

# Negative Ion Module Specification

Model: M2901

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| Approved<br>Approve | Reviewed<br>Check | Prepared<br>Prepare |
|---------------------|-------------------|---------------------|
|                     |                   |                     |

Xiamen MAXMAC Air Technology Co., Ltd.

## Table of Contents

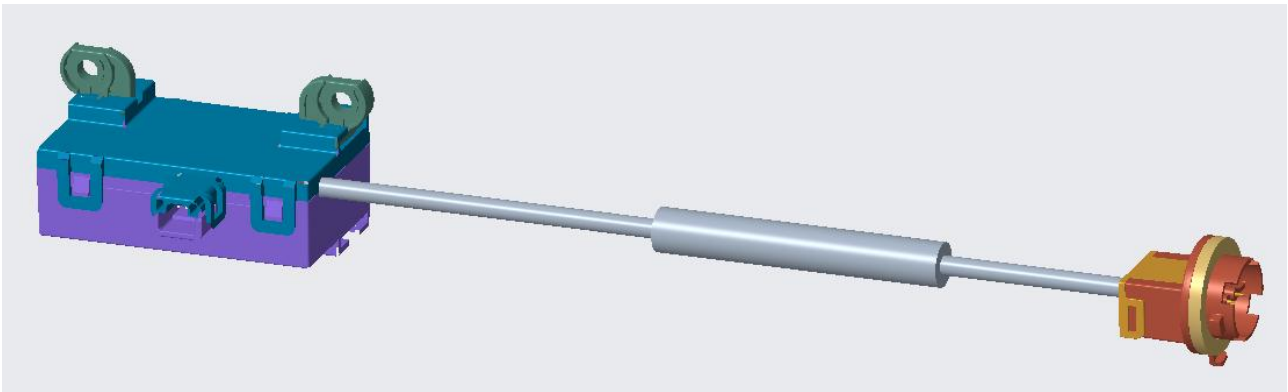
|                                                    |   |
|----------------------------------------------------|---|
| 1 Product Overview .....                           | 1 |
| 2 Appearance andStructure .....                    | 1 |
| 2.1 Overall View .....                             | 1 |
| 2.2 Exploded View .....                            | 1 |
| 2.3 2.3 Component Description .....                | 2 |
| 3 System Parameters .....                          | 2 |
| 4 System FunctionDescription .....                 | 3 |
| 4.1 Operating Principle of Negative Ions .....     | 3 |
| 4.2 Power Supply Circuit .....                     | 3 |
| 4.3 Fault Detection (DIG Function) .....           | 3 |
| 4.4 Enable Control Circuit .....                   | 4 |
| 5 Interface Information .....                      | 4 |
| 6. Core Advantages and Application Scenarios ..... | 5 |

## 1. 1 Product Overview

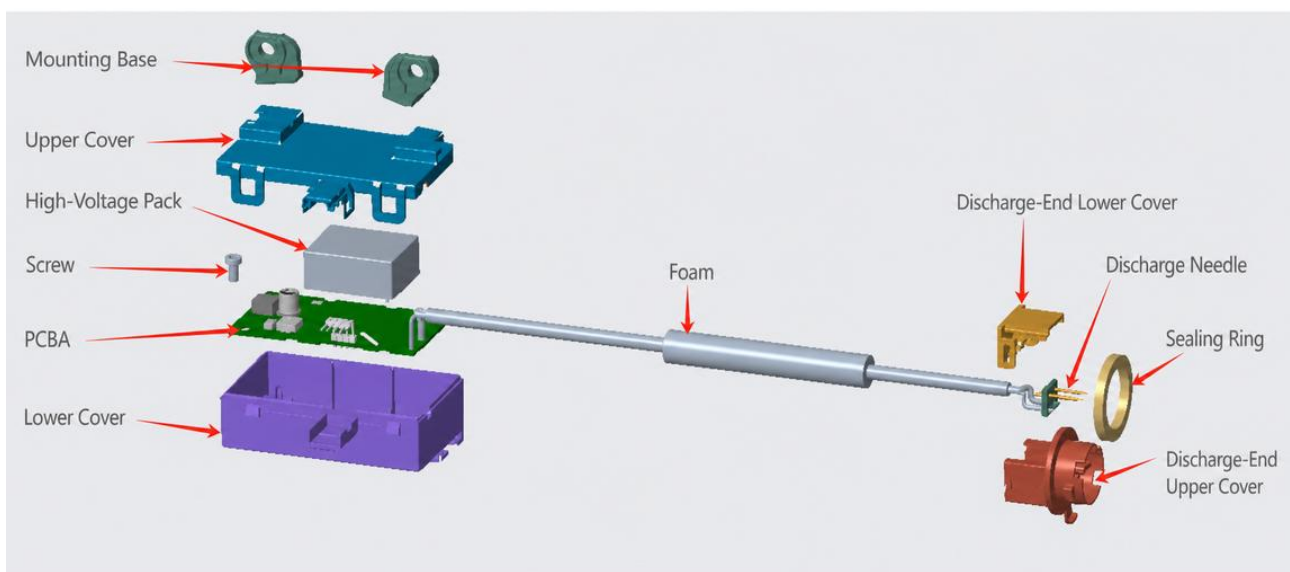
This product is a negative ion generator and an in-vehicle air purification device. It applies high voltage between electrodes to generate corona discharge, rapidly releasing a large number of electrons. The electrons are immediately captured by oxygen molecules in the air, forming negative ions that are released into the vehicle cabin. Negative ions provide an air purification effect by helping remove fine particles, smoke, odors, and other pollutants, thereby improving in-vehicle air quality.

## 2 Appearance and Structure

### 2.1 Overall View



### 2.2 Exploded View



## 2.3 Component Description

| Component Name                      | Description                                  |
|-------------------------------------|----------------------------------------------|
| Upper Cover / Lower Cover           | Device housing; protects internal components |
| High-Voltage Pack                   | Core component that generates high voltage   |
| PCBA                                | Circuit control assembly                     |
| Sealing Ring / Mounting Base        | Vibration-damping fixing device              |
| Discharge Needle Electrode Assembly | Electrode assembly that releases electrons   |

## 3 System Parameters

Table 1-1 Negative Ion Module System Parameters

| Item                       | Specification Parameter                                                                                   |
|----------------------------|-----------------------------------------------------------------------------------------------------------|
| Operating Voltage          | DC 9-16 V (vehicle power supply adaptation range)                                                         |
| Operating Current          | $\leq 80$ mA (normal operating power consumption)                                                         |
| Standby Current            | $\leq 0.1$ mA (low-power design to save energy)                                                           |
| Communication              | Hardwired communication - diagnostic DIG (real-time status feedback)                                      |
| Negative Ion Concentration | $> 20$ million PCS/cm <sup>3</sup><br>(@12 V, measurement position 10 cm from electrode, air speed 4 m/s) |
| Ozone Concentration        | $< 0.05$ PPM (meets national standard test requirements; no secondary pollution)                          |
| Operating Temperature      | -40 to 85 deg C (wide-temperature adaptability for various climates)                                      |
| Storage Temperature        | -40 to 85 deg C (stable performance during long-term storage)                                             |
| Operating Humidity         | 35%-85% RH                                                                                                |

## 4 System Function Description

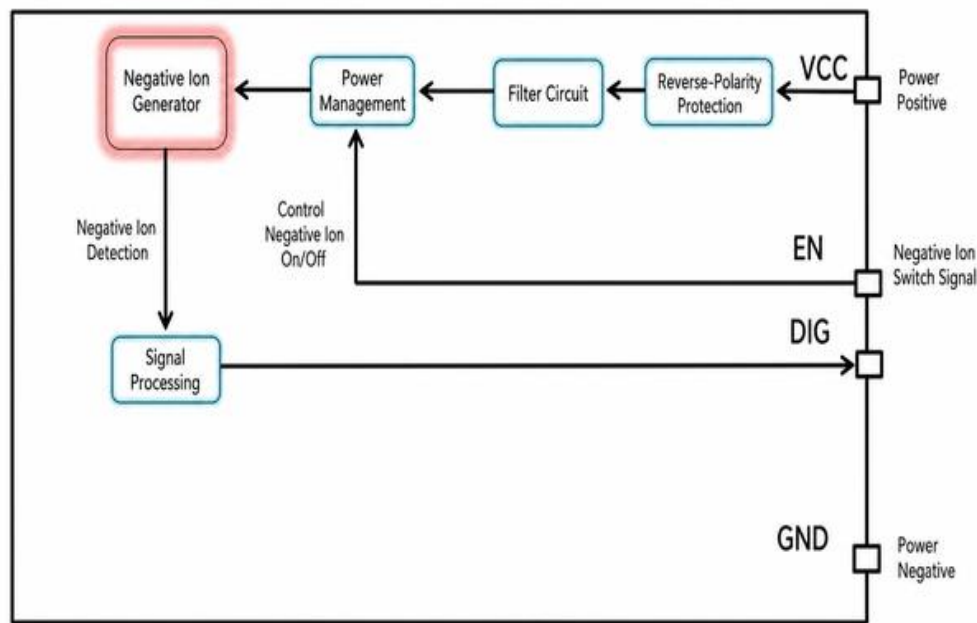


Figure 3-1 Negative Ion Module Functional Block Diagram

### 4.1 Operating Principle of Negative Ions

- A pulse and oscillator circuit raises the low voltage to a negative high DC voltage. The high DC voltage at the tip of the carbon fiber brush produces strong corona discharge and rapidly releases electrons ( $e^-$ ).
- Electrons have an extremely short lifetime in air, at the nanosecond (ns) level, and are quickly captured by oxygen molecules ( $O_2$ ) to form negative ions.

### 4.2 Power Supply Circuit

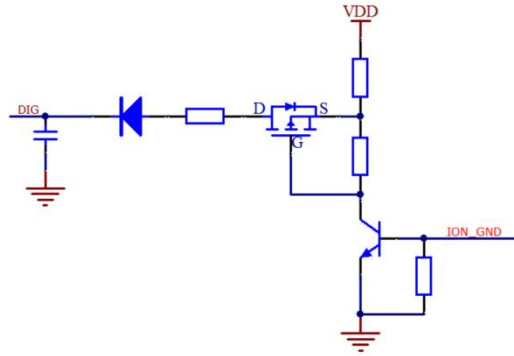
- Provides stable voltage to each functional module while meeting electrical performance and EMC test requirements.

### 4.3 Fault Detection (DIG Function)

The operating status of the negative ion module is monitored through the DIG pin:

During normal operation, when the supply voltage is 9-16 V, the normal voltage range of the feedback pin is 8.3 +/- 0.5 V; otherwise, the status is abnormal.

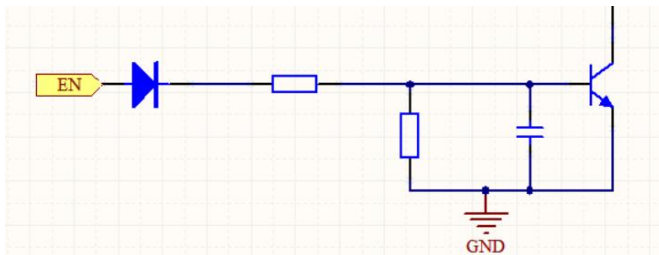
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#### 4.4 Enable Control Circuit

Controls negative ion output on and off:

- Input a 9-16 V signal level to turn on the device;
- Ground the pin to turn off the device.



#### 5 Interface Information

Molded with reference to TE 1376515-1 and compatible with mating connector model TE 1318620-1.

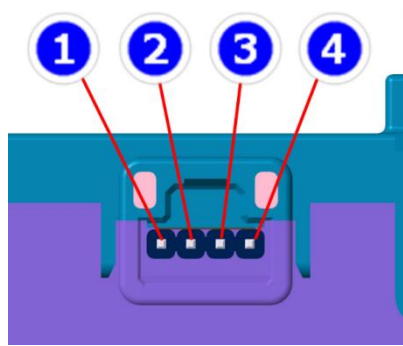


Figure 5-1 Communication Connector Terminal Appearance

The connector interface definition is shown in Table 4-1.

**Table 4-1 Connector Interface Definition**

| Pin | Function | Description    | Voltage Range                                                                                    | Rated Current |
|-----|----------|----------------|--------------------------------------------------------------------------------------------------|---------------|
| 1   | VCC      | Power positive | 9~16V                                                                                            | ≤80mA         |
| 2   | DIG      | Feedback pin   | When the supply voltage is 9-16 V, the normal voltage range of the feedback pin is 8.3 +/- 0.5 V | 7.6mA         |
| 3   | EN       | Enable pin     | Input a 9-16 V signal to turn on negative ion output; ground to turn off negative ion output     | 0.15mA        |
| 4   | GND      | Power negative | /                                                                                                | /             |

## Interface Description

- Input enable circuit: controls device start/stop through the EN pin level signal.
- Output feedback circuit: determines device operating status through the DIG pin voltage.

## 6 Core Advantages and Application Scenarios

- High-concentration purification: negative ion concentration >20 million PCS/cm<sup>3</sup>, rapidly decomposes formaldehyde, secondhand smoke, and other pollutants.
- Safe and low power consumption: standby current ≤0.1 mA; ozone concentration <0.05 PPM, meeting national standard certification requirements with no ozone hazard.
- Wide-temperature adaptability: -40 to 85 deg C operating temperature, suitable for automotive, industrial, and other application environments.