



PRODUCT SPECIFICATION

TITLE

2.4/5GHz BALANCE FLEX ANTENNA

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PS-146153 Series	Kang Cheng	Liu Hai	Andy Zhang

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)

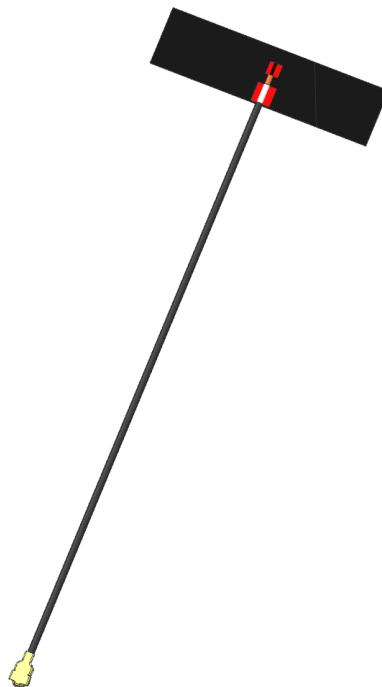
Product name: 2.4/5GHz Balance Flex Antenna
Series Number: 146153

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)
- Cable OD1.13mm
- Cable and connector can be customized
- RoHS Compliant



Molex 146153 2.4/5GHz BALANCE FLEX ANTENNA MODULE U.FL 3D VIEW

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Molex 146153 2.4/5GHz BALANCE FLEX ANTENNA MODULE MMCX 3D VIEW

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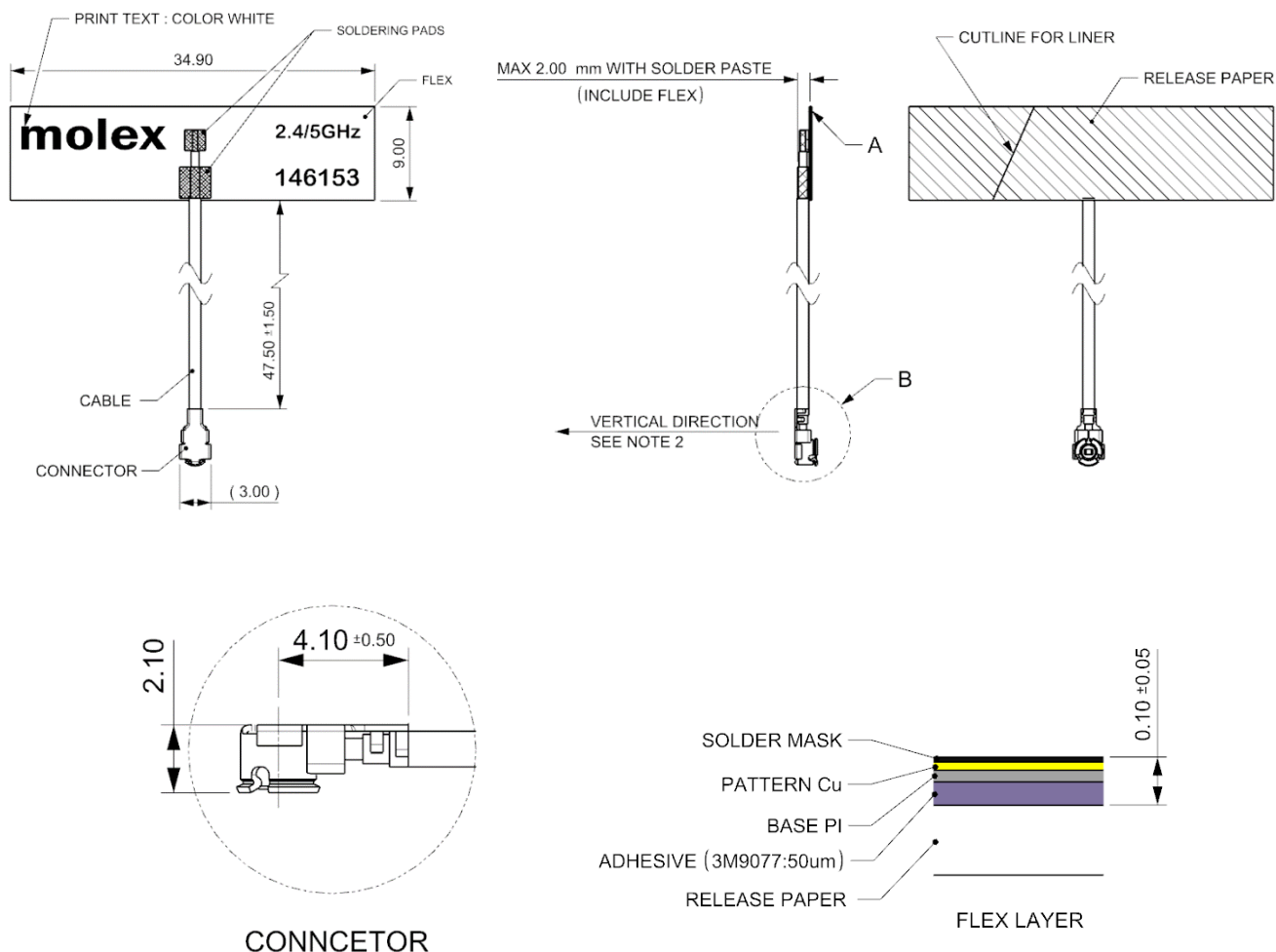
PRODUCT SPECIFICATION

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	Dipole	
Connector type	Compatible I-PEX MHF I & MMCX-JW	
User Implementation type	Adhesive 3M9077	
Cable diameter	Ø1.13mm	

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4.0 PRODUCT STRUCTURE INFORMATION (UNITE:MM)

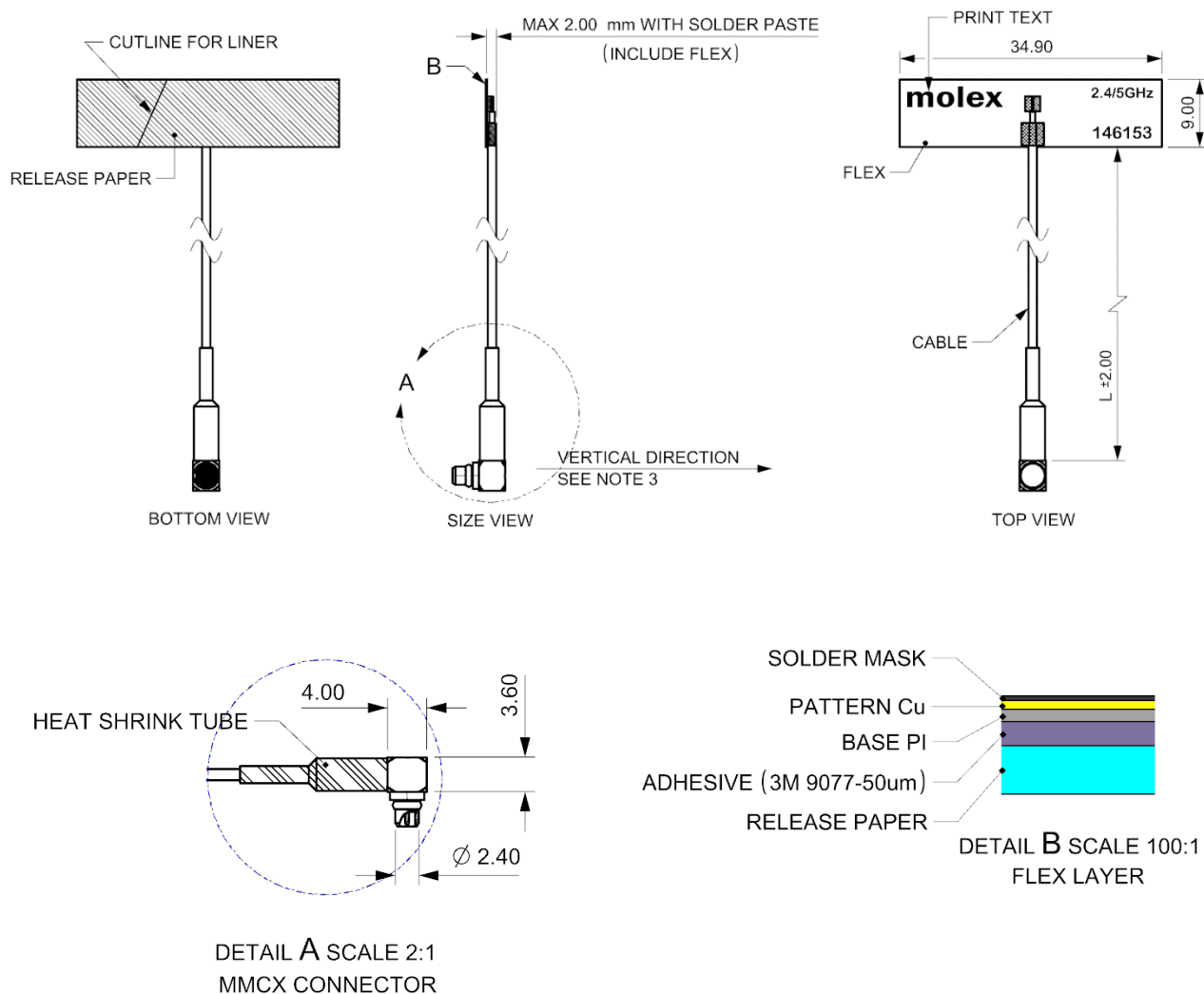


NOTES:

1. MATERIAL:
FLEX SIZE: 34.9*9mm
CABLE: $\varnothing 1.13$ mm
CONNECTOR: OD1.13 RF 2.5H U.FL CONNECTOR-PLUG GOLD PLATED
(IPEX MHF-I 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 146153 U.FL Series

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NOTES:

1. MATERIAL:
FLEX SIZE: 34.9*9mm
CABLE: $\varnothing 1.13$ mm
CONNECTOR: MMCX-JW-1.13 CONNECTOR(GOLD PLATED)
2. SOLDER MASK: BLACK.
3. FOR PULL TEST, CAN NOT LIFT UP IN THE VERTICAL DIRECTION.

ITEM	MATERIAL P/N	CABLE LENGTH"L"
1	1461532052	52 mm
2	1461532066	66 mm

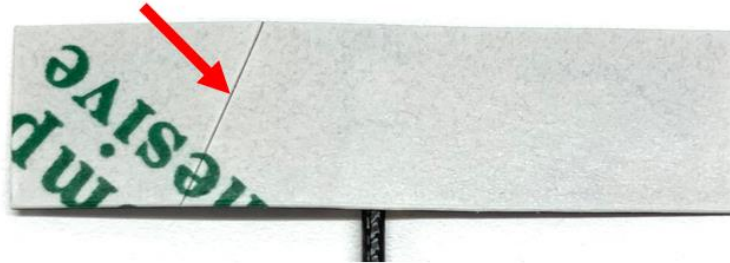
Mechanical Structure Information For 146153 MMCX Series

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5.0 ASSEMBLY GUIDELINE

The flex antenna comes with an adhesive 3m9077 for assemble onto the plastic wall of the system. The surface should be smooth with $ra < 1.6\mu m$ and need to clean the surface before sticking this product. The antenna cannot be placed on a metallic surface.

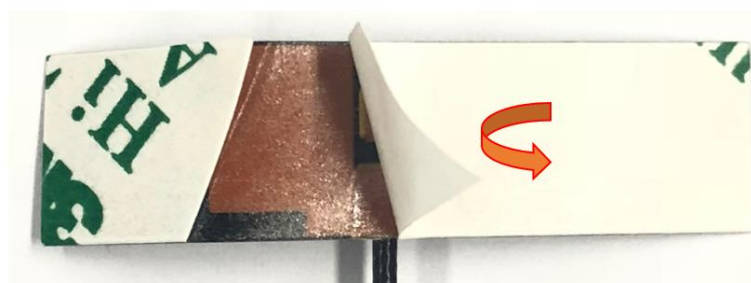
5.1 HOW TO TEAR FLEX RELEASE PAPER



1. Find cut line on flex back side



2. Bend flex slight along cut line



3. Tear release paper

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5.2 CABLE BENDING

During the assembly of the antenna in a device, the cable needs to be positioned away from the antenna flex to achieve best performance. The cable must be away from the Flex edge at least 5mm as shown in figure 5.2.1. If the cable bends into the antenna flex, the antenna performance will be degraded.

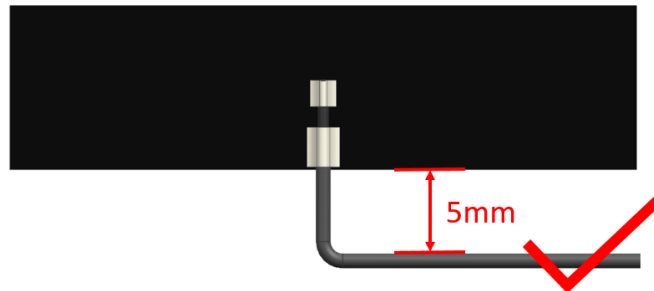


FIGURE 5.2.1 RECOMMENDED CABLE BENDING RANGE

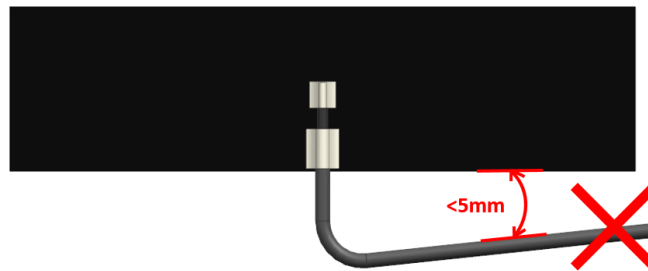


FIGURE 5.2.2 UNRECOMMENDED CABLE BENDING RANGE

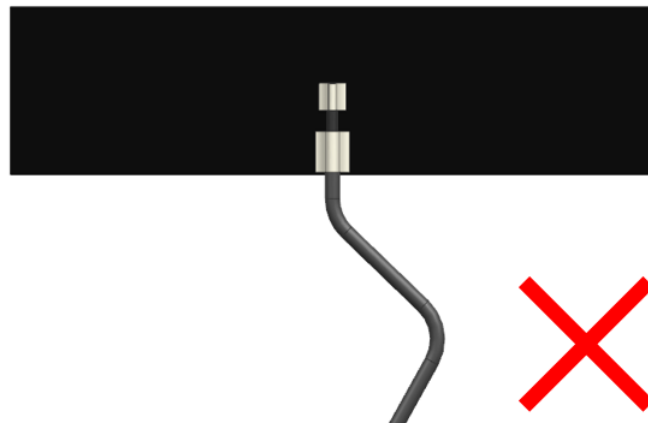


FIGURE 5.2.3 MULTIPLE BENDING OF CABLES IS NOT RECOMMENDED

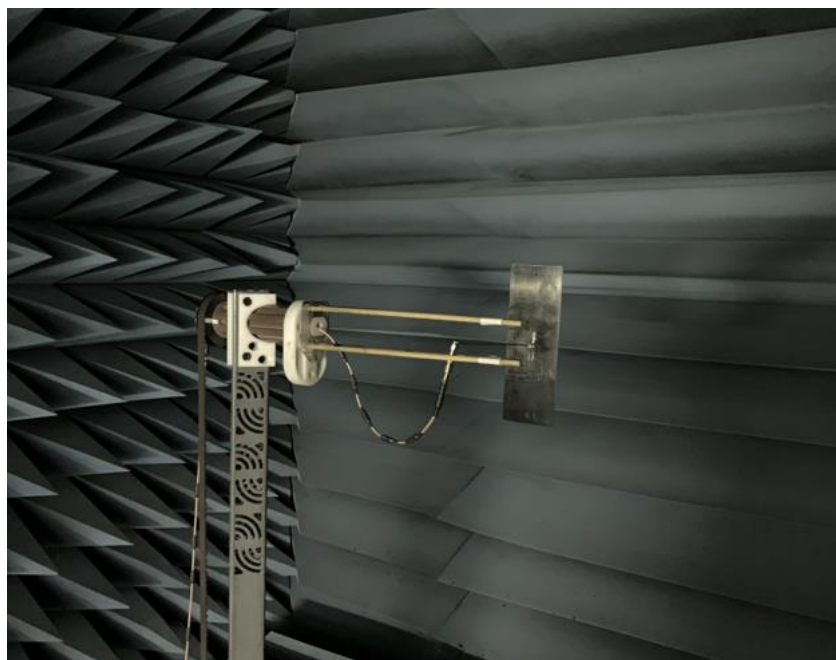
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6.0 ANTENNA SPECIFICATION

All measurements in this document are done with a cable length of 100mm and 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.1461530100.



ANTENNA LOADED WITH PC/ABS BLOCK OF 1.5 MM THICKNESS WITH VNA



ANTENNA LOADED WITH PC/ABS BLOCK OF 1.5 MM THICKNESS WITH OTA CHAMBER

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PRODUCT SPECIFICATION

6.1 ELECTRICAL REQUIREMENT

DESCRIPTION	EQUIPMENT	REQUIREMENT	
Frequency Range	VNA E5071C	2.4-2.5GHz	5.15-5.85GHz
Return Loss	VNA E5071C	<- 10dB	
Peak Gain (Max)	OTA Chamber	3.0dBi	4.1dBi
Average Total Efficiency	OTA Chamber	>75%	>75%
Polarization	OTA Chamber	Linear	
Input Impedance	VNA E5071C	50 ohms	

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.

6.2 CABLE LOSS

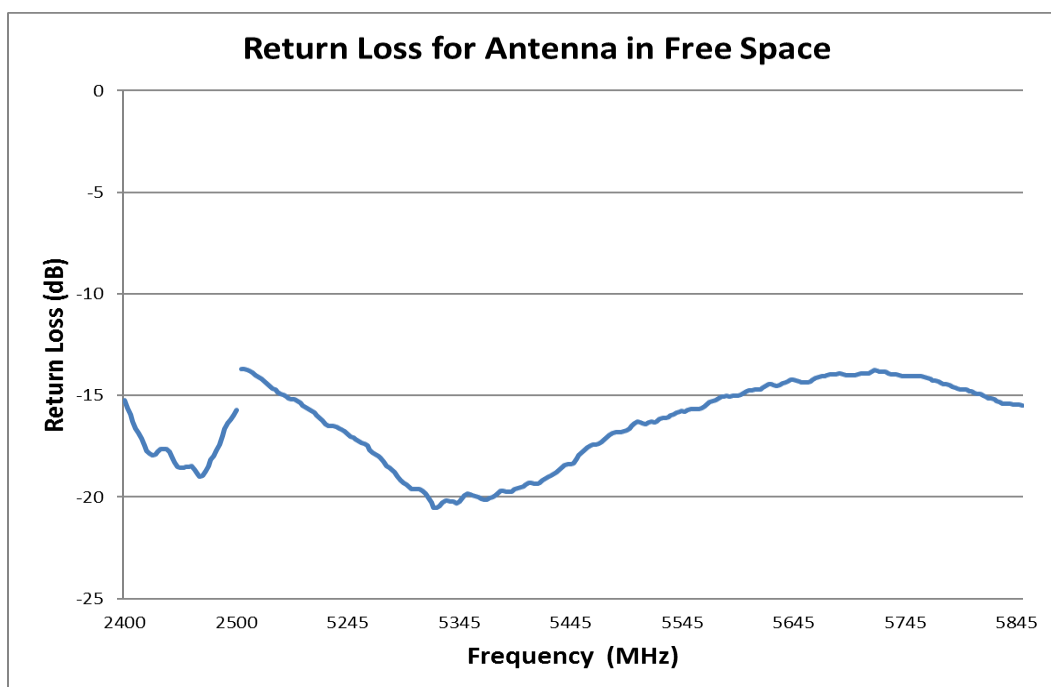
DESCRIPTION	TEST CONDITION	REQUIREMENTS	
Frequency Range	2.4GHz/5GHz	2.0GHz~3.0GHz	5.0GHz~6.0GHz
Attenuation	1m cable measured by VNA5071C	≤3dB/m	≤4.4dB/m

DESCRIPTION	TEST CONDITION	REQUIREMENTS			
Frequency Range	2.4-2.5GHz / 5.15-5.85GHz	50mm cable	100mm cable	150mm cable	200mm cable
Attenuation		0.15dB/ 0.22dB	0.3dB/ 0.44dB	0.45dB/ 0.66dB	0.6dB/ 0.88dB

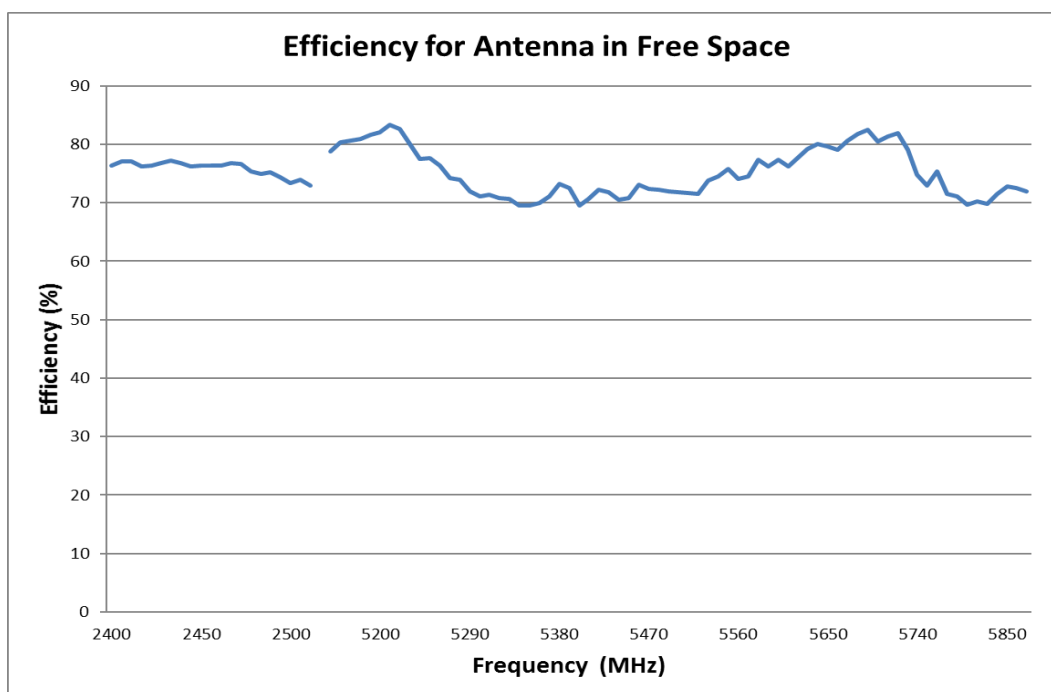
Balance antenna resonance is insensitive to cable's length, but the cable's loss will affect the total efficiency.

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6.3 CHARACTERISTIC CURVE



RETURN LOSS AND VSWR OF ANTENNA IN FREE SPACE

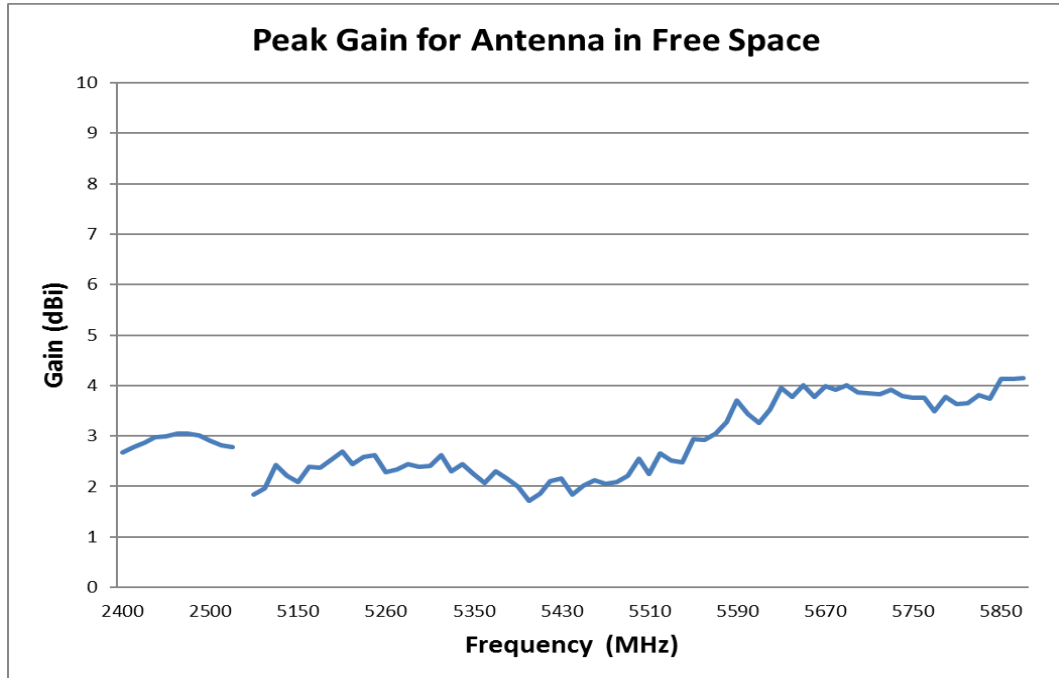


EFFICIENCY OF ANTENNA IN FREE SPACE

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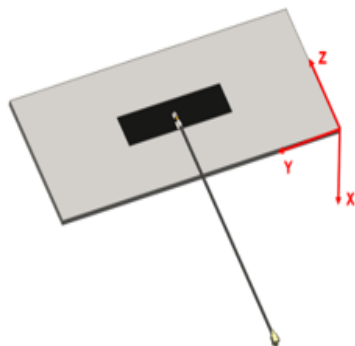


PRODUCT SPECIFICATION

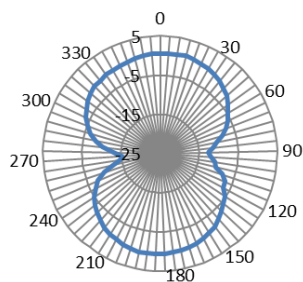


PEAK GAIN OF ANTENNA IN FREE SPACE

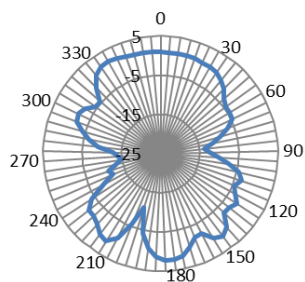
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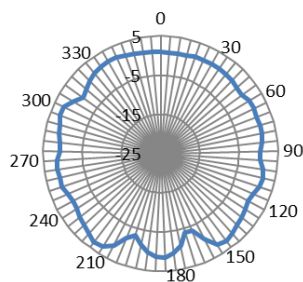
XY-2450MHz



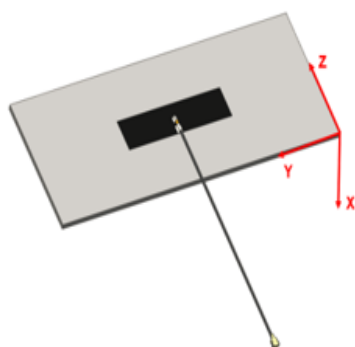
YZ-2450MHz



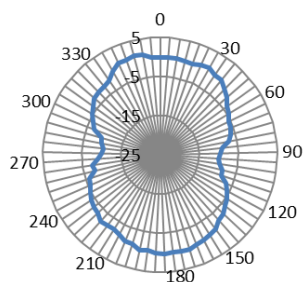
XZ-2450MHz



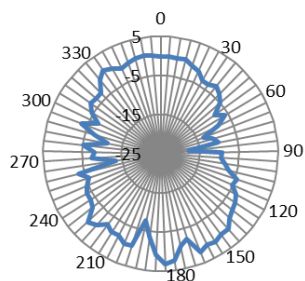
2D RADIATION PATTERN OF ANTENNA AT 2450MHZ IN FREE SPACE



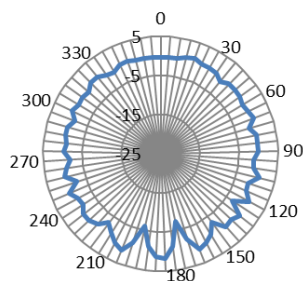
XY-5500MHz



YZ-5500MHz

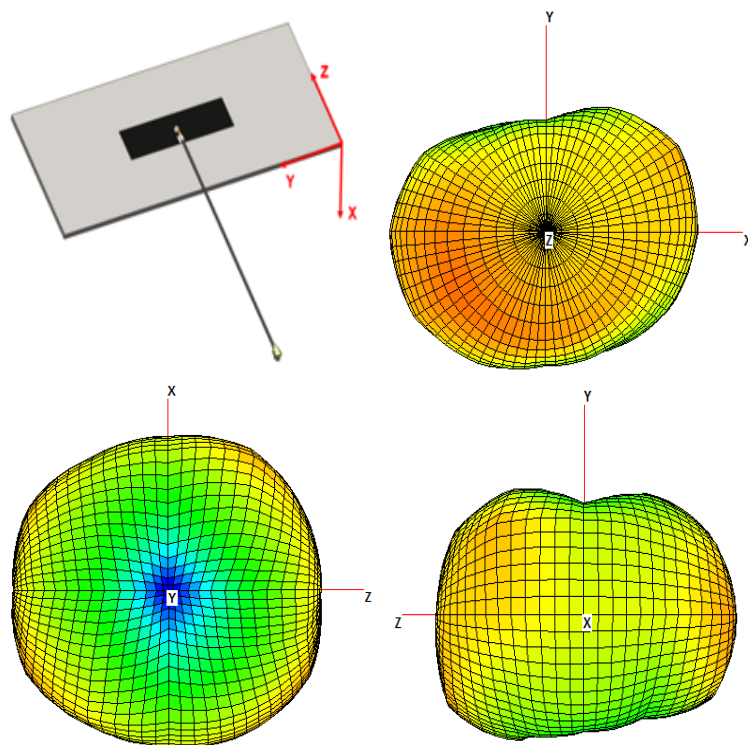


XZ-5500MHz

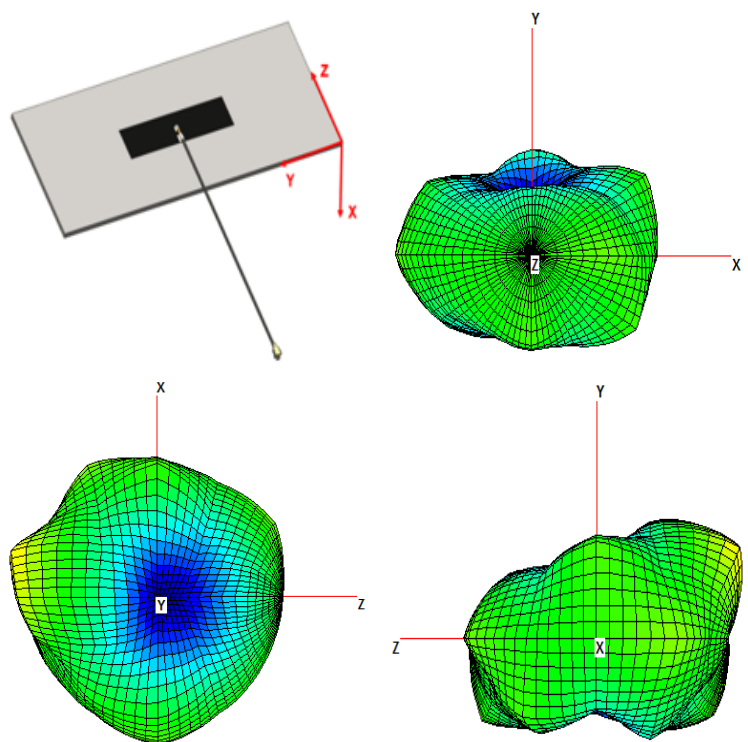


2D RADIATION PATTERN OF ANTENNA AT 5500MHZ IN FREE SPACE

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3D RADIATION PATTERN OF ANTENNA AT 2450MHZ IN FREE SPACE



3D RADIATION PATTERN OF ANTENNA AT 5500MHZ IN FREE SPACE

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PRODUCT SPECIFICATION

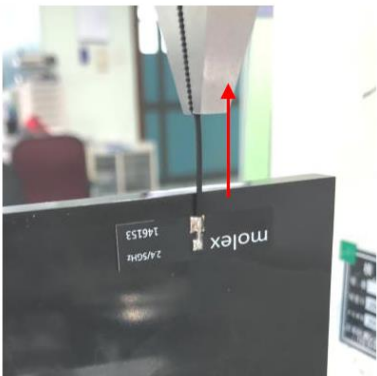
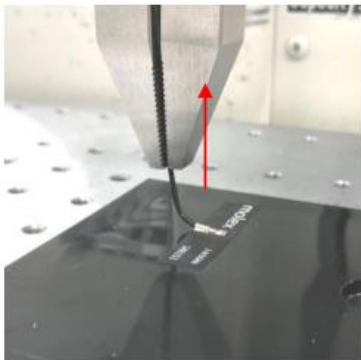
7.0 ENVIRONMENTAL SPECIFICATION

DESCRIPTION	SPECIFICATION
Temperature /Humidity Cycling	<ol style="list-style-type: none">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 degrees.3. Kept for 2 Hours in an environment with a temperature of 125 degrees.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	<ol style="list-style-type: none">1.The device under test at -40 °C⇌125 °C by 100 cycles, Dwell of 30 mins, transition time between Dwell 30 secs (~ 61 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	<ol style="list-style-type: none">1.Temperature:125°C, time:240 hours2.There is no substantial obstruction to air flow across and around the samples, and the samples are not touching each other3. Parts should meet RF spec before and after test.4. No cosmetic problem (No soldering problem; No adhesion problem of glue) .
Salt Mist Test	<ol style="list-style-type: none">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.4. Discoloration accept.

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8.0 MECHANICAL SPECIFICATION

All measurements in this document are done with the part no.146153 series 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, Cable keeps parallel to flex plane. pull cable in horizontal direction 	Pull force >15N
	1. Test machine : Max intelligent load tester 2. Stick the flex antenna on a plastic board, Pull the cable in a direction perpendicular to the flex plane. 	Pull force >8N

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DESCRIPTION	TEST CONDITION	TEST RESULT
Un-Mating Force (U.FL 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

After the connectors are mated, do not apply a load to the cable in excess of the values indicated in the diagram below.

To avoid excessive stress to cable connection points, it is recommended to use special jig. (such as I-PEX P/N:90192-001)

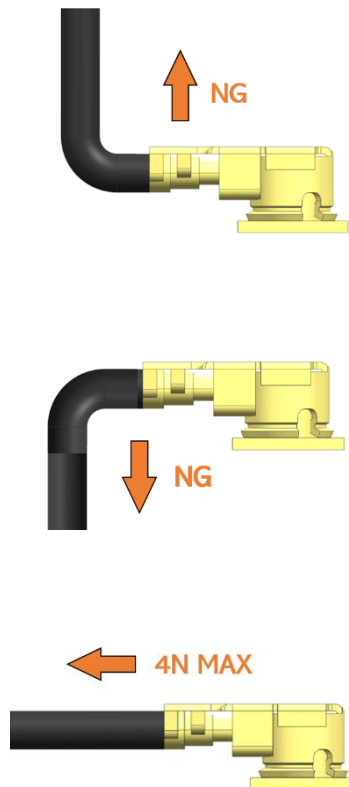


FIGURE 8-1 U.FL CONNECTOR

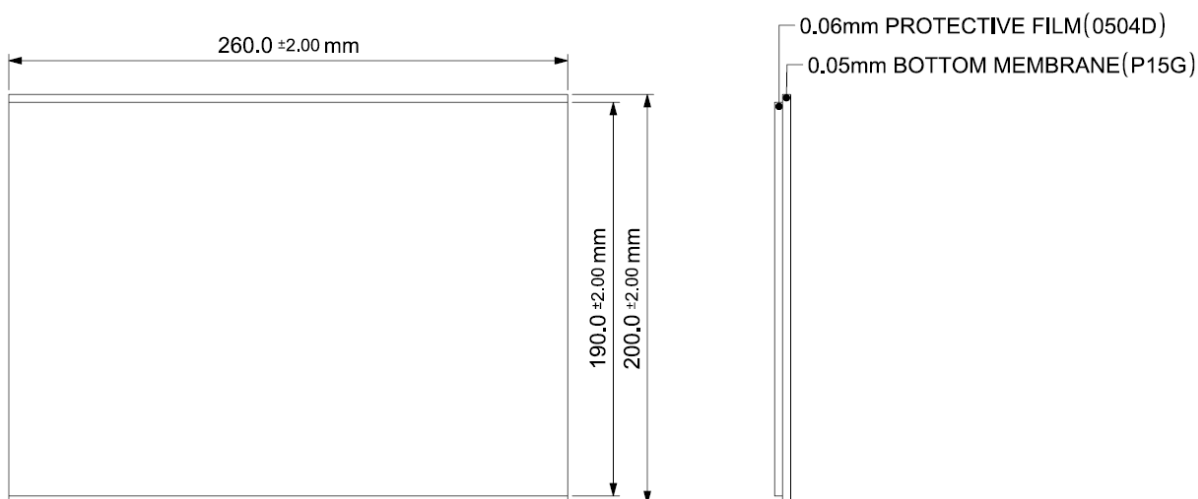
In the case of figure 8-1, it has possibility to damage to the housing and come off from race connector.

Especially when operator give continuous force to the direction, the tendency become higher.

So please take care of handing of harness.

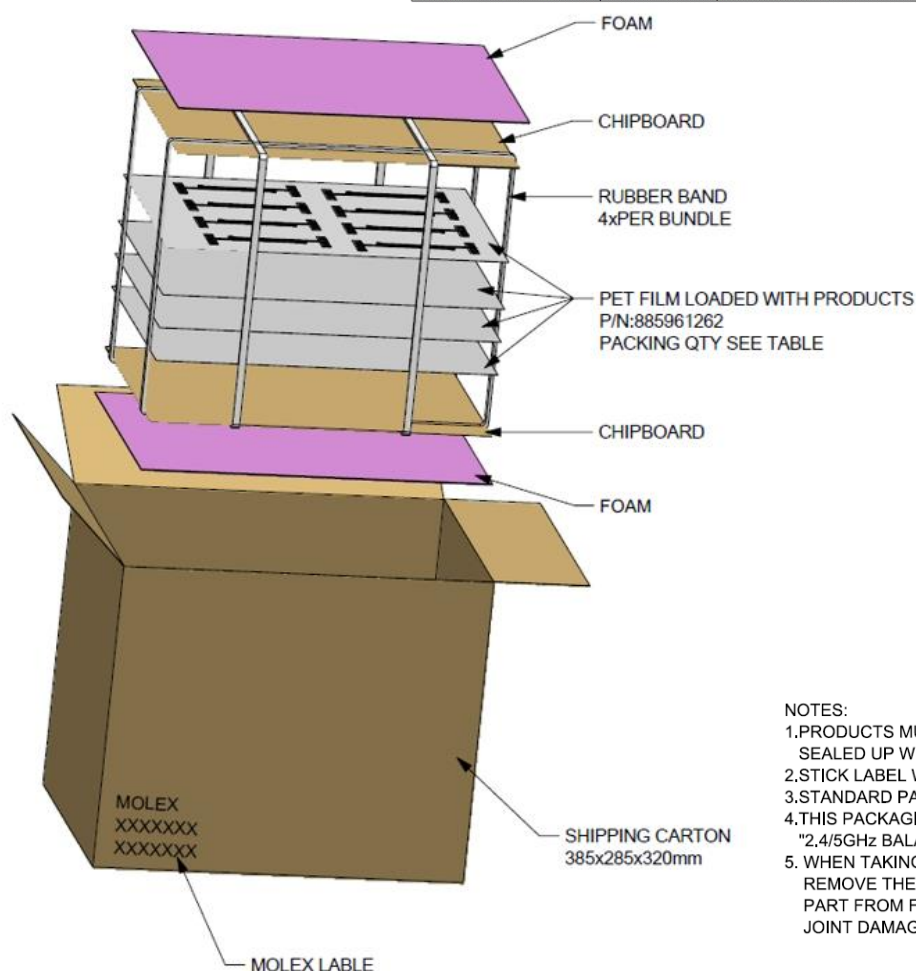
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9.0 PACKING



PET FILM

PART NUMBER	PCS/FILM	FILMS/BUNDLE	BUNDLES/CARTON	QTY/CARTON
1461530047	32	40	4	5120PCS



NOTES:

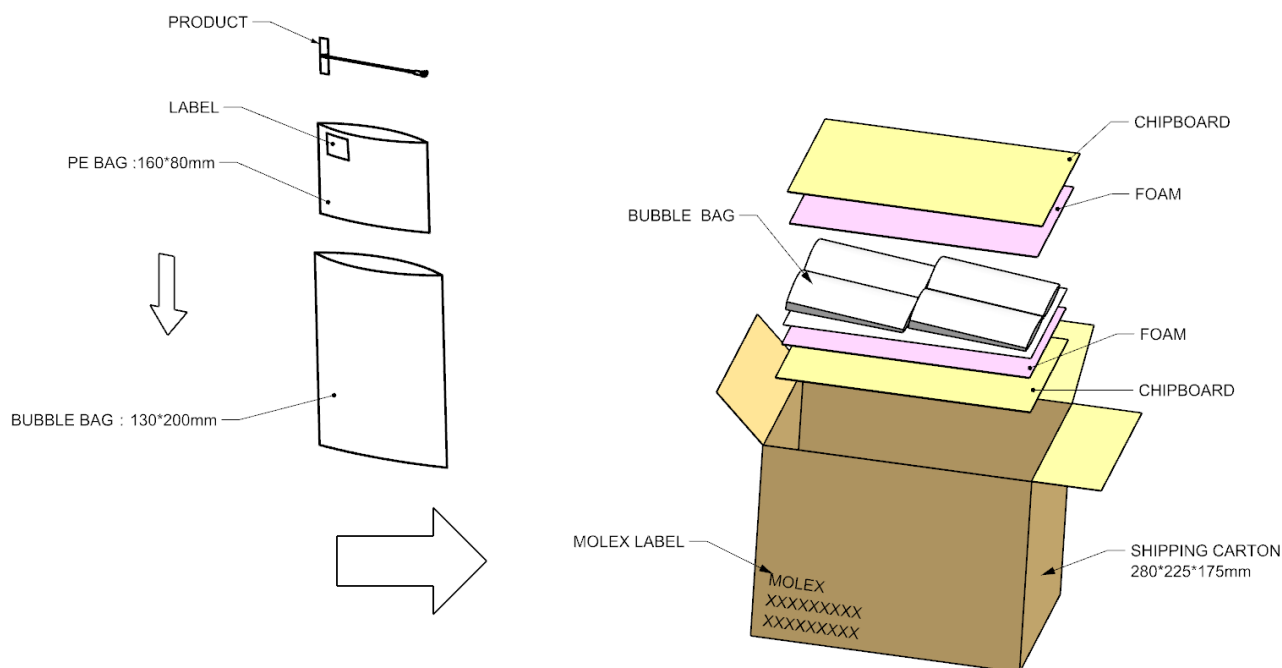
1. PRODUCTS MUST BE PACKED IN CARTONS AND SEALED UP WITH TAPE.
2. STICK LABEL WITH PART NUMBER AND DATE CODE
3. STANDARD PACKAGING QUANTITY: SEE TABLE
4. THIS PACKAGING SPECIFICATION TO BE USED FOR "2.4/5GHz BALANCE FLEX ANTENNA".
5. WHEN TAKING PRODUCT FROM PET FILM, PLEASE REMOVE THE COVER TAPE FIRST,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

PACKAGING INFORMATION FOR 146153 U.FL SERIES

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PRODUCT SPECIFICATION

PART NUMBER	PCS/PE BAG	PE BAG/BUBBLE BAG	BUBBLE BAG/CARTON	QTY/CARTON
1461532052	30	5	10	1500
1461532066	30	5	10	1500



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 FLEXIBLE ANTENNA WITH CABLE AND MMCX".

PACKAGING INFORMATION FOR 146153 MMCX SERIES

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