L26-T/L26-P

Hardware Design

GNSS Module Series

Rev. L26-T/L26-P_Hardware_Design_V1.0

Date: 2019-11-09

Status: Released

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Quectel Wireless Solutions Co., Ltd.
Building 5, Shanghai Business Park Phase III (Area B), No.1016 Tianlin Road, Minhang District, Shanghai, China 200233
Tel: +86 21 5108 6236
Email: info@quectel.com

Or our local office. For more information, please visit:
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About the Document

History

Revision	Date	Author	Description
1.0	2019-11-09	Brooke WANG/ Phil GAO	Initial

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1 Introduction

This document defines Quectel L26-T and L26-P GNSS modules and describes their hardware interfaces, external application reference circuits, physical characteristics and air interface.

This document helps customers quickly understand module interface specifications, electrical and mechanical details, as well as other related information of L26-T/L26-P module. Other documents such as relevant software application notes and user guides are also provided. Associated with application notes and user guides, customers can use L26-T/L26-P module to design and set up mobile applications easily.

1.1. Safety Information

The following safety precautions must be observed during all phases of operation, such as usage, service or repair of any terminal incorporating Quectel L26-T/L26-P module. Manufacturers of the terminal should notify users and operating personnel of the following safety information by incorporating these guidelines into all manuals offered with the product. If not so, Quectel assumes no liability for any failure to comply with these precautions.

	Be assure the use of the product conforms to the national safety and environmental regulations, and is allowed in the country and in the environment required.
	Keep away from explosive and flammable materials. The use of electronic products in extreme power supply conditions and locations with potentially explosive atmospheres causing fire and explosion hazards.
	The product has to be powered by a stabilized voltage source, and the wiring shall conform to security and fire prevention regulations.
	Proper ESD handling procedures must be applied throughout the mounting, handling and operation of any application that incorporates the module to avoid ESD damages.

2 Product Concept

2.1. General Description

L26-T module features precise timing for timing demanding applications world-wide. The module provides an accurate time reference even with only one visible satellite. It also supports the outputting of GNSS raw data.

L26-P module features high precision. The module integrates a 6-axis sensor, and supports to output raw data of GNSS and the sensor. Combined with Quectel's 4G modules, RTK and DR (dead reckoning) algorithm, L26-P provides outstanding positioning accuracy at centimeter level under open skies.

Table 1: Key Differences Between L26-T and L26-P

Module	Timing	High Precision	Embedded MEMS Sensor	Embedded LNA	Active Antenna Detection
L26-T	●			●	●
L26-P		●	●	●	●

L26-T/L26-P module supports multiple positioning and navigation systems including GPS, BeiDou, GLONASS, Galileo, SBAS (including WAAS, EGNOS, MSAS and GAGAN), QZSS, DGPS, and AGPS. Multi-constellation allows accurate navigation in harsh environments such as urban canyons. And the built-in LNA ensures better performance in circumstances of weak or intermittent signal.

L26-T/L26-P module is an SMD type module with a compact profile of 12.2mm × 16.0mm × 2.3mm. It can be embedded in customers' applications through the 24 LCC pins with 1.1mm pitch. It provides necessary hardware interfaces for connection with the main PCB.

L26-T/L26-P module is fully compliant with EU RoHS directive.

2.2. Key Features

Table 2: Key Features

Features	Details
Receiver Type [1)]	● GPS L1 C/A (1574.397MHz~1576.443MHz) ● Galileo E1 C/A (1573.374MHz~1577.466MHz) ● GLONASS L1 C/A (1597.5MHz~1605.8MHz) ● BeiDou B1 (1559.052MHz~1563.144MHz)
Power Supply	● Supply voltage: 3.0V~3.6V ● Typical: 3.3V
Power Consumption	● Refer to ***Chapter 5.3***
Sensitivity	● Acquisition: -147dBm ● Reacquisition: -154dBm ● Tracking: -162dBm
TTFF@-130dBm (without AGPS)	● Cold Start: <32s ● Warm Start: <25s ● Hot Start: <2s
TTFF@-130dBm (with AGPS)	● Cold Start: <13s
Horizontal Position Accuracy (Autonomous)	● <1.5m CEP @-130dBm
Accuracy of TIMEPULSE Signal	● Typical accuracy: **L26-T**: 3.9ns CEP@-130dBm **L26-P**: <100ns CEP@-130dBm ● Time pulse width: 500ms
Velocity Accuracy	● Without aid: <0.1m/s
Acceleration Accuracy	● Without aid: <0.1m/s²
Dynamic Performance	● Maximum Altitude: 18000m ● Maximum Velocity: 515m/s ● Acceleration: 4G
UART Interface	**L26-T**: ● Support baud rates from 9600bps (default) to 921600bps ● Used for NMEA/PSTM transmission and firmware upgrade **L26-P**: ● Support baud rates from 115200bps (default) to 921600bps ● Used for NMEA/PSTM transmission and firmware upgrade
Temperature Range	● Operation temperature range: -40°C ~ +85°C ● Storage temperature range: -40°C ~ +90°C

Physical Characteristics	● Size: (12.2±0.15)mm × (16.0±0.15)mm × (2.3±0.20)mm ● Weight: Approx. 0.9g

NOTE

1) The default GNSS configuration of L26-T/L26-P is GPS + GLONASS + Galileo. For more details about the GNSS configuration, please refer to ***document [1]***.

2.3. Block Diagram

The following figure shows a block diagram of L26-T/L26-P module. L26-T/L26-P module includes a single-chip GNSS IC, an LNA, a SAW filter, a 6-axis MEMS sensor chip (L26-P only), a TCXO and a crystal oscillator.

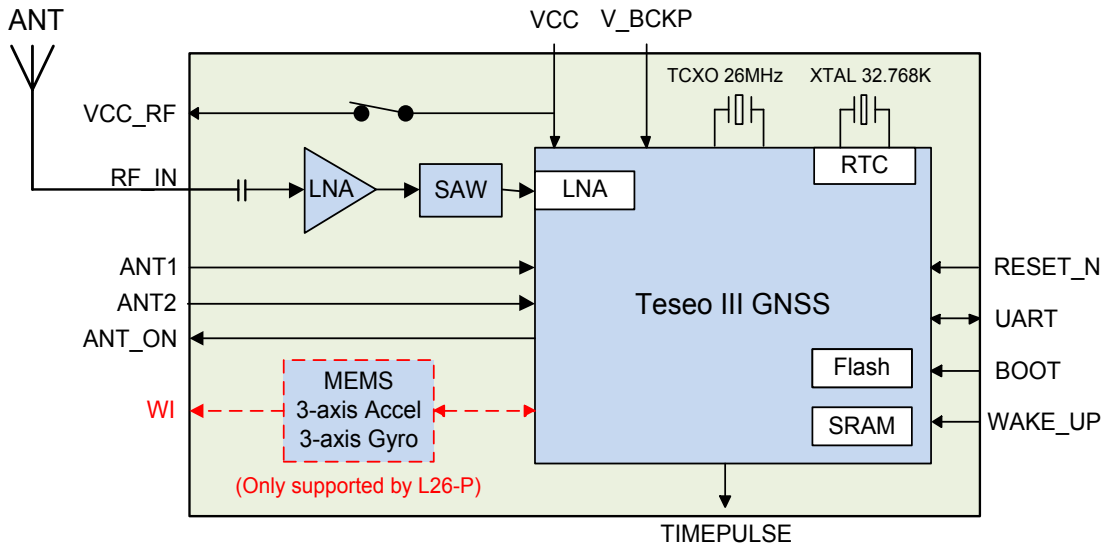

Figure 1: Block Diagram

2.4. Evaluation Board

To help customers to develop applications with L26-T/L26-P module, Quectel supplies an evaluation board (EVB) with a Micro-USB cable, an active antenna and other peripherals to test the module. For more details, please refer to ***document [2]***.

2.5. Protocols Supported by the Module

Table 3: Supported Protocols

Protocol	Description
NMEA	ASCII, 0183, 3.01(default) / 4.10
PSTM	ST proprietary protocols

NOTE

Please refer to ***document [1]*** for details of supported protocols.

3 Application Interfaces

L26-T/L26-P is equipped with 24 LCC pins that can be connected to customers' applications. The following chapters will provide a detailed introduction on the module interfaces.

3.1. Pin Assignment

Figure 2: Pin Assignment

NOTE

L26-T does not support WI, please keep this pin open when designing for L26-T.

3.2. Pin Description

Table 4: I/O Parameters Definition

Type	Description
AI	Analog Input
AO	Analog Output
DI	Digital Input
DO	Digital Output
IO	Bidirectional
PI	Power Input
PO	Power Output

Table 5: Pin Description

Power Supply					
Pin Name	**Pin No.**	**I/O**	**Description**	**DC Characteristics**	**Comment**
VCC	23	PI	Main power supply	Vmax=3.6V Vmin=3.0V Vnom=3.3V	Assure load current not less than 150mA.
V_BCKP	22	PI	RTC domain power supply	Vmax=3.6V Vmin=2.0V Vnom=3.3V	Supply power for RTC domain when VCC is powered off. If VCC is powered continuously, the V_BCKP can be left open.
Reset					
Pin Name	**Pin No.**	**I/O**	**Description**	**DC Characteristics**	**Comment**
RESET_N	8	DI	Reset the module	V_{IL}min=-0.3V V_{IL}max=0.35V V_{IH}min=0.65V V_{IH}max=1.3V	Active low. Please do not reserve any pull-up circuit for this pin. Leave it open if unused.

UART Interface					
Pin Name	**Pin No.**	**I/O**	**Description**	**DC Characteristics**	**Comment**
UART_TX	20	DO	Transmit data	V_{OL}max=0.4V V_{OH}min=VCC-0.4V V_{OH}nom=VCC-0.2V	Used for NMEA/PSTM transmission and firmware upgrade.
UART_RX	21	DI	Receive data	V_{IL}min=-0.3V V_{IL}max=0.8V V_{IH}min=2.0V V_{IH}max=VCC+0.3V	
RF Interface					
Pin Name	**Pin No.**	**I/O**	**Description**	**DC Characteristics**	**Comment**
VCC_RF	9	PO	Power supply for external RF components	Vmax=3.6V Vmin=3.0V Vnom=3.3V	Usually supply power for the external active antenna or the LNA. In standby mode, VCC_RF is turned off. VCC_RF≈VCC
RF_IN	11	AI	GNSS antenna interface		50Ω characteristic impedance.
ANT2	16	AI	Antenna detection 2	V_{IH}min=0V V_{IH}max=VCC	Leave open if unused.
ANT1	17	AI	Antenna detection 1		
ANT_ON	14	DO	power control for active antenna detection	V_{OL}max=0.4V V_{OH}min=VCC-0.4V V_{OH}nom=VCC	Leave open if unused.
Other Interfaces					
Pin Name	**Pin No.**	**I/O**	**Description**	**DC Characteristics**	**Comment**
BOOT	6	DI	Force the module to enter boot download	V_{IH}min=VCC-0.4V V_{IH}max=VCC	Pull up the pin to VCC with a 10kΩ resistor during start up, the module will enter boot download.
WAKE_UP	1	DI	Wake up the module from standby mode	V_{IL}min=-0.3V V_{IL}max=0.8V V_{IH}min=2.1V V_{IH}max=VCC	Keep this pin at low voltage level in full-on mode. It has been pulled down internally with a 47kΩ resistor. Drive the pin to a high voltage level to exit from

					standby mode. Leave open if unused.
TIMEPULSE	3	DO	One pulse per second	V_{OL}max=0.4V V_{OH}min=VCC-0.4V V_{OH}nom=VCC	Synchronized at rising edge, and the pulse width is 500ms. This pin must be at low level at startup for normal operation. It has been pulled down internally with a 47kΩ resistor. Leave open if unused.
WI	2	DO	Warning indicator	V_{OL}max=0.4V V_{OH}min=VCC-0.4V Vnorm=VCC	VCC must be valid to ensure the interrupt signal output. L26-T does not support this feature.
GND	10, 12, 13, 24		Ground		
RESERVED	2, 4, 5, 15, 18, 19		Not connected		Pin 2 is one of the reserved pins of L26-T. For L26-P, it is WI pin.
NC	7		Not connected		

NOTE

Please keep unused, NC, and RESERVED pins unconnected.

3.3. Power Supply

VCC pin supplies power for BB, RF, MEMS sensor and RTC domains. The load current of VCC pin varies with the VCC voltage level, processor load and satellite acquisition. It is recommended to choose an LDO regulator with minimum output current of 150mA as the power supply. The LDO regulator should be placed close to the module, and a decoupling capacitor combination (10μF and 100nF) as well as a TVS should be added near VCC pin.

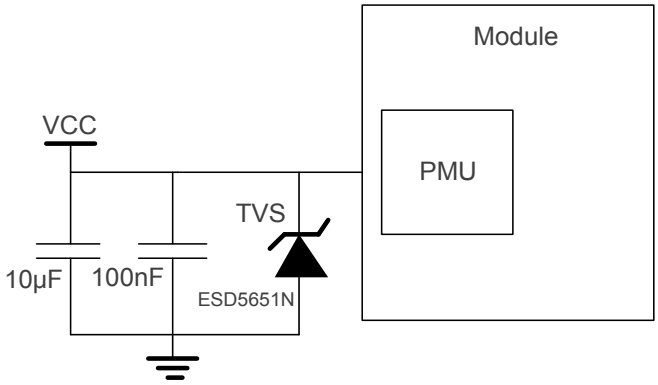

Figure 3: VCC Input Reference Circuit

VCC can be used as the power supply for RTC domain when its power supply voltage is within the normal range, otherwise, V_BCKP will be used. A cell battery and a capacitor combination (4.7μF and 100nF) are recommended to be placed nearby V_BCKP pin. The voltage of RTC domain ranges from 2.0V to 3.6V. In order to achieve better Time to First Fix (TTFF), RTC domain should be valid all the time so as to supply power for SRAM memory which contains all the necessary GNSS information for quick start-up and a small number of user-configured variables.

The module's internal power construction is shown as below.

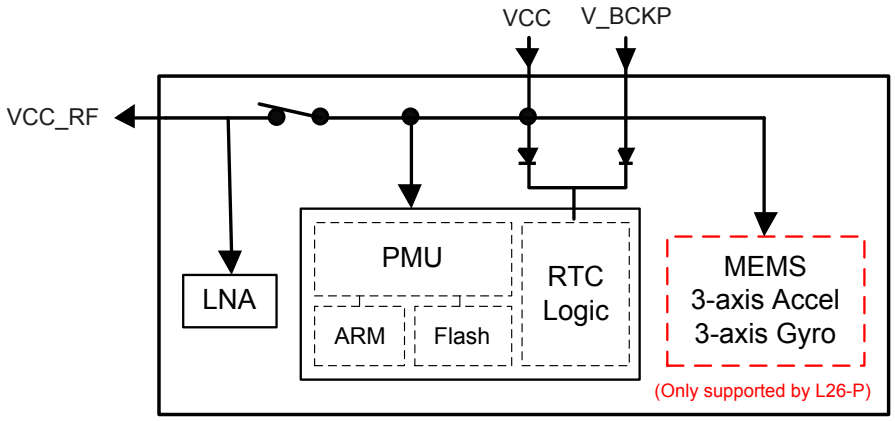

Figure 4: Internal Power Construction

3.4. Operation Modes

3.4.1. Full-on Mode

Full-on mode comprises tracking and acquisition states. In acquisition state, the module starts to search satellites, and to determine the visible satellites, coarse carrier frequency as well as code phase of satellite signals. When the acquisition is completed, it will automatically switch to tracking state. Tracking state is defined as the state in which the module is tracking satellites and demodulating the navigation data from specific satellites.

When the module is powered on, it will enter full-on mode automatically and starts with the default configurations as listed below. Please refer to ***Chapter 3.3*** about internal power construction for better comprehension.

Table 6: Default Configurations

Item	Configuration	Comment
Baud Rate	**L26-T**: 9600bps **L26-P**: 115200bps	
Protocol	**L26-T**: NMEA data **L26-P**: NMEA data, raw data of the MEMS sensor	**L26-T**: RMC, VTG, GGA, GSA, GSV and GLL **L26-P**: RMC, VTG, GGA, GSA, GSV, GLL and raw data of the MEMS sensor
Update Rate	**L26-T**: NMEA data: 1Hz **L26-P**: NMEA data: 1Hz Raw data of the MEMS sensor: 50Hz	
SBAS	Enabled	
GNSS	GPS + GLONASS + Galileo	

NOTE

RMC, VTG, GGA, GSA, GSV and GLL are NMEA output messages, which stand for functions as below:

- RMC: Recommended Minimum Specific GNSS Data
- VTG: Course Over Ground and Ground Speed
- GGA: Global Positioning System Fix Data
- GSA: GNSS DOP and Active Satellites
- GSV: GNSS Satellites in View
- GLL: Geographic Position in Latitude and Longitude

3.4.2. Standby Mode

Standby mode is a low-power-consuming mode. In this mode, the internal core and I/O power domain, RF and TCXO are powered off. UART is not accessible and the module stops acquiring and tracking satellites. But the MEMS sensor and RTC domain keep working.

There is one method to enter standby mode and two methods to exit from standby mode.

- To enter standby mode: send “$PSTMFORCESTANDBY,<duration>” command.
- To exit from standby mode: 1) drive WAKE_UP pin to high voltage level to trigger interrupt wakeup or 2) wait for the command duration to end.

Table 7: Command Duration

Parameter	Format	Description
<duration>	Decimal, 5 digits	Duration of the standby time in seconds

For a better understanding about the internal power construction, please refer to ***Chapter 3.3***.

RTC domain can be powered directly through V_BCKP by an external capacitor or battery (rechargeable or non-chargeable). The following figure illustrates the reference design of RTC domain power supply.

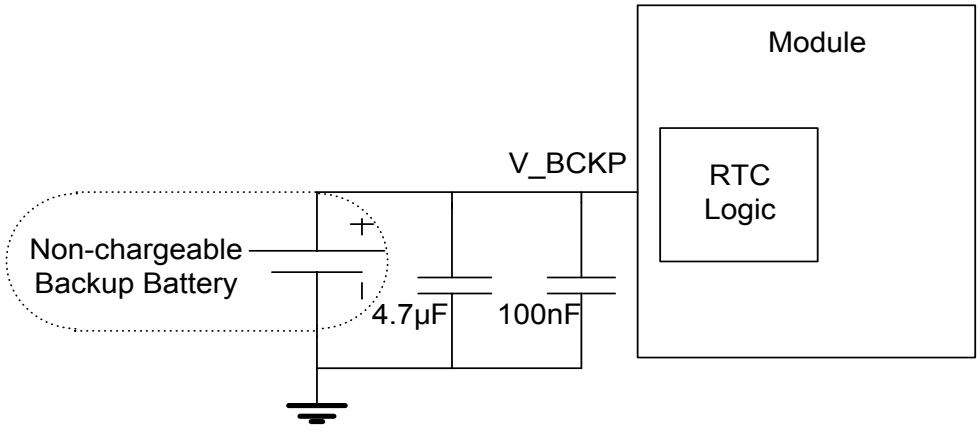

Figure 5: RTC Supply from Non-chargeable Battery

If designed with a charging circuit, V_BCKP will be able to support battery charging function. Please refer to the following reference charging circuit.

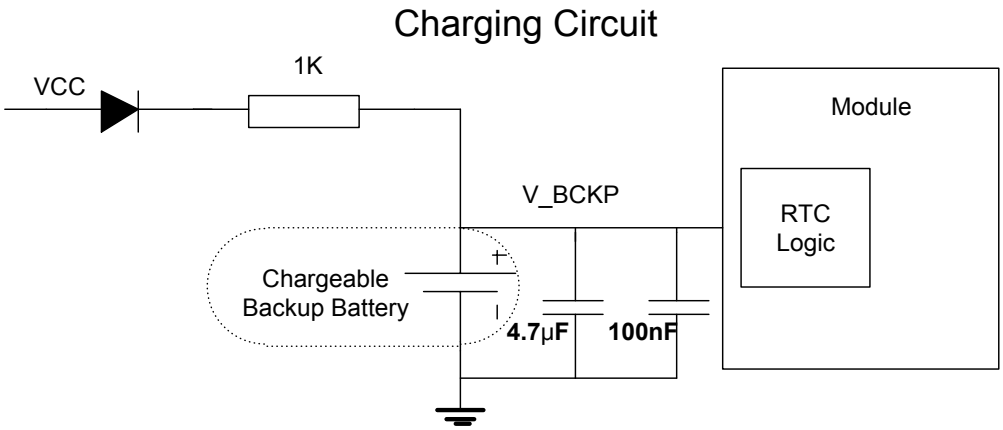

Figure 6: Reference Charging Circuit for Rechargeable Batteries

The coin-type rechargeable capacitor from Seiko (http://www.sii.co.jp/en) can be used as an alternative to the chargeable backup battery. And Schottky diode from ON Semiconductor (http://www.onsemi.com) is recommended to be used due to its low voltage drop.

3.5. Reset

As RESET is in 1.0V voltage domain, please do not reserve any pull-up circuit for this pin.

L26-T/L26-P module can be reset by releasing RESET_N after driving it to a low-level voltage for at least 10ms. To control RESET_N, an OC driver circuit shown as shown below is recommended.

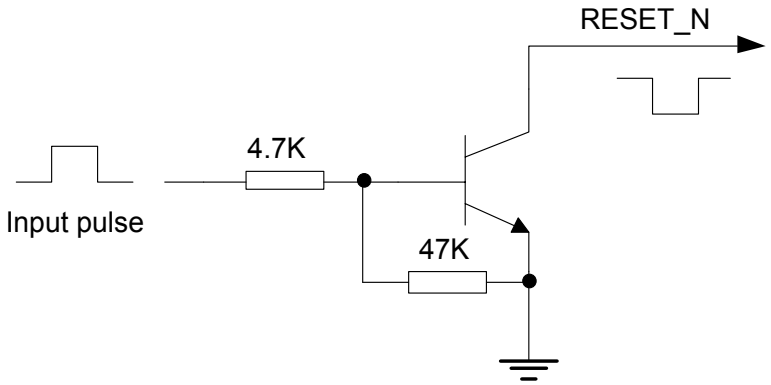

Figure 7: Reference OC Circuit for Module Reset

The following figure shows the reset timing of L26-T/L26-P module.

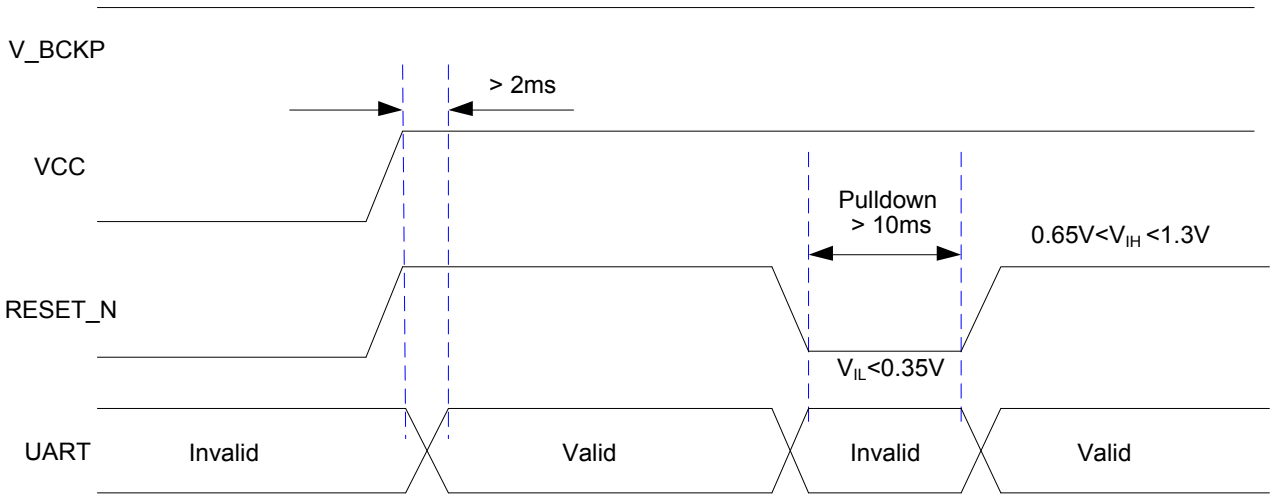

Figure 8: Reset Timing

NOTES

1. After the module is reset, data in the volatile memory will be cleared while that in the NVM will be retained. Thus, fast TTFF is still available and the command settings saved into NVM will not be cleared.
2. RESET pin can be used to reset the module to resolve crashes.

3.6. UART Interface

L26-T/L26-P provides one universal asynchronous receiver & transmitter (UART) serial port. The module is designed as DCE (Data Communication Equipment), following the traditional DCE-DTE (Data Terminal Equipment) connection. L26-T/L26-P module and the client (DTE) are connected through the signals shown in the following figure. L26-T supports baud rates 9600bps (default), 14400bps, 19200bps, 38400bps, 57600bps, 115200bps, 230400bps, 460800bps, and 921600bps, while L26-P supports baud rates 115200bps (default), 230400bps, 460800bps, and 921600bps.

UART port:

- UART_TX: Send data to the RXD signal line of DTE
- UART_RX: Receive data from the TXD signal line of DTE

The module and the client (DTE) are connected through the signals shown in the following figure.

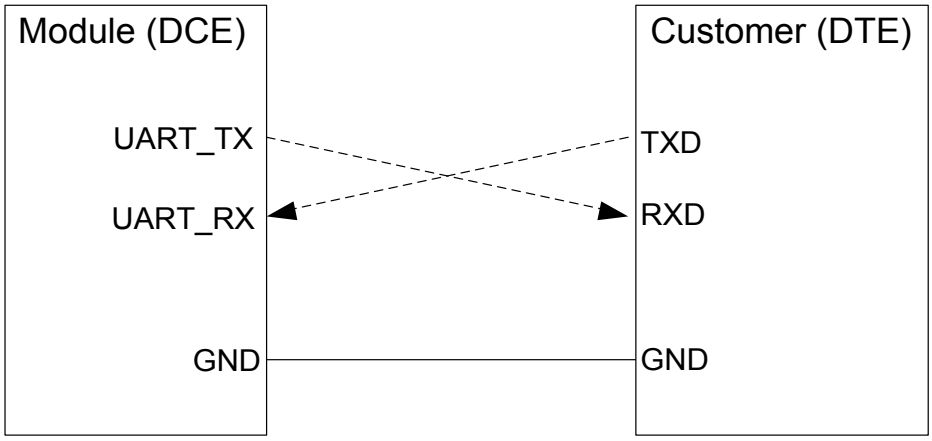

Figure 9: Reference Design for UART Port

The UART port has the following features:

L26-T:

- UART port can be used for NMEA/PSTM transmission and firmware upgrade.
- The default output NMEA type setting is RMC, VTG, GGA, GSA, GSV and GLL.
- The default setting is 9600bps, 8 bits, no parity bit and 1 stop bit.
- Hardware flow control and synchronous operation are not supported.

L26-P:

- UART port can be used for NMEA/PSTM transmission and firmware upgrade.
- The default output NMEA type setting is RMC, VTG, GGA, GSA, GSV and GLL.
- UART can be used to output raw data of MEMS sensor.
- The default setting is 115200bps, 8 bits, no parity bit and 1 stop bit.
- Hardware flow control and synchronous operation are not supported.

The UART port does not support the RS-232 level. If the module's UART port is connected to the UART port of a computer, it is necessary to add a level shift circuit in between, as illustrated below.

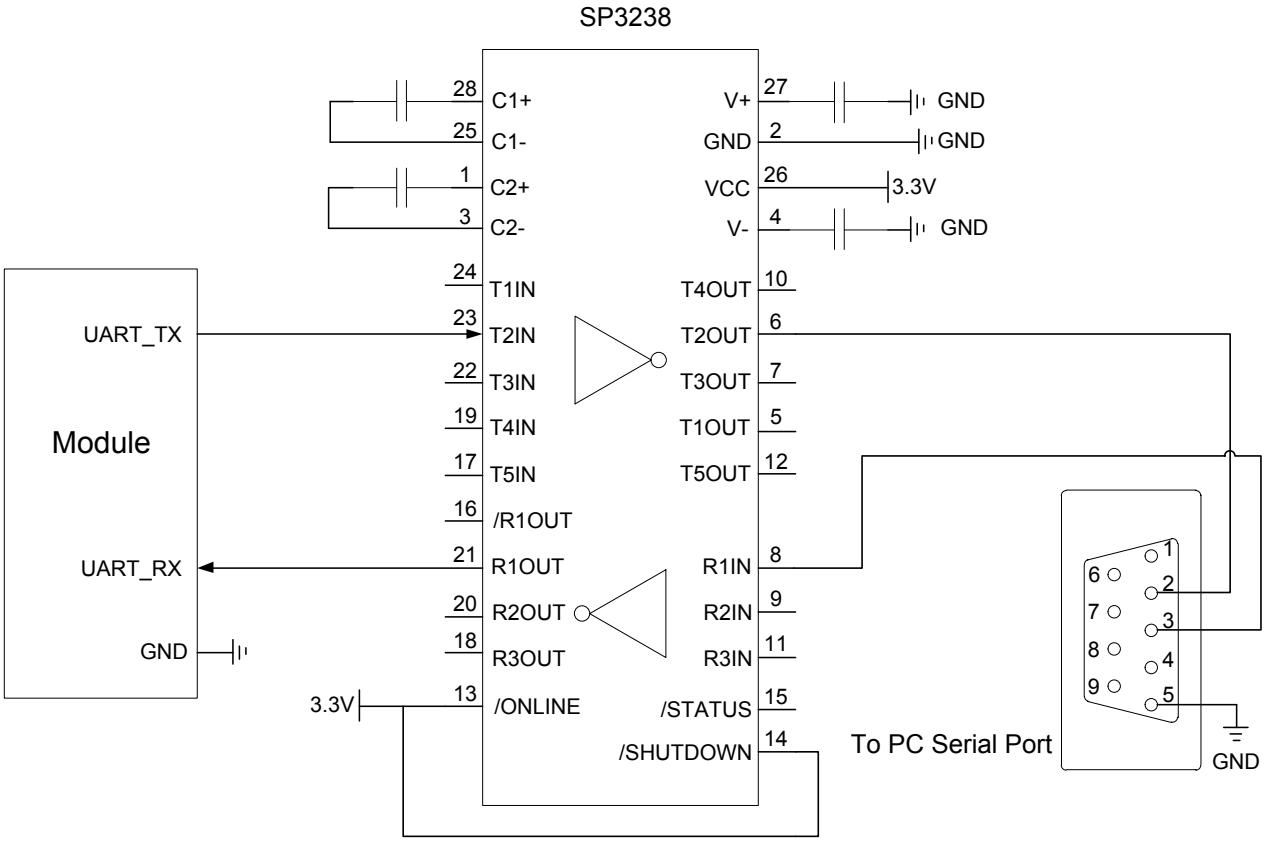

Figure 10: RS-232 Line Driver/Receiver Circuit

Please visit http://www.maxlinear.com for more information.

3.7. BOOT Interface

BOOT pin is used to enter boot download. When it is pulled up to VCC with a 10kΩ resistor during power-up, the module will enter boot download. For more details about the reference circuit design, please refer to ***document [3]***.

3.8. WI Interface

WI signal is an interrupt output to wake up the host when the value of MEMS sensor is greater than the threshold value. L26-P module cannot determine what causes an inclination angle of the vehicle. It needs the MCU to judge whether the vehicle is towed by a trailer or is running normally on an uphill road.

NOTE

To ensure the interrupt signal output, VCC of the module cannot be powered off.

4 Antenna Interfaces

L26-T/L26-P module supports GPS/Galileo/GLONASS/BeiDou/QZSS systems. The RF signal is obtained through the RF_IN pin. The impedance of RF trace should be controlled to 50Ω, and the trace length should be as short as possible. For more details about RF trace layout please refer to ***document [4].***

4.1. Antenna Specifications

L26-T/L26-P module can be connected to a dedicated passive or active GNSS antenna to receive GPS/Galileo/GLONASS/BeiDou/QZSS satellite signals. The recommended antenna specifications are given in the following table.

Table 8: Recommended Antenna Specifications

Antenna Type	Specification
GNSS	Frequency range: 1559MHz~1609MHz Polarization: RHCP or linear VSWR: <2 (Typ.) Passive antenna gain: >0dBi Active antenna noise figure: <1.5dB Active antenna total gain: <17dB

4.2. Recommended Circuit Designs for Antenna

Both active and passive GNSS antennas can be used for L26-T/L26-P module. Passive antenna is recommended if the antenna can be placed close to the module (that is, the distance between module and antenna is less than 1m). Otherwise, it is recommended to use an active antenna instead.

4.2.1. Active Antenna Reference Designs

4.2.1.1. Reference Design of Active Antenna without Antenna Detection

The following figure is a typical reference design for active antenna without Antenna Detection. In this mode, the antenna is powered by the VCC_RF. In standby mode, VCC_RF is automatically powered off.

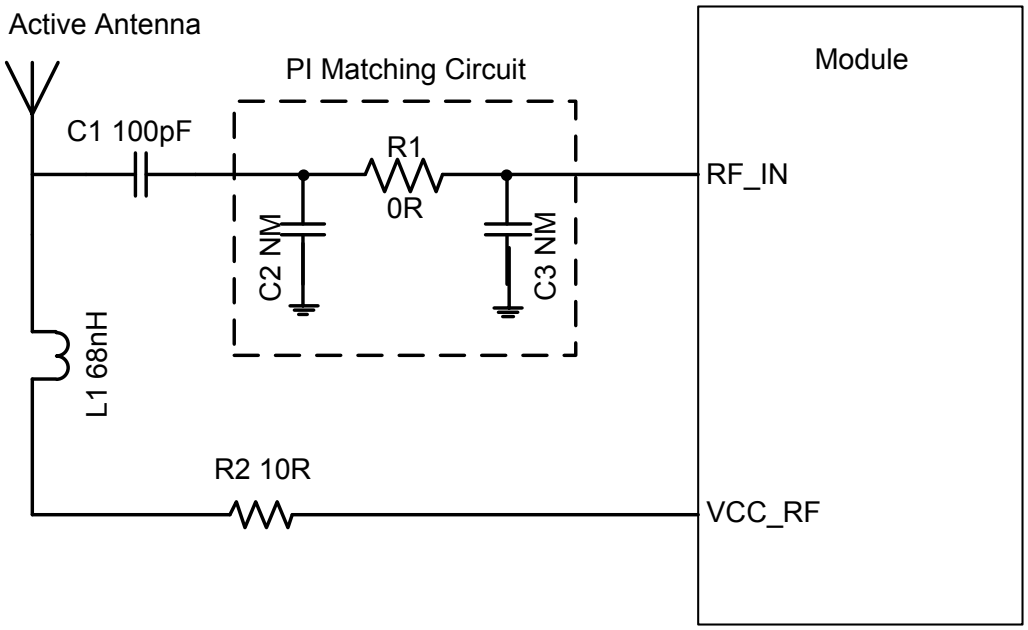

Figure 11: Reference Design for Active Antenna without Antenna Detection

C1 is used to block DC from VCC_RF. C2, R1 and C3 are reserved matching circuits for antenna impedance modification. By default, R1 is 0Ω, C1 is 100pF, while C2 and C3 are not mounted.

The inductor L1 is used to prevent the RF signal from leaking into the VCC_RF and route the bias supply to the active antenna. The recommended value of L1 is no less than 68nH. R2 protects the whole circuit in case that the active antenna is short-circuited to ground.

4.2.1.2. Reference Design of Active Antenna with Antenna Detection

The following figure is a typical reference design for active antenna with Antenna Detection.

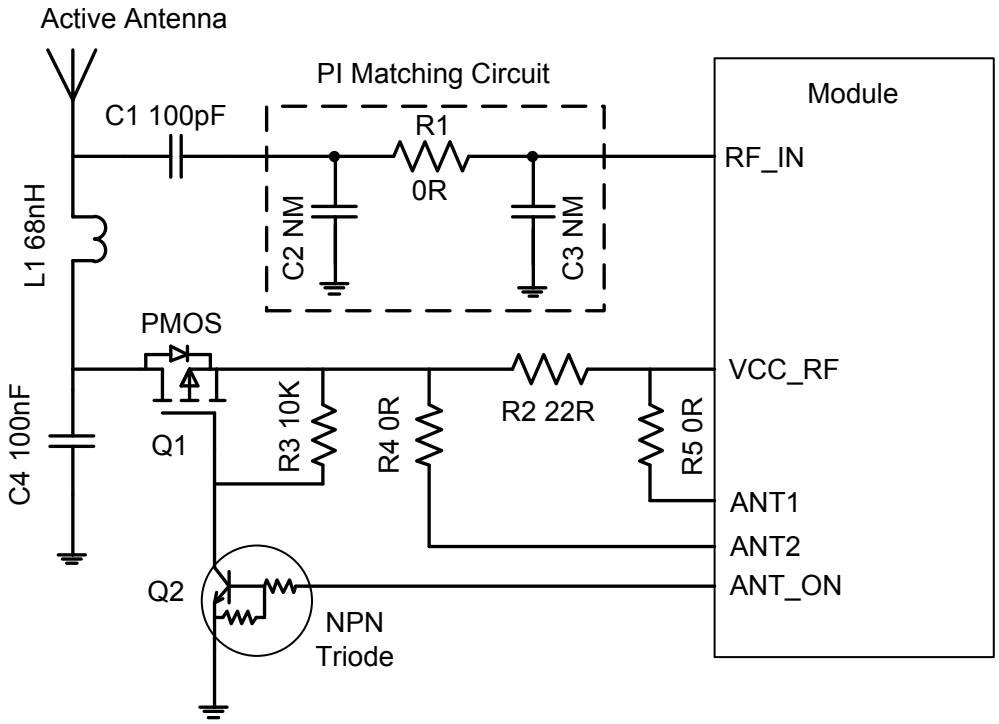

Figure 12: Reference Design for Active Antenna without Antenna Detection

L26-T/L26-P module reads the voltage at the R2 resistor ends (22Ω recommended) by two analog inputs ANT1 and ANT2. Through the antenna detection circuit, the state of antenna (normal/open/short) can be judged by comparing the voltages at the two ends of R2 resistor. The ANT_ON pin controls the power supply on the antenna.

When ANT_ON is at high level, both transistors Q1 and Q2 will be switched ON and the external antenna will be powered by VCC_RF. When ANT_ON is at low level, both Q1 and Q2 will be switched OFF and thus the external antenna will be disabled. In standby mode, VCC_RF will be automatically powered off.

Please guarantee current consumption of the antenna falls within the range of 7mA~30mA, otherwise the active antenna may not work. The status of the antenna supervisor will be reported in an NMEA ($PSTMANTENNASTATUS) message at start-up and on every change, for more details, please refer to ***document [1]***.

4.2.2. Passive Antenna Reference Designs

The following figure is a typical reference design for passive antenna.

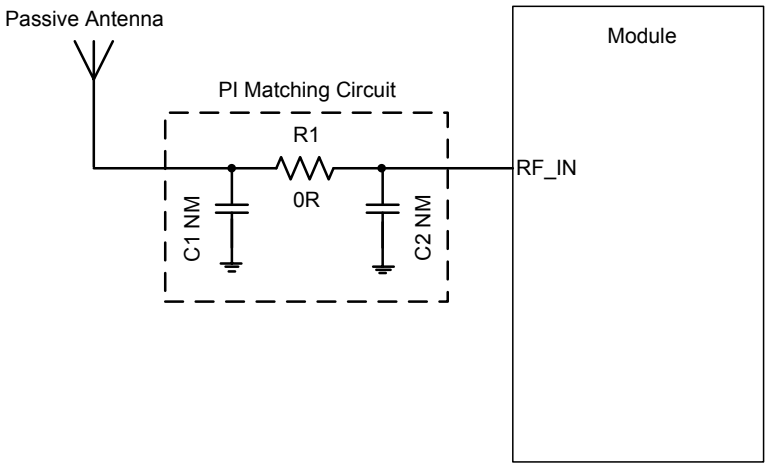

Figure 13: Reference Design for Passive Antenna

C1, R1 and C2 are reserved matching circuit for antenna impedance modification. By default, R1 is 0Ω, while C1 and C2 are not mounted. Impedance of RF trace should be controlled to 50Ω and the trace length should be kept as short as possible.

5 Electrical, Reliability and Radio Characteristics

5.1. Absolute Maximum Ratings

Absolute maximum rating for power supply and voltage on digital pins of the module are listed in the following table.

Table 9: Absolute Maximum Ratings

Parameter	Min.	Max.	Unit
Power Supply Voltage (VCC)	-0.3	4.8	V
Backup Battery Voltage (V_BCKP)	-0.3	4.8	V
Input Voltage at Digital Pins	-0.2	VCC+0.3V	V
Input Power at RF_IN (P_{RF_IN})		15	dBm

NOTE

Stressing the device beyond the “Absolute Maximum Ratings” may cause permanent damage. The product is not protected against over-voltage or reversed voltage. Thus, it is necessary to utilize appropriate protection diodes to keep voltage spikes between the minimum and maximum values given in the table above.

5.2. Operating Conditions

Table 10: Power Supply Ratings

Parameter	Description	Conditions	Min.	Typ.	Max.	Unit
VCC	Supply voltage	The actual input voltages must stay between the minimum and maximum values.	3.0	3.3	3.6	V
I_{VCCP}	Peak supply current	VCC=3.3V			150	mA
V_BCKP	Backup voltage supply		2.0	3.3	3.6	V
T_{OPR}	Full-on mode operating temperature		-40	25	+85	°C

NOTES

1. The values in the table above can be used to determine the maximum current capability of power supply.
2. Operation beyond the "Operating Conditions" is not recommended and long-time exposure beyond the "Operating Conditions" may affect device reliability.

5.3. Current Consumption

The values for current consumption are shown in the following table.

Table 11: Current Consumption

Module	Conditions	Acquisition @VCC=3.3V	Tracking @VCC=3.3V	Standby @VCC=3.3V V_BCKP=0V
L26-T	@-130dBm GPS	64mA	51mA	9μA
	@-130dBm GPS + BeiDou	72mA	62 mA	
	@-130dBm GPS + GLONASS	72mA	61 mA	
	@-130dBm GPS + GLONASS + Galileo	71mA	67mA	

L26-P	@-130dBm GPS	65mA	52mA	17μA
	@-130dBm GPS + BeiDou	73mA	62mA	
	@-130dBm GPS + GLONASS	73mA	63mA	
	@-130dBm GPS + GLONASS + Galileo	72mA	67mA	

5.4. Reliability Test

Table 12: Reliability Test

Test Item	Conditions	Standard
Thermal Shock	-30°C~+80°C, 144 cycles	GB/T 2423.22-2002 Test Na IEC 68-2-14 Na
Damp Heat, Cyclic	+55°C; >90% Rh 6 cycles for 144 hours	IEC 68-2-30 Db Test
Vibration Shock	5~20Hz, 0.96m^2/s^3; 20~500Hz, 0.96m^2/s^3-3dB/oct, 1hour/axis; no function	2423.13-1997 Test Fdb IEC 68-2-36 Fdb Test
Heat Test	85°C, 2 hours, operational	GB/T 2423.1-2001 Ab IEC 68-2-1 Test
Cold Test	-40°C, 2 hours, operational	GB/T 2423.1-2001 Ab IEC 68-2-1 Test
Heat Soak	90°C, 72 hours, non-operational	GB/T 2423.2-2001 Bb IEC 68-2-2 Test B
Cold Soak	-45°C, 72 hours, non-operational	GB/T 2423.1-2001 A IEC 68-2-1 Test

5.5. ESD Protection

L26-T/L26-P GNSS module is an ESD sensitive device. ESD protection precautions should be emphasized. Proper ESD handling and packaging procedures must be applied throughout the processing, handling and operation of any application that incorporates the module.

Please note the following measures are beneficial for ESD protection when the module is handled.

- The first contact point shall always be between the local GND and PCB GND when handling the PCB, unless there is a galvanic coupling between the local GND and the PCB GND.

- While mounting the module onto a motherboard, please make sure the GND is connected first, and then the RF_IN pad.
- Do not contact any charged capacitors or materials which may easily generate or store charges (such as patch antenna, coaxial cable, soldering iron, etc.) when handling the RF_IN pad.
- Make sure that an ESD safe soldering iron (tip) is used when soldering the RF_IN pin.

6 Mechanical Dimensions

This chapter describes the mechanical dimensions of the module. All dimensions are measured in millimeter (mm). The tolerances for dimensions are ±0.05mm unless otherwise specified.

6.1. Top and Side Dimensions of the Module

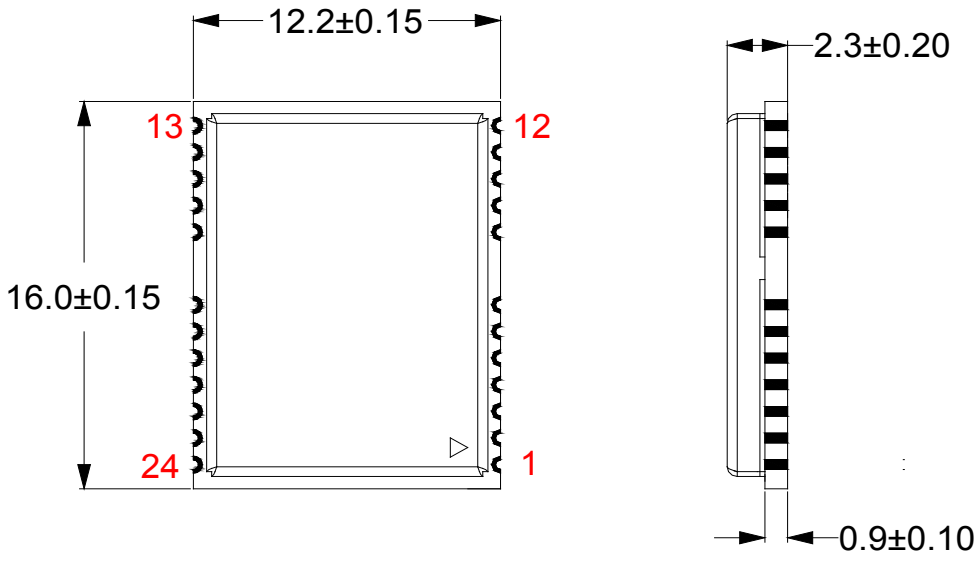

Figure 14: Top and Side Dimensions

6.2. Bottom Dimensions and Recommended Footprint

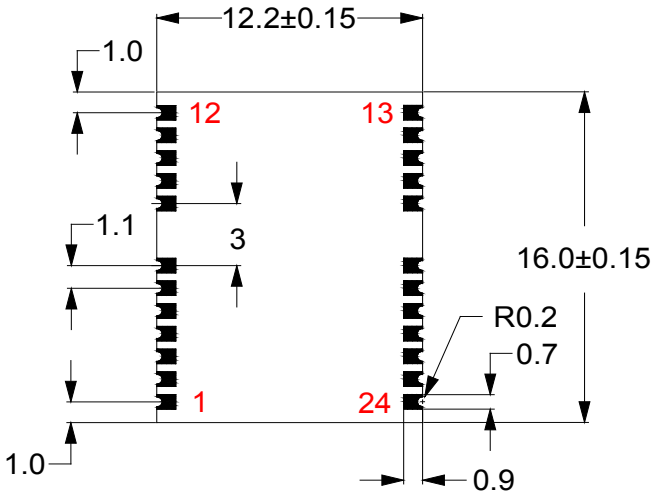

Figure 15: Bottom Dimensions

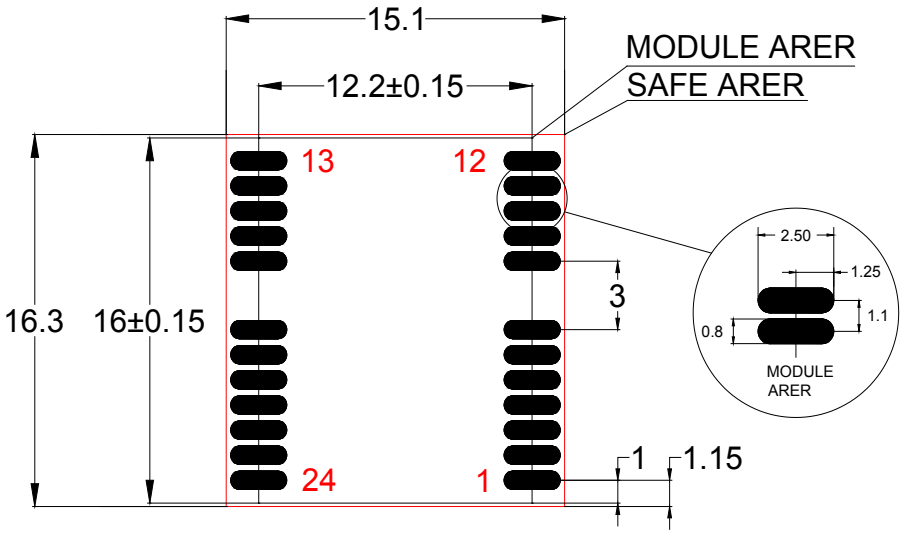

Figure 16: Recommended Footprint

NOTE

For easy maintenance of this module and accessing to these pins, please keep a distance of no less than 3mm between the module and other components on the host board.

6.3. Top and Bottom Views of the Module

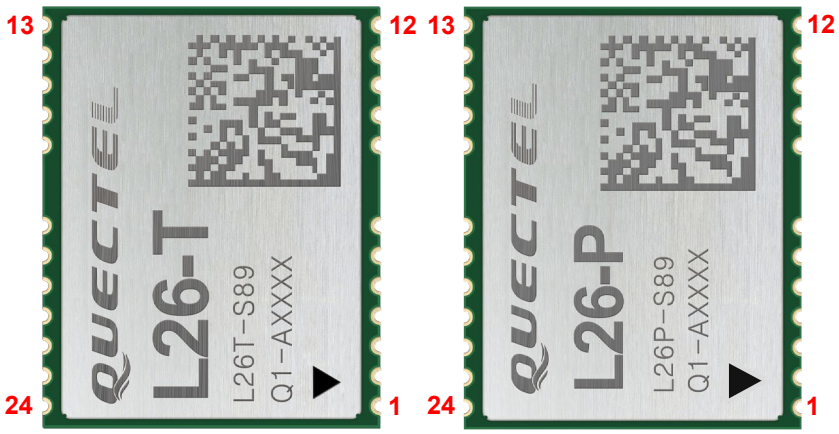

Figure 17: Top View of L26-T/L26-P Modules

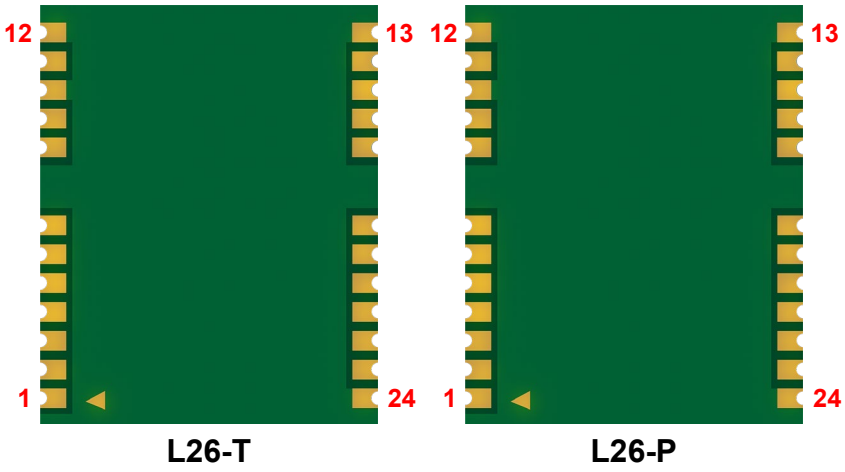

Figure 18: Bottom View of L26-T/L26-P Modules

NOTE

These are renderings of the modules. For authentic appearance and label information, please refer to the module that you receive from Quectel.

6.4. Recommended Mounting

Compared with the mounting of L26-T, which is not particularly required, the installation of L26-P is relatively more demanding. For L26-P, one of the X, Y and Z axis, shown in the following figure, should be perpendicular to the horizontal plane, and the deviation should be less than 20°. In this case, there is no limit to the placement direction on the plane formed by the other two axes.

For instance, if axis Z is perpendicular to the horizontal plane, there is no limit to the mounting direction of the module on the module plane (i.e. the plane formed by X and Y axis), as shown in the following figure.

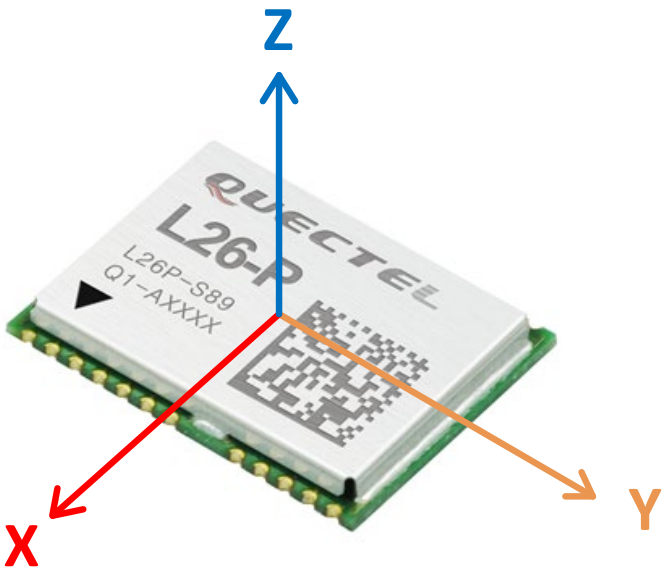

Figure 19: Module Axis

To ensure the performance, L26-P module must be fixed tightly on the vehicle without movement or shaking during positioning.

7 Storage, Manufacturing and Packaging

7.1. Storage

L26-T/L26-P is stored in a vacuum-sealed bag. It is rated at MSL 3, and its storage restrictions are shown as below.

1. Shelf life in the vacuum-sealed bag: 12 months at <40ºC/90%RH.

2. After the vacuum-sealed bag is opened, devices that will be subjected to reflow soldering or other high temperature processes must be:
   - Mounted within 168 hours at the factory environment of ≤30ºC/60%RH.
   - Stored at <10%RH.

3. Devices require baking before mounting, if any circumstance below occurs.
   - When the ambient temperature is 23ºC±5ºC and the humidity indication card shows the humidity is >10% before opening the vacuum-sealed bag.
   - Device mounting cannot be finished within 168 hours at factory conditions of ≤30ºC/60%RH.

4. If baking is required, devices may be baked for 8 hours at 120ºC±5ºC.

NOTE

As the plastic package cannot be subjected to high temperature, it should be removed from devices before high temperature (120ºC) baking. If shorter baking time is desired, please refer to *IPC/JEDECJ-STD-033* for baking procedure.

7.2. Manufacturing and Soldering

Push the squeegee to apply the solder paste on the surface of stencil, thus making the paste fill the stencil openings and then penetrate to the PCB. The force on the squeegee should be adjusted properly so as to produce a clean stencil surface on a single pass. To ensure the module soldering quality, the thickness of stencil for the module is recommended to be 0.13~0.15mm. For more details, please refer to ***document [5]***.

It is suggested that the peak reflow temperature is 238ºC ~245ºC, and the absolute maximum reflow temperature is 245ºC. To avoid damage to the module caused by repeated heating, it is strongly recommended that the module should be mounted after reflow soldering for the other side of PCB has been completed. The recommended reflow soldering thermal profile (lead-free reflow soldering) and related parameters are shown below.

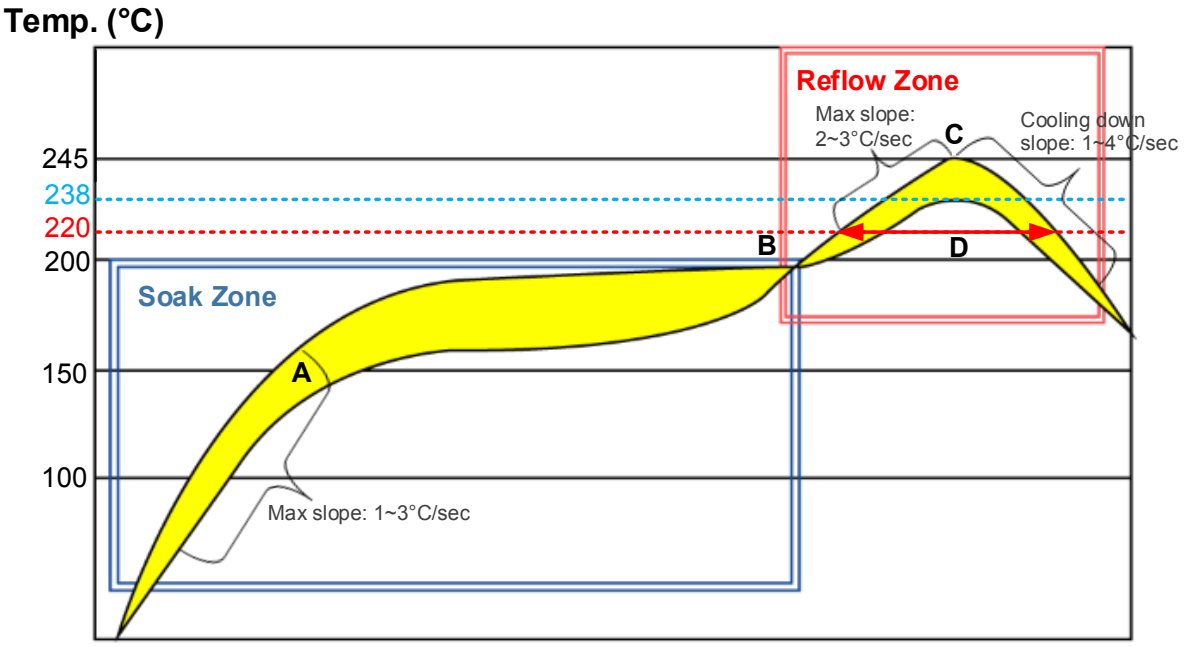

Figure 20: Recommended Reflow Soldering Thermal Profile

Table 13: Recommended Thermal Profile Parameters

Factor	Recommendation
Soak Zone	
Max slope	1 to 3°C/sec
Soak time (between A and B: 150°C and 200°C)	60 sec to 120 sec

Reflow Zone	
Max slope	2 to 3°C/sec
Reflow time (D: over 220°C)	40 sec to 60 sec
Max temperature	238°C~245°C
Cooling down slope	1 to 4°C/sec
Reflow Cycle	
Max reflow cycle	1

NOTES

1. During manufacturing and soldering, or any other processes that may contact the module directly, NEVER wipe the module's shielding can with organic solvents, such as acetone, ethyl alcohol, isopropyl alcohol, trichloroethylene, etc. Otherwise, the shielding can may become rusted.
2. The shielding can for the module is made of Cupro-Nickel base material. It is tested that after 12 hours' Neutral Salt Spray test, the laser engraved label information on the shielding can is still clearly identifiable and the QR code is still readable, although white rust may be found.

7.3. Tape and Reel Packaging

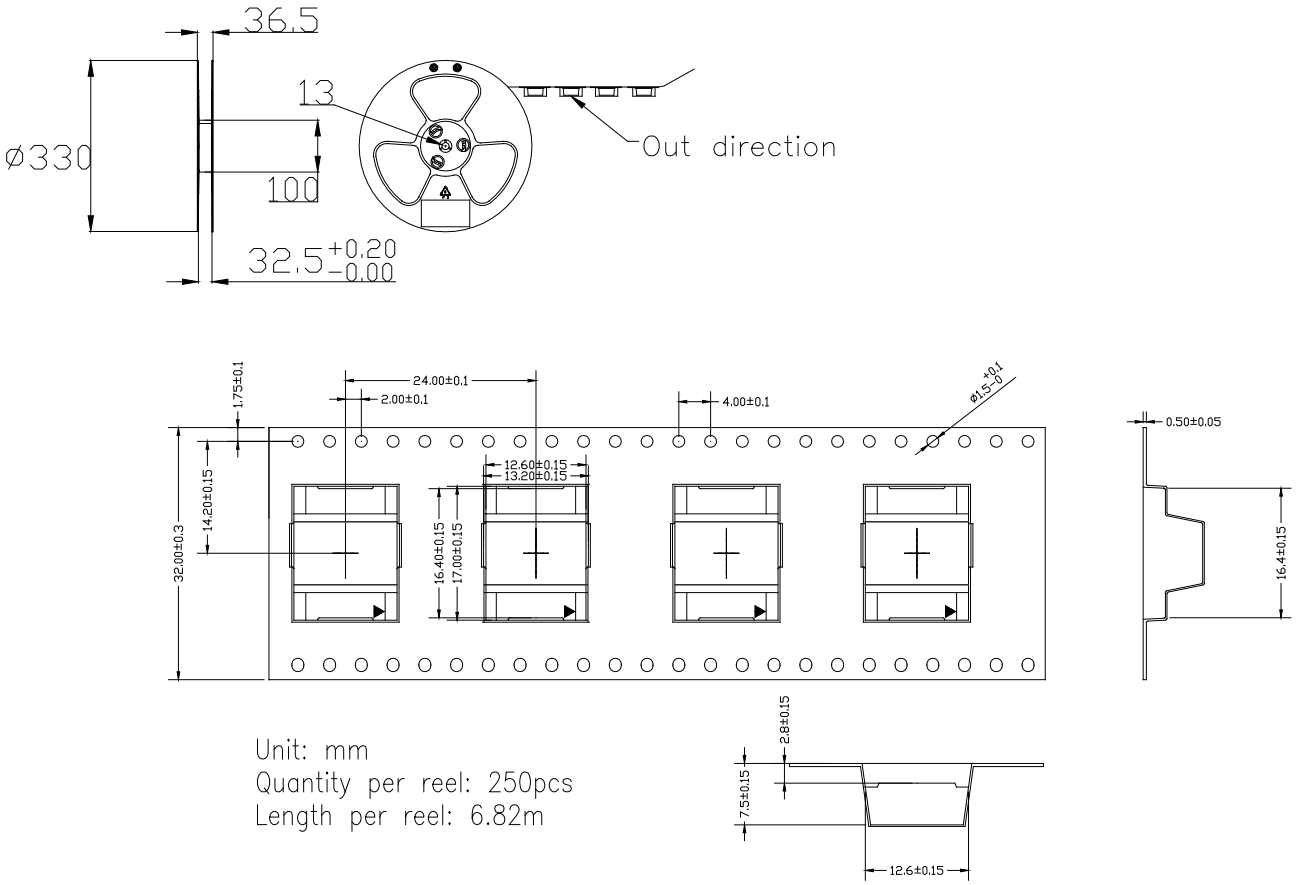

Figure 21: Tape and Reel Specifications

Table 14: Reel Packaging

Model Name	MOQ for MP	Minimum Package: 250pcs	Minimum Package x 4 = 1000pcs
L26-T	250pcs	Size: 370mm × 350mm × 56mm N.W: 0.225kg G.W: 1.0kg	Size: 380mm × 250mm × 365mm N.W: 0.9kg G.W: 4.3kg
L26-P	250pcs	Size: 370mm × 350mm × 56mm N.W: 0.225kg G.W: 1.0kg	Size: 380mm × 250mm × 365mm N.W: 0.9kg G.W: 4.3kg

8 Appendix A References

Table 15: Related Documents

SN	Document Name	Remark
[1]	Quectel_L26-T&L26-P_GNSS_Protocol_Specification	L26-T/L26-P GNSS Protocol Specification
[2]	Quectel_L26-T&L26-P_EVB_User_Guide	L26-T/L26-P EVB User Guide
[3]	Quectel_L26-T&L26-P_Reference_Design	L26-T/L26-P Reference Design
[4]	Quectel_RF_Layout_Application_Note	RF Layout Guide
[5]	Quectel_Module_Secondary_SMT_User_Guide	Module Secondary SMT User Guide

Table 16: Terms and Abbreviations

Abbreviation	Description
AGPS	Assisted GPS
CAN	Controller Area Network
CEP	Circular Error Probable
DGPS	Differential GPS
DR	Dead Reckoning
EGNOS	European Geostationary Navigation Overlay Service
ESD	Electrostatic Discharge
GPS	Global Positioning System
GNSS	Global Navigation Satellite System
GGA	GPS Fix Data

GLL	Geographic Position – Latitude/Longitude
GLONASS	Global Navigation Satellite System (the Russian GNSS)
GSA	GNSS DOP and Active Satellites
GSV	GNSS Satellites in View
IC	Integrated Circuit
I/O	Input /Output
Kbps	Kilo Bits Per Second
LNA	Low Noise Amplifier
MSAS	Multi-Functional Satellite Augmentation System
MOQ	Minimum Order Quantity
NMEA	National Marine Electronics Association
OC	Open Collector
PPS	Pulse Per Second
QZSS	Quasi-Zenith Satellite System
RHCP	Right Hand Circular Polarization
RMC	Recommended Minimum Specific GNSS Data
RTCM	Radio Technical Commission for Maritime Services
RTK	Real Time Kinematic
SBAS	Satellite-based Augmentation System
SAW	Surface Acoustic Wave
ST	STMicroelectronics
TTFF	Time To First Fix
UART	Universal Asynchronous Receiver & Transmitter
VTG	Course over Ground and Ground Speed, Horizontal Course and Horizontal Velocity
WAAS	Wide Area Augmentation System
Inom	Nominal Current

Imax	Maximum Load Current
Vmax	Maximum Voltage Value
Vnom	Nominal Voltage Value
Vmin	Minimum Voltage Value
V_{IH}max	Maximum Input High Level Voltage Value
V_{IH}min	Minimum Input High Level Voltage Value
V_{IL}max	Maximum Input Low Level Voltage Value
V_{IL}min	Minimum Input Low Level Voltage Value
$V_I$max	Absolute Maximum Input Voltage Value
$V_I$min	Absolute Minimum Input Voltage Value
V_{OH}max	Maximum Output High Level Voltage Value
V_{OH}min	Minimum Output High Level Voltage Value
V_{OL}max	Maximum Output Low Level Voltage Value
V_{OL}min	Minimum Output Low Level Voltage Value