LTE910XFX v1.00 CAT1 Worldwide Embedded Cellular Modem Manual

JANUS REMOTE COMMUNICATIONS

TABLE OF CONTENTS

DISCLAIMER

1 APPLICABILITY TABLE

Product	Part Number
LTE910XFX	v1.00

2 REFERENCES

2.1 Janus Document List

Janus Application Note 117 - FOTA (Firmware Over The Air)

2.2 Telit Document List

The modem uses Telit LE910C1-WWXD cellular module.

Please refer to Telit's website at www.telit.com for the latest information on the LE910Cx module family.

Telit LE910Cx AT Commands Reference Guide

Telit LE910Cx Hardware Design Guide

Telit IP Easy User Guide

Telit Single SKU AT Command Application Note

3 OVERVIEW

3.1 Introduction

The User Manual for the Modem devices is intended to illustrate how users can integrate and implement the features of each communication version of the device. The common factors are explained in detail, as well as special considerations and diagrams for each Modem. The Modem differences are highlighted in this manual for design considerations for future model placement.

3.2 Preview

The Modems are self-contained, multi-band, globally capable, IoT and M2M communication devices designed to provide a comprehensive solution to application problems for our customers. They utilize the proven technology of Telit's certified modules for their core communications engines.

3.2.1 Functional Description

Cellular
• LTE Cat-1

GNSS Functionality
• GPS, GLONASS, Beidou, Galileo, QZSS

UART
• 115200 bps default supporting 5 standard RS232 signals

USB
• HS/FS USB 2.0 Device (480Mb/s)

Physical Dimensions
• Length and width of all devices are equal
• Heights of different devices will vary
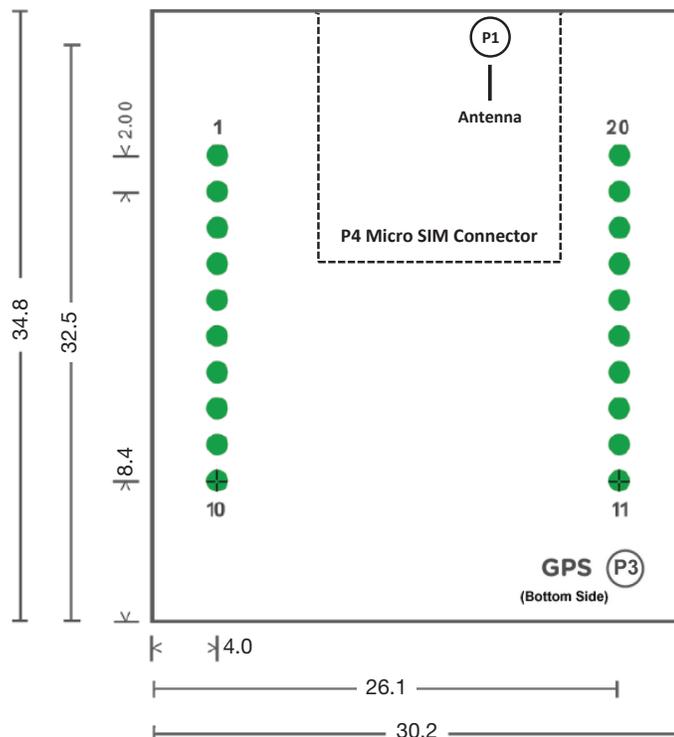
Figure 1 LTE910XFX v1.00 Physical Dimensions

3 OVERVIEW continued
3.3 Features

- Multi-Band Support
- LTE (4G) Bands: B1, B2, B3, B4, B5, B7, B8, B12, B13, B14, B19, B20, B26, B28
- UMTS (3G) B1, B2, B4, B5, B8, B19
- GSM (2G) Bands: B2, B3, B5, B8
- LTE Output Power: 23dBm (Power Class 3)
- GSM Output Power: 33dBm (Power Class 4)
- LTE: DL: Up to 10 Mbps, UL up to 5Mbps
- GNSS (Global Navigation Satellite System) includes GPS, GLONASS, Beidou and Galileo
- Control via standard and extended AT command set
- SIM application Tool Kits 3GPP TS 51.014

- IP stack with TCP/UDP protocol support
- SMS Support
- Through hole for screw mount
- Dimensions: 1.19" x 1.37" x 0.26"
- Operational Temperature Range: -40°C to 85°C
- Input Voltage Range: 3.4 to 5.5 Vdc (5.0 Vdc nominal)
- Variable logic level (UART/GPIO) Adjustable from 1.8 to 5.5 Vdc
- 3FF 'micro' SIM card socket
- Cellular and GNSS antenna connections via Hirose U.FL miniature RF connectors

3.4 Block Diagram
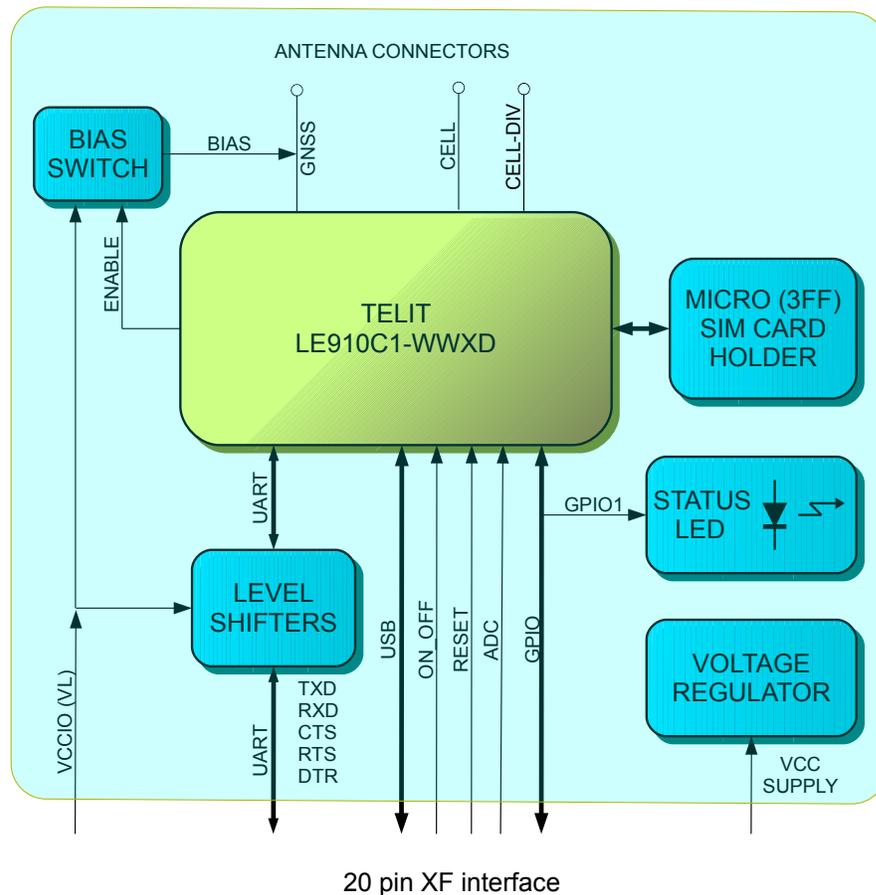
Figure 2 LTE910XFX v1.00 Block Diagram

3 OVERVIEW continued
3.5 FOTA Notice

The certification of LTE devices for use on the Verizon Wireless network REQUIRES that the end user implement an automated FOTA procedure on their devices that would allow the cellular module firmware to be updated if required.

Failure to implement an automated FOTA procedure violates the certification requirements of the cellular modem and may result in units becoming unusable on the cellular network in the future. Your end device must support the firmware over the air update for the cellular modem

You may use your own FOTA system to update the cellular modem firmware over the air. You may also be able to use the Verizon Wireless FOTA system, and FOTA services may be available from other 3rd party vendors.

To inquire about Verizon Wireless FOTA system information and technical specifications, contact VZW.FOTA-Services@VerizonWireless.com

4 INTERFACES
4.1 UART Interface Voltage Selection

The LTE910XFX is equipped with a variable voltage interface solution for the UART interface. This allows the user to match the device to the system's level without extra hardware. The UART signals are internally disabled by the cellular radio when it is off or in Power Saving Mode. The VL_IN signal can be applied or changed to a level within the 1.2V to 5.5V operational range.

Affexted I/O:

```
  PIN  NAME
----------------------------
    2  RXD
    3  TXD
    9  DTR
   12  CTS
   16  RTS
```

4 INTERFACES
4.2 Serial Interface

4.2.1 UART Serial Port

The serial interface is a CMOS level UART. Default Communications settings for this port are as follows:
- Baud Rate: 115.2 kbps
- Bits: 8
- Stop Bits: 1
- Parity: None
- Hardware Handshaking: Yes

Baud rate can be controlled with the AT+IPR command. Default setting is 115200 baud.

Note: If you are not using hardware handshaking, RTS must be connected to GROUND for proper communications when flow control is not used.

4.2.2 USB Port

The Modems that are USB ready include an integrated universal serial bus (USB) transceiver, compliant with USB 2.0 specifications. High data rates for the USB enabled Modems are only available over the USB interface, as the UART has a maximum baud rate of <1Mbps. In order for proper power-up of the Modems, the USB_VBUS line MUST be disconnected until the unit is otherwise fully powered and on. If the USB_VBUS line is attached and powered before the main power is brought up and the Modem turned on, power sequencing issues may occur.
Note: You must implement the USB interface in order to locally update module firmware.

4.2.2.1 USB Connection Diagram
When VBUS_ENABLE is HIGH the VBUS 5.0v signal will be passed to USB_VBUS, (pin 6) turning the USB ON.
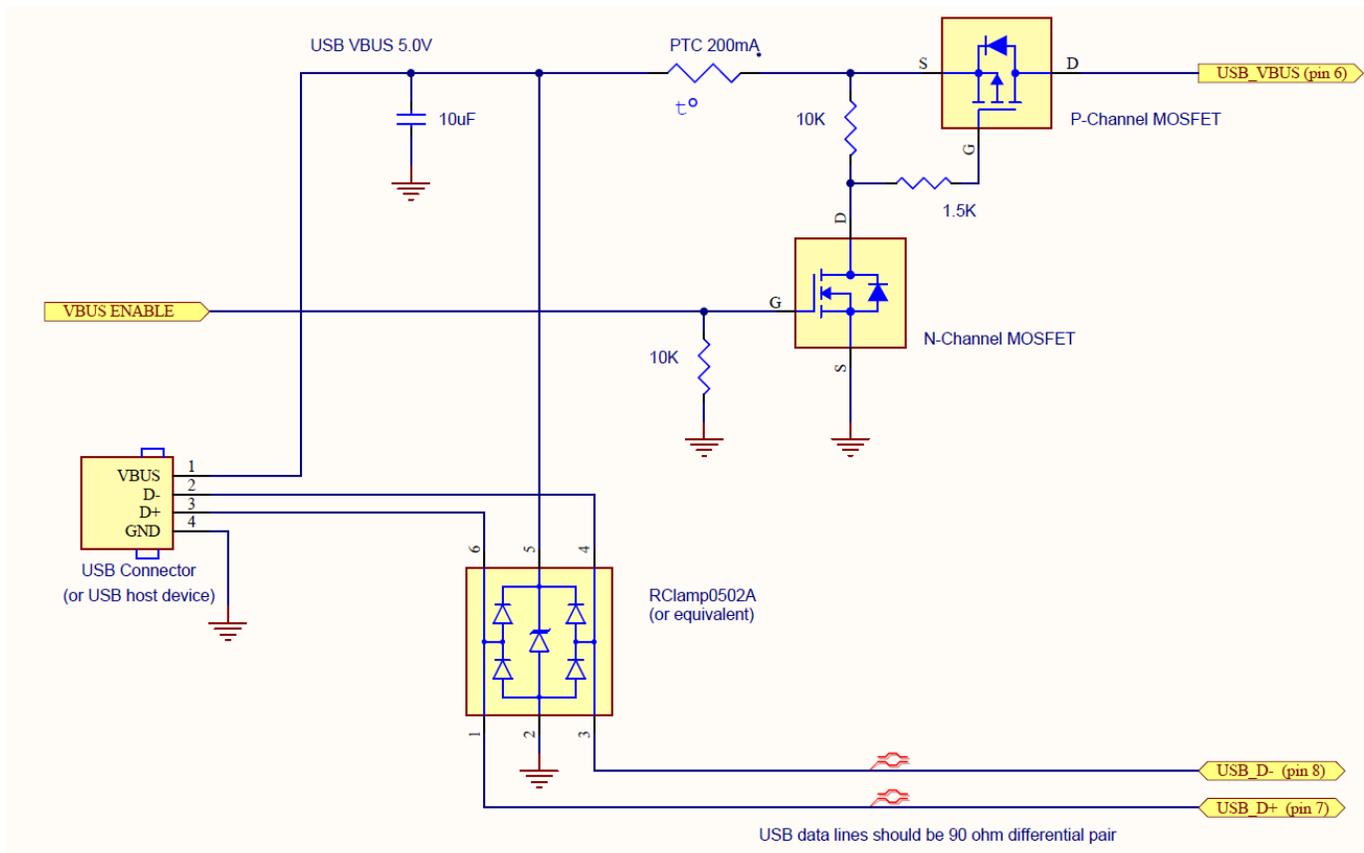
Figure 3 USB Connection Diagram

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4 Interfaces continued
4.3 Power Supply

See the Electrical Specifications section for the input voltage range and current requirements of the specific product variant. When transmitting the modem can require peak power events of 5W in 4G (LTE) mode or 10W in 2G fallback modes.

A good understanding of the load transients is required in order to meet the power requirements of a cellular radio. It is recommended that your supply source the full peak current value of the transmission pulse in order to maintain proper cellular operation. LDO (low-drop-out) linear supplies or switching supplies with very fast transient response capabilities along with bulk output capacitors on your supply design is recommended. Power supply design, thermal management and layout are outside the scope of this document. Please refer to power supply manufacturers for product documentation and design application notes.

4.4 Audio Interface

The DVI audio interface is not supported on these modules.

4.5 Pin-Out

PIN	NAME	Description	Direction	Voltage Rating	Notes
1	VCC	Power Supply	Input	3.4v to 5.5v	1
2	RXD	UART Received Data	Output	VL	
3	TXD	UART Transmitted Data	Input	VL	4
4	GND	Ground	---		1
5	RESET	Reset Control	Input	Internal pull-up to 3.8v	2,3
6	USB_VBUS	USB Supply Detect	Input	3.0 to 5.5v	3
7	USB_D+	USB Differential Data (+)	I/O		3
8	USB_D-	USB Differential Data (-)	I/O		3
9	DTR	UART Data Terminal Ready	Input	VL	
10	GND	Ground	---		1
11	GND	Ground	---		1
12	CTS	UART Clear to Send	Output	VL	
13	GPIO_1	General Purpose I/O	Output	1.8v	5
14	VL	Interface Voltage Reference	Input	1.2v to 5.5v	
15	GND	Ground	---		1
16	RTS	UART Ready to Send	Input	VL	
17	GPIO_3	General Purpose I/O	I/O	1.8v	
18	GPIO_2	General Purpose I/O	I/O	1.8v	
19	ADC	Analog to Digital Converter	Input	0v to 1.2v	
20	ON_OFF	On-Off Control	Output	Internal pull-up to 1.8v	2

Notes:
1. *Must be implemented.*
2. *Use external pull-down ONLY.*
3. *No connection if not used*
4. *Ground if not used.*
5. *Connected to on-board LED drive.*

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4 Interfaces continued

4.6 GPIO Details

GPIO are configurable as input, output, and alternate function. Configuration is controlled by AT commands.

Alternate functions include cellular status, ALARM pin function and temperature monitor indication.

4.6.1 Using a GPIO Pin as INPUT
The GPIO pins, when used as inputs, can be connected to a digital output of another device and report its status, provided this device has interface levels compatible with the voltage levels of the GPIO of the modem.

4.6.2 Using a GPIO Pin as OUTPUT
The GPIO pins, when used as outputs, can drive CMOS digital devices or compatible hardware. When set as outputs, the pins have a push-pull output.

4.6.3 Cellular Status LED (GPIO_1)
The GPIO_1 output is used to drive the on-board LED to give feedback on the registration status. This is an alternate function of GPIO_1 and is set via the AT#GPIO command. The default status indication is defined below. See Figure 4 below for a diagram of the on-board LED circuit.

Cellular Status Indication

LED Status	Device Status
Off	Cellular radio is off
Off	On/Searching
Slow Blinking (0.3 sec on / 2.7 sec off)	Registered

4.6.4 User GPIO
GPIO_2 (pin 18) and GPIO_3 (pin 17) are additional GPIO's that can utilized for user applications.
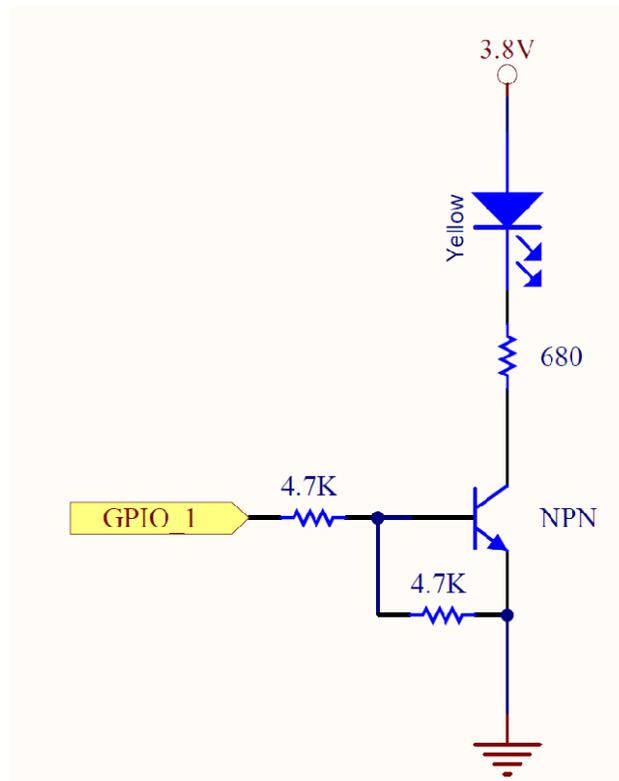
Figure 4 LED Indicators Diagram

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4 Interfaces continued

4.7 Analog to Digital Converter

Pin 19 is connected directly to the Telit module ADC pin. It has a 0 to 1.8v range with 10 bit resolution. Use the command AT#ADC=1,2<cr> to read the ADC. The returned value is expressed in millivolts.

ADC	Description
ADC1	Analog to digital converter input

4.7.1 RESET Pin

Input Logic State	Description
High-Z	Active state
0	Reset state

Notes:

1. It is required that this input be controlled by an open collector/drain output. Do not use an external pull-up resistor, a pull-up is included internal to the Modem.

2. The RESET pin is offered as a means to reset the Modem when and if the Modem becomes unresponsive. The RESET pin is not intended to be used as a means of turning the Modem off. Use the ON/OFF pin to turn the Modem on or off.

3. RESET state must be held for at least 200ms before returning to active state.
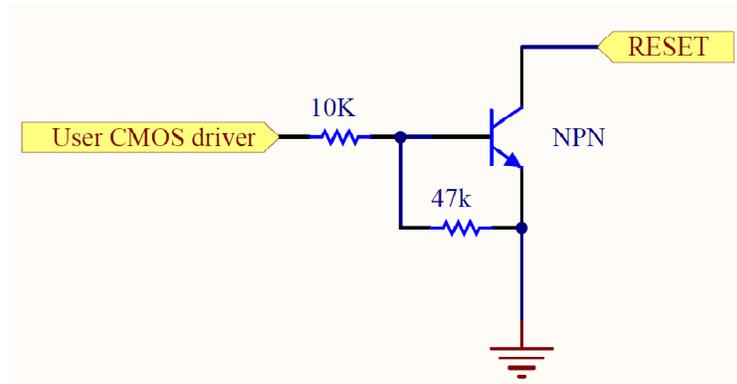
Figure 5 Reset Pin Diagram

4.7.3 ON/OFF Pin

Input Logic State	Description
High-Z	Modem turned ON or OFF after input returns to this state.
0	Toggle Modem ON or OFF

Notes:

1. *It is required that this input be controlled by an open collector/drain output. Do not use an external pull-up resistor, a pull-up is included internal to the Modem.*
2. *The ON_OFF pin is offered as a means to power-on and power-down the Modem. When the Modem powers-down it informs the cell tower that it is powering down and will not be communicating with the tower any more. This is considered a controlled power-down.*
3. *To turn ON the Modem, the ON_OFF input must be tied low for 5 seconds then released.*
4. *To turn OFF the Modem, the ON_OFF input must be tied low for 3 seconds then released.*
5. *Optionally the Modem may be powered-down with the use of AT commands.*
6. *It is required to stop driving terminal inputs high when turning ON the Modem by floating or bringing them low. If this is not done, power sequencing issues may occur.*
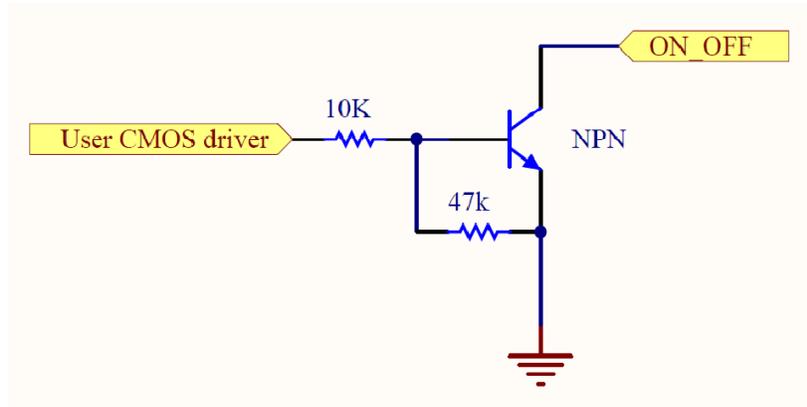
Figure 6 On / Off Pin Diagram

4.8 RF Interface

There are two RF interfaces on the Modem for a cellular antenna and a GNSS antenna.
The specifications and requirements for these are as follows:

Type: Hirose U.FL - MALE (Part Number: U.FL-R-SMT(10))

Pin	Description
Center Pin	RF signal
Outer Conductor	Signal ground

4.9 SIM Card Interface

The SIM Card Interface allows the Modem to accept the subscriber card provided by the cellular network provider. It accommodates a 3FF 'micro' sized SIM card operating at either 1.8v or 3.0v.

4.10 Header Interface Mounting Options

The Modems' header pin length has been chosen to allow for direct solder mount to a PCB of standard thickness. For socketing the modem, below are example products compatible with the Janus XF footprint series products.

Manufacturer	Part Number	Mounting Type
Samtec	SMM-110-01-S-S	surface mount
TE	1-2314876-0	through hole
Sullins	NPPN101BFCN-RC	through hole

5 LTE910XFX TECHNICAL SPECIFICATIONS
5.1 Electrical Specification[4]

5.1.1 Absolute Maximum Ratings

Parameter	Min	Typ	Max	Unit	Note
VCC Supply	0	-	6	Volt	
VIN (DIGITAL INPUTS 1.8V CMOS)	-0.3	-	2.1	Volt	
VIN UART Digital Inputs VL Selected)	-0.3	-		Volt	
Storage Temperature	-40	-	85	°C	

Operation of the device at these or any other conditions beyond those listed under Recommended Operating Conditions is not implied. Exposure to Absolute Maximum Rating conditions for extended periods of time may affect device reliability.

5.1.2 Recommended Operating Conditions

Parameter	Min	Typ	Max	Unit	Note
Temperature	-40	-	85	°C	
VCC Supply	3.4	5.0	5.25	Volt	
VL IN Selection	1.8	-	5.5	Volt	

Note: 1. When VL IN is utilized, VAUX will match VL.

5.1.3 Power Consumption [1, 2, 3]

Mode		Average (mA)	Mode Description
Switched Off			
Terminal Disabled		< 15µA	Terminal disabled (ENABLE SUPPLY = 0)
Cellular Radio Off		0.4	Cellular module powered but switched off via ON_OFF pin (PWRMON=0)
IDLE mode			
AT+CFUN=1	LTE	13	Normal mode: full functionality of the module
	WCDMA	15	
AT+CFUN=4		11	Disabled TX and RX; module is not registered on the network
AT+CFUN=5	LTE	2 to 6	Depends on paging cycle
	WCDMA	2	
Operative mode			
LTE Data call		190	Channel BW 5MHz, RB=1, TX=0dBm
LTE Data call	Max power	500	Channel BW 5MHz, RB=1, TX=22dBm
WCDMA HSDPA	Max power	440	WCDMA data call (RMC, TX = 23dBm

Note 1: These figures are derived from the component data sheets including the Telit Hardware User Guide. Per Telit, "The reported values are an average among all the product variants and bands for each network wireless technology." Results can vary depending network conditions.
Note 2: Values are calculated based on 5.0 volt supply voltage and on-board power supply efficiency.
Note 3: Values do not include GNSS operation or GNSS antenna bias requirements.

5.1.4 I/O Levels

5.1.4.1   1.8v Standard Interface Levels (GPIO 1,2,3)

Parameter	Min	Typ	Max	Unit	Note
Input Voltage High - Vih	1.5	-	1.9	Volt	
Input Voltage Low - Vil	0	-	0.35	Volt	
Output Voltage High - Voh	1.6	-	1.9	Volt	
Output Voltage Low - Vol	0	-	0.2	Volt	
Typical Current Source/Sink = 100uA/1uA					

5.1.4.2   VL=5.0v UART Interface Levels)

Parameter	Min	Typ	Max	Unit	Note
Input Voltage High - Vih	0.7*VL	-	5.5	Volt	1
Input Voltage Low - Vil	0	-	0.3*VL	Volt	1
Output Voltage High - Voh	VL - 0.1	-	VL	Volt	1, 2
Output Voltage Low - Vol	0	-	0.1	Volt	1, 2

5.1.4.3   VL=3.3v UART Interface Levels

Parameter	Min	Typ	Max	Unit	Note
Input Voltage High - Vih	2.0	-	5.5	Volt	1
Input Voltage Low - Vil	0	-	0.8	Volt	1
Output Voltage High - Voh	VL-0.1	-	VL	Volt	1, 2
Output Voltage Low - Vol	0	-	0.1	Volt	1, 2

5.1.4.4   ADC Input Levels

Parameter	Min	Typ	Max	Unit	Note
Input Voltage Range	0	-	1.8	Volt	
AD Conversion	-	-	10	Bits	
Input Resistance	1M	-	-	Ohm	
Input Capacitance	-	1	-	pF	

5.1.4.5   Reset Pin Input Levels

Parameter	Min	Typ	Max	Unit	Note
Input Voltage High - Vih	-	-	VIN	Volt	3
Input Voltage Low - Vil	0	-	-	Volt	3

5.1.4.6   ON_OFF Pin Input Levels

Parameter	Min	Typ	Max	Unit	Note
Input Voltage High - Vih	-	1.2	-	Volt	3
Input Voltage Low - Vil	0	-	-	Volt	3

Notes:
1. *See Nexperia 74LVC2T45 data sheet for other input and output voltage conditions*
2. *CMOS load: 100uA*
3. *It is required that this input be controlled by an Open Collector/Drain Output. Do not use an external pull-up resistor, a pull-up is included internal to the modem.*

5.1.5 LTE Cellular Antenna Specifications:

Parameter	Description
Frequency Range	Depending on frequency bands provided by the network operator, the customer should use the most suitable antenna for those frequencies.
Impedance	50Ω
Input Power	> 33 dBm(2 W) peak power in GSM
	> 24 dBm average power in WCDMA & LTE
VSWR Absolute Max	≤ 10:1
VSWR Recommended	≤ 2:1
Placement	Certification requires that the antennas be located at least 20 cm from the modem.

Maximum Antenna Gain (dBi)

This radio transmitter has been approved* by the indicated agency to operate with the maximum permissible gain indicated.

FCC and ISED

Band (MHz)	Max.gain (dBi)
850	3.62
1900	8.51
1700	5.50
900	7.38
700	6.64
600	N/A
2600	9.01

RED

Band (cellular designation)	Max.gain (dBi)
GSM 900	6.00
DCS 1800	11.80
WCDMA Band VIII	8.90
WCDMA Band I	12.30
LTE FDD 1	12.80
LTE FDD 7	13.00
LTE FDD 8	9.40
LTE FDD 20	9.20
LTE FDD 28	9.30
Omnidirectional	4.00

FCC - Federal Communications Commission (US)
ISED - Innovation, Science and Economic Development (Canada)
RED - Radio Equipment Directive (Europe)

Notes:
- Information derived from Telit LE910Cx Hardware Design Guide

5.1.6 LTE910XFX GNSS: GPS and GLONASS Antenna Specifications:

5.1.6.1 Antenna Requirements

Parameter	Description	Note
Input Voltage Range	VL	1
Frequency Range	1559.0 to 1610.0 MHz	
Gain	17dB typical	
Impedence	50Ω	
VSWR	≤ 3:1	
Current Consumption	30mA Max, 20mA Typ.	

Note 1: GPS bias voltage will match VL.

5.1.7 USB Transceiver Specifications

Parameter	Comments	Min	Typ	Max	Unit
USB_VBUS					
Supply voltage		4.5	5.0	5.25	Volt
Input levels for low-/full speed					
Receiver threshold (single-end)		0.8	-	2.0	Volt
Differential input sensitivity	$|D+ - D-|$, Vin = 0.8V to 2.5V	0.2	-	-	Volt
Differential common-mode range	Includes VDI	0.8	-	2.5	Volt
Output levels for low-/full speed					
Low	RL = 1.5 kΩ to 3.6 V	-	-	0.3	Volt
High	RL – 15 kΩ to GND	2.8	-	3.6	Volt
Output signal crossover voltage		1.3	-	2.0	Volt
Terminations					
Internal pull-up resistor	VTRM to D+, VTRM to D-	1.425	1.5	1.575	kΩ
Internal pull-down resistor	D= to GND, D- to GND	14.3	15	24.8	kΩ
High-Z state output impedance	0 V< VDD< 3.6 V; measured at D+ and D- pins to GND	300	-	-	kΩ
Termination voltage	An internal supply voltage, VTRM	3.0	3.3	3.6	Volt
Driver characteristics – full speed					
Transition time:					
Rise time	CL = 50 to 125 pF	4	-	20	ns
Fall time	CL – 50 to 125 pF	4	-	20	ns
Rise/fall time matching		90	-	111	%
Series output resistance	D+, D-	28	33	44	Ω
Driver characteristics – low speed					
Transition time:					
Rise time	CL = 50 to 600 pF	75	-	300	ns
Fall time	CL – 50 to 600 F	75	-	30	ns
Rise/fall time matching		80	-	125	%

5 LTE910XFX TECHNICAL SPECIFICATIONS continued
5.2 Mechanical Specification
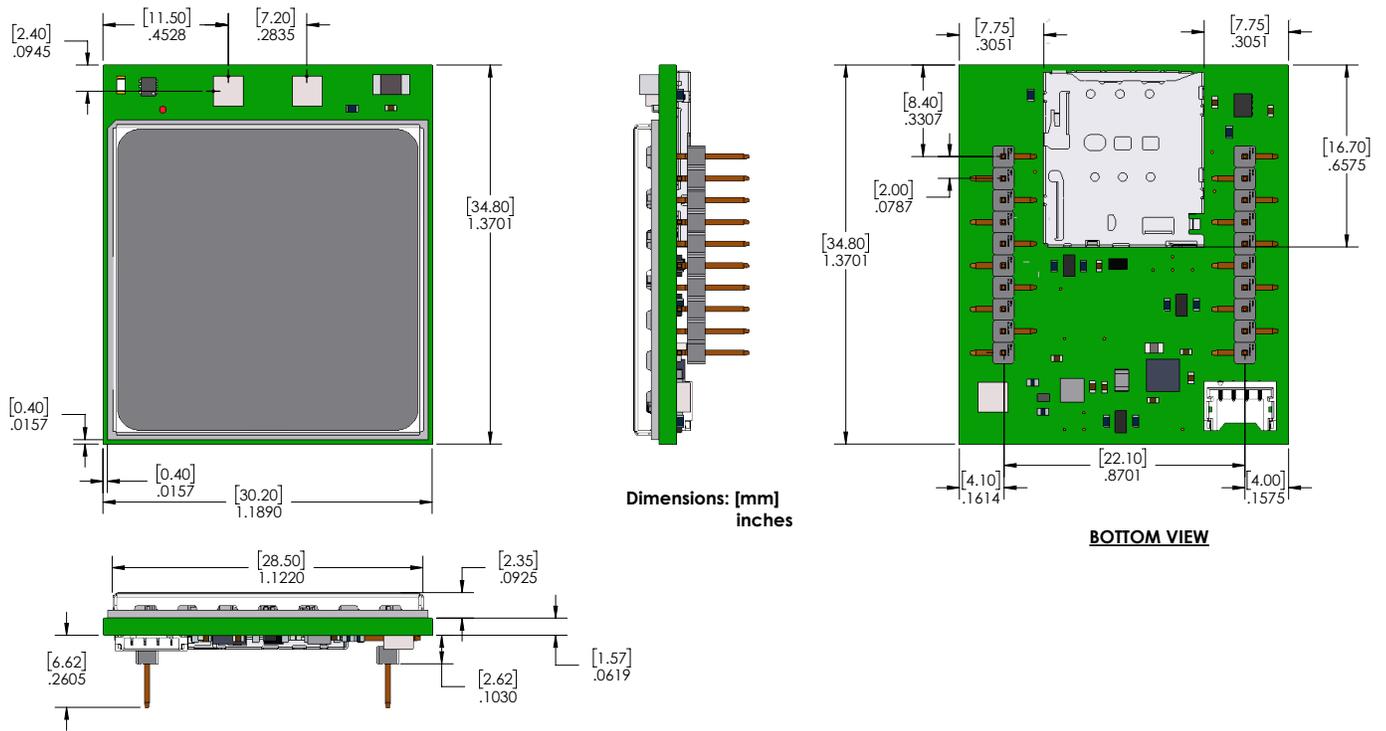

Dimensions: [mm] inches

BOTTOM VIEW

Figure 7 LTE910XFX Mechanical Dimensions

6 Operation
6.1 Powering ON/OFF

6.1.1 Powering ON
Power the Modem ON by pulling the ON_OFF signal (Pin 19) to ground for at least five (5) seconds, then release.

6.1.2 Powering OFF
There are two methods to to turn OFF the Modem under normal circumstances:
- Use the AT shutdown command (AT#SHDN)
- Pull ON_OFF signal (Pin 19) to ground for at least three (3) seconds, then release.

The normal shutdown procedure can take many seconds to complete. For power sensitive applications, consider using a 'fast shutdown' method to reduce the shutdown time. See the Telit AT Command Guide and the Telit Hardware Design Guide for more information.

Under abnormal circumstances, the modem can be shut down using the RESET input (pin 20).

6.2. Communicating with the Modem
The default configuration of the modem has AT command ports available on the UART interface and the USB interface.

6.2.1 UART Interface
The UART port operates at a the following default parameters:
- Baud Rate: 115.2 kbps
- Bits: 8
- Stop Bits: 1
- Parity: None
- Hardware Handshaking

6.2.2 USB Interface
The USB port instantiates two serial modem connections as AT command ports by default. USB drivers are available from Telit or Janus.

6.3 Testing Communications
- The cellular module should always respond to the attention command with 'OK'. Send:

      AT<cr>[1]

Note 1. "<cr>" designates a carriage return character.

   The module will response with 'OK'.

- Verify the module model. Send:

      AT+CGMM<cr>

   The response should be the Telit module model number.

- Verify the firmware version. Send:

      AT+CGMR<cr>

   The response will be the Telit module's current firmware.

6.4 Cellular Network Communications

6.4.1 SIM Card
All LTE modems require a SIM card. This modem supports a 3FF 'micro' size SIM card.

6.4.2 Data Contexts - setting the APN

6.4.2.1 Checking the Data Contexts

Data connections require that the carrier's Access Point Name (APN) be properly set in the data contexts using the AT+CGDCONT command. In LTE modules, some contexts may be assigned for the carrier's use. Normally the device will get an APN from the network and auto-attach. In some cases, you may need to set a different APN.

The data contexts can be checked by entering the following command:

```
AT+CGDCONT?<cr>
```

The module will respond with the current data contex settings.

NOTE: A SIM card must be present to read the data contexts.

The default settings for the LTE Cat.1 modems are as follows:

AT&T centric (#FWSWITCH=0):

```
+CGDCONT: 1,"IPV4V6","m2m.com.attz","",0,0,0,0
+CGDCONT: 4,"IPV4V6","attm2mglobal","",0,0,0,0
```

Verizon (#FWSWITCH=1):

```
+CGDCONT: 1,"IPV4V6","ims","",0,0,0,0
+CGDCONT: 2,"IPV4V6","vzwadmin","",0,0,0,0
+CGDCONT: 3,"IPV4V6","vzwinternet","",0,0,0,0
+CGDCONT: 4,"IPV4V6","vzwapp","",0,0,0,0
+CGDCONT: 5,"IPV4V6","","",0,0,0,1
+CGDCONT: 6,"IPV4V6","vzwclass6","",0,0,0,0
+CGDCONT: 7,"IPV4V6","vzwclass7","",0,0,0,0
```

Bell [Canada] (#FWSWITCH=3) and Australia/Telstra (#FWSWITCH=3):

```
+CGDCONT: 1,"IPV4V6","inet.bell.ca","",0,0,0,0
```

Telus [Canada] (#FWSWITCH=4):

```
+CGDCONT: 1,"IPV4V6","isp.telus.com","",0,0,0,0
```

Worldwide (#FWSWITCH=40):

```
+CGDCONT: 1,"IPV4V6","","",0,0,0,0
+CGDCONT: 2,"IPV4V6","ims","",0,0,0,0
```

Verizon uses context ID 3 for the default users data connection.
All other carriers usually use context ID 1 for the default users data connection.
Contact your carrier for the appropriate default context ID and APN to use.
See also section 6.8 - Firmware selection

6.4.2.2 Setting the Data Contexts

Cat.M1 devices may require a different APN (Access Point Name) than higher data rate modems (Cat.1, Cat.4, etc.). Make sure you are using an acceptable APN or the device will not register on the network. For example, the general Cat.M1 APN for AT&T is "m2m.com.attz"

To set a data context with this APN, enter the following:

```
AT+CGDCONT=1,"IPV4V6",""m2m.com.attz""<cr>
```

and wait for the "OK" response.

NOTE: Carrier services such as a staic IP address or VPN may require a specialized APN.

6.4.3 Signal Strength

Signal channel can be checked as follows. Enter:

```
AT+CSQ<cr>
```

The default response format will contain two numbers:

```
+CSQ: 17,0
```

The first number is the rssi (received signal strength indication) and the second is ber (bit error rate).

The rssi can be interpreted as follows:

    10-14 Okay

    15-20 Good

    20+ Excellent.

Anything below 10 would be considered marginal.

A response of 99 indicates no signal.

6.4.4 Registration

Network registration can be checked as follows. Enter:

```
AT+CEREG?<cr>
```

A response of +CEREG:0,1 or +CEREG: 0,5 indicates the device is registered to the home network or roaming, respectively.

If response is different than this, please refer to the Telit AT command reference document for more information

6.5 Data Communications

The modem incorporates a TCP/IP stack that can be used to directly send data using AT commands. Alternativly, an external host can be used to make a PPP connection.

See the Telit M/NB-IoT Quick Start Guide for further information

6.5.1 Data Communications - Using the Internal Stack

To send data using the internal stack, a data context must be activated.

Activate the context as follows:

    AT&T centric (FWSWITCH=0):

        Enter:

```
AT#SGACT=1,1<cr>
```

    Verizon (FWSWITCH=1):

        Enter:

```
AT#SGACT=3,1<cr>
```

If successful, the modem will respond with an IP address assigned by the carrier. Data can be sent to a host with a socket dial command. Enter:

```
AT#SD=<connid>,0,80,<IPaddr>
```

where <connid> is the user data context and <IPaddr> is a text string (in quotes) containing a dotted IP address or a DNS resovable host name.

The modem will respond with CONNECT and any data entererd thereafter will be sent to the connected host. Enter the escape sequence:

```
+++
```

to suspend the connection.

See the Telit IP Easy User Guide and the Telit AT Commands Guide for more information.

6.5.2 PPP Dialing

In a hosted system (e.g. Linux) the host TCP/IP stack can be used. A PPP connection is initiated using the ATD dialing command. Depending on the script or application performing the PPP connection, you may have to change the numeric digit in the PPP AT dialing command that designates the context to use.

The dialing string for the AT&T centric (#FWSWITCH=0) would be:

```
ATD*99***1#<cr>
```

Where the '1' digit selects the #1 data context set with the +CDGCONT command.

Similarly the dialing string for the Verizon (#FWSWITCH=1) would be:

```
ATD*99***3#<cr>
```

Where the '3' digit selects the #3 data context set with the +CDGCONT command.

6.6 SMS

SMS allows you to send a text message (max 160 characters) to a SMS capable unit.

• Set the SMS mode to text. This setting is not persistant; it must be entered every power cycle.

```
AT+CMGF=1<cr>
```

• To enter the receiving subscriber unit phone number and message enter:

```
AT+CMGS="8885551234"<cr>
```

Wait for response ">" then enter message text .

Enter

```
<ctrl-z>
```

to end the message text and send it.

6.7 GNSS

The GNSS system on the Telit module includes support for stand-alone operation with GPS, GLONASS, BeiDou, Galileo, and QZSS. The GPS and WWAN (cellular) systems share resources in the cellular module. The WWAN system has priority by default. See the Telit MEx10G1/ML865G1 GNSS Application Note for further information.

A simple example of stand-alone GPS operation follows.

Turn on the GNSS system:

```
AT$GPSP=1<cr>
```

After allowin enough time for a GPS fix to be obtained, the current location information can be read using:

```
AT$GPSACP<cr>
```

NMEA data can be continuously streamed. Enter:

```
AT$GPSNMUN=3,1,1,1,1,1,1<cr>
```

This enables multiple NMEA data messages and they will be continuously streamed to the AT command port until an escape sequence ("+++") is entered.

6 Operation continued
6.8 Firmware Selection

This modem has firmware to support multiple carriers
The firmware load can be changed by issuing the command:

```
AT#FWSWITCH=<image_number>,1
```

where <image_number> is

    0 for AT&T centric
    1 for Verizon
    3 for Bell [Canada]
    4 for Telus [Canada]
    40 for Worldwide

The module will automatically reboot with the new firmware image.
Current firmware status can be checked by issuing the command:

```
AT#FWSWITCH?
```

The response will be #FWSWITCH: <image_number>,n
where <image_number> is as described above.

Note that normally different SIM cards will be required for operation under the different carrier versions.
More information can be found in the Telit Single SKU AT Command Application Note.

7 Design Considerations
7.1 Minimum Required Module Pin Connects

Pin	Signal	Function
1	VCC	Power Supply
4,10,11,15	GND	Ground
2	RESET	Reset Control
20	ON_OFF	-Off Control

Additionally, you must implement either the UART or USB port to communicate with the modem
The UART port requires at a minimum:

Pin	Signal	Function
2	RXD	UART Received Data
3	TXD	UART Transmitted Data
14	VL	Interface Voltage Reference
16	RTS	UART Ready to Send

If not used the RTS signal must be connected to GND.

The USB port requires the following signals:

Pin	Signal	Function
6	USB_VBUS	USB Supply Detect
7	USB_D+	USB Differential Data (+)
8	USB_D-	USB Differential Data (-)

If not used, the USB port should still be made available for troubleshooting.

7.2 Software debug

You can get more verbose responses to some error conditions by issuing the command:

```
AT+CMEE=2
```

7.3 Hardware debug

To test and debug the modem it is recommend to incorporate test pads on the host PCB. This will allow verification of the connection between the modem and the host application. This is especially true of the USB port which provides access for flashing firmware and running diagnostic traces. Depending on the customer application, these pads include, but are not limited to the following signals:

- VCC   • RESET   • GND   • USB D+   • TXD   • USB D-   • RXD   • USB V_BUS   • ON/OFF

APPENDICES
Approvals

LTE910XFX v1.00
>   FCC: RI7LE910CXWWX
>   PTCRB, AT&T, Verizon Pending

Note: Further certification may be necessary if additional radio equipment is being integrated with this product.

Antenna Care and Replacement

Do not use the Modem with a damaged antenna.
Buy the antenna from an approved suppliers list. Using unauthorized antennas, modifications, or attachments could damage the Modem and may violate local RF emission regulations or invalidate type approval.

Abbreviations

3GPP	3rd Generation Partnership Project	HSPA	High Speed Packet Access
AC	Alternating Current	LTE	Long Term Evolution
ADC	Analog To Digital Converter	IoT	Internet of Things
APN	Access Point Name	LED	Light Emitting Diode
BER	Bit Error Rate	M2M	Machine To Machine
CD	Carrier Detect	RF	Radio Frequency
CDMA	Code Division Multiple Access	RI	Ring Indicator
CTS	Clear To Send	RSSI	Received Signal Strength Indication
DB	Decibel	RTS	Request To Send
DC	Direct Current	RxD	Received Data
DCE	Data Communications Equipment	SMS	Short Message Service
DSR	Data Set Ready	TTFF	Time To First Fix
DTMF	Dual-tone multi-frequency	TxD	Transmitted Data
DTR	DTE Ready	UICC	Universal Integrated Circuit Card
GNSS	Global Navigation Satellite System	UMTS	Universal Mobile Telecommunications System
GPIO	General Purpose Input Output	USIM	Universal Subscriber Identity Module
GPRS	General Packet Radio Service	VSWR	Voltage Standing Wave Ratio
GSM	Global System Mobile	WCDMA	Wideband Code Division Multiplexing Access

JANUS REMOTE COMMUNICATIONS

LTE910XFX v1.00 CAT-1 Worldwide Embedded Cellular Modem Manual

Ordering Information

Ordering Information	Description
LTE910XFX v1.00	LTE Cat-1 Modem - GNSS Enabled - AT&T, Verizon, Worldwide

Revision History

Revision	Revision Date	Note
00	09/29/22	New Release LTE910XFX v1.00 CAT1 User Manual
01	03/09/23	Remove Preliminary Status and Updated Antenna Specifications
02	01/18/24	Added Design Considerations and Spec Updates

JANUS REMOTE COMMUNICATIONS

Division of The Connor-Winfield Corporation
2359 Diehl Road • Aurora, IL 60502
Phone: 630.499.2121 • info@janus-rc.com

www.janus-rc.com

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Global Cellular Modem Solutions