WM1110

LoRa Wireless Module - Powered by Semtech LR1110

Datasheet

V1.0

Content

1 Introduction

WM1110 is a fusion positioning module based on LoRaWAN communication technology. The hardware mainly integrates Semtech LR1110 Edge chip and Nordic's Nrf series Bluetooth chip, which can provide a variety of positioning technologies including Bluetooth positioning, LP-GPS and WIFI positioning. It is an ideal platform for developing various tracking product solutions.

1.1 Feature

- Built-in LoRaWAN standard protocol and supports the global LoRaWAN® frequency plan:
  - ✓ EU868
  - ✓ US915 and US915 Hybrid
  - ✓ CN779
  - ✓ AU915
  - ✓ AS923
  - ✓ KR920
  - ✓ IN865
- Supports indoor and outdoor positioning
- Multiprotocol Bluetooth 5.3 SoC supporting Bluetooth Low Energy, Bluetooth mesh, NFC, Thread and Zigbee – Nordic nRF52840
- Stamp hole for LoRa antenna
- Built-in TCXO for improving high frequency stability
- Supports AT command for configuring
- Compact footprint and pins with SMT package
- BLE TX power default in 0 dBm
- Ultra-low power consumption

This product specification includes a detailed description of the WM1110 module's performance and functions. For the latest firmware, product updates or errata, please contact Seeed Studio.

2 Description

WM1110 is embedded with high-performance Semtech LR1110, which is very suitable for the design of various IoT nodes.

Ultra-low power platform that integrates a LoRa® transceiver, long range FHSS modulator, multi-constellation scanner, and passive Wi-Fi AP MAC address scanner targeting asset management applications. The LR1110 solution utilizes Semtech's LoRa Cloud™ Ceolocation capabilities, to significantly reduce power consumption by determining asset location in a Cloud-based solver.
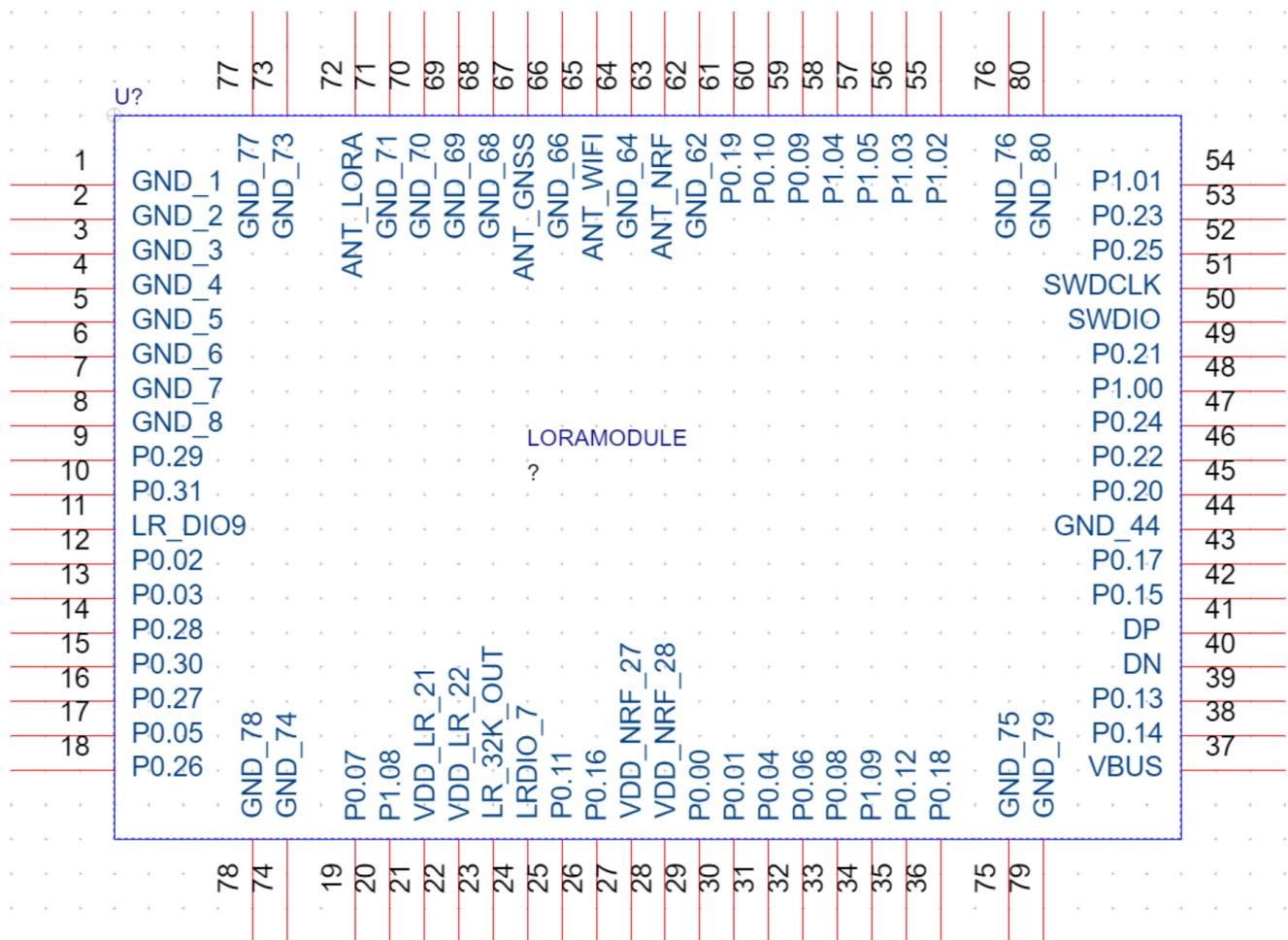
2.1 Pin definition

Figure 1 LoRa-E5 Pin arrangement

Table 1 LoRa-E5 pinout

Number	Name	Type	Description
1	GND	-	Ground
2	GND	-	Ground
3	GND	-	Ground
4	GND	-	Ground
5	GND	-	Ground
6	GND	-	Ground
7	GND	-	Ground
8	GND	-	Ground
9	P0.29	I/O	MCU GPIO P0.29
10	P0.31	I/O	MCU GPIO P0.31
11	LR_DIO9	O	LR1110 DOUT
12	P0.02	I/O	MCU GPIO P0.02
13	P0.03	I/O	MCU GPIO P0.03
14	P0.28	I/O	MCU GPIO P0.28
15	P0.30	I/O	MCU GPIO P0.30
16	P0.27	I/O	MCU GPIO P0.27
17	P0.05	I/O	MCU GPIO P0.05
18	P0.26	I/O	MCU GPIO P0.26
19	P0.07	I/O	MCU GPIO P0.07
20	P1.08	I/O	MCU GPIO P1.08
21	VDD_LR	-	Supply voltage for Lora
22	VDD_LR	-	Supply voltage for Lora
23	LR_DIO8	O	LR1110 DOUT
24	LR_DIO7	O	LR1110 DOUT
25	P0.11	I/O	MCU GPIO P0.11
26	P0.16	I/O	MCU GPIO P0.16
27	VDD_NRF	-	Supply voltage for Bluetooth
28	VDD_NRF	-	Supply voltage for Bluetooth
29	P0.00	I/O	MCU GPIO P0.00
30	P0.01	I/O	MCU GPIO P0.01
31	P0.04	I/O	MCU GPIO P0.04
32	P0.06	I/O	MCU GPIO P0.06
33	P0.08	I/O	MCU GPIO P0.08
34	P1.09	I/O	MCU GPIO P1.09
35	P0.12	I/O	MCU GPIO P0.12

36	P0.18	I/O	MCU GPIO P0.18
37	VBUS	I/O	MCU GPIO VBUS
38	P0.14	I/O	MCU GPIO P0.14
39	P0.13	I/O	MCU GPIO P0.13
40	DN	I/O	MCU USB DN
41	DP	I/O	MCU USB DP
42	P0.15	I/O	MCU GPIO P0.15
43	P0.17	I/O	MCU GPIO P0.17
44	GND	-	Ground
45	P0.20	I/O	MCU GPIO P0.20
46	P0.22	I/O	MCU GPIO P0.22
47	P0.24	I/O	MCU GPIO P0.24
48	P1.00	I/O	MCU GPIO P1.00
49	P0.21	I/O	MCU GPIO P0.21
50	SWDIO	I/O	MCU SWDIO
51	SWDCLK	I	MCU SWDCLK
52	P0.25	I/O	MCU GPIO P0.25
53	P0.23	I/O	MCU GPIO P0.23
54	P1.01	I/O	MCU GPIO P1.01
55	P1.02	I/O	MCU GPIO P1.02
56	P1.03	I/O	MCU GPIO P1.03
57	P1.05	I/O	MCU GPIO P1.05
58	P1.04	I/O	MCU GPIO P1.04
59	P0.09	I/O	MCU GPIO P0.09
60	P0.10	I/O	MCU GPIO P0.10
61	P0.19	I/O	MCU GPIO P0.19
62	GND	-	Ground
63	ANT_NRF	RFIO	Bluetooth Antenna
64	GND	-	Ground
65	ANT_WIFI	RFIO	WIFI SCAN Antenna
66	GND	-	Ground
67	ANT_GNSS	RFIO	GNSS Antenna
68	GND	-	Ground
69	GND	-	Ground
70	GND	-	Ground
71	GND	-	Ground
72	ANT_LORA	RFIO	LORA Antenna

73	GND	-	Ground
74	GND	-	Ground
75	GND	-	Ground
76	GND	-	Ground
77	GND	-	Ground
78	GND	-	Ground
79	GND	-	Ground
80	GND	-	Ground

3 Electrical characteristics

3.1 Maximum Ratings

Reaching or exceeding the maximum ratings listed in the table below can cause equipment damage.

Table 2 Absolute Maximum Ratings

Item	Description	min	max	unit
VDD_LR	Lora supply voltage	-0.5	+3.9	V
VDD_NRF	MCU supply voltage	-0.3	+3.9	V
VBUS	MCU USB VBUS	-0.3	+5.8	V
P_NRF	Bluetooth RF input power		+10	dBm
P_LR	Lora RF input power	-	+10	dBm

3.2 Normal working conditions

Table 3 Recommended Operating Conditions

Item	Description	min	max	unit
VDD_LR	Lora supply voltage	+1.8	+3.7	V
VDD_NRF	MCU supply voltage	+1.7	+3.6	V
VBUS	MCU USB VBUS	+4.35	+5.5	V
TA	Ambient temperature	-40	+85	℃
ML_GNSS	GNSS maximum input power		0	dBm
ML_LR	Lora maximum input power	-	0	dBm

3.3 Module specifications

Table 4 LoRa-E5 features

ITEMs	Parameter	Specifications	Unit
Structure	Size	20(W) X 20(L) X 2.3(H)	mm
	Package	80 pin LGA Module	
Electrical Characteristics	power supply	3.3V type	V
	Sleep current	7.6uA (WDT on);	uA
	Operation current (Transmitter+MCU)	150mA @ LoRa TX 22dBm	mA
		55mA @ Bluetooth TX 8dBm	
	Operation current (Receiver+MCU)	10mA @ LoRa SF12 125 kHz	mA
		7mA @ Bluetooth Scan	
		40mA @ GNSS Scan	
		40mA @ WiFi Scan	

		20dBm max @ LoRa				dBm
	Output power	6dBm max @ Bluetooth				
	Sensitivity	@BW125kHz 868/915MHz Boost=1				dBm
		SF	min	type	max	
		SF7	-	-125	-	
		SF12	-	-141	-	
Peripheral Interface	Full-speed 12 Mbps USB					
	QSPI/SPI/TWI/I²S/PDM/QDEC					
	High speed 32 MHz SPI					
	Quad SPI interface 32 MHz					
	Manual reset pin input					

4 Application information

4.1 Package information
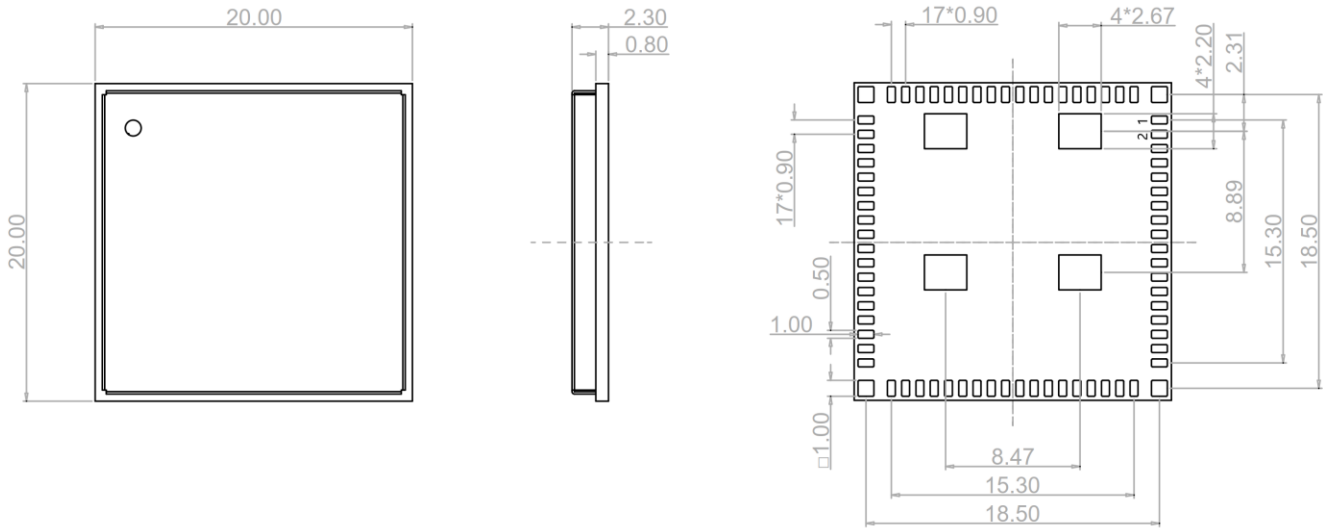
Figure 4 Package Outline Drawing

4.2 Land Pattern

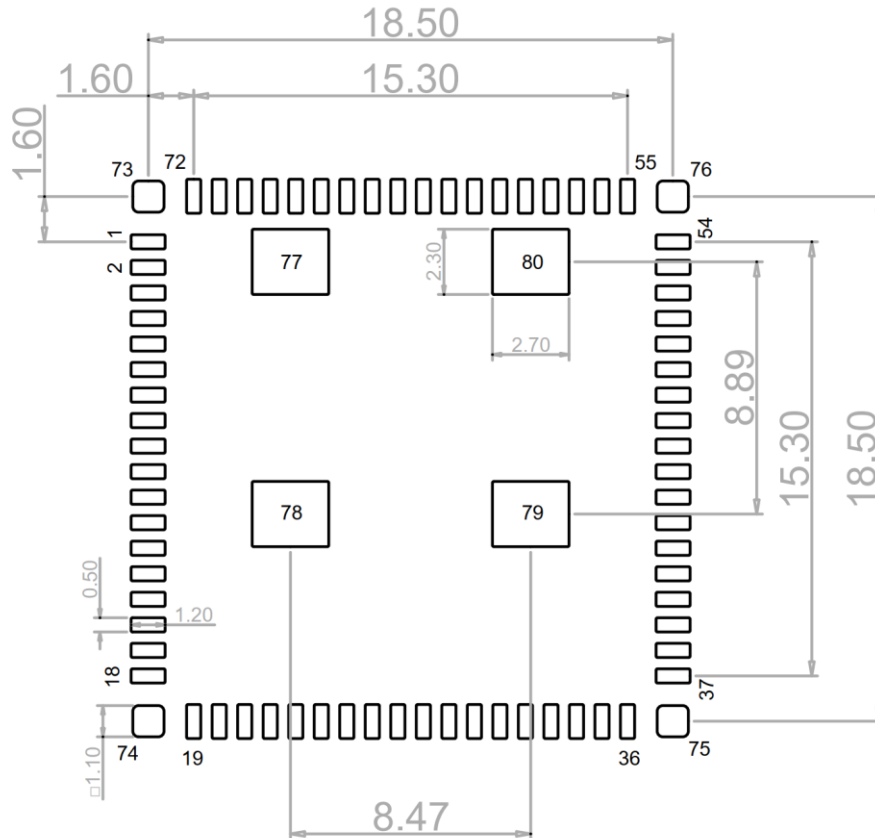The following figure shows the recommended pad dimensions.

Figure 5 PCB Layout

4.3 Package Marking

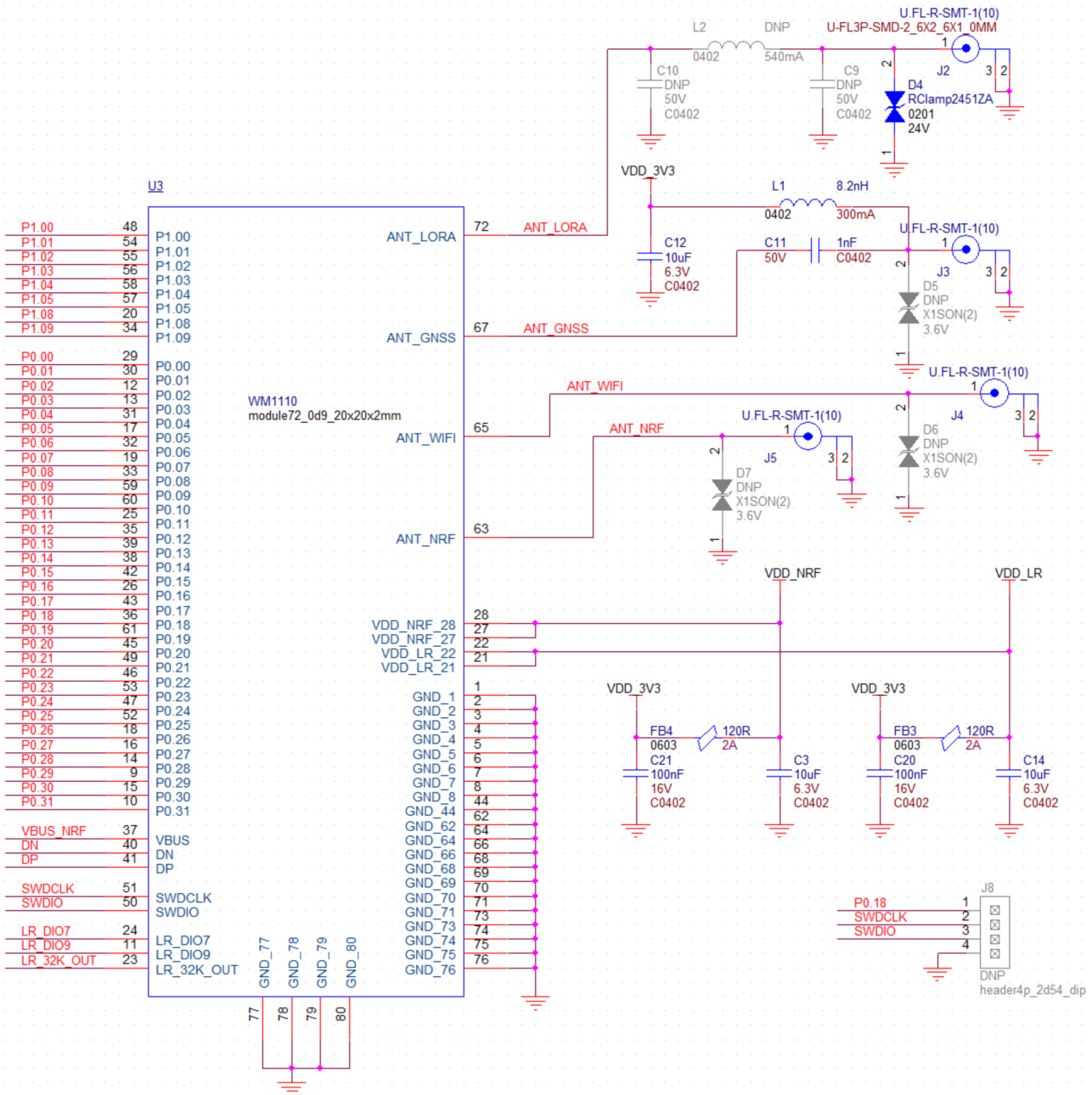## 4.4 Reference design based on WM1110 module

Figure 6 Reference design based on WM1110

P0.18 is configurable as RESET for MCU.
A Pi circuit maybe needed for antenna impedance matching, for the reference design, use a 0 Ohm resistor on L2.

5 Ordering information

Technical Support: sensecap@seeed.cc
Sales: iot@seeed.cc

Table 5 Ordering Information

Part Number	Description
WM1110-A	Standard version, no encryption chip
WM1110-S	Built-in encryption chip

6 Reversion

V1.0 2021-06-15 First release

7 FCC Statement

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 the equipment.

The modular can be installed or integrated in mobile or fix devices only. This modular cannot be installed in any portable device.

Note: 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.

FCC Radiation Exposure Statement

This modular complies with FCC RF radiation exposure limits set forth for an uncontrolled environment. This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter. This modular must be installed and operated with a minimum distance of 20 cm between the radiator and user body.

The module is limited to OEM installation only

The OEM integrator is responsible for ensuring that the end-user has no manual instructions to remove or install module

If the FCC identification number is not visible when the module is installed inside another device, then the outside of the device into which the module is installed must also display a label referring to the enclosed module. This exterior label can use wording such as the following: "Contains Transmitter Module FCC ID: Z4T-WM1110"

When the module is installed inside another device, the user manual of the host must contain below warning statements;

1. 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.

(2) This device must accept any interference received, including interference that may cause undesired operation.

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

The devices must be installed and used in strict accordance with the manufacturer's instructions as described in the user documentation that comes with the product.

Any company of the host device which install this modular with limit modular approval should perform the test of radiated emission and spurious emission according to FCC part 15C : 15.247 and 15.209 requirement, only if the test result comply with FCC part 15C : 15.247 and 15.209 requirement，then the host can be sold legally.