# NOTE D'ETUDE / *TECHNICAL DOCUMENT*

| REFERENCE | | | | ETUDE / *PROJECT* |
|---|---|---|---|---|
| **URD1 – OTL 5696.1–022/** | | | | **NOM DE L'ETUDE** |
| **72740** | Code | **C** | TA1 | **HILONC-3GPS** |

---

**TITRE / *TITLE* :**

<span style="color:red">**HILONC- 3GPS APPLICATION NOTE**</span>

---

| Edition | | Approbations /*Approvals* | | | | |
|---|---|---|---|---|---|---|
| **N°** **#** | **Nom** *Name* | **Rédacteur(s)** *Author(s)* | **Chef de projet** *Project design manager* | **Responsable d'entité /** *Product design manager* | **Chef Unité** *R&D unit manager* | **Assurance Qualité /** *R&D quality assurance* |
| **0.4** | | CC Hsieh | CC Hsieh | CW Sheu | P. NOM | Harry Lin |
| | **Date** | 01/08/2011 | 19/09/2011 | 19/09/2011 | 28/07/2011 | 21/09/2011 |
| | **Signature** | Aaron Wang | CC Hsieh | Ruth Chu | | Harry Lin |

---

## RESUME / *SUMMARY*

This document is the application notes of the HILONC-3GPS module.

**Mots clés / *Keywords* :  HiLoNC-3GPS, application Note**

---

√   ***DIFFUSION INTERNE / INTERNAL DISTRIBUTION***

REDACTEUR(S) */ AUTHOR (S)*  + *F.FREULON, F.GOUERE .*

[ ]   ***DIFFUSION EXTERNE sous convention de confidentialité :***
***EXTERNAL DISTRIBUTION with confidentiality agreement :***
………….

[ ]   ***Enregistrement relatif à la qualité (ERQ) / Quality record***

[ ]   ***A déposer en enveloppe soleau / Put in a soleau envelope***

# FICHE RECAPITULATIVE / *SUMMARY SHEET*

| Ed | Date<br><br>*Date* | Référence<br><br>*Reference* | Rédacteur(s)<br><br>*Author(s)* | Relecteur(s)<br><br>*Reviser(s)* | Pages modifiées /<br>*Changed pages* | Observations<br><br>*Comments* |
|----|------|-----------|-------------|-------------|----------------|--------------|
| 0.1 | 23/09/2011 | URD1 OTL 5696.1 022 72740 ed 0.1 - HiLoNC-3GPS Application Note | SAGEMCOM | SAGEMCOM. | All | First Draft release |
| 0.2 | 17/10/2011 | URD1 OTL 5696.1 022 72740 ed 0.2 - HiLoNC-3GPS Application Note | SAGEMCOM | SAGEMCOM | | Modification in the Sim schematics, PU on sim data removed |
| 0.3 | 09/11/2011 | URD1 OTL 5696.1 022 72740 ed 0.3 - HiLoNC-3GPS Application Note | SAGEMCOM | SAGEMCOM | | MSL chapter added |
| 0.4 | 03/12/2011 | URD1 OTL 5696.1 022 72740 ed 0.4 - HiLoNC-3GPS Application Note | SAGEMCOM | SAGEMCOM | | RTC and mechanical chapters improved |
| 1 | | | | | | |

-

# SOMMAIRE / *CONTENTS*

# 1. OVERVIEW

## 1.1. Document Objectives

The aim of this document is to provide examples of hardware solutions for development of products based around the Sagemcom HiLo NC-3GPS Module. Most of these solutions are not mandatory. Use them as suggestions of what should be done to achieve a working product and what should be avoided according to our own experiences.

This document gives suggestions on how to integrate the HiLo NC-3GPS module into devices for automotive applications, AMM (Automatic Metering Management), tracking systems; including connection with external devices, layout advices, external components (decoupling capacitors…), etc.

## 1.2. Reference Documents
[1] URD1 OTL 5696 3 001 72497- HILONC-3GPS technical specifications
[2] URD1 OTL 5696.1 006 72370- AT Command Set for SAGEM HILONC-3GPS Modules

## 1.3. Document Modifications
The information presented in this document should be accurate and reliable. However Sagemcom assumes no responsibility for its use, nor any infringement of patents or other third party rights which may result from its use. This document is subject to change without notice.
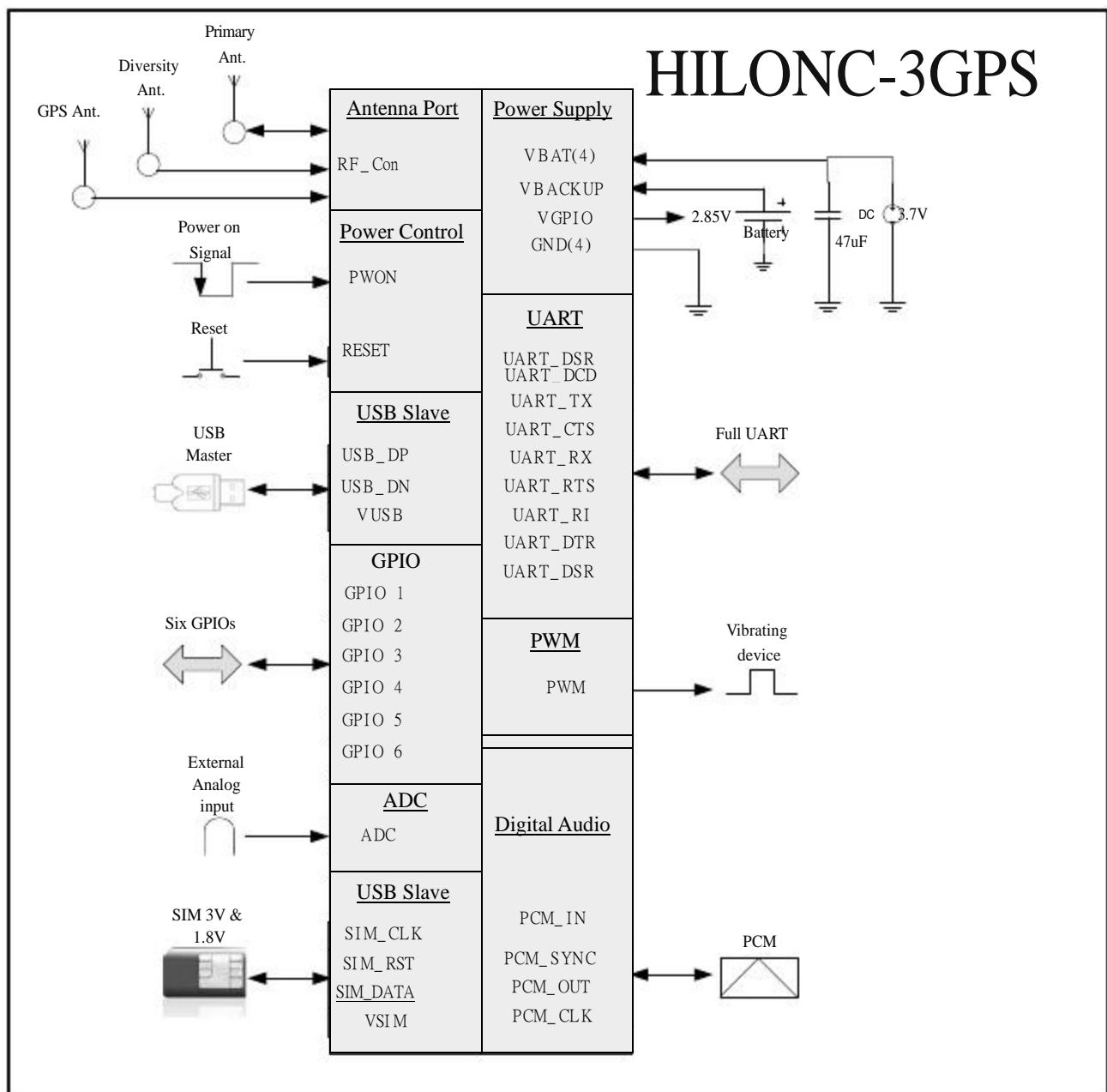
Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

## 1.4. Conventions
*SIGNAL NAMES:* All signal names written on the pins of the HILONC-3GPS module are in *italics*.

☞ Special attention must be paid to the information on them.


# 2. Block Diagram

# HILONC-3GPS

| | | |
|---|---|---|
| **Antenna Port** | **Power Supply** | |
| RF_Con | VBAT(4) | |
| | VBACKUP | |
| | VGPIO | |
| | GND(4) | |
| **Power Control** | | |
| PWON | | |
| RESET | **UART** | |
| | UART_DSR | |
| **USB Slave** | UART_DCD | |
| USB_DP | UART_TX | |
| USB_DN | UART_CTS | |
| VUSB | UART_RX | |
| | UART_RTS | Full UART |
| **GPIO** | UART_RI | |
| GPIO 1 | UART_DTR | |
| GPIO 2 | UART_DSR | |
| GPIO 3 | | |
| GPIO 4 | **PWM** | Vibrating device |
| GPIO 5 | PWM | |
| GPIO 6 | | |
| **ADC** | **Digital Audio** | |
| ADC | | |
| **USB Slave** | PCM_IN | |
| SIM_CLK | PCM_SYNC | PCM |
| SIM_RST | PCM_OUT | |
| SIM_DATA | PCM_CLK | |
| VSIM | | |

GPS Ant.

Diversity Ant.

Primary Ant.

Power on Signal

Reset

USB Master

Six GPIOs

External Analog input

SIM 3V & 1.8V

2.85V

Battery

47uF

DC 3.7V

: HILONC-3GPS module block diagram

---
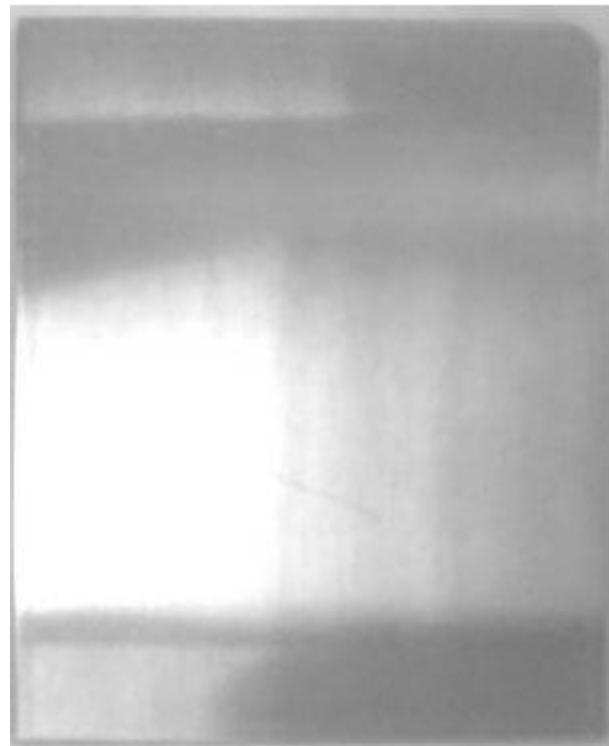
# 3. Functional Integration

Advancements in silicon technology have brought about concurrent functionality improvements that allow lower power consumption. The HILONC-3GPS module with 116 pin LGA is a very compact design with dimensions of only 28.5 x 34 x 2.35 mm and weighing less than 7 grams.

☞ All digital I/Os among the 116 pin LGA are within the 1.8V domain suitable for most systems with the exception of SIM I/O's, which can also be in the 3V domain depending on SIM-card use, and SDIOs which are in the 2.85V domain.

☞ Analog I/Os occupy the following power domains:
  · VSIM → SIM I/Os are in the 1.8V or 3V domain
  · VBACKUP → 3V domain
  · VGPIO → 2.85V domain
  · VBAT → from 3.4V to 4.2V. 3.7V is normal.
  · VUSB → 5V
  · ADC → 2.2V
  · Antenna → RF power amplifier is in the VBAT domain

☞ Do not power on the module I/O with a voltage over the specified limits. This could cause damage to the module.

☞ In order to achieve accurate audio performance from customer products it is necessary to have a basic competency in acoustic engineering.

☞ In order to achieve accurate radio performance from customer products it is necessary to have a basic competency in radio engineering.



: HILONC-3GPS module LGA pad side

: HILONC-3GPS module top side
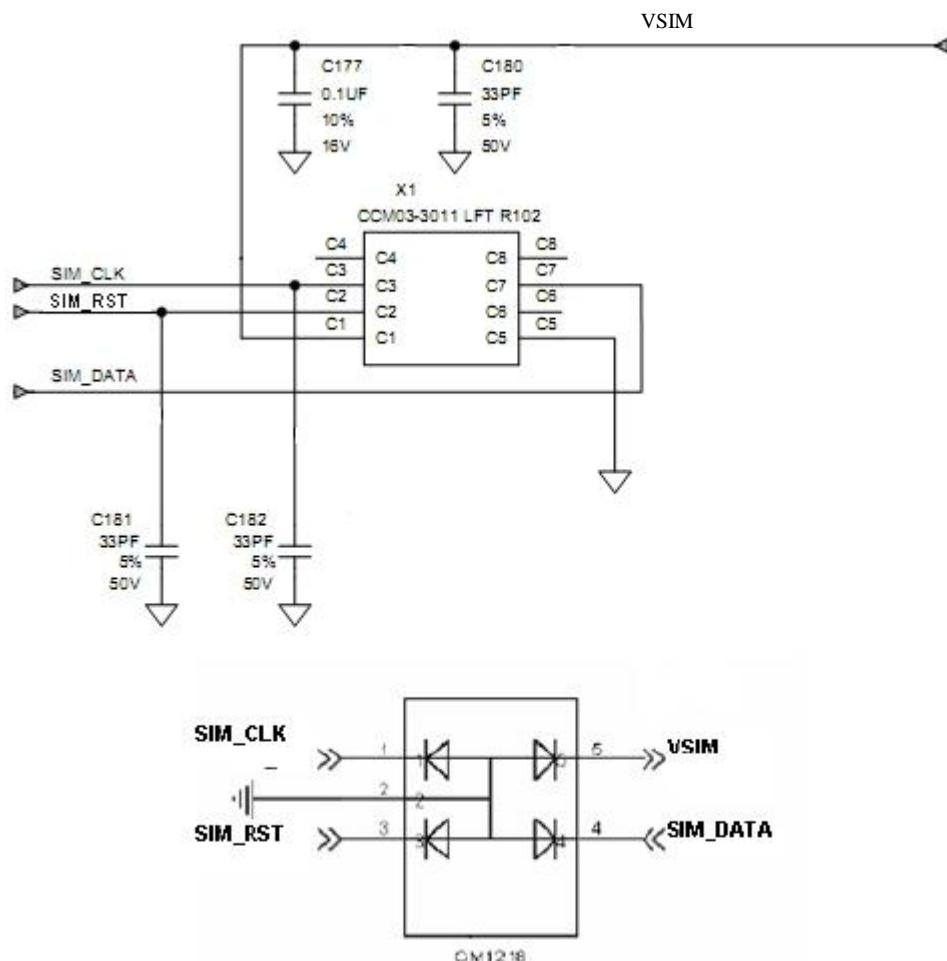
## 3.1. How to connect a SIM card

| PIN No. | Name |
|---------|------|
| C1 | VCC |
| C2 | RST |
| C3 | CLK |
| C4 | NA |
| C5 | GND |
| C6 | VPP |
| C7 | I/O |
| C8 | N/A |

: SIM Card signals
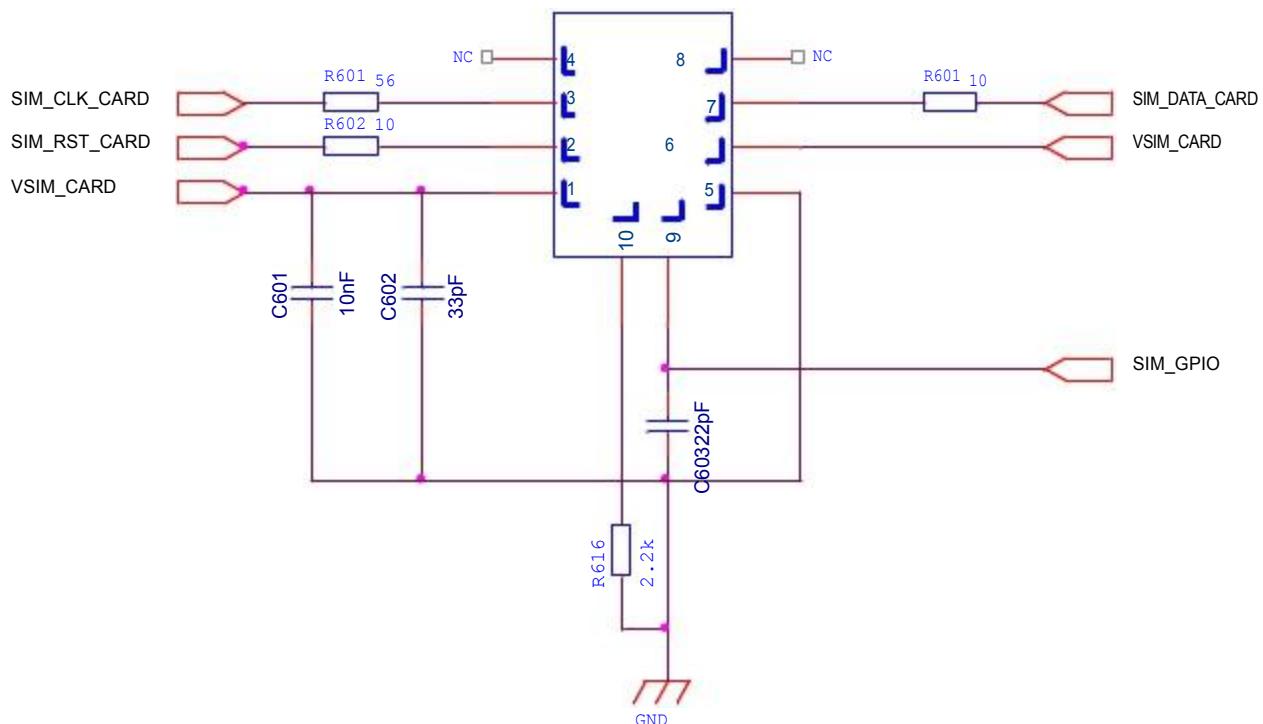
The HILONC-3GPS module provides SIM signals to the 116 pins of the LGA. A SIM card holder with 6 pins must be adopted to access SIM functions.

☞Decoupling capacitors must be added on to the VSIM,SIM_DATA,SIM_RST,and SIM_CLK signals as close as possible to the SIM card connector to avoid EMC issues and in order to pass SIM card approval tests.

☞Vsim must be used only for the SIM card.

☞Use ESD protection components to protect the SIM card and module I/Os against electrostatic discharge.

The following schematic shows how to protect SIM access of the 6 pin connector. This must be performed every time the SIM card holder is accessed by the end user.

: EMC and ESD protection components in the vicinity of the SIM

☞ If it is necessary to use long SIM bus lines of over 100 mm, it is recommended to adopt serial resistors to avoid electrical overshoot on SIM bus signals. Use 56 Ω for the clock line and 10Ω for the reset and data lines.

: Serial resistors for protection of long SIM bus lines

The schematic above includes a hardware SIM card presence detector. It can be connected to *GPIO2*.
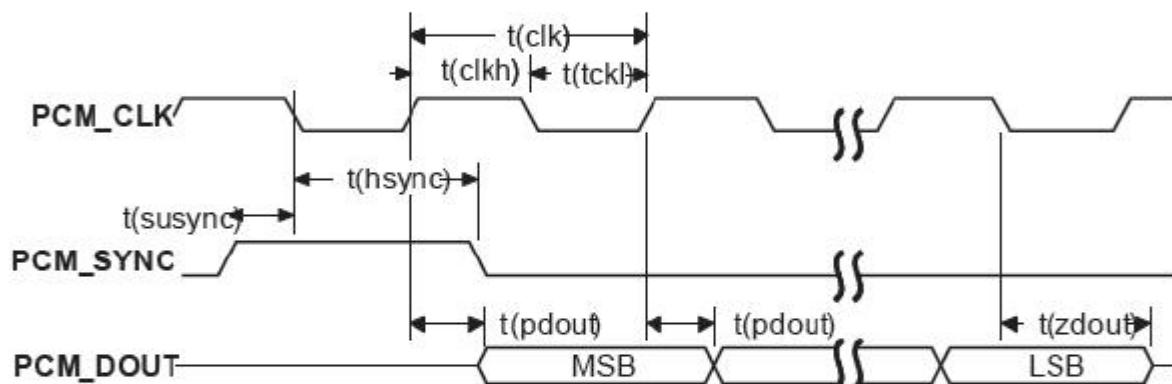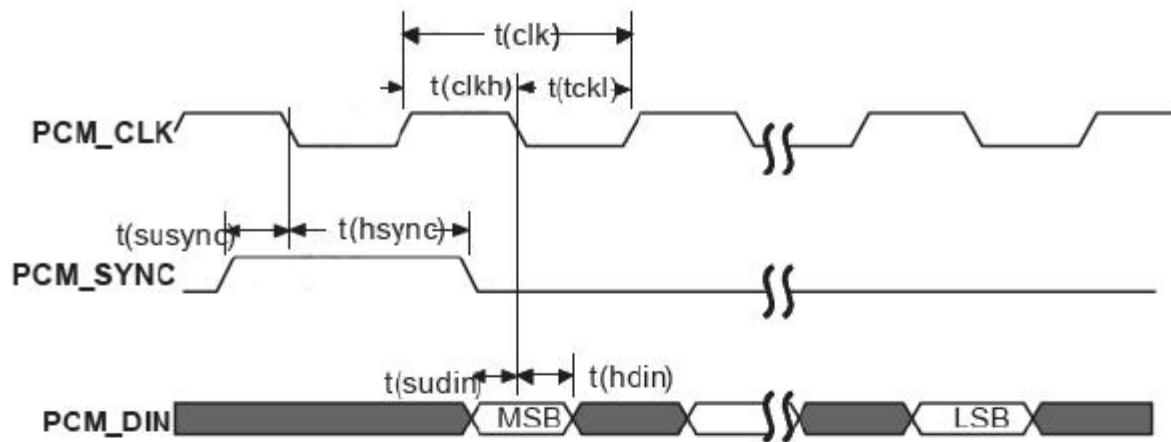
☞ *GPIO2* is the design default for SIM card detection.

☞ Use a 22pF capacitor to debounce the *GPIO2* detection signal.

☞ The SIM card must not be removed from its holder while it is still powered. Switch the module off with the AT command, then remove the SIM card from its holder.


## 3.2. Audio Connection

The HILONC-3GPS module features one input audio path and one output audio path. The input path is a PCM digital input.  The output path is a PCM digital output.
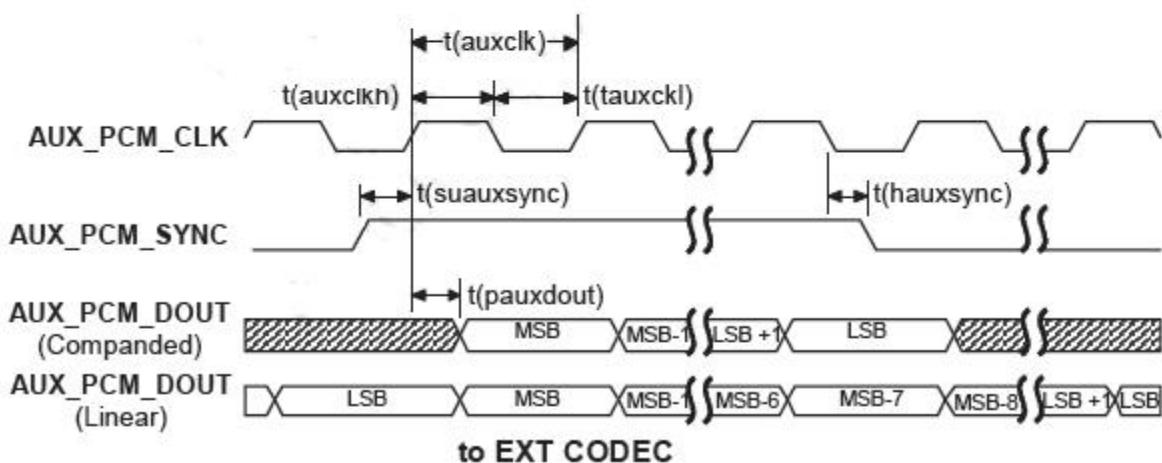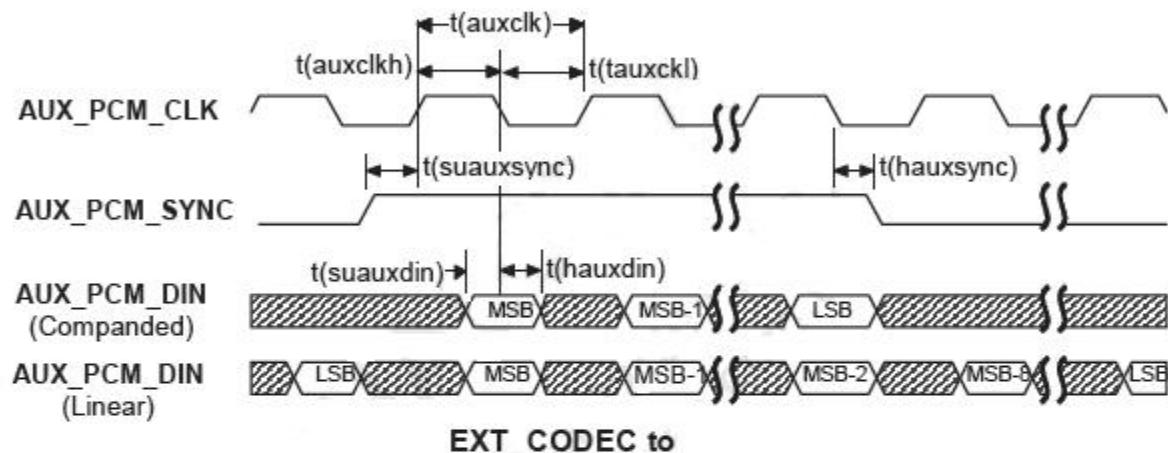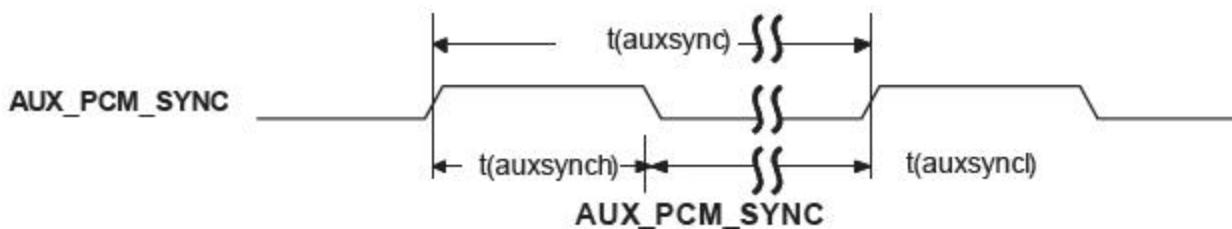
### 3.2.1. PCM Digital Audio

HILONC-3GPS can be used for connection to an external codec through the integrated PCM interface. The interface supports an 8 kHz short sync mode at 2048 kHz and an 8 kHz long sync mode at 128 kHz. In short-sync (primary PCM) mode, the HILONC-3GPS can act as master or slave. In long-sync (auxiliary PCM) mode, the HILONC-3GPS is always a master; there is no slave support.

| Parameter | Description | Min | Typ | Max | Unit |
|-----------|-------------|-----|-----|-----|------|
| T(sync) | PCM_SYNC cycle time | – | 125 | – | µs |
| T(synch) | PCM_SYNC high time | 400 | 500 | – | ns |
| T(syncl) | PCM_SYNC low time | – | 124.5 | – | µs |
| T(clk) | PCM_CLK cycle time | – | 488 | – | ns |
| T(clkh) | PCM_CLK high time | – | 244 | – | ns |
| T(clkl) | PCM_CLK low time | – | 244 | – | ns |
| T(susync) | PCM_SYNC setup time high before falling edge of PCM_CLK | 60 | – | – | ns |
| T(hsync | PCM_SYNC hold time after falling edge of PCM_CLK | 60 | – | – | ns |
| T(sudin) | PCM_DIN setup time before falling edge of PCM_CLK | 50 | – | – | ns |
| T(hdin) | PCM_DIN hold time after falling edge of PCM_CLK | 10 | – | – | ns |
| T(pdout) | Delay from PCM_CLK rising to PCM_DOUT valid | – | – | 350 | ns |
| T(zdout) | Delay from PCM_CLK falling to PCM_DOUT HIGH-Z | – | 160 | – | ns |

: Primary PCM mode timing parameter

EXT_CODEC to



to EXT CODEC

| Parameter | Description | Min | Typ | Max | Unit |
|---|---|---|---|---|---|
| T(auxsync) | AUX_PCM_SYNC cycle time | – | 125 | – | µs |
| T(auxsynch) | AUX_PCM_SYNC high time | 62.4 | 62.5 | – | µs |
| T(auxsyncl) | AUX_PCM_SYNC low time | 62.4 | 62.5 | – | µs |
| T(auxclk) | AUX_PCM_CLK cycle time | – | 7.8 | – | µs |
| T(auxclkh) | AUX_PCM_CLK high time | 3.8 | 3.9 | – | µs |
| Parameter | Description | Min | Typ | Max | Unit |
| T(auxclkl) | AUX_PCM_CLK low time | 3.8 | 3.9 | – | µs |
| T(suauxsync) | AUX_PCM_SYNC setup time high before falling edge of PCM_CLK | 1.95 | – | – | µs |
| T(hauxsync) | AUX_PCM SYNC hold time after falling edge of PCM_CLK | 1.95 | – | – | µs |
| T(suauxdin) | AUX_PCM_DIN setup time before falling edge of AUX_PCM_CLK | 70 | – | – | ns |
| T(hauxdin) | AUX_PCM_DIN hold time after falling edge of AUX_PCM_CLK | 20 | – | – | ns |
| T(pauxdout) | Delay from AUX_PCM_CLK rising to AUX_PCM_DOUT valid | – | – | 50 | ns |

: Auxiliary PCM mode timing parameter

## 3.3. PWM

A single PWM pin is available on the HILONC-3GPS. This is a general purpose PWM which can be used to drive a vibrating device, keypad backlight or LED. The PWM pin can be controlled by AT commands, allowing several periods and duty cycles. More details are given in the AT commands specifications document.
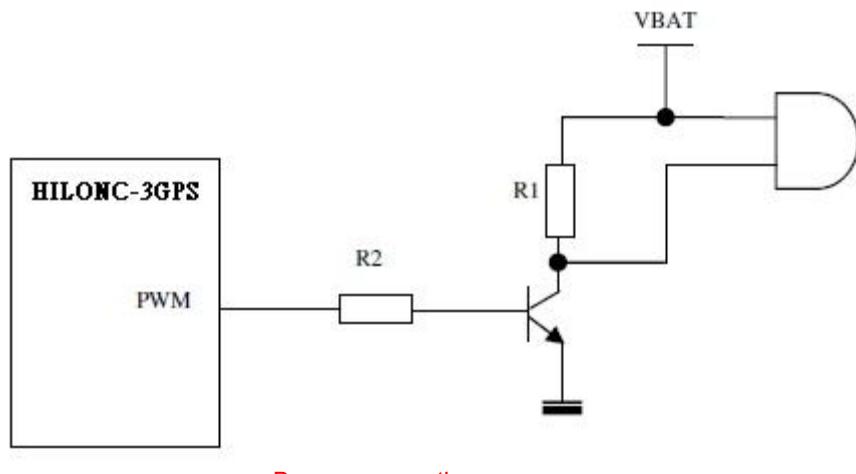
PWM output can be set by the user:

☞ Frequency between: 0.125Hz and 8KHz

☞ Duty range from: 0 to 100%

### 3.3.1. PWM for Buzzer connection

The HILONC-3GPS module can utilize PWM output to drive a buzzer. The buzzer can serve as an abnormal status alarm.
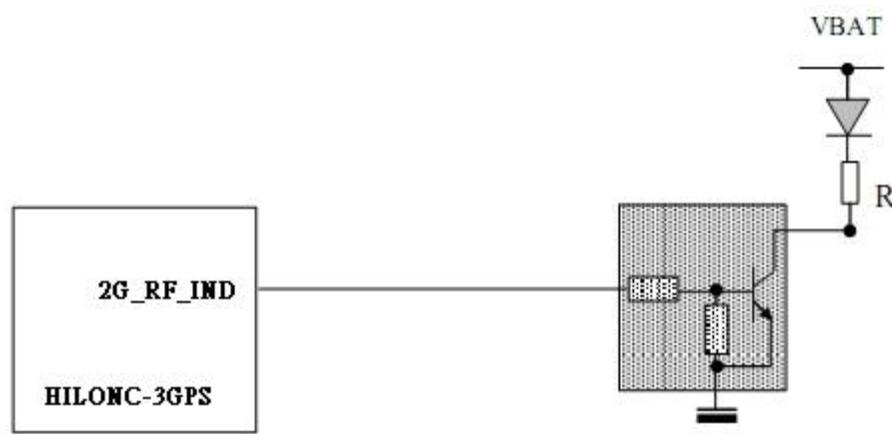
☞ Resistors must be added to protect the buzzer. The value of these resistors depends on the buzzer and the transistor. Normally, they are set at 1KΩ.

: Buzzer connection

### 3.3.2. Network LED

The HILONC-3GPS module can manage a network LED which can be connected to *2G_RF_IND*.
The transistors can be found in a single package referred to as the UMDXX or PUMDXX Family.
The value of resistor R depends on the characteristics of the LED; its purpose is to limit the current passing through the diode.
Use the AT command to set the *2G_RF_IND* used to control the LED.



: Network LED connection

## 3.4. Power Requirements

Input Rating : 3.4V ~ 4.2VDC , 700mA , Operation Temperature :  -40℃~85℃ .

The host system must supply 3.4V ~ 4.2Vof power  to the VBAT.

☞Within normal 2G and 3G operational modes, the maximum average current is approximately 1.1A depending on RF output power. In 2G mode peak current can be as high as 2A under matched antenna conditions. Peak current could be as high as 1.75A in the case of a mismatched antenna. In 3G mode and under conditions of antenna mismatch, peak current may increase by up to 700mA.

☞VBAT traces are required to be as short and as wide as possible.

☞VBAT ceramic decoupling capacitors of at least 100μF/10V are required to ensure good RF performance. It is strongly recommended to place capacitors close to the module's connection pad and connected via low resistance tracks to VBAT and GND.

☞Host power must be capable of sourcing enough current to accommodate maximum power in the event of 2G transmission bursts. This can be done, for example, by adding a large capacitor with a low ESR value.

☞PCB tracks must be well dimensioned to support a maximum current of 2.2A. Voltage ripple caused by serial resistance of the power supply path could result in instances of voltage drop.

☞The HILONC-3GPS does not support battery charging.

## 3.5. UART

The HILONC-3GPS has a UART port that can be used in low-speed, full-speed, and high-speed modes. The UART communicates with serial data ports conforming to the RS-232 interface protocol. With a properly written and user-defined download program, the UART port can be used for testing and debugging.
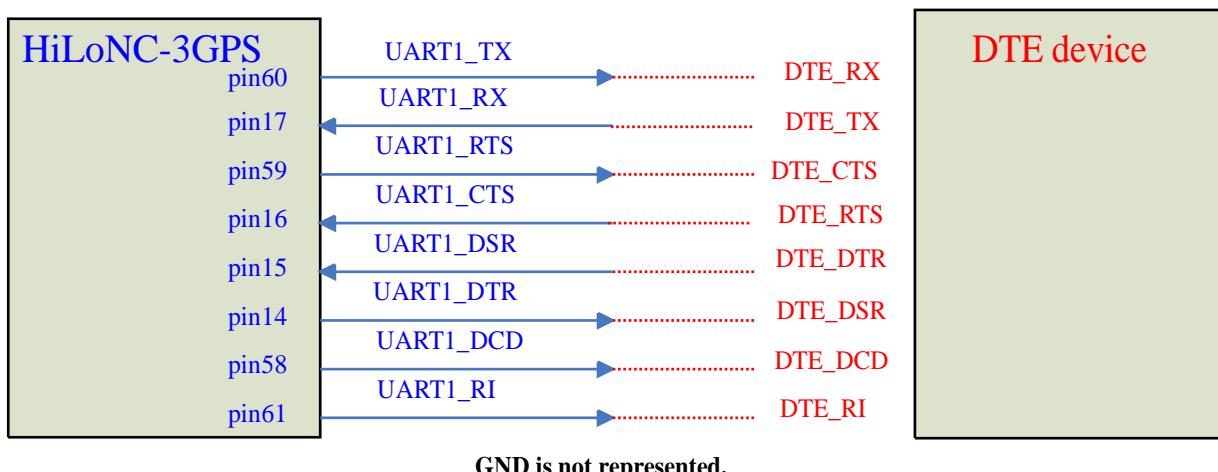
☞Provision of external access to the V24 interface for easy upgrade of software is recommended.

☞Baud rate up to 4Mbps.

☞Unused signals remain disconnected.

| Signal name (DCE point of view) | Signal name (DTE point of view) | Signal use (DTE point of view) |
|---|---|---|
| UART_DTR | DTE_DSR | Signal UART interface is ON |
| UART_DCD | DTE_DCD | Signal data connection in progress |
| UART_RX | DTE_TX | Transmit data |
| UART_RTS | DTE_CTS | HILONC-3GPS is ready to receive AT commands |
| UART_TX | DTE_RX | Receive data |
| UART_CTS | DTE_RTS | Wakes up the module when Ksleep=1 is used |
| UART_RI | DTE_RI | Signal incoming calls (voice and data), SMS, etc. |
| UART_DSR | | Prevents the HILONC-3GPS from entering sleep mode |
| | DTE_DTR | Switches between data mode and command mode Wakes the module up. |

### 3.5.1. Complete V24 Connection of HILONC-3GPS to host

The 40 pins of the HILONC-3GPS module provide a V24 interface with the following signals: *RTS/CTS, RXD/TXD, DSR, DTR, DCD, RI*.

☞Use of this complete V24 connection is required whenever your application exchanges data.

**HiLoNC-3GPS**

| Pin | Signal | | Signal |
|---|---|---|---|
| pin60 | UART1_TX | → | DTE_RX |
| pin17 | UART1_RX | ← | DTE_TX |
| pin59 | UART1_RTS | → | DTE_CTS |
| pin16 | UART1_CTS | ← | DTE_RTS |
| pin15 | UART1_DSR | ← | DTE_DTR |
| pin14 | UART1_DTR | → | DTE_DSR |
| pin58 | UART1_DCD | → | DTE_DCD |
| pin61 | UART1_RI | → | DTE_RI |

**DTE device**

**GND is not represented.**

: Complete V24 connection of HILONC-3GPS to host

This configuration allows the use of flow control RTS & CTS to avoid overflow error during data transfer. In addition, *UART_RTS* is used to inform DTE whether the HILONC-3GPS is ready to receive an AT command after power up sequence or wake up from the sleep mode.

Note d'étude / Technical document :

: RTS versus PWRON signal during power on sequence
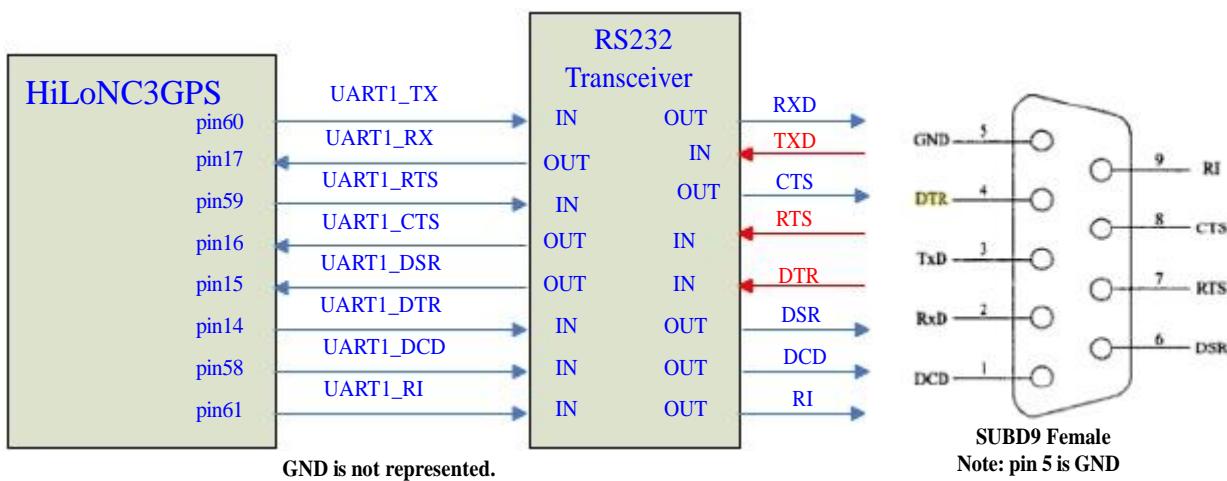
This signal configuration also enables all signals:

· *UART_RI signal* is used when programmed to indicate an incoming voice or data call or SMS incoming message, etc.

· *UART_DCD signal* is used to indicate GPRS connections.

· *UART_DTR signal* is used to indicate that the module's UART interface is ON.

· *UART_DSR signal* is used to prevent the HILONC-3GPS from entering sleep mode, switching between Data and AT commands, hanging up a call or waking up the module etc.

☞ Avoid supplying power to the UART before the HILONC-3GPS is ON, as this may result in power up sequence error.

### 3.5.2.    Complete V24 Interface with PC
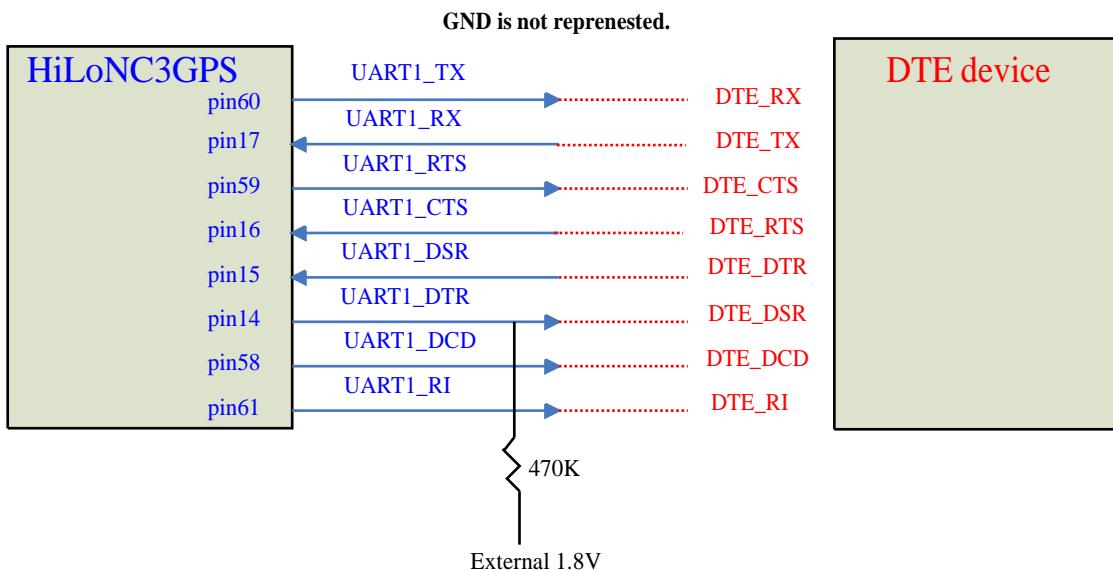
To use the V24 interface some adaptation of components is necessary. This is because HILONC-3GPS signals need to be converted to +/- 5V signals compatible with a PC.



**GND is not represented.**

**SUBD9 Female**
**Note: pin 5 is GND**

: Connection to a data cable
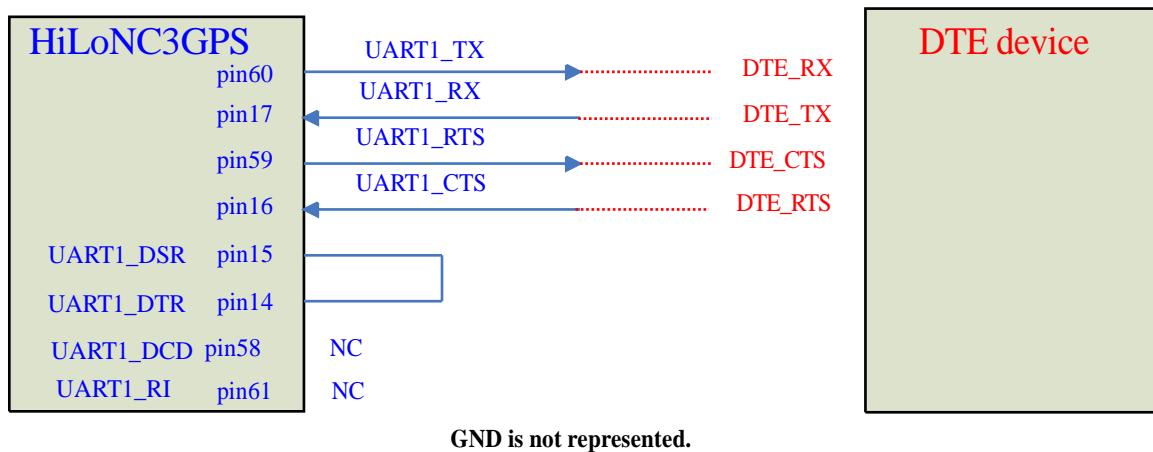
☞ Avoid supplying power to the UART before the HILONC-3GPS is ON, as this could result in power up sequence error.

☞ *UART_DTR* signal used to indicate module UART interface is ON (need to pull high the *UART_DTR* signal with 470 K ohms to external 3V, as shown below):

---

**GND is not represnested.**



### 3.5.3. Partial V24 (RX-TX-RTS-CTS) Connection of HILONC-3GPS to host

When using only *RX/TX/RTS/CTS* instead of the complete V24 link, the following schematic can be used:



**GND is not represented.**

: Partial V24 connection (4 wires) of HILONC-3GPS to host

☞As *UART_DTR* is active (low electrical level) once HILONC-3GPS is switched on, *UART_DSR* is also active (low electrical level), therefore the AT command AT+Ksleep can switch between the two sleep modes availableHILONC.

☞*UART_DCD* and *UART_RI* can remain disconnected and floating when not in use. Otherwise use 100KΩ to pull power up to 1.8V.
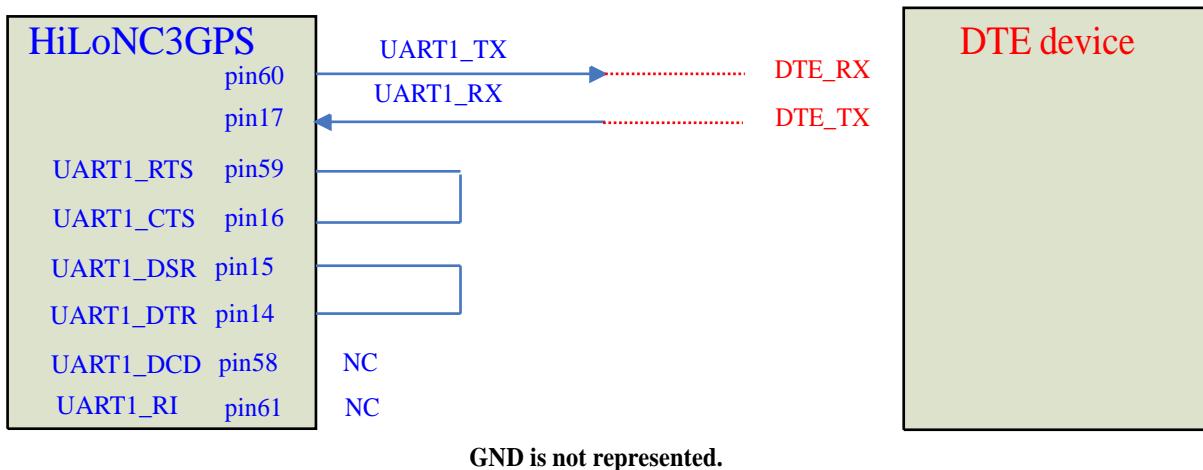
This configuration allows use of flow control RTS & CTS to avoid overflow error during data transfer. Moreover *UART_RTS* is used to indicate when the HILONC-3GPS module is ready to receive an AT command after power up sequence or wake up from sleep mode.

☞However this configuration does not allow signals such as:
· *UART_RI* signal used when programmed to indicate an incoming voice or data call or incoming SMS etc….
· *UART_DCD* signal used to indicate DATA connections.
· *UART_DTR* signal used to indicate module UART interface is ON.

Note d'étude / Technical document :

· The *UART_DSR* signal is used to prevent HILONC-3GPS from entering sleep mode or to switch between DATA and AT commands or to hang up a call or to wake up the module etc….

### 3.5.4. Partial V24 (RX-TX) Connection of HILONC-3GPS to host

When using only *RX/TX* instead of the complete V24 link the following schematic can be used:



**GND is not represented.**

: Partial V24 connection (2 wires) of HILONC-3GPS to host

☞As *UART_DTR* is active (low electrical level) once HILONC-3GPS is switched on, *UART_DSR* is also active (low electrical level), therefore the AT command "AT+Ksleep" can switch between the two available sleep modesHILONC.

☞As *UART_RTS* is active (low electrical level) once HILONC-3GPS is switched on, *UART_CTS* is also active (low electrical level), therefore the AT command "AT+Ksleep" can switch between the two available sleep modesHILONC. The HILONC-3GPS's firmware allows activation of *UART_RTS* during sleep state even when looped to the *UART_CTS* signal.

☞*UART_DCD* and *UART_RI* can remain disconnected and floating when not in use.

☞Note that this configuration does not allow the below signals:

· *RI* signal used when programmed to indicate an incoming voice or data call or incoming SMS etc….

· *UART_DCD* signal used to indicate GPRS connections.

· *UART_DTR* signal used to indicate the module UART interface is ON.

· *UART_DSR* signal used to prevent the HILONC-3GPS module from entering sleep mode.

### 3.6. GPIO

There are six GPIOs available on the HILONC-3GPS. Customer applications can directly access them through appropriate AT commands such as:

- Output: pin is set to High or Low state.

- Input: pin is read on request and customer application is responded to.

As an input different scenarios are possible to cover a maximum range of customer applications:

· Synchronous answer to AT command.

· Asynchronous answer to AT command. Customer's application prior to the read request has configured the GPIO to react to falling/rising edges. The customer application is notified asynchronously by AT command answer when the configured trigger occurs.

| Configuration type | Configuration description |
|---|---|
| Input | 1. No pull-up<br>2. Pull-up<br>3. Pull-down<br>4. Keeper |
| Output | 1. No pull-up<br>2. Pull-up<br>3. Pull-down<br>4. Keeper<br>5. Programmable drive current (2–16 mA in 2 mA steps)<br>6. Tri-state |

: Programmable GPIO configurations

By utilizing other special AT commands, GPIOs can be used to, for example:

1. Perform I/O toggling while the module is attached to the network.
2. Perform I/O toggling when a pre-set temperature is reached.
3. Serve as an input to detect the presence of an antenna (with some additional external power.)
4. GPIO2 serves as an input default to detect SIM card presence …etc.

## 3.7. ADC

The HILONC-3GPS has one ADC input pin which can be used to read the value of the voltage applied. The following conditions must be met to ensure correct performance:
· Input signal voltage must be within 0V to 2.1V.
· Input impedance of the pin is 2KΩ.
· Input capacitance typically is 53pF.

The AT command AT+KADC will produce a voltage value with the following characteristics:
· 15 bits resolution
· Maximum sampling frequency of 2.4MHz.

## 3.8. Backup Battery

### 3.8.1. Backup Battery Function Features
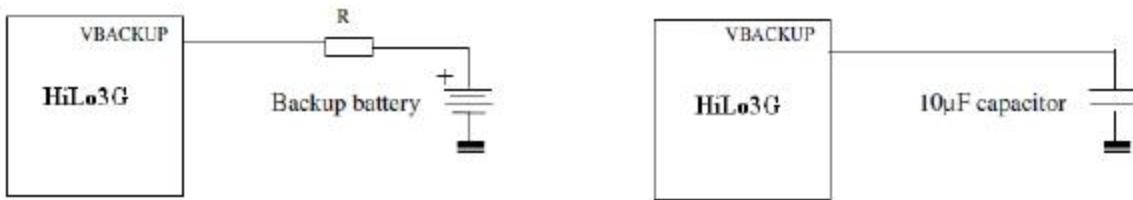
A backup battery can be connected to the module in order to supply internal RTC (Real Time Clock) when the main power supply is removed. Thus, when the main power supply is removed, the RTC is still supplied with power and the module keeps the time register running.
· If $VBAT$ < 3V, internal RTC is supplied by $VBACKUP$.
· If $VBAT$ ≥3V, internal RTC is supplied by $VBAT$.

### 3.8.2. Internal HILONC-3GPS Charging Function

HILONC-3GPS has a charging function that does not require any additional external power supply (power supply for the charging is provided by the HILONC-3GPS).

☞ Charge of the back-up battery occurs only when main power supply $VBAT$ is provided.

The value of resistor R depends on the charging current value of the backup battery manufacturer.

### 3.8.3. Backup Battery Technology

Capacitor batteries do not have the disadvantages of lithium ion rechargeable batteries:
· Maximum discharge current is generally greater,
· No need to regulate charge current.
Moreover, this kind of battery is available in the same kind of package as a lithium ion cell and is fully compatible from a mechanical perspective. The only disadvantage is that the capacity is significantly lower than a manganese silicon lithium ion battery.

## 3.9. USB

The HILONC-3GPS module has a set of USB_DP and USB_DN bi-directional differential USB data lines that comply with USB 2.0 specifications.
HILONC-3GPS acts as the USB-Slave and the customer application acts as the USB-Master.
· Integrated high-speed USB PHY.
· In compliance with USB 2.0 specifications for a peripheral device.
·The USB 2.0 specification requires hosts such as PCs to support all three USB speeds, namely low-speed (1.5 Mbps), full-speed (12 Mbps) and high-speed (480 Mbps). The USB 2.0 specification allows peripheral devices to support any one or more of these speeds.

☞The USB_DP and USB_DN signals are routed as a ~90 Ω differential pair. These signals must be routed side by side and on the same layer and their trace length should be matched as closely as possible.

☞A 2pF capacitor is required to be installed between USB_DP and USB_DN close to the HILONC-3GPS.

☞These signals have relatively fast edges, so they should be routed away from sensitive circuits and signals such as 19.2 MHz TCXO, sleep XTAL, and RF. Therefore, avoid routing these signals on surface layers; routing in the inner layer sandwiched between power and ground is preferable.

# 4. Power Management

The host system should supply 3.4V~4.2V to VBAT for powering the baseband, logics circuit and RF circuit.

## 4.1. Power Modes

Depending on the status of the HILONC-3GPS, different power consumption modes can be identified.
☞Active mode (Active communication)
All systems on HILONC-3GPS are active. In this mode, the module is registered to the network and a voice/data

call is actively transmitting data.

☞Sleep mode (Active idle)

All systems on HILONC-3GPS are active including the USB bus. In this mode, the module is registered to the network but it is idle/paging only. No voice/data call connection is established.

☞Fly mode

The processor is still active but the radio section is powered down. This mode can be controlled by sending an AT command to the module.

## 4.2.  Module Power up

Starting the HILONC-3GPS via *PWON*.

### 4.2.1.    PWON Power up

To start the module, first power up *VBAT*, which must be in the range 3.4V ~ 4.2V, and must be able to supply 1.75A during TX bursts.

☞*PWON* is a low level active signal internally pulled up to a dedicated power domain of 1.8V.

As *PWON* is internally pulled up, a simple open collector or open drain transistor must be used for ignition.

☞To start the module, a low level pulse must be applied on *PWON* for 500ms.

After a few seconds, the *UART_RTS* enters active state and the module is ready to receive AT commands.

☞ *VGPIO* is a supply output from the module that can be used to check if the module is active.

· When *VGPIO* = 0V the module is OFF.

· When *VGPIO* = 2.85V the module is ON.

TBD

: Power on sequence

TBD

: Power off sequence

☞Send AT COMMAND "AT+CPOF" to power off module.

### 4.2.2.  IO DC Presence before Power on

When VBAT is available but the module has not yet powered up, the following I/O's raise their output.

☞VBACKUP raise to 3V

☞PWON raise to 1.8V

## 4.3.    Power on and Sleep Diagrams

The 2 diagrams below show the behavior of the module and the DTE during power on and then in sleep modes.
Note: the module cannot enter sleep mode if USB bus is connected.

 TBD

: Diagram for power on
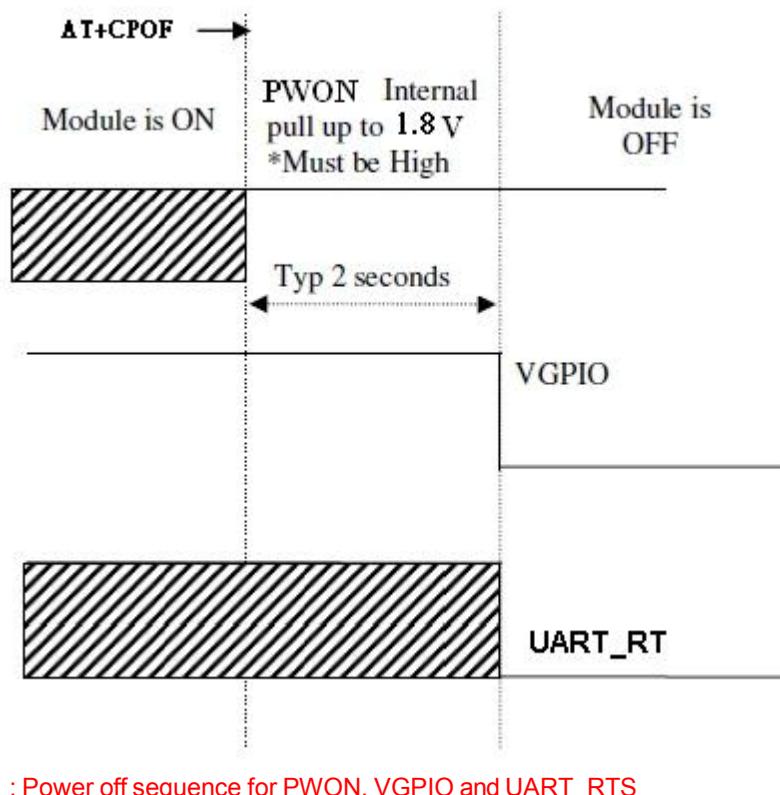
TBD

: Diagram for sleep mode

## 4.4.    Module Power off

### 4.4.1. UART Interface

To turn the module off, use the AT command AT+CPOF. If *PWON* is not pulled down the module will switch to OFF mode after the AT command, otherwise the module restarts immediately (OFF sequence is performed followed by power ON sequence).



: Power off sequence for PWON, VGPIO and UART_RTS

### 4.4.2. USB Interface

As the module can also be turned on when a USB cable is plugged in, the module turn off sequence requires the USB interface to be OFF or VBUS disconnected once the command is sent and acknowledged by the module. Thus, to turn the module off when USB interface is in use, use the AT command AT+CPOF, then disconnect VBUS signal (unplug the USB cable or use a command switch to switch off VBUS) when the module acknowledges (responds with an OK message) the command, otherwise the module will restart immediately (an OFF sequence is performed followed by a power ON sequence).

## 4.5. Sleep Mode

The AT command AT+KSLEEP allows configuration of the sleep mode.

When AT+KSLEEP=1 has been configured:
· The HILONC-3GPS module decides by itself when to enter sleep mode (no tasks running).
· "0x00" character on serial link wakes up the HILONC-3GPS module.

When AT+KSLEEP=0 has been configured:
· The HILONC-3GPS module is active when *UART_DSR* signal is active (low electrical level).
· When *UART_DSR* is deactivated (high electrical level), the HILONC-3GPS module enters sleep mode after a certain period of time.
· On *UART_DSR* activation (low electrical level), the HILONC-3GPS module wakes up.

When AT+KSLEEP=2 has been configured:
· The HILONC-3GPS module is prevented from ever entering sleep mode.
In sleep mode the module reduces power consumption and waits for a wake up signal from either the network,

from the operating system or from the host controller.
Note: The module cannot enter sleep mode if USB bus is connected.

# 5. ESD & EMC Recommendations

Adopting the Human Body Model of the JEDEC JESD 22-A114 standard, the HILONC-3GPS can support 2KV
on each  LGA pad.

## 5.1.    HILONC-3GPS Handling

HILONC-3GPS modules are packaged in boxes.
HILONC-3GPS modules contain electronic circuits sensitive to the electrostatic electricity of the human hand.
Handling without ESD protection could result in permanent damage or even destruction of the module.

## 5.2.    ESD Recommendations

If customer's design requires the ability to withstand more than 2KV of electrostatic discharge, the following
must be observed:

ESD current is able to penetrate into the device via the following typical components:
· SIM connector
· Battery / data connector
· All parts with conductive paint.

☞    In order to avoid ESD issues, as much as possible try to decrease the level of ESD current on electronic
components located inside the device (customer's board, HILONC-3GPS inputs, etc…)

### 5.2.1.    Avoiding ESD

☞ Ensure good ground connection of the HILONC-3GPS to the customer's board.

☞ Flex (if any) should be shielded and FPC connectors should be correctly grounded at each extremity.

☞ Put a 100nF capacitor to the battery, or even better put a varistor or ESD diode in parallel on battery and
charger wires (if any) and on all power wires connected to the module.
Following are the pin numbers to be protected from discharge of over 2KV and the varistor references.

Pin29/43/44: VBAT
Pin67/68/69: USB
Pin71: VGPIO
Pin33/34/35/79: USIM

| Part | Vendor | Part number |
|------|--------|-------------|
| Varistor | LITTLEFUSE | V0402MHS12NR |
| Varistor (for USB line) | COOPER | 0402ESDA-MLP1 |

## 5.3.    EMC recommendations

To avoid EMC issues, place the capacitors or filters as close as possible to high speed data lines such as USB
and SDIO.

# 6. Radio Integration

The HILONC-3GPS module incorporates RF transceiver technology that converts received signals directly from RF-to-baseband and transmits signals directly from baseband-to-RF (known as direct conversion or zero intermediate frequency (ZIF) processing). This technique eliminates the need for large IF surface acoustic wave (SAW) filters and supporting IF and LO circuits.

## 6.1. Antenna Connection

The HILONC-3GPS module is equipped with an RF LGA pad for antenna connection.
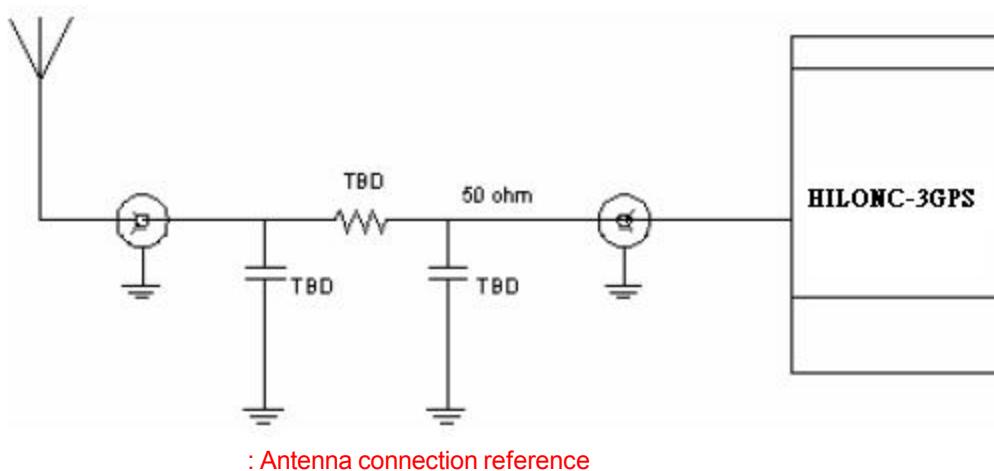
☞ Definition of the reference antenna connector:
· Strictly 50 ohms matched impedance PCB tracks
· Straight PCB tracks
☞ Antenna gain:
· Radiation pattern: depending on antenna position and size of device
· Gain average in space in all frequencies: > -3dBi
· Maximum VSWR: < 1.5:1 with 50 ohm reference impedance
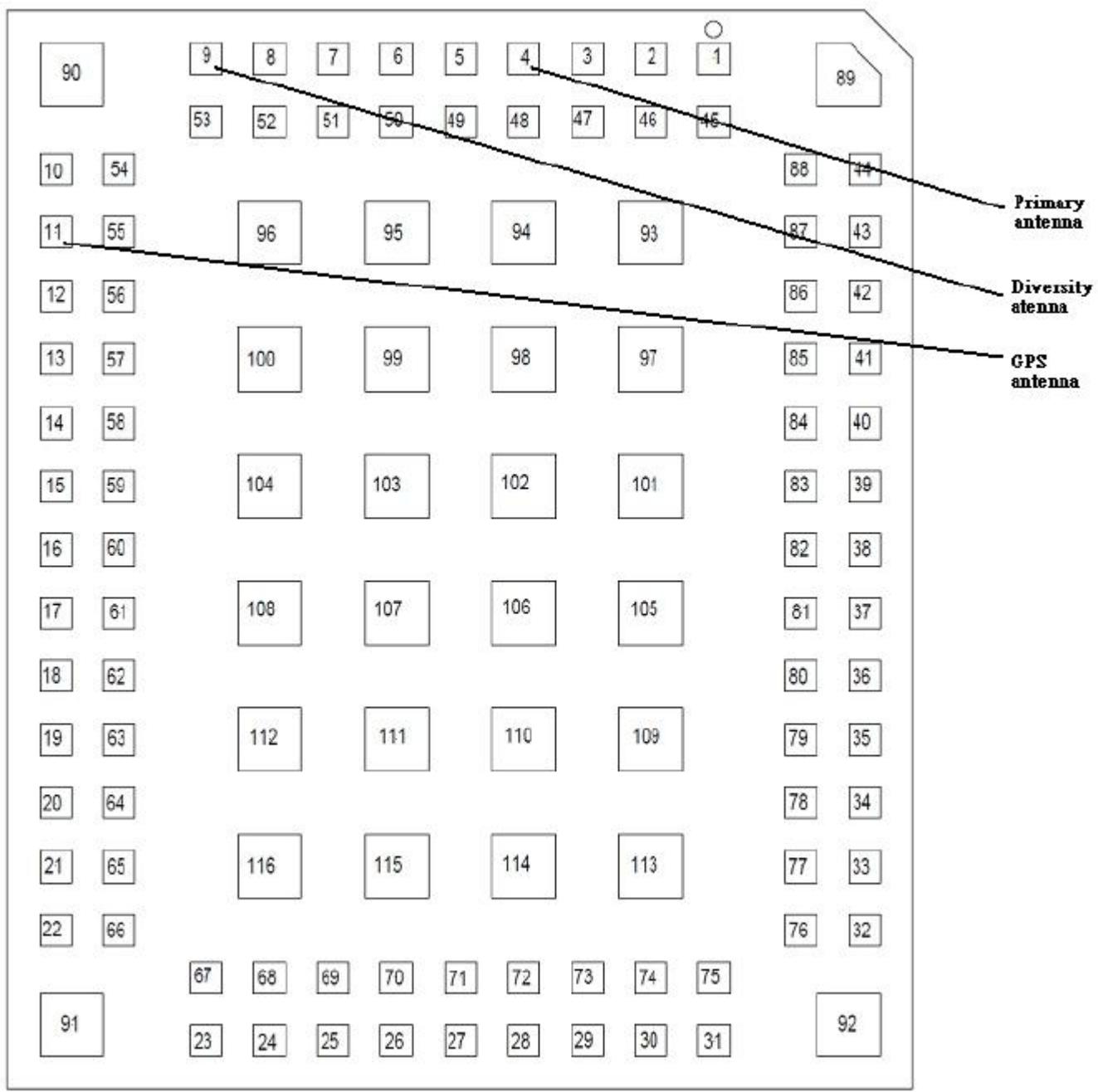
In order to achieve optimum sensitivity and output power, it is recommended to implement a matching circuit between the module and the antenna:



: Antenna connection reference

### 6.1.1. Antenna Pad

Three 50 ohm RF pads on the HILONC-3GPS PCB are available for antenna connection. One is for the Primary antenna, the second is for Diversity RX and the other is for GPS antenna.

: RF pads

## 6.1.2.    Antenna Recommendations

☞Antenna for HILONC-3GPS should resonate in the operating bands (GSM 850, 900, 1800, 1900 + UMTS band 1, 8) depending on the actual application of the specific HILONC-3GPS module.

☞Note that the RF-impedance of the HILONC-3GPS is 50Ω.

☞Use low loss antenna cable (max. 0.5dB).

☞ To avoid interference choose an antenna type with a radiation pattern that does not interfere with the module.  .

☞Circular polarized antennas are preferable.

☞Verify operation of the antenna by measuring the total radiated power.

☞Avoid placing a transmitting antenna near sensitive areas.

☞Apply EMC-design rules and follow shielding concepts.

☞ Keep EMC-sensitive and high-emission areas separate.

## 6.2. Ground Link Area

Good ground contact between the module and customer's board is required to achieve optimum radio performance (spurious, sensitivity…)

☞ All HILONC-3GPS ground pads must be connected to the ground of the customer's board.

☞ The thermal ground pads (pads 93~113) must be soldered to the ground of the customer's board to achieve better thermal dissipation.

TBD

: Thermal pads

## 6.3. Layout

☞ Isolate RF line and antenna from other bus or signals

☞ Signals should avoid being in the vicinity of 50 ohms. If not possible, add ground shielding using different layers.

☞ Do not add any ground layer under the antenna contact area.

☞ Do not add unvarnished layout traces on the first layer of the customer board, or unvarnished via holes under the module shield area or it will result in short circuit of those signals. This is mandatory.

☞ Free CAD software can be used to calculate the stack-up parameters to ensure a compliant 50 ohm RF track.

## 6.4. Mechanical Recommendations

☞ Do not apply mechanical pressure on the HILONC-3GPS shield. Doing so could damage the mechanical structure of the shield and lead to internal short-circuits or other issues.

☞ Avoid having metallic parts in the vicinity of  the antenna area.

☞ Keep FPCs and battery contact (if any) away from antenna area.

☞ FPC's (if any) have to be shielded.

## 6.5. Other Recommendation - production/design test

Sagemcom guarantees RF performance in conductive mode but strongly recommends carrying out RF measurements in an anechoic chamber in radiated mode (test conditions for FTA): radiated performance relies heavily on radio integration (layout, antenna, matching circuit, ground area….)

# 7. Audio Integration

The HILONC-3GPS module provides only a digital PCM interface for audio. A PCM codec must be put in customer's board if analog audio is required. The audio specifications which describe the audio tests are 3GPP TS 26.131 & 3GPP TS 26.132.

## 7.1. Mechanical integration and acoustics

*Particular care of Handset Mode:*
To achieve a more ideal audio output design (speaker part):

☞ The speaker must be completely sealed on the front side.

☞ The front aperture must in compliance with specifications of the speaker supplier.

☞ The back volume must be completely sealed.

☞ The sealed back volume must be in compliance with specifications of the speaker supplier.

☞ Pay attention to the design of the speaker gasket (elastomer).

☞ Make sure to leave sufficient space for the artificial ear gasket.

To achieve a more ideal audio input design (microphone part) :

☞ Pay attention to the design of the microphone (elastomer).

☞ All receivers must be completely sealed on the front side.

☞ Microphone sensitivity depends on the shape of the device but should be in the region of −40 ±3 dBV/Pa.

☞ Encourage the use of a pre-amplified microphone. If needed, use a pre-amplification stage.

As audio input and output are strongly linked:

☞ Place the microphone and the speaker as far away as possible from one another.

## 7.2. Electronics and layout

*Avoiding Distortion & Burst Noise*

☞ Audio signals must be symmetric (same components on each path).

☞ Differential signals must be routed in parallel.

☞ Audio layer must be surrounded by 2 ground layers.

☞ The link from one component to the ground must be as short as possible.

☞ If possible separate the PCBs of the microphone and speaker.

☞ Reduce the number of electronic components as much as possible (to avoid loss of quality and greater dispersion).

☞ Audio tracks must be larger than 0.5 mm.

# 8. Recommendations on customer board layout

## 8.1. General recommendations on layout

There are many different types of signals in the module which may interfere with each other. Particularly, audio signals are very sensitive to external signals such as *VBAT*. Therefore it is very important to follow some basic guidelines to avoid signal disruption or abnormal behavior.

☞ Magnetic fields generated by *VBAT* tracks may cause speaker interference and burst noise. In this case, modify layout of the *VBAT* tracks to reduce the phenomenon.

### 8.1.1. Ground

☞ Ensure the ground plane is as complete as possible.

☞ Grounding of components should be connected to the ground layer through a number of irregularly distributed vias.

☞ Top and bottom layer should set aside as much space for the ground plane as possible. Flood remaining empty surfaces of the layout of those two layers with a ground plane connected to the main ground through as many vias as possible.

### 8.1.2. Ground layout guidelines

☞ Proper grounding is crucial to end-product performance. At least one layer must be a dedicated ground plane. This ground plane is the common point referenced by all end-product circuits.

☞ In addition to the dedicated ground plane layer, unused space on all PCB layers should be filled with grounding to provide the most robust grounding possible from layer to layer.

☞ Bypass capacitors should be connected directly to their surface layer ground fill. Multiple vias should connect

each capacitor directly to the main ground plane, with one via in the capacitor's pad plus several vias within the surface layer ground fill area.

### 8.1.3. Digital ground

Digital ground should connect directly to the main ground plane. In addition, each layer between layer 1 and the main ground should include ground fills directly below the center grid area's digital pins, with each stack of vias connecting to each ground fill area. The large mass of copper tied together using this technique provides optimal electrical grounding and thermal conductivity.

### 8.1.4. Analog/RF ground

The analog/RF ground pins are connected to each other, but isolated from the digital ground (until main ground). Like the digital pins, the analog/RF pins should connect directly to the main ground plane. In addition, each layer between layer 1 and the main ground should include ground fills directly below the outer layer's analog/RF pins, with each stack of vias connecting to each ground fill area. The large mass of copper tied together using this technique provides optimal electrical grounding and thermal conductivity.

### 8.1.5. Power supply

☞ A layer for power supply signals (*VBAT*, *VGPIO*) is recommended.

☞ Looping of power signal layouts must be avoided in device design.

☞ Ensure suitable power supply (*VBAT*, *VGPIO*) track width and thickness.

### 8.1.6. Clocks

☞ Clock signals must be shielded between two ground layers and bordered with ground vias.

### 8.1.7. Data bus and other signals

☞ Data bus and commands have to be routed on the same layer. Lines of the bus should not be parallel to other lines.

☞ Line crossings should be perpendicular.

☞ Other signals should have suitable track width and thickness.

☞ Data bus must be protected by upper and lower ground planes

### 8.1.8. Radio

☞ Provide a 50 Ohm micro strip line for antenna connection.

### 8.1.9. Shielding

The following shielding comments are provided for designer consideration:

☞ At the very least the following devices and circuits should be shielded:

· High-speed memory
· RF front-end components
· Crystal circuits
· DC/DC circuits
· RF circuitry

☞ Recommended shield partitioning:

· For RF matching components do not locate matching inductors too close to shield walls (this may cause electromagnetic coupling and inductor de-Q).
· Memory devices must be shielded.
· Crystal circuits (other than reference circuits for RF frequency synthesizers) must be very close to their

corresponding pins.

· Metalized plastic is not as effective as metal cans.

· Shielded inductors might be needed on the DC/DC circuits, or they might need to be placed in their own shield area.

### 8.2. Example of a customer board layout

The following figure is an example of layer allocation for a 6-layer circuit (for reference purposes only):
Depending on the customer's design the layout could also be done using 4 layers.

| | Signal Assignment |
|---|---|
| Layer 1 | Components (HILONC-3GPS) |
| Layer 2 | BUS |
| Layer 3 | Power supply |
| Layer 4 | Complete GND layer |
| Layer 5 | Audio, Clocks, Sensitive signals |
| Layer 6 | GND, test points |

: 6 layer PCB stack

## 9. Moisture sensitivity level precautions

According to IPC/JEDEC J-STD 20, the HiLoNC 3GPS has the following MSL level: 3
Customer modules are shipped under a Dry package with all the MSL information labelled.

| Level | Floor Life | | Soak requirements | | | |
|---|---|---|---|---|---|---|
| | | | Standard | | Accelerated Equivalent | |
| | Time | Conditions | Time (hours) | Conditions | Time (hours) | Conditions |
| 3 | 168 hours | <= 30°C/60% RH | 192 +5/-0 | 30°C / 60% RH | 40 +1/-0 | 60°C / 60%RH |

It means that the customer's factory must process and solder the HiLoNC 3GPS on the customer's board up to

168 hours (7 days) after the HiLoNC 3GPS sealed package have been opened. This duration is given for factory floor conditions of T°<30°C, HR 60%.
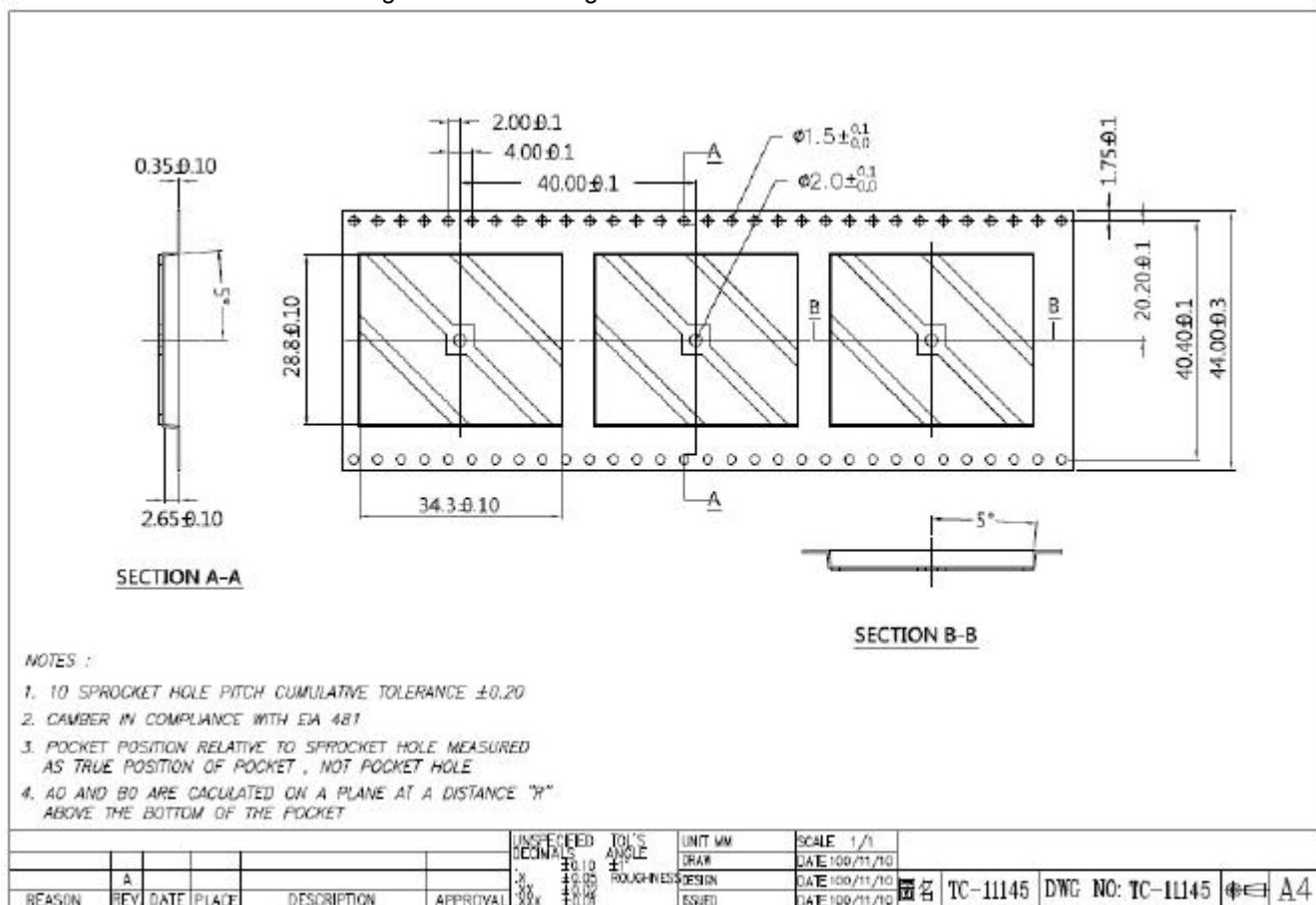
☞ If this maximum 7 days duration can not be fulfilled, the HiLoNC 3GPS part must be baked again.

☞ Unless the factory floor conditions are perfectly controlled, SAGEMCOM **does not** recommend to wait until this maximum 7 days duration before soldering the HiLoNC 3GPS on customer's board.

☞ For any module exposed to ambient moisture it is therefore **highly recommended** to proceed to a baking according to the JEDEC (125°C during 24H) to dry the module before any soldering process
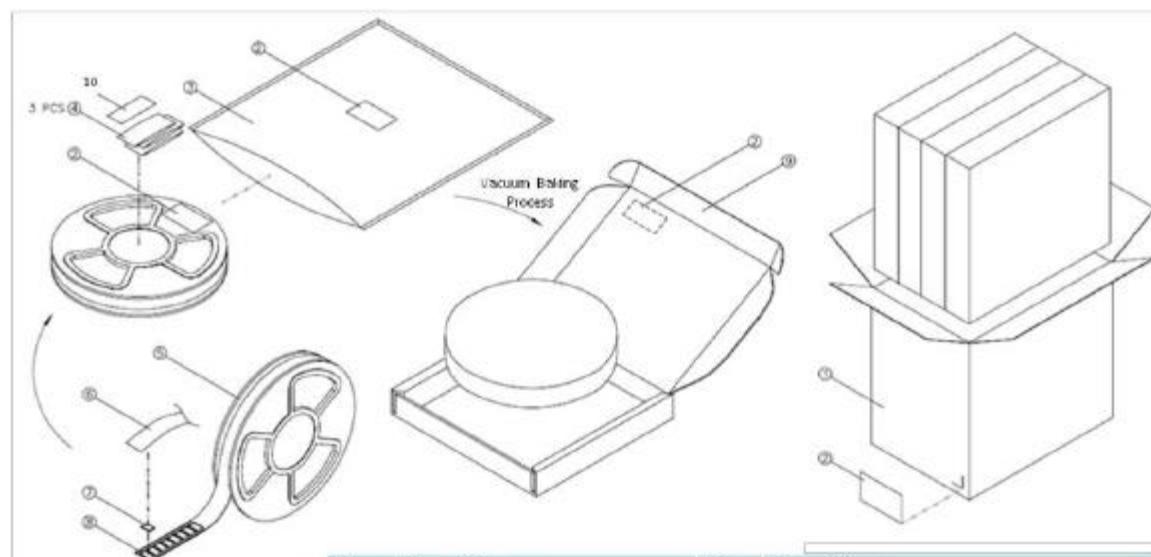
# 10 CUSTOMER PROCESS

## 10.1 PACKAGE

The HILONC-3GPS module is delivered in Tape and Reel package which is hermetically sealed to prevent from moisture and ESD.
The characteristics of the T&R are given in the drawing below.
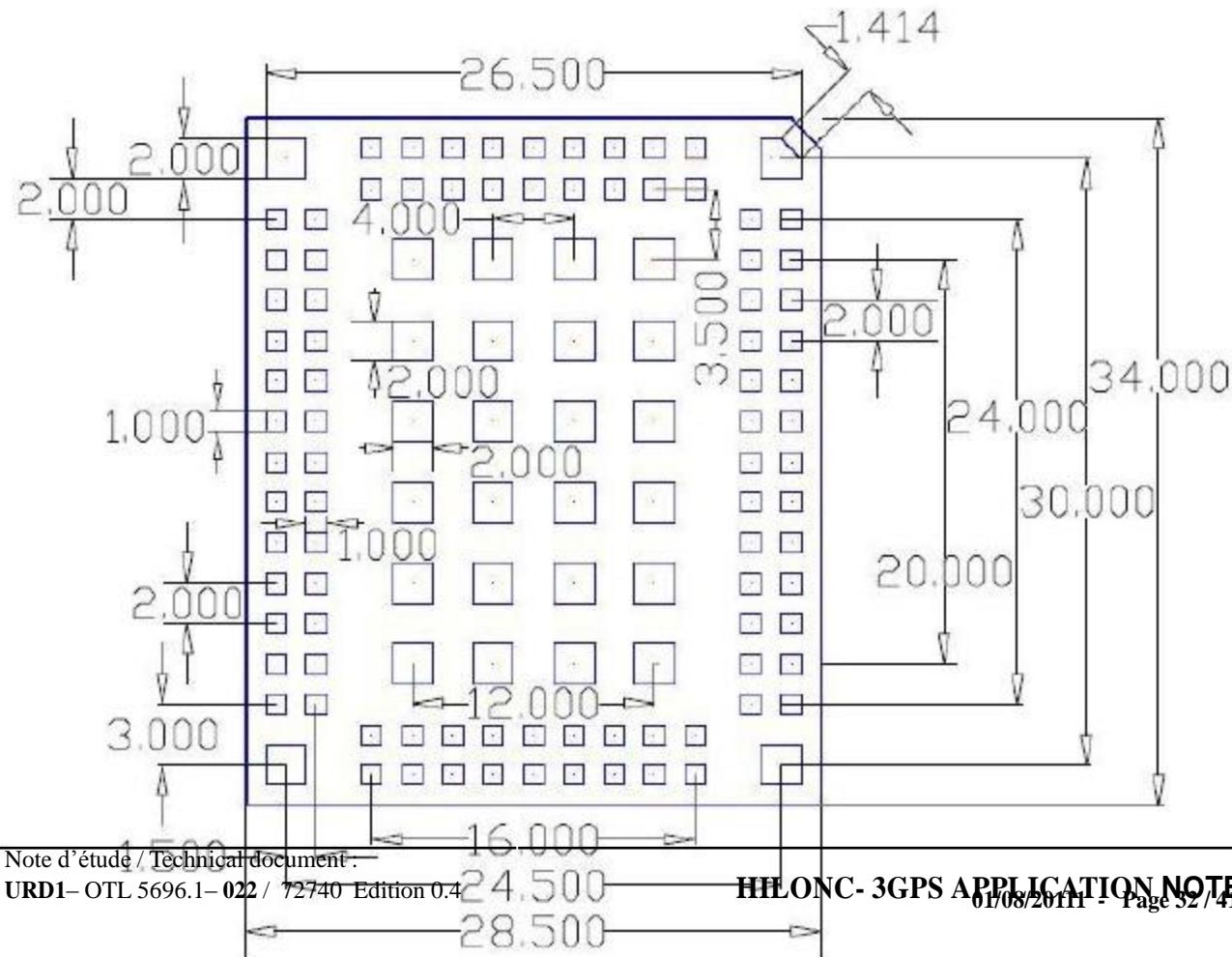
| No. | Description | No. | Description |
|-----|-------------|-----|-------------|
| 1 | Carton | 6 | Bag, Cover Tape |
| 2 | Label | 7 | Module |
| 3 | Aluminum Bag | 8 | Clamshell, Embossed Carrier Tape |
| 4 | Silica Gel Desiccant | 9 | Packing Box |
| 5 | Clamshell, Plastic Reel | 10 | Humidity Indicator card |

## 10.2 Stencil
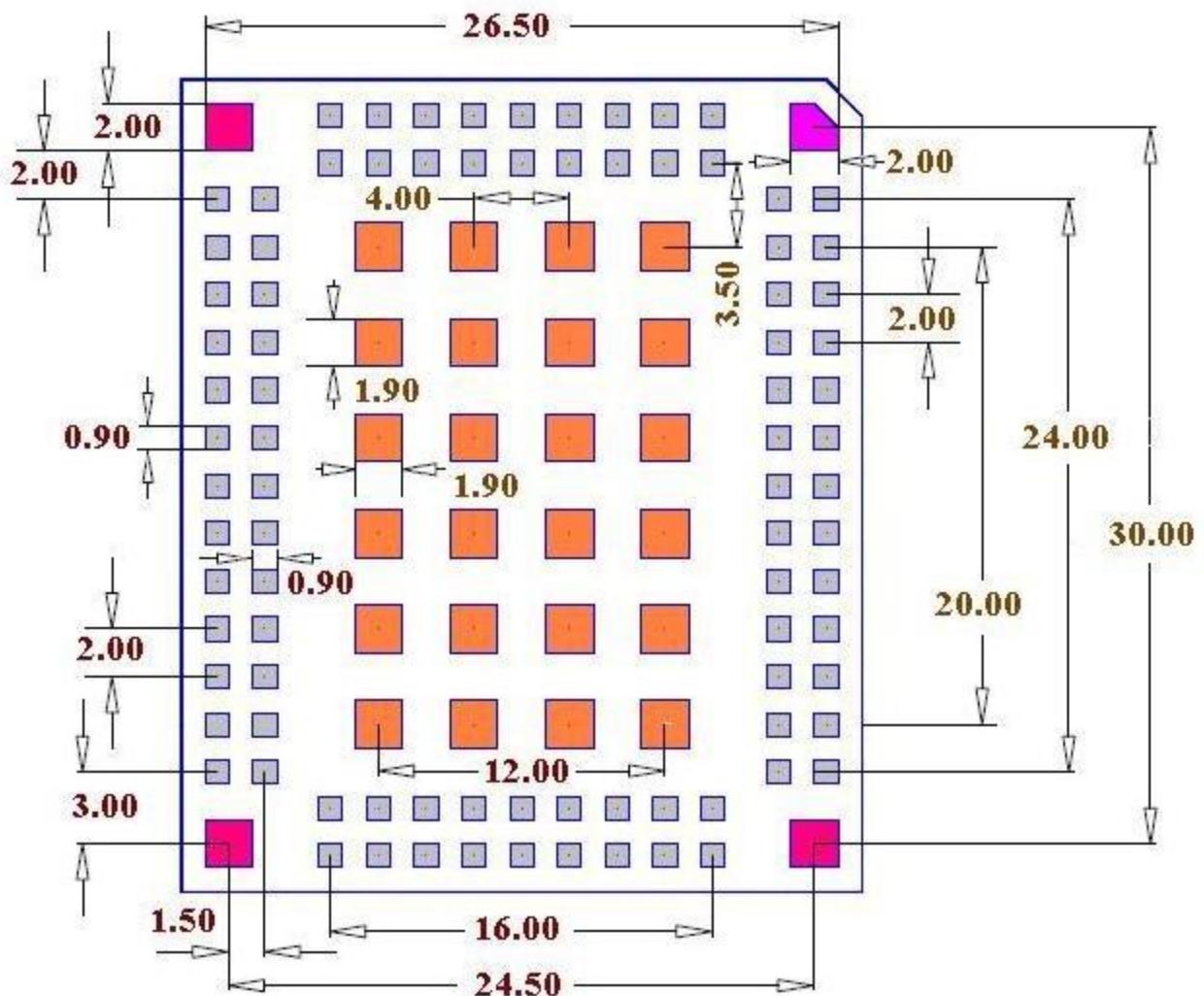
Below are given soldering characteristics to report the HILONC-3GPS on the customer's board.

### 10.2.1 Fotprint

Notes: all dimensions are in millimeter.

Note d'étude / Technical document :
URD1– OTL 5696.1– 022 / 72740 Edition 0.4     HILONC- 3GPS APPLICATION NOTE
01/08/2011 - Page 32 / 41

## 10.2.2 Recommended Stencil design



Stencil design advise thickness : 0.08mm ~ 0.13mm.
Solder paste advise thickness : 0.10mm ~ 0.18mm

## 10.3 Solder Paste

SAGEMCOM recommends Use of "No Clean" ASAHI soldering paste is strongly recommended, as it does not require cleaning after the soldering process has taken place. The paste listed in the example below meets these criteria.

Solder paste:          ACS-SN100C-MA1-S4 (Asahi Chemical (S) Pte Ltd.)
Alloy composition:     Sn-0.7Cu-0.05Ni+Ge (99.2% Tin / 0.7 % Copper / 0.05% Nickel / Germanium)
Melting temperature:   solidus 227°C / Peak 250°C / liquidus 227°C

## 10.4 Profile for Reflow soldering

A convection type soldering oven is recommended.
Typical usable profile is shown on the next figure. The final profile has to be tuned depending on other elements like solder paste, customer's board, other components…
Peak temperature: 235~250 Degree C.
Reflow zone (Above 220 Degree C): 30~70 sec.
Preheat zone (140~190 Degree C.): 60~120 sec.
Average ramp up rate : 2~4°C/second
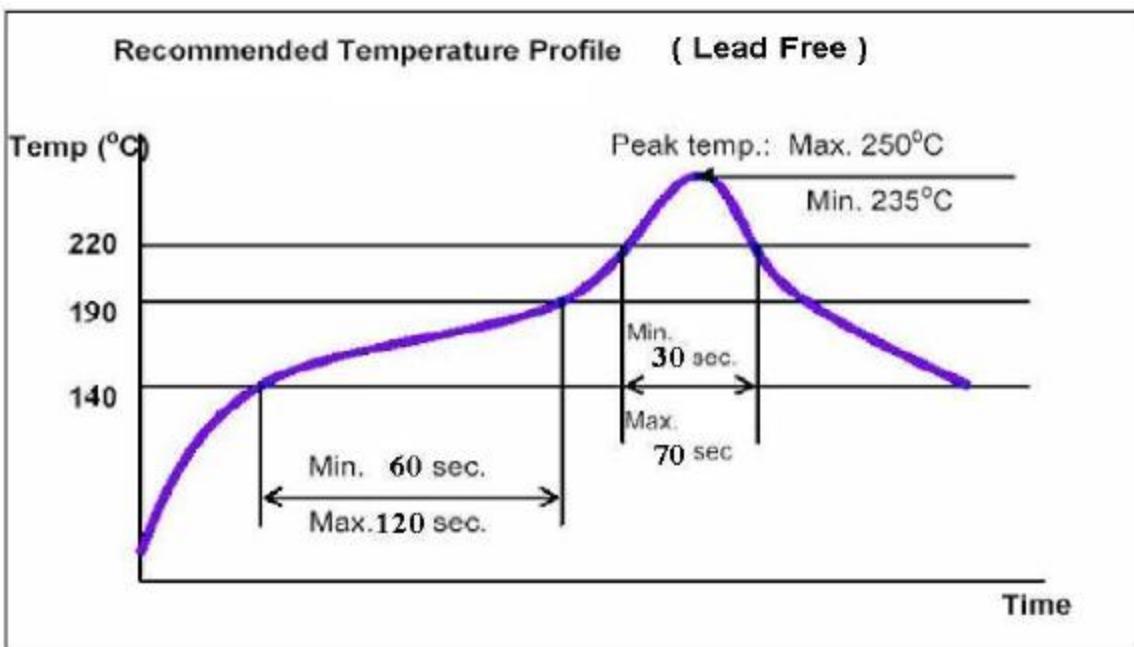
**Recommended Temperature Profile ( Lead Free )**

Peak temp.: Max. 250°C
Min. 235°C

Temp (°C)

220
190
140

Min. 30 sec.
Max. 70 sec

Min. 60 sec.
Max.120 sec.

Time
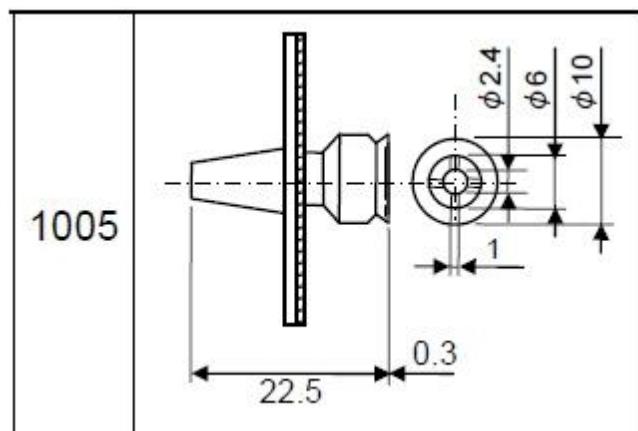
## 10.5  SMT Machine

### 10.5.1  Nozzles

SAGEMCOM recommends using SMT machine with nozzle diameters up to 10 mm in order to always have best prehension of the HILONC-3GPS module.
SAGEMCOM recommends using the following references of nozzles:
For the Panasonic, the nozzle 1005

φ2.4  φ6  φ10

1005

1

22.5    0.3

### 10.5.2  Fiducials

There is no fiducials design on the bottom side of the HILONC-3GPS.

## 10.6  Underfill

The HILONC-3GPS's shield did not  be designed accordingly to allow this underfill process.

## 10.7 Second reflow soldering

Even if SAGEMCOM recommends a single reflow soldering, a second reflow soldering can be conceivable.
Positive tests have been performed with HILONC-3GPS on the bottom side.

## 10.8  Hand soldering

Hand soldering is impossible for HILONC-3GPS.

## 10.9  Unsoldering

Manual unsoldering is possible, for repair purpose for example.
 A special care must be considered in order to avoid overheating the HILONC-3GPS.

For repairing: Usage of hot plate like example below can be considered with additional metallic cubic plate whose dimensions are HILONC-3GPS's ones (to heat only HILONC-3GPS surface)



Customer must remember to not have components on the HILONC-3GPS opposite side of the customer's board.

# 11.    Labelling

The HILONC-3GPS module is labeled with its own FCC ID (XXXHILONC-3GPS) on the shield side. When the module is installed inside customer's product, the FCC ID label on the module will not be visible. To avoid this scenario an exterior label must be stuck on the surface of the customer's product to indicate the FCC ID of the enclosed module. The label can use the following wording: "Contains transmitter module FCC ID: XXXHILONC-3GPS" or "Contains FCC ID: XXXHILONC-3GPS".

# 12.    CE/FCC/IC warning statement

## Europe – EU Declaration of Conformity

This device complies with the essential requirements of the R&TTE Directive 1999/5/EC. The following test methods have been applied in order to prove presumption of conformity with the essential requirements of the R&TTE Directive 1999/5/EC:
-    EN 60950-1: 2006+A11:2009:+A1:2010+A12:2011
     Safety of Information Technology Equipment

-    EN 301 908-2 V5.2.1

-    EN 62311: 2008
     Assessment of electronic and electrical equipment related to human exposure restrictions for electromagnetic fields (0 Hz-300 GHz)
     (IEC 62311:2007 (Modified))
-    EN 301 908-1 V4.2.1
-    Electromagnetic compatibility and Radio spectrum Matters (ERM); Base Stations (BS), Repeaters and User Equipment (UE) for IMT-2000 Third-Generation cellular networks; Part 1: Harmonized EN for IMT-2000, introduction and common requirements, covering essential requirements of article 3.2 of the R&TTE Directive
-    EN 301 511 V9.0.2: 2003

Note d'étude / Technical document :

- Global System for Mobile communications (GSM); Harmonized standard for mobile stations in the GSM 900 and DCS 1800 bands covering essential requirements under article 3.2 of the R&TTE directive (1999/5/EC)

EN 301 489-1 V1.8.1: 2008

Electromagnetic compatibility and Radio Spectrum Matters (ERM); ElectroMagnetic Compatibility (EMC) standard for radio equipment and services; Part 1: Common technical requirements

EN 301 489-7 V1.3.1: 2005

ElectroMagnetic compatibility and Radio spectrum Matters (ERM); ElectroMagnetic Compatibility (EMC) standard for radio equipment ad services; Part 7: Specific conditions for mobile and portable radio and ancillary equipment of digital cellular radio telecommunications systems (GSM and DCS)

EN 301 489-24 V1.5.1: 2010

Electromagnetic compatibility and Radio Spectrum Matters (ERM); ElectroMagnetic Compatibility (EMC) standard for radio equipment and services; Part 24: Specific conditions for IMT-2000 CDMA Direct Spread (UTRA) for Mobile and portable (UE) radio and ancillary equipment
EN 301 489-3 V1.4.1

CE 0682

| cs Česky [Czech] | *[Jméno výrobce]* tímto prohlašuje, že tento *[typ zařízení]* je ve shodě se základními požadavky a dalšími příslušnými ustanoveními směrnice 1999/5/ES. |
|---|---|
| da Dansk [Danish] | Undertegnede *[fabrikantens navn]* erklærer herved, at følgende udstyr *[udstyrets typebetegnelse]* overholder de væsentlige krav og øvrige relevante krav i direktiv 1999/5/EF. |
| de Deutsch [German] | Hiermit erklärt *[Name des Herstellers]*, dass sich das Gerät *[Gerätetyp]* in Übereinstimmung mit den grundlegenden Anforderungen und den übrigen einschlägigen Bestimmungen der Richtlinie 1999/5/EG befindet. |
| et Eesti [Estonian] | Käesolevaga kinnitab *[tootja nimi = name of manufacturer]* seadme *[seadme tüüp = type of equipment]* vastavust direktiivi 1999/5/EÜ põhinõuetele ja nimetatud direktiivist tulenevatele teistele asjakohastele sätetele. |
| en English | Hereby, *[name of manufacturer]*, declares that this *[type of equipment]* is in compliance with the essential requirements and other relevant provisions of Directive 1999/5/EC. |
| es Español [Spanish] | Por medio de la presente *[nombre del fabricante]* declara que el *[clase de equipo]* cumple con los requisitos esenciales y cualesquiera otras disposiciones aplicables o exigibles de la Directiva 1999/5/CE. |
| el Ελληνική [Greek] | ΜΕ ΣΗΝ ΠΑΡΟΤ□ Α*[name of manufacturer]* ΔΗΛΩΝΕΙ ΟΣΙ *[type of equipment]* □ ΤΜΜΟΡΦΩΝΕΣΑΙΠΡΟ□ ΣΙ□ ΟΤ□ ΙΩΔΕΙ□ΑΠΑΙΣΗ□ ΕΙ□ΚΑΙ ΣΙ□ ΛΟΙΠΕ□ □ ΥΕΣΙΚΕ□ ΔΙΑΣΑΞΕΙ□ ΣΗ□ ΟΔΗΓΙΑ□ 1999/5/ΕΚ. |
| fr Français [French] | Par la présente *[nom du fabricant]* déclare que l'appareil *[type d'appareil]* est conforme aux exigences essentielles et aux autres dispositions pertinentes de la directive 1999/5/CE. |
| it Italiano [Italian] | Con la presente *[nome del costruttore]* dichiara che questo *[tipo di apparecchio]* è conforme ai requisiti essenziali ed alle altre disposizioni pertinenti stabilite dalla direttiva 1999/5/CE. |
| Latviski [Latvian] | Ar šo *[name of manufacturer / izgatavotāja nosaukums]* deklarē, ka *[type of equipment / iekārtas tips]* atbilst Direktīvas 1999/5/EK būtiskajām prasībām un citiem ar to saistītajiem noteikumiem. |
| Lietuvių [Lithuanian] | Šiuo *[manufacturer name]* deklaruoja, kad šis *[equipment type]* atitinka esminius reikalavimus ir kitas 1999/5/EB Direktyvos nuostatas. |
| nl Nederlands [Dutch] | Hierbij verklaart *[naam van de fabrikant]* dat het toestel *[type van toestel]* in overeenstemming is met de essentiële eisen en de andere relevante bepalingen van richtlijn 1999/5/EG. |
| mt Malti [Maltese] | Hawnhekk, *[isem tal-manifattur]*, jiddikjara li dan *[il-mudel tal-prodott]* jikkonforma mal-ħtiġijiet essenzjali u ma provvedimenti oħrajn relevanti li hemm fid-Dirrettiva 1999/5/EC. |
| hu Magyar [Hungarian] | Alulírott, *[gyártó neve]* nyilatkozom, hogy a *[... típus]* megfelel a vonatkozó alapvető követelményeknek és az 1999/5/EC irányelv egyéb előírásainak. |

| | | |
|---|---|---|
| [pl] Polski [Polish] | Niniejszym *[nazwa producenta]* oświadcza, że *[nazwa wyrobu]* jest zgodny z zasadniczymi wymogami oraz pozostałymi stosownymi postanowieniami Dyrektywy 1999/5/EC. | |
| [pt] Português [Portuguese] | *[Nome do fabricante]* declara que este *[tipo de equipamento]* está conforme com os requisitos essenciais e outras disposições da Directiva 1999/5/CE. | |
| [sl] Slovensko [Slovenian] | *[Ime proizvajalca]* izjavlja, da je ta *[tip opreme]* v skladu z bistvenimi zahtevami in ostalimi relevantnimi določili direktive 1999/5/ES. | |
| Slovensky [Slovak] | *[Meno výrobcu]* týmto vyhlasuje, že *[typ zariadenia]* spĺňa základné požiadavky a všetky príslušné ustanovenia Smernice 1999/5/ES. | |
| [fi] Suomi [Finnish] | *[Valmistaja = manufacturer]* vakuuttaa täten että *[type of equipment = laitteen tyyppimerkintä]* tyyppinen laite on direktiivin 1999/5/EY oleellisten vaatimusten ja sitä koskevien direktiivin muiden ehtojen mukainen. | |
| [sv] Svenska [Swedish] | Härmed intygar *[företag]* att denna *[utrustningstyp]* står I överensstämmelse med de väsentliga egenskapskrav och övriga relevanta bestämmelser som framgår av direktiv 1999/5/EG. | |

# Federal Communication Commission Interference Statement

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.

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

This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter. This device complies with FCC radiation exposure limits set forth for an uncontrolled environment. In order to avoid the possibility of exceeding the FCC radio frequency exposure limits, human proximity to the antenna shall not be less than 20cm (8 inches) during normal operation.

## Industry Canada statement:

This device complies with RSS-210 of the Industry Canada 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.

Ce dispositif est conforme à la norme CNR-210 d'Industrie Canada applicable aux appareils radio exempts de licence. Son fonctionnement est sujet aux deux conditions suivantes: (1) le dispositif ne doit pas produire de brouillage préjudiciable, et (2) ce dispositif doit accepter tout brouillage reçu, y compris un brouillage susceptible de provoquer un fonctionnement indésirable.

### Radiation Exposure Statement:
This equipment complies with IC 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.

### Declaration d'exposition aux radiations:
Cet equipement est conforme aux limites d'exposition aux rayonnements IC etablies pour un environnement non controle. Cet equipement doit etre installe et utilise avec un minimum de 20 cm de distance entre la source de rayonnement et votre corps.

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

1) The antenna must be installed such that 20 cm is maintained between the antenna and users, and
2) The transmitter module may not be co-located with any other transmitter or antenna.

As long as 2 conditions above are met, further transmitter test will not be required. However, the OEM integrator is still responsible for testing their end-product for any additional compliance requirements required with this module installed

**Cet appareil est conçu uniquement pour les intégrateurs OEM dans les conditions suivantes: (Pour utilisation de dispositif module)**

1) L'antenne doit être installée de telle sorte qu'une distance de 20 cm est respectée entre l'antenne et les utilisateurs, et
2) Le module émetteur peut ne pas être coïmplanté avec un autre émetteur ou antenne.

Tant que les 2 conditions ci-dessus sont remplies, des essais supplémentaires sur l'émetteur ne seront pas nécessaires. Toutefois, l'intégrateur OEM est toujours responsable des essais sur son produit final pour toutes exigences de conformité supplémentaires requis pour ce module installé.

**IMPORTANT NOTE:** In the event that these conditions can not be met (for example certain laptop configurations or co-location with another transmitter), then the FCC/Canada authorization is no longer considered valid and the FCC/IC ID can not 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/Canada authorization.

**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'ID IC 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**

This transmitter module is authorized only for use in device where the antenna may be installed such that 20 cm may be maintained between the antenna and users. The final end product must be labeled in a visible area with the following: "Contains FCC ID: VW3HILONC-3GPS"
"Contains IC: 9140A-HILONC-3GPS"
The grantee's FCC ID/IC ID can be used only when all FCC/Canada compliance requirements are met.

## Plaque signalétique du produit final

Ce module émetteur est autorisé uniquement pour une utilisation dans un dispositif où l'antenne peut être installée de telle sorte qu'une distance de 20cm peut être maintenue entre l'antenne et les utilisateurs. Le produit final doit être étiqueté dans un endroit visible avec l'inscription suivante: "Contient des IC: 9140A-HILONC-3GPS".

### 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 device has been designed to operate with a dipole antenna have a maximum gain of [0.6] dB. Antenna having a higher gain is strictly prohibited per regulations of Industry Canada. The required antenna impedance is 50 ohms.

Under Industry Canada regulations, this radio transmitter may only operate using an antenna of a type and maximum (or lesser) gain approved for the transmitter by Industry Canada. To reduce potential radio interference to other users, the antenna type and its gain should be so chosen that the equivalent isotropically radiated power (e.i.r.p.) is not more than that necessary for successful communication.

This radio transmitter (IC: 9140A-HILONC-3GPS / Model: HiLoNC-3GPS ) has been approved by Industry Canada to operate with the antenna type, maximum permissible gain and required antenna impedance for each antenna type indicated. Antenna types not included in this user's manual, having a gain greater than the maximum gain indicated for that type, are strictly prohibited for use with this device.

Ce dispositif a été conçu pour fonctionner avec une antenne ayant un gain maximal de dipole antenne avec dB [0.6]. Une antenne à gain plus élevé est strictement interdite par les règlements d'Industrie Canada. L'impédance d'antenne requise est de 50 ohms.

Conformément à la réglementation d'Industrie Canada, le présent émetteur radio peutfonctionner avec une antenne d'un type et d'un gain maximal (ou inférieur) approuvé pourl'émetteur par Industrie Canada. Dans le but de réduire les risques de brouillage radioélectriqueà l'intention des autres utilisateurs, il faut choisir le type d'antenne et son gain de sorte que lapuissance isotrope rayonnée équivalente (p.i.r.e.) ne dépasse pas l'intensité nécessaire àl'établissement d'une communication satisfaisante.

Le présent émetteur radio (IC: 9140A-HILONC-3GPS / Modèle: HiLoNC-3GPS  ) a été approuvé par Industrie Canada pour fonctionner avec les types d'antenne énumérés ci-dessous et ayant un gain admissible maximal et l'impédance requise pour chaque type d'antenne. Les types d'antenne non inclus dans cette liste, ou dont le gain est supérieur au gain maximal indiqué, sont strictement interdits pour l'exploitation de l'émetteur.

## Declaration of Conformity

We, **Sagemcom SAS**
Address: 250 Route de l'Empereur, 92848 Rueil Malmaison Cedex France

Declare under our own responsibility that the product:

**Model: HiLoNC-3GPS**
**Intended use: Qual-Band GSM/GPRS/EDGE and Dual-Band WCDMA/HSDPA/HSUPA/HSPA+ Voice and Data Module**

*Complies with the essential requirements of Article 3 of the R&TTE 1999/5/EC Directive, if used for its intended use and that the following standards have been applied:*

1. **Health (Article 3.1(a) of the R&TTE Directive)**

   Applied Standard(s):
   - EN62311 :2008
2. **Safety (Article 3.1(a) of the R&TTE Directive)**

   Applied Standard(s):
   - EN 60950-1:2006+A11:2009+A1:2010+A12:2011
3. **Electromagnetic compatibility (Article 3.1 (b) of the R&TTE Directive)**

   Applied Standard(s):
   - EN 301 489-1 V1.8.1/-3 V1.4.1/-7V1.3.1/-24V1.5.1
4. **Radio frequency spectrum usage (Article 3.2 of the R&TTE Directive)**

   Applied Standard(s):
   - EN 300 440-1V1.6.1/EN 300 440-2 V1.4.1
   - EN 301 908-2 V5.2.1/EN 301 908-1V4.2.1
   - EN301 511 V 9.0.2