BC865RPA Class 2 Bluetooth Module

Features

- Class 2 module with printed PCB antenna
- 64Kbit EEPROM
- Fully Qualified Bluetooth v4.0
- CSR BC8645 ROM chip
- Low current consumption
- Supports 1.8v, 3.3V I/O operations.
- Supports Li-ion battery with maximum 500mA charging current.
- High quality 95db SNR on DAC playback
- Supports USB audio
- Supports single/dual-mic input
- Interface: PIOs, UART, SPI (for programming)
- Built-in DSP Co-Processor for audio signal processing
- Supports of noise and echo cancellation
- Configurable 5-band EQ
- 802.11 Co-existence
- A2DP, AVRCP, HSP, HFP profile support
- SBC, AAC, MP3 and aptX decoder support for direct streaming
- Optional NFC pairing support
- RoHS compliant
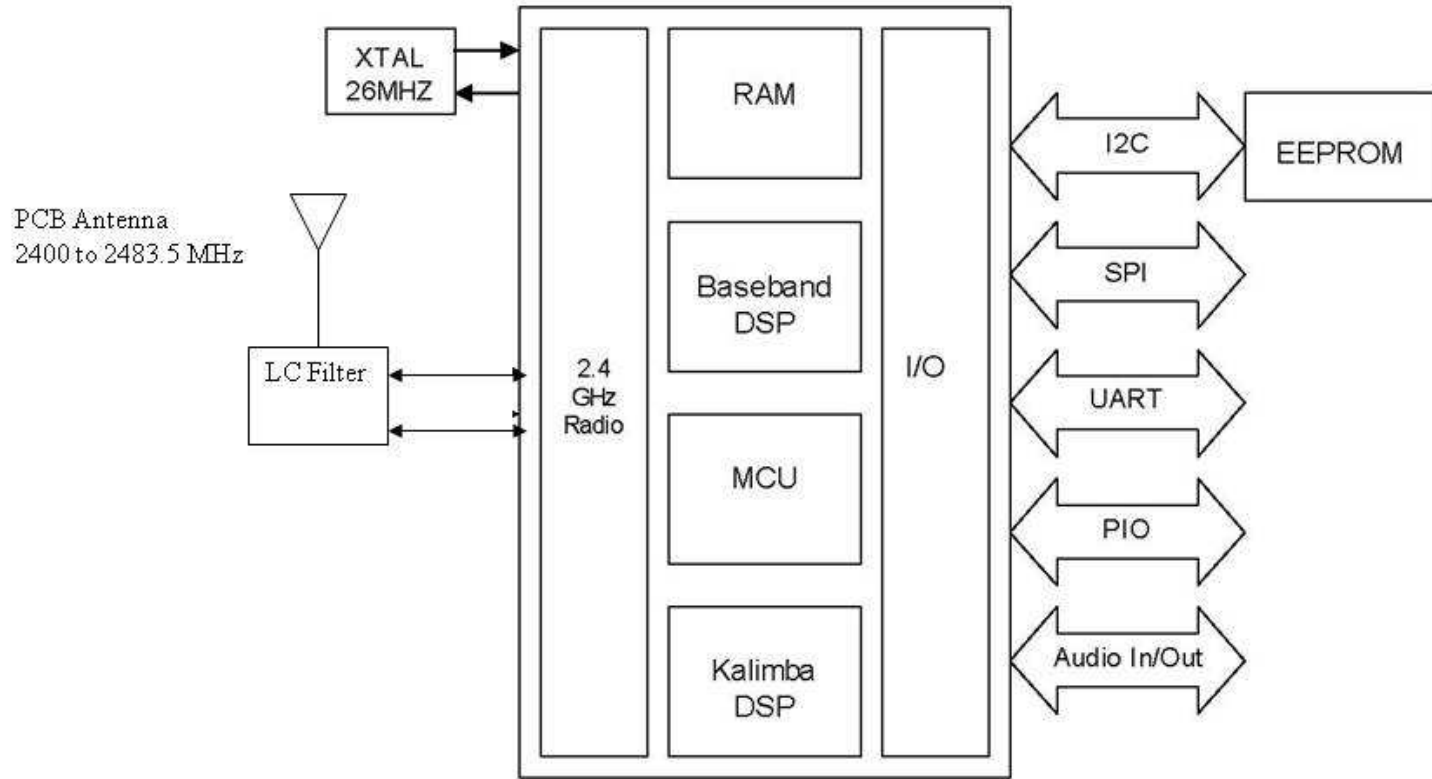- Dimension: 31.1 x 12.0 x 2.2 mm

Applications

- High Quality Mono/Stereo Wireless Headsets
- Hands-Free Car Kits
- Wireless Speakers
- Home-theater Sound Bar
- Bluetooth-Enabled Wireless Gateways

This module is limited to OEM Installation only.

Block Diagram

BC865RPA Block Diagram

```
XTAL
26MHZ ──→ ┌─────────────────────────────────┐
      ←── │        ┌──────────┐              │        ┌────────┐
          │        │   RAM    │              │ ←──I2C──→│ EEPROM │
PCB Antenna        └──────────┘              │        └────────┘
2400 to 2483.5 MHz │                         │
          ▽        │        ┌──────────┐     │        ←──SPI──→
          │        │ 2.4    │ Baseband │ I/O │
LC Filter ←──      │ GHz    │  DSP     │     │        ←──UART──→
          ──→      │ Radio  └──────────┘     │
          ←──      │        ┌──────────┐     │        ←──PIO──→
                   │        │  MCU     │     │
                   │        └──────────┘     │        ←──Audio In/Out──→
                   │        ┌──────────┐     │
                   │        │ Kalimba  │     │
                   │        │  DSP     │     │
                   │        └──────────┘     │
                   └─────────────────────────┘
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BC865RPA is a Class 2 Bluetooth sub-system using BC8645 ROM chipset from leading Bluetooth chipset supplier Cambridge Silicon Radio. .It interfaces to a 64Kbit serial EEPROM. The software stack running on the BC8645 ROM chipset is fully compliant to Bluetooth Specification v4.0. BC865RPA also has necessary matching filters to interface with a build-in PCB antenna, which forms a very cost effective radio subsystem.
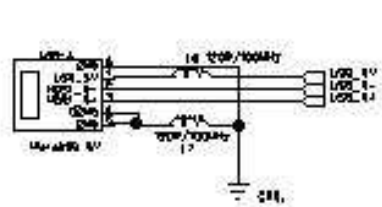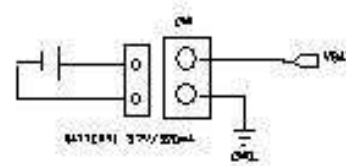
Applications Example
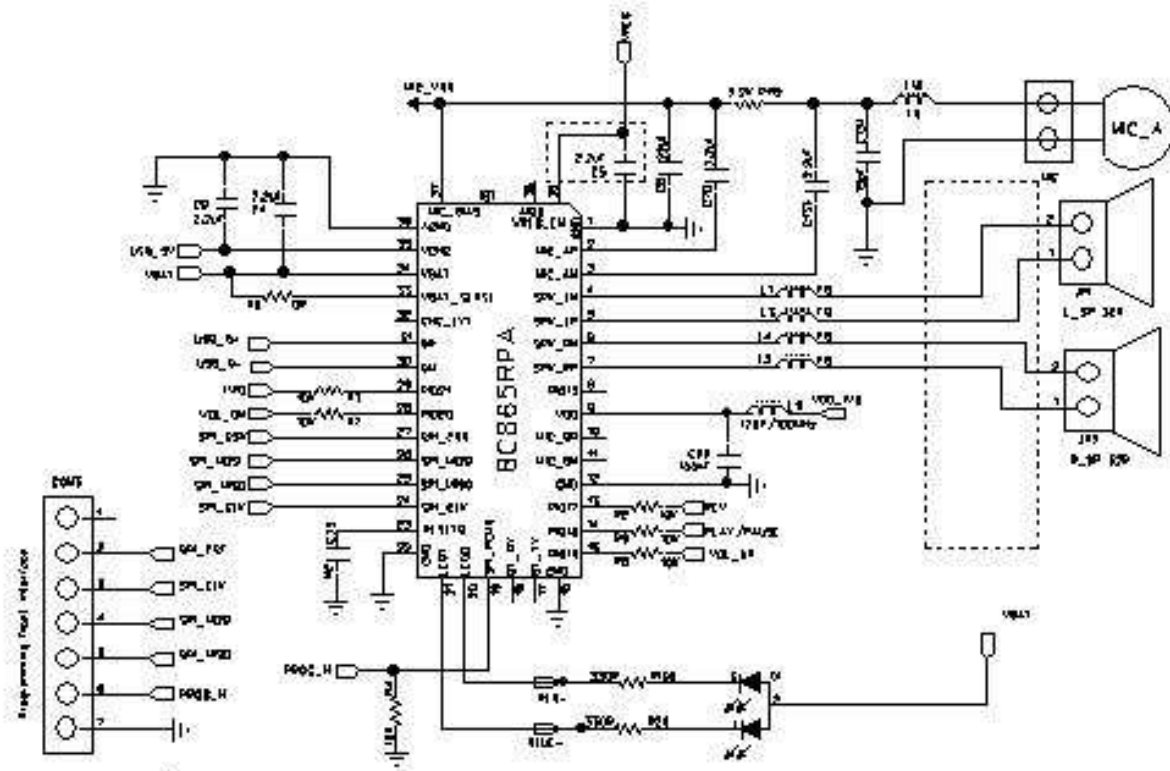
SPI Programming Port
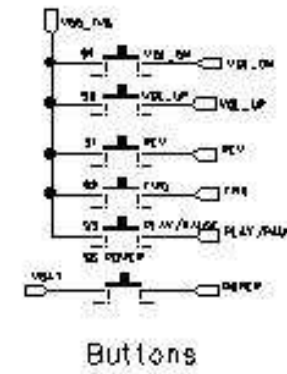
Buttons

USB Port

Li-ion Battery

BC865RPA Example Application

The above schematic shows a typical application of BC865RPA module with PIOs running at 1.8v. Double click on the diagram to see the detail drawings.

Power supply

The whole module shall be powered by a single cell 3.7v Li-ion rechargeable battery (VBAT, pin#34). A coupling capacitor of 2.2uF should be placed as close to this pin as possible. The module will output 1.8v at VPAD (pin #9). All PIO pins, SPI programming port and UART port will run at this power rail.

Differential Audio Outputs

The output stage digital circuitry converts the signal from 16-bit per sample, linear PCM of variable sampling frequency to bit stream, which is fed into the analogue output circuitry. The output stage circuit comprises a DAC with gain setting and class AB output stage amplifier. The output is available as a differential signal between SPK_LN and SPK_LP for the left channel, as the schematic shows, and between SPK_RN and SPK_RP for the right channel. The output stage is capable of driving a speaker directly when its impedance is at least 8Ω.

UART Port

BC865RPA has a standard UART serial interface that provides a simple mechanism for communicating with other serial devices using the RS232 protocol. A typical application will be connecting to an external HCI host. When BC865RPA is connected to another digital device, RX and TX transfer data between the 2 devices. UART configuration parameters, such as baud rate and packet format, are set by configuration of the BC8645 ROM chip.

To communicate with the UART at its maximum data rate using a standard PC, an accelerated serial port adapter card is required for the PC.

Possible UART Settings

Parameter		Possible values
Baud rate	Minimum	1200 baud (≤2% Error)
	Maximum	9600 baud (≤1% Error)
Parity		None, Odd or Even
Number of stop bits		1 or 2
Bits per byte		8

SPI Programming Port

The SPI is used to program and configure the ROM firmware inside BC8645 chip. It is required in production. Ensure the 4 SPI signals are brought out to either test points or a header. Note that these four signals will run at 1.8v power rail.

Mic Inputs

The microphone bias, MIC_BIAS, provides power to external mic circuitry, and is configurable from 1.8v to 2.4v. The MIC_BIAS is like any voltage regulator and requires a minimum load to maintain regulation. The MIC_BIAS maintains regulation within the limits 0.200mA to 1.230mA. The input impedance at MIC_A_N, MIC_A_P, MIC_B_N and MIC_B_P is typically 6.0kΩ.

LED Drivers

BC865RPA includes 2 pads dedicated to driving LED indicators. Both terminals can be controlled by firmware, The terminals are open-drain outputs, so the LED must be connected from a positive supply rail to the pad in series with a current limiting resistor. It is recommended that the LED pad, LED[0] or LED[1] pins, operate with a pad voltage below 0.5V. In this case, the pad is like a resistor, RON . The resistance together with the external series resistor sets the current in the LED.

Buttons

The example application has assigned the following functions to each PIO pins:

PIN	NAME	Function	Descriptions
13	PIO17	REV	Select previous song, fast rewind.
29	PIO21	FWD	Select next song, fast forward
14	PIO18	PLAY_PAUSE	Play / pause toggle
18	PIO20	VOL-	Volume decrease
15	PIO19	VOL+	Volume decrease
33	VBAT_SENSE	BAT_SENSE	Battery level detection
39	VREG	VREG_EN	Power on, sleep mode

<u>Battery and Charging</u>

The whole circuit is running with single cell 3.7v Li-ion battery connecting to the VBAT terminal. VBAT_SENSE is shorted to this terminal for battery level detection. 5V charging input coming from the micro USB port is connected to the VCHG terminal. In this typical circuit, a maximum of 150mA charging current can be supported.   Note that a decoupling capacitor of 2.2uF should be connected to VCHG.

<u>Host Information</u>

This module was defined to be used for specific host only. The designated host for this module was:
Company: GT-tronics HK Ltd.
Address: B202, Tonic Industrial Center, 19 Lam Hing Street, Kowloon Bay, Hong Kong
Host Model Name: BTSPK
Host brand name: GT-tronics

FCC RF Exposure Requirement

1. At least 20cm separation distance between the antenna and the user's body must be maintained at all times. And must not transmit simultaneously with any other antenna or transmitter, except in accordance with FCC multi transmitter product procedures.
2. To comply with FCC regulations limiting both maximum RF output power and human exposure to RF radiation, the maximum antenna gain including cable loss in a mobile-only exposure condition must not exceed 0dBi in the 2.4G band.
3. A user manual with the end product must clearly indicate the operating requirements and conditions that must be observed to ensure compliance with current FCC RF exposure guidelines.

Please be noticed following information and instructions should be placed in the end-user's operating manual

The Module has been granted as limited modular approval for mobile applications. This Module must be installed in the designated host as specified in this manual.
1. Separate approval is required for all other operating configurations, including portable configurations with respect to 2.1093 and different antenna configurations.
2. The Module and its antenna must not be co-located or operating in conjunction with any other transmitter or antenna within a host device. This equipment complies with FCC RF radiation exposure limits set forth for an uncontrolled environment.
3. A label must be affixed to the outside of the end product into which the module is incorporated, with a statement similar to the following: For BC865RPA: This device contains FCC ID: B4OBC86XRPA.
4. The module shall be in non-detachable construction protection into the finished products, so that the end-user has to destroy the module while remove or install it.
5. This module is to be installed only in mobile or fixed applications. According to FCC part 2.1091(b) definition of mobile and fixed devices is:.
Mobile device:
A mobile device is defined as a transmitting device designed to be used in other than fixed locations and to generally be used in such a way that a separation distance of at least 20 centimeters is normally maintained between the transmitter's radiating structure(s) and the body of the user or nearby persons. In this context, the term ''fixed location'' means that the device is physically secured at one location and is not able to be easily moved to another location.
Portable device:
For purposes of this section, a portable device is defined as a transmitting device designed to be used so that the radiating structure(s)
of the device is/are within 20 centimeters of the body of the user.
6. Separate approval is required for all other operating configurations, including portable configurations with respect to FCC Part 2.1093 and different antenna configurations.
7. A certified modular has the option to use a permanently affixed label, or an electronic label. For a permanently affixed label, the module must be labelled with an FCC ID: B4OBC86XRPA. The OEM manual must provide clear instructions explaining to the OEM the labelling requirements, options and OEM user manual instructions that are required
For a host using a this FCC certified modular with a standard fixed label, if (1) the module's FCC ID is not
visible when installed in the host, or (2) if the host is marketed so that end users do not have
straightforward commonly used methods for access to remove the module so that the FCC ID of
the module is visible; then an additional permanent label referring to the enclosed module:
"Contains Transmitter Module FCC ID: B4OBC86XRPA" or "Contains FCC ID: B4OBC86XRPA" must
be used. The host OEM user manual must also contain clear instructions on how end users can
find and/or access the module and the FCC ID.
8. Host product is required to comply with all applicable FCC equipment authorizations regulations, requirements and equipment functions not associated with the transmitter module portion. compliance must be demonstrated to regulations for other transmitter components within the host product; to requirements for unintentional radiators (Part 15B). To ensure compliance with all non-transmitter functions the host manufacturer is responsible for ensuring compliance with the module(s) installed and fully operational. If a host was previously authorized as an unintentional radiator under the Declaration of Conformity procedure without a transmitter certified module and a module is added, the host manufacturer is responsible for ensuring that the after the module is installed and operational the host continues to be compliant with the Part 15B unintentional radiator requirements. Since this may

depend on the details of how the module is integrated with the host, we suggest the host device to recertify part 15B to ensure complete compliance with FCC requirement: Part 2 Subpart J Equipment Authorization Procedures , KDB784748 D01 v07, and KDB 997198 about importation of radio frequency devices into the United States.

FCC Certification Requirement:
The end product with an embedded Module may also need to pass the FCC Part 15 unintentional emission testing requirements and be properly authorized per FCC Part 15.

Note: If this module is intended for use in a portable device, you are responsible for separate approval to satisfy the SAR requirements of FCC Part 2.1093.

This device complies with Part 15 of the FCC Rules.
Operation is subject to the following two conditions:
(1) this device may not cause harmful interference, and
(2) this device must accept any interference received, including interference that may cause undesired operation.
Changes or modifications made to this equipment not expressly approved by GT-tronics HK Ltd. may void the FCC authorization to operate this equipment.

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