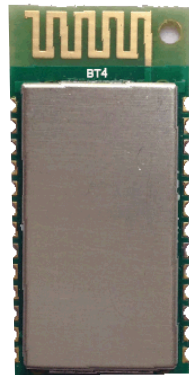


ZXM-10 BLE

Bluetooth Low Energy SPP Module





Disclaimer:

No part of this document may be copied or reproduced in any form or by any means, or transferred to any third party, without the prior written consent of an authorized representative of ZBA, Inc. ("ZBA"). The information in this document is subject to change without notice. ZBA assumes no responsibility for any errors or omissions that may appear in this document, and disclaims responsibility for any consequences resulting from the use of the information set forth herein. ZBA makes no commitments to update or to keep current information contained in this document. The products listed in this document are not suitable for use in applications such as, but not limited to, aircraft control systems, aerospace equipment, submarine cables, nuclear reactor control systems and life support systems. Moreover, ZBA does not recommend or approve the use of any of its products in life support devices or systems or in any application where failure could result in injury or death. If a customer wishes to use ZBA products in applications not intended by ZBA, said customer must contact an authorized ZBA representative to determine ZBA's willingness to support a given application. The information set forth in this document does not convey any license under the copyrights, patent rights, trademarks or other intellectual property rights claimed and owned by ZBA. The information set forth in this document is considered to be "Proprietary" and "Confidential" property

ALL PRODUCTS SOLD BY ZBA ARE COVERED BY THE PROVISIONS APPEARING IN ZBA'S TERMS AND CONDITIONS OF SALE ONLY, INCLUDING THE LIMITATIONS OF LIABILITY, WARRANTY AND INFRINGEMENT PROVISIONS. ZBA MAKES NO WARRANTIES OF ANY KIND, EXPRESS, STATUTORY, IMPLIED OR OTHERWISE, REGARDING INFORMATION SET FORTH HEREIN OR REGARDING THE FREEDOM OF THE DESCRIBED PRODUCTS FROM INTELLECTUAL PROPERTY INFRINGEMENT, AND EXPRESSLY DISCLAIMS ANY SUCH WARRANTIES INCLUDING WITHOUT LIMITATION ANY EXPRESS, STATUTORY OR IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE



Table of Contents

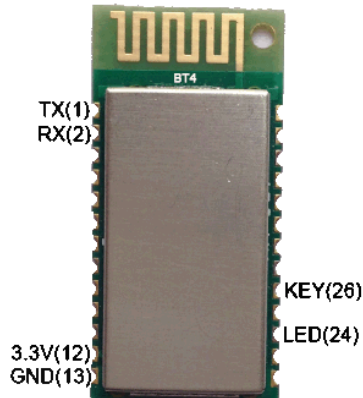
- 1 Features 3
- 2 Product Description 4
- 3 Applications 4
- 4 Block Diagram 5
- 5 Pin Description 5
 - 5.1 Device Terminal 5
 - 5.2 Device Terminal Functions 6
- 6 Electrical Specifications 7
 - 6.1 Absolute Maximum Ratings (1) 7
 - 6.2 Recommended Operating Conditions 7
 - 6.3 Electrical Characteristics 7
 - 6.4 General Characteristics 8
 - 6.5 RF Receive Section 8
 - 6.6 RF Transmit Section 9
 - 6.7 Analog Temperature Sensor 9
 - 6.8 ADC Characteristics 10
 - 6.9 DC Characteristics 11
 - 6.10 Reset circuitry 12
 - 6.11 Module specific UUID Property descriptors 12
- 7 Command Mode 14
 - 7.1 Command mode test code 14
 - 7.2 Type Inquire 14
 - 7.3 Set/ Inquire the Serial Port Baud Rate 14
 - 7.4 Set /Inquire Serial Data format 15
 - 7.5 Set / inquire Serial Data flow control (RTS/CTS) 15
 - 7.6 Inquire Bluetooth address 15
 - 7.7 Inquire software version 15
 - 7.8 Set and Inquire Device Name 15
 - 7.9 Set/ Inquire PIN code 16
 - 7.10 Set/ Inquire Safety Match Mode 16
 - 7.11 Clear Matching information 17
 - 7.12 Set/Inquire Data Flow control 17
 - 7.13 Set/Inquire connection parameters 17
 - 7.14 Set/Inquire Broadcast interval 17
 - 7.15 Sleep control 18
 - 7.16 Set/Inquire Auto sleep Enable 18
 - 7.17 Set/Inquire Role 18
 - 7.18 Set s single-port output PIO 18
 - 7.19 Set the PIO output and single-port memory 19



7.20	Remove the memory PIO output state	19
7.21	Set / Query - property operations PIO, PWM enable state preservation	19
7.22	PWM output waveform.....	20
7.23	PWM output waveform and memory	20
7.24	Clear memory of PWM output state.....	20
7.25	Restore unit to default state	20
7.26	Set/Inquire Enabled Services	21
7.27	Restarting the Module	21
8	Solder Profiles.....	22
9	Physical Dimensions	23
9.1	Recommended PCB Pad Dimensions	23
10	Guide for Antenna Placement.....	24
11	Typical Application Circuit.....	26
12	Document Status.....	27
13	Contact information.....	27

List of Figures

Figure 4-1	Block Diagram of the Bluetooth module.....	5
Figure 5-1	PIO Description.....	5
Block 6-1	Diagram of Reset circuitry	12
Figure 8-1	Typical Lead-Free Re-flow Solder Profile.....	22
Figure 9-1	Suggested PCB Pad dimensions.....	23
Figure 10-1	Guide for module placement.....	25
Figure 10-2	Typical Application Circuit.....	26



1 Features

- Bluetooth Low energy Spec. v4.0 compliant based upon the TI CC2540
- The device can run both application and BLE protocol stack, including peripherals to interface with wide range of sensors, etc.
- Programmable output power up to 4.5 dBm
- Operating Frequency Band 2.40 GHz~2.48GHz unlicensed ISM Band
- Class 2 type Output Power
- Support Firmware Upgrade
- Configurable as Master or Slave
- Optional I2C communications
- Can be Controlled via AT command set
- USARTs with support for several serial protocols (Default Profile is SPP emulation)
- 17 general-purpose I/O pins
- Low power modes:
 - Active mode RX: 19.6 mA
 - Active Mode TX (-6dBm) : 24 mA
 - Power Mode 1 (3-ms Wake-Up): 235 uA
 - Power Mode 2 (Sleep Timer On): 0.9 uA
 - Power Mode 3 (External Interrupts): 0.4 uA
- Full RAM and register retention in all power modes
- Nominal supply voltage at 3.3V±10%
- Additional profiles available
- Surface-mount, Size: 27.0mm×13.0mm×2.2mm (Tolerance = ±0.2mm)



2 Product Description

The ZXM-10BLE module (is based on the TI CC2540) is a cost-effective, low-power, true system-on-chip (SoC) module with on board antenna for *Bluetooth* low energy applications. It enables robust BLE master or slave nodes to be built with very low total bill-of-material costs. The ZXM-10BLE combines an excellent RF transceiver with an industry-standard enhanced 8051 MCU, in-system programmable flash memory, 8-KB RAM, and many other powerful supporting features and peripherals. The ZXM-10BLE is suitable for systems where very low power consumption is required. Very low-power sleep modes are available. Short transition times between operating modes further enable low power consumption.

The ZXM-10BLE Bluetooth module is compliant with the Bluetooth 4.0 BLE standard. The module can function as a serial data pass-through, PIO input and output control, PWM output control functions. The module has two operating modes: a) command mode and b) data mode. In the data mode the module can be operated as a Bluetooth Master or a Slave. When the module is in the command mode the user can send the AT commands, as described in this document. These commands include the module's configuration parameters. The ZXM-10 BLE module has a mode Status indicator pin that will be low if the module is in the command mode and high if the module is in the DATA mode. Typically, a LED is connected to a PIO pin as to provide a visual indicator of the modules operational mode. The switch from command mode from data mode is automatic once the wireless connection has been terminated.

3 Applications

- 2.4-GHz *Bluetooth* low energy systems
- Mobile phone accessories
- Sports and leisure equipment
- Consumer electronics
- Human interface devices (such as keyboard, mouse, remote control)
- USB dongles
- Health care and medical

4 Block Diagram

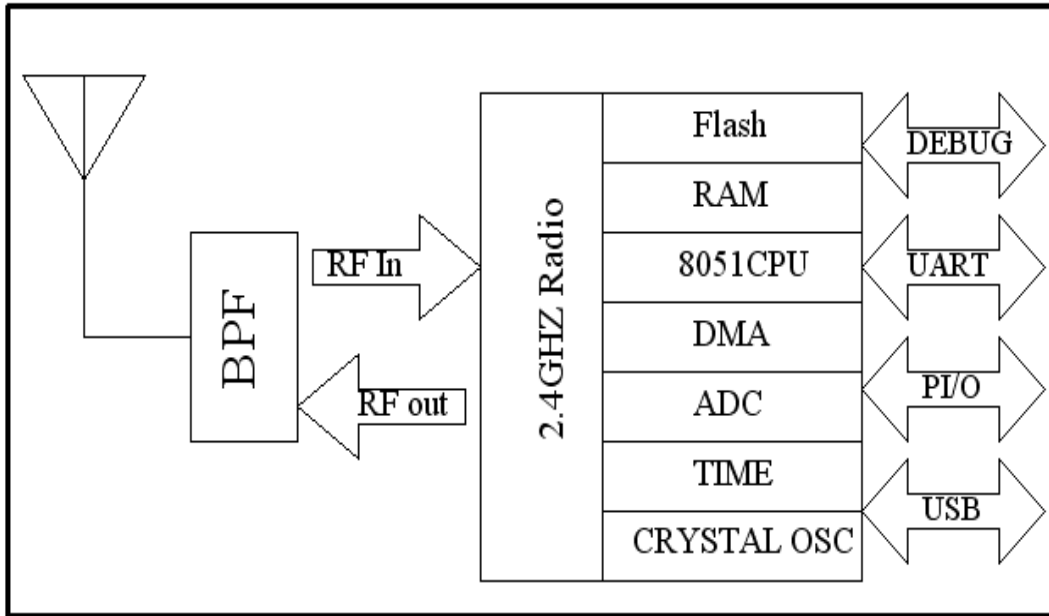


Figure 4-1 Block Diagram of the Bluetooth module

5 Pin Description

5.1 Device Terminal

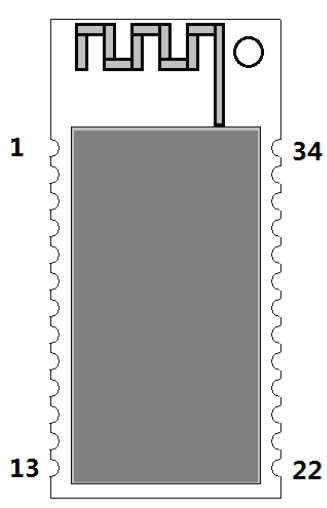
No.	Des		Des	No.
1	UART_TX		PIO11	34
2	UART_RX		PIO10	33
3	UART_CTS		PIO9	32
4	UART_RTS		PIO8	31
5	USB-DP		PIO7	30
6	USB-DN		PIO6	29
7	PIO14		PIO5	28
8	PIO13		PIO4	27
9	PIO12		PIO3	26
10	NC		PIO2	25
11	RESETB		PIO1	24
12	VCC		PIO0	23
13	GND		GND	22
14~21	N/A			

Figure 5-1 PIO Description



5.2 Device Terminal Functions

Pin	NAME	I/O Type	DESCRIPTION
1	UART_TXD	O	UART data output
2	UART_RXD	I	UART data input
3	UART_CTS	I	UART clear to send active low
4	UART_RTS	O	UART request to send active low
5	USB-DP	I/O	USB data plus
6	USB-DN	I/O	USB data minus
7	PIO14	I/O	Programmable input/output line
8	PIO13	I/O	Programmable input/output line
9	PIO12	I/O	Programmable input/output line
10	NC		
11	RESETB	I	Integrated inside the RC reset circuit, Reset if low. Input de-bounced so must be low for >5ms to cause a reset
12	VCC	S	Power Supply
13	GND	S	Ground
14~21	N/A		Pads do not exist in this version.
22	GND		Ground
23	PIO0	I/O	Programmable input/output line Low Power =0 operational=1 (note1)
24	PIO1	I/O	Programmable input/output line Connection indicator(note2)
25	PIO2	I/O	Programmable input/output line
26	PIO3	I/O	Programmable input/output line KEY (Reserved for Future use) (note3)
27	PIO4	I/O	Programmable input/output line
28	PIO5	I/O	Programmable input/output line
29	PIO6	I/O	Programmable input/output line
30	PIO7	I/O	Programmable input/output line
31	PIO8	I/O	Programmable input/output line
32	PIO9	I/O	Programmable input/output line
33	PIO10	I/O	Programmable input/output line
34	PIO11	I/O	Programmable input/output line

Note1: When operating In UART mode the device may be put into low power mode by switching this pin low. Hi= Operating mode.

Note2: Connection indicator H=Bluetooth connection and Low = Command Mode.

Note3: Reserved for Future use



6 Electrical Specifications

6.1 Absolute Maximum Ratings (1)

		MIN	MAX	UNIT
Supply voltage	All supply pins must have the same voltage	-0.3	3.9	V
Voltage on any digital pin (3)		-0.3	$V_{DD} + 0.3 \leq 3.9$	V
Input RF level			10	dBm
Storage temperature range		-40	125	°C
ESD(2)	All pads, according to human-body model, JEDEC STD 22, method A114		2	kV
	According to charged-device model, JEDEC STD 22, method C101		500	V

(1) Stresses beyond those listed under *Absolute Maximum Ratings* may cause permanent damage to the device. These are stress ratings only and functional operation of the device at these or any other conditions beyond those indicated under *Recommended Operating Conditions* are not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.

(2) CAUTION: ESD-sensitive device. Precautions should be used when handling the device in order to prevent permanent damage.

(3) Do not apply 5V to the device

6.2 Recommended Operating Conditions

	MIN	MAX	UNIT
Operating ambient temperature range, T_a	-40	125	°C
Operating supply voltage	2	3.6	V

6.3 Electrical Characteristics

Measured on Texas Instruments CC2540 EM reference design with $T_A = 25^\circ\text{C}$ and $V_{DD} = 3\text{ V}$

PARAMETER	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Lcore	Power mode#1 1) Digital regulator on; 2) 16-MHz RCOSC and 32-MHz crystal oscillator off; 3) 32.768-kHz XOSC, POR, BOD and sleep timer active; 4) RAM and register retention 5) Wake up= 4us		235		μA
	Power mode 2. 1) Digital regulator off;		0.9		



	2) 16-MHz RCOSC and 32-MHz crystal oscillator off; 3) 32.768-kHz XOSC, POR, and sleep timer active; 4) RAM and register retention 5) Wake up= 120us				
	Power mode 3. Digital regulator off; no clocks; POR active; RAM and register retention 5) Wake up= 120us		0.4		
	Low MCU activity: 32-MHz XOSC running. No radio or peripherals. No flash access, no RAM access.		6.7		mA
I _{peri}	Peripheral Current Consumption (Adds to core current I _{core} for each peripheral unit activated)				
	Timer 1	Timer running, 32-MHz XOSC used		90	μA
	Timer 2	Timer running, 32-MHz XOSC used		90	μA
	Timer 3	Timer running, 32-MHz XOSC used		60	μA
	Timer 4	Timer running, 32-MHz XOSC used		70	μA
	Sleep timer	Including 32.753-kHz RC OSC		0.6	μA
	ADC	When converting		1.2	mA

6.4 General Characteristics

Measured on Texas Instruments CC2540 EM reference design with T_A = 25°C and VDD = 3 V

TEST CONDITIONS		MIN	TYP	MAX	UNIT
WAKE-UP AND TIMING					
Power mode 1 → active	Digital regulator on, 16-MHz RCOSC and 32-MHz crystal oscillator off. Start-up of 16-MHz RCOSC		4		μs
Power mode 2 or 3 → active	Digital regulator off, 16-MHz RCOSC and 32-MHz crystal oscillator off. Start-up of regulator and 16-MHz RCOSC		120		μs
Rx/Tx Turnaround			150		μs
Active → TX or RX	Crystal ESR = 16 Ω. Initially running on 16-MHz RC OSC, with 32-MHz XOSC OFF		410		μs
	With 32-MHz XOSC initially on		160		μs
Radio					
RF frequency range	Programmable in 2-MHz steps	2402		2480	GHz
Data rate and modulation format					

6.5 RF Receive Section

Measured on Texas Instruments CC2540 EM reference design with T_A = 25°C, VDD = 3 V, f_c = 2440 MHz
1 Mbps, GFSK, 250-kHz deviation, Bluetooth low energy mode, and 0.1% BER⁽¹⁾

PARAMETER	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Receiver sensitivity ⁽²⁾	High-gain mode		-93		dBm
Receiver sensitivity ⁽²⁾	Standard mode		-87		dBm
Saturation ⁽³⁾			6		dBm
Co-channel rejection ⁽³⁾			-5		dB
Adjacent-channel rejection ⁽³⁾	±1 MHz		5		dB



Alternate-channel rejection ⁽³⁾	±2 MHz		30		dB
Blocking ⁽³⁾			-30		dBm
Frequency error tolerance ⁽⁴⁾	Including both initial tolerance and drift	-250		250	kHz
Symbol rate error tolerance ⁽⁵⁾		-80		80	ppm
Spurious emission. Only largest spurious emission stated within each band.	Conducted measurement with a 50-Ω single-ended load. Complies with EN 300 328, EN 300 440 class 2, FCC CFR47, Part 15 and ARIB STD-T-66		-75		dBm
Current consumption	RX mode, standard mode, no peripherals active, low MCU activity, MCU at 250 kHz		19.6		mA
	RX mode, high-gain mode, no peripherals active, low MCU activity, MCU at 250 kHz		22.1		

- (1) 0.1% BER maps to 30.8% PER
- (2) The receiver sensitivity setting is programmable using a TI BLE stack vendor-specific API command. The default value is standard mode.
- (3) Results based on standard gain mode
- (4) Difference between center frequency of the received RF signal and local oscillator frequency
- (5) Difference between incoming symbol rate and the internally generated symbol rate

6.6 RF Transmit Section

Measured on Texas Instruments CC2540 EM reference design with T_A = 25°C, VDD = 3 V and f_c = 2440 MHz

PARAMETER	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Output power	Delivered to a single-ended 50-Ω load through a balun using maximum recommended output power setting		4		dBm
	Delivered to a single-ended 50-Ω load through a balun using minimum recommended output power setting		-20		
Programmable output power range	Delivered to a single-ended 50 Ω load through a balun		24		dB
Spurious emissions	Conducted measurement with a 50-Ω single-ended load. Complies with EN 300 328, EN 300 440 class 2, FCC CFR47, Part 15 and ARIB STD-T-66 ⁽¹⁾		-41		dBm
Current consumption	TX mode, -23-dBm output power, no peripherals active, low MCU activity, MCU at 250 kHz		21.1		mA
	TX mode, -6-dBm output power, no peripherals active, low MCU activity, MCU at 250 kHz		23.8		
	TX mode, 0-dBm output power, no peripherals active, low MCU activity, MCU at 250 kHz		27		
	TX mode, 4-dBm output power, no peripherals active, low MCU activity, MCU at 250 kHz		31.6		
Optimum load impedance	Differential impedance as seen from the RF port (RF_P and RF_N) toward the antenna		70 + j30		Ω

(1) Designs with antenna connectors that require conducted ETSI compliance at 64 MHz should insert an LC resonator in front of the antenna connector. Use a 1.6-nH inductor in parallel with a 1.8-pF capacitor. Connect both from the signal trace to a good RF ground.

6.7 Analog Temperature Sensor

Measured on Texas Instruments CC2540 EM reference design with T_A = 25°C and VDD = 3 V



	TEST CONDITIONS	MIN TYP MAX	UNIT
Output at 25°C		1480	12-bit ADC
Temperature coefficient		4.5	/1°C
Voltage coefficient		1	/0.1 V
Initial accuracy without calibration	Measured using integrated ADC, using internal bandgap voltage reference and maximum resolution	±10	°C
Accuracy using 1-point calibration (entire temperature range)		±5	°C
Current consumption when enabled (ADC current not included)		0.5	mA

6.8 ADC Characteristics

TA = 25°C and VDD = 3 V, unless otherwise noted.

	PARAMETER	TEST CONDITIONS	MIN	TYP	MAX	UNIT
	Input voltage	V _{DD} is voltage on AVDD5 pin	0		V _{DD}	V
	External reference voltage	V _{DD} is voltage on AVDD5 pin	0		V _{DD}	V
	External reference voltage differential	V _{DD} is voltage on AVDD5 pin	0		V _{DD}	V
	Input resistance, signal	Using 4-MHz clock speed		197		kΩ
	Full-scale signal ⁽¹⁾	Peak-to-peak, defines 0 dB FS		2.97		V
	ENOB ⁽¹⁾	Single-ended input, 7-bit setting		5.7		bits
		Single-ended input, 9-bit setting		7.5		
		Single-ended input, 10-bit setting		9.3		
		Single-ended input, 12-bit setting		10.8		
		Differential input, 7-bit setting		6.5		
		Differential input, 9-bit setting		8.3		
		Differential input, 10-bit setting		10.0		
		Differential input, 12-bit setting		11.5		
	Useful power bandwidth	7-bit setting, both single and differential		0–20		kHz
	THD ⁽¹⁾	Single-ended input, 12-bit setting, –6 dBFS		–75.2		dB
		Differential input, 12-bit setting, –6 dBFS		–86.6		
	Signal to non-harmonic ratio ⁽¹⁾	Single-ended input, 12-bit setting		70.2		dB
		Differential input, 12-bit setting		79.3		
		Single-ended input, 12-bit setting, –6 dBFS		78.8		
		Differential input, 12-bit setting, –6 dBFS		88.9		
	CMRR	Differential input, 12-bit setting, 1-kHz sine (0 dBFS), limited by ADC resolution		>84		dB
	Crosstalk	Single-ended input, 12-bit setting, 1-kHz sine (0 dBFS), limited by ADC resolution		>84		dB
	Offset	Midscale		–3		mV
	Gain error			0.68		



			%	
DNL ⁽¹⁾	Differential nonlinearity	12-bit setting, mean	0.05	LSB
		12-bit setting, maximum	0.9	
INL ⁽¹⁾	Integral nonlinearity	12-bit setting, mean	4.6	LSB
		12-bit setting, maximum	13.3	
SINAD ⁽¹⁾ (-THD+N)	Signal-to-noise-and-distortion	Single-ended input, 7-bit setting	35.4	dB
		Single-ended input, 9-bit setting	46.8	
		Single-ended input, 10-bit setting	57.5	
		Single-ended input, 12-bit setting	66.6	
		Differential input, 7-bit setting	40.7	
		Differential input, 9-bit setting	51.6	
		Differential input, 12-bit setting	70.8	
	Conversion time	7-bit setting	20	ms
		9-bit setting	36	
		10-bit setting	68	
		12-bit setting	132	
	Power consumption		1.2	mA
	Internal reference voltage		1.15	V
	Internal reference VDD coefficient		4	mV/V
	Internal reference temperature coefficient		0.4	mV/10°C

(1) Measured with 300-Hz sine-wave input and VDD as reference.

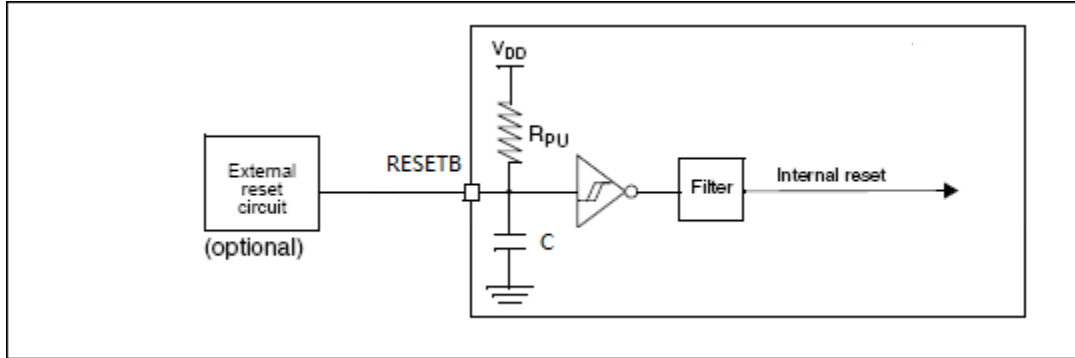
6.9 DC Characteristics

TA = 25°C, VDD = 3 V, unless otherwise noted.

	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Logic-0 input voltage				0.5	V
Logic-1 input voltage		2.			V
		5			V
Logic-0 input current	Input equals 0 V	-50 50			nA
Logic-1 input current	Input equals VDD	-50		50	nA
I/O-pin pullup and pulldown resistors			20		kΩ
Logic-0 output voltage, 4-mA pins	Output load 4 mA	0.5			V
Logic-1 output voltage, 4-mA pins	Output load 4 mA	2.			V
		4			V
Logic-0 output voltage, 20-mA pins	Output load 20 mA	0.5			V
Logic-1 output voltage, 20-mA pins	Output load 20 mA	2.4			V

6.10 Reset circuitry

The ZXM-10 Bluetooth module contains a on board RC reset circuit.



Block 6-1 Diagram of Reset circuitry

6.11 Module specific UID Property descriptors

Function	Address	Function	
0xFF8x Address mapped of the PIO. 0=low and 1= High	0xFF82	PIO2 status of this port	
	0xFF84	PIO4 status of this port	
	0xFF85	PIO5 status of this port	
	0xFF87	PIO7 status of this port	
	0xFF88	PIO8 status of this port	
	0xFF89	PIO9 status of this port	
	0xFF8A	PIO10 status of this port	
	0xFF8B	PIO11 status of this port	
	0xFF8C	PIO12 status of this port	
	0xFF8D	PIO13 status of this port	
	0xFF8E	PIO14 status of this port	
	0xFFAx Address mapping to write a 1 or zero to the PIO port/ Write a 0= low and Write a 1= high	0xFFA2	PIO2Set output of this port.
		0xFFA4	PIO4 output of this port.
0xFFA5		PIO5 output of this port.	
0xFFA7		PIO7 output of this port.	
0xFFA8		PIO8 output of this port.	
0xFFA9		PIO9 output of this port.	
0xFFAA		PIO10 output of this port.	
0xFFAB		PIO11 output of this port.	
0xFFAC		PIO12 output of this port.	
0xFFAD		PIO13 output of this port.	
0xFFAE	PIO14 output of this port.		



0xFFC0 PWM output This requires 4 control bytes , the first two bytes represent the frequency and the last two bytes represent the time the waveform is hi. The total time is 0xFFFF.	0xFFC4	PIO4 PWM output
	0xFFC5	PIO5 PWM output
0xFFE0 Serial Data Transmission control	0xFFE1	Transparent transmission of serial data the Module can commence the transmission of serial data either by polling from the host or the slave “pinging” the host data is ready.



7 Command Mode

After the module has been powered up and completed its power on reset function and the module is not connected to any Bluetooth Device then the module will enter the command mode. The state of the module can be sensed by the status of PIO1 (pin 24). When the PIO1's output level is low then the module is in command mode. When the PIO1's output level is high then the module is in Data Mode and the module is connected to the Bluetooth Host device (assuming the modules is configured as a slave).

All command instructions must be complete before they should be sent to the module, otherwise there will be no response from the module. All AT commands end with a Carriage Return Line Feed (0x0D 0x0A). The response from the module also ends with a Carriage Return Line Feed (0x0D 0x0A).

Serial default parameters: 9600 baud, 8 data bits, 1 stop bit, no parity, no flow control.

7.1 Command mode test code

Command	Response	Parameter
AT	OK	None

Use this command to verify the command mode and link is correct.

7.2 Type Inquire

Command	Response	Parameter
AT+TYPE=<nType>	OK	nType: module function mode
AT+TYPE?	+TYPE:<nType> OK	0 SPP Data mode 1 Command mode Default : 0

Type definition:

- a) SPP Data type: Transparent data communication between two connected Bluetooth device.
- b) Control Type: Connected remote Bluetooth device which can set AT control command to the module

7.3 Set/ Inquiry the Serial Port Baud Rate

Command	Response	Parameter
AT+BAUD=<nBaudRate>	OK	nBaudRate: Baud Rate (bits/s)
AT+BAUD?	+BAUD:<nBaudRate> OK	The following values are in decimal: 1200, 2400, 4800, 9600, 19200 38400, 57600, 115200, 230400 460800, 921600 Default: 9600



7.4 Set /Inquire Serial Data format

Command	Response	Parameter
AT+UARTMODE=<nParityBit>,<nStopBit>	OK	nParityBit: parity bit 0: No Parity 1: Even Parity 2: ODD Parity
AT+UARTMODE?	+UARTMODE: <nParityBit>,<nStopBit> OK	nStopBit: Stop bits 0: 1 Stop bit 1: 2 Stop bit Default:0,0

7.5 Set / inquire Serial Data flow control (RTS/CTS)

Command	Response	Parameter
AT+FLOWCTRL=<bEnable>	OK	bEnable: Hardware Flow control
AT+FLOWCTRL?	+FLOWCTRL:<bEnable> OK	1: Enable 0: Disable Default: 0

7.6 Inquire Bluetooth address

Command	Response	Parameter
AT+ADDR?	+ADDR:<bda> OK	bda: BT Address

Bluetooth address representation: NAP UAP LAP (hex)

For example:

Module Bluetooth device address is: 00:1B: 35:88:00:01

```
AT + ADDR?
+ ADDR: 001b35880001
OK
```

7.7 Inquire software version

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

For example:

```
AT + VERSION?
+ VERSION: 1.4.510
OK
```

7.8 Set and Inquire Device Name

Command	Response	Parameter
AT+NAME=<deviceName>	OK	deviceName
AT+NAME?	+NAME:<deviceName> OK	

Two example below: (note if the name has spaces, enclose the entire string in quotes)



```

AT + NAME = "Hello World"
OK
AT + NAME?
+ NAME: Hello World
OK
AT + NAME = ZXM-10
OK
AT + NAME?
+ NAME: ZXM-10
OK

```

7.9 Set/ Inquire PIN code

Command	Response	Parameter
AT+PSWD=<pinCode>	OK	pinCode: PIN CODE
AT+PSWD?	+PSWD:<pinCode> OK	Default: 000000

Note the PIN code is a fixed length of six (6) digits.

Example: if you enter AT+PSWD=1234, the actual data is saved as **001234**.

7.10 Set/ Inquire Safety Match Mode

Command	Response	Parameter
AT+SECMODE=<nPairMode>, <nIoCap>	OK	nPairMode: Match Mode 0: Do not allow Match 1: Matching optional, not mandatory, do not take the initiative to match, but allow matching 2: Matching Mandatory nIoCap: matching input and output capability 0: Display Only Device 3: No Display or Input Device Default: 1,0
AT+SECMODE?	+SECMODE: <nPairMode>, <nIoCap> OK	

For the module, combinations of several security modes are available:

1. (1,0) is no security requirement, the phone does not need to enter a password you can direct data communication.
2. (2,0) have security requirements, you must enter the password to the phone for data communication.
3. (2,3) have security requirements, the phone does not need to enter a password (some may need to confirm) to complete the match, and data communication.

The following is the actual test result

- 1) A) Samsung S3 android 4.3 kernel 3.0.31-2222515
 - a) (2,0) prompted for a password
 - b) (2,1) prompted for a password
 - c) (2,2) prompted random password



- d) (2,3) is not required to enter a password, do not confirm the direct matching success
- e) (2,4) prompted random password
- 2) Apple iPhone 4S operating system version 7.0.4
 - a) (2,0) prompted for a password
 - b) (2,1) prompted for a password
 - c) (2,2) prompted random password
 - d) (2,3) prompted to confirm the match, click on the button after the completion of the match to match, no need to enter a password.
 - e) (2,4) prompted random password

7.11 Clear Matching information

Command	Response	Parameter
AT+CLEAR	OK	none

7.12 Set/Inquire Data Flow control

Command	Response	Parameter
AT+DNOTI=<bEnable>	OK	bEnable: Flow control
AT+DNOTI?	+DNOTI:<bEnable> OK	1 Enable 0 Disable Default: 1

7.13 Set/Inquiry connection parameters

Command	Response	Parameter
AT+CONNP=<bUpdateEnable>, <nMin>, <nMax>, <nLatency>, <nTimeout>	OK	bUpdateEnable: update connection parameters 1: Automatically update upon connection 0: Do not update
AT+CONNP?	+CONNP: <bUpdateEnable>, <nMin>, <nMax>, <nLatency>, <nTimeout> OK	nMin: minimum connection interval (6-3200units 1.25mS) nMax: maximum connection interval (6-3200, units 1.25mS) nLatency: slave delay (0-499) nTimeout: connection time-out (10-3200, units10mS) Default: 0, 80, 100, 0, 500

7.14 Set/Inquire Broadcast interval

Command	Response	Parameter
AT+ADVI=<nSlot>	OK	nSlot: broadcast interval, the unit 625us Default: 160 is equivalent to 100ms



AT+ADVI?	+ADVI: <nSlot> OK	
----------	----------------------	--

7.15 Sleep control

Command	Response	Parameter
AT+SLEEP	OK	none

The control module enters a low-power sleep.
 Note: Not all models support this command.

7.16 Set/Inquire Auto sleep Enable

Command	Response	Parameter
AT+AUPM=<bEnable>	OK	bEnable: whether automatic energy saving 1: Enable 0: disables Default: 0
AT+AUPM?	+AUPM: <bEnable> OK	

Note: Not all models support

7.17 Set/Inquire Role

Command	Response	Parameter
AT+ROLE=<nRole>	OK	nRole: Parameter values are as follows: 0 - Slave 1 - Master Default: 0
AT+ROLE?	+ROLE: <nRole> OK	

Module Role Description:
 Slave: Cannot initiate a connection or disconnection responds to master's commands ;
 Master: Can initiate a new connection and disconnect a current connection .

Note: Not all models support both master and slave mode

7.18 Set s single-port output PIO

Command	Response	Parameter
AT+PIO=<nPio>, <level>	OK	nPio: PIO port number (decimal) level: PIO port output level 0 - LOW 1 - Active HIGH



ZXM-10 Bluetooth module provides users PIO port resources: PIO2 ~ PIO11, the user can be used to extend the input and output ports.

For example:

1. PIO10 port output high
AT + PIO = 10,1
OK
2. PIO10 port output high
AT + PIO = 10,0
OK

7.19 Set the PIO output and single-port memory

Command	Response	Parameter
AT+PIOS=<nPio>, <level>	OK	nPio: PIO port number (decimal) level: PIO port output level 0 - LOW 1 - active HIGH

This command is different than the AT + PIO command that sets the output state. This command will be saved to Flash, and when the module is restarted the module will automatically restore the last state of the PIO

7.20 Remove the memory PIO output state

Command	Response	Parameter
AT+PIOCS=<nPioMask>	OK	nPioMask: need to clear output PIO mask. (Hex)

This command is used to clear the AT + PIOS instruction memory state.
 nPioMask: PIO output state to clear the mask, each bit representing a PIO.
 State1 represents the corresponding PIO needs to be cleared.
 State 0 represents the corresponding PIO is maintained as before.
 The minimum representatives PIO0, such as clearing PIO5, output state PIO7, then nPioMask = (1 << 5) | (1 << 7) = (1010 0000) or A0 (hex).

7.21 Set / Query - property operations PIO, PWM enable state preservation

Command	Response	Parameter
AT+EPIOS=<bEnable>	OK	bEnable: by attribute manipulation PIO, PWM, does it save the state
AT+EPIOS?	+EPIOS:<bEnable> OK	1: Save 0: not saved Default: 0



7.22 PWM output waveform

Command	Response	Parameter
AT+PWM=<nPio>, <nFreqHZ>, <nHighValue>	OK	nPio: PIO port number (decimal) nFreqHZ: Frequency (decimal), the lowest 62Hz PWM waveform PWM output 0 means stop and clear the memory. nHighValue: PWM waveform is high time, a maximum of 65535

This command controls the Bluetooth module PIO port output PWM waveform.

nPio: PIO serial port Bluetooth module, we only support PIO4 and PIO5 output PWM waveform, so here can only select 4 or 5

nFreqHZ: PWM frequency of the waveform, such as the output waveform of 1K Hz, the value of 1000

nHighValue: This waveform is high time, the total time is 65535, that is, it determines the duty cycle of the PWM waveform, accounting for the high level of 65535.

7.23 PWM output waveform and memory

Command	Response	Parameter
AT+PWMS=<nPio>, <nFreqHZ>, <nHighValue>	OK	nPio: PIO port number (decimal) nFreqHZ: Frequency (decimal), the lowest 62Hz PWM waveform PWM output 0 means stop and clear the memory. nHighValue: PWM waveform is high time, a maximum of 65535

This command is different than the AT + PWM command that sets the PWM mode . This command will be saved to Flash, and when the module is restarted the module will automatically restore the last state PWM state.

7.24 Clear memory of PWM output state

Command	Response	Parameter
AT+PWMCS=<nPioMask>	OK	nPioMask: need to clear the PWM output state PIO mask. (Hex value)

This command is used to clear the AT + PWMS instruction memory state.

nPioMask: need to clear the PWM output state PIO mask, each bit representing a PIO, 1 represents the corresponding PIO needs to be cleared, 0 represents the state before the corresponding PIO to maintain a minimum representatives PIO0, since only PIO4 and PIO5 with PWM function, so here only the first 4 and No. 5 effective, other bits are invalid, such as clearing PIO4, output state PIO5, then nPioMask = (1 << 4) | (1 << 5) = 30 (hex)

7.25 Restore unit to default state

Command	Response	Parameter
---------	----------	-----------



AT+DEFAULT	OK	none
------------	----	------

The factory default state:

- 1) Module Role: Slave Mode
- 2) Serial port parameters:9600bps; Parity: None; Data bits: 8; Stop bit: 1;
- 3) Pairing code: "000000"
- 4) Device Name: "ZXM-10"

7.26 Set/Inquire Enabled Services

Command	Response	Parameter
AT+SERVICE=<nServiceMask>	OK	nServiceMask: enables services
AT+SERVICE?	+SERVICE:<nServiceMask> OK	Section 0 - Serial Service (0xFFE0) Section 1 - PIO Output Services (0xFFA0) Section 2 - PWM output services (0xFFC0) Section 3 - PIO Input Service (0xFF80)

7.27 Restarting the Module

Command	Response	Parameter
AT+RESET	OK	none

8 Solder Profiles

Composition of the solder ball: Sn 95.5%, Ag 4.0%, Cu 0.5%

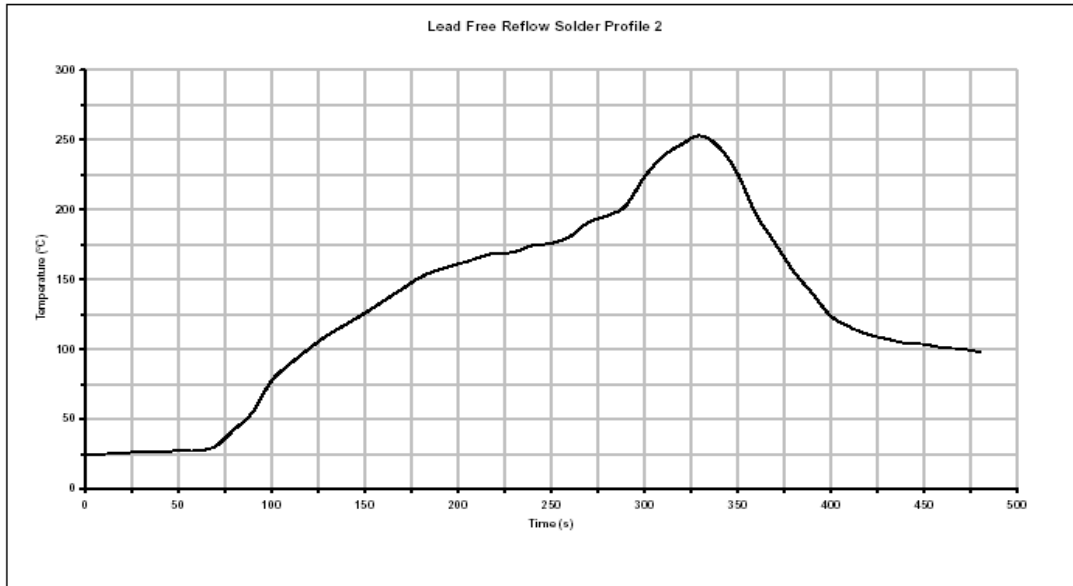


Figure 8-1 Typical Lead-Free Re-flow Solder Profile

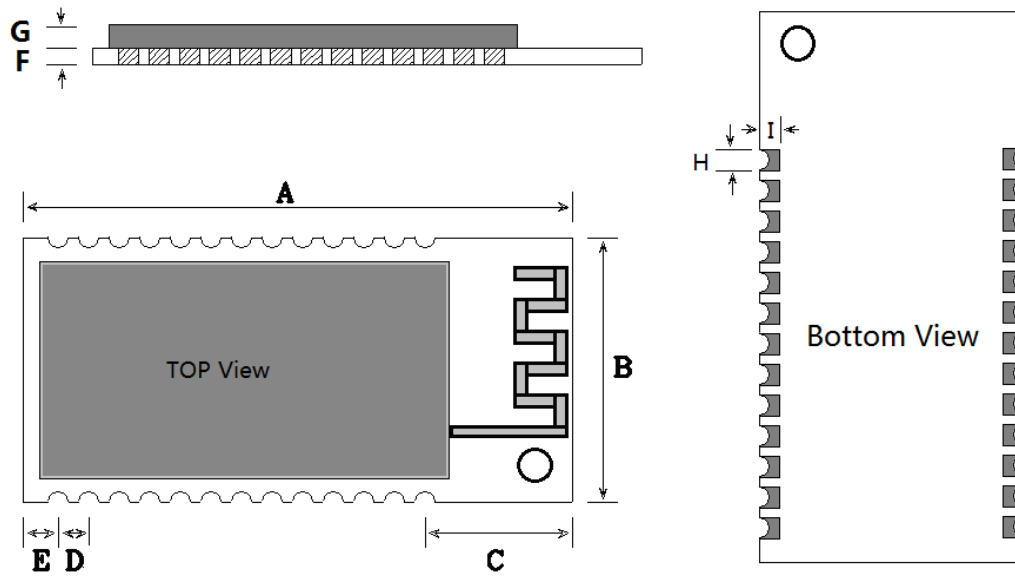
Key features of the profile:

- Initial Ramp = 1-2.5° C/sec to 175° C ± 25° C equilibrium
- Equilibrium time = 60 to 180 seconds
- Ramp to Maximum temperature (250° C) = 3° C/sec max.
- Time above liquid temperature (217° C): 45-90 seconds
- Device absolute maximum reflow temperature: 260° C

Devices will withstand the specified profile. Lead-free devices will withstand up to three reflows to a maximum temperature of 260° C.

Notes: The devices need to be baked prior to mounting.

9 Physical Dimensions



A	B	C	D	E	F	G	H	I	Unit
1.063	0.5118	0.2854	0.0591	0.0689	0.0315	0.0551	0.020	0.032	in
27	13	7.25	1.5	1.75	0.8	1.4	1.0	0.8	mm

9.1 Recommended PCB Pad Dimensions

The ZXM-10BLE is a solder down Bluetooth module. The IO's are an edge style pad with a pitch is 50mils. The exact dimensions of the pads should always be cross-checked with the manufacturer of the PCB and the assembly locations. The dimensions shown below are only recommended dimensions and they are what we have been using on our testing boards. The pad dimensions are 2.0 x 1.0 mm. See the dimensions located in the figure below.

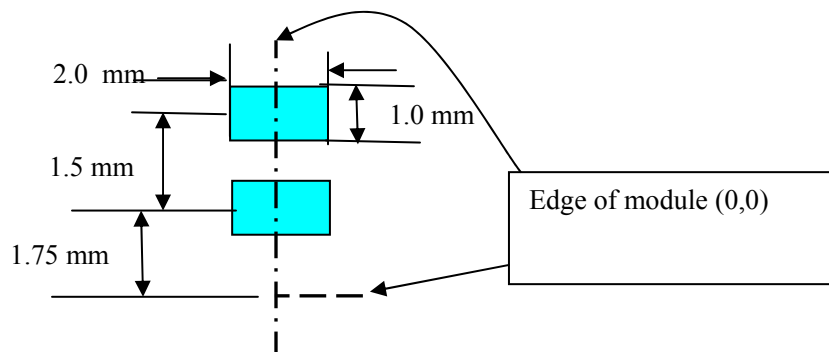
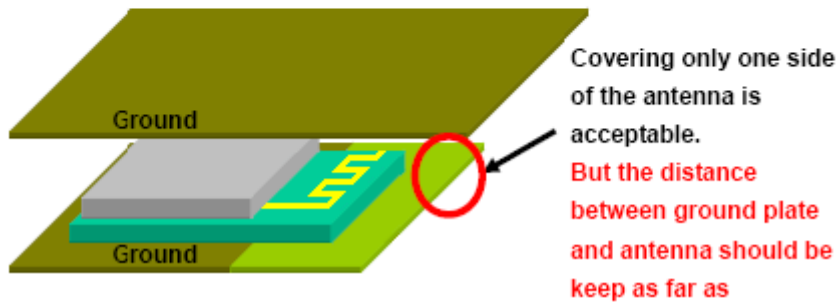
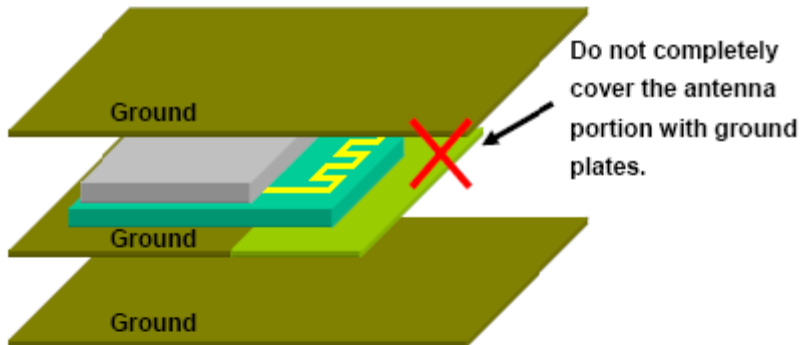
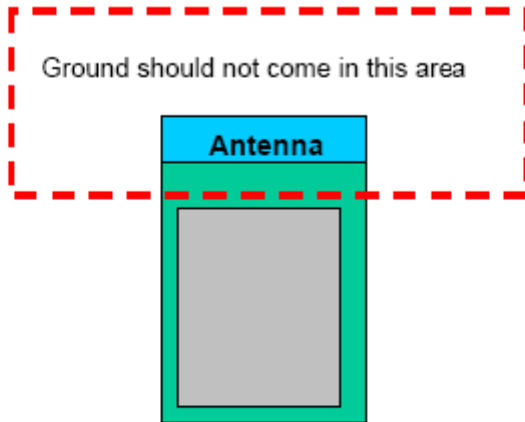


Figure 9-1 Suggested PCB Pad dimensions

10 Guide for Antenna Placement

In order to achieve longest communication range, please keep the area surrounding antenna free of grounding or metal housing.



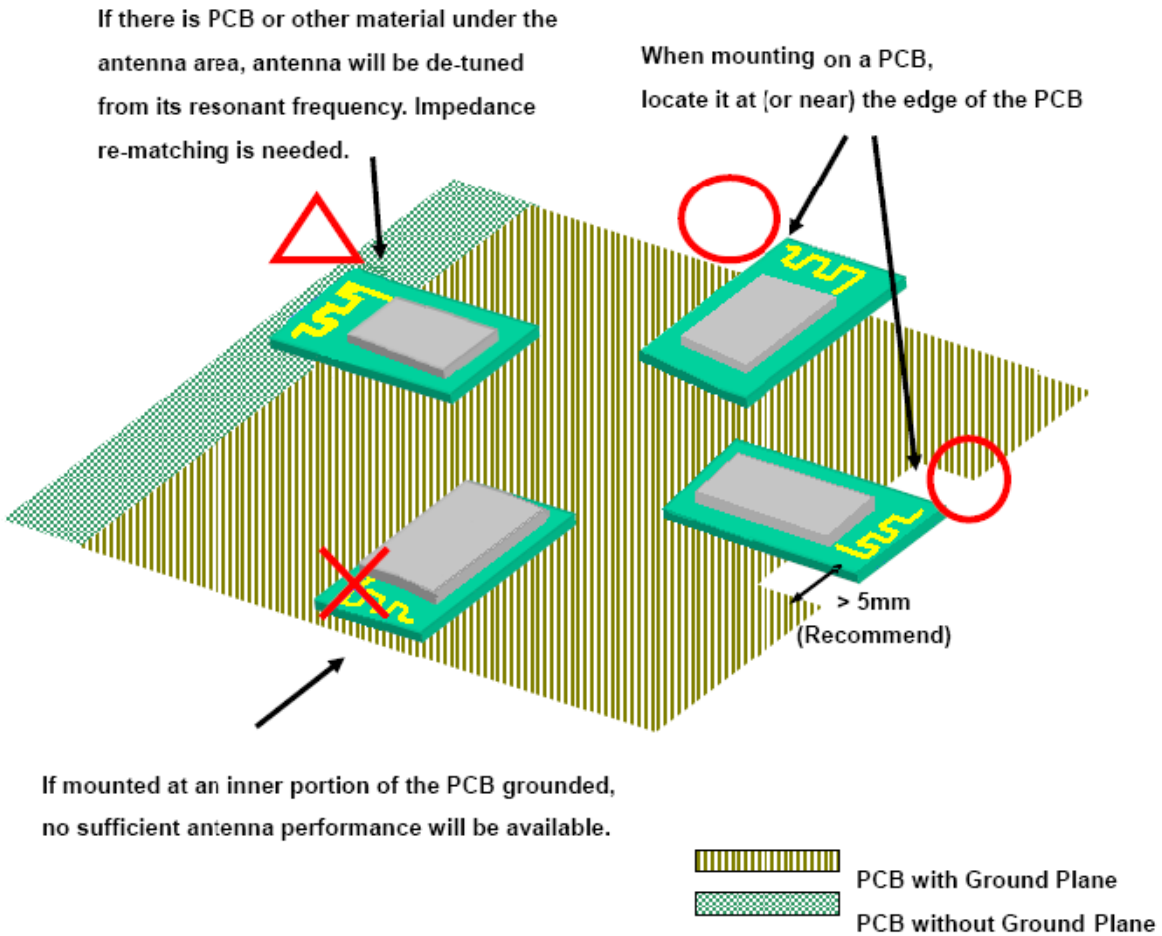


Figure 10-1 Guide for module placement

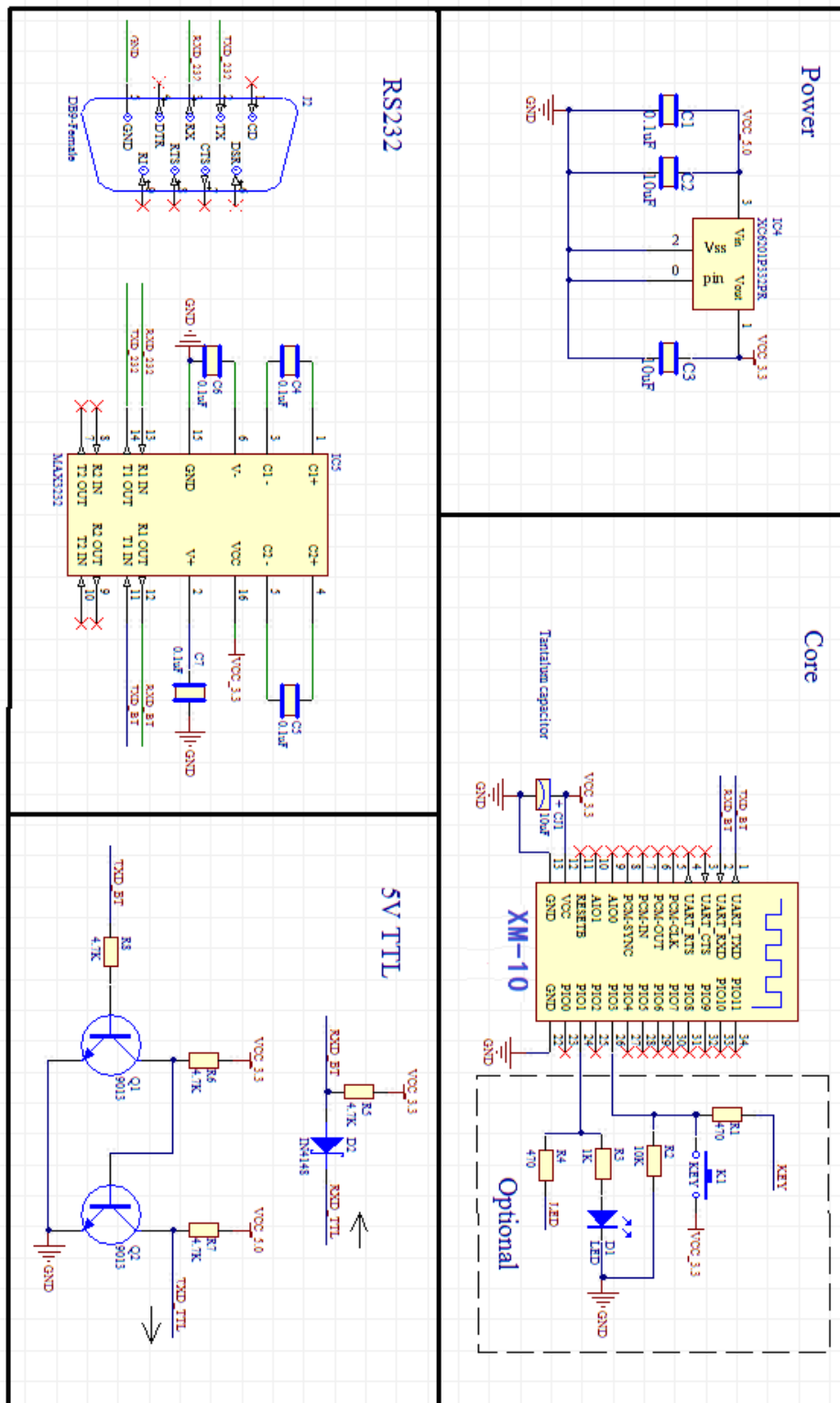


Figure 10-2 Typical Application Circuit



11 Document Status

Date	Comments
June 26, 2014	Rev. 1.0
March 26, 2015	Rev. 1.1 update commands

12 Contact information

ZBA, Inc.
94 Old Camplain Road
Hillsborough, NJ 08844
Phone: 908-359-2070
Fax 908-595-0909
E-mail: techsupport@zbausa.com
Website : <http://www.zbausa.com>