

Cellular LTE910XF v7.00 CAT 1 Plug-In XF Footprint Modem User Manual



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1. INTRODUCTION

1.1 Ordering Part numbers

| Ordering Information | Description |
|----------------------|-------------------------|
| LTE910XF v7.00 | LTE CAT 1 Plug-In Modem |

1.2 Additional Resources

The following documents or documentation resources are referenced within this document.

Telit LE910 V2 Hardware User Guide

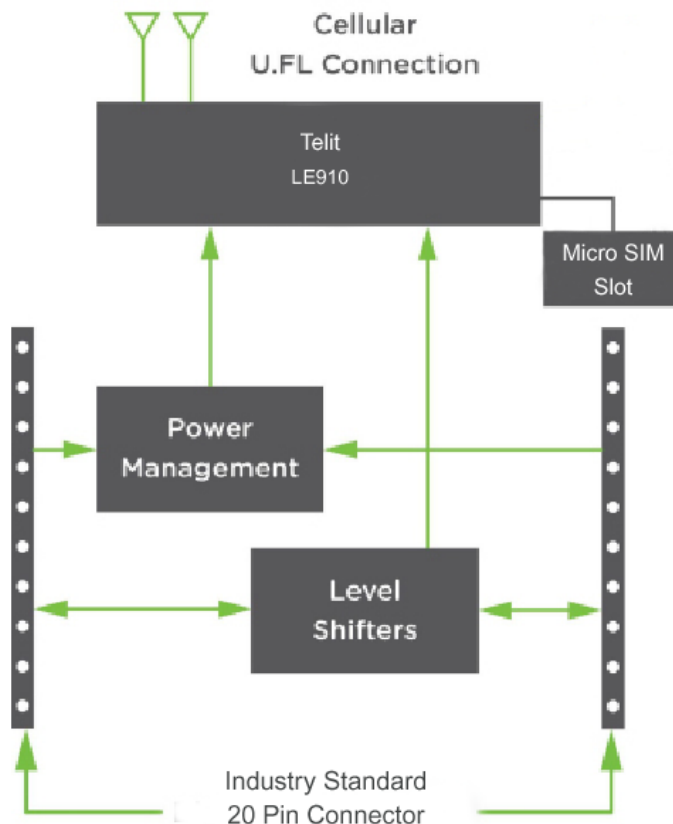
Telit LE910 V2 Series AT Commands Reference Guide

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

1.3 LTE910XF v7.00 Product Overview

Add robust, scalable, cellular connectivity to your IoT hardware solutions with the Janus line of “X” footprint (industry standard 20- pin connector) Socket Modems. Our Extensive experience in designing and manufacturing embedded radio solutions, along with our commitment to quality and reliability, makes the LTE910XF v7.00 CAT 1 cellular modem the most cost effective and flexible end device certified cellular modem available in the market today. It supports multiple LTE bands and fallback capability minimizing costs of hardware and network access. “End device” certification allows users to integrate any certified cellular XF modem into their application with no further carrier certification requirements, giving customer the quickest go-to-market option for their end solutions.

1.4 Block Diagram



2. TECHNICAL SPECIFICATIONS

2.1 Electrical Specifications

2.1.1 Absolute Maximum Ratings

| Parameter Signal | Signal | Maximum Rating |
|-----------------------|--------|----------------|
| Main Power Supply | VCC | 4.3V |
| I/O Voltage Reference | VREF | 5.0V |

2.1.2 Recommended Ratings & Module Pin out

2.1.2.1 Connectors J1 and J2

| Pin | Name | Direction | Description | Min | Typical | Max | If not used |
|-----|-----------|-----------|---|-------------------------|-----------------|-----------------------------------|--|
| 1 | VCC | Input | Main Power supply | 3.5V | 3.9V | 4.3V | Must be implemented |
| 2 | DOUT | Output | UART data out, I/O level tied to VREF | VOL: GND to 0.55V | | VOH: VREF x 0.67 to VREF | Must be implemented if USB not used, No connection |
| 3 | DIN | Input | UART data in, I/O level tied to VREF | VIL: GND to 0.15V | | VIH: VREF-0.4 V to VREF | Must be implemented if USB not used, No connection |
| 4 | GND | Input | Ground Pin | | 0 | | Must be implemented |
| 5 | RESET_nIN | Input | Controls HW_SHUTDOWN input on Telit LE910, tie low for 200mS and released to activate. Internally pulled up to VCC. Drive with open collector output. Assert only in an emergency as the module will not gracefully exit the cellular network when asserted. | | VREF | | No Connection |
| 6 | VUSB | Input | Supply for USB interface | 4.4V | 5V | 5V | No connection |
| 7 | USB_D+ | I/O | USB differential Data + signal | | | | No connection |
| 8 | USB_D- | I/O | USB differential Data - Signal | | | | No connection |
| 9 | DTR | Input | Modem Data Terminal Ready input | VIL: GND to 0.15V | | VIH: VREF-0.4 V to VREF | Tie to GND |
| 10 | GND | Input | Ground Pin | | 0 | | Must be implemented |
| 11 | GND | Input | Ground Pin | | 0 | | Must be implemented |
| 12 | CTS | Output | Modem Clear to Send hardware flow control output | VOL: GND to 0.55V | | VOH: VREF x 0.67 to VREF | No Connection |
| 13 | ON/nSLEEP | Output | Signal drives the onboard LED indicating network status. OFF = Device OFF, Fast blink = Searching for Network & Not Registered, Slow Blink = Registered with full service, Permanently on = call is active. See Telit AT Commands Guide for additional information. | 0 | | 1.8V | No Connection |
| 14 | VREF | Input | Voltage reference for offboard I/O signals. This signal drives the input voltage side of an onboard buffer which converts all external I/O voltage from VREF range to 1.8V range to drive the onboard Telit LE910 modem module. | 1.8V | 1.8V or 3.3V | 5.0V | Must be Implemented |
| 15 | GND | Input | Ground Pin | | 0 | | Must be implemented |

2. TECHNICAL SPECIFICATIONS continued

2.1 Electrical Specifications

2.1.2 Recommended Ratings & Module Pin out

2.1.2.1 Connectors J1 and J2 continued....

| Pin | Name | Direction | Description | Min | Typical | Max | If not used |
|-----|--------|-----------|---|-------------------------|---------|-------------------------------|---------------------|
| 16 | RTS | Input | Modem Request to Send hardware flow control input | VIL: GND to 0.15V | | VIH: VREF-0.4 V to VREF | Tie to GND |
| 17 | DIO3 | I/O | Programmable GPIO_03 on Telit LE910 module | 0 | | 1.8V | No connection |
| 18 | DIO2 | I/O | Programmable GPIO_02 on Telit LE910 module | 0 | | 1.8V | No connection |
| 19 | ADC1 | Input | ADC_IN1 input on Telit LE910 module (10bit resolution, <1.2mV) | 0 | | 1.2V | No connection |
| 20 | ON_OFF | Input | Modem On/Off signal. Assert low for at least 5 seconds and then release to activate start sequence. Drive with open collector output. Internally pulled up to internal I/O rail with pull up. Do not use any external pull ups. Note: If you want modem to turn on automatically when power is applied, permanently tie this signal to GND. | 0 | | 1.8V | Must be implemented |

2.1.2.2 Connectors P4, P1, P2

| Connector Designator | Description | Connector Location |
|----------------------|------------------------------|-----------------------|
| P4 | Micro SIM Connector | Bottom Side of Module |
| P1 | Primary Antenna Connection | Topside of Module |
| P2 | Secondary Antenna Connection | Topside of Module |

2.2 Mechanical Specifications

2.2.1 Mechanical Characteristics

| Parameter | Typical | Unit | Note |
|--|----------------------|--------|------|
| Dimensions (excluding pin height, for solder to board applications) | 1.14" x 1.3" x 0.256 | Inches | |
| Dimensions (including pin height, for board to board connector applications) | 1.14" x 1.3" x 0.422 | Inches | |
| Weight | 9 | Grams | |
| Connector Insertion/Removal | Hundreds | Cycles | |

2.2.2 Mating Connectors

| Connector Designator | Manufacture | Populated On Modem | Recommended Mate | Mate Manufacture |
|----------------------|-------------|--------------------|--|--------------------------------|
| J1, J2 | 3M | 951110-2530-ARPR | 950510-6102-AR | 3M |
| | | | Acceptable Alternate NPPN101BFCN-RC | Sullins Connector Solutions |
| P4 | JAE | SF56S006V4B | Micro SIM Card (3FF) | Cellular Carrier |
| P1, P2 | Hirose | U.FL-R-SMT(10) | CAB.011 | Taoglas |

2.2.3 Device Placement

Make sure the LTE910XF is installed in the correct orientation; failure to do so will damage the device and void the warranty.

2.3 Environmental Specifications

| Parameter | Min | Typical | Max | Unit | Note |
|-----------------------|-----|---------|-----|------|----------------|
| Operating Temperature | -40 | 25 | +85 | °C | |
| Storage Temperature | -40 | 25 | +85 | °C | |
| Operating Humidity | 20 | | 90 | % | Non-condensing |

3. IMPORTANT DESIGN CONSIDERATIONS

3.1 ON_OFF Signal

To conserve power, the Telit LE910 does not automatically start up when power is applied. The baseboard design must supply a means to assert the ON_OFF signal for the specified time (at least 5 seconds) and then released to start-up the module. After asserting the ON_OFF signal, software must wait for 15 seconds before attempting to communicate with the LE910. To make module automatically start when power is applied, tie ON/OFF signal to GND permanently. See Telit Hardware User Guide for additional details regarding the ON_OFF signal.

3.2 Power Supply Requirements

The equipment must be supplied by an external limited power source in compliance with the clause 2.5 of the standard IEC-60950-1. The module will regularly consume high amounts of current on the Main Power Supply (VCC), up to 2A during active transmits and receives. The baseboard power supply should be designed to support peak currents up to 2 Amps. A 100uF capacitor should be placed near the VCC pin on the module to ensure ample energy is available, with a low inductance path to the VCC pin. For example power supply designs, there are multiple references available. See the Telit Hardware User Guide which has an example of both Linear and Switching regulator designs.

3.3 Serial Communications

The LE910 can communicate over UART and/or USB. Design should implement one or both serial interfaces to be able to send commands to the modem.

3.4 Network Connection Status LED

The ON/nSLEEP signal on pin 13 drives the on-board LED indicating network status. By default, the LTE module has this setting disabled. Use the following commands to enable and save this feature.

First, configure the GPIO for alternate function:

AT#GPIO = 1,0,2

The modem should respond with:

OK

Next, set the desired LED behavior with this command:

AT#SLED=2,10,10

The modem should respond with:

OK

Finally, commit the changes to non-volatile memory so the setting will persist across power down/power up:

AT#SLEDSAV

The modem should respond with:

OK

| LED Status | Network Status Indication |
|-----------------|--|
| Permanently OFF | Device OFF or setting disabled (see above) |
| Permanently ON | Searching for Network & Not Registered |
| Slow Blinking | Registered with full service |
| Permanently ON | Call is active (Modem has been registered) |

3.5 FOTA

The certification of the following 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:

LTE910CF v3.0 LTE910XF v6.0 LTE910CF v6.0 LTE910XF v8.0

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 or use the Verizon Wireless FOTA system. FOTA services may also be available from other 3rd party vendors.

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

See Janus Application Note 117 – FOTA (Firmware Over The Air)

4. MOUNTING GUIDELINES

The LTE910XF embedded cellular modem supports multiple connection methods, the two primary methods are board to board connectors and soldering directly to the baseboard.

4.1 Board to Board connectors approach

The Standard Industry 20-pin form factor calls for two, 10 pin, 2mm pitch female receptacles.

There are many connector manufacturers that can be used; below is one readily available product:

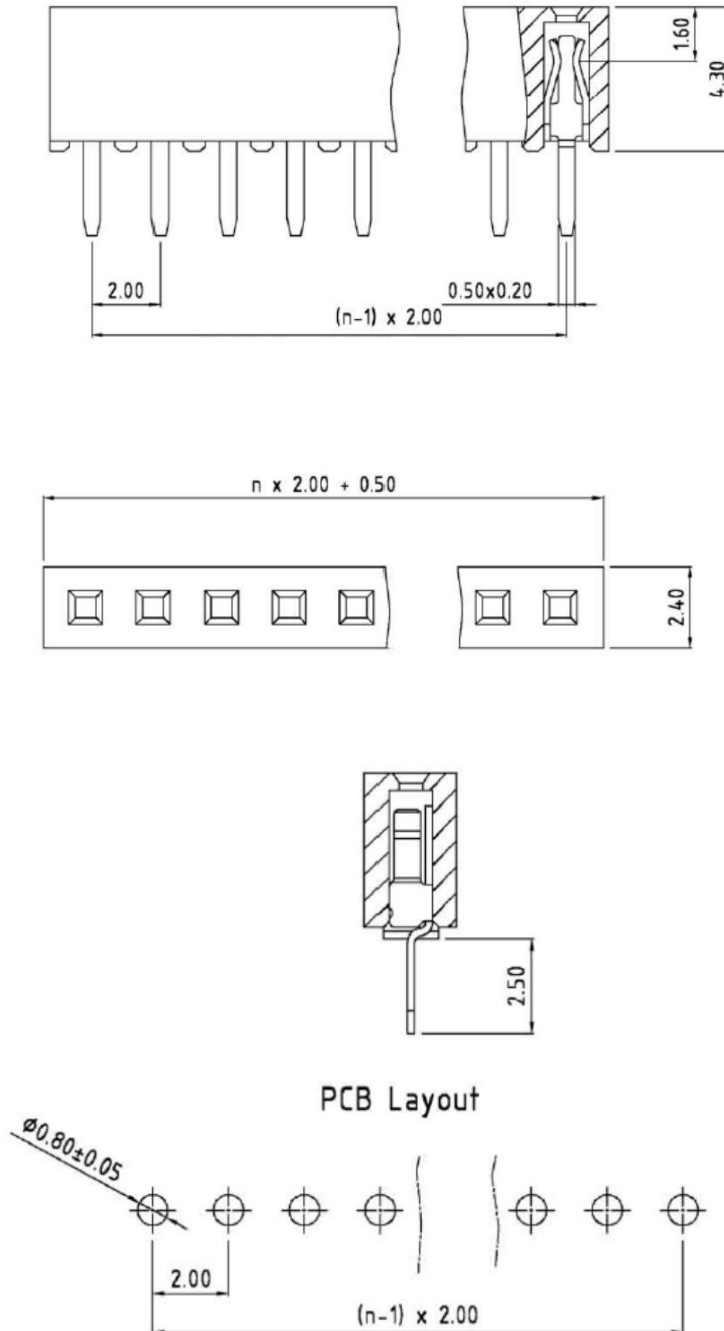
Manufacturer: 3M

Alternate: Sullins Connector Solutions

Part Number: 950510-6102-AR

Alternate P/N: NPPN101BFCN-RC

Typical part drawing and footprint information:



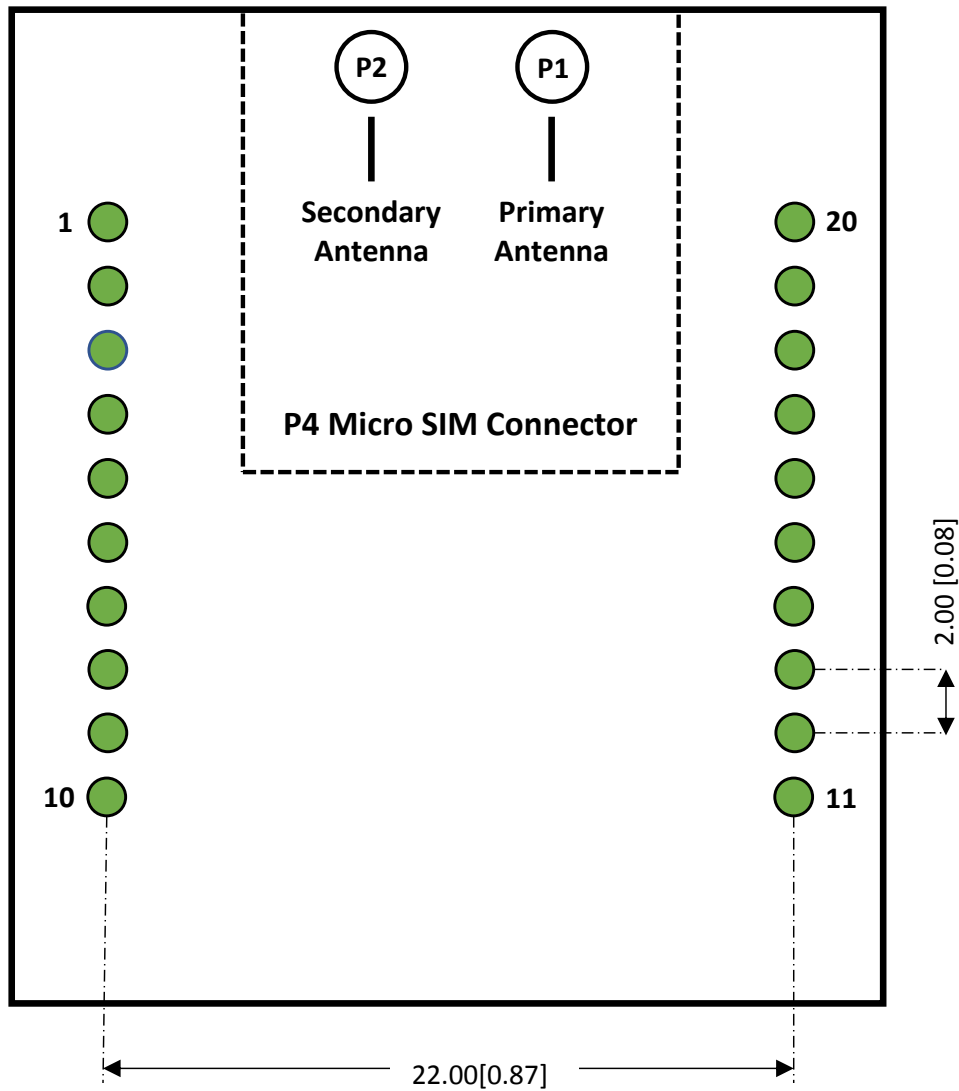
4. MOUNTING GUIDELINES continued

4.2 Solder to Board Connection Approach

The module can be soldered directly to a PCB. The PCB should be designed with two rows of ten, 0.8mm plated thru holes spaced 2mm apart. The two rows should be 22mm apart. See drawing for recommended footprint. U.FL locations are marked with circles, P1 and P2 on top side of board, P4 is Micro SIM card connector on bottom side of board.

TOP VIEW

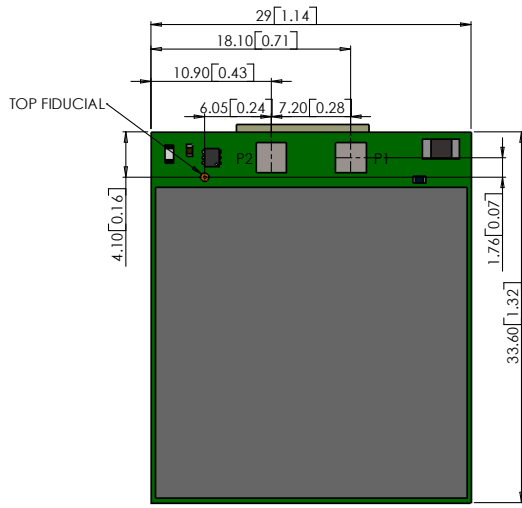
Dimensions in mm



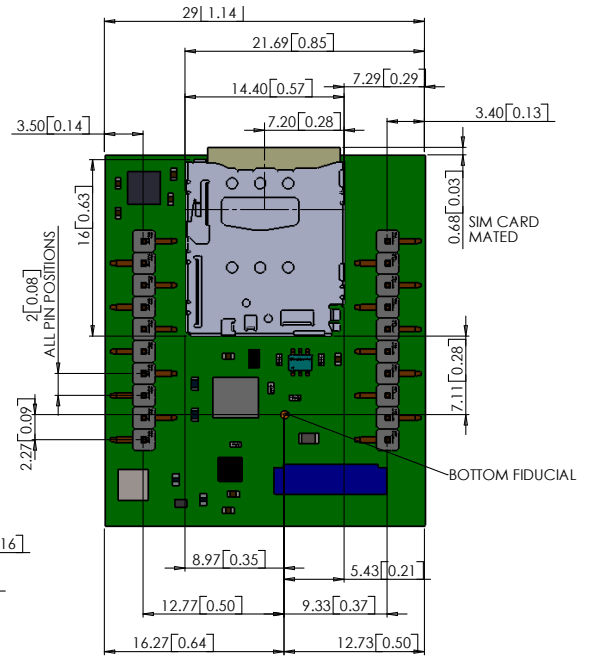
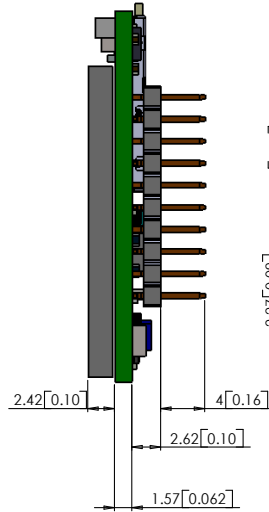
Dimensions: mm[inches]

4. MOUNTING GUIDELINES continued

4.3 Mechanical Dimensions

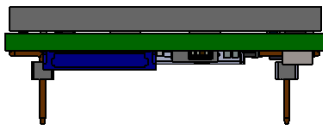


TOP VIEW



BOTTOM VIEW

Dimensions: mm
[inches]



5. ANTENNA CONSIDERATIONS

5.1 Antenna Requirements

These tables are copied from Telit LE910 V2 Hardware User Guide. Designers should review latest LE910 V2 Hardware User Guide to ensure the information is up to date.

| Antenna Requirements | |
|-----------------------|---|
| Frequency Range | Depending by frequency band(s) provided by the network operator, the customer shall use the most suitable antenna for that/those band(s). |
| Bandwidth | 140 MHz in LTE/WCDMA Band 2 |
| | 445 MHz in LTE Band 4 |
| | 70 MHz in LTE/WCDMA Band 5 |
| | 47 MHz in LTE Band 12 |
| | 41 MHz in LTE Band 13 Impedance 50 ohm |
| Input Power | >24Bm Average power |
| VSWR Absolute Maximum | < 10:1 (limit to avoid permanent damage) |
| VSWR Recommended | < 2:1 (limit to fulfill all regulatory requirements) |

5.2 Recommended Antennas

| Type | Manufacturer | Part Number |
|---------------------|----------------------|-------------|
| Primary & Secondary | Taoglas ¹ | TG.30.8113 |

Note 1 : U.FL to SMA adapter required.

6. CERTIFICATIONS

6.1 Carrier Specific

LTE910XF v7.00 Pending

6.2 Geography Specific

Federal Communications Commission (FCC47) part 22, 24
Complies with FCC47 Part 15 Class B Radiated and Conducted Emissions

7. FEDERAL REGULATORY LICENSING

7.1 Export Control Classification Number (ECCN)

ECCNs are five character alpha-numeric designations used on the Commerce Control List (CCL) to identify dual-use items for export control purposes. An ECCN categorizes items based on the nature of the product, i.e. type of commodity, software, or technology and its respective technical parameters.

All LTE910XF Modems: 5A992.a

7.2 Harmonized Tariff Schedule Code

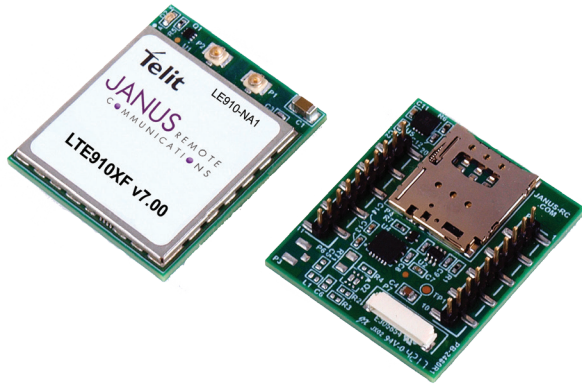
HTS Code: 8517.62.0010

8. END PRODUCT LABELING REQUIREMENTS

Contains FCC ID: R17LE910SVV2 and IC ID: 5131A-LE910SVV2

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interferences, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Cellular LTE910XF v7.00 CAT 1 Plug-In XF Footprint Modem User Manual



Revision History

| Revision | Revision Date | Note |
|----------|---------------|--|
| 00 | 04/04/18 | LTE910XF v7.00 Individual Plug-In User Manual |
| 01 | 06/07/18 | Updated Product Overview, Drawings I/O Voltage |

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