

- 1.8V CMOS level
- Up to 50 MHz clock rate



Note: The LE910Cx module supports Master mode only and cannot be configured as Slave mode.

PAD	Signal	I/O	Function	Type	Comment
F15	SPI_CLK	O	SPI clock output	1.8V	
E15	SPI_MISO	I	SPI data Master input Slave output	1.8V	Shared with RX_AUX
D15	SPI_MOSI	O	SPI data Master output Slave input	1.8V	Shared with TX_AUX
H14	SPI_CS	O	SPI chip-select output	1.8V	

Table 30: SPI Signals



Figure 19: SPI Signal Connectivity

8.5.2. I2C - Inter-integrated Circuit

The LE910Cx supports an I2C interface on the following pins:

- B11 - I2C_SCL
- B10 - I2C_SDA

The I2C can also be used externally by the end customer application.

In addition, SW emulated I2C functionality can be used on GPIO pins 1-10. Any GPIO (among GPIO 1-10) can be configured as SCL or SDA.

LE910Cx only supports I2C Master Mode.



Note: SW emulated I2C on GPIO lines is only supported from the modem side. For more information, refer to Ref 1: LE910Cx AT Command User Guide for command settings..



Note: To keep backward compatibility with previous LE910 products, it is recommended to keep using the SW emulated I2C available on GPIO's 1-10.

8.5.3. SD/MMC Card Interface

The LE910Cx provides an SD port supporting the SD3.0 specification, which can be used to support standard SD/MMC memory cards with the following features:

- Interface with SD/MMC memory cards up to 32 GB
- Max clock @ 2.95V - 50 MHz SDR
- Max Data: 25 MB/s
- SD standard: HS-SDR25 at 2.95V
- Max clock @ 1.8V - 200 MHz SDR
- Max Data: 100 MB/s
- SD standard: UHS-SDR104 at 1.8 V
- Max clock @ 1.8V - 50 MHz DDR
- Max Data: 50 MB/s
- SD standard: UHS-DDR50 at 1.8 V

Table 31 lists the LE910Cx SD card signals.

PAD	Signal	I/O	Function	Type	Comments
J12	SD/MMC_CMD	O	SD command	1.8/2.95V	
F12	SD/MMC_CLK	O	SD card clock	1.8/2.95V	
E12	SD/MMC_DATA0	I/O	SD Serial Data 0	1.8/2.95V	
G12	SD/MMC_DATA1	I/O	SD Serial Data 1	1.8/2.95V	
K12	SD/MMC_DATA2	I/O	SD Serial Data 2	1.8/2.95V	
H12	SD/MMC_DATA3	I/O	SD Serial Data 3	1.8/2.95V	
G13	SD/MMC_CD	I	SD card detect input	1.8V	Active Low

PAD	Signal	I/O	Function	Type	Comments
F13	VMMC	-	Power supply for MMC card pull-up resistors	1.8/2.95V	Max Current is 50mA

Table 31: SD Card Signals

Figure 20 shows the recommended connection diagram of the SD interface.

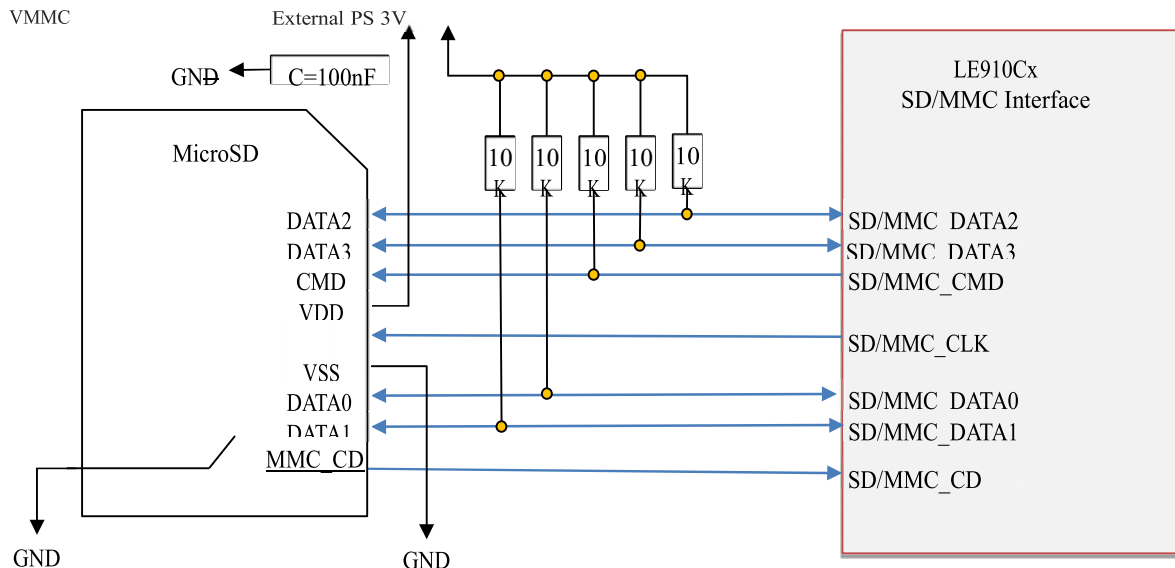


Figure 20: SD/MMC Interface Connectivity

Note: SD/MMC is only supported on the Linux side.

The power supply to the SD/MMC card must be supplied from the Host application board. The LE910Cx does not provide a dedicated power supply for the SD/MMC card.



The VMMC Supply is limited to 50mA so it can only supply the MMC card external pull-up resistors.

The Pull-up resistors must be placed on the host application board.

The card detection input has an internal pull-up resistor.

VMMC can be used to enable the external power supply (LDO Enable signal)

8.5.4. WiFi SDIO Interface

The LE910Cx provides an SDIO port supporting the SDIO3.0 specification, which can be used to interface with a WiFi chipset (Qualcomm QCA65x4 chipset or other WiFi solutions). The LE910Cx module includes an integrated SW driver to support the Qualcomm QCA6574 chipset.



Note: Qualcomm QCA9377 WiFi chipset may be supported on some of the LE910Cx variants.
Please contact your EXFO representative for more details.

The LE910Cx SDIO port supports the SDIO 3.0 specification at 1.8V CMOS only, so it cannot be used as an external SD/MMC card connection.

The LE910Cx module supports an LTE/WiFi coexistence mechanism via the WCI (Wireless Coexistence Interface) port, which connects between the module and the external WiFi IC.

For a detailed explanation, refer to Ref 5:

EXFO_LE920A4_LE910Cx_WiFi_Interface_Application_Note_r1.

PAD	Signal	I/O	Function	Type	Comments
N13	WIFI_SD_CMD	O	WiFi SD Command	1.8V	
L13	WIFI_SD_CLK	O	WiFi SD Clock	1.8V	200 MHz max.
J13	WIFI_SD_DATA0	I/O	WiFi SD Serial Data 0	1.8V	
M13	WIFI_SD_DATA1	I/O	WiFi SD Serial Data 1	1.8V	
K13	WIFI_SD_DATA2	I/O	WiFi SD Serial Data 2	1.8V	
H13	WIFI_SD_DATA3	I/O	WiFi SD Serial Data 3	1.8V	
L12	WIFI_SDRST	O	WiFi Reset / Power enable control	1.8V	Active Low
M8	WCI_TX	O	Wireless coexistence interface TXD	1.8V	
M9	WCI_RX	I	Wireless coexistence interface RXD	1.8V	

Table 32: WiFi SDIO Interface Signals

8.6. Audio Interface

The LE910Cx module supports a digital audio interface.

8.6.1. Digital Audio

The LE910Cx module can be connected to an external codec through the digital interface.

The product provides Digital Audio Interface (PCM/I2S) on the following pins:

PAD	Signal	I/O	Function	Type	Comments
B9	DVI_WA0	O	Digital Audio Interface (WA0)	B-PD 1.8V	PCM_SYNC I2S_WS
B6	DVI_RX	I	Digital Audio Interface (RX)	B-PD 1.8V	PCM_DIN I2S_DIN
B7	DVI_TX	O	Digital Audio Interface (TX)	B-PD 1.8V	PCM_DOUT I2S_DOUT
B8	DVI_CLK	O	Digital Audio Interface (CLK)	B-PD 1.8V	PCM_CLK I2S_CLK
B12	REF_CLK	O	Audio Master Clock	B-PD 1.8V	MCLK

Table 33: Digital Audio Interface Signals (PCM/I2S)

LE910Cx DVI has the following characteristics:

PCM

- PCM Master and slave modes using short or long frame sync modes
- 16-bit linear PCM format
- PCM clock rates of 128kHz, 256 kHz, 512 kHz, 1024 kHz and 2048 kHz (Default), 4096kHz
- Frame size of 8, 16, 32, 64, 128 & 256 bits per frame
- Sample rates of 8 kHz and 16 kHz

I2S

- Sample rate 8KHz, 16KHz, 48KHz
- Sample-width is 16bit only.
- Supported I2S standard only - Phillips I2S Bus Specifications revised June 5, 1996

In addition to the DVI port, the LE910Cx module provides a master clock signal (REF_CLK on Pin B12) which can either provide a reference clock to an external codec or form an PCM/I2S interface together with the DVI port where the REF_CLK acts as the MCLK.

The REF_CLK default frequency is 12.288 MHz.

When using the DVI with REF_CLK as PCM/I2S interface, 12.288 MHz is $256 \times f_s$ (where $f_s = 48 \text{ kHz}$)

8.6.1.1. Short Frame Timing Diagrams

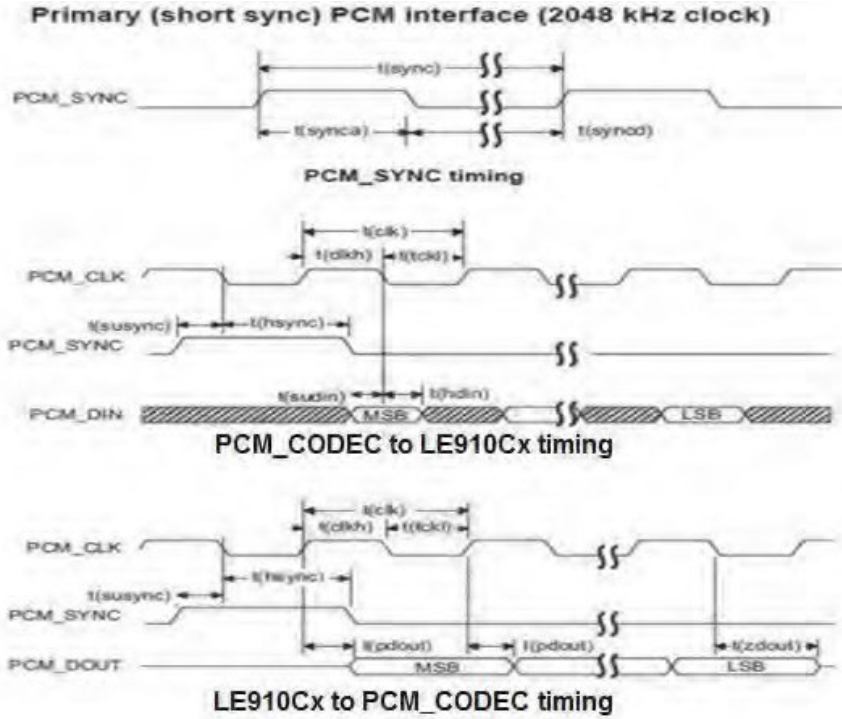


Figure 21: Primary PCM Timing

Parameter	Comments	Min	Typ	Max	Unit
t(sync)	PCM_SYNC cycle time	-	125	-	μs
t(synca)	PCM_SYNC asserted time	-	488	-	ns
t(syncd)	PCM_SYNC de-asserted time	-	124.5	-	μs
t(clk)	PCM_CLK cycle time	-	488	-	ns
t(clkh)	PCM_CLK high time	-	244	-	ns
t(clkl)	PCM_CLK low time	-	244	-	ns
t(sync_offset)	PCM_SYNC offset time to PCM_CLK falling	-	122	-	ns
t(sudin)	PCM_DIN setup time to PCM_CLK falling	60	-	-	ns
t(hdin)	PCM_DIN hold time after PCM_CLK falling	60	-	-	ns
t(pdout)	Delay from PCM_CLK rising to PCM_DOUT valid	-	-	60	ns
t(zdout)	Delay from PCM_CLK falling to PCM_DOUT HIGH-Z	-	-	60	ns

Table 34: PCM_CODEC Timing Parameters

8.6.1.2. Long Frame Timing Diagrams

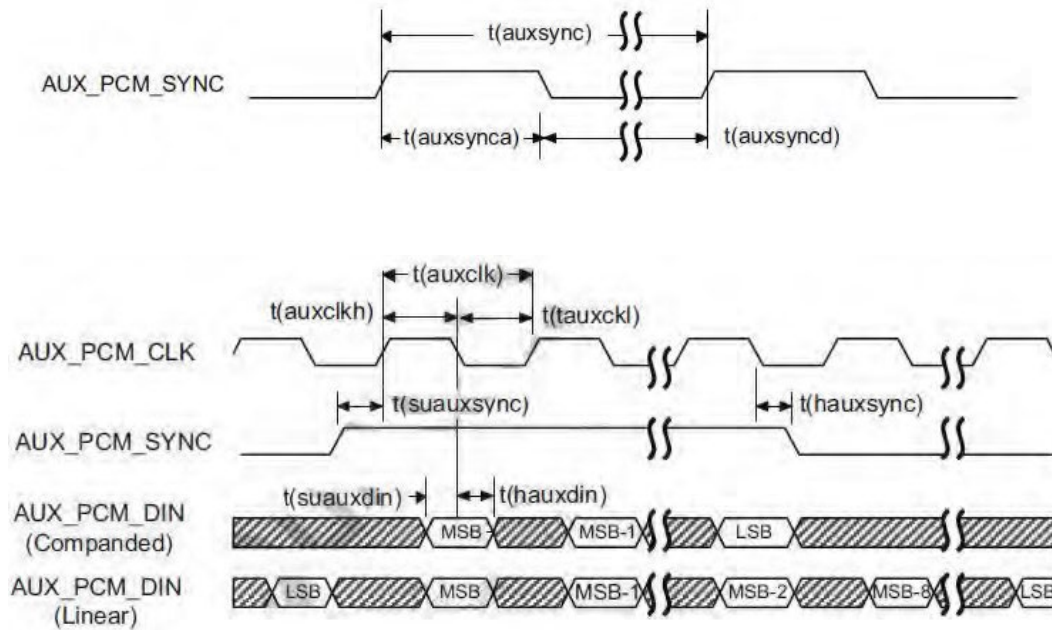
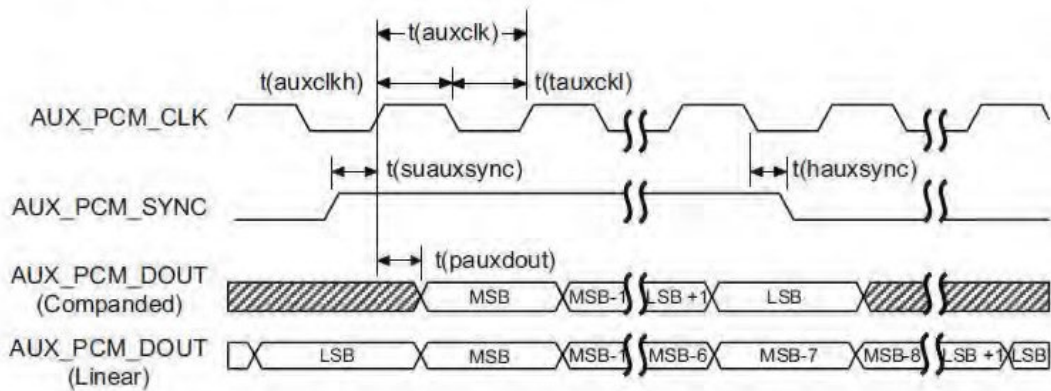
Long sync (auxiliary) PCM interface (128 kHz clock)**AUX_PCM_CODEC to MDM timing****MDM to AUX_PCM_CODEC timing**

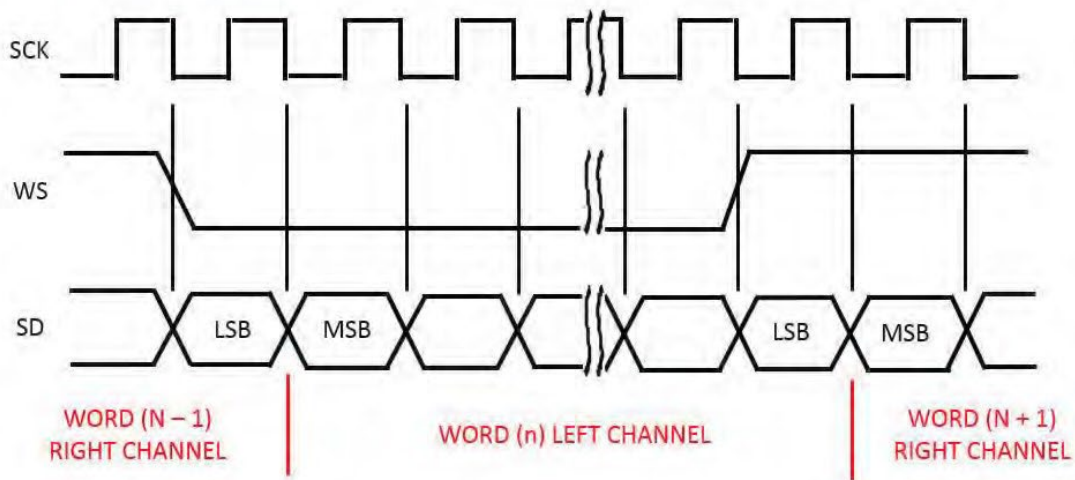
Figure 22: Auxiliary PCM Timing

Parameter	Comments	Min	Typ	Max	Unit
t(auxsync)	AUX_PCM_SYNC cycle time	-	125	-	μ s
t(auxsynca)	AUX_PCM_SYNC asserted time	62.4	62.5	-	μ s
t(auxsyncd)	AUX_PCM_SYNC de-asserted time	62.4	62.5	-	μ s
t(auxclk)	AUX_PCM_CLK cycle time	-	7.8	-	μ s
t(auxclkh)	AUX_PCM_CLK high time	3.8	3.9	-	μ s
t(auxclkl)	AUX_PCM_CLK low time	3.8	3.9	-	μ s
t(suauxsync)	AUX_PCM_SYNC setup time to AUX_PCM_CLK rising	1.95	-	-	ns
t(hauxsync)	PCM_DIN hold time after AUX_PCM_CLK rising	1.95	-	-	ns
t(suauxdin)	AUX_PCM_DIN setup time to AUX_PCM_CLK falling	70	-	-	ns
t(hauxdin)	AUX_PCM_DIN hold time after AUX_PCM_CLK falling	20	-	-	ns
t(pauxdout)	Delay from AUX_PCM_CLK to AUX_PCM_DOUT valid	-	-	50	ns

Table 35: AUX_PCM_CODEC Timing Parameters

8.6.1.3. I2S Digital Audio Diagram

High-level I2S timing



I2S timing details – Tx & Rx

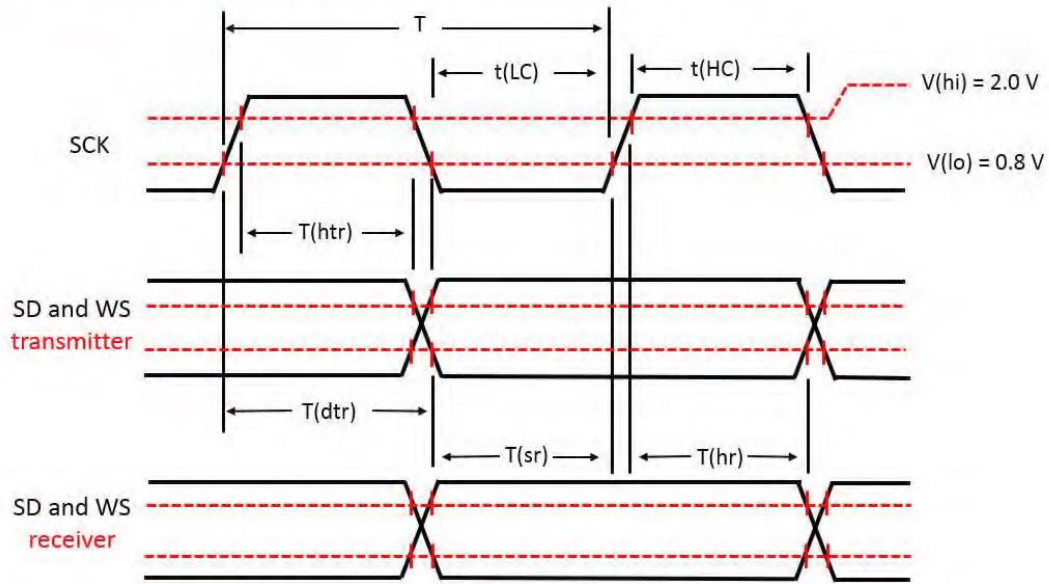


Figure 23: I2S timing diagram



Note LE910Cx family supports both PCM/I2S.

Parameter		Comments	Min	Typ	Max	Unit
Using internal SCK						
	Frequency		-	-	12.288	MHz
T	Clock period		81.380	-	-	ns
t(HC)	Clock high		$0.45 * T$	-	$0.55 * T$	ns
t(LC)	Clock low		$0.45 * T$	-	$0.55 * T$	ns
t(sr)	SD and WS input setup time		16.276	-	-	ns
t(hr)	SD and WS input hold time		0	-	-	ns
t(dtr)	SD and WS output delay		-		65.100	ns
t(htr)	SD and WS output hold time		0	-	-	ns
Using external SCK						
	Frequency		-	-	12.288	MHz
T	Clock period		81.380	-	-	ns
t(HC)	Clock high		$0.45 * T$	-	$0.55 * T$	ns
t(LC)	Clock low		$0.45 * T$	-	$0.55 * T$	ns

Parameter		Comments	Min	Typ	Max	Unit
t(sr)	SD and WS input setup time		16.276	-	-	ns
t(hr)	SD and WS input hold time		0	-	-	ns
t(dtr)	SD and WS output delay		-		65.100	ns
t(htr)	SD and WS output hold time		0	-	-	ns

Table 36: Interface timing

8.7. General Purpose I/O

The general-purpose I/O pads can be configured to act in three different ways:

- Input
- Output
- Alternative function (internally controlled)

The Input pads can only be read, reporting the digital values (high / low) present on the pad at the time of reading. The Output pads can only be written or queried and set values on the pad output. Pads with alternative function can be internally controlled by the LE910Cx firmware and act according to the implementation.

The following GPIOs are always available as a primary function on the LE910Cx.

PAD	Signal	I/O	Function	Type	Note
C8	GPIO_01	I/O	Configurable GPIO	CMOS 1.8V	*
C9	GPIO_02	I/O	Configurable GPIO	CMOS 1.8V	
C10	GPIO_03	I/O	Configurable GPIO	CMOS 1.8V	
C11	GPIO_04	I/O	Configurable GPIO	CMOS 1.8V	
B14	GPIO_05	I/O	Configurable GPIO	CMOS 1.8V	*
C12	GPIO_06	I/O	Configurable GPIO	CMOS 1.8V	*
C13	GPIO_07	I/O	Configurable GPIO	CMOS 1.8V	*
K15	GPIO_08	I/O	Configurable GPIO	CMOS 1.8V	*
L15	GPIO_09	I/O	Configurable GPIO	CMOS 1.8V	*
G15	GPIO_10	I/O	Configurable GPIO	CMOS 1.8V	

Table 37: Primary GPIOs



Warning: GPIO's marked with (*) must not be pulled high externally (from the carrier board) during module power on procedure. Pulling these pads high during module power up might lead to unwanted/non-operational boot mode.

The additional GPIOs below can be used in case their initial functionality is not used:

PAD	Signal	I/O	Initial Function	Alternate Function	Type	Note
L12	GPIO_13	I/O	WIFI_SDRST	Configurable GPIO	CMOS 1.8V	*
N13	GPIO_14	I/O	WIFI_SDIO_CMD	Configurable GPIO	CMOS 1.8V	
J13	GPIO_15	I/O	WIFI_SDIO_D0	Configurable GPIO	CMOS 1.8V	
M13	GPIO_16	I/O	WIFI_SDIO_D1	Configurable GPIO	CMOS 1.8V	
K13	GPIO_17	I/O	WIFI_SDIO_D2	Configurable GPIO	CMOS 1.8V	
H13	GPIO_18	I/O	WIFI_SDIO_D3	Configurable GPIO	CMOS 1.8V	
L13	GPIO_19	I/O	WIFI_SDIO_CLK	Configurable GPIO	CMOS 1.8V	
M8	GPIO_24	I/O	WCI_TXD	Configurable GPIO	CMOS 1.8V	*
M9	GPIO_25	I/O	WCI_RXD	Configurable GPIO	CMOS 1.8V	*
R14	GPIO_31	I/O	UART_RI	Configurable GPIO	CMOS 1.8V	
P14	GPIO_32	I/O	UART_DSR	Configurable GPIO	CMOS 1.8V	
N14	GPIO_33	I/O	UART_DCD	Configurable GPIO	CMOS 1.8V	
M14	GPIO_34	I/O	UART_DTR	Configurable GPIO	CMOS 1.8V	
F15	GPIO_35	I/O	SPI_CLK	Configurable GPIO	CMOS 1.8V	
E15	GPIO_36	I/O	SPI_MISO	Configurable GPIO	CMOS 1.8V	
D15	GPIO_37	I/O	SPI_MOSI	Configurable GPIO	CMOS 1.8V	
H14	GPIO_11	I/O	SPI_CS	Configurable GPIO	CMOS 1.8V	

Table 38: Additional GPIOs



Warning: GPIO's marked with (*) should not be pulled high externally (from the carrier board) during module power on procedure. Pulling these pads high during module power up might lead to unwanted/non-operational boot mode.



Note: LE910Cx GPIOs 1~10 can also be used as alternate I2C function. Refer to Section 8.5.2, I2C - Inter-integrated Circuit.

8.7.1. Using a GPIO Pad as Input

GPIO pads, when used as inputs, can be connected to a digital output of another device and report its status, provided that this device has interface levels compatible with the 1.8V CMOS levels of the GPIO.

If the digital output of the device is connected to the GPIO input, the pad has interface levels other than 1.8V CMOS. It can be buffered with an open collector transistor with a 10 k Ω pull-up resistor to 1.8V.

8.7.2. Using a GPIO Pad as an interrupt / Wakeup source

GPIO pads used as inputs can also be used as an interrupt source for software. In general, all GPIO pads can also be used as an interrupt. However, not all GPIO's can be used as a wakeup source of the module (wakeup from sleep).

Only the following GPIO's can be used for waking up the system from sleep:

- GPIO1
- GPIO4
- GPIO5
- GPIO8

8.7.3. Using a GPIO Pad as Output

The GPIO pads, when used as outputs, can drive 1.8V CMOS digital devices or compatible hardware. When set as outputs, the pads have a push-pull output, and therefore the pullup resistor can be omitted.

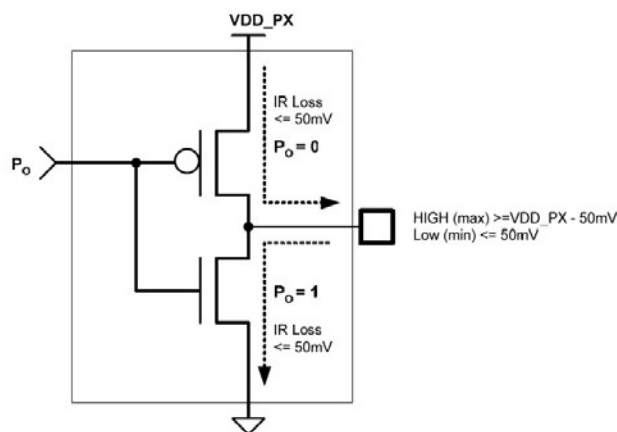


Figure 24: GPIO Output Pad Equivalent Circuit

9. MISCELLANEOUS FUNCTIONS

9.1. Indication of Network Service Availability

The STAT_LED pin status shows information on the network service availability and call status. In the LE910Cx module, the STAT_LED usually needs an external transistor to drive an external LED.

The STAT_LED does not have a dedicated pin. The STAT_LED functionality is available on GPIO_01 pin (by default GPIO_01 functions as STAT_LED)

See the AT Command User Guide for details about the AT#SLED section.

LED Status		Device Status
Permanently off		Device off
Blinking	Blinking 1s on and 2s off	Registered in idle
	Blinking time depends on network condition in order to minimize power consumption	Registered in idle with power saving
Permanently on		Not registered

Table 39: Network Service Availability Indication

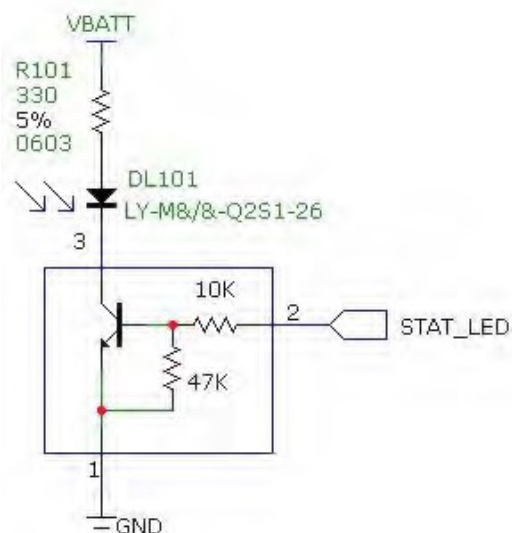


Figure 25: Status LED Circuit Example

9.2. Indication of Software Ready

The SW_RDY signal provides indication on the module's ability to receive commands. As long as the SW_RDY is asserted low, it indicates that the LE910Cx has not finished booting yet. Once the SW_RDY is asserted high, it indicates that the LE910Cx is ready to receive commands.

The SW_RDY does not have a dedicated pin. The SW_RDY functionality is available on GPIO_08 pin (by default GPIO_08 functions as SW_RDY).

9.3. RTC – Real Time Clock

The RTC within the LE910Cx module does not have a dedicated RTC supply pin. The RTC block is supplied by the VBATT supply.

If the battery is removed, the RTC is not maintained so if it is necessary to maintain an internal RTC, VBATT must be supplied continuously.

In Power OFF mode, the average current consumption is ~25uA.

9.4. VAUX Power Output

A regulated power supply output is provided to supply small devices from the module.

This output is active when the module is ON and turns OFF when the module is shut down. The operating range characteristics of the supply are as follows:

Item	Min	Typical	Max
Output voltage	1.75V	1.80V	1.85V
Output current			100 mA
Output bypass capacitor (within the module)			1 μ F

Table 40: Operating Range – VAUX Power Supply

9.5. ADC Converter

9.5.1. Description

The LE910Cx module provides three on-board 8-bit Analog to Digital converters. Each ADC reads the voltage level applied on the relevant pin, converts it and stores it into an 8-bit word.

Item	Min	Max	Units
Input voltage range	0.1	1.7	Volt
AD conversion	-	8	bits
Resolution	-	< 6.6	mV

Table 41: ADC Parameters

9.5.2. Using the ADC Converter

An AT command is available to use the ADC function.

The command is AT#ADC=1,2. The read value is expressed in mV.

Refer to Ref 1: LE910Cx AT Command User Guide for the full description of this function.

9.6. Using the Temperature Monitor Function

The Temperature Monitor supports temperature monitoring by providing periodic temperature indications, to perform some functions in extreme conditions. When properly set (see the #TEMPMON command in Ref 1: LE910Cx AT Command User Guide), it raises a GPIO to High Logic level when the maximum temperature is reached.

9.7. GNSS Characteristics

Table 42 specifies the GNSS characteristics and expected performance. The values are related to typical environment and conditions.

Parameters		Typical Measurement	Notes
Sensitivity	Standalone or MS Based Tracking Sensitivity	-160.0 dBm	
	Acquisition	-147.0 dBm	
	Cold Start Sensitivity	-145.0 dBm	
TTFF	Hot	1.1s	GPS+GLONASS Simulator test
	Warm	22.1s	GPS+GLONASS Simulator test
	Cold	29.94s	GPS+GLONASS Simulator test
Accuracy		< 2.0 m	GPS+GLONASS Simulator test @ CEP50
Min Navigation update rate		1Hz	
Dynamics		2g	
Operation limits		515 m/sec	
A-GPS		Supported	

Table 42: GNSS Characteristics



Note: The sensitivity level has a deviation about $\pm < 2\text{dB}$ each model and device

10. MOUNTING THE MODULE ON YOUR BOARD

10.1. General

The LE910Cx module is designed to be compliant with a standard lead-free soldering process.

10.2. Finishing & Dimensions

The below figure shows the mechanical dimensions of the LE910Cx module.

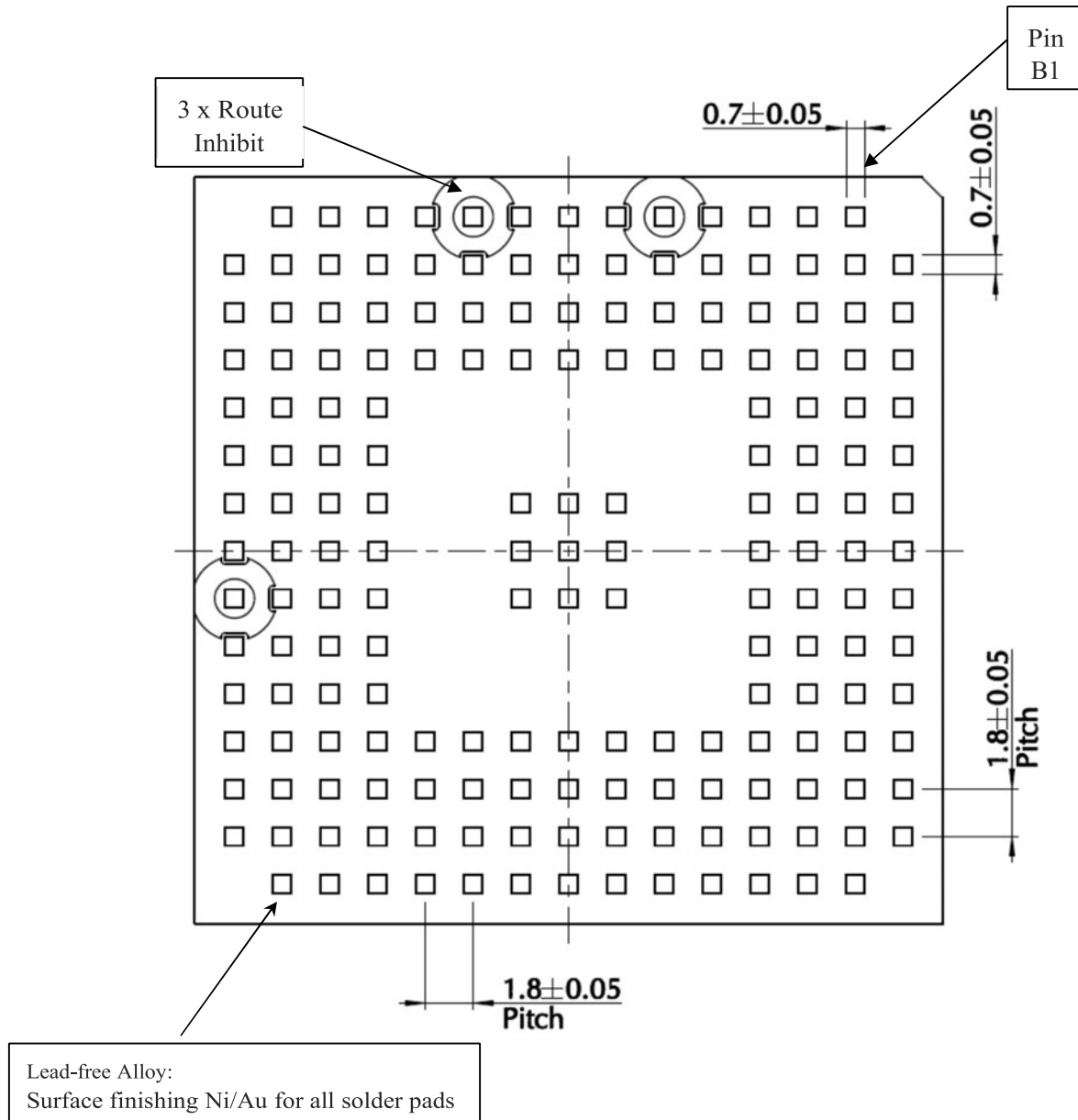


Figure 26: LE910Cx Mechanical Dimensions (Bottom View) except for LE910Cx-WWX

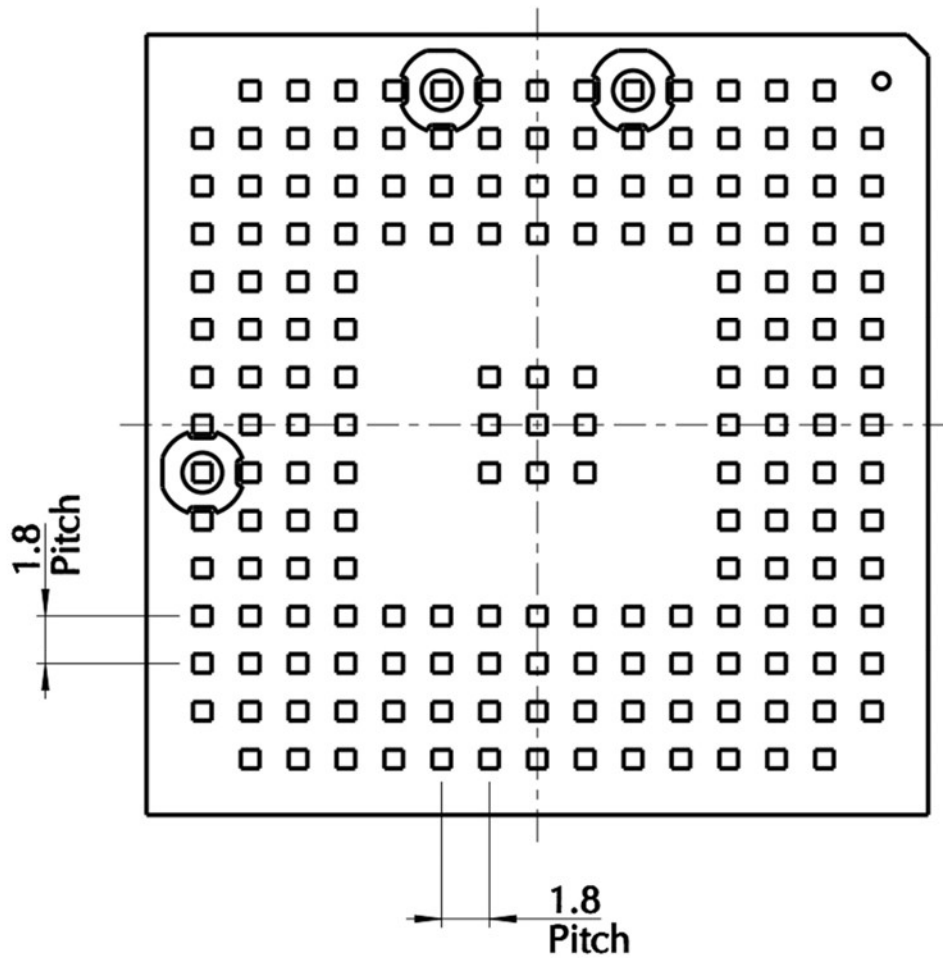


Figure 26-1: LE910Cx-WWX Mechanical Dimensions (Bottom View)



Note: LE910Cx-WWX mechanical dimension is bigger than other LE910Cx variants

Please, refer to 10.3 section for detail information.

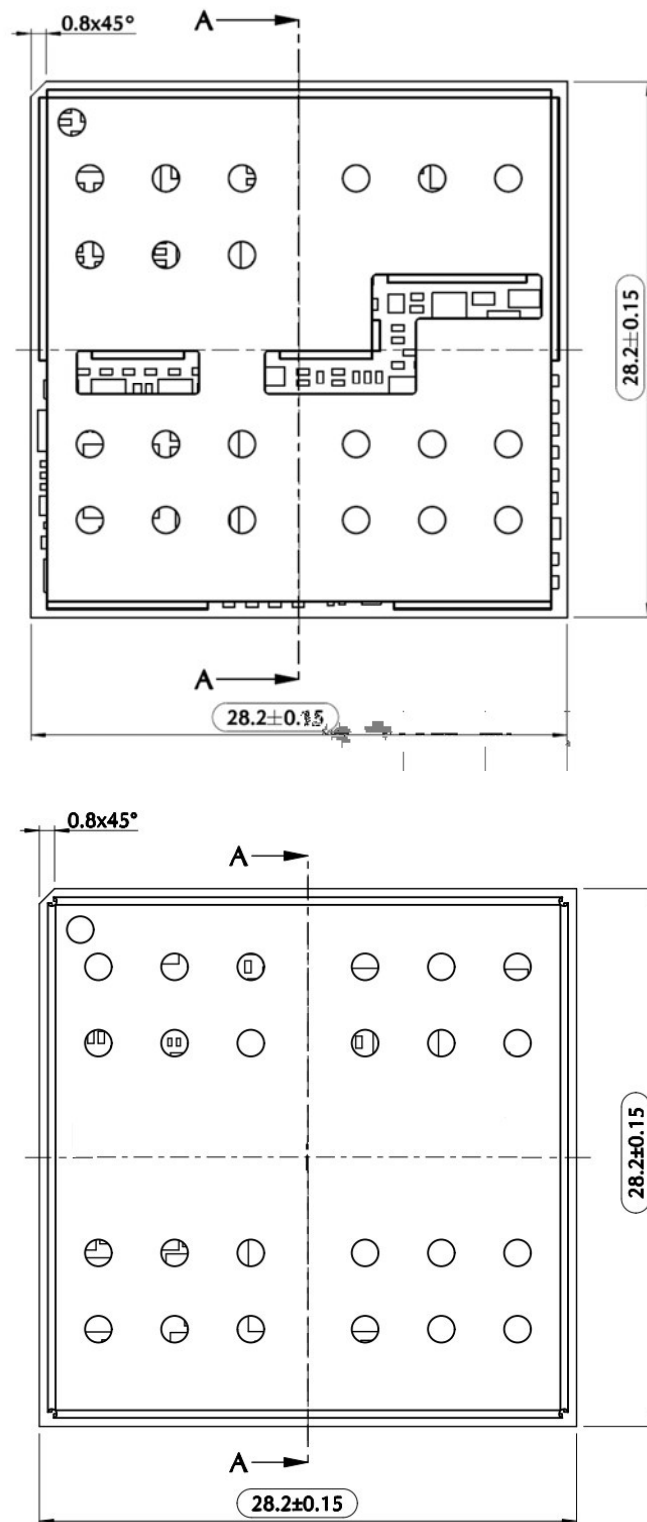


Figure 27: LE910Cx Mechanical Dimensions (Top view) with two kinds of shield design except for LE910Cx-WWX

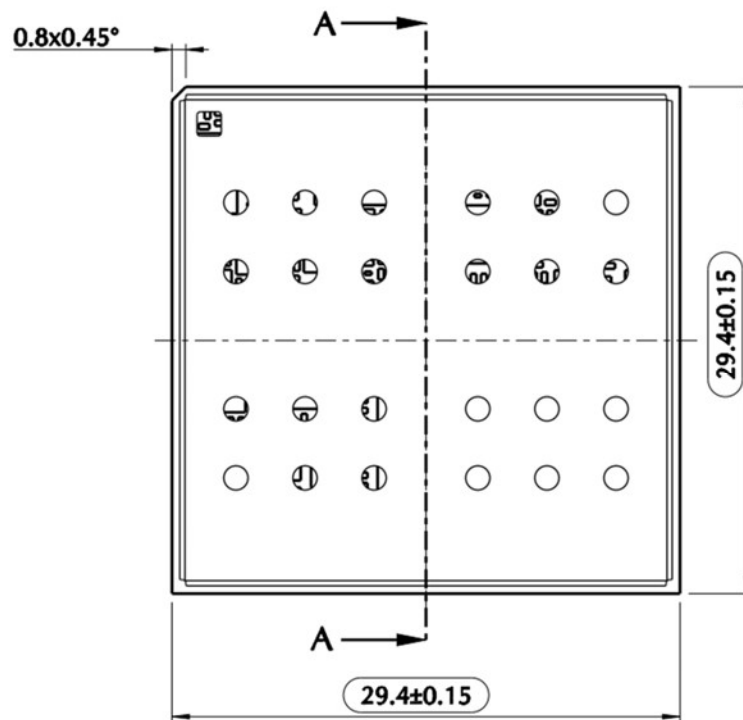


Figure 28: LE910Cx-WWX Mechanical Dimensions (Top view)



Note: LE910Cx-AP/NA/NS/EU/NF/ST/SA has two shield design and LE910Cx-SV/SVX/LA/CN/EUX/SAX/WWX has one shield design.

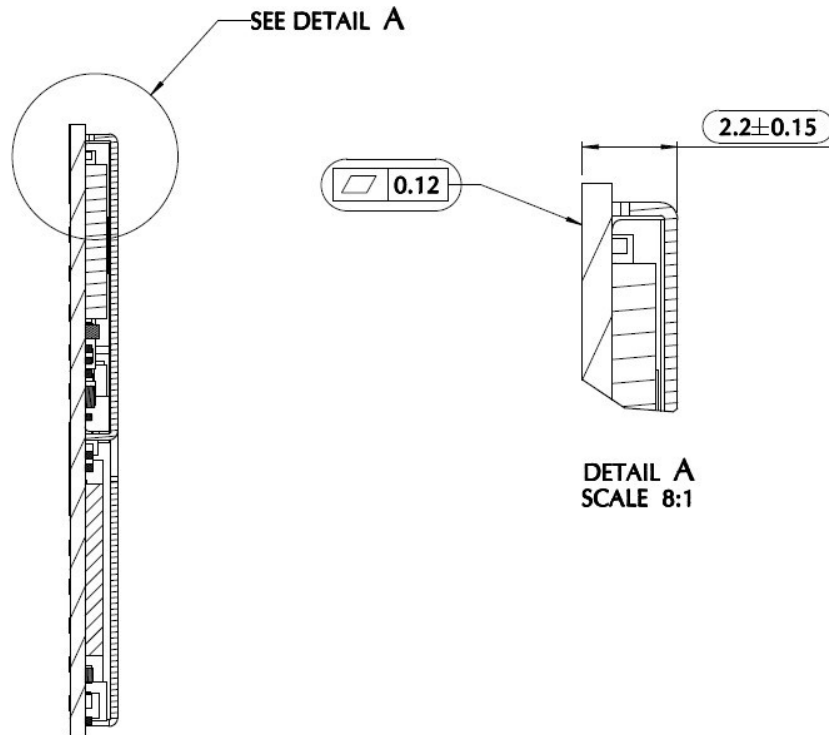


Figure 29: LE910Cx Mechanical Dimensions (Side view) except for LE910C1-SV and -SVX

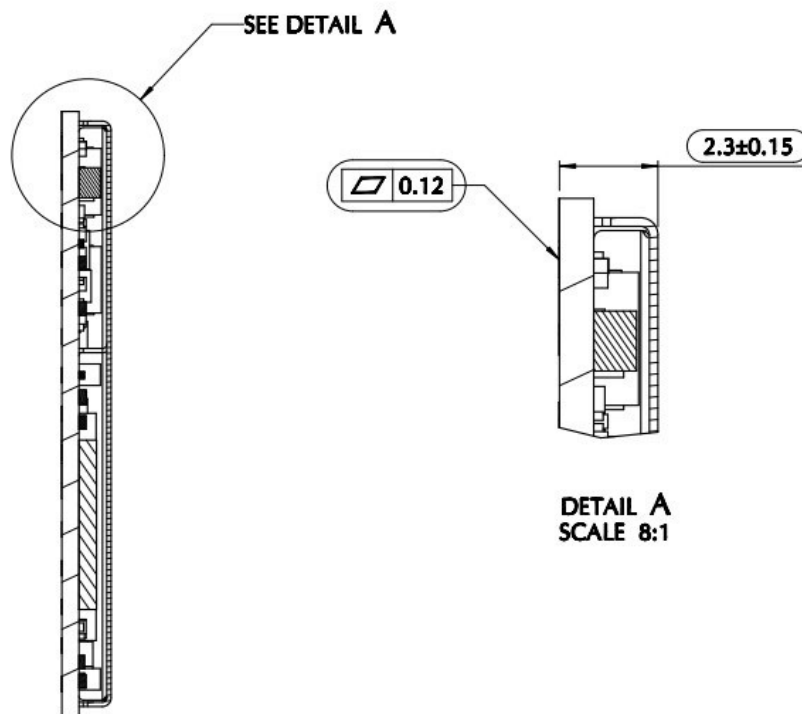


Figure 30: LE910C1-SV and SVX Mechanical Dimensions (Side view)

10.3. Recommended Footprint for the Application

Figure 31 and 31-1 shows the recommended footprint for the application board (dimensions are in mm).

To facilitate the replacement of the LE910Cx module if necessary, it is suggested to design the application board with a 1.5 mm placement inhibit area around the module.

It is also suggested, as a common rule for an SMT component, to avoid having a mechanical part of the application board in direct contact with the module.



Note: In the customer application, the region marked as INHIBIT WIRING in Figure 31 and 31-1 must be clear of signal wiring or ground polygons.

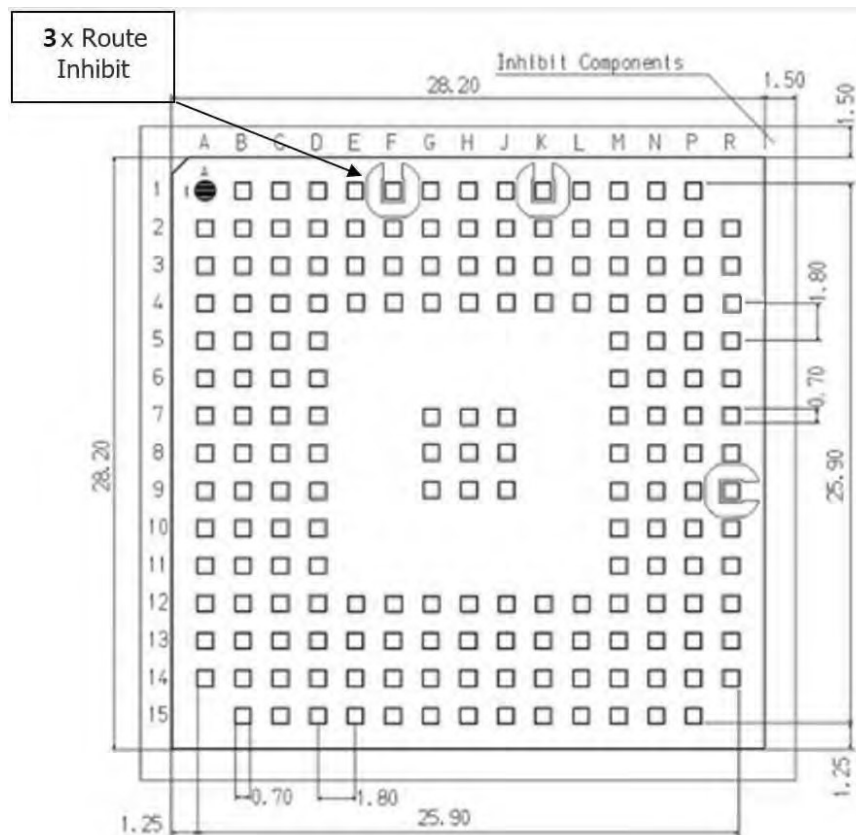


Figure 31: Recommended Footprint - Top View, 181 pads for LE910Cx variants except for LE910Cx-WWX

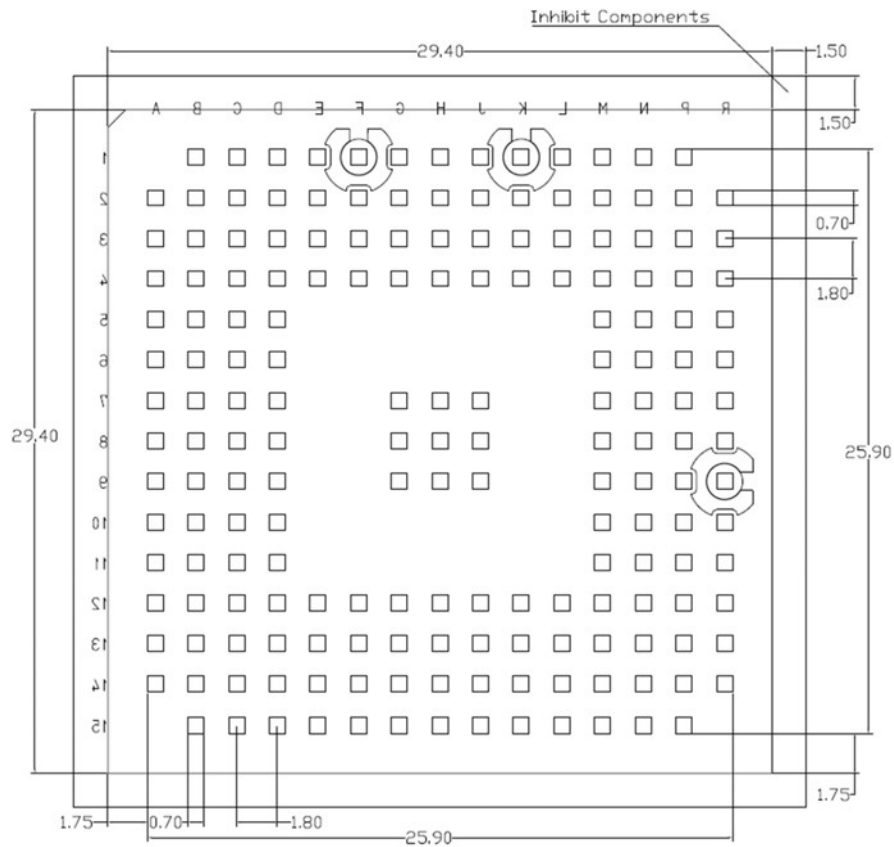


Figure 32-1: Recommended Footprint - Top View, 181 pads for LE910Cx-WWX only



Note: LE910Cx-WWX footprint is same as LE910Cx variants but PCB size is different others.

Please, refer to above dimension for LE910Cx-WWX.

10.4. Stencil

The layout of the stencil openings can be the same as the recommended footprint (1:1).
The suggested thickness of stencil foil is greater than 120 µm.

10.5. PCB Pad Design

The solder pads on the PCB are recommended to be of the Non-Solder Mask Defined (NSMD) type.

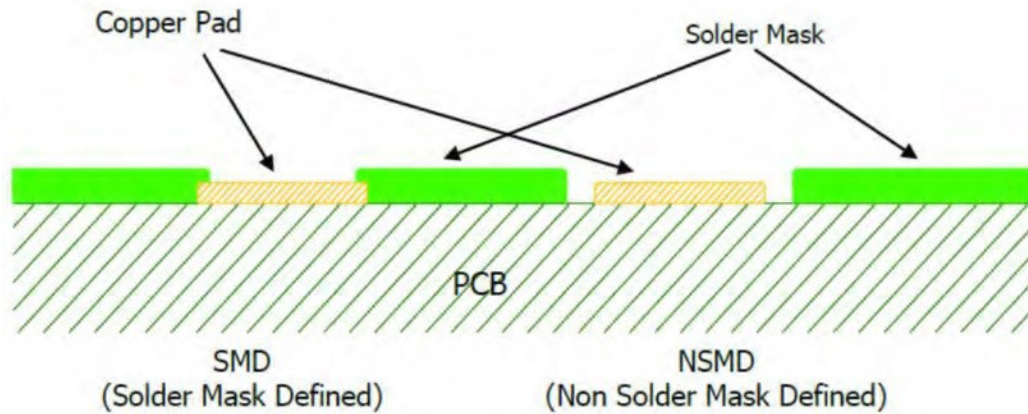


Figure 33: PCB Pad Design

10.6. Recommendations for PCB Pad Dimensions (mm)

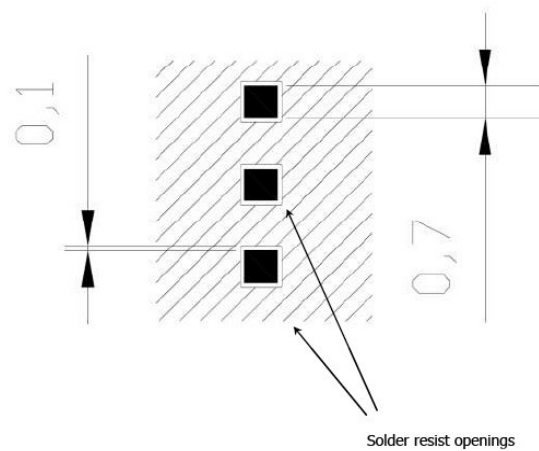


Figure 34: PCB Pad Dimensions

It is not recommended to place a via or micro-via not covered by solder resist around the pads in an area of 0.15 mm unless it carries the same signal as the pad itself. Micro vias inside the pads are allowed.

Holes in pad are only allowed for blind holes and not for through holes.

Finish	Layer Thickness (um)	Properties
Electro-less Ni / Immersion Au	3-7 / 0.05-0.15	Good solder ability protection, high shear force values

Table 43: Recommendations for PCB Pad Surfaces

The PCB must be able to resist the higher temperatures, which occur during the leadfree process. This issue should be discussed with the PCB-supplier. In general, the wettability of tin-lead solder paste on the described surface plating is better compared to lead-free solder paste.

10.7. Solder Paste

We recommend using only “no clean” solder paste to avoid the cleaning of the modules after assembly.

10.7.1. Solder Reflow

Figure 35 shows the recommended solder reflow profile.

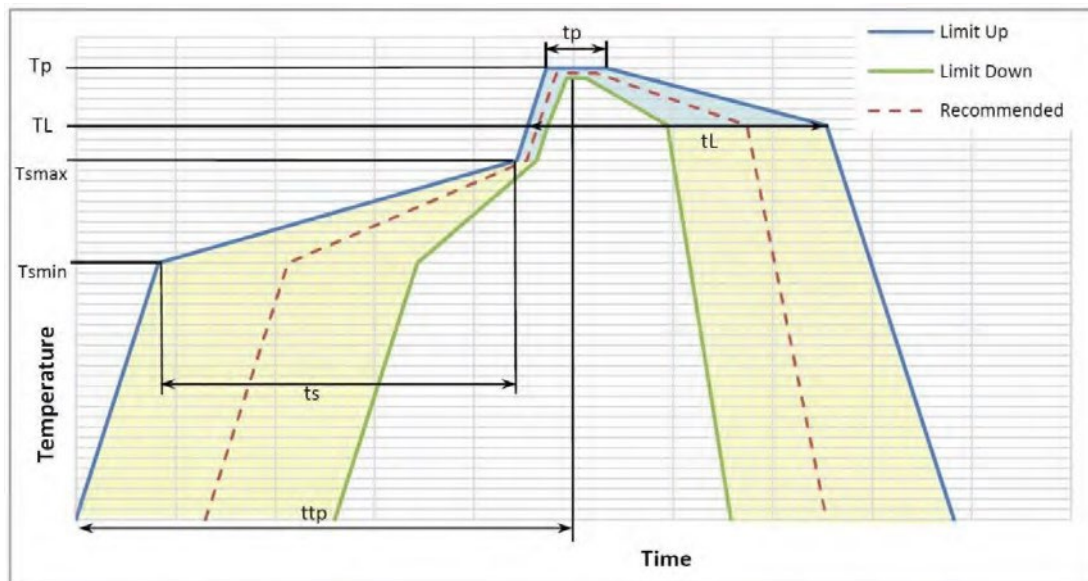


Figure 35: Solder Reflow Profile



Warning: The above solder reflow profile represents the typical SAC reflow limits and does not guarantee adequate adherence of the module to the customer application throughout the temperature range. Customer must optimize the reflow profile depending on the overall system taking into account such factors as thermal mass and warpage

Profile Feature	Pb-Free Assembly
Average ramp-up rate (TL to TP)	3°C/second max
Preheat – Temperature min (T _{min}) – Temperature max (T _{max}) – Time (min to max) (ts)	150°C 200°C 60-180 seconds
T _{max} to TL – Ramp-up rate	3°C/second max
Time maintained above: – Temperature (TL) – Time (tL)	217°C 60-150 seconds
Peak temperature (T _p)	245 +0/-5°C
Time within 5°C of actual peak Temperature (tp)	10-30 seconds
Ramp-down rate	6°C/second max
Time 25°C to peak temperature	8 minutes max

Table44:SolderProfileCharacteristics



Note: All temperatures refer to the top side of the package, measured on the package body surface.



Warning: The LE910Cx module withstands one reflow process only.

10.7.2. Cleaning

In general, cleaning the module mounted on the carrier board is not recommended.

- Residues between the module and the host board cannot be easily removed with any cleaning method.

- Cleaning with water or any organic solvent can lead to capillary effects where the cleaning solvent is absorbed into the gap between the module and the host board or even leaks inside the module (due to the gap between the module shield and PCB). The combination of soldering flux residues and encapsulated solvent could lead to short circuits between conductive parts. The solvent could also damage the module label.
- Ultrasonic cleaning could damage the module permanently. Especially for crystal oscillators where the risk of damaging is very high.

11. APPLICATION GUIDE

11.1. Debug of the LE910Cx Module in Production

To test and debug the mounting of the LE910Cx module, we strongly recommend adding several test pads on the application board design for the following purposes:

- Check the connection between the LE910Cx itself and the application
- Test the performance of the module by connecting it to an external computer

Depending on the customer's application, these test pads include, but are not limited to the following signals:

- TXD
- RXD
- ON/OFF
- HW_SHUTDOWN_N
- GND
- VBATT
- TX_AUX
- RX_AUX
- USB_VBUS
- USB_D+
- USB_D- □ GPIO_09
- WCI_RX

In addition, the following signals are also recommended (but not mandatory):

- PWRMON
- GPIO_01 (STAT_LED)
- GPIO_08 (SW_RDY)

11.2. Bypass Capacitor on Power Supplies

When there is a sudden voltage step to or a cut from the power supplies, the steep transition causes some reactions such as overshoot and undershoot. This abrupt voltage transition can affect the device causing it to fail or malfunction.

Bypass capacitors are needed to alleviate this behaviour. The behaviour can appear differently depending on the various applications. Customers need to pay special attention to this issue when designing their application board. The length and width of the power lines must be carefully considered, and the capacitance of the capacitors must be selected accordingly. The capacitor will also prevent power supplies ripple and switching noise caused in TDMA systems, such as GSM.

Especially, a suitable bypass capacitor must be mounted on the following lines on the application board:

- VBATT & VBATT_PA (M1, M2, N1, N2, P1, P2)
- USB_VBUS (Pad A13) Recommended values are:
- 100uF for both VBATT and VBATT_PA together
- 4.7uF for USB_VBUS (including the 1uF capacitor inside the module)

Customers must still consider that the capacitance mainly depends on the conditions of their application board.

Generally, more capacitance is required when the power line is longer.

11.3. SIM Interface

This section presents the recommended schematics for the design of SIM interfaces on the application boards. The LE910Cx supports two external SIM interfaces.

11.3.1. SIM Schematic Example

Figure 36 illustrates in particular how to design the application side and what values to assign the components.

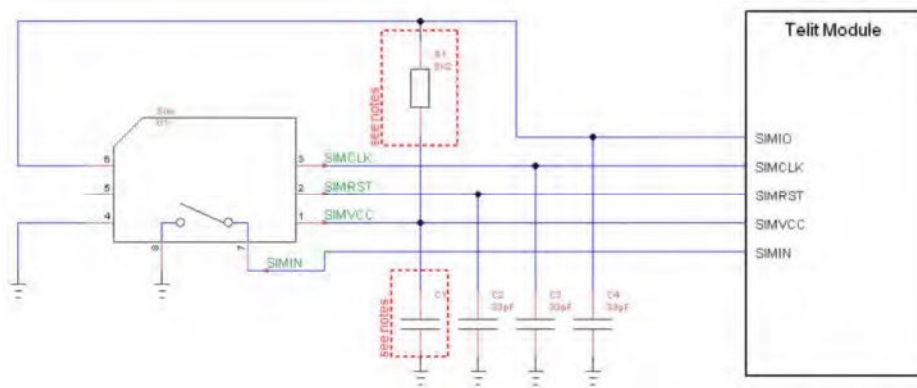


Figure 36: SIM Schematics

Note: The resistor value on SIMIO pulled up to SIMVCC must be defined to be compliant with the 3GPP specification for USIM electrical testing.

The LE910Cx module contains an internal pull-up resistor of 10K Ω on SIMIO.

However, the un-mounted R1 option in the application can be used to tune SIMIO timing if necessary.

Table 45 lists the values of C1 to be adopted with the LE910Cx product:

Product P/N	C1 Range (nF)
LE910Cx	100 nF

Table 45: SIM Interface – C1 Range

11.4. EMC Recommendations

All LE910Cx signals are provided with some EMC protection. However, the accepted level differs according to the specific pin.

Human body model (HBM) rating: 2000 V, JESD22-A114

Charged device model (CDM) rating: 500 V, JESD22-C101

Appropriate series resistors must be considered to protect the input lines from overvoltage.

11.5. Download and Debug Port

Choose one of the following options in the design of the host system to download or upgrade the EXFO software and debug the LE910Cx module when it is already mounted on a host system.

- UART and USB interfaces.
- Users who use both UART and USB interfaces to communicate with the LE910Cx module must implement a USB download method in the host system to upgrade the LE910Cx when it is mounted.
- USB interface only.
- Users who use a USB interface only to communicate with the LE910Cx module must arrange for a USB port in the host system to debug or upgrade the LE910Cx when it is mounted.
- UART interface only.

- Users who use a UART interface only to communicate with the LE910Cx module must arrange for a UART port in the host system to debug or upgrade the LE910Cx when it is mounted.

11.5.1. Fast Boot mode

Fast boot mode is normally used by EXFO SW to enter SW download mode

Fast boot is triggered by GPIO_09 (PAD L15). Asserting this signal high (1.8V) during boot will force the system into Fast boot

11.5.2. Recovery Boot Mode

Emergency boot download mode is used in case of corrupted boot image has been flashed into the device or in case all other recovery modes failed to work

The emergency download mode is triggered by WCI_RX signal (PAD M9). Asserting this signal high (1.8V) during boot will force the system into Emergency download.



Note: The application board must support accessible test pads on GPIO_09 and WCI_RX signal to enable the download recovery modes mentioned above.

12. PACKING SYSTEM

12.1. Packing System – Tray

The LE910Cx modules are packaged on trays of 36 pieces each as shown in Figure 37.

These trays can be used in SMT processes for pick & place handling.

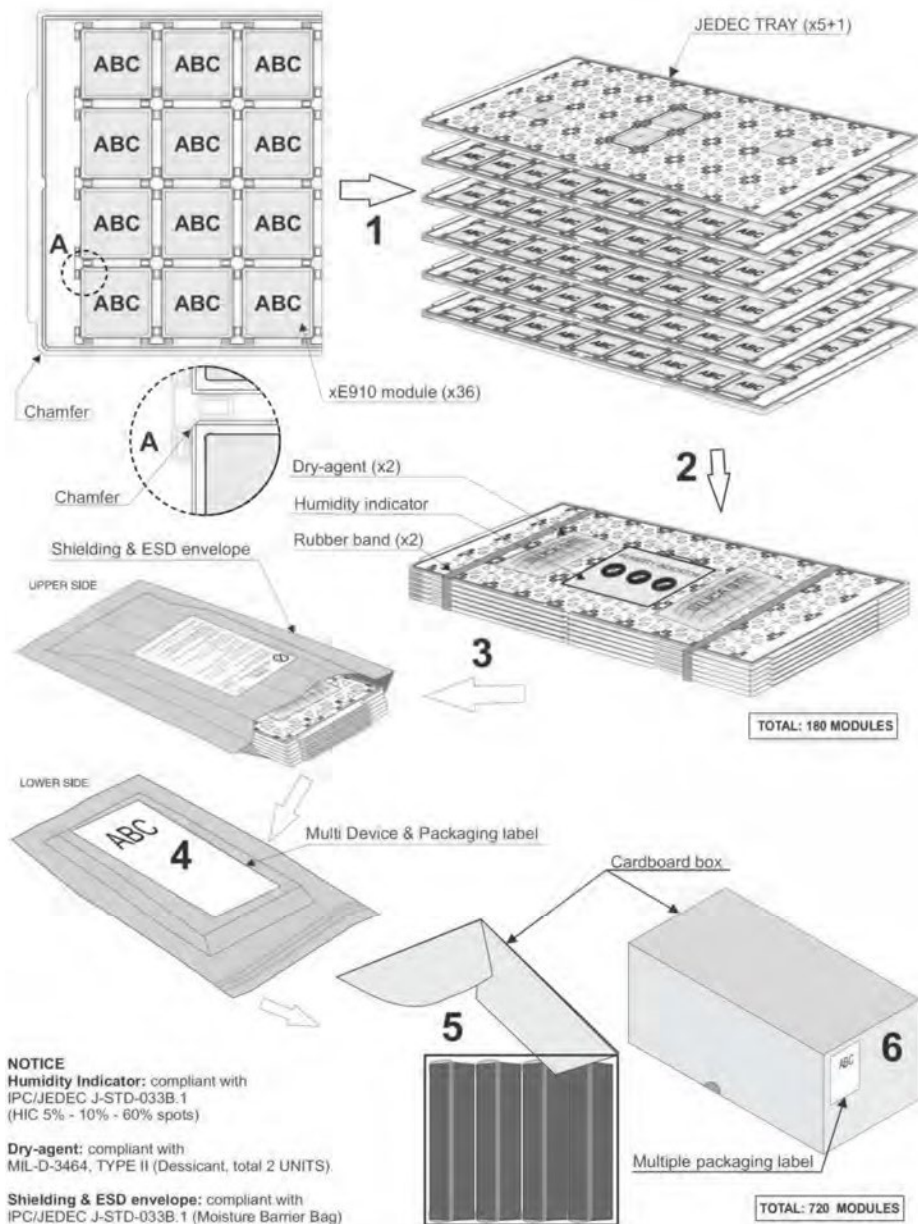


Figure 37: Packing

DETAIL

12.2. Tape & Reel

The LE910Cx can be packaged on reels of 200 pieces each.

See figure for module positioning into the carrier.

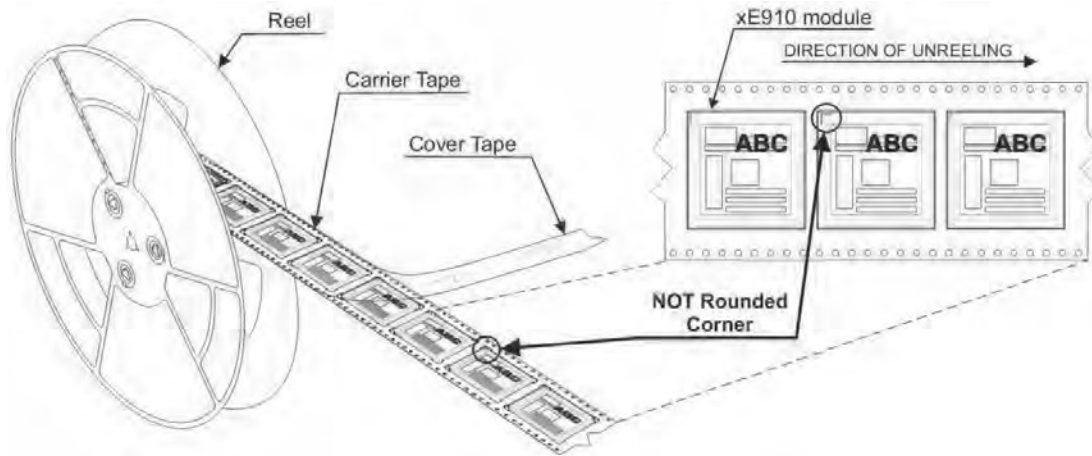


Figure 39: Module Positioning into the Carrier

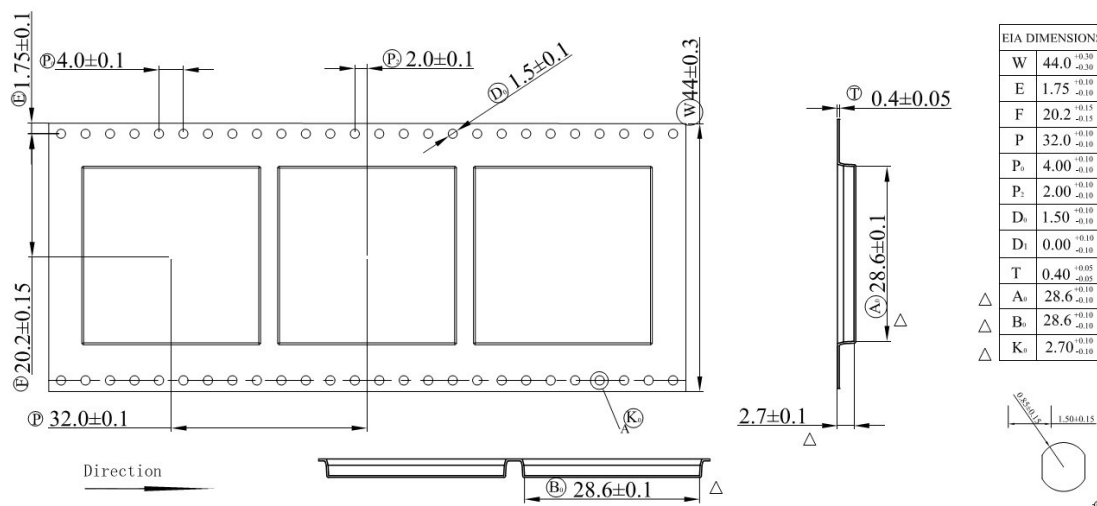


Figure 40: Carrier Tape Detail

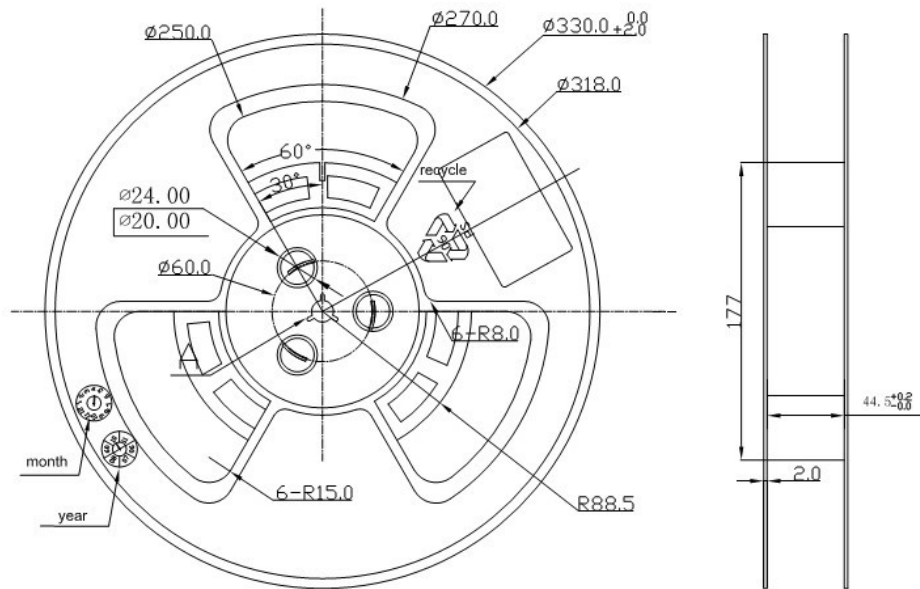


Figure 41: Reel Detail

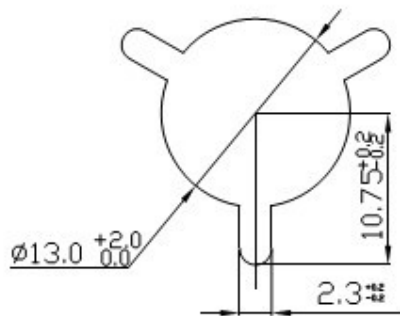


Figure 42: Detail

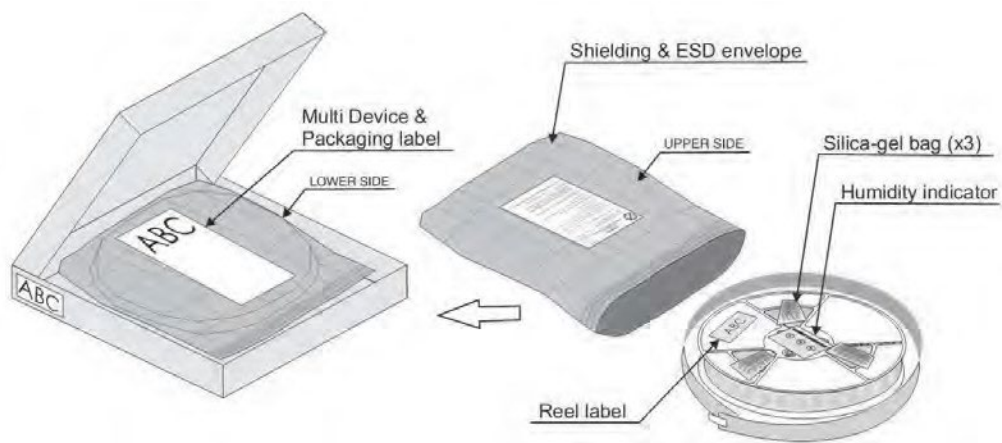


Figure 43: Reel Box Detail

12.3. Moisture Sensitivity

The LE910Cx module is a Moisture Sensitive Device Level 3, in accordance with standard IPC/JEDEC J-STD-020. Comply with all the requirements for using this kind of components.

13. CONFORMITY ASSESSMENT ISSUES

13.1. FCC/ISED Regulatory Notices

Information for the OEMs and Integrators

The following statement must be included with all versions of this document supplied to an OEM or integrator but should not be distributed to the end user.

1. This device is intended for OEM integrators only.
2. Please see the full Grant of Equipment document for other restrictions

Manual Information To the End User

The OEM integrator should be aware not to provide information to the end user on how to install or remove this RF module in the user's manual of the end product which integrates this module. The end user manual shall include all required regulatory information/warning as shown in this manual

ISED SAR compliance statement

This equipment complies with Innovation, Science and Economic Development Canada (ISED) RF exposure limits. The Specific Absorption Rate (SAR) measures RF energy absorbed by the body; for limb-worn devices, the limit is 4.0 W/kg averaged over 10 g of tissue. Compliance was demonstrated using calculations, with the device positioned against the limb at a 9 cm separation distance.

Cet équipement est conforme aux limites d'exposition aux radiofréquences (RF) établies par Innovation, Sciences et Développement économique Canada (ISDE). Le débit d'absorption spécifique (DAS) mesure l'énergie RF absorbée par le corps ; pour les dispositifs portés sur les membres, la limite est de 4,0 W/kg, moyenne sur 10 g de tissu. La conformité a été démontrée par calculs, l'appareil étant positionné contre le membre avec une distance de séparation de 9 cm.

FCC SAR compliance Statement

This device complies with FCC radiation exposure limits for uncontrolled environments. The Specific Absorption Rate (SAR) limit for extremities (hands, wrists, feet, ankles) is 4.0 W/kg averaged over 10 g of tissue. SAR compliance for limb-worn use was demonstrated via calculations using the device's highest certified transmit power, with the device positioned directly against the limb at 9 cm separation, in accordance with FCC evaluation procedures specified in 47 C.F.R. § 1.1310(c) and § 2.1093, and consistent with OET and KDB guidance.

Additional testing, Part 15 Subpart B disclaimer

The modular transmitter is only authorized by the FCC for the specific rule parts (for example, FCC transmitter rules) listed on the grant, and that the host product manufacturer is responsible for compliance to any other FCC rules that apply to the host not covered by the modular transmitter grant of certification. If the grantee markets their product as being Part 15 Subpart B compliant (when it also contains unintentional radiator digital circuitry), then the grantee shall provide a notice stating that the final host product still requires Part 15 Subpart B compliance testing with the modular transmitter installed. The end product with an embedded module may also need to pass the FCC Part 15 unintentional emission testing requirements and be properly authorized per FCC Part 15

Trace antenna designs

See 7.2 GSM/WCDMA/TD-SCDMA/LTE Antenna - PCB Line Guidelines

Summary of the specific operational use conditions

See apart 7.1 GSM/WCDMA/TD-SCDMA/LTE Antenna - Antenna requirements

Modification Statement

EXFO 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.

EXFO 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 (if it is not placed in the device)

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 device complies with FCC/ISED radiation exposure limits set forth for an uncontrolled environment and meets the FCC radio frequency (RF) Exposure Guidelines and RSS-102 of the ISED radio frequency (RF) Exposure rules. Antenna gain must be below:

Frequency Band	Freq [MHz]	LE910C1 -NA Gain [dBi]	LE910C1 -NS Gain [dBi]	LE910C1/C4 -NF Gain [dBi]	LE910C1 -SV Gain [dBi]	LE910C1/C4 -LA Gain [dBi]	LE910C1 -SA Gain [dBi]	LE910C1 -SAX Gain [dBi]	LE910C1 -ST Gain [dBi]	LE910C1/C4 -WWX Gain [dBi]
850 MHz	850	3.64	6.08	6.12	NA	3.5	NA	NA	NA	3.62
1900 MHz	1900	2.51	8.01	8.01	NA	9.5	8.01	8.00	8.01	8.51
1700 MHz	1700	5.00	5.00	5.00	6.00	13.0	5.00	5.00	5.00	5.50
900 MHz	900	5.00	N/A	N/A	N/A	N/A	NA	NA	NA	7.38
700 MHz	700	5.63	5.63	5.94	6.44	N/A	5.63	5.60	5.63	6.64
600 MHz	600	N/A	N/A	5.63	N/A	N/A	NA	NA	5.63	N/A
2600 MHz	2600	N/A	N/A	N/A	N/A	13.0	NA	NA	NA	9.01

Table 46: Antenna gain from FCC/ISED



Note: These are the max gain usable considering all the technologies featured, for more details please refer to FCC Grant for each project.

Le présent appareil est conforme à l'exposition aux radiations FCC / ISED définies pour un environnement non contrôlé et répond aux directives d'exposition de la fréquence de la FCC radiofréquence (RF) et RSS-102 de la fréquence radio (RF) ISED règles d'exposition. Gain de l'antenne doit être ci-dessous:

Frequency Band	Freq [MHz]	LE910C1 -NA Gain [dBi]	LE910C1 -NS Gain [dBi]	LE910C1/C4 -NF Gain [dBi]	LE910C1 -SV Gain [dBi]	LE910C1/C4 -LA Gain [dBi]	LE910C1 -SA Gain [dBi]	LE910C1 -SAX Gain [dBi]	LE910C1 -ST Gain [dBi]	LE910C1/C4 -WWX Gain [dBi]
850 MHz	850	3.64	6.08	6.12	NA	3.5	NA	NA	NA	3.62
1900 MHz	1900	2.51	8.01	8.01	NA	9.5	8.01	8.00	8.01	8.51
1700 MHz	1700	5.00	5.00	5.00	6.00	13.0	5.00	5.00	5.00	5.50
900 MHz	900	5.00	N/A	N/A	N/A	N/A	NA	NA	NA	7.38
700 MHz	700	5.63	5.63	5.94	6.44	N/A	5.63	5.60	5.63	6.64
600 MHz	600	N/A	N/A	5.63	N/A	N/A	NA	NA	5.63	N/A
2600 MHz	2600	N/A	N/A	N/A	N/A	13.0	NA	NA	NA	9.01

Table 47: Antenna gain from FCC/ISED

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:

LE910C1/C4 WWX

Contains FCC ID: 2AYQH-LE910CXWWX

Contains IC: 26882-LE910CXWWX

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

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:

LE910C1/C4 WWX

Contains FCC ID: 2AYQH-LE910CXWWX

Contains IC: 26882-LE910CXWWX

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.

13.2. JTBL Regulatory Notices

Antenna

According to Japan regulatory rule, module certification is valid only with the specific antennas registered to and approved by JRL certified body in relation to module certification. Customers who are going to use modules under Japan Radio Law, are responsible to contact EXFO technical support or sales to get the list of these antennas.

Dial Function

The JTBL Module Certification for “LE910C1-AP” is for “non-Auto Redial Function” device.

In case customer implement “Auto Redial” function into Application Device by controlling LE910C1-AP, the customer cannot utilize LE910C1-AP JTBL certification, and they must apply JTBL as “Application Device” System.

13.3. NCC Regulatory Notices

According to NCC Taiwan requirements, the module and the packaging shall be identified as described in the following lines. Shall be added also the specified safety warning statement.

Brand name: EXFO

Model name: LE910C1-AP

Product name: WWAN module

NCC logo:



NCC ID: CCAF19Z10050T8

NCC safety warning statement: “減少電磁波影響，請妥適使用”

13.4.

ANATEL Regulatory Notices



"Este equipamento não tem direito à proteção contra interferência prejudicial e não pode causar interferência em sistemas devidamente autorizados"

"This equipment is not entitled to protection against harmful interference and must not cause interference in duly authorized systems" LE910C1-LA Homologation # 05818-19-02618

LE910C1-AP Homologation # 04679-18-02618

LE910C4-LA Homologation # 07669-19-02618



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14.3. Safety Recommendations

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

- it can interfere with other electronic devices, particularly in environments such as hospitals, airports, aircrafts, etc.
- there is a 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 correct wiring of the product. The product has to be supplied with a stabilized voltage source and the wiring has to be conformed 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, the external components of the module, as well as any project or installation issue, have to be handled with care. Any interference may cause the risk of disturbing the GSM network or external devices or having an impact on the security system. 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 carefully in order to avoid any interference with other electronic devices.

The equipment must be supplied by an external specific limited power source in compliance with the standard EN 62368-1:2014.

The European Community provides some Directives for the electronic equipment introduced on the market. All of the relevant information is available on the European Community website:

https://ec.europa.eu/growth/sectors/electrical-engineering_en

15. GLOSSARY

ADC	Analog-to-digital converter
AE	Application-enabled
CABC	Content Adaptive Backlight Control
DAC	Digital-to-analog converter
DTE	Data Terminal Equipment
FDD	Frequency division duplex
GLONASS	Global orbiting navigation satellite system
GNSS	Global navigation satellite system
GPIO	General-purpose input/output
GPRS	General packet radio services
GPS	Global positioning system
GSM	Global system for mobile communications
HSIC	High-speed inter-chip
I2C	Inter-integrated circuit
LTE	Long term evolution
RGMII	Reduced Gigabit media-independent interface
SD	Secure digital
SGMII	Serial Gigabit media-independent interface
SIM	Subscriber identity module
SMX	SmartMX
SOC	System-on-Chip
SPI	Serial peripheral interface
UART	Universal asynchronous receiver transmitter
UMTS	Universal mobile telecommunications system
USB	Universal serial bus
WCDMA	Wideband code division multiple access
WCI	Wireless Coexistence Interface

16. DOCUMENT HISTORY

Revision	Date	Changes
34	2021-07-09	Table 48: GNSS Characteristics updated 13.1. FCC/ISED Regulatory Notices updated for LE910Cx-WWX
33	2021-07-01	Section 1.5 – Updated Related Documents Section 5.1 – Added flow chart for turn on and AT command managing procedure Section 6.2 – Added note for eDRX Section 8.6 – Update Audio Interface (ThreadX OS support PCM) Section 10-3 - Recommended Footprint for the Application updated for LE910Cx-WWX Table 49: LE910Cx Current Consumption updated Section 10.x – Dimension and Mechanical design updated
32	2021-03-23	Section 5.3.3 – Fixed Typo in Note of Section. Section 8.6 – Update PCM CLK rate.
31	2021-02-05	Table 1: Applicability Table updated Table 4: RF Bands per Regional Variant updated 2.8.1 Dimensions updated 3.1 Note added
30	2021-01-29	Section 2.3 – Added not supported function only based on TreadX OS models Section 8.5.1 – Updated Note
29	2021-01-12	Updated Section 8.6 – updated I2S diagram
28	2020-12-08	Updated APPLICABILITY TABLE and added notes Section 3.1 – Updated Pin-out Section 5.2 – Updated Initialization and Activation figure and added timing table Section 5.3 – Updated figures Section 14.1 - Updated FCC/ISED Regulatory Notices Updated Table 50: RF Bands per Regional Variant
27	2020-07-31	Section 11.4 – Updated EMC Recommendations
26	2020-07-22	7.4 Antenna Diversity Requirements – Note comment changed to AT#RXDIV 14.4 ANATEL Regulatory Notices - Updated
25	2020-06-15	Section 8 – Hardware Interfaces; USB part updated Section 8.1 – Note Updated Table 45 and 4 - EUX variant added Table 46 – CAT 4 DL/UL Tput swapped

Revision	Date	Changes
		Section 14.1 ANATEL Regulatory Notices – Homologation No. fixed Section 2.7.1 Sensitivity – Sensitivity Table added Section 2.2. Applications – E-call comment deleted Table 47 – Sensitivity level changed Sections 7.4 Antenna Diversity Requirements – Note comment changed Section 7.5 GNSS Antenna Requirements – Note added Table 39 – Sensitivity table changed and note added
24	2020-04-29	Section 8.3 – SGMII interface updated
23	2020-04-20	Section 6.2 – Power Consumption updated
22	2020-04-02	Section 7.4 – Diversity ANT PAD changed
21	2020-03-30	Section 2.8.2 – Weight updated
20	2020-01-23	Section 3.1 – WOW pin updated Section 3.2 – Table updated Section 3.3 – LGA Pads Layout updated Section 8.7 – GPIOs table updated
19	2019-11-27	Section 14.4 – Added ANATEL Regulatory notices
18	2019-11-21	Section 8.5.3 – SD/MMC Card interface updated
17	2019-10-29	Section 9.1 – STATUS LED control updated
16	2019-10-22	Section 2.7.2 – Output power updated
15	2019-10-15	Section 3.1 – Warning comment removed Table 34, 35 – note updated Table 18 – Updated Idle mode current consumption Section 14.3 – Added NCC (TW) requirement section
14	2019-09-03	Table 18 – Updated the current consumption of LTE max power Table 6 – Updated the description of E13 pin-out 14.1 FCC/ISED Regulatory Notices updated for LE910C1/C4-LA 14.1 FCC/ISED Regulatory Notices updated Table 5 – LTE B2 fixed Section 2.7.1 – Sensitivity updated Section 7.5 – Note added for passive or active ANT installation Table 36 – Network Service Availability Indication updated
13	2019-05-14	Table 1 and 4 LE910C1-xx bis Variants removed Section 3.2 and 7– Note for C1 bis variants removed

Revision	Date	Changes
12	2019-04-23	Table 1, 4 – Added variants Table 19,21 – Added comment
11	2019-03-22	Section 10.7.1 – Warning comment added
10	2019-03-13	Section 2.8.1 – Note added for C1-SV variant Section 3.1 – Updated E13 Pin-out Section 3.3 – Updated figure 2. LGA Pads Layout Added Fast Power Down Section 5.5 Table 18 – Updated Idle mode current consumption Section 10.2 – Picture added for Cx-SV/LA variants Section 14.2 – Japan Radio Law comment added
9	2019-03-06	Table 1 and 4 Variants updated Section 2.7 - RF Parameters updated Section 3.2 – Note added for C1 bis variants Section 6.2 – Power consumption update Section 7 – Note added for C1 bis variants
8	2018-12-12	14.1 FCC/ISED Regulatory Notices updated for LE910C1-SA and LE910C1-ST
7	2018-11-19	14.1 FCC/ISED Regulatory Notices updated for LE910C1-SV
6	2018-10-25	Table 1 & 4 – Added -SA, ST, SV and LA variants. Table 5 – Added B14 Section 2.5.1 – Updated Temperature Range
5	2018-09-16	Section 14 – Adding Antenna gain and FCC ID & IC numbers for LE910C1/C4 NF. Section 5.2 – Fixed typo related to power up timing.
4	2018-08-20	Table 1 & 4 - Added LE910C4-EU variant Section 2.3 – Updated SIM interface max speed Declared HSIC interface as optional throughout the document Section 2.6.2 – Updated RF frequency table Section 6.2 – Added clarification related to DRX and CFUN=5 Section 8.1 - Corrected Typo related to USB_VBUS pad number Section 8.4.1- Clarified note about DTR pin
3	2018-07-18	Section 2.8.1 - Fixed typo related to module size General - Align cross reference links across the document
2	2018-06-14	Template update and pagination update Section 1.5 – Updated AT Command UG reference

Revision	Date	Changes
		Section 2.6.1 - Updated Band support table Section 6.3.2 - Updated Thermal design guidelines Section 8.3 - Removed “optional” term from Ethernet interface
1.13	2018-05-17	Added new variant LE910C1-NF Section 2.6.1 - Added band 66 support for LE910Cx-NF Section 2.6.2 - Added band 66 and band 71 to frequency table Section 3.1 - Updated value of SIM internal pullup Section 8.3 – added clarification regarding Ethernet control interface logic levels Section 8.5.4 – Removed note related to WIFI_SDRST Section 9.7 - Updated GNSS characteristics
1.12	2018-03-18	Replaced LE910C1 with LE910Cx throughout the document Section 2.6.1 and Table 1 - Added LE910C1-EU and LE910C4-NF variants Section 8.7 – Added notes related to GPIO pullups Section 10.7.2 - Added clarification related to flux cleaning
1.11	2018-02-22	Section 5.3.2 – Updated section name Section 5.4 – Added section for clarifying power down and power off procedures Section 8.6.1 – Update for PCM slave mode
1.10	2017-12-27	General spelling and grammar edits throughout the document Section 2.3 – Updated features list table. Section 2.4 - Fixed typo in section and inside block diagram.
1.09	2017-12-07	Section 14.1 – Updated LE910C1 NA 850MHz Max antenna gain. Section 6.2.2 – Corrected Class12 to Class10.
1.08	2017-11-14	Section 2.6.2 - Changed B41 to B41M Section 2.7 – Renamed from Sensitivity to RF parameters and added TX output power section (2.7.2) Section 2.8 – Added note regarding label thickness Section 3.1 - Removed duplication of description related to USB_VBUS. Section 5.2 – Added clarification regarding ON_OFF. Section 7.5 – Added note related to GPS port. Section 8.1 – Added clarification regarding VBUS supply. Section 8.1.1 – Added clarification regarding OTG. Section 8.3.1 – Added clarification regarding ETH_INT_N pin.
1.07	2017-07-23	Adding a note for power supply section
1.06	2017-07-10	Renaming the product from LE910Cx to LE910C1
1.05	2017-06-18	Section 6.1 – Updated power consumption tables

Revision	Date	Changes
1.04	2017-05-25	Section 14.1 – Added Labelling Requirements for the Host device
1.03	2017-04-23	Section 11.4: Updated ESD values Updated Reference document table Section 8.3 - Updated Ethernet control interface information Section 8.5.2 – Added note related to I2C Section 2.6.2 – Updated table 4 with B25 information. Section 14.1: Added LE910C1 NS Max antenna gain. Added LE910C1 NS FCC ID & IC number.
1.02	2017-04-03	Section 14.1 – updated column “Band” to “Frequency Band” in Wireless notice table Section 8.4.1 - Added note regarding DTR
1.01	2017-02-16	Adding Section 14: FCC/ISED Regulatory notices Changing Document History section from 14 to 15
1.0	2016-12-22	Section 1.5 - Updated “Related Documents” table Section 5.3.4 – Added Figure for SHDN_N power down timing Section 8.5.3 – Added clarification about VMMC Section 9.7 - Added GNSS characteristics
0.6	2016-12-07	Remove all China variant related information
0.5	2016-12-02	Added section 9.2 to better describe SW_RDY signal Minor modifications per typos and improved description Renaming of SHDN_N pin
0.4	2016-11-30	Updated band support table Updated WIFI application note doc info Added note related to future compatibility related to few pins Updated section 3.2 - Signals That Must Be Connected Updated pinout and pin description Updated pinout layout (Figure 2) Remove HW RESET description section Updated serial port 2 section Updated SPI port section Updated 1.8V pads pull info Updated AUX UART section Updated GPIO section

Revision	Date	Changes
		Updated mechanical drawing (Cosmetic)
0.3	2016-11-13	Added information for GPIO usage as Interrupt Added clarification for AUX_UART location and backward compatibility
0.2	2016-09-05	Minor edits
0.1	2016-08-30	First Draft

