



## ***Hardware Design Guide***

22 Dec 2009

## 1 Preface

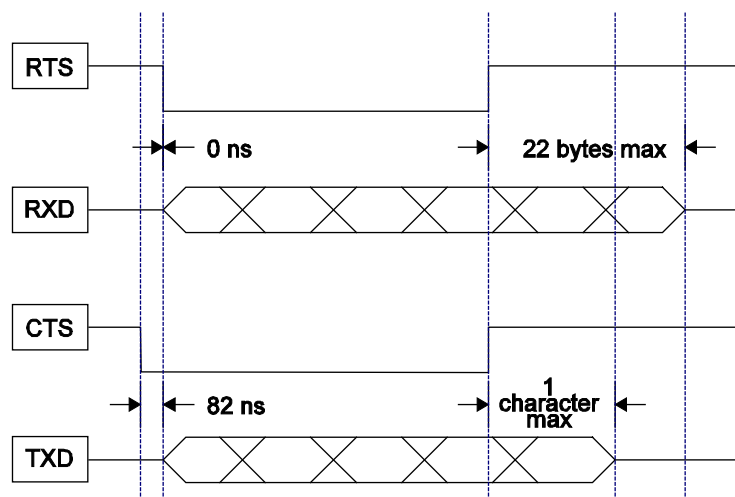
Amp'ed RF modules support UART, SPI, and GPIO hardware interfaces. This document details a typical usage model for these features. Please note that the usage of these interfaces is dependant upon the firmware that is loaded into the module, and is beyond the scope of this document.

## 2 General Notes

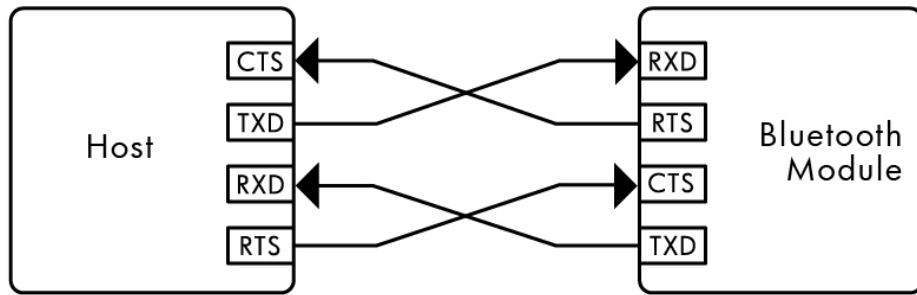
- All unused pins should be left floating; do not ground.
- All GND pins must be well grounded.
- The area around the module should be free of any ground planes, power planes, trace routings, or metal for 8 mm from the antenna in all directions.
- Traces should not be routed underneath the module.

## 3 UART Interface

The UART is compatible with the 16550 industry standard and supports 1200 , 2400 , 4800 , 9600 , 19.2K , 38.4K , 57.6K , 115.2K , 230.4K , 460.8K , 921.6K bits/s rates. Four signals are provided with the UART interface. The TXD and RXD pins are used for data while the CTS and RTS pins are used for flow control.

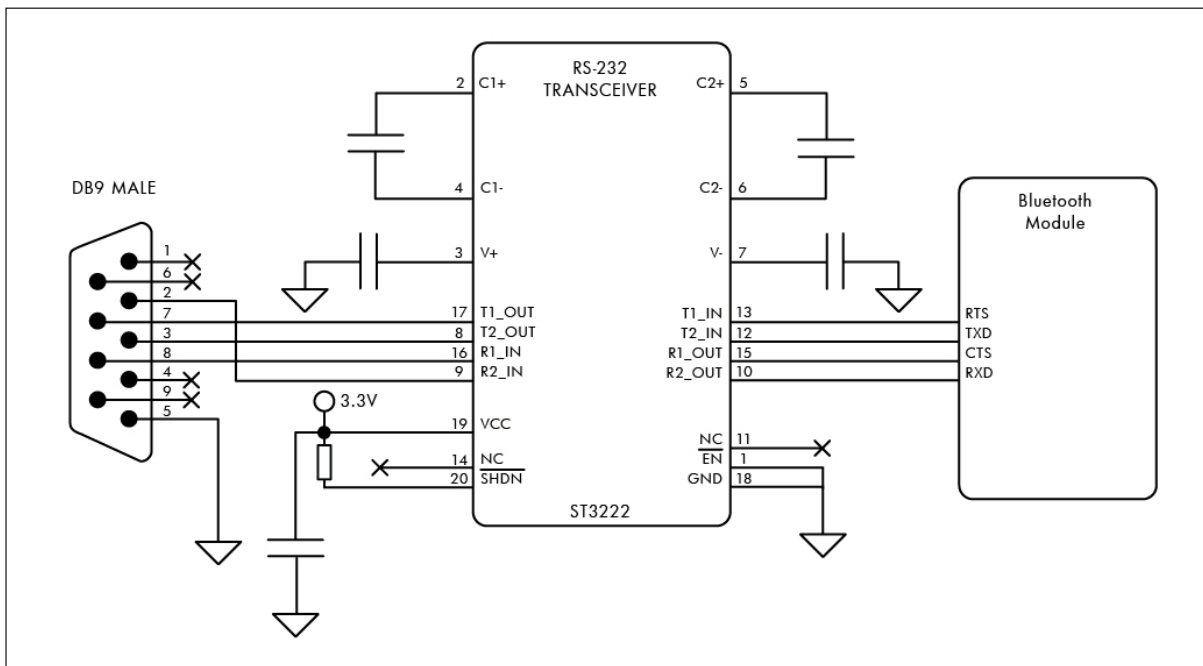


UART Timing Diagram



Connection to Host Device

**UART Signal Connections**



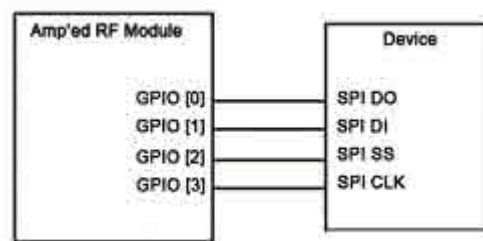
### Typical UART Circuit

## 4 GPIO Interface

All GPIOs are capable of sinking and sourcing 4mA of I/O current.

## 5 SPI Interface

The SPI Interface is defined by firmware. A typical application implementation is via the following GPIO pins:

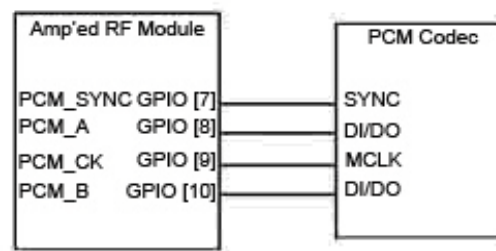


Typical SPI Connection, BT11 Module

For further details, please contact technical support: [support@ampedrfttech.com](mailto:support@ampedrfttech.com)

## 6 PCM Interface

The PCM Interface is used for Headset and Handsfree audio profile applications:



Typical PCM Connection

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## 7 I2C Interface

BT11 Module

Interface pins on:

GPIO 13 : I2C SCL

GPIO 14 : I2C SDA

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## 8 Firmware Reflashing

GPIO 2 of the module is used to select the boot loader ROM in order to reflash the application firmware. When the device is reset, the GPIO 2 state is read to determine the program execution section:

High (default): executes the application firmware.

Low: executes from the boot loader.

The boot loader requires a y-modem protocol, and uses the main UART running at 115200 baud. This operation is detailed in the *Firmware Reflashing Guide*.

(Note: Future re-flashing will also be supported on a dedicated Boot pin)

The minimum connections required to flash a device are:

RXD, TXD, GPIO 2, PWR, and GND

CTS and RTS flow control pins are NOT used.

## 9 PCB Layout Guidelines

