

Ambient Lighting

I. Basic Product Information

1. Product Name: Ambient Lighting (F0434-AW Automotive Roof Rack Ambient Lighting (RGB, Dynamic))
2. FCC ID:2BU4W-F0434
3. Wireless Function:

Bluetooth Low Energy	
Operation Frequency	2402-2480 MHz
Channel Number	40 Channels for BLE (DTS)
Modulation Technology	GFSK
Data Rates	1/2Mbps
Antenna Type And Gain	PCB Antenna, 1.13dBi

4. Application Scenarios: Off-road modifications and retrofits for passenger vehicles
5. Compliance: Certified to ECE R10, CE, and RoHS standards; IP65 waterproof rating; meets 9-16V operating voltage standards for passenger vehicles
4. Key Features: Equipped with 0.2W RGB-specific LEDs and a Bluetooth control module; includes 2 sets of side lights + 1 set of tail lights; comes with a 1-to-2 wiring harness; available in multiple color lens designs

II. Core Description of Bluetooth Functionality

The product's Bluetooth module serves as the core control component, enabling wireless connection and control between mobile devices and the ambient lighting system. It is compatible with the 9–16V operating voltage environment of passenger vehicles. The Bluetooth control functionality is deeply integrated with the product's lighting system. Specific features are as follows:

1. Memory-based Power-On Synchronization: The product illuminates immediately upon power-up. The Bluetooth module wakes up simultaneously and remembers the previous Bluetooth control mode, eliminating the need for repeated setup and ensuring seamless operation.
2. Comprehensive Lighting Adjustment: By connecting to the Bluetooth module via a mobile app, users can freely control the light colors (based on RGB LEDs: R: 620–630 nm, G: 520–530 nm, B: 460–470 nm, covering the full color spectrum) and brightness (precise adjustment within the brightness ranges of R: 200–500 mcd, G: 800–1300 mcd, B: 100–300 mcd).
3. Dynamic Effect Switching: Bluetooth control supports one-touch switching between dynamic effects such as flowing lights, steady-on, and color fading, meeting the visual needs of different scenarios. Dynamic effects operate stably and are perfectly matched with the 3.5–5.5V voltage standard of the LED chips.
4. Precise Mode Configuration: By connecting via Bluetooth to the mobile app, users can switch between static and dynamic modes, configure dedicated white light modes, and precisely control the lighting's operational state. For example, in full-white mode, it achieves a stable output of 550mA $\pm$ 20% input current.
5. Multi-Group Lighting Coordination: The Bluetooth module can simultaneously control 2 sets of side lights and 1 set of tail lights, enabling unified adjustment of color, brightness, and dynamic effects across multiple lighting groups to ensure consistency in the lighting display.

III. Core Advantages of Bluetooth Functionality

1. High Convenience: Free from the limitations of traditional physical buttons, the system uses a mobile app via Bluetooth for wireless, long-range, and contactless control. The intuitive interface allows for one-step mode switching and parameter adjustment, meeting the convenience needs of automotive aftermarket modifications.
2. Superior Control Precision: Stable Bluetooth signal transmission allows for precise matching of RGB LED wavelengths and brightness parameters, enabling accurate color tuning across the full spectrum and stepless brightness adjustment. It also precisely controls core metrics such as lighting current and luminous flux.
3. Strong Compatibility and Adaptability: The Bluetooth module supports the 9–16V universal voltage common in passenger vehicles, ensuring high compatibility with the product's power supply system. It also supports mainstream mobile operating systems, offering fast connection speeds, stable pairing, and no noticeable latency, meeting the connectivity demands of complex operating environments in off-road modified vehicles.
4. Excellent Functionality Expansion: The Bluetooth control program reserves space for mode expansion, allowing for the addition of dynamic effects, lighting scenes, and other features based on customer needs. It also supports retrofitting with product trim components without affecting the core Bluetooth control functions.
5. Excellent Stability and Reliability: The Bluetooth module is matched with the product's IP67 waterproof rating, making it suitable for the complex outdoor environments of off-road vehicles. It features strong anti-interference capabilities, maintaining a stable Bluetooth connection while the vehicle is in motion without disconnections or lag. It works in tandem with core components such as LED chips and light boards to ensure the stability of the entire lighting system (the total current of the L/R LEDs on the light board can be stably controlled at $610\text{mA} \pm 15\%$).
6. Aligned with aftermarket demands: The Bluetooth wireless control design meets the personalized needs of automotive aftermarket modifications, enabling custom lighting effects. Combined with a memory function, it significantly enhances the user experience and addresses key pain points in the off-road vehicle modification market.

IV. Bluetooth Functionality Assurance

The Bluetooth control functionality of this product has been incorporated into the core testing criteria for final product inspection. Each unit undergoes comprehensive testing covering the entire process—including Bluetooth connectivity, function adjustment, and mode memory—to ensure 100% operational reliability of the Bluetooth features. Additionally, product development strictly adheres to customer technical specifications; the compatibility and stability of the Bluetooth module with the lighting system have undergone rigorous functional and environmental testing, meeting the standards for both initial small-batch production and subsequent SOP mass production.

VI. Warning

§15.19

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions:

- (1) This device may not cause harmful interference,
- (2) this device must accept any interference received, including interference that may cause undesired operation.

§15.21

The users manual or instruction manual for an intentional or unintentional radiator shall caution the user that changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment. In cases where the manual is provided only in a form other than paper, such as on a computer disk or over the Internet, the information required by this section may be included in the manual in that alternative form, provided the user can reasonably be expected to have the capability to access information in that form

§15.105

NOTE: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/ TV technician for help.

This device and its antenna(s) must not be co-located or operation in conjunction with any other antenna or transmitter.

FCC Radiation Exposure Statement:

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance 20cm between the radiator&your body.