Amp'ed RF, Inc.
(phone) 408 213-9530
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Product Specification - Preliminary



10mm x 13mm

Description

Our micro-sized Bluetooth module is one of the smallest form factors available. The BT-22 is designed for maximum performance in a minimal space and includes 4 general purpose input/output lines, several serial interface options, analog-to-digital input, and up to 2M bps data throughput.

The BT-22 is a surface mount PCB module that provides fully embedded, ready to use Bluetooth wireless technology. The reprogrammable flash memory contains embedded firmware for serial cable replacement using the Bluetooth SPP profile. Other popular Bluetooth profiles, such as OBEX, are also available.

Customized firmware for peripheral device interaction, power optimization, security, and other proprietary features may be supported and can be ordered pre-loaded and configured.

Additional Documentation

- **BT HW Design Guide**
- **BT Getting Started Guide**
- **abSerial User Guide**
- **abSerial Reference Guide**

Features

- **Bluetooth Radio**
  - Fully embedded Bluetooth v2.0 Serial and OBEX Profiles
  - Class 2 radio
  - Complete RF ready module
  - Wireless data communications
  - 128-bit encryption security
  - Range up to 30m LOS
  - FCC & Bluetooth qualified
- **ST Micro ARM7 microprocessor up to 50MHz**
- **Memory**
  - 256K bytes flash memory
  - 64K bytes RAM memory
- **Data Rate**
  - 2M bps maximum data rate
  - Multipoint capability
- **Serial Interface**
  - UART, up to 480K baud (up to 3.25M baud on BT22.2)
  - Buffered SPI interface
  - I2C interface
- **General I/O**
  - 4 general purpose I/O
  - 1x12-bit A/D input
- **User Interface**
  - AT command set
  - Firmware upgrade over UART

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Software Architecture

Lower Layer Stack

- Full Bluetooth v2.0 data rate (3M bps maximum)
- Device power modes—active, sleep and deep sleep
- Wake on Bluetooth feature—optimized power consumption of host CPU
- Authentication and encryption
- Encryption key length from 8-bits to 128-bits maximum
- Persistent FLASH memory—for BD Address and radio parameter storage
- All ACL (Asynchronous Connection Less) packet types (DM1, DH1, DM3, DH3, DM5, DH5, 2-DH1, 2-DH3, 2-DH5, 3-DH1, 3-DH3, 3-DH5, AUX1)
- SCO (Synchronous Connection Oriented) packet types (HV1, HV2, HV3)
- Point to multipoint and scatternet support—3 master and 7 slave links allowed (10 active links simultaneously)
- Park, sniff, and hold modes—fully supported to maximum allowed intervals
- Master slave switch—supported during connection and post connection
- Dedicated Inquiry Access Code—for improved inquiry scan performance
- Dynamic packet selection—channel quality driven data rate to optimize link performance
- Dynamic power control—interference reduction and link performance
- Bluetooth test modes—per Bluetooth v2.0 specification
- 802.11b co-existence—AWMA and AFH
- Vendor specific HCI commands—to support device configuration and certification test modes

Upper Layer Stack: Amp'ed UP

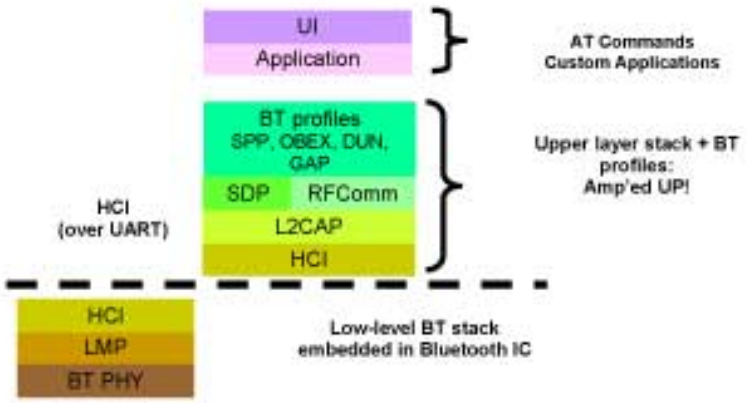
- SPP, OBEX, SDAP, GAP, and DUN protocols
- RFComm, SDP, and L2CAP supported
- Multipoint with 7 simultaneous slaves

HCI Interface

- Bluetooth v2.0 specification compliant
- HCI UART transport layer (H4)

AT Command Set: abSerial

- Please see *abSerial Reference Guide* for details



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Hardware Specifications

General Conditions (V_{IN}= 3.0V and 25°C)

Recommended Operating Conditions

Rating	Min	Typical	Max	Unit
Operating Temperature Range	-40	-	85	°C
Supply Voltage V_{IN}	2.85	3.0	3.4	Volts
Signal Pin Voltage	-	3.0	-	Volts
RF Frequency	2400	-	2483.5	MHz

Absolute Maximum Ratings

Rating	Min	Typical	Max	Unit
Storage temperature range	-55	-	+150	°C
Supply voltage, V_{IN}	-0.3	-	+ 3.6	Volts
I/O pin voltage, V_{IO}	-0.3	-	+ 4.0	Volts
RF input power	-	-	-5	dBm

Current Consumption

Modes	Avg	Unit
Typical Power Consumption		
ACL data 115K Baud UART at max throughput (Master)	33.0	mA
ACL data 115K Baud UART at max throughput (Slave)	34.0	mA
Connection, no data traffic, master	16.0	mA
Connection, no data traffic, slave	24.0	mA
Standby, without deep sleep	14.0	mA

I/O Operating Characteristics

Symbol	Parameter	Min	Max	Unit	Conditions
V_{IL}	Low-Level Input Voltage	-	0.9	Volts	V_{IN}, 3.0V
V_{IH}	High-Level Input Voltage	2.1	-	Volts	V_{IN}, 3.0V
V_{OL}	Low-Level Output Voltage	-	0.4	Volts	V_{IN}, 3.0V
V_{OH}	High-Level Output Voltage	2.2	-	Volts	V_{IN}, 3.0V
I_{OL}	Low -Level Output Current	-	4.0	mA	V_{OL} = 0.4 V
I_{OH}	High-Level Output Current	-	4.0	mA	V_{OH} = 2.2 V
R_{PU}	Pull-up Resistor	80	120	KΩ	Resistor Turned On
R_{PD}	Pull-down Resistor	80	120	KΩ	Resistor Turned On

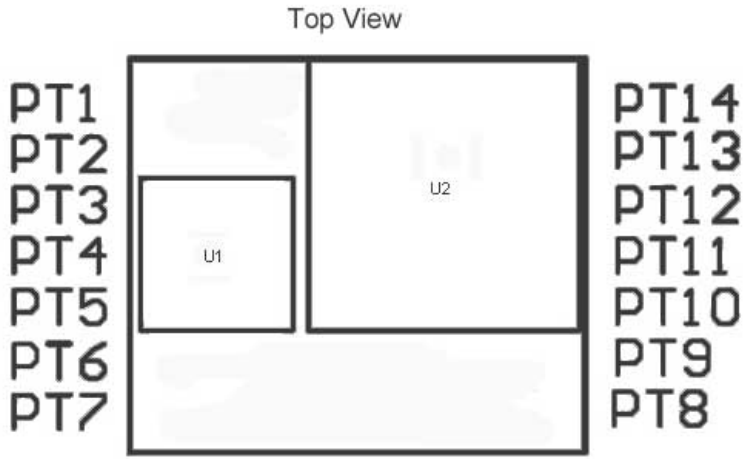
Selected RF Characteristics

Parameters	Conditions	BT Spec	Typical	Unit
Antenna load			50	ohm
Radio Receiver				
Sensitivity level	BER < .001 with DH5	≤ -70	-84	dBm
Maximum usable level	BER < .001 with DH1	≥ -20	-9	dBm
Input VSWR			2.5:1	
Radio Transmitter				
Maximum output power	50 Ω load	-6 to +4	+5	dBm
Initial Carrier Frequency Tolerance		± 75	0	kHz
20 dB Bandwidth for modulated carrier		≤ 1000	932	kHz

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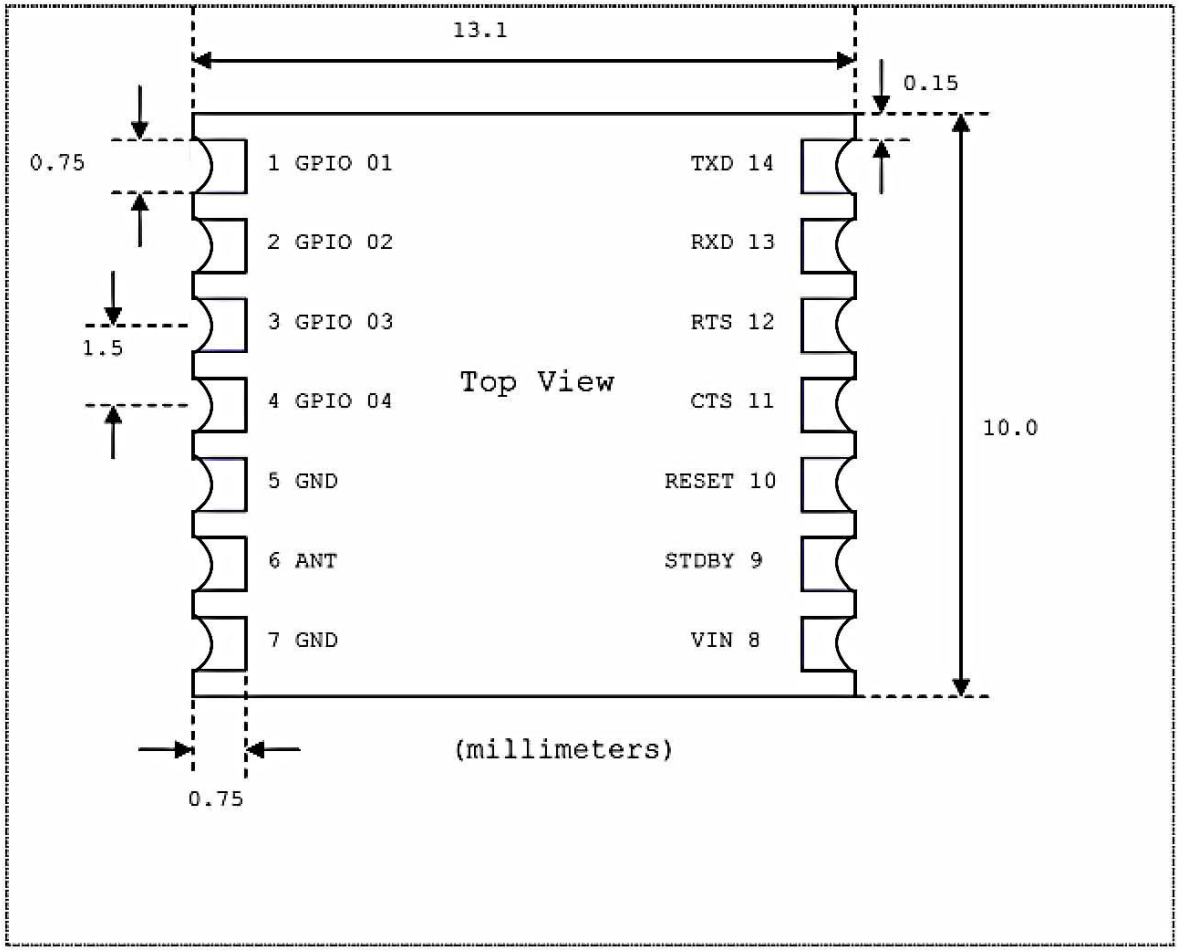
Pin Assignment

Name	Type	Pin #	Description	ALT Function
UART Interface				
RXD	I	13	Receive data	
TXD	O	14	Transmit data	
CTS	I	11	Clear to send (active low)	I2C Data
RTS	O	12	Request to send (active low)	I2C Clock
Antenna				
ANT	RF I/O	6	50Ω Rx/Tx antenna port	
Reserved – Future Boot 0				
STDBYN	I	9	Standby	
Power and Ground				
V_{in}		8	V_{in}	
GND		5, 7	GND	
Reset				
RESETN	I	10	Reset input (active low for 5 ms);	
GPIO – General Purpose Input/Output				
GPIO [1]	I/O	1	General Purpose Input/Output	SPI MISO
GPIO [2]	I/O	2	General Purpose Input/Output	SPI MOSI
GPIO [3]	I/O	3	General Purpose Input/Output	SPI SCLK/ADC 0
GPIO [4]	I/O	4	General Purpose Input/Output	SPI SS



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Layout Drawing, BT-22 (Standard Size)
Size: 10 mm x 13.1 mm x 2.2 mm (heigth)

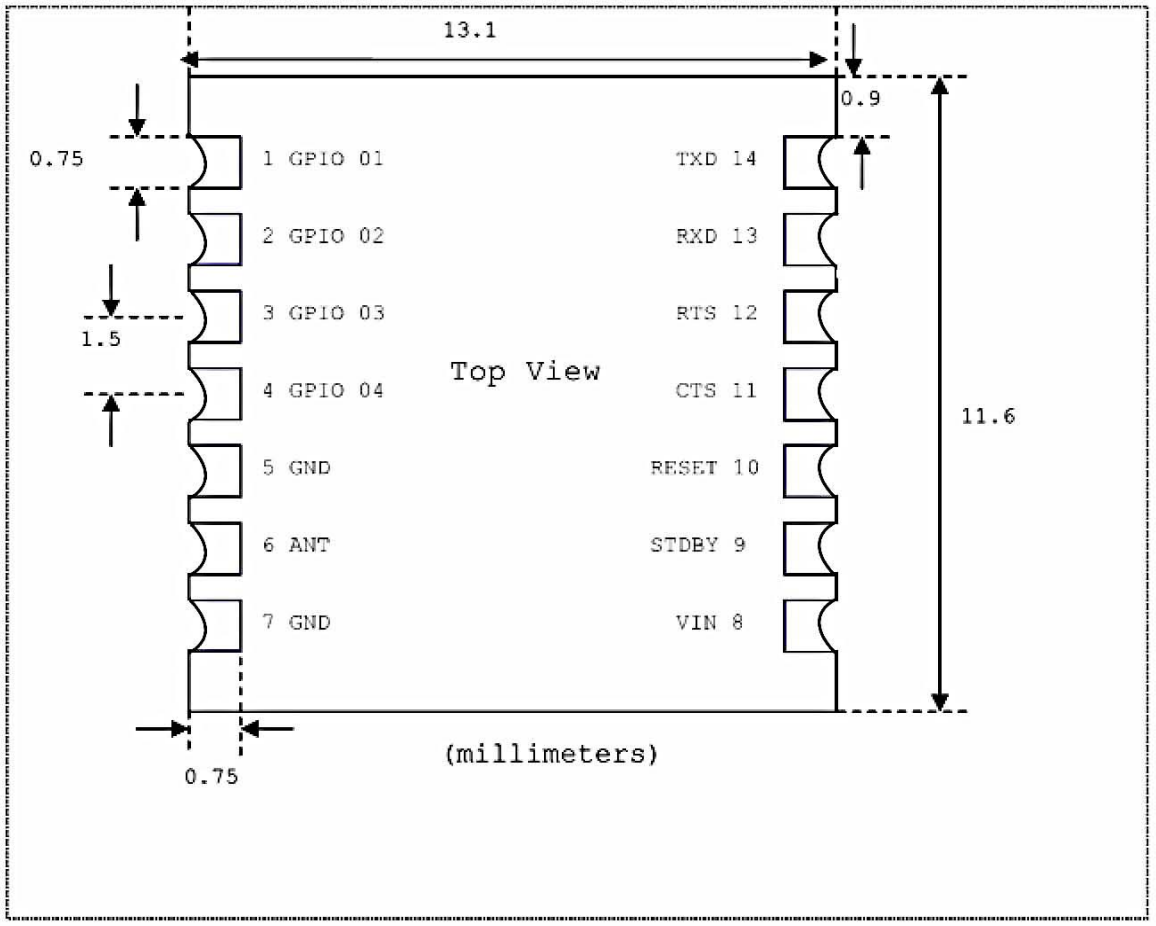


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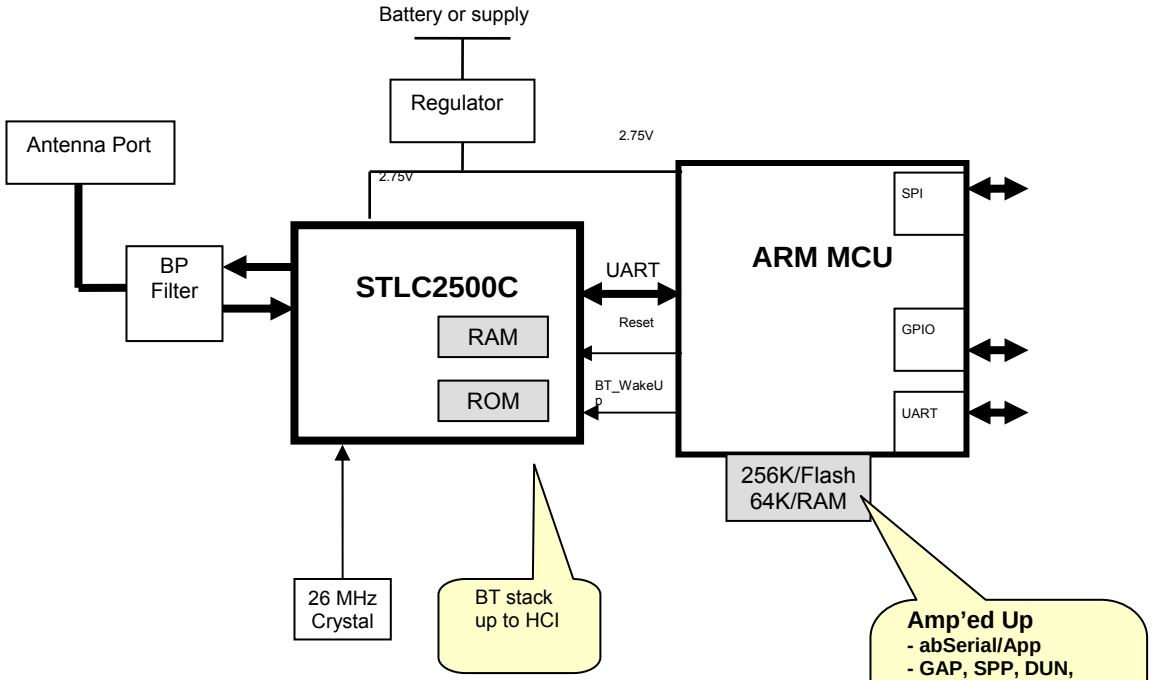
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Layout Drawing, BT-22A (Optional Size)

Size: 11.6 mm x 13.1 mm x 2.2 mm (heigth)



Hardware Block Diagram



BT22 Bluetooth Module Block Diagram

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Hardware Design

Amp'ed RF modules support UART, USB, SPI, and GPIO hardware interfaces. This section details typical usage models 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.

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 at least 8 mm from the antenna in all directions.
- Traces should not be routed underneath the module.

Module Reflow Installation

The BT-21 is a surface mount Bluetooth module supplied on a 24 pin, 6-layer PCB. The final assembly recommended reflow profiles are:

For non Pb-free applications, Sn63Pb37 solder is recommended.

- Maximum peak temperature of 208° - 210°C (below 220°C).
- Maximum rise and fall slope after liquidous of < 2°C/second.
- Maximum rise and fall slope after liquidous of < 2°C/second.
- Maximum time at liquidous of 50 – 90 seconds.

For RoHS/Pb-free applications, Sn96.5/Ag3.0/Cu0.5 solder is recommended.

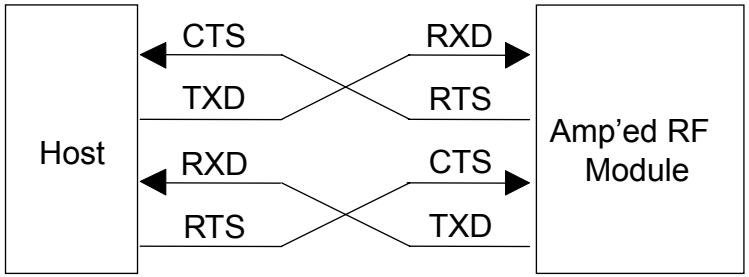
- Maximum peak temperature of 230° - 240°C (below 250°C).
- Maximum rise and fall slope after liquidous of < 2°C/second.
- Maximum rise and fall slope after liquidous of < 3°C/second.
- Maximum time at liquidous of 40 – 80 seconds.

GPIO Interface

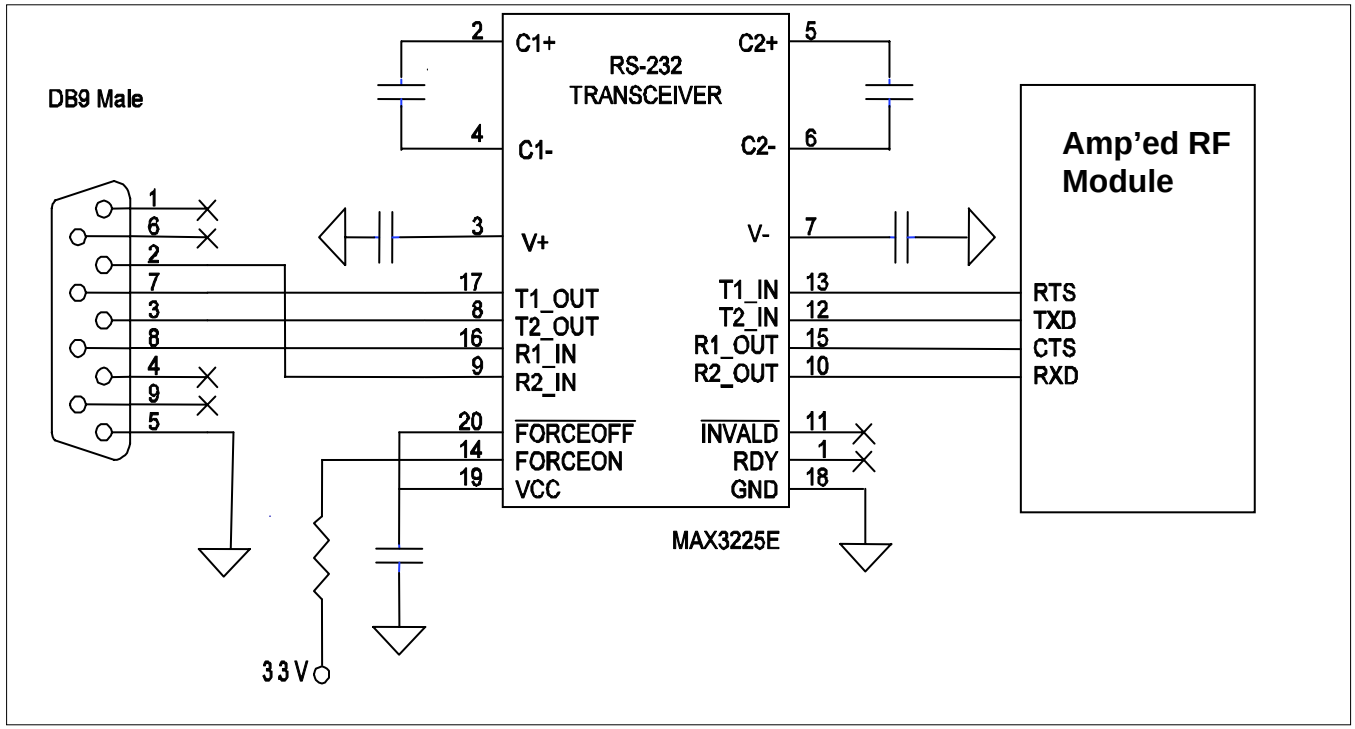
All GPIOs are capable of sinking and sourcing 4mA of I/O current. GPIO [0] to GPIO [7] are internally pulled down with 100KΩ (nominal) resistors GPIO [8] to GPIO [15] are internally pulled up with 100KΩ (nominal) resistors.

UART Interface

The UART is compatible with the 16550 industry standard. 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.



Connection to Host Device



Typical RS232 Circuit

FCC Regulatory Compliance

FCC licensing is dependent on final antenna implementation. Many tests do not need to be repeated for final compliance and certification. Some external antennas may be pre-approved – please contact technical support for details

Ordering Information

Part Name	Description
BT-22	Standard size option
BT-22A	PCB size option A

Picture Not Available

BT-22



BT-22A