

HCP - LC RS232 Leon G100 datasheet



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1. Introduction

This document describes the hardware of HCP LC RS232 with Leon G100 GSM/GPRS module, with interface specifications, electrical and mechanical characteristics.

HCP LC RS232 is intended to use in variety of M2M applications, such as POS systems, parking meters, energy meters, vending machines etc.

1.1 Related documents

- [1] LEON-G100-G200 datasheet
- [2] LEON-G100-G200 AT Commands Manual

1.2 Terms and Abbreviations

Abbreviation	Description
ADC	Analog-to-Digital Converter
ARP	Antenna Reference Point
ASIC	Application Specific Integrated Circuit
ATC	AT Cellular
BTS	Base Transceiver Station
CB	Cell Broadcast
CODEC	Coder-Decoder
CPU	Central Processing Unit
DCE	Data Circuit terminating Equipment
DSP	Digital Signal Processor
DSR	Data Set Ready
DTR	Data Terminal Ready
EFR	Enhanced Full Rate
EGSM	Enhanced GSM
EMC	Electromagnetic Compatibility
ESD	Electrostatic Discharge
ETS	European Telecommunication Standard
FDMA	Frequency Division Multiple Access
FR	Full rate
G.C.F.	GSM Conformity Forum
GSM	Global Standard for Mobile Communication
HF	Hands-free
HR	Half rate
HW	Hardware
IC	Integrated Circuit
IF	Intermediate Frequency
IMEI	International Mobile Equipment Identifier
I/O	Input/ Output
IGT	Ignition
ISO	International Standards Organization
ITU	International Telecommunications Union
kbps	kbits per second
Li-Ion	Lithium-Ion
LVD	Low voltage Directive
Mbps	Mbits per second
MMI	Machine Machine Interface
MO	Mobile Originated
MS	Mobile Station
MT	Mobile Terminated
NC	Not Connected
NTC	Negative Temperature Coefficient
PA	Power Amplifier
PCB	Printed Circuit Board
PCM	Pulse Code Modulation
PCS	Personal Communication System










Abbreviation	Description
PDU	Protocol Data Unit
R&TTE	Radio and Telecommunication Terminal Equipment
RAM	Random Access Memory
RF	Radio frequency
RI	Ring Indication
ROM	Read Only Memory
RX	Receive direction
SIM	Subscriber Identification Module
SMS	Short Message Service
SRAM	Static Random Access Memory
SW	Software
TDD	Time Division Duplex
TDMA	Time Division Multiple Access
TX	Transmit direction
UART	Universal Asynchronous Receiver and Transmitter
VAD	Voice Activity Detection
ZIF	Zero Insertion Force

Table 1. Terms and Abbreviations

1.3 Safety Precautions

Safety precautions must be observed during all phases of the operation, usage, service or repair of any cellular terminal from HCP d.o.o.

Failure to comply with these precautions violates safety standards of design, manufacture and intended use of the product. HCP d.o.o assumes no liability for customer's failure to comply with these precautions.

	<p>When in hospitals or other health care facilities, observe the restrictions on the use of mobiles. Switch off the cellular terminal or mobile if to be instructed to do so by the guidelines posted in sensitive areas. Medical equipment may be sensitive to RF energy.</p> <p>The operation of cardiac pacemakers, other implanted medical equipment and hearing aids can be affected by interference from cellular terminals or mobiles placed close to the device. If in doubt about potential danger, contact the physician or the manufacturer of the device to verify that the equipment is properly shielded.</p> <p>Pacemaker patients are advised to keep their hand-held mobile away from the pacemaker, while it is on. This personal subgroup always should check the distance to the mobile</p>
	<p>Switch off the cellular terminal or mobile before boarding an aircraft. Make sure it cannot be switched on inadvertently. The operation of wireless appliances in an aircraft is forbidden to prevent interference with communications systems. Failure to observe these instructions may lead to the suspension or denial of cellular services to the offender, legal action, or both. Check the local and actual laws about these themes.</p>
	<p>Do not operate the cellular terminal or mobile in the presence of flammable gases or fumes. Switch off the cellular terminal when you are near petrol stations, fuel depots, chemical plants or where blasting operations are in progress. Operation of any electrical equipment in potentially explosive atmospheres can constitute a safety hazard.</p>
	<p>Your cellular terminal or mobile receives and transmits radio frequency energy while switched on. Remember that interference can occur if it is used close to TV sets, radios, computers or inadequately shielded equipment. Follow any special regulations and always switch off the cellular terminal or mobile wherever forbidden, or when you suspect that it may cause interference or danger.</p>
	<p>Road safety comes first! Do not use a hand-held cellular terminal or mobile while driving a vehicle unless it is securely mounted in a holder for speakerphone operation. Before making a call with a hand-held terminal or mobile park the vehicle. Speakerphones must be installed by qualified personnel. Faulty installation or operation can constitute a safety hazard. Check the actual and local laws about these themes.</p>
 	<p>IMPORTANT!</p> <p>Cellular terminals or mobiles operate using radio signals and cellular networks. In that case connections cannot be guaranteed at all times under all conditions. Therefore, you should never rely solely upon any wireless device for essential communications, for example emergency calls. Remember, in order to make calls or receive calls the cellular terminal or mobile must be switched on in a service area with adequate cellular signal strength.</p> <p>Some networks do not allow for emergency calls if certain network services or phone features are in use (e.g. lock functions, fixed dialing etc.). You may need to deactivate those features before you can make an emergency call.</p> <p>Some networks require a valid SIM card to be properly inserted in the cellular terminal or mobile.</p>
	<p>If a power supply unit is used to supply the device it must meet the demands placed on SELV circuits in accordance with EN60950. The maximum permissible connection length between the device and the supply source should not exceed 3m.</p>
	<p>According to the guidelines for human exposure to radio frequency energy, an antenna connected to the FME jack of the device should be placed at least 20cm away from human bodies.</p>

2. Packaging

The complete package content of the HCP LC RS232 (Leon G100) terminal consist of:

- LC RS232 terminal
- Two holding bridles
- Package box

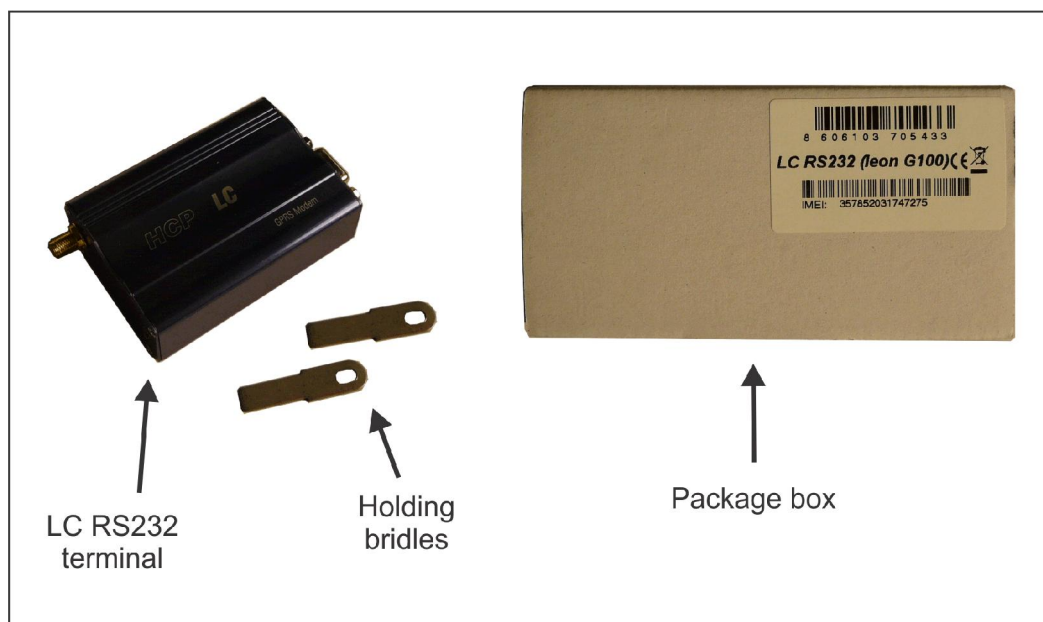


Figure 1. Package contents

Packaging box is a carton box with following dimensions:

- width: 128 mm
- height: 66 mm
- length: 158 mm

3. Product Concept

Key Features of GSM/GPRS module Leon G100

Feature	Implementation
General	
Incorporates Ublox Leon G100 module	The Leon G100 module handles all processing of data within the HCP LC RS232 device.
Frequency bands	Quad band: GSM 850/900/1800/1900MHz
Output power	Power Class 4 (33 dBm nominal maximum output power) for GSM/EGSM bands Power Class 1 (30 dBm nominal maximum output power) for DCS/PCS bands
Power supply	Single supply voltage 8V to 30V DC
Ambient operating temperature	Normal operation: -30°C to +70°C
Housing color	BLUE
RoHS	All hardware components fully compliant with EU RoHS Directive
Certification and approvals for Leon G100 module	R&TTE, CE, GCF, PTCRB, FCC, IC, NCC, ICASA, A-Tick, AT&T, Rogers, Orange
GSM/GPRS features	
Data transfer	<p>GPRS:</p> <ul style="list-style-type: none"> - Class 10 - Mobile Station Class B - GPRS coding schemes from CS1 to CS4 - 85.6 kb/s (max.), 53.6 kb/s (typ.) in down-link; 42.8 kb/s (max.), 26.8 kb/s (typ.) in up-link - USSD <p>GSM:</p> <ul style="list-style-type: none"> - 3GPP release 99 - PBCCH support <p>CSD:</p> <ul style="list-style-type: none"> - GSM max 9.6 kb/s - <p>Full-feature Release 99 GSM-GPRS protocol stack</p>
SMS	<ul style="list-style-type: none"> - MT/MO - PDU/Text mode - Reception of SMS via GSM or GPRS - SMS storage (customizable & configurable) provided
Fax	Group 3; Class 2.0

Feature	Implementation
Software	
Protocols	Embedded TCP/IP, UDP/IP, HTTP/FTP
Network	Jamming detection
AT commands	3GPP 27.005, 3GPP 27.007, u-blox proprietary AT command 3GPP 27.010 MUX protocol
SIM Application Toolkit	supported
Firmware update	Via UART – serial interface (Xmodem protocol)
Watchdog	Integrated hardware watchdog circuit on board
Interfaces	
Serial interface	RS232 interface
SIM interface	Supported SIM cards: 3V, 1.8V
GSM Antenna	SMA antenna connector
On LED	LED for signaling device power supply status

Table 2. Key feature of GSM/GPRS Leon G100 module

Please refer to [1] for full list of features of Leon G100 modul.

4. Interface Description

4.1 Overview

HCP LC RS232 terminal provides following connectors for power supply, communication, SIM card and antenna interface.

- 9-pole (female) SUB-D plug for RS-232 serial interface
- SMA antenna connector for GSM/GPRS
- RJ11 connector for power supply
- Status LED for power supply status
- SIM card interface (push-push type)

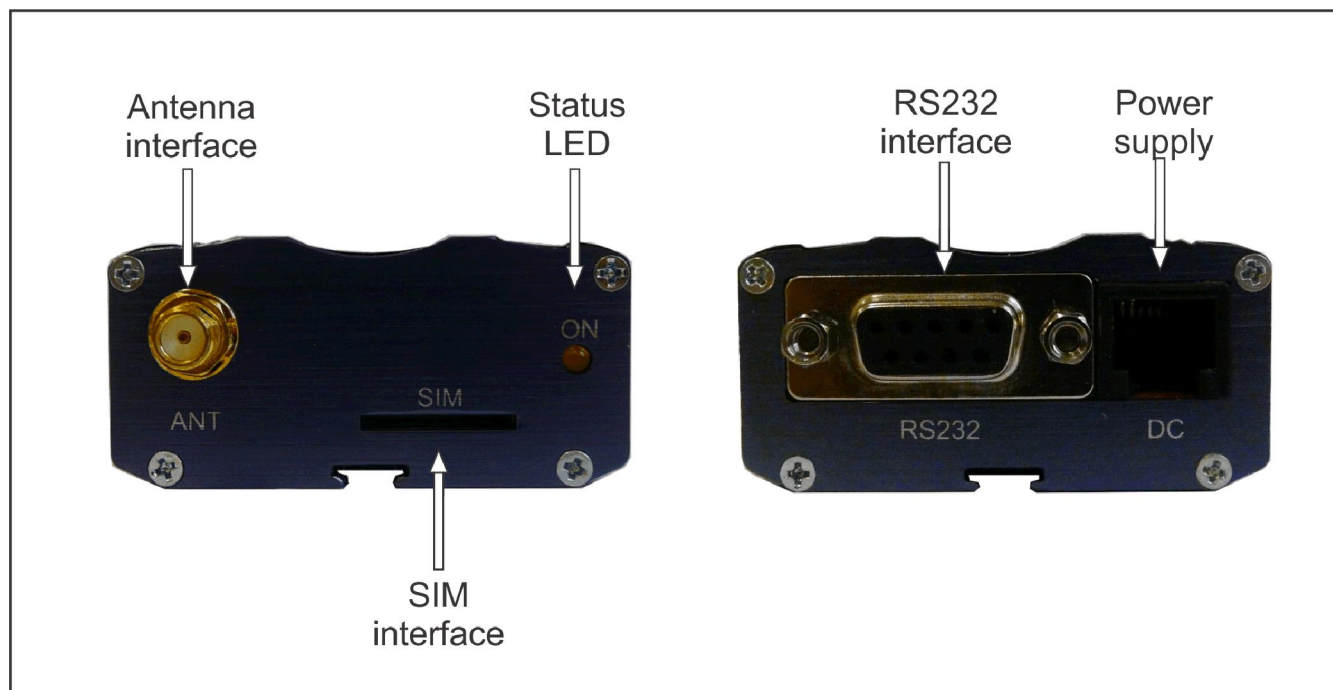


Figure 2. Front and rear view of HCP LC RS232 terminal

4.2 Block Diagram

Figure 2. shows block diagram of HCP LC RS232 terminal.

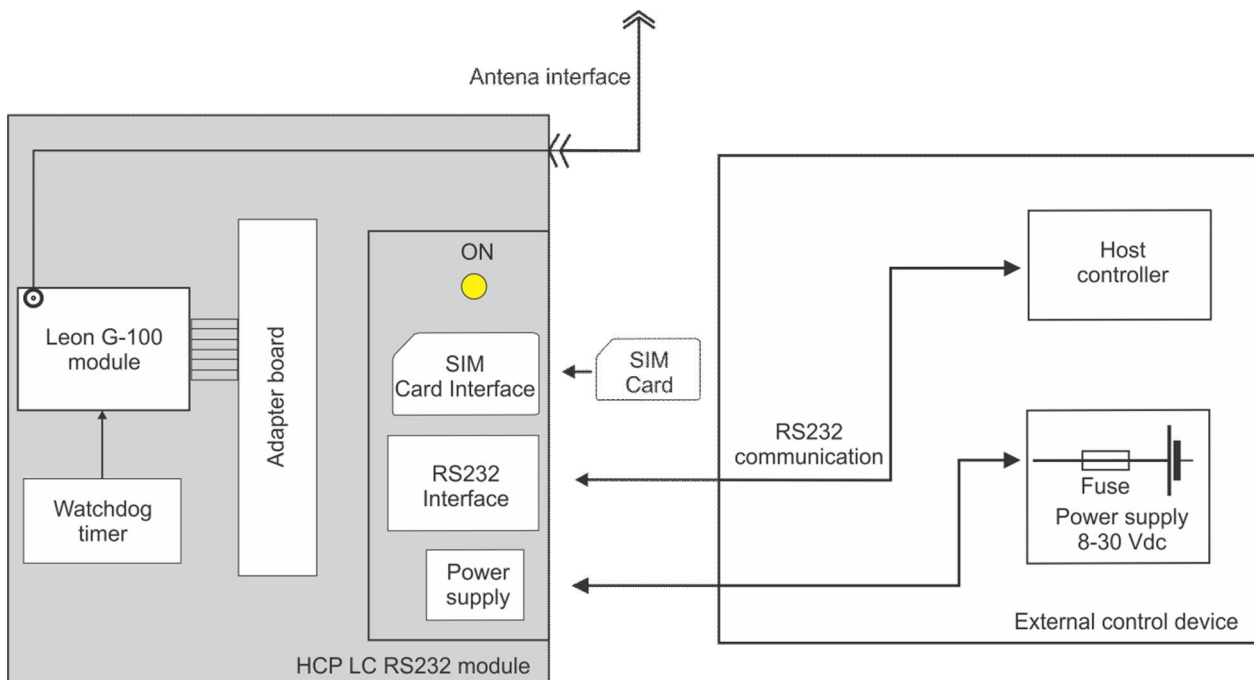


Figure 3. Block diagram of HCP LC RS232 terminal

4.3 Watchdog

LC RS232 terminal has a hardware watchdog circuit on board. Watchdog resets GSM module inside LC RS232 terminal every 8 to 10hours as a protection in case that software in GSM module get stack.

4.4 Power Supply

The power supply of the HCP LC RS232 has to be a single voltage source of 8V to 30V capable of providing a peak current of about 1.2A at 12V during an active transmission.

The uplink burst causes strong ripple (drop) on the power lines. The drop voltage should not exceed 1V, but the absolute minimum voltage during drops must be >7.6V. The the HCP LC RS232 is protected from supply voltage reversal.

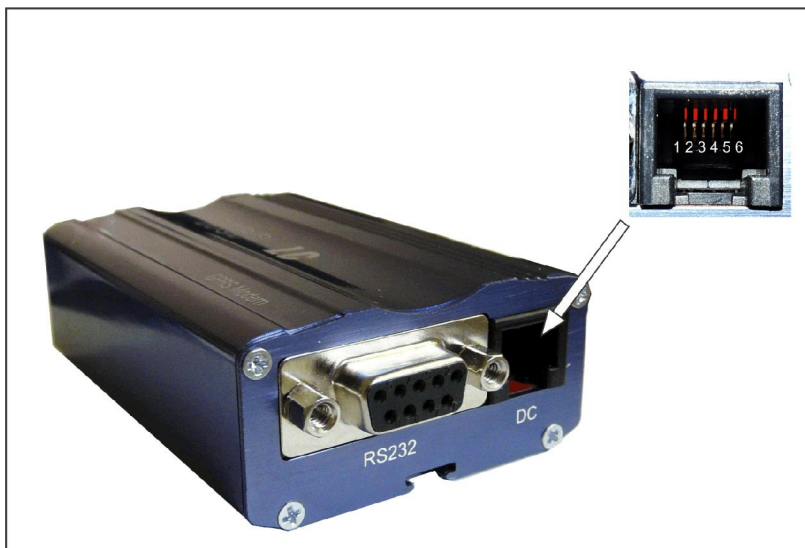


Figure 4. Power supply connector

Pin	Singal name	Use	Parameters
1	Vcc	Positive power supply	8V – 30V DC
2	Vcc	Positive power supply	8V – 30V DC
3	NC	Not connected	--
4	NC	Not connected	--
5	GND	Ground	0V
6	GND	Ground	0V

Table 3. Power supply connector pins

4.4.1 Turn LC RS232 terminal on

HCP LC RS232 terminal switches on automatically when power supply is attached. After start-up, the GSM module enters the net searching state.

After startup of the GSM module the RS232 lines are in an undefined state for approx. 900ms. This may cause undefined characters to be transmitted over the RS232 lines during this period.

4.4.2 Reset LC RS232 terminal

One way to reset LC RS232 terminal GSM module is entering AT command AT+CFUN . For details on AT+CFUN please refer [2].

Other ways for restarting LC RS232 terminal GSM module is:

- Activating DTR line on RS232 interface (the GSM module will switch on after few seconds)
- automatically by integrated watchdog timer on every 8 to 10 hours.

4.4.3 Turn off LC RS232 terminal

Normal shutdown:

- To turn off the LC RS232 terminal GSM modul Leon G-100 use the AT+CPWROFF command, rather than disconnecting the power supply adapter.

This procedure lets the LC RS232 terminal GSM modul log off from the network and allows the software to enter a secure state and save data before disconnecting the power supply. After AT+CPWROFF has been entered the GSM modul returns the following result codes:

^OK

The "^OK" result code indicates that the GSM module turns off in less than 1 second. After the shutdown procedure is complete the GSM module enters the POWER DOWN mode.

4.4.4 Disconnecting power supply

Before disconnecting the power supply from the Vcc pin, make sure that the LC RS232 terminal is in a safe condition. The best way is to wait 5s after at command for power off AT+CPWROFF and when result code "^OK" has been indicated.

4.5 RS-232 Interface

Over RS232 interface, external device, PC or other control device with RS232 interface, communicate with HCP LC RS232 terminal.



Figure 5. RS232 interface pin assignment

Pin	Singal name	Input/Output	Function
1	DCD	output	Data Carrier Detect
2	RxD	output	Receive Data
3	TxD	input	Transmit Data
4	DTR	input	Data Terminal Ready
5	GND	--	Ground
6	DSR	output	Data Set Ready
7	RTS	input	Request To Send
8	CTS	output	Clear To Send
9	RING	output	Ring Indication

Table 4. RS232 pin assigment

RS232 interface features are:

- Complete serial port with RS-232 functionality conforming to the ITU-T V.24 recommendation.
- Hardware flow control (default value), software flow control, or none flow control are supported
- 1200, 2400, 4800, 9600, 19200, 38400, 57600, 115200, 230400 b/s baud rates are supported for the AT interface; note that 1200 and 230400 b/s are available in conjunction only with autobauding

For more information about RS232 interface (uart on Leon G100) please refer to [1] & [2.]

4.6 SIM interface

HCP LC RS232 provides SIM interface with automatic detection for 1.8V and 3V SIM cards according to ISO-IEC 7816-3 specifications and automatic detection whether or not a SIM card is inserted.

The SIM driver supports the PPS (Protocol and Parameter Selection) procedure for baud-rate selection, according to the values proposed by the SIM Card.



Figure 6. SIM interface

Removing and inserting the SIM card during operation requires the software to be reinitialized. Therefore, after reinserting the SIM card it is necessary to restart HCP LC RS232 terminal.

Note: No guarantee can be given, nor any liability accepted, if loss of data is encountered after removing the SIM card during operation. Also, no guarantee can be given for properly initializing any SIM card that the user inserts after having removed a SIM card during operation. In this case, the application must restart the GSM module in HCP LC RS232

4.7 Status LED

Status LED is used for displaying power supply status of the HCP LC RS232 terminal.

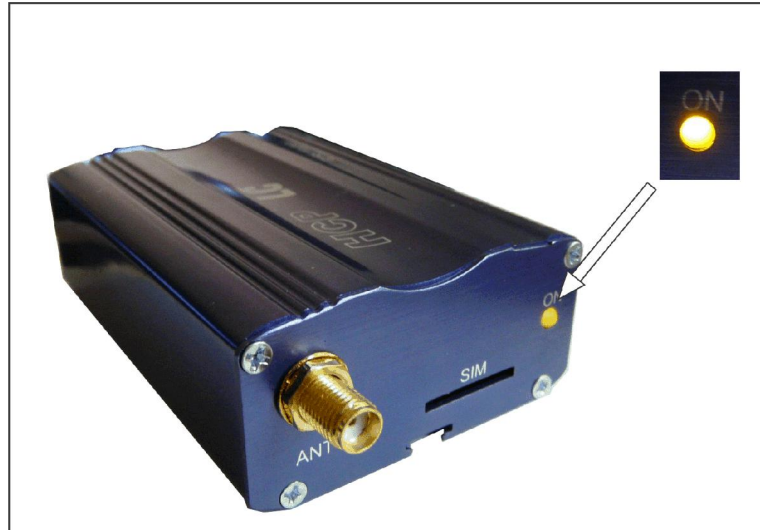


Figure 7. Status LED on HCP LC RS232

Location of status LED is shown on figure 8.

4.8 Antenna interface

The external antenna is connected via the LC RS232 terminal SMA connector (female), look at figure 8.

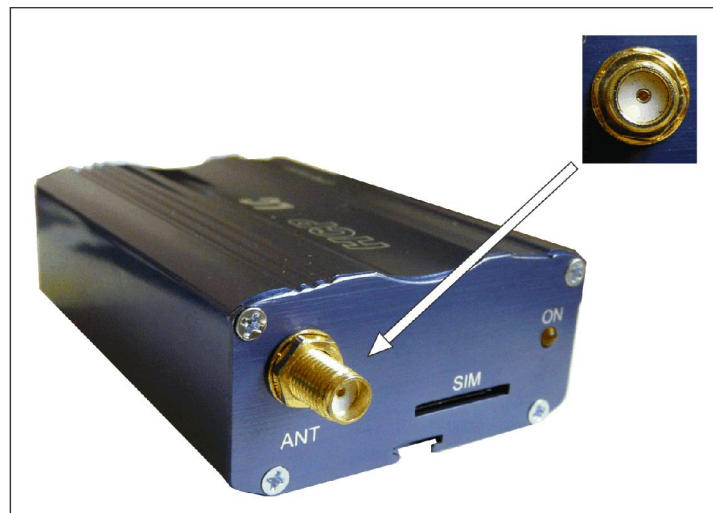


Figure 8. Antenna interface – SMA jack

An internal antenna cable adapts the antenna reference point of GSM module Leon G100 (antenna connector type U.FL-R-SMT from Hirose) to the SMA connector

- Cable loss of the internal cable
 - <0.4dB @ 900MHz
 - <0.6dB @ 1800MHz
- The system impedance is 50
- In every case, for good RF performance the return loss of the customer application's antenna should be better than 10dB (VSWR < 2).
- LC RS232 terminal GSM modul withstands a total mismatch at this connector when transmitting with power control level for maximum RF power.

5. Electrical and Environmental Characteristics

5.1 Absolute Maximum Ratings

Parameter	Pin / Parameter	Min.	Max.	Unit
Supply voltage	Vcc	8	30	V
RS232 input voltage range	TxD, DTR, RTS	-20	+20	V
	RxD, CTS, DSR, DCD, RING	-0.3	+5.3	V
Immunity against ESD	RS232 lines	-15	+15	kV
Protection Class	IP50(avoid exposing LC RS232 terminal to liquid or moisture)		IP50	

Table 5. Absolute maximum ratings

5.2 Recommended Operating conditions

Parameter	Pin / Parameter	Min.	Typ.	Max.	Unit
Supply voltage	Vcc		12		V
Supply current	Ic		100mA		mA
Operating temperature	--	-30	+25	+70	°C

Table 6. Recommended operating conditions

5.3 Storage Conditions

Type	Condition	Unit	Reference
Air temperature: Low High	-40 +85	°C	ETS 300 019-2-1: T1.2, IEC 68-2-1 Ab ETS 300 019-2-1: T1.2, IEC 68-2-2 Bb
Humidity relative: Low High Condens.	10 90 at 30°C 90-100 at 30°C	%	--- ETS 300 019-2-1: T1.2, IEC 68-2-56 Cb Cb ETS 300 019-2-1: T1.2, IEC 68-2-30 Db Db
Air pressure: Low High	70 106	kPa	IEC TR 60271-3-1: 1K4 IEC TR 60271-3-1: 1K4
Movement of surrounding air	1.0	m/s	IEC TR 60271-3-1: 1K4
Water: rain, dripping, icing and frosting	Not allowed	---	---
Radiation: Solar Heat	1120 600	W/m ²	ETS 300 019-2-1: T1.2, IEC 60068-2-2 Bb ETS 300 019-2-1: T1.2, IEC 60068-2-2 Bb
Chemically active substances	Not recomm.		EC TR 60271-3-1: 1C1L
Mechanically active substances	Not recomm.		IEC TR 60271-3-1: 1S1

Table 7. Storage conditions

The conditions stated above are only valid for devices in their original packed state in weather protected, non-temperature-controlled storage locations. Normal storage time under these conditions is 12 months maximum.

5.4 Electrical Specifications of the Application Interface

5.4.1 RS232 interface

Param.	Description	Conditions	Min.	Typ.	Max.	Unit
V _{OUT}	Transmitter output voltage for RxD, CTS, DSR, DCD, RING	@3K to GND	±5	±5.4		V
R _{OUT}	Transmitter output resistance RxD, CTS, DSR, DCD, RING		300	10M		
R _{IN}	Resistance TxD, RTS, DTR		3	5	7	k
V _{IN}	Receiver input voltage range TxD, RTS, DTR		-25		+25	V
V _{LOW}	Input threshold low				0.8	V
V _{HIGH}	Input threshold high		2			
Baudrate		Autobauding	1,200		230,400	bps
		Fixed range	1,200		230,400	bps
RS232 cable				1.8	2	m

Table 8. RS232 interface

5.4.2 GSM Antenna interface

Parameter		Min.	Typ.	Max.	Unit
Frequency range Uplink (MS BTS)	GSM 850	824		849	MHz
	E-GSM 900	880		915	MHz
	GSM 1800	1710		1785	MHz
	GSM 1900	1850		1910	MHz
Frequency range Downlink (BTS MS)	GSM 850	869		894	MHz
	E-GSM 900	925		960	MHz
	GSM 1800	1805		1880	MHz
	GSM 1900	1930		1990	MHz
Receiver input sensitivity Downlink RF level @ ARP BER Class II < 2.4 % Condition: 50 source	GSM 850	-102	-110		dBm
	E-GSM 900	-102	-110		dBm
	GSM 1800	-102	-109		dBm
	GSM 1900	-102	-109		dBm

Table 9. Antenna interface

Please refer to [1] for more information about antenna interface (RF performance).

6. Mechanical Characteristics

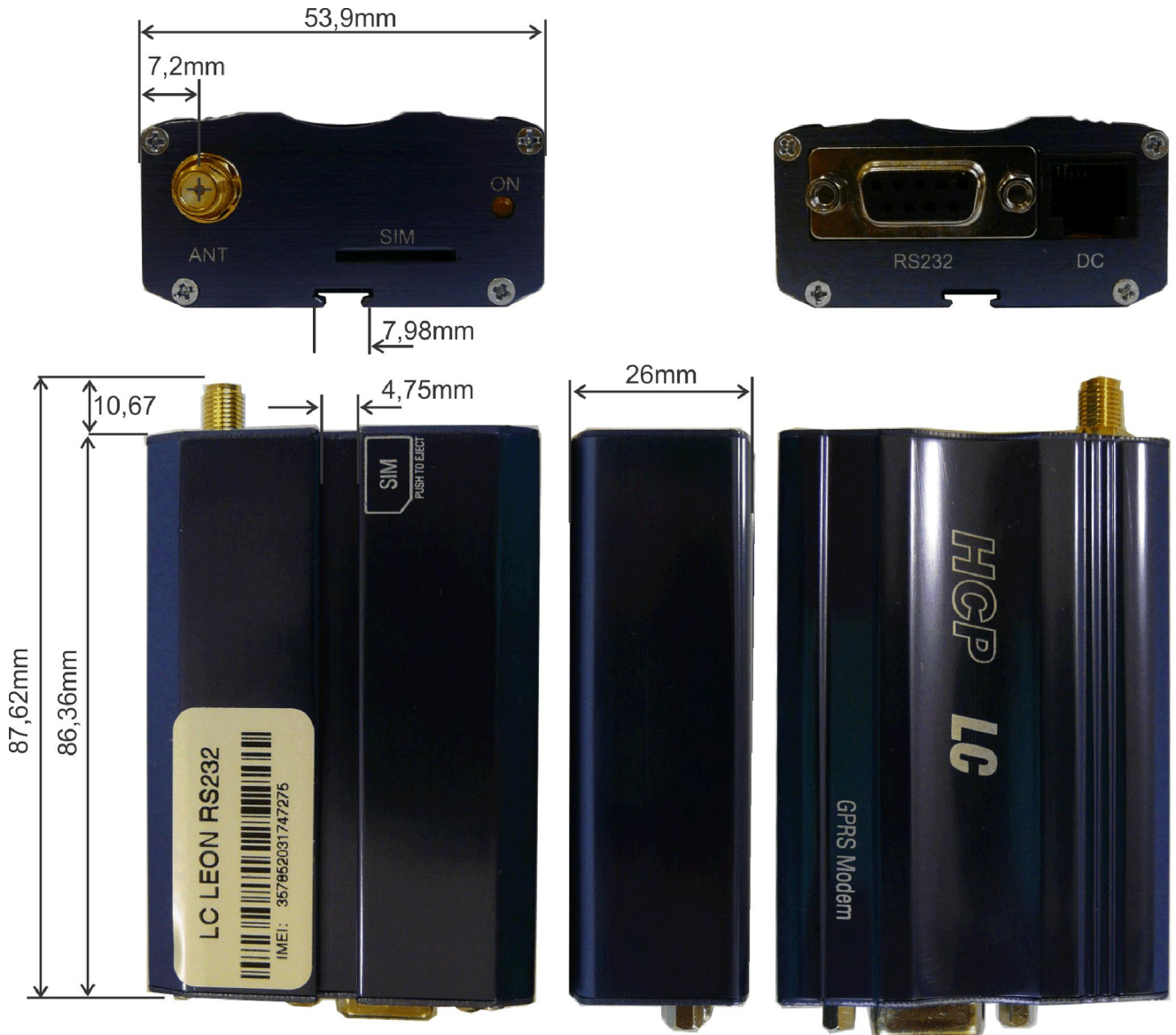
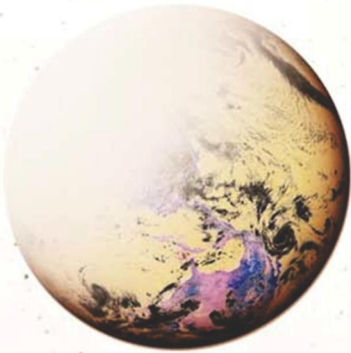


Figure 9. Mechanical characteristics of LC RS232 terminal

*all dimensions are in milimeters

7. List of Parts and Accessories

Description	Supplier	Picture
HCP – LC RS232 (Leon G100)	HCP d.o.o	
Power supply (AC/DC 9V/2A)	HCP d.o.o	
SMA antenna	HCP d.o.o	
RS232 cable (male – female)	HCP d.o.o	



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