xE910 Mini PCIe Hardware User Guide

1vv0301006 Rev.10 – 2015-12-06

Making machines talk.

APPLICABILITY TABLE

PRODUCT
HE910 Mini PCIe
HE910-D Mini PCIe
DE910 Mini PCIe
LE910-SVG Mini PCIe
LE910-NVG Mini PCIe
LE910-NAG Mini PCIe
LE910-EUG Mini PCIe
LE910-NA V2 Mini PCIe
LE910-SV V2 Mini PCIe
LE910-EU V2 Mini PCIe
LE910-AU V2 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 xE910 Mini PCIe Adapter.

1.2. Audience

This document is intended for Telit customers, who are integrators, about to implement their applications using our xE910 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
TS-NORTHAMERICA@telit.com
TS-LATINAMERICA@telit.com
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

- HE910/UE910 AT Commands Reference Guide 80378ST10091a
- HE910 Hardware User Guide 1vv03700925
- Event Monitor Application Note 80000nt10043a
- Digital Voice Interface Application Note 80000NT10004a
- LE910 AT Commands Reference Guide 80378ST10585a
- LE910 Hardware User Guide 1vv03701089
- LE910 Digital Voice Interface Application Note 80000NT11246a
- DE910 Hardware User Guide 1vv03700951
- LE910-V2 Modules AT Commands Reference Guide 80446ST10707A
- LE910-V2 Hardware User Guide 1VV0301200

2. Overview

The aim of this document is the description of some hardware solutions useful for developing a product that will host the Telit XE910 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 **XE910 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 **XE910 Mini PCIe** all'interno dell'applicazione dell'utente dovrà rispettare le indicazioni progettuali descritte in questo manuale.

(DE) Die Integration des **XE910 Mini PCIe** GSM/GPRS/WCDMA Mobilfunk-Moduls in ein Gerät muß gemäß der in diesem Dokument beschriebenen Kunstruktionsregeln erfolgen.

(SL) Integracija GSM/GPRS/WCDMA **XE910 Mini PCIe** modula v uporabniški aplikaciji bo morala upoštevati projektna navodila, opisana v tem priročniku.

(SP) La utilización del modulo GSM/GPRS/WCDMA **XE910 Mini PCIe** debe ser conforme a los usos para los cuales ha sido deseñado descritos en este manual del usuario.

(FR) L'intégration du module cellulaire GSM/GPRS/WCDMA **XE910 Mini PCIe** dans l'application de l'utilisateur sera faite selon les règles de conception décrites dans ce manuel.

(HE) האינטגרטור מתבקש ליישם את ההנחיות המפורטות במסמך זה בתהליך האינטגרציה של המודם הסלולרי עם המוצר. XE910 Mini PCIe

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3. xE910 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
Power Supply				
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
SIM Card Interface				
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
USB				
36	USB D-	I/O	USB differential Data (-)	0.3…2.8V
38	USB D+	I/O	USB differential Data (+)	0.3…2.8V

Pin	Signal	I/O	Function	Type

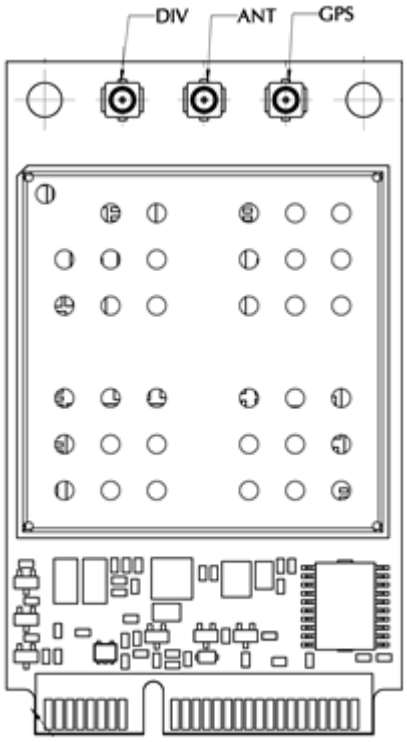
Miscellaneous Functions				
1	WAKE#	O	Active low signal used to wake up the system from stand-by	3.3V
20	WDISABLE#	I	Active low signal for wireless disabling (Flight mode)	3.3V
22	PERST#	I	Active low functional reset to the card	3.3V
42	LED_WWAN#	O	Active low, open drain signal for WWAN LED driving, used to provide module's status indication	3.3V…5V
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
N.C.				
3		-		
5		-		
6		-		
7		-		
11		-		
13		-		
16		-		
17		-		
19		-		
23		-		
25		-		
28		-		
30		-		
31		-		
32		-		
33		-		
44		-		
46		-		
48		-		

3.2. Antenna Connectors

The xE910 Mini PCIe adapter is equipped with a set of 50 Ω RF U.FL. connectors from Hirose U.FL-R-SMT-1(10).

The available connectors are:

- Main RF antenna (ANT)
- RX Diversity Antenna (DIV)
- GNSS Antenna (GPS)



See the picture on the right for their position on the interface.

The presence of all the connectors is depending on the product characteristics and supported functionalities.

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

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:

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

Please refer to the Module's Hardware User guide for the details

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. GSM/WCDMA/LTE /CDMA Radio Section

5.1. xE910 Mini PCI Product Variants

The following table is listing the main differences between the xE910 variants:

Product	2G Bands	3G Bands	LTE Bands	CDMA Bands	GNSS
LE910-NA V2	Not supported	B5, B2	B2, B4, B5, B12/B17 (B13)	NO	NO
LE910-SV V2	Not supported	Not supported	B2, B4, B13	NO	NO
LE910-EU V2	GSM 900, DCS1800	B1, B8	B3, B7, B20, B1, B8	NO	NO
LE910-AU V2	Not supported	Not supported	B3, B7, B28	NO	NO
LE910-EUG	GSM 900, DCS1800	B5(850), B8 (900), B1 (2100)	B20 (800), B3 (1800), B7 (2600)	NO	YES
LE910-NAG	GSM 850, PCS 1900	B5(850), B2(1900)	B17(700), B5(850), B4(1700), B2(1900)	NO	YES
LE910-NVG	Not supported	B5(850), B2(1900)	B13(700), B4(1700)	NO	YES
LE910-SVG	Not supported	Not supported	B13(700), B4(1700)	NO	YES
HE910	GSM 850, GSM 900, DCS1800, PCS 1900	FDD B1, B2, B4, B5, B8	Not supported	NO	YES
HE910-D	GSM 850, GSM 900, DCS1800, PCS 1900	FDD B1, B2, B4, B5, B8	Not supported	NO	NO
DE910-DUAL	Not supported	Not supported	Not supported	BC0, BC1	YES

5.2. TX and RX characteristics

Please refer to the Module's Hardware User guide for the details

5.3. GSM/WCDMA/LTE/CDMA Antenna Requirements

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.

The xE910 Mini PCIe adapter is provided with three RF connectors.
The available connectors are:

- Main RF antenna (ANT)
- RX Diversity Antenna (DIV)
- GNSS Antenna (GPS)

Connecting cables between the module and the antenna must have 50 Ω 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 50Ω load.

MAIN ANTENNA REQUIREMENTS for LE910-NA V2	
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	140 MHz in LTE/WCDMA Band 2 445 MHz in LTE Band 4 70 MHz in LTE/WCDMA Band 5 80 MHz in LTE Band 8 / GSM900 47 MHz in LTE Band 12 41 MHz in LTE Band 13 42 MHz in LTE band 17
Impedance	50 ohm
Input power	> 24dBm Average power in WCDMA & LTE
VSWR absolute max	≤ 10:1 (limit to avoid permanent damage)
VSWR recommended	≤ 2:1 (limit to fulfil all regulatory requirements)

MAIN ANTENNA REQUIREMENTS for LE910-AU V2	
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	170 MHz in LTE Band 3 190 MHz in LTE Band 7 100 MHz in LTE Band 28
Impedance	50 ohm
Input power	> 24dBm Average power in WCDMA & LTE
VSWR absolute max	≤ 10:1 (limit to avoid permanent damage)
VSWR recommended	≤ 2:1 (limit to fulfil all regulatory requirements)

MAIN ANTENNA REQUIREMENTS for LE910-EU V2	
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	250 MHz in LTE/WCDMA Band 1 170 MHz in LTE/WCDMA Band 3 / DCS1800 190 MHz in LTE Band 7 80 MHz in LTE/WCDMA Band 8 / GSM900 71 MHz in LTE Band 20
Impedance	50 ohm
Input power	> 24dBm Average power in WCDMA & LTE
VSWR absolute max	≤ 10:1 (limit to avoid permanent damage)
VSWR recommended	≤ 2:1 (limit to fulfil all regulatory requirements)

MAIN ANTENNA REQUIREMENTS for LE910-EUG	
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)	GSM900 : 80 MHz GSM1800(DCS) : 170 MHz
Bandwidth (WCDMA)	WCDMA band I(2100) : 250 MHz WCDMA band V(850) : 70 MHz WCDMA band VIII(900) : 80 MHz
Bandwidth (LTE)	LTE band III(1800) : 170 MHz LTE Band VII(2600) : 190 MHz LTE Band XX(800) : 71 MHz
Impedance	50 ohm
Input power	> 33dBm(2 W) peak power in GSM > 24dBm Average power in WCDMA & LTE
VSWR absolute max	≤ 10:1 (limit to avoid permanent damage)
VSWR recommended	≤ 2:1 (limit to fulfil all regulatory requirements)

MAIN ANTENNA REQUIREMENTS for LE910-NAG	
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)	GSM850 : 70 MHz GSM1900(PCS) : 140 MHz
Bandwidth (WCDMA)	WCDMA band II(1900) : 140 MHz WCDMA band V(850) : 70 MHz
Bandwidth (LTE)	LTE Band II(1900) : 140 MHz LTE Band IV(1700) : 445 MHz LTE Band V (850) : 70 MHz LTE Band XVII(700) : 42 MHz
Impedance	50 ohm
Input power	> 33dBm(2 W) peak power in GSM > 24dBm Average power in WCDMA & LTE
VSWR absolute max	≤ 10:1 (limit to avoid permanent damage)
VSWR recommended	≤ 2:1 (limit to fulfil all regulatory requirements)

MAIN ANTENNA REQUIREMENTS for LE910-NVG	
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 (WCDMA)	WCDMA band II(1900) : 140 MHz WCDMA band V(850) : 70 MHz
Bandwidth (LTE)	LTE Band IV(1700) : 445 MHz LTE Band XIII(700) : 41 MHz
Impedance	50 ohm
Input power	> 24dBm Average power in WCDMA & LTE
VSWR absolute max	≤ 10:1 (limit to avoid permanent damage)
VSWR recommended	≤ 2:1 (limit to fulfil all regulatory requirements)

MAIN ANTENNA REQUIREMENTS for LE910-SVG	
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 (LTE)	LTE Band IV(1700) : 445 MHz LTE Band XIII(700) : 41 MHz
Impedance	50 ohm
Input power	> 24dBm Average power
VSWR absolute max	≤ 10:1 (limit to avoid permanent damage)
VSWR recommended	≤ 2:1 (limit to fulfil all regulatory requirements)

MAIN ANTENNA REQUIREMENTS for HE910	
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, 170 MHz in DCS & 140 MHz PCS band
Bandwidth (WCDMA)	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
Impedance	50 ohm
Input power	> 33dBm(2 W) peak power in GSM > 24dBm Average power in WCDMA
VSWR absolute max	≤ 10:1 (limit to avoid permanent damage)
VSWR recommended	≤ 2:1 (limit to fulfil all regulatory requirements)

MAIN ANTENNA REQUIREMENTS for DE910-DUAL	
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	70 MHz in CDMA BC0 140 MHz in CDMA BC1
Gain	Gain < 5.12dBi in CDMA BC0 Gain < 6.12dBi in CDMA BC1
Impedance	50 ohm
Input power	> 24.4dBm Average Power in CDMA
VSWR absolute max	≤ 5:1 (Limit to avoid permanent damage)
VSWR recommended	≤ 2:1 (limit to fulfil all regulatory requirements)

Please refer to the Module's Hardware User guide for the details

5.3.1. GSM/WCDMA/LTE/CDMA Antenna - Installation Guidelines

- Install the antenna in a place covered by the GSM/WCDMA/LTE/CDMA signal.
- If the device antenna is located greater then 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.

5.4. Antenna Diversity Requirements

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

DIVERSITY ANTENNA REQUIREMENTS for LE910-NA V2	
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	60 MHz in LTE/WCDMA Band 2 45 MHz in LTE Band 4 25 MHz in LTE/WCDMA Band 5 35 MHz in LTE Band 8 / GSM900 15 MHz in LTE Band 12 10 MHz in LTE Band 13 12 MHz in LTE band 17
Impedance	50 ohm
VSWR recommended	≤ 2:1 (limit to fulfil all regulatory requirements)

DIVERSITY ANTENNA REQUIREMENTS for LE910-SV V2	
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	60 MHz in LTE/WCDMA Band 2 45 MHz in LTE Band 4 10 MHz in LTE Band 13
Impedance	50 ohm
VSWR recommended	≤ 2:1 (limit to fulfil all regulatory requirements)

DIVERSITY ANTENNA REQUIREMENTS for LE910-AU V2	
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	75 MHz in LTE Band 3 70 MHz in LTE Band 7 45 MHz in LTE Band 28
Impedance	50 ohm
VSWR recommended	≤ 2:1 (limit to fulfil all regulatory requirements)

DIVERSITY ANTENNA REQUIREMENTS for LE910-EU V2	
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	60 MHz in LTE/WCDMA Band 1 75 MHz in LTE/WCDMA Band 3 / DCS1800 70 MHz in LTE Band 7 35 MHz in LTE/WCDMA Band 8 / GSM900 30 MHz in LTE Band 20
Impedance	50 ohm
VSWR recommended	≤ 2:1 (limit to fulfil all regulatory requirements)

DIVERSITY ANTENNA REQUIREMENTS for LE910-EUG	
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 (WCDMA)	WCDMA band I(2100) : 250 MHz WCDMA band V(850) : 70 MHz WCDMA band VIII(900) : 80 MHz
Bandwidth (LTE)	LTE band III(1800) : 170 MHz LTE Band VII(2600) : 190 MHz LTE Band XX(800) : 71 MHz
Impedance	50 ohm
VSWR recommended	≤ 2:1 (limit to fulfil all regulatory requirements)

DIVERSITY ANTENNA REQUIREMENTS for LE910-NAG	
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 (WCDMA)	WCDMA band II(1900) : 140 MHz WCDMA band V(850) : 70 MHz
Bandwidth (LTE)	LTE Band II(1900) : 140 MHz LTE Band IV(1700) : 445 MHz LTE Band V (850) : 70 MHz LTE Band XVII(700) : 42 MHz
Impedance	50 ohm
VSWR recommended	≤ 2:1 (limit to fulfil all regulatory requirements)

DIVERSITY ANTENNA REQUIREMENTS for LE910-NVG	
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 (WCDMA)	WCDMA band II(1900) : 140 MHz WCDMA band V(850) : 70 MHz
Bandwidth (LTE)	LTE Band IV(1700) : 445 MHz LTE Band XIII(700) : 41 MHz
Impedance	50 ohm
VSWR recommended	≤ 2:1 (limit to fulfil all regulatory requirements)

DIVERSITY ANTENNA REQUIREMENTS for LE910-SVG	
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 (LTE)	LTE Band IV(1700) : 445 MHz LTE Band XIII(700) : 41 MHz
Impedance	50 ohm
VSWR recommended	≤ 2:1 (limit to fulfil all regulatory requirements)

DIVERSITY ANTENNA REQUIREMENTS for HE910	
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
VSWR recommended	≤ 2:1 (limit to fulfil all regulatory requirements)

DIVERSITY ANTENNA REQUIREMENTS for DE910-DUAL	
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	70 MHz in CDMA BC0 140 MHz in CDMA BC1
Impedance	50 ohm
VSWR recommended	≤ 2:1 (limit to fulfil all regulatory requirements)

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:

On HE910 the diversity is not supported on the FDD BAND IV and DCS band.

NOTE2:

In case of HE910, 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).

5.5. GNSS Receiver

The XE910 Mini PCIe adapter integrates a GNSS receiver that could be used in Standalone mode and in A-GPS (assisted GPS), according to the different configurations.

The supported technologies are described in the following table:

Product	GPS	GLONASS
LE910-EUG	YES	YES
LE910-NAG	YES	YES
LE910-NVG	YES	YES
LE910-SVG	YES	YES
HE910	YES	NO
HE910-D	NO	NO
DE910-DUAL	YES	YES
LE910-NA V2	NO	NO
LE910-SV V2	NO	NO
LE910-EU V2	NO	NO
LE910-AU V2	NO	NO

5.5.1. GNSS Performances

Please refer to the Module's Hardware User guide for the details

5.5.2. GNSS RF Front End Design

The xE910 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 xE910, then an active antenna (that is, an antenna with a low noise amplifier built in) can be used with an external dedicated power supply circuit.

NOTE:

Please refer to the Module's 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 xE910 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_{IH}	Input high level	2.0V	3.6V
V_{IL}	Input low level	-0.5V	0.8V
V_{OH}	Output high level	2.0V	3.6V
V_{OL}	Output low level	-0.5V	0.8V
I_{IN}	Input Leakage Current	-10µA	10µA
I_{OL}	Output Low Current for open-drain signals	4mA	

7. USB Port

The xE910 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
38	USB_D+	I/O	USB differential Data (+)	0.3…2.8V
36	USB_D-	I/O	USB differential Data (-)	0.3…2.8V

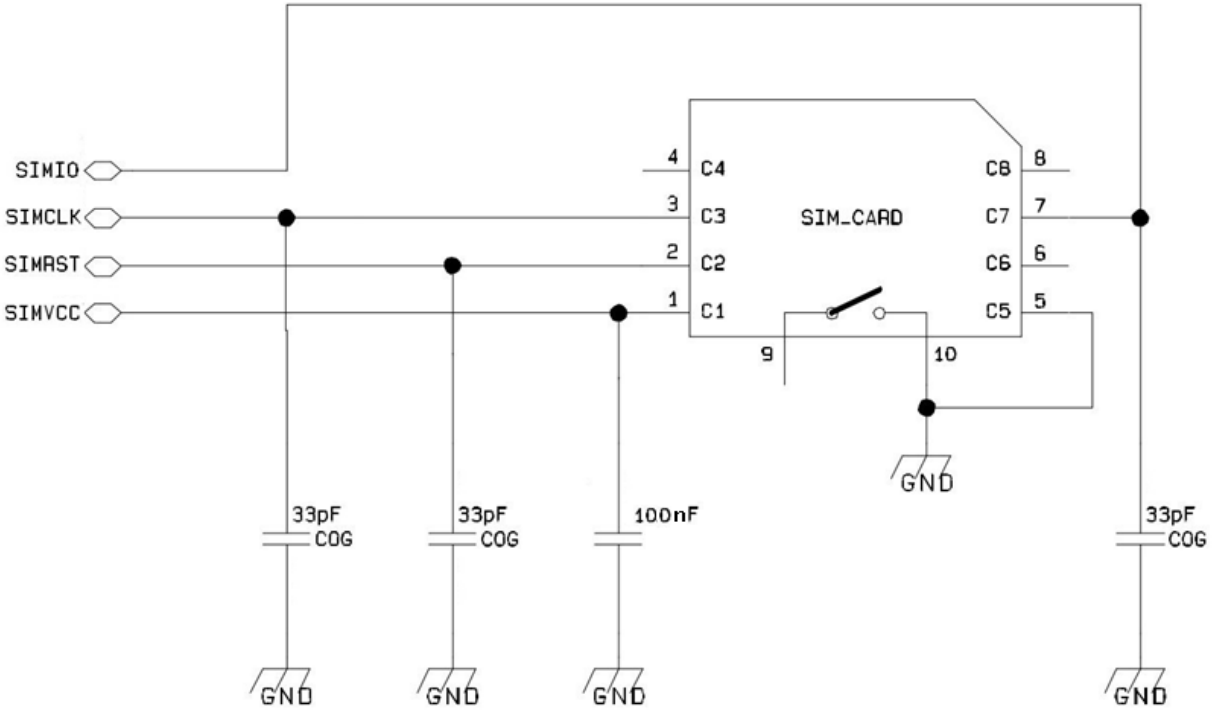
The USB interface is powered directly from the 3V3 supply.

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	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

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 XE910 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

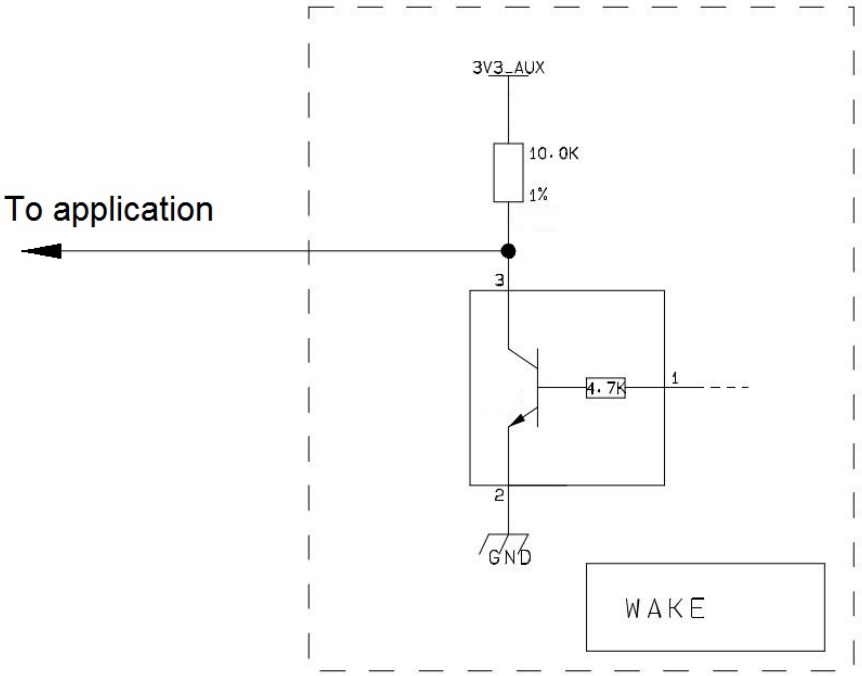
9.1. WAKE#

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.

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)

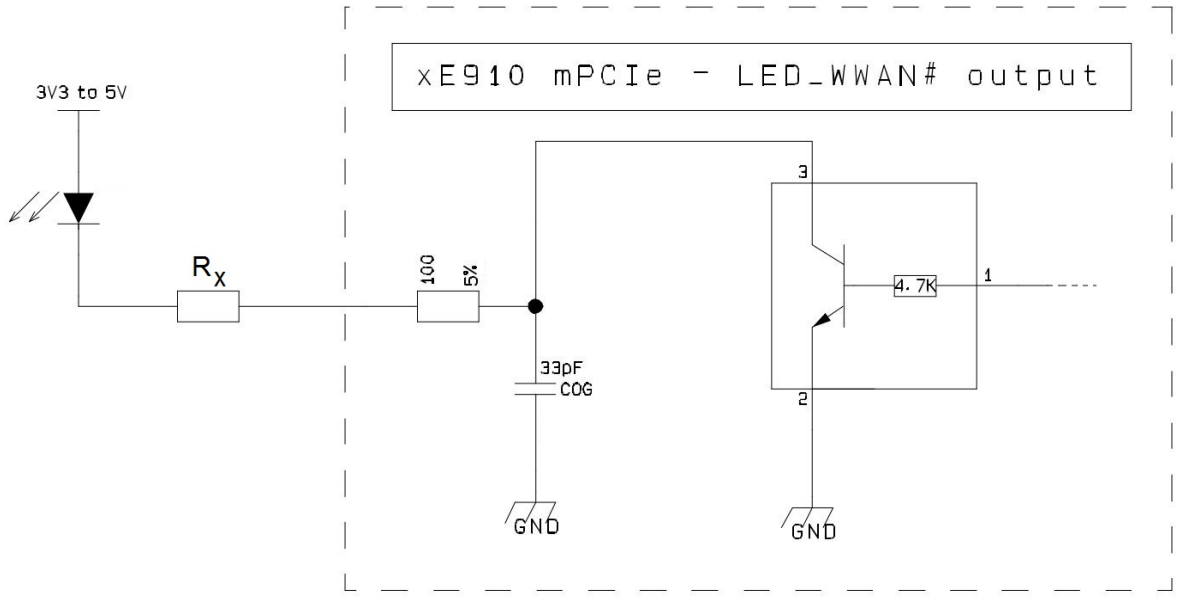
```
AT#ENAEVMONI=0                          //disable all events
AT#GPIO=3,0,1                           //Set GPIO3=>'0', "WAKE signal reset"
AT#ENAEVMONICFG=3,1,2                   //AT port setting
AT#EVMONI="RING",0,1,3                          //event 0-RING, after 3 rings
AT#EVMONI="RING",0,0,"AT#GPIO=3,1,1"    //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.

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 xE910. Whenever this signal is pulled low, the xE910 is reset. When the device is reset it stops any operation. After the release of the reset the xE910 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 xE910 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 xE910 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 Module's DVI application Note.

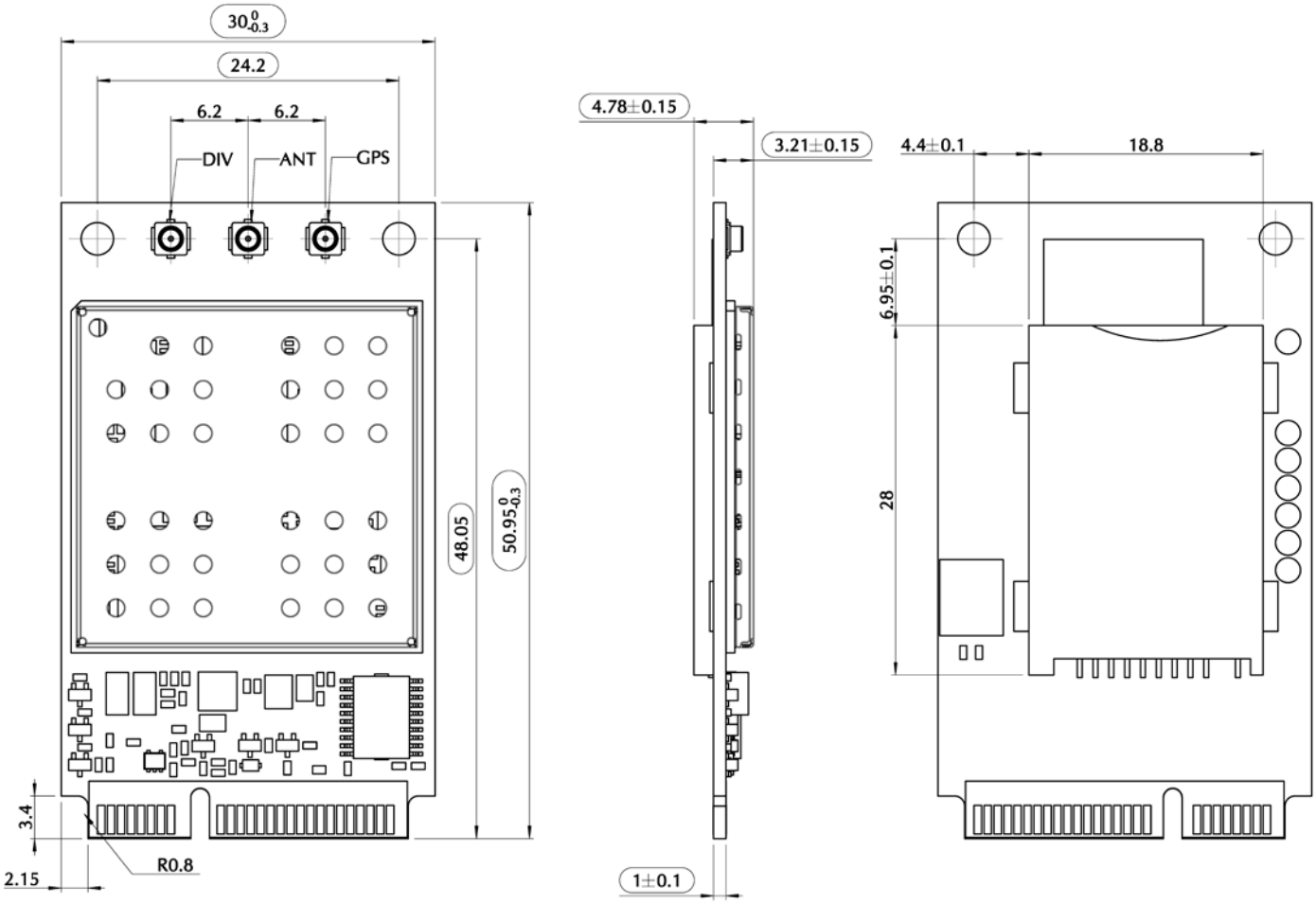
NOTE: THESE SIGNALS ARE 1.8V, NOT COMPATIBLE WITH Mini PCIe BUSES. THIS IS AN ADVANCED VOICE FUNCTIONALITY AND THE HOST SHOULD TAKE CARE OF CORRECT COMPATIBILITY.

10.2. CODEC Example

Please refer to the Module's Digital Voice Application Note

11. Mechanical specifications

The xE910 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.
Soldering pads are present on the back side of the adapter board to allow the optional mounting of a sim-holder. Starting from p/n HEPCxyyy204Tzzz the carrier board has been unified to the same used on the product DE910 Mini PCIe.



The Telit xE910 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 xE910 Mini PCIe adapter weight is about 10 grams.

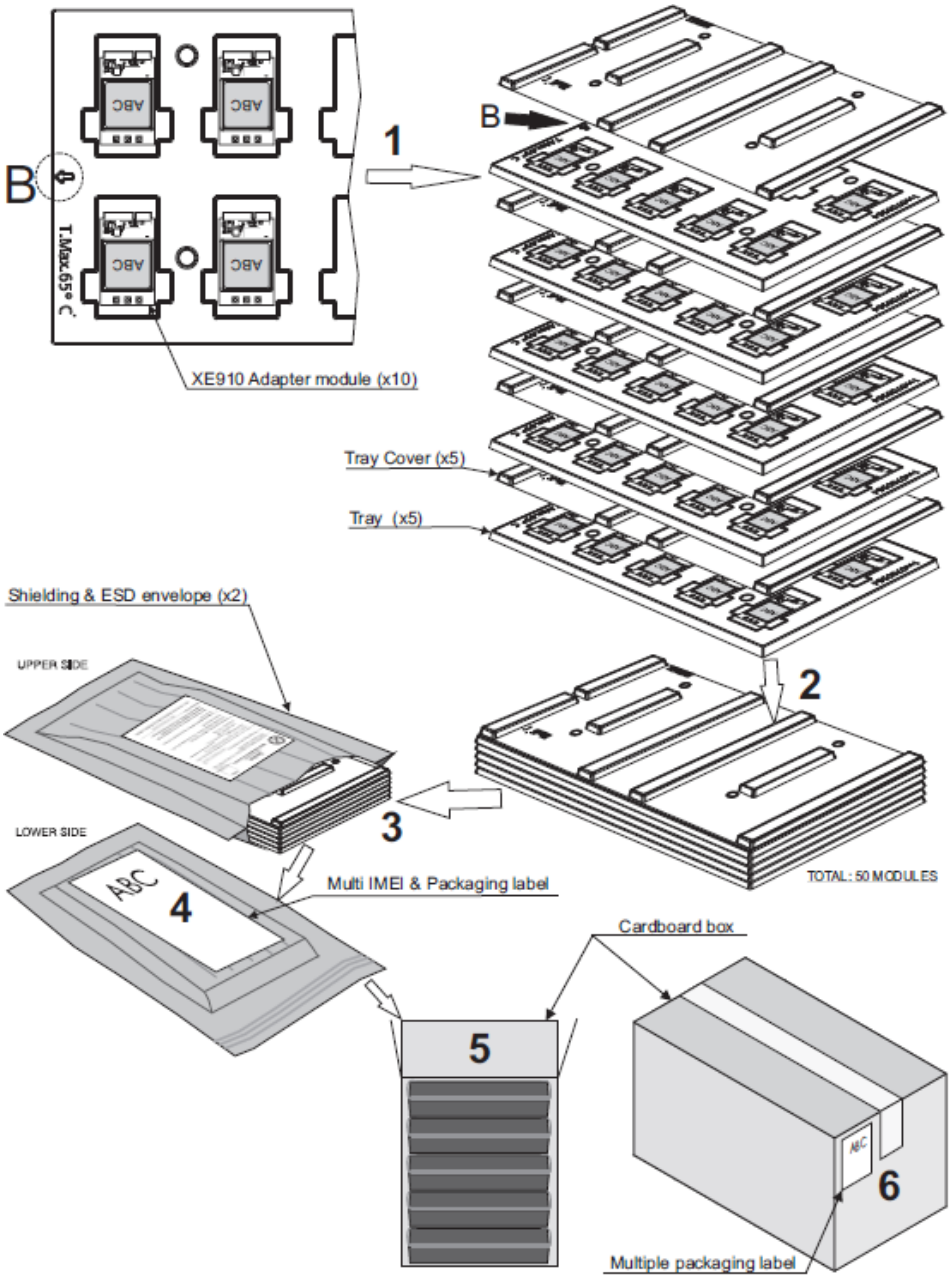
11.2. ENVIRONMENTAL REQUIREMENTS

Temperature range

Storage and operating Temperature Range	-40° ~ +85° C

12. Packing system

The XE910 Mini PCIe modules are packaged on trays of ***20*** pieces each.



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 rthe esponsibility 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 soldered on the carrier board

14.1. 1999/5/EC Directive (HE910)

The HE910 mPCIe and HE910-D mPCIe have 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/ЕС.
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/ΕΚ.
Hungarian	Alulírott, Telit Communications S.p.A. nyilatkozom, hogy a 2G/3G module megfelel a vonatkozó alapvetõ követelményeknek és az 1999/5/EC irányelv egyéb elõírásainak.
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-ħtiġijiet essenzjali u ma provvedimenti oħrajn relevanti li hemm fid-Dirrettiva 1999/5/EC.
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 module 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 mPCIe is compliant to 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 V6.2.1 EN 301 908-2 V6.2.1
EMC (R&TTE art. 3.1b)	EN 301 489-1 V1.9.2 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 EN 62311:2008

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

RF spectrum use (R&TTE art. 3.2)	EN 301 511 V9.02 EN 301 908-1 V6.2.1 EN 301 908-2 V6.2.1
EMC (R&TTE art. 3.1b)	EN 301 489-1 V1.9.2 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 EN 62311:2008

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

CETECOM ICT SERVICES GMBH
Untertürkheimer Straße 6-10 66117
SAARBRÜCKEN
Country: Germany
Notified Body Number 0682.
Thus, the following marking is included in the product: CE 0682

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

There is no restriction for the commercialisation of the HE910 mPCIe, HE910-D mPCIe 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

14.2. FCC/IC Regulatory notices (HE910)

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:

Frequency band	HE910, HE910-D
GSM 850/FDD V	5.22 dBi
PCS 1900/FDD II	3.31 dBi
FDD IV	6.45 dBi

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

Cet appareil est conforme aux limites d'exposition aux rayonnements de la IC pour un environnement non contrôlé. L'antenne doit être installé 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:

Bande de fréquence	***HE910, HE910-D***
GSM 850/FDD V	*5.22 dBi*
PCS 1900/FDD II	*3.31 dBi*
FDD IV	*6.45 dBi*

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.

14.3. 1999/5/EC Directive (LE910)

The LE910-EUG module 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/LTE module отговаря на съществените изисквания и другите приложими изисквания на Директива 1999/5/ЕС.
Czech	Telit Communications S.p.A. tímto prohlašuje, že tento 2G/3G/LTE 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/LTE 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/LTE 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/LTE 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/LTE 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/LTE 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/LTE module ΣΥΜΜΟΡΦΩΝΕΤΑΙ ΠΡΟΣ ΤΙΣ ΟΥΣΙΩΔΕΙΣ ΑΠΑΙΤΗΣΕΙΣ ΚΑΙ ΤΙΣ ΛΟΙΠΕΣ ΣΧΕΤΙΚΕΣ ΔΙΑΤΑΞΕΙΣ ΤΗΣ ΟΔΗΓΙΑΣ 1999/5/ΕΚ.
Hungarian	Alulírott, Telit Communications S.p.A. nyilatkozom, hogy a 2G/3G/LTE module megfelel a vonatkozó alapvetõ követelményeknek és az 1999/5/EC irányelv egyéb elõírásainak.
Finnish	Telit Communications S.p.A. vakuuttaa täten että 2G/3G/LTE 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/LTE 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/LTE 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/LTE 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/LTE 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/LTE module atitinka esminius reikalavimus ir kitas 1999/5/EB Direktyvos nuostatas.

Maltese	Hawnhekk, Telit Communications S.p.A., jiddikjara li dan 2G/3G/LTE module jikkonforma mal-ħtiġijiet essenzjali u ma provvedimenti oħrajn relevanti li hemm fid-Dirrettiva 1999/5/EC.
Norwegian	Telit Communications S.p.A. erklærer herved at utstyret 2G/3G/LTE 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/LTE 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/LTE 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/LTE module spĺňa základné požiadavky a všetky príslušné ustanovenia Smernice 1999/5/ES.
Slovenian	Telit Communications S.p.A. izjavlja, da je ta 2G/3G/LTE module 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/LTE 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/LTE 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 LE910-EUG module 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 V6.2.1 EN 301 908-2 V6.2.1 EN 301 908-13 V6.2.1
EMC (R&TTE art. 3.1b)	EN 301 489-1 V1.9.2 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 + AC:2011 EN 62311:2008 EN 62479:2010

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 Tecnologico de Andalucía
C/ Severo Ochoa 2
29590 Campanillas – Málaga
SPAIN
Notified Body No: 1909

Thus, the following marking is included in the product: CE1909

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

There is no restriction for the commercialisation of the LE910-EUG modules 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

14.4. FCC/IC Regulatory notices (LE910)

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:

Frequency band	LE910-NAG	LE910-NVG	LE910-SVG
700 MHz	8.74 dBi	9.16 dBi	6.93 dBi
850 MHz	6.93 dBi	9.42 dBi	N/A
1700 MHz	5.00 dBi	5.00 dBi	5.00 dBi
1900 MHz	2.51 dBi	8.01 dBi	N/A

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

Cet appareil est conforme aux limites d'exposition aux rayonnements de la IC pour un environnement non contrôlé. L'antenne doit être installé 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:

Bande de fréquence	**LE910-NAG**	**LE910-NVG**	**LE910-SVG**
700 MHz	8.74 dBi	9.16 dBi	6.93 dBi
850 MHz	6.93 dBi	9.42 dBi	N/A
1700 MHz	5.00 dBi	5.00 dBi	5.00 dBi
1900 MHz	2.51 dBi	8.01 dBi	N/A

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.

Labelling Requirements for the Host device

The host device shall be properly labelled to identify the modules within the host device. The certification label of the module shall be clearly visible at all times when installed in the host device, otherwise the host device must be labelled to display the FCC ID and IC of the module, preceded by the words "Contains transmitter module", or the word "Contains", or similar wording expressing the same meaning, as follows:

LE910-NAG

Contains FCC ID: RI7LE910NA
Contains IC: 5131A-LE910NA

LE910-NVG

Contains FCC ID: RI7LE910NV
Contains IC: 5131A-LE910NV

LE910-SVG

Contains FCC ID: RI7LE910SV
Contains IC: 5131A-LE910SV

L'appareil hôte doit être étiqueté comme il faut pour permettre l'identification des modules qui s'y trouvent. L'étiquette de certification du module donné doit être posée sur l'appareil hôte à un endroit bien en vue en tout temps. En l'absence d'étiquette, l'appareil hôte doit porter une étiquette donnant le FCC ID et le IC du module, précédé des mots « Contient un module d'émission », du mot « Contient » ou d'une formulation similaire exprimant le même sens, comme suit :

LE910-NAG

Contains FCC ID: RI7LE910NA
Contains IC: 5131A-LE910NA

LE910-NVG

Contains FCC ID: RI7LE910NV
Contains IC: 5131A-LE910NV

LE910-SVG

Contains FCC ID: RI7LE910SV
Contains IC: 5131A-LE910SV

CAN ICES-3 (B) / NMB-3 (B)

This Class B digital apparatus complies with Canadian ICES-003.

Cet appareil numérique de classe B est conforme à la norme canadienne ICES-003.

14.5. Conformity Assessment Issues / Problèmes d'évaluation de conformité (DE910)

The DE910 is FCC/IC Approved as a module to be installed in other devices. This device should be used only for fixed and mobile applications and if the final product after integration is intended for portable use, a new application and FCC is required.

Le DE910 est approuvé FCC/IC comme module à installer dans d'autres dispositifs. Ce dispositif doit être utilisé uniquement pour des applications fixes et mobiles et si le produit fini est prévu après intégration pour un usage portatif, une nouvelle application et la FCC est requise

The user is cautioned that this device should be used only as specified within this manual to meet RF exposure requirements.

L'utilisateur est averti que ce dispositif doit être utilisé uniquement comme spécifié dans ce manuel pour répondre aux normes d'exposition aux ondes rf.

Use of this device in a manner inconsistent with this manual could lead to excessive RF exposure conditions.

L'utilisation de ce dispositif en quelque sorte contradictoire avec ce manuel a pu mener aux états excessifs d'exposition de rf.

The DE910 conforms to the following US Directives:

- Use of RF Spectrum. Standards: FCC47 Part 22&24
- EMC Standards: FCC47 Part 15

Le DE910 est conforme aux directives suivantes des USA

- Utilisation de spectre de rf. Normes : FCC47 partie 22&24
- Normes d'EMC : FCC47 partie 15

This device complies with Part 15 of the FCC Rules.

Ce dispositif est conforme à la partie 15 des règles FCC.

Operation is subject to the following two conditions:

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

Le fonctionnement est sujet aux deux conditions suivantes :

(1) ce dispositif peut ne pas causer l'interférence nocive, et
(2) ce dispositif doit accepter aucune interférence, y compris un interférence qui pourrait causer le fonctionnement non désiré du dispositif.

The user must refer to below information to meet the FCC/IC's RF exposure rules and regulations when they design:

Lors de la conception, l'utilisateur doit se référer à l'information ci-dessous pour remplir les conditions et règlementations FCC/IC' d'exposition aux ondes RF:

- The system antenna(s) used for this transmitter must be installed to provide a separation distance of at least 20 cm from all the persons and must not be co-located or operating in conjunction with any other antenna or transmitter.
  Le système d'antenne utilisé pour cet émetteur doit être installé à une distance d'au moins de 20 cm de toute personne et ne doit pas être co-implanté ou opérer en même temps que n'importe quelle autre antenne ou émetteur.
- The system antenna(s) used for this module must not exceed 5.12dBi in CDMA BC0 and 6.12dBi in CDMA BC1 for mobile and fixed or mobile operating configurations.
  Le système d' antenne utilisé pour ce module ne doit pas dépasser 5.12dBi en CDMA BC0 et 6.12dBi en CDMA BC1 pour des configurations mobiles et fixes ou des configurations opérant en mode mobile.
- Users and installers must be provided with antenna installation instructions and transmitter operating conditions for satisfying RF exposure compliance.
  Manufacturers of mobile, fixed or portable devices incorporating this module are advised to clarify any regulatory questions and to have their complete product tested and approved for FCC compliance.
  Les instructions d'installation de l'antenne ainsi que les conditions de fonctionnement de l'émetteur doivent être remis aux utilisateurs et aux installateurs conformément à la règlementation sur l'exposition aux ondes rf.
  Des fabricants des dispositifs mobiles, fixes ou portables incorporant ce module sont invités à clarifier toutes les questions de normalisation et à avoir leur produit complètement testé pour la mise en conformité FCC.
- DE910 is intended for the OEM integrator only.
  DE910 est prévu pour l'intégrateur OEM seulement.
- The user is required to see the Grant of Equipment document for other restrictions.
  L'utilisateur doit se referrer au document « Grant of equipment » pour d'autres restrictions.
- DE910 must be operated and used with a locally approved access point.
  DE910 doit être actionné et utilisé avec un point d'accès localement approuvé.
- The radio transmitter(IC ID: 5131A-DE910DUAL) has been approved by Industry Canada to operate with the antenna type listed in this manual with the maximum permissible gain and required antenna impedance for each antenna type indicated. Antenna types not included in this list, having a gain greater than the maximum gain indicated for that type, are strictly prohibited for use with this device.
  L'émetteur radio (identification d'IC : 5131A-DE910DUAL) a été approuvé par Industry Canada pour fonctionner avec le type d'antenne énuméré dans ce manuel avec le gain autorisé maximum et l'impédance d'antenne exigée pour chaque type d'antenne indiqué. Les types d'antenne non inclus dans cette liste,

ayant un gain supérieur au gain maximum indiqué pour ce type, sont strictement interdits pour un usage avec ce dispositif.

The following regulatory and safety notices must be published in documentation supplied to the end user of the product or system incorporating an adapter in compliance with local regulations.

- Host system including DE910 must be labeled with
  "Contains transmitter module with
  FCC ID: RI7DE910-DUAL and IC ID: 5131A-DE910DUAL"

Les notices de normalisation et de sécurité doivent se trouver dans la documentation fournie à l'utilisateur du produit ou du système incorporant un adaptateur conforme aux règlementations locales.

- Le système hôte comprenant DE910 doit être marqué avec « Contient un module émetteur avec IDENTIFICATION FCC : RI7DE910-DUAL et identification IC : 5131A-DE910DUAL »

14.6. CONFORMITY ASSESSMENT ISSUES (LE910 V2)

14.6.1. 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.
Cet appareil est conforme aux limites d'exposition aux rayonnements de la IC pour un environnement non contrôlé. L'antenne doit être installé 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:

RF exposure

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:

	Antenna Gain	
Frequency Band	LE910-NA V2	LE910-SV V2
700 MHz	6.63 dBi	6.94 dBi
850 MHz	6.63 dBi	N/A
1700 MHz	6.00 dBi	6.00 dBi
1900 MHz	8.51 dBi	9.01 dBi

Cet appareil est conforme aux limites d'exposition aux rayonnements de la IC pour un environnement non contrôlé. L'antenne doit être installé 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:

Gain de l‘antenne

Bande de fréquence	LE910-NA V2	LE910-SV V2
700 MHz	6.63 dBi	6.94 dBi
850 MHz	6.63 dBi	N/A
1700 MHz	6.00 dBi	6.00 dBi
1900 MHz	8.51 dBi	9.01 dBi

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.

Labelling Requirements for the Host device

The host device shall be properly labelled to identify the modules within the host device. The certification label of the module shall be clearly visible at all times when installed in the host device, otherwise the host device must be labelled to display the FCC ID and IC of the module, preceded by the words "Contains transmitter module", or the word "Contains", or similar wording expressing the same meaning, as follows:

LE910-NA V2

Contains FCC ID: RI7LE910NAV2

Contains IC: 5131A-LE910NAV2

LE910-SV V2

Contains FCC ID: RI7LE910SVV2

Contains IC: 5131A-LE910SVV2

L'appareil hôte doit être étiqueté comme il faut pour permettre l'identification des modules qui s'y trouvent. L'étiquette de certification du module donné doit être posée sur l'appareil hôte à un endroit bien en vue en tout temps. En l'absence d'étiquette, l'appareil hôte doit porter une étiquette donnant le FCC ID et le IC du module, précédé des mots « Contient un module d'émission », du mot « Contient » ou d'une formulation similaire exprimant le même sens, comme suit :

LE910-NA V2

Contains FCC ID: RI7LE910NAV2

Contains IC: 5131A-LE910NAV2

LE910-SV V2

Contains FCC ID: RI7LE910SVV2

Contains IC: 5131A-LE910SVV2

CAN ICES-3 (B) / NMB-3 (B)

This Class B digital apparatus complies with Canadian ICES-003.

Cet appareil numérique de classe B est conforme à la norme canadienne ICES-003.

14.7. Safety Recommendations (LE910 V2)

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 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 of the functioning of the final product; therefore, care has to be taken to the external components of the module, as well as of 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 of 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 equipment 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 equipment is available, while the applicable Directives (Low Voltage and EMC) are available at:

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

14.8. Safety Recommendations (HE910)

The device must be supplied with a limited power source that meets clause 2.5 of the EN 60950-1 standard. This requirements are:

For power supplies without overcurrent protection device----> Shortcircuit current < 8 A. / Apparent power < 100 VA

For power supplies with overcurrent protection device (rated current of overcurrent device shall be < 5A) --- > Shortcircuit current < 333 A. / Apparent power < 250 VA.

Furthermore, the device must be installed within an enclosure that meets HB class or pass the 550º glowing fire test of EN 60695-2-11.

14.9. Safety Recommendations (DE910)

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's regulations and the specific environmental regulation.

Do not disassemble the product; any evidence of tampering will compromise the warranty validity. Follow 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 conform to the security and fire prevention regulations. The

product has to be handled with care, avoiding any contact with the pads because electrostatic discharges may damage the product itself.
The system integrator is responsible for the functioning of the final product; therefore, care has to be taken with the external components of the module as well as of any project or installation issue because of the risk of disturbing the CDMA network or external devices or having impact on 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 SAR regulations.

15. Document History

Revision	Date	Changes
ISSUE#0	2012-05-08	First issue
ISSUE#1	2012-27-07	3.1 PINOUT updated 9 Wake functionality and new example 10 Audio section added 11 Mechanical layout drawing changed
ISSUE#2	2012-25-09	Minor grammatical corrections
ISSUE#3	2012-11-22	Minor grammatical corrections. 4.2 peak current requirement raised to 2.4A 5 sensitivity and output power (modify) 8 SH note added. Capacitor on SIMVCC changed from 1uF to 100 nF. 11 new drawing Added chapters 5.3.1, 5.3.2, 11.1, 11.2
ISSUE#4	2013-08-22	Temperature Range modified
ISSUE#5	2014-04-08	Updated chapter 11.2
ISSUE#6	2014-05-16	Updated chapter 11
ISSUE #7	2014-08-06	Added LE910 and DE910 Updated document's tables
ISSUE #8	2014-10-20	Chapter 5.5.2 updated
ISSUE#9	2015-02-03	Chapter 14 updated; added 14.6 Safety Recommendations on HE910
ISSUE#10	2015-06-12	Added LE910 V2 across the document