

## Features

- Bluetooth v4.1 compliant
  - Supports master and slave modes
  - Multiple roles supported simultaneously
- Embedded Bluetooth low energy protocol stack
  - GAP, GATT, SM, L2CAP, LL, RFPHY
- Bluetooth low energy profiles provided separately
- Bluetooth radio performance:
  - Embedded ST BlueNRG-MS
  - Tx power: + 8 dBm
  - Rx sensitivity: - 88 dBm
  - Provides up to 96 dB link budget with excellent link reliability
- Host interface
  - SPI, IRQ, and RESET
  - On-field stack upgrading available via SPI
- AES security co-processor
- Certification
  - CE qualified
  - FCC, IC modular approval certified
- On-board trace antenna
- Operating supply voltage: from 1.7 to 3.6 V
- Operating temperature range: -0 °C to 40 °C

## Applications

- Consumer medical
- Home and industrial automation
- Assisted living
- Mobile phone peripherals
- PC peripherals

## Description

The LANSINOH BLE4.1 MODULE is an easy to use Bluetooth® Smart master/slave network processor module, compliant with Bluetooth® v4.1. The LANSINOH BLE4.1 MODULE supports multiple roles simultaneously, and can act at the same time as Bluetooth Smart sensor and hub device.

The entire Bluetooth Smart stack and protocols are embedded into LANSINOH BLE4.1 MODULE. The external host application processor, where the application resides, is connected to the LANSINOH BLE4.1 MODULE through a standard SPI interface.

The LANSINOH BLE4.1 MODULE provides a complete RF platform in a tiny form factor. Radio, antenna, high frequency and LPO oscillators are integrated to offer a certified solution to optimize the time to market of the final applications.

This module is certified for portable use and should not be used within 50mm of the body.

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# 1 Hardware specifications

General conditions ( $V_{IN} = 3.3$  V and 25 °C)

## 1.1 Absolute maximum ratings

Table 1. Absolute maximum ratings

Rating	Min	Typ.	Max	Unit
Storage temperature range	0	-	+40	°C
Supply voltage, $V_{IN}$	-0.3	-	3.9	V
I/O pin Voltage ( $V_{IO}$ five-volt tolerant pin)	-0.3	-	3.9	V
RF saturation input power	-	8	-	dBm

## 1.2 Recommended operating conditions

Table 2. Recommended operating conditions

Rating	Min	Typ.	Max	Unit
Storage temperature range	0	-	+40	°C
Supply voltage, $V_{IN}$	3.0	3.3	3.6	V
Signals & I/O pin voltage (according supply voltage)	3.0	-	3.6	V
RF Frequency	2402	-	2480	MHz

### 1.3 Pin assignment

Pin	Function
1	Vin
2	GND
3	SPI_IRQ
4	SPI_CLK
5	SPI_MOSI
6	SPI_MISO
7	SPI_CS
8	BT_RESET

Name	Type	Pin #	Description	V max. Tolerant
SPI Interface				
SPI_IRQ	O	3	SPI IRQ (SLAVE has data for MASTER)	V <sub>in</sub>
SPI_CLK	I	4	SPI CLOCK (Max. 8 MHz)	V <sub>in</sub>
SPI_MISO	O	6	SPI MISO (MASTER in / SLAVE out)	V <sub>in</sub>
SPI_MOSI	I	5	SPI MOSI (MASTER out SLAVE in)	V <sub>in</sub>
SPI_CS	I	7	SPI "Chip select" (SPI slave select)	V <sub>in</sub>
Power and ground				
V <sub>in</sub>		1	V <sub>in</sub>	(3.0V - 3.6V max.)
GND		2	GND	
Reset				
BT_RESET	I	8	Reset input (active low < 0.35 V <sub>in</sub> )	(3.0V - 3.6V max.)

### 1.4 Mechanical dimensions

The module measures 17mm x 22.5mm, pin 1 is in the bottom left corner.

## 2 Hardware design

LANSINOH BLE4.1 MODULE supports SPI hardware interfaces.

*Note:*

- All unused pins should be left floating; do not ground.
- All GND pins must be well grounded.
- The area around the module should be free of any ground planes, power planes, trace routings, or metal for 6 mm from the module antenna position, in all directions.
- Traces should not be routed underneath the module.

### 2.1 Reflow soldering

The LANSINOH BLE4.1 MODULE is a high temperature strength surface mount Bluetooth® module supplied on a 8 pin, 2-layer PCB. The final assembly recommended reflow profiles are indicated here below.

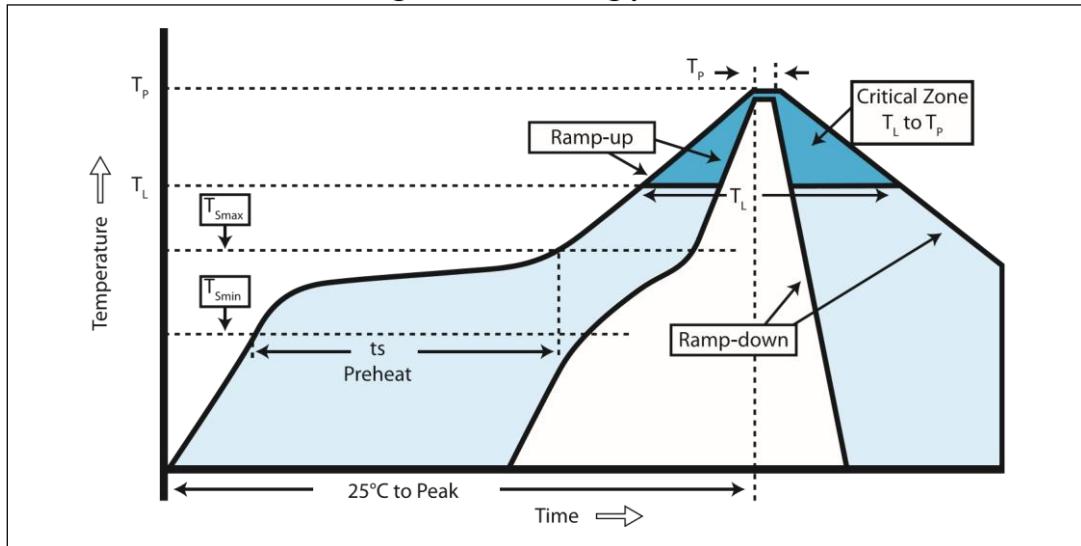
Soldering phase has to be executed with care: in order to avoid undesired melting phenomenon, particular attention has to be taken on the set up of the peak temperature.

Here following some suggestions for the temperature profile based on following recommendations.

**Table 6. Soldering**

Profile feature	PB-free assembly
Average ramp up rate ( $T_{S\text{MAX}}$ to $T_p$ )	3°C/ sec max
Preheat Temperature min ( $T_S$ mn) Temperature max ( $T_S$ max) Time ( $t_S$ min to $t_S$ max) ( $t_S$ )	150 °C 200 °C 60-100 sec
Time maintained above: Temperature $T_L$ Time $t_L$	217 °C 60-70 sec
Peak temperature ( $T_p$ )	240 + 0 °C
Time within 5 °C of actual peak temperature ( $T_p$ )	10-20 sec
Ramp down rate	6 °C/sec
Time from 25 °C to peak temperature	8 minutes' max

Figure 11. Soldering profiles



## 3 Regulatory compliance

### 3.1 FCC certification

This module has been tested and found to comply with the FCC part 15 rules. These limits are designed to provide reasonable protection against harmful interference in approved installations. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications.

However, there is no guarantee that interference may not occur in a particular installation.

This device complies with part 15 of the FCC rules. Operation is subject to the following two conditions:

1. This device may not cause harmful interference,
- and
2. this device must accept any interference received, including interference that may cause undesired operation.

Modifications or changes to this equipment not expressly approved by Lansinoh may render void the user's authority to operate this equipment.

#### *Modular approval*

FCC ID: 2AHGRBLE4V1M

In accordance with FCC part 15, the LANSINOH BLE4.1 MODULE is listed as a modular transmitter device.

This module is evaluated for stand-alone use only. Finished products incorporating multiple transmitters must comply with colocation and RF exposure requirements in accordance with FCC multi-transmitter product procedures. Collocated transmitters operating in portable RF Exposure conditions (e.g. <20 cm from persons including but not limited to body worn and hand held devices) may require separate approval.

#### 3.1.1 Labelling instructions

When integrating the LANSINOH BLE4.1 MODULE into the final product, the OEM must ensure that the FCC labelling requirements are satisfied. A statement must be included on the exterior of the final product which indicates the product includes a certified module. The label should state the following (or similar wording that conveys the same meaning):

Contains FCC ID: 2AHGRBLE4V1M

OR

This product contains FCC ID: 2AHGRBLE4V1M

The OEM must include the following statements on the exterior of the final product unless the product is too small (e.g. less than 4 x 4 inches):

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

1. this device may not cause harmful interference,
- and

2. this device must accept any interference received, including any interference that may cause undesired operation.

### 3.1.2 Product manual instructions

This section applies to OEM final products containing the LANSINOH BLE4.1 MODULE, subject to FCC compliance. The final product manual must contain the following statement (or a similar statement that conveys the same meaning):

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**Warning: Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment. (Part. 15.21)**

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In the case where an OEM seeks Class B (residential) limits for the final product, the following statement must be included in the final product manual:

*Note: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:*

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

In the case where an OEM seeks the lesser category of a Class A digital device for the final product, the following statement must be included in the final product manual:

*Note: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his expense.*

### 3.2 IC certification

The LANSINOH BLE4.1 MODULE has been tested and found compliant with the IC RSS-210 rules.

These limits are designed to provide reasonable protection against harmful interference in

approved installations. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications.

However, there is no guarantee that interference may not occur in a particular installation.

This device complies with RSS-210 of the IC rules. Operation is subject to the following two conditions:

1. this device may not cause harmful interference, and
2. this device must accept any interference received, including interference that may cause undesired operation.

Modifications or changes to this equipment not expressly approved by Lansinoh may render void the user's authority to operate this equipment.

#### *Modular approval*

IC: 21234-04467753150

Model: V1-01

In accordance with IC RSS-210, the LANSINOH BLE4.1 MODULE is listed as a modular transmitter device.

This module is evaluated for stand-alone use only. Finished products incorporating multiple transmitters must comply with colocation and RF exposure requirements in accordance with IC multi-transmitter product procedures. Collocated transmitters operating in portable RF Exposure conditions (e.g. <20cm from persons including but not limited to body worn and hand held devices) may require separate approval.

### **3.2.1 Labelling instructions**

When integrating the LANSINOH BLE4.1 MODULE into the final product, the OEM must ensure that the IC labelling requirements are satisfied. A statement must be included on the exterior of the final product which indicates that the product includes a certified module. The label should state the following (or similar wording that conveys the same meaning):

Contains IC: 21234-04467753150

OR

This product contains IC: 21234-04467753150

The OEM must include the following statements on the exterior of the final product unless the product is too small (e.g. less than 4 x 4 inches):

This device complies with RSS-210 of the IC Rules. Operation is subject to the following two conditions:

1. this device may not cause harmful interference, and
2. this device must accept any interference received, including any interference that may cause undesired operation.

### **Regulatory compliance**

### **3.2.2 Product manual instructions**

This section applies to OEM final products containing the LANSINOH BLE4.1 MODULE, subject to IC compliance. The final product manual must contain the following statement (or a similar statement that conveys the same meaning):

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**Warning:** Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment. (RSS-210)

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In the case where an OEM seeks Class B (residential) limits for the final product, the following statement must be included in the final product manual:

**Note:** *This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to RSS-210 of the IC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:*

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

In the case where an OEM seeks the lesser category of a Class A digital device for the final product, the following statement must be included in the final product manual:

**Note:** *This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to RSS-210 of the IC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his expense.*