WCM-9116 Instruction Manual SL

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Title

WCM Instruction Manual SL

Document Number - Revision

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Table of contents

1. Introduction

This document is used to describe the installation of the WCM-9116 (MS40251) into Dräger products. The information in this document is to help guide Dräger products that want to implement the WCM-9116 (MS40251 as a wireless solution for the product. The WCM-9116 (MS40251) is not intended for sale to third parties and may only be installed within Dräger products.

2. Description

The WCM-9116 (MS40251) is a wireless component of the Dräger Product Core System (PCS) Platform. The PCS is the core of Dräger Medical devices and applications including documentation and testing evidence. It is an integrated system, consisting of intertwined software and electronics components and is provided for reuse in different variations. The provided variability of the PCS is defined by a specific set of supported combinations of its electronics and software components like the WCM-9116 (MS40251). The WCM-9116 (MS40215) incorporates the Silicon Labs WiSeConnect wireless solution RS9116W-DB00-CC0 Wi-Fi module to provide Dräger products with a dual band IEEE 802.11 a/b/g/n, WPA/WPA2-Personal and Enterprise wireless solution.

2.1. Wi-Fi Features

- Compliant to 1x1 IEEE 802.11 a/b/g/n, 2.4GHz and 5GHz band support
- 20 MHz channel bandwidth
- Datas Rates: 802.11b: Up to 11 Mbps; 802.11g/a: Up to 54 Mbps; 802.11n: MCS0 to MCS7
- Operating Frequency Range: 2412 MHz – 2484MHz, 4.9 GHz – 5.975 GHz

2.2. Operating Conditions

- Operating Supply Range: 5.0V +/- .2V
- Operating Temperature Range: 0°C to +40°C

3. Installation

The WCM-9116 (MS40251) uses the Silcion Labs RS9116W-DB00-CC0 Wi-Fi module which is solderd to a PCBA and connected to one of the approved antennas listed in section 5 Approved Antennas via a u.fl connector. Figure 1 is an outline of the RS9116W-DB00-CC0 Wi-Fi module PCB landing pattern with dimentions from the Silicon Labs data sheet. This and other layout guidlines for installing the RS9116W-DB00-CC0 onto a PCB can be found in the Silicon Labs data sheet for the RS9116W-DB00-CC0. Figure 2 is the Drager PCBA layout showing the location of the RS9116W-DB00-CC0 and the u.fl connector to attach the approved antenna listed in section 5.

Figure 1 PCB Landing Pattern

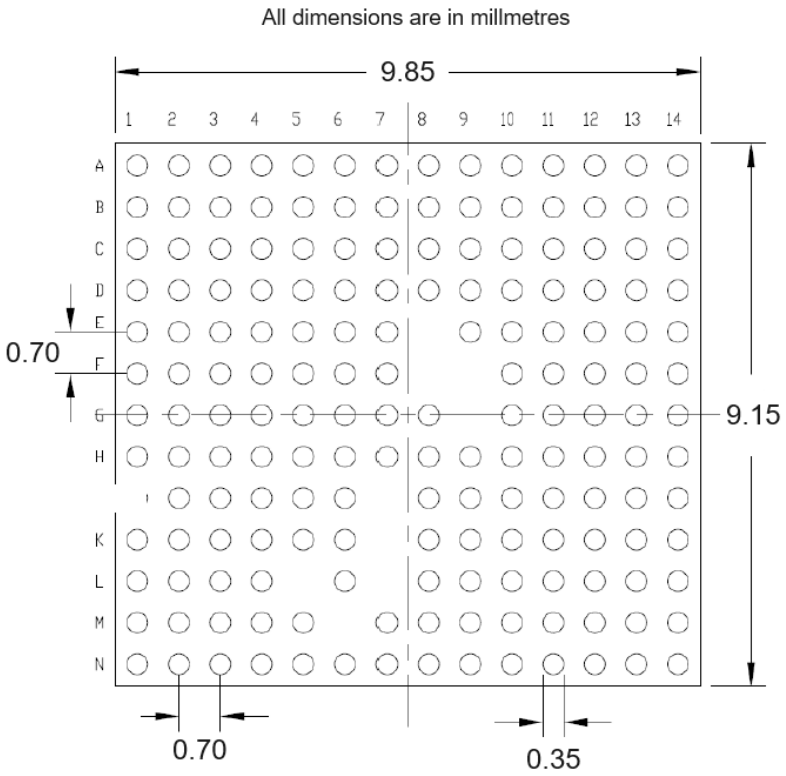
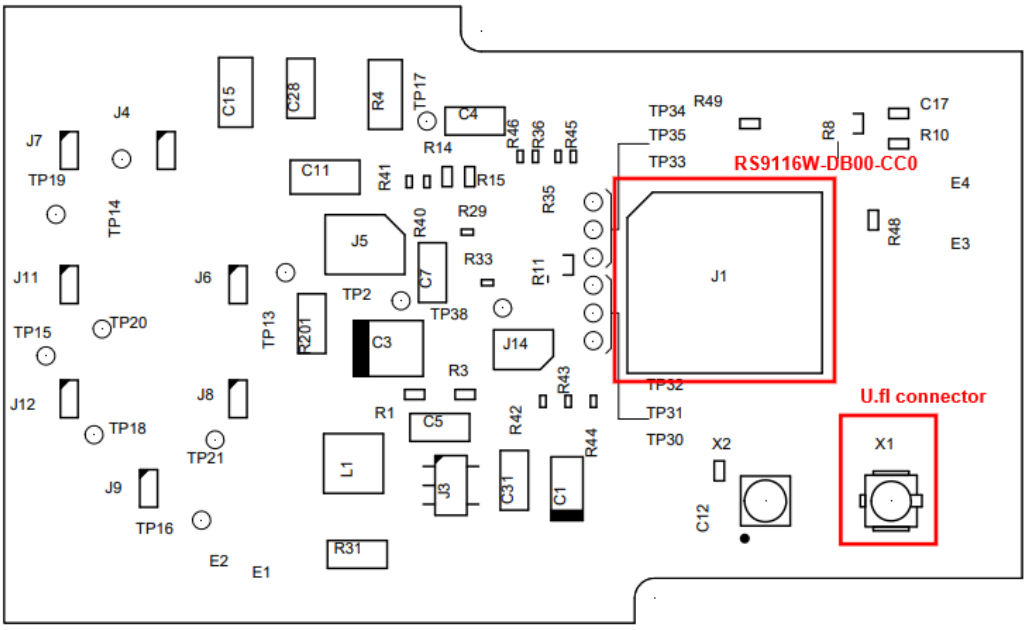


Figure 2 PCBA Layout



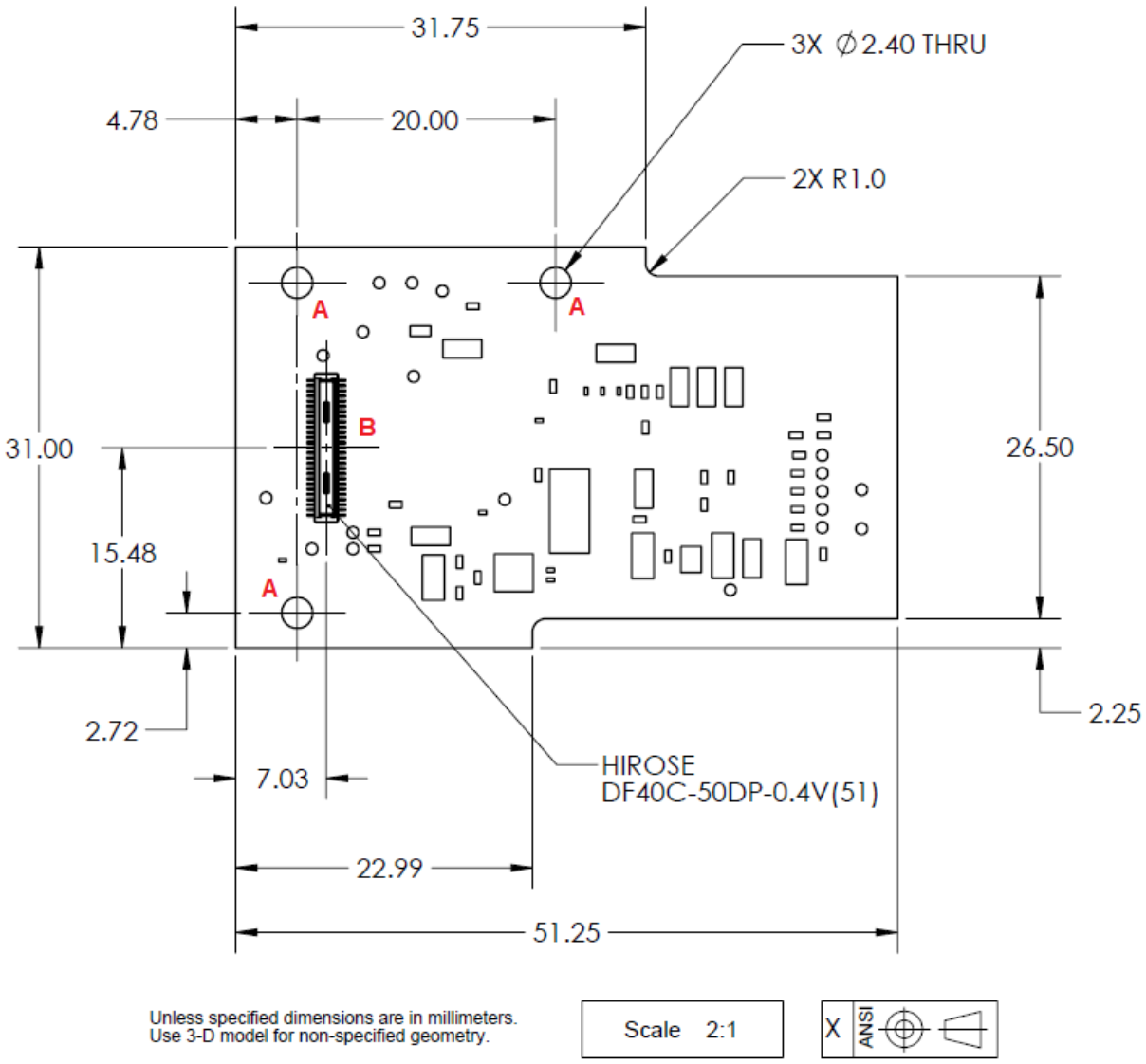
All PBCA design documents can be found in the Drager PLM database under the WCM-9116 MS40251. List of documents can be found under the Reference Documents table of this instruction manual.

Dräger product that will use the MS40251 PBA WCM-9116 INTERPOSER must be sure to provide PCBA clearance to mount the WCM-9116 PBA. The host will also need to install 3 PEM Standoffs M2x2 to secure the PBA (Figure 1, detail A) and the mating connector for the HIROSE DF40C-50DP-0.4V(51) (Figure 1, detail B) Table 1 provides Drager release parts that can be used on the Host platform.

Table 1 Part Numbers to be used by Host

Detail	Drager Part Number	Manufacturers Part Number	Notes
A	MS32772	N/A	Drager customized part used in M540 due to board thickness
	MS32699	SMTSO-M2-2ET	
B	MS32706	DF40C(2.0)-50DS-0.4V(51)	Mating connector for DF40C-50DP-0.4V(51)

Figure 3 WCM-9116 Outline



3.1. Block Diagram

Figure 4 PCBA Block Diagram

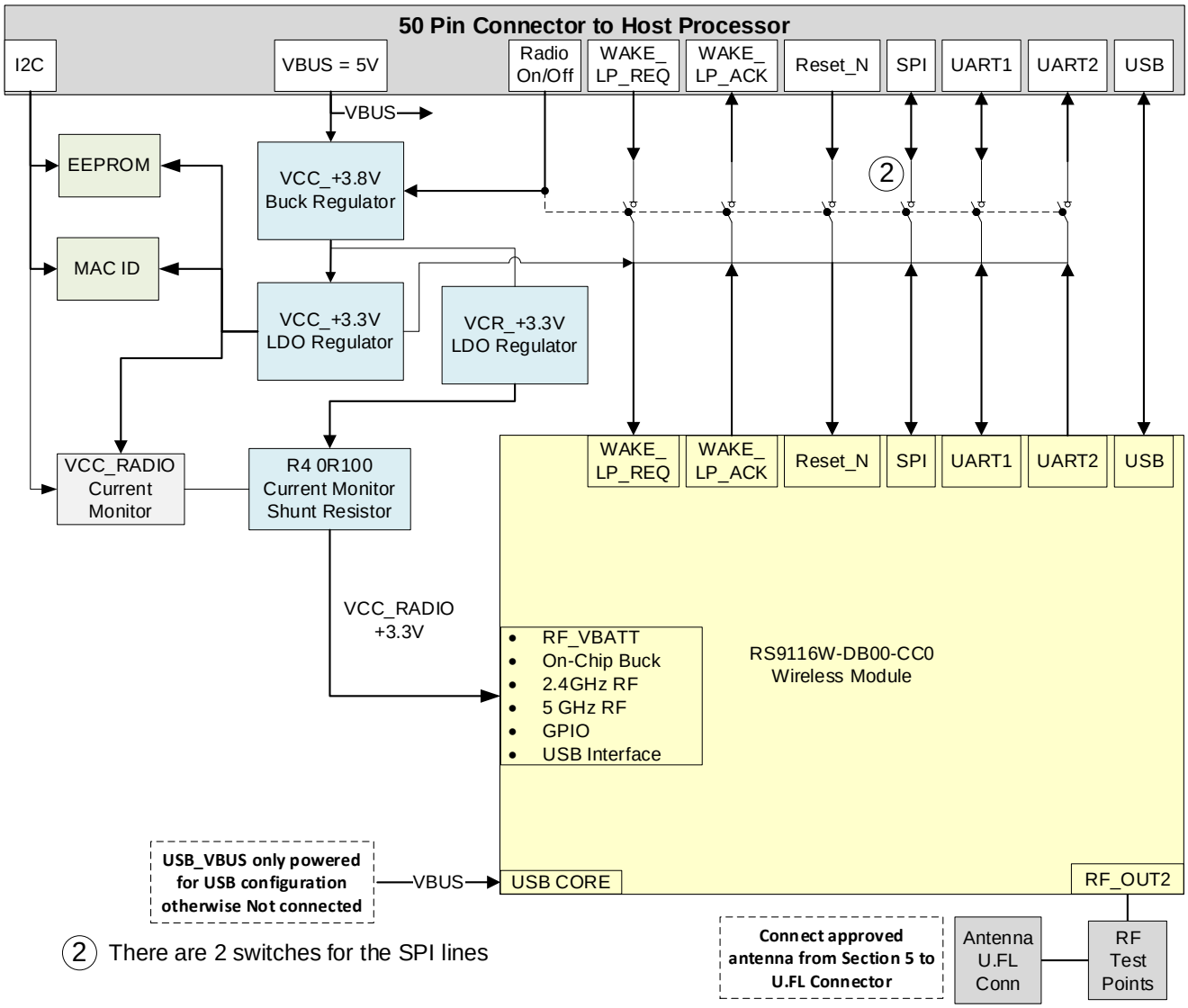
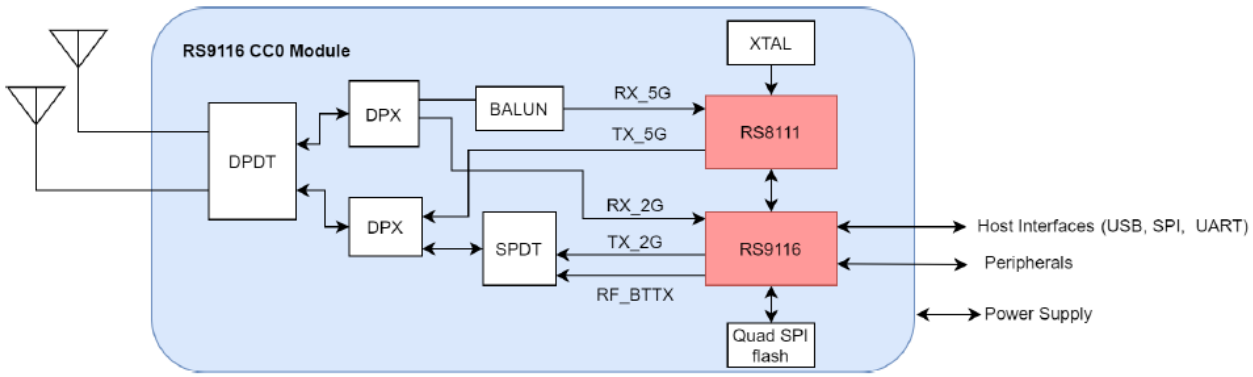


Figure 5 RS9116 CC0 Block Diagram



RS9116 CC0 block diagram provided by Silcon Labs datasheet

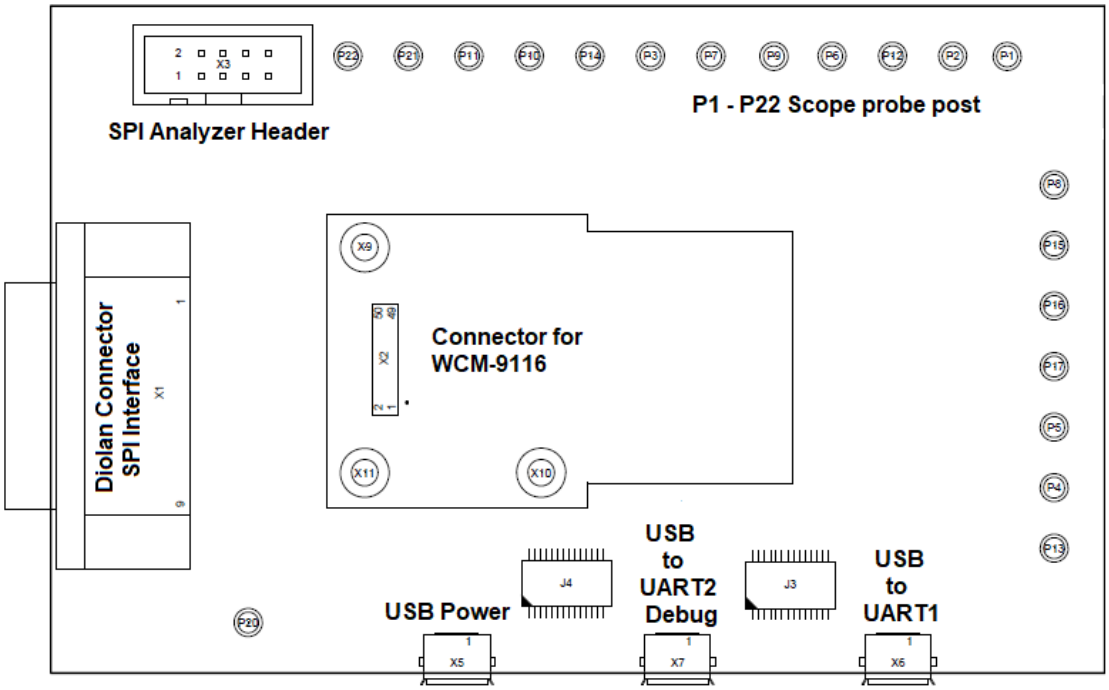
4. WLAN Performance Test Application

The WCM-9116 provides a SPI interface to the host application. Silicon labs provides a Simple API Reference manual (SAPI) for the RS9116W that describes how to configure and operate the RS9116W. One of the operation modes available to the RS9116W is PER Mode (Packet Error Rate), which is to be used for RF certification testing as per Silicon Labs RS9116 Regulatory Certification Application Note. Dräger has developed a user interface known as wchost270 which based on the Silicon Labs SAPI manual for the operation and configuration of the RS9116W such as operating in PER Mode.

4.1. WCM9116 INTER CARRY

A test platform PBA MS40313 was developed to facilitate communication between the WCM-9116 and host program like wchost270 via a SPI bus and a Diolan 4S USB adapter. The MS40313 PBA is also breakout board that can be used to analyze the SPI bus between the WCM-9116 and the host program. The MS40313 is used for testing the WCM-9116 independently and without a Dräger host product.

Figure 6 WCM9116 Carrier PBA



4.2. wchost270

wchost270 is a Qt program that manages the configuration of a Silicon Labs RS9116W CC0 module. wchost270 runs on a Windows Host PC (Win10 tested) and interacts with the WCM-9116 over a 4-wire SPI interface by way of a Diolan 4S USB adapter. The wchost270 program serves as a software prototyping and module-centric configuration and test platform for the WCM-9116 Interposer with RS9116W radio module. It is used as a basis of cross-verification for equivalent and independently maintained Dräger product RS9116W driver functionality. The wchost270 program is a Dräger development tool under bit bucket control.

4.3. Transmit Test

Start wchost270, PER Mode selections can be found under the Regulatory window of wchost270. Reference figure 2

4.3.1. PER Transmit

1. Under **Antenna Port**, Leave Platform EVK unchecked. EVK is only available when using the Silicon Labs RS9116 Evaluation Kit.
2. Under **Domain**, select FCC. Other available domains include ETSI, TELEC, KCC, and World*
3. Under **Gain Tables**, The RS9116W will use the firmware default antenna gain table, if no gain table is issued. To issue a customized gain table select Issue and File this will open a popup window to navigate to the customized gain table that is to be used for testing with the corresponding antenna being used. *
4. Under **WLAN** select the Rate you wish the module to use from the drop-down list. Available rates are 1, 2, 5.5, 11, 6, 9, 12, 18, 24, 36, 48, 54, mcs0, mcs1, mcs2, mcs3, mcs4, mcs5, mcs6, and mcs7. The packet length may also be adjusted, the default length is 1500.
5. Under **Gain and Channel**, use default power index 127*. Using power index 127 tells the RS9116W to use the gain setting listed in the installed gain table. If the gain needs to be lowered, the power index can be lowered until the gain setting allows the test to pass. The new gain setting needs to be recorded in the customized gain table and issued to the RS9116W for further usage with that antenna.
6. Under **Gain and Channel**, select the channel of operations from the dropdown list. (See table 2 for Channel number and corresponding frequencies)
7. Click **Configure** under the **WLAN** heading.

Note the CW heading is used to set up a carrier wave, should it be needed.

* For more information about using the World region, custom gain tables, and power indices, see Silicon Labs document AN1337: RS9116 Regulatory Certification Application Note

Table 2 Channel Numbers and Corresponding Center Frequencies

Band (GHz)	Bandwidth (MHz)	Channel	Center Frequency (MHz)
2.4	20	1	2412
2.4	20	2	2417
2.4	20	3	2422
2.4	20	4	2427
2.4	20	5	2432
2.4	20	6	2437
2.4	20	7	2442
2.4	20	8	2447
2.4	20	9	2452
2.4	20	10	2457
2.4	20	11	2462
2.4	20	12*	2467
2.4	20	13*	2472
2.4	20	14*	2484
5	20	36	5180
5	20	40	5200
5	20	44	5220
5	20	48	5240
5	20	52	5260
5	20	56	5280
5	20	60	5300
5	20	64	5320
5	20	100	5500
5	20	104	5520
5	20	108	5540
5	20	112	5560
5	20	116	5580
5	20	120**	5600
5	20	124**	5620
5	20	128**	5640
5	20	132	5660
5	20	136	5680
5	20	140	5700
5	20	149	5745
5	20	153	5765
5	20	157	5785
5	20	161	5805
5	20	165	5825

* Not available with Domain selection FCC

** Not allowed for Canada

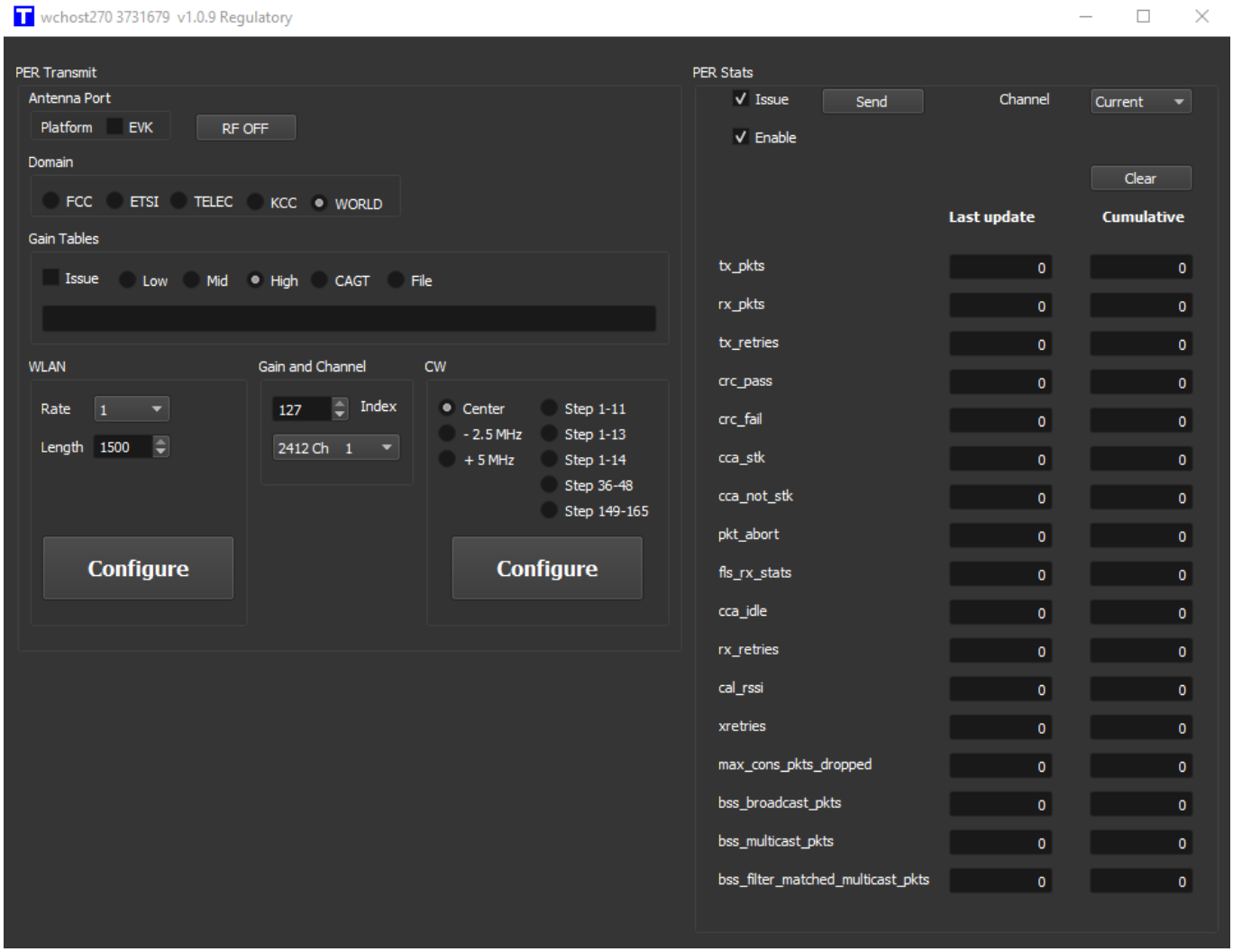
4.3.2. PER Stats (Receive)

The PER Stats can be used to display the following information

- Number of CRC PASS packets
- Number of CRC FAIL packets
- Number of FALSE CCAs

1. Under **PER Stats**, select the channel to receive on. (The default is current, if the module is already configured for transmit the selection will use the channel already configured by the PER Transmit set up otherwise you will need to select a channel from the drop down)
2. Under **PER Stats**, select Issue and Enable, then click on the Send button.
3. Clicking on the Clear button will clear all start and reset to zero.

Figure 7 wchost270 Regulatory Window



5. Approved Antennas

Taoglas – GW.71.5153

Part No. : GW.71.5153
Product Name : 2.4GHz/5.8GHz Terminal Mount Dipole Antenna for ISM Band and WLAN IEEE 802.11a/b/g/h
Feature : 5dBi High Performance Antenna
RP-SMA(M) Hinged Antenna
RoHS Compliant

Table 3 Max TX Power

Mode	Data Rate (Mbps)	2.4 GHz Channels		
		Channel 1 Low = 2412 MHz	**Channel 6 Mid = 2437 MHz**	**Channel 11 High = 2462 MHz**
802.11 b	1	14	14	13
	11	14	14	13
802.11 g	6	13	18	10
	24	13	18	10
	54	13	18	10
802.11 n_20MHz	MCS0	8	18	9
	MCS4	8	18	9
	MCS7	8	18	9
Mode	**Data Rate (MBPS)**	**5 GHz Channels**		
		Channel 36 Low = 5180 MHz	**Channel 40 Mid = 5200 MHz**	**Channel 48 High = 5240 MHz**
802.11a (5GHz U-NII-1)	6	7	7	7
	24	7	7	7
	54	7	7	7
802.11n 20 MHz (5GHz U-NII-1)	MCS0	8	8	8
	MCS4	8	8	8
	MCS7	8	8	8
		Channel 56 Low = 5260 MHz	**Channel 100 Mid = 5500 MHz**	**Channel 140 High = 5700 MHz**
802.11a (5GHz U-NII-2)	6	12	13	10
	24	12	13	10
	54	12	13	10
802.11n 20 MHz (5GHz U-NII-2)	MCS0	12	13	9
	MCS4	12	13	9
	MCS7	12	13	9
		Channel 149 Low = 5745 MHz	**Channel 157 Mid = 5785 MHz**	**Channel 165 High = 5825 MHz**
802.11a (5GHz U-NII-3)	6	13	13	13
	24	13	13	13
	54	13	13	13
802.11n 20 MHz (5GHz U-NII-3)	MCS0	14	14	14
	MCS4	14	14	14
	MCS7	14	14	14

6. FCC and IC Declaration

PBA WCM-9116 INTERPOSER (MS40251)
This device complies with Part 15 of the FCC Rules.
Operation is subject to the following two conditions:

1. This device may not cause interference.
2. This device must accept any interference, including interference that may cause undesired operation.

User Information FCC 15.21:
Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

Statement gem.RSS GEN Issue 5::
This device contains licence-exempt transmitter(s)/receiver(s) that comply with Innovation, Science and Economic Development Canada's licence-exempt RSS(s). Operation is subject to the following two conditions:

1. This device may not cause interference
2. This device must accept any interference, including interference that may cause undesired operation of the device.

Cet appareil contient des émetteurs / récepteurs exemptés de licence conformes aux RSS (RSS) d'Innovation, Sciences et Développement économique Canada. Le fonctionnement est soumis aux deux conditions suivantes:

1. Cet appareil ne doit pas causer d'interférences
2. Cet appareil doit accepter toutes les interférences, y compris celles susceptibles de provoquer un fonctionnement indésirable de l'appareil.

End Product Labeling

This Module is labeled with its own FCC ID. If the FCC ID Certification Number is not visible when installed inside a host device, then the host device should display a label on it referring to the enclosed module. In such as case, the host device (end product) must be visibly labeled with the following:

"Contains Transmitter Module FCC ID: URA-MS40251" or "Contains FCC ID: URA-MS40251"

This Module is labeled with its own IC ID. If the IC ID Certification Number is not visible when installed inside a host device, then the host device should display a label on it referring to the enclosed module. In such as case, the host device (end product) must be visibly labeled with the following:

"Contains Transmitter Module IC ID: 5895B-MS40251" or "Contains IC ID: 5895B-MS40251"

Radiation Exposure Statement:

This equipment must be installed and operated in accordance with provided instructions and the antenn(s) used for this transmitter must be installed to provide a separation distance of at least 20cm from all persons and must not be co-loacted or opertaining in conjunction with any other antenna or transmitter.

ISED

This equipment complies with IC radiation exposrue limits set forth for an uncontrolled environment. This equipemtn should be installed and operated with minimim distance 20cm beteween the radiatior & your body.

Délaration d'exposition aux radiations:
Cet équipement est conforme aux limites d'exposition aux rayonnements IC établies pour un environnement non contrôlé. Cet équipement doit être installé et utilize avec un minimum de 20 cm de distance entre la source de rayonnement et votre corps.

6.1. FCC and IC Product Identification

FCC ID: URA-MS40251

IC: 5895B-MS40251
HVIN: MS40251 PMN: WCM9116 FVIN: 1610.2.7.0.0.39

7. Labelling Instructions

WCM-9116 label (Figure 11) is to be applied to top of RS9116W-DB00-CC0 (Figure 10) See Figure 12. J1 of PCBA (Figure 13)

Figure 8 RS9116W-DB00-CC0 Top

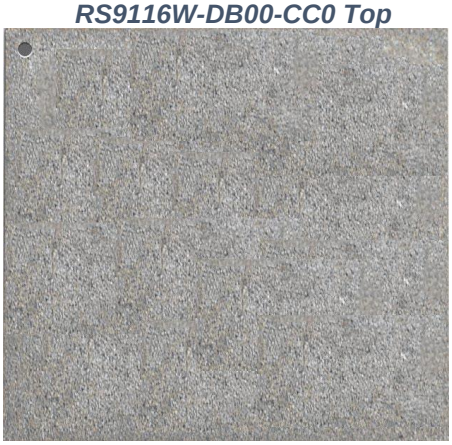


Figure 9 WCM-9116 Label

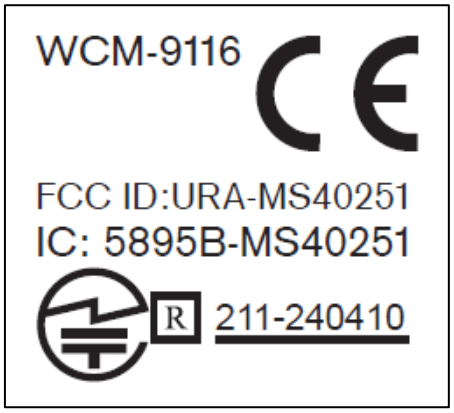


Figure 10 RS9116W-BD00-CC0 labeled WCM-9116

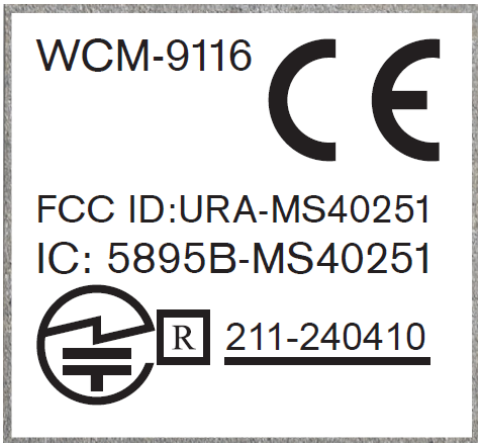
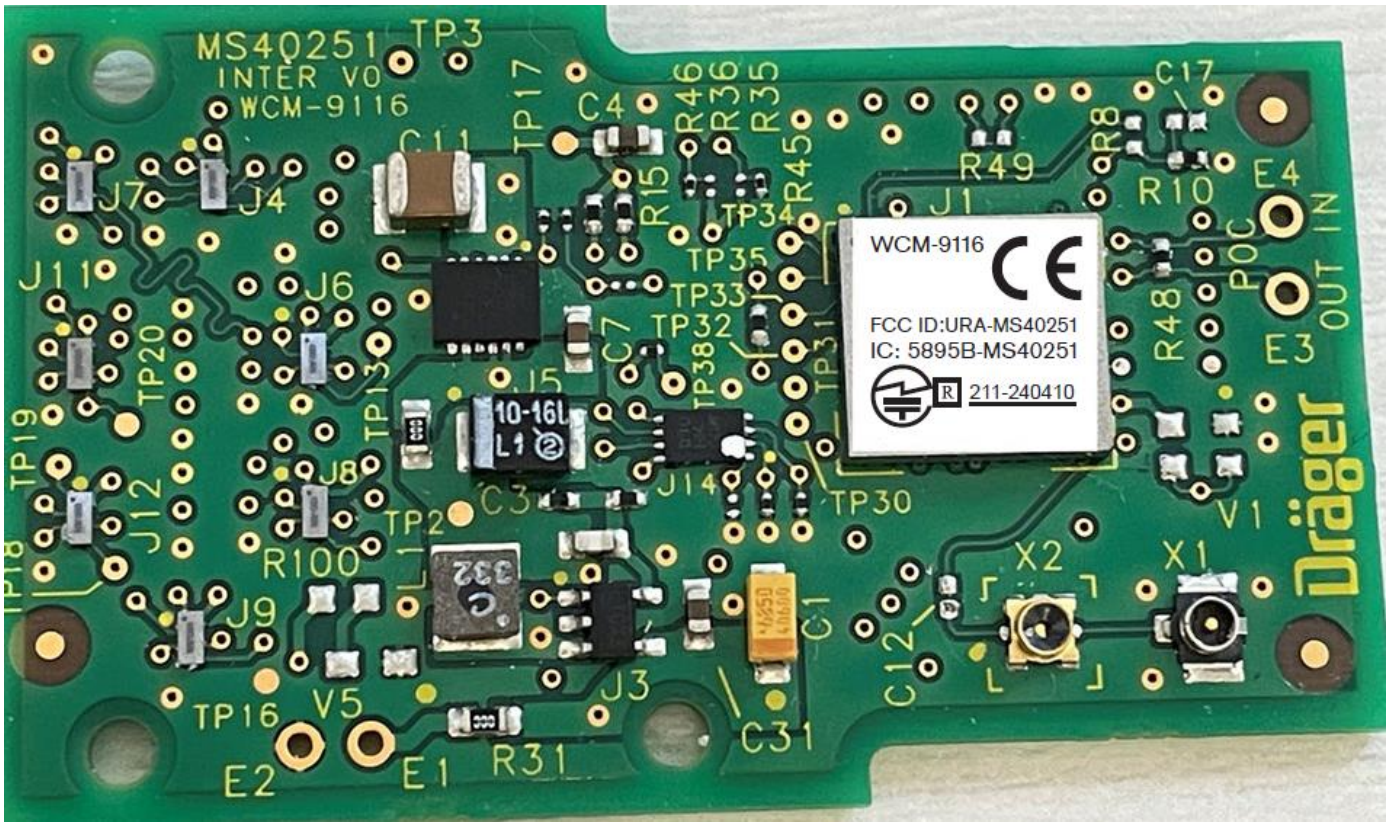


Figure 11 Final assembly labeled



Change history

Version	Date	Author	Change
00	2024-06-29	Bill Dowd	Initial Release

Reference Documents

Number	Description	Version	Date
AN1337	RS9116 Regulatory Certification Application Note	1.1	June 22, 2022
AN1048	Regulatory RF Module Certifications	0.3	February, 2021
N/A	RS9116W WiseConnect Simple API Reference	2.7	December 6, 2022
N/A	RS9116 CC0 Connectivity Module Datasheet	V1.0.12	December 2022
MS40254	SCH WCM-9116 INTERPOSER	04	July 6, 2023
11152028	PBA WCM-9116 INTERPOSER Elec Assy Drwg	01	July 6, 2023
11275361	PBA WCM-9116 INTERPOSER Mechanical Draw	00	8/3/2023

Abbreviations and Definitions

Abbreviation	Definition
API	Application Programming Interface
CRC	Cyclic Redundancy Check
EVK	Evaluation Kit
ETSI	European Telecommunications Standards Institute
FCC	Federal Communications Commission
GHz	Gigahertz
IEEE	Institute of Electrical and Electronics Engineers
KCC	Korean Community Center
Mbps	Megabits per second
msc	Modulation Coding Scheme
MHz	Megahertz
N/A	Not Applicable
PBA	Printed circuit Board Assembly
PCS	Product Core System
PER	Packet Error Rate
PWR	Power
Rx	Receive
SAPI	Simple Application Programming Interface
SCH	Schematic
SPI	Serial Peripheral Interface
TELEC	Telecom Engineering Center
Tx	Transmit
USB	Universal Serial Bus
WCM	Wireless Communications Module