

FEATURES

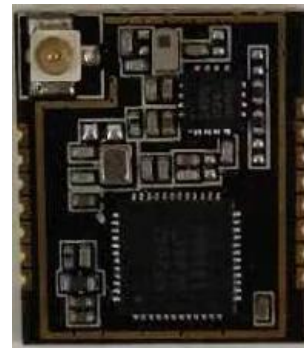
- Simple & fast integration with development kits and sample iOS & Android API
- Built-in reliable Connection based mesh to support large data packets, Mesh Network (Node and Bridge) for Android
- Long-range, module connectivity up to 100 meters
- Compact form factor 15.24mm X 17.60mm X 3mm
- Castellated 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 - 11
- Configurable I/O mapping for analog and digital
- Simultaneous master and slave operation
- *Certifications: FCC, IC (In progress)
- RoHS compliant

OPERATIONAL

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

APPLICATIONS

- Lighting fixtures
- Automotive
- Home Automation
- Power plugs, routers
- Internet of Things (IoT)
- Industrial Control



MESHTEK-H52E Bluetooth Module
with External Antenna

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-H52E Smart Mesh Module with IPX antenna allows users to connect External Antenna which is required for various applications. This complete platform solution includes software drivers, sample applications, API guide, user documentation and a world-class support.

The MESHTEK-H52E 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 you, our valued customer, with the best possible documentation to ensure successful use of your MeshTek products. To this end, we will continue to update our publications to better suit your needs. Our publications will be refined and enhanced as new volumes and updates are introduced.

Please note: images used in the manual are for reference purposes and may be different than the actual product.

If you have any questions or comments regarding this publication, please contact the Marketing Communications Department via Email at sales@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 the document to which it applies.

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

- Contact the MeshTek team
- Contact your local MeshTek sales representative

When contacting a sales office, please specify which device, revision of MeshTek-H52E data sheet (include literature number) you are using.

1. DEVICE OVERVIEW

The MESHTEK-H52E Bluetooth Low Energy RF module integrates Bluetooth 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-H52E BLOCK DIAGRAM

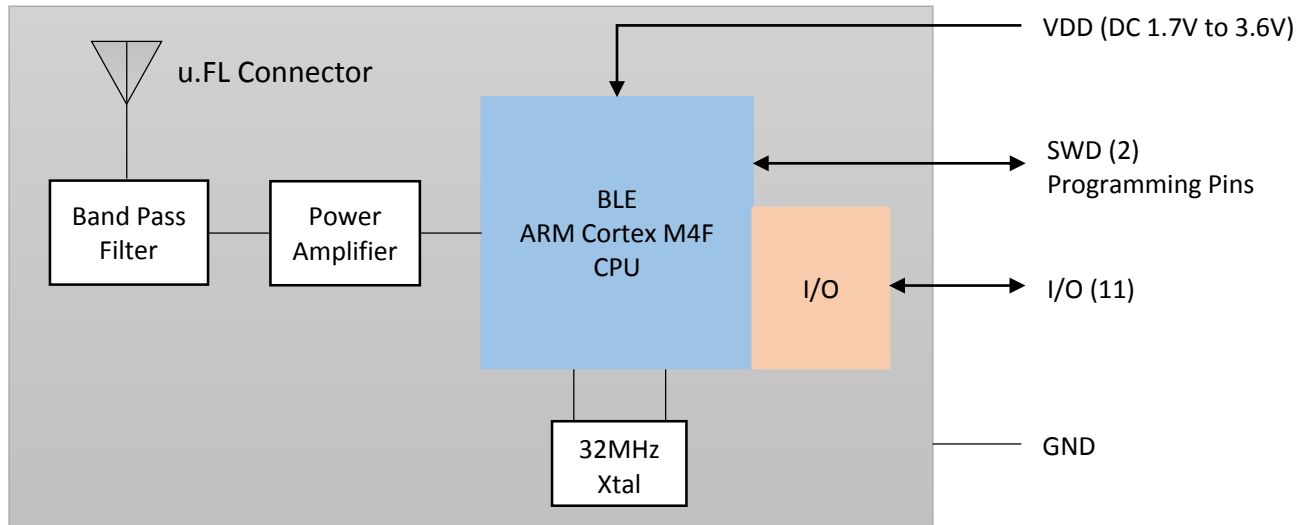


Figure 2: MESHTEK-H52E PINOUT

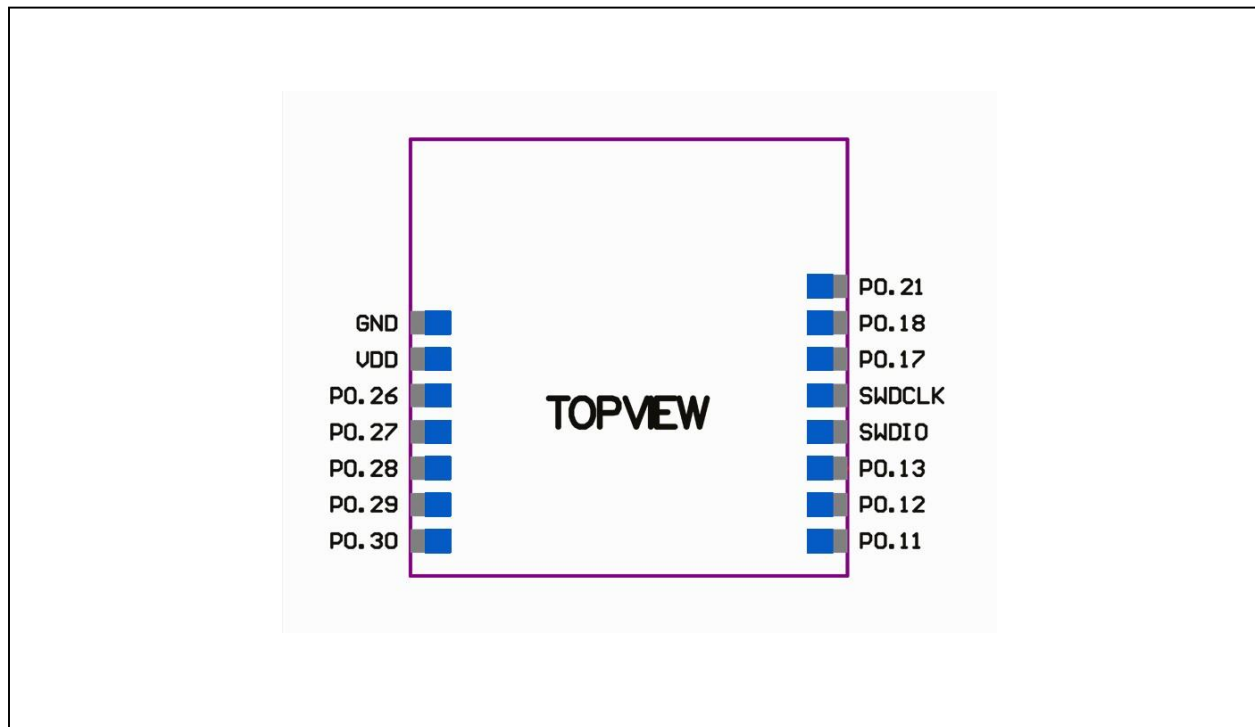


Table 1: PINOUT DESCRIPTION

Sr. No.	Pin out	Pin Function	Description
1	GND	Power	Ground (0 V)
2	VDD	Power	Power Supply
3	P0.26	Digital I/O	General purpose I/O pin.
4	P0.27	Digital I/O	General purpose I/O pin.
5	P0.28 (AIN4)	Digital I/O Analog input	General purpose I/O pin SAADC/COMP/LPCOMP input
6	P0.29 (AIN5)	Digital I/O Analog input	General purpose I/O pin SAADC/COMP/LPCOMP input
7	P0.30 (AIN6)	Digital I/O Analog input	General purpose I/O pin SAADC/COMP/LPCOMP input.
8	P0.21 (RESET)	Digital I/O	General purpose I/O pin Configurable as pin reset
9	P0.18 (TRACEDATA[0] / SWO)	Digital I/O	General purpose I/O pin
10	P0.17 (MI2C_DATA)	Digital I/O Digital output	General purpose I/O pin I2C Data out
11	SWDCLK	Digital input	Serial Wire Debug clock input for debug and programming
12	SWDIO	Digital I/O	Serial Wire Debug I/O for debug and programming
13	P0.13	Digital I/O	General purpose I/O pin
14	P0.12	Digital I/O	General purpose I/O pin
15	P0.11	Digital I/O	General purpose I/O pin

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

MESHTEK-H52E has u.FL connector present on the module, an external antenna with mating part needs to be connected to the module.



2. GENERAL SPECIFICATIONS

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

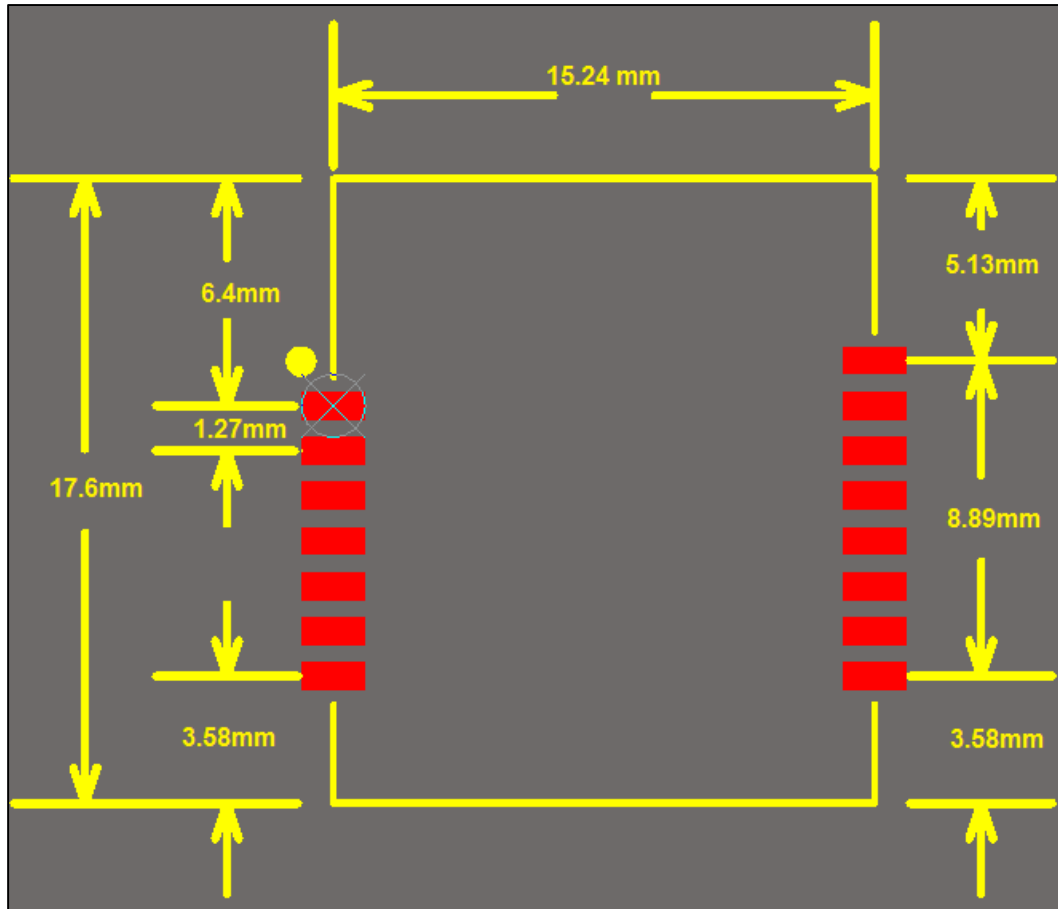
Table 2: ELECTRICAL SPECIFICATIONS

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	2.402GHz		2.480 GHz	
Radio On-Air Data Rate		1 Mbps	2 Mbps	
Radio Output Power			+19dBm	RF output power configured to +19dBm using external PA in continuous TX Mode
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	+19dBm 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

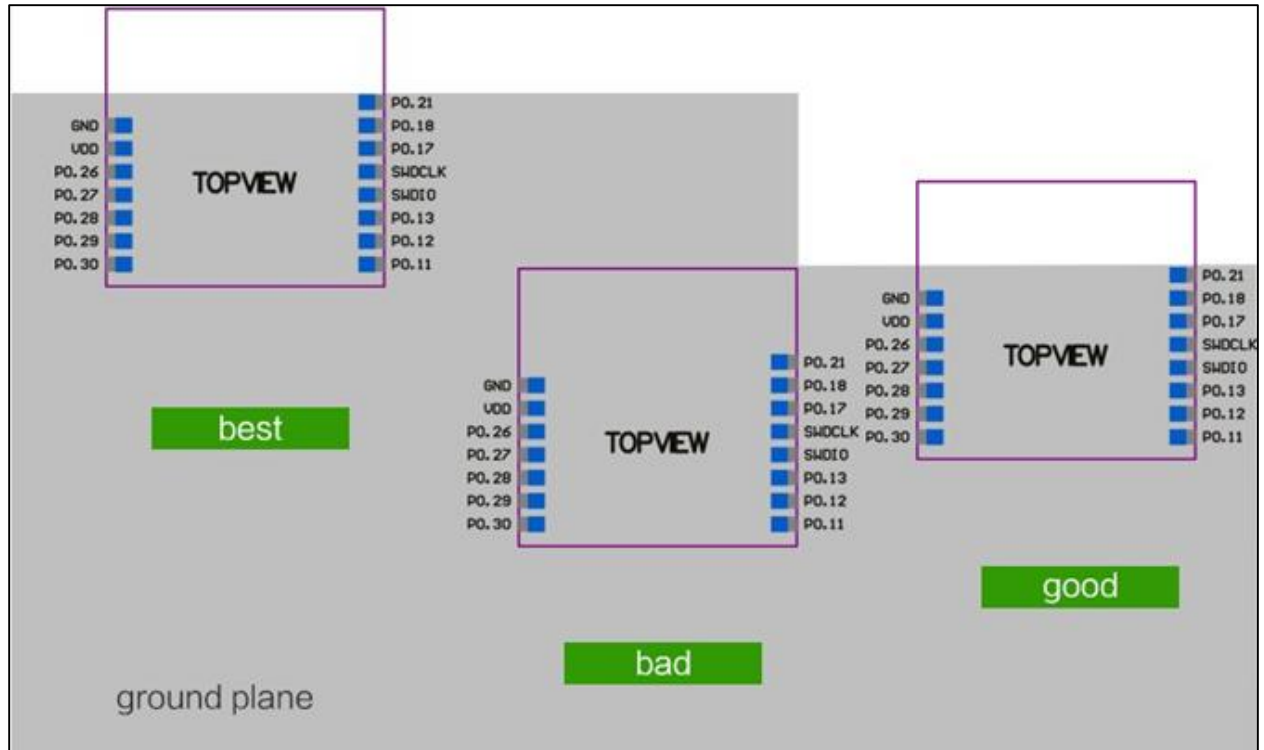
Figure 4 shows the size and footprint for MeshTek-H52E module

Figure 4: MESHTEK-H52E FOOTPRINT



4. LAYOUT AND MOUTING GUIDELINES

- We recommend 2 or more layers for the Carrier Board (Host PCB). The top side shall be mostly ground. Signal routing shall be done in the bottom or middle layers.
- When laying out the Carrier board for the MESHTEK-H52E module, the areas under the antenna and shielding connections should not have signal traces, ground planes or exposed vias.
- For the best Bluetooth range performance, the antenna area of module shall extend 6.3mm outside the edge of Carrier Board or 6.3mm outside the edge of a ground plane.
- For the best Bluetooth range performance, keep all external metal away from the antenna area.



5. REGULATORY APPROVAL

5.1. FCC and IC Compliance

The MESHTEK-H52E module conforms to the product specifications listed in below Table 4.

Table 3: MESHTEK-H52E FCC and IC Conformity

	Standard
FCC	FCC part 15 Subpart C Section 15.249 MESHTEK-H52E FCC ID: 2AEHU-MESHTEK-H52E
IC	Industry Canada RSS-210 Industry Canada RSS-Gen MESHTEK-H52E IC: 20059-MESHTEKH52E

5.1.1. 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.

5.1.2. 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.

5.1.3. Conformité aux normes 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.

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

The MESHTEK-H52E 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.

5.1.5. OEM Labeling requirements for end product

For an end product using the MESHTEK-H52E module there must be a label containing, at least, the following information:

CONTAIN FCC ID: 2AEHU-MESHTEK-H52E
CONTAIN IC: 20059-MESHTEKH52E

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.

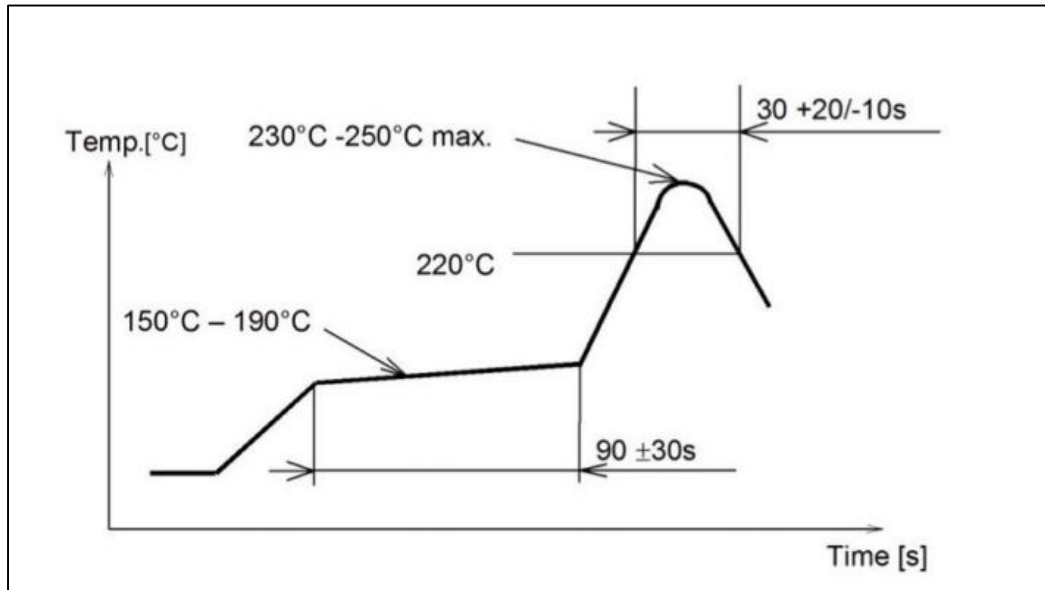
In case, where the final product will be installed in locations where the end-user is not able to see the FCC ID and/or this statement, the FCC ID and the statement shall also be included in the end-product manual.

6. PRODUCT HANDLING

6.1. SOLDER REFLOW PROFILE

Soldering Temperature-Time Profile for Reflow Soldering is described below in FIGURE 5. Maximum number of cycles for reflow is 2. No opposite side reflow is allowed due to module weight.

Figure 5: REFLOW PROFILE



6.2. MOISTURE SENSITIVITY LEVELS

The Moisture Sensitivity Level (MSL) relates to the required packaging and handling precautions. MeshTek-H52E 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.

7. PACKAGING AND LABELLING

7.1. PACKAGING

- MeshTek-H52E modules are deliverable in MPQ of 49pcs/tray.
- Package Type: antistatic bag/tray
- Unit weight of the MeshTek-H52E module is 1gm/pc

7.2. PACKAGING LABEL

TBD

8. ORDERING INFORMATION

Table 4 provides ordering information for the MESHTEK-H52E module.

Table 4: ORDERING INFORMATION

Part Number	Description
MESHTEK-H52E	Bluetooth High Power Module, Tray Packaging, 49 pcs

Note: For custom applications, contact sales@ilumisolutions.com

9. REVISION HISTORY

Revision	Date	Status / Comments
1.0	March 2019	Initial Release
1.1	October 2019	- Updated module images, dimension, pinout, footprint - Updated Layout and Mounting Guidelines - Updated reflow profile image

FCC Statement
FCC standards: FCC CFR Title 47 Part 15 Subpart C Section 15.247
Integral antenna with antenna gain 0dBi
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.
Any Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.
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.
We will retain control over the final installation of the modular such that compliance of the end product is assured. In such cases, an operating condition on the limit modular approval for the module must be only approved for use when installed in devices produced by a specific manufacturer. If any hardware modify or RF control software modify will be made by host manufacturer, C2PC or new certificate should be apply to get approval, if those change and modification made by host manufacturer not expressly approved by the party responsible for compliance, then it is illegal.
FCC Radiation Exposure Statement
The modular can be installed or integrated in mobile or fix devices only. This modular cannot be installed in any portable device. This modular complies with FCC RF radiation exposure limits set forth for an uncontrolled environment. This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter. This modular must be installed and operated with a minimum distance of 20 cm between the radiator and user body.
If the FCC identification number is not visible when the module is installed inside another device, then the outside of the device into which the module is installed must also display a label referring to the enclosed module. This exterior label can use wording such as the following: "Contains Transmitter Module FCC ID: 2AEHU-MESHTEK-H52E Or Contains FCC ID: 2AEHU-MESHTEK-H52E"
When the module is installed inside another device, the user manual of the host must contain below warning statements:
1. 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.
(2) This device must accept any interference received, including interference that may cause undesired operation.
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.
2. Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.
The devices must be installed and used in strict accordance with the manufacturer's instructions as described in the user documentation that comes with the product.
Any company of the host device which install this modular with modular approval should perform the test of radiated & conducted emission and spurious emission, etc. according to FCC part 15C : 15.247 and 15.209 & 15.207, 15B Class B requirement, Only if the test result comply with FCC part 15C : 15.247 and 15.209 & 15.207, 15B Class B requirement, then the host can be sold legally.

IC STATEMENT
IC standards: RSS-247 ISSUE 2
Integral antenna with antenna gain 0dBi
This device contains licence-exempt transmitter(s)/receiver(s) that comply with Innovation, Science and Economic Development Canada's licence-exempt RSS(s). Operation is subject to the following two conditions:
(1) This device may not cause interference.
(2) This device must accept any interference, including interference that may cause undesired operation of the device.
Cet appareil contient des émetteurs / récepteurs exemptés de licence conformes aux RSS (RSS) d'Innovation, Sciences et Développement économique Canada. Le fonctionnement est soumis aux deux conditions suivantes :
(1) Cet appareil ne doit pas causer d'interférences.
(2) Cet appareil doit accepter toutes les interférences, y compris celles susceptibles de provoquer un fonctionnement indésirable de l'appareil.
IC Radiation Exposure Statement
The modular can be installed or integrated in mobile or fix devices only. This modular cannot be installed in any portable device. This modular complies with IC RF radiation exposure limits set forth for an uncontrolled environment. This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter. This modular must be installed and operated with a minimum distance of 20 cm between the radiator and user body. Cette modulaire doit être installée et utilisée à une distance minimum de 20 cm entre le radiateur et le corps de l'utilisateur.
If the IC number is not visible when the module is installed inside another device, then the outside of the device into which the module is installed must also display a label referring to the enclosed module. This exterior label can use wording such as the following: "Contains IC: 20059-MESHTEKH52E"
When the module is installed inside another device, the user manual of the device must contain below warning statements:
1. This device contains licence-exempt transmitter(s)/receiver(s) that comply with Innovation, Science and Economic Development Canada's licence-exempt RSS(s). Operation is subject to the following two conditions:
(1) This device may not cause interference.
(2) This device must accept any interference, including interference that may cause undesired operation of the device.
2. Cet appareil contient des émetteurs / récepteurs exemptés de licence conformes aux RSS (RSS) d'Innovation, Sciences et Développement économique Canada. Le fonctionnement est soumis aux deux conditions suivantes :
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