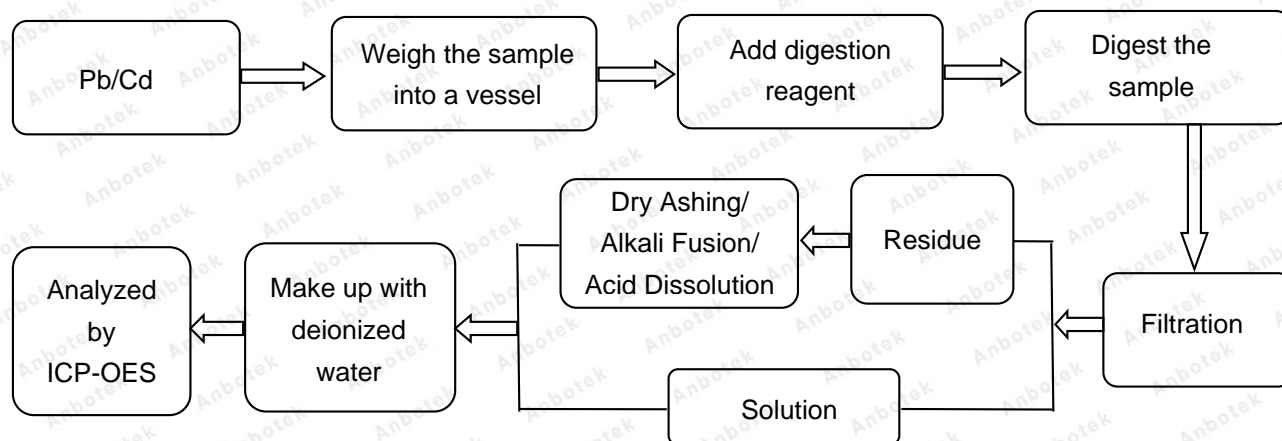
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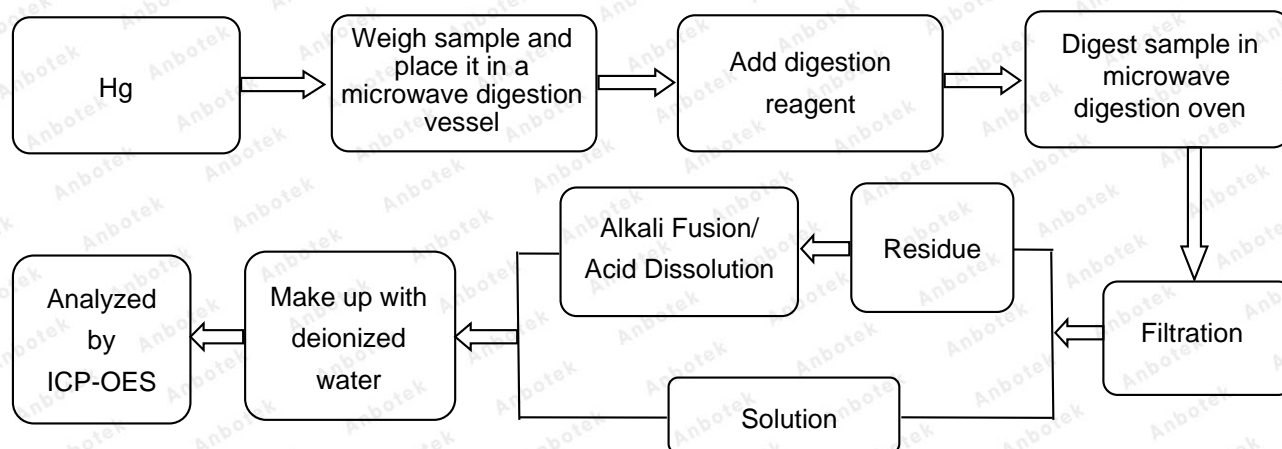
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Test Process:**The sample(s) had been dissolved totally tested for Lead, Cadmium, Mercury.**

◆ IEC 62321-5:2013 Ed.1.0



◆ IEC 62321-4:2013+AMD1:2017



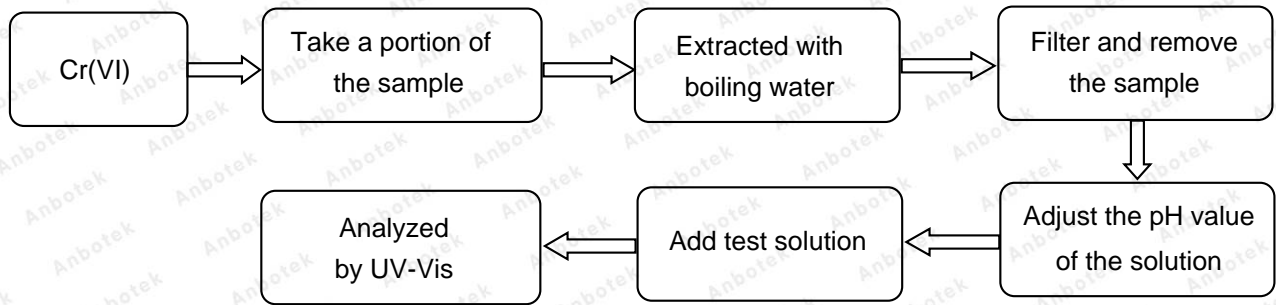
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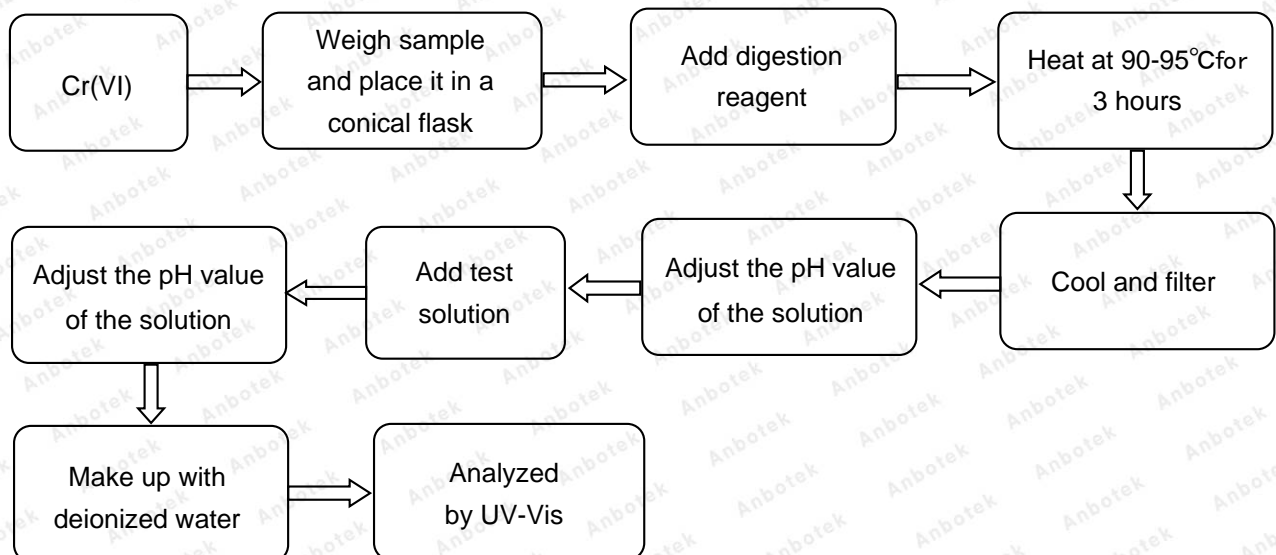
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◆ IEC 62321-7-1:2015 Ed.1.0



◆ IEC 62321-7-2:2017 Ed.1.0



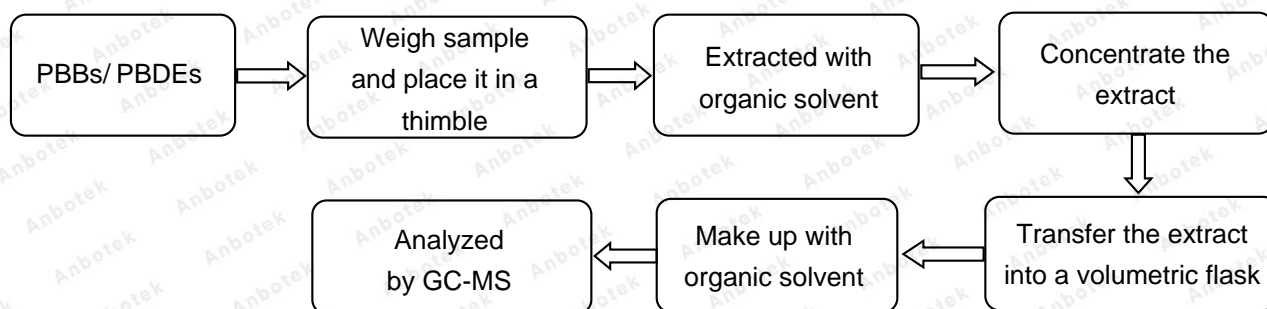
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◆ IEC 62321-6:2015 Ed.1.0



Photograph of Sample



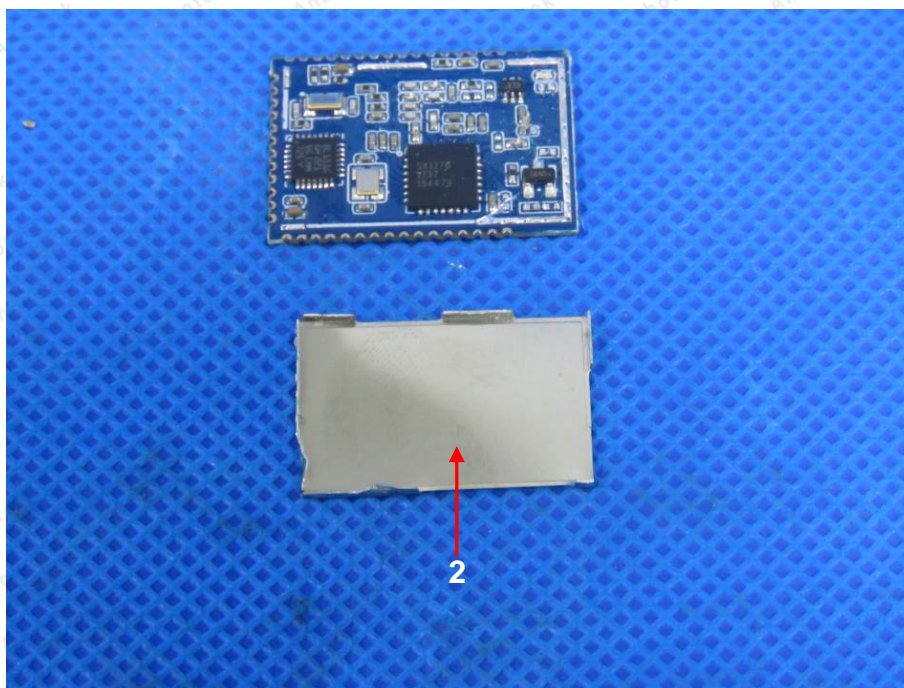
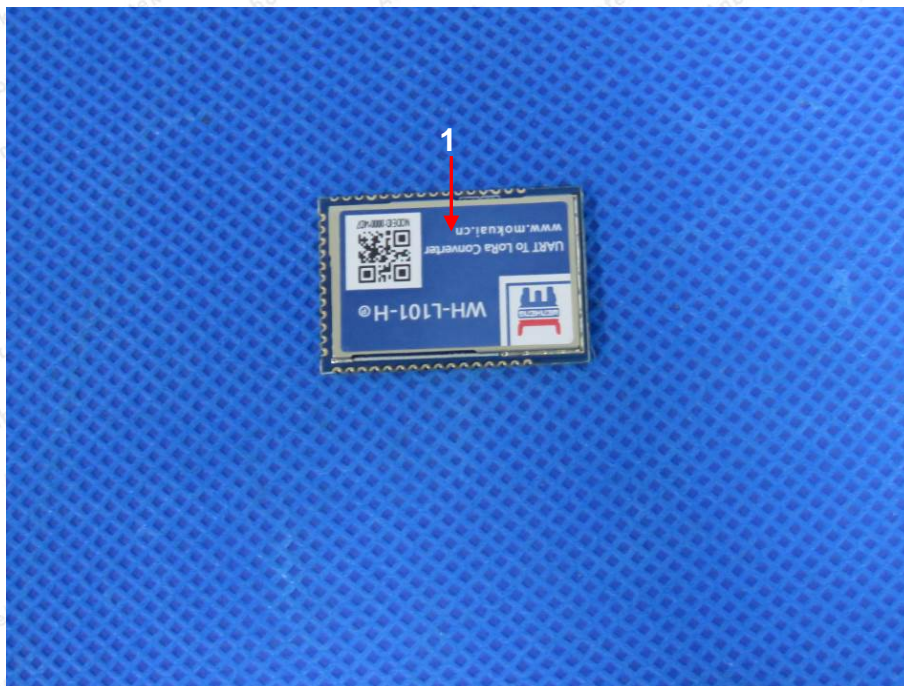
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Photo(s) of the tested component(s)

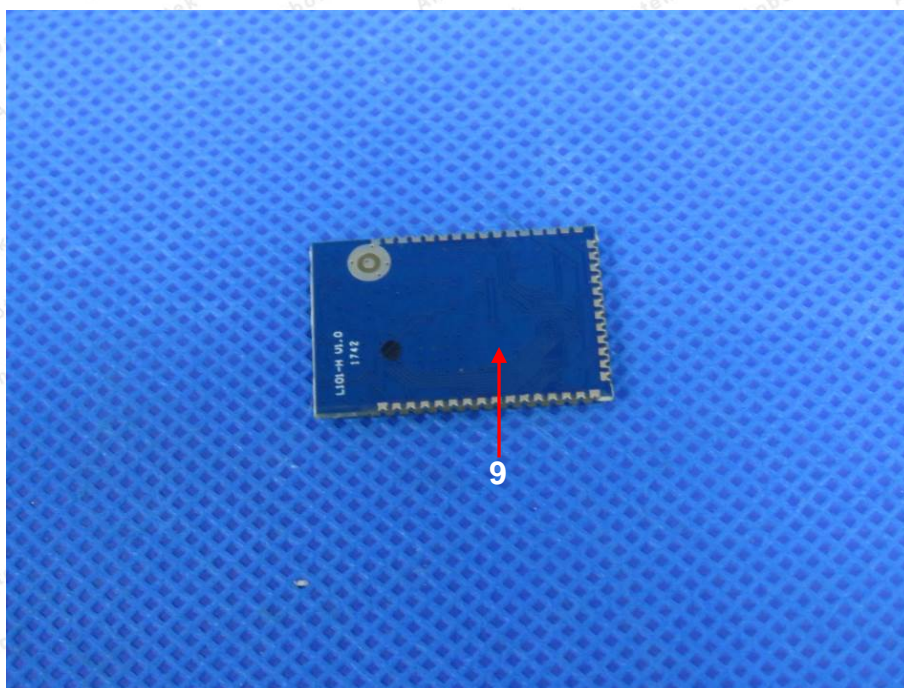
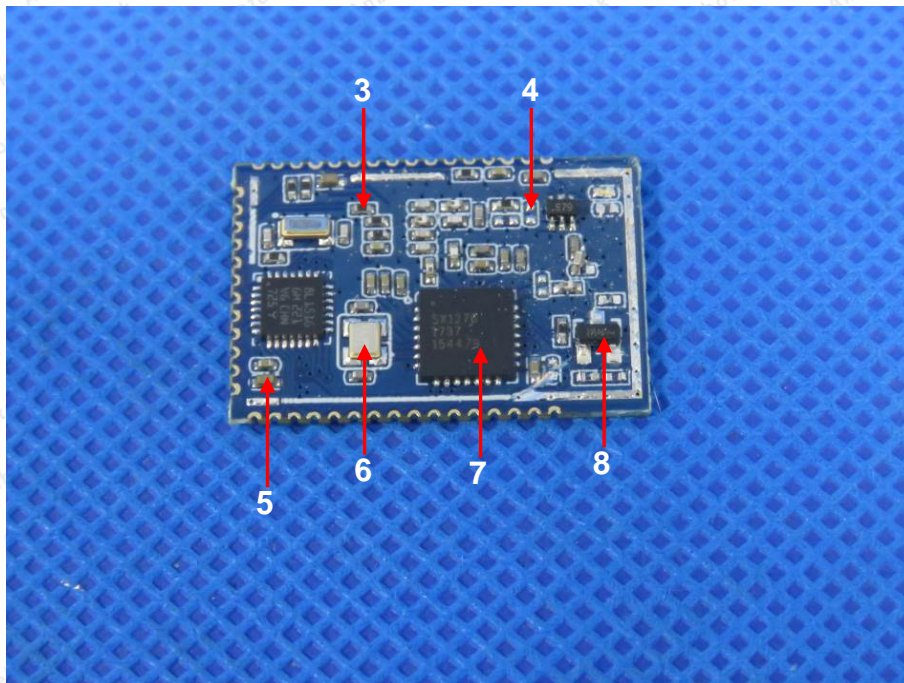


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***** End of Report *****

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