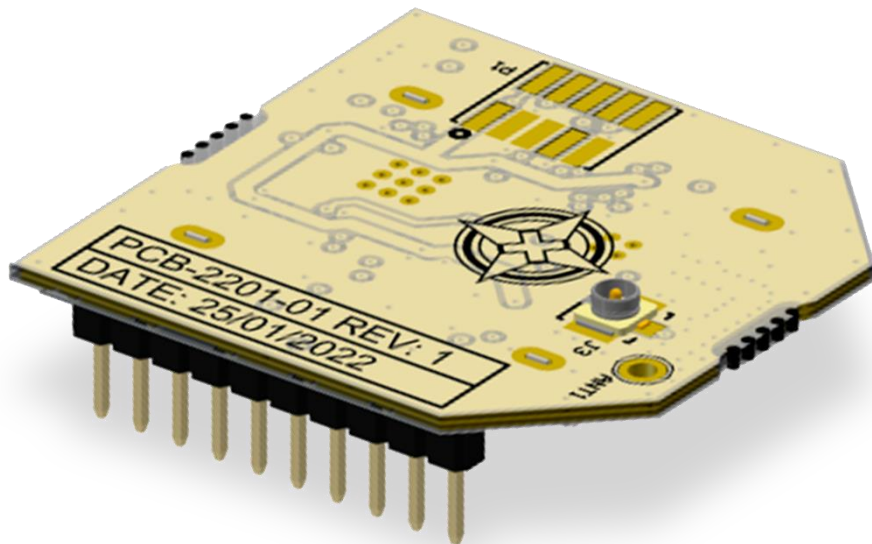


AV-RFM-01

Radio Frequency Module

Product Documentation





1.0 Introduction

The AV-RFM-01 is a wireless communication module which operates in the 2.4GHz ISM band. It is designed to provide the radio interface for Sealite products to be controlled wirelessly using the AvMesh™ network.

The AV-RFM-01 is to be used in Sealite products only and is not for sale to third parties.

User manual integration instructions are internal, confidential manufacturing documents.

1.1 AvMesh™ Communications System

The AvMesh™ Communications System is a wireless communication platform which operates by broadcasting signals from a wireless remote controller to the lights in the system via a 2.4GHz encrypted mesh network.

Instead of connecting to all other devices through a single centralized point, the lights, also known as nodes, act as centralized points and connect to all other nodes that are nearby in the mesh network. The nodes send signals to other nodes that are within range and the signals are passed from node to node until the final destination is reached. This allows all the lights in the system to be controlled wirelessly, even if the final destination is out of range of the wireless controller.

The mesh network is made up of a primary network and reserve network. The primary AvMesh™ network serves as the main pathway for signal propagation through the system. The secondary network provides a backup path for the signals if the primary network fails.

In the AvMesh™ Communications System, signals are sent from a wireless remote controller to the lights that are within range (approximately 1.4km but this may decrease depending on a number of factors). From here, the signal is re-sent by the nodes to the other lights within range (approximately 300m but this may decrease depending on a number of factors) until the signal has been sent to all of the lights throughout the entire mesh network. It is important to note that the signals mostly rely on line-of-sight propagation in order to be transmitted and received by the lights. If the lights are not in direct line of sight to each other, they will not be able to pass on the signals.

As the message propagates through the area such as a runway, each node delays repeating the signal by 0.6-3.2 seconds. This is done so that the nodes are not repeating over the top of the controller or each other. It is important to note that for distances greater than the operational range of the lights, there may be a delay in those lights receiving the information, as the further away the lights are from the controller, the longer it will take the signal to propagate to all lights in the system.

1.1.1 Node Information

Each light in the AvMesh™ Communications System is capable of determining whether or not it needs to become a node and repeat commands in the mesh network. The lights are able to configure themselves as either primary or reserve nodes or remain as listen only lights depending on what is required to provide the airfield enough coverage.



Primary Node

The primary nodes make up the primary network. This node is able to receive and decode signals from the Avlite wireless remote controller, another primary node or a reserve node and act upon the signal itself. The primary node is able to pass on the received signal to other lights within range. 4.1 Node Information AvMesh® RF Communications Systems Installation & Service Manual Latest products and information available at www.avlite.com 21

Reserve Nodes

The reserve nodes make up the reserve network. This type of node is able to receive and decode signals from either the Avlite wireless remote controller, a primary node or another reserve node and act upon the signal itself. The reserve node is also able to pass on the received signal to other lights within range.

Listen only Lights

A light is configured as listen only upon first start-up. Listen only lights receive and decode signals from either the Avlite wireless remote controller, a primary node or a reserve node and acts upon the signal itself. However, listen only lights are not able to pass on signals to other lights.

From the above descriptions, the primary and reserve nodes are, in essence, repeaters as they repeat the received signals to all the other lights within range. This includes all light groups, not just the light groups they belong to. The light groups they do not belong to will simply pass the signal on to the surrounding lights within range and will not act upon the signal. Primary and reserve nodes are therefore required to behave as both a transmitter and receiver

2.0 AV-RFM-01 Theory of Operation

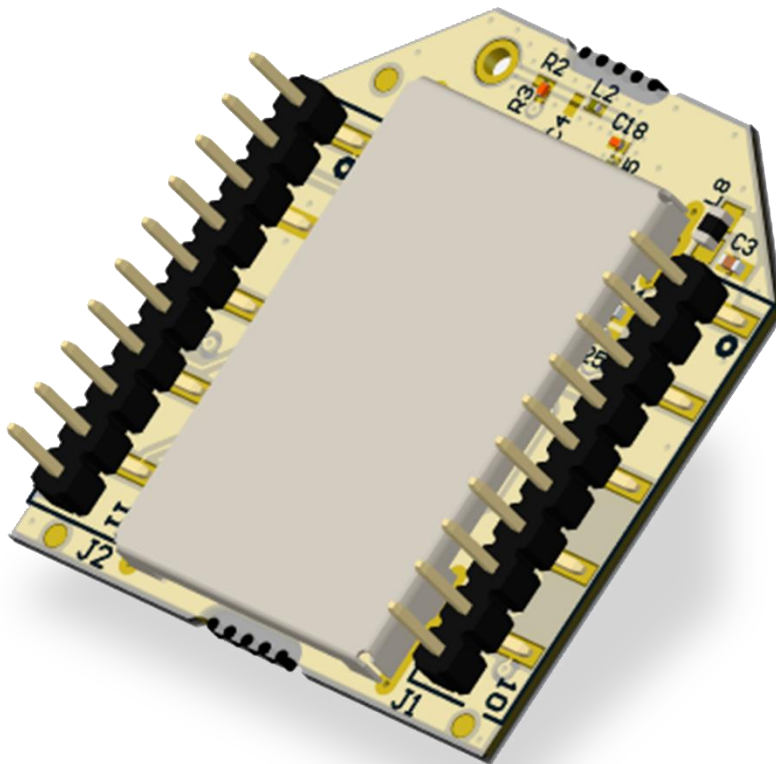
The AV-RM-01 is a 2.4GHz wireless communication module which interfaces to a host MCU through a serial UART to act as a wireless serial communications interface. The circuit of the device is composed of a Nordic nRF52833 multiprotocol SoC combined with an nRF21540 front-end module to boost the transmit power for longer operational range. The module operates using an 802.15.4 propriety protocol.

The radio RF signal from the Nordic nRF21540 front-end module is passed to a U.FL connector for connection to an external antenna. The antenna used during compliance testing is a TE connectivity 2118059-1 flat patch PCB antenna with a peak gain of +4dBi. To ensure RF signal integrity, the ground is common to all circuit elements and connected to the host device ground through the interface connectors.

3.0 Product Design

Dimensions	28.25mm x 27.50mm x 7.50mm
Weight	4g (approx.)
Power Requirements	3.3VDC

An EMC shield is installed on the underside of the radio module.





4.0 Product Compliance

Compliance statement (FCC Part 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 interference; and

(2) This device must accept any interference, including interference that may cause undesired operation of the device."

Modification warning (FCC Part 15.21)

Warning: Any changes or modifications not expressly approved by the grantee could void the user's authority to operate this equipment

Information to the user (FCC Part 15.105), Class B product

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

FCC MPE RF Exposure statement

This equipment complies with the FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with a minimum distance of 20 cm between the radiator and all persons during normal operation.