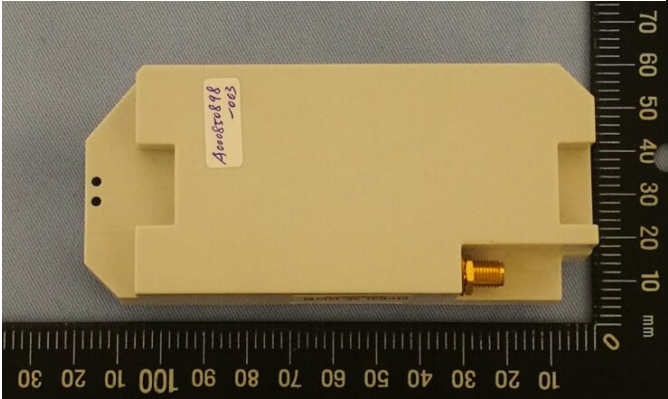


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Kunden Referenz-Nr.: <i>Client Reference No.:</i>		Auftragsdatum: 30-11-2018 <i>Order date:</i>			
Auftraggeber: <i>Client:</i> Hexing Electrical Co.,Ltd. 1418 moganshanRoad shangcheng Industrial Zone, 310011,Zhejiang P.R.China.		Lingqin Xu 0571-28859173 production_80@hxgroup.co			
Prüfgegenstand: <i>Test item:</i> HexNet module					
Bezeichnung / Typ-Nr.: <i>Identification / Type No.:</i> HexNet module					
Auftrags-Inhalt: <i>Order content:</i> Test of Conformance to LoRaWAN™ Specification V1.0.2					
Prüfgrundlage: <i>Test specification:</i> LoRa Alliance End Devices Certification Requirements for US and Canada 915MHz ISM Band Version 1.3					
Wareneingangsdatum: 10-12-2018 <i>Date of receipt:</i>					
Prüfmuster-Nr.: A000850898-003 <i>Test sample No.:</i>					
Prüfzeitraum: 14-12-2018 - 08-01-2019 <i>Testing period:</i>					
Ort der Prüfung: Taipei, Taiwan <i>Place of testing:</i>					
Prüflaboratorium: TÜV Rheinland Taiwan Ltd. <i>Testing laboratory:</i>					
Prüfergebnis: PASS <i>Test results:</i>					
Geprüft von: Justin K.C. Yu <i>Tested by:</i> Test Engineer		Kontrolliert von: Brenda S. H. Chen <i>Reviewed by:</i> Project Manager			
09-01-2019		09-01-2019			
Datum <i>Date</i>	Name / Stellung <i>Name / Position</i>	Unterschrift <i>Signature</i>	Datum <i>Date</i>	Name / Stellung <i>Name / Position</i>	Unterschrift <i>Signature</i>
Sontiges / <i>Other:</i> -					
<p>Dieser Prüfbericht bezieht sich nur auf das o.g. Prüfmuster und darf ohne Genehmigung der Prüfstelle nicht auszugsweise vervielfältigt werden. Dieser Bericht berechtigt nicht zur Verwendung eines Prüfzeichens. <i>This test report only relates to the a. m. test sample. Without permission of the test center this test report is not permitted to be duplicated in extracts. This test report does not entitle to carry any test mark</i></p>					

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Revisions <i>Revisions</i>			
Revision Revision	Datum Date	Anmerkung Remark	Verfasser Author

Note: Latest revision report will replace all previous reports

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1 PRODUCT INFORMATION

The device under test (DUT) is a HexNet module for LoRaWAN 1.0.2 Certification testing

General information	
Product name:	HexNet module
Model:	HexNet module
Description:	LoRa Alliance LoRaWAN compliance testing
Manufacturer SKU	-
Hardware version:	P60768R2100101
Firmware version:	MJN956.A2.F2.TY01
Contact person:	Gang Wang
Phone number:	+86-15167124067

LoRaWAN information	
Type of DUT	Module
LoRa Device Class	A
Geographical area of operation	USA 902-928 common region
Operating frequency	915 MHz
Adaptive Data Rate (ADR) supported?	Yes
Activation possibilities	Both Over the air and by personalization
Test According LoRaWAN™ Spec	V1.0.2
Output Power	Up to 20 dBm
Number / Type of Antenna(s)	1
Antenna Gain	<2dBi
Test sample information	production unit

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For OTA activation:	
Serial No of Device with OTAA	A000850898-003
End-device identifier (DevEUI)	BE7A 0000 0000 082A
Application identifier (AppEUI)	BE7C 0000 0000 051C
Application key (AppKey)	6EC0 92B1 9EF7 3976 C087 D6B2 A786 E37B
For activation by personalization:	
Serial No of Device with ABP	A000850898-003
End-device identifier (DevAddr)	49991960
Application identifier (AppSKey)	90C3 D443 CD69 0F53 71F4 929A 67FB 22BB
Application key (NwkSKey)	0276 ADE7 ADC7 DC3B DBFA E516 2646 286F
Default RX2 Window Frequency	923.3MHz
Default RX2 Window Data Rate	DR8 (SF12, 500kHz)
RECEIVE_DELAY1	1 s
RECEIVE_DELAY2	2 s (must be RECEIVE_DELAY1 + 1s)
JOIN_ACCEPT_DELAY1	5 s
JOIN_ACCEPT_DELAY2	6 s
MAX_FCNT_GAP	16384
ADR_ACK_LIMIT	64
ADR_ACK_DELAY	32
ACK_TIMEOUT	2 +/- 1 s (random delay between 1 and 3 seconds)

Submitted Documents:

LoRa Certification Customer Questionnaire document.
LoRa Test Environment log files.

Remarks:

All test cases are tested with Over the Air Activation (OTAA) mode, else explicitly Activation by Personalization (ABP) to be tested.

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2 TEST EQUIPMENT

Prüfmittel <i>Test equipment</i>	Marke <i>Brand</i>	Version <i>Version</i>
Comprehensive Testing Environment (CTE)	TÜV Rheinland Group	CTE - TMF V45.1 CTE - SIG - LoRa V3.3
Senet 915MHz Gateway 0005863 (SX1301 Array library version)	Senet	>=1.0.rc10
Senet 915MHz Gateway 0005863(Semtech Packet Forwarder)	Senet	>=1.0.rc3

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3 SUMMARY

Verdicts of functional requirements:	Verdict
Cert-Application Activation	PASS
Over the Air Activation	PASS
Channel Plan and Usage	PASS
Cryptography	PASS
Downlink Error Rate	PASS
Receive Window Timing	PASS
Frame Sequence Number	PASS
Confirmed Frames	PASS
Dev Status Request MAC command	PASS
New Channel Request MAC command	PASS
RX Parameter Setup Request	PASS
RX Timing Setup Request	PASS
Link ADR Request MAC command	PASS
RX1 Receive Window Test	PASS
RX2 Receive Window Test	PASS
RX Oversized Payload	PASS
Maximum Allowed Payload	PASS
MAC Command(s) in App-Payload (FRMPayload)	PASS

Supported optional features:	YES / No
Adaptive Data Rate (ADR)	YES

Overall Test Result: PASS

4 TEST CASE VERIDCTS AS PER TEST SPECIFICATIONS

Test results per test case (ABP):

Test item	Description	Implementation	Result
US902-928 2.1.1	Cert-Application Activation	Mandatory	PASS
US902-928 2.1.2	Over The Air Activation	Mandatory	PASS
US902-928 2.2.1.a	Channel Plan and Usage	Mandatory	PASS
US902-928 2.2.1.b.i	AES Encryption	Mandatory	PASS
US902-928 2.2.1.b.ii	Message Integrity Code	Mandatory	PASS
US902-928 2.2.1.c	Downlink Error Rate	Mandatory	PASS
US902-928 2.2.1.d	Downlink Window Timing	Mandatory	PASS
US902-928 2.2.1.e.i	Uplink Sequence Number	Mandatory	PASS
US902-928 2.2.1.e.ii & 2.2.1.e.iii	Downlink Sequence Number & Downlink Sequence Number Rollover	Mandatory	PASS
US902-928 2.2.2.a	Confirmed Uplinks	Mandatory	PASS
US902-928 2.2.2.b	Confirmed Uplink Retransmission	Mandatory	PASS
US902-928 2.2.2.c	Confirmed Downlinks	Mandatory	PASS
US902-928 2.2.2.d	Confirmed Downlink Retransmission	Mandatory	PASS
US902-928 2.3.1	DevStatusReq MAC Command	Mandatory	PASS
US902-928 2.3.2.a & 2.3.2.b	Addition of A Channel & Removal of A Channel	Mandatory	PASS
US902-928 2.3.2.c	Addition & Removal of Multiple Channels	Mandatory	PASS
US902-928 2.3.3	RXParamSetupReq MAC command	Mandatory	PASS
US902-928 2.3.4	RXTImingSetupReq MAC command	Mandatory	PASS
US902-928 2.3.5.a	ADR Bit	Mandatory	PASS
US902-928 2.3.5.b	TX Power	Mandatory	PASS
US902-928 2.3.5.c	Redundancy	Mandatory	PASS
US902-928 2.3.5.d	Data Rate Decay	Mandatory	PASS
US902-928 2.3.5.e	125KHz Uplink Channel Management	Mandatory	PASS
US902-928 2.3.5.f	500KHz Uplink Channel Management	Mandatory	PASS
US902-928 2.3.5.g	Channel Block Channel Management	Mandatory	PASS
US902-928 2.3.8	RX Oversized Payload	Mandatory	PASS
US902-928 2.3.9	Maximum Allowed Payload (UL)	Mandatory	PASS
US902-928 2.3.10	MAC Command in App-Payload and FOpts	Mandatory	PASS

Test results per test case (OTAA):

Test item	Description	Implementation	Result
US902-928 2.1.1	Cert-Application Activation	Mandatory	PASS
US902-928 2.1.2	Over The Air Activation	Mandatory	PASS
US902-928 2.2.1.a	Channel Plan and Usage	Mandatory	PASS
US902-928 2.2.1.b.i	AES Encryption	Mandatory	PASS
US902-928 2.2.1.b.ii	Message Integrity Code	Mandatory	PASS
US902-928 2.2.1.c	Downlink Error Rate	Mandatory	PASS
US902-928 2.2.1.d	Downlink Window Timing	Mandatory	PASS
US902-928 2.2.1.e.i	Uplink Sequence Number	Mandatory	PASS
US902-928 2.2.1.e.ii & 2.2.1.e.iii	Downlink Sequence Number & Downlink Sequence Number Rollover	Mandatory	PASS
US902-928 2.2.2.a	Confirmed Uplinks	Mandatory	PASS
US902-928 2.2.2.b	Confirmed Uplink Retransmission	Mandatory	PASS
US902-928 2.2.2.c	Confirmed Downlinks	Mandatory	PASS
US902-928 2.2.2.d	Confirmed Downlink Retransmission	Mandatory	PASS
US902-928 2.3.1	DevStatusReq MAC Command	Mandatory	PASS
US902-928 2.3.2.a & 2.3.2.b	Addition of A Channel & Removal of A Channel	Mandatory	PASS
US902-928 2.3.2.c	Addition & Removal of Multiple Channels	Mandatory	PASS
US902-928 2.3.3	RXParamSetupReq MAC command	Mandatory	PASS
US902-928 2.3.4	RXTImingSetupReq MAC command	Mandatory	PASS
US902-928 2.3.5.a	ADR Bit	Mandatory	PASS
US902-928 2.3.5.b	TX Power	Mandatory	PASS
US902-928 2.3.5.c	Redundancy	Mandatory	PASS
US902-928 2.3.5.d	Data Rate Decay	Mandatory	PASS
US902-928 2.3.5.e	125KHz Uplink Channel Management	Mandatory	PASS
US902-928 2.3.5.f	500KHz Uplink Channel Management	Mandatory	PASS
US902-928 2.3.5.g	Channel Block Channel Management	Mandatory	PASS
US902-928 2.3.6	RX1 Receive Window Test	Mandatory	PASS
US902-928 2.3.7	RX2 Receive Window Test	Mandatory	PASS
US902-928 2.3.8	RX Oversized Payload	Mandatory	PASS
US902-928 2.3.9	Maximum Allowed Payload (UL)	Mandatory	PASS
US902-928 2.3.10	MAC Command in App-Payload and FOpts	Mandatory	PASS

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5 TEST RESULTS

Detailed test results (OTAA):

Test item	Test Case Name	DataRate/ Timing	Limit	Results	Verdict
US902-928 2.2.1.c	Downlink Error Rate RX1	SF10BW500	5%	1.67 %	PASS
US902-928 2.2.1.c	Downlink Error Rate RX2	SF12BW500	5%	0.00 %	PASS
US902-928 2.2.1.d	Downlink Window Timing	-20ms	-	-	PASS
		+20ms	-	-	PASS
US902-928 2.3.6	RX1 Receive Window Test	SF12BW500	5%	0.00%	PASS
		SF11BW500	5%	0.00%	PASS
		SF10BW500	5%	0.00%	PASS
		SF9BW500	5%	0.00%	PASS
		SF8BW500	5%	0.00%	PASS
		SF7BW500	5%	1.67%	PASS
US902-928 2.3.7	RX2 Receive Window Test	SF12BW500	5%	0.00%	PASS
		SF11BW500	5%	0.00%	PASS
		SF10BW500	5%	0.00%	PASS
		SF9BW500	5%	0.00%	PASS
		SF8BW500	5%	1.67%	PASS
		SF7BW500	5%	5.00%	PASS

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6 PHOTO DOCUMENTATION



Photo 1: EUT front view

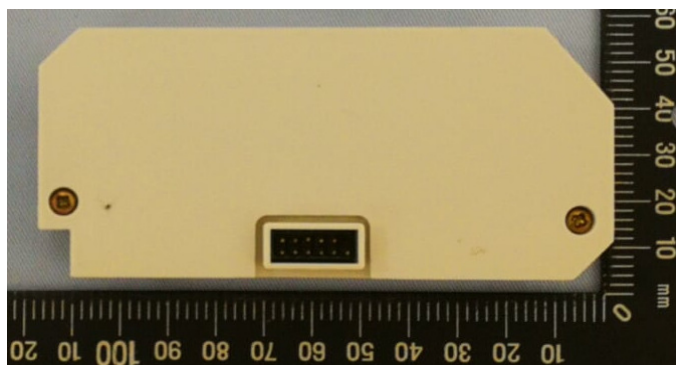


Photo 2: EUT rear view