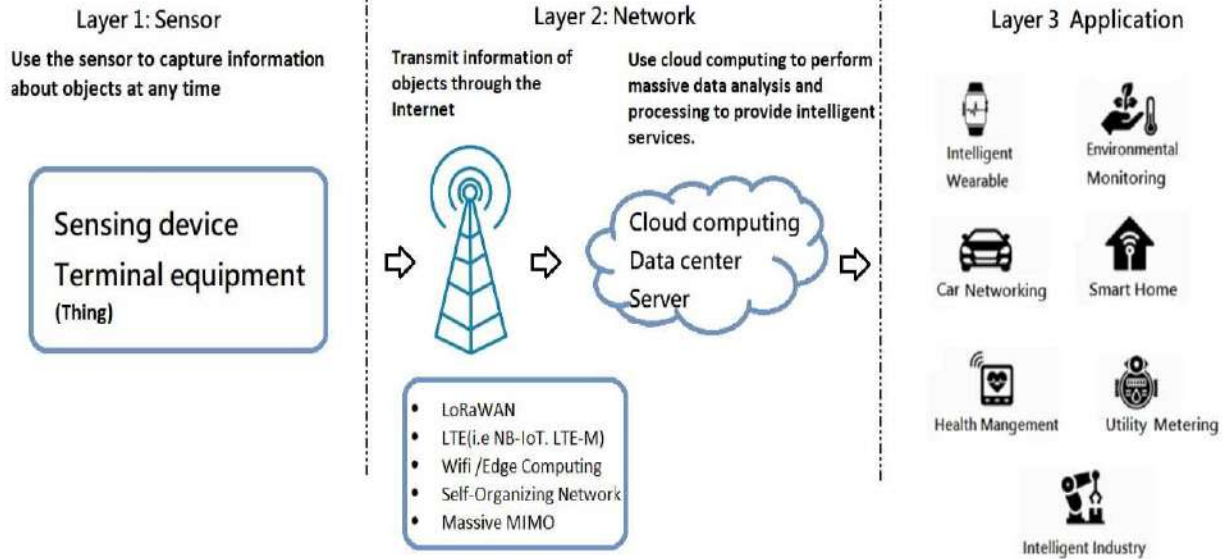




## NB-IoT and LoRa antenna solutions

### Architecture of Internet of Things



### Wide application scenarios of the Internet of Things

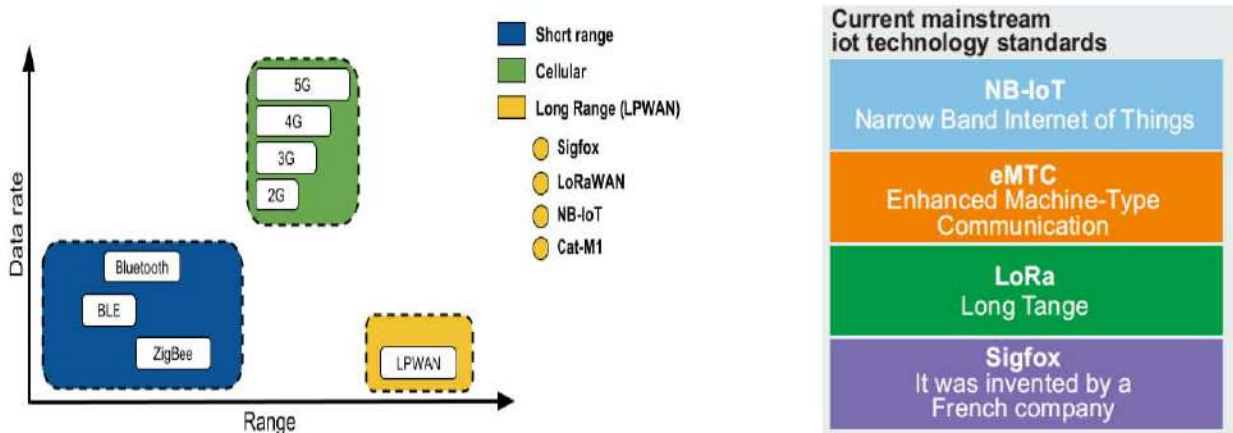
Industry	Examples of application scenarios
<b>Transportation</b>	Intelligent parking, road pricing, fleet management, logistics management, cargo tracking, automatic navigation
<b>Environmental protection</b>	Environmental monitoring, animal monitoring, wkdllife tracking, hazardous waste tracking
<b>Public facilities</b>	Intelligent meter reading, intelligent electricity/water/gas network, manhole cover monitoring, intelligent street lamp, monitoring camera
<b>Medical</b>	Medical equipment tracking, telemedicine diagnosis,remote monitoring
<b>Manufacturing</b>	Industrial automation, process monitoring, supply chain monitoring, goods management
<b>Commercial finance</b>	Vending machines, POS machines, ATM machines, electronic signs, advertising light boxes
<b>Family</b>	Smart home, wearable, pet tracking, children/elderly monitoring tracking, security monitoring, intelligent audio and video



Among the network layer of the second layer, the emerging wireless communication technology of Low Power Wide Area Network (LPWAN) has gradually brought lots of attention, which can greatly expand the application of the IoT. "SIGFOX", "LoRa" and "NB-IoT" are the most market-penetrating technologies in LPWAN technology.

Because of its low power consumption, low speed, low data volume and low cost, LPWAN is very suitable for smart energy, smart city, smart agriculture. It can be used for low-frequency data transmission application such as offshore oil well facilities, parking space management, farm cattle tracking, fish water quality monitoring, and earth-rock flow monitoring, etc.

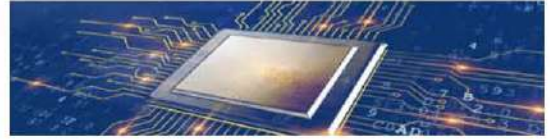
### Location of wireless technology on IoT



### LPWAN technology standard comparison

The LPWAN technologies can be divided into licensed band and unlicensed band:

	NB-IoT	LTE-M(eMTC)	LoRa	Sigfox
<b>Spectrum</b>	Licensed		Unlicensed	
<b>Organization</b>	3GPP	3GPP	LoRa Alliance	ESTI
<b>Frequency</b>	In-Band LTE/ LTE Guard Bands/ Stand alone (700- 900Mhz)	In-Band LTE	ISM Band Sub -1Ghz	ISM Band Sub -1Ghz
<b>Band Width</b>	180KHz	1.4MHz	125~500KHz	100KHz
<b>Speed</b>	~50Kbps	Upto 1Mbps	300bps~50Kbps	100bps
<b>Cost</b>	Medium	High	Low	Low
<b>Coverage/Range</b>	High	High	Medium/High	Medium/High
<b>Business model</b>	Telcos as network operators	Telcos as network operators	Private networks and networks operators	Own platform
<b>Standardization</b>	Standardized	Standardized	Proprietary	Proprietary



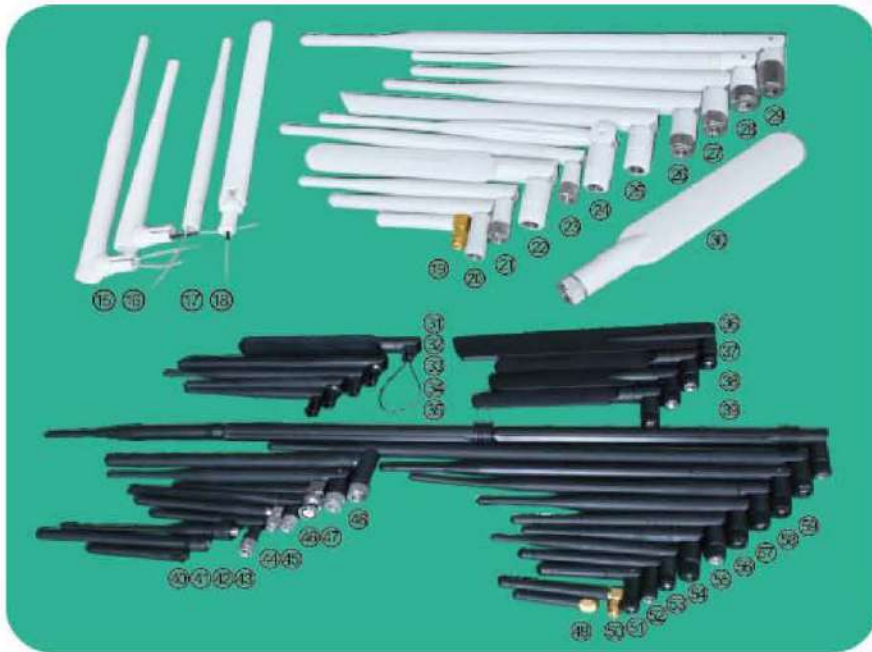
### LoRa wireless transmission

LoRa is one of the LPWAN communication technologies, which is a super-remote wireless transmission scheme based on spread spectrum technology. It provides users with a simple system that can have long distance, long battery life and large capacity functions, and extend the sensor networking.

It is mainly used in intelligent meter reading, intelligent parking, intelligent agriculture, intelligent security, intelligent street lighting and other fields.

### LoRa antennas

Frequency range: 433Mhz,450Mhz, 450-470Mhz, 470-510Mhz, 868Mhz, 868-900Mhz, 915Mhz, 900-930Mhz...etc.



**Electrical Characteristics**

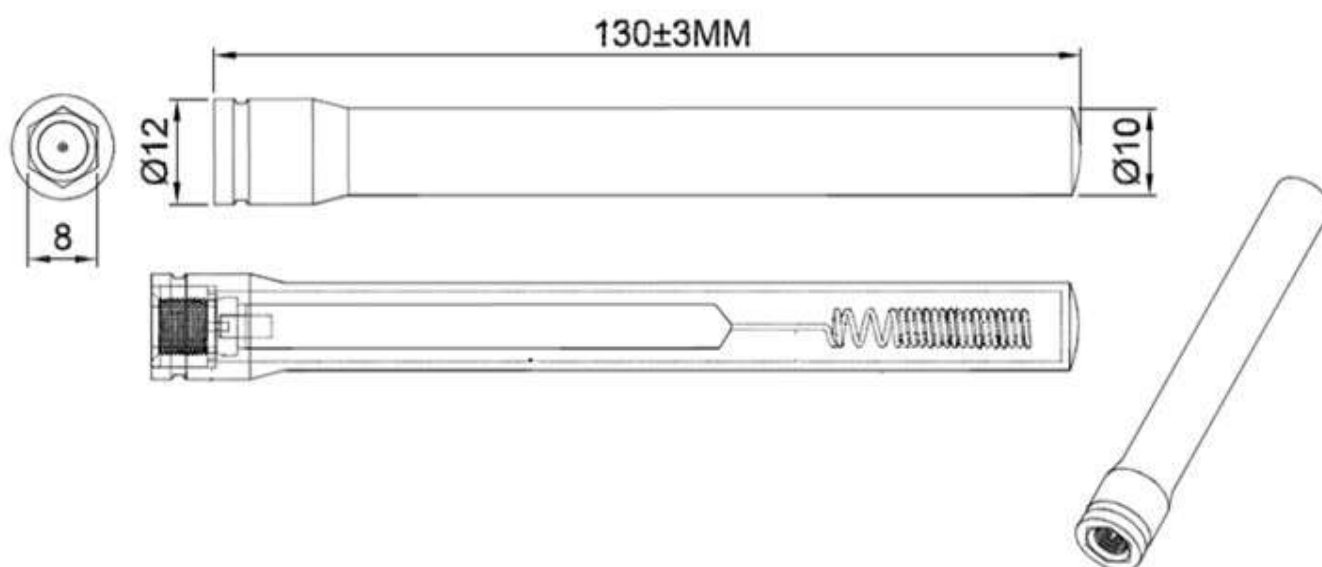
Working Frequency	868MHz
S.W.R	< 2.0
Typical Antenna Gain	2.0 dBi
Polarization	Vertical
Impedance	50 Ohm

**Material**

Material of Plastic	TPEE
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**Environment**

Operation Temperature	- 45°C~ + 85°C
Storage Temperature	- 45°C~ + 85°C


**How to order**

Series No.	Frequency	Connector
SA-05A	L1	01
	L1:868MHz	01: SMA Male
	Other frequencies are available	

**Electrical Characteristics**

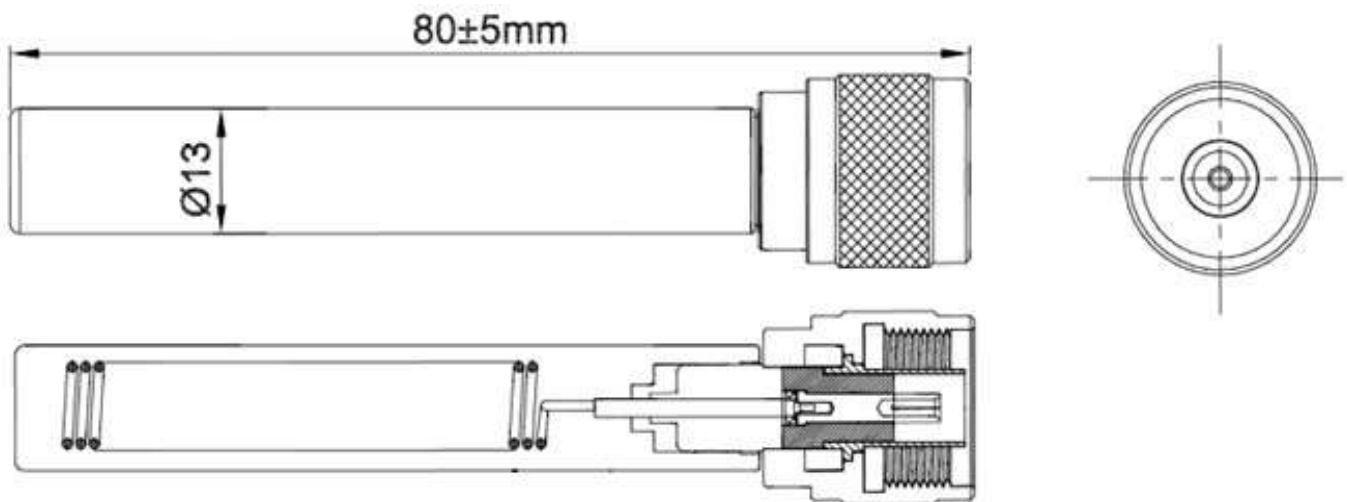
Working Frequency	868 ~ 930MHz
S.W.R	< 2.0
Typical Antenna Gain	1.5 dBi
Polarization	Vertical
Impedance	50 Ohm

**Material**

Material of Plastic	PC
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**Environment**

Operation Temperature	- 45°C~ + 85°C
Storage Temperature	- 45°C~ + 85°C


**How to order**

Series No.	Frequency	Connector
SA-05D	L	17
	L: 868-930MHz Other frequencies are available.	17: RP N Male

**Electrical Characteristics**

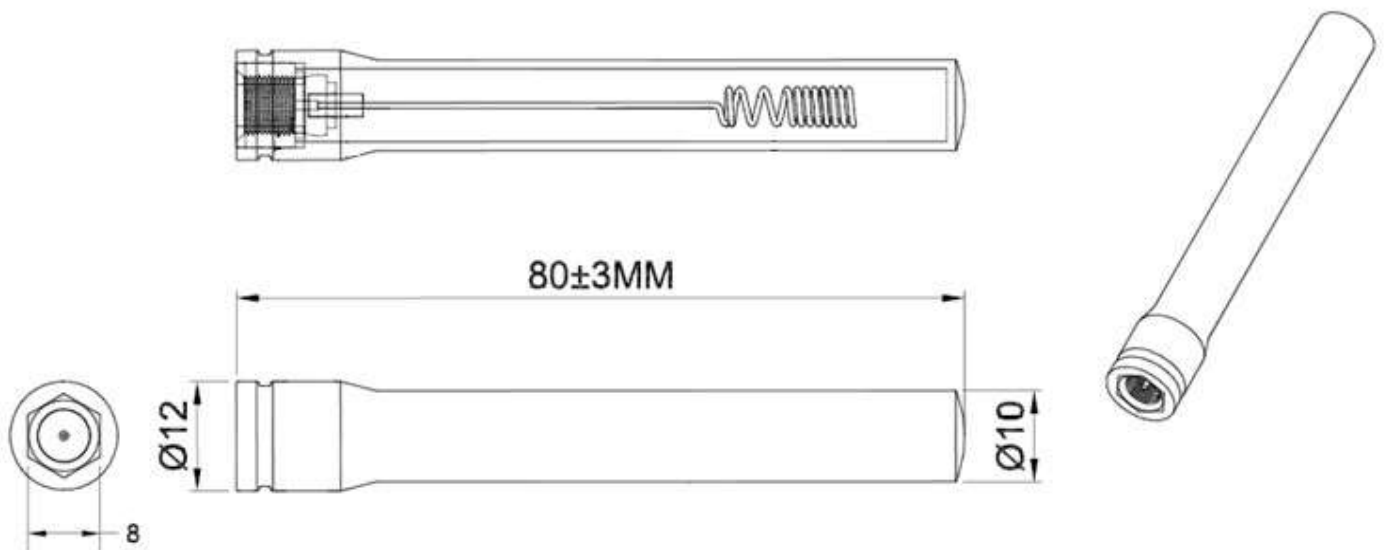
Working Frequency	868 ~ 915MHz
S.W.R	$\leq 2.0$
Typical Antenna Gain	3.0 dBi
Polarization	Linear
Impedance	50 Ohm

**Material**

Material of Radiator	CU
Material of Plastic	TPEE
Material of Coaxial Cable	RG178

**Environment**

Operation Temperature	- 45°C~ + 85°C
Storage Temperature	- 45°C~ + 85°C


**How to order**

Series No.	Frequency	WP
SA-05E	L3	WP
	L3: 868-915MHz	WP: Waterproof
	Other frequencies are available	

**Electrical Characteristics**

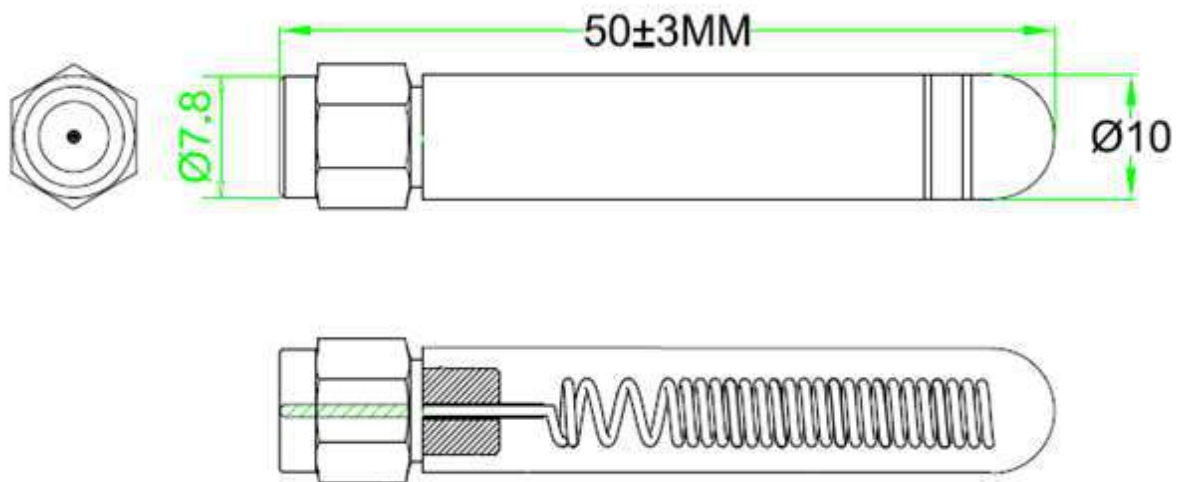
Working Frequency	433 MHz
S.W.R	< 2.0
Typical Antenna Gain	- 3 dBi
Polarization	Vertical
Impedance	50 Ohm

**Material**

Material of Plastic	TPEE
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**Environment**

Operation Temperature	- 45°C~ + 85°C
Storage Temperature	- 45°C~ + 85°C


**How to order**

Series No.	Frequency	Connector
SA-05H	L7	01
	L7: 433MHz	01: SMA Male
	Other frequencies are available	

**Electrical Characteristics**

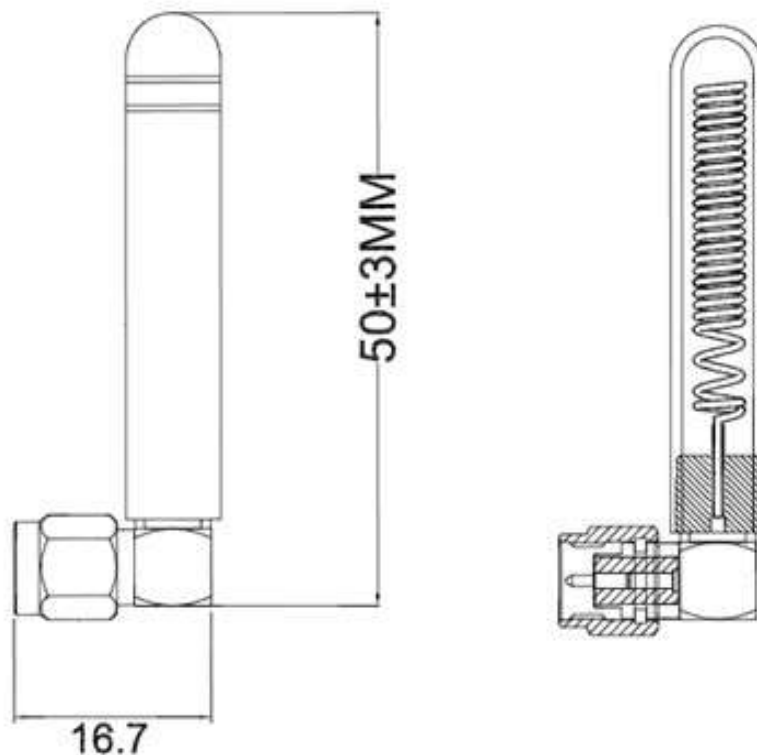
Working Frequency	902 ~ 928 MHz
S.W.R	< 2.0
Typical Antenna Gain	2 dBi
Polarization	Vertical
Impedance	50 Ohm

**Material**

Material of Plastic	TPEE
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**Environment**

Operation Temperature	- 45°C~ + 85°C
Storage Temperature	- 45°C~ + 85°C


**How to order**

Series No.	Frequency	Connector
SA-05N	L6	01
	L6: 902-928MHz Other frequencies are available.	01:SMA Male Optional



**Electrical Characteristics**

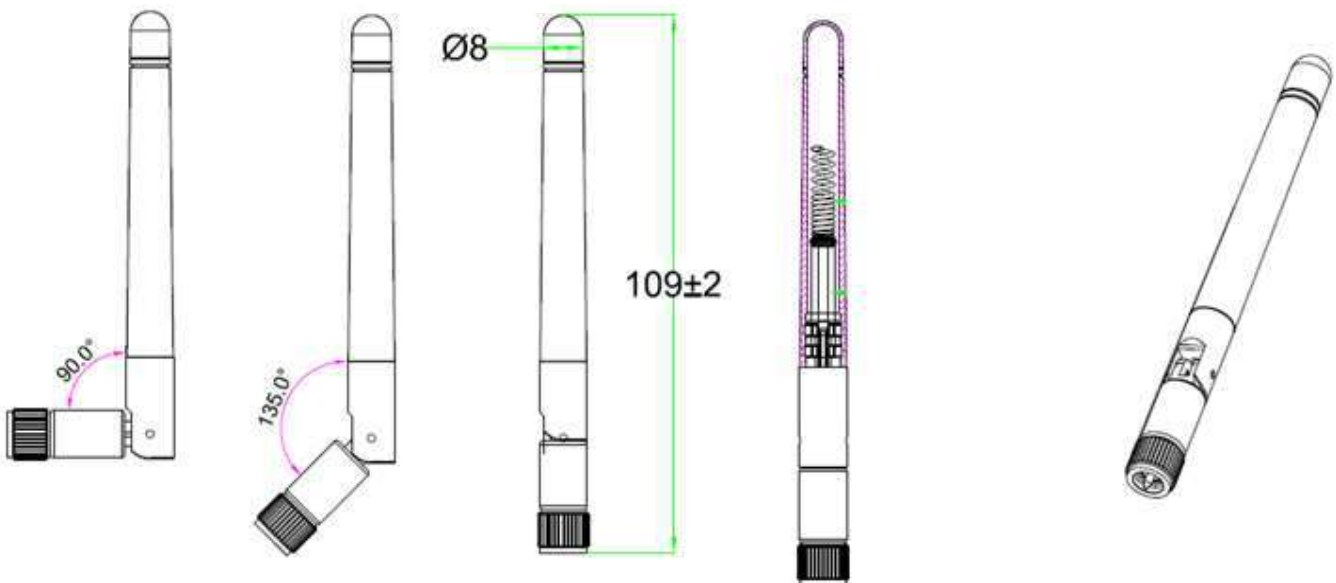
Working Frequency	915 MHz
S.W.R	< 2.0
Typical Antenna Gain	1 dBi
Polarization	Vertical
Impedance	50 Ohm

**Material**

Material of Plastic	TPEE
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**Environment**

Operation Temperature	- 45°C~ + 85°C
Storage Temperature	- 45°C~ + 85°C


**How to order**

Series No.	Frequency	Connector
SA-050	L6	01
	L6: 915MHz	01: SMA Male
	Other frequencies are available	

**Electrical Characteristics**

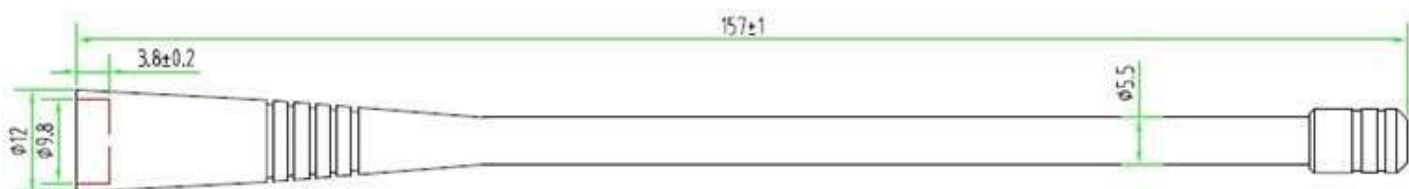
Working Frequency	433 MHz
S.W.R	≤ 2.0
Typical Antenna Gain	2 dBi
Polarization	Vertical
Impedance	50 Ohm

**Material**

Material of Plastic	TPEE
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**Environment**

Operation Temperature	- 45°C~ + 85°C
Storage Temperature	- 45°C~ + 85°C


**How to order**

Series No.	Frequency	Connector
SA-07A	L7	01
	L7:433MHz	01:SMA Male

**Electrical Characteristics**

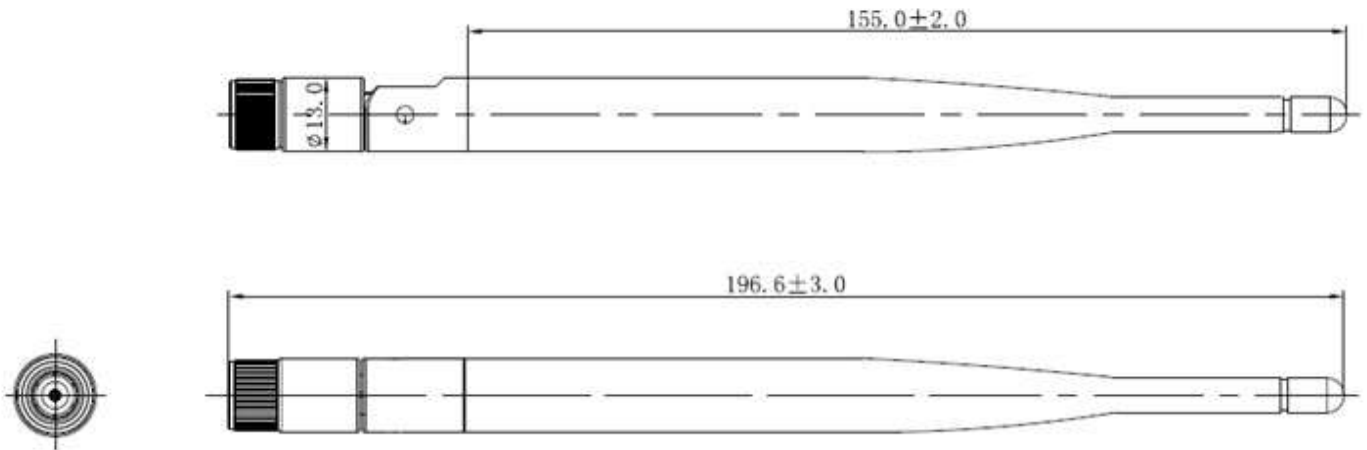
Working Frequency	900 ~ 915 MHz
S.W.R	$\leq 2.0$
Typical Antenna Gain	3 dBi
Polarization	Vertical
Impedance	50 Ohm

**Material**

Material of Plastic	CU
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**Environment**

Operation Temperature	- 45°C ~ + 85°C
Storage Temperature	- 45°C ~ + 85°C


**How to order**

Series No.	Frequency	Connector
SA-08A	L5	01
	L5: 900-915MHz	01: SMA Male
	Other frequencies are available	