MESHTEK-H52

Bluetooth® 5.0 Ready Module

FEATURES

- Simple & fast integration with development kits and sample iOS & Android API
- Built-in reliable Connection based mesh to support large data packets, Mesh Network (Node and Bridge) for Android
- Long-range, module connectivity up to 120 meters
- Compact form factor 17.4mm X 20.4mm X 3mm
- Castellated SMT pads for easy and reliable PCB mounting
- Over the Air firmware update from one device to an entire network
- 32-bit ARM® Cortex™ M4F nRF52832 CPU
- Proximity support for beacon and location based services
- No. of GPIOs available for user - 26
- Configurable I/O mapping for analog and digital
- Simultaneous master and slave operation
- Certifications: FCC, IC, CE, BT SIG (testing completed)
- RoHS compliant

OPERATIONAL

- Operating voltage range: 1.7V to 3.6VDC
- Temperature range: -40°C to 85°C
- Low-power consumption
- Interface: SPI, UART, NFC, I2C and 8/9/10bit ADC
- 512KB flash and 64KB RAM

APPLICATIONS

- Lighting – bulbs and fixtures
- Automotive
- Home Automation
- Power plugs, routers
- Internet of Things (IoT)
- AV consoles
- Industrial Control

MESHTEK-H52 Bluetooth 4.2 Low Energy Module

DESCRIPTION

With the smartest and most robust Bluetooth Mesh Network technology on the market, ilumi's MeshTek provides an elegant and affordable solution for manufacturers looking to quickly and reliably bring BLE enabled IoT products to market.

The MESHTEK-H52 Smart Mesh Module with integrated PCB antenna reduces development time, lowers manufacturing costs and eases certification. No RF expertise required to integrate this module. This complete platform solution includes software drivers, sample applications, API guide, user documentation and a world-class support.

The MESHTEK-H52 internal controller can be used for applications up to 64KB flash; without the need for external host MCU or software development tools.

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TO OUR VALUED CUSTOMERS

It is our intention to provide our valued customers with the best documentation possible to ensure successful use of ilumi Solutions Inc products. We will continue to improve our publications to suit your needs better. Our publications will be refined and enhanced as new volumes and updates are introduced.

If you have any questions or comments regarding this publication, please contact the Marketing Communications Department via E-mail at info@ilumisolutions.com. We welcome your feedback.

Errata

An errata sheet, describing minor operational differences from the data sheet and recommended workarounds, may exist for current devices. As device/documentation issues become known to us, we will publish an errata sheet. The errata will specify the revision of silicon and revision of document to which it applies.

To determine if an errata sheet exists for a particular device, please check with one of the following:

• Contact ilumi team
• Your local ilumi sales representative

When contacting a sales office, please specify which device, revision of MESHTEK-H52 and data sheet (include literature number) you are using.

1. DEVICE OVERVIEW

The MESHTEK-H52 Bluetooth Low Energy RF module integrates Bluetooth 4.2 radio baseband, 32-bit MCU, digital analog I/O, onboard MeshTek stack. Figure 1 shows the module's Block diagram. Figure 2 shows the module's pinout and the description is shown in Table 1.
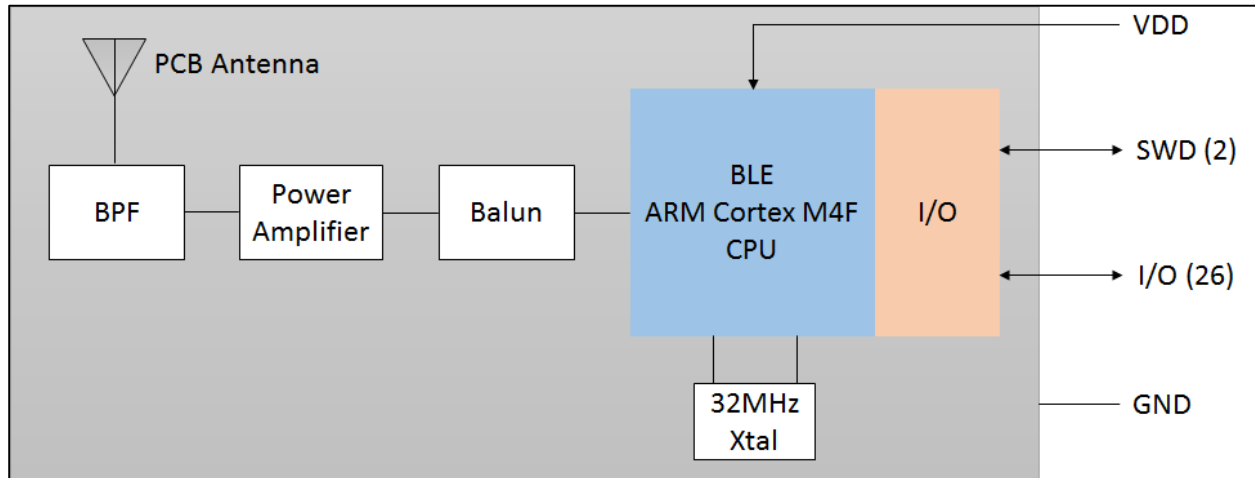
Figure 1: MESHTEK-H52 BLOCK DIAGRAM
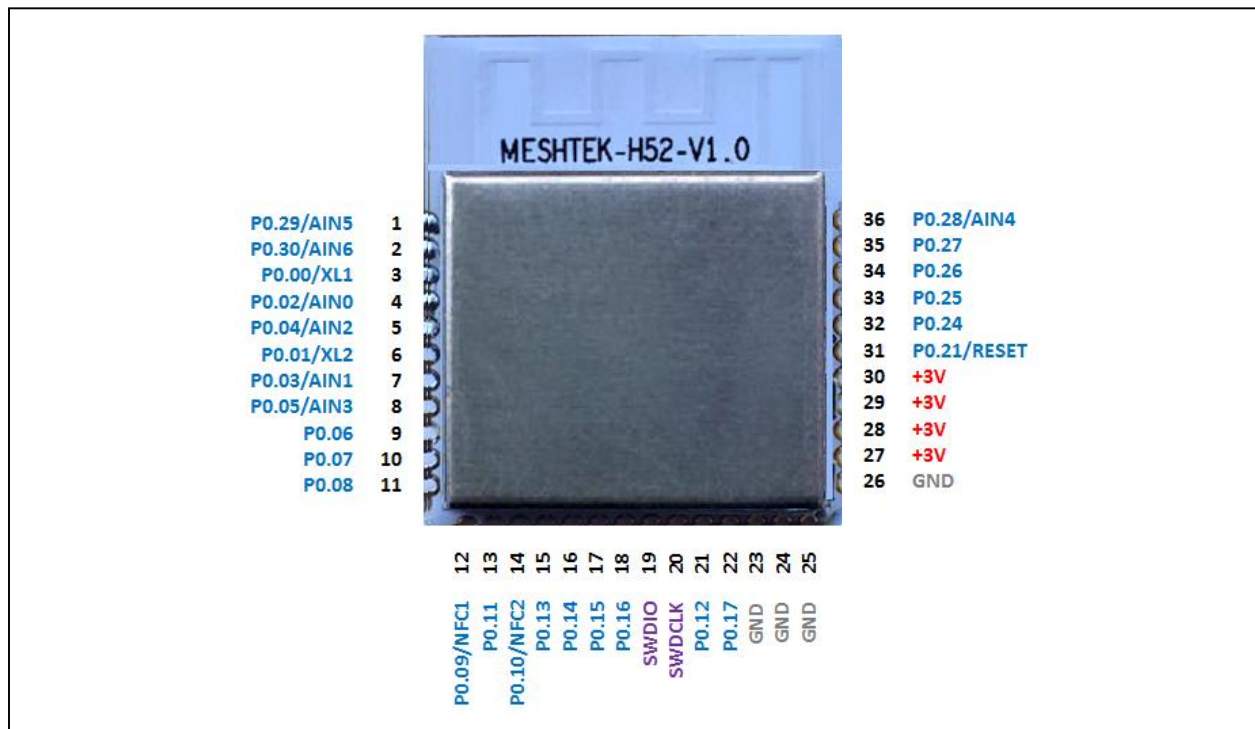

Figure 2: MESHTEK-H52 PINOUT

Table 1: PINOUT DESCRIPTION

Sr. No.	Pin out	Pin Function	Description
1	P0.29 AIN5	Digital I/O Analog input	General purpose I/O pin SAADC/COMP/LPCOMP input
2	P0.30 AIN6	Digital I/O Analog input	General purpose I/O pin SAADC/COMP/LPCOMP input.
3	P0.00 XL1	Digital I/O Analog input	General purpose I/O pin Connection for 32.768 kHz crystal (LFXO)
4	P0.02 AIN0	Digital I/O Analog input	General purpose I/O pin SAADC/COMP/LPCOMP input
5	P0.04 AIN2	Digital I/O Analog input	General purpose I/O pin SAADC/COMP/LPCOMP input
6	P0.01 XL2	Digital I/O Analog input	General purpose I/O pin Connection for 32.768 kHz crystal (LFXO)
7	P0.03 AIN1	Digital I/O Analog input	General purpose I/O pin SAADC/COMP/LPCOMP input
8	P0.05 AIN3	Digital I/O Analog input	General purpose I/O pin SAADC/COMP/LPCOMP input
9	P0.06	Digital I/O	General purpose I/O pin
10	P0.07	Digital I/O	General purpose I/O pin
11	P0.08	Digital I/O	General purpose I/O pin
12	P0.09 NFC1 UART_TX	Digital I/O NFC input Digital output	General purpose I/O pin NFC antenna connection UART Transmit
13	P0.11 UART_RX	Digital I/O Digital input	General purpose I/O pin UART Receive
14	P0.10 NFC2	Digital I/O NFC input	General purpose I/O pin NFC antenna connection
15	P0.13	Digital I/O	General purpose I/O pin
16	P0.14	Digital I/O	General purpose I/O pin
17	P0.15	Digital I/O	General purpose I/O pin
18	P0.16	Digital I/O	General purpose I/O pin
19	SWDIO	Digital I/O	Serial Wire Debug I/O for debug and programming
20	SWDCLK	Digital input	Serial Wire Debug clock input for debug and programming
21	P0.12 MI2C_CLK	Digital I/O Digital output	General purpose I/O pin I2C Clock out
22	P0.17 MI2C_DATA	Digital I/O Digital output	General purpose I/O pin I2C Data out
23	GND	Power	Ground (0 V)
24	GND	Power	Ground (0 V)
25	GND	Power	Ground (0 V)
26	GND	Power	Ground (0 V)
27	VDD	Power	Power Supply
28	VDD	Power	Power Supply
29	VDD	Power	Power Supply
30	VDD	Power	Power Supply
31	P0.21 RESET	Digital I/O	General purpose I/O pin Configurable as pin reset
32	P0.24	Digital I/O	General purpose I/O pin
33	P0.25	Digital I/O	General purpose I/O pin
34	P0.26	Digital I/O	General purpose I/O pin.
35	P0.27	Digital I/O	General purpose I/O pin.
36	P0.28 AIN4	Digital I/O Analog input	General purpose I/O pin SAADC/COMP/LPCOMP input

Note: For more details, check out nRF52832 (**QFN48**) Cortex ARM M4F controller specifications

2. GENERAL SPECIFICATIONS

Table 2 provides the general specifications for the module and current consumption.

Table 2: ELECTRICAL SPECIFICATIONS

ELECTRICAL SPECIFICATIONS				
Description	Min	Nom	Max	Notes
VDD - Supply Voltage	1.7V	3.0V	3.6V	
Operating Temperature Range	-40 °C		85 °C	
ESD - Human Body Model Class 2			4 kV	
Built-in Crystal Frequency		32 MHz		
Crystal Frequency Tolerance			+/- 10ppm	
Reset pin time for successful reset	60 msec			
Radio Operating Frequencies	2.360 GHz		2.500 GHz	
Radio On-Air Data Rate		1 Mbps	2 Mbps	
Radio Output Power			+18.9 dBm	RF output power configured to +18.9dBm using external PA
Receiver Sensitivity @ BLE Mode		-96 dBm		Ideal transmitter
Radio RSSI Accuracy			+/- 2 dB	
UART Baud Rate			1000 kbps	
SPI Bit Rate	0.125 Mbps		8 Mbps	
TWI Bit Rate	100 kbps		400 kbps	
Analog-to-Digital Converter (ADC) Range	0		VDD	8/10/12-bit ADC
VIH – Input High Voltage	0.7 * VDD		VDD	
VIL – Input Low Voltage	VSS		0.3 * VDD	
VOH – Output High Voltage	VDD – 0.4		VDD	
VOL – Output Low Voltage	VSS		VSS + 0.4	
Output standard drive current		20 mA		
Pull-up resistance / Pull-down resistance	11k	13k	16k	
Transmit Current			90mA	+18.9dBm output Power
Receive Current			24.8mA	Radio RX Active
System ON, No RAM retention, Wake on any event		1.2uA		
System ON, Full RAM retention, Wake on any event		1.5uA		

3. PHYSICAL DIMENSIONS

Figure 3 shows the Top and Bottom for MESHTEK-H52 module. Figure 4 shows the recommended PCB land pattern.

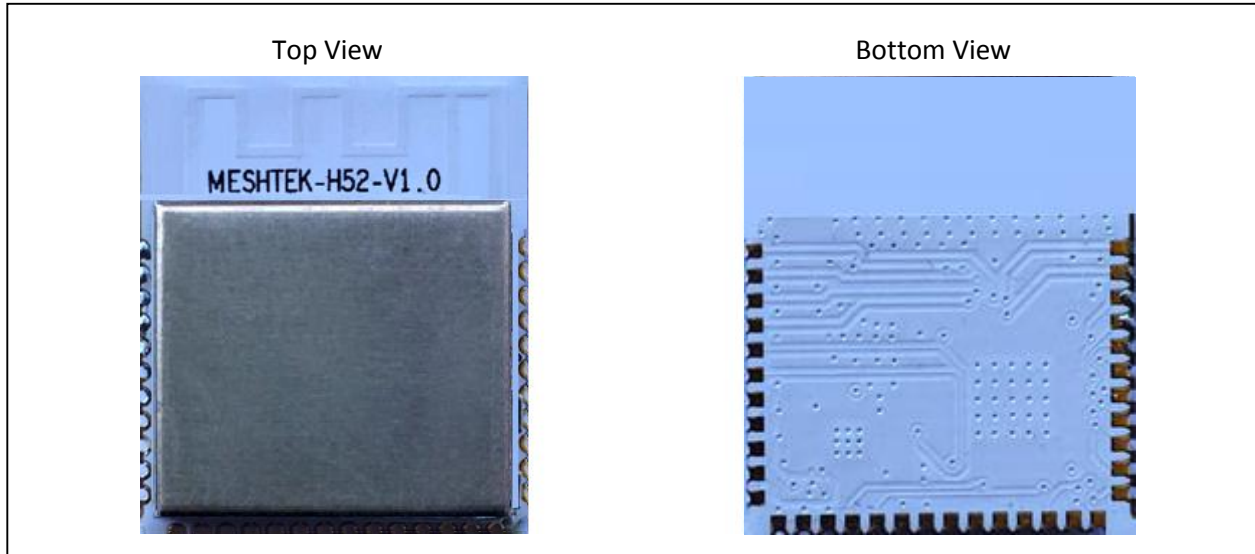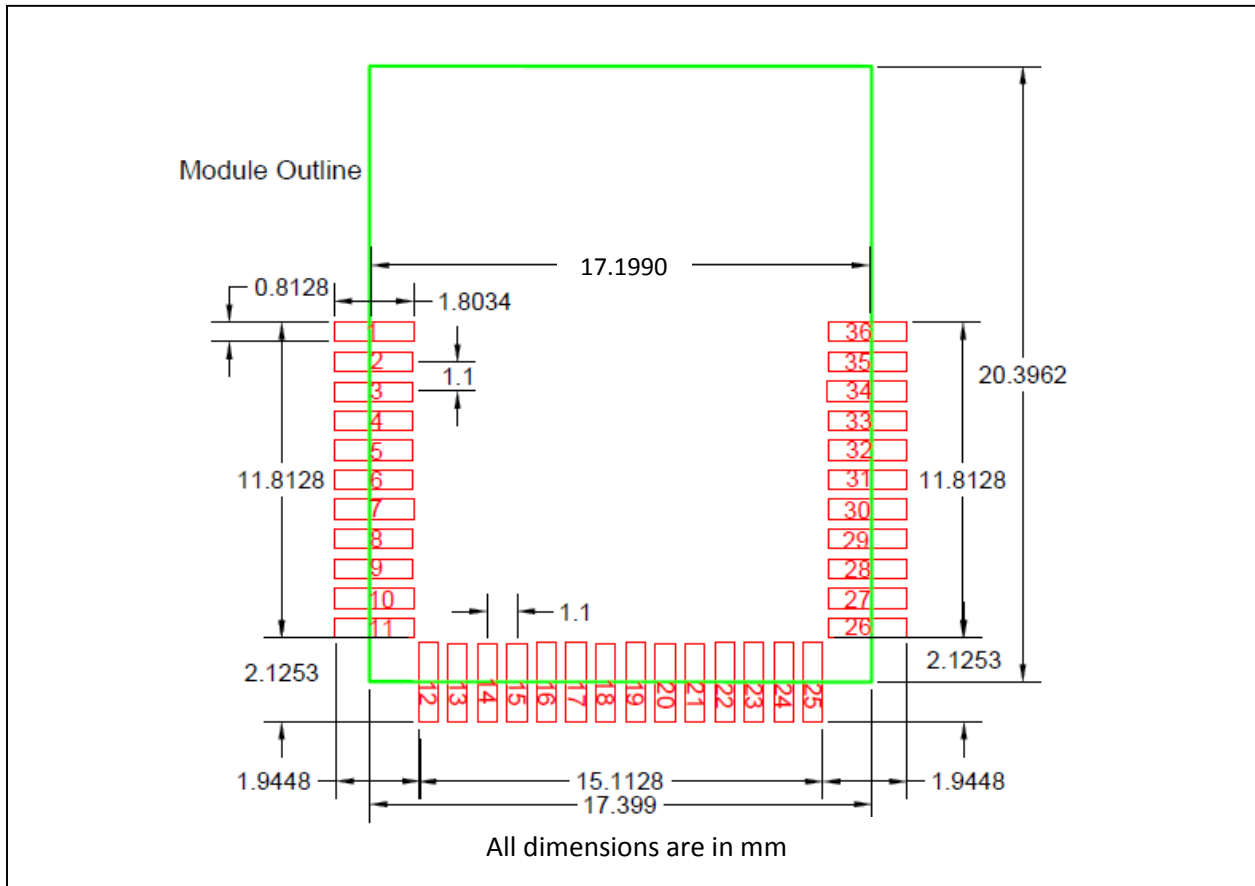**Figure 3: MESHTEK-H52 MODULE TOP AND BOTTOM VIEW**

Figure 4: MESHTEK-H52 RECOMMENDED PCB FOOTPRINT

When laying out the carrier board for the MESHTEK-H52 module, the areas under the antenna, RF text point (semi-circular pad) and shielding connections should not have surface traces, ground planes or exposed vias. Figure 5 shows the recommended mounting details and acceptable positioning of the MESHTEK-H52 on the host PCB. For optimal radio performance, the MESHTEK-H52 module's antenna end should protrude at least 30 mm beyond any metal enclosure.

Figure 5: MESHTEK-H52 MODULE MOUNTING DETAILS
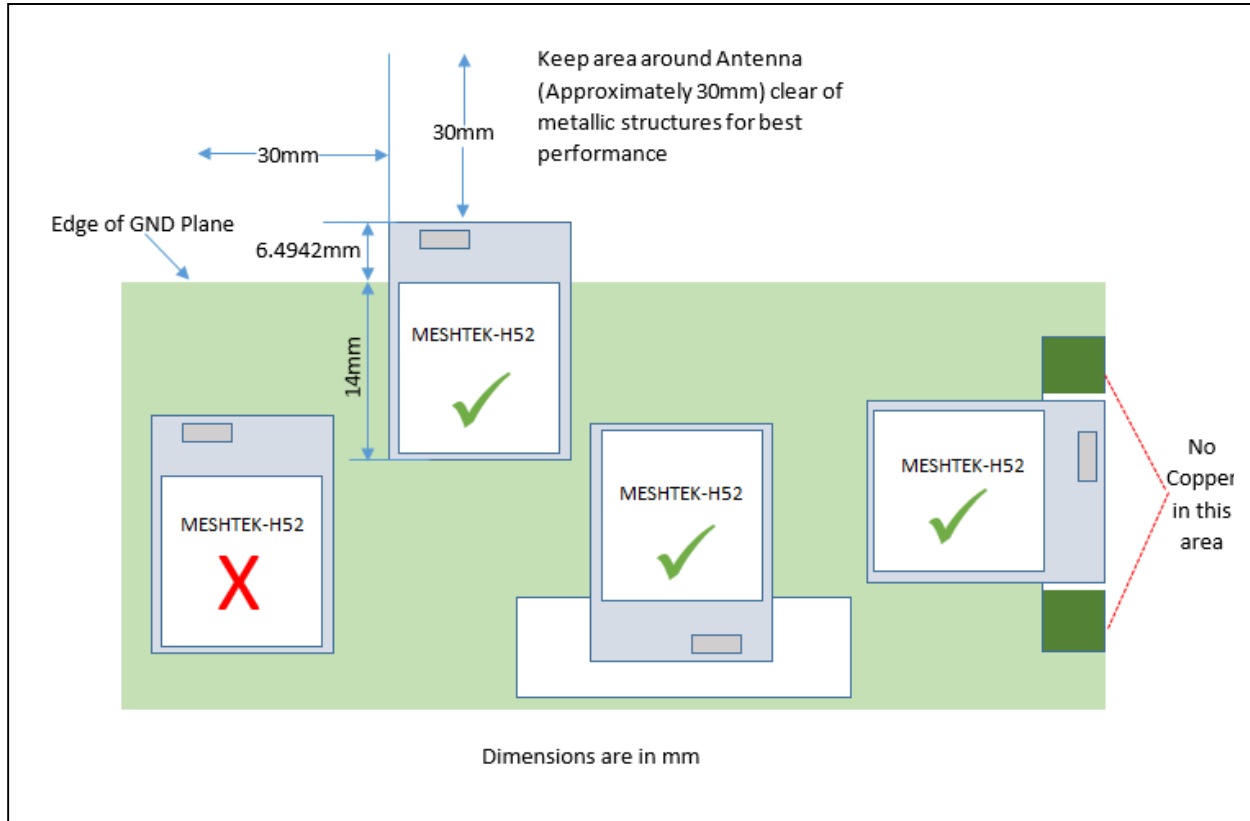
4. REGULATORY APPROVAL

4.1. European Union regulatory compliance

The MESHTEK-H52 module conforms to the product specifications listed in below Table 3.

Table 3: MESHTEK-H52 ETSI Conformity

	Standard
R&TTE directive 1999/5/EC	ETSI EN 300 328 V1.9.1 (2015-02)
	EN 62479: 2010
EMC	ETSI EN 301 489-1 V1.9.2(2011-09)
	ETSI EN 301 489-17 V2.2.1(2012-09)

4.2. FCC and IC Compliance

The MESHTEK-H52 module conforms to the product specifications listed in below Table 4.

Table 4: MESHTEK-H52 FCC and IC Conformity

	Standard
FCC	FCC part 15 modular certification
	MESHTEK-H52 FCC ID: 2AEHU-MESHTEK-H52
IC	Industry Canada RSS-247 modular certification
	MESHTEK-H52 IC: 20059-MESHTEKH52
Bluetooth	RF-PHY Component (Tested); QDID: 80428

4.2.1. FCC Statement

This device has been tested and found to comply with 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 the 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.

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

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

FCC CAUTION: Any changes or modifications NOT explicitly APPROVED by ilumi could cause the module to cease to comply with FCC rules part 15, and thus void the user's authority to operate the equipment.

4.2.2. IC compliance

This device complies with Industry Canada license-exempt RSS standard(s).

Operation is subject to the following two conditions:

1. This device may not cause interference, and
2. This device must accept any interference, including interference that may cause undesired operation of the device.

Under Industry Canada regulations, this radio transmitter may only operate using an antenna of a type and maximum (or lesser) gain approved for the transmitter by Industry Canada. To reduce potential radio interference to other users, the antenna type and its gain should be chosen in such a way that the equivalent isotropically radiated power (e.i.r.p.) is not more than that is necessary for successful communication.

This equipment complies with IC RSS-102 radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with a minimum distance of 20 cm between the radiator and your body.

4.2.3. Conformité aux norms d´IC

Cet appareil est conforme à la(aux) norme(s) RSS sans licence d'Industry Canada. Son utilisation est soumise aux deux conditions suivantes:

1. Cet appareil ne doit pas causer d'interférences et
2. il doit accepter toutes interférences reçues, y compris celles susceptibles d'avoir des effets indésirables sur son fonctionnement.

Conformément aux réglementations d'Industry Canada, cet émetteur radio ne peut fonctionner qu'à l'aide d'une antenne dont le type et le gain maximal (ou minimal) ont été approuvés pour cet émetteur par Industry Canada. Pour réduire le risque d'interférences avec d'autres utilisateurs, il faut choisir le type d'antenne et son gain de telle sorte que la puissance isotrope rayonnée équivalente (p.i.r.e) ne soit pas supérieure à celle requise pour obtenir une communication satisfaisante.

Cet équipement respecte les limites d'exposition aux rayonnements IC RSS-102 définies pour un environnement non contrôlé. Il doit être installé et utilisé en maintenant une distance minimum de 20 cm entre le radiateur et votre corps.

4.2.4. OEM RESPONSIBILITIES TO COMPLY WITH FCC AND INDUSTRY CANADA REGULATIONS

The MESHTEK-H52 Module has been certified for integration into products only by OEM integrators under the following conditions:

This device is granted for use in configurations in which the antennas used for this transmitter must be installed to provide a separation distance of at least 20cm from all person and not be co-located with any other transmitters except in accordance with FCC and Industry Canada multi-transmitter product procedures.

As long as the two conditions above are met, further transmitter testing will not be required.

However, the OEM integrator is still responsible for testing their end-product for any additional compliance requirements required with this module installed (for example, digital device emissions, PC peripheral requirements, etc.).

IMPORTANT NOTE: In the event that these conditions cannot be met (for certain configurations or co-location with another transmitter), then the FCC and Industry Canada authorizations are no longer considered valid and the FCC ID and IC Certification Number cannot be used on the final product. In these circumstances, the OEM integrator will be responsible for re-evaluating the end product (including the transmitter) and obtaining a separate FCC and Industry Canada authorization.

4.2.5. OEM Labeling requirements for end product

For an end product using the MESHTEK-H52 module there must be a label containing, at least, the following information:

This device contains FCC ID: 2AEHU-MESHTEK-H52 IC: 20059-MESHTEKH52

The label must be affixed on an exterior surface of the end product such that it will be visible upon inspection in compliance with the modular approval guidelines developed by the FCC.

In accordance with 47 CFR § 15.19, the end product shall bear the following statement in a conspicuous location on the device: "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."

When the device is so small or for such use that it is not practicable to place the statement above on it, the information shall be placed in a prominent location in the instruction manual or pamphlet supplied to the user or, alternatively, shall be placed on the container in which the device is marketed.
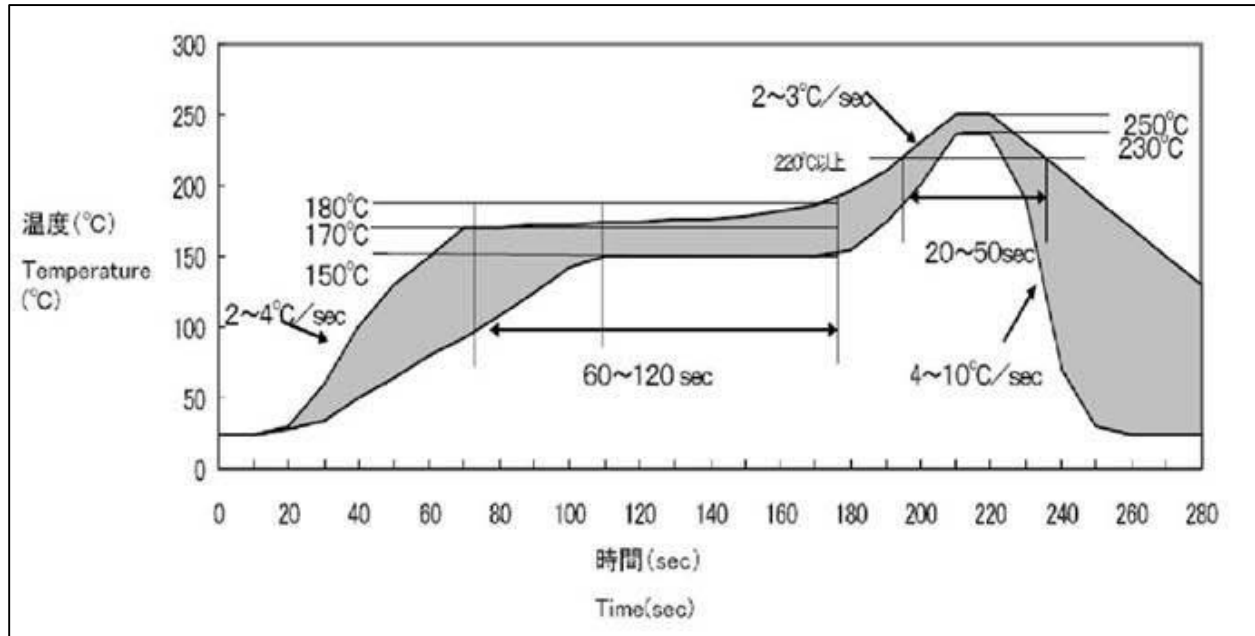In case, where the final product will be installed in locations where the end-user is not able to see the FCC ID and/or this statement, the FCC ID and the statement shall also be included in the end-product manual.

5. PRODUCT HANDLING

5.1. SOLDER REFLOW PROFILE

The solder profile is described below in FIGURE 6.

Figure 6: REFLOW PROFILE

5.2. MOISTURE SENSITIVITY LEVELS

The Moisture Sensitivity Level (MSL) relates to the required packaging and handling precautions. MeshTek-H52 module is rated for MSL 3, 168-hour floor life after opening.
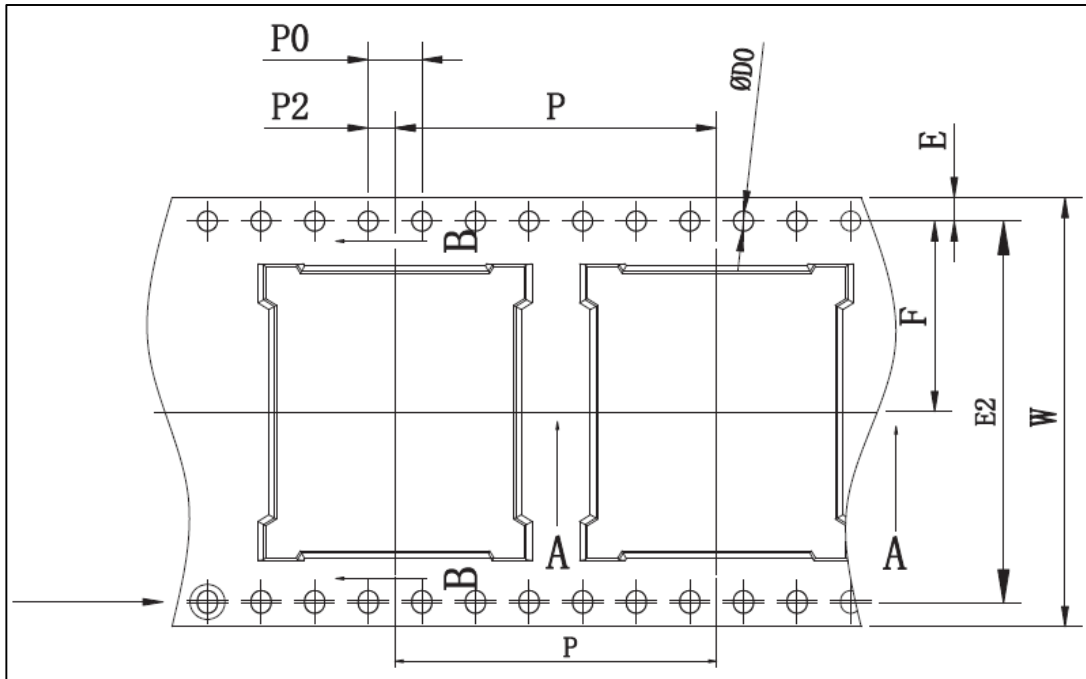
Note: For MSL standards, see IPC/JEDEC J-STD-020, which can be downloaded from www.jedec.org.
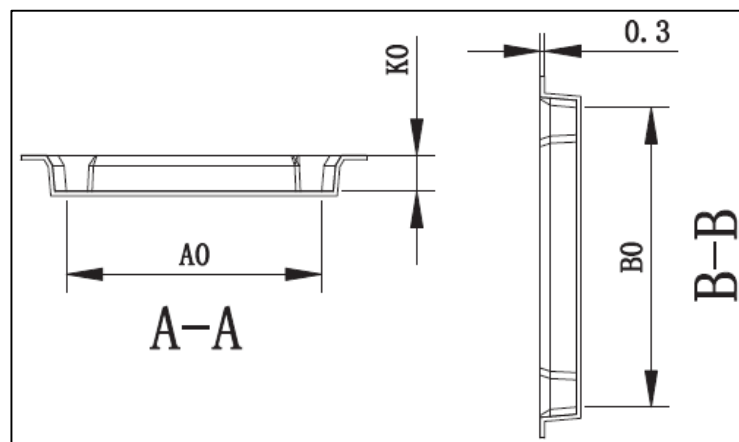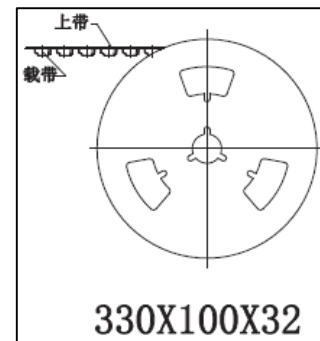
6. PACKAGING AND LABELLING

6.1. Carrier Tape Dimensions

MeshTek-H52 modules are deliverable in quantities of 500 pieces on a reel

Figure 7: CARRIER TAPE DIMENSIONS

尺寸栏	
E	1.75±0.10
E2	28.5±0.20
F	14.20±0.10
P2	2.00±0.10
ØDo	1.50±$^{0.10}_{0.00}$
ØD1	1.50±$^{0.10}_{0.00}$
Po	4.00±0.10
10Po	40.00±0.20
W	32.00±0.30
P	24.00±0.10
Ao	17.70±0.10
BO	20.70±0.10
KO	3.50±0.10
t	0.30±0.05

6.2. Reel Packaging

Modules come on 330mmx32mm reel loaded with 500 modules. Each reel is placed in an antistatic bag with a desiccant pack and humidity card and placed in a 345X336X41mm box. On the outside of the antistatic bag an antistatic warning and reel label are adhered.

6.3. Packaging Label

Figure 8: PACKAGING LABEL

7. ORDERING INFORMATION

Table 5 provides ordering information for the MESHTEK-H52 module.

Table 5: ORDERING INFORMATION

Part Number	Description
MESHTEK-H52	Bluetooth High Power Module, Tape and Reel, 500 pcs

Note: For custom applications, contact ilumi Solutions Inc. representative

8. REVISION HISTORY

Revision	Date	Status / Comments
1.0	May 2016	Initial Release
1.1	Dec 2016	Changed images of the module on Page no. 1 and Page no. 3 Updated certification information (Section 5) Updated Table of Contents
1.2	Feb 2017	Corrected operating temperature range of the module on Page no. 1 Updated Table 2 Electrical specification
1.3	March 2017	Added Product handling and packaging details Updated Table of Contents
1.4	May 2017	Updated Reflow solder profile Updated Packaging details

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