

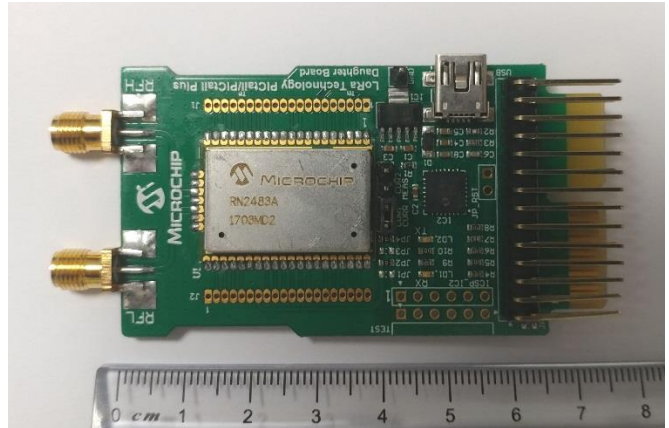


Prüfbericht-Nr.: <i>Test Report No.:</i>		31763075.002	Auftrags-Nr.: <i>Order No.:</i>		152357	Seite 1 von 8 Page 1 of 8
Kunden Referenz-Nr.: <i>Client Reference No.:</i>		50016473	Auftragsdatum: <i>Order date:</i>		09-06-2017 (mm-dd-yyyy)	
Auftraggeber: <i>Client:</i>		Microchip Technology Inc. 2355 WEST CHANDLER BLVD AZ 85224, CHANDLER U.S.A.	Jonathan Pearce jdp@microchip.com +44 7585 123 576			
Prüfgegenstand: <i>Test item:</i>		Microchip LoRaWAN Module				
Produkt: <i>Product type:</i>		Radio Module (with embedded MCU and LoRaWAN stack) Series: Microchip RN Wireless Module Family				
Bezeichnung / Typ-Nr.: <i>Identification / Type No.:</i>		RN2483A-I/RM104				
Auftrags-Inhalt: <i>Order content:</i>		Test of Conformance to LoRaWAN™ Specification V1.0.1				
Prüfgrundlage: <i>Test specification:</i>		LoRa End Device Certification EU Version 1.2				
Wareneingangsdatum: <i>Date of receipt:</i>		11-29-2017				
Prüfmuster-Nr.: <i>Test sample No.:</i>		1703MD2 (OTAA) 1703MD2 (ABP)				
Prüfzeitraum: <i>Testing period:</i>		11-27-2017 to 11-30-2017				
Ort der Prüfung: <i>Place of testing:</i>		Pleasanton, CA				
Prüflaboratorium: <i>Testing laboratory:</i>		TUV Rheinland of North America, Inc.				
Prüfergebnis: <i>Test results:</i>		PASS				
Geprüft von <i>Tested by:</i>		Bernd Jungbluth		Kontrolliert von <i>Reviewed by:</i>		Adeola Alade
						
12-07-2017		Bernd Jungbluth/ Senior Test Engineer		12-7-2017		Adeola Alade / Principal Test Engineer
Datum	Name / Stellung	Unterschrift	Datum	Name / Stellung	Unterschrift	
<i>Date (mm-dd-yyyy)</i>	<i>Name / Position</i>	<i>Signature</i>	<i>Date (mm-dd-yyyy)</i>	<i>Name / Position</i>	<i>Signature</i>	
Sontiges / Other: -						
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>						



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Revisions <i>Revisions</i>			
Revision Revision	Datum Date (mm-dd-yyyy)	Anmerkung Remark	Verfasser Author
0	12-07-2017	Original Report	B. Jungbluth

Note: Latest revision report will replace all previous reports

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1 Product Information

The device under test (DUT) is a wireless radio module for LoRaWAN Certification testing.

General information	
Product name:	Microchip LoRaWAN Module: RN2483A-I/RM104
Model:	RN2483A-I/RM104
Description:	Radio Module (with embedded MCU and LoRaWAN stack)
Series:	Microchip RN Wireless Module Family
Manufacturer SKU	Microchip Technology Inc.
Hardware version:	A
Software version:	1.0.4
Firmware Version:	1.0.4
Technical contact person:	Sushma Myneni
Email:	Sushma.Myneni@microchip.com
Phone number:	+1 480 792 4238

LoRaWAN information	
Type of DUT	Module
LoRa Device Class	A
Geographical area of operation	Europe
Operating frequency	868 MHz Note: The module supports additionally the European Frequency Band 433MHz. This test report concerns only the European 868MHz operation.
Adaptive Data Rate (ADR) supported?	Yes
Optional data rates supported?	DR6 (SF7BW250); DR7 (FSK50)
Activation possibilities	Both Over the air and by personalization
Test According LoRaWAN™ Spec	v1.0.1
Output Power	+14 dBm, programmable down to -1 dBm
Number / Type of Antenna(s)	1 (SMA port on Carrier board) Note: Port RFH 868MHZ. Port RFL intended for 433MHz operation.
Antenna Gain	N/A
Test sample information	production unit

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For OTA activation:	
Serial No of Device with OTAA	1703MD2 – (S\N unavailable)
End-device identifier (DevEUI)	7777777777777777
Application identifier (AppEUI)	7777777777777777
Application key (AppKey)	12345678901234567890123456789012
For activation by personalization:	
Serial No of Device with ABP	1703MD2 – (S\N unavailable)
End-device identifier (DevAddr)	77777777
Application identifier (AppSKey)	12345678901234567890123456789012
Application key (NwkSKey)	12345678901234567890123456789012
Default RX2 Window Frequency	869.525MHz
Default RX2 Window Data Rate	DR0 (SF12, 125kHz)
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 and Activation by Personalization (ABP) mode. Package Error Rate test case 15 and 16 only executed in OTAA mode.

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2 Test Equipment

Prüfmittel <i>Test equipment</i>	Marke <i>Brand</i>	Version <i>Version</i>
Comprehensive Testing Environment (CTE)	TUV Rheinland (former 4ffcom AG)	CTE - TMF V44.5 CTE - SIG – LoRawan v3.2
Semtech Development Kit IOT868STK1-8 (Semtech Gateway) for EU863-870MHz	Semtech	SX1301-based concentrator reference design >=GW_V3.1.0
Semtech Development Kit IOT868STK1-8 (Semtech Packet Forwarder) for EU863-870MHz Band	Semtech	>= PF_V_2.2.1

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3 Summary

Verdicts of functional requirements:	Verdict
Test Mode Activation (Activation by Personalization)	PASS
Test Mode Activation (Over the Air Activation)	PASS
Over The Air Activation	PASS
Test Application Functionality	PASS
Over The Air Activation	PASS
Cryptography	PASS
Downlink Error Rate	PASS
Downlink Window Timing	PASS
Frame Sequence Number	PASS
Device Status Request MAC command	PASS
MAC Commands	PASS
New Channel Request MAC command	PASS
DIChannelReq MAC command	PASS
Confirmed packets	PASS
RX Parameter Setup Request MAC command	PASS
Packet Error Rate RX1	PASS
Packet Error Rate RX2	PASS
RX Timing Setup Request MAC command	PASS
Link ADR Request MAC command	PASS
TxParamSetupReq MAC command	PASS

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

Overall Test Result: PASS

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4 Test Case verdicts as per Test Specifications

Test results per test case (OTAA):

Test item	Description	Implementation	Result
EU863-870 2.1	Device Activation	Mandatory	PASS
EU863-870 2.2	Test Application Functionality	Mandatory	PASS
EU863-870 2.3	Over The Air Activation	Mandatory	PASS
EU863-870 2.4	Packet Error Rate RX2 Default DR	Mandatory	PASS
EU863-870 2.5.a	AES encryption	Mandatory	PASS
EU863-870 2.5.b	MIC	Mandatory	PASS
EU863-870 2.6	Downlink window timing	Mandatory	PASS
EU863-870 2.7.a	Uplink sequence number	Mandatory	PASS
EU863-870 2.7.b	Downlink sequence number	Mandatory	PASS
EU863-870 2.8	DevStatusReq MAC command	Mandatory	PASS
EU863-870 2.9	MAC Commands	Mandatory	PASS
EU863-870 2.10.a	Read-only default channels	Mandatory	PASS
EU863-870 2.10.b	Addition and removal of multiple channels	Mandatory	PASS
EU863-870 2.10.c & 10.d	Addition and removal of a single channel	Mandatory	PASS
EU863-870 11.a	Uplink confirmed packets	Mandatory	PASS
EU863-870 11.b	Uplink retransmission	Mandatory	PASS
EU863-870 11.c	Downlink confirmed packets	Mandatory	PASS
EU863-870 11.d	Downlink retransmission	Mandatory	PASS
EU863-870 12	RXParamSetupReq MAC command	Mandatory	PASS
EU863-870 13	RXTimingSetupReq MAC command	Mandatory	PASS
EU863-870 14.a	ADR bit	Mandatory	PASS
EU863-870 14.b	TXPower	Mandatory	PASS
EU863-870 14.c	Required DataRates	Mandatory	PASS
EU863-870 14.d	Optional DataRates	Mandatory	PASS
EU863-870 14.e	ChannelMask	Mandatory	PASS
EU863-870 14.f	Redundancy	Mandatory	PASS
EU863-870 14.g	ADRACKReq bit	Mandatory	PASS
EU863-870 15.h	LinkADRReq commands block	Mandatory	PASS
EU863-870 16	Packet Error Rate RX1	Mandatory	PASS
EU863-870 17	Packet Error Rate RX2	Mandatory	PASS

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Test results per test case (ABP):

Test item	Description	Implementation	Result
EU863-870 2.1	Device Activation	Mandatory	PASS
EU863-870 2.2	Test Application Functionality	Mandatory	PASS
EU863-870 2.4	Packet Error Rate RX2 Default DR	Mandatory	PASS
EU863-870 2.5.a	AES encryption	Mandatory	PASS
EU863-870 2.5.b	MIC	Mandatory	PASS
EU863-870 2.6	Downlink window timing	Mandatory	PASS
EU863-870 2.7.a	Uplink sequence number	Mandatory	PASS
EU863-870 2.7.b	Downlink sequence number	Mandatory	PASS
EU863-870 2.8	DevStatusReq MAC command	Mandatory	PASS
EU863-870 2.9	MAC Commands	Mandatory	PASS
EU863-870 2.10.a	Read-only default channels	Mandatory	PASS
EU863-870 2.10.b	Addition and removal of multiple channels	Mandatory	PASS
EU863-870 2.10.c & 10.d	Addition and removal of a single channel	Mandatory	PASS
EU863-870 11.a	Uplink confirmed packets	Mandatory	PASS
EU863-870 11.b	Uplink retransmission	Mandatory	PASS
EU863-870 11.c	Downlink confirmed packets	Mandatory	PASS
EU863-870 11.d	Downlink retransmission	Mandatory	PASS
EU863-870 12	RXParamSetupReq MAC command	Mandatory	PASS
EU863-870 13	RXTimingSetupReq MAC command	Mandatory	PASS
EU863-870 14.a	ADR bit	Mandatory	PASS
EU863-870 14.b	TXPower	Mandatory	PASS
EU863-870 14.c	Required DataRates	Mandatory	PASS
EU863-870 14.d	Optional DataRates	Mandatory	PASS
EU863-870 14.e	ChannelMask	Mandatory	PASS
EU863-870 14.f	Redundancy	Mandatory	PASS
EU863-870 14.g	ADRACKReq bit	Mandatory	PASS
EU863-870 15.h	LinkADRReq commands block	Mandatory	PASS

Note:

Two preconfigured samples were used to test the ABP and OTAA mode separately.

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5 Test Results

Detailed test results

Test item	Test Case Name	DataRate/ Timing	Limit	Results	Verdict
EU863-870 2.4	Packet Error Rate RX1	SF12BW125	5%	0.00%	PASS
EU863-870 2.6	Downlink window timing	-20ms	-	-	PASS
		+20ms	-	-	PASS
EU863-870 2.16	Packet Error Rate RX1	SF12BW125	5%	0.00%	PASS
		SF11BW125	5%	0.00%	PASS
		SF9BW125	5%	0.00%	PASS
		SF8BW125	5%	0.00%	PASS
		SF7BW125	5%	0.00%	PASS
		SF7BW250	5%	1.67%	PASS
		FSK	5%	3.33%	PASS
EU863-870 2.17	Packet Error Rate RX2	SF12BW125	5%	0.00%	PASS
		SF11BW125	5%	0.00%	PASS
		SF10BW125	5%	0.00%	PASS
		SF9BW125	5%	0.00%	PASS
		SF8BW125	5%	0.00%	PASS
		SF7BW125	5%	0.00%	PASS
		SF7BW250	5%	3.33%	PASS
		FSK	5%	1.67%	PASS

6 Photo Documentation

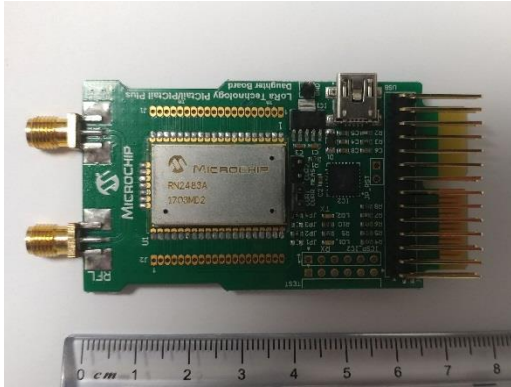


Photo 1:
EUT – Sample 1 – OTAA configuration – PCB

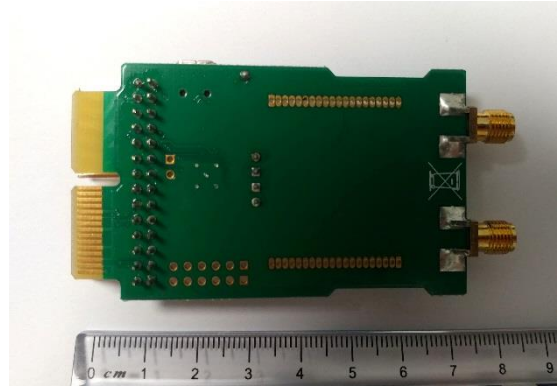


Photo 2:
EUT – Sample 1 – OTAA configuration – PCB Rear

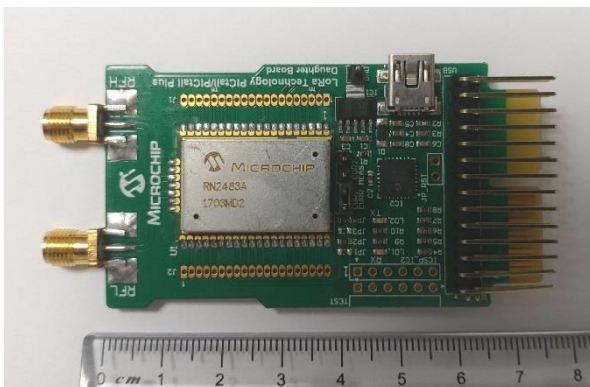


Photo 3:
EUT – Sample 2 – ABP configuration – PCB Top

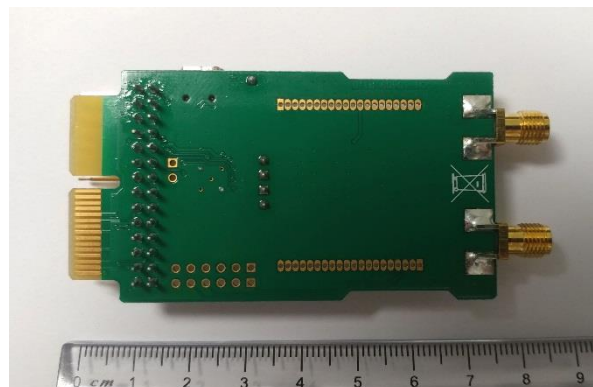


Photo 4:
EUT – Sample 2 – ABP configuration – PCB Rear



Photo 5: Laboratory Setup View