



# AudioMagic™ Module Datasheet

Point-to-Multipoint AVMD7211-04 Listener for  
Wireless Audio Systems, based on Avnera's AV7211 IC

## General Description

Every consumer wants to be free from wires, but system designers could never find a low-cost, high-quality, easy-to-use wireless audio solution for speakers, microphones, headphones and headsets on the market.

Avnera's proprietary wireless system changes the game by taking a new approach to wireless audio. The wireless protocol was designed from the ground up and delivers uncompressed stereo audio over the air without interference problems.

Avnera's wireless modules offer a low-touch, easy-to-integrate wireless audio solution and enable fast time to market by already solving the problem associated with FCC, antenna tuning and board optimization.

Modules based on Avnera's AV72xx silicon (also known as AudioMagic 1.5G) provide breakthrough wireless audio functionality with point to multipoint transport of uncompressed stereo PCM audio data from a single AVMD7211 sender and a total of up to three simultaneous AVMD7212 listeners.

## Applications

- ✓ Wireless audio transmitter for portable audio player
- ✓ Wireless audio distribution hub for surround speakers

## Ordering Options

AVMD7211-04-ACNA: Analog-in, normal range

AVMD7211-04-ACPA: Analog-in, extended range

## Features

- ✓ Uncompressed audio, point to multipoint capable (1 to 3)
- ✓ Audio path SNR: Stereo 84 dB SNR, 48 kHz sampling rate
- ✓ Support for 14m (normal) and 30m (extended) range
- ✓ Frequency range: 2.4 GHz ISM band, continuous dynamic frequency selection
- ✓ Forward error correction coding, error detection, and audio-specific error concealment
- ✓ Diversity antennas for multipath and fading mitigation
- ✓ Connector: Edge contact via array supports surface mount
- ✓ Auto-search/synch and dynamic channel selection
- ✓ Low, fixed latency suitable for video lip-synch
- ✓ Support for 16, 20, 24, and 32 bit PCM words at 16, 22.05, 24, 32, 44.1, 48, and 96 kHz
- ✓ General purpose over-the-air (OTA) serial interface:
  - ✓ 2 kbps, bi-directional, full duplex
  - ✓ Support for meta-data and remote control commands



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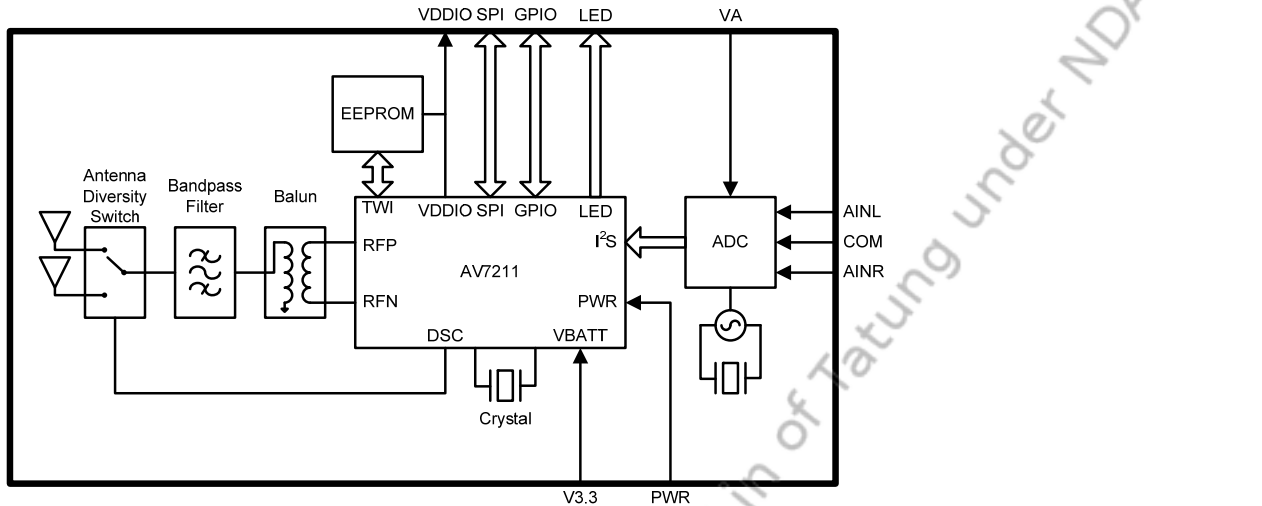
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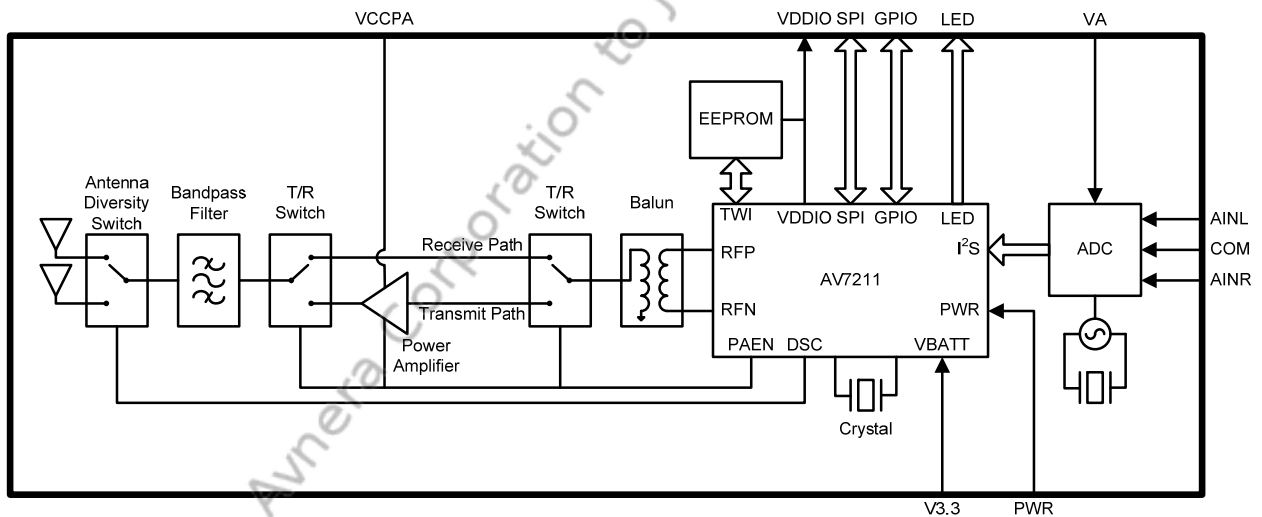
### 3 AVMD7211 Functional Block Diagrams

When paired with an AV7212-based companion receiving device, the AVMD7211 modules support group mode scenarios in which one sender can transmit audio to up to three listener modules simultaneously.

The nominal output power without PA is 0 dBm (normal range) and with a PA is +10 dBm (extended range) into the antennas.



**Figure 1: AVMD7211 Module Block Diagram without RF Power Amplifier (normal range)**



**Figure 2: AVMD7211 Module Block Diagram with RF Power Amplifier (extended range)**

**Table 1: AVMD7211-04 Module Block Diagram Description**

Interface	Description
SPI	The AVMD7111's SPI interface is used to allow an external host to control the AV7111 sender IC and to facilitate testing of the module.
GPIO/ LED	The GPIO and LED lines allow buttons and LEDs to be connected to the AVMD7111 to allow the user to control the AudioMagic™ system and communicate the system's state to the user.
AINL COM AINR	These three pins form the module's analog audio input. The COM pin is tied to analog ground on the module and should not be connected to ground in the host system.
PWR	This pin connects directly to the "PWR" pin on the AV7111 IC and is used to signal the module to power on and off.
V3.3 VA VCCPA	These pins provide power to various elements of the AVMD7111. The V3.3 pin, connected to the AV7111 IC's VBATT pin, supplies power to the AV7111. The VA pin supplies power to the ADC. On the PA-enabled version of the module, VCCPA supplies power to the RF power amplifier. In normal operation, all three pins are connected to the 3.3V (nom) main supply.
VDDIO	The VDDIO pin is connected to the VDDIO regulator bypass pin on the AV7111. The pin can be used to indicate when the AV7111 IC is powered on. Note that VDDIO must NOT be used to power an external device, nor should it be driven by an external supply.

## 4 AVMD7211 Pin Information

**Table 2: AVMD7211-04 Pin Information**

Pin Number	Pin Name	Type	Pin Description
1	VCCPA	Analog Power	RF power amplifier supply connection
2	AGND	Ground	Analog section ground
3	V3.3	Analog Power	3.3V power supply connection
4	AGND	Ground	Analog section ground
5	VA	Analog Power	ADC power supply (3.3 V)
6	AINL	Analog Input	Left-channel audio input.
7	COM	Analog Input	Analog common connection
8	AINR	Analog Input	Right-channel audio input
9	PWR	Analog Input	Power switch input
10	LED2	Digital Output	LED drive line
11	LED1	Digital Output	LED drive line
12	LED0	Digital Output	LED drive line
13	NC	NC	NC
14	NC	NC	NC
15	NC	NC	NC
16	GPIO6	Digital I/O	General-Purpose I/O
17	GPIO5	Digital I/O	General-Purpose I/O
18	DGND	Ground	Digital section ground
19	VDDIO	Digital Power	3.3V regulated voltage
20	GPIO4	Digital I/O	General-Purpose I/O
21	GPIO3	Digital I/O	General-Purpose I/O
22	GPIO2	Digital I/O	General-Purpose I/O
23	GPIO1	Digital I/O	General-Purpose I/O
24	SDO	Digital Output	SPI data output
25	SDI	Digital Input	SPI data input
26	SSB	Digital Input	SPI slave select, active low
27	SCLK	Digital Input	SPI data clock input
28	AGND	Ground	Analog section ground
29	AGND	Ground	Analog section ground
30	AGND	Ground	Analog section ground

5 AVMD7211 Mechanical Dimensions

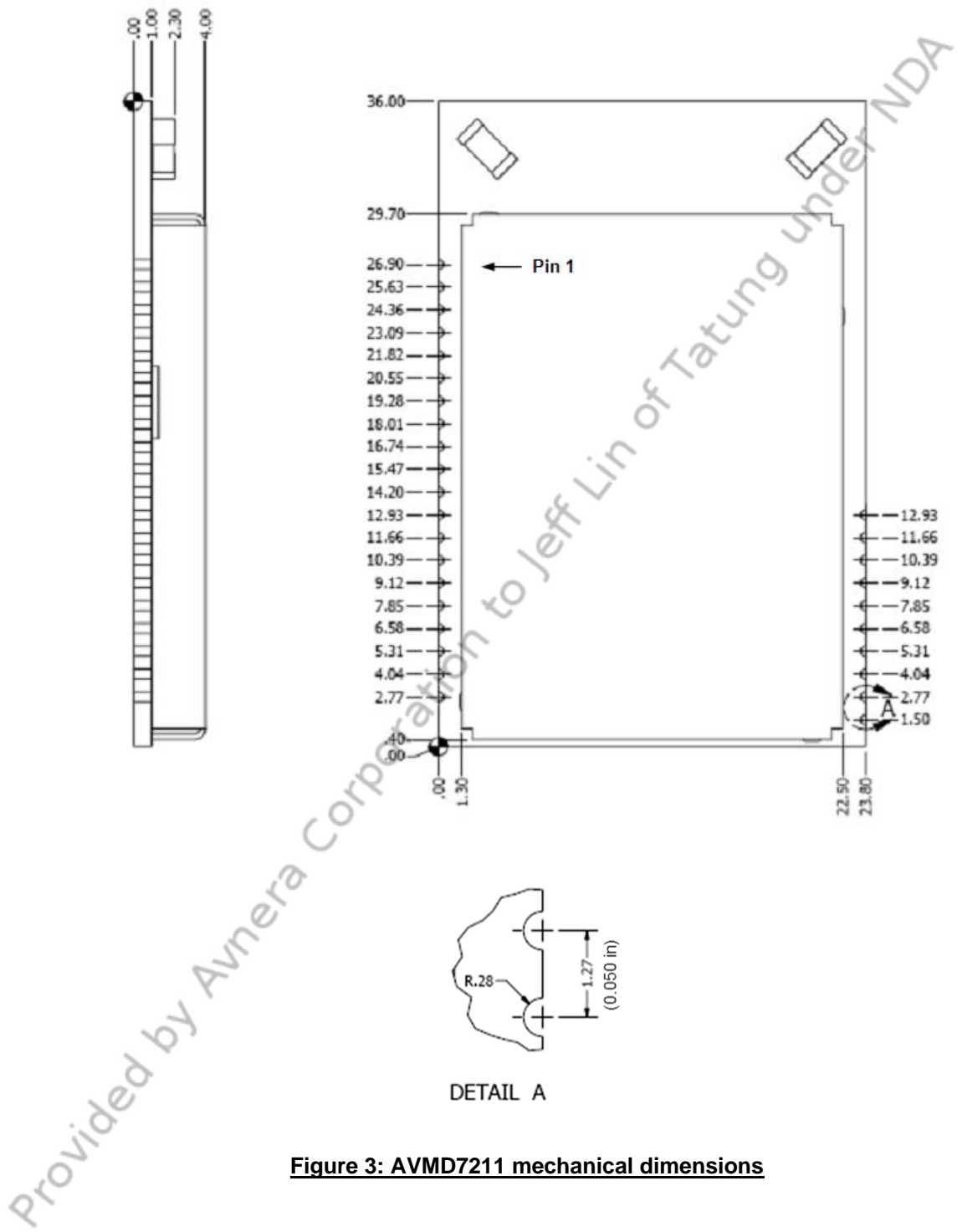


Figure 3: AVMD7211 mechanical dimensions

## 6 Electrical Specifications

### 6.1 Absolute Maximum Ratings

Absolute Maximum Ratings (AMR) are stress ratings only. AMR corresponds to the maximum value that can be applied without leading to instantaneous or very short-term unrecoverable hard failure (destructive breakdown). Stresses beyond those listed under AMR may cause permanent damage to the device.

Functional operation of the device at these or any other conditions beyond those indicated under "Recommended Operating Range" is not implied. Exposure to absolute-maximum-rated conditions for extended periods may adversely affect device reliability.

Device functional operating limits and guaranteed performance specifications are given under Electrical Characteristics at the test conditions specified.

CONDITION	MIN	MAX
VA Supply Voltage Input	-0.3V	6V
V3.3 Supply Voltage Input	-0.3V	4V
VCCPA Supply Voltage Input	0	6V
Input Voltage Range – Digital Inputs	-0.3V	$V_{DDIO} + 0.3V$
Input Voltage Range – Analog Inputs	-0.3V	$V_A + 0.3V$
Operating Temperature	-40°C	+85°C
Storage Temperature	-40°C	+100°C
Static Discharge Voltage – HBM *	1000V	

\*Terminology: HBM => ESD human body model

### 6.2 Recommended Operating Range

PARAMETER	MIN	TYP	MAX	UNIT
VA pin voltage	3.0		3.5	V
V3.3 pin voltage	3.0		3.5	V
VCCPA pin voltage	3.0		3.6	V
Ambient Temperature ( $T_A$ )	-20		70	°C



### 6.3 Electrical Characteristics

Test Conditions:  $T_A = +25^{\circ}\text{C}$

**Table 3; AVMD7211-04 Electrical Characteristics**

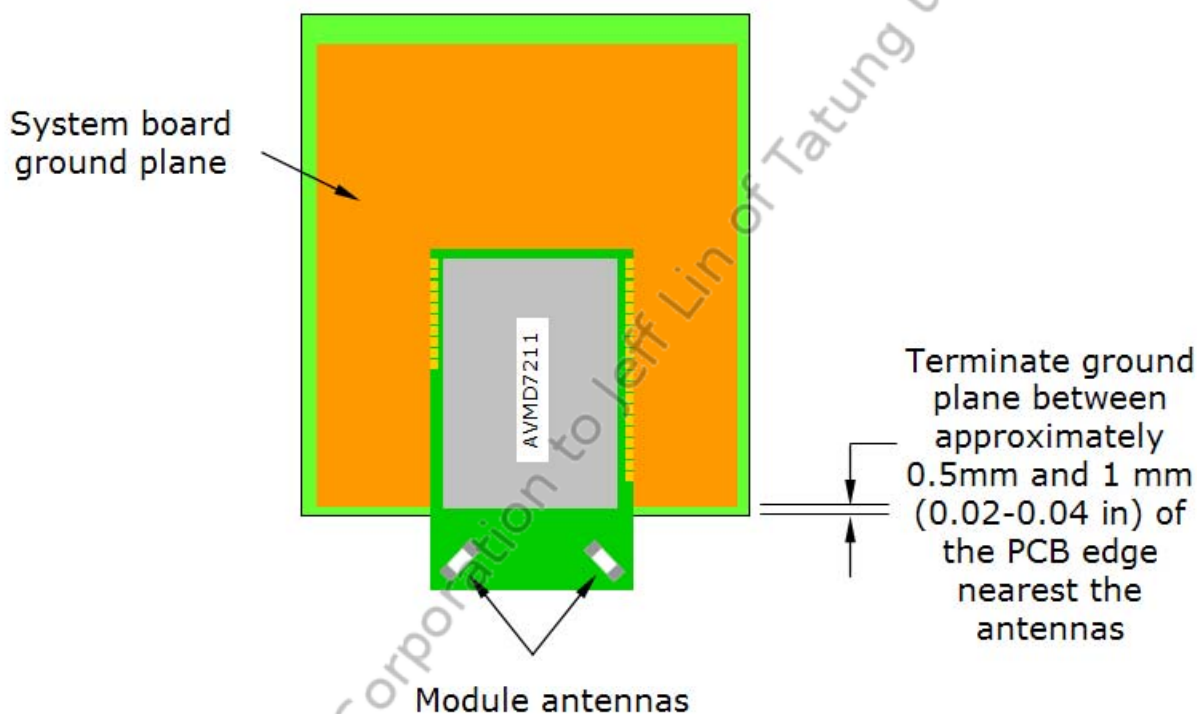
PARAMETER	CONDITIONS	MIN	TYP	MAX	UNIT
RF Frequency Range		2405		2477	MHz
Audio Input Voltage	VA is the level on the ADC power pin	0.51* VA		0.57* VA	V <sub>PK</sub>
Audio Input Pin Impedance		9.78		10.18	k $\Omega$
Audio SNR			90		dB
Audio THD+N			-74		dB
Audio Input Impedance			9k		ohms
Range (LOS) <sup>1</sup>	Normal range		14		m
	Extended		30		m
Current consumption (normal range)	V3.3 (Active Audio Mode)		63		mA
	V <sub>CCPA</sub>		0		mA
Current consumption (extended range)	V3.3 (Active Audio Mode)		63		mA
	V <sub>CCPA</sub>		110		mA

<sup>1</sup> LOS Line of sight

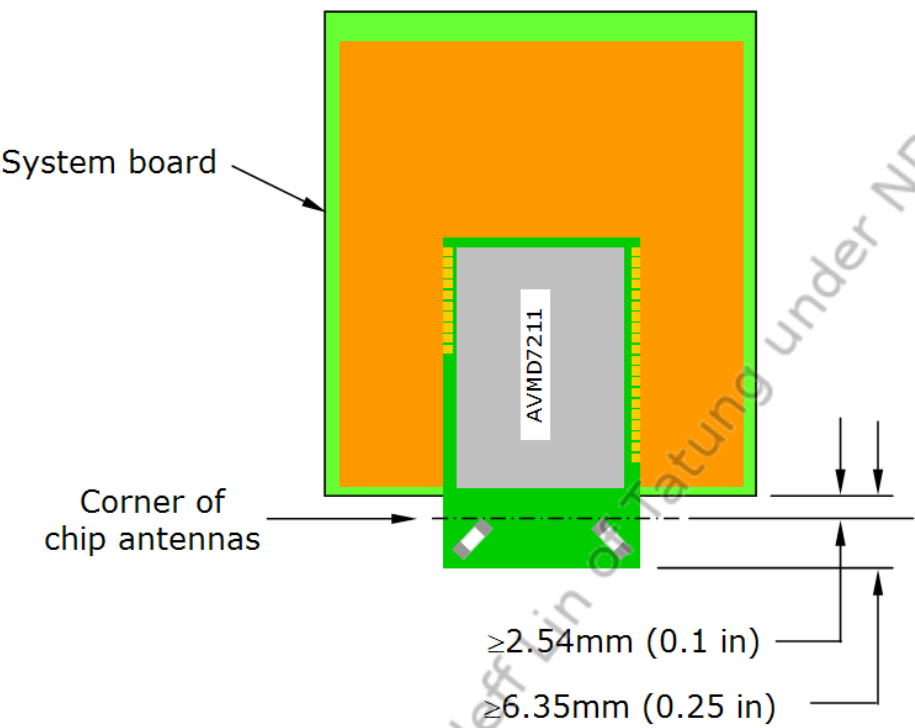
## 7 Application information

### 7.1 Mechanical requirements

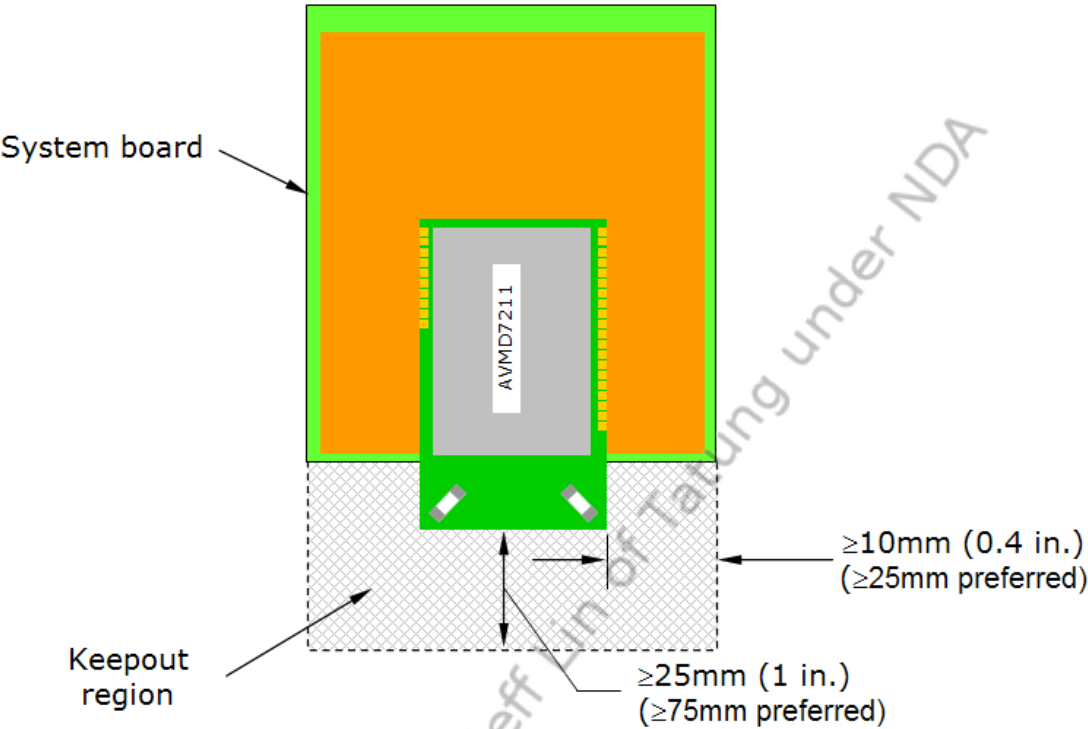
The AVMD7211 module is designed to be surface mounted directly to a supporting system board. The antennas are tuned to the correct impedance and band center in the presence of the module circuit board, without any other close-by materials. As such, in the final application the module must be positioned in such a way that all foreign material, including other circuit boards, ground plane, other metal structures, and enclosure components, must be kept away from the antennas. The diagrams in the figures below provide guidance for mounting the module as well as configuring the system board in the vicinity of the module itself.



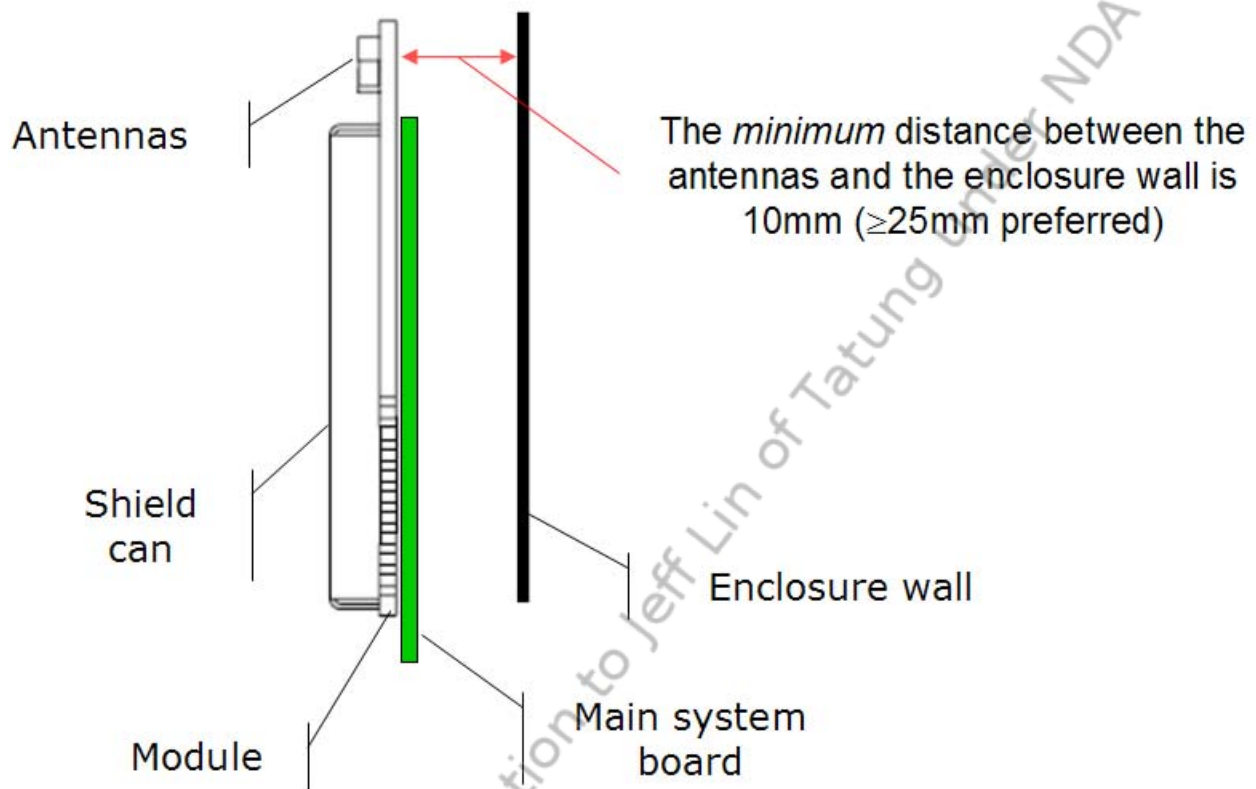
**Figure 4: Main board ground plane guidelines in the vicinity of the module**



**Figure 5: Module mounting requirements on the main board**



**Figure 6: Keep out requirements around the antenna of the module**



**Figure 7: Enclosure spacing requirements around the antenna end of the module**

## 7.2 Application circuit

The schematic shown below represents a generic application, showing how the AVMD7212 would be connected to the outside world for the purposes of control, power supply, and analog output.

TBD

Figure 8: AVMD7211 application schematic

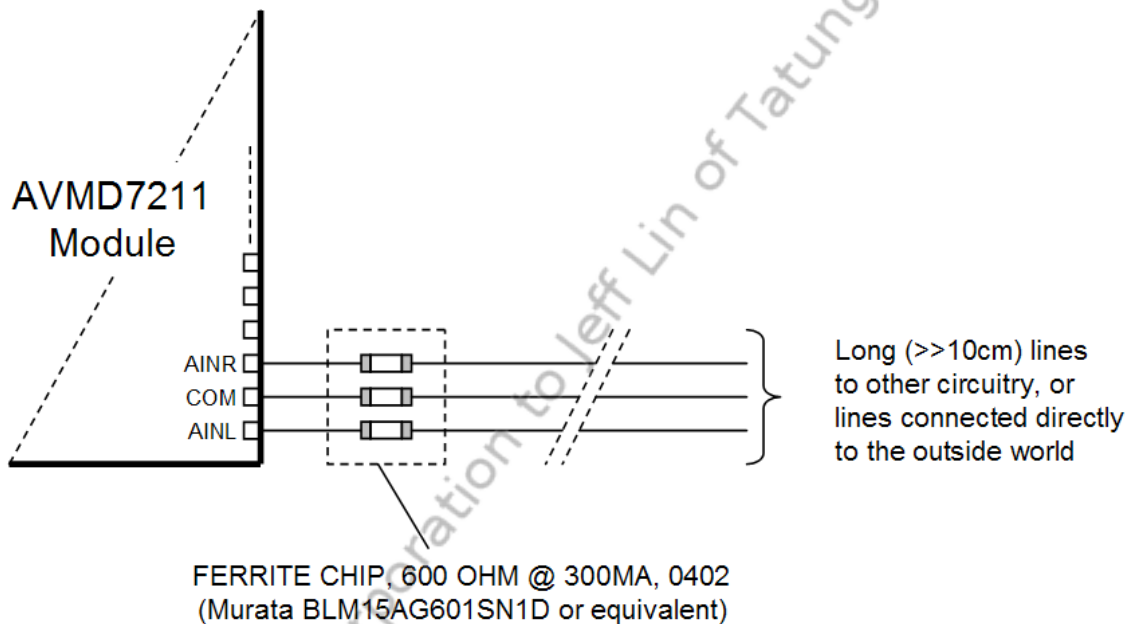
Provided by Avnera Corporation to Jeff Lin of Tatung under NDA

### 7.3 EMI considerations

Applications employing long signal lines to connect to the module are under increased risk of EMI. This can manifest as buzzing noise or spurious emissions impacting FCC certification. System designers should avoid:

- Long cables connecting the modules to headphones or speakers
- Long power cords connecting the modules to AC wall adapters

Adding ferrite chips close to the edge of the modules can reduce the impact of signal coupling and sub-1GHz spurious emissions (see Figure below). This mitigation method may not be necessary when connecting the analog inputs directly to a circuitry located on the main board using short wires or PCB traces. Note that connecting the analog inputs directly to the outside world through a jack or other terminals re-introduces the risk of spurious emissions.



**Figure 9: Example of sub-1GHz EMI suppression using in-line ferrite chips**

The ferrite chips should be located close to the edge of the module.

Note: Do not connect analog input COM pin to external ground. The COM line is carefully connected to ground inside the module. Connecting COM to an external ground may create a ground loop that can lead to either or both unwanted noise pickup or radiation of spurious signals.

## 8 FCC and Industry Canada certification information

### 8.1 Label Information

The AVMD7211 family of modules has passed the requirements set by the US Federal Communications Commission (Part 15) and Industry Canada (RSS-Gen, Issue 2, June 2006 and RSS-210e) for certification as modular intentional radiators. The certification identification numbers are as follows:

US FCC ID: V3CAVMD7F11A

Industry Canada (IC): 7853A-AVMD7F11A

Avnera makes the following representations: 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.

Per FCC regulation 47 CFR 15.21: Changes or modifications not expressly approved by Avnera, as the party responsible for compliance, can void the user's authority to operate the equipment using AVMD7211 modules.

### 8.2 Equipment labeling requirements

The statement shown below, or its equivalent, must appear on the external label of every piece of equipment that contains an AVMD7211 module. If the size of the final equipment is too small to support such a label, the statement described in must appear in the user manual for that equipment.

Contains

FCC ID V3CAVMD7F11A

IC: 7853A-AVMD7F11A

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



### 8.3 User manual labeling requirements

The statements shown below, or their equivalents, must appear in the user manual for equipment containing AVMD7211 modules:

Contains

FCC ID V3CAVMD7F11A

IC: 7853A-AVMD7F11A

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

Per FCC regulation 47 CFR 15.21: Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

9 Ordering Information

Table 4: AVMD7211 Module Ordering Information

Module Part Number	Option Code	Description
AVMD7211-04	ACNA	Analog out, enables surface-mount, normal range, integrated antennas
AVMD7211-04	ACPA	Analog out, enables surface-mount, extended range, integrated antennas



0dBm version (no RF PA)



+10dBm version (with RF PA)

Figure 9: Module pictures (not shown actual size)

## 10 Contact Information and Legal Disclaimer

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