BlueMod+S42M
Hardware User Guide

1VV0301379 Rev. 4 – 2018-11-28

TELIT
TECHNICAL
DOCUMENTATION

SPECIFICATIONS ARE SUBJECT TO CHANGE WITHOUT NOTICE

NOTICE

While reasonable efforts have been made to assure the accuracy of this document, Telit assumes no liability resulting from any inaccuracies or omissions in this document, or from use of the information obtained herein. The information in this document has been carefully checked and is believed to be reliable. However, no responsibility is assumed for inaccuracies or omissions. Telit reserves the right to make changes to any products described herein and reserves the right to revise this document and to make changes from time to time in content hereof with no obligation to notify any person of revisions or changes. Telit does not assume any liability arising out of the application or use of any product, software, or circuit described herein; neither does it convey license under its patent rights or the rights of others.

It is possible that this publication may contain references to, or information about Telit products (machines and programs), programming, or services that are not announced in your country. Such references or information must not be construed to mean that Telit intends to announce such Telit products, programming, or services in your country.

COPYRIGHTS

This instruction manual and the Telit products described in this instruction manual may be, include or describe copyrighted Telit material, such as computer programs stored in semiconductor memories or other media. Laws in the Italy and other countries preserve for Telit and its licensors certain exclusive rights for copyrighted material, including the exclusive right to copy, reproduce in any form, distribute and make derivative works of the copyrighted material. Accordingly, any copyrighted material of Telit and its licensors contained herein or in the Telit products described in this instruction manual may not be copied, reproduced, distributed, merged or modified in any manner without the express written permission of Telit. Furthermore, the purchase of Telit products shall not be deemed to grant either directly or by implication, estoppel, or otherwise, any license under the copyrights, patents or patent applications of Telit, as arises by operation of law in the sale of a product.

COMPUTER SOFTWARE COPYRIGHTS

The Telit and 3rd Party supplied Software (SW) products described in this instruction manual may include copyrighted Telit and other 3rd Party supplied computer programs stored in semiconductor memories or other media. Laws in the Italy and other countries preserve for Telit and other 3rd Party supplied SW certain exclusive rights for copyrighted computer programs, including the exclusive right to copy or reproduce in any form the copyrighted computer program. Accordingly, any copyrighted Telit or other 3rd Party supplied SW computer programs contained in the Telit products described in this instruction manual may not be copied (reverse engineered) or reproduced in any manner without the express written permission of Telit or the 3rd Party SW supplier. Furthermore, the purchase of Telit products shall not be deemed to grant either directly or by implication, estoppel, or otherwise, any license under the copyrights, patents or patent applications of Telit or other 3rd Party supplied SW, except for the normal non-exclusive, royalty free license to use that arises by operation of law in the sale of a product.

USAGE AND DISCLOSURE RESTRICTIONS

I. License Agreements

The software described in this document is the property of Telit and its licensors. It is furnished by express license agreement only and may be used only in accordance with the terms of such an agreement.

II. Copyrighted Materials

Software and documentation are copyrighted materials. Making unauthorized copies is prohibited by law. No part of the software or documentation may be reproduced, transmitted, transcribed, stored in a retrieval system, or translated into any language or computer language, in any form or by any means, without prior written permission of Telit.

III. High Risk Materials

Components, units, or third-party products used in the product described herein are NOT fault-tolerant and are NOT designed, manufactured, or intended for use as on-line control equipment in the following hazardous environments requiring fail-safe controls: the operation of Nuclear Facilities, Aircraft Navigation or Aircraft Communication Systems, Air Traffic Control, Life Support, or Weapons Systems (High Risk Activities"). Telit and its supplier(s) specifically disclaim any expressed or implied warranty of fitness for such High Risk Activities.

IV. Trademarks

TELIT and the Stylized T Logo are registered in Trademark Office. All other product or service names are the property of their respective owners.

V. Third Party Rights

The software may include Third Party Right software. In this case you agree to comply with all terms and conditions imposed on you in respect of such separate software. In addition to Third Party Terms, the disclaimer of warranty and limitation of liability provisions in this License shall apply to the Third Party Right software.

TELIT HEREBY DISCLAIMS ANY AND ALL WARRANTIES EXPRESS OR IMPLIED FROM ANY THIRD PARTIES REGARDING ANY SEPARATE FILES, ANY THIRD PARTY MATERIALS INCLUDED IN THE SOFTWARE, ANY THIRD PARTY MATERIALS FROM WHICH THE SOFTWARE IS DERIVED (COLLECTIVELY “OTHER CODE”), AND THE USE OF ANY OR ALL THE OTHER CODE IN CONNECTION WITH THE SOFTWARE, INCLUDING (WITHOUT LIMITATION) ANY WARRANTIES OF SATISFACTORY QUALITY OR FITNESS FOR A PARTICULAR PURPOSE.

NO THIRD PARTY LICENSORS OF OTHER CODE SHALL HAVE ANY LIABILITY FOR ANY DIRECT, INDIRECT, INCIDENTAL, SPECIAL, EXEMPLARY, OR CONSEQUENTIAL DAMAGES (INCLUDING WITHOUT LIMITATION LOST PROFITS), HOWEVER CAUSED AND WHETHER MADE UNDER CONTRACT, TORT OR OTHER LEGAL THEORY, ARISING IN ANY WAY OUT OF THE USE OR DISTRIBUTION OF THE OTHER CODE OR THE EXERCISE OF ANY RIGHTS GRANTED UNDER EITHER OR BOTH THIS LICENSE AND THE LEGAL TERMS APPLICABLE TO ANY SEPARATE FILES, EVEN IF ADVISED OF THE POSSIBILITY OF SUCH DAMAGES.

APPLICABILITY TABLE

PRODUCTS

- BLUEMOD+S42M/AI
- BLUEMOD+S42M/AI3ATH

CONTENTS

1. INTRODUCTION

1.1. Scope

This document provides information how the BlueMod+S42M can be integrated into customer systems. It addresses hardware specifications of the BlueMod+S42M and requirements of the hardware environments for the BlueMod+S42M.

The description text “BlueMod+S42M” refers to all modules listed in the Applicability Table.

1.2. Audience

This document is intended for Telit customers, especially system integrators, about to implement Bluetooth modules in their application.

1.3. Contact Information, Support

For general contact, technical support services, technical questions and report documentation errors contact Telit Technical Support at:

- TS-EMEA@telit.com
- TS-AMERICAS@telit.com
- TS-APAC@telit.com
- TS-SRD@telit.com

Alternatively, use:

https://www.telit.com/contact-us/

For detailed information about where you can buy the Telit modules or for recommendations on accessories and components visit:

https://www.telit.com/

Our aim is to make this guide as helpful as possible. Keep us informed of your comments and suggestions for improvements.

Telit appreciates feedback from the users of our information.

1.4. Text Conventions

Danger – This information MUST be followed or catastrophic equipment failure or bodily injury may occur.

Caution or Warning – Alerts the user to important points about integrating the module, if these points are not followed, the module and end user equipment may fail or malfunction.

Tip or Information – Provides advice and suggestions that may be useful when integrating the module.

All dates are in ISO 8601 format, i.e. YYYY-MM-DD.

1.5. Related Documents

- [1] Bluetooth SIG Core SpecificationV4.2
- [2] UICP_UART_Interface_Control_Protocol, 30507ST10756A
- [3] BlueMod+S42M AT Command Reference, 80527ST10839A
- [4] BlueMod+S42M Software User Guide, 1VV0301391
- [5] BlueEva+S42M Evaluation Kit User Guide, 1VV0301390

2. OVERVIEW

This document provides information how the BlueMod+S42M can be integrated into customer systems. It addresses hardware specifications of the BlueMod+S42M and requirements of the hardware environments for the BlueMod+S42M.

The term BlueMod+S42M is used as an abreviation and refers to both, the BlueMod+S42M/AI and the BlueMod+S42M/AI3ATH.

If information is related to dedicated versions, the whole product name is used.

The BlueMod+S42M is delivered in two different hardware versions:

- BlueMod+S42M/AI: with integrated bluetooth antenna and without additional sensors
- BlueMod+S42M/AI3ATH: with integrated bluetooth antenna and with a 3 axis acceleration sensor (3A) and a temperature and humidity sensor (TH)

The integration of the BlueMod+S42M bluetooth module within user application shall be done according to the design rules described in this manual.

The information presented in this document is believed to be accurate and reliable. However, no responsibility is assumed by Telit Communications S.p.A. for its use, nor any infringement of patents or other rights of third parties which may result from its use. No license is granted by implication or otherwise under any patent rights of Telit Communications S.p.A. other than for circuitry embodied in Telit products. This document is subject to change without notice.

3. GENERAL PRODUCT DESCRIPTION

3.1. Feature Summary

- Supports Bluetooth low energy
- Fully qualified Bluetooth V4.2 Single Mode LE
- CE certified
- SRRC and NCC certified
- Humidity sensor onboard (optional)
- 3 axis accelerometer onboard (optional)
- Fast connection setup
- RF output power typ 0dBm
- RF output power -40dBm in Whisper Mode
- High sensitivity design
- Supply voltage range 1,8V to 3,6V
- Internal crystal oscillator (40 MHz)
- LGA Surface Mount type. BlueMod+S42M: 17 x 10 x 2.6 mm^3
- Pin compatible to Telit BlueMod+S, BlueMod+S42 and BlueMod+SR
- Shielded to be compliant to optional FCC full modular approval
- Flexible Power Management
- 128-bit AES encryption
- High-speed UART interface
- I^2C Master
- Manufactured in conformance with RoHS2
- Weight: 0.65g

3.2. Applications

The BlueMod+S42M is designed to be used in low power applications, like sensor devices. Some typical applications are described in this chapter.

Supported profiles are:

- Terminal I/O
- GATT based LE-profiles

Support for any additional profile is possible on request.

3.2.1. General Cable Replacement

In case there is no standardized application specific profile available the BlueMod+S42M offers Telit's Terminal I/O profile, which allows transparent data transfer over UART and supports Secure Simple Pairing, making the pairing process easy and the connection secure. Terminal I/O is available for iOS and Android as well as implemented in Telit's dual mode module BlueMod+SR.

3.2.2. Industry

BlueMod+S42M can be used to monitor and control motors, actuators, values and entire processes.

3.2.3. POS/Advertising

BlueMod+S42M supports iBeacon or similar applications.

3.2.4. Healthcare and Medical

Usage of Bluetooth is aimed mainly at devices that are used for monitoring vital data. Typical devices are blood glucose meter, blood pressure cuffs and pulse ox meters. Bluetooth BR/EDR and low energy were chosen by the Continua Health Alliance as transports for interoperable end to end communication.

3.2.5. Sports and Fitness

In the sports and fitness segment the BlueMod+S42M is used in devices for positioning as well as monitoring vital data. Typical devices in this market are heart rate monitors, body temperature thermometers, pedometers, cadence meters, altimeter, positioning / GPS tracking and watches displaying information from sensors.

3.2.6. Entertainment

Bluetooth technology is already used in a wide variety of devices in the entertainment sector, namely set-top boxes / gaming consoles. BlueMod+S42M is especially suited for use in remote controls, gaming controller and wireless mouse/keyboard applications.

3.3. Block Diagram

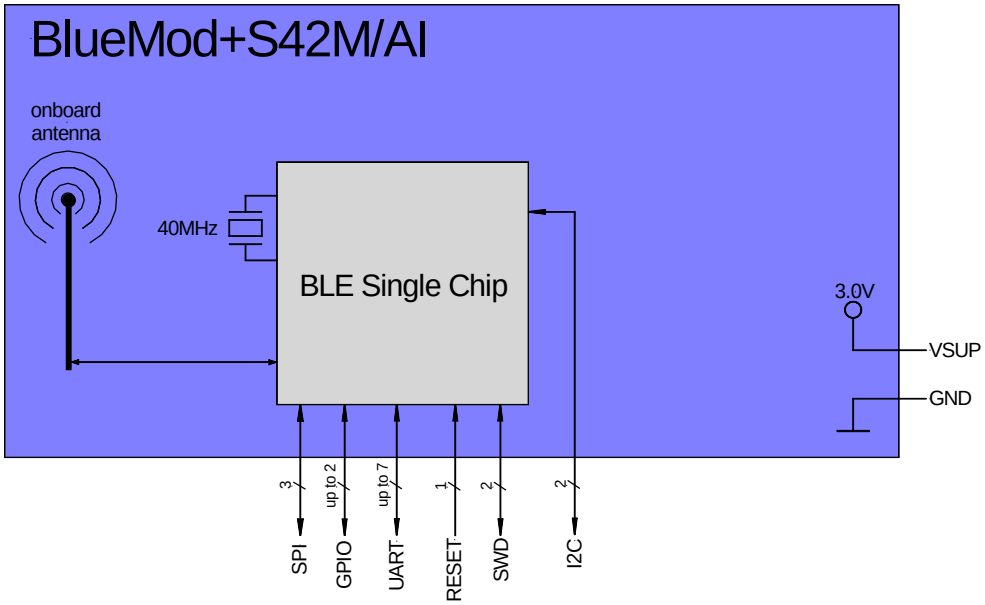


Figure 1: BlueMod+S42M/AI Block Diagram

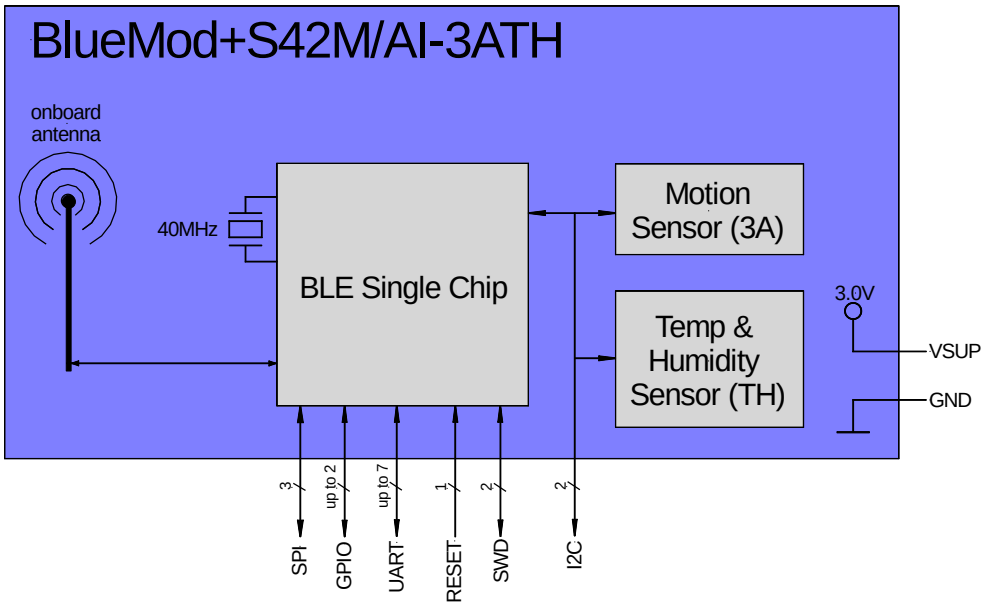


Figure 2: BlueMod+S42M/AI3ATH Block Diagram

4. APPLICATION INTERFACE

4.1. Power Supply

BlueMod+S42M require a power supply with the following characteristics:

Typical: 3,0V_{DC}, min.: 1,8V_{DC}, max.: 3,6V_{DC}, thereby delivering > 25 mA peak

BlueMod+S42M is designed to be powered from 3V coin cell batteries e.g. CR2032 directly, or any other power source complying with the given requirements. For optimal performance, a stable supply is recommended. Furthermore, it is recommended to place a capacitor in parallel to the CR2032 3V coin cell battery in order to prolong battery lifetime, by compensating the effects of the rising source resistance of the battery to pulsed loads. Since the isolation resistance of this capacitor will discharge the battery in a not insignificant scale, the capacitor should be chosen under consideration of the following rules:

- capacitance as small as necessary
- nominal voltage as high as possible
- case size as large as possible
- use X7R instead of X5R

.

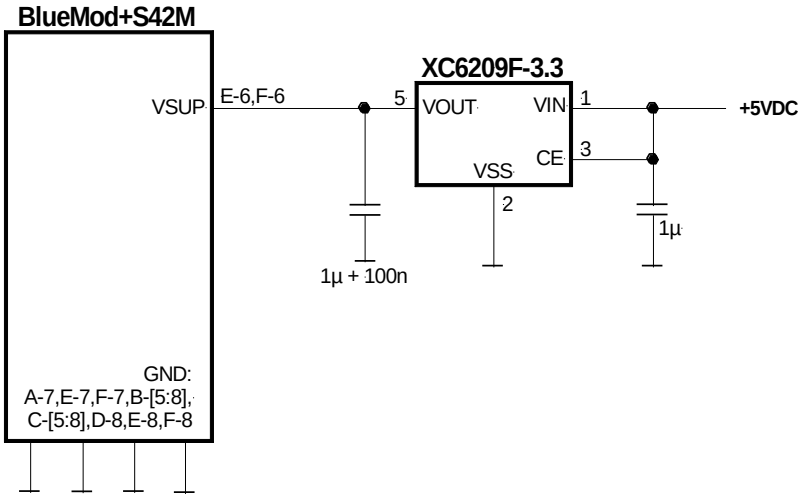
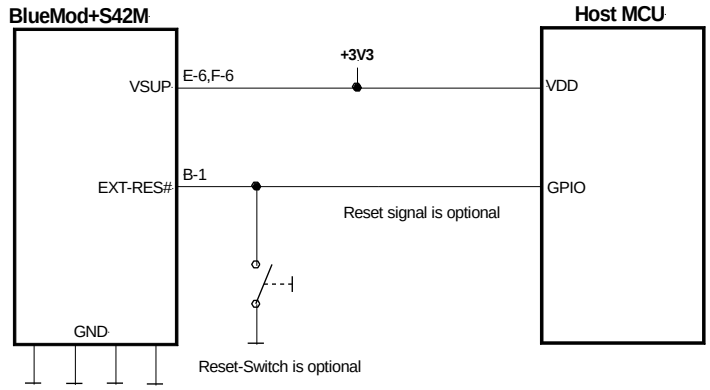


Figure 3: BlueMod+S42M Example Power Supply with LDO

4.2. Reset

BlueMod+S42M are equipped with circuitry for generating reset from two sources:

- A reset is held active, when VSUP falls below the threshold of the Supply Voltage Monitor (V_{IT-} = 1,67V), and is released when VSUP rises above $V_{IT-} + V_{HYST}$.
- By holding pin B-1 (EXT-RES#) at ≤ VSUP*0,3V for $t_{HOLDRESETNORMAL}$ ≥ 0,2µs, an external reset (*pin reset*) is generated. This pin has a fixed internal pull-up resistor (R_{PU} = 10kΩ ... 30kΩ). EXT-RES# may be left open if not used.



Please Note: EXT-RES# of BlueMod+S42M has a 20k (range 10k to 30k) internal pullup.

Figure 4: BlueMod+S42M Example Reset

The following table shows the pin states of BlueMod+S42M during reset active.

Pin Name	State: BlueMod+S42M
EXT-RES#	Input with pull-up typ. 20kΩ
XL-IN	Input
XL-OUT	Output
SWDIO	Input with pull-up (1)
SWCLK	Input with pull-up (1)
all other port pins	Input with pull-down (1)

(1) pull-up, pull-down: R_{PU}, R_{PD} is typ. 10kΩ

Table 1: Pin States during Reset

If a logic signal driving EXT-RES# does not go fully to VSUP, some additional current is drawn as a result of the internal pullup resistor on EXT-RES#. To minimize current draw, an open drain driver or a logic-level FET as shown in Figure 5 can be used.

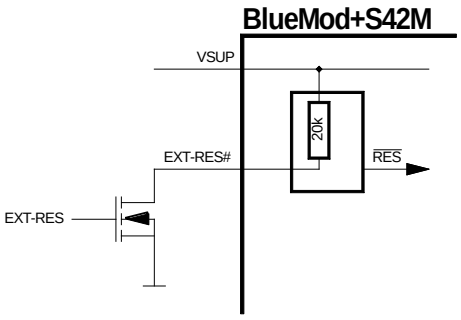


Figure 5: EXT-RES# with external FET

4.3. Serial Interface

The serial interface of BlueMod+S42M is a high-speed UART interface supporting RTS/CTS flow control and interface-up/down mechanism according to the UICP+ protocol (refer to [2]).

Electrical interfacing is at CMOS levels (defined by VSUP; see chapter 6.4.1).

Transmission speeds are 9600 – 921600 bps and 1Mbps (asynchronous).

Character representation: 8 Bit, no parity, 1 stop bit (8N1).

Hardware flow-control with RTS and CTS (active low).

Transmission speed may be limited by firmware. See corresponding AT command reference [3] for further information.

4.3.1. Basic Serial Interface

The basic serial interface (with RTS/CTS flow control) uses only four signal lines (UART-RXD, UART-TXD, UART-CTS#, UART-RTS#) and GND. IUR-IN#, IUR-OUT# and GPIO[4] (see below) can be left unconnected.

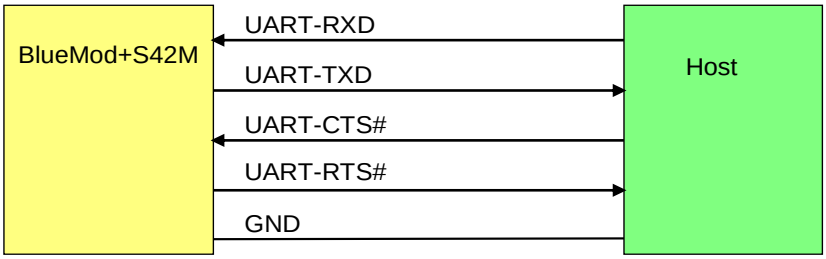


Figure 6: Basic Serial Interface

If the host in question is sufficiently fast, a four-wire scheme may be successful. Connect the serial lines UART-RXD, UART-TXD as well as UART-RTS# and GND; leave UART-CTS# open. The host is required to stop sending data within a short time after de-assertion of UART-RTS# (there is room for up to 4 more characters at the time RTS# drops).

UICP has to be deactivated permanently in this configuration, because signal UART-CTS# and IUR-IN# become inputs with no PU or PD if UICP is active. This would cause floating CMOS inputs.

It is strongly recommended to use hardware flow control in both directions. Not using flow control can cause a loss of data.

4.3.2. Serial Interface with UICP

A substantially saving of power during idle phases can be achieved (see 6.5.1) when the UICP protocol is used (refer to [2]). This protocol should be implemented on the host side as well. Signals IUR-IN# and IUR-OUT# should be connected to the host and may be mapped to DSR and DTR, if an RS232-style (DTE-type) interface is used (see Figure 7).

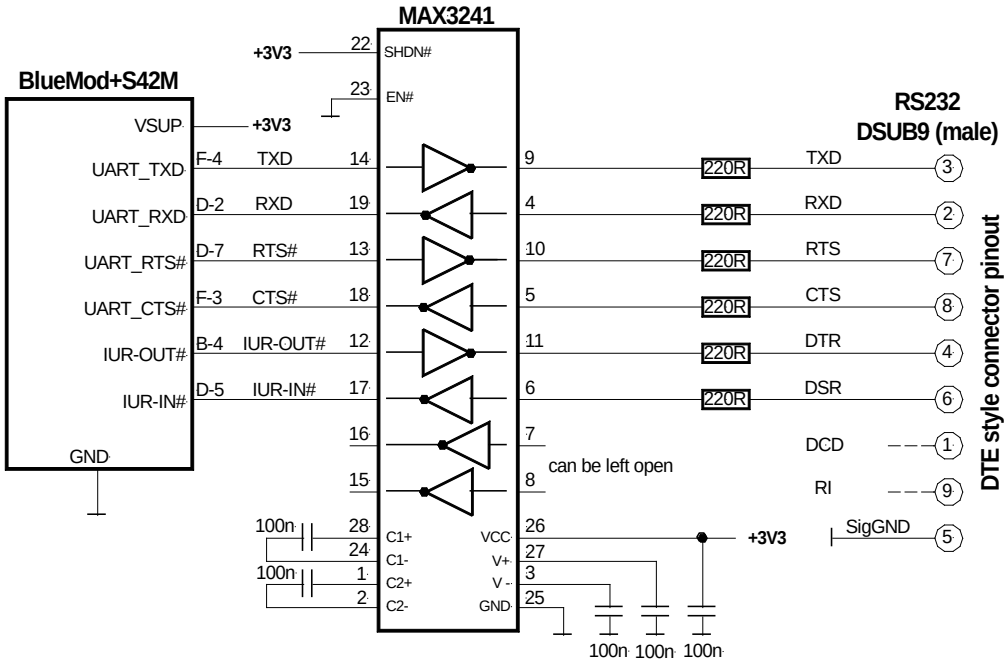


Figure 7: BlueMod+S42M Example Serial Interface (RS-232) Supporting UICP

If I/O line availability at the host side is extremely tight, 2 I/O lines could be saved by using the following scheme. This would come at the cost of

- The host is not allowed to enter sleep mode.
- The host must accept incoming data at all times and is not able to stop the BlueMod+Sx sending data. This may be difficult to control for all scenarios and adds the risk that data gets lost.
- The host doesn't implement UICP, but wake-up BT via GPIO.

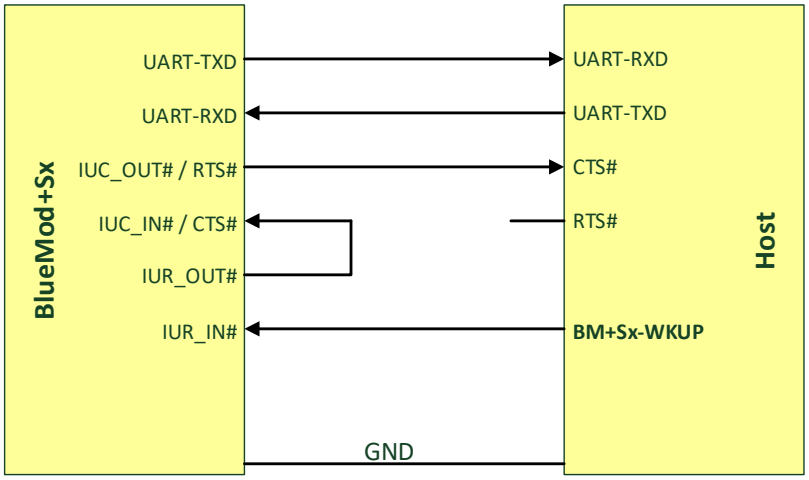


Figure 8: Five Wire Interface supporting UICP

4.4. I²C Interface

The I²C bus interface serves as an interface between the internal microcontroller and the serial I²C bus. BlueMod+S42M is the master and controls all I²C bus specific sequencing, protocol and timing. It supports standard (100kHz) and fast (400kHz) speed modes. The BlueMod+S42M as an I²C master must be the only master of the I²C bus (no *multimaster* capability). Clock stretching is not supported.

SDA and SCL can be used to form an I²C interface. It is not required to connect pull-up resistors on SCL and SDA when this interface is used.

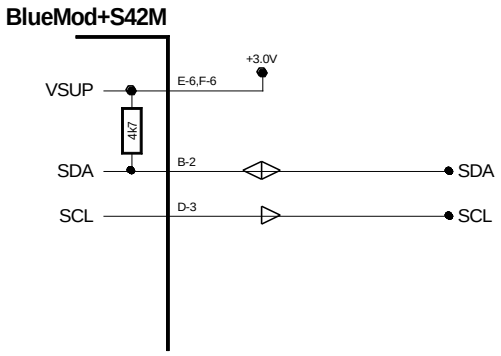


Figure 9: BlueMod+S42M I²C Interface

4.5. General Purpose I/O (GPIO)

Configuration and functionality of pins

- IOA
- IOB
- HANGUP

are described in [3]. Unused GPIO pins shall be left unconnected to stay compatible. There may be functions assigned to some in future versions of the firmware.

4.6. Serial Wire Debug Interface

The Serial Wire Debug (SWD) interface (signals SWDIO, SWCLK) is normally not used in a customer's product. It is reserved for debugging purposes.

Leave SWDIO, SWCLK unconnected. Only if you intend to use them for debugging purposes, make them available.

4.7. MEMS Sensors (Optional)

The BlueMod+S42M includes optional an triaxial, low-g acceleration sensor, which integrates a multitude of features that facilitate its use especially in the area of motion detection applications, such as device orientation detection, navigation and spirit level measurements. Featuring 14 bit digital resolution, the sensor allows very low-noise measurement of accelerations in 3 perpendicular axes and thus senses tilt, motion, shock and vibration.

Option: 3A

Furthermore the BlueMod+S42M includes optional an humidity and temperature sensor that provides high accuracy measurements with very low power consumption.

The capacitive-based sensor provides high accuracy measurement capability for a wide range of environmental monitoring applications and Internet of Things (IoT) such as smart thermostats, smart home assistants and wearables. The sensor can also be used to provide critical temperature and humidity data for cold chain transportation and storage of perishable goods to help ensure products like food and pharma- ceuticals arrive fresh.

The sensor is factory-calibrated to 0.2°C temperature accuracy and 2% relative humidity accuracy and includes a heating element to burn away condensation and moisture for increased reliability.

Option: TH

The functionality of both sensors is highly Firmware dependent!

Please refer to [4] for further informations.

4.8. Test Mode

For regulatory approval purposes, the ability of test mode operation like “Direct Test Mode” (DTM) is mandatory. The Direct Test Mode (as defined by the Bluetooth SIG) is part of the BlueMod+S42M.

For enabling the test mode the BlueMod+S42M provides the Testmode# IO pin. This pin is low active, connect to GND to activate DTM.

To enter and use DTM, access to the following signals is required:

- TESTMODE#
- UART-RXD
- UART-TXD
- UART-RTS#
- UART-CTS#
- GND

These pins shall be routed to some test pads on an outer layer, but can be left open during normal operation when not used.

Please note the UART is required for operation of DTM. For any regulatory approval, UART-RXD, UART-TXD, UART-RTS# and UART-CTS# must be freely accessible.

4.9. Operating in a Power-Switched Environment

A potential “back feeding” problem may arise, if the module is operated in an environment where its power supply (VSUP) is switched off by the application. This might be done to save some power in times Bluetooth is not needed.

As stated in Table 4, the voltage on any I/O pin must not exceed VSUP by more than 0,3V at any time. Otherwise, some current I_{INJ} flows through the internal protection diodes. This may damage the module (please refer to chapter 6.1 for limits).

There is no problem if the application circuit design and programming can assure that all signals directed towards BlueMod+S42M are set to low (U < 0,3V) before and while VSUP is turned off. If this is not guaranteed, at least a series resistor (about 1k) must be inserted into each signal path. This does protect the module but obviously cannot prevent from an unwanted, additional current flow in case of such signal being at high-level. It may be necessary to use driver chips in such applications, that gate off these signals while VSUP is not present.

5. MODULE PINS

5.1. Pin Numbering

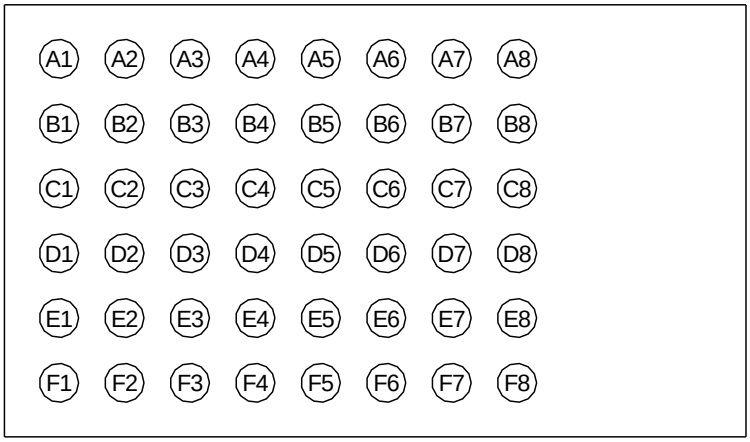


Figure 10: BlueMod+S42M Pin Numbering (Top View)

5.2. Pin Allocation

	1	2	3	4	5	6	7	8
A	DNU	DNU	DNU	DNU	DNU	DNU	GND	DNU
B	EXT-RES#	I2C-SDA	DNU	IUR-OUT#	GND	GND	GND	GND
C	DNU	DNU	DNU	DNU	GND	GND	GND	GND
D	DNU	UART-RXD	I2C-SCL	HANGUP	IUR-IN#	DNU	UART-RTS#	GND
E	DNU	IOA	DNU	IOB	DNU	VSUP	GND	GND
F	TESTMODE#	DNU	UART-CTS#	UART-TXD	DNU	VSUP	GND	GND
	1	2	3	4	5	6	7	8

Table 2: BlueMod+S42M Pin Allocation (Top View)

5.3. Pin Description

Pin Name	Signal	Function	Type[1]	Act	Description
E-6	VSUP1	Power	PWR		+3,3V nom.
F-6	VSUP2	Power	PWR		+3,3V nom
A-7,E-7,F-7, B-[5,6,7,8], C-[5,6,7,8], D-8,E-8,F-8	GND	GND	PWR		Ground All GND pins must be connected
A-[1,2,3] C-[1,2,3,4] B-3 D-1 E-1 E-5 F-2 F-5	not connected	none			leave open
A-8	reserved	DNU			leave open
B-1	EXT-RES#	Reset	I-PU	L	User Reset
A-6	reserved	DNU			leave open
F-4	UART-TXD	TXD	O		Serial Data Transmit (OUT)
D-2	UART-RXD	RXD	I		Serial Data Receive (IN)
D-7	UART-RTS#	/RTS	O	L	Flow Control Ready to Send
F-3	UART-CTS#	/CTS	I-PD	L	Flow Control Clear to Send
B-4	IUR-OUT#	/IUR-OUT	O	L	UICP Control
D-5	IUR-IN#	/IUR-IN	I	L	UICP Control
D-3	SCL	I2C-SCL	O		I2C-Clock Output
B-2	SDA	I2C-SDA	I/O-PU		I2C-Data In-/Output
E-4	IOB	GPIO	I/O		Firmware depent GPIO
D-4	HANGUP	Input	I-PD		Hangup Connection, FW depent
E-2	IOA	GPIO	I/O		Firmware depent GPIO
A-4	reserved	DNU			leave open, see warning below
F-1	TESTMODE#	Input	I-PU	L	Enable Direct Test Mode
E-3	SWDIO	DNU			Serial Wire Debug
D-6	SWCLK	DNU			Serial Wire Debug
A-5	reserved	DNU			leave open

[1] PU: pull-up; PD: pull-down; PWR: Power; I: Input; O: Output; I/O: bidir; RF: RadioFreq; DNU: Do Not Use

Table 3: Pin Assignments

5.4. Handling of Unused Signals

Depending on the application, not all signals of BlueMod+S42M may be needed. The following list gives some hints how to handle unused signals.

Signal	Handling
EXT-RES#	If no external Reset is needed: Leave open
UART-RXD	add a pullup (e.g.100kΩ) to VSUP [1]
UART-TXD	leave UART-TXD open [1]
UART-RTS#, UART-CTS#	If neither flow control nor UICP is used: Leave open [1][2]
IUR-OUT#, IUR-IN#	If UICP is not used: leave open
TESTMODE#	Leave open [1]
unused GPIOs	Leave open
SWDIO, SWCLK	Leave open. Only needed for debug purposes

[1] Signals must be accessible for regulatory approving

[2] It is strongly recommended to use hardware flow control in both directions. Not using flow control can cause loss of data.

Table 4: Handling of Unused Signals

6. ELECTRICAL CHARACTERISTICS

6.1. Absolute Maximum Ratings

Stresses beyond those listed under “Absolute Maximum Ratings” may cause permanent damage to the device. These are stress ratings only and functional operation of the device at these or any other conditions beyond those indicated under “Electrical Requirements” is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.

Item	Symbol	Min	Max	Unit
Supply voltage	VSUP	-0,3	3,6	V
Voltage on any pin	V_{Pin}	-0,3	VSUP+0,3 ≤ 3,6	V

Table 4: Absolute Maximum Ratings

6.2. Operating Conditions

T_{amb} = 25°C

Item	Condition	Limit			Unit
		Min	Typ	Max	
Supply voltage VSUP		1,8	3,0	3,6	V_{DC}

Table 5: DC Operating Conditions

6.3. Environmental Requirements

Item	Symbol	Absolute Maximum Ratings	Unit
Storage temperature range	T_{stg}	-40 to +125	°C
Operating temperature range	T_{op}	-20 to +70	°C

Table 6: Environmental Requirements

6.4. DC Parameter

6.4.1. General Purpose I/O (GPIO)

T_{amb} = 25°C

Symbol	Item	Condition	Limit			Unit
			Min	Typ	Max	
V_{IL}	Input Low Voltage	VSUP = 3,3V VSUP = 2,8V	-	0	0,9 0,8	V
V_{IH}	Input High Voltage	VSUP = 3,3V VSUP = 2,8V	2 1,8	3,3 2,8	3,6 3,1	V
V_{OL}	Output Low Voltage	VSUP = 3,3V VSUP = 2,8V	0	-	0,33 0,28	V
V_{OH}	Output High Voltage	VSUP = 3,3V VSUP = 2,8V	2,97 2,5	-	3,3 3,1	V
I_{OL}/I_{OH}	Low and High Level Output Current	A4, F1 VSUP=3.3V	-	20	-	mA
		Other Pads VSUP=3.3V	-	8	-	mA
R_{PU}/R_{PD}	pull-up/down resistor		-	10	-	kΩ

Table 7: DC Characteristics, Digital IO

6.4.2. Reset

BlueMod+S42M contains a voltage supervisory circuit that monitors VSUP.

The reset device initiates an internal reset signal whenever:

- VSUP drops below V_{IT-}

or

- EXT-RES# is ≤V_{ILMR}

The reset remains active for 200 ms (typical) after:

- VSUP rises above V_{IT-} + V_{hys}

and

- EXT-RES# is ≥V_{IHMR}

T_{amb} = 25°C

Symbol	Item	Limit			Unit
		Min	Typ	Max	
$V_{(POR)}$	VSUP for valid reset function	0,6			V
V_{IT-}	Negative going Threshold	1,628	1,670	1,695	V
V_{hys}	Hysteresis		17		mV
V_{ILMR}	EXT-RES# low-level input voltage			0,3VSUP	V
V_{IHMR}	EXT-RES# high-level input voltage	0,7VSUP			
R_{PU}	pull-up resistor	10	20	30	kΩ

Table 8: Reset Characteristics

6.5. Power Consumption and Power-Down Modes

6.5.1. Terminal I/O Configuration

The following values are typical power consumption values in different states of operation. BlueMod+S42M configured as a peripheral device.

VSUP = 3,0V, T_{amb} = 25°C, all GPIO lines left open

Mode	Condition	Note	Current Consumption (I_{Avg}) Tx power: 0dBm (max)		Unit
			AI	AI3ATH	
System off	CPU off, Radio inactive, 32k clock off, SRAM Retention off		1	1,9	µA
Reset	Device hold in Reset		1,1	1,6	mA
UICP active *and* serial interface down	Standby, Advertising Off (Radio inactive)		1,2	2,2	µA
	Standby, Advertising, 3 channels advertising interval: 1.28s		25	28	µA
	Connected, connection interval: 1.28s	(1)	34	39	µA
	Connected, connection interval: 40ms	(1,2)	560	620	µA
UICP not active *or* serial interface up	Idle, Advertising Off (Radio inactive)		3,5	3,9	mA
	Advertising, 3 channels advertising interval: 1.28s		3,5	3,9	mA
	Connected, connection interval: 1.28s	(1)	3,5	3,9	mA
	Connected, connection interval: 40ms	(1,2)	3,5	3,9	mA
	Connected, connection interval: 7,5ms	(1)	3,7	4,1	mA

(1) connection parameters are setup by the central device when connection is established
(2) these are a typical connection parameters used by an iPhone, iPad or iPad mini device in the central device role

Table 9: Supply Current BLE Terminal I/O Profile, Peripheral Device Role

6.6. RF Performance

6.6.1. BLE Receiver

VSUP = 3,0V, T_{amb} = +25°C

Receiver	Conditions	Min	Typ	Max	BT Spec	Unit
Sensitivity	PER ≤ 30,8%	-94,0			≤ -70	dBm
max received input level	PER ≤ 30,8%		-1		≥ -10	dBm
max PER report integrity Wanted signal level -30dBm	2,426 Ghz		50		50 < PER < 65,4	%
Blocker Power Wanted signal level -67dBm	0,030 – 2,000	-30			-30	dBm
	2,000 – 2,400	-35			-35	
	2,500 – 3,000	-35			-35	
	3,000 – 12,75	-30			-30	
Adjacent channel Selectivity C/I	co-channel		6		≤21	dB
	F = F0 + 1 MHz		-9		≤15	dB
	F = F0 - 1 MHz		-8		≤15	dB
	F = F0 + 2 MHz		-38		≤-17	dB
	F = F0 - 2 MHz		-32		≤-15	dB
	F = F0 + 3 MHz		-41		≤-27	dB
	F = Fimage		-26		≤-9	dB
max intermodulation level		-50			≥-50	dBm

Table 10: RF Performance BLE Receiver

6.6.2. BLE Transmitter

VSUP = 1,7V to 3,6V, T_{amb} = +20°C

Transmitter	Conditions	Min	Typ	Max	BT Spec	Unit
RF Transmit Power	-		0		-20 to +10	dBm
RF Frequency Range	-	2402		2480		MHz
RF Transmit Power “Whisper Mode”	-		-40		N/A	dBm
Adjacent Channel Power ACP	F = F0 ± 2MHz				≤ -20	dBm
	F = F0 ± 3MHz				≤ -30	
	F = F0 ± > 3MHz				≤ -30	
Modulation Characteristics	Δf1avg		250		225 … 275	kHz
	Δf2max *Thrsh. 185kHz*		100		≥ 99,9	%
	Δf2avg / Δf1avg		0,9		≥ 0,8	
Carrier Frequency Offset and drift	Avg Fn		± 20		± 150	kHz
	avg drift		8		≤ 50	kHz
	max drift rate		7,5		≤ 20	kHz/50µs

Table 11: RF Performance BLE Transmitter

6.7. Antenna-Gain and Radiation Pattern

If BlueMod+S42M is integrated into an end product while the recommendations depicted in chapter 7.4 are maintained, the following typical antenna radiation patterns can be expected.

Radiation Pattern will depend on the end products PCB size, masses in the antenna environment, housing material and geometrics.

Typical antenna gain is about +2dBi.

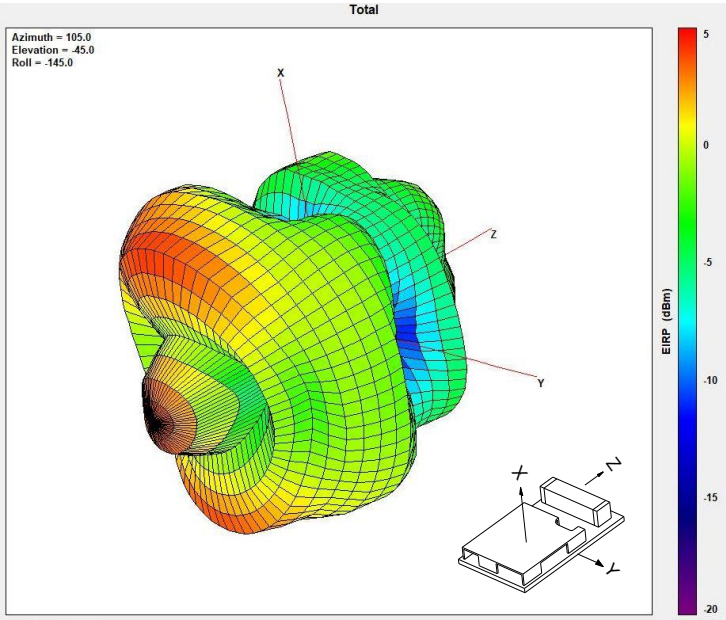


Figure 11: Typical Antenna Radiation Pattern at 2402MHz

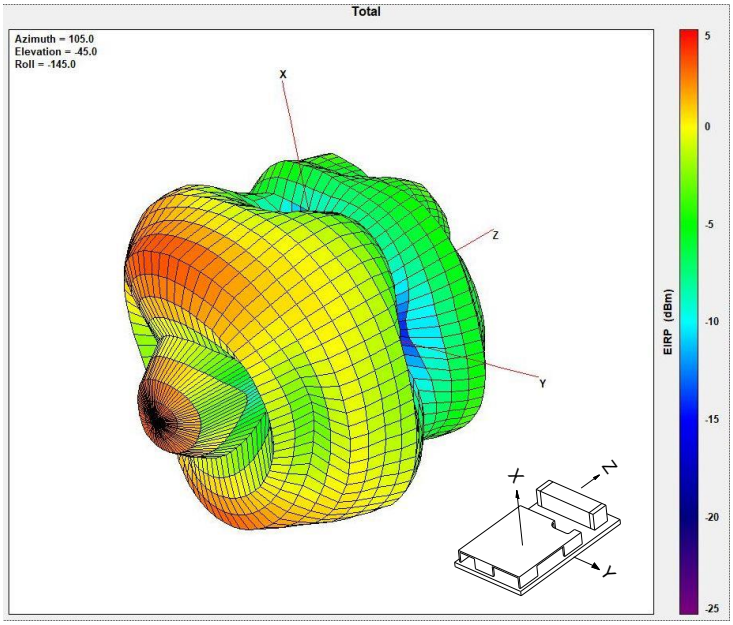


Figure 12: Typical Antenna Radiation Pattern at 2440MHz

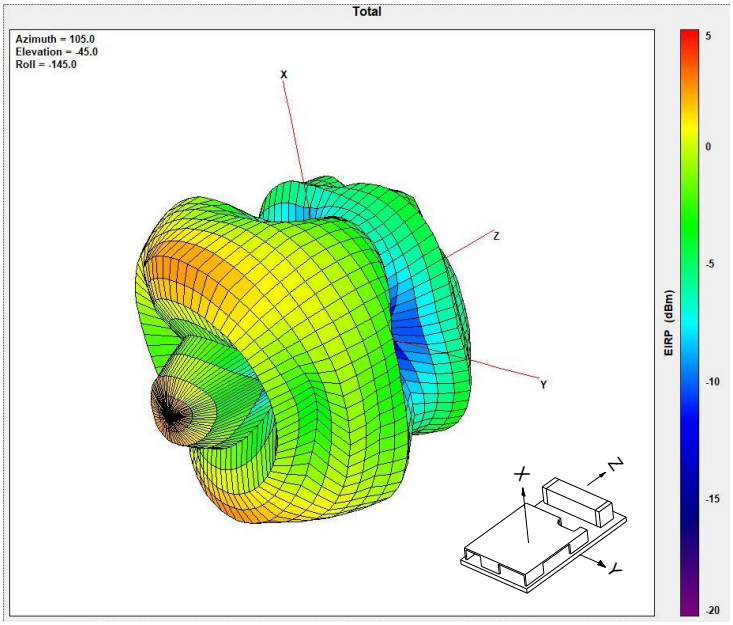
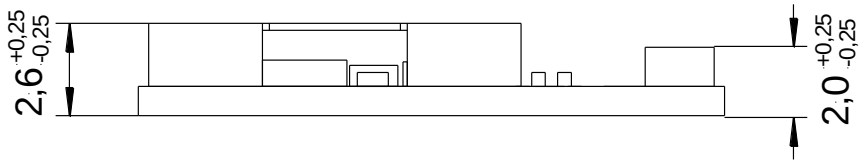


Figure 13: Typical Antenna Radiation Pattern at 2480MHz

7. MECHANICAL CHARACTERISTICS

All dimensions are in millimeters.

7.1. Dimensions



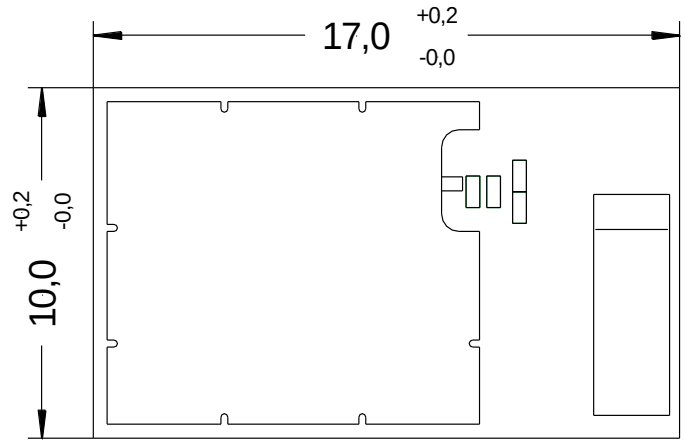


Figure 14: BlueMod+S42M Dimensions

7.2. Recommended Land Pattern

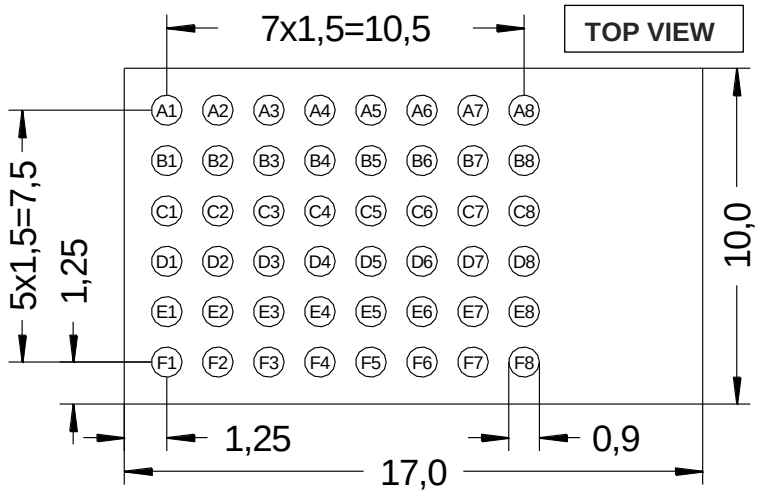


Figure 15: BlueMod+S42M Land Pattern

7.3. Re-flow Temperature-Time Profile

The data here is given only for guidance on solder and has to be adapted to your process and other re-flow parameters for example the used solder paste. The paste manufacturer provides a re-flow profile recommendation for his product.

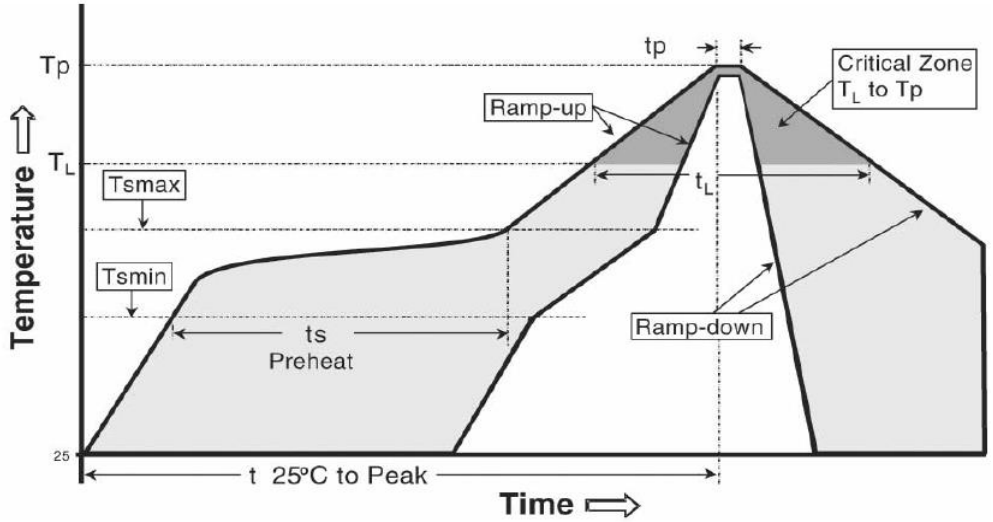


Figure 16: Soldering Temperature-Time Profile (For Reflow Soldering)

Preheat		**Main Heat**		**Peak**	
tsmax		tLmax		tpmax	
Temperature	Time	Temperature	Time	Temperature	Time
[°C]	[sec]	[°C]	[sec]	[°C]	[sec]
150	100	217	90	260	10
		230	50		
Average ramp-up rate		[°C / sec]	3		
Average ramp-down rate		[°C / sec]	6		
Max. Time 25°C to Peak Temperature		[min.]	8		

Opposite side reflow is prohibited due to module weight.

Devices will withstand the specified profile and will withstand up to one re-flows to a maximum temperature of 260°C. The reflow soldering profile may only be applied if the BlueMod+S42M resides on the PCB side looking up. Heat above the solder eutectic point while the BlueMod+S42M is mounted facing down may damage the module permanently.

7.4. Placement Recommendation

To achieve best radio performance for BlueMod+S42M, it is recommended to use the placement shown in Figure 17. This is a “corner placement” meaning the module is placed such that the antenna comes close to the corner of the application PCB (red area). So, the yellow area is outside the PCB and regards to the housing, too (refer to 7.6).

Please note that for best possible performance the antenna should be directed away from the application PCB as shown in Figure 17.

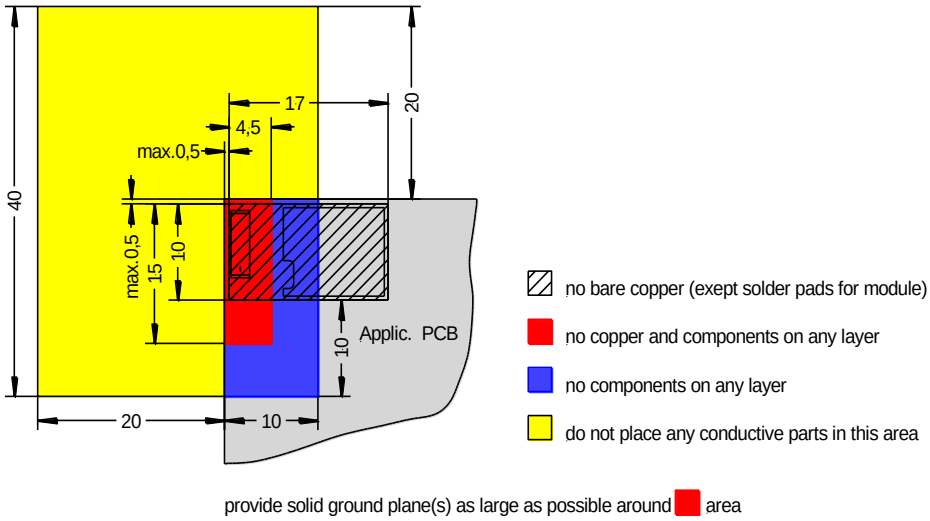


Figure 17: BlueMod+S42M Placement Recommendation

7.5. Antenna Issues

BlueMod+S42M comprises a ceramic antenna, which as a component is soldered to the circuit board. The performance of the antenna has to be checked within the final integration environment. Adjacent PCBs, components, cables, housings etc. could otherwise influence the radiation pattern or be influenced by the radio wave energy.

7.6. Housing Guidelines

The individual case must be checked to decide whether a specific housing is suitable for the use of the internal antenna. A plastic housing must at least fulfill the following requirements:

- Non-conductive material, non-RF-blocking plastics
- No metallic coating
- ABS is suggested

7.7. Safety Guidelines

According to SAR regulation EN 62479:2010 the BlueMod+S42M is not intended to be used in close proximity to the human body. Please refer to above-mentioned regulation for more specific information.

In respect to the safety regulation EN 62368-1:2014 + AC:2015 all conductive parts of the BlueMod+S42M are to be classified as SELV circuitry. OEM’s implementing the BlueMod+S42M in their products should follow the isolation rules given in regulation EN 62368-1:2014.

The PCB material of the BlueMod+S42M is classified UL-94V0.

7.8. Cleaning

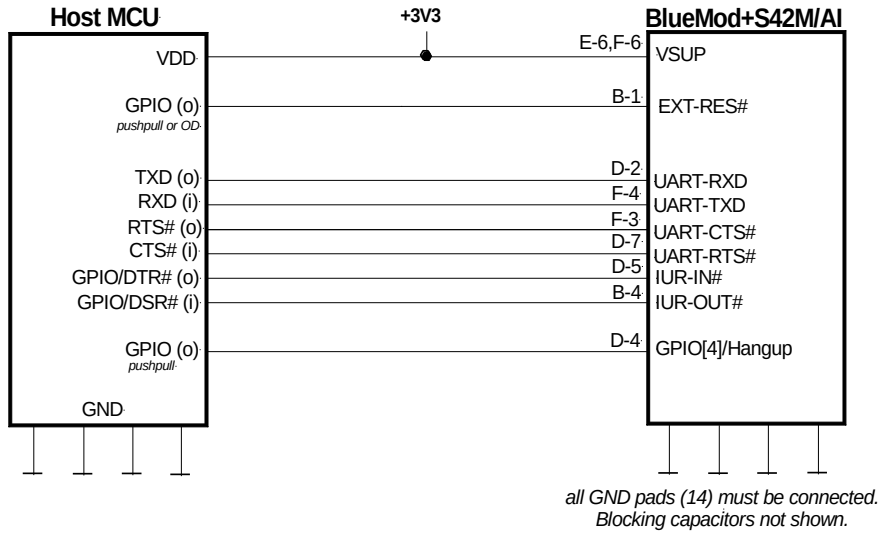
In general, cleaning the modules mounted on the host board is strongly discouraged. Residues between module and host board cannot be easily removed with any cleaning method.

- Cleaning with water or any organic solvent can lead to capillary effects where the cleaning solvent is absorbed into the gap between the module and the host board. The combination of soldering flux residues and encapsulated solvent could lead to short circuits between conductive parts. The solvent could also damage any labels.
- Ultrasonic cleaning could damage the module permanently. Especially for crystal oscillators the risk of damaging is very high.

8. APPLICATION DIAGRAM

Figure 18 shows a typical application of BlueMod+S42M. The module is connected to some MCU running the application layer. MCU and BlueMod+S42M use the same 3,3V power supply. The serial interface has RTS/CTS flow control and UICP support in this example. The optional hangup feature to close down the link is provided.

All other module pins may be left unconnected.



In this example BlueMod+S42M is connected to an MCU supporting UICP, RTS/CTS flow control and Hangup.

Figure 18: Typical Application Schematics

9. COMPLIANCES

The BlueMod+S42M has been tested to comply with the appropriate EU, SRRC, NCC, FCC and IC directives.

CE testing is intended for end products only. Therefore, CE testing is not mandatory for a Bluetooth Module sold to OEM's. However, Telit provides CE tested Modules for customers in order to ease CE compliance assessment of end products and to minimize test effort.

9.1. Declaration of Conformity CE

The BlueMod+S42M fully complies with the essential requirements of the following EU directives:

- RED 2014/53/EU
- RoHS 2011/65/EC (Assessment in progress)

The actual version of EU Declaration of Conformity (EU DoC) can be downloaded from

https://www.telit.com/RED/

9.2. SRRC Compliance

The BlueMod+S42M is certified in China according to the Radio regulations of the People's republic of China with the CMIIT ID: 2017DJ6332.

The actual version of the SRRC certificate can be downloaded from the Telit Download Zone:

https://www.telit.com/support-training/download-zone/

Take note that you have to register to get access to the Download Zone.

9.3. NCC Compliance

9.3.1. NCC Warning Statement

- 經型式認證合格之低功率射頻電機，非經許可，公司、商號或使用者均不得擅自變更頻率、加大功率或變更原設計之特性及功能。
- 低功率射頻電機之使用不得影響飛航安全及干擾合法通信；經發現有干擾現象時，應立即停用，並改善至無干擾時方得繼續使用。前項合法通信，指依電信法規定作業之無線電通信。低功率射頻電機須忍受合法通信或工業、科學及醫療用電波輻射性電機設備之干擾

Statement translation:

- Without permission granted by the NCC, any company, enterprise, or user is not allowed to change frequency, enhance transmitting power or alter original characteristic as well as performance to approved low power radio-frequency devices.
- The low power radio-frequency devices shall not influence aircraft security and interfere legal communications; If found, the user shall cease operating immediately until no interference is achieved. The said legal communications means radio communications is operated in compliance with the Telecommunications Act. The low power radio-frequency devices must be susceptible with the interference from legal communications or ISM radio wave radiated devices.

9.3.2. NCC Label Requirements for End product

A product implementing the BlueMod+S42M and placed on the Taiwanese market has be affixed with a label containing at least the following information.

CCAK17LP1710T3

9.3.3. Certificate

The actual version of the NCC certificate can be downloaded from the Telit Download Zone:

https://www.telit.com/support-training/download-zone/

Take note that you have to register to get access to the Download Zone.

9.4. FCC Compliance

The BlueMod+S42M has been tested to fulfill the FCC requirements. Test reports are available on request.

9.4.1. FCC Grant

The actual version of the FCC Grant can be downloaded from the Telit Download Zone:

https://www.telit.com/support-training/download-zone/

Take note that you have to register to get access to the Download Zone.

9.4.2. FCC Statement

This device complies with 47 CFR Part 2 and Part 15 of the FCC Rules.

Operation is subject to the following two conditions:

(1) this device my not cause harmful interference, and

(2) this device must accept any interference received, including interference that may cause undesired operation.

9.4.3. FCC Caution

WARNING:

Changes or modifications made to this equipment not expressly approved by Telit may void the FCC authorization to operate this equipment

9.4.4. FCC Warning

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.

Consult the dealer or an experienced radio/TV technician for help.

9.4.5. FCC RF-exposure Statement

The BlueMod+S42M complies with the FCC/IC RF radiation exposure limits set forth for an uncontrolled environment.

The output power is < 10mW EIRP and therefore according to “FCC OET KDB 447498 D01 General RF Exposure Guidance v05” Appendix A, table “SAR Exclusion Threshold”, excluded from SAR testing for test separation distances ≥ 5mm and if it is not used in co-locations with other antennas. If the product implementing the BlueMod+S42M has other antennas in co-location or separation distances < 5mm, a MPE has to be re-evaluated.

9.4.6. FCC Labeling Requirements for the End Product

Any End Product integrating the BlueMod+S42M must be labeled with at least the following information:

This device contains transmitter with

FCC ID: RI7-S42M

IC: 5131A-S42M

9.5. IC Compliance

The BlueMod+S42M has been tested to fulfill the IC requirements. Test reports RSS-247 of Industry Canada are available on request.

Le BlueMod + S42M a été testé pour répondre aux exigences de l'Indutrie du Canada.

Les rapports de test RSS-247 d'Industrie du Canada sont disponibles sur demande.

9.5.1. IC Grant

The actual version of the IC Grants can be downloaded from the Telit Download Zone:

https://www.telit.com/support-training/download-zone/

Take note that you have to register to get access to the Download Zone.

Le certificat fourni par L'Indutrie du Canada peut être téléchargé en ligne sur le site TELIT suivant le lien ci-dessous :

https://www.telit.com/support-training/download-zone/

Prenez note que vous devez au prealable vous inscrire sur le site Telit pour accéder à la zone de téléchargement.

9.5.2. IC Statement

(i) This device must be installed and operated in a fully enclosed enclosure to prevent RF radiation that could otherwise interfere with aeronautical navigation. Installation must be performed by qualified installers, in full compliance with the manufacturer's instructions.

(ii) This device can only be operated in a non-jamming and non-protection mode, i.e. the user must accept that high power radars of the same frequency band can jam this device or even damage it. On the other hand, level sensors that have been shown to interfere with an operation authorized by a Master Operating License must be removed at the expense of the user.

(i) Ce dispositif doit être installé et exploité dans une enceinte entièrement fermée afin de prévenir les rayonnements RF qui pourraient autrement perturber la navigation aéronautique. L'installation doit être effectuée par des installateurs qualifiés, en pleine conformité avec les instructions du fabricant.

(ii) Ce dispositif ne peut être exploité qu'en régime de non-brouillage et de non-protection, c'est-à-dire que l'utilisateur doit accepter que des radars de haute puissance de la même bande de fréquences puissent brouiller ce dispositif ou même l'endommager. D'autre part, les capteurs de niveau à propos desquels il est démontré qu'ils perturbent une exploitation autorisée par licence de fonctionnement principal doivent être enlevés aux frais de leur utilisateur.

This device complies with Industry Canada license-exempt RSS standard(s). Operation is subject to the following two conditions:

(1) this device may not cause interference, and

(2) this device must accept any interference, including interference that may cause undesired operation of the device.

Cet appareil est conforme aux normes RSS exemptes de licence de l'Industrie du Canada. L'utilisation est soumise aux deux conditions suivantes:

(1) cet appareil ne doit pas causer d'interférences, et

(2) cet appareil doit accepter toute interférence, y compris les interférences susceptibles de provoquer un fonctionnement indésirable de l'appareil.

NOTICE:

This Class B digital apparatus complies with Canadian ICES-003.

Cet appareil numérique de la classe B est conforme à la norme NMB-003 en vigeur au Canada.

9.5.3. IC Caution

WARNING:

Telit has not approved any changes or modifications to this device by the user. Any changes or modifications could void the user's authority to operate the equipment.

Telit n'approuve aucune modification apportée à l'appareil par l'utilisateur, quelle qu'en soit la nature. Tout changement ou modification peuvent annuler le droit d'utilisation de l'appareil par l'utilisateur.

9.5.4. IC RF-exposure Statement

This equipment is portable device. According to RSS-102 Issue 5 §2.5.1 Exemption Limits for Routine Evaluation – SAR Evaluation Table 1, the allowed distances to the human body for products implementing the BlueMod+S42M can be calculated as follows. If the intended use of the end product asks for smaller distances a new evaluation has to be repeated with the end product.

- Max. RF output power is 0dBm
- Antenna peak Gain is +2dBi
- Resulting max. RF output power is +2dBm = 1.6mW < 4mW
- Table 1 of RSS-102 Issue 5 §2.5.1 shows that for 2450MHz the distance at 4mW should be 5 mm

Cet équipement est un appareil portable. Selon le document RSS-102 Issue 5 §2.5.1 Exemption Limits for Routine Evaluation – SAR Evaluation Table 1, les distances autorisées par rapport au corps humain pour les produits mettant en œuvre BlueMod + S42M peuvent être calculées comme suit. Si l'utilisation prévue du produit final nécessite de plus petites distances, une nouvelle évaluation doit être répétée avec le produit final.

- *La puissance de sortie RF maximale est 0dBm*
- *Le gain l'antenne est +2dBi*
- *La puissance de sortie RF maximale résultante est +2dBm = 1.6mW < 4mW*
- *Le tableau 1 du document RSS-102, numéro 5, § 2.5.1 stipule que pour les frequences de 2450 MHz, la distance à 4 mW doit être de 5 mm.*

9.5.5. IC Labeling Requirements for the End Product

Any end product integrating the BlueMod+S42M must be labeled with at least the following information:

This device contains transmitter with

Tout produit final intégrant le BlueMod + S42M doit porter au minimum les informations suivantes:

Cet appareil contient un émetteur avec

FCC ID: RI7-S42M

IC: 5131A-S42

9.5.6. IC Label Information BlueMod+S42M

The BlueMod+S42M shows the IC-ID on the product label.

Le BlueMod + S42M affiche l'IC-ID sur l'étiquette du produit.

Model: BlueMod+S42M

IC-ID: 5131A-S42M

9.6. Bluetooth Qualification

The BlueMod+S42M is a qualified design according to the Bluetooth Qualification Program Reference Document (PRD) V2.3.

The Declaration ID is:

D036716

The Qualified Design ID is:

99965

For further information about marking requirements of your product attention should be paid the Bluetooth Brand Usage Guide at

https://www.bluetooth.org/en-us/bluetooth-brand/bluetooth-brand

According to the Bluetooth SIG rules (Bluetooth Declaration Process Document – DPD) you must complete a Product Listing and Declaration of Compliance (DoC) referencing the Qualified Design (QDID) for your product. For further information see www.Bluetooth.org or contact Telit.

QDL Bluetooth® qualified design listing

The Bluetooth SIG Hereby Recognizes

Telit Wireless Solutions GmbH
Member Company

BlueMod+S42M
Qualified Design Name

Declaration ID: D036716
Qualified Design ID: 99965
Specification Name: 4.2
Project Type: End Product
Model Number: BE890F2-SI
Listing Date: 25 August 2017
Assessment Date: 25 August 2017
Hardware Version Number: GS0026b
Software Version Number: V0.600, V0.700

This certificate acknowledges the *Bluetooth*® Specifications declared by the member are achieved in accordance with the Bluetooth Qualification Process as specified within the Bluetooth Specifications and as required within the current PRD

Bluetooth®

9.7. RoHS Declaration

The BlueMod+S42M fully complies with the EU RoHS directive:

- RoHS 2011/65/EC

The actual version of RoHS Declaration of Conformity (EU DoC) can be downloaded from the Telit Download Zone:

https://www.telit.com/support-training/download-zone

Take note that you have to register to get access to the Download Zone.

10. PACKING

The BlueMod+S42M modules are packed either as Tape&Reel or as tray packing.

10.1. Tape&Reel Packing

The BlueMod+S42M modules are packed using carrier tape in this orientation.

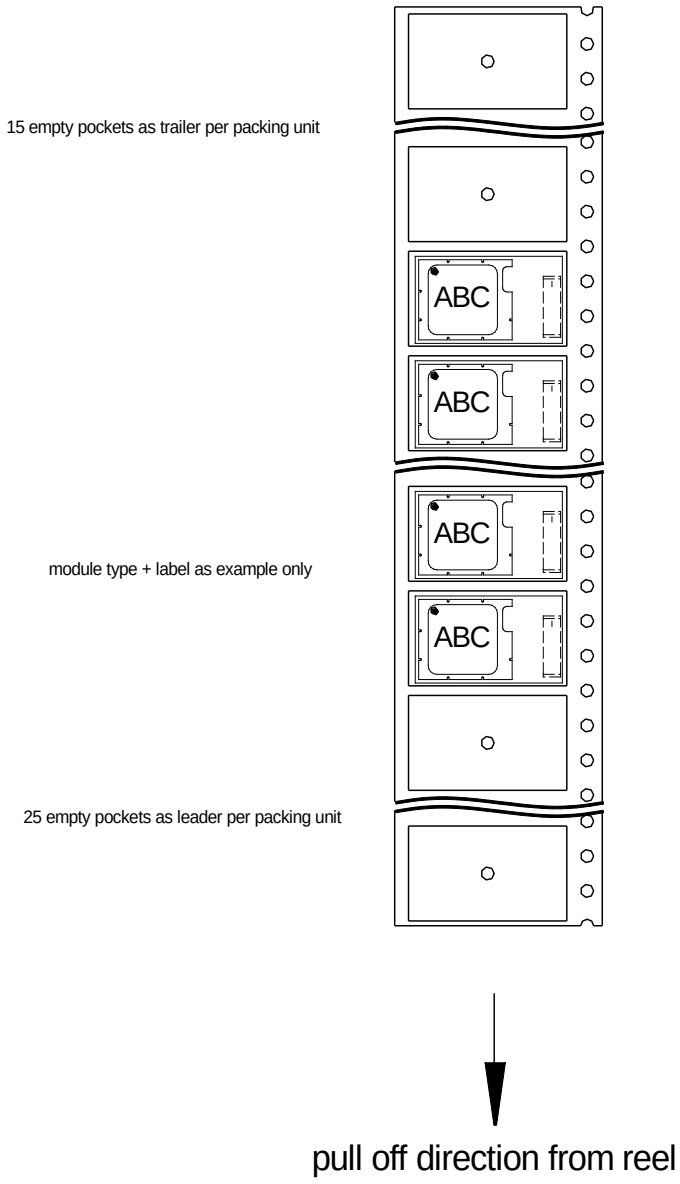


Figure 19: Module Orientation in Carrier Tape

10.1.1. Tape

The dimensions of the tape are shown in Figure 20 (values in mm):

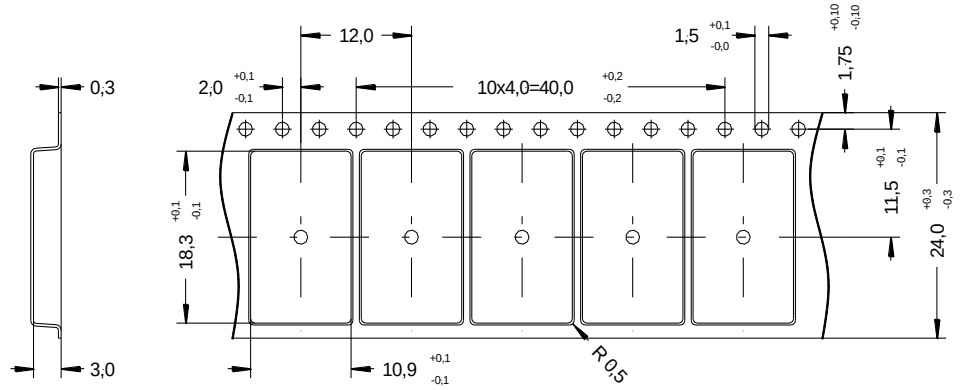


Figure 20: Carrier Tape Dimensions

10.1.2. Reel

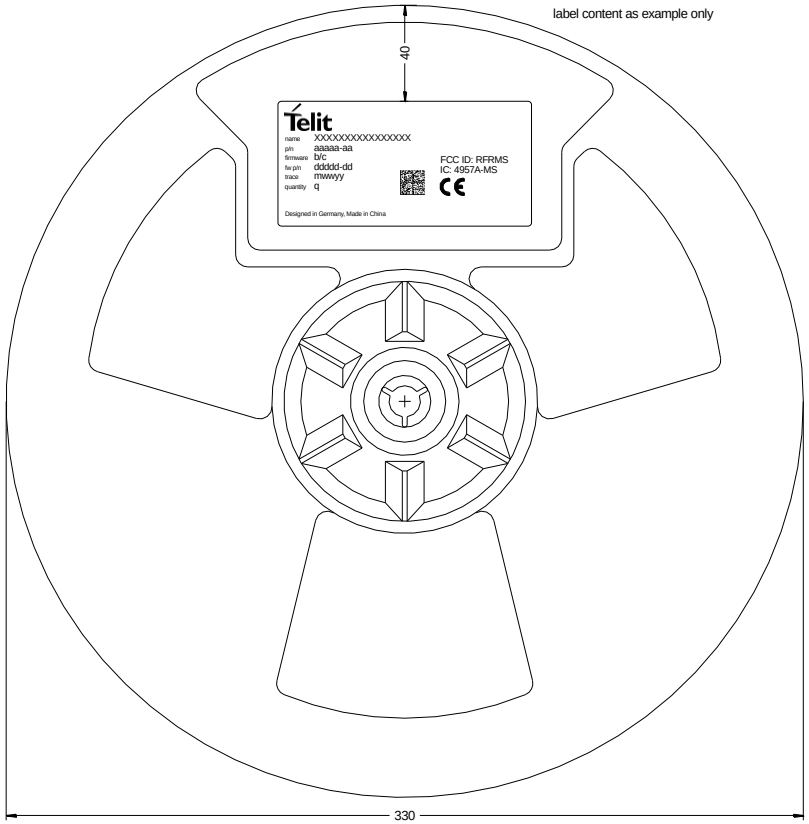


Figure 21: Reel Dimensions

10.2. Tray Packing

10.2.1. Module Orientation

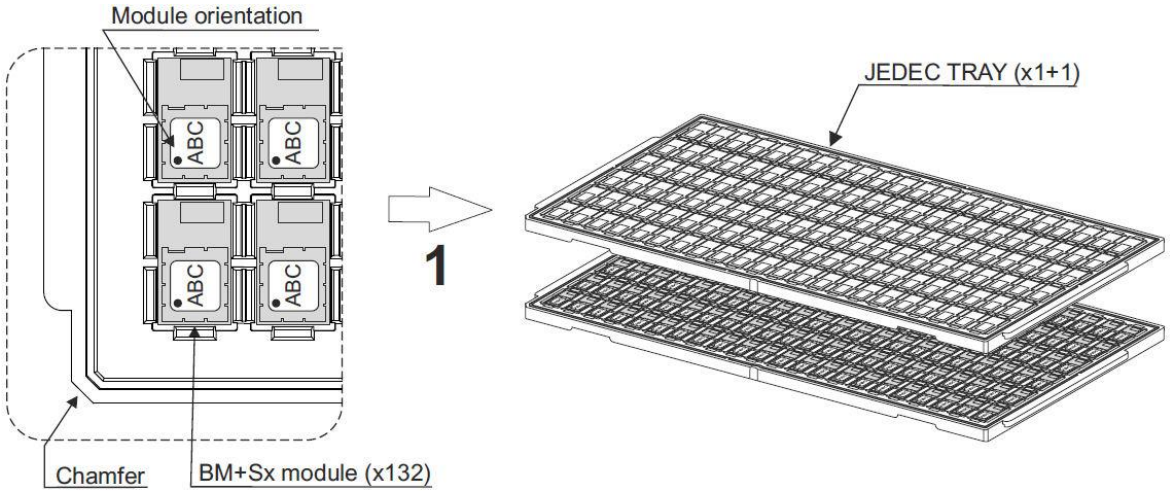


Figure 22: Module Orientation on Tray

10.2.2. Tray Dimensions

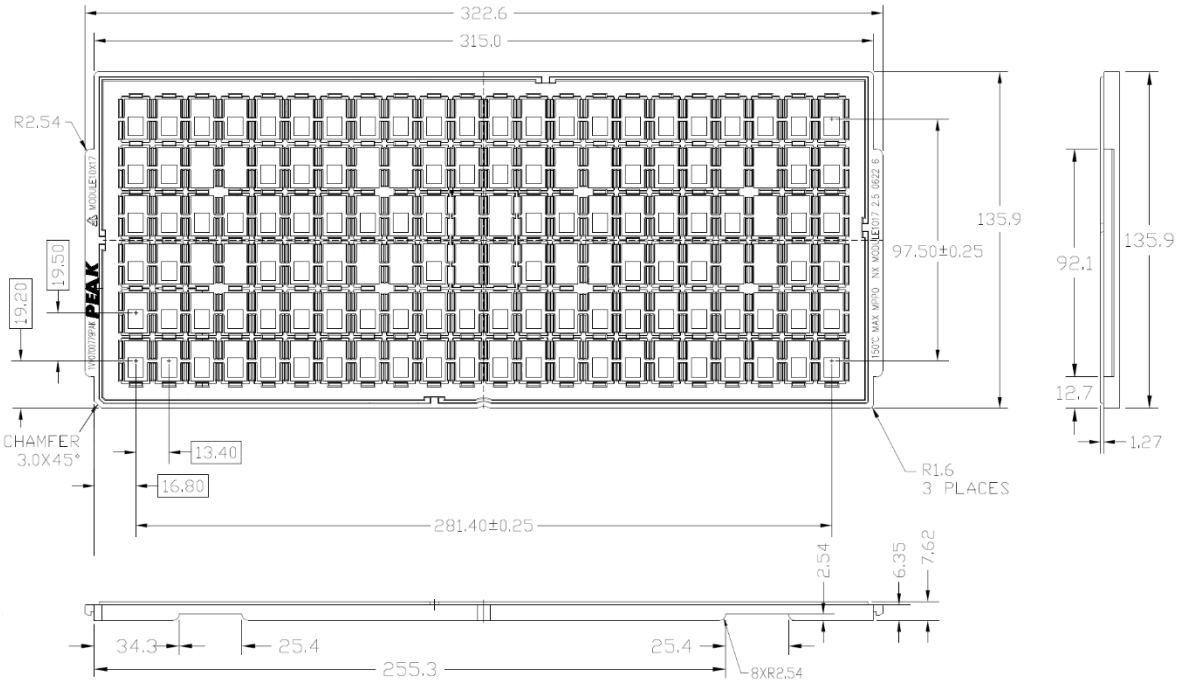


Figure 23: Tray Dimensions

10.3. Moisture Sensitivity Level

Moisture Sensitivity Level (MSL) for BlueMod+S42M is 3.

11. EVALUATION KIT

Following evaluation kits are available:

- BLUEEVA+S42M/AI
- BLUEEVA+S42M/AI3ATH

Please refer to [5] for additional informations.

12. SAFETY RECOMMENDATIONS

Read carefully

Be sure the use of this product is allowed in the country and in the environment required. The use of this product may be dangerous and has to be avoided in the following areas:

- Where it can interfere with other electronic devices in environments such as hospitals, airports, aircrafts, etc.
- Where there is risk of explosion such as gasoline stations, oil refineries, etc. It is the responsibility of the user to enforce the country regulation and the specific environment regulation.

Do not disassemble the product; any mark of tampering will compromise the warranty validity. We recommend following the instructions of the hardware user guides for correct wiring of the product. The product has to be supplied with a stabilized voltage source and the wiring has to be conformed to the security and fire prevention regulations. The product has to be handled with care, avoiding any contact with the pins because electrostatic discharges may damage the product itself. Same cautions have to be taken for the SIM, checking carefully the instruction for its use. Do not insert or remove the SIM when the product is in power saving mode.

The system integrator is responsible for the functioning of the final product; therefore, care has to be taken to the external components of the module, as well as any project or installation issue, because the risk of disturbing the GSM network or external devices or having impact on the security. Should there be any doubt, please refer to the technical documentation and the regulations in force. Every module has to be equipped with a proper antenna with specific characteristics. The antenna has to be installed with care in order to avoid any interference with other electronic devices and has to guarantee a minimum distance from the body (5 cm). In case this requirement cannot be satisfied, the system integrator has to assess the final product against the SAR regulation.

The European Community provides some Directives for the electronic equipment introduced on the market. All of the relevant information is available on the European Community website:

http://ec.europa.eu/enterprise/sectors/rtte/documents/

The text of the Directive 99/05 regarding telecommunication equipment is available,

while the applicable Directives (Low Voltage and EMC) are available at:

http://ec.europa.eu/enterprise/sectors/electrical/

13. ACRONYMS

TTSC	Telit Technical Support Centre
USB	Universal Serial Bus
DTE	Data Terminal Equipment
UART	Universal Asynchronous Receiver Transmitter
SPI	Serial Peripheral Interface
I/O	Input Output
GPIO	General Purpose Input Output
CMOS	Complementary Metal – Oxide Semiconductor
MOSI	Master Output – Slave Input
MISO	Master Input – Slave Output
CLK	Clock
CS	Chip Select
PCB	Printed Circuit Board
ESR	Equivalent Series Resistance
VSWR	Voltage Standing Wave Radio
VNA	Vector Network Analyzer

14. DOCUMENT HISTORY

Revision	Date	Changes
0	2017-08-22	Initial release
1	2017-12-12	Chapter Compliances revised Power consumption values added
2	2018-01-31	Operating temperature range extended to -20°C Safety standard adapted to newer version
3	2018-10-19	Update power consumtion values of the AI3ATH variant for UICP and systemoff Added chapters FCC Compliance and IC Compliance Updated Chapter 9.7
4	2018-11-28	Updated chapter IC Compliance with text in French

SUPPORT INQUIRIES

Link to **www.telit.com** and contact our technical support team for any questions related to technical issues.

www.telit.com

Telit Communications S.p.A.
Via Stazione di Prosecco, 5/B
I-34010 Sgonico (Trieste), Italy

Telit IoT Platforms LLC
5300 Broken Sound Blvd, Suite 150
Boca Raton, FL 33487, USA

Telit Wireless Solutions Inc.
3131 RDU Center Drive, Suite 135
Morrisville, NC 27560, USA

Telit Wireless Solutions Co., Ltd.
8th Fl., Shinyoung Securities Bld.
6, Gukjegeumyung-ro8-gil, Yeongdeungpo-gu
Seoul, 150-884, Korea

Telit Wireless Solutions Ltd.
10 Habarzel St.
Tel Aviv 69710, Israel

Telit Wireless Solutions
Technologia e Servicos Ltda
Avenida Paulista, 1776, Room 10.C
01310-921 São Paulo, Brazil