

# HE910 Mini PCIe Hardware User Guide

1w0301006 Rev.3 – 2012-11-22



## APPLICABILITY TABLE

PRODUCT
HE910 Mini PCIe



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# 1. Introduction

## 1.1. Scope

The aim of this document is the description of some hardware solutions useful for developing a product with the Telit HE910 Mini PCIe Adapter.

## 1.2. Audience

This document is intended for Telit customers, who are integrators, about to implement their applications using our HE910 Mini PCIe Adapter.

## 1.3. Contact Information, Support

For general contact, technical support, to report documentation errors and to order manuals, contact Telit's Technical Support Center (TTSC) at:

[TS-EMEA@telit.com](mailto:TS-EMEA@telit.com)  
[TS-NORTHAMERICA@telit.com](mailto:TS-NORTHAMERICA@telit.com)  
[TS-LATINAMERICA@telit.com](mailto:TS-LATINAMERICA@telit.com)  
[TS-APAC@telit.com](mailto:TS-APAC@telit.com)

Alternatively, use:

<http://www.telit.com/en/products/technical-support-center/contact.php>

For detailed information about where you can buy the Telit modules or for recommendations on accessories and components visit:

<http://www.telit.com>

To register for product news and announcements or for product questions contact Telit's Technical Support Center (TTSC).

Our aim is to make this guide as helpful as possible. Keep us informed of your comments and suggestions for improvements.

Telit appreciates feedback from the users of our information.

## 1.4. Text Conventions



***Danger – This information MUST be followed or catastrophic equipment failure or bodily injury may occur.***



***Caution or Warning – Alerts the user to important points about integrating the module, if these points are not followed, the module and end user equipment may fail or malfunction.***



**Tip or Information – Provides advice and suggestions that may be useful when integrating the module.**



All dates are in ISO 8601 format, i.e. YYYY-MM-DD.

## 1.5. Related Documents

- AT Commands Reference Guide 80378ST10091A
- HE910 Hardware User Guide 1w03700925
- Event Monitor Application Note 80000nt10043a
- Digital Voice Interface Application Note 80000NT10004a





## 2. Overview

The aim of this document is the description of some hardware solutions useful for developing a product that will host the Telit HE910 Mini PCIe Adapter.

In this document all the basic functions of a mobile phone will be taken into account; for each one of them a proper hardware solution will be suggested and eventually the wrong solutions and common errors to be avoided will be evidenced. Obviously this document cannot embrace the whole hardware solutions and products that may be designed. The wrong solutions to be avoided shall be considered as mandatory, while the suggested hardware configurations shall not be considered mandatory, instead the information given shall be used as a guide and a starting point for properly developing your product with the Telit Mini PCIe module.



### NOTICE:

(EN) The integration of the GSM/GPRS/WCDMA **HE910 Mini PCIe** cellular module within user application shall be done according to the design rules described in this manual.

(IT) L'integrazione del modulo cellulare GSM/GPRS/WCDMA **HE910 Mini PCIe** all'interno dell'applicazione dell'utente dovrà rispettare le indicazioni progettuali descritte in questo manuale.

(DE) Die Integration des **HE910 Mini PCIe** GSM/GPRS/WCDMA Mobilfunk-Moduls in ein Gerät muß gemäß der in diesem Dokument beschriebenen Konstruktionsregeln erfolgen.

(SL) Integracija GSM/GPRS/WCDMA **HE910 Mini PCIe** modula v uporabniški aplikaciji bo morala upoštevati projektna navodila, opisana v tem priročniku.

(SP) La utilización del modulo GSM/GPRS/WCDMA **HE910 Mini PCIe** debe ser conforme a los usos para los cuales ha sido diseñado descritos en este manual del usuario.

(FR) L'intégration du module cellulaire GSM/GPRS/WCDMA **HE910 Mini PCIe** dans l'application de l'utilisateur sera faite selon les règles de conception décrites dans ce manuel.

(HE) האינטגרציה של המודם הסלולרי **HE910 Mini PCIe** עם המוצר. תהליך האינטגרציה של המודם הסלולרי

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### 3. HE910 Mini PCI express card connections

#### 3.1. PIN-OUT

This product has a standard Mini PCI express connector, excepting the (4) audio signals which use normally reserved connectors.

Pin	Signal	I/O	Function	Type
<b>Power Supply</b>				
2	3V3_AUX	O	3.3V supply	Power
24	3V3	O	3.3V supply	Power
39	3V3_AUX	O	3.3V supply	Power
41	3V3_AUX	O	3.3V supply	Power
52	3V3_AUX	O	3.3V supply	Power
4	GND	-	Ground	Power
9	GND	-	Ground	Power
15	GND	-	Ground	Power
18	GND	-	Ground	Power
21	GND	-	Ground	Power
26	GND	-	Ground	Power
27	GND	-	Ground	Power
29	GND	-	Ground	Power
34	GND	-	Ground	Power
35	GND	-	Ground	Power
37	GND	-	Ground	Power
40	GND	-	Ground	Power
43	GND	-	Ground	Power
50	GND	-	Ground	Power
<b>SIM Card Interface</b>				
8	SIMVCC	O	External SIM signal – Power supply for the SIM	1.8 / 3V
10	SIMIO	I/O	External SIM signal - Data I/O	1.8 / 3V
12	SIMCLK	O	External SIM signal – Clock	1.8 / 3V
14	SIMRST	O	External SIM signal – Reset	1.8 / 3V
<b>USB</b>				
36	USB D-	I/O	USB differential Data (-)	0.3...2.8V
38	USB D+	I/O	USB differential Data (+)	0.3...2.8V



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Pin	Signal	I/O	Function	Type
<b>Miscellaneous Functions</b>				
1	WAKE#	O	Active low signal used to wake up the system from stand-by	3.3V
20	WDISABLE#	I	Active low signal for wireless disabling (Flight mode)	3.3V
22	PERST#	I	Active low functional reset to the card	3.3V
42	LED_WWAN#	O	Active low, open drain signal for WWAN LED driving, used to provide module's status indication	3.3V...5V
<b>Digital Voice Interface (DVI)</b>				
45	PCM_CLK	I/O	Digital Audio Interface (CLK)	CMOS 1.8V
47	PCM_RX	I	Digital Audio Interface (RX)	CMOS 1.8V
49	PCM_TX	O	Digital Audio Interface (TX)	CMOS 1.8V
51	PCM_SYNC	I/O	Digital Audio Interface (SYNC)	CMOS 1.8V
<b>N.C.</b>				
3		-		
5		-		
6		-		
7		-		
11		-		
13		-		
16		-		
17		-		
19		-		
23		-		
25		-		
28		-		
30		-		
31		-		
32		-		
33		-		
44		-		
46		-		
48		-		



## 3.2. Antenna connectors

The HE910 Mini PCIe adapter is equipped with three 50  $\Omega$  RF U.FL. connectors from Hirose U.FL-R-SMT-1(10).

For more information about mating connectors visit the website <http://www.hirose-connectors.com/>

One connector is for the RF antenna and the others for RX Diversity and GPS receiver (see drawing in the chapter “Mechanical Specifications”).



## 4. Power Supply

The power supply circuitry and board layout are a very important part in the full product design and they strongly reflect on the product overall performances, hence read the requirements carefully and the guidelines that will follow for a proper design.

### 4.1. Power Supply Requirements

The external power supply must be connected to the pins 2, 39, 41, 52 and must fulfill the following requirements:

POWER SUPPLY	
Nominal Supply Voltage	3.3 V
Normal Operating Voltage Range	3.00 V ÷ 3.60 V



**NOTE:**

Pin 24 of MKT3990250875 is internally connected to pins 2,39,41,52.



**NOTE:**

The Operating Voltage Range **MUST** never be exceeded; care must be taken when designing the application's power supply section to avoid having an excessive voltage drop.

If the voltage drop is exceeding the limits it could cause a Power Off of the module.



**NOTE:**

Overshoot voltage (regarding MAX Operating Voltage) and drop in voltage (regarding MIN Operating Voltage) **MUST** never be exceeded;



## 4.2. Power Consumption (preliminary)

HE910		
Mode	Average (mA)	Mode description
<b>SWITCHED OFF</b>		
Switched Off	44uA	Module supplied but Switched Off
<b>IDLE mode (WCDMA)</b>		
AT+CFUN=5	1.32	Disabled TX and RX; DRX7
<b>IDLE mode (GSM/EDGE)</b>		
AT+CFUN=1	20.9	Normal mode: full functionality of the module
AT+CFUN=4	18.1	Disabled TX and RX; module is not registered on the network
AT+CFUN=5	0.9	Disabled TX and RX; DRX9 (1.2mA in case of DRX5)
<b>Operative mode (WCDMA)</b>		
WCDMA HSDPA (0dBm)	187	WCDMA data call (Cat 14, TX = 0dBm)
WCDMA HSDPA (22dBm)	494	WCDMA data call (Cat 14, TX = 22dBm)
<b>Operative mode (EDGE)</b>		
<b>EDGE 4TX+2RX</b>		
GSM900 PL5	495	EDGE Sending data mode
DCS1800 PL0	484	
<b>Operative mode (GSM)</b>		
<b>CSD TX and RX mode</b>		
GSM900 CSD PL5	220	GSM Circuit Switched Data
DCS1800 CSD PL0	167	
<b>GPRS 4TX+2RX</b>		
GSM900 PL5	580	GPRS Sending data mode
DCS1800 PL0	438	

The GSM system is made in a way that the RF transmission is not continuous, else it is packed into bursts at a base frequency of about 216 Hz, and the relative current peaks can be as high as about 2.4A. Therefore the power supply has to be designed in order to withstand with these current peaks without big voltage drops; this means that both the electrical design and the board layout must be designed for this current flow. If the voltage drop during the peak current absorption is too much, then the device may even shutdown as a consequence of the supply voltage drop.



**NOTE:**

The electrical design for the Power supply should be made ensuring it will be capable of a peak current output of at least 2.4 A.



## 5. RF Specifications

The HE910 Mini PCIe adapter is provided with three RF connectors. One connector is for the main RF path, the second is for Rx Diversity and the third for GPS.

The antenna connection is one of the most important aspect in the full product design as it strongly affects the product overall performances, hence read carefully and follow the requirements and the guidelines for a proper design.

Connecting cables between the module and the antenna must have 50  $\Omega$  impedance. If the impedance of the module is mismatched, RF performance is reduced significantly.

If the host device is not designed to use the module's diversity or GPS antenna, terminate the interface with a 50  $\Omega$  load.

**RF Performance**

Band	Output power	Sensitivity
850 / 900 MHz, GSM	Class 4 (2W)	- 107 dBm (typ.)
1800 / 1900 MHz, GSM	Class 1 (1W)	- 106 dBm (typ.)
850/900 MHz, EDGE	Class E2 (0.5W)	- 107 dBm (typ.)
1800/1900 MHz, EDGE	Class E2 (0.4W)	- 106 dBm (typ.)
850/900/1700/1900/2100 MHz, WCDMA	Class 3 (0.25W)	- 108 dBm (typ.)

### 5.1. GSM/WCDMA Antenna Requirements

The antenna for a Telit HE910 Mini PCIe adapter shall fulfill the following requirements:

ANTENNA REQUIREMENTS	
<b>Frequency range</b>	Depending by frequency band(s) provided by the network operator, the customer shall use the most suitable antenna for that/those band(s)
<b>Bandwidth (GSM/EDGE)</b>	70 MHz in GSM850, 80 MHz in GSM900, 170 MHz in DCS & 140 MHz PCS band
<b>Bandwidth (WCDMA)</b>	70 MHz in WCDMA Band V 80 MHz in WCDMA Band VIII 460 MHz in WCDMA Band IV 140 MHz in WCDMA Band II 250 MHz in WCDMA Band I
<b>Impedance</b>	50 ohm
<b>Input power</b>	> 33dBm(2 W) peak power in GSM > 24dBm Average power in WCDMA
<b>VSWR absolute max</b>	$\leq$ 5:1 (limit to avoid permanent damage)
<b>VSWR recommended</b>	$\leq$ 2:1 (limit to fulfil all regulatory requirements)



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Furthermore if the device is developed for the US market and/or Canadian market, it shall comply with the FCC and/or IC approval requirements:

This device is to be used only for mobile and fixed application. In order to re-use the Telit FCC/IC approvals the antenna(s) used for this transmitter must be installed to provide a separation distance of at least 20 cm from all persons and must not be co-located or operating in conjunction with any other antenna or transmitter. If an antenna is installed with a separation distance of less than 20 cm from all persons or is co-located or operating in conjunction with any other antenna or transmitter then additional FCC/IC testing may be required.

End-Users must be provided with transmitter operation conditions for satisfying RF exposure compliance.

Antennas used for this OEM module must not exceed the following gains for mobile and fixed operating configurations:

- GSM 850/FDD V: 5.22 dBi
- PCS 1900/FDD II: 3.31 dBi
- FDD IV: 6.45 dBi

### 5.1.1. GSM/WCDMA Antenna - Installation Guidelines

- Install the antenna in a place covered by the GSM signal.
- If the device antenna is located greater than 20cm from the human body and there are no co-located transmitters then the Telit FCC/IC approvals can be re-used by the end product
- If the device antenna is located less than 20cm from the human body or there are no co-located transmitters then the additional FCC/IC testing may be required for the end product (Telit FCC/IC approvals cannot be reused)
- Antenna shall not be installed inside metal cases
- Antenna shall be installed also according antenna manufacturer instructions.

### 5.2. Antenna Diversity Requirements

This product includes an input for a second RX antenna to improve the radio sensitivity. The function is called Antenna Diversity.

ANTENNA REQUIREMENTS	
Frequency range	Depending by frequency band(s) provided by the network operator, the customer shall use the most suitable antenna for that/those band(s)
Bandwidth (GSM/EDGE)	70 MHz in GSM850, 80 MHz in GSM900, 140 MHz PCS band
Bandwidth (WCDMA)	70 MHz in WCDMA Band V 80 MHz in WCDMA Band VIII 140 MHz in WCDMA Band II 250 MHz in WCDMA Band I
Impedance	50 ohm





The second Rx antenna should not be located in the close vicinity of main antenna. In order to improve Diversity Gain, Isolation and reduce mutual interaction, the two antennas should be located at the maximum reciprocal distance possible, taking into consideration the available space in the application.



**NOTE1:**

The Diversity is not supported on the FDD BAND IV and DCS band.



**NOTE2:**

If the RX Diversity is not used/connected, disable the Diversity functionality using the AT#RXDIV command (ref to the At User guide for the proper syntax).

## 5.3. GPS Receiver

The HE910 Mini PCIe adapter integrates a GPS receiver that could be used in Standalone mode and in A-GPS (assisted GPS), according to the different configurations. With the help of advanced digital signal processing algorithms and the use of A-GPS data, the receiver is capable to achieve sensitivity values of better than -165 dBm as is required for indoor applications.

### 5.3.1. GPS Performances

- Advanced real time hardware correlation engine for enhanced sensitivity (better than -165 dBm for A-GPS).
- Fast Acquisition giving rapid Time-to-First-Fix (TTFF)
- Capability to monitor up to 28 channels
- Stand Alone and Assisted mode
- Integrated LNA



The following Table is listing the main characteristics:

Characteristic	Typical Values
GPS RX Sensitivity	-164dBm
GPS Cold Start Autonomous	-147dBm
GPS Hot Start Autonomous	-161dBm
GPS tracking mode	-166 dBm
GPS Accuracy	3m
TTF from Cold Start	42 sec
TTF from Warm Start	30sec
TTF from Hot Start	1.8 sec
Power Consumption in Acquisition	46.4 mA @3.8V
Power Consumption in Tracking	37.8 mA @3.8V
Power Consumption in Low Power Tracking	25.7 mA @3.8V

### 5.3.2. RF Front End Design

The HE910 Mini PCIe adapter contains an integrated LNA and pre-select SAW filter. This allows the module to work well with a passive GPS antenna. If the antenna cannot be located near the HE910, then an active antenna (that is, an antenna with a low noise amplifier built in) can be used. For additional info regarding GPS RF signal requirements



**NOTE:**

Please refer to the HE910 Hardware User Guide for detailed information about GPS operating modes and RF signal requirements.



## 6. Logic level specifications

The following table shows logic level specifications used in the HE910 interface circuits:

### Absolute Maximum Ratings -Not Functional

Parameter	Min	Max
Input level on any digital pin (CMOS 1. with respect to ground	-0.5V	3.6V

### Operating Range – DC Specification for 3V3 Logic Signalling

Symbol	Parameter	Min	Max
3V3, 3V3_AUX	Supply voltage	3.0V	3.6V
V <sub>IH</sub>	Input high level	2.0V	3.6V
V <sub>IL</sub>	Input low level	-0.5V	0.8V
V <sub>OH</sub>	Output high level	2.0V	3.6V
V <sub>OL</sub>	Output low level	-0.5V	0.8V
I <sub>IN</sub>	Input Leakage Current	-10µA	10µA
I <sub>OL</sub>	Output Low Current for open-drain signals	4mA	



## 7. USB Port

The HE910 Mini PCIe adapter includes one integrated universal serial bus (USB) transceiver, compliant with the standard USB 2.0 for high speed (HS) operations.

### 7.1. USB 2.0 HS

This port is compliant with the USB 2.0 specifications.  
The following table lists the available signals:

PAD	Signal	I/O	Function	Type	NOTE
38	USB_D+	I/O	USB differential Data (+)	0.3...2.8V	
36	USB_D-	I/O	USB differential Data (-)	0.3...2.8V	

The USB interface is powered directly from the 3V3 supply.

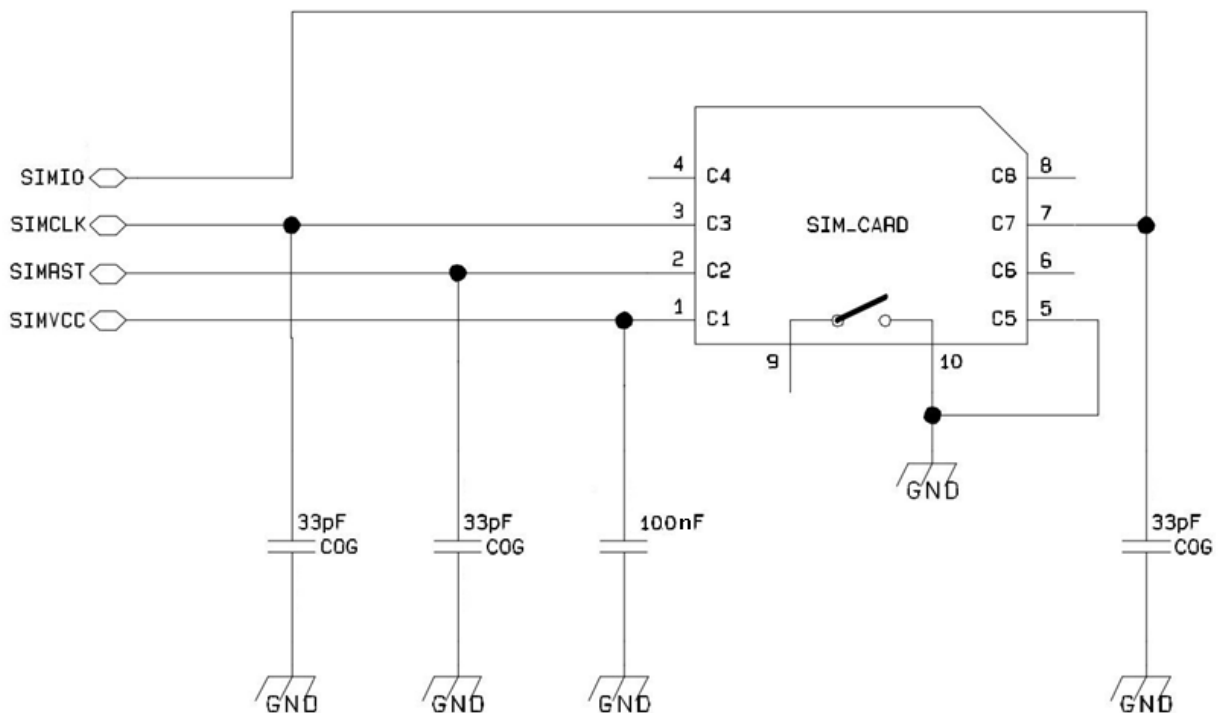


## 8. SIM interface

The SIM pins provide the connections necessary to interface to a SIM socket located on the host device. Voltage levels over this interface comply with 3GPP standards.

SIM Card Interface				
8	SIMVCC	0	External SIM signal - Power supply for the SIM	1.8 / 3V
10	SIMIO	I/O	External SIM signal - Data I/O	1.8 / 3V
12	SIMCLK	0	External SIM signal - Clock	1.8 / 3V
14	SIMRST	0	External SIM signal - Reset	1.8 / 3V

Following picture depicts the external SIM recommended connections:



**NOTE:** DO NOT TERMINATE PINS 8, 10, 12, 14 WHEN USING MODEL INCLUDING SIM CARD HOLDER.



## 9. Control signals

The HE910 Mini PCIe provides signals for module control, as described in the following table:

Pin	Signal	I/O	Function	Type
1	WAKE#	O	Active low signal used to wake up the system from stand-by	3.3V
20	W_DISABLE#	I	Active low signal for wireless disabling (Airplane mode)	3.3V
22	PERST#	I	Active low functional reset to the card	3.3V
42	LED_WWAN#	O	Active low, open drain signal for WWAN LED driving, used to provide module's status indication	3.3V...5V

### 9.1. WAKE#

WAKE# is driven, by default, by the module according the PCI Express Mini Card Electromechanical Specification Revision 1.2.




---

**NOTE:** WAKE# IS NOT SUPPORTED IN HOST USING PCI EXPRESS MINI CARD ELECTROMECHANICAL SPECIFICATION REVISION 1.1 AND BELOW.

---



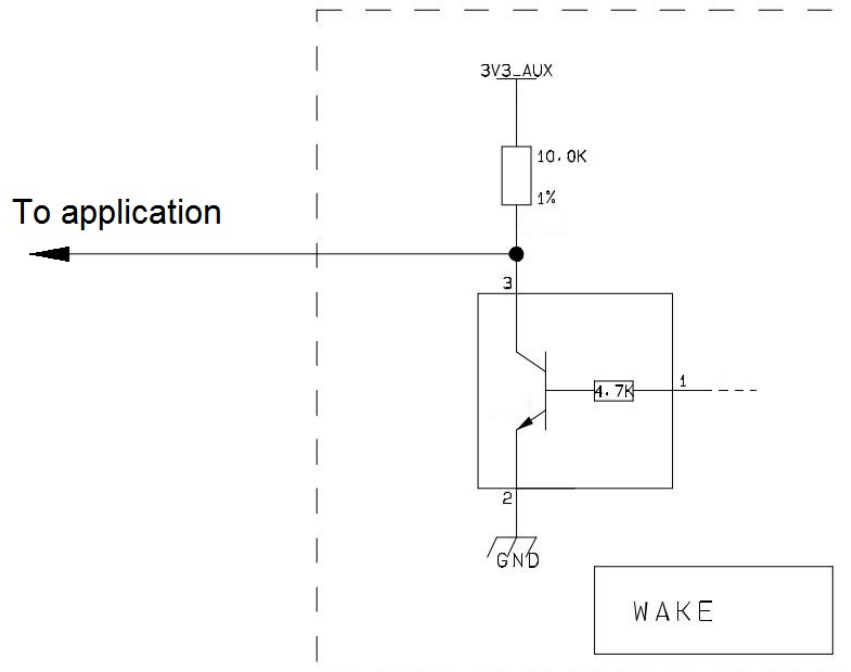

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**NOTE:** THIS SIGNAL IS NOT ACTIVE BY DEFAULT. IF DESIRED IT CAN BE CONFIGURED REMAPPING AN EVENT UNDER MONITORING THROUGH AT#EVMONI. FOR DETAILS REFER TO THE AT COMMAND USER GUIDE

---



Following picture shows the internal WAKE# driver:



WAKE# output may be connected to an edge sensitive application input (e.g. a microcontroller input with IRQ enabled). No external pull-up is needed, since it is internally implemented.

**EXAMPLE:** In the following example, a RING monitor activates the WAKEUP signal. (cf. Event Monitor App.Note 80000nt10043a)

AT#ENAEVMONI=0	//disable all events
AT#GPIO=3,0,1	//Set GPIO3=>'0', "WAKE signal reset"
AT#ENAEVMONICFG=3,1,2	//AT port setting
AT#EVMONI="RING",0,1,3	//event 0-RING, after 3 rings
AT#EVMONI="RING",0,0,"AT#GPIO=3,1,1"	//GPIO3=>'1', "WAKE signal active"
AT#EVMONI="RING",1	//event 0-RING enabled
AT#EVMONI="GPIO1",1,1,3	//event 1-GPIO3
AT#EVMONI="GPIO1",1,2,1	//when goes hi
AT#EVMONI="GPIO1",1,3,5	//after 5s
AT#EVMONI="GPIO1",1,0,"AT#GPIO=3,0,1"	//Set GPIO3=>'0', "WAKE signal reset"
AT#EVMONI="GPIO1",1	//event 1-GPIO3 enabled
AT#ENAEVMONI=1	//enable all events



## 9.2. W\_DISABLE#

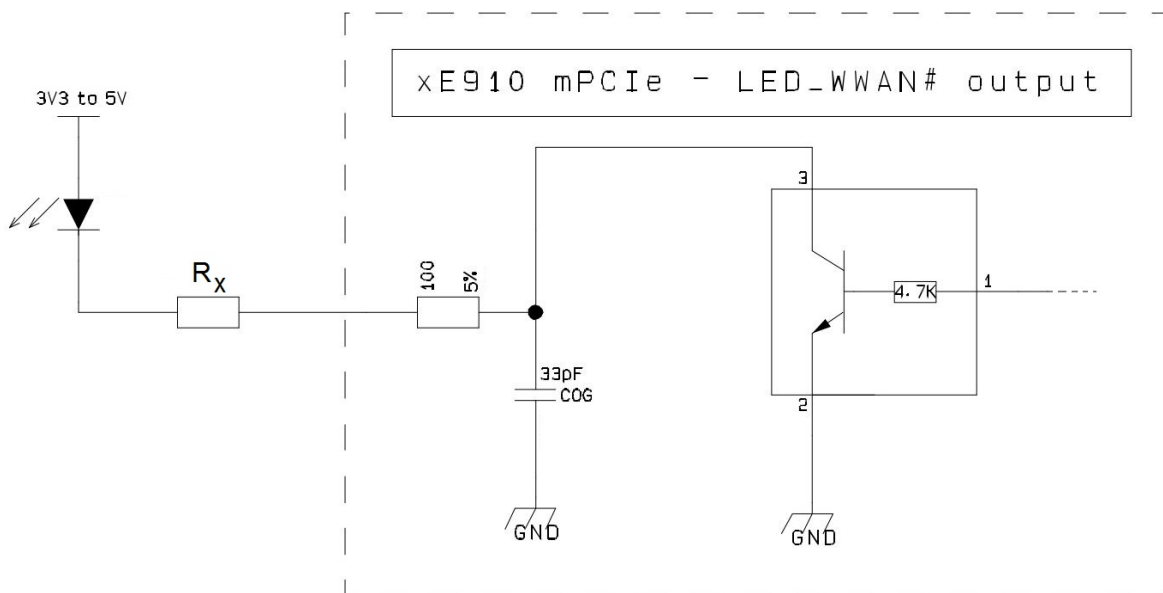
W\_DISABLE# is used to force the module to shut down. Thanks to its internal pull-up, leaving this pin unconnected allows the module to operate normally. This switch follows the behavior as described in the PCI-Express Mini Card specification.



**NOTE: THIS SIGNAL IS NOT AVAILABLE ON MKT3990250875 SAMPLES**

## 9.3. LED\_WWAN#

LED\_WWAN# is driven, by default, by the module according the PCI Express Mini Card Electromechanical Specification Revision 1.1. If desired, LED behavior can be configured by adjusting software settings. The following picture shows the internal LED\_WWAN# driver and its recommended connection to a LED:



$R_x$  should be dimensioned according to typical voltage drop on application LED and to its supply voltage (3V3 to 5V).







**NOTE:** THIS SIGNAL IS NOT ACTIVE BY DEFAULT. REFER TO AT#SLED DESCRIPTION IN THE AT COMMAND USER GUIDE

## 9.4. PERST#

Reset Signal

Signal	Function	I/O	Pin
PERST# *	Phone reset	I	22

PERST# \* is used to reset the HE910. Whenever this signal is pulled low, the HE910 is reset. When the device is reset it stops any operation. After the release of the reset the HE910 is unconditionally restarted, without doing any detach operation from the network where it is registered. The reset signal must not be used to normally restart the device, but only as an emergency exit in the rare case the device remains stuck waiting for some network response. PERST#\* is internally controlled on start-up to achieve a proper power-on reset sequence, so there's no need to control this pin on start-up. It may only be used to reset a device already on that is not responding to any command.



**NOTE:**

Do not use this signal to power cycle the HE910 Mini PCIe. Use the AT#SHDN command instead.

Reset Signal Operating levels:

Signal	Min	Max
RESET Input high	2.0V	3.6V
RESET Input low	-0.5V	0.8V

\* this signal is not internally pulled up so an external pull-up is required whenever the pin is not used.

If PERST# is used, then it **must always be connected to a push-pull output** in order to allow the internal circuitry to correctly execute power on reset and under voltage lockout functions.



## 10. Audio Section Overview

The HE910 Module does not provide an Analog Audio section. One DIGITAL AUDIO bus is available.

In order to develop an application including an Analog Audio it is necessary to add a dedicated CODEC on the Application design.

### 10.1. Electrical Characteristics

The product provides a PCM Digital Audio Interface (DVI) on the following Pins:

Digital Voice Interface (DVI)				
45	PCM_CLK	I/O	Digital Audio Interface (CLK)	CMOS 1.8V
47	PCM_RX	I	Digital Audio Interface (RX)	CMOS 1.8V
49	PCM_TX	O	Digital Audio Interface (TX)	CMOS 1.8V
51	PCM_SYNC	I/O	Digital Audio Interface (SYNC)	CMOS 1.8V

More details on the use of digital audio can be found in AT Commands Reference Guide.



**NOTE:** THESE SIGNALS ARE 1.8V, NOT COMPATIBLE WITH Mini PCIe BUSES. THIS IS AN ADVANCED VOICE FUNCTIONALITY AND THE HOST SHOULD TAKE CARE OF CORRECT COMPATIBILITY.

### 10.2. CODEC Example

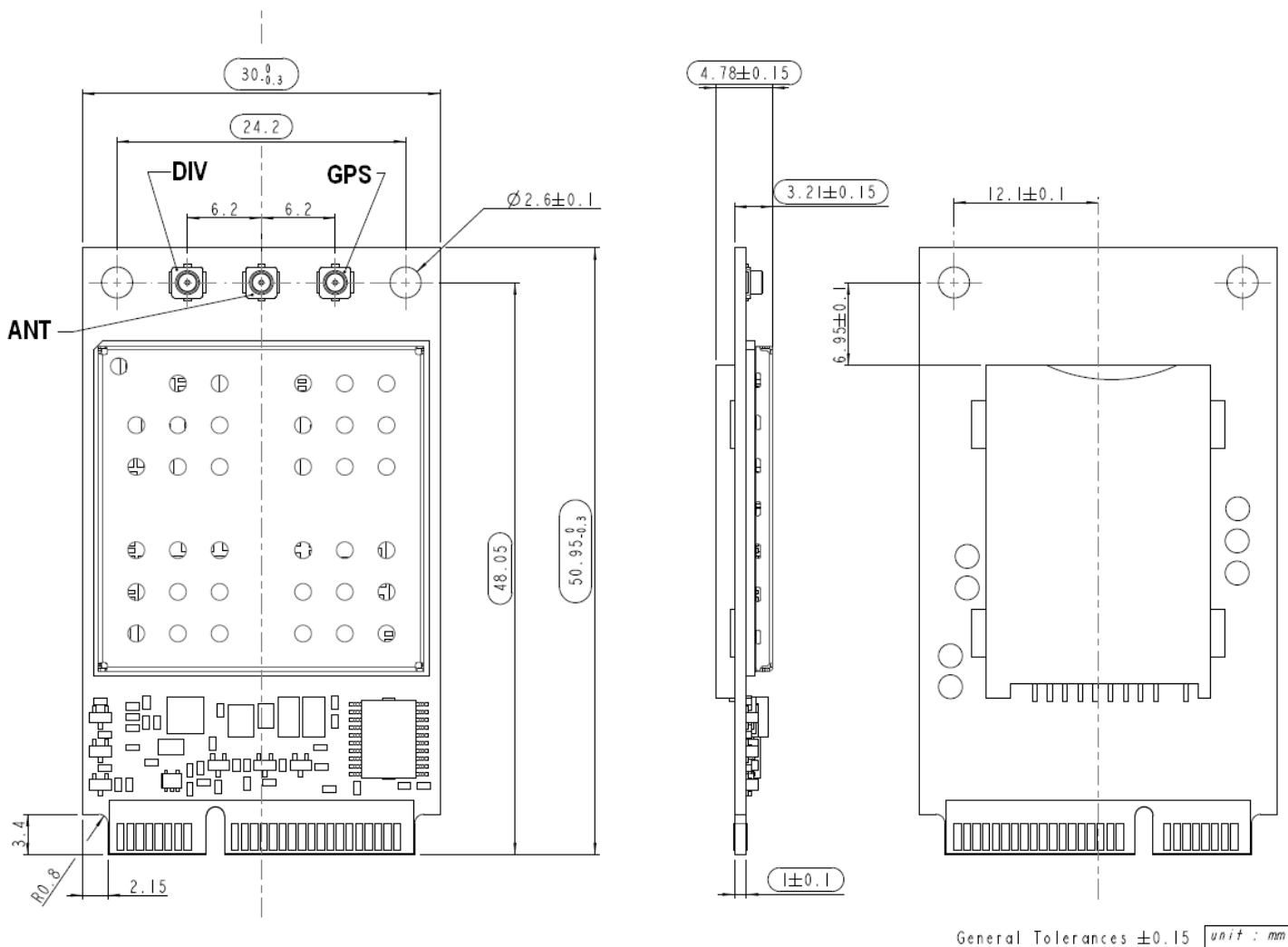
Please refer to the Digital Voice Application note 80000NT10050A.



## 11. Mechanical specifications

The HE910 Mini PCIe adapters have been designed to be compliant with a standard lead-free SMT process.

Moreover, it is compatible with the Mini PCIe card 52-pin card edge-type connector. The position of the antenna connectors is shown in the following picture.



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The Telit HE910 Mini PCIe adapter overall dimensions are:

- Length: 51.0 mm
- Width: 30 mm
- Thickness: 3.2 mm
- Thickness(SIM holder version): 4.78 mm

The module complies with the standard dimensions specified in the *PCI Express Mini Card Electromechanical Specification Revision 1.1*

## 11.1. WEIGHT

The Telit HE910 Mini PCIe adapter weight is about 10 grams.

## 11.2. ENVIRONMENTAL REQUIREMENTS

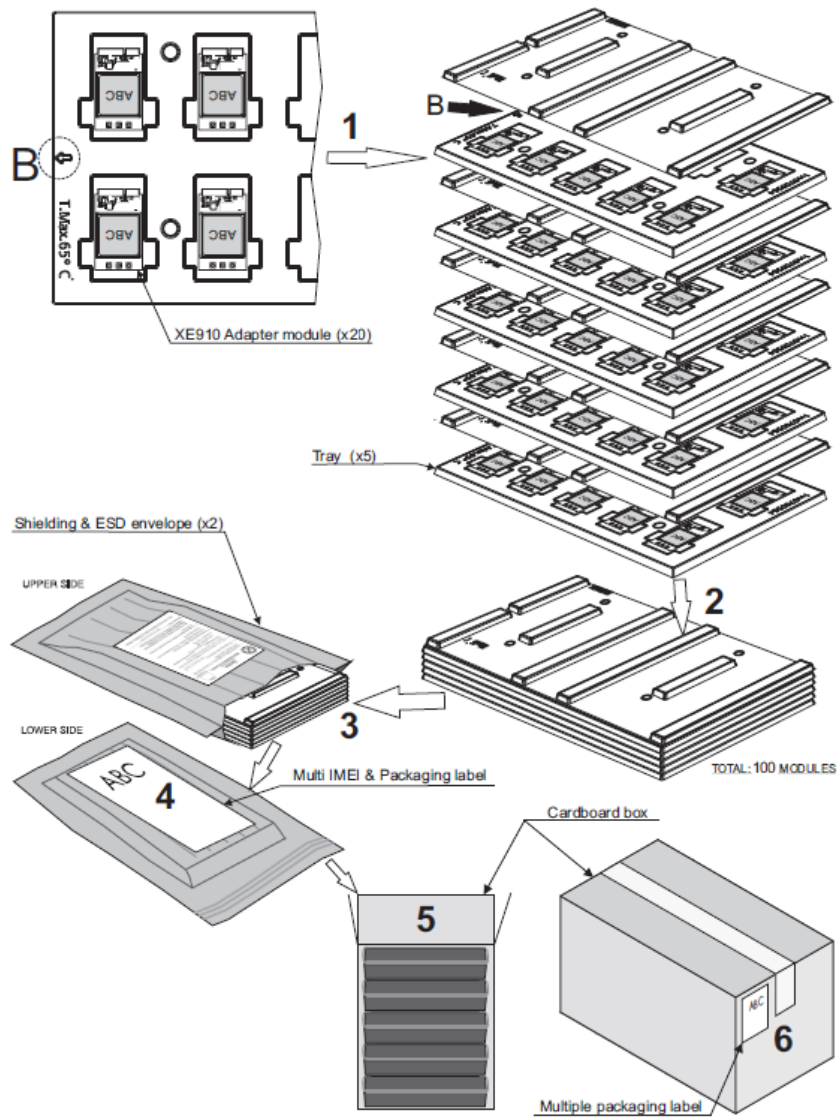
**Temperature range**

		Note
Operating Temperature Range	-20° ~ +55° C	The module is fully functional(*) in all the temperature range, and it fully meets the ETSI specifications
	-30° ~ +85° C	The module is fully functional(*) in all the temperature range. Temperatures outside the range -20° ~ +55°C might slightly deviate from ETSI specifications.
Storage and non operating Temperature Range	-40° ~ +85° C	



## 12. Packing system

The HE910 Mini PCIe modules are packaged on trays of **20** pieces each.



## 12.1. Moisture sensitivity:

The HE910 Mini PCIe is a Moisture Sensitive Device level 3, in according with standard IPC/JEDEC J-STD-020. Take care regarding all the relatives requirements for using this kind of components.

Moreover, the customer has to take care of the following conditions:

- a) Calculated shelf life in sealed bag: 12 months at <math><40^{\circ}\text{C}</math> and <math><90\%</math> relative humidity (RH).
- b) Environmental condition during the production:  $30^{\circ}\text{C}$  / 60% RH  
(according to IPC/JEDEC J-STD-033A paragraph 5.)
- c) The maximum time between the opening of the sealed bag and the reflow process must be 168 hours  
(if condition <b> “IPC/JEDEC J-STD-033A paragraph 5.2” is respected)
- d) Baking is required if conditions b) or c) are not respected
- e) Baking is required if the humidity indicator inside the bag indicates 10% RH or more



## 13. SAFETY RECOMMANDATIONS

### READ CAREFULLY

Be sure the use of this product is allowed in the country and in the environment required. The use of this product may be dangerous and has to be avoided in the following areas:

- Where it can interfere with other electronic devices in environments such as hospitals, airports, aircrafts, etc
- Where there is risk of explosion such as gasoline stations, oil refineries, etc

It is the responsibility of the user to enforce the country regulation and the specific environment regulation.

Do not disassemble the product; any mark of tampering will compromise the warranty validity.

We recommend following the instructions of the hardware user guides for a correct wiring of the product. The product has to be supplied with a stabilized voltage source and the wiring has to be conforming to the security and fire prevention regulations.

The product has to be handled with care, avoiding any contact with the pins because electrostatic discharges may damage the product itself. Same cautions have to be taken for the SIM, checking carefully the instruction for its use. Do not insert or remove the SIM when the product is in power saving mode.

The system integrator is responsible for the functioning of the final product; therefore, care has to be taken to the external components of the module, as well as any project or installation issue, because the risk of disturbing the GSM network or external devices or having impact on the security. Should there be any doubt, please refer to the technical documentation and the regulations in force.

Every module has to be equipped with a proper antenna with specific characteristics. The antenna has to be installed with care in order to avoid any interference with other electronic devices and has to guarantee a minimum distance from the body (20 cm). In case this requirement cannot be satisfied, the system integrator has to assess the final product against the SAR regulation.

The European Community provides some Directives for the electronic equipments introduced on the market. All the relevant information's are available on the European Community website:

<http://ec.europa.eu/enterprise/sectors/rtte/documents/>

The text of the Directive 99/05 regarding telecommunication equipments is available, while the applicable Directives (Low Voltage and EMC) are available at:

<http://ec.europa.eu/enterprise/sectors/electrical>



## 14. Conformity assessment issues

The following chapters are related to the module HE910 soldered on the carrier board

### 14.1. 1999/5/EC Directive

The HE910 family has been evaluated against the essential requirements of the 1999/5/EC Directive.

Bulgarian	С настоящето Telit Communications S.p.A. декларира, че 2G/3G module отговаря на съществените изисквания и другите приложими изисквания на Директива 1999/5/EC.
Czech	Telit Communications S.p.A. tímto prohlašuje, že tento 2G/3G module je ve shodě se základními požadavky a dalšími příslušnými ustanoveními směrnice 1999/5/ES.
Danish	Undertegnede Telit Communications S.p.A. erklærer herved, at følgende udstyr 2G/3G module overholder de væsentlige krav og øvrige relevante krav i direktiv 1999/5/EF.
Dutch	Hierbij verklaart Telit Communications S.p.A. dat het toestel 2G/3G module in overeenstemming is met de essentiële eisen en de andere relevante bepalingen van richtlijn 1999/5/EG.
English	Hereby, Telit Communications S.p.A., declares that this 2G/3G module is in compliance with the essential requirements and other relevant provisions of Directive 1999/5/EC.
Estonian	Käesolevaga kinnitab Telit Communications S.p.A. seadme 2G/3G module vastavust direktiivi 1999/5/EÜ põhinõuetele ja nimetatud direktiivist tulenevatele teistele asjakohastele sätetele.
German	Hiermit erklärt Telit Communications S.p.A., dass sich das Gerät 2G/3G module in Übereinstimmung mit den grundlegenden Anforderungen und den übrigen einschlägigen Bestimmungen der Richtlinie 1999/5/EG befindet.
Greek	ΜΕ ΤΗΝ ΠΑΡΟΥΣΑ Telit Communications S.p.A. ΔΗΛΩΝΕΙ ΟΤΙ 2G/3G module ΣΥΜΜΟΡΦΩΝΕΤΑΙ ΠΡΟΣ ΤΙΣ ΟΥΣΙΩΔΕΙΣ ΑΠΑΙΤΗΣΕΙΣ ΚΑΙ ΤΙΣ ΛΟΙΠΕΣ ΣΧΕΤΙΚΕΣ ΔΙΑΤΑΞΕΙΣ ΤΗΣ ΟΔΗΓΙΑΣ 1999/5/EK.
Hungarian	Alulírott, Telit Communications S.p.A. nyilatkozom, hogy a 2G/3G module megfelel a vonatkozó alapvető követelményeknek és az 1999/5/EC irányelv egyéb előírásainak.
Finnish	Telit Communications S.p.A. vakuuttaa täten että 2G/3G module tyyppinen laite on direktiivin 1999/5/EY oleellisten vaatimusten ja sitä koskevien direktiivin muiden ehtojen mukainen.
French	Par la présente Telit Communications S.p.A. déclare que l'appareil 2G/3G module est conforme aux exigences essentielles et aux autres dispositions pertinentes de la directive 1999/5/CE.
Icelandic	Hér með lýsir Telit Communications S.p.A. yfir því að 2G/3G module er í samræmi við grunnkröfur og aðrar kröfur, sem gerðar eru í tilskipun 1999/5/EC
Italian	Con la presente Telit Communications S.p.A. dichiara che questo 2G/3G module è conforme ai requisiti essenziali ed alle altre disposizioni pertinenti stabilite dalla direttiva 1999/5/CE.
Latvian	Ar šo Telit Communications S.p.A. deklarē, ka 2G/3G module atbilst Direktīvas 1999/5/EK būtiskajām prasībām un citiem ar to saistītajiem noteikumiem.
Lithuanian	Šiuo Telit Communications S.p.A. deklaruoja, kad šis 2G/3G module atitinka esminius reikalavimus ir kitas 1999/5/EB Direktyvos nuostatas.
Maltese	Hawnhekk, Telit Communications S.p.A., jiddikjara li dan 2G/3G module jikkonforma mal-htigijiet essenzjali u ma provvedimenti oħrajn relevanti li hemm fid-Dirrettiva 1999/5/EC.





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Norwegian	Telit Communications S.p.A. erklærer herved at utstyret 2G/3G module er i samsvar med de grunnleggende krav og øvrige relevante krav i direktiv 1999/5/EF.
Polish	Niniejszym Telit Communications S.p.A. oświadcza, że 2G/3G module jest zgodny z zasadniczymi wymogami oraz pozostałymi stosownymi postanowieniami Dyrektywy 1999/5/EC
Portuguese	Telit Communications S.p.A. declara que este 2G/3G module está conforme com os requisitos essenciais e outras disposições da Directiva 1999/5/CE.
Slovak	Telit Communications S.p.A. týmto vyhlasuje, že 2G/3G module spĺňa základné požiadavky a všetky príslušné ustanovenia Smernice 1999/5/ES.
Slovenian	Telit Communications S.p.A. izjavlja, da je ta 2G/3G modul v skladu z bistvenimi zahtevami in ostalimi relevantnimi določili direktive 1999/5/ES.
Spanish	Por medio de la presente Telit Communications S.p.A. declara que el 2G/3G module cumple con los requisitos esenciales y cualesquiera otras disposiciones aplicables o exigibles de la Directiva 1999/5/CE.
Swedish	Härmed intygar Telit Communications S.p.A. att denna 2G/3G module står i överensstämmelse med de väsentliga egenskapskrav och övriga relevanta bestämmelser som framgår av direktiv 1999/5/EG.

In order to satisfy the essential requirements of 1999/5/EC Directive, the HE910 is compliant with the following standards:

RF spectrum use (R&TTE art. 3.2)	EN 300 440-2 V1.4.1 EN 301 511 V9.0.2 EN 301 908-1 V4.2.1 EN 301 908-2 V4.2.1
EMC (R&TTE art. 3.1b)	EN 301 489-1 V1.8.1 EN 301 489-3 V1.4.1 EN 301 489-7 V1.3.1 EN 301 489-24 V1.5.1
Health & Safety (R&TTE art. 3.1a)	EN 60950-1:2006 + A11:2009 + A1:2010 + A12:2011



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The conformity assessment procedure referred to in Article 10 and detailed in Annex IV of Directive 1999/5/EC has been followed with the involvement of the following Notified Body:

AT4 wireless, S.A.  
Parque Tecnológico de Andalucía  
C/ Severo Ochoa 2  
29590 Campanillas – Málaga  
SPAIN  
Notified Body No: 1909

Thus, the following marking is included in the product:



The full declaration of conformity can be found on the following address:  
<http://www.telit.com/>

There is no restriction for the commercialisation in all the countries of the European Union.

Final product integrating this module must be assessed against essential requirements of the 1999/5/EC (R&TTE) Directive. It should be noted that assessment does not necessarily lead to testing. Telit Communications S.p.A. recommends carrying out the following assessments:

RF spectrum use (R&TTE art. 3.2)	It will depend on the antenna used on the final product.
EMC (R&TTE art. 3.1b)	Testing
Health & Safety (R&TTE art. 3.1a)	Testing

Alternately, assessment of the final product against EMC (Art. 3.1b) and Electrical safety (Art. 3.1a) essential requirements can be done against the essential requirements of the EMC and the LVD Directives:

- Low Voltage Directive 2006/95/EC and product safety
- Directive EMC 2004/108/EC for conformity for EMC



## 15. FCC/IC Regulatory notices

### Modification statement

Telit has not approved any changes or modifications to this device by the user. Any changes or modifications could void the user's authority to operate the equipment.

*Telit n'approuve aucune modification apportée à l'appareil par l'utilisateur, quelle qu'en soit la nature. Tout changement ou modification peuvent annuler le droit d'utilisation de l'appareil par l'utilisateur.*

### Interference statement

This device complies with Part 15 of the FCC Rules and Industry Canada licence-exempt RSS standard(s). Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.

*Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes : (1) l'appareil ne doit pas produire de brouillage, et (2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.*

### Wireless notice

This equipment complies with FCC and IC radiation exposure limits set forth for an uncontrolled environment. The antenna should be installed and operated with minimum distance of 20 cm between the radiator and your body. Antenna gain must be below:

GSM 850/FDD V: 5.22 dBi

PCS 1900/FDD II: 3.31 dBi

FDD IV: 6.45 dBi (not applicable to HE910-GA module)

This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.



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*Cet appareil est conforme aux limites d'exposition aux rayonnements de la IC pour un environnement non contrôlé. L'antenne doit être installée de façon à garder une distance minimale de 20 centimètres entre la source de rayonnements et votre corps. Gain de l'antenne doit être ci-dessous:*

*GSM 850/FDD V: 5.22 dBi*

*PCS 1900/FDD II: 3.31 dBi*

*FDD IV: 6.45 dBi (n'est pas applicable au module HE910-GA)*

*L'émetteur ne doit pas être colocalisé ni fonctionner conjointement avec à autre antenne ou autre émetteur.*

### FCC Class B digital device notice

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.



