

BCM-DA100-AS

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CONFIDENTIAL INFORMATION

BnCOM Co.,Ltd.

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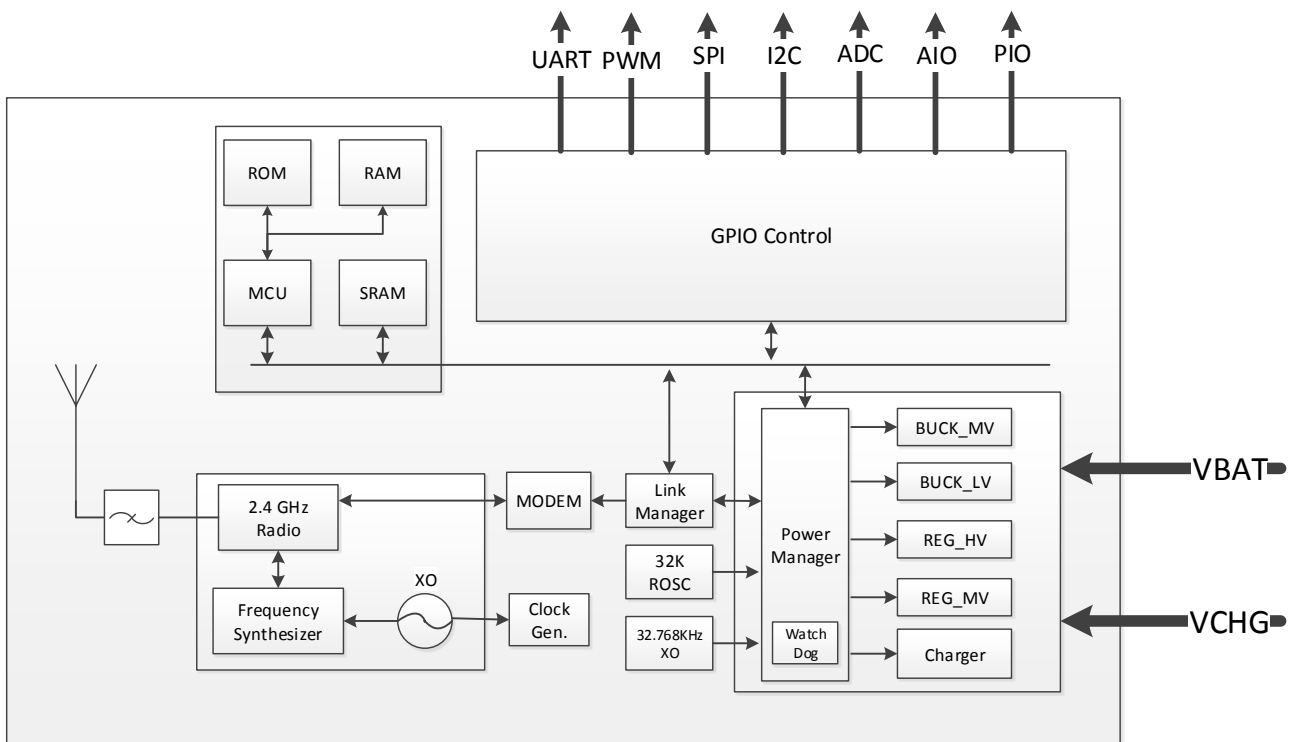
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1. General

1.1 Overview

This specification covers Bluetooth module which complies with Bluetooth specification version 4.2 and integrates RF & Baseband controller in small package. This Module has deployed Airoha AB1122 chipset.

All detailed specification including pin outs and electrical specification may be changed without notice.



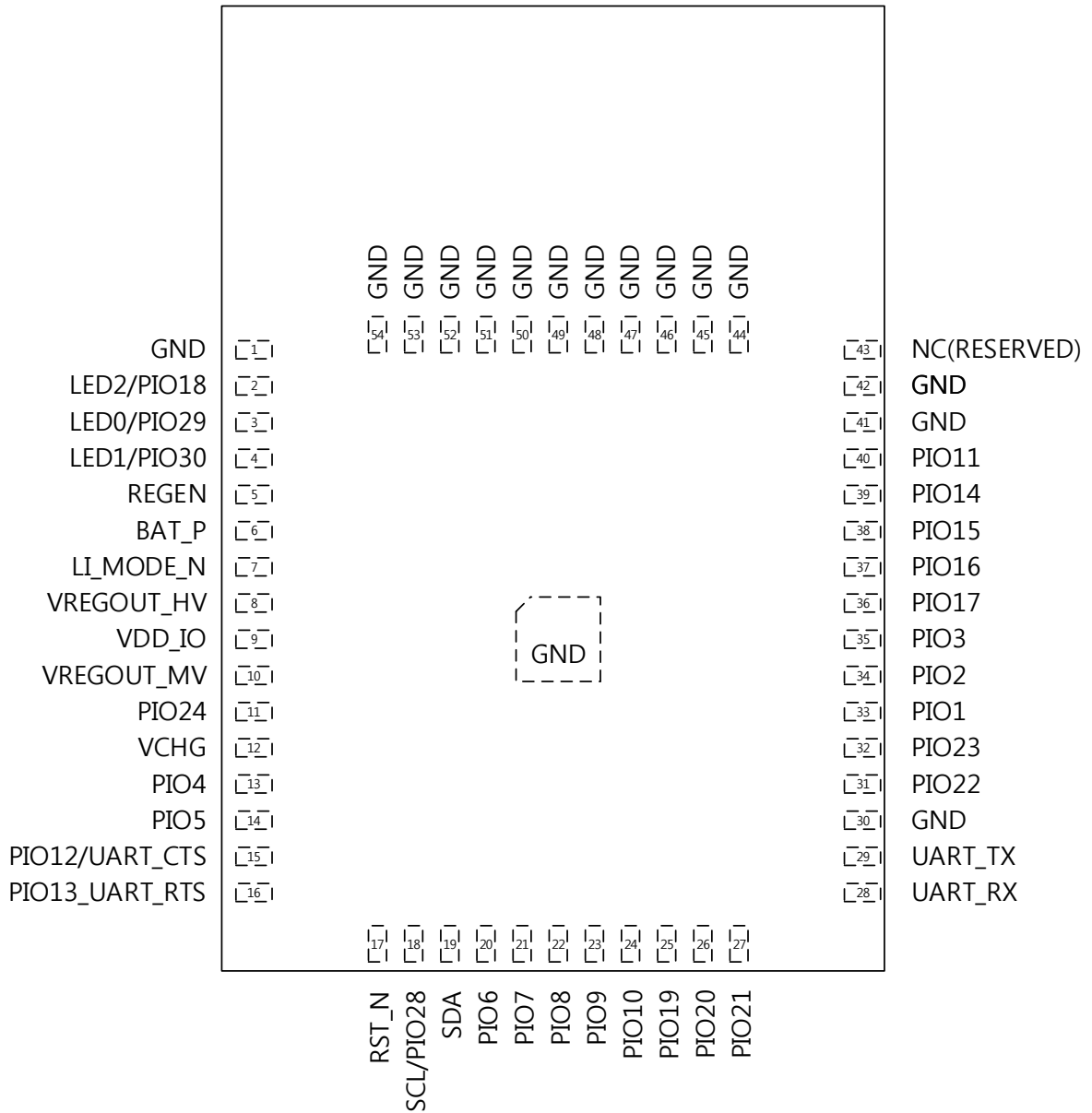
1.2 Features

- Bluetooth® v4.2 (Dual mode) specification compliant
- Radio includes integrated balun and typical RF performance of 6 dBm transmit power and -94 dBm receive sensitivity
- Embedded 80251 MCU with 12/24MHz clock rate
- Embedded 4Mbit Flash
- Serial interfaces: UART, I²C and SPI
- 23 GPIO Support include alternative 16 AIO (12Bit)
- 3 on dedicated LED pads
- Integrated Li-mode battery charger support 700mA fast charging
- Integrate 1.25V switching regulator and 1.8V/3.3V LDO regulator
- Competitive Size: 11mm x 16mm x 2.5mm : 54Pin
- Operating temperature range (MAX -30°C ~ 85°C)

1.3 Application

- Game Controller
- Mobile Payment
- Smart Home
- Remote Sensor

1.3 Pin Configuration



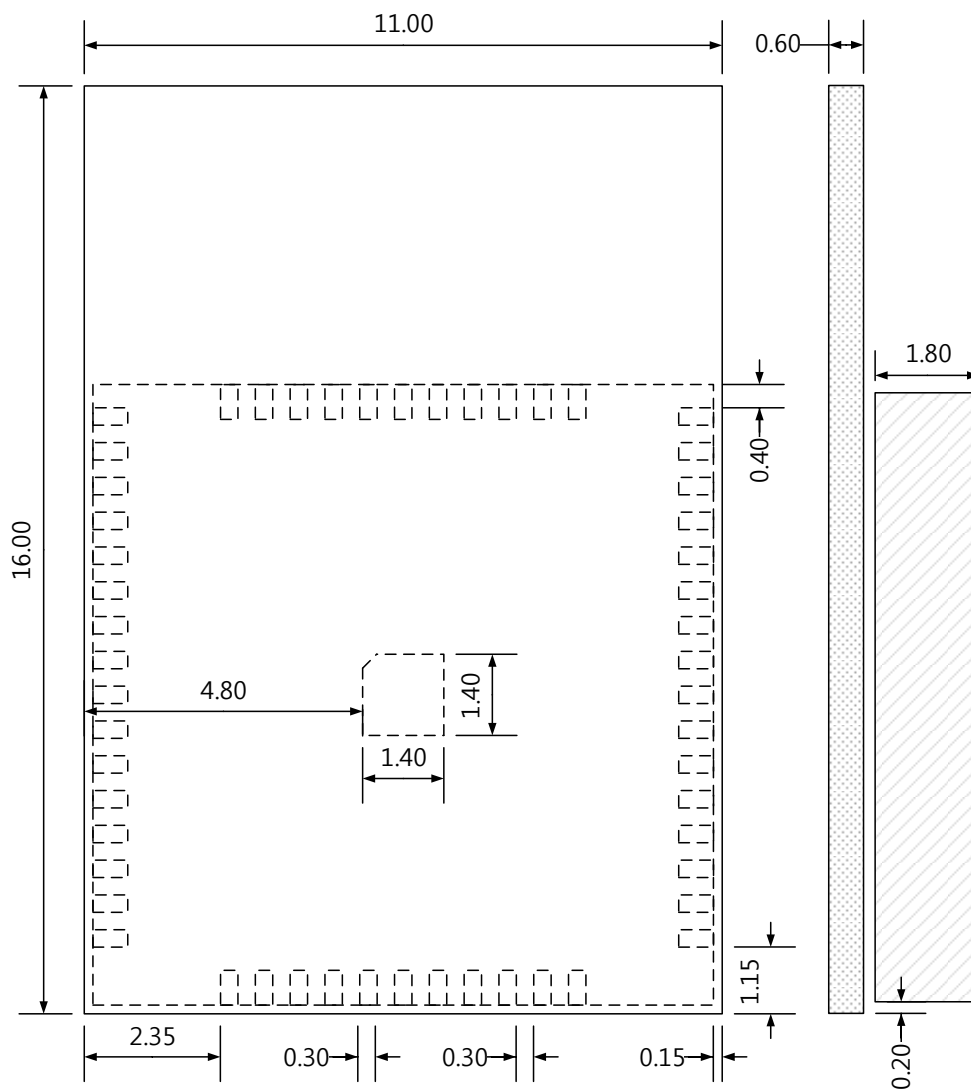
Pin Configuration (TOP VIEW)

1.4 Device Terminal Functions

	Function			Pin Name	Pin No	Pin type	Description
NC	-	-	-	NC	43		Not connection
LED	LED0	PIO29	-	LED0	3	Open drain	LED driver
	LED1	PIO30	-	LED1	4		
	LED2	PIO18	-	LED2	2		
UART	UART_TX	-	-	UART_TX	29	Output only, Digital	-
	UART_RX	-	-	UART_RX	28	Input only, Digital	-
	UART_CTS	PIO12	AIO	PIO12/UART_CTS	15	Input / Output	Programmable IO
	UART_RTS	PIO13	AIO	PIO13/UART_RTS	16	Input / Output	Programmable IO
I2C	SDA	-	-	SDA	19	I2C data line	-
	SCL	PIO28	-	SCL/PIO28	18	I2C clock line	-
GPIO	'-	PIO24	AIO	PIO24	11	Input / Output	Programmable IO
	SPI_NCS	PIO4	AIO	PIO4	13	Input / Output	Programmable IO
	SPI_MOSI	PIO5	AIO	PIO5	14	Input / Output	Programmable IO
	SPI_MISO	PIO6	AIO	PIO6	20	Input / Output	Programmable IO
	SPI_SCK	PIO7	AIO	PIO7	21	Input / Output	Programmable IO
	-	PIO8	AIO	PIO8	22	Input / Output	Programmable IO
	-	PIO9	AIO	PIO9	23	Input / Output	Programmable IO
	'-	PIO10	AIO	PIO10	24	Input / Output	Programmable IO
	-	PIO19	AIO	PIO19	25	Input / Output	Programmable IO
	-	PIO20	AIO	PIO20	26	Input / Output	Programmable IO
	-	PIO21	AIO	PIO21	27	Input / Output	Programmable IO
	-	PIO22	-	PIO22	31	Input / Output	Programmable IO
	-	PIO23	-	PIO23	32	Input / Output	Programmable IO
	-	PIO1	-	PIO1	33	Input only, Digital	Input Pin with 750k pull up
	-	PIO2	-	PIO2	34	Input only, Digital	Input Pin with 750k pull up
	-	PIO3	-	PIO3	35	Input / Output	Programmable IO
	SPI_SCK	PIO17	-	PIO17	36	Input / Output	Programmable IO
	SPI_MISO	PIO16	-	PIO16	37	Input / Output	Programmable IO
	SPI_MOSI	PIO15	-	PIO15	38	Input / Output	Programmable IO
SPI_NCS	PIO14	-	PIO14	39	Input / Output	Programmable IO	
	PIO11	AIO	PIO11	40	Input / Output	Programmable IO	
Other Pin	REGEN	-	-	REGEN	5	Input, Digital	Regulator enable, Input pin with 100k pull down
	BAT_P	-	-	BAT_P	6	Supply	Battery input P, as Switching/Linear regulator input
	LI_MODE_N	-	-	LI_MODE_N	7	Input only, Digital	Charger function enable, Active low
	VREGOUT_HV	-	-	VREGOUT_HV	8	Analog	LDP output
	VDD_IO	-	-	VDD_IO	9	Supply, 1.8V ~ 3.3V	VDD for IO
	VREGOUT_MV	-	-	VREGOUT_MV	10	Analog	LDO output
	VCHG	-	-	VCHG	12	Supply, 5V	VDD for Charger
	RST_N	'-	-	RST_N	17	Input, Digital	Global reset, active low
Ground	-	-	GND	1,30,41,42,44, 45,46,47,48,49 50,51,52,53,54 EPAD	-	Ground	

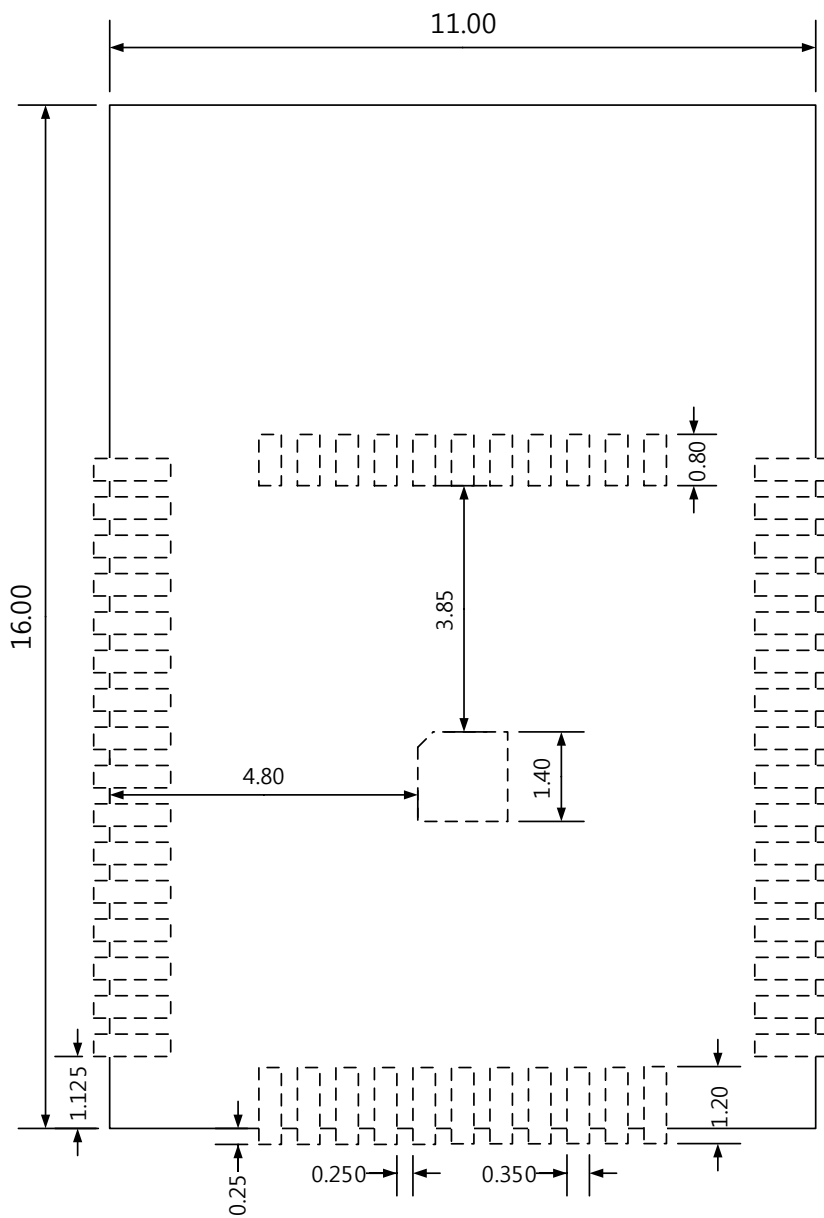
1.5 Package Dimensions & Land Pattern

- unit = mm
- General Tolerances = $\pm 0.2\text{mm}$



BCM-DA100-AS Package Dimensions

● unit = mm



< Land Pattern >

2. Characteristics

2.1 Electrical Characteristics

■ Absolute Maximum Ratings

ITEM		Min	Max	Unit
Storage Temperature range		-40	85	°C
Charger	VCHG	-0.3	6.5	V
Battery	VBAT	-0.3	4.4	V
Switching Regulator supply voltage	VIN	-0.3	4.4	V
VDD_IO		-0.3	3.6	V

■ Recommended Operating Conditions

ITEM		Min	TYP	Max	Unit
Operating Temperature range		-30	20	85	°C
Charger	VCHG	4.5	5.0	6.5	V
Battery	VBAT	2.7	3.7	4.2	V
Switching Regulator supply voltage	VIN	2.7	3.7	4.2	V
VDD_IO		1.7	1.8	3.6	V

■ High-Voltage LDO

ITEM		Min	TYP	Max	Unit
Input Voltage	LI_MODE_N=0	2.7	-	4.4	V
	LI_MODE_N=1	-	-	3.6	
Output Voltage	Input voltage > 3.3V	2.9	3	3.1	V
Rated Output Current(I _{out})	Input voltage = 4.2V	-	-	300	mA

■ Medium-Voltage LDO

ITEM		Min	TYP	Max	Unit
Input Voltage	LI_MODE_N=0	2.7		4.4	
	LI_MODE_N=1			3.6	
Output voltage		1.7	1.8	1.9	V
Load current		-	-	200	mA

■ Battery Charger

ITEM	Min	TYP	Max	Unit
Input voltage, VCHG	4.5	5	6.5	V
Charge Current (CC Mode)	25	-	250	mA
Trickle Charge Current	-	8	-	mA
Trickle Charge Threshold Voltage	-	2.92	-	V
Regulated Output (Float) Voltage	-	4.2	-	V

■ Digital Terminals

ITEM	Min	TYP	Max	Unit
Input Voltage Levels				
Input logic level low (V_{IL})	0	-	$0.3 \cdot V_{DDIO}$	V
Input logic level high (V_{IH})	$0.7 \cdot V_{DDIO}$	-	$V_{DDIO} + 0.4$	V
Output Voltage Levels ($1.7V \leq V_{DDIO} \leq 1.9V$)				
output logic level low (V_{OL}), $I_o = 4.0mA$	-	-	0.2	V
output logic level high (V_{OH}), $I_o = -4.0mA$	$V_{DDIO} - 0.2$	-	-	V
Output Voltage Levels ($2.7V \leq V_{DDIO} \leq 3.0V$)				
output logic level low (V_{OL}), $I_o = 4.0mA$	-	-	0.4	V
output logic level high (V_{OH}), $I_o = -4.0mA$	$V_{DDIO} - 0.4$	-	-	V

2.2 RF Characteristics

RF	Specification	Condition	Min	Typ	Max	Unit
Transmitter	Output transmit power	CH0	-	5.82	-	dBm
		CH39	-	5.92	-	dBm
		CH78	-	5.72	-	dBm
	Transmit power density		-	-4.06	-	dBm
	Transmit power control (power step)	CH0	3.78	-	4.83	dB
		CH39	3.52	-	4.62	dB
		CH78	3.42	-	4.51	dB
	Frequency Range $f_l > 2400, f_h < 2483.50$	-	2401.521	-	2480.531	Mhz
	20Db bandwidth for modulation ($f_h - f_l \leq 1\text{Mhz}$)	CH0	-	0.859	-	Mhz
		CH39	-	0.906	-	Mhz
		CH78	-	0.906	-	Mhz
	Adjacent channel transmit power	+/- 2Mhz	-	-28.28	-	dBm
		+/- 3Mhz	-	--42.77	-	dBm
		+/- 4Mhz	-	--48.83	-	dBm
	Modulation characteristics 140Khz \leq df1_avg, df2 pass rate >99.9% df2/df1 \geq 0.8	-	$\Delta f1_{avg}$	$\Delta f2$ pass rate	$\Delta f1_{avg}/\Delta f2_{avg}$	-
		CH0	161.8 Khz	100%	0.96	-
		CH39	161.9 Khz	100%	0.96	-
		CH78	161.8 Khz	100%	0.96	-
	Initial carrier frequency tolerance -75Khz \leq df0_min df0_max \geq 75Khz	-	-	26.4	-	-
		-	-	28.4	-	-
-		-	24.6	-	-	
Carrier frequency drift	DH1	-	-	-	-	
	DH3	-	-	-	-	
	DH5	-	5.3khz	-	-	
Receiver	Sensitivity at 0.1% BER for all Basic rate packet type	CH0		-94		dBm
		CH39		-95		dBm
		CH78		-94		dBm

3. Terminal Description

3.1 UART Interface

This is a standard UART interface for communicating with other serial devices.

BCM-DA100-AS UART interface provides a simple mechanism for communicating with other serial devices using the RS-232 protocol.

When BCM-DA100-AS is connected to another digital device, UART_RX and UART_TX transfer data between the 2 devices. The remaining 2 signals, UART_CTS and UART_RTS, implement optional RS232 hardware flow control where both are active low indicators

If UART_CTS and UART_RTS are not required for hardware flow control, they are reconfigurable as PIO. UART configuration parameters, such as baud rate and packet format, are set using BCM-DA100-AS firmware.

3.1.1 Configuration list

Configuration Parameters	Supported Values
Data Length	8bit
Flow Control	Hardware RTS/CTS None
Parity	Even Odd None
Number of stop bits	1 or 2
Baud rate	1200 2400 4800 9600 19200 38400 57600 76800 115200 230400 460800 921600 1843200

3.2 SPI Interface

The SPI is capable of communicating with external device.

Both 3-wire and 4-wire mode SPI interface are supported.

When 3-wire mode is selected, SPI_MOSI would be data I/O pin of the SPI interface.

Only master mode supported. The SPI interface is shared with GPIOs and the mapping tables are Listed below.

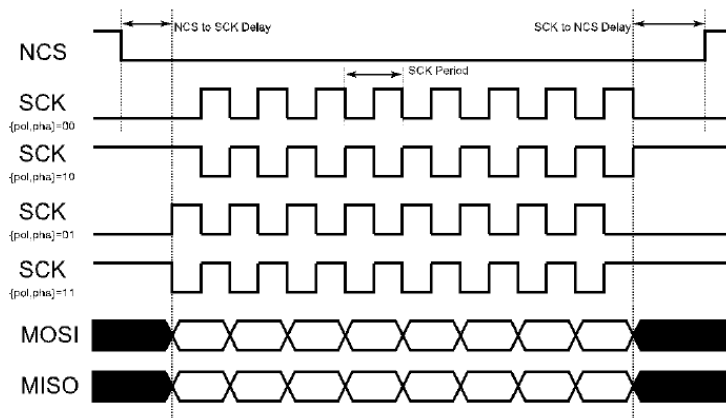
GPIO pin	SPI Master mode 0	SPI Master mode 1
GPIO4	SPI_NCS	
GPIO5	SPI_MOSI	
GPIO6	SPI_MISO	
GPIO7	SPI_SCK	
GPIO14		SPI_NCS
GPIO15		SPI_MOSI
GPIO16		SPI_MISO
GPIO17		SPI_SCK

The SPI interface provides much flexibility that can fit most SPI slave devices.

The polarity and phase of SCK can be both programmed and results in four combinations.

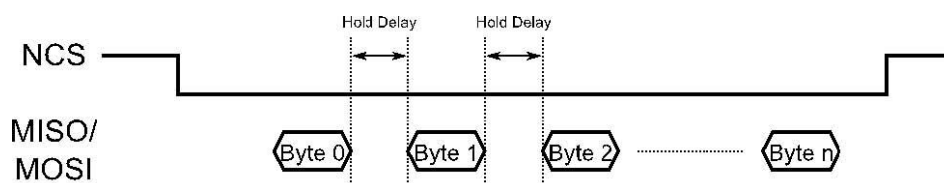
The NCS to SCK delay, the SCK to NCS delay and SCK period are also programmed.

The timing relationships of SPI interface are illustrated below.



SPI interface Timing Diagram

The SPI interface also supports multiple bytes in single transfer. Between each byte, a hold delay can be set. This is drawn in below



SPI interface Multiple Bytes Transfer.

3.3 I2C Interface

The I2C is master interface. It supports 100, 400 and 800Khz clock rates. For controlling EEPROM, A write protect (WP) signal is also supported through GPIO. The I2C interface provides several data formats and can fit various I2C peripherals. Sequential read and write are supported to improve throughputs.

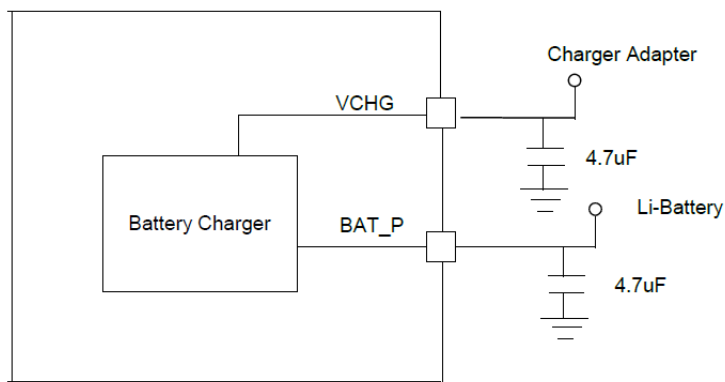
4. Battery Charger

4.1. Battery Charger Hardware Operating Modes

The Li-mode battery charger of BCM-DA100-AS provides four modes:

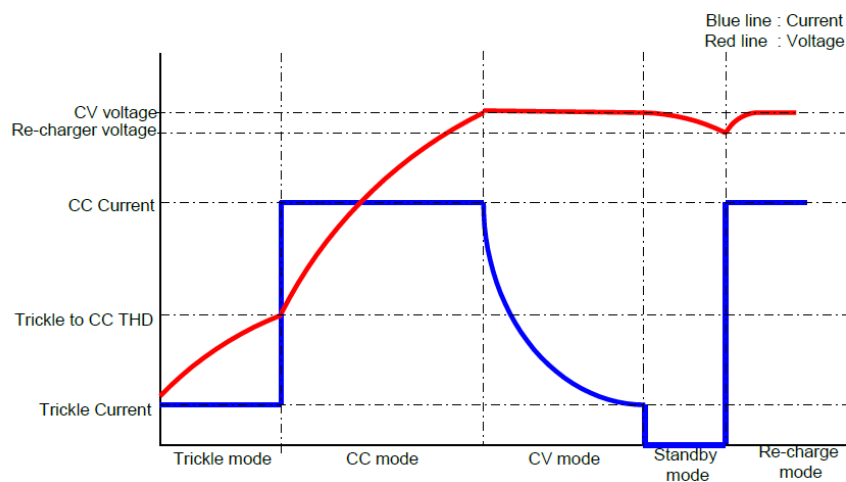
- Trickle mode
- Constant current mode (CC mode)
- Constant voltage mode (CV mode)
- Standby mode

The below block diagram shows the charge circuit. When an external power supply is connected to AB1122 VCHG pin, PMU will first detect if the VCHG voltage is correct and enable the charger circuit.



Battery Charger Circuit

When Charger circuit is enabled, it will detect the battery voltage and enter 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. The Charge profiles are shown as below.



Charger Profile

WARNING : For BCM-DA100-AS.

If you have reflow process multiple times in your product, you must be proceed this module in the final reflow process. If not the Shield can will drop out.

FCC MODULAR APPROVAL INFORMATION EXAMPLES for Manual

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.
- (2) This device must accept any interference received, including interference that may cause undesired operation.

CAUTION: 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.

FCC Radiation Exposure Statement:

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance 20 cm between the radiator & your body.

OEM INTEGRATION INSTRUCTIONS:

This device is intended only for OEM integrators under the following conditions:

The module must be installed in the host equipment such that 20 cm is maintained between the antenna and users, and the transmitter module may not be co-located with any other transmitter or antenna. The module shall be only used with the internal on-board antenna that has been originally tested and certified with this module. External antennas are not supported. As long as these 3 conditions above are met, further transmitter test will not be required.

However, the OEM integrator is still responsible for testing their end-product for any additional compliance requirements required with this module installed (for example, digital device emissions, PC peripheral requirements, etc.). The end-product may need Verification testing, Declaration of Conformity testing, a Permissive Class II Change or new Certification. Please involve a FCC certification specialist in order to determine what will be exactly applicable for the end-product.

Validity of using the module certification:

In the event that these conditions cannot be met (for example certain laptop configurations or co-location with another transmitter), then the FCC authorization for this module in combination with the host equipment is no longer considered valid and the FCC ID of the module cannot be used on the final product. In these circumstances, the OEM integrator will be responsible for re-evaluating the end product (including the transmitter) and obtaining a separate FCC authorization. In such cases, please involve a FCC certification specialist in order to determine if a Permissive Class II Change or new Certification is required.

Upgrade Firmware:

The software provided for firmware upgrade will not be capable to affect any RF parameters as certified for the FCC for this module, in order to prevent compliance issues.

End product labeling:

This transmitter module is authorized only for use in device where the antenna may be installed such that 20 cm may be maintained between the antenna and users. The final end product must be labeled in a visible area with the following: "Contains FCCID: 2APDI-BCM-DA100-AS" .

Information that must be placed in the end user manual:

The OEM integrator has to be aware not to provide information to the end user regarding how to install or remove this RF module in the user's manual of the end product which integrates this module. The end user manual shall include all required regulatory information/warning as show in this manual.