Sierra Wireless RC76xx, WP76xx

Development Kit User Guide

SIERRA WIRELESS®

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Rev. 3

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Revision History

Revision number	Release date	Changes
1.0	March 2022	Creation
2.0	July 2022	Modify the content
3.0	June 2023	Removed List of Figures and List of Tables TOCs Minor formatting updates Added description after Table 3-18 Added Interface for Arduino® and Interface for STMod+

Contents

1: Introduction

This document describes the Sierra Wireless RC76xx / WP76xx Series Development Kit and how it integrates with the RC76xx / WP76xx series of embedded modules via a specific snap-in connector. It also briefly describes the different interfaces and peripheral connections supported by the Development Kit and provides schematics to facilitate the user's understanding and configuration of the Development Kit board for their own application use.

The Development Kit may be used to develop both software and hardware applications based on embedded modules from the RC76xx / WP76xx series.

The following table enumerates the different RC76xx / WP76xx variants that can be used with the Development Kit.

Table 1-1: Supported Module Variants

Variant Name	Description
RC76xx	LTE Cat-4, Cat-1, UMTS, GSM/GPRS, and capable with GLONASS support
WP76xx	LTE Cat-4, Cat-1, UMTS, GSM/GPRS, and capable with GLONASS support

For more information about the RC76xx / WP76xx series of embedded modules, refer to the Product Technical Specification document.

2: General Description

This section gives a brief overview of the Development Kit and describes the interfaces and special jumpers used to control or set the unit's behavior. It also lists all available test points on the Development Kit board.

2.1 Development Kit

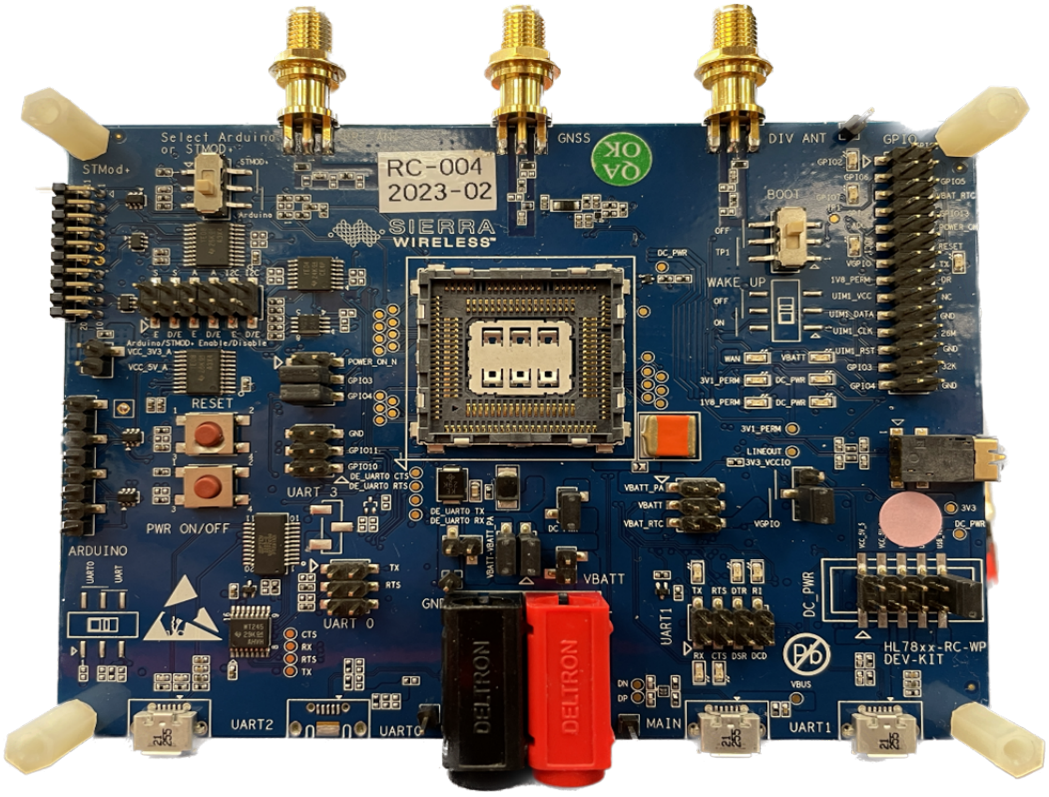


Figure 2-1: Development Kit—Top View

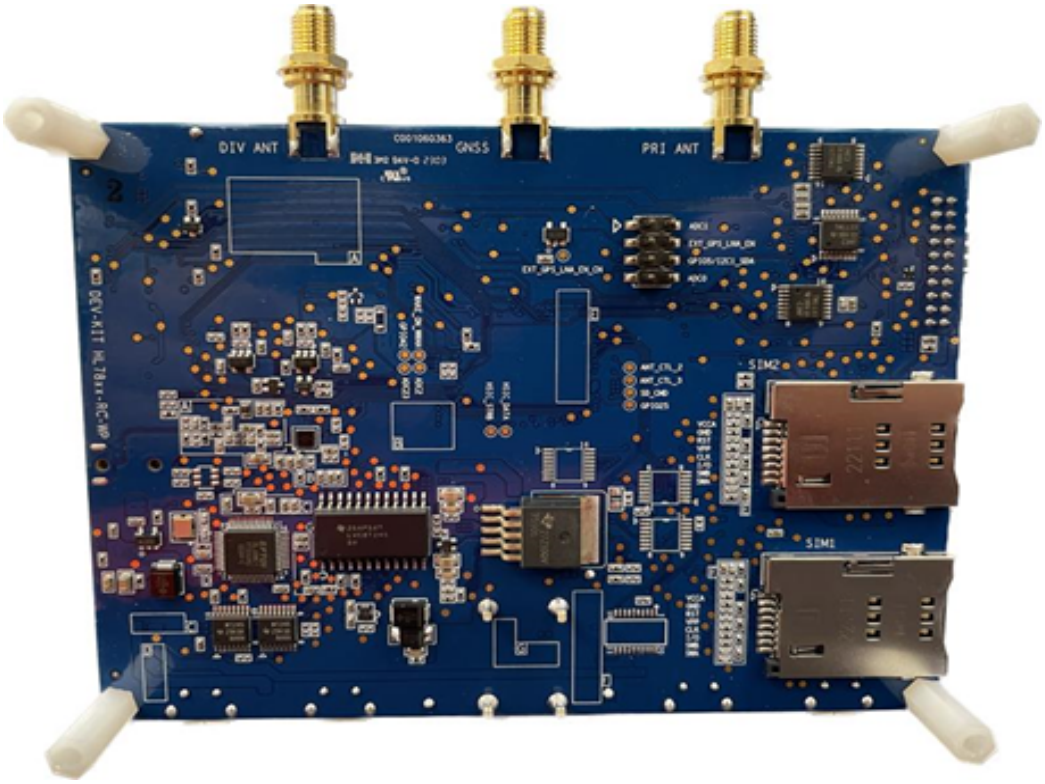


Figure 2-2: Development Kit—Bottom View

2.1.1 Features

Interfaces available on the Development Kit board include:

- Power supply connectors
  - Module's radio frequency main supply (VBATT_PA)
  - Module's baseband main supply (VBATT)
  - Application development kit's main supply (CN805)
- ON/OFF push button
- RESET_IN_N push button
- BOOT Switch
- Tests points (TP) to access all signals of the embedded module
- Main serial link, interfaced through USB connector and USB to serial converter, for modem port with full signals
- Auxiliary serial link, interfaced through USB connector and USB to serial converter, for UART1 function with 8 wire UART signals
- Auxiliary serial link, interfaced through USB connector and USB to serial converter, for UART0/3 function with 4 wire UART signals (Debug Log)
- Full speed main USB connector
- SIM 3V / 1.8V (with SIM presence management)
- Audio connectors: microphone/loudspeaker
- PCM digital/analog audio via external codec
- GPIOs
- ADCs
- TX-ON (RF transmit signal)

- System 19.2Mhz clock out
- VGPIO reference voltage out
- LEDs for several indications
- RF connector and detection circuit antenna
- GNSS connector and detection circuit antenna
- LNA enable by GNSS
- Snap-in connector (for plugging in the RC76xx / WP76xx series modules)

Refer to Interfaces for detailed information about these interfaces.

2.1.2 Connectors and Component Placement

Refer to the following figure for the location of connectors and other components on the Development Kit.

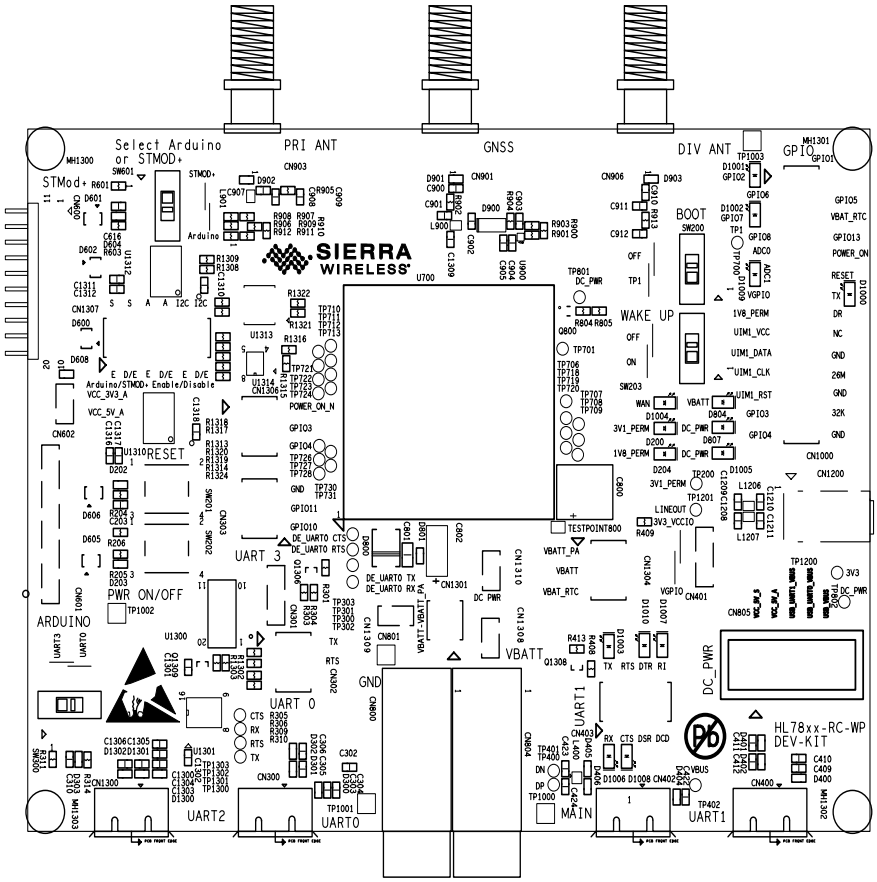


Figure 2-3: Available Connectors and Components – Top

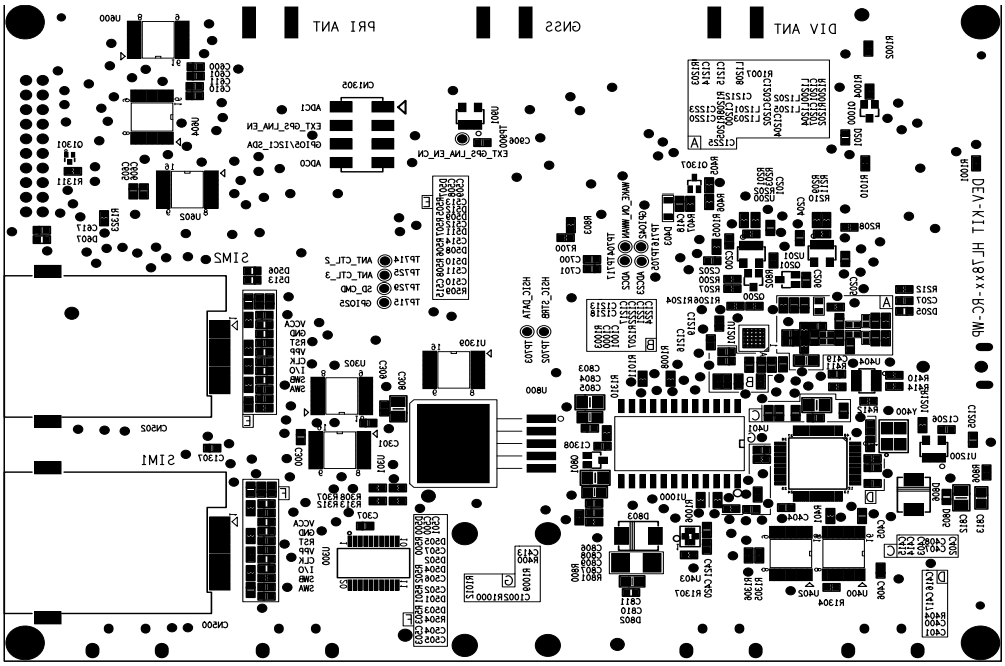


Figure 2-4: Available Connectors and Components – Bottom

The following table describes the connectors and switches available on the Development Kit and the table after describes the different connections available.

Table 2-1: Connector and Switch Description

Connector / Switch	Description	RC76xx / WP76xx
SW200	BOOT	✓
SW201	RESET pushbutton	✓
SW202	POWER_ON_N switch	✓
CN400	USB-UART 1	✓
CN401	U400, U402, U403 enable	✓
CN402	Main USB	✓
CN403	UART1 test pin	✓
CN500	SIM1	✓
CN502	SIM2	✓
CN600	STMod+ test pin	✓

Table 2-1: Connector and Switch Description (Continued)

Connector / Switch	Description	RC76xx / WP76xx
CN601	Arduino test pin	✓
CN602	Arduino 3V / 5V input	✓
SW601	Arduino / STMod+ selector	✓
U700	Snap-in connector	✓
CN800	GND Jack	✓
CN801	4V, 3.75A power (VBATT_PA)	✓
CN802	VBATT_APPLI to VBATT_BB and/or VBATT_RF	✓
CN804	VBAT Jack	✓
CN805	Power supply selector	✓
CN900	Antenna detection circuit enable for GNSS / ADC1	✓
CN901	GNSS connector	✓
CN903	RF main connector	✓
CN906	RF diversity connector	✓
CN1000	GPIO test pin	✓
CN1200	Audio jack	✓
CN1300	USB UART2	✓
CN1306	UIM1_DET/GPIO3 UIM2_DET/GPIO4	✓
CN1307	Arduino / STMod+ enable and disable	✓
CN1301	VBATT_APPLI to VBATT_BB and/or VBATT_RF	✓
CN1305	Antenna detection circuit enable for GNSS/EXT_GPS_LNA_EN, RF/GPIO5, RF/ADC0	✓
CN1304	VBAT_RTC	✓
CN1308	VBATT_BB power jumper	✓
CN1309	VBATT_RF power jumper	✓
CN1310	DC_PWR power jumper	✓

Table 2-2: Available Connector, Switch and Jumper Solder Pads

Connector, Switch and Jumper Solder Pads	Connection
SW200	Switch “OFF” the module to force it to go into Download mode
SW201	• push button (level ‘0’) to enable RESET • No push button (level ‘1’) to disable RESET
SW202	• push button (level ‘0’) to enable POWER_ON_N on the module • No push button (level ‘1’) to disable POWER_ON_N on the module
CN401	Short with a jumper to enable UART1

CN1306	• Short with a jumper to enable SIM insertion detection
	• This connector is shorted by default via a jumper:
	  ▪ Jumper connected = UIM1_DET/GPIO3 (SIM detection)
	  ▪ Jumper disconnected = GPIO3 (GPIO only)

CN1306	• Short with a jumper to enable SIM insertion detection
	• This connector is shorted by default via a jumper:
	  ▪ Jumper connected = UIM2_DET/GPIO4 (SIM detection)
	  ▪ Jumper disconnected = GPIO4 (GPIO only)

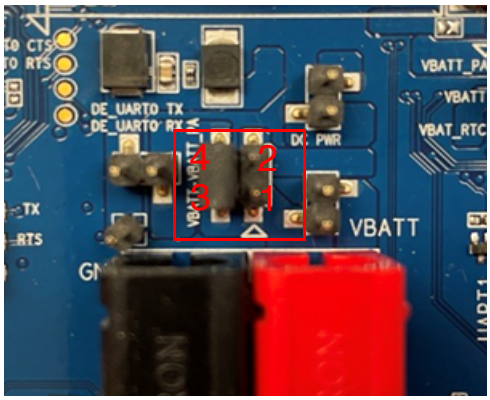
CN1307	Short with a jumper to enable the STMod+ or Arduino
SW601	• Switch to “3V1_PERM” to enable STMod+ • Switch to “GND” to enable Arduino
CN801	This connector is shorted by default via a jumper: • Jumper connected = VBATT connection with VBATT_PA • Jumper disconnected = VBATT disconnection with VBATT_PA
CN1301 	This connector is shorted by default via a jumper: • Jumper installed on 3 and 4 = VBATT connection with VBATT_PA • Jumper removed from 3 and 4 = VBATT and VBATT_PA are separated • Jumper installed on 1 and 2 = DC_PWR is connected to VBATT and/or VBATT_PA • Jumper removed from 1 and 2 = DC_PWR is not connected to VBATT and/or VBATT_PA

Table 2-2: Available Connector, Switch and Jumper Solder Pads (Continued)

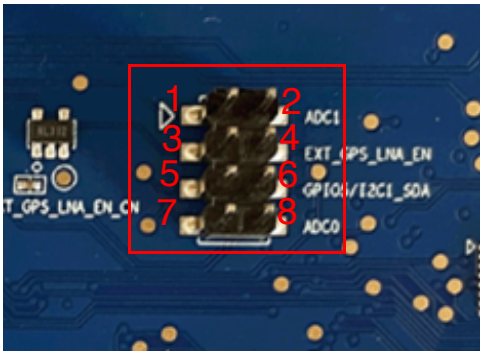
Connector, Switch and Jumper Solder Pads	Connection
CN805	This connector is shorted by default via a jumper: • Jumper installed on 1 and 2: Power from STMOD+ 5V • Jumper installed on 3 and 4: Power from ARDUINO 5V. • Jumper installed on 5 and 6: Power from USB_UART1 5V • Jumper installed on 7 and 8: Power from USB_UART0 5V • Jumper installed on 9 and 10: Power from Main USB 5V
CN1305 	This connector is shorted by default via a jumper: • Jumper installed on 1 and 2 = antenna detection circuit enable for GNSS antenna • Jumper removed from 1 and 2 = ADC1 application • Jumper installed on 3 and 4 = GPS LNA Enable • Jumper removed from 3 and 4 = GPS LNA Disable • Jumper installed on 5 and 6 = GPIO5 high level (1.8V) • Jumper removed from 5 and 6= GPIO5 low level (0V) • Jumper installed on 7 and 8 = ADC0 input 1.8V • Jumper removed from 7 and 8 = ADC0 input 0V

Table 2-3: Available Test Points

Test Points	Description
TP200	3V1_PERM
TP300	DEBUG_UART_TX
TP301	DEBUG_UART_RTS
TP302	DEBUG_UART_RX
TP303	DEBUG_UART_CTS
TP400	USB_DP
TP401	USB_DN
TP402	USB_VBUS
CN403	UART1_RX UART1_TX UART1_CTS UART1_RTS UART1_DSR UART1_DTR UART1_DCD UART1_RI
CN602	VCC_3V3_A VCC_5V_A

Table 2-3: Available Test Points (Continued)

Test Points	Description
TP700	TP1
TP701	GND
TP702	HSIC_STRB
TP703	HSIC_DATA
TP704	WAKE_ON_WWAN
TP705	ADC3
TP706	WWAN_LED_N
TP707	GPIO32
TP708	GPIO36
TP709	GPIO34
TP710	GPIO21
TP711	GPIO23
TP712	W_DISABLE_N
TP713	ANT_CTL_0
TP714	ANT_CTL_2
TP715	GPIO25
TP716	GPIO42
TP717	ADC2
TP718	GPIO33
TP719	GPIO37
TP720	GPIO35
TP721	GPIO22
TP722	GPIO24
TP723	SAFE_PWR_REMOVE
TP724	ANT_CTL_1
TP725	ANT_CTL_3
TP726	SD_CLK
TP727	SD_D2
TP728	SD_D0
TP729	SD_CMD
TP730	SD_D3

Table 2-3: Available Test Points (Continued)

Test Points	Description
TP731	SD_D1
TP801	LDO_1V8_PERM LDO_3V1_PERM enable
TP802	DC_PWR
TP900	EXT_GPS_LNA_EN
CN1000	GPIO testing header
TP1000	GND
TP1001	GND
TP1002	GND
TP1200	VCC_3V3
TP1201	WM8944 LINEOUT
TP1300	UART2_TX
TP1301	UART2_RTS
TP1302	UART2_RX
TP1303	UART2_CTS

2.1.3 Snap-In Connector

The snap-in connector houses the embedded module and allows easy switching between any of the supported RC76xx / WP76xx series embedded modules.

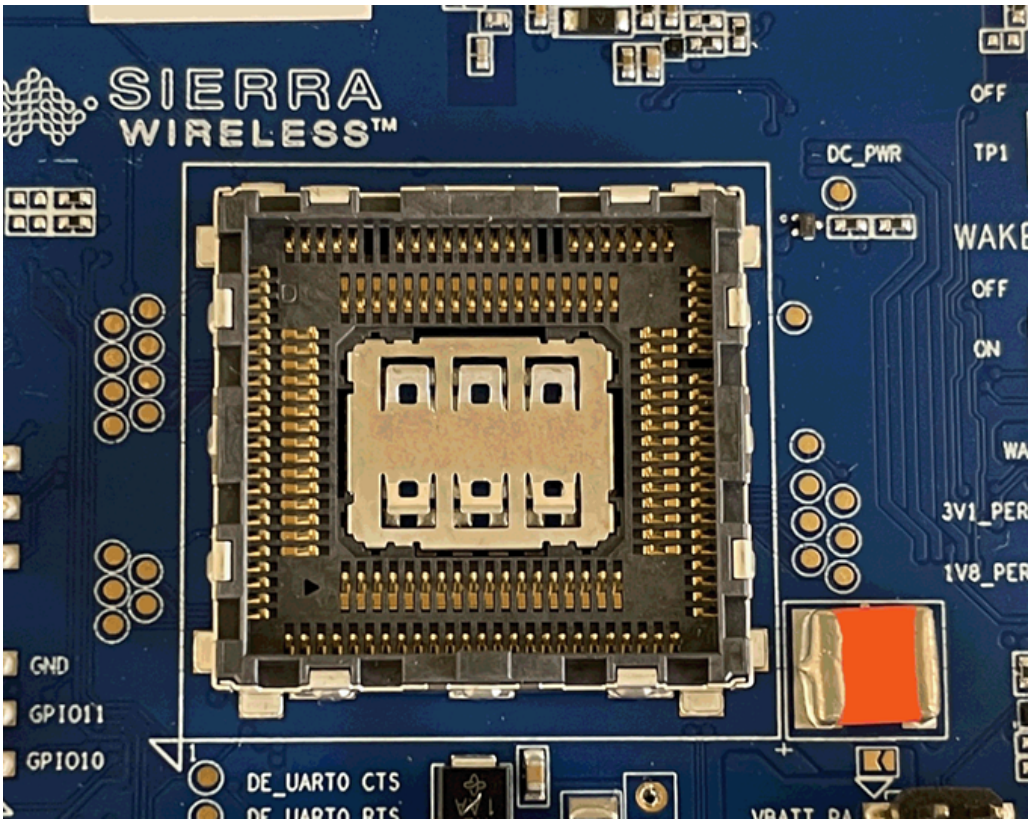


Figure 2-5: Snap-In Connector

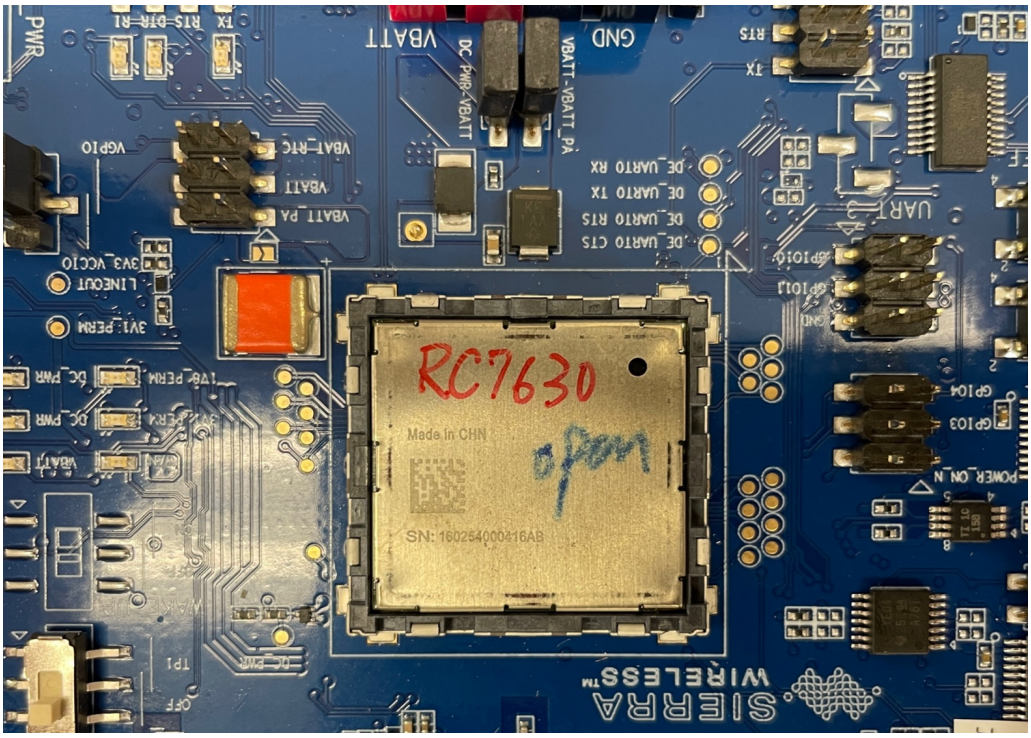


Figure 2-6: Snap-In Connector with Interposer and an RC76xx / WP76xx Module

Note: The RC76xx / WP76xx needs to be placed in the snap-in socket in the correct orientation. This is determined by lining up the dot on the unit itself, the lid, and the arrow on the snap-in socket base itself (refer to Figure 2-5).

After plugging an RC76xx / WP76xx module in the snap-in connector, attach the snap-in cover as show in the following figure.

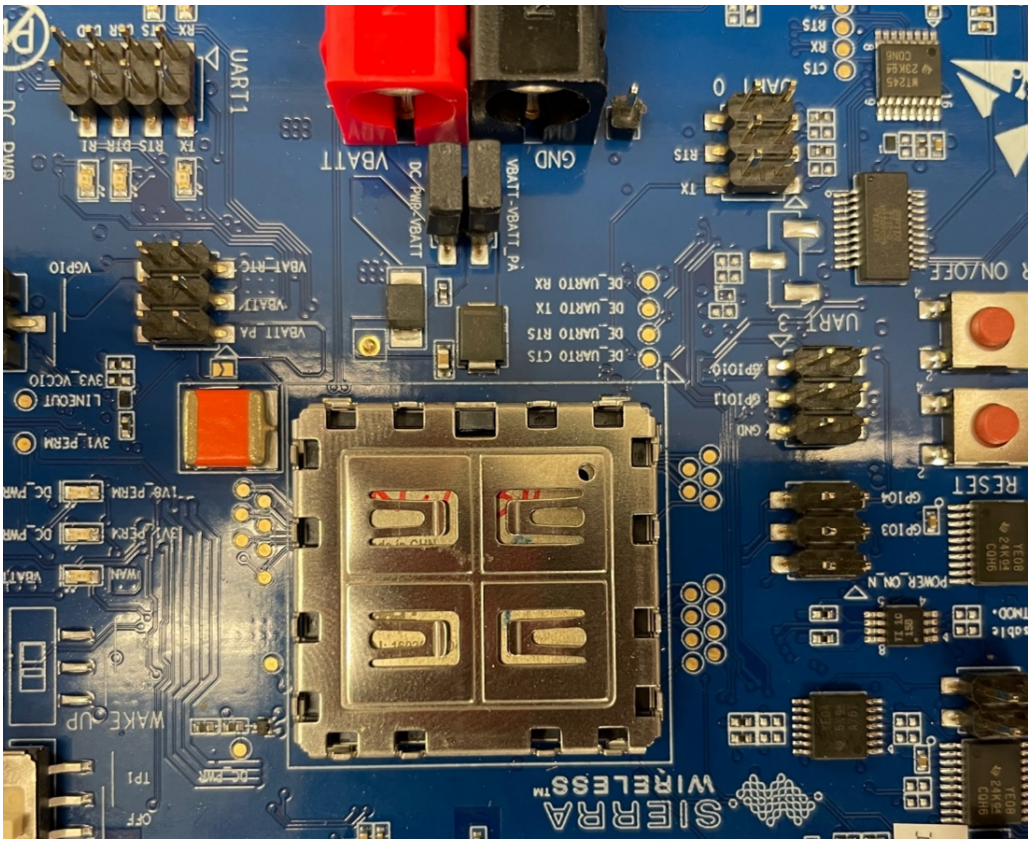


Figure 2-7: Snap-In Connector with RC76xx / WP76xx Module and Cover

2.1.4 Test Points

There are a total of 66 test points available on the Development Kit. The following table lists the test point label and the corresponding signal names of the applicable HL78xx module.

For more information about these signals, refer to the Product Technical Specification document.

Table 2-4: RC76xx / WP76xx Series Development Kit Test Ports

Test Port	Test Port Serigraphy	Test Point	Connector	RC76xx / WP76xx Pin Out Signal Name
C1	GPIO1 / I2C1_CLK		CN1000_2	I2C1_CLK
C2	UART1_RI		CN403_8	UART1_RI
C3	UART1_RTS		CN403_4	UART1_RTS
C4	UART1_CTS		CN403_3	UART1_CTS
C5	UART1_TX		CN403_2	UART1_TX
C6	UART1_RX		CN403_1	UART1_RX
C7	UART1_DTR		CN403_6	UART1_DTR
C8	UART1_DCD		CN403_7	UART1_DCD
C9	UART1_DSR		CN403_5	UART1_DSR
C10	GPIO2		CN1000_1	GPIO2
C11	RESET_IN_N		CN1000_12	RESET_IN_N
C12	USB_DN	TP401		USB_DN
C13	USB_DP	TP400		USB_DP
C14	NC			NC
C15	NC			NC
C17	NC			NC
C18	NC			NC
C19	NC			NC
C20	NC			NC
C21	VBAT_RTC		CN1000_6	NC
C22	26MHZ		CN1000_22	SYS_CLK
C23	32KHZ		CN1000_26	SLEEP_CLK
C24	ADC1		CN1000_11	ADC1
C25	ADC0		CN1000_9	ADC0
C26	UIM1_VCC		CN1000_17	UIM1_VCC

Table 2-4: RC76xx / WP76xx Series Development Kit Test Ports (Continued)

Test Port	Test Port Serigraphy	Test Point	Connector	RC76xx / WP76xx Pin Out Signal Name
C27	UIM1_CLK		CN1000_21	UIM1_CLK
C28	UIM1_DATA		CN1000_19	UIM1_DATA
C29	UIM1_RST		CN1000_23	UIM1_RST
C30	GND			GND
C31	RF_DIV		CN906	RF_DIV
C32	GND			GND
C33	PCM_OUT			PCM_OUT / I2S_OUT
C34	PCM_IN			PCM_IN / I2S_IN
C35	PCM_SYNC			PCM_SYNC / I2S_WS
C36	PCM_CLK			PCM_CLK / I2S_CLK
C37	GND			GND
C38	GNSS		CN901	GNSS_ANT
C39	GND			GND
C40	GPIO07		CN1000_5	GPIO7
C41	GPIO08		CN1000_7	GPIO8
C42	DR_SYNC		CN1000_16	DR_SYNC
C43	EXT_LNA_GPS_EN	TP900		EXT_LNA_GPS_EN
C44	WAKEUP / GPIO13		CN1000_8	GPIO13
C45	VGPIO		CN1000_13	VGPIO
C46	GPIO06		CN1000_3	GPIO6
C47	TP1	TP700		TP1
C48	GND			GND
C49	PRI_ANT		C903	PRI_ANT
C50	GND			GND
C59	POWER_ON		CN1000_10	POWER_ON_N
C60	TX_ON		CN1000_14	TX_ON
C61	VBATT_RF		CN801	VBATT_RF
C62	VBATT_RF		CN801	VBATT_RF
C63	VBATT_BB		CN804	VBATT_BB
C64	UIM1_DET GPIO03		CN1000_25	UIM_DET GPIO3

Table 2-4: RC76xx / WP76xx Series Development Kit Test Ports (Continued)

Test Port	Test Port Serigraphy	Test Point	Connector	RC76xx / WP76xx Pin Out Signal Name
C65	FAST_SHUTDOWN GPIO4 UIM2_DET		CN1000_27	GPIO4
C66	GPIO5/I2C1_SDA		CN1000_4	I2C1_Data
C67	GND			GND
C68	GND			GND
C69	GND			GND
C70	GND			GND
C71	NC			NC
C72	NC			NC
C73	NC			NC
C74	NC			NC
C75	NC			NC
C76	NC			NC
C77	NC			NC
C78	NC			NC
C79	NC			NC
C80	NC			NC
C81	NC			NC
C82	NC			NC
C83	NC			NC
C84	NC			NC
C85	NC			NC
C86	NC			NC
C87	NC			NC
C88	NC			NC
C89	NC			NC
C90	NC			NC
C91	NC			NC
C92	NC			NC
C93	NC			NC

Table 2-4: RC76xx / WP76xx Series Development Kit Test Ports (Continued)

Test Port	Test Port Serigraphy	Test Point	Connector	RC76xx / WP76xx Pin Out Signal Name
C94	NC			NC
C95	NC			NC
C96	UART2_TX	TP1300		UART2_TX
C97	UART2_RX	TP1302		UART2_RX
C98	UART2_RTS	TP1301		UART2_RTS
C99	UART2_CTS	TP1303		UART2_CTS
C100	GPIO34	TP709		GPIO34
C101	GPIO35	TP720		GPIO35
C102	GPIO36	TP708		GPIO36
C103	GPIO37	TP719		GPIO37
C104	GPIO32	TP707		GPIO32
C105	GPIO33	TP718		GPIO33
C106	WWAN_LED_N	TP706		WWAN_LED_N
C107	ADC2	TP717		ADC2
C108	ADC3	TP705		ADC3
C109	GPIO42	TP716		GPIO42
C110	WAKE_ON_WWAN	TP704		WAKE_ON_WWAN
C111	GND			GND
C113	GND			GND
C114	NC			NC
C115	NC			NC
C116	NC			NC
C117	NC			NC
C118	NC			NC
C119	NC			NC
C120	NC			NC
C121	NC			NC
C122	NC			NC
C123	NC			NC
C124	NC			NC

Table 2-4: RC76xx / WP76xx Series Development Kit Test Ports (Continued)

Test Port	Test Port Serigraphy	Test Point	Connector	RC76xx / WP76xx Pin Out Signal Name
C125	GND			GND
C128	GND			GND
C129	NC			NC
C130	NC			NC
C131	NC			NC
C132	NC			NC
C133	NC			NC
C134	NC			NC
C135	NC			NC
C136	GND			GND
C139	GND			GND
C140	NC			NC
C141	NC			NC
C142	NC			NC
C143	NC			NC
C144	NC			NC
C145	NC			NC
C146	NC			NC
C147	GPIO21	TP710		GPIO21
C148	GPIO22	TP721		GPIO22
C149	GPIO23	TP711		GPIO23
C150	GPIO24	TP722		GPIO24
C151	W_DISABLE_N	TP712		W_DISABLE_N
C152	SAFE_PWR_REMOVE	TP723		SAFE_PWR_REMOVE
C153	ANT_CNTL0 / GPIO28	TP713		ANT_CNTL0 / GPIO28
C154	ANT_CNTL1 / GPIO29	TP724		ANT_CNTL1 / GPIO29
C155	ANT_CNTL2 / GPIO30	TP714		ANT_CNTL2 / GPIO30
C156	ANT_CNTL3 / GPIO31	TP725		ANT_CNTL3 / GPIO31
C157	VBAT_RF	TP800	CN801_2	VBAT_RF
C158	VBAT_BB		CN801_1	VBAT_BB

Table 2-4: RC76xx / WP76xx Series Development Kit Test Ports (Continued)

Test Port	Test Port Serigraphy	Test Point	Connector	RC76xx / WP76xx Pin Out Signal Name
C159	GPIO25	TP715		GPIO25
C160	NC			NC
C161	SD_CMD (WP only)	TP729		SD_CMD (WP only)
C162	SD_CLK (WP only)	TP726		SD_CLK (WP only)
C163	SD_D3 (WP only)	TP730		SD_D3 (WP only)
C164	SD_D2 (WP only)	TP727		SD_D2 (WP only)
C165	SD_D1 (WP only)	TP731		SD_D1 (WP only)
C166	SD_D0 (WP only)	TP728		SD_D0 (WP only)
C167	GND			GND
C168	GND			GND
C169	GND			GND
C170	GND			GND

3: Interfaces

3.1 Power

3.1.1 Power Supply

The following supply sources are available on the Development Kit. To use these supply sources, CN1301 must install the jumper connector via the following options:

Table 3-1: Connector and Jump Configuration for Power Supply Sources

Connector	Jump
CN400	CN805_5 and CN805_6
CN402	CN805_9 and CN805_10
CN600	CN805_1 and CN805_2
CN602	CN805_3 and CN805_4

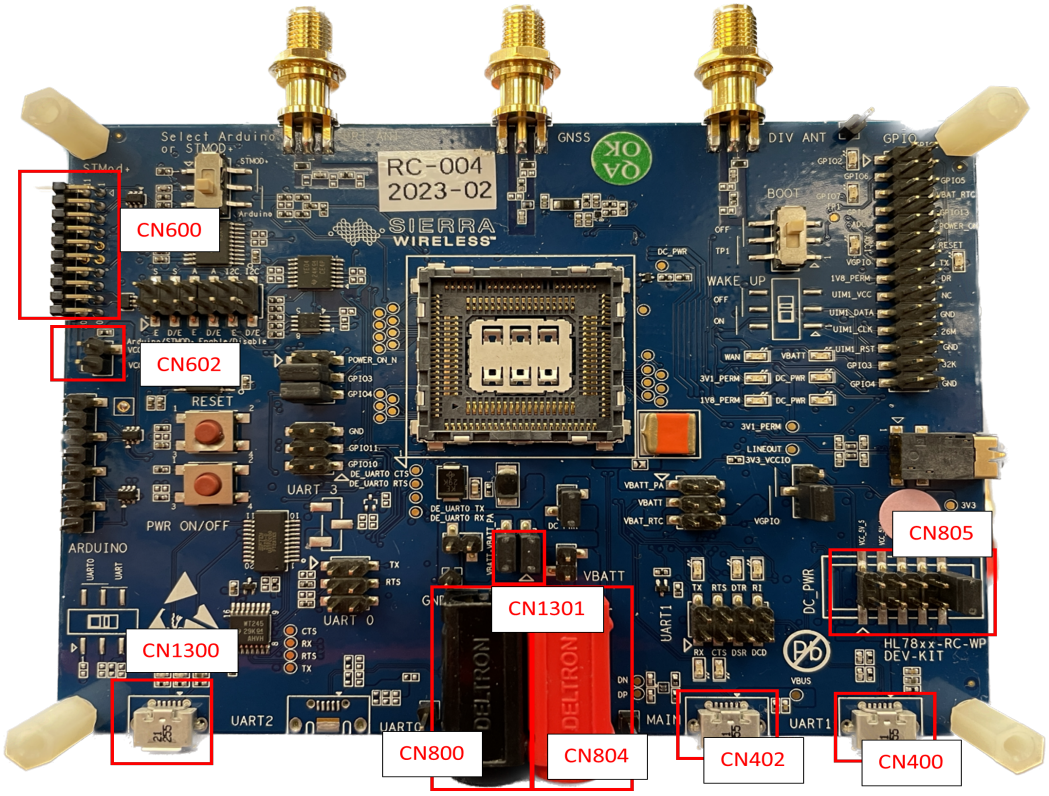


Figure 3-1: DC_PWR Connector (on the top side of the Development Kit)

Three power supplies can be used to supply the Development Kit and the RC76xx / WP76xx module. They can be used to supply power to DC_PWR, VBATT and VBATT_PA separately or they can supply power collectively depending on CN1301 jumper configurations.

VBAT_BB and VBATT_RF of the embedded module can be measured separately or as a total current drain depending on the following configurations.

Table 3-2: C1301 Jumper Configuration

	CN1310	CN1301_1 and CN1301_2	CN1301_3 and CN1301_4	Current measurement
Current for VBAT_RF and VBAT_BB are measured together	Disconnected	Disconnected	Connected	CN804 and CN800
Current for VBAT_RF and VBAT_BB are measured separately	Disconnected	Disconnected	Disconnected	VBAT_BB: CN804 and CN800 VBAT_RF: CN1301_4 and CN800

The state of DC_PWR is indicated by a green LED and can be controlled by a test point. VBATT and VBATT_PA can be controlled by two test points.

Note: The green LED, D807, is always activated regardless of the connection of jumpers CN1301.

Table 3-3: Power Supply Pin Description

RC76xx / WP76xx Signal Name	RC76xx / WP76xx Pin Out	I/O	LED	Test Point / Jumper	Development Kit Signal Name
DC_PWR		I	D807	TP802 / CN1301_2	DC_PWR
VBATT	C63	I		CN1301_1 / CN1301_3	VBATT
VBATT_PA	C61 C62	I		CN1301_4	VBATT_PA

Refer to the following table for the electrical characteristics of the power supplies.

Table 3-4: Power Supply Electrical Characteristics

Power Supply	Vmin.	Vnom.	Vmax.
DC_PWR (V)	3.6	4	4.35
VBATT_BB (V)	3.2[a]	3.7	4.35
VBATT_RF (V) Full Specification	3.2[a]	3.7	4.35
VBATT_RF (V) Extended Range	2.8[b]	3.7	4.35

a. This value must be guaranteed during the burst.
b. No guarantee of 3GPP performances over extended range.

For more information, refer to the Product Technical Specification document.

3.1.2 Internal Power Supply

The Development Kit includes two internal power supplies that are permanently activated. These two power supplies are powered by the DC_PWR power supply.

Figure 3-2: Internal Power Supply

Table 3-5: Internal Power Supply Description

RC76xx / WP76xx Signal Name	RC76xx / WP76xx Pin Out	I/O	Voltage Level	LEDs	Test Point / Jumper	Development Kit Signal Name
		O	1V8 / 200mA	D204	CN1000_15	LDO_1V8_PERM
		O	3V1 / 300mA	D200	TP200	LDO_3V1_PERM

3.1.3 POWER_ON_N

The Development Kit includes a POWER_ON_N switch, SW202, and can start the RC76xx and WP76xx module.

Note: The RC76xx / WP76xx module automatically turns on when power is provided to the Development Kit.

Once the Development Kit is connected to an external source, the RC76xx / WP76xx module will start monitoring the POWER_ON_N pin for a power on event.

The module can be powered off by disconnecting the Development Kit from the power source or by issuing the appropriate AT command. For more information about AT commands, refer to the HL78xx Series AT Commands Interface Guide.

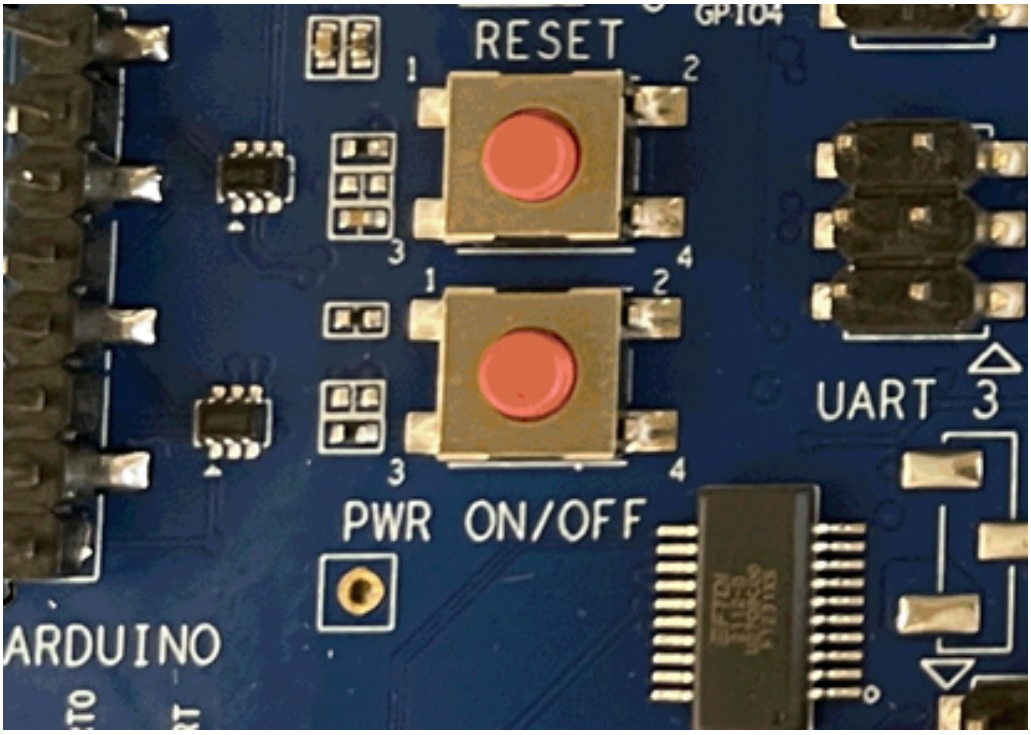


Figure 3-3: POWER_ON_N pushbutton

Table 3-6: POWER_ON_N Pin Description

RC76xx / WP76xx Signal Name	RC76xx / WP76xx Pin Out	I/O	Voltage Level	LEDs	Test Point / Jumper	Development Kit Signal Name
POWER_ON_N	C59	I	1.8v		CN1000_10	POWER_ON_N

3.2 Control Functions

3.2.1 RESET_IN_N

The Development Kit includes a RESET_IN_N pushbutton to reset the HL78xx module.

The SW201 pushbutton starts a general reset when it is pushed. Reset can only be executed after the module has been switched ON.

Note: A controlled reset via software, using at+cfun=1,1 is the recommended reset mechanism. A hard reset should only be used when the unit is non responsive.

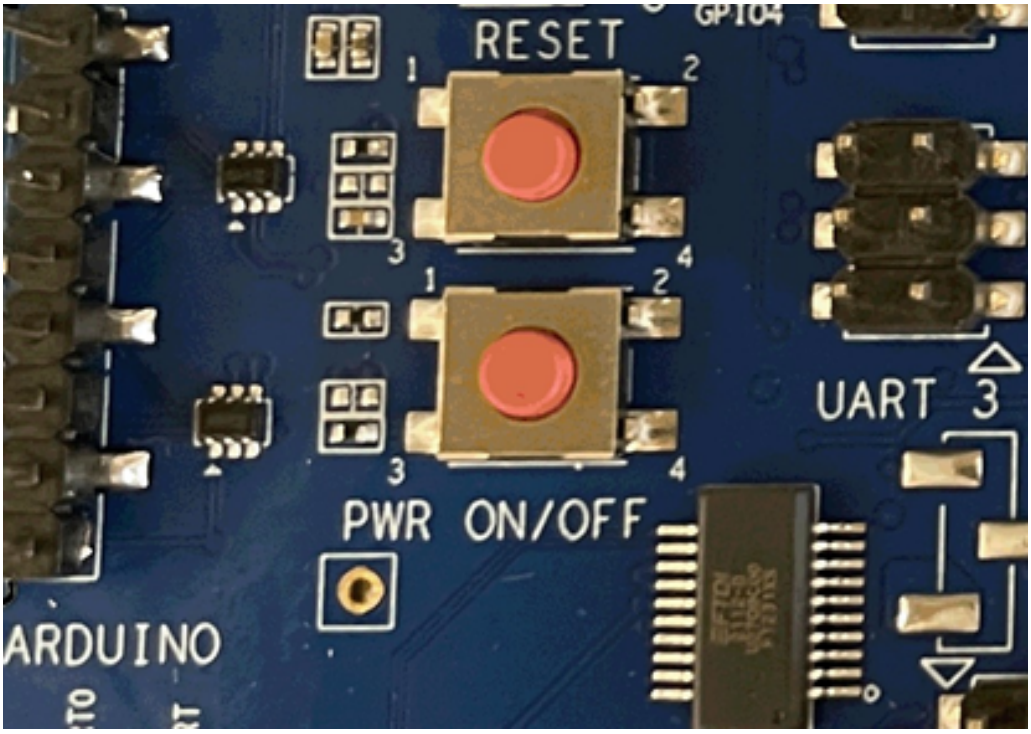


Figure 3-4: RESET_IN_N pushbutton

Table 3-7: RESET_IN_N Pin Description

RC76xx / WP76xx Signal Name	RC76xx / WP76xx Pin Out	I/O	Voltage Level	LEDs	Test Point / Jumper	Development Kit Signal Name
RESET_IN_N	C11	I	1.8v		CN1000_12	RESET_IN_N

3.3 USB (Main)

The main USB connection on the Development Kit is available from CN402 and can be used to communicate with the RC76xx / WP76xx module directly via a PC.

CN402 is a receptacle USB Micro-AB connector.

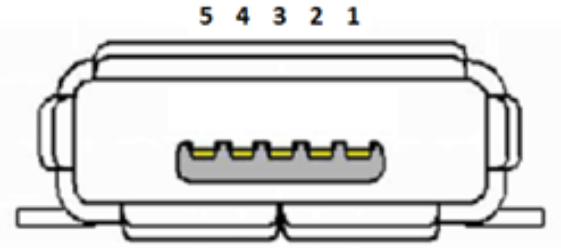


Figure 3-5: Micro-AB USB Connector

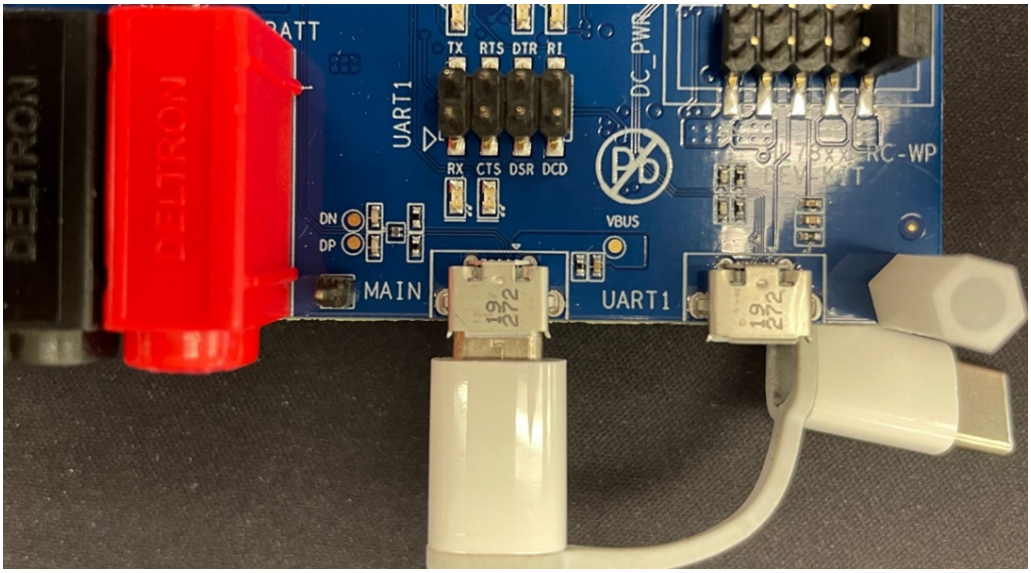


Figure 3-6: Main USB Interface

Table 3-8: Main USB Connector Pin Description

Pin #	Signal Name	I/O	I/O Type	Description
1	USB_VBUS	I	USB	+5 VDC
2	USB_DN	I/O	USB	Data -
3	USB_DP	I/O	USB	Data +
4	NC	I	USB	USB OTG ID
5	GND			Ground

A Green LED, D1005, indicates the USB_VBUS state. When this LED is lit, it indicates that the USB cable is plugged into the receptacle USB Micro-AB connector and is available for use.

One test point is available to control the state of USB_VBUS.

Table 3-9: Main USB Pin Description

RC76xx / WP76xx Signal Name	RC76xx / WP76xx Pin Out	I/O	Voltage Level	LED	Test Point / PCB Pad	Development Kit Signal Name
USB_VBUS	C16	I	5V	D1005	TP402	VBUS
USB_DP	C13	I/O	3.3V		TP400 (pads)	
USB_DN	C12	I/O	3.3V		TP401 (pads)	

3.4 Audio

An audio codec, WM8944BECS/R from Cirrus Logic, is mounted on the Development Kit and is used to translate the embedded module's digital audio interface or PCM interface into an analog audio signal. This was done because performance and functionality tests are run under analog audio levels, and because final customer applications are also in analog.

When the audio amplifier interface is switched ON, it is recommended to use audio jack, CN1200, for microphone and for amplified earphone.

Refer to the following table for the audio handset connector pin description.

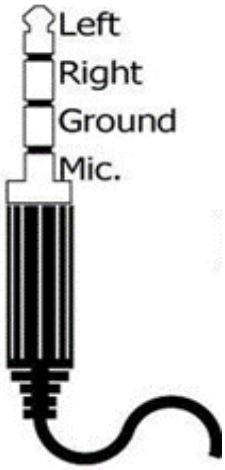


Figure 3-7: Audio Signals

Refer to the following tables for the audio jack 3.5mm connector pin description.

Table 3-10: Main USB Connector Pin Description

Pin #	Signal Name	I/O	I/O Type	Description	Development Kit Signal Name
1	MICRO+	I	Analog	Main microphone positive input	MIC
4	GND			Ground	MIC

Table 3-11: Earphone (CN600) Connector Pin Description

Pin #	Signal Name	I/O	I/O Type	Description	Development Kit Signal Name
3	AMPL_SPK+	O	Analog	Amplifier speaker positive output	SPK_AMPL
2	AMPL_SPK-	O	Analog	Amplifier speaker positive output	SPK_AMPL

Both microphone and speaker amplifier signals are configured in differential mode.

Four test points are available to control the state of the four PCM signals of the RC76xx / WP76xx module.

Refer to the following table for the PCM pin description.

Table 3-12: PCM Pin Description

RC76xx / WP76xx Signal Name	RC76xx / WP76xx Pin Out	I/O	O	Voltage Level	LED	Test Point / PCB Pad	Development Kit Signal Name
PCM_CLK	C36	I/O	Digital	1.8V			PCM_CLK
PCM_IN	C34	I	Digital	1.8V			PCM_IN
PCM_OUT	C33	O	Digital	1.8V			PCM_OUT
PCM_SYNC	C35	I/O	Digital	1.8V			PCM_SYNC

3.5 UIM / SIM1

The Development Kit has one SIM connector, SIM1, CN500.

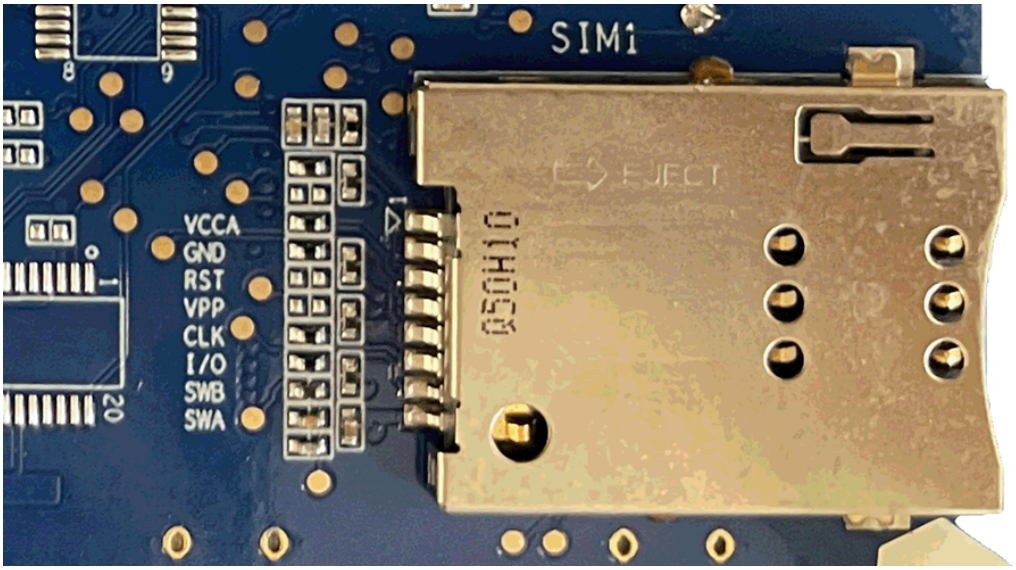


Figure 3-8: SIM1 Interface—Bottom Side

Note: ESD protection is available on all SIM1 signals.

Refer to the following table for the SIM1 connector pin description.

Table 3-13: SIM1 Connector Pin Description

Pin #	Signal Name	I/O	I/O Type	Description
1	UIM1_VCC	O	1.8V/2.85V	SIM Power Supply
2	UIM1_RESET	O	1.8V/2.85V	SIM Reset
3	UIM1_CLK	O	1.8V/2.85V	SIM Clock
4	CC4	Not used		
5	GND			Ground
6	VPP	Not used		
7	UIM1_DATA	I/O	1.8V/2.85V	SIM Data
8	CC8	Not used		
9	1V8_PERM	I	VIO[a]	VIO supply from the Development Kit
10	UIM1_DET / GPIO3	I	VIO[a]	SIM Card Detect
11 12 13 14	GND			Ground casing

a. VIO = 1.8V (1V8_PERM) from the Development Kit.

Four test points are available to control the state of the four SIM1 signals of the RC76xx / WP76xx module, and one jumper is available to control the status of the SIM1 detection signal of the module.

Refer to the following table for the SIM1 pin description.

Table 3-14: SIM1 Pin Description

RC76xx / WP76xx Signal Name	RC76xx / WP76xx Pin Out	I/O	Voltage Level	LED	Test Point / Jumper	Development Kit Signal Name
UIM1_VCC	C26	O	1.8V/2.85V		CN1000_17	UIM1_VCC
UIM1_DATA	C28	I/O	1.8V/2.85V		CN1000_19	UIM1_DATA
UIM1_RST	C29	O	1.8V/2.85V		CN1000_23	UIM1_RST
UIM1_CLK	C27	O	1.8V/2.85V		CN1000_21	UIM1_CLK
UIM1_DET / GPIO3	C64	I	1.8V		CN1000_25	UIM1_DET, GPIO3

3.6 UIM / SIM2 (Only available on special variants)

The Development Kit has one SIM connector, SIM2, CN502.

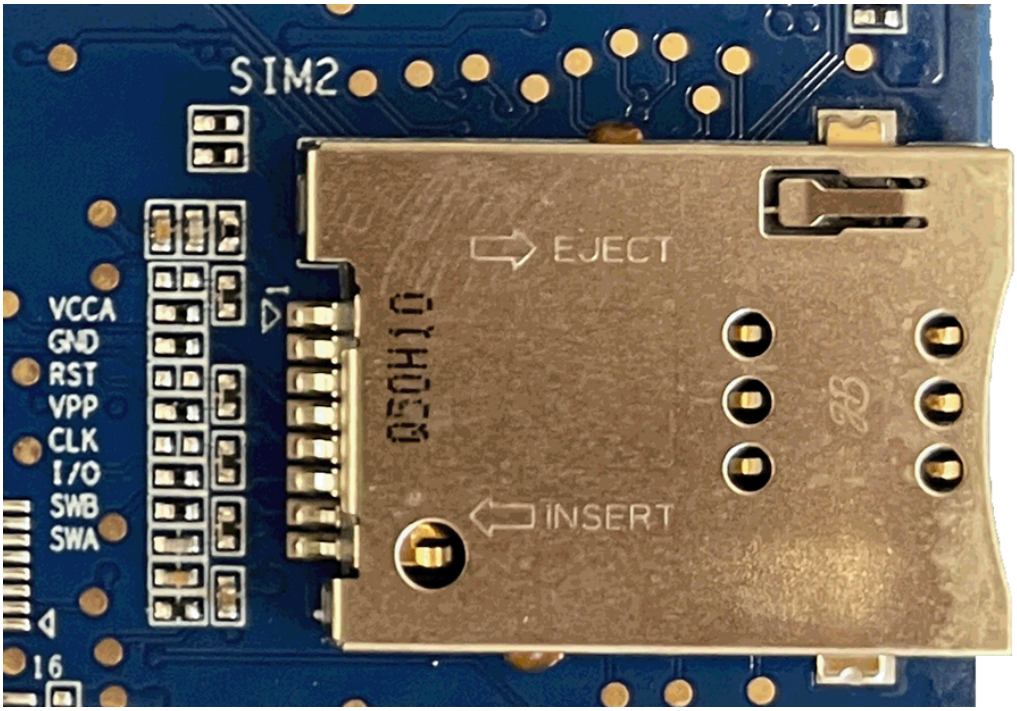


Figure 3-9: SIM2 Interface (bottom side)

Note: ESD protection is available on all SIM2 signals.

Refer to the following table for the SIM2 connector pin description.

Table 3-15: SIM2 Connector Pin Description

Pin #	Signal Name	I/O	I/O Type	Description
1	UIM2_VCC	O	1.8V/2.85V	SIM Power Supply
2	UIM2_RESET	O	1.8V/2.85V	SIM Reset
3	UIM2_CLK	O	1.8V/2.85V	SIM Clock
4	CC4	Not used		
5	GND			Ground
6	VPP	Not used		
7	UIM2_DATA	I/O	1.8V/2.85V	SIM Data
8	CC8	Not used		
9	1V8_PERM	I	VIO[a]	VIO supply from the Development Kit
10	UIM2_DET / GPIO4	I	VIO[a]	SIM Card Detect
11 12 13 14	GND			Ground casing

a. VIO = 1.8V (1V8_PERM) from the Development Kit.

Four test points are available to control the state of the four SIM2 signals of the RC76xx/ WP76xx module, and one jumper is available to control the status of the SIM2 detection signal of the module.

Refer to the following table for the SIM2 pin description.

Table 3-16: SIM2 Pin Description

RC76xx / WP76xx Signal Name	RC76xx / WP76xx Pin Out	I/O	Voltage Level	LED	Test Point / Jumper	Development Kit Signal Name
UIM2_VCC	C26	O	1.8V/2.85V			UIM2_VCC
UIM2_DATA	C28	I/O	1.8V/2.85V			UIM2_DATA
UIM2_RST	C29	O	1.8V/2.85V			UIM2_RST
UIM2_CLK	C27	O	1.8V/2.85V			UIM2_CLK
UIM2_DET / GPIO4	C64	I	1.8V			UIM2_DET, GPIO04

3.7 UART1

3.7.1 USB-UART1

The USB-UART1 connection on the Development Kit is available from CN400, which is a receptacle USB Micro-AB connector via a USB-UART transceiver and voltage level translator at level 1.8V. Refer to Figure 3-5 for connector reference.

This interface is used to communicate between the module and a PC or host processor.

Figure 3-10: USB-UART1 Interface

Table 3-17: UART1 Pin Description

RC76xx / WP76xx Signal Name	RC76xx / WP76xx Pin Out	I/O	Voltage Level	LED	Test Point	Development Kit Signal Name
UART1_TX	C5	I	1.8V	D1003	CN403_2	UART1_TX
UART1_RX	C6	O	1.8V	D1006	CN403_1	UART1_RX
UART1_RTS	C3	I	1.8V		CN403_4	UART1_RTS
UART1_CTS	C4	O	1.8V	D1008	CN403_3	UART1_CTS
UART1_DSR	C9	O	1.8V		CN403_5	UART1_DSR
UART1_DTR	C7	I	1.8V	D1010	CN403_6	UART1_DTR
UART1_DCD	C8	O	1.8V		CN403_7	UART1_DCD
UART1_RI	C2	O	1.8V		CN403_8	UART1_RI

Table 3-18: USB-UART1 Connector Pin Description

Pin #	Signal Name	I/O	I/O Type	Description
1	USB_UART1_VBUS	I	USB	+5 VDC
2	USB_DN	I/O	USB	Data -
3	USB_DP	I/O	USB	Data +
4	NC	I	USB	NC
5	GND			Ground

The power for UART to USB IC is provided by external power. When module is off, the RXD and CTS pin are no longer controlled by the module. The signal level will change from low to high due to the external power provided from UART to USB IC. If the user tries to input keys, a voltage drop happening on RXD and CTS pins causes the appearance of certain characters.

3.8 UART2

3.8.1 USB-UART2

The USB-UART2 connection on the Development Kit is available from CN1300, which is a receptacle USB Micro-AB connector via a USB-UART transceiver and voltage level translator at level 1.8V. Refer to Figure 3-5 for connector reference.This interface is used to communicate between the module and a PC or host processor

Figure 3-11: USB-UART2 Interface

Table 3-19: USB-UART2 Interface

RC76xx / WP76xx Signal Name	RC76xx / WP76xx Pin Out	I/O	Voltage Level	LED	Test Point	Development Kit Signal Name
UART2_TX	C96	I	1.8V		TP300	UART2_TX
UART2_RX	C97	O	1.8V		TP302	UART2_RX
UART2_RTS	C98	I	1.8V		TP301	UART2_RTS
UART2_CTS	C99	O	1.8V		TP303	UART2_CTS

Table 3-20: USB-UART2 Connector Pin Description

Pin #	Signal Name	I/O	I/O Type	Description
1	USB_UART1_VBUS	I	USB	+5 VDC
2	USB_DN	I/O	USB	Data -
3	USB_DP	I/O	USB	Data +
4	NC	I	USB	NC
5	GND			Ground

3.9 GPIO

The Development Kit provides all GPIO signals from the RC76xx / WP76xx module.

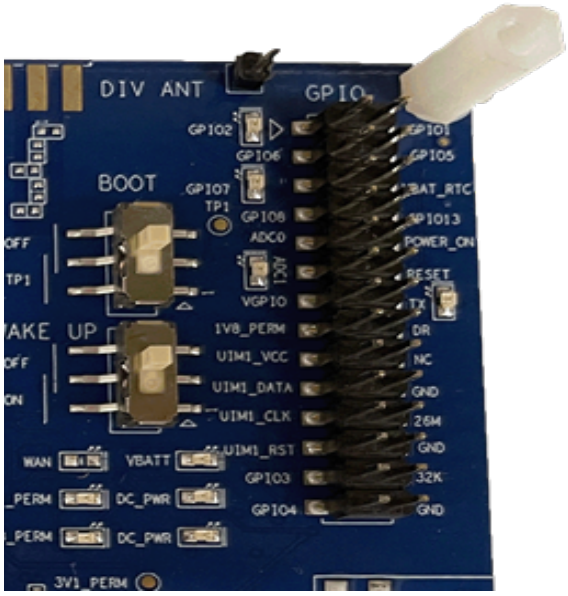


Figure 3-12: GPIO Signals

The state of GPIOs can be controlled by eight test points.

Table 3-21: GPIO Pin Description

RC76xx / WP76xx Signal Name	RC76xx / WP76xx Pin Out	I/O	Voltage Level	LED	Test Point / Jumper	Development Kit Signal Name
GPIO1/ I2C1_CLK	C1	I/O	1.8V		CN1000_2	GPIO1/ I2C1_CLK
GPIO2	C10	I/O	1.8V		CN1000_1	GPIO02
GPIO3/UIM1_DET	C64	I/O	1.8V		CN1000_25	GPIO3/UIM1_DET
GPIO4/UIM2_DET	C65	I/O	1.8V		CN1000_27	GPIO4/UIM2_DET
GPIO5/I2C1_SDA	C66	I/O	1.8V		CN1000_4	GPIO5/I2C1_SDA
GPIO6	C46	I/O	1.8V		CN1000_3	GPIO06
GPIO7	C40	I/O	1.8V		CN1000_5	GPIO07
GPIO8	C41	I/O	1.8V		CN1000_7	GPIO08

Note: Ensure that CN1000 is set to position "OUT" when testing GPIOs set as output signals.

3.10 ADC

Two ADC signals are available on the Development Kit.

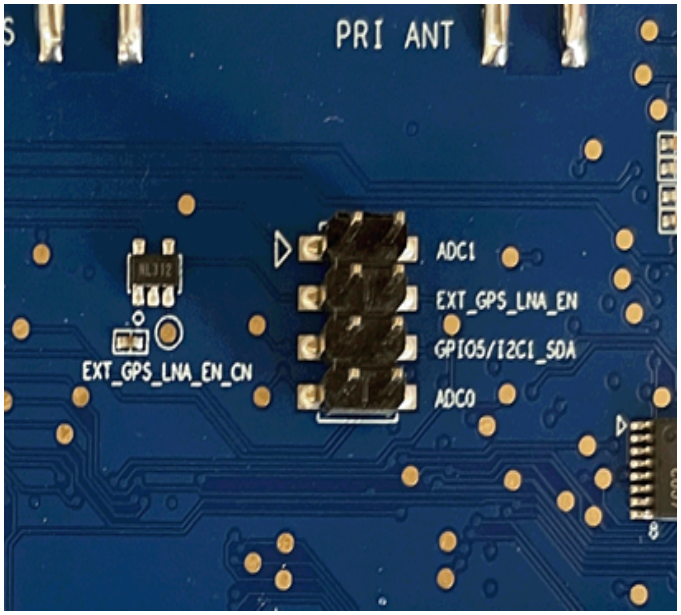


Figure 3-13: ADC Signals

Two test points are available to control the state of the two ADC signals.

Table 3-22: GPIO Pin Description

RC76xx / WP76xx Signal Name	RC76xx / WP76xx Pin Out	I/O	Voltage Level[a]	LED	Test Point / Jumper	Development Kit Signal Name
ADC0	C25	O	1.8V		CN1000_9	ADC0
ADC1	C24	O	1.8V		CN1000_11	ADC1

a. ADCx voltage = 0.0V to 1.8V.

3.11 EXT_GPS_LNA_EN

The Development Kit provides an EXT_GPS_LNA_EN signal from the RC76xx / WP76xx module. The EXT_GPS_LNA_EN signal indicates whether the GNSS receiver is active and can be used to enable an external LNA (for active antenna).

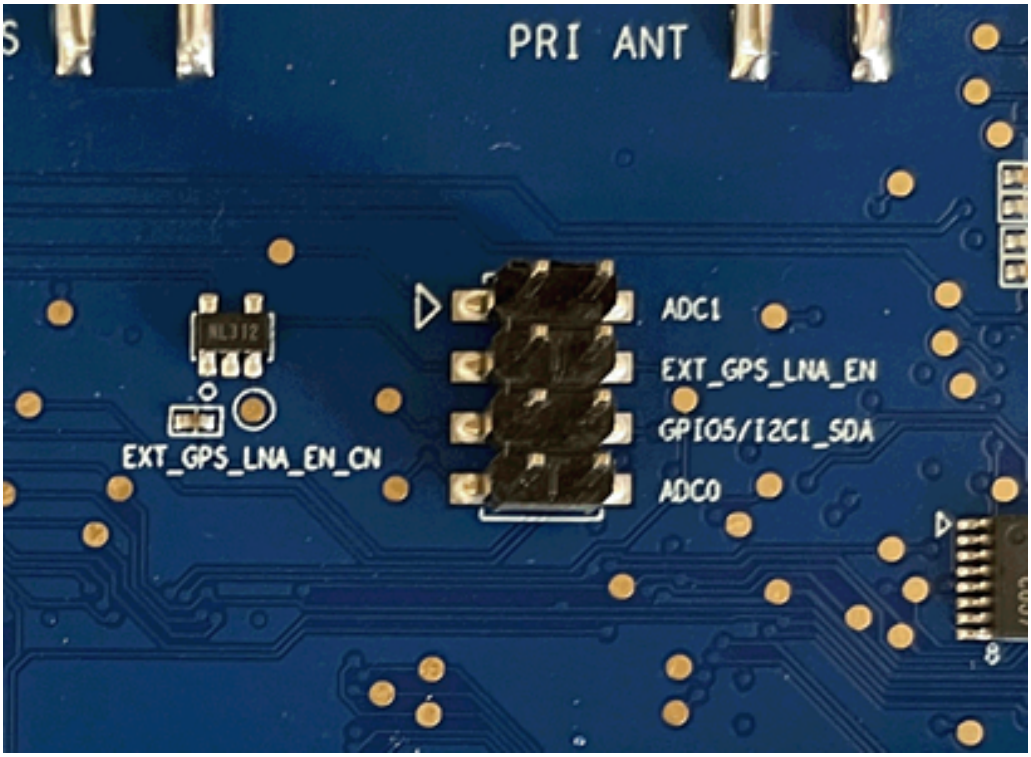


Figure 3-14: EXT_GPS_LNA_EN Signal

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Table 3-23: GPIO Pin Description

RC76xx / WP76xx Signal Name	RC76xx / WP76xx Pin Out	I/O	Voltage Level	LED	Test Point / Jumper	Development Kit Signal Name
EXT_GPS_LNA_EN	C43	O	1.8V		TP900 / CN1305	EXT_GPS_LNA_EN

3.12 Antenna Detection Circuit

The Development Kit provides two antenna detection circuits for the RF and GNSS connectors, and a GNSS antenna bias circuit (for active antenna).

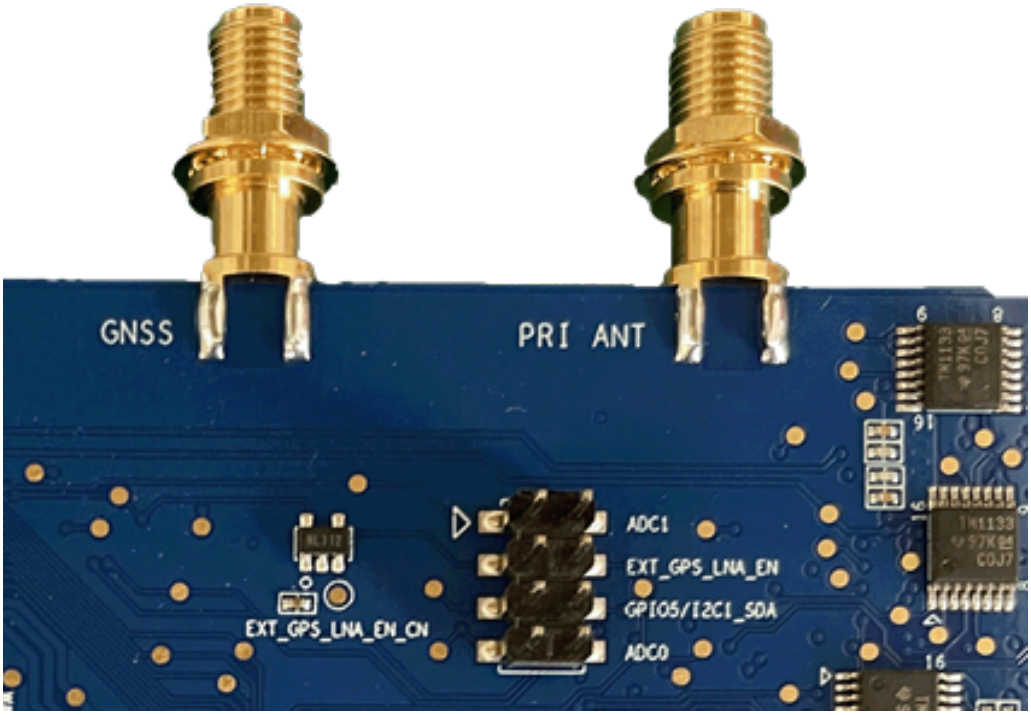

Figure 3-15: RF and GNSS Antenna Detection

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Table 3-24: RF Antenna Detection Pin Description

RC76xx / WP76xx Signal Name	RC76xx / WP76xx Pin Out	I/O	Voltage Level	LED	Test Point	Development Kit Signal Name
ADC0	C25	O	1.8V		CN1305_7_8 / CN1000_9	ADC0
GPIO5	C66	I/O	1.8V		CN1305_5_6 / CN1000_4	GPIO05

Table 3-25: GNSS Antenna Detection Pin Description

RC76xx / WP76xx Signal Name	RC76xx / WP76xx Pin Out	I/O	Voltage Level	LED	Test Point	Development Kit Signal Name
ADC1	C24	O	1.8V		CN1305_1_2/ CN1000_11	ADC1
EXT_GPS_LNA_EN	C43	O	1.8V	D1112	CN1305_3_4/ TP900	EXT_GPS_LNA_EN

3.13 Clock Out

Two clocks out signals are available on the Development Kit from the RC76xx / WP76xx module.

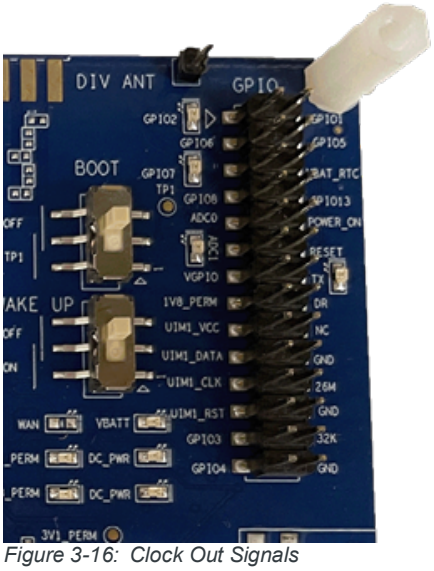

Figure 3-16: Clock Out Signals

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Table 3-26: Clock Out Pin Description

RC76xx / WP76xx Signal Name	RC76xx / WP76xx Pin Out	I/O	Voltage Level	LED	Test Point / Jumper	Development Kit Signal Name
32K_CLKOUT[a]	C23	O	1.8V		CN1000_26	32KHZ
26M_CLKOUT[b]	C22	O	1.8V		CN1000_22	26MHZ

a. 32K_CLKOUT = 32.768 KHz
b. 26M_CLKOUT = 19.2 MHz in RC76xx / WP76xx

3.14 TX-ON

The Development Kit provides a TX-ON signal from the RC76xx / WP76xx module. The TX-ON indication status signal depends on the module's transmitter state.

Figure 3-17: TX-ON Signal

The state of TX-ON is indicated by a green LED and can be controlled by a test point.

.

Table 3-27: Clock Out Pin Description

RC76xx / WP76xx Signal Name	RC76xx / WP76xx Pin Out	I/O	Voltage Level	LED	Test Point / Jumper	Development Kit Signal Name
TX-ON	C60	O	1.8V	D1000	CN1000_14	TX-ON

3.15 VGPIO

One VGPIO power supply signal is available on the Development Kit from the RC76xx / WP76xx module.

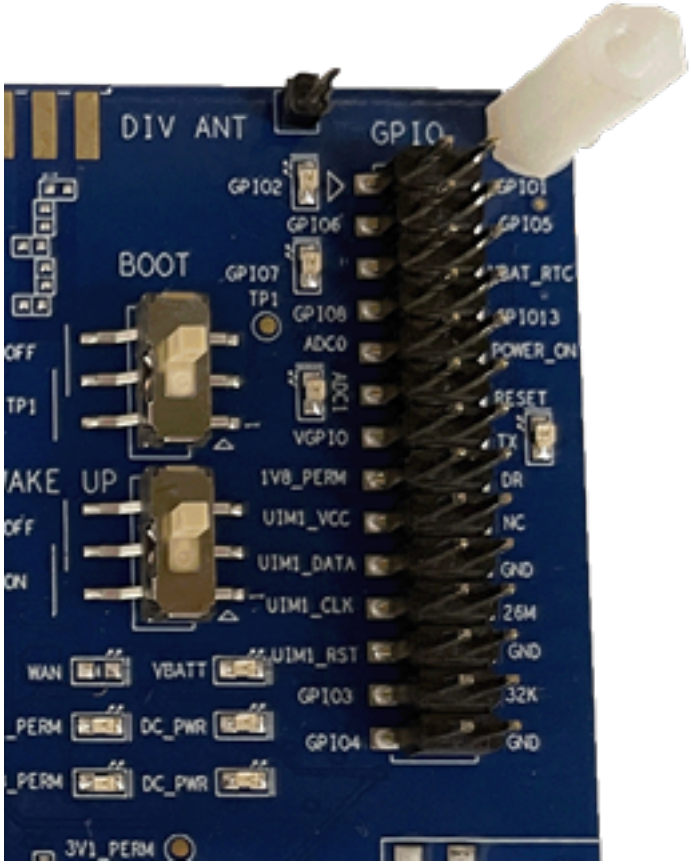


Figure 3-18: VGPIO Signal

One test point is available to control the state of VGPIO.

Table 3-28: VGPIO Pin Description

RC76xx / WP76xx Signal Name	RC76xx / WP76xx Pin Out	I/O	Voltage Level	LED	Test Point / Jumper	Development Kit Signal Name
VGPIO	C45	O	1.8V		CN1000_13	VGPIO

3.16 RF and GNSS Antenna

Two SMA connectors are available on the Development Kit for RF and GNSS antenna connections:

- RF antenna via CN903 (PRI_ANT) and CN906 (DIV_ANT)
- GNSS antenna via CN901

Figure 3-19: RF and GNSS Antenna Connectors

3.17 Interface for Arduino®

The Development Kit provides an Arduino IO interface which can boot up and control the RC76xx / WP76xx module using Arduino.

Make sure VCC_5V_A and DC_PWR are short together on CN805 and Arduino should be input 5V and 3V3 to CN602.

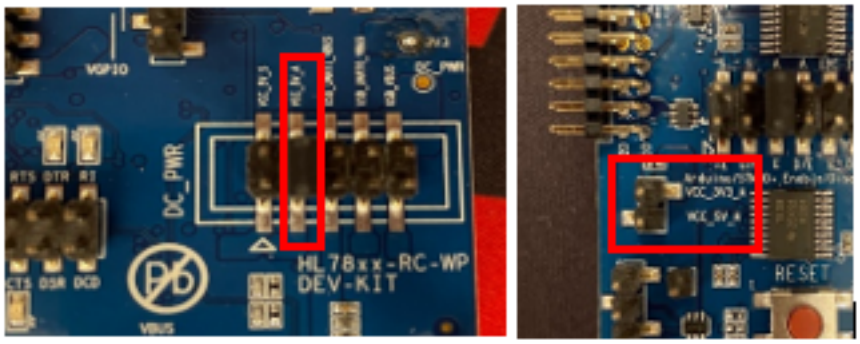


Figure 3-20: Jumpers for Power Supply

The SW601 should be changed to Arduino mode. To ensure the correct booting sequence, CN1307 must remain in the **Arduino disable** state when the RC76xx / WP76xx is still booting. After the module has boot-up, CN1307 can be returned to its **Arduino enable** state.

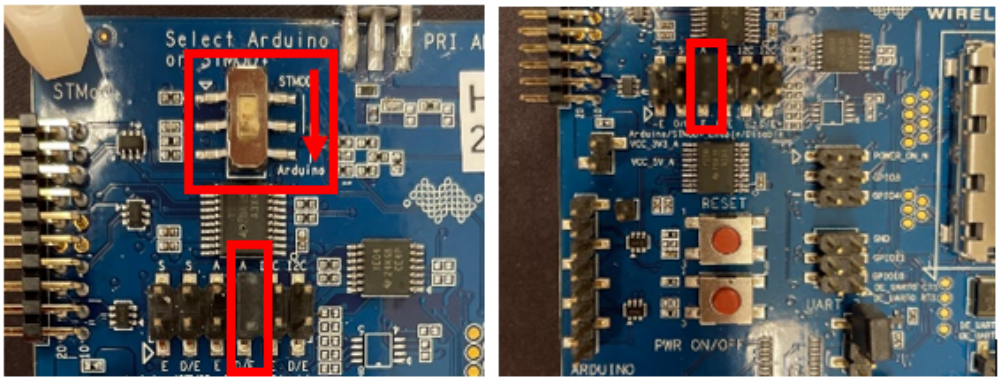


Figure 3-21: Boot-up

Make sure your configuration of UART can connect to Rx, Tx, CTS, and RTS. CN401 must be removed.

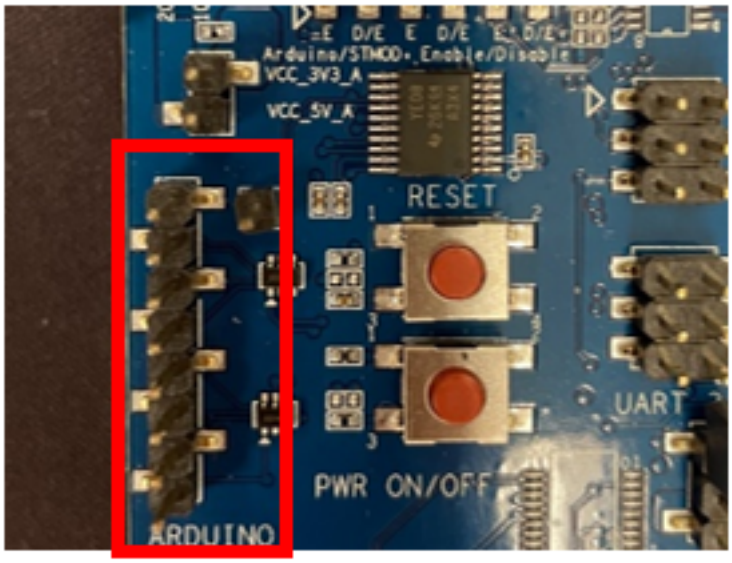


Figure 3-22: Interface for Arduino

You may refer to the following IO list:

Table 3-29: Connector Pin Description for Arduino

Pin #	Signal Name	I/O	Description
1	VGPIO	O	+1.8 VDC
2	ARDUINO_RESET_IN_N	I	Module reset
3	ARDUINO_WAKEUP / GPIO13	I/O	HL78xx: WAKEUP, WP76xx: GPIO13
4	ARDUINO_GPIO2	I/O	GPIO2
5	ARDUINO_UART1_CTS	O	UART1_CTS
6	ARDUINO_UART1_RTS	I	UART1_RTS
7	ARDUINO_UART1_Rx	O	UART1_Rx
8	ARDUINO_UART1_Tx	I	UART1_Tx

3.18 Interface for STMod+

The Development Kit provides an STMod+ IO interface, It can boot up and control the RC76xx / WP76xx module through STMod+.

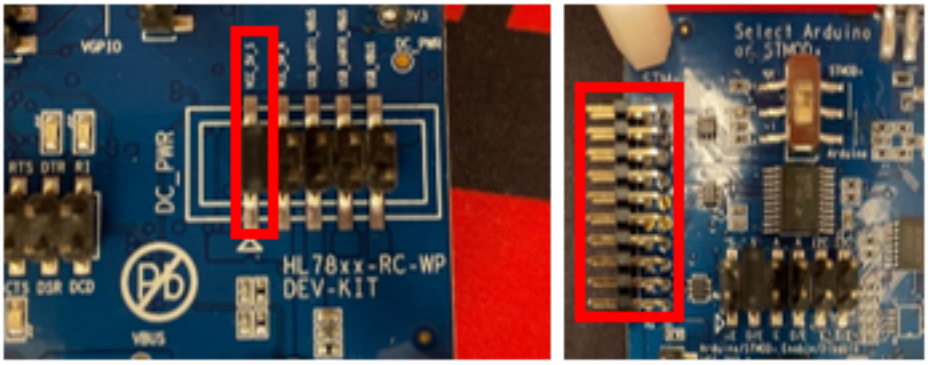


Figure 3-23: Internal Power Supply

The SW601 should be changed to STMod+ mode. To ensure the correct booting sequence, CN1307 must remain in the **STMod+ disable** state when the RC76xx / WP76xx is still booting. After the module has boot-up, CN1307 can be returned to an **STMod+ enable** state.

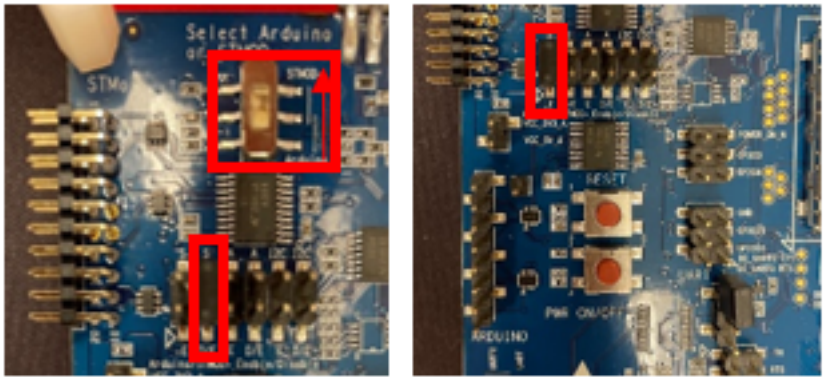


Figure 3-24: Boot Up

Make sure your configuration of UART can connect to Rx, Tx, CTS, and RTS. CN401 must be removed.

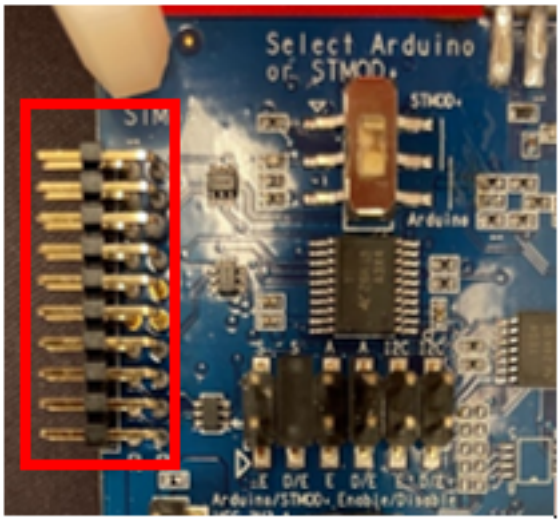


Figure 3-25: Interface for STMod+

You may refer to the following IO list:

Table 3-30: Connector Pin Description for Arduino

Pin #	Signal Name	I/O	Description
1	STMOD_UART1_CTS	O	UART1_CTS
2	STMOD_UART1_Tx	I	UART1_Tx
3	STMOD_UART1_Rx	O	UART1_Rx
4	STMOD_UART1_RTS	I	UART1_RTS
5	GND	Power	GND
6	VCC_5V_S	Power	+5V VDC
7	S_GPIO1/I2C1_SCL	I/O	GPIO1/I2C1_SCL
8	NC	-	-
9	STMOD_POWER_ON_N	I	Module Power ON key
10	S_GPIO5/I2C1_SDA	I/O	GPIO5/I2C1_SDA
11	STMOD_UART1_RI	I/O	UART1_RI
12	STMOD_RESET_IN_N	I	Module reset
13	NC	-	-
14	STMOD_UART1_DTR	I	UART1_DTR
15	VCC_5V_S	Power	+5V VDC

Table 3-30: Connector Pin Description for Arduino (Continued)

Pin #	Signal Name	I/O	Description
16	GND	Power	
17	VGPIO	O	+1.8 VDC
18	STMOD_GPIO2	I/O	GPIO2
19	STMOD_WAKEUP/GPIO13	I/O	HL78xx: WAKEUP, WP76xx: GPIO13
20	NC	-	-

4: Getting Started

This section describes how the Development Kit is set up as well as describes communications testing, making calls and debugging with an embedded module.

4.1 Setting Up

Do the following steps before powering on the Development Kit:

1. Ensure that switches and connectors are configured as required. By default, the Development Kit board is configured from the factory before shipment to allow the module to power up normally.
2. Plug an RC76xx/WP76xx module to the snap-in connector with an interposer and attach the snap-in cover as shown in Snap-In Connector.
3. Insert a SIM or USIM card in the SIM slot, CN500, if communications are required.
4. Connect the RC76xx/WP76xx module to a PC using CN402 (modem port). By default, baud rate = 115.2Kbps, data bits = 8, parity = N, and stop bits = 1.
5. Connect an RF antenna to the CN903 and CN906 of the Development Kit.
6. Connect a GNSS antenna to the CN901 of the Development Kit.
7. Connect an earphone to the CN1200 for audio communication a
8. Connect a power cable to the CN402 and check if jumpers are plugged on the CN1301and CN805.

Note that the Development Kit may be supplied with power depending on jumper configurations and power supplies CN805. Refer to Power Supply for more information on supplying power to the Development Kit.

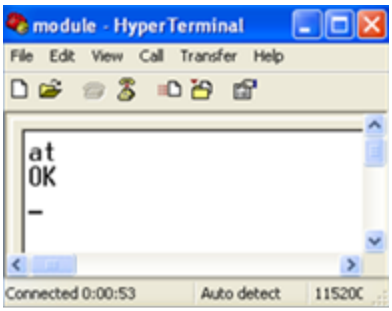
4.2 RF Communications

4.2.1 Configure the COM Port

4.2.1.1 USB Port

The RC76xx / WP76xx module is automatically detected when the USB cable from the Development Kit is connected to the PC.(UART1 to USB).

Test communications using a PC terminal emulator (HyperTerminal or Clear Terminal, for example) by entering **AT**. The module should answer with **OK**.

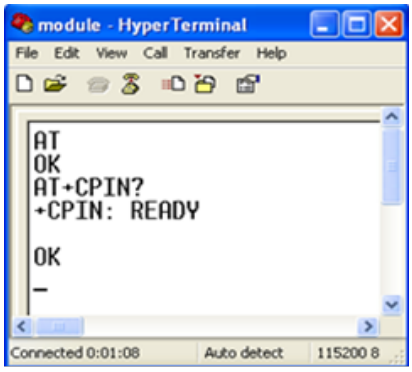


4.2.2 Make a Voice Call

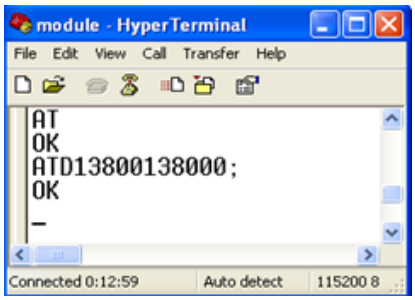
Follow these steps to make a voice call:

1. Follow these steps to make a voice call:
2. Ensure that:
   a. power is on.
   b. module is ON
   c. COM port is connected by main USB CN402
   d. SIM card is inserted in SIM holder, CN500.
   e. RF antenna is connected to CN903 and CN906.
   f. A earphone is connected to CN1200

Once the SIM card is ready, the module will respond with +CPIN: READY. Otherwise, it will return ERROR.Once the SIM card is ready, the module will respond with +CPIN: READY. Otherwise, it will return ERROR.



3. Enter ATD<phone number>; to make a call. For example, enter ATD13800138000;



4.3 GNSS Communications

To get GNSS output, ensure that:

- Power is on.
- Module is ON
- COM port is connected by main USB CN402
- SIM card is inserted in SIM holder, CN500.
- RF antenna is connected to CN901
- Jumper CN902 is shorted if using GNSS antenna bias circuit (for active antenna), or jumper CN902 is not shorted if using GNSS antenna (for passive antenna).

4.4 Low Power Consumption Measurement

Put the RC76xx / WP76xx module inside the snap-in connector in the correct position; refer to Snap-In Connector for details.

Currently due to circuit design limitation, the low power consumption measure, for examples the PSM, eDRX mode, cannot be tested on PVT samples. The low power consumption measurement jumper (as below figure) will implement on MP samples.

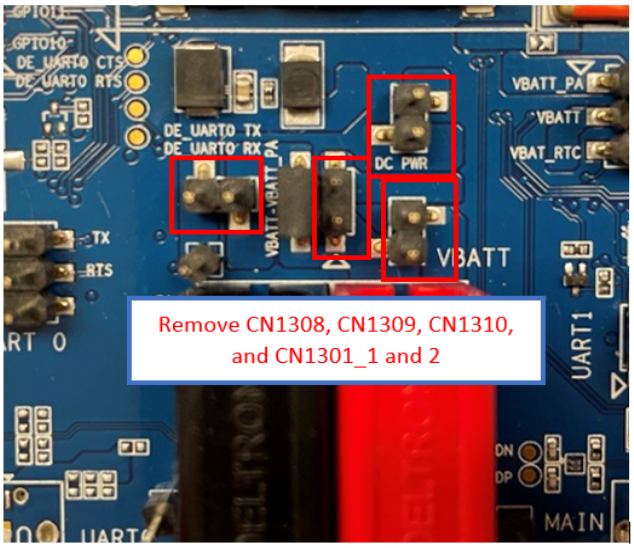


Figure 4-1: Low Power Consumption Measurement Jumper

Note: When entering low-power mode, the module should be powered by CN804 and CN800.

5: ESD Protection

External ESD protection is available on the Development Kit for the following connectors:

- UIM/SIM1 connector
- USB main connector
- USB-UART0 connector
- USB-UART1 connector
- RF connector
- GNSS connector

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