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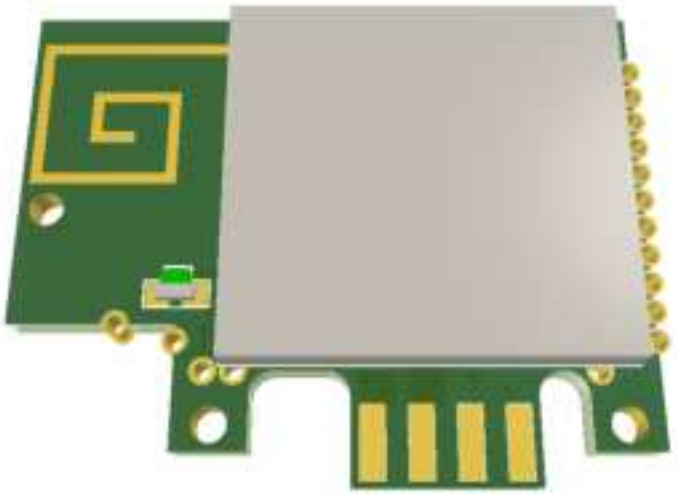
INNOVATION BY ELECTRONICS

SENSOR ELECTRONICS
SYSTEM SOLUTIONS
TELEMETRIE
HARDWARE
SOFTWARE

Modul VIII

Release 1.x

Version 1.2
27.02.2025



Dear customer,

We are delighted that you have decided on a module from the product range of senTec Elektronik GmbH. The senTec Elektronik GmbH offers you the highest quality and the latest technology. In order to be able to take full advantage of the performance of your module and to enjoy your device for many years, please read these operating instructions carefully before connecting and commissioning and operate the module according to the instructions. The operational safety and function of the module can only be guaranteed if both the general safety and accident prevention regulations of the legislator and the safety instructions in the operating instructions are observed. We assume no liability for damage caused by improper use or incorrect operation.

Please ensure that everyone who operate the module has read and understood the operating instructions.

Keep the operating instructions in a safe place so that you can refer to them at any time if necessary.

Content

1 For your Safety

1.1 Observe the Operating Instructions

Any commissioning and handling of the module requires precise knowledge and observance of these operating instructions. The module is only intended for the use described.
In these operating instructions, **especially important comments** are highlighted as follows:

Warning

**This is a warning that indicates risk situations and dangers. Failure to observe this warning may result in life-threatening situations.
These warnings must be observed!**

Information

This is information that indicates certain features that must be observed.

1.2 Safety Instructions

The module is designed for a DC voltage of 3V to 3.7V. Make sure that your device is always operated with the correct DC voltage.

1.3 Liability for Function and Damage

The liability for the function of the module is in any case transferred to the owner or operator, if the module is improperly maintained, repaired or changed by persons who do not belong to an authorized specialist company or if it is handled that does not correspond to its intended use.
The senTec Elektronik GmbH is not liable for damage caused by **failure to observe** the above information.
The warranty and liability conditions of the sales and delivery conditions of senTec Elektronik GmbH are not extended by the above information.

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CEO: Michael Binhack, Rico Röhner
http://www.senTec-Elektronik.de

2 General

2.1 Description

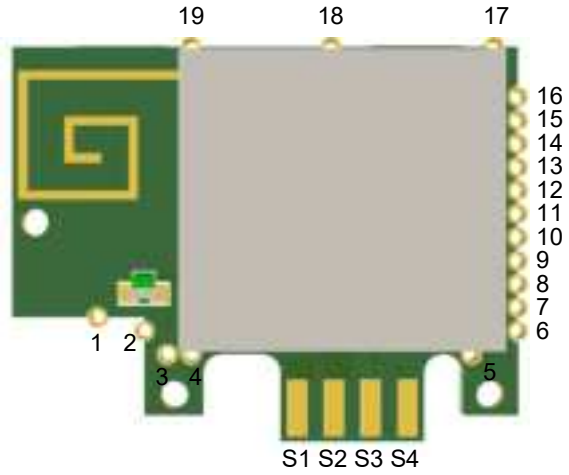
The Modul VIII is a radio module with an integrated EFR32FG23 from Silicon Labs. The EFR32 combines an ARM Cortex-M33 core with a sub-GHz transceiver.
The module has 256kB flash memory, 32kB RAM and can be used as a plug-in module or as module for PCB assembly.
The module has a double side 4-pin edge connector and 19 side pads for the PCB assembly. The edge connector contains the power supply, UART interface, programming interface and the side pads contains different user defined GPIOs. The power supply for the module is 3.3VDC. The module has a fixed integrated PCB-antenna.
The module is certified according to the Radio Equipment Directive 2014/53/EU, FCC and ISED.

2.2 Application

The main applications for the module are:

- Home and Building Automation
- Water, Gas and Energy Meter Measurements
- Wireless Sensor Networks
- Lighting Control
- Health and Fitness Applications

2.3 Pinout



PAD Modul	PAD SIDE CONNECTOR	Funktion	PIN EFR22FG23 (M40)
1	S1	VCC_3.3V	12, 24, 27, 28, 40, 57
2		ADC0_CH0 PA08	29
3	S2	#RESET	11
4	S3	DGND	EP
5	S3	DGND	EP
6	S7	UART0_RX	26
7	S5	UART0_TX	25
8	S8	SWCLK	22
9	S6	SWDIO	23
10	S4	SWO	24
11		PC00	1
12		PC01	2
13		PC02	3
14		PC05	6
15		PC04	5
16		PC03	4
17	S3	DGND	EP
18	S3	DGND	EP
19	S3	DGND	EP

3 Electrical Specification

3.1 Maximum Operating Conditions

Parameter	Symbol	Min	Type	Max	Unit
Temperature Range Storage	T_{STG}	-40	-	85	°C
Maximum Soldering Temperature	T_S	-	-	260	°C
External Voltage Supply	V_{DDMAX}	0	-	3.8	V
Voltage I/O	V_{IOPIN}	-0.3	-	V_{DD} + 0.3	V

The module is designed for a DC voltage of 3V to 3.7V. Make sure that your device is always operated with the correct DC voltage.

3.2 Technical Data

Parameter	Symbol	Min	Type	Max	Unit
Temperature Range Operation	T_{STG}	-20	-	70	°C
Voltage Supply Operation	V_{DD}	3.0	3.3	3.7	V
Voltage I/O	V_{IOPIN}	-0.3	-	V_{DD} + 0.3	V
Power Consumption TX (14dBm)	I_{TX10}	-	25	-	mA
Power Consumption RX	I_{RX}	-	4	-	mA
Reception Sensitivity	P_{LNA}	-	-112	-	dBm
Receiver Category EN 300 220-1 V3.1.1	-	-	1.5	-	-
Internal Clock Frequency	f_{int}	-	-	78	MHz
Memory Size RAM	-	-	32	-	kB
Memory Size Flash	-	-	256	-	kB

HF Characteristics senTec Radio Protocol RED					
Parameter	Symbol	Min	Type	Max	Unit
Modulation			2GFSK		
Frequency Deviation	f_{Dev}	±40	±50	±60	kHz
Frequency Bandwidth	f_{OCW}	150	200	350	kHz
Data Rate			100		kbps
Transmission Power Power Amplifier	P_{PA}		14		dBm
Reception Sensitivity	P_{LNA}		-110		dBm
Duty Cycle	DC	1%			
Basic Frequency (Band L&M)	f_{Bas}	867,500	868,000	869,850	MHz
Frequency CH1 (Band L)	f_{CH1}	865,450	865,500	865,550	MHz
Frequency CH2 (Band L)	f_{CH2}	866,120	866,125	866,130	MHz
Frequency CH3 (Band L)	f_{CH3}	866,700	866,750	866,800	MHz
Frequency CH4 (Band L)	f_{CH4}	867,370	867,375	867,380	MHz
Frequency CH5 (Band R)	f_{CH5}	869,800	869,850	869,900	MHz

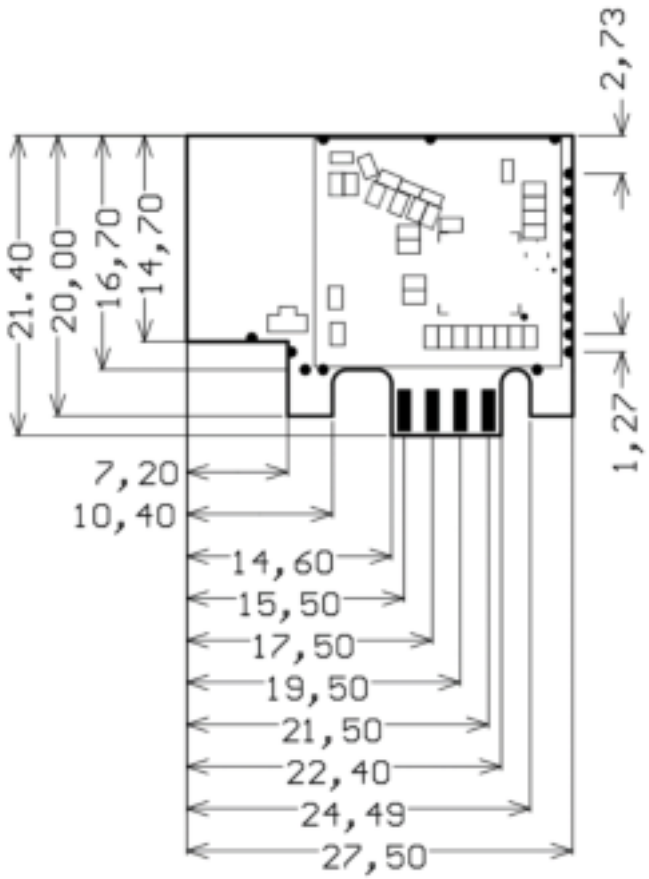
HF Characteristics senTec Radio Protocol FCC					
Parameter	Symbol	Min	Type	Max	Unit
Modulation			2GFSK		
Frequency Deviation	f_{Dev}	±190	±200	±210	kHz
Frequency Bandwidth 6dB	f_{OCW}	500	550	600	kHz
Data Rate			100		kbps
Transmission Power Power Amplifier	P_{PA}		17		dBm
Reception Sensitivity	P_{LNA}		-110		dBm
Duty Cycle	DC	1%			
Basic Frequency	f_{Bas}	915,150	915,500	915,85	MHz
Frequency CH1	f_{CH1}	903,150	903,500	903,85	MHz
Frequency CH2	f_{CH2}	904,350	904,700	905,05	MHz
Frequency CH3	f_{CH3}	905,550	905,900	906,25	MHz
Frequency CH4	f_{CH4}	906,750	907,100	907,45	MHz
Frequency CH5	f_{CH5}	907,950	908,300	908,65	MHz
Frequency CH6	f_{CH6}	909,150	909,500	909,85	MHz
Frequency CH7	f_{CH7}	910,350	910,700	911,05	MHz
Frequency CH8	f_{CH8}	911,550	911,900	912,25	MHz
Frequency CH9	f_{CH9}	912,750	913,100	913,45	MHz
Frequency CH10	f_{CH10}	913,950	914,300	914,65	MHz
Frequency CH11	f_{CH11}	916,350	916,700	917,05	MHz
Frequency CH12	f_{CH12}	917,550	917,900	918,25	MHz
Frequency CH13	f_{CH13}	918,750	919,100	919,45	MHz
Frequency CH14	f_{CH14}	919,950	920,300	920,65	MHz

Frequency CH15	f_{CH15}	921,150	921,500	921,85	MHz
Frequency CH16	f_{CH16}	922,350	922,700	923,05	MHz
Frequency CH17	f_{CH17}	923,550	923,900	924,25	MHz
Frequency CH18	f_{CH18}	924,750	925,100	925,45	MHz
Frequency CH19	f_{CH19}	925,950	926,300	926,65	MHz
Frequency CH20	f_{CH20}	927,150	927,500	927,85	MHz

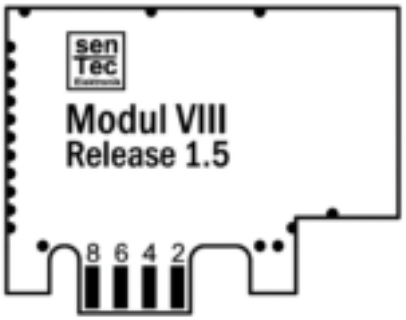
4 Mechanical Specification

4.1 Dimensions

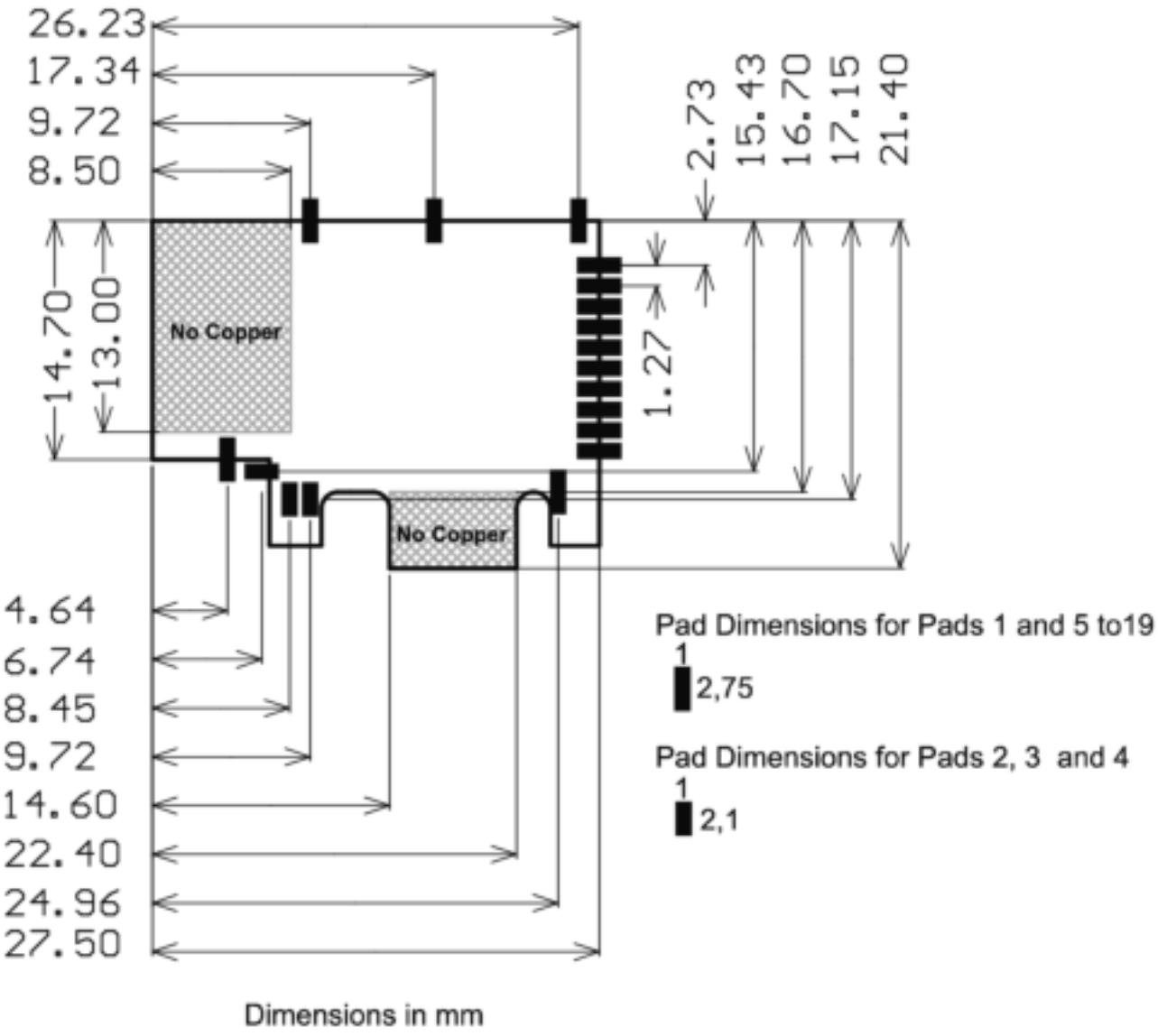
Top View



Bottom View



4.2 Footprint



Dimensions in mm

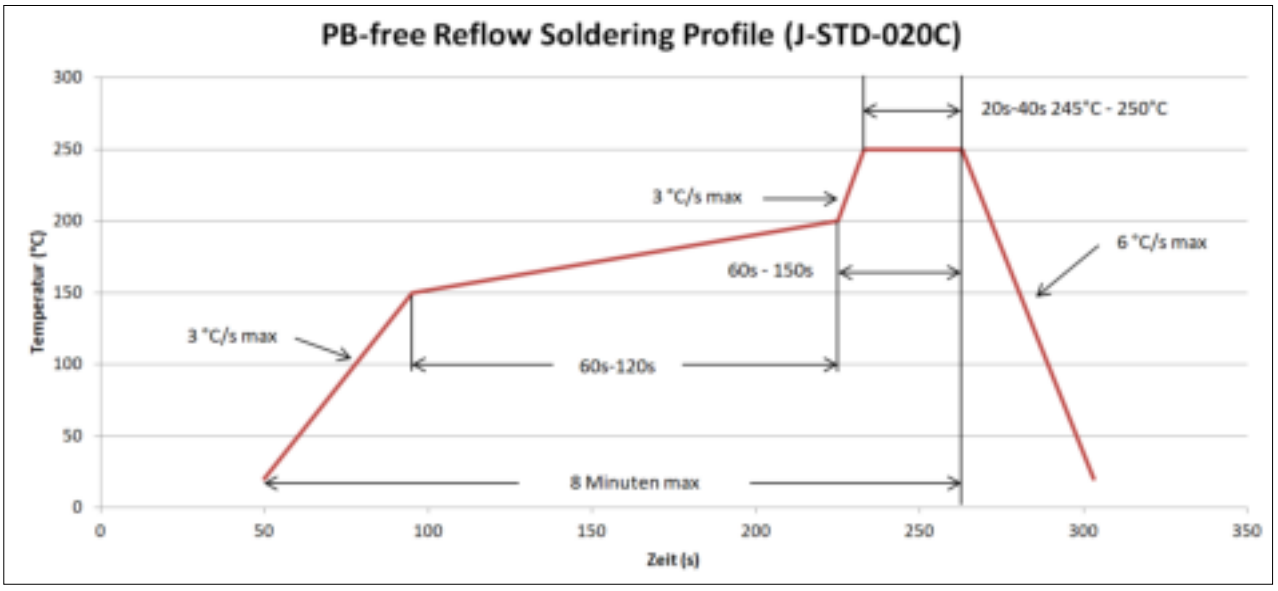
4.3 Recommended Connector

The following connectors are recommended for using the module:

Manufacturer	Manufacturer Designation	Manufacturer-Nr
AVX	Vertical Top Entry Card Edge	009159004551906
AVX	Inverted Thru Board Card Edge	009159004501906

When using other connectors, ensure the exact fit and pin assignment!

4.4 Soldering profile



5 Labelling Modul VIII

The label is located on the top of the shielding from the Modul VIII. The Label size is 16,2mm x 15,0mm. It contains the following information:

Information:

1. Software version
2. Module address
3. FCC mark
4. CE mark
5. FCC ID
6. ISED ID
7. Production information as QR-Code
8. Production information as plan text

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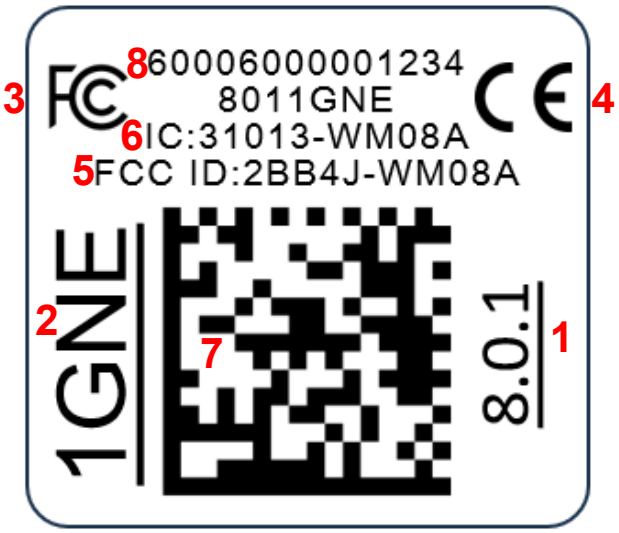

The manufacturer, product name and the hardware release are printed on the backside of the module.

Picture Modul 868MHz VIII top-side

Picture Modul 868MHz VIII bottom-side

6 EU Declaration of Conformity

supplier´s name **senTec Elektronik GmbH**

address **Robert-Bosch-Ring 2**
98693 Ilmenau

We declare in our sole responsibility that the product(s)

Modul VIII
Hardware Release 1.x
Firmware Release 8.x

complies with requirements of the following European directive(s):

Radio Equipment Directive 2014/53/EU

RoHS- directive 2011/65/EU

the following standards are used:

Safety (Art. 3.1a 2014/53/EU)	**EMC** (Art. 3.1b 2014/53/EU)	**Spectrum** (Art. 3.2 2014/53/EU)
EN 62368-1:2014/ AC:2015/A11:2017/AC2017	EN 301 489-1 V2.2.3:2019-11 EN 301 489-3 V2.3.1:2022-11	EN 300 220-1 V3.1.1 EN 300 220-2 V3.1.1

Health
(Art. 3.1a 2014/53/EU)

EN 62479:2010

7 FCC

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

2.2 List of applicable FCC / ISED rules

FCC:	ISED:
47CFR Part 15 Subpart C §15.247	RSS-247

2.3 Specific operational use conditions

The module has a double side 4-pin edge connector and 19 side pads for the PCB assembly. The edge connector contains the power supply, UART interface, programming interface and the side pads contains different user defined GPIOs. The power supply for the module is 3.3VDC. The module has a fixed integrated PCB-antenna. The operation frequency is 903.5Mhz to 927.5MHz. The modulation type is 2GFSK.

2.4 Limited module procedures

Installations Notes:
The power supply for the module is 3.3VDC
When connect the module to the host device, the host device must power off.
Make sure the module pins correctly installed.
When used as an SMD module, the PCB antenna area on the circuit board must be free of any copper.

2.5 Trace antenna designs

Not applicable. The module does have a fixed PCB-antenna.

2.6 RF exposure considerations

This equipment complies with FCC's RF radiation exposure limits set forth for an uncontrolled environment.

2.7 Antennas

PCB-antenna is permanently attached, can't be replaced. The PCB-antenna design corresponds to the Silicon Labs reference design WES0118-01-APL915S-01.

2.8 Label and compliance information

Each module has its own label with the FCC identification number. It is placed at the shielding of the module. The host device shall be labelled to identify the modules within the host device, which means that the host device shall be labelled to display the FCC ID of the module preceded by words "Contains transmitter module" or "Contains", E.g.

Contains FCC ID: 2BB4J-WM08A

2.9 Information on test modes and additional testing requirements

Contact senTec Elektronik GmbH for information on how to configure test modes for the module.

2.10 Additional testing, Part 15 Subpart B disclaimer

The modular transmitter is only FCC authorized for the specific rule parts listed on the grant. 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.

7.2 FCC Statement

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.
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 module
▪ 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.

7.3 FCC Radiation Exposure Statement

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance 20cm between the radiator & your body

8 ISED

8.1 ISED RF Exposure Compliance Statement according RSS-102

This equipment complies with ISED RSS-102 radiation exposure limits set forth for an uncontrolled environment.
This equipment should be installed and operated with minimum distance 20 cm between the radiator and your body.

8.2 RSP-100/ RSS-Gen

This device contains license-exempt transmitter(s)/receiver(s) that comply with Innovation, Science and Economic Development Canada's license-exempt RSS(s). Operation is subject to the following two conditions:

(1) This device may not cause interference.
(2) This device must accept any interference, including interference that may cause undesired operation of the device.

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;
(2) L'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

9 Technical Support

If you have any technical questions, please contact us at the following E-Mail-Address:

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