L89 (HA)&L89 (HB)
Difference Introduction

GNSS Module Series

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About the Document

Document Information	
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-	2022-07-06	Creation of the document
1.0	2022-09-08	First official release

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1 Introduction

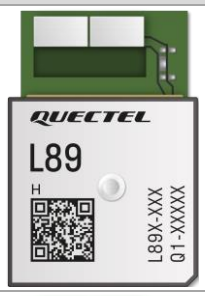
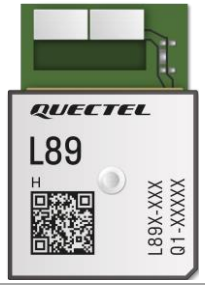
This document describes main differences between L89 (HA) and L89 (HB) modules in terms of hardware and software designs, including module protection functions, the RESET_N pin, Backup mode, supply current and firmware version.

2 Hardware Differences

2.1. General Information

The L89 (HA) and L89 (HB) modules are pin-to-pin compatible and have the same electrical characteristics.

Table 1: General Information

Module	Appearance	Packaging	Dimensions (mm)	Supply Voltage	
L89 (HA)		16 LCC pins 29 LGA pins	26.4 × 18.4 × 6.8	VCC	3.1–4.3 V Typ. 3.3 V
				V_BCKP	2.2–4.3 V Typ. 3.3 V
				IO Voltage	Typ. 3.0 V
L89 (HB)		16 LCC pins 29 LGA pins	26.4 × 18.4 × 6.8	VCC	3.1–4.3 V Typ. 3.3 V
				V_BCKP	2.2–4.3 V Typ. 3.3 V
				IO Voltage	Typ. 3.0 V

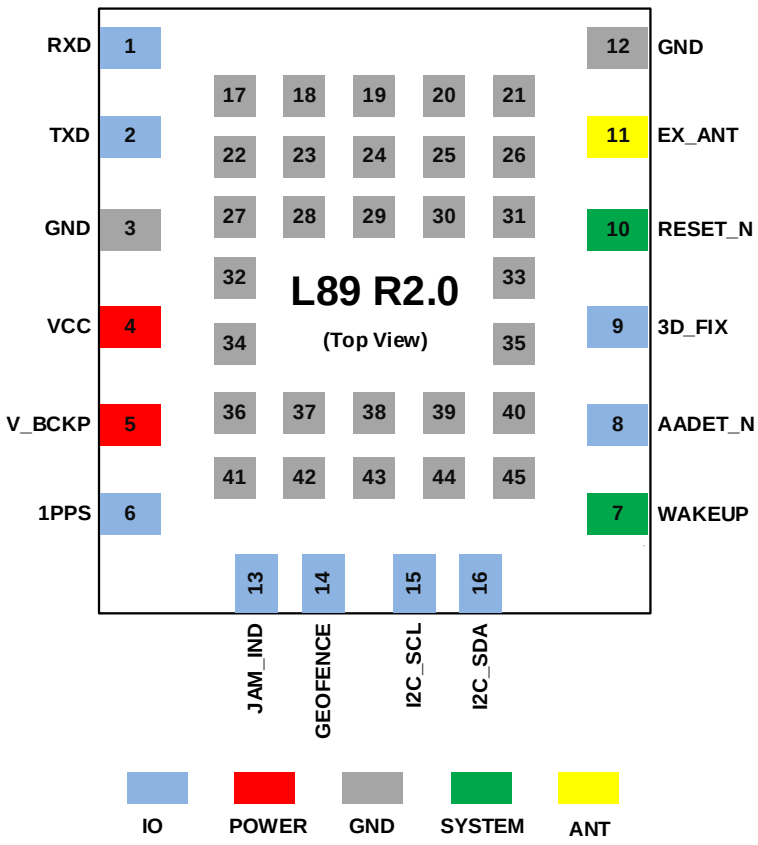


Figure 1: Pin Assignment

2.2. Module Protection

The L89 (HB) has an extra hardware watchdog timer (WDT), which provides features of power-on delay, undervoltage protection and automatic reset under abnormal conditions. The L89 (HA) does not support these features.

2.2.1. Power-on Delay

After the VCC is powered up for 200 ms, the internal LDO supplies power to the GNSS IC and the L89 (HB) module works normally, avoiding the impact of voltage jitter during power-up.

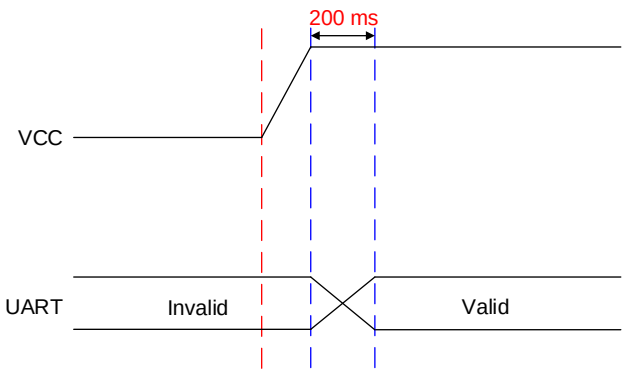


Figure 2: Power-on Delay Sequence

2.2.2. Undervoltage Protection

Undervoltage protection is activated if the VCC power supply of the module drops below the threshold, which is detected by the internal watchdog timer as undervoltage state. In this state, the internal LDO does not supply power to the GNSS IC, which in turn stops the operation of internal GNSS IC. The module enters Backup mode when the V_BCKP voltage is in the normal operating range; it is powered off automatically if the V_BCKP voltage drops below 2.2 V.

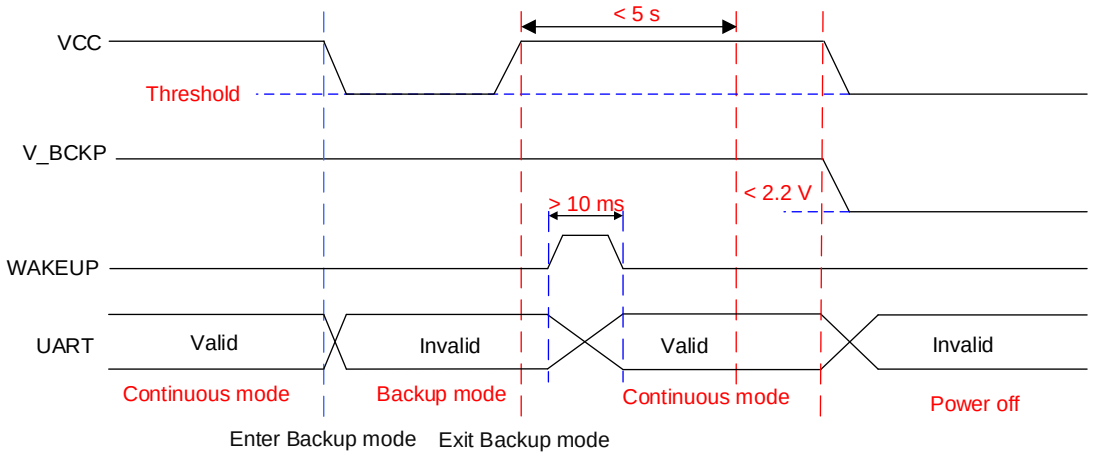


Figure 3: Undervoltage Protection Sequence

2.2.3. Automatic Reset

If the L89 (HB) module enters an abnormal state in which UART interface does not output data, after a 5-second delay, the watchdog timer automatically resets the module by driving the RESET_N pin low with an internal control circuit.

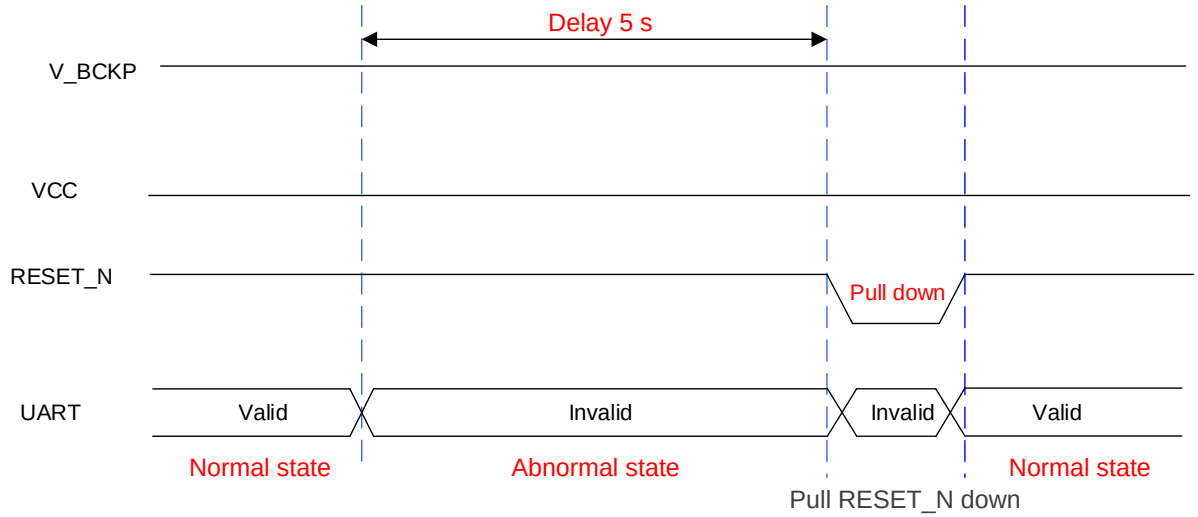


Figure 4: Automatic Reset Sequence

2.3. RESET_N

RESET_N is an input pin. The module can be reset by driving the RESET_N pin low for at least 100 ms and then releasing it.

- For L89 (HA), it is internally pulled up to 1.8 V with a 10 kΩ resistor by default.
- For L89 (HB), it is internally pulled up to V_BCKP with a 10 kΩ resistor by default.

No external pull-up circuit is allowed for this pin.

2.4. Backup Mode

The L89 (HA) and L89 (HB) modules enter/exit the Backup mode differently.

L89 (HA) module:

- Enter the Backup mode:
  1. Send **$PAIR650** to shut down internal main power supply in sequence.
  2. Cut off the power supply to the VCC pin and keep the V_BCKP pin powered.

- Exit the Backup mode:
  1. Restore VCC.
  2. Pull WAKEUP high for at least 10 ms after the VCC power supply is restored.

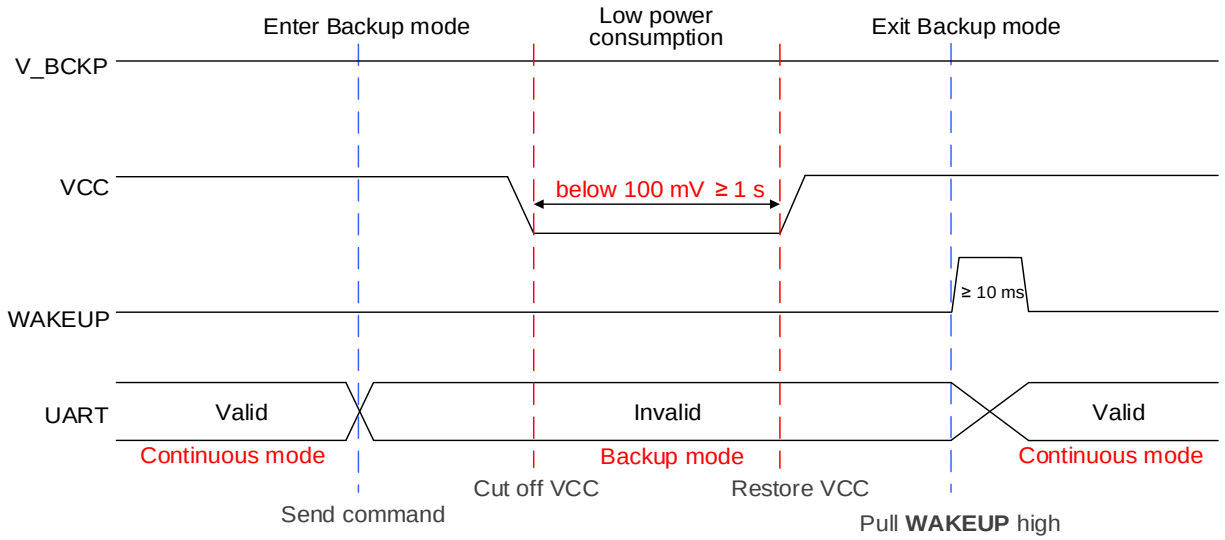


Figure 5: L89 (HA) Sequence of Entering/Exiting Backup Mode

L89 (HB) module:

- Enter the Backup mode:
  1. Send **$PAIR650** to shut down internal main power supply in sequence.
  2. Cut off the power supply to the VCC pin within 5 s of a successful execution of the software command while keeping V_BCKP powered, otherwise the module will restart.

- Exit the Backup mode:
  1. Restore VCC.
  2. Pull WAKEUP high for at least 10 ms within 5 s after the VCC power supply is restored.

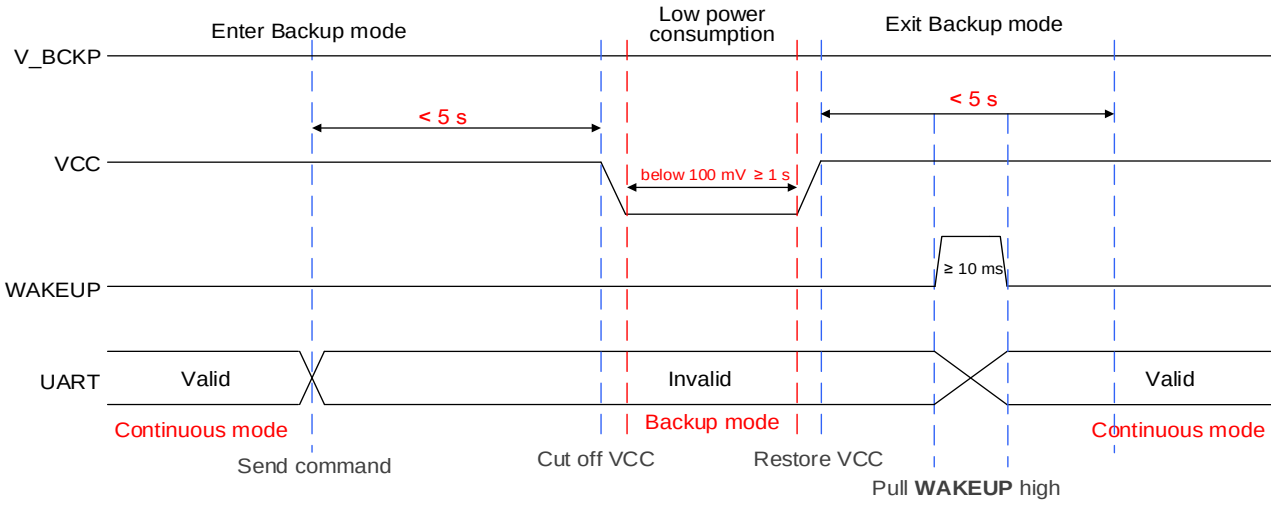


Figure 6: L89 (HB) Sequence of Entering/Exiting Backup Mode

2.5. Supply Current

Table 2: Supply Current

Parameter	Description	Condition	L89 (HA)		L89 (HB)	
			$I_{Typ.}$ [1]	I_{PEAK} [1]	$I_{Typ.}$ [1]	I_{PEAK} [1]
I_{VCC} [2]	Current at VCC	Acquisition	32 mA	48 mA	32 mA	48 mA
		Tracking	32 mA	50 mA	32 mA	49 mA
I_{V_BCKP} [3]	Current at V_BCKP	Continuous mode	10 μA	50 μA	10 μA	51 μA
		Backup mode	51 μA	108 μA	51 μA	108 μA

[1] Room temperature, measurements are taken with typical voltage.
[2] Used to determine the maximum current capability of power supply.
[3] Used to determine the required battery current capacity.

3 Software Difference

3.1. Firmware Version

The firmware version differences are shown in the table below.

Table 3: Firmware Version Differences

Module	Firmware Version
L89 (HA)	L89HANRxxAxxS
L89 (HB)	L89HBNRxxAxxS

NOTE

x is a number between 0 and 9.

3.1.1. PQTMVERNO

Queries software version.

Type:

Command

Synopsis:

```
$PQTMVERNO*<Checksum><CR><LF>
```

Parameter:

None

Result:

Returns the query result.

Query result message format:

```
$PQTMVERNO,<Type>,<Data>,<Time>*<Checksum><CR><LF>
```

Parameters included in the result:

Field	Format	Unit	Description
<Type>	Numeric	-	Software version number, which is different for L89 (HA) and L89 (HB). See ***Table 3*** for details.
<Data>	Numeric	-	Build date of software version.
<Time>	Numeric	-	Build time of software version.

Example:

```
//L89HANR01A05S
$PQTMVERNO*58
$PQTMVERNO,L89HANR01A05S,2022/07/22,10:17:59*34

//L89HBNR01A01S
$PQTMVERNO*58
$PQTMVERNO,L89HBNR01A01S,2022/07/22,11:20:59*36
```

4 Appendix References

Table 4: Related Documents

Document Name	
[1]	Quectel_L89_R2.0_Hardware_Design
[2]	Quectel_L89_R2.0_GNSS_Protocol_Specification

Table 5:Terms and Abbreviations

Abbreviation	Description
ANT	Antenna
BDS	Chinese BeiDou Global Positioning System
DI	Digital Input
D(I)O	Digital Input and Output
DO	Digital Output
Galileo	Galileo Satellite Navigation System (EU)
GLONASS	Global Navigation Satellite System (the Russian GNSS)
GPS	Global Positioning System
GND	Ground
GNSS	Global Navigation Satellite System
IRNSS	India Regional Navigation Satellite System
I^2C	I^2C interface
LCC	Leadless Chip Carriers
LGA	Land Grid Array

Abbreviation	Description
NMEA	NMEA (National Marine Electronics Association) 0183 Interface Standard
PI	Power Input
1PPS	One Pulse Per Second
QZSS	Quasi-Zenith Satellite System
RXD	Receive Data (Pin)
TXD	Transmit Data (Pin)
UART	Universal Asynchronous Receiver & Transmitter
WDT	Watchdog Timer