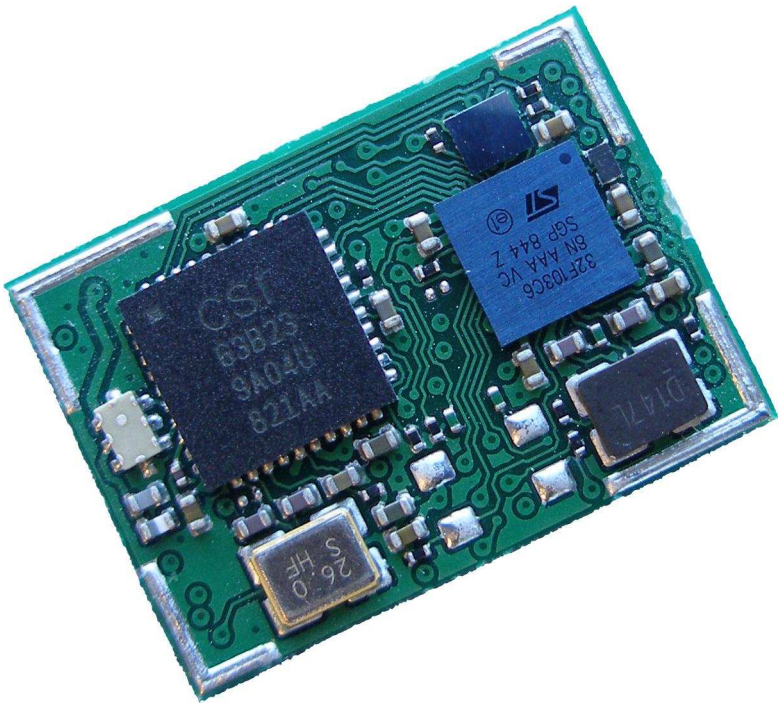
BlueMod+P24/G2

BlueMod+P25/G2

Hardware Reference

Release r02



Note

This device was developed for the purpose of communication in an office environment. It is intended solely for our industrial clients for physical integration into their own technical products after careful examination by experienced technical personnel for its suitability for the intended purpose. The device was not developed for or intended for use in any specific customer application. The firmware of the device may have to be adapted to the specific intended modalities of use or even replaced by other firmware in order to ensure flawless function in the respective areas of application. Performance data (range, power requirements, 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. Variations in the performance data of mass-produced devices may occur due to individual differences between such devices. Device 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 device for a specific purpose as defined by our customers. Stollmann reserves the right to make changes to the hardware or firmware or to the specifications without prior notice or to replace the device with a successor model. Of course, any changes to the hardware or firmware of any devices 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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Table of contents

1 Introduction

1.1 Feature Summary

Bluetooth specification v2.0 + EDR (**E**nhanced **D**ata **R**ate)

CSR BlueCore6-ROM inside

Complete Co-location and Co-existence with IEEE 802.11 (AWMA, AFH and SFH)

Fast Connection Setup

Extended SCO Link

RF output power class 2 with power control

Supply Voltage 3.0V to 3.6V

Internal crystal oscillator (26MHz, 14.7456 MHz and optional 32 kHz for deep sleep)

Surface mount type

BlueMod+P24/G2: 13.5 x 18.75 x 2.85 mm

BlueMod+P25/G2: 13.5 x 22.75 x 2.85 mm

Shielded to be compliant to FCC

Full Bluetooth data rate up to 2178kbps asymmetric

Support for all Bluetooth power saving modes (Park, Sniff, Hold)

Support for very low-power modes (deep sleep and power down)

Optional support for ultra-low-power mode. Standby with Battery-Backup

PCM Interface Master / Slave supporting 13 or 16 bit linear, 8 bit µ-law or A-law Codec and CVSD transcoders on up to 3 SCO channels

Full 8- to 128-bit encryption

High sensitivity design (-86 dBm typ.)

3 UART, USB, I2C and 2 SPI Interfaces

18 GPIO’s for individual usage for your embedded software

3 Channel ADC and 1 Channel DAC

Cortex-M3 ST32F103 core for embedded profiles or application software

Manufactured in conformance with RoHS

1.2 Applications

All Embedded Wireless Applications

- Access Points
- Printer Adapters
- Printers
- Scanners
- Wireless Sensors
- Cable Replacement
- Personal Digital Assistants (PDAs)
- Access Points
- Computers and Peripherals
- Industrial Control Applications

2 Block Diagram

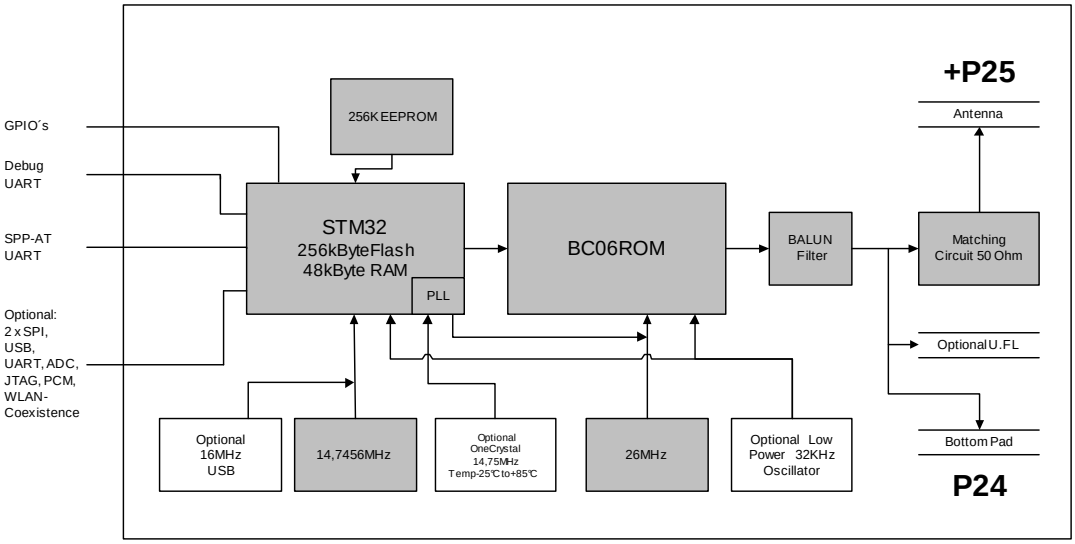


Figure 2.1 BlueMod+P24/5/G2 Block-Diagram

3 Application Interface

3.1 Power Supply

Both BlueMod+P24/G2 and BlueMod+P25/G2 require a power supply with the following characteristics:

- Typical : 3.3VDC, min.: 2.8VDC – max.: 3.6VDC, low noise (≤10mV), >80mA peak

Due to the technological requirements and the pulsed radio transmission the supply needs to be fed by an ultra fast (response time ≤20µs) linear regulator placed as close as possible to the VSUP pin (16). Functionality has been verified with the following types: TOREX: XC6204x332xx or XC6401xx42xx

It is also recommended to place a low ESR capacitor with at least 10µF as close as possible to the VSUP pin (16).

NOTE: You must ensure that during operation the supply voltage never drops below 2.8 VDC. Otherwise the flash contents (firmware and/or configuration data) can get lost

3.2 Power-up / -down slew-rate

Parameter	Min	Max	Unit
V_{SUP} rise time rate	0	∞	µs/V
V_{SUP} fall time rate	20	∞	

3.3 Optional Battery-Backup[1,2]

An optional ultra-low-power mode including a Battery-Backup Function is supported by Pin D. The Voltage Range at VBAT should be 1.8V – 3.6V and depends on the optional Crystal oscillator voltage range. (e.g. 2.8V +/-10% for a 3V lithium coin cell)

[1] subject to firmware support, contact Stollmann for current status

[2] subject to hardware support, contact Stollmann for availability of variants

3.4 Reset

Both BlueMod+P24/G2and BlueMod+P25/G2 are equipped with circuitry for generating PowerOn/-Off Reset from the internal Voltage VSUP. A reset is generated when the VSUP falls below typically 1,88V and is released when it rises above typically 1,92V. In case of Power-On, Power-Off, Watchdog, Low-Power or Software, RESET# acts as an Output by holding RESET# at ≤ 0.3V for min. 1,5ms and max. 3,5ms.

In an application with an **external** Reset as an Input, for example external Reset-Controller, we recommend to use Open-Drain-Output for this circuit. An external reset shall be generated at RESET# ≤ 0.3V for ≥ 5ms after VSUP has stabilized in the recommended voltage range.

3.4.1 Pin State on reset

The following table shows the pin states of BlueMod+P2x/G2 on reset.

Pin Name	State: BlueMod+P2x/G2
UART_RTS#	Input Floating
UART_TXD	Input Floating
UART_RXD	Input Floating
UART_CTS#	Input Pull-Up
GPIO[0] – GPIO[13], GPIO[16], GPIO[17]	Input Floating
GPIO[14]	Input Pull-Up
GPIO[15]	Input Pull-Up
Boot0	Input Pull-Down
ATRST	Input Pull-Up
ATDI	Input Pull-Up
ATMS	Input Pull-Up
ATDO	Input Floating
ATCK	Input Pull-Down
USB_DM	Input Floating
USB_DP	Input Floating

3.5 Serial Interface

The functionality of the interface corresponds to the V.24 / RS-232 standard on TTL-level.

- Transmission speeds:
  - 1200 bps
  - 2400 bps
  - 4800 bps
  - 9600 bps
  - 19200 bps
  - 38400 bps
  - 57600 bps
  - 115200 bps
  - 230400 bps
  - 460800 bps
  - 921200 bps
- Character representation:
  - 8 Bit, even/odd/no Parity, 1 or 2 stop bits
  - 7 Bit, even/odd Parity, 1 or 2 stop bits
  - 7 Bit no Parity, 2 stop bits
- Hardware flow-control with UART_RTS and UART_CTS (active low)

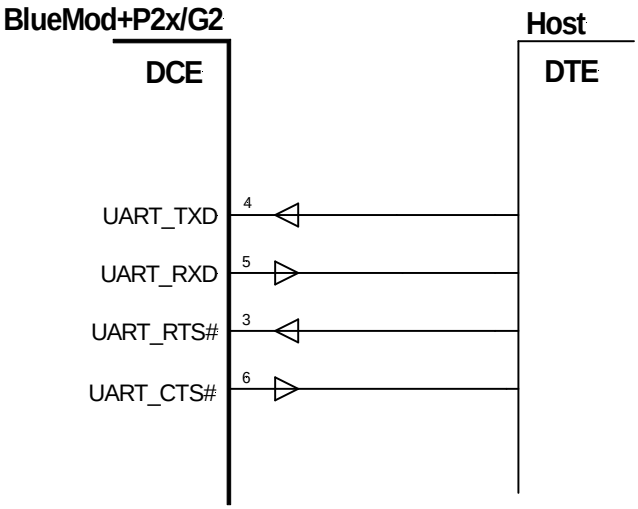


Figure 3.1 BlueMod+P2x/G2 Serial Interface

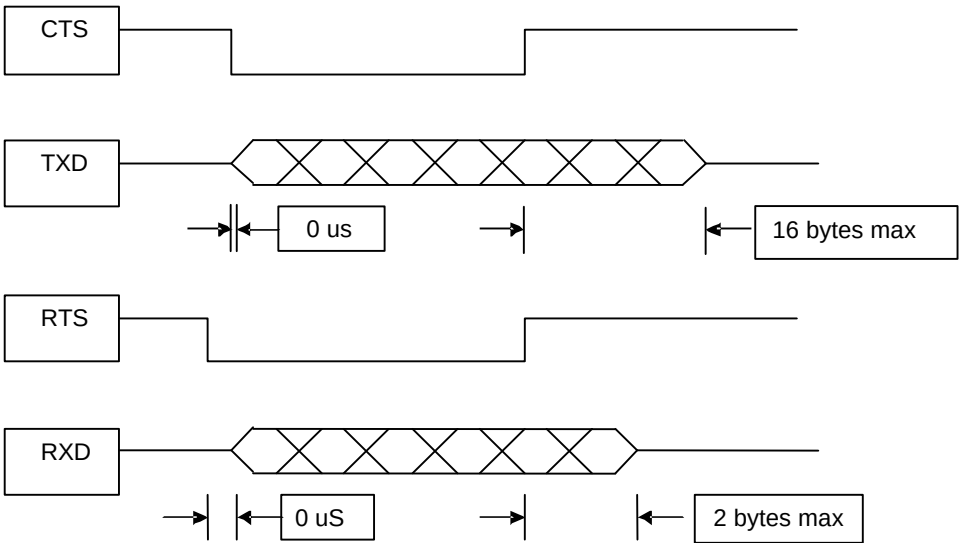


Figure 3.2 BlueMod+P2x/G2 UART Timing Diagram

3.5.1 3-wire Serial Interface

When using only GND and UART_Rx, UART_Tx serial lines, you may leave UART_RTS# and UART_CTS# open.

Note: Not using flow control can result in loss of data.

3.6 GPIO Interface

It is possible to use the programmable digital I/Os GPIO[0:17]. The Current from GPIO[17] is limited to 3mA max.

For 5V tolerant GPIO´s refer to chapter 4.2.2.1

3.7 ADC[3]

It is possible to use the programmable I/Os PIO[0:3,6,7,13:15] as ADC.

The 12-bit ADC is a successive approximation analogue-to-digital converter. A/D conversion can be performed in single, continuous, scan or discontinuous mode.

3.8 DAC[4]

It is possible to use the programmable I/Os PIO[2,3] as ADAC

The DAC module is a 12-bit, voltage output digital-to-analogue converter. The DAC can be configured in 8- or 12-bit mode and may be used in conjunction with the DMA controller.

3.9 Bluetooth radio Interface

The BlueMod+P24/G2 presents no integrated ceramic antenna whereas provides a 50Ω RF Interface.

The BlueMod+P25/G2 presents an integrated ceramic antenna.

Note: It is highly recommended that you follow the design rule given in this document chapter 6.4 Antenna Issues and the Stollmann Application Note on Antenna design [2].

[3] subject to firmware support, contact Stollmann for current status

[4] subject to firmware support, contact Stollmann for current status

3.10 PCM Interface[5]

PCM or Pulse Code Modulation is a sampling technique for digitising analogue signals.

The PCM interface for voice applications is provided via the PCM_OUT, PCM_IN, PCM_CLK and PCM_SYNC pins.

The PCM interface can act as master or as slave device.

In master mode, clock frequencies of 128kHz, 256kHz or 512kHz can be generated, when using the internal 4MHz clock. In slave mode, clock frequencies up to 2048kHz are accepted.

The Frame Clock is 8kHz. Long and Short Frame Sync are supported.

Both BlueMod+P24/G2 and BlueMod+P25/G2 interface directly to PCM audio devices including the following:

OKI MSM7705 four channel A-law and µ-law codec

Motorola MC145481 8-bit A-law and µ-law codec

Motorola MC145483 13-bit linear codec

WINBOND W681310 8-bit A-law and µ-law codec

WINBOND W681360 13-bit linear codec

STW 5093 5094 14-bit linear codec

BlueMod+P2x/G2 is also compatible with the Motorola SSI interface

3.11 USB Interface[6,7]

3.11.1 USB_DP, USB_DN

BlueMod+P2x/G2 contain a full speed USB version 2.0 compliant interface capable of directly driving an USB cable. The BlueMod+P2x/G2 operates as a USB peripheral and responds to requests from a USB master host controller.

[5] subject to firmware support, contact Stollmann for current status

[6] subject to firmware support, contact Stollmann for current status.

[7] subject to hardware support, contact Stollmann for availability of variants

3.11.2 USB Self-Powered Mode

In USB self-powered mode, the BlueMod+P2x/G2 is powered from its own power supply and not from the USB Vbus line. In order to detect when the USB Vbus line is powered up, the USB Vbus line is monitored by PIO[3] through a voltage divider.

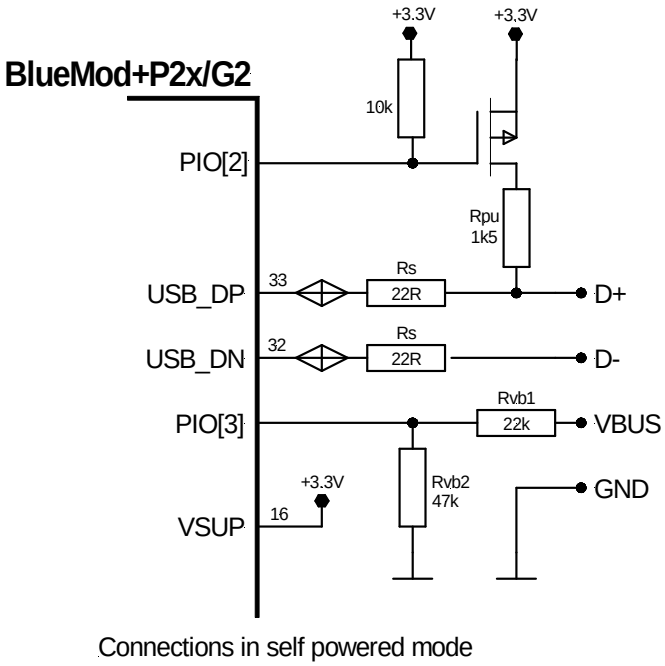


Figure 3.3 BlueMod+P2x/G2 USB Self-Powered Mode

In self powered mode a 1.5KΩ pull up resistor needs to be connected between PIO[2] and the USB D+ line. This pulls the USB D+ line high when the BlueMod+P2x/G2 is ready for enumeration, signalling to the host controller that the BlueMod+P2x/G2 a full speed (12Mbps) USB device.

3.11.3 USB Bus-Powered Mode

In USB bus-powered mode, the BlueMod+P2x/G2 is powered from the USB Vbus line by means of a Low Drop Out (LDO) Voltage Regulator. When choosing the LDO Voltage Regulator for supplying the +3.3V power to the the BlueMod+P2x/G2, some factors that need to be considered are:

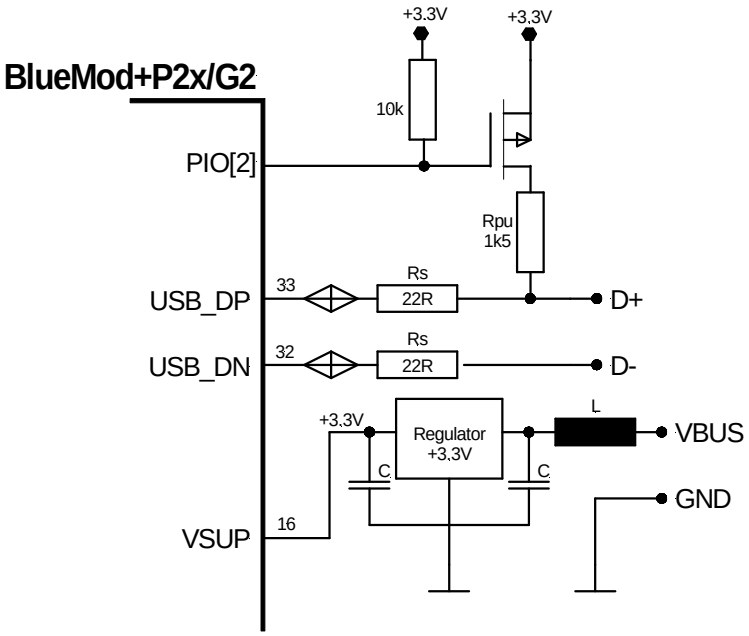
The voltage specification for the USB Vbus line is +4.75V to +5.25V.

The total current required (average and peak) for the design.

The voltage regulator's drop out voltage vs. output current.

The voltage regulator's power dissipation over the operating temperature range.

Filtering requirements on the USB Vbus line to attenuate noise above the voltage regulator's bandwidth.



Connections in bus powered mode

Figure 3.4 BlueMod+P2x/G2 USB Bus-Powered Mode

For details see related Software- or Interface- description.

3.12 Serial Peripheral Interface[8]

The serial peripheral interface (SPI) allows half/full-duplex, synchronous, serial communication with external devices. The interface can be configured as the master and in this case it provides the communication clock (SCK) to the external slave device. The interface is also capable of operating in multi master configuration.

It may be used for a variety of purposes, including simplex synchronous transfer on two lines with a possible bidirectional data line or reliable communication using CRC checking.

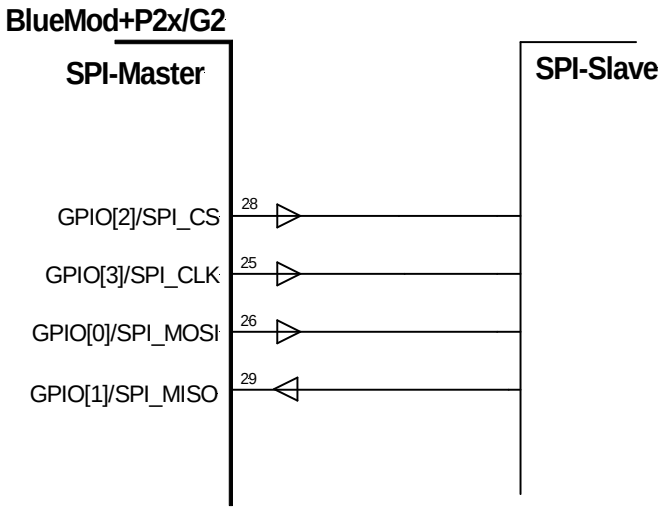


Figure 3.5 BlueMod+P2x/G2 SPI Interface e.g. in Master Mode

[8] subject to firmware support, contact Stollmann for current status.

3.13 I2C Interface[9]

The I2C bus interface serves as an interface between the internal microcontroller an the serial I2C bus. It provides multi master capability, and controls all I2C bus specific sequencing, protocol, arbitration and timing. It supports standard (100kHz) and fast (400kHz) speed modes.

GPIO[11]/I2C SDA and GPIO[12]/I2C SCL can be used to form an I^2C interface. It is recommended to connect 4k7Ω Pull-up Resistors on GPIO[12]/I2C_SCL and GPIO[11]/I2C_SDA.

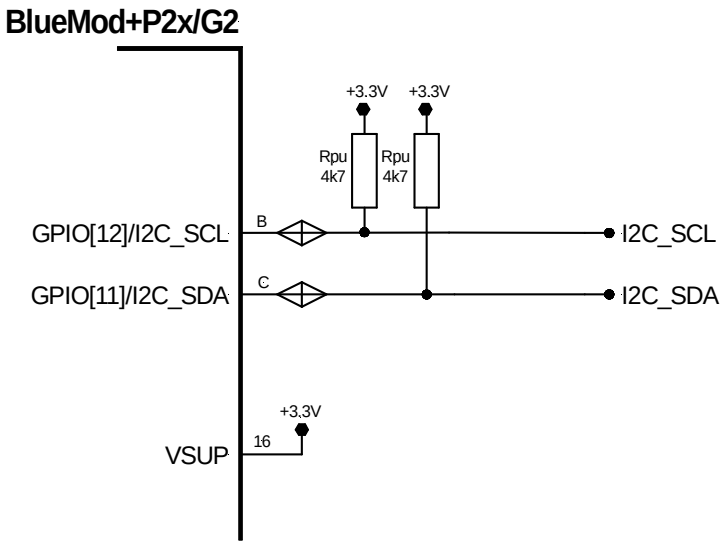


Figure 3.6 BlueMod+P2x/G2 I2C Interface

[9] subject to firmware support, contact Stollmann for current status.

4 Pin Description

4.1 Pin Numbering

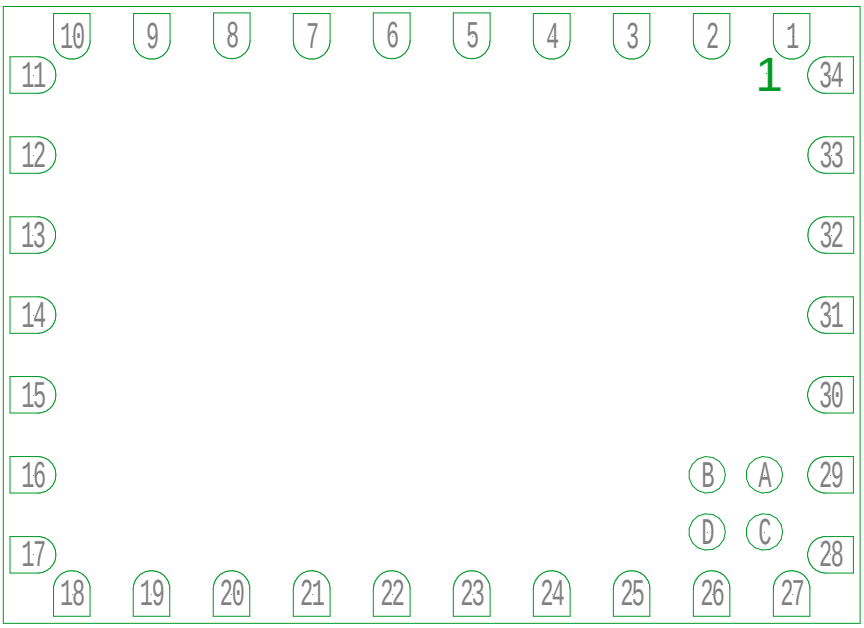


Figure 4.1 BlueMod+P24/G2 Pin Numbering

(Bottom-View)

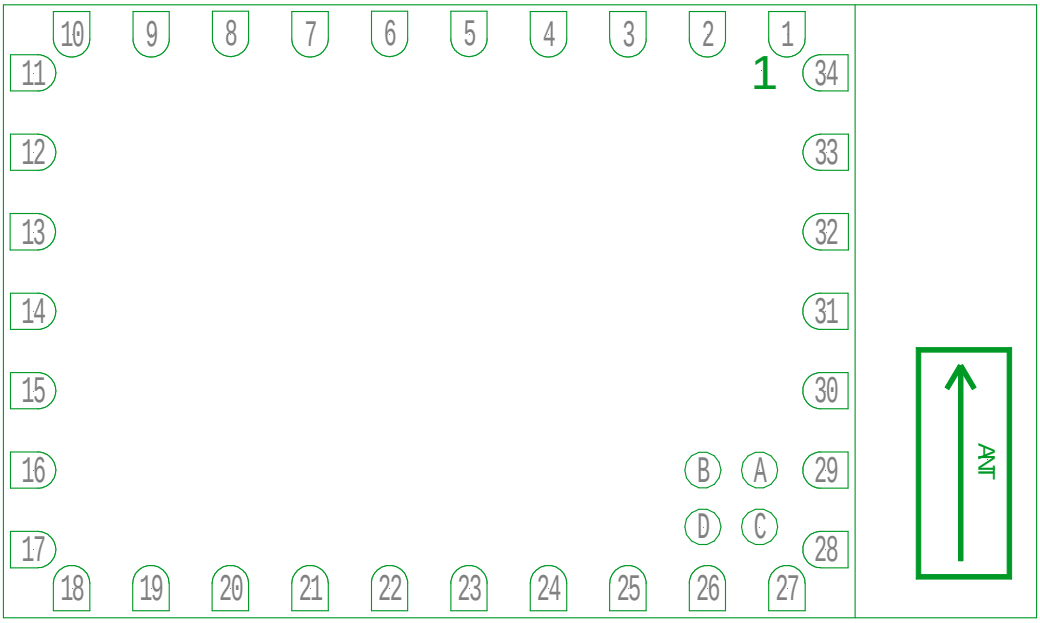


Figure 4.2 BlueMod+P25/G2 Pin Numbering

(Bottom-View)

4.2 Pin Description

4.2.1 General Pin Description

No	Pin Name	Type	PU/PD	Active	Description
1	GND1	P	-	-	Connect to Ground
2	ANT	I/O	-	-	Antenna Connector
3	UART_RTS#	I	PD	H	UART Request To Send (active low)
4	UART_TXD	I	PD	L	UART Data Input, weak internal Pull-Down
5	UART_RXD	O	-	L	UART Data Output
6	UART_CTS#	O	-	H	UART Clear To Send, internal Pull-Up
7	GPIO[9]/PCM_CLK	I/O	PU	L	General Purpose Input/Output, weak internal Pull-Up / PCM Data Clock Output
8	GPIO[10]/PCM_O/TXD3	I/O	PU	L	General Purpose Input/Output, weak internal Pull-Up / PCM Data Output/ UART3 DATA Output
9	GPIO[7]/PCM_SYNC	I/O	PD	H	General Purpose Input/Output, weak internal Pull-Down / PCM Data Sync Output
10	GND2	P	-	-	Connect to Ground
11	ATRST/SPI2_MISO	I/O	PU	H	JTAG reset, internal Pull-Up / SPI2 Master In - Slave Out
12	GPIO[8]/PCM_I/RXD3	I/O	PU	L	General Purpose Input/Output, weak internal Pull-Up / PCM Data Input / UART3 DATA Input
13	ATDI/SPI2_CS	I/O	PU	-	JTAG test data input, weak internal Pull-Up / SPI2 Chip Select
14	ATMS	I	PU	-	JTAG mode select, weak internal Pull-Up
15	RESERVED	I	PD	-	for Debug-Use only, leave open
16	VCC	P	-	-	VCC
17	RESET#	I/O	PU	L	Reset input/output
18	GND3	P	-	-	Connect to Ground
19	GPIO[14]	I/O	PU	L	General Purpose Input/Output, weak internal Pull-Up
20	GPIO[13]	I/O	PD	H	General Purpose Input/Output, weak internal Pull-Down
21	GPIO[15]	I/O	PU	L	General Purpose Input/Output, weak internal Pull-Up
22	GPIO[6]/ADC	I/O	PD	H	General Purpose Input/Output, weak internal Pull-Up / ADC Input
23	ATDO/SPI2_SCK	O	PU	-	JTAG test data output
24	ATCK	O	PD	-	JTAG clock, weak internal Pull-Down
25	GPIO[3]/SPI_CLK	I/O	PD	H	General Purpose Input/Output, weak internal Pull-Down / SPI Clock
26	GPIO[0]/SPI_MOSI	I/O	PD	H	General Purpose Input/Output, weak internal Pull-Down / SPI Master Out – Slave In
27	GND4	P	-	-	Connect to Ground
28	GPIO[2]/SPI_CS	I/O	PD	H	General Purpose Input/Output, weak internal Pull-Down / SPI Chip Select
29	GPIO[1]/SPI_MISO	I/O	PD	H	General Purpose Input/Output, weak internal Pull-Down / SPI Master In – Slave Out
30	GPIO[5]/TXD2	I/O	PD	H	General Purpose Input/Output, weak internal Pull-Down / UART2 DATA Output
31	GPIO[4]/RXD2	I/O	PD	H	General Purpose Input/Output, weak internal Pull-Down / UART2 DATA Input
32	USB_DN	I/O	PD	-	USB Data Minus Terminal
33	USB_DP	I/O	PD	-	USB Data Plus Terminal
34	GPIO[17]/TAMPER	I/O	PD	-	General Purpose Input/Output, weak internal Pull-Down, do not use as current source! / TAMPER In

No	Pin Name	Type	PU/PD	Active	Description
A	GPIO[16]/SPI2_MOSI	I/O	PU	L	General Purpose Input/Output, weak internal Pull-Up / SPI2 Master Out – Slave In
B	GPIO[12]/I2C_SCL	I/O	PU	L	General Purpose Input/Output, weak internal Pull-Up / I2C Serial Clock Line
C	GPIO[11]/I2C_SDA	I/O	PU	L	General Purpose Input/Output, weak internal Pull-Up / I2C Serial Data Line
D	VBAT	P	-	-	Optional Batterie Backup

Type: PU - Pulled up; PD – pulled down; P – Power; I – Input; O – Output; I/O - bidirectional

4.2.2 Application Specific Pin Description

4.2.2.1 SPP PIN Configuration DCE Mode

No	Pin Name	SPP-Function	Type	PU/PD	Active	Description
1	GND1	Power	P	-	-	Connect to Ground
2	ANT	Antenna	I/O	-	-	Antenna Connector
3	UART_RTS#	/RTS	I	PU	L	UART Request To Send
4	UART_TXD	TXD	I	PD	H	UART Data Input
5	UART_RXD	RXD	O		H	UART Data Output
6	UART_CTS#	/CTS	O		L	UART Clear To Send
7	GPIO[9]/PCM_CLK	/LED2	O		L	Bluetooth connected. Active if a Bluetooth connection exists. Inactive in idle state. Flashes during startup.
8	GPIO[10]/PCM_O/TXD3	UA2	O			User Output 2
9	GPIO[7]/PCM_SYNC	/LED1	O		L	Device Ready
10	GND2	Power	-	-	-	Connect to Ground
11	ATRST/SPI2_MISO	reserved	I/O	PU	H	leave open
12	GPIO[8]/PCM_I/RXD3	/UE1	I	PU	L	User Input 1
13	ATDI/SPI2_CS	reserved	I/O	PU	-	leave open
14	ATMS	reserved	I	PU	-	leave open
15	RESERVED	reserved	I	PD	H	for Debug-Use only, leave open
16	VCC	Power	-	-	-	VCC
17	RESET#	/RESET	I/O	PU	L	Reset input/output
18	GND3	Power	-		-	Connect to Ground
19	GPIO[14]	/RTC-OUT	O		L	DSR in DCE mode, DTR in DTE mode
20	GPIO[13]	/RTC-IN	I	PU	L	DTR in DCE mode, DSR in DTE mode
21	GPIO[15]	/DCD or /DCD-DTE	I/O	PU	L	Data Carrier Detect , Input in DTE mode Output in DCE mode
22	GPIO[6]/ADC	/RI	I/O	PU	L	Ring Indicator, Input in DTE mode Output in DCE mode
23	ATDO/SPI2_SCK	reserved	O	PU	-	JTAG
24	ATCK	reserved	O	PD	-	JTAG
25	GPIO[3]/SPI_CLK	reserved	I/O	PD	H	leave open
26	GPIO[0]/SPI_MOSI	reserved	I/O	PD	H	leave open
27	GND4	Power	-		-	Connect to Ground
28	GPIO[2]/SPI_CS	reserved	O			leave open
29	GPIO[1]/SPI_MISO	/UE2	I (FT)	PD	H	User Input 2, Break Detect (1)
30	GPIO[5]/TXD2	reserved	O			leave open
31	GPIO[4]/RXD2	DTE-/DCE Select	I (FT)	PD	H	DTE (high) DCE (low) mode selector
32	USB_DN	reserved	I/O (FT)	PD	-	leave open
33	USB_DP	reserved	I/O (FT)	PD	-	leave open
34	GPIO[17]/TAMPER	reserved	I/O	PD	-	leave open
A	GPIO[16]/SPI2_MOSI	reserved	I/O	PU	L	leave open
B	GPIO[12]/I2C_SCL	reserved	I/O	PU	L	leave open
C	GPIO[11]/I2C_SDA	reserved	I/O	PU	L	leave open
D	VBAT	Power	-		-	Optional Batterie Backup

Type: PU - Pulled up; PD – pulled down; P – Power; I – Input; O – Output; I/O – bidirectional; (FT) - 5V tolerant

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_{SUP}	-0.4 to +3.7	V
Batterie Backup Voltage	V_{BAT}	-0.4 to +1.8 … +3.7 (depends on the optional crystal oscillator)	V
Voltage on any pin	V_{Pin}	GND -0.3 to VSUP +0.3	V
Voltage on 5V tolerant pin	V_{Pin}	GND -0.3 to +5.5V	V

5.2 Electrical Requirements

VSUP = 3.3V, T_{amb} = 25℃ if nothing else stated

Item	Condition	Limit			Unit
		Min	Typ	Max	
Frequency Range		2400		2483.5	MHz
Load impedance	Measured with network analyzer in the frequency range at antenna pin		50		Ohm
Output return loss	Receive Mode to 50Ω load Transmit Mode to 50Ω load	-10 -10			dBm
Supply voltage VSUP	The typical voltage is recommended VSUP at voltage pin	2.8	3.3	3.6	Vdc
Ripple on Vcc	Ripple frequency ≤10MHz			10	mVrms

5.3 Environmental Requirements

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

5.4 Digital I/O including RESET#

VSUP = 3.3V, T_{amb} = 25℃

Symbol	Item	Condition	Limit			Unit
			Min	Typ	Max	
V_{IL}	Low-Level Input Voltage	VSUP = 3.3V	- 0.5	-	0.8	V
V_{IH}	High-Level Input Voltage		2.0	-	VSUP +0.5	V
V_{OL}	Low-Level Output Voltage	I_{OL} = mA	-	-	0.2	V
V_{OH}	High-Level Output Voltage	I_{OH} = -4mA	VSUP-0.2	-	-	V
I_{OL}	Low -Level Output Current (except GPIO[17])	V_{OL} = 0.4V	-	-	8	mA
I_{OH}	High-Level Output Current (except GPIO[17])	V_{OH} = 2.4V	-	-	8	mA
I_{OL} (GPIO[17])	Low -Level Output Current at GPIO[17]	V_{OL} = 0.4V	-	-	3	mA
I_{OH} (GPIO[17])	High-Level Output Current at GPIO[17]	V_{OH} = 2.4V	-	-	3	mA
I_{wp-u}	Input-current	Weak pull-up typ. 40kΩ	–5.0	–1.0	–0.2	µA
I_{wp-d}	Input-current	Weak pull-down typ. 40kΩ	+0,2	+1.0	+5.0	µA
I_{lc}	I/O pad leakage current	Standard I/Os	–1.0	0	+1.0	µA
I_{lc}	I/O pad leakage current	Vin = 5V	-3,0	0	+3,0	µA
C_I	Input Capacitance		-	5	-	pF

5.5 USB-Interface

VSUP = 3.3V, T_{amb} = 25℃

Item			Unit
	Min	Max	
Input logic level low	-	0.3xVSUP	V
Input logic level high	0.7xVSUP	5.5	V
Output logic level low)*	0	0.2	V
Output logic level high)*	2.8	VSUP	V

)* connected to correctly terminated USB cable

5.6 Power consumption and power down modes

5.6.1 SPP configuration

5.6.1.1 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+P2x/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.

5.6.1.2 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+P24/P25 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.

5.6.1.3 Idle state

No power down mode activated.

All functionality is available immediately including connection control using AT command set.

5.6.1.4 Power consumption

The following values are approximate power consumption values in the different states:

VSUP = 3.3V, T_{amb} = 25°C

Condition	Current Consumption		Unit
	I_{MEAN}	I_{PEAK}	
Idle, no page scan, no inquiry scan, Uart baud rate: 1200 baud	7,5	15	mA
Idle, all functions available, no Bluetooth link, page scan & inquiry scan interval 1,28s	8	56	mA
Idle, all functions available, no Bluetooth link, continuous page scans	50	60	mA
Bluetooth connected, no data traffic – close range (Slave)	10	56	mA
Bluetooth connected, data traffic 115 kbit/s – close range (Slave)	33	61	mA
ACL connected DH5 max PWR, shortest Poll Period (Slave)	43	68	mA
ACL connected DH5 min PWR, shortest Poll Period (Slave)	42	67	mA
ACL connected DH1 max PWR, shortest Poll Period (Slave)	43	69	mA
ACL connected DH1 min PWR, shortest Poll Period (Slave)	41	67	mA
Power Down	7,5	--	mA
Device in reset	1,5	--	mA

5.7 Power-up time

The time until the BlueMod+P2x/G2 is able to accept link requests or serial data depends on the firmware version and the software parameters RSTTIM and RSTMSG. In the SPP firmware version 1.001 the module is command ready after at least 0,3s (RSTTIM=3 / RSTMSG=0) and 2,16s (RSTTIM=40 / RSTMSG=1) maximum. Bluetooth links are accepted 2,3s after reset.

Note: For further information refer to the document BlueMod+_startup_timing_r03

5.8 RF performance

Vcc = 3.0V to 3.6V, T_{amb} = - 40℃ to +85℃

Receiver	Frequency [GHz]	Limit			BT	Unit
		Min	Typ	Max	Spec	
Sensitivity at 0.1% BER DH1	2.402	-70,0	-85,3		≤-70	dBm
	2.441	-70,0	-85,4			
	2.480	-70,0	-86,0			
Sensitivity at 0.1% BER DH5	2.402	-70,0	-84,4		≤-70	dBm
	2.441	-70,0	-84,9			
	2.480	-70,0	-85,6			
Sensitivity at 0.1% BER EDR2, PI/4 DQPSK	2.402	-70,0	-88,1		≤-70	dBm
	2.441	-70,0	-88,3			
	2.480	-70,0	-88,1			
Sensitivity at 0.1% BER EDR3, 8DPSK	2.402	-70,0	-82,0		≤-70	dBm
	2.441	-70,0	-82,7			
	2.480	-70,0	-82,4			
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	>0		≥-20	dBm
Maximum received signal at 0.1% BER with EDR3, 8DPSK		-20,0	>0		≥-20	dBm
C/I co-channel [a)]			6	11	≤ 11	dB
Adjacent channel selectivity C/I f = f_0 + 1MHz [a)]			-5	0	≤ 0	dB
Adjacent channel selectivity C/I f = f_0 - 1MHz [a)]			-5	0	≤ 0	dB
Adjacent channel selectivity C/I f ≥ f_0 + 2MHz [a)]			-38	-30	≤ -30	dB
Adjacent channel selectivity C/I f ≤ f_0 - 2MHz [a)]			-22	-20	≤ -20	dB
Adjacent channel selectivity C/I f ≥ f_0 + 3MHz [a)]			-42	-40	≤ -40	dB
Adjacent channel selectivity C/I f ≤ f_0 - 5MHz [a)]			-45	-40	≤ -40	dB
Adjacent channel selectivity C/I f = f_{image} [a)]			-15	-9	≤ -9	dB

Notes: a) For BER less then 0,1%. Applies according to BT Test Specification Ver. 1.2/2.0/2.0 + EDR only for Tamb = 20℃

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

Transmitter	Frequency [GHz]	Limit			BT	Unit
		Min	Typ	Max	Spec	
RF transmit power 50 Ω load, at antenna Class 1 device GFSK [b)]	2.402	2,3	3,9	3,9		dBm
	2.441	2,5	3,2	4,0		
	2.480	2,2	3,0	4,0		
RF transmit power 50 Ω load, at antenna Class 1 device EDR2, PI/4 DQPSK [b)]	2.402 GFSK		2,7			dBm
	2.402 DPSK		1,6			
	2.441 GFSK		2,7			
	2.441 DPSK		1,6			
	2.480 GFSK		2,2			
	2.480 DPSK		1,0			
RF transmit power 50 Ω load, at antenna Class 1 device EDR3, 8DPSK [b)]	2.402 GFSK		2,6			dBm
	2.402 DPSK		1,6			
	2.441 GFSK		2,7			
	2.441 DPSK		1,6			
	2.480 GFSK		2,2			
	2.480 DPSK		1,0			
RF power control range		-21	-	4,0		dB
RF power range control resolution		3,2	3,9	4,6	2 to 8	dB
20 dB bandwidth for modulated carrier		920	924	1000	≤1000	kHz
Initial carrier frequency tolerance		-75	-10	75	≤ ±75	kHz
Carrier frequency drift (packet DH1)		-25	11	25	≤ ±25	kHz
Drift Rate		-20	0	20	20	kHz/ 50µs
$\Delta f1_{avg}$ “Maximum Modulation”		140	166	175	≥140 to ≤175	kHz
$\Delta f2_{avg}$ “Minimum Modulation”		115	155	-	≥ 115	kHz

Notes: b) excluding +2dBi antenna gain

6 Mechanical Characteristics

6.1 Dimensions

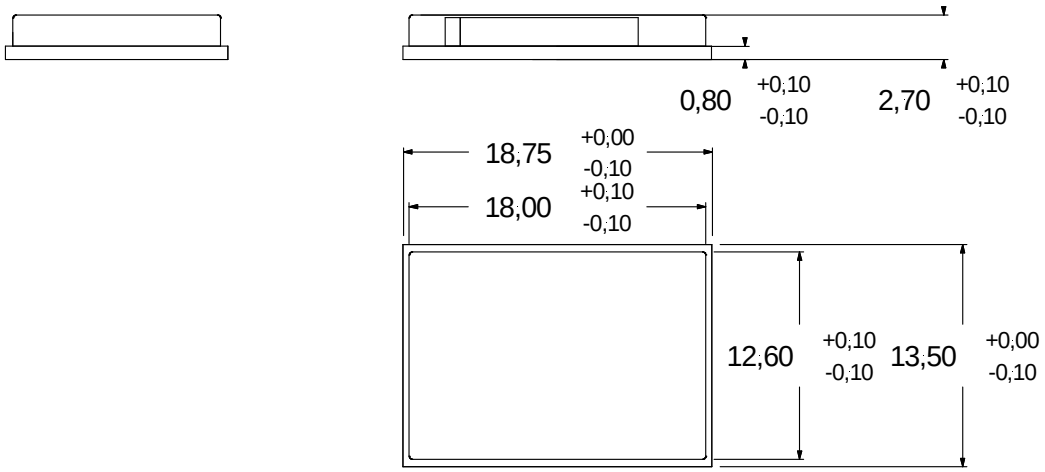


Figure 6.1 BlueMod+P24/G2 dimensions

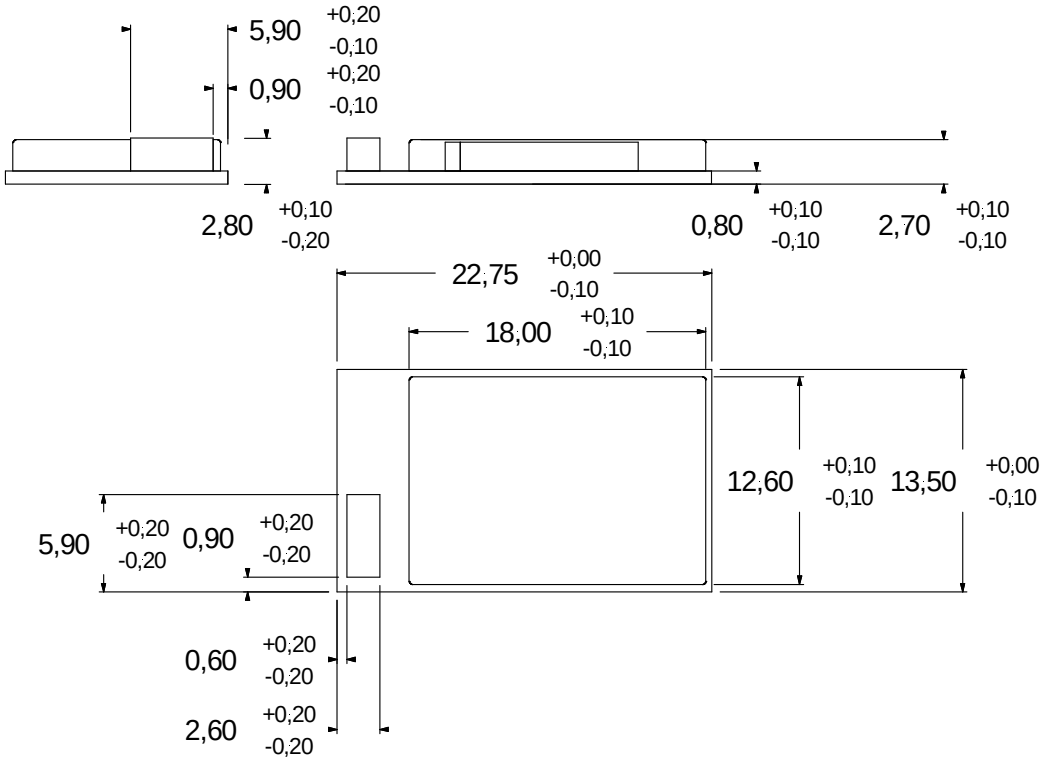


Figure 6.2 BlueMod+P25/G2 dimensions

6.2 Recommended Land pattern

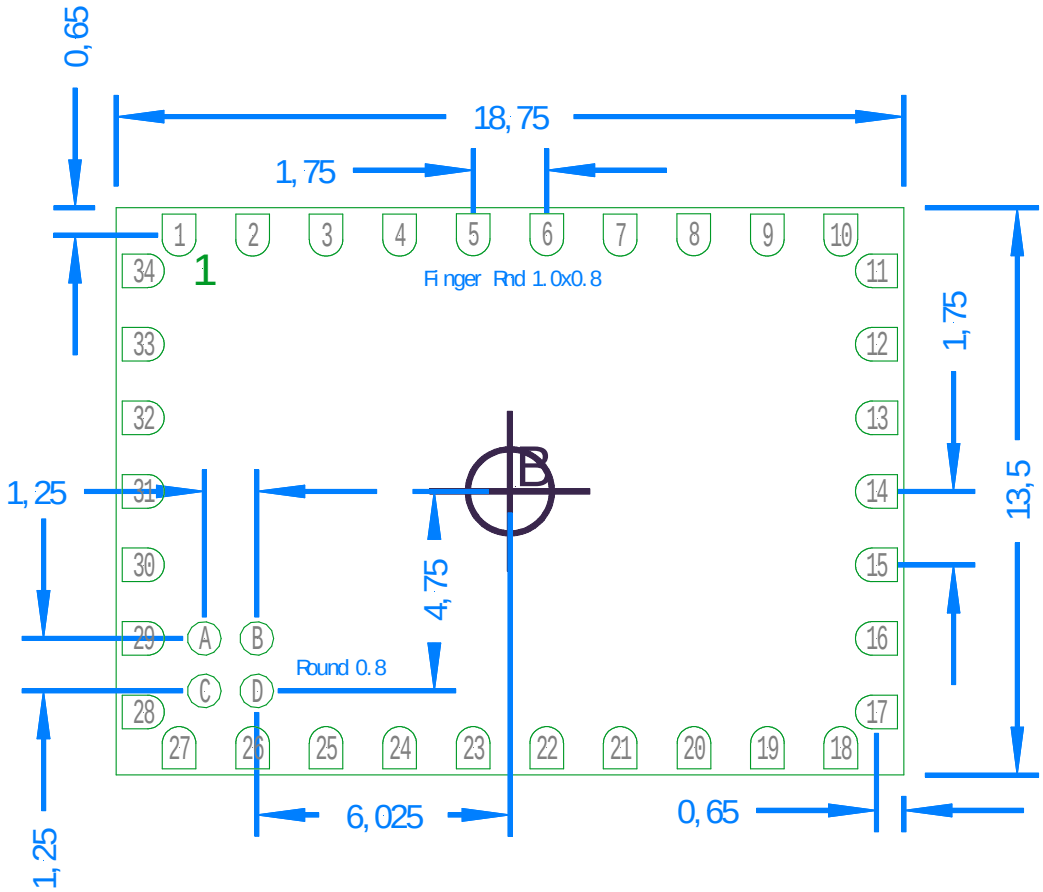


Figure 6.3 BlueMod+P24/G2 Recommended Land pattern

(Top-View not scaled)

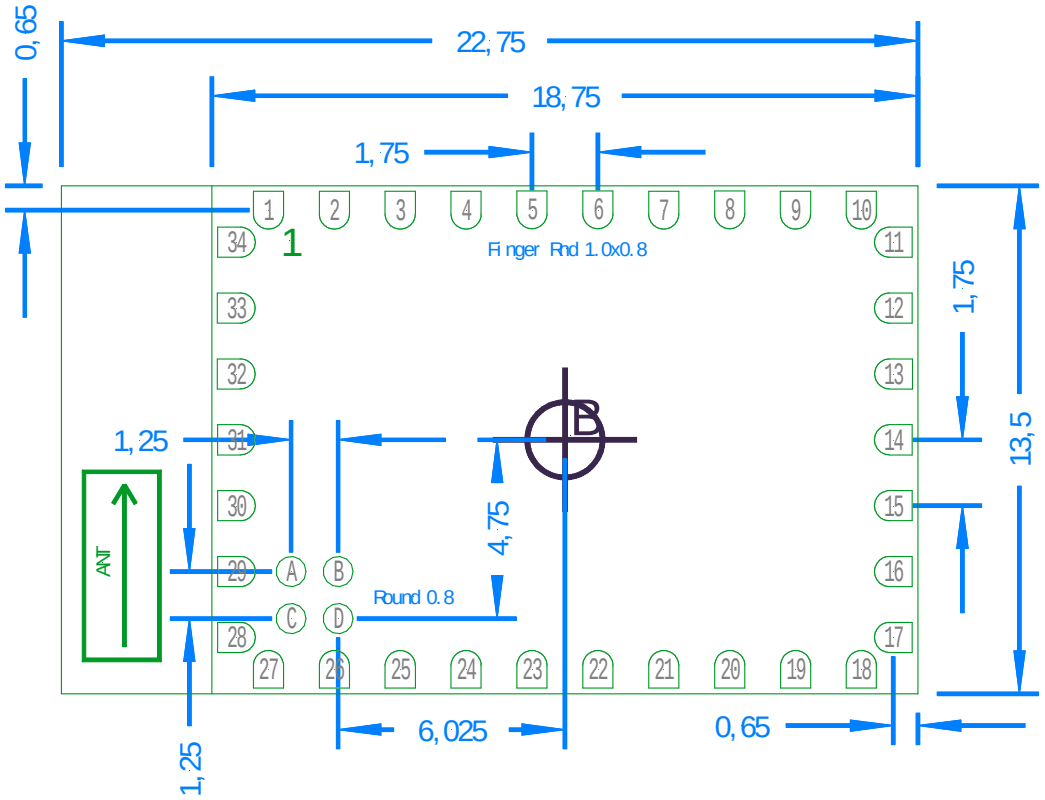


Figure 6.4 BlueMod+P25/G2 Recommended Land pattern

(Top-View not scaled)

6.3 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

6.4 Antenna Issues

BlueMod+P25/G2 comprises a ceramic antenna which as a component is soldered to the circuit board. This is functional for a BlueMod+P25/G2 integrated into a plastic housing. No additional antenna is required.

For an external antenna to be set in, e.g. because the BlueMod+P24/G2 is integrated into a metal housing, the ceramic antenna is replaced.

BlueMod+P24/G2 routes the antenna signal to pin 2.

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.

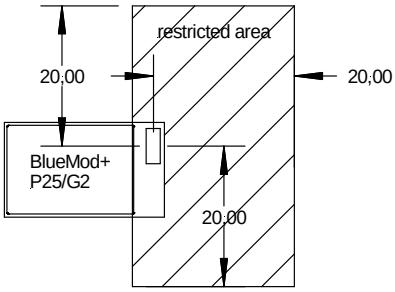


Figure 6.7 BlueMod+P25/G2 Recommended Restricted Area

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.

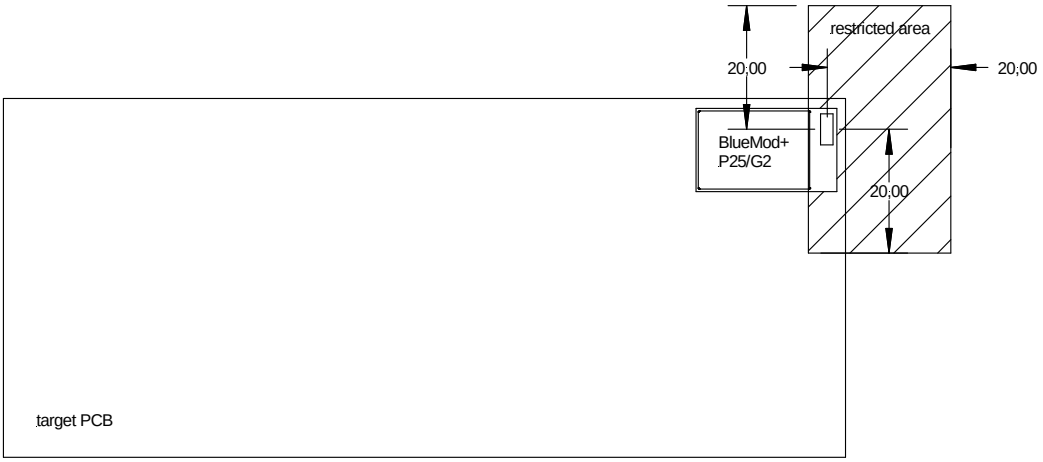


Figure 6.8 Optimal placement

The best position to place the BlueMod+P25/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 keep free for the restricted area.

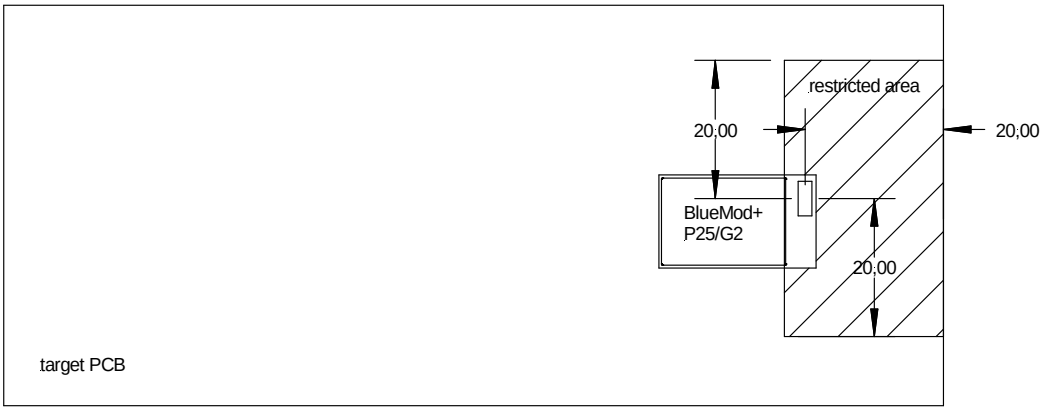


Figure 6.9 recomendable placement

When placing the BlueMod+P25/G2 at the right edge of the PCB ensure that the restricted area on the target PCB is free of planes, traces and parts.

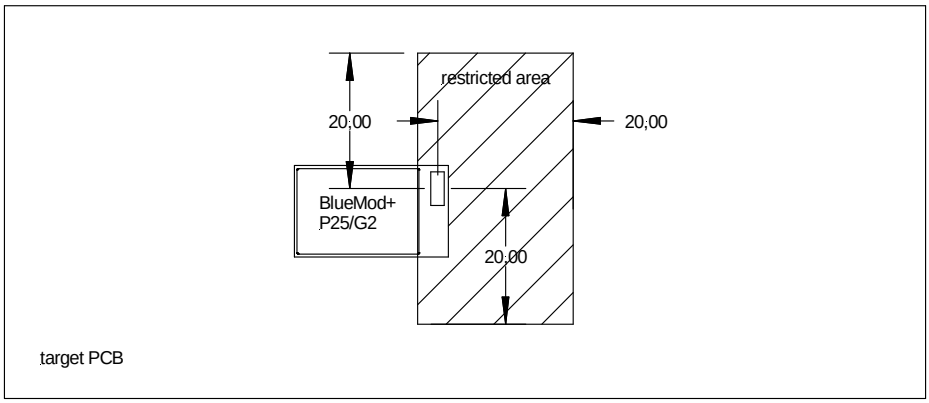


Figure 6.10 acceptable, but not optimal placement

When placing the BlueMod+P25/G2 on other positions than the right side the complete restricted area should be kept free of planes, traces and parts.

6.5 Safety Guidelines

According to SAR regulation EN 50371-2002 the BlueMod+P24/G2 and BlueMod+P25/G2 are not intended to be used in close proximity to the human body. Please refer to above-mentioned regulation for more specific information.

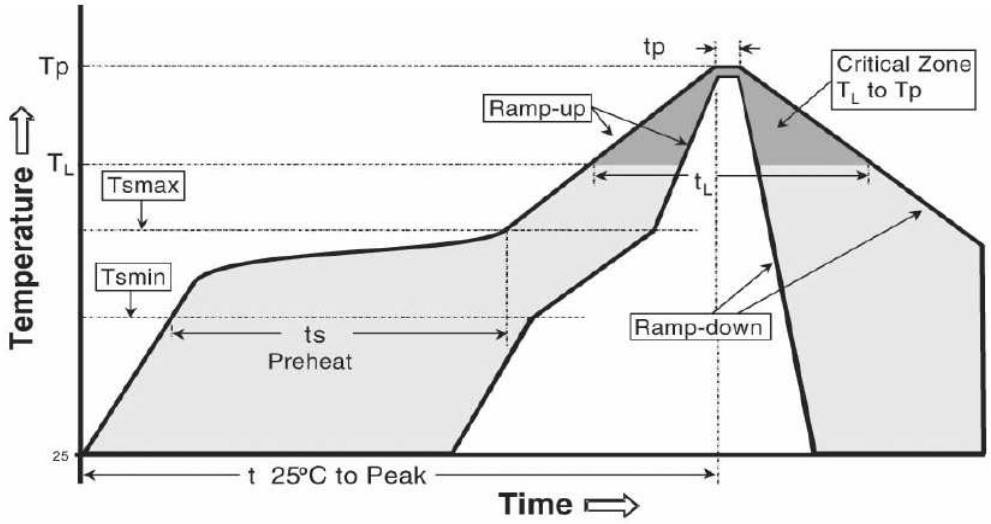
In respect to the safety regulation EN 60950-1: 2001 all conductive parts of the BlueMod+P24/G2 and BlueMod+P25/G2 are to be classified as SELV circuitry. OEM's implementing the modules in their products should follow the isolation rules given in regulation EN 60950-1: 2001.

The PCB material of the BlueMod+P24/G2 and BlueMod+P25/G2 are classified UL-94V0.

6.6 Re-flow Temperature / Time Profile

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	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 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.

7 Approvals/Certifications

7.1 R&TTE 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+P24/G2 (with external antenna maximal gain +2dBi)
BlueMod+P25/G2 (with internal Chip antenna)

Telekommunikationendeinrichtung mit Verwendungszweck: Bluetooth Modul
Telecommunications terminal equipment with intended purpose: 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))
Ausgangsleistung ist kleiner 20mW
Output Power is lower than 20mW
angewendete harmonisierte Normen
harmonised standards applied
EN 60 950-1: 2006
EN 50 371: 2002

Wenn der bestimmungsgemäße Betrieb des Endgerätes in das dieses Bluetooth Modul eingebaut wird vorsieht, dass dieses Endgerät am menschlichen Körper getragen wird, ist eine SAR Betrachtung dieses Endgerätes durchzuführen.
If the intended use of the OEM product integrating this Bluetooth Module allows to wear the OEM product on the human body, a SAR evaluation of the OEM product has to be conducted.

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 EVA Board 52495V03)
EN 301 489-17 V1.3.2 (tested mounted on EVA Board 52495V03)
EN 300 328-2 V1.7.1
Elektromagnetische Verträglichkeit in Bezug auf das Radio Frequenz Spektrum
Electromagnetic compatibility and Radio Spectrum Matters (ERM)

Ort, Datum Place & date of issue	Firmenstempel Firm stamp	Name, Unterschrift Name and signature
Hamburg, den 15.04.2009 i.A.	Stollmann Entwicklungs- und Vertriebs-GmbH Mendelssohnstr. 15d 22761 Hamburg	

7.2 FCC Compliance

7.2.1 FCC Notice

The Bluetooth Modules BlueMod+P25/G2, including the ceramic antenna and also the BlueMod+P24/G2, used with an external antenna as listed in chapter “Approved External Antenna List” complies with Part 15 of the FCC Rules. The Bluetooth Modules meet the requirements for modular transmitter approval as detailed in

FCC public Notice DA00-1407.transmitter.

Notice:
Operation is subject to the following two conditions: (1) These Bluetooth Modules may not cause harmful interference, and (2) must accept any interference received, including interference that may cause undesired operation.

7.2.2 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.

7.2.3 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.

7.2.4 Labeling Requirements

The Original Equipment Manufacturer (OEM) must ensure that FCC labeling requirements are met. This includes a clearly visible label on the outside of the OEM enclosure specifying the appropriate FCC identifier for this product as well as the FCC Notice above. The FCC identifier is **FCC ID: T7V-BC06.** The FCC identifier is valid for both versions BlueMod+P24/G2 and BlueMod+P25/G2.

In any case the OEM end product must be labeled exterior with

Contains transmitter
FCC ID: T7V-BC06
IC: 216Q-BC06

7.2.5 Antenna Warning

The BlueMod+P24/G2 with the RF signal routed to a SMD pin has to be used with an external antenna as given in chapter “Approved External Antenna List”. This Bluetooth Module has been tested with a U.FL connector and with the antennas listed in chapter “Approved External Antenna List”. When integrated in the OEMs product, these antennas require installation preventing end-users from replacing them with non-approved antennas. Any antenna not listed in chapter “Approved External Antenna List” must be tested to comply with FCC Section 15.203 for unique antenna connectors and Section 15.247 for emissions. This could be done together with the routine FCC EMC test of the OEMs product.

7.2.6 Approved External Antenna List

Item	Part Number	Manufacturer	Frequency Band	Type	Gain (dBi)
1	WIMO17010.10	Wimo	2.4GHz	ROD	+2
2					

7.2.7 RF Exposure Statement

To comply with FCC RF Exposue requirements, the OEM must ensure that the internal antenna or an approved external antenna as listed in chapter “Approved External Antenna List” is installed.
The preceding statement must be included as a CAUTION statement in manuals for products operating with the approved antennas to alert users on FCC RF Exposure compliance.
Any notification to the end user of installation or removal instructions about the integrated radio module is not allowed.
The radiated output power of the BlueMod+P25/G2 with internal ceramic antenna (FCC ID: T7V-BC06) is far below the FCC radio frequency exposure limits. Nvertheless, the BlueMod+P2x/G2 shall be used in such a manner that the potential for human contact during normal operation is minimized.
End users may not be provided with the module installation instructions. OEM integrators and end users must be provided with transmitter operating conditions for satisfying RF exposure compliance.

7.3 IC Industry Canada Certification

The Bluetooth Modules BlueMod+P25/G2 and BlueMod+P24/G2 comply with the regulatory requirements of Industry Canada (IC), license **IC: 216Q-BC06**

Manufacturers of mobile, fixed or portable devices incorporating these modules are advised to clarify any regulatory questions and ensure compliance for SAR and/or RF exposure limits. OEMs can obtain Canadian information on RF exposure and compliance from http://www.ic.gc.ca/

The Bluetooth Modules have been designed to operate with theinternal ceramic antenna or with external antennas listed in chapter “Approved External Antenna List”. Having a maximum gain of +2.0dBi. Antennas not included in this list or having a gain greater than +2.0dBi are strictly prohibited for use with these modules. The required antenna impedance is 50 Ohm. The antenna used for this transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

7.4 Bluetooth Qualification

BlueMod+P24/G2 and BlueMod+P25/G2 are a qualified design according to the Bluetooth Qualification Program Reference Document (PRD) V2.0. The Qualified Design ID (QDID) is:

tbd

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.

7.5 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

9 Ordering Information

BlueMod+P2x/G2 is available in the following variants:

Name	Antenna	Part No.	Minimum Order Quantity:
BlueMod+P25/G2/SPP	Internal	52988	1 unit
BlueMod+P24/G2/SPP	External	52989	1 unit
BlueMod+P25/G2/HID-KB	Internal	53033	1 unit
BlueMod+P25/G2/HID-M	Internal	tbd	1 unit

10 History

Version	Release Date	By	Change description
r01 draft	15.12.2008 13.01.2008	aa JW	Start review and corrections
r02	19.05.2009	AA HB JJ JW	Complete rework, first release

Life Support Policy

This Stollmann product is not designed for use in life support appliances, devices, or systems where malfunction can reasonably be expected to result in a significant personal injury to the user, or as a critical component in any life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness. Stollmann customers using or selling these products for use in such applications do so at their own risk and agree to fully indemnify Stollmann for any damages resulting.

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