

Quick Start Guide

for

VTX-301

Reviewers

Department	Name	Acceptance Date	Note
PD	Nidor Huang	2020/4/7	
RD	JY Ou		

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Revision	Date	Originator	Comment
0.1	2020/1/31	Nidor Huang	Creating document
0.2	2020/3/10	Nidor Huang	Adding Operating Frequency
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1. Objective

The purpose of this document is to provide you with information necessary to install, set and customize settings, including troubleshooting of the VTX-301 start-up. To ensure safe installation and operation of the equipment, read the safety guidelines at the beginning of this manual and follow the procedures outlined in the following chapters before connecting power to the motherboard or to the I/O cable of VTX-301. Keep this operating manual handy and distribute to all users, technicians and maintenance personnel for reference.

2. Reference

- Unex VTX-301 datasheet
- Hirose U.FL series catalog
- I-PEX MHF Micro RF coax connector product series catalog

3. Safety Guideline

- Do not touch the module while power is applied
- Hold the module by its edge to avoid corrosion and contamination caused by perspiration.
- Do not touch the SMD components without wearing ESD personal protective equipment.
- Operators handling the product should wear ESD personal protective equipment at all times.
- Keep working area clean and dry while assembling
- Keep the operating environment clean and dry at all times
- When operating under extreme temperature/humidity conditions, environmental control measures (e.g. heating, cooling, or dehumidifying) should be considered

4. FCC Compliance and Advisory 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.

4.1. Information for the OEMs and Integrators

The following statement must be included with all versions of this document supplied to an OEM or integrator, but should not be distributed to the end user.

- 1) This device is intended for OEM integrators only.
- 2) Please see the full Grant of Equipment document for other restrictions.

4.2. Manual Information to the End User

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 shown in this manual.

4.3. Federal Communications Commission Interference Statement

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.

CAUTION:

Any changes or modifications not expressly approved by the grantee of this device could void the user's authority to operate the equipment.

4.4. Modular approval RF Exposure

This equipment must be installed and operated in accordance with provided instructions and the antenna(s) used for this transmitter must be installed to provide a separation distance of at least 20 cm from all persons and must not be co-located or operating in conjunction with any other antenna or transmitter. End-users and installers must be provide with antenna installation instructions and consider removing the no-collocation statement.

4.5. Labelling Requirements for the Host device

The host device shall be properly labelled to identify the modules within the host device. The certification label of the module shall be clearly visible at all times when installed in the host device, otherwise the host device must be labelled to display the FCC ID and IC of the module, preceded by the words "Contains transmitter module", or the word "Contains", or similar wording expressing the same meaning, as follows:

Contains FCC ID: NUK-VTX3012

5. Product Appearance

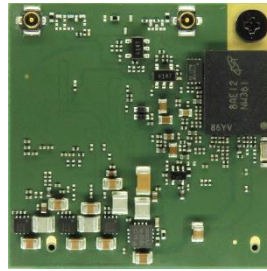


Figure 1. Appearance

6. Functional Block Diagram

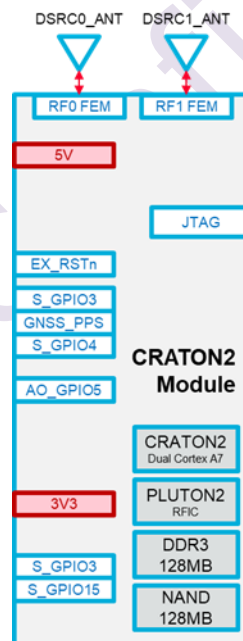


Figure 2: Functional block diagram

7. I/O Interfaces

7.1. Antenna Interfaces

7.1.1. Connectors

The VTX-301 provides two 50 Ω RF connectors. Receptacle connectors are compatible with *I-PEX MHF I 20279-001E-03* or *HIROSE U.FL-R-SMT-1(10)*. For more information about mating connectors, visit the website <https://www.i-pex.com/Products/detail/129> or <http://www.hirose-connectors.com/> for more detail.

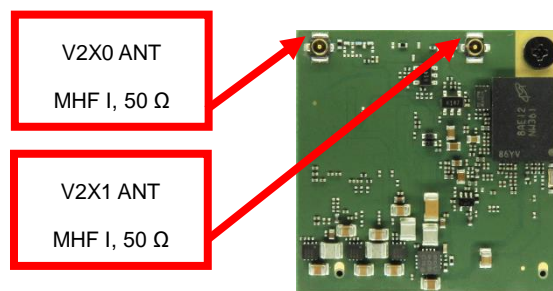


Figure 3: Antenna connectors

The antenna connection is one of the most important aspect in the full product design as it strongly affects the RF performance. Connecting cables between the module and the antenna must have 50 Ω impedance. If the impedance of the module is mismatched, RF performance will be reduced significantly.

Please be careful when extracting the antenna cable from the VTX-301. Extracting the connector by pulling the cable may cause damage on the antenna plug assembly. It is recommended to extract the cable using extraction tool like *I-PEX 90192-001* or *HIROSE U.FL-LP-N-2*.



Figure 4: Antenna cable extraction tool

7.1.2. Operating Frequency

VTX-301 can transmit/receive in U-NII-4 band (5850-5925 MHz). There are 7 available channels (172, 174, 176, 178, 180, 182, and 184) with 10 MHz bandwidth. If using U-NII-4 band is not allowed by local authorities, U-NII-3 (5725-5850 MHz) can be used as an alternative option.

7.2. Pinout

Please note that the pinout listed here is seen from the VTX-301 side. For designing a system board interface, the input and output direction must be reversed.

Typical internal PU/PD resistor is 30K-70K Ω .

Table 1: VTX-301 Pinout

Pin	Symbol	Type	Pull	Drive Strength (mA)	Description	Power Domain
1	VDD_5V	P	-	-	5V Power Supply	-
2	VDD_5V	P	-	-	5V Power Supply	-
3	VDD_5V	P	-	-	5V Power Supply	-
4	VDD_5V	P	-	-	5V Power Supply	-
5	VDD_5V	P	-	-	5V Power Supply	-
6	GND	G	-	-	Ground	-
7	GND	G	-	-	Ground	-
8	GND	G	-	-	Ground	-
9	GND	G	-	-	Ground	-
10	GND	G	-	-	Ground	-
11	CLOCKOUT0_125Mhz	O	PU	8	125MHz clock used to transport the Tx / Rx indication signals over coaxial cable for the cable compensator	VDD_3.3V
12	N.C.	-	-	-	Non Connection	-

Pin	Symbol	Type	Pull	Drive Strength (mA)	Description	Power Domain
13	BOOT_IO13	I/O	PU	4	Bootstrapping: Pull low with 3K Ohm to boot from NAND. Floating to boot form USB0.	VDD_3.3V
14	RF1_COMP_TX_EN	O	PU	8	Tx/Rx control for the RF0 cable compensator	VDD_3.3V
15	GND	G	-	-	Ground	-
16	EX_RSTn	I	PU	-	Module reset, active LOW.	VDD_3.3V
17	GND	G	-	-	Ground	-
18	AO_GPIO4	I/O	PD	2	General Purpose I/O.	VDD_3V3_A
19	AO_GPIO0	I/O	PD	2	General Purpose I/O.	VDD_3V3_A
20	TAMPER	I	PD	-	0=Tampering, 1=Normal operation	VDD_3V3_A
21	AO_GPIO2	I/O	PD	2	General Purpose I/O.	VDD_3V3_A
22	AO_GPIO1	I/O	PD	2	General Purpose I/O.	VDD_3V3_A
23	AO_GPIO3	I/O	PD	2	General Purpose I/O.	VDD_3V3_A
24	GND	G	-	-	Ground	-
25	GNSS_PPS	I	PU	-	GNSS PPS input	VDD_3.3V
26	UART5_RXD	I	PU	4	UART Interface, Receive input for RF1 cable compensator	VDD_3.3V
27	S_GPIO3	I/O	PU	4	General Purpose I/O	VDD_3.3V
28	UART1_RXD	I	PU	8	UART Interface, Receive input (NMEA, 230440bps, 8N1)	VDD_3.3V
29	UART1_TXD	O	PU	8	UART Interface, Transmit output (NMEA, 230440bps, 8N1)	VDD_3.3V
30	GND	G	-	-	Ground	-
31	ETH0_TX_CLK	O	PU	8	Ethernet MAC Interface, Tx Clock	VDD_3.3V
32	GND	G	-	-	Ground	-
33	ETH0_TX0	O	PU	8	Ethernet MAC Interface, Tx Data line 0	VDD_3.3V
34	ETH0_TX1	O	PU	8	Ethernet MAC Interface, Tx Data line 1	VDD_3.3V
35	ETH0_TX2	O	PU	8	Ethernet MAC Interface, Tx Data line 2	VDD_3.3V
36	ETH0_TX3	O	PU	8	Ethernet MAC Interface, Tx Data line 3	VDD_3.3V
37	ETH0_TX_EN	O	PU	8	Ethernet MAC Interface, Tx Enable	VDD_3.3V
38	GND	G	-	-	Ground	-
39	ETH0_RX_CLK	I	PU	8	Ethernet MAC Interface, Rx Clock	VDD_3.3V
40	GND	G	-	-	Ground	-
41	ETH0_RX0	I	PU	8	Ethernet MAC Interface, Rx Data line 0	VDD_3.3V
42	ETH0_RX1	I	PU	8	Ethernet MAC Interface, Rx Data line 1	VDD_3.3V
43	ETH0_RX2	I	PU	8	Ethernet MAC Interface, Rx Data line 2	VDD_3.3V
44	ETH0_RX3	I	PU	8	Ethernet MAC Interface, Rx Data line 3	VDD_3.3V
45	ETH0_RX_DV	I	PU	8	Ethernet MAC Interface, Carrier Sense / Rx Data Valid	VDD_3.3V
46	ETH0_RESETn	O	PU	4	Ethernet MAC Interface, Reset	VDD_3.3V
47	GND	G	-	-	Ground	-
48	ETH0_MDC	O	PU	8	Ethernet MAC Interface, Management interface clock	VDD_3.3V
49	ETH0_MDIO	I/O	PU	8	Ethernet MAC Interface, Management interface Input / Output	VDD_3.3V
50	GND	G	-	-	Ground	-
51	GND	G	-	-	Ground	-
52	CAN1_RX	I	PU	4	CAN Interface, Receive input (CAN FD/CAN2.0B)	VDD_3.3V
53	CAN1_TX	O	PU	4	CAN Interface, Transmit output (CAN FD/CAN2.0B)	VDD_3.3V
54	CAN0_RX	I	-	-	CAN Interface, Receive input (CAN2.0B)	VDD_3.3V
55	CAN0_TX	O	-	-	CAN Interface, Transmit output (CAN2.0B)	VDD_3.3V

Pin	Symbol	Type	Pull	Drive Strength (mA)	Description	Power Domain
56	UART4_RXD	I	PU	4	UART Interface, Receive input for RF0 cable compensator	VDD_3.3V
57	S_GPIO15	I/O	PU	4	General Purpose I/O	VDD_3.3V
58	GND	G	-	-	Ground	-
59	M3_CLK32KOUT	O	-	-	Output 32 kHz clock. RTC Clock source for external CPU	VDD_3V3_A
60	GND	G	-	-	Ground	-
61	VBAT_3V3_AO_PG_OC	I	PU	-	Low voltage indicator (LVI). Used by PMU to change system state from normal to standby (Falling = Stand By; Rising = Wake Up)	VDD_3V3_A
62	CAN0_INH	O	PU	4	CAN0 Inhibit pin. Active HIGH. (High = CAN standby; Low = CAN normal)	VDD_3.3V
63	M3_ONOFF	I	PU	-	On/Off bottom input. Falling edge toggles Normal => Standby or Standby => Normal operation.	VDD_3V3_A
64	VDD_3V3_A	P	-	-	3.3V Power Supply Always On (VDD_3V3_A)	-
65	GND	G	-	-	Ground	-
66	UART2_TXD	O	PU	4	UART Interface, Transmit output	VDD_3.3V
67	UART2_RXD	I	PU	4	UART Interface, Receive input	VDD_3.3V
68	UART3_TXD	O	PU	4	UART Interface, Transmit output (console, 115200bps, 8N1)	VDD_3.3V
69	UART3_RXD	I	PU	4	UART Interface, Receive input (console, 115200bps, 8N1)	VDD_3.3V
70	N.C.	-	-	-	Non Connection	-
71	N.C.	-	-	-	Non Connection	-
72	N.C.	-	-	-	Non Connection	-
73	N.C.	-	-	-	Non Connection	-
74	GND	G	-	-	Ground	-
75	SAR_ADC_CH0	I	-	-	Analog to Digital Converter, resolution 10bits, ENOB 9bits, sampling rate 2.5MHz	VDD_3.3V
76	SAR_ADC_CH1	I	-	-	Analog to Digital Converter, resolution 10bits, ENOB 9bits, sampling rate 2.5MHz	VDD_3.3V
77	SAR_ADC_CH2	I	-	-	Analog to Digital Converter, resolution 10bits, ENOB 9bits, sampling rate 2.5MHz	VDD_3.3V
78	SAR_ADC_CH3	I	-	-	Analog to Digital Converter, resolution 10bits, ENOB 9bits, sampling rate 2.5MHz	VDD_3.3V
79	GND	G	-	-	Ground	-
80	USB0_DP	I/O	-	-	USB differential line D+	VDD_3.3V
81	USB0_DN	I/O	-	-	USB differential line D-	VDD_3.3V
82	GND	G	-	-	Ground	-
83	GND	G	-	-	Ground	-
84	USB1_DP	I/O	-	-	USB differential line D+	VDD_3.3V
85	USB1_DN	I/O	-	-	USB differential line D-	VDD_3.3V
86	GND	G	-	-	Ground	-
87	I2C_SCL	I/O	PU	4	I2C Interface, clock line	VDD_3.3V
88	I2C_SDA	I/O	PU	4	I2C Interface, data line	VDD_3.3V
89	RF2_COMP_TX_EN	O	PU	8	Tx/Rx control for the RF1 cable compensator	VDD_3.3V
90	WD_OUT_IND	O	PU	4	Asserted upon SoC WD reset; Can be used to reset devices on board (like SQI flash) upon SoC WD reset.	VDD_3.3V
91	S_GPIO4	I/O	PU	4	General Purpose I/O	VDD_3.3V
92	GND	G	-	-	Ground	-

Pin	Symbol	Type	Pull	Drive Strength (mA)	Description	Power Domain
93	N.C.	-	-	-	Non Connection	-
94	N.C.	-	-	-	Non Connection	-
95	GND	G	-	-	Ground	-
96	GND	G	-	-	Ground	-
97	GND	G	-	-	Ground	-
98	VDD_5V	P	-	-	5V Power Supply	-
99	VDD_5V	P	-	-	5V Power Supply	-
100	VDD_5V	P	-	-	5V Power Supply	-

7.3. Thermal Solution

Applying a soft silicone thermally conductive pad to fill the air gap between VTX-301 and its system board could help disperse heat generated by the VTX-301 to the system board. It is recommended to keep continuous large copper pour area on the system PCB underneath the VTX-301, better with exposed bare copper especially directly under the CPU.

The distance between system board and CPU top surface is 3.7mm. Recommended size of thermally conductive pad: 16x16x4mm.

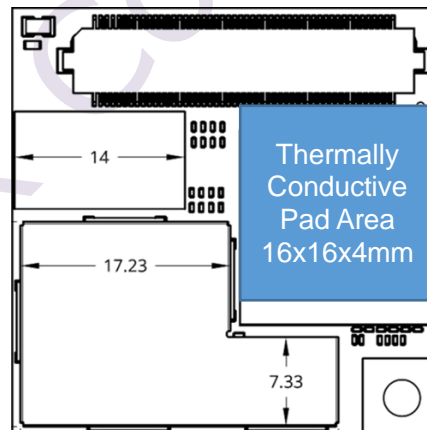


Figure 5: Recommended Thermally Conductive Pad Area

7.4. Component Keep Out Area

In order to avoid interference with VTX-301, the system board side component height underneath the VTX-301 should not exceed 3.0mm.