



Application Engineering

Design review report

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Rev: 6
Date: 2021-02-11
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1. Scope

Aim of this document is to describe suggestions and corrections that Telit advises to improve Ovoo Electronics B100AA application that integrates Telit GE910-QUAD V3 and BlueMod S50 modules.

2. Design review

Design review is based on the following received documentation:

- Schematic files: B151BA Schematic.PDF, B100AA Schematic R4.PDF
- Gerber folders: B100AA PCB Gerber, B151BA PCB Gerber
- Other: B100AA Draftsman.PDF, B100AA PCB 3D Print.PDF, Telit Design Review R05 (PCB).PDF, B151BA Draftsman.PDF, B151BA PCB 3D Print.PDF, B151BA PCB 3D Print.PDF, Ekran Resmi 2021-02-10 13.55.25.PNG

Summary Tables:

Schematic Review	P	F	I	MI	N/A
Power Supply	✓				
SIM Pins	✓				
Digital Pins	✓				
Audio					✓
RF				✓	

PCB Layout Review	P	F	I	MI	N/A
General Placement			✓		
Antenna Waveguide			✓		
RF Aspects		✓			
Audio Aspects					✓

P: Pass; F: Fail; I: Improvements possible; MI: Missing Information; N/A: Not Applicable

The following symbols will be used throughout the Design Review to indicate:

- ✓ OK: No design changes are required.
- ℹ Tip: information or possible improvement, not mandatory but recommended.
- ⚠ Warning: if you don't follow the recommendation there's a risk of malfunctioning or issues during the homologation phase, strongly recommended.
- 🛑 Error: it's mandatory to follow the recommendation otherwise the module could be damaged or could not work properly or there's high probability of facing issues during the homologation phase.
- ? Missing Information: some relevant information is missing therefore the DR cannot be accurate on this item.

2.1. Schematic review

2.1.1. Power supply

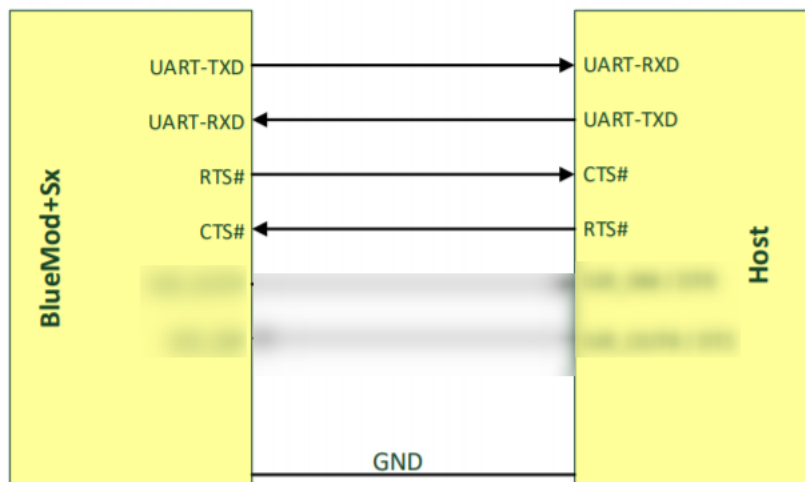
✓ Ok.

2.1.2. SIM pins

✓ Ok.

2.1.3. Digital pins

- 📘 Kindly make sure the BlueMod+S50 UART lines are connected to HOST MCU as shown below,



- 📘 We recommend placing test points for BOOT0 pin, UART-RXD, UART-TXD, UART-RTS# and UART-CTS#. This will be useful for Regulatory approval purpose.

Test mode# Pin	BOOT0 Pin	Mode
LOW	LOW	Test mode (38400, 8N1)
LOW	HIGH	DTM (19200, 8N1)
HIGH	LOW	Firmware (115200, 8N1)
HIGH	HIGH	Bootloader

For more details on Test Mode, refer BlueMod+S50 HUG section 4.8.

2.1.4. Audio pins

✓ N.A.

2.1.5. RF aspects

(F) ?

Looks the current design is using BlueMod+S50_AP variant. Antenna part number is missing in the schematics.

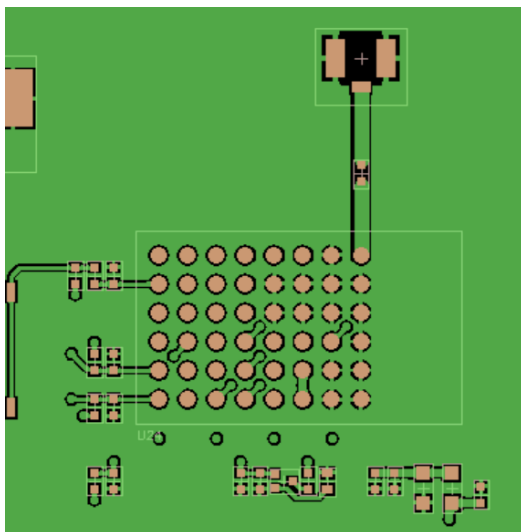
2.2. PCB Layout review

2.2.1. General placement

- Be aware that all PCBs placed close to GSM antenna must be RF proof and not only the PCB mounting the module; this means that all the PCB placed less than 30cm from the antenna must have shields over the noisiest components (switching, MCU, RAM, Ethernet PHY, etc..) and with the top and bottom layers mostly ground planes.

(A)

- ⚠ Cover with solder resist also external layers of the B151BA PCB. *Gerber export nedini ile göre mediler. ✓*
- ✓ BlueMod+S50_AP variant placement is OK. For more details on placement, refer section 7.5 in BlueMod+S50 HUG for AP variant Placement and antenna port layout recommendation.

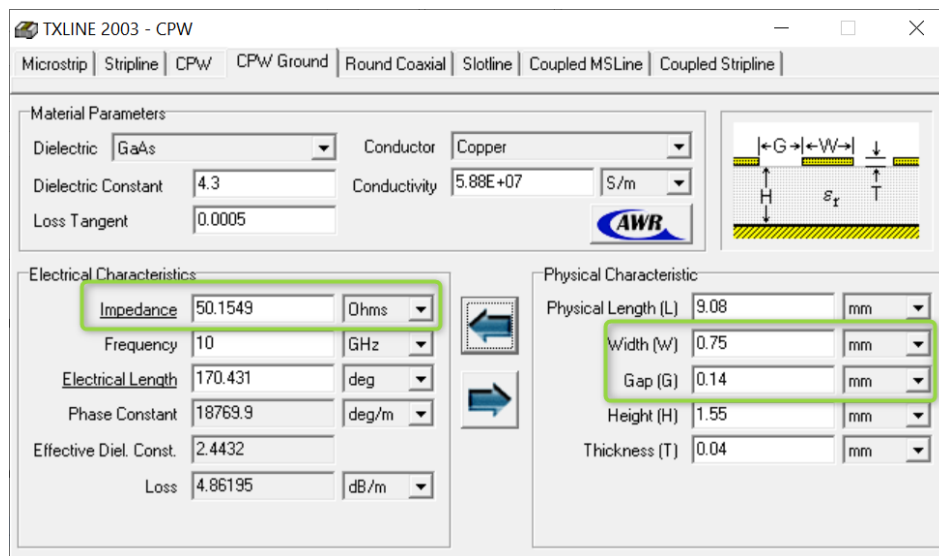


2.2.2. RF aspects

(B)

- ⚠ On B151BA PCB, RF line for the BlueMOD S50 module is a waveguide with characteristic impedance of about 50 Ohms. According to our calculations done assuming a $\epsilon_r=4.3$ of the pre-preg, the resulting impedance of your CPWGs is about **51,05 Ohm: too high**. The RF trace impedance must be 50 Ohms. For achieving 50 Ohm impedance, we recommend modifying RF copper trace Width(W) and Gap(G) to 0.75mm and 0.14mm, as shown below.

750 ohm →



Material Parameters:

Dielectric	GaAs	Conductor	Copper
Dielectric Constant	4.3	Conductivity	5.88E+07 S/m
Loss Tangent	0.0005		

Electrical Characteristics:

Impedance	50.1549	Ohms
Frequency	10	GHz
Electrical Length	170.431	deg
Phase Constant	18769.9	deg/m
Effective Diel. Const.	2.4432	
Loss	4.86195	dB/m

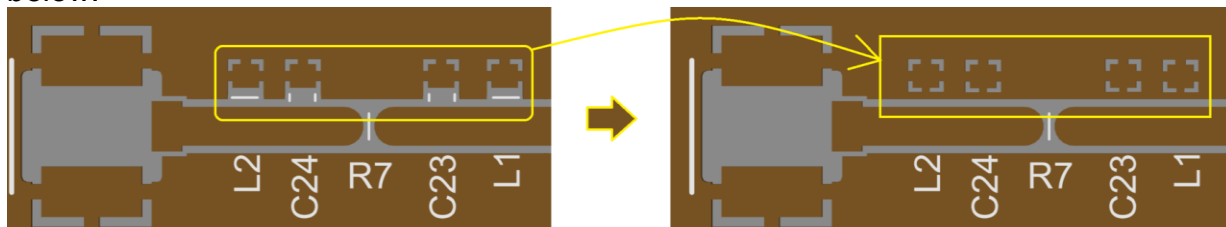
Physical Characteristics:

Physical Length (L)	9.08	mm
Width (W)	0.75	mm
Gap (G)	0.14	mm
Height (H)	1.55	mm
Thickness (T)	0.04	mm

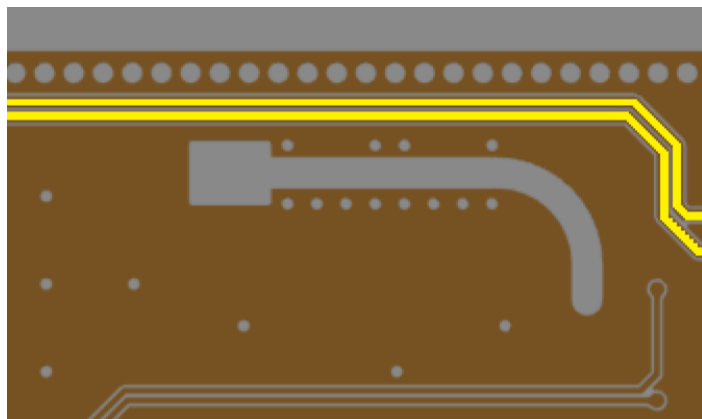
STOP Your cellular RF line on B100AA PCB has not a uniform layout. We remind you that all waveguide parameters (**Width, Gap** and Height) must remain constant all track long, including the matching network pads otherwise this can lead to characteristic impedance discontinuities.

In your waveguides, width and Gap change in several points along the track introducing discontinuities to the characteristic impedance.

In order to avoid discontinuities, we suggest routing your waveguide as depicted below:



STOP ON the third and fifth layer of the B100AA PCB, the CPWG and the RF connector are facing signal tracks which are routed very close the CPWG area. We strongly suggest moving away signal tracks from the RF track and connector area.





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2.3. General comments

Please check and follow Telit Modem Integration Design Guide.

Review is related to received application information and the supposed use of it.

3. Quality record

This design review is registered internally in Bugzilla with ID #33285.

The customer request is registered internally in Salesforce with ID # 00201737.