SPSGPE

Sub1GHz (433 or 868 or 915 MHz) programmable transceiver module

Preliminary Datasheet

Features

- LGA-SMT module
- Complete RF-ready module based on:
  - SPIRIT1 low data rate, low power sub-GHz transceiver by ST Microelectronics
  - STM32L151RDY6 Ultra low power ARM-based 32-bit microcontroller by ST Microelectronics with 32 MHz CPU, 384 KB Flash Memory and 48 KB RAM
  - Embedded balun and filtering network.
- Compact size: 27.15 mm x 16 mm x 2.5 mm
- Operating on ETSI band 433.05 MHz to 434.79 MHz (SPSGPE-433)
- Operating on ETSI bands 868 MHz to 868.6 MHz and 869.4 MHz to 869.65 MHz (SPSGPE-868),
- Operating on FCC band is configured by uploading the relevant application firmware image (see section 0) band 902.0 MHz to 928.0 MHz (SPSGPE-915).
- Operating from a single 1.9 V to 3.6 V supply
- Output power up to +10.5 dBm (SPSGPE-868/SPSGPE-915) and up to +10 dBm (SPSGPE-433)
- Data rates up to 50 kbps
- Modulation scheme GFSK
- Operating temperature range: -40°C to +85°C
- UART and USB interface with AT command set.

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1 Description

SPSGPE is a hardware LGA-SMT module for easy development of high performance wireless network applications for a wide range of applications.

Compact-sized, low power and fully integrated, SPSGPE is available in 3 versions:

- SPSGPE-433 operating on ETSI 433 MHz band
- SPSGPE-868 operating on ETSI 868 MHz band
- SPSGPE-915 operating FCC 915 MHz band.

All versions have the same pin-out and mechanical shape.

SPSGPE is based on SPIRIT1 RF sub-GHz transceiver (with integrated SMPS) and STM32L151RDY6 microcontroller by ST Microelectronics. Balun and filtering network are embedded in the module. An external antenna can be connected through one pin of the module which requires an impedance-controlled track of 50 Ω. The UART host interface and USB device interface allow simple connection to an external microcontroller with a standard firmware or a host computer, enabling AT commands to facilitate RF configuration, data transmission and reception, using simple point-to-point communication. Selected STM32L1 GPIO and peripherals are available to interface external devices and enable user applications. Advanced features of SPIRIT1 radio are also accessible.

SPSGPE is designed and engineered to build OEM solutions and applications primarily in the following domains:

- Internet of Things (IoT) and Machine-to-Machine (M2M);
- Smart Cities;
- Smart Grids and Energy Management;
- Home & Building Automation;
- Wireless Sensor Networks;
- Data acquisition equipment management;
- Industrial condition and asset monitoring.

2   Hardware specifications

Unless otherwise specified, typical data are based on T_A = 25 °C, V_{DD} = 3.3 V.

2.1 Recommended operating conditions

Symbol	Parameter	Min.	Typ.	Max.	Unit
T_A	Operating ambient temperature range	-40	-	+85	°C
V_{DD}	Operating supply voltage [1]	1.9	3.3	3.6	V
FREQ	RF frequency 1 for SPSGPE-433	433.05	-	434.79	MHz
FREQ	RF frequency 1 in ETSI band for SPSGPE-868	868	-	868.6	MHz
FREQ	RF frequency 2 in ETSI band for SPSGPE-868	869.4	-	869.65	MHz
FREQ	RF frequency 1 in FCC band for SPSGPE-915	902.0	-	928.0	MHz

(1) USB is not functional below V_{DD}=2.0V. Should be USB compliant from I/O voltage standpoint, the minimum V_{DD} is 3.0 V. For further details, please refer to STM32L151RDY6 datasheet.

Table 1. Recommended operating conditions.

2.2 Absolute maximum ratings

Symbol	Parameter	Min.	Typ.	Max.	Unit
T_{STG}	Storage temperature range	-40	-	+85	°C
V_{DD}	Operating supply voltage	-0.3	-	3.9	V
V_{IO}	I/O pin voltage	-0.3	-	5.5	V

Table 2. Absolute maximum ratings.

2.3 I/O operating specifications

Symbol	Parameter	Min.	Typ.	Max.	Unit
V_{IL}[1]	I/O input low level voltage	-0.3	-	0.3 V_{DD}	V
V_{IH}[1]	I/O input high level voltage	0.7 V_{IN}	-	V_{DD}+0.3	V

(1) For further details, please refer to STM32L151RDY6 datasheet, I/O port features.

Table 3. I/O operating specificat

2.4 Current consumption

Symbol	Parameter	Test conditions	Typ.	Unit
I_{DD}	Supply current	Operating mode TX, +11 dBm, freq. 868MHz	27	mA
I_{DD}	Supply current	Operating mode TX, +10.5 dBm, freq. 915MHz	39	mA
I_{DD}	Supply current	Operating mode TX, +10 dBm, freq. 433MHz	24	mA
I_{DD}	Supply current	Operating mode RX, freq. 868MHz	19	mA
I_{DD}	Supply current	Operating mode RX, freq. 915MHz	28	mA
I_{DD}	Supply current	Operating mode RX, freq. 433MHz	18	mA
I_{DD}	Supply current	Stand-by (Radio off, STM32L151RDY6 in Stop mode with RTC)	5	µA

Table 4. Current consumption.

2.5 RF compliance limits

RF compliance limits for CE and FCC certifications, referring to factory loaded firmware. If applying a custom firmware, please ensure these limits are not exceeded, voiding CE and FCC certifications.

Standards	Parameter	Max.	Unit
FCC Part 15.207 [1] FCC Part 15.247 [1] EN 300 220-2 V2.4.1 [2] EN 301 489-01 V1.9.2 [2] EN 301 489-03 V1.4.1 [2]	Data rate	50	kbps
	Output power (ETSI 868 MHz and FCC 915 MHz band)	+10.5	dbm
	Output power (ETSI 433 MHz band)	+10	
	Modulation	GFSK	

(1) FCC standards are only applicable to SPSGPE-915 operating in the FCC 915 MHz band

(2) EN standards are only applicable to SPSGPE-433 and SPSGPE-868 operating in the ETSI 433MHz and ETSI 868MHz respectively.

Table 5. RF compliance limits.

2.6 RF sensitivity data

RF sensitivity data for all the versions of SPSGPE are reported in Table 6.

| Parameter	SPSGPE version	Test conditions	Typ.	Unit
Sensitivity (1% BER)	SPSGPE-433	FREQ = 434 MHz, Data Rate = 50 kbps (25 kHz dev. CH Filter=125kHz), VDD = 3.3 V, TA = 25°C Spirit1 SMPS enabled	-98	dBm
Sensitivity (1% BER)	SPSGPE-868	FREQ = 868 MHz, Data Rate = 50 kbps (25 kHz dev. CH Filter=125kHz), VDD = 3.3 V, TA = 25°C Spirit1 SMPS enabled	-104	dBm
Sensitivity (1% BER)	SPSGPE-915	FREQ = 915 MHz, Data Rate = 50 kbps (25 kHz dev. CH Filter=125kHz), VDD = 3.3 V, TA = 25°C Spirit1 SMPS enabled	-105	dBm

Table 6 RF sensitivity data.

2.7 Pin assignment

Pin	Name	Type	Description	STM32L151RDY6 pin[1]
TP1	I2C1_SCL[4]	I/O	I^{2}C clock[3] or general purpose input/output	PB8
TP2	SWDIO	I/O	Serial wire I/O[2]	PA13
TP3	GPIO_11	I/O	General purpose input/output	PB7
TP4	GPIO_12	I/O	General purpose input/output	PC12
TP5	GPIO_13	I/O	General purpose input/output	PA15
TP6	RESET	I	Reset input, active low, internal pull-up	NRST
TP9	I2C1_SDA[4]	I/O	I^{2}C data in/out[3] or general purpose input/output	PB9
TP10	STAT_LED	O	Status indicator LED	PB6
TP11	USB_DEV_CONN	I	Pull high, if USB is used/connected, pull low, if USB is not used/connected	PB5
TP12	GPIO_8	I/O	General purpose input/output	PB4
TP13	GPIO_10	I/O	General purpose input/output	PB3
TP14	PWR_MON	O	Power ON monitor, goes high if the module is powered on, goes low if the module is not powered	PC11
TP15	GPIO_14	I/O	General purpose input/output	PD2
TP16	SWCLK	I	Serial wire clock[2]	PA14
TP17	GND	Power	Ground	-
TP18	USB_P / RTS	I/O	USB DATA- or Request to send signal from DTE, depending on firmware configuration	PA12
TP19	USB_N / CTS	I/O	USB DATA+ or Clear to send signal to DTE, depending on firmware configuration	PA11
TP20	UART2_RX	I	Serial data input from DTE	PA10
TP21	UART2_TX	O	Serial data output to DTE	PA9
TP22	GPIO_9	I/O	General purpose input/output	PC6
TP23	SPI_MISO[4]	I/O	SPI MISO or general purpose input/output	PB14
TP24	SPI_MOSI[4]	I/O	SPI MOSI or general purpose input/output	PB15
TP25	RI	O	Ring indicator to DTE	PB12
TP26	SPI_CLK[4]	I/O	SPI clock or general purpose input/output	PB13
TP27	VDD	Power	Supply input voltage	-
TP28	DTR	I	Data terminal ready from DTE	PB2
TP29	TX_AUX	O	Auxiliary serial data output for debug/test	PB10
TP30	ADC_01	I/O	ADC input or general purpose input/output	PB0
TP31	GPIO_6	I/O	General purpose input/output	PC5
TP32	GPIO_5	I/O	General purpose input/output	PC4
TP33	ON/OFF	I	Input for switching ON or OFF the module	PA0
TP34	UART1_RX	I/O	Serial data input	PA3
TP35	UART1_TX	I/O	Serial data output	PA2
TP36	ALARM/GPIO_1	I/O	Alarm output or general purpose input/output	PCO
TP37	GPIO_4	I/O	General purpose input/output	PC3
TP38	GPIO_2/RF_TX_MON	O	RF transmitter ON monitor or general purpose input/output	PC1
TP39	RX_AUX	I	Auxiliary serial data input for debug/test	PB11
TP40	ADC_01	I/O	ADC input or general purpose input/output	PB1
TP41	RESERVED	-	Must be left unconnected (for future uses)	PA8
TP42	GPIO_7	I/O	General purpose input/output	PA1

TP43	GPIO_3	I/O	General purpose input/output	PC2
TP44	GND	Power	Ground	-
TP45	ANT	I/O	Connection pin for external antenna (50 Ω)	-
TP46	GND	Power	Ground	-

Table 7. Pin assignment.

 (1) For further details, please refer to STM32L151RDY6 datasheet, Pin descriptions section.

(2) Do not use SWD interface for any reason, unless to intentionally erase module flash memory and install a different firmware image. Any attempt to use SWD interface will force an immediate flash memory full erase, leaving SPSGPE in a clean state. Please notice that "FW Copy Protection Level 1" of STM32L151RDY6 microcontroller is activated.

(3) For I^2C operation at 100 kHz an external pull-up resistor of 4.7 kΩ needs to be used. For I^2C operation at 400 kHz an external pull-up resistor of 4.7 kΩ needs to be used.

(4) Pin may be configured either as the function indicated in the pin name, or as general purpose input/output.

2.8 Pin placement
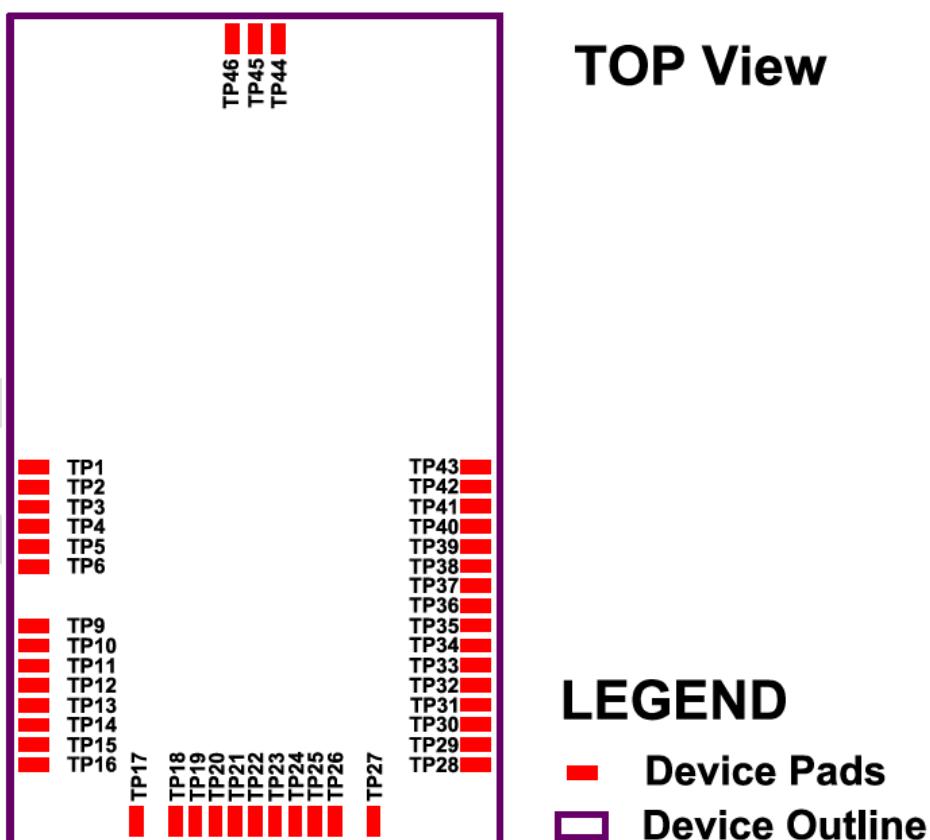
Figure 1. Pin placement (top view of LGA pads placed on bottom side).

2.9 Memory resources

Memory resources available in the STM32L151RDY6 microcontroller unit adopted in all SPSGPE versions are listed in Table 8. For further details, please refer to STM32L151RDY6 microcontroller unit datasheet and user manual, and SPSGPE user manual.

Item	Value
Flash Memory[1]	384 kByte
RAM	48 kByte
I/O[2]	39 channels

Table 8. Memory resources.

(1) Amount of Flash memory available without any firmware installed on SPSGPE. To calculate the amount of available Flash memory with SPSGPE firmware, please refer to SPSGPE software user manual. For further details, please refer to STM32L151RDY6 datasheet.
(2) The number of available I/O channels may change depending on actual hardware configuration. For further details, please refer to par. 0and 0.

2.10 Hardware block diagram
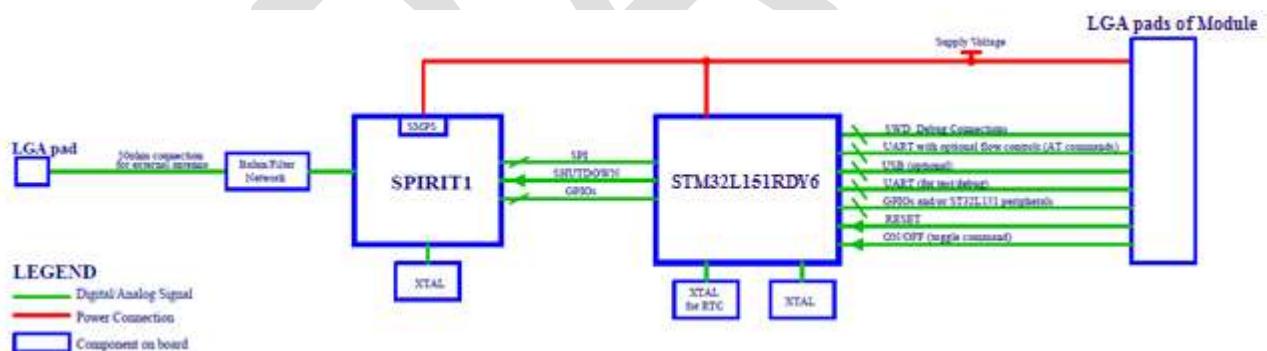
Figure 1. Hardware block diagram

3 Hardware design

3.1 Pin usage

If used with default firmware and interfaced to a host microcontroller unit, SPSGPE requires minimum power, ground and UART to transmit and receive signals, that is to be connected. Other signals are optional and provide additional functionality. Unused signals must be left unconnected.

In case the module is connected to a host microcontroller unit, SPSGPE pins requiring connections are outlined in Table 9.

Pin	Name	Description	Optional
TP27	VDD	Supply input voltage	No
TP17			
TP44	GND	Ground	No
TP46			
TP21	UART2_TX	Serial data output to DTE	No
TP20	UART2_RX	Serial data input from DTE	No
TP18	USB_P / RTS	Request to send signal from DTE, if used. If flow controls are not used, this pin must be connected to GND. It could be left floating, if USB is supported by firmware.	Yes
TP33	ON/OFF	Input for switching ON or OFF the module[1] (toggle command)	Yes
TP6	RESET	Reset input, active low, internal pull-up[1]	No
TP45	ANT	Connection pin for external antenna (50 Ω)	No

(1) Open drain connection is required.

Table 9. SPSGPE pins requiring connections, when the module is connected to a host microcontroller unit.

In another typical application circuit, SPSGPE is connected to a host computer through a standard USB connector. In this case, module pins requiring connections are listed in Table 10.

Pin	Name	Description	Optional
TP27	VDD	Supply input voltage	No
TP17			
TP44	GND	Ground	No
TP46			
TP18	USB_P / RTS	USB Data– (90 Ω differential)	No
TP19	USB_N / CTS	USB Data+ (90 Ω differential)	No
TP11	USB_DEV_CONN	Input for detecting the connection to the USB cable. Pull it high when USB cable is connected.	No
TP33	ON/OFF	Input for switching module ON or OFF (toggle command)	Yes
TP6	RESET	Reset input, active low, internal pull-up	No
TP45	ANT	Connection pin for external antenna (50 Ω)	No

Table 10. SPSGPE pins requiring connections, when the module is connected to a host computer via USB.

3.2 Typical application circuits

In a typical application circuit, SPSGPE is connected to a host microcontroller unit through a standard UART to transmit and receive signals. This application is pictured in Figure 2.
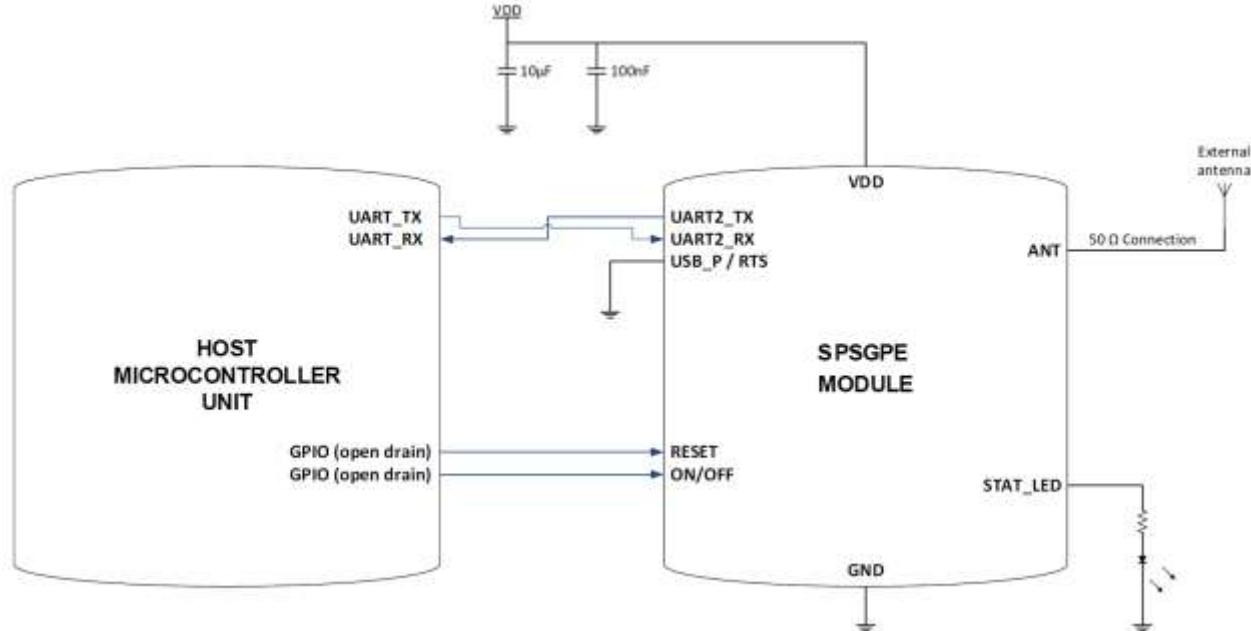
Figure 2. Typical application circuit of SPSGPE connected to a host microcontroller.

Please notice that "USB / RTS" could be left floating if USB is supported by firmware.

In another typical application circuit, SPSGPE is connected to a host computer through a standard USB connector. This application is pictured in Figure 3.
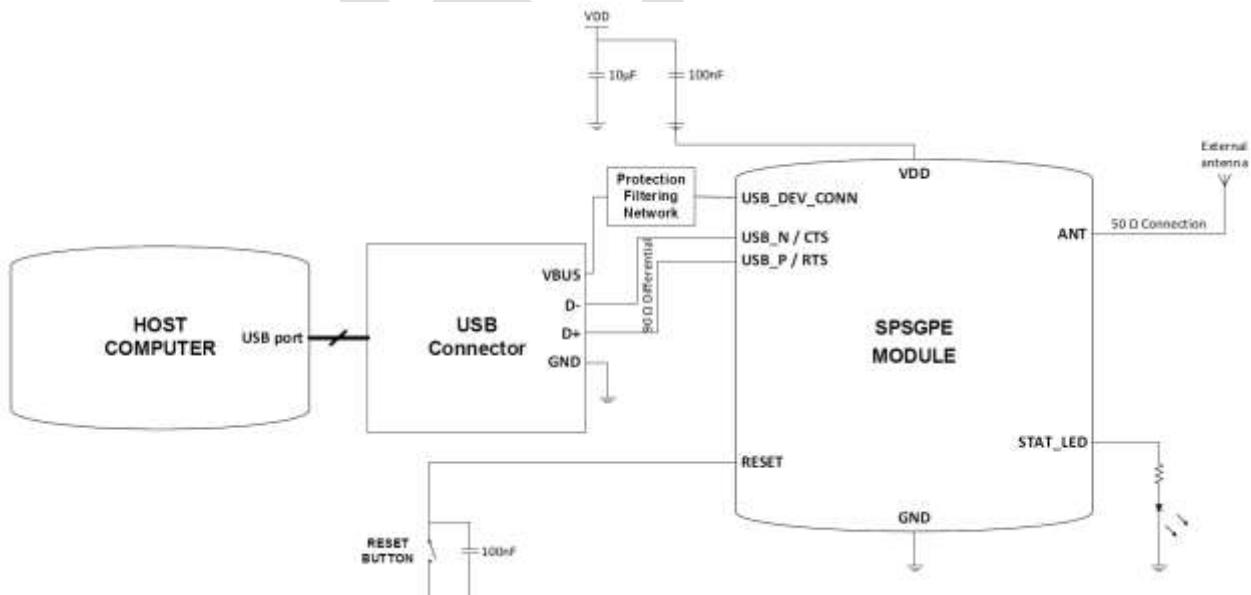
Figure 3. Typical application circuit of SPSGPE connected to a host computer via USB.

NOTE: when using the SPSGPE in a USB self-powered application, USB back-voltage test requirement must be met (i.e. a maximum of 400 mV may be measured on the VBUS, D+, or D- when the device is not plugged into a USB port). For this purposes, SPSGPE requires to receive on the pin USB_DEV_CONN a signal indicating, when set at high logical level, that the VBUS is detected in order to properly control the internal pull-up resistor connected to D+ line available internally to the STM32L151RDY6. For further details, please refer to STM32L151RDY6 datasheet.

Special features are enabled by the following pins:

- STAT_LED (pin TP10): output to drive an external LED and indicated status of SPSGPE connections. If this pin is used as output to an external LED, possible outputs are listed in Table 11.

LED Output	Description
Periodic single flashing with long ON time and short OFF time.	Application is waiting for commands from DTE.
Periodic single flashing with short ON time and long OFF time.	Application has started and SPSGPE is seeking for connection.
Periodic fast double flashing.	Application has started and SPSGPE is connected to a gateway.

Table 11. Outputs to external LED by pin STAT_LED (TP10).

- RESET (pin TP6): internal pulled-up signal for resetting SPSGPE. It has to be tied low for at least 100 ms and then released to perform SPSGPE unconditional hardware restart. Please notice that unconditional hardware restart must not be used during normal device operation, since it does not detach the device from the network. It shall be kept as emergency exit procedure in the rare case the module gets stacked waiting for network response. It is suggested to implement unconditional hardware restart (through a GPIO of the host microcontroller unit, to be configured as open drain or through a push button) on SPSGPE applications only as emergency exit procedure.
- ON/OFF (pin TP33): it performs the turning on/off procedure for SPSGPE when voltage supply at VDD (pin 27) stands within recommended operating range (please refer to Table 1). To start the turning off procedure when the module is turned on, the ON/OFF signal needs to be tied low for at least 2 seconds. Similarly, to start the turning on procedure when the module is turned off, the ON/OFF signal needs to be tied low for at least 2 seconds. The turning on/off procedure can also be performed via AT commands (please refer to SPSGPE software guide).
- PWR_MON (pin TP14): output signal indicating SPSGPE power status. It climbs high when SPSGPE is properly powered on, and it climbs down when SPSGPE is not powered.
- USB_DEV_CONN (pin TP11): input signal to detect USB cable connections. It has to be high when USB is connected, and low when USB is disconnected. Considering a 5 V tolerant pin, it is recommended to connect it to the VBUS pin of USB connector with proper protection and filtering network, adopting components like diode, ferrite bead and capacitors. If USB is used, UART interface to DTE is automatically disabled. To re-enable UART, this pin has to be tied low.

3.3 Layout guidelines

When adopting SPSGPE, please consider the following guidelines for a correct PCB design:

1. A minimum four-layer PCB is suggested.
2. At least one of the PCB layers should be used to implement a copper ground plane without cuts.
3. Copper planes and/or heavy traces are recommended to implement power supply connections.
4. Decoupling capacitors (recommended values are 100 nF and 10 µF in parallel) have to be placed very close to power supply pins.
5. Routing of traces (especially noisy and high frequency ones) across the power supply should be avoided.
6. The ANT pin (pin TP45) needs to be used for connecting the module to an external antenna. Its related RF ground is represented by pins TP44 and TP46. A trace having a controlled impedance of 50 Ω needs to be used to connect the ANT pin (pin TP45) to an external antenna (microstrip or grounded coplanar waveguide solutions of 50 Ω are suggested).
7. Routing of traces (especially noisy, high frequency and power supply ones) near or across the connection between the ANT pin (pin TP45) and the external antenna should be avoided.
8. Connection of all ground metallization and/or layers should have as many vias as possible. Number and density of these vias should be increased in the connection area between the ANT pin (pin TP45) and the external antenna.
9. A differential trace of 90 Ω needs to be used to connect pins TP18 and TP19 (USB_P / RTS and USB_N / CTS, respectively) to a USB connector, in case they are used as USB traces. It is also strongly recommended to follow all hardware and layout guidelines by USB standards.

An example of SPSGPE layout is pictured in
Figure *4*.
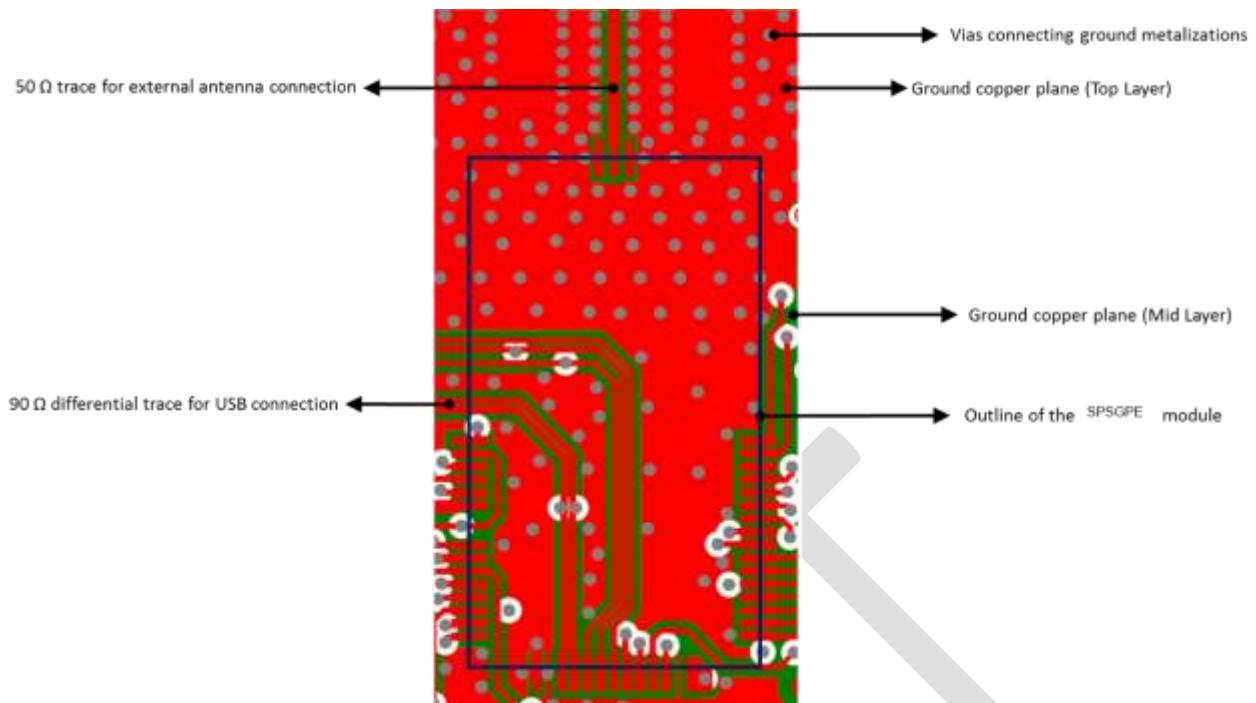
Figure 4. Example of SPSGPE layout.

Labels in figure:
- 50 Ω trace for external antenna connection
- 90 Ω differential trace for USB connection
- Vias connecting ground metalizations
- Ground copper plane (Top Layer)
- Ground copper plane (Mid Layer)
- Outline of the SPSGPE module

3.4 Recommended footprint
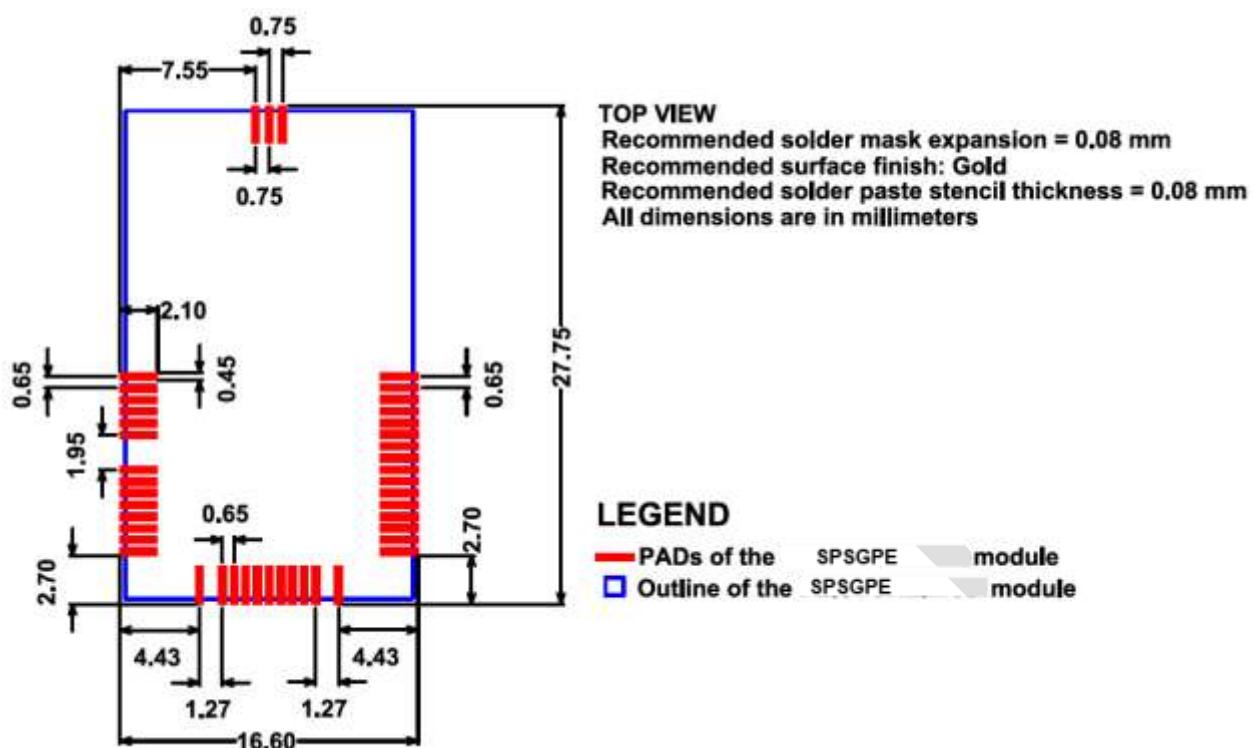
Figure 5. Recommended SPSGPE footprint.

All dimensions are in millimeters.

3.5 Module reflow installation

SPSGPE is a surface mount module supplied on a 46-pin, 6-layer PCB, with gold surface finish. Final assembly recommended reflow profile is outlined below, based on IPC/JEDEC JSTD-020C, July 2004 recommendations.

Profile feature	Lead-free assembly
Average ramp-up rate (T_{SMAX} to T_P)	1.7°C/sec max
Preheat:	
- Temperature min (T_S min.)	150°C
- Temperature max (T_S max.)	200°C
- Time (T_S min. to T_S max.) (t_S)	60-100 sec (suggested: 85 sec)
Time maintained above:	
- Temperature T_L	217 °C
- Temperature T_L	60-100 sec (suggested: 99 sec)
Peak temperature (T_P)	242 °C
Time within 5°C of actual peak temperature (T_P)	10-20 sec
Ramp-down rate	2°C/sec
Time from 25°C to peak temperature	8 minutes max.

Table 12. Soldering profile.
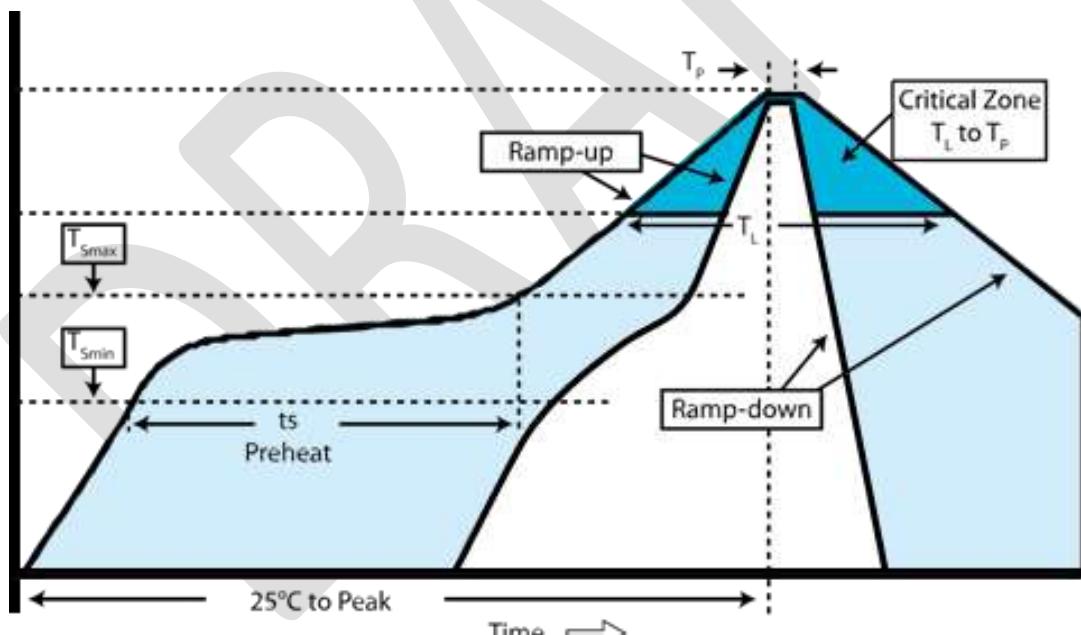
Figure 6. Soldering profile.

4 Module operation

SPSGPE software architecture is based on SPSGPE.OS operating system and provides a set of precompiled firmware libraries to manage module operation.

Two operational modes are supported:

- SPSGPE working as a "communication module", using AT/HDLC commands;
- SPSGPE working as a "standalone module", running embedded standalone application.

When using SPSGPE as a communication module, the module acts as a wireless RF module. SPSGPE.OS operating system handles SPSGPE internal transceiver and any external device connected to it, providing mesh routing connectivity. Thus, it allows to configure SPSGPE either as a node or as a gateway, enabling different application domains including and not limited to low-power applications.

This operational mode enables module configuration and status interrogation, and supports two different high-level communication interfaces: AT command set and HDLC command interface.

AT and HDLC command interfaces assume communications with an external host processor via USB and/or UART serial interfaces, in a scenario where SPSGPE acts as an RF modem device and the user application runs on the host processor.

The two types of command modes are briefly described below:

- AT command: it implements a set of AT commands compliant with Hayes standard AT command set and expanded through Paradox Engineering proprietary AT command set for special purposes.
- HDLC command: it offers a fast optimized binary HDLC protocol with a set of HDLC commands for managing and controlling SPSGPE.

When using SPSGPE as a standalone module, the user can develop its own application code and link it to SPSGPE.OS, or customize a standard SPSGPE application firmware image through the scripting tool. Once developed with the scripting tool, compiled script programs can be uploaded and executed under the control of SPSGPE Script Engine.

For further details about SPSGPE software architecture, command and operating modes, please refer to SPSGPE Application and Software – User Guide (document reference: tbd)

5 Package mechanical data
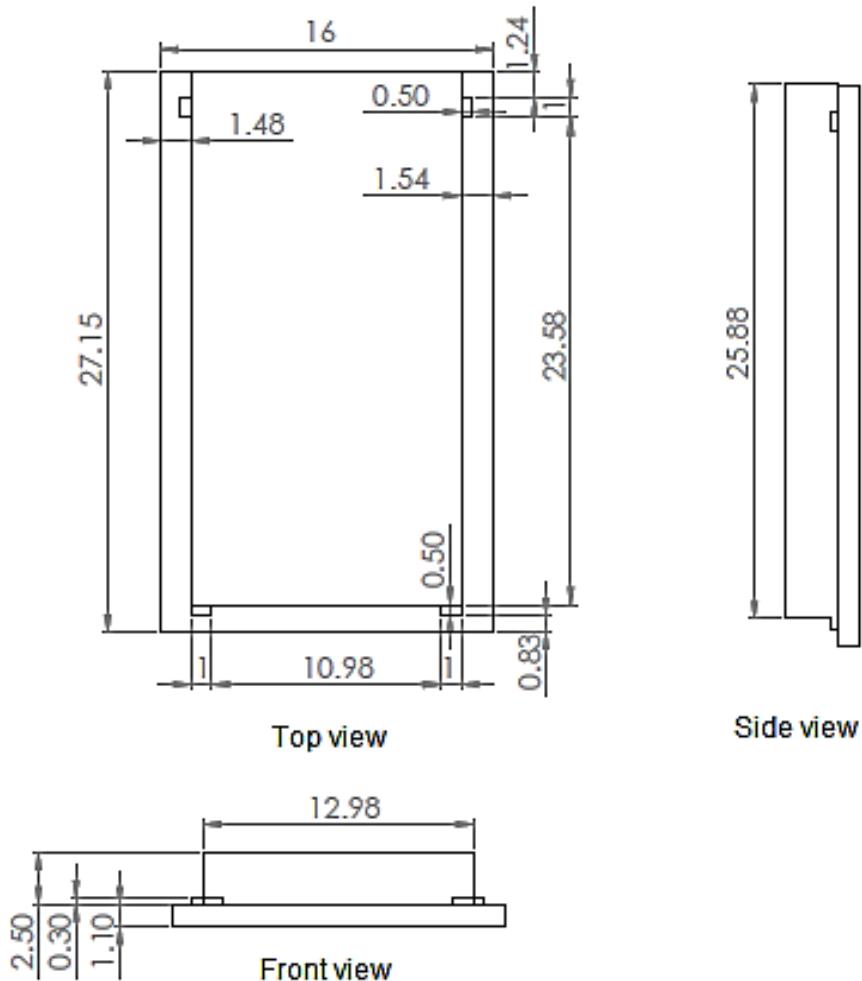
Figure 7. Package mechanical data.
All dimensions are in millimeters.

6 Regulatory compliance

NOTE: this section will be completed and confirmed after the certification process is done.

6.1 CE certification

SPSGPE-433 and SPSGPE-868 are certified in accordance with the following standards:

> EN 300 220-2 V2.4.1
> EN 301 489-01 V1.9.2
> EN 301 489-03 V1.6.1

Receiver category: Class 2 receiver.

6.2 FCC certification

SPSGPE-915 is certified in accordance with the following standards:

> FCC Part 15.207
> FCC Part 15.247

FCC ID: S9NSPSGPE

6.3 IC certification

SPSGPE-915 is certified in accordance with the following standards:
> RSS-247 Issue 1

IC ID: 8976C-SPSGPE

(Please, refer to Appendix A of this document for the French translation).

6.4 Labeling instructions

When integrating SPSGPE-915 into a finished product, the OEM must ensure that FCC labeling requirements are satisfied. A statement must be placed over the finished product to indicate it includes a certified module. The label should state the following (or similar wording that conveys the same meaning):

Contains FCC ID: S9NSPSGPE

OR

This product contains FCC ID: S9NSPSGPE

The OEM must place the following statements over the finished product unless it is too small (e.g. less than 4 x 4 inches):

> *This device complies with Part 15 of 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 any interference that may cause undesired operation.*

When integrating SPSGPE-915 into a finished product, the OEM must ensure that IC labeling requirements are satisfied. A statement must be placed over the finished product to indicate it includes a certified module. The label should state the following (or similar wording that conveys the same meaning):

Contains IC ID: 8976C-SPSGPE

OR

This product contains IC ID: 8976C-SPSGPE

The OEM must place the following statements over the finished product unless it is too small (e.g. less than 4 x 4 inches):

> *This device complies with RSS-247 of IC 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 any interference that may cause undesired operation.*

6.5 Product manual instructions

This paragraph applies to OEM finished products containing SPSGPE and subject to FCC compliance. The finished product manual must contain the following statement (or similar wording that conveys the same meaning):

> *WARNING: Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.*

In cases the OEM seeks Class B (residential) limits for the finished product, the following statement must be included in the finished product manual:

> *NOTE: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of 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 given instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur under certain circumstances. 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.*

In cases the OEM seeks Class A digital device category for the finished product, the following statement must be included in the finished product manual:

> *NOTE: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications.*
> *Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expenses.*

7 Ordering information

Product name	EAN code	Description
SPSGPE-433	tbd	Version operating on ETSI 433 MHz band (Region 1, Europe)
SPSGPE-868	tbd	Version operating on ETSI 868 MHz band (Region 1, Europe
SPSGPE-915	tbd	Version operating on FCC 915 MHz band (Region 2, The Americas)

Table 13. Ordering information.

Appendix A
Déclaration de conformité

A.1 Certification FCC

Le module SPSGPE-915 a été testé et déclaré conforme avec la section 15 de la Règlementation FCC. Ces limitations sont stipulées afin de procurer une protection raisonnable contre les interférences gênantes dans les installations approuvées. Cet appareil génère, utilise et diffuse des ondes radio et, s'il n'est pas installé et utilisé en conformité avec les instructions dont il fait l'objet, peut causer des interférences gênantes sur les communications radio.

Il n'y a cependant pas de garantie qu'une interférence ne se produira pas dans une installation particulière.

Cet appareil est en conformité avec la section 15 des règlements FCC. L'utilisation est soumise aux deux conditions suivantes: (1) cet appareil ne doit pas causer d'interférences nocives, et (2) Cet appareil doit supporter toute interférence reçue, y compris des interférences qui peuvent provoquer un fonctionnement non désiré.

Tout changement ou modification fait(e) à cet appareil et non expressément approuvé(e) par STMicroelectronics peut annuler l'autorisation pour l'utilisateur de faire fonctionner l'appareil.

Approbation du module

FCC ID: S9NSPSGPE

Conformément à la section 15 des règlements FCC, le module SPSGPE-915 est répertorié comme un dispositif émetteur modulaire.

Ce module n'est évalué que pour une utilisation autonome. Les produits finis incorporant plusieurs émetteurs doivent être conformes à la colocation et aux exigences d'exposition RF en concordance avec les procédures FCC multi-émetteurs. D'autres émetteurs fonctionnant dans des dispositifs portables exposés aux RF (par exemple, situés à moins de 20 cm des personnes avec dispositifs portatifs ou portés contre le corps) peuvent nécessiter d'une approbation séparée.

A.1.1 Instructions d'étiquetage

Lors de l'intégration du module SPSGPE-915 dans le produit final, le fabricant doit s'assurer que les exigences en matière d'étiquetage de la FCC sont satisfaites. Une déclaration doit être placée sur l'étiquette extérieure du produit final indiquant que le produit comprend un module certifié. L'étiquette doit comporter les informations suivantes (ou une mention analogue que recouvre la même notion):

Contient FCC ID: S9NSPSGPE

OU   Ce produit contient FCC ID: S9NSPSGPE

Le sous-traitant doit inclure les énoncés suivants sur l'étiquette extérieure du produit final à moins que le produit ne soit trop petit (par exemple moins de 4 x 4 pouces):

Cet appareil est en conformité avec la section 15 des règlements FCC. L'utilisation est soumise aux deux conditions suivantes:

(1) cet appareil ne doit pas causer d'interférences nocives, et

(2) Cet appareil doit supporter toute interférence reçue, y compris des interférences qui peuvent provoquer un fonctionnement non désiré.

A.1.2 Instructions pour l'utilisation du produit

La présente section concerne les produits finis contenant le module SPSGPE-915, assujettis aux normes FCC. Le manuel du produit final doit contenir la déclaration suivante (ou une mention analogue que recouvre la même notion):

" Avertissement: Les changements ou modifications non expressément approuvés par la partie responsable de la conformité pourraient annuler l'autorisation de l'utilisateur de faire fonctionner cet équipement. (Section 15.21)"

Dans le cas où le produit finis d'un fabriquant OEM rentre dans les limites de la Classe B (résidentiel), les énoncés suivants doivent être inclus dans le manuel du produit finis:

"Remarque : Cet équipement a été testé et déclaré conforme aux limitations prévues dans le cadre de la classe B des appareils numériques, définies par la section 15 du règlement de la FCC. Ces limites sont conçues pour fournir une protection raisonnable contre toute interférence dangereuse issue d'une installation résidentielle. Cet équipement produit, utilise et peut émettre de l'énergie radio électrique et, s'il n'est pas installé et utilisé conformément aux présentes instructions, peut causer des interférences nuisibles aux communications radio. Cependant, il se peut que des interférences se produisent dans une installation particulière. Si cet appareil cause des interférences nuisibles à la réception des signaux de radio ou de télévision, ce qui peut être déterminé en allumant et en éteignant l'appareil, on encourage l'utilisateur d'essayer de corriger ces interférences par l'un des moyens suivants:

- *Réorienter ou repositionner l'antenne de réception.*
- *Augmenter la distance séparant l'équipement du récepteur.*
- *Connecter l'équipement à une prise appartenant à un circuit différent de celui sur lequel le récepteur est connecté.*
- *Consulter le revendeur ou un technicien radio/TV expérimenté pour obtenir de l'aide."*

Dans le cas où le produit fini d'un sous-traitant rentre dans les limites imposées aux appareils numériques de classe A, les énoncés suivants doivent être inclus dans le manuel du produit finis:

"REMARQUE : Cet appareil a été testé et certifié conforme aux spécifications d'un appareil électronique de classe A (class A digital device), conformément à la partie 15 du règlement de la FCC. Ces contraintes sont destinées à fournir une protection raisonnable contre les interférences nuisibles quand l'appareil est utilisé dans une installation commerciale. Cet équipement produit, utilise et peut émettre de l'énergie radio électrique et, s'il n'est pas installé et utilisé conformément aux présentes instructions, peut causer des interférences nuisibles aux communications radio. L'utilisation de cet appareil dans une installation résidentielle peut entraîner des interférences nuisibles et l'utilisateur devra corriger les interférences à ses propres frais."

A.2 Certification IC [a]

Le module SPSGPE-915 a été testé et déclaré conforme avec la Règlementation IC CNR-210. Ces limitations sont stipulées afin de procurer une protection raisonnable contre les interférences gênantes en installations approuvées. Cet appareil génère, utilise et diffuse des ondes radio et, s'il n'est pas installé et utilisé en conformité avec les instructions dont il fait l'objet, peut causer des interférences gênantes sur les communications radio.

Il n'y a cependant pas de garantie qu'une interférence ne se produira pas dans une installation particulière.

Ce produit répond aux exigences de la norme CNR-210 d'Industrie Canada. Son fonctionnement est soumis aux deux conditions suivantes:
(1) cet appareil ne doit pas causer d'interférences nocives, et
(2) Cet appareil doit supporter toute interférence reçue, y compris des interférences qui peuvent provoquer un fonctionnement non désiré.

Tout changement ou modification fait(e) à cet appareil et non expressément approuvé(e) par STMicroelectronics peut annuler l'autorisation pour l'utilisateur de faire fonctionner l'appareil.

Approbation du module

IC: 8976C-SPSGPE

Conformément à IC CNR-210, le module SPSGPE-915 est répertorié comme un dispositif émetteur modulaire
Ce module n'est évalué que pour une utilisation autonome. Les produits finis incorporant plusieurs émetteurs doivent être conformes à la colocation et aux exigences d'exposition RF en concordance avec les procédures FCC multi-émetteurs. D'autres émetteurs fonctionnant dans des dispositifs portables exposés aux RF (par exemple, situés à moins de 20 cm des personnes avec dispositifs portatifs ou portés contre le corps) peuvent nécessiter d'une approbation séparée.

A.2.1 Instructions d'étiquetage

Lors de l'intégration du module SPSGPE-915 dans le produit final, le fabricant doit s'assurer que les exigences en matière d'étiquetage de la IC sont satisfaites. Une déclaration doit être placée sur l'étiquette extérieure du produit final indiquant que le produit comprend un module certifié. L'étiquette doit comporter les informations suivantes (ou une mention analogue que recouvre la même notion):

Contient IC ID: 8976C-SPSGPE

OU   Ce produit contient IC ID: 8976C-SPSGPE

Le sous-traitant doit inclure les énoncés suivants sur l'étiquette extérieure du produit final à moins que le produit ne soit trop petit (par exemple moins de 4 x 4 pouces):

Cet appareil est en conformité aux normes IC. L'utilisation est soumise aux deux conditions suivantes:
(1) cet appareil ne doit pas causer d'interférences nocives, et

(2) Cet appareil doit supporter toute interférence reçue, y compris des interférences qui peuvent provoquer un fonctionnement non désiré

A.2.2 Instructions pour l'utilisation du produit

La présente section concerne les produits finis contenant le module SPSGPE-915, assujettis aux normes IC. Le manuel du produit final doit contenir la déclaration suivante (ou une mention analogue que recouvre la même notion):

"Avertissement: Les changements ou modifications non expressément approuvés par la partie responsable de la conformité pourraient annuler l'autorisation de l'utilisateur de faire fonctionner cet équipement. (CNR-210)"

Dans le cas où le produit finis d'un fabriquant OEM rentre dans les limites de la Classe B (résidentiel), les énoncés suivants doivent être inclus dans le manuel du produit finis:

" Remarque : Cet équipement a été testé et déclaré conforme aux limitations prévues dans le cadre de la classe B des appareils numériques, définies par la norme CNR-210 d'Industrie Canada.

Ces limites sont conçues pour fournir une protection raisonnable contre toute interférence dangereuse issue d'une installation résidentielle. Cet équipement produit, utilise et peut émettre de l'énergie radio électrique et, s'il n'est pas installé et utilisé conformément aux présentes instructions, peut causer des interférences nuisibles aux communications radio. Cependant, il se peut que des interférences se produisent dans une installation particulière. Si cet appareil cause des interférences nuisibles à la réception des signaux de radio ou de télévision, ce qui peut être déterminé en allumant et en éteignant l'appareil, nous encourageons l'utilisateur à essayer de corriger ces interférences par l'un des moyens suivants:

- *Réorienter ou repositionner l'antenne de réception.*
- *Augmenter la distance séparant l'équipement du récepteur.*
- *Connecter l'équipement à une prise appartenant à un circuit différent de celui sur lequel le récepteur est connecté.*
- *Consulter le revendeur ou un technicien radio/TV expérimenté pour obtenir de l'aide."*

Dans le cas où le produit finis d'un fabriquant OEM rentre dans le cadre des limites imposées aux appareils numériques de classe A, les énoncés suivants doivent être inclus dans le manuel du produit finis:

" REMARQUE: Cet appareil a été testé et certifié conforme aux spécifications d'un appareil électronique de classe A (class A digital device), conformément à la norme CNR-210 d'Industrie Canada. Ces contraintes sont destinées à fournir une protection raisonnable contre les interférences nuisibles quand l'appareil est utilisé dans une installation commerciale. Cet équipement produit, utilise et peut émettre de l'énergie radio électrique et, s'il n'est pas installé et utilisé conformément aux présentes instructions, peut causer des interférences nuisibles aux communications radio. L'utilisation de cet appareil dans une installation résidentielle peut entraîner des interférences nuisibles et l'utilisateur devra corriger les interférences à ses propres frais."

A.3 Certification CE

Le module SPSGPE a obtenu une certification de conformité aux normes suivantes :

- – EN 300 328 V1.8.1 :2012
- – EN 300 328 V1.9.1 :2015
- – EN 301 489-17 V2.2.1 :2009
- – EN 301 489-1 V1.9.2:2011
- – EN 62479 :2010
- – EN60950-1:2006 + A11:2009 + A1:2010 + A12:2011 + A2 :2013

Le module est certifié CE.

Appendix 1   Document revision history

Date	Revision	Changes
2016-09-15	1.0	First release
2016-10-11	1.1	by A.R.
2017-02-16	1.2	By A.R.

Table 14. Document revision history

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