406TX(2.4GHz)
406RX(2.4GHz)

Instruction Manual

ARC
ADVANCED RADIOTECH CORPORATION

Specification

Electrical Characteristics

Absolute Maximum Ratings

Parameter	Minimum	Maximum
Voltage on any pin, except RESET with respect to ground	-0.3V	3.6V (VDD max)
Input RF level		+10dBm
Current into Vcc pins		200mA

Notes: 1. Absolute Maximum Ratings are the values beyond which damage to the device may occur. Under no circumstances must the absolute maximum ratings given in this table be violated. Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device.This is a stress rating only. Functional operation of the device at these or other conditions, beyond those indicated in the operational sections of this specification, is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

2. Attention! This is an ESD-sensitive device. Precaution should be taken when handling the device in order to prevent permanent damage.

Power Supply

Test Conditions (unless otherwise stated), Vcc = 3V, Tamb = 25°C.

Parameter	Range	Unit
Supply voltage, VDD	3.0	V
Current consumption: TX ON, FEM ON(1)	157	mA
Current consumption: RX ON, RPC, LNA Bypass	7.5	mA
Current consumption: RX ON, RPC, LNA ON	12.5	mA
Current consumption: RX ON, LNA ON	17	mA
Current consumption: TRX_OFF, FEM Sleep	337	μA
Sleep Current consumption: TRX Sleep, FEM Sleep	0.7	μA

Current consumption depends on multiple factors, including but not limited to, the board design and materials. When this module is assembled on a base board, the MCU current also should be considered in estimating Active and Sleep currents of the product

Physical/Environmental Characteristics and Outline

Physical characteristics.

MODEL	Parameters	Value	Comments
406TX(2.4GHz)	Size	35mm x 45mm	
406RX(2.4GHz)	Size	33mm x 48mm	
	Operating temperature range	-25°C to +75°C	-40°C to +85°C operational

Pin Configuration

Pinout description 406TX(2.4GHz) model to transmitter

Pin Out	Pin descriptions	Function
CN7-1	GPIO3	TO U3 ATMEGA1608-XU PIN24, PA2 = UART-CLOCK
CN7-2	GPIO2	TO U3 ATMEGA1608-XU PIN23, PA1 = UART-RX
CN7-3	GND	
CN7-4		U1 Enable , power switch
CN7-5	GND	
CN7-6	+3.3V	Power input pin +3.3V
CN8-1	NA	
CN8-2	GPIO0	TO U3 ATMEGA1608-XU PIN23, PA0 = UART-TX
CN8-3	NA	
CN8-4	NA	
CN8-5	NA	
CN8-6	NA	

Pinout description 406RX(2.4GHz) model to receiver

Pin Out	Pin descriptions	Function
CN7-1	GPIO3	TO U3 ATMEGA1608-XU PIN24, PA2 = UART-CLOCK
CN7-2	GPIO2	TO U3 ATMEGA1608-XU PIN23, PA1 = UART-RX
CN7-3	GND	
CN7-4		U1 Enable , power switch
CN7-5	GND	
CN7-6	+3.3V	Power input pin +3.3V
CN8-1	NA	
CN8-2	GPIO0	TO U3 ATMEGA1608-XU PIN23, PA0 = UART-TX
CN8-3	NA	
CN8-4	NA	
CN8-5	NA	
CN8-6	NA	
CN10-6	EXT	Antenna switch , EXT=+3.3V , U5 ANT1 output , EXT=+0V or floating , U5 ANT2 output

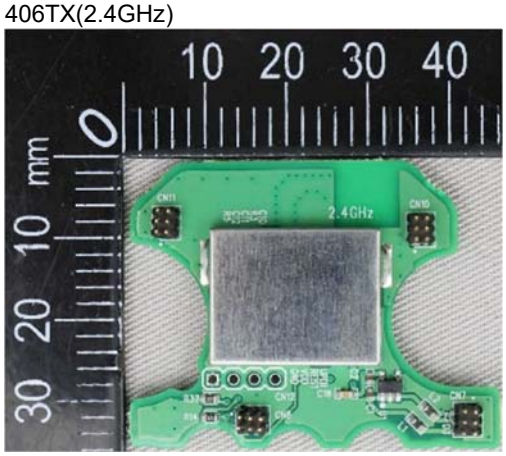
∗ CN12

Mounting Information

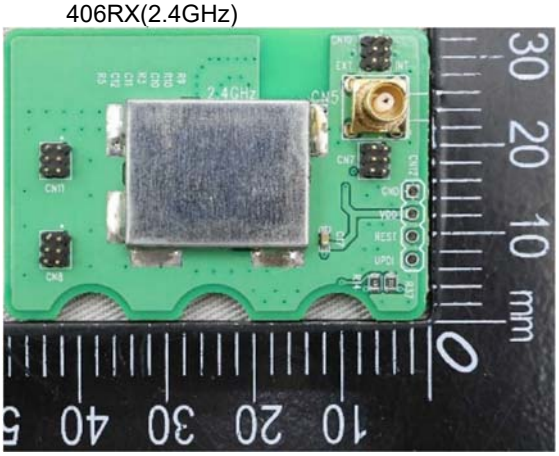
The Figure below shows the PCB layout recommended for the module. Neither via-holes nor wires are allowed on the PCB upper layer in the area occupied by the module. As a critical requirement, RF_GND pins should be grounded via several via-holes to be located right next to the pins thus minimizing inductance and preventing both mismatch and losses.

Dimensions

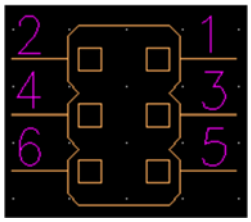
406TX(2.4GHz)



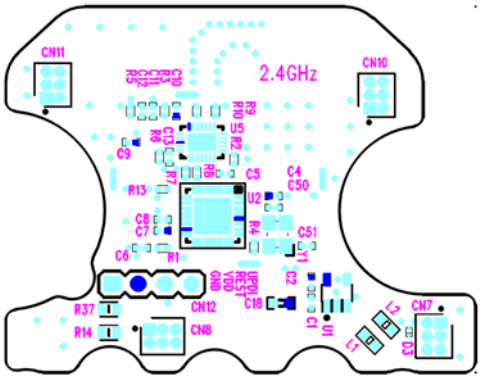
406RX(2.4GHz)

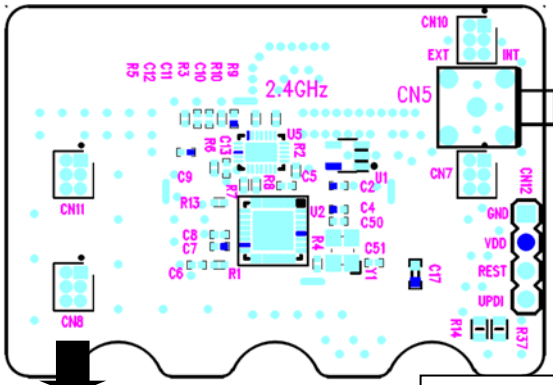


Pinout



CN10-2	CN10-1
CN10-4	CN10-3
CN10-6	CN10-5





CN8-2	CN8-1
CN8-4	CN8-3
CN8-6	CN8-5

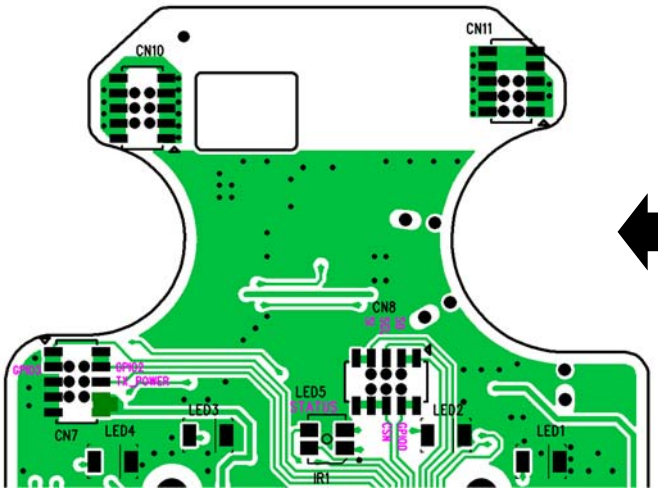
CN7-2	CN7-1
CN7-4	CN7-3
CN7-6	CN7-5

CN8-2	CN8-1
CN8-4	CN8-3
CN8-6	CN8-5

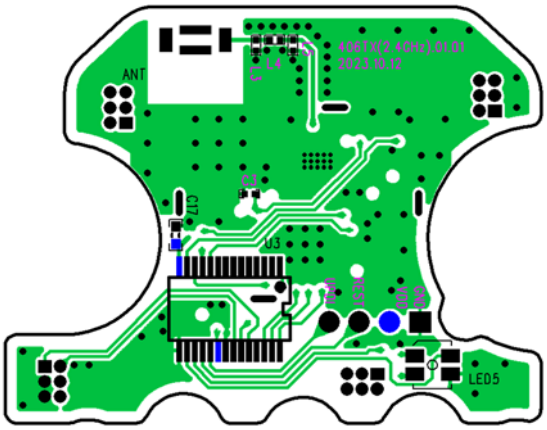
CN7-2	CN7-1
CN7-4	CN7-3
CN7-6	CN7-5

Mounting Information

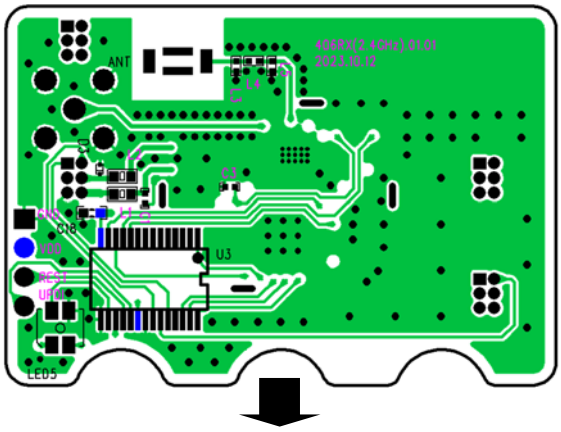
Transmitter Top



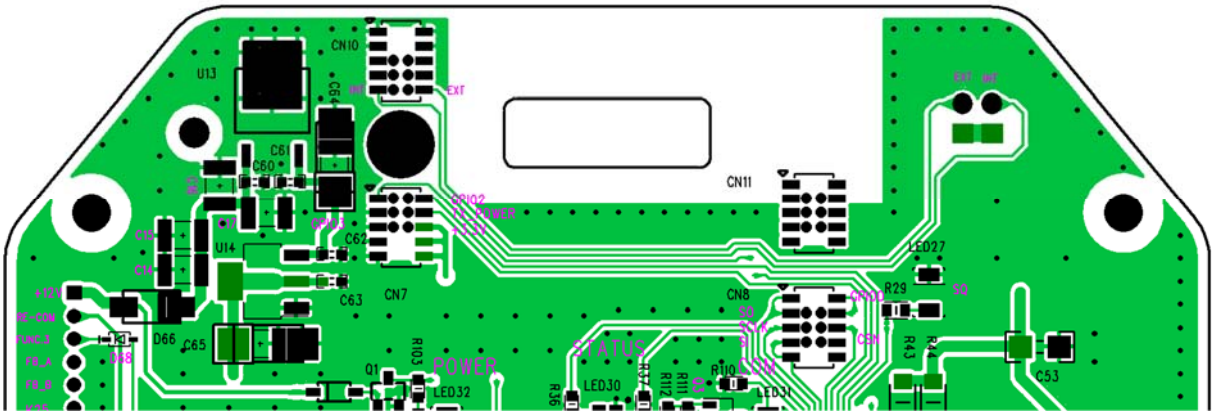
406TX(2.4GHz) Top



406RX(2.4GHz) Top



Receiver Top



The location and orientation on the carrier board is illustrated in the above Mounting information drawing. The Recommended placement on Carrier Board needs to be accurately followed to ensure performance on the end application.

Please note the areas in the Mounting information drawing for copper and component keep out to ensure superior performance on your End pplication. Copper keep out recommended in the drawing applies for all layers of the carrier board

Soldering Profile

Soldering profile

Profile feature	Green package
Average ramp-up rate (217°C to peak)	3°C/s max
Preheat temperature 175°C ±25°C	180s max
Temperature maintained above 217°C	60s to 150s
Time within 5°C of actual peak temperature	20s to 40s
Peak temperature range	260°C
Ramp-down rate	6°C/s max
Time within 25°C to peak temperature	8 minutes

Note: 1. The package is backward compatible with PB/Sn soldering profile.

Handling Instructions

The Modules are fixed with an EMI Shield to ensure compliance to Emission and Immunity rules. This shield is galvanic and NOT air tight. So cleaning of the module with IPA / other similar agents is not advised. Humidity protection coating (conformal) will cause deviated RF behavior and coating material being trapped inside EMI Shield. So this should be avoided. For products requiring conformal coating, it is advised to suitably mask before applying the coating to rest of the carrier board. To protect it from humidity, the housing of the product should ensure suitable Ingress Protection standards are complied with.
The MS-147 connector should never be exposed to Varnish / similar conformal coating material which will affect electrical connection on the surfaces of connector.
The in-built chip antenna has been tuned for the particular design

General Recommendations

•Metal enclosure should not be used. Using low profile enclosure might also affect antenna tuning

•Placing high profile components next to antenna should be avoided

•Having holes/vias punched around the periphery of the board eliminates parasitic radiation from the board edges also distorting antenna pattern

•The module should not be placed next to consumer electronics which might interfere with RF frequency band

WARRANTY INFORMATION

15.19
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.

15.105(b)
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.

15.21
You are cautioned that changes or modifications not expressly approved by the part responsible for compliance could void the user's authority to operate the equipment.

FCC RF Radiation Exposure Statement:
1. This Transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.
2. This equipment complies with RF radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated, keeping the radiator at least 20cm or more away from the person's body.

IC
Canadian Notice
This device contains licence-exempt transmitter(s)/receiver(s) that comply with Innovation, Science and Economic Development Canada's licence-exempt RSS(s). Operation is subject to the following two conditions:
1. This device may not cause interference, and
2. This device must accept any interference, including interference that may cause undesired operation of the device.

Avis Canadien
L'émetteur/récepteur exempt de licence contenu dans le présent appareil est conforme aux CNR d'Innovation, Sciences et Développement économique Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes :
1. l'appareil ne doit pas produire de brouillage, et
2. l'utilisateur de l'appareil doit accepter tout brouillage radioelectrique subi, meme si le brouillage est susceptible d'en compromettre le fonctionnement.

Caution: Exposure to Radio Frequency Radiation
1. To comply with the Canadian RF exposure compliance requirements, this device and its antenna must not be co-located or operating in conjunction with any other antenna or transmitter.
2. To comply with RSS 102 RF exposure compliance requirements, this equipment should be

installed and operated, keeping the radiator at least 20cm or more away from the person's body.

Attention: exposition au rayonnement radiofréquence
1. Pour se conformer aux exigences de conformité RF canadienne l'exposition, cet appareil et son antenne ne doivent pas être co-localisés ou fonctionnant en conjonction avec une autre antenne ou transmetteur.
2. Pour se conformer aux exigences de conformité CNR 102 RF exposition, cet équipement doit être installé et utilisé en maintenant le radiateur à au moins 20cm ou plus du corps de la personne.

This module has been tested and found to comply with the following requirements for Modular Approval.

Part 15.247 - Operation within the bands 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz.

RF exposure considerations

In the end product, the antenna(s) used with this transmitter must be installed to provide a separation distance of at least 20cm from all persons and must not be co-located or operation in conjunction with any other antenna or transmitter except in accordance with multi-transmitter product procedures. User and installers must be provided with antenna installation instructions and transmitter operating conditions for satisfying the RF exposure compliance.

Antennas

This radio transmitter has been approved by the FCC and ISED to operate with the antenna types listed below with the maximum permissible gain indicated. Antenna types not included in this list, having a gain greater than the maximum gain indicated for that type, are strictly prohibited for use with this device.

Antennes

Cet émetteur radio a été approuvé par la FCC et ISED pour fonctionner avec les types d'antennes répertoriés ci-dessous avec le gain maximal autorisé indiqué. Les types d'antennes non inclus dans cette liste, ayant un gain supérieur au gain maximum indiqué pour ce type, sont strictement interdits pour une utilisation avec cet appareil.

Antenna Type	Supplier	Antenna Part No.	Freq. (MHz)	Peak Antenna Gain (dBi)
Chip	Johanson Technology, Inc.	2450AT42B100	2405~2480	0

Required End Product Labeling

Any device incorporating this module must display an external, visible, permanently affixed label with the FCC ID and the ISED certification number preceded by the term as follows.
For the 406TX, “ Contains FCC ID: R4UARCRFM2400TX ” “ Contains IC: 5097A-RFM2400TX ”
For the 406RX, “ Contains FCC ID: R4UARCRFM2400RX ” “ Contains IC: 5097A-RFM2400RX ”

Obligation d'étiquetage du produit final:

Tout appareil intégrant ce module doit afficher une étiquette externe, visible et apposée en permanence avec le numéro de certification ISDE précédé du terme comme suit.

Pour le 406TX« Contient IC : 5097A-RFM2400TX »
Pour le 406RX« Contient IC : 5097A-RFM2400RX »

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 User manual.

Test Modes

This device uses various test mode programs for test set up which operate separate from production firmware. Host integrators should contact the grantee for assistance with test modes needed for module/host compliance test requirements.

Additional testing, Part 15 Subpart B disclaimer

The modular transmitter is only FCC authorized for the specific rule parts (i.e., FCC transmitter rules) listed on the grant, and that the host product manufacturer is responsible for compliance to any other FCC rules that apply to the host not covered by the modular transmitter grant of certification.

The final host product still requires Part 15 Subpart B compliance testing with the modular transmitter installed.

Note EMI Considerations

Note that a host manufacture is recommended to use KDB996369 D04 Module Integration Guide recommending as "best practice" RF design engineering testing and evaluation in case non-linear interactions generate additional non-compliant limits due to module placement to host components or properties

For standalone mode, reference the guidance in KDB996369 D04 Module Integration Guide and for simultaneous mode; see KDB996369 D02 Module Q&A Question 12, which permits the host manufacturer to confirm compliance.

How to make changes

Only Grantees are permitted to make permissive changes, if the module will be used differently than granted conditions, please contact us to ensure modifications will not affect compliance.