PHYCHIPS

WINE 7

User Manual

Version History

Version	Date	Description
0.1.0	2024.12.02	Initial Release

Contents

1. Overview

1.1 Instruction

WINE7 is a high-performance module built upon the PR7 platform. It features an optimized configuration aimed at maximizing the capabilities of the PR7, a third-generation reader System-on-Chip (SoC). The innovative WINE reader protocol empowers users to seamlessly integrate their own applications. Designed as a universally compatible Stock Keeping Unit (SKU), it can be deployed globally with easy region-specific settings. WINE7 is versatile, catering to a diverse array of single-antenna applications, spanning from mobile and handheld to fixed readers
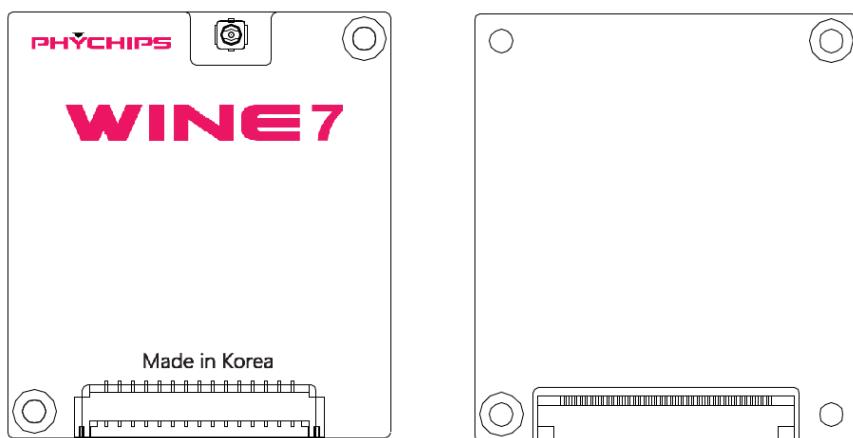
Figure 1 WINE7 module

1.2 Product composition

WINE 7 Module include

- PR7 Rain / RFID reader Chipset

- 32MHz TCXO / RFID Power Amplifier

- Saw / Lowpass / DRM Filter

- Coupler / LDO

- Interface / Antenna Connector.

- etc.

1.3 Basic features of WINE 7

Hardware

- High performance PHYCHIPS Chipset PR7

- Output Transmit power: Typical +30 dBm

- Sensitivity: Typical -84 dBm

- Module Size: 40mm X 36mm X 7.2mm

- Operating Temperature: -20℃ ~ +70℃

Software

- Optimize to new PHYCHIPS module including leakage cancellation algorithm

- Update Registry information

- Modify user environments

- Very easy information log to help user understand module status and operation

- Add very useful functions: leakage RSSI Plot, Read range calculator

- Add user friendly Script: easy to use module and RFID operation

- Do not need install GUI drivers (for windows)

2. Hardware description

2.1 Specification

2.1.1 Absolute Maximum Ratings.

Parameter	Condition	Min.	Typ.	Max.	Unit
Supply voltage		4.5	5.0	5.5	V
Storage Temperature		-40		+85	°C

2.1.2 Functional Specifications.

Parameter		Condition	Min.	Typ.	Max.	Unit
Frequency range			860		930	MHz
Tx Maximum power			29	30	31	dBm
Tx Dynamic Range				30		dB
DC voltage		VCC50		5.0		V
GPIO voltage		VCC33		3.3		V
Operation Temperature			-20		+70	°C
Current	Idle			45		mA
	Active	CW on, Tx power 30dBm	950	1050	1150	mA

2.1.3 15 Pin Connector Description.

No	Name	IO	Type	Description
1	GND	P		Ground
2	GND	P		Ground
3	VCC50	P		DC 5.0V for Reader
4	VCC50	P		DC 5.0V for Reader
5	PB0	IO	Digital	I/O port
6	PB1	IO	Digital	I/O port
7	PC6	IO	Digital	I/O port
8	PC7	IO	Digital	I/O port
9	PA1_RXD	I	Digital	UART input
10	PA0_TXD	O	Digital	UART output
11	DM	IO	Digital	USB Data -
12	DP	IO	Digital	USB Data +
13	WAKEUPB	I		Reader wake up signal [0: Wake up]
14	CSE	I	Digital	Chip Select Enable / Module power enable [0: Disable 1: Enable]
15	RESETB	I		Reader reset signal [0: Reset]

- ✓ Connector type: 1.25mm pitch connector
- ✓ Model part Number: 53261-1571 [Molex]
- ✓ Housing for this wafer is 51021-1500 [Molex]

2.1.4 40 Pin Connector Description.

No	Name	IO	Type	Description
1	GND	P		Ground
2	CSE	I	Digital	Chip Select Enable / Module power enable [0: Disable 1: Enable]
3	WAKEUPB	I	Analog	Reader wake up signal [0: Wake up]
4	RESETB	I		Reader reset signal [0: Reset]
5	DM	IO	Digital	USB Data -
6	DP	IO	Digital	USB Data +
7	PA0_TXD	O	Digital	UART output
8	PA1_RXD	I	Digital	UART input
9	PA2	IO	Digital	I/O port
10	PA3	IO	Digital	I/O port
11	GND	P		Ground
12	PA4	IO	Digital	I/O port
13	PA5	IO	Digital	I/O port
14	PA6	IO	Digital	I/O port
15	PA7	IO	Digital	I/O port
16	PB0	IO	Digital	I/O port
17	PB1	IO	Digital	I/O port
18	PB2	IO	Digital	I/O port
19	PB3	IO	Digital	I/O port
20	PB4	IO	Digital	I/O port
21	GND	P		Ground
22	PB5	IO	Digital	I/O port
23	PB6	IO	Digital	I/O port
24	PB7	IO	Digital	I/O port
25	PC0	IO	Digital	I/O port
26	PC1	IO	Digital	I/O port
27	PC2	IO	Digital	I/O port
28	PC3	IO	Digital	I/O port
29	PC4	IO	Digital	I/O port
30	PC5	IO	Digital	I/O port
31	GND	P		Ground
32	PC6	IO	Digital	I/O port
33	PC7	IO	Digital	I/O port

34	TCK/SWCLK	I	Digital	JTAG Clock / Serial Wire Clock
35	TMS/SWDIO	I	Digital	JTAG Test Mode State / Serial Wire Data Input Output
36~40	VCC50	P		DC 5.0V for Reader

- ✓ Connector type: 0.5mm pitch FPC connector
- ✓ Model part Number: 05002HR-40CE [HIROSE]

2.2 Antenna Connector.

WINE 7 Module is supported by a U. FL Antenna connector.

Antenna Connector is optimized with 50 Ω impedance.

- ✓   Connector type: Coaxial Micro-Receptacle
- ✓   Model part No.: U. FL-R-SMT-1(10) [HIROSE]

3. GUI Description

3.1 Introduction.

The WINE Utility helps the user to start working with WINE DK RFID reader quickly.

It supports all the WINE series.

System requirements Microsoft .NET 6.0 or higher version OS: Windows 10, Windows 11

3.2 GUI Overview.
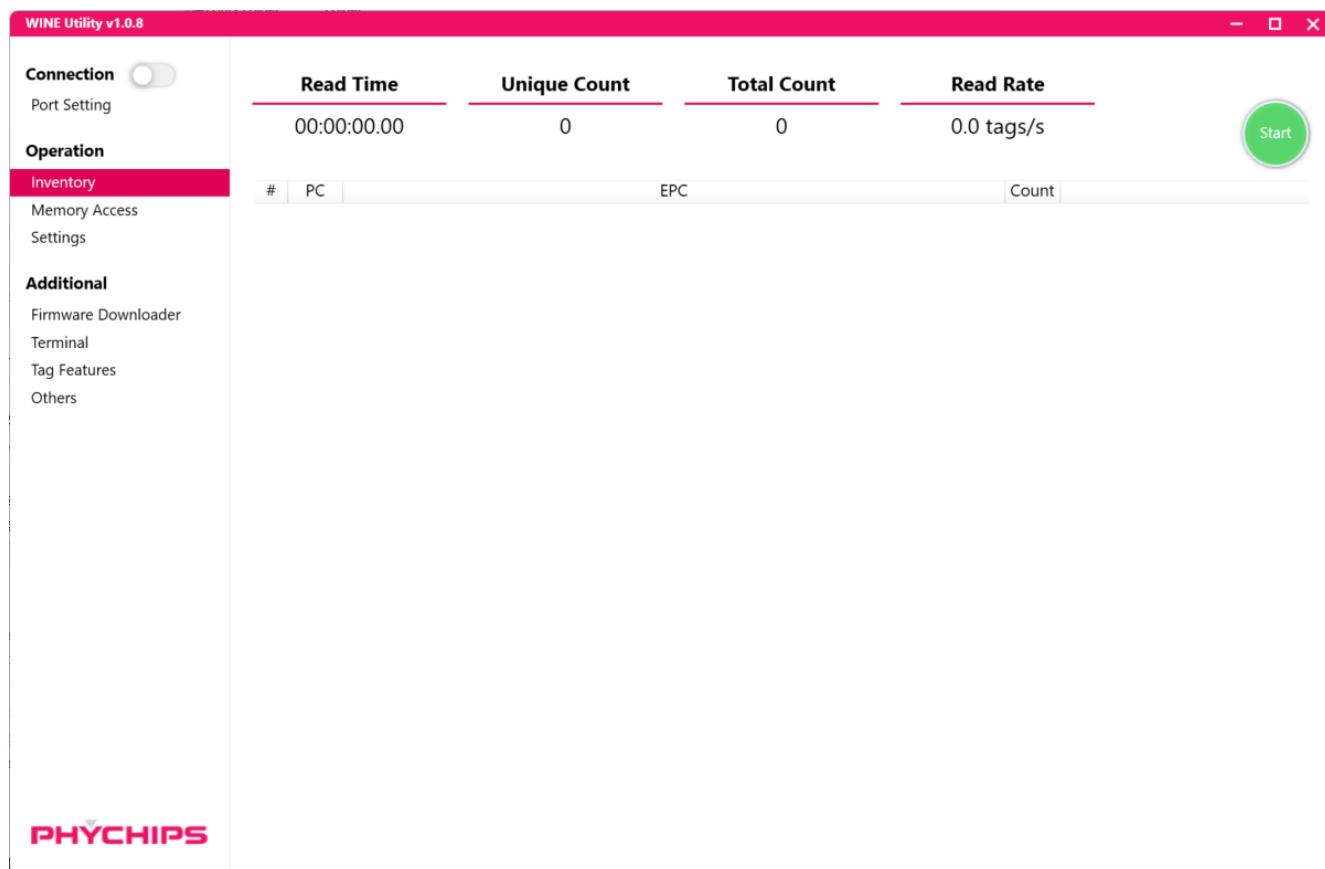
Figure 5 WINE Utility Basic Window

3.2.1 Connection.

 : Connect or Disconnect Button.

Port Setting: Page to performs UART settings

3.2.2 Operation.

Inventory: Page to performs Inventory (Tag read).

Memory Access: Page to performs Access action on the read tags.

Settings: Page to perform Inventory settings or Reader settings.

3.2.3 Additional

Firmware Downloader: Page to perform firmware update of DK with Hex file.

Terminal: Page monitoring the WINE protocol.

Tag Features: Provides test for tag features (Temperature Sensor, E-paper, etc.)

Others: Provides other convenience features (Communicate Logger, Hotkey etc.)

4. Connection

4.1 Connect

To Connection, follow the below process.

Step 1. Connect PC and WINE DK with USB to UART cable (please refer to Quick Start Guide)

Step 2. Click "Port Setting" on side menu.

Step 3. Set VCP Parameters appropriately. (If can't find the com port, please refer to below guide)

In normal cases, WINE DK has the following VCP settings.

1. Baudrate : 460800
2. DataBits : 8
3. Parity : None
4. StopBits : 1

Step 4. Toggle "Connection" switch.

※ If not exist WINE DK VCP port, try below guides.

1. Download VCP driver suitable for OS, install it.

https://www.silabs.com/developers/usb-to-uart-bridge-vcp-drivers?tab=downloads

2. Check recognition on Device Manager
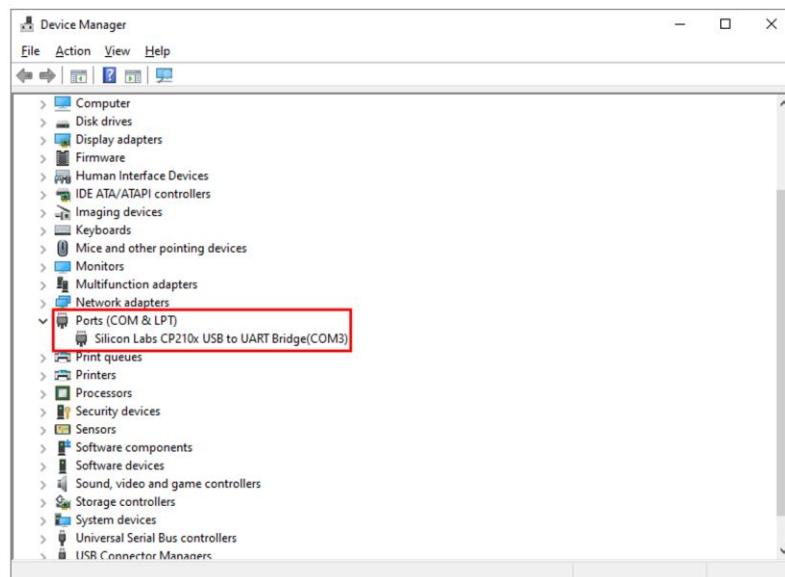
Figure 6 UART Recognition

4.2 Sync with Connected WINE DK

WINE DK operates according to the GUI settings (Inventory settings and Reader settings).

Synchronization occurs immediately upon connection

5. Operation

5.1 Inventory

Figure 7 Inventory Page

5.1.1 Inventory (Tag Read) Start/Stop

When you press the start button, the start button changes to a stop button and the inventory executed.
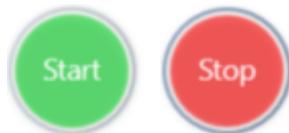
Stop Button's border line color indicates Leakage RSSI State

5.1.2 Indicators

1. Read Time: Time Spent from "Start button" pushed.
   Unique Count: Individual tags count

2.Total Count : Total number of reads.
3. Read Rate : The number of tag count per 1 second.

5.1.3 Tag List

By default, PC and EPC listed.

Also, some parameters are displayed when setting the mode such as TID, User etc.

If there are no additional tag count, the tag's line will turn gray.

5.1.4 Context Menu

To context menu open, Right-click on the Inventory page.

The operation of each menu is as follows.

1. Select Tag (S0, Target A Only): Perform the "Select" (RFID protocol) with the selected tag.
   Because the Select Parameter is fixed to Session 0 and Target A, additional detailed settings are required on the Inventory Settings page for intended operation.
2. Deselect Tag: Deactivate the "Select" (RFID protocol).
3. Clear Tag List: Clear all tags from tag list.
4. Export Tag List to CSV: Save tag list to csv file.
5. Copy To Clipboard: copy to clipboard selected tags (like Ctrl+C).

5.1.5 Other function

1. Sort: You can sort the list by clicking on a column header.
2. Conditional stop: For stop according to conditions, please refer to 5.3.1.2 (Inventory End Option).
   Automatic stop: When changing pages, inventory stopped automatically

5.2 Settings

5.2.1 Inventory Settings
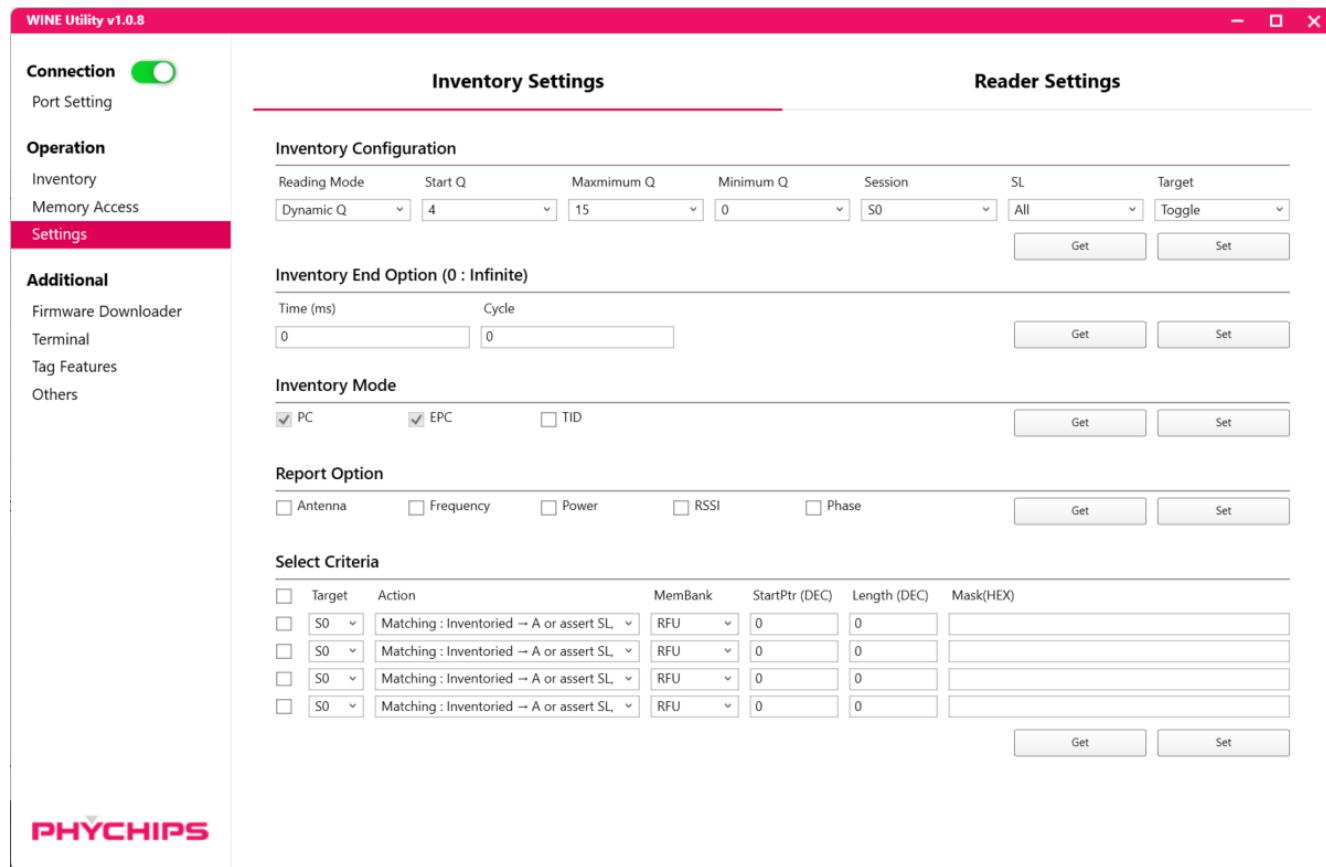
Figure 12 Inventory Settings Page

5.2.1.1 Inventory Configuration

1. Reading Mode

    a) Fixed Q : Q value was maintained Start Q value in Query.

    b) Dynamic Q : Q value in Query was changed each inventory cycle.

2. Start Q : First Q value in Query.

3. Maximum Q : Highest Q Value on Dynamic Q mode.

4. Minimum Q : Lowest Q Value on Dynamic Q mode.

5. Session : Chooses a session for the inventory round.

    a) S0 : Inventoried flag is changed by energy.

    b) S1 : Inventoried flag is changed by time.

    c) S2 : Inventoried flag is changed by energy and time.

    d) S3 : Inventoried flag is changed by energy and time.

6. SL : Chooses which Tags respond to the Query.

    a) All : Tags respond to query regardless of the SL flag state.

    b) Asserted : Tags respond to query only in SL flag asserted state.

    c) Deasserted : Tags respond to query only in SL flag not asserted state.

7. Target : Selects whether Tags whose inventoried flag is A or B.

    a) Toggle : Query target was changed each Inventory round on Fixed Q mode.

    In Dynamic Q mode, Query target was changed by Algorithm.

    b) A : Tags respond to query only in inventoried flag A.

    c) B : Tags respond to query only in inventoried flag B.

5.2.1.2 Inventory End Option

Set inventory end options. Setting it to 0 means continuous execution.

1. Time (ms) : Inventory stops after a set amount of time.

2. Cycle : Inventory stops when the set cycle is complete.

5.2.1.3 Inventory Mode

Set the information received from the tag during inventory operation. If TID is checked, TID information is reported as an additional memory access operation.

5.2.1.4 Report Option

This is used when you want to obtain information such as the operating environment other than tag memory information during inventory operation.

1. Antenna : Includes Antenna port information when reporting the tag information.
2. Frequency : Includes Frequency information when reporting the tag information.
3. Power : Includes Tx power information when reporting the tag information.
4. RSSI : Includes RSSI information when reporting the tag information.
5. Phase : Includes Phase information when reporting the tag information.

5.2.1.5 Select Criteria

1. CheckBox : Checked state means enable the select line.
2. Target : Action target. SL flag or Inventoried flag.
3. Action : Tag behavior for matching and not-matching.
4. MemBank : Specifies a MemBank for the mask.
5. StartPtr : Specifies a starting bit address for the mask.
6. Length : Length of Mask (bit length).
7. Mask : Mask Data. A match between the tag data and the mask activates the select action.

5.2.2 Reader Settings
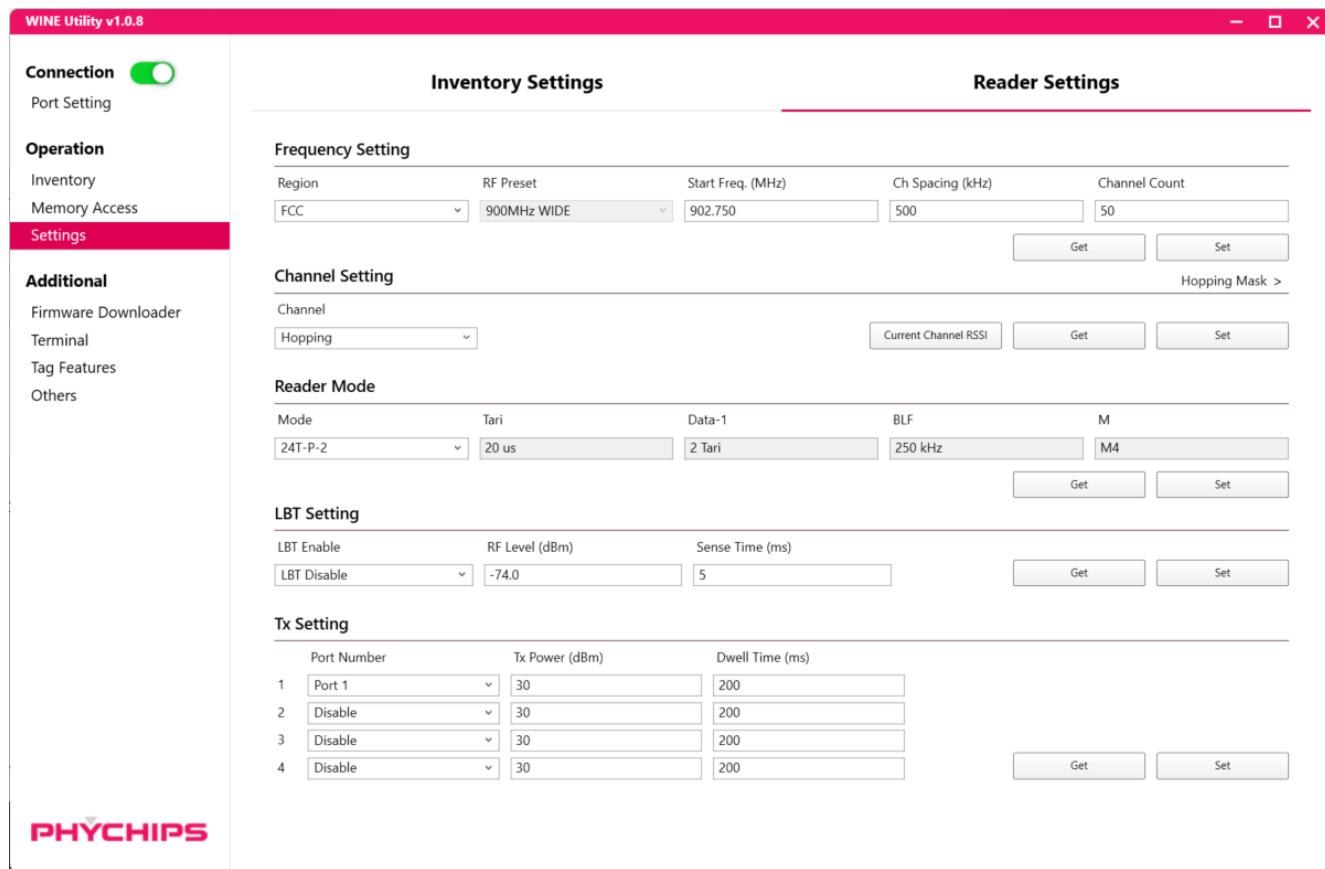
Figure 13 Reader Settings Page

5.2.2.1 Frequency Setting

1. Region

By default, WINE Utility has 28 region settings (refer to Table 1).

If you select "Manual", you can use the custom region.

Region Code	Region	Band	Start Freq	Spacing	Ch. Count	Use Channel
0	FCC	900MHz WIDE	902750	500	50	All
1	FCC_NARROW	900MHz NARROW	917100	200	50	All
2	ETSI_LOWER	800MHz	865700	600	4	All
3	ETSI_UPPER	900MHz WIDE	916300	1200	3	All
4	AUSTRALIA	900MHz NARROW	920250	500	12	All
5	BANGLADESH	900MHz NARROW	925250	500	4	All
6	BRAZIL	900MHz WIDE	902750	500	50	1~10, 26~50
7	BRUNEI	900MHz NARROW	923250	500	4	All
8	CHINA	900MHz NARROW	920625	250	16	All
9	HONGKONG	900MHz NARROW	920250	500	10	All
10	INDIA	800MHz	865100	600	4	All
11	INDONESIA	900MHz NARROW	923250	500	4	All
12	IRAN	800MHz	865700	600	4	All
13	ISRAEL	900MHz WIDE	916250	500	1	All
14	JAPAN	900MHz NARROW	916000	200	25	17, 23~25
15	JORDAN	800MHz	865700	600	4	All
16	KOREA	900MHz NARROW	917300	600	6	All
17	MALAYSIA	900MHz NARROW	919250	500	8	All
18	NEWZEALAND	900MHz NARROW	922250	500	11	All
19	PERU	900MHz WIDE	915250	500	25	All
20	RUSSIA_LOWER	800MHz	866300	600	3	All
21	RUSSIA_UPPER	900MHz WIDE	916200	1200	4	All
22	SINGAPORE	900MHz NARROW	920250	500	10	All
23	SOUTH_AFRICA	900MHz WIDE	915600	200	17	All
24	TAIWAN	900MHz NARROW	922250	500	12	All
25	THAILAND	900MHz NARROW	920250	500	10	All
26	URUGUAY	900MHz WIDE	916250	500	23	All
27	VENEZUELA	900MHz NARROW	922250	500	12	All
28	MANUAL	-	-	-	-	All

Table 1 Default Region Setting Table

2. Band

  a) 900MHz NARROW: 917.25MHz ~ 927.75MHz.

  b) 900MHz WIDE: 900MHz Bandwidth what does not belong to '900MHz Narrow'.

  c) 800MHz: 800MHz ~ Less than 900MHz.

3. Start Frequency : Lowest the frequency in the desired band.

4. Ch Spacing : The frequency spacing of each channel.

5. Max. Channel : The number of channels.

5.2.2.2 Channel Setting

1. Set Channel number : The frequency is maintained.
2. Set Hopping : Channel changes every inventory round.
3. Current Channel RSSI : Get the channel RSSI value of current channel.

✓ Hopping Mask : If you press the arrow button, the window for masking the hopping table will expand. The channel list set in Region setting is displayed and channels can be used selectively.

5.2.2.3 Reader Mode

Name	Value	Data-0 (Tari)	Data-1	BLF	Data Encoding
60S-D-1	0x03	6.25 us	1.5 Tari	640 kHz	FM0
60S-D-2	0x05	6.25 us	2 Tari	640 kHz	FM0
62S-D-1	0x07	6.25 us	1.5 Tari	640 kHz	M2
68S-D	0x41	6.25 us	1.5 Tari	640 kHz	M8
62E-P-1	0x10	8 us	1.5 Tari	640 kHz	M2
64E-P-1	0x14	8 us	1.5 Tari	640 kHz	M4
62t-P-2	0x1E	10 us	2 Tari	640 kHz	M2
32T-P	0x24	20 us	2 Tari	320 kHz	M2
34T-P	0x26	20 us	2 Tari	320 kHz	M4
24T-P-2	0x2C	20 us	2 Tari	250 kHz	M4
28T-P	0x2E	20 us	2 Tari	250 kHz	M8
18T-P	0x30	20 us	2 Tari	160 kHz	M8

Table 2 Reader Mode Table

5.2.2.4 LBT Setting

1. LBT Enable : If LBT Enable set, "Listen before talk" is activated.
2. RF Level : RSSI threshold level. If there is a signal greater than the LBT RF Level, either wait until the channel is empty (Hopping Disabled) or move to another channel (Hopping Enabled).
3. Sense Time : RSSI measurement time.

5.2.2.5 Tx Setting

1. Port Number : Antenna Port Number.
2. Tx Power : Output Tx power. It can be set in 1dBm increments, and the setting range is 0~30dBm.
3. Dwell Time : Output operating time.

6. Utility

6.1 Firmware Download
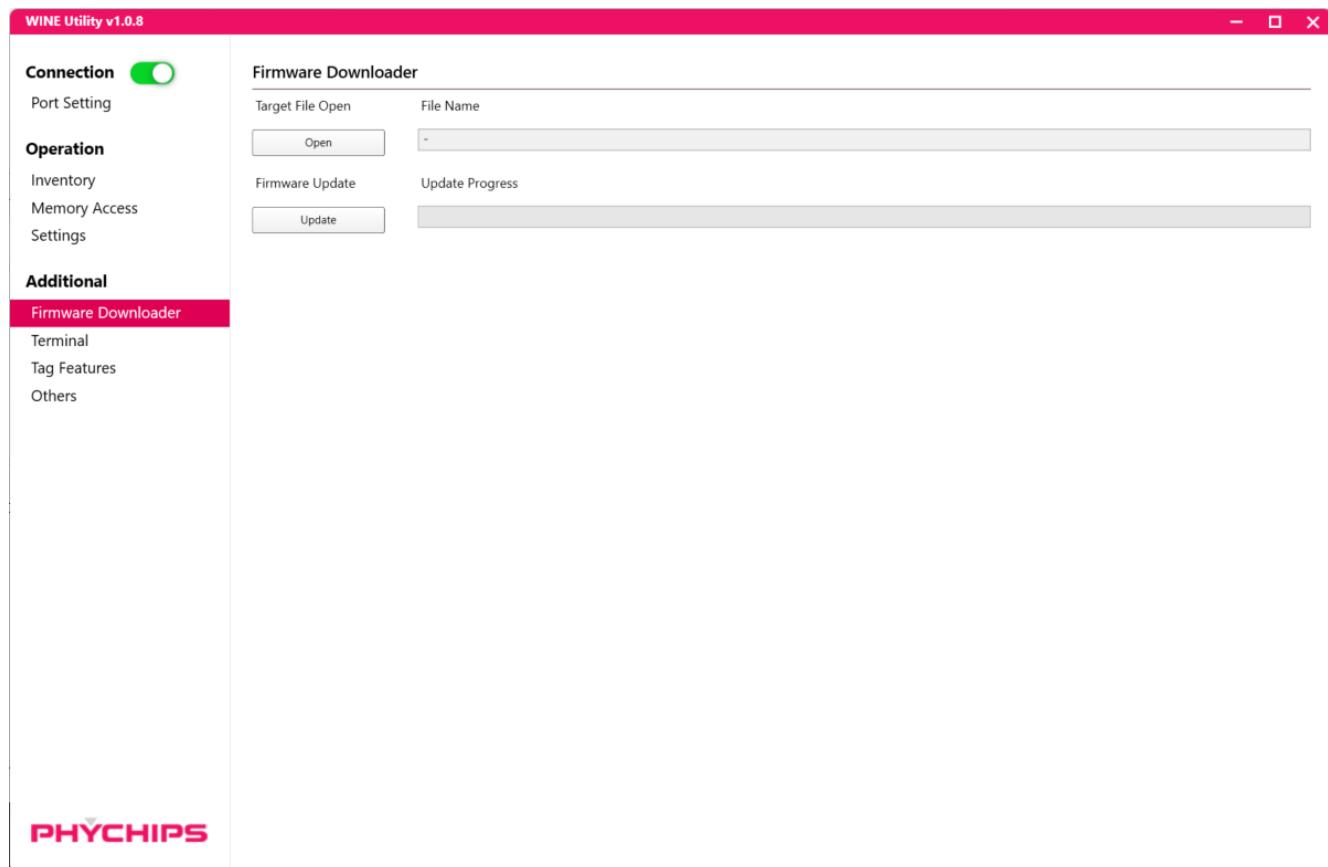
Figure 14 Firmware Download Page

WINE Utility provide firmware update through UART.

To proceed firmware download, follow the below process.

Step 1. Push the Open button.

Step 2. Select the firmware update file(*.hex) in the popup window.

Step 3. Push the Update button.

Step 4. Wait until the progress bar to fill up.

       Upon successful completion, a Success message appears.

6.2 Terminal
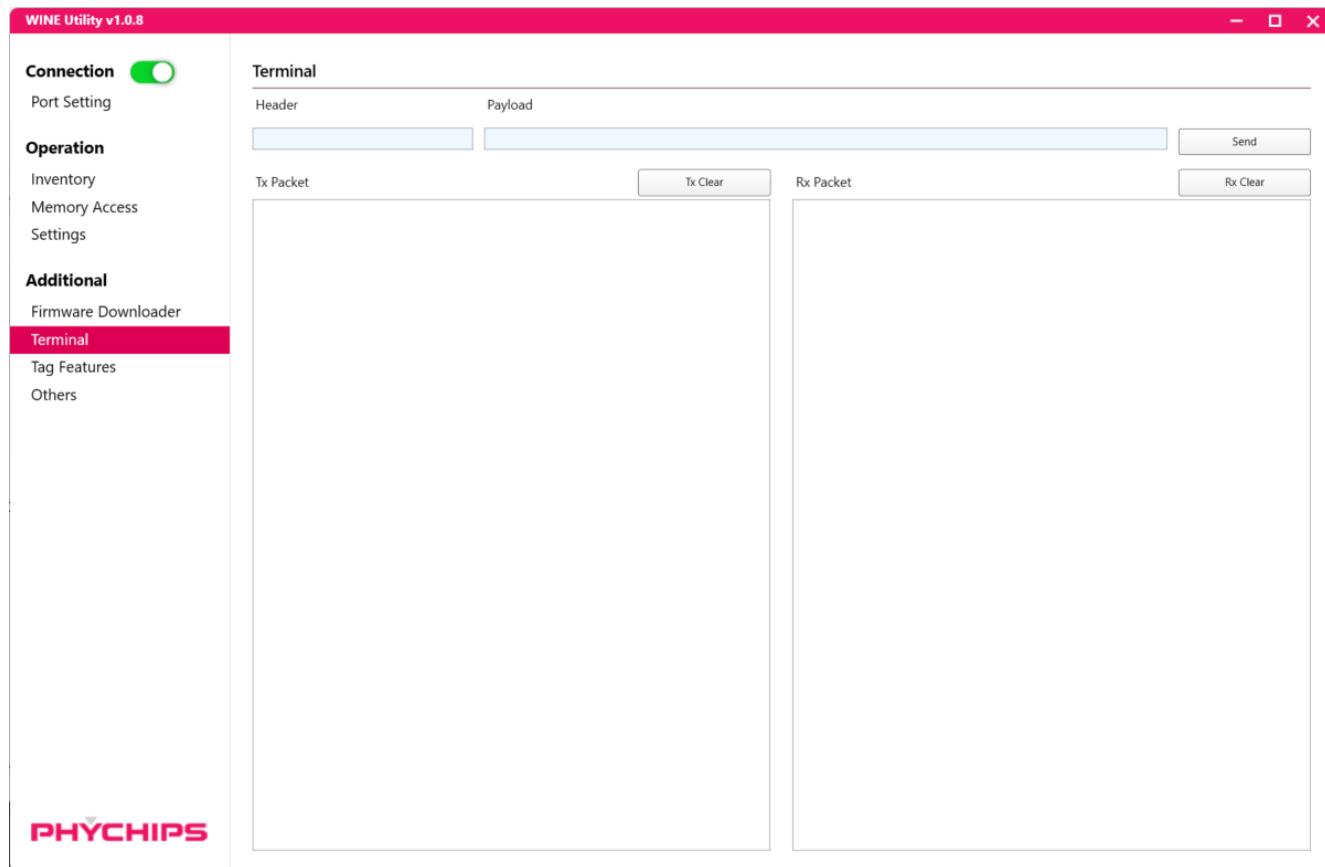
Figure 15 Terminal Page

The terminal page is where you can directly test the WINE protocol.

After entering the appropriate header and payload, click the Send button.

For details, refer to WINE protocol documentation.

6.2.1 Logger
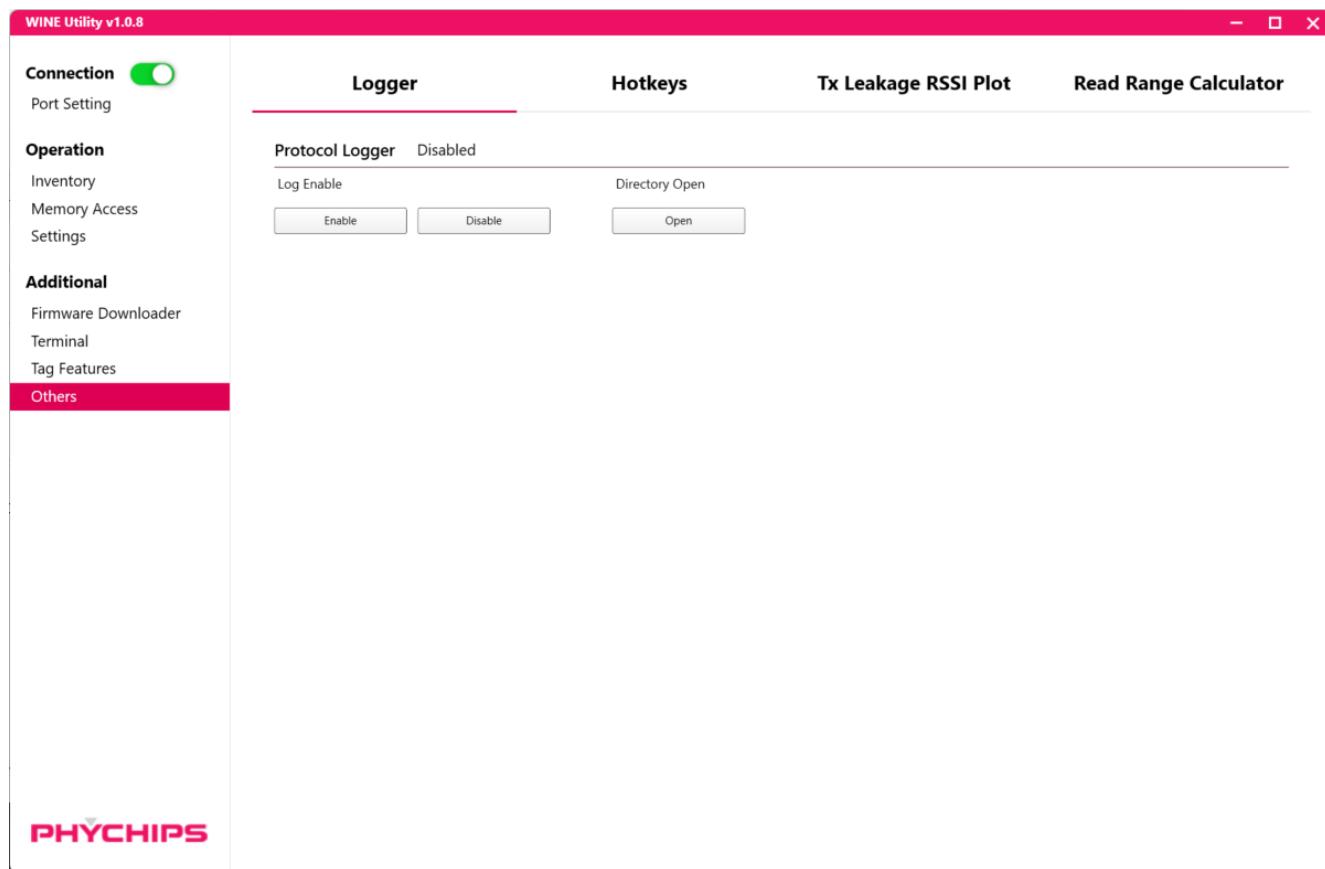
Figure 19 Logger Page

Enabling the Logger with the "Enable" button will log the WINE protocol to the csv file.

Since logger data is saved when disabled, press the "Disable" button when recording is complete.

The Directory open button opens the default log directory (Documents₩Phychips₩Log).

6.2.2 Hotkeys
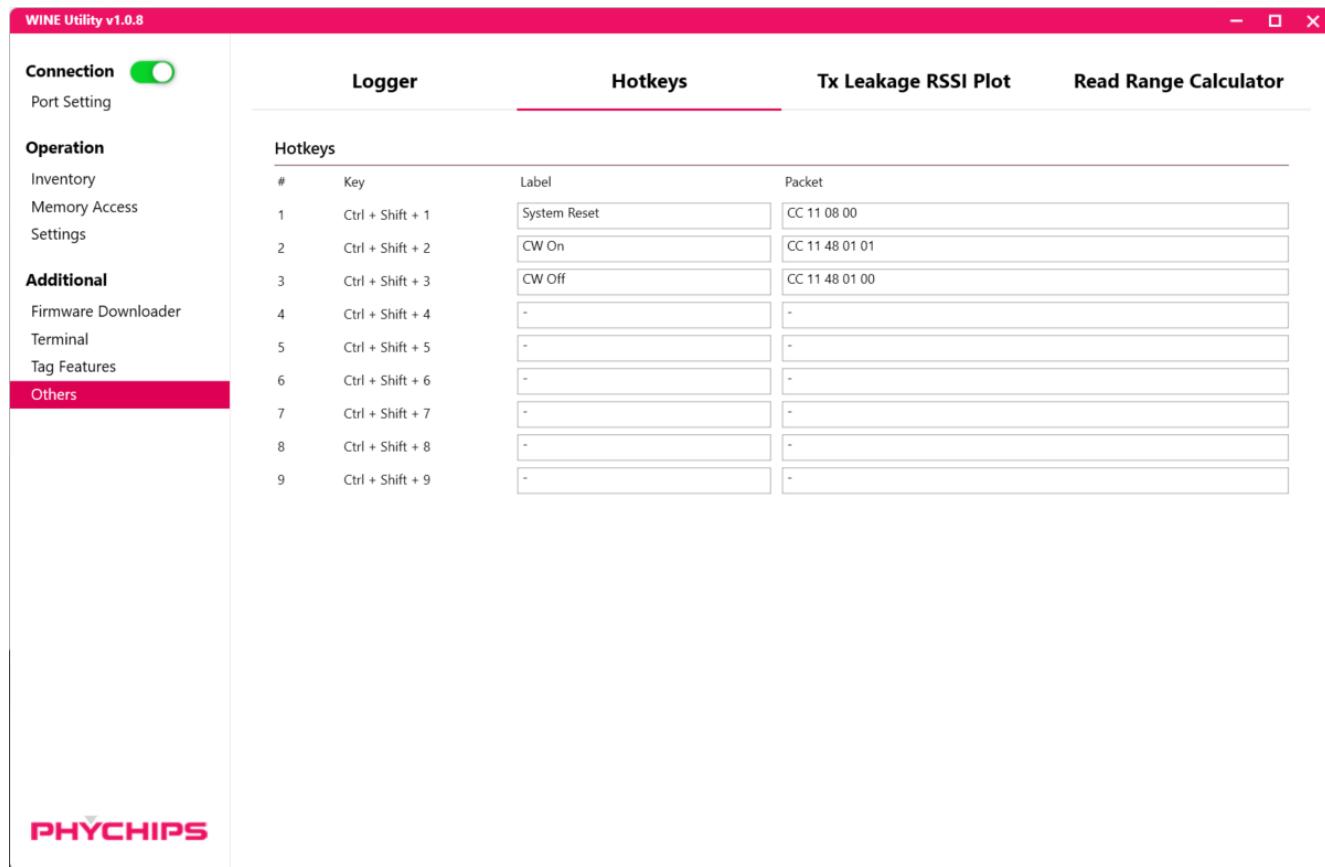
Figure 1 Hotkeys Page

In Hotkeys, frequently used commands can be registered as shortcut keys. (Ctrl + Shift + 1~9)

You can use it after inputting the Wine protocol packet excluding the checksum.

6.2.3 Tx Leakage RSSI Plot
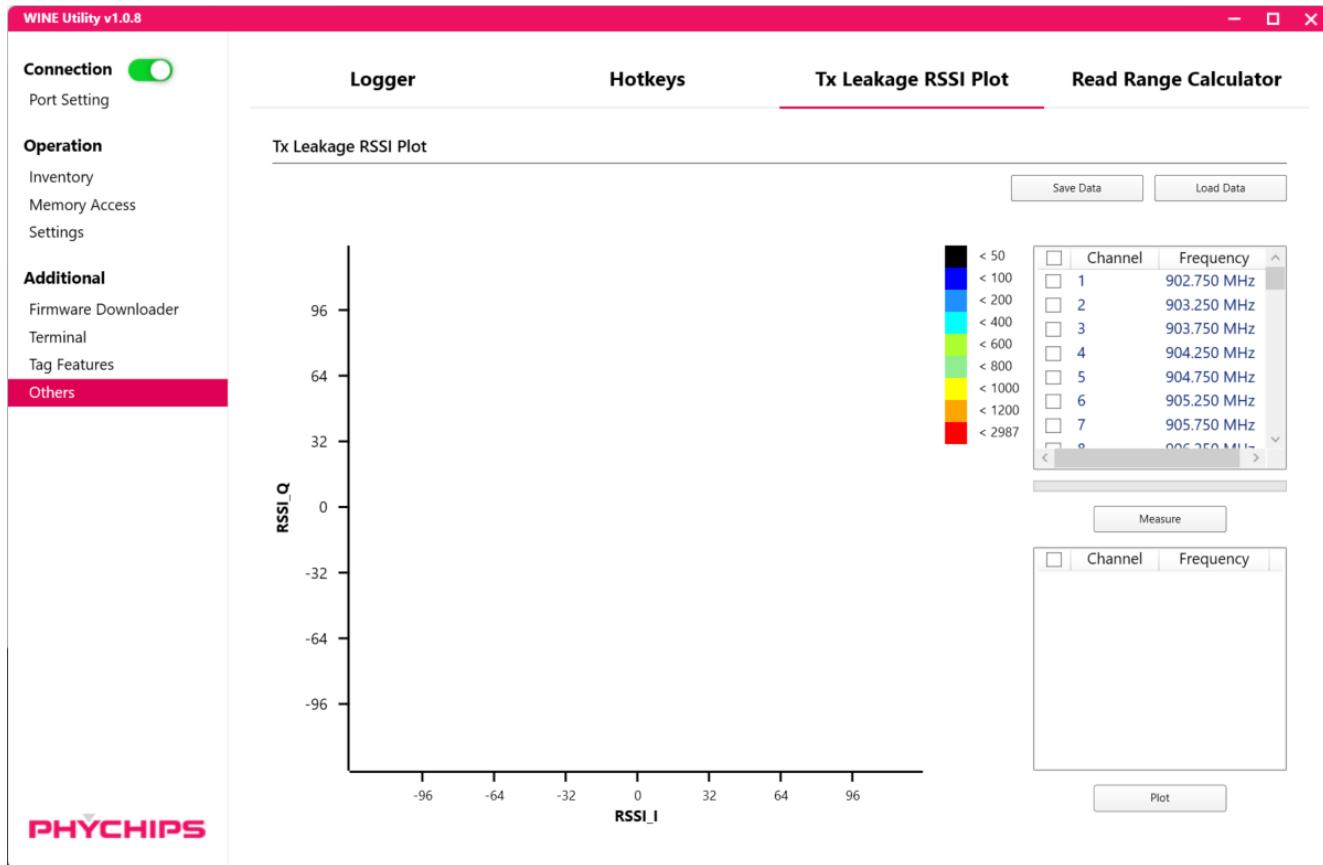
Figure 2 Tx Leakage RSSI Plot Page

6.2.3.1 Measure

Measure Leakage RSSI value of selected channels.

Typically, RFID communication runs at the lowest Leakage RSSI value point.

To proceed Tx Leakage RSSI measure, follow the below process.

Step 1. Select target channels in channel list.

Step 2. Push the "Measure" button.

Step 3. Wait until the progress bar to fill up.

6.2.3.2   Plot
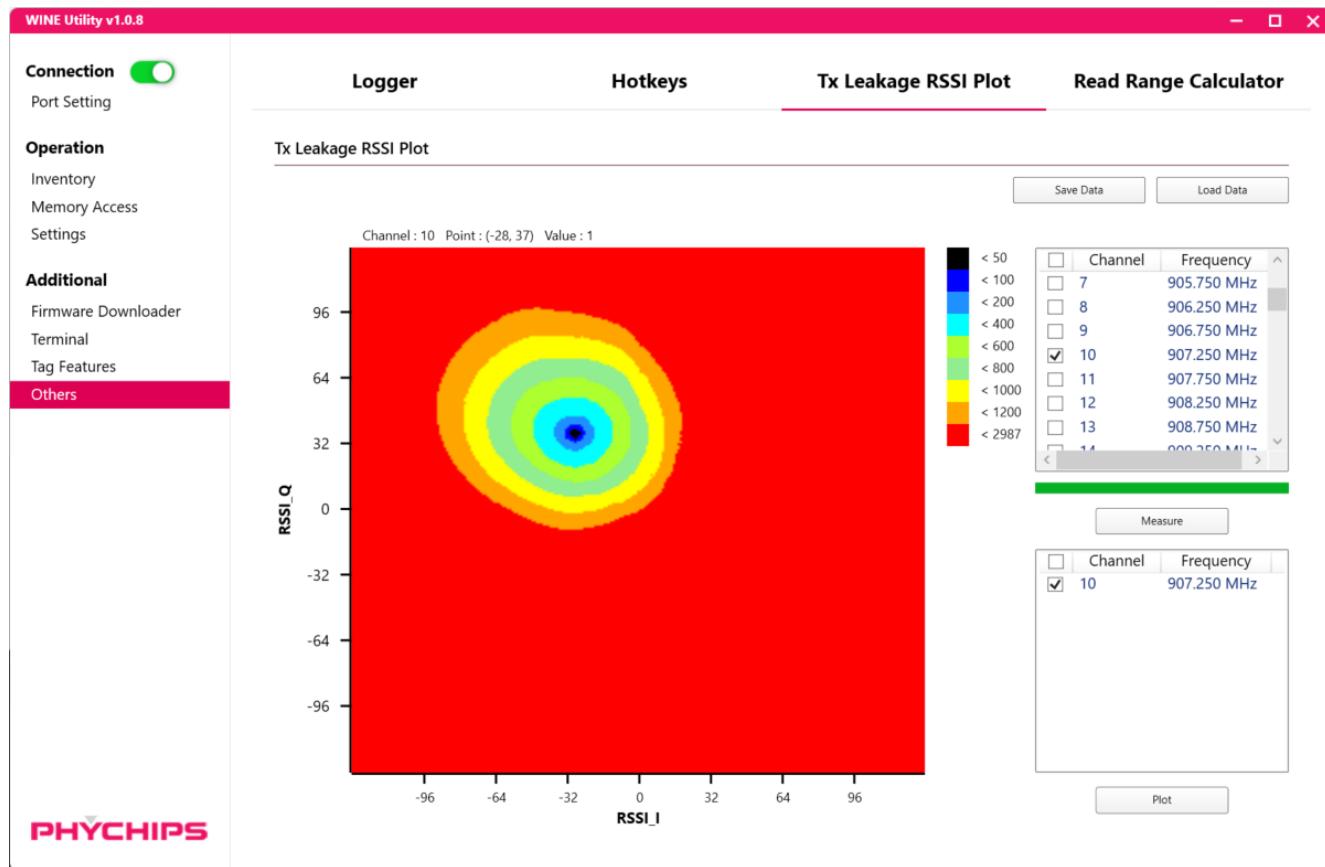
Figure 3 Tx Leakage RSSI Plot result

Display measured Leakage RSSI data of selected channels.

If multiple channels are selected, each point displays the lowest value of the selected channels.

6.2.3.3   Save and Load Data

WINE Utility provides save and load measured Tx Leakage RSSI data.

Click the Save button and specify a file name, the measured data in the plot list will be saved as a file in csv format.

Conversely, loading a data csv file will load the data into the plot list.

6.2.4 Read Range Calculator
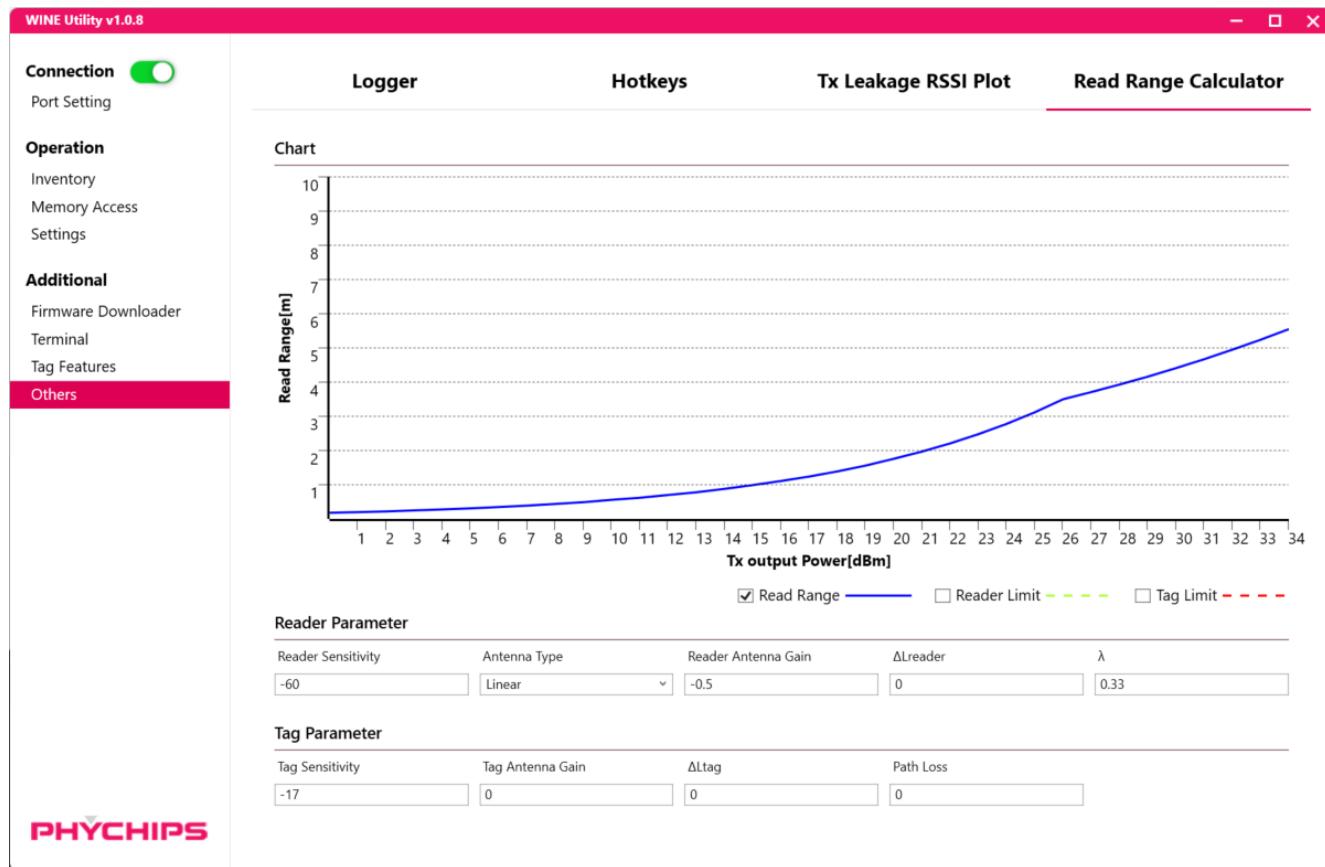
Figure 23 Read Range Calculator Page

Read Range Calculator shows the relationship between Tx Output Power and Read Range based on some parameters.

In General, RFID use circular type antenna because tag use linear antenna.

7. Mechanical drawing.

7.1 Module Dimension

Unit: mm
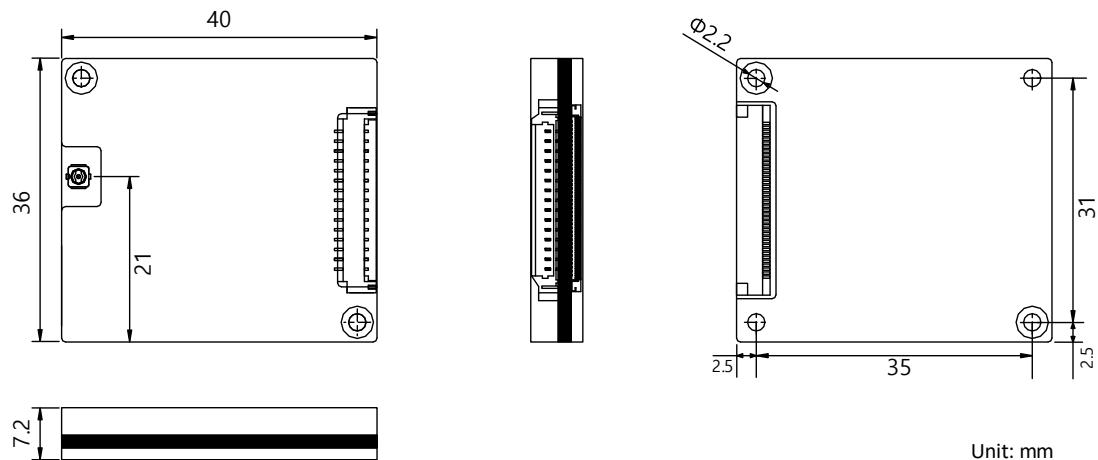
7.2 Label & Location

8. Packaging Information.
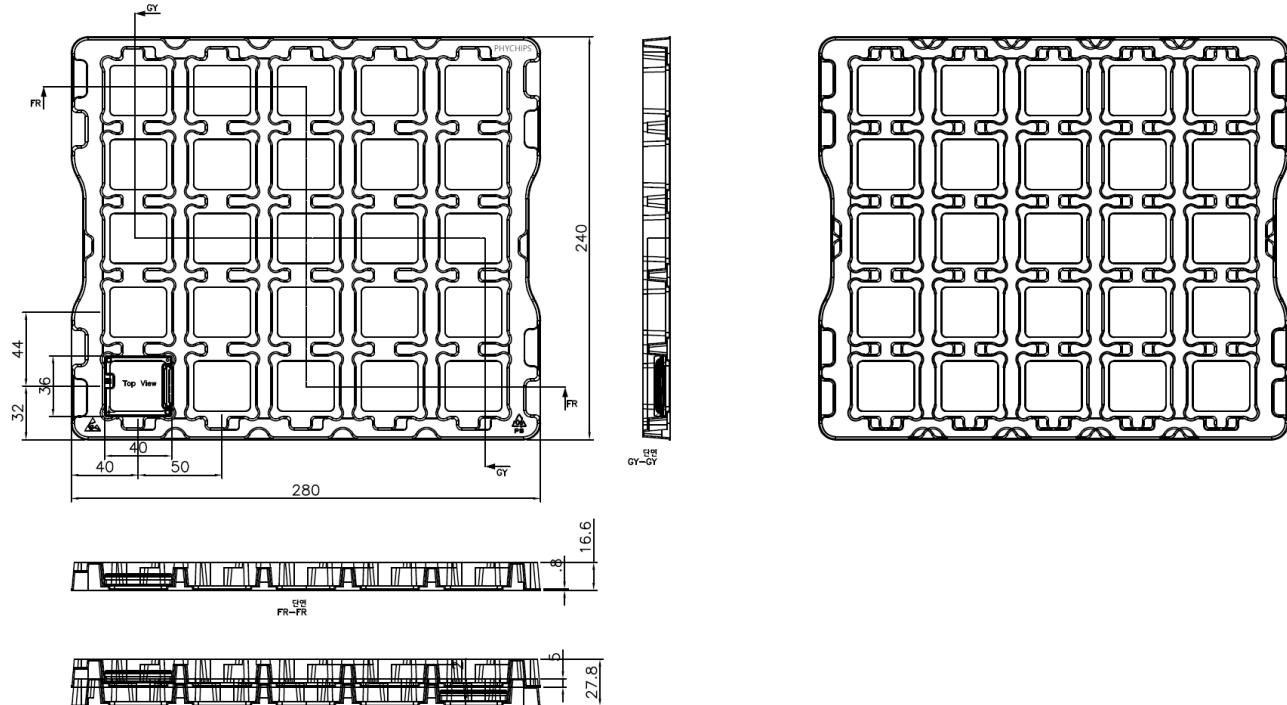
9. Certifications.

9.1 KC

TBD

9.2 CE

TBD

9.3 FCC

FCC Information to User

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

   — Reorient or relocate the receiving antenna.

   — Increase the separation between the equipment and receiver.

   — Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.

   — Consult the dealer or an experienced radio/TV technician for help.

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate this equipment.

IMPORTANT NOTE:

FCC RF Radiation Exposure Statement:

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance 25 cm between the radiator & your body.

This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

OEM INTEGRATION INSTRUCTIONS:

This device is intended only for OEM integrators under the following conditions:

The module must be installed in the host equipment such that 25 cm is maintained between the antenna and users, and the transmitter module may not be co-located with any other transmitter or antenna. The module shall be only used with the internal on-board antenna that has been originally tested and certified with this module. External antennas are not supported. As long as these 3 conditions above are met, further transmitter test will not be required.

However, the OEM integrator is still responsible for testing their end-product for any additional compliance requirements required with this module installed (for example, digital device emissions, PC peripheral requirements, etc.). The end-product may need Verification testing, Declaration of Conformity testing, a Permissive Class II Change or new Certification. Please involve a FCC certification specialist in order to determine what will be exactly applicable for the end-product.

Validity of using the module certification:

In the event that these conditions cannot be met (for example certain laptop configurations or co-location with another transmitter), then the FCC authorization for this module in combination with the host equipment is no longer considered valid and the FCC ID of the module cannot be used on the final product. In these circumstances, the OEM integrator will be responsible for re-evaluating the end product (including the transmitter) and obtaining a separate FCC authorization. In such cases, please involve a FCC certification specialist in order to determine if a Permissive Class II Change or new Certification is required.

Upgrade Firmware:

The software provided for firmware upgrade will not be capable to affect any RF parameters as certified for the FCC for this module, in order to prevent compliance issues.

End product labeling:

This transmitter module is authorized only for use in device where the antenna may be installed such that 25 cm may be maintained between the antenna and users. The final end product must be labeled in a visible area with the following:

▶ **Contains FCC ID: Y3D-WINE7**

- This Module has been tested and should be used with below antennas:

Antenna Type	Peak Gain (dBi)	Part Name
Patch	5.84	MARCRO260-919
Patch	1.01	QUBE 6015 PLUS

Information that must be placed in the end user manual:

The OEM integrator has to be aware not to provide information to the end user regarding how to install or remove this RF module in the user's manual of the end product which integrates this module. The end user manual shall include all required regulatory information/warning as show in this manual.

9.4 TELEC

TBD