## 1.4 Dimension

The dimension of SB52 is 55 mm x 45 mm x 3.5 mm. Detail dimension please see Fig1-2.

Figure 1-2 SB52 SOM Dimension
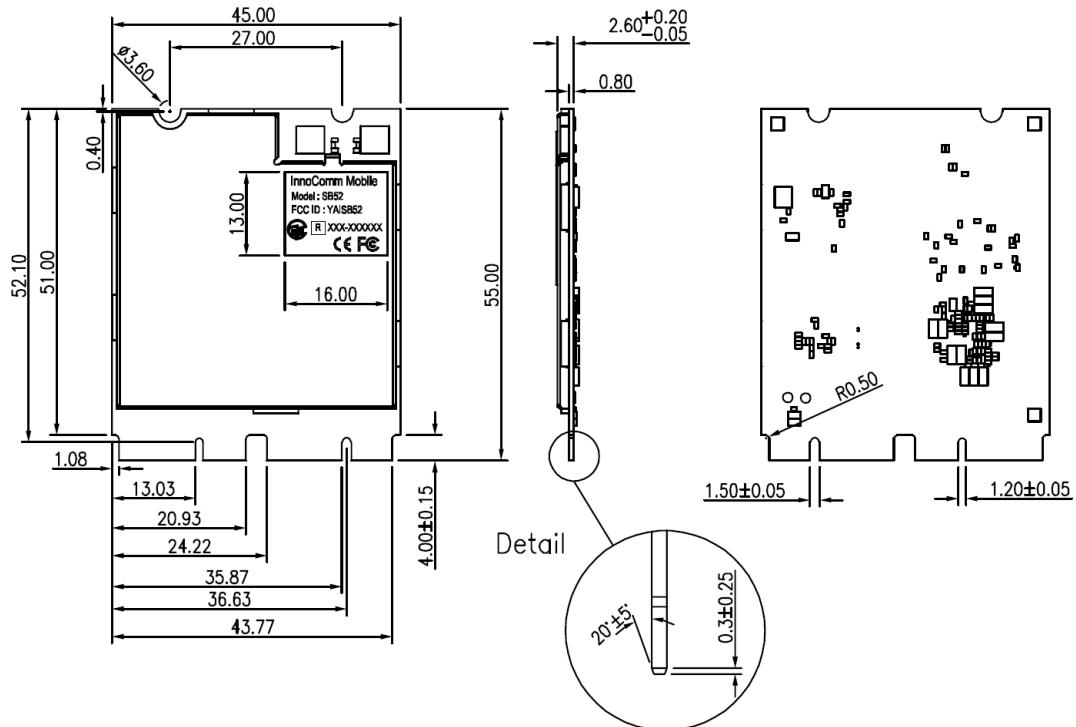
1.5 Electrical Specifications

Symbol	Parameter	Minimum	Maximum	Unit
VSYS	Input Voltage	3.4	4.35	V
VSYS	Input Current		1.5	A

Table 1-1: Input Power Absolute Maximum Ratings

Symbol	Parameter	Minimum	Maximum	Unit
VIO28_PMU	VDDIO_2V8	2.66	2.94	V
VIO18_PMU	VDDIO_1V8	1.71	1.89	V

Table 1-2: Output Power

Symbol	Parameter	Minimum	Maximum	Unit
T	Operating Temp.	0	60*	°C

Table 1-3 Operating Temperature

Note * : Test with heat sink

1.6 General Application Notes

Consider the following recommendations when designing application boards:

- Use a GND plane underneath the SB52.
- Do not use vias in high-speed interface lines such as USB and Ethernet.
- Rout high-speed interface lines differentially and leave several mm gap to other signal lines when possible.
- Do not place any components which dissipate heat close to or underneath the module.
- A heat sink is suggested to allow prolonged operation under full CPU speed. Connect heat sink to CPU and WiFi via thermal pad, ensure that heat sink is not tilted or applying high force onto the module.

2 Main Hardware Components

SB52 SOM has two 75-pin M.2 E-key golden fingers to connect with another carrier board. It integrates MTK the i500, LPDDR4 Memory, eMMC, Power Manage IC (PMIC), and Wi-Fi/Bluetooth on the module.

Figure 2-1 – Top side of SB52 SOM
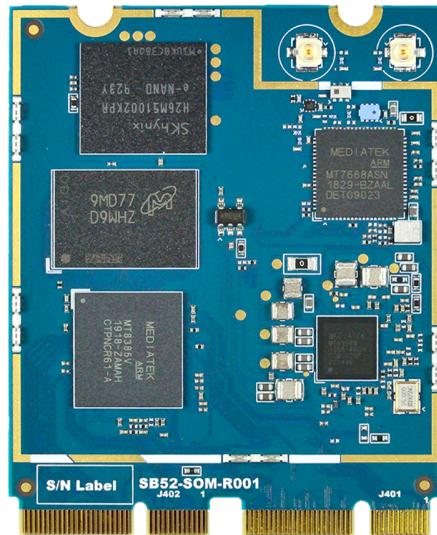
Figure 2-2 – Bottom side of SB52 SOM
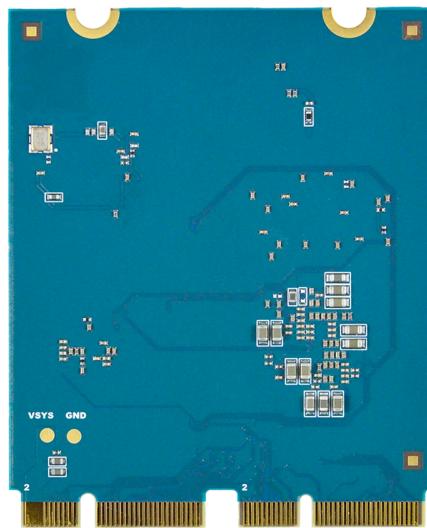
2.1 CPU

MTK i500 processor integrates a multi-core ARM® Cortex-A73, ARM® Cortex-A53 MPCore equipped with the NEON engine offers processing power necessary to support the latest OpenOs along with its demanding applications such as web browsing, email, GPS navigation, and games.

The features of i500 processors include the following:

- Quad-core ARM Cortex-A73 MPCore operating at 2GHz
- Quad-core ARM Cortex-A53 MPCore operating at 2GHz
- NEON multimedia processing engine
- ARM TrustZone security

2.2 Memory

SB52 SOM is embedded 2GB of LPDDR4X memory with the following feature,

- Dual channels with a 16-bit data bus width
- Up to 3200MHz memory clock
- Supports self-refresh/ partial self-refresh mode
- Supports dual-rank memory device
- Advanced bandwidth arbitration control

2.3 Power Management IC

MTK MT6358 power management IC is used for SB52 SOM. MT6358 is a programmable power management IC that integrates 9 buck converters and 33 LDOs to provide all power rails required by SoC and peripherals.

MT6358 adopts the SPI interface and two SRCLKEN control pins to control buck converters, LDOs, and various drivers; it provides enhanced safety control and protocol for handshaking with i500.

For system management, it provides the following features,

- Support software shutdown or hardware power off
- 32K RTC oscillator for system timing
- Watchdog reset
- Over-current and thermal overload protection
- OVP, UVLO function
- Precision voltage, temperature, and current measurement fuel gauge

2.4 eMMC Storage

The onboard eMMC device is connected to the MSDC0 interface of the i500 processor in an 8-bit width configuration.

2.5 Wi-Fi/Bluetooth Module

MTK MT7668 WIFI/BT IC is used for SB52. It supports Wi-Fi 802.11 a/b/g/n/ac MIMO and BT5.0.

3 SB52 SOM Interfaces and Connectors

SB52 use two M.2 E-key golden finger to connect with the carrier board. The tables below detail the pin assignment and functionality of these connectors.

3.1 J401 Connector

Table 3-1 J401 Connector

J401 Pin #	Signal Name	I500 Pin #	MT6358 Pin #	I/O	Voltage (V)
1	SYSRSTB	K23	D4	I	1.8
2	VBAT			PI	3.4 ~ 4.35
3	PWRKEY_SW		D2	I	0 ~ 5
4	VBAT			PI	3.4 ~ 4.35
5	VCAMA2_PMU		N10	PO	1.8/2.5/2.7/2.8/2.9/3
6	VBAT			PI	3.4 ~ 4.35
7	GND				
8	VBAT			PI	3.4 ~ 4.35
9	GND				
10	GND				
11	AUXIN4	AG18		AI	0 ~ 1.8
12	VBUS		K12	PI	5
13	GPIO9	W4		I/O	1.8
14	VRTC28		M8	PO	2.8
15	GPIO17	AB26		I/O	1.8
16	GPIO10	Y4		I/O	1.8
17	UCTS1	N26		I/O	1.8
18	GPIO22	Y26		I/O	1.8
19	SDA2	AB1		OD	1.8
20	GPIO23	AA26		I/O	1.8
21	SCL2	AB2		OD	1.8
22	GPIO24	AA23		I/O	1.8
23	AU_MICBIAS0		K5	PO	1.7~2.6

J401 Pin#	Signal Name	I500 Pin #	MT6358 Pin #	I/O	Voltage
32	SPI_CSB	AG3		I/O	1.8
33	AU_VIN2_N		K3	I	MICBIAS
34	SPI_CLK	AF3		I/O	1.8
35	AU_VIN0_P		K1	I	MICBIAS
36	SPI_MI	AJ2		I/O	1.8
37	AU_VIN0_N		L1	I	MICBIAS
38	SPI_MO	AH2		I/O	1.8
39	AU_REFN		H5	AGND	
40	URTS1	P26		I/O	1.8
41	AU_HPR		G4	AO	-1.98 ~ 1.98
42	GPIO19	W24		I/O	1.8
43	AU_HPL		H4	AO	-1.98 ~ 1.98
44	GPIO150	R25		I/O	1.8
45	GND			GND	
46	I2S1_LRCK	AD21		I/O	1.8
47	AU_MICBIAS1		L5	O	1.7~2.6
48	I2S1_BCK	AG23		I/O	1.8
49	AU_VIN1_P		L4	I	MICBIAS
50	I2S1_DO	AG21		I/O	1.8
51	AU_VIN1_N		L3	I	MICBIAS
52	KPROW0	AA5		I/O	1.8
53	ACCDET		K6	I	0 ~ 2.94V
54	URXD1	AG25		I/O	1.8
55	HP_EINT		J4	I	0 ~ 2.94V
56	UTXD1	AG24		I/O	1.8
57	GND			GND	
58	KPCOL0	AC4		I/O	1.8
59	USB_DM	G26		USB	
60	KPROW1	AH1		I/O	1.8
61	USB_DP	F26		USB	
62	KPCOL1	AE3		I/O	1.8
63	GND			GND	
64	SDA1	AF4		I/O	1.8
65	SDA3	AG22		I/O	1.8
66	SCL1	AE4		I/O	1.8

J401 Pin#	Signal Name	I500 Pin #	MT6358 Pin #	I/O	Voltage
67	SCL3	AF22		I/O	1.8
68	GPIO0	AB5		I/O	1.8
69	GND			GND	
70	GPIO20	Y24		I/O	1.8
71	SDA0	AC5		I/O	1.8
72	GPIO42	AF26		I/O	1.8
73	SCL0	AB6		I/O	1.8
74	GPIO8	AD4		I/O	1.8
75	VIO18_PMU		F3	PO	1.8

3.2 J402 Connector

Table 3-2 J402 Connector

J402 Pin#	Signal Name	I500 Pin #	MT6358 Pin #	I/O	Voltage
1	AVSS28_AUD		J5	AGND	
2	VLDO28_PMU		P8	PO	2.8/3
3	GND			GND	
4	GPIO45	AH27		I/O	1.8
5	UART_RXD0	AD2		I/O	1.8
6	DISP_PWM	AH23		I/O	1.8
7	UART_TXD0	AD1		I/O	1.8
8	DISP_TE	AG26		I/O	1.8
9	HOMEKEY		G13	I	1.8
10	GPIO21	AB24		I/O	1.8
11	IDDIG	AF23		I/O	1.8
12	GPIO2	AG2		I/O	1.8
13	GPIO98	Y5		I/O	1.8
14	GPIO1	AB4		I/O	1.8
15	GPIO102	AA2		I/O	1.8
16	GPIO7	AE1		I/O	1.8
17	DSI0_D2N	V24		DSI	
18	GPIO151	L25		I/O	1.8

J402 Pin#	Signal Name	I500 Pin #	MT6358 Pin #	I/O	Voltage
19	DSI0_D2P	V25		DSI	
20	DSI0_D3N	T24		DSI	
21	DSI0_D1N	T26		DSI	
22	DSI0_D3P	T25		DSI	
23	DSI0_D1P	U26		DSI	
32	DSI0_CKP	U25		DSI	
33	DSI0_D0N	R27		DSI	
34	DSI0_CKN	U24		DSI	
35	DSI0_D0P	T27		DSI	
36	CAM_CLK0	AA4		I/O	1.8
37	RDN3	T1		CSI	
38	RDN2	P3		CSI	
39	RDP3	T2		CSI	
40	RDP2	P4		CSI	
41	RDN1	R4		CSI	
42	RCP	P5		CSI	
43	RDP1	R3		CSI	
44	RCN	N5		CSI	
45	RDN0	R1		CSI	
46	GND			GND	
47	RDP0	R2		CSI	
48	RDN3_A	P1		CSI	
49	GND			GND	
50	RDP3_A	P2		CSI	
51	VCAMA_PMU		M10	PO	1.8/2.5/2.7/ 2.8/2.9/3
52	RDN2_A	M1		CSI	
53	VCAMD_PMU		M15	PO	0.9/1.0/1.05/1.1 /1.2/1.3/1.5/1.8
54	RDP2_A	M2		CSI	
55	VCAMIO_PMU		E6	PO	1.8
56	GPIO97	W6		I/O	1.8
57	GPIO101	AA3		I/O	1.8

J402 Pin#	Signal Name	I500 Pin #	MT6358 Pin #	I/O	Voltage
58	GND			GND	
59	RCP_A	N1		CSI	
60	GPIO3	AG1		I/O	1.8
61	RCN_A	N2		CSI	
62	VMCH_PMU		R10	PO	2.9/3/3.3
63	GND			GND	
64	GPIO177			I/O	1.8
65	CAM_CLK1	AC2		I/O	1.8
66	I2S1_DI	AD27		I/O	1.8
67	GND			GND	
68	I2S1_MCK	AD20		I/O	1.8
69	RDN1_A	N4		CSI	
70	GPIO6	AE2		I/O	1.8
71	RDP1_A	N3		CSI	
72	GPIO5	AF2		I/O	1.8
73	RDN0_A	M4		CSI	
74	GPIO4	AC3		I/O	1.8
75	RDP0_A	M3		CSI	

3.3 Power Signals

Table 3-3 Power Signal Pins

Connector#	PIN#	Function	I/O	Description
J401	2,4,6,8	VSYS	I	Input power 3.4 ~ 4.35V
J401	14	VRTC28	I/O	RTC power 2.8V
J401	5	VCAMA2_PMU	O	Camera2 power 2.8V
J401	23	AU_MICBIAS0	O	Microphone0 Bias power 1.7~2.6V
J401	47	AU_MICBIAS1	O	Microphone1 Bias power 1.7~2.6V
J401	75	VIO18_PMU	O	IO power 1.8V
J402	51	VCAMA_PMU	O	Camera1 power 2.8V
J402	53	VCAMD_PMU	O	Camera1 power 1.2V
J402	55	VCAMIO_PMU	O	Camera1 power 1.8V
J402	2	VLDO28_PMU	O	IO power 2.8V
J402	62	VMCH_PMU	O	IO power 3.3V

3.4 I2Cs Parameter Specification

SB52 SOM I2C is an open-drain interface, the specification is shown in Table 3-5.

Table 3-4 I2C parameter specificaition

Parameters	Description	Min	Typ	Max	Unit
VIH	Input logic high voltage	0.65*VDD		VDD+0.3	V
VIL	Input logic low voltage	-0.3		0.35*VDD	V
VOL	DC output low voltage			0.2*VDD	V

* VDD is 1.8V

Table 3-5 I2C Signal Pins

Connector#	PIN#	PIN name	I/O	Description
J401	71	SDA0	OD*	I2C0_SDA
J401	73	SCL0	OD*	I2C0_SCL
J401	64	SDA1	OD*	I2C1_SDA
J401	66	SCL1	OD*	I2C1_SCL
J401	19	SDA2	OD*	I2C2_SDA
J401	21	SCL2	OD*	I2C2_SCL
J401	65	SDA3	OD*	I2C3_SDA
J401	67	SCL3	OD*	I2C3_SCL
J401	40	URTS1	OD*	I2C6_SDA
J401	17	UCTS1	OD*	I2C6_SCL

* OD is Open drain

3.5   UARTs

SB52 supports two UARTs. UART0 is not recommended to use since this port is default for debug trace log function. UART1 has HW flow control with another two control pins for CTS and RTS function.

Table 3-6 UART Signal Pins

Connector#	PIN#	PIN name	I/O	Description
J402	5	UART_RXD0	I	UART0_RXD
J402	7	UART_TXD0	O	UART0_TXD
J401	54	URXD1	I	UART1_RXD
J401	56	UTXD1	O	UART1_TXD
J401	17	UCTS1	I	UART1_CTS
J401	40	URTS1	O	UART1_RTS

3.6 DSI Interface

SB52 SOM provides a 4-lanes MIPI DSI display interface operating up to 2400x1080@60fps resolution

Table 3-7 DSI Signal Pins

Connector#	PIN#	PIN name	I/O	Description
J402	33	DSI0_D0N	O	DSI_D0M
J402	35	DSI0_D0P	O	DSI_D0P
J402	21	DSI0_D1N	O	DSI_D1M
J402	23	DSI0_D1P	O	DSI_D1P
J402	17	DSI0_D2N	O	DSI_D2M
J402	19	DSI0_D2P	O	DSI_D2P
J402	20	DSI0_D3N	O	DSI_D3M
J402	22	DSI0_D3P	O	DSI_D3P
J402	34	DSI0_CKN	O	DSI_CLKM
J402	35	DSI0_CKP	O	DSI_CLKP

3.7 CSI Interface

SB52 SOM provides 2 MIPI CSI high-speed camera serial interface with 4 data lane (for main and sub) and throughput up to 2.8G bps for 1 data lane.

Table 3-8 CSI0 Signal Pins

Connector#	PIN#	PIN name	I/O	Description
J402	47	RDP0	I	CSI0_D0P
J402	45	RDN0	I	CSI0_D0M
J402	43	RDP1	I	CSI0_D1P
J402	41	RDN1	I	CSI0_D1M
J402	40	RDP2	I	CSI0_D2P
J402	38	RDN2	I	CSI0_D2M
J402	39	RDP3	I	CSI0_D3P
J402	37	RDN3	I	CSI0_D3M
J402	42	ROP	I	CSI0_CLKP
J402	44	RCN	I	CSI0_CLKM

Table 3-9 CSI1 Signal Pins

Connector#	PIN#	PIN name	I/O	Description
J402	75	RDP0_A	I	CSI1_D0P
J402	73	RDN0_A	I	CSI1_D0M
J402	71	RDP1_A	I	CSI1_D1P
J402	69	RDN1_A	I	CSI1_D1M
J402	54	RDP2_A	I	CSI1_D2P
J402	52	RDN2_A	I	CSI1_D2M
J402	50	RDP3_A	I	CSI1_D3P
J402	48	RDN3_A	I	CSI1_D3M
J402	59	ROP_A	I	CSI1_CLKP
J402	61	RCN_A	I	CSI1_CLKM

3.8 Audio

SB52 SOM provides a Master I2S input/output interface from I500, 2 PDM interface for DMIC and 1 earphone interface from MT6358.

SB52SOM supports I2S audio interface with below feature,

- Audio content sampling rates supported: 8kHz to 192kHz

- Audio content sample formats supported: 8-bit/16-bit/24-bit, Mono/stereo

- Interface supported: I2S, PCM

- External CODEC I2S interface supports 16-bit/24-bit, Mono/Stereo, 8kHz to 192kHz

Table 3-10 I2S Signal Pins

Connector#	PIN#	PIN name	I/O	Description
J401	46	I2S1_LRCK	O	I2S LRCK
J401	48	I2S1_BCK	O	I2S BCK
J401	50	I2S1_DO	O	I2S DO
J402	68	I2S1_MCK	O	I2S MCLK
J402	66	I2S2_DI	I	I2S DI

Table 3-11 other Audio Signal Pins

Connector#	PIN#	PIN name	I/O	Description
J401	37	AU_VIN0_N	I	PDM for DMIC
J401	35	AU_VIN0_P	I	PDM for DMIC
J401	51	AU_VIN1_N	I	earphone MIC input
J401	49	AU_VIN1_P	I	earphone MIC input
J401	33	AU_VIN2_N	I	PDM for DMIC
J401	39	AU_REFN	GND	earphone line out reference GND
J401	41	AU_HPR	O	earphone line out
J401	43	AU_HPL	O	earphone line out
J401	53	ACCDET	I	Accessory detection input
J401	55	HP_EINT	I	HPL detection

3.9 USB

SB52 SOM provides high speed USB functionality conforms to the USB2.0. The OTG controller conforms to OTG2.0 specification.

Table 3-12 USB Signal Pins

Connector#	PIN#	PIN name	I/O	Description
J401	61	USB_DP	I/0	USB DP
J401	59	USB_DM	I/0	USB DM
J402	11	IDDIG	I	USB ID
J401	12	VBUS	P	USB VBUS

3.10 GPIO

All the IOs from i500 can be configured to GPIO purposes. For more detail pin-mux table please see the reference documents [1].

4 Reference Documents

1. MT8167A_Technical _Brief datasheet.
2. MT6385_PMIC_Data_Sheet.
3. MT7668AUN_MT7668AEN_MT7668ASN_Datasheet

5 How to Process SB52

SB52 is base on Android 10 OS , to access SB52, please install display share tools in PC

If you have no ADB driver, You can find ADB driver from web side or download form [android link](#)

There are many APPs you can use, you can download tools from web side:

For example:

1. Google Vyser

Vysor lets you view and control your Android on your computer. Easy peasy.

Please find Vysor App under link: http://www.vysor.io/download/

2. Scrcpy APP,

This application provides display and control of Android devices connected on USB (or over TCP/IP). It does not require any *root* access. It works on *GNU/Linux*, *Windows* and *MacOS*

Please find scrcpy App under link: https://github.com/Genymobile/scrcpy

Getting Started

The Module can function with external EVB board and only DC power input only, and no battery included.

Once you've plug in the DC adapter, you can turn on your SB52 and start using it.

Set up your SB52 for the first time

Please follow the instruction showed on the SB52.

Home
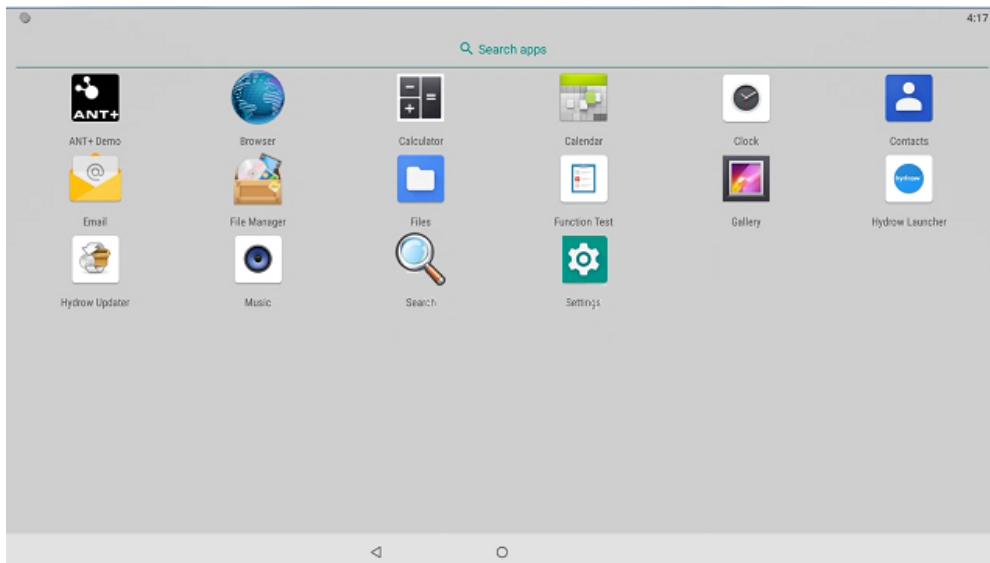
The Home screen is your starting point for using the applications on your SB52.

## *There are many programs on applications ,*

Enjoy the SB52 !!
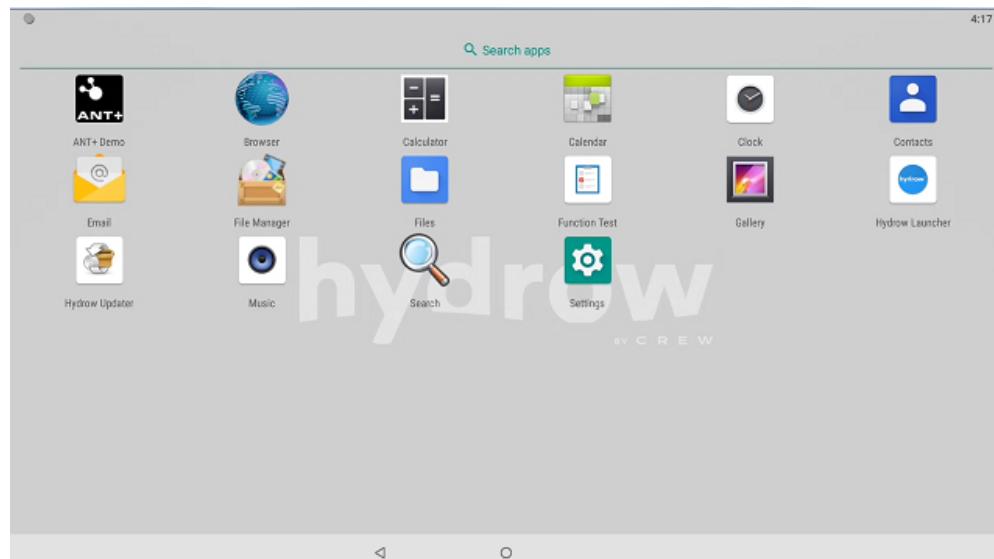
Setting Wireless connection:

**1.Quick setting: Swipe down to show quick setup options**
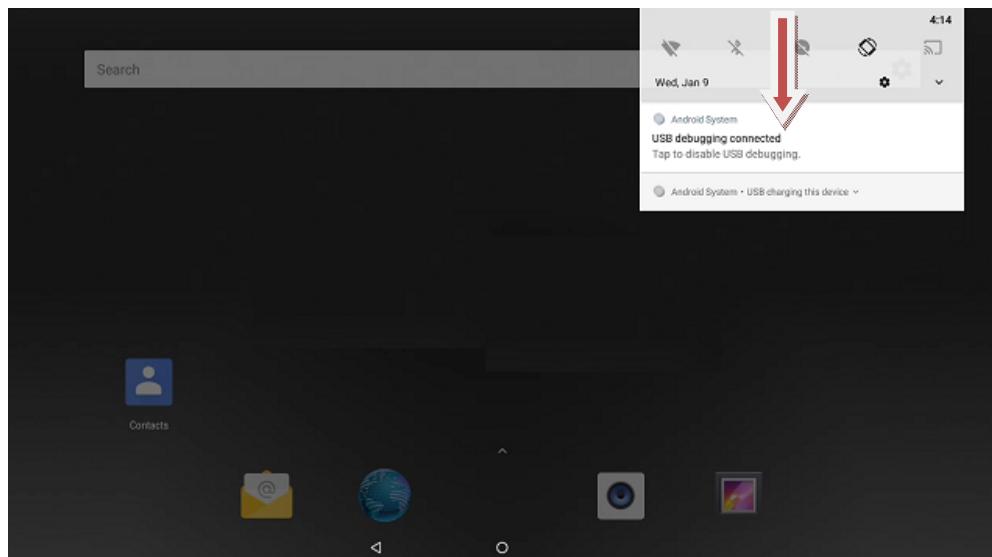
2.1 Normal setting: To have WLAN and BT connection
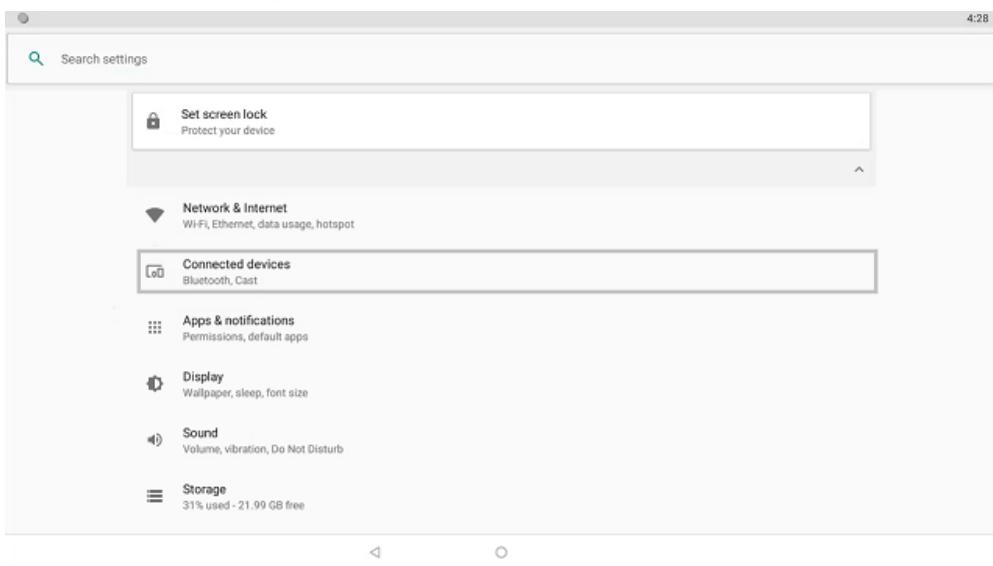
1. **Make device discoverable**: Under "Settings", choose "Connected devices". Tap "Bluetooth" to turn on it and tap "Search for devices". The Bluetooth indicator then appears in the status bar.
2. **Scan for devices**: After scanning, there will be a list of the IDs of all available Bluetooth devices in range. If the device you want to pair with isn't in the list, ensure that the other device is turned on and set to be discoverable.
3. **Pair with the Bluetooth device**: Tap the name of an available Bluetooth device to pair with. In the popup "Bluetooth pairing request" dialog, type a PIN. If the pairing is successful, your SB52 connects to the device.

2.2 Normal setting: To have WLAN
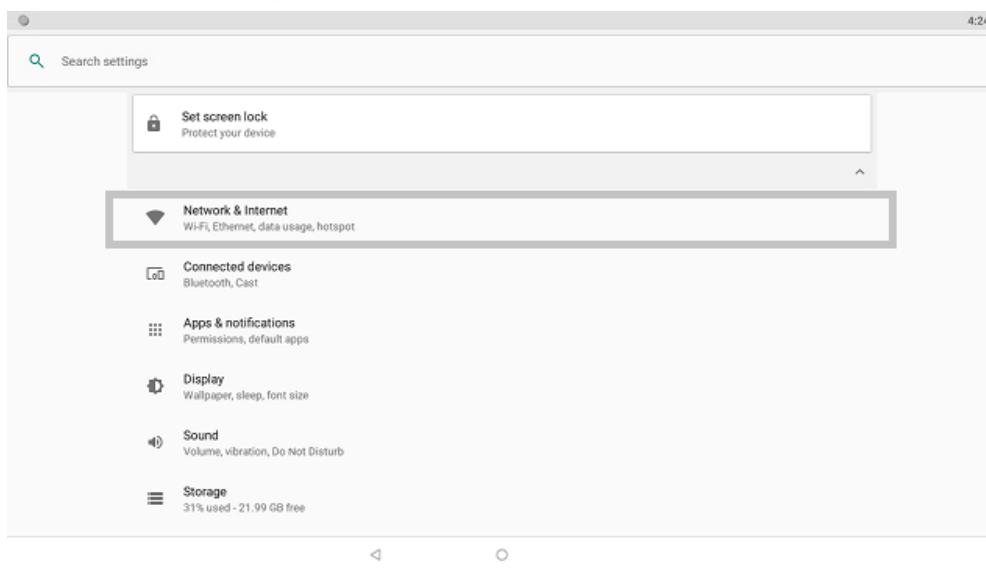
1. **Make device discoverable**: Under "Settings", choose "Network and internet". Tap "Wi-iFi" to turn on it and Searching Access Point devices.
2. **Scan for device**s: After scanning, there will be a list of the APs SSID of all available APs devices in range. If the device you want to connect with isn't in the list, ensure that the other device is turned on and set to be discoverable.
3. **Connect to the WLAN APs**: Tap the name of an available Bluetooth device to pair with. In the popup "Bluetooth pairing request" dialog, type a PIN. If the pairing is successful, your SB52 connects to the device.

Federal Communication Commission Interference Statement

15.19

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.

15.105

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.

15.21

Any changes or modifications not expressly approved by the party responsible for compliance could void the authority to operate equipment.

This device and its antenna must not be co-
located or operating in conjunction with any other antenna or transmitter.

End-users and installers must be provided with antenna installation instructions and transmitter operating conditions for satisfying RF exposure compliance.

For product available in the USA/Canada market, only channel 1~11 can be operated. Selection of other channels is not possible

FCC RF Radiation Exposure Statement:

This module is intended for OEM integrator. The OEM integrator is still responsible for the FCC compliance requirement of the end product,

which integrates this module. 20cm minimum distance has to be able to be maintained between the antenna and the users for the host this

module is integrated into. Under such configuration, the FCC radiation exposure limits set forth for an population/uncontrolled environment can

be satisfied.

Any changes or modifications not expressly approved by the manufacturer could void the user's authority to operate this equipment.

USERS MANUAL OF THE END PRODUCT:

In the users manual of the end product, the end user has to be informed to keep at least 20cm separation with the antenna while this end

product is installed and operated. The end user has to be informed that the FCC radio-frequency exposure guidelines for an uncontrolled

environment can be satisfied. The end user has to also be informed that any changes or modifications not expressly approved by the

manufacturer could void the user's authority to operate this equipment.

END PRODUCT LABELING :

This transmitter module is authorized only for use in devices where the antenna may be installed such that 20 cm may be maintained between the antenna and users (for example access points, routers, wireless ASDL modems, certain laptop configurations, and similar equipment).

The final end product must be labeled in a visible area with the following: "Contains TX FCC ID: YAISB52".

If the size of the end product is larger than 8x10cm, then the following FCC part 15.19 statement has to also be available on the label: This device complies with Part 15 of 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.

Antennas

Brand name	Model name	Antenna type	Antenna gain	Antenna connector
BJTEK	TH96-120mm-ipex & Holder	Monopole	3.14(dBi)	ipex

Label and Compliance Information

Product manufacturers need to provide a physical or e-label stating

"Contains FCC ID: YAISB52" with finished product

Information on Test Modes and Additional Testing Requirements

Test tool: Android debug bridge shall be used to set the module to transmit continuously.