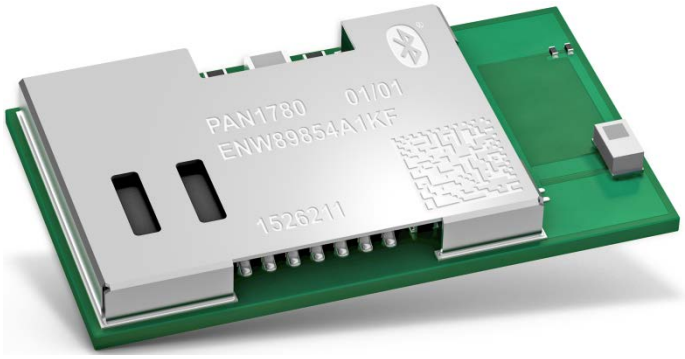
Panasonic
INDUSTRY

PAN1780

Bluetooth® Low Energy Module

Application Note

Rev. 1.1



Wireless Connectivity

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Table of Contents

1 About This Document

1.1 Purpose and Audience

This document shows how to prepare a conducted EUT of the PAN1780 module for certification purpose and a parts overview of the module's antenna area. The Application Note is intended for hardware engineers.

1.2 Revision History

Revision	Date	Modifications/Remarks
1.0	2020-12-11	First version
1.1	2021-08-27	Add information of antenna circuitry

1.3 Use of Symbols

Symbol	Description
	**Note** Indicates important information for the proper use of the product. Non-observance can lead to errors.
	**Attention** Indicates important notes that, if not observed, can put the product's functionality at risk.
	**Tip** Indicates useful information designed to facilitate working with the module.
⇨ [chapter number] [chapter title]	**Cross reference** Indicates cross references within the document. **Example:** Description of the symbols used in this document ⇨ 1.3 Use of Symbols.
✓	**Requirement** Indicates a requirement that must be met before the corresponding tasks can be completed.
➔	**Result** Indicates the result of a task or the result of a series of tasks.
This font	**GUI text** Indicates fixed terms and text of the graphical user interface. **Example:** Click **Save**.

Symbol	Description
Menu > **Menu item**	**Path** Indicates a path, e.g. to access a dialog. **Example:** In the menu, select **File** > **Setup page**.
`This font`	**File names, messages, user input** Indicates file names or messages and information displayed on the screen or to be selected or entered by the user. **Examples:** `PAN1780.c` contains the actual module initialization. The message `Failed to save your data` is displayed. Enter the value `Product 123`.
Key	**Key** Indicates a key on the keyboard, e.g. **F10**.

1.4 Related Documents

For related documents please refer to the Panasonic website ⇨ 7.2 Product Information.

2 Overview

The PAN1780 is based on the Nordic nRF52840 single-chip controller. For further information please visit https://www.nordicsemi.com/Products/Low-power-short-range-wireless/nRF52840.

The PAN1780 ETU is a development platform for the Bluetooth 5 Low Energy (LE) PAN1780.

The design and basic usage is described in the “PAN1780 Module Integration Guide”. For further information please refer to the Panasonic website ⇨ 7.2 Product Information.

Nordic provides a Bluetooth software development kit (nRF5 SDK). For further information please visit https://www.nordicsemi.com/Software-and-tools/Software/nRF5-SDK/Download#infotabs.

This document shows information of the module’s antenna circuitry and how to prepare a conducted EUT of the PAN1780 module for certification purpose.

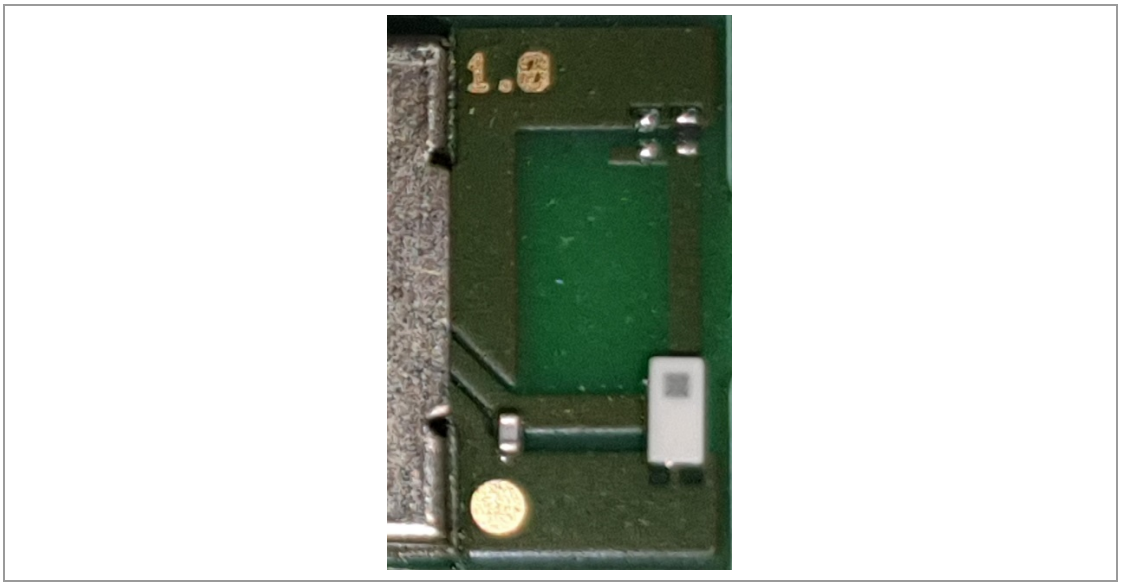
3 Information of the Antenna Circuitry

PAN1780 is a Bluetooth Low Energy module which comes with an antenna on module.

The information shows the schematic, the placement drawing, and the assembled components of the PAN1780 antenna area.

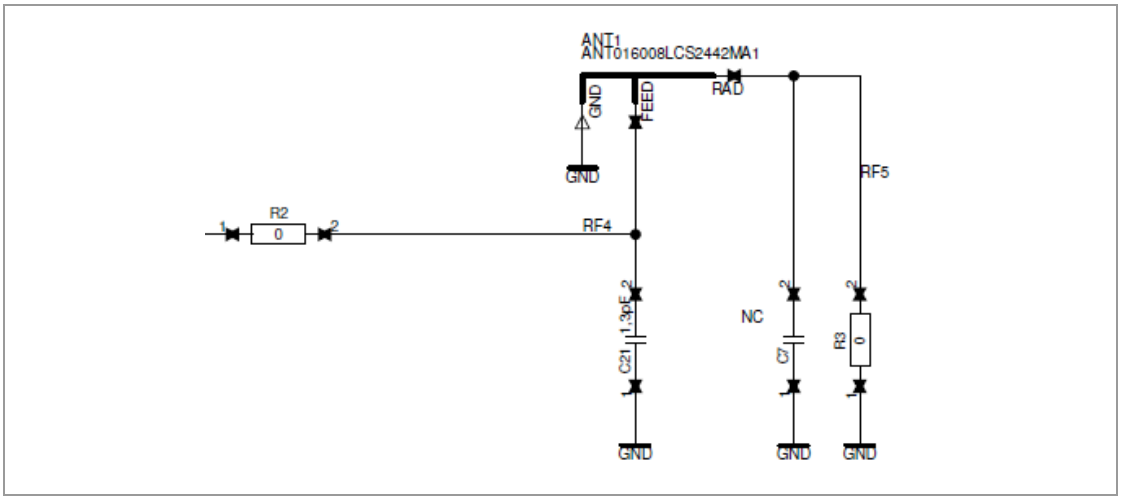
3.1 Live View

The live view of PAN1780 module's antenna area should look like the following picture.



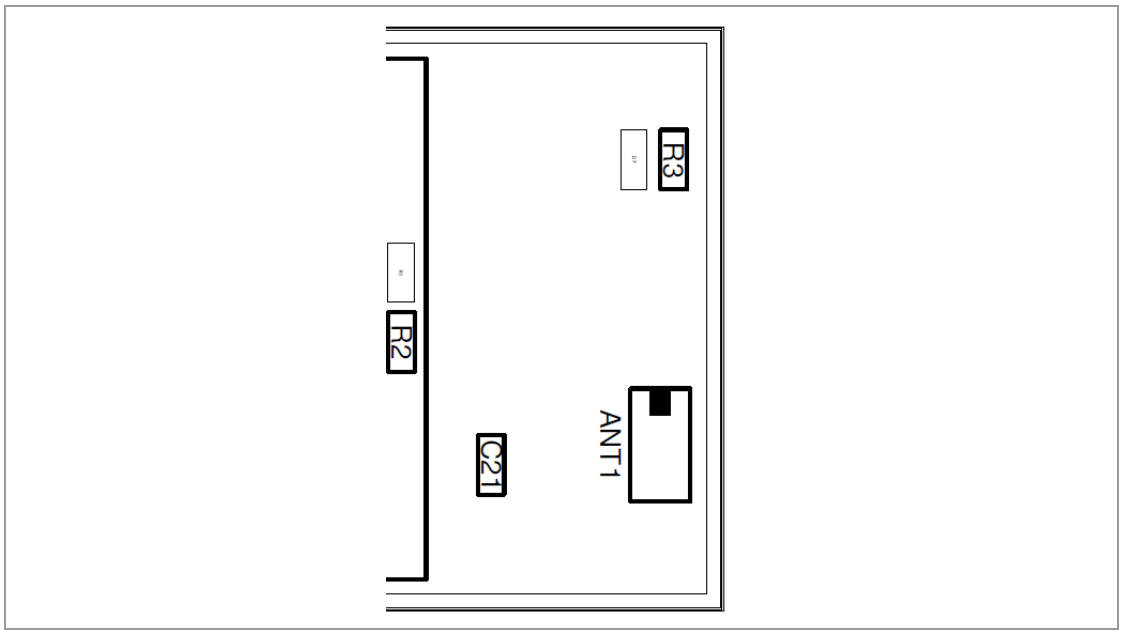
3.2 Schematic Part

The PAN1780 module's schematic of antenna part is shown below.



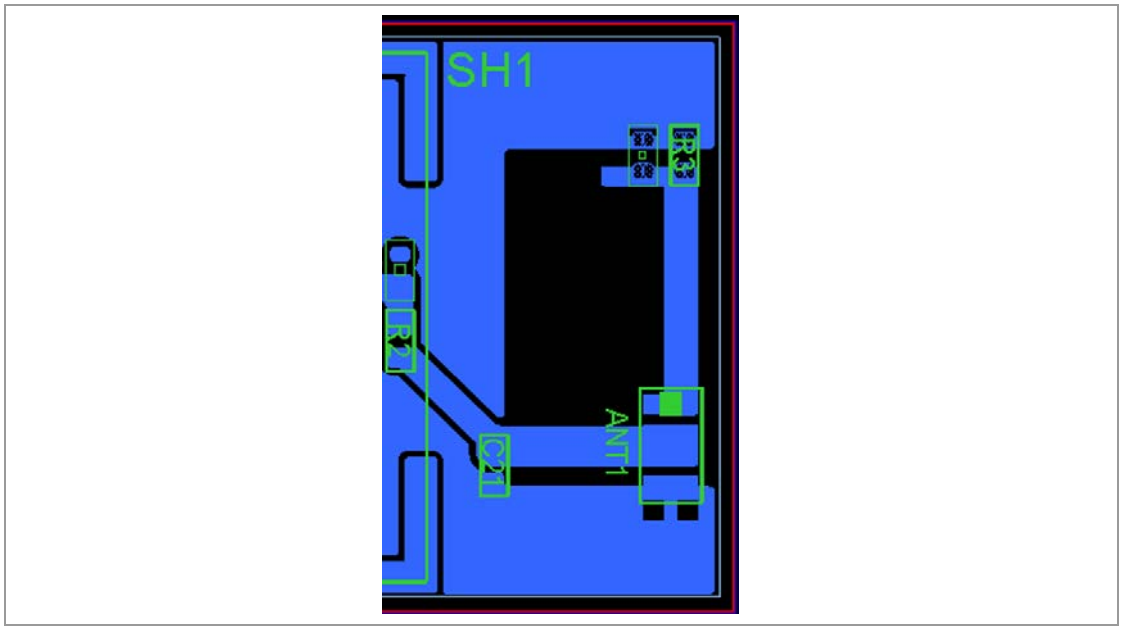
3.3 Parts Placement

The PAN1780 module's parts placement drawing of antenna part is shown below.



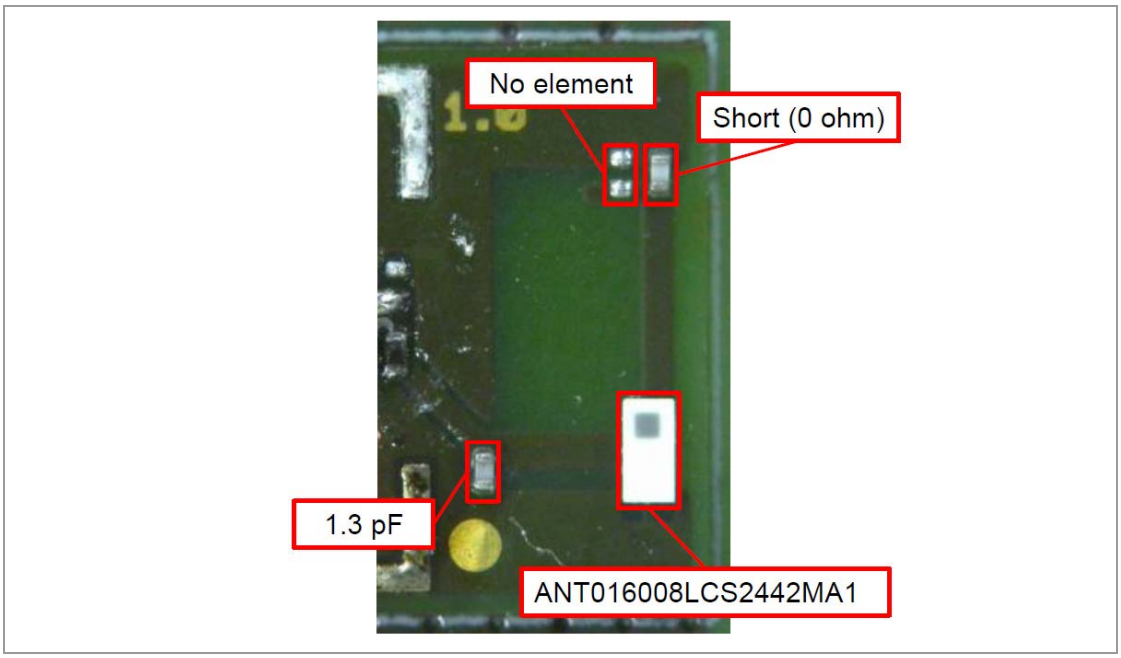
3.4 Layout View

The PAN1780 module's parts placement drawing of antenna part is shown below.



3.5 Parts View

The components value of PAN1780 module's antenna part are shown below.



3.6 Parts List

The parts list of PAN1780 module's antenna part is shown below.

Ref Des	Part	Manufacturer	Description
ANT1	ANT16008LCS2442MA1	TDK	Multilayer Antenna 2.4GHz 1.6 x 0.8 x 0.4
C7	no element	-	-
C21	GJM0335C1E1R3BB01D	Murata	CAP-C 1.3pF +/-0.1pF 25V COG 0201
R2	RMC1/20JPPA	Kamaya	RES-S 0,0R 0201 1/20W TAPE SMD
R3	RMC1/20JPPA	Kamaya	RES-S 0,0R 0201 1/20W TAPE SMD

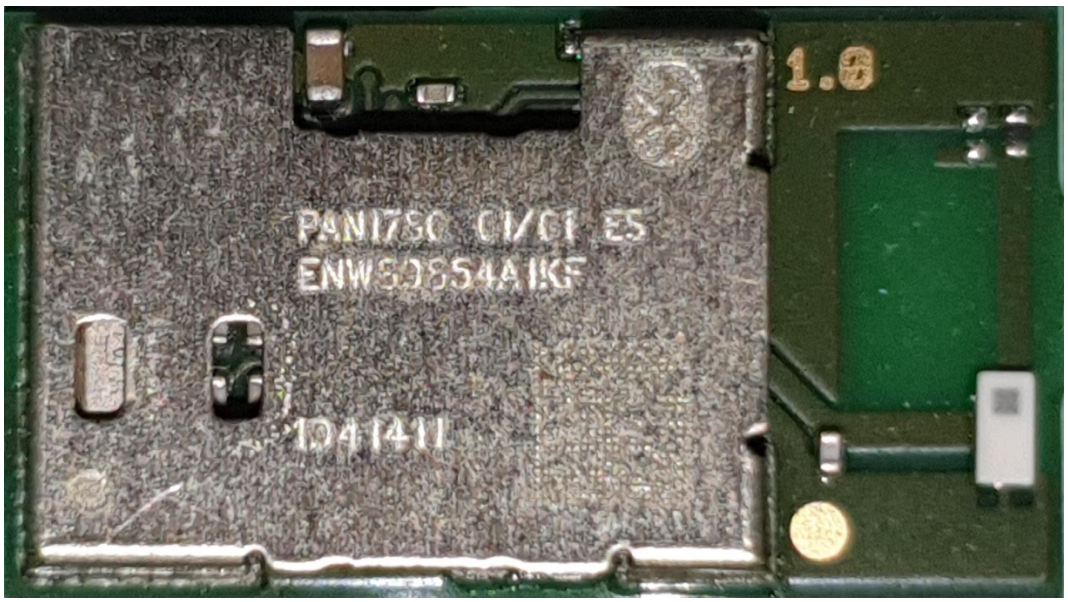
4 How to prepare a conducted EUT?

PAN1780 is a Bluetooth Low Energy module which comes with an antenna on module. Additionally, there is a RF Bottom Pad at pin A10 on the modules footprint which isn't enabled as RF output by default. It could be used to connect to an U. FL SMD connector on customers PCBA but the most of them doesn't have the space to design-in an U. FL connector beside the module. Furtherly the RF Bottom Pad needs to be enabled by a Chip Resistor underneath the modules shielding cover which is basically difficult to apply.

This application note shows how the PAN1780 can be reworked with an U. FL SMD connector at the antenna area of the module.

4.1 Overview

The PAN1780 should look like the following picture. The SMD antenna is placed on the right side of module and has a white surface with a black rectangular marking. The other two SMD components are used for tuning and RF matching of antenna.



4.2 Preparations

A PAN1780 module assembled on PCBA must be available to apply the rework to a conducted EUT for certification purpose.

The following requirements must be met:

- ✓ PAN1780 module assembled on PCBA
- ✓ U. FL SMD connector (e.g. Hirose U. FL-R-SMT-1(10))
- ✓ Lead Free Solder Wire
- ✓ Copper Wire with small diameter

- ✓ Two solder irons with a small soldering tip
- ✓ Cutter

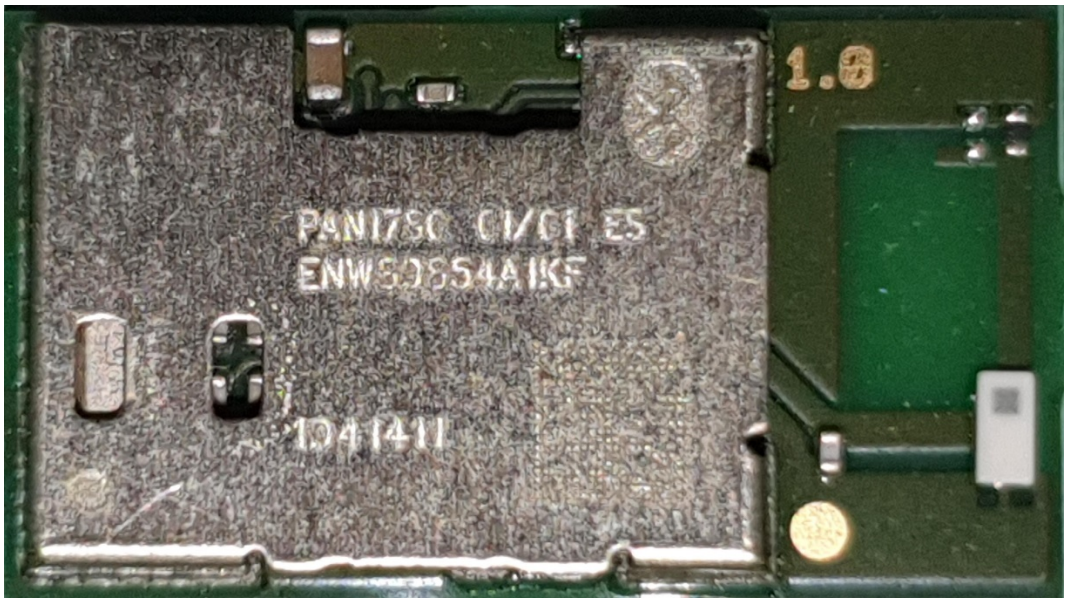
The goal of this application note is to assemble an U. FL SMD connector at the antenna area of PAN1780 module. It is necessary to remove the SMD antenna and two chip components from the module. For removement two solder irons with a small soldering dip are needed. Additionally, it is necessary to remove copper partitions and open the green resist mask with a cutter at the position where the U. FL SMD connector will be assembled later. The SMD connector and an additional copper wire should be soldered with Lead Free solder wire.

4.2.1 Hardware Modification

A PAN1780 module assembled on PCBA should be used for hardware modification. Additionally, an U. FL SMD connector like Hirose U. FL-R-SMT-1(10) should be in place.

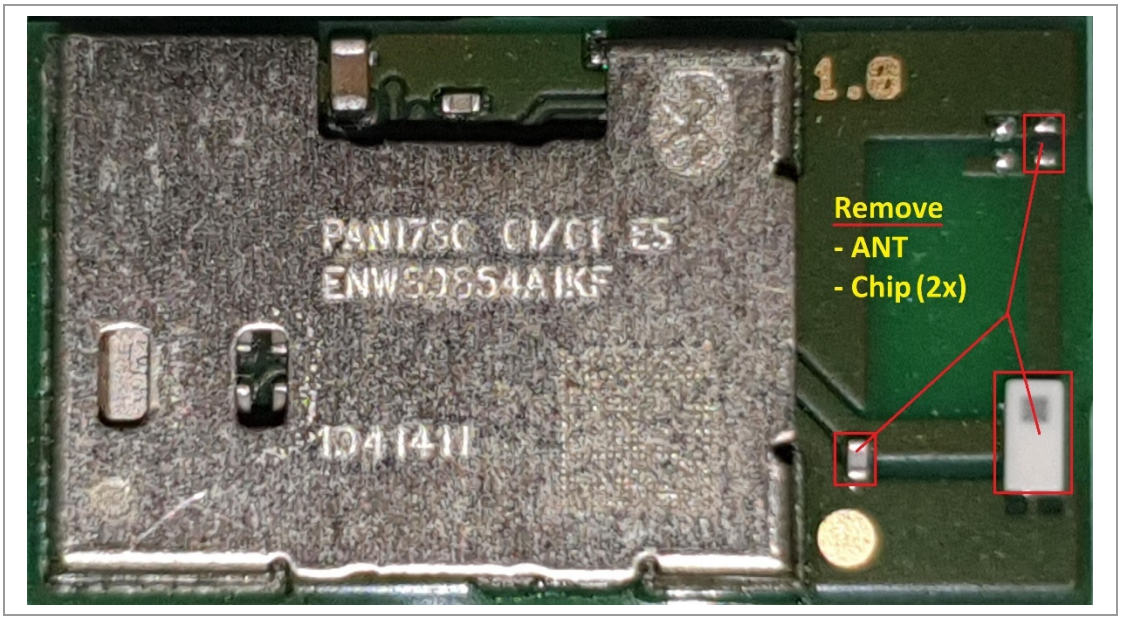
Initial Condition

The following picture shows the initial condition of PAN1780 module.



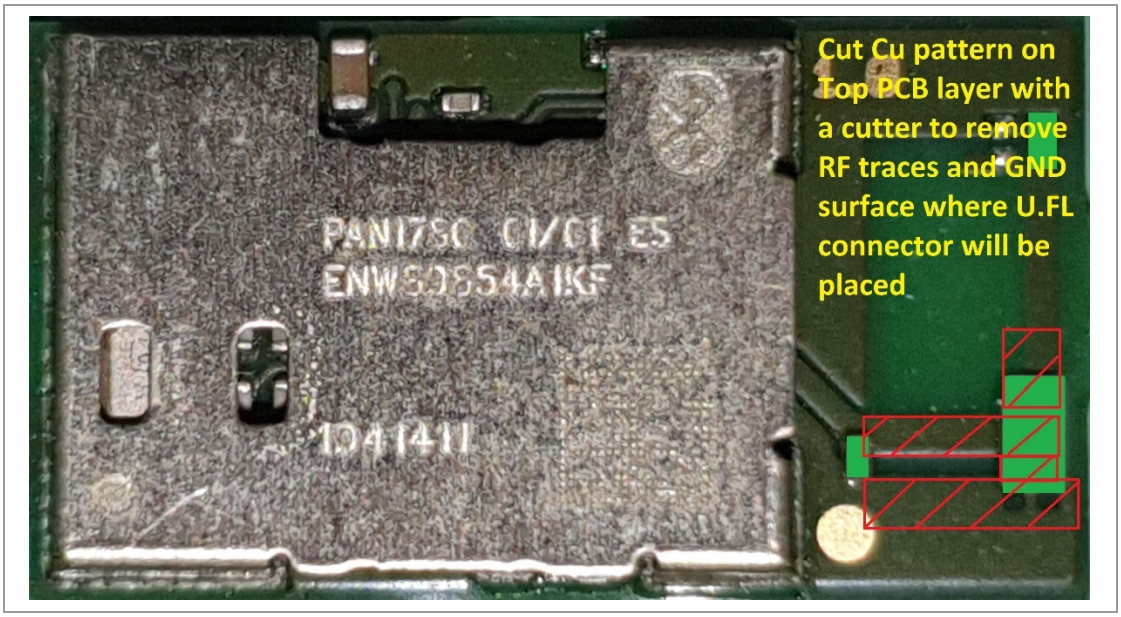
Modification Step 1

The following picture shows the SMD components which should be removed from the PAN1780 module. The parts to be removed are marked with red rectangular boxes.

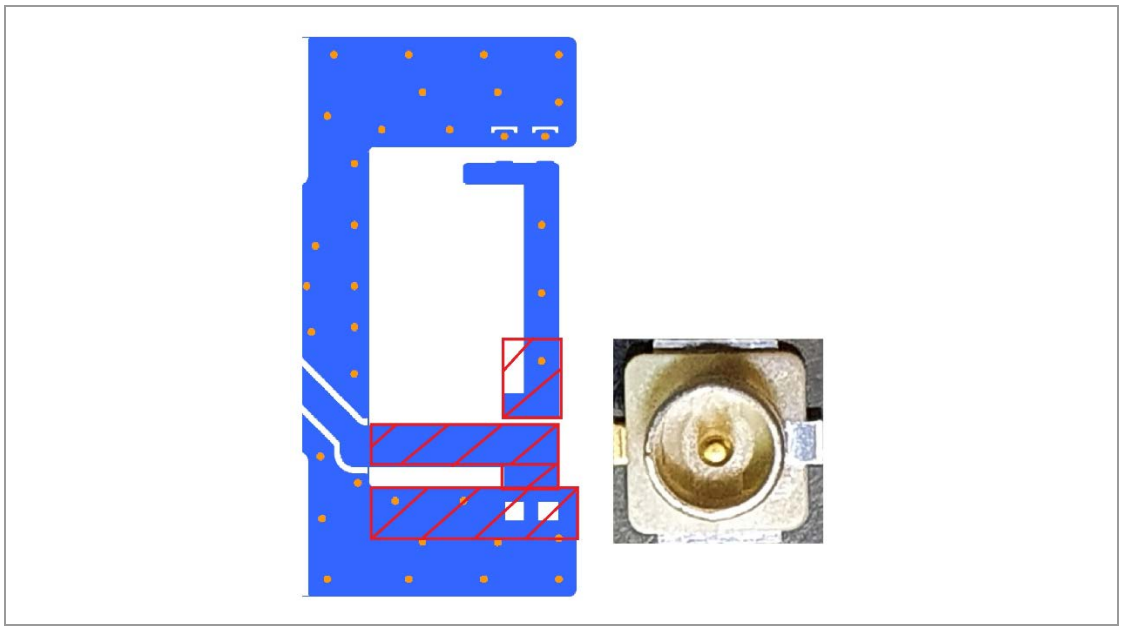


Modification Step 2

The following picture shows the copper partitions which should be removed from the Top layer of PAN1780 PCB. The partitions to be removed with a cutter are marked with red rectangular boxes.

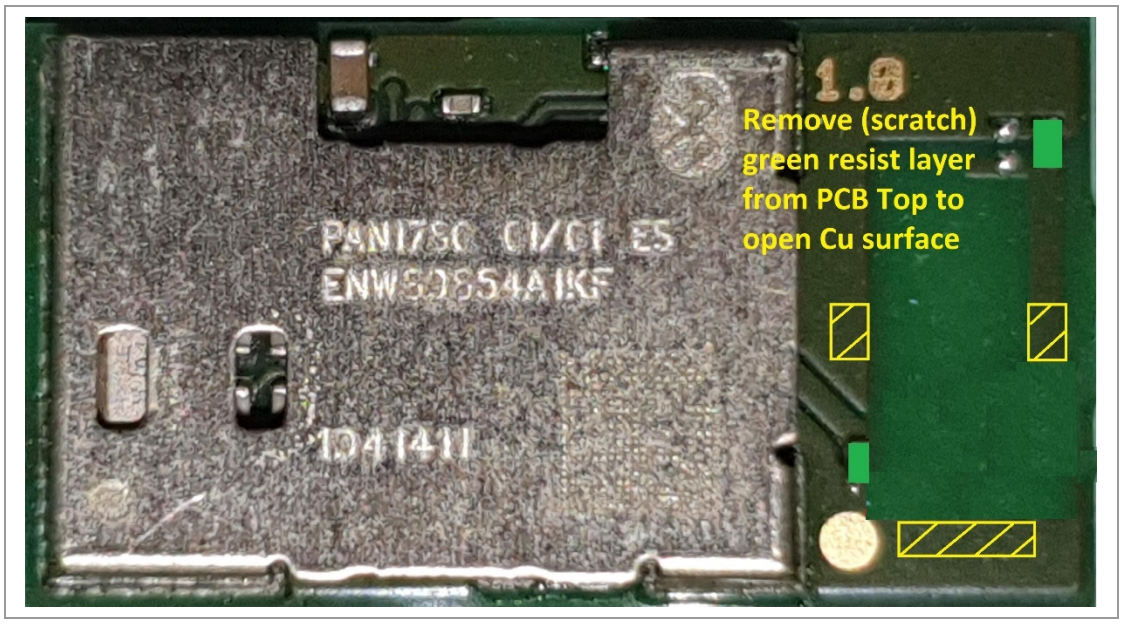


The following picture shows the copper partitions in the PCB layout view. The partitions to be removed are marked again with red rectangular boxes. The picture shows also the top view of a Hirose U. FL-R-SMT-1(10) SMD connector.

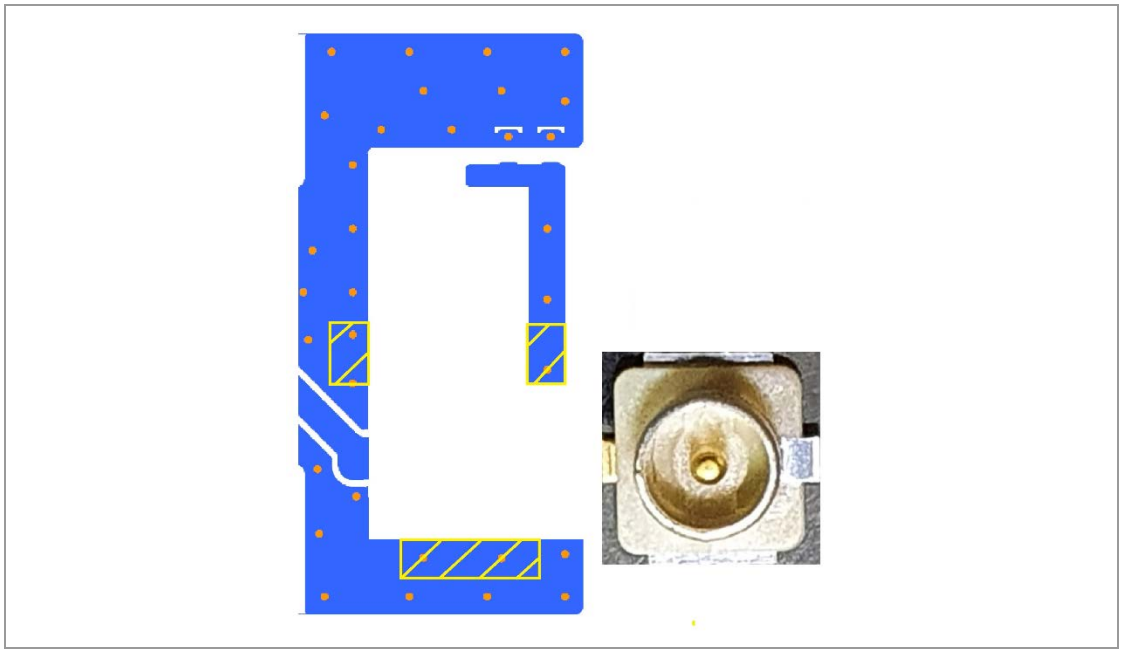


Modification Step 3

The following picture shows the yellow marked partitions of green resist layer which should be opened down to the copper surface from the Top layer of PAN1780 PCB by using a cutter.

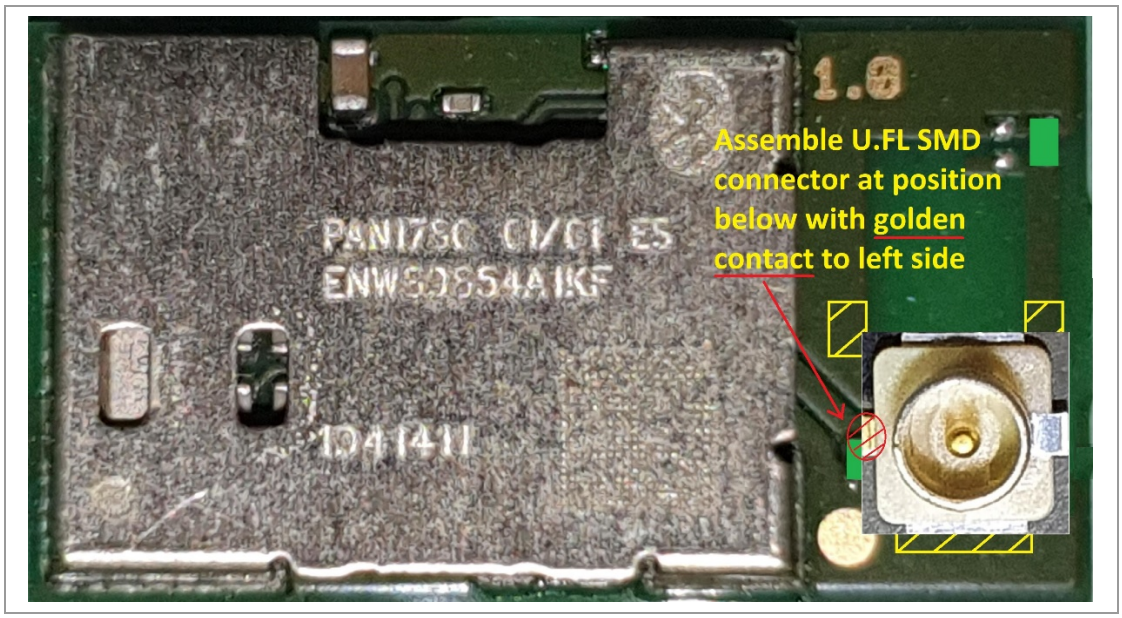


The following picture shows the of resist layer partitions in the PCB layout view. The resist mask to be opened down to the copper surface are marked with yellow rectangular boxes.

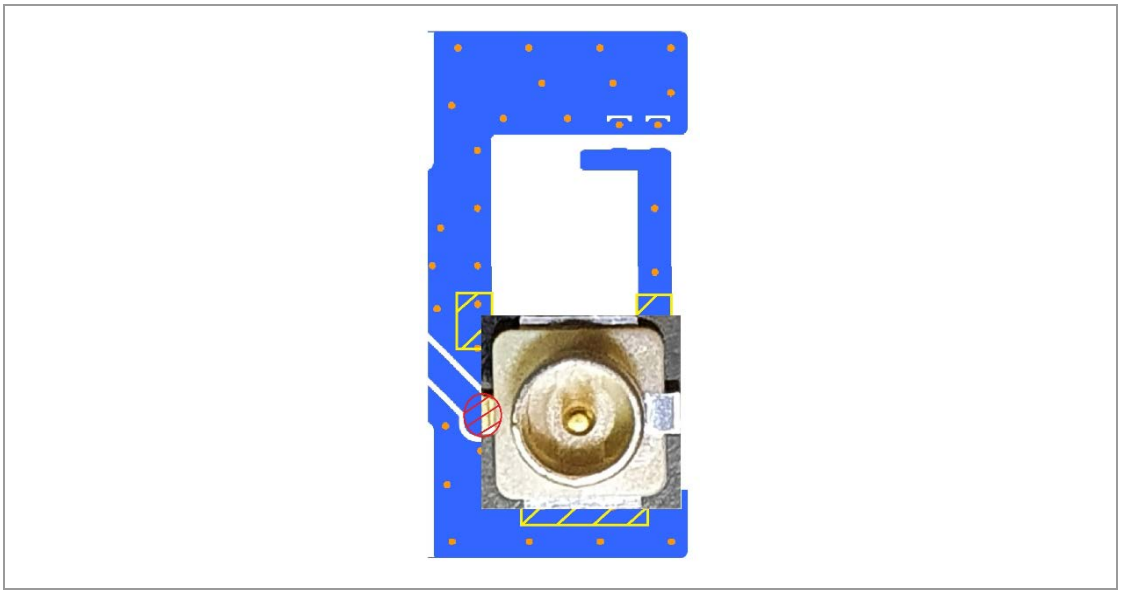


Modification Step 4

The following picture shows the assembly position and location of golden contact of U. FL SMD connector from the Top view of PAN1780 PCB.

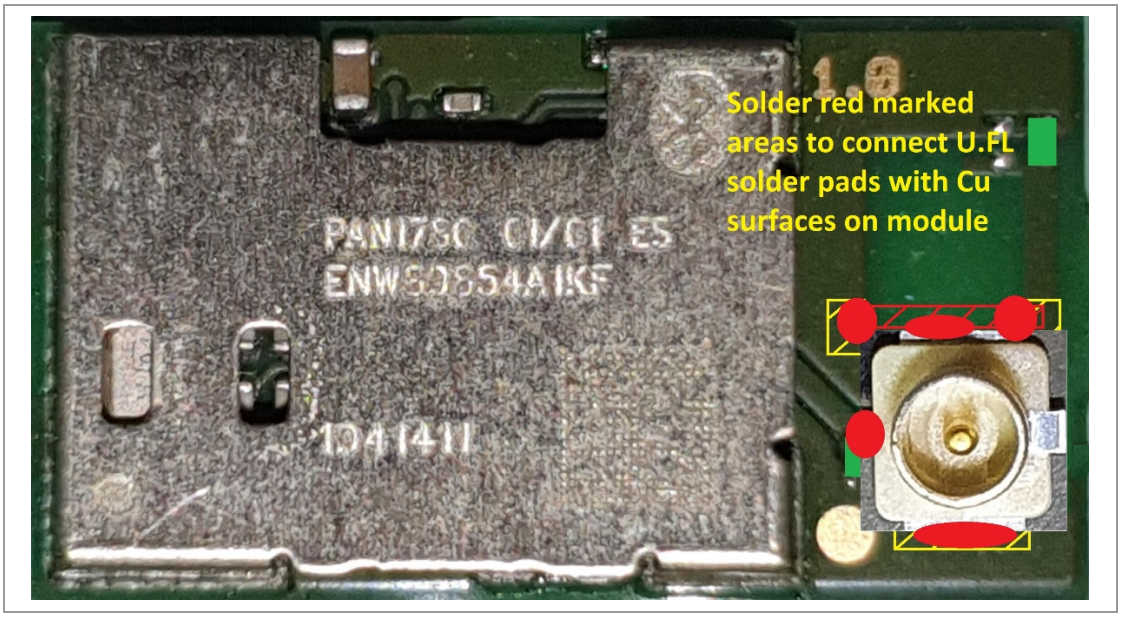


The following picture shows the assembly position and location of golden contact of Hirose U. FL-R-SMT-1(10) SMD connector in the PCB layout view of PAN1780.

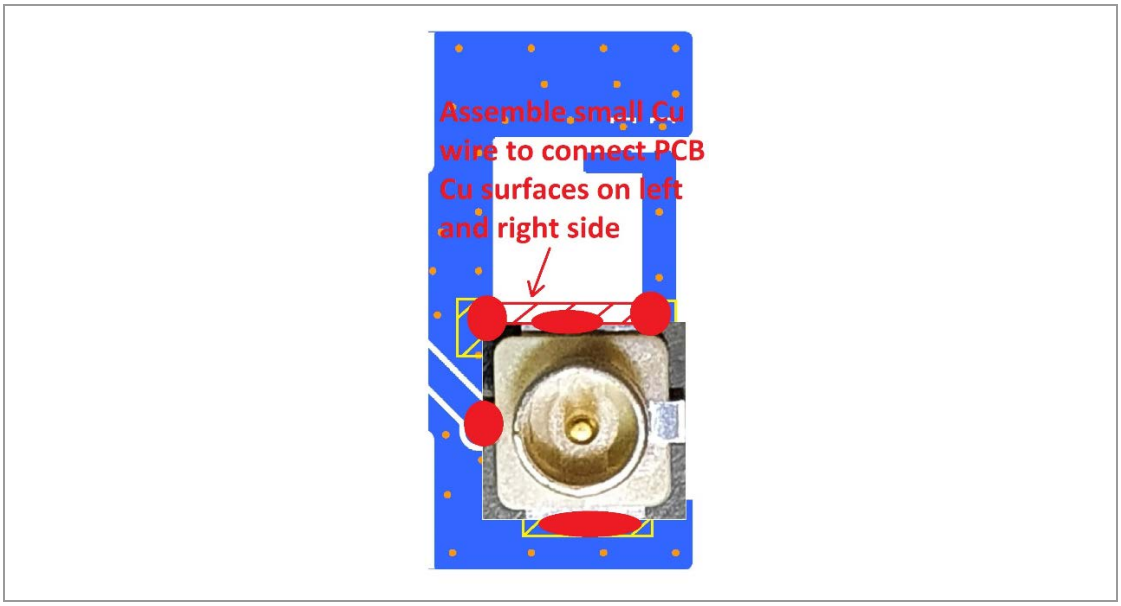


Modification Step 5

The following picture shows the red marked areas of solder joints to be soldered with a solder iron and lead free solder wire on the Top layer of PAN1780 PCB. The solder joints should connect the PCB copper areas which were opened at the resist layer with the solder pads of U. FL SMD connector. Additionally, a small copper wire should be placed as shown in the red rectangular box below which connects the copper surfaces on left and right side and hold mechanical force on the U. FL SMD connector.

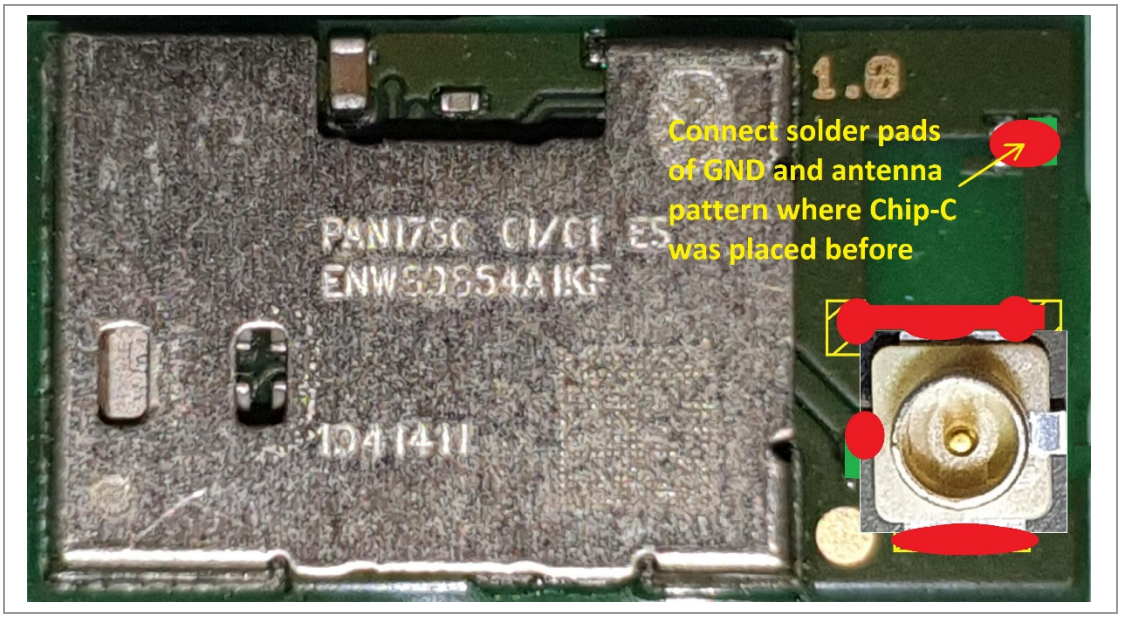


The following picture shows the red marked areas of solder joints in the PCB layout view.



Modification Step 6

The following picture shows a red marked area of solder joint to connect the solder pads of GND and antenna pattern (where chip component was placed before).



5 Contact Details

5.1 Contact Us

Please contact your local Panasonic Sales office for details on additional product options and services:

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https://eu.industrial.panasonic.com/about-us/contact-us

Email: wireless@eu.panasonic.com

For Panasonic Sales assistance in **North America**, visit the Panasonic website "Sales & Support" to find assistance near you at

https://na.industrial.panasonic.com/distributors

Please visit the **Panasonic Wireless Technical Forum** to submit a question at

https://forum.na.industrial.panasonic.com

5.2 Product Information

Please refer to the Panasonic Wireless Connectivity website for further information on our products and related documents:

For complete Panasonic product details in the **EU**, visit

http://pideu.panasonic.de/products/wireless-modules.html

For complete Panasonic product details in **North America**, visit

http://www.panasonic.com/rfmodules