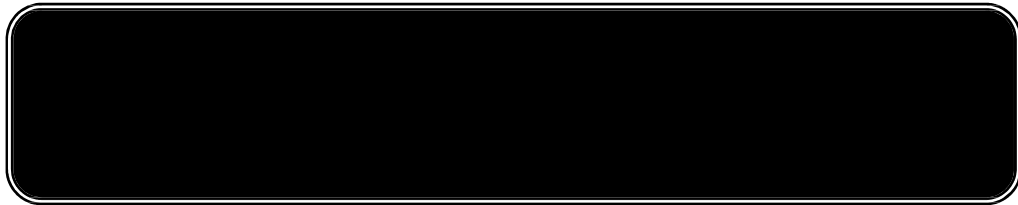


Model Name	BSM02B-G	Revision
Release Date	2006/5/23	C



Model Name : BSM02B-G

Product Name : Bluetooth UART/PCM RF Module

威譜通訊股份有限公司

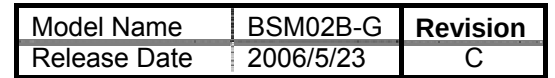
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Product Overview

The Air2U universal Class2 Bluetooth Module BSM02B-G is a compact and BQB qualified module that provides a complete 2.4GHz Bluetooth system for data and voice communications. This module is optimized for fast implementation in various applications to enable electronic devices to communicate wirelessly with other Bluetooth enabled devices. For example, the module can be used in applications such as Laptop PC, PC accessories, PDA, access points and other embedded integration applications. The BSM02B-G, Air2U's core universal class2 Bluetooth Module, comes without an antenna or connector and is designed to operate in commercial temperature range. Extra reference designs, such as a class1 device design or a system antenna integration design can also be supported by Air2U to meet customers' specific requirements. Standard software for the BSM02B-G Bluetooth module includes the lower layer protocol stack software up to the host interface (HCI). The upper layer protocol stacks, profiles, and application software are also available directly from Air2U in a case by case design base. This module also complies with RoHS instructions.



Features

⌘ Radio Transceiver

1. Typical -80 dBm receiver sensitivity under high interference environment
2. Output power ranges from 0~2dBm RF transmit power with level control

⌘ BaseBand

1. Compliant with Bluetooth V 2.0 including AFH and extended SCO
2. Standard HCI interface
3. Piconet and scatternet with support for up to 7 active connections.
4. Powerful 32-bit ARM7TDMI processor with ability to execute complete voice algorithms without separate DSP
5. Low current CMOS technology reduces standby current consumption.
6. Extensive multi function I/Os allow flexible application usage
7. Software execution from external flash memory or internal ROM with patching capability.
8. Channel Quality Driven Data Rate controls multi-slot packets to minimize packet overhead and maximize data throughput.
9. Built-in UltimateBlue Coexistence Software reduces interference to 802.11 devices.

⌘ Physical Interfaces

1. Standard HCI interface (UART) with programmable baud rate (9.6k, 19.2k, 38.4k, 57.6k, 115.2k, 230.4k, 460.8k, 500k, 921.6k, 1M, 1.5M, 2M) and flow control
2. Audio Codec Interface can be configured to support:
 - a. Standard 64KHz PCM clock rate and up to 2.048MHz clock rates with support for multi-slot handshakes and synchronization
 - b. Motorola SSI mode
 - c. Either master or slave mode
 - d. Support 8, 13, 14, and 16-bit PCM data
3. Up to 8 multi-function I/O ports are available
4. I2C bus can be configured and enabled to interface and control external I2C devices. The I2C bus is controlled by the application software.
5. Auxiliary ADC is available for application usage such as battery level detection or position sensing

⌘ Package Option

SMD Type

Summary of Benefits

⌘ Complete Bluetooth Solution

1. A single-chip processor IC combines complete 2.4GHz Radio Transceiver, baseband and protocol stack software for Bluetooth wireless technology
2. RFMD 3500, single chip Bluetooth system with 0.18um low power CMOS technology
3. Complex audio algorithms such as noise canceling algorithms for improved audio performance are also available for integration
4. Fully V2.0 BQB qualified
5. Simplify overall design and development cycle
6. Full speed class2 Bluetooth operation with full 7 slave piconet support
7. Provides an open platform for the development of upper layer protocol stack, profiles and application software

⌘ Radio Features

1. Direct conversion architecture with outstanding receiver blocking performance
2. On chip 50ohm matching network requires no external impedance matching components
3. Clock_Request signals are available allowing control of external clock source during low power states
4. Low out of band spurious emission

⌘ Baseband and Standard Protocol Stack Features

1. Powerful ARM7TDMI processor core with up to 32MIPs of total CPU resource.
2. Full-featured protocol stack from link manager up to and including the host interface (HCI)
3. Full support of low power park and sniff with selectable sniff internals of match system wake/sleep cycles
4. Verified compatibility with multiple upper layer stack software
5. Low power connection states with hold, sniff, and park modes.
6. Low power standby modes to enable very efficient power management

⌘ Application

1. PC, Notebooks, printers, Mobile phone, PDAs
2. GPS and Navigator
3. Cordless headsets, digital camera
4. Computer Accessories
5. Many other computer peripherals or embedded devices applications

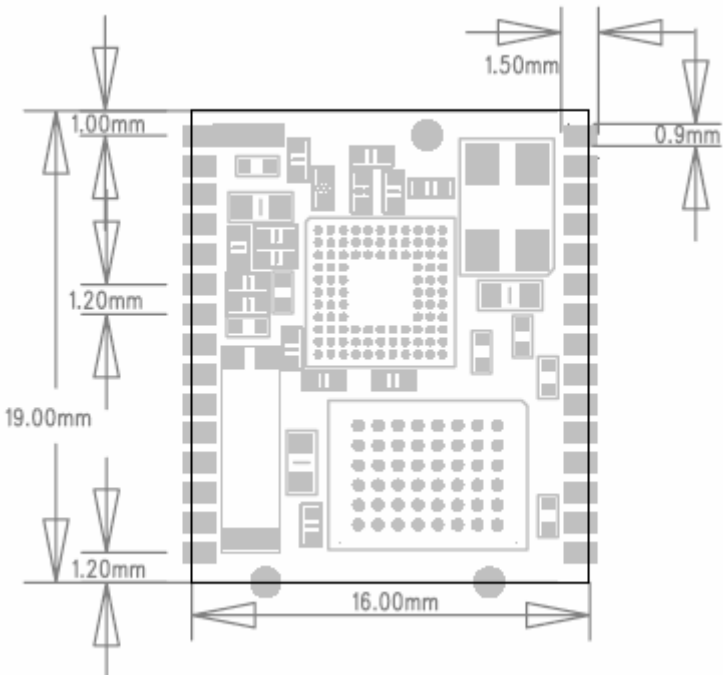
⌘ Support Profiles

Headset Gateway Profile (HSP), Hands Free Gateway Profile (HFP), Serial Port (SPP), Human Interface Device Profile (HID)

Operation Description (Pin assignment)

TP 1	GND	NC	TP 16
TP 2	RF Output	PCM_CLK	TP 17
TP 3	GND	PCM_SYNC	TP 18
TP 4	NC	PCM_IN	TP 19
TP 5	MFP[0]	PCM_OUT	TP 20
TP 6	FORCE_RESETn	MFP[3]	TP 21
TP 7	HOST_WAKE	MFP[5]	TP 22
TP 8	EXT_WAKE	MFP[4]	TP 23
TP 9	UART_RTS	MFP[6]	TP 24
TP 10	UART_CTS	MFP[7]	TP 25
TP 11	UART_TXD	AUX_TXD	TP 26
TP 12	UART_RXD	ADC_IN	TP 27
TP 13	GND	PWR_REG_EN	TP 28
TP 14	+(Vcc)	FORCE_Download	TP 29
TP 15	GND	NC	TP 30

PIN	PIN Name	Type	Description
TP1,3,13,15	GND	GND	Module Ground
TP2	RF Output	Bi-Dir	Output TX/RX
TP5	MFP[0]	CMOS Bi-Dir	Programmable I/O line
TP6	FORCE_RESETn	CMOS input	System Reset
TP7	MFP[1]/HOST_WAKE	CMOS Bi-Dir	Programmable I/O line
TP8	EXT_WAKE	CMOS input	Wake up signal from host
TP9	UART_RTS	CMOS output	UART ready to send
TP10	UART_CTS	CMOS input	UART clear to send
TP11	UART_TXD	CMOS output	UART data output
TP12	UART_RXD	CMOS input	UART data input
TP14	+(Vcc)	VDD	Module Power
TP17	PCM_CLK	CMOS Bi-Dir	Synchronous data clock
TP18	PCM_SYNC	CMOS Bi-Dir	Synchronous data strobe
TP19	PCM_IN	CMOS input	Synchronous data input
TP20	PCM_OUT	CMOS output	Synchronous data output
TP21	MFP[3]	CMOS Bi-Dir	Programmable I/O line
TP22	MFP[5]	CMOS Bi-Dir	Programmable I/O line
TP23	MFP[4]	CMOS Bi-Dir	Programmable I/O line
TP24	MFP[6]/AUX_RXD	CMOS Bi-Dir	Programmable I/O line
TP25	MFP[7]	CMOS Bi-Dir	Programmable I/O line
TP26	AUX_TXD	CMOS Bi-Dir	Programmable I/O line
TP27	ADC_IN	Analog	A to D converter input
TP28	PWR_REG_IN	CMOS Bi-Dir	Enable for external regulator
TP29	FORCE_Download	CMOS input	Force to download mode

Mechanical Requirement	
Recommended PCB Layout outline	 The diagram shows a top-down view of a PCB layout. It features a central rectangular area with various components represented by symbols. Dimensions are indicated with arrows and labels: 1.00mm (top left), 1.20mm (middle left), 19.00mm (total height), 1.20mm (bottom left), 16.00mm (total width), 1.50mm (top right), and 0.9mm (middle right). The layout is surrounded by a border of small squares, likely representing a solder mask or a specific material layer.
Dimension	16 * 19 * 2.86 mm (L * W * H) (Estimation) +- 0.1 mm Upper and left side is TP 1

Necessary Pin Connection Notice	
TP1,3,13,15	GND
TP2	RF Output (The RF performance has been guaranteed by exact 50 ohms microstrip feeding width. Your main board RF trace ought to be 15 mil with the thickness of the substrate 8 mil and $\epsilon=4.5$)
TP6	FORCE_RESETh (Using Reset IC or your system reset pin, Low Reset)
TP9	UART_RTS (Must use in download mode, but not necessary in application)
TP10	UART_CTS (Must use in download mode, but not necessary in application)
TP11	UART_TXD (If you consider on board download function, please add jumper on your Mother board)
TP12	UART_RXD (If you consider on board download function, please add jumper on your Mother board)
TP14	Input Voltage 3.0~3.3V (Please use Fast-Raising-Up or Voltage Detector Voltage Regulator. Recommend Part: *TOREX, C6209B302MR, Regulator) Output Bypass Capacitor only need 2.2uF~10uF
TP29	Pull High for Force Download Mode (If necessary for re-download)
GPIO	Firmware defined by customers, Function such as LED, BT status, Default GPIO: TP 5 - GPIO 0 : BT status , 0 represent connected and 1 represent No connected. TP 22 - GPIO 5 : Test Mode, 0 represent test mode and Floating represent normal status TP 24 - GPIO 6 : Activity Low LED TP 25 - GPIO 7 : Auto Connect to Device, Floating represent auto connection by device, 0 disable this function

*Note : The recommended mother board trace width $\geq$ 5 mil

Environment Test Specification

1	Operation Temperature	-10°C ~ 60°C
2	Storage Temperature	-20°C ~ 80°C
3	Operation Humidity	10% ~ 90% No condensing
4	Storage Humidity	10% ~ 90% No condensing

Certified

1	EMC	CE, FCC (Pre-certified)
2	Bluetooth	BQB

Current Consumption

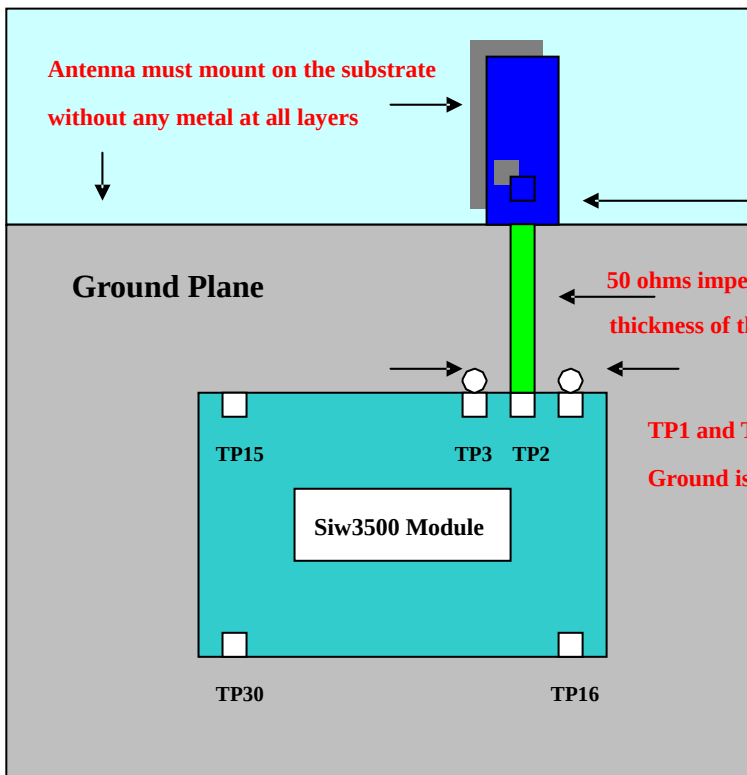
Operating Mode	Average	Unit
Standby	20	uA
Parked slave, 1.28sec, interval	70	uA
Page/Inquiry scan, 1.28sec, interval	1.1	mA
ACL connection, sniff mode, 40 ms interval	1.3	mA
ACL data transfer 723 kbps TX, 57 kbps RX, DH5 continuous packets	42	mA
SCO connection, HV3 packets	22	mA

Receiver Specification					
Parameter	Description	Min	Typ	Max	Unit
Receiver sensitivity	BER< 0.1%	-	-80	-	dBm
Max usable signal	BER< 0.1%	-10	0	-	dBm
C/I co-channel (0.1%BER)	Co-channel selectivity	-	8.0	10.0	dB
C/I 1MHz (0.1%BER)	Adjacent channel selectivity	-	-4.0	-3.0	dB
C/I 2MHz (0.1%BER)	2 nd adjacent channel selectivity	-	-38.0	-35.0	dB
C/I >=3MHz (0.1%BER)	3 rd adjacent channel selectivity	-	-43	-40	dB
Out-of-band blocking	30 MHz – 2000 MHz	-10	-	-	dBm
	2000MHz – 2399 MHz	-27	-	-	dBm
	2498 MHz – 3000 MHz	-27	-	-	dBm
	3000MHz – 12.75 GHz	-10	-	-	dBm
Intermodulation	Max interferer level to maintain 0.1%BER, interference signals at 3 and 6 MHz offset	-39	-36	-	dBm
Receiver spurious emission	30 MHz to 1 GHz	-	-	-57	dBm
	1GHz to 12.75GHz	-	-	-47	dBm
Note: 1. Measured into the chip with 50ohms source and no bandpass filter 2. Nominal and extreme Bluetooth test conditions as defined by the BT SIG published RF test spec 2.0 3. Out-of-band blocking guaranteed by design 4. Except receive channel sub harmonics					

Transmitter Specification					
Parameter	Description	Min	Typ	Max	Unit
Output RF transmit power	Δt maximum power output level	-	0	-	dBm
Modulation Characteristics	$\Delta f1$ avg	140	155	175	KHz
	$\Delta f2$ max (For at least 99.9% of all $\Delta f2$ max)	115	-	-	KHz
	$\Delta f1$ avg/ $\Delta f2$ avg	0.8	-	-	KHz
Initial carrier frequency accuracy	-	-75	-	+75	KHz
Carrier frequency drift	One slot packet	-25	-	+25	KHz
	Two slot packet	-40	-	+40	KHz
	Five slot packet	-40	-	+40	KHz
	Max drift rate	-	-	20	KHz/50us
20dB occupied bandwidth	Test Per Bluetooth specification	-	-	1000	KHz
In-band spurious emission	2MHz offset	-	-	-40	dBm
	>3MHz offset	-	-	-60	dBm
Out-of-band spurious emission	30MHz to 1GHz, operating mode	-	-	-55	dBm
	30MHz to 1GHz, idle mode	-	-	-57	dBm
	1GHz to 12.75GHz, operating mode	-	-	-50	dBm
	1GHz to 12.75GHz, idle mode	-	-	-47	dBm
	1.8GHz to 1.9GHz	-	-	-62	dBm
	5.15GHz to 5.3GHz	-	-	-47	dBm

External Reference Requirement				
Parameter	Description	Min	Max	Unit
Drive level	AC amplitude	0.5	VCC	Vp-p
	DC level	0.3	VCC	V
Phase noise	100Hz offset	-	-100	dBc/Hz
	1KHz offset	-	-120	dBc/Hz
	10KHz offset	-	-140	dBc/Hz

BSM02B-G Module External Antenna Application Note

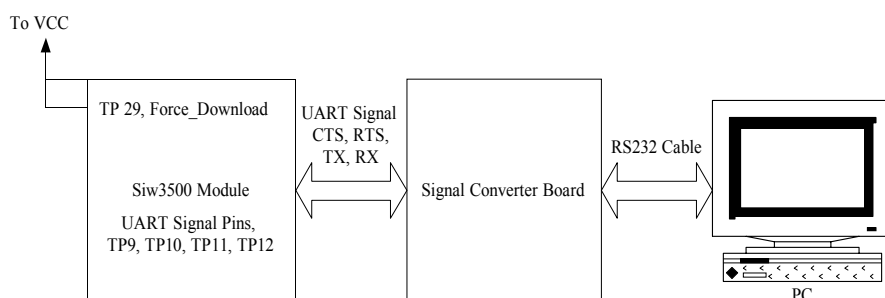
1	P/N	ACX AT9520-B2R4HAAB
2	Frequency Range	2.4~2.5GHz
3	Peak Gain	3.0dBi typ.
4	Average Gain	1.0dBi typ.
5	VSWR @ BW	2.0 max.
6	Impedance	50 ohm
7	Size	9.5 X 2.0 mm Monolithic SMD
8	Web Site	http://www.acxc.com.tw
9		

*Note-1 : The detailed spec was shown at datasheet.

*Note-2 : The RF performance has been guaranteed by exact 50 ohms microstrip feeding width. It is known that the width is 15 mil when the thickness of the substrate is 8 mil and $\epsilon=4.5$. If you don't make sure the feeding width of your board, please contact with our engineer.

Application example

Download Process

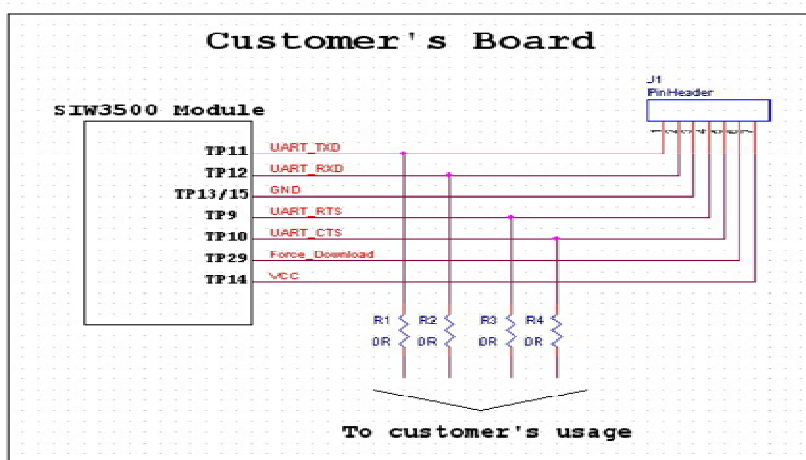


You can force SiW3500 module to download mode. In this mode, you can download the firmware and nvm parameter. The procedure to force the module to download mode are

1. Connect TP9~12 to "Signal Converter Board". (This board can be provided from Air2U.)
2. Connect TP29 to VCC.
3. Connect RS232 cable between "Signal Converter Board" and PC.
4. Give the power to SiW3500 module. (SiW3500 module's VCC and GND can be shared with Signal Converter Board's.)
5. In PC side, launch the download program provided by Air2U.

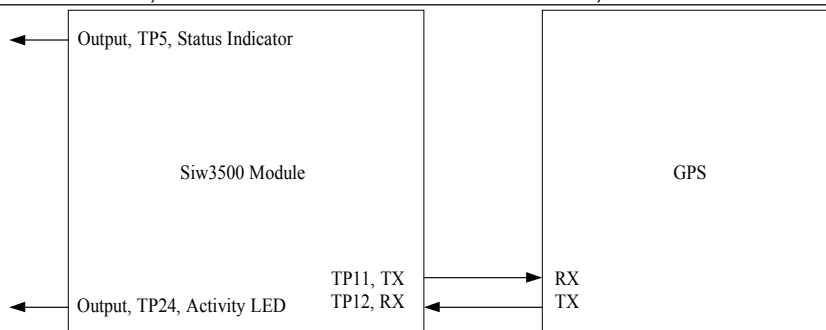
Reserve for Download (Suggestion)

If it is necessary to upgrade firmware, you need to reserve some components on your board as:



For normal customer's usage, R1~R4 should be mounted and J1 can be non-mounted. Once you need to upgrade firmware, you can mount J1 and remove R1~R4. Then, follow "Download Process" as above,

Connect w/ device



Reference Circuit design	
Download Tool	As the “RFMD Module-Download Tool” Drawing
PCM Application	As the “PCM Application” Drawing

1. The device 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.
2. This device and its antenna(s) must not be co-located or operating in conjunction with any other antenna or transmitter.
3. Changes or modifications to this unit not expressly approved by the party responsible for compliance could void the user authority to operate the equipment.
4. This Equipment has been tested and found to comply with the limits for a class B ☐ digital device, pursuant to Part 15 of the FCC rules. These limits are designed to ☐ provide reasonable protection against harmful interference in a residential ☐ installation. This equipment generates, uses and can radiate radio frequency ☐ energy and, if not installed and used in accordance with the instructions, may ☐ cause harmful interference to radio communications. However, there is no ☐ guarantee that interference will not occur in a particular installation. If this ☐ equipment does cause harmful interference to radio or television reception, which ☐ can be determined by turning the equipment off and on, the user is encouraged to ☐ try to correct the interference by one or more of the following measures: ☐
 - ☐ - Reorient or relocate the receiving antenna. ☐
 - ☐ - Increase the separation between the equipment and receiver. ☐
 - ☐ - Connect the equipment into an outlet on a circuit different from that to ☐ which the receiver is connected. ☐
 - ☐ - Consult the dealer or an experienced radio/TV technician for help.