



Development Kit User Guide

AirPrime SL6087



SIERRA
WIRELESS

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6,653,979	6,697,030	6,785,830	6,845,249	6,847,830	6,876,697	6,879,585	6,886,049
6,968,171	6,985,757	7,023,878	7,053,843	7,106,569	7,145,267	7,200,512	7,295,171
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1. Overview

This document describes the AirPrime SL Development Kit and how it integrates with the AirPrime SL6087 Intelligent Embedded Module via a socket-up board. This document discusses the different interface and peripheral connections supported by the AirPrime SL Development Kit and provide schematics to facilitate the user's understanding and configuration of the development kit board for their own application use.

The AirPrime SL Development Kit Board may be used to develop both software and hardware applications based on the AirPrime SL6087 embedded module. Note however that in order to use the development kit with the embedded module, the embedded module must be soldered-down to a socket-up board.

For more information about the AirPrime SL6087 and the Sierra Wireless Software Suite, refer to the documents listed in section 10 Reference Documents.

2. General Description

This section gives a brief overview of the AirPrime SL Development Kit and briefly describes the interfaces and special jumper pads available.

2.1. AirPrime SL Development Kit

The AirPrime SL Development Kit is used to allow users to create and define applications using the AirPrime SL6087 embedded module.

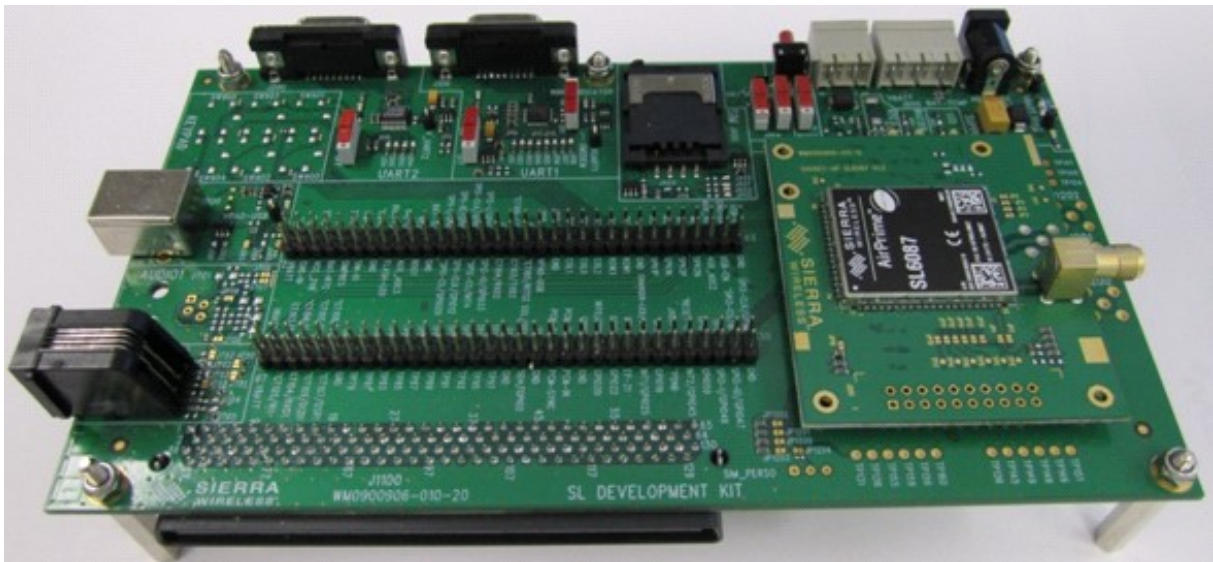


Figure 1. AirPrime SL Development Kit with the AirPrime SL6087 Socket-Up Board and Embedded Module

2.1.1. Interfaces

Interfaces available on the AirPrime SL Development Kit which are supported on the AirPrime SL6087 include:

- 1 external board to board connector and test point (TP) to access all signals for the adaptor board
- Serial link RS232, UART1* with full signals
- Ring Indicator
- Serial link RS232, UART2* with four signals
- Slave USB*, with SoftConnect™ signal. USB 2.0 Compliant (full speed)
- SIM* (1.8/3V)
- 1 Audio connector (AUDIO2)
- LEDs for several indications
- Power supply connectors
- RESET Pushbutton
- ON/OFF switch
- BOOT switch
- Buzzer LED
- Flash LED
- Charger Interface

Note: * These signals from the connector side can be electrically disconnected from the AirPrime SL6087 if the related jumper pads are dissociated. Refer to section 2.1.3 Special Soldering for Jumper Pads for more information regarding jumper pads.

2.1.2. Default Soldering Configuration for Jumpers

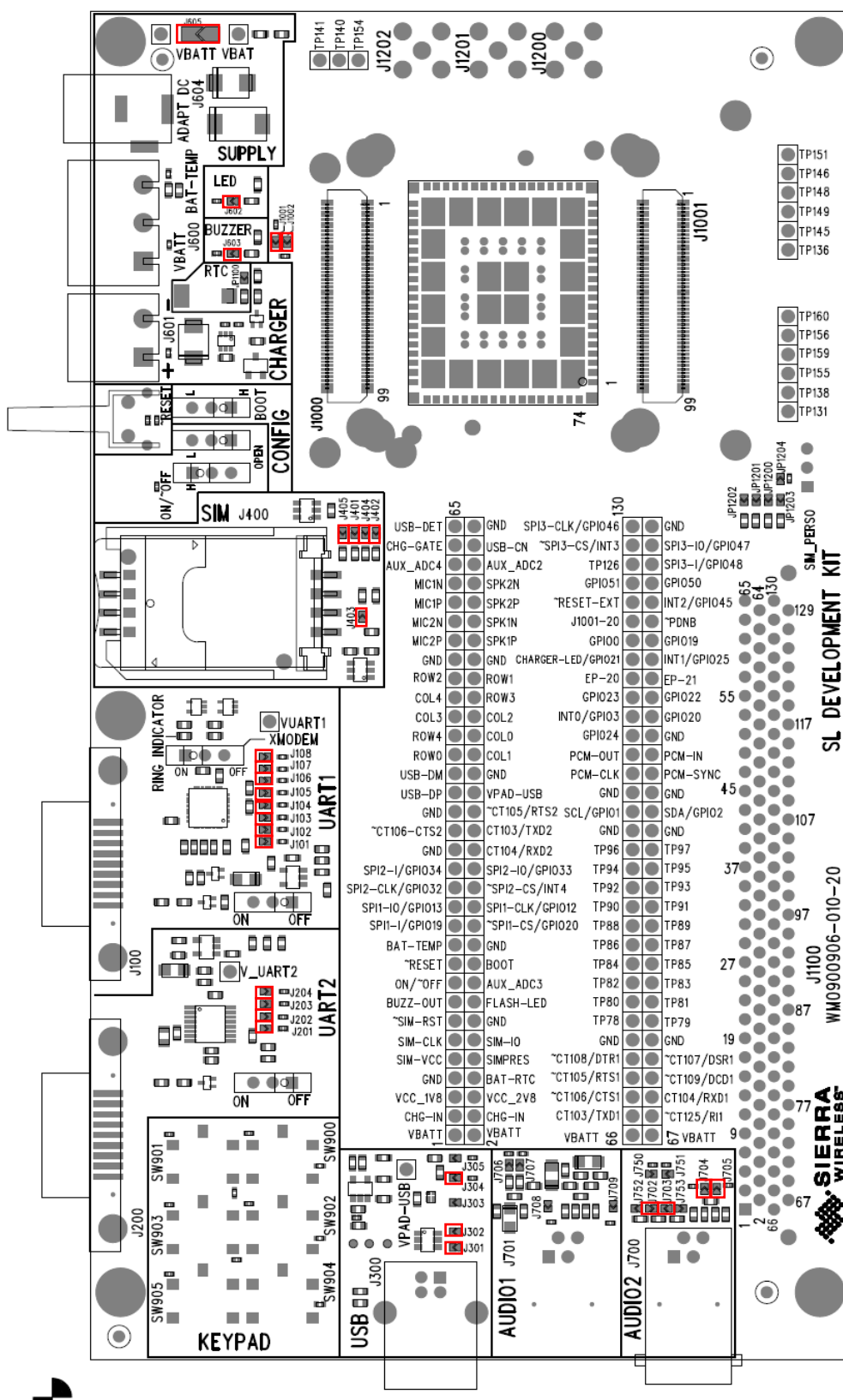


Figure 2. Default Soldering Configuration for Jumpers (Development Kit)

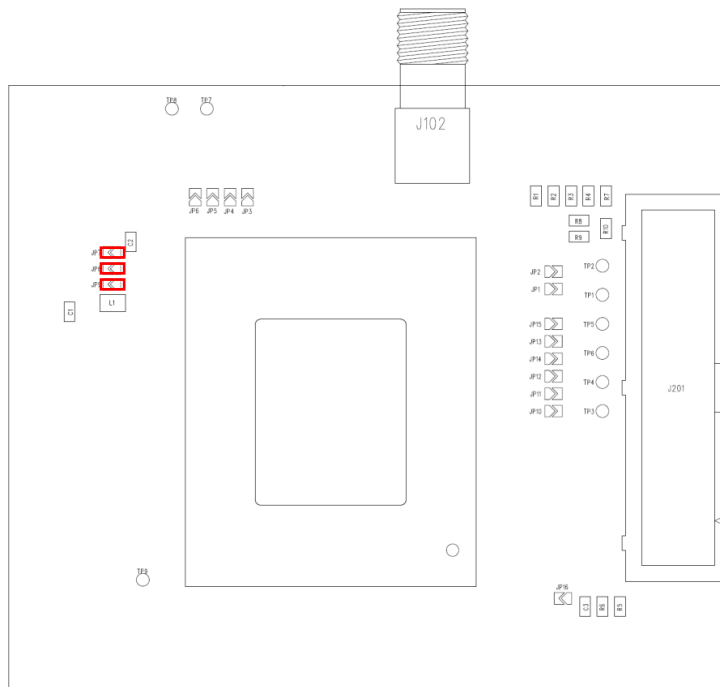


Figure 3. Default Soldering Configuration for Jumpers (Socket-Up Board)

2.1.3. Special Soldering for Jumper Pads

PCB jumper prints are used to electrically connect or disconnect peripherals between the AirPrime SL6087 embedded module and the AirPrime SL Development Kit.

To connect signals between the AirPrime SL6087 (from J1000 and J1001) and the dedicated connectors on the AirPrime SL Development Kit, solder the PCB jumper prints specified in section 2.1.2 Default Soldering Configuration for Jumpers.

To connect signals between the AirPrime SL6087 socket-up board and the external board connector (J1100), it is recommended to NOT solder the PCB prints. Instead, a daughter board can be prototyped to connect the socket-up board directly through the board connector (J1100).



Figure 4. Jumper Solder Pad

The interfaces (and signals) listed below could be electrically removed by dissociating the following PCB jumper prints:

- Power supply of the AirPrime SL Development Kit interfaces (All components from J605, except for the AirPrime SL6087 embedded module. For more information, refer to section 9 Current Consumption Measurement.)
- SIM (from J401 to J405)
- UART1 (from J101 to J108)
- UART2 (from J201 to J204)
- USB (from J301 to J305)
- AUDIO2 (from J702 to J705)
- FLASH-LED signal (J602)
- BUZZ-OUT signal (J603)

2.2. RoHS Compliance

The AirPrime SL Development Kit board is compliant with RoHS (Restriction of Hazardous Substances in Electrical and Electronic Equipment) Directive 2002/95/EC which sets limits for the use of certain restricted hazardous substances. This directive states that “from 1st July 2006, new electrical and electronic equipment put on the market does not contain lead, mercury, cadmium, hexavalent chromium, polybrominated biphenyls (PBB) or polybrominated diphenyl ethers (PBDE)”.

The AirPrime SL6087 embedded module is also compliant with this directive and is identified by the RoHS logo on its label.



>> 3. AirPrime SL Development Kit

This section provides photographs of both the top and bottom views of the AirPrime SL Development Kit that show the locations of the several ports and interfaces available; and lists all available test points on the development kit.

3.1. AirPrime SL Development Kit Top View

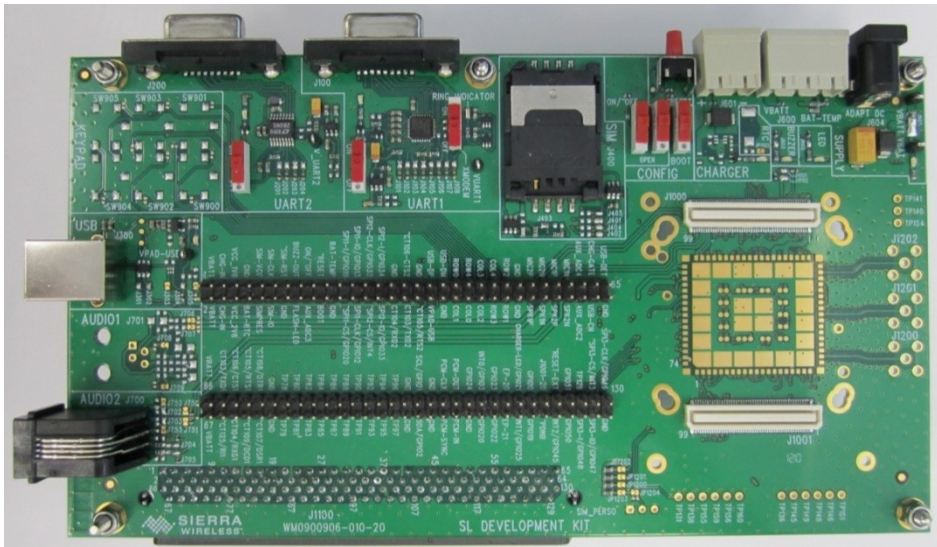


Figure 5. AirPrime SL Development Kit, Top View

3.2. AirPrime SL Development Kit Bottom View

The J1101 connector can be used as a daughter board interface when implementing applications with the AirPrime SL6087. Refer to document [3] AirPrime WMP100 Development Kit User Guide for more information about the external board connector pin assignments.

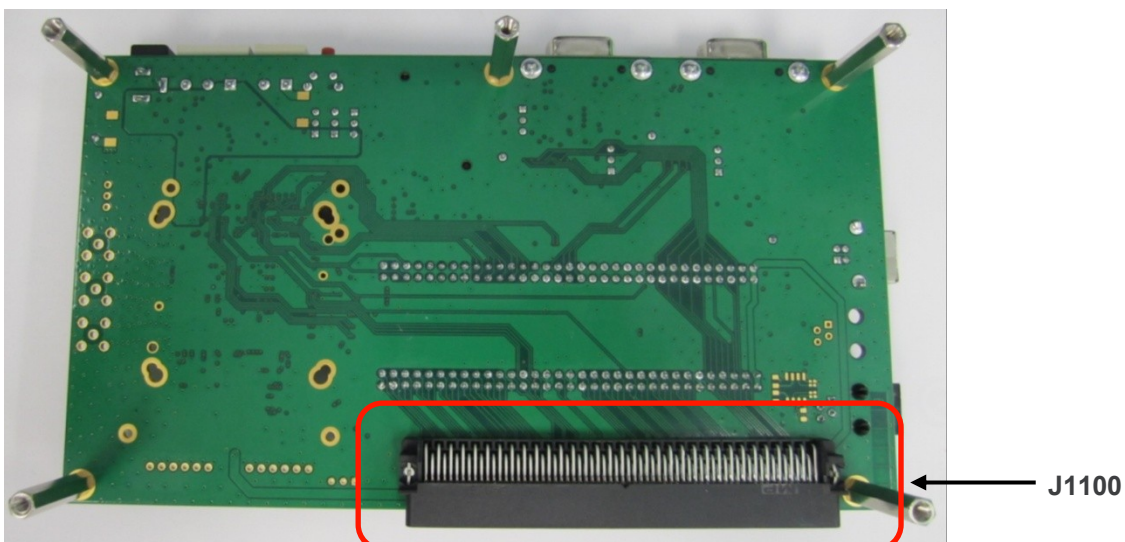


Figure 6. AirPrime SL Development Kit, Bottom View

3.3. Available Test Ports on the AirPrime SL Development Kit

There are a total of 130 test ports available in the AirPrime SL Development Kit. The following figure shows the location of these test ports in the AirPrime SL Development Kit and the table below lists their corresponding pin assignments.

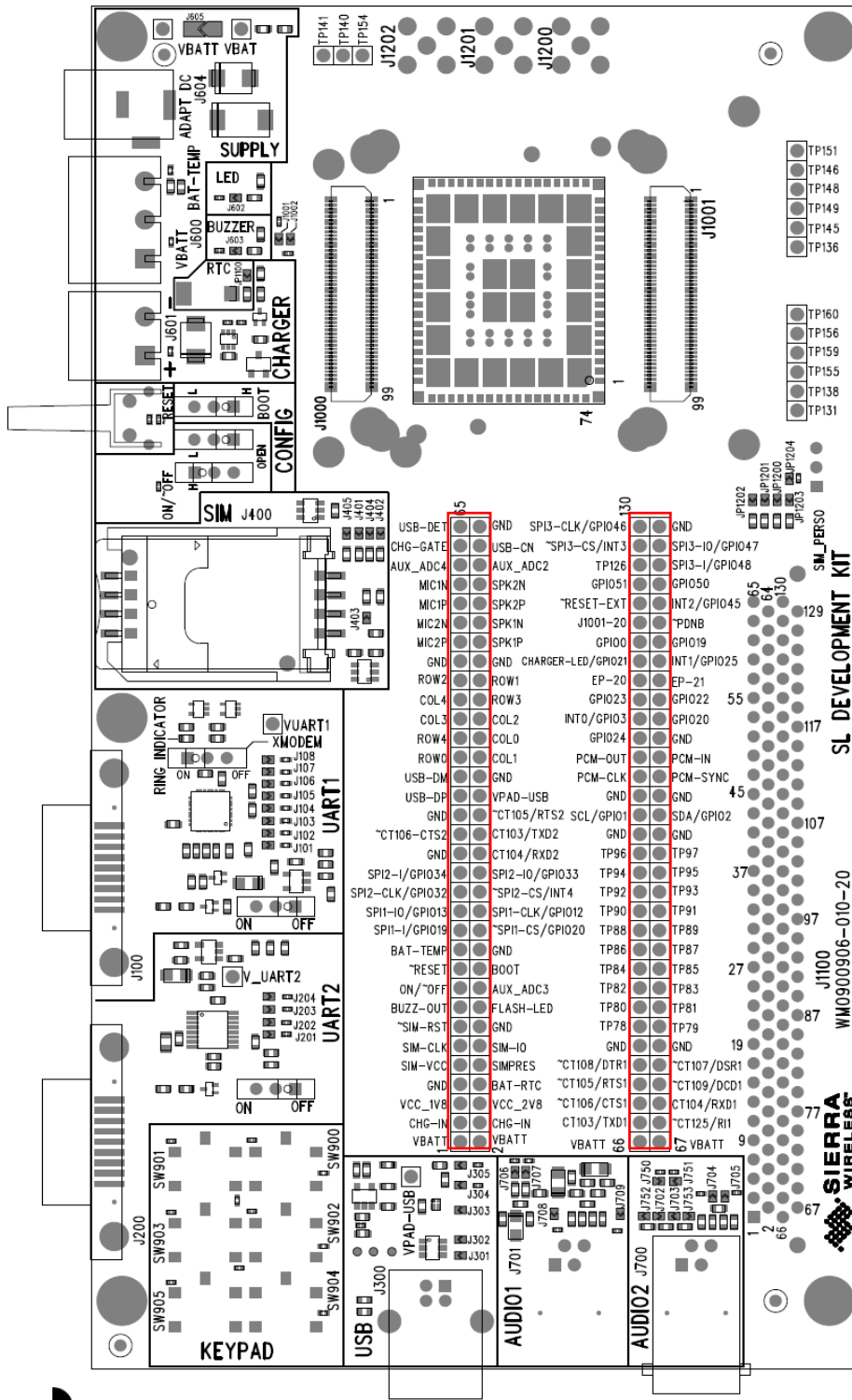


Table 1: AirPrime SL Development Kit Test Ports

Test Port	Pin Assignment (Signal)
1	VBATT
2	VBATT
3	CHG-IN
4	CHG-IN
5	VCC_1V8
6	VCC_2V8
7	GND
8	BAT_RTC
9	SIM-VCC
10	SIMPRES
11	SIM-CLK
12	SIM-IO
13	~SIM-RST
14	GND
15	BUZZ-OUT
16	FLASH-LED
17	ON/~OFF
18	AUX_ADC3
19	~RESET
20	BOOT
21	BAT-TEMP
22	GND
23	SPI1-I/GPIO19
24	~SPI1-CS/GPIO20
25	SPI1-IO/GPIO13
26	SPI1-CLK/GPIO12
27	SPI2-CLK/GPIO32
28	~SPI2-CS/INT4
29	SPI2-I/GPIO34
30	SPI2-IO/GPIO33
31	GND
32	CT104/RXD2
33	~CT106/CTS2
34	CT103/TXD2
35	GND
36	~CT105/RTS2
37	USB-DP
38	VPAD-USB
39	USB-DM
40	GND
41	ROW0
42	COL1

Test Port	Pin Assignment (Signal)
43	ROW4
44	COL0
45	COL3
46	COL2
47	COL4
48	ROW3
49	ROW2
50	ROW1
51	GND
52	GND
53	MIC2P
54	SPK1P
55	MIC2N
56	SPK1N
57	MIC1P
58	SPK2P
59	MIC1N
60	SPK2N
61	AUX_ADC4
62	AUX_ADC2
63	CHG-GATE
64	USB-CN
65	USB-DET
66	VBATT
67	VBATT
68	CT103/TXD1
69	~CT125/RI1
70	~CT106/CTS1
71	CT104/RXD1
72	~CT105/RTS1
73	~CT109/DCD1
74	~CT108/DTR1
75	~CT107/DSR1
76	GND
77	GND
78	TP78
79	TP79
80	TP80
81	TP81
82	TP82
83	TP83
84	TP84
85	TP85

Test Port	Pin Assignment (Signal)
86	TP86
87	TP87
88	TP88
89	TP89
90	TP99
91	TP91
92	TP92
93	TP93
94	TP94
95	TP95
96	TP96
97	TP97
98	GND
99	GND
100	SCL/GPIO1
101	SDA/GPIO2
102	GND
103	GND
104	PCM-CLK
105	PCM-SYNC
106	PCM-OUT
107	PCM-IN
108	GPIO24
109	GND
110	INT0/GPIO3
111	GPIO20
112	GPIO23
113	GPIO22
114	EP-20
115	EP-21
116	CHARGER-LED/GPIO21
117	INT1/GPIO25
118	GPIO0
119	GPIO19
120	J1001-20
121	~PDNB
122	~RESET-EXT
123	INT2/GPIO45
124	GPIO51
125	GPIO50
126	TP126
127	SPI3-I/GPIO48
128	~SPI3-CS/INT3

Test Port	Pin Assignment (Signal)
129	SPI3-IO/GPIO47
130	SPI3-CLK/GPIO46



4. AirPrime SL6087 Socket-Up Board

Because the AirPrime SL6087 embedded module can't be directly soldered-down on the AirPrime SL Development Kit, an adaptor board, the AirPrime SL6087 socket-up board, must be used as an interface between the embedded module and the development kit.

Refer to section 12 Appendix for further information about the AirPrime SL Development Kit and the AirPrime SL6087 Socket-Up Board.

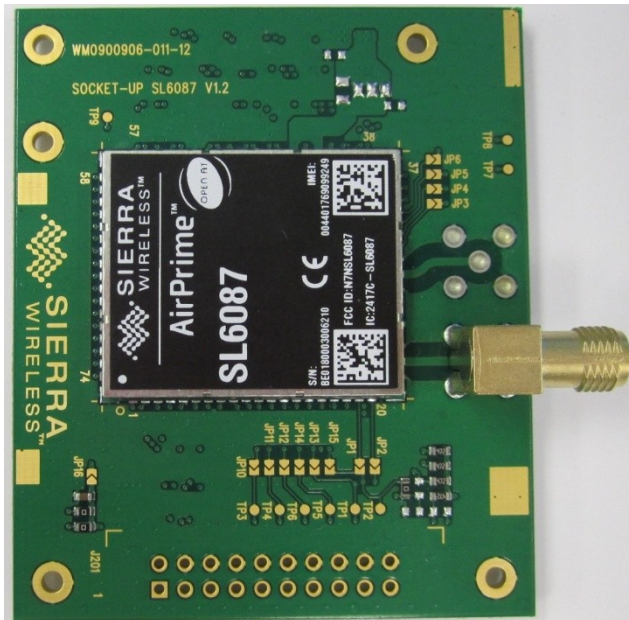


Figure 8. AirPrime SL6087 Socket-Up Board with the AirPrime SL6087 Embedded Module (Top View)

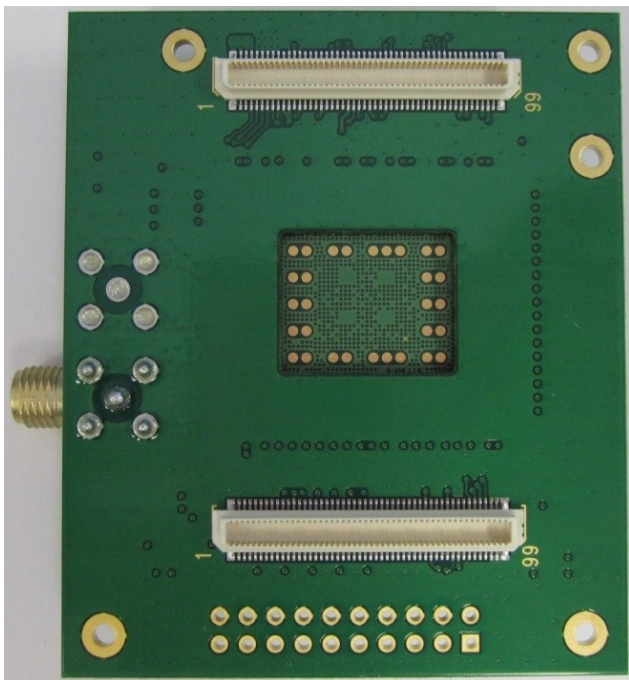


Figure 9. AirPrime SL6087 Socket-Up Board with the AirPrime SL6087 Embedded Module (Bottom View)

4.1. AirPrime SL6087 Socket-Up Board Component Placement Diagrams

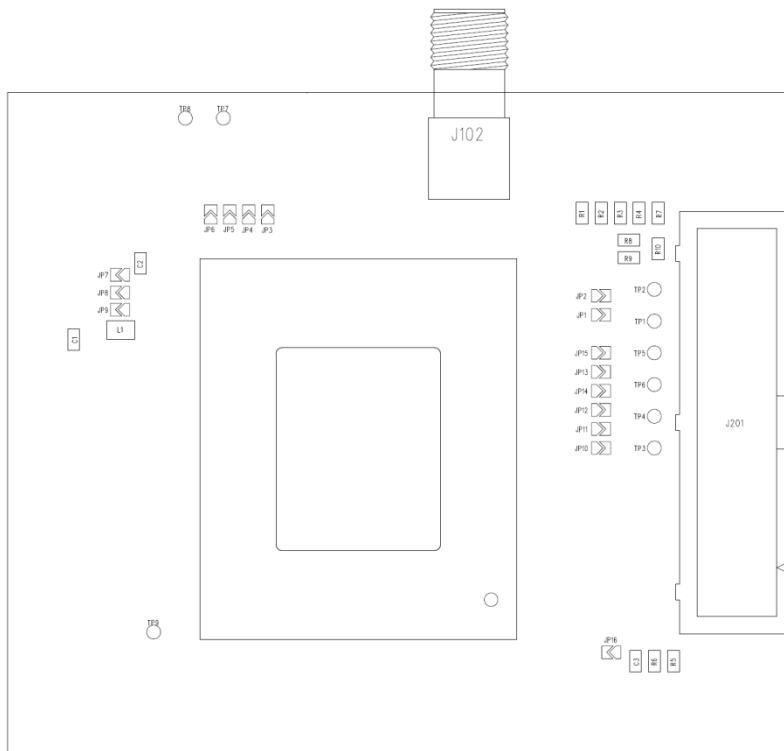


Figure 10. AirPrime SL6087 Socket-Up Board (Top View)

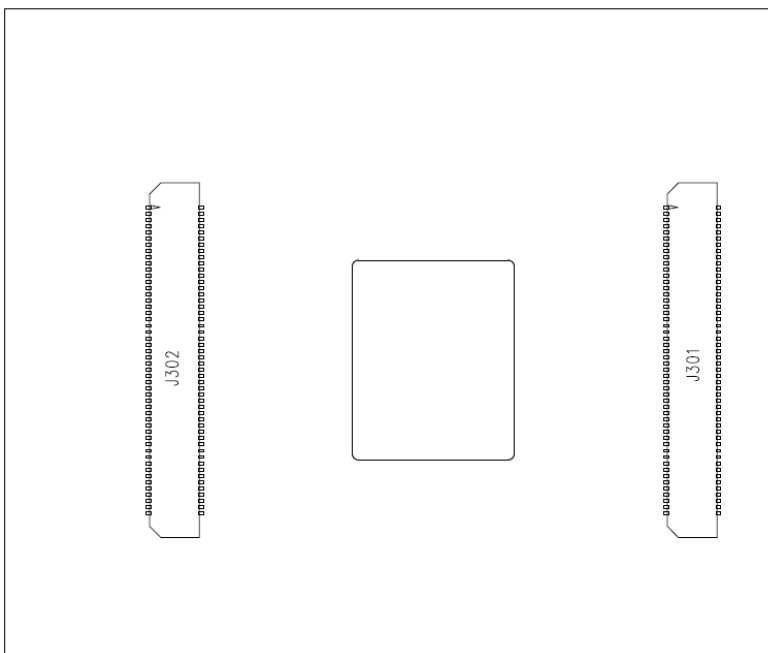


Figure 11. AirPrime SL6087 Socket-Up Board (Bottom View)



5. Setting Up the AirPrime SL Development Kit

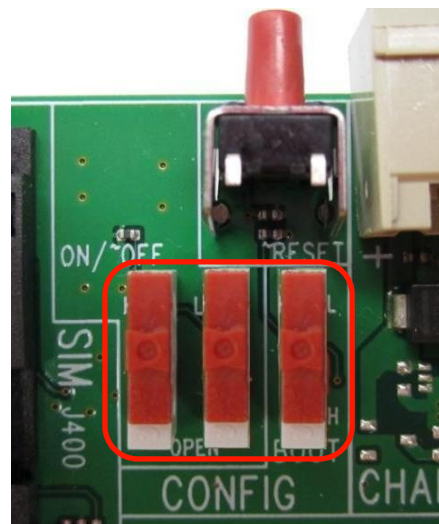
The following section describes how the AirPrime SL Development Kit and the AirPrime SL6087 Socket-Up Board (with the AirPrime SL6087 embedded module soldered-down) are setup. It also briefly describes how communication tests are done to ensure that the AirPrime SL6087 Embedded Module has been properly connected to the AirPrime SL Development Kit.

5.1. Setting Up the AirPrime SL Development Kit

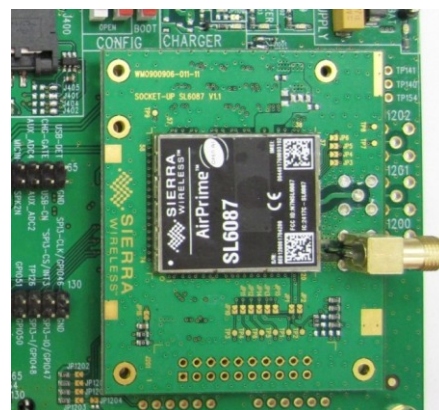
Prepare the AirPrime SL Development Kit and the AirPrime SL6087 Socket-Up Board by following these instructions step by step.

1. Turn the ON/~OFF switches as follows:
 - SW600 should be in the “H” position
 - SW601 should be in the “L” position

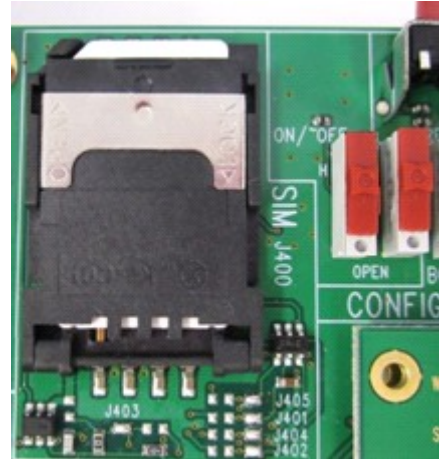
The BOOT switch (SW602) should also be turned to the “L” position.



2. Plug the AirPrime SL6087 Socket-Up Board onto the AirPrime SL Development Kit using board to board connectors J1000 and J1001.



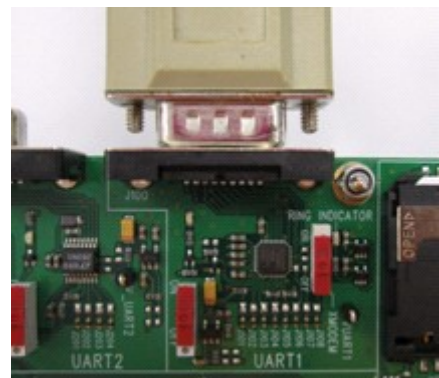
3. Insert a SIM card into the SIM card holder, J400 (if RF communications is required).



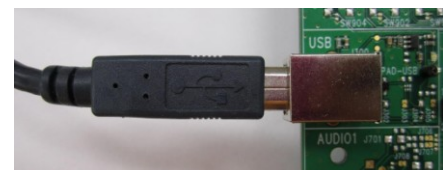
Note: Note that all jumper pads are soldered by default. (Refer to section 2.1.3 Special Soldering for Jumper Pads for more information.) Retain these settings.

4. Connect the RS232 cable between the PC port and J100 of the AirPrime SL Development Kit and make sure that SW101 is in the “ON” position.

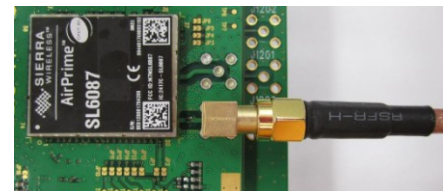
Note: By default, baud rate = 115200 kbps, data bits = 8, parity = none, and stop bits = 1.



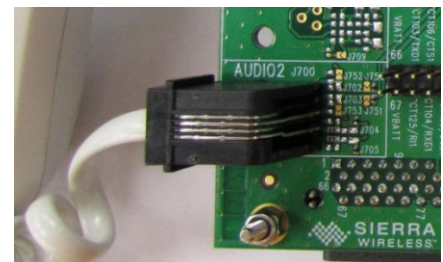
5. If USB communications is required, connect the USB cable between the USB port and J300 of the AirPrime SL Development Kit. The provided USB driver should be also installed in the host computer.



6. If RF communications is required, connect the SMA connector on the AirPrime SL6087 Socket-Up Board to an external antenna or a Radio Communication Tester using a coaxial cable.



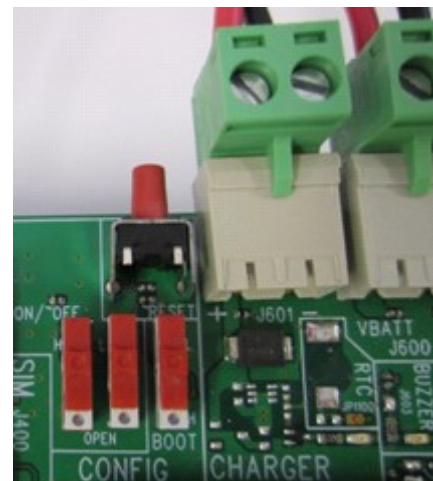
7. If audio communications is required, connect the handset to the audio connector, J700.



8. Plug in the AC/DC power supply provided in the J604 connector; or connect it to an external DC power supply at 4V/2A (J600).



9. If using the battery charging interface, plug in the charger power supply provided in the J601 connector.



The AirPrime SL Development Kit should look like the following figure after it has been properly setup.

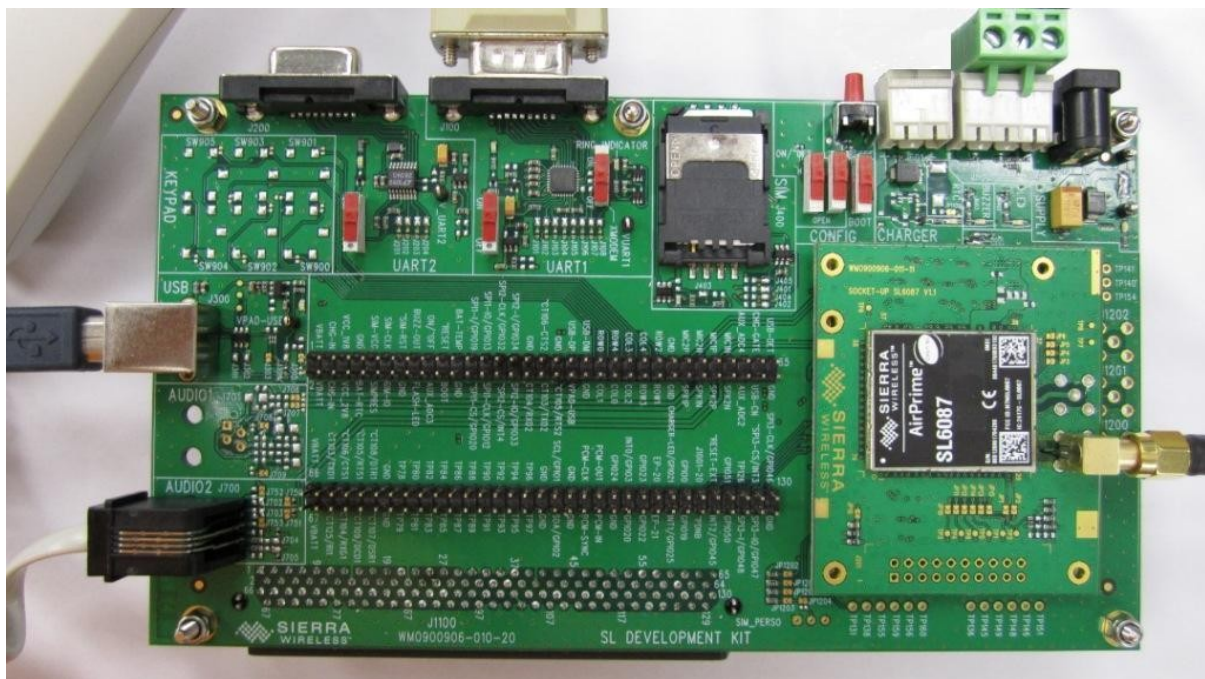
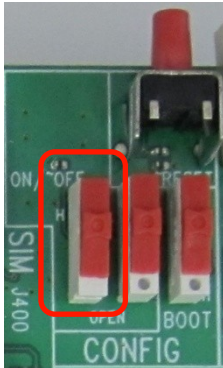


Figure 12. AirPrime SL Development Kit

5.2. Communications Test

To perform a communications test after setting the AirPrime SL Development Kit with the AirPrime SL6087 embedded module, do the following:

1. If switch SW600 is set to the “H” position as specified in section 5.1 Setting Up the AirPrime SL Development Kit, the AirPrime SL6087 embedded module will be automatically switched ON once power is applied.



2. Using a PC terminal emulator, send the following command on a serial port to communicate with the AirPrime SL6087 embedded module:

AT↵

3. When communications is established between the PC and the AirPrime SL6087 embedded module, the embedded module replies with an “OK”. Verify that the response is displayed in the terminal emulator window.

Refer to document [2] Firmware 7.4b AT Commands Manual (Sierra Wireless Software Suite 2.32) for more information about using AT Commands to communicate between a PC and the AirPrime SL6087 embedded module.

>> 6. Interfaces/Peripherals

This section describes the different interfaces/peripherals that are available in the AirPrime SL Development Kit.

6.1. Power Supplies

Two power supply sources are available on the AirPrime SL Development Kit:

- DC external supply (via J600)
- AC/DC adapter (via J604)

These power supplies are protected against electrostatic discharge (ESDs) and voltage or current transient surges by ESD diodes or varistors.

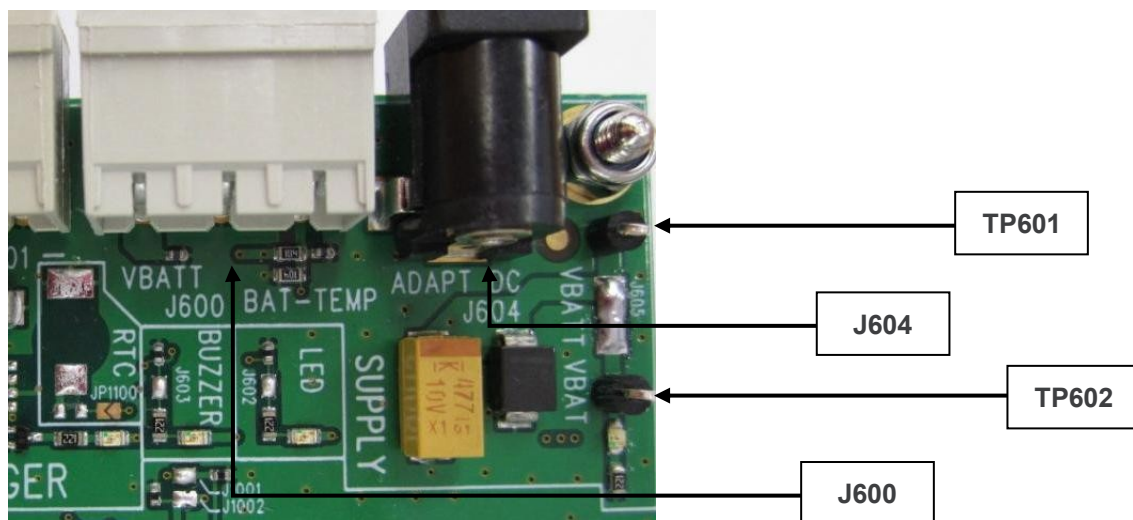


Figure 13. Power Supply Connectors (J604 and J600)

Either one these power supplies can be used for **both** the AirPrime SL6087 embedded module and the peripherals on the AirPrime SL Development Kit.

Note that it is possible to separate the power supply for the AirPrime SL6087 Socket-Up Board (“VBATT” via TP601) and the power supply for the peripherals (“VBAT” via TP602) by unsoldering J605. Current measurement is therefore possible for the AirPrime SL Development Kit and for the AirPrime SL6087 embedded module. Refer to section 9 Current Consumption Measurement for more information.



Figure 14. VBATT Connection (J605)

6.1.1. Main Supply Adapter

The J604 connector powers the AirPrime SL Development Kit using an AC/DC power supply cable.

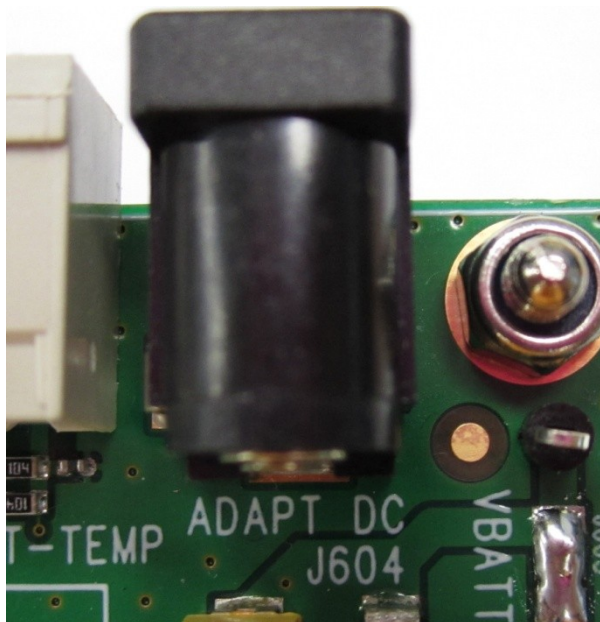


Figure 15. Main Supply Adapter

Details on the only supported adapter are listed in the following table.

Table 2: Supported Adapter

Manufacturer	Reference	Characteristics
SINPRO	SPU12C-101	4V DC / 2.5A

6.1.2. External Supply

The external supply is accessible through the J600 connector.

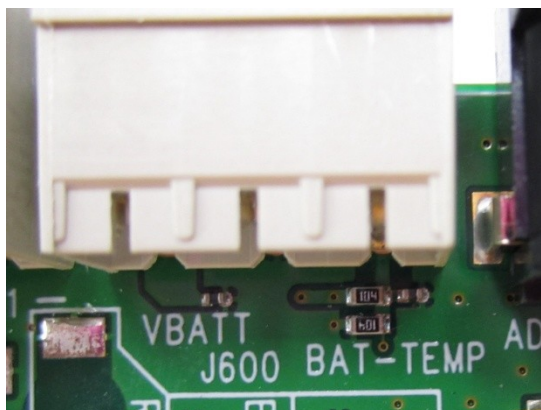


Figure 16. External Power Supply

The J600 connector has three pins:

- **Pins 1-2** are used to plug the power supply.
- **Pins 2-3** are used to plug in BAT-TEMP. (Refer to section 6.1.2.1 BAT-TEMP for more information.)

BAT-TEMP GND VBATT

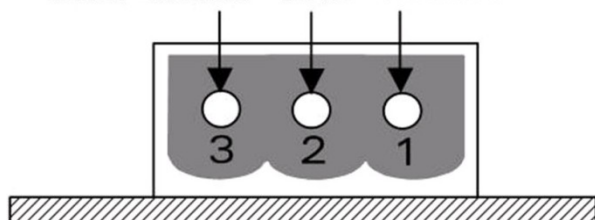


Figure 17. External Power Supply Pins

Refer to the following table for the electrical characteristics of VBATT.

Table 3: Electrical Characteristics of VBATT

	V_{MIN}	V_{NOM}	V_{MAX}
VBATT ^{1,2}	3.2V	3.6V	4.8V

1: This value has to be guaranteed during the burst (with 1.5A Peak in GSM or GPRS mode).

2: Maximum operating Voltage Stationary Wave Ratio (VSWR) is 2:1.

For more information, refer to document [1] AirPrime SL6087 Product Technical Specification and Customer Design Guidelines.

6.1.2.1. BAT-TEMP

The BAT-TEMP signal is an input (ADC) to the AirPrime SL6087 embedded module.

Pins 2-3 of J600 allow the simulation of the temperature level from a sensor inside the battery. Refer to the following table for the electrical characteristics of BAT-TEMP.

Table 4: Electrical Characteristics of BAT-TEMP

	V _{MIN}	V _{NOM}	V _{MAX}
BAT-TEMP	0	-	2V

For more information, refer to document [1] AirPrime SL6087 Product Technical Specification and Customer Design Guidelines.

6.1.3. LED Signalization for VBAT

The “VBAT” indicator is a green LED and it indicates the presence of a power supply at J600 or J604. Both the AirPrime SL6087 embedded module and its peripherals are powered by this power source when J605 is soldered. If J605 is unsoldered, an extra external power supply should be connected to “VBAT” for the AirPrime SL Development Kit.

Tip: *It is recommended to always use both VBATT and VBAT simultaneously.*

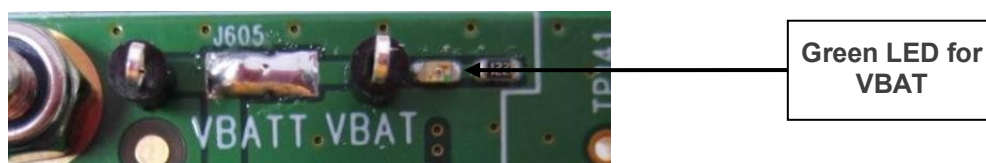


Figure 18. LED Signalization of VBAT

Refer to the following table for the VBATT and VBAT status depending on the LED state.

Table 5: Status of VBATT and VBAT

LED State	VBATT Status	VBAT Status
ON	ON	ON
OFF	ON when J605 is soldered; OFF when J605 is un-soldered	OFF

6.2. SIM

The SIM interface signals on the AirPrime SL Development Kit can be electrically disconnected from the AirPrime SL6087 embedded module if the five solder pads, J401 to J405, are dissociated.

Unsoldering them allows the SIM signals to transmit to an external interface board via the external connector (J1100), with R1122, R1123, R1124, R1125 and R1126 equipped with 0Ω resistors (0603 package resistors).

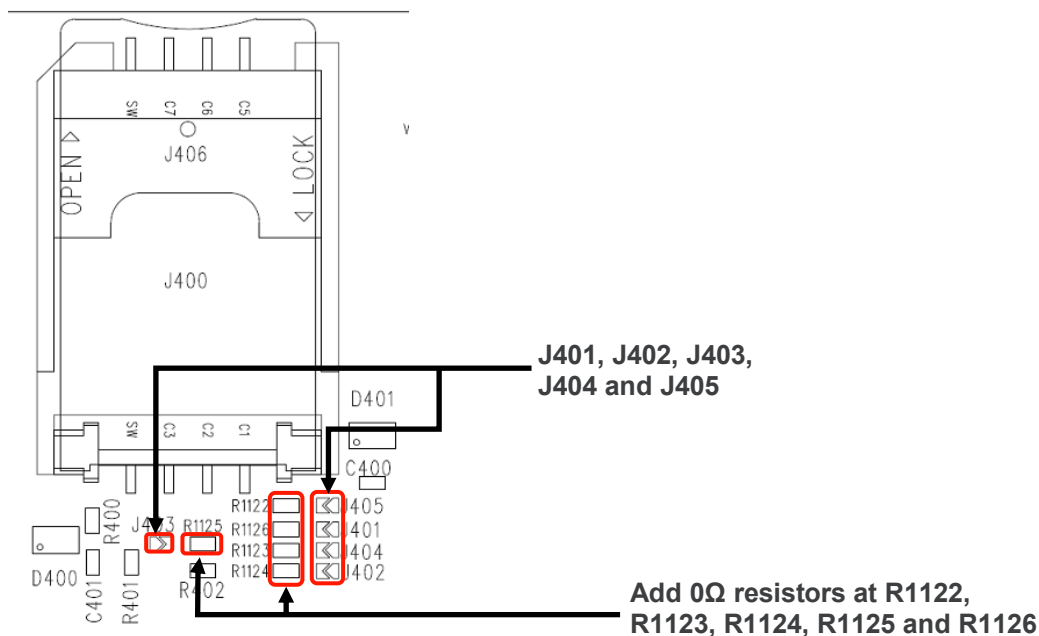


Figure 19. Solder Pads and Resistor Locations on the SIM Interface

By default, SIM is available on its dedicated connector, J400, with J401 to J405 soldered.

Note: ESD protection is available on all SIM signals.

6.2.1. SIM Connector (J400)

J400 is a standard 1V8 or 3V SIM socket.

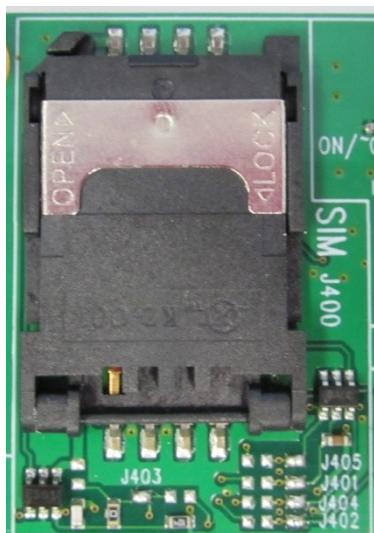


Figure 20. SIM Connector

Refer to the following table for the SIM connector pin description.

Table 6: SIM Connector Pin Description

Pin Number	Signal Name	I/O	I/O Type	Description
1	SIM-VCC	O	1V8 or 2V9	SIM Power Supply
2	SIM-RST	O	1V8 or 2V9	SIM Reset
3	SIM-CLK	O	1V8 or 2V9	SIM Clock
4	SIMPRES	I	2V8 max*	SIM Card Detect (Not used)
5	GND			Ground
6	VPP	Not used		
7	SIM-IO	I/O	1V8 or 2V9	SIM Data
8	CC8		2V8	SIMPRES signal supply (Not used)

* For either 1V8 or 3V SIM cards.

6.3. UART1

UART1 of the AirPrime SL Development Kit is connected to the RS232 serial link interface of the AirPrime SL6087 embedded module. The voltage level of UART1 is 2.8V from the AirPrime SL Development Kit side.

The eight UART1 signals in the AirPrime SL Development Kit could be electrically disconnected from the AirPrime SL6087 embedded module if the eight tie pads, J101 to J108, are dissociated. Unsoldering them allows the UART1 signals to transmit to an external interface board via the external connector (J1100).

By default, UART1 is available on its dedicator connector, J100, with J101 to J108 soldered.

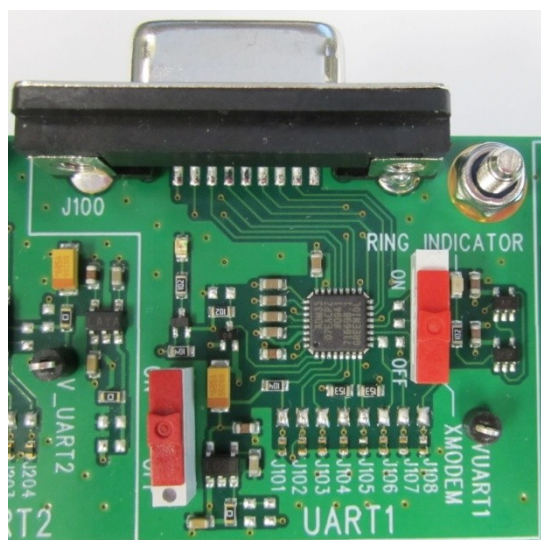


Figure 21. UART1 Connector

6.3.1. UART1 Connector (J100)

J100 is a SUB-D 9-pin female connector.

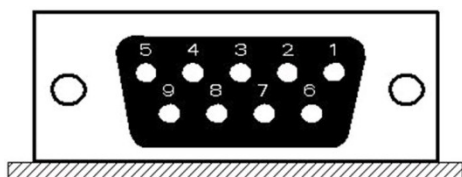


Figure 22. DB-9 Female Connector for UART1

Refer to the following table for the UART1 connector signal pin description.

Table 7: UART1 Connector Pin Description

Pin Number	Signal Name	I/O	I/O Type	Description
1	CT109 DCD	O	RS232 (V24/V28)	Data Carrier Detect
2	CT104 RXD	O	RS232 (V24/V28)	Receive serial data
3	CT103 TXD	I	RS232 (V24/V28)	Transmit serial data
4	CT108-2 DTR	I	RS232 (V24/V28)	Data Terminal Ready
5	GND			Ground
6	CT107 DSR	O	RS232 (V24/V28)	Data Set Ready
7	CT105 RTS	I	RS232 (V24/V28)	Request To Send
8	CT106 CTS	O	RS232 (V24/V28)	Clear To Send
9	CT125 RI	O	RS232 (V24/V28)	Ring Indicator

6.3.2. UART1 Configuration

The AirPrime SL Development Kit acts as a DCE and is connected to a DTE (PC or terminal) with a “straight cable”. This is a full UART.

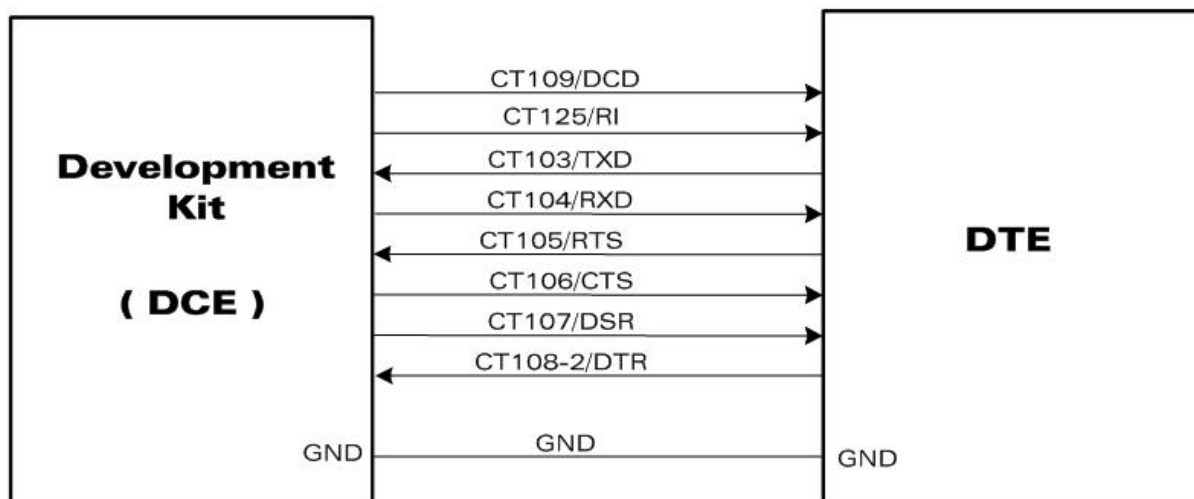


Figure 23. RS232 Main Serial Link

6.3.3. Enabling the UART1 Function (SW101)

The UART1 interface can be enabled by switching SW101 to the “ON” position.

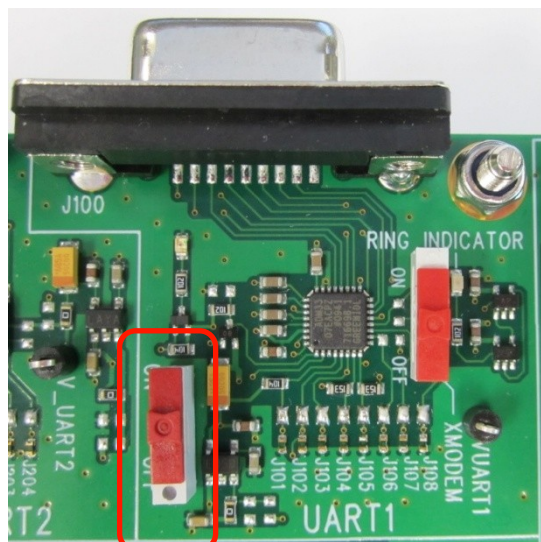


Figure 24. UART1 Switch Configuration

6.3.4. Switch “XMODEM” (SW100)

Caution: The “XMODEM” switch must always be in the “OFF” position, as shown in the figure below. Do not use this switch. If SW100 is in the wrong position (“ON”), UART1 will not work properly.

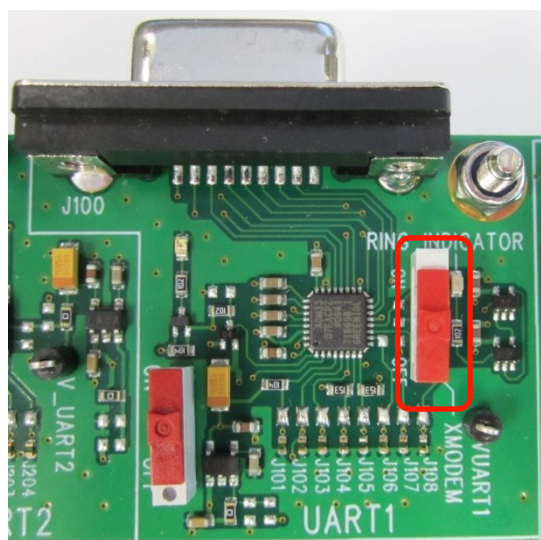


Figure 25. XMODEM Switch Configuration (SW100)

Refer to the following table for the XMODEM configuration.

Table 8: XMODEM Configuration

Mode	Description
Normal	OFF

6.3.5. LED Signalization for UART1 (D100, D101)

Two LEDs are available to indicate the state of UART1.

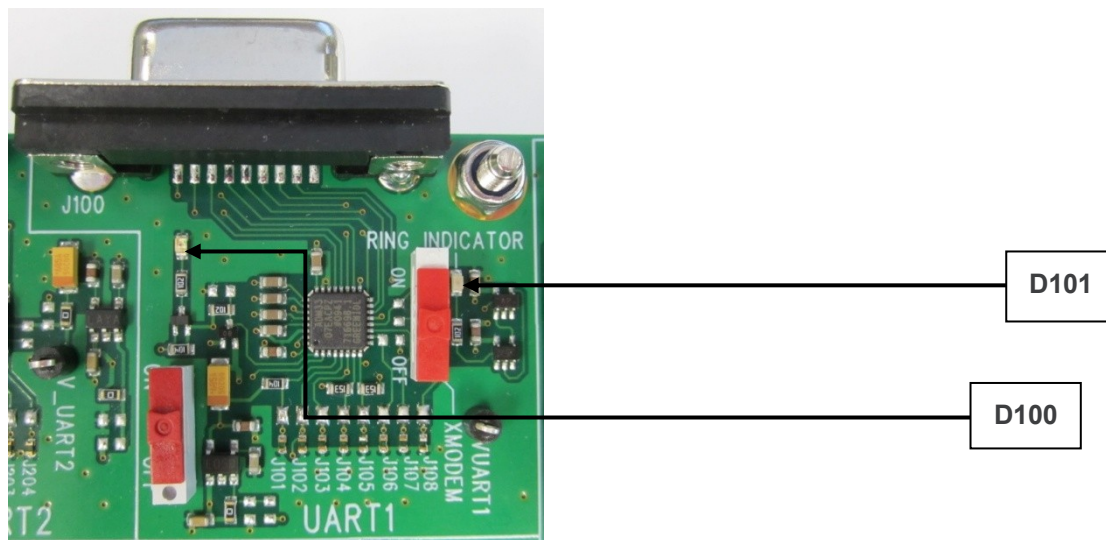


Figure 26. UART1 LED Location (D100, D101)

6.3.5.1. LED “UART1” (D100)

This green LED indicates the power supply state of UART1.

The interface can be used when it is lit depending on which power supply is present (J600 or J604). Refer to section 6.1 Power Supplies for more information.

6.3.5.2. LED “RING INDICATOR” (D101)

The “RING INDICATOR” indicator is a yellow LED controlled by the RI signal on the AirPrime SL6087 embedded module.

When the AirPrime SL6087 embedded module receives an incoming call, the RI signal goes from high to low for 0.5sec alternately; hence making the D101 LED blink.

6.4. UART2

UART2 of the AirPrime SL Development Kit is connected to the auxiliary RS232 serial link interface of the AirPrime SL6087 embedded module at voltage level 1.8V.

The four UART2 signals from the AirPrime SL6087 Socket-Up Board could be disconnected by dissociating solder pads J201 to J204. Dissociating the four pads allows for the transmission of undisturbed signals to an external interface board via the external connector (J1100).

By default, UART2 is available on its dedicated connector, J200, with J201 to J204 soldered.

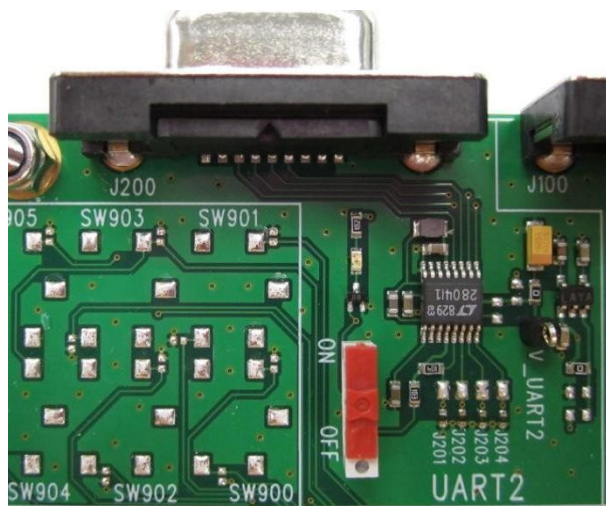


Figure 27. UART2 Connector

6.4.1. UART2 Connector (J200)

J200 is a SUB-D 9-pin female connector.

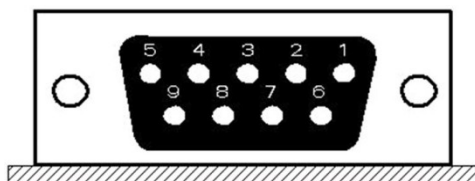


Figure 28. DB-9 Female Connector for UART2

Refer to the following table for the UART2 connector signal pin description.

Table 9: UART2 Connector Pin Description

Pin Number	Signal Name	I/O	I/O Type	Description
1	Not used*	-	-	-
2	CT104 RXD	O	RS232 (V24/V28)	Receive serial data
3	CT103 TXD	I	RS232 (V24/V28)	Transmit serial data
4	Not used*	-	-	-
5	GND			Ground
6	Not used*	-	-	-
7	CT105 RTS	I	RS232 (V24/V28)	Request To Send

Pin Number	Signal Name	I/O	I/O Type	Description
8	CT106 CTS	O	RS232 (V24/V28)	Clear To Send
9	Not used*	-	-	-

* Only four signals are used on this connector.

6.4.2. UART2 Configuration

The AirPrime SL Development Kit acts as a DCE and is connected to a DTE (PC or terminal) with a “straight cable”. There are only 4 signals on the UART2 as shown in the figure below.

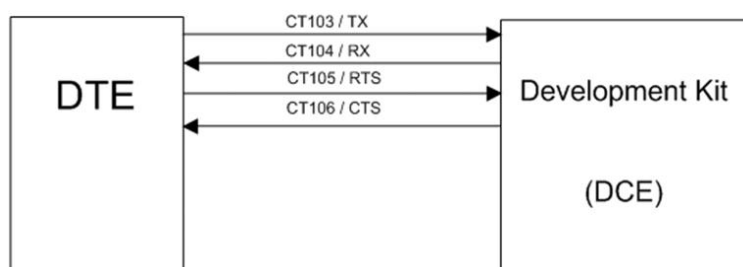


Figure 29. RS232 Auxiliary Serial Link

6.4.3. Enabling the UART2 Function (SW200)

The UART2 interface can be enabled by switching SW200 to the “ON” position.

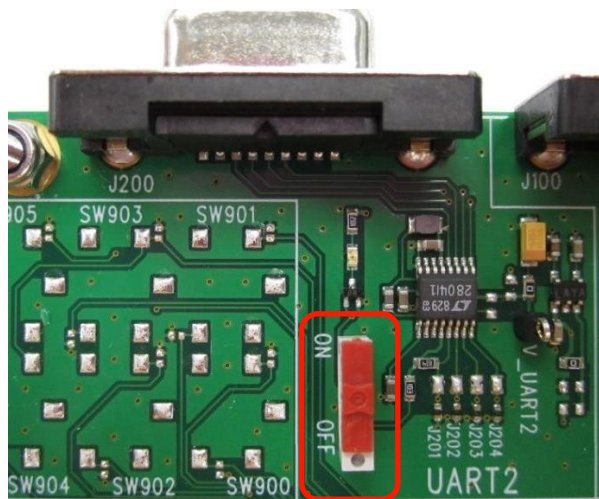


Figure 30. UART2 Switch Configuration

6.4.4. LED Signalization for UART2 (D200)

A green LED indicates the UART2 state. When this LED is lit, it indicates that the UART2 interface is available for use.

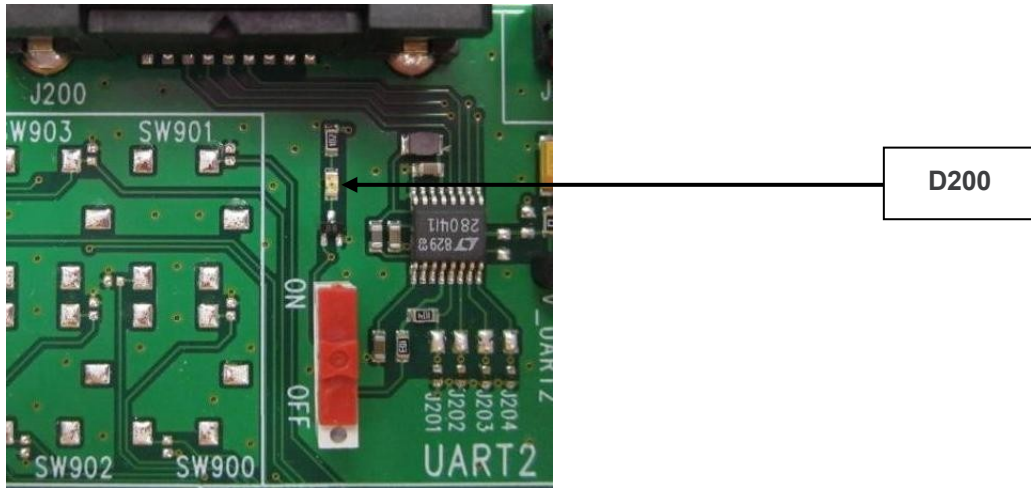


Figure 31. UART2 LED Location (D200)

6.5. USB

The USB interface on the AirPrime SL Development Kit board could be disconnected by dissociating solder pads J301 to J305. Dissociating the five solder pads allows for the transmission of undisturbed signals to an external interface board via the external connector (J1100).

By default, USB is available on its dedicated connector, J300; with J301, J302 and J304 soldered.



Figure 32. USB Connector

Note that ESD protection is used on the USB signals.

Refer to document [1] AirPrime SL6087 Product Technical Specification and Customer Design Guidelines for more information on the characteristics of the USB interface of the AirPrime SL6087 embedded module.

6.5.1. USB Connector (J300)

J300 is a USB B type receptacle.

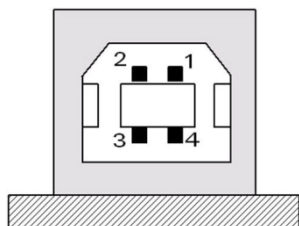


Figure 33. USB B Type Receptacle

Refer to the following table for the USB connector pin description.

Table 10: USB Connector Pin Description

Pin Number	Signal Name	I/O	I/O Type	Description
1	VBUS	I	Power supply	+ 5V DC
2	DM	I/O	Digital	USB negative line
3	DP	I/O	Digital	USB positive line
4	GND		Power supply	Ground
Shell	Shielding			

6.5.2. LED Signalization for USB (VPAD-USB)

The VPAD-USB is a green LED that is activated by the presence of VBUS (when plugged into the USB connector).

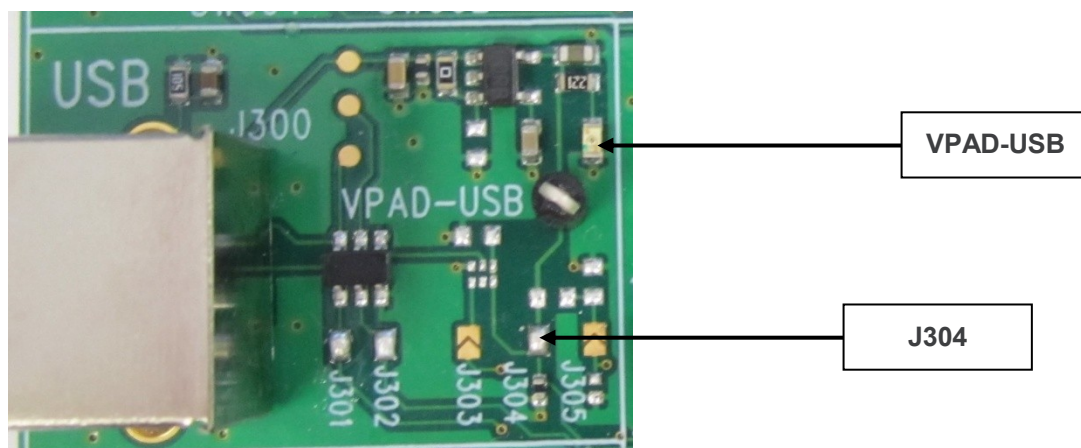


Figure 34. USB LED Location (VPAD-USB)

The power supply for the USB interface in the AirPrime SL Development Kit is provided by the USB connector. If a USB cable is plugged in, the LED and VPAD-USB (regulator, LDO, output) is at 3.3V.

Note: Solder pad J304 must be soldered to power the USB interface in the AirPrime SL6087 embedded module.

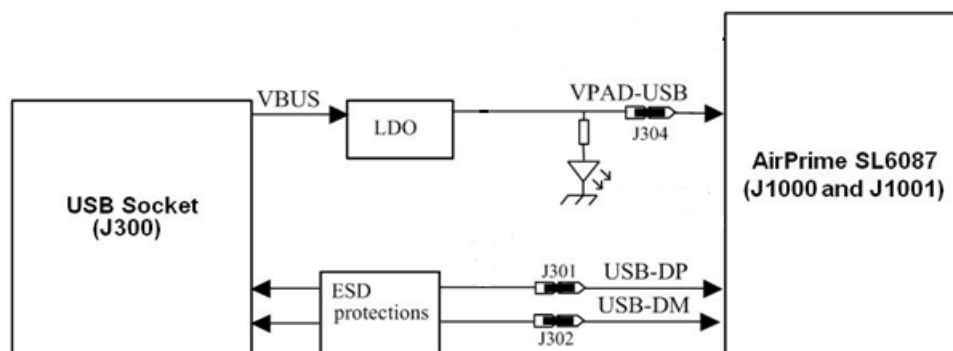


Figure 35. USB Electrical Diagram

6.6. Audio

There is one AUDIO interface in the AirPrime SL6087 embedded module. Use J700 (AUDIO2) in the AirPrime SL Development Kit to connect to this audio interface.

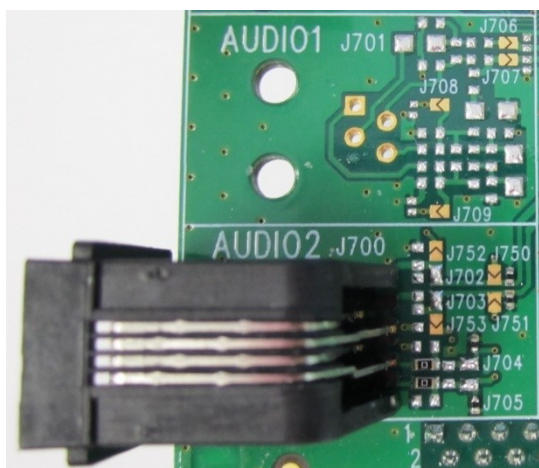


Figure 36. AUDIO Connectors

6.6.1. AUDIO1 Connector (J701)

The audio function at AUDIO1 J701 is not available.

6.6.2. AUDIO2 Connector (J700)

The audio connector could be disconnected from the AirPrime SL6087 embedded module when soldering pads J702 to J705 are dissociated. That is, having it unsoldered allows for the transmission of undisturbed signals to an external interface board via the external connector (J1100).

By default, AUDIO signals of the AirPrime SL6087 embedded module are available on its dedicated connector J700 (AUDIO2) when J702 to J705 are soldered.

J700 is an RJ9 4-pin connector.

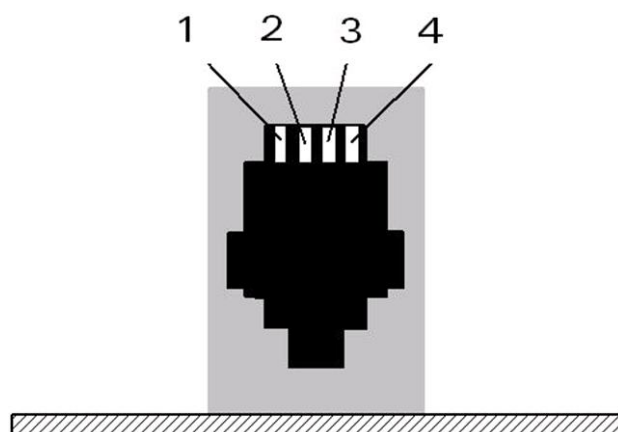


Figure 37. RJ9 4-pin Connector for AUDIO2

Refer to the following table for the AUDIO2 connector signal pin description.

Table 11: AUDIO2 Connector Pin Description

Pin Number	Signal Name	I/O	I/O Type	Description
1	MIC Ground	GND	Analog	Microphone ground
2	HSET_OUTN	O	Analog	Main speaker negative output
3	HSET_OUTP	O	Analog	Main speaker positive output
4	INTMIC_P	I	Analog	Main microphone positive input

Both microphone and speaker signals of the AirPrime SL6087 embedded module can be configured in either single-ended or differential mode. By default, both microphone and speaker signals are set to differential mode on the AirPrime SL Development Kit. The following diagrams show how the AirPrime SL Development Kit should be configured for the differential microphone and speaker.

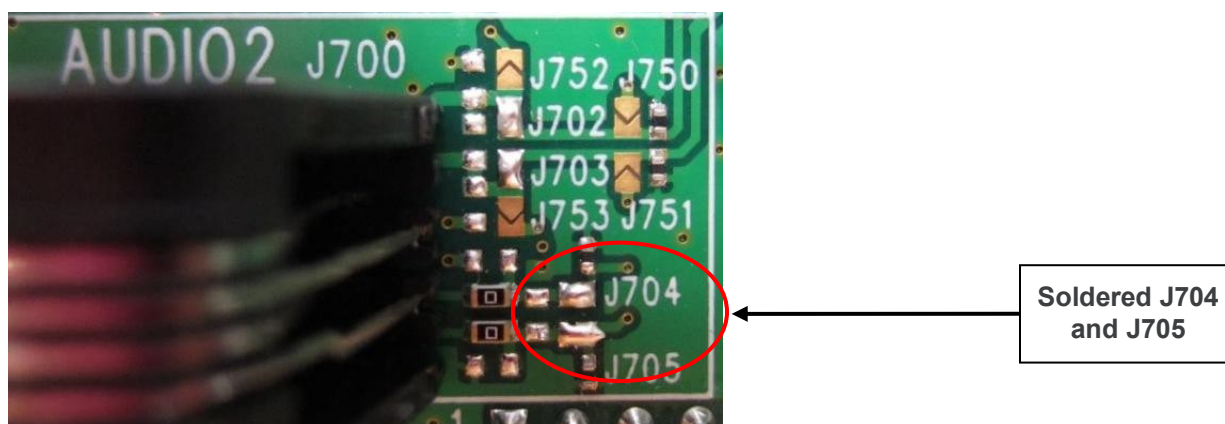


Figure 38. Settings for a Differential Microphone

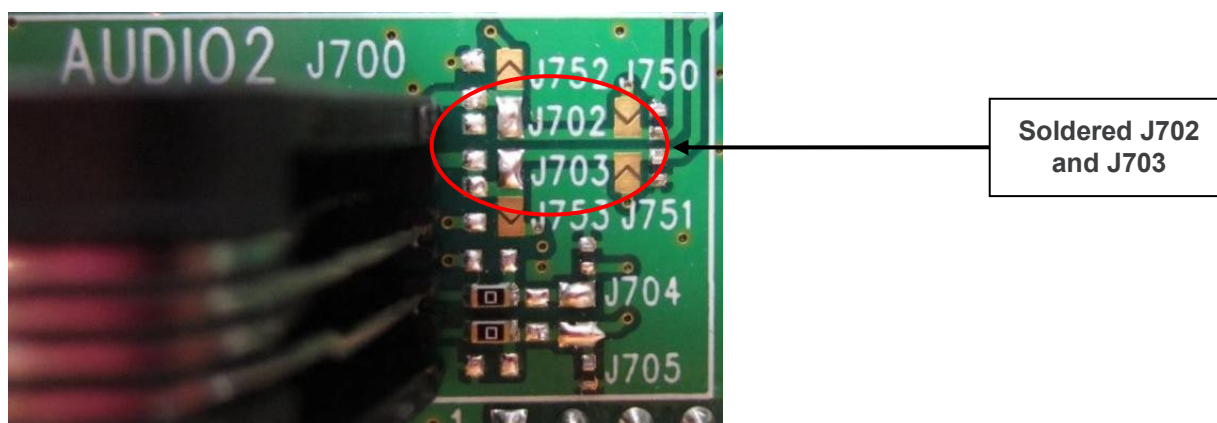


Figure 39. Settings for a Differential Speaker

For a single-ended microphone connection, the settings on the AirPrime SL6087 Development Kit Board should be modified as follows. For more information, refer to document [1] AirPrime SL6087 Product Technical Specification and Customer Design Guidelines.

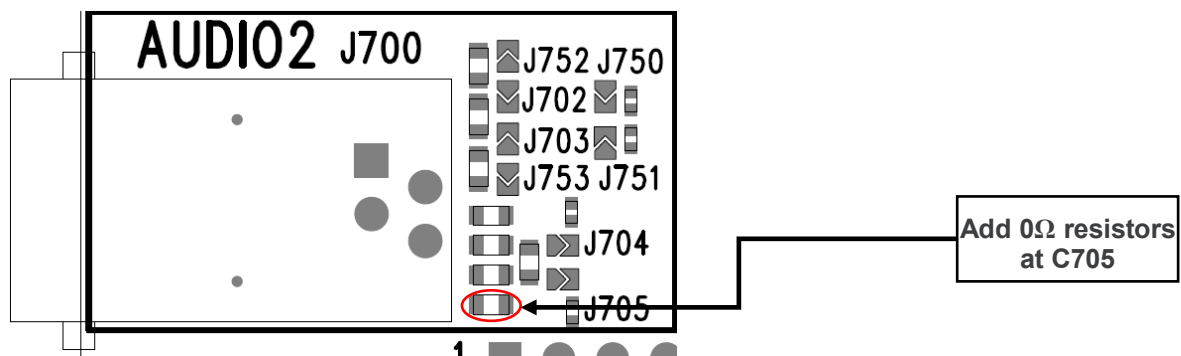


Figure 40. Settings for a Single-Ended Microphone

6.7. Flash LED (LED, D602)

The LED location is shown in the following figure.

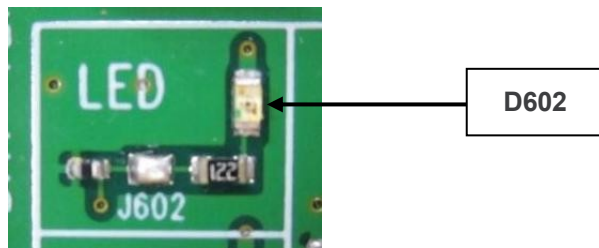


Figure 41. LED Location

The LED indicator, D602, is a green LED that indicates 2 operating modes as follows:

- OFF state: The LED blinks in pre-charging mode (via the J601 connector)
- ON state: The LED indicates the network status

For more information, refer to document [1] AirPrime SL6087 Product Technical Specification and Customer Design Guidelines.

6.8. Buzzer LED (BUZZER, D600)

The BUZZER location is shown in the figure below.

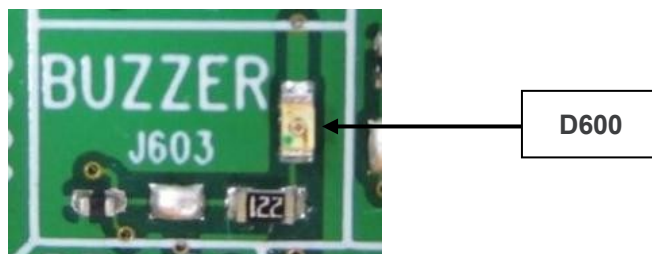


Figure 42. BUZZER Location

The BUZZER indicator, D600, is a green LED that is controlled by the BUZZ-OUT signal of the AirPrime SL6087 embedded module.

For more information, refer to document [1] AirPrime SL6087 Product Technical Specification and Customer Design Guidelines.

6.9. Charger

The AirPrime SL6087 embedded module supports a battery charging interface. Use J601 (CHARGER) in the AirPrime SL Development Kit to connect to this interface.

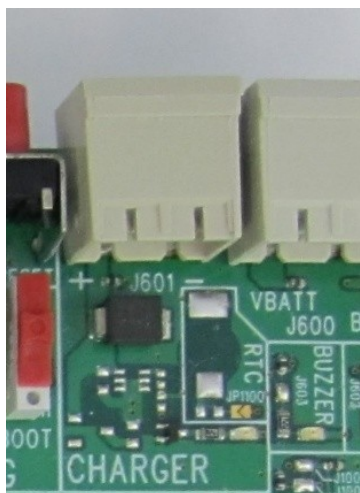


Figure 43. Charger Connector

This power supply is protected against electrostatic discharge and voltage or current transient surges.

Note: The battery must be connected when the charger is used.

6.9.1. Charger Connector (J601)

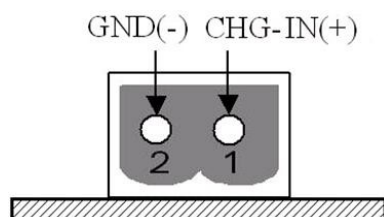


Figure 44. 2-Pin Charger Connector

Refer to the following table for the electrical characteristics of this power supply.

Table 12: Charger Supply Voltage

	V_{MIN}	V_{NOM}	V_{MAX}
CHG-IN voltage (for $I=I_{MAX}$)	4.8V*		6V

* Parameters are set per battery manufacturer.

6.10. Other Interfaces

Other interfaces and signals available on the AirPrime SL Development Kit Board are available on both the test points at the center of the AirPrime SL Development Kit Board, and also on the external board connector J1100. The following sub-sections discuss these additional interfaces and signals.

Refer to sections 3.3 Available Test Ports on the AirPrime SL Development Kit and 6.12 External Board Connector (J1100) for the test point location and the pin description.

For further technical information, refer to document [1] AirPrime SL6087 Product Technical Specification and Customer Design Guidelines.

6.10.1. Power Supply Function

These outputs (VCC_1V8 and VCC_2V8) from the AirPrime SL6087 embedded module can be used to connect pull-up resistors. VCC_2V8 is 2.8V. They must only be used as a reference supply.

6.10.2. Backup Battery Function

The AirPrime SL6087 embedded module provides an input/output signal, BAT-RTC, for connecting a Real Time Clock power supply. This pin is used as a backup power supply to preserve the date and time when VBATT is switched OFF (no VBATT).

6.10.3. Serial Interface

The AirPrime SL6087 embedded module may be connected to an LCD module driver through either an SPI bus (3 or 4-wire interface) or an I²C bus (2-wire interface).

6.10.3.1. SPI Bus

The AirPrime SL6087 embedded module provides one SPI bus with a maximum speed of 13Mb/s in Master mode operation using a 3 or 4-wire interface design.

For more information about this interface, refer to document [1] AirPrime SL6087 Product Technical Specification and Customer Design Guidelines.

6.10.3.2. I²C Bus

The AirPrime SL6087 embedded module provides an I²C bus that includes a clock signal (CLK) and a data signal (SDA) with a maximum speed of 400Kb/s in Master mode operation.

For more information about this interface, refer to document [1] AirPrime SL6087 Product Technical Specification and Customer Design Guidelines.

6.10.4. Digital Audio Interface (PCM)

The digital audio interface (PCM) allows connectivity with standard audio peripherals.

For more information about this interface, refer to document [1] AirPrime SL6087 Product Technical Specification and Customer Design Guidelines.

6.10.5. ADC Function

The AirPrime SL6087 embedded module provides two analog to digital converters, BAT-TEMP/ADC1 and AUX-ADC. These converters are 10-bit resolution ADCs ranging from 0V to 2V.

For more information about this interface, refer to document [1] AirPrime SL6087 Product Technical Specification and Customer Design Guidelines.

6.10.5.1. BAT-TEMP/ADC1

This analog input signal can be used to monitor external (application) temperature. For example, it can be use for a battery charging temperature sensor.

6.10.5.2. AUX-ADC

This input may be used for customer specific applications.

6.10.6. External Interrupt

The AirPrime SL6087 embedded module provides two external interrupt inputs, INT0 and INT1, with differing voltages. INT0 is a 1V8-type input while INT1 is 2V8-type input.

For more information about this interface, refer to document [1] AirPrime SL6087 Product Technical Specification and Customer Design Guidelines.

6.11. Antenna Function

The SMA connector, available on the AirPrime SL6087 Socket-Up Board, is used for customer applications.

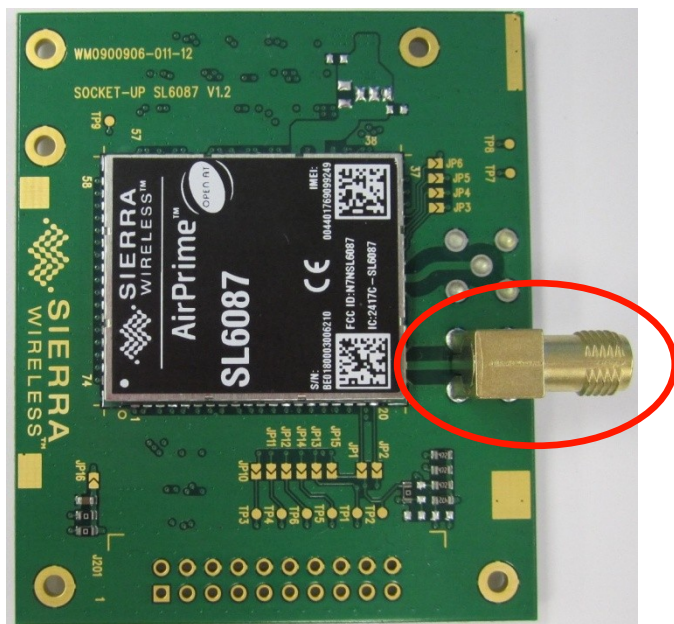


Figure 45. SMA Connector on the AirPrime SL6087 Socket-Up Board for Customer Applications

6.12. External Board Connector (J1100)

The external board connector is an interface to connect an external test bench for testing or debugging.



Figure 46. External Board Connector

Most of the AirPrime SL6087 Socket-Up Board signals are connected to the external board connector (J1100) and are available via TP from the center of the AirPrime SL Development Kit Board. Refer to the following table for the pin description of the J1100 connector.

For further information about the AirPrime SL6087 embedded module signals and their corresponding multiplexed signals, refer to document [1] AirPrime SL6087 Product Technical Specification and Customer Design Guidelines.

Table 13: External Board Connector (J1100) Pin Description

Pin Number	Signal Name	I/O	I/O Type	Description
1	VBATT	I	Supply	Battery Input
2	VBATT	I	Supply	Battery Input
3	CHG-IN	I	Supply	Current source input
4	CHG-IN	I	Supply	Current source input
5	VCC_1V8	O	Supply	1.8V digital supply output
6	VCC_2V8	O	Supply	2.8V digital supply output
7	GND			Ground
8	BAT_RTC	I/O	Supply	RTC back-up supply
9	SIM-VCC	O	Supply	SIM card supply
10	SIMPRES	I/O	1V8	SIM card detect (Multiplexed)
11	SIM-CLK	O	1V8 / 2V9	SIM clock
12	SIM-IO	I/O	1V8 / 2V9	SIM data
13	~SIM-RST	O	1V8 / 2V9	SIM reset
14	GND			Ground
15	BUZZ-OUT	O	Open drain	PWM / Buzzer output
16	FLASH-LED	O	Open Drain	Charging indicator + Network status
17	ON/~OFF	I	VBATT	Power ON / OFF
18	AUX_ADC	I	Analog	Auxiliary ADC3
19	~RESET	I/O	Open Drain	Reset Input
20	BOOT	I	1V8	SW download (with "DWLwin" software)
21	BAT-TEMP	I	Analog	ADC input (i.e. battery temperature measurement)
22	GND			Ground
23	SPI1-I/GPIO19	I/O	2V8	SPI1 Serial input/GPIO30 (Multiplexed)
24	~SPI1-CS/GPIO20	I/O	2V8	SPI1 Enable/ GPIO31/INT5 (Multiplexed)
25	SPI1-IO/GPIO13	I/O	2V8	SPI1 Serial input/output/GPIO29
26	SPI1-CLK/GPIO12	I/O	2V8	SPI1 Serial Clock / GPIO28
27	N/C			Not connected
28	N/C			Not connected
29	N/C			Not connected
30	N/C			Not connected
31	GND			Ground
32	CT104/RXD2	I/O	1V8	Auxiliary RS232 Receive Serial Data / GPIO15 (According to PC view)
33	~CT106/CTS2	I/O	1V8	Auxiliary RS232 Clear To Send / GPIO16 (According to PC view)
34	CT103/TXD2	I/O	1V8	Auxiliary RS232 Transmit Serial Data / GPIO14 / INT6 (According to PC view)
35	GND			Ground

Pin Number	Signal Name	I/O	I/O Type	Description
36	~CT105/RTS2	I/O	1V8	Auxiliary RS232 Request To Send / GPIO17 / INT7 (According to PC view)
37	USB-DP	I/O	3V3	Differential data interface positive
38	VPAD-USB	I	3V3	USB power supply
39	USB-DM	I/O	3V3	Differential data interface negative
40	GND			Ground
41	N/C			Not connected
42	N/C			Not connected
43	N/C			Not connected
44	N/C			Not connected
45	N/C			Not connected
46	N/C			Not connected
47	N/C			Not connected
48	N/C			Not connected
49	N/C			Not connected
50	N/C			Not connected
51	GND			Ground
52	GND			Ground
53	MIC2P	I	Analog	Microphone 2 positive input
54	N/C			Not connected
55	N/C			Not connected
56	SPK1N	O	Analog	Speaker 1 negative output
57	MIC1P	I	Analog	Microphone 1 positive input
58	N/C			Not connected
59	MIC1N	I	Analog	Microphone 1 negative input
60	N/C			Not connected
61	N/C			Not connected
62	N/C			Not connected
63	N/C			Not connected
64	N/C			Not connected
65	N/C			Not connected
66	VBATT	I	Supply	Battery Input
67	VBATT	I	Supply	Battery Input
68	CT103/TXD1	I/O	2V8	Main RS232 Transmit Serial Data / GPIO36 (According to PC view)
69	~CT125/RI1	I/O	2V8	Main RS232 Ring indicator / GPIO42 (According to PC view)
70	~CT106/CTS1	I/O	2V8	Main RS232 Clear To Send / GPIO39 (According to PC view)
71	CT104/RXD1	I/O	2V8	Main RS232 Receive Serial Data / GPIO37 (According to PC view)
72	~CT105/RTS1	I/O	2V8	Main RS232 Request To Send / GPIO38 (According to PC view)

Pin Number	Signal Name	I/O	I/O Type	Description
73	~CT109/DCD1	I/O	2V8	Main RS232 Data Carrier Detect / GPIO43 (According to PC view)
74	~CT108/DTR1	I/O	2V8	Main RS232 Data Terminal Ready / GPIO41 (According to PC view)
75	~CT107/DSR1	I/O	2V8	Main RS232 Data Set Ready / GPIO40 (According to PC view)
76	GND			Ground
77	GND			Ground
78	N/C			Not connected
79	N/C			Not connected
80	N/C			Not connected
81	N/C			Not connected
82	N/C			Not connected
83	N/C			Not connected
84	N/C			Not connected
85	N/C			Not connected
86	N/C			Not connected
87	N/C			Not connected
88	N/C			Not connected
89	N/C			Not connected
90	N/C			Not connected
91	N/C			Not connected
92	TDI			Not available
93	NTRS			Not available
94	TMS			Not available
95	TDO			Not available
96	RTCK			Not available
97	TCK			Not available
98	GND			GROUND
99	GND			GROUND
100	SCL/GPIO1	I/O	Open drain	Serial Clock / GPIO26
101	SDA/GPIO2	I/O	Open drain	Serial Data / GPIO27
102	GND			GROUND
103	GND			GROUND
104	PCM-CLK	O	1V8	Data clock
105	PCM-SYNC	O	1V8	Frame synchronization 8KHz
106	PCM-OUT	O	1V8	Data output
107	PCM-IN	I	1V8	Data input
108	GPIO24	I/O	2V8	GPIO24
109	GND			GROUND
110	INT0/GPIO3	I/O	1V8	INT0 / GPIO3 / A26
111	N/C			Not connected
112	GPIO23	I/O	2V8	GPIO23
113	GPIO22	I/O	2V8	GPIO22

Pin Number	Signal Name	I/O	I/O Type	Description
114	N/C			Not connected
115	N/C			Not connected
116	CHARGER-LED/GPIO21	I/O	2V8	GPIO21
117	INT1/GPIO25	I/O	2V8	Interruption 1 / GPIO25
118	GPIO0	I/O	2V8	GPIO44
119	N/C			Not connected
120	N/C			Not connected
121	N/C			Not connected
122	N/C			Not connected
123	N/C			Not connected
124	N/C			Not connected
125	N/C			Not connected
126	N/C			Not connected
127	N/C			Not connected
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129	N/C			Not connected
130	N/C			Not connected

>> 7. Control Functions

This section discusses the control functions available in the AirPrime SL Development Kit.

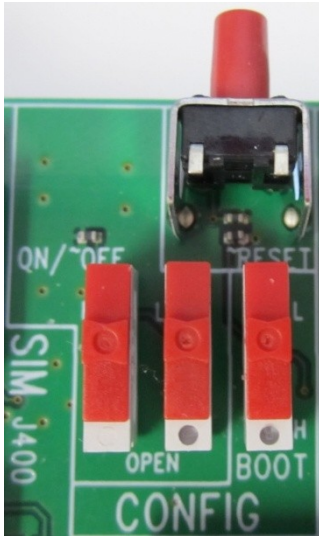


Figure 47. Control Functions

7.1. ON/~OFF

When the AirPrime SL Development Kit is connected to an external power supply (via J600 or J604) and SW600 is set to the “H” position, a HIGH level signal is sent to the AirPrime SL6087 embedded module through VBATT.

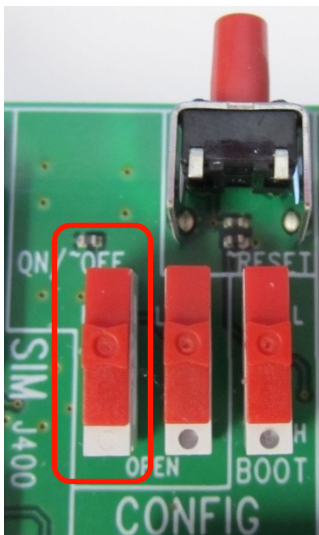


Figure 48. SW600 in the “H” Position

The switch SW601 is used together with switch SW600 for the ON or OFF control of the AirPrime SL6087 embedded module. This switch should be set to the “L” position.

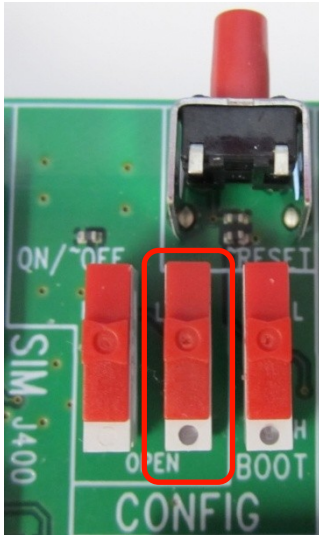


Figure 49. Switch SW601 in the “L” Position

Refer to the following table for the configuration of switches SW600 and SW601 and the corresponding ON/~OFF state of the embedded module.

Table 14: SW600 and SW601 Configuration

SW600 State	SW601 State	ON/~OFF State
H	Open	H
H	L	H
L	L	L
L	Open	Open

For more information about the ON/~OFF signal, refer to document [1] AirPrime SL6087 Product Technical Specification and Customer Design Guidelines.

7.2. ~RESET

The ~RESET button starts a general reset when it is pushed.

Caution: *A software reset is preferred to a hardware reset.*

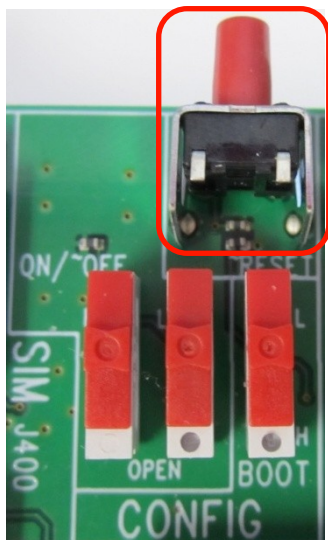


Figure 50. ~RESET Button

For more information about this signal, refer to document [1] AirPrime SL6087 Product Technical Specification and Customer Design Guidelines.

7.3. BOOT

The BOOT switch is only used when downloading new software to the AirPrime SL6087 embedded module via UART1 using specific download software provided by Sierra Wireless. This switch is set to the “OFF” position by default.

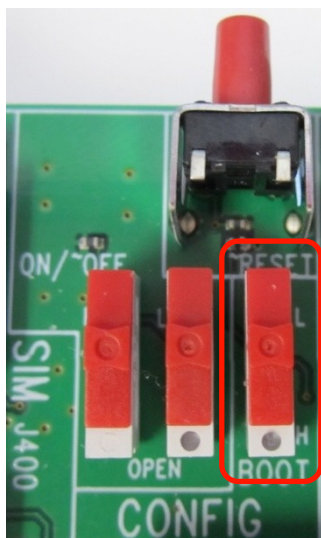


Figure 51. BOOT Switch in the “OFF” Position

Refer to the following table for the BOOT signal configuration.

Table 15: BOOT Configuration

Mode	BOOT	ON/~OFF
Normal	OFF	ON*
Backup download with specific download software	ON	ON

* The BOOT switch can be switched to the “OFF” position within two seconds if the ON/~OFF signal is to be driven by software (via the AT+CPOF AT command). For more information about this AT command, refer to document [2] Firmware 7.4b AT Commands Manual (Sierra Wireless Software Suite 2.32).

8. ESD Protections

External ESD protections are available on the AirPrime SL Development Kit for the following signals:

- SIM interface signals:
 - SIM-VCC
 - SIM-IO
 - SIM-CLK
 - SIM-RST
- AUDIO2
- USB
 - USB-DP
 - USB-DM

Other interface signals protected on the AirPrime SL6087 embedded module are as follows:

- UART1 signals with the ADM3307 transceiver
- UART2 signals with the LTC2804 transceiver

Caution: *As the test points at the center of the AirPrime SL Development Kit are not protected against ESD discharge and they are directly connected to the signal pins of the AirPrime SL6087 embedded module, users must be careful when using these TP signals.*

9. Current Consumption Measurement

To measure the current consumption of the AirPrime SL6087 embedded module, configure the AirPrime SL Development Kit as shown in the following sub-sections.

Caution: *Before making any of the adjustments below, ensure that the AirPrime SL Development Kit is disconnected from the power supply.*

Note that with the configuration described in the following sub-sections, the consumption current from VBATT is only* that of the AirPrime SL6087 embedded module soldered-down. For more information about the AirPrime SL6087 embedded module and its current consumption, refer to document [1] AirPrime SL6087 Product Technical Specification and Customer Design Guidelines.

Note: * Subtract a quiescent current of 50 μ A from T100.

Also, make sure to take note of the following additional points:

- T100 used for UART1 enable will affect power consumption on 4V (VBATT) by an additional 50 μ A.
- C600 and D604 connected on 4V (VBATT) may affect power consumption on 4V (VBATT). Disconnect these 2 components if necessary.
- Flash LED (D602) and can affect power consumption and can be disconnected by opening jumper J602.

9.1. AirPrime SL Development Kit Board

Configure the AirPrime SL Development Kit Board as follows:

- Around the Power Supply area:
 - Unsolder jumper J605 to disconnect VBATT and VBAT.
- Around the UART2 area:
 - Disconnect UART2 from the AirPrime SL6087 embedded module by dissociating J201 to J204.
- Around BAT-TEMP (VBATT area):
 - Remove R600, D603 and D604 in order to eliminate the current drawn by the application circuit on the AirPrime SL Development Kit.
 - Dissociate J605 in order to separate the power supplies of the AirPrime SL Development Kit and the AirPrime SL6087 embedded module.
 - Connect a 4V external power supply to the test point TP602 ("VBAT") and ground.

Note: *The current from J600 is supplied to the AirPrime SL6087 embedded module; while the current from TP602 is supplied to the AirPrime SL Development Kit.*

- Around the USB area:
 - Disconnect USB from the AirPrime SL6087 embedded module by dissociating J301, J302, J303, J304 and J305.

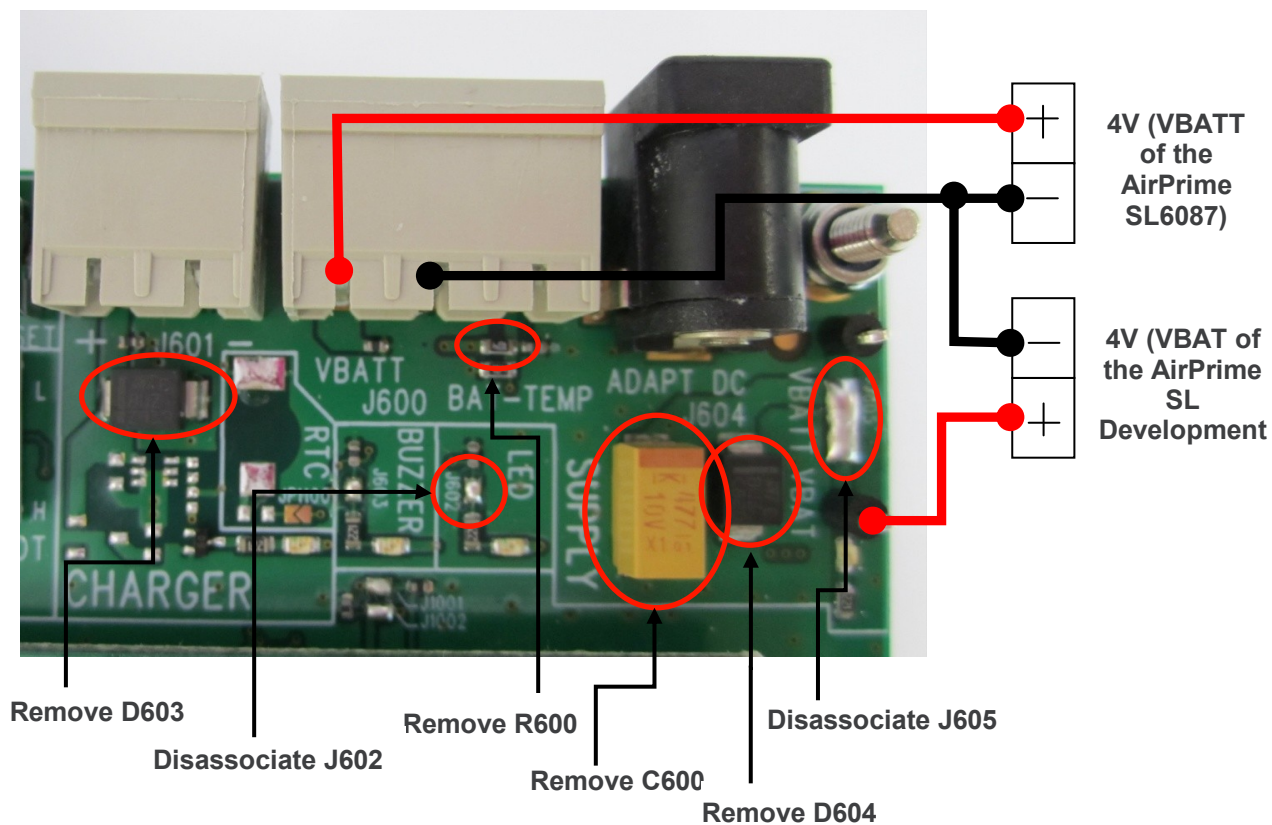


Figure 52. Configuration of VBATT for Current Consumption Measurement

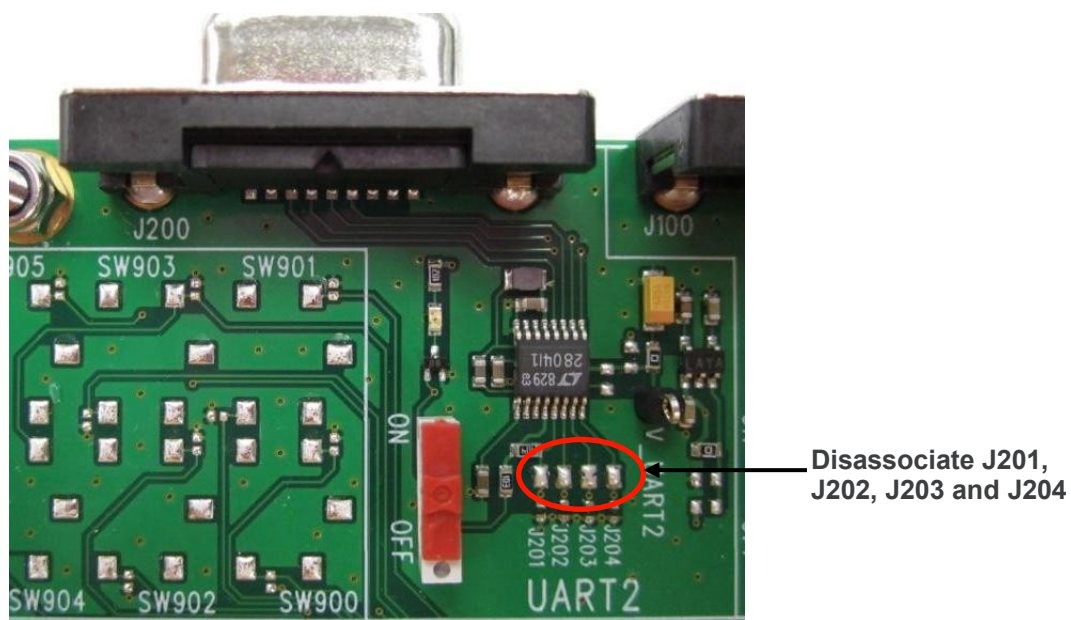


Figure 53. Configuration of UART2 for Current Consumption Measurement

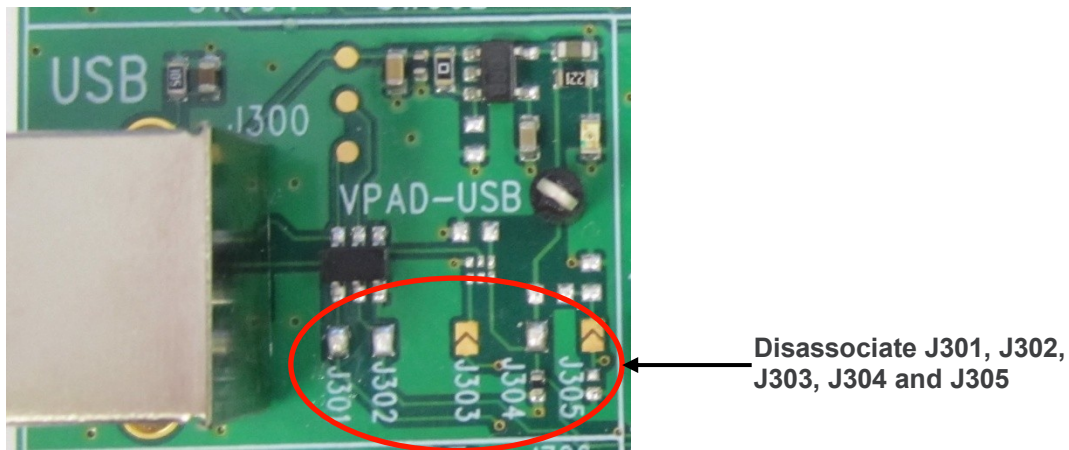


Figure 54. Configuration of USB for Current Consumption Measurement

9.2. AirPrime SL6087 Socket-Up Board

Keep the default settings on the AirPrime SL6087 Socket-Up Board.

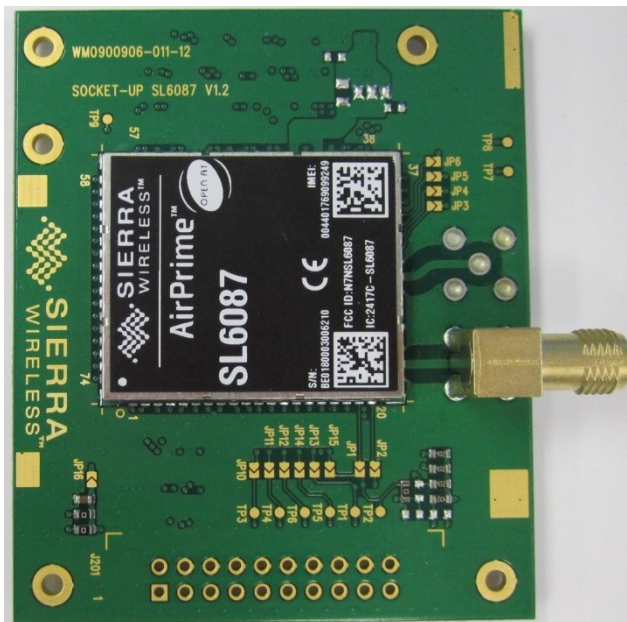


Figure 55. Configuration of the AirPrime SL6087 Socket-Up Board for Current Consumption Measurement



10. Reference Documents

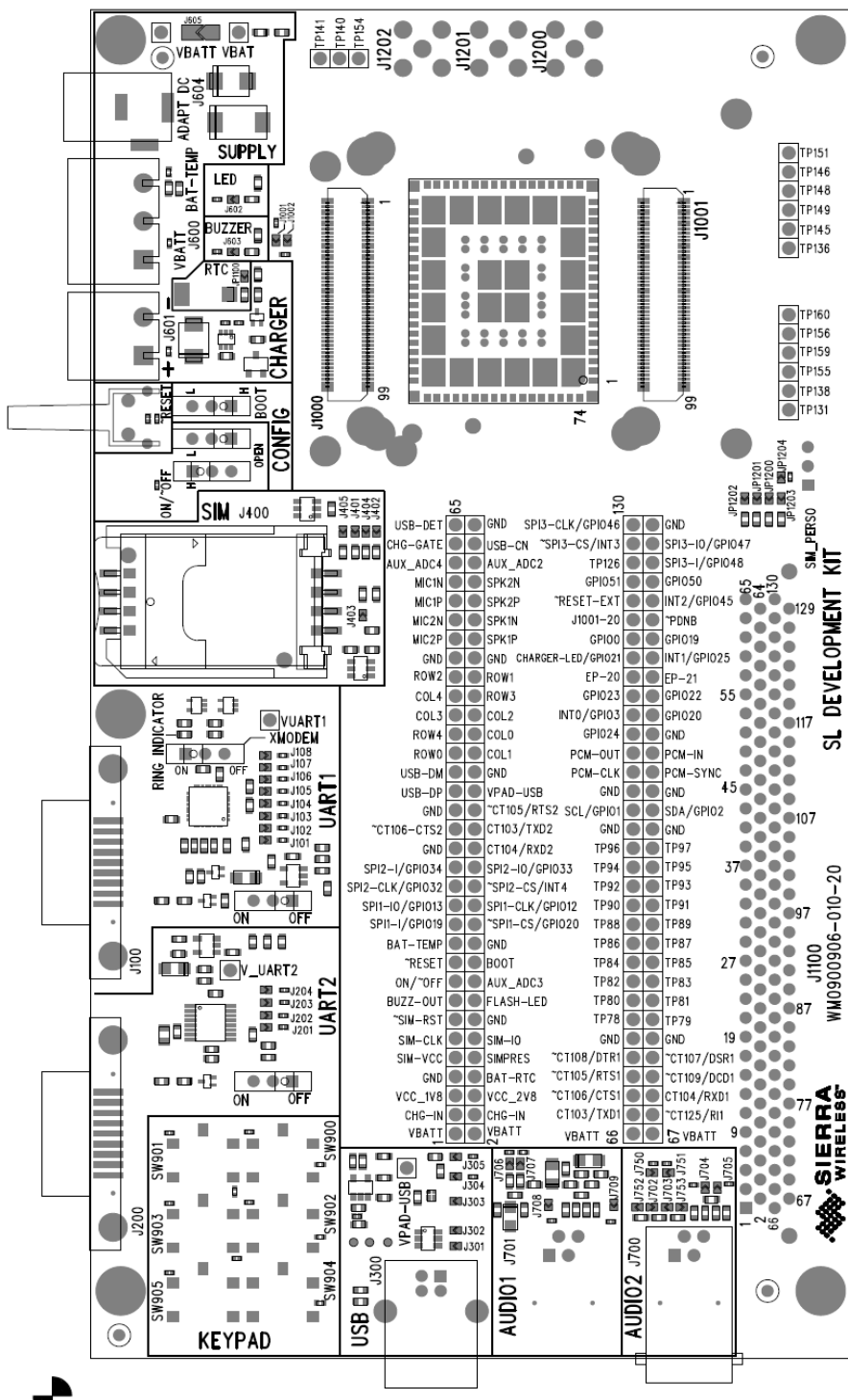
- [1] AirPrime SL6087 Product Technical Specification and Customer Design Guidelines
Reference: WA_DEV_SL6087_PTS_001
- [2] Firmware 7.4b AT Commands Manual (Sierra Wireless Software Suite 2.32)
Reference: WM_DEV_OAT_UGD_079
- [3] AirPrime WMP100 Development Kit User Guide
Reference: WM_DEV_WUP_UGD_001

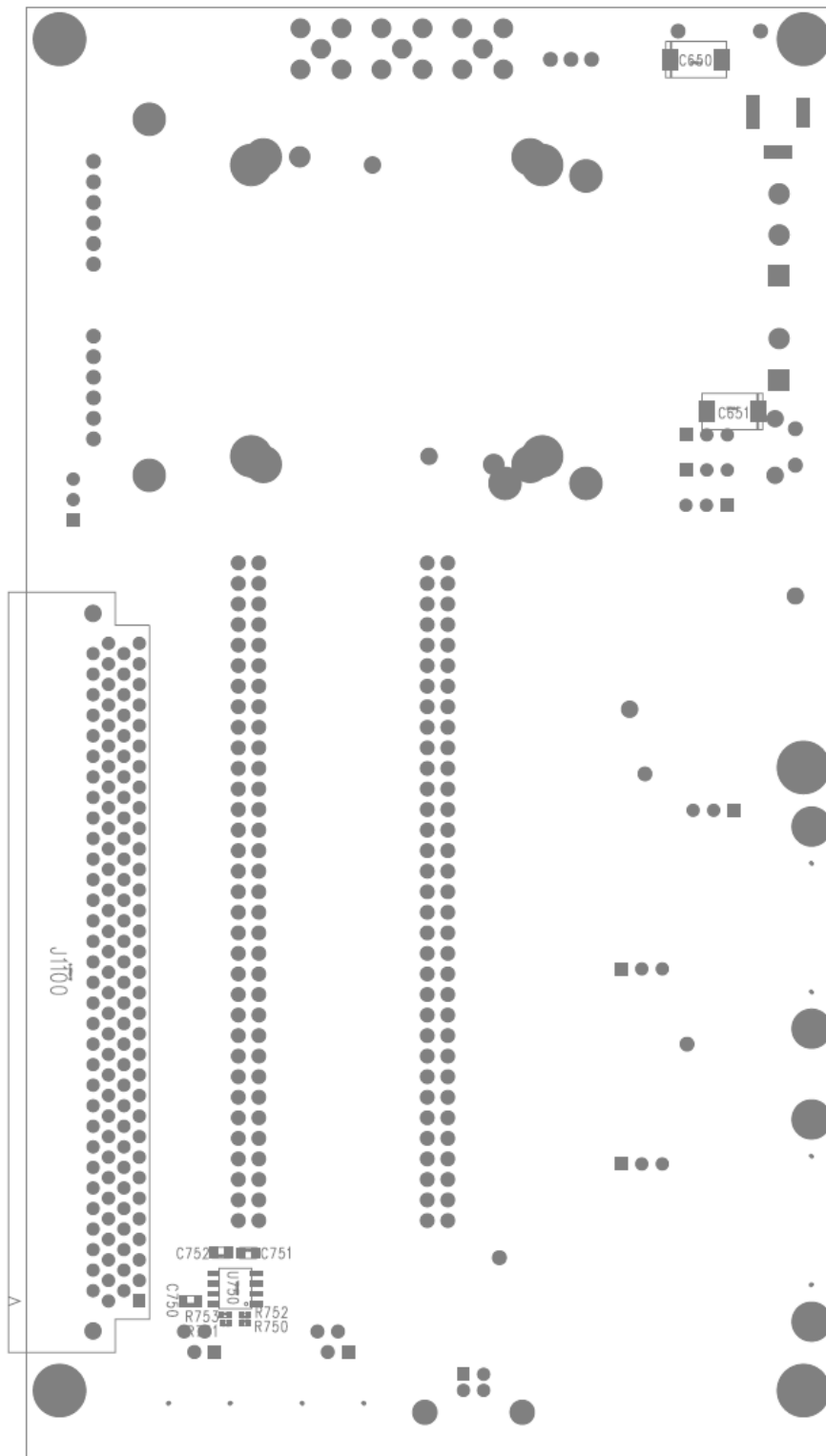
>> 11. List of Abbreviations

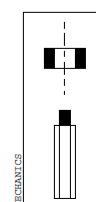
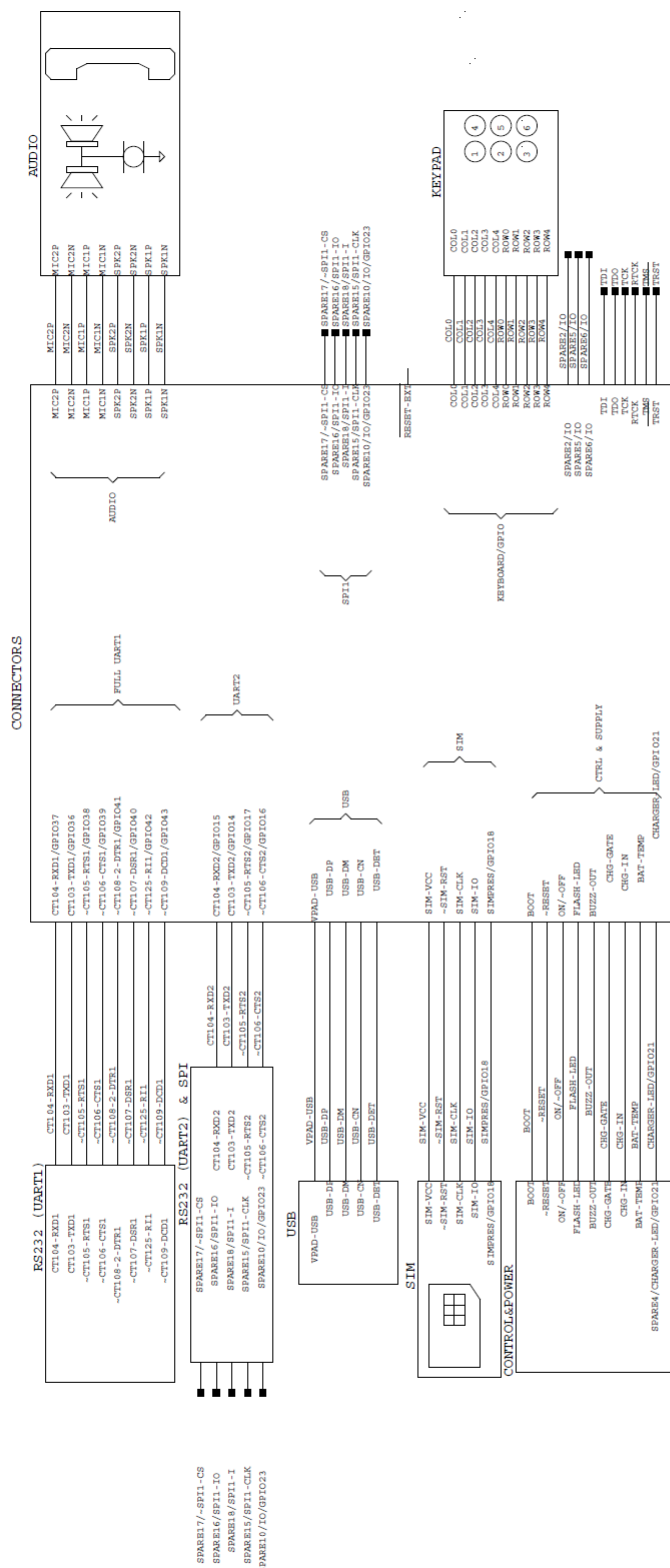
Abbreviation	Definition
ADC	Analog to Digital Converter
AUX	AUXiliary
CLK	CLock
CPU	Central Process Unit
CTS	Clear To Send
DAC	Digital to Analog Converter
DC	Direct Current
DCD	Data Carrier Detect
DCE	Data Communication Equipment
DSR	Data Set Ready
DTE	Data Terminal Equipment
DTR	Data Terminal Ready
ESD	ElectroStatic Discharges
GND	GrouND
GPI	General Purpose Input
GPIO	General Purpose Input Output
GPO	General Purpose Output
IIC (I2C)	Inter IC Control bus
I/O	Input / Output
MIC	MICrophone
PC	Personal Computer
PCB	Printed Circuit Board.
PCM	Pulse Code Modulation
PWM	Pulse Width Modulation
RF	Radio Frequency
RI	Ring Indicator
RTC	Real Time Clock
RTS	Request To Send
RXD	Receive Data
SIM	Subscriber Identity Module
SPI	Serial Peripheral Interface
SPK	SPeaKer
TP	Test Point
TXD	Transmit Data
UART	Universal Asynchronous Receiver-Transmitter
USB	Universal Serial Bus

This section contains schematic diagrams for the AirPrime SL Development Kit and AirPrime SL6087 Socket-Up Board.

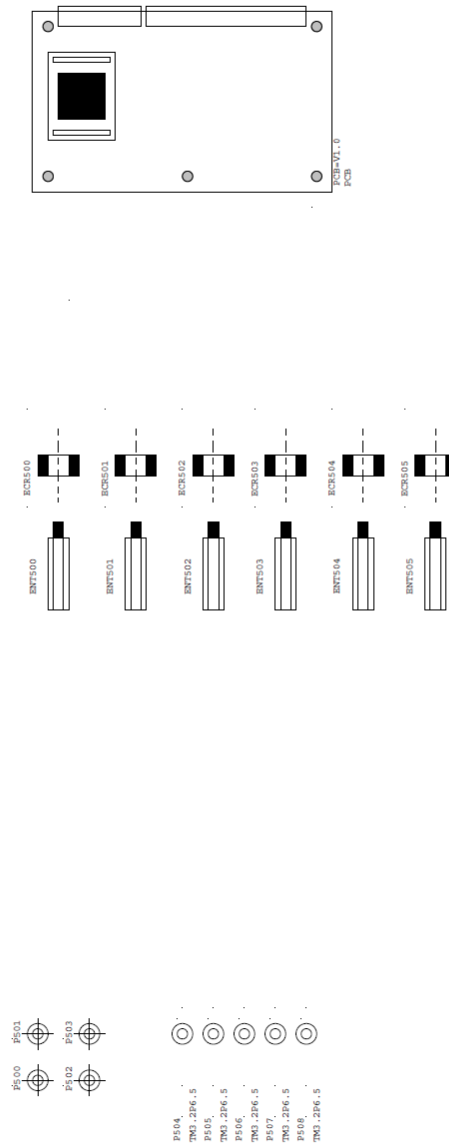
12.1. AirPrime SL Development Kit



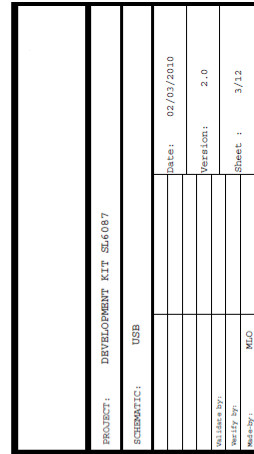


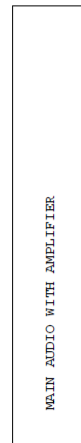


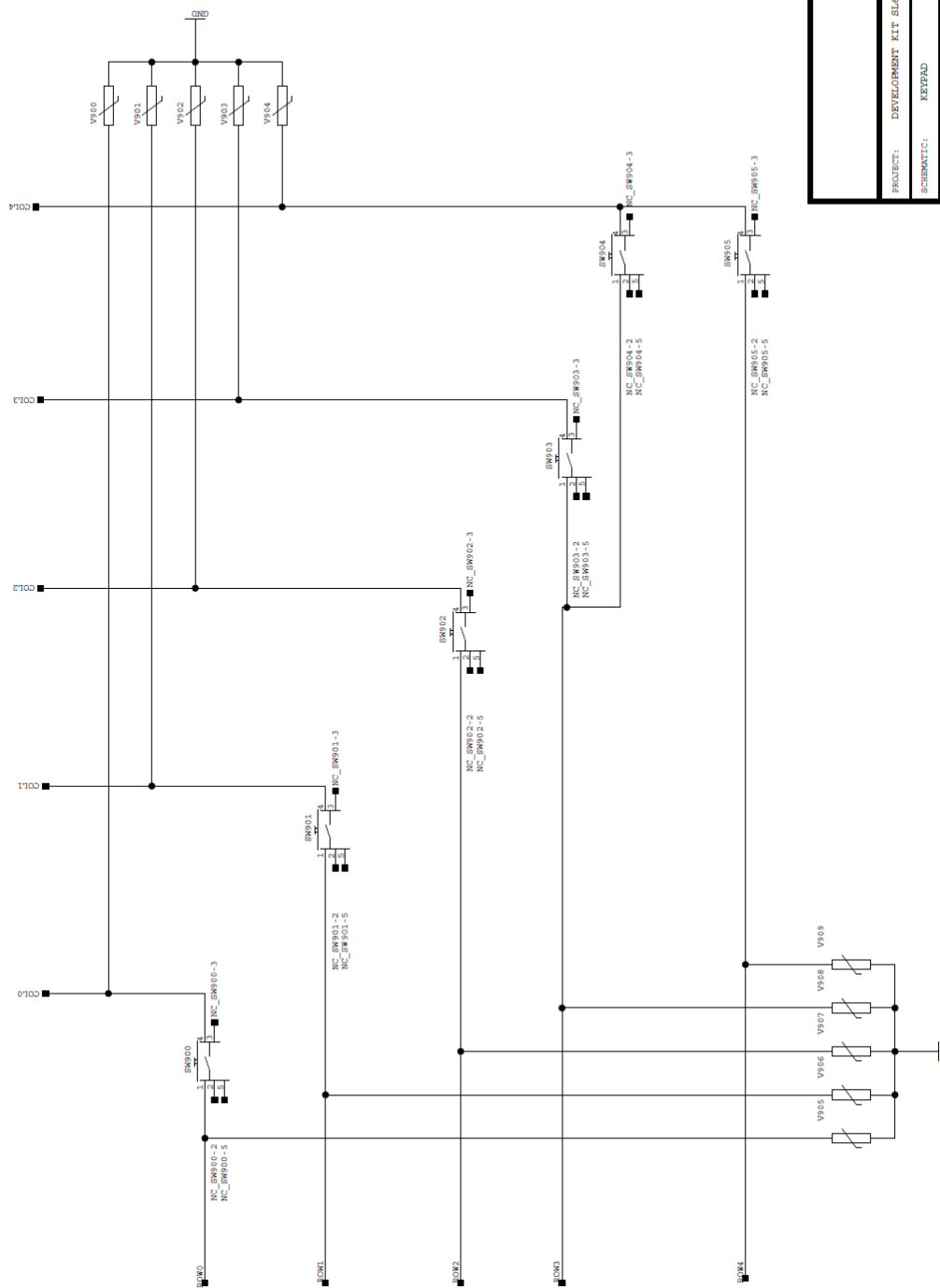
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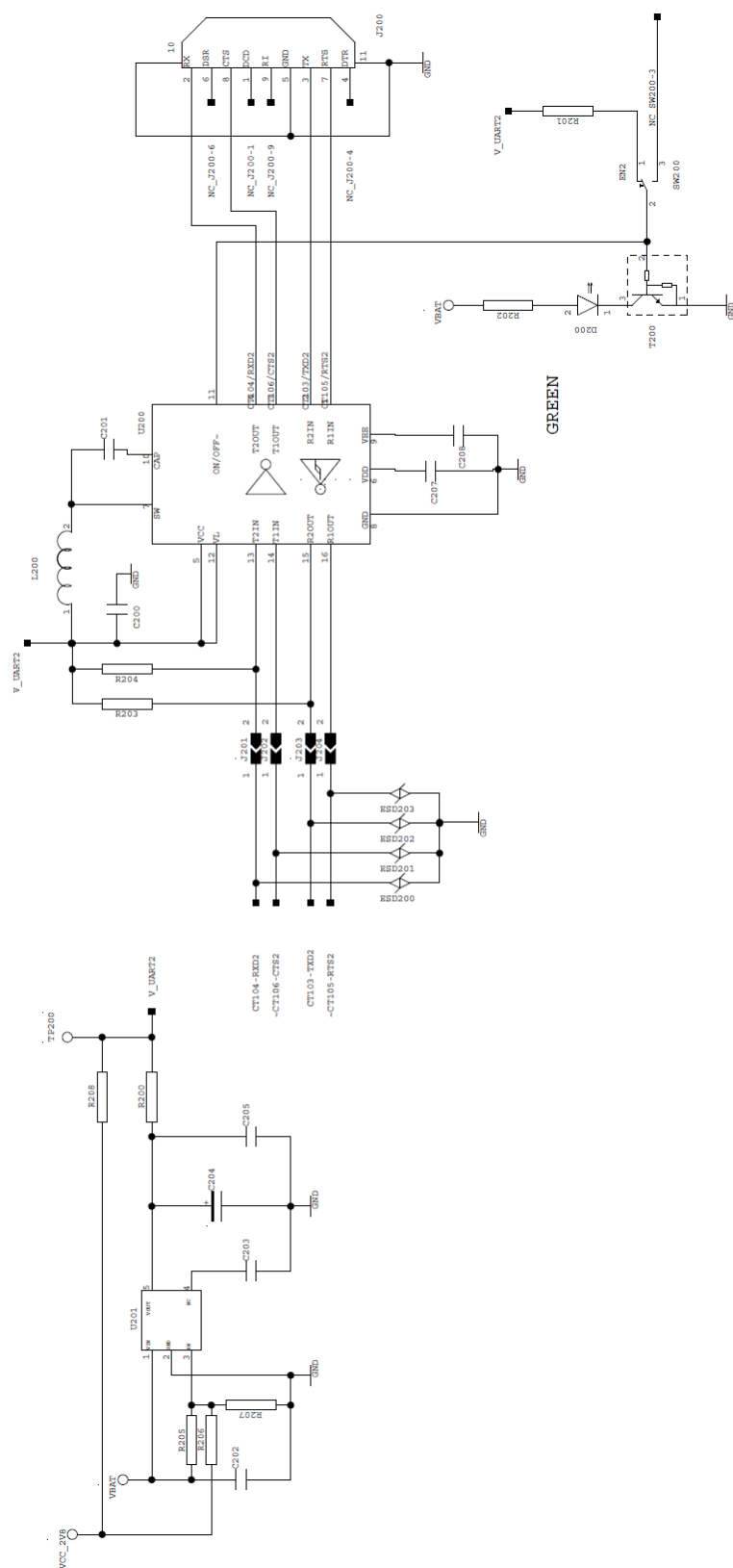
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Verify by	
Make-by:	MLO



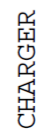
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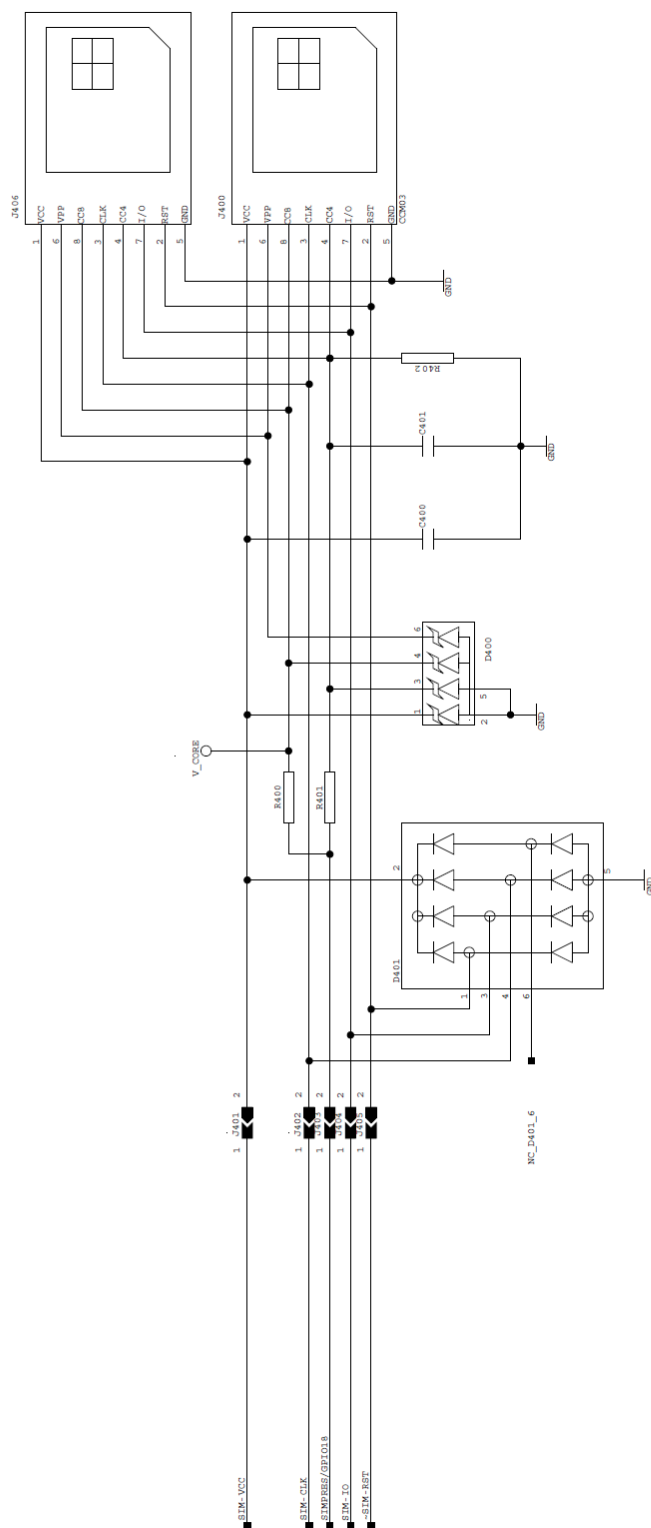


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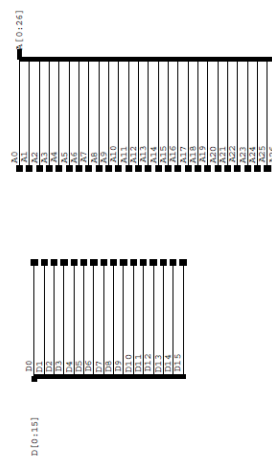
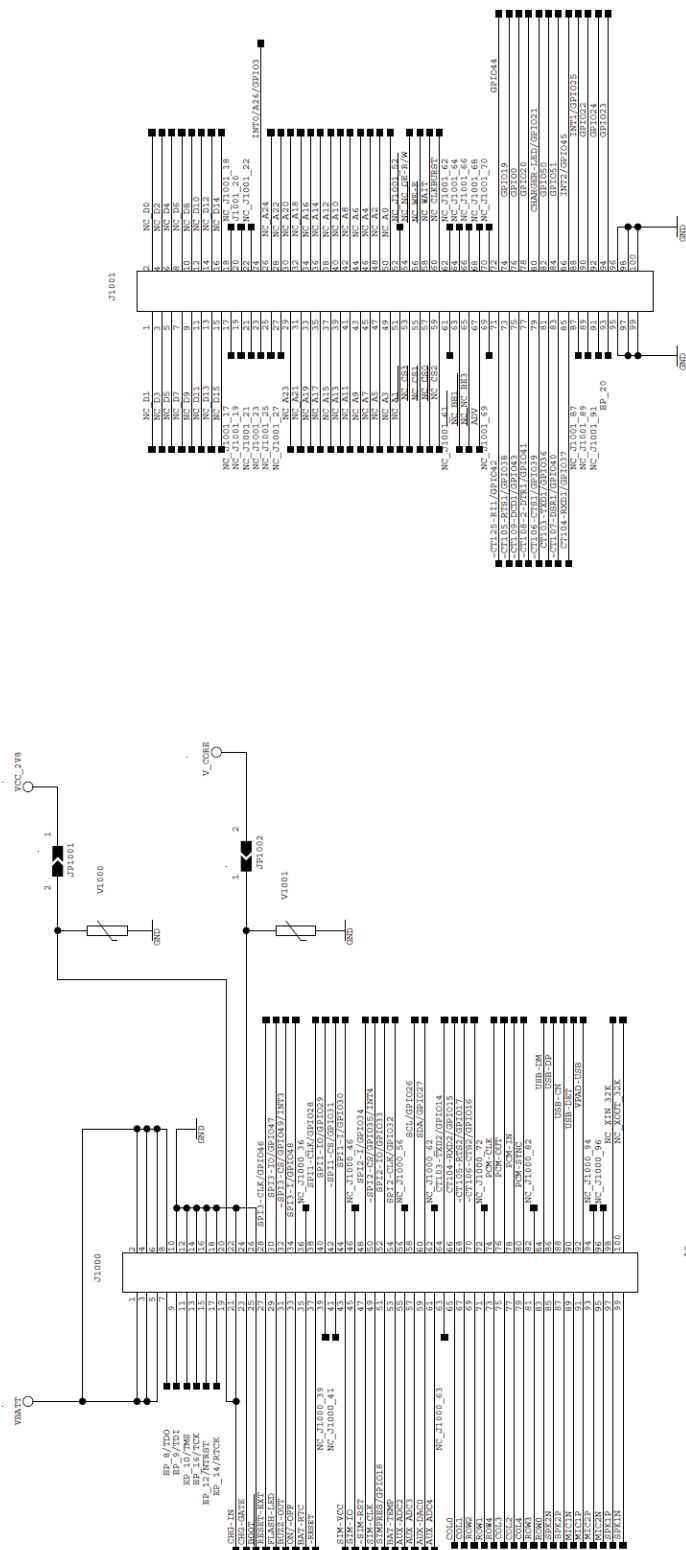


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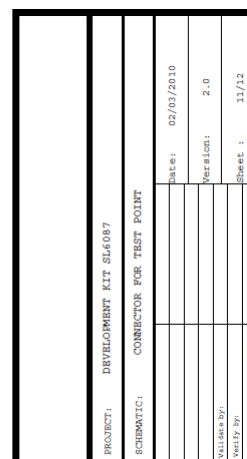
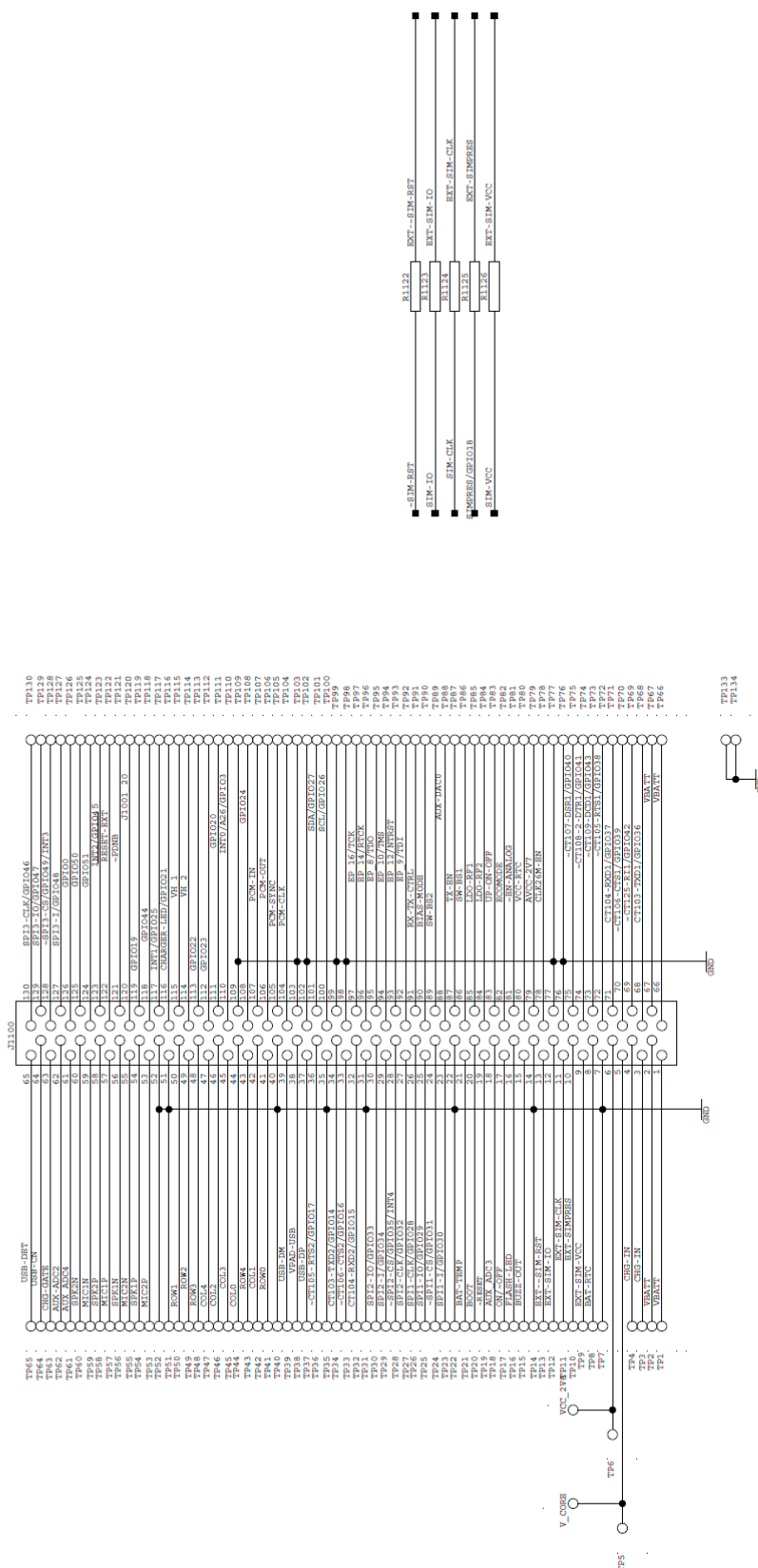
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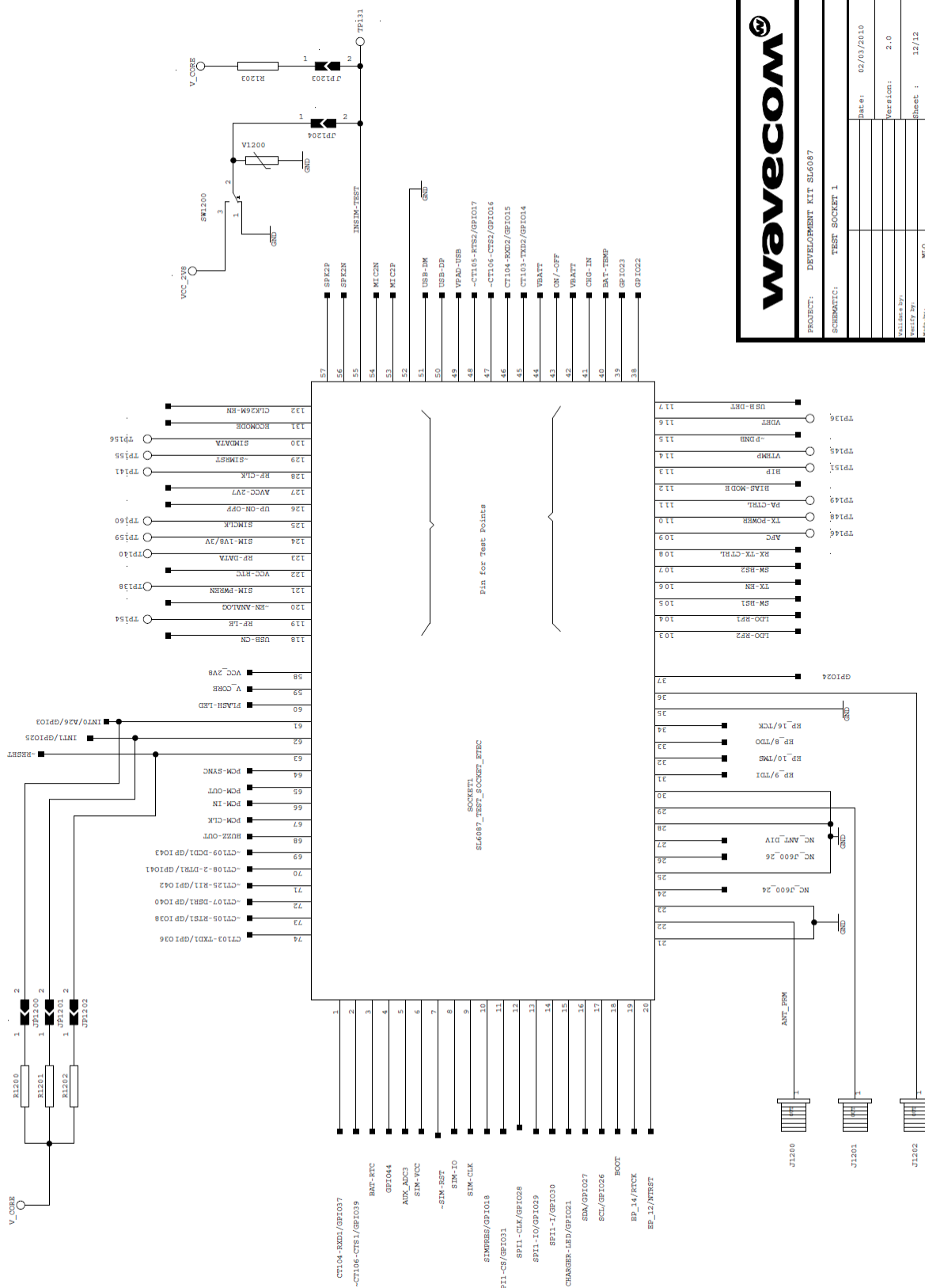


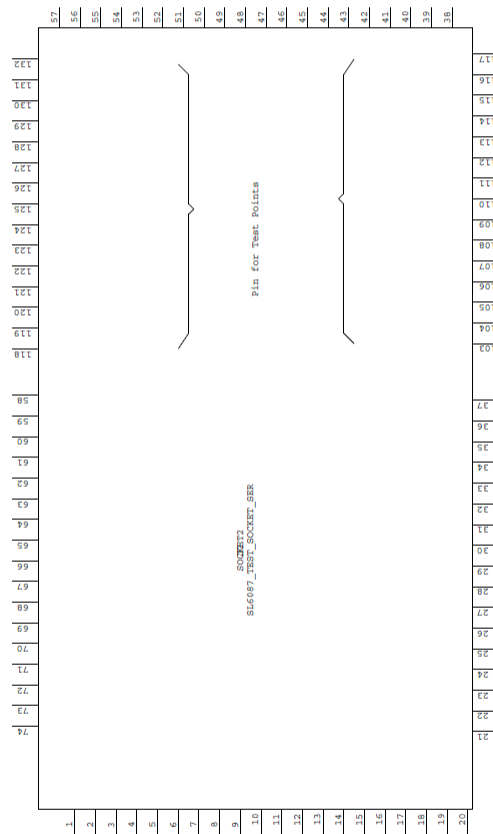
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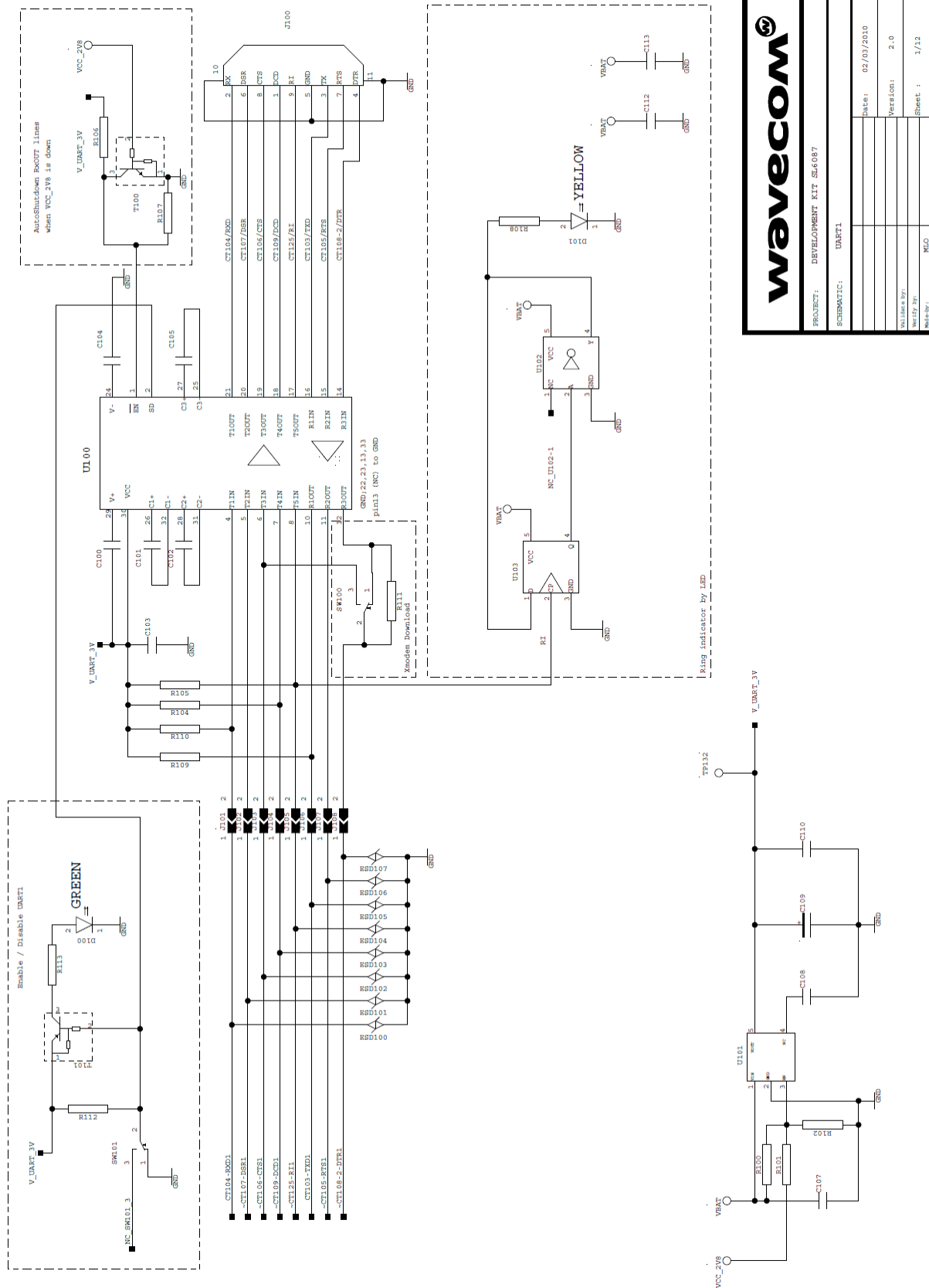
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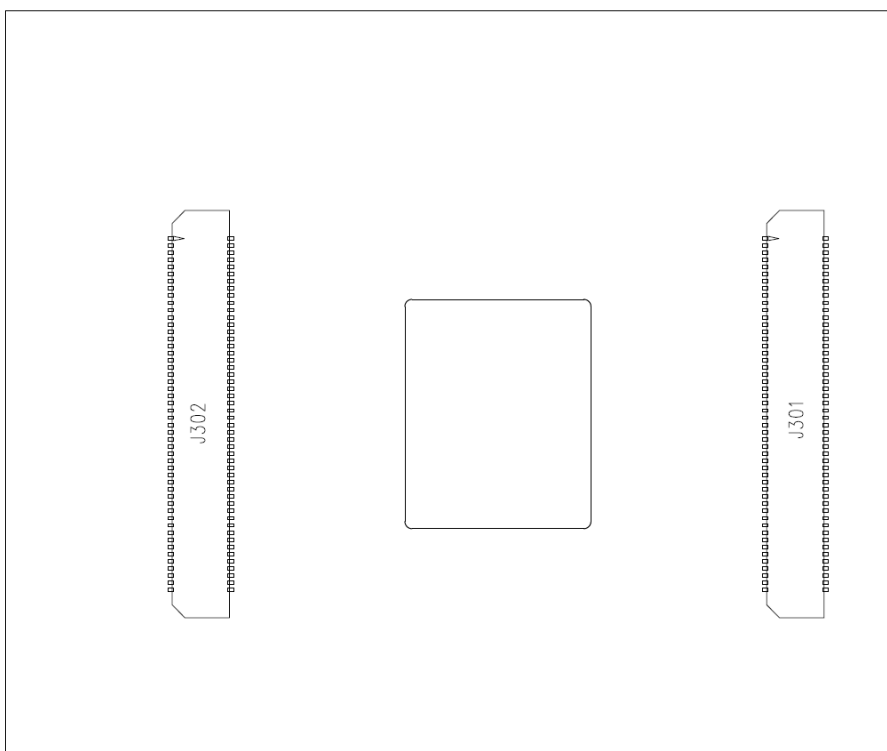
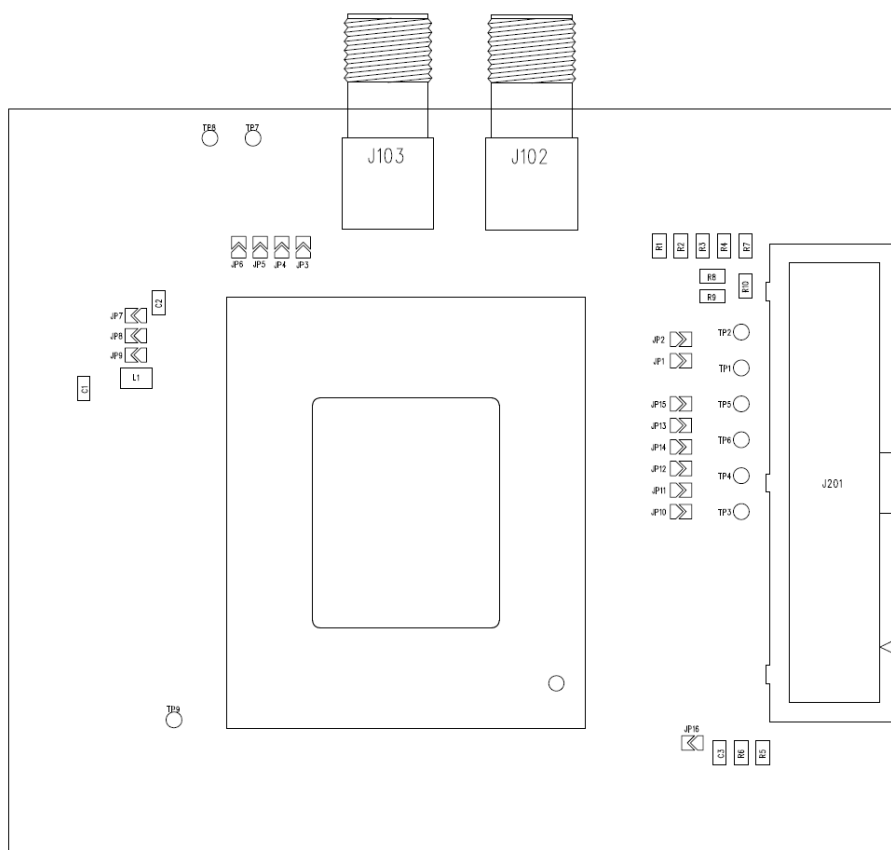


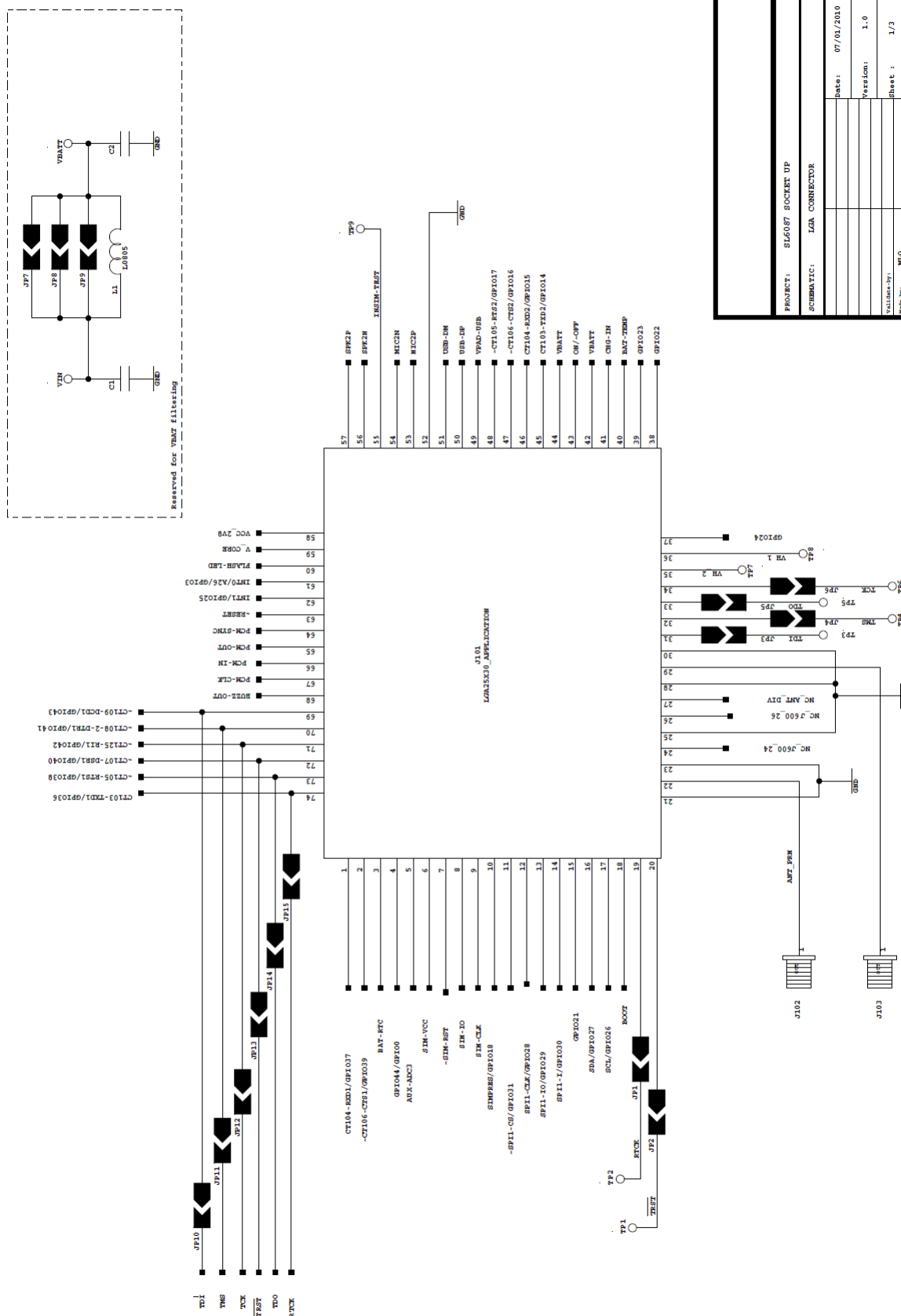


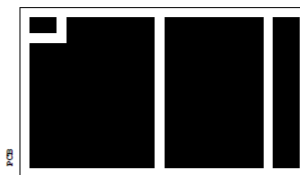
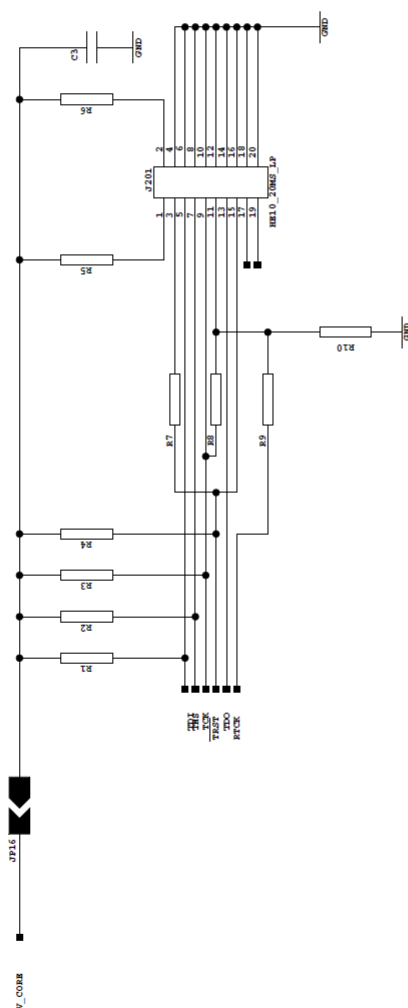
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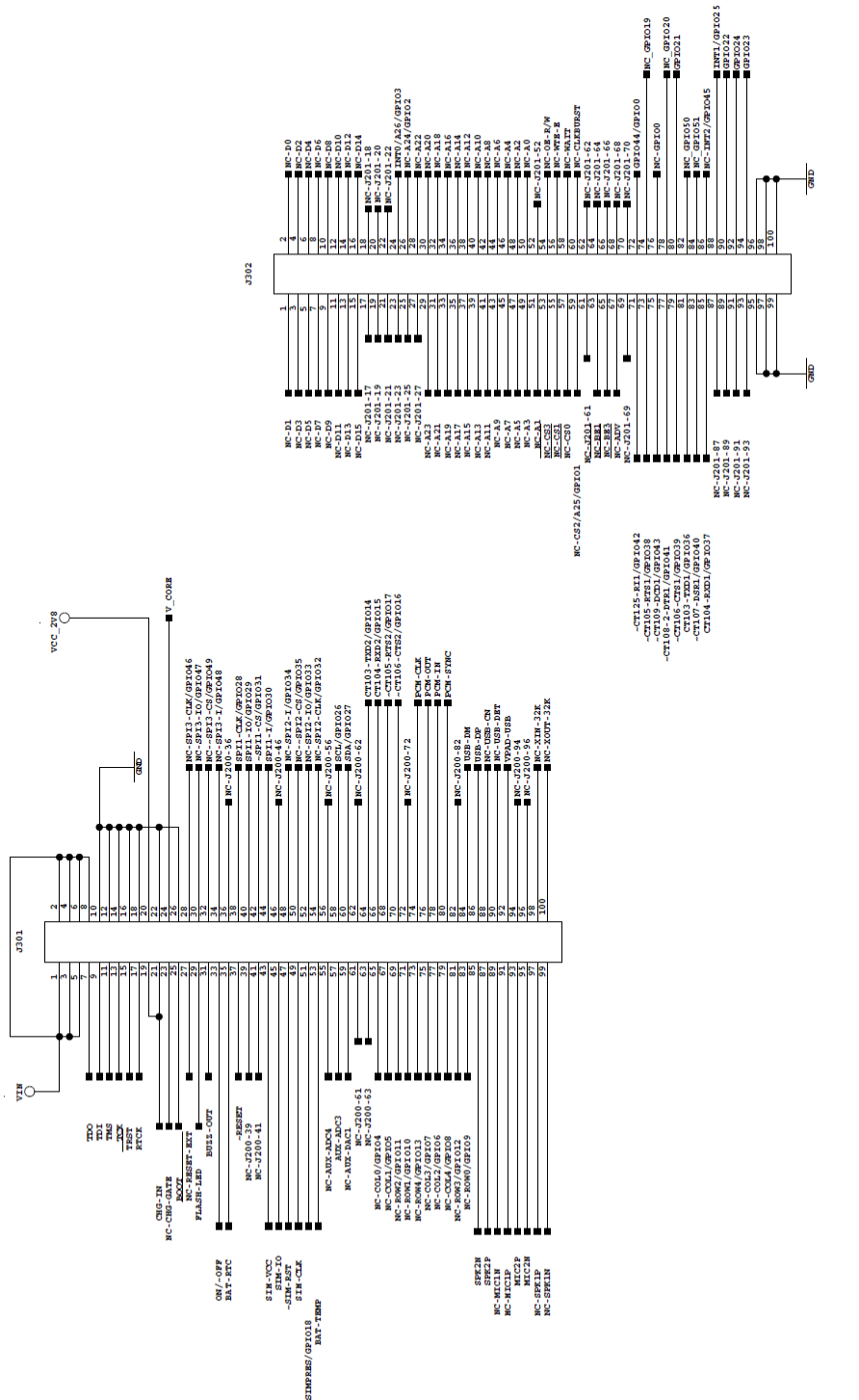
12.2. AirPrime SL6087 Socket-Up Board







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SHEET:	3/3

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P2 SOCKET UP LOCATION: HOLE

P1 SOCKET UP LOCATION: HOLE



SIERRA
WIRELESS