L26-T&LC29H (AI)

Hardware Difference Introduction

GNSS Module Series

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	Ensure that the product may be used in the country and the required environment, as well as that it conforms to the local safety and environmental regulations.
	Keep away from explosive and flammable materials. The use of electronic products in extreme power supply conditions and locations with potentially explosive atmospheres may cause fire and explosion accidents.
	The product must be powered by a stable voltage source, and the wiring shall conform to security precautions and fire prevention regulations.
	Proper ESD handling procedures must be followed throughout the mounting, handling and operation of any devices and equipment that incorporate the module to avoid ESD damages.

About the Document

Document Information	
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Contents

Table Index

1 Introduction

This document describes the hardware differences between L26-T and LC29H (AI) in terms of pin assignment, supported constellations, and module performance. The two modules are based on different chipsets from different vendors.

1.1. Special Mark

Table 1: Special Mark

Mark	Definition
●	The symbol indicates that a function or technology is supported by the module(s).

2 Hardware Difference Introduction

2.1. General Information

General information about the modules is presented in the table below, with differences highlighted in red.

Table 2: General Information

Module	Appearance	Packaging	Dimensions (mm)	Supply Voltage	
L26-T		24 LCC pins	12.2 × 16.0 × 2.3	VCC	3.0–3.6 V Typ. 3.3 V
				V_BCKP	2.0–3.6 V Typ. 3.3 V
				I/O Voltage	Following VCC
LC29H (AI)		24 LCC pins	12.2 × 16.0 × 2.5	VCC	3.1–3.6 V Typ. 3.3 V
				V_BCKP	2.2–3.6 V Typ. 3.3 V
				I/O Voltage [1]	Typ. 2.8 V
					Typ. 1.8 V

[1] For D_SEL1, D_SEL2 and UART2, the voltage domain is 1.8 V on LC29H (AI).

2.2. Pin Assignment

The differences between the pins of the L26-T and LC29H (AI) modules are listed below.

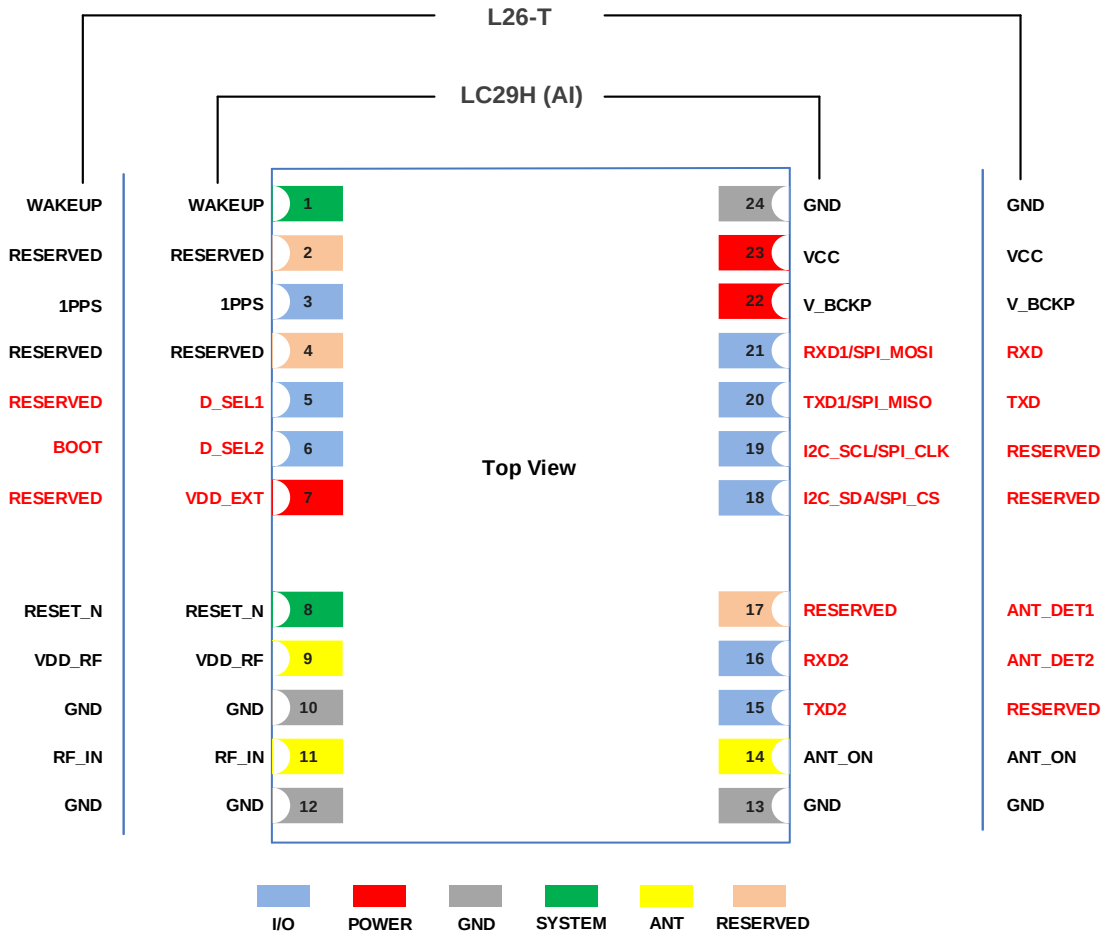

Figure 1: Pin Assignment

NOTE

Pins highlighted in red (e.g., pin 5) have different functions.

Table 3: Pin Description

Pin No.	Pin Name		Description
	L26-T	LC29H (AI)	
1	WAKEUP	WAKEUP	On L26-T, the pin is used for waking up the module from the Standby mode. On LC29H (AI), the pin is used for waking up the module from the Backup mode.
2	RESERVED	RESERVED	Reserved.
3	1PPS	1PPS	One pulse per second.
4	RESERVED	RESERVED	Reserved.
5	RESERVED	D_SEL1	On L26-T, the pin 5 is RESERVED and the pin 6 is used for controlling module startup mode. On LC29H (AI), pins 5 and 6 are used for selecting UART1/SPI/I2C (the interface for communication and firmware upgrade).
6	BOOT	D_SEL2	
7	RESERVED	VDD_EXT	On L26-T, the pin is RESERVED. On LC29H (AI), the pin is used for providing 2.8 V for external circuit.
8	RESET_N	RESET_N	The pin is used for resetting the module.
9	VDD_RF	VDD_RF	On L26-T, the pin is used to supply power for external RF components. On LC29H (AI), the pin is used to supply power for external RF components.
10	GND	GND	Ground.
11	RF_IN	RF_IN	GNSS antenna interface.
12	GND	GND	Ground.
13	GND	GND	Ground.
14	ANT_ON	ANT_ON	On L26-T, the pin is used as the power control for external active antenna with antenna detection or LNA. On LC29H (AI), the pin is used as the power control for external LNA and active antenna.

Pin No.	Pin Name		Description
	L26-T	LC29H (AI)	
15	RESERVED	TXD2	On L26-T, the pin 15 is RESERVED and the pin 16 is used as external active antenna detection 2. On LC29H (AI), pins 15 and 16 are used as the UART2 interface that supports system debugging data. The I/O voltage domain is 1.8 V.
16	ANT_DET2	RXD2	
17	ANT_DET1	RESERVED	On L26-T, the pin used as external active antenna detection 1. On LC29H (AI), the pin is RESERVED.
18	RESERVED	I2C_SDA/ SPI_CS	On L26-T: ● Pins 18 and 19 are RESERVED. ● Pins 20 and 21 are used as the UART interface for standard NMEA message, PSTM message and firmware upgrade. On LC29H (AI): ● Pins 18 and 19 are used as the I2C interface for standard NMEA message, RTCM message, binary data, PAIR/PQTM message and firmware upgrade. ● Pins 20 and 21 are used as the UART1 interface for standard NMEA message, RTCM message, binary data, PAIR/PQTM message and firmware upgrade. ● Pins 18–21 are used as the SPI for standard NMEA message, RTCM message, binary data, PAIR/PQTM message and firmware upgrade.
19	RESERVED	I2C_SCL/ SPI_CLK	
20	TXD	TXD1/ SPI_MISO	
21	RXD	RXD1/ SPI_MOSI	
22	V_BCKP	V_BCKP	Backup power supply for backup domain.
23	VCC	VCC	Main power supply.
24	GND	GND	Ground.

NOTE

For detailed differences in pin description between the two modules, see *documents [1]* and *[2] hardware design*.

2.3. Features

L26-T features high precision timing and the 1PPS timing accuracy is < 13.6 (±6.8 ns) @ 1σ. The module supports GPS + GLONASS + Galileo by default.

LC29H (AI) features dual-band capability and the accuracy of 1PPS signal is 80 ns (RMS). It supports GPS + GLONASS + Galileo + BDS + QZSS + NavIC by default.

Features supported by the two modules are listed in the table below.

Table 4: Features

Features		L26-T	LC29H (AI)
Grade	Industrial	●	●
	Automotive	-	-
Category	Standard Precision GNSS	●	●
	High Precision GNSS	-	-
	DR	-	-
	RTK [2]	-	-
	Timing	●	-
Communication Interfaces	UART	●	●
	SPI	-	●
	I2C	-	●
Integrated Features	Additional LNA	●	●
	Additional Filter	●	●
	RTC Crystal	●	●
	TCXO Oscillator	●	●
	6-axis IMU	-	-
Constellations	Number of Concurrent GNSS	3 + QZSS	5 + QZSS

[2] For LC29H (AI), RTK function can be implemented using an external position engine running on external host, while the module will provide the raw data only.

Features			L26-T	LC29H (AI)
and Frequency Bands	GPS	L1 C/A	●	●
		L5	-	-
	GLONASS	L1	●	●
	Galileo	E1	●	●
		E5a	-	-
	BDS	B1I	●	●
		B2a	-	-
	QZSS	L1 C/A	●	●
		L5	-	-
	NavIC	L5	-	●
SBAS		L1	●	●
Temperature Range	Operating temperature range: -40 °C to +85 °C Storage temperature range: -40 °C to +90 °C			
Physical Characteristics			Size: (12.2 ±0.15) mm × (16.0 ±0.15) mm × (2.3 ±0.20) mm	Size: (12.2 ±0.15) mm × (16.0 ±0.15) mm × (2.5 ±0.20) mm
			Weight: Approx. 0.9 g	

NOTE

For more information about constellation configurations of the two modules, see *documents [3]* and *[4] protocol specification*.

2.4. Module Performance

2.4.1. Power Consumption

Table 5: Power Consumption

Power Consumption [3]	L26-T	LC29H (AI)	Unit
	GPS + GLONASS + Galileo	GPS + GLONASS + Galileo + BDS + QZSS + NavIC	
Acquisition	76	16	mA
Tracking	73	16	mA
Standby mode	12	-	μA
Backup mode	7	51	μA

2.4.2. Electrical Specification

Table 6: Absolute Maximum Ratings

Parameter	Description		L26-T		LC29H (AI)		Unit
			Min.	Max.	Min.	Max.	
VCC	Main Power Supply Voltage		-0.3	3.6	-0.3	4.3	V
V_BCKP	Backup Supply Voltage		-0.3	3.6	-0.3	4.3	V
V_{IN}_IO	Input Voltage at I/O Pins	$V_{I/O}$ = VCC	-0.2	VCC + 0.3	-	-	V
		$V_{I/O}$ = 2.8 V	-	-	-0.3	3.08	V
		$V_{I/O}$ = 1.8 V	-	-	-0.3	1.98	V
P_{RF_IN}	Input Power at RF_IN		-	0	-	0	dBm
T_storage	Storage Temperature		-40	90	-40	90	°C

[3] Tested at room temperature, with typical operating voltage, and satellite signal of -130 dBm configured by the instrument.

Table 7: Recommended Operating Conditions

Parameter	Description		L26-T			LC29H (AI)			Unit
			Min.	Typ.	Max.	Min.	Typ.	Max.	
VCC	Main Power Supply Voltage		3.0	3.3	3.6	3.1	3.3	3.6	V
V_BCKP	Backup Supply Voltage		2.0	3.3	3.6	2.2	3.3	3.6	V
VDD_EXT	Power Output Voltage		-	-	-	-	2.8	-	V
IO_Domain	Digital I/O Pin Voltage Domain		-	VCC	-	2.1	2.8	3.08	V
						1.62	1.8	1.98	V
V_{IL}	Digital I/O Pin Low-level Input Voltage	$V_{I/O}$ = VCC	-0.3	-	0.8	-	-	-	V
		$V_{I/O}$ = 2.8 V	-	-	-	-0.3	0	0.7	V
		$V_{I/O}$ = 1.8 V	-	-	-	-0.3	0	0.63	V
V_{IH}	Digital I/O Pin High-level Input Voltage	$V_{I/O}$ = VCC	2.0	-	VCC + 0.3	-	-	-	V
		$V_{I/O}$ = 2.8 V	-	-	-	1.75	-	3.08	V
		$V_{I/O}$ = 1.8 V	-	-	-	1.17	-	2.1	V
V_{OL}	Digital I/O Pin Low-level Output Voltage	$V_{I/O}$ = VCC	-	-	0.4	-	-	-	V
		$V_{I/O}$ = 2.8 V	-	-	-	-	-	0.35	V
		$V_{I/O}$ = 1.8 V	-	-	-	-	-	0.45	V
V_{OH}	Digital I/O Pin High-level Output Voltage	$V_{I/O}$ = VCC	VCC - 0.4	-	-	-	-	-	V
		$V_{I/O}$ = 2.8 V	-	-	-	2.1	-	-	V
		$V_{I/O}$ = 1.8 V	-	-	-	1.35	-	-	V
RESET_N	Low-level Input Voltage		-0.3	-	0.35	-0.3	-	0.1	V
	High-level Input Voltage		0.65	-	1.3	1.8	3.3	3.6	V
WAKEUP	Low-level Output Voltage		-	-	-	-0.3	0	0.7	V
	High-level Input Voltage		2.1	-	VCC	3.0	3.3	3.6	V
VDD_RF	VDD_RF Output Voltage		-	VCC	-	3.1	3.3	3.6	V
I_{VDD_RF}	VDD_RF Output Current		-	100	-	-	-	100	mA
T_operating	Operating Temperature		-40	25	+85	-40	25	+85	°C

NOTE

Operation beyond the "Operating Conditions" is not recommended and extended exposure beyond the "Operating Conditions" may affect device reliability.

Table 8: Supply Current

Parameter	Description	Condition	L26-T		LC29H (AI)	
			$I_{Typ.}$ [4]	I_{PEAK} [4]	$I_{Typ.}$ [4]	I_{PEAK} [4]
I_{VCC} [5]	Current at VCC	Acquisition	76 mA	112 mA	16 mA	61 mA
		Tracking	73 mA	112 mA	16 mA	65 mA
		Standby mode	7 μA	29 μA	-	-
I_{V_BCKP} [6]	Current at V_BCKP	Continuous mode	78 μA	111 μA	123 μA	202 μA
		Standby mode	5 μA	25 μA	-	-
		Backup mode	7 μA	43 μA	51 μA	68 μA

2.4.3. RF Sensitivity

Table 9: Conducted RF Sensitivity

Configuration	L26-T	LC29H (AI) [7]	Unit
	GPS + GLONASS + Galileo	GPS + GLONASS + Galileo + BDS + QZSS + NavIC	
Acquisition	-145	-150	dBm
Reacquisition	-153	-160	dBm
Tracking	-162	-165	dBm

[4] Tested at room temperature, with typical operating voltage, and satellite signal of -130 dBm configured by the instrument.
[5] Used to determine the maximum current capability of power supply.
[6] Used to determine the required battery current capacity.
[7] Tested with an external LNA with 17 dB gain and 0.55 dB noise figure.

3 Appendix References

Table 10: Related Documents

Document Name	
[1]	Quectel_LC29H_Series_Hardware_Design
[2]	Quectel_L26-P&L26-T_Hardware_Design
[3]	Quectel_L89(HD)&LC29H(AI)_GNSS_Protocol_Specification
[4]	Quectel_L26-DR&L26-P&L26-T&LC98S_Series_GNSS_Protocol_Specification

Table 11: Terms and Abbreviations

Abbreviation	Description
1PPS	1 Pulse Per Second
BDS	BeiDou Navigation Satellite System
Galileo	Galileo Satellite Navigation System (EU)
GLONASS	Global Navigation Satellite System (Russia)
GPS	Global Positioning System
GND	Ground
GNSS	Global Navigation Satellite System
I/O	Input/Output
I2C	Inter-integrated Circuit
LCC	Leadless Chip Carrier (package)
NavIC	Indian Regional Navigation Satellite System
NMEA	NMEA (National Marine Electronics Association) 0183 Interface Standard

Abbreviation	Description
PAIR	Proprietary Protocol of Airoha
PI	Power Input
PO	Power Output
PQTM	Quectel Proprietary Message
QZSS	Quasi-Zenith Satellite System
RF	Radio Frequency
RTCM	Radio Technical Commission for Maritime Services
SPI	Serial Peripheral Interface
UART	Universal Asynchronous Receiver/Transmitter