

DATA SHEET

AB1120

Bluetooth 3.0 Single Chip for HID Applications

Preliminary Specification

VERSION 0.20 12-APR-2011

AIROHA
Airoha Technology Corp.

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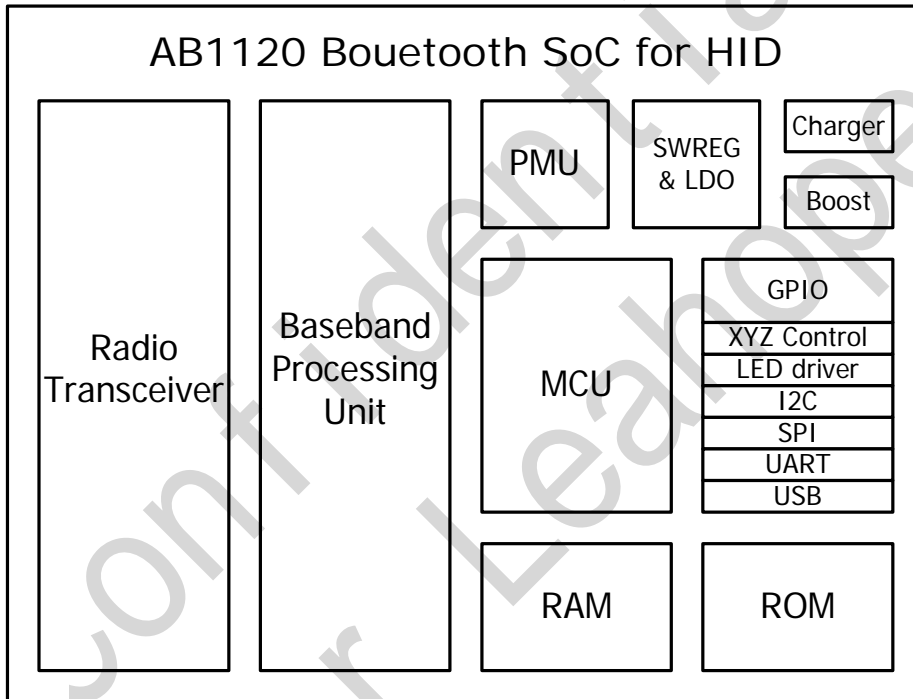
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1 Features

- Compliant with Bluetooth 3.0 specifications
- HID profile version 1.0 compliant
- Supports AFH
- Supports sniff sub-rating for longer battery life & faster re-connect
- 18 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
- Supports USB interface for host 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
- Embedded charger circuits with Li-battery mode
- 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
- QFN 6mmx6mm 48 pin package

2 Description

AB1120 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. AB1120's scatternet can join up to 3 piconets. It complies with RF transceiver, baseband processor, PMU, switching regulator, Boost regulator and Li-ion battery charger. Several Serial Communication Interfaces including USB, UART, I2C and SPI are supported.



2.1 Radio Transceiver

A common RF terminal is shared by the TX/RX paths of AB1120 with embedded TX/RX switch. Only an external balun and 3 matching components are required in the RF port.

A Low-IF architecture is implemented in the receiver part. The receiver sensitivity is -88dBm at basic data rate. The RSSI value which indicates the received signal power level is also measured and provided to the upper layers.

A direct-up conversion architecture is used in the transmitter part. 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 AB1120 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. External clock signal can also be fed into AB1120 instead of the 26MHz crystal clock signal.

2.2 Baseband Processor

The Baseband Processor of AB1120 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, scatter-net operation, etc.

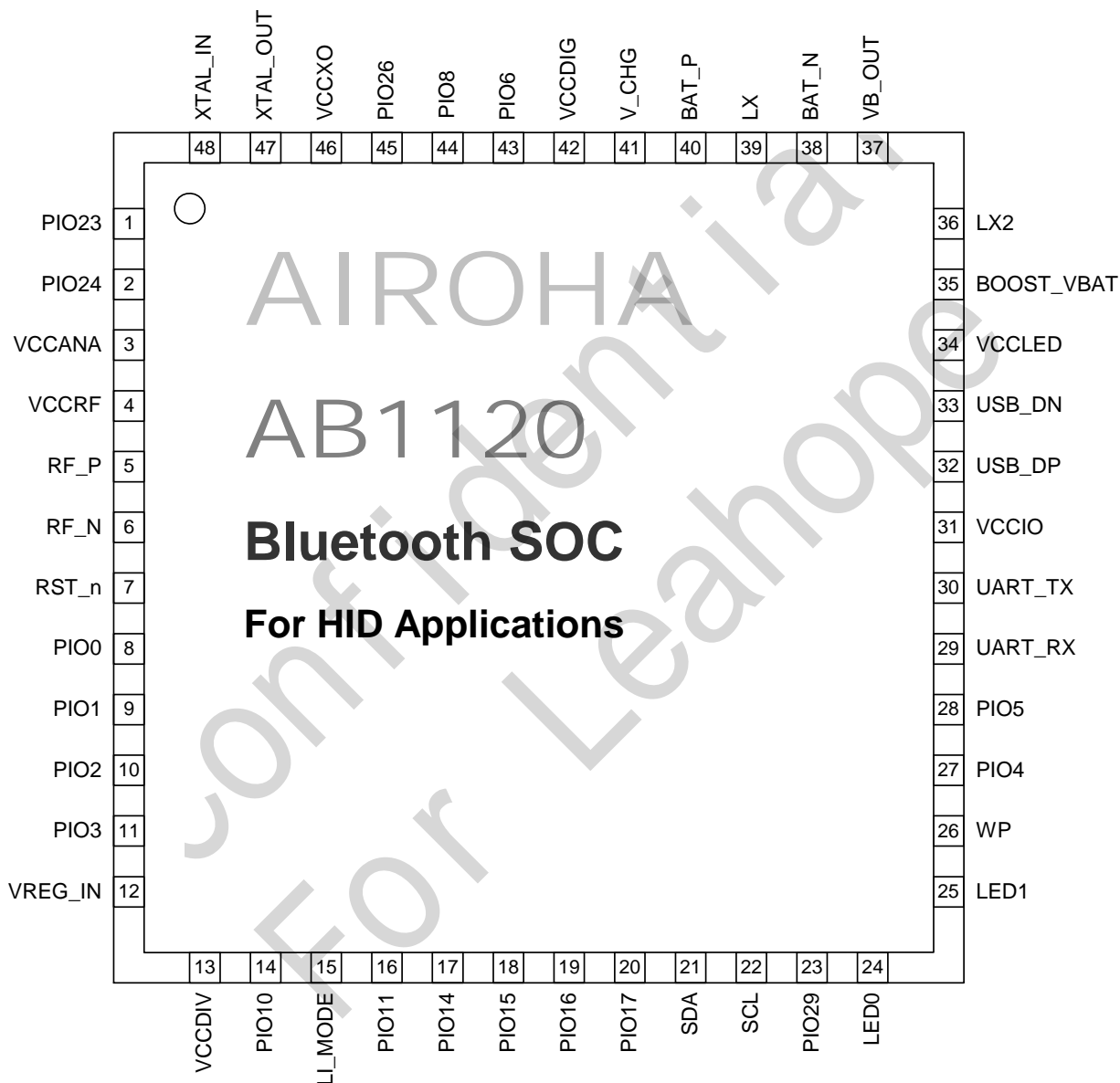
2.3 Serial Communication Interface

Several Serial Communication Interfaces including **USB**, UART and SPI are supported in AB1120. An I2C interface is implemented for EEPROM access.

2.4 I/O Ports

The total number of I/O pins of AB1120 is 18 pins, including 6 pins dedicated for input and 1 pin (PIO29) dedicated for EEPROM Write Protection. Other 11 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.

3 Pin Definition



4 Pin Description

| PIN | SIGANL | TYPE | DESCRIPTION | ALTERNATIVE |
|-----|---------|-------------------------------|---------------------------------------|----------------|
| 1 | PIO23 | Input/Output, Digital | Programmable IO | |
| 2 | PIO24 | Input, Digital | Input Pin | |
| 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 | PIO10 | Input/Output, Digital | Programmable IO | |
| 15 | LI_MODE | Input, Digital | Battery mode indicator | |
| 16 | PIO11 | Input/Output, Digital | Programmable IO | |
| 17 | PIO14 | Input/Output, Digital | Programmable IO | SPI_CSB (NCS) |
| 18 | PIO15 | Input/Output, Digital | Programmable IO | SPI_MOSI |
| 19 | PIO16 | Input/Output, Digital | Programmable IO | SPI_MISO |
| 20 | PIO17 | Input/Output, Digital | Programmable IO | SPI_CLK (SCLK) |
| 21 | SDA | Input/Output, Digital | I2C data line | |
| 22 | SCL | Input/Output, Digital | I2C clock line | |
| 23 | PIO29 | Output, Digital | Output Pin (dedicated for EEPROM WP) | |
| 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 |

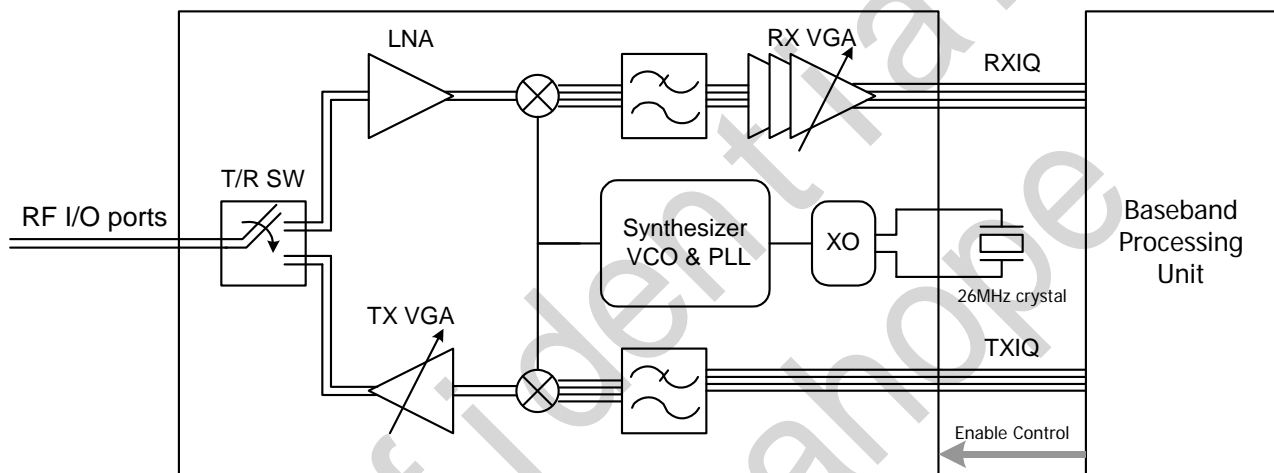
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|----|------------|-----------------------|---|--|
| 29 | UART_RX | Input, Digital | UART RX | |
| 30 | UART_TX | Output, Digital | UART TX | |
| 31 | VCCIO | Supply, 1.8V ~ 3.3V | VCC for IO ports | |
| 32 | USB_DP | Input/Output, Analog | USB Data I/O | |
| 33 | USB_DN | Input/Output, Analog | USB Data I/O | |
| 34 | VCCLED | Output | VCC Output, Supply to LED | |
| 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 | V_CHG | Supply | VCC for Li-ion Battery Charger | |
| 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, Digital | Input Pin | |
| 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, 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 |
| 29 | OUTPUT, PIO29 is dedicated to EEPROM Write Protection |

5 Radio Transceiver

The AB1120 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 a balun and some matching components are placed outside the RF terminals.

5.2 Receiver

The AB1120 RF receiver implements a Low-IF architecture, which is composed with two parts: RF front-end and Low-IF part. The RF front-end part comprises a LNA and a quadrature mixer. The LIF 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 Low-IF band.

At the LIF 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

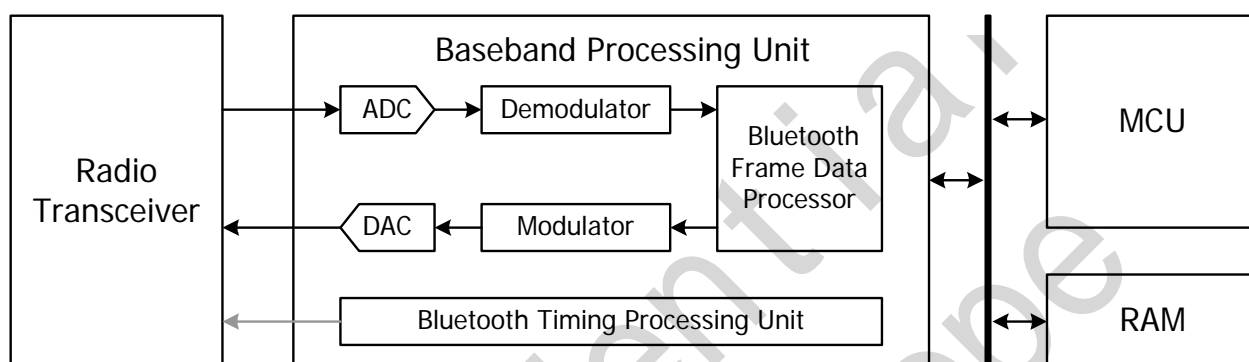
The AB1120 RF transmitter implements a direct-up-conversion architecture, which comprises a LPF, a modulator and a VGA stage. The TX baseband signals are fed from baseband DAC, generated by the baseband modulators. A LPF is implemented to attenuate the second sidelobe of signal spectrum and unwanted 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 AB1120 implements a fractional-N synthesizer with embedded VCO and loop filter without the need of external components. AB1120 also integrates an internal crystal oscillator that only an external 26MHz crystal is required. External clock signal can also be fed into AB1120 instead of the 26MHz crystal clock signal.

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

AB1120 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

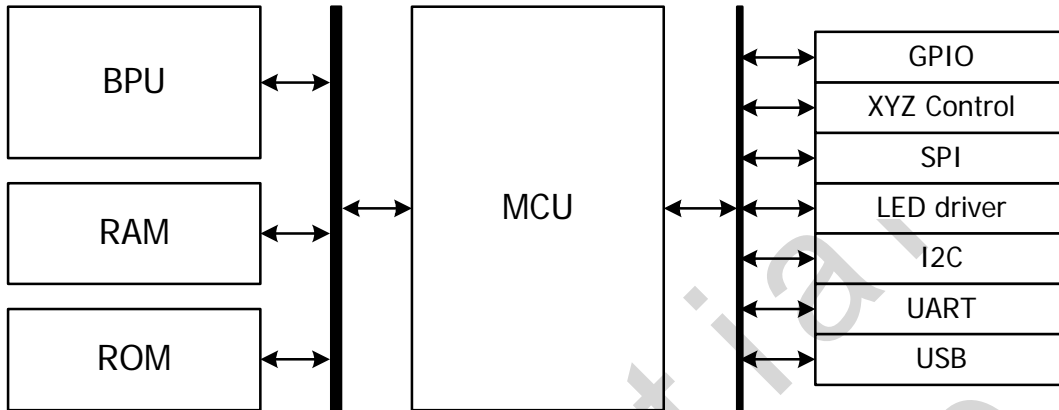
The modulator can generate GFSK, DQPSK and D8PSK signals according to which data rate is adopted in the frame data. The demodulator can convert the received data signal to digitized data bit format according to the modulation type indicated in the header region.

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.

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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 AB1120 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. **Another peripheral bus is connected with MCU for the peripherals access.**

8 Peripheral Control and Serial Communication Interfaces

The total number of I/O pins of AB1120 is 18, including 6 pins dedicated for input, 1 pin for EEPROM Write Protection(PIO29). Other 11 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 and an USB for firmware downloading and peripheral control are also supported.

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

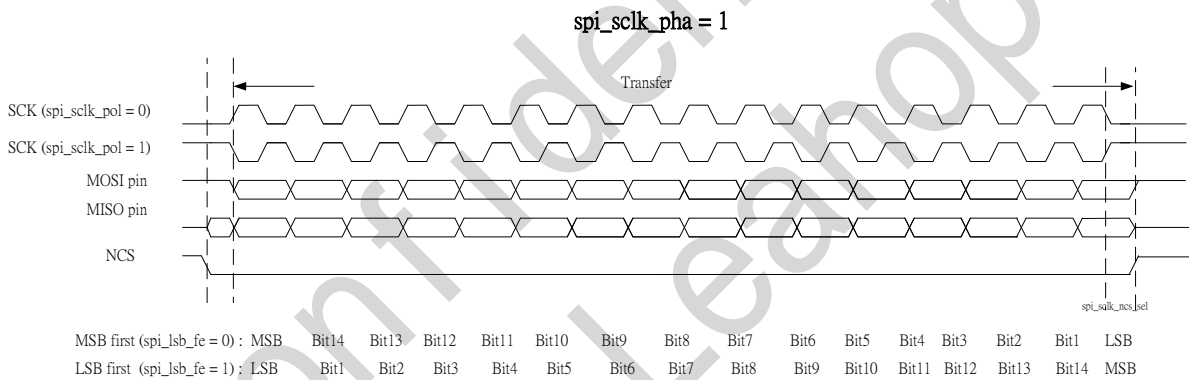
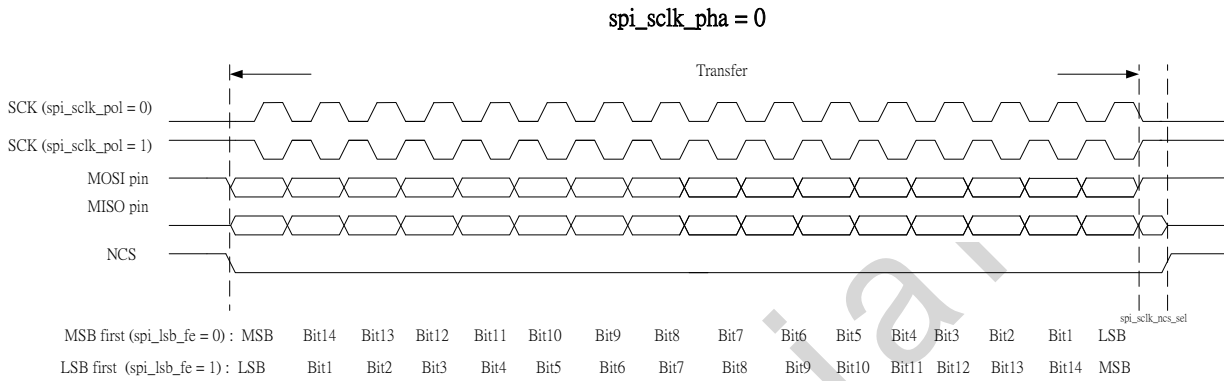
The I2C interface is used to connect to a serial EEPROM, which supports 100KHz / 400KHz / 800KHz bus clock rate at 1.8 or 3.3V voltage supply.

The UART interface supports up to 3M baud rate. The USB interface supports USB 2.0 full speed. Both of them are connected to the peripheral interface.

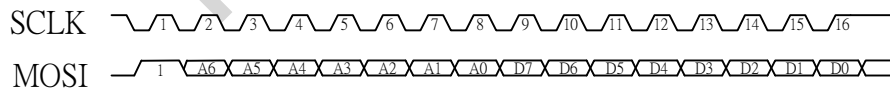
8.1 Serial Peripheral Interface

A SPI interface allows AB1120 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 AB1120. 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 AB1120.

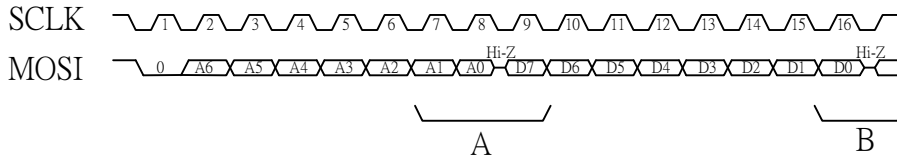
General Waveform



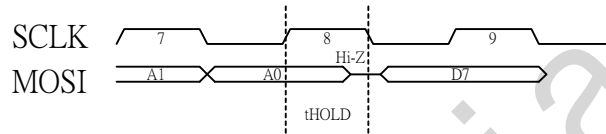
Write Operation



Read Operation



Part A :

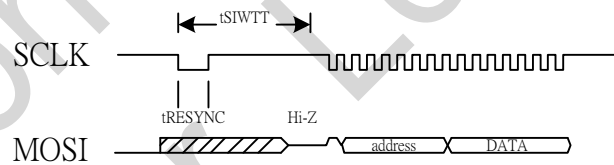


tHOLD : MOSI Read Hold Time

Part B :



Resync



tSIWTT : Serial Interface Watchdog Timer Timeout

tRESYNC : Serial Interface RESYNC

9 Power Management / Regulation

AB1120 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. **A Li-ion battery charger is also embedded.**

9.1 Power Regulation

A switching regulator is embedded to convert VBAT to 1.8V voltage supply for the core of AB1120. 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 AB1120.

9.2 Power Management Unit (PMU)

A PMU is designed in AB1120 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 AB1120 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 AB1120, 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 AB1120 HID software stack provides total solution of Bluetooth HID profile (device role), including all protocol stacks and profiles defined in HID v1.0. In addition, it has some extra features as shown below:

- Configurable MMI: Customers can modify user interface behavior by setting registers in EEPROM. In addition, AB1120 provides a set of function interface in AROHA HID 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 AROHA HID Customer Code Environment for other sensor.
- Good report rate for HID Mouse. (up to 125Hz)
- Low-power operation based on various hardware-wakeup mechanisms.

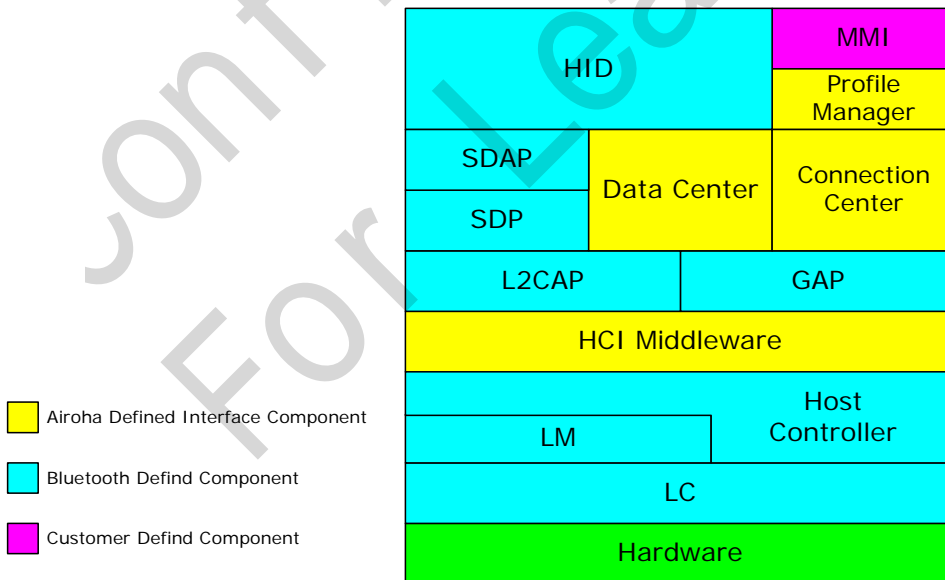


Figure 10.1: HID Software Stack

10.2 Development Environments and Tools

10.2.1 Software Development Environments

AB1120 provides a set of function interface in **ARIOHA HID 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:

- AB1120 LabTest
AB1120 LabTest provides the capability for RF testing and can be used as HID module testing during mass-production.
- AB1120 HID Configuration tool
AB1120 HID 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

AB1120 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 |
| Charger supply voltage (V_CHG) | -0.3V | 6.5V |
| Switching Regulator supply voltage (BAT_P) | -0.3V | 5.5V |
| 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 |
| Charger supply voltage (V_CHG) | 4.5 | 5 | 6.5 | V |
| Switching Regulator supply voltage (BAT_P) | 2 | | 4.2 | V |

11.3 Digital Terminals

| Item | Min. | Typ. | Max. | Unit |
|--|-----------------------|------|-----------------------|------|
| Input Voltage Levels | | | | |
| Input logic level low (V_{IL}) | 0 | | $0.3 \times V_{CCIO}$ | V |
| Input logic level high (V_{IH}) | $0.7 \times V_{CCIO}$ | | $V_{CCIO} + 0.4$ | V |
| Output Voltage Levels ($1.7V \leq V_{CCIO} \leq 1.9V$) | | | | |
| Output logic level low (V_{OL}), $I_O = 4.0mA$ | | | 0.4 | V |
| Output logic level high (V_{OH}), $I_O = -4.0mA$ | $V_{CCIO} - 0.4$ | | | V |
| Output Voltage Levels ($2.7V \leq V_{CCIO} \leq 3.0V$) | | | | |
| Output logic level low (V_{OL}), $I_O = 4.0mA$ | | | 0.2 | V |
| Output logic level high (V_{OH}), $I_O = -4.0mA$ | $V_{CCIO} - 0.2$ | | | V |

11.4 PIO Current Sink/Source Capabilities

| Item | Output | Criteria | Capability | Note |
|---|--------|------------------------------------|------------|------|
| $V_{CCIO} = 3.3V$ | | | | |
| Max. Input Current | Low | $V_{out} \leq 0.3 \times V_{CCIO}$ | > 10 mA | |
| Max. Output Current | High | $V_{out} \geq 0.7 \times V_{CCIO}$ | > 10 mA | |
| $V_{CCIO} = 2.7V$ | | | | |
| Max. Input Current | Low | $V_{out} \leq 0.3 \times V_{CCIO}$ | > 10 mA | |
| Max. Output Current | High | $V_{out} \geq 0.7 \times V_{CCIO}$ | > 10 mA | |
| <ul style="list-style-type: none"> This table is applied to PIO # 4, 5, 6, 8, 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 | °C |
| Frequency Stability over Operating Temperature Range | -10 | | +10 | ppm |
| Crystal Oscillator Characteristics | | | | |
| Tuning 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 | Min. | Typ. | Max. | Unit |
|-----------------------------|--------------|------|------|------|
| Input Voltage | 2 | | 3.6 | V |
| Output Voltage | BAT_P > 2.2V | 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 | 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 @ 25°C

| Item | Min. | Typ. | Max. | Unit |
|---|------|------|------|------|
| Transmit (Peak Current) | | 53 | | mA |
| Receive (Peak Current) | | 48 | | mA |
| DM1(TX mode) | | 53 | | mA |
| DM1(RX mode) | | 48 | | mA |
| Sniff mode, 10ms | | 5.1 | | mA |
| Sniff mode, 100ms | | | | mA |
| Sniff mode, 1.28s | | | | mA |
| Deep sleep (disconnected, link loss state, wake on interrupt) | | 27 | | μA |

The current consumption was measured directly on the buck and boost output.

11.9 Radio Characteristics

11.9.1 Transmitter (Basic Data Rate)

Core Supply Voltage = 1.8V @ 25°C

| 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 |
| 2 nd Harmonic Content | | | -30 | dBm |
| 3 rd 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°C

| 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 | $F = F_0 + 1\text{MHz}$ | | -5 | | dB |
| | $F = F_0 - 1\text{MHz}$ | | -5 | | dB |
| | $F = F_0 + 2\text{MHz}$ | | -35 | | dB |
| | $F = F_0 - 2\text{MHz}$ | | -28 | | dB |
| | $F = F_0 + 3\text{MHz}$ | | -43 | | dB |
| | $F = F_{\text{image}}$ | | -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°C

| Item | Min. | Typ. | Max. | Unit |
|---|-------------------------|------|------|------|
| Relative transmit power | | -3 | | dB |
| $\pi/4$ DQPSK max carrier frequency stability $ \omega_o $ | | 1 | | KHz |
| $\pi/4$ DQPSK max carrier frequency stability $ \omega_i $ | | 3 | | KHz |
| $\pi/4$ DQPSK max carrier frequency stability $ \omega_o + \omega_i $ | | 4 | | KHz |
| 8DPSK max carrier frequency stability $ \omega_o $ | | 1 | | KHz |
| 8DPSK max carrier frequency stability $ \omega_i $ | | 3 | | KHz |
| 8DPSK max carrier frequency stability $ \omega_o + \omega_i $ | | 4 | | KHz |
| $\pi/4$ 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 | $F > F_0 + 3\text{MHz}$ | | | dBm |
| | $F < F_0 - 3\text{MHz}$ | | | dBm |
| | $F = F_0 + 3\text{MHz}$ | | -34 | dBm |
| | $F = F_0 - 3\text{MHz}$ | | -40 | dBm |
| | $F = F_0 + 2\text{MHz}$ | | -23 | dBm |
| | $F = F_0 - 2\text{MHz}$ | | -33 | dBm |
| | $F = F_0 + 1\text{MHz}$ | | -30 | dBm |
| | $F = F_0 - 1\text{MHz}$ | | -30 | dBm |
| EDR Differential Phase Encoding | | 0 | | % |

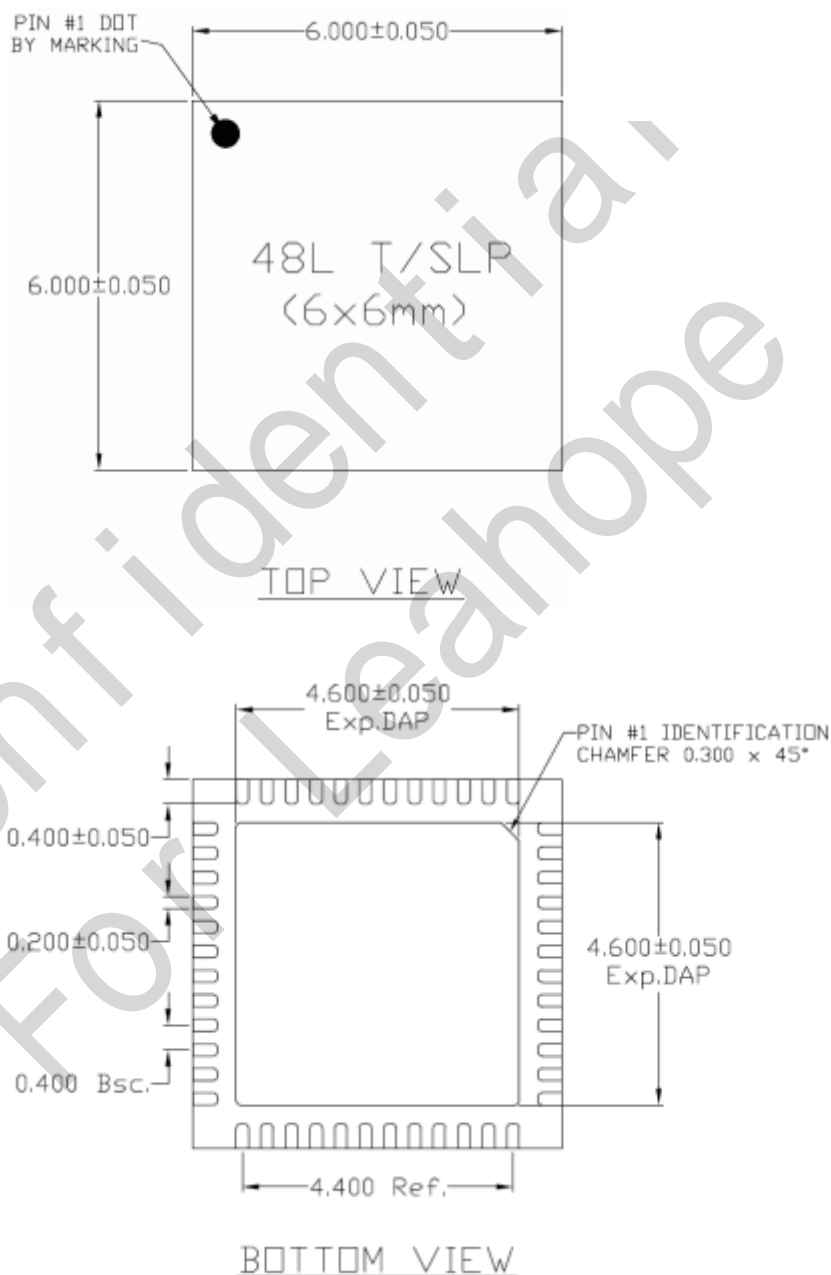
11.9.4 Receiver (Enhanced Data Rate)

Core Supply Voltage = 1.8V @ 25°C

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

12 Package Information

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





NOTE:

1) TSLP AND SLP SHARE THE SAME EXPOSE OUTLINE
 BUT WITH DIFFERENT THICKNESS:

| | | TSLP | SLP |
|---|------|-------|-------|
| A | MAX. | 0.800 | 0.900 |
| | NOM. | 0.750 | 0.850 |
| | MIN. | 0.700 | 0.800 |

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