

# LTE Mini PCI-e Module—LP 15 User Manual



V2.0

### Revision History

Revision	Changes	Date
V1.0	Initial Draft	2012-08-19
V2.0	Revise	2012-12-06

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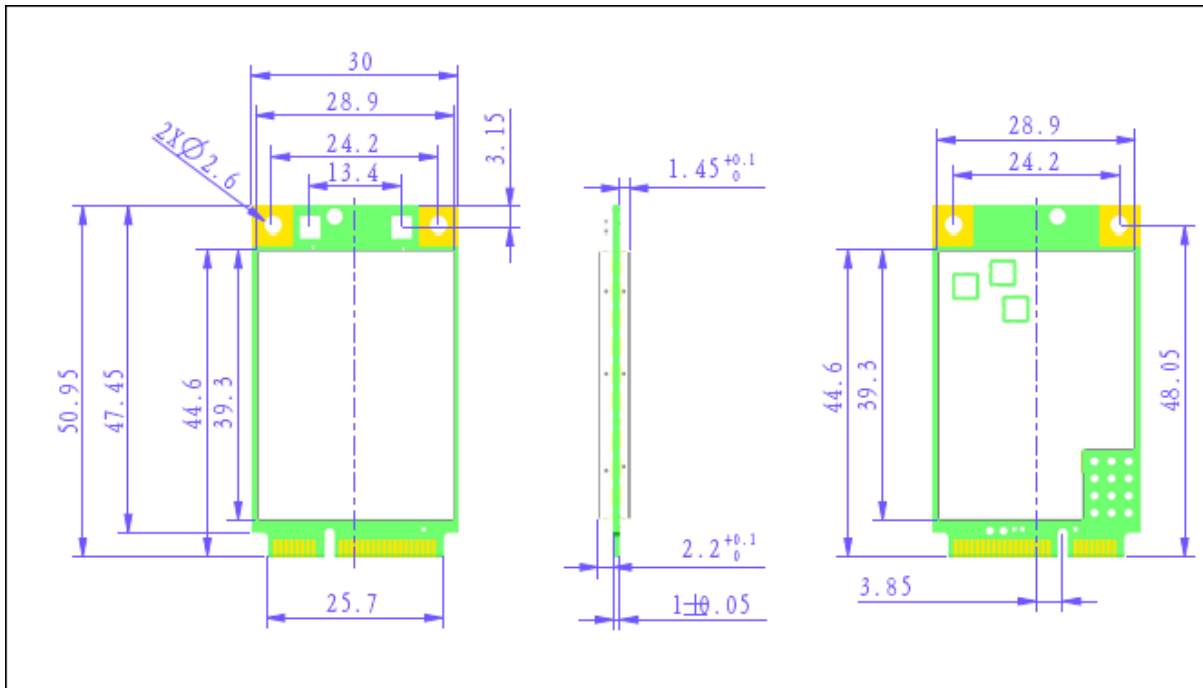
## LTE Mini PCI-e Module User Manual

### 1 Introduction

LP15 is Mini-PCIE interface wireless LTE module base on LTE technology, which has high performance and durability and could be used in CPE, POS machine, electronic metering, security camera and medical care area. It has standard Mini PCI-e interface which is easy to be integrated.

Mode	Description
LP15	Support Band14

### 2 Mechanical Information



Items	Specification
Size	51(L)x30(W)x4.5(H) mm
Mini PCI-e	Full Mini PCI-e

### **3 Specifications**

<b>LTE Features</b>	
Support Band	Band14
LTE Standard	3GPP Release 8
UE Category	Category 3
Bandwidth	5MHz,10MHz
<b>Interfaces</b>	
Mini PCI-e	52PIN Mini PCI-e
USB interface	USB 2.0 high speed
UART	Support
USIM interface	1.8V or 3.0V USIM
Antenna port	Dual-Antenna connector
RF Connectors	20279-001E-01(I-PEX)
Operating voltage	3.3 V
<b>Power supply</b>	
Electrical Power	3.3 Vdc
Power Consumption	3.5 Watts maximum
<b>RF performance</b>	
Maximum Output Power	22±1dBm
TX Performance	See details TX performance
RX Performance	See details RX performance
<b>Mechanical</b>	
Module Interface	52 pin Full-Mini PCI Express Card interface
Dimensions	30x 51x4.6mm
<b>Environmental</b>	
Operation Temperature	-20°C ~ 55°C
Storage Temperature	-40°C ~ 85°C
Operation Humidity	5% ~ 95%

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### 3.1 RF Performance

#### 3.1.1 RX Performance

Item	Description	
Frequency range	758MHz-768MHz	
Reference sensitivity level (TDD)	<-99.3dBm@BW=5MHz	
	<-96.3dBm@BW=10MHz	
	<-94.5dBm@BW=15MHz	
	<-93.3dBm@BW=20MHz	
Maximum input level	>-25.7dBm	
Spurious emissions	<-57 dBm@100KHz	30MHz ≤ f < 1GHz
	<-47 dBm@1MHz	1GHz ≤ f ≤ 12.75 GHz

#### 3.1.2 TX Performance

Item	Description	
Frequency range	788MHz-798MHz	
UE Maximum Output Power	22±1dBm	
Maximum Power Reduction (MPR)	22+1/-2.7dBm	QPSK(Full RB)
	22+12/-2.7dBm	16QAM(Low RB)
	22+1/-3.7dBm	16QAM(Full RB)
Minimum Output Power	<-39dBm	
Transmit OFF power	<-48.5 dBm	
Frequency Error	Δf  ≤ (0.1 PPM + 15 Hz)	
Error Vector Magnitude (EVM)	PUSCH 17.5@QPSK BPSK ;12.5%@16QAM	
	PUCCH 17.5%	
	PRACH 17.5%@FFS	
Carrier leakage	<-24.2dBc@3.2 dBm ±3.2dB	
	<-19.2dBc@-26.8 dBm ±3.2dB	
	<-9.2dBc@-36.8 dBm ±3.2dB	
Adjacent Channel Leakage power Ratio	<-32.2dBc@ACPR1_UTRA	
	<-35.2dBc@ACPR2_UTRA	
	<-29.2dBc@ACPR_EUTRA	
Transmitter Spurious emissions	<-36 dBm@BW=1KHz	9 kHz ≤ f < 150 kHz
	<-36 dBm@BW=10KHz	150 kHz ≤ f < 30 MHz
	<-36 dBm@BW=100KHz	30 MHz ≤ f < 1000 MHz
	<-30dBm@BW=1MHz	1 GHz ≤ f < 12.75 GHz

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### 3.1.3 UIM Card

LP15 supports UIM card. The UIM interface includes all the necessary signals, which are routed to the interface connector.

### 3.1.4 USB PORT

LP15 has USB client port, it can be used as debug, download, AT command and modem interface port.

### 3.1.5 RF Subsystem

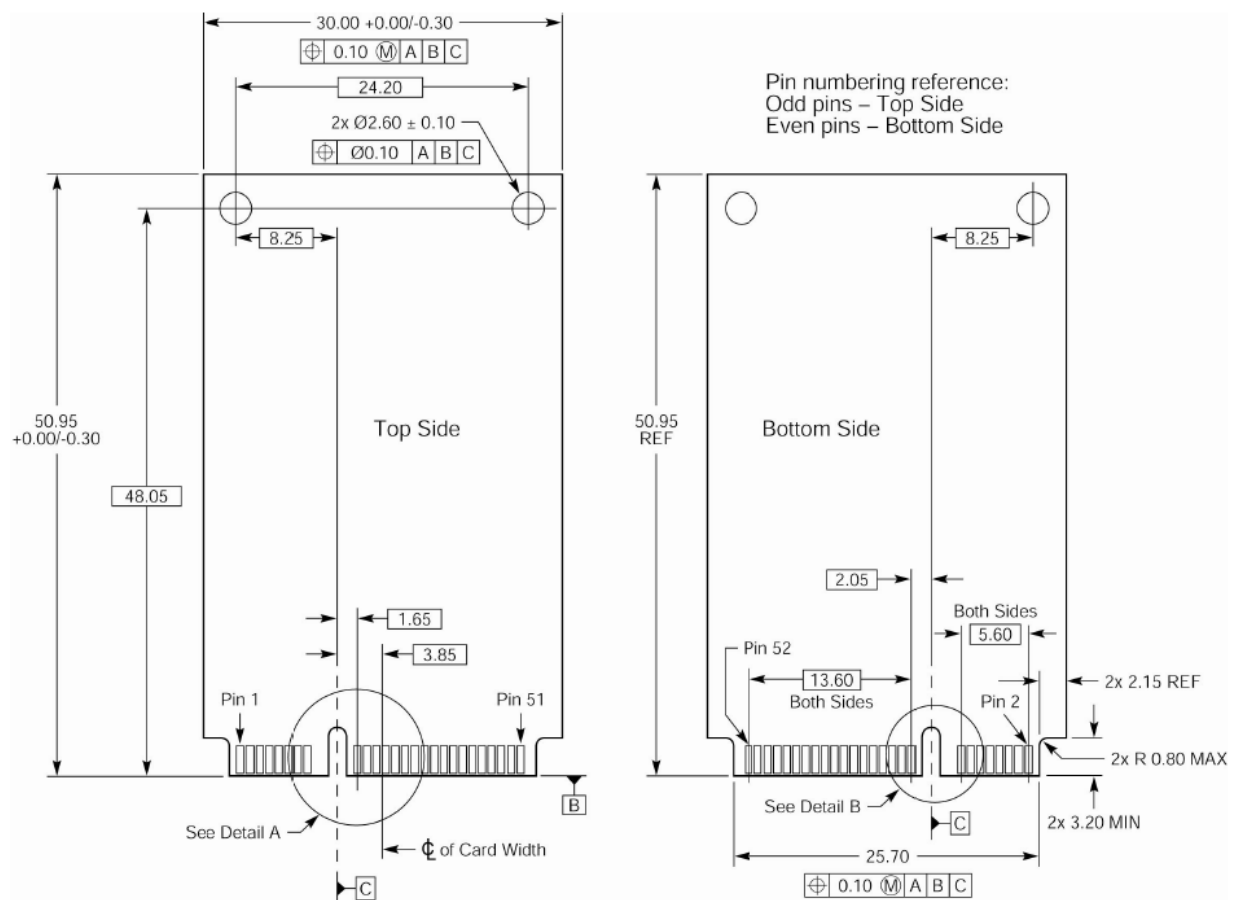
LP15 includes all of the active BB and RF circuit, no need to add other RF components, suggest to have a Pi type antenna matching circuits if you want to have external antenna

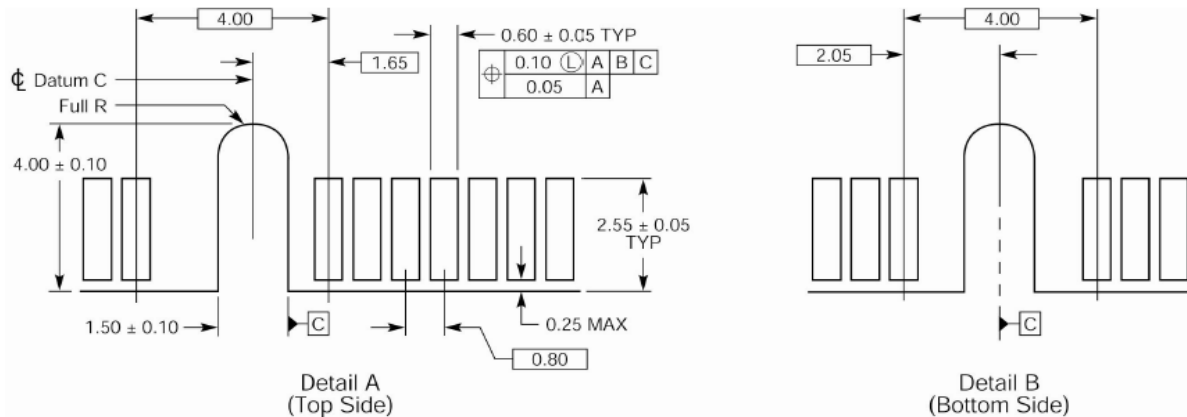
Note: The RF connector information:

Manufacture: I-PEX

MPN: 20279-001E-01

## 3.2 Full-Mini PCI Express Card PCB Details





## 4 Regulatory and Safety Information

### 4.1 Regulatory Approvals

#### 4.1.1 Transmitter

LP15 have been tested and meet FCC (Part2/Part 90) regulatory requirements.

#### 4.1.2 Receiver

The receiver associated with this transmitting device has been tested and declared to meet the regulatory requirements.

#### 4.1.3 FCC Compliance

This device complies with Part 15 of the FCC Rules. Operation is subject to the condition that this device does not cause harmful interference.

The user should take caution that changes or modifications not expressly approved by manufacturer could void the user's authority to operate this equipment. All required software and operating conditions must not be violated by the installer/user and is an express condition of use for this equipment.

Modular Approval for use as a module in mobile-only exposure conditions. Only those antenna(s) specified in the filing may be used with this transmitter. This device is only authorized for OEM integration into host products; consumer or end-user installation is not allowed. The antenna(s) used for this transmitter must be installed to provide a separation distance of at least 20 cm from all persons.



### 4.1.4 Labeling

The FCC labeling of the module is shown below. When integrating the module into a host, the label must be visible through a window, visible through an access panel that is easily removed, or a second label must be placed on the outside of the host device that contains the following text: Contains FCC ID: J26-4859300114.



### 4.2 RF Exposure Compliance



The LP15 module radio is intended for use in the Industrial Monitoring and Control and SCADA markets. The LP15 module unit must be professionally installed and must ensure a minimum separation distance between the radiating structure and any person. It is the responsibility of the user to guarantee compliance with the FCC MPE regulations when operating this device.

LP15 module uses a low power radio frequency transmitter. The concentrated energy from an antenna may pose a health hazard. People should not be in front of the antenna when the transmitter is operating.

The installer of this equipment must ensure the antenna is located or pointed such that it does not emit an RF field in excess of Health Canada limits for the general population.

Recommended safety guidelines for the human exposure to radio frequency electromagnetic energy are contained in the Canadian Safety Code 6 (available from Health Canada) and the Federal Communications Commission (FCC) Bulletin 65.

Any changes or modifications not expressly approved by the party responsible for compliance (in the country where used) could void the user's authority to operate the equipment.

The resulted power density at a distance of 20 cm can be deducted as follows:

$$\text{EIRP} = 23 + 2 = 25 \text{ dBm} = 316 \text{ mW}$$

$$\text{Power Density} = \text{EIRP} \cdot \text{Duty Cycle} / (4\pi R^2)$$

$$= 305 \cdot 1 / (4 \cdot \pi \cdot 20^2) = 0.06 \text{ mW/cm}^2$$

Where DutyCycle is 1 and R is 20 cm, antenna gain is 2dBi

The MPE limit for General Population/Uncontrolled Exposure is shown in the FCC OET Bulletin 65 Supplement C and can be calculated as follows:

$$\text{MPE limit} = 790.5 / 1500 = 0.527 \text{ mW/cm}^2$$

## 5 Installation Guidelines

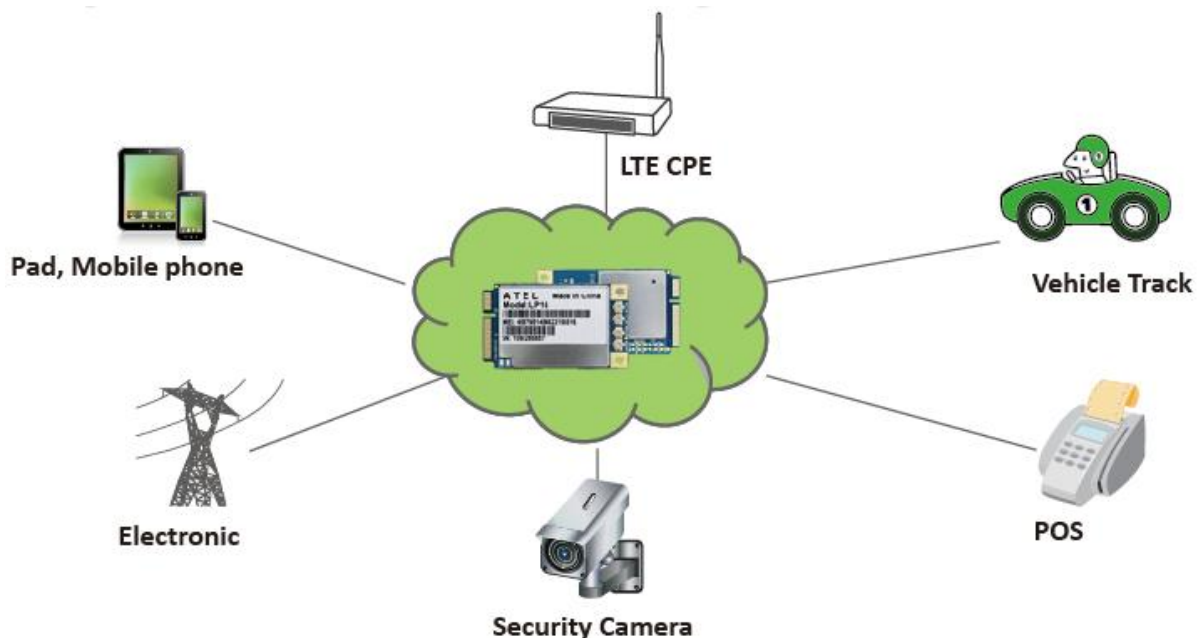
### 5.1 Introduction

Careful planning and preparation of any installation will always benefit the end result; always read and follow all installation instructions. Follow ESD precautions and prepare an ESD safe workspace for installation. Turn the power to the host off and ground yourself to dissipate static charge.

Mount only in sockets and locations intended for Type F1 Full-Mini cards and consult manufacturer on thermal management recommendations for the module mounted within the host.

### 5.2 Application Type

The application type of the module is shown as bellow:



All instructions relating to the integration of the module described on the FCC Grant notes must be followed.