VC7300 USB Module User Guide

Reported
FAE Dept.

Date
Nov. 24th 2023

Agenda

AENEAS

- Module Type
- IC Version Recognition
- Schematic
- I/O Function
- LED Behavior
- Operation and Networking
- Download Image to Device

Module Type

P/N	RF IC	Flash	Antenna	Power
VC7300AU RFMM-USB	VC7300AU	512KB	Chip Dipole (by Ipex to SMA connector)	20dBm
VC7300BU RFMM-USB	VC7300BU	1024KB	Chip Dipole (by Ipex to SMA connector)	20dBm

IC Version Recognition

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VC7300**A**U

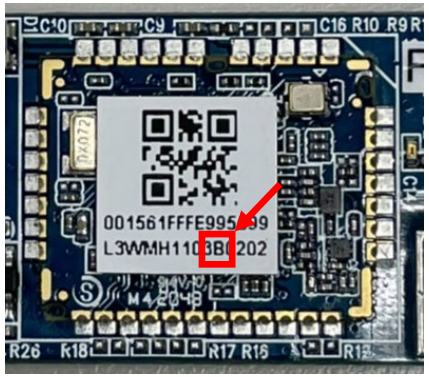
Anti-Static Shielding Bag

QR Code

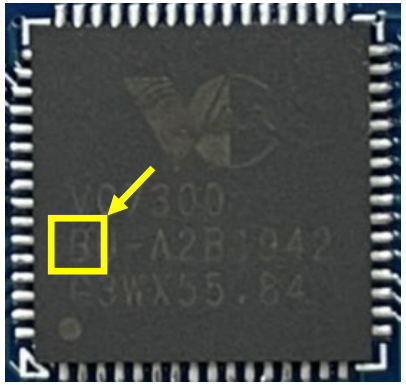
IC Marking

VC7300**B**U

Anti-Static Shielding Bag



QR Code



IC Marking

Schematic (RFMM_1)

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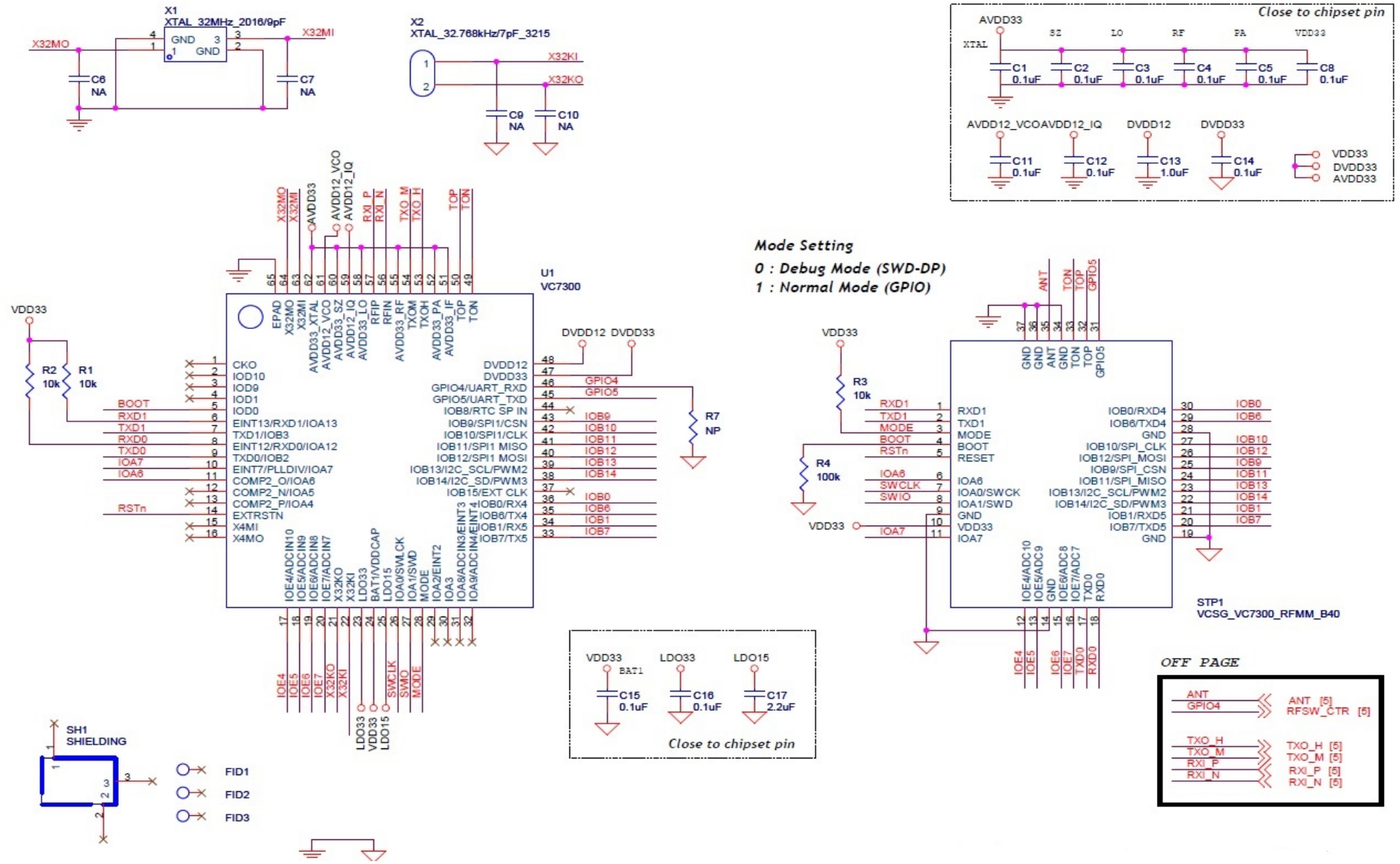
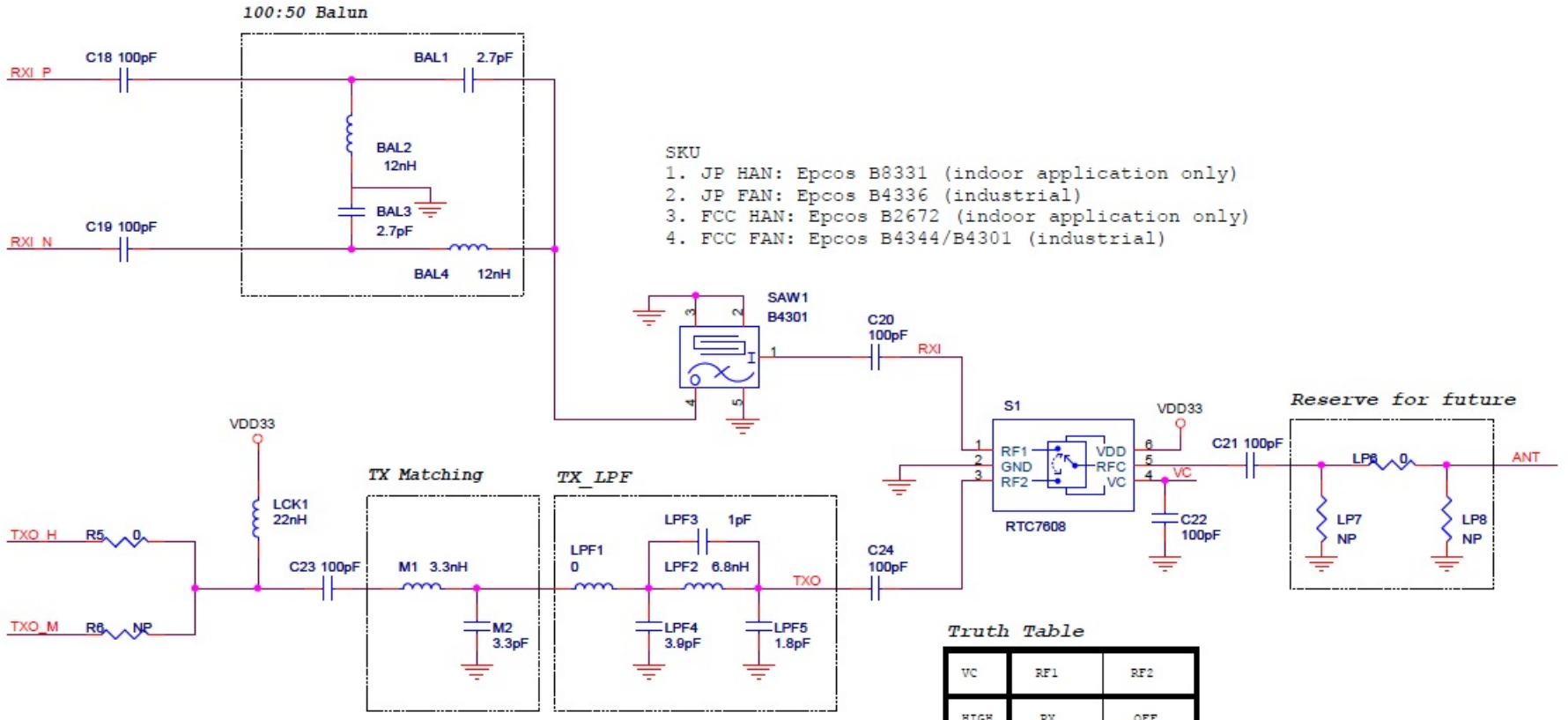


Schematic (RFMM_2)



SKU
1. JP HAN: Epcos B8331 (indoor application only)
2. JP FAN: Epcos B4336 (industrial)
3. FCC HAN: Epcos B2672 (indoor application only)
4. FCC FAN: Epcos B4344/B4301 (industrial)

Truth Table

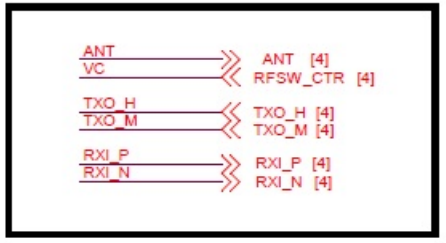
VC	RF1	RF2
HIGH	RX	OFF
LOW	OFF	TX

Default matching for SKU1
SKU1: JP, MPA, Freq: 922~928MHz
SKU2: FCC, HPA, Freq: 902~928MHz

Matching Difference between JP and FCC band

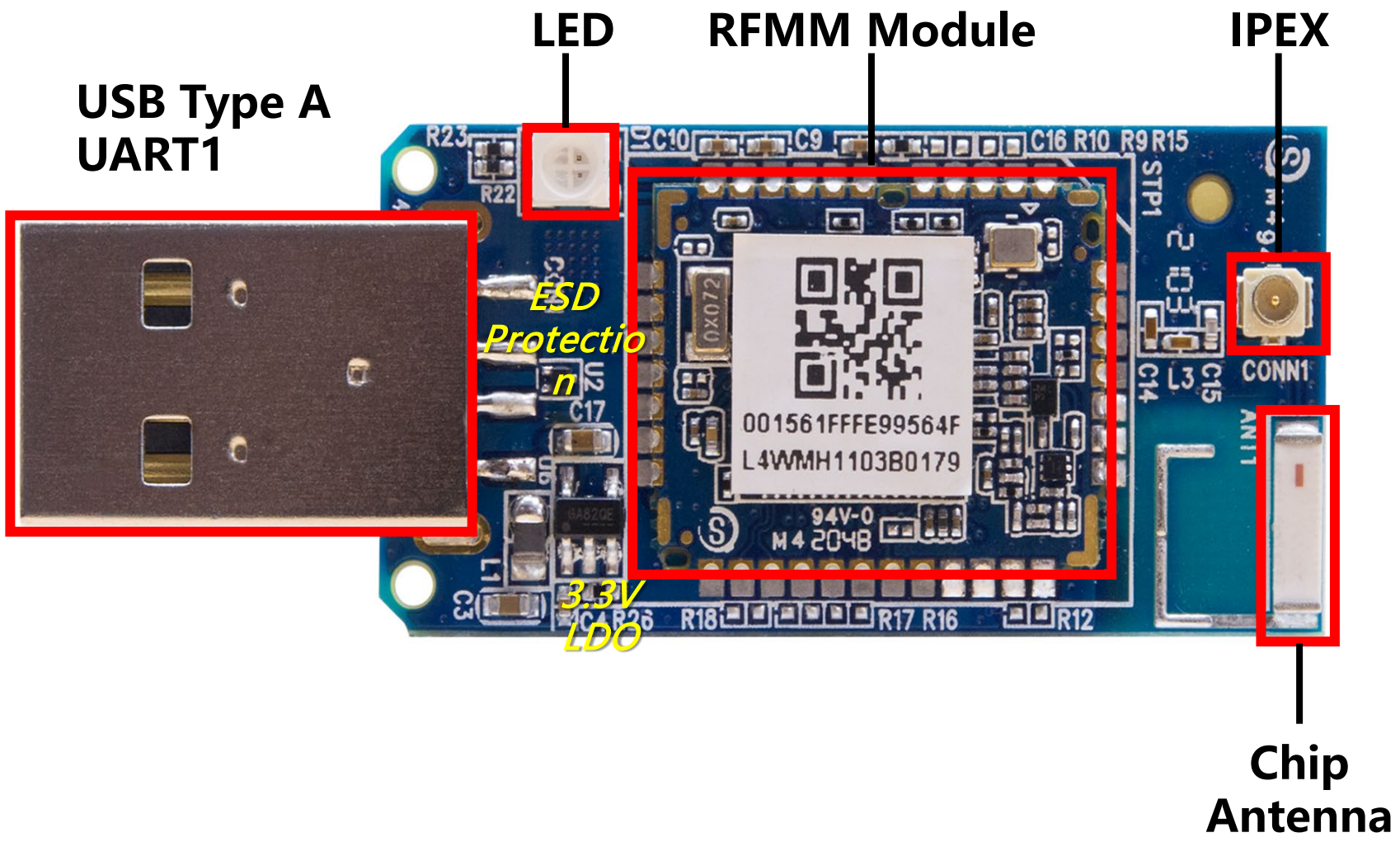
	R5	R6	LCK1	M1	M2	SAW1
JP	N/A	2.2nH	22nH	6.8nH	2.2pF	B4336
FCC	0ohm	N/A	22nH	3.3nH	3.3pF	B4301

OFF PAGE

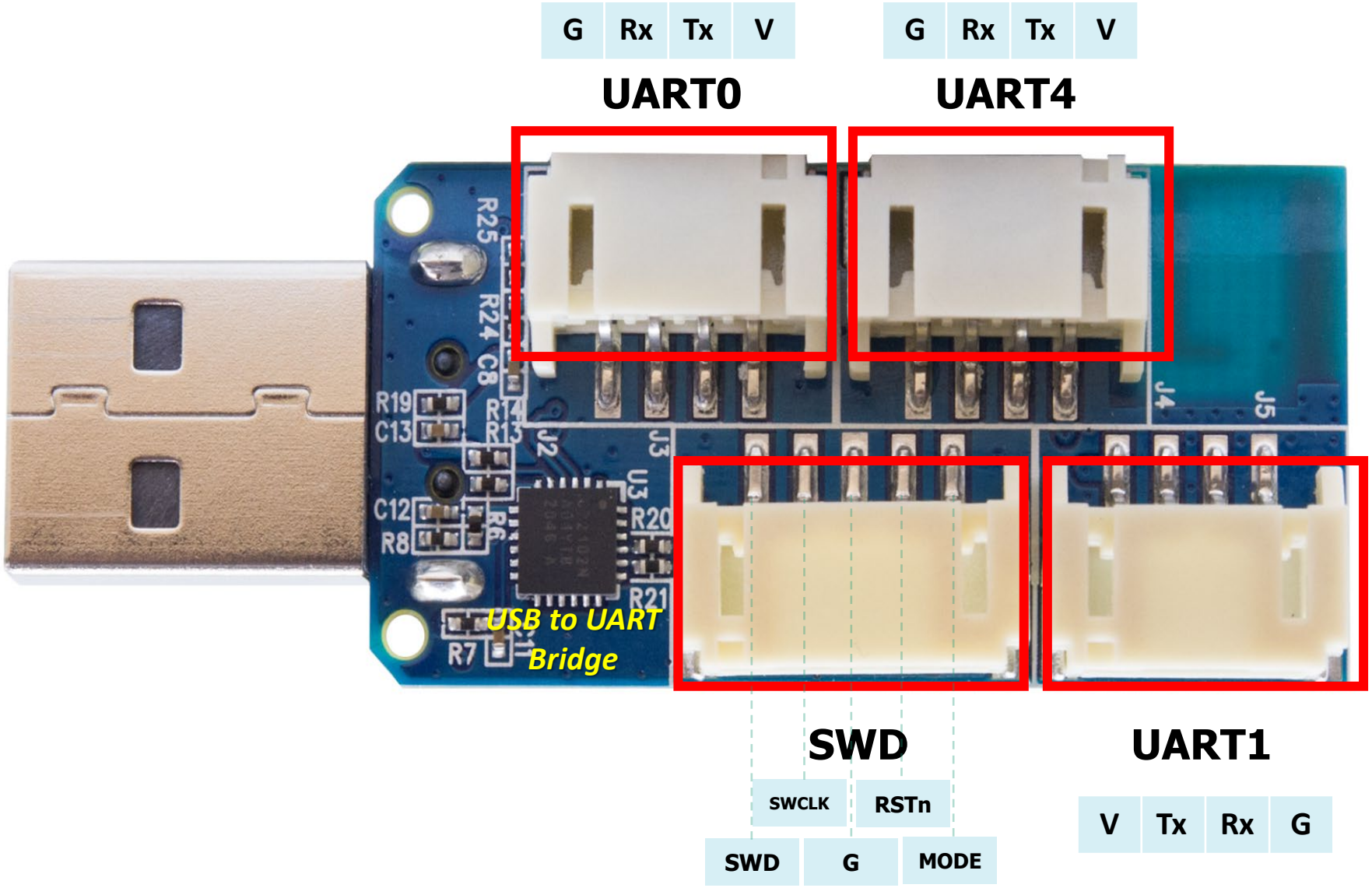


I/O Function

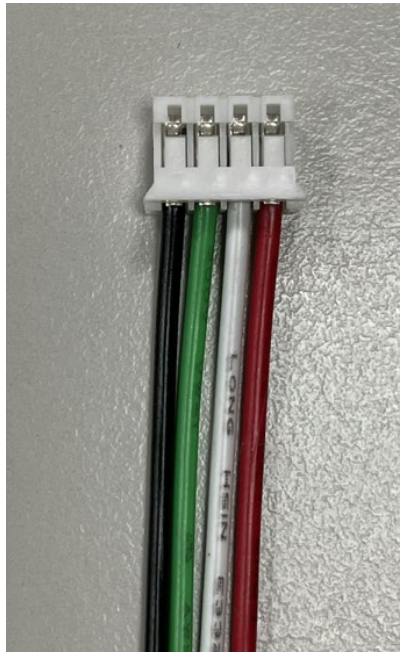
AENEAS

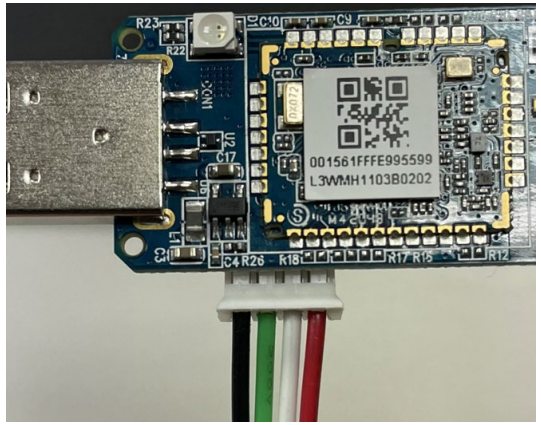


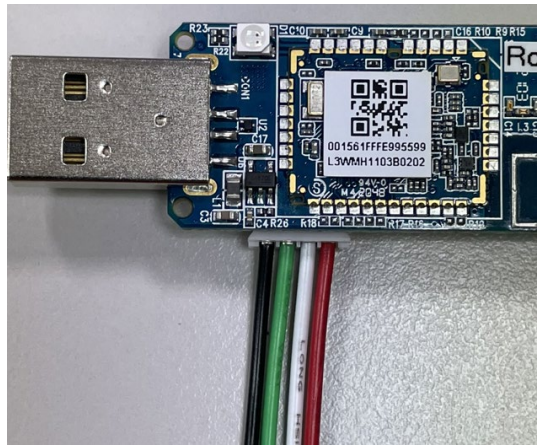
I/O Function

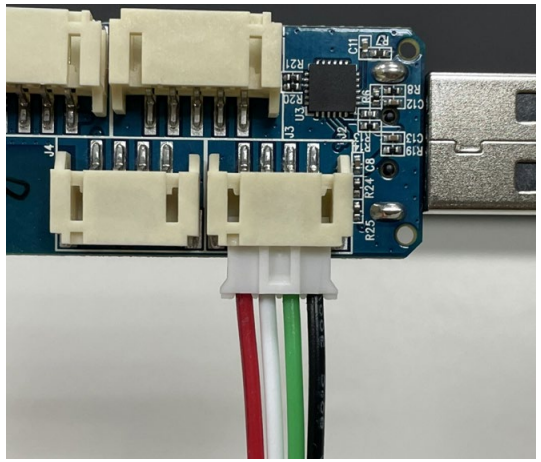

G
Rx
Tx
V
G
Rx
Tx
V
UART0
UART4
USB to UART Bridge
SWD
SWCLK
RSTn
SWD
G
MODE
UART1
V
Tx
Rx
G

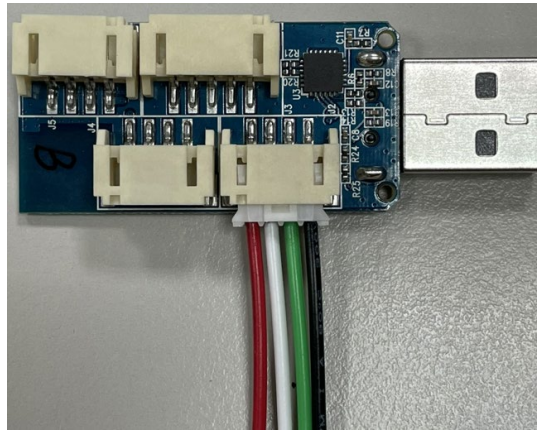
I/O Function











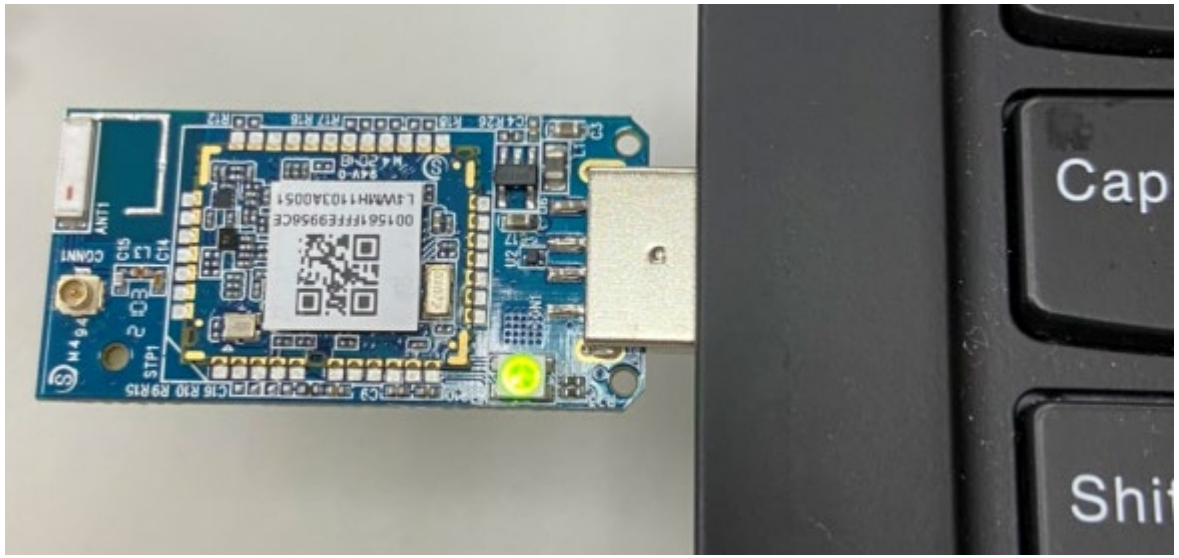
You can easily find the connector from the market. (Pitch=2.0mm)

LED Behavior

Description	LED Behavior
Device has not joined the PAN	Red & Green twinkle
Device completes join the PAN	All LED off
Device go into boot mode	Green LED
System error	Red LED on
Transmit packet	Green LED blink
Receive packet	Red LED blink
System bootup	Red & Green LED blink

Operation and Networking

1. Connect VC7300 USB Wi-SUN module to PC USB port.
2. Execute Tera Term.



Key in reboot, and show the boot information.

Root

COM11:115200baud - Tera Term VT

File Edit Setup Control Window Help

```
reboot
ota part base 0x1000000 size 262144, main part base 0x4000 size 503808
 vc_lfs_init, baseaddr 0x1078000, totalsize 32768, sector count 8,lookahead
 32
vc_lfs_init, err 0x0
SFTRST
------------------------------------------------------
VERTEXCOM Technologies, Inc.
------------------------------------------------------
NET       : sicslowpan
LLSEC     : nullsec
MAC       : WISUN
RDC       : wisunrdc
SW BRANCH : v1.0.0.0
NODE ID   : 0xf994
NODE MAC  : ff:ff:ff:ff:f4:5a:0d:ce
------------------------------------------------------
Net Service Start:
RAND INIT : 0x3899
NODE ID   : 0xf994
NODE MAC  : ff:ff:ff:ff:f4:5a:0d:ce
random_init: seed = 0x3899
MPL: init
m_max_buffer_sz=712, m_rx_buff=20019150, m_systick_offset=1008
m_ack_buff=20019438
IC version = 7000b4
spacing 200
rx[141], rx_ack[142], tx[143], tx_complete[144], eapol[145], refresh timing
[146], collision[147], unicast[148], broadcast[149], broadcast interval[150
], rpl[151], pcs fail[152], system pause[153], rpl leave[154], wakeup[155],
 factory[156]
wisun_mac_trickle_timers_init
br timer[0x20005689], node timer[0x2000569A]
WiSUN: starting as coordinator
Starting: 'vertexcom_apps_test_process'
```

Serial Number

MAC Address

Root

Node

COM10:115200baud - Tera Term VT

File Edit Setup Control Window Help

```
reboot
ota part base 0x1000000 size 262144, main part base 0x4000 size 503808
 vc_lfs_init, baseaddr 0x1078000, totalsize 32768, sector count 8,lookahead
 32
vc_lfs_init, err 0x0
SFTRST
------------------------------------------------------
VERTEXCOM Technologies, Inc.
------------------------------------------------------
NET       : sicslowpan
LLSEC     : nullsec
MAC       : WISUN
RDC       : wisunrdc
SW BRANCH : v1.0.0.0
NODE ID   : 0xf995
NODE MAC  : ff:ff:ff:ff:f4:5a:0d:cf
------------------------------------------------------
Net Service Start:
RAND INIT : 0x3263
NODE ID   : 0xf995
NODE MAC  : ff:ff:ff:ff:f4:5a:0d:cf
random_init: seed = 0x3263
MPL: init
m_max_buffer_sz=712, m_rx_buff=20016778, m_systick_offset=1008
m_ack_buff=20016a60
IC version = 7000b4
spacing 200
rx[141], rx_ack[142], tx[143], tx_complete[144], eapol[145], refresh timing
[146], collision[147], unicast[148], broadcast[149], broadcast interval[150
], rpl[151], pcs fail[152], system pause[153], rpl leave[154], wakeup[155],
 factory[156]
wisun_mac_trickle_timers_init
br timer[0x20005555], node timer[0x20005566]
WiSUN: starting as node
Starting: 'vertexcom_apps_test_process'
```

Serial Number

MAC Address

Node

Operation and Networking

AENEAS

Key in cfg wisun, check Channel Plan and Net Name are same.

Root

COM11:115200baud - Tera Term VT

File Edit Setup Control Window Help

```
[146], collision[147], unicast[148], broadcast[149], broadcast interval[150
], rpl[151], pcs fail[152], system pause[153], rpl leave[154], wakeup[155],
 factory[156]
wisun_mac_trickle_timers_init
br timer[0x20005689], node timer[0x2000569A]
WiSUN: starting as coordinator
Starting: 'vertexcom_apps_test_process'

rpl_root_init
dhcp6s: Listening on port 547 my_addr = 1
vc# Watchdog enabled
WiSUN: get rpl ready
cfg wisun
wisun.PANid = 272
wisun.UDI = 200
wisun.chPlan = 0
wisun.chFun = 2
wisun.control = 0
wisun.ch0 = 902200
wisun.spacing = 200
wisun.fixed = 0
wisun.chNum = 129
wisun.routing_method = 0x1
wisun.NetName = [VertexCom]
wisun.eapol_ready = 1
wisun.rd = 1
wisun.oc = 1
wisun.exNum = 2
wisun.exNumStart1 = 10
wisun.exNumEnd1 = 20
wisun.exNumStart2 = 40
wisun.exNumEnd2 = 50
wisun.mask = 0xa 0x1b 0x2c 0x3d 0x0 0x0 0x4e 0x5f 0x0 0x0 0x0 0x0 0x0 0x0 0
x0 0x0
```

Default PANid

Channel Plan

Net Name

Node

COM10:115200baud - Tera Term VT

File Edit Setup Control Window Help

```
IC version = 7000b4
spacing 200
rx[141], rx_ack[142], tx[143], tx_complete[144], eapol[145], refresh timing
[146], collision[147], unicast[148], broadcast[149], broadcast interval[150
], rpl[151], pcs fail[152], system pause[153], rpl leave[154], wakeup[155],
 factory[156]
wisun_mac_trickle_timers_init
br timer[0x20005555], node timer[0x20005566]
WiSUN: starting as node
Starting: 'vertexcom_apps_test_process'

vc# Watchdog enabled
WiSUN: node No Pan state
cfg wisun
wisun.UDI = 200
wisun.chPlan = 0
wisun.chFun = 2
wisun.control = 0
wisun.ch0 = 902200
wisun.spacing = 200
wisun.fixed = 0
wisun.chNum = 129
wisun.routing_method = 0x1
wisun.NetName = [VertexCom]
wisun.eapol_ready = 0
wisun.rd = 1
wisun.oc = 1
wisun.exNum = 2
wisun.exNumStart1 = 10
wisun.exNumEnd1 = 20
wisun.exNumStart2 = 40
wisun.exNumEnd2 = 50
wisun.mask = 0xa 0x1b 0x2c 0x3d 0x0 0x0 0x4e 0x5f 0x0 0x0 0x0 0x0 0x0 0x0 0
x0 0x0
```

Node is not join PAN yet, there is no PANid

Channel Plan

Net Name

Key in cent nv to check if Frequency Band settings are same.

Root

COM11:115200baud - Tera Term VT

File Edit Setup Control Window Help

```
], rpl[151], pcs fail[152], system pause[153], rpl leave[154], wakeup[155],
 factory[156]
wisun_mac_trickle_timers_init
br timer[0x20005689], node timer[0x2000569A]
WiSUN: starting as coordinator
Starting: 'vertexcom_apps_test_process'

rpl_root_init
dhcp6s: Listening on port 547 my_addr = 1
vc# Watchdog enabled
WiSUN: get rpl ready
cent nv
cent nv
series_number 73010638
date 20200114
carrier_frequency 915000000
xtal_offset 44
pa_sel 1
tx_power_default 20
tx_power_cal_offset 39
rssi_offset 8
elna_rssi_offset 25
fe_hw_cfg:
    [0]ELNA state        : enable
    [1]EPA state         : disable
    [2]Antenna diversity : disable
mac_addr ff:ff:ff:ff:f4:5a:0d:ce
cca_threshold -112
rftest 0
chip_id 0
board_id 0
temp_offset 0
fec 0 (0:disable,1:NRNSC,2:RSC)
lfxo 4
vc#
```

Frequency Band

Node

COM10:115200baud - Tera Term VT

File Edit Setup Control Window Help

```
rx[141], rx_ack[142], tx[143], tx_complete[144], eapol[145], refresh timing
[146], collision[147], unicast[148], broadcast[149], broadcast interval[150
], rpl[151], pcs fail[152], system pause[153], rpl leave[154], wakeup[155],
 factory[156]
wisun_mac_trickle_timers_init
br timer[0x20005555], node timer[0x20005566]
WiSUN: starting as node
Starting: 'vertexcom_apps_test_process'

vc# Watchdog enabled
WiSUN: node No Pan state
cent nv
cent nv
series_number 73010639
date 20200114
carrier_frequency 915000000
xtal_offset 33
pa_sel 1
tx_power_default 20
tx_power_cal_offset 41
rssi_offset 9
elna_rssi_offset 26
fe_hw_cfg:
    [0]ELNA state        : enable
    [1]EPA state         : disable
    [2]Antenna diversity : disable
mac_addr ff:ff:ff:ff:f4:5a:0d:cf
cca_threshold -112
rftest 0
chip_id 0
board_id 0
temp_offset 0
fec 0 (0:disable,1:NRNSC,2:RSC)
lfxo 4
vc#
```

Frequency Band

Operation and Networking

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After 3~5 minutes, Networking is complete automatically.

Root

COM11:115200baud - Tera Term VT

File Edit Setup Control Window Help

```
MAC       : WISUN
RDC       : wisunrdc
SW BRANCH : v1.0.0.0
NODE ID   : 0xf994
NODE MAC  : ff:ff:ff:ff:f4:5a:0d:ce
----------------------------------------------------------
Net Service Start:
RAND INIT : 0x3899
NODE ID   : 0xf994
NODE MAC  : ff:ff:ff:ff:f4:5a:0d:ce
random_init: seed = 0x3899
MPL: init
m_max_buffer_sz=712, m_rx_buff=20019150, m_systick_offset=1008
m_ack_buff=20019438
IC version = 7000b4
spacing 200
rx[141], rx_ack[142], tx[143], tx_complete[144], eapol[145], refresh timing
[146], collision[147], unicast[148], broadcast[149], broadcast interval[150
], rpl[151], pcs fail[152], system pause[153], rpl leave[154], wakeup[155],
 factory[156]
wisun_mac_trickle_timers_init
br timer[0x20005689], node timer[0x2000569A]
WiSUN: starting as coordinator
Starting: 'vertexcom_apps_test_process'

rpl_root_init
dhcp6s: Listening on port 547 my_addr = 1
vc# Watchdog enabled
WiSUN: get rpl ready
[373714][RPL JOIN] 2: lladdr=FF:FF:FF:FF:F4:5A:0D:CF device=2001:db8::3 par
ent=2001:db8::1
Border Router new pc version[6][1800269]
[2772787][RPL JOIN] 2: lladdr=FF:FF:FF:FF:F4:5A:0D:CF device=2001:db8::3 pa
rent=2001:db8::1
```

A node joins the PAN

Node

COM10:115200baud - Tera Term VT

File Edit Setup Control Window Help

```
NODE ID   : 0xf995
NODE MAC  : ff:ff:ff:ff:f4:5a:0d:cf
----------------------------------------------------------
Net Service Start:
RAND INIT : 0x3263
NODE ID   : 0xf995
NODE MAC  : ff:ff:ff:ff:f4:5a:0d:cf
random_init: seed = 0x3263
MPL: init
m_max_buffer_sz=712, m_rx_buff=20016778, m_systick_offset=1008
m_ack_buff=20016a60
IC version = 7000b4
spacing 200
rx[141], rx_ack[142], tx[143], tx_complete[144], eapol[145], refresh timing
[146], collision[147], unicast[148], broadcast[149], broadcast interval[150
], rpl[151], pcs fail[152], system pause[153], rpl leave[154], wakeup[155],
 factory[156]
wisun_mac_trickle_timers_init
br timer[0x20005555], node timer[0x20005566]
WiSUN: starting as node
Starting: 'vertexcom_apps_test_process'

vc# Watchdog enabled
WiSUN: node No Pan state
version[0][5]
Receive PC[334990]
WiSUN: restart rpl
WiSUN: init crystal drift base time[339][334776]
RPL: Following BR CCA Setting = -100
[368167][DHCP] Get global address 2001:db8::3
[369269][RPL JOIN] device=2001:db8::3 parent=2001:db8::1
WiSUN: get rpl ready
new pc version[5][6][1868212]
[2768361][RPL JOIN] device=2001:db8::3 parent=2001:db8::1
```

Node receive PC from Root

Node is assigned IPv6 Address and joins the PAN

The IPv6 Address of parent node is 2001:db8::1

Operation and Networking

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Key in rpl, check networking status.

Root

COM11:115200baud - Tera Term VT

File Edit Setup Control Window Help

```
br timer[0x20005549], node timer[0x2000555A]
WiSUN: starting as coordinator
Starting: 'vertexcom_apps_test_process'

rpl_root_init
dhcp6s: Listening on port 547 my_addr = 1
vc# Watchdog enabled
WiSUN: get rpl ready
[217548][RPL JOIN] 2: lladdr=FF:FF:FF:FF:F4:5A:0D:CF device=2001:db8::3 par
ent=2001:db8::1
rpl
--- Network status ---
- MAC addresses:
-- ff:ff:ff:ff:f4:5a:0d:ce
- Unicast IPv6 addresses:
-- 2001:db8::1
-- fe80::fdff:ffff:f45a:dce
- Multicast IPv6 addresses:
-- ff02::1:ff00:1
-- ff02::1a
-- ff03::fc
-- ff03::2
-- ff02::2
-- ff03::1
-- ff02::1
-- ff02::1:ff5a:dce
- IPv6 prefix:
-- fe80::/64
- Default route:
-- None
[VC+RPN: 2 in total Routing link]
[VC+RPL:[0001] => DODAG root  (lifetime: 4294967295 seconds)]
[VC+RPL:[0003] => [0001] (lifetime: 14389 seconds)]
----------------------
```

There are two nodes in this Routing Table
The last IPv6 code of the root node is 1
The last IPv6 code of the other node is 3

Node

COM10:115200baud - Tera Term VT

File Edit Setup Control Window Help

```
Starting: 'vertexcom_apps_test_process'

vc# Watchdog enabled
WiSUN: node No Pan state
version[0][26]
Receive PC[129884]
WiSUN: restart rpl
WiSUN: init crystal drift base time[191][188484]
RPL: Following BR CCA Setting = -100
[213953][DHCP] Get global address 2001:db8::3
[214813][RPL JOIN] device=2001:db8::3 parent=2001:db8::1
WiSUN: get rpl ready
rpl
--- Network status ---
- MAC addresses:
-- ff:ff:ff:ff:f4:5a:0d:cf
- Unicast IPv6 addresses:
-- 2001:db8::3
-- fe80::fdff:ffff:f45a:dcf
- Multicast IPv6 addresses:
-- ff02::1:ff00:3
-- ff02::1a
-- ff03::fc
-- ff03::2
-- ff02::2
-- ff03::1
-- ff02::1
-- ff02::1:ff5a:dcf
- IPv6 prefix:
-- fe80::/64
- Default route:
-- fe80::fdff:ffff:f45a:dce (lifetime: 0 seconds)
[VC+RPN: 0 in total Routing link]
----------------------
```

Node is assigned IPv6 Address

Operation and Networking

AENEAS

Key in cfg wisun, check networking configuration settings.

Root

COM11:115200baud - Tera Term VT

File Edit Setup Control Window Help

```
 factory[156]
wisun_mac_trickle_timers_init
br timer[0x20005549], node timer[0x2000555A]
WiSUN: starting as coordinator
Starting: 'vertexcom_apps_test_process'

rpl_root_init
dhcp6s: Listening on port 547 my_addr = 1
vc# Watchdog enabled
WiSUN: get rpl ready
[240567][RPL JOIN] 2: lladdr=FF:FF:FF:FF:F4:5A:0D:CF device=2001:db8::3 par
ent=2001:db8::1
cfg wisun
wisun.PANid = 272
wisun.UDI = 200
wisun.chPlan = 0
wisun.chFun = 2
wisun.control = 0
wisun.ch0 = 902200
wisun.spacing = 200
wisun.fixed = 0
wisun.chNum = 129
wisun.routing_method = 0x1
wisun.NetName = [VertexCom]
wisun.eapol_ready = 1
wisun.rd = 1
wisun.oc = 1
wisun.exNum = 2
wisun.exNumStart1 = 10
wisun.exNumEnd1 = 20
wisun.exNumStart2 = 40
wisun.exNumEnd2 = 50
wisun.mask = 0xa 0x1b 0x2c 0x3d 0x0 0x0 0x4e 0x5f 0x0 0x0 0x0 0x0 0x0 0x0 0
x0 0x0
```

Default PANid

Channel Plan

Net Name

Node

COM10:115200baud - Tera Term VT

File Edit Setup Control Window Help

```
Starting: 'vertexcom_apps_test_process'

vc# Watchdog enabled
WiSUN: node No Pan state
version[0][29]
Receive PC[172405]
WiSUN: restart rpl
WiSUN: init crystal drift base time[212][215333]
RPL: Following BR CCA Setting = -100
[242708][DHCP] Get global address 2001:db8::3
[243683][RPL JOIN] device=2001:db8::3 parent=2001:db8::1
WiSUN: get rpl ready
cfg wisun
wisun.PANid = 272
wisun.UDI = 200
wisun.chPlan = 0
wisun.chFun = 2
wisun.control = 0
wisun.ch0 = 902200
wisun.spacing = 200
wisun.fixed = 0
wisun.chNum = 129
wisun.routing_method = 0x1
wisun.NetName = [VertexCom]
wisun.eapol_ready = 1
wisun.rd = 1
wisun.oc = 1
wisun.exNum = 2
wisun.exNumStart1 = 10
wisun.exNumEnd1 = 20
wisun.exNumStart2 = 40
wisun.exNumEnd2 = 50
wisun.mask = 0xa 0x1b 0x2c 0x3d 0x0 0x0 0x4e 0x5f 0x0 0x0 0x0 0x0 0x0 0x0 0
x0 0x0
```

Node has joined the PAN, PANid will be assigned and same as the root

Channel Plan

Net Name

Operation and Networking

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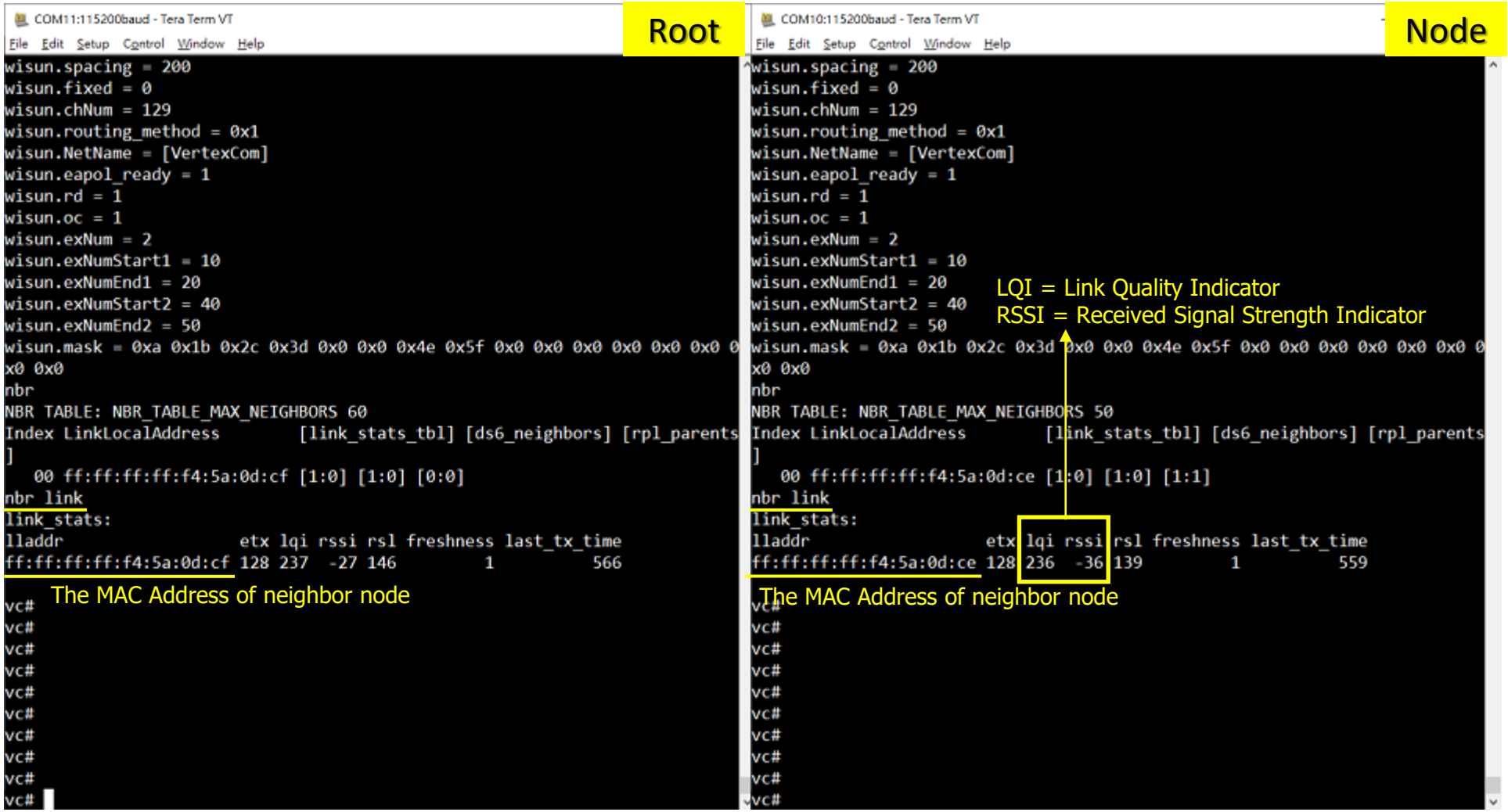
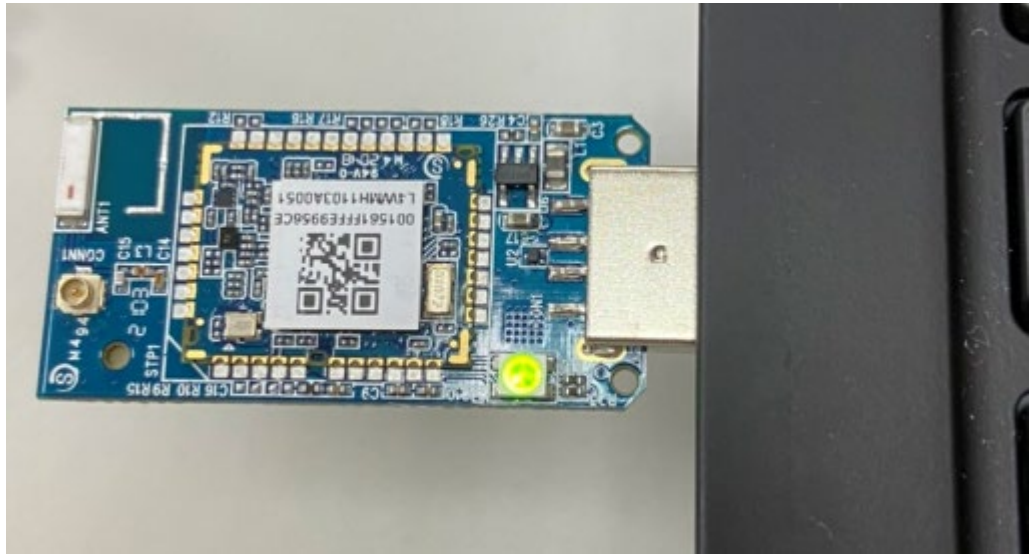
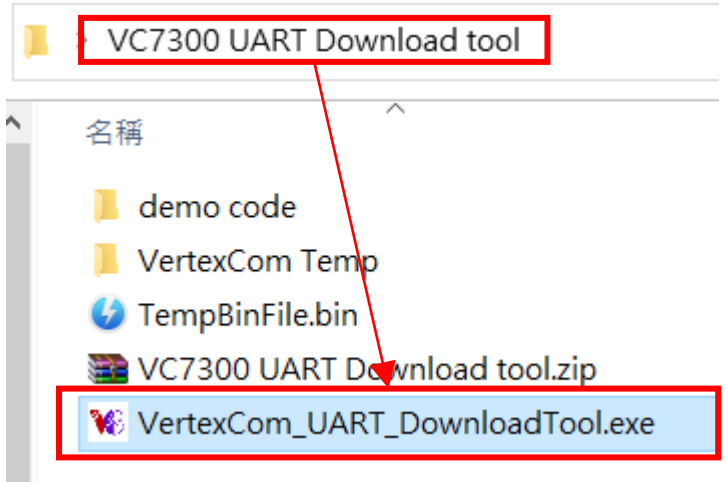
Key in nbr link, and show the communication status.



Download Image to Device

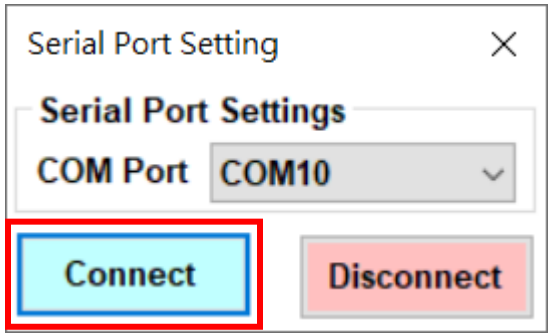
1. Connect VC7300 Wi-SUN USB module to PC USB port.
2. Execute VertexCom_UART_DownloadTool.exe.

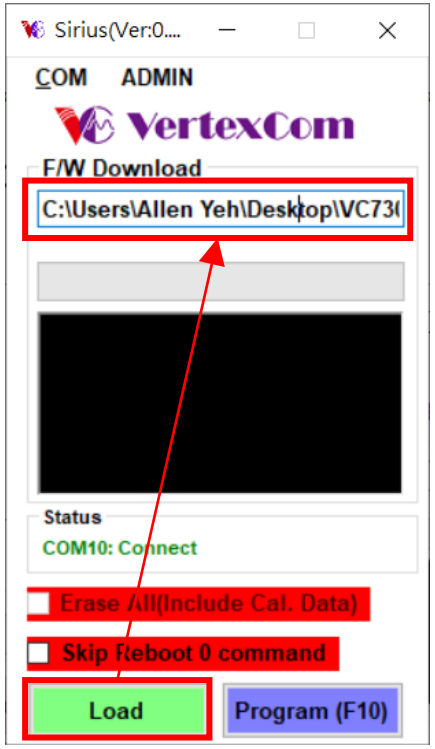




Download Image to Device

3. Select the corresponding COM port and click "Connect" to connect the device.
4. Click "Load" and select the image to be downloaded. The source path will be displayed under F/W Download.

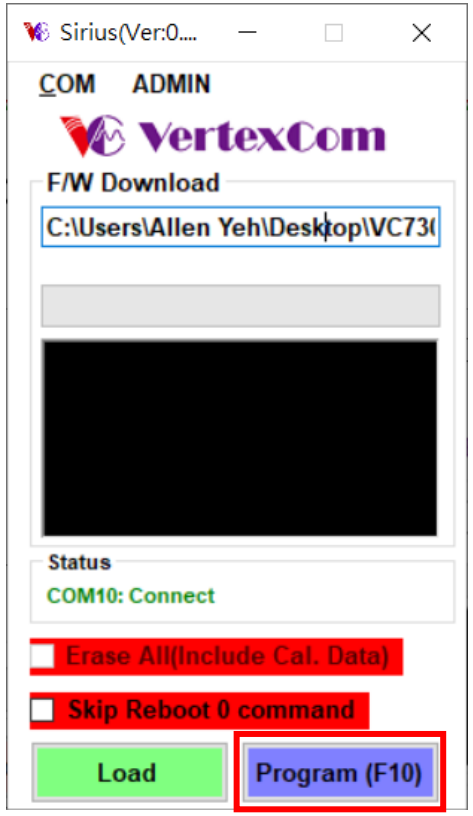


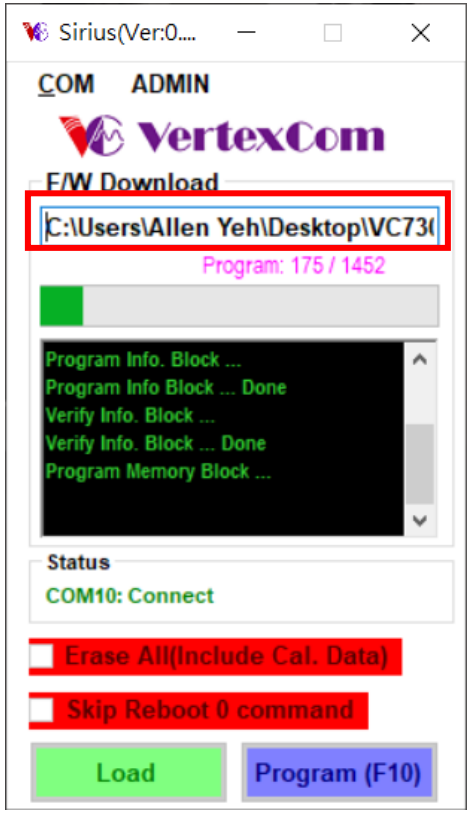


Download Image to Device

5. Click "Program (F10)" to start downloading.
6. The process bar will display the download progress.

   (Program first and then verify).





Download Image to Device

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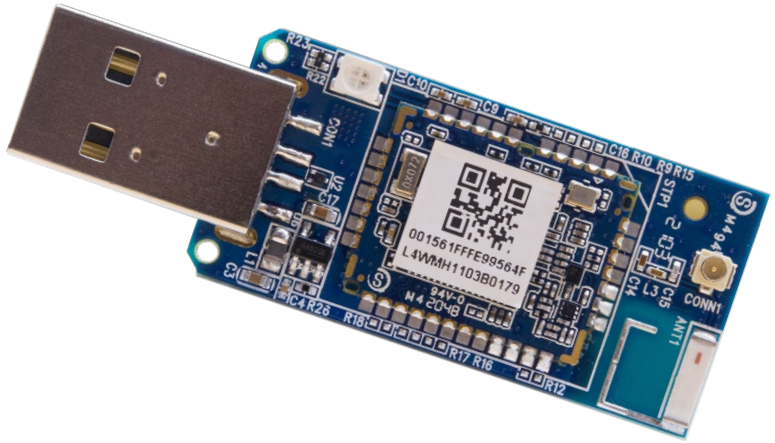
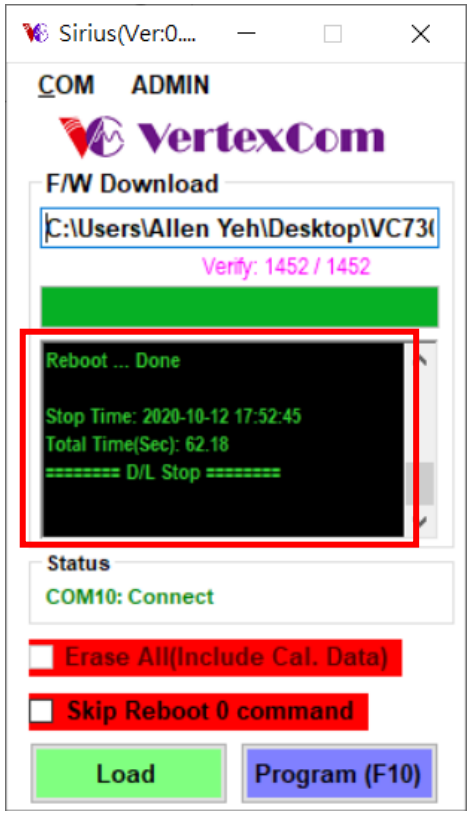
7. After verification is completed, the device will automatically reboot and display D/L Stop.
8. Remove VC7300 Wi-SUN USB module from the PC, and start using the device.





Thank You!