

LBCA1KU1WA User Manual

Model Name: 1WA
FCC ID: Z7ALBCA1KU1WA
IC: 4919E-LBCA1KU1WA

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Note: This device cannot be sold to the public.

1. Scope

This specification is applied to the Bluetooth 5.0 module.

Interface	UART, PCM, 12S
Peripheral	SPI (slave of master), I2C (master)
Bluetooth IC	CYW20721
Sleep Clock	External 32.768 kHz oscillator required.
Dimensions	5.9 x 5.1 x 1.1 mm
Weight	75.6mg
Frequency Range	2402 - 2480 MHz
MSL	3
Voltage Range	N/A
Temperature Range	N/A
RoHS	This module complies with RoHS requirements

2. Identification and Certification Information

- Model Name: LBCA1KU1WA
- FCC ID: Z7ALBCA1KU1WA
- IC ID: 4919E-LBCA1KU1WA

3. List of Applicable FCC Rules

This module complies with FCC Rules part 15.247 for a Class B digital device.

4. Specific Operational Use and Storage Conditions

4.1. Operating Condition

		Minimum	Typical	Maximum	Unit
Operating Temperature Range		- 40	+25	+85	Degree C
Supply Voltage	VDD	1.75	3.0	3.63	V
	VDDIO*	---	3.0	---	V

* Maximum Tune-Up Tolerance is "Average Power" during Duty ON time.

4.2. Storage Condition

		Minimum	Maximum	Unit
Storage Temperature		- 40	+85	Degree C
Applying Voltage	VDD3P3	- 0.5	3.795	V
	VDDIO	- 0.3	3.795	V

5. Limited Module Procedures

Not applicable as this component was registered for modular approval.

6. RF Performance

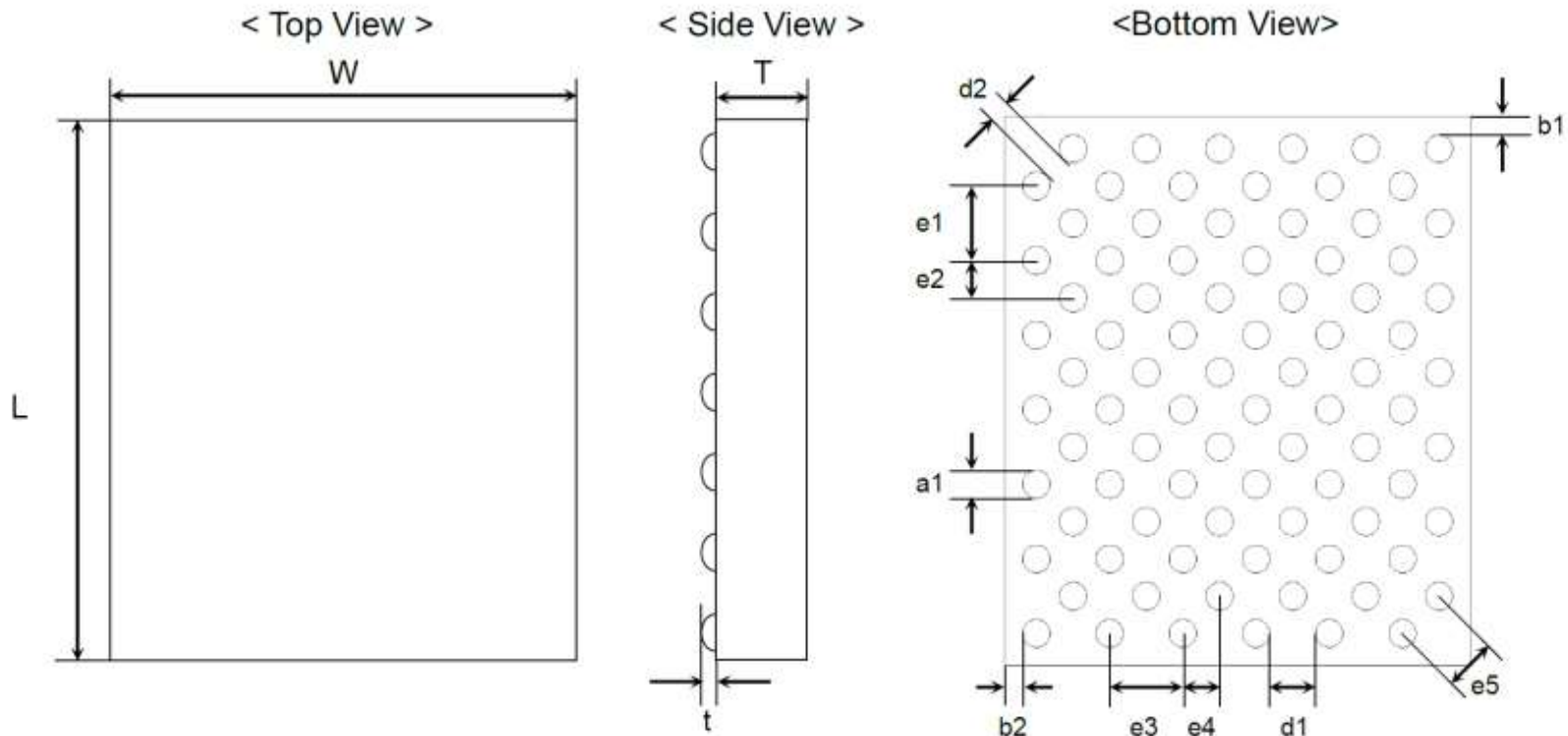
Note: The muRata radio is capable of using BLE, however the Bluetooth transmitter FCC ID: Z7ALBCA1KU1WA is disabled while used with the Stryker Medical products.

Mode	Maximum Tune Up Tolerance (dBm)
BT	4.5
BLE	4.5

* Maximum Tune-Up Tolerance is "Average Power" during Duty ON time.

When this module is used for Bluetooth only (BLE disabled), with Molex WiFi 6E flex cable balance antenna, series 146153, it may be used no closer than 10mm from the body.

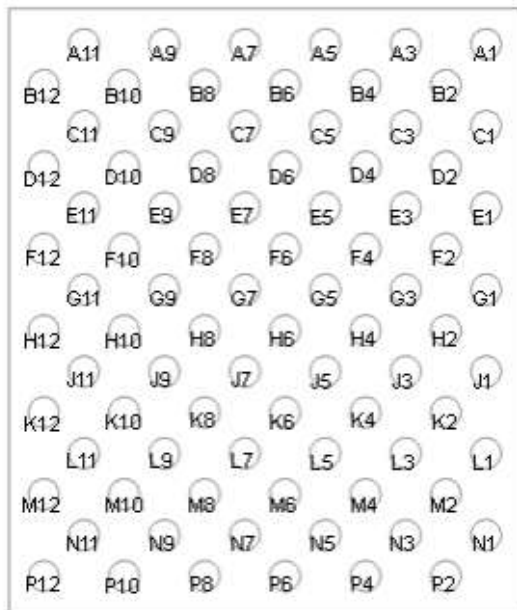
7. Module Dimensions



(units = mm)

Mark	Dimensions	Mark	Dimensions	Mark	Dimensions	Mark	Dimensions	Mark	Dimensions
L	5.9 ± 0.2	t	0.07 max.	e5	0.566 ± 0.1	e3	0.8 ± 0.1	e2	0.4 ± 0.1
W	5.1 ± 0.2	d2	0.266 ± 0.2	d1	0.5 ± 0.2	b2	0.2 ± 0.2	e1	0.8 ± 0.1
T	1.10 max.	b1	0.2 ± 0.2	e4	0.4 ± 0.1	a1	0.3 ± 0.2		

8. Module PIN Layout



No.	Terminal Name	No.	Terminal Name	No.	Terminal Name
A1	GND	E9	P3	K6	P17
A3	BT_CBUCK_OUT	E11	GND	K8	GND
A5	P31	F2	GND	K10	BT_UART_TXD
A7	BT_XTAL_32K_I	F4	P25	K12	P15
A9	BT_XTAL_32K_O	F6	P23	L1	RF
A11	GND	F8	P19	L3	GND
B2	VDD3P3	F10	P2	L5	P7
B4	P32	F12	GND	L7	GND
B6	P24	G1	GND	L9	BT_GPIO2
B8	P36	G3	P29	L11	BT_UART_RTS_N
B10	P21	G5	P18	M2	GND
B12	P22	G7	P11	M4	P4
C1	GND	G9	P9	M6	P5
C3	GND	G11	GND	M8	BT_HOST_WAKE
C5	NC	H2	P37	M10	BT_UART_RXD
C7	P26	H4	P13	M12	VDDIO
C9	P10	H6	P16	N1	GND
C11	P14	H8	GND	N3	GND
D2	BT_CBUCK_IN	H10	GND	N5	P6
D4	P30	H12	GND	N7	BT_GPIO5
D6	P35	J1	GND	N9	BT_GPIO3
D8	P1	J3	P33	N11	GND
D10	P28	J5	P34	P2	GND
D12	P20	J7	P8	P4	GND
E1	GND	J9	GND	P6	BT_GPIO4
E3	P27	J11	BT_UART_CTS_N	P8	BT_DEV_WAKE
E5	P0	K2	GND	P10	RST_N
E7	P12	K4	P38	P12	GND

9. Antennas

9.1. Trace Antenna Design

Not applicable as this antenna is an external antenna.

9.2. 2.4/5GHz Balance Flex Antenna

Please perform the antenna design that followed the specifications of the antenna about the signal line between an antenna and a module.

It is a 50-ohm line design.

Fine tuning of return loss etc. can be performed using a matching network. However, it is required to check "Class1 change" and "Class2 change" which the authorities define then.

The concrete contents of a check are the following three points.

- a) It is the same type as the antenna type of antenna specifications.
- b) An antenna gain is lower than a gain given in antenna specifications.
- c) The emission level is not getting worse.

The following is the design of the EVB used for the test.

Note for FCC & IC certification: Only the antenna type approved with the module can be used. The module is certified with a standard 2 dBi dipole. Any other type of antenna will require authorization either through C2PC, Change of ID, or new certification.

9.3. List of Recommended Antennas

Molex 2.4/5GHz Balance Flex Antenna Series 146153

100 mm (P/N for 1461530100/1461531100)
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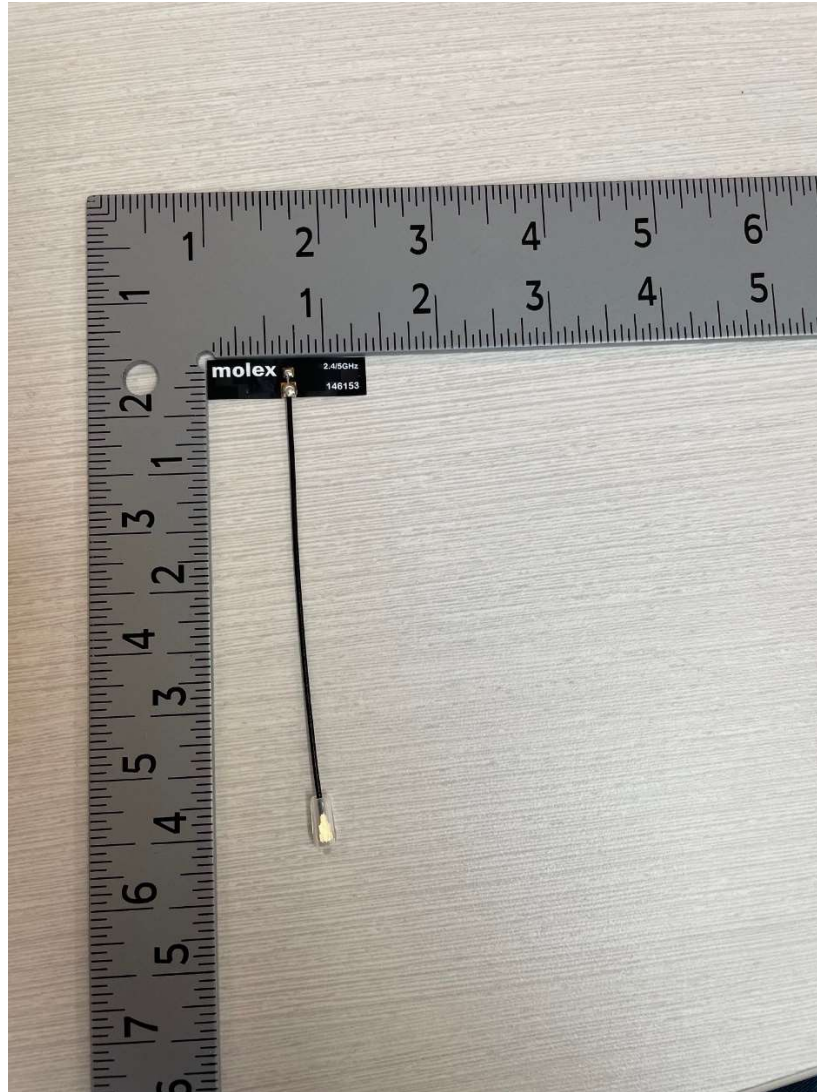


Figure 1: Picture of the Molex 2.4/5GHz Balance Flex Antenna

9.4. Molex 2.4/5GHz Balance Flex Antenna Specifications



PRODUCT SPECIFICATION

TITLE

2.4/5GHz BALANCE FLEX ANTENNA

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REVISION:	ECR/ECN INFORMATION:	TITLE:	SHEET No.
E3	EC No: 618578 DATE: 2019/11/20	2.4/5GHz Balance Flex Antenna Product Specification	1 of 10
DOCUMENT NUMBER:	CREATED / REVISED BY:	CHECKED BY:	APPROVED BY:
PS-1461530100	Kang Cheng 2019/10/17	Cooper Zhou 2019/10/17	Stary Song 2019/10/17

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PRODUCT SPECIFICATION

2.4/5GHz BALANCE FLEX ANTENNA

1.0 SCOPE

This Product Specification covers the mechanical, electrical and environmental performances specification for 2.4/5GHz Balance Flex Antenna.

2.0 PRODUCT DESCRIPTION

2.1 PRODUCT NAME AND SERIES NUMBER (S)

Product name: 2.4/5GHz Balance Flex Antenna
Series Number: 146153

2.2 DESCRIPTION

Series 146153 is a balanced, dipole-type, high efficiency antenna for 2.4/5 GHz applications, including WiFi, Bluetooth, Zigbee and others. This antenna is made from poly flexible material with small size 35*9*0.1mm and has double-sided adhesive tape for easy "peel and stick" mounting. This balanced antenna with ground plane independent design offers various cable length options for ease of integration into various devices.

2.3 FEATURES

- Ground plane independent, balanced dual band antenna
- Flex size 35 x 9 x 0.1mm (not contain solder area)
- IPEX MHF (U.FL compatible) connector (Such as MHF1/MHF4)
- Cable OD1.13mm
- Cable and connector can be customized
- RoHS Compliant



Molex 1461530100 2.4/5GHz BALANCE FLEX ANTENNA MODULE 3D VIEW

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PRODUCT SPECIFICATION

3.0 GENERAL SPECIFICATION

Product name	2.4/5GHz Balance Flex Antenna	
Part number	146153	
Frequency	2.4GHz-2.5GHz	5.15GHz-5.85GHz
Polarization	Linear	
Operating with matching	-40°C to 85°C	
Storage with matching	-40°C to 85°C	
RF Power	2 Watts	
Impedance with matching	50 Ohms	
Antenna type	Flex	
Connector type	146153 0XXX	146153 1XXX
	Compatible MHF1	Compatible MHF4
User Implementation type	Adhesive 3M9077	
Cable diameter	Ø1.13mm	
Cable length	████████████████████	
	100 mm (P/N for 1461530100/1461531100)	
	████████████████████	
	████████████████████	
	████████████████████	
	████████████████████	

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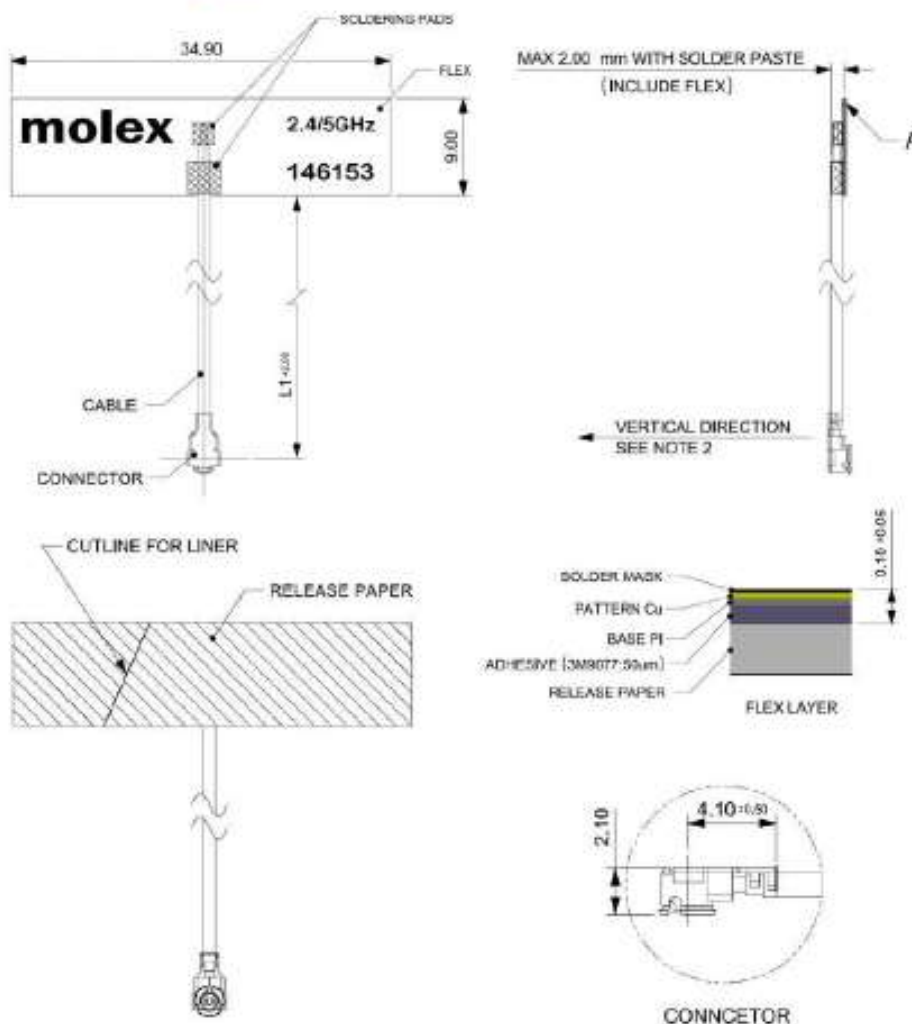
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4.0 PRODUCT STRUCTURE INFORMATION

P/N 146153 0XXX



ITEM	MATERIAL NO.	CABLE LENGTH "L1"
1		
2	1461530100	93.3 mm
3		
4		
5		
6		

NOTES:
 1. MATERIAL:
 FLEX SIZE: 34.9*9mm
 CABLE: Ø1.13 mm
 CONNECTOR: 001.13 RF 2.5H U.F.L CONNECTOR-PLUG GOLD PLATED (IPEX MHF-4 COMPATIBLE)
 2. FOR PULL TEST, CAN NOT LIFT UP IN THE VERTICAL DIRECTION.
 3. SOLDER MASK: BLACK.
 4. THE CONNECTOR WILL BE PROTECTED WITH A CAP.

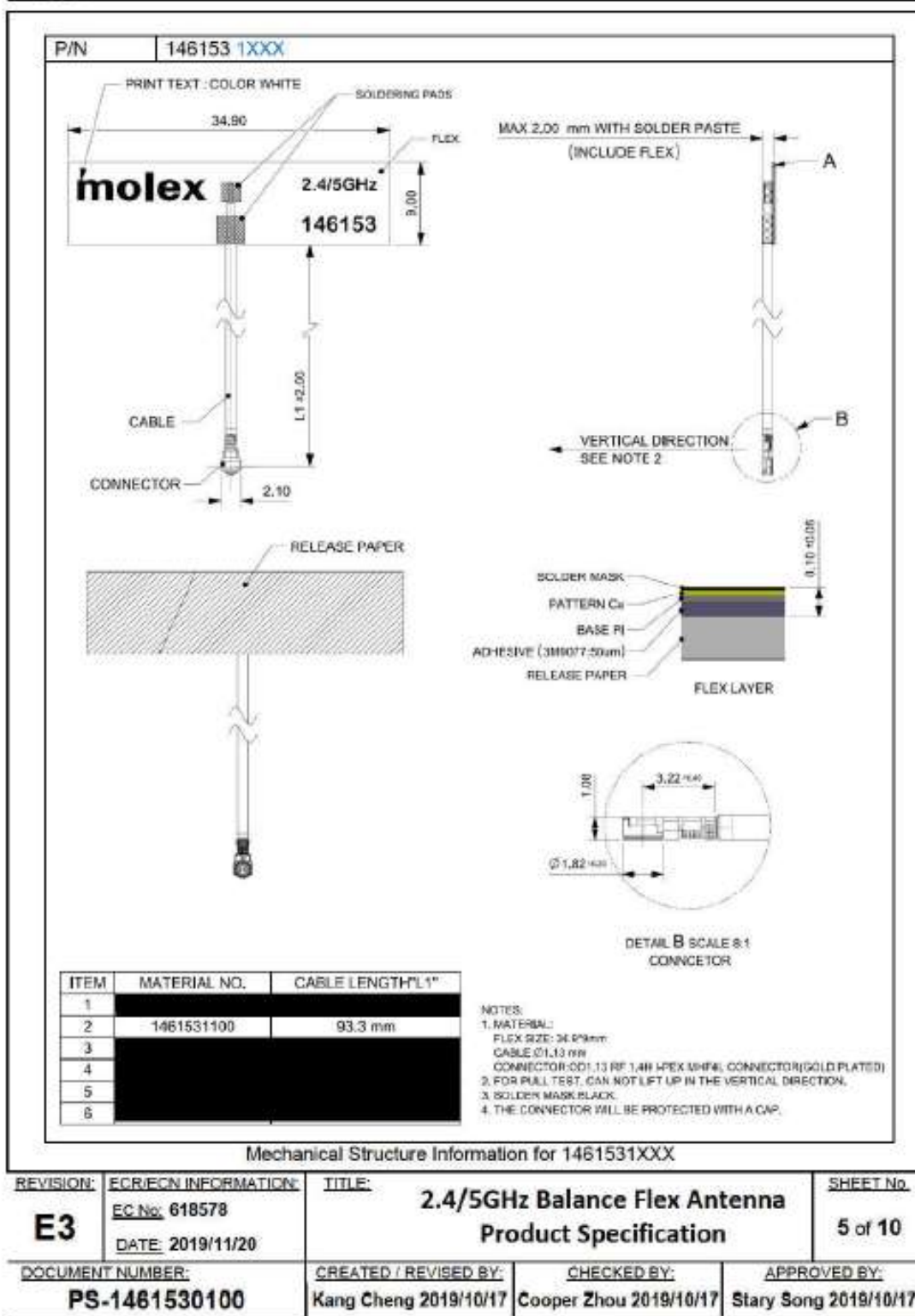
Mechanical Structure Information for 1461530XXX

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PRODUCT SPECIFICATION





PRODUCT SPECIFICATION

5.0 APPLICABLE DOCUMENTS

DOCUMENT	NUMBER	DESCRIPTION
Sale Drawing (SD)	SD-1481530050	Mechanical Dimension of the product
	SD-1481531050	
Application Guide (AS)	AS-1481530100	Antenna Application and surrounding
Packing Drawing (PK)	PK-1481530100	Product packaging specifications

6.0 ANTENNA SPECIFICATION

All measurements are done of the antenna mounted on a PC/ABS material block of 1.5 mm thickness with VNA Agilent E5071C and Over-The-Air (OTA) chamber. All measurements in this document are done with the part no.1481530100 for different cable length.

6.1 ELECTRICAL REQUIREMENT

6.1.2 ELECTRICAL REQUIREMENTS FOR CABLE LENGTH 100mm		
P/N	1481530100	
Frequency Range	2.4GHz-2.5GHz	5.15GHz-5.85GHz
Peak Gain (Max)	3.0dBi	4.0dBi
Average Total efficiency	>75%	>75%
Return Loss	< -10 dB	< -10 dB

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PRODUCT SPECIFICATION

[REDACTED]		
[REDACTED]	[REDACTED]	
[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]
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[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]

Note that the above antenna performance is measured with just the antenna mounted on a PC/ABS block to similar a free-space condition. When implement into the system, the frequency resonant might be off-tune due to the loading of surrounding components especially metal plane. This off-tune can be compensated through matching. Although module manufacturers specify a peak gain limit, it is based on free-space conditions. The peak gain will be degraded by 1 to 2dBi in the actual implementation as the radiation pattern will change due to the surround components. As such, during selection of antenna, you can select one with high peak gain to compensate for the loss. Molex can offer assistant to choose the best location and best tuning in-order to meet this peak gain requirement.

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PRODUCT SPECIFICATION

6.2 CABLE LOSS

DESCRIPTION	TEST CONDITION	REQUIREMENTS	
Frequency Range	2.4GHz/5GHz	2.0GHz~3.0GHz	5.0GHz~6.0GHz
Attenuation	1m cable measured by VNA5071C	≤3.5dB/m	≤5.5dB/m

Balance antenna resonance is insensitive to cable's length, but the cable's loss will affect the total efficiency.

7.0 MECHANICAL SPECIFICATION

All measurements in this document are done with the part no.1461530100 for different cable length.

DESCRIPTION	TEST CONDITION	TEST RESULT
Pull Test	1. Test machine: Max intelligent load tester 2. Stick the flex antenna on a plastic board, pull cable in axial direction.	Pull force >8N
Un-mating force (connector)	Solder the receptacle connector to the test board, then place the board and plug on push-on/pull-off machine, and repeat mating and un-mating 30 cycles at a speed 25±3mm/min. along the mating axis.	Un-mating force : 0.5 kgf min

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PRODUCT SPECIFICATION

8.0 ENVIRONMENTAL SPECIFICATION

DESCRIPTION	SPECIFICATION
Temperature /Humidity cycling	1.The device under test is kept for 30 mins in an environment with a temperature of -40 °C. 2. Kept for 4 Hours in an environment with a temperature of 85 °C. 3. Kept for 2 Hours in an environment with a temperature of 125 °C. 4. The cycle is repeated until a total of 40 cycles have been completed. Hereafter the conditions are stabilized at room temperature. Transfer temperature 8 °C per min. 5. Parts should meet RF spec before and after test. 6. No cosmetic problem (No soldering problem; No adhesion problem of glue.)
Temperature Shock	1.The device under test at -40 °C⇒125 °C by 100 cycles, Dwell of 30 mins, transition time between Dwell 30 secs (~ 81 mins / cycle) and each item should be measured after exposing them in normal temperature and humidity for 24 h. 2. Parts should meet RF spec before and after test. 3. No cosmetic problem (No soldering problem; No adhesion problem of glue) .
High Temperature	1.Temperature:125°C, time:1008 hours 2.There is no substantial obstruction to air flow across and around the samples, and the samples are not touching each other 3. Parts should meet RF spec before and after test. 4. No cosmetic problem (No soldering problem; No adhesion problem of glue) .
Salt mist test	1. The device under test is exposed to a spray of a 5% (by volume) resolution of NaCl in water for 2 hours. Thereafter the device under test is left for 1 week in room temperature at a relative humidity of 95%. The cycle is repeated until a total of 2 cycles have been completed. Here after the conditions are stabilized at room temperature. 2. Parts should meet RF spec before and after test. 3. No visible corrosion. Discoloration accept.

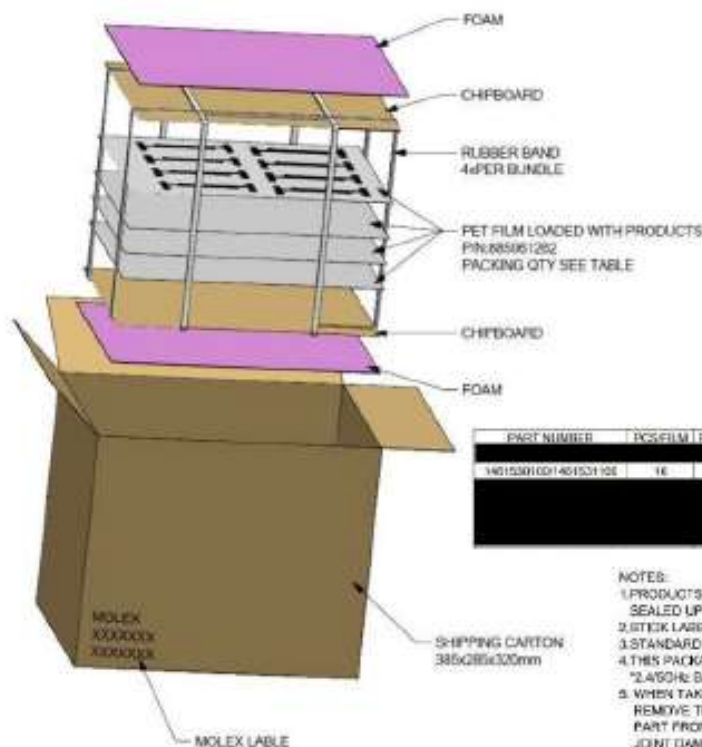
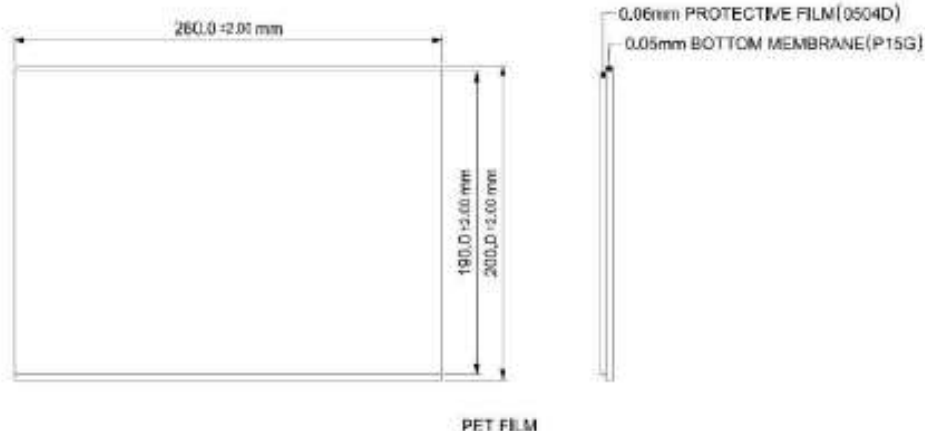
REVISION: E3	ECR/ECN INFORMATION: EC No: 618578 DATE: 2019/11/20	TITLE: 2.4/5GHz Balance Flex Antenna Product Specification	SHEET No. 9 of 10
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PRODUCT SPECIFICATION

9.0 PACKING



PART NUMBER	PCSEFILM	FLUORIMIDE	BUNDLE	CARTON	QTY/CARTON
1461530100	16	40	5	3200PCS	

- NOTES:
1. PRODUCTS MUST BE PACKED IN CARTONS AND SEALED UP WITH TAPE.
 2. STICK LABEL WITH PART NUMBER AND DATE CODE.
 3. STANDARD PACKAGING QUANTITY: SEE TABLE.
 4. THIS PACKAGING SPECIFICATION TO BE USED FOR "2.4/5GHz BALANCE FLEX ANTENNA".
 5. WHEN TAKING PRODUCT FROM PET FILM, PLEASE REMOVE THE COVER TAPE FIRST, THEN PICK UP THE PART FROM FLEX NOT THE CABLE, TO AVOID SOLDER JOINT DAMAGE.

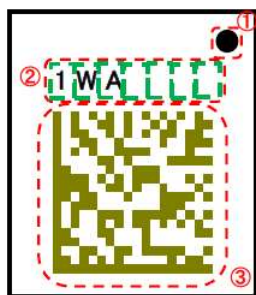
PACKAGING INFORMATION FOR 146153 Series

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10. Labeling

10.1. Radio Label Information



FCC ID: Z7ALBCA1KU1WA
IC: 4919E-LBCA1KU1WA
Model Name: LBCA1KU1WA

- 1WA : Stryker Medical's model name for management
Note: The product name to apply is "LBCA1KU1WA"
- : Direction display
-  : 2D code

10.2. Packaging Label



FCC ID: Z7ALBCA1KU1WA IC: 4919E-LBCA1KU1WA HVIN: LBCA1KU1WA
This device complies with part 15 of FCC rules and Industry Canada's license-exempt RSS. 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.
Ce produit répond aux conditions à la partie 15 des règles de la FCC et aux normes des CNR d'Industry Canada. L'appareil ne doit pas produire de brouillage, et l'appareil doit accepter tout brouillage radio, même si le brouillage est susceptible d'en compromettre le fonctionnement.

The character size is 4 points or more.

Notation requirement areas of other countries.

11. Compliance Information

11.1. FCC Compliance Information

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.

Please note that changes or modifications not expressly approved by Stryker Medical could void the user's authority to operate the equipment.

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. If it is not installed and used in accordance with these instructions, it 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.

Additional Testing, Part 15 Subpart B Disclaimer

This device is only FCC authorized for the specific rule parts (i.e., FCC transmitter rules) listed on Stryker's grant. Stryker is responsible for compliance to any other FCC rules that may apply to the device not covered by the modular transmitter grant of certification. For products using this device, they are required to be Part 15 Subpart B compliant (when it also contains unintentional-radiator digital circuitry) and shall provide a notice stating that the final host product still requires Part 15 Subpart B compliance testing with the modular transmitter installed.

11.2. ISED Compliance Information

This device complies with Industry Canada's applicable license-exempt RSSs. 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.

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes : 1) l'appareil ne doit pas produire de brouillage; 2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

13. OEM/Integrators Installation Procedure

This module has been granted modular approval for mobile applications. OEM integrators for host products may use the module in their final products without additional FCC / IC (Industry Canada) certification if they meet the following conditions. Otherwise, additional FCC / IC approvals must be obtained.

- The host product with the module installed must be evaluated for simultaneous transmission requirements.
- The user's manual for the host product must clearly indicate the operating requirements and conditions that must be observed to ensure compliance with current FCC / IC RF exposure guidelines.
- To comply with FCC / IC regulations limiting both maximum RF output power and human exposure to RF radiation, the maximum antenna gain including cable loss in a mobile-only exposure condition must not exceed, it includes one chip antenna with Max antenna gain 2 dBi, Pattern antenna with Max antenna gain 4 dBi, and 100mm flex antenna with Max antenna gain 3.0 dBi;
- A label must be affixed to the outside of the host product with the following statements:
 - This device contains FCC ID: Z7ALBCA1KU1WA
 - This equipment contains equipment certified under IC: 4919E-LBCA1KU1WA

The final host / module combination may also need to be evaluated against the FCC Part 15B criteria for unintentional radiators to be properly authorized for operation as a Part 15 digital device.

If the final host / module combination is intended for use as a portable device (see classifications below) the host manufacturer is responsible for separate approvals for the SAR requirements from FCC Part 2.1093 and RSS-102.

14. FCC Definitions

Portable: (§2.1093) — A portable device is defined as a transmitting device designed to be used so that the radiating structure(s) of the device is / are within 20 centimeters of the body of the user.

Mobile: (§2.1091) (b) — A mobile device is defined as a transmitting device designed to be used in other than fixed locations and to generally be used in such a way that a separation distance of at least 20 centimeters is normally maintained between the transmitter's radiating structure(s) and the body of the user or nearby persons. Per §2.1091d(d)(4) In some cases (for example, modular or desktop transmitters), the potential conditions of use of a device may not allow easy classification of that device as either Mobile or Portable. In these cases, applicants are responsible for determining minimum distances for compliance for the intended use and installation of the device based on evaluation of either specific absorption rate (SAR), field strength, or power density, whichever is most appropriate.

15. Additional Test Requirements - Simultaneous Transmission Evaluation

This module has not been evaluated or approved for simultaneous transmission as it is impossible to determine the exact multi-transmission scenario that a host manufacturer may choose. Any simultaneous transmission condition established through module integration into a host product must be evaluated per

the requirements in KDB447498D01(8) and KDB616217D01, D03 (for laptop, notebook, netbook, and tablet applications).

These requirements include, but are not limited to:

- Transmitters and modules certified for mobile or portable exposure conditions can be incorporated in mobile host devices without further testing or certification when:
- The closest separation among all simultaneous transmitting antennas is >10 mm,

OR

- Antenna separation distance and MPE compliance requirements for ALL simultaneous transmitting antennas have been specified in the application filing of at least one of the certified transmitters within the host device. In addition, when transmitters certified for portable use are incorporated in a mobile host device, the antenna(s) must be >5 cm from all other simultaneous transmitting antennas.
- All antennas in the final product must be at least 20 cm from users and nearby persons.

16. EMI considerations

In the event of non-linear interactions could generate additional non-compliant limits due to module placement to host components or properties, please use FCC's KDB 996369 D04 Module Integration Guide for testing and evaluation.

For standalone mode, please follow FCC's KDB 996369 D04 Module Integration Guide.

For simultaneous mode, please follow FCC's KDB 996369 D02 Module Q&A, Question 1