OSB DA14585

Bluetooth 5.0 LE MESH Module

Product Specification

Rev. 1.2

Overview

The OSB DA14585 RF module was designed in compliance with the Bluetooth 5.0 LE Specification and is based on the Dialog DA14585 single-chip controller.

Features

- Small 16.8 mm x 21.0 mm x 3.5 mm SMD module
- Bluetooth 5.0, ETSI EN 300 328 V2.1.1
- Supports up to 64 Bluetooth LE connections
- Fast cold boot in less than 50 ms

Processing units

- 16 MHz 32 bit ARM Cortex-M0 with SWD interface
- Dedicated Link Layer Processor
- AES-128 bit encryption Processor

Memories

- 64 kB One-Time-Programmable (OTP) memory
- 96 kB Data/Retention SRAM
- 128 kB ROM Operating System and protocol stack
- 1.024 kB Serial Flash for User Specific Software Stack

Power management

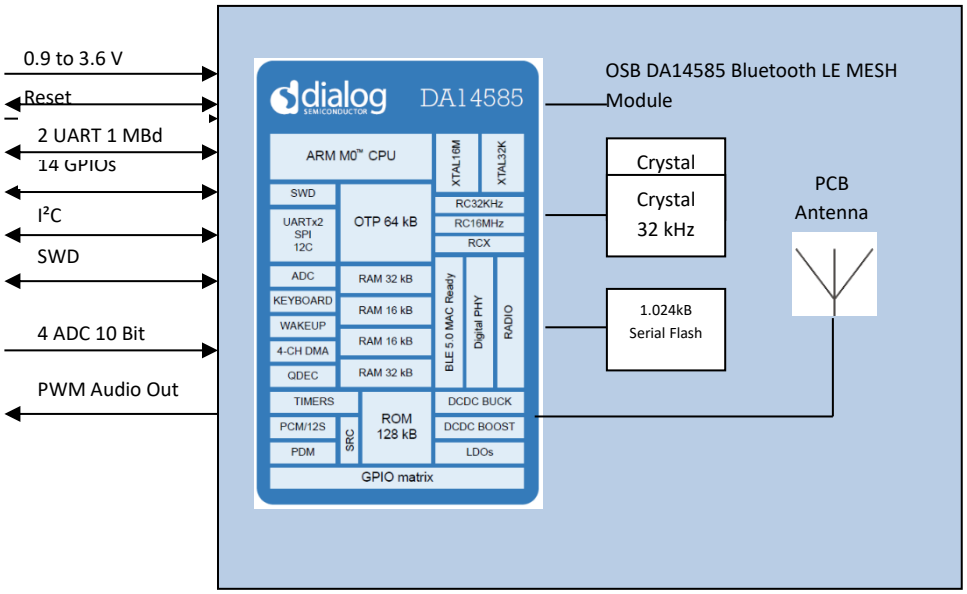
- Integrated Buck/Boost DCDC converter
- 1.8 V cold boot support-buck mode
- 0.9 V cold boot support-boost mode
- 10-bit ADC for battery voltage measurement

Digital controlled oscillators

- 16 MHz crystal (±20 ppm max) and RC oscillator
- 32 kHz crystal (±50 ppm)
- RCX oscillator(±500 ppm max)

General purpose, Capture and Sleep timers

- Digital interfaces
- Gen. purpose I/Os: 14
- 2 UARTs with hardware flow control up to 1 MBd
- SPI+™ interface
- I^2C bus at 100 kHz, 400 kHz
- 3-axes capable Quadrature Decoder
- System & Power On Reset in a single pin
- 4-channel 10-bit ADC



By purchase of any of the products described in this document the customer accepts the document's validity and declares their agreement and understanding of its contents and recommendations. OSB AG reserves the right to make changes as required at any time without notification. Please consult the most recently issued Product Specification before initiating or completing a design.

© OSB AG 2020

This specification sheet is copyrighted. Reproduction of this document is permissible only if reproduction is without alteration and is accompanied by all associated warranties, conditions, limitations, and notices. Do not disclose it to a third party.

All rights reserved.

This Product Specification does not lodge the claim to be complete and free of mistakes.

Engineering Samples (ES)

If Engineering Samples are delivered to the customer, these samples have the status "Engineering Samples". This means that the design of this product is not yet concluded. Engineering Samples may be partially or fully functional, and they may differ from the published Product Specification.

Engineering Samples are not qualified and they are not to be used for reliability testing or series production.

Disclaimer

The customer acknowledges that samples may deviate from the Product Specification and may bear defects due to their status of development and the lack of qualification mentioned above.

OSB AG rejects any liability or product warranty for Engineering Samples. In particular, OSB AG disclaims liability for damages caused by:

- The use of the Engineering Sample other than for evaluation purposes, particularly the installation or integration in another product to be sold by the customer,
- Deviation or lapse in function of the Engineering Sample,
- Improper use of the Engineering Sample.

OSB AG disclaims any liability for consequential and incidental damages. In case of any queries regarding the Engineering Samples, please contact your local sales partner or the related product manager.

Table of Contents

Table of Contents

1 About This Document 6
1.1 Purpose and Audience 6
1.2 Revision History 6
1.3 Use of Symbols 6
1.4 Related Documents 6
2 Overview 7
2.1 Block Diagram 8
2.3 UART Interface 10
2.4 Bluetooth Features 10
3 Module Dimensions 10
3.1 OSB DA14585 Bluetooth Module Evalboard Schematics 11
3.2 OSB DA14585 Bluetooth Module Evalboard Connectors 11
..... 12
4 Integrated Software Features 13
4.1 Embedded Module Software 13
4.1.3 Module Test Setup 13
4.1.4 Module Telnet Setup 13
4.1.5 Test Features 14
4.2 Module Services 14
4.2.1 Serial Service 14
4.2.2 Peripheral Service 15
4.2.3 MLSH/MLSP-Service 16
4.2.4 Software Update Over the Air Service 16
4.3 Android App and iOS App Software 16
4.3.1 Android App and iOS App Features 16
4.3.2 Android App and iOS App Installation 17
4.3.3 Initialize Bluetooth Connection 17
4.3.4 Device Peripheral Control 18
4.3.5 Android Telnet Client 19
4.3.6 Software Update over the Air 21

4.3.7 MESH Communication Network Setup 22
4.4 Full Serial TTL Interface TelNet Features 23
4.4.1 TelNet View Master and Client Connection 23
4.4.2 Telnet Master to Slave Communication 25
4.4.3 TelNet Slave to Master Connection 26
4.4.4 TelNet Slave to Master Status Button and AD Input Display 26
4.4.5 TelNet MESH communication with disconnected Host App 27
4.4.6 Special TelNet MESH command set 27
5 Specification 30
5.1 Default Test Conditions 30
5.2 Absolute Maximum Ratings 30
5.3 Recommended Operating Conditions 31
5.4 Current Consumption 31
5.5 Bluetooth 32
5.6 Reliability Tests 32
5.7 Recommended Soldering Profile 33
6 Cautions 34
6.1 Design Notes 34
6.2 Installation Notes 34
6.3 Usage Condition Notes 34
6.4 Storage Notes 35
6.5 Safety Cautions 35
6.6 Other Cautions 35
6.7 Life Support Policy 36
6.8 Restricted End Use 36
7 Regulatory and Certification Information 37
7.1 European EMV Conformity According to ETSI EN 300 328 V2.1.1 37
7.2 Bluetooth 38
7.2 RoHS and REACH Declaration 38
8 Appendix 38
8.1 Contact Details 38
8.1.1 Contact Us 38
8.1.2 Product Information 38

1 About This Document

1.1 Purpose and Audience

This Product Specification provides details on the functional, operational, and electrical characteristics of the OSB DA14585 Bluetooth 5.0 LE MESH Module.

It is intended for hardware design, application, and Original Equipment Manufacturers (OEM) engineers.

The product is referred to as “the DA14585 module” or “the module” within this document.

1.2 Revision History

Revision	Date	Modifications/Remarks
1.0	2019-05-14	Initial release
1.1	2020-04-02	Updated release
1.2	2020-09-10	Updated release

1.3 Use of Symbols

Symbol	Description
	Note Indicates important information for the proper use of the product. Non-observance can lead to errors.
	Attention Indicates important notes that, if not observed, can put the product’s functionality at risk.
→[chapter number chapter title]	**Cross reference** Indicates cross references within the document. **Example:** Description of the symbols used in this document →[1.3 Use of Symbols].

1.4 Related Documents

Please refer to the www.osb-innovations.com for related documents.

2 Overview

The OSB DA14585 RF module was designed in compliance with the Bluetooth 5.0 LE Specification and is based on the Dialog DA14585 single-chip controller.

The new Bluetooth 5.0 features enable a higher symbol rate of 2 Mbps and open field transmission rage up to 90 meters.

The new channel selection algorithm improves the performance in environments which are busy at 2.4 GHz. Furthermore, the new Low Energy advertising extensions allow for much larger amounts of data to be broadcast in connectionless scenarios, are therefore favorable for beacon, and mesh applications.

A high output power of up to 0 dBm sensitivity of the Dialog DA14585 make the module very attractive in applications where a long range is required.

The ultra-low current consumption of the OSB DA14585 Bluetooth 5.0 LE MESH Module make the module an ideal choice for battery powered devices. Various sleep modes can be used to minimize power consumption and prolong battery lifetime.

To provide maximum flexibility, the module can be operated in hosted as well as standalone mode.

In standalone mode no external processor is necessary, which saves complexity, space, and cost. The built-in 1.024 kB serial flash memory is completely free for application use.

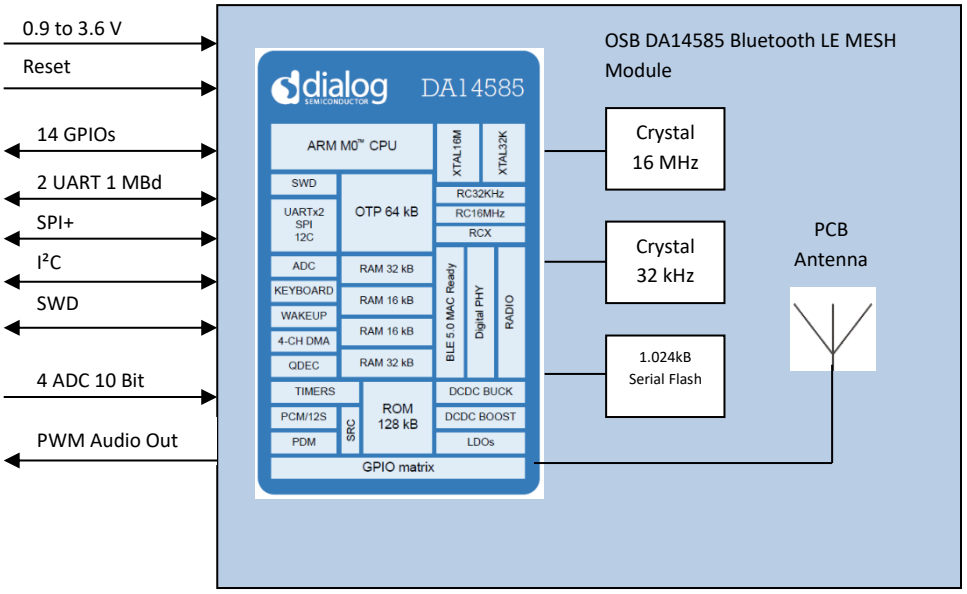
OSB DA14585 Bluetooth 5.0 LE MESH Module has a small form factor and footprint.

The integrated AI software allows a broad set of Plug & Play Features:

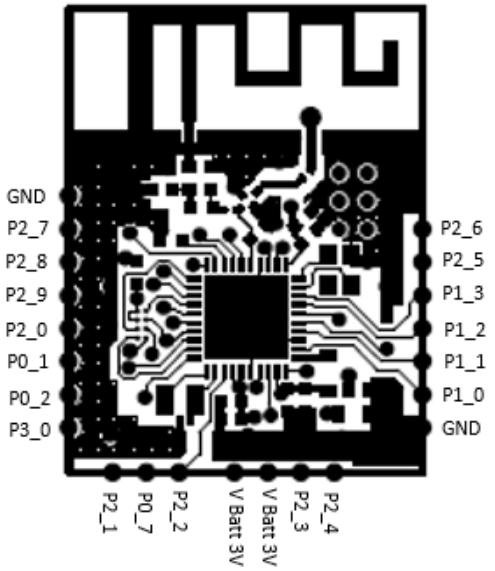
- 2 MBit Full Duplex Telnet Connection between Consumer Application and Android or iOS Device
- Up to 1 MBit Device to Device Connection with a 64 Devices MESH Network
- MESH Networking Background Repeater Function for other known devices
- Encrypted Communication Stack
- Audio Transmission Real Time or Delayed
- 2D relative Geo Positioning, Beacon Functionality
- Over the Air Software Update of features

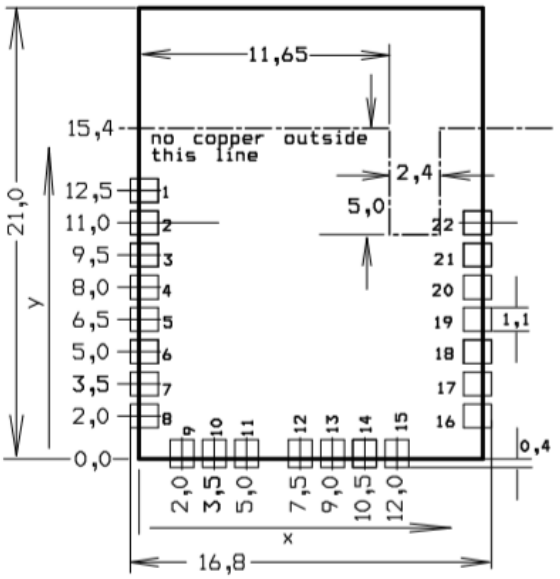
Please refer to www.osb-innovations.com for related documents

2.1 Block Diagram



2.3 Pin Configuration





Pin Functions

No	Pin Name	Pin Type	Description
1	GND	Ground	
2	P2_7	GPIO	Assignable
3	P2_8	GPIO	Assignable
4	P2_9	GPIO	Assignable
5	P2_0	GPIO	Input 4
6	P0_1	GPIO	Input 3
7	P0_2	GPIO	Input 2
8	P3_0	GPIO	Input 1
9	P2_1	GPIO	PWM Speaker Out
10	P0_7	GPIO	Output 1
11	P2_2	GPIO	Output 2
12	VCC	Power	0.9 – 3.6 V Supply Voltage
13	VCC	Power	0.9 – 3.6 V Supply Voltage
14	P2_3	GPIO	Output 3
15	P2_4	GPIO	Output 4
16	GND	Ground	
17	P1_0	GPIO	Assignable
18	P1_1	GPIO	UART RTS
19	P1_2	GPIO	UART TX
20	P1_3	GPIO	Assignable
21	P2_5	GPIO	UART CTS
22	P2_6	GPIO	UART RX

Minimal configuration

- VCC
- GND
- UART Rx, Tx, no flow control

2.3 UART Interface

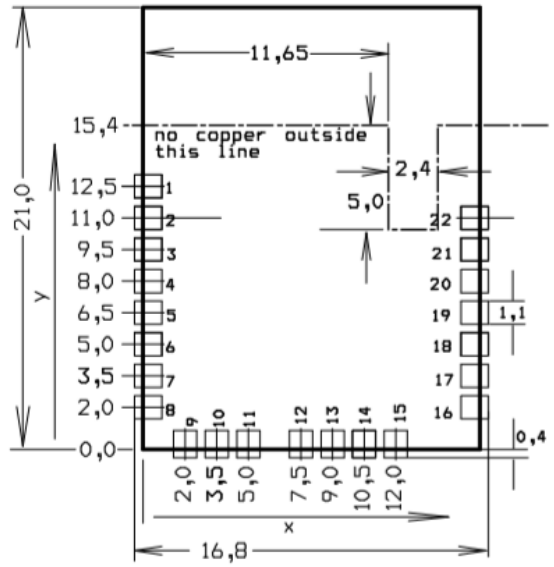
- Default baud rate: 115 200
- Data format: 8, Stop: 1, Parity: none, LSB first
- Rx, Tx, no flow control

2.4 Bluetooth Features

- 2 Mbps high-speed PHY, Low Energy long range coded PHY
- Low Energy advertising extensions (advertising on 40 channels total)
- Channel selection algorithm 2
- Low Energy secure connections
- Advertising function without CPU Wake-Up and interaction
- Bluetooth SIG certified Mesh stack (soon)

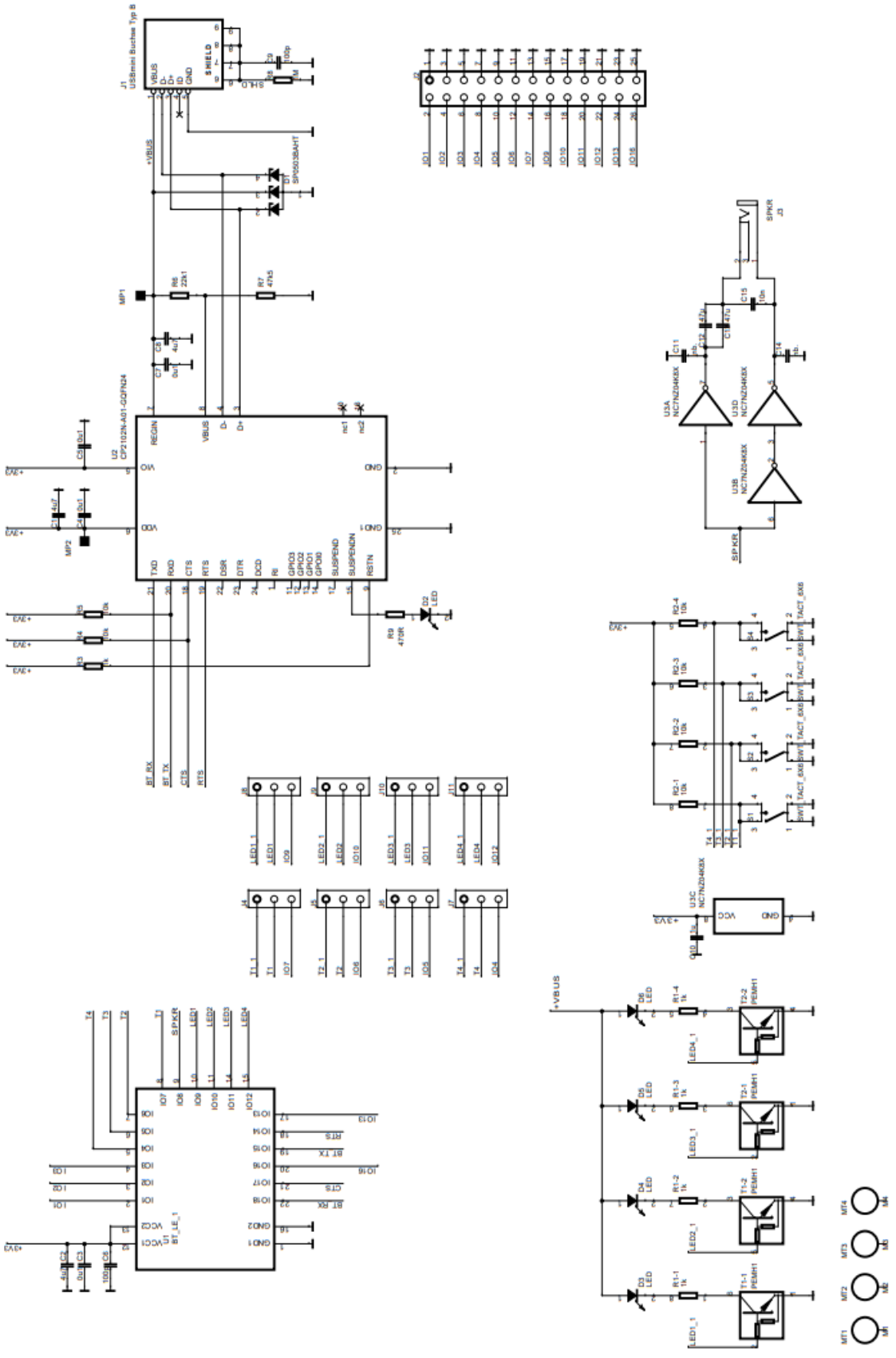
3 Module Dimensions

All dimensions are in millimeters

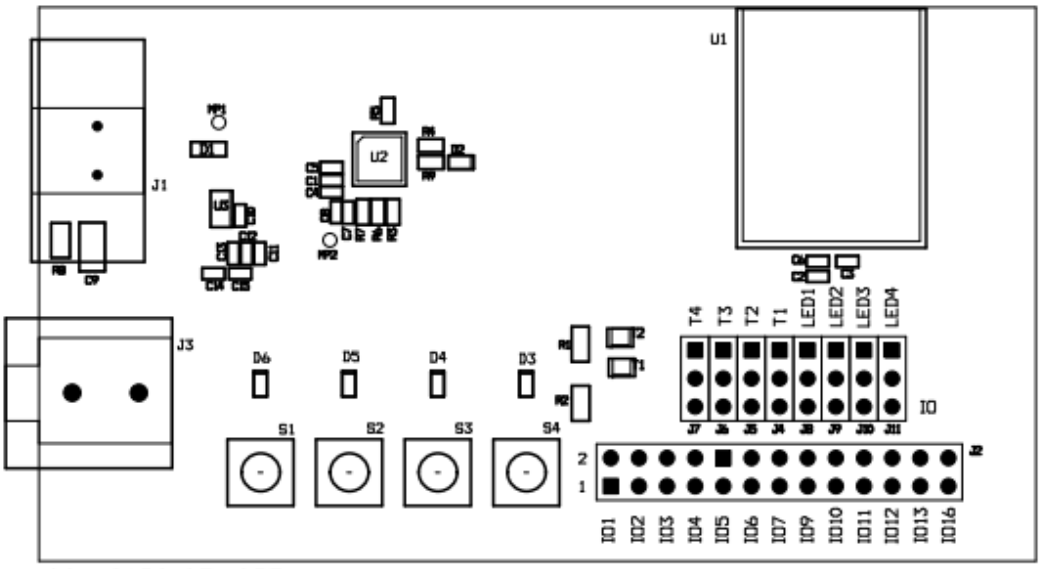


No.	Item	Dimension	Tolerance	Remark
1	Width	16.8	± 0.35	
2	Length	21,0	± 0.35	
3	Height	3.50	± 0.35	With case

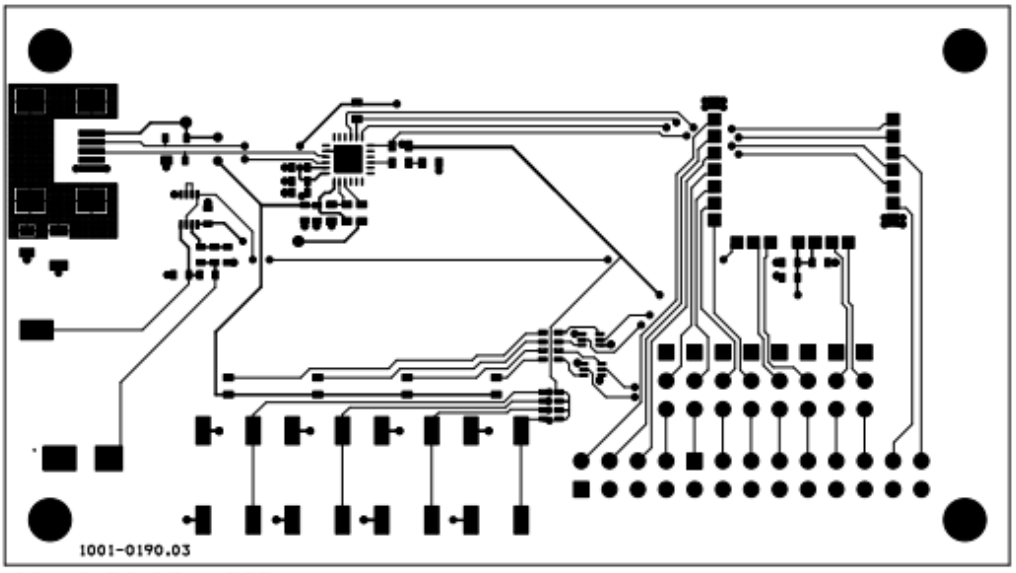
3.1 OSB DA14585 Bluetooth Module Evalboard Schematics



3.2 OSB DA14585 Bluetooth Module Evalboard Connectors



1001-0190.03 AST



1001-0190.03 TOP

4 Integrated Software Features

4.1 Embedded Module Software

The OSB DA14585 Bluetooth LE MESH Module is pre- programmed with test- software, which allows to test and to evaluate the module features. In buildings the maximum module transmission range is 50 meters, in free field the transmission range is 90 meters.

4.1.1 Module Update Over the Air

To allow a module update over the air, the demo software is pre- programmed in the 1.024 kByte module serial flash, the onboard 128 kByte OTP is unused, free for future OEM applications.

4.1.2 Initial Bluetooth Address

Every OSB DA14585 Bluetooth Module generates a random Bluetooth Address for the initial start, the Bluetooth-Name consists of the Default-Value “Multilink-Periph0x” and the first two bytes of the Bluetooth address.

4.1.3 Module Test Setup

For module pin connections please refer to →[2.2 Pin Configuration]

For module test purposes

- loudspeaker
- 4 test switches
- 4 test LEDs

Can be connected to the module, please refer to →[2.2 Pin Configuration]

4.1.4 Module Telnet Setup

To test the **Telnet connection** of the module to a PC a serial-TTL to USB Cable has to be applied to the defined module pins →[2.2 Pin Configuration].

OSB AG recommends the FTDI Serial TTL to USB Cable
https://www.ftdichip.com/Products/Cables/USBTTLSerial.htm

Alternatively the OSB DA14585 Bluetooth Module Evaluation Board can be used for test purposes, please refer to www.osb-innovations.com

A Telnet Client, has to be installed on the PC to display transmitted module communication.

Tera Term: https://ttssh2.osdn.jp/index.html.en

After starting the Telnet program on PC please apply the following settings

- Serial Port: COM Port installed with the connection of the serial TTL cable
- Speed: 115200
- Data: 8 bit
- Parity: none
- Stop bits: 1 bit
- Flow control: none
- Transmit delay: 0

4.1.5 Test Features

After downloading and installing the OSB DA14585 Bluetooth Test App on your Smartphone from the Android /IOS Store you can test the following module features

- GPIO control
- GPIO status request
- Battery level check
- Signal strength
- Full-Duplex Telnet communication between PC and Smartphone App
- Multilink Network Creation
- Message Transmission over several End to End devices
- Software Update Over the Air
- Module Serial Flash Usage
- Audio PWM Playback

4.2 Module Services

4.2.1 Serial Service

The Serial Service establishes the Telnet Communication between the OSB Android App, the OSB DA14585 Bluetooth Module and all MESH networked modules.

- **Name**: Receive Serial Data from Chip**UUID**: 0783b03e-8535-b5a0-7140-a304d2495cb8
- **Feature**: Notify-Characteristic
- **Length:** 1 Byte
- **Brief**: Whenever the Chip gets a value on its TelNet this value is send to the cellphone.

- **Name**: Send Serial Data to Chip.**UUID**: 0783b03e-8535-b5a0-7140-a304d2495cba
- **Feature:** Write no Response -Characteristic
- **Length**: up to 32 Byte
- **Brief**: Receive Serial Data from Chip

4.2.2 Peripheral Service

The Peripheral-Service controls the connected devices and delivers the device status information

- **Name**: Buttons
- **UUID**: 0783b03e-8535-b5a0-7140-a304d2495cbc
- **Feature:** Notify -Characteristic
- **Length**: 1 Byte
- **Brief:** Read GPIO state changes

- **Name**: LEDs
- **UUID**: 0783b03e-8535-b5a0-7140-a304d2495cbd
- **Feature:** Write -Characteristic
- **Length**: 1 Byte
- **Brief**: Write GPIO state LED

- **Name**: Sound
- **UUID**: 0783b03e-8535-b5a0-7140-a304d2495cbe
- **Feature:** Write -Characteristic
- **Length**: 1 Byte
- **Brief:** Play the selected Soundfile

- **Name**: Serial commands
- **UUID**: 0783b03e-8535-b5a0-7140-a304d2495cbf
- **Feature**: Write -Characteristic
- **Length:** 1 Byte
- **Brief:** Send serial commands to the Chip. Some of them will be redirected to the devices in the mesh.

Available Serial Commands:

- **0x10:** Get device information (Company name, software version, firmware release date).
- **0x02:** Battery charge level.
- **0x30:** Get the strength of the signal communication (RSSI) between the Chip and the cellphone.
- **0x40:** Get the RSSI between the Chip and all the other devices connected to it.
- **0x5X:** Change TelNet communication speed (Baud rate) from 2400 to 1000000. The value for X will be 1 for 2.400, 2 for 9.600, 3 for 1.4400, 5 for 19.200 and so on until D for 1.000.000. Deafult value is 115.200.
- **0x6X:** When enable (X=1) the Chip will get the values from another specific device's TelNet. When disable (X=0) the Chip is not getting the values from another specific device TelNet.

4.2.3 MLSH/MLSP-Service

MLSH and MLSP allow to setup the multilink network services.

- **Name**: MLSH Status
- **UUID**: f2dec691 - 472 - 1e85 - 972d - 37d5476c00d2
- **Feature:** Read -Characteristic
- **Length:** 24 Bytes
- **Brief:** Define Bluetooth Addresses of all connected devices

- **Name**: MLSH Config
- **UUID**: f2dec692 - 472 - 1e85 - 972d - 37d5476c00d2
- **Feature**: Write -Characteristic
- **Length:** 15 Bytes
- **Brief:** Configure connected devices, establishes indirect connections

4.2.4 Software Update Over the Air Service

Allows the Update of the Module Software by the connected OSB Smartphone App.

- **Name:** SUOTA Service
- **UUID:** 0000fef5-0000-1000-8000-00805f9b34fb

4.3 Android App and iOS App Software

4.3.1 Android App and iOS App Features

The main App Features are

- GPIO read out and control
- Android Telnet Communication Interface to MESH DA14585 Modules
- Module Software Update Over the Air
- Module Pairing, SetUp of a Bluetooth MESH Network
- Multi Level Network Communication
- Module Distance Measurement over the MESH Antenna Grid

4.3.2 Android App and iOS App Installation

To find the latest OSB DA14585 Bluetooth Module App for Android Smartphone please open **Google Playstore** and search for “OSB DA14585”.

To find the latest OSB DA14585 Bluetooth Module App for iOS Smartphone please open **Apple App Store** and search for “OSB DA14585”.

Please download and install the OSB DA1585 Bluetooth Module App from **Google Playstore or Apple App Store.** First time started after installation the App wants you to register.

During the first Start of the OSB DA14585 App the user has to give the following permissions

- Allow DA14585 to access photos, media, and data access (needed for device software updates over the air)
- Allow DA14585 to localize position of your device (needed for Bluetooth scan)

Your Android ot iOS Device has to fulfill the following requirements for the OSB DA14585 App to work properly

- Device must support Bluetooth connectivity
- Device shall support Bluetooth Low Energy LE
- Bluetooth shall be activated on your device
- Position Localization shall be activated on the device

Please do a module image software update first →[4.3.6 Software Update over the Air]

4.3.3 Initialize Bluetooth Connection

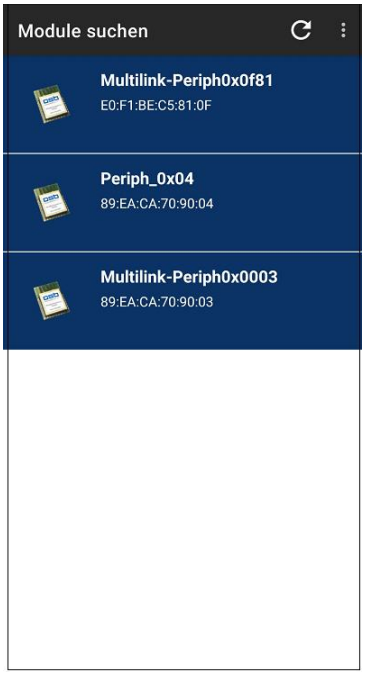
After the OSB DA14585 App has been launched, an automatic scan for visible DA14585 Bluetooth modules is started. This scan takes about 3 seconds.

If the scan does not deliver the right or sufficient results, you can do a re-scan by pressing the scan button.

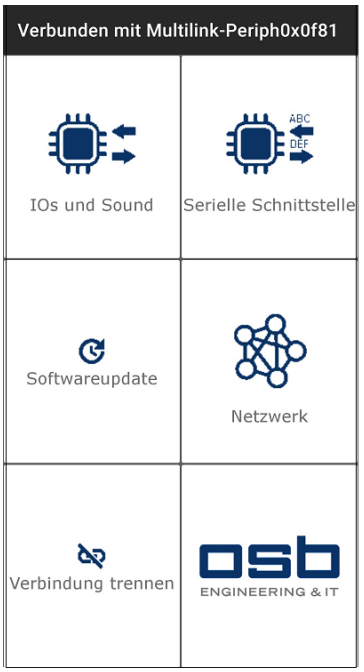
iOS App only: for every new module Setup an Re-Scan please close and Re- Open the App.

Now all the detected OSB DA14585 Bluetooth Modules are displayed in a list with device name and Bluetooth address.

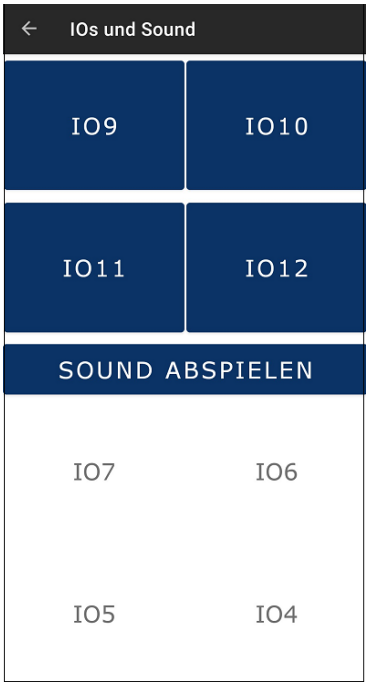
To connect a dedicated module touch the device on the list.



As soon a Bluetooth connection has been established the DA14585 App changes to the main view.



4.3.4 Device Peripheral Control



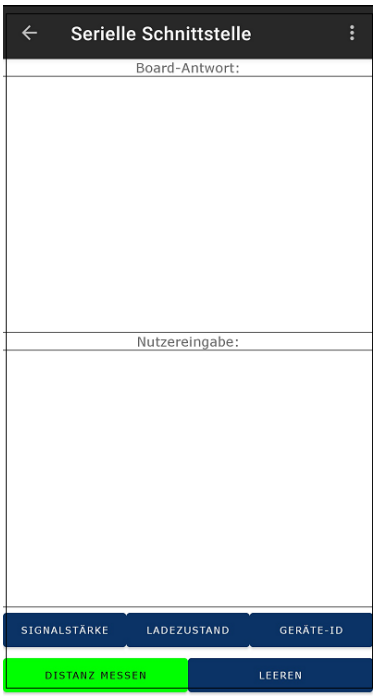
By touching the Button „IOs and Sound“ the App switches to the GPIO control screen

By touching the blue buttons IO9, IO10, IO11, IO12 the status of the OSB DA14585 Module Output 1, Output 2, Output 3, Output 4 is changed →[2.2 Pin Configuration]

The Color of the Buttons IO5, IO6, IO7, IO8 changes (white/blue) when the OSB DA14585 Module Input 1, Input 2, Input3, Input 4 is toggled →[2.2 Pin Configuration]

The Button „Play Sound“ plays a pre-defined sound file, when an amplifier and a loudspeaker are connected to PWM Speaker Out →[2.2 Pin Configuration]

4.3.5 Android Telnet Client

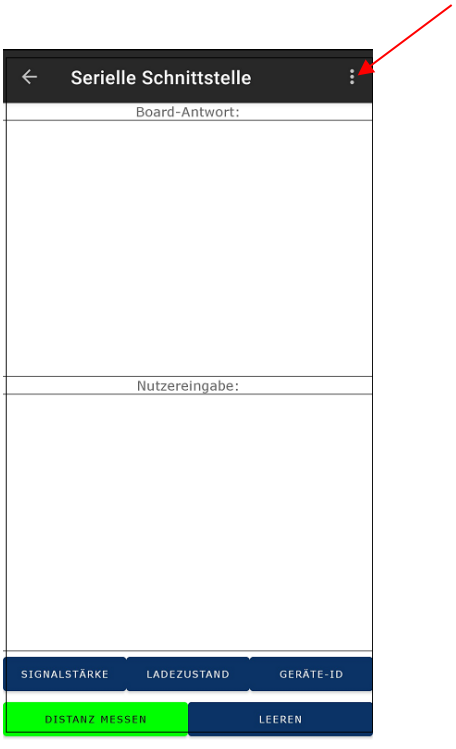


By touching the Button „Serial Interface“ the App switches to the DA14585 Android Telnet Client Screen.

In the lower part of the screen the user can enter data, which is transmitted to the UART connectors of the DA14585 Module.

In the upper part of the screen, the user can see the data which is received from the UART connectors of the DA14585 Module.

The →[chapter 4.1.4] describes how a PC is connected to the Serial TTL interfaces, to create a Telnet Client Interface on the DA14585 Module side.



Please click on settings on the upper right corner to change the Serial TTL Baud Rate settings of the module.

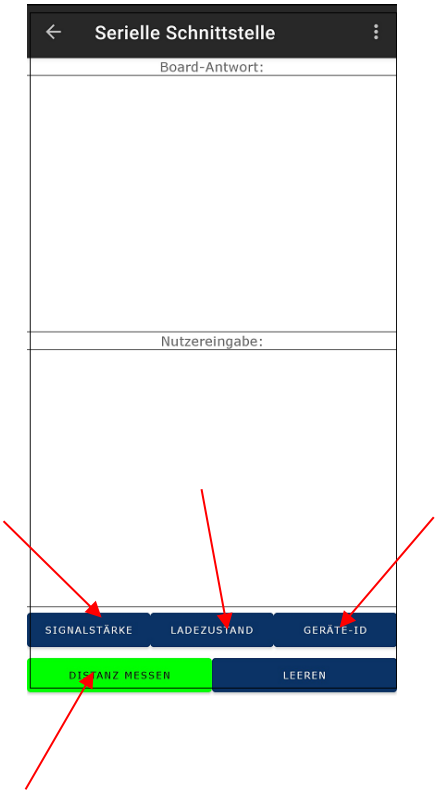
Note: the standard Baud Rate setting after DA14585 module re- start is always 115.200 Baud.

Touching the Button “Signal Strength” the Signal Strength between Smartphone and Module Master Device is displayed on the Serial TTL connected Telnet Screen.

Touching the Button “Distance Measurement” after setting up a MESH Network →[chapter 4.3.7], the Signal Strength between Smartphone, Module Master Device and all connected MESH Clients is displayed on the Serial TTL connected Telnet Screens continuously (Switch ON/OFF Button).

Touching the Button “Battery Charge” the Battery Charge is displayed on the Serial TTL connected Telnet Screen.

Touching the Button “Device ID” the Device ID is displayed on the Serial TTL connected Telnet Screen.



4.3.6 Software Update over the Air

After OSB DA14585 Bluetooth Module App installation

Please do a module image software update first.

Touching the Button „Software Update“ the App switches to the DA14585 Module Software Update Screen.

The request for a Download PIN is appearing on the display. If you got a customer specific software download PIN, please enter the PIN to get access to restricted DA14585 Bluetooth Module software image downloads, if you did not receive a PIN, just press OK, to get access to the common software image downloads

The latest module images for download (July 2020) are
DA14585_ADC_01 to DA14585_ADC_08

For full MESH functionality please download
DA14585_ADC_01 to module 01,
DA14585_ADC_02 to module 02,
DA14585_ADC_03 to module 03,
(...)
DA14585_ADC_08 to module 08

Now touch the App button “Image Selection”, choose an image to install, and start the module update process by touching the button

„Software Update“.

The update process takes about 20 seconds, after that the OSB DA14585 Bluetooth Module has to be rebooted by un-/plugging it to the power supply.

The module restarts with the new OS software.

4.3.7 MESH Communication Network Setup

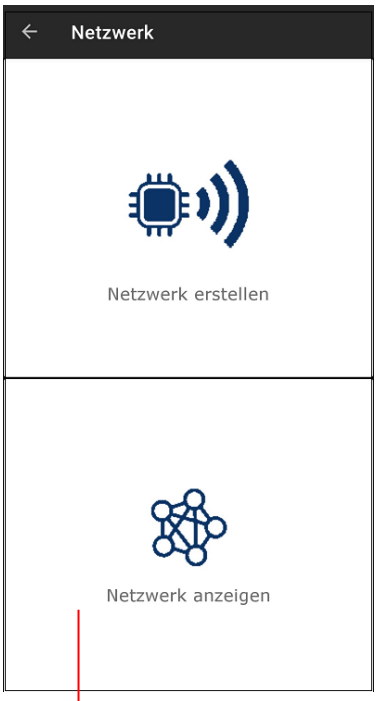
Touching the Button „Network“ the App switches to the DA14585 Module MESH Network Setup Screen.

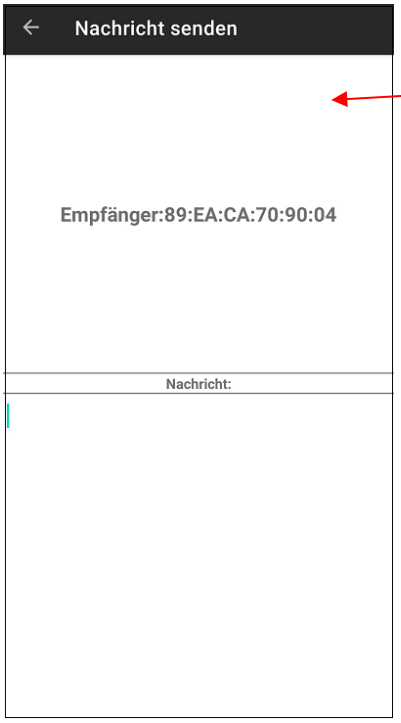
Touch the button „Create Network“ to create a new Network. After 15 seconds the active DA14585 Modules **are MESH connected** and you can display the MESH Network by touching the button „Display Network“.

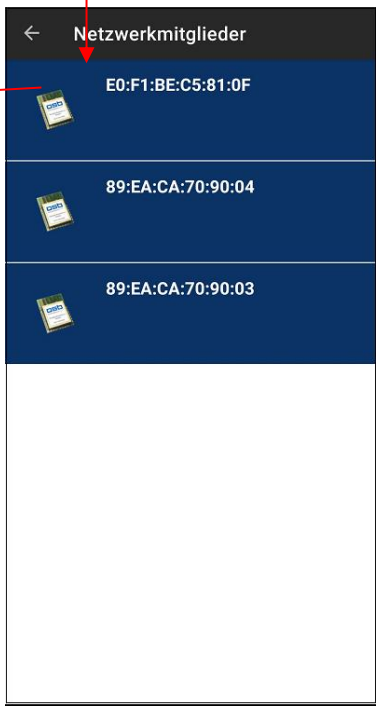
It takes some seconds to display all devices of the MESH network.

If not all DA14585 Modules are displayed as Members of the MESH please touch the „Create Network“ button once more and the missing members will be added to the existing MESH.

In the Submenu „Network Members“ you can select a MESH connected DA14585 Bluetooth Module, and exchange Messages with the selected DA14585 module over the Android Telnet Client. The UART of the selected module will receive the Android Telnet Data.







4.4 Full Serial TTL Interface TelNet Features

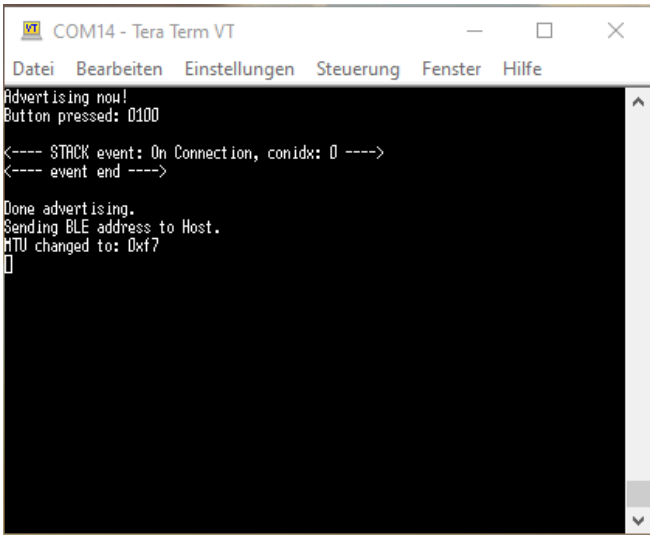
Every OSB DA14585 Bluetooth Module comes with a wide range Serial TTL TelNet features.

The following chapters describe, what you see when a TeraTerm TelNet Emulation is connected to the OSB DA14585 Bloetooth Module RX/TX Pins or over Evalboard USB Port →[4.1.4 Module TelNet Setup]

The TelNet functions have a focus on a host (Smartphone App) independent setup, replacing every App Feature in a MESH connected Network with a own command subset.

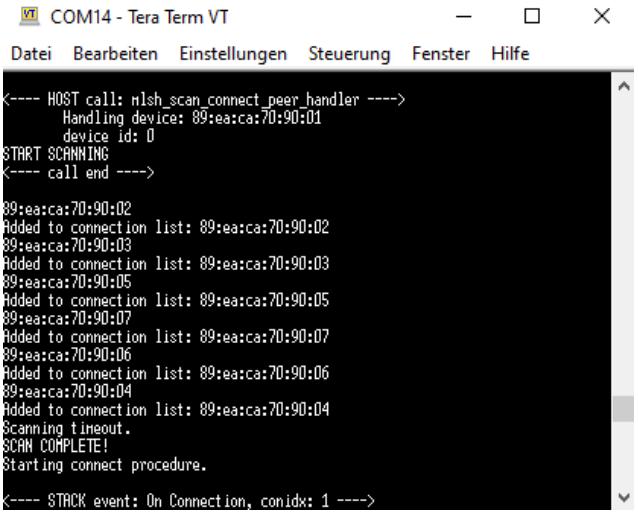
4.4.1 TelNet View Master and Client Connection

After Connecting a DA14585 Module the first Time to a Host App →[4.3.3 Initialize Bluetooth Connection] the Master Serial TTL Telnet Screen of the connected device shows the following information.

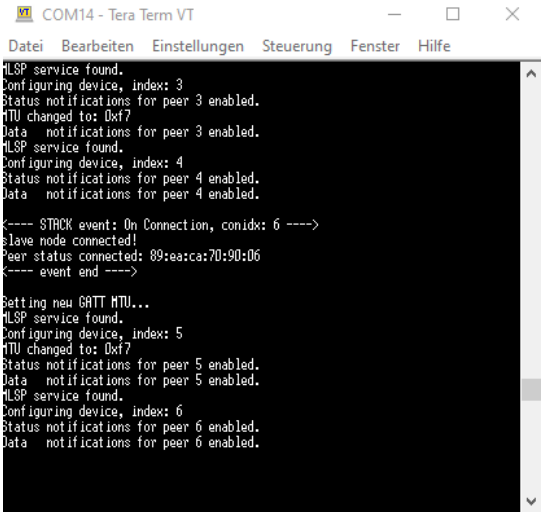


Now please start a MESH Scan on the App and establish a MESH Master Cliient Network →[4.3.7 MESH Communication Network Setup]

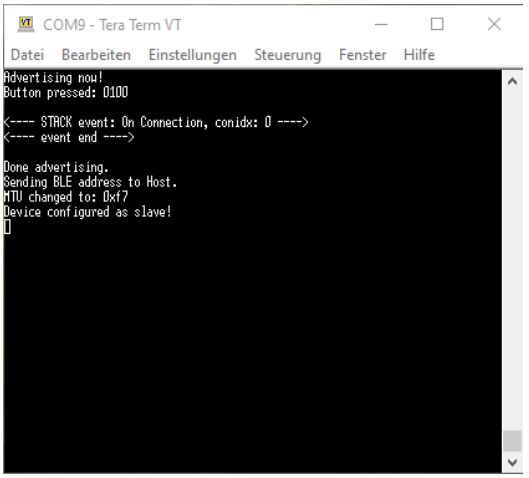
The Master is now scanning for all available OSB DA14585 Bluetooth Modules and marks them on the telnet screen as available devices.



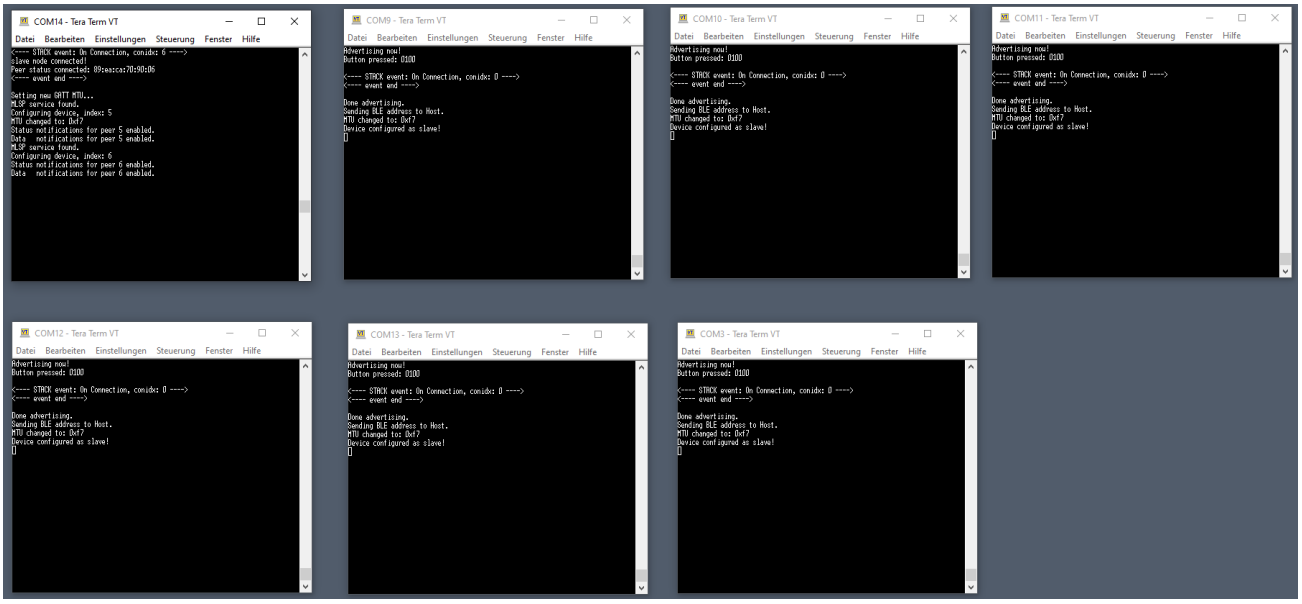
The connection procedure starts and all available clients are connected. Please wait until the last device is connected and the scan procedure finished. If a device was not detected you might press “Create Network” on the App again, and the scan process re- starts. Here is the Serial TTL Telnet Screen.



Every slave connected Serial TTL Telnet will also display that this OSB DA14585 device is now a slave.



For example we created a network with one master and 6 slave configured OSB DA14585 Bluetooth Modules, with 7 Serial TTL connections displayed on Tera Term.



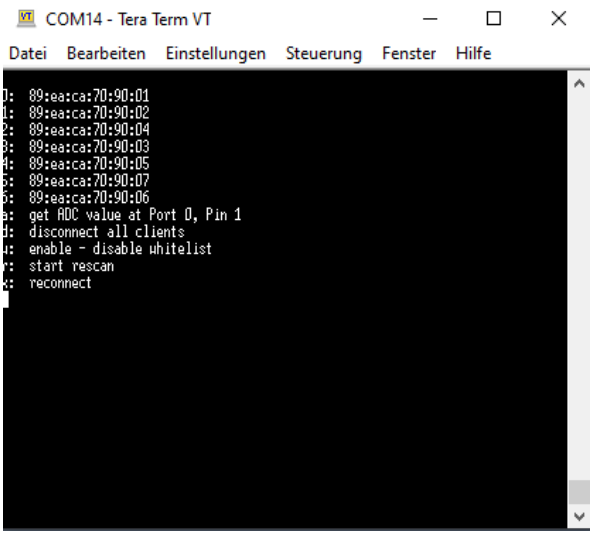
4.4.2 Telnet Master to Slave Communication

To write a message from master to a dedicated client press “$” on the master Telnet Screen and a list of the connected Bluetooth devices appears.

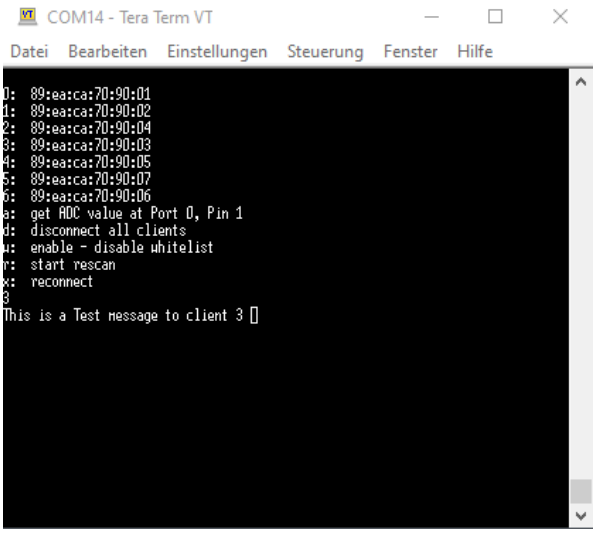
Note: because the master is connected to several slaves, the slave has always be addressed for sending a message.

Note: Device 0 is always the master, do not choose this or you write to yourself.

Enter a number 1 to 6 (in this example with 6 clients we entered 3 for client 3).



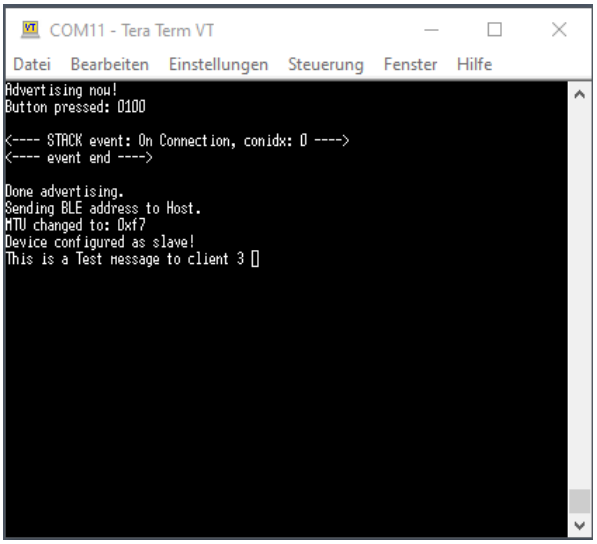
Now we write a message on the Master.



And the message appears character by character in real time on the addressed client screen.

Note: to write to another slave just press “$” followed by the number of another slave.

Now you are writing to the addressed slave.

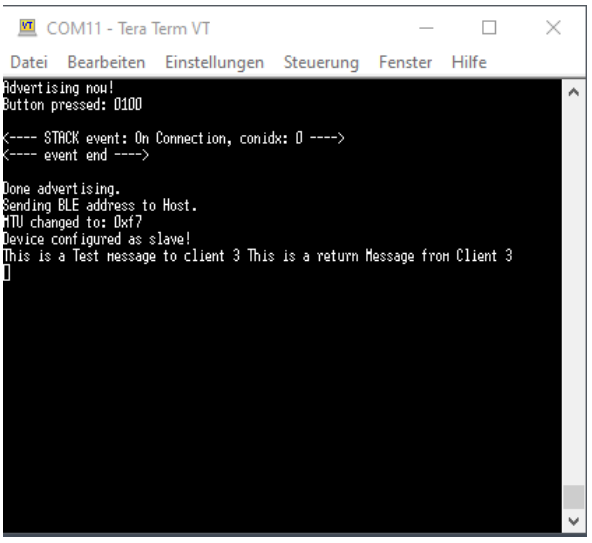


4.4.3 TelNet Slave to Master Connection

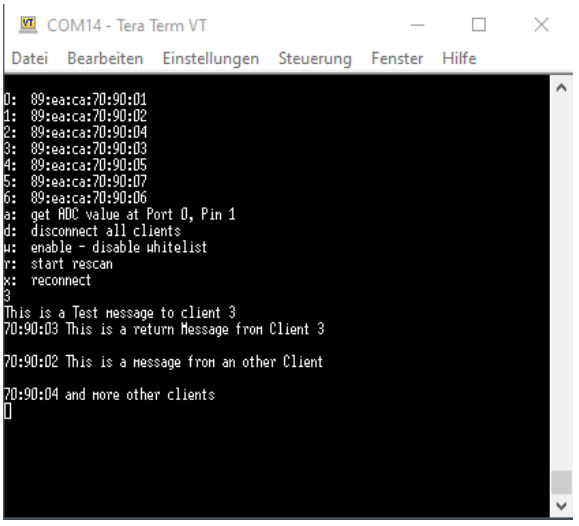
Because a slave can only send a message to the master, writing a message to the master is relatively easy from the slave side. There is no need for addressing.

Just enter a message on any connected slave Serial TTL TelNet interface.

Then press Return on the slave TelNet Screen.



Now the whole message appears on the master Serial TTL Telnet Screen with a 6 Digit ID from which networked slave the message was sent.

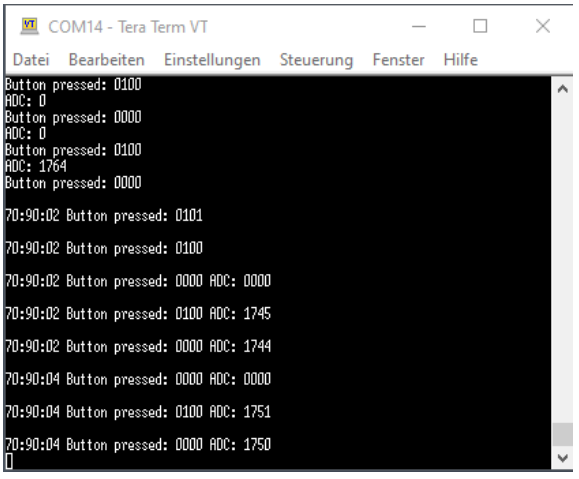


4.4.4 TelNet Slave to Master Status Button and AD Input Display

The Master Serial TTL Telnet Screen displays the status of the GPIO Input Buttons IO4, IO6, IO7 (digital) and the ADC (analog) Input changes,

- the own master buttons whenever the status changes without 6 digit address
- the slave buttons whenever the status changes with 6 digit address

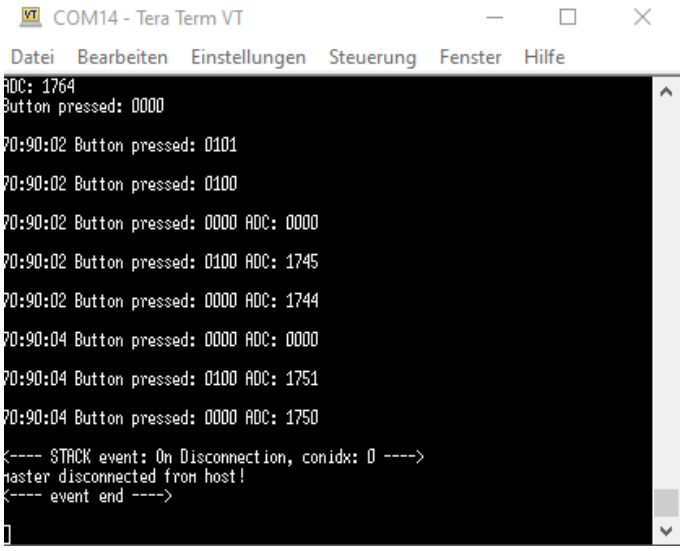
Note: a Slave Telnet Screen displays only the own button status changes.



4.4.5 TelNet MESH communication with disconnected Host App

The Master Slave OSB DA14585 Bluetooth Module MESH Network stays connected, even if the Host App on the Smartphone is disconnected (closed by the Android or iOS Task Manager).

In the case of disconnection from the Host App the Master Serial TTL TelNet shows the following message on the screen.

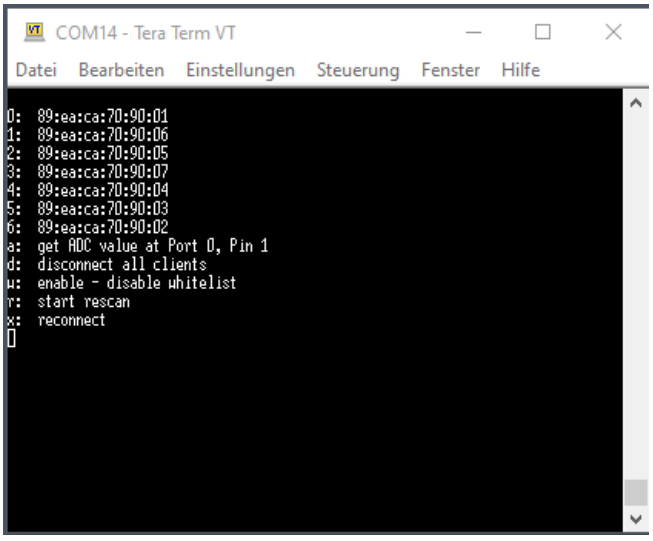


Note: the master to slave MESH is now invisible for any Bluetooth scan by an Android or iOS App.

The full MESH Master to Slave Serial TTL Telnet communication (described in chapter 4.4.2 to 4.4.5) stays alive with disconnected Host App

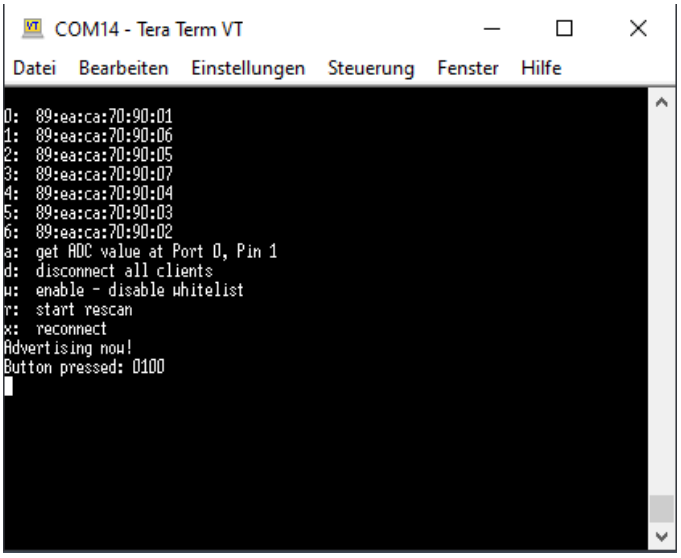
4.4.6 Special TelNet MESH command set

When the Host App is disconnected a **dedicated control menu on the master serial TTL TelNet Interface** can replace the Host App function, the menu is accessed by entering a “$” on the master TelNet Screen. The communication menu appears.



Disconnect

Entering a “$” and a “d” on the Master Serial TTL TelNet forces a hard disconnect of the master to slave MESH network.



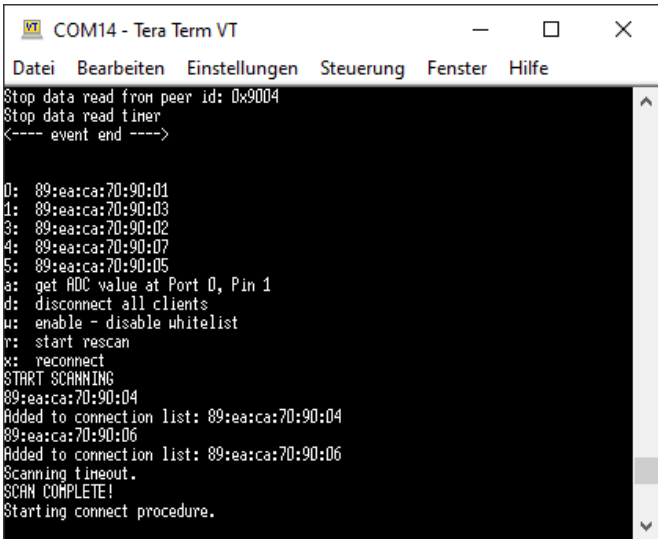
Note: the master and the slaves are now visible again to the Host Smartphone App and a new MESH can be created exclusively by the controlling Host App.

A complete MESH master to client network disconnection can be also forced by disconnecting the master module from the power supply. The slaves are disconnecting automatically within 3 seconds.

The disconnection was successful when all modules show the status “advertising now” on the Serial TTL TelNet Screen.

Rescan

Entering “$” and a “r” on the Master Serial TTL TelNet starts a Master Re- Scan Procedure which is equal to the feature button →[4.3.7 MESH Communication Network Setup] on the Host App.



All available devices are scanned, and new devices are added to the MESH.

Note: the Master Serial TTL TelNet Re- Scan feature only works, if the Master was former configured as a Master by the Host App, a MESH network was created, and at least one slave is still connected to the master.

Whitelist

Pressing “$” and “w” on the master Serial TTL TelNet enables or disables (toggles) the whitelist which is displayed by “Whitelist Enabled” or “Whitelist Disabled” on the screen.

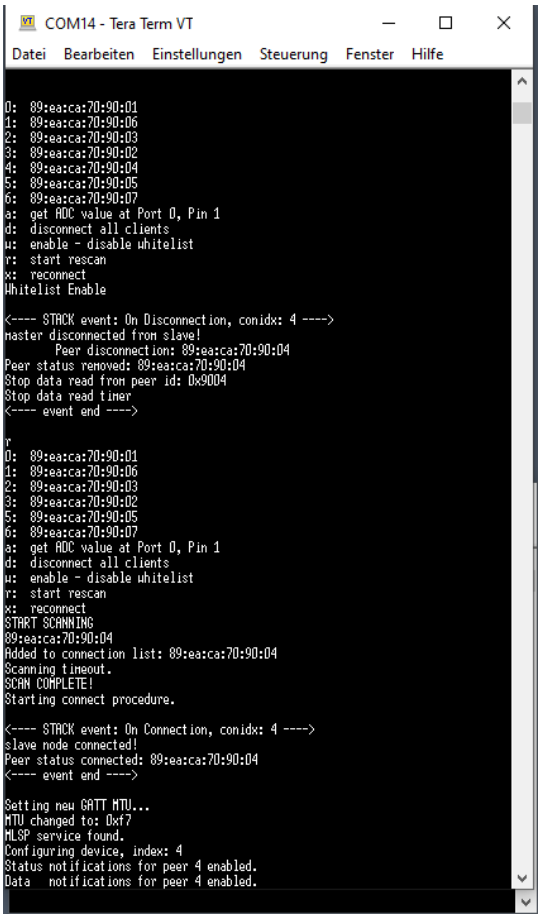
Whitelist changes the Re- Scan behavior by pressing “$” and “r”

In Whitelist Mode the scan of the available slave modules is skipped, and the last lost slave module (i.e. lost by a power failure) is added to the network again.

Note: Whitelist is a safety feature for a hidden existing master to slave MESH, it adds only already known and former connected devices to the MESH, while Re- Scan adds typically everything what is visible to the MESH.

In the example on the right, we enabled whitelist by entering “$” and “w”, then we disconnected the power supply of peer slave 4.

By pressing “$” and “r” in whitelist mode only the last disconnected slave is added to the MESH again without a scan.



Reconnect

Pressing “$” and “x” on the Master Serial TTL TelNet starts Re-Connect.

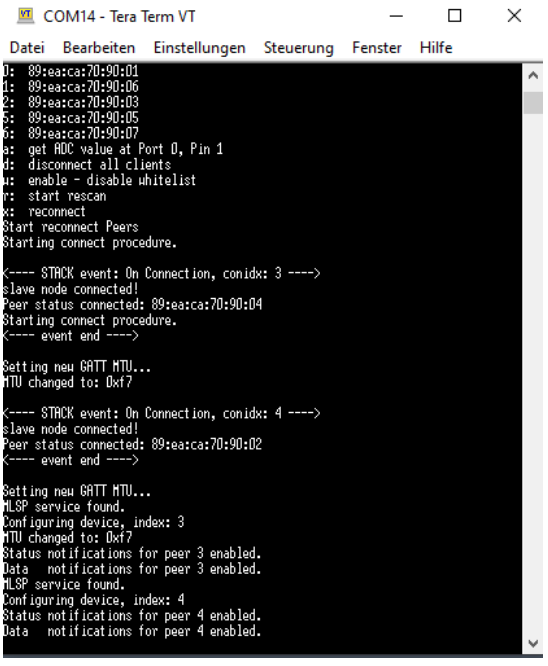
Re- Connect is a fast and “brute force” method to reconnect all OSB DA14585 Bluetooth modules which are visible.

Note: for a save “slower” reconnection please use “$” and “r” with Re- Scan or in Whitelist Mode.

Note: Whitelist has no effect in Re- Connect Mode.

In the example on the right, we disconnected peer slave 3 and peer slave 4 from power.

After pressing “$” and “x” both slaves are reconnected without a prior scan.



5 Specification

All specifications are over temperature and process, unless indicated otherwise.

5.1 Default Test Conditions

Temperature: 25 °C ± 10 °C
Humidity: 40 % to 85 % RH
Supply Voltage: 3.3 V

5.2 Absolute Maximum Ratings

The maximum ratings may not be exceeded under any circumstances, not even momentarily or individually, as permanent damage to the module may result.

Symbol	Parameter	Condition	Min.	Typ.	Max.	Units
T_{STOR}	Storage temperature		-40	22	85	°C
V_{DD}	Power supply		-0.3	3.3	3.9	V
V_{ESD}	ESD robustness (Target value)	All pads, according to human body model (HBM), JEDEC STD 22, method A114			1 000	V
		According to charged device model (CDM), JEDEC STD 22, method C101			500	V
P_{RF}	RF input level				10	dBm
V_{DIG}	Voltage on any digital pins		-0.3		V_{DD} 0.3	V
I_{IN}	Input current for any digital pin		-10		10	mA

5.3 Recommended Operating Conditions

The maximum ratings shall not be exceeded under any circumstances, not even momentarily or individually, as permanent damage to the module may result.

Symbol	Parameter	Condition	Min.	Typ.	Max.	Units
T_A	Ambient operating temperature range		-40	22	85	°C
V_{DD}	3V Supply voltage		1.8	3.3	3.6	V

5.4 Current Consumption

The current consumption depends on the user scenario, on the setup, and timing in the power modes.

Assume VDD = 3.0 V, Tamb = 25 °C, if nothing else stated.

Parameter	Condition	Min.	Typ.	Max.	Units
Current consumption of the digital circuits at operation	Bluetooth wireless: not used Built-in flash memory: not used		1.2		mA
Data transmission current consumption	Target value,1 Mbps, 0 dBm		5.2		mA
	Target value, 2 Mbps, 0 dBm		5.4		mA
Data reception current consumption	Target value, 1 Mbps		5.1		mA
	Target value, 2 Mbps		5.6		mA
Current consumption in Low power mode (sleep mode)	Power supply of CPU: on The oscillation of the sleep clock is operated. Whole of the data is retained.		2.5		µA
Current consumption in Low power mode (backup mode)	Power supply of CPU: off The oscillation of the sleep clock is operated. Whole of the data is retained.		2.5		µA
Deep sleep mode	Power supply of CPU: off The oscillation of the sleep clock is stopped. No data is retained.		50		nA

5.5 Bluetooth

Parameter	Condition	Min.	Typ.	Max.	Units
Operation frequency range		2 402		2 480	MHz
Channel spacing	Bluetooth LE		2		MHz
Output Power	Maximum setting		0		dBm
Sensitivity	1 Mbps, PER = 30.8 % at 1 500 packets with dirty Tx, 37 octets		-95		dBm
	2 Mbps, PER = 30.8 % at 1 500 packets with dirty Tx, 37 octets		-93		dBm
	500 kbps (S = 2), PER = 30.8 % at 1 500 packets with dirty Tx, 37 octets		-101		dBm
	125 kbps (S = 8), PER = 30.8 % at 1 500 packets with dirty Tx, 37 octets		-105		dBm

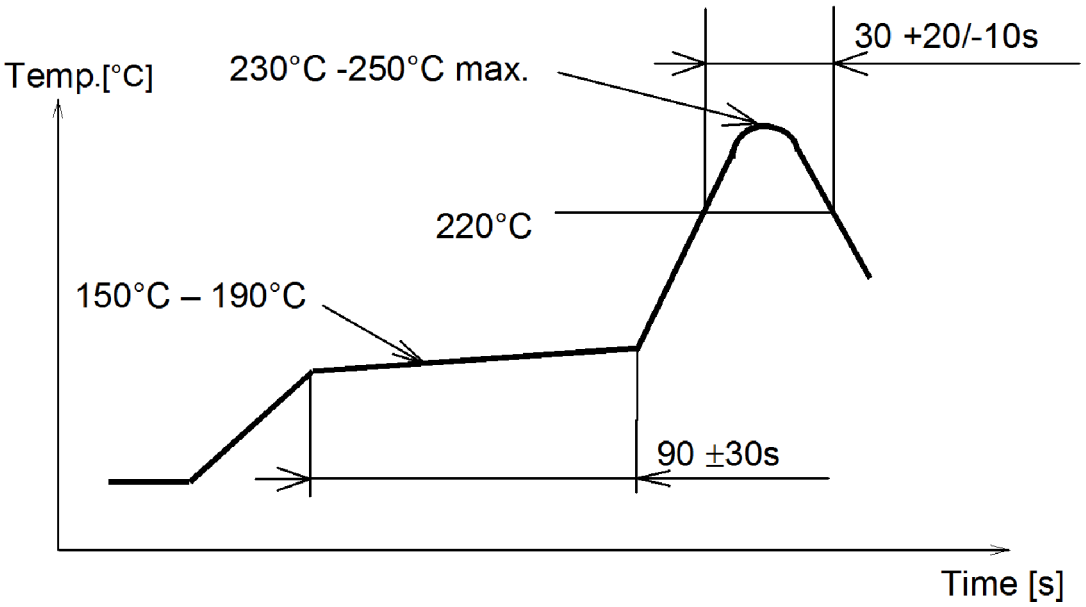
5.6 Reliability Tests

The measurement should be done after the test device has been exposed to room temperature and humidity for one hour.

No.	Item	Limit	Condition
1	Variable Vibration Test	Electrical parameters should be within specification	Freq.: 20~2 000 Hz, Acc.: 17-50 G, Sweep: 8 min, 2 hours, For: XYZ axis
2	Shock Drop Test	Electrical parameters should be within specification	Drop parts on concrete from a height of 1 m for 3 times
3	Heat-Shock/ Temperature Cycling Test	Electrical parameters should be within specification	at -40 °C and 85 °C for 1 h/cycle Total = 300 cycles
4	Temperature Humidity Bias Test	Electrical parameters should be within specification	at 60 °C, 85 % r. H., 300 h
5	Low Temperature Storage Life Test	Electrical parameters should be within specification	at -40 °C, 300 h
6	High Temperature Storage Life Test	Electrical parameters should be within specification	at 85 °C, 300 h

5.7 Recommended Soldering Profile

Reflow permissible cycles: 2
Due to module weight, opposite side reflow is prohibited.
The soldering profiles should be adhered to in order to prevent electrical or mechanical damage. Soldering profile assumes lead-free soldering.



6 Cautions

Failure to follow the guidelines set forth in this document may result in degrading of the module functions and damage to the module.

6.1 Design Notes

1. Follow the conditions written in this specification, especially the control signals of this module.
2. The supply voltage should abide by the maximum ratings →[5.2 Absolute Maximum Ratings].
3. The supply voltage must be free of AC ripple voltage (for example from a battery or a low noise regulator output). For noisy supply voltages, provide a decoupling circuit (for example a ferrite in series connection and a bypass capacitor to ground of at least 47 µF directly at the module).
4. This module should not be mechanically stressed when installed.
5. Keep this module away from heat. Heat is the major cause of decreasing the life time of these modules.
6. Avoid assembly and use of the target equipment in conditions where the module temperature may exceed the maximum tolerance.
7. Keep this module away from other high frequency circuits.
8. Refer to the recommended pattern when designing a board.

6.2 Installation Notes

1. Reflow soldering is possible twice based on the conditions set forth in →[5.7 Recommended Soldering Profile] Set up the temperature at the soldering portion of this module according to this reflow profile.
2. Carefully position the module so that the heat will not burn into printed circuit boards or affect other components that are susceptible to heat.
3. Carefully locate the module, to avoid an increased temperature caused by heat generated by neighboring components.
4. If a vinyl-covered wire comes into contact with the module, the wire cover will melt and generate toxic gas, damaging the insulation. Never allow contact between a vinyl cover and these modules to occur.
5. This module should not be mechanically stressed or vibrated when reflowed.
6. To repair the board by hand soldering, follow the conditions set forth in this chapter.
7. Do not wash this product.
8. Pressing on parts of the metal cover or fastening objects to the metal will cause damage to the module.

6.3 Usage Condition Notes

1. Take measures to protect the module against static electricity.
2. If pulses or transient loads (a large load, which is suddenly applied) are applied to the modules, check and evaluate their operation before assembly of the final products.
3. Do not use dropped modules.
4. Do not touch, damage, or soil the pins.
5. Follow the recommended condition ratings about the power supply applied to this module.

6. Electrode peeling strength: Do not apply a force of more than 4.9 N in any direction on the soldered module.
7. Pressing on parts of the metal cover or fastening objects to the metal cover will cause damage.
8. These modules are intended for general purpose and standard use in general electronic equipment, such as home appliances, office equipment, information, and communication equipment.

6.4 Storage Notes

1. The module should not be stressed mechanically during storage.
2. Do not store these modules in the following conditions or the performance characteristics of the module, such as RF performance will be adversely affected:
   - Storage in salty air or in an environment with a high concentration of corrosive gas, such as Cl2, H2S, NH3, SO2, or NOX,
   - Storage in direct sunlight,
   - Storage in an environment where the temperature may be outside the range of 5 °C to 35°C, or where the humidity may be outside the 45 % to 85 % range,
   - Storage of the modules for more than one year after the date of delivery storage period: Please check the adhesive strength of the embossed tape and soldering after 6 months of storage.
3. Keep this module away from water, poisonous gas, and corrosive gas.
4. This module should not be stressed or shocked when transported. 5. Follow the specification when stacking packed crates (max. 10).

6.5 Safety Cautions

These specifications are intended to preserve the quality assurance of products and individual components.

Before use, check and evaluate the operation when mounted on your products. Abide by these specifications without deviation when using the products. These products may short-circuit. If electrical shocks, smoke, fire, and/or accidents involving human life are anticipated when a short circuit occurs, provide the following failsafe functions as a minimum:

1. Ensure the safety of the whole system by installing a protection circuit and a protection device.
2. Ensure the safety of the whole system by installing a redundant circuit or another system to prevent a single fault causing an unsafe status.

6.6 Other Cautions

1. Do not use the module for other purposes than those listed in section →[6.3 Usage Condition Notes].
2. Be sure to provide an appropriate fail-safe function on your product to prevent any additional damage that may be caused by the abnormal function or the failure of the module.
3. This module has been manufactured without any ozone chemical controlled under the Montreal Protocol.
4. These modules are not intended for use under the special conditions shown below. Before using these modules under such special conditions, carefully check their performance and reliability under the said special conditions to determine whether or not they can be used in such a manner:
   - In liquid, such as water, salt water, oil, alkali, or organic solvent, or in places where liquid may splash,
   - In direct sunlight, outdoors, or in a dusty environment,
   - In an environment where condensation occurs,

- In an environment with a high concentration of harmful gas (e. g. salty air, HCl, Cl2,
- SO2, H2S, NH3, and NOX).

5. If an abnormal voltage is applied due to a problem occurring in other components or circuits, replace these modules with new modules, because they may not be able to provide normal performance even if their electronic characteristics and appearances appear satisfactory.

Please refer www.osb-innovations.com

6.7 Life Support Policy

This product is not designed

- for use in life support appliances, devices.
- for systems where malfunction can reasonably be expected to result in a significant personal injury to the user.
- as a critical component in any life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.

OSB AG customers using or selling these products for use in such applications do so at their own risk and agree to fully indemnify OSB AG for any damages resulting.

6.8 Restricted End Use

This OSB AG product is not designed for any restricted activity that supports the development, production, handling usage, maintenance, storage, inventory or proliferation of any weapons or military use.

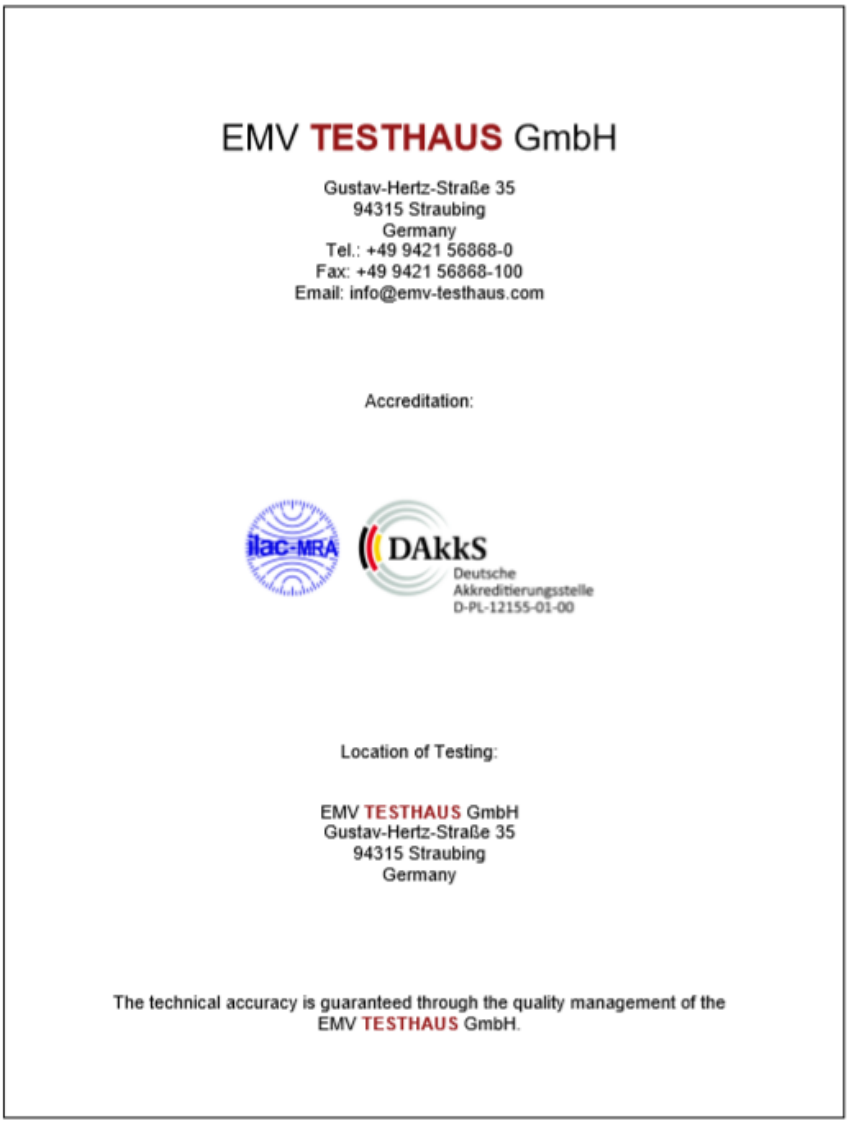
Transfer, export, re-export, usage or reselling of this product to any destination, end user or any end use prohibited by the European Union, United States or any other applicable law is strictly prohibited.

7 Regulatory and Certification Information

7.1 European EMV Conformity According to ETSI EN 300 328 V2.1.1

The Module has passed all tests in conformance to European Wideband Transmission Standards

ETSI EN 300 328 V2.1.1



EMV TESTHAUS GmbH

Gustav-Hertz-Straße 35
94315 Straubing
Germany
Tel.: +49 9421 56868-0
Fax: +49 9421 56868-100
Email: info@emv-testhaus.com

Accreditation:

ilac-MRA DAkkS Deutsche Akkreditierungsstelle D-PL-12155-01-00

Location of Testing:

EMV TESTHAUS GmbH
Gustav-Hertz-Straße 35
94315 Straubing
Germany

The technical accuracy is guaranteed through the quality management of the EMV TESTHAUS GmbH.

7.2 Bluetooth

Certification is pending.

7.2 RoHS and REACH Declaration

The latest declaration of environmental compatibility (Restriction of Hazardous Substances, RoHS and Registration, Evaluation, Authorisation and Restriction of Chemicals, REACH) for supplied products can be found on www.osb-innovations.com

8 Appendix

8.1 Contact Details

8.1.1 Contact Us

Please contact your local CODICO office for details on additional product options and services:

For CODICO Sales assistance visit www.codico.com

8.1.2 Product Information

For complete OSB DA14585 Module product details visit www.osb-innovations.com