DATA SHEET

AB1120J

Bluetooth 3.0 Single Chip for HID Applications

Preliminary Datasheet

VERSION 0.20 08-Mar-2012

Airoha Technology Corp.

Revision History

Version	Change Summary	Date	Author
0.10	Created	22-Feb-12	KH Chen
0.20	Pin out updated	08-Mar-12	KH Chen

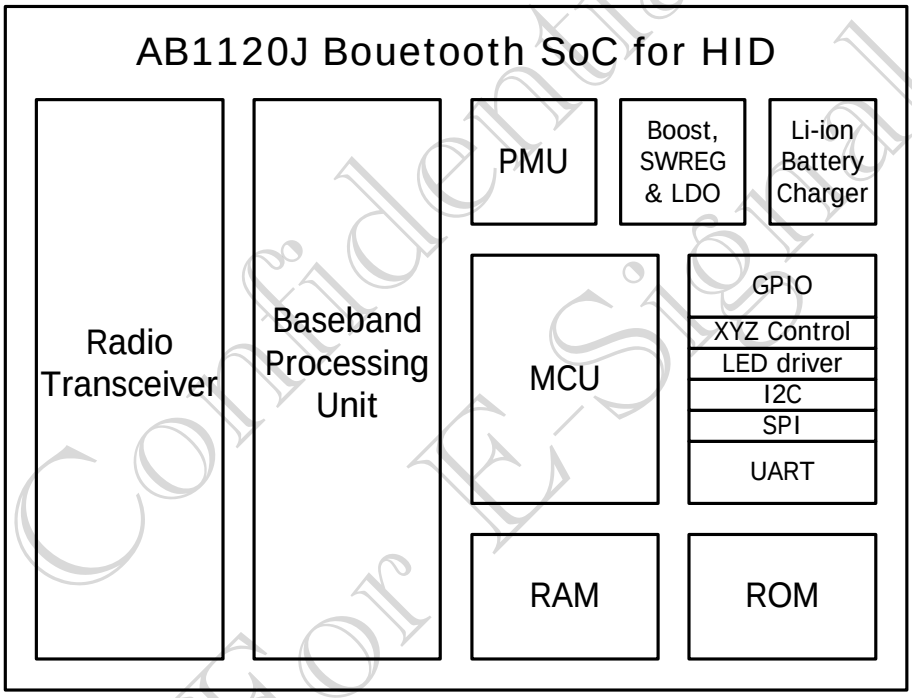
INDEX

1 Features

- Compliant with Bluetooth 3.0 specifications
- HID profile version 1.0 compliant
- 21 Programmable GPIOs
- Supports 3 axis detection
- Supports SPI interface with 3/4-wire mode to sensor IC
- Supports I2C EEPROM interface
- Supports UART interface for firmware downloading and peripheral control
- Embedded 2 LED drivers with fader
- Low cost ROM based design with customer code support
- Embedded power management unit
- Integrated 1.8V Buck and 2.7~3.3V Boost switching regulator
- Integrated Li-mode battery charger
- Single RF port for transmitter and receiver
- Receiver sensitivity of –88dBm at basic data rate
- Transmit power up to +6dBm with 20 dB gain tuning range
- Supported Profiles: HID
- QFN 6mmx6mm 48 pin package

2 Description

AB1120J is a single-chip IC for HID applications, which supports Bluetooth system version 3.0 features including AFH function. It supports sniff sub-rating for longer battery life & faster re-connect. Bluetooth 3.0 simple-pairing mechanism is also implemented. It complies with RF transceiver, baseband processor, PMU, switching regulator, Boost regulator and Li-ion battery charger. Several Serial Communication Interfaces including UART, I2C and SPI are supported.



2.1 Radio Transceiver

A common RF terminal is shared by the TX/RX paths of AB1120J with embedded TX/RX switch. Only few matching components are required in the RF port.

The receiver sensitivity is –88dBm at basic data rate. The output power level at TX part is +6dBm for the basic data rate, with 20dB VGA gain tuning range.

A fractional-N synthesizer is implemented in AB1120J with internal loop filters such that

no external components are required.

An internal crystal oscillator is integrated such that only an external 26MHz crystal is required. An internal 32.768KHz slow clock is also generated.

2.2 Baseband Processor

The Baseband Processor of AB1120J supports Bluetooth 3.0 specifications including AFH. A digital data processing unit is in charge of the GFSK, DQPSK and D8PSK modulation / demodulation, channel filtering, error detection/correction, and burst framing.

A MCU-based Link Controller is implemented for the whole baseband control functions. A firmware is in charge of the Link Management Protocols, Profiles and MMI. Several hardware accelerators are implemented to support the baseband processing such as encryption.

2.3 Serial Communication Interface

Several Serial Communication Interfaces including UART and SPI are supported in AB1120J. An I2C interface is implemented for EEPROM access.

2.4 I/O Ports

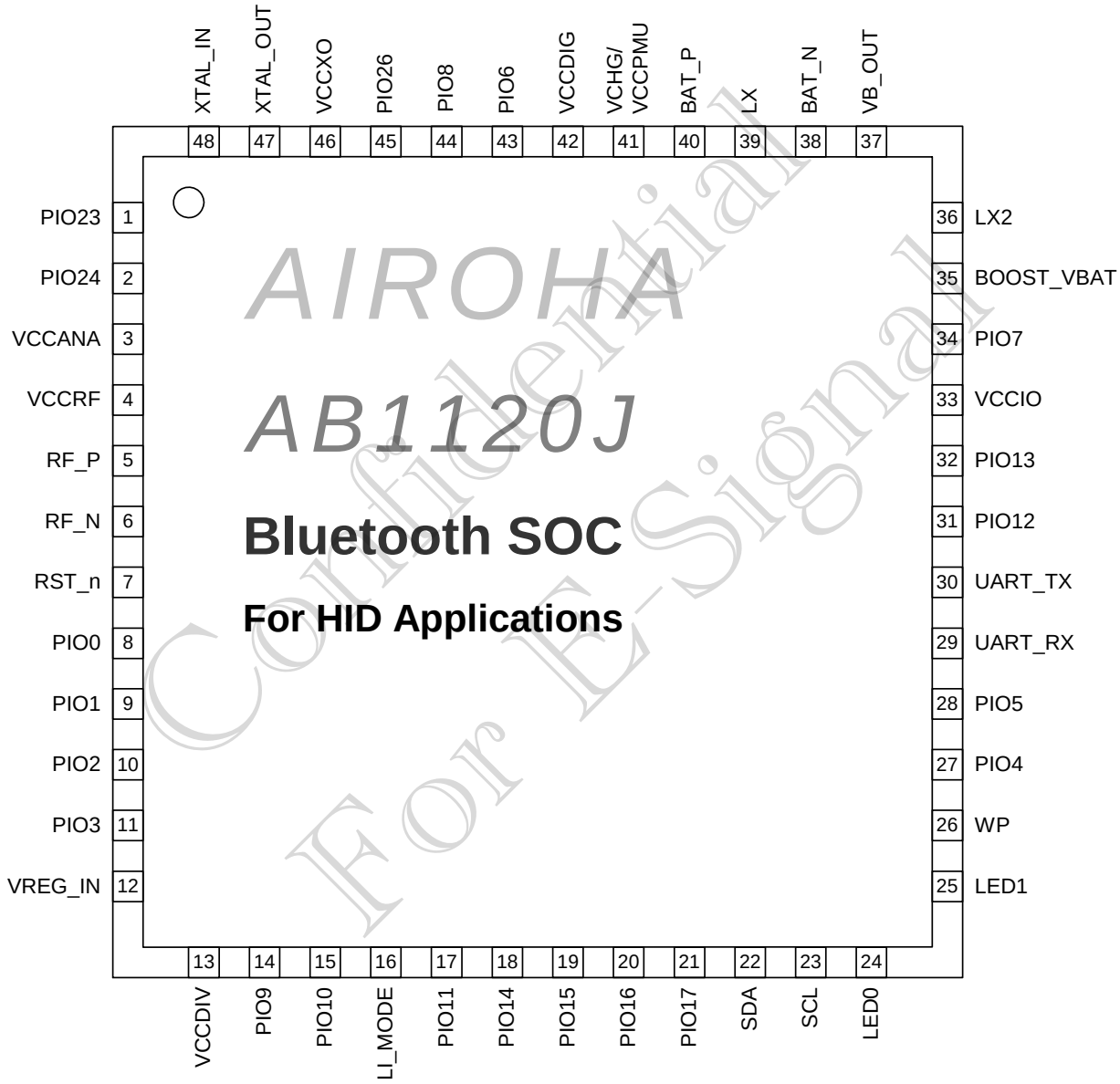
The total number of I/O pins of AB1120J is 21 pins, including 4 pins dedicated for input. Other 17 I/O pins are programmable and support both input and output. A 3-axis detection is supported for external button control (i.e. PIO4/PIO5 are dedicated to ZA/ZB control in mouse application). Two LED drivers with faders for blue/red LEDs are also included.

2.5 Peripherals

An on-chip switching regulator is used to provide 1.8V VCC to the whole chip from battery supply. An integrated Li-mode battery charger is included for Li-ion battery. A 2.7~3.3V (selectable) Boost switching regulator is also included for the power supply of PMU, LED and external sensor IC of the HID device. A PMU is embedded in AB1120J for the power

management affairs.

3 Pin Definition



4 Pin Description

PIN	SIGANL	TYPE	DESCRIPTION	ALTERNATIVE
1	PIO23	Input/Output, Digital	Programmable IO	
2	PIO24	Input/Output, Digital	Programmable IO	
3	VCCANA	Supply, 1.8V	VCC for Analog	
4	VCCRF	Supply, 1.8V	VCC for RF	
5	RF_P	Input/Output, Differential RF	RF input/output P	
6	RF_N	Input/Output, Differential RF	RF input/output N	
7	RST_n	Input, Digital	Global reset	
8	PIO0	Input, Digital	Input Pin	
9	PIO1	Input, Digital	Input Pin	
10	PIO2	Input, Digital	Input Pin	
11	PIO3	Input, Digital	Input Pin	Motion Wake up
12	VREG_IN	Supply, 1.8V	VCO Regulator input	
13	VCCDIV	Supply, 1.8V	VCC for Divider	
14	PIO9	Input/Output, Digital	Programmable IO	
15	PIO10	Input/Output, Digital	Programmable IO	
16	LI_MODE	Input, Digital	Li mode selection	
17	PIO11	Input/Output, Digital	Programmable IO	
18	PIO14	Input/Output, Digital	Programmable IO	SPI_CSB (NCS)
19	PIO15	Input/Output, Digital	Programmable IO	SPI_MOSI
20	PIO16	Input/Output, Digital	Programmable IO	SPI_MISO
21	PIO17	Input/Output, Digital	Programmable IO	SPI_CLK (SCLK)
22	SDA	Input/Output, Digital	I2C data line	
23	SCL	Input/Output, Digital	I2C clock line	
24	LED0	Open Drain	LED 0 for Red Light	
25	LED1	Open Drain	LED 1 for Blue Light	
26	WP	Output, Digital	Write Protect Control for EEPROM	
27	PIO4	Input/Output, Digital	Programmable IO	ZB
28	PIO5	Input/Output, Digital	Programmable IO	ZA

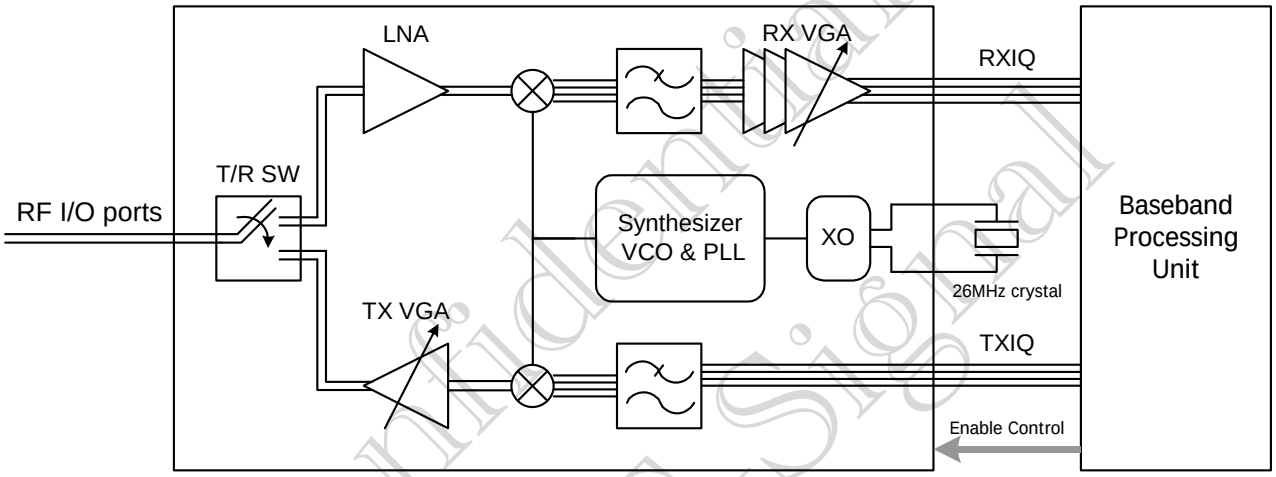
29	UART_RX	Input, Digital	UART RX	
30	UART_TX	Output, Digital	UART TX	
31	PIO12	Input/Output, Digital	Programmable IO	
32	PIO13	Input/Output, Digital	Programmable IO	
33	VCCIO	Supply, 1.8V ~ 3.3V	VCC for IO ports	
34	PIO7	Input/Output, Digital	Programmable IO	
35	BOOST_VBAT	Input, Analog	Boost Enable Signal	
36	LX2	Supply	Boost Regulator input	
37	VB_OUT	Output, 2.7 ~ 3.3V	Boost Regulator output	
38	BAT_N	GND	Battery input N, Connected to GND	
39	LX	Analog	Switching Regulator output	
40	BAT_P	Supply	Battery input P, as Switching/Linear regulator input	
41	VCHG/VCCPMU	Supply, 2.7V ~ 3.3V	VCC for Charger/PMU	
42	VCCDIG	Supply, 1.8V	VCC for Digital circuits	
43	PIO6	Input/Output, Digital	Programmable IO	
44	PIO8	Input/Output, Digital	Programmable IO	
45	PIO26	Input/Output, Digital	Programmable IO	
46	VCCXO	Supply, 1.8V	VCC for XO	
47	XTAL_OUT	Analog	Crystal output	
48	XTAL_IN	Analog	Crystal input	

4.1 Suggestion to PIO Input/Output Usage

PIO	Suggestion
0, 1, 2, 3, 24, 26	Used as INPUT pins only
4, 5, 6, 8, 9, 10, 11, 14, 15, 16, 17, 23	Could be used as INPUT or OUTPUT. **Note:** **PIO4, PIO5 are dedicated for ZA/ZB usage of mouse application** **PIO14, PIO15, PIO16, PIO17 are also used as SPI interface**

5 Radio Transceiver

The AB1120J RF transceiver is a 2.4GHz-band transceiver for the Bluetooth applications. There are three main functions – transmitter, receiver, and synthesizer. The enable control signals of these functions are given by the Baseband Processing Unit.



5.1 RF Front-end

The RX input ports and TX output ports share the same RF terminals such that no external T/R switch is required. Only few matching components are placed outside the RF terminals.

5.2 Receiver

The AB1120J RF receiver is composed with two parts: RF front-end and IF part. The RF front-end part comprises a LNA and a quadrature mixer. The IF part comprises a low-pass filter (LPF) for out-band filtering and a variable gain amplifier (VGA).

The LNA input shares the same RF ports with TX output. The RX front-end gain could be

adjusted, and thus reduce the probability of bit errors caused by poor signal-to-noise ratio. After the LNA is followed by a quadrature mixer that down-converts the RF signal to IF band.

At the IF part, the down-converted signal is first low-pass filtered by the LPF, amplified by the VGA, and then sent to the ADC for demodulation. The 3dB bandwidth of the LPF could be adjusted through RF registers. The LNA and VGA provide more than 80dB gain control range.

5.3 Transmitter

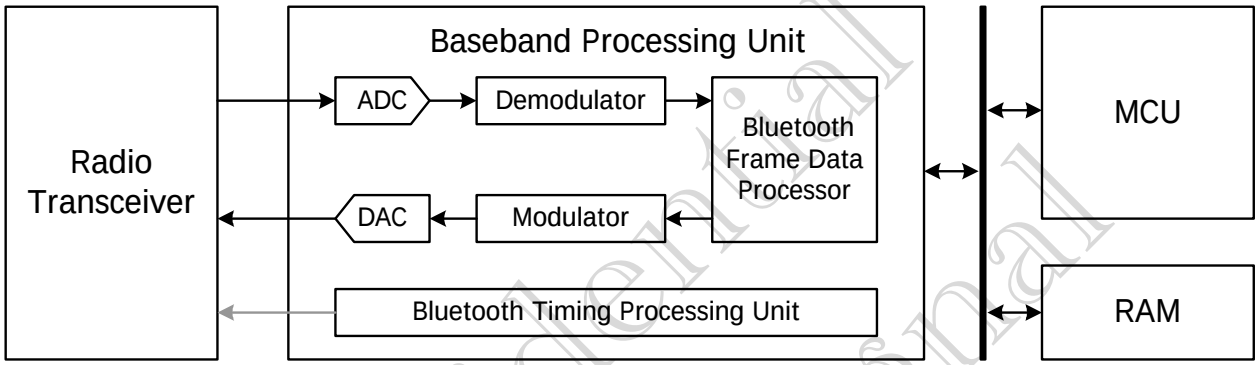
The AB1120J RF transmitter comprises a LPF, a modulator and a VGA stage. The TX baseband signals are fed from baseband DAC, generated by the baseband modulators. A LPF is implemented to attenuate the second sidelobe of signal spectrum and unwanted oversampling clock or spurious signals. The 3dB bandwidth of the LPF could be adjusted through RF registers. The VGA provides variable gain with more than 28dB dynamic range, and could be controlled through RF register interface.

5.4 Synthesizer

The AB1120J implements a fractional-N synthesizer with embedded VCO and loop filter without the need of external components. AB1120J also integrates an internal crystal oscillator that only an external 26MHz crystal is required.

6 Baseband Processing Unit

The Baseband Processing Unit (BPU) comprises a Digital-to-Analog Convert (DAC), an Analog-to-Digital Converter (ADC), a digital modulator, a digital demodulator, a Bluetooth Frame Data Processor, and a Timing Processing Unit (TPU).



6.1 Bluetooth Frame Data Processor

AB1120J baseband processing unit supports all packet types of Bluetooth 1Mbps, 2Mbps and 3Mbps modes. On transmitter side, the frame data processor can construct Bluetooth data packet according to the packet type given by MCU. The constructed data packet then will be converted to analog modulated signal format by the modulator and DAC.

On the receiver side, the analog received signal will be first converted to digitized data format by the ADC and demodulator, and then the frame data processor will de-construct the received data to several parts and identify if the received signal is a valid Bluetooth packet and if the packet is for the device itself. The received header data and PSDU data will be stored into memory if it is a valid Bluetooth data packet and is for the device itself.

Access code check, Header Error Check (HEC) and PSDU CRC checking functions are performed by the frame data processor, too, to see if this received signal is valid and error free or not. A data whitening circuit and an encryption engine are also included in the frame data processor for both transmitter and receiver paths.

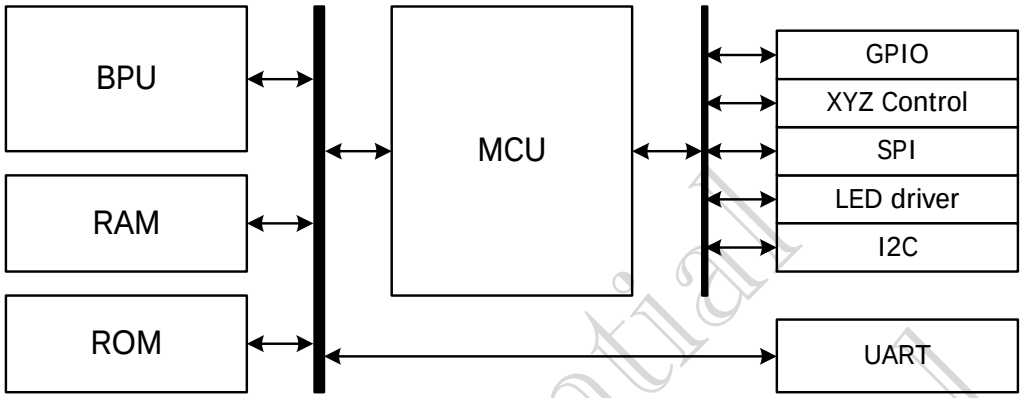
6.2 Modulator and Demodulator

The modulator can generate GFSK, DQPSK and D8PSK signals according to which data rate is adopted in the frame data. The demodulator can convert the received data signal to digitized data bit format according to the modulation type indicated in the header region.

6.3 Bluetooth Timing Processing Unit

A Bluetooth Timing Processing Unit (TPU) is embedded in the Baseband processing unit. TPU is in charge of generating RF timing control signals to the RF radio part, such as TX enabling signals and RX enabling signals.

7 MCU and memory



The micro-control unit (MCU) executes the Bluetooth protocol software stack, controls the Bluetooth baseband processing unit (BPU) and Serial Communication Interfaces. 2Mbits ROM is embedded in AB1120J to store the software stack, and 24Kbytes RAM is provided to support the MCU and baseband data processing.

Data are transferred between MCU, ROM, RAM and BPU with a shared memory bus. The UART interface is also connected to the memory bus for directly access. There is another peripheral bus that connects the peripherals with MCU.

8 Peripheral Control and Serial Communication Interfaces

The total number of I/O pins of AB1120J is 21, including 6 pins dedicated for input. Other 15 I/O pins are programmable and support both input and output directions. The ROM firmware provides a possibility that developers could select different PIOs for input without re-compile their customer code. An easy-to-use configuration utility program can modify the PIO selections and up to 16 pins could be programmed as input simultaneously, for example a device with 16 buttons, and thus can fulfill the HID MMI requirements in most applications.

There are one set of 3-axis detection IO ports, 2 LED drivers, one SPI interface, and one I2C interface connected to MCU with a peripheral bus. An UART for firmware downloading and peripheral control is also supported.

The LED drivers integrate fader function and can drive red and blue LEDs for HID device indication purposes.

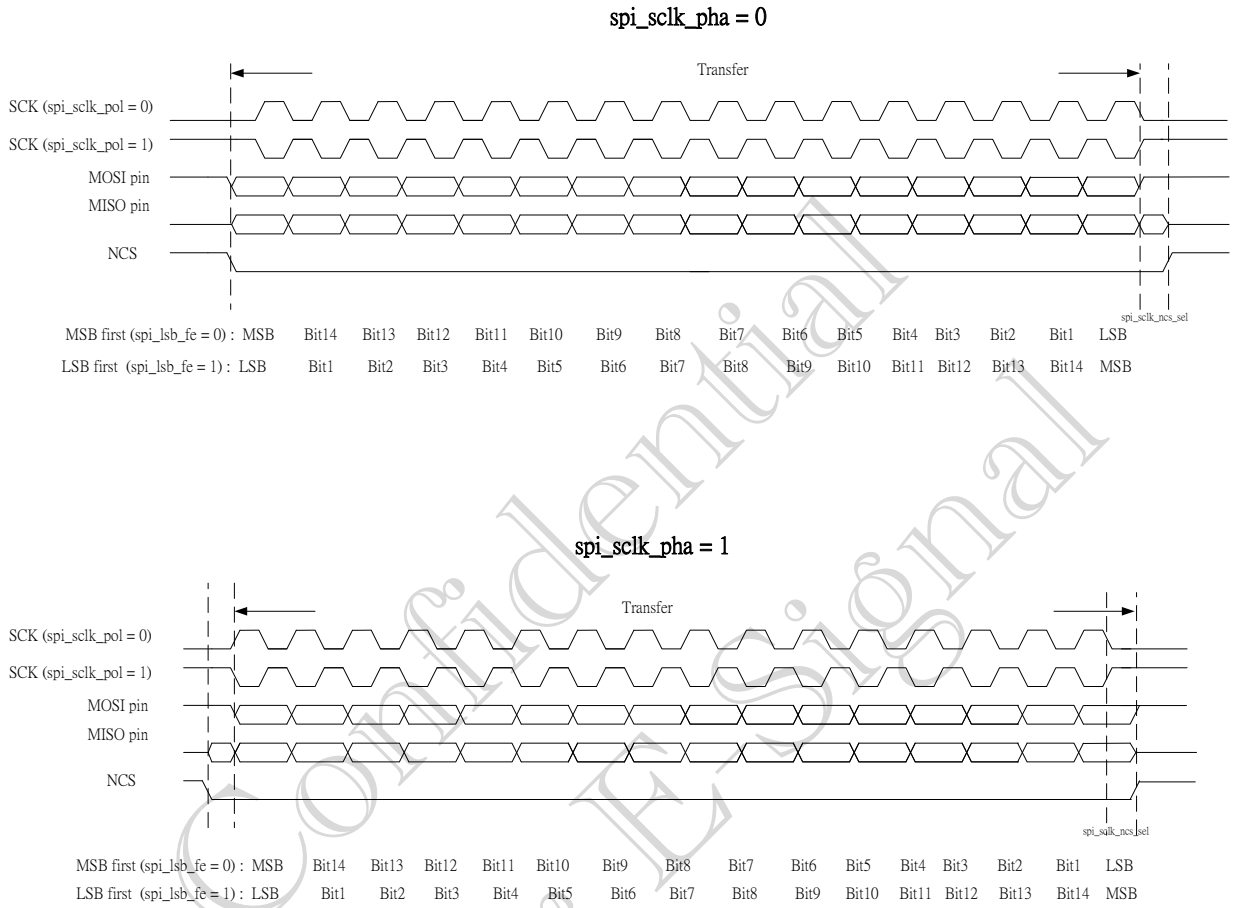
The I2C interface is used to connect to a serial EEPROM, which supports 100KHz / 400KHz / 800KHz bus clock rate at 1.8 or 3.3V voltage supply.

The UART interface supports up to 3M baud rate, and is directly connected to the memory interface.

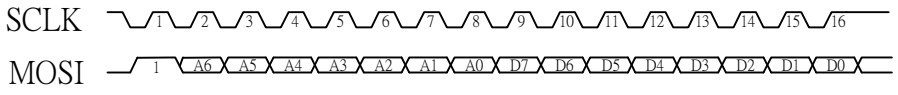
8.1 Serial Peripheral Interface

A SPI interface allows AB1120J to communicate with external HID device controller to exchange the MMI information such as button, axis control, etc. Both 3-wire and 4-wire mode SPI interfaces are supported in AB1120J. When 3-wire mode is selected, pin 18 (SPI_MOSI) would be data I/O pin of the SPI interface. Only Master Mode is supported in AB1120J.

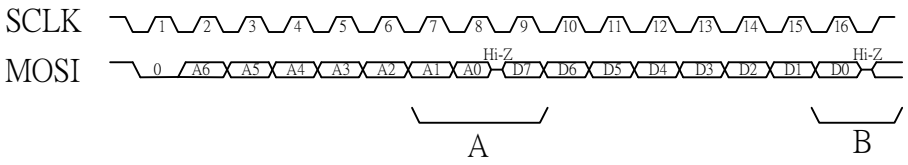
General Waveform



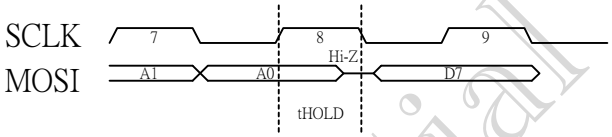
Write Operation



Read Operation

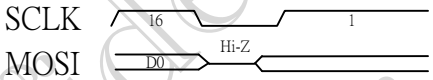


Part A：

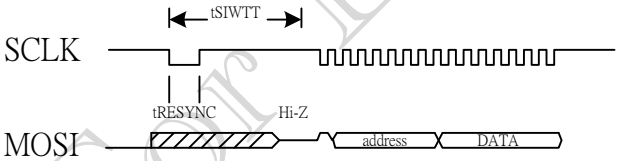


tHOLD：MOSI Read Hold Time

Part B：



Resync



tSIWTT：Serial Interface Watchdog Timer Timeout

tRESYNC：Serial Interface RESYNC

9 Power Management / Regulation

AB1120J integrates a Power Management Unit (PMU), two internal switching regulators: one Bulk regulator from VBAT to 1.8V VCC, and one Boost regulator from VBAT to higher voltage (2.7~3.3V, selectable), and a 1.5V LDO regulator for VCO.

9.1 Power Regulation

A switching regulator is embedded to convert VBAT to 1.8V voltage supply for the core of AB1120J. There is another Boost regulator to up convert the VBAT supply voltage to a higher level (2.7~3.3V, selectable) for the power supply of PMU, LED driver, and external sensor IC. All these regulators are integrated within AB1120J.

9.2 Power Management Unit (PMU)

A PMU is designed in AB1120J for the power management affairs. During general operations, MCU may get into sleep mode for power saving. At this moment the PMU watches the keys and wake up MCU if one of the keys is pressed. PMU also monitors the battery voltage and reports to MCU.

9.3 Li-mode Battery Charger

The Li-mode battery charger of AB1120J provides several operation modes including Trickle mode, Constant Current mode (CC mode), Constant Voltage mode (CV mode), and Standby mode. When an external power supply is connected to AB1120J, PMU will first detect if the voltage is correct and enable the charger circuit. When Charger circuit is enabled, it will detect the battery voltage and enters the associated mode to charge the battery, i.e. Trickle, CC or CV mode. When the battery voltage reaches a high threshold, the charger will enter standby mode and keep watching the battery voltage. If the battery voltage drops to a lower threshold, charger circuit will re-charge the battery again.

10 Software Stack

10.1 Key Features of HID Device Stack

The Airoha AB1120J HID software stack provides total solution of Bluetooth HID profiles (device role), including all protocol stacks and profiles defined in HID v1.0. In additional, it has some extra features as shown below:

- Configurable MMI: Customers can modify user interface behavior by setting registers in EEPROM. In additional, AB1120J provides a set of function interface in ARIOHA Customer Code Environment. Customers can re-write these functions to configure their own MMI.
- Support mainstream optical/laser sensors by default, and can be chosen by EEPROM settings. Customers can re-write the MMI using ARIOHA Customer Code Environment for other sensor.
- Good report rate for HID Mouse. (up to 125Hz)
- Low-power operation based on various hardware-wakeup mechanisms.

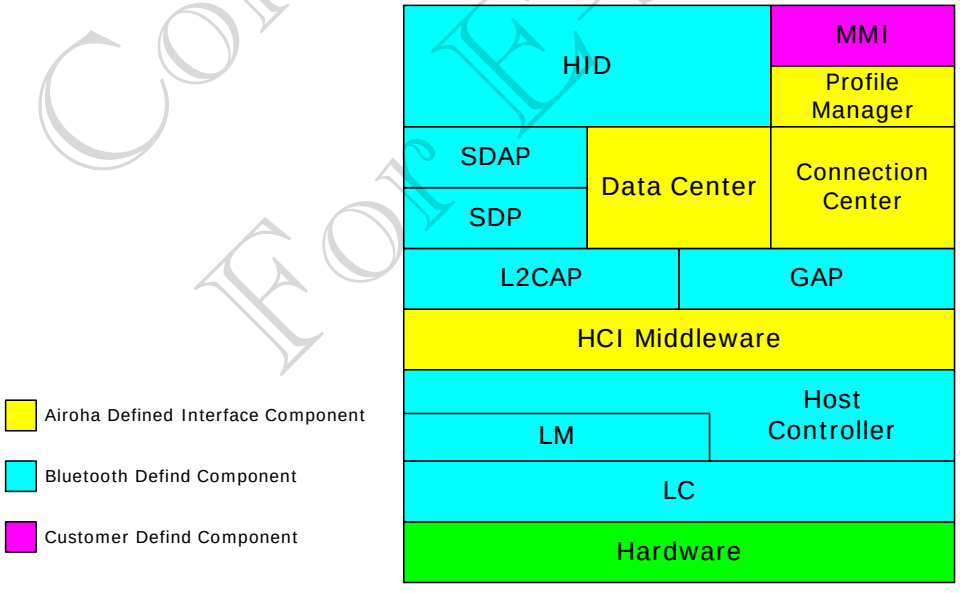


Figure 10.1: HID Software Stack

10.2 Development Environments and Tools

10.2.1 Software Development Environments

AB1120J provides a set of function interface in **ARIOHA Customer Code Environment**. Customers can rewrite these functions to control their hardware components, such as keypad, LED, SPI , optical sensor and etc..

10.2.2 Test and Configuration Tools

Various tools are provided for testing and configuration as shown below:

- AB1120J LabTest

  AB1120J LabTest provides the capability for RF testing and can be used as HID module testing during mass-production.
- AB1120J HID Configuration tool

  AB1120J Configuration tool provides to customers the capability to configure the various settings, such as Button I/O, LED behavior, Battery Parameters, and Sensor settings stored in EEPROM.

11 Electrical Characteristics

11.1 Absolute Maximum Ratings

AB1120J could be damaged by any stress in excess of the absolute maximum ratings listed below.

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

11.2 Recommended Operating Conditions

Item	Min.	Typ.	Max.	Unit
Core supply voltage (VCCANA, VCCRF, VCCDIV, VREG_IN, VCCDIG, VCCXO)		1.8		V
I/O supply voltage (VCCIO)	1.8		3.6	V
Boost supply voltage (VB_IN)	1.6		3.3	V
Switching Regulator supply voltage (BAT_P)	2		4.2	V
Charger supply voltage (V_CHG)	4.5	5	6.5	V

11.3 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 (1.7V≦VCCIO≦1.9V)				
Output logic level low (V_{OL}), I_O=4.0mA *			0.2	V
Output logic level high (V_{OH}), I_O=-4.0mA **	VCCIO-0.2			V
Output Voltage Levels (2.7V≦VCCIO≦3.0V)				
Output logic level low (V_{OL}), I_O=4.0mA *			0.4	V
Output logic level high (V_{OH}), I_O=-4.0mA **	VCCIO-0.4			V

11.4 PIO Current Sink/Source Capabilities

Item	Output	Criteria	Capability	Note
VCCIO = 3.3 V				
Max. Input Current	Low	Vout ≦ 0.3×VCCIO	> 10 mA	
Max. Output Current	High	Vout ≧ 0.7×VCCIO	> 10 mA	
VCCIO = 2.7 V				
Max. Input Current	Low	Vout ≦ 0.3×VCCIO	> 10 mA	
Max. Output Current	High	Vout ≧ 0.7×VCCIO	> 10 mA	
● This table is applied to PIO # 4, 5, 6, 8, 9, 10, 11, 14, 15, 16, 17, 23				

11.5 Reference Clock

Item	Min.	Typ.	Max.	Unit
Crystal Requirement				
Nominal Frequency		26		MHz
Operating Temperature Range	-30	25	85	℃
Frequency Stability over Operating Temperature Range	-10		+10	ppm
Crystal Oscillator Characteristics				
Tunning Range (with 128 steps)		95		ppm
Negative resistance (@ C0 = 0.89pF, CL = 10pF)		140		Ω
External Reference Clock Requirement				
Input Frequency		26		MHz
Clock Input Level (AC-coupled, sinusoidal or square wave)	0.2		1.8	V pk-pk
XTAL_IN input impedance		10		KΩ
XTAL_IN input capacitance		10		pF

11.6 Switching Regulator

11.6.1 Buck Regulator

external inductor = 33uH, external capacitor = 4.7uF

Item	Condition	Min.	Typ.	Max.	Unit
Input Voltage		2		3.6	V
Output Voltage	BAT_P > 2.2V	1.7	1.8	1.9	V
Rated Output Current (Iout)	BAT_P > 3.6V			60	mA
Switching Frequency			1		MHz
Power Efficiency	@Iout max		80		%

11.6.2 Boost Regulator

external inductor = 4.7uH, external capacitor = 10uF

Item	Condition	Min.	Typ.	Max.	Unit
Input Voltage		1.6		3.6	V
Output Voltage	at VB_OUT = 3V setting	2.7	3	3.3	V
Rated Output Current (Iout)	VB_IN = 2.4V, VB_OUT=3V			100	mA
Switching Frequency			566		KHz
Power Efficiency	@Iout max		80		%

11.7 Li-Mode Charger

Item	Min.	Typ.	Max.	Unit
Input Voltage	4.5	5	6.5	V
Charge Current (CC Mode)	40		100	mA
Trickle Charge Current	5	5.5	6	mA
Trickle Charge Threshold Voltage		2.8		V
Regulated Output (Float) Voltage	4.16	4.2	4.24	V
Battery charger termination current		10		%
Recharge Battery Hysteresis Voltage		100		mV

11.8 Typical Current Consumption

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

Item	Condition	Min.	Typ.	Max.	Unit
Transmit	Peak Current		53		mA
Receive	Peak Current		48		mA
Sniff mode	10 ms		5.1		mA
	100 ms		0.8		mA
	1.28 s		0.4		mA
Deep sleep (disconnected, link loss state, wake on interrupt)	One battery/Li-Po battery solution, vbat=3v, boost off, buck off, wake on by GPIO0~3 only		31		uA
	Two battery solution, vbat=3v, boost on, buck off, wake on by GPIO0~3 only		72		uA

Transmit, receive and sniff current consumption were measured directly on the buck output (1.8V at 25°C), while deep sleep current was measured at battery output.

11.9 Radio Characteristics

11.9.1 Transmitter (Basic Data Rate)

Core Supply Voltage = 1.8V @ 25℃

Item		Min.	Typ.	Max.	Unit
Maximum RF transmit Power*1			1		dBm
RF power control range			20		dB
20dB bandwidth for modulated carrier			950		KHz
Adjacent channel transmit power	+2MHz		-21		dBm
	-2MHz		-34		dBm
	+3MHz		-47		dBm
	-3MHz		-43		dBm
Frequency deviation	Average deviation in payload		140		KHz
	Maximum deviation in payload		160		KHz
Initial carrier frequency tolerance			10		KHz
Drift	DH1 packet		15		KHz
	DH3 packet		15		KHz
	DH5 packet		15		KHz
Drift Rate			5		KHz/50us
2nd Harmonic Content				-30	dBm
3rd Harmonic Content				-30	dBm

*1 The maximum RF transmit power could reach to 6dBm with appropriate settings

11.9.2 Receiver (Basic Data Rate)

Core Supply Voltage = 1.8V @ 25℃

Item		Min.	Typ.	Max.	Unit
Sensitivity at 0.1% BER	2.402GHz		-88		dBm
	2.441GHz		-88		dBm
	2.480GHz		-88		dBm
Maximum input power at 0.1% BER		0			dBm
Co-Channel interference			7		dB
Adjacent channel selectivity C/I	$F = F_0 + 1MHz$		-5		dB
	$F = F_0 - 1MHz$		-5		dB
	$F = F_0 + 2MHz$		-35		dB
	$F = F_0 - 2MHz$		-28		dB
	$F = F_0 + 3MHz$		-43		dB
	$F = F_{image}$		-18		dB
Maximum level of intermodulation interference			-32		dBm
Blocking @Pin=-67dBm with 0.1%BER	30-2000 MHz		-3		dBm
	2000-2400 MHz		-10		dBm
	2500-3000 MHz		-10		dBm
	3000-12750 MHZ		0		dBm

11.9.3 Transmitter (Enhanced Data Rate)

Core Supply Voltage = 1.8V @ 25℃

Item		Min.	Typ.	Max.	Unit
Relative transmit power			-3		dB
π/4 DQPSK max carrier frequency stability |ω_o|			1		KHz
π/4 DQPSK max carrier frequency stability |ω_i|			3		KHz
π/4 DQPSK max carrier frequency stability |ω_o+ω_i|			4		KHz
8DPSK max carrier frequency stability |ω_o|			1		KHz
8DPSK max carrier frequency stability |ω_i|			3		KHz
8DPSK max carrier frequency stability |ω_o+ω_i|			4		KHz
π/4 DQPSK Modulation Accuracy	RMS DEVM		7		%
	99% DEVM				%
	Peak DEVM		19		%
8DPSK Modulation Accuracy	RMS DEVM		7		%
	99% DEVM				%
	Peak DEVM		19		%
In-band spurious emissions	F > F0 + 3MHz				dBm
	F < F0 - 3MHz				dBm
	F = F0 + 3MHz		-34		dBm
	F = F0 - 3MHz		-40		dBm
	F = F0 + 2MHz		-23		dBm
	F = F0 - 2MHz		-33		dBm
	F = F0 + 1MHz		-30		dBm
	F = F0 - 1MHz		-30		dBm
EDR Differential Phase Encoding			0		%

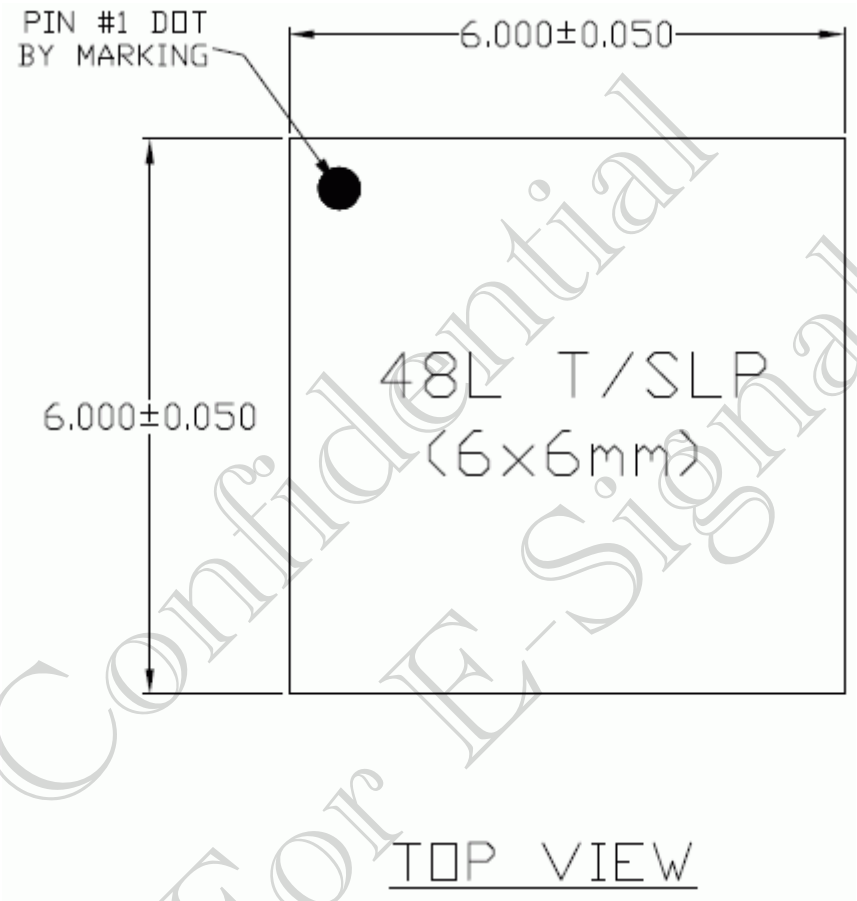
11.9.4 Receiver (Enhanced Data Rate)

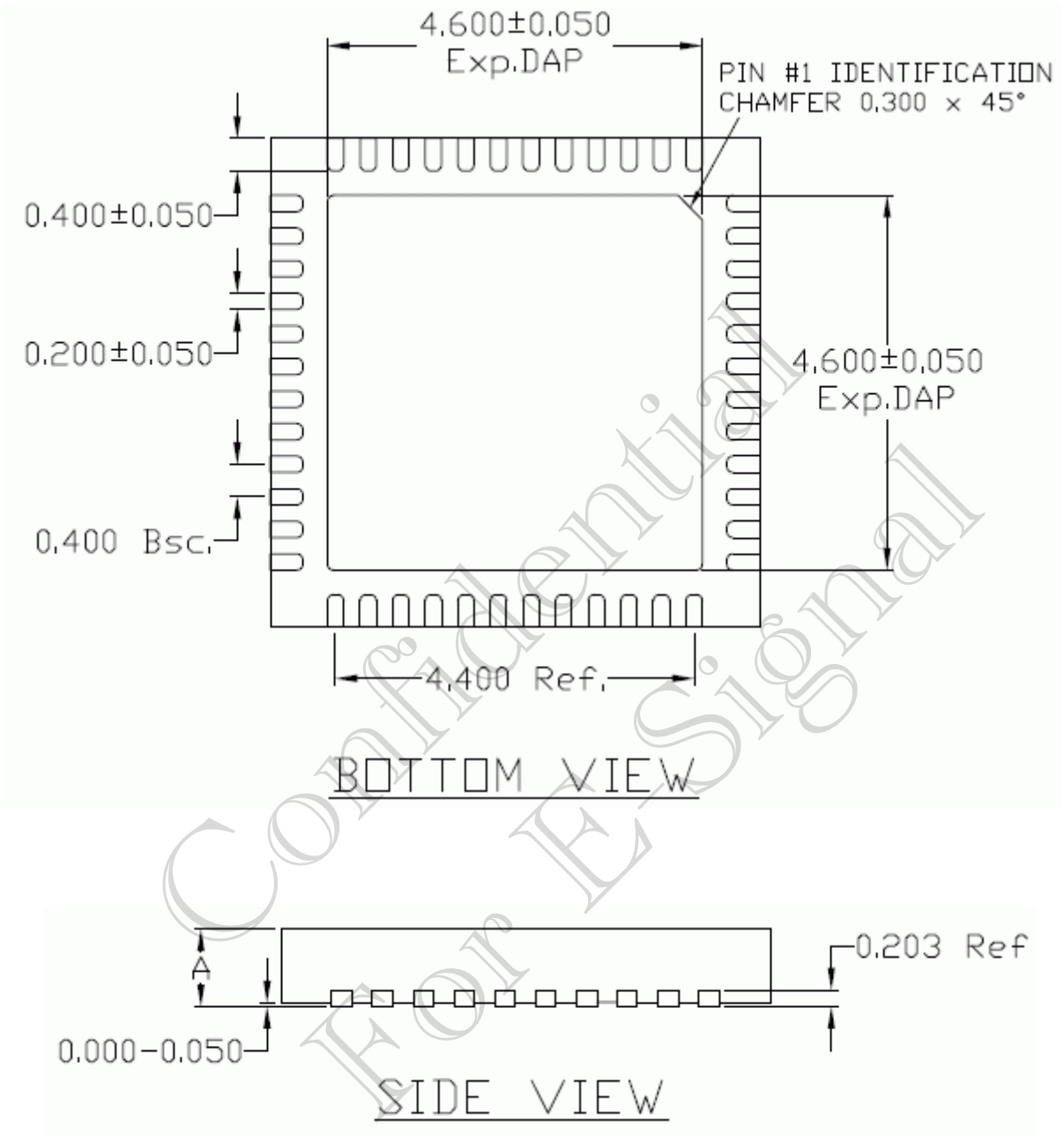
Core Supply Voltage = 1.8V @ 25℃

Item			Min.	Typ.	Max.	Unit
Sensitivity at 0.01% EDR	π /4 DQPSK			-89		dBm
	8DPSK			-81		dBm
Maximum input power at 0.1% BER	π /4 DQPSK			0		dBm
	8DPSK			0		dBm
Co-Channel interference	π /4 DQPSK			10		dB
	8DPSK			17		dB
Adjacent channel selectivity C/I	$F = F_0 + 1MHz$	π /4 DQPSK		-11		dB
		8DPSK		-5		dB
	$F = F_0 - 1MHz$	π /4 DQPSK		-11		dB
		8DPSK		-5		dB
	$F = F_0 + 2MHz$	π /4 DQPSK		-34		dB
		8DPSK		-28		dB
	$F = F_0 - 2MHz$	π /4 DQPSK		-30		dB
		8DPSK		-23		dB
	$F = F_0 + 3MHz$	π /4 DQPSK		-41		dB
		8DPSK		-34		dB
	$F = F_{image}$	π /4 DQPSK		-15		dB
		8DPSK		-8		dB

12 Package Information

SAW QFN 48LD, 6x6x0.85 PKG 0.40 PITCH POD





A	Maximum	0.90
	Normal	0.85
	Minimum	0.80