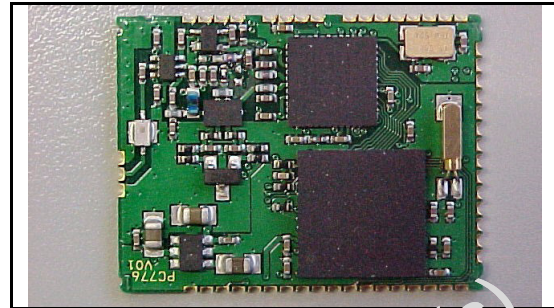# GS-BT2416C1

## Bluetooth class 1 module

## Features

- Bluetooth specification V.1.2 compliant
- Output power class 1 ( 20 dBm max)
- Transmission rate up to 721Kbps
- Working distance up to 100 meters
- ACL & SCO links
- AFH interference resistance
- Supports USB (1.1) /UART/PCM (Pulse Code Modulation) /SPI/I$^2$C interfaces
- Optimized link manager and control
- Support wireless LAN coexistence in collocated scenario
- Integrated 4Mbit flash, 64Kbytes RAM, 4KBytes ROM
- 3.3V single supply voltage
- Hardware based UART flow control

## Applications

- Serial cable replacement
- Industrial control
- POS terminals
- Data acquisition equipment
- Internet access points
- Machine control
- Sensor monitoring
- Robotic and bionic control
- Security control
- Patient monitoring
- Audio gateway applications
- Hands-free sets
- Wireless printers
- Cordless terminals
- Laptops, PCs and accessories
- Hand held devices and accessories
- HID devices (keyboard, mouse, joystick, game controller)

## Order codes

- GS-BT2416C1

## Description

ST Bluetooth Modules are highly integrated for easy implementation in embedded applications. Class 1 modules enable wireless communication with other Bluetooth enabled devices up to 100 m away. The GS-BT2416C1 integrates on a unique FR4 PCB support: BT 1.2 radio and baseband, memory, 32 KHz and 13 MHz oscillators, Vreg as well as PA function. The antenna has not been included in order to grant a degree of freedom to the user in selecting the most suitable design and placement between external and integrated antenna that could be SMA aerial or a low cost antenna trace designed on PCB. For more details please refer to GS-BT2416C1DB Application Note. Modules are coming without any SW to offer a further freedom degree to user that can embed his own solution or any available BT certified SW upon his choose and preference.

## Certification

- CE Compliant IMQ Exp. Opinion 0081-AREF0017
  - Safety EN60950-1 (2001)
  - EMC EN301 489 17V1.2.1
  - Radio ES 300 328 V1.6
- BQB compliant

# Contents

# 1 Maximum ratings

## 1.1 Absolute maximum ratings

Operation of the module beyond these limits is not guaranteed.

Sustained exposure to these limits will adversely affect device reliability.

**Table 1.    Absolute maximum ratings**

| Symbol | Parameter | Values | | Unit |
|---|---|---|---|---|
| | | **Min** | **Max** | |
| $V_{DD}$ | Module supply voltage | | 4 | V |
| $V_{IN}$ | Input voltage on any digital pin | Vss1-0.5 | Vdd+0.3 | V |
| $T_{stg}$ | Storage temperature | -40 | +85 | °C |
| $T_{sold}$ | Soldering temperature | | 240 | °C |

## 1.2 Operating ranges

Operating ranges define the limits for functional operation and parametrics characteristics of the module.

Functionality outside these limits is not implied

**Table 2.    Operating ranges**

| Symbol | Parameter | Conditions | Values | | | Unit |
|---|---|---|---|---|---|---|
| | | | **Min** | **Typ** | **Max** | |
| $V_{DD}$ | Module supply voltage | -20°C < T < 70 °C | 3.13 | 3.3 | 3.47 | V |
| $T_{stg}$ | Operating ambient temperature | | -20 | | +70 | °C |

# 2    I/O specification

**Table 3.    DC Input / Output specification**

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|--------|-----------|-----------|-----|-----|-----|------|
| $V_{il}$ | Low level input voltage | 3.13 V < $V_{DD}$ < 3.47 V | | | 0.8 | V |
| $V_{ih}$ | High level input voltage | 3.13 V < $V_{DD}$ < 3.47 V | 2 | | | V |
| $V_{hyst}$ | Schmitt trigger hysteresis | 3.13 V < $V_{DD}$ < 3.47 V | 0.4 | | | V |
| $V_{ol}$ | Low level output voltage | Io load = pin drive capability | | | 0.15 | V |
| $V_{oh}$ | High level output voltage | Io load = pin drive capability | $V_{DD}$-0.15 | | | V |

# 3    Bluetooth section

**Table 4.    Bluetooth section**

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|--------|-----------|-----------|-----|-----|-----|------|
| Ptr | Transmission power | 3.13V < $V_{DD}$ < 3.47V | | 18 | 20 | dBm |
| Sens | Sensitivity | 3.13V < $V_{DD}$ < 3.47V | -70 | | | dBm |
| Flim | Frequency limit | 3.13V < $V_{DD}$ < 3.47V | 2402 | | 2480 | MHz |
| CHs | channel space | | | 1 | | MHz |
| Hop | Hopping | | | 1600 | | hops/sec |
| RF ck | RF crystal oscillator | | | 13 | | MHz |
| BB ck | Baseband crystal oscillator | | | 32 | | kHz |
| Tra | Transmission rate asyncronous | | | | 721 | kbits/sec |
| Trs | Transmission rate syncronous | | | | 432 | kbits/sec |
| Iop | Operation current TX Mode | | | 180 | | mA |
| | Operation current RX Mode | | | 60 | | mA |

# 4      Block diagram

**Figure 1.      Block diagram**
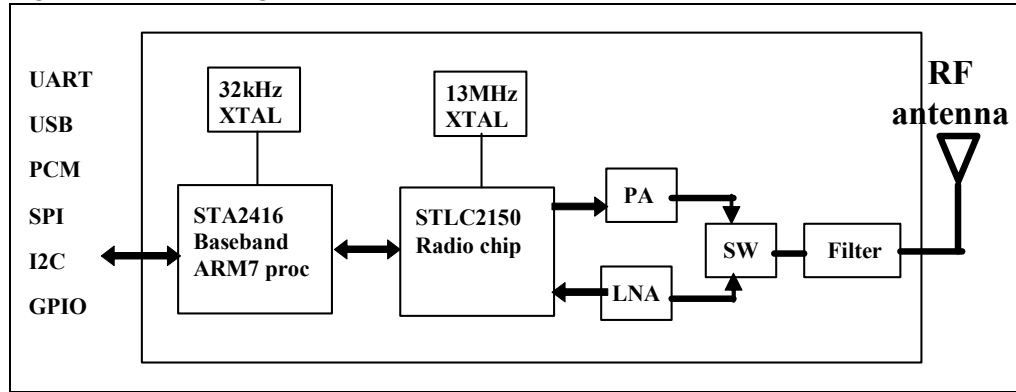
# 5 Pin settings

**Table 5.** **Pin description**

| Pin N° | Name | I/O | Description |
|--------|------|-----|-------------|
| 1 | Vss1 | -- | GND |
| 2 | Vdd | -- | Module supply voltage- Single 3.3V |
| 3 | GPIO0 | I/O | General purpose I/O line |
| 4 | GPIO1 | I/O | General purpose I/O line |
| 5 | GPIO2 | I/O | General purpose I/O line |
| 6 | GPIO3 | I/O | General purpose I/O line |
| 7 | GPIO4 | I/O | General purpose I/O line |
| 8 | GPIO5 | I/O | General purpose I/O line |
| 9 | ---- | I/O | Not to be used<br>Internally used for RX/TX switch |
| 10 | GPIO7 | I/O | General purpose I/O line |
| 11 | GPIO8 | I/O | General purpose I/O line |
| 12 | GPIO9 | I/O | General purpose I/O line |
| 13 | LP CLOCK OUT | --- | 32kHz Out |
| 14 | GPIO11 | I/O | General purpose I/O line |
| 15 | ---- | I/O | Not to be used<br>Internally used for TX gain setting |
| 16 | ---- | I/O | Not to be used<br>Internally used for TX gain setting |
| 17 | ---- | I/O | Not to be used<br>Internally used for TX gain setting |
| 18 | ---- | I/O | Not to be used<br>Internally used for TX gain setting |
| 19 | TDI | | JTAG pin |
| 20 | TDO | | JTAG pin |
| 21 | TMS | | JTAG pin |
| 22 | NTRST | | JTAG pin |
| 23 | TCK | | JTAG pin<br>If not used connect to VSS1 |
| 24 | I2C_dat | I/O | I2C bus interface data<br>To be connected to VDD with 10 KΩ resistor |
| 25 | I2C_clk | I/O | I2C bus interface clock<br>To be connected to VDD with 10 KΩ resistor |

**Table 5.    Pin description  (continued)**

| Pin N° | Name | I/O | Description |
|--------|------|-----|-------------|
| 26 | INT1 | I | External Interrupt signal<br>Internally connected to VSS1 with 10KΩ /<br>If not used connect to VSS1 |
| 27 | PCM_SYNC | I/O | PCM 8kHz synch |
| 28 | PCM_CLK | I/O | PCM clock |
| 29 | PCM_A | I/O | PCM Data In/Out |
| 30 | PCM_B | I/O | PCM Data In//Out |
| 31 | USB_DN | I/O | USB data -<br>If not used connect to VSS1 |
| 32 | USB_DP | I/O | USB data +<br>If not used connect to VSS1 |
| 33 | UART2_RXD | I | UART2 data input<br>If not used connect to VDD |
| 34 | UART2_TXD | O | UART2 data output |
| 35 | UART2_I1 | I | UART2 clear to send input<br>If not used connect to VDD |
| 36 | UART2_02 | O | UART2 ready to send output |
| 37 | SPI_FRM | I/O | Syncronous Serial Interface frame synch |
| 38 | SPI_CLK | I/O | Syncronous Serial Interface clock |
| 39 | SPI_TXD | O/T | Syncronous Serial Interface transmit data |
| 40 | SPI_RXD | I | Syncronous Serial Interface receive data<br>If not used connect to VSS1 |
| 41 | 1V8 | O | 1.8V digital supply out ( test purpose)<br>To be left Not Connected |
| 42 | 3V3 | O | 3.3V I/O power supply out ( test purpose) To be left Not Connected |
| 43 | Vss1 | - | GND ( test purpose)<br>To be left Not Connected |
| 44 | 2V7 | O | 2.7 digital core supply out ( test purpose) To be left Not Connected |
| 45 | RESET | I | Reset pin ( active low) |
| 46 | BOOT | I | External downloading Enable ( active low)<br>Internally pul-upped to 1.8V by 10kohm |
| 47 | UART10_TXD | O | UART1 data output |
| 48 | UART11_RXD | I | UART1 data input<br>If not used connect to VDD |
| 49 | Vss2 ( RF GND) | -- | RF GND |
| 50 | +ANTENNA | -- | Antenna out |
| 51 | Vss2 (RF GND) | -- | RF GND |

# 6 Mechanical dimensions

**Figure 2. Mechanical dimensions**
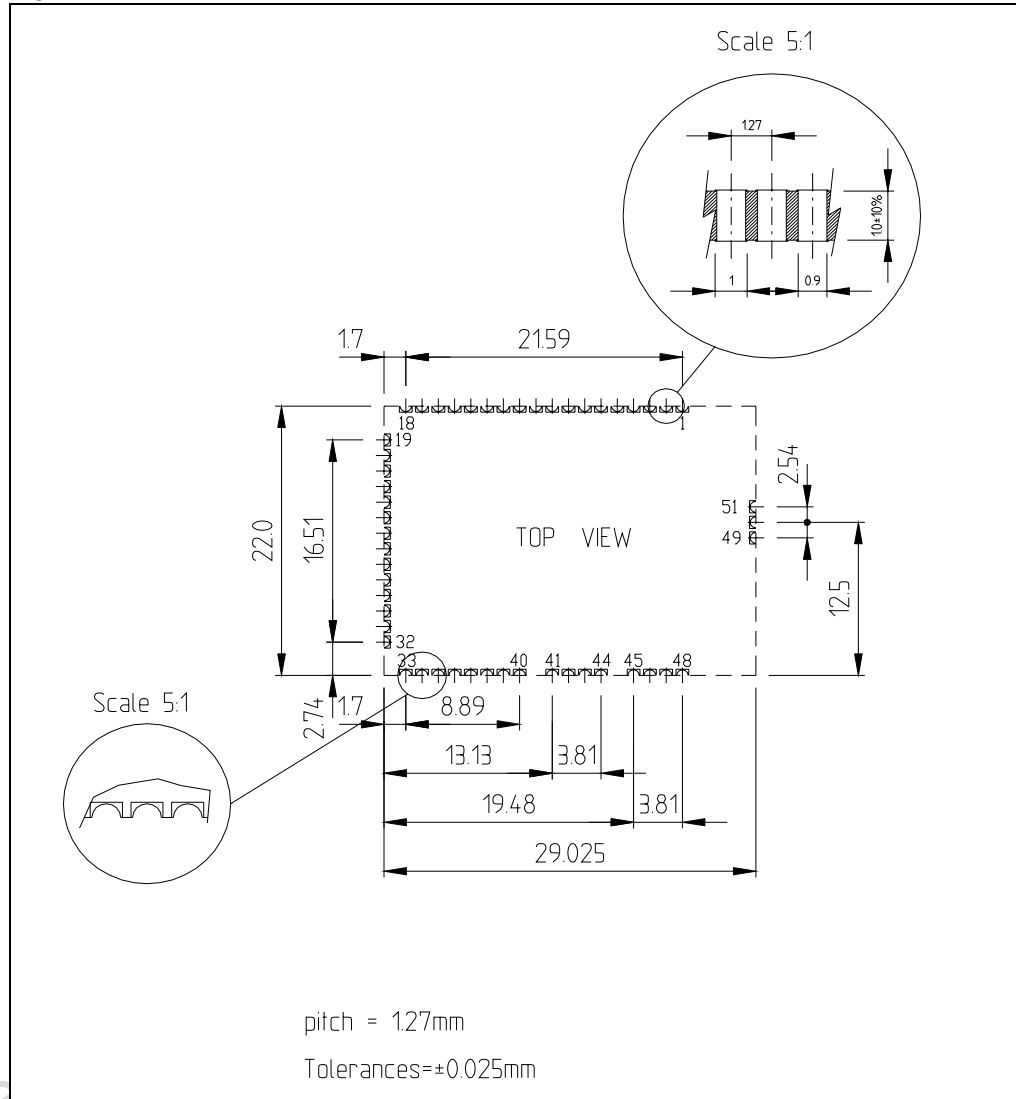
**Figure 3.    Land pattern and connection diagram**



RECOMMENDED LAND PATTERN TOP VIEW
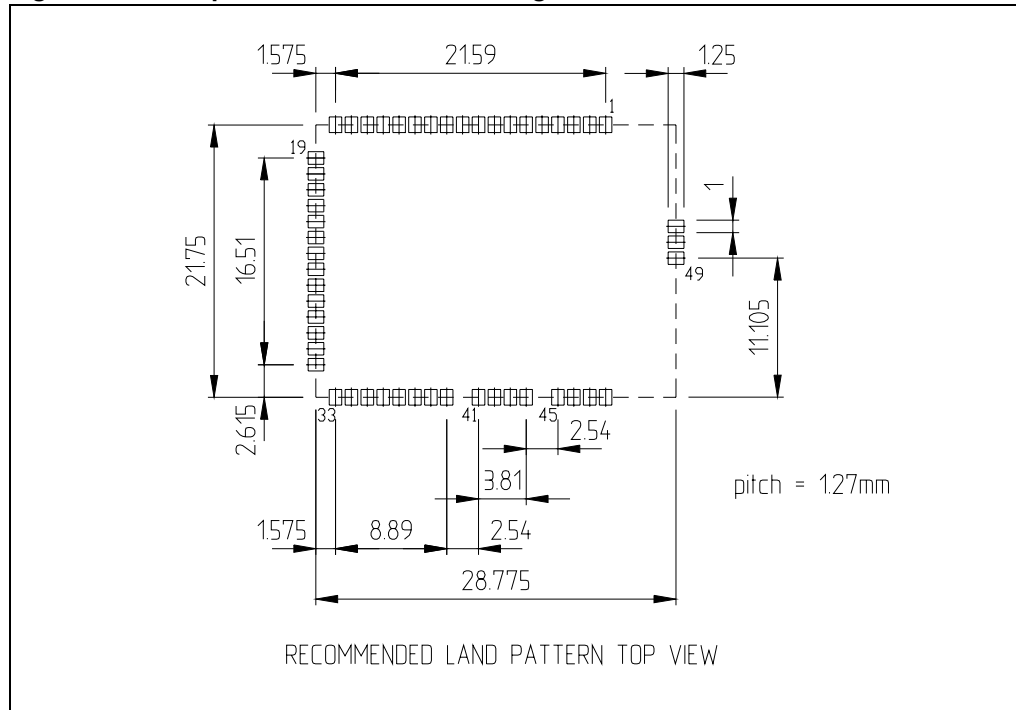
# 7 Revision history

**Table 6. Revision history**

| Date | Revision | Changes |
|------|----------|---------|
| 12-Dec-2006 | 1 | First release |
| 26-Jan-2007 | 2 | Updated *Table 4: Bluetooth section on page 4* |
| 30-Aug-2007 | 3 | Updates involved: Cover page, *Table 4 on page 4*, *Table 5 on page 6*. |

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