

## **Functional Description**

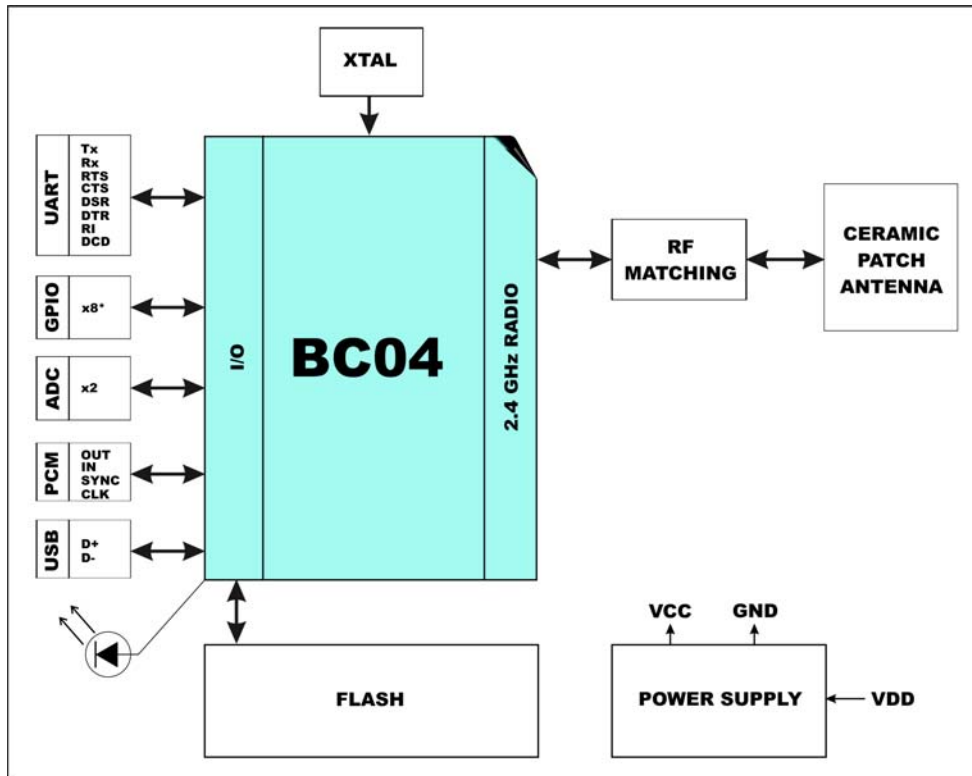
Ezurio's Bluetooth Serial Module is a fully integrated and qualified Class 1 Bluetooth solution designed for lowest cost of integration and ownership for designers wishing to incorporate Bluetooth functionality into their products. The module will be qualified to Bluetooth Version 2.0.

The Bluetooth Module is based on Cambridge Silicon Radio's BlueCore 04 chipset. The module contains all of the hardware and firmware for a complete Bluetooth solution, requiring no further components. The Module has an integrated, high performance antenna, which is matched with the Bluetooth RF and base band circuitry. The firmware integrated into the BC04 chipset implement the higher layer Bluetooth protocol stack, up to and including the Generic Access Profile (GAP), Service Discovery Profile (SDAP), Serial Port Profile (SPP), Dial Up Networking Profile (DUN) and Audio Gateway. A virtual processor is used within the BC04 to implement an AT command processor. This interfaces to the host system over a straightforward serial port using an extensive range of AT commands. The AT command set abstracts the Bluetooth protocol from the host application, saving many months of programming and integration time. It provides extremely short integration times for data oriented cable replacement and voice applications.

In addition to the Bluetooth functionality, The Bluetooth Module provides access to 8 General I/O lines and 2 analogue I/O lines. These can be configured to provide connection to simple devices such as switches or LEDs without requiring any external processing. Both the GPIO and ADC lines can be accessed either via the wired host UART connection, or remotely over the Bluetooth link.

The Bluetooth module is supplied in a small form factor pcb (25mm x 35mm x 10mm). The module is also available in the same size as the Bluetooth Module version I (69mm x 24mm x 10mm) for backward compatibility. The Bluetooth Module connects to a main pcb using a 40-way Hirose connector. The module includes a high sensitivity, high gain antenna which provides excellent range. Typical open field performance provides ranges of over 250 metres at transmit powers of only 4mW.

## Block Diagram



The Bluetooth module is a self-contained Bluetooth product and requires only power to implement full Bluetooth communication. The integrated, high performance antenna together with the RF and Base-band circuitry provides the Bluetooth wireless link and the UART interface provides a connection to the host system.

The variety of interfaces and the AT command set allow the Bluetooth module to be used for a wide number of short range wireless applications, from simple cable replacement to complex multipoint applications, where multiple radio links are active at the same time.

The complexity and flexibility of configuration are made simple for the design engineer by the integration of a extremely comprehensive set of AT commands, supplemented with a range of “S” registers which are used for non volatile storage of system parameters. These are fully documented in the “Blu2i AT Command Reference Manual”.

To provide the widest scope for integration a range of different physical host interfaces are provided

### UART interface

UART\_TX, UART\_RX, UART\_RTS and UART\_CTS form a conventional asynchronous serial data port. The interface is designed to operate correctly when connected to other UART devices such as the 16550A. The signalling levels are

nominal 0V and 3.3V and are inverted with respect to the signalling on an RS232 cable. The interface is programmable over a variety of bit rates; no, even or odd parity; stop bit and hardware flow control. The default condition on power-up is pre-assigned in the external Flash. Two-way hardware flow control is implemented by UART\_RTS and UART\_CTS. UART\_RTS is an output and is active low. UART\_CTS is an input and is active low. These signals operate according to normal industry convention.

By writing different values to the S register the UART\_RI can be continuously polled to detect incoming communication. The UART\_RI signal serves to indicate incoming calls.

UART\_DSR is an active low input. It should be connected to DTR output of the host. When the module is running in high speed mode (See definition for S Reg 512), this pin should be asserted by the host to ensure connection is maintained. A de-assertion is taken to mean that the connection should be dropped, or an online command mode is being requested.

## **SPI bus**

The Module is a slave device that uses terminals SPI\_MOSI, SPI\_MISO, SPI\_CLK and SPI\_CS. This interface is used for program firmware update.

Note: The designer should be aware that no security protection is built into the hardware or firmware associated with this port, so the terminals should not be permanently connected in a PC application.

## **GPIO Port**

Eight lines of programmable bi-directional input/outputs (I/O) are provided that can be accessed either via the UART port, or Over The Air from a second Bluetooth unit. These can be used as data inputs or to control external equipment. By using these in OTA mode, a BISM21 module can be used for control and data acquisition without the need for any additional host processor.

Each of the GPIO [1:8] ports can be independently configured to be either an Input or Output. A selection of ports can be accessed synchronously.

GPIO 1 and 2 can be configured as event counters.

The ports are powered from V<sub>CC</sub>. The mode of these lines can be configured and the lines are accessed via S Registers 621 to 625.

Low latency I/O can be accessed by using Ezurio's I/O via enquiry process.

## **PCM CODEC Interface**

PCM\_OUT, PCM\_IN, PCM\_CLK and PCM\_SYNC carry up to three bi-directional channels of voice data, each at 8ksamples/s. The format of the PCM samples can be 8-bit A-law, 8-bit  $\mu$ -law, 13-bit linear or 16-bit linear. The PCM\_CLK and PCM\_SYNC terminals can be configured as inputs or outputs, depending on whether the module is the Master or Slave of the PCM interface.

The Module is compatible with the Motorola SSI TM interface and interfaces directly to PCM audio devices including the following:

## **ADC**

The BISM2 provides access to two 8-bit ADCs. These provide a range of 0mV to 1,800mV, which can be read using the S registers 701 and 702. Suitable external scaling and over-voltage protection should be incorporated in your design.

*For detail description of the hardware, please refer to the module data sheet.*