# LM930 Bluetooth® low energy Module (with IPEX Connector)
## Standalone (With Embedded Bluetooth® v4.1 Stack)

| | |
|---|---|
| Product | LM930 |
| Part No | See Last Page |
| Revised | 25/AUG/2017 |

**Bluetooth®**

2.50mm
10.11mm
22mm
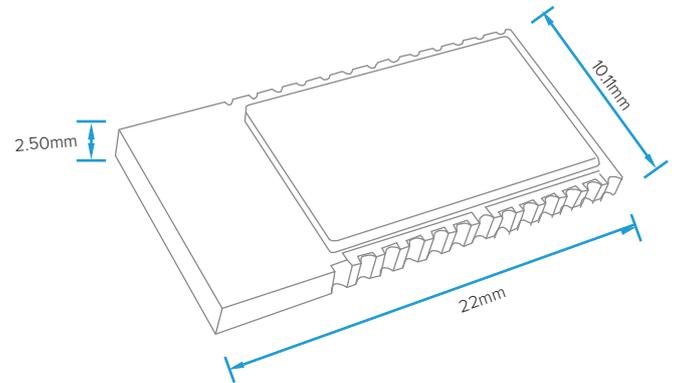
## Features

- Bluetooth® v4.1 specification
- 14 mA Current Consumption (at 0 dBm Tx Output Power)
- IPEX Connector
- 9 dBm Tx Output Power (Max) and -92 dBm Rx Sensitivity
- Over-the-Air Upgrade (OTAU) available
- Application Firmware Support
- IoT Applications available including Serial over GATT, Eddystone™ Beacon and Cloud Sensor & Cloud Collector
- Fully integrated module with no additional components required

- I²C and UART
- 9 digital and 3 analogue I/O (10-bit ADC)
- Wake-up interrupt and Watchdog timer
- 4 PWM channels
- 22mm x 10.11mm x 2.50mm
- SMT Side and Bottom Pads for easy production
- See our website for this products certifications
- RoHS, REACH and WEEE Compliant Solution

## Overview

The LM930 Bluetooth® low energy module is designed for use within embedded systems. It is implemented as a peripheral device within a product, while saving the developer valuable PCB space. The LM930 enables wireless communication with other nearby Bluetooth® low energy devices (e.g. iOS and Android) using a highly power efficient connection. The transmission output power ranges from 0 dBm to 9 dBm and can be configured to provide an extended battery life or a longer communication range.

This single core standalone module combines a Bluetooth® low energy radio using a Bluetooth® v4.1 stack, plus a microcontroller with 512 kB EEPROM for running the application. The LM930 incorporates 27 pin outs including UART and I²C for interfacing with a wide range of peripheral devices like sensors. It's SMT side and bottom pads allow for easy manufacture and placement into your product. Application firmware and configuration settings can be preloaded to the module before supply.

LM offer bespoke integration into your product by supporting your developer. We can also assist in the development of new IoT applications for the module. IoT applications such as Serial over GATT, iBeacon™ and Key Fob (with RGB LED Controller) are available with the module's LM53X development kits. The firmware is customisable to meet your requirements.

The IPEX connector provides the developer with the flexibility to add an antenna that suits the products unique requirements, such as dipole, IC or PCB antenna types. The selected antenna can be placed anywhere on the product, which is useful for avoiding any metallic surfaces of the product housing and a noisy environment of the product's PCB. Depending on the antenna used a longer range, omnidirectional or unidirectional RF signal is produced.

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## General Specification

### Wireless

| | |
|---|---|
| Bluetooth® Standard | v4.1 |
| Module Type | Standalone (Embedded Bluetooth® Stack) |
| Profiles | GATT-Based |

### Hardware

| | |
|---|---|
| Chipset | Qualcomm® |
| Antenna | IPEX Connector |
| Microcontroller (MCU) | 16-bit RISC |
| EEPROM Memory | 512 kB |
| RAM | 64 kB |
| Programming Interface | SPI |
| Interfaces | I²C, UART, AIO and PIO |
| Power Supply | 3V3 (3V6 Max) |
| Crystal Oscillators | 32 kHz and 16 MHz |
| Development Kit | LM53X |

### RF Characteristics

| | |
|---|---|
| Tx Output Power | 0 dBm to 9 dBm |
| Rx Sensitivity | -92 dBm (Typical) |
| Current Consumption (Cont.Tx) | 14 mA (at 0 dBm), 15.9 mA (at 3 dBm) and <25 mA (at 9 dBm) |
| Current Consumption (Cont.Rx) | 22 mA (Typical) |
| Range (in open space) | 110m + (with a 2 dBi antenna) |
| Data Rate | Up to 1 Mbps |
| Frequency | 2.4 GHz to 2.485 GHz |

### Physical Characteristics

| | |
|---|---|
| Operating Temperature | -30°C to +85°C |
| Dimensions (L x W x H) | 22mm x 10.11mm x 2.50mm |
| Weight | 0.82g |
| Certifications | See our website for this products certifications |
| Compliance | RoHS, REACH and WEEE Compliant Solution |

# LM930 Bluetooth® low energy Module (with IPEX Connector)
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## IoT Applications

The LM930 standalone module is capable of running your Bluetooth® low energy application. Requiring no external hardware and supports a wide range of applications such as:

- Alert Tag
- Automotive Key Fob
- Beacon
- Blood Pressure Sensor
- Cycling Speed and Cadence Sensor
- Environment Sensor
- Health Thermometer
- Heart Rate Sensor
- Keyboard & Mouse
- Multifunction Steering Wheel
- Security Tag
- Serial Communication
- Time Client
- Temperature and Pressure
- Weight Scale
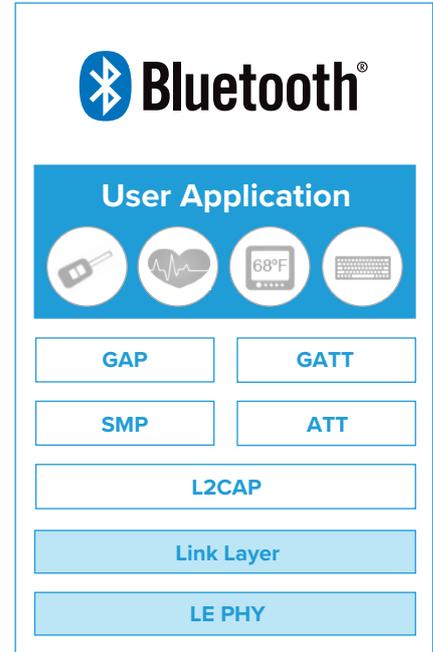
LM Technologies offer application support, including assisting the developer and creating new applications. LM provide firmware that can be customised to your specification.

Firmware available:

- Cloud Sensor
- Cloud Collector
- Eddystone™ Beacon
- URL Beacon
- iBeacon™
- Serial Server
- Console
- Key Fob (with RGB LED Controller)

# LM930 Bluetooth® low energy Module (with IPEX Connector)
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## Radio Frequency Characteristics

### Transmit Power Measurements

**Crystal Trim**

| Specification | Measurement | Unit |
|---|---|---|
| Frequency Offset ±1KHz | 0.75KHz | KHz |
| Trim Value | 18 | - |

**Output Power**

| Specification | | | Measurement | | | | | | Unit |
|---|---|---|---|---|---|---|---|---|---|
| Low Energy | Ppk | Pav | 2402MHz (CH0*) | | 2442MHz (CH20*) | | 2480MHz (CH39*) | | |
| | | | Pav | Ppk | Pav | Ppk | Pav | Ppk | |
| | <Pav +3 dBm | -20 dBm<Pave<10dBm | 7.6 | 8 | 8.0 | 8.4 | 8.9 | 9.1 | dBm |

### Receive Measurements

**Limitation Sensitivity**

| Specification | Measurement | | | Unit |
|---|---|---|---|---|
| Low Energy | 2402MHz (CH0*) | 2442MHz (CH20*) | 2480MHz (CH39*) | |
| BER≤30.8% for receiving power is -70 dBm or better. | -93 | -92 | -93 | dBm |

**Maximum Input Level**

| Specification | Measurement | | | Unit |
|---|---|---|---|---|
| Low Energy | 2402MHz (CH0*) | 2442MHz (CH20*) | 2480MHz (CH39*) | |
| PER≤30.8% for receiving power is -10 dBm or better. | 0 | 0 | 0 | % |

## Current Consumption Test

### Test Condition

(BLE PRBS9 Channel 2442MHz Package Length 37)

Continuous Tx: 14 mA (at 0 dBm), 15.9mA (at 3dBm) and <25 mA (at 9dBm)

Continuous Rx: 22 mA (typ.

Power boot up: 3 mA (typ.)

Figure
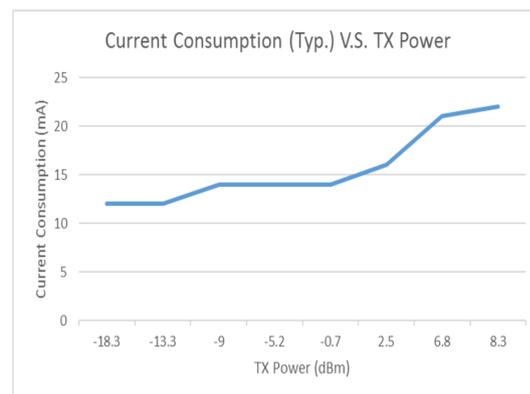


Current Consumption (Typ.) V.S. TX Power

# LM930 Bluetooth® low energy Module (with IPEX Connector)
## Standalone (With Embedded Bluetooth® v4.1 Stack)

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## Powering

Use VDD_PADS (Pin 16) or VBAT (Pin 17) to power the module.

## Pin Out
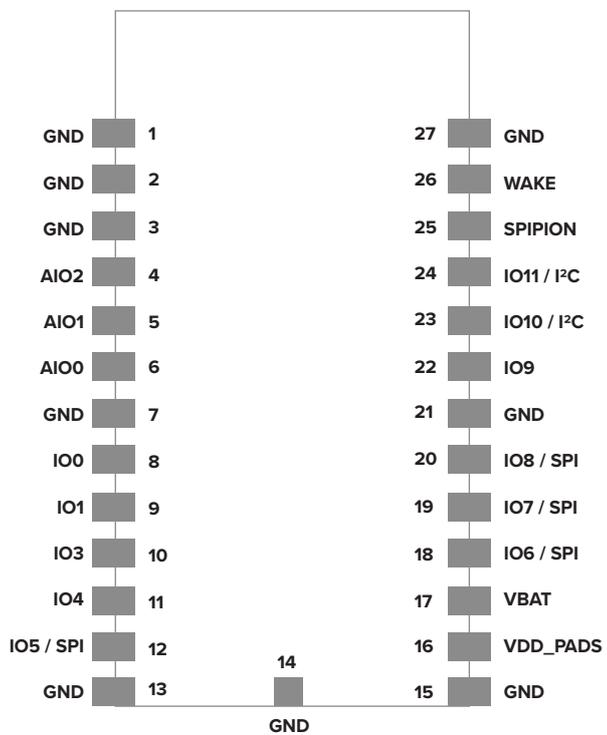
| Pin | Name | | Pin | Name |
|---|---|---|---|---|
| 1 | GND | | 27 | GND |
| 2 | GND | | 26 | WAKE |
| 3 | GND | | 25 | SPIPION |
| 4 | AIO2 | | 24 | IO11 / I²C |
| 5 | AIO1 | | 23 | IO10 / I²C |
| 6 | AIO0 | | 22 | IO9 |
| 7 | GND | | 21 | GND |
| 8 | IO0 | | 20 | IO8 / SPI |
| 9 | IO1 | | 19 | IO7 / SPI |
| 10 | IO3 | | 18 | IO6 / SPI |
| 11 | IO4 | | 17 | VBAT |
| 12 | IO5 / SPI | | 16 | VDD_PADS |
| 13 | GND | | 15 | GND |
| 14 | GND | | | |

# LM930 Bluetooth® low energy Module (with IPEX Connector)
## Standalone (With Embedded Bluetooth® v4.1 Stack)

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## Pin Assignments

| Pin | Name | Type | Description | Min | Typical | Max |
|---|---|---|---|---|---|---|
| 1 | GND | Ground | Common Ground | | 0V | |
| 2 | GND | Ground | Common Ground | | 0V | |
| 3 | GND | Ground | Common Ground | | 0V | |
| 4 | AIO2 | Input | Analogue Input | | | VDD |
| 5 | AIO1 | Input | Analogue Input | | | VDD |
| 6 | AIO0 | Input | Analogue Input | | | VDD |
| 7 | GND | Ground | Common Ground | | 0V | |
| 8 | IO0 | I/O | UART TX | | | VDD |
| 9 | IO1 | I/O | UART RX | | | VDD |
| 10 | IO3 | I/O | Programmable Input Output (PIO) | | | VDD |
| 11 | IO4 | I/O | Programmable Input Output (PIO) | | | VDD |
| 12* | IO5 / SPI | I/O | Programmable Input Output (PIO) / DEBUG_CLK | | | VDD |
| 13 | GND | Ground | Common Ground | | 0V | |
| 14 | GND | Ground | Common Ground | | 0V | |
| 15 | GND | Ground | Common Ground | | 0V | |
| 16 | VDD_PADS | Power | Positive supply for all digital and analogue I/O Pins | 1V2 | 3V3 | 3V6 |
| 17 | VBAT | Power | Module battery power supply DC | 1V8 | 3V3 | 3V6 |
| 18* | IO6 / SPI | I/O | Programmable Input Output (PIO) / DEBUG_CS# | | | VDD |
| 19* | IO7 / SPI | I/O | Programmable Input Output (PIO) / DEBUG_MOSI | | | VDD |
| 20* | IO8 / SPI | I/O | Programmable Input Output (PIO) / DEBUG_MISO | | | VDD |
| 21 | GND | Ground | Common Ground | | 0V | |
| 22 | IO9 | I/O | Programmable Input Output (PIO) | | | VDD |
| 23 | IO10 / I²C | I/O | Programmable Input Output (PIO) / SDA | | | VDD |
| 24 | IO11 / I²C | I/O | Programmable Input Output (PIO) / SCL | | | VDD |
| 25 | SPIPION | Input | High to enable the SPI debug interface, Low to enable PIO | | | VDD |
| 26 | WAKE | Input | Toggle to wake from Dormant Mode | | | VDD_BAT |
| 27 | GND | Ground | Common Ground | | 0V | |

\* for SPI at P12, P18, P19 and P20 set P25 to High.

\* for PIO at P12, P18, P19 and P20 set P25 to Low.

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# LM930 Bluetooth® low energy Module (with IPEX Connector)
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## Module Block Diagram
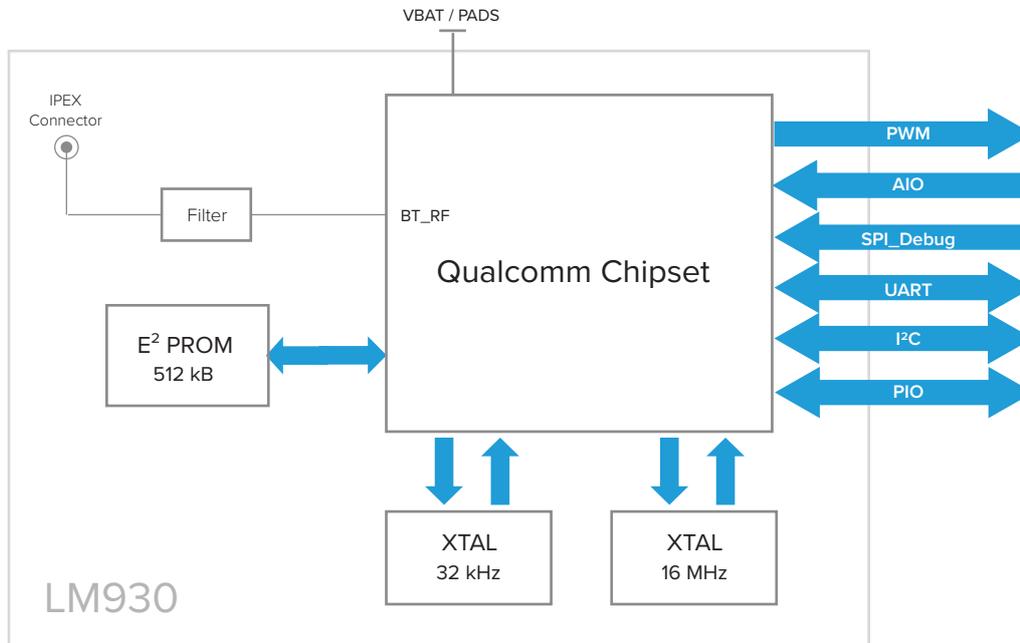
```
                              VBAT / PADS
                                   |
  IPEX
  Connector
     ⊙
     |
     |        Filter          BT_RF                          ━━▶ PWM
     |                                                       ◀━━ AIO
                          Qualcomm Chipset                   ◀━━ SPI_Debug
  E² PROM   ◀━━▶                                             ◀━▶ UART
  512 kB                                                     ◀━▶ I²C
                                                             ◀━▶ PIO

                      ↓↑             ↓↑
                    XTAL           XTAL
                    32 kHz         16 MHz
  LM930
```

# LM930 Bluetooth® low energy Module (with IPEX Connector)
## Standalone (With Embedded Bluetooth® v4.1 Stack)

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## Physical Dimensions

### Top View
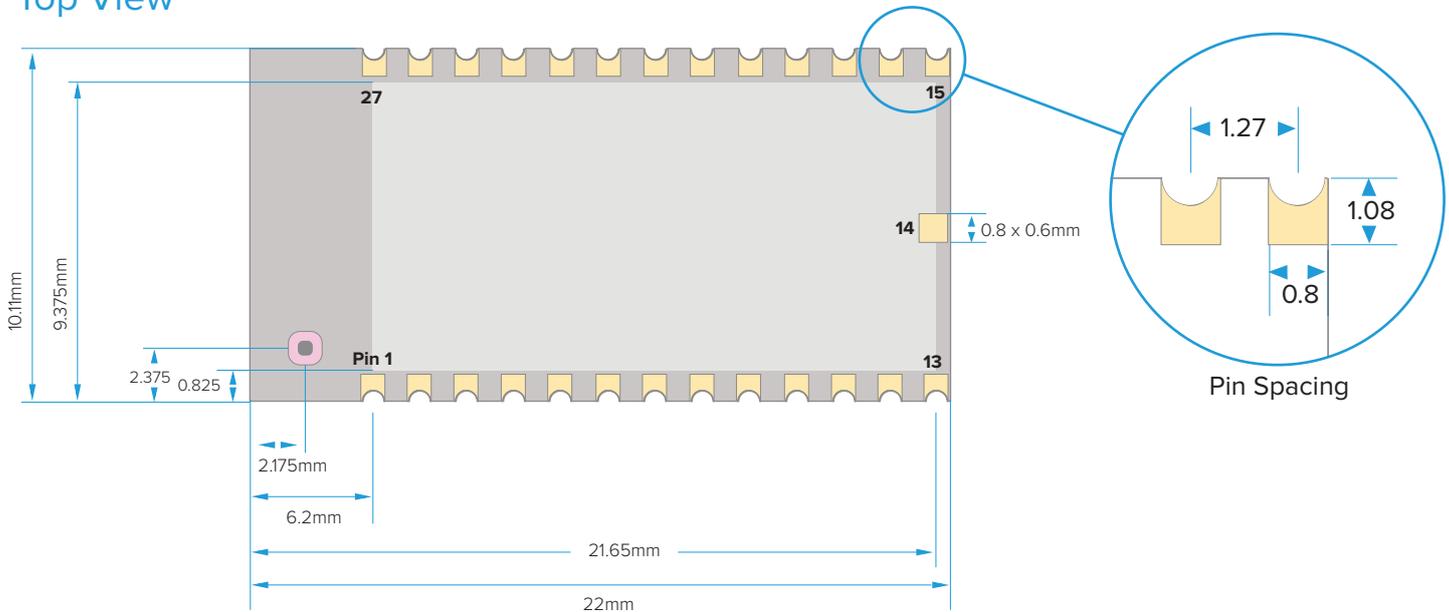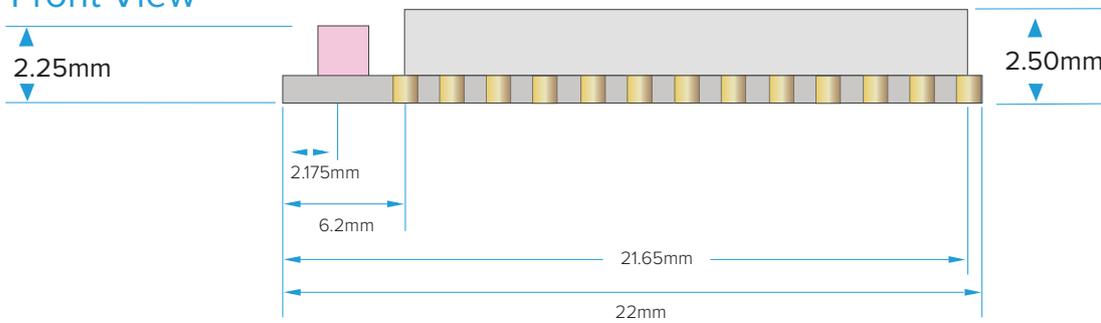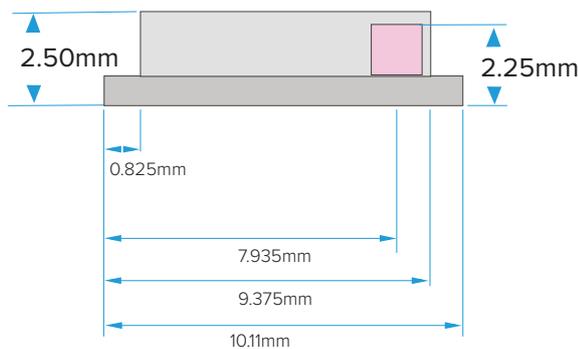


10.11mm
9.375mm
27
15
14
0.8 x 0.6mm
Pin 1
13
2.375
0.825
2.175mm
6.2mm
21.65mm
22mm

1.27
1.08
0.8

Pin Spacing

### Front View



2.25mm
2.50mm
2.175mm
6.2mm
21.65mm
22mm

### Side View



2.50mm
2.25mm
0.825mm
7.935mm
9.375mm
10.11mm

## LM930 Bluetooth® low energy Module (with IPEX Connector)
Standalone (With Embedded Bluetooth® v4.1 Stack)

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### PCB Footprint
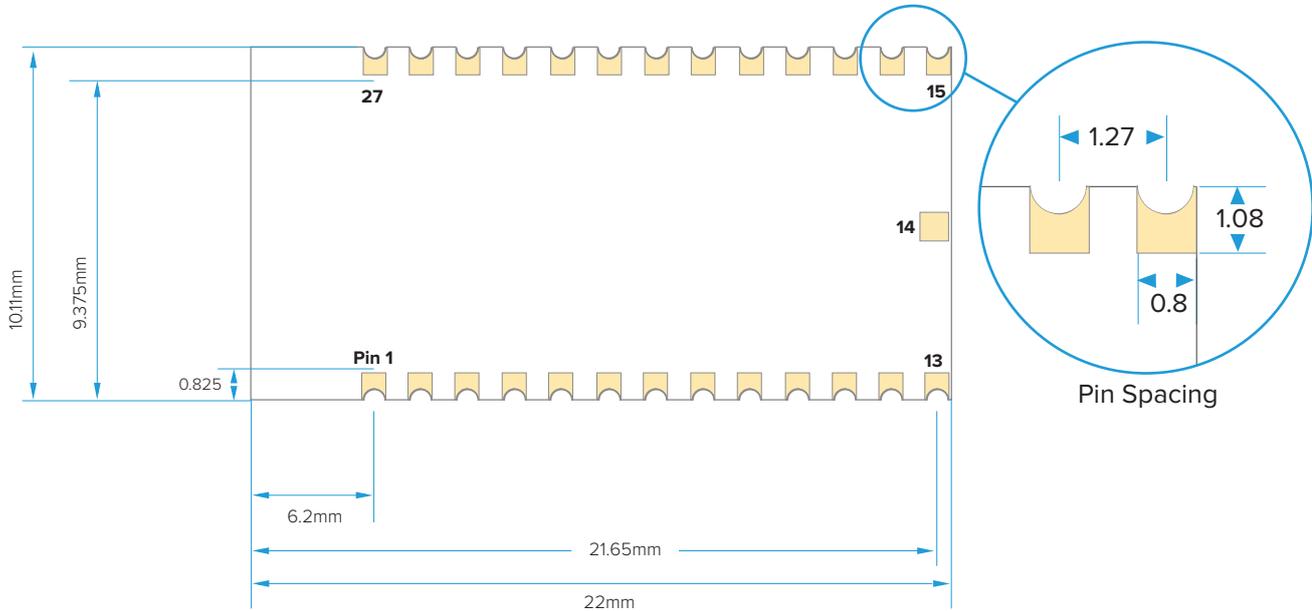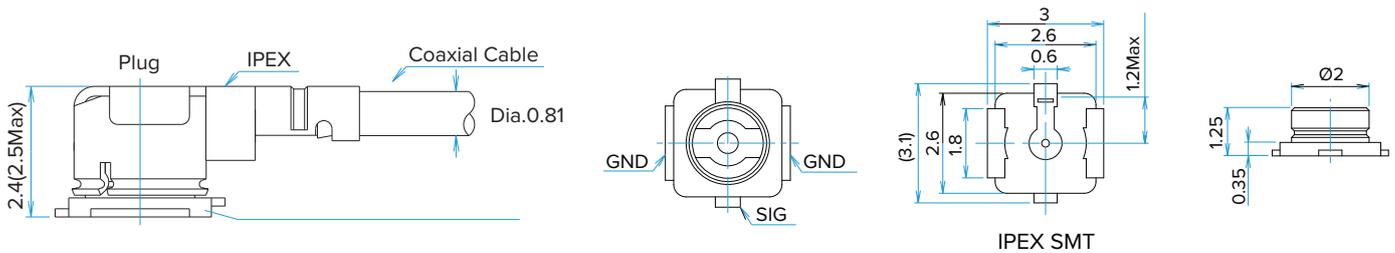


Pin Spacing

### IPEX Connector



IPEX SMT

# LM930 Bluetooth® low energy Module (with IPEX Connector)
Standalone (With Embedded Bluetooth® v4.1 Stack)

## Soldering Reflow Chart
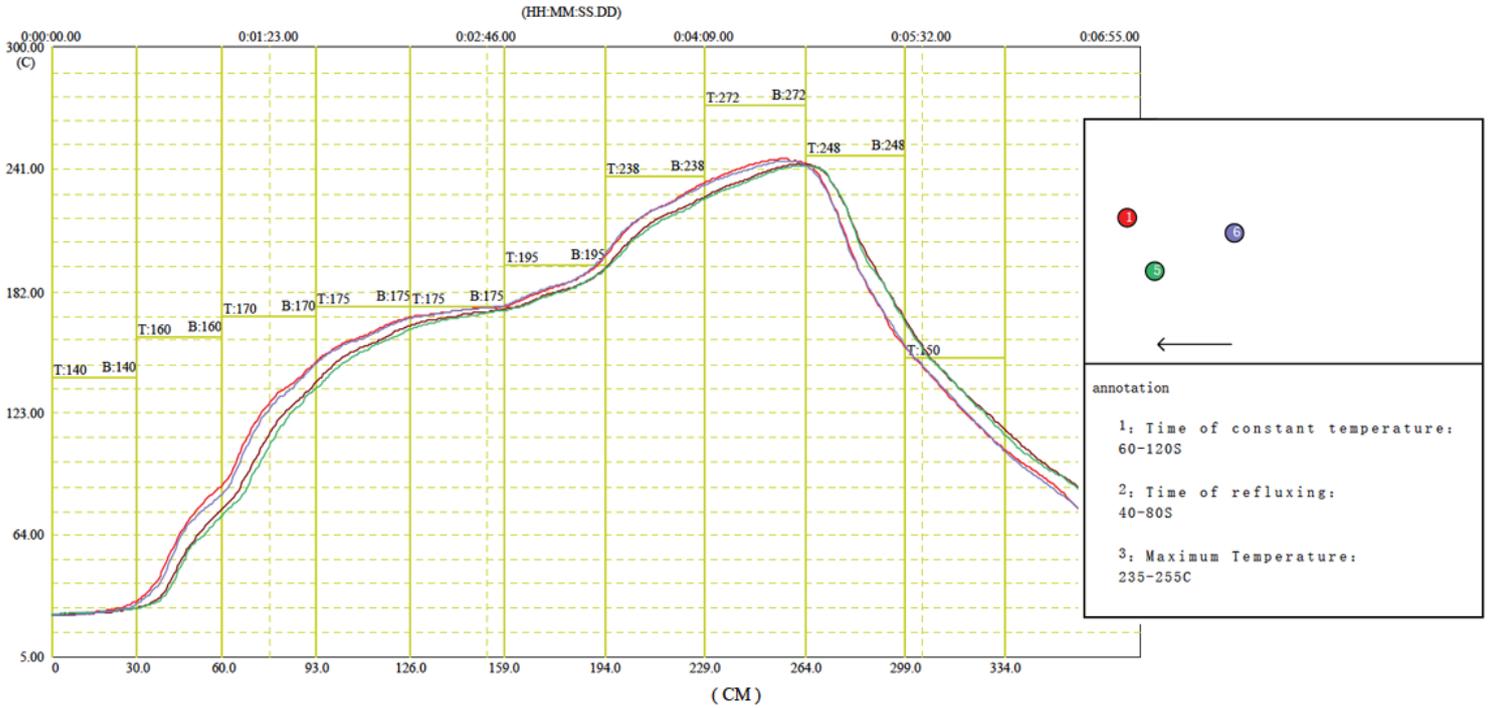


| | Preheat zone slope | | Immersion time 150 to 180℃ | | Refluxing time 220℃ | | Maximum Temperature | | cooling zone slope | |
|---|---|---|---|---|---|---|---|---|---|---|
| 🟥 | 2.80 | 80.00% | 80.00 | −50.00% | 72.50 | 62.50% | 246.5 | 43.33% | −2.75 | −10.00% |
| 🟫 | 2.50 | 50.00% | 76.00 | −60.00% | 68.00 | 40.00% | 244.0 | 26.67% | −2.33 | −26.67% |
| 🟩 | 2.50 | 50.00% | 75.00 | −62.50% | 65.50 | 27.50% | 243.0 | 20.00% | −2.36 | −25.45% |
| 🟪 | 2.70 | 70.00% | 77.00 | −57.50% | 72.50 | 62.50% | 245.4 | 36.00% | −2.57 | −17.33% |

# LM930 Bluetooth® low energy Module (with IPEX Connector)
## Standalone (With Embedded Bluetooth® v4.1 Stack)

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## Tape and Reel Packaging

### Tape Dimensions



LM930/931

16mm   0.15mm   4mm

23mm   48mm

0.32mm

11mm

3.25mm

### Reel Dimensions



330mm

48mm

92mm
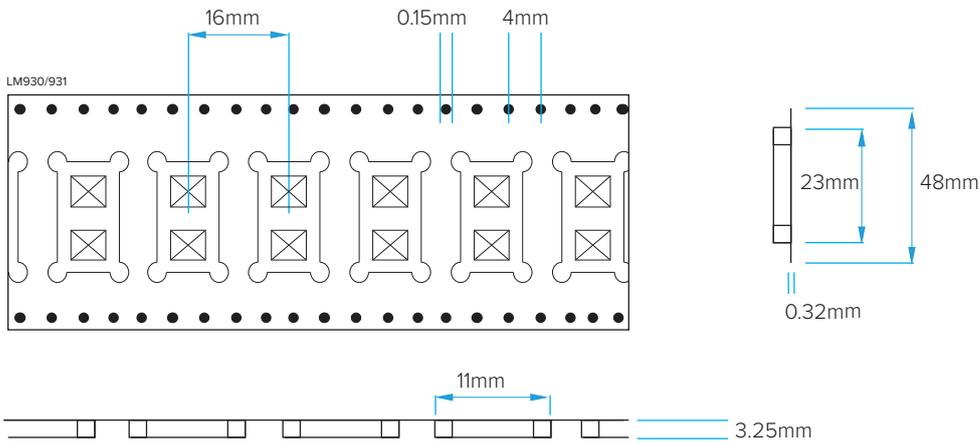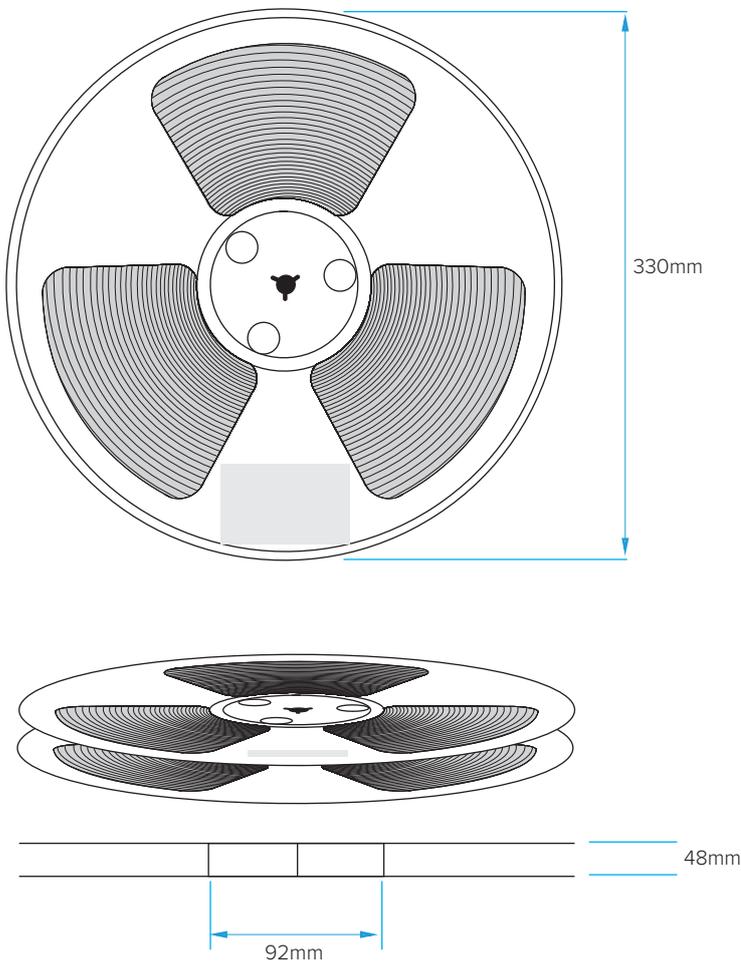
### Notes
- Carton Dimensions (L x W x H): 360mm x 290mm x 370mm

### Quantities
- 1250 modules per Tape
- 4 Boxes per Carton
- 5000 modules per Carton

# LM930 Bluetooth® low energy Module (with IPEX Connector)
## Standalone (With Embedded Bluetooth® v4.1 Stack)

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## Tray Packaging

### Tray Dimensions
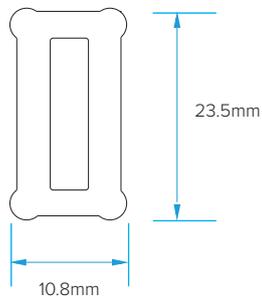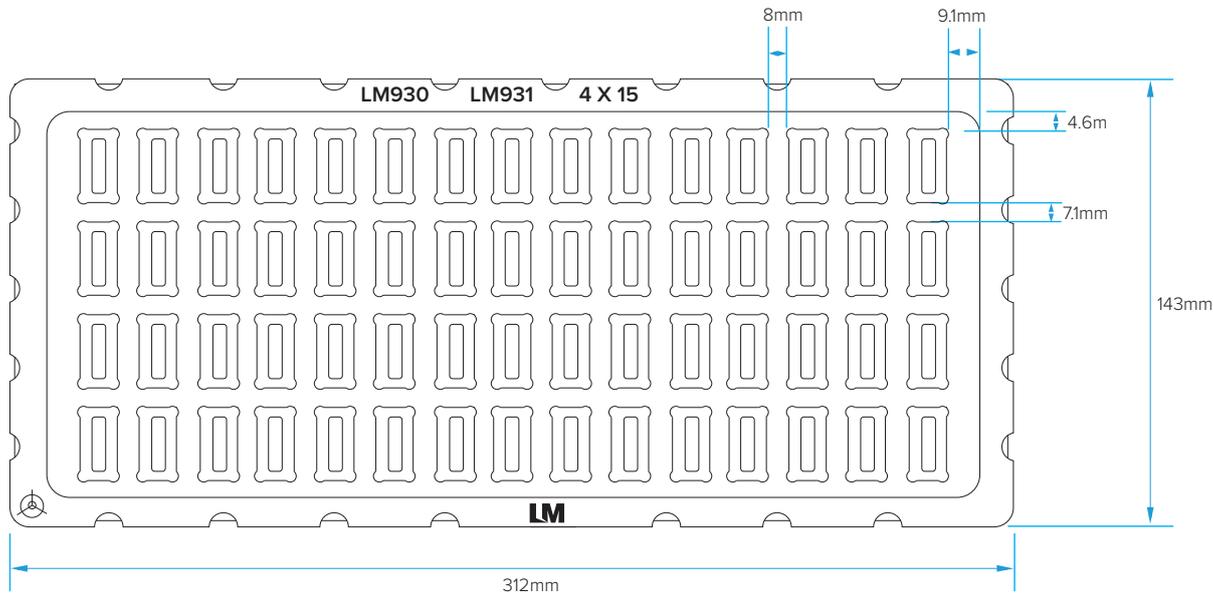


### Notes

- 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

# LM930 Bluetooth® low energy Module (with IPEX Connector)
## Standalone (With Embedded Bluetooth® v4.1 Stack)

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## Packaging for Tape & Reel / Tray

The trays/reels are stacked and inserted into an anti-static vacuum bag, with the anti-static, model name and moisture sensitive labels affixed.
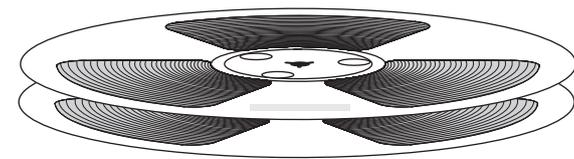


Reels are place within a vacuum bag.

drying agent

Humidity Indicator Card

Anti-static aluminium vacuum bag.
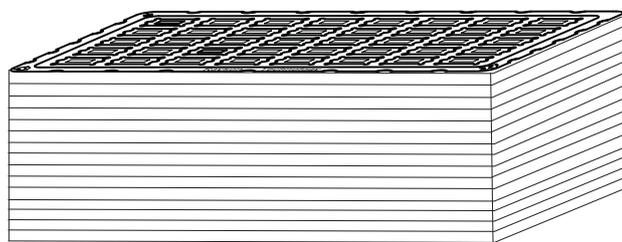
Trays are stacked up with an empty tray on the top.
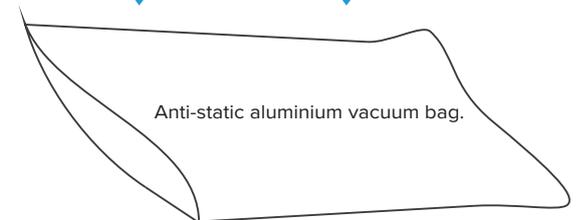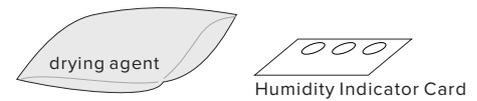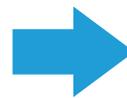
The vacuum bag is placed inside the box and a model name label affixed on the front-side of each box.



Anti-static aluminium vacuum bag.

box

Model name label

box

carton

carton label
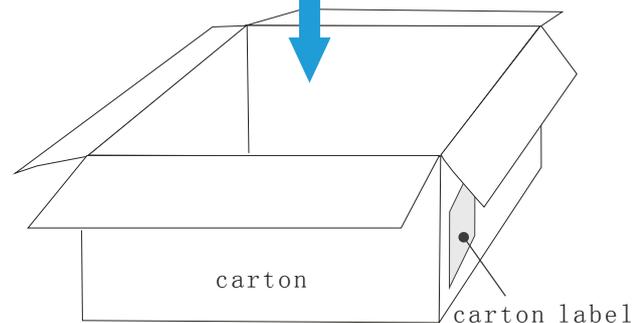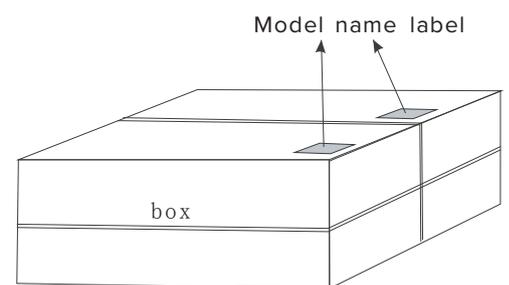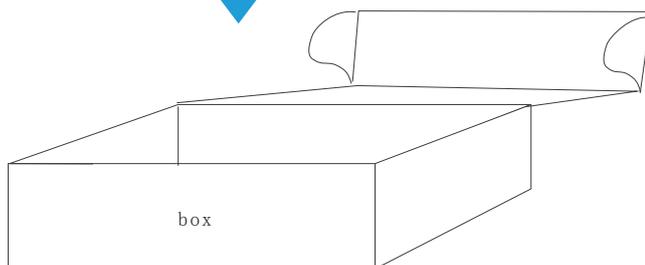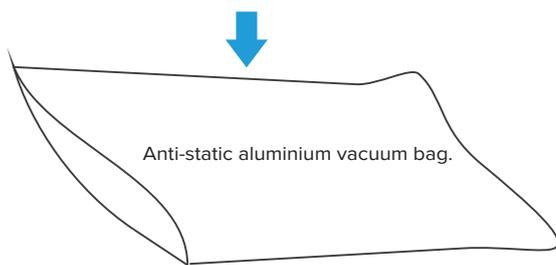
Each carton contains 4 boxes.

# LM930 Bluetooth® low energy Module (with IPEX Connector)
## Standalone (With Embedded Bluetooth® v4.1 Stack)

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Part No      See Below

## LM930 Packaging Options



930-0634

**LM930 Module**
1 x LM930 SMT Plug & Play IPEX Connector Module
Retail Pack (RP)



930-0635

**LM930 Module**
1 x LM930 SMT Plug & Play IPEX Connector Module
Tray



930-0633

**LM930 Module**
1 x LM930 SMT Plug & Play IPEX Connector Module
Tape & Reel

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