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AIM4M1 Module User Guide

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Revision History

Date	Author	Description
12/02/2009	C. Leidigh	Initial draft

01/10/2010	C. Leidigh	Added antenna and mounting sections
01/13/2010	C. Leidigh	Corrected output power, LDO voltage

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Definitions

ISM: Industrial, Scientific, and Medical radio bands intended for unlicensed operation

LMA: Limited Modular Approval

LDO: Low Dropout Regulator

Related Documents

Block Diagram

Schematic Diagrams

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System Overview

The Alektrona AIM4M1 RF module is intended to be used for devices and systems requiring communication using the 2.4GHz IEEE 802.15.4 low power radio standard for the ISM band. The module, when mounted on a PCB and combined with an antenna and i/o processor (supporting system) provides a complete mechanism to communicate with other standard 802.15.4 based devices. Under FCC rules, the module can be used with its LMA (Limited Module Authorization) when the following conditions are met:

1) The end user product\system must utilize one of the approved antenna types specified in the antenna section and Appendix A.

2) The end user product\system must mount the module on a PCB per the mounting description in Appendix B using an Alektrona provided supporting system.

3) The end user product\system must incorporate the Alektrona furnished i/o driver so as to meet the duty cycling control requirements per the LMA.

Module Description

The module is a system including a fully 802.15.4 compliant radio with a power amplifier and low noise amplifier achieving a nominal +18dBm transmit output and a receive sensitivity of 96dBm. For FCC\IC compliance the unit is shielded and has buffered I/O and a Low Dropout Regulator for local voltage regulation. The module will accept a DC input voltage of 3.0VDC to 5.5VDC. The local LDO maintains a module voltage of 3.1VDC. Radio communication is achieved using the SPI I/O lines and the RF output is connected to an external, approved antenna. Within the confines of the LMA grant, the module must be incorporated into an Alektrona assembly or product with a base PCB and Supporting System.

Supporting System: Host Processor and Duty Cycling Driver

The AIM4M1 module is always provided with an Alektrona supporting system with the host processor and driver. The supporting system will also include one of the approved antenna types.

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Antenna

The AIM4M1 is approved for use with specified antennas. The antennas will either be permanently attached as in the case of the PCB F antenna on the Alektrona support board or in conjunction with a non-standard antenna connector such as RP-SMA or UFL. See Appendix A for approved antennas.

Agency Approvals

United States (FCC)

The AIM4M1 module complies with Part 15 of the FCC rules and regulations. For products using the AIM4M1 module the following list of requirements must be met to fulfill FCC regulations:

1. A product containing the AIM4M1 where the FCC label on the module is not visible must contain a label with the FCC ID of the AIM4M1. An example of acceptable label text is given below:

> Contains FCC ID: XSY-AIM4M1
>
> The enclosed device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (i) this device may not cause harmful interference and (ii.) this device must accept any interference received, including interference that may cause undesired operation.

2. The AIM4M1 must be used with an approved antenna device (see Antenna section). Other antennas may be used provided that the installer has authorized such antennas not on the current approved list following Part 15.21 of FCC antenna requirements.

Notes:

1. The OEM must externally label devices per above requirements in order that the FCC ID is visible.

2. Internal and external antennas must provide a separation of 20 cm from all persons.

3. Any modifications not contemplated in this user guide may void the user's authority to operate this equipment (FCC section 15.21).

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4. This equipment has been tested 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 when the equipment is operated in commercial or residential installations. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications.

Canada (IC)

The AIM4M1 module complies with Industry Canada rules and regulations. For products using the AIM4M1 module the following list of requirements must be met to fulfill IC regulations:

1. A product containing the AIM4M1 where the IC label on the module is not visible must contain a label with the IC ID of the AIM4M1. An example of acceptable label text is given below. Labeling can also be combined with other required compliance labeling.

Contains IC ID: 8703A-AIM4M1

2. The AIM4M1 must be used with an approved antenna device (see Antenna section). The antenna type and gain chosen should not have an equivalent isotropically radiaated power (e.i.r.p.) no more than necessary for successful communication.

Notes:

1. The OEM must externally label devices per above requirements in order that the IC ID is visible.

2. The installer of this radio equipment must ensure that the antenna is located or pointed such that it does not emit RF field in excess of Heath Canada limits for the general population. Consult Safety Code 6, obtainable from Heath Canada's website www.hc-sc.gc.ca/rbp.

3. Any modifications not contemplated in this user guide may void the user's authority to operate this equipment under IC rules.

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Appendix A: Approved Antennas

Type A: Approved whip antennas

Manufacturer – Part Number	Description
Pulse engineering – W1030	¼ Wave, swivel, 2dBi, reverse SMA

Type B: Onboard PCB antenna, inverted F type

The approved inverted F antenna should be constructed with the exact dimensions in the table below. The design and dimensions are reproduced courtesy of Texas Instruments and detailed in TI Design Note DN007. Since the F antenna is constructed with no ground plane underneath it, PCB construction and thickness have no effect on the antenna. The attached microstrip should be constructed for a 50 ohm impedance.
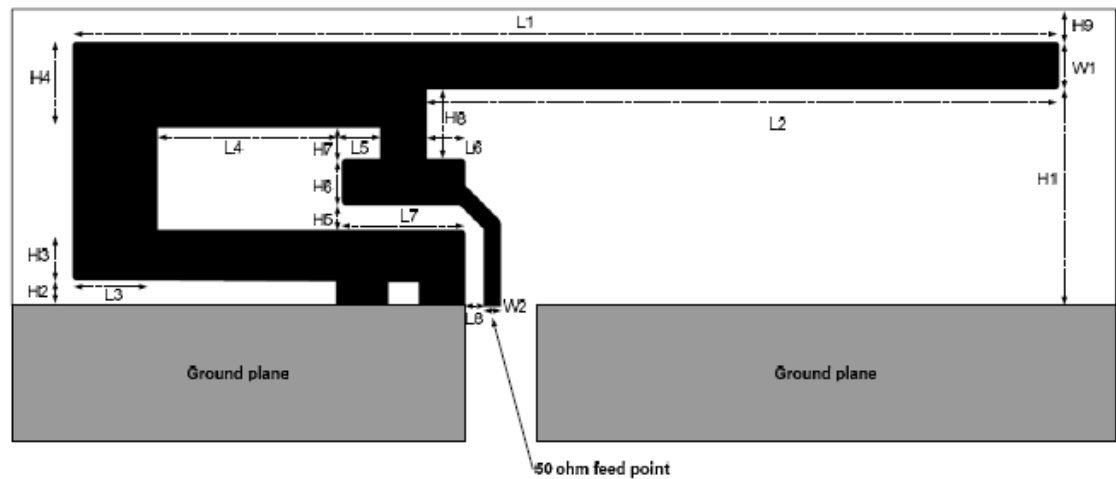

Figure 1. IFA Dimensions

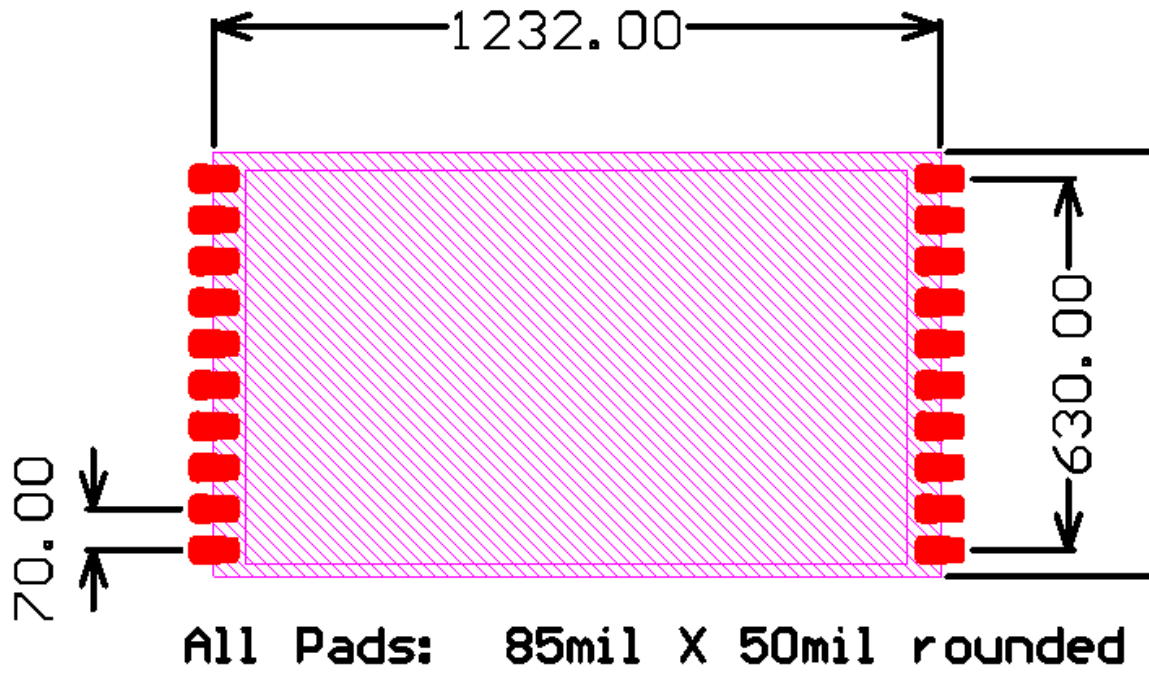|			
H1	5.70 mm	W2	0.46 mm
H2	0.74 mm	L1	25.58 mm
H3	1.29 mm	L2	16.40 mm
H4	2.21 mm	L3	2.18 mm
H5	0.66 mm	L4	4.80 mm
H6	1.21 mm	L5	1.00 mm
H7	0.80 mm	L6	1.00 mm
H8	1.80 mm	L7	3.20 mm
H9	0.61 mm	L8	0.45 mm
W1	1.21 mm		

Appendix A: AIM4 Module Land Pattern

Figure 1: AIM4 PCB Land Pattern, all dimensions in mils

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