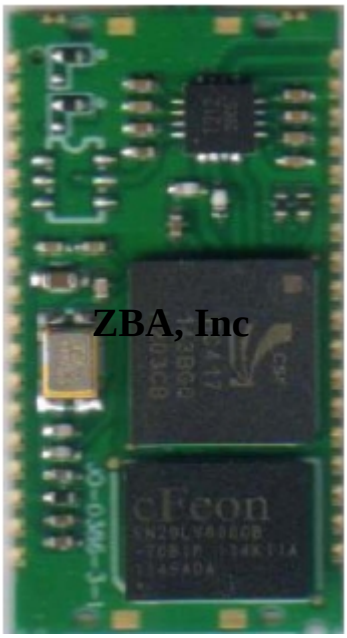
ZBA Bluetooth 2.0 Class 1 Module

Assembly No. BT44 – 111S



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1 Document Status

Date	Comments
February 2008	http://www.zbausa.com publication
June 2008 November 2008	Updated contact info Added PNs for additional profiles
February 2012	Update pin orientation drawings

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2 Scope

The intention of this specification is to provide general guidelines on the integration of the **BT44-111S** Bluetooth assembly. This product, which complies with Bluetooth Specification 2.0, is designed to help companies offer Bluetooth enabled products by speeding their development processes with a ready to integrate Bluetooth assembly with external antenna attachment.

3 Bluetooth Assembly Description

The **BT44-111S** is a general purpose surface mount Bluetooth module with an 50 ohm antenna drive. The BT44-111S Bluetooth Module is a Class 1 Bluetooth module using BlueCore4-External chipset from Cambridge Silicon Radio, a leading Bluetooth chipset supplier. It provides a fully compliant Bluetooth system for data and voice communications. The module interfaces with a host via UART (USB optional) and supports EDR data rate up to 3Mbps modulation modes. The module and device firmware is fully compliant with the Bluetooth specification V2.0.

The Bluetooth assembly is available in four different variants:

1) UART transport with serial port emulation (Serial Port Profile)
2) UART transport with HCI interface
3) UART transport with HID interface
4) UART transport with OBEX and FTP profiles

Modules with profiles corresponding to variants 2, 3 and 4 are available upon special request.

4 Features

Operating Frequency Band 2.40 GHz~2.48GHz unlicensed ISM Band
Bluetooth Spec. v2.0 Compliant + Enhanced Data Rate (EDR)

- EDR compliant with v2.0.E.2 of specification for both 2Mbps and 3Mbps modulation modes

Class 1 Output Power Range up to 100m
Firmware Upgrade Support (via the UART)
Solder down connections
Active Bluetooth Connections signal
Piconet Support, up to 7 Slaves
USB 2.0 and UART Host Interface
PCM Audio Interface
Low Voltage Power Supply, 2.7V to 3.6V
Built-in 8Mbit Flash Memory
Low Power Modes Available: Park, Sniff, Hold and Deep Sleep
Dimensions: 27.5 x 14.5 x 2 mm

5 Applications

PCs, PDAs
Computer Accessories (CF Cards, USB Dongles, PCMCIA, RS232 Adaptors, etc.)
Mice, Keyboards, Joysticks
Cordless Phones
FAX, Printer Adaptors
Digital Cameras
Access Points to LAN and/or Dial-up network

6 Block Diagram

The transmitter design consists of a Bluetooth Chip device connected to an Atmel power amplifier via a matching network and balun. Harmonic filtering, a transmit/receive switch, a ceramic bandpass filter and a SMA connector are also included.
The receiver uses the same antenna, bandpass filter and transmit/receive switch as the transmitter. To improve the sensitivity, the LNA within the Atmel device and the single-ended receiver port of Bluetooth Chip are used.

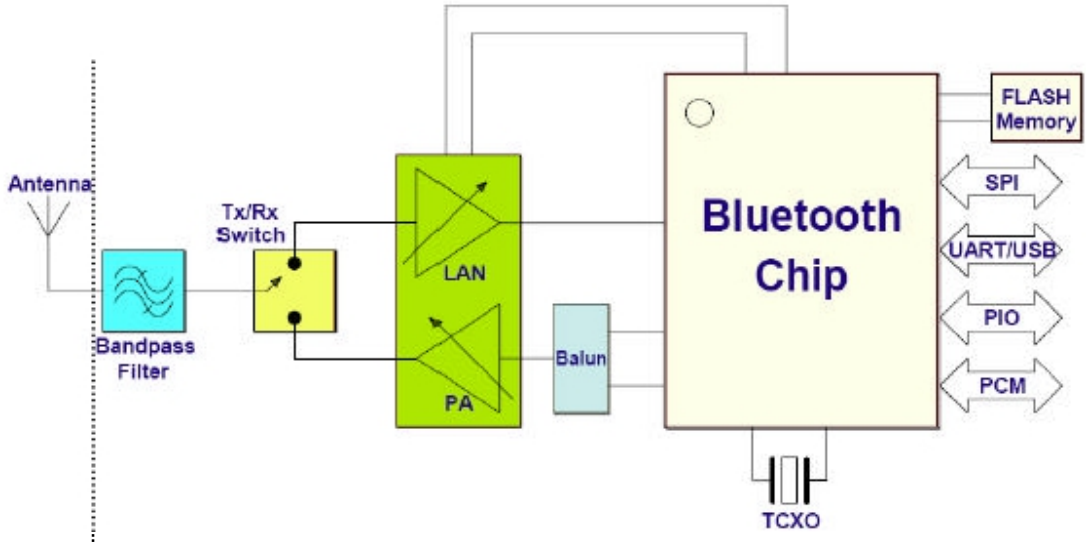

Figure 1: Block Diagram of the BT Module

7 Pin-out and Mechanical Specifications

7.1 Pin Configurations

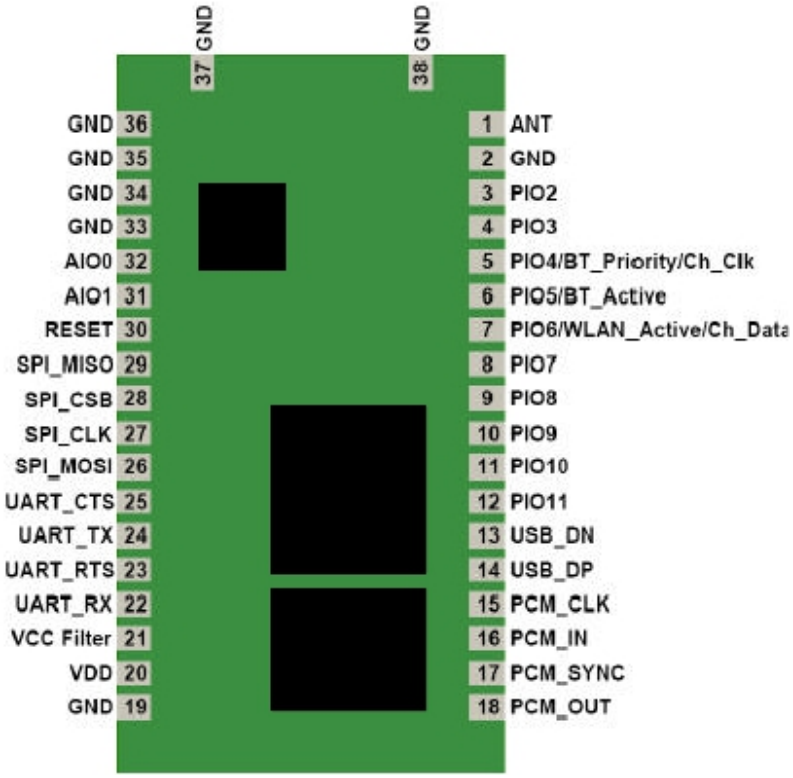

Figure 2 Pin Configuration of the BT44-111S Module (top view)

Pin #	Name	Type	Description
1	ANT	I/O	Transmitter out and receiver input
2	GND	GND	Ground
3	PIO2	Bi-directional with programmable strength internal pull-up/down	Programmable Input/Output Line
4	PIO3	Bi-directional with programmable strength internal pull-up/down Programmable	Input/Output Line
5	PIO[4]/ BT_Priority/ Ch_Clk	Bi-directional with programmable strength internal pull-up/down	Programmable input/output line or Optionally BT_Priority/Ch_Clk output for co-existence signaling
6	6 PIO[5]/ BT_Active	Bi-directional with programmable strength internal pull-up/down	Programmable input/output line or Optionally BT_Active output for co-existence signaling

7	PIO[6]/ WLAN_Active/ Ch_Data	Bi-directional with programmable strength internal pull-up/down	Programmable input/output line or Optionally WLAN_Active/Ch_Data input for co-existence signaling
8	PIO7	Bi-directional with programmable strength internal pull-up/down	Programmable Input/Output Line
9	PIO8	Bi-directional with programmable strength internal pull-up/down	Programmable Input/Output Line
10	PIO9	Bi-directional with programmable strength internal pull-up/down	Programmable Input/Output Line
11	PIO10	Bi-directional with programmable strength internal pull-up/down	Programmable Input/Output Line
12	PIO11	Bi-directional with programmable strength internal pull-up/down	Programmable Input/Output Line
13	USB_DN	Bi-directional	USB Data-
14	USB_DP	Bi-directional	USB Data+
15	PCM_CLK	Bi-directional with weak internal pull-down	Synchronous Data Clock
16	PCM_IN	CMOS input, with weak internal pull-down	Synchronous data input
17	PCM_SYNC	Bi-directional with weak internal pull-down	Synchronous Data Strobe
18	PCM_OUT	CMOS output, tri-state, with weak internal pull-down	Synchronous Data Output
19	GND	GND	Ground
20	VDD	Power Supply	3.3 V for RF circuit
221	VCC Filter		Filter Capacitor for 1.8V
22	UART_RX	CMOS input with weak internal pull-down	Asynchronous Serial Data
23	UART_RTS	CMOS output, tri-state, with weak internal pull-up	UART ready to send
24	UART_TX	CMOS output, tri-state, with weak internal pull-up	Asynchronous Serial Data Output
25	UART_CTS	CMOS input with weak internal pull-down	UART clear to send
26	SPI_MOSI	CMOS input with weak internal pull-down	Synchronous Serial Interface Data Input
27	SPI_CLK	CMOS input with weak Internal pull-down	Synchronous Serial Interface Clock
28	SPI_CSB	CMOS input with weak internal pull-up	Chip select for Synchronous Serial Interface
29	SPI_MISO	CMOS output, tri-state, with weak internal pull-down	Synchronous Serial Interface Data Input
30	RESET	CMOS input with weak	internal pull-up Reset if low. Input

		internal pull-up	de-bounced so must be low for >5ms to cause a reset
31	AIO1	Bi-directional	Programmable Input/Output line
32	AIO0	Bi-directional	Programmable Input/Output line
33	GND	GND	Ground
34	GND	GND	Ground
35	GND	GND	Ground
36	GND	GND	Ground
37	GND	GND	Ground
38	GND	GND	Ground

7.2 Dimensional Drawing

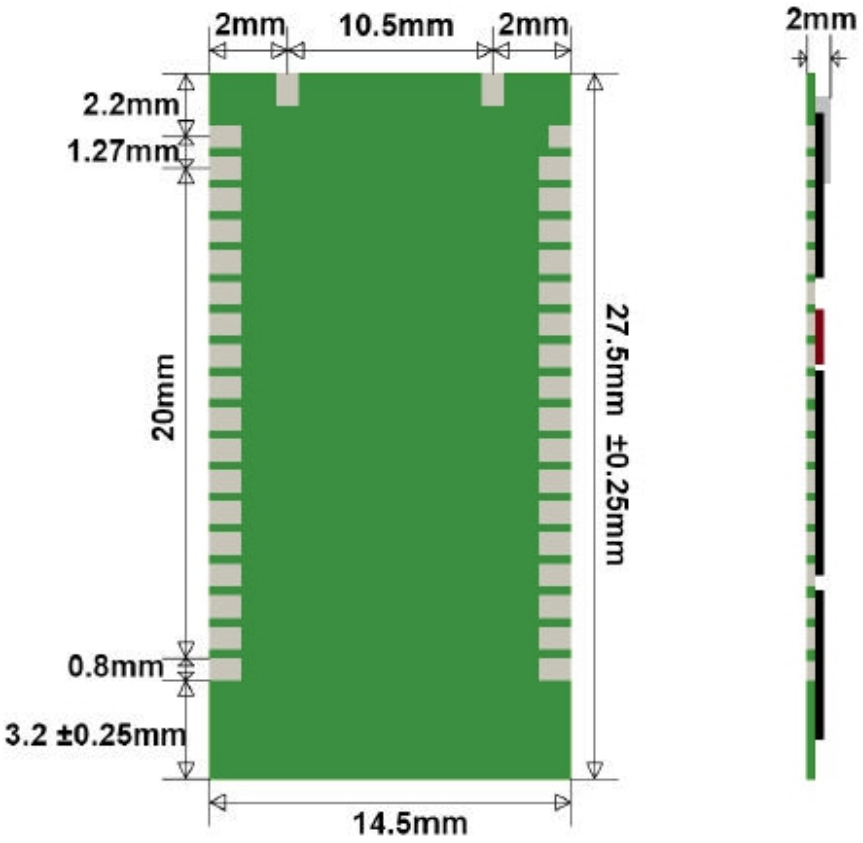

Figure 3 Dimensional Drawing of the BT44-111S (top & side views)

7.3 PCB Land Patterns

The BT44-111S is a solder down Bluetooth module. The pad is an edge style pad with a pitch of 50mils. The exact dimensions of the pad should always be cross-checked with the manufacturer of the PCB and the assembly locations. The dimensions shown below are only recommended dimensions and are used on our testing boards. See Figure 4 below.

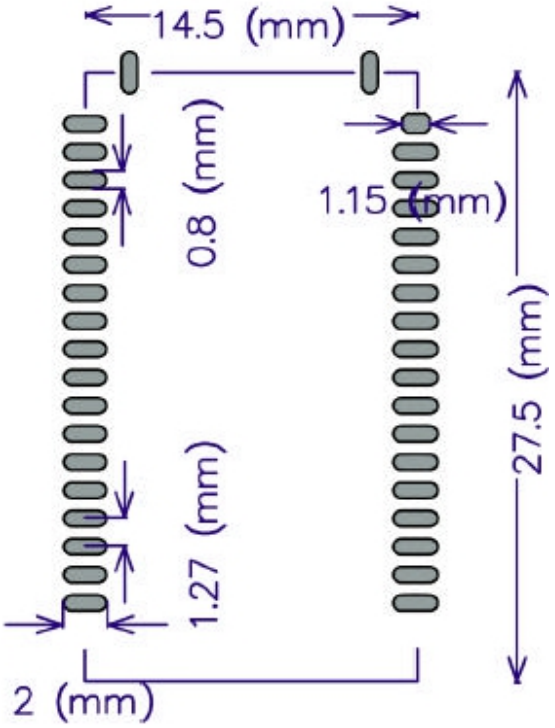

Figure 4 Dimensional drawing of the recommended PCB footprint

8 General Specifications

Item	Specification
Carrier Frequency	2400MHz to 2483.5MHz
Modulation	GFSK, 1Mbps, 0.5BT Gaussian
Channel Intervals	1MHz
Number of Channels	79
Frequency Hopping	1600hops/sec, 1MHz channel space
Receive Sensitivity	-82 dBm typ. @0.1% BER
Transmission Power	+18dBm max.
Maximum Data Throughput	Asynchronous : 3 Mbps
Output Interface	Full speed UART,
Power Supply	3.3V ±10%
Operating Temperature Range	-20°C to 85°C
Storage Temperature Range	-40°C to 85°C
Antenna	50 ohm external antenna required (not part of the module)

8.1 Electrical Characteristics

8.1.1 Absolute Maximum Ratings

Absolute maximum ratings for supply voltage and voltages on digital and analog pins of the Module are listed below; exceeding these values will cause permanent damage

Voltage	
Supply Voltage Range	-0.3 to 3.6 V
Voltage at digital pins	-0.3 to 3.6 V
Storage Conditions	
Storage Temperature	-10°C to 70°C (ambient)
Storage Humidity	0-90% RH
Operating Conditions	
Temperature Range	-0°C< T_A<60°C
Peak Power supply current	150 mA
Relative humidity	5% to 95% non condensing

8.1.2 Input/Output Terminal Characteristics

Digital Terminals	Min	Typ	Max	Units
Input Voltage Levels				
VIL input logic level low2.7V = VDD = 3.0V	-0.4		+0.8	V
VIH input logic level high -	0.7VDD		VDD+0.4	V
Output Voltage Levels				

VOL output logic level low (Io = 4.0mA), 2.7V = VDD = 3.0V		- 0.2		V
VOH output logic level high (Io = -4.0mA), 2.7V = VDD = 3.0V		VDD-0.2		V
Input and Tri-state Current with:				
Strong pull-up	-100	-40	-10	µA
Strong pull-down	+10	+40	+100	µA
Weak pull-up	-5.0	-1.0	-0.2	µA
Weak pull-down	+0.2	+1.0	+5.0	µA
I/O pad leakage current	I -1	0	+1	µA
CI Input Capacitance	1.0	-	5.0	pF
USB Terminals	**Min**	**Typ**	**Max**	**Units**
VDD_USB for correct USB operation (1)	3.1		3.6	V
Input threshold				
VIL input logic level low	-	-	- 0.3VDD_USB	V
VIH input logic level high	0.7VDD_USB	-	-	V
Input leakage current				
VSS_PADS < VIN < VDD_USB(1)	-1	1	5	µA
CI Input capacitance	2. 5	-	10.0	pF
Output Voltage levels To correctly terminated USB Cable				
VOL output logic level low	0.0	-	0.2	V
VOH output logic level high	2.8	-	VDD_USB	V

8.2 Radio Characteristics: Basic Data Rate

8.2.1 Transmitter (Temperature =20oC)

Description	**Min**	**Typ**	**MAX**	**Bluetooth Specification**	**Units**
Maximum RF transmit power		14(3)		- 0 to +20(4)	dBm
Variation in RF power over temperature range with compensation disabled (±)		2.0		-	- dB
Variation in RF power over temperature range with compensation enabled (±)		1.0			dB
RF power control range		>20		>16	dB
RF power range control resolution		0.5		-	dB

20dB bandwidth for modulated carrier	-	670		≤ 1000	kHz
Adjacent channel transmit power F=F0 ±2MHz		-35		≤ -20	dBm
Adjacent channel transmit power F=F0 ±3MHz -		-40		≤ -40	dBm
Adjacent channel transmit power F=F0>±3MHz -		-47		≤ -40	dBm
Δ f1avg Maximum Modulation		159		140<? f1avg<175	kHz
Δ f2max Minimum Modulation		123 -		≥ 115	kHz
Δ f2avg / ?f1avg		- 0.84		≥ 0.80 -	-
Initial carrier frequency tolerance		- 6.0		±75	KHz
Drift Rate		8.0		≤ 20	kHz/50µs
Drift (single slot packet)		9.0		≤ 25	- kHz
Drift (five slot packet)		11.0		≤ 40	kHz
2nd Harmonic content		-43		≤ - 30	dBm
3rd Harmonic content		-34		≤ - 30	dBm

Notes:
(1) The design is capable of producing 18dBm at 20°C. However, in order to meet both the FCC Part 15.205a and 15.209a radiated spurious requirement of -41dBm/MHz (500microvolts/metre at a distance of 3 meters) and the Bluetooth requirement for ACP, it is necessary to limit the maximum output power to +14dBm at 20°C. The corresponding recommended POWER_TABLE entry is internal gain 55, external gain 170.
(2) Class 1 RF transmit power range, Bluetooth specification v2.0 + EDR.
(3) To some extent these parameters are dependent on the matching circuit used and its behaviour over temperature. Therefore, these parameters may be beyond CSR's direct control.
(4) Resolution guaranteed over the range -5dB to -25dB relative to maximum power for Tx Level >20.
(5) Measured at F_0 = 2441MHz.
(6) Up to three exceptions are allowed in v2.0 + EDR of the Bluetooth specification. BlueCore4-External is guaranteed to meet the ACP performance as specified by the Bluetooth specification v2.0 + EDR.
(7) Measurement made using a POWER_TABLE entry of internal gain 55, external gain 170. This ensures that the Bluetooth requirements and those defined by the FCC and ETSI are satisfied over the operating temperature range of -20°C to +65°C. Measured using an operating output power of 14dBm at 20°C.

8.2.2 Basic Data Rate---Receiver (Temperature =20oC)

Frequency (GHz)		Min	Typ	MAX	Bluetooth Specification	Units
Sensitivity at 0.1% BER for all packet types	2.402		- -86.5 -		≤ -70 dBm	**dBm**
	2.441		**-86.5**			
	2.480		**-87**			
Maximum received signal at 0.1% BER			- >-20		≥ -20	dBm
Frequency (MHz)		**Min**	**Typ**	**MAX**	**Bluetooth**	**Units**

					Specification	
Continuous power required to block Bluetooth reception (for sensitivity of -67dBm with 0.1% BER). Measured at the antenna connection.	30 – 2000		>0		-10	dBm
	2000 – 2400		- >-15		**-27**	
	2500 – 3000		>-18		**-27**	
C/I co-channel			-9		≤ 11	dB
Adjacent channel selectivity C/I F=F0 +1MHz			-4		≤ 0	dB
Adjacent channel selectivity C/I F=F0 - 1MHz			-2		≤ 0	dB
Adjacent channel selectivity C/I F=F0 +2MHz			-38		≤ -30	dB
Adjacent channel selectivity C/I F=F0 - 2MHz			-21		≤ -20	dB
Adjacent channel selectivity C/I F=F0 ?+3MHz			-43		- ≤ -40	dB
Adjacent channel selectivity C/I F=F0 - 5MHz			- -43		≤ -40	dB
Adjacent channel selectivity C/I $F=F_{Image}$			-21		**<-9**	dB
Maximum level of inter-modulation interferers			-37		≥ -39	dBm
Spurious output level			-140		**-**	dBm/Hz

Notes:
(1) Up to five exceptions are allowed in v2.0 + EDR of the Bluetooth specification. BlueCore4-External is guaranteed to meet the C/I performance as specified by the Bluetooth specification v2.0 + EDR
(2) Measured at F_0 = 2441MHz
(3) Measured at f1-f2 = 5MHz. Measurement is performed in accordance with Bluetooth RF test RCV/CA/05/c, i.e. wanted signal at -64dBm
(4) Measured at the antenna connection. Integrated in 100kHz bandwidth and then normalized to 1Hz. Bluetooth band of frequencies, with exceptions of -84dBm at 1625MHz, -76dBm at 2435MHz, and -68dBm at 3200MHz.

8.2.3 Radio Characteristics: Enhanced Data Rate

8.2.3.1 Transmitter (Temperature = +20°C)

Description	**Min**	**Typ**	**Max**	**Bluetooth Specification**	**units**
Maximum RF transmit power		18(2)		- 0 to +20 (3)	dBm
Relative transmit power		-2		-4 to +1	dB
π /4 DQPSK Max carrier frequency stability w0		1.5		≤ ±10 for all blocks	kHz
π /4 DQPSK Max carrier frequency stability wi		6.6		- ≤ ±75 for all packets	kHz

π /4 DQPSK Max carrier frequency stability ¦w0 + wi¦		7.0		≤ ±75 for all blocks	kHz
8DPSK Max carrier frequency stability w0		1.5		- ≤ ±10 for all blocks	kHz
8DPSK Max carrier frequency stability wi		4.5		≤ ±75 for all packets	kHz
8DPSK Max carrier frequency stability ¦w0 + wi¦		5.0		≤ ±75 for all blocks	kHz
π /4 DQPSK Modulation Accuracy					
RMS DEVM		7.0		- ≤ 20	%
99% DEVM		12.0		≤ 30	%
Peak DEVM		16.0		≤ 35	%
8DPSK Modulation Accuracy					
RMS DEVM		8.0 -		≤ 13	%
99% DEVM		13.0		≤ 20	%
Peak DEVM		16.0		≤ 25	%
In-band spurious emissions					
F > Fo+3MHz		- -45		≤ -40	dBm
F < Fo -3MHz		-45		≤ -40	dBm
F = Fo -3MHz(6)		-38		≤ -40	dBm
F = Fo -2MHz		-25		≤ -20	dBm
F = Fo –1MHz		-36		≤ -26	dB
F = Fo +1MHz		-36		≤ -26	dB
F = Fo +2MHz		-25		≤ -20	dBm
F = Fo +3MHz(6)		-28		≤ -40	dBm
EDR Differential Phase Encoding		No Errors		=99	%

Notes:
(1) BlueCore4-External firmware maintains the transmit power to be within the Bluetooth v2.0 + EDR specification limits.
(2) Although the design is capable of generating in excess of +18dBm, regulatory compliance over the full temperature range of -20°C to +65°C will not be satisfied if the transmit power approaches this value. Actual output power with TX_PRE 71, INT PA 63, EXT PA 255 corresponds to +8dBm at 20°C.

(3) Class 1 RF transmit power range, Bluetooth v2.0 + EDR specification.
(4) Measurements methods are in accordance with the EDR RF Test Specification v2.0.E.2.
(5) Modulation accuracy utilizes Differential Error Vector Magnitude (DEVM) with tracking of the carrier frequency drift.
(6) The Bluetooth specification values are for 8DPSK modulation. Up to three exceptions are allowed in the Bluetooth v2.0 + EDR specification. BlueCore4-External is guaranteed to meet the ACP performance as specified by the Bluetooth v2.0 + EDR specification.

8.2.3.2 Receiver (Temperature = +20°C)

Description	Min	Typ.	Max	Bluetooth specification	Units
Sensitivity at 0.01% BER					
π /4 DQPSK	-	-89	-	≤ -70	dBm
8DPSK	-	-82	-	≤ -70	dBm
Maximum received signal at 0.1% BER					
π /4 DQPSK	-	>0	-	≥ -20	dBm
8DPSK	-	-10	-	≥ -20	dBm
C/I co-channel at 0.1% BER					
π /4 DQPSK	-	10	-	≤ +13	dB
8DPSK	-	18	-	≤ +21	dB
Adjacent channel selectivity C/I F=F0 +1MHz		-11		≤ 0	
π /4 DQPSK	-		-		dB
8DPSK	-	-5	-	≤ +5	dB
Adjacent channel selectivity C/I F=F -1MHz					
π /4 DQPSK	-	- -8	-	≤ 0 dB	dB
8DPSK	-	-4	-	≤ +5	dB
Adjacent channel selectivity C/I F=F dB 0 +2MHz					
π /4 DQPSK	-	-43	-	≤ -30	dB
8DPSK	-	-38	-	- ≤ -25	dB
Adjacent channel selectivity C/I F=F dB 0 -2MHz					

π /4 DQPSK	-	-22	-	≤ -20	dB
8DPSK -	-	22	-	≤ -13	dB
Adjacent channel selectivity C/I F=F dB 0 +3MHz					
π /4 DQPSK	-	-46	-	≤ -40	dB
8DPSK	-	-42	-	≤ -33	dB
Adjacent channel selectivity C/I F=F dB 0 –5MHz					
π /4 DQPSK	-	-43	-	≤ -40	dB
8DPSK	-	-40	-	- ≤ -33	dB
Adjacent channel selectivity C/I F=F dB Image					
π /4DQPSK	-	-21	-	≤ -7	dB
8DPSK	-	-14	-	≤ 0	dB

Notes: (1) Measured at F0 = 2405MHz, 2441MHz, 2477MHz

9 Typical Application Circuit

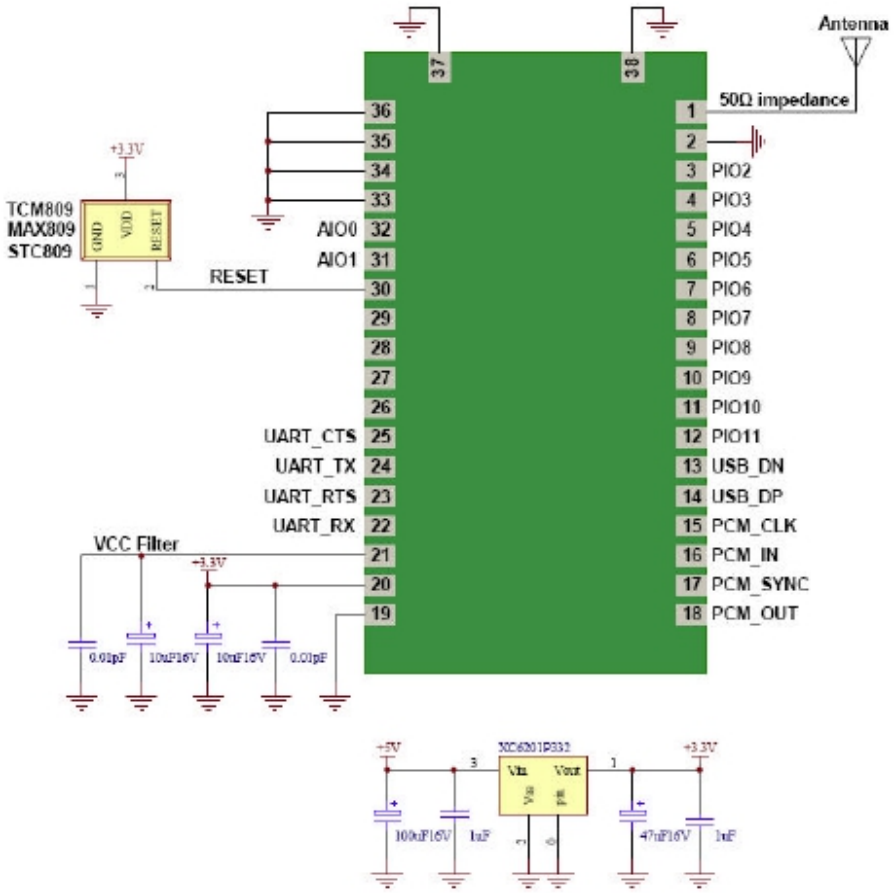

Figure 5 Schematic of typical application circuit

10 Serial Port Profile

When shipped with the pre-programmed Serial Port Profile (SPP), the module's firmware emulates the function of a serial port. When connected to the host microprocessor via the UART transport, the module appears as a COM port. This makes it easy for designers to write software to utilize Bluetooth wireless communication. The SPP profile embedded within the module provides a menu for making configuration changes utilizing AT commands described below in section 10.2:

10.1 Default Configuration

- UART Baud Rate: 9600 baud
- Number of Bits: 8
- Stop bit: One
- Parity: None
- H/W Flow Control: Disable
- PIN: 1111
- Device Name: ZBA-SPP
- Mode: Slave
- Sleep Mode: Deep sleep whenever possible.
- Partner pairing is dropped at power off or un-pairing by master.

10.2 Configuration Commands Set-up & Procedures

PC interface: If you wish to connect the module to a PC's comm. port it is necessary to include a level shifter between the module and the PC. A recommended interface IC would be the MAX3232 RS232 driver IC (or equiv.) and a 3.3 Volt voltage regulator.
Please contact ZBA for details on purchasing an evaluation board to ease the interface the module to the PC.

Microcontroller Interface: The UART of the Bluetooth module can directly connect to the microprocessors UART. The Microprocessor must have an I/O that will operate from 0 to 3.3 Volts or the appropriate level shifter circuitry must be used as to not overstress the I/O of either device.

Entering Command Mode:
. For modules to enter in the command mode, the host must send a single character **ESC <0x1B>** within **5** second after the unit has been powered on. If the **ESC** character is not sent within the specified 5 second window then the module will automatically enter the SPP mode and any information sent to the UART will be treated as data to be transmitted over a Bluetooth link. Please note. The modules will only respond to the host set-up commands

after the module has entered the command mode

Entering the SPP mode
After running any set-up commands then there are two ways to enter the **SPP mode**

a) Disconnect the 3.3 Volts supply to the module then re-power the module and **DO NOT** hit the <**ESC**> key or send the <ESC> command. After 5 seconds the module will be in the SPP operation mode.
b) From the Set-up mode type: **AT+EXIT**
The module will respond with: **OK**
The module is now in SPP operation mode.

Note: **All Commands except the first <ESC> command should contain a suffix of <CR><LF>.**

10.2.1 Entering the Set-up Mode

Command	Response	Parameter
ESC	<CR> +OPEN:num<CR><LF>	Num= 0: device is not paired Num= 1 Device has a saved BT Address in memory

Note: If the device returns **+open:0** and bind is disabled (bind=0) then the device is not paired or connected and there is no remote device saved in the remote address (+RADDR) variable If the device returns a **+open:1** and the bind is enabled (bind=1) then the module device is operating as a cable replacement function and it will pair with the master Bluetooth device that is saved in the remote address variable ASAP. The BT44-xxx module is bound to the companion device whose address is saved in the + RADDR variable.

10.2.2 Testing the Communication Link

Command	Response	Parameter
AT	OK	None

10.2.3 Command list

Command	Response	Parameter
ATZ?	List of Commands	None

10.2.4 Set RS232 Baud Rate (bps)

Command	Response	Parameter

Note: The default baud rate is 9600bps

10.2.5 Set/inquired UART Parameters

Command	Response	Parameter
AT+UARTMODE=<Para1>,<Para2>	OK	<Para1>= Stop-bit <Para1> 0 = 1 Stop bit 1 = 2 Stop bits <Para2> Parity- bit 0 = None 1 = ODD 2 = EVEN
AT+ UARTMODE?	OK UARTMODE: <Para1>,<Para2>	

Note: the default UARTMODE parameters are N, 8, 1 and the overall comm.
Default Parameters are 9600,N,8,1

10.2.6 Set Authentication

Command	Response	Parameter
AT+AUTH=<Para1>	OK	Para1 = Authentication 0 = disable 1= enable Default mode: Authentication enabled
AT+AUTH?	OK +AUTH:<Para1>	

Note: The default authentication mode is Authentication enabled.

10.2.7 Set Password

Command	Response	Parameter
AT+PASSWORD= < Para1>	OK	Para1 Password Default = 1111
AT+PASSWORD?	OK +PASSWORD: < Para1>	

Note: The default authentication password = 1111.

10.2.8 Set Device Name

Command	Response	Parameter
AT+NAME= < Para1>	OK	Para1= Device name Default= ZBA-SPP
AT+NAME?	OK +NAME: <Para1>	

AT+BAUD= <Para1>	OK	Para1 = 1200, 2400, 4800, 9600, 19200, 38400, 57600, 115200, 230400
AT+BAUD?	OK +BAUD: <para1>	

Note: The default Device name = ZBA-SPP.

10.2.9 Set Device Type

Command	Response	Parameter
AT+CLASS=< Para1>	OK	Para1 Device type (Length must = 6 characters) default = 000000
AT+CLASS?	OK +CLASS:<Para1>	

10.2.10 Set Master/Slave Mode

Command	Response	Parameter
AT+ROLE=< Para1>	OK	Para1 Slave = 0, Master = 1 Default = 0, Slave
AT+ROLE?	OK +ROLE: <Para1>	

Note: The default mode is Slave.

10.2.11 Set Sniff Power Saving Mode

Command	Response	Parameter
AT+SNIFF=<Para1>,<Para2>,<Para3>,<Para4>	OK	Para1 Maximum Para2 Minimum Para3 test Para4 Over time
AT+SNIFF?	OK +SNIFF<Para1>,<Para2>,<Para3>,<Para4>	

Note: Default = 1024, 512, 1024, 512 number in decimal mode

10.2.12 Set Sniff Power Saving Mode—Extended

Command	Response	Parameter
AT+SNIFFEX=<Para1>,<Para2>,<Para3>,<Para4>	OK	Para1 Maximum Para2 Minimum Para3 test Para4 Over time Para5 Sniff timeout
AT+SNIFFEX?	OK +SNIFFEX<Para1>,<Para2>,<Para3>,<Para4>	

Note: Default = 1024, 512, 1024, 512, 10 number in decimal mode

10.2.13 Reset to Factory Default

Command	Response	Parameter
AT+RESET	OK	None

10.2.14 Set/Inquire Scan Time

Command	Response	Parameter

AT+SCANTIME=<Para1>,<Para2>, <Para3>,<Para4>	OK	Para1= Scan interval tim Para2=Scan time-out Para3=Inquiry interval Para4=Inquiry time-out
AT+SCANTIME?	OK +SCAN :<Para1>,<Para2>, <Para3>,<Para4>	

Note: The Default Values (in decimal = N* 625 us)
Para1 = 2048
Para2 = 18
Para3 = 2048
Para4 = 18

10.2.15 Set/Inquire Paired Device

Command	Response	Parameter
AT+BIND= < Para1>	OK	Para1 0 = Drop pair 1 =Always paired Default=0 Drop pairing
AT+BIND?	OK +BIND:<Para1>	

Note: The default mode is to **drop pair**. The drop pair function occurs when the module (slave or master mode) is power-off then back on or the master drops pairing. This will allow another master to commence a discovery process and connect to the module (slave) device.

If the device is set-up as **always paired** (bind=1) then the module will **only** communicate with the specific slave (or master) whose address it has been bound to even after power off and power-on. This mode is useful for application where a cable replacement function is the requirement. To communicate to a different master, the module must have the bound address cleared. This is accomplished by running the **AT+CLEARADDR** command.

If a module has been operated with bind=1 and then subsequently the bind function is set to 0, the module will still remember the previous bound address. So if bind is re-enabled then device will re-connect to the previously bound master. To clear the memory please run the **AT+CLEARADDR** command.

10.2.16 Clear Paired Device Address

Command	Response	Parameter
AT+CLEARADDR	OK	None

Note: This command will clear any remote device address to which the module has been paired.

10.2.17 Inquire Version

Command	Response	Parameter
AT+VERSION?	OK +VERSION:<Para1>	Para1 version #

Note: This command will return the firmware version of the module.

10.2.18 Inquire Remote Device Address

Command	Response	Parameter
AT+INQ	OK + BT address, Device name	

Note: This command commences the discovery process to detect any BT device in the neighborhood. Completion of this command may take up to 30 seconds.

An example of the response to the above command is: +INQRESU:0005164801E6, ZBA-SPP where the data following the colon is one example of the Bluetooth address of one of the devices in the neighborhood and the data following the comma is the name of the discovered device.

10.2.19 Set/Inquire Paired Device Address

Command	Response	Parameter
AT+RADDR=<Para1>	OK	Para1= Paired device BT address
AT+ RADDR?	OK +RADDR:<Para1>	

Example of how to pair using the BT44-191 as the Master
Example to set-up the Module to communicate with one specific BT device whose BT address is currently unknown.
First type: **AT+INQ** which causes the Module to return the BT addresses of the devices in the BT neighbourhood. Then the module will return **+INQCOMP.** This response will indicate that the Inquiry process has terminated.
To terminate the **AT+INQ** command early, please type the command **AT+CANCEL**

Then type **AT+RADDR= BT address** (the specific device you wish to pair as determined from the AT+INQ Command).
.
The module will remain bound to this address until the **AT+CLEARADDR** (command 8.2.16) is run or the module is powered off and then back on again.

10.2.20 Cancel Inquiry

Command	Response	Parameter
AT+CANCEL?	OK	

	+INQCOMP	

Note: This command will cancel the inquiry command (AT+INQ).

10.2.21 Inquire Device BD Address

Command	Response	Parameter
AT+LADDR?	OK +LADDR:<Para1>	Para1 Device address

Note: This command returns the (local) BT address of the module.

10.2.22 Software Reset

10.2.23 Set/Inquire about Low power mode

Command	Response	Parameter
AT+LOWPOWER=<Para1>	OK	<Para1>： 0： low power disabled 1：Low power mode Enabled
AT+ LOWPOWER?	OK +LOWPOWER：<Para1>	

Note: the default value for Low power =0

10.2.24 Set/Inquire Data processing mode at BT disconnect

Command	Response	Parameter
AT+ DATAMODE=<Para1>	OK	<Para1>： 0：Data is held in buffer, & it will be sent to the other device after successfully connect. 1：Data will be deleted after the BT devices have been disconnected.
AT+ DATAMODE?	OK + DATAMODE：<Para1>	

Note: the default value for Datamode =0

10.2.25 Set/Inquire about Flow control mode (Handshaking)

Command	Response	Parameter
AT+ FLOWCONTROL=<Para1>	OK	<Para1>： 0: No Flowcontrol 1：Use hardware Flowcontrol

Command	Response	Parameter
AT+ RESTART	OK	None

AT+ FLOWCONTROL?	OK + FLOWCONTROL：<Para1>

Note: the default value for Flowcontrol =0

10.2.26 Exiting the Set-up Mode

Command	Response	Parameter
AT+EXIT	OK	None

Note: This command returns the module to SPP mode.

11 Low Power Modes

11.1 Park & Sniff

The module will automatically go into a reduced power mode if there is no UART activity and no RF activity. The Device will sniff in order to maintain synchronization with the Master.

To save maximum power then it is possible to completely turn-off the power to the module. When operating in this mode the Master/ Slave must then proceed through the Discovery phase (consuming time and energy) before a connection can be re-established. This mode is only recommended if there are very, very long periods of inactivity and the battery power is of the utmost concern.

12 Mounting Recommendations

For maximized performance please orient the device with the antenna as close to the antenna connector as possible. Best performance will occur if the underlying PCB has a ground plane under the module.

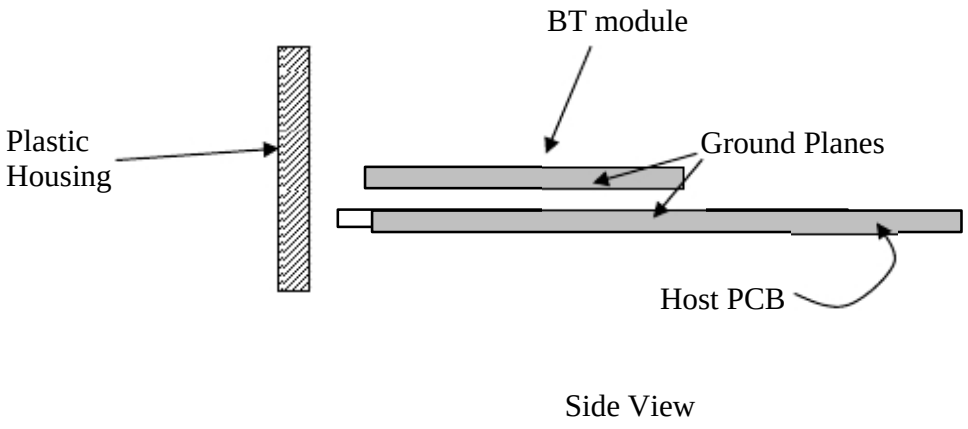

Figure 6 Cross-section of recommended mounting of the BT module

13 Solder Profiles

WARNING : Contact ZBA if you wish **to reflow the Modules in your production environment**. There are specific configurations that need to be reviewed with the production facility to allow for proper reflow of the modules. Typically sample quantities of the modules are hand soldered! Small quantities of modules should be hand soldered to the main PCB.

When ordering PRODUCTION QUANTITES please CONTACT ZBA to make sure that the modules have the correct configuration for Reflow processing.

The solder profile is available upon request.

14 Ordering Information

Ordering P/N	Description
BT44-111S-XXX	Class 1 Bluetooth Module requires an External Antenna XXX = SPP Serial Port Profile = HCI Host controller Interface over UART = HID Human Interface device = OOX Object push/ pull and FTP

Other Solder down Bluetooth module variants

Ordering P/N	Description
BT44-191S-XXX	Class 2 Module with Onboard Antenna XXX = SPP Serial Port Profile = HCI Host controller Interface over UART = HID Human Interface device = OOX Object push/ pull and FTP
BT44-147S-XXX	Class 2 Bluetooth Module requires External Antenna XXX = SPP Serial Port Profile = HCI Host controller Interface over UART = HID Human Interface device = OOX Object push/pull and FTP

Please contact ZBA Inc at 908-359-2070 for any other profiles that you may require.

####

FCC ID statement

This equipment 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.

Any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate this equipment.

IC ID statement

Disclaimer:
Operation is subject to the following two conditions:
(1) This device may not cause interference, and
(2) This device must accept any interference, including interference that may cause undesired operation of the device.

RF exposure warning

This equipment must be installed and operated in accordance with provide instructions and the antenna used for this transmitter must be installed to provide a separation distance of at least 20 cm from all persons and must not be co-located or operation in conjunction with any other antenna or transmitter. End-users and installers must be provide with antenna installation instructions and transmitter operating conditions for satisfying RF exposure compliance.

Information for the OEMs and Integrators

The following statement must be included with all versions of this document supplied to an OEM or integrator, but should not be distributed to the end user.

This device is intended for OEM integrators only.
Please see the full grant of equipment document for other restrictions.

Information to be supplied to the end user by the OEM or Integrator

The following regulator and safety notices must be published in documentation supplied to the end user of the product or system incorporating an adapter in compliance with local regulation. Host system must be labeled as following:
"Contains transmitter module FCC ID: VMTB44-111S, IC ID: 8941A-BT44111S"