



PRODUCT SPECIFICATION

TITLE

2.4/5GHz BALANCE FLEX ANTENNA

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



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)

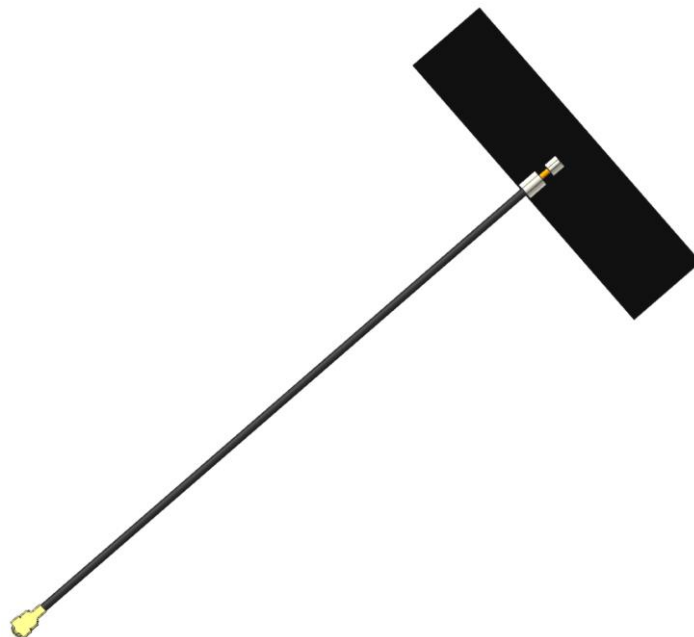
Product name: 2.4/5GHz Balance Flex Antenna
Series Number: 146153

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, 6 standard length options (50/100/150/200/250/300mm)
- Cable and connector can be customized
- RoHS Compliant



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

| | | | |
|------------------------------------------|-----------------------------------------------------------|--------------------------------------------------------------------------|---------------------------------------|
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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 | 50 mm (P/N for 1461530050/1461531050) | |
| | 100 mm (P/N for 1461530100/1461531100) | |
| | 150 mm (P/N for 1461530150/1461531150) | |
| | 200 mm (P/N for 1461530200/1461531200) | |
| | 250 mm (P/N for 1461530050/1461531250) | |
| | 300 mm (P/N for 1461530050/1461531300) | |

| | | | |
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4.0 PRODUCT STRUCTURE INFORMATION

| | | | |
|-----|-------------|--|--|
| P/N | 146153 0XXX | | |
|-----|-------------|--|--|

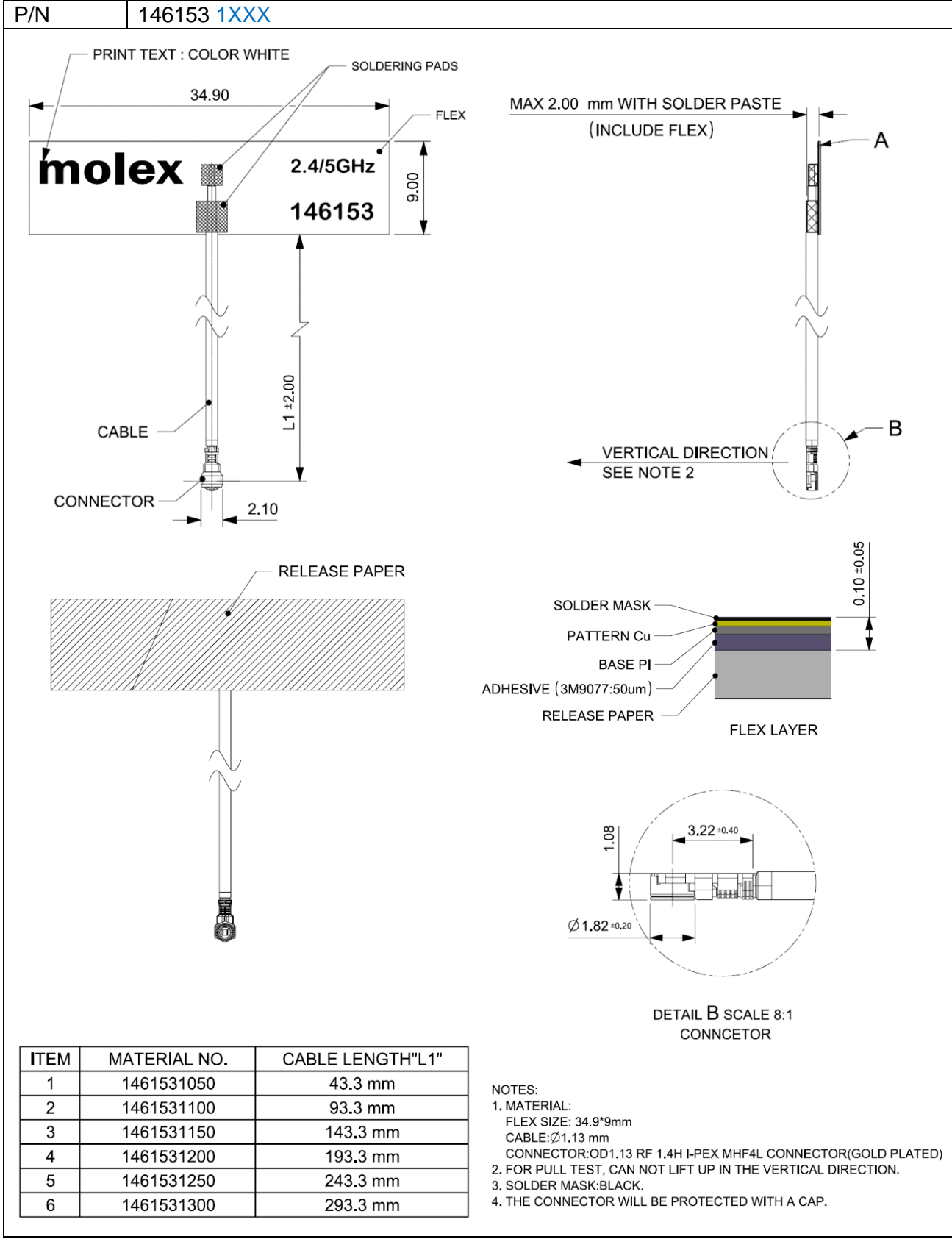
| ITEM | MATERIAL NO. | CABLE LENGTH "L1" |
|------|--------------|-------------------|
| 1 | 1461530050 | 43.3 mm |
| 2 | 1461530100 | 93.3 mm |
| 3 | 1461530150 | 143.3 mm |
| 4 | 1461530200 | 193.3 mm |
| 5 | 1461530250 | 243.3 mm |
| 6 | 1461530300 | 293.3 mm |

NOTES:

- 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)
- FOR PULL TEST, CAN NOT LIFT UP IN THE VERTICAL DIRECTION.
- SOLDER MASK: BLACK.
- THE CONNECTOR WILL BE PROTECTED WITH A CAP.

Mechanical Structure Information for 1461530XXX

| | | | |
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| PS-1461530100 | Kang Cheng 2019/10/17 | Cooper Zhou 2019/10/17 | Stary Song 2019/10/17 |



Mechanical Structure Information for 1461531XXX

| | | | |
|-------------------------|-----------------------------------|----------------------------------------------------------------|-----------------------|
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PRODUCT SPECIFICATION

5.0 APPLICABLE DOCUMENTS

| DOCUMENT | NUMBER | DESCRIPTION |
|------------------------|---------------|-------------------------------------|
| Sale Drawing (SD) | SD-1461530050 | Mechanical Dimension of the product |
| | SD-1461531050 | |
| Application Guide (AS) | AS-1461530100 | Antenna Application and surrounding |
| Packing Drawing (PK) | PK-1461530100 | 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.1461530100 for different cable length.

6.1 ELECTRICAL REQUIREMENT

| 6.1.1 ELECTRICAL REQUIREMENTS FOR CABLE LENGTH 50mm | | |
|-----------------------------------------------------|---------------|-----------------|
| P/N | 1461530050 | |
| Frequency Range | 2.4GHz-2.5GHz | 5.15GHz-5.85GHz |
| Peak Gain (Max) | 3.2dBi | 4.25dBi |
| Average Total efficiency | >78% | >79% |
| Return Loss | < -10 dB | < -10 dB |

| 6.1.2 ELECTRICAL REQUIREMENTS FOR CABLE LENGTH 100mm | | |
|------------------------------------------------------|---------------|-----------------|
| P/N | 1461530100 | |
| 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 |

| 6.1.3 ELECTRICAL REQUIREMENTS FOR CABLE LENGTH 150mm | | |
|------------------------------------------------------|---------------|-----------------|
| P/N | 1461530150 | |
| Frequency Range | 2.4GHz-2.5GHz | 5.15GHz-5.85GHz |
| Peak Gain (Max) | 2.8dBi | 3.7dBi |
| Average Total efficiency | >72% | >70% |
| Return Loss | < -10 dB | < -10 dB |

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|-------------------------------------------------------|---------------|-----------------|
| 6.1.4 ELECTRICAL REQUIREMENTS FOR CABLE LENGTHH 200mm | | |
| P/N | 1461530200 | |
| Frequency Range | 2.4GHz-2.5GHz | 5.15GHz-5.85GHz |
| Peak Gain (Max) | 2.6dBi | 3.5dBi |
| Average Total efficiency | >69% | >66% |
| Return Loss | < -10 dB | < -10 dB |

| | | |
|-------------------------------------------------------|---------------|-----------------|
| 6.1.5 ELECTRICAL REQUIREMENTS FOR CABLE LENGTHH 250mm | | |
| P/N | 1461530250 | |
| Frequency Range | 2.4GHz-2.5GHz | 5.15GHz-5.85GHz |
| Peak Gain (Max) | 2.4dBi | 3.2dBi |
| Average Total efficiency | >66% | >63% |
| Return Loss | < -10 dB | < -10 dB |

| | | |
|-------------------------------------------------------|---------------|-----------------|
| 6.1.6 ELECTRICAL REQUIREMENTS FOR CABLE LENGTHH 300mm | | |
| P/N | 1461530300 | |
| Frequency Range | 2.4GHz-2.5GHz | 5.15GHz-5.85GHz |
| Peak Gain (Max) | 2.2dBi | 2.8dBi |
| Average Total efficiency | >63% | >59% |
| Return Loss | < -10 dB | < -10 dB |

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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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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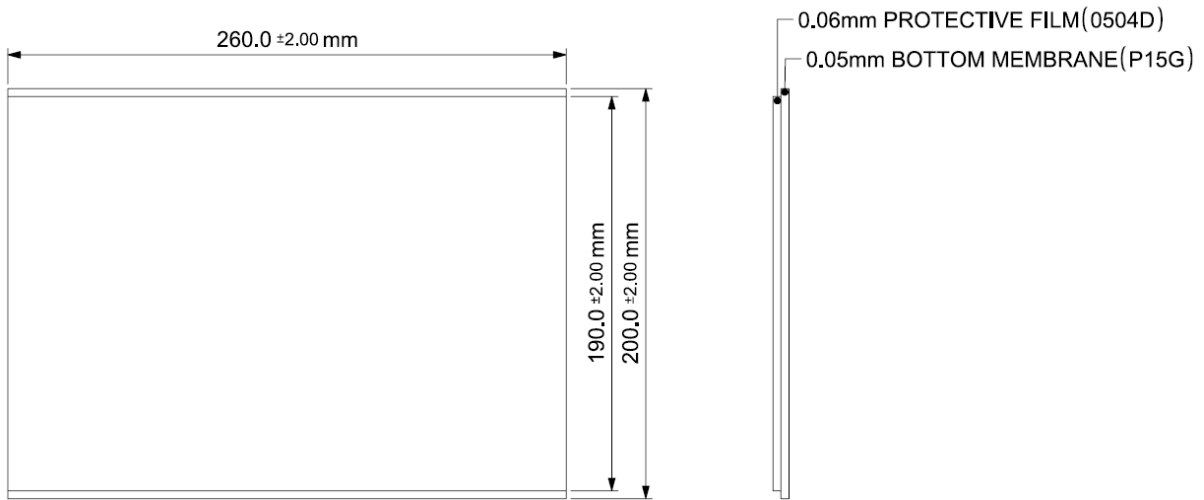
PRODUCT SPECIFICATION

8.0 ENVIRONMENTAL SPECIFICATION

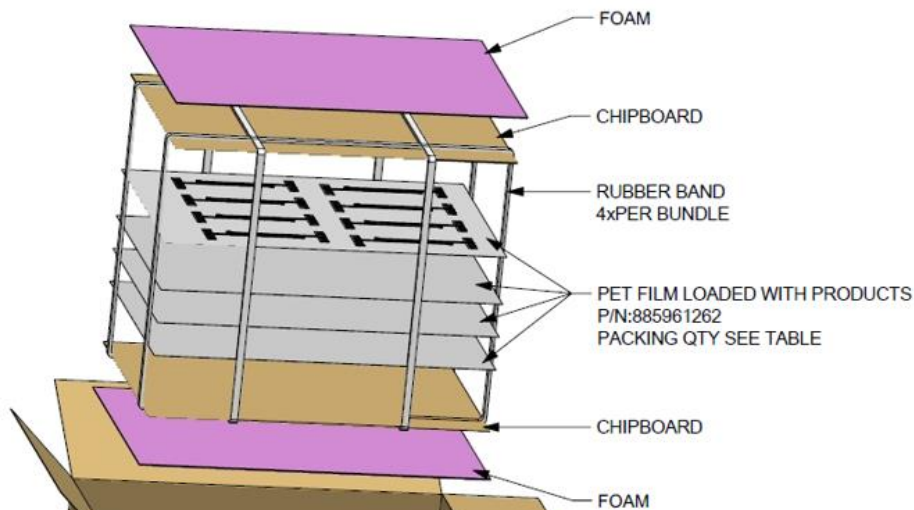
| DESCRIPTION | SPECIFICATION |
|-------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Temperature /Humidity cycling | <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 °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 | <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: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 | <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. Discoloration accept. |

| | | | |
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9.0 PACKING



PET FILM



| PART NUMBER | PCS/FILM | FILM/BUNDLE | BUNDLE/CARTON | QTY/CARTON |
|-----------------------|----------|-------------|---------------|------------|
| 1461530050/1461531050 | 32 | 40 | 4 | 5120PCS |
| 1461530100/1461531100 | 16 | 40 | 5 | 3200PCS |
| 1461530150/1461531150 | 12 | 40 | 5 | 2400PCS |
| 1461530200/1461531200 | 12 | 40 | 5 | 2400PCS |
| 1461530250/1461531250 | 8 | 40 | 5 | 1600PCS |
| 1461530300/1461531300 | 8 | 40 | 5 | 1600PCS |

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.

MOLEX
XXXXXX
XXXXXX

SHIPPING CARTON
385x285x320mm

MOLEX LABEL

PACKAGING INFORMATION FOR 146153 Series

| | | | |
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