AirPrime HL78xx

Development Kit User Guide

SIERRA WIRELESS®

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Document History

Version	Date	Updates
1.0	August 06, 2018	Creation
1.1	August 08, 2018	Updated: • Document formatting • 3.8 GPIO
2.0	November 06, 2018	Added 4.4 Low Power Consumption Measurement
		Updated Figure 11 Power Supply Configurations
3.0	December 04, 2018	Updated for development kit board Rev4

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1. Overview

This document describes the AirPrime HL78xx Series Development Kit Rev4 (PCB board version: 5303247) and how it integrates with the AirPrime HL78xx 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 AirPrime HL78xx series.

The following table enumerates the different HL78xx variants that can be used with the Development Kit.

Table 1. Supported Module Variants

Variant Name	Description
HL7800	1.8V, LTE Cat-M1 and Cat-NB1, and capable with GLONASS support
HL7802	1.8V, LTE Cat-1 and Cat-NB1, GSM/GPRS class 10, E-GSM 900/DCS 1800, and capable with GLONASS support

For more information about the AirPrime HL78xx series of embedded modules, refer to the product technical specifications listed in section 6 Reference Documents.

2. General Description

This section gives a brief overview of the Development Kit and briefly describes the interfaces and special jumper pads available; and lists all available test points on the Development Kit board.

2.1. RoHS Compliance

The AirPrime HL78xx Series Development Kit Rev4 is compliant with RoHS (Restriction of Hazardous Substances in Electrical and Electronic Equipment) Directive 2011/65/EU 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 HL78xx series of embedded modules are also compliant with this directive.

2.2. Development Kit

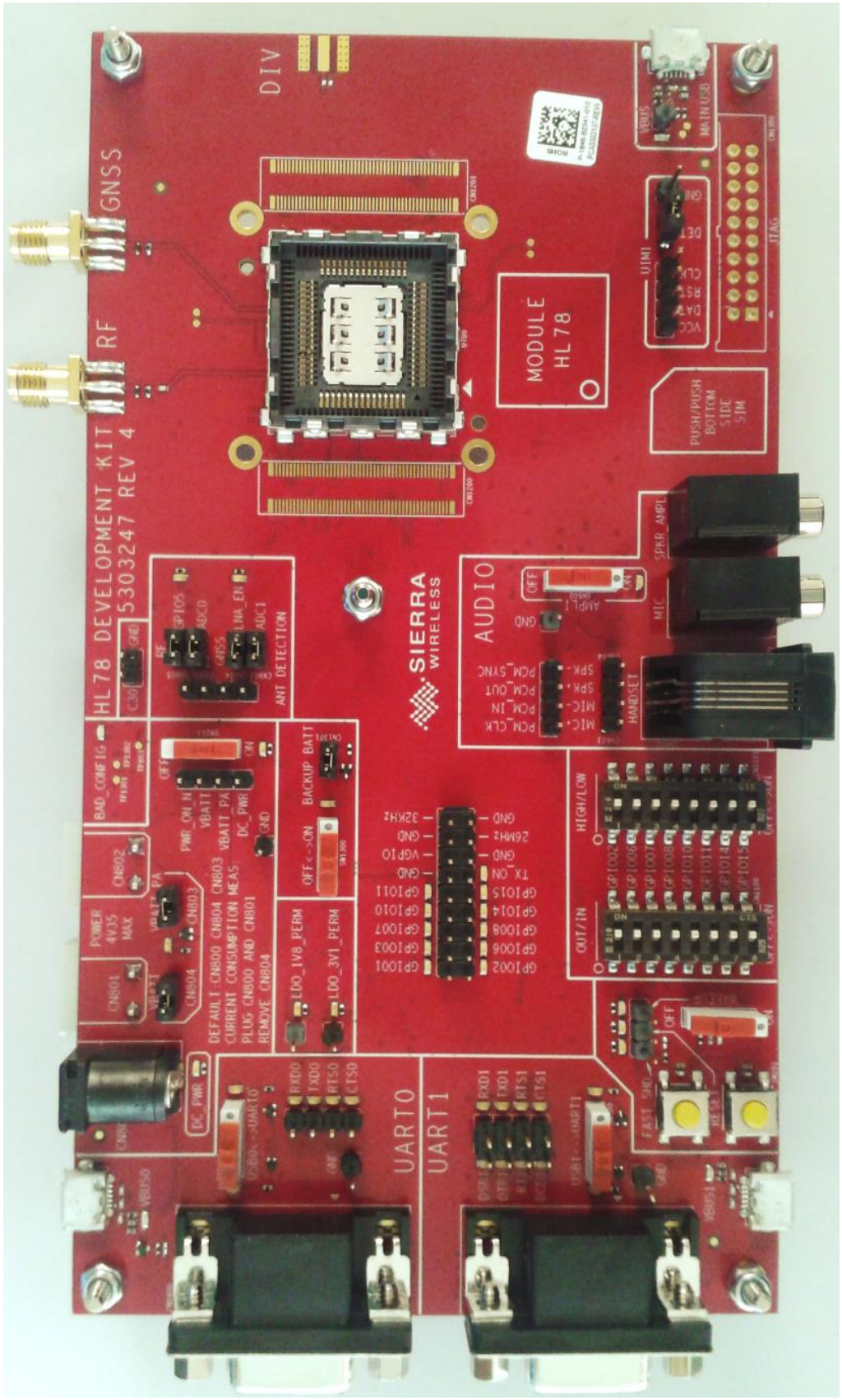


Figure 1. Development Kit – Top View

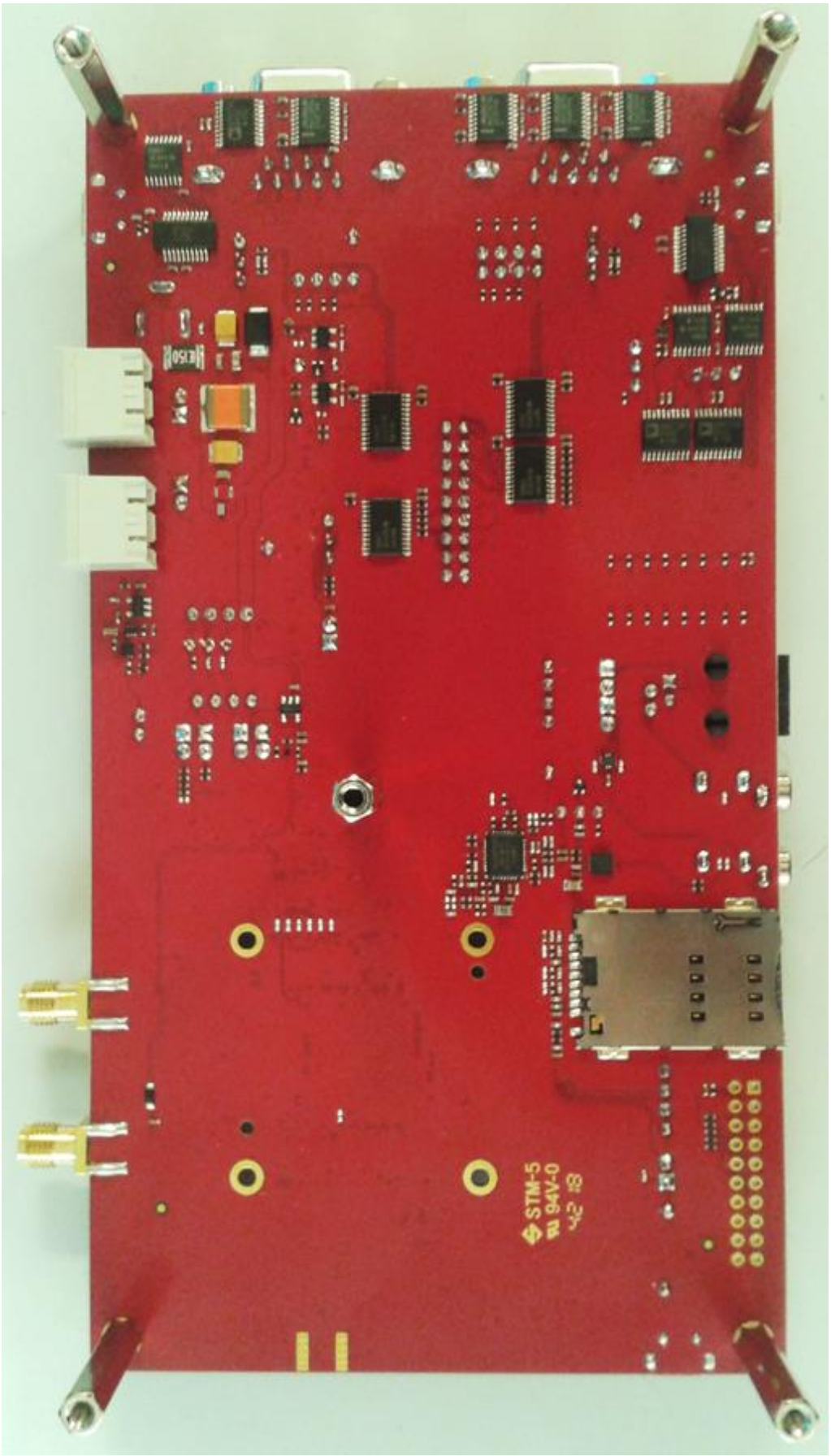


Figure 2. Development Kit – Bottom View

2.2.1. Features

Interfaces available on the Development Kit board include:

- Power supply connectors
  - Module’s radio frequency main supply (VBATT_RF)
  - Module’s baseband main supply (VBATT_BB)
  - Application development kit’s main supply (VBATT_APPLI)
- Automatic detection of module’s wrong orientation
- ON/OFF switch
- RESET_IN_N pushbutton
- WAKE-UP switch
- FAST_SHUTDOWN pushbutton
- Tests points (TP) to access all signals of the embedded module
- Main serial link, selectable by RS232 or USB connectors, for UART1 function with full signals
- Auxiliary serial link, selectable by RS232 or USB connectors, for UART0 function with 4 signals (debug interface)
- Full speed main USB connector
- SIM 1.8V (with SIM presence management)
- Audio connectors: handset, microphone/loudspeaker
- PCM digital/analog audio via external codec
- Audio amplifier selectable or not via switch
- GPIOs
- ADCs
- TX-ON (RF transmit signal)
- System 26Mhz clock out
- Real time 32Khz clock out
- VGPIO reference voltage out
- 8x DIP switches for GPIO logic input/output control
- LEDs for several indications
- RTC back-up battery
- JTAG connector
- RF connector and detection circuit antenna
- GNSS connector and detection circuit antenna
- LNA enable by GNSS
- Snap-in connector (for plugging in the HL78xx series modules)
- External board-to-board connectors (unsoldered by default)
- Diversity 4G RF connector antenna (unsoldered by default)

Refer to section 3 Interfaces for detailed information about these interfaces.

2.2.2. Connectors and Component Placement

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

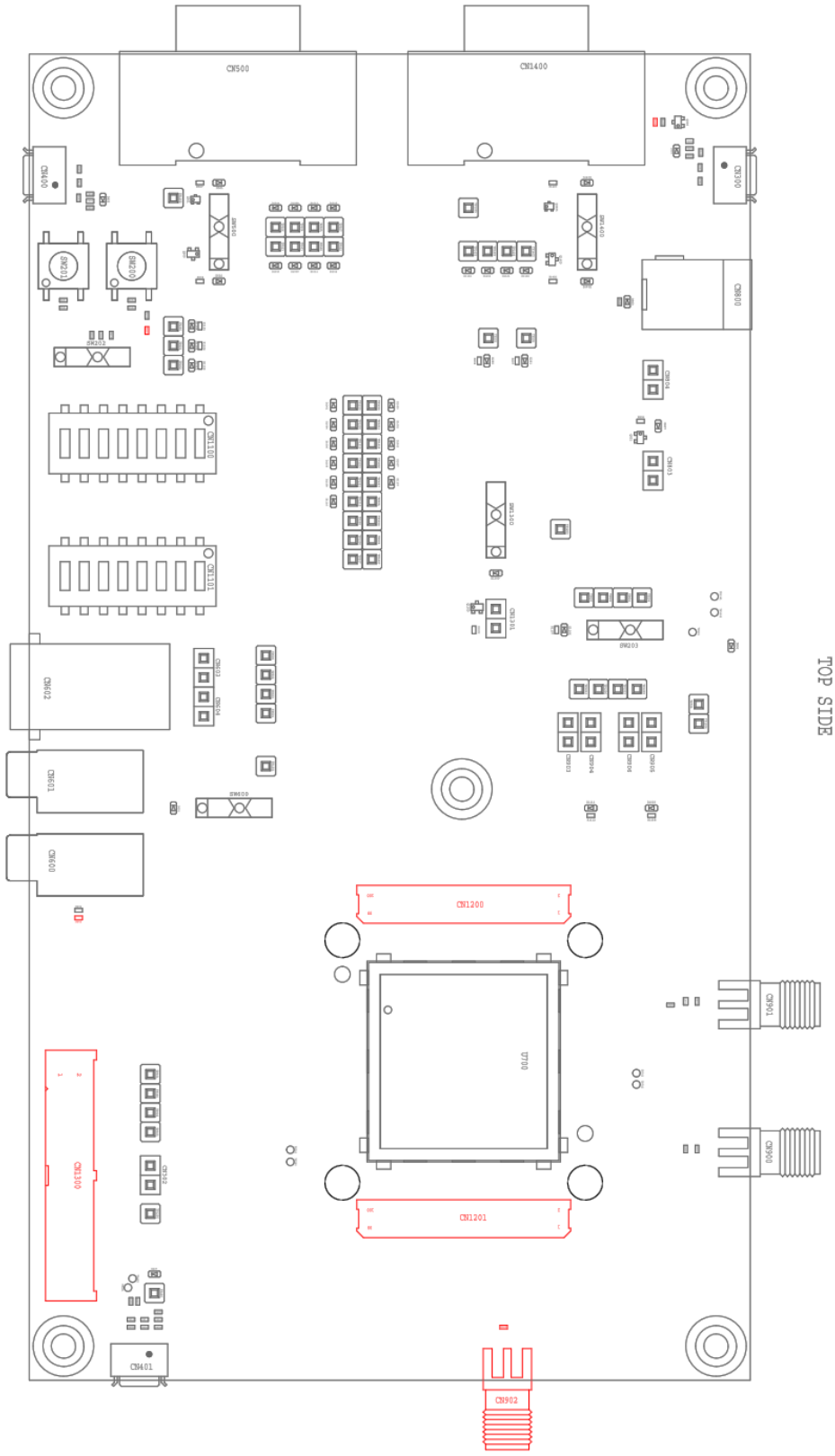


Figure 3. Available Connectors and Components – Top

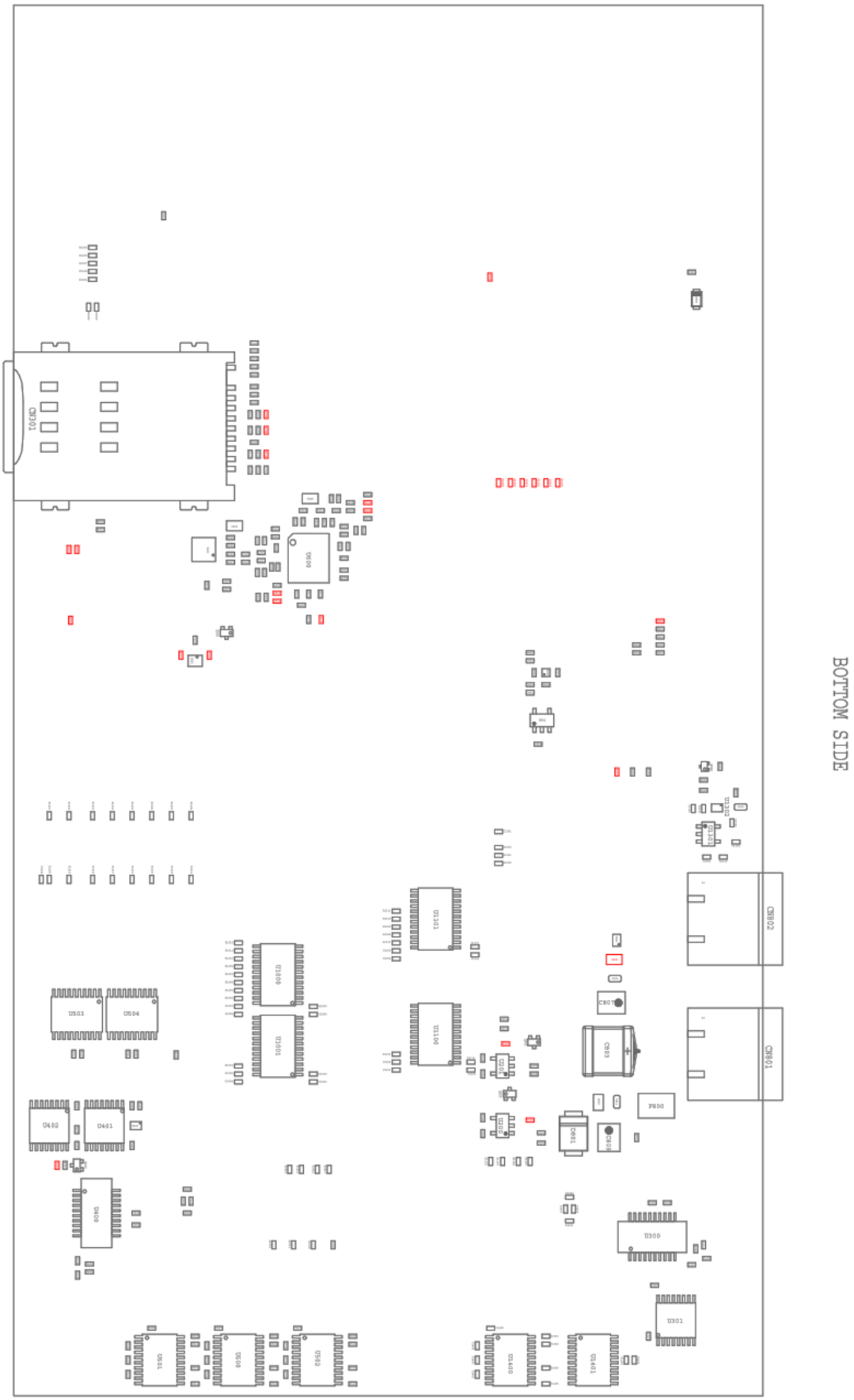


Figure 4. Available Connectors and Components – Bottom

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

Table 2. Connector and Switch Description

Connector/Switch	Description	HL7800	HL7802
SW200	FAST_SHUTDOWN push button	✓	✓
SW201	RESET push button	✓	✓
SW202	WAKE-UP switch	✓	✓
SW203	POWER_ON_N switch	✓	✓
CN300	USB-UART0 (dwl and debug port)	✓	✓
CN301	SIM1	✓	✓
CN302	UIM1_DET/GPIO3	✓	✓
CN400	USB-UART1	✓	✓
CN401	USB main	✓	✓
CN500	RS232-UART1	✓	✓
SW500	USB-UART1 or RS232-UART1 selector	✓	✓
SW600	Audio amplifier selector	✓	✓
CN600	Audio jack loudspeaker	✓	✓
CN601	Audio jack microphone	✓	✓
CN602	RJ22 handset	✓	✓
U700	Snap-in connector	✓	✓
CN800	4V, 3.75A power jack (VBATT_APPLI)	✓	✓
CN801	4V, 3.75A power (VBATT_BB)	✓	✓
CN802	4V, 3.75A power (VBATT_RF)	✓	✓
CN803	VBATT_BB to VBATT_RF	✓	✓
CN804	VBATT_APPLI to VBATT_BB and/or VBATT_RF	✓	✓
CN900	GNSS connector	✓	✓
CN901	RF main connector	✓	✓
CN902	RF diversity connector	-	-
CN903	Antenna detection circuit enable for GNSS/ADC1	✓	✓
CN904	Antenna detection circuit enable for GNSS/GPIO1	✓	✓
CN905	Antenna detection circuit enable for RF/GPIO5	✓	✓
CN906	Antenna detection circuit enable for RF/ADC0	✓	✓
CN1200 and CN1201	Board to board connector (Development Kit to socket board connection) (unsoldered)	✓	✓
CN1100	GPIOs dip switch output/input	✓	✓
CN1101	GPIOs dip switch high/low level	✓	✓
CN1300	JTAG connector (unsoldered)	✓	✓
SW1300	VBAT_RTC switch	✓	✓
CN1301	VBAT_RTC signal	✓	✓
CN1400	USB-UART0 (dwl and debug port)	✓	✓
SW1400	USB-UART0 or RS232-UART0 selector	✓	✓

Table 3. Available Connector, Switch and Jumper Solder Pads

Connector, Switch and Jumper Solder Pads	Connection
SW200	• Push button (level '0') to enable FAST_SHUTDOWN • No push button (level '1') to disable FAST_SHUTDOWN
SW201	• Push button (level '0') to enable RESET • No push button (level '1') to disable RESET
SW202	• Push button (level '0') to enable WAKE-UP • No push button (level '1') to disable WAKE-UP
SW203	• Switch to "ON" (level '1') to enable POWER_ON_N on the module • Switch to "OFF" (level '0') to disable POWER_ON_N on the module
CN302	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)
SW500	• Switch to "UART1" (level '1') for RS232-UART1 connector • Switch to "USB1" (level '0') for USB-UART1 connector
SW600	• Switch to "ON" (level '1') to enable amplifier for audio out • Switch to "OFF" (level '0') to disable amplifier for audio out
F600	This jumper solder pad is soldered by default • Soldered = enable output amplifier speaker+ • Not soldered = disable output amplifier speaker+
F601	This jumper solder pad is soldered by default • Soldered = enable output amplifier speaker- • Not soldered = disable output amplifier speaker-
CN803	This connector is shorted by default via a jumper • Jumper connected = VBATT_BB is connected to VBATT_RF • Jumper disconnected = VBATT_BB is not connected to VBATT_RF
CN804	This connector is shorted by default via a jumper • Jumper connected = VBATT_APPLI is connected to VBATT_BB and/or VBATT_RF • Jumper disconnected = VBATT_APPLI is not connected to VBATT_BB and/or VBATT_RF
CN903	This connector is shorted by default via a jumper • Jumper connected = antenna detection circuit enable for GNSS antenna • Jumper disconnected = ADC1 application
CN904	This connector is shorted by default via a jumper • Jumper connected = antenna detection circuit enable for GNSS antenna • Jumper disconnected = GPIO1 application
CN905	This connector is shorted by default via a jumper • Jumper connected = antenna detection circuit enable for RF antenna • Jumper disconnected = GPIO5 application
CN906	This connector is shorted by default via a jumper • Jumper connected = antenna detection circuit enable for RF antenna • Jumper disconnected = ADC0 application
CN1100	• Switch to "OUT" to enable GPIO2, 6, 7, 8, 10, 11, 14, 15 (default setting) • Switch to "IN" to enable GPIO2, 6, 7, 8, 10, 11, 14, 15

Connector, Switch and Jumper Solder Pads	Connection
CN1101	• Switch to “HIGH” to enable GPIO2, 6, 7, 8, 10, 11, 14, 15 pull up • Switch to “LOW” to enable GPIO2, 6, 7, 8, 10, 11, 14, 15 pull down
SW1300	• Switch to “ON” (level ‘1’) = back-up battery RTC is present • Switch to “OFF” (level ‘0’) = back-up battery RTC is not present
CN1301	This connector is shorted by default via a jumper • Jumper connected = back-up battery RTC is present • Jumper disconnected = back-up battery RTC is not present
SW1400	• Switch to “UART0” (level ‘1’) for RS232-UART0 connector • Switch to “USB0” (level ‘0’) for USB-UART0 connector

Table 4. Available Tests Points

Test Points	Description
TP200	FAST_SHUTDOWN
TP201	RESET_IN_N
TP202	WAKE-UP
TP203	3V1_PERM
TP204	POWER_ON_N
TP205	1V8_PERM
TP206	GND
TP207	GND
TP208	GND
TP209	GND
TP300	UIM1_DATA
TP301	UIM1_VCC
TP302	UIM1_RST
TP303	UIM1_CLK
TP400	USB_VBUS
TP500	UART1_CTS
TP501	UART1_RX
TP502	UART1_RTS
TP503	UART1_TX
TP504	UART1_DSR
TP505	UART1_DCD
TP506	UART1_DTR
TP507	UART1_RI
TP600	PCM_CLK
TP601	PCM_SYNC
TP602	PCM_IN
TP603	PCM_OUT
TP704	GND_C30
CN603	MIC+ and MIC-
CN604	SPK+ and SPK-

Test Points	Description
TP800	VBATT_APPLI
TP801	VBATT_BB
TP802	VBATT_RF
TP1200	GND
TP1201	GND
TP1202	GND
TP1203	GND
TP1204	GND
TP1205	GND
TP1206	EXT_GPS_LNA_EN
TP1207	32K_CLKOUT (32,768 Khz)
TP1208	26M_CLKOUT (26 Mhz)
TP1209	GPIO5
TP1210	TX_ON
TP1211	UIM1_DET/GPIO3
TP1212	ADC0
TP1213	ADC1
TP1214	VGPIO – reference voltage output
TP1215	GPIO2
TP1216	GPIO1
TP1217	GPIO11
TP1218	GPIO7
TP1219	GPIO8
TP1220	GPIO6
TP1221	GPIO15
TP1222	GPIO10
TP1223	GPIO14

2.2.3. Snap-In Connector

The snap-in connector houses the embedded module and allows easy switching between any of the supported HL78xx series embedded modules.

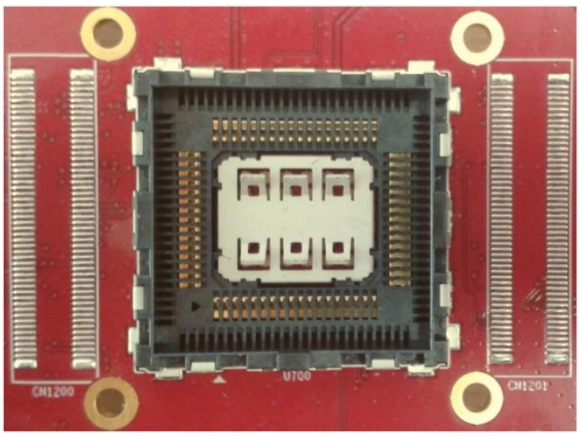


Figure 5. Snap-In Connector

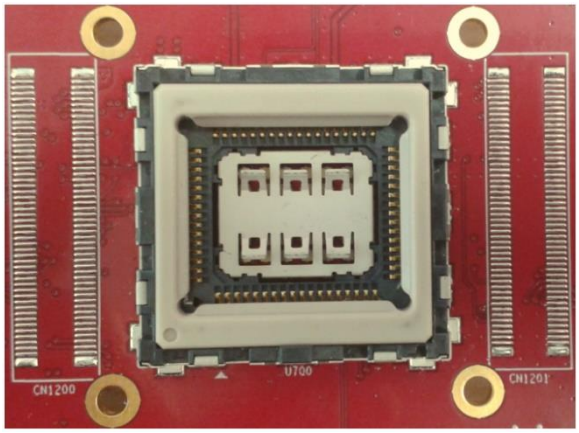


Figure 6. Snap-In Connector with Interposer

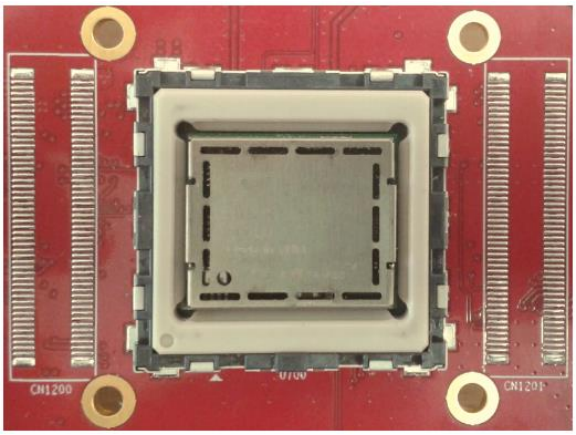


Figure 7. Snap-In Connector with Interposer and an HL78xx Module

Note: Ensure that the HL78xx module is positioned properly inside the snap-in connector to make it work properly with the Development Kit.

After plugging an HL78xx module and interposer in the snap-in connector, attach the snap-in cover as shown in the figure below.

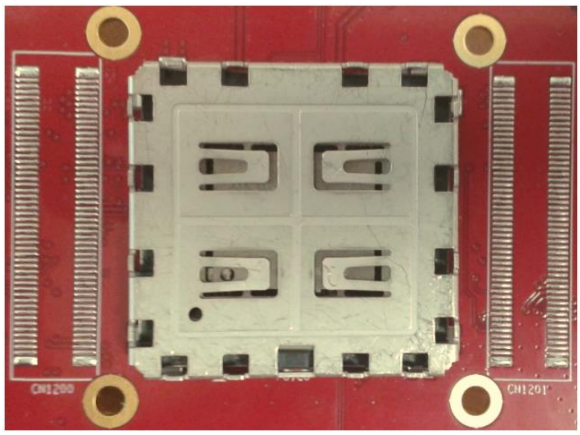


Figure 8. Snap-In Connector with HL78xx Module and Cover

2.2.4. Test Ports

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

For more information about these signals, refer to the product technical specifications listed in section 6 Reference Documents.

Table 5. Development Kit Test Ports

AirPrime HL78xx Series Development Kit					AirPrime HL78xx Series Embedded Modules	
Test Port #	**Test Port Serigraphy #**	**Board to Board Connector Pin #**	**Test Points #**	**Connector #**	**HL7800 Pin Out Signal Name**	**HL7802 Pin Out Signal Name**
C1	GPIO1	CN1200.32	TP1214	CN904	GPIO1	GPIO1
C2	RI1	CN1201.71	TP504		UART1_RI	UART1_RI
C3	RTS1	CN1201.73	TP501		UART1_RTS	UART1_RTS
C4	CTS1	CN1201.79	TP503		UART1_CTS	UART1_CTS
C5	TXD1	CN1201.81	TP500		UART1_TX	UART1_TX
C6	RXD1	CN1201.85	TP502		UART1_RX	UART1_RX
C7	DTR1	CN1201.77	TP505		UART1_DTR	UART1_DTR
C8	DCD1	CN1201.75	TP506		UART1_DCD	UART1_DCD
C9	DSR1	CN1201.83	TP507		UART1_DSR	UART1_DSR
C10	GPIO2	CN1200.30	TP1213		GPIO2	GPIO2
C11	RESET	CN1200.37	TP201		RESET_IN_N	RESET_IN_N
C12	-	-	-	CN401	USB_DN	USB_DN
C13	-	-	-	CN401	USB_DP	USB_DP
C14	NC				NC	NC
C15	NC				NC	NC
C16	VBUS	-	TP400	CN401	USB_VBUS	USB_VBUS

AirPrime HL78xx Series Development Kit					AirPrime HL78xx Series Embedded Modules	
Test Port #	**Test Port Serigraphy #**	**Board to Board Connector Pin #**	**Test Points #**	**Connector #**	**HL7800 Pin Out Signal Name**	**HL7802 Pin Out Signal Name**
C17	NC				NC	NC
C18	NC				NC	NC
C19	NC				NC	NC
C20	NC				NC	NC
C21	Back-Up Battery	CN1200.35		CN1301	VBAT_RTC	VBAT_RTC
C22	26MHZ	CN1201.84	TP1206		26M_CLKOUT	26M_CLKOUT
C23	32KHZ	CN1201.76	TP1207		32K_CLKOUT	32K_CLKOUT
C24	ADC1	CN1200.55	TP1211	CN903	ADC1	ADC1
C25	ADC0	CN1200.53	TP1210	CN906	ADC0	ADC0
C26	UIM1_VCC	CN1200.43	TP307		UIM1_VCC	UIM1_VCC
C27	UIM1_CLK	CN1200.49	TP306		UIM1_CLK	UIM1_CLK
C28	UIM1_DATA	CN1200.45	TP304		UIM1_DATA	UIM1_DATA
C29	UIM1_RST	CN1200.47	TP305		UIM1_RST	UIM1_RST
C30	GND				GND	GND
C31	NC				NC	NC
C32	GND				GND	GND
C33	PCM_OUT	CN1200.76	TP603		PCM_OUT	PCM_OUT
C34	PCM_IN	CN1200.78	TP602		PCM_IN	PCM_IN
C35	PCM_SYNC	CN1200.80	TP601		PCM_SYNC	PCM_SYNC
C36	PCM_CLK	CN1200.74	TP600		PCM_CLK	PCM_CLK
C37	GND				GND	GND
C38	GNSS	-	-	CN900	GNSS_ANT	GNSS_ANT
C39	GND				GND	GND
C40	GPIO07	CN1200.40	TP1216		GPIO7	GPIO7

AirPrime HL78xx Series Development Kit					AirPrime HL78xx Series Embedded Modules	
Test Port #	**Test Port Serigraphy #**	**Board to Board Connector Pin #**	**Test Points #**	**Connector #**	**HL7800 Pin Out Signal Name**	**HL7802 Pin Out Signal Name**
C41	GPIO08	CN1200.42	TP1217		GPIO8	GPIO8
C42	NC				NC	NC
C43	LNA_EN	CN1201.32	TP1204		EXT_LNA_GPS_EN	EXT_LNA_GPS_EN
C44	WAKEUP	CN1200.70	TP202		WAKEUP	WAKEUP
C45	VGPIO	CN1200.20	TP1212		VGPIO	VGPIO
C46	GPIO06	CN1200.60	TP1218		GPIO6	GPIO6
C47	NC				NC	NC
C48	GND				GND	GND
C49	RF	-	-	CN901	PRI_ANT	PRI_ANT
C50	GND				GND	GND
C51	GPIO14	CN1200.68	TP1221		GPIO14	GPIO14
C52	GPIO10	CN1200.66	TP1220		GPIO10	GPIO10
C53	GPIO11	CN1200.38	TP1215		GPIO11	GPIO11
C54	GPIO15	CN1200.64	TP1219		GPIO15	GPIO15
C55	RX0	CN1201.8	TP1402		UART0_RX	UART0_RX
C56	TX0	CN1201.6	TP1400		UART0_TX	UART0_TX
C57	CTS0	CN1201.4	TP1403		UART0_CTS	UART0_CTS
C58	RTS0	CN1201.10	TP1401		UART0_RTS	UART0_RTS
C59	POWER_ON	CN1200.33	TP204		POWER_ON_N	POWER_ON_N
C60	TX_ON	CN1200.29	TP1208		TX_ON	TX_ON
C61	VBATT_RF	CN1200.2, CN1200.4 CN1200.6, CN1200.8	TP802		VBATT_RF	VBATT_RF
C62	VBATT_RF	CN1200.2, CN1200.4 CN1200.6, CN1200.8	TP802		VBATT_RF	VBATT_RF

AirPrime HL78xx Series Development Kit					AirPrime HL78xx Series Embedded Modules	
Test Port #	**Test Port Serigraphy #**	**Board to Board Connector Pin #**	**Test Points #**	**Connector #**	**HL7800 Pin Out Signal Name**	**HL7802 Pin Out Signal Name**
C63	VBATT_BB	CN1200.1, CN1200.3, CN1200.5	TP801		VBATT_BB	VBATT_BB
C64	UIM1_DET/GPIO03	CN1200.51	TP1209	CN302	UIM1_DET/GPIO3	UIM1_DET/GPIO3
C65	FAST_SHD	CN1200.69	TP200		FAST_SHUTDOWN	FAST_SHUTDOWN
C66	GPIO05	CN1201.90	TP1207	CN905	GPIO5	GPIO5

3. Interfaces

3.1. Power

3.1.1. Power Supply

Three power supply sources are available on the Development Kit :

- DC power jack connector via CN800
- Connector via CN801
- Connector via CN802

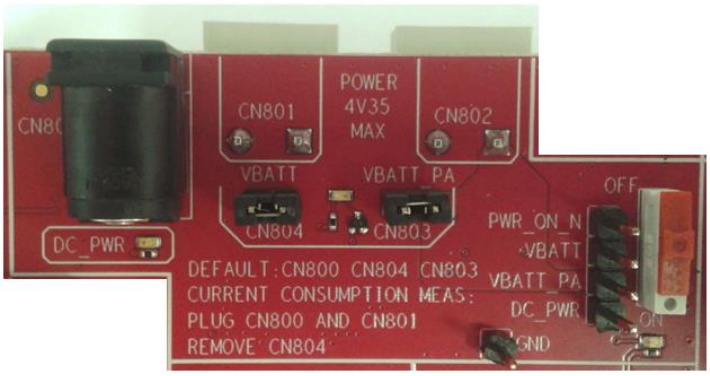


Figure 9. VBATT_APPLI Connector (on the top side of the Development Kit)

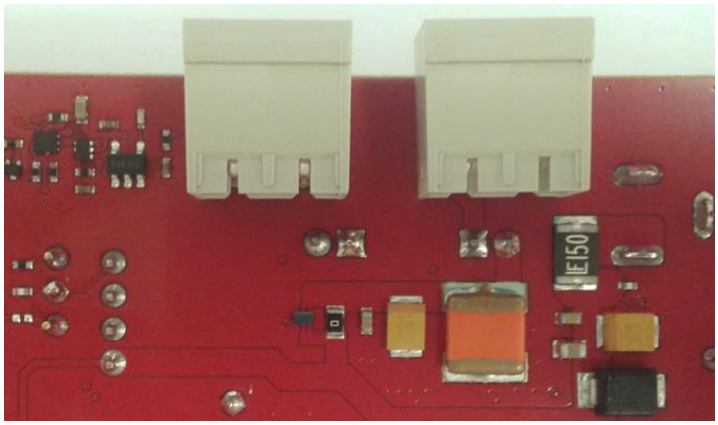


Figure 10. VBATT_BB and VBATT_RF Connectors (on the bottom side of the Development Kit)

Three powers supplies can be used to supply the Development Kit and the HL78xx module. They can be used to supply power to VBATT_APPLI, VBATT_BB and VBATT_RF separately or they can provide supply collectively depending on CN803 and/or CN804 jumper configurations.

To measure the global current consumed by the HL78xx module (baseband + radio frequency), disconnect CN803 and supply the Development Kit separately.

VBATT_BB and VBATT_RF of the embedded module can be measured separately or as a total current drain depending on the configurations of CN803 and CN804.

Refer to the following figure for possible configuration settings:

		Configurations:				
		Jack VBATT_APLLI **CN800**	Connector VBATT_BB **CN801**	Connector VBATT_RF **CN802**	Jumper **CN803**	Jumper **CN804**
Apply powers supplies	remarks					
Connect VBATT_APPLI	normal use:only one power supply	**connected**			**YES**	**YES**
Connect VBATT_APPLI and VBATT_BB or	powers suplies dev-kit and module isolate	**connected**	**connected**		**YES**	**NO**
Connect VBATT_APPLI and VBATT_RF		**connected**		**connected**	**YES**	**NO**
Connect VBATT_APPLI and VBATT_BB and VBATT_RF	all powers supplies isolate	**connected**	**connected**	**connected**	**NO**	**NO**

Figure 11. Power Supply Configurations

Refer to the following pictures for connector and jumper configurations.

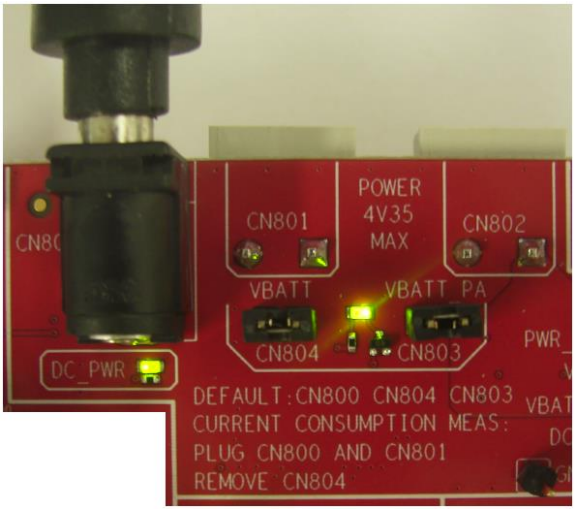


Figure 12. Single Power Supply Configuration

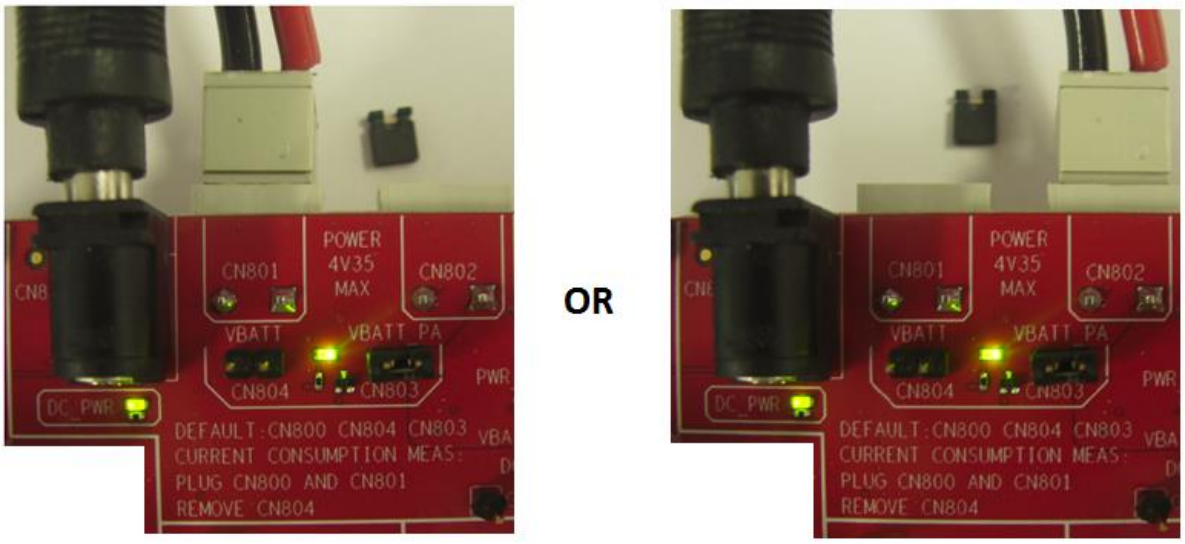


Figure 13. Separate Power Supplies for the Development Kit and Module Configurations

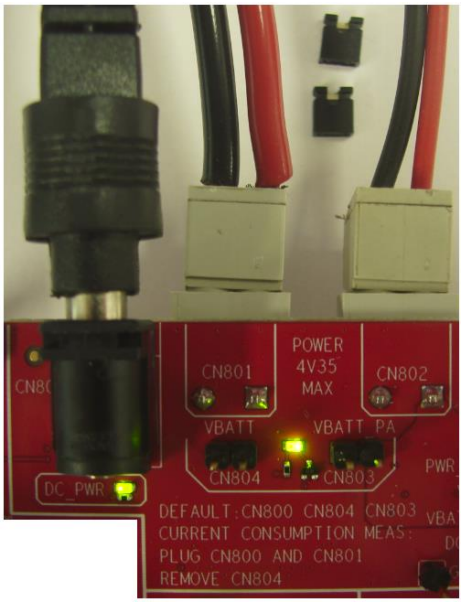


Figure 14. Separate VBATT_APPLI, VBATT_BB and VBATT_RF Configuration

The state of VBATT_APPLI is indicated by a green LED and can be controlled by a test point. Similarly, the state of VBATT_BB and VBATT_RF are indicated by a green LED and can be controlled by two test points.

Note: The green LED, D807, is always activated regardless of the connection of jumpers CN803 and CN804.

Table 6. Power Supply Pin Description

HL78xx Signal Name	HL78xx Pin Out	I/O	LED	Test Point / Jumper	Development Kit Signal Name
VBATT_APPLI	-	I	D803	TP800	DC_PWR
VBATT_BB	C63	I	D807	TP801	VBATT
VBATT_RF	C61, C62	I		TP802	VBATT_PA

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

Table 7. Power Supply Electrical Characteristics

Power Supply	Vmin.	Vnom.	Vmax.
VBATT_APPLI (V)	3.6	4	4.35
VBATT_BB (V)	3.2*	3.7	4.35
VBATT_RF (V) Full Specification	3.2*	3.7	4.35
VBATT_RF (V) Extended Range	2.8**	3.7	4.35

* This value must be guaranteed during the burst.

** No guarantee of 3GPP performances over extended range.

For more information, refer to the product technical specifications listed in section 6 Reference Documents.

3.1.2. Module Orientation Detection

The Development Kit includes a system for automatically detecting the module's orientation, as well as the absence of a module, inside the snap-in connector.

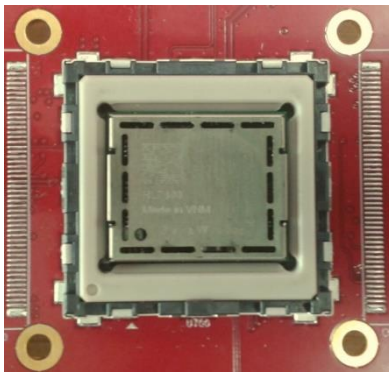


Figure 15. Module in Correct Orientation

Figure 16. FLASH_LED for Module in Correct Orientation

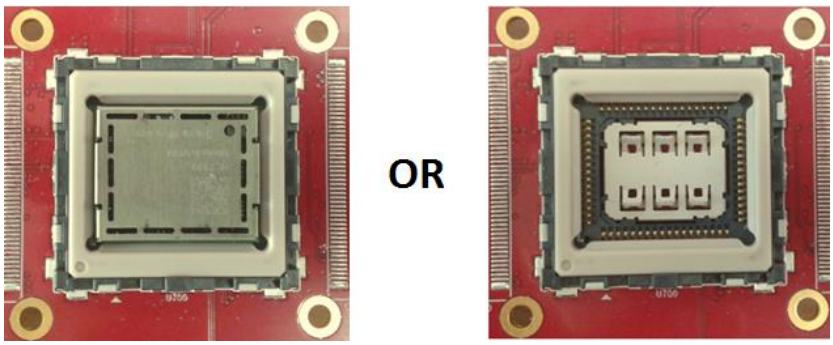


Figure 17. Module in Incorrect Orientation or No Module Present

Figure 18. FLASH_LED for Module in Incorrect Orientation or No Module Present

One red (flashing) LED is available to indicate the module's wrong orientation.

Table 8. Bad Configuration

HL78xx Signal Name	HL78xx Pin Out	I/O	Voltage Level	LED	Test Point / Jumper	Development Kit Signal Name
-	-	-	-	D806 (red)	-	BAD CONFIG

3.1.3. Internal Power Supply

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

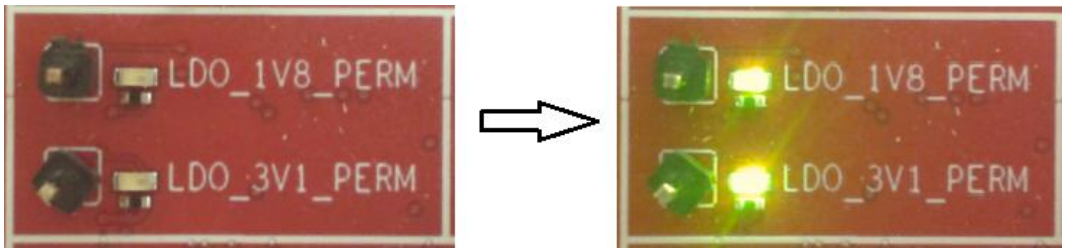


Figure 19. Internal Power Supply

Table 9. Internal Power Supply Description

HL78xx Signal Name	HL78xx Pin Out	I/O	Voltage Level	LEDs	Test Point / Jumper	Development Kit Signal Name
-	-	O	1V8 / 200mA	D201	TP205	LDO_1V8_PERM
-	-	O	3V1 / 300mA	D200	TP203	LDO_3V1_PERM

3.1.4. POWER_ON_N

The Development Kit includes a POWER_ON_N switch, SW203, to start the HL78xx module.

Once the Development Kit is connected to an external source, the HL78xx module will start monitoring the POWER_ON_N pin for a power on event.

The module may be enabled by switching SW203 to the “ON” position, and disabled by moving it to the “OFF” position.

A green LED, D1106, indicates the POWER_ON_N state. When this LED is lit, it indicates that the module is powered on.

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 document [1] AirPrime HL78xx Series AT Commands Interface Guide.

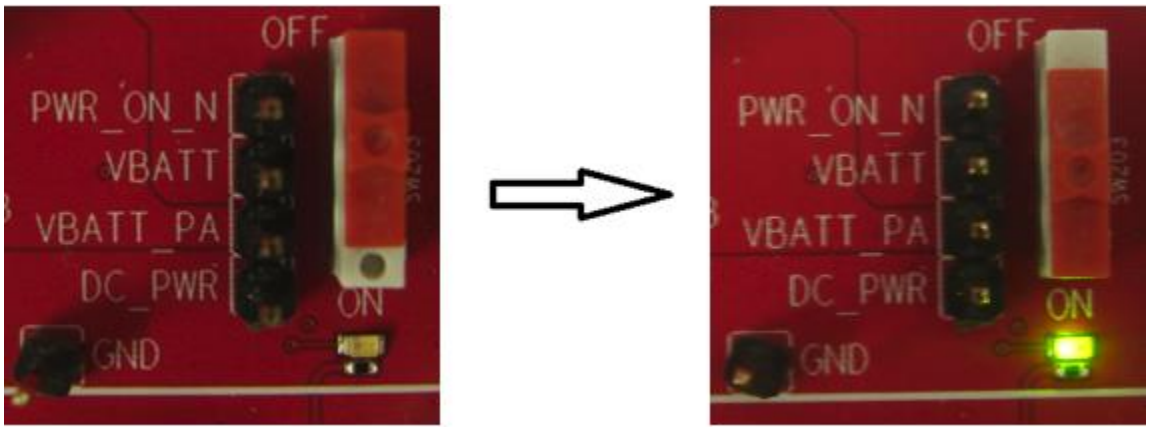


Figure 20. POWER_ON_N Pushbutton

Note: The HL78xx module will start regardless of whether switch SW203 is in the “ON” or “OFF” position.

Table 10. POWER_ON_N Pin Description

HL78xx Signal Name	HL78xx Pin Out	I/O	Voltage Level	LED	Test Point / Jumper	Development Kit Signal Name
POWER_ON_N	C59	I	1.8V	D1106	TP204	POWER_ON

3.2. Control Functions

3.2.1. FAST_SHUTDOWN

The Development Kit includes a FAST_SHUTDOWN pushbutton to quickly shut down the HL78xx module.

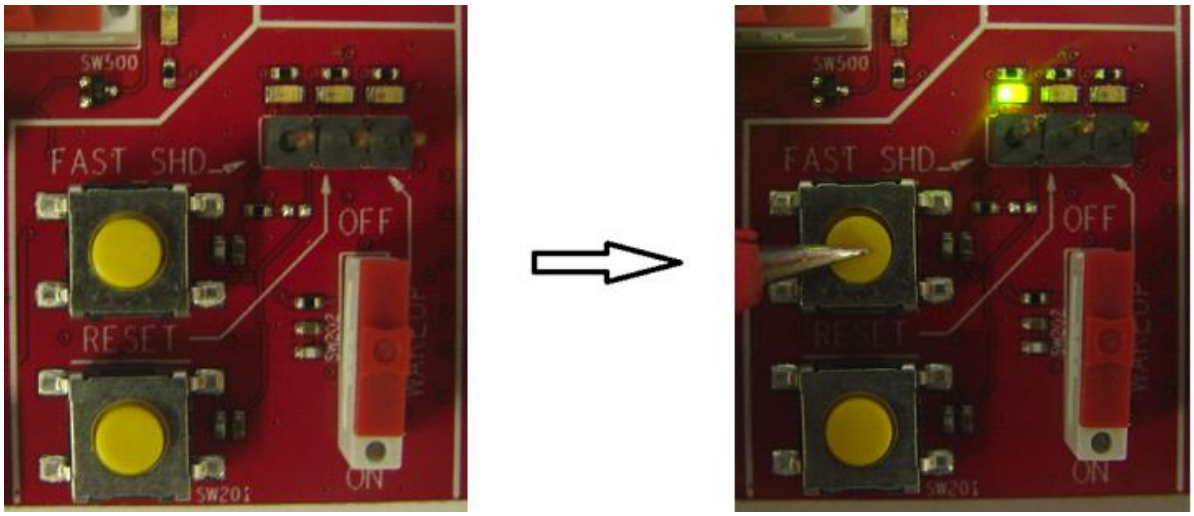


Figure 21. FAST_SHUTDOWN Pushbutton

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

Table 11. FAST_SHUTDOWN Pin Description

HL78xx Signal Name	HL78xx Pin Out	I/O	Voltage Level	LEDs	Test Point / Jumper	Development Kit Signal Name
FAST_SHUTDOWN	C65	I	1.8V	D1104	TP200	FAST_SHD

3.2.2. WAKE-UP

The Development Kit includes a WAKE-UP switch to wake the HL78xx module up.

The WAKE-UP pushbutton starts a wake when it is always activated.

The WAKE-UP pin is used to wake up the system from ultra-low power modes (from OFF mode, Sleep mode, FAST_SHUTDOWN, or after a software power off). This signal should be set to high level (external 1.8V) for at least a few milliseconds until the system is active to wake the module up from these modes.

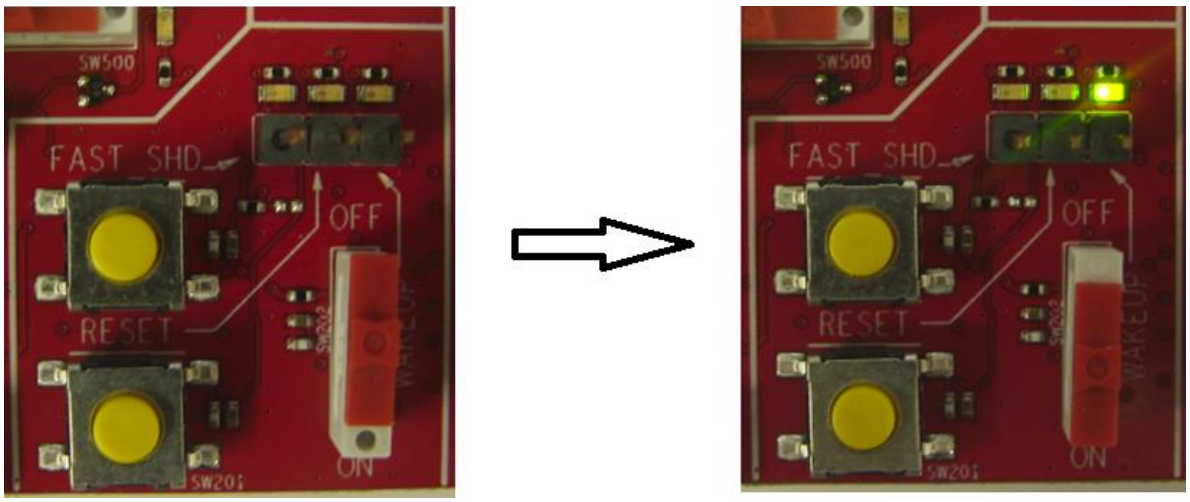


Figure 22. WAKE-UP Pushbutton

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

Table 12. WAKE-UP Pin Description

HL78xx Signal Name	HL78xx Pin Out	I/O	Voltage Level	LED	Test Point / Jumper	Development Kit Signal Name
WAKE-UP	C44	I	1.8V	D1112	TP202	WAKEUP

3.2.3. RESET_IN_N

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

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

Note: An operating system reset is preferred to a hardware reset.

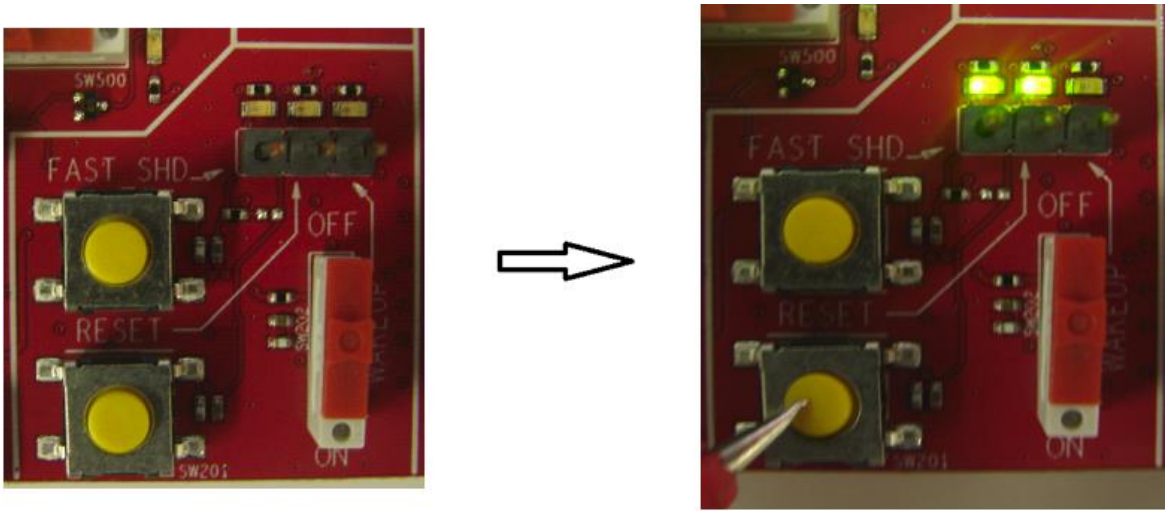


Figure 23. RESET_IN_N Pushbutton

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

Table 13. RESET_IN_N Pin Description

HL78xx Signal Name	HL78xx Pin Out	I/O	Voltage Level	LED	Test Point / Jumper	Development Kit Signal Name
RESET_IN_N	C11	I	1.8V	D1105	TP201	RESET

3.3. USB (Main)

The main USB connection on the Development Kit is available from CN401 and can be used to communicate with the HL78xx module directly via a PC.

CN401 is a receptacle USB Micro-AB connector.

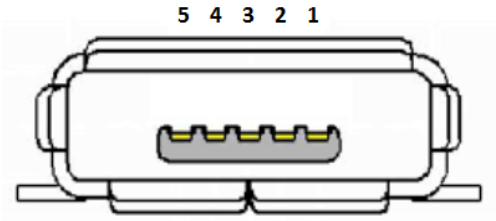


Figure 24. Micro-AB USB Connector

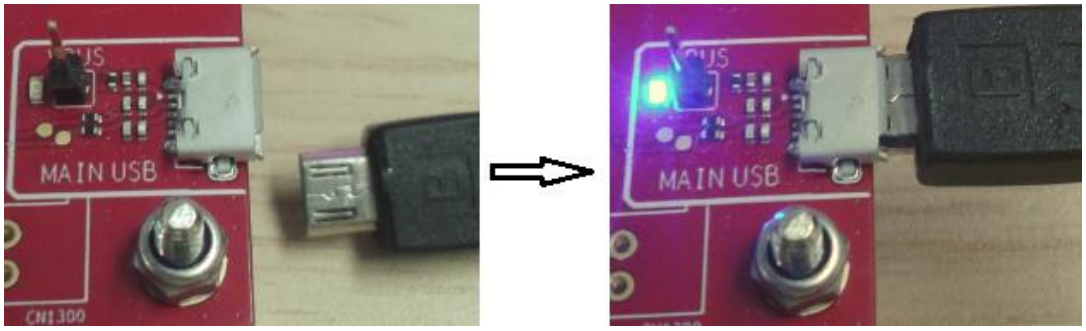


Figure 25. Main USB Interface

Table 14. 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 blue LED, D407, 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 15. Main USB Pin Description

HL78xx Signal Name	HL78xx Pin Out	I/O	Voltage Level	LED	Test Point / PCB Pad	Development Kit Signal Name
USB_VBUS	C16	I	5V	D407	TP400	VBUS
USB_DP	C13	I/O	3.3V	-	TP401 (pads)	-
USB_DN	C12	I/O	3.3V	-	TP402 (pads)	-

3.4. Audio

The headset jack available on the Development Kit, CN602, is a 4-pin RJ22 and allows the HL78xx module to connect to an audio interface.

An audio codec, W681360YG from WINBOND, 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.

An audio amplifier chipset is mounted on the Development Kit ; the audio amplifier interface can be disabled by switching SW600 to the "OFF" position and enabled by switching it to the "ON" position.

A green LED, D601, indicates the audio amplifier state. When this LED is lit, it indicates that the audio amplifier is activated.

Jumper solder pads F600 and F601 are used to enable or disable the audio amplifier speaker signals with headset jack RJ22, CN602. These two jumpers solder pads are soldered by default.

When the audio amplifier interface is switched ON, it is recommended to use audio jack, CN601, for microphone and for amplified earphone.

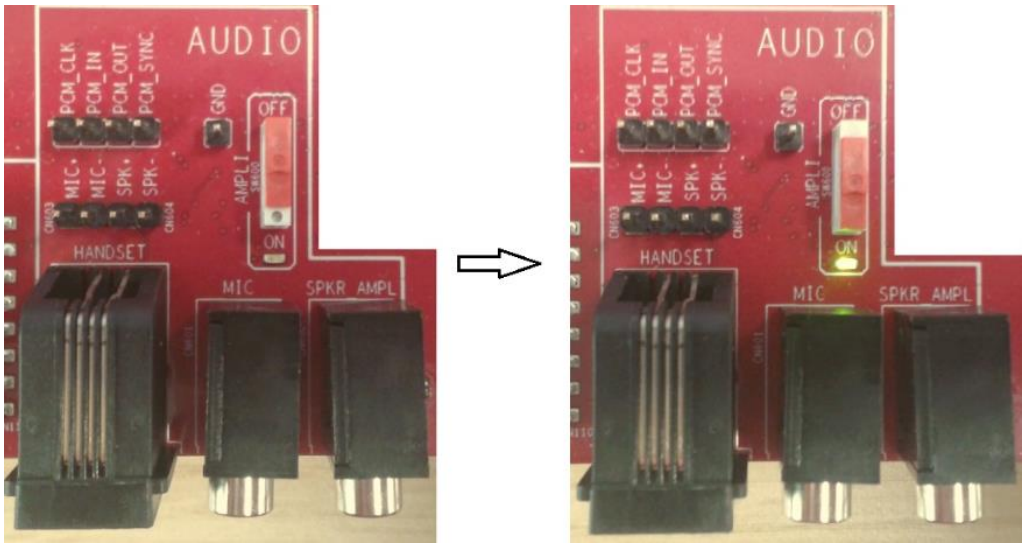


Figure 26. Audio Interface

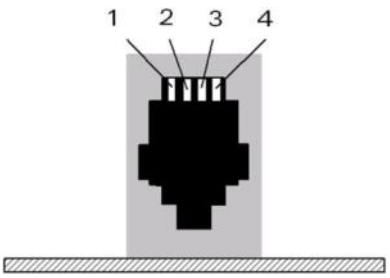


Figure 27. 4-pin RJ22 Handset Connector for Audio Signals

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

Table 16. Audio Handset Connector Pin Description

Pin #	Signal Name	I/O	I/O Type	Description	Handset Connector / Test Point	Development Kit Signal Name
1	MICRO+	I	Analog	Main microphone negative input	CN602-1 / CN603-2	MIC+
4	MICRO-	I	Analog	Main microphone positive input	CN602-4 / CN603-1	MIC-
3	SPEAKER+	O	Analog	Main speaker positive output	CN602-2 / CN604-2	SPK+
2	SPEAKER-	O	Analog	Main speaker negative output	CN602-3 / CN604-1	SPK-

Both microphone and speaker signals are configured in differential mode.

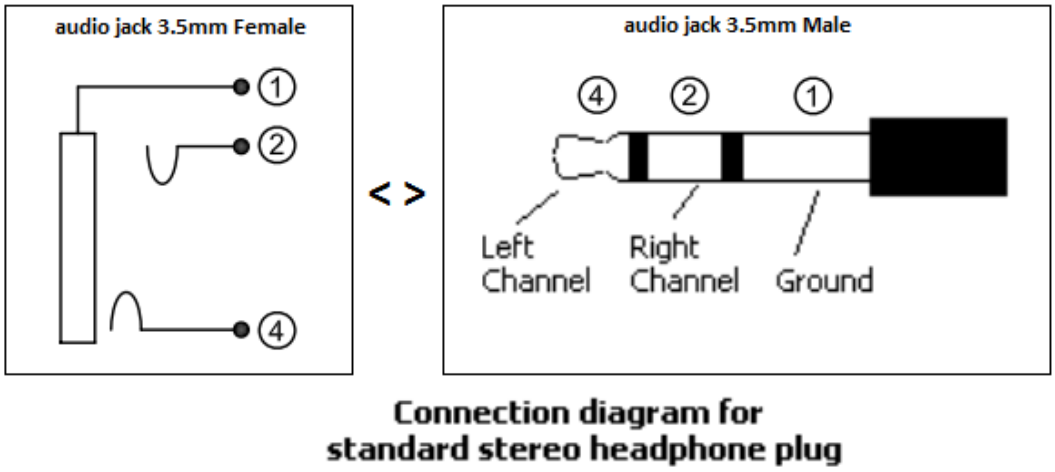


Figure 28. Audio Jack Connector for Audio Signals

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

Table 17. Microphone (CN601) Connector Pin Description

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

Table 18. Earphone (CN600) Connector Pin Description

Pin #	Signal Name	I/O	I/O Type	Description	Development Kit Signal Name
4	AMPL_SPK-	O	Analog	Amplifier speaker negative output	SPK_AMPL
2	AMPL_SPK+	O	Analog	Amplifier speaker positive output	SPK_AMPL
1	AMPL_SPK-	O	Analog	Amplifier speaker negative 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 HL78xx module.

Refer to the following table for the PCM pin description.

Table 19. PCM Pin Description

HL78xx Signal Name	HL78xx Pin Out	I/O	I/O Type	Voltage Level	LED	Test Point / Jumper	Development Kit Signal Name
PCM_CLK	C36	I/O	Digital	1.8V	-	TP600	PCM_CLK
PCM_IN	C34	I	Digital	1.8V	-	TP602	PCM_IN
PCM_OUT	C33	O	Digital	1.8V	-	TP603	PCM_OUT
PCM_SYNC	C35	I/O	Digital	1.8V	-	TP601	PCM_SYNC

3.5. UIM/SIM1

The Development Kit has one SIM connector, SIM1, CN301.

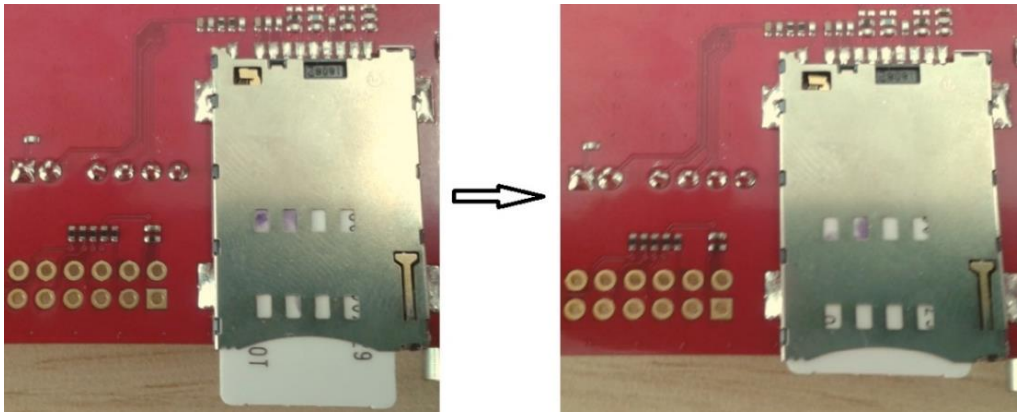


Figure 29. SIM1 Interface (bottom side)

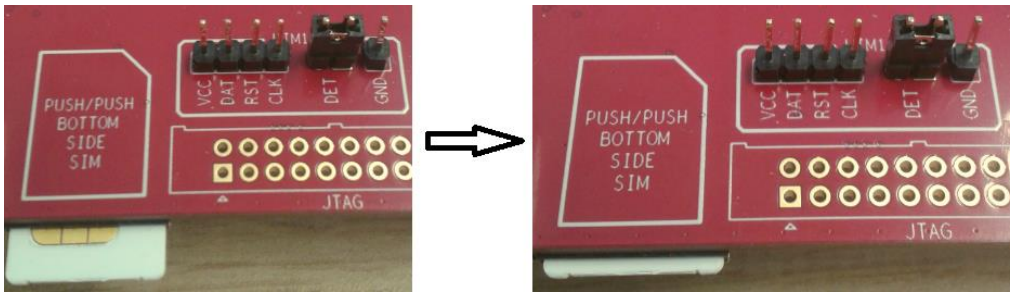


Figure 30. SIM1 Interface (top side)

Note: ESD protection is available on all SIM1 signals.

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

Table 20. SIM1 Connector Pin Description

Pin #	Signal Name	I/O	I/O Type	Description
1	UIM1_VCC	O	1V7 << 1V9	SIM Power Supply
2	UIM1_RESET	O	1V7 << 1V9	SIM Reset
3	UIM1_CLK	O	1V7 << 1V9	SIM Clock
4	CC4	Not used		
5	GND			Ground
6	VPP	Not used		
7	UIM1_DATA	I/O	1V7 << 1V9	SIM Data
8	CC8	Not used		
9	1V8_PERM	I	VIO*	VIO supply from the Development Kit
10	UIM1_DET/GPIO3	I	VIO*	SIM Card Detect
11, 12, 13, 14	GND			Ground casing

* 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 HL78xx 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 21. SIM1 Pin Description

HL78xx Signal Name	HL78xx Pin Out	I/O	Voltage Level	LED	Test Point / Jumper	Development Kit Signal Name
UIM1_VCC	C26	O	1.8V	-	TP301	UIM1_VCC
UIM1_DATA	C28	I/O	1.8V	-	TP300	UIM1_DATA
UIM1_RST	C29	O	1.8V	-	TP302	UIM1_RST
UIM1_CLK	C27	O	1.8V	-	TP303	UIM1_CLK
UIM1_DET/GPIO3	C64	I	1.8V	-	CN302, TP1213	UIM1_DET, GPIO03

3.6. UART1

3.6.1. RS232-UART1

The serial link connection, RS232-UART1, on the Development Kit is available from CN500, which is a SUB-D 9-pin female connector via three transceivers at voltage level 1.8V.

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

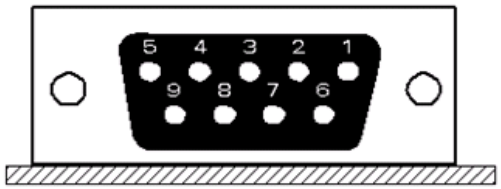


Figure 31. DB-9 Female Connector

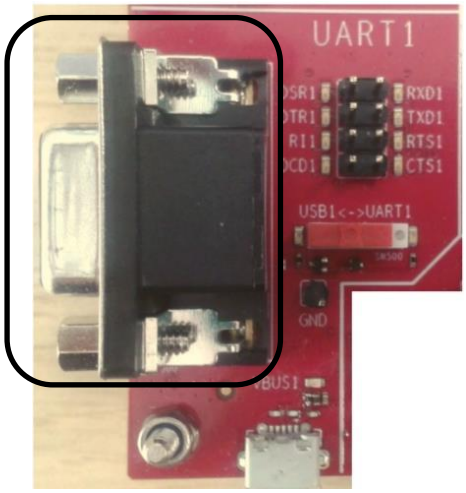


Figure 32. RS232-UART1 Interface

Table 22. RS232-UART1 Connector Pin Description

Pin #	Signal Name*	I/O	I/O Type	Description
1	RS232_DCD1	O	RS232 (V24/V28)	Data carrier detect
2	RS232_RX1	O	RS232 (V24/V28)	Receive serial data
3	RS232_TX1	I	RS232 (V24/V28)	Transmit serial data
4	RS232_DTR1	I	RS232 (V24/V28)	Data terminal ready
5	GND			Ground
6	RS232_DSR1	O	RS232 (V24/V28)	Data set ready
7	RS232_RTS1	I	RS232 (V24/V28)	Request to send
8	RS232_CTS1	O	RS232 (V24/V28)	Clear to send
9	RS232_RI1	O	RS232 (V24/V28)	Ring indicator

* Signal view from PC side.

3.6.2. 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 24 Micro-AB USB Connector for connector reference.

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

For detailed information about the USB-UART transceiver embedded on the Development Kit, refer to http://www.ftdichip.com/Products/ICs/FT231X.html.

A blue LED, D403, indicates the USB-UART1 state. When this LED is lit, it indicates that a USB cable is plugged into the receptacle and is available for use.

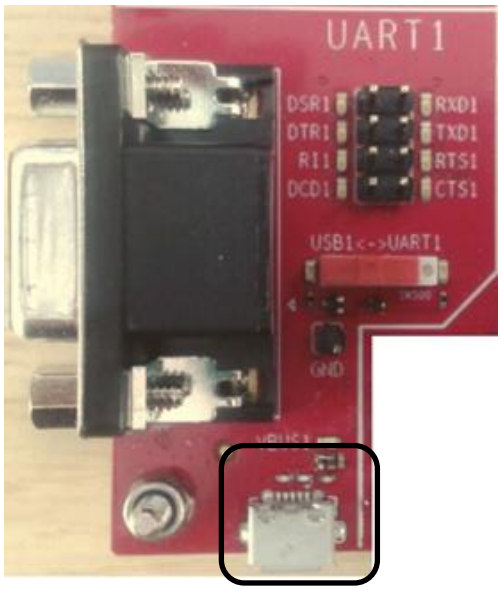


Figure 33. USB-UART1 Interface

Table 23. 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	USB OTG ID
5	GND			Ground

3.6.3. RS232-UART1 or USB-UART1

The RS232-UART1 interface can be enabled by switching SW500 to the “UART1” position.

A green LED, D502, indicates the RS232-UART1 state. When this LED is lit, it indicates that the RS232-UART1 interface is available for use.

Similarly, the USB-UART1 interface can be enabled by switching SW500 to the “USB1” position.

A green LED, D501, indicates the USB-UART1 state. When this LED is lit, it indicates that the USB-UART1 interface is available for use.

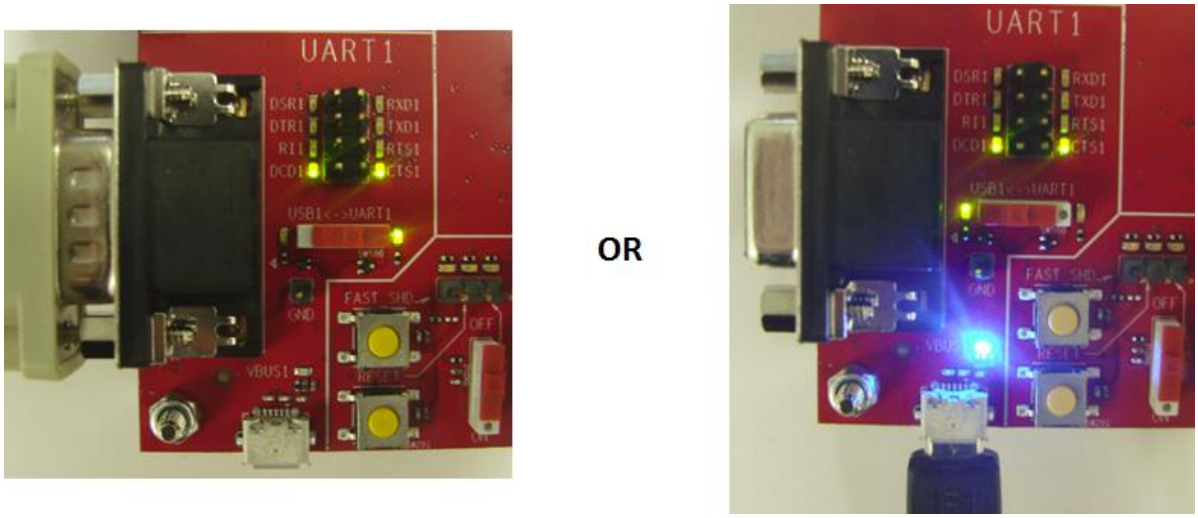


Figure 34. RS232-UART1 or USB-UART1 Switch Configuration

The state of UART1 is indicated by eight green LEDs and can be controlled by eight test points.

Table 24. UART1 Pin Description

HL78xx Signal Name*	HL78xx Pin Out	I/O	Voltage Level	LED	Test Point	Development Kit Signal Name
UART1_TX	C5	I	1.8V	D1011	TP500	TXD1
UART1_RX	C6	O	1.8V	D1012	TP502	RXD1
UART1_RTS	C3	I	1.8V	D1009	TP501	RTS1
UART1_CTS	C4	O	1.8V	D1010	TP503	CTS1
UART1_DSR	C9	O	1.8V	D1015	TP507	DSR1
UART1_DTR	C7	I	1.8V	D1013	TP505	DTR1
UART1_DCD	C8	O	1.8V	D1014	TP506	DCD1
UART1_RI	C2	O	1.8V	D1008	TP504	RI1

* Signal view from PC side.

3.7. UART0

3.7.1. RS232-UART0

The serial link, RS232-UART0, connection on the Development Kit is available from CN1400, which is a SUB-D 9-pin female connector via a transceiver at voltage level 1.8V. Refer to Figure 31 DB-9 Female Connector for connector reference.

This interface is used to communicate with the module's debug trace and download port interface via a PC.

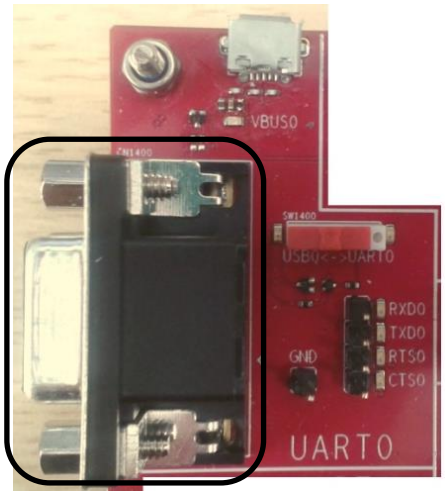


Figure 35. RS232-UART0 Interface

Table 25. RS232-UART0 Connector Pin Description

Pin #	Signal Name*	I/O	I/O Type	Description
1	Not used	-	-	-
2	RS232_RX0	O	RS232 (V24/V28)	Receive serial data
3	RS232_TX0	I	RS232 (V24/V28)	Transmit serial data
4	Not used	-	-	-
5	GND			Ground
6	Not used	-	-	-
7	RS232_RTS0	I	RS232 (V24/V28)	Request to send
8	RS232_CTS0	O	RS232 (V24/V28)	Clear to send
9	Not used	-	-	-

* Signal view from PC side.

3.7.2. USB-UART0

The USB-UART0 connection on the Development Kit is available from CN300, which is a receptacle USB Micro-AB connector via a USB-UART transceiver and voltage level translator at level 1.8V. Refer to Figure 24 Micro-AB USB Connector for connector reference.

This interface is used to communicate with the module's debug trace and download port interface via a PC.

For detailed information about the USB-UART transceiver embedded on the Development Kit, refer to http://www.ftdichip.com/Products/ICs/FT231X.html.

A blue LED, D303, indicates the USB-UART0 state. When this LED is lit, it indicates that a USB cable is plugged into the receptacle and is available for use.

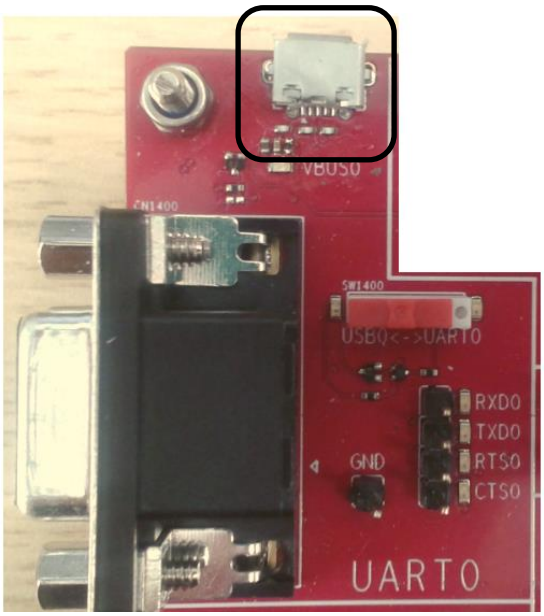


Figure 36. USB-UART0 Interface

Table 26. USB-UART0 Connector Pin Description

Pin #	Signal Name	I/O	I/O Type	Description
1	USB_UART0_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

3.7.3. RS232-UART0 or USB-UART0

The RS232-UART0 interface can be enabled by switching SW1400 to the “UART0” position.

A green LED, D1402, indicates the RS232-UART0 state. When this LED is lit, it indicates that the RS232-UART0 interface is available for use.

Similarly, the USB-UART0 interface can be enabled by switching SW1400 to the “USB0” position.

A green LED, D1401, indicates the USB-UART0 state. When this LED is lit, it indicates that the USB-UART0 interface is available for use.

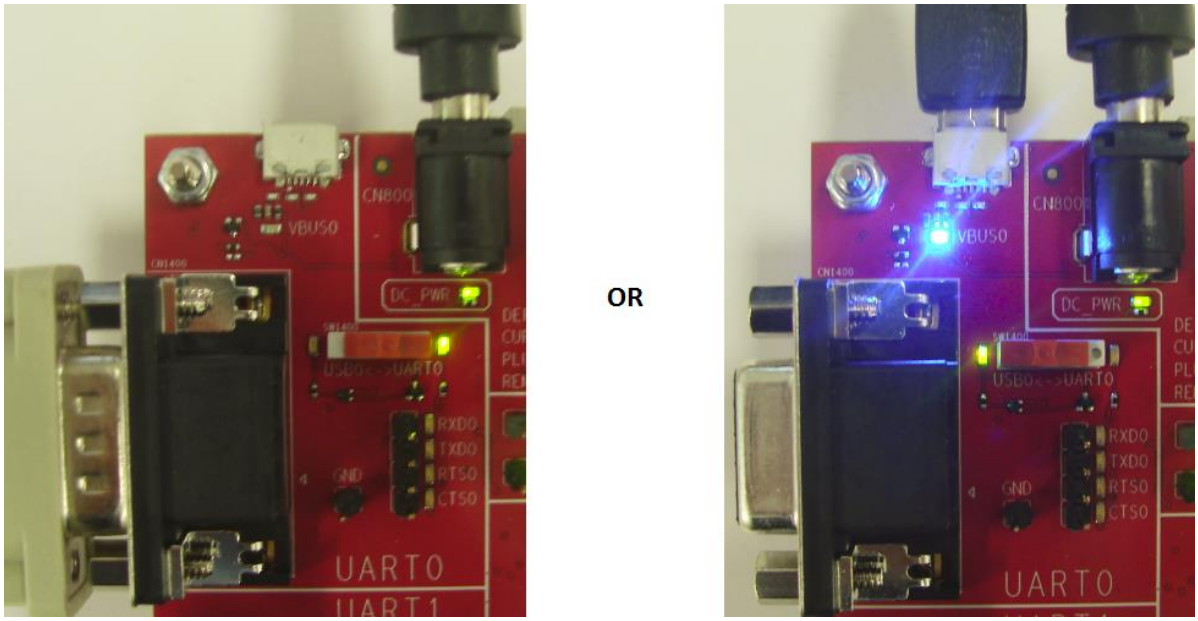


Figure 37. RS232-UART0 or USB-UART0 Switch Configuration

The state of UART0 is indicated by four green LEDs and can be controlled by four test points.

Table 27. UART0 Pin Description

HL78xx Signal Name*	HL78xx Pin Out	I/O	Voltage Level	LED	Test Point	Development Kit Signal Name
UART0_TX	C56	I	1.8V	D1101	TP1400	TXD0
UART0_RX	C55	O	1.8V	D1100	TP1402	RXD0
UART0_RTS	C58	I	1.8V	D1103	TP1401	RTS0
UART0_CTS	C57	O	1.8V	D1102	TP1403	CTS0

* Signal view from PC side.

3.8. GPIO

The Development Kit provides all GPIO signals from the HL78xx module.

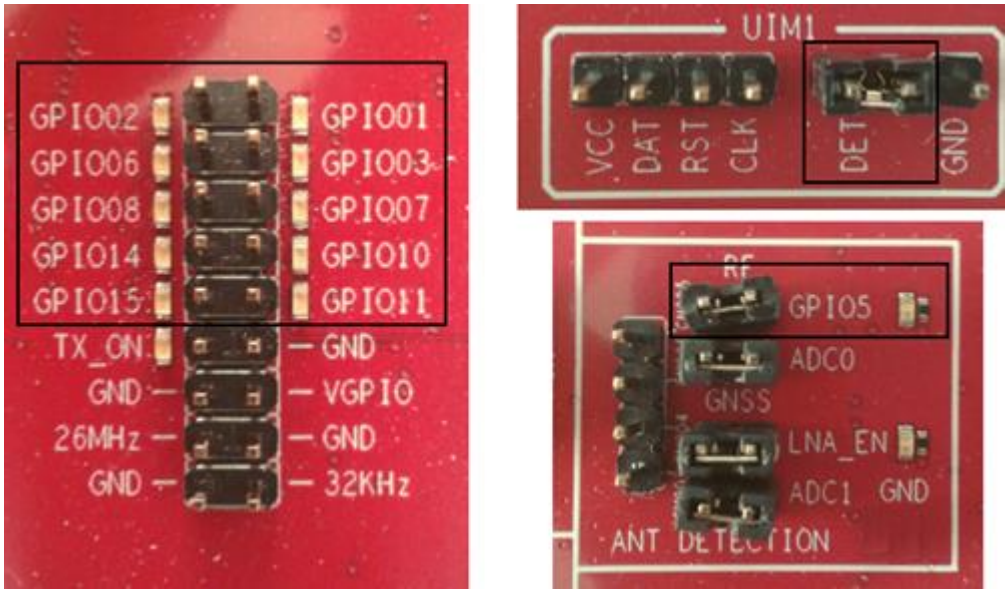


Figure 38. GPIO Signals

The state of GPIOs are indicated by eleven green LEDs and can be controlled by eleven test points.

Table 28. GPIO Pin Description

HL78xx Signal Name	HL78xx Pin Out	I/O	Voltage Level	LED	Test Point / Jumper	Development Kit Signal Name
GPIO1	C1	I/O	1.8V	D1000	TP1216	GPIO01
GPIO2	C10	I/O	1.8V	D1001	TP1215	GPIO02
GPIO3 / UIM1_DET	C64	I/O	1.8V	D1002	TP1213 / CN302	GPIO03 / UIM1_DET
GPIO5	C66	I/O	1.8V	D1003	TP1209 / CN905	GPIO05
GPIO6	C46	I/O	1.8V	D1004	TP1220	GPIO06
GPIO7	C40	I/O	1.8V	D1005	TP1218	GPIO07
GPIO8	C41	I/O	1.8V	D1006	TP1219	GPIO08
GPIO10	C52	I/O	1.8V	D1007	TP1222	GPIO10
GPIO11	C53	I/O	1.8V	D1107	TP1217	GPIO11
GPIO14	C51	I/O	1.8V	D1109	TP1223	GPIO14
GPIO15	C54	I/O	1.8V	D1108	TP1221	GPIO15

Note: Ensure that CN1100 is set to position “OUT” when testing GPIOs set as output signals.

3.8.1. GPIO Control Signals

Two switch sets, CN1100 and CN1101, are available on the Development Kit for GPIO test purposes.

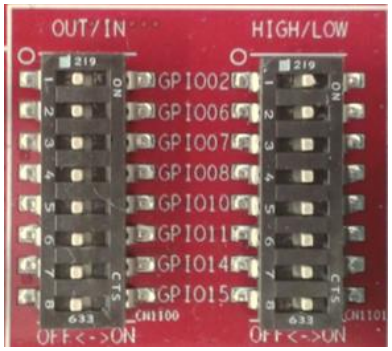


Figure 39. GPIOs Control Switches

CN1100 enables GPIOx (where x = 2, 6, 7, 8, 10, 11, 14 and 15), while CN1101 enables these GPIOs to be connected to 1V8_PERM either as 1kΩ pull-ups or 100Ω pull-lows.

GPIO settings can be set or reset using AT commands. For more information about AT commands, refer to document [1] AirPrime HL78xx Series AT Commands Interface Guide.

Table 29. GPIO Control Switch Configuration

GPIO Mode	CN1100 Position	CN1101 Position
Output	OUT	-
Input	IN	LOW
		HIGH

3.9. ADC

Two ADC signals are available on the Development Kit.

Figure 40. ADC Signals

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

Table 30. ADC Pin Description

HL78xx Signal Name	HL78xx Pin Out	I/O	Voltage Level*	LED	Test Point / Jumper	Development Kit Signal Name
ADC0	C25	O	1.8V	-	TP1212 / CN906	ADC0
ADC1	C24	O	1.8V	-	TP1213 / CN903	ADC1

* ADCx voltage = 0.0V to 1.8V.

3.10. EXT_GPS_LNA_EN

The Development Kit provides an EXT_GPS_LNA_EN signal from the HL78xx 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 41. EXT_GPS_LNA_EN Signal

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

Table 31. EXT_GPS_LNA_EN Pin Description

HL78xx Signal Name	HL78xx Pin Out	I/O	Voltage Level	LED	Test Point / Jumper	Development Kit Signal Name
EXT_GPS_LNA_EN	C43	O	1.8V	D1112	TP1206 / CN904	LNA_EN

3.11. 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 42. RF and GNSS Antenna Detection

Table 32. RF Antenna Detection Pin Description

HL78xx Signal Name	HL78xx Pin Out	I/O	Voltage Level	LED	Test Point	Development Kit Signal Name
ADC0	C25	O	1.8V	-	TP1212 / CN906	ADC0
GPIO5	C66	I/O	1.8V	D1003	TP1209 / CN905	GPIO05

Table 33. GNSS Antenna Detection Pin Description

HL78xx Signal Name	HL78xx Pin Out	I/O	Voltage Level	LED	Test Point	Development Kit Signal Name
ADC1	C24	O	1.8V	-	TP1213 / CN903	ADC1
EXT_GPS_LNA_EN	C43	O	1.8V	D1112	TP1206 / CN904	LNA_EN

3.12. Clock Out

Two clocks out signals are available on the Development Kit from the HL78xx module.

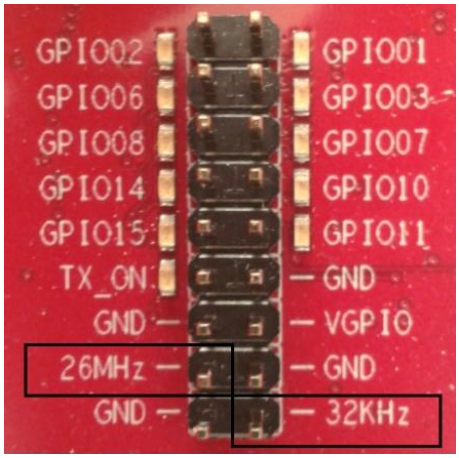


Figure 43. Clock Out Signals

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

Table 34. Clock Out Pin Description

HL78xx Signal Name	HL78xx Pin Out	I/O	Voltage Level	LED	Test Point / Jumper	Development Kit Signal Name
32K_CLKOUT*	C23	O	1.8V	-	TP1207	32KHZ
26M_CLKOUT**	C22	O	1.8V	-	TP1208	26MHZ

* 32K_CLKOUT = 32.768 Khz

** 26M_CLKOUT = 26 Mhz

3.13. TX-ON

The Development Kit provides a TX-ON signal from the HL78xx module. The TX-ON indication status signal depends on the module's transmitter state.

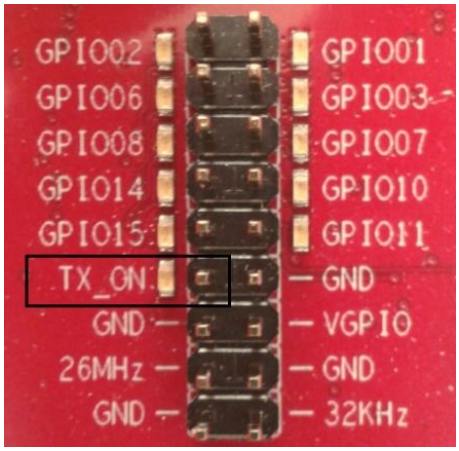


Figure 44. TX-ON Signal

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

Table 35. TX-ON Pin Description

HL78xx Signal Name	HL78xx Pin Out	I/O	Voltage Level	LED	Test Point / Jumper	Development Kit Signal Name
TX-ON	C60	O	1.8V	D1111	TP1210	TX-ON

3.14. VGPIO

One VGPIO power supply signal is available on the Development Kit from the HL78xx module.

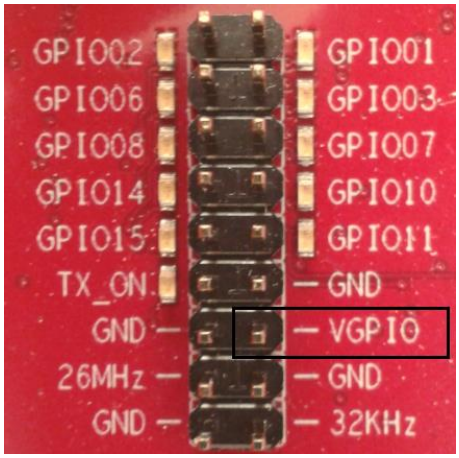


Figure 45. VGPIO Signal

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

Table 36. VGPIO Pin Description

HL78xx Signal Name	HL78xx Pin Out	I/O	Voltage Level	LED	Test Point / Jumper	Development Kit Signal Name
VGPIO	C45	O	1.8V	-	TP1214	VGPIO

3.15. RTC Backup Battery

The Development Kit provides an input signal, VBAT_RTC, for connecting a coin battery or external power supply, which is used as a backup power supply to preserve the date and time when VBATT is switched OFF (no VBATT).

The VBAT_RTC interface can be enabled by switching SW1300 to the “ON” position and shorting jumper CN1301. To disable this interface, switch SW1300 to the “OFF” position (jumper CN1301 can either be shorted or not).

A green LED, D1300, indicates the VBAT_RTC state if jumper solder pad F1300 is soldered. When this LED is lit, it indicates that a power supply is present on VBAT_RTC.

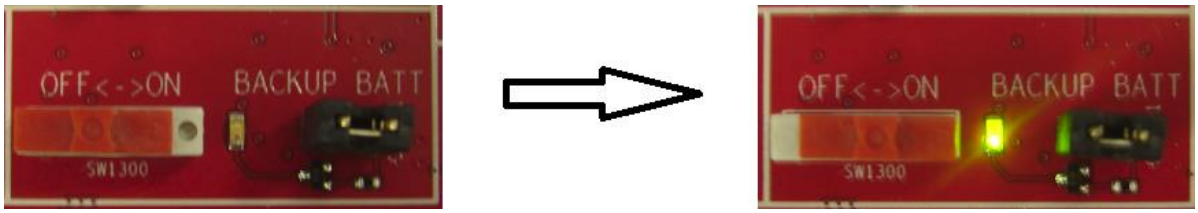


Figure 46. RTC Backup Battery

Table 37. VBAT_RTC Pin Description

HL78xx Signal Name	HL78xx Pin Out	I/O	Voltage Level	LED	Test Point / Jumper	Development Kit Signal Name
VBAT_RTC	C21	I	2.2V to 4.35V*	D1300	CN1301	BACKUP BATT

* Development Kit RTC backup batter voltage = 3.1 V.

3.16. RF and GNSS Antenna

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

- RF antenna via CN901
- GNSS antenna via CN900

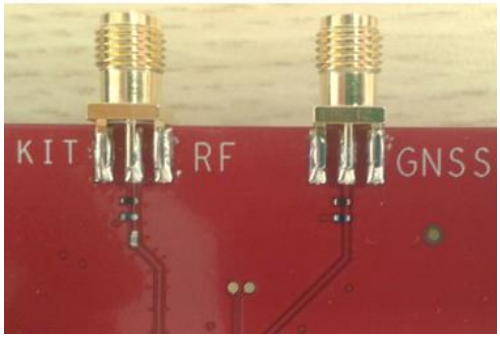


Figure 47. RF and GNSS Antenna Connectors

3.17. Diversity Antenna

An SMA connector is available on the Development Kit for RF diversity (DIV) antenna connection via CN902. This is not connected by default.

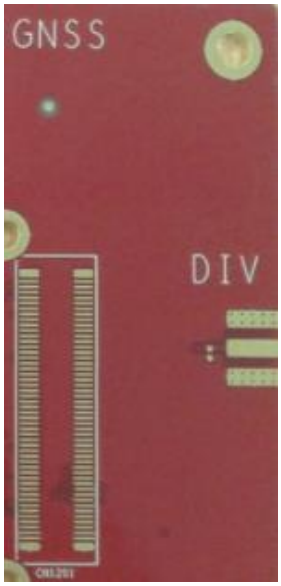


Figure 48. RF Diversity Antenna Connector

3.18. JTAG

A JTAG connector is available on the Development Kit via CN1300 for debug. This is not connected by default.

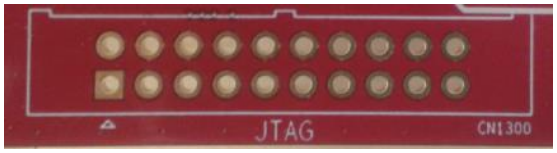


Figure 49. JTAG Connector

Warning: *This interface is not available for customer use.*

3.19. Board to Board Connector

Two 100 pts board to board connectors are available on the Development Kit for plugging in a socket-up board. These are not connected by default.

- 100 pts connectors via CN1200
- 100 pts connectors via CN1201

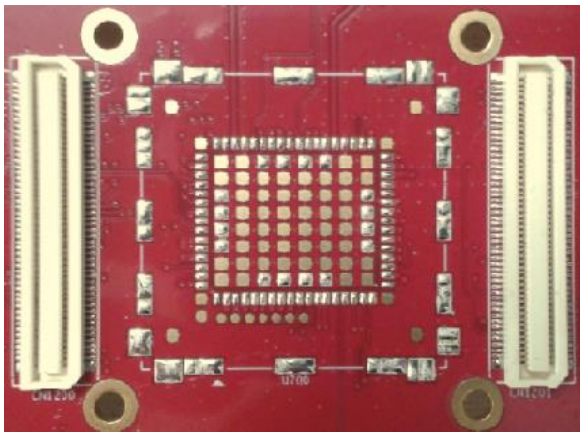


Figure 50. Board To Board Connectors

Warning: *This interface is not available for customer use.*

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

Perform the following steps before powering the Development Kit on:

1. Ensure that switches and connectors are configured accordingly. By default, the Development Kit board is configured from the factory before shipment.
2. Plug an HL78xx module to the snap-in connector with an interposer and attach the snap-in cover.
3. Insert a SIM or USIM card in the SIM slot, CN301, if communications are required.
4. Connect the HL78xx module to a PC using any of the following methods:
   - Connect the RS232 cable between the PC port and CN500 of the Development Kit for UART1 connection and switch SW500 to position “UART1”.
     By default, baud rate = 115.2Kbps, data bits = 8, parity = N, and stop bits = 1.
   - Connect the USB cable between the PC port and CN400 of the Development Kit for UART1 connection and switch SW500 to position “USB1”.
   - Connect the USB cable between the PC port and CN401 of the Development Kit for the main USB connection.
5. Connect an RF antenna to CN901 of the Development Kit.
6. Connect a GNSS antenna to CN900 of the Development Kit.
7. Connect a handset to CN602 for audio communication and switch SW600 to either “ON” or “OFF” depending on whether an audio amplifier is used, and F600 and F601 solder pads are soldered to enable the audio amplifier (not soldered by default).
8. Connect a 4V power DC jack to CN800 and check if jumpers are plugged on CN803 and CN804. Note that the Development Kit may be supplied with power depending on jumper configurations and power supplies CN800, CN801 and CN802. Refer to section 3.1.1 Power Supply for more information on supplying power to the Development Kit.

The Development Kit should look like either of the following figures after it has been properly set up.

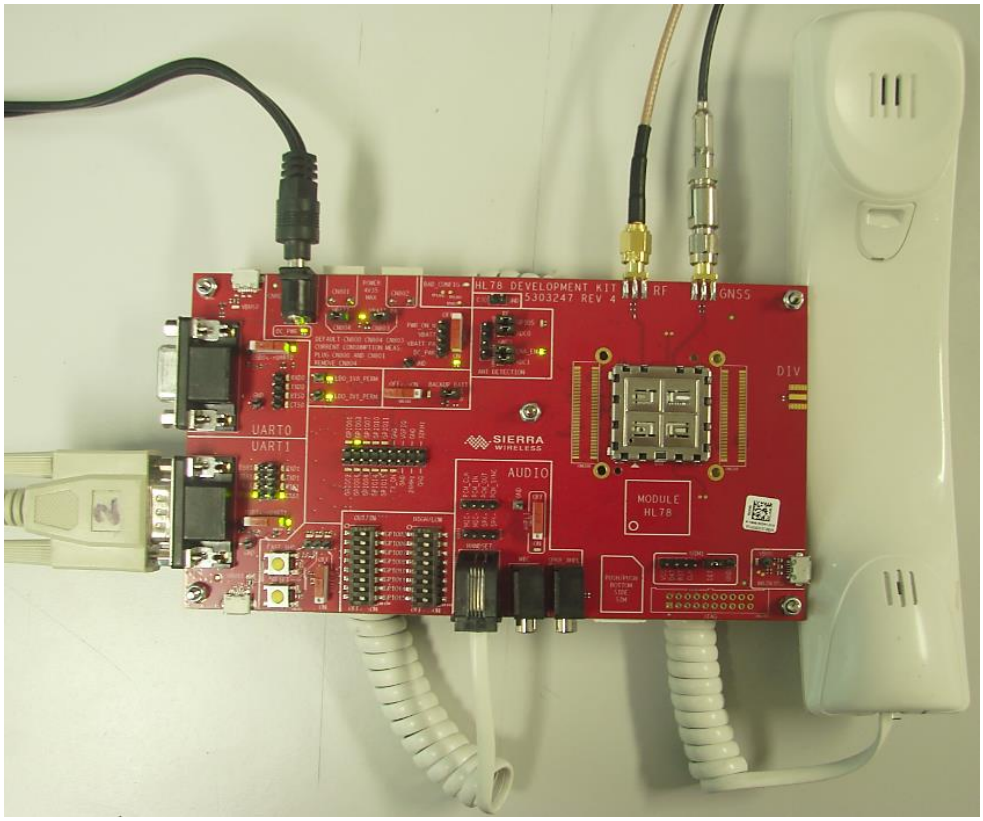


Figure 51. Fully Setup Development Kit with a UART Connection

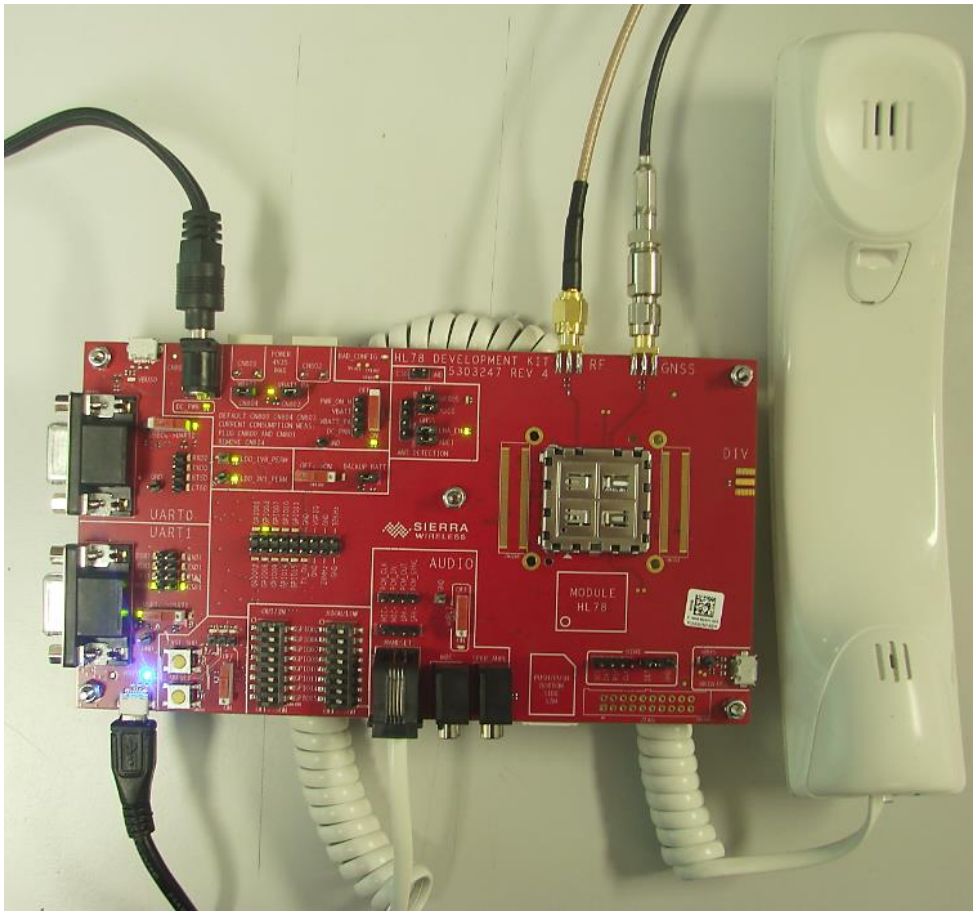


Figure 52. Fully Setup Development Kit with a USB Connection

4.2. RF Communications

4.2.1. Configure the COM Port

4.2.1.1. RS232 Serial Link

Configure the RS232 serial COM port settings by selecting the port which is connected to the Development Kit and specifying the following port settings.

- Bits per second: 115200
- Data bits: 8
- Parity: None
- Stop bits: 1
- Flow control: Hardware

4.2.1.2. USB Port

Note: The provided USB driver should be installed in the host computer when using this method to configure the COM port.

The HL78xx module is automatically detected when the USB cable from the Development Kit is connected to the PC.

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

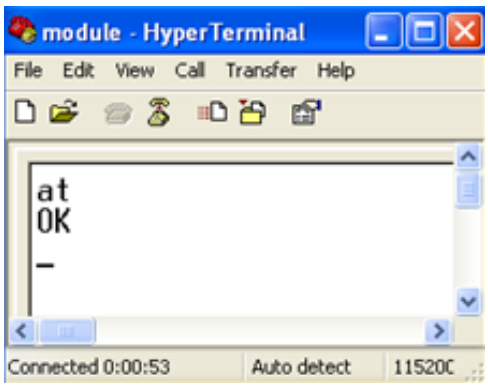
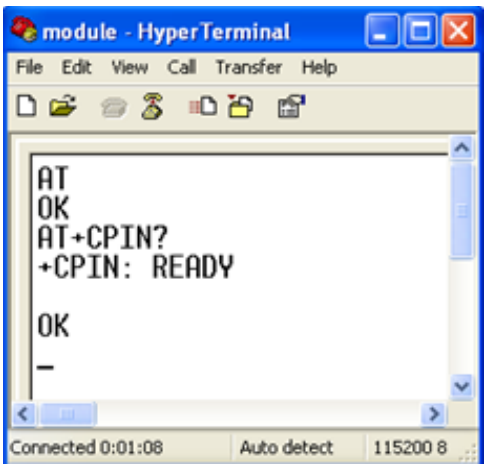


Figure 53. AT Communication with the HL78xx

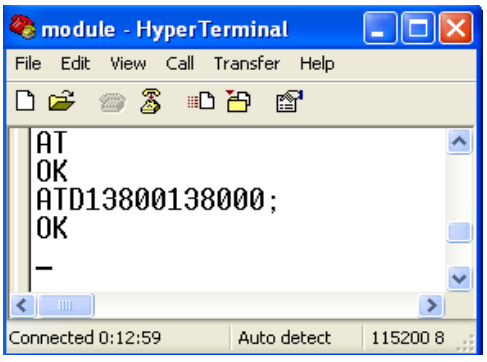
4.2.2. Make a Voice Call

Follow these steps to make a voice call:

1. Ensure that:
   - Cable power DC jack is connected to CN800.
   - CN803 and CN804 are connected with a jumper.
   - SW203 is switched to position “ON” to start the module.
   - COM port is connected by either UART1 or main USB:
     - If connecting via the UART1 serial port com, do either of the following:
       - Connect the UART RS232 cable to CN500 with SW500 in position “UART1”.
       - Connect the USB cable to CN400 with SW500 in position “USB1”.
     - If connecting via the main USB port com, connect the USB cable to CN401.
   - SIM card is inserted in SIM holder, CN301.
   - CN302 is connected with a jumper (if using SIM presence detection).
   - RF antenna is connected to CN901.
   - A handset is connected to CN602.
   - SW600 is switched to either “ON” or “OFF” depending on whether an audio amplifier is used.
   - F600 and F601 solder pads are soldered to enable the audio amplifier (these are soldered by default).
2. 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:

- Cable power DC jack is connected to CN800.
- CN803 and CN804 are connected with a jumper.
- SW203 is switched to position “ON” to start the module.
- COM port is connected by either UART1 or main USB:
  - If connecting via the UART1 serial port com, do either of the following:
    - Connect the UART RS232 cable to CN500 with SW500 in position “UART1”.
    - Connect the USB cable to CN400 with SW500 in position “USB1”.
  - If connecting via the main USB port com, connect the USB cable to CN401.
- GNSS antenna is connected to CN900.
- Jumper CN904 is shorted if using GNSS antenna bias circuit (for active antenna), or jumper CN904 is not shorted if using GNSS antenna (for passive antenna).

4.4. Low Power Consumption Measurement

Put the HL78xx module inside the snap-in connector in the correct position; refer to section 3.1.2 Module Orientation Detection for details.

To get low power consumption measurement in the HL78xx, ensure that the settings and configurations specified in section 3.1.1 Power Supply and Figure 11, Figure 12, Figure 13, and Figure 14 are followed, or refer to the following sub-sections for different measurement details.

4.4.1. Global Current Consumption

Setup the Development Kit as follows to measure the global current consumption of the HL78xx module (baseband + radio frequency) and Development Kit (normal use):

1. Plug power supply VBATT_APPLI on CN800.
2. Plug jumper CN804.
3. Plug jumper CN803.

4.4.2. Isolated Development Kit and Module Power Supply

Follow these steps to only measure the consumption of the HL78xx module (baseband + radio frequency) separately from the consumption of the Development Kit:

1. Plug power supply VBATT_APPLI on CN800.
2. Plug power supply VBATT_BB on CN801 (VBATT_RF on CN802 = NC); or plug power supply VBATT_RF on CN802 (VBATT_BB on CN801 = NC).
3. Unplug jumper CN804.
4. Plug jumper CN803.

4.4.3. All Power Supplies are Isolated

Follow these steps to isolate the consumption of the Development Kit, and to measure the module's baseband consumption and radio frequency consumption separately:

1. Plug power supply VBATT_APPLI on CN800.
2. Plug power supply VBATT_BB on CN801.
3. Plug power supply VBATT_RF on CN802.
4. Unplug jumper CN804.
5. Unplug jumper CN803.

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

Other interface signals protected on the module are:

- RS232-UART1 signals with the MAX13235 transceiver
- RS232-UART2 signals with the MAX13235 transceiver

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.*

6. Reference Documents

[1] AirPrime HL78xx Series AT Commands Interface Guide
Reference Number: 41111821

[2] AirPrime HL7800 and HL7800-M Product Technical Specification
Reference Number: 41111094

[3] AirPrime HL7802 Product Technical Specification
Reference Number: TBD