



# PRODUCT SPECIFICATION

## TITLE

### MULTI-BAND CELLULAR/WIFI COMBO FLEX ANTENNA

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DOCUMENT NUMBER: <b>PS-146185-100</b>	CREATED / REVISED BY: <b>Benson Liu 2016-02-03</b>	CHECKED BY: <b>Ryan Liu 2016-02-03</b>	APPROVED BY: <b>Welson Tan2016-02-03</b>



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## MULTI-BAND CELLULAR/WIFI COMBO FLEX ANTENNA

### 1.0 SCOPE

This Product Specification covers the mechanical, electrical and environmental performances requirements and test methods for balance antenna.

### 2.0 PRODUCT DESCRIPTION

#### 2.1 PRODUCT NAME AND SERIES NUMBER (S)

Product name: MULTI-BAND CELLULAR/WIFI COMBO FLEX ANTENNA-146185-0100

#### 2.2 Design and Construction

Antenna shall be of the design, construction and physical dimensions specified on the applicable sales drawing.

#### 2.3 Materials

- a) Flex: Refer to respective Molex sales or engineering drawings
- b) Plating: Refer to respective Molex sales or engineering drawings
- c) Cable Line: Refer to respective Molex sales or engineering drawings
- d) Connector: Refer to respective Molex sales or engineering drawings

### 3.0 APPLICABLE DOCUMENTS AND SPECIFICATIONS

See drawings and other sections of this specification for the relevant reference documents. In cases where the specification differs from the drawings, the drawings take precedence.

### 4.0 RATINGS

#### 4.1 RF POWER

2 WATTS

#### 4.2 TEMPERATURE

Operating: - 30°C to + 85°C

Storage : - 40°C to + 95°C

#### 4.3 HUMIDITY

Operating : -30°C to+85°C

-30°C to+50°C, 85%RH or less

+50°C to+85°C, 60%RH or less

Storage : -40°C to+95°C

-40°C to+50°C, 85%RH or less

+50°C to+95°C, 60%RH or less

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## 5.0 PERFORMANCE

### 5.1 ELECTRICAL REQUIREMENTS FOR CABLE LENGTH 50mm (1461850050)

DESCRIPTION	TEST CONDITION	REQUIREMENTS		
		824MHz~960MHz	1.71GHz~2.7GHz	3GHz~6GHz
Frequency Range	0.824GHz~6GHz	824MHz~960MHz	1.71GHz~2.7GHz	3GHz~6GHz
Return Loss	Antenna loaded on PC/ABS housing (thickness 1mm) with 100mm 1.13mm diameter micro coaxial cable Measured by VNA5071C	< -4 dB	< -4 dB	< -6 dB
Peak Gain	Measure antenna on recommended PC/ABS housing through OTA chamber	1.6dBi	3.4dBi	4.2dBi
Total Efficiency	Measure antenna on recommended PC/ABS housing through OTA chamber	>65%	>72%	74%
Polarization	Measure antenna on recommended PC/ABS housing through OTA chamber	Linear		
Input Impedance	Measure antenna on recommended PC/ABS housing through VNA E5071C	50 Ohms		

### 5.2 ELECTRICAL REQUIREMENTS FOR CABLE LENGTH 100mm (1461850100)

DESCRIPTION	TEST CONDITION	REQUIREMENTS		
		824MHz~960MHz	1.71GHz~2.7GHz	3GHz~6GHz
Frequency Range	0.824GHz~6GHz	824MHz~960MHz	1.71GHz~2.7GHz	3GHz~6GHz
Return Loss	Antenna loaded on PC/ABS housing (thickness 1mm) with 100mm 1.13mm diameter micro coaxial cable Measured by VNA5071C	< -4 dB	< -4 dB	< -6 dB
Peak Gain	Measure antenna on recommended PC/ABS housing through OTA chamber	1.5 dBi	3.2 dBi	4.0dBi
Total Efficiency	Measure antenna on recommended PC/ABS housing through OTA chamber	>64%	>70%	70%
Polarization	Measure antenna on recommended PC/ABS housing through OTA chamber	Linear		
Input Impedance	Measure antenna on recommended PC/ABS housing through VNA E5071C	50 Ohms		

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## 5.3 ELECTRICAL REQUIREMENTS FOR CABLE LENGTH 150mm (1461850150)

DESCRIPTION	TEST CONDITION	REQUIREMENTS		
		824MHz~960MHz	1.71GHz~2.7GHz	3GHz~6GHz
Frequency Range	0.824GHz~6GHz	824MHz~960MHz	1.71GHz~2.7GHz	3GHz~6GHz
Return Loss	Antenna loaded on PC/ABS housing (thickness 1mm) with 100mm 1.13mm diameter micro coaxial cable Measured by VNA5071C	< -4 dB	< -4 dB	< -6 dB
Peak Gain	Measure antenna on recommended PC/ABS housing through OTA chamber	1.4 dBi	3.0 dBi	3.7dBi
Total Efficiency	Measure antenna on recommended PC/ABS housing through OTA chamber	>62%	>67%	66%
Polarization	Measure antenna on recommended PC/ABS housing through OTA chamber	Linear		
Input Impedance	Measure antenna on recommended PC/ABS housing through VNA E5071C	50 Ohms		

## 5.4 ELECTRICAL REQUIREMENTS FOR CABLE LENGTH 200mm (1461850200)

DESCRIPTION	TEST CONDITION	REQUIREMENTS		
		824MHz~960MHz	1.71GHz~2.7GHz	3GHz~6GHz
Frequency Range	0.824GHz~6GHz	824MHz~960MHz	1.71GHz~2.7GHz	3GHz~6GHz
Return Loss	Antenna loaded on PC/ABS housing (thickness 1mm) with 100mm 1.13mm diameter micro coaxial cable Measured by VNA5071C	< -4 dB	< -4 dB	< -6 dB
Peak Gain	Measure antenna on recommended PC/ABS housing through OTA chamber	1.3dBi	2.9dBi	3.5dBi
Total Efficiency	Measure antenna on recommended PC/ABS housing through OTA chamber	>61%	>65%	62%
Polarization	Measure antenna on recommended PC/ABS housing through OTA chamber	Linear		
Input Impedance	Measure antenna on recommended PC/ABS housing through VNA E5071C	50 Ohms		

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## 5.5 ELECTRICAL REQUIREMENTS FOR CABLE LENGTH 250mm (1461850250)

DESCRIPTION	TEST CONDITION	REQUIREMENTS		
Frequency Range	0.824GHz~6GHz	824MHz~960MHz	1.71GHz~2.7GHz	3GHz~6GHz
Return Loss	Antenna loaded on PC/ABS housing (thickness 1mm) with 100mm 1.13mm diameter micro coaxial cable Measured by VNA5071C	< -4 dB	< -4 dB	< -6 dB
Peak Gain	Measure antenna on recommended PC/ABS housing through OTA chamber	1.2dBi	2.7dBi	3.3dBi
Total Efficiency	Measure antenna on recommended PC/ABS housing through OTA chamber	>60%	>63%	59%
Polarization	Measure antenna on recommended PC/ABS housing through OTA chamber	Linear		
Input Impedance	Measure antenna on recommended PC/ABS housing through VNA E5071C	50 Ohms		

## 5.6 ELECTRICAL REQUIREMENTS FOR CABLE LENGTH 300mm (1461850300)

DESCRIPTION	TEST CONDITION	REQUIREMENTS		
Frequency Range	0.824GHz~6GHz	824MHz~960MHz	1.71GHz~2.7GHz	3GHz~6GHz
Return Loss	Antenna loaded on PC/ABS housing (thickness 1mm) with 100mm 1.13mm diameter micro coaxial cable Measured by VNA5071C	< -4 dB	< -4 dB	< -6 dB
Peak Gain	Measure antenna on recommended PC/ABS housing through OTA chamber	1.1dBi	2.6dBi	3dBi
Total Efficiency	Measure antenna on recommended PC/ABS housing through OTA chamber	>59%	>61%	56%
Polarization	Measure antenna on recommended PC/ABS housing through OTA chamber	Linear		
Input Impedance	Measure antenna on recommended PC/ABS housing through VNA E5071C	50 Ohms		

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## 5.7 CABLE LOSS

ITEM	DESCRIPTION	TEST CONDITION	REQUIREMENT			
			824MHz~960 MHz	1.7GHz~2.7 GHz	3GHz~5GHz	5GHz~6GHz
5.7.1	Frequency Range	824MHz~6GHz	824MHz~960 MHz	1.7GHz~2.7 GHz	3GHz~5GHz	5GHz~6GHz
5.7.2	Attenuation	1m cable measured by VNA5071C	≤1.8dB/m	≤3.5dB/m	≤4dB/m	≤5dB/m

## 5.8 CABLE LENGTH AFFECT THE ANTENNA PERFORMANCE

Balance antenna resonance is insensitive by cable's length, but the cable's loss will affect the total efficiency. Refer to 5.7

## 5.9 MECHANICAL REQUIREMENTS

ITEM	DESCRIPTION	TEST CONDITION	REQUIREMENT
5.9.1	Pull test	Test machine : Max intelligent load tester Stick the flex antenna in a PC block, pull cable in horizontal direction	Pull force <18 N

## 5.10 RELIABILITY REQUIREMENTS

ITEM	DESCRIPTION	TEST CONDITION	REQUIREMENT
5.10.1	Cross section	Cross section on pad soldering area. Check under microscope	No soldering problem

## 5.11 ENVIRONMENTAL REQUIREMENTS

ITEM	DESCRIPTION	TEST CONDITION	REQUIREMENT
5.11.1	Temperature /Humidity cycling	Test condition: 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 and a relative humidity of 95%. 3) Kept for 2 Hours in an environment with a temperature of 125 degrees and a relative humidity of 95%. 4) The cycle is repeated until a total of 40 cycles have been completed. Hereafter the conditions are stabilized at room temperature.	1) Parts should meet RF spec before and after test. 2) No cosmetic problem

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5.11.2	Temperature Shock	<p>Test condition: 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.</p>	<p>1) Parts should meet RF spec before and after test. 2) No cosmetic problem</p>
5.11.3	High Temperature	<p>Test condition: Temperature:125°C, time:1008hours There is no substantial obstruction to air flow across and around the samples, and the samples are not touching each other</p>	<p>Parts should meet RF spec before and after test. No cosmetic problem</p>
5.11.4	Salt mist test	<p>1. Test condition: 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.</p>	<p>1) Parts should meet RF spec before and after test. 2) No visible corrosion. Discoloration accept.</p>

The meaning of text “No Cosmetic Problem” in the table above is:

- a. no soldering problem
- b. no adhesion problem of glue
- c. no peel off of plating

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## 6.0 TEST GROUPINGS

Test Item	Description	Group1	Group2	Group3	Group4	Group5	Group6
5.9.1	Pull test	X					
5.10.1	Cross section		X				
5.11.1	Temperature /Humidity cycling			X			
5.11.2	Temperature Shock				X		
5.11.3	High Temperature					X	
5.11.4	Salt mist test						X
	Sample Quantity	5	5	5	5	5	5

## 7.0 PACKAGING

Refer to the Molex related packaging drawings.

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