



# User Guide

**AirPrime HL7548**



**SIERRA**  
WIRELESS®

TBC  
1.0  
January 28, 2015

## Important Notice

Due to the nature of wireless communications, transmission and reception of data can never be guaranteed. Data may be delayed, corrupted (i.e., have errors) or be totally lost. Although significant delays or losses of data are rare when wireless devices such as the Sierra Wireless modem are used in a normal manner with a well-constructed network, the Sierra Wireless modem should not be used in situations where failure to transmit or receive data could result in damage of any kind to the user or any other party, including but not limited to personal injury, death, or loss of property. Sierra Wireless accepts no responsibility for damages of any kind resulting from delays or errors in data transmitted or received using the Sierra Wireless modem, or for failure of the Sierra Wireless modem to transmit or receive such data.

## Safety and Hazards

Do not operate the Sierra Wireless modem in areas where cellular modems are not advised without proper device certifications. These areas include environments where cellular radio can interfere such as explosive atmospheres, medical equipment, or any other equipment which may be susceptible to any form of radio interference. The Sierra Wireless modem can transmit signals that could interfere with this equipment. Do not operate the Sierra Wireless modem in any aircraft, whether the aircraft is on the ground or in flight. In aircraft, the Sierra Wireless modem **MUST BE POWERED OFF**. When operating, the Sierra Wireless modem can transmit signals that could interfere with various onboard systems.

---

*Note: Some airlines may permit the use of cellular phones while the aircraft is on the ground and the door is open. Sierra Wireless modems may be used at this time.*

---

The driver or operator of any vehicle should not operate the Sierra Wireless modem while in control of a vehicle. Doing so will detract from the driver or operator's control and operation of that vehicle. In some states and provinces, operating such communications devices while in control of a vehicle is an offence.

## Limitations of Liability

This manual is provided "as is". Sierra Wireless makes no warranties of any kind, either expressed or implied, including any implied warranties of merchantability, fitness for a particular purpose, or noninfringement. The recipient of the manual shall endorse all risks arising from its use.

The information in this manual is subject to change without notice and does not represent a commitment on the part of Sierra Wireless. SIERRA WIRELESS AND ITS AFFILIATES SPECIFICALLY DISCLAIM LIABILITY FOR ANY AND ALL DIRECT, INDIRECT, SPECIAL, GENERAL, INCIDENTAL, CONSEQUENTIAL, PUNITIVE OR EXEMPLARY DAMAGES INCLUDING, BUT NOT LIMITED TO, LOSS OF PROFITS OR REVENUE OR ANTICIPATED PROFITS OR REVENUE ARISING OUT OF THE USE OR INABILITY TO USE ANY SIERRA WIRELESS PRODUCT, EVEN IF SIERRA WIRELESS AND/OR ITS AFFILIATES HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES OR THEY ARE FORESEEABLE OR FOR CLAIMS BY ANY THIRD PARTY.

Notwithstanding the foregoing, in no event shall Sierra Wireless and/or its affiliates aggregate liability arising under or in connection with the Sierra Wireless product, regardless of the number of events, occurrences, or claims giving rise to liability, be in excess of the price paid by the purchaser for the Sierra Wireless product.

Customer understands that Sierra Wireless is not providing cellular or GPS (including A-GPS) services. These services are provided by a third party and should be purchased directly by the Customer.

**SPECIFIC DISCLAIMERS OF LIABILITY:** CUSTOMER RECOGNIZES AND ACKNOWLEDGES SIERRA WIRELESS IS NOT RESPONSIBLE FOR AND SHALL NOT BE HELD LIABLE FOR ANY DEFECT OR DEFICIENCY OF ANY KIND OF CELLULAR OR GPS (INCLUDING A-GPS) SERVICES.

## Patents

This product may contain technology developed by or for Sierra Wireless Inc.

This product includes technology licensed from QUALCOMM®.

This product is manufactured or sold by Sierra Wireless Inc. or its affiliates under one or more patents licensed from InterDigital Group and MMP Portfolio Licensing.

## Copyright

© 2015 Sierra Wireless. All rights reserved.

## Trademarks

Sierra Wireless®, AirPrime®, AirLink®, AirVantage®, WISMO® and the Sierra Wireless and Open AT logos are registered trademarks of Sierra Wireless, Inc. or one of its subsidiaries.

Watcher® is a registered trademark of NETGEAR, Inc., used under license.

Windows® and Windows Vista® are registered trademarks of Microsoft Corporation.

Macintosh® and Mac OS X® are registered trademarks of Apple Inc., registered in the U.S. and other countries.

QUALCOMM® is a registered trademark of QUALCOMM Incorporated. Used under license.

Other trademarks are the property of their respective owners.

## Contact Information

Sales Desk:	Phone:	1-604-232-1488
	Hours:	8:00 AM to 5:00 PM Pacific Time
	Contact:	<a href="http://www.sierrawireless.com/sales">http://www.sierrawireless.com/sales</a>
Post:	Sierra Wireless 13811 Wireless Way Richmond, BC Canada V6V 3A4	
Technical Support:	<a href="mailto:support@sierrawireless.com">support@sierrawireless.com</a>	
RMA Support:	<a href="mailto:repairs@sierrawireless.com">repairs@sierrawireless.com</a>	
Fax:	1-604-231-1109	
Web:	<a href="http://www.sierrawireless.com/">http://www.sierrawireless.com/</a>	

Consult our website for up-to-date product descriptions, documentation, application notes, firmware upgrades, troubleshooting tips, and press releases: [www.sierrawireless.com](http://www.sierrawireless.com)

# Document History

Version	Date	Updates
1.0	January 28, 2015	Creation



# Contents

<b>1. INTRODUCTION .....</b>	<b>8</b>
1.1. Common Flexible Form Factor (CF <sup>3</sup> ).....	8
1.2. Physical Dimensions .....	8
1.3. General Features .....	9
1.4. Architecture .....	11
1.5. Interfaces .....	11
1.6. Connection Interface .....	12
1.7. ESD .....	12
1.8. Environmental & Certifications .....	13
1.8.1. Environmental Specifications .....	13
1.8.2. Regulatory .....	13
1.8.3. RoHS Directive Compliant .....	13
1.8.4. Disposing of the Product .....	14
1.8.5. References .....	14
<b>2. DETAILED INTERFACE SPECIFICATIONS.....</b>	<b>15</b>
2.1. Power Supply .....	15
2.2. Current Consumption .....	15
2.3. VGPIO.....	16
<b>3. MECHANICAL DRAWINGS.....</b>	<b>17</b>
<b>4. LEGAL INFORMATION .....</b>	<b>19</b>
4.1. FCC Regulations.....	19
4.2. IC Regulations.....	20
<b>5. TERMS AND ABBREVIATIONS.....</b>	<b>22</b>



# List of Figures

Figure 1.	AirPrime HL7548 Architecture Overview .....	11
Figure 2.	AirPrime HL7548 Mechanical Overview .....	12
Figure 3.	AirPrime HL7548 Mechanical Drawing .....	17
Figure 4.	AirPrime HL7548 Dimensions Drawing .....	18



## List of Tables

Table 1.	Supported Bands/Connectivity .....	8
Table 2.	AirPrime HL7548 Features.....	9
Table 3.	ESD Specifications.....	12
Table 4.	AirPrime HL7519, HL7548 and HL7588 Environmental Specifications .....	13
Table 5.	Regulation Compliance .....	13
Table 6.	Power Supply .....	15
Table 7.	Current Consumption .....	15
Table 8.	VGPIO Electrical Characteristics.....	16



# 1. Introduction

This document is the Product Technical Specification for the AirPrime HL7548 Embedded Module. It defines the high level product features and illustrates the interfaces for these features. This document is intended to cover the hardware aspects of the product, including electrical and mechanical.

The AirPrime HL7548 belongs to the AirPrime HL Series from Essential Connectivity Module family. These are industrial grade Embedded Wireless Modules that provide data connectivity on wireless networks (as listed in Table 1 Supported Bands/Connectivity).

The HL7548 supports a large variety of interfaces such as USB 2.0, UART, GPIOs, and dual SIM to provide customers with the highest level of flexibility in implementing high-end solutions.

Table 1. Supported Bands/Connectivity

RF Band	Transmit band (Tx)	Receive band (Rx)	HL7548
LTE B2	1850 to 1910 MHz	1930 to 1990 MHz	✓
LTE B4	1710 to 1755 MHz	2110 to 2155 MHz	✓
LTE B5	824 to 849 MHz	869 to 894 MHz	✓
LTE B17	704 to 716 MHz	734 to 746 MHz	✓

## 1.1. Common Flexible Form Factor (CF<sup>3</sup>)

The AirPrime HL7548 belongs to the Common Flexible Form Factor (CF<sup>3</sup>) family of modules. This family consists of a series of WWAN modules that share the same mechanical dimensions (same width and length with varying thicknesses) and footprint. The CF<sup>3</sup> form factor provides a unique solution to a series of problems faced commonly in the WWAN module space as it:

- Accommodates multiple radio technologies (from 2G to LTE advanced) and band groupings
- Supports bit-pipe (Essential Module Series) and value add (Smart Module Series) solutions
- Offers electrical and functional compatibility
- Provides Direct Mount as well as Socketability depending on customer needs

## 1.2. Physical Dimensions

AirPrime HL7548 module is a compact, robust, fully shielded module with the following dimensions:

- Length: 23 mm
- Width: 22 mm
- Thickness: 2.5 mm
- Weight: 3.5 g

---

*Note: Dimensions specified above are typical values.*

## 1.3. General Features

The table below summarizes the AirPrime HL7548 features.

Table 2. AirPrime HL7548 Features

Feature	Description
Physical	<ul style="list-style-type: none"> <li>• Small form factor (146-pin solderable LGA pad) – 23mm x 22mm x 2.5mm (nominal)</li> <li>• Complete body shielding</li> <li>• RF connection pads (RF main interface)</li> <li>• Baseband signals connection</li> </ul>
Electrical	Single or double supply voltage (VBATT and VBATT_PA) – 3.2V – 4.5V
RF	Quad-band LTE: <ul style="list-style-type: none"> <li>• LTE B2: 1900 PCS</li> <li>• LTE B4: 1700 AWS</li> <li>• LTE B5: 850 CLR</li> <li>• LTE B17: 700</li> </ul>
SIM interface	<ul style="list-style-type: none"> <li>• 1.8V/3V support</li> <li>• SIM extraction / hot plug detection</li> <li>• SIM/USIM support</li> <li>• Conforms with ETSI UICC Specifications</li> <li>• Supports SIM application tool kit with proactive SIM commands</li> </ul>
Application interface	<ul style="list-style-type: none"> <li>• NDIS NIC interface support (Windows XP, Windows 7, Windows 8, Windows CE, Linux)</li> <li>• Multiple non-multiplexed USB channel support</li> <li>• Dial-up networking</li> <li>• USB selective suspend to maximize power savings</li> <li>• CMUX multiplexing over UART (not available on the HL7548)</li> <li>• AT command interface – 3GPP 27.007 standard, plus proprietary extended AT commands</li> </ul>
Protocol Stack	<ul style="list-style-type: none"> <li>• Single mode LTE operation:               <ul style="list-style-type: none"> <li>▪ LTE FDD, bandwidth 1.4-20 MHz</li> <li>▪ System Release: 3GPP Rel. 9</li> <li>▪ Category 4 (up to 150 Mbit/s in downlink, 50 Mbit/s in uplink)</li> <li>▪ MIMO 2x2</li> <li>▪ Max modulation 64 QAM DL, 16 QAM UL</li> <li>▪ Intra-frequency and inter-frequency mobility</li> <li>▪ SMS over SGs and IMS</li> <li>▪ SON ANR</li> <li>▪ Public Warning System PWS</li> </ul> </li> </ul>

Feature	Description
SMS	<ul style="list-style-type: none"> <li>• SMS over SGs and IMS</li> <li>• SMS MO and MT</li> <li>• SMS saving to SIM card or ME storage</li> <li>• SMS reading from SIM card or ME storage</li> <li>• SMS sorting</li> <li>• SMS concatenation</li> <li>• SMS Status Report</li> <li>• SMS replacement support</li> <li>• SMS storing rules (support of <b>AT+CNMI</b>, <b>AT+CNMA</b>)</li> </ul>
Connectivity	<ul style="list-style-type: none"> <li>• Multiple (up to 20) cellular packet data profiles</li> <li>• Sleep mode for minimum idle power draw</li> <li>• Mobile-originated PDP context activation / deactivation</li> <li>• Support QoS profile <ul style="list-style-type: none"> <li>▪ Release 97 – Precedence Class, Reliability Class, Delay Class, Peak Throughput, Mean Throughput</li> <li>▪ Release 99 QoS negotiation – Background, Interactive, and Streaming</li> </ul> </li> <li>• Static and Dynamic IP address. The network may assign a fixed IP address or dynamically assign one using DHCP (Dynamic Host Configuration Protocol).</li> <li>• Supports PAP and CHAP authentication protocols</li> <li>• PDP context type (IPv4, IPv6, IPv4v6). IP Packet Data Protocol context</li> <li>• RFC1144 TCP/IP header compression</li> </ul>
Environmental	<p>Operating temperature ranges (industrial grade):</p> <ul style="list-style-type: none"> <li>• Class A: -30°C to +70°C</li> <li>• Class B: -40°C to +85°C</li> </ul>
RTC	Real Time Clock (RTC) with calendar

## 1.4. Architecture

The figure below presents an overview of the AirPrime HL7548's internal architecture and external interfaces.

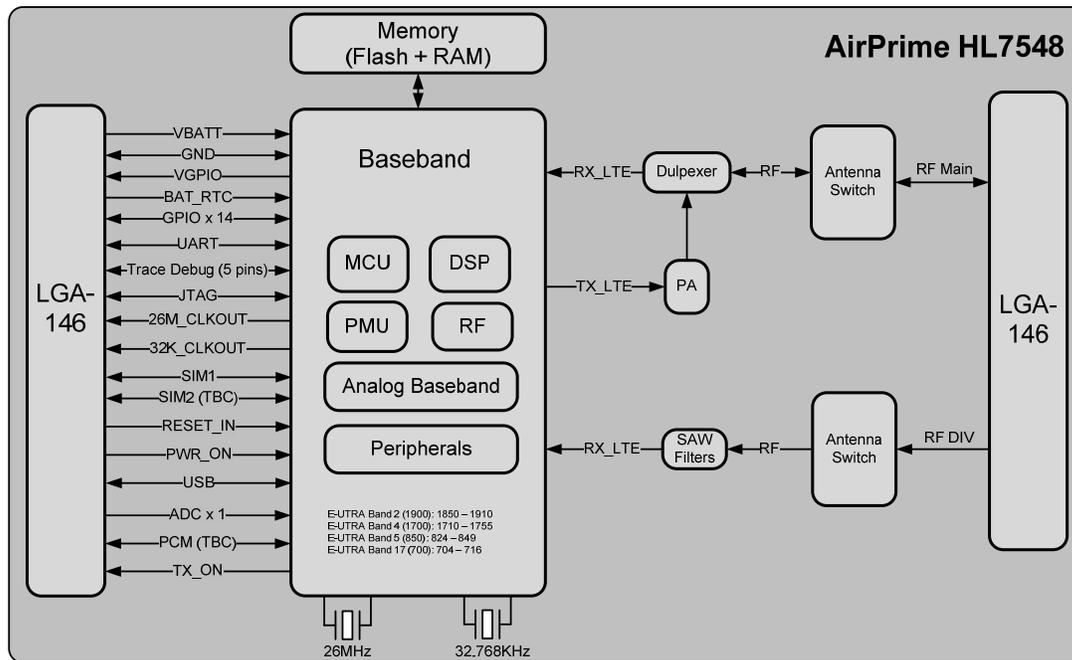


Figure 1. AirPrime HL7548 Architecture Overview

## 1.5. Interfaces

The AirPrime HL7548 module provides the following interfaces and peripheral connectivity:

- 1x - 4-pin UART
- 1x - Active Low RESET
- 1x - USB 2.0
- 1x - Backup Battery Interface
- 2x - System Clock Out
- 1x - Active Low POWER-ON
- 1x - 1.8V/3V SIM
- 1x - JTAG Interface
- 14x - GPIOs (5 of which have multiplexes)
- 1x - Main Antenna
- 1x - RX Diversity Antenna
- 1x - VGPIO
- 1x - TX ON
- 1x - ADC
- 1x - Debug Interface

## 1.6. Connection Interface

The AirPrime HL7548 module is an LGA form factor device. All electrical and mechanical connections are made through the 146 Land Grid Array (LGA) pads on the bottom side of the PCB.

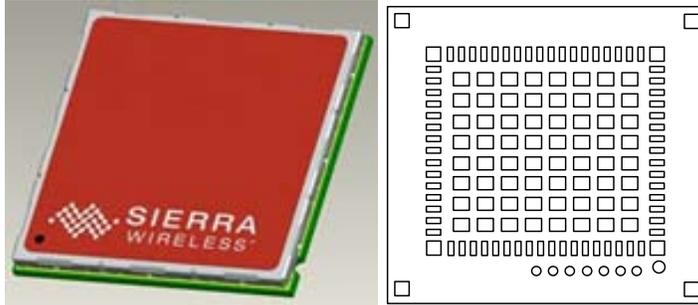


Figure 2. AirPrime HL7548 Mechanical Overview

The 146 pads have the following distribution:

- 66 inner signal pads, 1x0.5mm, pitch 0.8mm
- 1 reserved test point (do not connect), 1.0mm diameter
- 7 test point (JTAG), 0.8mm diameter, 1.20mm pitch
- 64 inner ground pads, 1.0x1.0mm, pitch 1.825mm/1.475mm
- 4 inner corner ground pads, 1x1mm
- 4 outer corner ground pads, 1x0.9mm

## 1.7. ESD

Refer to the following table for ESD Specifications.

*Note: Information specified in the following table is preliminary and subject to change.*

Table 3. ESD Specifications

Category	Connection	Specification
Operational	RF ports	IEC-61000-4-2 — Level (Electrostatic Discharge Immunity Test)
Non-operational	Host connector interface	Unless otherwise specified: <ul style="list-style-type: none"> <li>• JESD22-A114 +/- 2kV Human Body Model</li> <li>• JESD22-A115 +/- 200V Machine Model</li> <li>• JESD22-C101C +/- 250V Charged Device Model</li> </ul>
	SIM connector	Adding ESD protection is highly recommended at the point where the USIM contacts are exposed, and for any other signals that would be subjected to ESD by the user.
Signals	Other host signals	

## 1.8. Environmental & Certifications

### 1.8.1. Environmental Specifications

The environmental specification for both operating and storage conditions are defined in the table below.

Table 4. AirPrime HL7519, HL7548 and HL7588 Environmental Specifications

Conditions	Range
Operating Class A	-30°C to +70°C
Operating Class B	-40°C to +85°C
Storage	-40°C to +85°C

Class A is defined as the operating temperature ranges that the device:

- Shall exhibit normal function during and after environmental exposure.
- Shall meet the minimum requirements of 3GPP or appropriate wireless standards.

Class B is defined as the operating temperature ranges that the device:

- Shall remain fully functional during and after environmental exposure
- Shall exhibit the ability to establish an SMS or DATA call (emergency call) at all times even when one or more environmental constraint exceeds the specified tolerance.
- Unless otherwise stated, full performance should return to normal after the excessive constraint(s) have been removed.

### 1.8.2. Regulatory

The AirPrime HL7548 is compliant with FCC and IC regulations.

FCC and IC compliance will be reflected on the AirPrime HL7548 label.

Table 5. Regulation Compliance

Document	Current Version	Description	HL7548
NAPRD.03	V5.22 or later	North American Program Reference Document	✓
FCC Part 22, 24, 27	NA	Federal Communications Commission	✓
IC RSS-130, RSS-132, RSS-133, RSS-139	NA	Industry Canada	✓

### 1.8.3. RoHS Directive Compliant

The AirPrime HL7548 modules are compliant with RoHS Directive 2011/65/EU which sets limits for the use of certain restricted hazardous substances. This directive states that "from 1st July 2006, new

electrical and electronic equipment put on the market does not contain lead, mercury, cadmium, hexavalent chromium, polybrominated biphenyls (PBB) or polybrominated diphenyl ethers (PBDE)”.

### 1.8.4. Disposing of the Product

This electronic product is subject to the EU Directive 2012/19/EU for Waste Electrical and Electronic Equipment (WEEE). As such, this product must not be disposed of at a municipal waste collection point. Please refer to local regulations for directions on how to dispose of this product in an environmental friendly manner.



### 1.8.5. References

- [1] AirPrime HL Series Customer Process Guidelines  
Reference Number: 4114330
- [2] AirPrime HL7519, HL7548 and HL7588 AT Commands Interface Guide  
Reference Number: TBC

## 2.

# Detailed Interface Specifications

**Note:** If not specified, all electrical values are given for VBATT=3.7V and an operating temperature of 25°C.

For standard applications, VBATT and VBATT\_PA must be tied externally to the same power supply. For some specific applications, AirPrime HL7548 modules support separate VBATT and VBATT\_PA connection if requirements below are fulfilled.

## 2.1. Power Supply

The AirPrime HL7548 module is supplied through the VBATT signal with the following characteristics.

Table 6. Power Supply

Supply	Minimum	Typical	Maximum
VBATT voltage (V)	3.2 <sup>1</sup>	3.7	4.5
VBATT_PA voltage (V) Full Specification	3.2 <sup>1</sup>	3.7	4.5
VBATT_PA voltage (V) Extended Range	2.8	3.7	4.5

1 This value has to be guaranteed during the burst.

**Note:** Load capacitance for VBATT is around 32µF ± 20% embedded inside the module.  
Load capacitance for VBATT\_PA is around 10µF ± 20% embedded inside the module.

## 2.2. Current Consumption

The following table lists the current consumption of the AirPrime HL7548 at different conditions.

**Note:** Typical values are defined for VBATT/VBATT\_PA at 3.7V and 25°C, for 50Ω impedance at all RF ports. Maximum values are provided for VSWR4:1 with worst conditions among supported ranges of voltages and temperature.

Table 7. Current Consumption

Parameter	Minimum	Typical	Maximum	Unit
Off mode		110		µA
Sleep mode – LTE DRX = 1.28s USB = suspended	Band 2	1.40 (TBC)		mA
	Band 4	1.40 (TBC)		mA
	Band 5	1.41 (TBC)		mA
	Band 17	1.41 (TBC)		mA

Parameter		Minimum	Typical	Maximum	Unit
LTE in communication mode (TX Max)	Band 2		600 (TBC)		mA
	Band 4		600 (TBC)		mA
	Band 5		650 (TBC)		mA
	Band 17		650 (TBC)		mA
HSPA+ (TX Max)	Band 2		TBD		mA
	Band 5		TBD		mA

## 2.3. VGPIO

The VGPIO output can be used to:

- Pull-up signals such as I/Os
- Supply the digital transistors driving LEDs

The VGPIO output is available when the AirPrime HL7548 module is switched ON.

Table 8. VGPIO Electrical Characteristics

Parameter	Min	Typ	Max	Remarks
Voltage level (V)	1.7	1.8	1.9	Both active mode and sleep mode
Current capability Active Mode (mA)	-	-	50	Power management support up to 50mA output in Active mode
Current capability Sleep Mode (mA)	-	-	3	Power management support up to 3mA output in Sleep mode
Rise Time(ms)	-	-	1.5	Start-Up time from 0V



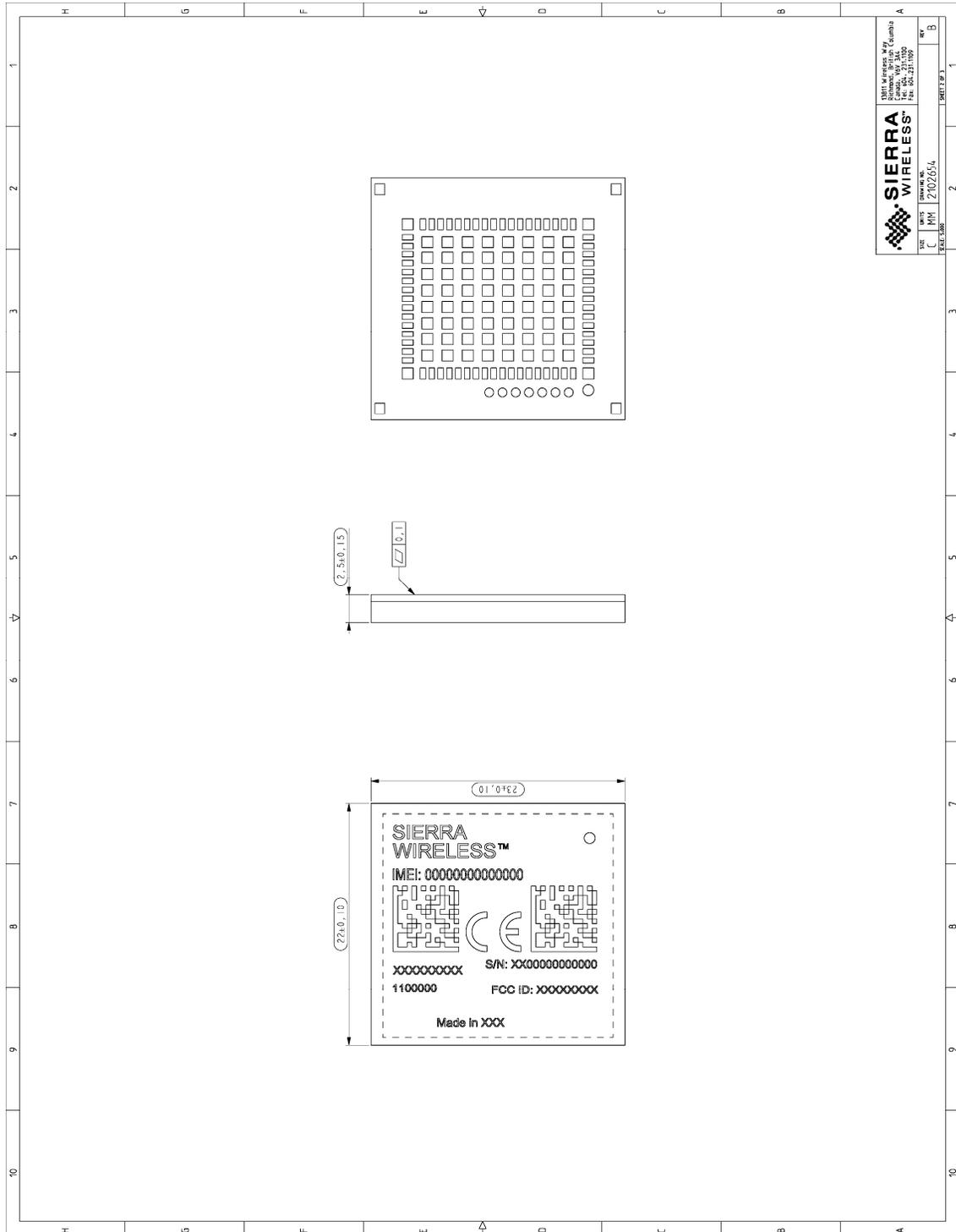


Figure 4. AirPrime HL7548 Dimensions Drawing

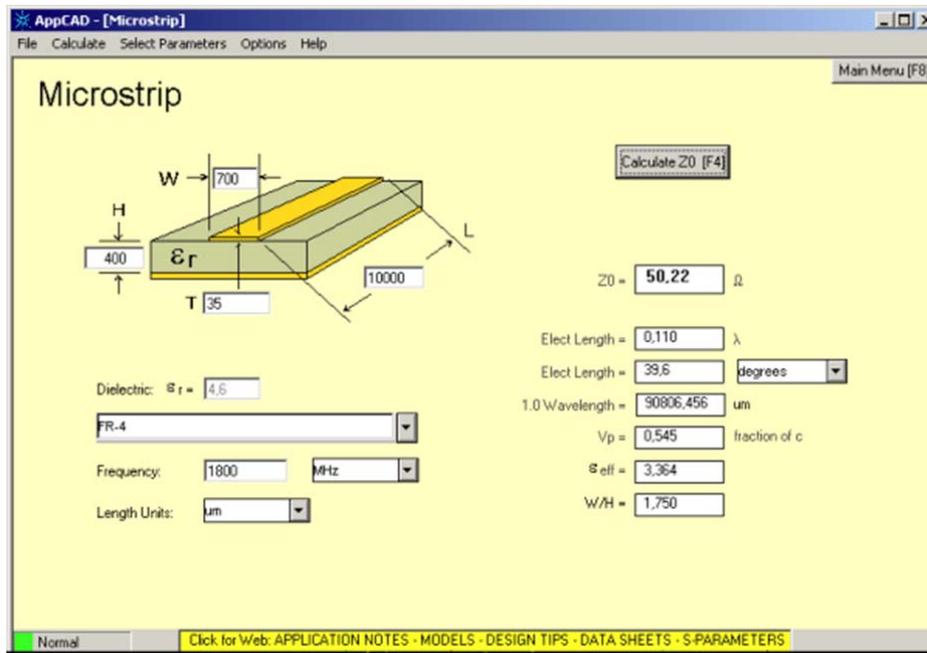
## 4.

# Legal Information

## 4.1. FCC Regulations

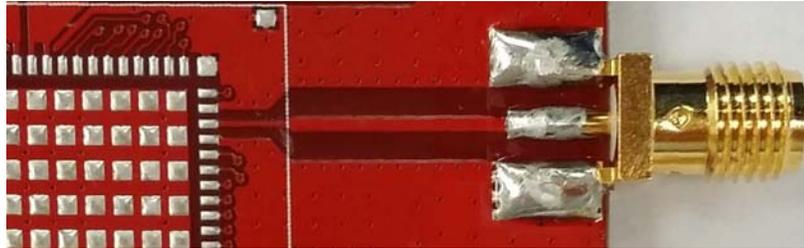
The HL7548 module has been granted modular approval for mobile applications. Integrators may use the HL7548 module in their final products without additional FCC certification if they meet the following conditions. Otherwise, additional FCC approvals must be obtained.

1. At least 20 cm separation distance between the antenna and the user's body must be maintained at all times.
2. To comply with FCC regulations limiting both maximum RF output power and human exposure to RF radiation, the maximum antenna gain including cable loss in a mobile-only exposure condition must not exceed:
  - 9.01 dBi in LTE Band 2
  - 6.00 dBi in LTE Band 4
  - 10.42 dBi in LTE Band 5
  - 9.73 dBi in LTE Band 17
3. This device and its antenna(s) must not transmit be co-located or operating in conjunction with any other antenna or transmitter, except in accordance with FCC multi-transmitter RF exposure product procedures.
4. The RF signal must be routed on the application board using tracks with a 50Ω characteristic impedance. Basically, the characteristic impedance depends on the dielectric, the track width and the ground plane spacing. In order to respect this constraint, Sierra Wireless recommends using MicroStrip or StripLine structure and computing the Tracks width with a simulation tool (like AppCad shown in the figure below and that is available free of charge at <http://www.agilent.com>).



If a multi-layered PCB is used, the RF path on the board must not cross any signal (digital, analog or supply).

If necessary, use Stripline structure and route the digital line(s) "outside" the RF structure. An example of proper routing is shown in the figure below.



Stripline and Coplanar design requires having a correct ground plane at both sides. Consequently, it is necessary to add some vias along the RF path. It is recommended to use Stripline design if the RF path is fairly long (more than 3cm), since MicroStrip design is not shielded. Consequently, the RF signal (when transmitting) may interfere with neighbouring electronics (AF amplifier, etc.). In the same way, the neighbouring electronics (micro-controllers, etc.) may degrade the reception performances. The antenna connector is intended to be directly connected to a 50Ω antenna and no matching is needed.

5. A label must be affixed to the outside of the end product into which the HL7548 module is incorporated, with a statement similar to the following:  
This device contains FCC ID: N7NHL7548
6. A user manual with the end product must clearly indicate the operating requirements and conditions that must be observed to ensure compliance with current FCC RF exposure guidelines.

The end product with an embedded HL7548 module may also need to pass the FCC Part 15 unintentional emission testing requirements and be properly authorized per FCC Part 15.

---

*Note: If this module is intended for use in a portable device, you are responsible for separate approval to satisfy the SAR requirements of FCC Part 2.1093.*

---

## 4.2. IC Regulations

IC Radiation Exposure Statement:

This equipment complies with IC RSS-102 radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance 20cm between the radiator and your body.

This device and its antenna(s) must not transmit be co-located or operating in conjunction with any other antenna or transmitter, except in accordance with IC multi-transmitter RF exposure product procedures.

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

Under Industry Canada regulations, this radio transmitter may only operate using an antenna of a type and maximum (or lesser) gain approved for the transmitter by Industry Canada. To reduce potential radio interference to other users, the antenna type and its gain should be so chosen that the equivalent isotropically radiated power (e.i.r.p) is not more than necessary for successful communication.

Labeling Requirements for the Host Device (from Section 7.2 of RSP-100, Issue 10, November 2014): The host device shall be properly labeled to identify the module within the host device. The Industry Canada certification label of a module shall be clearly visible at all times when installed in the host device, otherwise the host device must be labeled to display the Industry Canada certification number of the module, preceded by the words – Contains

transmitter module, or the word – Contains, or similar wording expressing the same meaning, as follows: Contains transmitter module IC: 2417C-HL7548.

This radio transmitter (identify the device by certification number, or model number if Category II) has been approved by Industry Canada to operate with the antenna types operating with the maximum permissible gain and required antenna impedance for each antenna type indicated:

- 9.01 dBi in LTE Band 2
- 6.00 dBi in LTE Band 4
- 10.42 dBi in LTE Band 5
- 9.73 dBi in LTE Band 17

Antenna types having a gain greater than the maximum gain indicated for that type are strictly prohibited for use with this device.

## 5.

# Terms and Abbreviations

Abbreviation	Definition
ADC	Analog to Digital Converter
AGC	Automatic Gain Control
AT	Attention (prefix for modem commands)
CDMA	Code Division Multiple Access
CF3	Common Flexible Form Factor
CLK	Clock
CODEC	Coder DECoder
CPU	Central Processing Unit
DAC	Digital to Analog Converter
DTR	Data Terminal Ready
EGNOS	European Geostationary Navigation Overlay Service
EMC	ElectroMagnetic Compatibility
EMI	ElectroMagnetic Interference
EN	Enable
ESD	ElectroStatic Discharges
ETSI	European Telecommunications Standards Institute
FDMA	Frequency-division multiple access
GAGAN	GPS aided geo augmented navigation
GLONASS	GLOBAL NAVigation Satellite System
GND	Ground
GNSS	Global Navigation Satellite System
GPIO	General Purpose Input Output
GPRS	General Packet Radio Service
GSM	Global System for Mobile communications
Hi Z	High impedance (Z)
IC	Integrated Circuit
IMEI	International Mobile Equipment Identification
I/O	Input / Output
LED	Light Emitting Diode
LNA	Low Noise Amplifier
MAX	MAXimum
MIN	MINimum
MSAS	Multi-functional Satellite Augmentation System
N/A	Not Applicable
PA	Power Amplifier
PC	Personal Computer
PCB	Printed Circuit Board
PCL	Power Control Level
PLL	Phase Lock Loop
PWM	Pulse Width Modulation

<b>Abbreviation</b>	<b>Definition</b>
QZSS	Quasi-Zenith Satellite System
RF	Radio Frequency
RFI	Radio Frequency Interference
RMS	Root Mean Square
RST	ReSeT
RTC	Real Time Clock
RX	Receive
SCL	Serial CLock
SDA	Serial DATA
SIM	Subscriber Identification Module
SMD	Surface Mounted Device/Design
SPI	Serial Peripheral Interface
SW	SoftWare
PSRAM	Pseudo Static RAM
TBC	To Be Confirmed
TBD	To Be Defined
TP	Test Point
TX	Transmit
TYP	TYPical
UART	Universal Asynchronous Receiver-Transmitter
UICC	Universal Integrated Circuit Card
USB	Universal Serial Bus
UIM	User Identity Module
VBATT	Main Supply Voltage from Battery or DC adapter
VSWR	Voltage Standing Wave Ratio
WAAS	Wide Area Augmentation System