GL7812

Product Technical Specification and User Guide

SIERRA WIRELESS®

41114652
Rev. 2

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Revision History

Revision number	Release date	Changes
1.0	September 2023	Creation
2.0	December 2023	Updated Operating Class Temperature Range Added note under Overview

Contents

1: Overview

The GL7812 is a wireless modem that allows users to connect to a cellular network. It offers data connectivity on Cat-M, Cat-NB1/NB2, and 2G networks. It also supports GNSS for positioning. It was designed using the HL7812 embedded module.

The following section provides information about the physical attributes and briefly summarizes the modem's features, interfaces and connectors.

Note: Sierra Wireless modules are shipped factory-programmed, with industry or mobile operator approved firmware, according to the specific SKU ordered. Periodically, newer firmware versions become available and can include new features, bug fixes, or critical security updates. Sierra Wireless strongly recommends that customers establish their own production capability for updating module firmware on their assembled end platform, in the event that a newer firmware must be installed before deployment. Sierra Wireless also recommends customers design their products to support post-deployment FOTA upgrades using the AirVantage cloud platform.

1.1 General Information

1.1.1 Physical Dimensions

Figure 1-1: GL7812 Modem

The modem has a complete box casing with the following properties:

Table 1-1: Box Casing Properties

Dimension	Value	Condition
Length	67 mm	Casing only
	72.8 mm	Casing with SMA connector
Width	51.5 mm	-
Thickness	23.5 mm	-
Weight	41 g	

1.1.2 Interfaces

- 1V8 SIM interface
- RF interface
- Serial link (RS232) interface
- Power supply DC input from 6V to 24V
- Power LED indicator

1.1.3 Connections Interfaces

- One SIM connector
- SMA type RF connector
- One 8-pin Micro-Fit connector for serial link (RS232) and power supply
- Micro USB connector

1.1.4 Environmental Compliance

1.1.4.1 Environmental Specifications

The modem is compliant with the following operating classes. The table below lists the ideal temperature range of the environment.

Table 1-2: Operating Class Temperature Range

Conditions	Temperature Range
Operating/Class A	-20 °C to +55°C
Operating/Class B	-30 °C to +70°C
Storage	-40 °C to +80°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.

1.1.4.2 RoHS Compliance

GL7812 modems are compliant with RoHS Directive 2011/65/EU, including directive 2015/863 amending annex II, which sets limits for the use of certain restricted hazardous substances. This directive states that electrical and electronic equipment put on the market does not contain lead, mercury, cadmium, hexavalent chromium, polybrominated biphenyls (PBB), polybrominated diphenyl ethers (PBDE), Bis (2-ethylhexyl) phthalate (DEHP), Butyl benzyl phthalate (BBP), Dibutyl phthalate (DBP) or Diisobutyl phthalate (DIBP) above threshold limits.

1.1.4.3 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 environmentally friendly manner.

1.2 Functional Architecture

The global architecture is shown in the figure below.

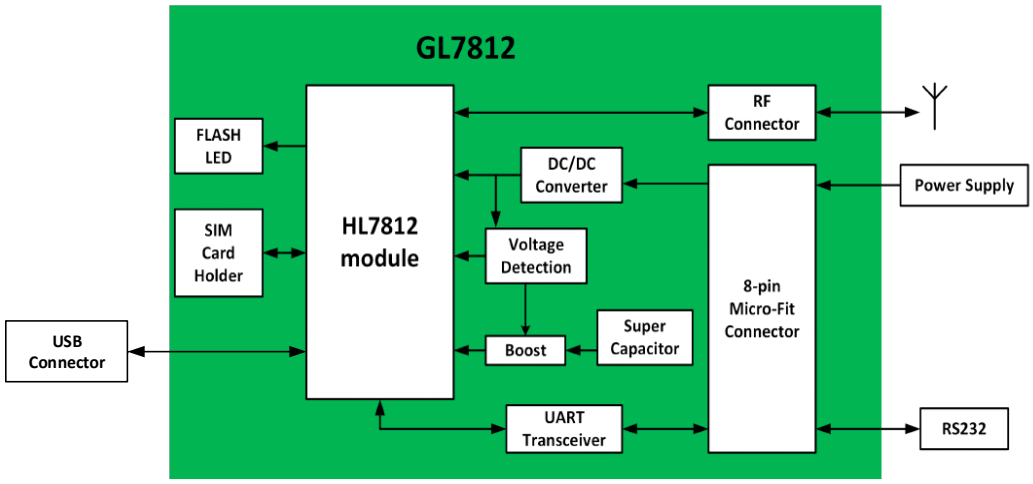


Figure 1-2: Functional Architecture

1.2.1 RF Functionalities

The Radio Frequency (RF) range complies with the 3GPP requirements. The corresponding frequency recommendations for both transmission and reception bands are listed in the table below.

Table 1-3: GL7812 Supported Bands / Connectivity

Feature	RF Band	Transmit (TX) Frequency (MHz)	Receive (Rx) Frequency (MHz)	Cat-M1	Cat-NB2	2G
GL7812	LTE B1	1920-1980	2110-2170	Y	Y	
	LTE B2	1850-1910	1930-1990	Y	Y[a]	
	LTE B3	1710-1785	1805-1880	Y	Y	
	LTE B4	1710-1755	2110-2155	Y	Y[a]	
	LTE B5	824-849	869-894	Y	Y[a]	
	LTE B8	880-915	925-960	Y	Y	
	LTE B12	699-716	729-746	Y	Y[a]	
	LTE B13	777-787	746-756	Y	Y[a]	
	LTE B18	815-830	860-875	Y	Y	
	LTE B19	830-845	875-890	Y	Y	
	LTE B20	832-862	791-821	Y	Y	
	LTE B25	1850-1915	1930-1995	Y	Y[a]	
	LTE B26	814-849	859-894	Y	Y[a]	
	LTE B28	703-748	758-803	Y	Y	
	LTE B66	1710-1780	2110-2200	Y	Y[a]	
	LTE B85	698-716	728-746	Y	Y[a]	
	GSM 850	824-849	869-894			Y
	E-GSM 900	890-915	925-960			Y
	DCS 1800	1710-1785	1805-1880			Y
	PCS 1900	1850-1910	1930-1990			Y

a. To ensure FCC compliance near NB band edges, Cat-NB2 supported TX channel ranges do not include outer channels. Supported channel ranges are:
• B2: 18602–19198 • B4: 19952–20398 • B5: 20402–20648 • B12: 23012–23178
• B13: 23182–23278 • B25: 26042–26688 • B26: 26692–27038 • B66: 131974 - 132670
• B85: 134004–134179

1.3 Mechanical Specifications

1.3.1 Mechanical Drawing

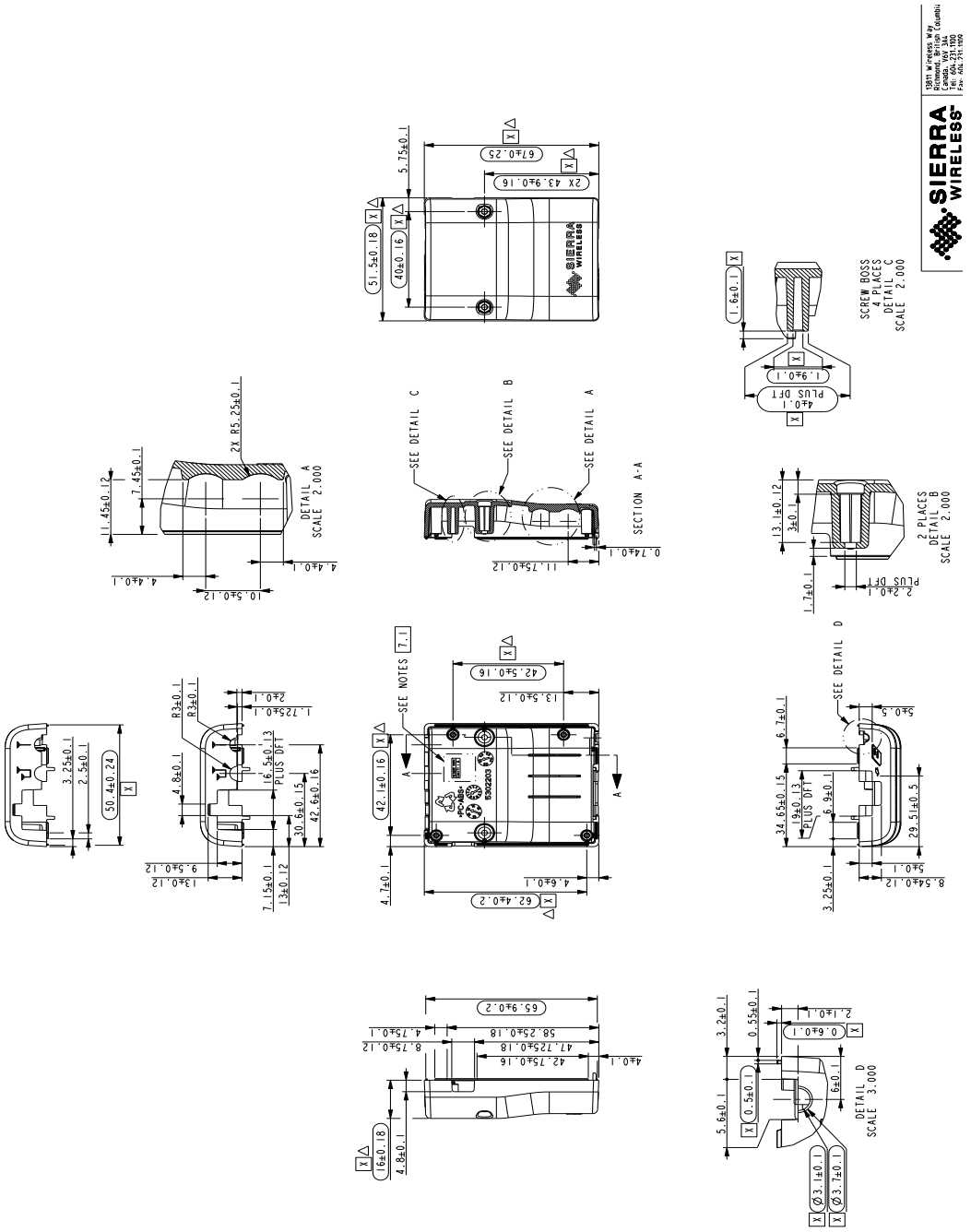


Figure 1-3: Top View

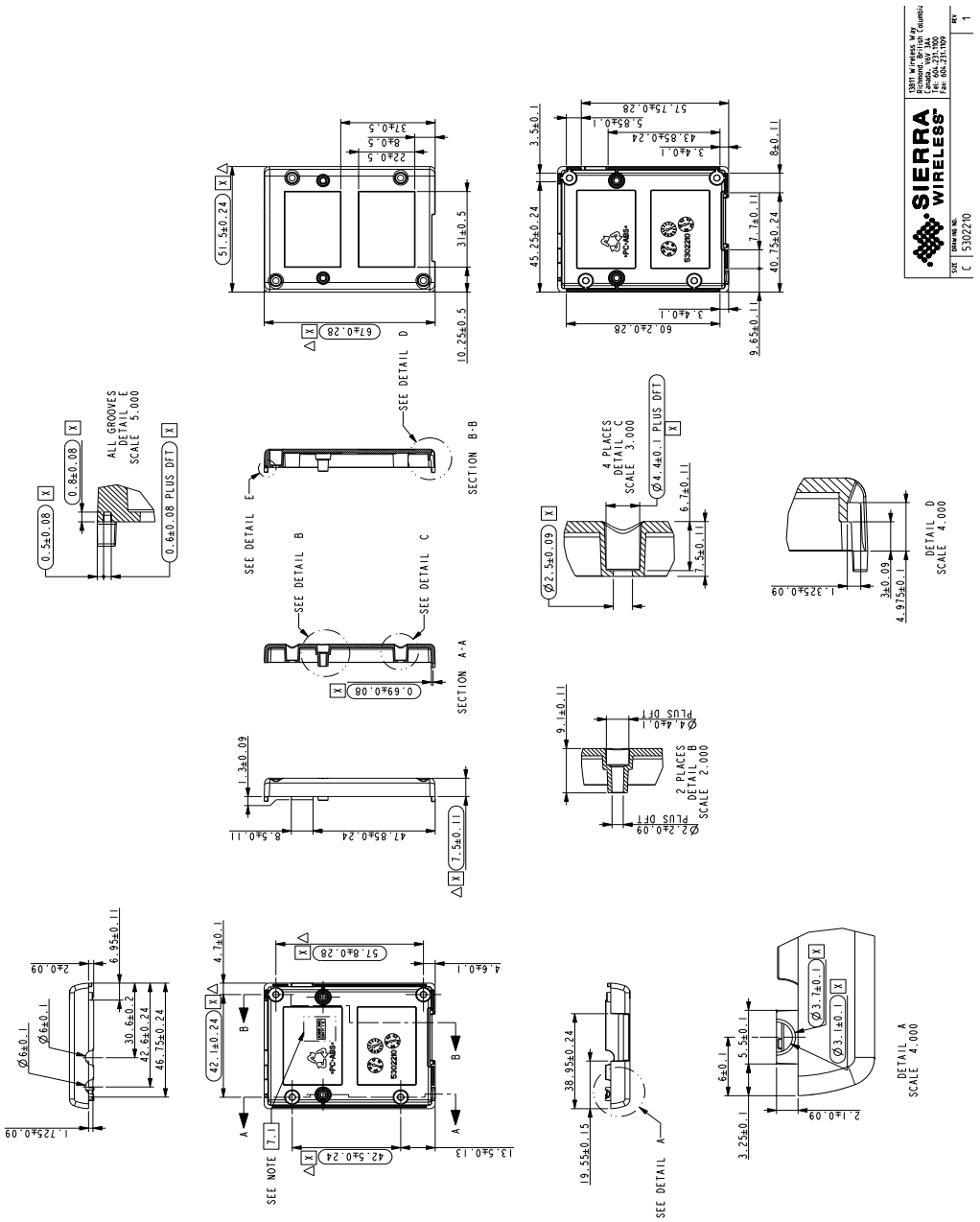


Figure 1-4: Bottom View

1.3.2 Product Color

The GL7812 comes in:

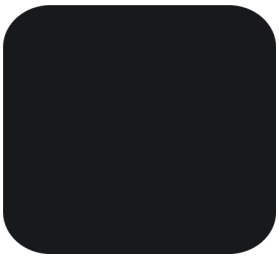


Figure 1-5: OSAKI BLACK

Muncell 10B 1.5 / 0.5

DIC 581B

(PANTONE 426C)

C5% M5% Y0 or 5%K 90%

R24G25B26

HTML: #18191A

2: Interfaces / Peripherals

This section describes the different connectors, interfaces and peripherals that connect with the modem.

The modem is distributed in the market as a finished product with the following interfaces:

- an 8-pin Micro-Fit Connector
- a Power LED Indicator
- a SIM connector
- a Micro USB connector

The interface signals available from the modem are listed in the following table. For more information about these signals, refer to the corresponding chapters.

Table 2-1: Available Interface Signals

Name	Driven by AT Commands
Serial Link (RS232)	Yes
SIM Interface	Yes
Micro USB Connector	Yes

2.1 Front Interface

Figure 2-1: Front View

2.2 SIM Interface

The Subscriber Identification Module can be directly inserted in the modem through the SIM door.

The SIM interface controls 1.8V SIM/USIM cards and it is fully compliant with ETSI UICC specification.

The SIM interface is ESD protected. Transient Voltage Suppressor diodes are internally added on the signals connected to the SIM interface to prevent any damage from electrostatic discharge.

The SIM uses five SIM signals, namely:
- SIM-VCC, which is the SIM power supply
- SIM-RST, which is reset
- SIM-CLK, is clock
- SIM-IO, as the I/O port
- SIM-DET, for SIM detection

Refer to the following table for the electrical characteristics of the SIM interface.

Table 2-2: SIM Interface Electrical Characteristics

Parameter	Minimum	Typical	Maximum	Remarks
SIM Interface Voltage (V) (VCC, CLK, IO, RST)	-	1.80	-	The appropriate output voltage is auto-detected and selected by software.
SIM-DET	-	1.80	-	High active
SIM-VCC Current (mA)	-	-	50	In sleep mode Max output current = 3mA
SIM-VCC Power-up Setting Time from power down (µs)	-	10	-	

2.2.1 Power LED

The GL7812 has an LED indicator to show the status of power on.

Table 2-3: LED Status

Modem State	LED Status	Modem Status
ON	Permanently lit	The modem is powered ON.
	Slow flash (LED is switched ON for 200ms, OFF for 2s)	The modem is powered ON and registered in the network.
OFF	OFF	The modem is switched OFF.

2.3 Micro USB Connector

The GL7812 supports a USB 2.0 interface which could be connected directly to a PC USB port.

The signals on the micro USB connector are as follows:

- Vin, 5V (pin 1)
- D- (pin 2)
- D+ (pin 3)
- GND (pin 4)

Note: The Micro USB connector is only used as an AT port and for debugging data transfer. It cannot be used to power the modem.

Figure 2-2: USB Signals on the Micro USB Connector

AT Command **+KUSBCOMP** can be used on UART to enable or disable USB mode. For details on AT Command usage, refer to the HL78xx AT Command Guide.

2.3.1 Pin Description

Refer to the following table for the USB pin description.

Table 2-4: USB Pin Description

Pin Number	Signal	Description
1	Vin	5V, voltage input
2	D+	Universal serial bus data positive
3	D-	Universal serial bus data negative
4	GND	Ground

2.3.2 USB Driver

USB driver version 4.32 can be downloaded from http://source.sierrawireless.com/.

2.4 Back Interface

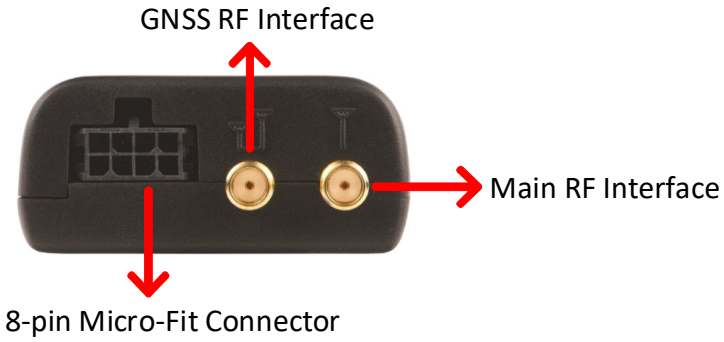


Figure 2-3: Back View

2.4.1 8-pin Micro-Fit Connector

The 8-pin Micro-Fit connector is used for the following connections:

- External DC power supply connection with voltage from 6V to 24V
- Serial link (RS232) interface

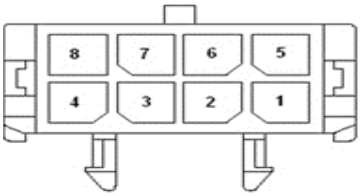


Figure 2-4: Pin Assignment of the 8-pin Micro-Fit Connector

Customers who have previously purchased GL7500 and GL7600 devices should note that the Y cable (with the 8-pin micro-fit connector to serial/power) included with those older devices is not compatible with GL7812 devices.

Using a GL7500/GL7600 Y cable with a GL7812 will result in significantly higher power consumption. It is recommended that customers use the cables included with the GL7812 device, or another customer-sourced option following the described wiring.

Table 2-5: Micro-Fit Connector Pin Description

Pin #	Signal	I/O	I/O Type	Voltage	Description
1	DCIN	I	Power Supply	6V to 24V	6V to 24V DC input
2	RS232-DTR	I	RS-232	-5.5V to 5.5V	Data Terminal Ready
3	RS232-RXD	O	RS-232	-5.5V to 5.5V	Receive Serial Data
4	RS232-CTS	O	RS-232	-5.5V to 5.5V	Clear To Send
5	RS232-DCD	O	RS-232	-5.5V to 5.5V	Data Carrier Detect
6	GND	-	GND	GND	Ground

Table 2-5: Micro-Fit Connector Pin Description

7	RS232-TXD	I	RS-232	-5.5V to 5.5V	Transmit Serial Data
8	RS232- RTS	I	RS-232	-5.5V to 5.5V	Request To Send

Note: Pins 2-5 and Pin 7-8 are used by the serial link interface. It is strictly prohibited to connect them to any power supply at the risk of damaging the GL7812.

2.4.1.1 Power Supply

The modem is supplied by an external DC voltage (DCIN) that ranges from 6V to 24V (with a recommended maximum rating of 1A). This input is available on the modem from the 8-pin Micro-Fit connector.

Table 2-6: Input Power Supply Voltage

Pin Number	Signal	Description
1	DCIN	6V to 24V DC input
6	GND	Ground Connection

Note: Transient voltage impact on DCIN should be taken into consideration as damages to the modem from improper protection is not covered under warranty. Refer to Power Supply for protection recommendations.

2.4.1.2 Serial Link (RS232)

The modem's serial link, RS232, performs the voltage level adaptation (V24/CMOS) between the internal Plug and Play (DCE) and external applications (DTE).

The RS232 interface is internally protected against electrostatic surges on its lines by ESD protection.

The RS232 interface has the following filtering guarantees:
- EMI/RFI protection on both the input and the output
- Signal smoothing

Signals available on the RS232 serial link are as follows:
- TX data (RS232-TXD)
- RX data (RS232-RXD)
- Request To Send (RS232-RTS)
- Clear To Send (RS232-CTS)
- Data Terminal Ready (RS232-DTR)
- Data Carrier Detect (RS232-DCD)

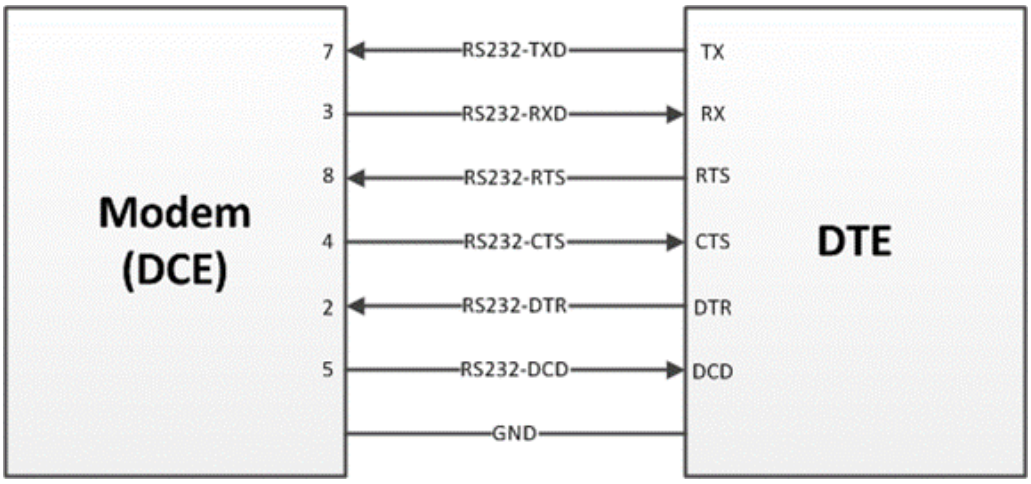


Figure 2-5: RS232 Serial Link Signals

Pin DescriptionThe RS232 interface has been designed to allow flexibility in the use of the

Table 2-7: Serial Link Pin Description from the Micro-Fit Connector (CN201)

Pin #	Signal[a]	I/O[b]	I/O Type	Reset State	Description
2	RS232-DTR	I	RS-232	Z	Data Terminal Ready
3	RS232-RXD	O	RS-232	1	Receive Serial Data
4	RS232-CTS	O	RS-232	Z	Clear To Send
5	RS232-DCD	O	RS-232	Undefined	Data Carrier Detect
6	GND	-	GND		Ground
7	RS232-TXD	I	RS-232	Z	Transmit Serial Data
8	RS232- RTS	I	RS-232	Z	Request To Send

a. According to PC (DTE) view.
b. According to modem (DCE) view, from which the direction of the signal is defined.

The RS232 interface has been designed to allow flexibility in the use of the serial interface signals. However, the use of TX and RX signals are mandatory; while the use of CTS, RTS, DTR and DCD signals are optional.

Note: The modem is designed to operate with Hardware Flow Control. It is recommended to use RS232-RTS and RS232-CTS for hardware flow control to avoid data corruption during transmission.

The modem also implements the Serial Port Shutdown feature with the DTR signal. It is recommended to use RS232-DTR signal to benefit from the current consumption improvement performed by this feature. For more information about the Serial Port Shutdown, refer to Serial Port Shutdown Mode.

5-wire Serial Interface Hardware Design

The signals used in this interface hardware design are as follows:

- RS232-TXD
- RS232-RXD
- RS232-CTS
- RS232-RTS
- RS232-DTR

Note: The RS232-DTR signal must be managed following the V24 protocol signaling if the Sleep Mode and Serial Port Shutdown feature are to be used.

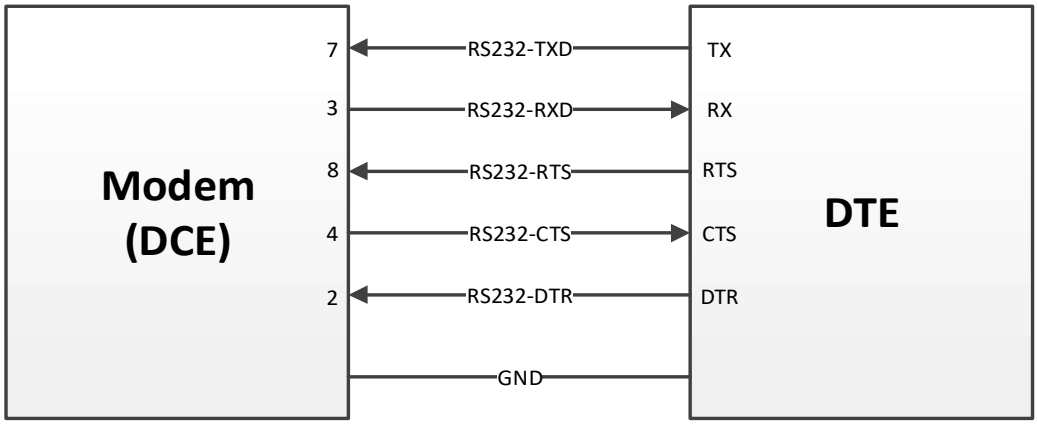


Figure 2-6: 5-wire Serial Link Implementation

4-wire Serial Interface Hardware Design

The signals used in this interface hardware design are as follows:

- RS232-TXD
- RS232-RXD
- RS232-CTS
- RS232-RTS

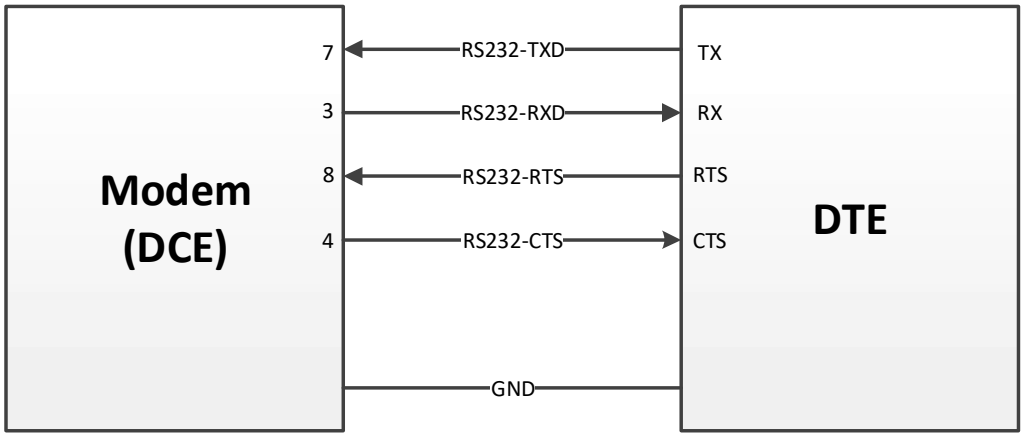


Figure 2-7: 4-wire Serial Link Implementation

2-wire Serial Interface Hardware Design

The signals used in this interface hardware design are as follows:

- RS232-TXD
- RS232-RXD

Note: Although this case is possible, it is not recommended. The flow control mechanism must be managed from the customer end.

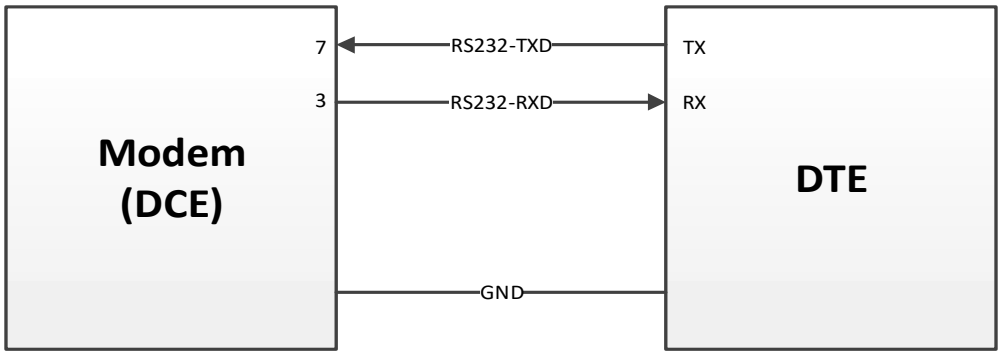


Figure 2-8: 2-wire Serial Link Implementation

The RS232-CTS and RS232-RTS signals are not used in this configuration. Sierra Wireless recommends the use of hardware flow control, but if not needed, the AT commands **AT&K0** and **AT&W0** can be used to disable the flow control function on the embedded module.

*Note: A 2-wire serial link implementation is not possible if **AT+KSLEEP=0**.*

For more information about AT commands applicable to the GL7812, please refer to the HL78xx AT Command Reference Guide.

2.4.2 RF Interface

The GL7812 supports two RF connectors for a primary and a diversity antenna. These antenna connectors allow the transmission of radio frequency (RF) signals from the device to an external customer supplied antenna. The connector is an SMA coaxial connector.

The nominal impedance of the antenna interface is 50Ω.

Note: The diversity antenna connector cannot be used without using the main antenna connector.

2.4.2.1 Maximum Output Power

The maximum transmitter output power of the modem for all bands in normal operation conditions (25°C) is specified in the following table.

Table 2-8: GL7812 Maximum Output Power

LTE Bands	Min	Typ	Max	Units	Notes
All bands	21.5[a]	23	24.5	dBm	Power class 3

a. Additional power reduction is applied to the lowest and highest supported channels for each band — see Table 1-3 footnote for supported Tx channel ranges. (e.g. applies to B2 channels 18602 and 19198)

2.4.2.2 RF Sensitivity

The modem's receiver sensitivity is specified in the following table. The test condition used for the following values are as follows:

- Cat-M1

Table 2-9: GL7812 Conducted Rx Sensitivity — LTE Bands Cat-M1 RX Sensitivity

LTE Bands	Typical Reference Sensitivity Level @ 95% of Maximum Throughput		
	@ +25°C (dBm)	@ Class A (dBm)	3GPP Limit (dBm)[a]
B1	-103.5	-102.5	-102.3
B2	-103.5	-102.5	-100.3
B3	-104.5	-103	-99.3
B4	-103.5	-102.5	-102.3
B5	-104.5	-103.5	-100.8
B8	-104.5	-102.5	-99.8
B12	-104.5	-103	-99.3
B13	-104.5	-103.5	-99.3
B18	-104.5	-103.5	-100.3

Table 2-9: GL7812 Conducted Rx Sensitivity — LTE Bands Cat-M1 RX Sensitivity (Continued)

LTE Bands	Typical Reference Sensitivity Level @ 95% of Maximum Throughput		
	@ +25°C (dBm)	@ Class A (dBm)	3GPP Limit (dBm)[a]
B19	-104.5	-103.5	-102.3
B20	-104.5	-103.5	-99.8
B25	-104.5	-102.5	-100.3
B26	-104.5	-104	-100.3[b]
B28	-104.5	-103.5	-100.8
B66	-103.5	-102.5	-102.3 [b]
B85	-104.5	-103.5	-102.3

a. Displayed limits derived from 3GPP TS 36.521-1 V16.20, Table 7.3EA-2 adjusted by +0.7 dB for measurement uncertainty.
b. Band not defined by 3GPP therefore no associated limit.

Test conditions per 3GPP TS 36.521-1 v13: Bandwidth: 5MHz on Reference Measurement Channel.

Table 2-10: GL7812 Conducted Rx Sensitivity — LTE Bands NB1/NB2 RX Sensitivity

LTE Bands	Typical Reference Sensitivity Level @ 95% of Maximum Throughput		
	@ +25°C (dBm)	@ Class A (dBm)	3GPP Limit (dBm)
B1	-112.5	-111	-107.5
B2	-113	-111.6	-107.5
B3	-113.5	-112	-107.5
B4	-112.5	-111.1	-107.5
B5	-113	-111.8	-107.5
B8	-112.5	-111.3	-107.5
B12	-112	-110.7	-107.5
B13	-112.5	-111.3	-107.5
B18	-113	-111.7	-107.5
B19	-113	-111.7	-107.5
B20	-112.5	-111.2	-107.5
B25	-112.5	-111.2	-107.5
B26	-113.3	-112	-107.5
B28	-112.5	-111.2	-107.5

Table 2-10: GL7812 Conducted Rx Sensitivity — LTE Bands NB1/NB2 RX Sensitivity (Continued)

LTE Bands	Typical Reference Sensitivity Level @ 95% of Maximum Throughput		
	@ +25°C (dBm)	@ Class A (dBm)	3GPP Limit (dBm)
B66	-112.5	-111	-107.5
B85	-113	-112	-107.5

2.4.2.3 Antenna Specifications

The antenna should fulfill the requirements listed in the table below.

The optimum operating frequency will depend on the application. An antenna that supports the LTE bands listed in Table 1-3 will work and should have the following characteristics.

Table 2-11: Antenna Specifications

Impedance		50Ω
VSWR	**Rx max**	1.5:1
	Tx max	1.5:1
Typical radiated gain		0dBi in one direction at least

Note: Both mechanical and electrical antenna adaptations are key issues in the design of the terminal.

It is strongly recommended to work with an antenna manufacturer to either develop an antenna adapted to the application or to adapt an existing solution to the application.

2.4.3 2G RF Interface

The GL7812 module is a GPRS-only device (no EGPRS support) supporting GSM multi-slot class 10—4 DL / 2UL max (5 slots).

2.4.3.1 Tx Output Power

The module's 2G maximum transmitter output power is specified in Table 2-12.

Table 2-12: GL7812 Conducted Tx Max Output Power Tolerances—2G[a,b]

RF Band	Min	Typ	Max	Units	Notes
GSM 850	31.5	32.5	33.5	dBm	GMSK mode (Class 4; 2 W, 33 dBm)
E-GSM 900	31.5	32.5	33.5	dBm	GMSK mode (Class 4; 2 W, 33 dBm)
DCS 1800	28.5	29.5	30.5	dBm	GMSK mode (Class 1; 1 W 30 dBm)
PCS 1900	28.5	29.5	30.5	dBm	GMSK mode (Class 1; 1 W 30 dBm)

a. Stated power tolerances satisfy 3GPP TS 51.010-1 requirements for normal (25°) and Class A (extreme conditions.
b. Stated power tolerances for input voltage of 6V.

2.4.3.2 Rx Sensitivity

The module's GPRS receiver sensitivity is specified in.Table 2-13.

Table 2-13: Typical Conducted Rx Sensitivity—GPRS Bands[a]

GPRS Bands	Parameters	Typical Reference Sensitivity Level @ 95% of Maximum Throughput		
		@ +25°C (dBm)	@ Class A (dBm)	Standard Limit (dBm)
GSM 850	10% BLER; GMSK CS1	-109.5	-107.5	-102
E-GSM 900	10% BLER; GMSK CS1	-109.5	-107.5	-102
DCS 1800	10% BLER; GMSK CS1	-111.5	-109.5	-102
PCS 1900	10% BLER; GMSK CS1	-111.5	-109.5	-102

a. Stated sensitivity values satisfy 3GPP TS 51.010-1 requirements for normal (25°C) and Class A (extreme) conditions.

2.5 GNSS

The GL7812 GNSS implementation supports GPS L1 and GLONASS G1 operation.

Note: The GNSS receiver and LTE/GSM receiver share the sme RF resources, therefore GNSS can only be used when the module is not actively connected on LTE/GSM. An example of a suitable implementation of GNSS in an end product would be the use of GNSS positioning for asset management applications where infrequent and no real-time position updates are required.

Table 2-14 describes the GNSS antenna specifications. Note that the GL7812 does not support an active GPS/GNSS antenna

Table 2-14: GNSS Antenna Specifications

Characteristics		Value	Unit
Frequency	GPS L1	1575.42 ± 20	MHz
	GLONASS G1	1589.0625-1605.275	MHz
RF Impedance (RF_GNSS pad)		50	Ω
VSWR max		2:1	-

2.5.1 GNSS Performance

summarizes the GL7812's module GNSS performance characteristics.

Table 2-15: GNSS Performance

Parameters	Conditions	Typical Value
Sensitivity	Cold Start	-145 dBm
	Hot Start	-151 dBm
	Tracking	-161 dBm
Time to First Fix (TTFF)	Cold start, Input power -130 dBm	39 s
	Hot start, Input power -130 dBm	1 s
2D Position Error	Input power -130 dBm	1.29 m

3: Using the GL7812

3.1 Getting Started

To set up, follow the procedures shown below.

1. Insert the SIM card into the SIM card socket. (Refer to Inserting the SIM Card and Extracting the SIM Card for more details on how to insert and extract the SIM card from the GL7812.)

2. Connect the antenna to the SMA RF connector.

3. Plug the power supply cable into the GL7812 and switch on the external power supply source.

3.1.1 Inserting the SIM Card

To insert the SIM card, follow the procedires shown below.

1. Prepare the SIM card in the correct position as shown in the figure.

2. Slide the SIM card into the SIM holder.

3. Use a tool to help push the SIM card into the SIM holder. Push the SIM card all the way in until you hear a clicking sound.

3.1.2 Extracting the SIM Card

To extract the SIM card, follow the procedures shown below.

1. Use a tool to further push the SIM card into the SIM holder. Push until you hear a clicking sound.

2. The SIM card should spring out a little bit after the clicking sound.

3. Extract the SIM card from the GL7812.

3.2 Operational Status

The modem's operational status is defined by an LED, which is located next to the SIM connector. Refer to Power LED for more information.

4: Communicating with the GL7812

After setting up the modem, communications can be established by directly sending AT commands to the device using terminal software such as HyperTerminal for MS Windows. The following sub-sections describe how this is done.

4.1 Communications Testing

To perform a communications test after the modem has been setup, do the following:

- Connect the RS232 link between the external application (DTE) and the modem (DCE).
- Configure the RS232 port of the DTE as follows:
  - Bits per second: 9,600bps
  - Data bits: 8
  - Parity: None
  - Stop bits: 1
  - Flow control: hardware
  - Using a communication software such as HyperTerminal, enter:
    AT↵
- When communications have been established, the modem will respond with an “OK”, which is displayed in the HyperTerminal window.

If communications cannot be established with the modem, do the following:

- Check the RS232 connection between the application (DTE) and the modem (DCE).
- Check the configuration of the port COM used on the DTE

4.2 Checking the PIN Code Status

To check if a pin code has been entered, do the following:

- Using a communication software such as HyperTerminal, enter the AT command AT+CPIN?
- Refer to the table below for the meaning of the AT command response.

Table 4-1: AT+CPIN Responses

AT+CPIN Responses	Description
+CPIN: READY	PIN Code has been entered
+CPIN: SIM PIN	PIN Code has not been entered

For more information about AT commands applicable to the GL7812, please refer to the HL78xx AT Commands Interface Guide.

4.3 Verifying the Receive Strength Signal

The modem establishes a call only if the received signal is sufficiently strong. To verify the received signal strength, do the following:

- Using a communication software such as HyperTerminal, enter the AT command **AT+CSQ**. The response returned has the following format:

  +CSQ: <rssi>,<ber> with:

  <rssi> = received signal strength indication

  <ber> = channel bit error rate
- Verify the <rssi> value returned using the table below.

Table 4-2: Received Signal Strength Values

Value of Received Signal Strength Indication (<rssi>)	Interpretation of the Received Signal Strength
0 – 10	Insufficient[a]
11 – 31	Sufficient[a]
32 – 98	Not defined
99	No measure available

a. Based on general observations.

For more information about AT commands applicable to the GL7812, please refer to the HL78xx AT Commands Interface Guide.

4.4 Verifying the Network Registration

To verify the modem's network registration, ensure that a valid SIM card has been inserted into the modem's SIM card holder (when using Embedded SIM, verify that the device has been registered by the network provider) and do the following:

- Using a communication software such as HyperTerminal, enter the following AT commands:

  AT+CPIN="xxxx" — to enter PIN code xxxx)

  AT+KSRAT? — to ascertain the radio access technology)

  AT+CREG? — to ascertain the registration status)

  AT+CEREG? — to ascertain the EPS network registration status)

  The response returned has the following format:

  +CREG: <mode>,<stat> where:

  <mode> = unsolicited registration message configuration

  <stat> = registration state
- Verify the state of registration according to the returned values given in the table below.

Table 4-3: Network Registration Values

Returned Values <mode>,<stat>	Network Registration
+CREG: 0,0	No (not registered)
+CREG: 0,1	Yes (registered, home network)
+CREG: 0,5	Yes (registered, roaming)

For more information about AT commands applicable to the GL7812 please refer to the HL78xx AT Commands Interface Guide.

If the modem is not registered on the network, perform the following procedures:
- Check the connection between the modem and the antenna.
- Verify the signal strength to determine the received signal strength (refer to Verifying the Receive Strength Signal for more information).

4.5 Main AT Commands for the GL7812

The table below lists the main AT commands required for starting the GL7812.

Table 4-4: Main AT Commands for the GL7812

Function	AT Commands	Response	Notes
Enter PIN code	AT+CPIN="xxxx" (xxxx = PIN code)	OK	PIN Code is accepted.
		+CME ERROR: 16	Incorrect PIN Code (with +CMEE = 1 mode)*
		+CME ERROR: 3	PIN code has already been entered (with +CMEE = 1 mode)*
Network registration checking	AT+CREG?	+CREG: 0,1	The modem is registered on the network.
		+CREG: 0,2	The modem is not registered on the network, registration is being attempted.
		+CREG: 0,0	The modem is not registered on the network, registration is not being attempted.
Store the parameters in EEPROM	AT&W	OK	The configuration settings are stored in non-volatile memory (EEPROM).

The command AT+CMEE=1 switches to a mode enabling more complete error diagnostics. For more information about AT commands applicable to the GL7812, please refer to the HL78xx AT Commands Interface Guide.

4.6 Echo Function

If no echo is displayed when entering an AT command, it could mean either of the following:

- The "local echo" parameter of your communication software such as HyperTerminal, is disabled.
- The modem's echo function is disabled.

To enable the modem's echo function, enter ATE1.

When sending AT commands to the modem through a communication software such as HyperTerminal, it is recommended to:

- Disable the "local echo" parameter of your communication software
- Enable the modem's echo function (ATE1 command)

In a machine-to-machine communication with the modem, it is recommended to disable the modem's echo function (ATE0 command) to avoid useless CPU processing.

For more information about AT commands applicable to the GL7812, please refer to the HL78xx AT Commands Interface Guide.

4.7 Last Gasp

The GL7812 has a last gasp feature that allows the module to send an SMS to the mobile phone when the said module is powered at a low voltage of 3.3V or turned off.

When GPIO2 and GPIO4 pulls high voltage from VBOOSTOUT, the voltage rises to 4V and VACP starts to discharge. When the module enters DH0 mode, GPIO does not work and disables the last gasp function.

Use the following AT commands to configure the last gasp feature.

Table 4-5: Last Gasp AT Commands for the GL7812

Function	AT Commands	Example
Set mobile phone number	AT+LASTGASPSMS	AT+LASTGASPSMS="phone number ","low voltage alert !!"
Set UDP server	AT+LASTGASPUDP	AT+LASTGASPUDP="flake.legato.io",6000,0,"low voltage alert !!"
Configure the master switch	AT+LASTGASP	AT+LASTGASP=1 *Note: Set this to 0 to turn off the module.*

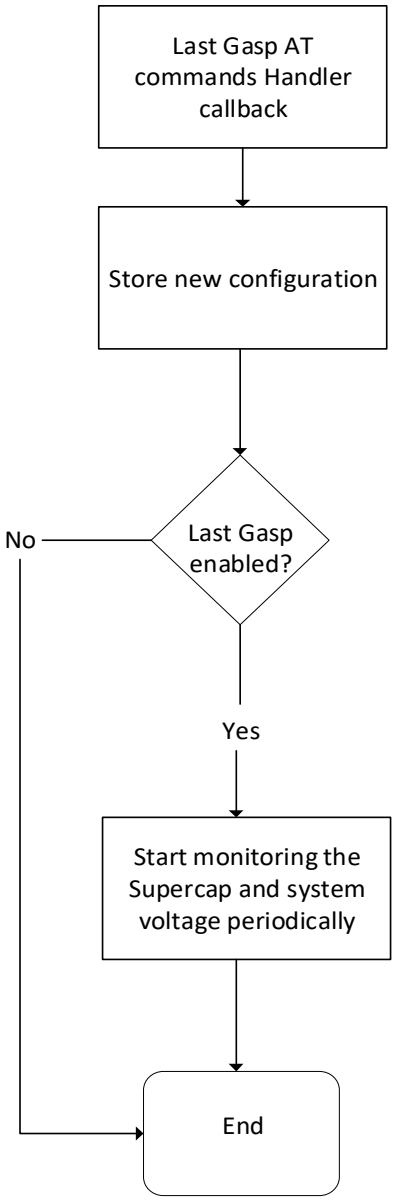


Figure 4-1: Last Gasp Feature

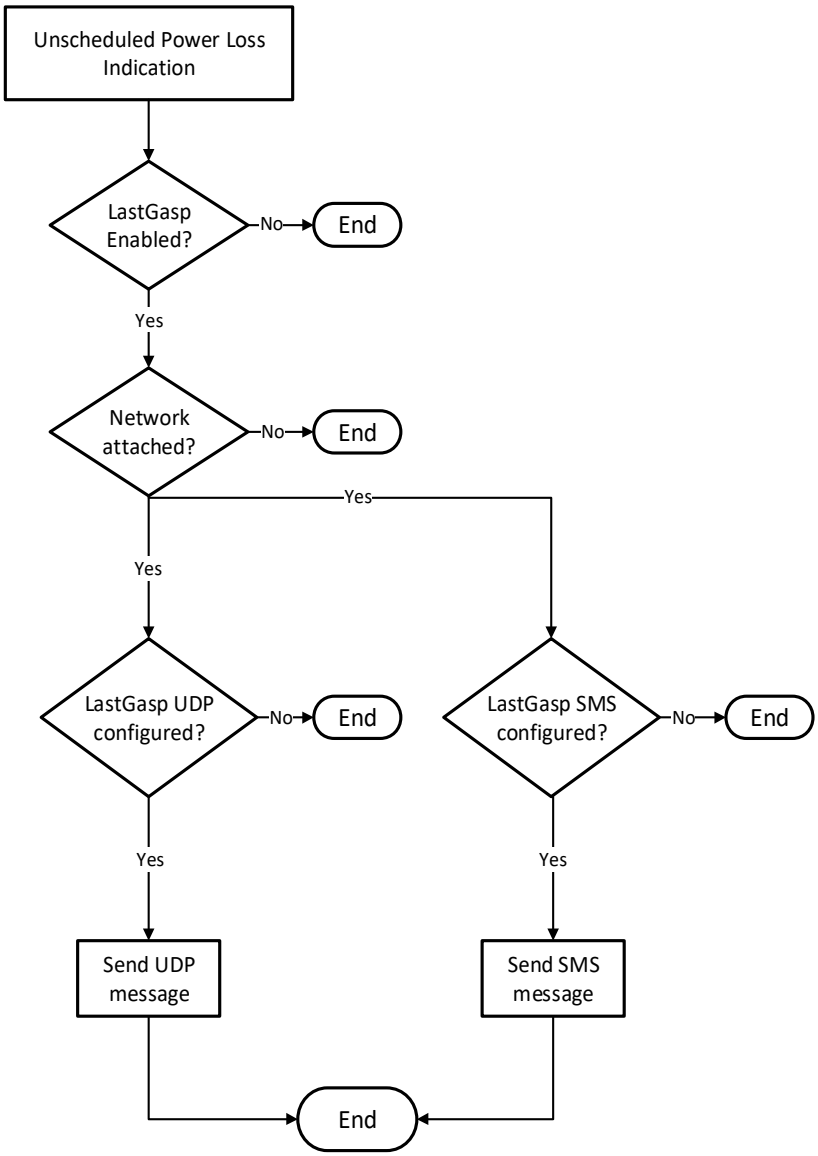


Figure 4-2: Last Gasp Feature—Power Loss Indication

When GL7812 VBAT voltage is lower than 3.3V, Last Gasp is enabled.

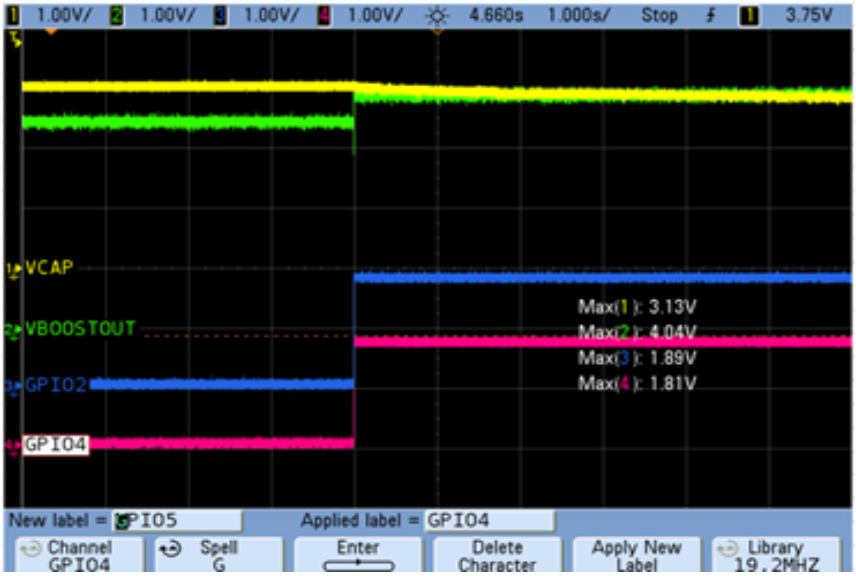


Figure 4-3: Last Gasp—Low Voltage

The module discharge time is 1.5 minutes due to VCAP is 3V.

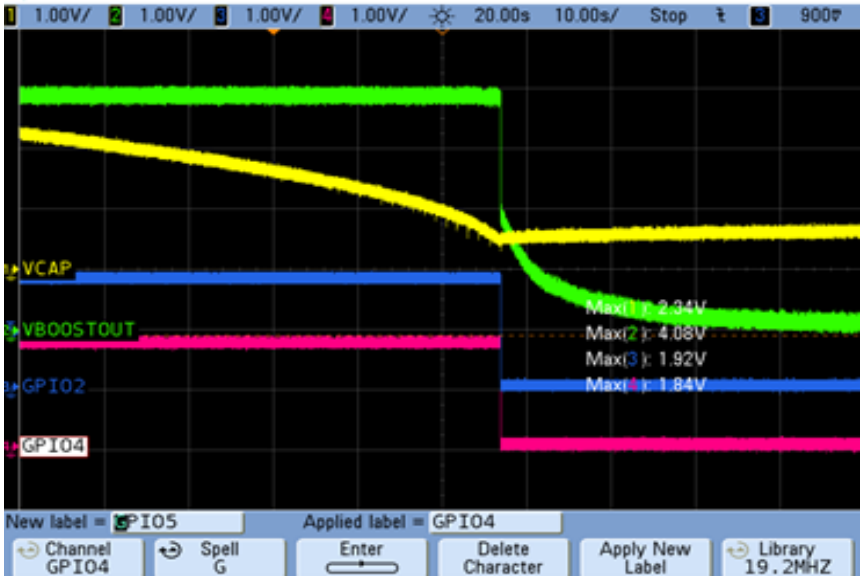


Figure 4-4: Last Gasp—VCAP

5: Troubleshooting

This section of the document describes possible problems that might be encountered when using the modem and their corresponding solutions.

To read about other troubleshooting information, refer to https://source.sierrawireless.com

5.1 No Communications through the Serial Link

If the modem does not answer to AT commands through the serial link, refer to the table below for possible causes and their corresponding solutions.

Table 5-1: Solutions for No Connection through the Serial Link

If the modem returns	Then ask	Action
Nothing	Is the modem powered correctly?	Make sure that the external power supply is connected to the modem and provides a voltage within the range of 6V to 24V.
	Is the serial cable connected at both sides?	Check the serial cable connection.
	Does the serial cable correctly follow the pin assignments as shown in section 8-pin Micro-Fit Connector?	Connect the cable by following the pin assignments as given in section 8-pin Micro-Fit Connector.
Nothing or non-significant characters	Is the communication program properly configured on the PC?	Ensure that the settings of the communication program are compatible with the settings of the modem. The modem's factory settings are: Data bits = 8 Parity = none Stop bits = 1 Baud = 9600 bps Flow control = hardware
	Is there another program interfering with the communication program (i.e. conflict on communication port access)?	Close the interfering program.

5.2 Receiving an “ERROR” Message

The modem returns an "ERROR" message (in reply to an AT command) in the following cases:

- The AT command syntax is incorrect. In this case, check the command syntax applicable to the HL78xx in the HL78xx AT Commands Interface Guide.
- The AT command syntax is correct, but was transmitted using the wrong parameters:
  - Enter the AT+CMEE=1 command to change the error report method to the verbose method, which includes the error codes.
  - Re-enter the AT command which previously caused the reception of an "ERROR" message to get the Mobile Equipment error code.

When the verbose error report method is enabled, the response of the modem in case of error is either:

- +CME ERROR: <error result code>
  or
- +CMS ERROR: <error result code>

For more information on error result code description and further details on the AT+CMEE command that are applicable to the HL78xx, please refer to the commands marked as supported by either the HL78xx in the HL78xx AT Commands Interface Guide.

Tip: *It is strongly recommended to always enable the verbose error report method to get the Mobile Equipment error code (enter the AT+CMEE=1 command).*

5.3 Receiving a “NO CARRIER” Message

If the modem returns a "NO CARRIER" message upon an attempted data call, refer to the table below for possible causes and their corresponding solutions.

Table 5-2: Solutions for Receiving a “NO CARRIER” Message

If the modem returns	Then ask	Action
“NO CARRIER”	Is the received signal strong enough?	Refer to Verifying the Receive Strength Signal to verify the strength of the received signal.
	Is the modem registered on the network?	Refer to Verifying the Network Registration to verify the network registration.
	Is the antenna properly connected?	Refer to Antenna Specifications for antenna requirements.
"NO CARRIER" (when trying to issue a data communication)	Is the SIM card configured for data/fax calls?	Configure the SIM card for data/fax calls. (Ask your network provider if necessary).
	Is the selected bearer type supported by the network?	Ensure that the selected bearer type is supported by the network. If still unsuccessful, try to attach to the network using the AT command: **AT+CGATT=1**

If the modem returns a "NO CARRIER" message, you may retrieve the extended error code by using the AT command AT+CEER. Refer to the table below for the interpretation of extended error codes.

Table 5-3: Extended Error Codes

Error Code	Diagnosis	Hint
1	Unallocated phone number	
16	Normal call clearing	
17	User busy	
18	No user responding	
19	User alerting, no answer	
21	Call rejected	
22	Number changed	
31	Normal, unspecified	
50	Requested facility not subscribed	Check your subscription. (Is data subscription available?)
68	ACM equal or greater than ACMmax	The credit of your pre-paid SIM card has expired.
252	Call barring on outgoing calls	
253	Call barring on incoming calls	
3, 6, 8, 29, 34, 38, 41, 42, 43, 44, 47, 49, 57, 58, 63, 65, 69, 70, 79, 254	Network causes	For more information about AT commands applicable to the GL7812, please refer to the commands marked as supported by HL78xx in the HL78xx AT Commands Interface Guide or check with your network provider.

5.4 Resetting the Modem

Resetting the modem could be triggered by the AT command AT+CFUN=1,1, or it could be done by simply unplugging and then re-plugging the power supply (DCIN).

Note: Resetting or shutting down the module must be done using AT commands except when there is an abrupt power outage.

6: Power Consumption

6.1 Consumption Measurement Procedure

This chapter describes the procedure for consumption measurement which is used to obtain the modem's consumption specifications.

The modem consumption specification values are measured for all operating modes available on this product. For more information about the different operating modes, refer to Operating Modes.

Consumption results are highly dependent on the hardware configuration used during measurement and the following chapter describes the hardware configuration settings that should be used to obtain optimum consumption measurements.

6.1.1 Hardware Configuration

The following hardware configuration includes both the measurement equipment and the modem.

6.1.1.1 Equipment

Three devices are used to perform consumption measurement:

- A communication tester
- A current measuring power supply
- A computer, to control the modem and to save measurement data

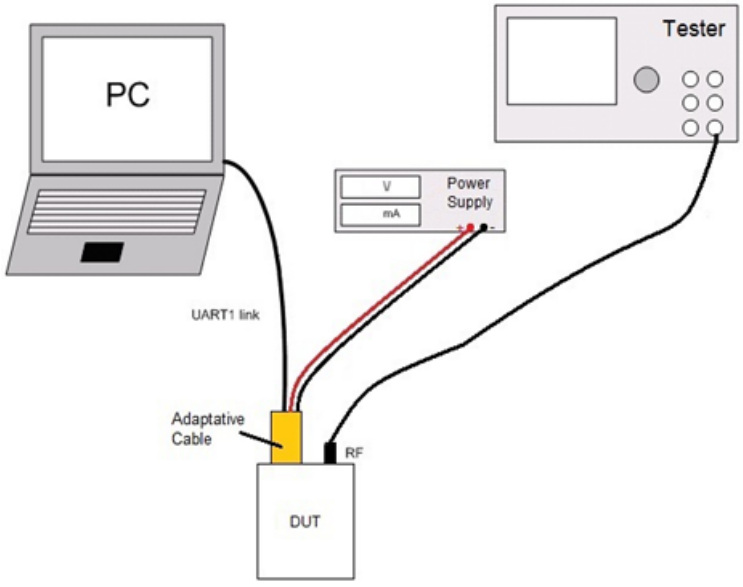


Figure 6-1: Typical Hardware Configuration

The communication tester is a CMW 500 from Rhode & Schwartz. This tester offers all required LTE network configurations and allows a wide range of network configurations to be set.

TheN6705C power supply can be used to supply the modem, and it could also be used to measure the total current drain by the device at 6V and 12V. The "current measuring power supply" is also connected and controlled by the computer (GPIB control not shown in the previous figure).

Note: A SIM is inserted during all consumption measurements.

The following table lists the recommended equipment to use for the consumption measurement.

Table 6-1: List of Recommended Equipment

Device	Manufacturer	Part Number	Notes/Description
Communication Tester	Rhode & Schwartz	CMW500	
Current measuring power supply	Keysight	N6705C	Used for DCIN

6.1.1.2 SIM Card

The SIM card’s voltage is supplied by the modem power supply. The SIM card should allow shut down or polling off. Consumption measurement results may vary depending on the SIM card.

6.1.2 Software Configuration

This section describes the modem settings and software configuration for the equipment used.

6.1.2.1 Modem Configuration

The software configuration is done by selecting the operating mode to use in performing the measurement. Refer to Operating Modes for more information.

Refer to the following list for the available operating modes on the modem:
- Active Mode
- Communication Mode
- Low Power Mode

6.1.2.2 Equipment Configuration

The communication tester is set according to the operating mode.

6.2 Operating Modes

Power consumption levels of the modem also vary depending on the operating mode used.

Refer to the table below for the different kinds of operating modes available.

Table 6-2: Operating Modes

Operating Mode	Description
Active Mode	Default mode. No functional restrictions.
Communication Mode	When the modem has a data connection with a live network.

6.2.1 Serial Port Shutdown Mode

Table 6-3: Low Power Mode Matrix

Low Power Mode	Wake Up Source
Sleep DRX Mode (UART off)	• DTR • DRX timer for DRX mode • SMS/IP data reception for DRX mode
eDRX Mode (UART off)	• DTR • eDRX timer for eDRX mode • SMS/IP data reception for eDRX mode

The modem could be configured to shut down the serial link interface while there is no traffic on the serial link channel using the following AT commands:

6.2.1.1 Enabling Serial Port Auto Shutdown Mode (when without UART signal)

AT+KGPIOCFG=7,0,2 //set GPIO7 as an output

AT+KGPIO=7,0 //set GPIO7 output low

6.2.1.2 Disabling Serial Port Shutdown Mode (when with UART signal)

AT+KGPIOCFG=7,0,2 //set GPIO7 as an output

AT+KGPIO=7,1 //set GPIO7 output high

For more information about AT commands applicable to the GL7812, please refer to the HL78xx AT Command Reference Guide.

The Serial Port Shutdown Mode will be immediately activated within 30 seconds after the AT command set. To wake the modem up from this mode, just simply send AT command to the modem.

6.3 Power Consumption Values

These consumption values were obtained by performing measurements on samples at a temperature of 25°C with the assumption of a 50Ω RF output.

Three DC inputs (DCIN) were used to measure the consumption: VinMIN (6V), VinTYP (12V) and VinMAX (24V). Both the average current and maximum current peaks were also measured.

Note that power consumption performance is also software related.

Table 6-4: GL7812 Connected Mode Current Consumption (Typical Values)

Parameter	Bands	Output Power	$I_{average}$			Unit
			Vin = 6V	Vin = 12V	Vin = 24V	
LTE Cat-M1 • Modem State: Connected • 4RB DL at MCS 14 1RB_UL at MCS 15 • Maximum 3 UL sub-frames and 3 DL sub-frames every 10 ms	1, 2, 3, 4, 5, 8, 12, 13, 18, 19, 20, 25, 26, 28, 66, 85	23 dBm	124.727-151.195	72.076-88.42	38.759-46.524	mA
		0 dBm	95.637-103.035	52.27-61.677	29.045-31.381	mA
NB1: UL peak throughput (62.5 kbps) UL Subcarrier spacing: 15 KHz Subcarriers uplink: 3 MCS TBS 13		23 dBm	95.842-107.033	51.395-57.871	28.304-32.812	mA
		0 dBm	71.852-75.696	39.382-42.373	21.935-23.799	mA
NB1 DL peak throughput (27.2 kbps) UL Subcarrier spacing: 15 KHz Subcarriers downlink: 12 MCS TBS: 13		23 dBm	83.27-89.593	44.894-49.211	25.189-27.461	mA
		0 dBm	72.026-81.391	39.836-44.069	23.372-26.033	mA
NB2: UL peak throughput (159 kbps) UL Subcarrier spacing: 15 KHz Subcarriers uplink: 3 MCS TBS 13		23 dBm	176.851-215.835	93.699-115.139	50.455-60.768	mA
		0 dBm	106.791-120.999	58.217-64.49	32.243-35.902	mA
NB2: DL peak throughput (134 kbps) UL Subcarrier spacing: 15 KHz Subcarriers downlink: 12 MCS TBS: 13		23 dBm	129.732-148.902	69.624-79.648	38.116-43.438	mA
		0 dBm	91.694-101.326	50.301-53.999	28.089-29.986	mA

Table 6-4: GL7812 Connected Mode Current Consumption (Typical Values) (Continued)

Parameter	Bands	Output Power	$I_{average}$			Unit
			Vin = 6V	Vin = 12V	Vin = 24V	
PCL5	850/900 MHz	32.5 dBm	227.17	105.985	57.01	mA
PCL19		5 dBm	92.18	45.095	25.075	mA
PCL0	1800/1900 MHz	29.5 dBm	155.747	75.81	40.155	mA
PCL15		0 dBm	81.7	43.345	23.94	mA

Table 6-5: Cat-M1 Low Power Mode Current Consumption (Typical Values)

Parameter		$I_{average}$			Unit
		Vin = 6V	Vin = 12V	Vin = 24V	
Active Mode	DRX independent	44	26	16	mA
Sleep Mode[a]	DRX 1.28	4	2.5	1.5	mA
	DRX 2.56	4	2.5	1.5	mA
Hibernate Mode[a]	PSM 1h cycle and T3324 = 20s[b]	970	550	380	µA
	Floor current during PSM dormant	790	450	320	µA
	eDRX 20.48s with PTW 1[c]	860	730	360	µA
	eDRX 81.92s with PTW 1[c]	790	490	340	µA
	Floor current during eDRX dormant	780	480	330	µA

Table 6-5: Cat-M1 Low Power Mode Current Consumption (Typical Values) (Continued)

Parameter		$I_{average}$			Unit
		Vin = 6V	Vin = 12V	Vin = 24V	
Lite Hibernate Mode[a]	PSM 1h cycle and T3324 = 20s[b]	1.8	1.05	0.67	mA
	Floor current during PSM dormant	1.6	0.95	0.62	mA
	eDRX 20.48s with PTW 1[c]	1.7	1	0.65	mA
	eDRX 81.92s with PTW 1[c]	1.64	0.97	0.63	mA
	Floor current during eDRX dormant	1.59	0.95	0.62	mA

a. Keep UART off.
b. Active timer (T3324) dependent.
c. PTW and DRX dependent.

Table 6-6: Cat-NB2 Low Power Mode Current Consumption (Typical Values)

Parameter		$I_{average}$			Unit
		Vin = 6V	Vin = 12V	Vin = 24V	
Active Mode	DRX independent	43	30	16	mA
Sleep Mode[a]	DRX 1.28	5	3.5	2.5	mA
	DRX 2.56	5	3.5	2.5	mA
Hibernate Mode[a]	PSM 1h cycle and T3324 = 20s[b]	860	500	350	µA
	Floor current during PSM dormant	750	445	320	µA
	eDRX 20.48s with PTW 1[c]	1.1	640	490	µA
	eDRX 81.92s with PTW 1[c]	890	520	360	µA
	Floor current during eDRX dormant	775	470	330	µA

Table 6-6: Cat-NB2 Low Power Mode Current Consumption (Typical Values) (Continued)

Parameter		$I_{average}$			Unit
		Vin = 6V	Vin = 12V	Vin = 24V	
Lite Hibernate Mode[a]	PSM 1h cycle and T3324 = 20s[b]	1.7	1	0.65	mA
	Floor current during PSM dormant	1.6	0.95	0.62	mA
	eDRX 20.48s with PTW 1[c]	1.88	1.1	0.74	mA
	eDRX 81.92s with PTW 1[c]	1.66	0.98	0.65	mA
	Floor current during eDRX dormant	1.65	0.93	0.62	mA

a. Keep UART off.
b. Active timer (T3324) dependent.
c. PTW and DRX dependent.

7: Reliability Specification

7.1 Functional / Performance Tests

Operating Condition: Powered

Test Temperature: Class A and Class B

7.2 Aging Tests

7.2.1 High Temperature Operating Life Test

Standard: IEC 60068-2-2, Test B: Dry heat

Test Temperature: 75°C

Operating Condition: 45 minutes Max TX / 15 minutes Idle

Duration: 40 days

7.2.2 Humidity Test

Standard: IEC 60068-2-78, Test Cab: Damp heat, steady state

Test Temperature: 65°C

Relative Humidity: 95%

Operating Condition: 15 minutes Idle / 15 minutes Off

Duration: 10 days

7.2.3 Thermal Shock Test

Standard: IEC 60068-2-14, Test N: Change of temperature

Test Temperature: -40°C to 85°C

Temperature Transition Time: < 30 seconds

Dwell Time: 10 minutes

Operating Condition: Un-powered

Duration: 300 cycles

7.3 Characterization Tests

7.3.1 Electrostatic Discharge Test

Standard: IEC 61000-4-2: Testing and measurement techniques - Electrostatic discharge immunity test

Operating Condition: Powered

Air Voltage: ±2kV, ±4kV, ±8kV

Contact Voltage: ±2kV, ±4kV, ±6kV

7.3.2 Low Temperature Cold Start Test

Standard: IEC 60068-2-1, Test A: Cold

Test Temperature: -40°C

Operating Condition: 30 minutes Off / 5 minutes Idle

Duration: 5 days

7.3.3 Mechanical Shock Test

Standard: IEC 60068-2-27, Test Ea and guidance: Shock

Waveform: Half sine

Peak Acceleration: 30 g

Shock Duration: 6 ms

Number of Shock: 3

Shock Direction: ±X, ±Y, ±Z

Operating Condition: Un-powered

7.3.4 Unprotected Free Fall Drop Test

Standard: IEC 60068-2-31, Test Ec: Rough handling shocks, primarily for equipment-type specimens

Number of Drops: 1 drop per direction (±X, ±Y, ±Z), 6 directions

Surface Type: Un-protected drops onto concrete

Drop Height: 1 meter

Operating Condition: Un-powered

8: Legal Information

8.1 Important Information for Users in Canada and the United States

Note: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

This device contains licence-exempt transmitter(s)/receiver(s) that comply with Innovation, Science and Economic Development Canada's licence-exempt RSS(s). Operation is subject to the following two conditions:

1. This device may not cause interference.
2. This device must accept any interference, including interference that may cause undesired operation of the device.

L'émetteur/récepteur exempt de licence contenu dans le présent appareil est conforme aux CNR d'Innovation, Sciences et Développement économique 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;
2. L'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

Warning: *This product is only to be installed by qualified personnel.*

Warning: *Changes or modifications to this device not expressly approved by Sierra Wireless could void the user's authority to operate the device.*

This device can operate in collocation with cellular radios not exceeding the specifications in the following table:

Table 8-1: Collocated Devices—Antenna Gain and Radio Transmitter Specifications

Technology	Band	Frequency (MHz)	Maximum antenna gain (dBi)	
			Standalone	Collocated
LTE	B2	1850–1910	6	6
	B4	1710–1755	5.5	5.5
	B5	824-829	6	4
	B8	897.5-900.5	6	4
	B12	699-716	6	4
	B13	777-787	6	4
	B25	1850-1915	6	6
	B26	814-849	6	4
	B66	1710-1780	5.5	5.5
	B85	698-716	6	4
GPRS	GPRS G850	824-849	3	1
	GPRS G1900	1850-1910	2	2

8.1.1 Regulatory IDs

8.1.1.1 For GL7812

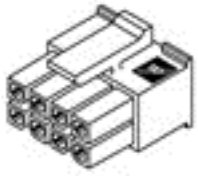
- **FCC: N7NHL78C**
- **IC: 2417C-HL78C**

9: Other Guidelines

9.1 Mating Connector

The recommended mating connector to use with the 8-pin Micro-Fit Connector is described in the table below.

Table 9-1: Recommended Mating Connector for the Micro-Fit Connector

Supplier	Description	Vendor Part Number	Sample
Molex	3.0mm Pitch Micro-Fit 3.0™ Receptacle Housing, Dual row, 8 Circuits	430250800	

9.2 Mechanical Constraints

9.2.1 Micro-Fit Connector

The following table lists the mechanical constraints that must be considered when using the 8-pin Micro-Fit connector.

Table 9-2: Micro-Fit Connector Mechanical Constraints

Description	Mechanical Limit	Notes
Connector Mate and Unmate Forces	MINIMUM withdrawal force: 3.7N (0.8lbf)	This is the least amount of force needed to unplug the cable from the 8-pin Micro-Fit connector.
	MAXIMUM insertion force: 8.0N (1.8lbf)	This is the maximum amount of force that should be used when inserting a male connector into the 8-pin Micro-Fit connector. Using force greater than this might damage the Micro-Fit connector.
Terminal Retention Force (in housing)	MINIMUM retention force: 24.5N (5.5lbf)	This is the least amount of force needed to keep the power supply cable connected to the 8-pin Micro-Fit connector.
Terminal Insertion Force (into housing)	MAXIMUM insertion force: 14.7N (3.3lbf)	This is the maximum amount of force that should be used when pushing in the power supply cable into the 8-pin Micro-Fit connector. Using force greater than this might damage the Micro-Fit connector.

9.3 Protections

9.3.1 Power Supply

Sierra Wireless recommends having a 1000mA/250V slow break fuse bonded to the power supply cable which can protect the modem's internal electronic components from over-current consumption.

9.3.2 Electrostatic Discharge

The modem withstands ESD according to IEC 1000-4-2 requirements for all accessible parts of the modem except the RF part, which only protects:

- ±8kV of air discharge
- ±4kV of contact discharge

9.3.3 Miscellaneous

The modem is guaranteed to have filtering for:

- EMI/RFI protection on both the input and the output
- Signal smoothing

9.4 Upgrade Guidelines

9.4.1 Operating System Upgrade

The modem’s operating system is stored in flash memory and can be easily upgraded.

The operating system file can be downloaded into the modem via the RS232.

Listed below are the serial signals required to proceed the firmware upgrading:
- TXD
- RXD
- RTS
- CTS
- GND

The operating system file can also be downloaded onto the modem using the DOTA (download over the air) feature. For more information about AT commands applicable to the GL7812, please refer to the HL78xx AT Command Reference Guide.

9.4.2 Firmware Upgrade

The firmware upgrade procedure is used to update the firmware embedded in the modem.

This procedure consists of downloading the firmware into internal memories through the RS232 serial link available on the Micro-fit 8-pin connector.

9.5 Cable and Accessories

9.5.1 Adaptive Cable

The adaptive cable provides a serial interface and is used as the power source of the GL7812. It has three edges/plugs.

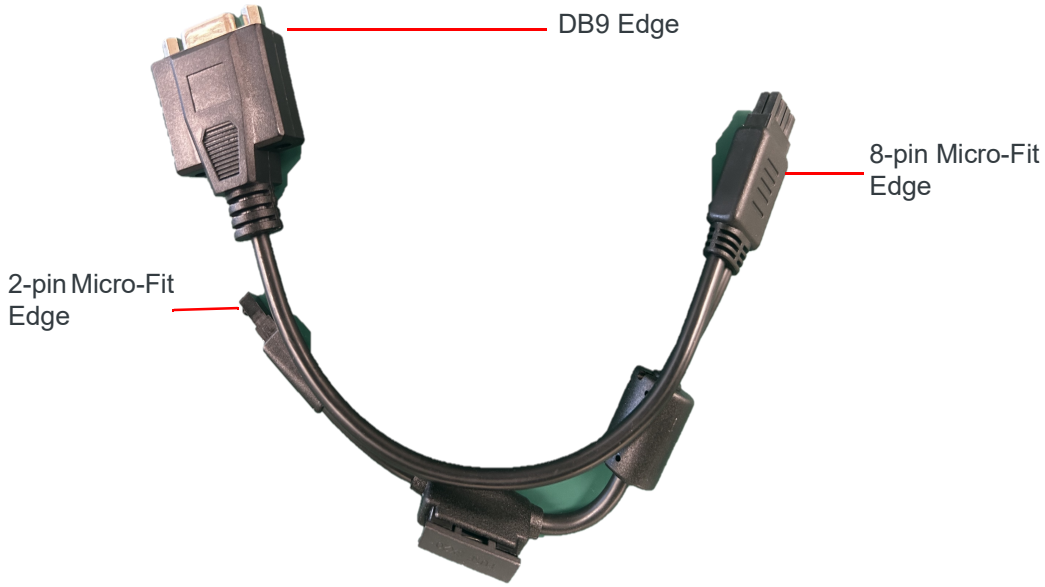


Figure 9-1: Adaptive cable for GL7812

9.5.2 8-pin Micro-Fit Edge

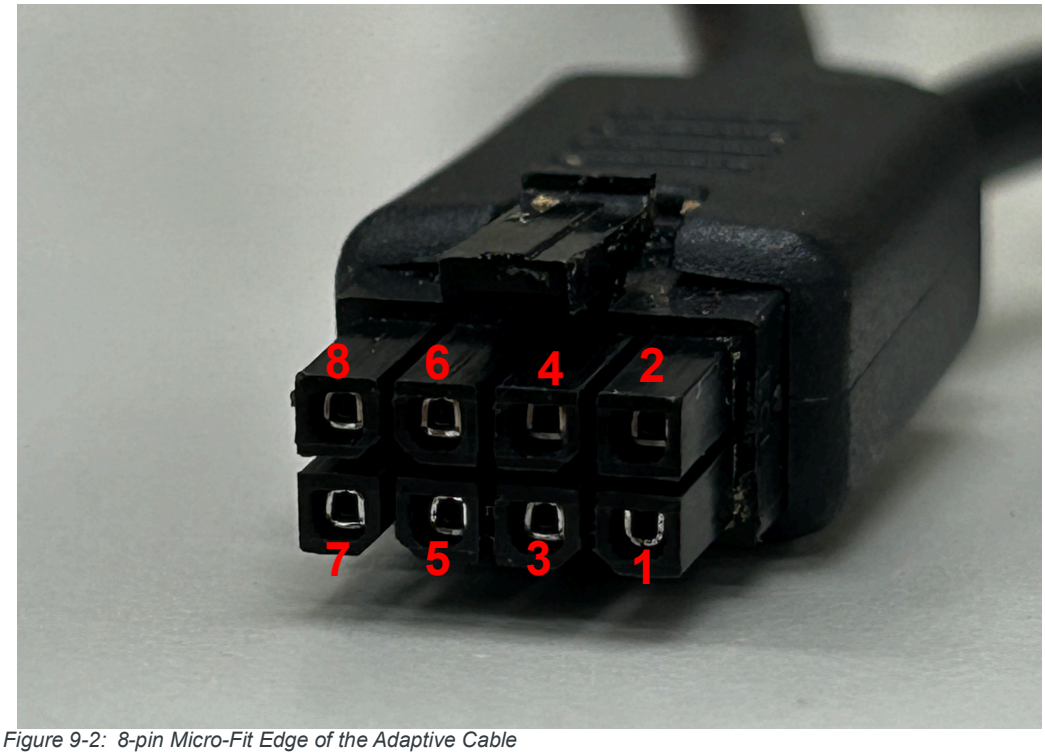


Figure 9-2: 8-pin Micro-Fit Edge of the Adaptive Cable

Refer to the following table for the pin description of the 8-pin Micro-Fit Edge of the Adaptive cable.

Table 9-3: 8-pin Micro-Fit Pin Description of the Adaptive Cable

Pin Number	Signal	Description
1	RS232-CTS	Main RS232 Clear To Send
2	RS232-RTS	Main RS232 Request To Send
3	RS232-RXD	Main RS232 Receive Serial Data
4	RS232-TXD	Main RS232 Transmit Serial Data
5	RS232-DTR	Main RS232 Data Terminal Ready
6	GND	Ground Connection
7	Vin	Power Supply with a 6-24V DC input
8	GND	Ground Connection

Refer to 8-pin Micro-Fit Connector for more information about the pin assignments and description.

9.5.3 DB9 Edge

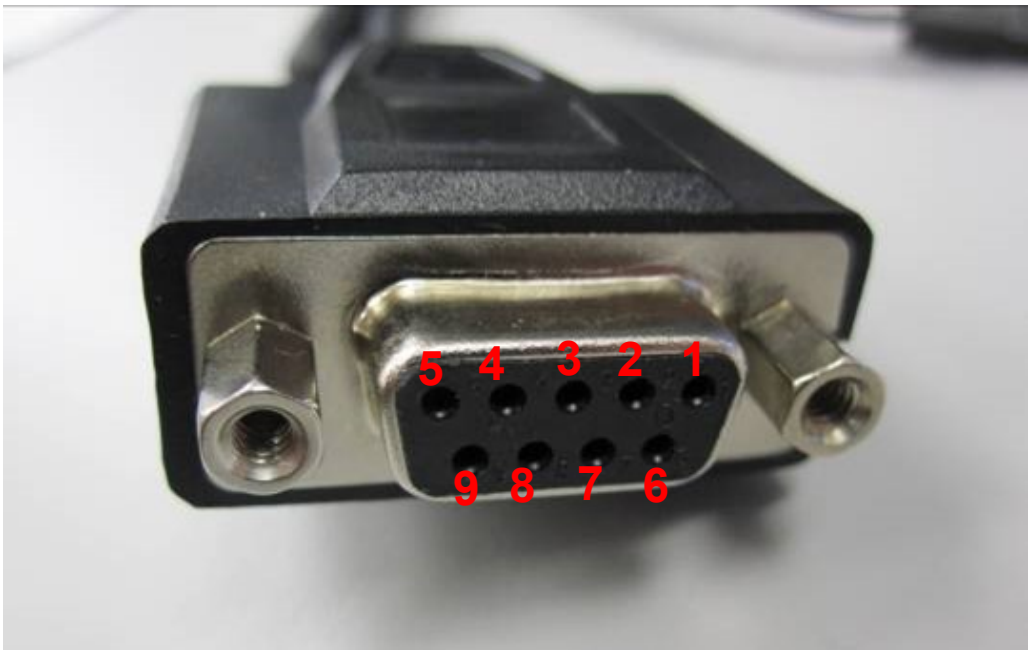


Figure 9-3: DB9 Edge of the Adaptation Cable

Refer to the following table for the pin description of the DB9 Edge of the Adaptation cable.

Table 9-4: DB9 Connector Pin Description

Pin Number	Signal	Description
1	Not Connected	
2	RS232 – RXD	Output Data to DTE
3	RS232 – TXD	Input Date from DTE
4	RS232 – DTR	Input Signal from DTE
5	GND	Ground Connection
6	Not Connected	
7	RS232 – RTS	Flow Control Signal from DTE
8	RS232 – CTS	Flow Control Signal to DTE
9	Not Connected	

9.5.4 2-pin Micro-Fit Edge

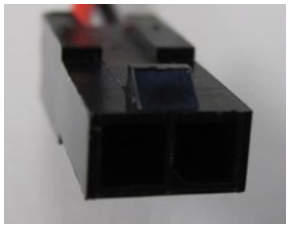


Figure 9-4: 2-pin Micro-Fit Edge of the Adaptive Cable

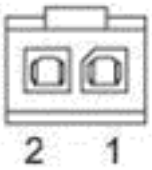


Figure 9-5: Pin Assignment of the 2-pin Micro-Fit Edge

Refer to the following table for the pin description of the 2-pin Micro-Fit Edge of the Adaptive cable.

Table 9-5: 2-pin Micro-Fit Connector Pin Description

Pin Number	Signal	Description
1	GND	Ground Connection
2	Vin	6V to 24V

9.5.5 DC Cable

This cable supplies the power source for the GL7812, and is used with the Adaptive cable.

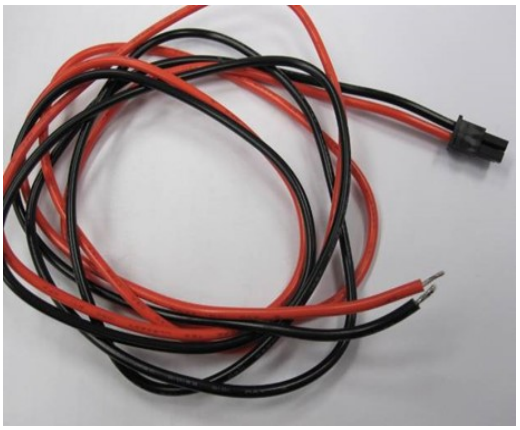


Figure 9-6: DC Cable

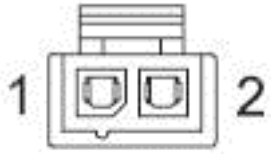


Figure 9-7: Pin Assignment of the DC cable

Table 9-6: DC Cable Pin Description

Pin Number	Signal	Description
1	GND	Black color
2	Vin	Red color

A: Appendix

A.1 List of References

- HL78xx Product Technical Specification
  Reference: 41114133
- HL78xx AT Commands Reference Guide
  Reference: 41111821
- ISO 7816-3 Standard

A.2 List of Abbreviations

Abbreviation	Definition
AC	Alternative Current
ADC	Analog to Digital Converter
A/D	Analog to Digital conversion
AF	Audio-Frequency
AT	Attention (prefix for modem commands)
AUX	Auxiliary
CAN	Controller Area Network
CB	Cell Broadcast
CEP	Circular Error Probable
CLK	Clock
CMOS	Complementary Metal Oxide Semiconductor
CS	Coding Scheme
CTS	Clear To Send
DAC	Digital to Analogue Converter
dB	Decibel
DC	Direct Current
DCD	Data Carrier Detect
DCE	Data Communication Equipment
DCS	Digital Cellular System
DR	Dynamic Range
DSR	Data Set Ready
DTE	Data Terminal Equipment
DTR	Data Terminal Ready
EFR	Enhanced Full Rate
E-GSM	Extended GSM
EMC	Electromagnetic Compatibility
EMI	Electromagnetic Interference
EMS	Enhanced Message Service
EN	Enable
ESD	Electrostatic Discharges

Abbreviation	Definition
FIFO	First In First Out
FR	Full Rate
FTA	Full Type Approval
GND	Ground
GPI	General Purpose Input
GPC	General Purpose Connector
GPIO	General Purpose Input Output
GPO	General Purpose Output
GPRS	General Packet Radio Service
GPS	Global Positioning System
GSM	Global System for Mobile communications
HR	Half Rate
I/O	Input / Output
JTAG	Joint Test Action Group
LED	Light Emitting Diode
LNA	Low Noise Amplifier
LTE	Long-Term Evolution
MAX	Maximum
MIC	Microphone
MIN	Minimum
MMS	Multimedia Message Service
MO	Mobile Originated
MT	Mobile Terminated
na	Not Applicable
NF	Noise Factor
NMEA	National Marine Electronics Association
NOM	Nominal
NTC	Negative Temperature Coefficient
OTA	Over the air
PA	Power Amplifier
Pa	Pascal (for speaker sound pressure measurements)
PBCCH	Packet Broadcast Control Channel

Abbreviation	Definition
PC	Personal Computer
PCB	Printed Circuit Board
PDA	Personal Digital Assistant
PFM	Power Frequency Modulation
PSM	Phase Shift Modulation
PWM	Pulse Width Modulation
RAM	Random Access Memory
RF	Radio Frequency
RFI	Radio Frequency Interference
RHCP	Right Hand Circular Polarization
RI	Ring Indicator
RST	Reset
RTC	Real Time Clock
RTCM	Radio Technical Commission for Maritime services
RTS	Request To Send
RX	Receive
SCL	Serial Clock
SDA	Serial Data
SIM	Subscriber Identification Module
SMS	Short Message Service
SPI	Serial Peripheral Interface
SPL	Sound Pressure Level
SPK	Speaker
SW	Software
PSRAM	Pseudo Static RAM
TBC	To Be Confirmed
TBD	To Be Determined
TDMA	Time Division Multiple Access
TP	Test Point
TVS	Transient Voltage Suppressor
TX	Transmit
TYP	Typical

Abbreviation	Definition
UART	Universal Asynchronous Receiver-Transmitter
UMTS	Universal Mobile Telecommunications System
USB	Universal Serial Bus
USSD	Unstructured Supplementary Services Data
VSWR	Voltage Standing Wave Ratio
WCDMA	Wideband Code Division Multiple Access

A.3 Safety Recommendations (for information only)

For the efficient and safe operation of your wireless device, please read the following information carefully.

A.3.1 RF Safety

A.3.1.1 General

Your wireless terminal is based on the 3GPP standard for cellular technology. The standard is spread all over the world. It covers Europe, Asia and some parts of America and Africa. This is the most used telecommunication standard.

Your wireless terminal is actually a low power radio transmitter and receiver. It sends out and receives radio frequency energy. When you use your wireless application, the cellular system which handles your calls controls both the radio frequency and the power level of your cellular modem.

A.3.1.2 Efficient Terminal Operation

For your wireless terminal to operate at the lowest power level, consistent with satisfactory call quality:

If your terminal has an extendible antenna, extend it fully. Some models allow you to place a call with the antenna retracted. However, your wireless terminal operates more efficiently with the antenna fully extended.

Do not hold the antenna when the terminal is " IN USE ". Holding the antenna affects call quality and may cause the modem to operate at a higher power level than needed.

A.3.1.3 Antenna Care and Replacement

Do not use the wireless terminal with a damaged antenna. If a damaged antenna comes into contact with the skin, a minor burn may result. Replace a damaged antenna immediately. Consult your manual to see if you may change the antenna yourself. If so, use only a manufacturer-approved antenna. Otherwise, have your antenna repaired by a qualified technician.

Use only the supplied or approved antenna. Unauthorized antennas, modifications or attachments could damage the terminal and may contravene local RF emission regulations or invalidate type approval.

A.4 General Safety

A.4.1 Driving

Check the laws and the regulations regarding the use of cellular devices in the area where you have to drive as you always have to comply with them. When using your wireless terminal while driving, please:

- give full attention to driving,
- pull off the road and park before making or answering a call if driving conditions so require.

A.4.2 Electronic Devices

Most electronic equipment, for example in hospitals and motor vehicles is shielded from RF energy. However, RF energy may affect some improperly shielded electronic equipment.

A.4.3 Vehicle Electronic Equipment

Check your vehicle manufacturer representative to determine if any on-board electronic equipment is adequately shielded from RF energy.

A.4.4 Medical Electronic Equipment

Consult the manufacturer of any personal medical devices (such as pacemakers, hearing aids, etc.) to determine if they are adequately shielded from external RF energy.

Turn your terminal OFF in health care facilities when any regulations posted in the area instruct you to do so. Hospitals or health care facilities may be using RF monitoring equipment.

A.4.5 Aircraft

Turn your terminal OFF before boarding any aircraft.

- Use it on the ground only with crew permission
- Do not use it in the air

To prevent possible interference with aircraft systems, Federal Aviation Administration (FAA) regulations require you to have permission from a crew member to use your terminal while the aircraft is on the ground. To prevent interference with cellular systems, local RF regulations prohibit using your modem while airborne.

A.4.6 Children

Do not allow children to play with your wireless terminal. It is not a toy. Children could hurt themselves or others (by poking themselves or others in the eye with the antenna, for example). Children could damage the modem, or make calls that increase your modem bills.

A.4.7 Blasting Areas

To avoid interfering with blasting operations, turn your unit OFF when in a « blasting area » or in areas posted: « turn off two-way radio ». Construction crew often use remote control RF devices to set off explosives.

A.4.8 Potentially Explosive Atmospheres

Turn your terminal OFF when in any area with a potentially explosive atmosphere. It is rare, but your modem or its accessories could generate sparks. Sparks in such areas could cause an explosion or fire resulting in bodily injuries or even death.

Areas with a potentially explosive atmosphere are often, but not always, clearly marked. They include fuelling areas such as petrol stations; below decks on boats; fuel or chemical transfer or storage facilities; and areas where the air contains chemicals or particles, such as grain, dust, or metal powders.

Do not transport or store flammable gas, liquid, or explosives, in the compartment of your vehicle which contains your terminal or accessories.

Before using your terminal in a vehicle powered by liquefied petroleum gas (such as propane or butane) ensure that the vehicle complies with the relevant fire and safety regulations of the country in which the vehicle is to be used.

Warning: *The device should not be in durable use within 20 cm of the human body*

A.5 Packaging

The normal delivery package content of the GL7812 consists of 50 pcs per box.

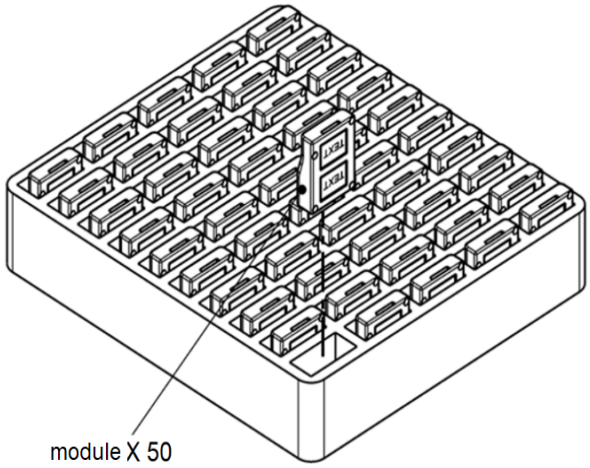


Figure 1-1: Packaging Contents

A.6 Product Labeling

Two product labels are available at the back of the GL7812.

A.6.1 Model Label

The Model label provides the following information:
- GL7812
- Serial number bar code and serial number
- FCC, IC, CE, RCM logo
- WEEE symbol

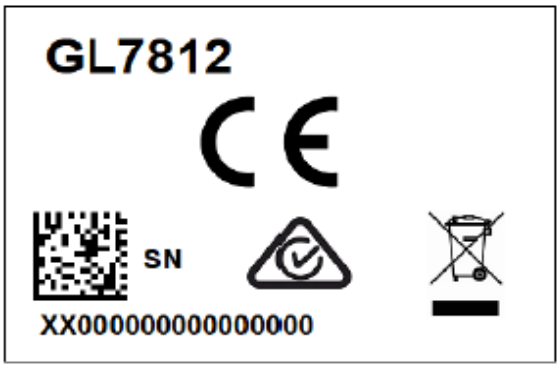


Figure A-2: Sample Model Label

A.6.2 IMEI Label

The IMEI label provides the following information:
- IMEI bar code, IMEI number
- Year of manufacture
- Sierra Wireless
- Factory location
- Operator name

Figure A-3: Sample IMEI Label