
# Hardware Manual
# Bubblegum96

Version：1.1

2016-5-18

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# Contents

Revision History

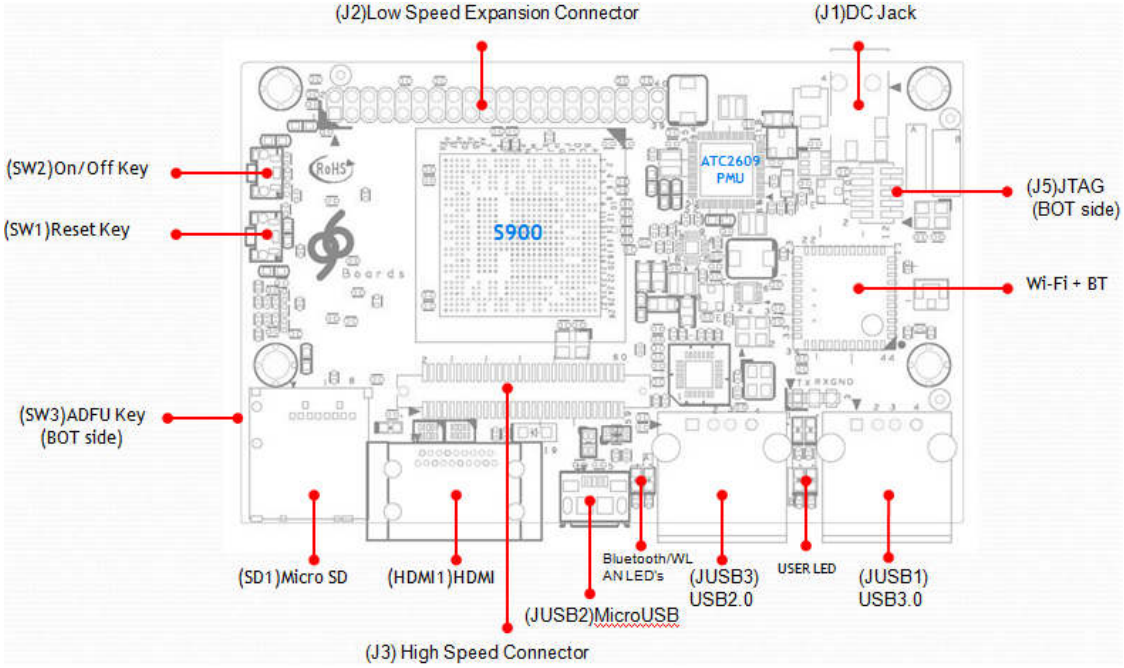
| Date | Revision | Description |
|---|---|---|
| 2015-11-26 | 1.0 | First Release |
| 2016-05-18 | 1.1 | Replace pictures and add UART debug part |

# 1 Introduction

The Bubblegum96 is a 96Boards compliant community board based on Actions S900 series of SoC's. The following table lists its key features:

| | |
|---|---|
| Processor | Actions -S900<br>CPU:Quad-core ARM® Cortex® A53 at up to 1.6 GHz per core<br>64-Bit capable<br>GPU:imagination PowerVR G6230<br>OpenGL ES 3.1, OpenGL 3.2, DirectX 10,OpenCL 1.2EP |
| Memory/ Storage | 2GB LPDDR3 533MHz<br>8GB eMMC 4.51<br>SD 3.0 |
| Video | 1080p@60fps HD video playback and capture with H.264 (AVC),<br>4096*2304@30fps playback with H.265 (HEVC) |
| Display | HDMI 1.4b with HDCP (HDMI connector type A/C), up to 4K Ultra |
| Audio | PCM/AAC+/MP3/WMA, |
| Connectivity | WLAN 802.11a/b/g/n 2.4GHz, Bluetooth 4.1<br>One USB 3.0 Type A (Host mode and ADB mode)<br>One USB 2.0 micro B (Host & device mode)<br>One USB 2.0 Type A(Host mode, not support USB Hub. |
| I/O Interfaces | One 40-pin Low Speed (LS) expansion connector<br>• UART, SPI, I2S, I2C x2, GPIO x12, DC power<br>One 60-pin High Speed (HS) expansion connector<br>• 4L-MIPI DSI, USB, I2C x2, 2L+4L-MIPI CSI<br>The board can be made compatible using an add-on mezzanine board<br>One JTAG Header option. |
| External Storage | Micro SD card slot |
| User Interface | Power/Reset Key<br>ADFU Key<br>6 LED indicators<br>• 4 - user controllable<br>• 2 - for radios (BT and WLAN activity) |
| OS-support | Android 5.1<br>Linux based on Debian |
| Power, Mechanical and Environmental | Power: +6.5V to +18V<br>Dimensions: 54mm by 85mm meeting 96Boards™ Consumer Edition standard dimensions specifications.<br>Operating Temp: 0°C to +70°C<br>RoHS and Reach compliant |

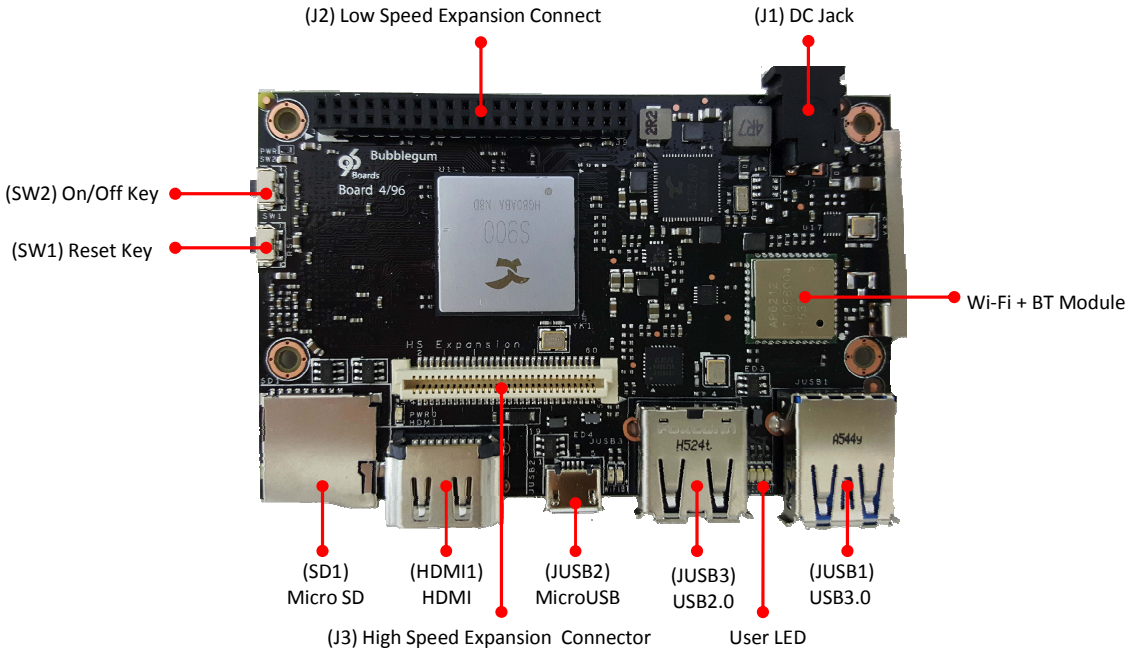
## 1.1 Board overview



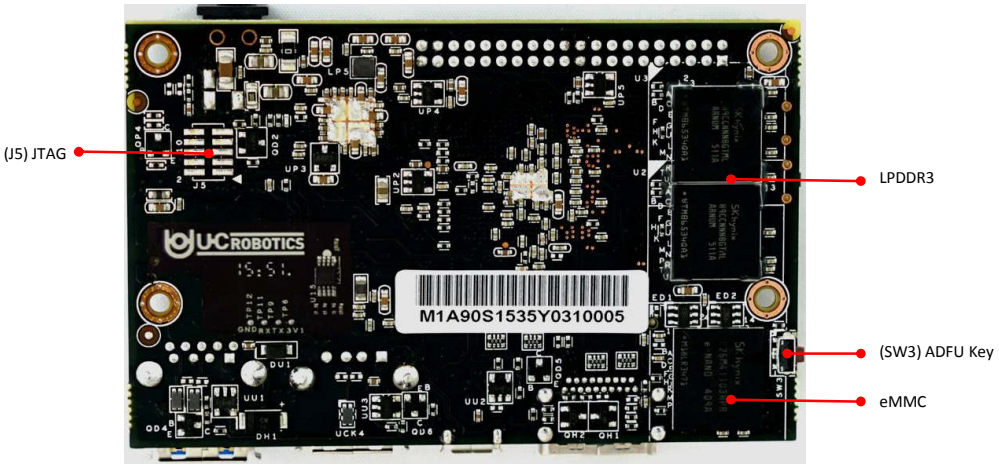

| Part Ref | Description | | Part Ref | Description |
|---|---|---|---|---|
| (J2) | LS EXPANSION CNT | | (J1) | DC IN JACK |
| (SW2) | ON/OFF Key | | (J5) | JTAG |
| (SW1) | Reset Key | | (U4) | WiFi+BT Module |
| (SW3) | ADFU Key | | (JUSB1) | USB3.0 |
| (SD1) | Micro SD | | (LED0~3) | USER LEDs |
| (HDMI1) | HDMI PLUG | | (JUSB3) | USB2.0 |
| (J3) | High Speed EXP CNT | | (WiFi/BT LED) | WiFi/BT LEDs |
| (JUSB2) | Micro USB | | (UP1) | PMIC-ATC2609 |
| (U1-1) | SoC-S900 | | | |

# 2 PCB TOP & BOT Side

Top side view of the Bubblegum96




Bottom side view of the Bubblegum96



# 3 Getting started

## 3.1 Prerequisites

Before you power up your Bubblegum96 board for the first time you will need the following:

1. Bubblegum96 Board
2. 96Boards compliant power supply 12V/2A (sold separately by Arrow).
3. HDMI or DVI LCD Monitor that supports a resolution of 1080P/30Hz.
4. HDMI-HDMI cable or HDMI-DVI cable to connect the board to the Monitor.
5. Computer keyboard with USB interface
6. Computer mouse with USB interface.

## 3.2 Starting the board for the first time

To start the board, follow these simple steps:

step 1. Connect the HDMI cable to the Bubblegum-96 Board HDMI connector and to the LCD Monitor.

step 2. Connect the keyboard to the boards USB connector marked USB3.0/USB2.0 Connector and the mouse to the USB3.0/2.0 connector (It doesn't matter which order you connect them in. You can also connect via an external USB Hub to USB3.0 Connector.)

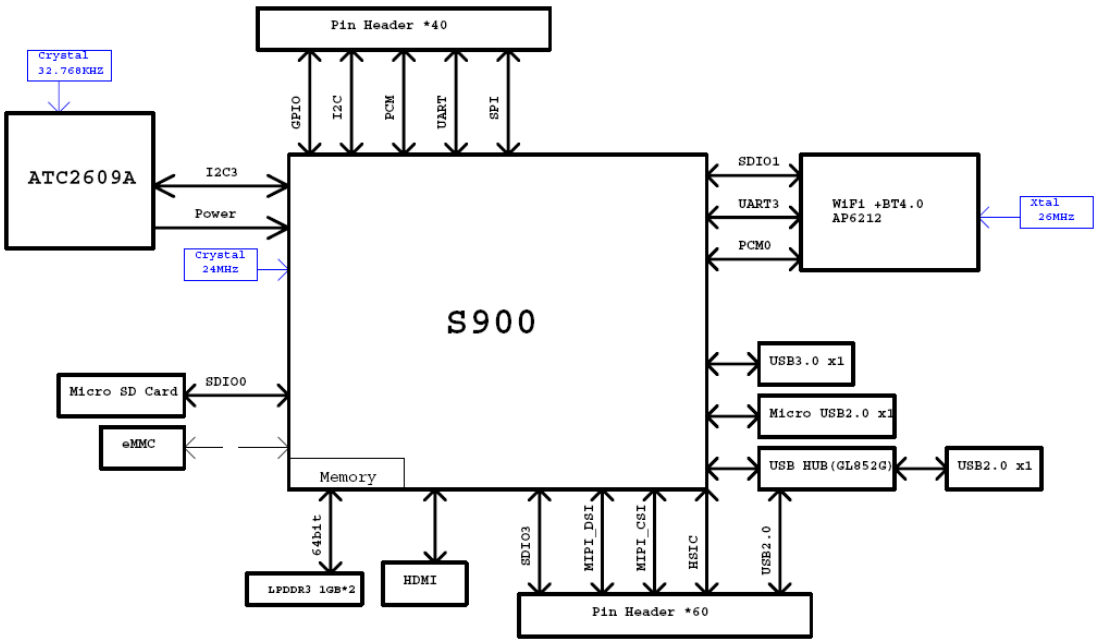
step 3. Connect the power supply to DC Jack.

Once you plug the power supply into a power outlet the board will start the booting process, and you should see Android boot up.

Please note that the first boot takes several minutes due to Androids initialization. Subsequent boot times should be faster.

# 4 Bubblegum96 S900 Overview

## 4.1 System Block diagram




## 4.2 Processor

The Bubblegum96 is a 96Boards compliant community board based on Actions S900 series of SoC's.
CPU Quad-core ARM® Cortex® A53 at up to 1.8 GHz per core ,supports both DDR3 / LP-DDR3 SDRAM interface,. 64-Bit capable
GPU:imagination PowerVR G6230
OpenGL ES 3.1, OpenGL 3.2, DirectX 10,OpenCL 1.2EP

## 4.3 Memory

The Bubblegum96 uses 2GB LPDDR3 DRAM & 8GB eMMC flash memory solution.

- The LPDDR3 is a 32bit width bus implementation interfacing directly to the S900 build-in LPDDR controller. The DDR clock up to 533Mhz
- The eMMC is an 8bit implementation interfacing with S900 N0 interface supporting eMMC 4.5 specifications.

## 4.4 MicroSDHC

The 96Boards specification calls for a microSDHC socket to be present on the board.
The Bubblegum96 SD slot (SD1) signals are routed directly to the S900 SDIO0 interface. The slot is a push-push type with a dedicated support for card detect signal (many SD slots do not have a dedicated CD pins, they use DATA3 state as the card detected signal). The Bubblegum-96 board uses GPIOE14 as the CARD_DT

## 4.5 WiFi/BT

The 96Boards specifications calls for a WiFi (minimally 802.11g/n) and Bluetooth 4.1 (Bluetooth Low Energy)

The Bubblegum96 board deployed Broadcom-43438 chip solution

- WLAN compliant with IEEE 802.11 b/g/n specifications, meeting 96Boards minimal requirements for WiFi.
- Bluetooth compliant with the BT specifications version 4.1 (BLE), meeting the 96Boards requirements for BT

## 4.6 Display Interface

### 4.6.1 HDMI

The 96Boards specification calls for an HDMI port to be present on the board. The S900 built-in HDMI interface Module consists of HDMI Video interface, HDMI Audio interface and HDMI Transmitter Core Transmitter code witch HDCP and fully compliant with the HDMI 1.4b,MHL2.1,DVI 1.0 & HDCP 1.4 Specifications, so it can support 480P to 4K*2K@30Hz

### 4.6.2 MIPI-DSI

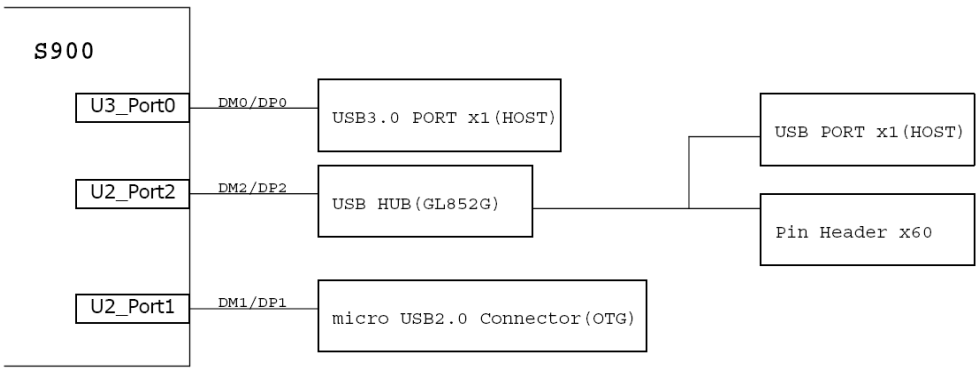
The 96Boards specification calls for a MIPI-DSI implementation via the High Speed Expansion Connector. The S900 implemented a four-lane MIPI_DSI interface meeting this requirement. More information about this implementation can be found in High speed expansion connector(J3).

## 4.7 Camera Interfaces

The 96Boards specification calls for two camera interfaces.

The S900 implements two camera interfaces, one with a 4-lane MIPI_CSI interface and one with two-lane MIPI_CSI interface, meeting this requirement. More information about this implementation can be found in High speed expansion connector(J3).

## 4.8 USB Ports



### 4.8.1 USB-Host ports

The 96Boards specification calls for three USB host ports. The S900 includes a 3 channel.

- S900 U3_Port0(see JUSB1 USB3.0 TypeA Connector) is USB3.0 Support Supper Speed(5Gb/s),High Speed(480Mb/s) and Full Speed(12Mb/s)Support in Host mode, and also can Support USB HUB,
  U3 Port0 can support Device/ADB mode but need use UART Command to Change mode.
  U3 Port0 can support Image Update(ADFU), Please see for detailed information on the "ADFU Operating Instructions.
- S900 U2_Port2(see JUSB2 USB2.0 TypeA Connector) is USB3.0 Support High Speed(480Mb/s) and Full Speed(12Mb/s)Support in Host mode, But it can't support USB HUB over2 levels series.

### 4.8.2 USB-Device port

The 96Boards specification calls for a USB port to be implemented as an OTG port or a device port.
The Bubblegum96 board implements a device port. The port is located at JUSB2, a MicroUSB type B.
***Please note:*** *Micro USB can work in one mode at a time, Host mode or Device mode, not both.*

## 4.9 Audio

The 96Boards specifications calls for a minimum of single channel audio through two interfaces, BT and HDMI/MHL/DisplayPort
The Bubblegum96 meets this requirement,BT Audio From WiFi module use PCM Interface that connects directly to the S900 SoC, The S900 built-in HDMI interface Module that Included of HDMI Audio interface.

## 4.10 DC-power and Battery Power

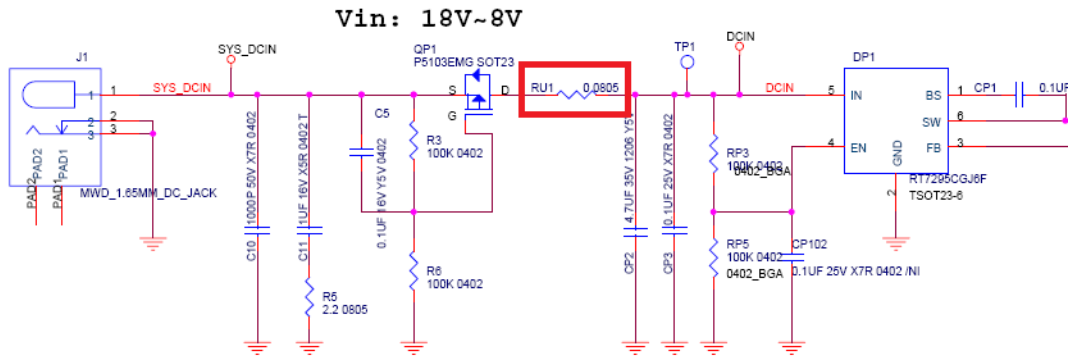
The 96Boards specification calls for power to be provided to the board in one of the following ways:

An 8V to 18V power from a dedicated DC jack
An 8V to 18V power from the SYS_DCIN pins on the Low Speed Expansion Connector
A USB Type C port at 5V

The Bubblegum96 meets this requirement , but not support USB Port Provide Power.

## 4.11 Measurements

The 96Boards specification calls for support for measuring power consumptions of the board. Bubblegum96 can use A 0.1ohm resistor is placed in line to the SYS_DCIN power line coming from J1 (please note that this power in measurement only works for SYS_DCIN from J1, it will not measure SYS_DCIN applied from the Low Speed Expansion Connector). Placing a probe over this resistor will provide a voltage measurement of the voltage drop across the resistor. Dividing this measurement by 0.1 will give you the amount of the current flowing into the board. The board provides a means to use ARM Energy probe for this measurement,




## 4.12 Buttons

The 96Boards specification calls for the present of two buttons, a Power on/sleep button and a Reset button. The Bubblegum96 meets these requirements. And has Additional (SW3)ADFU Key For Debug.

(SW1) – Reset Key.

(SW2) – ON/OFF Key

(SW3) – ADFU Key

## 4.13 External Fan connection

The 96Boards specification calls for support for an external fan. That can be achieved by using the 5V or the SYS_DCIN, both present on the Low Speed Expansion connector.

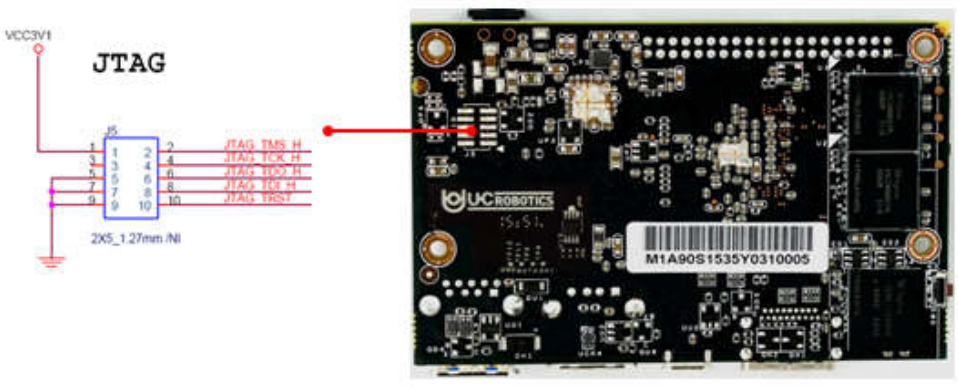
## 4.14 UART

The 96Boards specification calls for support for one UART port and an optional second UART, both of them will be routed to the Low Speed Expansion Connector.

The Bubblegum96 meets these requirements. It has "4-wire port - S900 UART2" & "2-wire port - S900 UART5". By default, software layer configure S900 UART5 as the UART debug port, early boot info, u-boot output, and kernel dmesg will route to this port. Definitely, user would like to connect to S900 UART5 as u-boot serial console & kernel serial console (ttyS5).

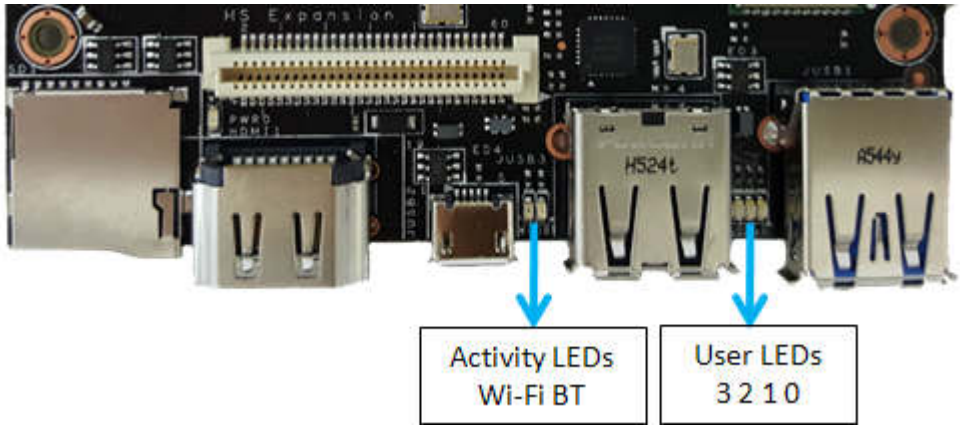
## 4.15 JTAG

The 96Boards specification does not call for a dedicated JTAG connector. The Bubblegum-96 meets these requirements, The J5 connector does have a JTAG connector pitch and pin define as follow.



## 4.16 System and user LEDs

The 96Boards specifications calls for six LEDs to be implemented on the board. The specification defines the LEDs color and mechanical location on the board.




**Two activity LEDs:**

- WiFi activity LED – Bubble-96 board drives this Yellow LED via GPIOA14 from the S900.
- BT activity LED –Bubble-96 board drives this Blue LED via GPIOA18 from the S900..

**Four User-LED's:**

The four user LEDs are surface mount Green in 0603 size located next to the two USB type A connector and labeled 'USER LEDS 4 3 2 1'. The Bubblegum-96 board drives four LEDs from the S900

- LED0- S900 GPIOA19
- LED1- S900 GPIOA20
- LED2- S900 GPIOF1
- LED3- S900 GPIOF2.

## 4.17 Expansion Connector

The 96Boards specification calls for two Expansion Connectors, a Low Speed and a High Speed.
The Bubblegum96 meets this requirement, please review section 5.0 for detailed information regarding the Low Speed Expansion Connector and section 6.0 for detailed information regarding the High Speed Expansion Connector.

## 4.18 Additional Functionality

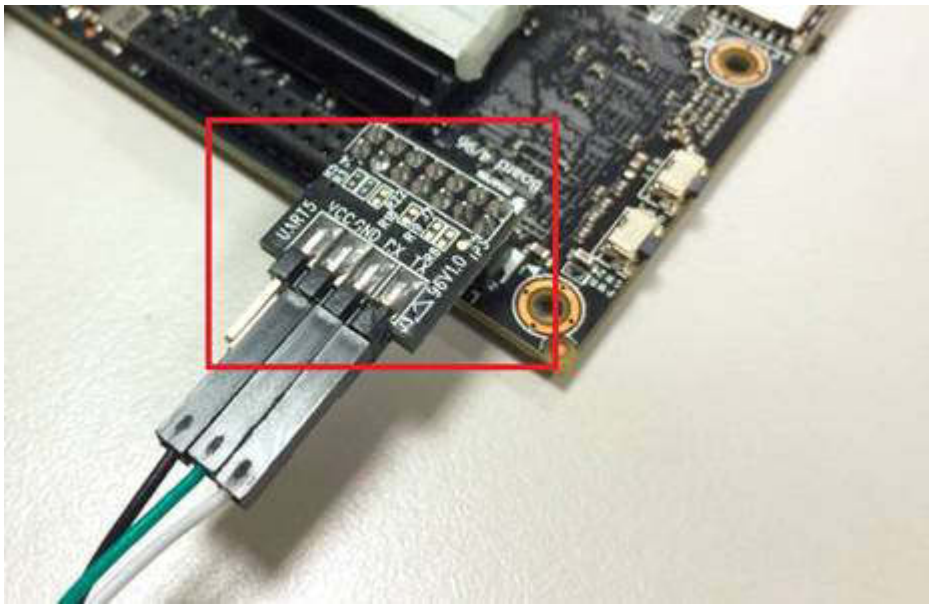
The 96Boards specifications allows for additional functionality provided that all mandatory functionality is available and there is no impact on the physical footprint specifications including height and do not prevent the use of the 96Boards CE low speed and high speed expansion facilities
The 96 board implements a few additional functions, which are listed in the following sub-chapters.

### 4.18.1 ADFU Key

U3 Port0 can support Image Update (ADFU), Please see for detailed information on the "ADFU Operating Instructions.

### 4.18.2 UART Debug Test Port

The Bubblegum96 has Additional TP9(TX),TP11(RX) Key For Debug as second option, by default the software using S900 UART5 as default debug port, please check 4.14




The following tables show the Low Speed Expansion Connector pin out:

| PIN | 96Boards Signals | UART Debug expansion board | UART to USB Cable |
|---|---|---|---|
| 1 | GND | GND | Black color |
| 11 | S900 UART5_TX | TOP Side UART5_TX | White color |
| 13 | S900 UART5_RX | TOP Side UART5_RX | Green color |

# 5 Low speed expansion connector


The following tables show the Low Speed Expansion Connector pin out:

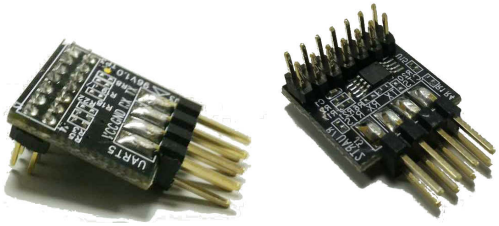
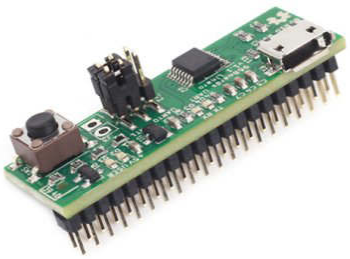
| PIN | 96Boards Signals | Bubblegum96-S900 | Note |
|---|---|---|---|
| 1 | GND | GND | |
| 3 | UART0_CTS | GPIOB17/UART0_TX/UART2_CTSB | S900 UART2 |
| 5 | UART0_TxD | GPIOB15/UART2_TX | S900 UART2 |
| 7 | UART0_RxD | GPIOB14/UART2_RX | S900 UART2 |
| 9 | UART0_RTS | GPIOB16/UART0_RX/UART2_RTSB | S900 UART2 |
| 11 | UART1_TxD | GPIOA27/UART5_TX/SENS0_HSYNC/PWM2/ERAM_A11 | S900 UART5 |
| 13 | UART1_RxD | GPIOA25/UART5_RX/SENS0_VSYNC/PWM2/ERAM_A9 | S900 UART5 |
| 15 | I2C0_SCL | GPIOB22/I2C1_SCLK | S900 I2C1 |
| 17 | I2C0_SDA | GPIOB23/I2C1_SDATA | S900 I2C1 |
| 19 | I2C1_SCL | GPIOB24/I2C2_SCLK | S900 I2C2 |
| 21 | I2C1_SDA | GPIOB25/I2C2_SDATA | S900 I2C2 |
| 23 | GPIO-A | GPIOA0/SPI2_SCLK/PWM0/ETH_TXD0 | |
| 25 | GPIO-C | GPIOA2/PWM2/ETH_TXEN | |
| 27 | GPIO-E | GPIOA4/SPI2_MISO/ETH_CRS_DV | |
| 29 | GPIO-G | GPIOA6/UART2_CTSB/PWM1/ETH_RXD0 | |
| 31 | GPIO-I | GPIOA8/PWM2/UART2_RX/ETH_MDC | |
| 33 | GPIO-K | GPIOE27/N1_CLE | |
| 35 | +1V8 | VCC1V8_IO | |
| 37 | +5V | SYSPWR_4.8V | |
| 39 | GND | GND | |

| PIN | 96Boards Signals | 96Board-S900 | Note |
|---|---|---|---|
| 2 | GND | GND | |
| 4 | PWR_BTN_N | GPIOE22/SD3_D6/N1_D6 | |
| 6 | RST_BTN_N | GPIOE23/SD3_D7/N1_D7 | |
| 8 | SPI0_SCLK | GPIOB8/I2C3_SCLK/SPI0_SCLK | |
| 10 | SPI0_DIN | GPIOB11/I2C3_SDATA/SPI0_MOSI | |
| 12 | SPI0_CS | GPIOB9/I2S_LRCLK1/PCM1-0_OUT/PWM4/SPI0_SS | |
| 14 | SPI0_DOUT | GPIOB10/I2S_MCLK1/PCM1-0_IN/PWM5/SPI0_MISO | |
| 16 | PCM_FS | GPIOD7/PCM1_SYNC/OBN | Not Support I2S |
| 18 | PCM_CLK | GPIOD6/PCM1_CLK/OBP | Not Support I2S |
| 20 | PCM_DO | GPIOD5/PCM1_OUT/OCN | Not Support I2S |
| 22 | PCM_DI | GPIOD4/PCM1_IN/OCP | Not Support I2S |
| 24 | GPIO-B | GPIOA1/SPI2_SS/PWM1/ETH_TXD1 | |
| 26 | GPIO-D | GPIOA3/PWM3/ETH_RXER | |
| 28 | GPIO-F | GPIOA5/UART2_RTSB/PWM0/ETH_RXD1 | |
| 30 | GPIO-H | GPIOA7/SPI2_MOSI/UART4_TX/ETH_REF_CLK | |
| 32 | GPIO-J | GPIOA9/PWM3/UART2_TX/ETH_MDIO | |
| 34 | GPIO-L | GPIOE26/N1_ALE | |
| 36 | SYS_DCIN | SYS_DCIN | |
| 38 | SYC_DCIN | SYS_DCIN | |
| 40 | GND | GND | |

## 5.1 UART {2/5}

The 96Boards specification calls for a 4-wire UART implementation, S900 UART2 and an optimal second 2-wire UART, S900 UART5 on the Low Speed Expansion Connector.

- The Bubblegum96 board implements **UART2** as a 4-wire UART that connects directly to the S900 SoC. These signals are driven at 1.8V. Actually, it corresponds to 96board UART Serial Adapter **UART0.**
- The Bubblegum96 board implements UART5 as a 2-wire UART that connects directly to the S900 SoC. These signals are driven at 1.8V. It corresponds to 96board UART Serial Adapter **UART1**.

| Actions debug board | 96board UART Serial Adapter |
|---|---|
|  |  |
| **UART2** (bottom) is for CTS/RTS | **UART0** for is CTS/RTS |
| **UART5** (top) is the default console | **UART1** is the default console |

## 5.2 I2C {0/1}

The 96Boards specification calls for two I2C interfaces to be implemented on the Low Speed Expansion Connector.
The Bubblegum96 board implements both interfaces, I2C1 and I2C2 that connects directly to the S900 SoC. A 2K2 resistor is provided as pull-up for each of the I2C lines per the I2C specifications, these pull-ups are connected to the 1.8V voltage rail.

## 5.3 GPIO {A-L}

The 96Boards specifications calls for 12 GPIO lines to be implemented on the Low Speed Expansion Connector. Some of these GPIOs may support alternate functions for DSI/CSI control
The Bubblegum96 board implements this requirement. 12 GPIOs are routed to the S900 SoC. It is a 1.8V signal.

## 5.4 SPI 0

The 96Boards specification calls for one SPI bus master to be provided on the Low Speed Expansion Connector.
The Bubblegum96 board implements a full SPI master with 4 wires, CLK, CS, MOSI and MISO all connect directly to the S900 SoC. These signals are driven at 1.8V.

## 5.5 PCM/I2S

The 96Boards specification calls for one PCM/I2S bus to be provided on the Low Speed Expansion Connector. The CLK, FS and DO signals are required while the DI is optional.
The Bubblegum96 implements a PCM1 with 4 wires, CLK, FS, DO and DI signal are routed to the S900 SoC. The PCM1 signals are connected directly to the S900 SoC. These signals are driven at 1.8V.

However the S900 PCM1 Can't Change to I2S Functions, this issue will be addressed on a future revision of the 96Board board.

## 5.6 Power and Reset

The 96Boards specification calls for a signal on the Low Speed Expansion Connector that can power on/off the board and a signal that serves as a board reset signal.

- The Bubblegum96 board routes the PWR_BTN_N (named GPIOE22/PWR_BTN_N on S900 schematic).
- The Bubblegum96 board routes the RST_BTN_N (named GPIOE23/RST_BTN_N on S900 schematic)

## 5.7 Power Supplies

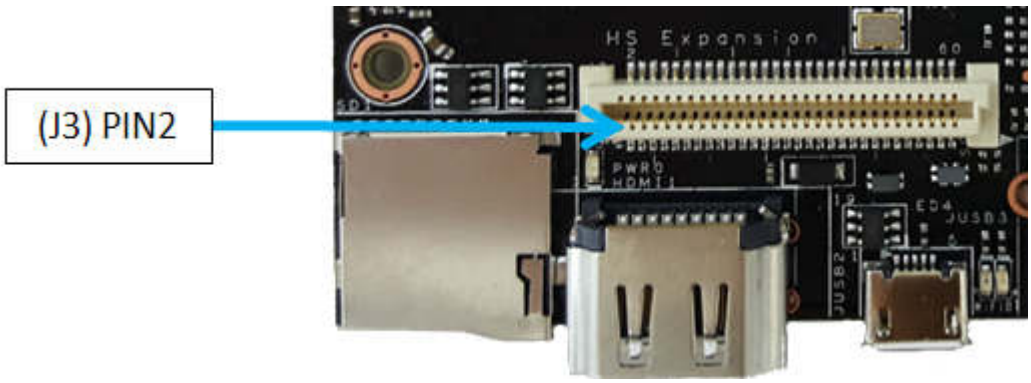
The 96Boards specification calls for three power rails to be present on the Low Speed Expansion Connector:

- +1.8V : Max of 100mA
- +5V : Able to provide a minimum of 5W of power (1A).
- SYS_DCIN : 9-18V input with enough current to support all the board functions or the output DCIN from on-board DC Connector able to provide a minimum of 7W of power.

The Bubblegum96 board supports these requirements as follows:

- +1.8V : Driven by ATC2609 PMIC LDO7 can provide 200mA,so it meets the 96Boards requirement.
- +5V : Driven by the 3.5A 5.0V buck switcher (DP1). This buck switcher powers both USB limit current devices (each at 1A max). The remaining capacity provides a max current of 1.5A to the Low Speed Expansion Connector, for a total of 7.5W which meets the 96Boards requirements.
- SYS_DCIN: Can serves as the board's main power source or can receive power from the board.

# 6 High speed expansion connector




The following table shows the High Speed Expansion Connector pin out:

| PIN | 96Boards Signals | Bubblegum-96 S900 Signals | Note |
|---|---|---|---|
| 1 | SD_DAT0/SPI1_DOUT | GPIOE16/SD3_D0/N1_D0 | |
| 3 | SD_DAT1 | SGPIOE17/SD3_D1/N1_D1 | |
| 5 | SD_DAT2 | GPIOE18/SD3_D2/N1_D2 | |
| 7 | SD_DAT3/SPI1_CS | GPIOE19/SD3_D3/N1_D3 | |
| 9 | SD_SCLK/SPI1_SCLK | GPIOE29/SD3_CLK/N1_CEB1 | |
| 11 | SD_CMD/SPI1_DIN | GPIOE25/SD3_CMD/N1_DQSN | |
| 13 | GND | GND | |
| 15 | CLK0/CSI0_MCLK | GPIOC4/SEN_PCLK | |
| 17 | CLK1/CSI1_MCLK | GPIOC11/SEN_CKOUT | |
| 19 | GND | GND | |
| 21 | DSI_CLK+ | GPIOD24/PCM1_IN/DSI_CP | |
| 23 | DSI_CLK- | GPIOD25/PCM1_OUT/DSI_CN | |
| 25 | GND | GND | |
| 27 | DSI_D0+ | GPIOD26/PCM1_CLK/DSI_DP0 | |
| 29 | DSI_D0- | GPIOD27/PCM1_SYNC/DSI_DN0 | |
| 31 | GND | GND | |
| 33 | DSI_D1+ | GPIOD22/UART2_RTSB/DSI_DP1 | |
| 35 | DSI_D1- | GPIOD23/UART2_CTSB/DSI_DN1 | |
| 37 | GND | GND | |
| 39 | DSI_D2+ | GPIOD28/UART4_RX/DSI_DP2 | |
| 41 | DSI_D2- | GPIOD29/UART4_TX/DSI_DN2 | |
| 43 | GND | GND | |
| 45 | DSI_D3+ | GPIOD20/UART2_RX/DSI_DP3 | |
| 47 | DSI_D3- | GPIOD21/UART2_TX/DSI_DN3 | |
| 49 | GND | GND | |
| 51 | USB_D+ | USBHUB1_DPC | From USB Hub(GL852G) |

| | | | |
|---|---|---|---|
| 53 | USB_D- | USBHUB1_DMC | From USB Hub(GL852G) |
| 55 | GND | GND | |
| 57 | HSIC_STR | HSIC_DQS | |
| 59 | HSIC_DATA | HSIC_DQ | |

| PIN | 96Boards Signals | Bubblegum-96 S900 Signals | Note |
|---|---|---|---|
| 2 | CSI0_C+ | GPIOB31/SENS0_D1/SENS0_HSYNC/CSI0_CP | |
| 4 | CSI0_C- | GPIOB30/SENS0_D0/SENS0_VSYNC/CSI0_CN | |
| 6 | GND | GND | |
| 8 | CSI0_D0+ | GPIOB27/SENS0_D3/CSI0_DP0 | |
| 10 | CSI0_D0- | GPIOB26/SENS0_D2/CSI0_DN0 | |
| 12 | GND | GND | |
| 14 | CSI0_D1+ | GPIOB29/SENS0_D5/CSI0_DP1 | |
| 16 | CCSI0_D1- | GPIOB28/SENS0_D4/CSI0_DN1 | |
| 18 | GND | GND | |
| 20 | CSI0_D2+ | GPIOC1/SENS0_D7/CSI0_DP2 | |
| 22 | CSI0_D2- | GPIOC0/SENS0_D6/CSI0_DN2 | |
| 24 | GND | GND | |
| 26 | CSI0_D3+ | GPIOC3/SENS0_D9/CSI0_DP3 | |
| 28 | CSI0_D3- | GPIOC2/SENS0_D8/CSI0_DN3 | |
| 30 | GND | GND | |
| 32 | I2C2_SCL | GPIOB18/UART4_RX/I2C4_SCLK | |
| 34 | I2C2_SDA | GPIOB19/UART4_TX/I2C4_SDATA | |
| 36 | I2C3_SCL | GPIOB13/SPDIF/I2C5_SCLK/UART0_TX | |
| 38 | I2C3_SDA | GPIOB12/I2S_MCLK1/I2C5_SDATA/UART0_RX | |
| 40 | GND | GND | |
| 42 | CSI1_D0+ | GPIOC6/SENS0_D1/SENSOR0_CKOUT/CSI1_DP0 | |
| 44 | CSI1_D0- | GPIOC5/SENS0_D0/SENSOR0_PCLK/CSI1_DN0 | |
| 46 | GND | GND | |
| 48 | CSI1_D1+ | GPIOC8/SENS0_D3/CSI1_DP1 | |
| 50 | CSI1_D1- | GPIOC7/SENS0_D2/CSI1_DN1 | |
| 52 | GND | GND | |
| 54 | CSI1_C+ | GPIOC10/SENS0_D5/CSI1_CP | |
| 56 | CSI1_C- | GPIOC9/SENS0_D4/CSI1_CN | |
| 58 | GND | GND | |
| 60 | RESERVED | RESERVED | |

## 6.1 MIPI DSI 0

The 96Boards specification calls for a MIPI-DSI to be present on the High Speed Expansion Connector. A minimum of one lane is required and up to four lanes can be accommodated on the connector.
The Bubblegum96 meets this requirement , S900 implementation supports a full four lane MIPI-DSI interface that is routed to the High Speed Expansion Connector, MIPI-DSI signals are routed directly to/from the S900

## 6.2 MIPI CSI {0/1}

The 96Boards specification calls for two MIPI-CSI interfaces to be present on the High Speed Expansion Connector. Both interfaces are optional. CSI0 interface can be up to four lanes while CSI1 is up to two lanes.
The Bubblegum96 board implementation supports a full four lane MIPI-CSI interface on CSI0 and two lanes of MIPI-CSI on CSI1. All MIPI-CSI signals are routed directly to/from the S900

## 6.3 I2C {2/3}

The 96Boards specification calls for two I2C interfaces to be present on the High Speed Expansion Connector. Both interfaces are optional unless a MIPI-CSI interface has been implemented. Then an I2C interface shall be implemented.
The Bubblegum96 board implementation supports two MIPI-CSI interfaces and therefore must support two I2C(TWI4,TWI5) interfaces.
For MIPI-CSI0 the companion I2C is TWI4 that routed directly from the S900. For MIPI-CSI1, the companion I2C is TWI5
Note: Both interfaces, TWI4 and TWI5 have on-board 2K2 pull-up resistors pulled-up to the 1.8V voltage rail.

## 6.4 HSIC

The 96Boards specification calls for an optional MIPI-HSIC interface to be present on the High Speed Expansion Connector.
The Bubblegum board implementation support this optional requirement. HSIC signals are routed directly to/from the S900.

## 6.5 Reserved

The 96Boards specification calls for a 10K pull-up to 1.8V to be connected to pin 60 of the High Speed Expansion Connector.
The Bubblegum96 board implementation does not support this requirement. This issue will be addressed on a future revision of the 96Board board.

## 6.6 SD/SPI

The 96Boards specification calls for an SD interface or a SPI port to be part of the High Speed Expansion Connector.
The Bubblegum96 board implements a SD signals are routed directly to the S900 SD3 interface-SD3 _D0~D3, SD3_CLK,SD3_CMD ,all connect directly to the S900 SoC. These signals are driven at 1.8V.

## 6.7 Clocks

The 96Boards specification calls for one or two programmable clock interfaces to be provided on the High Speed Expansion Connector. These clocks may have a secondary function of being CSI0_MCLK and CSI1_MCLK. If these clocks can't be supported by the SoC than an alternative GPIO or No-Connect is allowed by the specifications.
The Bubblegum board implements two CSI clocks, CSI0_MCLK via S900_ GPIOC4/SEN_PCLK and CSI1_MCLK via S900_ GPIOC11/SEN_CKOUT . These signals are driven at 1.8V.

## 6.8 USB

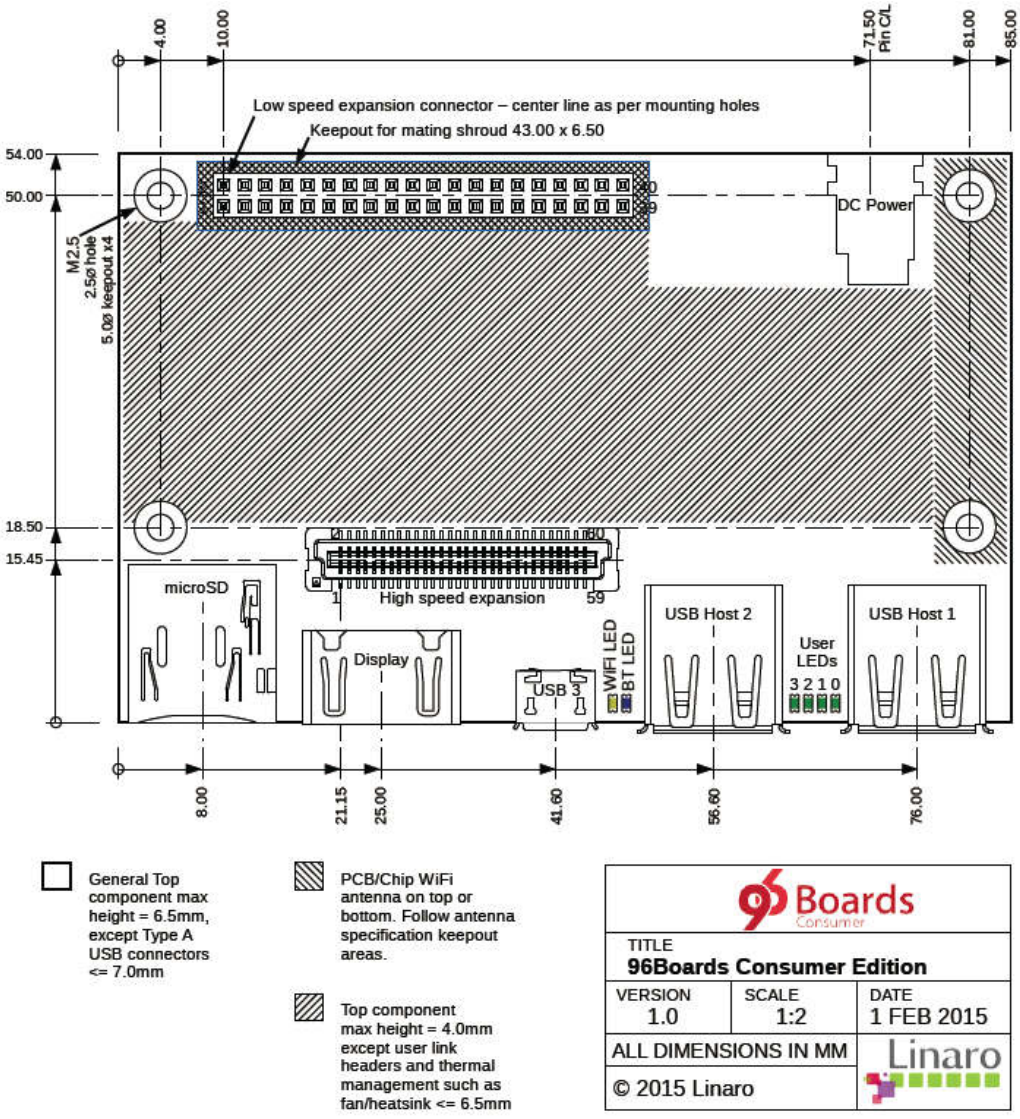
The 96Boards specification calls for a USB Data line interface to be present on the High Speed Expansion Connector.
The Bubblegum board implements this requirements by routing S900_U2 Port2 from the USB HUB(GL852G) to the High Speed Expansion Connector.

Note: High speed Expansion Connector USB Data not support USB Hub , Because in Host mode can't support USB HUB over2 levels series, Bubblegum96 already use the on board USB Hub IC(GL852G)

# 7 Mechanical specifications

## 7.1 Board dimensions

## 2D Reference Drawing

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