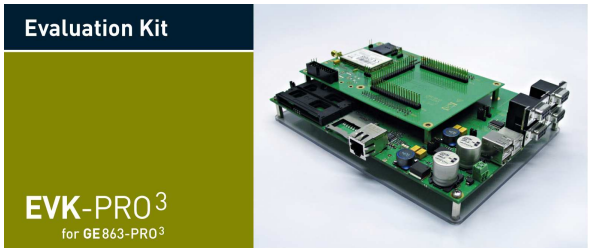
EVK-PRO^3 User Guide

1VV0300776 Rev. 4 – 2010-05-24

Making machines talk.

Applicable Products

PRODUCT	
	
Model	**P/N**
EVK-PRO^3	**3990150470**

Contents

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1. Introduction

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1.1. Scope

The purpose of this User Manual is to introduce the Telit environment for a quick and easy development of applications with Telit **GE863-PRO³** called **EVK-PRO³ EVALUATION KIT** (also indicated as **EVK-PRO³**).

1.2. Contact Information, Support

For general contact, technical support, to report documentation errors and to order manuals, contact Telit Technical Support Center (TTSC) at:

TS-EMEA@telit.com
TS-NORTHAMERICA@telit.com
TS-LATINAMERICA@telit.com
TS-APAC@telit.com

Alternatively, use:
http://www.telit.com/en/products/technical-support-center/contact.php
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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.

1.3. 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.

1.4. Related Documents

- Telit **GE863-PRO³** complete documentation available on the web site www.telit.com
- Telit **WE865-DUAL** complete documentation available on the web site www.telit.com

1.5. Document History

Revision	Date	Changes
ISSUE#0	2008-03-13	First Release
ISSUE#1	2008-05-23	Updated connectors pin-out tables in paragraph 4
ISSUE#2	2009-03-31	Updated images 3.1, 3.3, 4.3 Updated connector pin-out table 4.3 Added: 8 – Audio Section 11.1 – POWER ON/OFF Switch 11.2 – RESET Switch 11.3 – GSM POWER and RESET Switches Updated Annex B Interface board Schematics
ISSUE#3	2010-03-31	Restyling Added chapter 15 “Suggested design improvements”
ISSUE#4	2010-05-24	Updated chapter 15 Improved schematics resolution

2. Overview

The Telit **EVK-PRO³ EVALUATION KIT** represents a system for:

- Developing application based on Telit **GE863-PRO³**
- Easy programming and updating of the Telit **GE863-PRO³** firmware
- Testing and Debugging Telit module-based applications

The topics covered in this document are the following:

- Kit content
- Board overview
- How to configure the kit

3. General description

The **EVK-PRO^3 EVALUATION KIT** can be split into several functional blocks depending on the implemented function. The core of the system is the **GE863-PRO^3** module divided into two parts: the GSM engine and the ARM processor that can be linked together via UART2-ASC0 ports. These parts can also work independently. In the following scheme you can see the interfaces provided by **GE863-PRO^3**, some of them are on the motherboard (RS232, USB, Ethernet, SD, ISO7816), while others are placed on the interface board (JTAG, SIM, GPIOs).

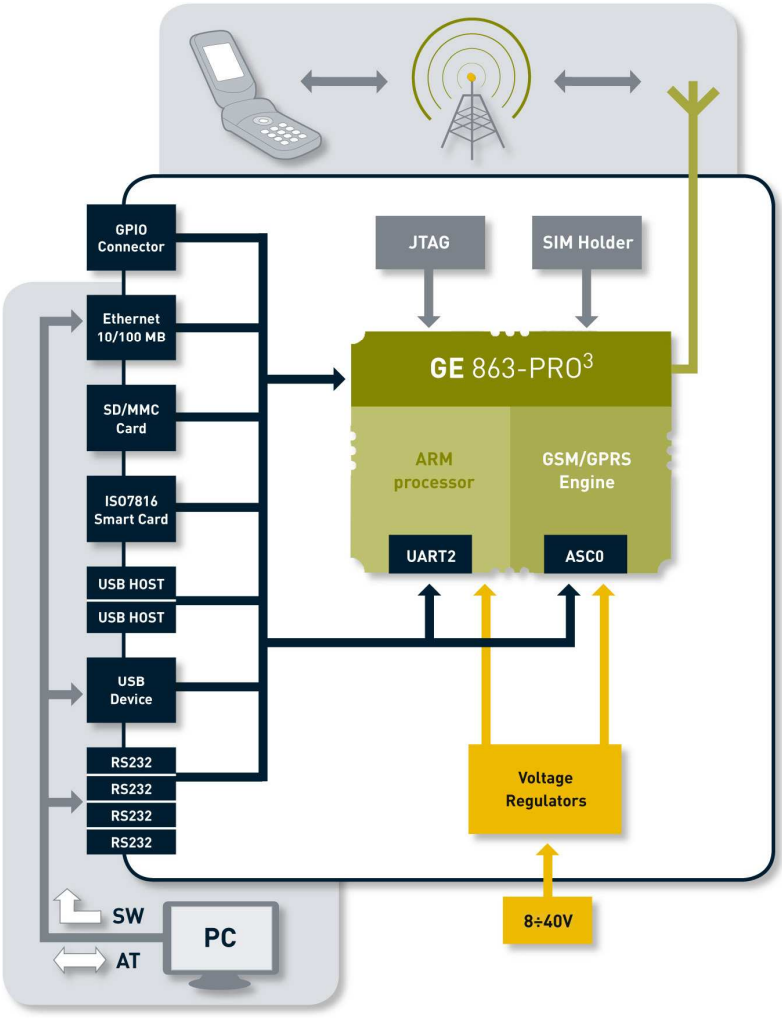


Image 3.1 - EVK-PRO^3 block diagram

4. Content of EVK-PRO³ KIT

The Telit **EVK-PRO³ EVALUATION KIT** is formed by a motherboard, on top of which an interface or adapter board with the **GE863-PRO³** module is plugged in. This concept allows using a unique motherboard compatible for both **GE863-PRO³** with Linux or without OS, and can also be applied for future product variants.
The kit includes:

Description	Quantity
EVK-PRO³ motherboard	1
EVK-PRO³ interface board – separate item	1
GSM MAGNETIC ANTENNA CABLE RG174 WITH SMA/M	1
RED & BLACK CABLE WITH PLUGS	1
ASSEMBLED USB A-B CABLE	1
RS232 CABLE	1
2 PIN FEMALE JUMPER CONNECTOR	10

Table 4.1 – Kit content

Basic requirements to run and manage the **EVK-PRO³ EVALUATION KIT** are:

1. a personal computer or microcontroller;
2. a SIM card with a valid Mobile Operator Network subscription;
3. audio accessories (speakers, earphone);
4. a knowledge of AT commands programming;
5. a 8÷40 V/3A power supply.

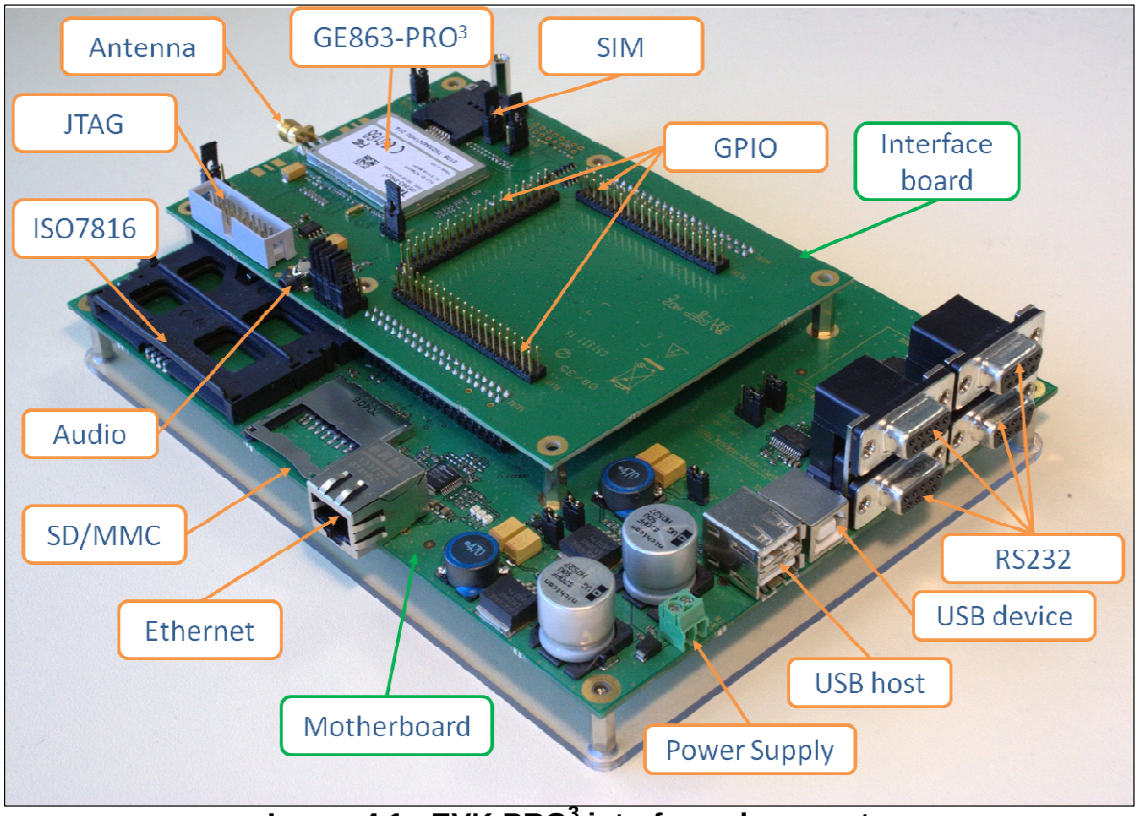


Image 4.1 - EVK-PRO³ interface placement

4.1. Motherboard

The motherboard of **EVK-PRO³** provides the functionalities shown in the figure below. Reset and on/off keys for both GSM/GPRS and ARM parts are placed on the board. The ARM core and the GSM/GPRS engine of **GE863-PRO³** can establish connection on adapter board and both sides of the communication can be monitored on the RS232 ports.
The motherboard provides the following interfaces:

- 4 X RS232 (with different functionalities)
- 1 X USB 2.0 device (USB type B)
- 2 X USB 2.0 host (USB type A)
- 1 X RJ45 (Ethernet)
- 1 X SD/MMC
- 1 X ISO7816 (Smart Card)
- 1 X 3.5mm Jack Audio

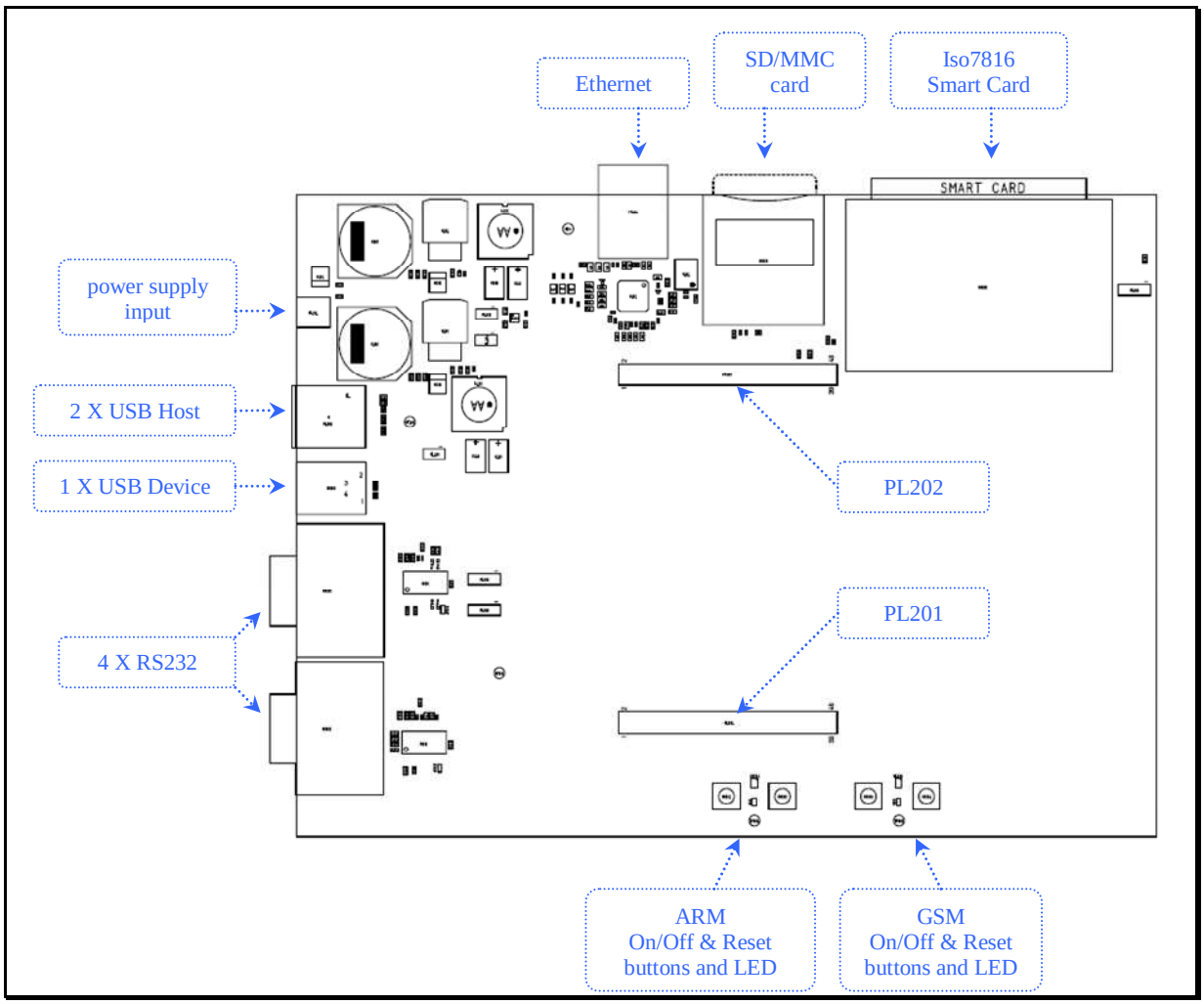


Image 4.2 – Motherboard layout

4.2. Interface board

Interface board converts the connection technology of the **GE863-PRO3** module (BGA solder) into a Pass through pin connector. Apart from hosting **GE863-PRO3** module, the interface board also serves the specific interfaces needed for user's application, extension boards (i.e. Telit **WE865-DUAL**) or other development tools and measurement equipment. These specific interfaces are:

- SMA coaxial antenna connector
- SIM card holder
- GPIOs

- ARM JTAG connector
- 3.5 mm Jack audio connector

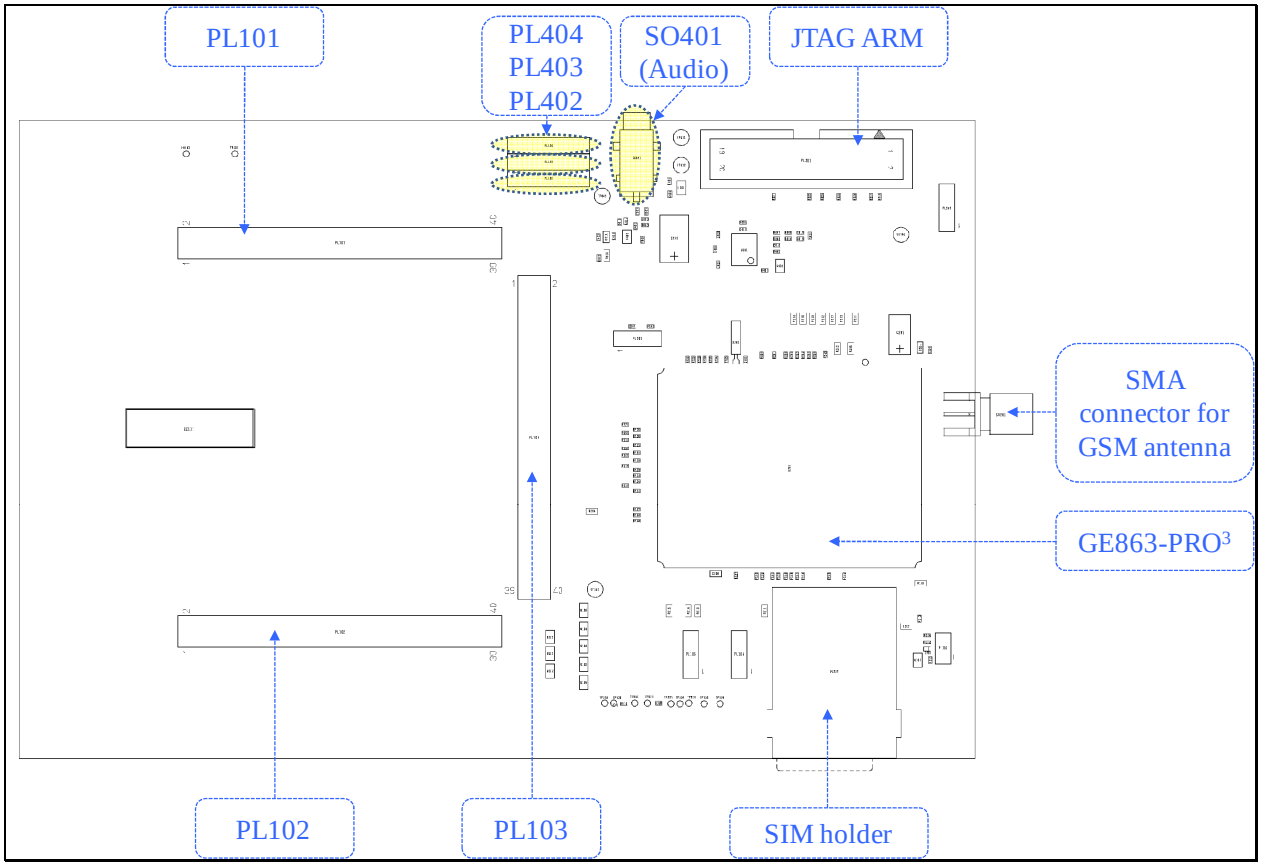


Image 4.3 - Upper layer, interface board

5. Connectors pin-out

The following paragraphs describe the pin header of motherboard and interface board. These headers are used to connect motherboard to interface board, and interface board to an optional extension board.

5.1. From motherboard to interface board

The connections between the motherboard and its upper layer are made through 2 X 40 pin header connectors, named PL201 and PL202 (check their exact placement in Image 4.2).

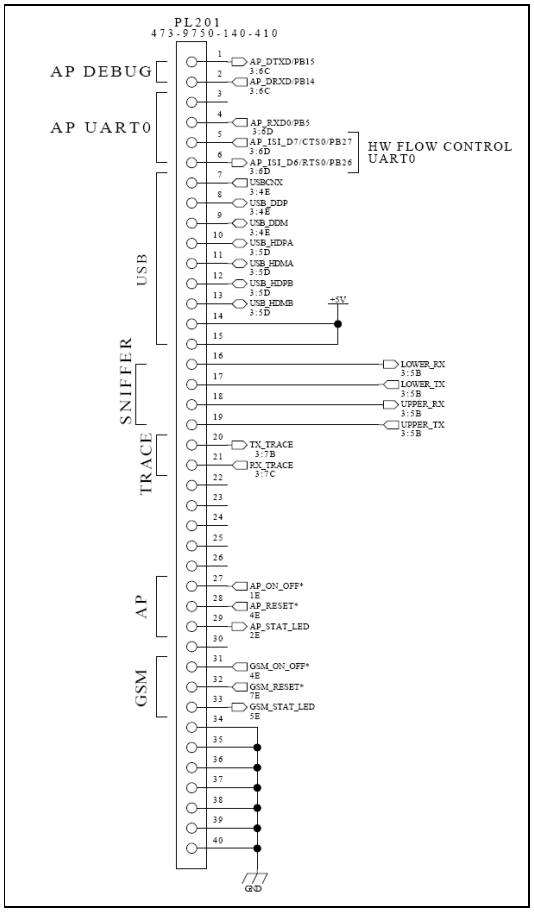


Image 5.1 - PL201 Pin Header

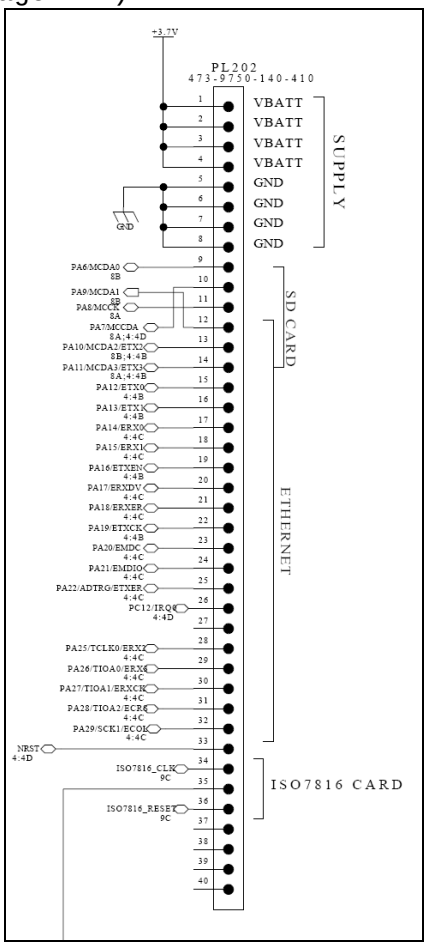


Image 5.2 - PL202 Pin Header

Their pin functions are listed in the following tables.

Pin	Signal	Function
1	PB15	ARM DEBUG
2	PB14	ARM DEBUG
3	PB4	ARM UART0
4	PB5	ARM UART0
5	PB27	ARM UART0
6	PB26	ARM UART0
7	USBCNX[1]	USB
8	DDP	USB
9	DDM	USB
10	HDPA	USB
11	HDMA	USB
12	HDPB	USB
13	HDMB	USB
14	+5V	USB Supply
15	+5V	USB Supply
16	LOWER_RX	SNIFFER
17	LOWER_TX	SNIFFER
18	UPPER_RX	SNIFFER
19	UPPER_TX	SNIFFER
20	---	---
21	---	---
22	---	---
23	---	---
24	---	---
25	---	---
26	---	---
27	ON/OFF*-AP *	ARM
28	NRST	Reset ARM
29	AP_STAT_LED	ARM
30	---	---
31	ON/OFF*-GSM	GSM
32	RESET*-GSM	GSM
33	STAT_LED	GSM
34	GND	
35	GND	
36	GND	
37	GND	
38	GND	
39	GND	
40	GND	

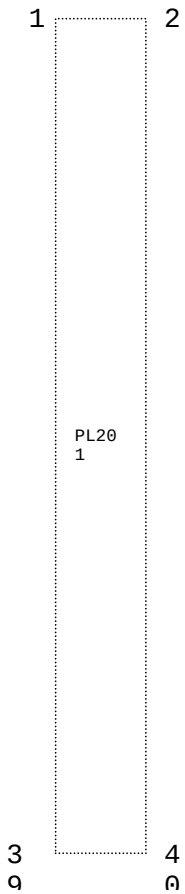


Table 5.1 - PL201 Pin Header Dual Row

[1] Detects USB presence

Pin	Signal	Function
1	+3.7V	VBATT / VBATT2 Supply
2	+3.7V	VBATT / VBATT2 Supply
3	+3.7V	VBATT / VBATT2 Supply
4	+3.7V	VBATT / VBATT2 Supply
5	GND	SUPPLY - GND
6	GND	SUPPLY - GND
7	GND	SUPPLY - GND
8	GND	SUPPLY - GND
9	PA6	SD
10	PA7	SD
11	PA8	SD
12	PA9	SD/ETHERNET
13	PA10	SD/ETHERNET
14	PA11	SD/ETHERNET
15	PA12	ETHERNET
16	PA13	ETHERNET
17	PA14	ETHERNET
18	PA15	ETHERNET
19	PA16	ETHERNET
20	PA17	ETHERNET
21	PA18	ETHERNET
22	PA19	ETHERNET
23	PA20	ETHERNET
24	PA21	ETHERNET
25	PA22	ETHERNET
26	PC12	ETHERNET
27	---	---
28	PA25	ETHERNET
29	PA26	ETHERNET
30	PA27	ETHERNET
31	PA28	ETHERNET
32	PA29	ETHERNET
33	NRST	RESET ARM
34	PA31	ISO7816CARD
35	PB4	ISO7816CARD
36	PB25	ISO7816CARD
37	---	---
38	---	---
39	---	---
40	---	---

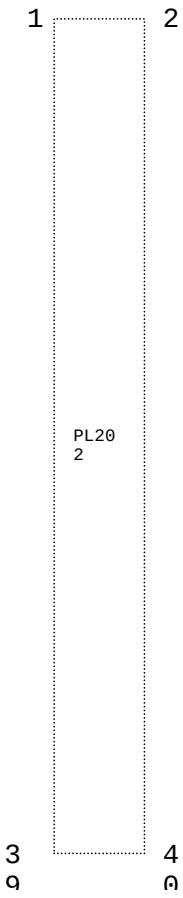


Table 5.2 - PL202 Pin Header Dual Row

5.2. From interface board to extension board

The connections between the interface board and an optional extension board is made through 3 X 40 jumper connectors, named PL101, PL102, PL103 (check their placement in Image 4.3).

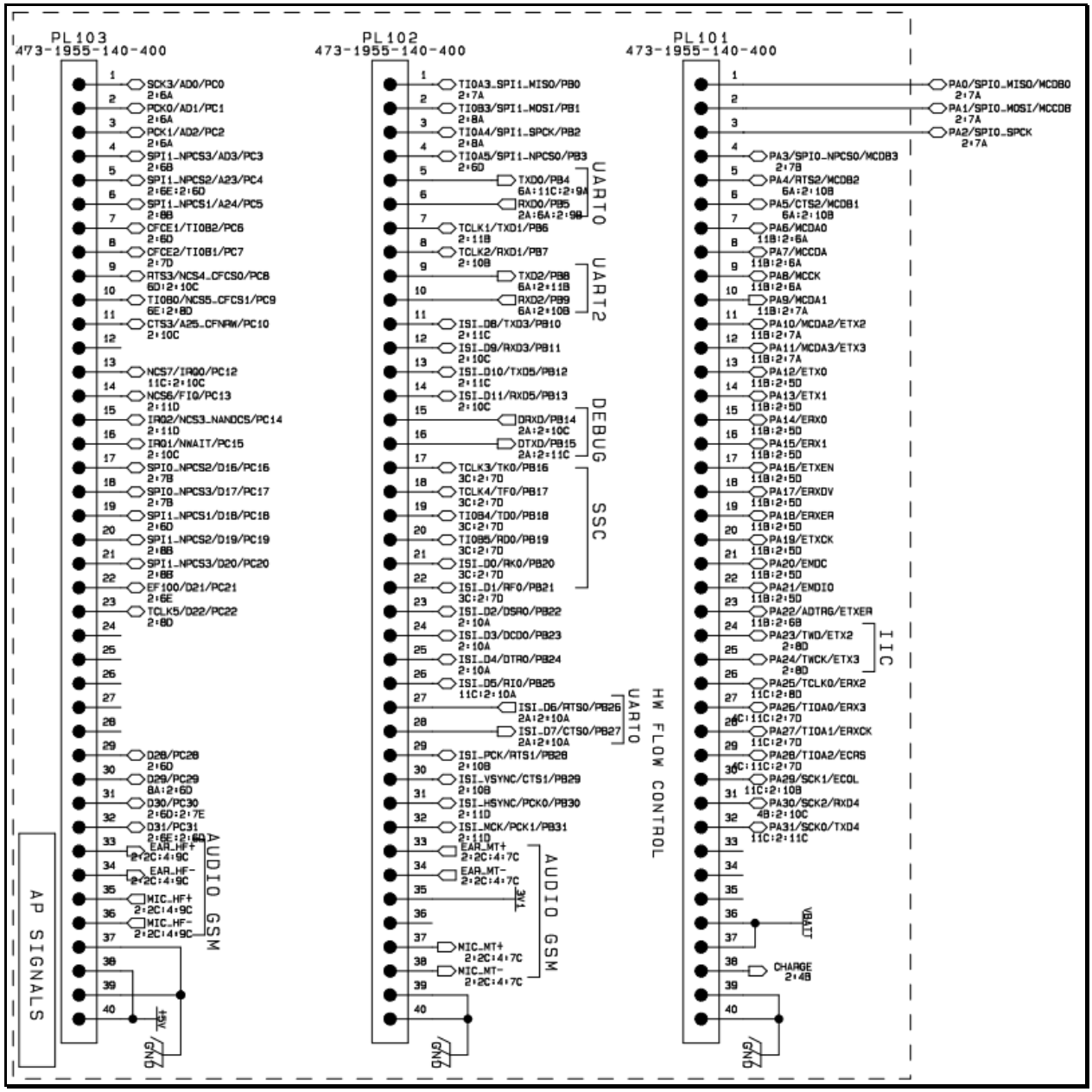


Image 5.3 - Pin Header interface board

Their pin functions are listed in the following tables.

Pin	Signal	ARM/GSM	Function
1	PA0	ARM	SPI0
2	PA1	ARM	SPI0
3	PA2	ARM	SPI0
4	PA3	ARM	SPI0
5	PA4	ARM	UART2
6	PA5	ARM	UART2
7	PA6	ARM	SD CARD
8	PA7	ARM	SD CARD
9	PA8	ARM	SD CARD
10	PA9	ARM	SD CARD
11	PA10	ARM	SD CARD
12	PA11	ARM	SD CARD
13	PA12	ARM	ETHERNET
14	PA13	ARM	ETHERNET
15	PA14	ARM	ETHERNET
16	PA15	ARM	ETHERNET
17	PA16	ARM	ETHERNET
18	PA17	ARM	ETHERNET
19	PA18	ARM	ETHERNET
20	PA19	ARM	ETHERNET
21	PA20	ARM	ETHERNET
22	PA21	ARM	ETHERNET
23	PA22	ARM	ADC
24	PA23	ARM	IIC
25	PA24	ARM	IIC
26	PA25	ARM	COUNTER
27	PA26	ARM	PWM DAC
28	PA27	ARM	PWM DAC
29	PA28	ARM	PWM DAC
30	PA29	ARM	UART1
31	PA30	ARM	UART4
32	PA31	ARM	UART4
33	---		
34	---		
35	---		
36	VBATT / VBATT2	GSM / ARM	Power
37	---		
38	CHARGE	GSM	Power
39	GND		
40	GND		

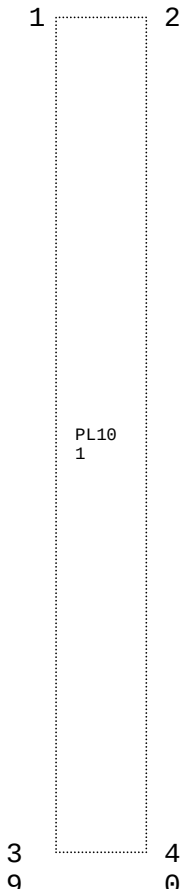


Table 5.3 - PL101 Pin Header Dual Row

Pin	Signal	ARM/GSM	Function
1	PB0	ARM	SPI1
2	PB1	ARM	SPI1
3	PB2	ARM	SPI1

4	PB3	ARM	PWM DAC
5	PB4	ARM	UART0
6	PB5	ARM	UART0
7	PB6	ARM	UART1
8	PB7	ARM	UART1
9	PB8	ARM	UART2
10	PB9	ARM	UART2
11	PB10	ARM	UART3
12	PB11	ARM	UART3
13	PB12	ARM	UART5
14	PB13	ARM	UART5
15	PB14	ARM	DEBUG
16	PB15	ARM	DEBUG
17	PB16	ARM	SSC
18	PB17	ARM	SSC
19	PB18	ARM	SSC
20	PB19	ARM	SSC
21	PB20	ARM	SSC
22	PB21	ARM	SSC
23	PB22	ARM	UART0
24	PB23	ARM	UART0
25	PB24	ARM	UART0
26	PB25	ARM	UART0
27	PB26	ARM	UART0
28	PB27	ARM	UART0
29	PB28	ARM	UART1
30	PB29	ARM	UART1
31	PB30	ARM	CLOCK
32	PB31	ARM	CLOCK
33	EAR_MT+	GSM	AUDIO
34	EAR_MT-	GSM	AUDIO
35	3.1V_OUT	ARM	POWER OUTPUT
36	---	---	---
37	MIC_MT+	GSM	AUDIO
38	MIC_MT-	GSM	AUDIO
39	GND		
40	GND		

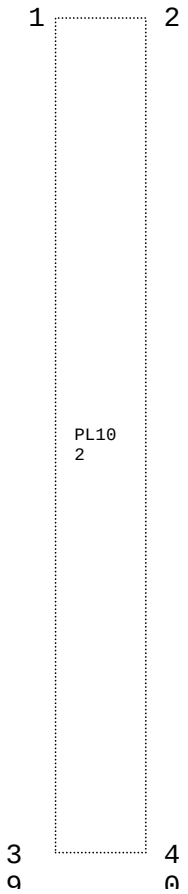
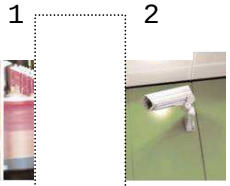


Table 5.4 - PL102 Pin Header Dual Row

Pin	Signal	ARM/GSM	Function
1	PC0	ARM	ADC
2	PC1	ARM	ADC
3	PC2	ARM	ADC
4	PC3	ARM	ADC
5	PC4	ARM	GPIO
6	PC5	ARM	SPI1
7	PC6	ARM	PWM DAC



8	PC7	ARM	PWM DAC
9	PC8	ARM	UART3
10	PC9	ARM	COUNTER
11	PC10	ARM	UART3
12	---	---	---
13	PC12	ARM	INTERRUPT
14	PC13	ARM	INTERRUPT
15	PC14	ARM	INTERRUPT
16	PC15	ARM	INTERRUPT
17	PC16	ARM	SPI0
18	PC17	ARM	SPI0
19	PC18	ARM	GPIO
20	PC19	ARM	SPI1
21	PC20	ARM	SPI1
22	PC21	ARM	GPIO
23	PC22	ARM	COUNTER
24	---	---	---
25	---	---	---
26	---	---	---
27	---	---	---
28	---	---	---
29	PC28	ARM	GPIO
30	PC29	ARM	GPIO
31	PC30	ARM	GPIO
32	PC31	ARM	GPIO
33	EAR_HF+	GSM	AUDIO
34	EAR_HF-	GSM	AUDIO
35	MIC_HF+	GSM	AUDIO
36	MIC_HF-	GSM	AUDIO
37	GND		
38	+5V	ARM	USB Supply
39	GND		
40	+5V	ARM	USB Supply

Table 5.5 - PL103 Pin Header Dual Row

6. Serial interface

As shown in **EVK-PRO3** block diagram (§3) and motherboard description (§4.1), four stacked standard RS232 communications port (double 9way D-socket connector at slow data rates) are available for the user. They have different functionalities.

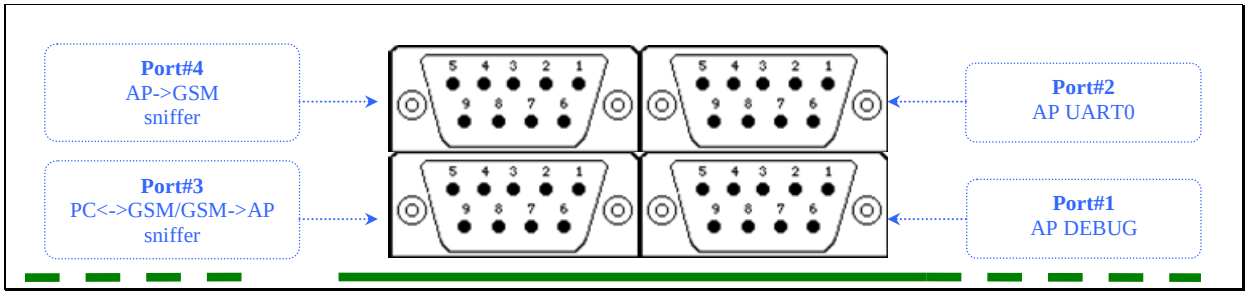


Image 6.1 - Serial ports on EVK motherboard

- Port#1 has the purpose to give an access to the system: through this port is possible to flash the **GE863-PRO3** module ARM part and to connect to the shell. It is a serial port without hardware flow control. The port is connected with pins #1, #2 of pin header PL201 (Table 5.1). When the interface board is inserted on the motherboard, this port is connected with pins #15, #16 of pin header PL102 (Image 5.3, Table 5.4) and to the DEBUG port (balls M5, M6) of **GE863-PRO3** ARM processor (see □).

- Port#2 is connected to UART0 port of **GE863-PRO3** ARM processor (balls F9, F10, D8, D9; see □). It is a serial port with hardware flow control, connected with pins #3, #4, #5, #6 of pin header PL201 (, Table 5.1). When the interface board is inserted on the motherboard, this port is connected with pins #5, #6, #27, #28 of pin header PL102 (Image 5.3, Table 5.4).

- Port#3 behaviour depends on jumper PL104 (§10.1) on Interface board:
  - If jumper PC<->GSM is closed, Port#3 is connected to GSM engine of GE863-PRO3 via port ASC0, therefore it is possible to send directly AT command via serial connection to the GPRS modem inside the GE863 PRO3. In this configuration Port#3 is connected with pins #16, #17 of pin header PL201 (Image 4.1, Table 4.1).

- If jumper SNIFFER is closed, Port #3 has only TXD connected and reports the sniffing of communication from GPRS modem to the ARM port UART2 which are connected. Note that a typical configuration where the ARM processor of **GE863-PRO3** exchanges data with the GPRS modem of **GE863-PRO3** through a UART2 requires that both PL104 and PL105 are set to SNIFFER. In this way the communication can be sniffed at the Port#3 and Port#4. In this case serial port is without hardware flow control.

- Port #4 behaviour depends on jumpers PL302 (§10.1) and PL303 (§10.1) on motherboard and jumper PL105 (§10.2) of interface board:
  - If jumpers PL302 and PL303 are closed in PC<->AP/AP->GSM, and jumper PL105 is closed in SNIFFER it is connected to UART2 of ARM processor. Note that a typical configuration where the ARM processor of **GE863-PRO3** exchanges data with the GPRS modem of **GE863-PRO3** through a UART2 requires that both PL104 and PL105 are set to SNIFFER. In this way the communication can be sniffed at Port#3 and Port#4 one way for port;
  - The second jumper configuration is reserved.

7. JTAG connector

Standard 10 pin-dual row JTAG connector is available on the interface board for ARM debugging purposes.

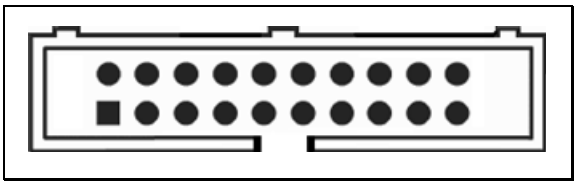
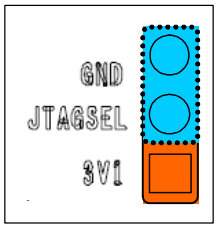


Image 7.1 - JTAG connector

Its behaviour depends on jumper PL302 (§10.2, Image 4.3). This jumper can enable the debugging unit of ARM processor inside **GE863-PRO[3]**



If jumper GND-JTAGSEL is closed, normal operation JTAG debugger is active

If jumper 3V1-JTAGSEL is closed, JTAG Boundary scan is active

If jumper PL302 is closed in 3V1-JTAGSEL position, ARM processor will not execute any code.

8. ISO7816 – Smart Card

ISO7816 card holder is placed on the motherboard.

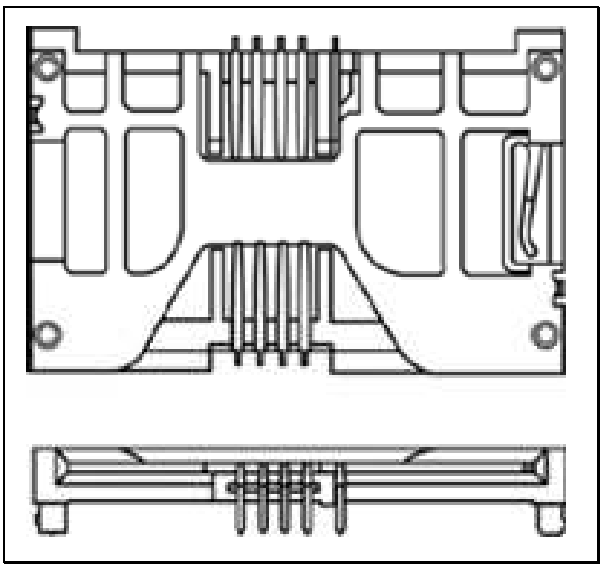
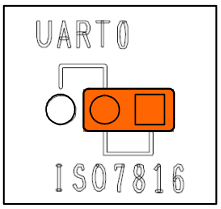


Image 8.1 - ISO7816connector

It is connected to interface board via pin header PL202 (Image 5.2), and it is available on UART0 of **GE863-PRO³ only** if jumper PL203 (§10.1, Image 8.2) is closed in ISO7816 position.



NOTE:
Note that ISO7816 and UART0 use the same resources from ARM processor therefore they cannot be used simultaneously. When using ISO7816 the Port#2 should be left unconnected and viceversa.

9. Audio Section

9.1. Overview

The Baseband chip of **GE863-PRO[3]** provides two audio paths both in receive and in transmit sections, which could be active only one at time.
To turn on your well-suited section on **EVK-PRO[3]**, please refer to *"AF Amplifiers Setting"* paragraph and followings.
To know what the requirements for audio transducers are, please refer to *"Audio Accessories"* paragraph.

9.1.1. History

The Baseband chip of our modules was developed for the cellular phones, which needed two separated amplifiers both in RX and in TX section. A couple of amplifiers had to be used with internal audio transducers (Handset mode, *HS*) while the other couple of amplifiers must be used with external audio transducers (Handsfree mode, *HF*).

9.1.1.1. Transducers definitions

Headsets are transducers that receive an electrical signal from a receiver and use speakers placed in close proximity to the ears to convert the signal into audible sound waves.
In the context of telecommunication, the word *Headset* is also commonly understood to refer to a combination of ***Headphone*** and Microphone used for two-way communication, like with a mobile phone.
Earphones are small Headphones that are placed directly outside of the ear canal, but without fully enveloping it. They are generally inexpensive and are favoured for their portability and convenience.
Earpiece
A part whether of a telephone receiver or hearing aid, that fits in or is held next to the ear.

9.1.2. Actual

The *HS* and *HF* definitions have been kept in the Software and on the schematics of the Telit modules. But with **EVK-PRO[3]** we will prefer to speak of *Audio1* or *Audio2* instead of *Handset* and *Handsfree* respectively, remembering that:

- they can have fully equivalent electrical performances (*like the two microphone amplifiers*)
- they can activate the same functionalities (*like the Echo Canceller module*)
- they can offer slightly different performances (*like the two speaker buffering stages)*

9.1.3. Select the audio path

The activation of the desired audio path is made by ***AT#CAP*** Software command.
If you don't have any load driving constraint (*like a speaker with a coil impedance lower than 16Ω*), the choice between one or other "*block*" could be done without consideration related to the electrical performances.

9.2. Differential and Single Ended

9.2.1. Concepts

Any voltage can be characterized by a potential difference between two terminals.
The configuration of the two terminals and how the signal is delivered from output to input allows the signal to be more generally described in one of three ways:

- *Single-ended signal*. This is a signal delivered between a signal trace and a ground. One terminal for a single-ended connection is always at fixed potential (*usually Ground*).
- *Differential Signals*. These are signals that travel through a pair of traces. On the signal pair, neither of the terminals is Ground.
- *Common mode Signals. They represent a special case of differential signals, also traveling between a pair of traces, where the voltage potential on both signals is the same.*

9.2.2. Benefits and disadvantages

Differential amplifiers are desirable to use, especially in audio applications where signal levels are very low such as those from microphones.
Classically, the benefits obtained from differential amplification are:

- *Increase of Common Mode Rejection Ratio (CMRR)*

Differential inputs enable cancellation of any noise common on both inputs. Noise generated at the input of the

amplifier has a greater effect than noise generated at the output, because any noise on the input is multiplied by the gain of the amplifier.

- *Increase Signal to Noise Ratio (SNR)*

The inputs to the amplifier are especially sensitive to noise because they are typically not driven by a very low impedance source.

- *High Rejection in Electromagnetic Interference (EMI)*

Noise immunity is very important in wireless phones because the RF signal is sent in bursts such that the frequency between bursts is in the audio band. RF rectification is such a problem that many manufacturers shield the audio portion of the phone.

- *Double Useful signals level*

The signal levels from microphone and the voltage swing to the load are doubled. Then the AF power to the load it is 4 times the single-ended AFpower at the same voltage supply.

- *No output blocking capacitor is needed*

Even if the differential outputs are biased at half-supply; no DC voltage exists across the load. You do not need the big, expensive and heavy blocking capacitors (generally from 33 µF to 1000 µF), lowering the cost and saving PCB space There is no frequency limiting effect due to the high pass filter network created with the speaker impedance and the coupling capacitance.

- *Less shielding is required from amplifier to load*

Mainly we have only one disadvantage using differential amplification: the routing of one more signal line could be more difficult and the additional trace requires more board space.

9.3. Audio performance evaluation

9.3.1. Headset connection

You will be able to evaluate the audio performance during a real conversation connecting a standard *off-the-shelf Headset (microphone plus earpiece) to SO401 jack connector*.

NOTE:
REMINDER: the coil impedance of the *Headset* should be higher than 16Ω@1KHz

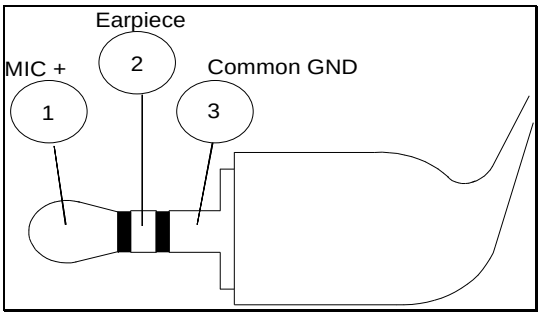


Image 9.1 - 3.5mm Audio Jack Plug

9.3.2. Instrumentation test mode

This could be considered as the "*instrumentation test mode*", by which you will be able to evaluate the audio performance by instrumentation connected to *PL402* or to *PL404*.
In such case you will apply a:

- *Differential* architecture*, if both lines of the audio paths will* be connec*ted to measurements setup;*
- *Single Ended* architecture, if only one line *of the audio paths will* be connec*ted to measurements setup, while the other will remain unused* (*open of AF grounded*)

The *in/out lines* of the module will be directly available on *PL402* (*AUDIO1*) and *PL404 (AUDIO2)* connectors after removing all *2 contacts jumpers* inserted between *PL402 & PL403* or *PL403 & PL404*.

WARNING:
In this case the external audio generator is directly connected to the input/output lines of Base Band Chip of the module.

MANDATORY: insert a 100nF capacitor in series of (MIC+) & (MIC-) input lines

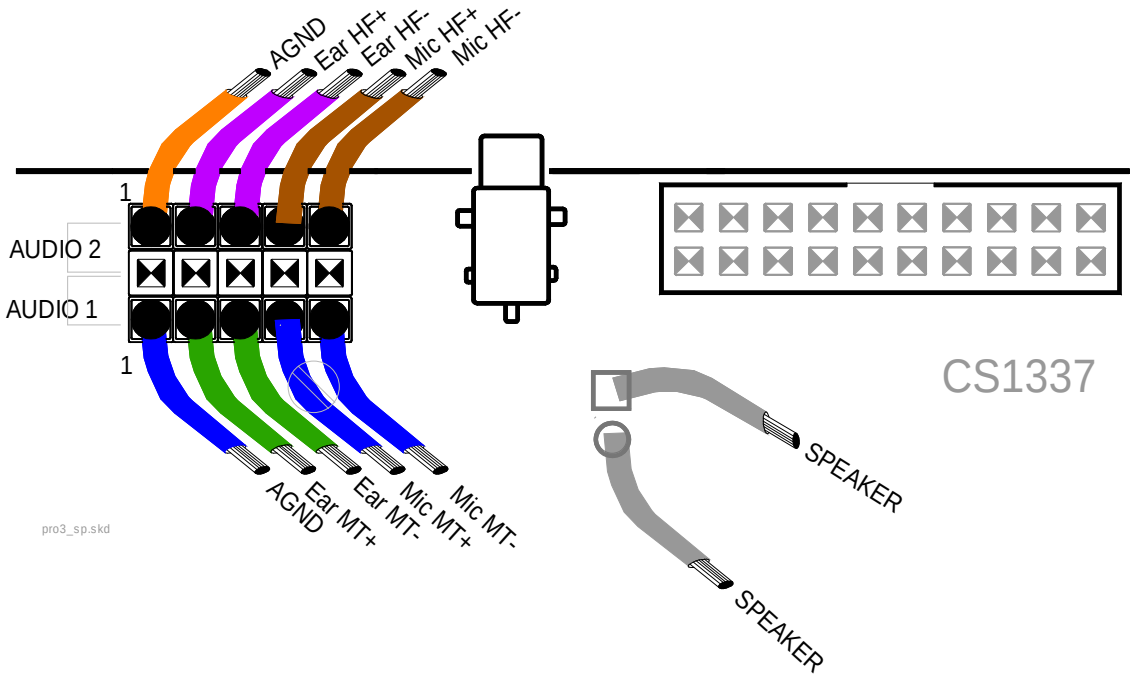


Image 9.2 - *PL402* and *PL404 in/out audio lines.*

9.4. Audio Outputs

The **EVK-PRO³** audio output signals could drive a device connected to SO401 (headset) or to speaker (as indicated on image 8.2).

9.5. AF Power Amplifier

A ***8Ω@1KHz*** Speaker could be connected as shown in Image 9.2 .

In this case the Speaker will be driven in fully differential configuration, with no side connected to ground and without any output coupling capacitor. Therefore care must be taken because there is a DC voltage on both sides of the Speaker.
The overall gain of this amplifier can be modified varying the ratios R406/R404 and R407/R410:

$$A_v = 2 \bullet \frac{R404}{R406} = 2 \bullet \frac{R407}{R410}$$ if R404=R407 and R406=R410

NOTE:
the coil impedance of the Speaker should be higher than 8Ω@1KHz

9.6. Speaker plus Headset

If you have chosen to connect the Speaker to *AF Power Amplifier* connector, without having a stand-alone electrete microphone, it is also possible to connect a standard *off-the-shelf Headset* to SO401 without any problem, as shown in the next figure: the RX signal will be heard on both Speaker and Earpiece.

9.7. Warnings

9.7.1. Coil impedance

You must use the right coil impedance depending from audio output you want to use.

9.7.1.1. Headset

If you sort out the LOW AF POWER solution connecting your Headset to SO401, the coil impedance ***must be at least 16Ω@1KHz*** **or *higher.***

9.7.1.2. Speaker

If you sort out the HIGH AF POWER solution connecting your Speaker to PL401, the coil impedance ***must be at least 8Ω@1KHz or higher***.

9.8. Audio Accessories

The following tables show the suggested specification to obtain the best performance from audio peripherals.

9.8.1. Headset

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

Table 9.1 - Microphone electrical characteristics

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

Table 9.2 - Earpiece electrical characteristics

9.8.2. Stand-alone microphone

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

Table 9.3 - Microphone electrical characteristics

9.8.3. Speaker

Rated Input Power	500 mW
Maximum Input Power	1W
Coil Impedance	≥ 8Ω
SPL	≥ 85±3 dB @ 1KHz
Resonance frequency (Fo)	< 350Hz
Useful Bandwidth	Fo ÷ 8000 Hz @ -3dB

Table 9.4 - Speaker electrical characteristics

10. Jumper details

In the following paragraphs, the jumpers of motherboard and interface board of the **EVK-PRO³** are described.

10.1. Jumpers in motherboard

In the motherboard there are six jumpers:

- Three jumpers (PL102, PL103, PL104) can be used to select some power supply setting
- Two jumpers (PL302, PL303) can be used to select RS232 serial link for GSM/GPRS
- One jumper (PL203) can be used to pull apart ISO7816 Smart Card from UART0

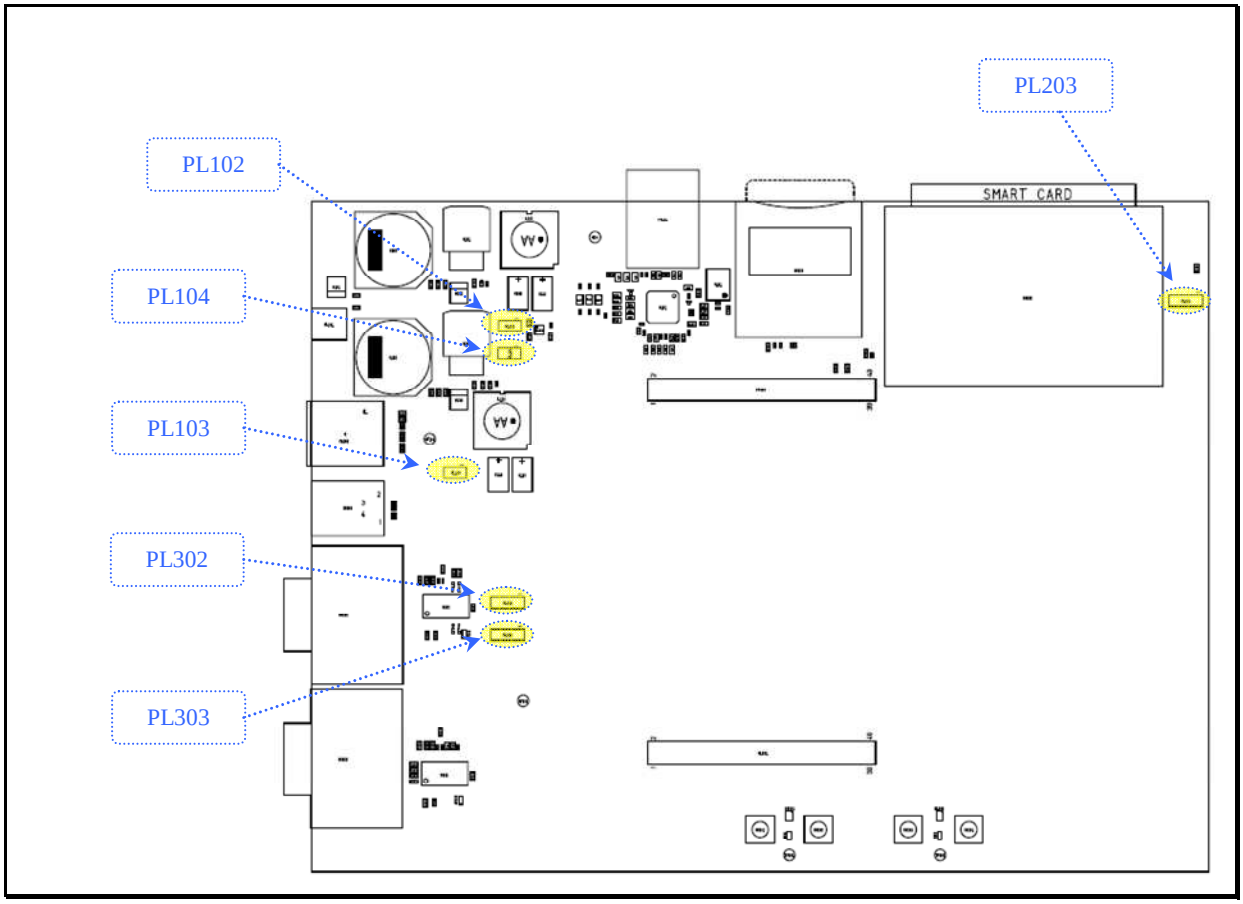


Image 10.1 - Jumpers in motherboard

10.2. Jumpers in interface board

In the interface board there are five jumpers:

- One jumper (PL302) can be used to select the debugging unit of ARM processor
- One jumper (PL201) can be used to select the use of external or internal oscillator
- One jumper (PL106) powers up the ARM processor of **GE863-PRO^3**
- Two jumpers (PL104, PL105) can be used to route GSM channel toward ARM or RS232

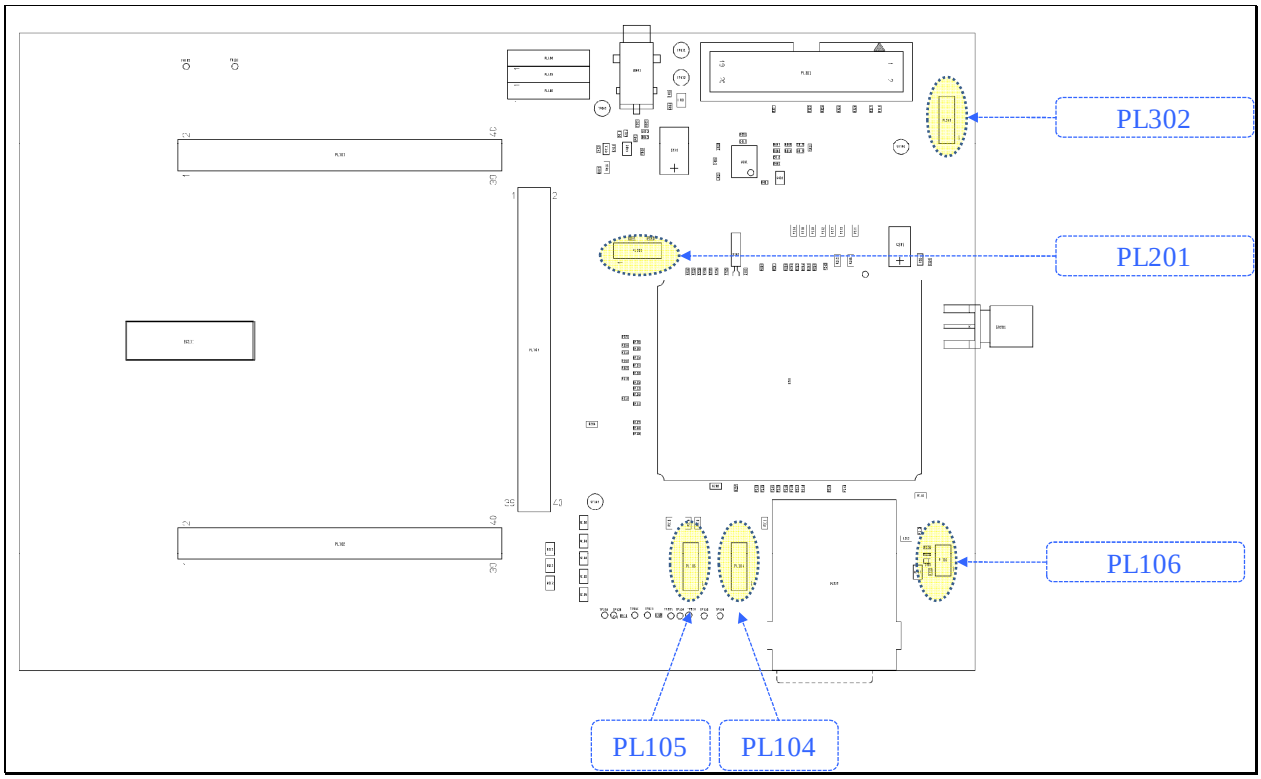


Image 10.2 - Jumpers in interface board

11. Assembling the KIT

11.1. Positioning the interface board

If the kit is delivered not assembled as shown in Image 4.1, the interface board should be inserted on the motherboard with the great attention to match the position of the main connectors. This can be made very easily in the following way:

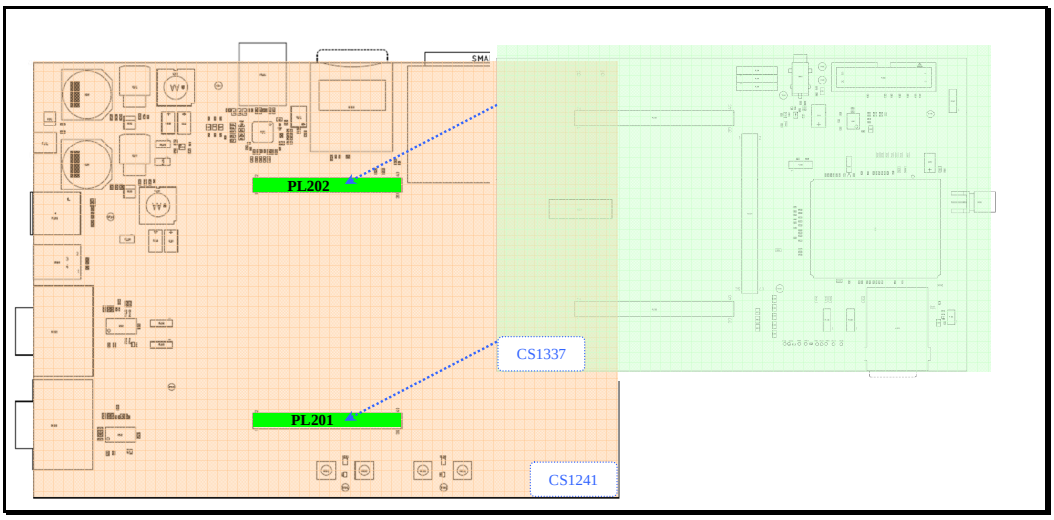


Image 11.1 - Positioning scheme for interface board

11.2. Power supply setting

The **EVK-PRO³** can be powered by simply inserting the provided red and black cable in the power connector (PL101) on the left of the motherboard and connecting a +8÷40V fixed DC source to PL101 respecting the polarization

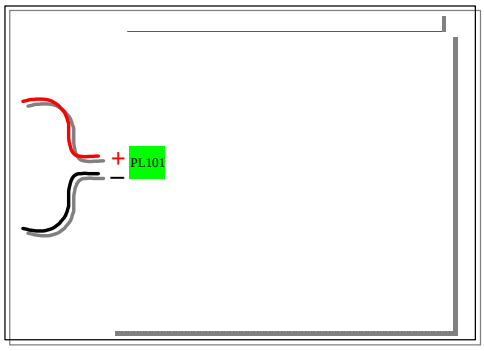


Image 11.2 - Power supply setting

WARNING:
Be careful: even if the supply line is protected by a diode against "*polarity reversing*" and by a fuse resistor against "*short circuiting*", it is highly recommended to observe the correct polarity.

12. Start-up procedure

The motherboard factory setup is:

DC source		8÷40 V
Motherboard jumpers	PL102	present
	PL103	present
	PL104	present
	PL203	UART0
	PL302	GSM TRACE
	PL303	GSM TRACE
Interface jumpers	PL302	GND-JTAGSEL
	PL201	32KHZ
	PL106	present
	PL104	SNIFFER
	PL105	SNIFFER

Table 12.1 – Factory configuration

Respect the following order to use the **EVK-PRO[3]**:

1. insert your SIM card
2. set properly all jumpers in the desired position
3. plug the module Interface board into PL201 and PL202
4. connect the antenna to RF connector
5. connect the audio accessories as required
6. connect to the external power supply
7. switch ON the external power supply
8. connect the serial cable between your PC and UART (RS232 or USB 1.1)
9. push ON/OFF button for at least 2 seconds until the STATUS LED is on

The **EVK-PRO[3]** should now be operational and ready to receive commands.

12.1. POWER ON/OFF Switch

Pressing for at least 2 seconds the *Power ON SWITCH*, you turn *On/Off* the whole **EVK-PRO[3]** and the Telit module in use: the *STAT_LED* starts to blink slowly (*ON state*) or stops blinking (*OFF state*).

12.2. RESET Switch

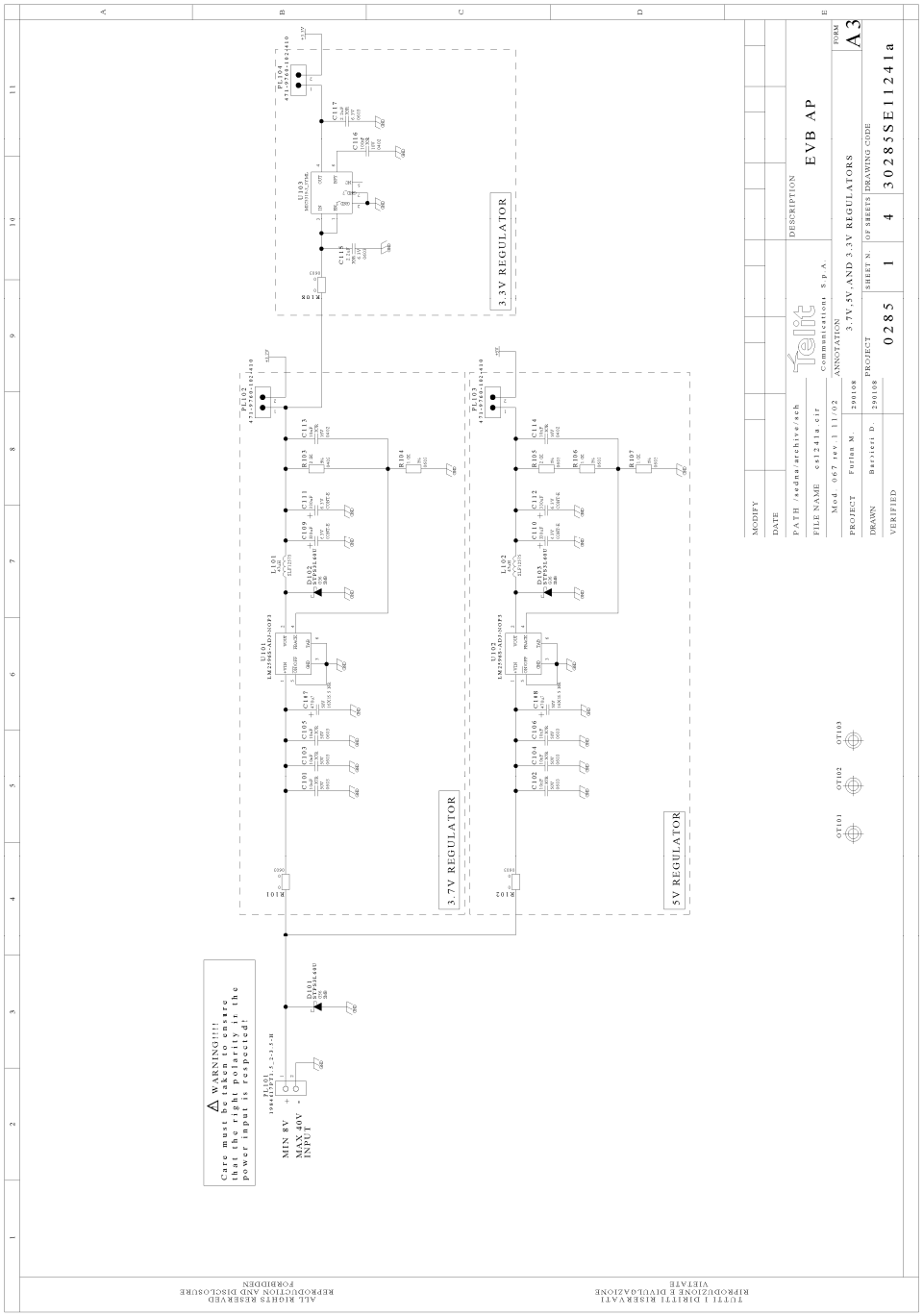
Whenever the RESET SWITCH is pressed, you could reset the Telit module in use.

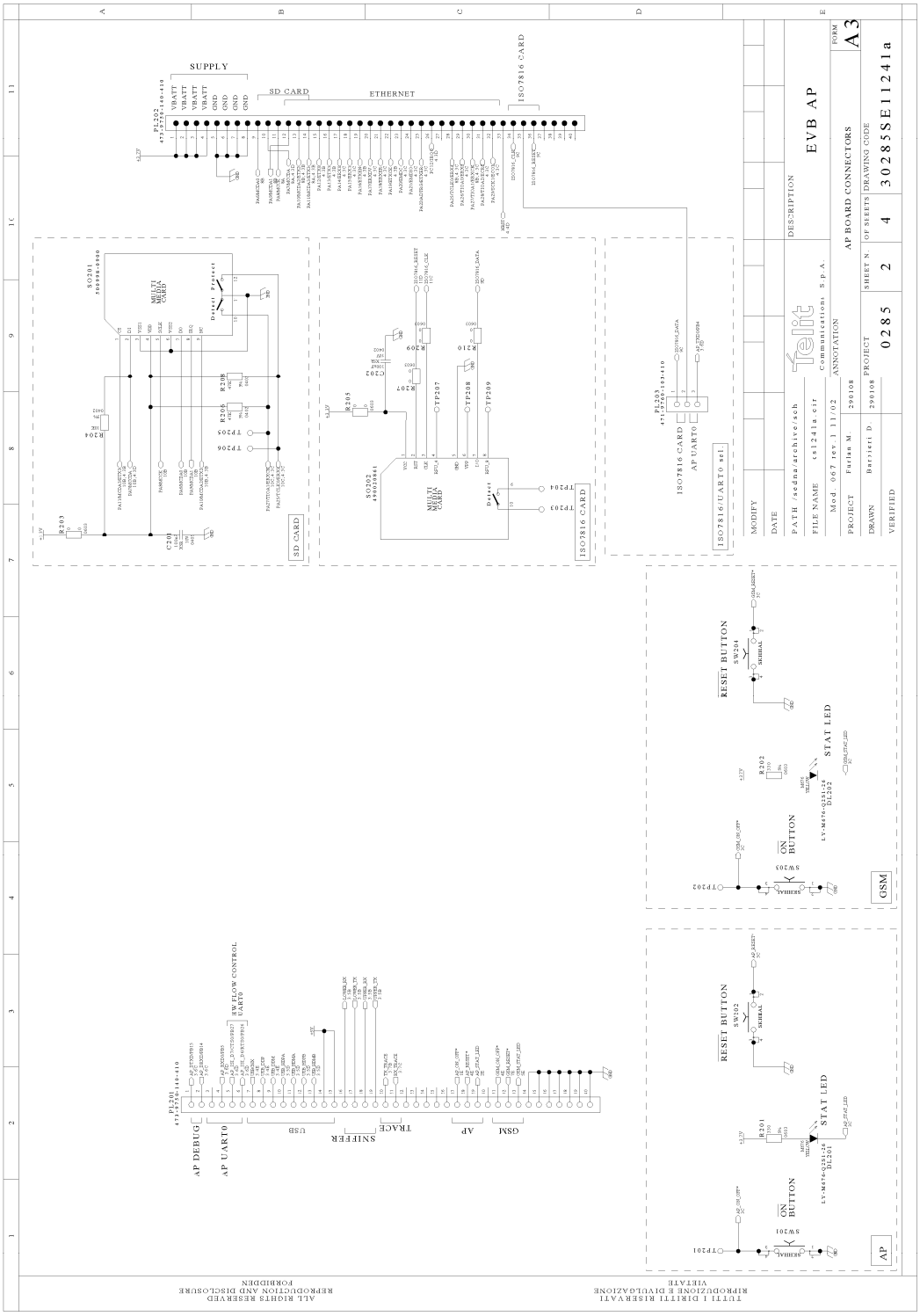
When the device is reset, it stops any operation without doing any detach operation from the network where it is registered and it reboots after the release of the Reset Switch.
This behavior is not a proper shut down because any GSM device is requested to issue a detach request at turning off. For this reason the Reset pressing action must not be used to normally reboot/shutting down the device, but only as an emergency exit in the rare case the device remains stuck waiting for some network response.
The RESET is internally controlled at start-up to achieve always a proper power-on reset sequence, so there is no need to control this pin on start-up. It may only be used to reset a device already on that is not responding to any command.

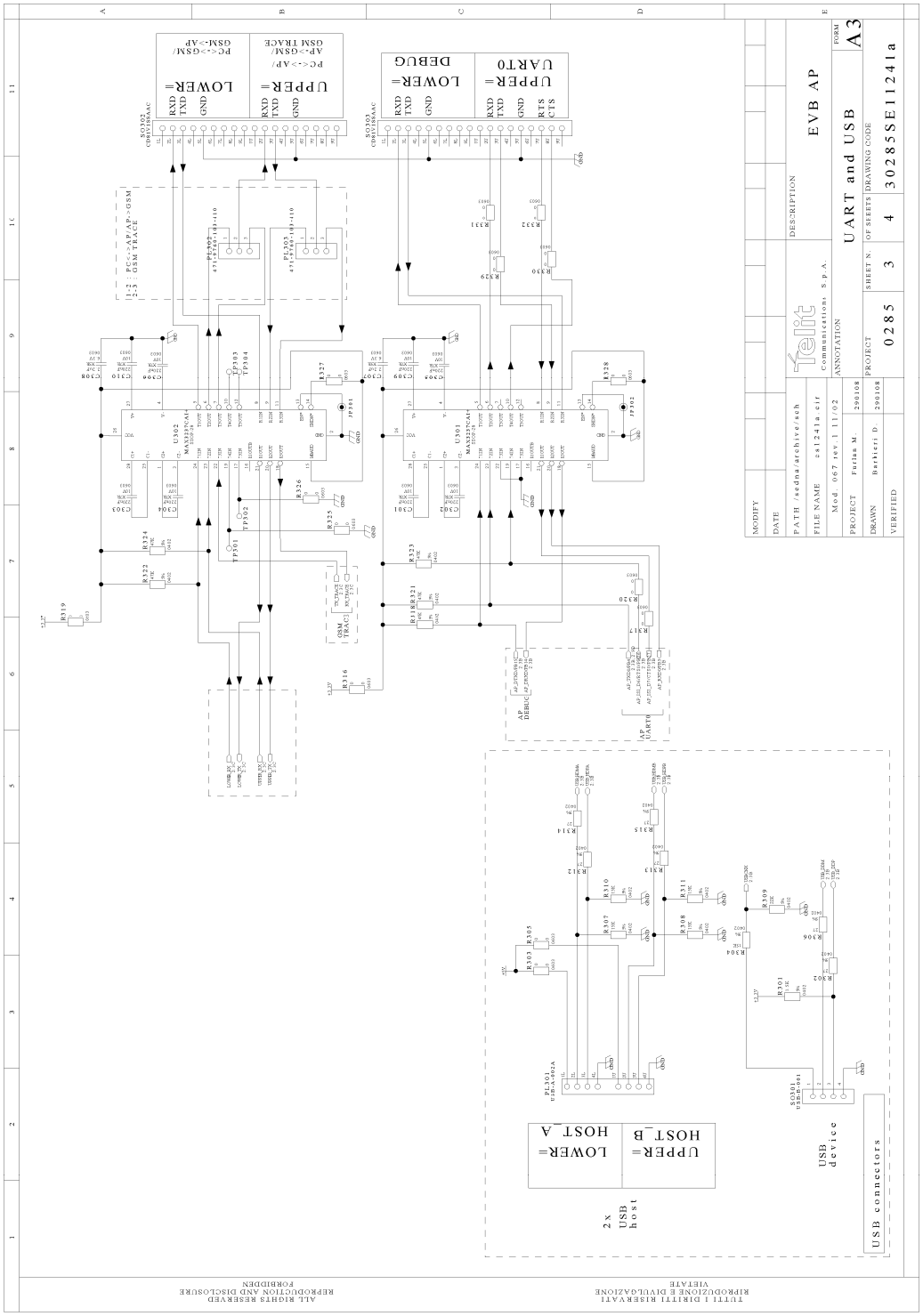
12.3. GSM POWER and RESET Switches

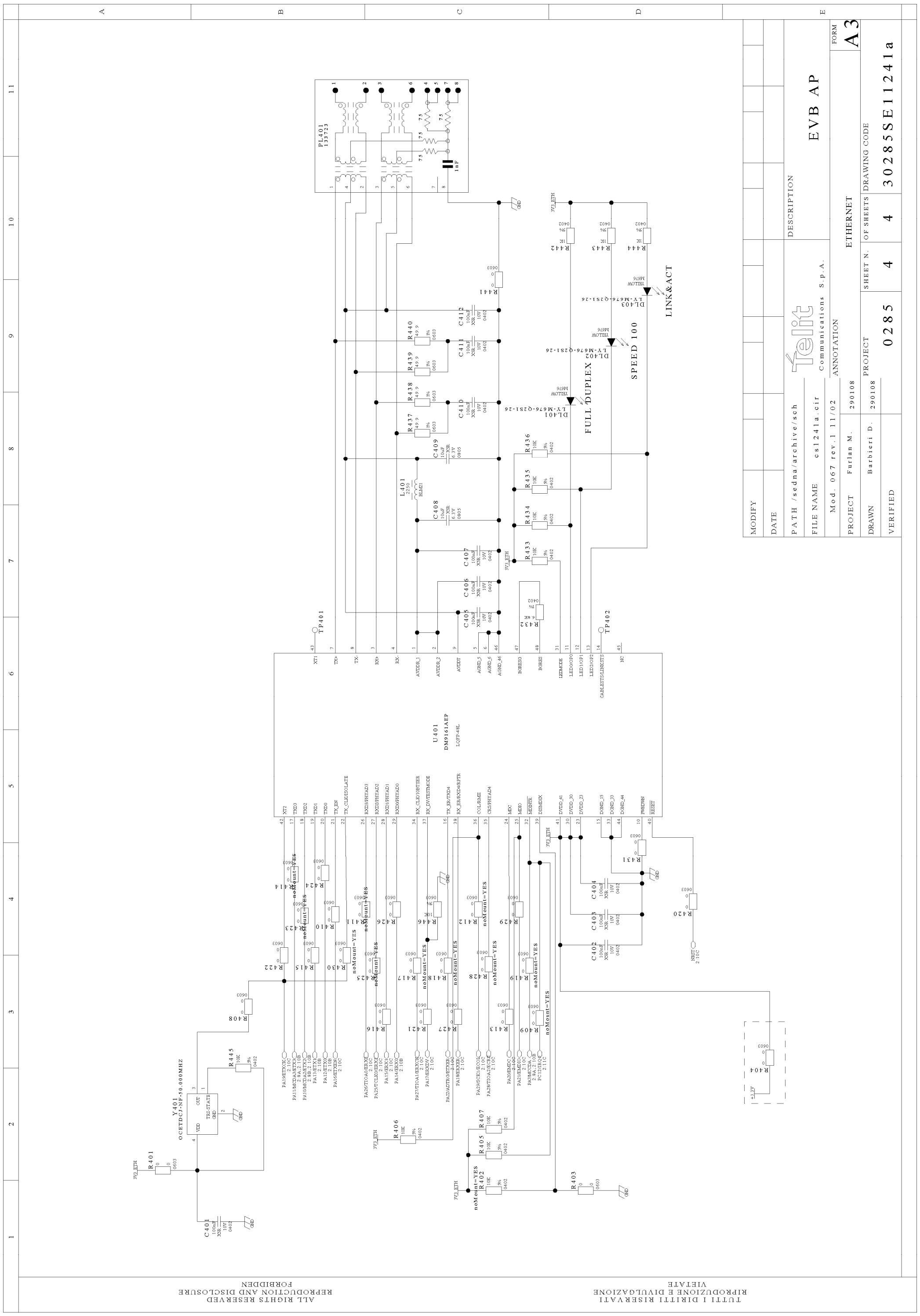
The GSM module has separate power on/off and RESET buttons. You can turn on the GSM module after the **EVK-PRO[3]** has been powered on. Please remember that the RESET button should be used as an emergency exit: for “normal” reset operations please use AT commands or Software controlled reboot procedure.

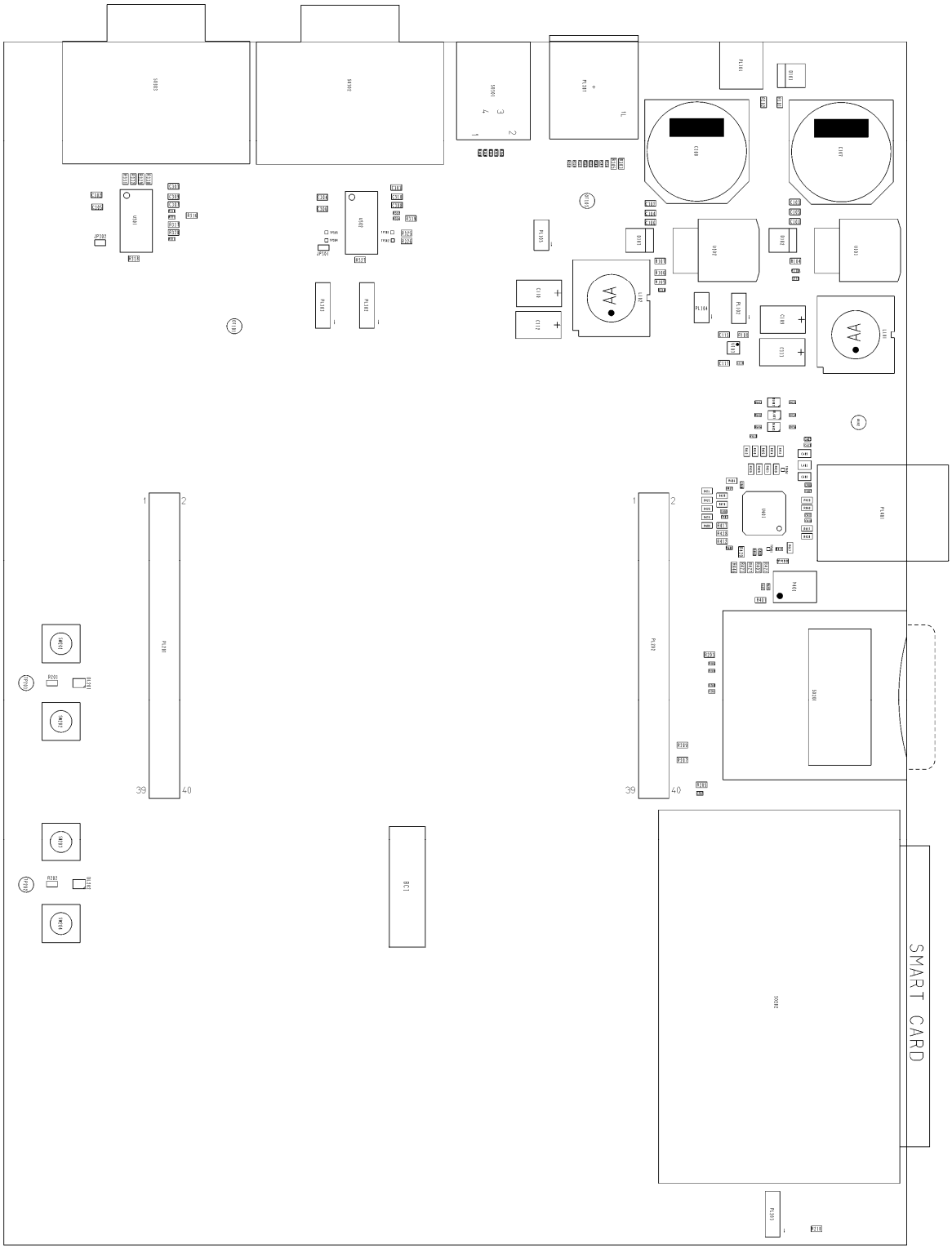
13. Annex A – Motherboard Schematics



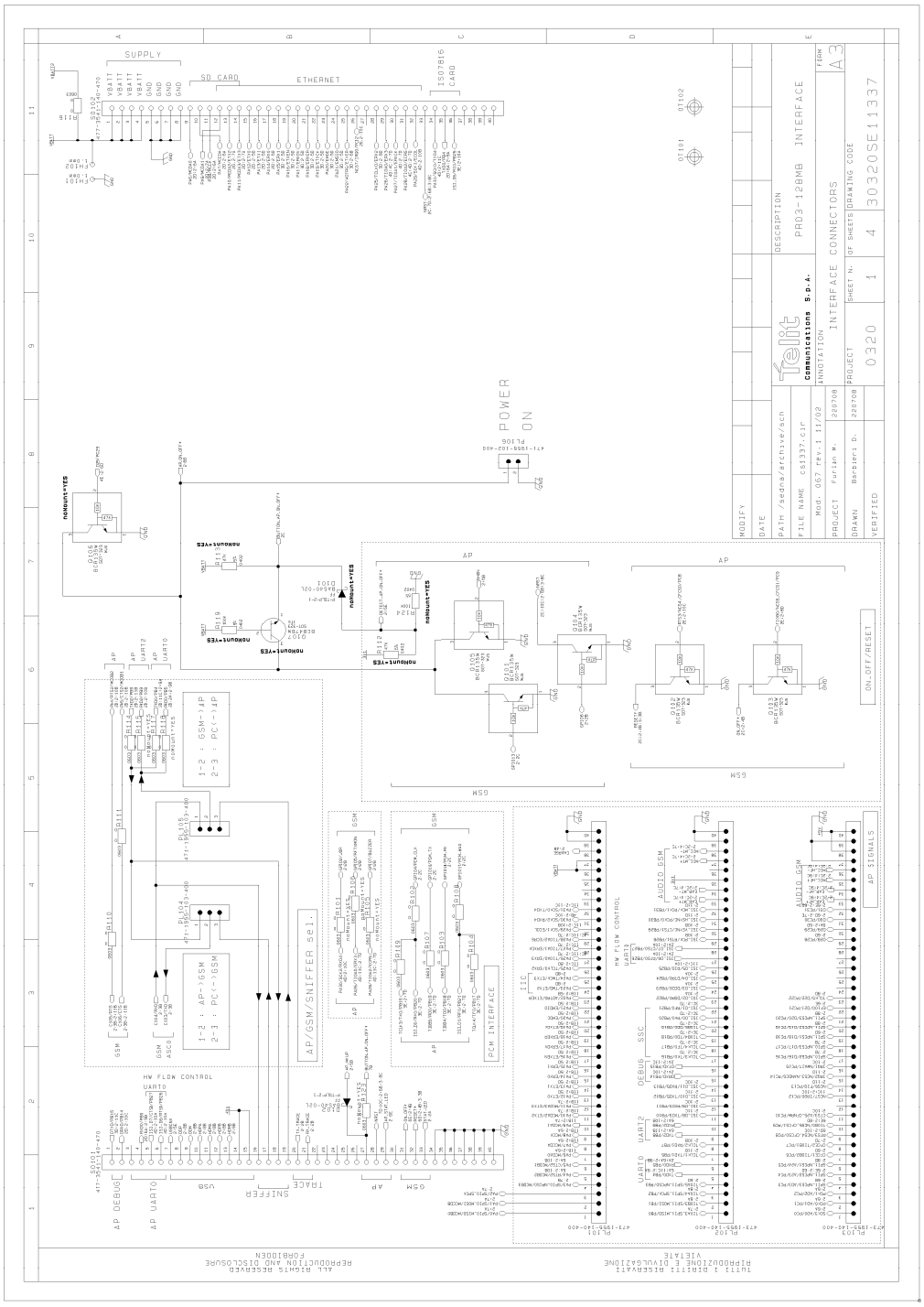








14. Annex B – GE863-PRO^3 Interface board Schematics


SUPPLY
SD CARD
ETHERNET
ISO7816 CARD
POWER ON
AP
GSM
AP/GSM/SNIFFER sel.
1-2 : GSM->AP
2-3 : PC<->AP
1-2 : AP->GSM
2-3 : PC<->GSM
PCM INTERFACE
HW FLOW CONTROL
ON-OFF/RESET
AP SIGNALS
DESCRIPTION
PRO3-128MB INTERFACE CONNECTORS
DRAWING CODE
30320SE11337
PROJECT
0320
DRAWN
Barbieri D.
VERIFIED
Furlan M.
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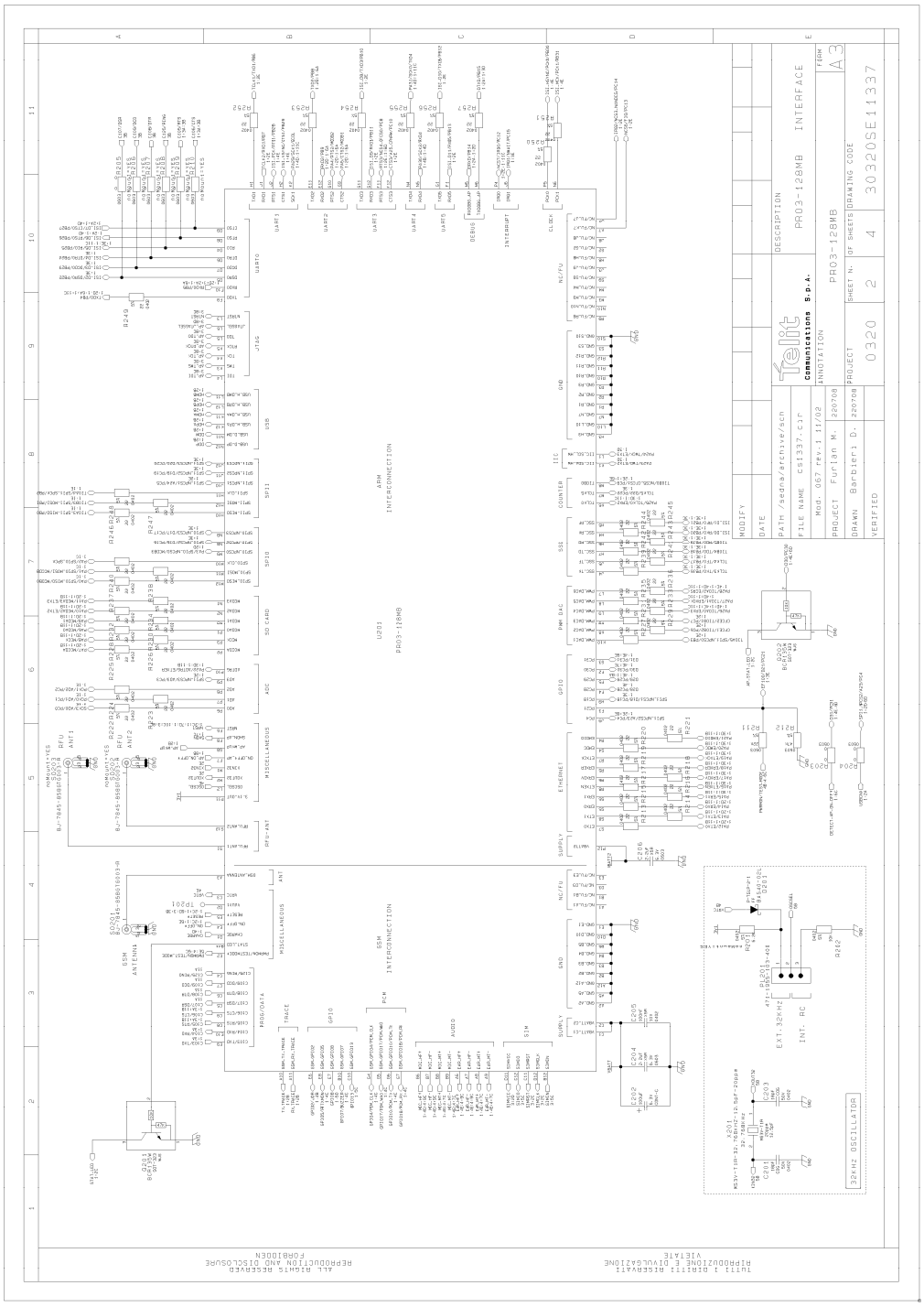

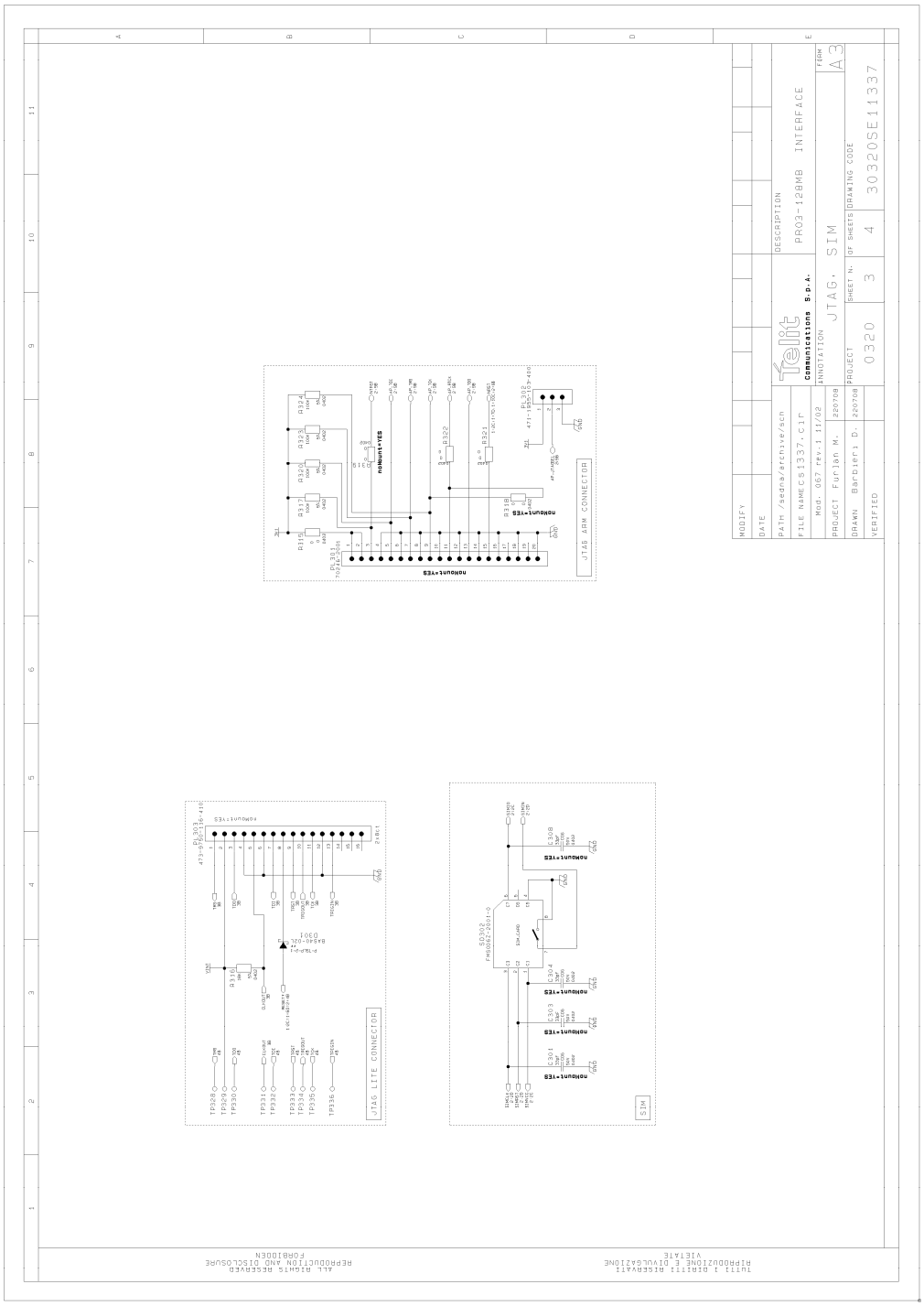
JTAG, SIM
PRO3-128MB INTERFACE
JTAG ARM CONNECTOR
JTAG LITE CONNECTOR
SIM
30320SE11337
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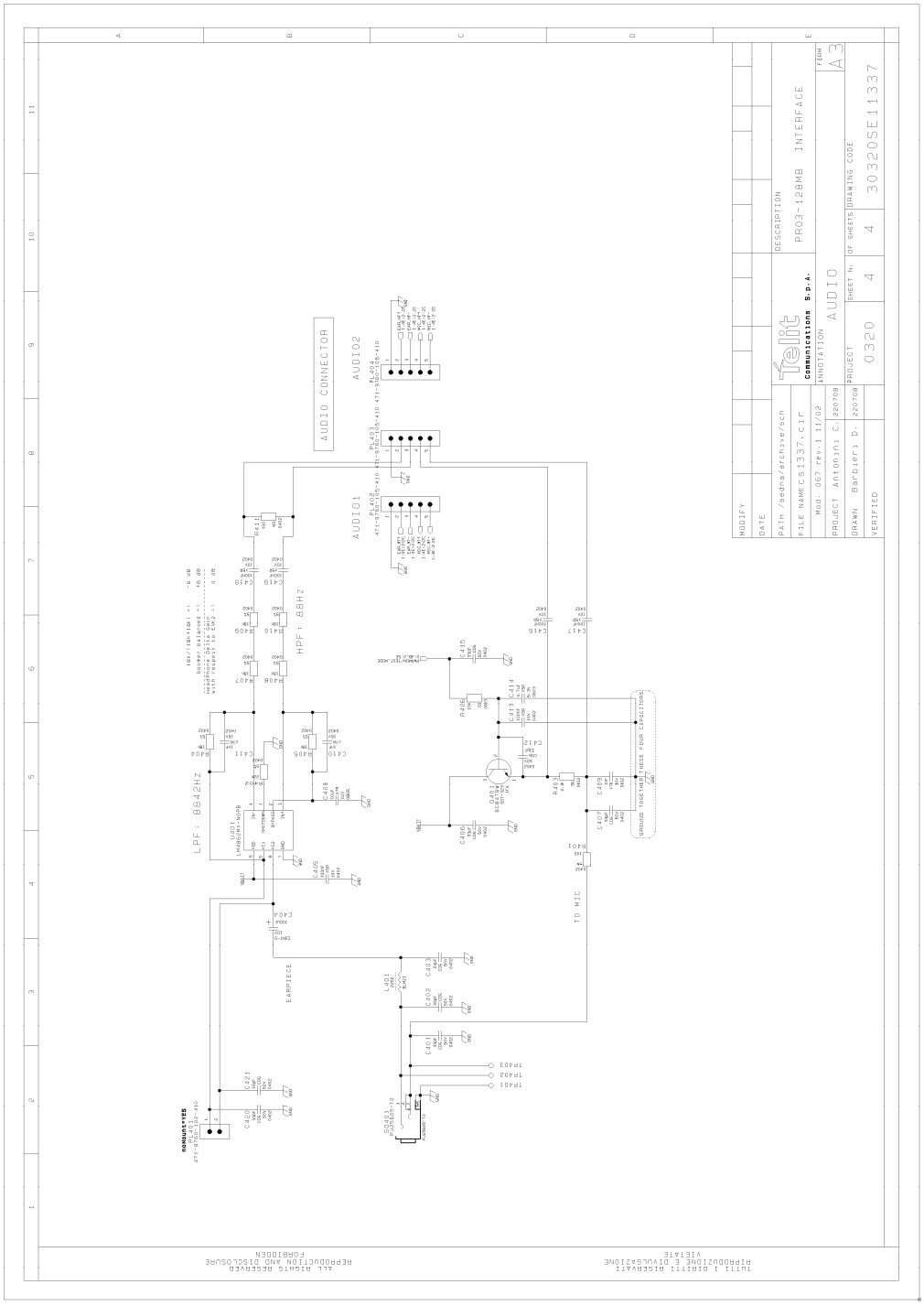

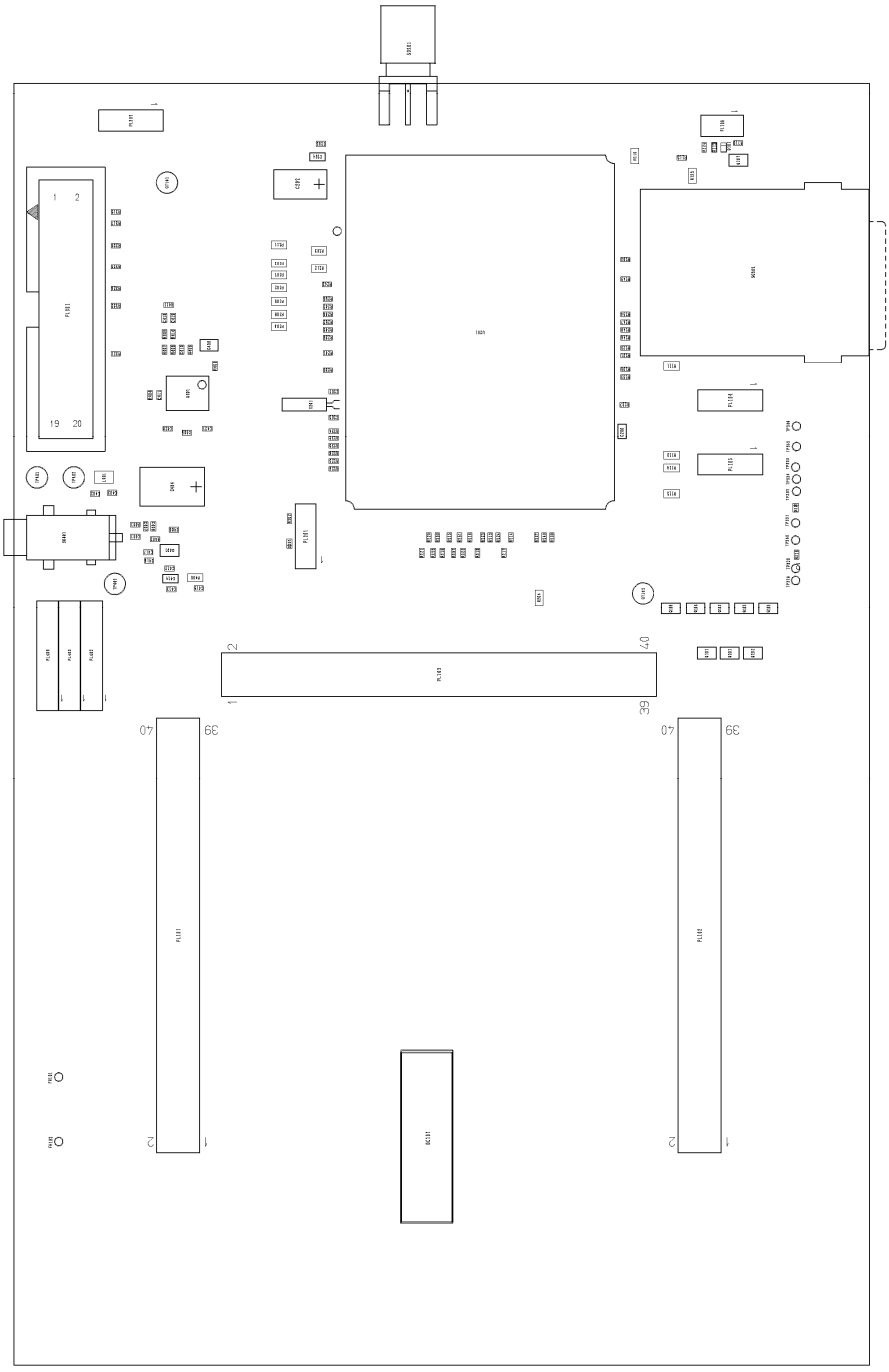

15. Suggested design improvements

For designs based on GE863-PRO3 minor modifications are suggested to be applied to the above reported schemes in order to improve systems noise response and functionalities.
The first changes involves the AP on/off circuit; in order to correctly maintain on status after start-up the AP_ON_OFF* signal must be controlled not only by the SHDN signal but also by a dedicated GPIO which will work as a SHDN_EN signal connected via a buffer transistor. This circuit requirement is implemented in the GE863-PRO3 interface board schematics with the transistor Q106 (see page 42) driven by PC29. It's necessary to replace the BJT transistors used in the AP on/off circuit with MOSFET transistors or, at least, to replace the one driven by the SHDN signal with a BJT without additional resistor between base and emitter. If using BJT transistors attention must be paid while dimensioning the circuit in order to correctly drive the base terminal.
Another change is related to the two signals coming from the AP and controlling the reset and on/off lines of the GSM section: we recommend using PB30 for GSM reset in place of PC8 and PB31 for GSM on/off in place of PC9.
The last change to the interface board schematics is related to the JTAGSEL high state voltage. This signal belong to the same power region of the OSCSEL signal and so the high level reference voltage must be obtained from VRTC with a series Schottky diode as done for the OSCSEL signal (see page 43 circuit near PL201).
Circuit upgrades are required also for the EVK motherboard schematics reported at page 38: for a correct interfacing with the GE863-PRO3 the value of R304 must become 20KΩ while R309 must become 10KΩ Furthermore a 1µF bypass capacitor (supporting at least 6.3V) is required on signal USBCNX (after R304, in parallel with R309).