FN980 FAMILY TLB
HW Design Guide

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TELIT
TECHNICAL
DOCUMENTATION

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APPLICABILITY TABLE

PRODUCTS

- FN980 - 3G / 4G / 5G Sub-6 cellular module
  FN980m - 3G / 4G / 5G Sub-6 / 5G mmWave cellular module

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1. INTRODUCTION

1.1. Scope

This scope of this document is to describe the FN980 Family TLB which is part of complete FN980 Family Development Kit (Dev-Kit)

1.2. Audience

This document is intended for Telit customers, especially system integrators, about to implement their applications using the Telit module.

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
- TS-SRD@telit.com

Alternatively, use:

https://www.telit.com/support-training/

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. 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.

1.5. Related Documents

- FN980 FAMILY HW User Guide, 1VV0301603
- FN980 Family Pinout, 80624ST10993A
- Telit EVB (Evaluation Board) User Guide, 1VV0301249
- FN980 Family AT Commands Reference Guide, 80624ST10996A

2. GENERAL PRODUCT DESCRIPTION

2.1. Overview

The Translation Board (TLB) is custom designed to interface the Telit module variant FN980m with the Telit Generic Evaluation Board (EVB) thus forming the complete Development Kit of FN980 Family.

The TLB provides the mapping of Telit module signals and functions into the generic EVB signals and functions.

The FN980 Family TLB design includes the following items:

- FN980 Family module
- RF SMA connectors
- Board to Board connectors for interfacing to EVB main board
- Module specific circuitry which is not part of the generic circuitry of the EVB

The TLB also makes provision to assemble a custom designed module socket instead of assembling the module.

Power supply and control interface for the RF module is provided from the EVB via the B2B connectors.

To monitor the temperature, a thermistor is placed on the top GND plane, close to the module which should be representative for the module's backside temperature.

The bottom plane solder-mask is cutout below the RF module in order to optimally mount/attach a heatsink aiming to cool the module via the many heat conducting GND via's.

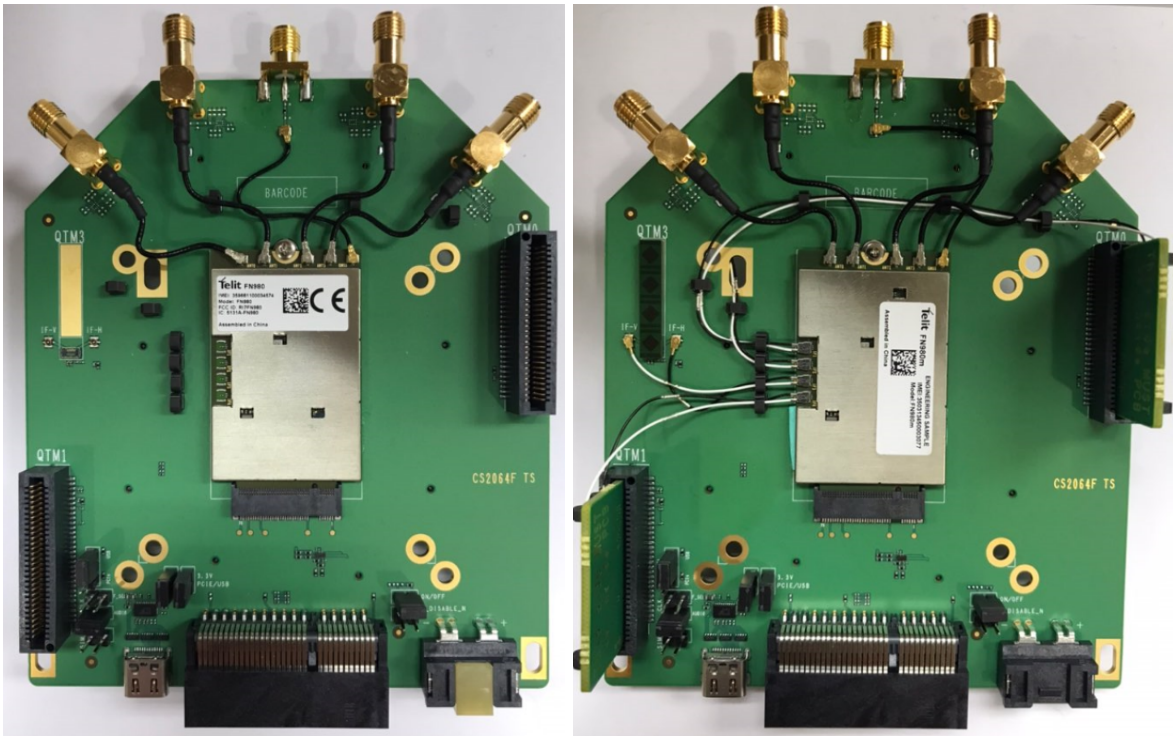
The board is designed to accommodate new modules according FN980 Family M.2 (50 x 30.00 x 3.40mm, +/- 0.15 mm tolerance and 75 pins) updated pin mapping.

Latest PCB reference numbers:

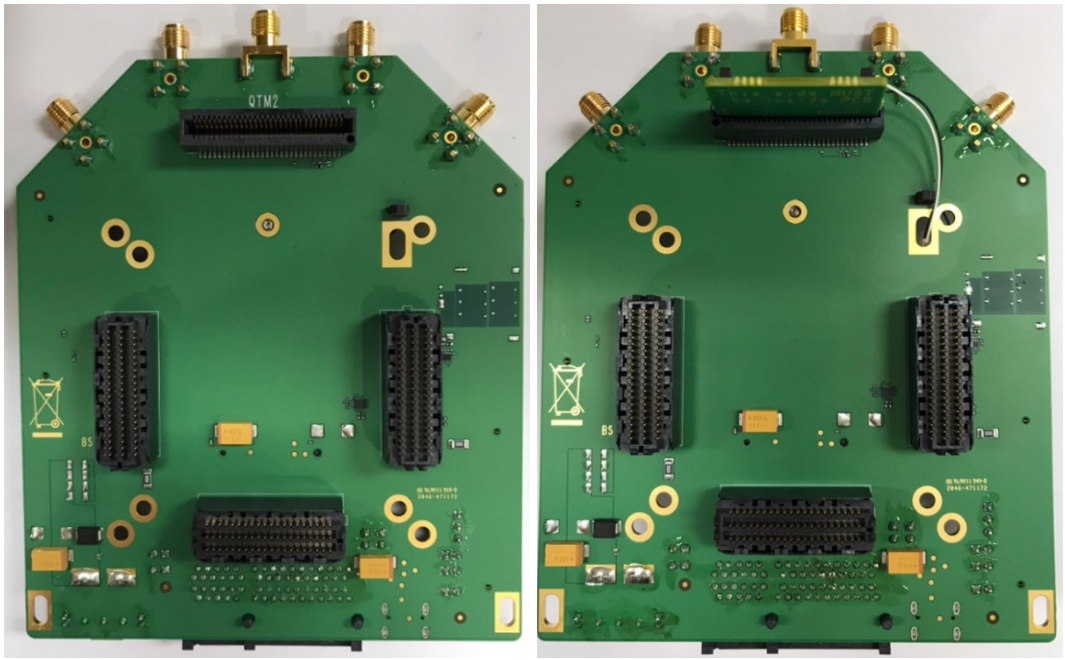
TLB	CS2064F
SUB PCB	CS2093
EVB	CS1984C or CS1742E
Module	FN980 Family

2.2. TLB View

The below pictures show the TLB top and bottom view.



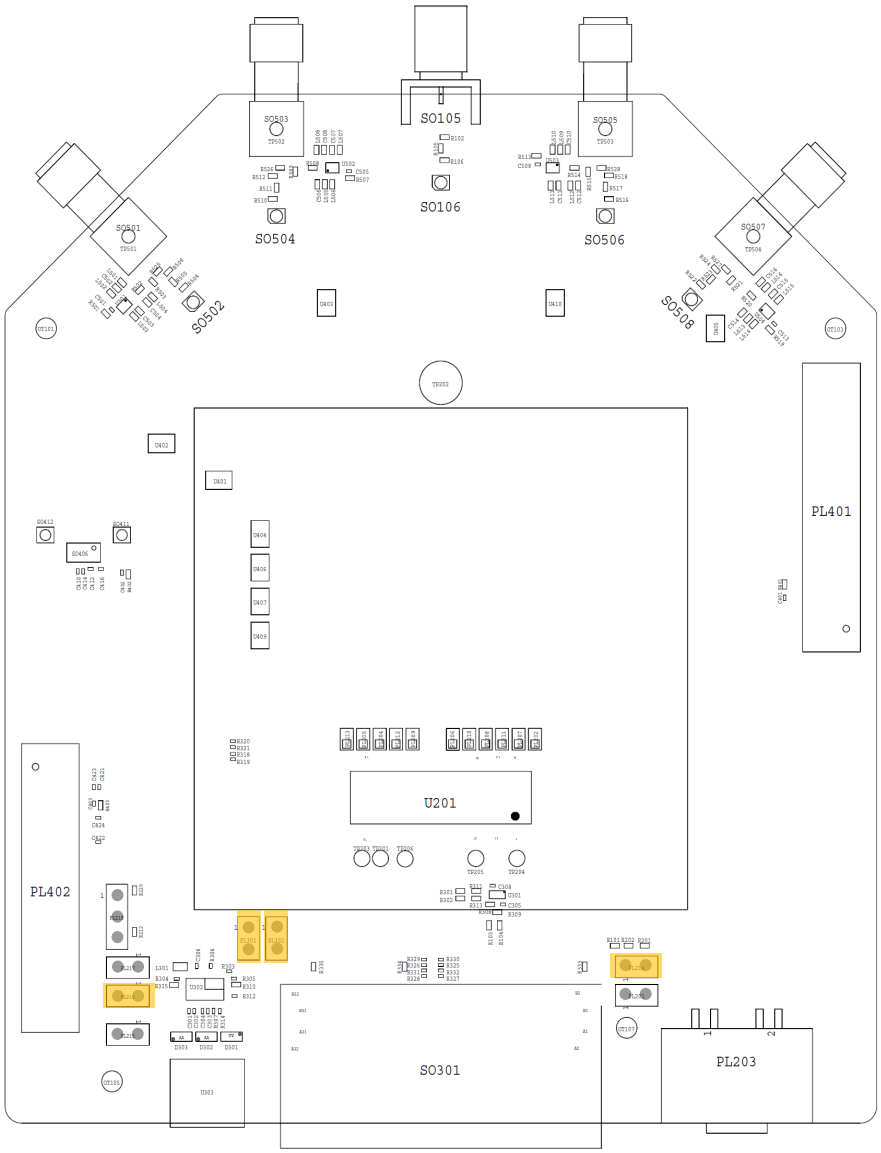
FN980 (L) / FN980m (R) TLB Top View



FN980 (L) / FN980m (R) TLB Bottom View

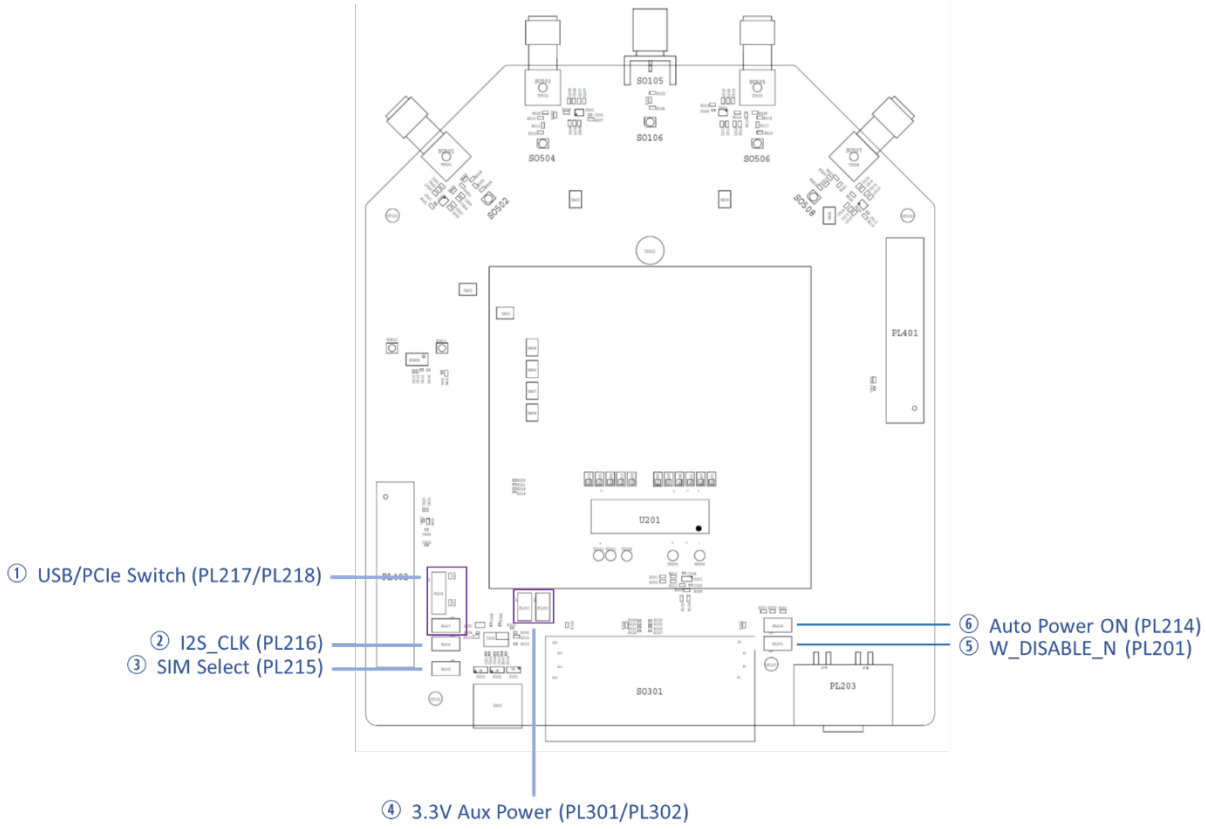
2.3. Jumper Setting Guidelines

2.3.1. Default Jumper Setting of TLB

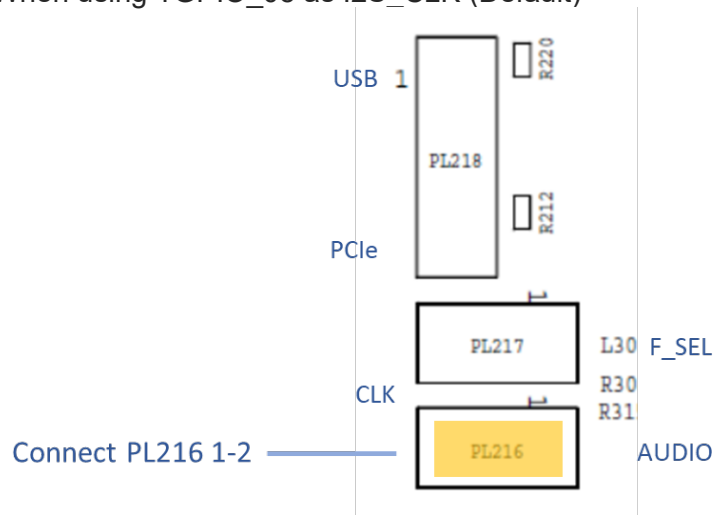


Jumper	Jumper Type	Set Position	Description
PL214	2.54 mm	1-2	Auto Power ON
PL301	2.54 mm	1-2	3.3V PCIe/USB
PL302	2.54 mm	1-2	3.3V PCIe/USB
PL216	2.54 mm	1-2	Enable Audio Function

2.3.2. Jumper Description

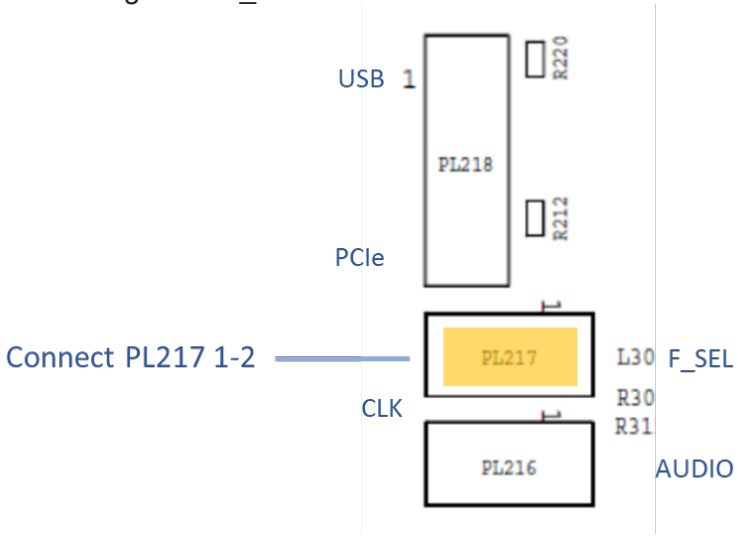


(1) When using TGPIO_05 as I2S_CLK (Default)



The I2S function can be evaluated using the audio codec implemented in EVB. Check out the AT#DVI section of the FN980 Family AT Commands Reference Guide.

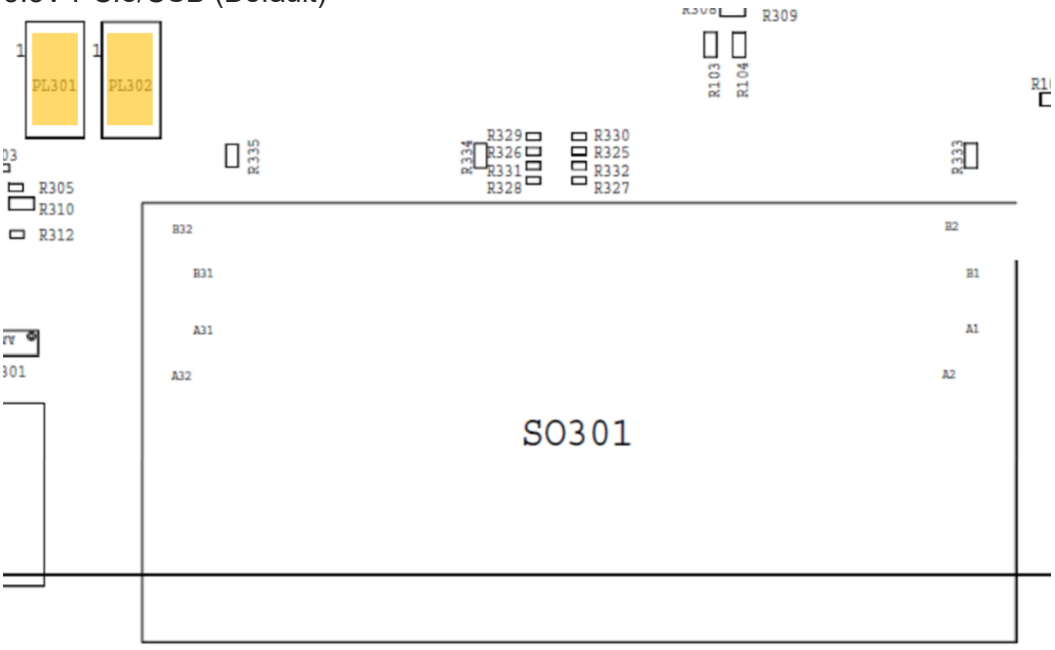
(2) When using TGPIO_05 as USB/PCIe Switch Feature



FN980 family support USB/PCIe switch feature which is switching between USB and PCIe for Network Interface.
Check out the AT#USBPCISWITCH section of the FN980 Family AT Commands Reference Guide.

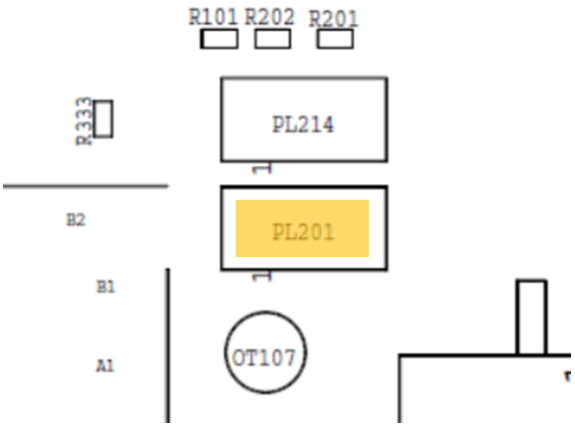
(3) SIM select
PL215 is not currently used. Leave it floating.

(4) 3.3V PCIe/USB (Default)



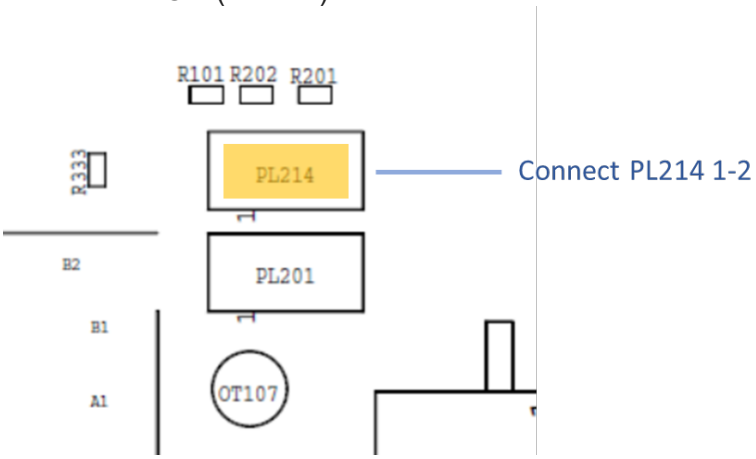
By connecting PL301/PL302,
- 3.3V power is supplied to the USB switch block, so USB 3.1 gen2 can be supported by using Type C connector.
- When FN980 family operates as PCIe EP, it can be supplied VBATT from host through SO301.

(5) W_DISABLE_N



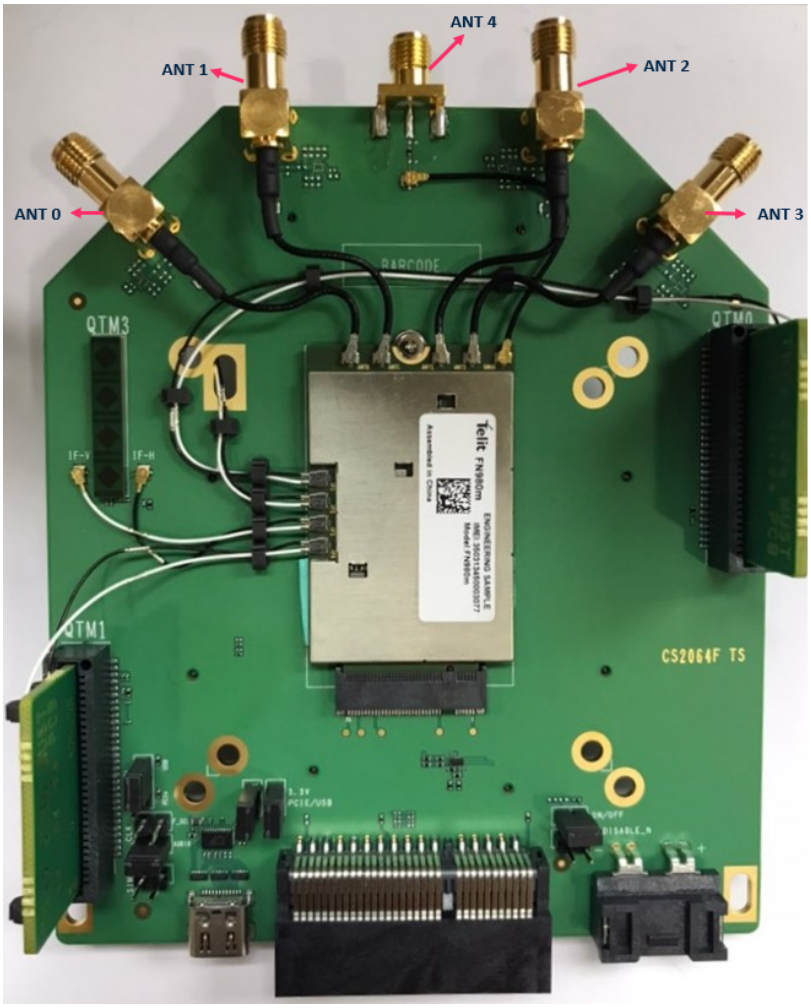
Connecting a jumper to PL201 triggers the W_DISABLE_N function. (Power Saving Mode)
Check out the AT#PSMWDISACFG section of the FN980 Family AT Commands Reference Guide.

(6) Auto Power ON (Default)



If PL214 1-2 is connected by jumper, then FN980 will be automatically powered on when the VBATT is supplied.

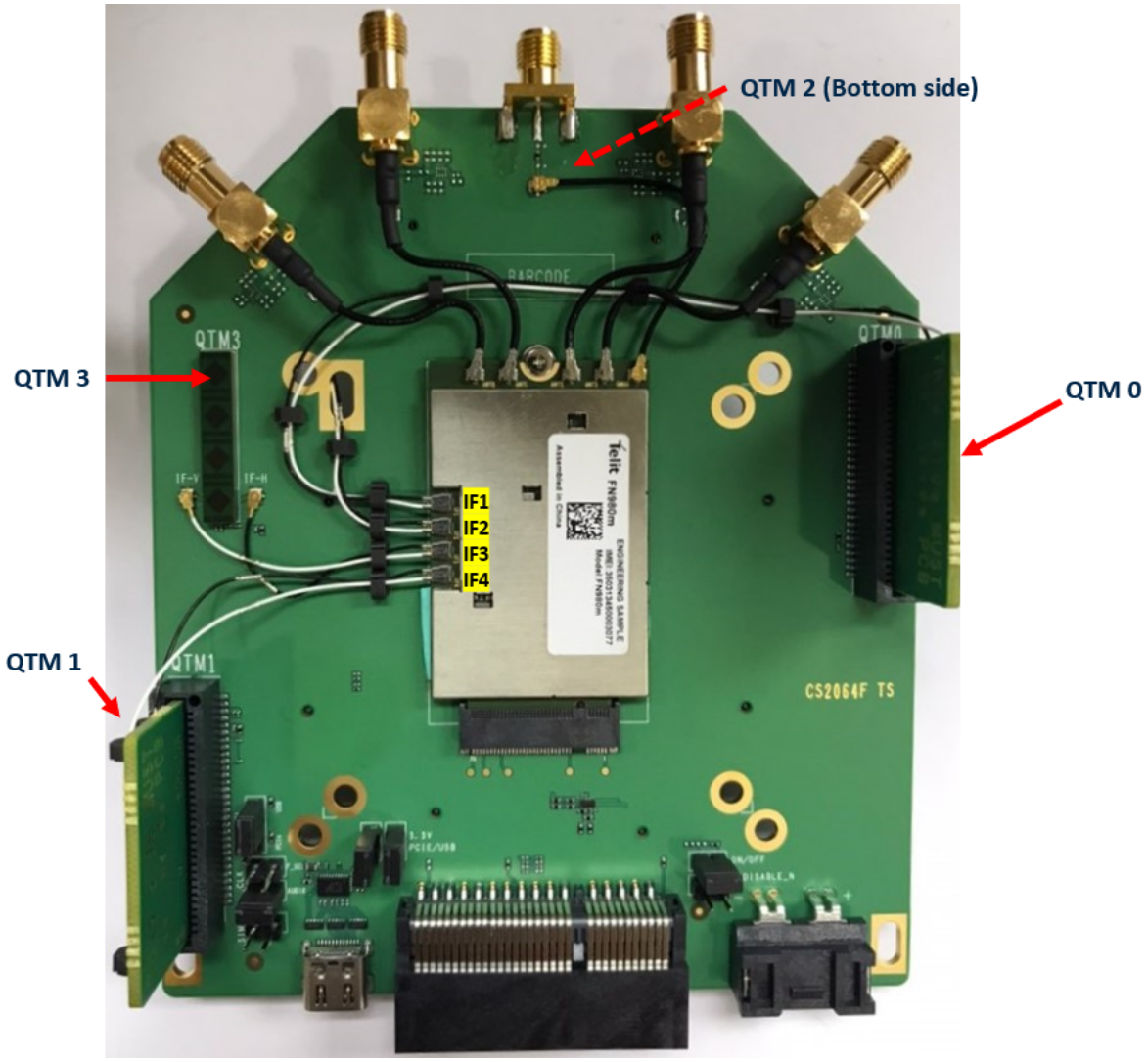
2.4. Antenna Ports



Information – For more detail information of Antenna ports, please refer to FN980 Family HW User Guide, 1VV0301603, Chapter 7.1 Antenna Interface.

Caution – Be careful cables and RF connectors assembly not to damage when Antenna cables for LTE/FR1/FR2/GNSS are connected.

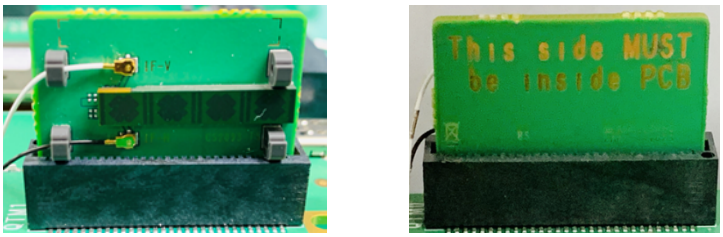
2.5. QTM525 mmWave antenna module assembly for FN980m



Information – For more detail information of 2in1 IF cables connecting, please refer to below FN980m IF connector table, and connect 2in1 IF cable carefully Black one to IF-H and White one to IF-V. Users who want to customize 2in1 IF cable, please refer to 1VV0301603 FN980 Family HW User Guide, Chapter 7.3.2 Cable for mmWave IF.

FN980m IF connector	IF1	IF2	IF3	IF4
Pin No.	QTM525#0	QTM525#2	QTM525#3	QTM525#1
1	IFV4	IFV3	IFV2	IFV1
3	IFH1	IFH2	IFH3	IFH4
mmWave Control pin No.	PON_0 (M.2 pin40)	PON_2 (M.2 pin44)	PON_3 (M.2 pin46)	PON_1 (M.2 pin42)
IF Cable	150mm	80mm	40mm	60mm

FN980m IF connector and Control pin connection



QTM525 SUB PCB Top (L) / Bottom (R) View

Information – For more detail information of QTM525 SUB PCB assembly, bottom side of SUB PCB **MUST** be inside.

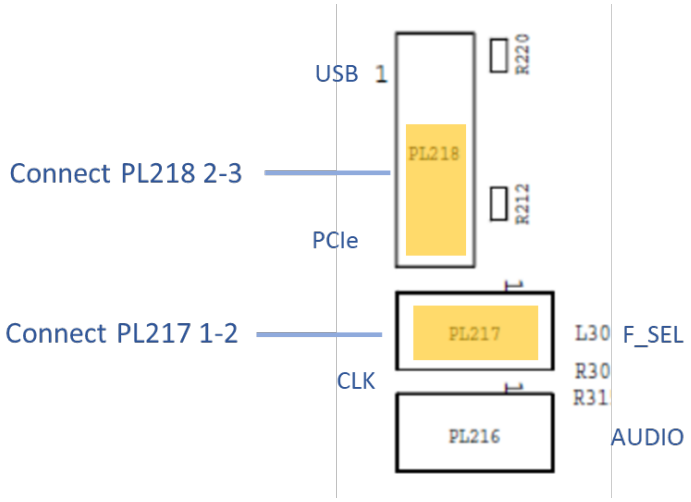
2.6. PCIe

2.6.1. End Point

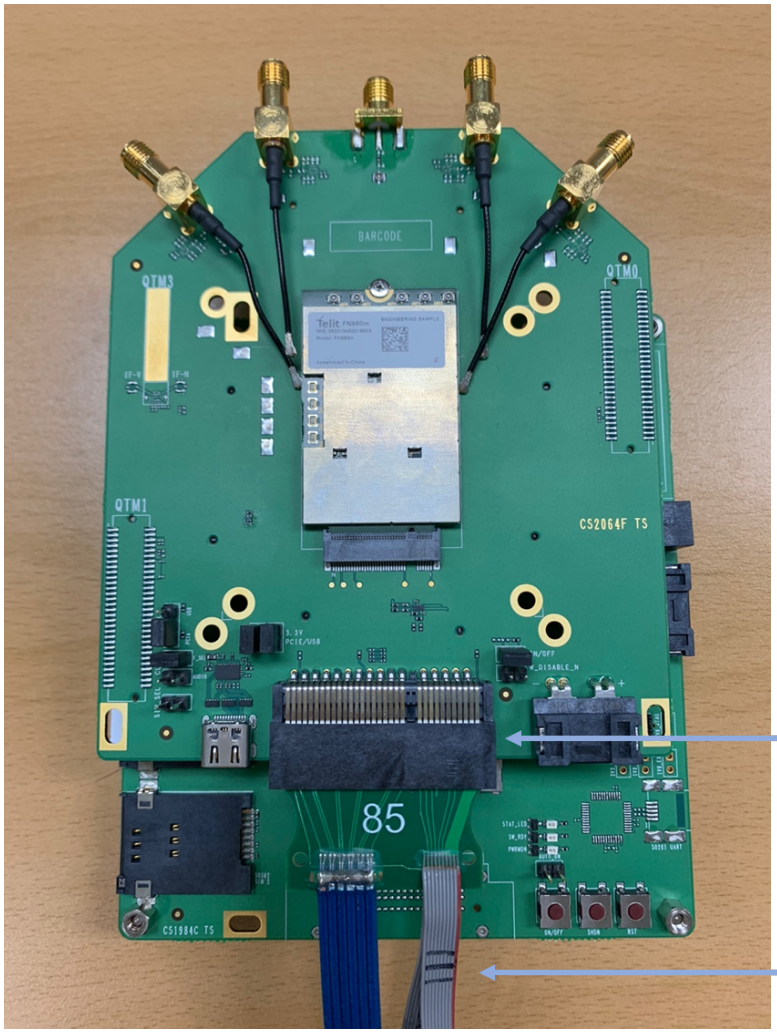
First, enter the following command AT#USBPCISWITCH=1,5
Then USB/PCIe switch feature is enable and will be triggered by TGPIO05.

Please refer to AT#USBPCISWITCH section of the FN980 Family AT Commands Reference Guide for more details.

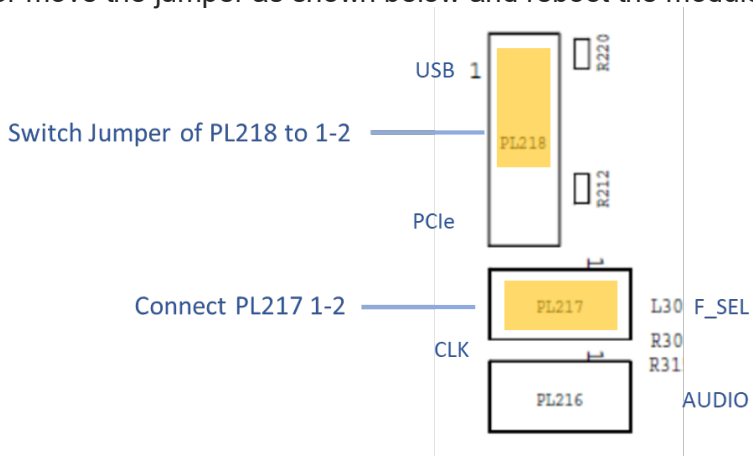
And set the jumper as shown below.



Now FN980 family will operated as PCIe EP by connecting it to the host using an extension cable.



If you want to use USB as a network interface again, just disable the USB/PCIe function, or move the jumper as shown below and reboot the module.



For technical supports and questions about PCIe interface, contact Telit Technical Support at:

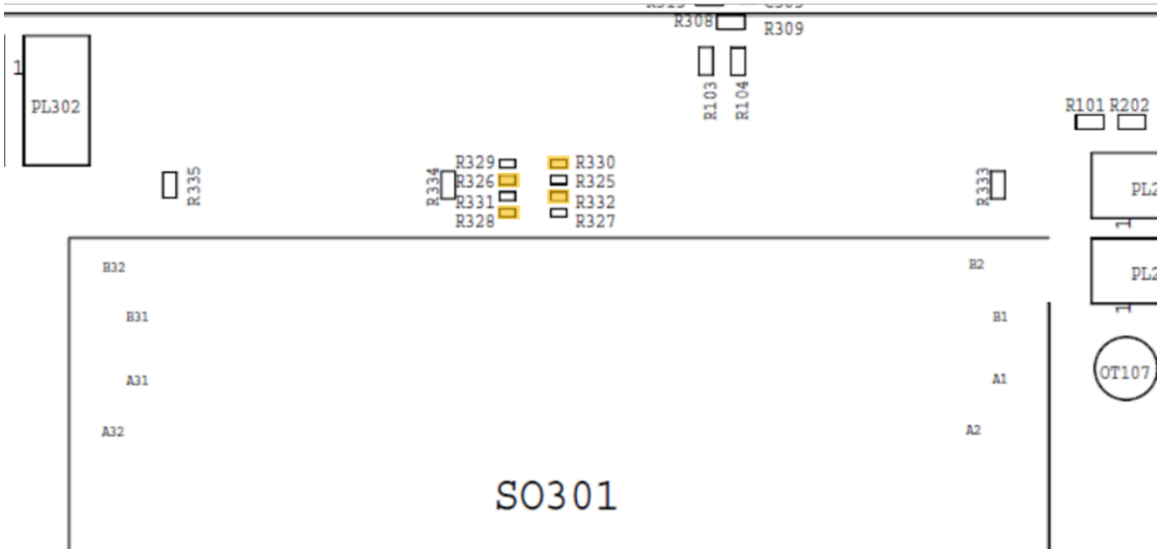
- TS-EMEA@telit.com
- TS-AMERICAS@telit.com
- TS-APAC@telit.com
- TS-SRD@telit.com

2.6.2. Root Complex

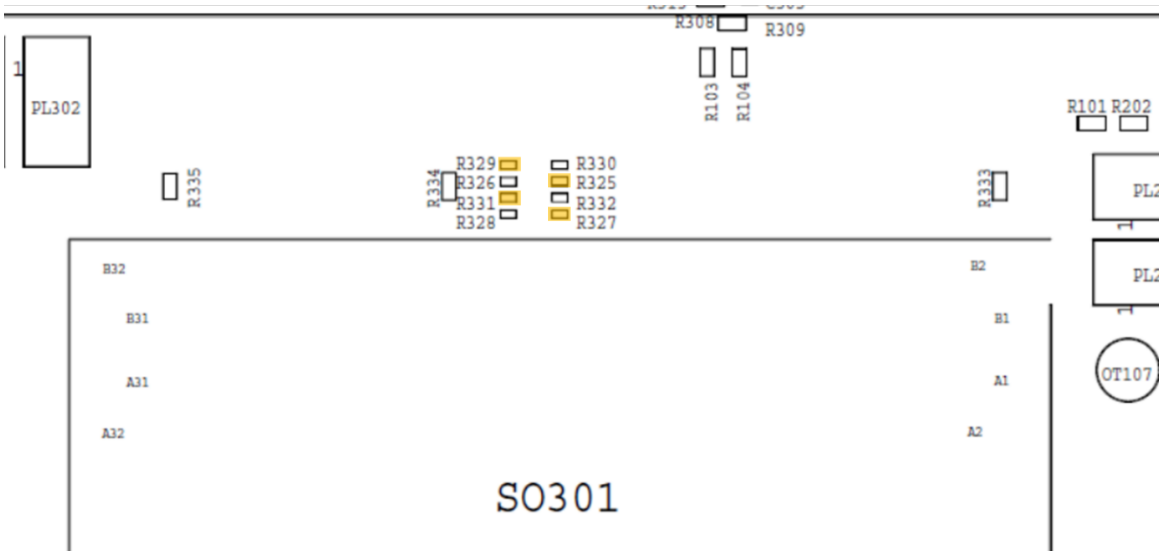
Since FN980 is made according to the m.2 card standard, it basically operates as EP.

If you want to run FN980 as RC using PCIe 64pin connector, you need to move 4 optional resistors referring to the figure below.

PCIe End Point



PCIe Root Complex



Otherwise there are FT980 series routers equipped with the FN980 family.
It supports functions such as PCIe to Ethernet, USB 3.1 gen 2, and mmWave.

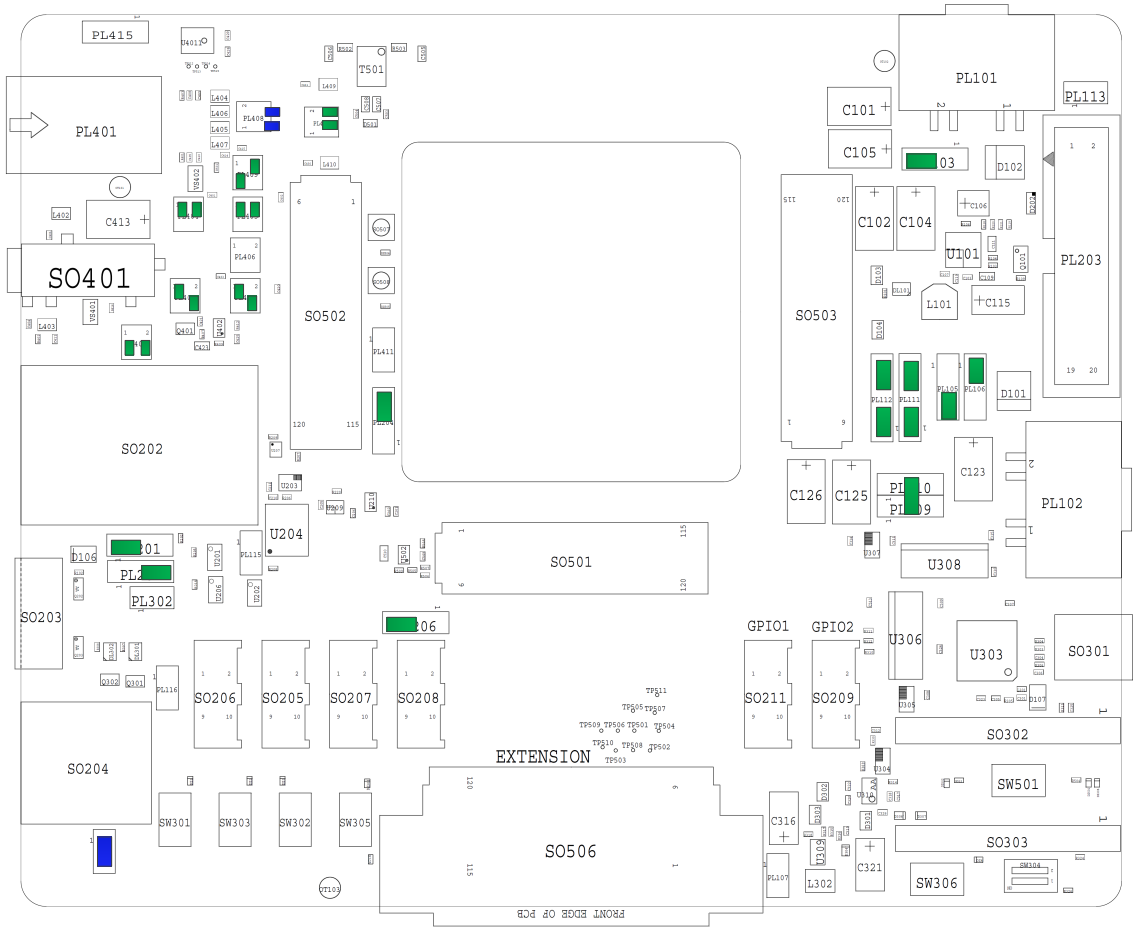
For technical supports and questions about PCIe interface, contact Telit Technical Support at:

- TS-EMEA@telit.com
- TS-AMERICAS@telit.com
- TS-APAC@telit.com
- TS-SRD@telit.com

2.7. Guidance for Evaluation Board

The EVB can be configured for different power supply sources depending on the required use case.

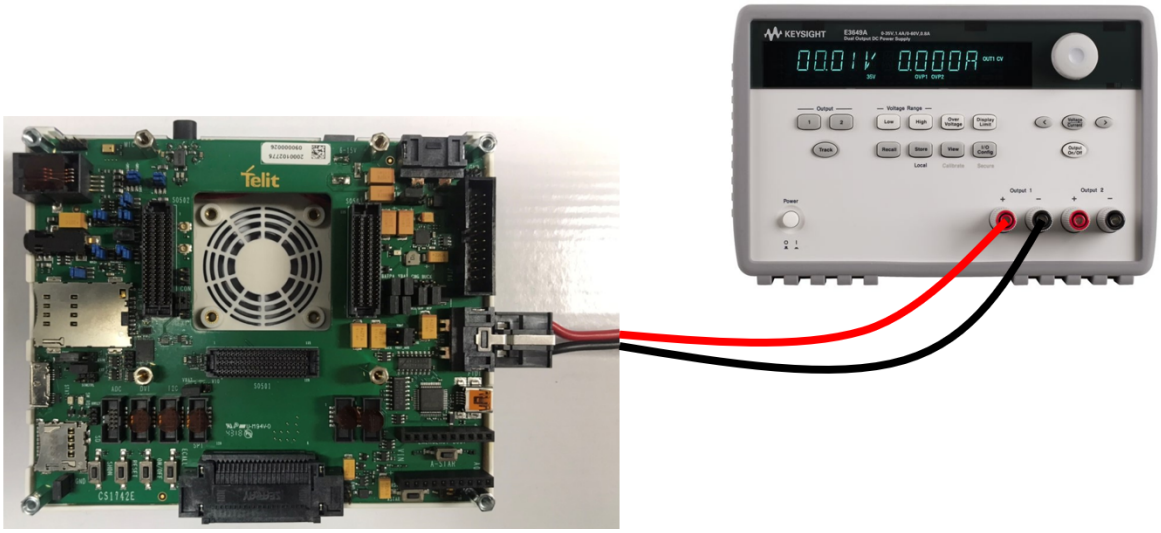
Information – For more detail information of power supply source selection, please refer to 1VV0301249 Telit Evaluation Board (EVB) HW User Guide, Chapter 3.1 Supply Source Selection.



<Default Jumper Setting>

2.7.1. Bypass Setting

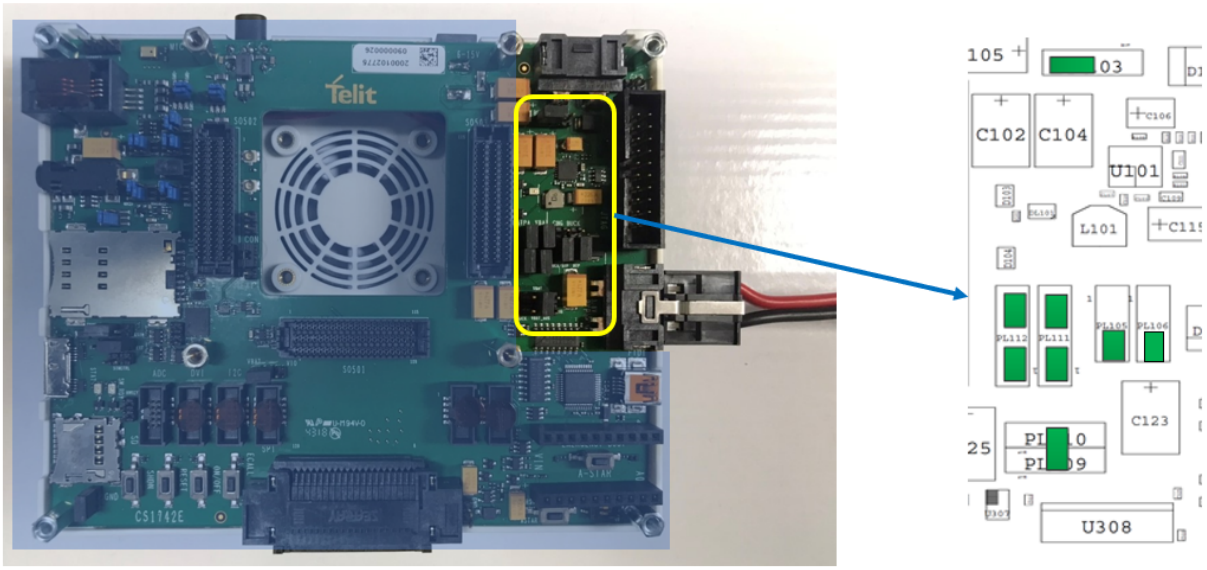
Power Supply Requirement	
Voltage / Max.Current	3.3 V ± 5 % / 3 A



Information – Need to set to over 6A in case of NR FR1 Power Class 2.

2.7.1.1. Jumper Setting for Bypass Mode

PL106/2-3



2.7.2. 6-15V Setting

The EVB main power connector is PL101/SO101 with an input range of 6-15V.

It can be using via power supply or power adaptor.

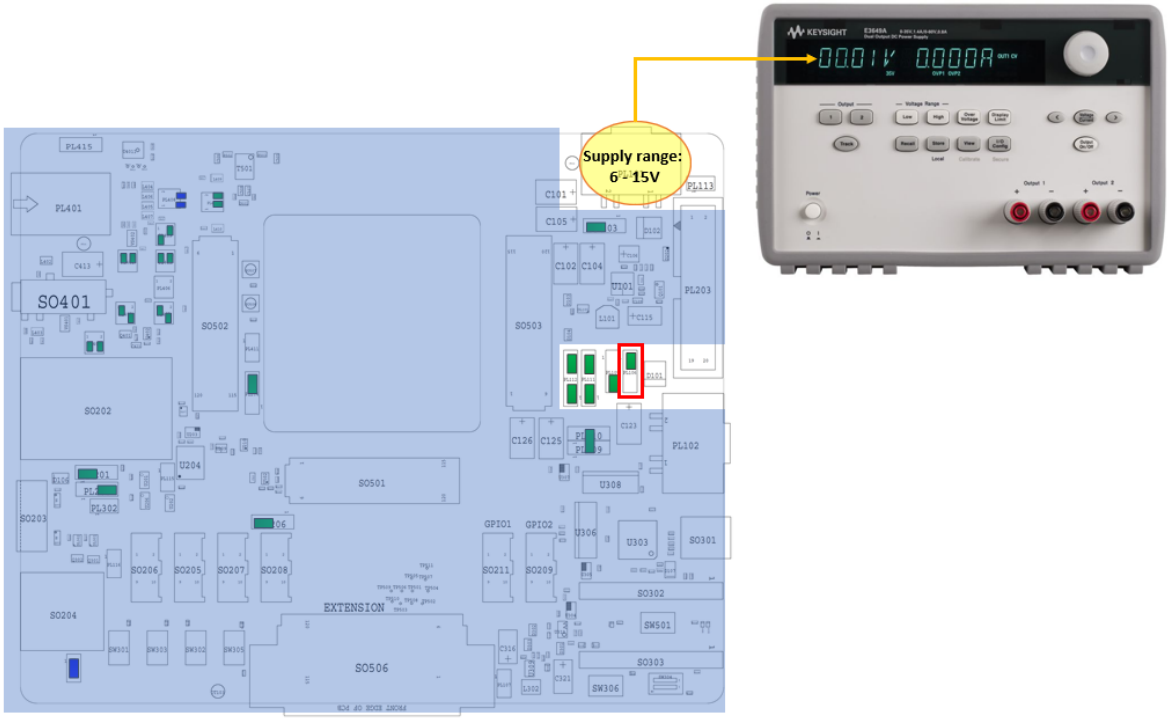
2.7.2.1. Guidelines of ECO for 3.3V output

- **Step 1**

  In case of using a supply 6-15V or 12V adaptor, please change the header as shown below figure. (PL106/1-2; Red Box)

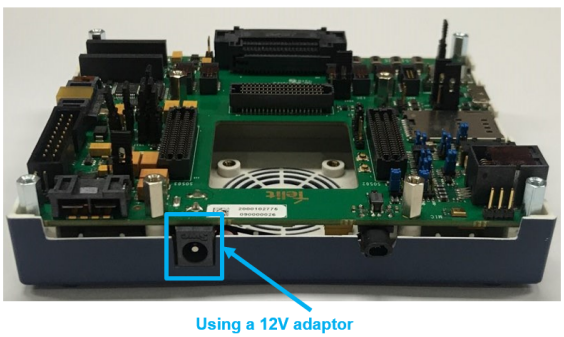
PL101: Power Supply Connector

Power source by power supply: 6-15V



SO101: 12V adaptor connector

Power source by an adaptor

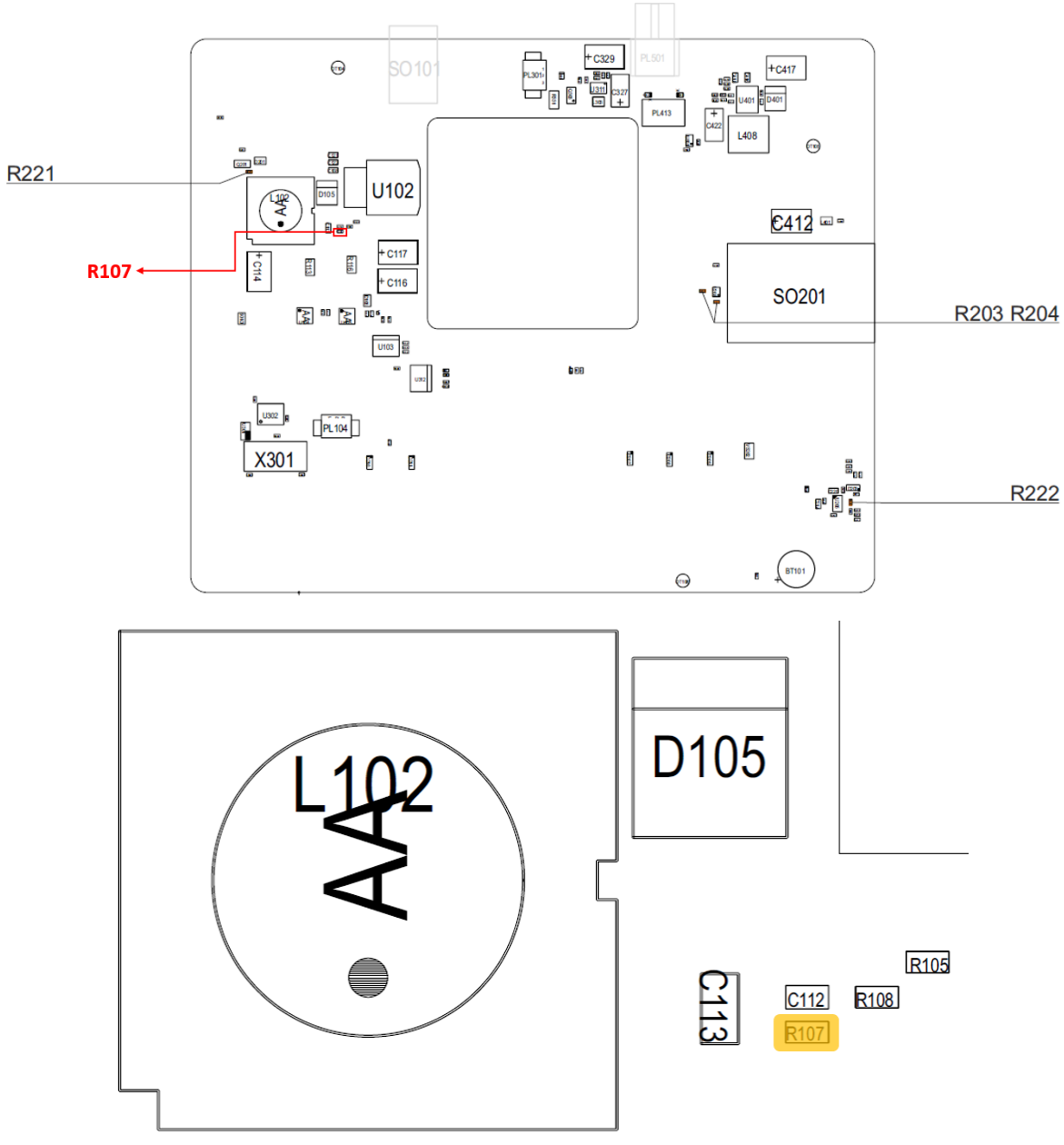


- **Step 2**

  Power source by SMPS down convertor (set-point **3.9V, Default setting**) fed from PL101/SO101

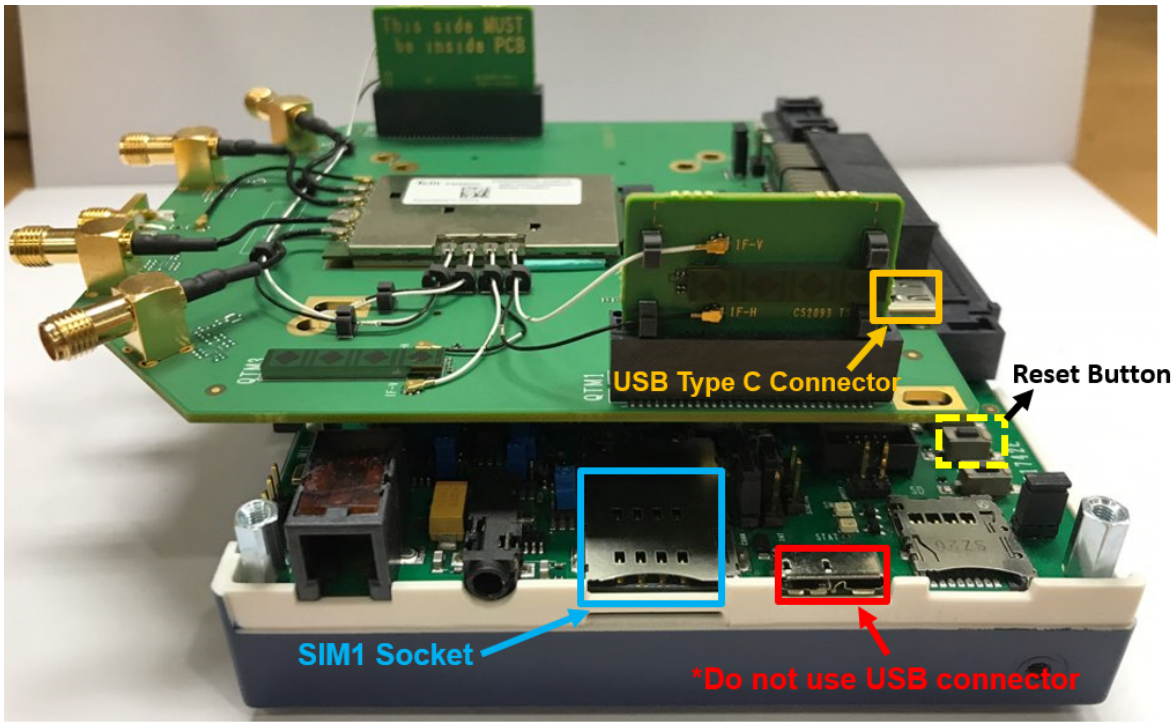
  In order to change **3.3 V output** for FN980 family module, **MUST** change **R107** resistor which is general 0402 **1.69 K ohm** resistor.

Information – We highly recommend general 1.69 K ohm Tol. 1% 1/16W 0402 inch resistor for stable 3.3V output.



<Bottom View of PCB, CS1742E>

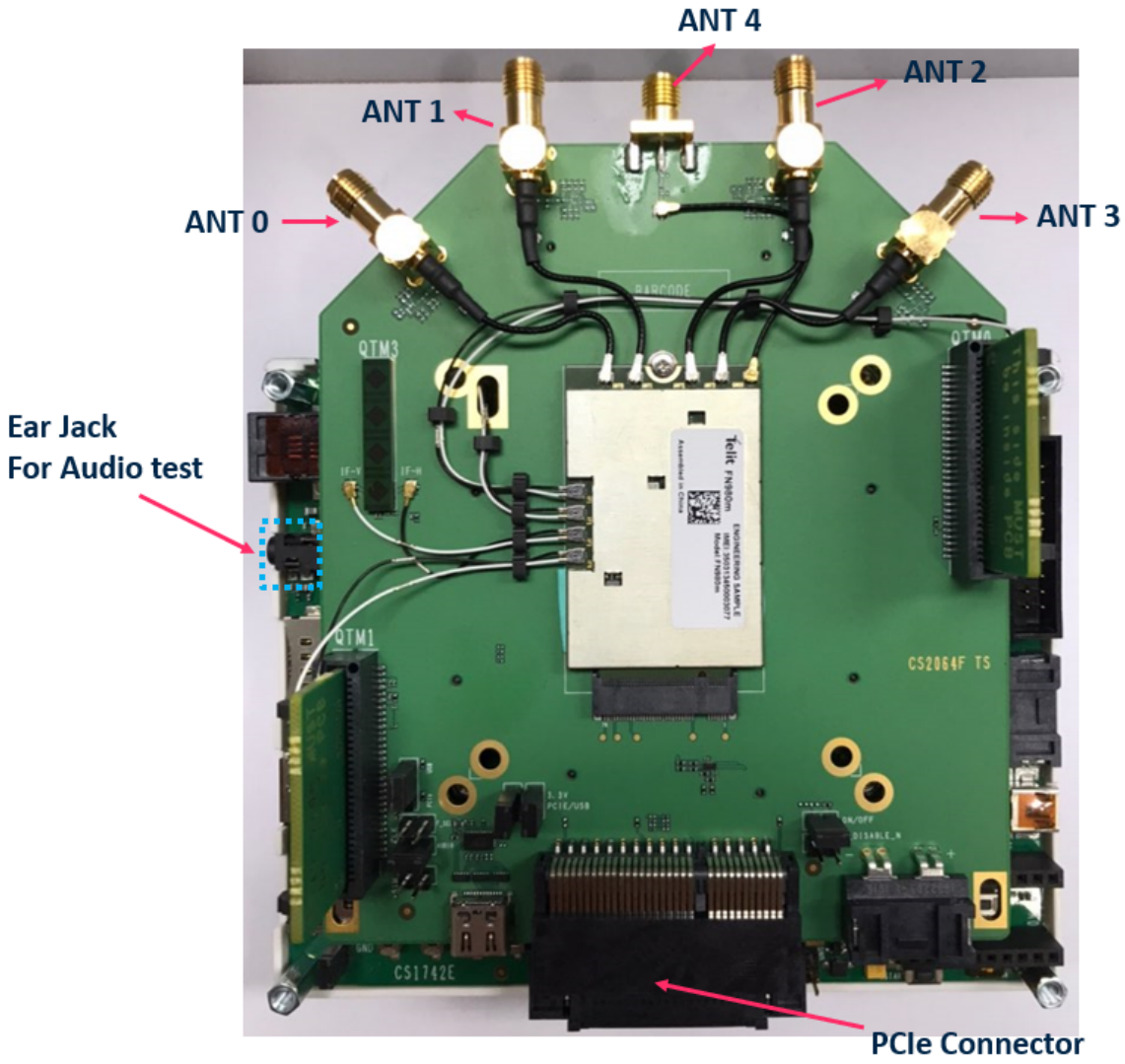
2.7.3. SDK Overview



Warning – FN980 Family features high throughput and high speed peripherals.

For such a reason, users who want to use USB interface **MUST** use USB C type connector which is in TLB.

The USB connector which is in TELIT EVB is not supported on FN980 Family.

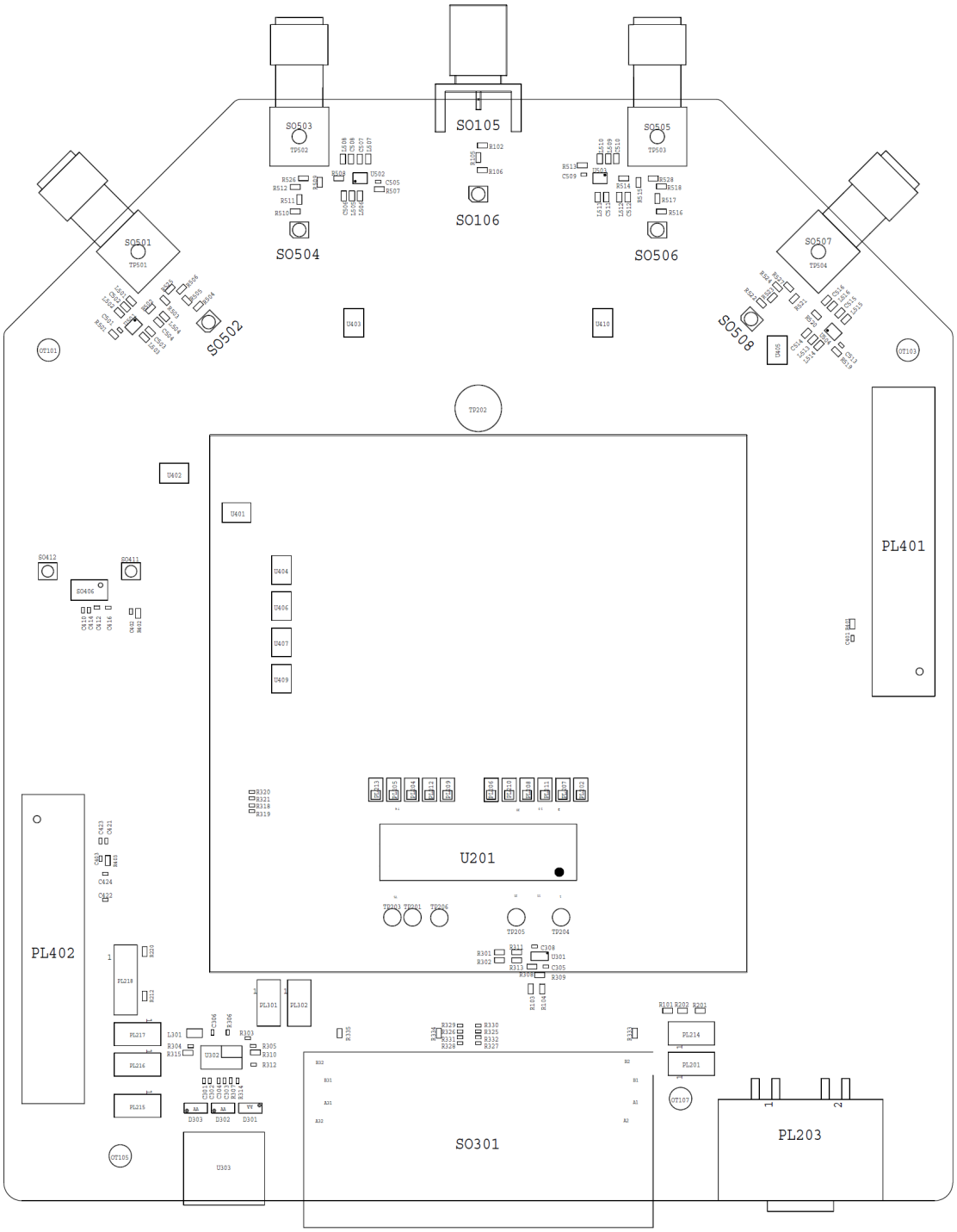


SIM Card	You can use the SIM 1 Socket on the top interface board.
Power ON	To Power-ON the Telit module, connect an AC adaptor or power supply (3.3 V).
Power OFF	To Power-OFF the Telit module, unplug an adaptor or turn-off the power supply.
Modem Reset	To reset the Telit module, press the reset button for more than 1 second.
RF Antenna	For RF antenna, connect antennas to the 4 antenna ports ANT0, ANT1, ANT2 and ANT3.
GNSS Antenna	For GNSS antenna, you can use ANT4.

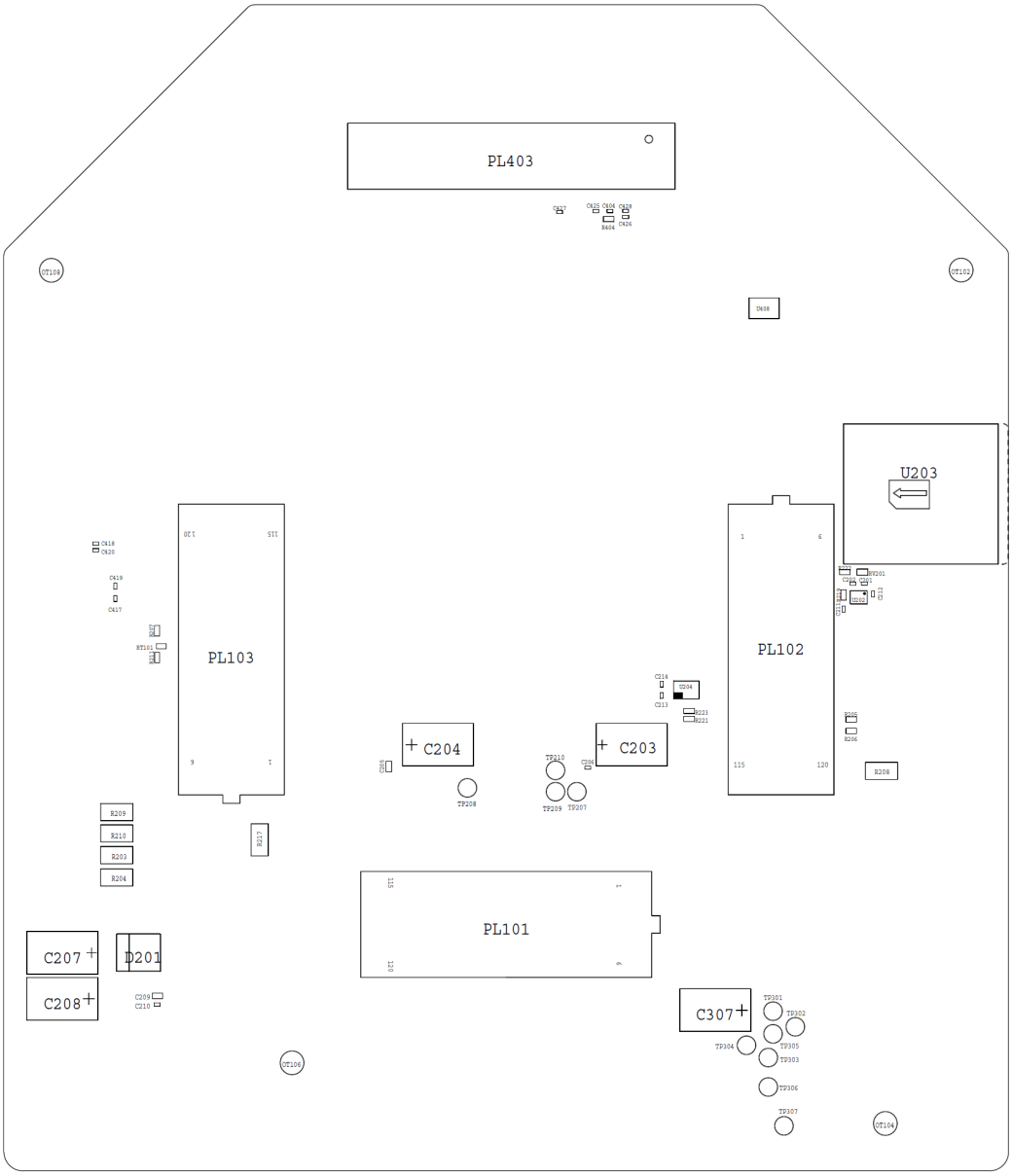
***USB Type-C**	FN980 Family supports USB 3.1 GEN2 interface. USB connector of Telit Evaluation Board does not support 10 Gbit/s. Must use USB Type-C connector which is located in TLB of FN980 Family.
AT Commands / DATA Port	Connect the USB Type-C cable to a Windows PC or Linux PC only after you install necessary drivers. Refer to software user guide for details.

3. COMPONENT ASSEMBLY DIAGRAM

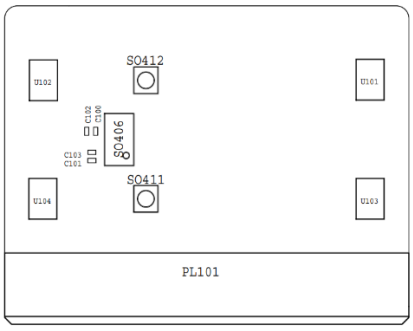
Layout



Component Diagram Top View

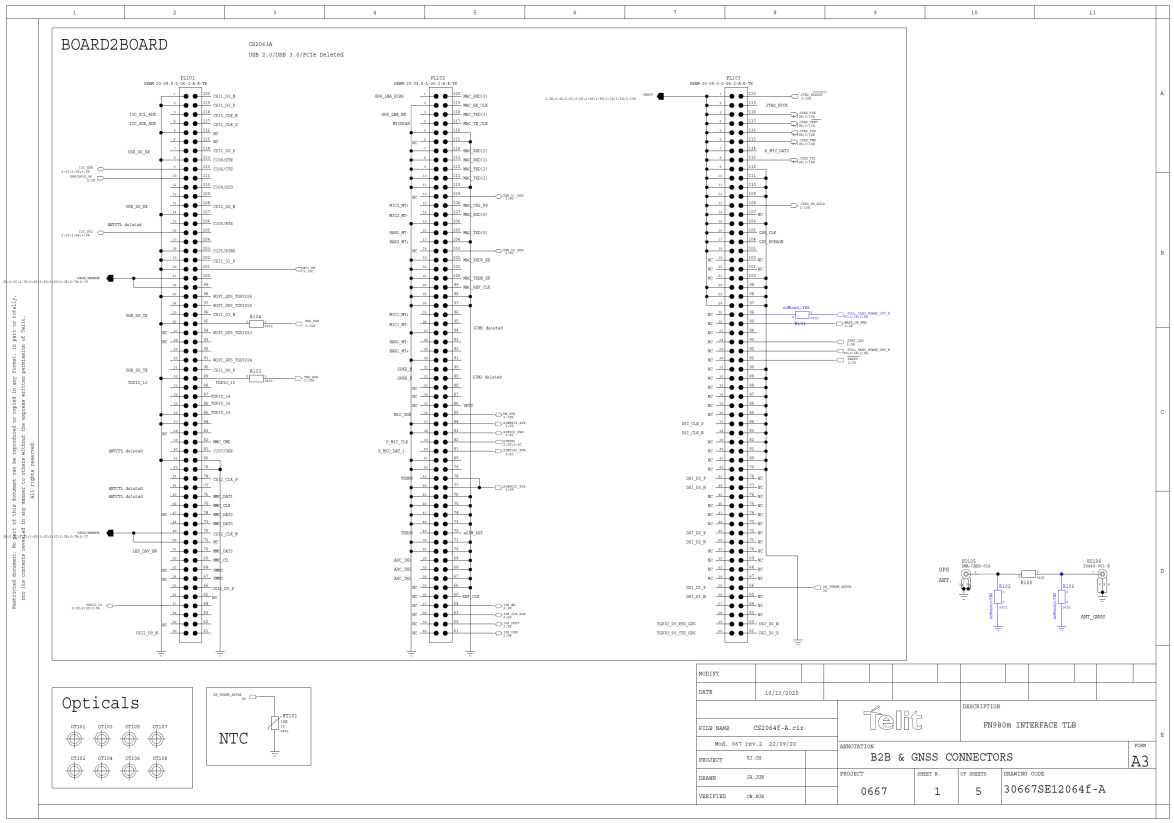


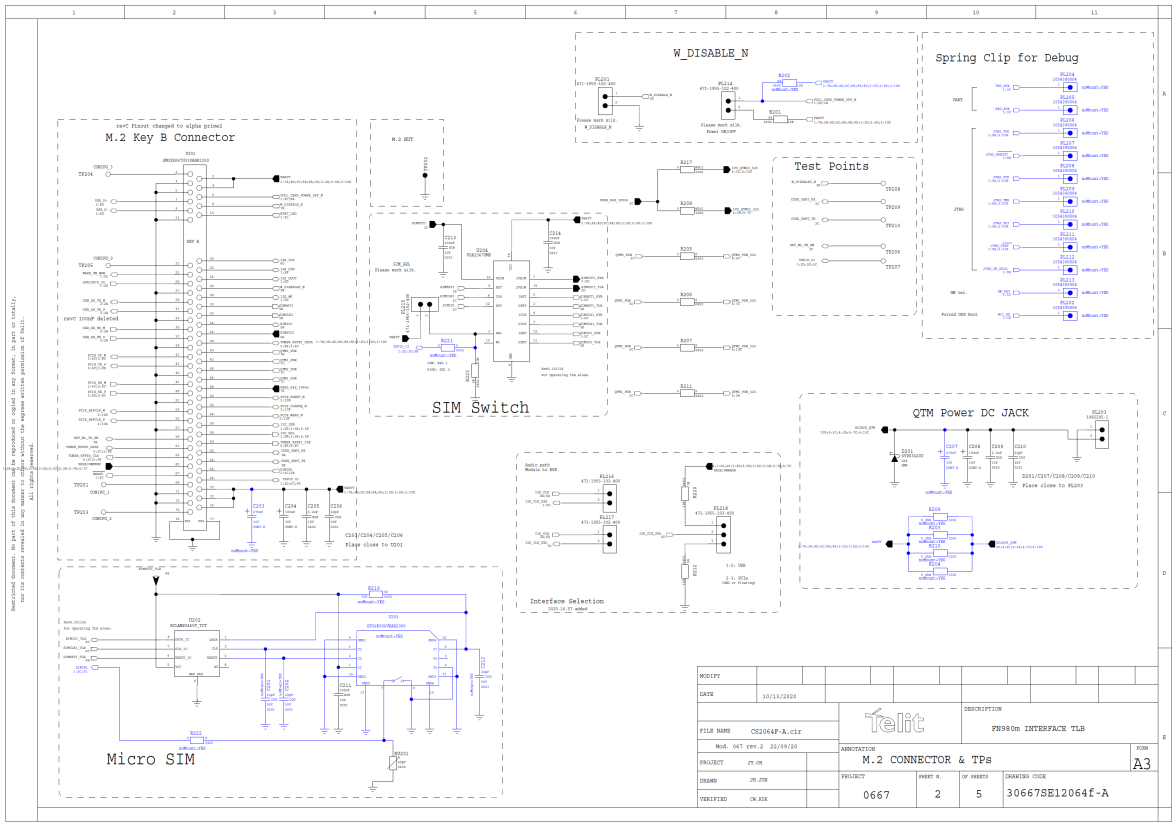
Component Diagram Bottom View

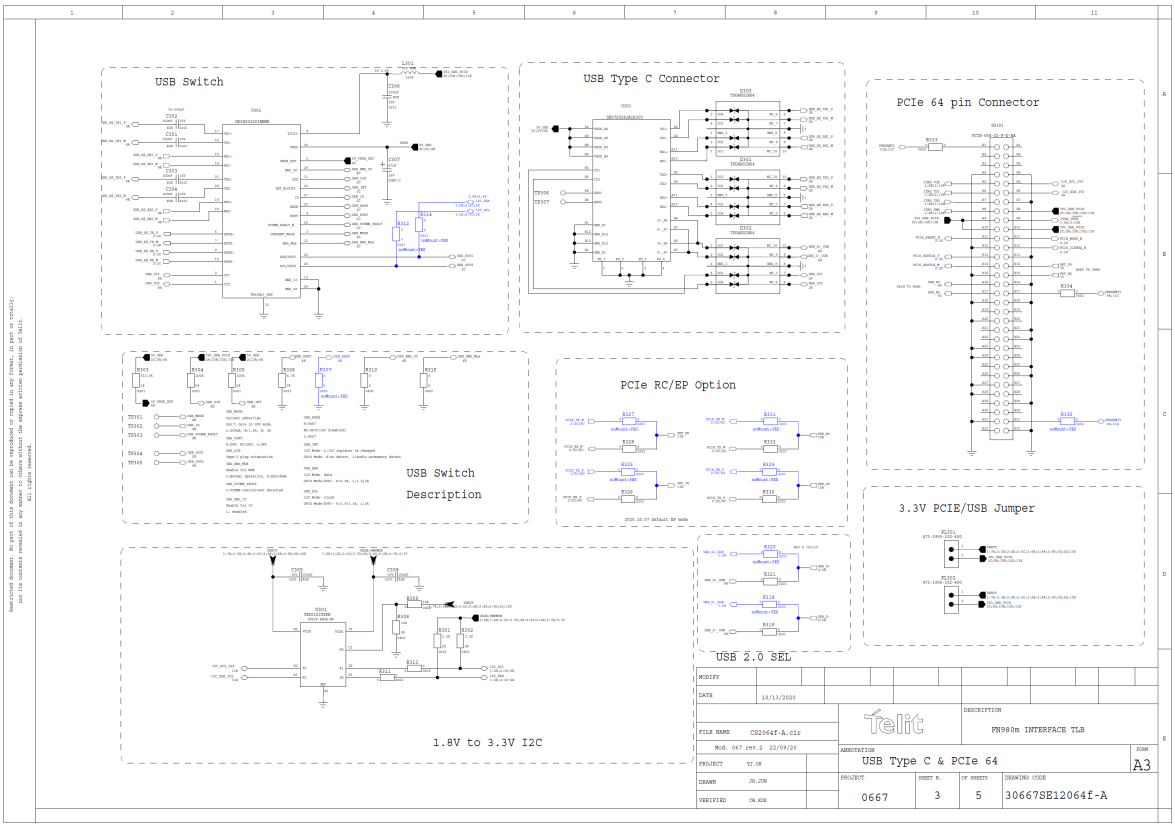


SUB PCB Component Diagram Top View

4. SCHEMATICS






USB Switch
USB Type C Connector
PCIe 64 pin Connector
USB Switch Description
PCIe RC/EP Option
3.3V PCIE/USB Jumper
1.8V to 3.3V I2C
USB 2.0 SEL
MODIFY
DATE
10/13/2020
FILE NAME
CS2064f-A.cir
PROJECT
DRAWN
VERIFIED
DESCRIPTION
FN980m INTERFACE TLB
ANNOTATION
USB Type C & PCIe 64
FORM
A3
PROJECT
0667
SHEET N.
3
OF SHEETS
5
DRAWING CODE
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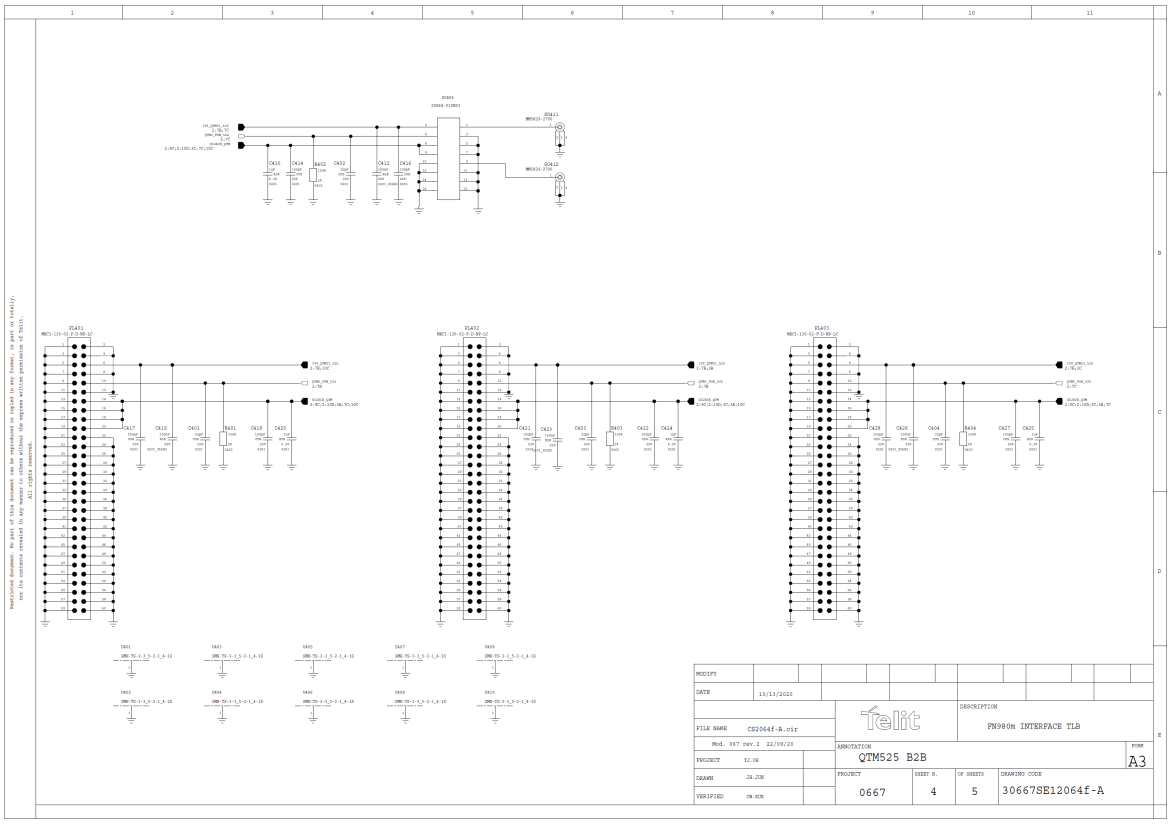
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PROJECT
0667
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4
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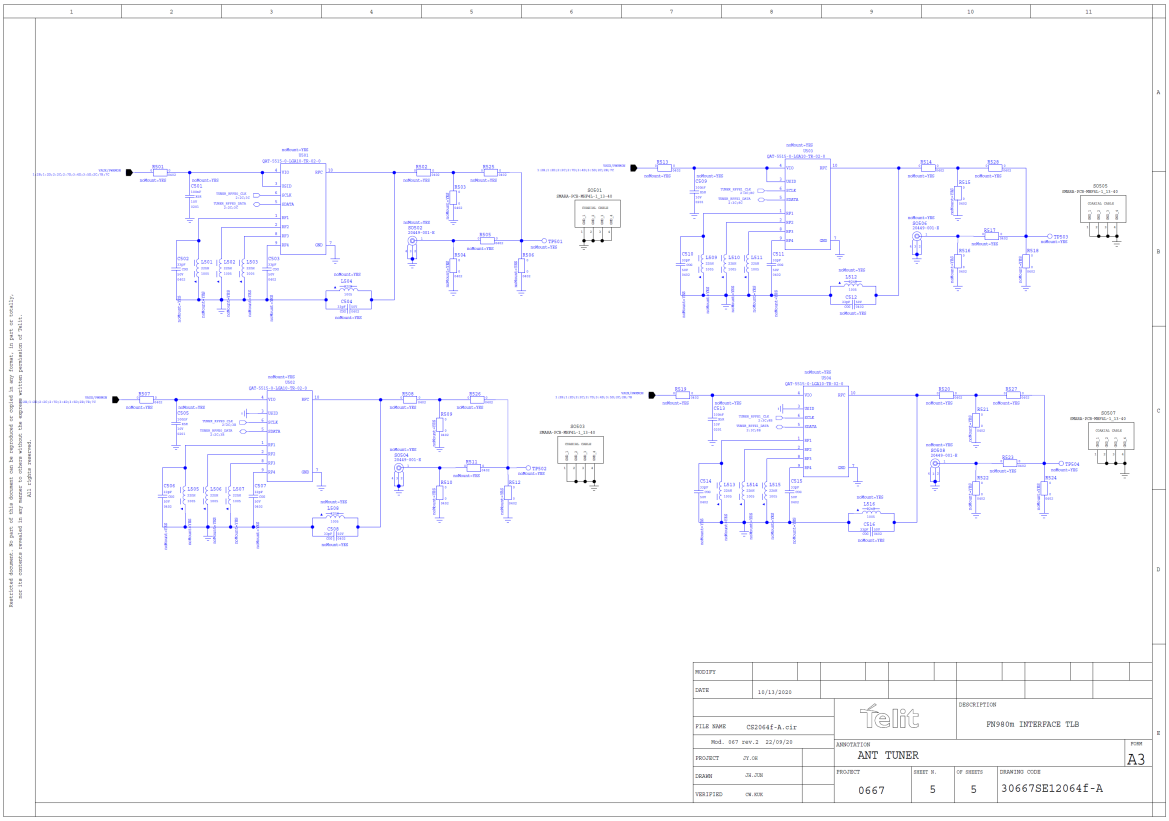

Information – For a higher resolution picture of schematic, please contact Telit technical support as below.

- TS-EMEA@telit.com
- TS-AMERICAS@telit.com
- TS-APAC@telit.com
- TS-SRD@telit.com

5. CHANGE LIST

This section will explain the changes from the previous TLB.

There are some differences that are described in below table.

PCB Code	Change List
CS2064	Prototype.
CS2064A	Used with the FN980 alpha module.(CS2067) Module size is 30 * 52 mm USB Type C block and PCIe 64 connector are added.
CS2064B	Used with the FN980 alpha'/alpha'' module.(CS2067A/CS2067B) Module size is 30 * 50 mm which is same as latest sample.
CS2064D	Used with the FN980 alpha2 module or later (CS2067C – CS2067J) M.2 Pin-out is changed for supporting mmWave control. (Same as latest sample.) mmWave connector is added.
CS2064E	Used with the FN980 alpha2 module or later (CS2067C – CS2067J) Micro SIM connector is added on bottom side. But it is not used anymore.
CS2064F	Used with the FN980 alpha2 module or later (CS2067C – CS2067J) Jumpers for USB/PCIe switch and SIM select are added. PCIe option resistors are set as default EP.

6. SAFETY RECOMMENDATIONS

6.1. 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 the 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 correct wiring of the product. The product has to be supplied with a stabilized voltage source and the wiring has to be conformed 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 for the functioning of the final product; therefore, care has to be taken to the external components of the module, as well as 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 body (20 cm). In case 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 of the relevant information is available on the European Community website:

http://ec.europa.eu/enterprise/sectors/rtte/documents/

The text of the Directive 99/05 regarding telecommunication equipment is available,

while the applicable Directives (Low Voltage and EMC) are available at:

http://ec.europa.eu/enterprise/sectors/electrical/

7. ACRONYMS

EVB	Evaluation Board
TLB	Translation Board
IFBD	Interface Board
USB	Universal serial bus
SIM	Subscriber Identification Module
TIM	Thermal Interface Material
PCB	Printed Circuit Board
ECO	Engineering Change Order
SDK	Software Development Kit

8. DOCUMENT HISTORY

Revision	Date	Changes
0	2020-02-28	First draft
1	2020-08-13	Name changed to FN980 Family Modified typos
2	2021-02-24	Newest FN980 Family TLB (CS2064F) updated Section 2.3 – Added Jumper Setting Guidelines Section 2.6 – Added PCIe section Section 5 – Added Change List section Section 7 – Updated Acronyms table

SUPPORT INQUIRIES

Link to **www.telit.com** and contact our technical support team for any questions related to technical issues.

www.telit.com

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