

## AS064-2-GPAIRFRREFZ

Cost-effective NVM Configurable Air Freshener

This document describes the AS064-2-GPAIRFRREFZ hardware and explains how to use the board's modules.

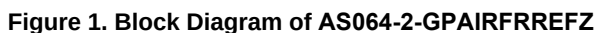
## Contents

|                                                          |           |
|----------------------------------------------------------|-----------|
| <b>1. Introduction</b>                                   | <b>2</b>  |
| <b>2. AS064-2-GPAIRFRREFZ Hardware</b>                   | <b>2</b>  |
| <b>3. Board Design</b>                                   | <b>4</b>  |
| 3.1 Schematic Diagram                                    | 4         |
| 3.2 Bill of Materials (BOM)                              | 5         |
| 3.3 Board Layout                                         | 6         |
| <b>4. AS064-2-GPAIRFRREFZ Software</b>                   | <b>7</b>  |
| 4.1 Specifications                                       | 7         |
| 4.2 Switch States                                        | 7         |
| <b>5. Software Overview</b>                              | <b>8</b>  |
| 5.1 Go Configuration Code Design and Code Flashing Steps | 8         |
| <b>6. Device Setup</b>                                   | <b>11</b> |
| <b>7. Ordering Information</b>                           | <b>12</b> |
| <b>8. Revision History</b>                               | <b>12</b> |

## Figures

|                                                            |    |
|------------------------------------------------------------|----|
| Figure 1. Block Diagram of AS064-2-GPAIRFRREFZ             | 2  |
| Figure 2. GreenPAK/Control Section                         | 3  |
| Figure 3. Battery and Motor Drive Section                  | 3  |
| Figure 4. AS064-2-GPAIRFRREFZ Board Image (Top and Bottom) | 4  |
| Figure 5. AS064-2-GPAIRFRREFZ Schematics                   | 4  |
| Figure 6. Multilayer Layout Image                          | 6  |
| Figure 7. Top and Bottom Layer                             | 6  |
| Figure 8. Top and Bottom Silkscreen/Overlay                | 6  |
| Figure 9: Design block for Air Freshener                   | 8  |
| Figure 10. Build and Download the Project                  | 9  |
| Figure 11. GreenPAK Configuration Setup                    | 10 |
| Figure 12. Air Freshener Unit                              | 11 |

The GreenPAK Air freshener is a versatile device that can be used for multiple different purposes. The device's fragrant sprays can be used in many ways to create a more pleasant atmosphere. The device has a flexi-control timer that sprays every 10, 20, or 40 minutes, allowing you to control fragrance intensity. The battery-operated room freshener keeps your space fragrant 24x7 without any hassle.



The SLG46108V provides a small, low-power component for commonly used mixed-signal functions. The user creates their circuit design by programming the one-time Non-Volatile Memory (NVM) to configure the interconnect logic, the I/O pins, and the macrocells of the SLG46108. This highly versatile device allows a wide variety of mixed-signal functions to be designed within a very small, low-power single integrated circuit.

The circuit starts with the battery compartment, which supplies power to the entire unit. The SLG46108V is 3V powered from 2 x AA batteries. The GreenPAK regulates this power and directs it to the necessary components. The GreenPAK IC SLG46108V is programmed with a timing algorithm. It keeps track of the set intervals (e.g., 10, 20, 40 minutes) and triggers the motor to activate the spray mechanism at these intervals. This timing can be set using external switches or buttons connected to the SLG46108V. When the SLG46108V sends a signal to the motor, it turns on for a short duration. This motor is connected to an actuator, which is designed to press down on the aerosol can's nozzle, releasing a burst of fragrance. The LED is provided to indicate different statuses. A blinking light indicates the device is working normally.

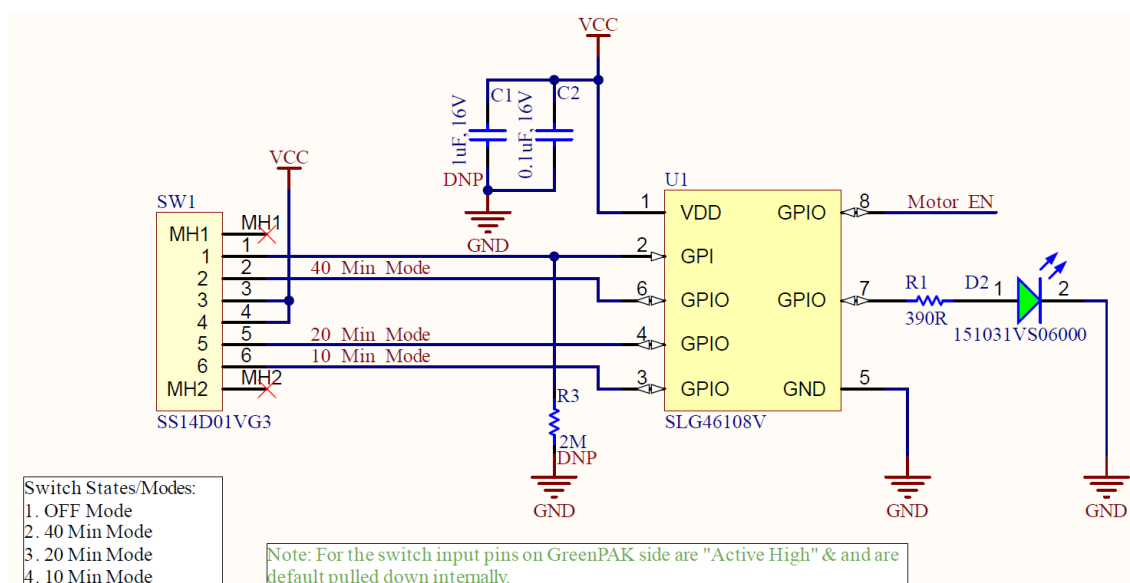


Figure 2. GreenPAK/Control Section

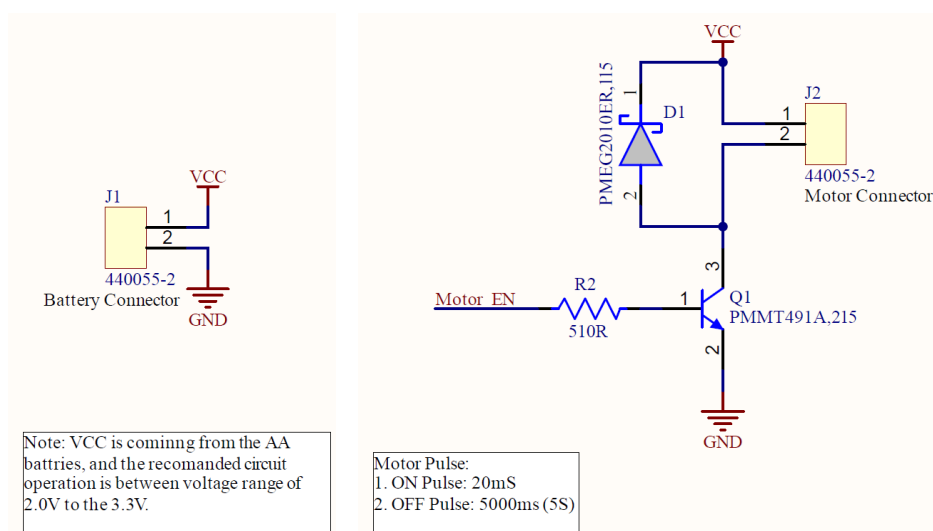


Figure 3. Battery and Motor Drive Section

### 3. Board Design

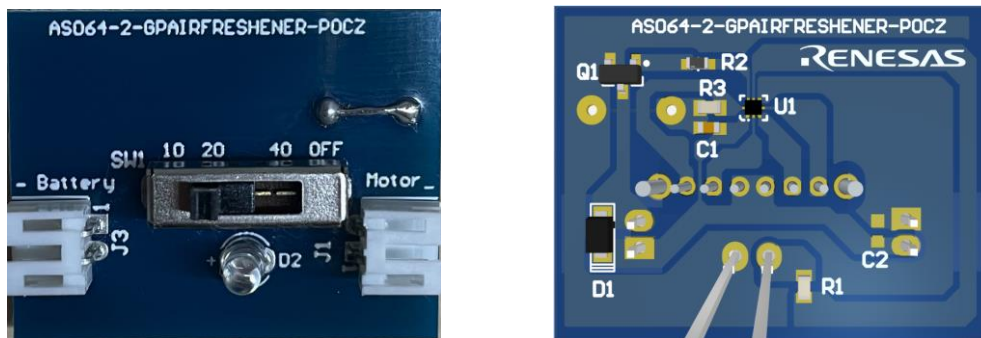


Figure 4. AS064-2-GPAIRFRREFZ Board Image (Top and Bottom)

#### 3.1 Schematic Diagram

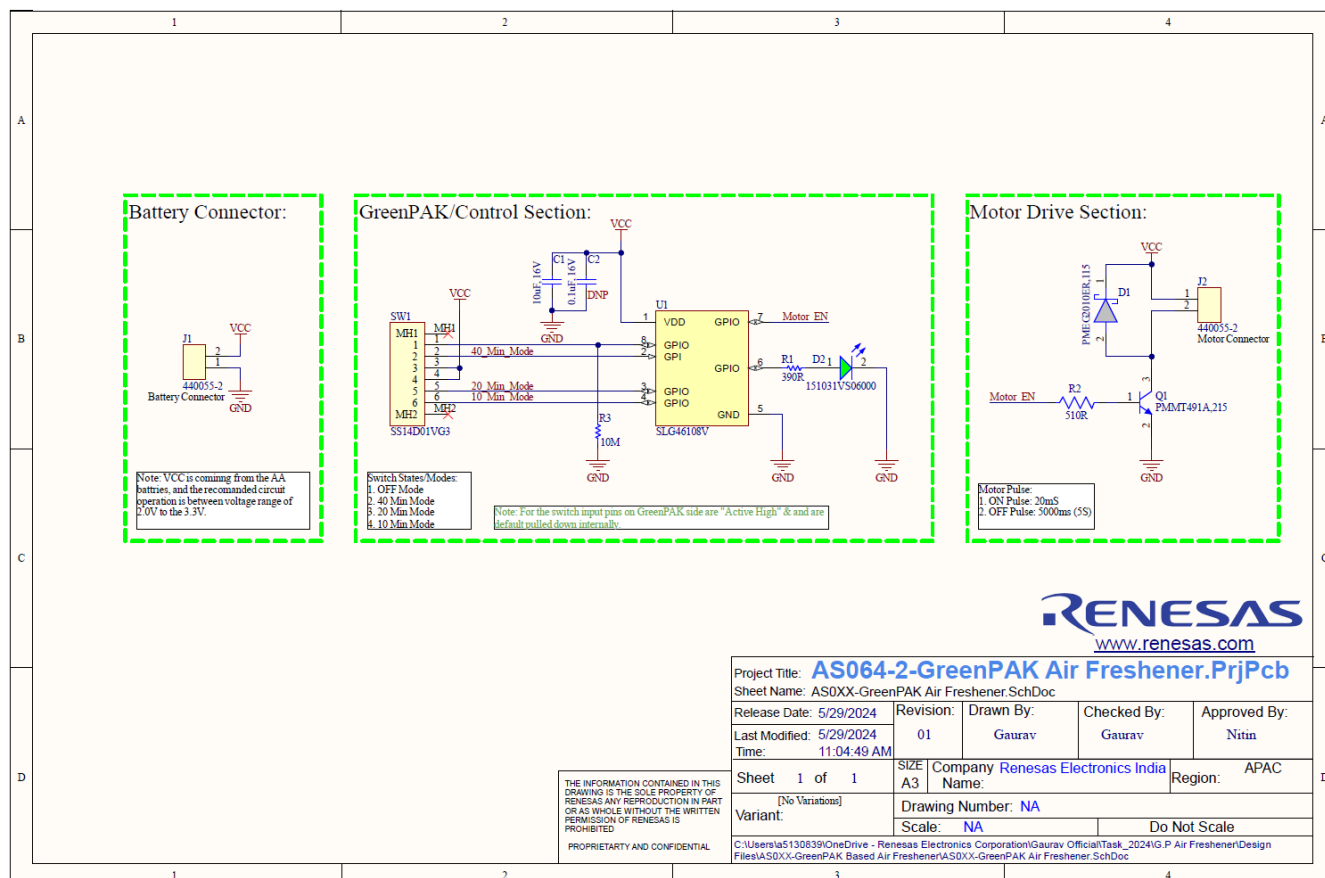


Figure 5. AS064-2-GPAIRFRREFZ Schematics

## 3.2 Bill of Materials (BOM)

Table 1. AS064-2-GPAIRFRREFZ BOM

| Quantity | Designator | Description                                                                                                                           | Manufacturer                   | Manufacturer Part #  |
|----------|------------|---------------------------------------------------------------------------------------------------------------------------------------|--------------------------------|----------------------|
| 1        | C1         | 10 $\mu$ F $\pm$ 20% 16V Ceramic Capacitor X5R 0603 (1608 Metric)                                                                     | TDK Corporation                | C1608X5R1C106M08 0AB |
| 0        | C2         | 0.1 $\mu$ F $\pm$ 10% 16V Ceramic Capacitor X7R 0603 (1608 Metric)                                                                    | Würth Electronics              | 885012206046         |
| 1        | D1         | Rectifier Diode, Schottky, 1 Phase, 1 Element, 20V V(RRM), Silicon                                                                    | Nexperia                       | PMEG2010ER,115       |
| 1        | D2         | Green 568nm LED Indication - Discrete 2.2V Radial                                                                                     | Würth Electronics              | 151031VS06000        |
| 2        | J1, J2     | Board Connector, 2 Contact(s), 1 Row(s), Male, Right Angle, 0.079-inch Pitch, Solder Terminal, Locking, Natural Insulator, Receptacle | TE Connectivity AMP Connectors | 440055-2             |
| 1        | Q1         | Small Signal Bipolar Transistor, 1A I(C), 40V V(BR)CEO, 1-Element, NPN, Silicon, TO-236AB                                             | Nexperia                       | PMMT491A,215         |
| 1        | R1         | General Purpose Chip Resistor, 390 Ohm, $\pm$ 1%, -55 to 155 degC, 0603 (1608 Metric), RoHS, Tape and Reel                            | Yageo                          | RC0603FR-07390RL     |
| 1        | R2         | 510 Ohms $\pm$ 1% 0.1W, 1/10W Chip Resistor 0603 (1608 Metric) Moisture Resistant Thick Film                                          | Yageo                          | RC0603FR-07510RL     |
| 1        | R3         | 10 MOhms $\pm$ 1% 0.1W, 1/10W Chip Resistor 0603 (1608 Metric) Moisture Resistant Thick Film.                                         | Yageo                          | RC0603FR-0710ML      |
| 1        | SW1        | SWITCH SLIDE SP4T 0.3A 30V                                                                                                            | C&K                            | SS14D01VG3           |
| 1        | U1         | GreenPAK Ultra-small Programmable Mixed-signal Matrix                                                                                 | Renesas Electronics            | SLG46108V            |

### 3.3 Board Layout

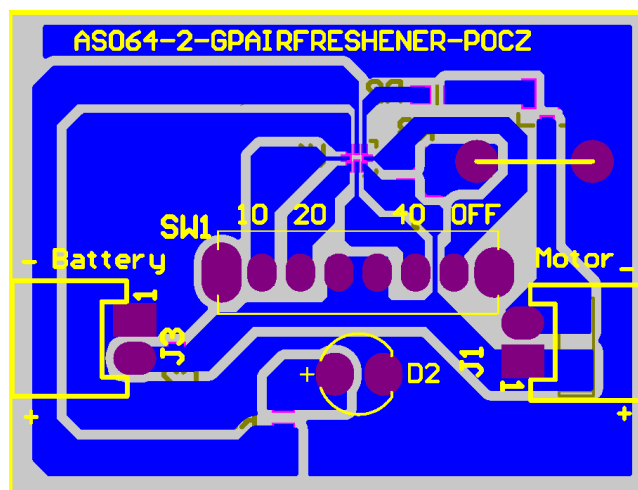


Figure 6. Multilayer Layout Image

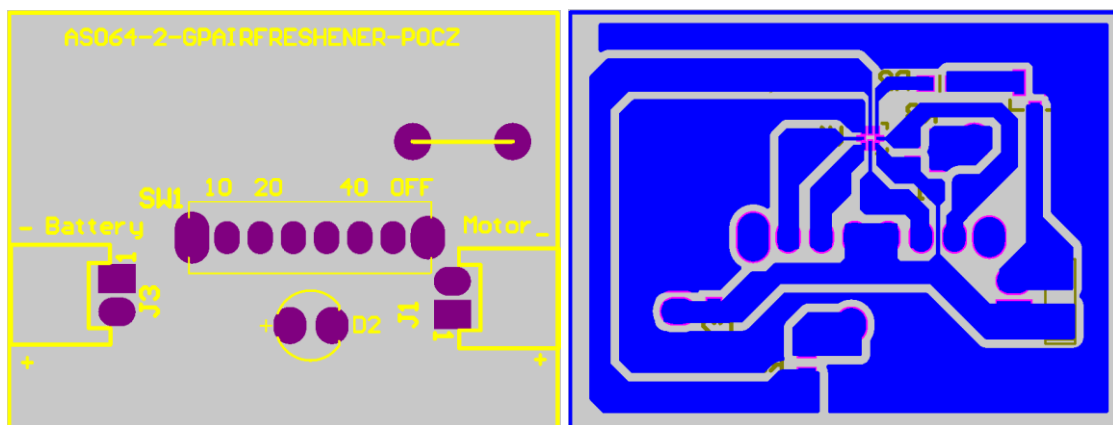


Figure 7. Top and Bottom Layer

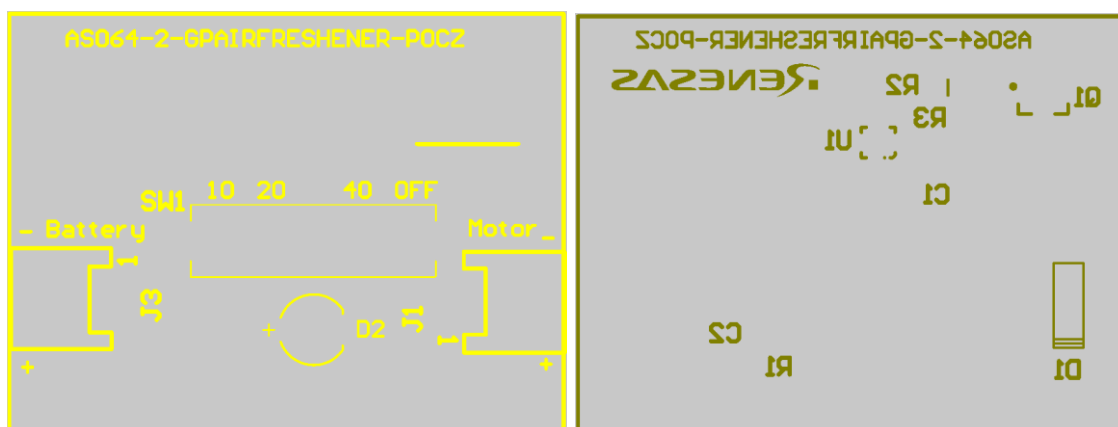


Figure 8. Top and Bottom Silkscreen/Overlay

## 4. AS064-2-GPAIRFRREFZ Software

### 4.1 Specifications

Table 2: Peripheral Function and Uses

| Peripheral Function                | Use                                                                                                                                                                           |
|------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| On Chip RC Oscillator (25KHz/2MHz) | We are using an on-chip RC oscillator at 25KHz frequency.                                                                                                                     |
| Counter/Delay Block                | We are using a total of four counter/Delay blocks. Two are dedicated for use in counter mode to generate a delay of 5s and 600s, and the other two are for use in Delay mode. |
| Programable Delay Block            | Programable Delay block used in a rising edge detector mode.                                                                                                                  |
| PIN-2 (GPI)                        | Switch input for 40 min mode.                                                                                                                                                 |
| PIN-3 (GPI)                        | Switch input for 20 min mode.                                                                                                                                                 |
| PIN-4 (GPI)                        | Switch input for 10 min mode.                                                                                                                                                 |
| PIN-6 (GPO)                        | Output for motor control.                                                                                                                                                     |
| PIN-7 (GPO)                        | Output for LED.                                                                                                                                                               |
| PIN-8 (GPI)                        | Switch input for OFF-Mode/ Oscillator power down mode.                                                                                                                        |

### 4.2 Switch States

Switch configuration for different modes.

Table 3: List of Pins to be Used

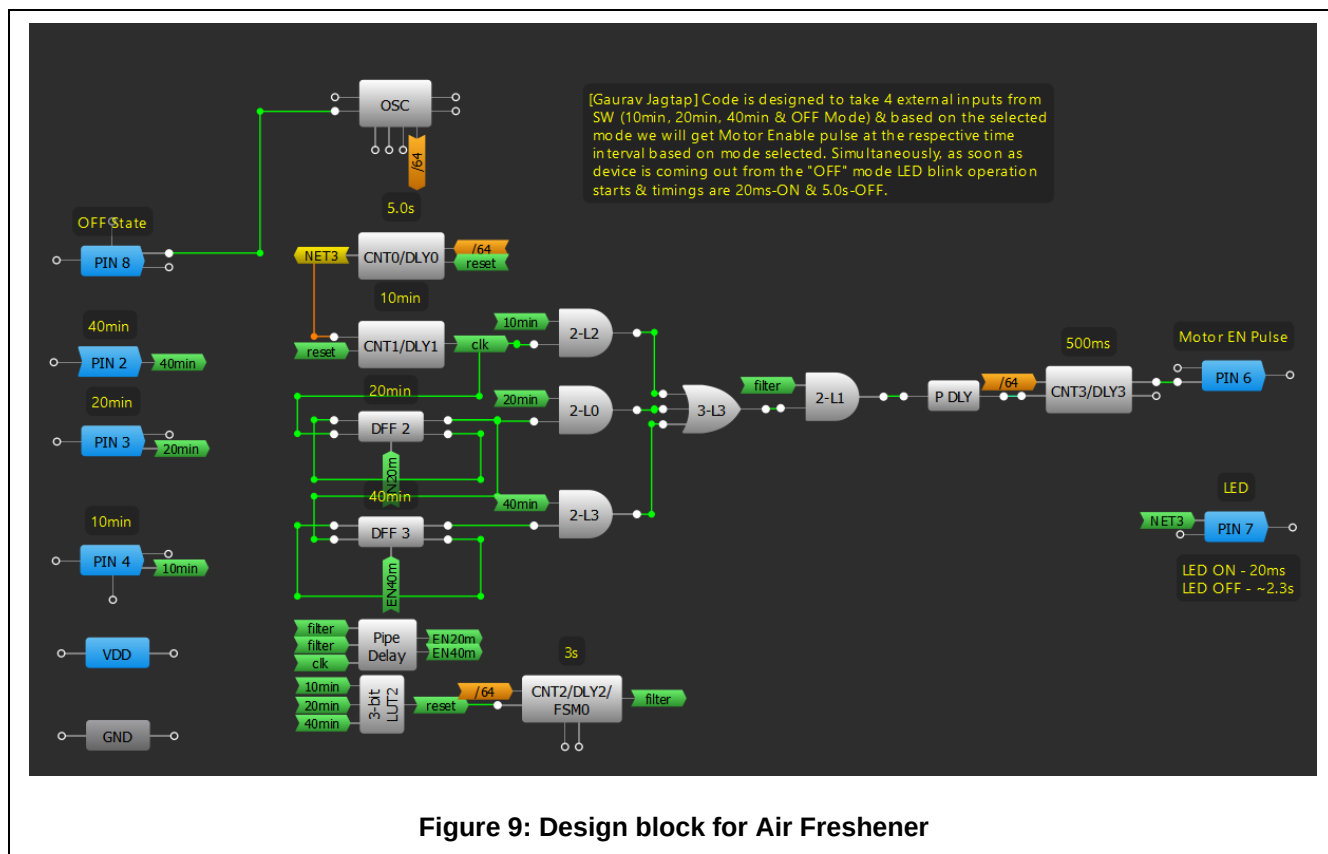
| Modes  | PIN-2 | PIN-3 | PIN-4 | PIN-8 |
|--------|-------|-------|-------|-------|
| Off    | 0     | 0     | 0     | 1     |
| 40 min | 1     | 0     | 0     | 0     |
| 20 min | 0     | 1     | 0     | 0     |
| 10 min | 0     | 0     | 1     | 0     |

## 5. Software Overview

### 5.1 Go Configuration Code Design and Code Flashing Steps

To design your own code or create your own custom logic IC in “Go Configure” please refer the [GreenPAK Cookbook](#) on the Renesas website. In addition, by installing the free tool called [Go Configure](#), you can then start your design.

1. Design blocks for Air Freshener:
  - a. Main clock source: Internal RC oscillator of 25KHz.
  - b. CNT0 block for 5 Sec pulse.
  - c. CNT1 block for 10 Min delay implementation.
  - d. CNT2 block for 5s delay implementation to filter un-desired pulse.
  - e. CNT3 block is to set the Motor ON pulse width.
  - f. Other standard logic blocks and digital gates to filter out the unwanted pulses in order to smoothen operation of the Air Freshener logic.



2. Adhere to the following settings to flash the SLG46108V device with Air Freshener code/logic:
  - a. Place an unprogrammed SLG46108V device into the socket adapter.
  - b. Connect the socket adapter (including blank chip) to the “GreenPAK Universal Development Board”. (see Figure 10)
  - c. Connect the GreenPAK Universal Development Board with the PC using the USB cable.
  - d. Open the Air Freshener Code (.gp3) file in “Go Configure Tool” (see Figure 11).
  - e. Press debug button from toolbar and select the correct development board (Figure 11).
  - f. Press program button from debugging control panel window (see Figure 11).

- g. Confirm and click on “OK” for the pop-up showing the “One Time Programmable (OTP)” message.

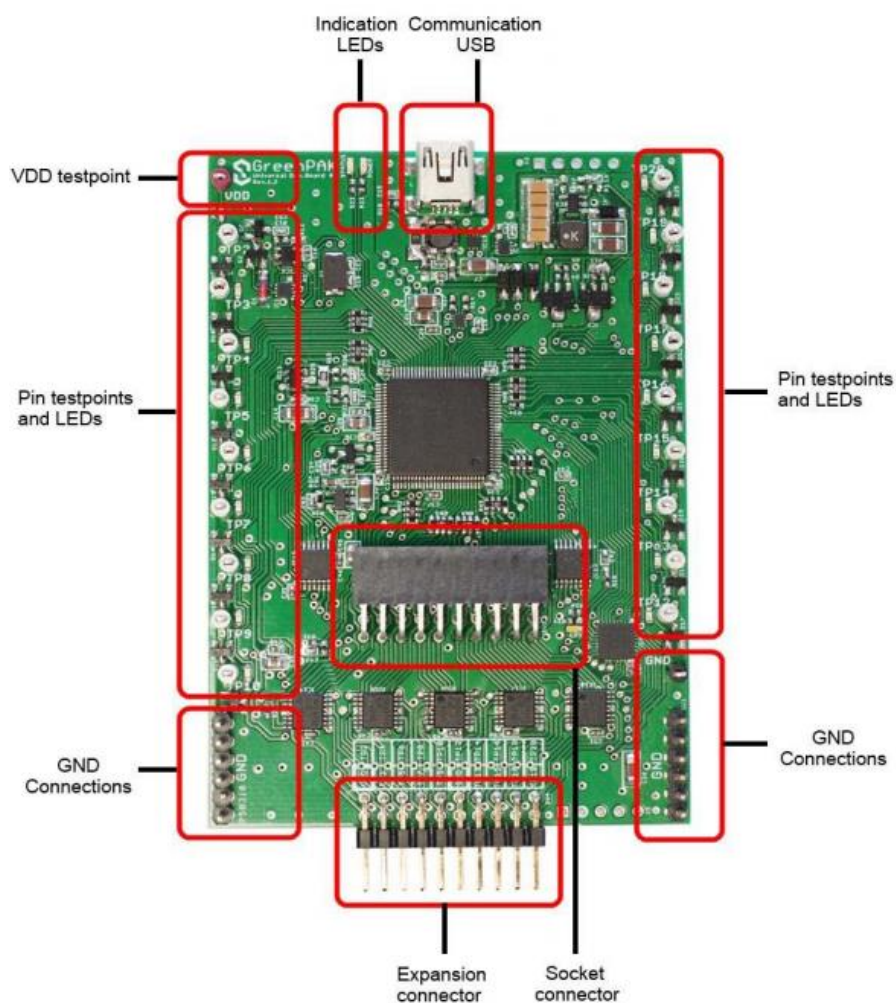


Figure 10. Build and Download the Project

## AS064-2-GPAIRFRREFZ Quick Start Guide

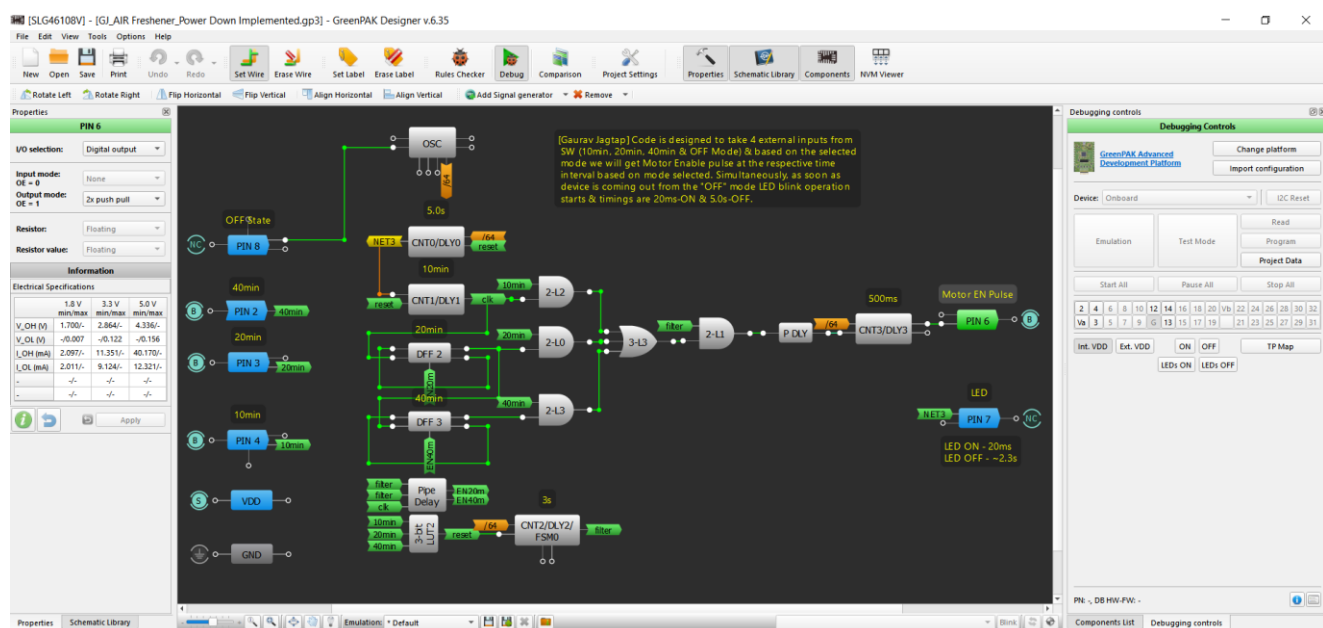
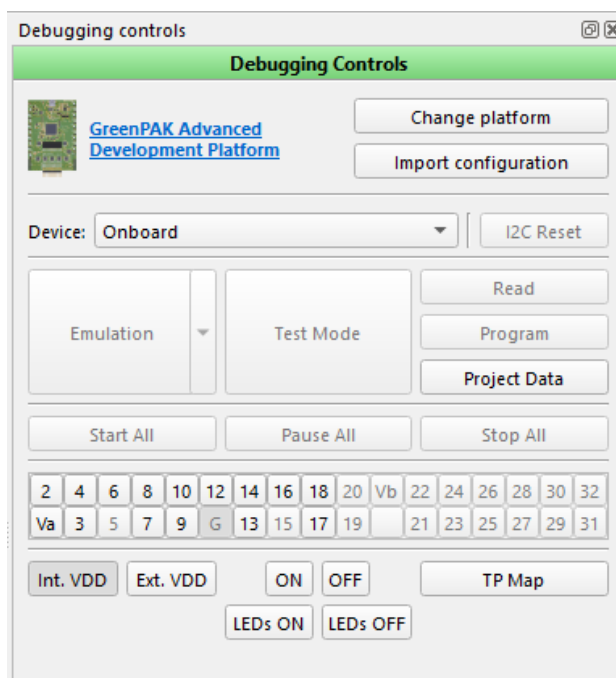


Figure 11. GreenPAK Configuration Setup

## 6. Device Setup

### Device Setup

1. Open the dispenser – Press the designated button or release latch to open the front cover.
2. Insert the batteries – Place two AA batteries into the battery compartment.
3. Insert the refill canister – Place the refill canister inside the dispenser with the nozzle facing outward.
4. Timer settings – The control panel allows you to set the frequency of fragrance release. Common settings include 10 minutes, 20 minutes, 40 minutes, etc.
5. Power on/off – An on/off switch or button to activate the device.

### Operation

1. Automated dispensing – When turned on and set, the dispenser automatically sprays a burst of fragrance at the set intervals. The intervals are 10 minutes, 20 minutes, and 40 minutes.
2. Spray mechanism – A small, motorized mechanism presses down on the nozzle of the refill canister to release the fragrance into the air.
3. LED indicators – LED indicators are provided below the Timer setting switch to indicate to the user that the device is turned on.

### Device Specifications

The AS064-2-GPAIRFRREFZ is a battery-operated Air Freshener dispenser designed to release fragrance at set intervals. The following is an overview of its circuit and components:

1. GreenPAK – SLG46108V is used, controlling the timing and activation of the spray mechanism.
2. Power supply – Typically, 2 AA batteries are used to provide the necessary power.
3. Motor – Operates the spray mechanism to release the fragrance.
4. Actuator – Mechanically linked to the motor; it presses down on the aerosol can nozzle to release the fragrance.
5. LED indicator – Shows the operational status of the device; that is, when it is on, off, or when batteries are low.
6. Switches/buttons – For setting the spray intervals and turning the device on or off.



Figure 12. Air Freshener Unit

## 7. Ordering Information

| Part Number         | Description                                               |
|---------------------|-----------------------------------------------------------|
| AS064-2-GPAIRFRREFZ | Cost-effective NVM Configurable (GreenPAK™) Air Freshener |

## 8. Revision History

| Revision | Date         | Description      |
|----------|--------------|------------------|
| 1.00     | Oct 25, 2024 | Initial release. |

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