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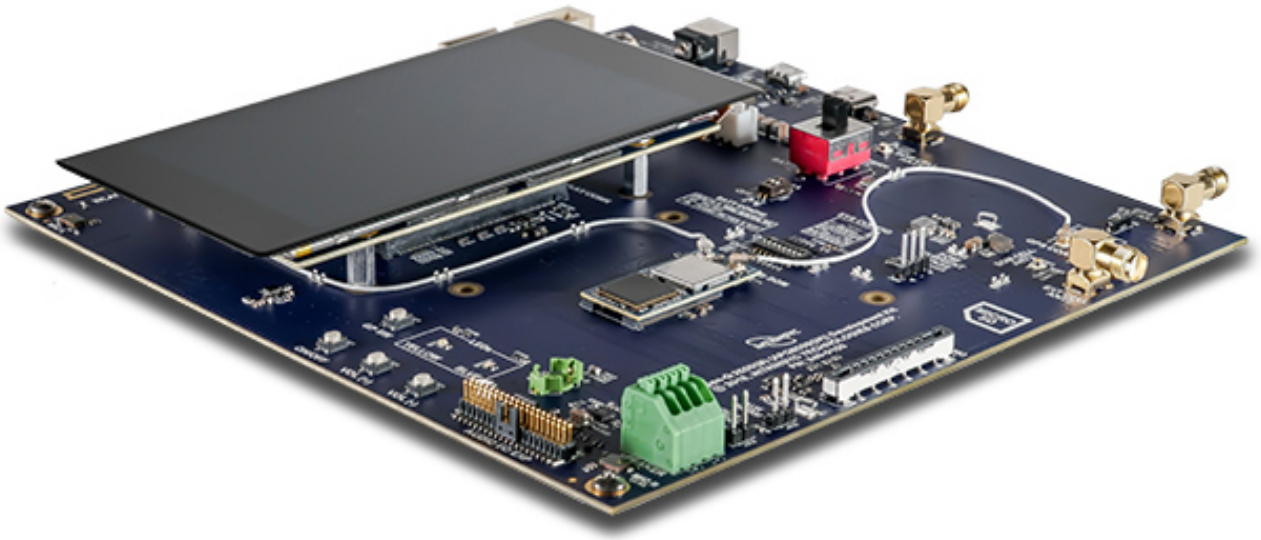

Open-Q™ 2500 Development Kit User Guide

Part Number PMD-00073

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Revision History

Date	Rev.	Comments
December 2018	1.0	Initial release. Intrinsyc document number: ITC-01IMP1366-UG-001
February 2019	1.1	Battery, Sensor, and GPS updates
August 2020	A	Initial Lantronix document. Added Lantronix document part number, Lantronix logo, branding, contact information, and links.

For the latest revision of this product document, please go to: http://tech.intrinsyc.com.

Contents

List of Figures

List of Tables

1 Introduction

1.1 Purpose

The purpose of this user guide is to provide primary technical information on the Open-Q™ 2500 Development Kit.

For more background information on this development kit, visit: https://www.lantronix.com/products/open-q-2500-development-kit/

1.2 Scope

This document will cover the following items on the Open-Q 2500:

- Block Diagram and Overview
- Hardware Features
- Configuration
- SOM
- Carrier Board
- Available peripherals

1.3 Intended Audience

This document is intended for users who would like to develop custom applications on the Lantronix Open-Q 2500 Development Kit.

2 Documents

This section lists the supplementary documents for the Open-Q 2500 development kit.

2.1 Applicable Documents

Reference	Title
A-1	Intrinsyc Purchase and Software License Agreement for the Open-Q Development Kit

2.2 Reference Documents

The below listed documents are available on the Lantronix Support Site (registration required).

https://www.lantronix.com/products/open-q-2500-development-kit/

Reference	Title
R-1	Open-Q 2500 SOM – HW Device Specification
R-2	Open-Q 2500 SOM – Carrier Board Design Guide – Tech Note 52
R-3	Open-Q 2500 Schematics (SOM and Carrier)
R-4	Open-Q 2500 Development Kit – Display Adapter Design Guide – Tech note 53
R-5	Open-Q 2500 Development Kit – Camera Adapter Design Guide – Tech note 55
R-6	Open-Q 2500 SOM Development Kit – Tech Note 54: Battery Charging

2.3 Terms and Acronyms

Term and acronyms	Definition
AMIC	Analog Microphone
ANC	Audio Noise Cancellation
B2B	Board to Board
BLSP	Bus access manager Low Speed Peripheral (Serial interfaces like UART / SPI / I2C/ UIM)
BT LE	Bluetooth Low Energy
CSI	Camera Serial Interface
DSI	MIPI Display Serial Interface

Term and acronyms	Definition
EEPROM	Electrically Erasable Programmable Read only memory
eMMC	Embedded Multimedia Card
FCC	US Federal Communications Commission
FWVGA	Full Wide Video Graphics Array
GPS	Global Positioning system
HDMI	High Definition Media Interface
HSIC	High Speed Inter Connect Bus
JTAG	Joint Test Action Group
LNA	Low Noise Amplifier
MIPI	Mobile Industry processor interface
MPP	Multi-Purpose Pin
NFC	Near Field Communication
RF	Radio Frequency
SATA	Serial ATA
SLIMBUS	Serial Low-power Inter-chip Media Bus
SOM	System on Module
SPMI	System Power Management Interface (Qualcomm PMIC / baseband proprietary protocol)
SSBI	Single wire serial bus interface (Qualcomm proprietary mostly PMIC / Companion chip and baseband processor protocol)
UART	Universal Asynchronous Receiver Transmitter
UFS	Universal Flash Storage
UIM	User Identity module
USB	Universal Serial Bus
USB HS	USB High Speed

Term and acronyms	Definition
USB SS	USB Super Speed

3 Open-Q 2500 Development KIT

3.1 Introduction

The Open-Q 2500 provides a quick reference and evaluation platform for the Qualcomm Wear 2500 Platform. The development kit is suited for Android / Linux application developers, OEMs, consumer manufacturers, hardware component vendors, camera vendors, and wearable product designers to evaluate, optimize, test and deploy applications that can utilize the Qualcomm Wear 2500 Platform technology.

3.2 Development Platform Notice

This development platform contains RF/digital hardware and software intended for engineering development, engineering evaluation, or demonstration purposes only and is meant for use in a controlled environment. This device is not being placed on the market, leased or sold for use in a residential environment or for use by the general public as an end user device.

This development platform is not intended to meet the requirements of a commercially available consumer device including those requirements specified in the European Union directives applicable for Radio devices being placed on the market, FCC equipment authorization rules or other regulations pertaining to consumer devices being placed on the market for use by the general public.

This development platform may only be used in a controlled user environment where operators have obtained the necessary regulatory approvals for experimentation using a radio device and have appropriate technical training. The device may not be used by members of the general population or other individuals that have not been instructed on methods for conducting controlled experiments and taking necessary precautions for preventing harmful interference and minimizing RF exposure risks. Additional RF exposure information can be found on the FCC website at

http://www.fcc.gov/oet/rfsafety/

3.3 Anti-Static Handling Procedures

The Open-Q 2500 Development Kit has exposed electronics and chipsets. Proper anti-static precautions should be employed when handling the kit, including but not limited to:

- Using a grounded anti-static mat
- Using a grounded wrist or foot strap.

3.4 Development Kit Contents

The Open-Q 2500 Development Kit comes with Android software pre-programmed and includes the following:

- Open-Q 2500 SOM with the Qualcomm APQ8009W processor
- Mini-ITX form-factor carrier board
- AC power adapter

3.4.1 Important Locations

See the diagram below for the locations of key components, interfaces, and controls.

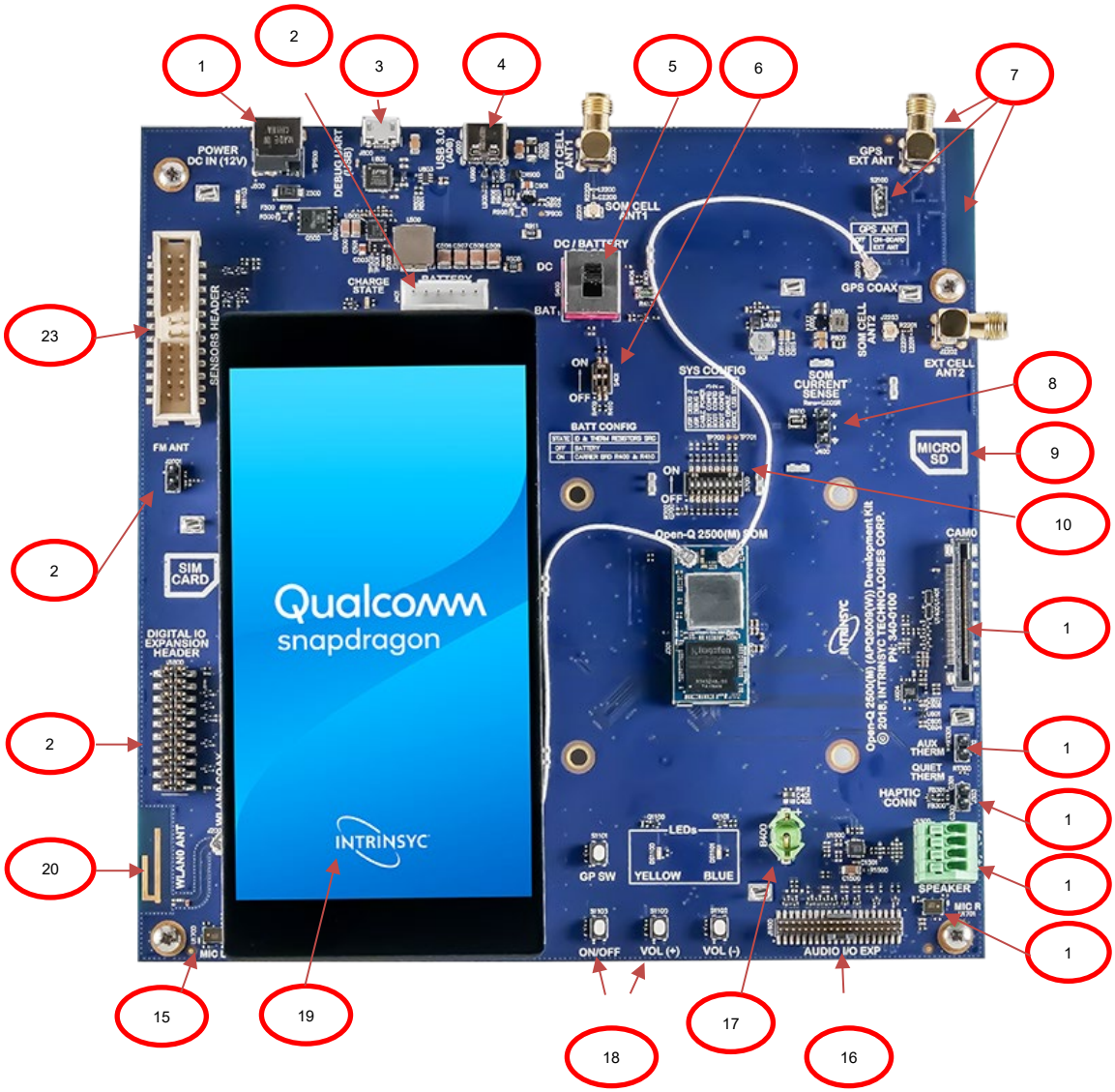


Figure 1 - Assembled Open-Q 2500 Development Kit

List of Features itemized in the figure above:

1. DC Power supply connecter
2. Battery input header
3. USB serial debug console

4. USB Type-C connector for ADB
5. DC / Battery Power input selection switch
6. Battery configuration DIP switch
7. GPS antenna connection options and DIP switch
8. SOM Current Sense Header
9. Micro SD card connector
10. System Configuration DIP Switch
11. Camera connector
12. Auxiliary Thermistor Header
13. Haptic Header
14. Speaker Output Connector
15. On-board Microphones (bottom left and right corners of Carrier board)
16. Audio IO header
17. Coin cell battery holder
18. Buttons and LEDs including the power on/off switch
19. On board Display
20. On board WLAN antenna
21. Digital IO header
22. FM antenna header
23. Sensor header

3.4.2 Block Diagram

The block diagram below shows the connectivity and major components of the Open-Q 2500 Development Kit.

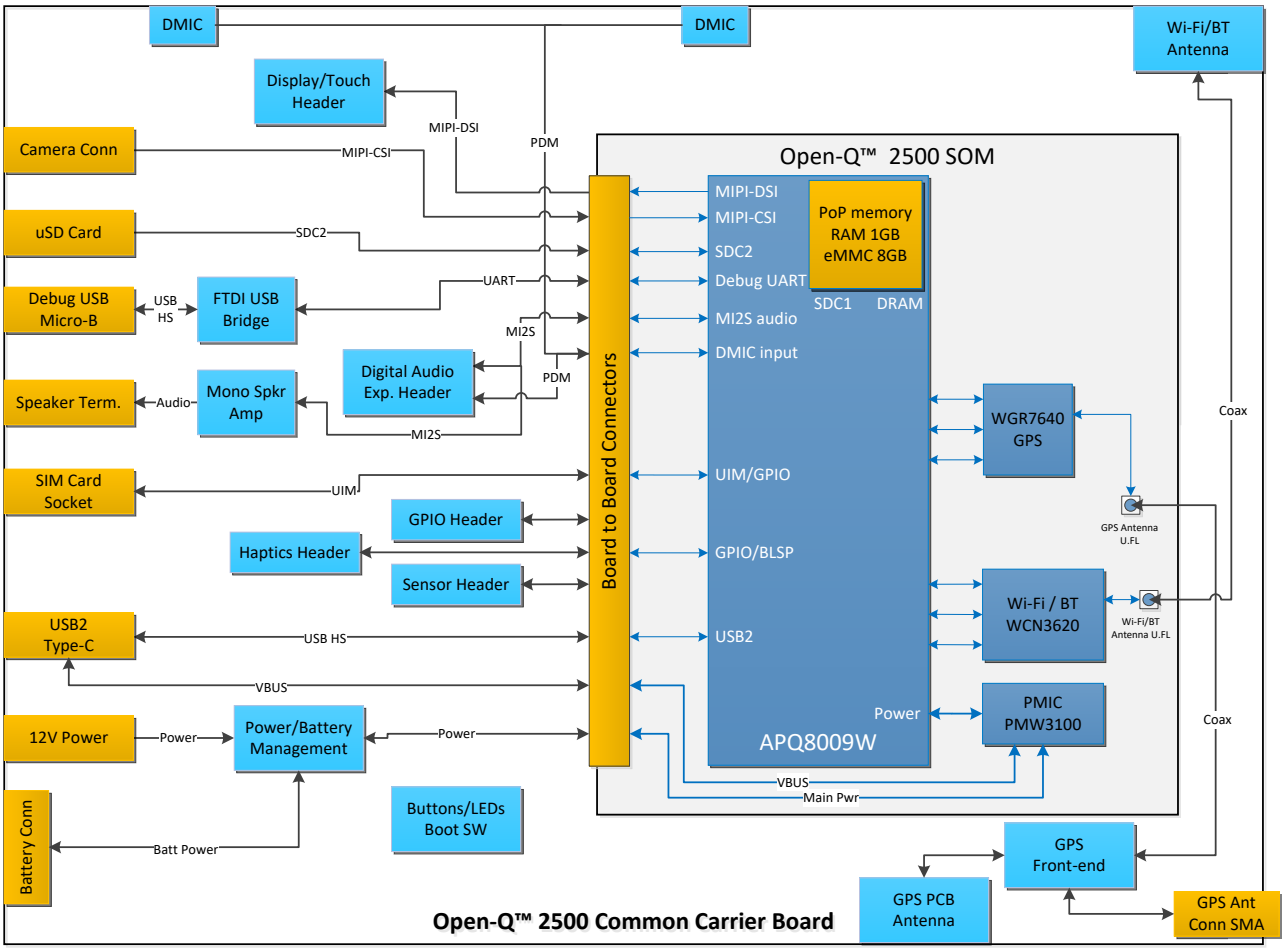


Figure 2 - Open-Q 2500 Block Diagram

3.4.3 Optional Accessories

Optional accessories are available for the Open-Q 2500 development kit, like LCD Panel, Camera adapter, and sensor board. Please visit the Lantronix product store for availability of these accessories: http://shop.intrinsyc.com, or contact sales@lantronix.com.

3.5 Getting Started

This section explains how to setup the Open-Q 2500 Development Kit and start using it.

3.5.1 Registration

To register the development kit and gain access to the Lantronix support site, please visit: https://tech.intrinsyc.com/account/register.

To proceed with registration, the development kit serial number is required. These serial numbers can be found on the labels that are present on the SOM and carrier boards. The labels contain the following information:

- SOM: Serial Number, WIFI MAC address
- Carrier: Serial Number

Note: Please retain the SOM and carrier board serial numbers for warranty purposes.

Refer to http://tech.intrinsyc.com/projects/serialnumber/wiki for more details about locating the development kit serial number.

3.5.2 Configuration Switch Settings

The default configuration for the system configuration DIP switch S700 is for all switches to be open or OFF. For details about other configurations, see section 3.7.2.

3.5.3 Powering Up the Development Kit

The development kit can be powered up by either using a DC power supply or by connecting a battery on the connector J401. Select the desired power source using the switch S400 on the carrier board. The green LED on the board is the power LED and should glow once the development kit is powered. To see the debug logs, connect a serial debug cable on the J800 connector.

To power-up the board, perform the following exact steps below detailed below:

1. At a static-safe workstation, remove the development kit board carefully from the anti-static bag.
2. Connect the Power Adapter to the 12V DC Jack and then press and hold the power button until you see the Lantronix logo appear on the on-board display (~3 seconds).
3. Navigate using the touchscreen on the on-board display.

3.6 Open-Q 2500 SOM

The Open-Q 2500 SOM contains the core Wear 2500 architecture. Measuring in at 31.5mm x 15mm, the SOM is where all the processing occurs. It is connected to the carrier board via two 100 pin Hirose DF40 connectors which allows essential power rails and signals to be exposed for supporting other peripherals and interfaces on the platform.

For detailed information about the Open-Q 2500 SOM, see the device specification noted as reference document R-1.

3.7 Open-Q 2500 Carrier Board

The Open-Q 2500 Carrier board is a Mini-ITX form factor board with various connectors used for connecting different peripherals. The table and sections below provide in depth information on the carrier board properties, user interfaces, connectors, and expansion headers found on the carrier board. This information is important for users wishing to connect other external hardware devices to the Open-Q 2500 development kit. Users must ensure that before connecting any hardware device to the development kit, that it is compatible with the Open-Q 2500 hardware specifications.

Table 1 - Carrier Board Properties

Item	Description	Specification	Usage
Form Factor	Dimensions: 170mm x 170mm	Mini-ITX Form Factor	
SOM Interface	2 x 100-pin Hirose DF40 connectors	SOM power and signal IO connection to carrier board.	The Open-Q 2500 SOM connects to the carrier board through this interface.
Power	AC / Barrel charger	12 V DC Power Supply	Power Supply
Power	Battery connector for single cell lithium battery		Input power option
Debug Serial via USB	Debug Serial UART console over USB for development	USB Micro B connector	Development Serial Connector for debug output via USB
Buttons	General Purpose SW button	SMD Button	Additional button for general purpose
	Power Button	SMD Button	Power Button for Suspend / Resume and Power off
Volume Keys	Volume + key	SMD Button	Volume +Key
	Volume – key	SMD Button	Volume – Key
Sensor Connector	24 pin Sensor Expansion Connector		Available via Lantronix optional accessories kit
Digital IO Expansion Header	Exposes general purpose IO for user development		
Micro SD (on bottom)	Micro SD card	4bit Micro SD card support	External Storage
Dual on-board Digital Microphones	DMIC interface available on audio IO expansion with modifications to carrier board		
Speaker output connector			For speaker connection
USB Type C		Micro type C connector	For USB debugging and client / host mode

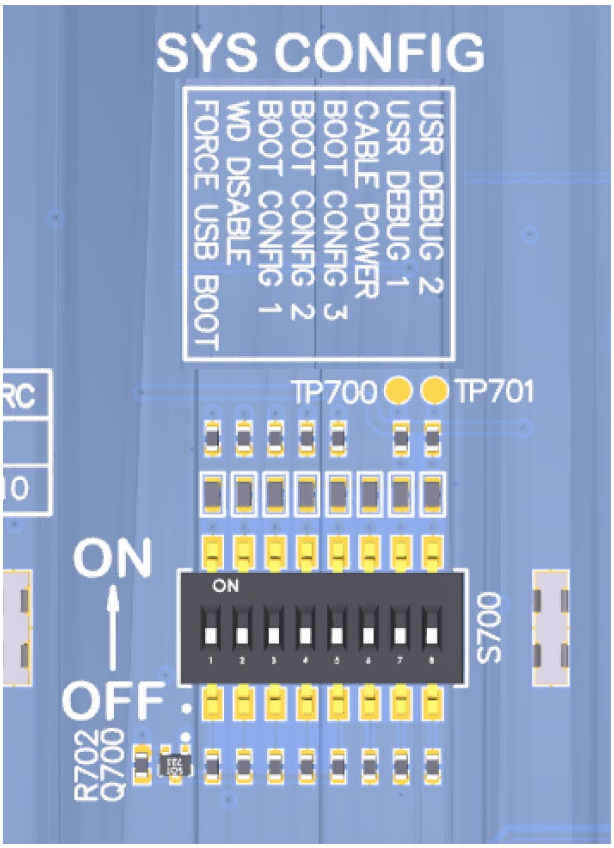
Item	Description	Specification	Usage
WLAN Antenna	PCB Antenna		Coax connection to SOM WiFi module
GPS Antenna options	PCB Antenna or SMA connector for external antenna		Coax connection to SOM GPS module
Coin Cell Holder	Coin Cell battery holder provided	for PMIC RTC	
LEDs	Four LEDs	Two user driven LEDs	
LCD Display and Touch connector	100 pin for LCD signals	4-lane MIPI DSI MIPI Alliance Specification v1.01 MIPI D-PHY Specification v0.65, v0.81, v0.90, v1.01	For connecting display accessory
Sensor header	24 pin sensor header	24 pin sensor header	Header to connect sensor board. Please contact Lantronix for availabilities of this board
CSI Camera connector	One camera connector	MIPI Alliance Specification v1.00 for Camera Serial Interface	For connecting camera accessories.
Current Sense Header	3 pin header	Sense lines connected across 0.005 Ohm resistor	To measure current consumption of SOM

3.7.1 SOM Board to Board Connectors

The Open-Q 2500 SOM connects to the carrier board via two 100 pin Hirose DF40 connectors which allows essential power rails and signals to be exposed for supporting other peripherals and interfaces on the platform. For the list of signals exposed by the SOM, see the device specification noted as reference document R-1.

3.7.2 Configuration – DIP Switch S700

There is a DIP switch S700 on the top side of the Open-Q 2500 carrier board. The 8-bit switch allows the user to control the system configuration and boot options. The image below shows the DIP switch assignments. **NOTE: the silkscreen shown on REV1 carrier boards is reversed from the image below. The image below is correct.**



See the table below for a description of the DIP switch connections.

Table 2 - System Configuration DIP Switch Settings

Function	DIP Switch	Description	Notes
FORCED_USB_BOOT	S700-1	For factory mode programming. Connected to APQ GPIO37.	For Lantronix use only. Leave open / OFF.
WATCHDOG _DISABLE	S700-2	Enables WATCHDOG_DISABLE when DIP switch turned on. Connected to APQ-GPIO76	Unsupported feature. Leave switch open / OFF.
BOOT_CONFIG[1]	S700-3	APQ boot configuration bit 1. Connected to APQ GPIO77	For default boot configuration, leave open / OFF. Other boot configurations not supported.
BOOT_CONFIG[2]	S700-4	APQ boot configuration bit 2. Connected to APQ GPIO78	For default boot configuration, leave open / OFF. Other boot configurations not supported.

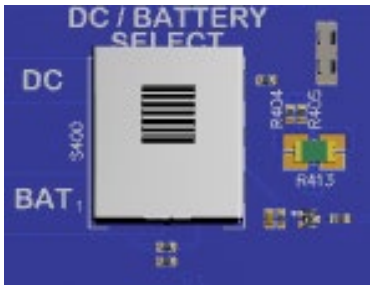
BOOT_CONFIG[3]	S700-5	APQ boot configuration bit 3. Connected to APQ GPIO79	For default boot configuration, leave open / OFF. Other boot configurations not supported.
CBL_PWN_N	S700-6	Controls the auto power of the SOM.	Default configuration is open / OFF. To enable auto power on of the SOM, set switch closed / ON.
USR_DEBUG 2	S700-7	User debug switch	Default out of the box configuration is OFF
USR_DEBUG 1	S700-8	User debug switch	Default out of the box configuration is OFF

3.7.3 Input Power Selection

The development kit can be powered using either external DC power supply or by using a battery. The input power selection can be done using the power selection switch S400 as mentioned below.

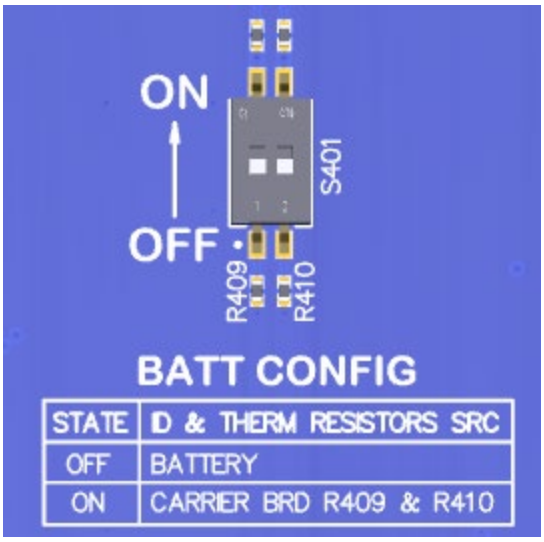
3.7.3.1 Input Power Selection Switch S400

The S400 switch is used to select the power source. To select the external DC power supply as the power source, change the switch towards the DC position(label). To power up the kit using the battery, change the switch towards the BAT position(label).



3.7.3.2 Battery ID and Thermistor Configuration DIP Switch S401

Battery ID and thermistor configuration is handled by the DIP switch S401. This switch has two sub switches, one is used for battery ID and another one is used for battery thermistor. When power is supplied by the external power supply, or when the connected battery does not have a battery ID or thermistor, the battery ID and the battery thermistor must be faked. In order to fake this, turn the battery ID and battery term switches to ON position.



3.7.3.3 DC Power Input Jack J500

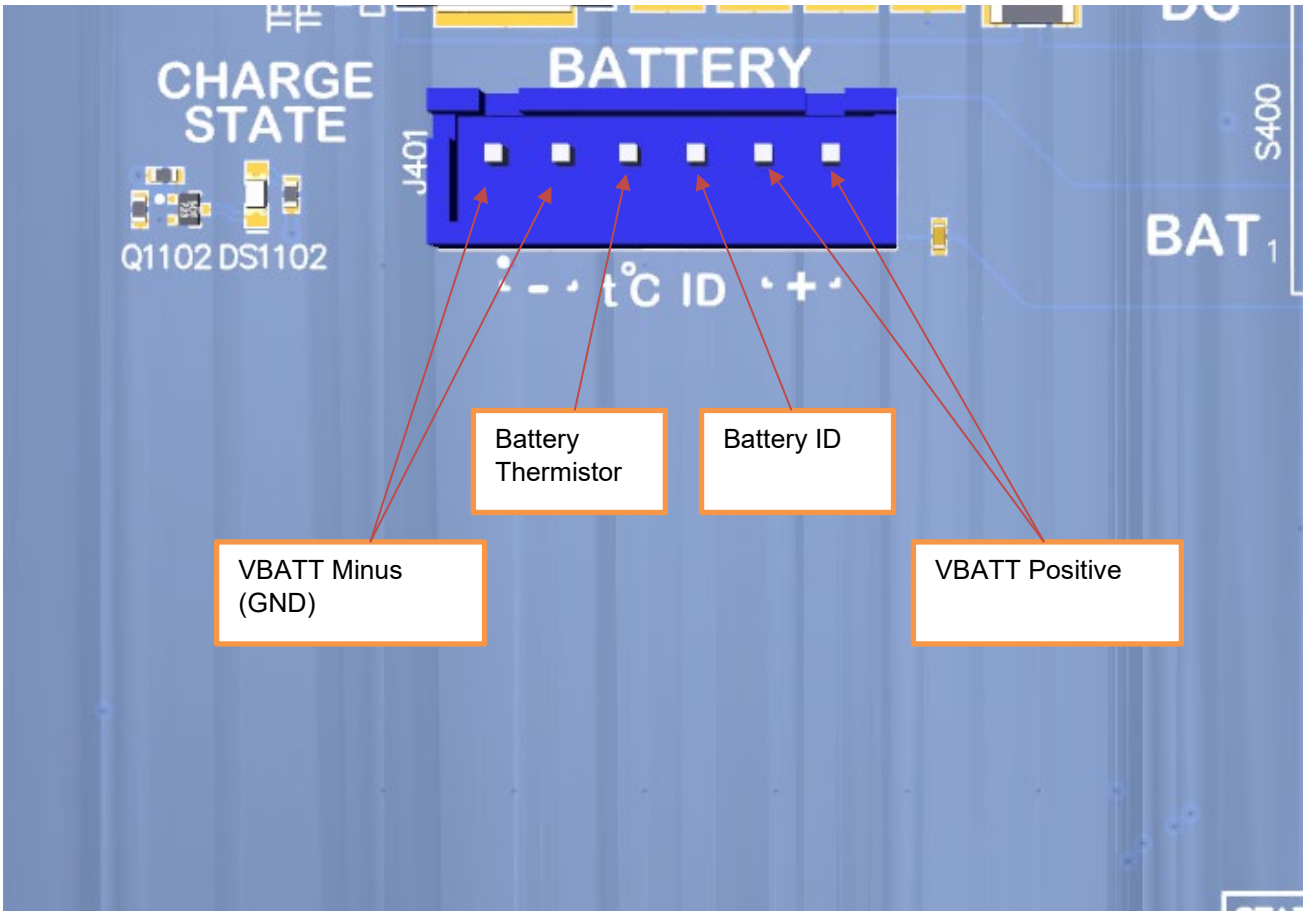
The Open-Q2500 development kit power source connects to the 12V DC power supply jack J500. Starting from the power jack, the 12V power supply branches off into different voltage rails via step down converters on the carrier board and PMIC on the SOM.

Figure 3 - J500 12V DC Power Jack

3.7.3.4 Battery Connector J401

The Open-Q 2500 development Kit can also be powered through a battery. Use the J401 connector on the carrier board to connect a battery to power up the kit as shown in the image below.

Please refer to R-6 (Tech. Note 54) for further detail on how to power the development kit with a battery.



3.7.4 SOM Current Sense Header J400

The SOM Current Sense header, J400, can be used to monitor the SOM's current consumption on the main SOM_SYS_PWR power rail.

Figure 4 - SOM Current Sense Header

The table below summarizes the pin outs of header J400

Table 3 - Power Header J400 Pin-out

Description	Signal	pin
SOM power positive current sense line	SOM_PWR_SENSE_P	J400[1]
SOM power negative current sense line	SOM_PWR_SENSE_N	J400[2]
GND	GND	J400[3]

To obtain power consumption measurements, the header is connected to a data acquisition unit (e.g. Keithley 2701) and the voltages on the SOM_PWR_SENSE_P/N pins are captured every few seconds over the test period (typically 30 minutes). The SOM power consumption is then calculated as (where R_{sense} = 5 milliohms):

$$Psom = Vsom_{pwr_{sense_N}} * \frac{(Vsom_{pwr_{sense_P}} - Vsom_{pwr_{sense_N}})}{Rsense}$$

3.7.5 Coin Cell Battery Holder B400

The coin cell holder allows the user to use a coin cell for supplying power to the SOM VCOIN power input. It is recommended that a Panasonics ML621 series rechargeable coin cell be used (not supplied with the development kit).

3.7.6 User Buttons and LEDs

There are four user buttons and four LED's on the Open-Q 2500 development kit. Following is the information regarding the User Buttons:

	User Button	Function
S1100	Volume +	Use this button to control or increase the volume.
S1102	Volume -	Use this button to control or decrease the volume. This button can also be used to reset the board.
S1101	GP Switch	This is a general-purpose user button.
S1103	Power ON	Use this button to power on the 2500 development kit.

Following is the information regarding the User LED's:

	LED	Function
DS1100	Yellow LED	General purpose LED
DS1101	Blue LED	General purpose LED
DS1102	Red LED	This LED indicates charging (NOTE: not functional in REV1 of carrier board)
DS1103	Green LED	This LED indicates power

3.7.7 Debug Serial UART over USB J800

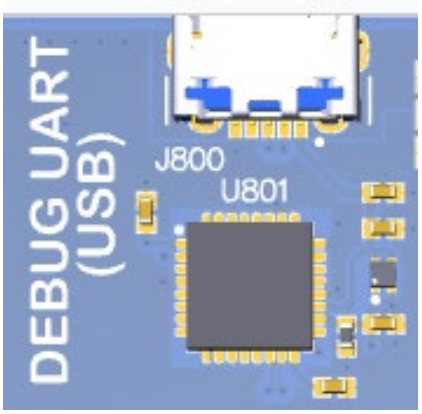
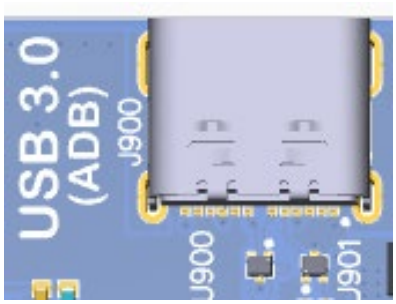


Figure 5 - Debug UART over USB

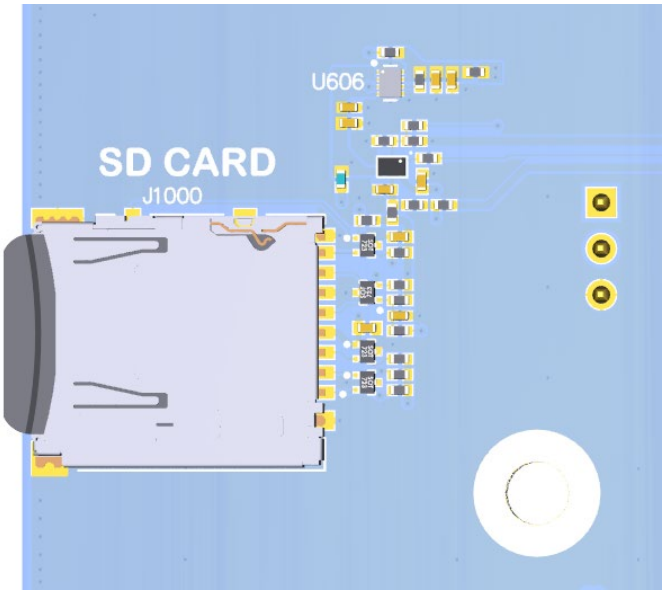
The UART connection used on the Open-Q 2500 is a USB micro B connector (J800). This debug UART is available over USB via the FTDI FT232RQ chip on the carrier board. To get the serial terminal working with a PC, user needs to ensure that the appropriate FTDI drivers are installed.

3.7.8 USB Type C (for ADB) J900



The USB connection on the Open-Q 2500 is a USB Type C connector (J900). This connection is used for Android debug bridge (ADB) functionality. To get the adb shell, ensure that the board is up and running and connect the Type C cable between the board and the PC. Type the command adb shell on the PC prompt to exercise the adb shell functionality.

3.7.9 Micro SD Card Socket J1000



J1000 (Micro-SD card connector) provides 4-bit secure digital (SD) interface for external storage. It is located on the bottom side of the carrier board.

3.7.10 Display Connector J1300

The 100-pin display connector, J1300, allows for a display adapter to be connected to the development kit. Lantronix supplies a compatible LCD panel to be connected to the Open-Q 2500. See https://shop.intrinsyc.com/products/open-q-810-820-lcd for details.

Exposed on the display connector are the following interfaces:

- One 4-lane MIPI DSI high speed display interface
- LCD backlight control signals
- I2C bus for touch panel support
- Additional GPIOs for general purposes available
- Various power rails for powering the display adapter

For details on the signal list provided on the display connector, see the development kit schematic (R-3) and the display adapter design guide technical note document (R-4).

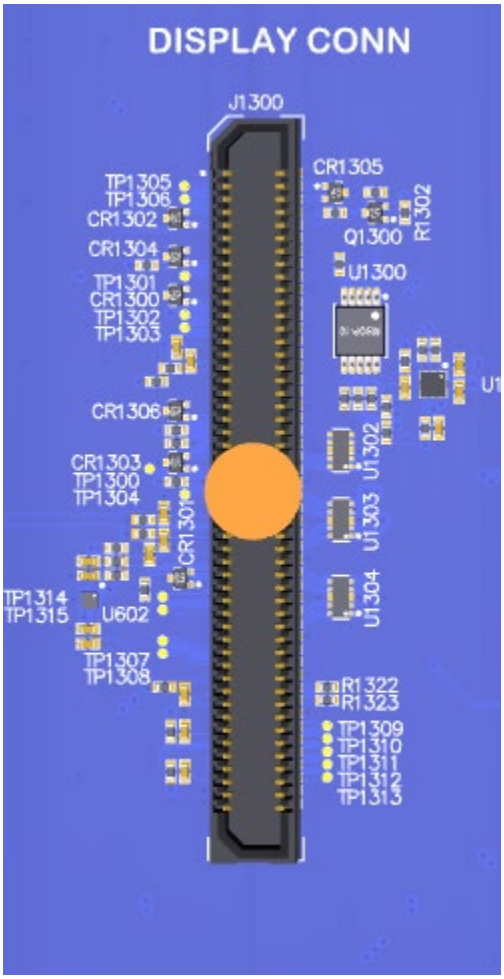


Figure 6 - Display Connector

3.7.11 Camera Connector J1400

The Open-Q 2500 development kit include a camera interface connector, J1400, allowing users to connect a camera adapter to the development kit. Lantronix offers compatible camera modules for the Open-Q 2500. See https://shop.intrinsyc.com/collections/accessories for details.

Exposed on the camera connector are the following interfaces:

- One 2-lane MIPI CSI high speed camera interface
- I2C bus for camera and actuator control
- Additional GPIOs for general purposes available
- Various power rails for powering the camera adapter

For details on the signal list provided on the camera connector, see the development kit schematic (R-3) and the camera adapter design guide technical note document (R-5).

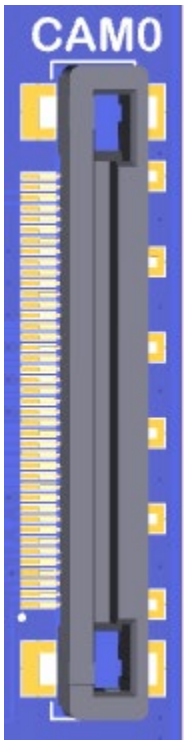


Figure 7 - Camera Connector

3.7.12 Digital IO Expansion Header J1800

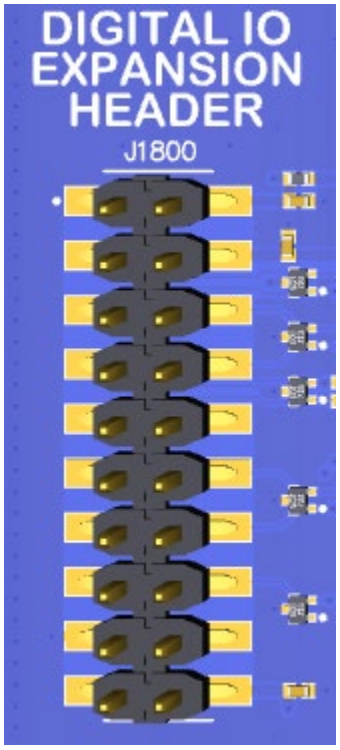


Figure 8 - J1800 Digital IO Expansion header

GPIO header expansion J1800 is a 20-pin connector that provides access to a selection of SOM GPIO signals and power rails. The following table shows the pin out description for this header.

Table 4 - J1800 Digital IO Expansion Header Pinout

Description	Signal	Pin NO	Description	Signal	Pin NO
NC	NC	J1800[1]	+1.8V IO voltage	VREG_L13_1P8	J1800[2]
APQ GPIO8	GPIO_8_BLSP6_3_MOSI	J1800[3]	+3.3V power rail	MB_VREG_3P3	J1800[4]
APQ GPIO9	GPIO_9_BLSP6_2_MISO	J1800[5]	APQ GPIO51	GPIO_51_GPIO_EXP_P9	J1800[6]
APQ GPIO10	GPIO_10_BLSP6_1_CS_N	J1800[7]	APQ GPIO91	GPIO_91_GPIO_EXP_P8	J1800[8]
APQ GPIO11	GPIO_11_BLSP6_0_CLK	J1800[9]	NC	NC	J1800[10]
NC	NC	J1800[11]	PMW3100 PMIC GPIO5	PMW3100_GPIO_5_EXP_P14	J1800[12]

Description	Signal	Pin NO	Description	Signal	Pin NO
NC	NC	J1800[13]	APQ GPIO82	GPIO_82_GPIO_EXP_P16	J1800[14]
NC	NC	J1800[15]	APQ GPIO88	GPIO_88_GPIO_EXP_P16	J1800[16]
GND reference	GND	J1800[17]	NC	NC	J1800[18]
NC	NC	J1800[19]	+5V power rail	MB_VREG_5P0	J1800[20]

For more details regarding configuring the GPIOs on this header, refer to the Open-Q 2500 software Release Notes to determine feature support in the latest software release.

3.7.13 Sensor IO Expansion Header J1900

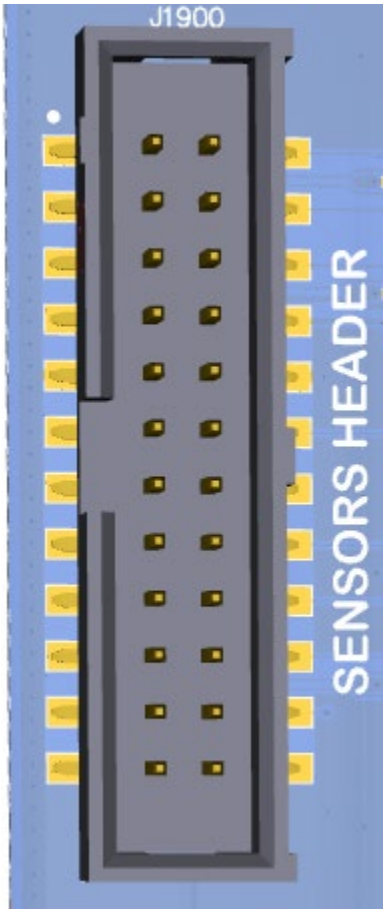


Figure 9 - Sensor Expansion Header

The sensor expansion header J1900 allows for a 24-pin connection to an optional sensor board. If user application does not require a sensor, then this header can be used for other applications that require I2C or GPIO input and output connections.

Following is the pin breakout for sensor expansion header J1900.

Table 5 - Sensor Expansion Header J1900 Pinout

Description	Signal	Pin NO	Description	Signal	Pin NO
APQ GPIO6	GPIO_6_BLSP1_1_SNS_I2C_SDA	J1900[1]	APQ GPIO96	GPIO_96_ACC1_INT1_N	J1900[2]
APQ GPIO7	GPIO_7_BLSP1_0_SNS_I2C_SCL	J1900[3]	APQ GPIO36	GPIO_36_ACC1_INT2_N	J1900[4]
APQ GPIO27	GPIO_27_SNS_P5	J1900[5]	APQ GPIO99	GPIO_99_GYRO_INT_N	J1900[6]
Sensor IO +1.8V Power rail. Connected to VREG_L11_1P8 by default	SENS_IO_PWR	J1900[7]	Sensor Analog +3.3V power rail. Connected to MB_VREG_3P3.	SENS_ANA_PWR	J1900[8]
GND reference	GND	J1900[9]	GND	GND	J1900[10]
NC	NC	J1900[11]	APQ GPIO95	GPIO_95_APQ_RSB_INT	J1900[12]
NC	NC	J1900[13]	NC	NC	J1900[14]
NC	NC	J1900[15]	APQ GPIO65	GPIO_65_COMP_INT_N	J1900[16]
NC	NC	J1900[17]	APQ GPIO52	GPIO_52_MAG_DRDY_INT_N	J1900[18]
APQ GPIO18	GPIO_18_BLSP5_1_SPI_CS_N	J1900[19]	APQ GPIO16	GPIO_16_BLSP5_3_SPI_MOSI	J1900[20]
APQ GPIO19	GPIO_19_BLSP5_0_SPI_CLK	J1900[21]	APQ GPIO17	GPIO_17_BLSP5_2_SPI_MISO	J1900[22]
NC	NC	J1900[23]	NC	NC	J1900[24]

Please refer to the schematic and consider the power before connecting anything to this header. For more details regarding configuration, refer to the Open-Q 2500 software Release Notes to determine feature support in the latest software release.

3.7.13.1 Sensors module – STMicroelectronics STEVAL V6

The Open-Q 2500 Development kit comes with a STMicroelectronics STEVAL V6 sensor board as shown in below.

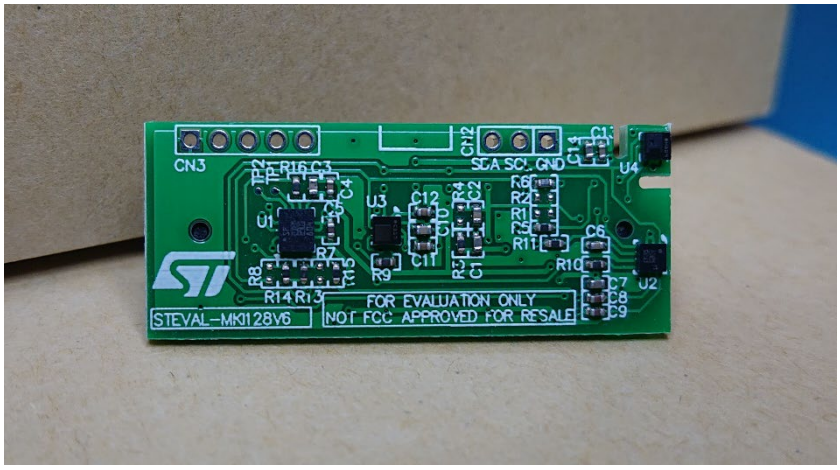


Figure 10 – STMicroelectronics STEVAL V6 Sensors Board

This sensor board contains the following STMicroelectronics sensors:

1. 3D Accelerometer and 3D Gyroscope – LSM6DSM
2. 3-axis Magnetometer – LIS2MDL
3. Barometer – LPS22HB
4. Relative Humidity and Temperature Sensor – HTS221

The STEVAL V6 sensor card has a keyed connector as shown in below and can be plugged into J1900 on the carrier board.

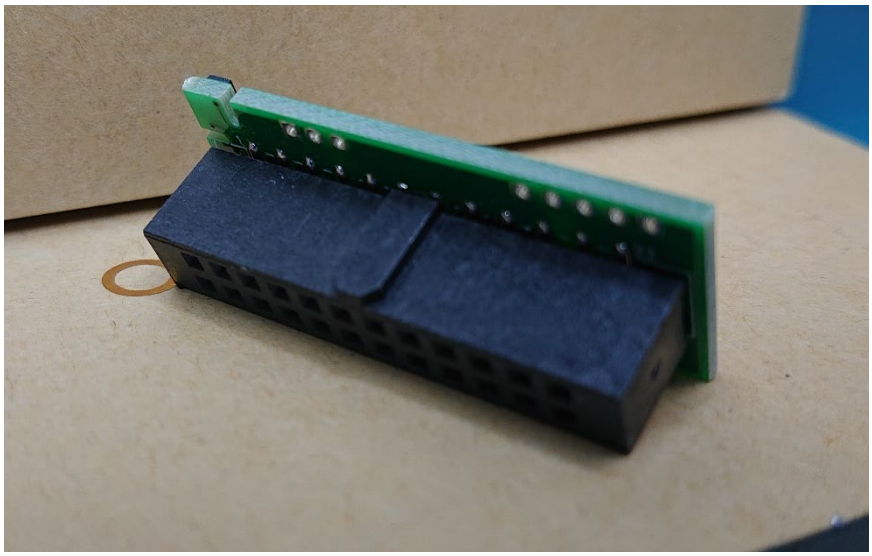


Figure 11 – Keyed connector on the STEVAL V6 Sensor Card

3.7.14 Audio IO Expansion Header J1600

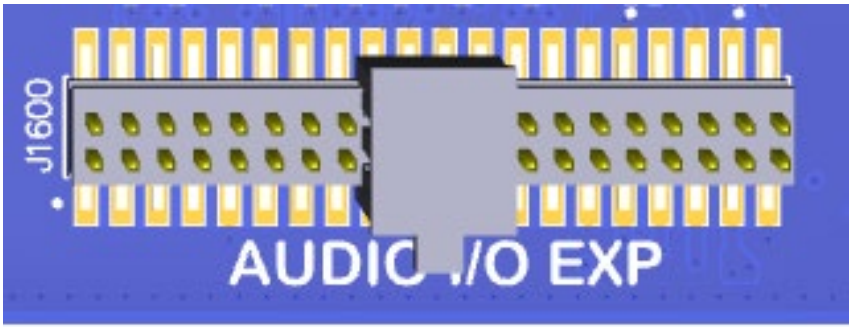


Figure 12 - Audio IO Expansion Header

The Audio IO expansion header J1600 is a 40-pin connecter that expose audio related signals as described in the pinout table below.

Table 6 - Audio IO Expansion Header Pinout

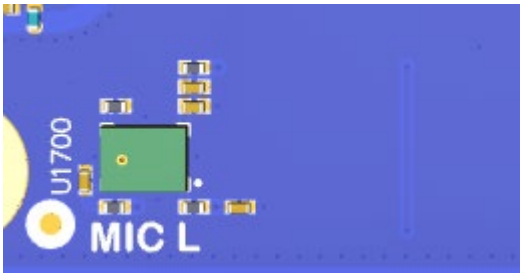
Description	Signal	Pin NO	Description	Signal	Pin NO
NC	NC	J1600[1]	GND	GND	J1600[2]
NC	NC	J1600[3]	APQ GPIO59	GPIO_59_MI2S_1_MCLK_A	J1600[4]
APQ GPIO14	GPIO_14_BLSP4_1_I2C_SDA_AUD	J1600[5]	NC	NC	J1600[6]
APQ GPIO15	GPIO_15_BLSP4_1_I2C_SCL_AUD	J1600[7]	NC	NC	J1600[8]
GND	GND	J1600[9]	NC	NC	J1600[10]
Connected to VREG_L11_1P8	MIC_BIAS_1P8	J1600[11]	GND	GND	J1600[12]
APQ GPIO97	GPIO_97_HDSET_DET	J1600[13]	APQ GPIO63	GPIO_63_MI2S_1_D1_A	J1600[14]
APQ GPIO5 Disconnected by default to enable the on-board microphone	GPIO_5_DMIC0_DATA_C	J1600[15]	APQ GPIO62	GPIO_62_MI2S_1_D0_A	J1600[16]
APQ GPIO4 Disconnected by default to enable the on-board microphone	GPIO_5_DMIC0_CLK_C	J1600[17]	APQ GPIO61	GPIO_61_MI2S_1_WS_A	J1600[18]
GND	GND	J1600[19]	APQ GPIO60	GPIO_60_MI2S_1_SCK_A	J1600[20]
APQ GPIO3 Disconnected by default to enable the on-board speaker output	GPIO_3_MI2S_2_D1	J1600[21]	GND	GND	J1600[22]
APQ GPIO2 Disconnected by default to enable the on-board speaker output	GPIO_2_MI2S_2_D0	J1600[23]	NC	NC	J1600[24]
APQ GPIO0 Disconnected by default to enable the	GPIO_0_MI2S_2_WS	J1600[25]	NC	NC	J1600[26]

Description	Signal	Pin NO	Description	Signal	Pin NO
on-board speaker output					
APQ GPIO1 Disconnected by default to enable the on-board speaker output	GPIO_1_MI2S_2_CLK	J1600[27]	NC	NC	J1600[28]
GND	GND	J1600[29]	APQ GPIO98	GPIO_98_MI2S_2_MCLK_C	J1600[30]
1.8 V voltage rail	MB_VREG_1P8	J1600[31]	GND	GND	J1600[32]
3.3 V voltage rail	MB_VREG_3P3	J1600[33]	NC	NC	J1600[34]
5.0 V voltage rail	MB_VREG_5P0	J1600[35]	PWM2 signal	BPG_PWM_2_C	J1600[36]
12 V voltage rail	DC_IN_12V	J1600[37]	PWM1 signal	BPG_PWM_1_C	J1600[38]
GND	GND	J1600[39]	PWM0 signal	BPG_PWM_0_C	J1600[40]

Please refer to the schematic and consider the power before connecting anything to this header. For more details regarding configuration, refer to the Open-Q 2500 software Release Notes to determine feature support in the latest software release.

3.7.15 On Board Digital Microphones

There are two on board digital microphones as shown above and can be used for recording audio. These microphones are connected to APQ GPIOs 4 & 5. Refer to the schematic to see what component population modifications are necessary to gain access to these GPIOs on the Audio IO expansion header J1600.



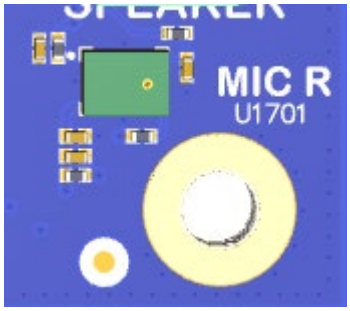
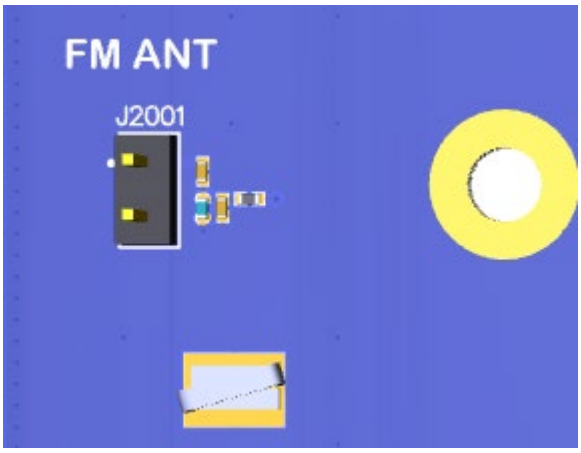


Figure 13 - On board digital MIC's

3.7.16 FM Antenna Header J2001

The FM Antenna Header J2001 can be used for connecting an external FM antenna to the Open Q-2500 development kit. Refer to the Open-Q 2500 software Release Notes to determine if this feature is supported in the latest software release.



3.7.17 WLAN / BT Antenna Connection

The Open-Q 2500 development kit is shipped by default with the SOM WLAN / BT antenna coax connecter mated to the Carrier board WLAN / BT PCB antenna via a U.FL coax cable. The two images below show the two ends of the WLAN / BT antenna connection.

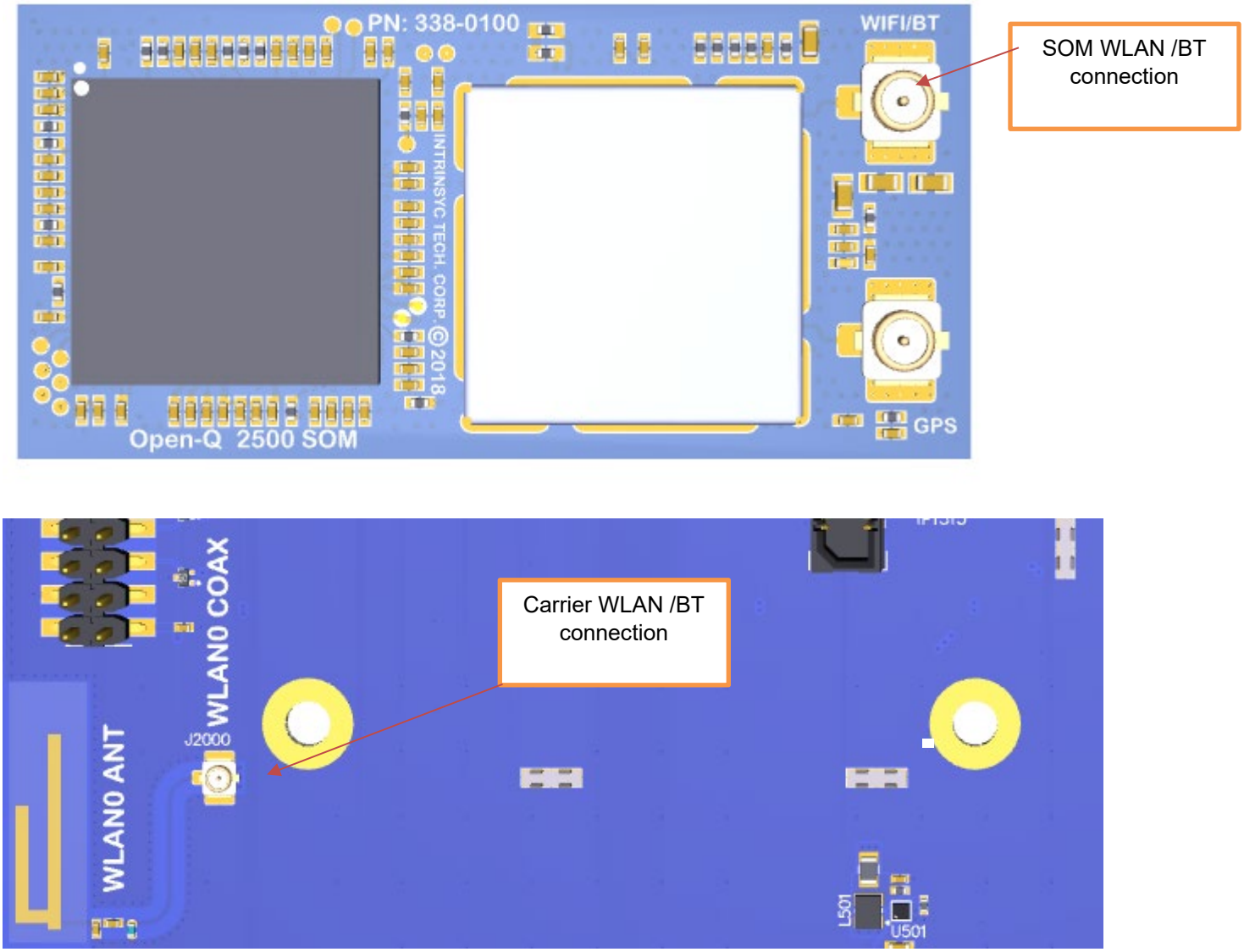


Figure 14 - WLAN / BT Antenna Connection

3.7.18 GPS Antenna Connection Options

The Open-Q 2500 development kit is shipped by default with the SOM GPS antenna coax connecter mated to the Carrier board GPS antenna coax connector via a U.FL coax cable. The two images below show the two ends of the GPS antenna connection.

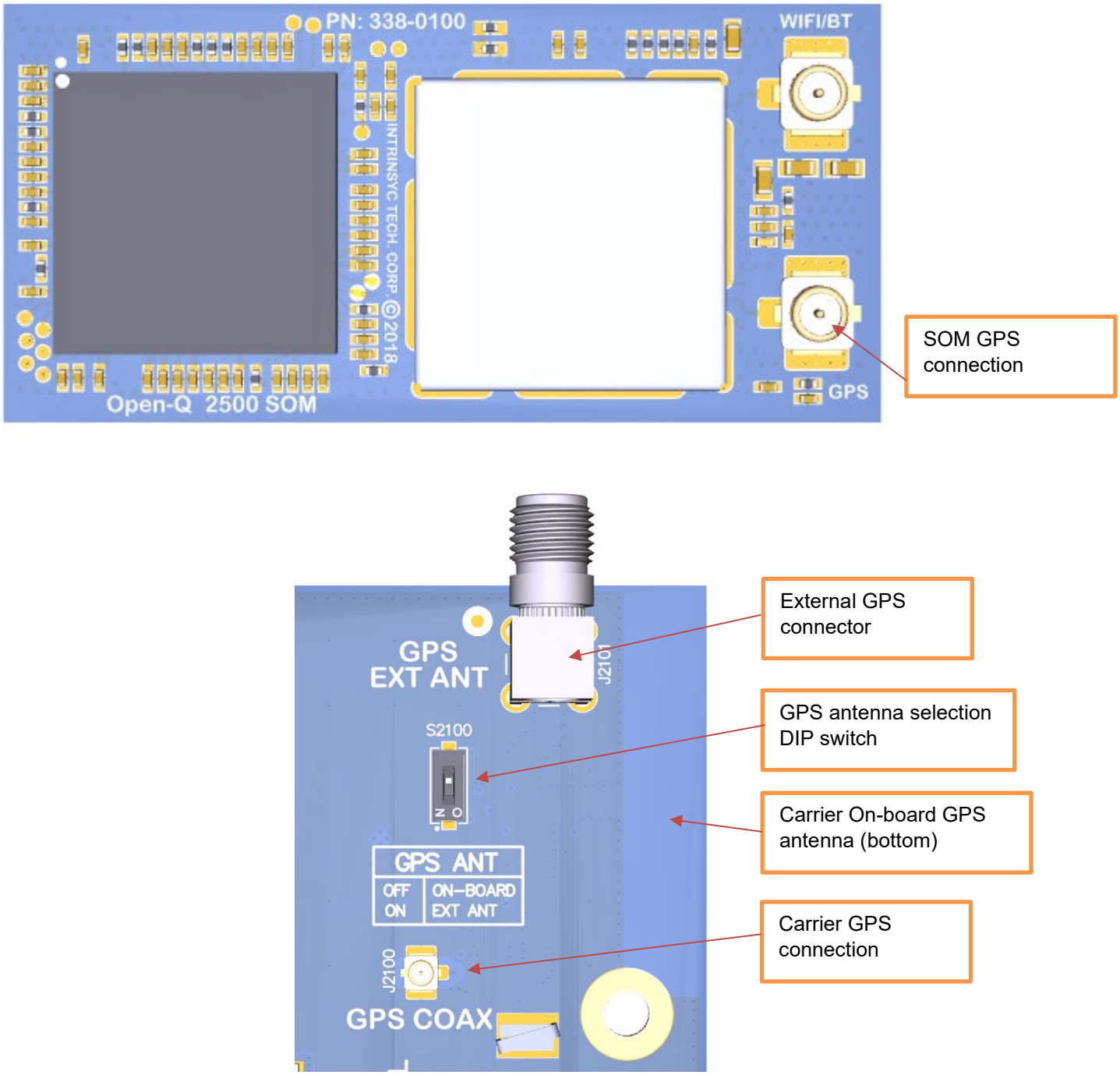


Figure 15 - GPS Antenna Connection Options

As shown above, DIP switch S2100 is used to select the GPS antenna connection to be either the on-board PCB trace antenna (located on the bottom side of the carrier board) or from an external GPS antenna which can be connected to the SMA coax connector J2101. The SOM supplies a bias voltage on the GPS antenna connection allowing for an active antenna to be used. The bias is supplied by VREG_L8_1P8, with a default

voltage of 1.8V and a max. current of 800mA. Please refer to the SOM device specification (R-1) for more information.

Table 7 - GPS Antenna Selection DIP Switch

GPS Antenna Selection	Dip Switch S2100 Selection
On Board PCB Antenna	Off Position
External Antenna	On Position

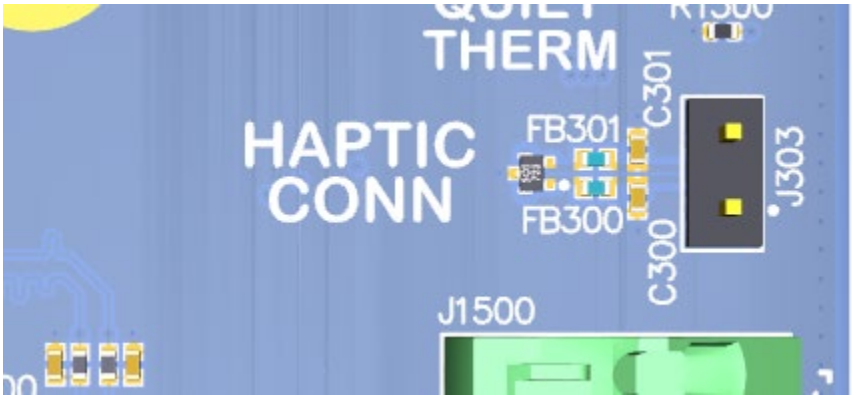
It is important to note that GPS should be used or tested near a window or a location where satellites are easily “seen” by the device.

3.7.19 Auxiliary Thermistor Header J302

The auxiliary thermistor header J302 is provided if the user would like to connect a different thermistor to this temperature input port. If the header is used, the on-board thermistor RT301, must be removed.

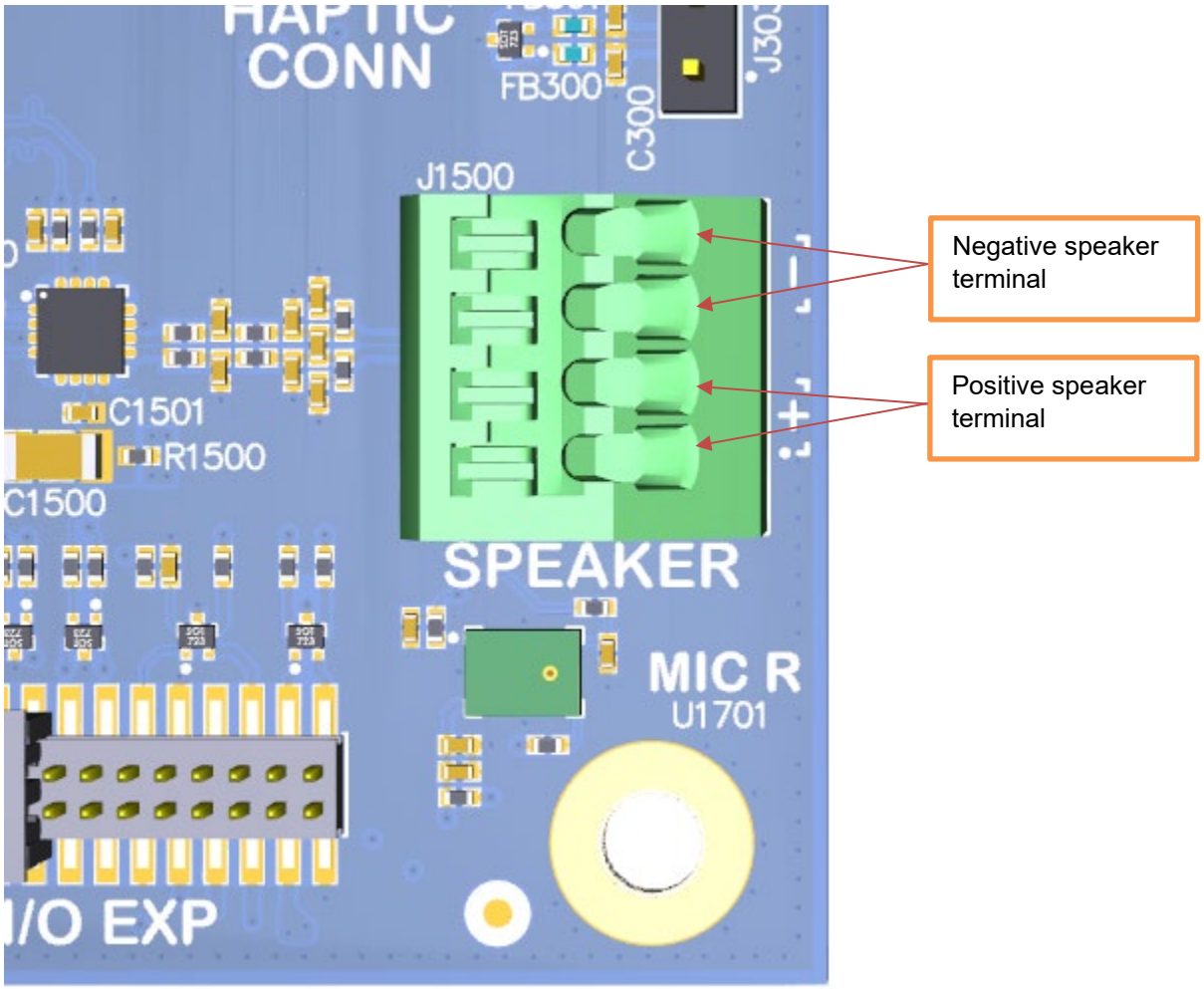
3.7.20 Haptic Output Header J303

The haptic output header J303 is provided for the user to gain access to the SOM’s PMW3100 haptic output.



3.7.21 Speaker Output Connector

There is a speaker output connection provided on the carrier board. The positive and negative terminals are shown in the figure below.



3.7.22 Unsupported Features

The Open-Q 2500 carrier board contains features for a modem enabled SOM, such as a SIM card socket and two cellular antenna coax connectors. These features are not supported on the current Open-Q 2500 development kit.