
REVENSE

Date of reg

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Document Change List

V1.0.0	20170401	Initial version
V5.0.0	20190919	Update to MG21 series chips

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- Dimension: 20.4*14.8*2.5mm
- Max output power:14dBm
- Max receiving sensitivity: -102.5dBm(Zigbee)
- Reliable communication distance: 1000m (view of sight distance)

- Multiple antenna options
- Extreme low power consumption
 - Sleep mode: <5.0μA
 - Receiving mode: 9.4mA (Zigbee)
- 15 GPIOs can be configured for various functional interfaces according to application
 - GPIO
 - External interrupts
 - 12 bytes precision ADC sampling channel
 - USART Hardware flow control
 - TWI interface
 - UART / SPI / I²C interface
 - PWM output

1.4 Product Advantage

- Small Package fits small devices well.
- Advanced link budget in the industry
- Outstanding battery longevity
- Rich storage resource for various software application
- Powerful mesh network management ability
- With development kit easy to use and cost-effective
- ISM band license free

1.5 Abbreviations

ADC	Analog-to -Digital Converter
GPIO	General Purpose Input /Output
HVAC	Heating, Ventilating and Air Conditioning
TWI	Inter-Integrated Circuit
IEEE	Institute of Electrical and Electronics Engineers
ISM	Industrial, Scientific and Medical radio band
JTAG	Digital interface for debugging of embedded device, also known as IEEE 1149.1 standard interface
MAC	Medium Access Control layer
PCB	Printed Circuit Board
RAM	Random Access Memory
RF	Radio Frequency

RTS/CTS	Request to Send/ Clear to Send
RX	Receiver
SMA	Surface Mount Assembly
SPI	Serial Peripheral Interface
TX	Transmitter
UART	Universal Asynchronous Receiver/Transmitter
ZigBee PRO	Wireless networking standards targeted at low-power applications

1.6 Related Documents

[1] ZigBee 3.0 – The Open, Global Standard for the Internet of Things December 2, 2014

2. Product Overview

2.1 Overview

REX3B21 is a compact IOT module, higher sensitivity and lower power. It conforms to IEEE 802.15.4 and ZigBee 3.0 standard protocol. Based on EFR32 platform of SiliconLabs, this module has outstanding RF characteristics, lower power consumption, and powerful processor core.

REX3B21 module conforms to the FCC, ISCED, CE, and RoHS, which can be applied to various devices in different environments.

At the same time, our company also provides a complete set of development and evaluation kits, users can choose kits of different versions for testing and development according to their requirement

3. Technical Specification

3.1. Electrical Specification

3.1.1. Electrical Specification

Table 3-1. Absolute Maximum Ratings

Parameter	Min	Max
Module input voltage (VCC)	1.71V	3.8V
Pin voltage (except ADC pin)	-0.3V	VDD_PADS+0.3
ADC Pin voltage	0V	3.3V
Data of maximum drive current of all I/Os		50 mA
Maximum RF signal receiving density of chips		+14 dBm

Note: exceeding the absolute maximum ratings may damage module. In any case, the user shall not violate the absolute maximum ratings listed in the previous table. If there is a violation, it may cause irreparable damage to the module.

3.1.2. Power Consumption

Table 3-2. Test conditions (unless otherwise agreed), VCC = 3.3V, temperature = 25°C

Parameter	Range	Unit
Receiving current	9.4	mA
(@14dBm) Transmitting current	186	mA
Sleeping current	5.0	μA
Transmitting power	14	dBm
(99%) Receiving sensitivity	-102.5	dBm

3.1.3. RF Electrical Characteristics

Table 3-3. RF Electrical Characteristics

Parameter	Range	Unit
Frequency range	2400~2483.5	MHz
Quantity of Channels	16	
Channel spacing	5	MHz
Transmitting power	14	dBm
Receiving sensitivity	-102.5	dBm
Max transmitting rate	250	kbps
Rated Input / Output Impedance	50	Ω

3.1.4. Processor Characteristics

Table 3-4. Processor Characteristics

Parameter	
Processor core	32bit ARM®-M33
Max operating frequency	80MHz

3.1.5. Module Interface Characteristics

Table 3-5. Module Interface Characteristics

Parameter	Test Conditions	Range	Unit
UART Max baud rate		230400	bps
The resolution / conversion time of the analog channel	Half-duplex mode	12/4096	Bits/ μ s
Analog input impedance		>1	M Ω
Analog reference voltage (VREF)		3.3	V
Analog input voltage		0 - VREF	V
I2C bus maximum clock frequency		1000	KHz
GPIO output voltage (logic 0)	-8/ 4 mA	0 ~ 0.18*VCC	V
GPIO output voltage (logic 1)	-8/ 4 mA	0.82*VCC ~ VCC	V
Real-time clock frequency		32.768	KHz

3.2. Physical/Ambient Characteristics

Table 3-6. Physical/Ambient Characteristics

Parameter	Value	Note
Physical size	20.4*14.8*2.5mm	
Weight	<1g	
Working temperature	-40°C to +85°C (default)	
Relative working Humidity	<95%	

3.3. Pin Configuration

Figure3-1. Dimensions

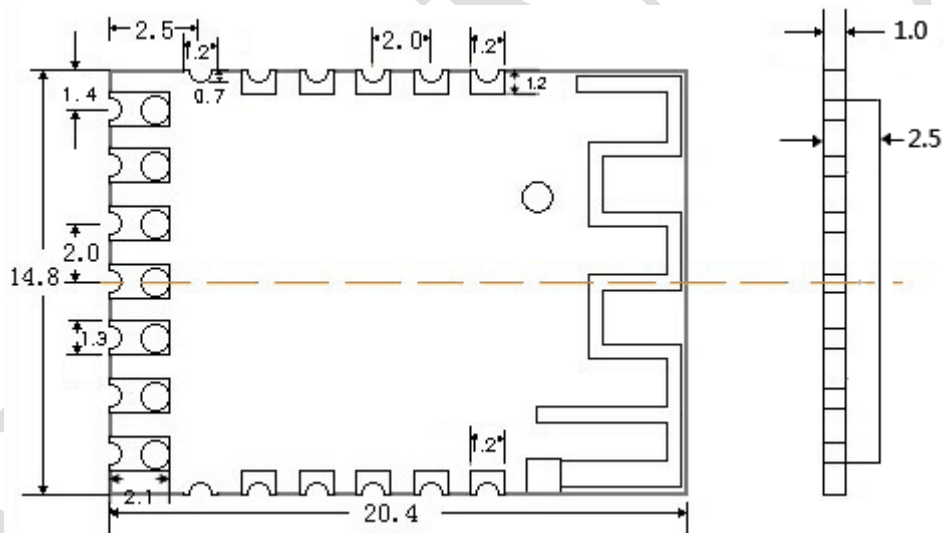


Figure3-2. Footprint

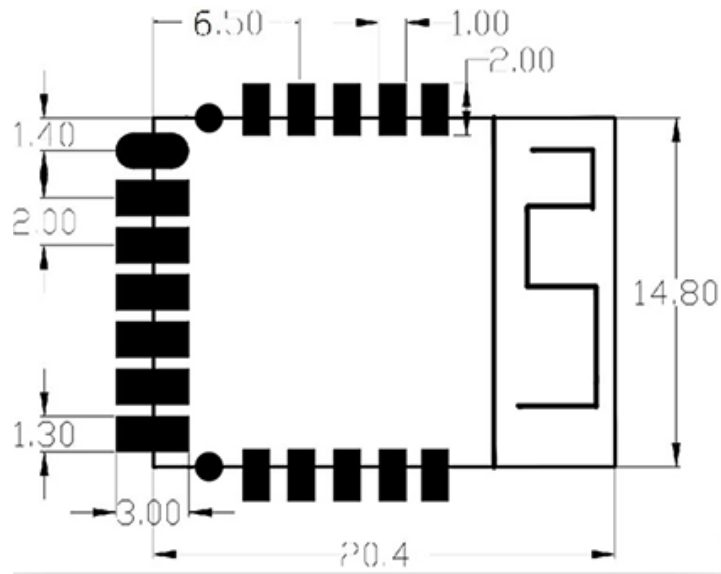


Figure 3-3. Pin Definition

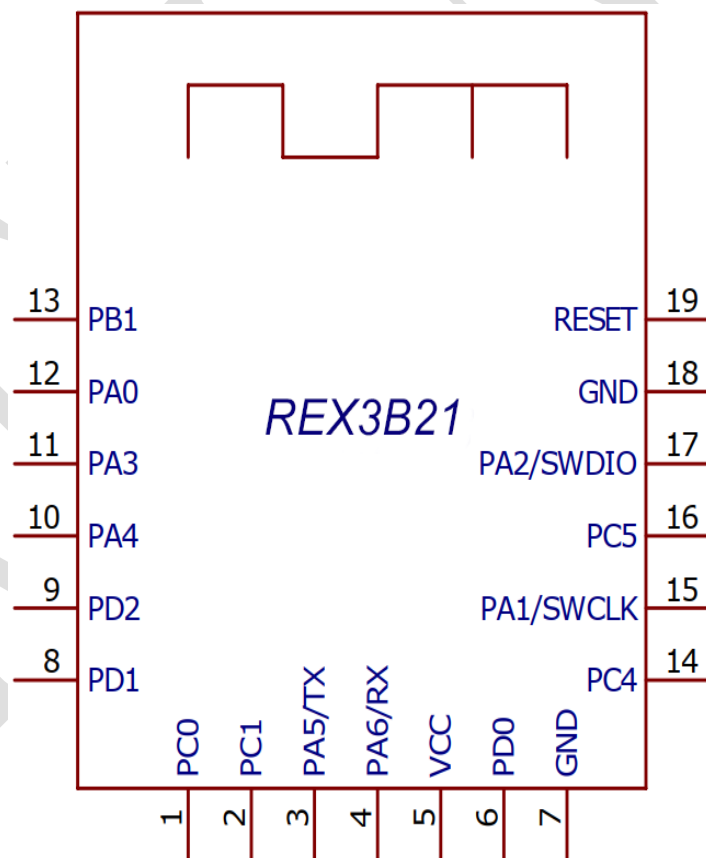


Table 3-7. Pin Description

No. of module pins	No. of QFN32 package pins	Pin signal	Direction	Pin specification
1	1	PC0	I/O	GPIO
2	2	PC1	I/O	GPIO
3	22	PA5	I/O	GPIO; TXD
4	23	PA6	I/O	GPIO; RXD
5	10, 25, 26, 27	3.3V	I	VCC
6	32	PD0	I/O	GPIO
7	11, 0	GND	I	GND
8	31	PD1	I/O	GPIO
9	30	PD2	I/O	GPIO
10	21	PA4	I/O	GPIO
11	20	PA3	I/O	GPIO
12	17	PA0	I/O	GPIO
13	15	PB1	I/O	GPIO
14	5	PC4	I/O	GPIO
15	18	PA1	IO	GPIO; SWCLK
16	6	PC5	IO	GPIO
17	19	PA2	IO	GPIO; SWDIO
18	11, 0	GND	I	GND
19	9	RESET	I	RESET

3.4 Antenna Specification

3.4.1 On Board PCB Antenna

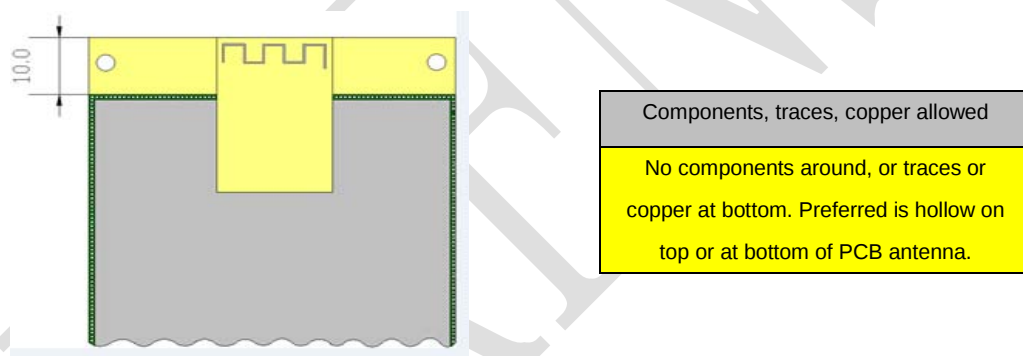
REX3B21 has an on board PCB antenna. Notes for using PCB antenna:

- Avoid placing module in a metal shell.
- Keep metal object from the PCB antenna (at least 1cm above, 2.7cm plus recommend).
- Do not keep module nearby the devices with electromagnetic radiation source, such as transformers.

The design of a user's PCB should prevent the module's PCB antenna from the interference of its components, traces and bottom. The basic principles are:

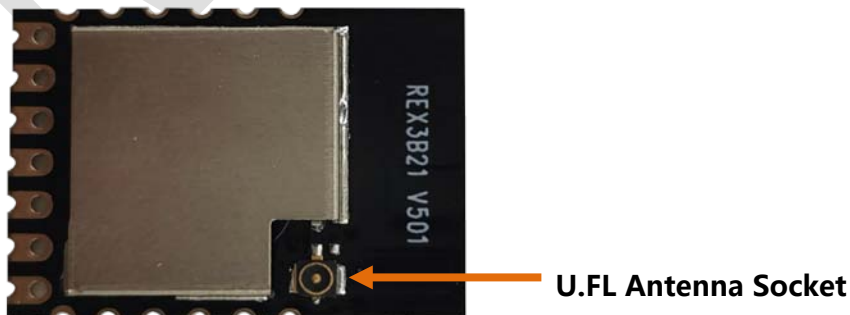
- No traces, bottom around the PCB antenna with no other components placed
- The PCB antenna shall be out of PCB board
- Do not cover the PCB antenna with metal shell

Figure 3-4. PCB Antenna Placement



3.4.2 U.FL Antenna Socket

Figure 3-5. U.FL Antenna socket



3.5. RF Performance

Figure 3-8. Carrier Signal

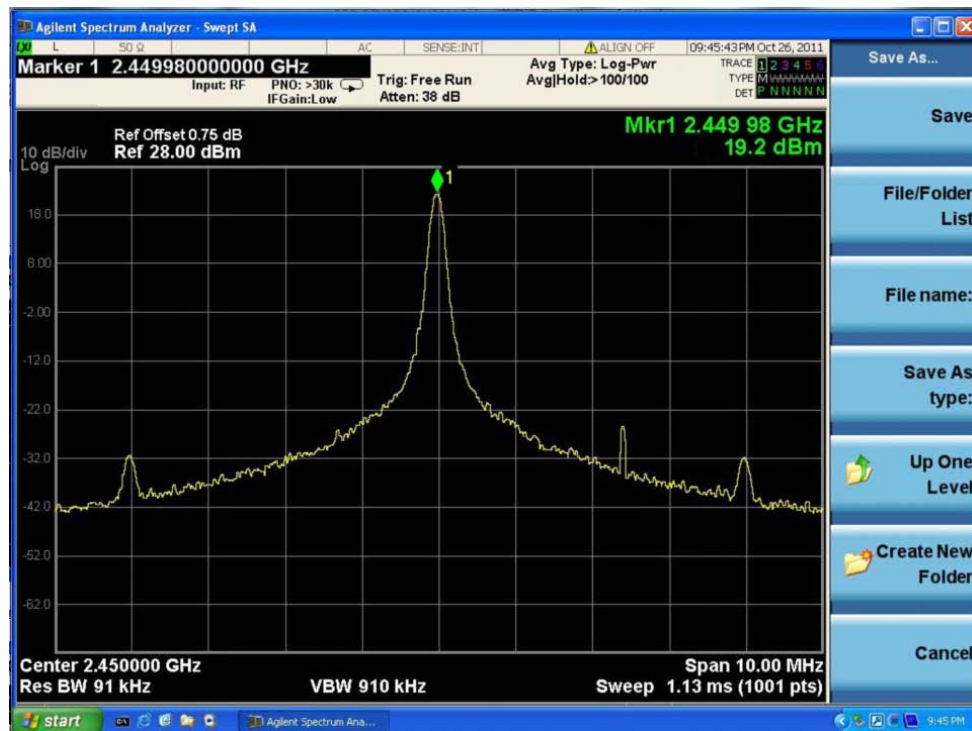
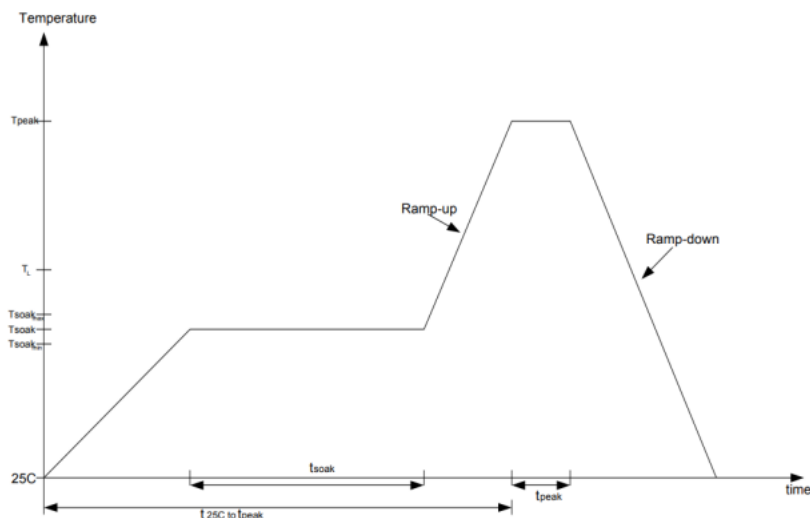


Figure 3-9. Modulation Signal



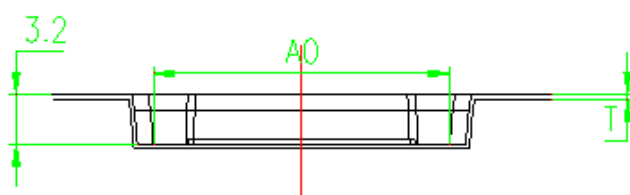
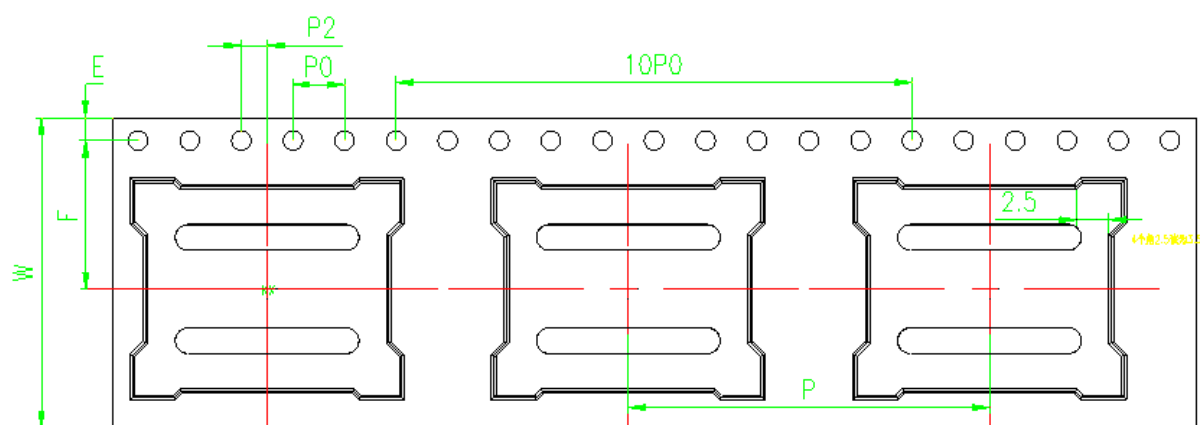
3.6. Soldering Temperature for Module

The max temperature for soldering module shall be within 237-245°C in 20s.

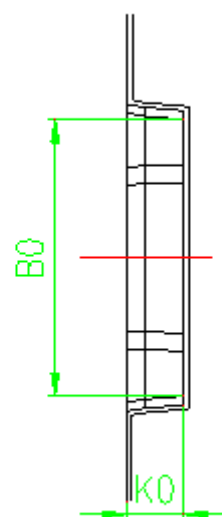


Parameter	Value
Average Ramp Up Rate (from Tsoakmax to Tpeak)	3 °C per second max
Minimum Soak Temperature (Tsoakmin)	150 °C
Maximum Soak Temperature (Tsoakmax)	200 °C
TL	21.7 °C
Time above TL	60–150 seconds
Tpeak	260 ± 0 °C
Time within 5 °C of Tpeak	20–40 seconds
Ramp Down Rate	6 °C per second max
Time from 25 °C to Tpeak	8 minutes, max

3.7. Packing



ITEM	SPEC (mm)
W	32.00 ± 0.30
F	14.5 ± 0.10
P	1.75 ± 0.10
ΦD0	1.5
P0	4.00 ± 0.10
A0	21.00 ± 0.30
B0	15.5 ± 0.30



4. Ordering Information

Manufacturer	REX	3	B	21
REX=REXENSE				
Series				
3=Zigbee				
Packaging Type				
M = Mini				
B = On board PCB antenna (This)				
P = Full GPIO Pin				
Core				
21 = EFR32MG 21				

5. Contact Us

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FCC Compliance Notice

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.

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 equipment complies with FCC 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 equipment should be installed and operated with minimum distance 20cm between the radiator& your body.

ISED RSS warning

This device complies with Innovation, Science and Economic Development Canada Compliance licence-exempt RSS standard (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.

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 radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

ISED Radiation Exposure Statement:

This equipment complies with ISED 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.

IC exposition aux radiations:

Cet équipement est conforme avec ISED les limites d'exposition aux rayonnements définies pour un contrôlé environnement.

Cet émetteur ne doit pas être co-localisés ou fonctionner en conjonction avec une autre antenne ou émetteur.

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

Tous les changements ou modifications non expressément approuvée par le responsable de la conformité pourrait vider l'utilisateur est habilité à exploiter l'équipement.

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: 2AOE2-REX3B21 or Contains FCC ID: 2AOE2-REX3B21"

The outside of final products that contains this module device must display a label referring to the enclosed module. This exterior label can use wording such as:

"Contains Transmitter Module IC: 22670-REX3B21", or "Contains IC: 22670-REX3B21", Any similar wording that expresses the same meaning may be used

Instructions d'étiquetage IC: L'extérieur des produits finis contenant ce module doit afficher une étiquette faisant référence au module inclus. Cette étiquette extérieure peut utiliser des libellés tels que: contient le module émetteur IC: 22670-REX3B21" ou " contient: IC: 22670-REX3B21 ", tout libellé similaire exprimant le même sens peut être utilisé

Integration instructions for host product manufacturers according to KDB 996369 D03 OEM Manual v01

2.2 List of applicable FCC rules

CFR 47 FCC PART 15 SUBPART C has been investigated. It is applicable to the modular.

2.3 Specific operational use conditions

This module is stand-alone modular. If the end product will involve the Multiple simultaneously transmitting condition or different operational conditions for a stand-alone modular transmitter in a host, host manufacturer have to consult with module manufacturer for the installation method in end system.

2.4 Limited module procedures

Not applicable

2.5 Trace antenna designs

Not applicable

2.6 RF exposure considerations

To maintain compliance with FCC' s RF Exposure guidelines, this equipment should be installed and operated with minimum distance of 20cm from your body.

2.7 Antennas

This radio transmitter FCC ID: 2AOE2-REX3B21 has been approved by FederalCommunications

Commission to operate with the antenna types listed below, with the maximum permissible gain indicated. Antenna types not included in this list that have a gain greater than the maximum gain indicated for any type listed are strictly prohibited for use with this device.

Antenna type	Maximum Antenna gain
PCB Antenna	1.78dBi

2.8 Label and compliance information

The final end product must be labeled in a visible area with the following " Contains FCCID:2AOE2-REX3B21"

2.9 Information on test modes and additional testing requirements

Host manufacturer is strongly recommended to confirm compliance with FCC requirements for the transmitter when the module is installed in the host.

2.10 Additional testing, Part 15 Subpart B disclaimer

Host manufacturer is responsible for compliance of the host system with module installed with all other applicable requirements for the system such as Part 15 B.

ISED Important Note:

In the event that these conditions cannot be met (for example certain laptop configurations or co-location with another transmitter), then the Canada authorization is no longer considered valid

and the ISED cannot be used on the final product. In these circumstances, the OEM integrator will be responsible for re-evaluating the end product (including the transmitter) and obtaining a separate Canada authorization.

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 RSS-247 and RSSGen requirement, only if the test result comply with RSS-247 and RSS-Gen requirement, then the host can be sold legally.

Note Importante :

Dans le cas où ces conditions ne peuvent être satisfaites (par exemple pour certaines configurations d'ordinateur portable ou de certaines co-localisation avec un autre émetteur), l'autorisation du Canada n'est plus considéré comme valide et l'ISED ne peut pas être utilisé sur le produit final. Dans ces circonstances, l'intégrateur OEM sera chargé de réévaluer le produit final (y compris l'émetteur) et l'obtention d'une autorisation distincte au Canada. toute entreprise de l'hôte qui installent ce dispositif modulaire avec limite approbation devrait effectuer l'essai des modules et des rayonnements non essentiels des émissions rayonnées selon rss-247 et le cnr - gen, seulement si le résultat d'essai conforme rss-247 et le cnr - gen, puis l'hôte peut être vendu légalement.

End Product Labeling

The final end product must be labeled in a visible area with the following: Contains

IC:22670-REX3B21.

Plaque signalétique du produit final Le produit final doit être étiqueté dans un endroit visible avec l'inscription suivante: Contient des IC:22670-REX3B21.

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 show in this manual.

Manuel d'information à l'utilisateur final

L'intégrateur OEM doit être conscient de ne pas fournir des informations à l'utilisateur final quant à la façon d'installer ou de supprimer ce module RF dans le manuel de l'utilisateur du produit final qui intègre ce module.

Le manuel de l'utilisateur final doit inclure toutes les informations réglementaires requises et avertissements comme indiqué dans ce manuel.

This radio transmitter [22670-REX3B21] has been approved by Innovation, Scienceand Economic Development Canada to operate with the antenna types listed below, It has an antenna with the maximum antenna gain is 1.78dBi.

Antenna type	Maximum Antenna gain
PCB Antenna	1.78dBi

Antenna types not included in this list that have a gain greater than the maximum gain indicated for any type listed are strictly prohibited for use with this device.

Cet émetteur radio [22670-REX3B21] a été approuvé par Innovation, Science et développement économique Canada pour fonctionner avec les types d' antenne énumérés ci-dessous.

Il dispose d'une antenne avec une prise le gain maximum d'antenne est de 1.78 dBi.

Antenna type	Maximum Antenna gain
PCB Antenna	1.78dBi

Les types d'antennes non inclus dans cette liste qui ont un gain supérieur au gain maximum indiqué pour tout type répertorié sont strictement interdits pour l'utilisation avec cet appareil.