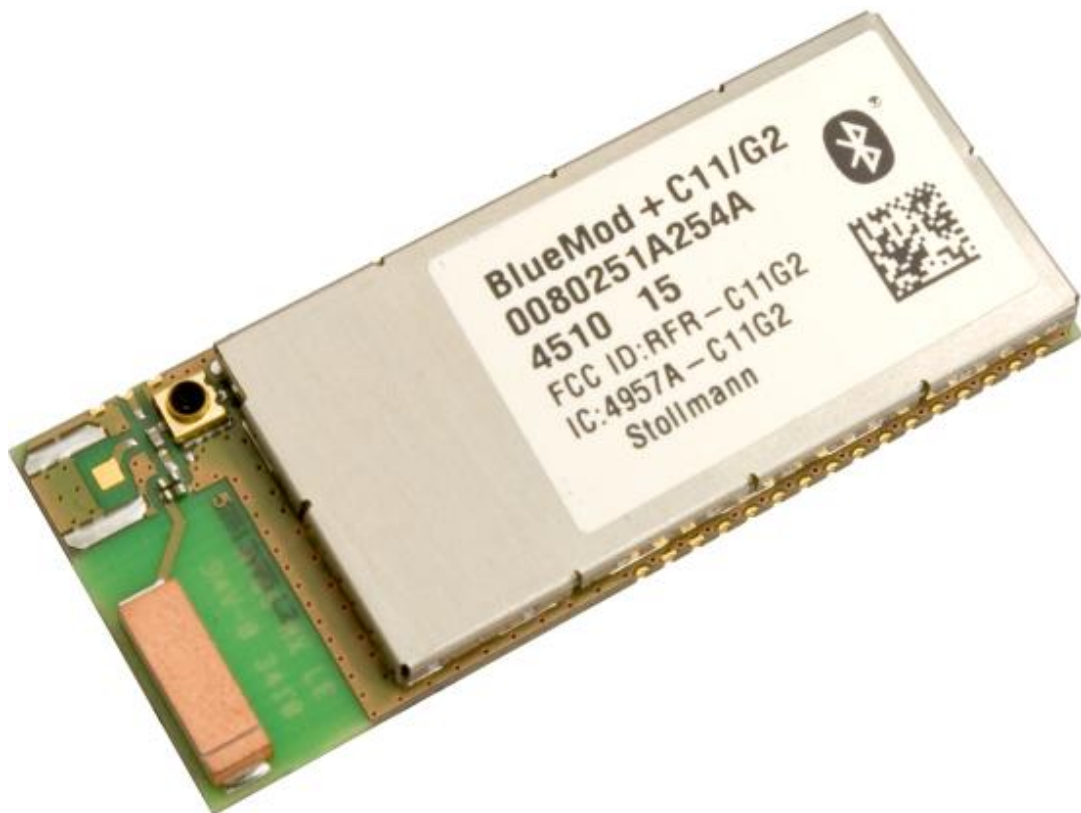


BlueMod+C11/G2

Hardware Reference

Release r07



Note

This product was developed for the purpose of communication. It is intended solely for our clients for integration into their own technical products after careful examination by experienced technical personnel for its suitability for the intended purpose. The product was not developed for or intended for use in any specific customer application. It may have to be adapted to the specific intended modalities of use or even replaced by other components in order to ensure flawless function in the respective areas of application. Performance data (range, power requirements, footprint, etc.) may depend on the operating environment, the area of application, the configuration, and method of control, as well as on other conditions of use; these may deviate from the technical specifications, the Design Guide specifications, or other product documentation. The actual performance characteristics can be determined only by measurements subsequent to integration in the target environment. Variations in the performance data of mass-produced devices may occur due to individual differences between such devices. Product samples were tested in a reference environment for compliance with the legal requirements applicable to the reference environment. No representation is made regarding the compliance with legal, regulatory, or other requirements in other environments. No representation can be made and no warranty can be assumed regarding the suitability of the product for a specific purpose. Stollmann reserves the right to make changes to the product without prior notice or to replace the product with a successor model. Of course, any changes to the product for which we have entered into a supply agreement with our customers will be made only if, and only to the extent that, such changes can reasonably be expected to be acceptable to our customers. No general commitment will be made regarding periods of availability; these must be subject to individual agreement. All agreements are subject to our Terms and Conditions for Deliveries and Payments, a copy of which is available from Stollmann.

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1 Introduction

This Hardware Reference Guide documents how BlueMod+C11/G2 can be integrated into customer systems.

It addresses developers of hardware environments for BlueMod+C11/G2.

For detailed information about software interfaces refer to the software reference manual.

The BlueMod+C11/G2 is available with EDR functionality disabled and enabled. For the product with EDR disabled all information given in the following chapters regarding EDR performance and functionality is not valid. Information regarding EDR performance and functionality applies only to the BlueMod+C11/G2 with EDR functionality enabled.

For the latest version of this document please check the following URL:

<http://www.stollmann.de/en/modules/bluetooth-products/bluemod-c11g2/>

1.1 Feature Summary

- Bluetooth specification V2.0+EDR
- EDR compliant with V2.0 of specification for 2Mbps and 3Mbps modulation modes
- Full Speed Bluetooth Operation with Full Piconet Support
- Scatternet Support
- Complete Co-location and Co-existence with 802.11 (AWMA, AFH and SFH)
- Fast Connection Setup
- RF output power class 1 with power control
- Supply Voltage 3.0V to 3.6V
- Internal crystal oscillator (26 MHz BC04 and 14,7456MHz for ARM7)
- Full Bluetooth data rate up to 2178 kbps asymmetric
- Support for very low-power modes (sleep and deep sleep)
- Full 8- to 128-bit encryption
- High sensitivity design (-87 dBm typ.)
- Extra ARM7TDMI CPU for embedded profiles and/or application software
- Up to 17 GPIO lines
- USB 2.0 Full Speed Device Interface
- Master/Slave SPI
- Synchronous Serial Controller

- PWM Controller
- 10 bit A/D Converter
- Power control
- 5V tolerant I/Os
- -40°C to +85°C industrial operating temperature range
- RoHS Compliant

1.2 Applications

BlueMod+C11/G2 can be used in different applications.

Available applications are

- Bluetooth SPP
- BlueMux Point to Multipoint SPP
- BlueCluster Adhoc Networking

Please refer the software reference and interface specifications for further information.

2 Block Diagram

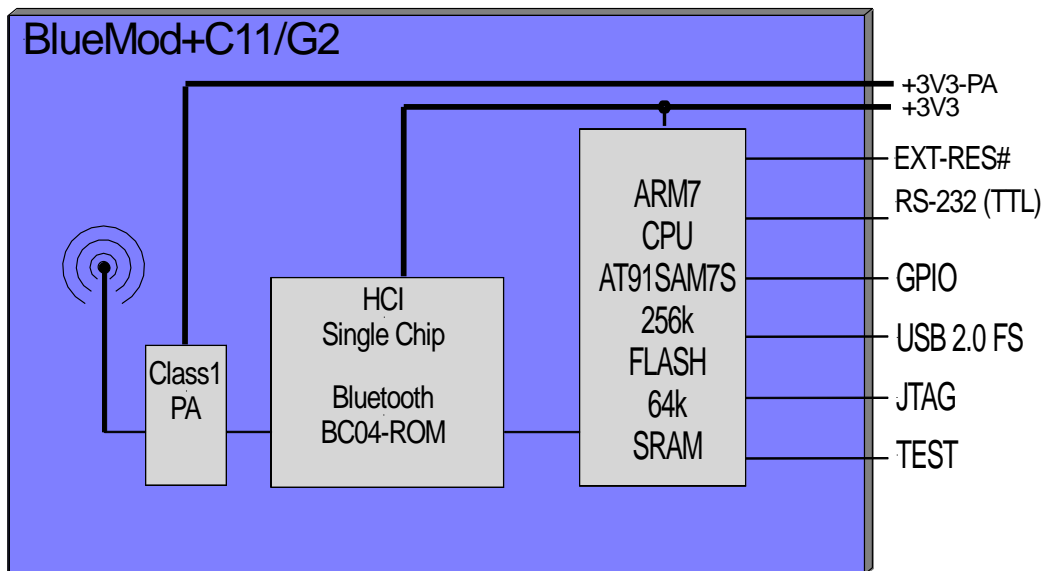


Fig. 1 Block Diagram

3 Application Interface

3.1 Power Supply

The BlueMod+C11/G2 has two power supply rails, which always should be kept on the same voltage level. Although we recommend using two different power rails, it is as well possible to feed both rail from a single supply.

| Pin # | Signal | Usage |
|-------|--------|--|
| C-13 | 3V3 | Supply for digital and low power RF circuitry, |
| C-16 | 3V3-PA | Supply for RF Amplifier |
| C-14 | GND | Reference Supply |
| C-15 | GND | Reference Supply |

The pin order is made such that on the customer hardware directly at the pins of each supply pair pins (C-13/C14) and pins (C-16/C-15) a 10uF X5R ceramic capacitor with for example a 1206 footprint can be placed for decoupling. It is recommended to add further smaller value ceramic capacitors. These values depend on noise frequencies on the supply rail. The following picture shows a sample layout with two linear regulators in SOT23-5 housings and various capacitors in SMT shapes 0402, 0805 and 1206.

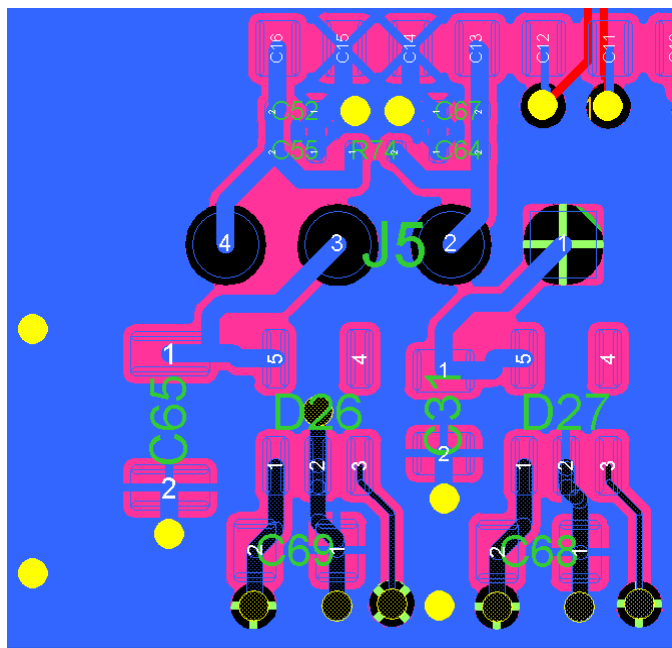


Fig. 2 Sample Layout Power Supply

Each supply rail should be fed with 3,3V, Range 3,0V to 3,6V incl. Noise, low noise from a linear regulator with fast transient response. Stollmann suggest using two pcs.

TOREX: XC6204B332MR

regulators, so that the fast current transients of the class1 RF power amplifier do not interfere with sensitive PLL circuitry of the low power RF circuitry.

For layout guidelines please see sample implementation Stollmann reference design BlueMod+Eval/C11/G2.

Excessive noise or too slow current transient response on the supply rails may have an impact on the RF performance.

3.2 Power-up slew-rate

The Power up slew-rate for the BlueMod+C11/G2 must be more then 6V/ms for proper startup of the AT91SAM7S Controller used on the BlueMod+C11/G2.

Figure 3 shows an example circuit for a power supply. The Output Voltage of the Regulator is enabled by the Threshold Voltage of a RESET-Circuit, when VCC Startup ramp reaches a valid Voltage.

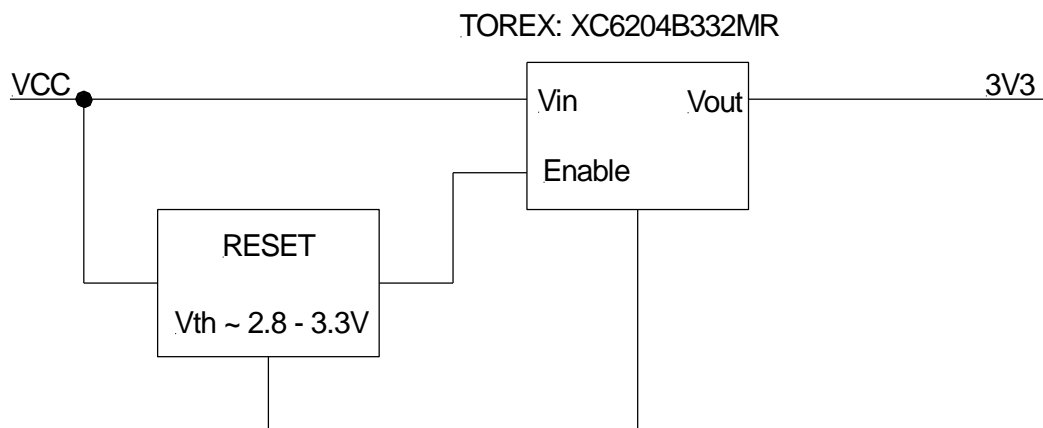


Figure 3 power supply example circuit

3.3 Power-On-Reset

The BlueMod+C11/G2 is equipped with circuitry for generating Power-On Reset and to provide under-voltage supervision. An integrated circuit type Maxim DS1818R provides this functionality.

A reset is generated if the 3.3V supply rail including noise falls below 2,8V to 2,97V.

Via Pin A-1 an external reset can be generated by holding EXT-RES# at $\leq 0.3V$ for $\geq 10ms$. A 74LVC14 Schmitt Trigger gate with a $1kR5/10nF$ low-pass filter at the input is implemented to avoid false reset pulse recognition due to EMC effects.

If EXT-RES# is not used, it may be left open or tied to VCC.

3.4 Serial Interface

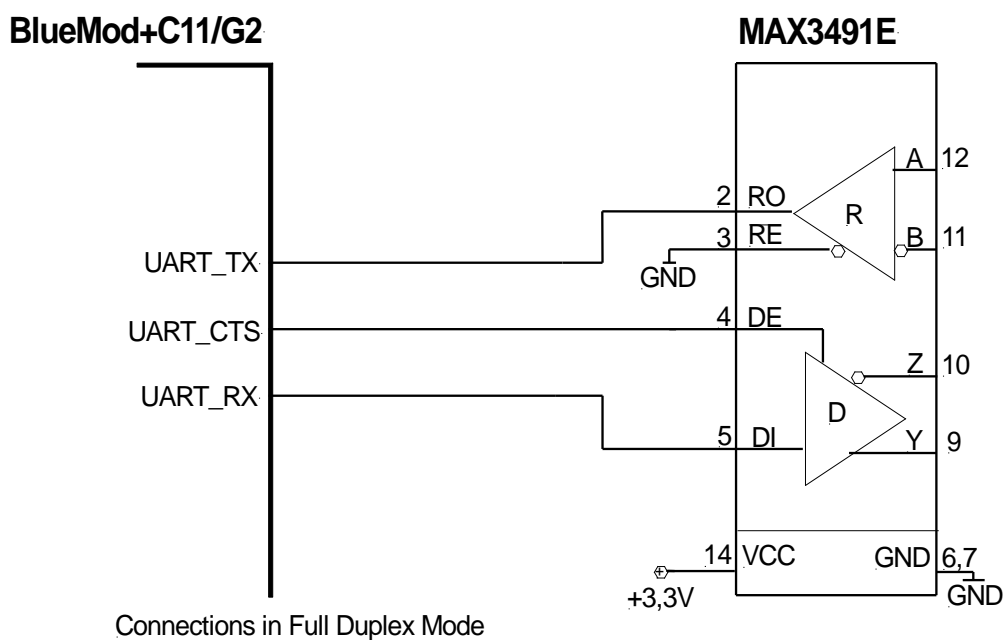
The interface functionally corresponds to the norm V.24 / RS-232 but has TTL-level.

- Transmission speeds 300 bps – 921600 bps (asynchronous)
- Character representation: 7 to 9 Bit, even, odd, mark, space or no Parity, 1, 1.5 or 2 stop bits
- Half duplex or full duplex
- Hardware flow-control (RTS/CTS)

Note: All signals of the serial interface are named according to the EIA232 DTE definition.

3.4.1 RS-485 Support

For RS-485 support the serial interface has to be connected to an external Transceiver, we suggest the MAX3491E from Maxim Integrated Products, due to it supports full duplex transmissions.



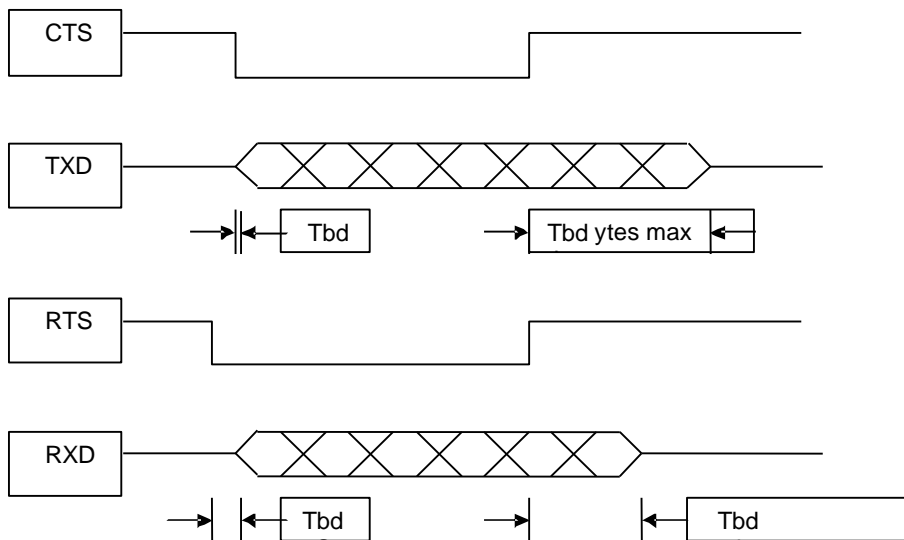
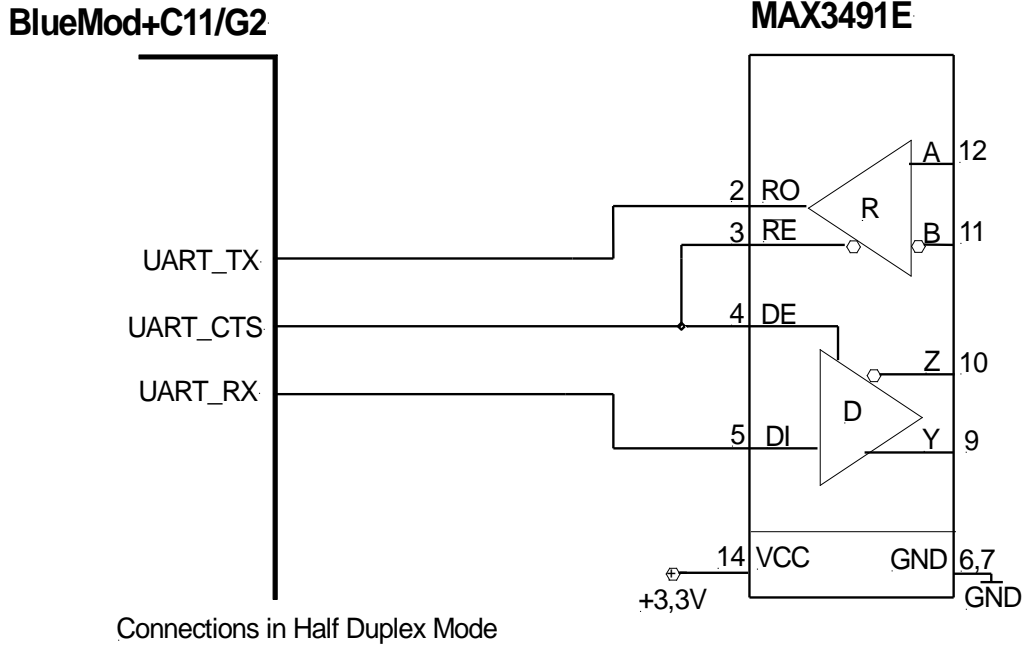


Figure 4. UART Timing Diagram

3.5 GPIO Interface

All user signals, except for EXT-RES#, which is routed via an Schmitt Trigger gate, are connected directly to port pins of the ATMEL AT91SAM7S256 CPU. Except for USB signals DP, DM and GPIO(4), no additional pull-up or down resistors are implemented, so that the I/O characteristics of the ATMEL CPU apply. These are

- 3V3 logic 5V tolerant
- $V_{IL\ max} = 0.8V$, $V_{IH\ min} = 2.0V$, $V_{IH\ max} = 5.5V$
- $V_{OH\ min} = VCC - 0.4V @ I_O = 8mA$, $V_{OL} < 0.4V @ I_O = 8mA$
- LED's can be driven directly on specific GPIO lines when I_o stays below 8mA
All current consumption data in this document are given with $I_o(GPIO) = 0mA$
See chapter 5 Electrical Characteristics for detailed information.
- All I/O signals except USB, GPIO(4) and JTAG are connected directly from the AT91SAM7S pins to the user accessible stamp pins. Therefore, the electrical characteristics of the I/O pins are programmable in regard to direction, pull-up resistor, function, push-pull or open drain. Please see specific application software documentation for details. After reset, all GPIOs have pull-ups activated. GPIO10, GPIO8 and TXD have 50kR to 300kR pull-ups, all other I/Os have 5kR to 20kR pull-ups

3.6 Alternate GPIO/IO Functions

Application specifically dedicated GPIO or IO pins can be programmed to alternative functionalities. Then pin functionality and direction are fixed for the activated function block. Many GPIOs are used by the SPP application. See chapter [SPP Configuration](#). Probably some of them can be released for use by other function blocks. Co-functionality of blocks has to be carefully considered, because pin multiplexing possibilities are fixed by the ATMEL AT91SAM7S CPU and using a function block often causes that other function blocks can't be used at the same time. Please refer to the ATMEL data sheet AT91SAM7Sxxx Rev. F for complete information. The possibilities depicted in the following chapters are a subset only.

The following function blocks may be usable on the BlueMod+C11/G2:

3.6.1 Master/Slave SPI Interface

| Pin # | GPIO# IO Name | Alternative Signal Name | Description | Direction | |
|-------|------------------|----------------------------|-------------------------|-----------|-------|
| | | | | Master | Slave |
| A5 | GPIO1 | MISO | Master In Slave Out | IN | OUT |
| A4 | GPIO0 | MOSI | Master Out Slave In | OUT | IN |
| A3 | GPIO3 | SPCK | Serial Clock | OUT | IN |
| A6 | GPIO2 | NPCS0 | Peripheral. Chip Select | OUT | IN |

Clock polarity and phase are programmable. The chip select signal is low active.

3.6.2 Synchronous Serial Interface

The Synchronous Serial Interface is capable of handling the protocols I2S, Short Frame Sync, Long Frame Sync and other Telecom protocols. Receiver and transmitter do act independently. Due to multiplexing interdependencies, the SSC is only available with the Transmitter clock signal TK used for both directions if the UART IF is enabled. JTAG reset, signal /ATRST, is also not available, if the SSC signal RF, Receiver Frame Sync is used.

| Pin # | GPIO# IO Name | Alternative Signal Name | Description | Direction | |
|-------|------------------|----------------------------|------------------------|-----------|--------|
| | | | | Case 1 | Case 2 |
| A16 | /ATRST | RF | Receiver Frame Sync | IN | OUT |
| A12 | GPIO10 | RD | Receiver Data | IN | IN |
| C7 | TXD | RK | Receiver Clock | IN | OUT |
| A13 | GPIO7 | TF | Transmitter Frame Sync | IN | OUT |
| A11 | GPIO8 | TD | Transmitter Data | OUT | OUT |
| A14 | GPIO9 | TK | Transmitter Clock | IN | OUT |

3.6.3 Multi Channel PWM Controller

Each PWM channel can be programmed individually in regard to IO pin assignment and PWM functionality. Therefore, PWM application designers can choose a proper channel and pin for their application with the chance not to interfere with other necessary interfaces.

| Pin # | GPIO# IO Name | Alternative Signal Name | Description | Direction |
|-------|------------------|----------------------------|----------------------|-----------|
| A6 | GPIO2 | PWM0 | PWM Waveform Out CH0 | OUT |
| C9 | GPIO5 | PWM0 | PWM Waveform Out CH0 | OUT |
| C5 | /CTS | PWM1 | PWM Waveform Out CH1 | OUT |
| A5 | GPIO1 | PWM1 | PWM Waveform Out CH1 | OUT |
| A5 | GPIO1 | PWM1 | PWM Waveform Out CH1 | OUT |
| C2 | GPIO15 | PWM1 | PWM Waveform Out CH1 | OUT |
| C4 | /RTS | PWM2 | PWM Waveform Out CH2 | OUT |
| A4 | GPIO1 | PWM2 | PWM Waveform Out CH2 | OUT |
| C8 | GPIO6 | PWM2 | PWM Waveform Out CH2 | OUT |
| A3 | GPIO3 | PWM3 | PWM Waveform Out CH3 | OUT |

3.6.4 Analog to Digital Converter

Three ADC channels with 8 to 10bit resolution in reference to 1.8V are available. A wide range of trigger sources and programmable S&H timing are available.

| Pin # | GPIO# IO Name | Alternative Signal Name | Description | Direction |
|-------|------------------|----------------------------|------------------|------------------|
| A16 | JTAG-RES# | AD3 | ADC channel 3 | In ana- logue |
| A12 | GPIO10 | AD0 | ADC channel 0 | In ana- logue |
| A11 | GPIO8 | AD1 | ADC channel 1 | In ana- logue |

3.7 Bluetooth radio Interface

The BlueMod+C11/G2 offers three population variants for the antenna

1) The BlueMod+C11/G2/AE variant presents a 50Ω impedance antenna interface on a Radiall UMP connector, type R107103020. See <http://www.radiall.com/>

2) The BlueMod+C11/G2/AI variant presents an integrated ceramic antenna.

In both cases the Pins A-26 – A-28 can be left unconnected.

3) The BlueMod+C11/G2/AP variant presents a 50Ω impedance antenna interface on pin A-27 with adjacent GND pins A-26 and A-28. In this case Pin A-26 and A28 shall be connected directly to the reference GND plane. Signal routing of the RF signal on customer PCB has to be implemented with 50R micro-strip line technique.

If the antenna performance does not meet your requirements or you need antenna support, please contact Stollmann.

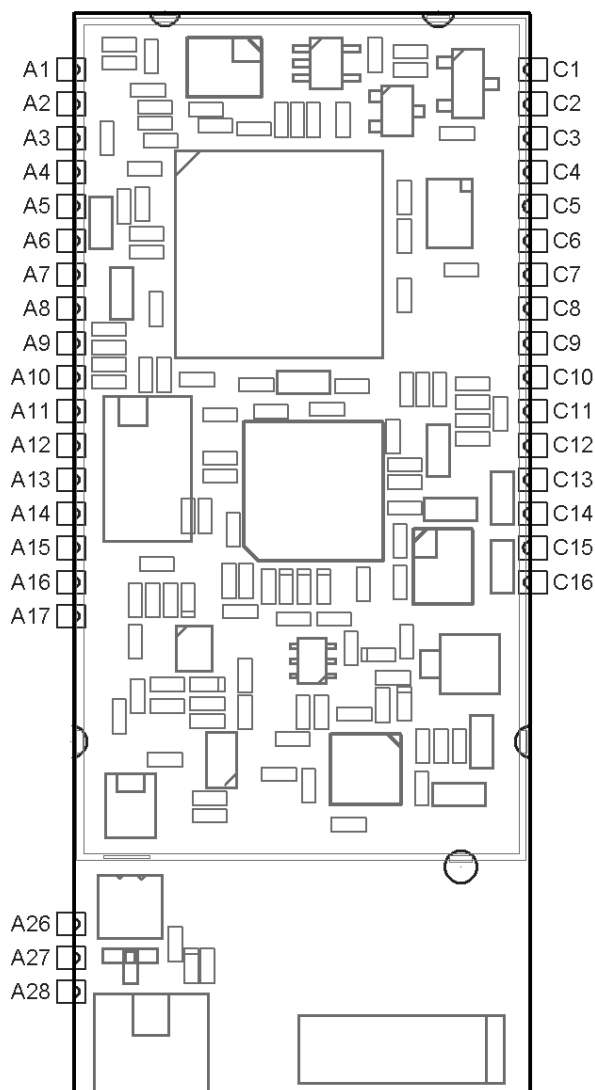
3.8 JTAG

For software development purposes a full JTAG interface, connected to the ATMEL MCU is available.

4 Pin Description

The BlueMod+C11/G2 module is soldered on customers PCB via stamp pins located on the module PCB edges.

4.1 Pin Numbering



Top View

4.2 Pin Description

4.2.1 General Pin Description

| Pin | Signal | Type | Ac- tive | Description |
|-----|-----------------------|--------|-------------|---|
| A1 | /EXT_RES | I-PU | L | Reset low active internal 47k pull-up |
| A2 | GPIO11 (DTXD) | I/O-PU | | General Purpose IO – Debug Uart Output |
| A3 | GPIO3 | I/O-PU | | General Purpose IO |
| A4 | GPIO0 | I/O-PU | | General Purpose IO |
| A5 | GPIO1 | I/O-PU | | General Purpose IO |
| A6 | GPIO2 | I/O-PU | | General Purpose IO |
| A7 | ATDO | O | | JTAG test data output |
| A8 | ATCK | I-PU | | JTAG clock |
| A9 | ATMS | I-PU | | JTAG mode select |
| A10 | ATDI | I-PU | | JTAG test data input |
| A11 | GPIO8 | I/O-PU | | General Purpose IO |
| A12 | GPIO10 | I/O-PU | | General Purpose IO - internal 10k pull-up |
| A13 | GPIO7 | I/O-PU | | General Purpose IO |
| A14 | GPIO9 | I/O-PU | | General Purpose IO |
| A15 | GPIO12 (DRXD) | I/O-PU | | General Purpose IO – Debug Uart Input |
| A16 | GPIO16 | I/O-PU | L | General Purpose IO |
| A17 | reserved | | | do not connect- |
| A26 | ANT_GND ^{a)} | | | Antenna ground, connect directly to plane |
| A27 | ANT ^{a)} | | | 50 Ohm Rx/Tx connection to antenna |
| A28 | ANT_GND ^{a)} | | | Antenna ground, connect directly to plane |
| C1 | GPIO14 | I/O-PU | | General Purpose IO |
| C2 | GPIO15 | I/O-PU | | General Purpose IO |
| C3 | GPIO13 | I/O-PU | | General Purpose IO |
| C4 | /RTS | I-PU | L | Request to send |
| C5 | /CTS | O | L | Clear to send |
| C6 | RXD | O | | Receive Data |
| C7 | TXD | I-PU | | Transmit Data |
| C8 | GPIO6 | I/O-PU | | General Purpose IO |
| C9 | GPIO5 | I/O-PU | | General Purpose IO |
| C10 | GPIO4 | I/O-PD | | General Purpose IO - internal 47k pull-down |
| C11 | USB_DM | I/O | | USB D-, Data pin |
| C12 | USB_DP | I/O | | USB D+, Data pin |
| C13 | VCC | P | | +3.3V Power digital and low power RF |
| C14 | GND | P | | GND |
| C15 | GND | P | | GND |
| C16 | VCC | P | | +3.3V Power RF amplifier |

Type: PU – pulled up on Module; PD pulled down on Module

Notes: a) refer to Chapter 3.7

4.2.2 Application Specific Pin Description

4.2.3 SPP Configuration

| Pin | Pin Name | SPP function | Type | Active | Description |
|-----|----------|--------------|--------|--------|---|
| A11 | GPIO8 | Reserved | I-PU | | |
| A12 | GPIO10 | Reserved | I-PU | | |
| A13 | GPIO7 | /LED1 | O | L | Device ready |
| A14 | GPIO9 | /LED2 | O | L | Bluetooth connected. Active if a Bluetooth connection exists. Inactive in idle state. Flashes during startup. |
| C1 | GPIO14 | /RTC-OUT | O | L | DSR in DCE mode DTR in DTE mode |
| C2 | GPIO15 | /DCD | I/O-PU | L | Data Carrier Detect input in DTE mode, output in DCE mode |
| C3 | GPIO13 | /RTC-IN | I-PU | L | DTR in DCE mode DSR in DTE mode |
| C4 | /RTS | | I-PU | L | Request to send |
| C5 | /CTS | | O | L | Clear to send |
| C6 | RXD | | O | | Receive Data |
| C7 | TXD | | I | | Transmit Data |
| C8 | GPIO6 | /RI | I/O-PU | | Ring Indicator input in DTE mode, output in DCE mode |
| C9 | GPIO5 | Reserved | I-PU | | |
| C10 | GPIO4 | DTE-/DCE | I-PD | 47k PD | DTE DCE mode selector |
| C13 | VCC | VCC | P | | +3.3V Power |
| C14 | GND | GND | P | | GND |
| C15 | GND | GND | P | | GND |
| C16 | VCC | VCC | P | | +3.3V Power |
| A1 | /EXT_RES | /EXT_RES | I | L | Reset low active |
| C11 | USB_DM | | | | Do not connect |
| C12 | USB_DP | | | | Do not connect |

5 Electrical Characteristics

5.1 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 | Absolute Maximum Ratings | Unit |
|--------------------|-----------|---|------|
| Supply voltage | V_{cc} | 3,7V with respect to GND to - 0,4V with respect to GND | V |
| Voltage on any pin | V_{Pin} | VCC + 0,4V with respect to GND to - 0,4V with respect to GND | V |
| Input RF level | P_{max} | 0 | dBm |
| ESD on any pin | V_{ESD} | This device is ESD sensitive. Handling and assembly of this device should be at ESD protected workstations. | |

5.2 Environmental Requirements

| Item | Symbol | Absolute Maximum Ratings | Unit |
|-----------------------------|-----------|--------------------------|------|
| Storage temperature range | T_{stg} | -40 to +105 | °C |
| Operating temperature range | T_{op} | -40 to +85 | °C |

5.3 Operating Conditions

5.3.1 RF and Supply Connections

$V_{cc} = 3.0V$ to $3.6V$, $T_{amb} = -40^{\circ}C$ to $+85^{\circ}C$

| Item | Condition | Limit | | | Unit |
|--|---|------------|-----|----------|----------|
| | | Min | Typ | Max | |
| Frequency Range Pin A-27 | | 2400 | | 2483.5 | MHz |
| Load impedance Pin A-27 or UMP connector | Measured with network analyzer in the frequency range at antenna pin | | 50 | | Ω |
| Output return loss Pin A-27 or UMP connector | Receive Mode to 50Ω load Transmit Mode to 50Ω load | -10 -10 | | | dBm |
| Supply voltage Pin C-13 and Pin C-16 | The typical voltage is recommended V_{cc} at voltage pin (incl. ripple) | 3.0 | 3.3 | 3.6 | Vdc |
| Ripple on V_{cc} | Ripple frequency $\geq 200kHz$ Ripple frequency $< 200kHz$ | | | 20 20 | mVrms |

5.3.2 GPIO, JTAG; Serial IF and Test Pins

$V_{CC} = 3.3V$, $T_{amb} = -40^{\circ}C$ to $+85^{\circ}C$

| Symbol | Item | Condition | Limit | | Unit |
|----------|---|----------------|--------------|-----|------|
| | | | Min | Max | |
| V_{IL} | Low-Level Input Voltage | | -0.3 | 0.8 | V |
| V_{IH} | High-Level Input Voltage | | 2.0 | 5.5 | V |
| V_{OL} | Low-Level Output Voltage | $I_{OL} < 8mA$ | - | 0.4 | V |
| V_{OH} | High-Level Output Voltage | $I_{OH} < 8mA$ | $V_{CC}-0.4$ | - | V |
| I_{O1} | Output Current GPIO(5,6,15) | | - | 16 | mA |
| I_{O2} | Output Current GPIO(10,8), TXD, /JTAG-RES | | - | 2 | mA |
| I_{O3} | Output Current Other PIO except USB | | | 8 | |

Note: Please refer to ATMEL AT91SAM7S data sheet for more specific information

5.3.3 USB Pins

$V_{CC} = 3.3V$, $T_{amb} = -40^{\circ}C$ to $+85^{\circ}C$

| Symbol | Item | Condition | Limit | | Unit |
|----------|---------------------------|-------------------------|-------|------|------|
| | | | Min | Max | |
| V_{IL} | Low-Level Input Voltage | | | 0.8 | V |
| V_{IH} | High-Level Input Voltage | | 2.0 | | V |
| V_{DI} | Diff. Input Sensitivity | | 0.2 | | V |
| V_{CM} | Common Mode Range | | 0.8 | 2.5 | V |
| V_{OL} | Low-Level Output Voltage | $R_L = 1.425k$ to $3V6$ | 0.0 | 0.3 | V |
| V_{OH} | High-Level Output Voltage | $R_L = 14.25k$ to GND | 2.8 | 3.6- | V |

5.4 Power consumption and power down modes

To reduce power consumption of the BlueMod+C11/G2 power down modes can be activated automatically by the BlueMod+C11/G2 (controlled by parameter settings).

If no Bluetooth connection is established, the following states are implemented, the activation of these states can be controlled by the parameters *bpsm* and *pwd*.

For more details please refer to the BlueMod+C11/G2 software manual.

5.4.1 SPP configuration

5.4.1.1 Deep Sleep state

The Bluetooth RF is completely deactivated; no paging requests from other Bluetooth devices will be recognized. Only rising control line DTR will activate the BlueMod+C11/G2 and may initiate a Bluetooth link dependent on other parameters.

Note: In Deep Sleep state the AT command set is not active, CTS line is low

5.4.1.2 Power down state

The Bluetooth RF is activated every 1.25 seconds, paging requests from other Bluetooth devices will be recognized after that intervals and accepted if allowed. Additionally rising control line DTR will activate the BlueMod+C11/G2 and may initiate a Bluetooth link dependent on other parameters.

Note: In Power down state the AT command set is not active, CTS line is low

5.4.1.3 Idle state

The Bluetooth RF is activated every 1.25 seconds, paging requests from other Bluetooth devices will be recognized after that intervals and accepted if allowed. Additionally rising control line DTR will activate the BlueMod+C11/G2 and may initiate a Bluetooth link dependent on other parameters

5.4.1.4 Power Consumption

$V_{CC} = 3.3V$, $T_{amb} = 20^{\circ}C$, all I/O lines open

| Condition | Current Consumption | | Unit |
|---|---------------------|-------------------|------|
| | I _{MEAN} | I _{PEAK} | |
| RESET | 31 | 60 | mA |
| Deep sleep | 4,9 | 17,5 | mA |
| Power down | 9,1 | 147,8 | mA |
| Idle, all functions available, no Bluetooth link | 9,7 | 147,8 | mA |
| Page Scan | 9,5 | 147,0 | mA |
| Inquiry and Page Scan | 10 | 147,0 | mA |
| Bluetooth connected, no data traffic, max. TX PWR (Slave) | 34,1 | 150 | mA |
| ACL connected DH5 max PWR, shortest Poll Period (Slave) | 117,3 | 152,8 | mA |
| ACL connected DH5 min PWR, shortest Poll Period (Slave) | 61,7 | 75,2 | mA |
| ACL connected DH1 max PWR, shortest Poll Period (Slave) | 72,8 | 154,3 | mA |
| ACL connected DH1 min PWR, shortest Poll Period (Slave) | 49,7 | 73,7 | mA |

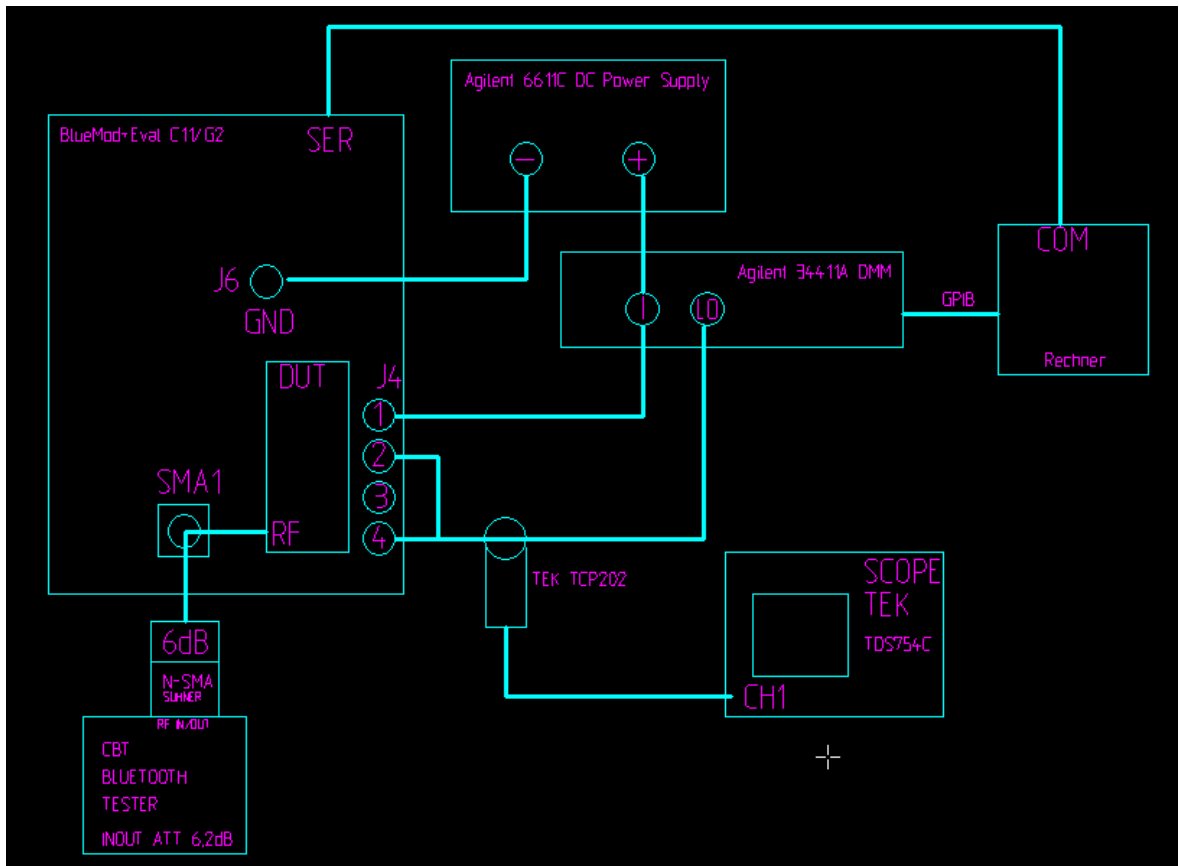


Fig. 3: MEASURMENT SET UP

5.5 RF performance

V_{cc} = 3.0V to 3.6V, T_{amb} = - 40°C to +85°C

| Receiver | Frequency [GHz] | Limit | | | BT Spec | Unit |
|--|-----------------|-------|-------|-----|---------|------|
| | | Min | Typ | Max | | |
| Sensitivity at 0.1% BER DH1 | 2.402 | -80,0 | -94,0 | | ≤-70 | dBm |
| | 2.441 | -80,0 | -93,0 | | | |
| | 2.480 | -80,0 | -93,0 | | | |
| Sensitivity at 0.1% BER DH5 | 2.402 | -80,0 | -93,0 | | ≤-70 | dBm |
| | 2.441 | -80,0 | -93,0 | | | |
| | 2.480 | -80,0 | -93,0 | | | |
| Sensitivity at 0.007% BER EDR2, PI/4 DQPSK | 2.402 | -80,0 | -96,0 | | ≤-70 | dBm |
| | 2.441 | -80,0 | -96,0 | | | |
| | 2.480 | -80,0 | -96,0 | | | |
| Sensitivity at 0.007% BER EDR3, 8DPSK | 2.402 | -74,0 | -88,0 | | ≤-70 | dBm |
| | 2.441 | -74,0 | -89,0 | | | |
| | 2.480 | -74,0 | -88,0 | | | |
| Maximum received signal at 0.1% BER with DH1 | | -20,0 | >10 | | ≥-20 | dBm |
| Maximum received signal at 0.1% BER with DH5 | | -20,0 | >10 | | ≥-20 | dBm |
| Maximum received signal at 0.1% BER with EDR2, PI/4 DQPSK | | -20,0 | -12,0 | | ≥-20 | dBm |
| Maximum received signal at 0.1% BER with EDR3, 8DPSK | | -20,0 | -18,0 | | ≥-20 | dBm |
| C/I co-channel ^{a)} | | | 9,2 | 11 | ≤ 11 | dB |
| Adjacent channel selectivity C/I f = f ₀ + 1MHz ^{a)} | | | -4,6 | 0 | ≤ 0 | dB |
| Adjacent channel selectivity C/I f = f ₀ - 1MHz ^{a)} | | | -1,9 | 0 | ≤ 0 | dB |
| Adjacent channel selectivity C/I f ≥ f ₀ + 2MHz ^{a)} | | | -42 | -30 | ≤ -30 | dB |
| Adjacent channel selectivity C/I f ≤ f ₀ - 2MHz ^{a)} | | | -23 | -20 | ≤ -30 | dB |
| Adjacent channel selectivity C/I f ≥ f ₀ + 3MHz ^{a)} | | | -47 | -40 | ≤ -40 | dB |
| Adjacent channel selectivity C/I f ≤ f ₀ - 5MHz ^{a)} | | | -49 | -40 | ≤ -40 | dB |
| Adjacent channel selectivity C/I f = f _{image} ^{a)} | | | -23 | -9 | ≤ -9 | dB |
| Intermodulation at 0.1%BER, GFSK, Interfererdistance CW +/- 5MHz & BT +/-10MHz | 2.412 | -39,0 | -36,0 | | < -39 | dB |
| | 2.441 | -39,0 | -36,0 | | | |
| | 2.470 | -39,0 | -36,0 | | | |

Notes:

a) For BER less then 0,1%. Applies according to BT Test Specification Ver. 1.2/2.0/2.0 + EDR only for T_{amb} = 20°C

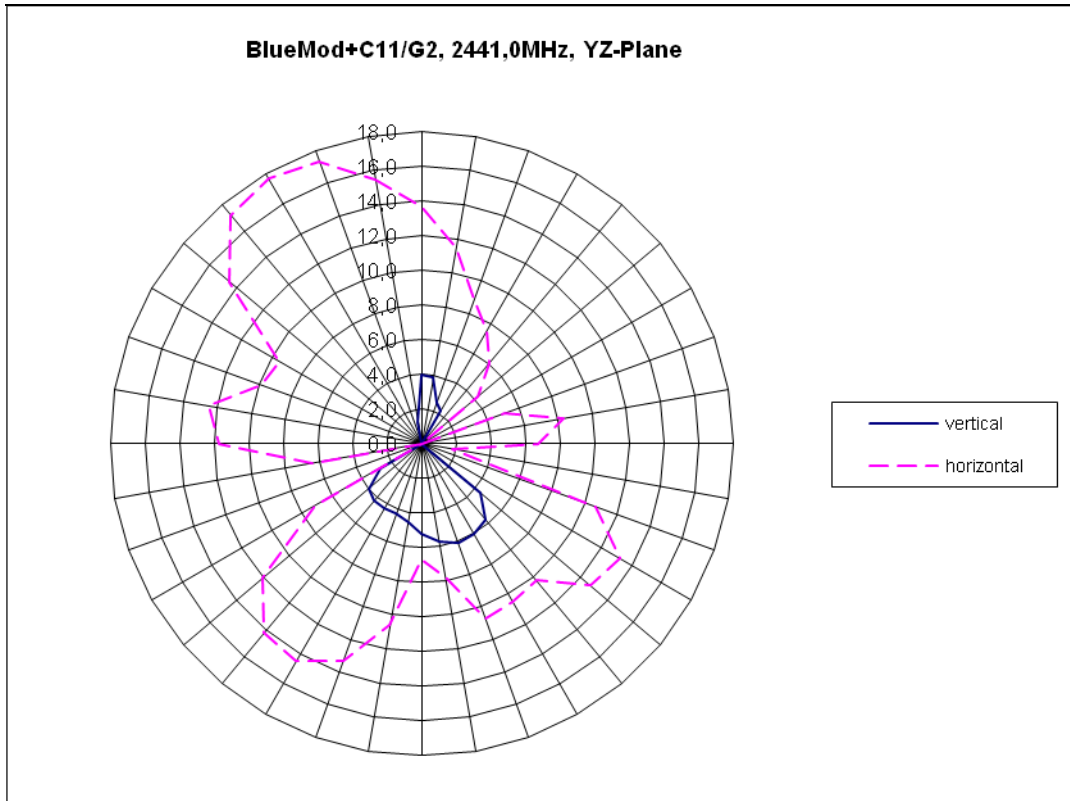
Vcc = 3.0V to 3.6V, Tamb = - 40°C to +85°C

| Transmitter | Frequency [GHz] | Limit | | | BT Spec | Unit |
|---|-----------------|-------|-------|-------|--------------------|-----------|
| | | Min | Typ | Max | | |
| RF transmit power at antenna Class 1 device GFSK ^{b)} | 2.402 | 16,0 | 18,8 | 19,0 | +4 to +20 | dBm |
| | 2.441 | 16,0 | 18,3 | 19,0 | | |
| | 2.480 | 16,0 | 17,9 | 19,0 | | |
| RF transmit power at antenna Class 1 device EDR2, PI/4 DQPSK ^{b)} | 2.402 GFSK | | 4,3 | | | dBm |
| | 2.402 DPSK | | 3,3 | | | |
| | 2.441 GFSK | | 3,8 | | | |
| | 2.441 DPSK | | 2,6 | | | |
| | 2.480 GFSK | | 3,3 | | | |
| | 2.480 DPSK | | 2,0 | | | |
| RF transmit power at antenna Class 1 device EDR3, 8DPSK ^{b)} | 2.402 GFSK | | 4,3 | | | dBm |
| | 2.402 DPSK | | 3,5 | | | |
| | 2.441 GFSK | | 3,8 | | | |
| | 2.441 DPSK | | 2,8 | | | |
| | 2.480 GFSK | | 3,1 | | | |
| | 2.480 DPSK | | 2,1 | | | |
| RF power control range | | | 17 | | | dB |
| RF power range control resolution | | | 4 | | 2 to 8 | dB |
| 20 dB bandwidth for modulated carrier | | | 930 | 1000 | ≤1000 | kHz |
| Initial carrier frequency tolerance | | | +/-5 | +/-30 | ≤ ±75 | kHz |
| Carrier frequency drift (packet DH1) | | | +/-15 | 25 | ≤ ±25 | kHz |
| Drift Rate | | | 8 | 20 | 20 | kHz/ 50µs |
| Δf _{1avg} "Maximum Modulation" | | 140 | 164 | 175 | ≥140 to ≤175 | kHz |
| Δf _{2avg} "Minimum Modulation" | | 115 | 154 | | ≥ 115 | kHz |

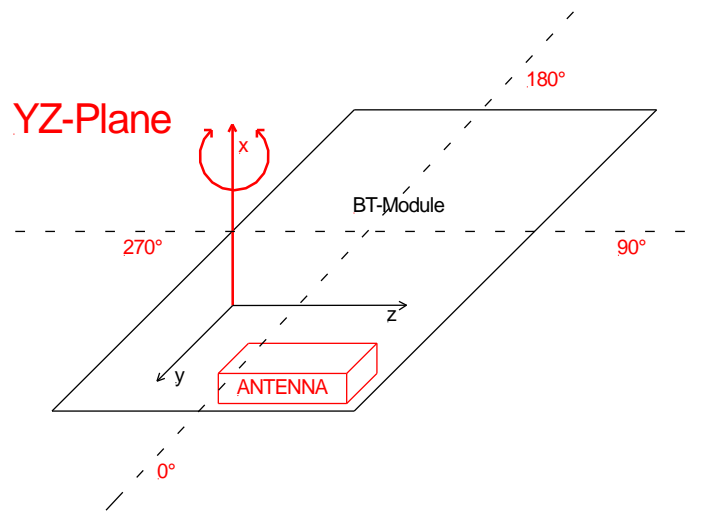
Notes: b) Including +2dBi antenna gain

5.5.1 Antenna-Gain and Radiation-Pattern

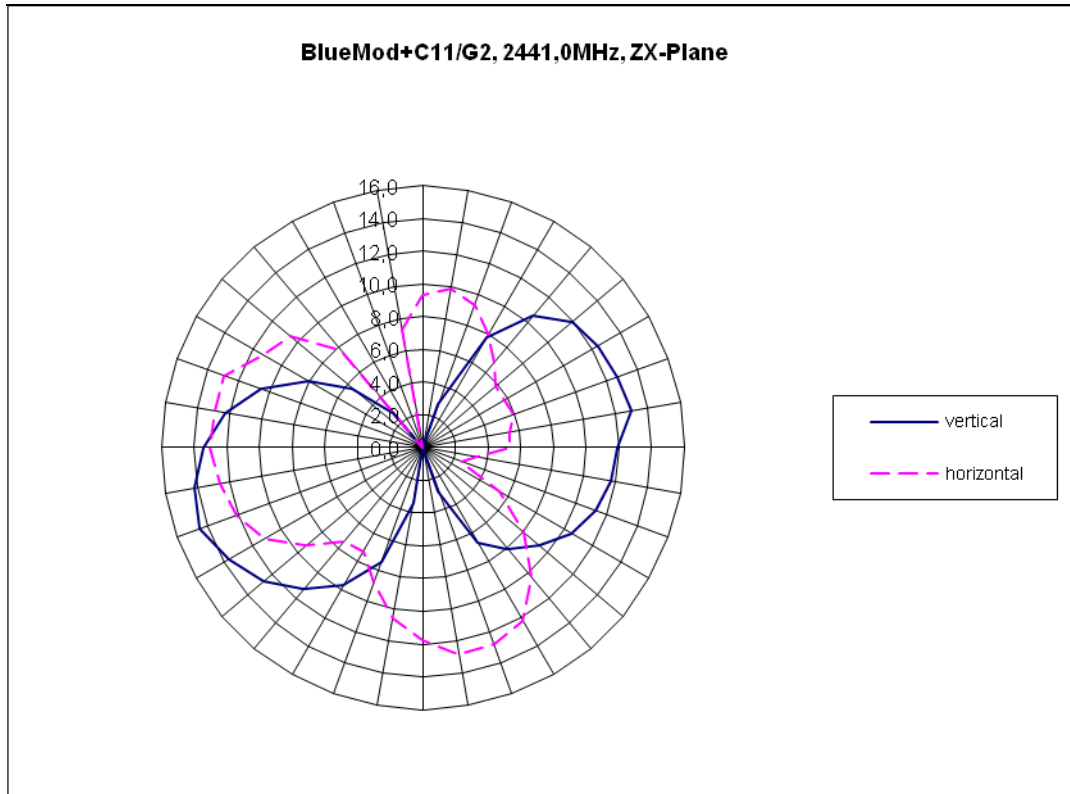
Peak Antenna-Gain = 2dBi



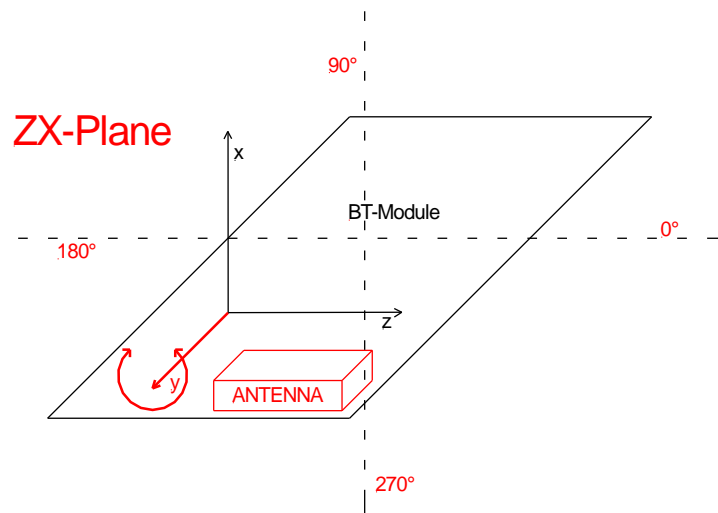
Rotation Axis is X



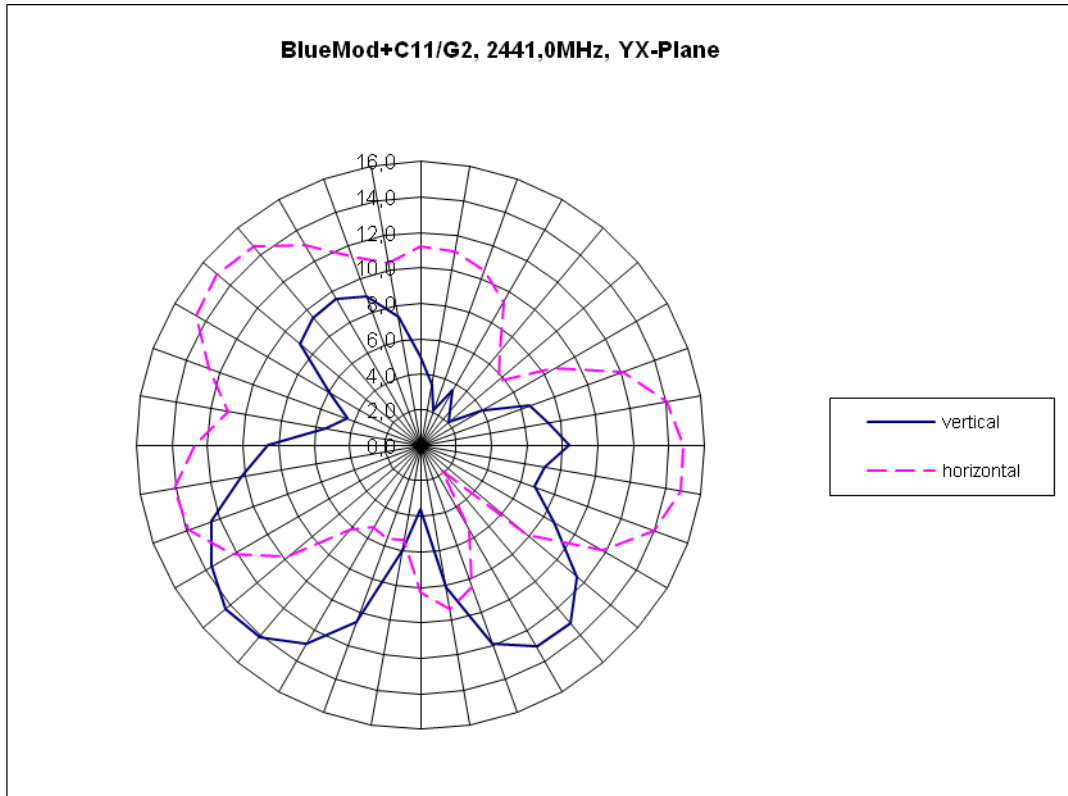
YZ-Plane Drawing, 0° is y-axis, 90° is z-axis



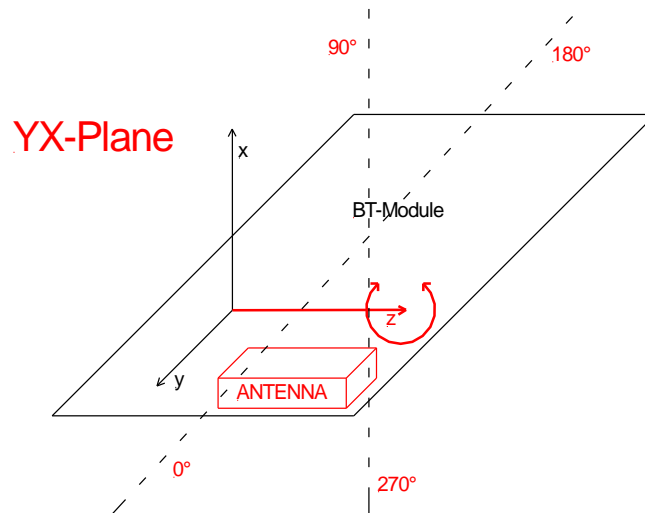
Rotations Axis is Y



ZX-Plane Drawing, 0° is z-axis, 90° is x-axis



Rotations Axis is Z



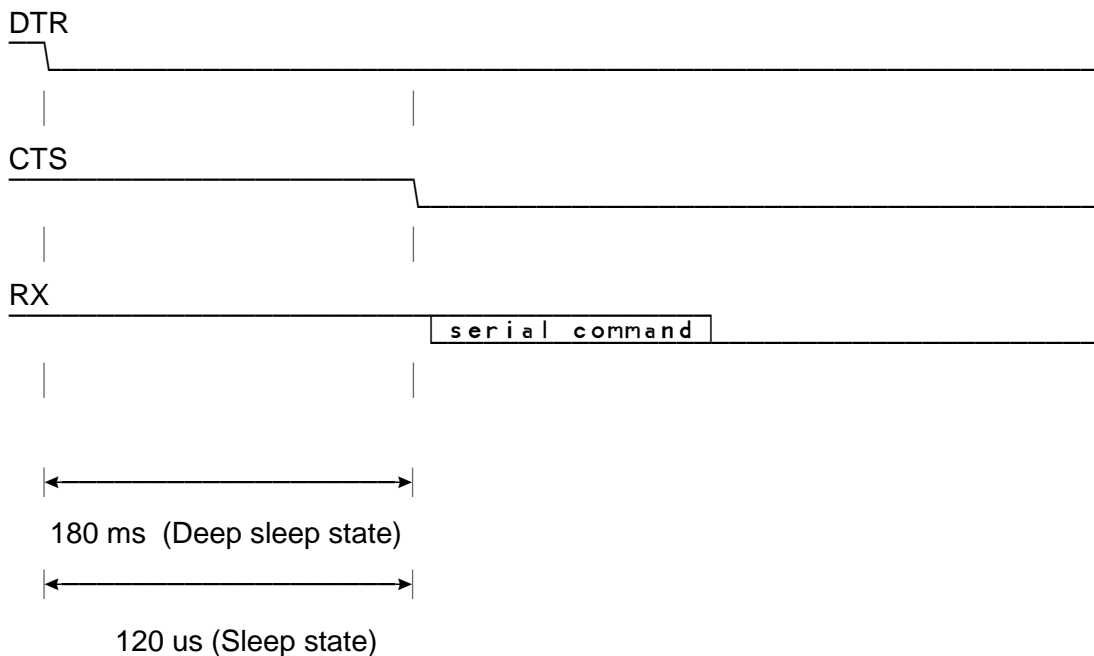
YX-Plane Drawing, 0° is y-axis, 90° is x-axis

5.6 Power-up Time

The time until the BlueMod+C11/G2 is able to accept link requests or serial data is about 4 seconds after power-up. This time can be reduced to approx. 1.5 seconds by parameter change.

5.7 Wake-up Time

The time until the BlueMod+C11/G2 is able to process commands coming from a sleep state / deep sleep state.

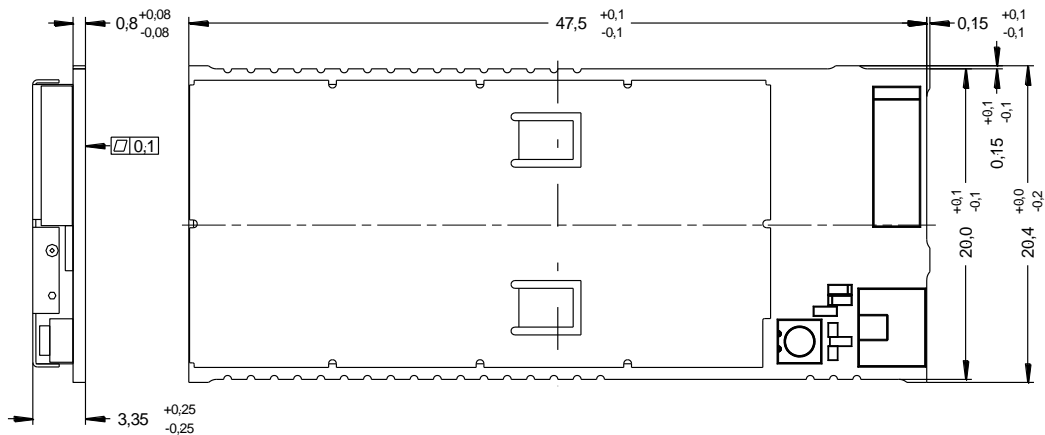


The module processes commands after 180ms coming from deep sleep state and accordingly after 120us coming from sleep (power-down) state.

Serial commands can be sent directly after CTS is active(low).

6 Mechanical Characteristics

6.1 Dimensions



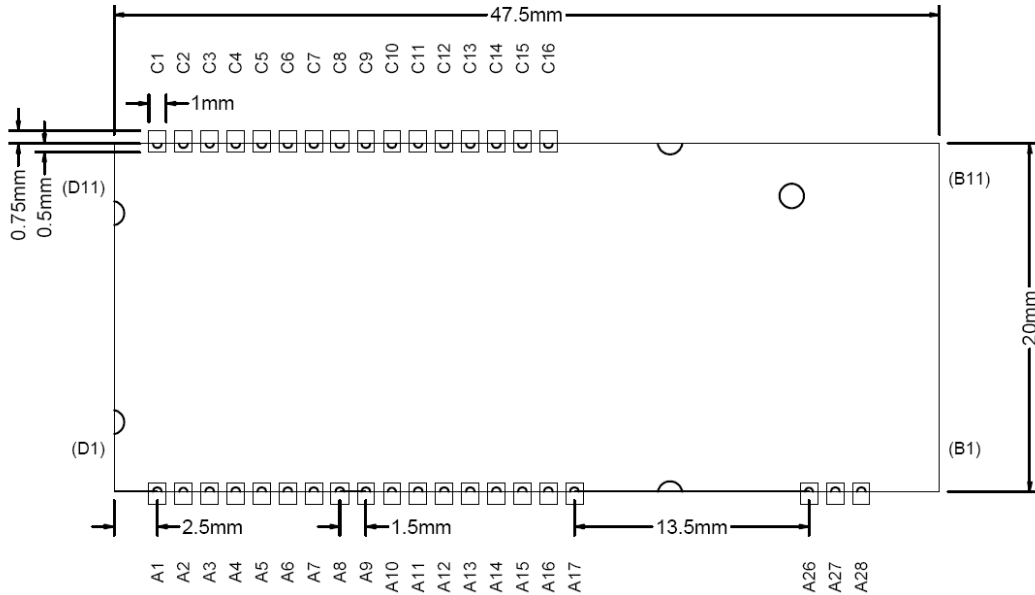
6.2 Connectors

Except for the stamp pins A-[1-17,26-28] and C-[1-16] and the UMP antenna connector no user accessible connectors are implemented.

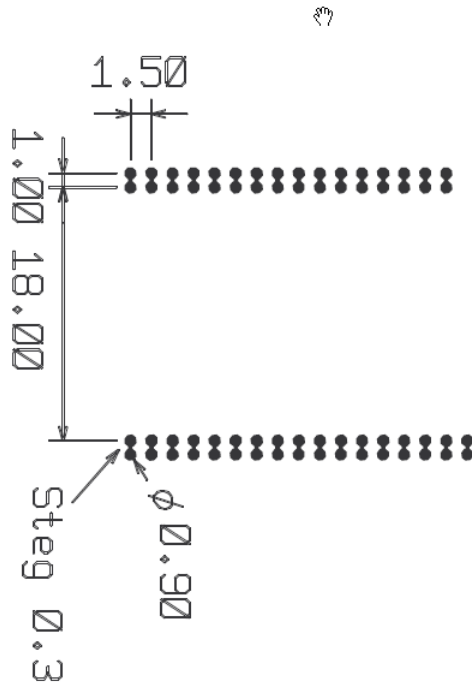
If the use of the UMP antenna connector is considered, please contact Stollmann for information on accessories like cables, plugs etc. Or look at www.radiall.com for the UMP type family. On the BlueMod+C11/G2 the following receptacle will be populated for RF signal routing, if the BlueMod+C11/G2/AE variant is ordered.

| Manufacturer | Type |
|--------------|--|
| Radiall | RADIALL: R107103020 UMP connector receptacle |

6.3 Recommended Land Pattern



Land pattern recommended for manual soldering

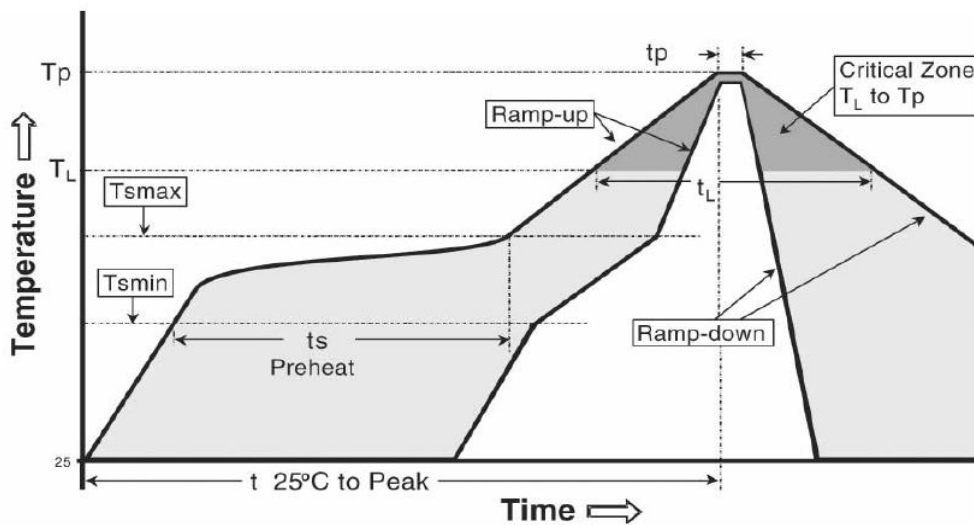


Alternative land pattern recommended for reflow soldering (preliminary)

6.4 Soldering Temperature-Time Profile (for lead-free re-flow soldering)

The data here is given only for guidance on solder and has to be adopted 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.

For lead-free solder



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 | 90 | 217 | 90 | 260 | 10 |
| | | 230 | 30 | | |
| 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 re-flow is prohibited due to module weight.

Devices will withstand the specified profile and will withstand up to 1 lead-free re-flows to a maximum temperature of 260°C.

6.5 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

6.6 Antenna Issues

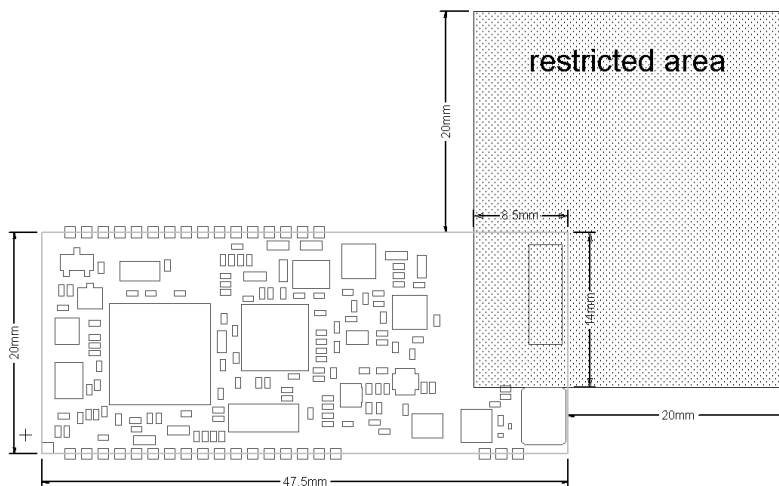
BlueMod+C11/G2 is shipped with 3 different antenna designs:

- BlueMod+C11/G2/-AI comprises a ceramic antenna which as a component is soldered to the circuit board. This is functional for a BlueMod+C11/G2/-AI integrated into a plastic housing. No additional antenna is required. For an external antenna to be set in, e.g. because the BlueMod+C11/G2 is integrated into a metal housing, the ceramic antenna is replaced by 2 alternative solutions
- BlueMod+C11/G2/AE has a UMP connector (50 Ohm technology) populated as Antenna Interface
- BlueMod+C11/G21/AP routes the antenna signal to pin A27.

The gain of the external antenna shall not exceed +2dB_i .

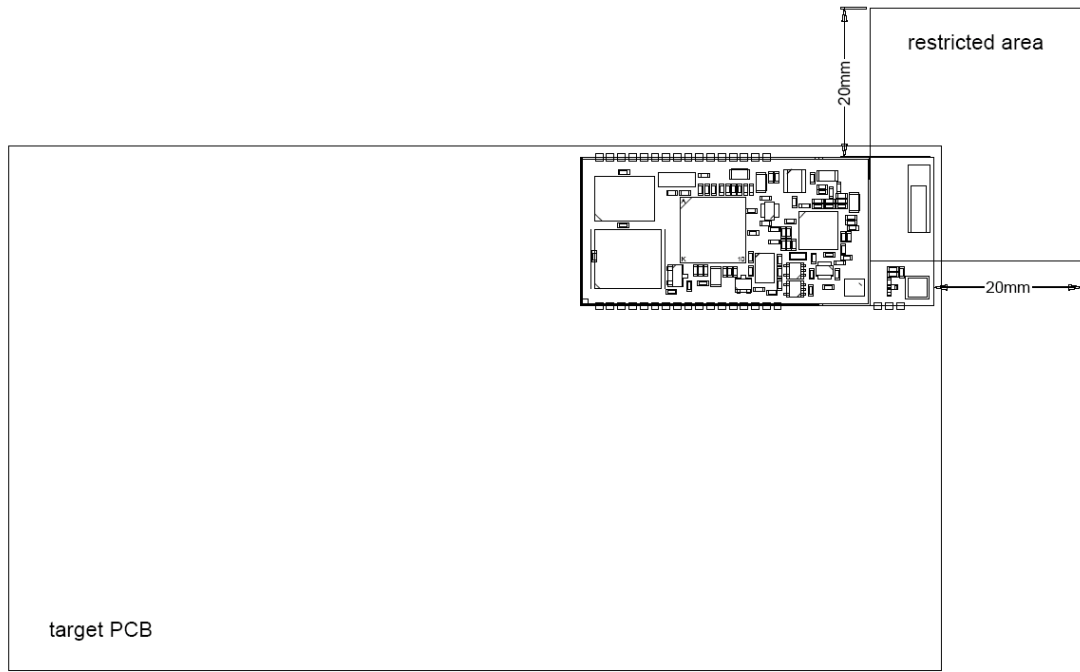
When using an external Antenna the antenna is fixed and cannot be removed or replaced by the end user. The performance of the internal antenna respectively the external antenna has in any case to be checked within the final integration environment. Adjacent PCBs, components, cables, housings etc. could otherwise influence the radiation pattern or be influenced by the radio wave energy.

It must be ensured that the antenna is not co-located or operating in conjunction with any other antennas, transmitters, cables or connectors. When the internal ceramic antenna is used, certain restrictions are to be considered.



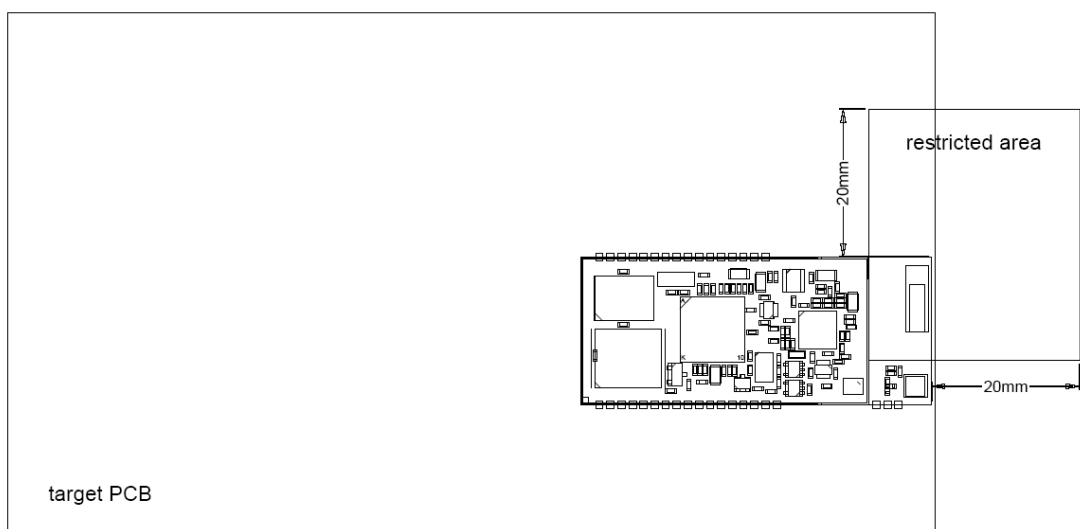
Antenna – recommended restricted area

To give an optimized antenna performance the restricted area having no ground or power planes, traces or parts should be widened. The following dimensions should be implemented, depending on your possible space.



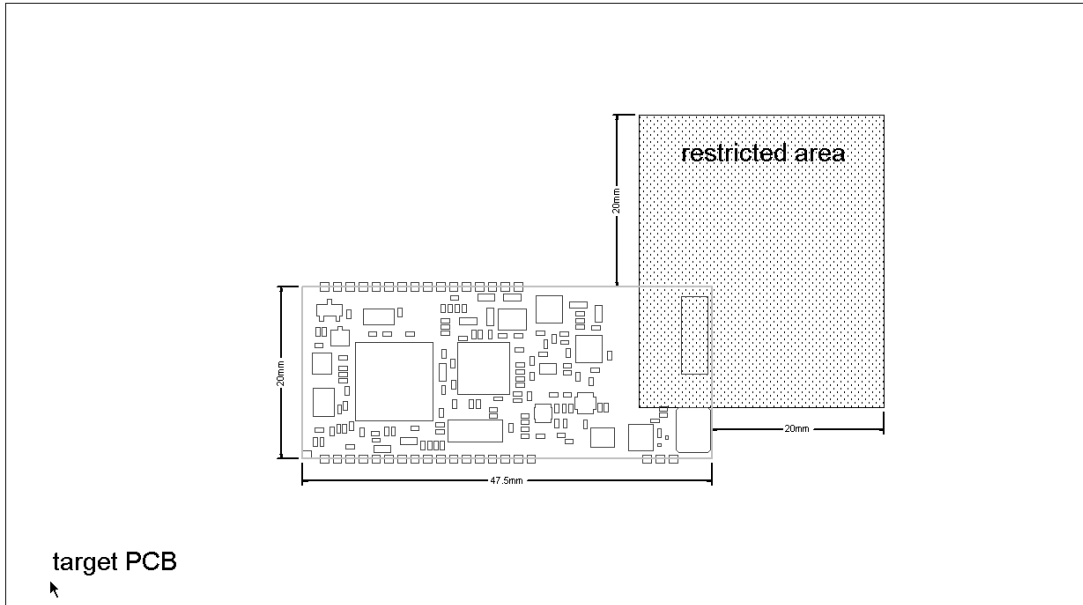
Optimal placement

The best position to place the **BlueMod+C11/G2** on the target PCB is in the upper right corner. This position is optimal concerning antenna interference; radiation pattern and PCB space that has to be kept free for the restricted area.



recomendable placement

When placing the BlueMod+C11/G2 at the right edge of the PCB ensure that the restricted area on the target PCB is free of planes, traces and parts.



acceptable, but not optimal placement

When placing the BlueMod+C11/G2 on other positions than the right side the complete restricted area should be kept free of planes, traces and parts.

6.7 Safety Guidelines

According to SAR regulation EN 50371-2002 the BlueMod+C11/G2 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 IEC 60950-1:2005 (2nd Edition) and EN60950-1:2006 + A11: 2009 all conductive parts of the BlueMod+C11 are to be classified as SELV circuitry. OEM's implementing the BlueMod+C11/G2 in their products should follow the isolation rules given in regulation EN 60950-1: 2001.

The PCB material of the BlueMod+C11/G2 is classified UL-94V0.

7 Approvals/Certifications

7.1 Declaration of conformity

Konformitätserklärung gemäß dem Gesetz über Funkanlagen und Telekommunikationsendeinrichtungen (FTEG) und der Richtlinie 1999/5/EG (R&TTE)

Declaration of Conformity in accordance with Radio and Telecommunications Terminal Equipment Act (FTEG) and Directive 1999/5/EC (R&TTE Directive)

Stollmann Entwicklungs- und Vertriebs-GmbH, Mendelssohnstr. 15d, D-22761 Hamburg,
Jens Jensen

Hersteller/Verantwortliche Person // The manufacturer / responsible person

erklärt, daß die Produktfamilie
declares that the product family

BlueMod+C11/G2 V5

Telekommunikationseinrichtung mit Verwendungszweck: Serielles Bluetooth Modul
Telecommunications terminal equipment with intended purpose: Serial Bluetooth Module

bei bestimmungsgemäßer Verwendung den grundlegenden Anforderungen des §3 und den übrigen einschlägigen Bestimmungen des FTEG (Artikel 3 der R&TTE) entspricht.
complies with the essential requirements of §3 and the other relevant provisions of the FTEG (Article 3 of the R&TTE Directive), when used for its intended purpose

Gesundheit und Sicherheit gemäß §3(1)1.(Artikel 3 (1) a))

Health and safety requirements pursuant to §3(1)1.(Article 3(1)a))

Konform zu IEC 62311, Gebrauch am menschlichen Körper nicht zugelassen

Conform to EN 62311, not intended to be used close to the human body

angewendete harmonisierte Normen

harmonised standards applied

EN 60 950-1: 2006 + A11:2009, EN 62311: 2008

Schutzanforderungen in Bezug auf die elektromagnetische Verträglichkeit §3(1)2, Artikel 3(1)b))

Protection requirements concerning electromagnetic compatibility §3(1)2, (Article 3(1)b))

angewendete harmonisierte Normen

harmonised standards applied

EN 301 489-1 V1.8.1 (tested mounted on Blue+EVA)

EN 301 489-17 V1.3.2 (tested mounted on Blue+EVA)

EN 300 328 V1.7.1

Elektromagnetische Verträglichkeit (Artikel 3.1.b der R&TTE-Richtlinie)

Electromagnetic compatibility (Article 3.1.b of the R&TTE Directive)

Effiziente Nutzung des Funkfrequenzspektrums (Artikel 3.2 der R&TTE-Richtlinie)

Efficient use of the radio frequency spectrum (Article 3.2 of the R&TTE Directive)

Ort, Datum

Place & date of issue

Hamburg, den 21.12.10

i.A.

Firmenstempel

Firm stamp

Stollmann Entwicklungs- und Vertriebs-GmbH

Mendelssohnstr. 15d
22761 Hamburg

Name, Unterschrift

Name and signature

7.2 FCC Grant

TCB

**GRANT OF EQUIPMENT
AUTHORIZATION**

TCB

Certification
Issued Under the Authority of the
Federal Communications Commission
By:

CETECOM ICT Services GmbH
Untertuerkheimer Strasse 6-10
D-66117 Saarbruecken,
Germany

Date of Grant: 02/09/2011
Application Dated: 02/09/2011

Stollmann E+V GmbH
Mendelssohnstrasse 15
Hamburg, 22761
Germany

Attention: Jens Jensen

NOT TRANSFERABLE

EQUIPMENT AUTHORIZATION is hereby issued to the named GRANTEE,
and is VALID ONLY for the equipment identified hereon for use under the
Commission's Rules and Regulations listed below.

FCC IDENTIFIER: RFR-C11G2

Name of Grantee: Stollmann E+V GmbH

Equipment Class: Part 15 Spread Spectrum Transmitter

Notes: Bluetooth module

Modular Type: Limited Single Modular

| <u>Grant Notes</u> | <u>FCC Rule Parts</u> | <u>Frequency Range (MHZ)</u> | <u>Output Watts</u> | <u>Frequency Tolerance</u> | <u>Emission Designator</u> |
|--------------------|-----------------------|----------------------------------|-------------------------|--------------------------------|--------------------------------|
| | 15C | 2402.0 - 2480.0 | 0.0505 | | |

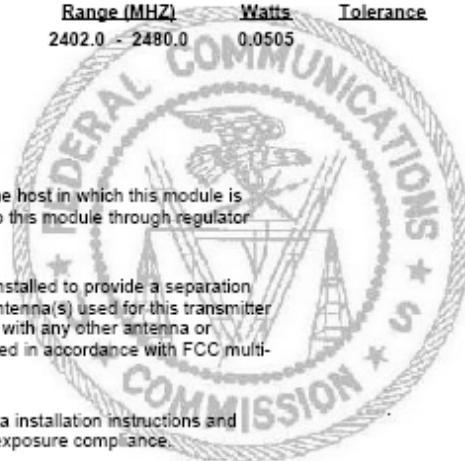
PCII filing.

Power Output listed is conducted.

Approval is limited to OEM installation only, and the host in which this module is
integrated should provide stable 3.3 VDC power to this module through regulator
circuit.

The antenna(s) used for this transmitter must be installed to provide a separation
distance of at least 20 cm from all persons. The antenna(s) used for this transmitter
must not be collocated or operating in conjunction with any other antenna or
transmitter within a host device, except as described in accordance with FCC multi-
transmitter product procedures.

Users and installers must be provided with antenna installation instructions and
transmitter operating conditions for satisfying RF exposure compliance.



7.3 IC Grant

| | | |
|--|--|--|
| CETECOM ICT Services GmbH Untertürkheimer Strasse 6-10, D-66117 Saarbrücken, Germany | |  |
| Conformity Assessment Body Recognized Conformity Assessment Body for Canada | | |
| CERTIFICATE OF CONFORMITY | | |
| Certificate Holder: | Stollmann E+V GmbH Mendelssohnstr. 15 22761 Hamburg Germany | |
| Model Identification: | BlueMod+C11/G2 BlueMod+C11/G2/AE | |
| Description: | Bluetooth Module | |
| Equipment Category: | Bluetooth Device Limited Modular Approval | |
| Standards and Specifications: | RSS-210 Issue 7 | |
| OATS Facility: | Cetecom ICT Services GmbH Untertuerkheimer Str. 6-10 66117 Saarbruecken Germany Phone: +49 681 598-0 Fax: +49 681 598-8775 Email: info@ict.cetecom.de | |
| OATS Facility ID: | 3462C-1 | |
| IC Certification Number: | 4957A-C11G2 | |
| Frequency Range: | 2402 – 2480 MHz | |
| Emission Designator: | 944KFXD (GFSK) / 1M28GXD (Pi4-DQPSK) / 1M28GXD (8DPSK) | |
| RF Output Rating: | 56 mW cond. / 3.5 mW cond. / 3.8 mW cond. | |
| Antenna Information: | BlueMod+C11/G2: On board Ceramic chip antenna BlueMod+C11/G2/AE: Ext. Flagpole antenna (WIMO 17010.010) | |
| CETECOM Registration No: | 1-2349-1/10 | |
| <p>Certification of equipment means only that the equipment has met the requirements of the above noted specification. License applications, where applicable to use certified equipment, are acted on accordingly by the issuing office and will depend on the existing radio environment, service and location of operation. This certificate is issued on condition that the holder complies and will continue to comply with the requirements of the radio standards specifications and procedures issued by Industry Canada. This certificate is issued on condition that the holder complies and will continue to comply with the requirements of the radio standards specifications and procedures issued by the Department. The Bureau will record the details of all certifications in the Department's Radio List (REL). Certified equipment shall not be distributed, leased, sold, offered for sale in Canada before the details of this certification have been added to the REL.</p> <p>URL: http://strategies.ic.gc.ca/sift/reltel/search/newRadioSearch.do?language=eng</p> | | |
| Recognized by | CETECOM ICT Services GmbH | |
|  CB ID: DE0001 | via  <small>Bundesnetzagentur</small> <small>BMWSA-CAB-03/22-01</small> |  |
| | | 2011-01-04 Date: Gerald Schmidt Signature: |

7.4 FCC Compliance and FCC Statement

This device complies with Part 15 of the FCC Rules and with RSS-210 of Industry Canada.

Operation is subject to the following two conditions:

This device may not cause harmful interference, and

This device must accept any interference received, including interference that may cause undesired operation.

7.4.1 Caution

Warning: Changes or modifications made to this equipment not expressly approved by Stollmann Entwicklungs und Vertriebs GmbH may void the FCC authorization to operate this equipment.

7.4.2 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.

The radiated output power of BlueMod+C11/G2 is far below the FCC radio frequency exposure limits. Nevertheless, the BlueMod+C11/G2 shall be used in such a manner, that the potential for human contact during normal operation is minimized.

7.4.3 RF-exposure Statement

The BlueMod+C11/G2 contains a modular transmitter. Thus it must have a separation of at least 20 cm between the antenna and the body of the user or nearby persons, excluding hands, wrists, feet, and ankles.

The rating of this distance depends on the intended use. Wall mounted or table desk devices are assumed to fulfill this requirement. If the intended use is to wear the portable modular transmitter close to the body, e.g. pocket device or head set a TCB should be consulted. Rules can be found via

<http://www.fcc.gov/oet/ea/eameasurements.html>

Any notification to the end user of installation or removal instructions about the integrated radio module is **not** allowed.

7.4.4 Labelling and re-test requirements for the End Product

Any End Product integrating the BlueMod+C11/G2 must be labeled with at least the following information:

| | |
|---------------------------------------|-------------|
| This device contains transmitter with | |
| FCCID: | RFR- C11G2 |
| IC ID: | 4957A-C11G2 |

Since the BlueMod+C11/G2 is a module to be integrated into a for the FCC authority unknown end product, the FCC approval under this ID is a "Limited Modular Approval", also called LMO. This implies that all OEM's incorporating the BlueMod+C11/G2 in their end product and wanting to ship to the USA or Canada have to measure spurious emissions according to FCC Part 15.247 in a FCC accredited EMC lab and have to keep the test report in their technical compliance folder ready for being checked by US/CA market authorities.

Note: The LMO is not applicable for the variant BlueMod+C11/G2/AP !

7.5 Bluetooth Qualification

The BlueMod+C11/G2 is a qualified design according to the Bluetooth Qualification Program Reference Document (PRD) V2.0. The Qualified Design ID (QDID) is:

B012419

For further information about marking requirements of your product attention should be paid the Bluetooth Product Marking Guide at https://programs.bluetooth.org/Download/Marking_Guide_20060601.pdf

According to the Bluetooth SIG rules (Qualification Program Reference Document – PRD V2.1) you are required to perform the mandatory End Product Listing (EPL) for your product. For further information see www.Bluetooth.org or contact Stollmann.



Bluetooth SIG Qualification Design (QDL) Certificate

QDL Certificate: This certificate represents the Specifications declared by the Member as having passed the Bluetooth Qualification/Certification Process as specified within the Bluetooth Specifications and as required within the PRD 2.0.

Design Name: **BlueMod+C11/G2**

Certified



This Product Design has passed the Bluetooth Qualification Process!

Specification Version: 2.0/2.0+EDR

QDID: B012419

Declared Specifications: Baseband Conformance, Radio, Service Discovery Protocol, Logical Link Control and Adaption Protocol, Generic Access Profile, Link Manager, Serial Port Profile, RFCOMM, Service Discovery Application Profile, Interoperability Test Specification, Host Controller Interface

| Member Company: | Requirements: | Project Dates: |
|---|--|---|
| Stollmann E+V GmbH Mendelssohnstr. 15d empty Hamburg, NA 22761 | 1. Testing 2. Documentation 3. Assessment 4. Declaration 5. Listing 6. Marking 7. Compliance to Auditing and Enforcement | Assessment Date: August/30/2007 Listing Date: August/30/2007 |

7.6 RoHS Declaration

Declaration of environmental compatibility for supplied products:

Hereby we declare to our best present knowledge based on declaration of our suppliers that this product do not contain by now the following substances which are banned by Directive 2002/95/EC (RoHS) or if contain a maximum concentration of 0,1% by weight in homogeneous materials for

- Lead and lead compounds
- Mercury and mercury compounds
- Chromium (VI)
- PBB (polybrominated biphenyl) category
- PBDE (polybrominated biphenyl ether) category

and a maximum concentration of 0,01% by weight in homogeneous materials for Cadmium and cadmium compounds

8 Related Documents

- ATMEL data sheet AT91SAM7Sxxx Rev. F
- CSR product data book BlueCore™4-ROM BC41B143A April 2006
- Radiall UMP MMP Introduction
- Radiall data sheet UMP R107.103.020Stollmann BlueRS+ - SPP
- Stollmann AT Command Reference
- Bluetooth SIG RF_TS_EDR.pdf test specification

9 Ordering Information

The BlueMod+C11/G2 is available in the following variants:

| Name | Antenna | Art No. |
|---|----------|---------|
| BlueMod+C11/G2/AI/SPP | Internal | 52672 |
| BlueMod+C11/G2/AE/SPP | External | 52733 |
| BlueMod+C11/G2/AP/SPP ¹ | External | 52742 |
| SPP Evaluation Kit BlueEva+C11/G2/SPP, | Internal | 52743 |

Other variants on request, please contact Stollmann sales department.

¹ FCC ID RFR- C11G2 and IC ID 4957A-C11G2 are not applicable for this variant.

10 History

| Version | Release Date | By | Change description |
|---------|--|--------------------|---|
| 0.1 | 20.10.2006 | JJ | Initial Document - preliminary |
| 0.2 | 27.10.2006 | JJ | Updated Alternative GPIO Functionality, Name correction |
| 1.0 | 20.02.2007 | JJ | Updated to evaluated data |
| 1.1 | 15.03.2007 | JW | General revision, First final version |
| r02 | 29.08.2007 | BG | New template |
| r03 | 17.09.2008 11.12.2008 | HB AA | 5.7 Wake-up Time: chapter added 5.2 Environmental Requirements: chapter moved 6.1 Dimensions: Added module height 3.4.1RS-485 Support: chapter added 3.2 Power-up slew-rate new chapter 5.5.1 Antenna-Gain and Radiation-Pattern added 6.4 Soldering Temperature-Time Profile (for lead-free re-flow soldering) corrected |
| r04 | 23.03.2009 15.04.2009 20.04.2009 | JJ AA JW | 7.1.4 RF Exposure Info 20cm instead of 2,5cm FCC PCC1 5.5 Receiver Sensitivity min. Value 6.4 Soldering Temperature-Time Profile (for lead-free re-flow soldering) in accordance with IPC corrected product name in 2 Block Diagram added EPL statement in chapter 7.5 Bluetooth Qualification URL link to active document version added in chapter 1 Introduction |
| r05 | 04.09.2009 | AA JW | changed requirements for GND pins in chapter 3.7 Bluetooth radio Interface and 4.2.1 General Pin Description updated chapter 7.1 Declaration of conformity |
| r06 | 03.12.2010 | HB | Initial Version for HW V5 / TCB upload removed PCM Interface changed mechanical characteristics changed radiation pattern changed title picture |
| r07 | 08.12.2010 | AA HB | 5.5 RF Performance for HW V5 Changed title Picture 7.1 added Declaration of conformity 7.2 added FCC Grant 7.3 added IC Grant |

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