HIRSCH

HIGH SECURITY MADE SIMPLE

Hardware Integration Guide

for HIRSCH Contactless uTrust Reader-Writer Modules

Contents

Introduction

Purpose and Scope

This guide provides hardware engineers and system integrators with best practices and detailed instructions for integrating HIRSCH uTrust contactless modules into end products. It covers handling, mounting, electrical integration, antenna / module placement considerations to ensure optimal performance and reliability. For software integration please refer to the product´s software integration reference manual.

HIRSCH uTrust Contactless Modules Product Overview

The uTrust family from HIRSCH includes a range of contactless and dual-interface modules supporting ISO/IEC 14443, ISO/IEC 15693, ISO/IEC 18092 (NFC), and 125 kHz LF standards.

These modules are designed for secure identification, access control, industrial automation and other NFC/RFID applications.

Product Name	Product Type	Operating frequency	Contact/ Contactless	Supported Contactless Standards
uTrust 3502 F	Module/PCBA external antenna	13.56 MHz	Contactless	ISO/IEC 14443, ISO/IEC 18092 (NFC)
uTrust 3523 F	Module/PCBA external antenna	13.56 MHz	Contactless	ISO/IEC 14443, ISO/IEC 15693, FeliCa
uTrust 4501 F	Module/PCBA integrated antenna	13.56 MHz	Dual Interface	ISO/IEC 14443 Part 1-4, ISO/IEC 18092
uTrust 4511 F	Module/PCBA integrated antenna	13.56 MHz	Contactless with SAM	ISO/IEC 14443 Part 1-4, ISO/IEC 18092
uTrust 5501 F EA	Module/PCBA external antenna	13.56 MHz,125 kHz	Dual frequency	ISO/IEC 14443, ISO/IEC 15693, FeliCa, 125 KHz var.
uTrust 5501 HF OBA	Module/PCBA integrated antenna	13.56 MHz	Contactless	ISO/IEC 14443, ISO/IEC 15693, FeliCa, 125 KHz var.
uTrust 5501 F OBA	Module/PCBA integrated antenna	13.56 MHz,125 kHz	Cless with SAM	ISO/IEC 14443, ISO/IEC 15693, FeliCa, 125 KHz var.
uTrust 5501 F DTC	Module/PCBA integrated antenna	13.56 MHz	Cless with SAM	ISO/IEC 14443, ISO/IEC 15693, FeliCa var.

Software and Firmware Integration

- Refer to the HIRSCH-Software Reference Manual(s)
- Install HIRSCH provided drivers and SDKs for PC and embedded platforms.
- Ensure device firmware is up to date and follow update procedures.

Regulatory and Certification Information

- Confirm that the integrated product complies with relevant regulatory standards (FCC, CE, etc.).
- Maintain product labeling and documentation as required by regulation.

Consult HIRSCH for assistance with product certification if needed.

Safety and Handling Precautions

Mechanical Handling of Modules (PCBAs)

Handle modules gently to avoid bending or flexing the PCB. Do not apply excessive force on connectors or antenna areas. Avoid dropping or impact that could damage components.

Electrostatic Discharge (ESD) Protection

Always use ESD-safe workstations, wrist straps, and packaging when handling modules. The RF components and ICs are sensitive to static discharge which can cause permanent damage.

Environmental Conditions

Store and operate modules within recommended temperature and humidity ranges (typically 0°C to +50°C operating, -20°C to +70°C storage). Avoid exposure to moisture, dust, and corrosive environments.

Module Physical Dimensions and Interfaces Descriptions

Mechanical Dimensions and Mounting Points

Refer to the respective pages of this integration guide of your chosen uTrust module for exact dimensions and mounting hole locations. Use appropriate screws and torque to secure the module without damaging the PCB.

Electrical Interfaces

the uTrust Modules typically provide a USB interfaces for power and communication.

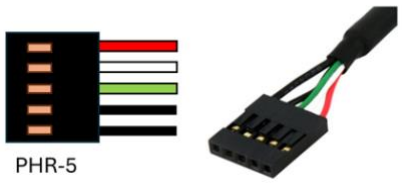
Power supply pins must be connected as specified in the following section.

Most of the uTrust F modules feature the following USB on board connector.

Molex Part number 53254-0570 (or alternative): 0.08"/2mm pitch, 5 pin header, single row, right-angle, through hole.

Cable connector and pin out :

Wire Color	Name	Purpose
Red	VBUS	+5V Power
White	D−	Data−
Green	D+	Data+
Black	GND	Ground
Shield (optional)	Shield	Electromagnetic interference (EMI) protection



The standard 0.08"/2mm, 5-pin USB header must be connected as depicted above. The positive supply (Vbus RED) is situated at the edge of the connector and needs to fit the marking on the respective uTrust module as indicated in the following sections images.

Note: *It is crucial to avoid inserting the USB cable header in the wrong orientation at all costs, as this may result in permanent damage.*

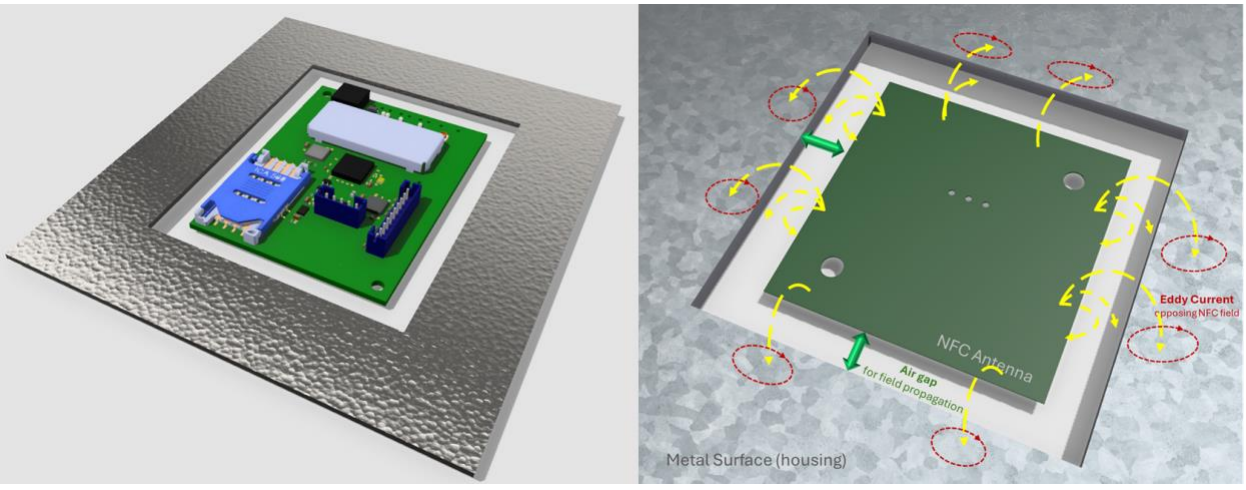
Mounting Guidelines

General Mounting and Antenna Positioning Recommendations

- Mount modules on/into stable, non-conductive surfaces to avoid detuning or shielding of the antenna.
- Maintain clearance around the antenna area to prevent loss of operating distance and communication stability.
- Avoid placing modules near larger metal parts or components that can absorb or distort the magnetic field.
- 13.56 MHz antennas are more sensitive to conductive material in their proximity than 125 kHz LF antennas. De-tuning.
- Use low torque force to prevent module or antenna damage.

Mounting Modules with onboard NFC Antenna

- Position the module so the antenna coil faces the expected user interaction area and is parallel to the card or device.
- Maintain a minimum clearance of 5–10 mm from metal or conductive materials near the antenna to avoid / minimize detuning.
- Use ferrite sheets behind the antenna if metal proximity is unavoidable to reduce eddy currents and improve coupling.
- Secure the module firmly but avoid mechanical stress on the antenna coil or PCB.
- Design for mechanical robustness to withstand vibration and shock in the target environment.



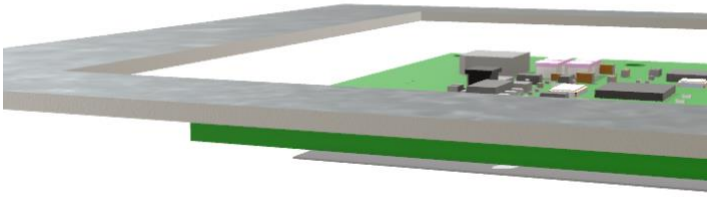


Figure: antenna positioning - module with on-board antenna (OBA) vs. external antenna (EA)

uTrust Modules for external antennas

Products for use with external Antennas via RF cable

- uTrust 3502 F
- uTrust 3523 F
- uTrust 5501 F EA (external antenna)

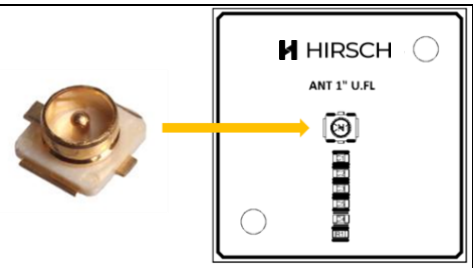
Mounting Modules with External NFC Antenna and 50 Ohm RF cable

- Use only HIRSCH-approved external antennas and high quality RF cables to maintain impedance matching and minimize losses.
- Mount the external antenna in a location free from metal interference and aligned with the user interaction zone.
- Avoid placing modules too close to metals or materials that absorb RF energy as a conductive environment influences the matching circuit and affects the overall performance (operating distance)
- Maintain a minimum clearance of 5–10 mm (0.2-0.4 inch) from metal or conductive materials near the antenna to avoid / minimize detuning.
- Use ferrite shields or spacer material if metal proximity is unavoidable.
- Keep antenna cables as short as possible and avoid loops and sharp bends

50 Ohm RF antenna cable

- U.FL (also known as IPEX, IPX, MHF, or AMC) connectors are miniature RF coaxial connectors that are widely used for high-frequency signals in space-constrained applications, including NFC antenna connections to the uTrust module.
- MHF/IPEX is a widely used industry equivalent to U.FL, and the terms are often used interchangeably for these tiny snap-in RF connectors.

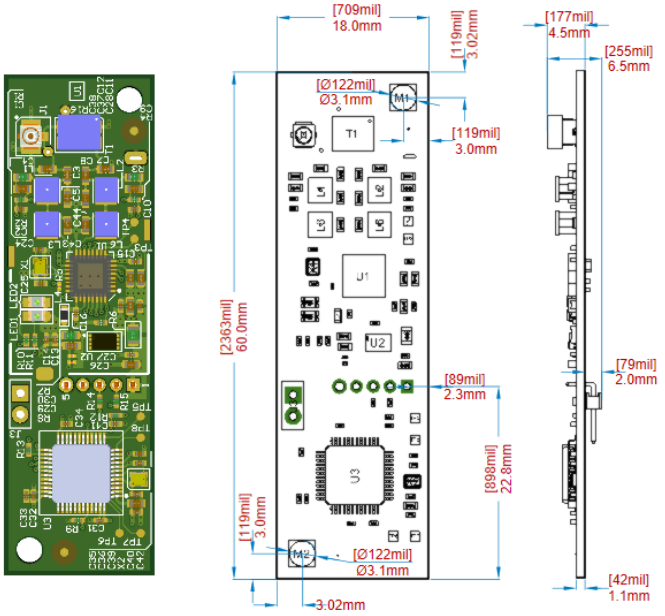
Connectors: Plug & Socket

	
The U.FL male connector is surface-mount and soldered to the antenna PCB	The female comes attached to the cable (pigtail)

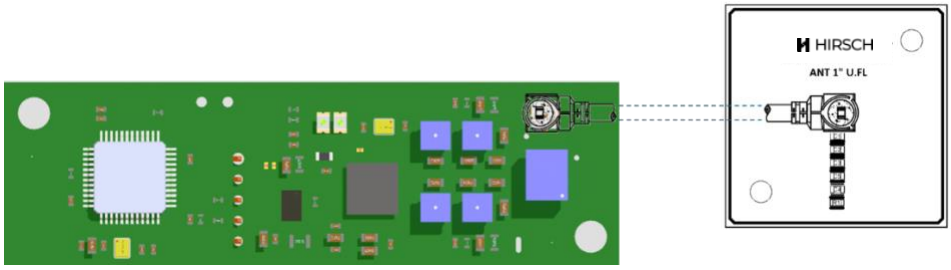
Cable Diameters: Typical micro-coaxial cable sizes for U.FL/MHF connections are 0.81mm, 1.13mm, 1.32mm, in outer diameter. The most common for NFC pigtails are 0.81 and 1.13mm

uTrust 3502 F / uTrust 3523 F

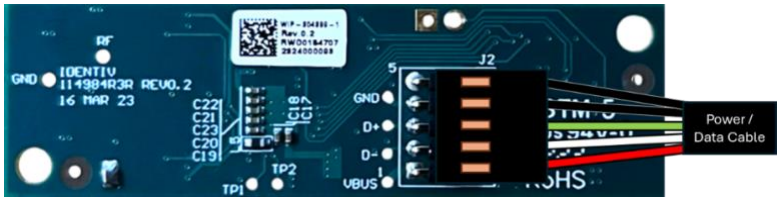
Physical Dimensions



External Antenna Connection via UF-L (IPEX) cable/connector



Power Supply and Communication

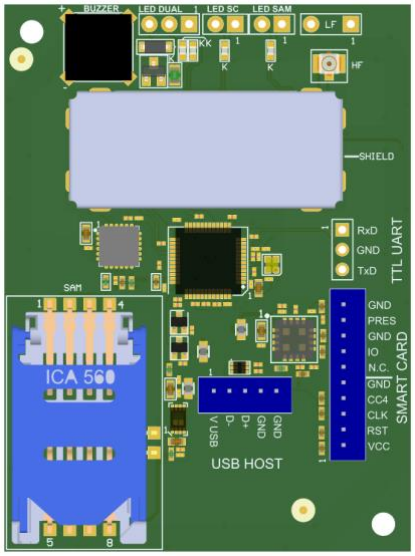


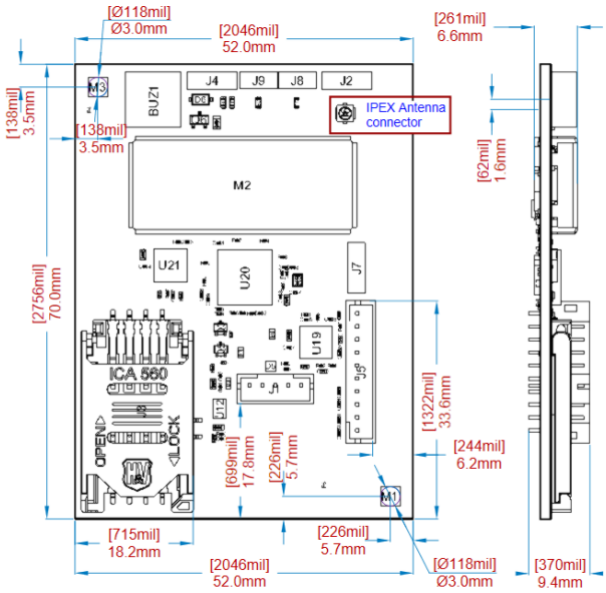
Remarks	
USB connector	Ensure the USB cable header is inserted with the correct orientation to prevent possible damage to the module !
Module orientation	The module can be installed in any orientation or location. The U.FL cable length sets the maximum distance between the antenna and the uTrust module.
Antenna orientation	The orientation of the antenna, including its top and bottom sides, can be selected as needed. However, restrictions regarding installation near metal surfaces must considered

uTrust 5501 EA

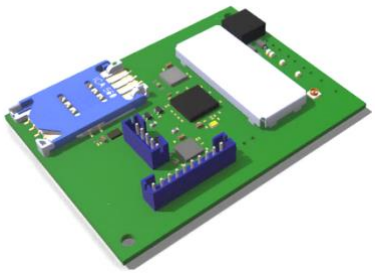
Physical Dimensions 70 x 52 x 0,8 mm (2. 75 x 2.00 x 0.32 inch)

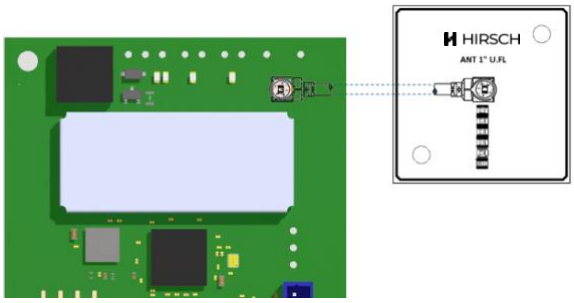
Connector Pin Outs



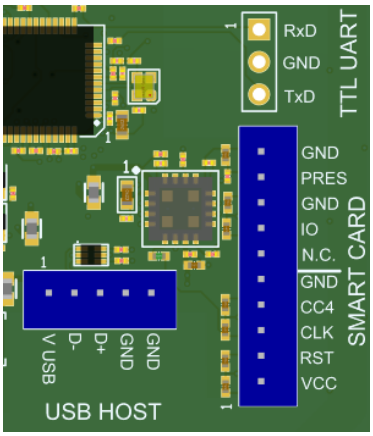


External Antenna Connection via UF-L (IPEX) cable/connector





Power Supply and Communication, Connector Pin Out



USB connector Molex Mating Connector PHR-5 Manufacturer JST (e.g. DK part # 455-1163-ND)

Pinout descriptions Smart Card Interface (J5)

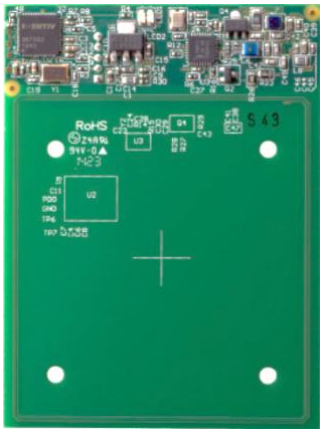
Pin	Name	Description
1	GND	Signal Ground
2	SC_PRSNT	Smart Card Present Signal (from smart card connector)
3	SC_CC8	Contact #8
4	SC_IO	Smart Communication interface I/O
5	n.c.	Not Connected / unused
6	GND	Signal Ground
7	SC_CC4	Smart Card Module Contact #4
8	SC_CLOCK	Clock (input)
9	SC_RST	Smart Card IC Reset (input)
10	SC_VCC	Smart Card IC (Positive supply voltage)

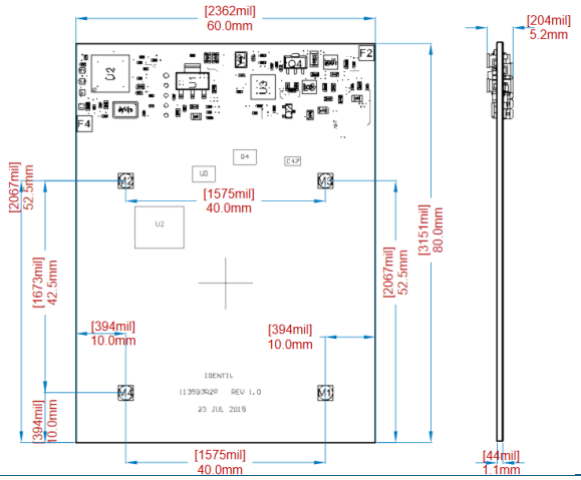
uTrust Modules with PCB on board antenna

- uTrust 3500 F
- uTrust 4501 F
- uTrust 4511 F
- uTrust 5501 F OBA

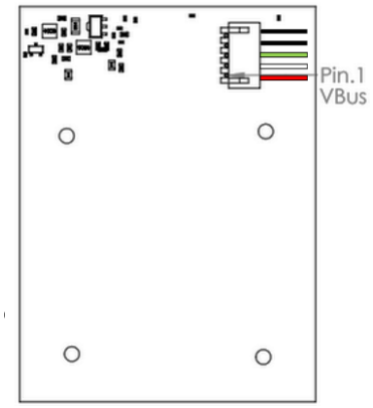
uTrust 3500 F

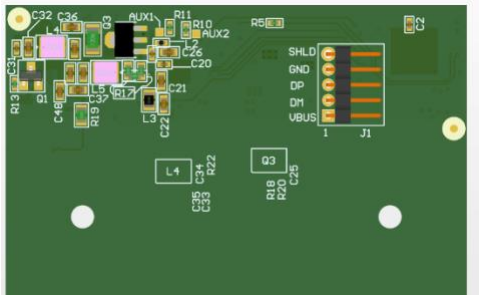
Physical Dimensions 100 x 70 x 11 mm (3.937 x 2.756 x 0.433 in)





Power Supply and Communication



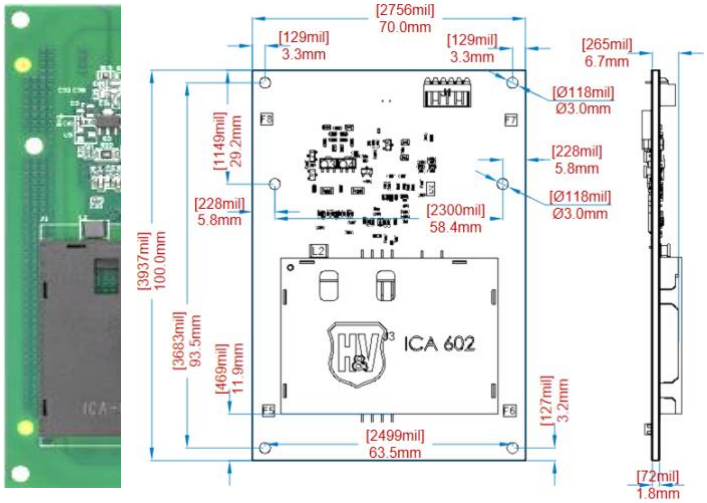


USB connector Molex Mating Connector PHR-5 Manufacturer JST (e.g. DK part # 455-1163-ND)

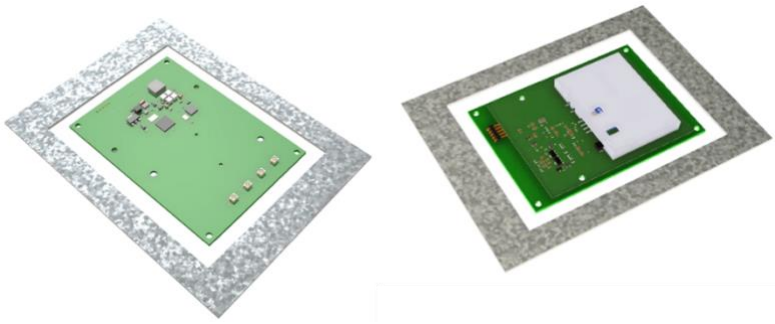
USB connector	Ensure the USB cable header is inserted with the correct orientation to prevent possible damage to the module !
Module orientation	The module can be installed in any orientation or location. The U.FL cable length sets the maximum distance between the antenna and the uTrust module.
Antenna orientation	The orientation of the antenna, including its top and bottom sides, can be selected as needed. However, restrictions regarding installation near metal surfaces must considered

uTrust 4501 F (ID1 card slot)

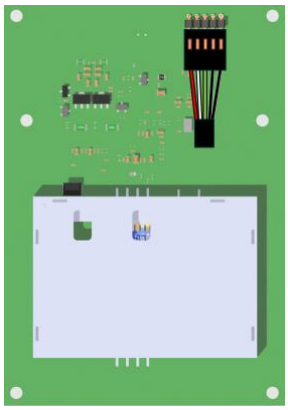
Physical Dimensions 100 x 70 x 11 mm (3.937 x 2.756 x 0.433 in)



Recommended spacing near metal



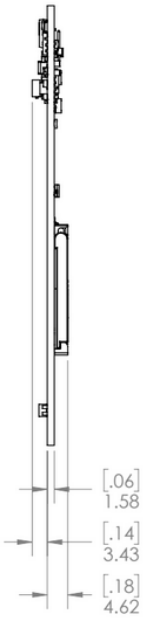
Power Supply and Communication

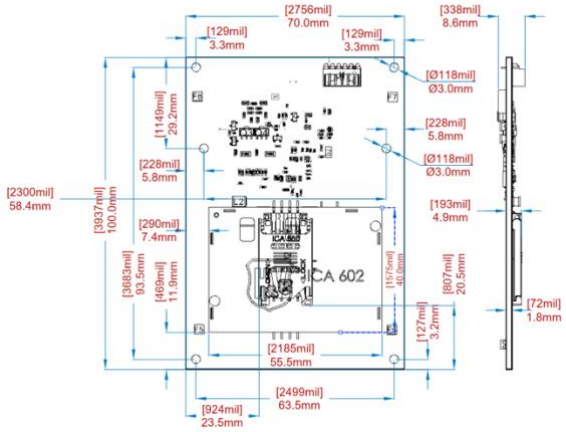


USB connector	Ensure the USB cable header is inserted with the correct orientation to prevent possible damage to the module !
Module orientation	The module can be installed in any orientation or location. The U.FL cable length sets the maximum distance between the antenna and the uTrust module.
Antenna orientation	The orientation of the antenna, including its top and bottom sides, can be selected as needed. However, restrictions regarding installation near metal surfaces must considered

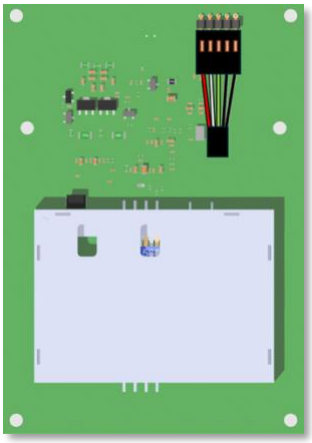
uTrust 4511 F (SAM slot)

Physical Dimensions 100 x 70 x 11 mm (3.937 x 2.756 x 0.433 in)





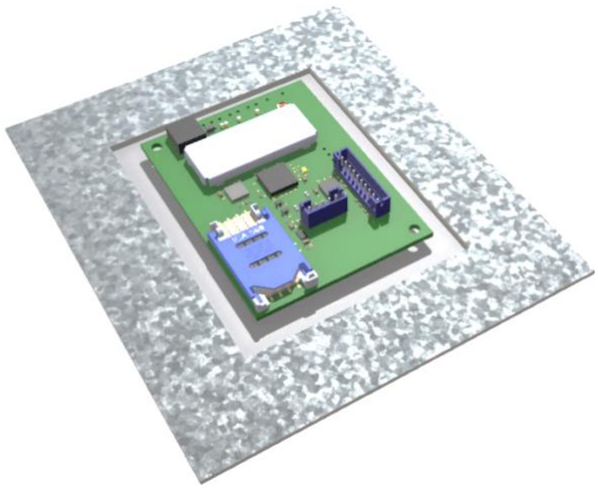
Power Supply and Communication

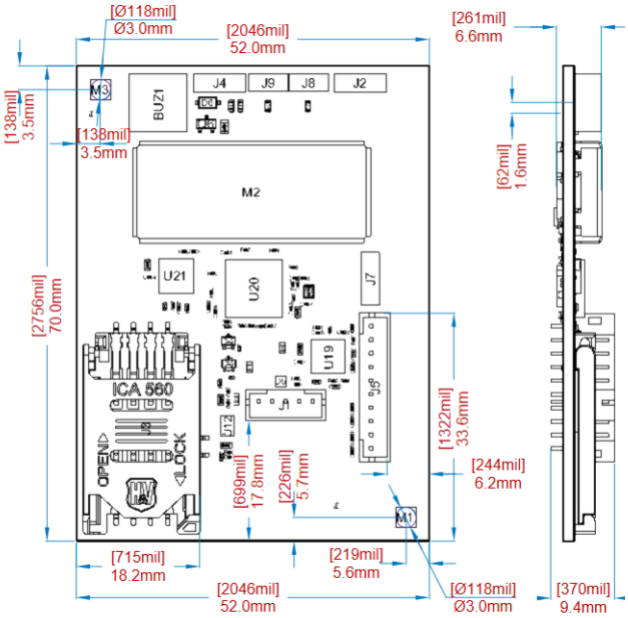


USB connector	Ensure the USB cable header is inserted with the correct orientation to prevent possible damage to the module !
Module orientation	The module can be installed in any orientation or location. The U.FL cable length sets the maximum distance between the antenna and the uTrust module.
Antenna orientation	The orientation of the antenna, including its top and bottom sides, can be selected as needed. However, restrictions regarding installation near metal surfaces must considered

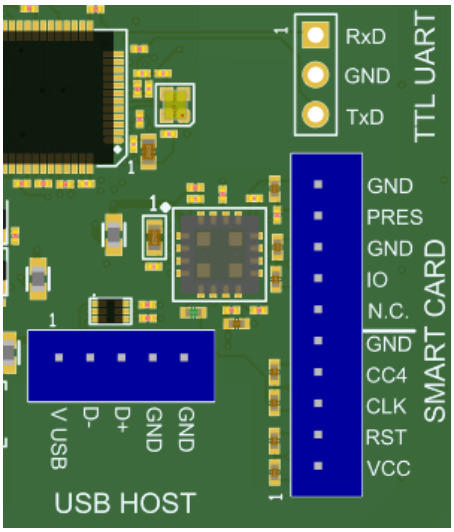
uTrust 5501 OBA

Physical Dimensions 100 x 70 x 11 mm (3.937 x 2.756 x 0.433 in)





Power Supply and Communication



USB connector Molex Mating Connector PHR-5 Manufacturer JST (e.g. DK part # 455-1163-ND)

USB connector	Use the original HIRSCH USB cable
Module orientation	The module can be installed in any orientation or location. The U.FL cable length sets the maximum distance between the antenna and the uTrust module.
Antenna orientation	The orientation of the antenna, including its top and bottom sides, can be selected as needed. However, restrictions regarding installation near metal surfaces must considered