



Roost User and Technical Manual TRTN Transmitter Module

User Guide Version: 1a
Publication date: Jan 13, 2020

©2020 Roost, Inc. All rights reserved. The Roost™ word mark and logo are trademarks of Roost, Inc. All other logos and trademarks are the property of their respective owners. See www.getroost.com/patents for a list of applicable patents and/or patent applications.

No part of this publication may be stored, reproduced, transmitted or distributed, in whole or in part, in any manner, electronic or otherwise, whether or not for a charge or other or no consideration, without the prior written permission of Roost, Inc. Requests for permission to store, reproduce, transmit or distribute materials may be made to the following address: Roost, Inc.

1250
Borregas Avenue
Sunnyvale, CA 94089
support@getroost.com

1) Compatibility

902-928MHz Band ONLY

2) FCC Notice to OEM

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.

CAUTION:

Changes or modifications to this unit not expressly approved by Roost, Inc. could void the user's authority to operate this equipment.

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:

1. Reorient the Roost Device containing this TRTN Module
2. Consult getroost.com/support for help

Radiation Exposure Statement: This equipment complies with the FCC radiation exposure limit set forth for an uncontrolled environment. This equipment should be installed and operated with a minimum distance of 20cm between radiator and your body.

OEM Warning: The modular transmitter must be equipped with either a permanently affixed label or must be capable of electronically displaying its FCC identification number – FCC ID: 2AE5A-

TRTN. 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: 2AE5A-TRTN." Any similar wording that expresses the same meaning may be used. The Grantee may either provide such a label, an example of which must be included in the application for equipment authorization, or, must provide adequate instructions along with the module which explain this requirement. In the latter case, a copy of these instructions must be included in the application for equipment authorization.

3) ISEDC Notice

This device complies with Innovation, Science, and Economic Development Canada license-exempt RSS standard(s). Operation is subject to the following conditions:

- This device may not cause harmful interference.
- This device must accept any interference received, including interference that may cause undesired operation of the device.

Cet appareil est conforme à Industrie Canada une licence standard RSS exonérés (s). Son fonctionnement est soumis aux deux conditions suivantes:

- Cet appareil ne doit pas provoquer d'interférences
- Cet appareil doit accepter toute interference recue, y compris les interferences pouvant provoquer un fonctionnement indésirable de l'appareil..

Radiation Exposure Statement: This equipment complies with the IC RSS-102 radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with a minimum distance of 20 cm between the radiator and your body.

Enoncé d'exposition aux rayonnements: Cet équipement est conforme aux limites d'exposition aux rayonnements ioniques RSS-102 Pour un environnement incontrôlé. Cet équipement doit être installé et utilisé avec un Distance minimale de 20 cm entre le radiateur votre corps.

OEM Warning: The modular transmitter must be equipped with either a permanently affixed label or must be capable of electronically displaying its ISEDC identification number – IC: 20891-TRTN. If the ISEDC 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 IC: 20891-TRTN." Any similar wording that expresses the same meaning may be used. The Grantee may either provide such a label, an example of which must be included in the application for equipment authorization, or, must provide adequate instructions along with the module which explain this requirement. In the latter case, a copy of these instructions must be included in the application for equipment authorization.

4) Safety Information

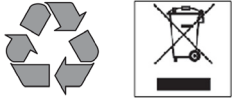
WARNING: Do not expose this Roost TRTN transmitter module to excessive heat, direct sunlight, or fire. Do not expose to excessive humidity, rain, moisture or other liquids. Store at room temperature between 40 and 80 degrees F for best results.

WARNING: Keep out of reach of children. Ingestion hazard. Harmful if swallowed.

5) Disposal Information

The Roost TRTN Transmitter Module Must be Recycled or Disposed of Properly.

When the Roost TRTN Transmitter module is no longer functional, please dispose of it properly, following the guidelines in accordance with applicable regulations for your country. In most countries, electronic printed circuit boards must be recycled.



6) No Lifesaving Uses of the Services

The Roost TRTN Transmitter module, Monitor app (including mobile and web applications), the Smart Monitor device, and the Smart Monitor software may be collectively referred to as the “Services”. The Roost Smart Monitor APP is not an alarm. The apps and device software are intended to be accessed and used for non-critical information and control of the smart Monitor hardware. You will not rely on the Services for any health, lifesaving, or emergency purposes. Under no circumstances should you enter into a life-threatening environment. The Services (on their own or in combination with third-party products or services) are not a third-party monitored emergency notification system and are not certified for emergency response. Roost will not dispatch emergency authorities to your home in the event of an emergency

7) Applicable FCC rules and HOST Product marking

- This TRTN Transmitter module has been modularly certified to meet 47 CFR 15.247 as a frequency hopping digitally modulated radio. Integration of this TRTN Transmitter module into a HOST product still requires Part 15 Subpart B certification on the HOST product as well as any further FCC certifications specific to the operation of the HOST product, including, but not limited to, coexistence testing with any other transmitter modules present in the HOST product.. Only the 47 CFR 15.247 modular certification grant can be carried over to the host in which the TRTN transmitter module is mounted.
- The HOST product is required to be externally marked with the following FCC and ISDEC information as it relates to the TRTN Transmitter module being present inside the HOST product:
 - ‘Contains FCC ID 2AE5A-TRTN’
 - ‘Contains IC 20891-TRTN’

8) HW Integration of the Roost TRTN Transmitter Module into OEM product

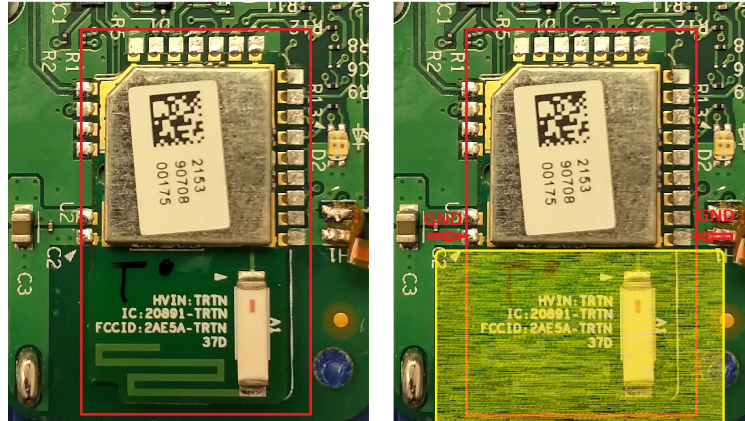
The TRTN Transmitter Module is meant for Internet of Things applications and for integration into Roost Authored products only:

- **Operational Use conditions:**
 - The TRTN transmitter module is a single chip module, fully self-contained with integrated antenna requiring only an external power source and an interrupt driver.
 - **Electrical Specifications of the Roost TRTN Transmitter Module**
 - Input Operating Voltage Range (VBAT): 1.8V minimum, 3.3V Maximum, 3V nominal
 - Absolute Maximum Input Voltage: 3.6V
 - Input Current consumption (with no load on Control Interface Logic Signals),

- 6uA nom, 50mA max
- Interrupt and Digital Interface Logic Levels: 1.8V to 3.3V CMOS
- Digital Interface Output Drive Level: 2mA maximum
- Audio Signal Level: 50mV minimum, 5V Maximum, AC coupled, 3KHz nominal
- RF Transceiver operation: 902-928MHz ISM Band
- Protocol: proprietary but very similar to 802.15.4
- Absolute Maximum Transmit power: 5.16 dBm
- Control Signal Connector Type: Custom PCB Surface Mount pattern
- Normal Operating Temperature Range: -0C to +40C
- Operable Temperature Range: -20C to +60C
- Maximum Humidity limit: 60C with 100% relative humidity for 24 hours operating
- Mechanical Vibration limit: Single axis sinusoidal for 4 hours, 10-30-10Hz sweeps at 2 cycles/min with 0.5 5mm displacement
- Mechanical Shock limit: half sine, 109G@8.0mSec. Two shocks in all three axes for a total of 12 shocks
- Available Interface Pins (requires Roost proprietary Schematic for identification)
 - Test Mode Enable (for Production line testing).
 - Exerting TEST mode pin disables TRTN transmitter module operation. Module will remain in standby mode (transmitter off) until Roost proprietary Production line commands are sent across the HOST UART DeBug port. Access to Roost Proprietary Production Test Protocol is required for this mode of operation. But this Test Mode operation is not offered to the HOST product manufacturer. See Hardware Test Section 9 below for HOST product testing.
 - 2 external interrupt pins to be connected to output of HOST sensor circuit. These trigger the TRTN module Transmit condition which sends message to Roost Hub.
 - HOST UART 2 wire DeBug port (requires Roost proprietary decoding protocol)
 - 5 General Logic Level, LED or Analog input/output drivers (source 10mA max)
 - I2C Master (400kHz) for controlling external sensor chips.
 - 4 wire SPI Master interface
 - 2 wire JTAG interface for Firmware Programming Firmware.
 - VBAT power source input pin
 - 4 ground pins.
- Antenna is an integrated Johansson Chip Antenna (0900AT43A0070).
 - No external antenna is allowed to be used with this TRTN Transmitter Module.
 - Sections 2 and 3 of this document outline user RF exposure information and the HOST product user manual should also provide this same information regarding RF exposure limits.
 - See below for proper ground plane pull back on HOST PCB.
 - The last two pins on either side of the module adjacent to the antenna area are Ground pins. The HOST PCB Ground plane should be

connected to these two pins.

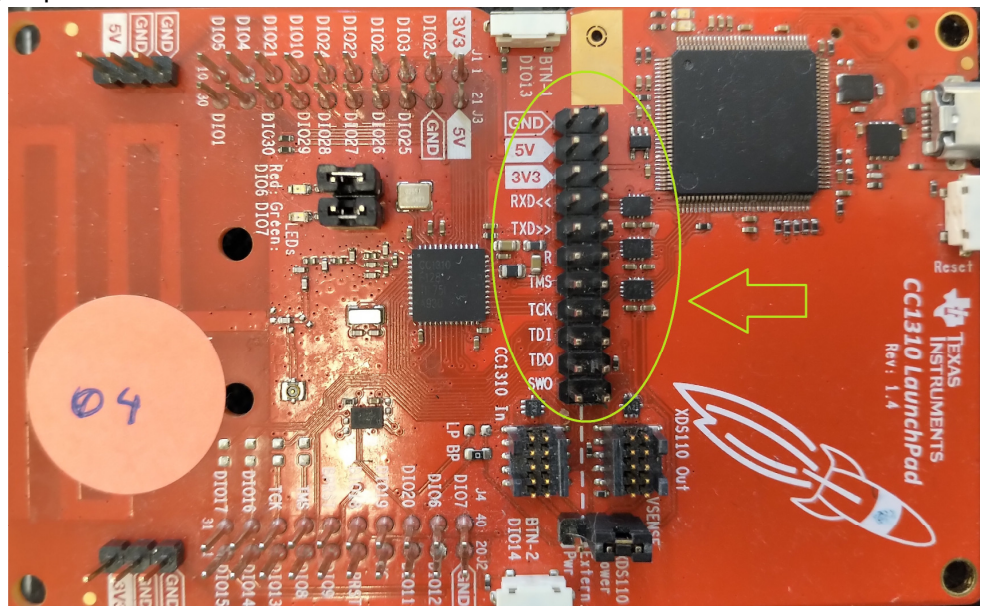
- All HOST PCB Ground plane shall be removed below the antenna area as outlined in the below picture YELLOW area. The minimum Yellow area dimension is 16mm (wide) by 13mm centered below module. Note that Ground free area includes all metal materials.



9) HW testing of the Roost TRTN Transmitter Module in OEM product

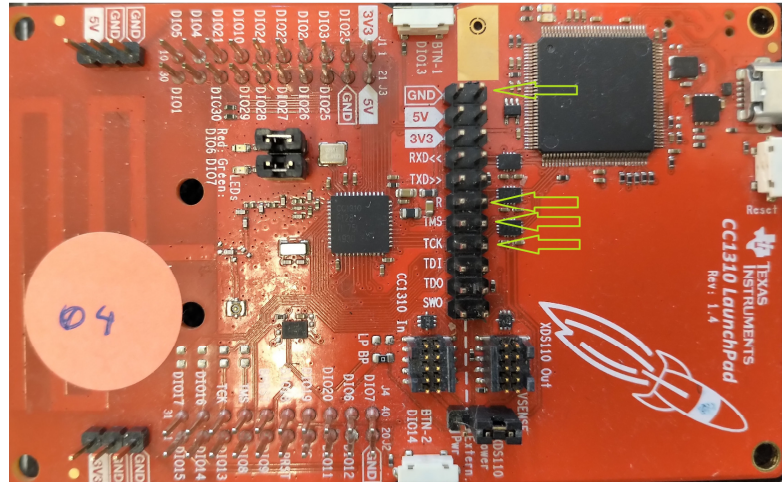
All testing of the TRTN Transmitter Module in HOST product applications should occur using the Texas Instruments SmartRF Studio Controller Software (for CC1310) available to download free of charge from the Texas Instruments web site.

- Testing requires purchase of a Texas Instruments CC1310 Evaluation Board.
 - This evaluation board allows disconnection of Evaluation onboard CC1310 so the SmartRF Studio Controller chip on the Evaluation board can be connected to the CC1310 on the HOST product board by removing the 11 jumpers as shown below.



- Interface to the TRTN Transmitter Module requires Connection of the

following Pins (RESET, TMS, TCK, GND) to the appropriate pins on the Host TRTN Transmitter module. Of course, if these pins on the TRTN Host Transmitter Module are connected elsewhere on the HOST, then the all connections to the HOST board should be broken before connecting to the Texas Instruments Eval Board.



- The Texas Instruments Eval board should then be connected to computer running SmartRF Studio Software via a USB cable such that the TRTN radio module can now be commanded to proper operation mode. Note that proper Texas Instruments Drivers are required to be downloaded and installed when the SmartRF Studio Software is installed.

10) Additional Information for Integration into HOST

- The module interface connector requires a proper land pattern on the motherboard PCB. This requires access to proprietary ROOST Hardware information.
- As good practice with all radio PCBs,, it is expected the mother board holding the TRTN Transmitter Module will have, at a minimum, a continuous ground plane in the area directly beneath and outlining the TRTN Transmitter. This ground plane can be on the top, bottom, or internal layers and should be connected to the TRTN interface connector ground terminals. The module should be positioned such that the antenna is located next to one of the edges of the motherboard PCB. Also note that the ground copper on all layers of the motherboard PCB should be relieved from the two Ground terminals adjacent to the Antenna all the way to the Antenna end of the TRTN board
- No components should be placed under the relieved ground plane area under the TRTN module antenna.
- The TRTN Transmitter Module is expected to be placed in a Roost Authored product and as such, review of Motherboard PCB layout by the ROOST hardware team is expected.
- The TRTN Transmitter Module is expected to be in an RF inert plastic housing for the OEM end product.
 - The transmitter module was certified without any housing, but any RF losses in the plastic housing material will reduce emissions (wanted and unwanted), and reduce sensitivity.
 - The product has limited Electrostatic protection, particularly on the antennae input