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XE866 INTERFACES USER GUIDE

APPLICABILITY TABLE

  GE866-QUAD INTERFACE	3990251275
  UE866-N3G INTERFACE	3990251273
  LE866-SV1 INTERFACE	3990251313
  LE866A1-KK INTERFACE	3990251343

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1 INTRODUCTION

1.1 Scope

The Aim of this document is the handling description of the EVK2 Interfaces for the products based on xE866 Form Factor.

1.2 Audience

All given information shall be used as a guide and a starting point for properly developing of your product. Obviously this document cannot cover all the hardware solutions and products that may be designed.

1.3 Contact Information, Support

For general contact, technical support services, technical questions and report documentation errors contact Telit Technical Support at:

TS-EMEA@telit.com

TS-AMERICAS@telit.com

TS-APAC@telit.com

Alternatively, use:

<http://www.telit.com/support>

For detailed information about where you can buy the Telit modules or for recommendations on accessories and components visit:

<http://www.telit.com>

Our aim is to make this guide as helpful as possible. Keep us informed of your comments and suggestions for improvements.

Telit appreciates feedback from the users of our information.

1.4 List of acronyms

Acronym	Description
ARFCN	Absolute Radio Frequency Channel Number
AT	Attention command
CTS	Clear To Send
DCD	Data Carrier Detect
DCE	Data Communication Equipment
DCS	Digital Cellular System
DSR	Data Set Ready
DTE	Data Terminal Equipment
DTMF	Dual Tone Multi Frequency
DTR	Data Terminal Ready
GLONASS	Global positioning system maintained by the Russian Space Forces
GNSS	Any single or combined satellite navigation system (GPS, GLONASS and combined GPS/GLONASS)
GPRS	Global Packet Radio Service
GPS	Global Positioning System
GSM	Global System Mobile
IMEI	International Mobile Equipment Identity
ME	Mobile Equipment
NMEA	National Marine Electronics Association
RTS	Request To Send
SMS	Short Message Service
TE	Terminal Equipment
LTE	Long Term Evolution

1.5 Text Conventions



Danger – This information **MUST** be followed or catastrophic equipment failure or bodily injury may occur.



Caution or Warning – Alerts the user to important points about integrating the module, if these points are not followed, the module and end user equipment may fail or malfunction.



Tip or Information – Provides advice and suggestions that may be useful when integrating the module.

All dates are in ISO 8601 format, i.e. YYYY-MM-DD.

1.6. Related Documents

- Telit EVK2 User Guide (1VV0300704)
- GE866-QUAD HW User Guide (1VV0301051)
- UE866-N3G HW User Guide (1VV0301157)
- LE866 HW User Guide (1VV0301210)
- Telit AT Commands User Guide (80000ST10025a)
- Telit 3G Modules AT Commands Reference Guide (80378ST10091a)
- LE866 Series AT Commands Reference Guide (80471ST10691A)

2 OVERVIEW

The Telit Evaluation Kit (EVK2) provides a robust, future-proof and flexible environment to streamline all application development based on Telit GSM/GPRS, UMTS/HSPA, CDMA 1x/EV-DO, and LTE module families, significantly reducing time-to-market.

The EVK2 kit includes a motherboard where to connect the Interface board of a Telit module. This concept allows the EVK2 to be used across various form factors and product generations, both present and future.

The motherboard includes the basic interfaces such as power input, SIM card holder, audio monitor outputs, RS-232, and USB; as well as a Reset button and power switch. The circuit implemented in the EVK2 motherboard is based on the recommended reference design for the module's peripheral components and I/O connections.

Adapter boards are available for all the different module families.

The interface boards convert the module connection technology (board-to-board or BGA soldering) into a PTH pin connector. The part of the basic interfaces is served by the motherboard, whereas specific interfaces according to the type of the module (antenna, general purpose inputs/outputs GPIO, ADC/DAC, UART) are available on the adapter board to connect it to the user applications, extension boards, measurements equipment or other tools.

All connections are made through 2x40 contacts connectors.

It is possible to use these Interface Boards also in stand-alone mode, inserting the “not mounted” components (related to RESET BUTTON, ON BUTTON, SIM HOLDER and STATUS LED functions) plus the use of an external level translator circuit.

This document is describing the available Adapter Boards for the modules based on the xE866 form factor.



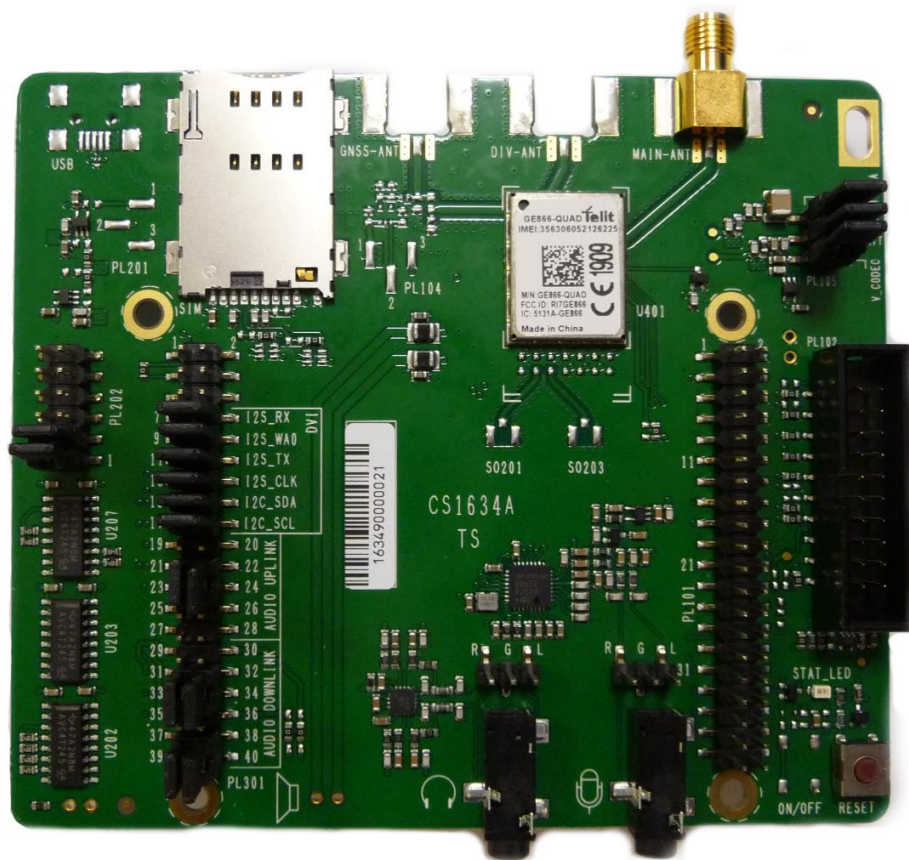
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3 GE866-QUAD INTERFACE

3.1 Description

This board allows easily interfacing the GE866-QUAD modules with the EVK2 and testing their functionalities.

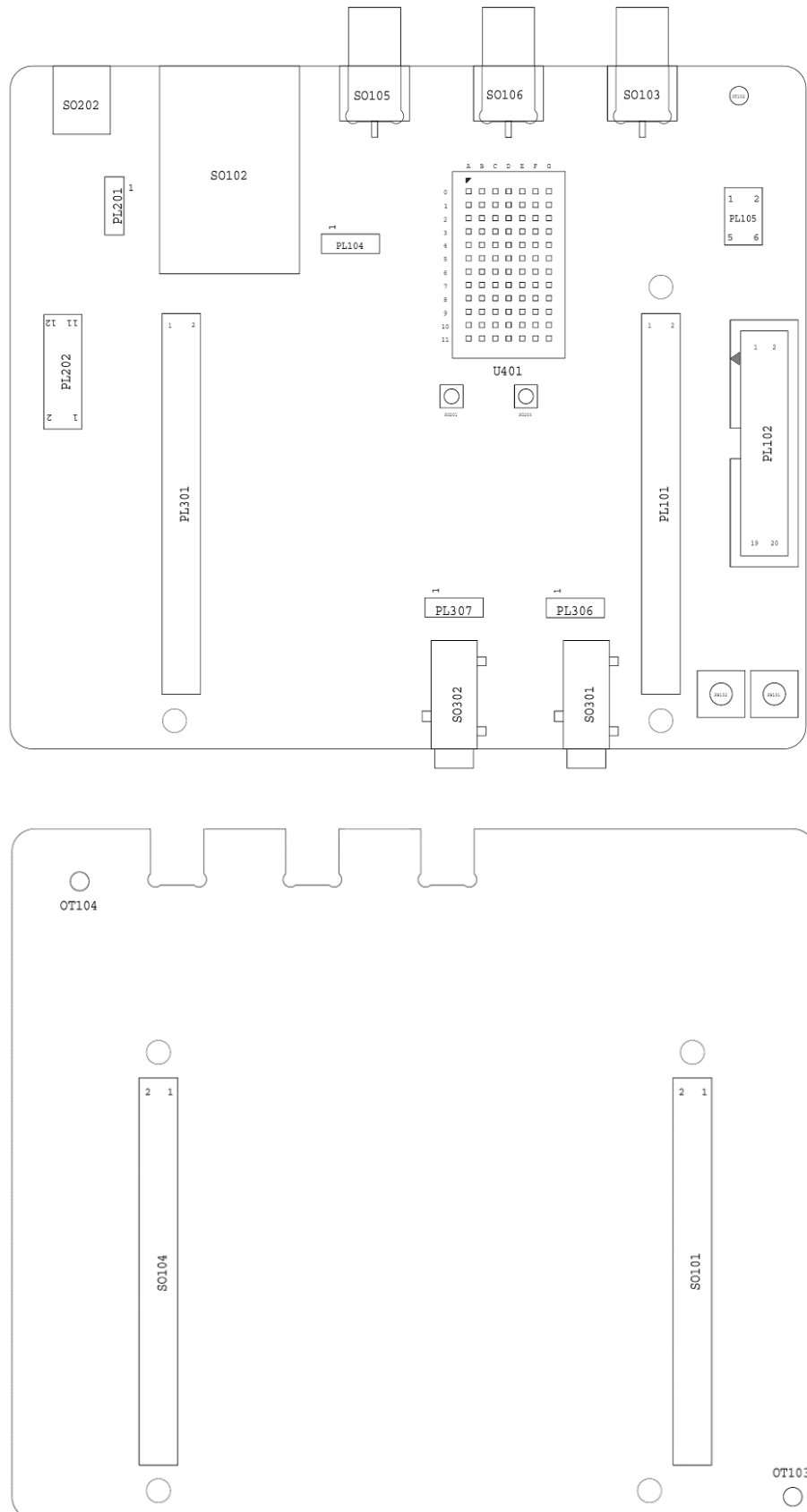


3.2 Physical dimensions

Item	Value
Length	92,00 mm
Width	107,00 mm
Height	25,00 mm

3.3 Interface Details

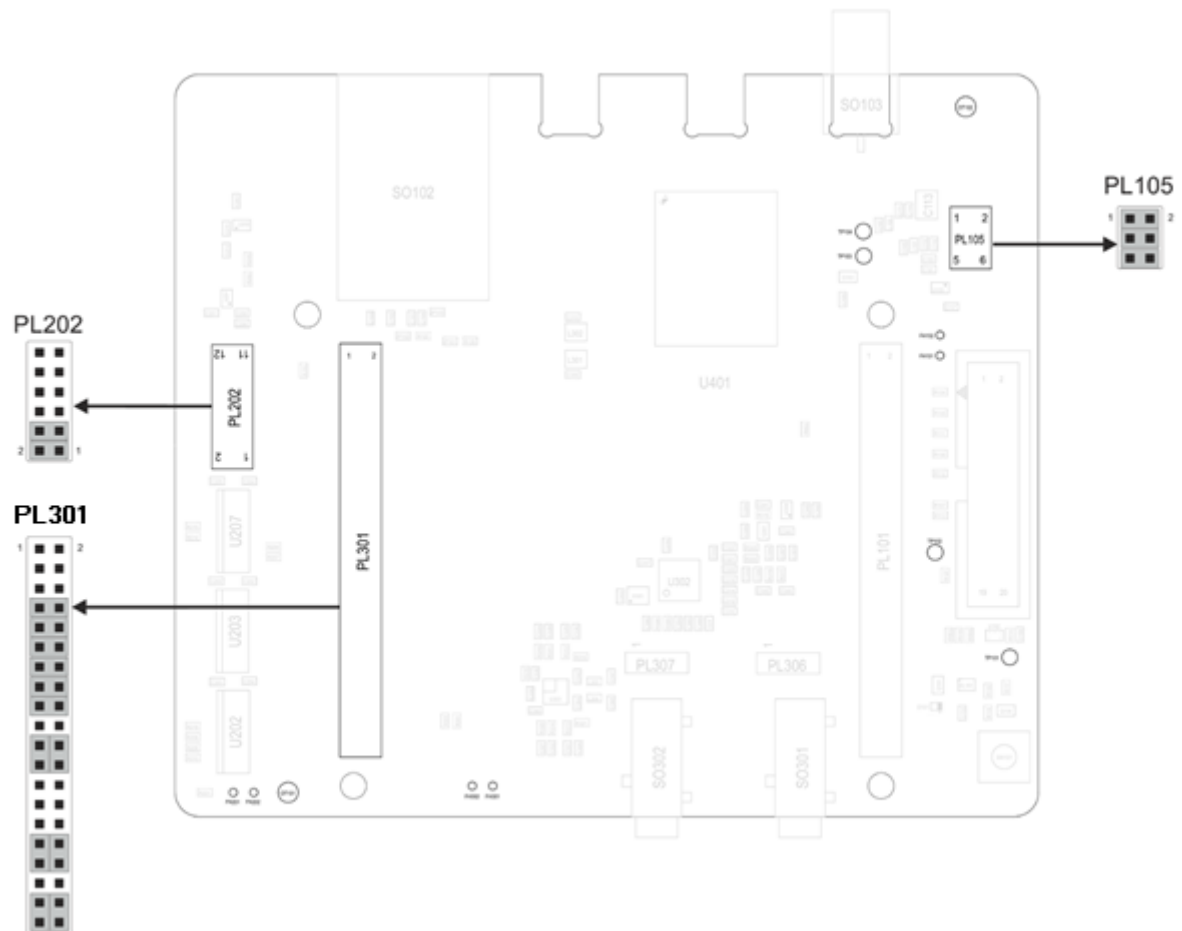
3.3.1 Connectors Position



3.3.2 Jumpers Setting

The following picture shows the jumpers placement and their default settings.

Details in the following paragraphs.



3.3.3 SO101 & SO104 - EVK2 Connection

The connections between the Interface and the EVK2 is done through two 2x40 pin female connectors present on the bottom (SO101 and SO104). Their pin functions are listed in the following tables:

SO101

Pin	Signal	Type	Function
1	NC	-	Do not connect
2	TX_Aux	Digital Output	to RS232 or USB level translators
3	RX_Aux	Digital Input	from RS232 or USB level translators
4	NC	-	Do not connect
5	GND	DC voltage	Power
6	NC	-	Do not connect
7	NC	-	Do not connect
8	NC	-	Do not connect
9	NC	-	Do not connect
10	NC	-	Do not connect
11	GND	DC voltage	Power
12	GND	DC voltage	Power
13	GND	DC voltage	Power
14	GND	DC voltage	Power
15	C109/DCD	Digital Output	to RS232 or USB level translator
16	C104/RXD	Digital Output	to RS232 or USB level translator
17	C103/TXD	Digital Input	from RS232 or USB level translator
18	C108/DTR	Digital Input	from RS232 or USB level translator
19	GND	DC voltage	Power
20	C107/DSR	Digital Output	to RS232 or USB level translator
21	C105/RTS	Digital Input	from RS232 or USB level translator
22	C106/CTS	Digital Output	to RS232 or USB level translator
23	C125/RING	Digital Output	to RS232 or USB level translator
24	NC	-	Do not connect

SO101

Pin	Signal	Type	Function
25	GND	DC voltage	Power
26	GND	DC voltage	Power
27	GND	DC voltage	Power
28	GND	DC voltage	Power
29	EAR_HF+	AC Out Voltage	Audio
30	EAR_MT-	AC Out Voltage	Audio
31	EAR_HF-	AC Out Voltage	Audio
32	EAR_MT+	AC Out Voltage	Audio
33	NC	-	Do not connect
34	MIC_HF-	AC In Voltage	Audio
35	MIC_MT+	AC In Voltage	Audio
36	MIC_HF+	AC In Voltage	Audio
37	MIC_MT-	AC In Voltage	Audio
38	GND	DC voltage	Power
39	GND	DC voltage	Power
40	GND	DC voltage	Power

SO104

Pin	Signal	Type	Function
1	VBATT	DC voltage	Power
2	VBATT	DC voltage	Power
3	VBATT	DC voltage	Power
4	VBATT	DC voltage	Power
5	GND	DC voltage	Power
6	GND	DC voltage	Power
7	GND	DC voltage	Power
8	GND	DC voltage	Power
9	NC	-	Do not connect
10	NC	-	Do not connect
11	GND	DC voltage	Power
12	GND	DC voltage	Power
13	GND	DC voltage	Power
14	GND	DC voltage	Power
15	RESERVED	-	
16	NC	-	Do not connect
17	RESET*	Digital Signal	Module Reset
18	NC	-	Do not connect
19	NC	-	Do not connect
20	NC	-	Do not connect
21	STAT_LED	Digital Signal	Status Indicator LED
22	NC	-	Do not connect
23	NC	-	Do not connect
24	NC	-	Do not connect
25	GND	DC voltage	Power
26	GND	DC voltage	Power
27	GND	DC voltage	Power
28	GND	DC voltage	Power

SO104

Pin	Signal	Type	Function
29	NC	-	Do not connect
30	NC	-	Do not connect
31	SIMIO	Digital Signal	SIM Data I/O
32	SIMCLK	Digital Signal	SIM Clock
33	SIMRST	Digital Signal	SIM Reset
34	SIMVCC	DC voltage	SIM Power
35	SIMIN	Digital Signal	SIM Presence detector
36	NC	-	Do not connect
37	NC	-	Do not connect
38	NC	-	Do not connect
39	GND	DC voltage	Power
40	GND	DC voltage	Power



The signals related to MAIN UART and AUX_UART on the SO101 and SO104 have a different Logic level from the GE866 because they have been adapted to the EVK2 levels (2.8V DC).

3.3.4 Antenna Connectors

3.3.4.1 SO103 - MAIN Antenna connector

The GE866 is provided by one single RF antenna. The connector is SO103 and it is a female SMA. A WCDMA compatible antenna (Refer to the product's HW user guide) must be connected to SO103.

3.3.5 PL105 - Power Supply Setting

The PL105 connector is permitting to configure how to supply the module.

The Interface is designed to supply and filter the two Module's inputs VBATT and VBATT_PA and separately the rest of circuits of the Interface (VBATT_AUX)

The connector is provided by 3 Jumpers (Mounted by default) that permits to:

- Select if to supply the module from EVK2 or from an external source
- Insert a Power consumption Meter in series to the supply

The connector carries the following signals:

PL105		
Pin	Signal	Function
1	VBATT_PA (Module)	Module's VBATT_PA signal
2	VBATT_PA (EVK2)	VBATT_PA from the EVK2
3	VBATT (Module)	Module's VBATT signal
4	VBATT (EVK2)	VBATT from the EVK2
5	VBATT_AUX (Interface)	Supply input for the Interface circuits (except the module)
6	VBATT_AUX (EVK2)	VBATT_AUX from the EVK2 usable to supply the Interface's circuit.

3.3.6 SIM Holder and SIM Detection

The Interface is provided by a SIM Holder (SO102).

The SIM holder lines are in parallel to the lines connected to the SIM Holder on EVK2 so it is not allowed to have a SIM in both holders.

Due to the fact the product is not provided by a dedicated pin for the HW SIM Presence detection, it is possible to select one GPIO to be used for this function.

On the interface it has been considered to have the possibility to choose between GPIO 5, 6 or 7 adding a Jumper on PL301.

On PL301 the lines dedicated to this activity are:

SIM IN Settings on PL301

Pin	Signal	Function
1	GPIO_07	GPIO_07 on module
2	SIM_IN	SIMIN Line from SIM Holder SO102
3	GPIO_06	GPIO_06 on module
4	SIM_IN	SIMIN Line from SIM Holder SO102
5	GPIO_05	GPIO_05 on module
6	SIM_IN	SIMIN Line from SIM Holder SO102

Supposing to define the GPIO_05 as SIM detection (See AT Commands user guide) it is needed to add a jumper between pin 5 and 6 of PL301.

3.3.7 RESET

The Interface is provided by a button that permits to RESET the module.

Please refer to the Module's HW user guide for its use and behaviour.

3.3.8 STAT LED

The Interface is provided by a LED controlled by the STAT LED line of the module.

Please refer to the Module's HW user guide for its use and behaviour.

3.3.9 Expansion Connectors

3.3.9.1 PL101

The connector carries the following signals:

PL101		
Pin	Signal	Function
1	GND	Ground
2	VBATT_AUX	Interface Power supply
3	NC	
4	NC	
5	NC	
6	NC	
7	NC	
8	GPIO_01/DVI_RX	Digital audio interface RX
9	NC	
10	NC	
11	NC	
12	ADC_IN	11 bit ADC converter, 0-1.2V DC
13	VRTC	Real Time Clock backup
14	DAC_OUT	DAC converter
15	VAUX/PWRMON	Power supply for external devices/Power ON Monitor
16	NC	
17	NC	
18	NC	
19	GPIO_06	GPIO
20	NC	

PL101

Pin	Signal	Function
21	NC	
22	NC	
23	GPIO_03/DVI_TX	Digital audio interface TX
24	GPIO_04/DVI_CLK	Digital audio interface Clock
25	GPIO_01/DVI_WA0	Digital audio interface WA0
26	GPIO_07/STAT_LED	Status pin
27	NC	
28	NC	
29	GPIO_06	GPIO
30	GPIO_05	GPIO
31	NC	
32	NC	
33	NC	
34	NC	
35	NC	
36	NC	
37	NC	
38	NC	
39	NC	
40	NC	

3.3.9.2 PL202

The connector carries the following signals:

PL202		
Pin	Signal	Function
1	TX_AUX	AUX UART TX (Output from Module)
2	TX_AUX (Lev. Adapter)	AUX UART TX (Input of Level Adapter)
3	RX_AUX	AUX UART RX (Input to Module)
4	RX_AUX (Lev. Adapter)	AUX UART RX (Output from Level Adapter)
5	NC	
6	NC	
7	NC	
8	NC	
9	NC	
10	NC	
11	GND	
12	NC	

There are two Jumpers on this connector that permit to connect the AUX UART of the module to the level adapter (1.8V to 2.8V DC and vice versa) interfacing the EVK2.

The Jumpers are set between Pin 1 and 2 for the TX_AUX signal and between pin 3 and 4 for the RX_AUX signal.

In case is needed to connect an external application to the AUX UART or simply to isolate it from the rest of the circuitry it is only needed to remove the two jumpers.

3.3.10 Audio Section and Settings

The Interface is equipped with an Audio Codec usable in connection with the module's DVI.

In case there is a need to use the Module's Analog Audio lines it is possible to access them on the Interface connectors.

3.3.10.1 Audio Codec

The Interface is provided by an Audio codec (MAX9867ETJ from Maxim) that could be used to interface the Module's DVI.

The CODEC could be programmed through the I2C using two GPIOs of the module (GPIO_05 for I2C_SCL and GPIO_06 for I2C_SDA) and the AT#I2CWR command (see AT Commands specification).

3.3.10.2 Audio Inputs

The Interface Board is provided by a set of possible Audio inputs to interface the Audio circuitry (i.e. Audio Codec) or directly the module.

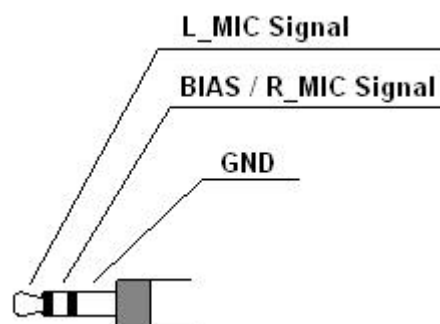
Its configuration could be set using the Jumpers on PL301.

You could refer to the "PL301 - Audio Settings" paragraph for the details.

3.3.10.2.1 Microphone Input

This circuit permits to connect a standard **electret microphone**.

It could be connected using the SO301 connector (Jack 3.5mm) where the jack contacts are described in the following Image:



Or using the PL306 connector where the pin-out is the following:

- 1 BIAS/R_MIC Signal
- 2 GND
- 3 L_MIC Signal

3.3.10.3 Audio Outputs

The Interface is provided by a set of possible Audio Outputs to interface the Audio circuitry (i.e. Audio Codec) or directly the module.

Its configuration could be set using the Jumpers on PL301.

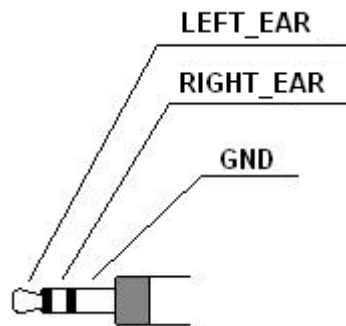
You could refer to the “PL301 - Audio Settings” paragraph for the details.

3.3.10.3.1 EAR Output

This part of the circuit permits to amplify the audio signal coming from the Codec or directly from the Analog Audio output from the module.

It is designed using a MAX9722 amplifier from Maxim

This circuit permits to connect a headset using the SO302 connector (Jack 3.5mm) where the jack contacts are described in the following Image:



Or using the PL602 connector where the pin-out is the following:

- 1 RIGHT_EAR
- 2 GND
- 3 LEFT_EAR

3.3.10.4 PL301 – Audio Settings

The Audio Configuration could be done using the Jumpers on PL301.

3.3.10.4.1 DVI and I2C Connections

This connector allows configuring GPIOs from 1 to 6 as DIGITAL AUDIO INTERFACE.

This configuration is done setting the jumpers as indicated below:

DVI and I2C connections

Jumpers on Pin	Signal on Module	Description
7-8	GPIO 02/DVI RX	DVI RX
9-10	GPIO 01/DVI WA0	DVI WA0
11-12	GPIO 03/DVI TX	DVI TX
13-14	GPIO 04/DVI CLK	DVI CLK
15-16	GPIO 06/ALARM/BUZZER	I2C SDA (GPIO used as I2C SDA with AT#I2CWR only to configure external codec)
17-18	GPIO 05/RFTXMON	I2C SCL (GPIO used as I2C SCL with AT#I2CWR only to configure external codec)

If the DVI is not needed you could remove all the above jumpers and use the signals as normal GPIOs.

3.3.10.4.2 Audio Path Settings

On another section of PL301 is possible to configure the path of audio data Analog or digital.

Audio Uplink Setting on PL301

Jumpers on Pin	Signal	Description
19-21 20-22	MIC- (Modem) MIC+ (Modem)	From SO301/PL306 to Module
21-23 22-24	MIC L – (Codec) MIC L + (Codec)	From SO301/PL306 to Audio Codec
23-25 24-26	MIC L – (Codec) MIC L + (Codec)	From EVK2 to Audio Codec
25-27 26-28	MIC- (Modem) MIC+ (Modem)	From EVK2 to Module

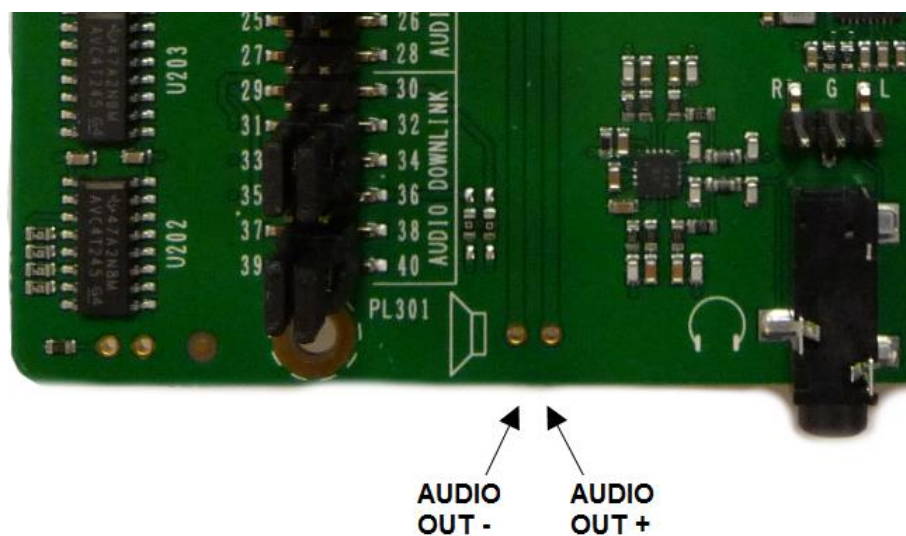
Audio Downlink Setting on PL301

Jumpers on Pin	Signal	Description
29-31 30-32	SPK+ (Modem)	From Module
33-35 34-36	SPK- (Modem)	From Module
31-33 32-34	LOUTP ROUTP	From CODEC
35-37 36-38	LOUTN ROUTN	From CODEC

The Default setting is DVI connected Uplink from SO301 to CODEC, Downlink from CODEC.

3.3.10.5 *Speaker connections*

It is also possible to connect an external speaker by using the two Test Points, as shown in the figure below:



3.3.11 Audio Accessories

The following tables show the suggested specification to obtain the best performance from off-the-shelf accessories.

3.3.11.1.1 Headset Specification

The typical characteristics of the Microphone and Earpiece to be used with the Interface are:

Microphone

Item	Value
Nominal sensitivity	-45dBV _{rms} /1Pa (+/- 3dB)
Line coupling	AC
Nominal Voltage	2V
Range of Using Voltage	(1÷10)V
Consumption Current	(150÷500) μ A
Impedance	2,2K Ω
Signal to Noise Ratio	56dB /1KHz/1Pa (A curve)
Inner EMI capacitor between terminals	10pF, 33pF

Earpiece

Item	Value
Rated Input Power	5mW
Maximum Input Power	20mW
Coil Impedance	32 Ω \pm 5 Ω @ 1kHz
SPL	95 \pm 3 dB @ 1KHz/1mW sine wave
Resonance frequency (Fo)	< 350Hz
Useful Bandwidth	Fo \div 8000 Hz @ -3dB

3.3.12 Stand-alone setup

The GE866 Interface could be used in Stand alone (without the EVK2 mainboard) with the following remarks:

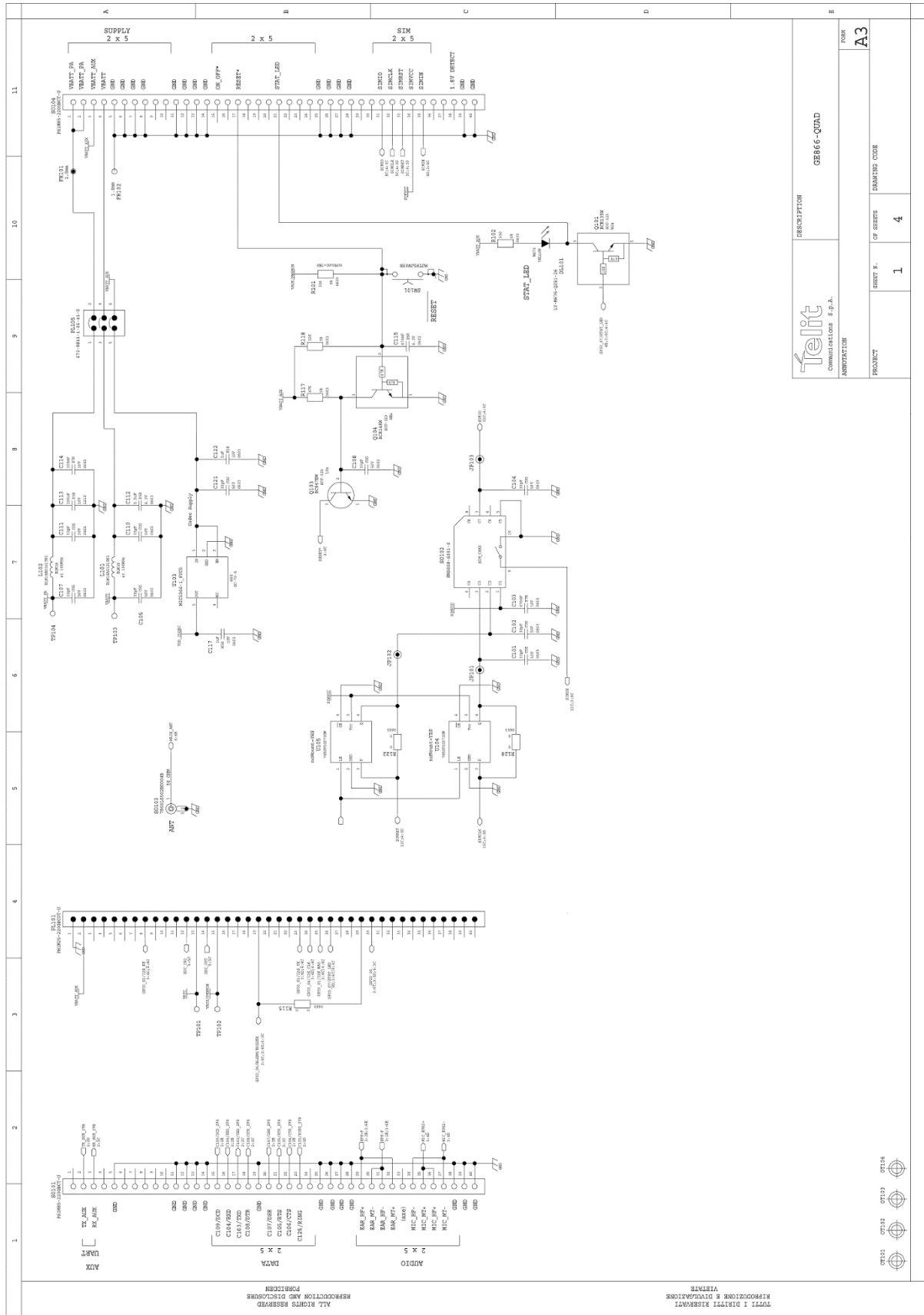
- The Power supply could be provided connecting a Power supply to SO104 or PL105 (removing the Jumpers)
- The Power supply level has to be carefully verified in the Module's HW User Guide
- The SIM could be inserted in the SO102 Holder
- The communication with the module through the UART requires the use of a level adapter between the PC and the Interface (the lines are available on SO101 but please be aware that the signals on that connector have been adapted to the 2.8V logic levels of EVK2)
- The Audio section could be used accessing directly to the Analog lines (see above chapters for pinout) or through the codec using SO301 and SO302
- The RESET line could be controlled using the SW101 Button
- The STAT LED line is present on the Interface (DL101)
- The Antenna could be connected on SO103 (Ref to Module's HW User Guide for the correct model)

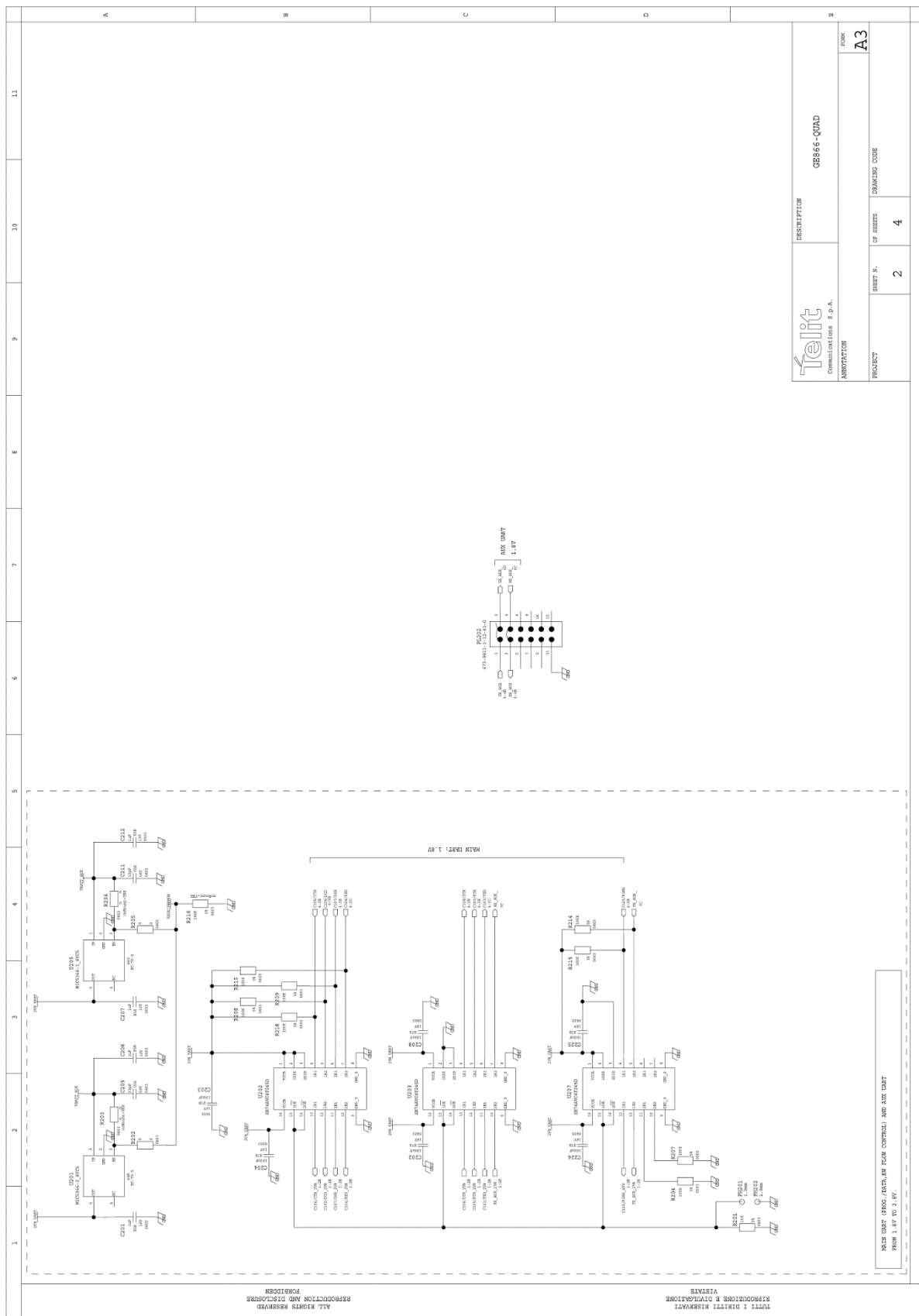
3.3.13 FIRMWARE UPDATE

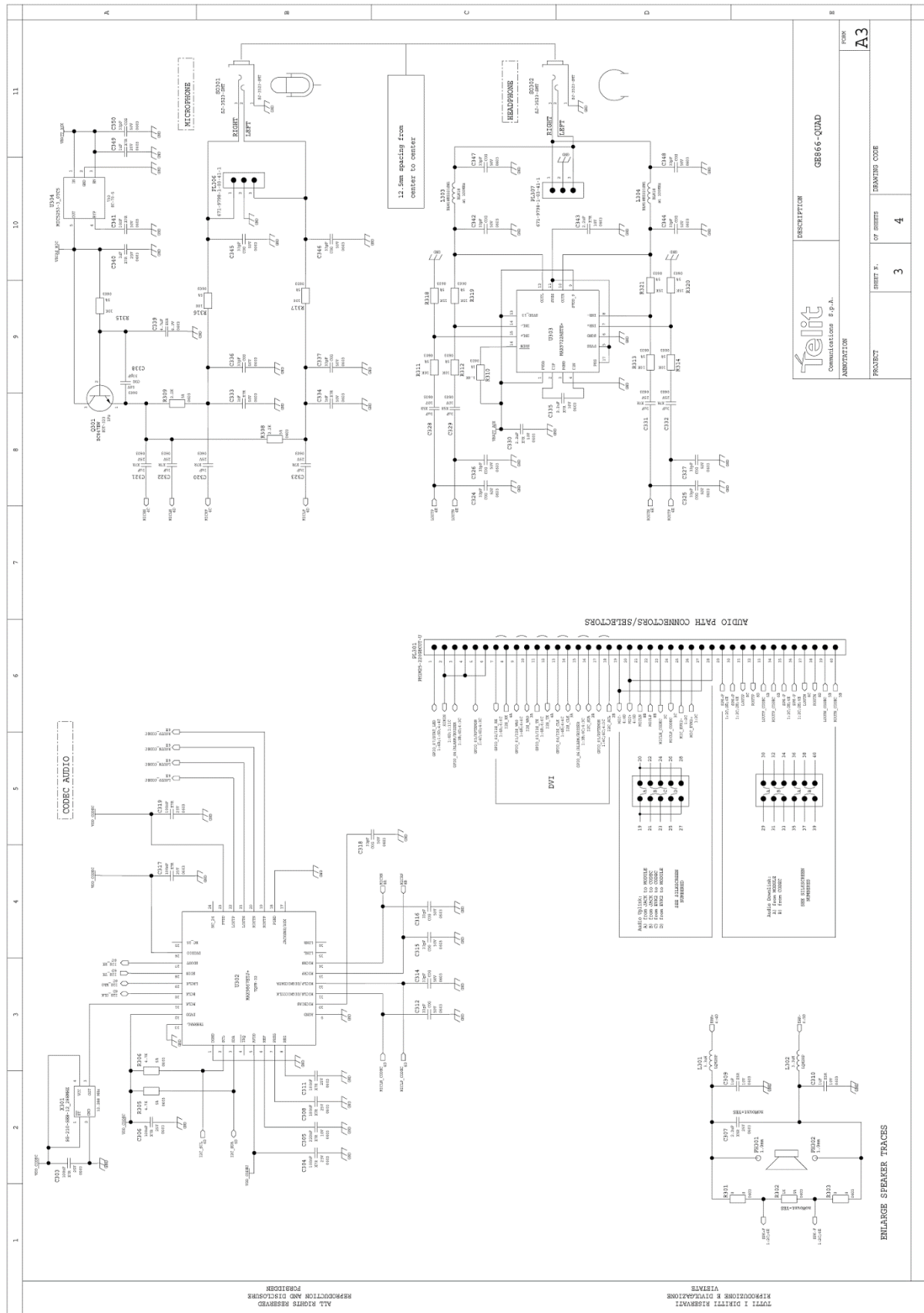
You can update the Telit Module firmware through the serial port.

Please refer to the GE866 Documentation for details.

3.3.14 Interface Schematics

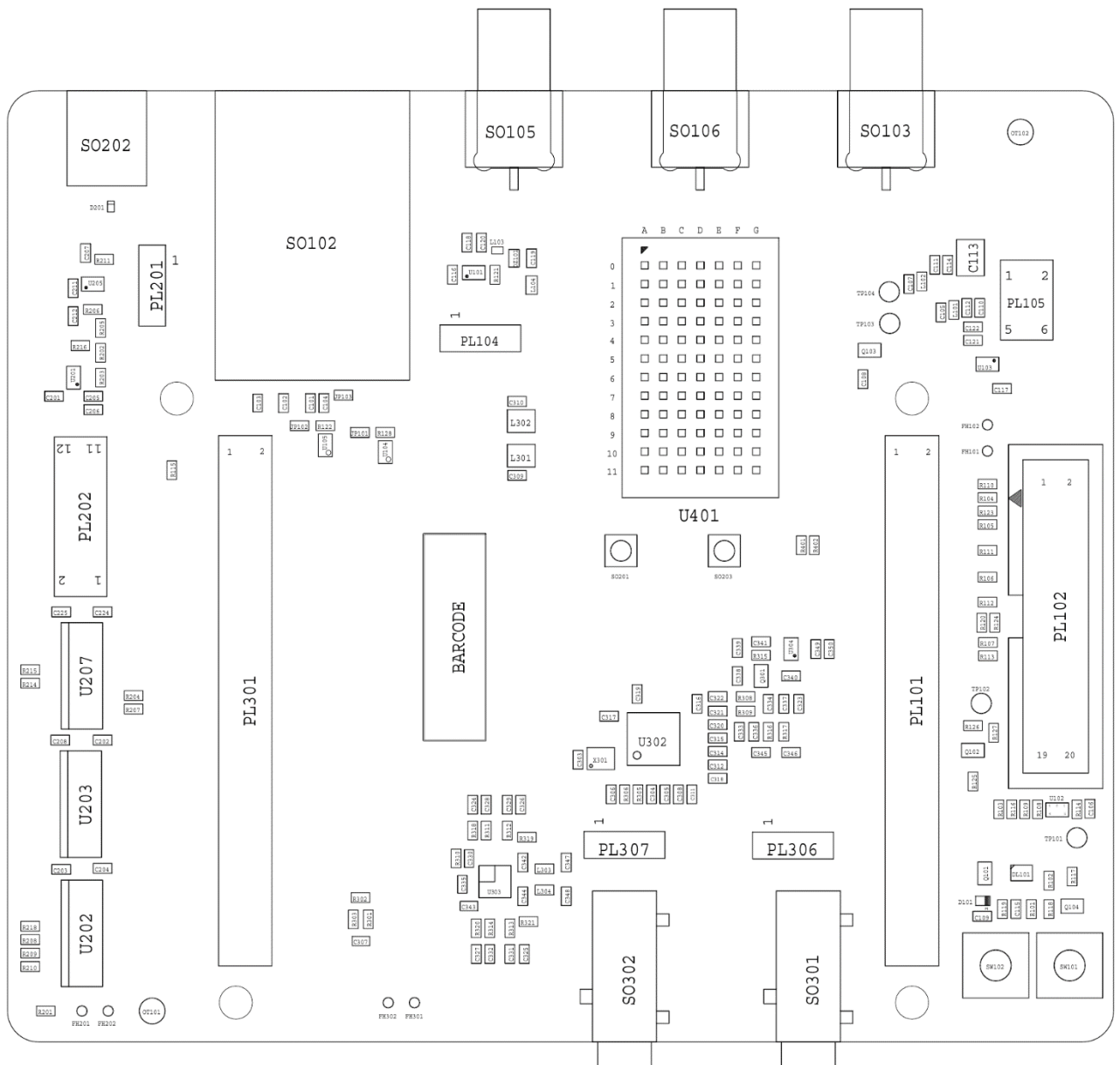






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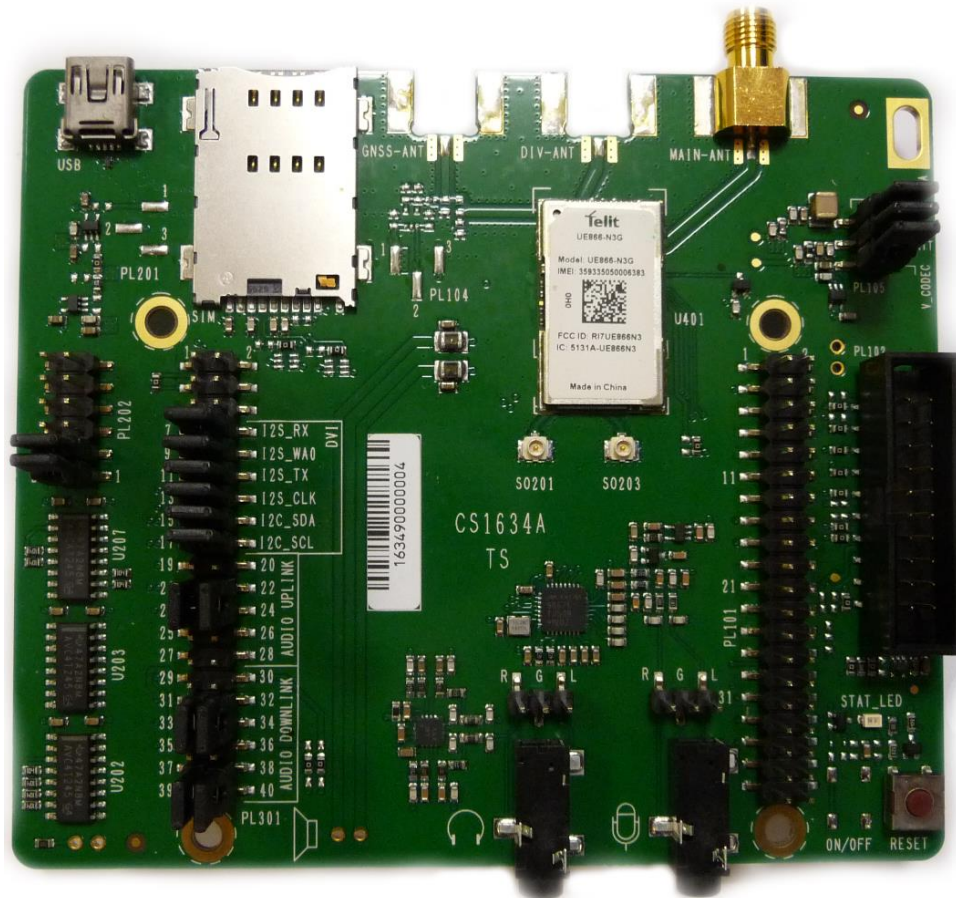
3.3.15 Components Layout



4 UE866-N3G INTERFACE

4.1 Description

This board allows easily interfacing the UE866-N3G modules with the EVK2 and testing their functionalities.

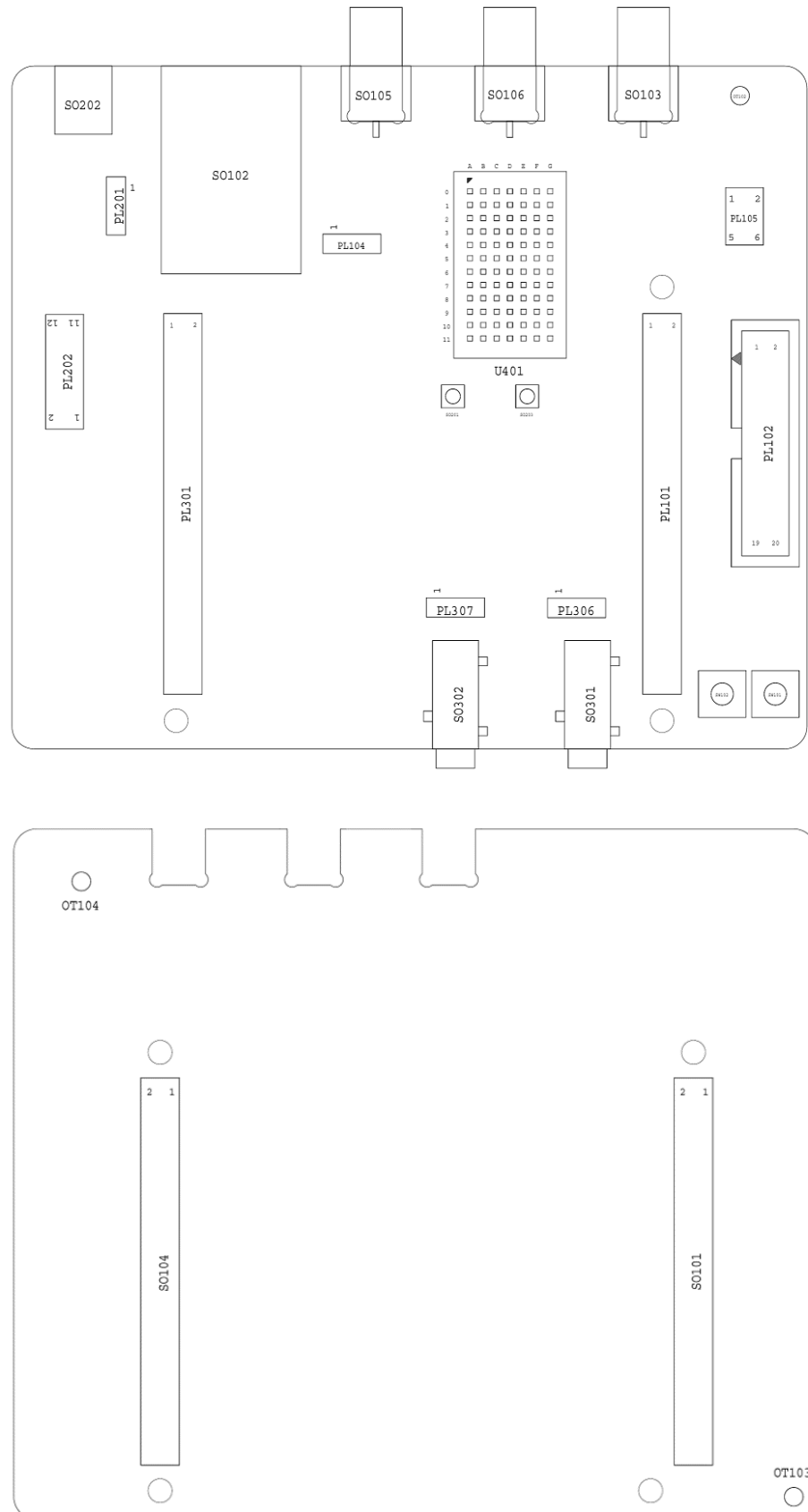


4.2 Physical dimensions

Item	Value
Length	92,00 mm
Width	107,00 mm
Height	25,00 mm

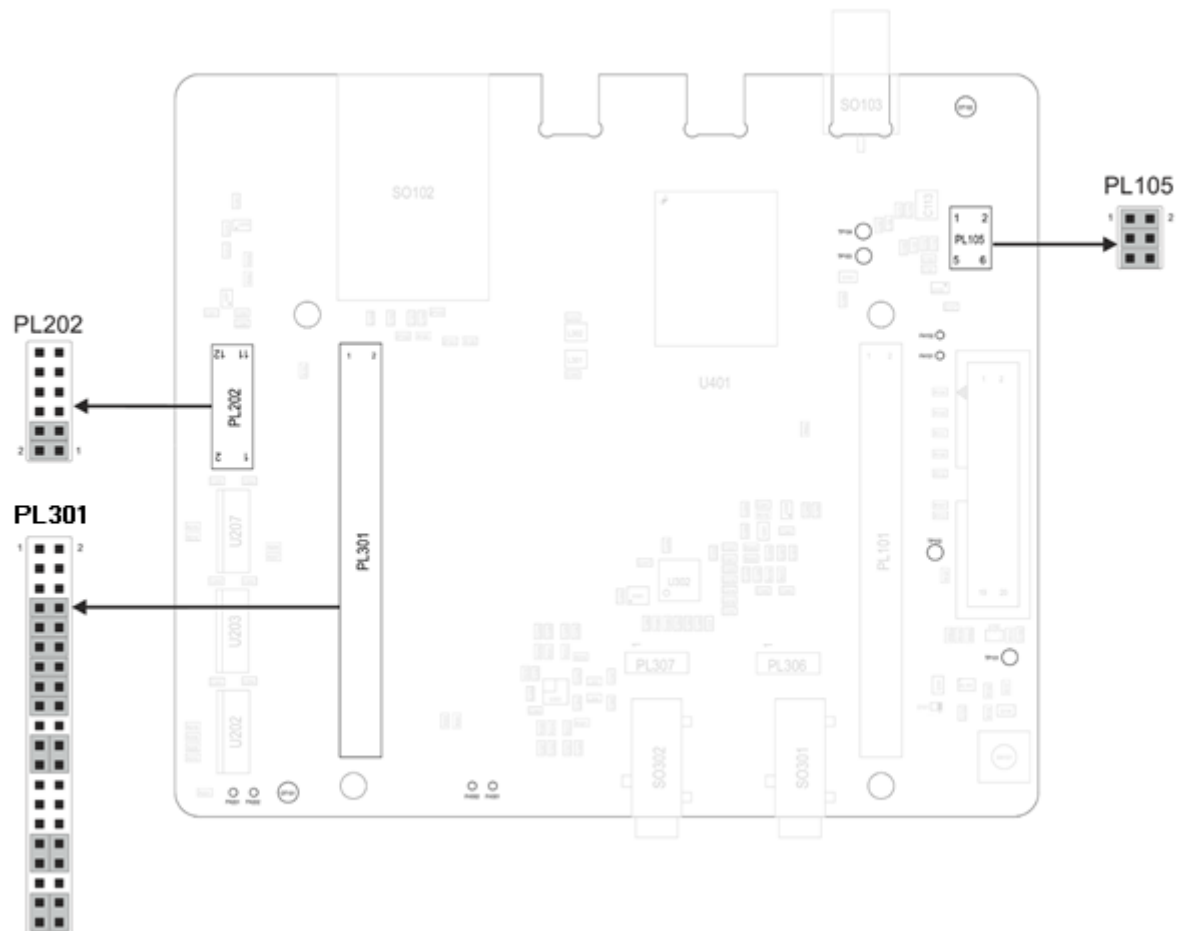
4.3 Interface Details

4.3.1 Connectors Position



4.3.2 Jumpers Setting

The following picture shows the jumpers placement and their default settings.
Details in the following paragraphs.



4.3.3 SO101 & SO104 - EVK2 Connection

The connections between the Interface and the EVK2 is done through two 2x40 pin female connectors present on the bottom (SO101 and SO104). Their pin functions are listed in the following tables:

SO101

Pin	Signal	Type	Function
1	NC	-	Do not connect
2	TX_AUX	Digital Output	to RS232 or USB level translators
3	RX_AUX	Digital Input	from RS232 or USB level translators
4	NC	-	Do not connect
5	GND	DC voltage	Power
6	NC	-	Do not connect
7	NC	-	Do not connect
8	NC	-	Do not connect
9	NC	-	Do not connect
10	NC	-	Do not connect
11	GND	DC voltage	Power
12	GND	DC voltage	Power
13	GND	DC voltage	Power
14	GND	DC voltage	Power
15	C109/DCD	Digital Output	to RS232 or USB level translator
16	C104/RXD	Digital Output	to RS232 or USB level translator
17	C103/TXD	Digital Input	from RS232 or USB level translator
18	C108/DTR	Digital Input	from RS232 or USB level translator
19	GND	DC voltage	Power
20	C107/DSR	Digital Output	to RS232 or USB level translator
21	C105/RTS	Digital Input	from RS232 or USB level translator
22	C106/CTS	Digital Output	to RS232 or USB level translator
23	C125/RING	Digital Output	to RS232 or USB level translator
24	NC	-	Do not connect

SO101

Pin	Signal	Type	Function
25	GND	DC voltage	Power
26	GND	DC voltage	Power
27	GND	DC voltage	Power
28	GND	DC voltage	Power
29	NC	-	Do not connect
30	NC	-	Do not connect
31	NC	-	Do not connect
32	NC	-	Do not connect
33	NC	-	Do not connect
34	NC	-	Do not connect
35	NC	-	Do not connect
36	NC	-	Do not connect
37	NC	-	Do not connect
38	GND	DC voltage	Power
39	GND	DC voltage	Power
40	GND	DC voltage	Power

SO104

Pin	Signal	Type	Function
1	VBATT	DC voltage	Power
2	VBATT	DC voltage	Power
3	VBATT	DC voltage	Power
4	VBATT	DC voltage	Power
5	GND	DC voltage	Power
6	GND	DC voltage	Power
7	GND	DC voltage	Power
8	GND	DC voltage	Power
9	NC	-	Do not connect
10	NC	-	Do not connect
11	GND	DC voltage	Power
12	GND	DC voltage	Power
13	GND	DC voltage	Power
14	GND	DC voltage	Power
15	RESERVED	-	
16	NC	-	Do not connect
17	RESET*	Digital Signal	Module Reset
18	NC	-	Do not connect
19	NC	-	Do not connect
20	NC	-	Do not connect
21	STAT_LED	Digital Signal	Status Indicator LED
22	NC	-	Do not connect
23	NC	-	Do not connect
24	NC	-	Do not connect
25	GND	DC voltage	Power
26	GND	DC voltage	Power
27	GND	DC voltage	Power
28	GND	DC voltage	Power

SO104

Pin	Signal	Type	Function
29	NC	-	Do not connect
30	NC	-	Do not connect
31	SIMIO	Digital Signal	SIM Data I/O
32	SIMCLK	Digital Signal	SIM Clock
33	SIMRST	Digital Signal	SIM Reset
34	SIMVCC	DC voltage	SIM Power
35	SIMIN	Digital Signal	SIM Presence detector
36	NC	-	Do not connect
37	NC	-	Do not connect
38	NC	-	Do not connect
39	GND	DC voltage	Power
40	GND	DC voltage	Power



The signals related to MAIN UART and AUX_UART on the SO101 and SO104 have a different Logic level from the GE866 because they have been adapted to the EVK2 levels (2.8V DC).

4.3.4 Antenna Connectors

4.3.4.1 SO103 - GSM Antenna connector

The UE866 is provided by one single RF antenna. The connector is SO103 and it is a female SMA.

A WCDMA compatible antenna (Refer to the product's HW user guide) must be connected to SO103.

4.3.5 PL105 - Power Supply Setting

The PL105 connector is permitting to configure how to supply the module.

The Interface is designed to supply and filter the two Module's inputs VBATT and VBATT_PA and separately the rest of circuits of the Interface (VBATT_AUX)

The connector is provided by 3 Jumpers (Mounted by default) that permits to:

- Select if to supply the module from EVK2 or from an external source
- Insert a Power consumption Meter in series to the supply

The connector carries the following signals:

PL105		
Pin	Signal	Function
1	VBATT_PA (Module)	Module's VBATT_PA signal
2	VBATT_PA (EVK2)	VBATT_PA from the EVK2
3	VBATT (Module)	Module's VBATT signal
4	VBATT (EVK2)	VBATT from the EVK2
5	VBATT_AUX (Interface)	Supply input for the Interface circuits (except the module)
6	VBATT_AUX (EVK2)	VBATT_AUX from the EVK2 usable to supply the Interface's circuit.

4.3.6 SIM Holder and SIM Detection

The Interface is provided by a SIM Holder (SO102).

The SIM holder lines are in parallel to the lines connected to the SIM Holder on EVK2 so it is not allowed to have a SIM in both holders.

Due to the fact the product is not provided by a dedicated pin for the HW SIM Presence detection, it is possible to select one GPIO to be used for this function.

On the interface it has been considered to have the possibility to choose between GPIO 5, 6 or 7 adding a Jumper on PL301.

On PL301 the lines dedicated to this activity are:

SIM IN Settings on PL301

Pin	Signal	Function
1	GPIO_07	GPIO_07 on module
2	SIM_IN	SIMIN Line from SIM Holder SO102
3	GPIO_06	GPIO_06 on module
4	SIM_IN	SIMIN Line from SIM Holder SO102
5	GPIO_05	GPIO_05 on module
6	SIM_IN	SIMIN Line from SIM Holder SO102

Supposing to define the GPIO_05 as SIM detection (See AT Commands user guide) it is needed to add a jumper between pin 5 and 6 of PL301.

4.3.7 USB

The Interface is provided by an USB connector (SO202) permitting to access the UE866 USB 2.0 port.

The connector is a MINI USB Type B.

Please refer to the Module's HW user guide for its use and behaviour.

4.3.8 RESET

The Interface is provided by a button that permits to RESET the module.

Please refer to the Module's HW user guide for its use and behaviour.

4.3.9 STAT LED

The Interface is provided by a LED controlled by the STAT LED line of the module.

Please refer to the Module's HW user guide for its use and behaviour.

4.3.10 Expansion Connectors

4.3.10.1 PL101

The connector carries the following signals:

PL101		
Pin	Signal	Function
1	GND	Ground
2	VBATT_AUX	Interface Power supply
3	NC	
4	NC	
5	NC	
6	NC	
7	NC	
8	GPIO_01/DVI_RX	Digital audio interface RX
9	NC	
10	NC	
11	NC	
12	ADC_IN	11 bit ADC converter, 0-1.2V DC
13	VRTC	Real Time Clock backup
14	DAC_OUT	DAC converter
15	VAUX/PWRMON	Power supply for external devices/Power ON Monitor
16	NC	
17	NC	
18	NC	
19	GPIO_06	GPIO
20	NC	

PL101

Pin	Signal	Function
21	NC	
22	NC	
23	GPIO_03/DVI_TX	Digital audio interface TX
24	GPIO_04/DVI_CLK	Digital audio interface Clock
25	GPIO_01/DVI_WA0	Digital audio interface WA0
26	GPIO_07/STAT_LED	Status pin
27	NC	
28	NC	
29	GPIO_06	GPIO
30	GPIO_05	GPIO
31	NC	
32	NC	
33	NC	
34	NC	
35	NC	
36	NC	
37	NC	
38	NC	
39	NC	
40	NC	

4.3.10.2 PL202

The connector carries the following signals:

PL202		
Pin	Signal	Function
1	TX_AUX	AUX UART TX (Output from Module)
2	TX_AUX (Lev. Adapter)	AUX UART TX (Input of Level Adapter)
3	RX_AUX	AUX UART RX (Input to Module)
4	RX_AUX (Lev. Adapter)	AUX UART RX (Output from Level Adapter)
5	NC	
6	NC	
7	NC	
8	NC	
9	NC	
10	NC	
11	GND	
12	NC	

There are two Jumpers on this connector that permit to connect the AUX UART of the module to the level adapter (1.8V to 2.8V DC and vice versa) interfacing the EVK2.

The Jumpers are set between Pin 1 and 2 for the TX_AUX signal and between pin 3 and 4 for the RX_AUX signal.

In case is needed to connect an external application to the AUX UART or simply to isolate it from the rest of the circuitry it is only needed to remove the two jumpers.

4.3.11 Audio Section and Settings

The Interface is equipped with an Audio Codec usable in connection with the module's DVI.

4.3.11.1 Audio Codec

The Interface is provided by an Audio codec (MAX9867ETJ from Maxim) that could be used to interface the Module's DVI.

The CODEC could be programmed through the I2C using two GPIOs of the module (GPIO_05 for I2C_SCL and GPIO_06 for I2C_SDA) and the AT#I2CWR command (see AT Commands specification).

4.3.11.2 Audio Inputs

The Interface Board is provided by a set of possible Audio inputs to interface the Audio circuitry (i.e. Audio Codec) or directly the module.

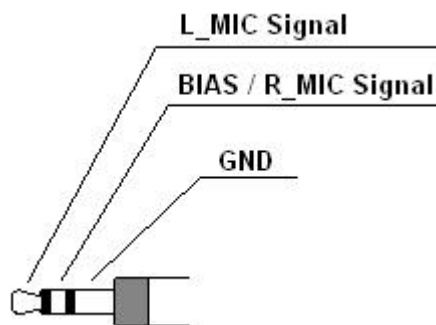
Its configuration could be set using the Jumpers on PL301.

You could refer to the “PL301 - Audio Settings” paragraph for the details.

4.3.11.2.1 Microphone Input

This circuit permits to connect a standard **electret microphone**.

It could be connected using the SO301 connector (Jack 3.5mm) where the jack contacts are described in the following Image:



Or using the PL306 connector where the pin-out is the following:

- 1 BIAS/R_MIC Signal
- 2 GND
- 3 L_MIC Signal

4.3.11.3 Audio Outputs

The Interface is provided by a set of possible Audio Outputs to interface the Audio circuitry (i.e. Audio Codec).

Its configuration could be set using the Jumpers on PL301.

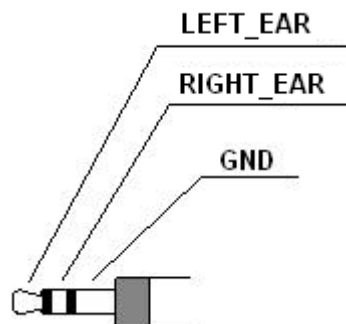
You could refer to the “PL301 - Audio Settings” paragraph for the details.

4.3.11.3.1 EAR Output

This part of the circuit permits to amplify the audio signal coming from the Codec.

It is designed using a MAX9722 amplifier from Maxim

This circuit permits to connect a headset using the SO302 connector (Jack 3.5mm) where the jack contacts are described in the following Image:



Or using the PL602 connector where the pin-out is the following:

- 1 RIGHT_EAR
- 2 GND
- 3 LEFT_EAR

4.3.11.4 PL301 – Audio Settings

The Audio Configuration could be done using the Jumpers on PL301.

4.3.11.4.1 DVI and I2C Connections

This connector allows configuring GPIOs from 1 to 6 as DIGITAL AUDIO INTERFACE.

This configuration is done setting the jumpers as indicated below:

DVI and I2C connections

Jumpers on Pin	Signal on Module	Description
7-8	GPIO 02/DVI RX	DVI RX
9-10	GPIO 01/DVI WA0	DVI WA0
11-12	GPIO 03/DVI TX	DVI TX
13-14	GPIO 04/DVI CLK	DVI CLK
15-16	GPIO 06	I2C SDA (GPIO used as I2C SDA with AT#I2CWR only to configure external codec)
17-18	GPIO 05	I2C SCL (GPIO used as I2C SCL with AT#I2CWR only to configure external codec)

If the DVI is not needed you could remove all the above jumpers and use the signals as normal GPIOs.

4.3.11.4.2 Audio Path Settings

On another section of PL301 is possible to configure the path of audio data Analog or digital.

Audio Uplink Setting on PL301

Jumpers on Pin	Signal	Description
19-21 20-22	MIC- (Modem) MIC+ (Modem)	From SO301/PL306 to Module (NOT SUPPORTED)
21-23 22-24	MIC L – (Codec) MIC L + (Codec)	From SO301/PL306 to Audio Codec
23-25 24-26	MIC L – (Codec) MIC L + (Codec)	From EVK2 to Audio Codec
25-27 26-28	MIC- (Modem) MIC+ (Modem)	From EVK2 to Module (NOT SUPPORTED)

Audio Downlink Setting on PL301

Jumpers on Pin	Signal	Description
29-31 30-32	SPK+ (Modem)	From Module (NOT SUPPORTED)
33-35 34-36	SPK- (Modem)	From Module (NOT SUPPORTED)
31-33 32-34	LOUTP ROUTP	From CODEC
35-37 36-38	LOUTN ROUTN	From CODEC

The Default setting is DVI connected Uplink from SO301 to CODEC, Downlink from CODEC.

4.3.12 Audio Accessories

The following tables show the suggested specification to obtain the best performance from off-the-shelf accessories.

4.3.12.1.1 Headset Specification

The typical characteristics of the Microphone and Earpiece to be used with the Interface are:

Microphone

Item	Value
Nominal sensitivity	-45dBV _{rms} /1Pa (+/- 3dB)
Line coupling	AC
Nominal Voltage	2V
Range of Using Voltage	(1÷10)V
Consumption Current	(150÷500) μ A
Impedance	2,2K Ω
Signal to Noise Ratio	56dB /1KHz/1Pa (A curve)
Inner EMI capacitor between terminals	10pF, 33pF

Earpiece

Item	Value
Rated Input Power	5mW
Maximum Input Power	20mW
Coil Impedance	32 Ω \pm 5 Ω @ 1kHz
SPL	95 \pm 3 dB @ 1KHz/1mW sine wave
Resonance frequency (Fo)	< 350Hz
Useful Bandwidth	Fo \div 8000 Hz @ -3dB

4.3.13 Stand-alone setup

The UE866 Interface could be used in Stand alone (without the EVK2 mainboard) with the following remarks:

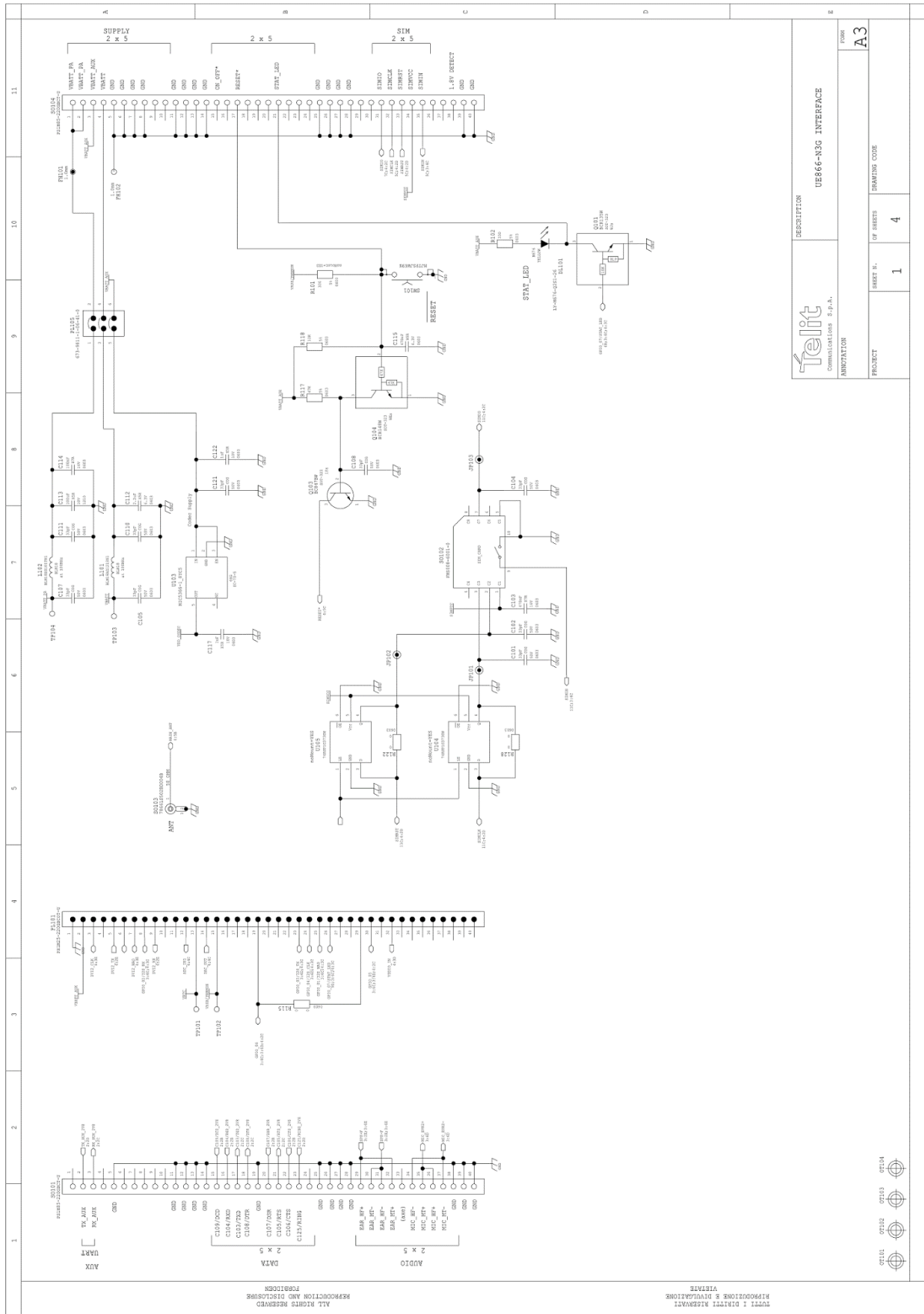
- The Power supply could be provided connecting a Power supply to SO104 or PL105 (removing the Jumpers)
- The Power supply level has to be carefully verified in the Module's HW User Guide
- The SIM could be inserted in the SO102 Holder
- The Audio section could be used through the codec using SO301 and SO302
- The RESET line could be controlled using the SW101 Button
- The STAT LED line is present on the Interface (DL101)
- The Antenna could be connected on SO103 (Ref to Module's HW User Guide for the correct model)
- The serial communication with the module could be done using the USB port
- The communication with the module through the UART requires the use of a level adapter between the PC and the Interface (the lines are available on SO101 but please be aware that the signals on that connector have been adapted to the 2.8V logic levels of EVK2)

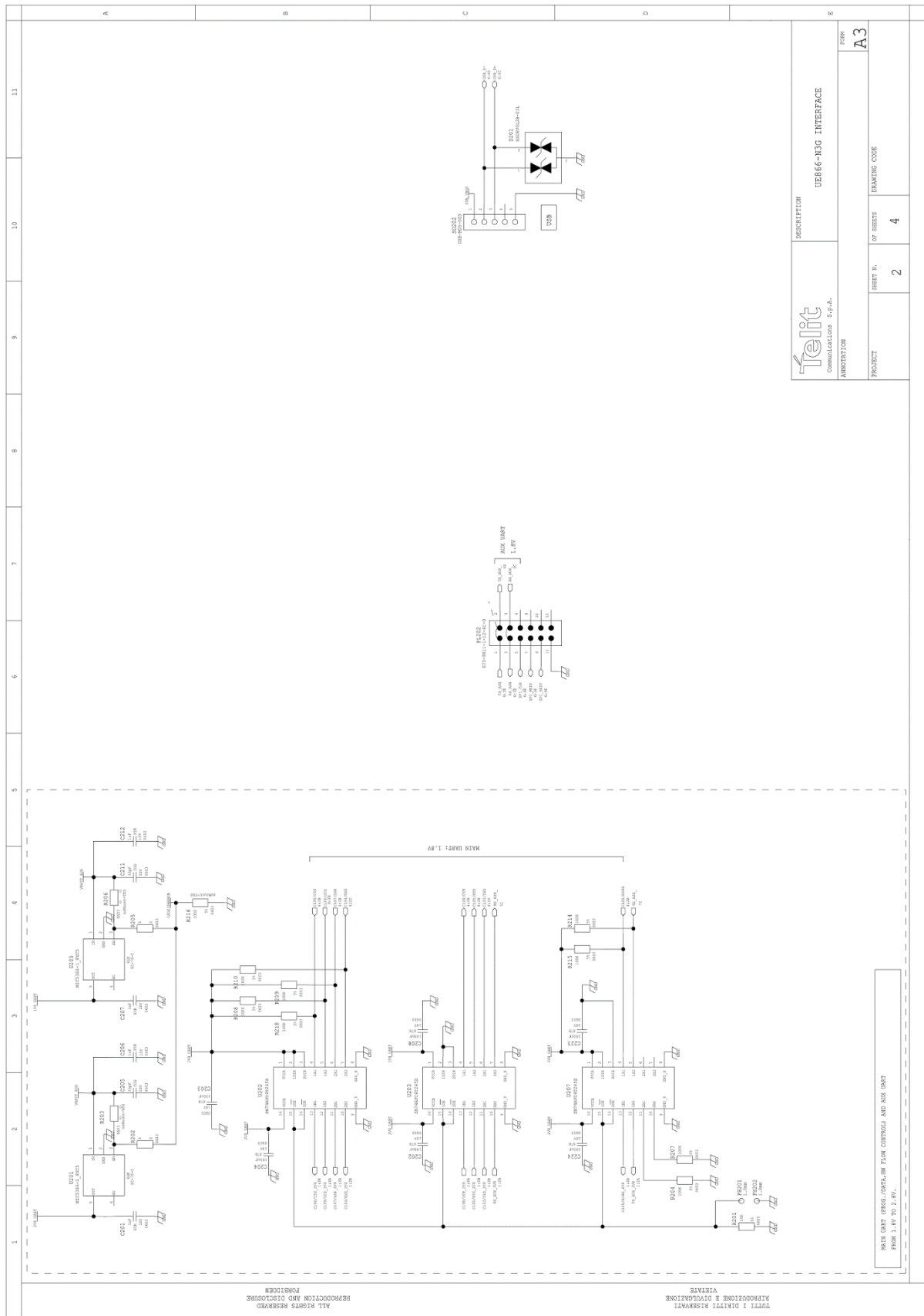
4.3.14 FIRMWARE UPDATE

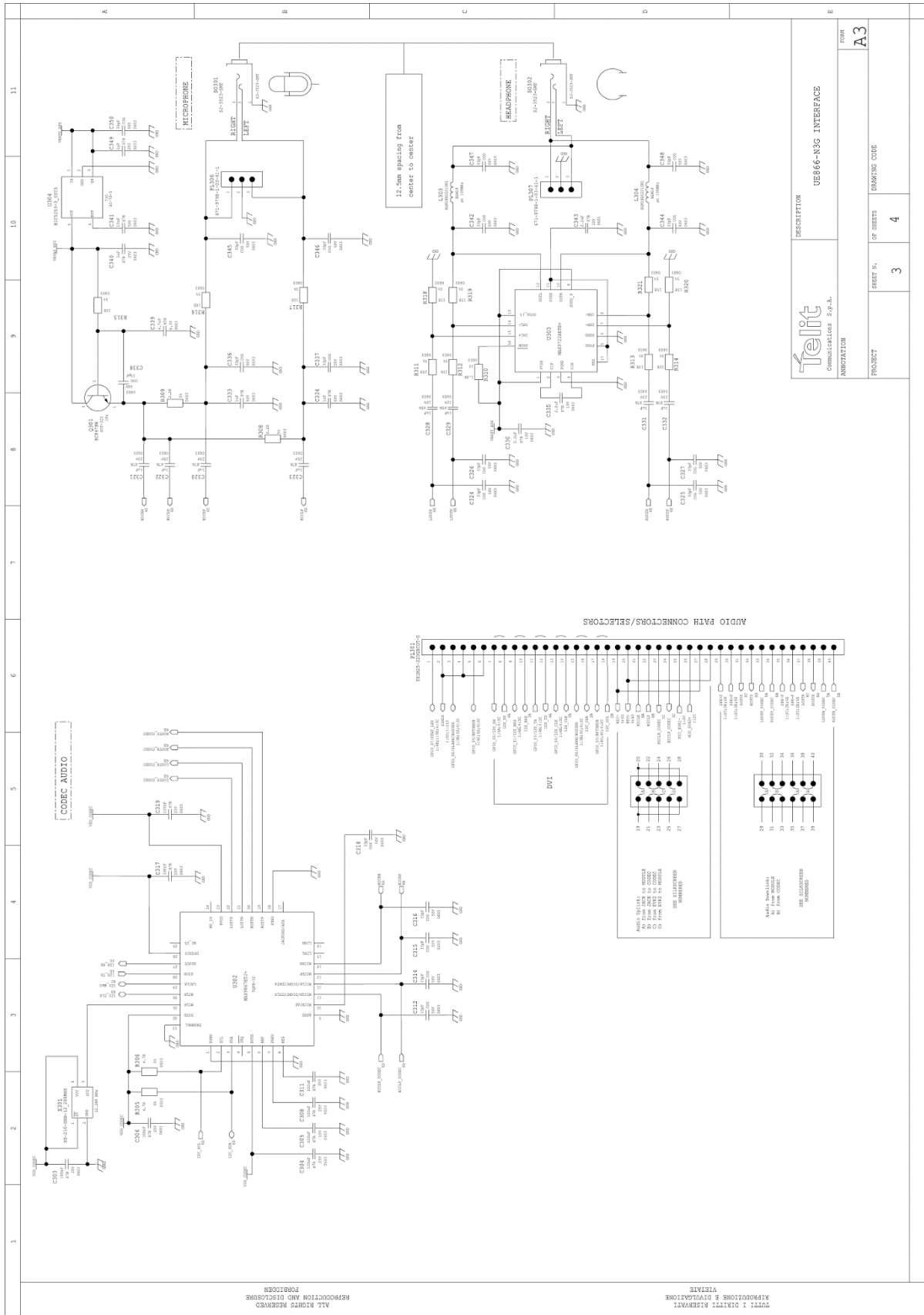
You can update the Telit Module firmware through the serial port or the USB.

Please refer to the Module's Documentation for details.

4.3.15 Interface Schematics





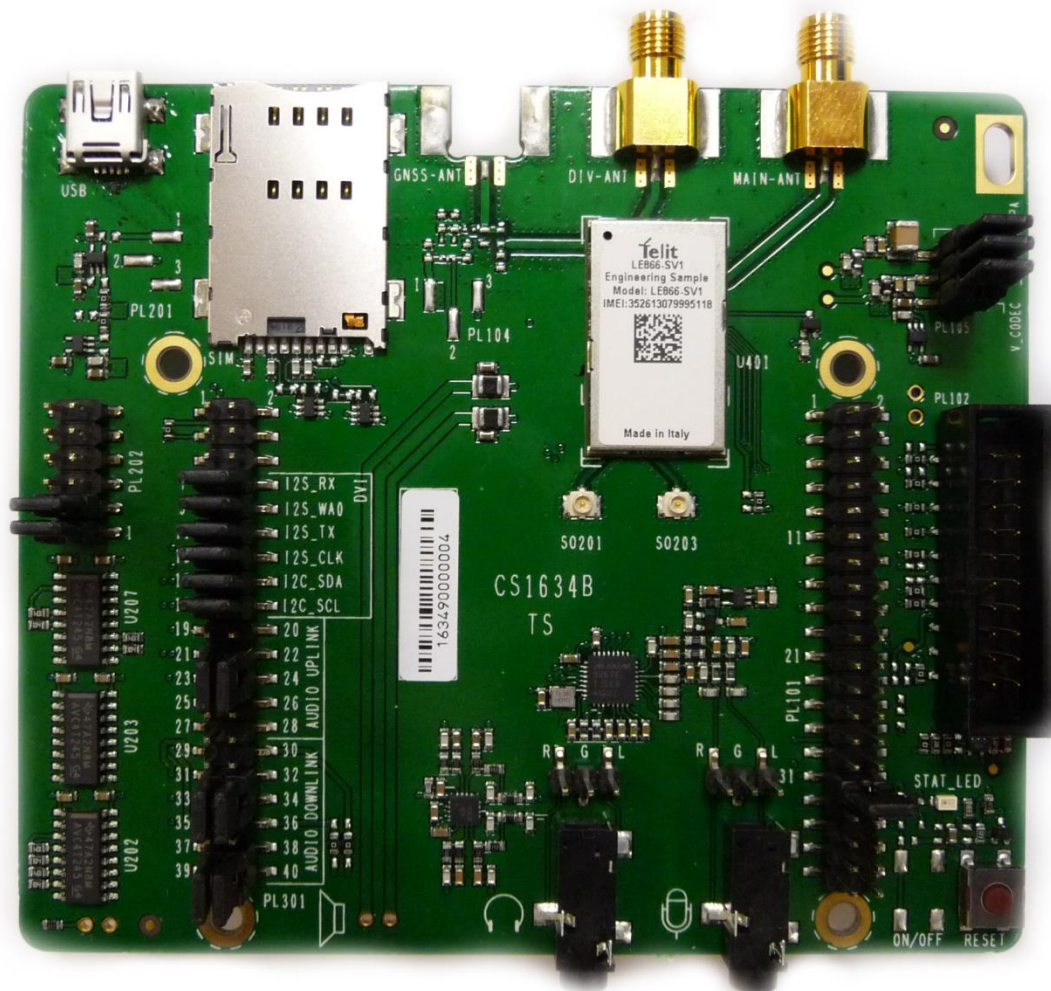


1	2	3	4	5	6	7	8	9	10	11
U401 UB866-331324-4 V0000_07										

5 LE866 INTERFACE

5.1 Description

This board allows easily interfacing the LE866 modules with the EVK2 and testing their functionalities.

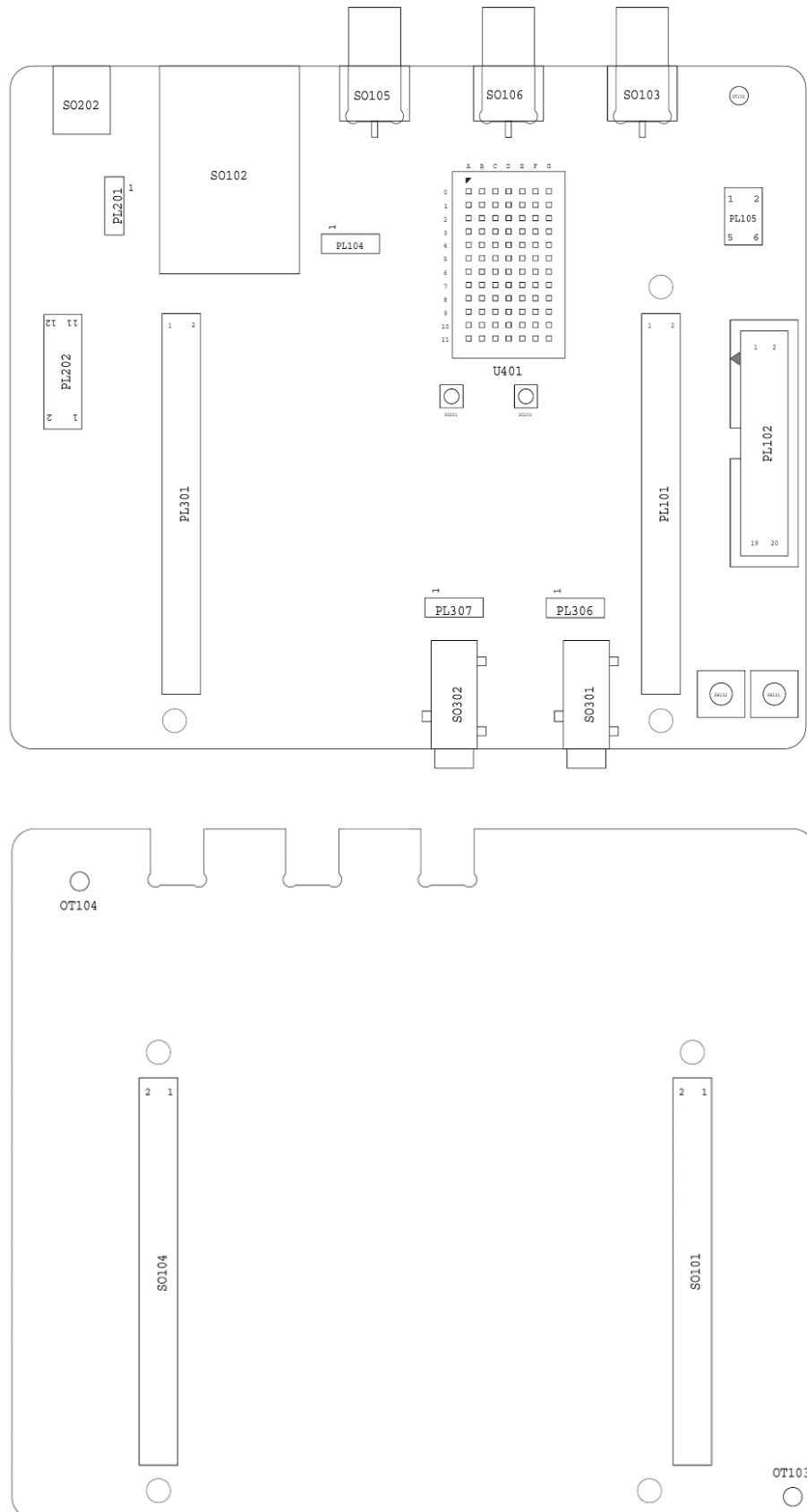


5.2 Physical dimensions

Item	Value
Length	92,00 mm
Width	107,00 mm
Height	25,00 mm

5.3 Interface Details

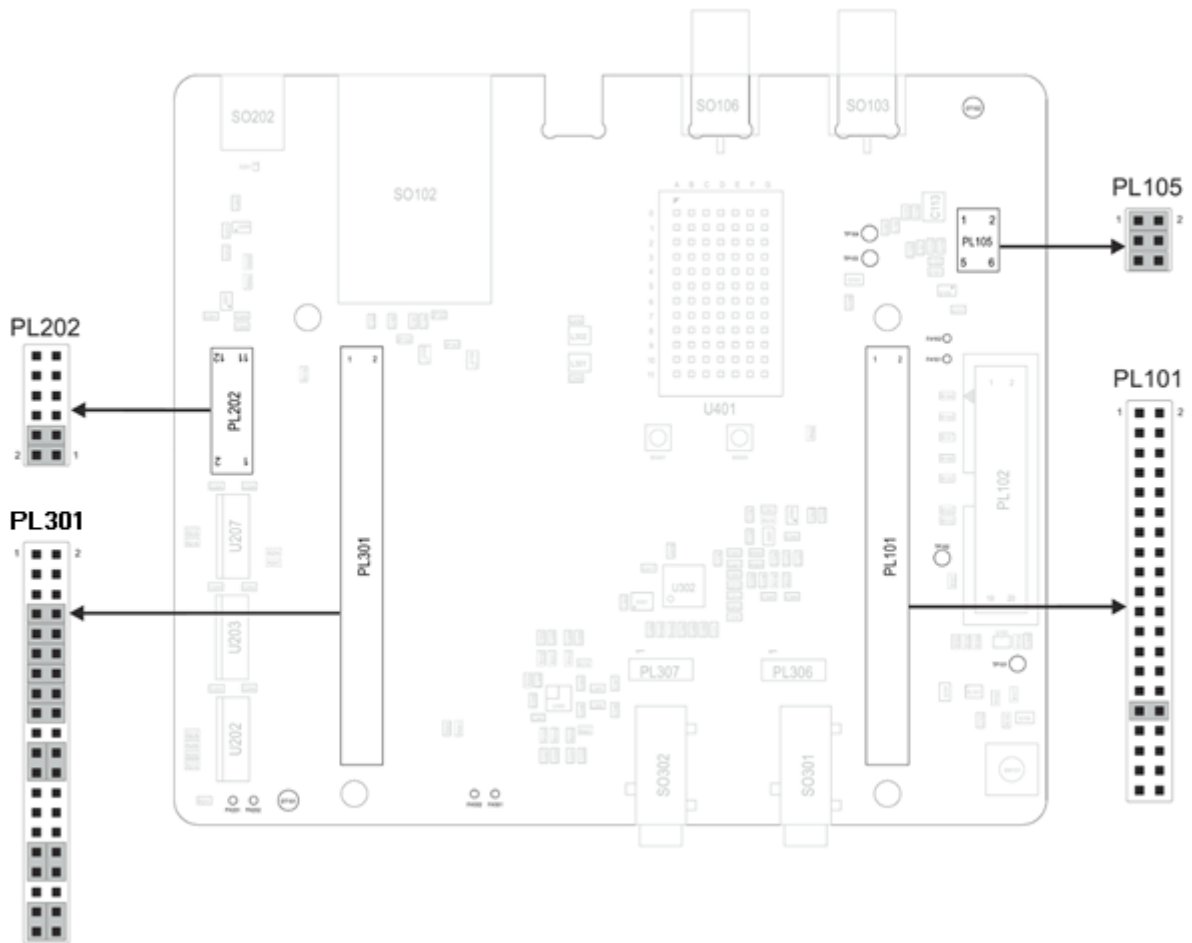
5.3.1 Connectors Position



5.3.2 Jumpers Setting

The following picture shows the jumpers placement and their default settings.

Details in the following paragraphs.



5.3.3 SO101 & SO104 - EVK2 Connection

The connections between the Interface and the EVK2 is done through two 2x40 pin female connectors present on the bottom (SO101 and SO104). Theirs pin functions are listed in the following tables:

SO101

Pin	Signal	Type	Function
1	NC	-	Do not connect
2	TX_AUX	Digital Output	to RS232 or USB level translators
3	RX_AUX	Digital Input	from RS232 or USB level translators
4	NC	-	Do not connect
5	GND	DC voltage	Power
6	NC	-	Do not connect
7	NC	-	Do not connect
8	NC	-	Do not connect
9	NC	-	Do not connect
10	NC	-	Do not connect
11	GND	DC voltage	Power
12	GND	DC voltage	Power
13	GND	DC voltage	Power
14	GND	DC voltage	Power
15	C109/DCD	Digital Output	to RS232 or USB level translator
16	C104/RXD	Digital Output	to RS232 or USB level translator
17	C103/TXD	Digital Input	from RS232 or USB level translator
18	C108/DTR	Digital Input	from RS232 or USB level translator
19	GND	DC voltage	Power
20	C107/DSR	Digital Output	to RS232 or USB level translator
21	C105/RTS	Digital Input	from RS232 or USB level translator
22	C106/CTS	Digital Output	to RS232 or USB level translator
23	C125/RING	Digital Output	to RS232 or USB level translator
24	NC	-	Do not connect

SO101

Pin	Signal	Type	Function
25	GND	DC voltage	Power
26	GND	DC voltage	Power
27	GND	DC voltage	Power
28	GND	DC voltage	Power
29	NC	-	Do not connect
30	NC	-	Do not connect
31	NC	-	Do not connect
32	NC	-	Do not connect
33	NC	-	Do not connect
34	NC	-	Do not connect
35	NC	-	Do not connect
36	NC	-	Do not connect
37	NC	-	Do not connect
38	GND	DC voltage	Power
39	GND	DC voltage	Power
40	GND	DC voltage	Power

SO104

Pin	Signal	Type	Function
1	VBATT	DC voltage	Power
2	VBATT	DC voltage	Power
3	VBATT	DC voltage	Power
4	VBATT	DC voltage	Power
5	GND	DC voltage	Power
6	GND	DC voltage	Power
7	GND	DC voltage	Power
8	GND	DC voltage	Power
9	NC	-	Do not connect
10	NC	-	Do not connect
11	GND	DC voltage	Power
12	GND	DC voltage	Power
13	GND	DC voltage	Power
14	GND	DC voltage	Power
15	RESERVED	-	
16	NC	-	Do not connect
17	RESET*	Digital Signal	Module Reset
18	NC	-	Do not connect
19	NC	-	Do not connect
20	NC	-	Do not connect
21	STAT_LED	Digital Signal	Status Indicator LED
22	NC	-	Do not connect
23	NC	-	Do not connect
24	NC	-	Do not connect
25	GND	DC voltage	Power
26	GND	DC voltage	Power
27	GND	DC voltage	Power
28	GND	DC voltage	Power

SO104

Pin	Signal	Type	Function
29	NC	-	Do not connect
30	NC	-	Do not connect
31	SIMIO	Digital Signal	SIM Data I/O
32	SIMCLK	Digital Signal	SIM Clock
33	SIMRST	Digital Signal	SIM Reset
34	SIMVCC	DC voltage	SIM Power
35	SIMIN	Digital Signal	SIM Presence detector
36	NC	-	Do not connect
37	NC	-	Do not connect
38	NC	-	Do not connect
39	GND	DC voltage	Power
40	GND	DC voltage	Power



The signals related to MAIN UART and AUX_UART on the SO101 and SO104 have a different Logic level from the GE866 because they have been adapted to the EVK2 levels (2.8V DC).

5.3.4 Antenna Connectors

5.3.4.1 SO103 - Main Antenna connector

The connector SO103 (Female SMA) is related to the MAIN ANTENNA of the LE866.

An LTE compatible antenna (Refer to the product's HW user guide) must be connected to SO103.

5.3.4.2 SO106 - Diversity Antenna connector

The connector SO106 (Female SMA) is related to the Diversity Antenna input of the LE866.

An LTE compatible antenna (Refer to the product's HW user guide) must be connected to SO106.

5.3.5 PL105 - Power Supply Setting

The PL105 connector is permitting to configure how to supply the module.

The Interface is designed to supply and filter the two Module's inputs VBATT and VBATT_PA and separately the rest of circuits of the Interface (VBATT_AUX)

The connector is provided by 3 Jumpers (Mounted by default) that permits to:

- Select if to supply the module from EVK2 or from an external source
- Insert a Power consumption Meter in series to the supply

The connector carries the following signals:

PL105		
Pin	Signal	Function
1	VBATT_PA (Module)	Module's VBATT_PA signal
2	VBATT_PA (EVK2)	VBATT_PA from the EVK2
3	VBATT (Module)	Module's VBATT signal
4	VBATT (EVK2)	VBATT from the EVK2
5	VBATT_AUX (Interface)	Supply input for the Interface circuits (except the module)
6	VBATT_AUX (EVK2)	VBATT_AUX from the EVK2 usable to supply the Interface's circuit.

5.3.6 SIM Holder and SIM Detection

The Interface is provided by a SIM Holder (SO102).

The SIM holder lines are in parallel to the lines connected to the SIM Holder on EVK2 so it is not allowed to have a SIM in both holders.

Due to the fact the product is not provided by a dedicated pin for the HW SIM Presence detection, it is possible to select one GPIO to be used for this function.

On the interface it has been considered to have the possibility to choose between GPIO 5, 6 or 7 adding a Jumper on PL301.

On PL301 the lines dedicated to this activity are:

SIM IN Settings on PL301

Pin	Signal	Function
1	GPIO_07	GPIO_07 on module
2	SIM_IN	SIMIN Line from SIM Holder SO102
3	GPIO_06	GPIO_06 on module
4	SIM_IN	SIMIN Line from SIM Holder SO102
5	GPIO_05	GPIO_05 on module
6	SIM_IN	SIMIN Line from SIM Holder SO102

Supposing to define the GPIO_05 as SIM detection (See AT Commands user guide) it is needed to add a jumper between pin 5 and 6 of PL301.

5.3.7 USB

The Interface is provided by an USB connector (SO202) permitting to access the UE866 USB 2.0 port.

The connector is a MINI USB Type B.

Please refer to the Module's HW user guide for its use and behaviour.

5.3.8 RESET

The Interface is provided by a button that permits to RESET the module.

Please refer to the Module's HW user guide for its use and behaviour.

5.3.9 STAT LED

The Interface is provided by a LED controlled by the STAT LED line of the module.

Please refer to the Module's HW user guide for its use and behaviour.

5.3.10 Expansion Connectors

5.3.10.1 PL101

The connector carries the following signals:

PL101		
Pin	Signal	Function
1	GND	Ground
2	VBATT_AUX	Interface Power supply
3	NC	
4	NC	
5	NC	
6	NC	
7	NC	
8	GPIO_01/DVI_RX	Digital audio interface RX
9	NC	
10	NC	
11	NC	
12	ADC_IN	11 bit ADC converter, 0-1.2V DC
13	VRTC	Real Time Clock backup
14	DAC_OUT	DAC converter
15	VAUX/PWRMON	Power supply for external devices/Power ON Monitor
16	NC	
17	NC	
18	NC	
19	GPIO_06	GPIO
20	NC	

PL101

Pin	Signal	Function
21	NC	
22	NC	
23	GPIO_03/DVI_TX	Digital audio interface TX
24	GPIO_04/DVI_CLK	Digital audio interface Clock
25	GPIO_01/DVI_WA0	Digital audio interface WA0
26	GPIO_07/STAT_LED	Status pin
27	NC	
28	NC	
29	GPIO_06	GPIO
30	GPIO_05	GPIO
31	NC	
32	NC	
33	NC	
34	NC	
35	NC	
36	NC	
37	NC	
38	NC	
39	NC	
40	NC	

5.3.10.2 PL202

The connector carries the following signals:

PL202		
Pin	Signal	Function
1	TX_AUX	AUX UART TX (Output from Module)
2	TX_AUX (Lev. Adapter)	AUX UART TX (Input of Level Adapter)
3	RX_AUX	AUX UART RX (Input to Module)
4	RX_AUX (Lev. Adapter)	AUX UART RX (Output from Level Adapter)
5	NC	
6	NC	
7	NC	
8	NC	
9	NC	
10	NC	
11	GND	
12	NC	

There are two Jumpers on this connector that permit to connect the AUX UART of the module to the level adapter (1.8V to 2.8V DC and vice versa) interfacing the EVK2.

The Jumpers are set between Pin 1 and 2 for the TX_AUX signal and between pin 3 and 4 for the RX_AUX signal.

In case is needed to connect an external application to the AUX UART or simply to isolate it from the rest of the circuitry it is only needed to remove the two jumpers.

5.3.11 Stand-alone setup

The Interface could be used in Stand alone (without the EVK2 mainboard) with the following remarks:

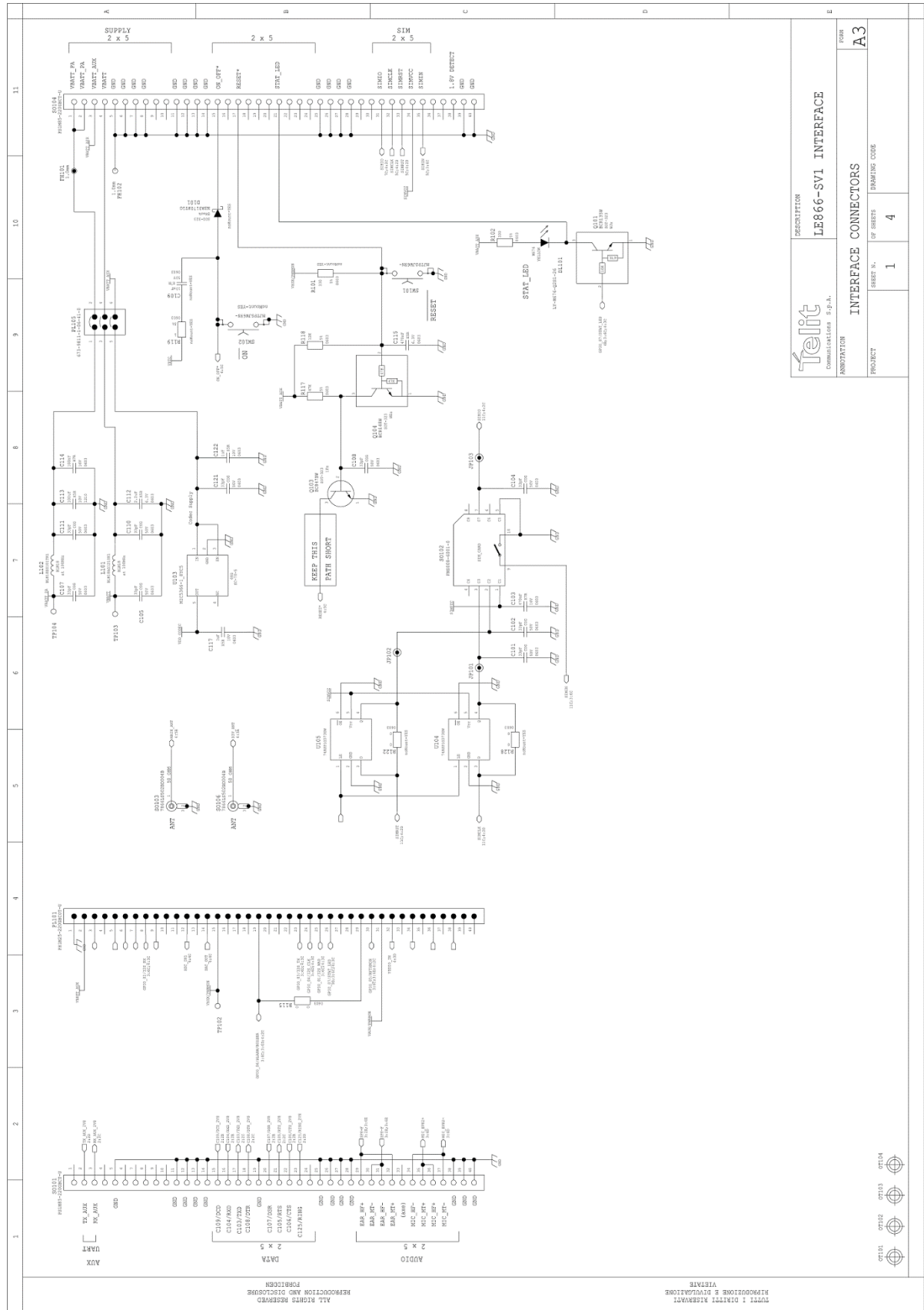
- The Power supply could be provided connecting a Power supply to SO104 or PL105 (removing the Jumpers)
- The Power supply level has to be carefully verified in the Module's HW User Guide
- The USIM could be inserted in the SO102 Holder
- The RESET line could be controlled using the SW101 Button
- The STAT LED line is present on the Interface (DL101)
- The Antennas could be connected on SO103 and SO106 (Ref to Module's HW User Guide for the correct model)
- The serial communication with the module could be done using the USB port
- The communication with the module through the UART requires the use of a level adapter between the PC and the Interface (the lines are available on SO101 but please be aware that the signals on that connector have been adapted to the 2.8V logic levels of EVK2)

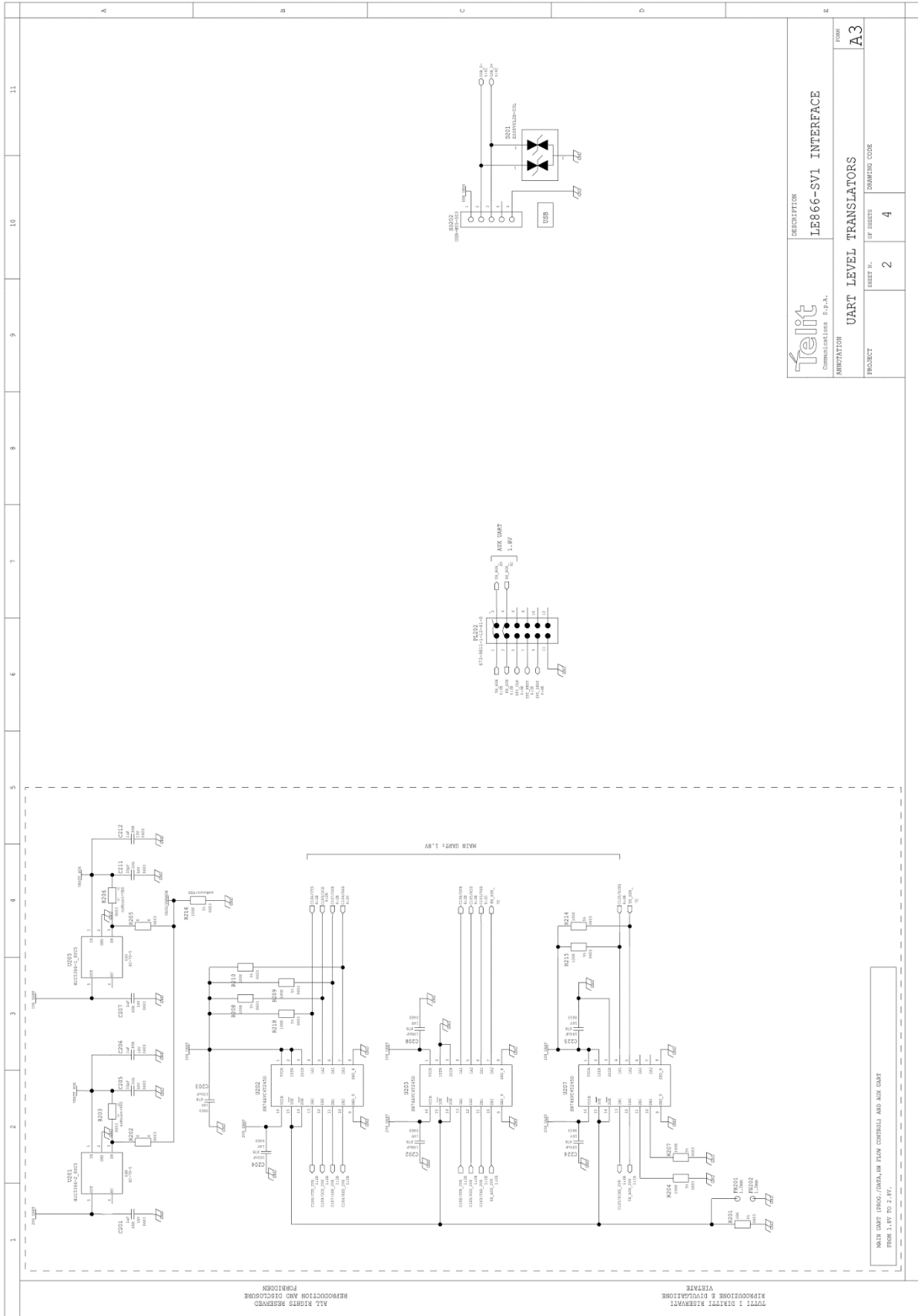
5.3.12 FIRMWARE UPDATE

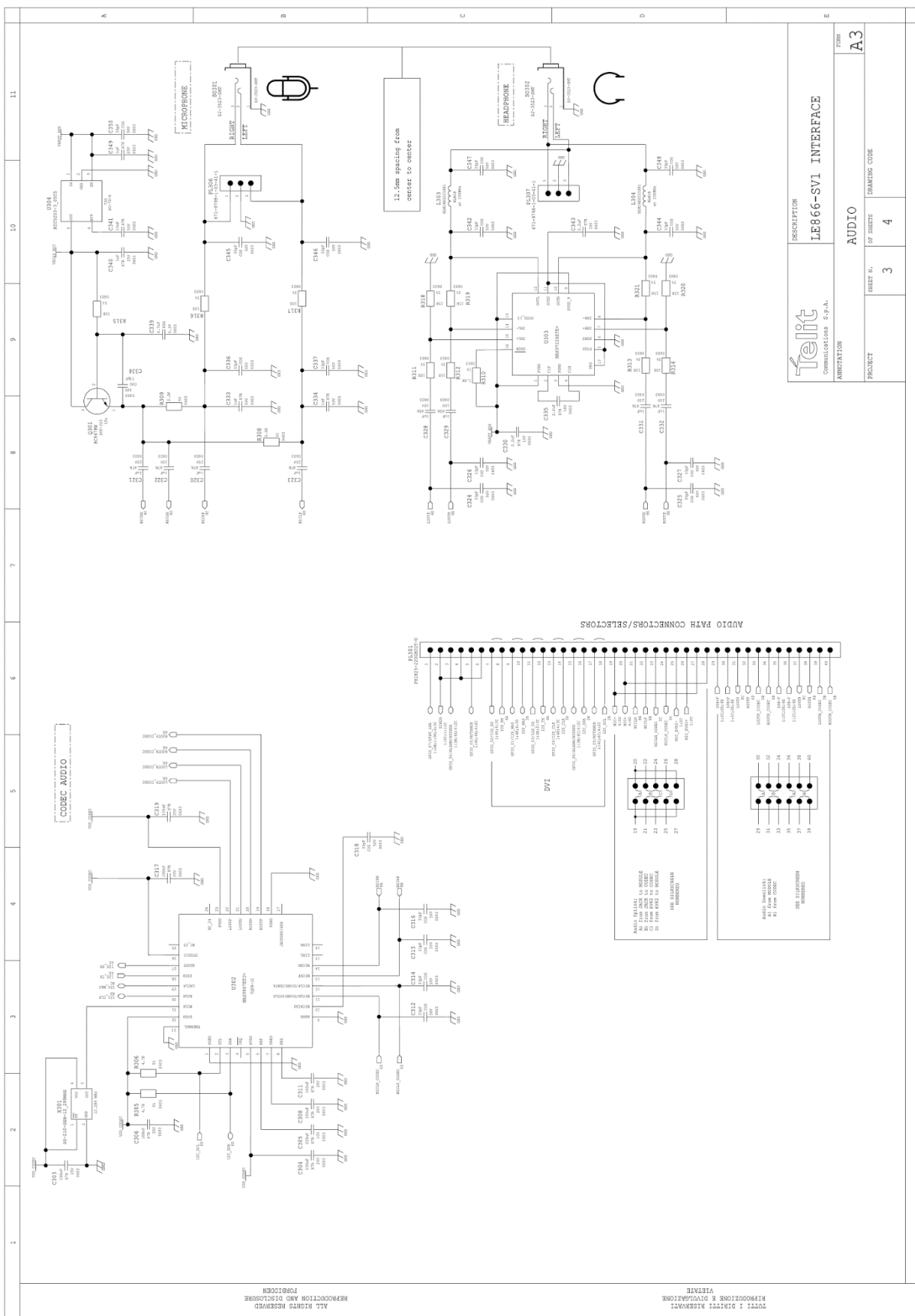
You can update the Telit Module firmware through the USB.

Please refer to the Module's Documentation for details.

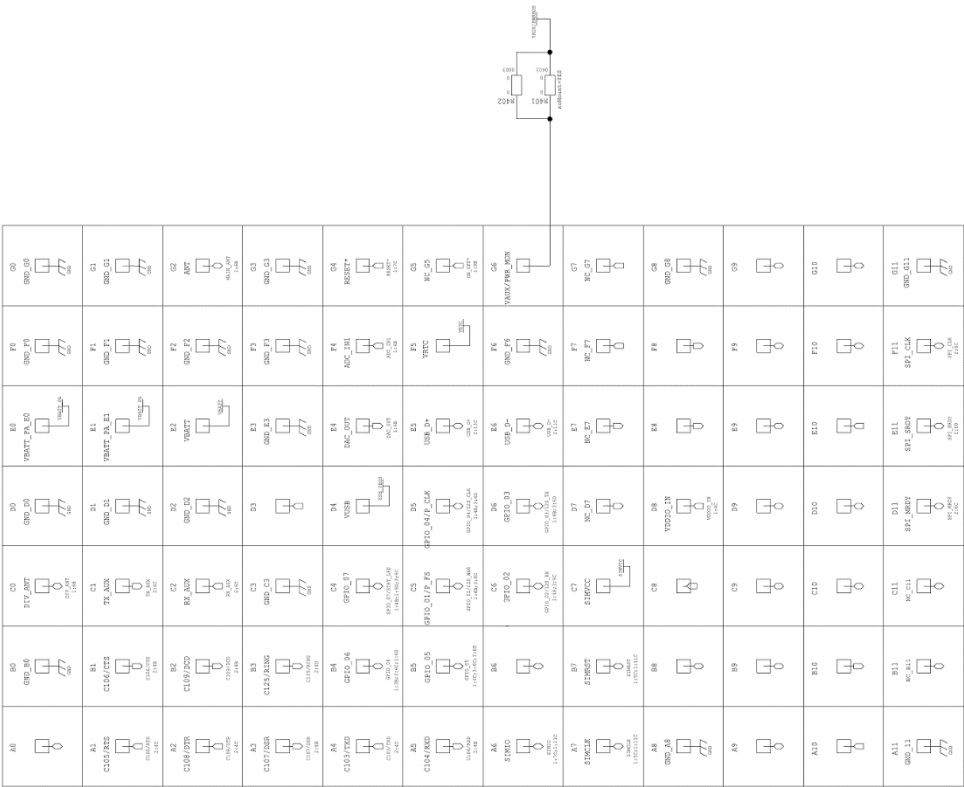
5.3.13 Interface Schematics







		DESCRIPTION	
COMMUNICATIONS S.p.A.		LE866-SV1 INTERFACE	
PROJECT		AUDIO	
SHEET N.		OF SHEETS	
3		4	
FORM		DRAWING CODE	
A3			

U401 LE866-031260-A REV. 1.0										
ALL RIGHTS RESERVED REPRODUCTION AND DISCLOSURE PROHIBITED										
										
DESCRIPTION LE866-SV1 INTERFACE										
FORM A3										
PROJECT 4										
SHEET N. 4 OF 4										
DRAWING CODE										

6 SAFETY RECOMMENDATIONS

READ CAREFULLY

Be sure the use of this product is allowed in the country and in the environment required. The use of this product may be dangerous and has to be avoided in the following areas:

Where it can interfere with other electronic devices in environments such as hospitals, airports, aircrafts, etc

Where there is risk of explosion such as gasoline stations, oil refineries, etc

It is responsibility of the user to enforce the country regulation and the specific environment regulation.

Do not disassemble the product; any mark of tampering will compromise the warranty validity.

We recommend following the instructions of the hardware user guides for a correct wiring of the product. The product has to be supplied with a stabilized voltage source and the wiring has to be conforming to the security and fire prevention regulations.

The product has to be handled with care, avoiding any contact with the pins because electrostatic discharges may damage the product itself. Same cautions have to be taken for the SIM, checking carefully the instruction for its use. Do not insert or remove the SIM when the product is in power saving mode.

The system integrator is responsible of the functioning of the final product; therefore, care has to be taken to the external components of the module, as well as of any project or installation issue, because the risk of disturbing the GSM network or external devices or having impact on the security. Should there be any doubt, please refer to the technical documentation and the regulations in force.

Every module has to be equipped with a proper antenna with specific characteristics. The antenna has to be installed with care in order to avoid any interference with other electronic devices and has to guarantee a minimum distance from the people (20 cm). In case of this requirement cannot be satisfied, the system integrator has to assess the final product against the SAR regulation.

The European Community provides some Directives for the electronic equipment introduced on the market. All the relevant information's are available on the European Community website:

<http://europa.eu.int/comm/enterprise/rte/dir99-5.htm>

The text of the Directive 99/05 regarding telecommunication equipments is available, while the applicable Directives (Low Voltage and EMC) are available at:

http://europa.eu.int/comm/enterprise/electr_equipment/index_en.htm

6.1 Disposal of this product in the European Union

According to the WEEE Directive 2012/19/EU, the crossed-out wheeled bin symbol on the product or on its packaging indicates that the product must not be disposed of with your other household waste.



For equipment in private household, it's user's responsibility to dispose of his waste equipment by handing it over to a designated collection point for the recycling of waste electrical and electronic equipment. For more information about where you can drop off your waste equipment from private household for recycling, please contact your local city office, your household waste disposal service or the retailer where you purchased the product. As a producer of electronic devices, TELIT provides for the financing of the treatment and recycling of waste returned through the designated collection points in accordance with local requirements. If you have professional electronic equipment that you purchased directly from TELIT that you wish to have picked up for recycling, please contact us to receive necessary information and instructions. The separate collection and recycling of your waste equipment at the time of disposal will help to conserve natural resources and ensure that it is recycled in a manner that protects human health and the environment.

Reference Directives:

2012/19/EU Directive of the European Parliament and of the Council of 4 July 2012 on waste electrical and electronic equipment (WEEE).

6.2 Disposal of this product in other countries outside the European Union

Please dispose of this product in accordance with local requirements; contact your local authorities or dealer and ask for the correct method of disposal.

7 DOCUMENT HISTORY

7.1 Revisions

Revision	Date	Changes
Rev 0	2016/02/10	First issue
Rev 1	2016/04/13	Updated Jumpers Layout
Rev 2	2016/09/01	Added LE866A1-KK

