

apm1842 Bluetooth Class2 Module



General Description

This compact Bluetooth™ class2 PCB module combines a 2.4 GHz radio processor, regulator, crystal, matching network, on-board antenna and flash memory into a single PCB module with a small form factor of 14mm by 32mm by 2.45mm. A jumper is used to select the on-board antenna or an external antenna. This PCB module provides internal Flash allowing loading specified profiles and customized application software. The module also supports the deep sleep mode to reduce power consumption.

Features

- Small form factor module. PCB LGA package with a compact size of 14mm by 32mm by 2.45mm.
- Low power consumption.
- Integrating Bluetooth chip, matching network, antenna, crystal, 4Mbit flash memory and LDO on a single module.
- Provide total solution for Bluetooth and WLAN co-existence technology.
- Support multiple reference clock frequencies for GSM/GPRS and CDMA cellular applications.
- Compliant with Bluetooth specification V1.2.

- Support UART and USB 2.0 interfaces.
- PCM audio CODEC interface supports both master and slave mode operation.
- Support firmware upgrade.

Applications

- Portable Devices: Cellular phones, headsets, PDAs, palmtops.
- Computer Peripheral: PCs, notebooks, printers.
- Consumer Electronics: MP3 players, digital cameras, joysticks.
- Automotive phone kits, Bluetooth tire pressure sensors, Barcode scanners.

Functional Block Diagram

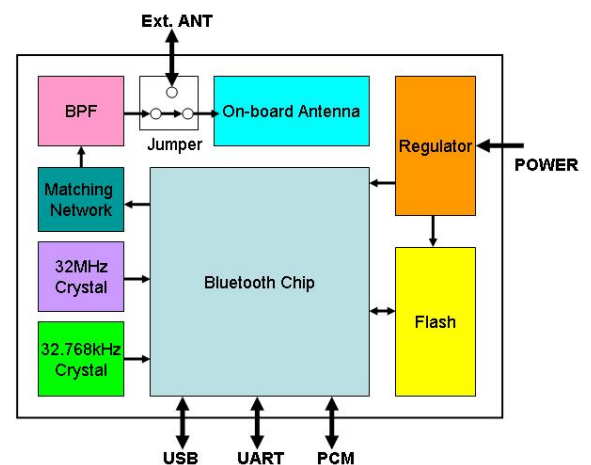


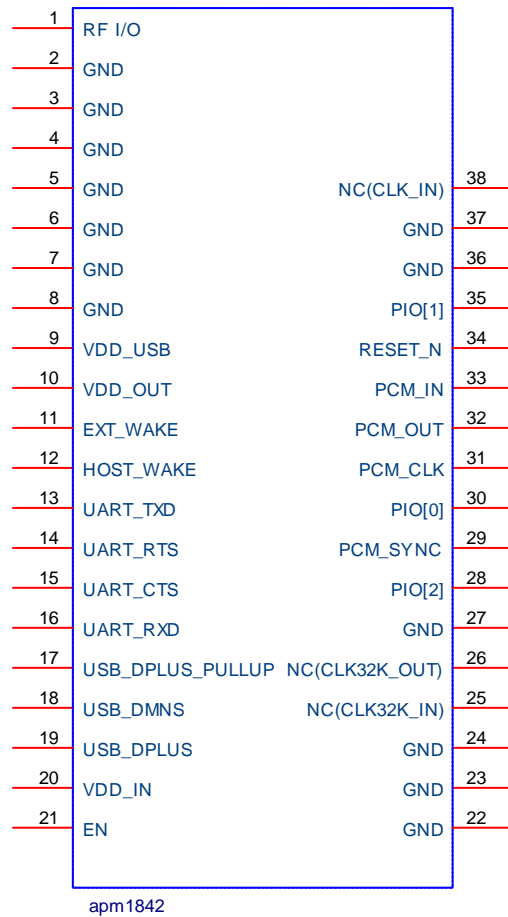


TABLE OF CONTENTS

1 Pin Descriptions	3
1-1 Pin Assignment (Top view)	3
1-2 Pin Definition	3
2 System Specifications	5
3 Electrical Characteristics	5
4 apm1842 Bluetooth System Stacks	8
5 WLAN Coexistence Technology	9
6 Mounting Guide for Antenna Performance	10
7 Mechanical Drawing	11
8 Contact Information	11

1 Pin Descriptions

1-1 Pin Assignment (Top view)



1-2 Pin Definition

Pin #	Pin Name	Pad Type	Description
1	RF_I/O	Analog	RF signal input into the receiver or output from the transmitter.
2-8	GND	Ground	Ground connections.
9	VDD_USB	Power	Positive supply for USB interface.
10	VDD_OUT	Power	3.3V output power from internal regulator
11	EXT_WAKE	CMOS input	Wake up signal from host.
12	HOST_WAKEUP	CMOS output	Wake up signal to host.
13	UART_TXD	CMOS output	UART transmit data.
14	UART_RTS	CMOS output	UART flow control ready to send.

Pin #	Pin Name	Pad Type	Description
15	UART_CTS	CMOS input	UART flow control clear to send.
16	UART_RXD	CMOS input	UART receive data.
17	USB_DPLS_PULLUP	Bi-directional	Output signal for controlling the on/off of the pull-up of the USB_DPLS line.
18	USB_DMNS	Analog	USB differential pair negative signal.
19	USB_DPLS	Analog	USB differential pair positive signal.
20	VDD_IN	Power	Positive supply to internal low dropout regulator. Also supply for digital input/output ports including peripheral interface, external memory interface, and UART interface.
21	EN	Power	Normally floats high. Disable module when low.
22-24	GND	Ground	Ground connections.
25	NC (CLK32K_IN)	Analog	NC pin. (For crystal or external 32.768kHz clock input.)
26	NC (CLK32K_OUT)	Analog	NC pin. (Drive for crystal.)
27	GND	Ground	Ground connections.
28	PIO[2]	Bi-directional	Programmable input/output. Sampled following reset for transport selection: PIO[2] = 0, selects UART transport PIO[2] = 1, selects USB transport
29	PCM_SYNC	Bi-directional	PCM synchronization data strobe to the remote device. Normally an output. Input for Motorola SSI slave mode.
30	PIO[0]	Bi-directional	Programmable input/output. Sampled following reset for boot mode options: PIO[0] = 0, Boot from internal ROM PIO[0] = 1, Boot from external Flash
31	PCM_CLK	Bi-directional	PCM synchronous data clock to the remote device. Normally an output. Input for Motorola SSI slave mode.
32	PCM_OUT	Bi-directional	PCM data from the remote device. Normally an input.
33	PCM_IN	Bi-directional	PCM data to the remote device. Normally an output.
34	RESET_N	CMOS input	Optional system level reset (active low).
35	PIO[1]	Bi-directional	Programmable input/output Sampled following reset for frequency selection: If UART transport is selected and PIO[1] = 0, frequency is selected by the state of USB_DPLS_PULLUP pin. If UART transport is selected and PIO[1] = 1, frequency is selected by NVM parameter. Default for proper UART operation will be configured as 32MHz. If USB transport is selected, PIO[1] is ignored and the frequency will be configured as 32MHz
36-37	GND	Ground	Ground connections.
38	NC (CLK_IN)	Analog	NC pin. (System reference clock input.)

2 System Specifications

2-1 Absolute Maximum Ratings

Symbol	Description	Min.	Max.	Units
VDD_IN	Input supply voltage	-0.3	8	V
T _{ST}	Storage temperature	-55	+125	°C

Absolute maximum ratings indicate limits beyond which damage to the device may occur.

2-2 Recommended Operating Conditions

Symbol	Description	Min.	Max.	Units
VDD_IN	Input supply voltage	3.3	7	V
T _{OP}	Operating temperature (industrial grade)	-40	+85	°C

3 Electrical Characteristics

3-1 DC Specification (T_{op}=25°C, VDD_OUT=3.3V)

Symbol	Description/Test Conditions	Min.	Typ.	Max.	Units
V _{IL}	Input low voltage	GND-0.1		0.3·V _{DD_OUT}	V
V _{IH}	Input high voltage	0.7·V _{DD_OUT}		V _{DD_OUT}	V
V _{OL}	Output low voltage	GND		0.2·V _{DD_OUT}	V
V _{OH}	Output high voltage	0.8·V _{DD_OUT}		V _{DD_OUT}	V
I _{OH}	Output high current		1		μA
I _{OL}	Output low current		1		μA
I _{ILI}	Input leakage current		1		μA

3-2 Current Consumption (T_{op}=25°C)

Operating Mode	Average	Units
Shutdown (EN = low)	0.5*	μA
Standby	49	μA
Parked Slave, 1.28 sec. interval	160	μA
Page/Inquire Scan, 1.28 sec. interval	1.5	mA
ACL connection, sniff mode, 100 ms interval	1.2	mA
ACL data transfer 720 kbps, DH5 continuous packets	60	mA
SCO connection, HV1 packets	60	mA
SCO connection, HV3 packets	32	mA

*It's shutdown supply current while Bluetooth module is disable.

3-3 Radio Specification

Parameter	Description	Min.	Typ.	Max.	Unit
VCO operating range	Frequency	2402	--	2480	MHz
PLL lock time	--	--	55	100	μS

3-4 Receiver specification (VDD = 3.3 V)

Parameter	Description	Min.	Typ.	Max.	Bluetooth Spec.	Unit
Receiver sensitivity	BER < 0.1%	-	-85	-80	≤ -70	dBm
Maximum usable signal	BER < 0.1%	-	0	-	≥ -20	dBm
C/I co-channel (0.1% BER)	Co-channel selectivity	-	10	11	≤ 11	dB
C/I 1 MHz (0.1% BER)	Adjacent channel selectivity	-	-4	0	≤ 0	dB
C/I 2 MHz (0.1% BER)	2nd adjacent channel selectivity	-	-38	-35	≤ -30	dB
C/I ≥ 3 MHz (0.1% BER)	3rd adjacent channel selectivity	-	-43	-40	≤ -40	dB
Out-of-band blocking	30 MHz – 2000 MHz	-10	-	-	≥ -10	dBm
	2000 MHz – 2399 MHz	-27	-	-	≥ -27	dBm
	2498 MHz – 3000 MHz	-27	-	-	≥ -27	dBm
	3000 MHz – 12.75 GHz	-10	-	-	≥ -10	dBm
Intermodulation	Max interferer level to maintain 0.1% BER, interference signal at 3 and 6 MHz offset	-39	-36	-	≥ -39	dBm
Receiver spurious emission	30 MHz to 1 GHz	-	-	-57	-	dBm
	1 GHz to 12.75 GHz	-	-	-47	-	dBm

3-5 Transmitter Specification (VDD = 3.3 V)

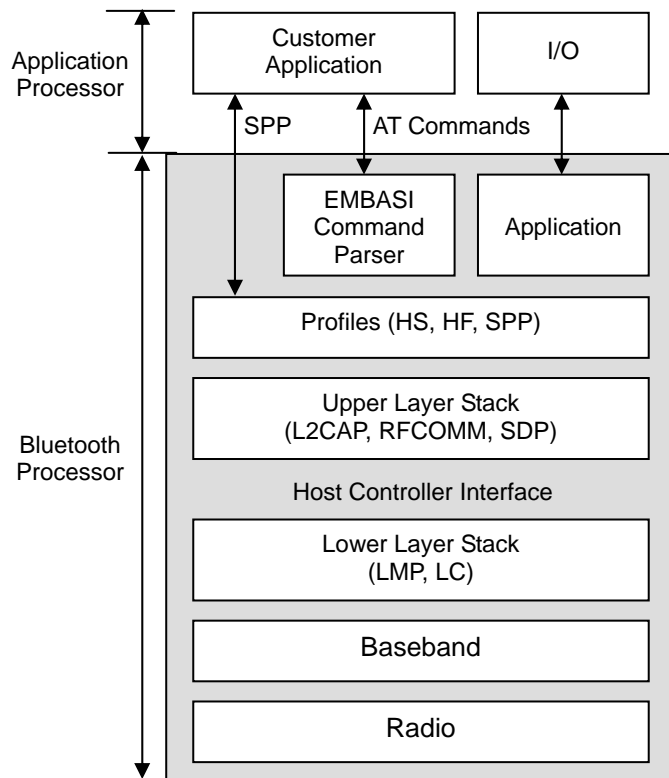
Parameter	Description	Min.	Typ.	Max.	Bluetooth Spec.	Unit
Output RF transmit power	At maximum power output setting	-2	+2	+4	-6 to +4	dBm
Modulation index	--	0.28	0.306	0.35	-	-
Initial carrier frequency accuracy	--	-75	-	+75	± 75	kHz
Carrier frequency drift	One slot packet	-25	-	+25	± 25	kHz
	Two slot packet	-40	-	+40	± 40	kHz
	Five slot packet	-40	-	+40	± 40	kHz
	Max drift rate	-	-	400	≤ 400	Hz/us
20 dB occupied bandwidth	Bluetooth specification	-	-	1000	≤ 1000	kHz



Parameter	Description	Min.	Typ.	Max.	Bluetooth Spec.	Unit
In-band spurious emission	2 MHz offset	-	-74	-55	-	dBm
	>3 MHz offset	-	-74	-55	-	dBm
Out-of-band spurious	30 MHz to 1 GHz, operating mode	-	-70	-55	-	dBm
	1 GHz to 12.75 GHz, operating mode	-	-70	-57	-	dBm
	1.8 GHz to 1.9 GHz	-	-	-62	-	dBm
	5.15 GHz to 5.3 GHz	-	-	-47	-	dBm

4 apm1842 Bluetooth System Stacks

The total solution of apm1842 includes hardware, firmware and software. The systems stacks overview is as shown below. For further information details on apm1842 software, please contact technical engineer.



5 WLAN Coexistence Technology

apm1842 Bluetooth module provides three solutions for WLAN coexistence technologies. These techniques all use frequency allocation which means the Bluetooth will avoid operating on the same frequency as WLAN devices.

- **AFH (Adaptive Frequency Hopping):**

apm1842 Bluetooth module is fully compliant with Bluetooth specification V1.2. Thus, it supports AFH feature and no any hardware interface and host software modifications are needed for WLAN chip or module provider.

- **UltimateBlue Coexistence**

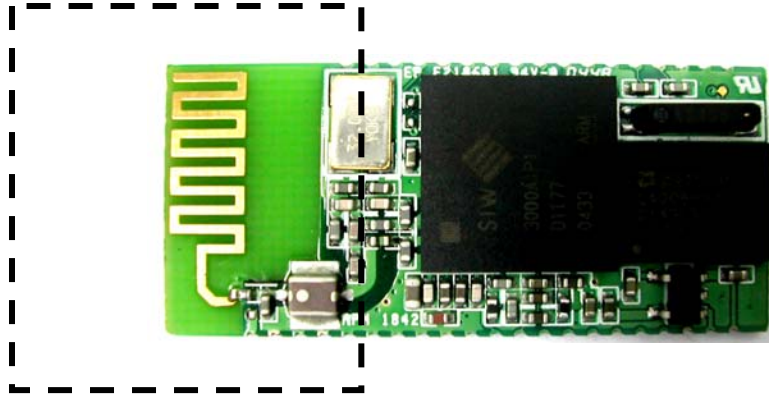
apm1842 provides the UltimateBlue Coexistence (UBC) technology when it wants to connect to another device which only supports Bluetooth v1.1 specification. No host software changes needed.

- **Intel® Wireless Coexistence System (WCS)**

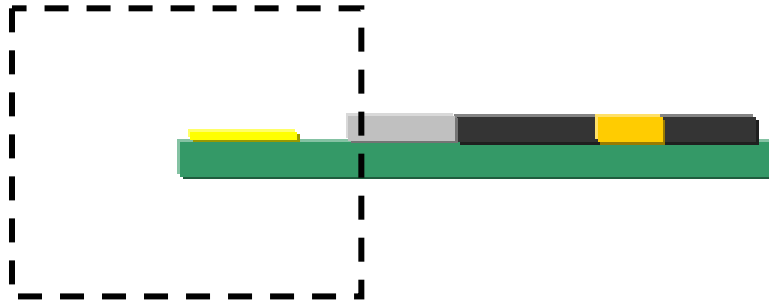
apm1842 works with Intel® PRO wireless 2100 and 2200BG network connections. The occupied WLAN channel information is transmitted to Bluetooth device via hardware lines to avoid using on the same frequency between Bluetooth and WLAN devices.

6 Mounting Guide for Antenna Performance

Forbidden area of ground plane



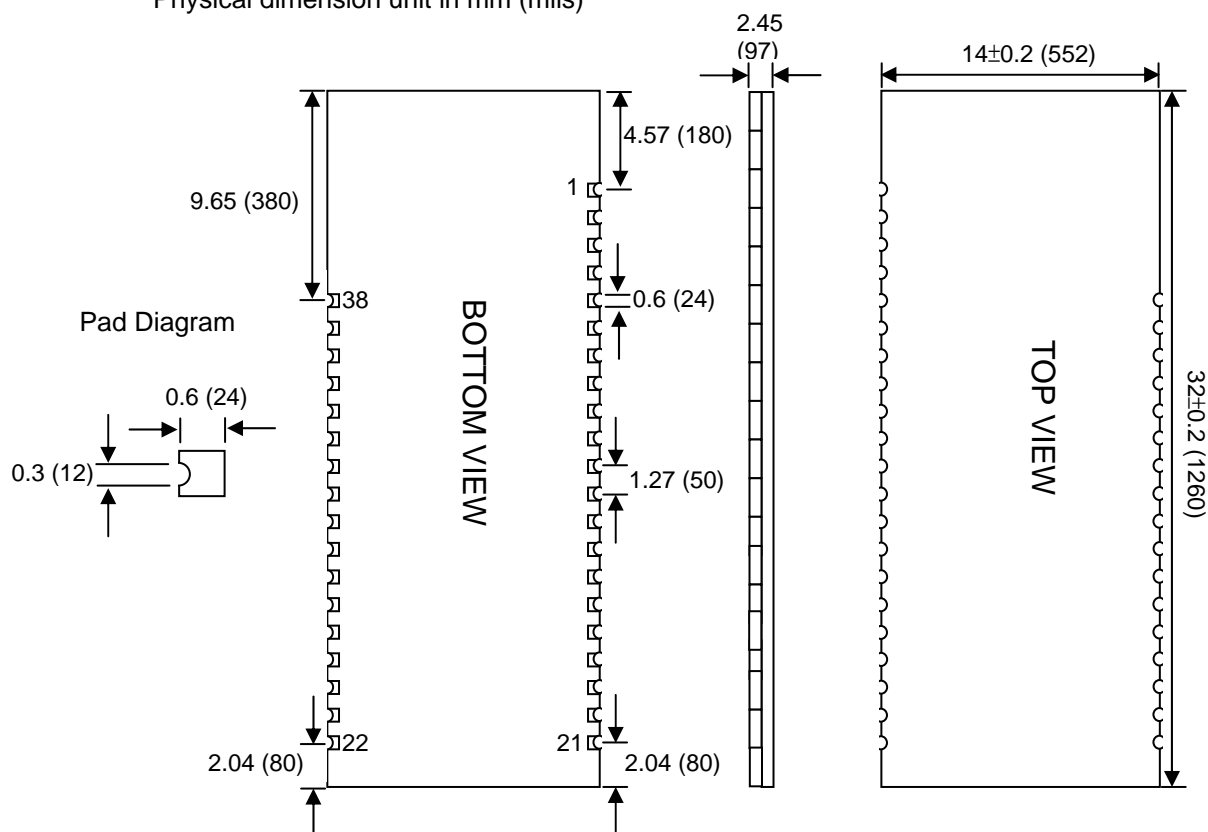
Forbidden area of ground plane



*Ground plane should be away from antenna as far as possible to assure antenna of better radiation performance.

7 Mechanical Drawing

*Physical dimension unit in mm (mils)



8 Contact Information

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