Users Manual

AB1126

TABLE OF CONTENTS

1 System Overview

1.1 General Description

AB1126 is an optimized single-chip solution which integrates baseband and radio for wireless human input device applications including 3D glasses, game controller, remote control, and wireless mouse. It complies with Bluetooth system version 3.0 with the EDR function. AB1126 integrates the Li-ion battery charger circuit that provides 400mA charging current and reduces customer charging time.

1.2 Features

- Compliant with Bluetooth 3.0 specification
- Support EDR function
- HID profile version 1.1 compliant
- 3D Sync profile 1.0 compliant
- Device ID profile 1.3 compliant
- Support 3-axis detection
- Support hardware key-scan matrix
- Support SPI interface with 2/4-wire mode to mouse sensor IC
- Support I2C EEPROM interface
- Support UART interface for firmware downloading and peripheral control
- Embedded 4 LED drivers with fader
- Low cost ROM based design with customer code support
- Embedded power management unit
- Integrated 1.8V Buck and 1.8/2.7V LDO regulator
- Integrated Li-ion battery charger
- Single RF port for transmitter and receiver
- Receiver sensitivity of -89dBm at basic data rate
- Transmit power up to +4dBm with 25 dB gain tuning range
- QFN 5mm x 5mm 40 pin package

1.3 Applications

There are two typical applications of AB1126. One is 3D Glasses, and the other is wireless mouse. The application block diagrams are illustrated as below

3D Glasses

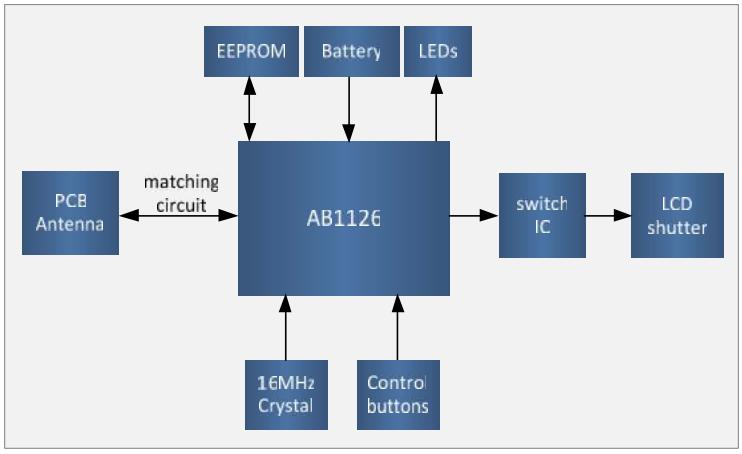

Figure 1-1 3DG Application Block Diagram

Wireless Mouse

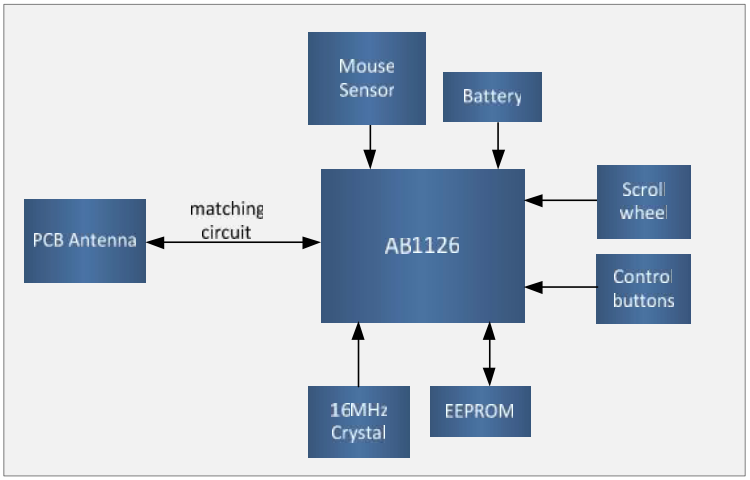

Figure 1-2 Wireless Mouse Application Block Diagram

2 Electrical Characteristics

2.1 Absolute Maximum Ratings

ITEM	MIN.	MAX.	UNIT
I/O supply voltage (VCCIO)	-0.3	5.5	V
Switching Regulator supply voltage (BAT_P)	-0.3	5.5	V
Charger supply voltage (V_CHG)	-0.3	6.5	V
Operating temperature	-40	+85	°C
Storage temperature	-65	+150	°C
LNA input level	-	+10	dBm
PA output load mismatch	-	10:1	

Table 3-1 Absolute Maximum Ratings

AB1128 could be damaged by any stress in excess of the absolute maximum ratings listed above

2.2 Recommended Operating Conditions

Item	Min.	Typ.	Max.	Unit
Core supply voltage (VCCIF, VCCRF, VCCVCO, VCCPLL, VCCDIG, VCCXO)		1.8		V
I/O supply voltage (VCCIO)	1.8		3.6	V
Switching Regulator supply voltage (BAT_P)	2		4.2	V
Charger supply voltage (VCHG)	4.5	5	6.5	V

Table 3-2 Recommended Operating Conditions

2.3 Digital Terminals

Item	Min.	Typ.	Max.	Unit
Input Voltage Levels				
Input logic level low (V_{IL})	0		0.3*VCCIO	V

Input logic level high (V_{IH})	0.7*VCCIO		VCCIO+0.4	V
Output Voltage Levels (VCCIO=1.8V)				
Output logic level low (V_{OL}), I_O=4.0mA *			0.4	V
Output logic level high (V_{OH}), I_O=-4.0mA **	0.7*VCCIO			V
Output Voltage Levels (VCCIO=3.3V)				
Output logic level low (V_{OL}), I_O=4.0mA *			0.4	V
Output logic level high (V_{OH}), I_O=-4.0mA **	0.7*VCCIO			V

Table 3-3 Digital Terminals

2.4 Reference Clock

Item	Min.	Typ.	Max.	Unit
Crystal Requirement				
Nominal Frequency		16		MHz
Operating Temperature Range	-30	25	85	℃
aging	-20		+20	ppm
Drive level		100		uW
Load capacitance		9		pF
Frequency tolerance				
Frequency Stability over Operating Temperature Range	-10		+10	ppm
Crystal Oscillator Characteristics				
Tuning Range	-30		+30	ppm
Negative resistance		-150		Ω

Table 3-4 Reference Clock

2.5 Switching Regulator

External inductor = 10uH, External capacitor = 10uF

Item	Condition	Min.	Typ.	Max.	Unit
Input Voltage		2		4.4	V
Output Voltage	BAT_P > 2.2V	1.7	1.8	1.9	V
Rated Output Current (Iout)			100		mA
Switching Frequency			1.3		MHz
Power Efficiency	@Iout=40mA		90		%

Table 3-5 Switching Regulator

2.6 LDO Regulator

External capacitor = 10uF

Item	Condition	Min.	Typ.	Max.	Unit
Input Voltage	LI_MODE_N=1	2.0		4.4	V
Input Voltage	LI_MODE_N=0	2.7		4.4	V
Output Voltage	LI_MODE_N=1		1.8		V
Output Voltage	LI_MODE_N=0	2.5		3.2	V
Rated Output Current (Iout)			100		mA

Table 3-6 LDO Regulator

2.7 Battery Charger

Item	Min.	Typ.	Max.	Unit
Input Voltage	4.5	5	6.5	V
Charge Current (CC Mode)	25		400	mA
Trickle Charge Current		8		mA
Trickle to CC Charge Threshold Voltage		3		V
Recharge Battery Hysteresis Voltage		200		mV

Table 3-7 Battery Charger

2.8 Typical Current Consumption

Core Supply Voltage = 1.8V (buck output) @ 25℃ unless other specified.

Item	Condition	Min.	Typ.	Max.	Unit
Transmit	Peak Current		TBD		mA
Receive	Peak Current		TBD		mA
Sniff mode	10 ms		TBD		mA
	100 ms		TBD		mA
	1.28 s		TBD		mA
Deep sleep (disconnected, link loss state, wake on interrupt)	buck off, wake on by all GPIOs		2		uA

Table 3-8 Typical Current Consumption

The transmit and the receive current consumptions were measured directly on the buck output (1.8V at 25°C), while the sniff mode and deep sleep current was measured at battery output

2.9 Radio Characteristics

2.9.1 Transmitter

Basic Data Rate

Core Supply Voltage = 1.8V @ 25℃

Item		Min.	Typ.	Max.	Unit
Maximum RF transmit Power*1			4		dBm
Maximum RF transmit Power (Low power)			0		dBm
RF power control range			25		dB
20dB bandwidth for modulated carrier				1000	KHz
Adjacent channel transmit power	+2MHz			-20	dBm
	-2MHz			-20	dBm
	+3MHz			-40	dBm
	-3MHz			-40	dBm
Frequency deviation	Average deviation in payload	115			KHz
	Maximum deviation in payload	140		175	KHz
Initial carrier frequency tolerance		-75		75	KHz
Drift	DH1 packet	-25		25	KHz
	DH3 packet	-40		40	KHz
	DH5 packet	-40		40	KHz
Drift Rate		-20		20	KHz/50us
Harmonic Content			-45		dBm

Table 3-9 Transmitter Basic Data Rate

*1 The maximum RF transmit power could reach 4dBm with appropriate settings

Enhanced Data Rate

Core Supply Voltage = 1.8V @ 25℃

Item	Min.	Typ.	Max.	Unit

Relative transmit power			-1.5		dB
π/4 DQPSK max carrier frequency stability $\|\omega_o\|$		-10		10	KHz
π/4 DQPSK max carrier frequency stability $\|\omega_i\|$		-75		75	KHz
π/4 DQPSK max carrier frequency stability $\|\omega_o+\omega_i\|$		-75		75	KHz
8DPSK max carrier frequency stability $\|\omega_o\|$		-10		10	KHz
8DPSK max carrier frequency stability $\|\omega_i\|$		-75		75	KHz
8DPSK max carrier frequency stability $\|\omega_o+\omega_i\|$		-75		75	KHz
π/4 DQPSK Modulation Accuracy	RMS DEVM			20	%
	99% DEVM	99			%
	Peak DEVM			35	%
8DPSK Modulation Accuracy	RMS DEVM			13	%
	99% DEVM	99			%
	Peak DEVM			25	%
In-band spurious emissions	F > F0 + 3MHz			-40	dBm
	F < F0 - 3MHz			-40	dBm
	F = F0 + 3MHz			-40	dBm
	F = F0 - 3MHz			-40	dBm
	F = F0 + 2MHz			-20	dBm
	F = F0 - 2MHz			-20	dBm
	F = F0 + 1MHz			-26	dBm
	F = F0 - 1MHz			-26	dBm
EDR Differential Phase Encoding		99			%

Table 3-10 Transceiver Enhanced Data Rate

2.9.2 Receiver

Basic Data Rate

Core Supply Voltage = 1.8V @ 25℃

Item		Min.	Typ.	Max.	Unit
Sensitivity at 0.1% BER	2.402GHz		-89		dBm
	2.441GHz		-89		dBm
	2.480GHz		-89		dBm
Sensitivity at 0.1% BER (Low Power)	2.402GHz		-84		dBm
	2.441GHz		-84		dBm

	2.480GHz		-84		dBm
Maximum input power at 0.1% BER		-20			dBm
Co-Channel interference				11	dB
Adjacent channel selectivity C/I	$F = F_0$+5MHz			-40	dB
	$F = F_0$+4MHz			-40	dB
	$F = F_0$+3MHz			-40	dB
	$F = F_0$+2MHz			-30	dB
	$F = F_0$+1MHz			0	dB
	$F = F_0$			11	dB
Adjacent channel selectivity C/I	$F = F_0$-1MHz			0	dB
	$F = F_0$-2MHz			-20	dB
	$F = F_0$-3MHz (F_{image})			-9	dB
	$F = F_0$-4MHz			-20	dB
	$F = F_0$-5MHz			-40	dB
Maximum level of intermodulation interference				-39	dBm
Blocking @Pin=-67dBm with 0.1%BER	30-2000 MHz			-10	dBm
	2000-2400 MHz			-27	dBm
	2500-3000 MHz			-27	dBm
	3000-12750 MHZ			-10	dBm

Table 3-11 Receiver Basic Rate

Enhanced Data Rate

Core Supply Voltage = 1.8V @ 25℃

Item			Min.	Typ.	Max.	Unit
Sensitivity at 0.01% EDR	π/4 DQPSK			-90		dBm
	8DPSK			-81		dBm
Sensitivity at 0.01% EDR (Low power)	π/4 DQPSK			-86		dBm
	8DPSK			-77		dBm
Maximum input power at 0.1% BER	π/4 DQPSK		-20			dBm
	8DPSK		-20			dBm
Co-Channel interference	π/4 DQPSK				13	dB
	8DPSK				21	dB
Adjacent channel selectivity C/I	$F = F_0$+1MHz	π/4 DQPSK			0	dB
		8DPSK			5	dB

	$F = F_0$-1MHz	π/4 DQPSK			0	dB
		8DPSK			5	dB
	$F = F_0$+2MHz	π/4 DQPSK			-30	dB
		8DPSK			-25	dB
	$F = F_0$-2MHz	π/4 DQPSK			-20	dB
		8DPSK			-13	dB
	$F = F_0$+3MHz	π/4 DQPSK			-40	dB
		8DPSK			-33	dB
	$F = F_{image}$	π/4 DQPSK			-7	dB
		8DPSK			0	dB

Table 3-12 Receiver Enhanced Data Rate

FCC STATEMENT :

This 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.
Warning: Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

NOTE: 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.

RF warning statement:

The device has been evaluated to meet general RF exposure requirement. The device can be used in portable exposure condition without restriction.

Module Warning Statement:

This Bluetooth module is designed to comply with the FCC statement, FCC ID is: 2ADQG-AB1126.

The host system using this module, should have label in a visible area indicated the following texts: “Contains FCC ID: 2ADQG-AB1126”.

This radio module must not be installed to co-locate and operated simultaneously with other radios in host system, additional testing and equipment authorization may be required to operating simultaneously with other radio.

This Bluetooth module has a PCB antenna. While this module has no shielding, and therefore the host equipment shall add a shielding function, and any host with module installed, has to be retested, then additional equipment authorization shall be achieved on the host equipment that has the module installed.