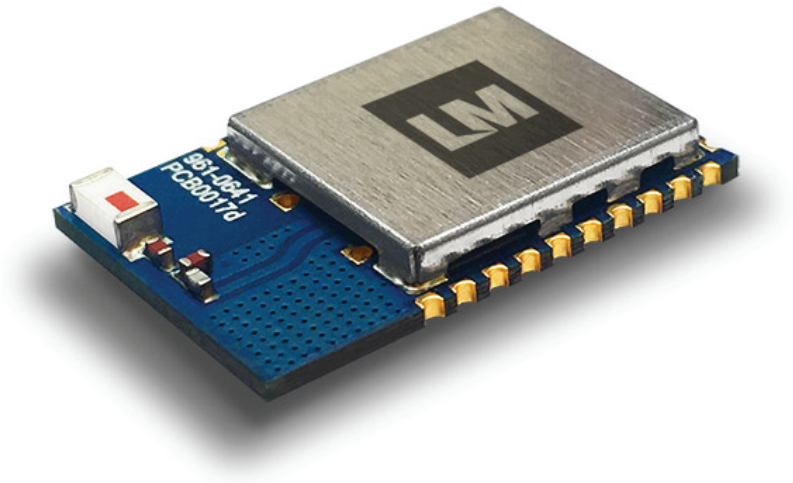
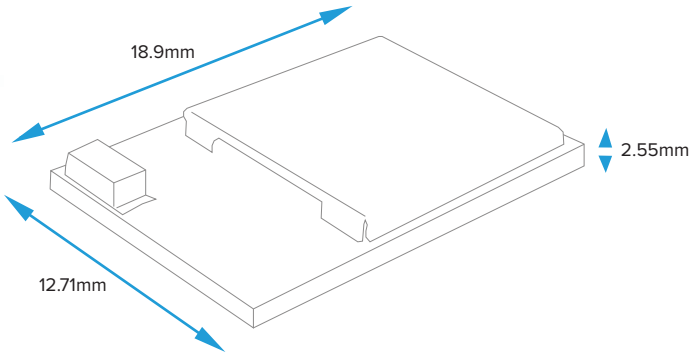
LM961 Bluetooth® 5.0 Dual Mode Module

Standalone (With Embedded Bluetooth® 5.0 Stack)

Revised	22/JAN/2021
Datasheet Version	1.4
Ordering Options	See last page





Features

- Bluetooth® 5.0 specification (Dual Mode)
- Class 1 Tx Out Power
- Low Power Consumption
- IC Antenna Onboard
- Over-the-Air Upgrade (OTAU) available
- Configurable with AT Commands
- Application firmware support
- Applications available including SPP with GAP Central, SPP or GAP Peripheral and SPP to Serial Bridge
- Fully integrated module with no additional components required
- I2C, UART and USB 2.0
- Individual PWM channels (3 on dedicated LED pads)
- 6 digital and 3 analogue I/O
- 18.9mm x 12.71mm x 2.55mm
- SMT Side and Bottom Pads for easy production
- RoHS, REACH and WEEE Compliant Solution
- See our website for this products certifications

Overview

The LM961 Bluetooth® 5.0 Dual Mode module is a powerful, versatile and cost effective solution designed for use as a GAP Central (master) or GAP Peripheral device. This allows your embedded system to wirelessly communicate with other nearby Bluetooth® v2.0, v2.1 and Bluetooth® v4.0, v4.1, v5.0 enabled devices (e.g. iOS and Android). The LM961 is also ideal for streaming high quality data and establishing Bluetooth® low energy connections.

This single core standalone module combines a Bluetooth® low energy and v2.0, v2.1 radio using a dual mode Bluetooth® 5.0 stack, plus a microcontroller unit with an 8 Mbit flash memory for running the application. It also incorporates 29 pin outs, including I2C, UART and USB for interfacing with sensors and many other peripheral devices. It's SMT side and bottom pads allow for easy manufacture and placement within your product.

LM offer bespoke integration into your product by supporting your developer, including development of new applications for the module. We also offer Bluetooth® Dual Mode demo applications, which can be customised to your specification. The module can be used as a bridge between Bluetooth® v2.0, v2.1 and Bluetooth® v4.0, v4.1, v5.0 devices, using our SPP to Serial Bridge application. We also offer SPP with GAP Central and SPP or GAP Peripheral applications.

Developed firmware and configuration settings can be preloaded to the module before supply.

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General Specification

Wireless

Bluetooth® Standard	5.0 (Dual Mode)
Module Type	Standalone (Configurable with AT Commands)
Profiles	Partial Supported SPP and GATT-Based

Hardware

Chipset	Qualcomm
Antenna	IC Antenna Onboard
Microcontroller (MCU)	16-bit RISC 80 MHz MCU
Flash Memory	8 Mbit
RAM	56 KB (12K x 24-bit)
Program Interface	SPI
Interfaces	I2C, UART, USB 2.0, AIO, PIO and PWM
Power Supply	5V (VCHG/ VBUS) or 2V8 (VBAT)
Crystal Oscillators	26 MHz
Development Kit	LM55X

RF Characteristics

Tx Output Power	9.4 dBm (Bluetooth® v2.0, v.2.1) and 10 dBm (Bluetooth® v4.0/v4.1)
Rx Sensitivity	-87 dBm (Bluetooth® v2.0, v.2.1) and -92 dBm (Bluetooth® v4.0/v4.1)
Data Rate	Up to 3Mbps
Frequency	2.4 GHz to 2.485 GHz

Physical Characteristics

Operating Temperature	-40°C to +85°C
Dimensions (L x W x H)	18.9mm x 12.71mm x 2.55mm
Weight	0.58g +/- 0.25g tolerance
Certifications	See our website for this products certifications
Compliance	RoHS, REACH and WEEE

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Firmware

The LM961 Bluetooth® 5.0 Dual Mode module is configured by using AT commands in configuration mode. The AT command set controls the primary operations such as information enquiry, connection/disconnection set up and settings. The LM961 module can be configured via its UART interface from a microcontroller or computer, using MCU software or a serial terminal (e.g. Hercules SETUP utility) respectively. At the start of every power up cycle the LM961 enters the configuration mode.

When the LM961 is connected to another Bluetooth device it enters into data mode. In data mode, users can send/receive data between the module and the remote device via UART. To exit data mode, the user can use the escape sequence. If the LM961 responds with “OK” to the escape sequence it enters into the online_command_mode (i.e. the connection is still active, AT commands can be entered via UART or the connection can be dropped). The LM961 can re-enter into data mode by using AT commands.

Default Factory Settings

Device Settings

- Discoverable: ON
- Device Name: LM961_2_Default
- Echo of command: ON
- Response to commands: ON
- Pairable State: ON

UART Settings

- Baud rate : 115200
- Stop bit : ONE
- Parity bits: NONE
- Flow Control: OFF

Bluetooth® (v1.0 - v3.0) Profile Settings

- SPP Role: Dual
- Escape sequence check enabled: YES

Bluetooth® low energy Settings

- GAP Role: Central or Peripheral (dependent on the application)

Security Settings

- Pin: 1234
- DPIN: OFF
- MITM: OFF
- IOTYPE: No Input Output

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Bluetooth® Applications

The LM961 module can run full application code for a wide range of industries. This includes the M2M (industrial cable replacement), EPOS, health & fitness and consumer electronics industries.

The LM961 modules can run all Bluetooth® applications. Depending on whether the embedded developer requires a Bluetooth® low energy connection, a high-quality data stream Bluetooth® connection or both simultaneously.

LM Technologies offer application support, including designing new applications such as:

- Alert Tag
- Beacon
- Blood Pressure Sensor
- Cycling Speed and Cadence Sensor
- Environment Sensor
- Health Thermometer
- Heart Rate Sensor
- Keyboard & Mouse
- Multifunction Steering Wheel
- Printer
- Security Tag
- Serial Communication
- Time Client
- Temperature and Pressure
- Weight Scale

Firmware Available

- SPP with GAP Central
- SPP or GAP Peripheral
- SPP to Serial Bridge

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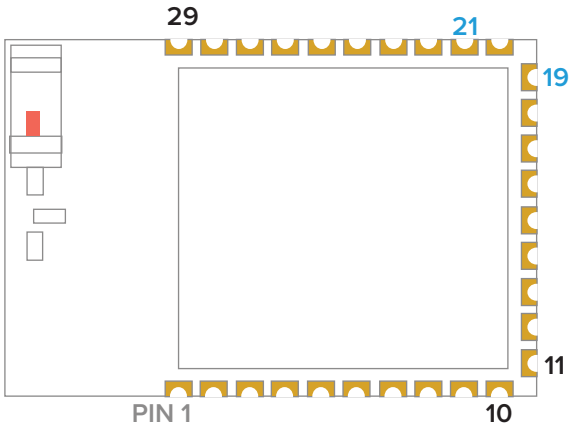
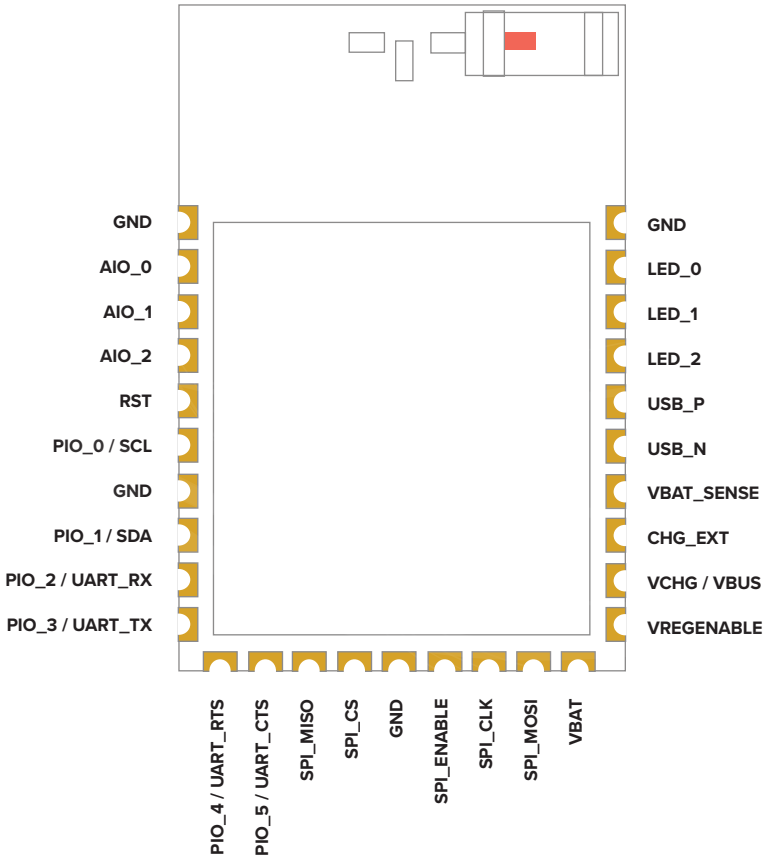
Powering

- The LM961 can be powered in one of 2 ways:

  1) Powered through the VCHG/VBUS (Pin 21)
  2) Powered from a Lithium ion / Lithium polymer battery through VBAT (Pin 19)



Pin Outs



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Pin Assignments

Pin	Name	Type	Description	Typical
1	GND	Ground	Common Ground	0V
2	AIO_0	Input	Analog Input	0V - VDD
3	AIO_1	Input	Analog Input	0V - VDD
4	AIO_2	Input	Analog Input	0V - VDD
5	RST	Input	Reset	0V - VDD
6	PIO_0 / SCL	I/O	Programmable Input / Output or I2C Serial Clock	0V - VDD
7	GND	Ground	Common Ground	0V
8	PIO_1 / SDA	I/O	Programmable Input / Output or I2C Serial Data	0V - VDD
9	PIO_2 / UART_RX	I/O	Programmable Input / Output or UART Receive	0V - VDD
10	PIO_3 / UART_TX	I/O	Programmable Input / Output or UART Transmit	0V - VDD
11	PIO_4 / UART_RTS	I/O	Programmable Input / Output or UART RTS	0V - VDD
12	PIO_5 / UART_CTS	I/O	Programmable Input / Output or UART CTS	0V - VDD
13	SPI_MISO	I/O	SPI Master In Slave Out	0V - VDD
14	SPI_CS	I/O	SPI Chip Select	0V - VDD
15	GND	Ground	Common Ground	0V
16	SPI_ENABLE	I/O	SPI Enable (CSR)	0V - VDD
17	SPI_CLK	I/O	SPI Clock	0V - VDD
18	SPI_MOSI	I/O	SPI Master Out Slave In	0V - VDD
19	VBAT	Power	Battery input	2V8
20	VREGENABLE	Power	Voltage Regulator Enable	1V
21	VCHG / VBUS	Power	Battery Charger Input/ Positive Power Supply	5V (3V - 6.5V)
22	CHG_EXT	Power	External Battery Charge Control	0V - 6.5V & 0mA-20mA
23	VBAT_SENSE	Power	Battery Charger Sense Input	200mV (195mV - 205mV)
24	USB_N	I/O	USB Negative	0V - VDD
25	USB_P	I/O	USB Positive	0V - VDD
26	LED_2	Output	PWM / LED 2	0V - VDD
27	LED_1	Output	PWM / LED 1	0V - VDD
28	LED_0	Output	PWM / LED 0	0V - VDD
29	GND	Ground	Common Ground	0V

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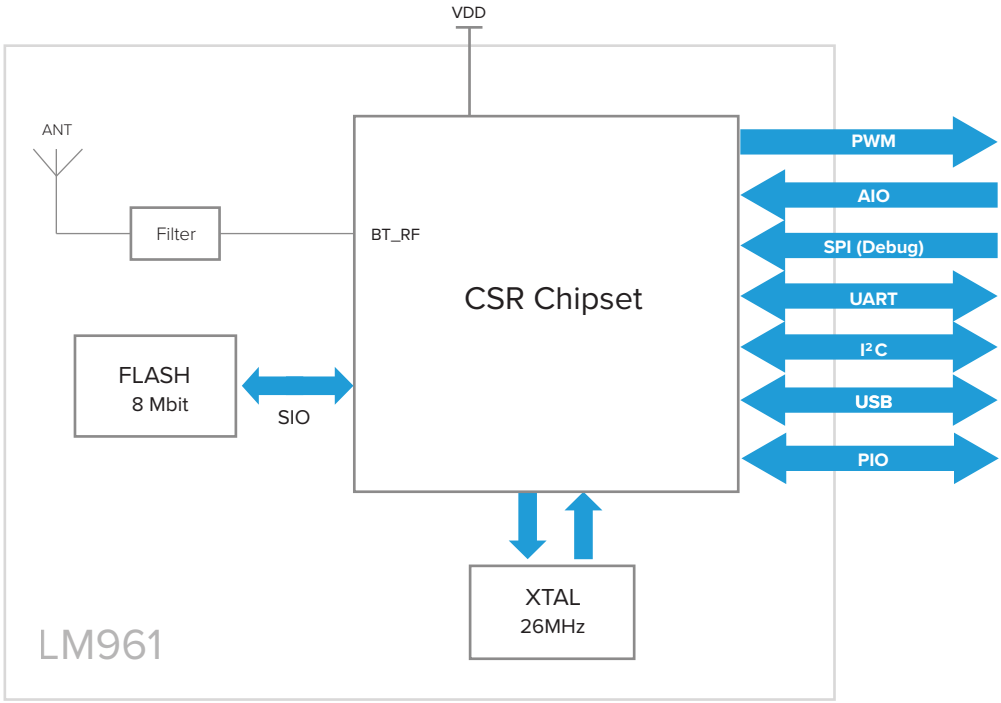
Module Block Diagram

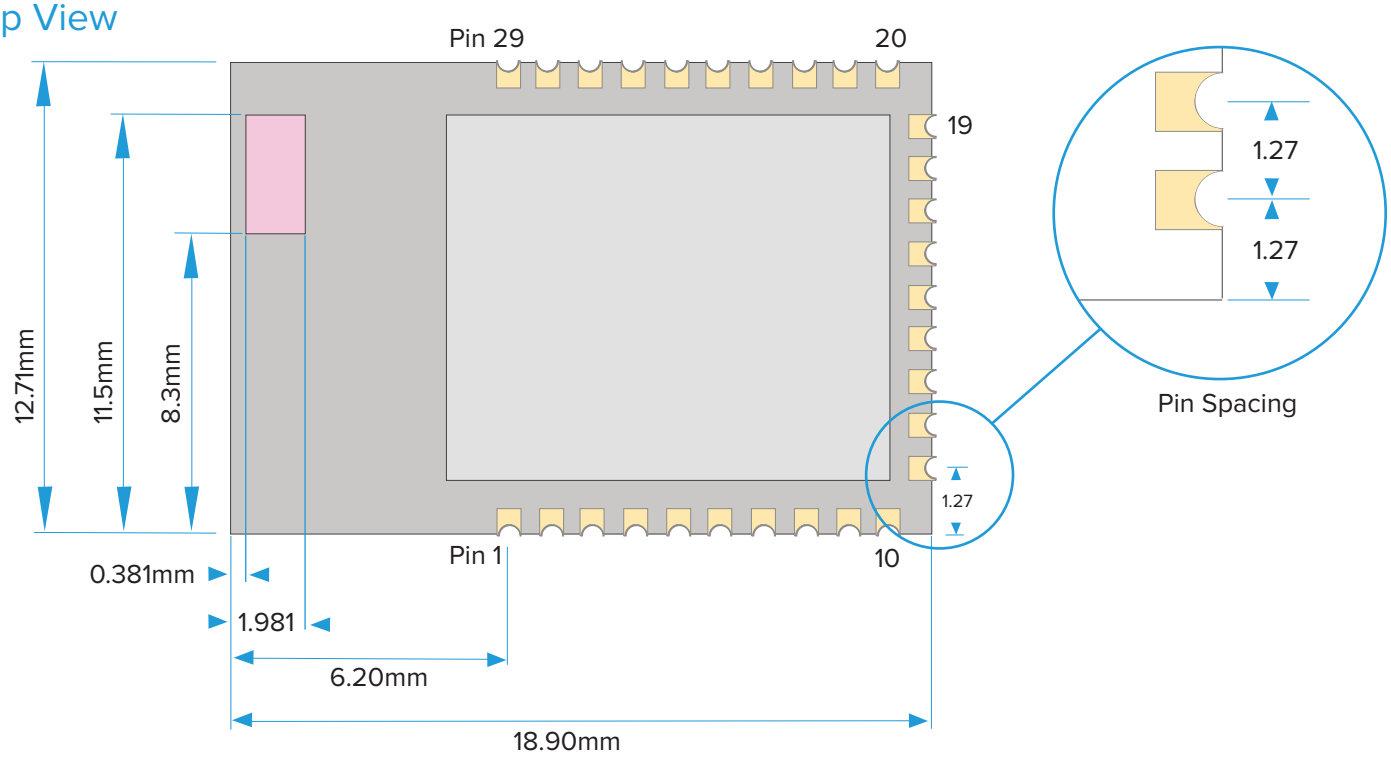


LM961 Bluetooth® 5.0 Dual Mode Module

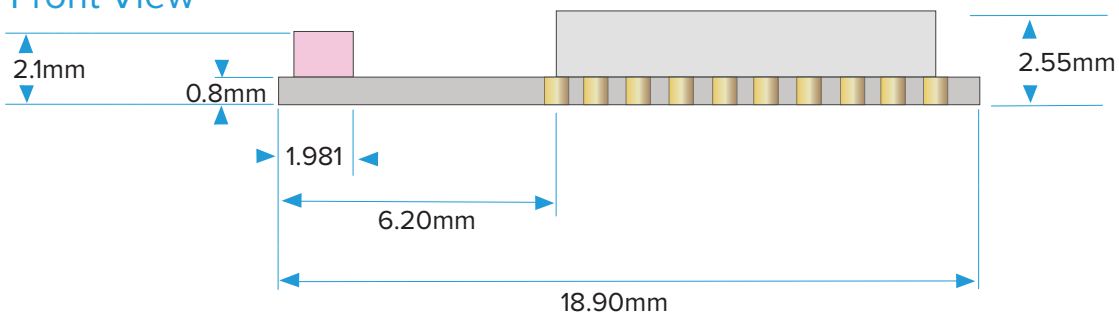
Standalone (With Embedded Bluetooth® 5.0 Stack)

Physical Dimensions

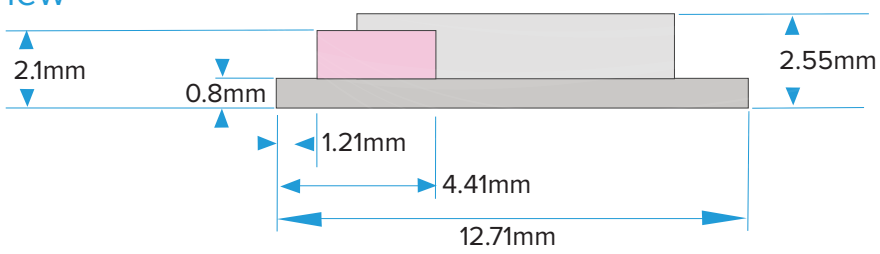
Top View



Front View



Side View



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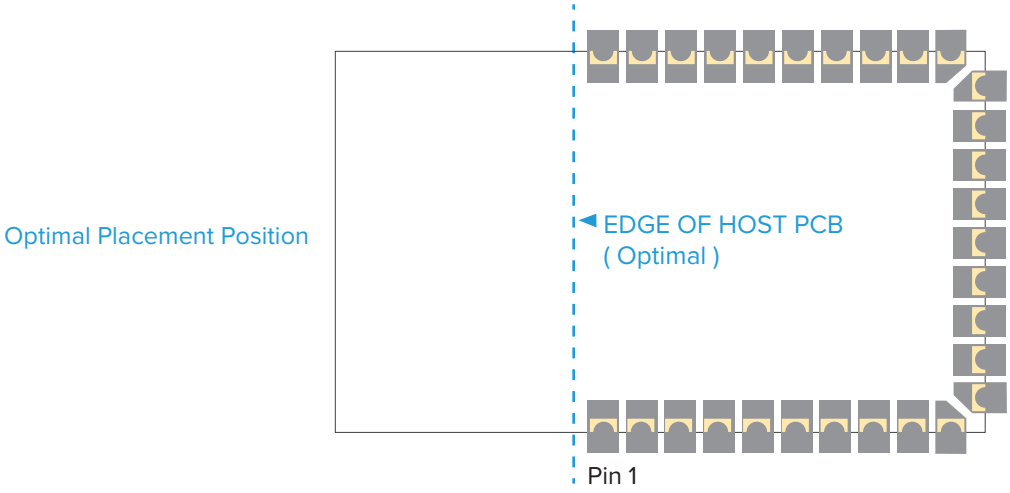
Standalone (With Embedded Bluetooth® 5.0 Stack)

PCB Footprint

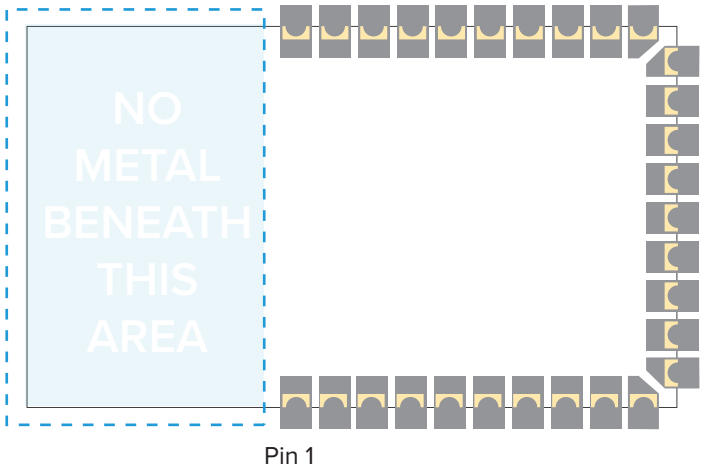


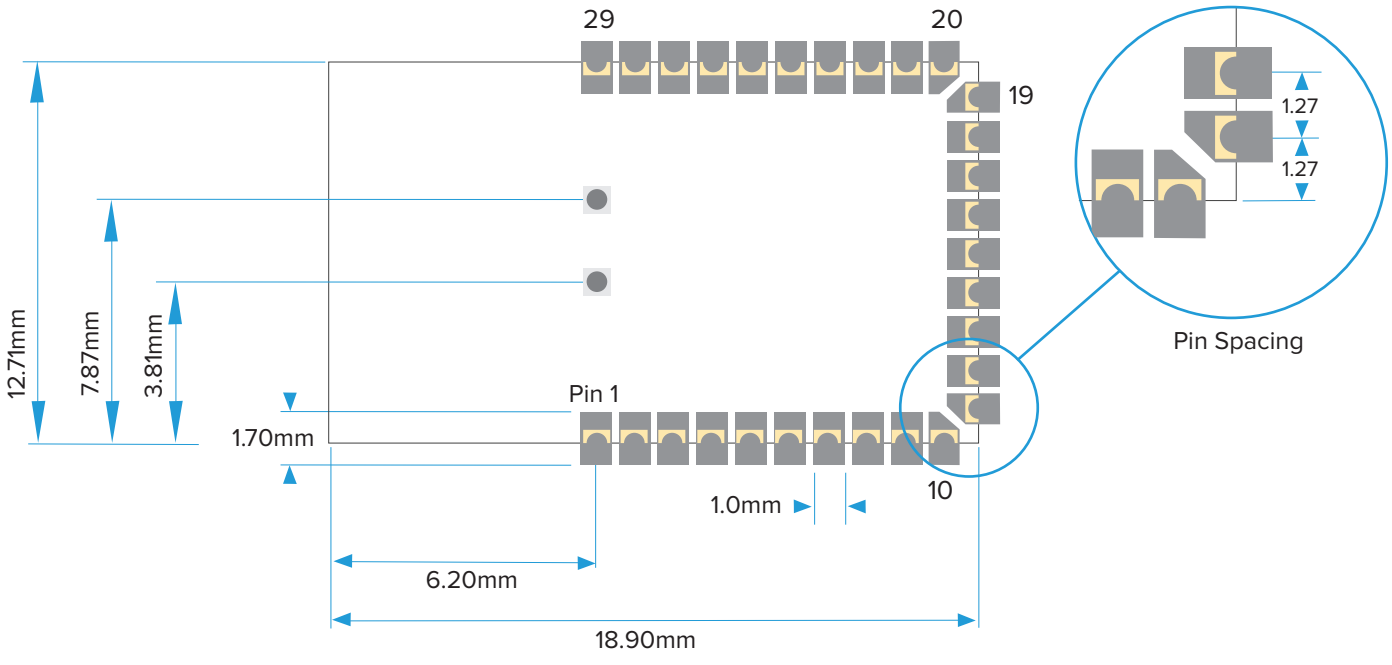
Placement Note

If the optimal placement position cannot be achieved, ensure there is no metal beneath the highlighted part of module.

NB

Aim to place the module away from interference. (i.e: place the module at the edge of the board.)





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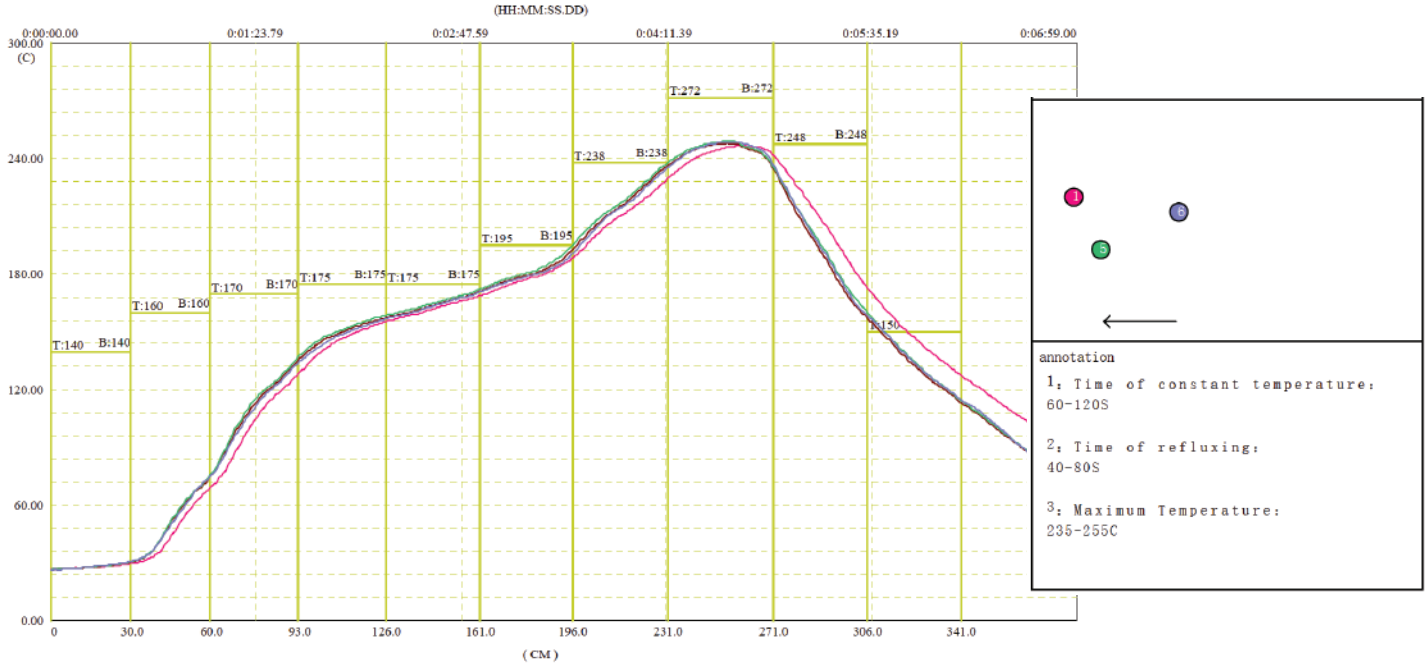
Standalone (With Embedded Bluetooth® 5.0 Stack)

PCB Drying Conditions

Please refer below to the conditions for drying before the solder reflow processes. (Extracted from IPC/JEDEC J-STD-033B.1)

Soldering and Reflow Chart



	Preheat zone slope		Immersion time 150 to 180℃		Refluxing time 220℃		Maximum Temperature		cooling zone slope	
	1.80	-13.33%	76.00	-60.00%	65.50	27.50%	247.0	46.67%	-1.70	-52.00%
	1.90	-6.67%	76.50	-58.75%	64.50	22.50%	248.3	55.33%	-2.44	-22.40%
	2.10	5.00%	75.50	-61.25%	67.00	35.00%	249.2	61.33%	-2.13	-34.67%
	1.80	-13.33%	75.50	-61.25%	63.50	17.50%	248.9	59.33%	-2.36	-25.50%

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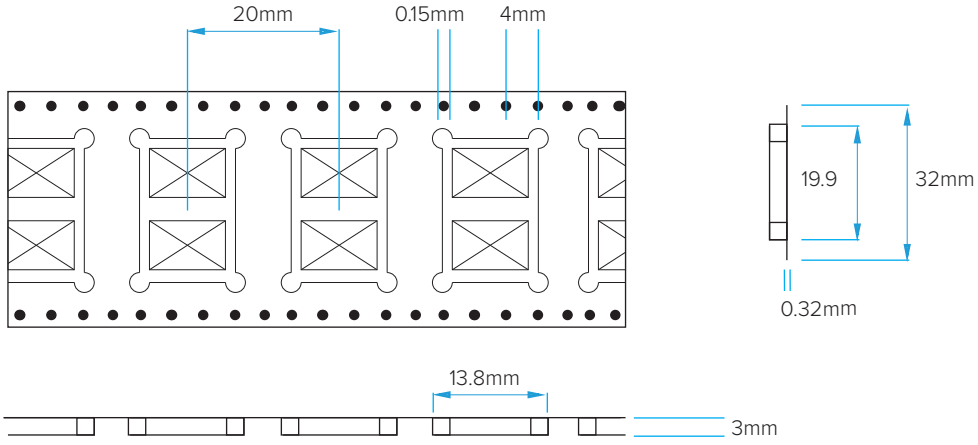
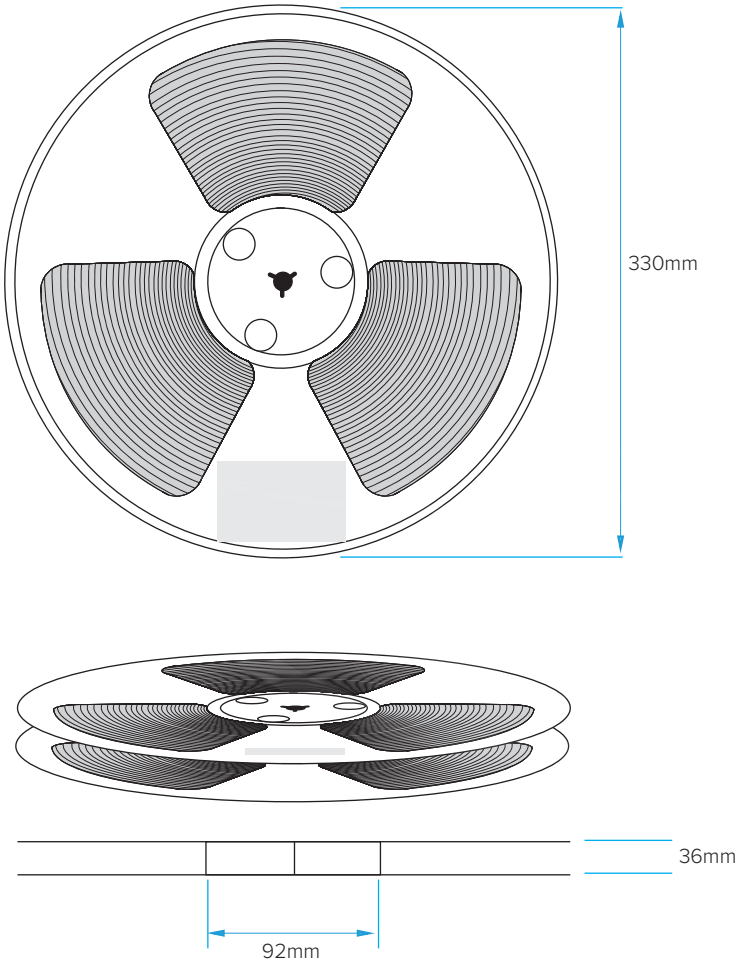
Tape and Reel Packaging

Tape Dimensions



Reel Dimensions



Notes

- Carton Dimensions (L x W x H): 360mm x 290mm x 370mm

Quantities

- 1000 modules per Tape
- 4 Boxes per Carton
- 4000 modules per Carton

LM961 Bluetooth® 5.0 Dual Mode Module

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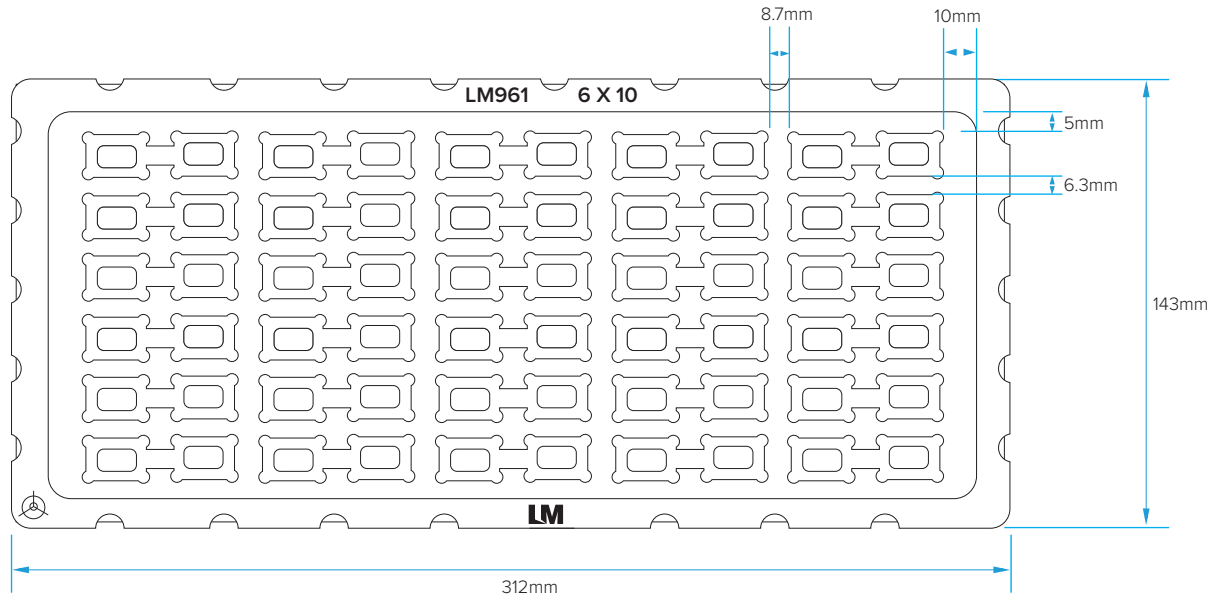
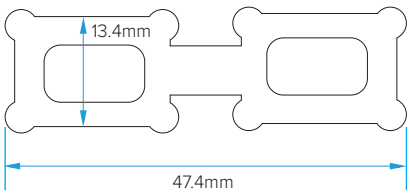
Tray Packaging

Tray Dimensions





Notes

- Anti-Static PS Tray, Black .
- Electrical Resistance: 1 MΩ< R< 100MΩ .
- Thickness: T= 0.8 mm
- Carton Dimensions (L x W x H):
  360mm x 325mm x 160mm

Quantities

- 60 modules per Tray
- 600 modules per Box
- 4 Boxes per Carton
- 2400 modules per Carton

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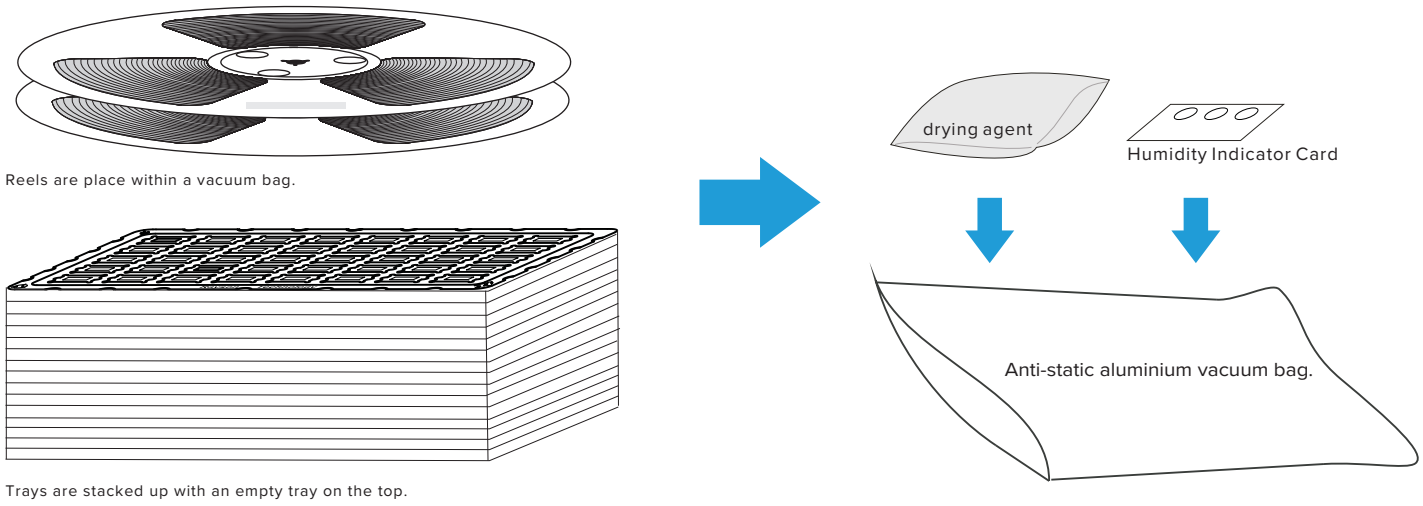
Packaging for Tape & Reel / Tray

The trays/reels are stacked and inserted into an anti-static vacuum bag with a Humidity Indicator Card.

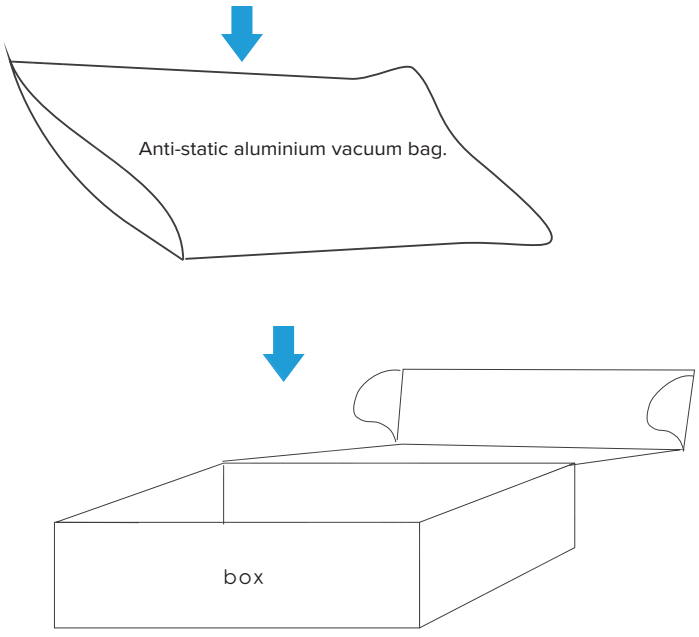
On the outside of the bag are labels for Anti-Static, Model Name and Moisture Sensitivity Levels.

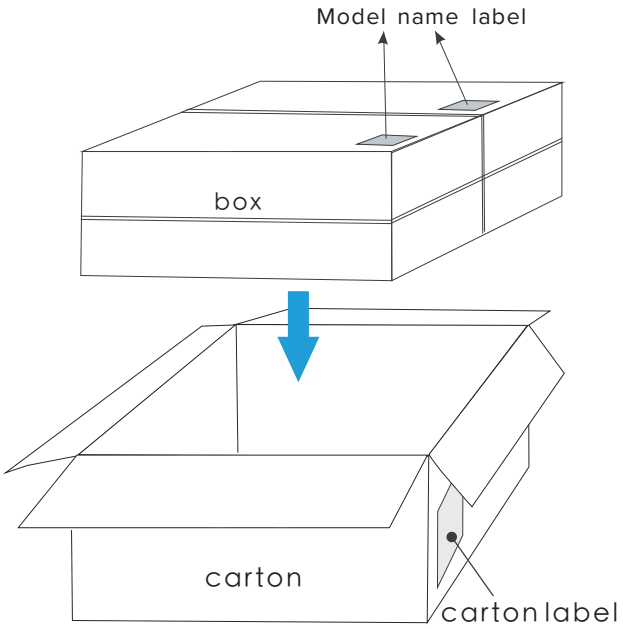


Reels are place within a vacuum bag.

Trays are stacked up with an empty tray on the top.

The vacuum bag is placed inside the box and a model name label affixed on the front-side of each box.





Each carton contains 4 boxes.

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Datasheet Version Notes

v1.0	13 MAR 2018	Added version notes to datasheet.
v1.1	13 MAR 2018	MSL Description text improvement in the PCB Drying Conditions section.
v1.1	29 MAR 2018	Datasheet Revision date typo amended.
v1.2	04 JUL 2018	MSL Description text improvement in the PCB Drying Conditions section. Packing information addition.
v1.3	22 MAY 2019	Updated Bluetooth® core version references.
v1.4	22 JAN 2021	Datasheet branding update.

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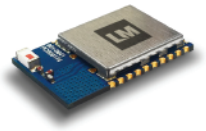
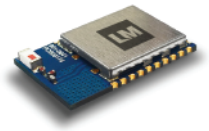
Ordering Options



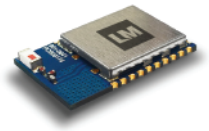
961-0650

LM961 Module
MOD SMT PROG BT5.0 D/Mode Fw5.x 9dBm IC ANT PCS



961-0651

LM961 Module
MOD SMT PROG BT5.0 D/Mode Fw5.x 9dBm IC ANT TRAY

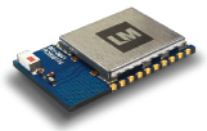


961-0652

LM961 Module
MOD SMT PROG BT5.0 D/Mode Fw 5.x 9dBm IC ANT T&R

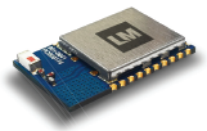
961-0660

LM961 Module
MOD SMT PROG BT5.0 D/Mode Fw5.x 4dBm IC ANT PCS



961-0661

LM961 Module
MOD SMT PROG BT5.0 D/Mode Fw5.x 4dBm IC ANT TRAY



961-0662

LM961 Module
MOD SMT PROG BT5.0 D/Mode Fw 5.x 4dBm IC ANT T&R