ZBA Bluetooth 2.0 Module with On-Board Antenna.

Assembly No. BT44-eb101S

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1. Document Status

Date	Comments
January 18, 2010	First draft
May 2, 2010	Update for command mode interface

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2. Scope of this document

The intention of this specification is to provide general guidelines on the integration of the **BT44-eb101S** 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 integrated antenna.

3. Bluetooth Assembly Description

The **BT44-eb101S** is a general purpose Bluetooth module incorporating an on-board ceramic antenna designed to be incorporated into an end product. This Bluetooth Module assembly is based on the BlueCore4-External chipset from Cambridge Silicon Radio, a leading Bluetooth chipset supplier. It provides a fully compliant Bluetooth system for data communications. It interfaces with a host via UART and supports EDR data rate up to 3Mbps modulation modes. The module and device firmware are 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 2 type Output Power
- Bluetooth connection indicator.
- Supports encrypted communications
- Support Firmware Upgrade
- Support Piconet as MASTER with up to 4 Slaves (requires piconet firmware)
- USB 2.0 and UART Host Interface
- Low Voltage Power Supply, 2.7V to 3.6V (Typical Vdd=3.3V)
- Built-in 8Mbit Flash Memory
- Low Power Modes Available: Park, Sniff, Hold and Deep Sleep
- Surface-mount, Size: 25.00 x 14.5 x 2.1 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

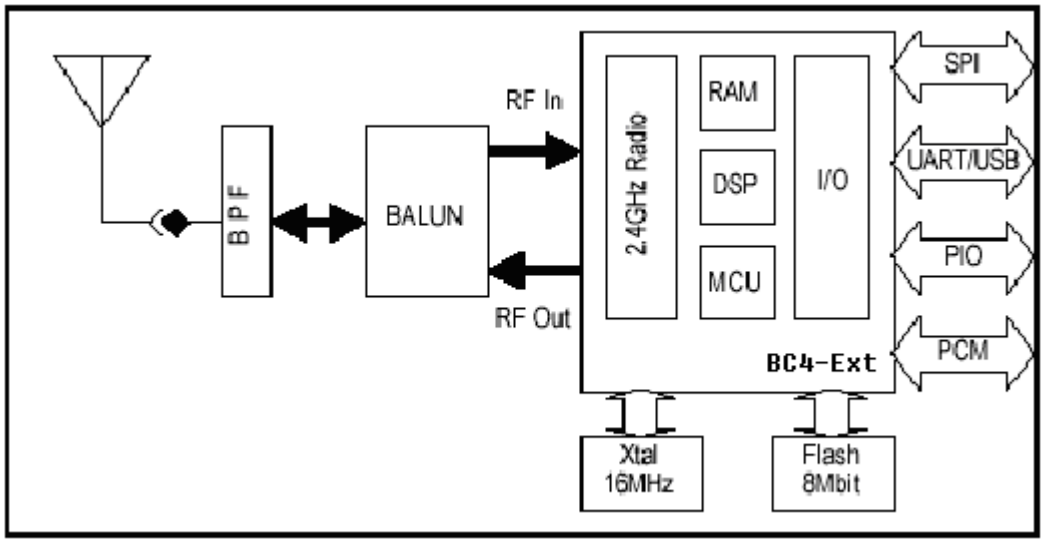


Figure 6-1 Block Diagram of Bluetooth Module

7. Pin-out and Mechanical Specifications

7.1. *Pin Configurations*

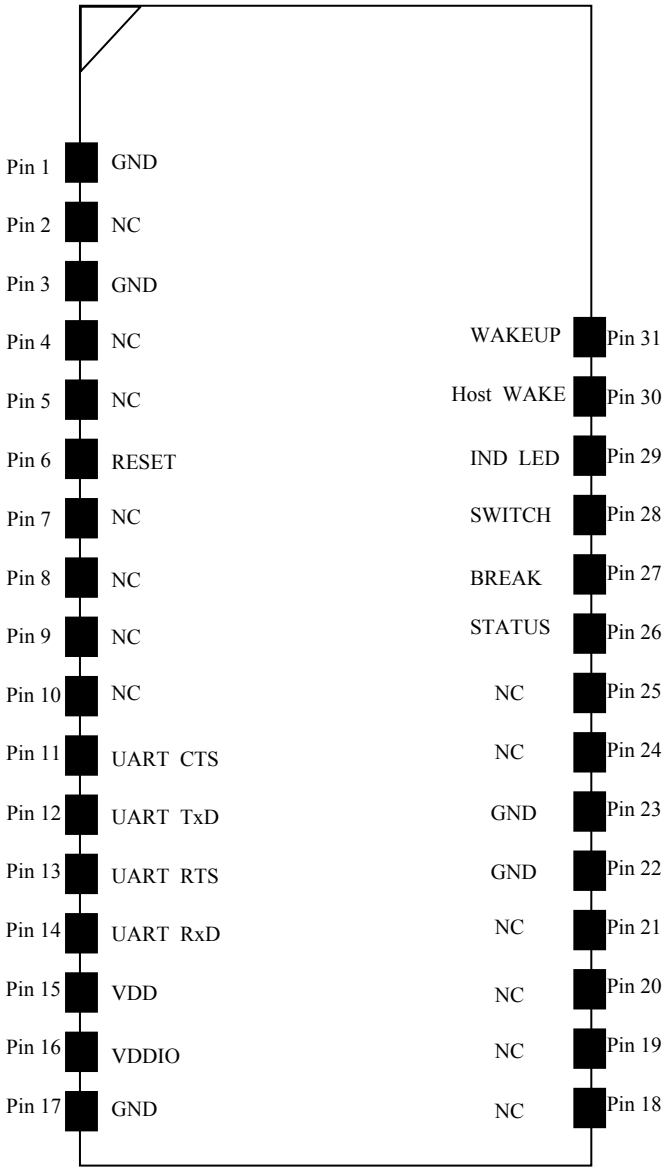
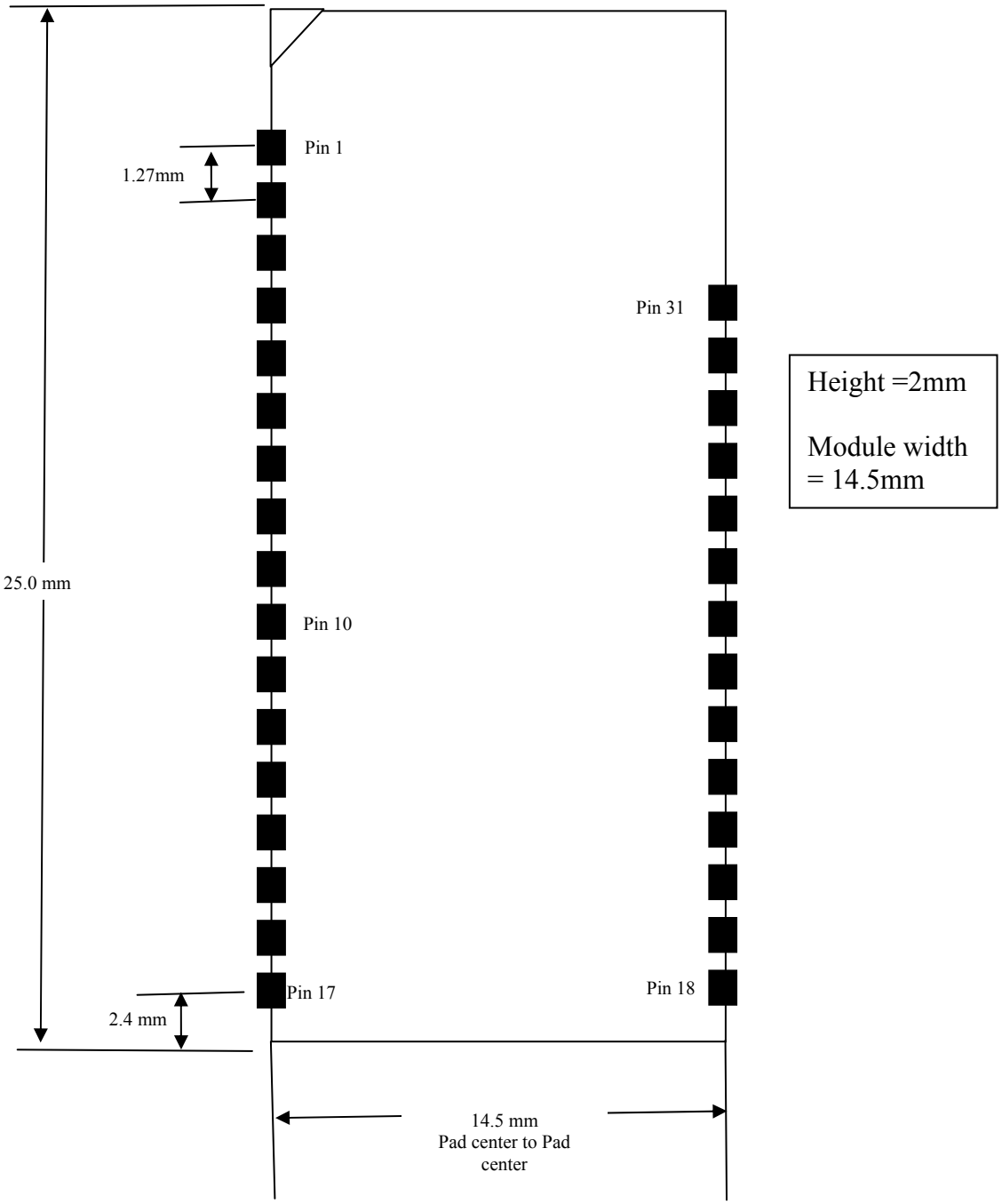


Figure 7-1 Pin-out of the BT44-EB101S Module

7.2. *Recommended PCB Pad Dimensions*

The BT44-eb101S is a solder down Bluetooth module. The Pad is an edge style pad with a pitch is 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 they are what have been used on our testing boards. See the dimensions located below in figure 10-3



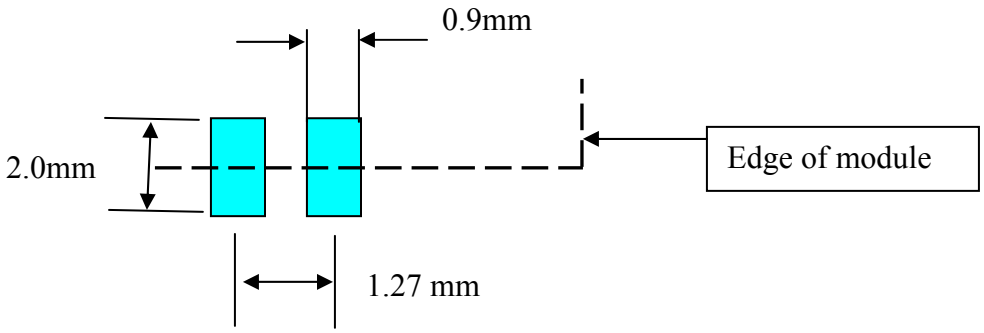


Figure 7-2 Suggested Solder Pad Dimensions

7.3. *Typical Circuit Connections*

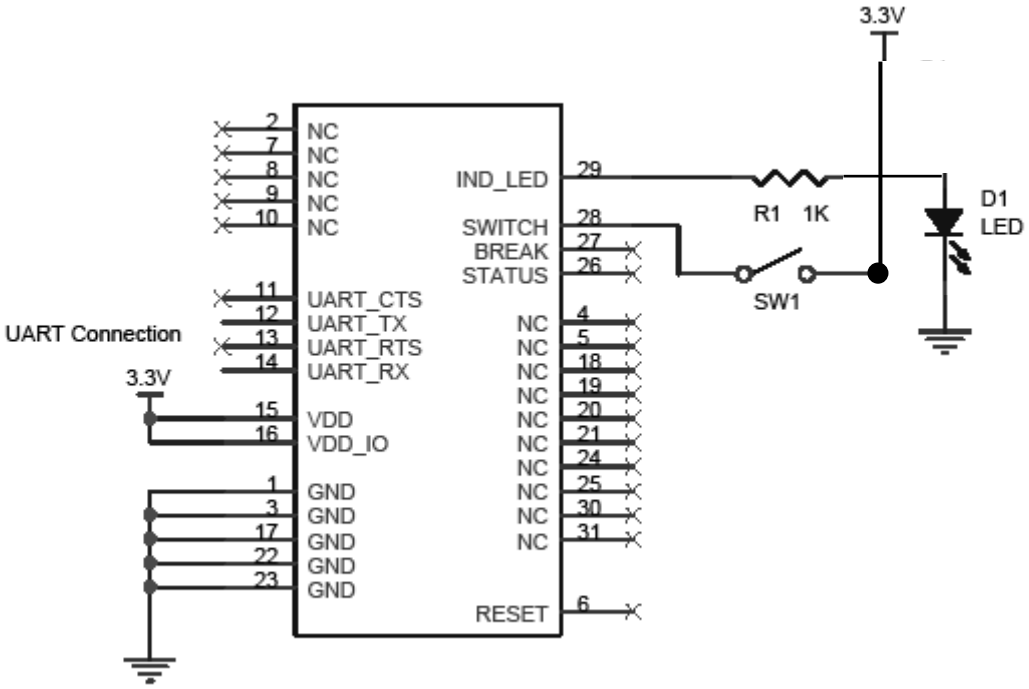


Figure 7-3 Typical Circuit Connections

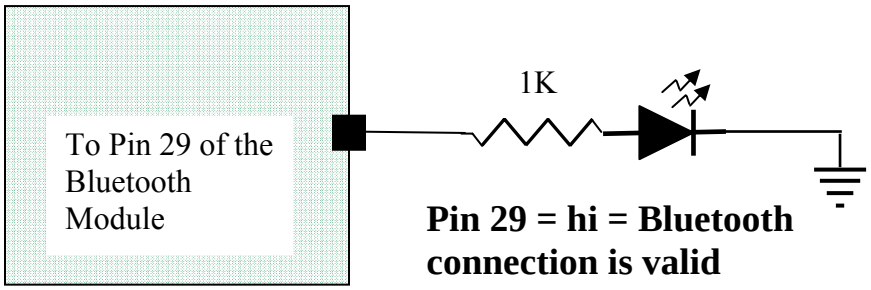
7.4. *Pin Descriptions BT44-eb101s*

PIN	NAME	TYPE	DESCRIPTION
1	GND	GND	Ground
2	NC	No Connection	
3	GND	GND	Ground
4	NC	No Connection	
5	NC	No Connection	
6	RESETB	CMOS input with weak internal pull-up	Internal pull-up Reset if low. Input denounced so must be low for >5ms to cause a reset
7	NC	No Connection	
8	NC	No Connection	
9	NC	No Connection	
10	NC	No Connection	
11	UART_CTS	CMOS input with weak internal pull-down	UART clear to send active low
12	UART_TX	CMOS output, tri-state, with weak internal pull-up	UART data output
13	UART_RTS	CMOS output, tri-state, with weak internal pull-up	UART request to send active low
14	UART_RX	CMOS input with weak internal pull-down	UART data input
15	VDD		=3.3 v SUPPLY
16	VDD/IO	Power Supply	+3.3V Power Supply Bypass with a 0.1uF in parallel with 0.001 uF Cap placed as close to the pin as possible
17	GND	GND	Ground
18	NC	No Connection	
19	NC	No Connection	
20	NC	No Connection	
21	NC	No Connection	
22	GND	GND	Ground
23	GND	GND	Ground
24	NC	No Connection	
25	NC	No Connection	
26	STATUS (Connection)	CMOS output, tri-state, with weak internal pull-up	Future option Contact ZBA
27	BREAK	CMOS input, with weak internal pull-up	Future option Contact ZBA
28	SWITCH	CMOS input, with weak internal pull-up	See below
29	IND_LED	CMOS input, with weak internal pull-up	Logic hi when there is an active BT connections
30	Host_Wake	Bi-directional with programmable strength internal pull-up/down	Future option Contact ZBA
31	WAKEUP	Bi-directional with programmable strength internal pull-up/down	See below
32		Future option	
33		Future option	
34		Future option	

Note1: Do not connect pins labeled NC.

7.5. *Indicator LED (connection)*

This is an output line that can be used to monitor the status of a Bluetooth connection in both command mode and connection mode. This line will be low when there is an active connection and high when there is no connection. A maximum of 8mA of current may be drawn from this line. Should a visual indicator function not be required then please leave pin 26 unconnected.



7.6. *SWITCH (command mode)*

Drive this line hi will bring the module into the command mode. This function is programmable and to use this function it must be configured.

8. The UART

The module provides four-wire serial asynchronous communication interface;
The following diagram shows the TXD, RXD, CTS, RTS signals for the UART and the direction of the data flow. The voltage levels of the UART are low= 0 Volts and Hi = Vdd (3.3Volts).

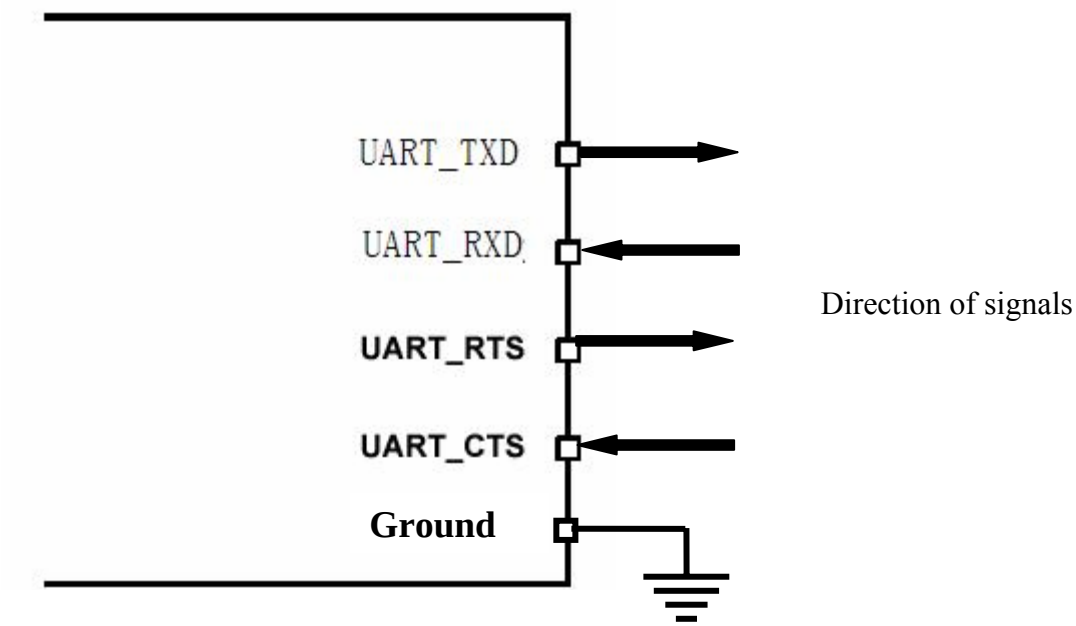


Figure 8-1 Diagram of the UART four wire (+Ground) interfaces:

Communication Parameters		
Baud Rate	Min	1200 (<2% bit error rate)
	Default	9600(<1% bit error rate)
	Maximum	921K
Hardware flow control		CTS/RTS
Parity		Odd parity, even parity, no parity
Stop bits		1 or 2
Data bits		8

Percentage of error at various baud rates

Baud Rate	Error
1200	1.73%
2400	1.73%
4800	1.73%
9600	-0.82%
19200	0.45%
38400	-0.18%
57600	-0.03%
76800	0.14%
115200	0.03%
230400	0.03%
460800	-0.02%
921600	-0.00%

9. 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	+4dBm max.
Maximum Data Throughput	Asynchronous : 3 Mbps
Output Interface	Full speed UART
Power Supply	3.3V ±10%
Operating Temperature Range	-40°C to 85°C
Storage Temperature Range	-40°C to 120°C
Dimensions	30mm X 17mm X 3.15 mm
Antenna	Ceramic

9.1. *Electrical Characteristics*

9.1.1. *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	
Voltage Range -Power Pins	2.7 to 3.6V
Voltage Range –Digital Pins	-0.3V to 3.6V
Storage Conditions	
Storage Temperature	-40°C to 150°C (ambient)
Storage Humidity	0-90% RH
Operating Conditions	
Temperature Range	-20°C< T_A<95°C
Peak Power supply current	75 A

9.1.2. *Radio Characteristics*

Temperature = -20°C						
Receiver	**Frequency (GHz)**	**Min**	**Typ**	**Max**	**Bluetooth Specification**	**Unit**
Sensitivity at 0.1% BER	2.402	-	-84	-80	≤-70	dBm
	2.441	-	-84	-80		dBm
	2.480	-	-84	-80		dBm
Maximum received signal at 0.1% BER		0	10	-	≤-20	dBm
Transmitter	**Frequency (GHz)**	**Min**	**Typ**	**Max**	**Bluetooth Specification**	**Unit**
RF transmit power (1)(2)	2.402	0	2.5	4	-6 to +4 (3)	dBm
	2.441	0	2.5	4		dBm
	2.480	0	2.5	4		dBm
RF power control range		-	35	-	≥16	dB
RF power range control resolution		-	1.8	-	-	dB
20 dB bandwidth for modulated carrier		-	800	-	1000	KHz
Initial carrier frequency tolerance		-	±25	-	≤ ±75	KHz
Drift		-	±15	-	≤ ±25	KHz
Drift Rate		-	±20	-	400	Hz/µs
$\Delta f1_{avg}$ "Maximum Modulation"		-	165	-	$140<\Delta f1_{avg}<175$	KHz
$\Delta f2_{avg}$ "Minimum Modulation"		-	150	-	115	KHz
Note 1: BlueCore4 firmware maintains the transmit power to be within the Bluetooth v2.0 + EDR specification limits Note 2: Measurement made using a PSKEY_LC_MAX_TX_POWER setting corresponds to a PSKEY_LC_POWER_TABLE power table entry of 63. Note 3: Class 2 RF transmit power range, Bluetooth v2.0 + EDR specification.						
Temperature = +20°C						
Receiver	**Frequency (GHz)**	**Min**	**Typ**	**Max**	**Bluetooth Specification**	**Unit**
Sensitivity at 0.1% BER	2.402	-	-82	-80	≤-70	dBm
	2.441	-	-84	-80		dBm

	2.480	-	-84	-80		dBm
Maximum received signal at 0.1% BER		0	-	-	≥-20	dBm
Transmitter	**Frequency (GHz)**	**Min**	**Typ**	**Max**	**Bluetooth Specification**	**Unit**
RF transmit power	2.402	0	2.5	4	-6 to +4	dBm
	2.441	0	2.5	4		dBm
	2.480	0	2.5	4		dBm
RF power control range		-	35	-	≥16	dB
RF power range control resolution		-	1.8	-	-	dB
20 dB bandwidth for modulated carrier		-	800	-	1000	kHz
Initial carrier frequency tolerance		-	±25	-	≤ ±75	kHz
Drift		-	±15	-	≤ ±25	kHz
Drift Rate		-	±20	-	400	Hz/µs
$\Delta f1_{avg}$ "Maximum Modulation"		-	165	-	$140<\Delta f1_{avg}<175$	kHz
$\Delta f2_{avg}$ "Minimum Modulation"		-	150	-	115	kHz
C/I co-channel		-	10	11	≤ 11	dB
Adjacent channel selectivity C/I $f=f_0 \pm 1MHz$		-	-4	0	≤ 0	dB
Adjacent channel selectivity C/I $f=f_0 \pm 2MHz$		-	-35	-30	≤ -30	dB
Adjacent channel selectivity C/I $f \geq f_0+3MHz$		-	-45	-	≤ -40	dB
Adjacent channel selectivity C/I $f \leq f_0-3MHz$		-	-45	-	≤ -40	dB
Adjacent channel selectivity C/I $f=f_{image}$		-	-18	-9	≤ -9	dB
Adjacent channel transmit power $f=f_0 \pm 2MHz$		-	-35	-20	≤ -20	dBc
Adjacent channel transmit power $f=f_0 \pm 3MHz$		-	-35	-40	≤ -40	dBc
Maximum received signal at 0.1% BER		0	-	-	≥-20	dBm
Transmitter	**Frequency (GHz)**	**Min**	**Typ**	**Max**	**Bluetooth Specification**	**Unit**
RF transmit power	2.402	0	1	4	-6 to +4	dBm
	2.441	0	1	4		dBm
	2.480	0	1	4		dBm

RF power control range	-	35	-	≥16	dB
RF power range control resolution	-	1.8	-	-	dB
20 dB bandwidth for modulated carrier	-	800	-	1000	kHz
Initial carrier frequency tolerance	-	±25	-	≤ ±75	kHz
Drift	-	±15	-	≤ ±25	kHz
Drift Rate	-	±20	-	400	Hz/µs
$\Delta f1_{avg}$ "Maximum Modulation"	-	165	-	$140<\Delta f1_{avg}<175$	kHz
$\Delta f2_{avg}$ "Minimum Modulation"	-	150	-	115	kHz

9.1.3. *Power Consumption*

Operation Mode	Connection Type	UART Rate (kbps)	Average	Unit
Page scan	----	115.2	- 0.42	mA
Inquiry and page scan	-	115.2	0.76	mA
ACL No traffic	Master	115.2	4.60	mA
ACL With file transfer	Master	115.2	10.3	mA
ACL No traffic	Slave	115.2	17.0	mA
ACL With file transfer	Slave	115.2	24.7	mA
ACL 40ms sniff	Master	38.4	2.40	mA
ACL 1.28s sniff	Master	38.4	0.37	mA
SCO HV1	Master	38.4	39.2	mA
SCO HV3	Master	38.4	20.3	mA
SCO HV3 30ms sniff	Master	38.4	19.8	mA
ACL 40ms sniff	Slave	38.4	2.11	mA
ACL 1.28s sniff	Slave	38.4	0.42	mA
Parked 1.28s beacon	Slave	38.4	0.20	mA
SCO HV1	Slave	38.4	39.1	mA
SCO HV3	Slave	38.4	24.8	mA
SCO HV3 30ms sniff	Slave	38.4	19.0	mA
Standby Host connection(a)	-	38.4	40	uA
Reset (RESETB low)(a)	---	---	34	uA

(a) Low power mode on the linear regulator is entered and exited automatically when the chip enters/leaves Deep Sleep mode.

10. Serial Port Profile (ZBA Standard Firmware)

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:

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 the MASTER
- Firmware Version: 6.30 or later

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**

- 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.
- From the Set-up mode type: **AT+EXIT**
  The module will respond with: **OK**
  The module is now in SPP operation mode.

Note1: **All Commands except the first <ESC> command should contain a suffix of <CR><LF>.**
Note2: See the appendix on the Data + Audio firmware for a description on entering the command mode. The Data +Audio firmware is controlled by the state of a PIO pin.

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

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

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

AT+NAME?	OK +NAME: <Para1>	Default= ZBA-SPP

Note: The default Device name = ZBA-SPP.

10.2.9. *Set Device Class*

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. *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-xxxxx 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*

Command	Response	Parameter
AT+ RESTART	OK	None

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
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.

The following commands are valid for firmware versions **6.30_xxxxx** and later.

10.2.27. *Set the Command mode interface mode*

Command	Response	Parameter
AT + CMD = x, y, z	OK	The three values are in sequence x,y,z and they independently control the method of entering the command mode x：setting this value to 1 will enable the use of the ESC <0x1B> command within 500 ms and 5 seconds after power up to enter the command mode Setting this value to 0 will disable the above command. y: setting this value to 1 will enable the use of the Character Sequence via the UART to enter the command mode Setting this value to 0 will disable the

		above command. z: setting this value to 1 will enable the use of the PIO (Pin 12) to enter the command mode. Setting this value to 0 will disable the above command. Default Value 1,0,0
AT + CMD?	OK + CMD: x,y,z	

Note: the default value for the CMD mode is 1,0,0. In this mode the only way to enter the command mode is by sending the ESC command within 5 seconds of powering the unit up.

NOTE: UNDER NO CIRCUMSTANCES SHOULD YOU SEND 0,0,0 AS THIS WILL DISABLE THE COMMAND MODE!!!!!!

10.2.28. *Set the Command mode character string*

Command	Response	Parameter
AT+CMDCODE=y	OK	The y value represents the specific character string that the module will search for to switch the operational mode of the module to the Command mode. The maximum number of characters is 15 Default Value: ^^^
AT+CMDCODE?	OK + CMDCODE:<command code character string > Default value = ^^^ **[note: CR/LF not needed]**	

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

12.1. *Recommended Module Locations for On-Board Antenna*

For maximized performance please orient the device with the antenna as close to the outside of the housing as possible. Best performance will occur if the underlying PCB does not have a ground plane under the area where the antenna is located. A ground plane directly underneath the antenna region will drastically reduce the range of the module. The absolute minimum nearest ground plane should be 3mm away from any point on the antenna; 5 mm or greater is preferred.

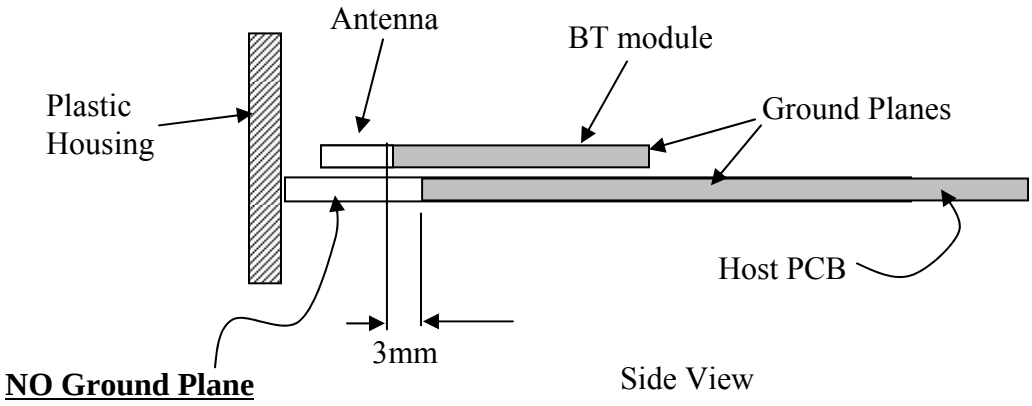


Figure 12-1 Side view of BT module mounting recommendations

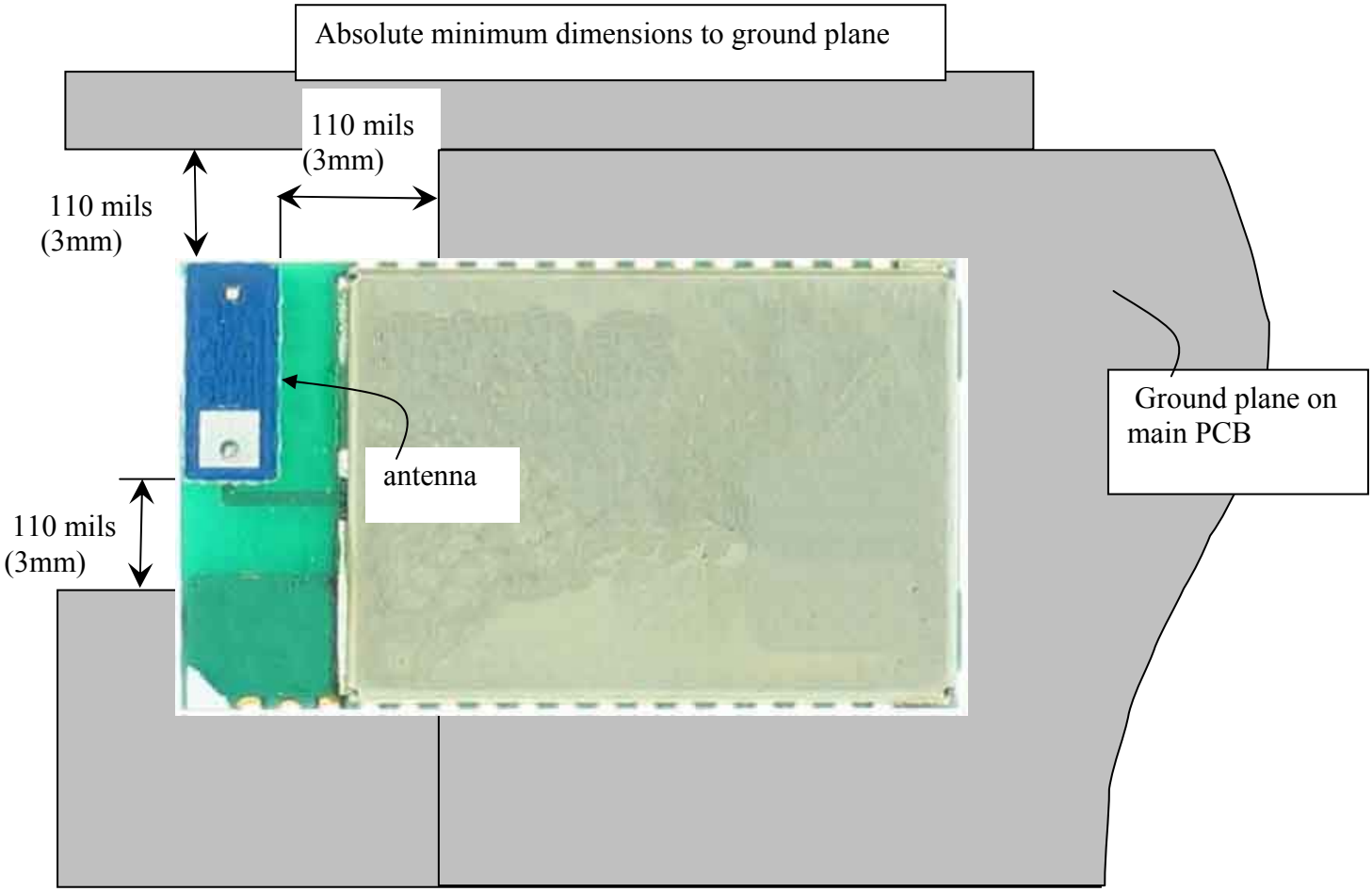


Figure 12-2 Top view of BT module mounting recommendations

Solder Profiles

NOTE: 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. **SAMPLE QUANTITIES OR SMALL PRODUCTION RUNS WILL TYPICALLY BE CONFIGURED FOR HAND SOLDERING.**

The soldering profile depends on various parameters necessitating a set up for each application. The data here is given only for guidance on solder re-flow. There are four zones:

1. Preheat Zone - This zone raises the temperature at a controlled rate, typically 1-2.5°C/s.
2. Equilibrium Zone - This zone brings the board to a uniform temperature and also activates the flux.
3. The duration in this zone (typically 2 -3 minutes) will need to be adjusted to optimize the out gassing of the flux.
4. Reflow Zone - The peak temperature should be high enough to achieve good wetting but not so high as to cause component discoloration or damage. Excessive soldering time can lead to inter-metallic growth which can result in a brittle joint.
5. Cooling Zone - The cooling rate should be fast, to keep the solder grains small which will give a longer lasting joint. Typical rates will be 2-5°C/s.

Solder Re-Flow Profile

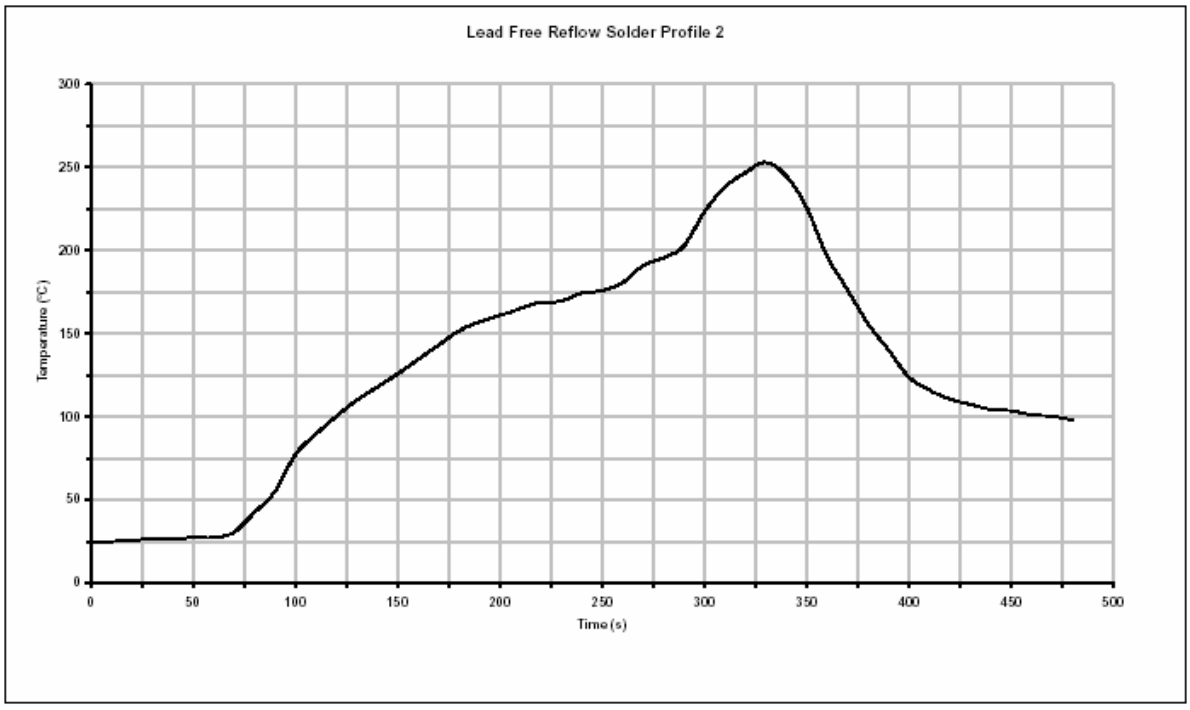


Figure 12-3 Typical Lead-Free Re-flow Solder Profile

Ordering Information

Ordering P/N	Description
BT44-eb101S-XXX	Class 2 Bluetooth Module with On-board Antenna XXX = SPP Serial Port Profile = HCI Host controller Interface over UART = HID Human Interface device = OOX Object push/ pull and FTP = PCN Piconet firmware

Other ZBA Inc. Solder down Bluetooth module variants

Ordering P/N	Description
BT44-191s-XXX	Class 2 Bluetooth Module with On-board Antenna XXX = SPP Serial Port Profile = HCI Host controller Interface over UART = HID Human Interface device = OOX Object push/ pull and FTP (special order) = PCN Piconet firmware (special order)
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 (special order) = PCN Piconet firmware (special order)
BT44-111S-XXX	Class 1 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 (special order) = PCN Piconet firmware (special order)
Other ZBA Inc. Bluetooth module variants with connector	
BT44-191C-XXX	Class 2 Bluetooth Module with on board antenna XXX = SPP Serial Port Profile = HCI Host controller Interface over UART = HID Human Interface device = OOX Object push/ pull and FTP (special order) = PCN Piconet firmware (special order)

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