集芯微电子
Gisemi Microelectronics

2.4G Module

G01-SPIPX-N User Manual

Based on Si24R1，2.4G，160W，IPEX antenna RF transceiver module

A. Product Overview

G01-SPIPX-N is a 160mW industrial wireless data transceiver with high speed and high stability, operates at ISM band 2.4GHz. The module uses original Si24R1. It comes with high-performance IPEX antenna and accurate impedance matching. The module is equipped with a shielding cover to effectively enhance the anti-interference capability. It features enough power, good spectral properties, small harmonic wave, small cross talk, and super small volume. Some of the devices meet military grade standard.

B. Product Features

- Comes with IPEX antenna, transmission distance up to 2.0km[1]
- Super low power consumption, the lowest power consumption is about 2uA
- Operation frequency 2.4-2.4835GHz channels
  - ➢Frequency adjustable,1MHz stepping
  - ➢GFSK modulation
- 3 FIFO levels
  - ➢Transmission length:1-32 bytes each data packet
  - ➢Receiving length: 1-32 bytes each data packet
  - ➢Automatically resend mechanism
  - ➢Support data transmission of 6 channels
- Communication interface
  - ➢Hardware SPI interface of 4-Pin
  - ➢4Mbps data speed is recommended, Max speed is up to 10Mbps.
- Multiple levels of wireless data rate
  - ➢3 levels of wireless data rate are optional: [2] 250Kbps, 1Mbps
- 4 operation modes [4]
  - ➢Power down
  - ➢Standby
  - ➢Send
  - ➢Receive
- Supply voltage range
  - ➢2.0V-3.6VDC
- Receiving sensibility
  - ➢-99dBm (data speed 1Mbps)
  - ➢-108dBm (data speed 250Kbps)
- Ultra-small volume, SMD package
  - ➢13 * 19mm
  - ➢Module weight is about 0.5g
- Ultra-small volume, in-line package
  - ➢12 * 19mm
  - ➢Module weight is about 3.5g

Remarks:

1. Open, sunny, no obstacles; The max power, height 2m, data speed 250Kbps
2. The airspeed is higher, the distance is closer. The wireless data rate is lower, the distance is longer.
3. For transmitting power, please see chip manual of Si24R1
4. For four operation modes, please see chip manual Si24R1
5. Voltage higher than 3.6V will damage the module permanently

C. Series products

Model number	Carrier frequency(Hz)	IC	Package	Size(mm)	Range(km)	Antenna type	
G01-S	2.4G~2.4835G	Si24R1	SMD	12 * 19	0.15	PCB	
G01-D	2.4G~2.4835G	Si24R1	DIP	12.5 * 22	0.15	PCB	
G01-IPX	2.4G~2.4835G	Si24R1	SMD	12 * 19	0.15	PCB	
G01-DP3	2.4G~2.4835G	Si24R1 +PA	DIP	15 * 27	2.0	SMA-K	
G01-DP5	2.4G~2.4835G	Si24R1 +PA	DIP	18 * 33.3	2.0	SMA-K	
* Above model numbers of the G01 series can communicate with each other. *							

D. Electrical Parameters

Test condition: Tc = 25℃，VCC = 3.3V

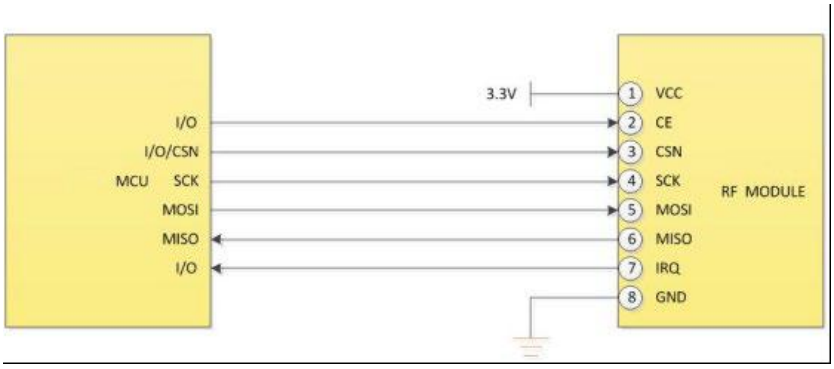
Parameter	Parameter name	Description	Min. value	Typic	Max. value	Unit
Voltage	Supply[1]		2.0		3.6	VDC
	Communication level	The communication level is generally smaller than the supply voltage, and VCC in 0.7*VCC refers to the supply voltage.	0.3*VCC		0.7*VCC	V
Current	Transmitting current[2]			210		mA
	Receiving current	CE=1		28		mA
	Turn off current	Set Si24R1 as power down mode, CE is low level.		2		uA
RF Parameters	Operating frequency	Adjustable, 1MHz stepping	2.4		2.525	GHz
	Receiving sensitivity	-96dBm@250kbps, receive sensitivity is detailed in the chip manual		-108		dBm
	Wireless data rate	3 data rate are available（250Kbps、1Mbps）	250K	250K	1M	bps
Operation Environment	Operating temperature	Industrial grade	-40		+85	℃
	Operating humidity	Relative humidity, no condensation	10%		90%	
	Storage temperature		-40		+125	℃

Remarks:

1. Voltage higher than 3.6V will damage the module. The lower the voltage, the lower the transmission power.
2. Power supply capability must be greater than 30mA.

E. Module Functions

5.1 Recommended Connection Diagram



5-1 connectivity diagram

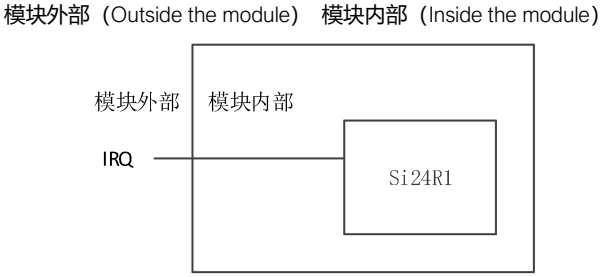
1. High level CE is valid. When the module writes the register, it must first be set to power-down mode. It is recommended to connect CE to the IO port of the micro-controller.
2. IRQ is recommended to connect the external interrupt of the micro-controller. Alternatively, the SPI query mode can be used to obtain the interrupt status.
3. The Si24R1 technical manual requires that the high-level time of the CE pin is greater than 10us to start data transmission. However, to make the same code compatible with our G01 series modules with PA and LNA, it is recommended to change CE to high level after setting the SPI operation. After the completion of the transmission, continue to maintain a high level of 1ms, and then lower the CE.

5.2 Pin Definition

Pin No.	Pin Name	Pin Direction	Pin Description
1	VCC		Power supply，range1.9~3.6V, recommend 3.3V，it is recommended to add ceramic filter capacitors externally.
2	CE	input	Module control pin, please see Si24R1 datasheet for details
3	CSN	input	Module chip select pin, used to start an SPI communication
4	SCK	input	Module SPI bus clock
5	MOSI	input	Module SPI data input pin
6	MISO	output	Module SPI data output pin
7	IRQ	output	Module interrupt signal output, valid in low communication level
8	GND		Ground, connect to power reference ground
* See the Si24R1 data sheet for pin definitions, software drivers, and communication protocols of the module. *			

5.3 Pin Function

Function of IRQ Pin



Picture 5-2 IRQ Local Connection Diagram

IRQ is an interrupt mapping pin, which is active at low level. Refer to the Si24R1 chip manual for the specific interrupt signal it represents.

CE pin function

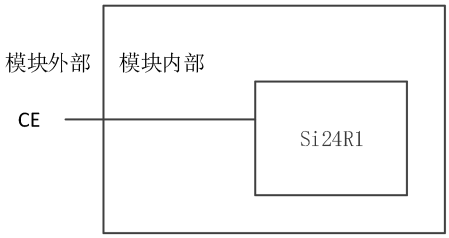
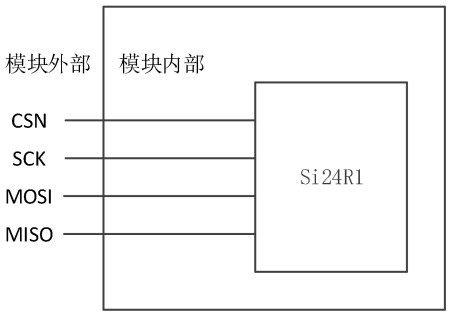


Figure 5-3 CE pin local connection diagram

The module control pin, the module's transmit mode (TXD) and receive mode (RXD) are determined by this pin. See the Si24R1 chip manual for details.

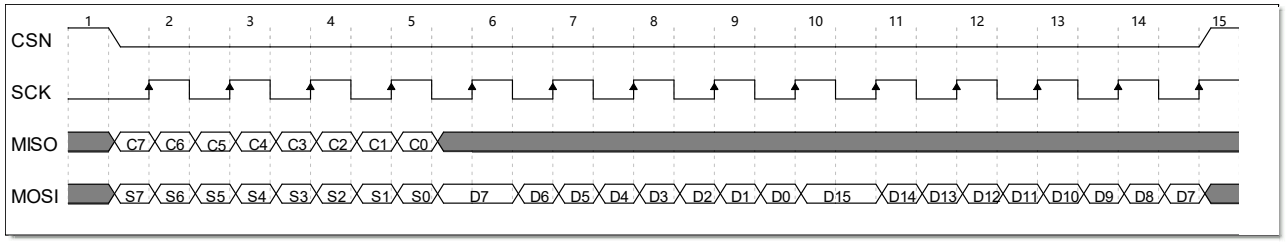
Function of SPI pin



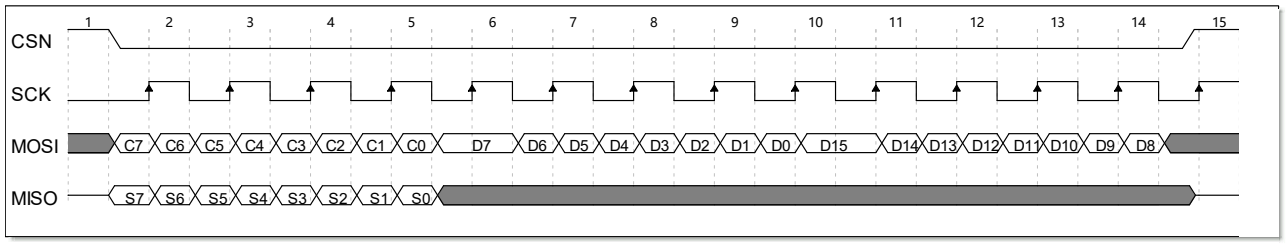
Picture 5-4 SPI local connection diagram

The SPI sequence diagram is as follows:

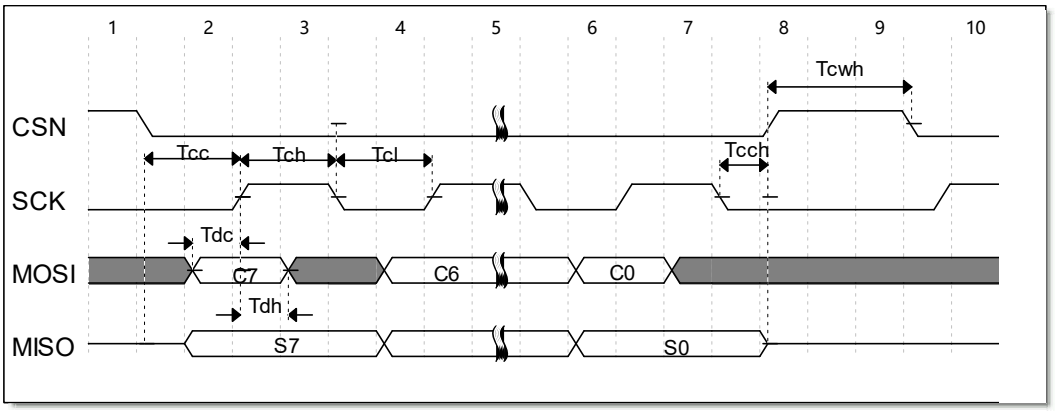
Abbr	Description
Cn	SPI command bit
Sn	Status register bit
Dn	Data bit



Picture 5-5 Sequence diagram of SPI read operation



Picture 5-6 Sequence diagram of SPI write operation

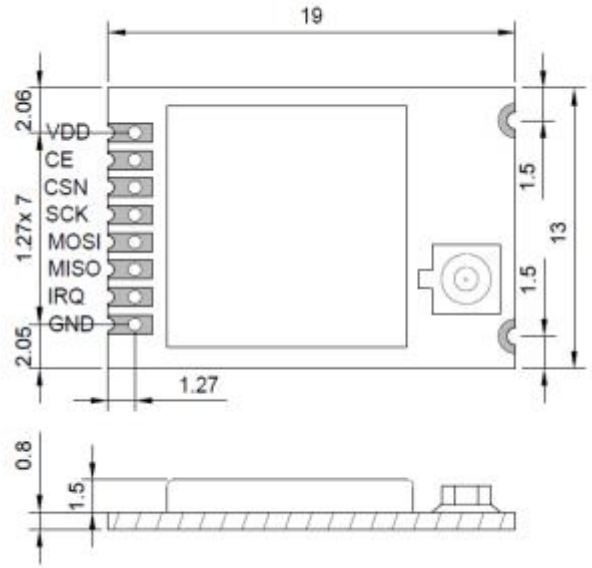


Picture 5-7 SPI sequence diagram of parameters

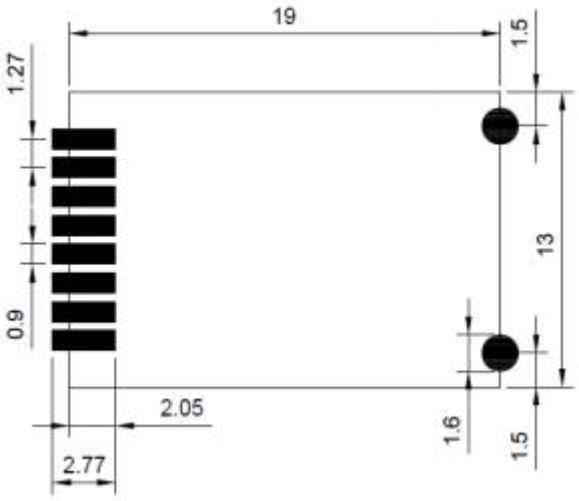
Parameters Symbols	Description	Min.	Max.	Unit
Tcc	Chip select clock setting	2		ns
Tch	Clock high level time	40		ns
Tcl	Clock low level time	40		ns
Tcch	The selection time lasts	2		ns
Tcwh	Chip selection idle time	50		ns
Tdc	Data initialization clock	2		ns
Tdh	Data duration	2		ns

F. Package Information

6.1 Overall dimension(unit：mm)

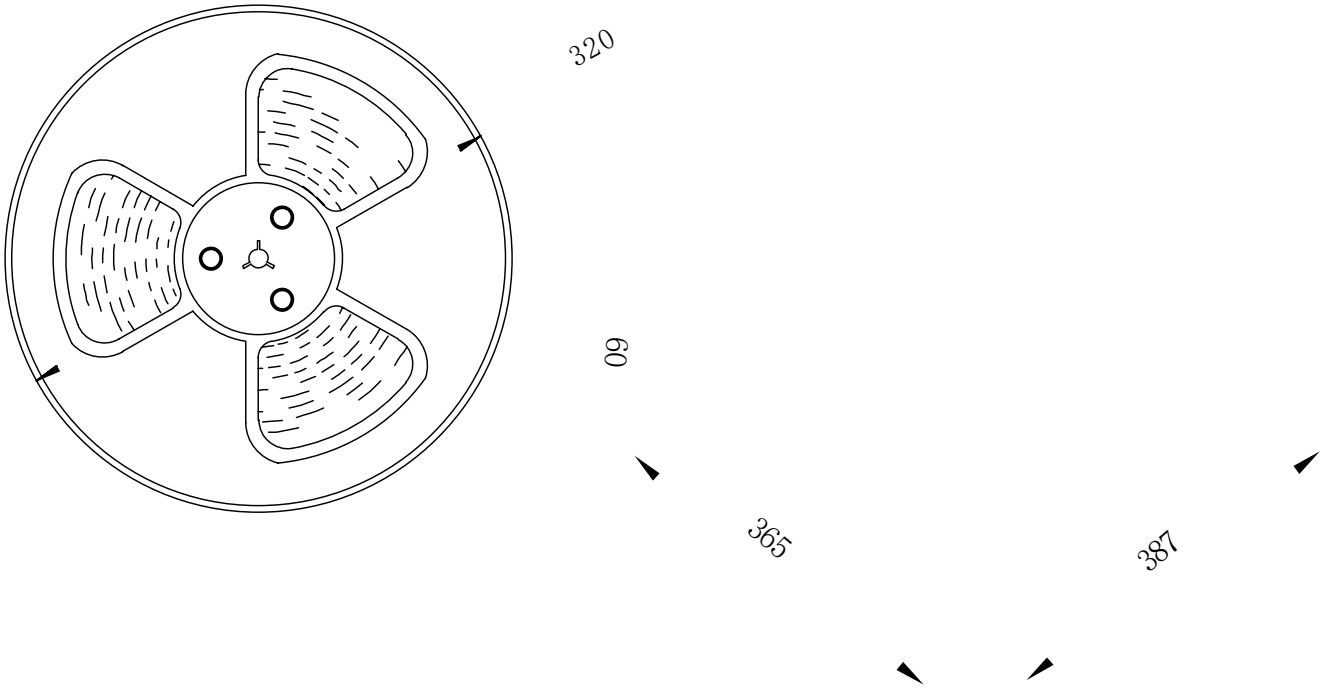


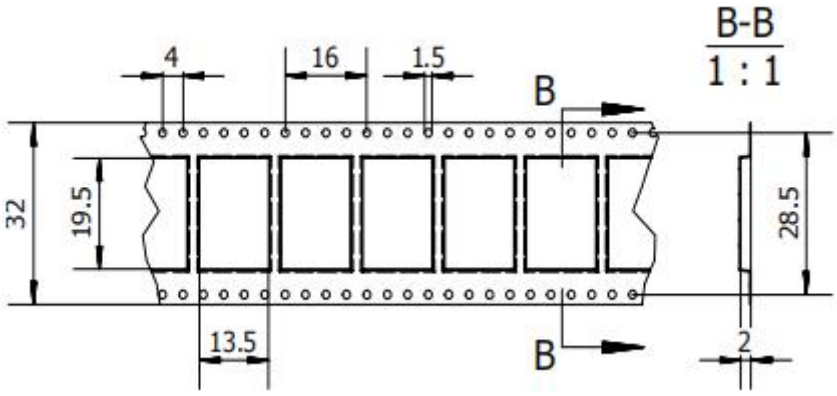
6.2 Reference Pad Design (unit：mm)



G. Package

7.1 Electrostatic Bag Package (unit: mm)





Important Remarks and Disclaimers

As the hardware and software of the product continue to improve, this manual may be subject to change, and the final version of the manual shall prevail.

Users of this product need to pay attention to the product dynamics on the official website, so that users can get the latest information of this product in time.

The pictures and diagrams used in this manual to explain the functions of this product are for reference only.

The measured data in this specification are all measured by our company at room temperature for reference only. Please refer to the actual measurement for details.

Chengdu Gisemi Electronics Co., Ltd. reserves the right of final interpretation and modification of all contents in this manual.

FCC Statement

This device complies with part 15 of the FCC rules. Operation is subject to the following two conditions: (1) thi s device may not cause harmful interference, and (2) this device must accept any interference received, incl uding interference that may cause undesired operation.

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, pursua nt to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful inte rference in a residential installation. This equipment generates uses and can radiate radio frequency energy a nd, if not installed and used in accordance with the instructions, may cause harmful interference to radio com munications. 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 turn ing 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 important announcement

Important Note:

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 and your body.

This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter. Country Code selection feature to be disabled for products marketed to the US/ Canada.

This device is intended only for OEM integrators under the following conditions:

1.The antenna must be installed such that 20cm is maintained between the antenna and users, and

2.The transmitter module may not be co-located with any other transmitter or antenna,

Important Note:
In the event that these conditions cannot be met (for example certain laptop configurations or co -location with another transmitter), then the FCC authorization is no longer considered valid and the FCC ID 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 FCC authorization.

End Product Labeling
The final end product must be labeled in a visible area with the following" Contains FCC ID: 2ANIV-G01"

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

2.2List of applicable FCC rules

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

2.3Specific 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.

2.4Limited module procedures
Not applicable

2.5Trace antenna designs
Not applicable

2.6RF exposure considerations

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.

2.7Antennas
This radio transmitter FCC ID:2ANIV-G01 has been approved by Federal Communications 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 No.	Model No. of antenna:	Type of antenna and Gain of the antenna (Max.)	Frequency range:
2.4G Antenna	/	FPC Antenna , 0.71dBi(Max.)	2400MHz-2500MHz

2.8Label and compliance information
The final end product must be labeled in a visible area with the following" Contains FCC ID:2ANIV-G01".

2.9Information on test modes and additional testing requirements
Host manufacturer which install this modular with single modular approval should perform the test of radiated emission and spurious emission according to FCC part 15C:15.247 and 15.209 requirement, only if the test result comply with FCC part 15.247 and 15.209 requirement, then the host can be sold legally.

2.10Additional 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 Statement

English: This device complies with Industry Canada license - exempt RSS standard(s). Operation is subject to the following two conditions: (1) This device may not cause interference, a nd (2) This device must accept any interference, including interference that may cause undesired operation of the device.

The digital apparatus complies with Canadian CAN ICES - 3 (B)/NMB - 3(B).

- French: Le présentappareilestconforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitationestautorisée aux deux conditions suivantes: (1) l'appareil ne doit pas produire de brouillage, et (2) l'utilisateur de l'appareildoit accepter tout brouillageradi oélectriquesubi, mêmesi le brouillageest susceptible d'encompromettre le fonctionnement.

l'appareil numérique du ciem conforme canadien peut - 3 (b) / nmb - 3 (b).

This device meets the exemption from the routine evaluation limits in section 2.5 of RSS 102 and compliance with RSS 102 RF exposure, users can obtain Canadian information on RF exposure and compliance.

cet appareil est conforme à l'exemption des limites d'évaluation courante dans la section 2.5 du cnr - 102 et conformité avec rss 102 de l'exposition aux rf, les utilisateurs peuvent obtenir des données canadiennes sur l'exposition aux champs rf et la conformité.

This equipment complies with Canada radiation exposure limits set forth for an uncontrolled environment.

Cet équipement est conforme Canada limites d'exposition aux radiations dans un environnement non contrôlé.

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

Cet équipementdoit être installé et utilisé à une distance minimale de 20 cm entre le radiateur et votre corps.

Note Importante:

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.

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.

End Product Labeling

The final end product must be labeled in a visible area with the following: Contains IC: 22889-G01

Plaque signalétique du produit final

Le produit final doit être étiqueté dans un endroit visible avec l'inscription suivante: Contient des IC: 22889-G01

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.