

## WS2812B RGB Gradient LED Sphere DIY Kit

### 1.Introduction:

It is a WS2812B RGB Gradient LED Sphere DIY Kit. Users can write their own code to display the lighting effect they want. It is a very interesting light ball

It is a very interesting DIY electronic product, which enables users to understand the circuit more clearly and learn welding skills.

### 2.Feature:

- 1>.Custom programmable control
- 2>.WS2812B RGB gradient and flashing
- 3>.Perfect simple circuit
- 4>.DIY hand soldering

### 3.Parameter:

- 1>.Product Name:WS2812B RGB Gradient LED Sphere DIY Kit
- 2>.Work Voltage:DC 3.7V
- 3>.Color:RGB LED
- 4>.Mode:LED gradient/flashes automatically
- 5>.Work Temperature:-20℃~85℃
- 6>.Work Humidity:5%~95%RH
- 7>.Size(Installed):73\*73\*68mm

### 4.Note:

1>.The battery will keep supplying power to the controller, if the switch is turned on, it will supply power to the light.

2>.It is recommended to check to charge the battery.

3>.Please charge the battery for 5~10 minutes at first if the light does not turn on when the switch is turned on.May need to charge several times.

4>.Please charge the battery for 2~4 hours if turn on the switch but some lights do not light up.

### 5.Application:

- 1>.Training welding skills
- 2>.Student school
- 3>.DIY production
- 4>.Project Design
- 5>.Electronic competition
- 6>.Gift giving
- 7>.Crafts collection
- 8>.Home decoration
- 9>.Souvenir collection
- 10>.Graduation design
- 11>.Holiday gifts

### 6.Package:

- 1>.1pcs ESP32 Controller
- 2>.194pcs 5050 WS2812B RGB LED
- 3>.1pcs 3.7V 1000mAh Polymer Lithium Battery
- 4>.1pcs Toggle Switch
- 5>.1pcs 60cm Micro USB Cable
- 6>.1pcs 0.8mm 8meter Copper Wire
- 7>.2pcs XH2.54-13P Male Pin

- 8>.1pcs 30cm Connect Wire
- 9>.1pcs 3D Printing Holder Mold

## 7.Installation Tips:

- 1>.User needs to prepare the welding tool at first.
- 2>.Please be patient until the installation is complete.
- 3>.The package is DIY kit.It need finish install by user.
- 4>.The soldering iron can't touch the components for a long time(3.0 second), otherwise it will damage the components.
- 5>.Pay attention to the positive and negative of the components.
- 6>.Strictly prohibit short circuit.
- 7>.User must install the LED according to the specified rules.Otherwise some LED will not light.
- 8>.Install complex components preferentially.
- 9>.Make sure all components are in right direction and right place.
- 10>.Check that all of the LED can be illuminated.
- 11>.It is strongly recommended to read the installation manual before starting installation!!!
- 12>.Please wear anti-static gloves or anti-static wristbands when installing electronic components.

## 8.Installation Steps(Please be patient install!!!):

### 1>.Processing brass wire to make copper coil.

1.1>.Step 1: Cut 58mm, 93mm, 106mm, 136mm, 148mm, 171mm, 182mm, 198mm, 202mm, 213mm, 216mm copper wire from the copper coil in 11 size. 2pcs copper wires per size. 22pcs copper wires in total.

1.2>.Step 2: Straighten the copper wire. Tips: Cover the copper wire with a steel ruler, press and roll the steel ruler to straighten the copper wire.

1.3>.Step 3: Make copper wire circle. Make 22pcs circle with the help of a circular object (such as a marker or beer bottle) to make it as round as possible. Note: The two ends of the copper coil shall not be connected and fixed at this time.

### 2>.Make 5mm copper connector.

2.1>.Step 4: Cut about 200pcs 5mm copper connector form copper coil. They are used to connect DIN and DOUT from 2 adjacent LED.

### 3>.Make 10mm copper jumper wire.

3.1>.Step 5: Cut about 25pcs 10mm copper connector form copper coil. They are used to VCC( or GND) between 2 adjacent LED rings.

3.2>.Step 6: Using pliers or other tools, bend them into a V-shape or C-shape to avoid short circuit with other copper wires.

### 4>.Mark LED pin.

4.1>.Step 7: Identify LED pin. It is GND pin where there is a mark on LED. VCC is above the diagonal of GND. The signal input pin DIN in the upper right corner. The signal output pin DOUT in the lower left corner.

4.2>.Step 8: Mark the GND pin with a marker on the back of the LED. This operation is conducive to placing the LED in the 3D Printing Holder Mold.

### 5>.Install the first hemisphere(6 Rings)

5.1>.Step 9: Place LED on 3D Printing Holder Mold. The front of the LED is embedded in the mold. Note:The black GND is in the lower right corner.

5.2>.Step 10: Fix the connection points GND(black mark) of 2pcs adjacent LED to copper wire by 1pcs 58mm copper wire circle.

5.3>.Step 11: Use tweezers to handle the copper wire: solve the problem that the copper wire is too close or too far from the LED GND(black mark).

5.4>.Step 12: Connect VCC pin where in the upper right corner of the LED by 1pcs 93mm copper wire circle in the same method.

5.5>.Step 13: Use the same method to install other LED rings.

5.6>.Step 14: Select an aligned column of LED as the signal transmission layer

and mark.

5.7>.Step 15: Connect the DOUT pin of marked LED from upper LED ring to the DIN of the next ring by 1pcs 10mm copper connector. Note: the signal wire shall not be short circuited with other copper wires. The input signal at the biggest ring for 6-Rings LED(which is **different form 5-Rings!**).

5.8>.Step 16: Connect output signal DOUT of the previous LED to input signal DIN of the next LED by 5mm copper connector for the first LED ring. Note: the signal wire shall not be short circuited with other copper wires; Make sure that the soldering iron does not touch the LED for a long time.

5.9>.Step 17: Connect the VCC(GND) of each ring by 10mm copper connector. At the same time, in order to fix the hemisphere, two adjacent VCC(GND) rings are connected with multiple copper wires. It is recommended to install a fixed bracket(10mm copper connector) with 3~5pcs LED at each interval.

5.10>.Step 18 Test circuit by multimeter. Check whether VCC and GND are short circuited and whether VCC or GND of each ring is successfully connected.

5.11>.Step 19: Remove the 2 retaining rings on 3D Printing Holder Mold and then take out the 6-ring hemisphere. Pay attention to gentle disassembly.

5.12>.Step 20: Test. Connect the signal form Pin19 at ESP32 controller to LED signal input terminal at the biggest ring. Connect VCC and GND to ESP32. Re-solder the pad or replace the LED according to the test results.

#### **6>.Install the first hemisphere(5 Rings)**

6.1>.Step 21: Use the same method to install VCC and GND for 5-Rings LED.

6.2>.Step 22: Select an aligned column of LED as the signal transmission layer and mark.

6.3>.Step 23: Connect the DOUT pin of marked LED from upper LED ring to the DIN of the next ring by 1pcs 10mm copper connector. Note: the signal wire shall not be short circuited with other copper wires. The input signal at the smallest ring for 5-Rings LED(which is **different form 6-Rings!**). The output signal at the biggest ring is used as input signal for 6-Rings LED at the biggest ring.

6.4>.Step 24: Connect output signal DOUT of the previous LED to input signal DIN of the next LED by 5mm copper connector for the first LED ring. Note: the signal wire shall not be short circuited with other copper wires; Make sure that the soldering iron does not touch the LED for a long time.

6.5>.Step 25: Connect VCC and GND and fixed bracket and test.

6.6>.Step 26: Test. Connect the signal form Pin19 at ESP32 controller to LED signal input terminal at the smallest ring. Connect VCC and GND to ESP32. Re-solder the pad or replace the LED according to the test results.

#### **7>.Download/Update firmware:**

7.1>.Step 27: There is no code inside the controller, so it needs to download and update the code.(User needs to be able to program the code if update the firmware!)

7.2>.Step 28: Get Arduino IDE from: <https://www.arduino.cc/en/software>

7.3>.Step 29: We have provided the firmware code 'neo-sphere.ino' and then open it by Arduino IDE.

7.4>.Step 30: Configure ESP32 working environment on Arduino IDE : File -> Preferences -> Settings -> Additional Boards Manager URLs : [https://dl.espressif.com/dl/package\\_esp32\\_index.json](https://dl.espressif.com/dl/package_esp32_index.json) and then click 'OK'.

7.5>.Step 31: Search/add ESP32 device : Tools -> Board -> Board Manager.

7.6>.Step 32: Enter 'ESP32' in the input box and then install.

7.7>.Step 33: Install function library 'NeoPixelBus.h': Sketch->Include Library->Manage Libraries

7.8>.Step 34: Enter 'NeoPixelBus' in the input box and then install.

7.9>.Step 35: Compile and run the code. Install the library in the same method if the IDE prompts that the library is missing.

7.10>.Step 36: Select controller: Tools -> Board->ESP32 Arduino->ESP32 Dev Module

7.11>.Step 37: Successful compilation means successful configuration.

7.12>.Step 38: Notice:The code has a built-in light flashing code. User can

add/flash the light flashing code according to needs after the test is successful.  
TestCode:<http://attach01.oss-us-west-1.aliyuncs.com/IC/DIY-Manual/WS2812TestCode.rar>

7.13>.Step 39: Connect ESP32 controller to PC by Micro USB wire and then check the COM port: Tools -> Port -> COM?.

7.14>.Step 40: Upload firmware code to ESP32 controller.

7.15>.Step 41: ESP32 controller can start to run the firmware after press the RST reset button on ESP32 controller.

### **8>.Assemble two hemispheres**

8.1>.Step 42: Connect output signal(from 5-Rings LED at the biggest ring) to input terminal from 6-Rings LED at the biggest ring by 10cm wire. Also connect GND with each other.

8.2>.Step 43: Connect the battery and use insulating tape to bind the battery and ESP32 controller together.

8.3>.Step 44: ESP32 controller is fixed on the 5-ring hemisphere by copper wire.Note that the USB interface is kept in the smallest LED ring and convenient to connect USB.The smallest copper wire ring cannot block the USB interface. Pay attention to the convenience of connecting the marked DIN pin to Pin19.

8.4>.Step 45: Fix the USB shell on the smallest copper wire ring.Note that the solder tin cannot enter the inside of the USB.

8.5>.Step 46: Connect fixed copper wires:

8.5.1>.LED GND ring connect to ESP32 GND.(Tips: Users can apply solder tin to one end of the copper wire at first and then fix the copper wire and the length of the copper wire is cut according to the actual situation)

8.5.2>.Two 3mm mounting holes connect to LED GND ring(Be careful not to damage the battery with the soldering iron)

8.6>.Step 47: Connect signal input DIN pin in the smallest LED ring from 5-Ring to Pin19 on ESP32 controller by 10cm (or copper) wire.

8.7>.Step 48: Connect 2pcs 10cm (copper)wire to the adjacent 2 pins of the switch(Tips:Heat shrinkable tube can be added to avoid short circuit)

8.8>.Step 49: Fix the switch shell on the smallest copper wire ring next to USB.

8.9>.Step 50: Connect switch wires to LED VCC ring and ESP32 VCC 3.3V.

8.10>.Step 51: Connect VCC wire. The largest copper ring in both hemispheres is VCC. So user can connect two VCC by 8pcs 2mm copper connector.Place the two hemispheres on the 3D Printing Holder Mold to assist in connection and installation. 8pcs is used to fix two hemispheres.

### **9>.Enjoy effect**

9.1>.Step 52: Turn ON switch and enjoy the effect.

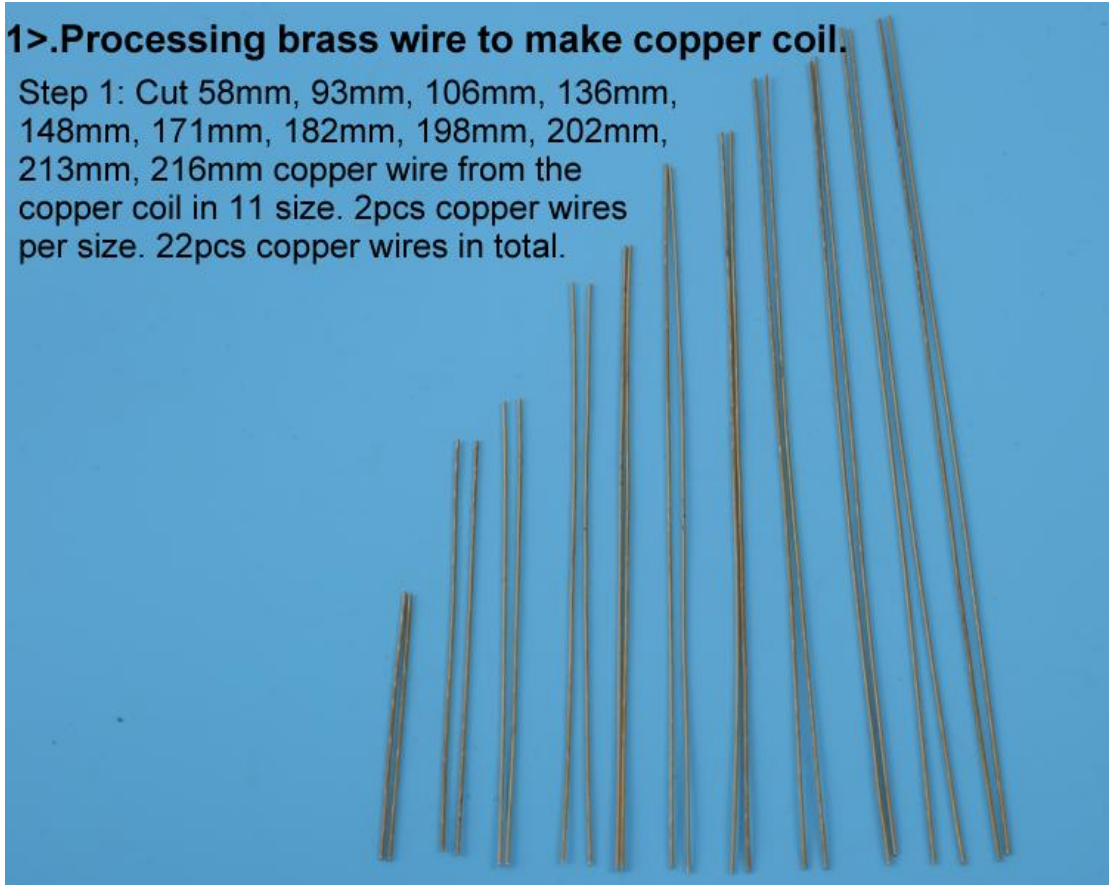
### **10>.Note:**

10.1>.Users can refer to other types of installation steps as following:  
<https://www.instructables.com/Spring-Making-Wire-Bending-Machine/>

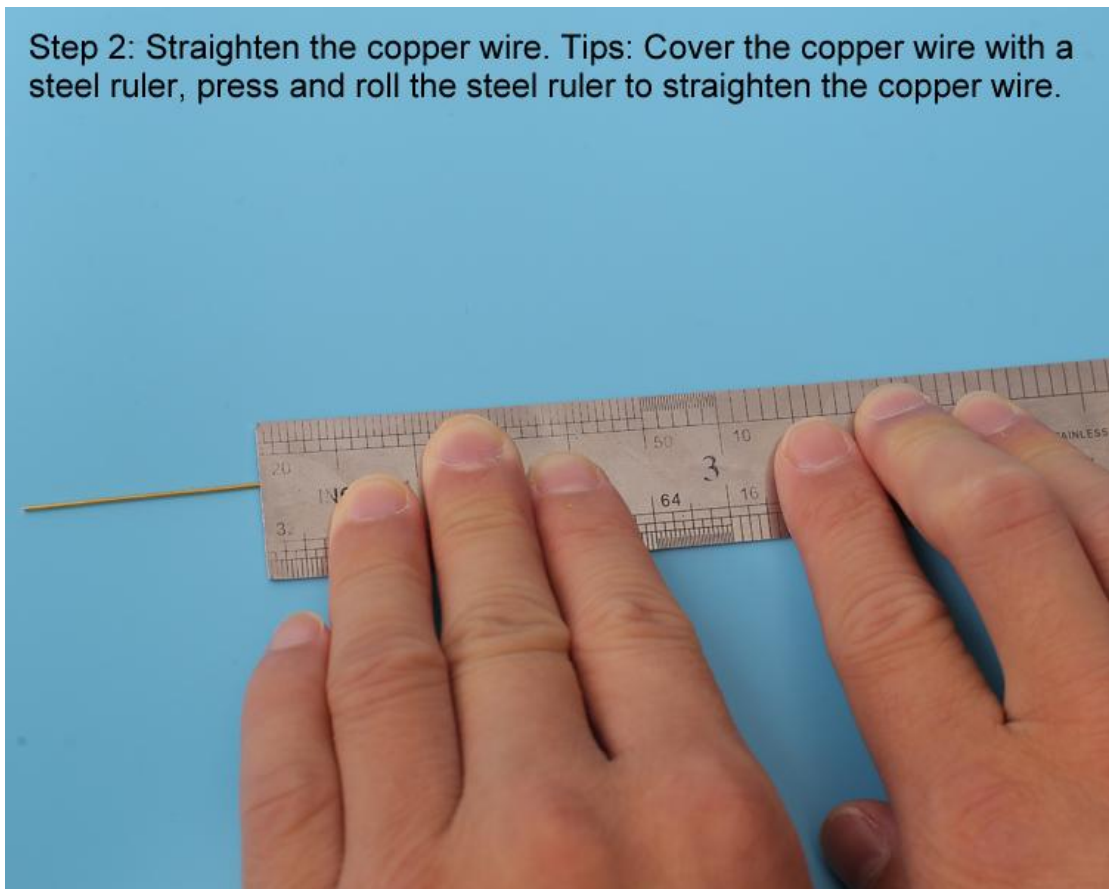
## **9.Install shown steps:**

### 1>.Processing brass wire to make copper coil.

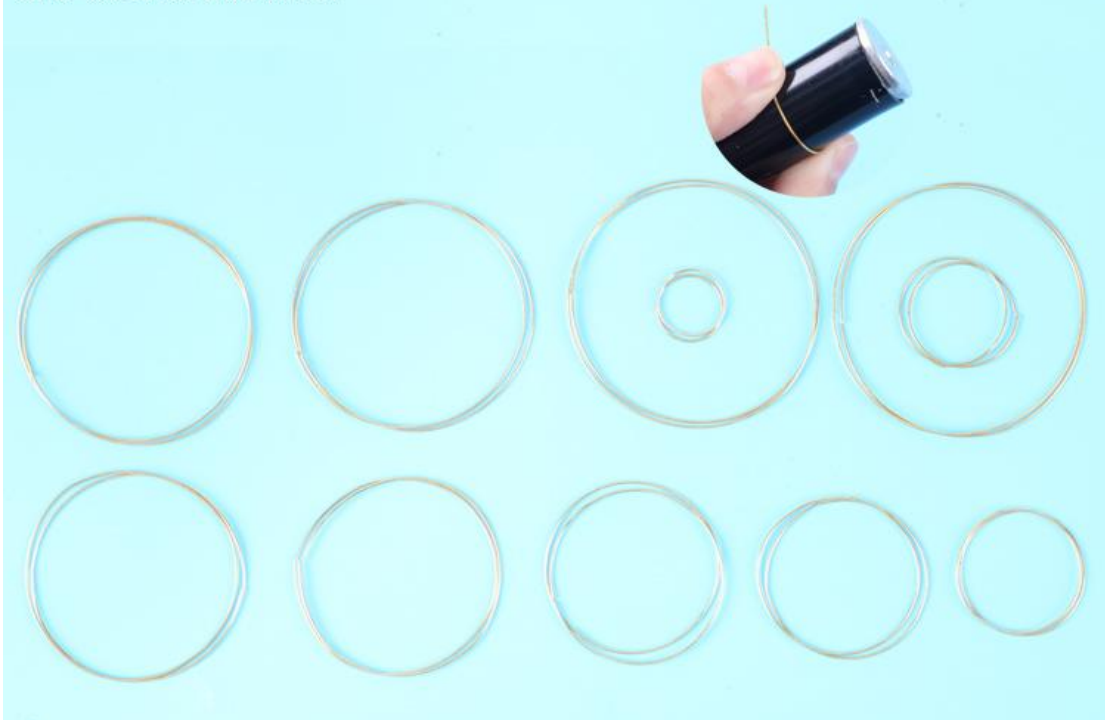
Step 1: Cut 58mm, 93mm, 106mm, 136mm, 148mm, 171mm, 182mm, 198mm, 202mm, 213mm, 216mm copper wire from the copper coil in 11 size. 2pcs copper wires per size. 22pcs copper wires in total.



Step 2: Straighten the copper wire. Tips: Cover the copper wire with a steel ruler, press and roll the steel ruler to straighten the copper wire.



**Step 3: Make copper wire circle.** Make 22pcs circle with the help of a circular object (such as a marker or beer bottle) to make it as round as possible. Note: The two ends of the copper coil shall not be connected and fixed at this time.



**2>.Make 5mm copper connector.**

Step 4: Cut about 200pcs 5mm copper connector form copper coil. They are used to connect DIN and DOUT from 2 adjacent LED.



**3>.Make 10mm copper jumper wire.**

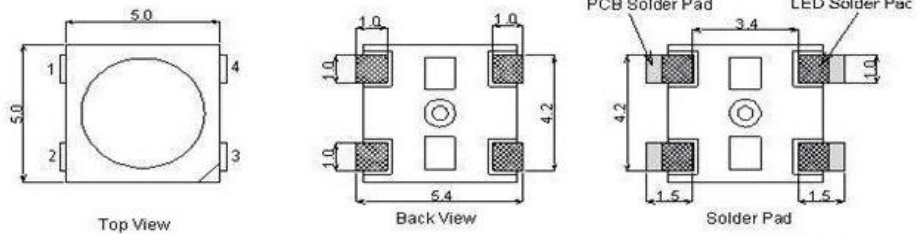
Step 5: Cut about 25pcs 10mm copper connector form copper coil. They are used to VCC( or GND) between 2 adjacent LED rings.

Step 6: Using pliers or other tools, bend them into a V-shape or C-shape to avoid short circuit with other copper wires.

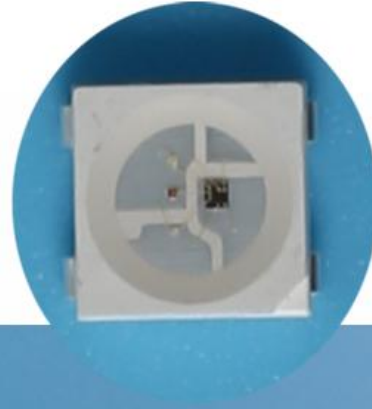
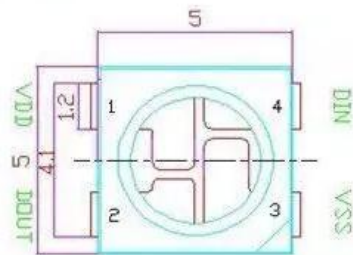


Step 7: Identify LED pin. It is GND pin where there is a mark on LED. VCC is above the diagonal of GND. The signal input pin DIN in the upper right corner. The signal output pin DOUT in the lower left corner.

**Mechanical Dimensions**



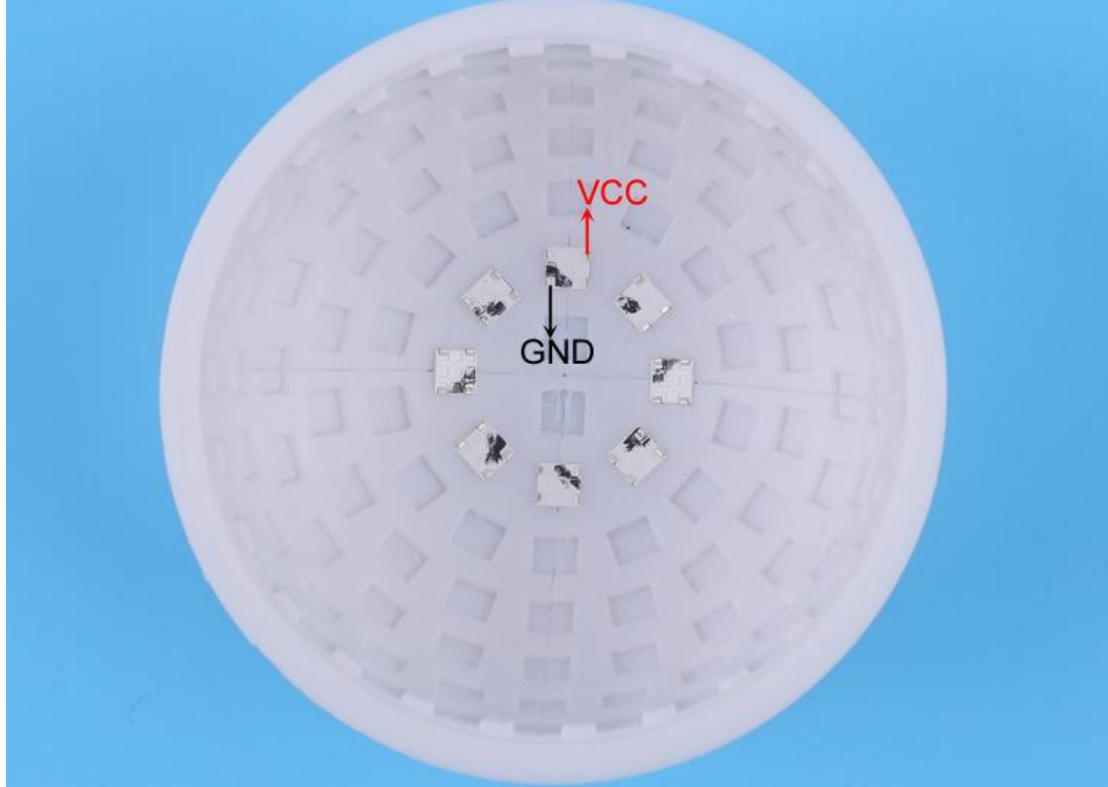
**PIN configuration**



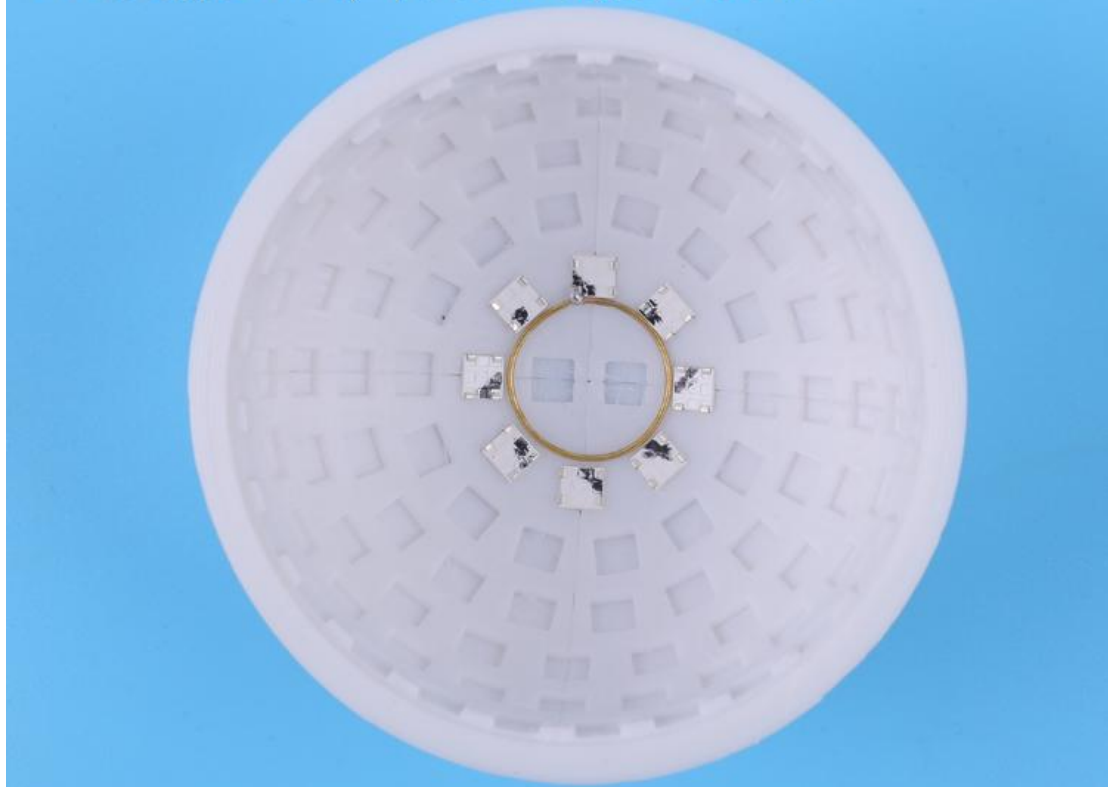
Step 8: Mark the GND pin with a marker on the back of the LED. This operation is conducive to placing the LED in the 3D Printing Holder Mold.



Step 9: Place LED on 3D Printing Holder Mold. The front of the LED is embedded in the mold. Note: The black GND is in the lower right corner.



Step 10: Fix the connection points GND(black mark) of 2pcs adjacent LED to copper wire by 1pcs 58mm copper wire circle.

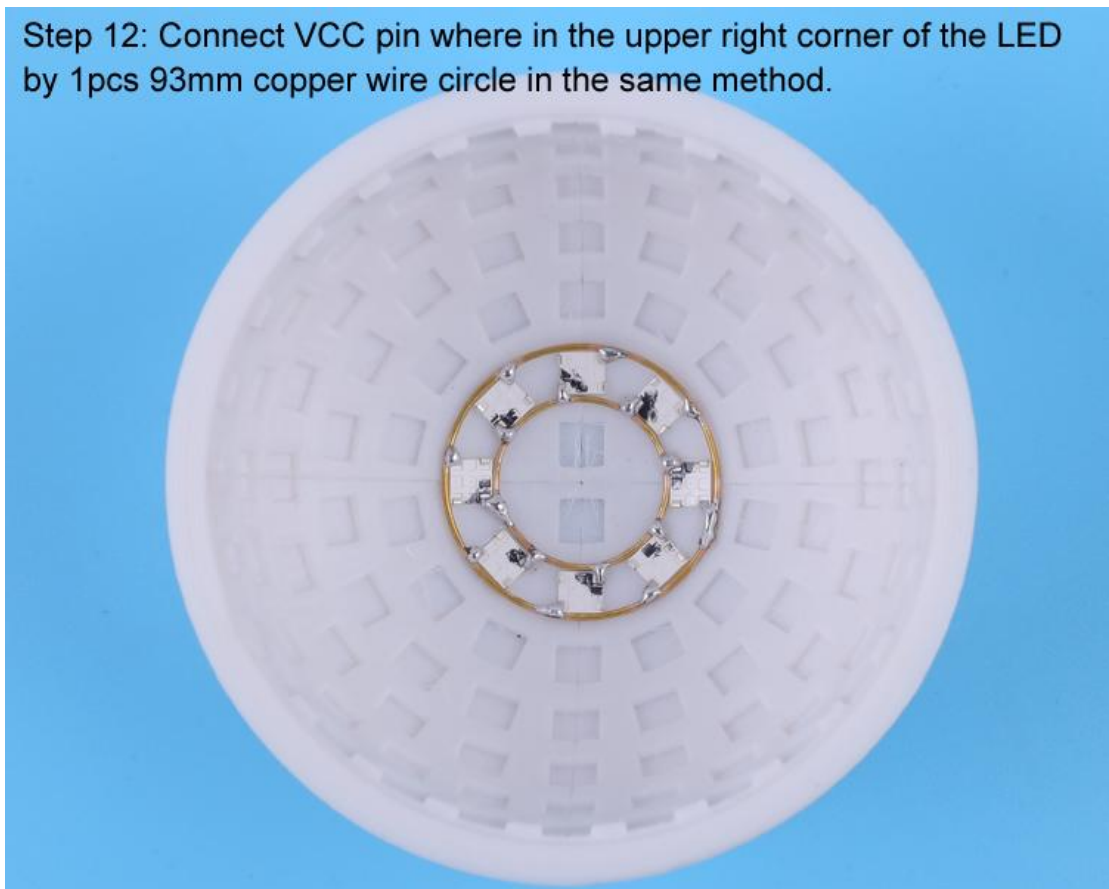




Step 11: Use tweezers to handle the copper wire: solve the problem that the copper wire is too close or too far from the LED GND(black mark).



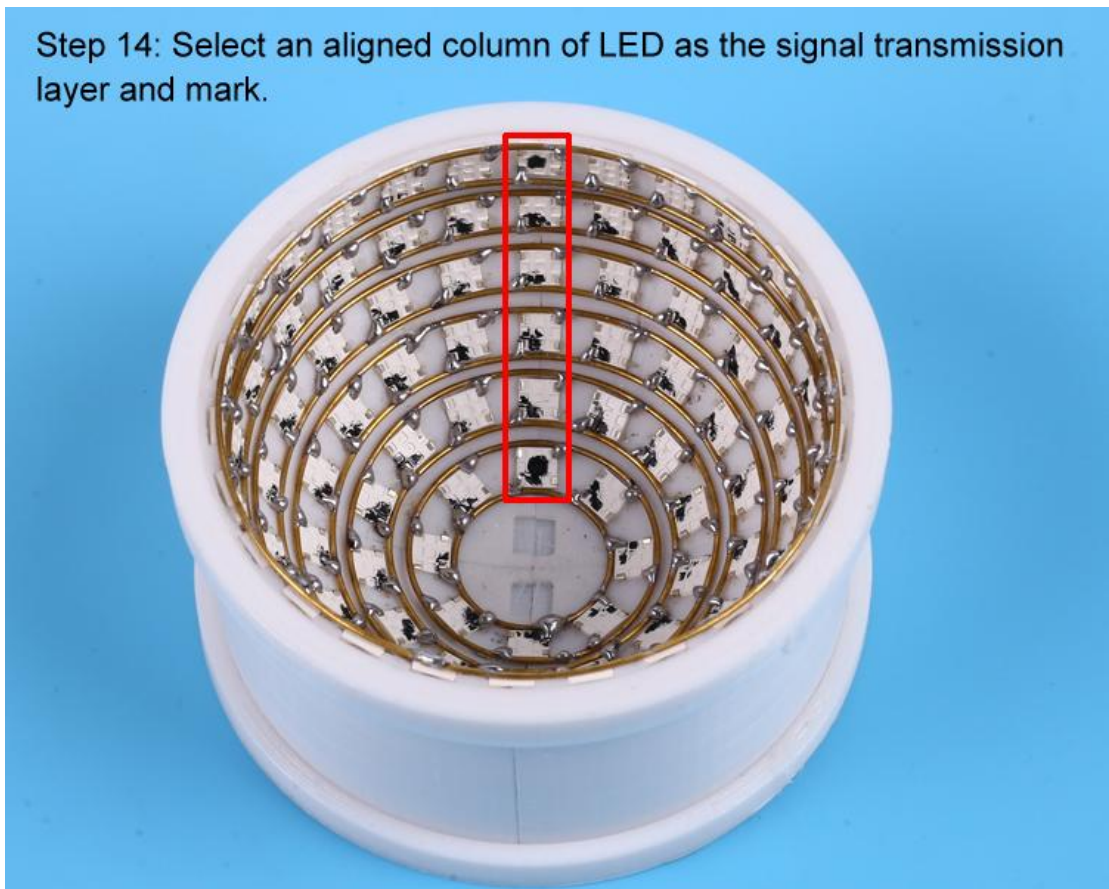
Step 12: Connect VCC pin where in the upper right corner of the LED by 1 pcs 93mm copper wire circle in the same method.



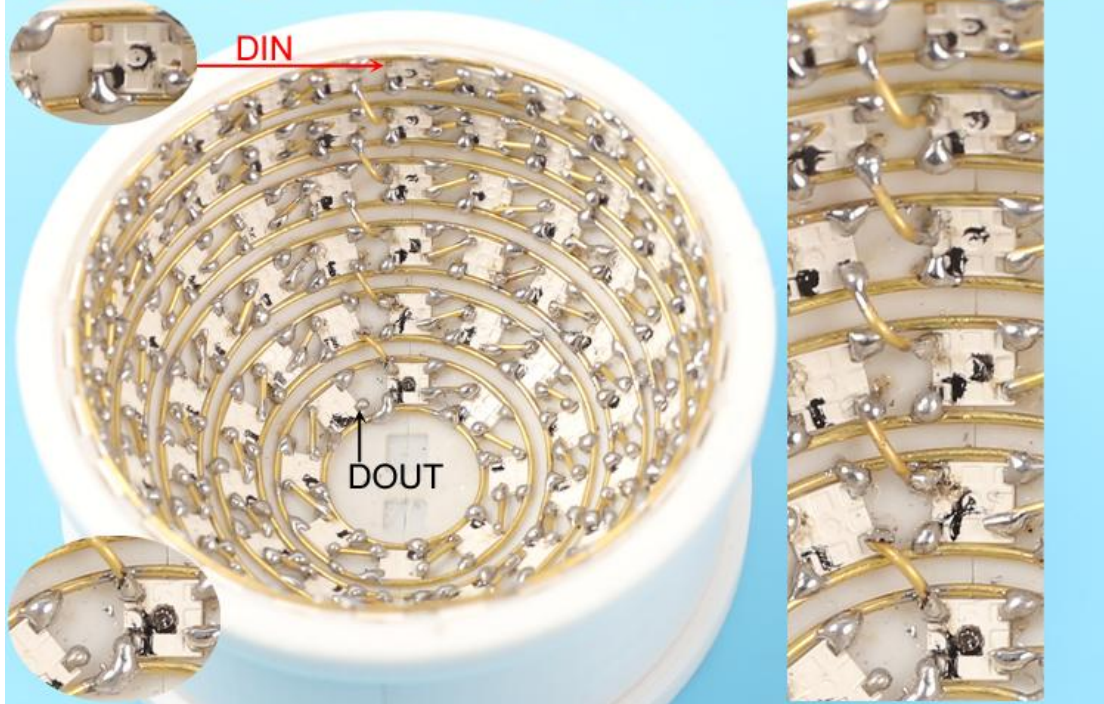
Step 13: Use the same method to install other LED rings.



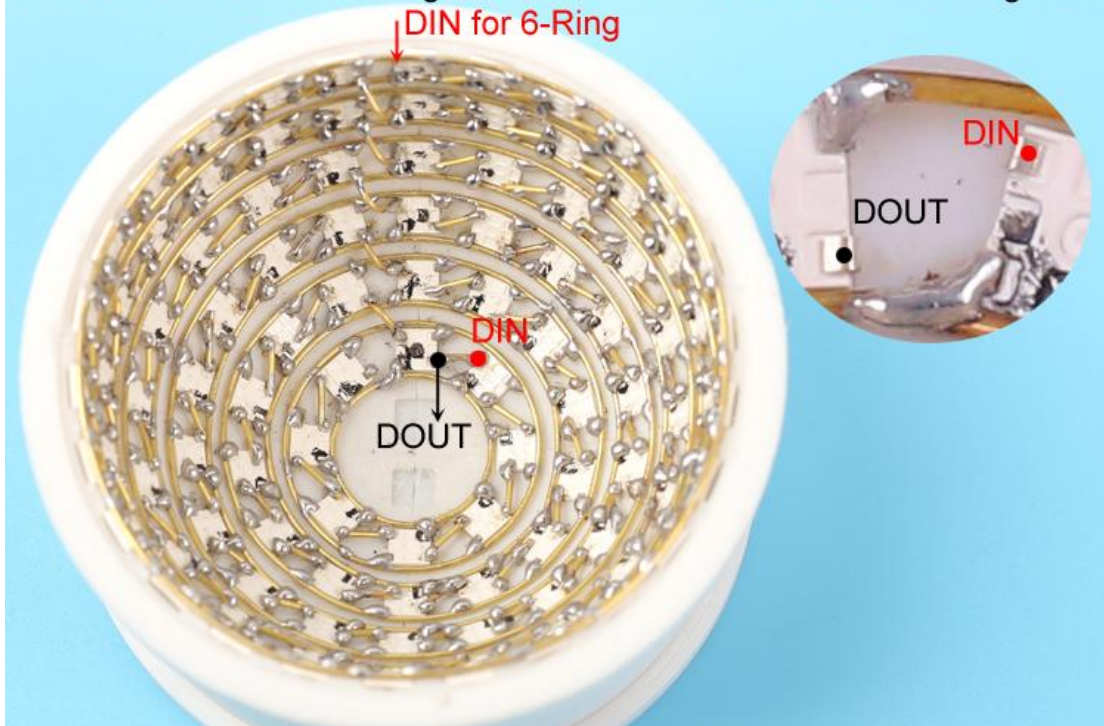
Step 14: Select an aligned column of LED as the signal transmission layer and mark.



Step 15: Connect the DOUT pin of marked LED from upper LED ring to the DIN of the next ring by 1pcs 10mm copper connector. Note: the signal wire shall not be short circuited with other copper wires. The input signal at the biggest ring for 6-Rings (which is different form 5-Rings!).



Step 16: Connect output signal DOUT of the previous LED to input signal DIN of the next LED by 5mm copper connector for the first LED ring. Note: the signal wire shall not be short circuited with other copper wires; Make sure that the soldering iron does not touch the LED for a long time.

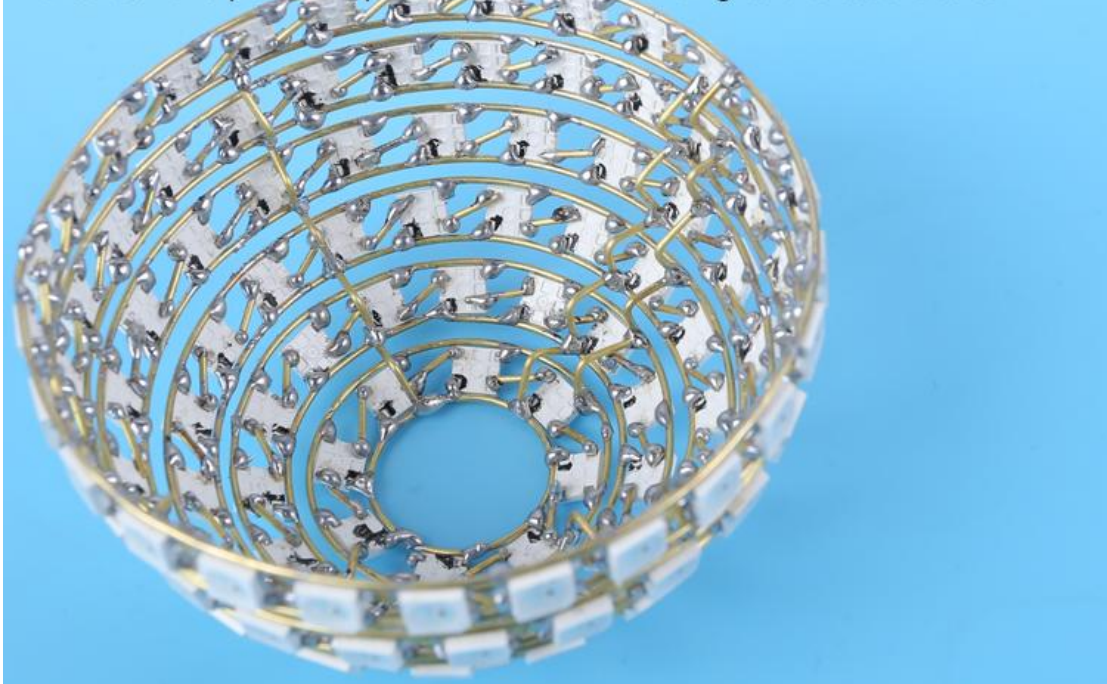


Step 17: Connect VCC(GND) of each ring by 10mm copper connector. At the same time, in order to fix the hemisphere, two adjacent VCC(GND) rings are connected with copper wires. It's recommended to install a fixed bracket(10mm copper connector) with 3~5pcs LED at each interval.



Step 18 Test circuit by multimeter. Check whether VCC and GND are short circuited and whether VCC or GND of each ring is successfully connected.

Step 19: Remove the 2 retaining rings on 3D Printing Holder Mold and then take out the 6-ring hemisphere. Pay attention to gentle disassembly.  
 Step 20: Test. Connect the signal from Pin19 at ESP32 controller to LED signal input terminal at the biggest ring. Connect VCC /GND to ESP32. Re-solder the pad or replace the LED according to the test results.



## 6>.Install the first hemisphere(5 Rings)

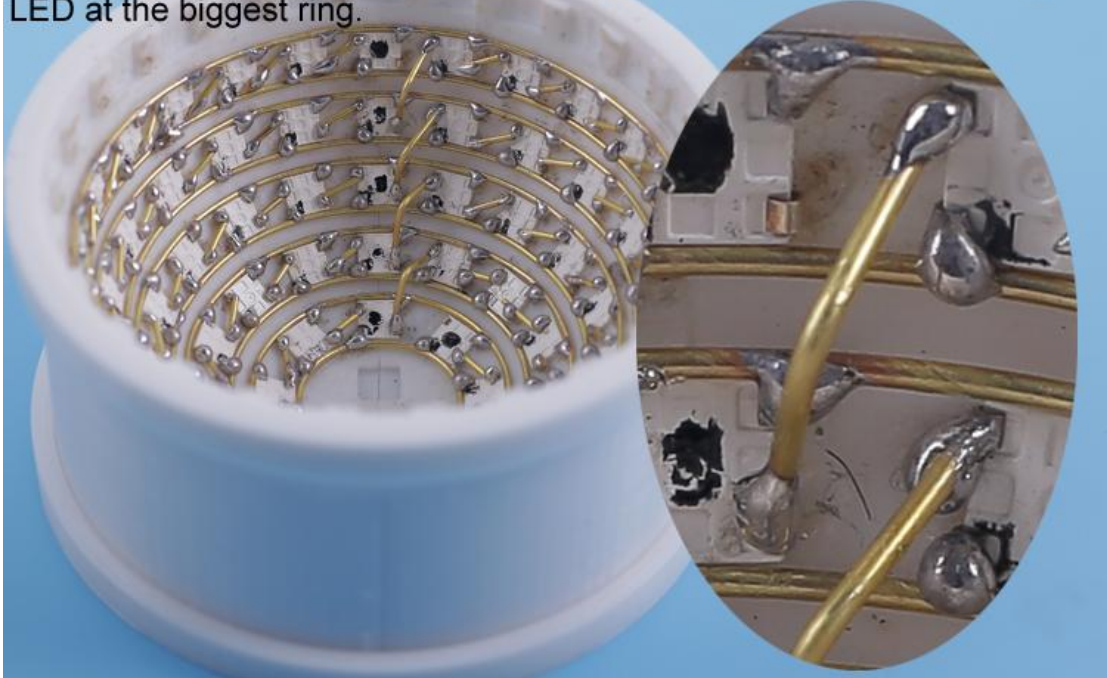
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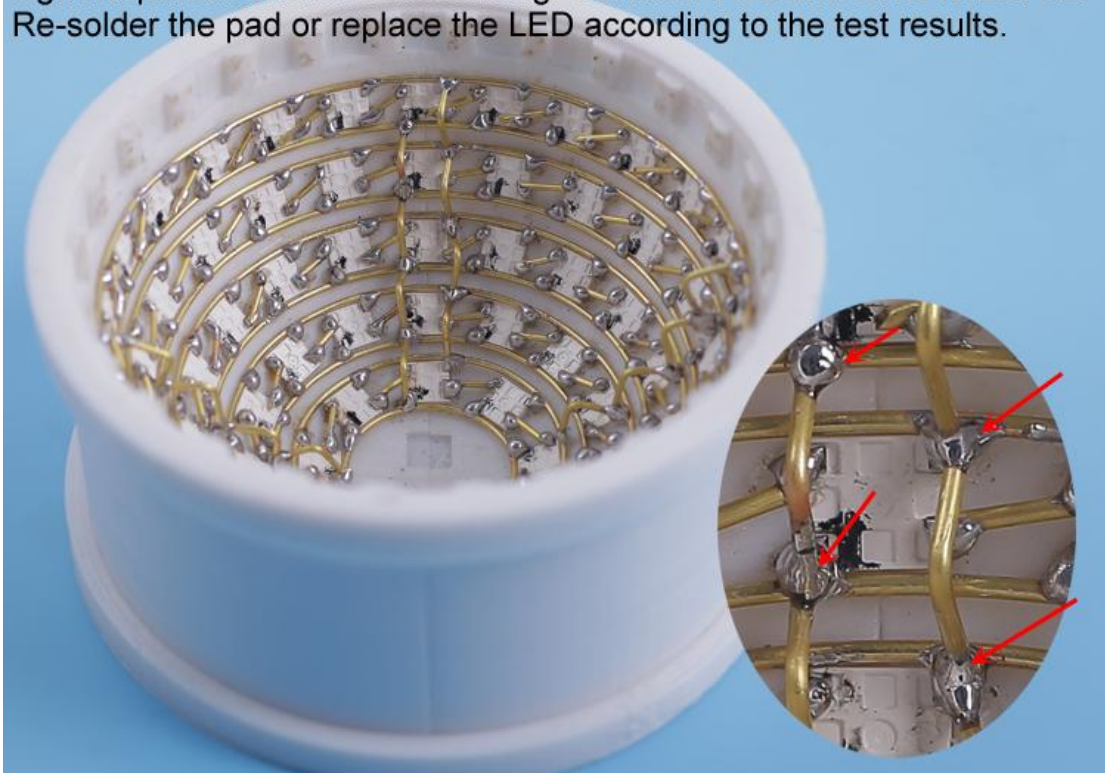
Step 23: Connect the DOUT pin of marked LED from upper LED ring to the DIN of the next ring by 1pcs 10mm copper connector. Note: the signal wire shall not be short circuited with other copper wires. The input signal at the smallest ring for 5-Rings LED (which is **different form 6-Rings!**). The output signal at the biggest ring is used as input signal for 6-Rings LED at the biggest ring.



Step 24: Connect output signal DOUT of the previous LED to input signal DIN of the next LED by 5mm copper connector for the first LED ring. Note: the signal wire shall not be short circuited with other copper wires; Make sure that the soldering iron does not touch the LED for a long time.



Step 25: Connect VCC and GND and fixed bracket and test.  
 Step 26: Test. Connect the signal from Pin19 at ESP32 controller to LED signal input terminal at smallest ring. Connect VCC and GND to ESP32.  
 Re-solder the pad or replace the LED according to the test results.



**7>.Download/Update firmware:**

Step 27: There is no code inside the controller, so it needs to download and update the code.(User needs to be able to program the code if update the firmware!)

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File -> Preferences -> Settings -> Additional Boards Manager URLs :  
[https://dl.espressif.com/dl/package\\_esp32\\_index.json](https://dl.espressif.com/dl/package_esp32_index.json) and then click 'OK'.

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Step 35: Compile and run the code. Install the library in the same method if the IDE prompts that the library is missing.

Step 36: Select controller:Tools->Board->ESP32 Arduino->ESP32 Dev Module

Step 37: Successful compilation means successful configuration.

Step 38: Note:Code has a built-in light flashing code.User can add/flash the light flashing code according to needs after the test is successful.

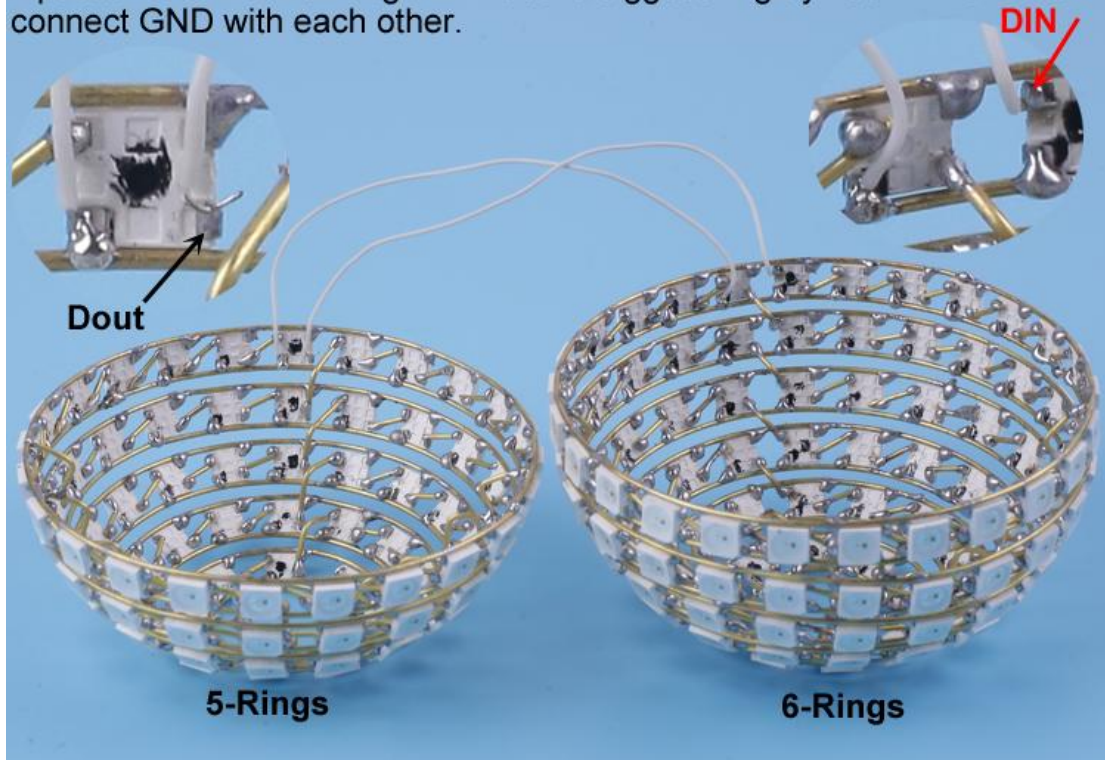
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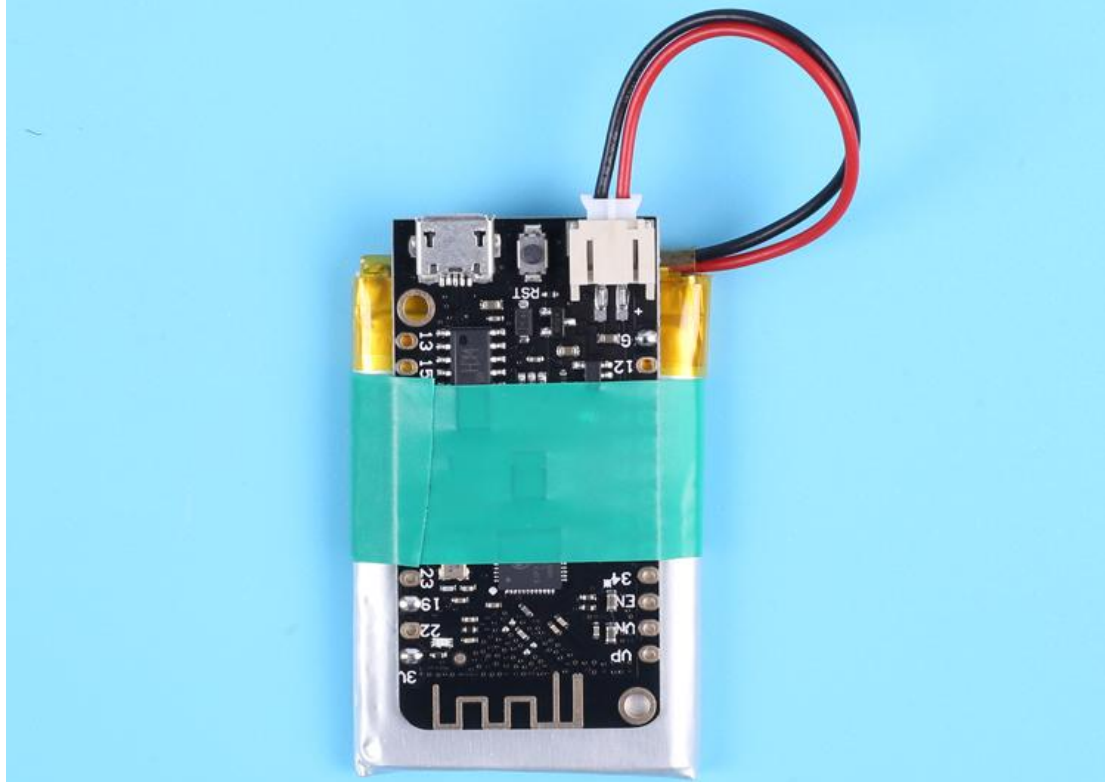
Step 41: ESP32 controller can start to run the firmware after press the RST reset button on ESP32 controller.

### 8>.Assemble two hemispheres

Step 42: Connect output signal(from 5-Rings LED at the biggest ring) to input terminal from 6-Rings LED at the biggest ring by 10cm wire. Also connect GND with each other.

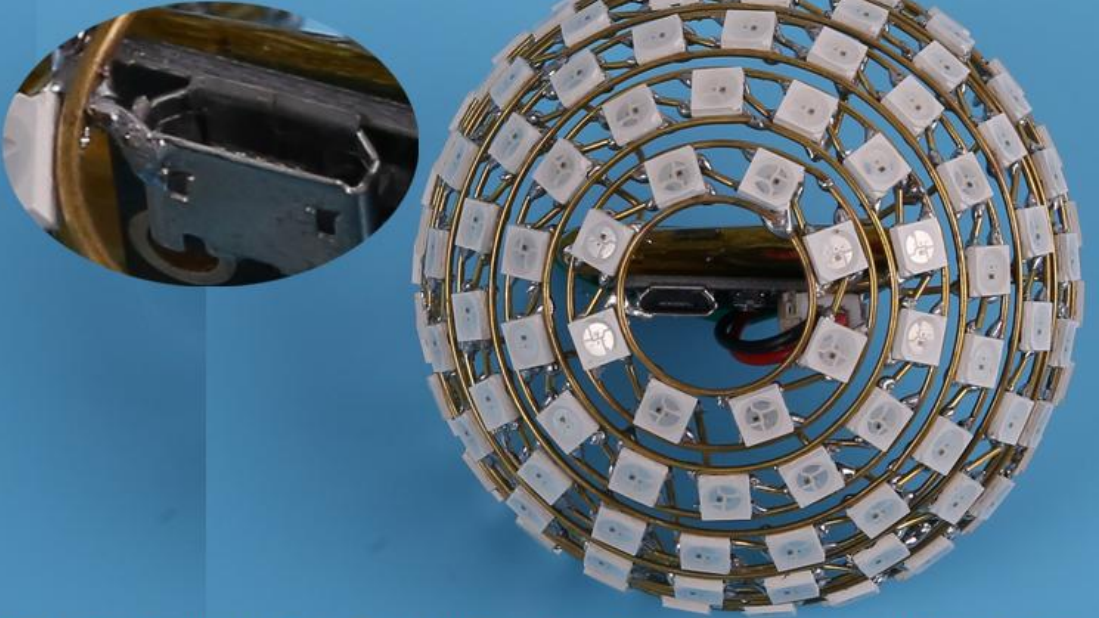


Step 43: Connect the battery and use insulating tape to bind the battery and ESP32 controller together.



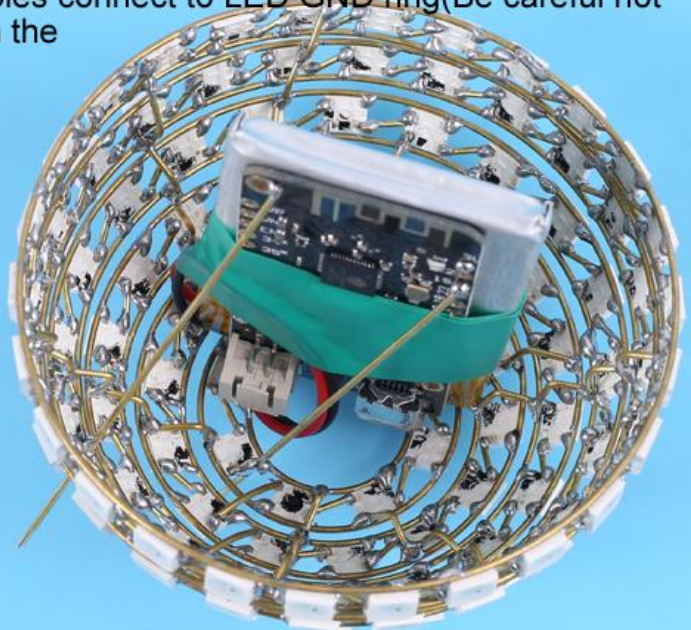


Step 44: ESP32 controller is fixed on the 5-ring hemisphere by copper wire. Note that the USB interface is kept in the smallest LED ring and convenient to connect USB. The smallest copper wire ring cannot block the USB interface. Pay attention to the convenience of connecting the marked DIN pin to Pin19.



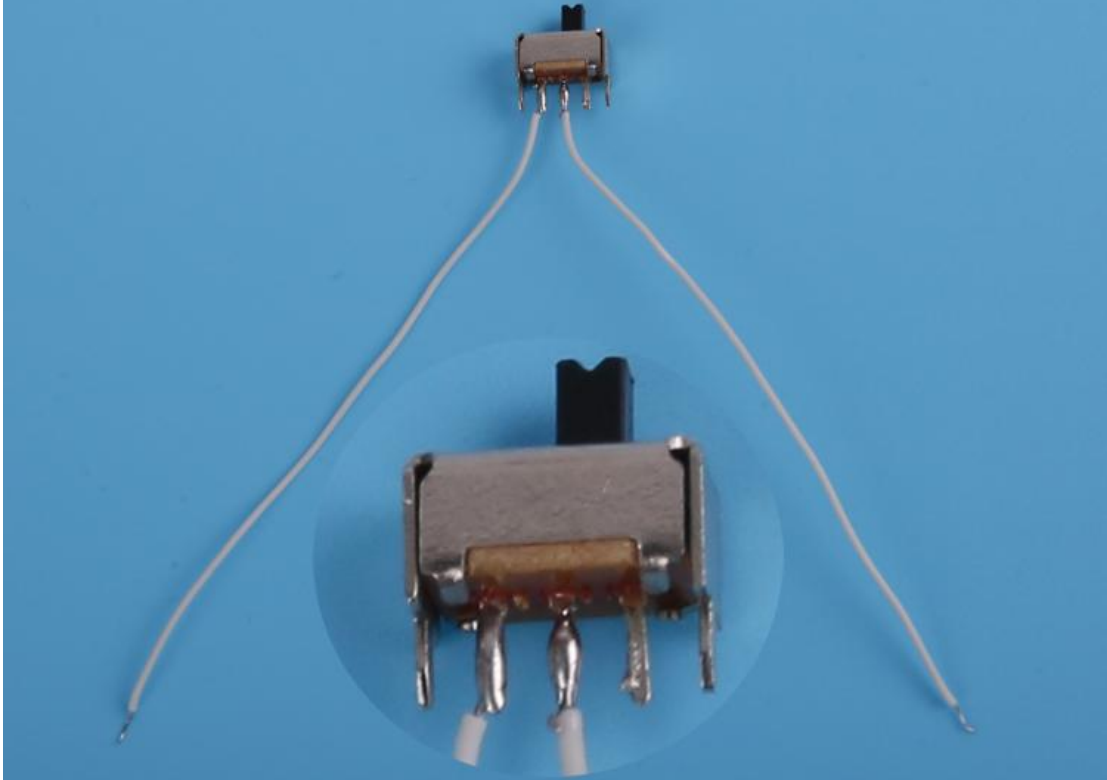
Step 45: Fix the USB shell on the smallest copper wire ring. Note that the solder tin cannot enter the inside of the USB.

Step 46: Connect fixed copper wires:  
1>.LED GND ring connect to ESP32 GND.(Tips: Users can apply solder tin to one end of the copper wire at first and then fix the copper wire and the length of the copper wire is cut according to the actual situation)  
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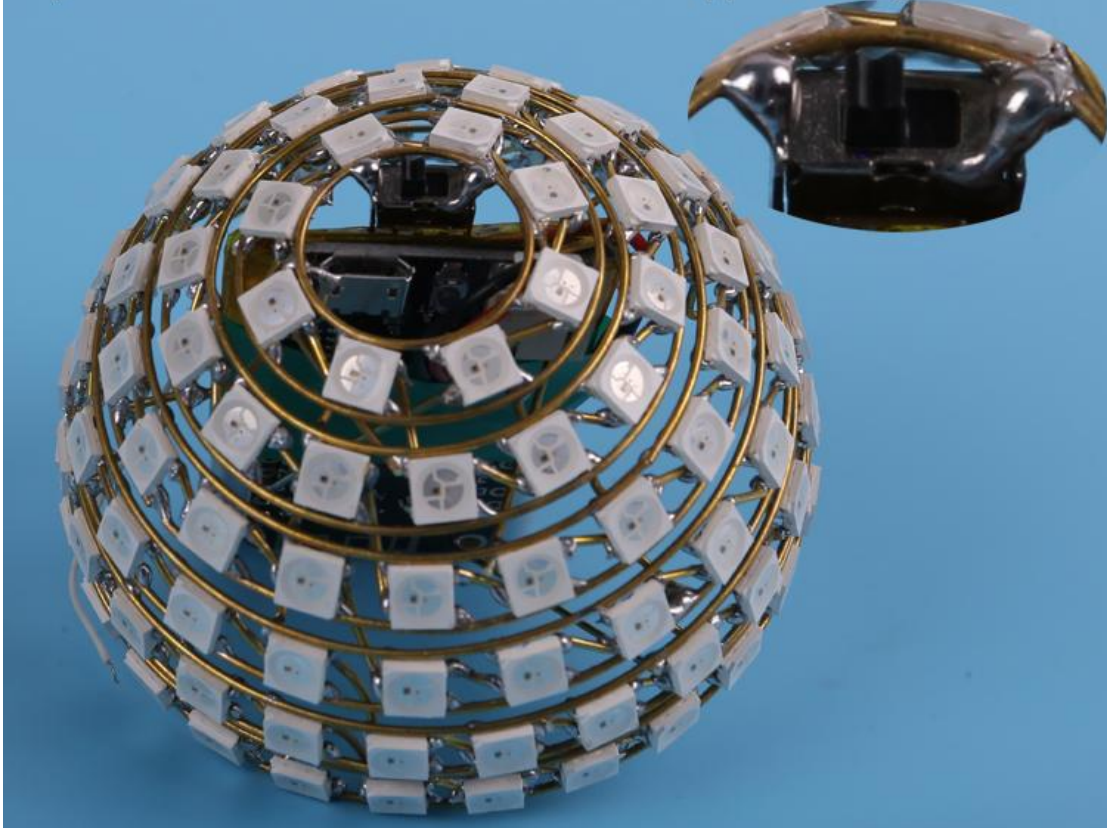


Step 47: Connect signal input DIN pin in the smallest LED ring from 5-Ring to Pin19 on ESP32 controller by 10cm (or copper) wire.

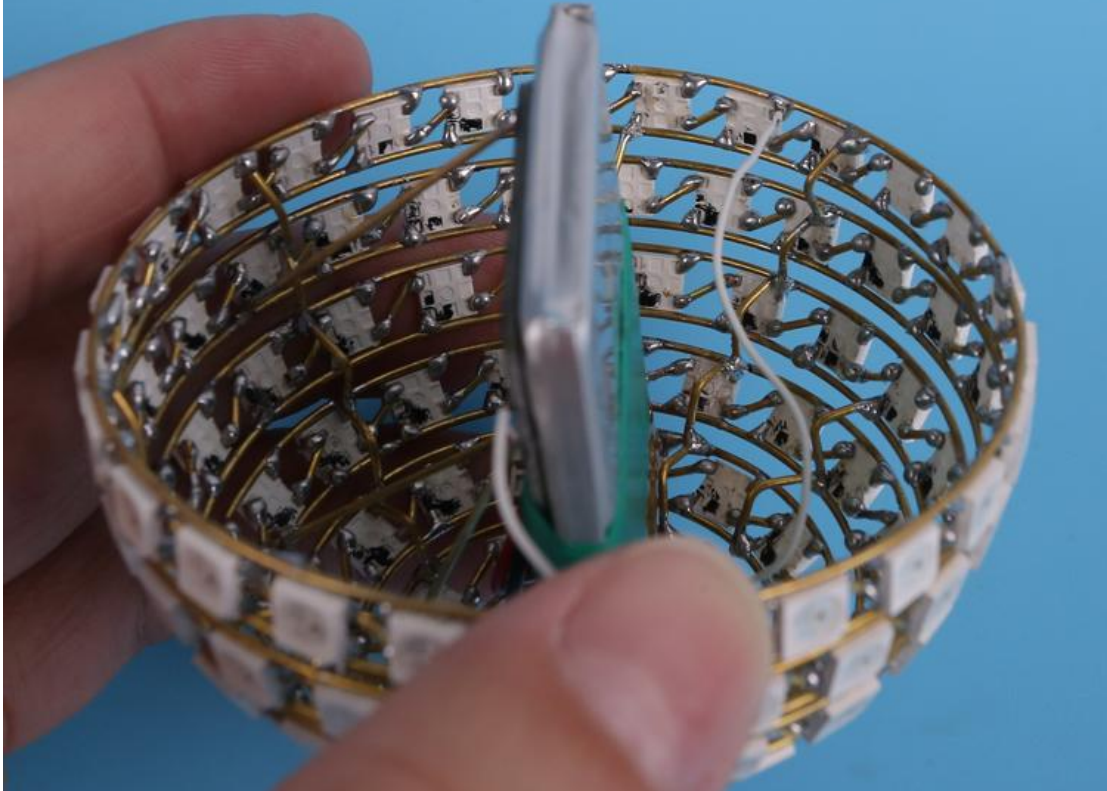
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Step 49: Fix the switch shell on the smallest copper wire ring next to USB.



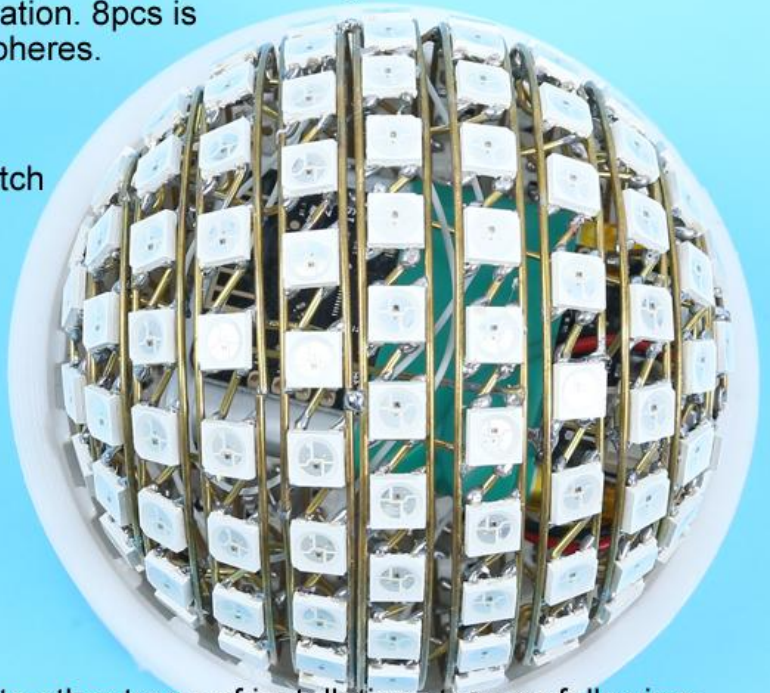
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Step 51: Connect VCC wire. The largest copper ring in both hemispheres is VCC. So user can connect two VCC by 8pcs 2mm copper connector. Place the two hemispheres on the 3D Printing Holder Mold to assist in connection and installation. 8pcs is used to fix two hemispheres.

### 9>.Enjoy effect

Step 52: Turn ON switch and enjoy the effect.



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