

The scent EC24 module functionality specification (Controller Type)

Prepared by:

Reviewed by:

Countersigned by:

Approved by:

October 2021

The story of the Revision History

Version No.	Changes to the description/Revision Description	Revised Date	Revised by
1.0	Initial Version	2021.10.1	jp.chen
1.1	Modified format, partial details	2021.10.9	jp.chen

Notes:

1) The method of compilation of the version sequence is to increase the initial version to 1.0 in sequence. When the version is sequential to 1.9 and then changed again, the version sequence is changed to 2.0, and the subsequent sequence sequence is moved accordingly.

2) Date names in the year-month-day order, specific format see examples in the table above.

Note:

1) Version No. should be increased in order. The first version No. is 1.0. If the version No. reach to 1.9 and the specification is revised once again, the version No. should be increased to 2.0.

2) Date should be in format: Year-Month-Day, see the demo in the table above.

Contents

1 summary 1.....	
------------------	--

1.1 Objective 1.....	
1.2 Scope 1.....	
1.3 Abbreviations and definitions 1.....	
1.4 Reference documents/standards 2.....	
2 System Overview 2.....	
2.1 Product Overview & Block Diagram 2.....	
2.2 Technical parameters 2.....	
2.3 List of critical electronic devices 3.....	
2.4 3D and Exploded Views 3.....	
2.5 Operating Modes 4.....	
3 HMI Interaction 5.....	
3.1 Fragrance Functions 5.....	
3.2 Other HMI Changes 7.....	
4 Fragrance Subsystem.....	
4.1 LIN Communication 7.....	
4.2 LIN Communication 7.....	
4.3 Blower Module 9.....	
4.4 Motor Module 9.....	
4.5 Fragrance Cartridge system 10.....	
4.6 Main MCU Module 12.....	
5 Cross-Contamination Prevention 12.....	
5.1 Mechanical Prevention Strategy 12.....	
5.2 Software Prevention Strategy 13.....	
6 Vehicle Integration Plan 13.....	

7 Diagnostics	13	
8.1 Blower Fault	13	
8.2 Motor Fault	13	
8.3 Supply Voltage Fault	13	
8.4 LIN Communication Fault	13	
8 External Requirements	13	
10 Mechanical	14	
11 Testing	15	

1 Overview

1.1 Purpose

This instruction is intended for the development of the Fragrance Module system and contains functional, operational and operational requirements for Fragrange Module.

1.2 Scope

This instruction applies to vehicles in the Fragrance Module system.

1.3 Abbreviations and definitions

1.3.1 Abbreviations

Table 1 Abbreviations

Abbreviation for short	Description of the project
UART	Universal Asynchronous Receiver/Transmitter
GPIO	General Purpose Input Output
PWM	Pulse Width Modulation
HMI	Human Machine Interface

1.3.2 Definition of the

Table 2 Definitions

Term	Description
Must	Gateway design and production legislative or regulatory requirements
Shall	refers to a mandatory requirement to be followed and deviation is only allowed after discussion with project responsibility from costumer.
Should Should	refers to recommendation or advice on implementing a requirement to achieve a specific requirement

1.4 Reference documents/standards

The following reference document forms part of a special description of this instruction. Unless otherwise specified, refers to the latest version of the reference document.

Table 3 Reference Documents/Standards

Document	Description
EC24EV-302-002M M01 AC_LIN C_Ma	Matrix files

2 Fragrance System summary

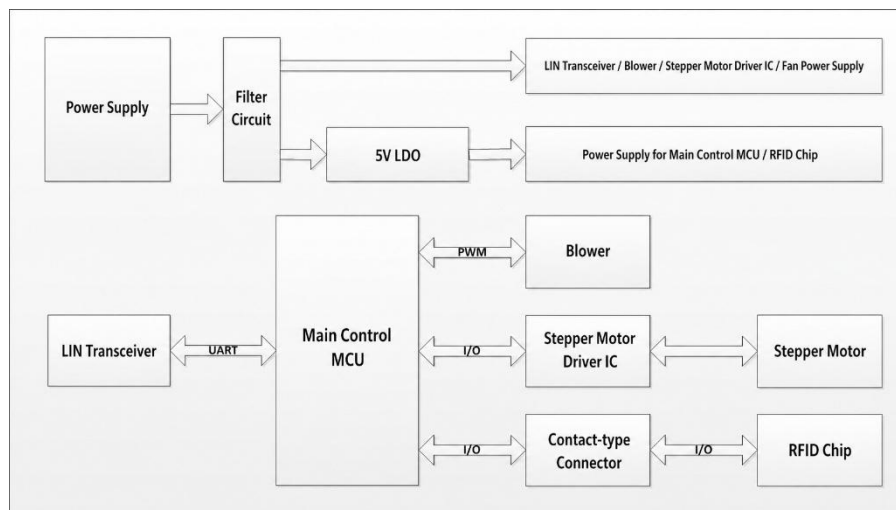
2.1 Product overview and system frameworks

2.1.1 Product description

The Fragrance System is first injected into the air by the drum blower, which then enters the fragrance cartridge through a rotary valve device, which is then sent to the exhaust pipe by the drum blower. The valve device is driven by a stepper motor. The valve device, in turn, produces a position signal through a Photoelectric Switch, which achieves the precise positioning and determination of the valve.

Each Fragrance Cartridge has a fixed ID card, which records the relevant information about the atmosphere, and each ID card is linked to the main control panel through the card, thus enabling the identification of the currently loaded atmosphere.

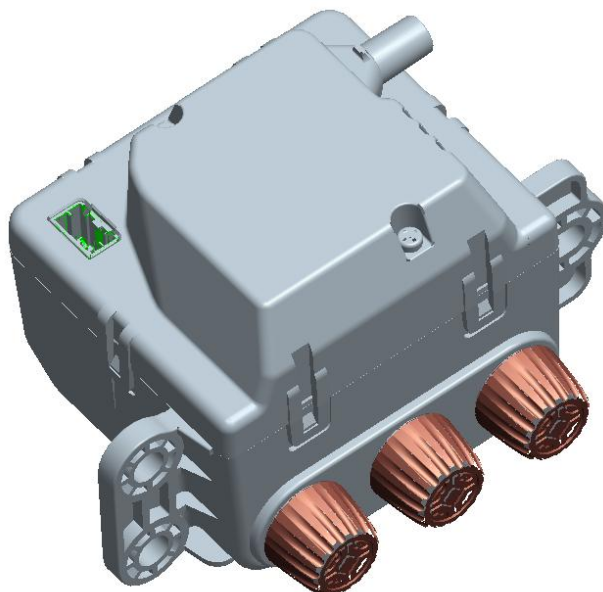
2.1.2、 System Box

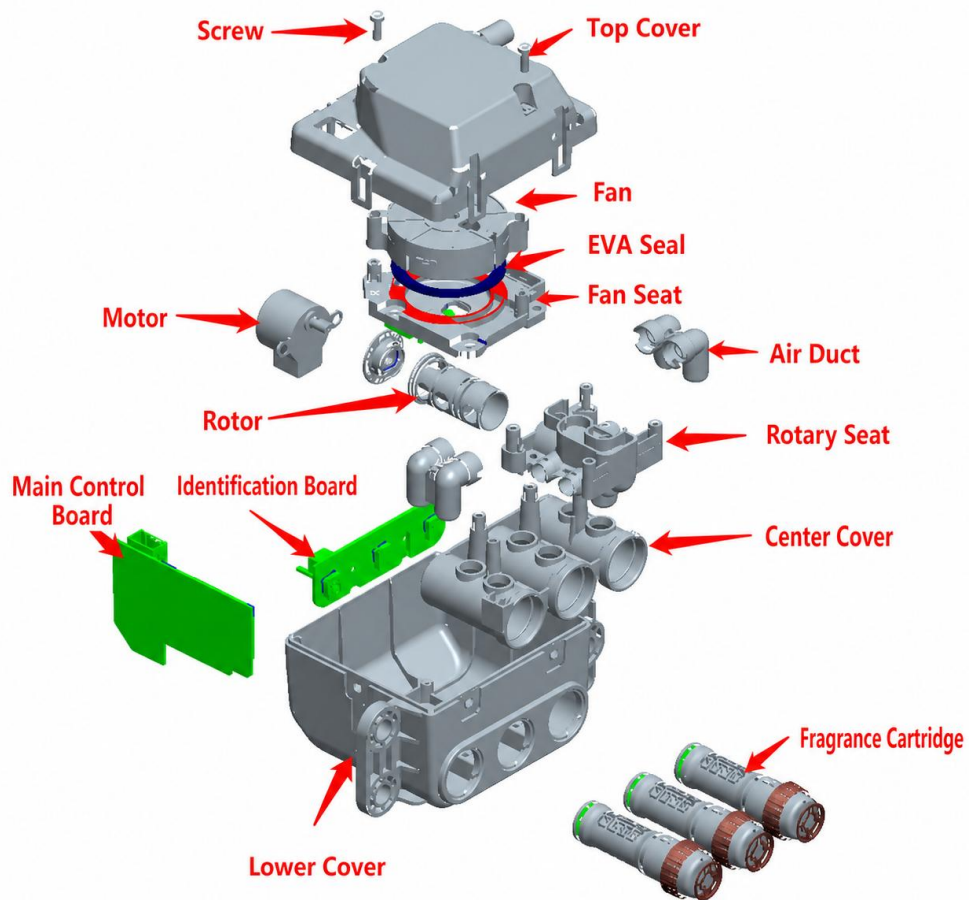


2.2 Technical parameters

Organizing voltage	DV: 9~16V
Organizing Current	$\leq 200\text{mA}$
Standby Current	$\leq 15\text{mA}$
Static current	$\leq 0.2\text{mA}$
Noise	A) 30 cm distance from the test
Operation Temperature	- 40°C to 85°C (-40°C to 10°C and 60°C to 80°C functional grade C, limited to the physical properties of the fragrance itself, without evaluating the actual car fragrance grade)
Storage Temperature	-40°C-85°C
Work Humidity	0%-95%RH
Power management	12V/1 to 200mA, maximum power of 3.2W
Compunication Output	LIN2.1
Equipment lifetime	> 10000h

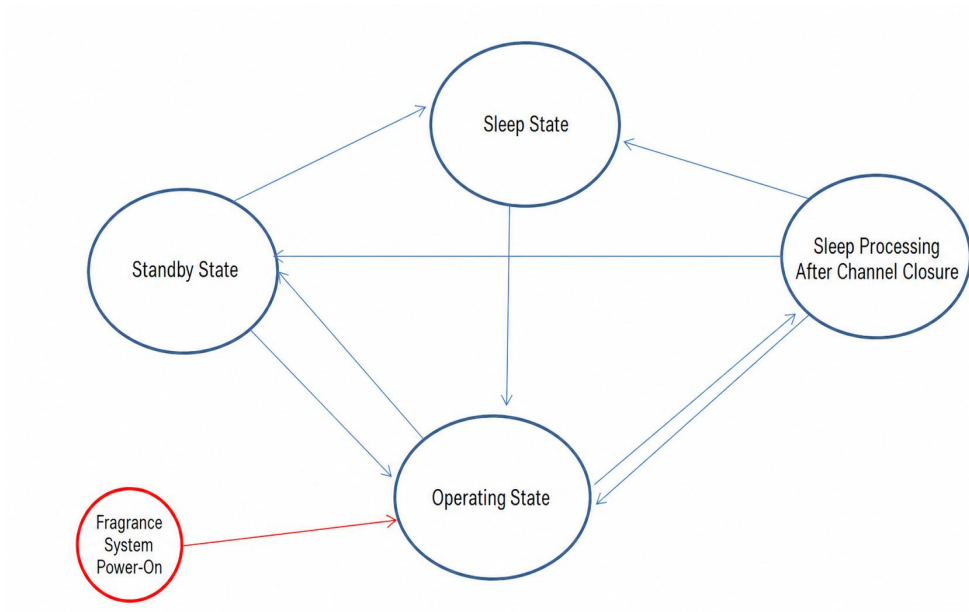
2.3 3D effects and explosion charts of fragrance products





2.4 Product Operating Modes

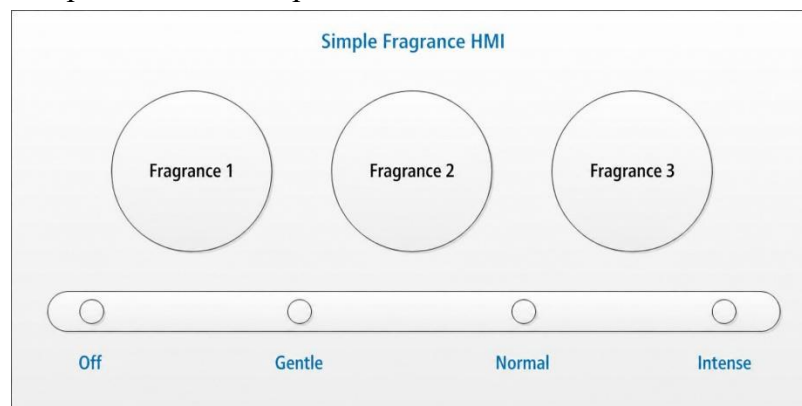
When the power supply is turned on, the Fragrance Generator is powered and the Fragrance Generator will enter the standby mode after initialization. The Fragrance Generator will be executed according to the `FGAEnaReq = 0x1:Enable` command from the A/C Controller, according to the `FGAEnaReq = 0x1:Enable` command from the A/C Controller.



3 Fragrance System HMI interaction description

3.1 The scent features

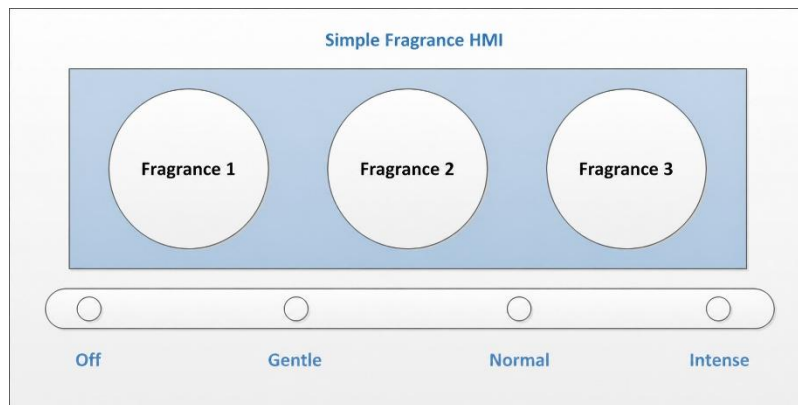
Since the user can operate the device through a large screen of the entertainment system, the diagram below is a simple HMI for the operation of the device.



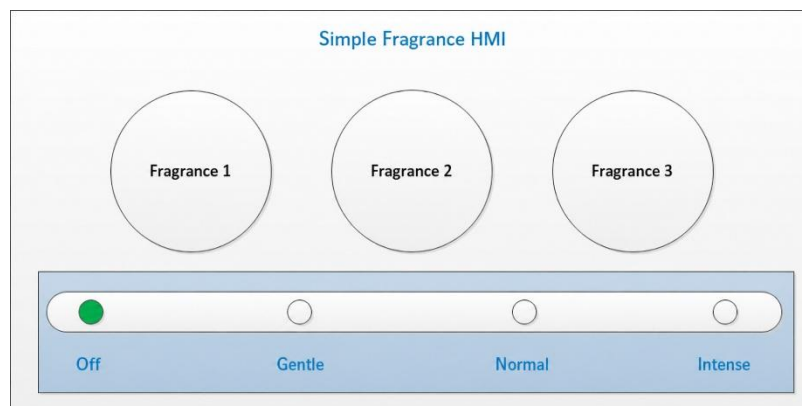
The sections describe:

- Scent 1 / Scent 2 / Scent 3: Scent type selection, where users select and switch the scent by clicking the corresponding button, as shown in the light blue area below.
- FGACHanTyp = 0x1 is the control signal that the Fragrance System switches Channel 1.
- FGACHanTyp = 0x2 is the control signal that is sent to the Fragrance System to switch Channel 2.

- FGACHanTyp = 0x3 allows the Fragrance System to switch Channel 3;



- Press FGALvlReq = 0x1:Level 3 ((High), and the blower switches to high-end wind.
Typically: press FGALvlReq = 0x1:Level 2 ((Mid), and the blower switches to medium-range wind.
Soft: press FGALvlReq = 0x1:Level1 ((Low), and the blower switches to low-level wind.
Close: Click FGALvlReq = 0x0:Level0 (Off), Blower switches to close the file.



- Flavor 1 capacity: When selected, the Fragrance System will respond to Chan1AvailTime to display the flavor's capacity information, and evaluate the time spent on the fragrance to signal the flavor 1 remaining available time through Blower working time.
- Flavor 2 capacity: When selected, the fragrance system will respond to Chan2AvailTime to display the flavor's capacity information, and evaluate the time spent on the fragrance to send the signal.
- Fragrance 3 capacity: When selecting Fragrance 3, the Fragrance System will respond to Chan3AvailTime to display the capacity information for the fragrance, and evaluate the time spent on the fragrance to send the signal.

* Note: AvailTime = total time 180h - calculated time, due to decreased spicy consumption,

actual lifespan is 120h: the 40h coefficient is 1 in the first phase of the software strategy, the middle phase coefficient is 1.5; the second phase is 2; and the $40+40*1.5+40*2=180$, actual use time is $40+40+40=120h$)

- (a) Expiry reminder: Fragrance Cartridge has a physical lifetime of one year (from the time when Fragrance Cartridge was assembled into a finished product, which was written in IC). The corresponding signal intersects Chan1 TimeoutAlarm = 0x1 when the period of time exceeds one year, reminding the atmosphere to expire;
- Fragrance 2 expiration warning: same as Fragrance 1;
- Fragrance 3 expiration warning: same as Fragrance 1;
- The issue of when to install the fragrance: The time of production of the fragrance bomb is written in the time of production, the time of its life is based on the date of its production and the date of its current time ≤ 365 days, the period between the assembly of the product and its sale is uncertain, and it is possible that Fragrance Cartridge passed the warranty period during this period, and it is therefore recommended that it be placed in Fragrance Cartridge at the time of sale.

3.2 Other causes of HMI changes

- Unnomal: When it is discovered that the fragrance cartridge is not the original one, Chan1IllegalitySts sends an illegal signal Chan1IllegalitySts = 0x1 which is Unnomal, the large screen makes the interface a reminder.
- Fragrance 2 unauthorized-cartridge warning: same as Fragrance 1;
- Fragrance 3 unauthorized-cartridge warning: same as Fragrance 1;

4 The fragrance system description

4.1 LinCommunication section

4.2 LinCommunication section

4.2.1 LIN IC features

The scent product uses a LINCommunicationIC from NXP, model TJA1028.

- Compatible with LIN 2.0/2.1 (maximum downward compatibility to version 1.3) – SAE J2602 protocol
- 5V/3.3V, 70mA flat output with voltage output accuracy of $\pm 2\%$
- It has good EMI/EME properties and strong electromagnetic interference resistance.

- Typical standby current is less than 45uA and typical dormant current is less than 12uA
- Self-contained LIN wake-up function
- Certified by AEC-Q100

This internal IC system frame is as follows:

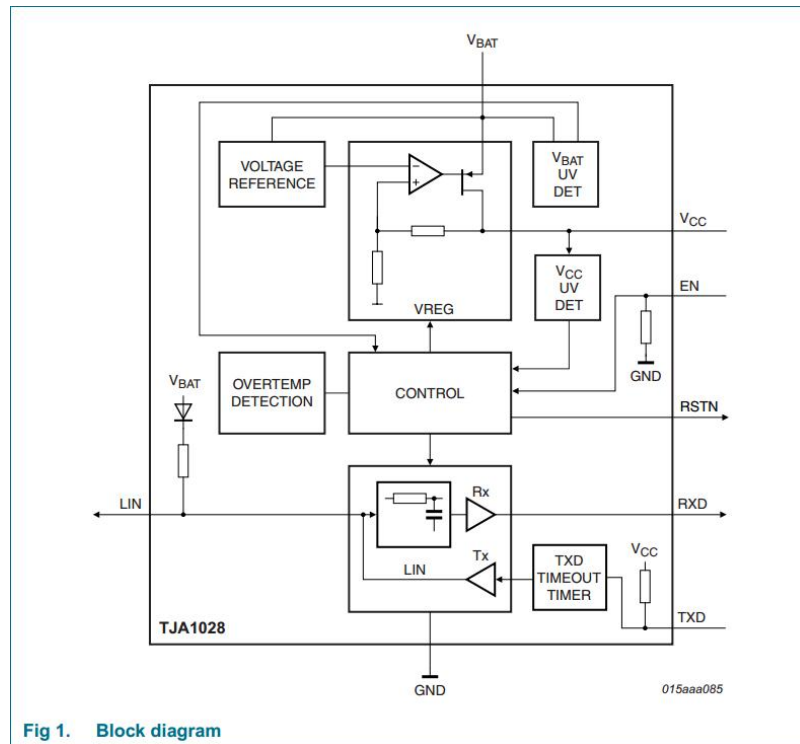
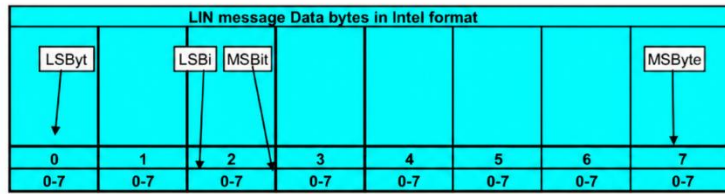


Fig 1. Block diagram

4. 2. 2 Network Regulation Note

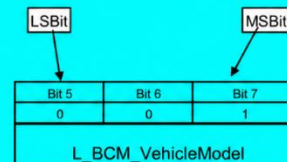
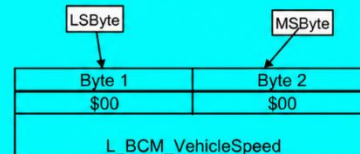
This module LIN equipment is a Slave Node device. The package protocol format is based on the LIN bus Master Node device. The protocol format is described below:

LIN data formats



Full-byte data must be stored in Intel Format. For example, in message BCM_01, the LSByte of L_BCM_VehicleSpeed is stored in Byte 1 and the MSByte is stored in Byte 2, as shown at right.

Multi-bit data must also be stored in Intel Format. For example, signal L_BCM_VehicleModel is stored in Bits 5–7 of message BCM_01, where Bit 7 is the MSBit and Bit 5 is the LSBit, as shown at right.



4.3 Blower Module

4.3.1 Blower Feature Parameters

The Fragrance System is a straight-line brushless blower with the following characteristics:

Item	Specifications
Operating Voltage Range	8--16V
Maximum rated Operating Current	0.198A/12V
Maximum rated power	2.376W
Speed	5500RPM ±10%
Service Life	> 50000h @40°C
Operational Temperature Range	-40~85°C
Scope	-40~85°C
Locked-Rotor Protection	1、Rated voltage locks 1s, automatically disconnects 2、After automatic power outages, 2-6s automatically try to start.
Frequency range of drive	18~30KHz

The blower's interface and function are as follows:

Pin	Pin Function
VCC	Blower Power Pin

PWM	Blower uses PWM controls to adjust the size of the rotation speed
FB	Remittance foot position, stabilize the Blower speed and keep it in line.
GND	Blower Ground Pin

4.4 Motor Module

4. 4. 1 Electrical characteristics

The Fragrance System uses Stepper Motor to conduct conduction testing.

No.	Parameter	Specifications
1	Number of Phases	2
2	Gear Ratio	1/64
3	Step Angle	5.625°/64
5	Excitation Mode	1-2
6	Drive Pulse Rate	100pps
7	Step versus rotational step angles	1:1

Stepper Motor's stepping angle is 5.625°/64, which means that it takes 64 steps to turn a circle.

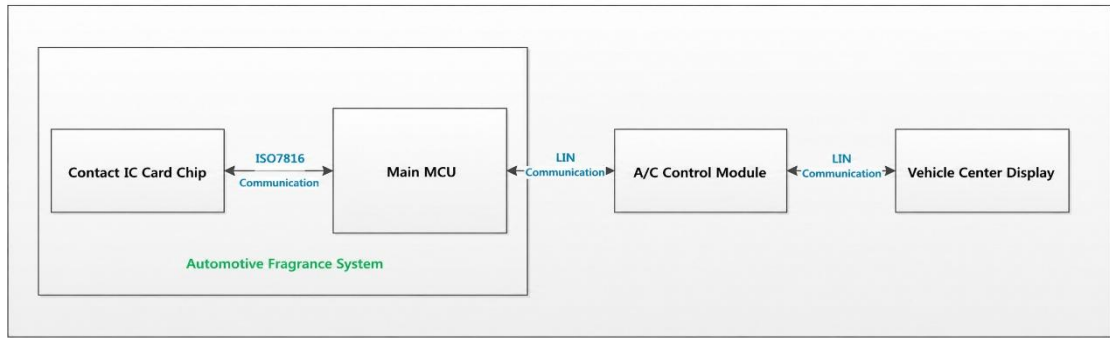
4. 4. 2 Motor-powered IC characteristics

Stepper Motor drives the IC characteristics as follows:

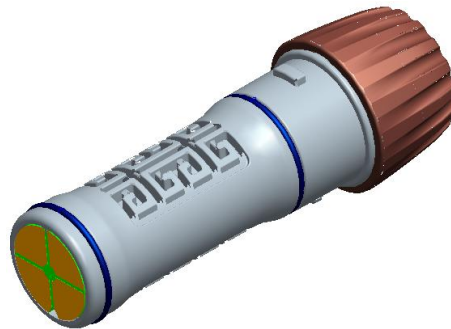
No.	Item	Specifications
1	Operating Voltage Range	5.5~35V
2	Operational Temperature Range	-40~100°C
3	Scope	-55~150°C
5	Max. Continuous driver current	1.5A
6	Maximum Organizing Current	6.8mA
7	Maximum Sleep Current	50uA

4.5 Fragrance Cartridge

4. 5. 1 Fragrance Cartridge interaction process map with user terminal (in-car)



Fragrance Cartridge presentation Figure



As shown above, contact-based identification IC card chips are fixed to the surface of the fragrance structure carrier, using PCBA method to be fixed to the scented bulb. Information on the IC card is as follows:

The IC card chip selected is an EEPROM with logic encryption capability of 2048×8 bits, with the PIN information as follows:

Pin	Bytes Used	Read/Write Interval
C1	VCC	Operating Voltage 2.5 to 5.5 V
C2	SCL	Clock Signal
C3	SDA	Data Line
C4	GND	Ground

4. 5. 2 Fragrance Cartridge writes type of information

Item	Bytes Used
Fragrance Type	1Byte
Elapsed Usage Time	4Byte
Manufacture Date	3Byte
Fragrance Cartridge ID	1Byte
Total Space Used	9 Byte

The IC actually has 256*8 bits of EEPROM, which is fully satisfied with the storage space requirements.

4.5.3 Fragrance Cartridge is an informal channel alert

Fragrance System reads the ID code to a non-company ID and sends a reminder that it is an unofficial Fragrance Cartridge.

4.6 Main MCU Module

Fragrance System is an 8-bit microprocessor with a microchip, and the selected ICs meet the requirements of the vehicle regulations and are certified by AEC-Q100.

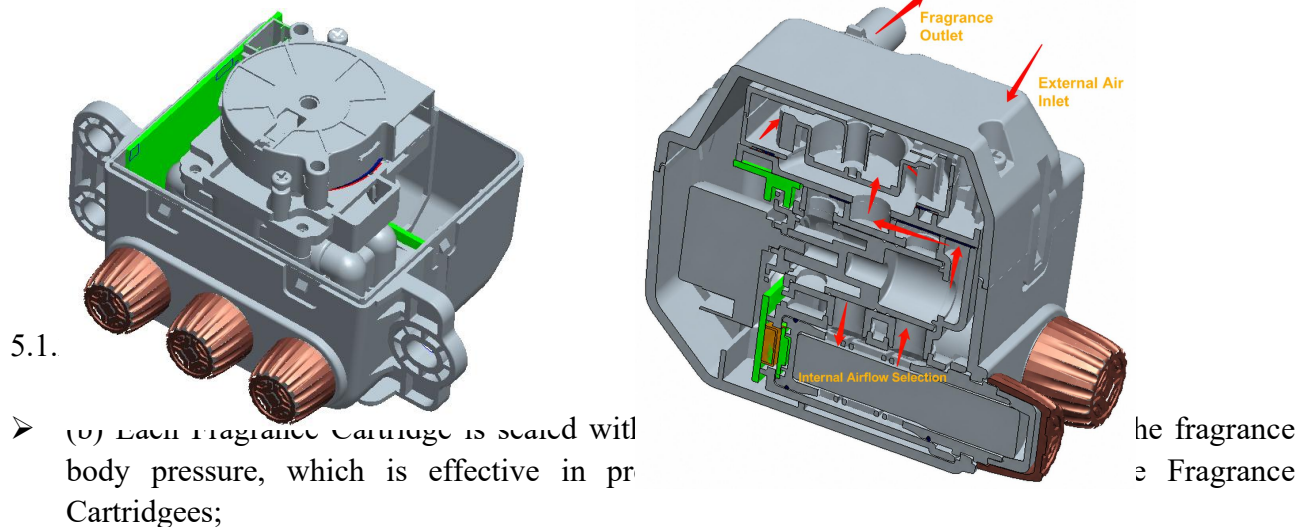
The specific functions are as follows:

- Data protection features (including detection of illegal memory access)
- With a dog timer on the screen (combined with a low-velocity oscillating clock inside the chip)
- 12 bit A/D converter
- The ROM with 128KB
- Operating Voltage range: 1.8V to 5.0V
- Operating Temperature range: 40 to 85°C
- I have two lines, a line, and a can.
- The total dormant current can be reduced to 14uA

5 Fragrance Cross-Contamination Prevention

5.1 Cross-Contamination Prevention 1 (Mechanical Design)

- The main structure of the existing wind tunnel is mainly driven by a motor to turn the turner, the wind tunnel on the turner is oriented towards different cylinder holes, thus achieving switching and closing of different wind tunnel, and when the turner is oriented towards channel 1, channel 2 and channel 3 are closed, thus effectively preventing odor confusion.



5.2 Cross-Contamination Prevention 2 (Software)

When the rotor turns on the switch (which is a shorter blower stop time, while the motor switches

off and blower stops moving) during the fragrance type, the software defines blower to shut off, blower not working, to prevent stinking;

6 Vehicle Integration Test Plan

For fratricidal products, there is a greater preference for subjective evaluation and for providing users with a better sense of fratricidal output, the necessary physical connection is necessary, as follows:

- 6.1 The scent monitor monitor for the scent signals, the reporting, the fluidity of the response to the expiration of the scent block, the unrecognized, the illegal;
- 6.2 The effects of the blower's response to sensation, actual atmosphere, and whether the blower's airflow is adjusted.

7 Diagnosis information

8.1 Blower Fault

When Blower is running, the Blower rotation speed is not within the target range, the Blower stops running, and the Fragrance Generator sends a FanErrSts signal 0x1:Error to Master Node.

Type of failure: Blower blockage

8.2 Motor Fault

When the motor is running, the motor stops turning when it is not in its correct position for a long time, and the Fragrance Generator sends a motorErrSts signal 0x1:Error to the Master Node.

Type of failure: Motor clogged

8.3 Supply Voltage Fault

When the AD detects that the power supply voltage is out of range, the Fragrance System enters a standby state and the Fragrance Generator sends the FG_VoltErrSts signal 0x1:Error to the Master Node.

Type of failure: Supply voltage exceeding 9 to 16 V (± 0.5 V)

8.4 LIN Communication Fault

When the Master NodeLIN information checksum is received, the fragrance generator sends the LIN_Resp_Error signal 0x1:Error to the Master Node.

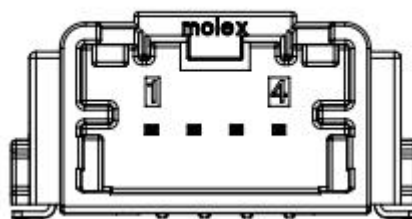
8 Fragrance Systems requests

9.1 General Electrical Requirements

No.	Symbol	Function
1	POWER	Power
2	LIN	LIN Communication Line (max. 19.2 kbit/s)
3	NC	Blank
4	GND	Ground

9.2 Recommended Connector

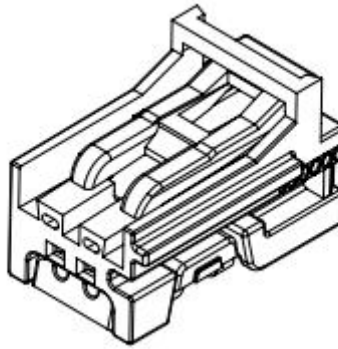
The power outlet is located at the end of the board: model: 0349128040



4 CKT SMT HEADER
POLARIZATION OPTION A

TIN P/N: 34912-8040
GOLD P/N: 34912-6040

Wiring Harness End Connector: Plug-in model: 0347910040



10 Mechanical

10.1 General mechanical description

Fragrance Module can be attached to the car by a bolt lock, a cascading part of the cascading cascading and claving, while Fragrance Module provides the public end and the whole car provides the mother end.

10.2 Mechanical/Housing Design

The Fragrance Module has a motor, blower, switch valve, fragrance cartridge, and other components attached to it, which form an internal wind tunnel between the internal devices, which flows through the Fragrance Cartridge through the blower, and is eventually transmitted to the entire car space.

10.3 Materials

The outer membrane uses PA6+15% GF for injection molding and the outer membrane uses a tubing.

10.4 Weight

≤ 0.5 KG

10.5 Other

XXXXXXXXXX

11 Test

XXXXXXXXXX