



AudioMagic Module Datasheet

Point-to-Multipoint AVMD7212-02 Listener for
Wireless Audio Systems, based on Avnera's AV7212 IC

General Description

Avnera's AVMD7212 wireless modules are tested and FCC certified with the target of being integrated directly into end-products. They offer a low-touch solution for wireless audio systems.

This datasheet covers the with- and without-PA versions of the AVMD7212-02 module, which are optimized for point-to-multipoint applications based on Avnera's AV7212 silicon IC.

When paired with a companion sender-side AVMD7211 module, the AVMD7212 provides 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 AVMD7212-02 Listeners

The modules integrate all necessary components to support analog-in to analog-out audio transmission between sender and listener, and can be soldered directly onto a mother or carrier board.

The AudioMagic intelligent link protocol and audio coding deliver an audio signal path that is extremely robust against common RF interferers and 2.4 GHz spectrum imperfections.

Applications

- ✓ Wireless stereo speakers
- ✓ Wireless surround speakers
- ✓ Wireless room B speakers
- ✓ Wireless headphones

Ordering Options

AVMD7212-02-ACNA: Analog-in, no PA

AVMD7212-02-ACPA: Analog-in, with PA

Features

- ✓ Uncompressed audio
- ✓ Point to multipoint capable (1 to 3)
- ✓ Audio path SNR: Stereo 84 dB SNR, 48 kHz sampling rate
- ✓ 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 castellations
- ✓ Auto-search/synch and dynamic channel selection
- ✓ Low, fixed latency suitable for video lip-synch
- ✓ Sample rate converter: 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



(not to scale)

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3 Reference Documents

For more information on Avnera devices and their functionality please see the documents listed below. For access to these documents contact your Avnera representative, check your support center account www.avnera.com/extranet or request access at www.avnera.com.

Document Title
AV7212 Datasheet

4 AVMD7212 Functional Block Diagrams

When paired with an AV7211- or AV7201-based companion sending device, the AVMD7212 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 and with a PA is +10 dBm into the antennas.

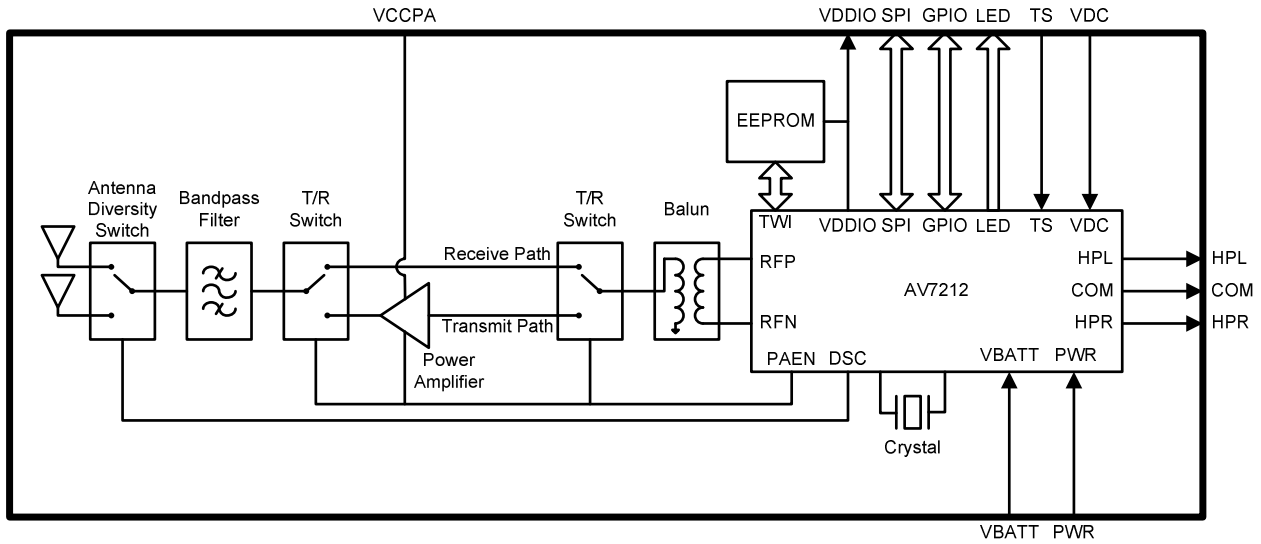


Figure 1: AVMD7212-02 Module Block Diagram with RF Power Amplifier.

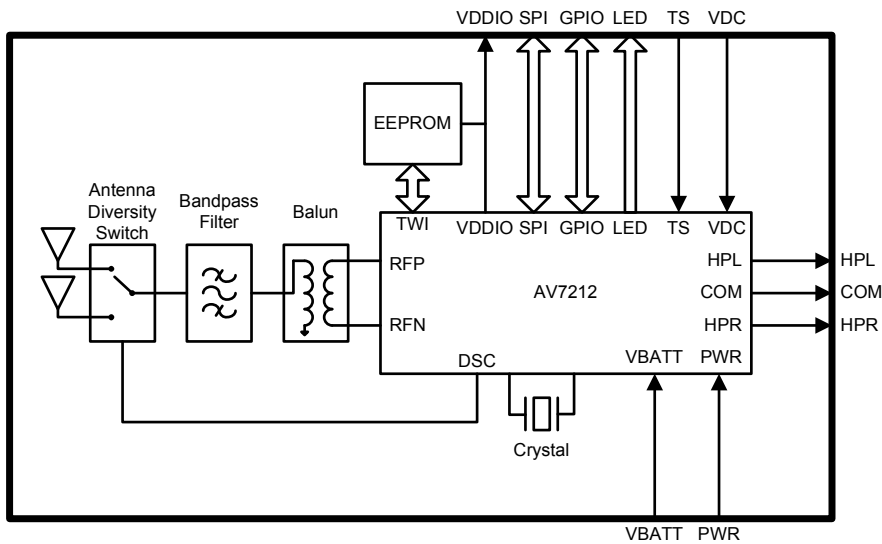


Figure 2: AVMD7212-02 Module Block Diagram without RF Power Amplifier

Table 1: AVMD7212-02 Module Block Diagram Description

Interface	Description
SPI	The AVMD7212's SPI interface is used to allow an external host to control the AV7212 listener IC and to facilitate testing of the module. It can also be used to program the module's EEPROM.
GPIO/ LED	The GPIO and LED lines allow buttons and LEDs to be connected to the AVMD7212 to allow the user to control the AudioMagic™ system and communicate the system's state to the user.
HPL COM HPR	These pins form the module's analog audio output. The COM pin is tied to analog ground on the module and should be isolated from the host system's ground.
PWR	This pin connects directly to the "PWR" pin on the AV7212 IC and is used to signal the module to power on and off.
VBATT VCCPA	These pins provide power to various elements of the AVMD7212. The VBATT pin, connected to the AV7212's VBATT pin, supplies power to the AV7212. On the PA-enabled version of the module, VCCPA supplies power to the RF power amplifier.
VDC TS	These pins connect to the AV7212's internal battery charger. The VDC pin is used to source current to charge the battery, and the TS pin may be connected to a thermistor to monitor battery temperature.
VDDIO	The VDDIO pin is connected to the VDDIO regulator bypass pin on the AV7212. The pin can be used to indicate when the AV7212 IC is turned on.

5 AVMD7212 Pin Information

Table 2: AVMD7212-02 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	AGND	Ground	Analog section ground
4	AGND	Ground	Analog section ground
5	VBATT	Analog Power	Regulator capacitor terminal
6	AGND	Ground	Analog section ground
7	VDC	Digital Power	5V input
8	AGND	Ground	Analog section ground
9	PWR	Analog Input	Power switch input
10	TS	Analog Input	Battery temperature sense
11	LED2	Digital Output	LED drive line
12	LED1	Digital Output	LED drive line
13	LED0	Digital Output	LED drive line
14	GPIO7	Digital I/O	General-Purpose I/O
15	GPIO6	Digital I/O	General-Purpose I/O
16	GPIO5	Digital I/O	General-Purpose I/O
17	GPIO4	Digital I/O	General-Purpose I/O
18	GPIO3	Digital I/O	General-Purpose I/O
19	GPIO2	Digital I/O	General-Purpose I/O
20	GPIO1	Digital I/O	General-Purpose I/O
21	HPL	Analog Output	Left headphone drive output
22	COM	Analog Input	Analog common connection
23	HPR	Analog Output	Right headphone drive output
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	DGND	Ground	Digital section ground
29	VDDIO	Digital Power	3.3V regulated voltage
30	DGND	Ground	Digital section ground

6 AVMD7212 Mechanical Dimensions

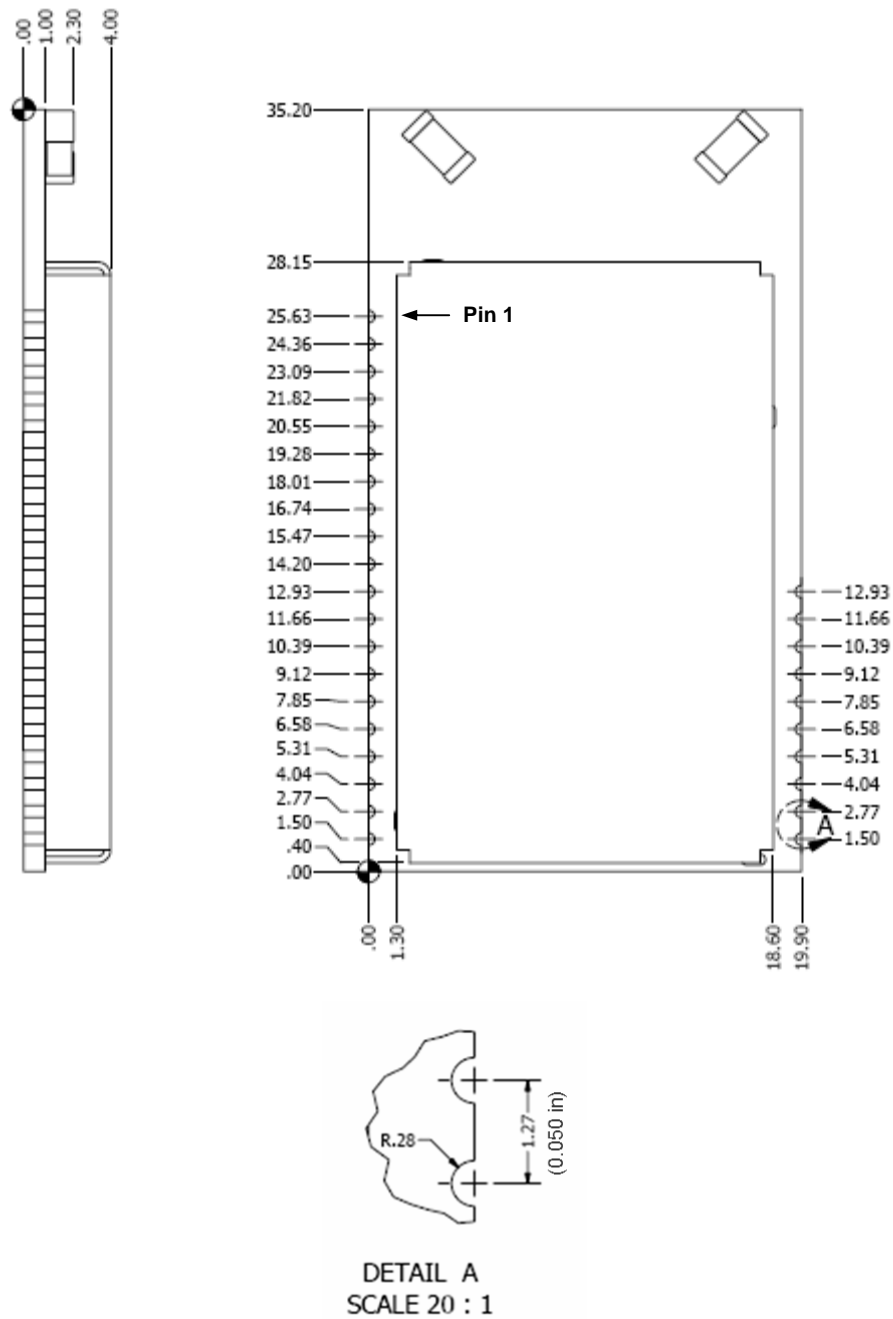


Figure 3: AVMD7212 mechanical dimensions

7 Electrical Specifications

7.1 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
VCCPA Supply Voltage Input	0	6V
VDC	-0.3V	+6.5V
Input Voltage Range – Digital Inputs	-0.3V	$V_{VDDIO} + 0.3V$
Input Voltage Range – Analog Inputs	-0.3V	$V_{VBATT} + 0.3V$
Operating Temperature	-40°C	+85°C
Storage Temperature	-40°C	+100°C
Static Discharge Voltage (other Digital) – HBM*	1000V	
Static Discharge Voltage (RF) – HBM*	1000V	

*Terminology: HBM => ESD human body model

7.2 Recommended Operating Range

PARAMETER	MIN	TYP	MAX	UNIT
VA pin voltage	3.0		3.5	V
VCCPA pin voltage	3.0		3.6	V
VDC pin voltage	4.5	5.0	5.5	V
Ambient Temperature (T_A)	-20		70	°C

7.3 Electrical Characteristics

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

Table 3 AVMD7212-02 Electrical Characteristics

PARAMETER	CONDITIONS	MIN	TYP	MAX	UNIT
RF Frequency Range		2405		2477	MHz
Audio Output Voltage			.7		V_{RMS}
Audio SNR			90		dB
Audio THD+N			-68		dB
Audio Output Load		16			ohms
Range (LOS)	No PA		14		m
	With PA		30		m
Current consumption (no PA)	V_{BATT} (Active Audio mode)		60		mA
	V_{CCPA}		0		mA
Current consumption (with PA)	V_{BATT} (Active Audio mode)		TBD		mA
	V_{CCPA}		110		mA

8 Application information

8.1 Mechanical requirements

The AVMD7212 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.

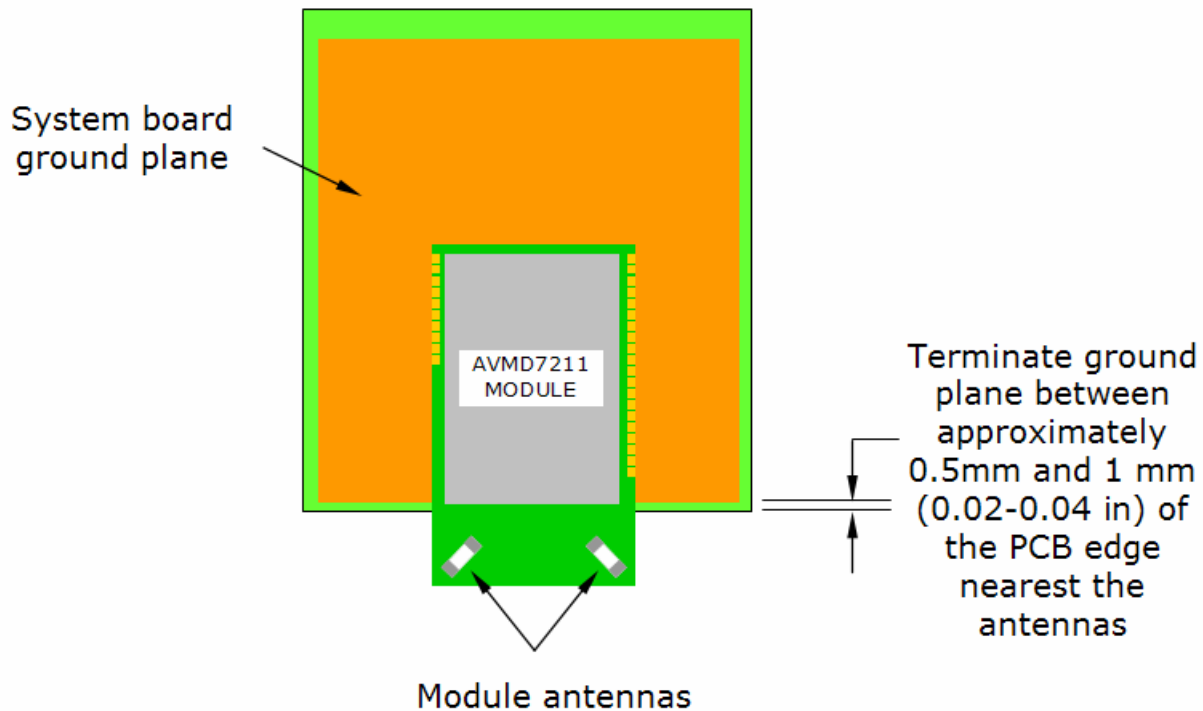


Figure 4: Main board ground plane guidelines in the vicinity of the module

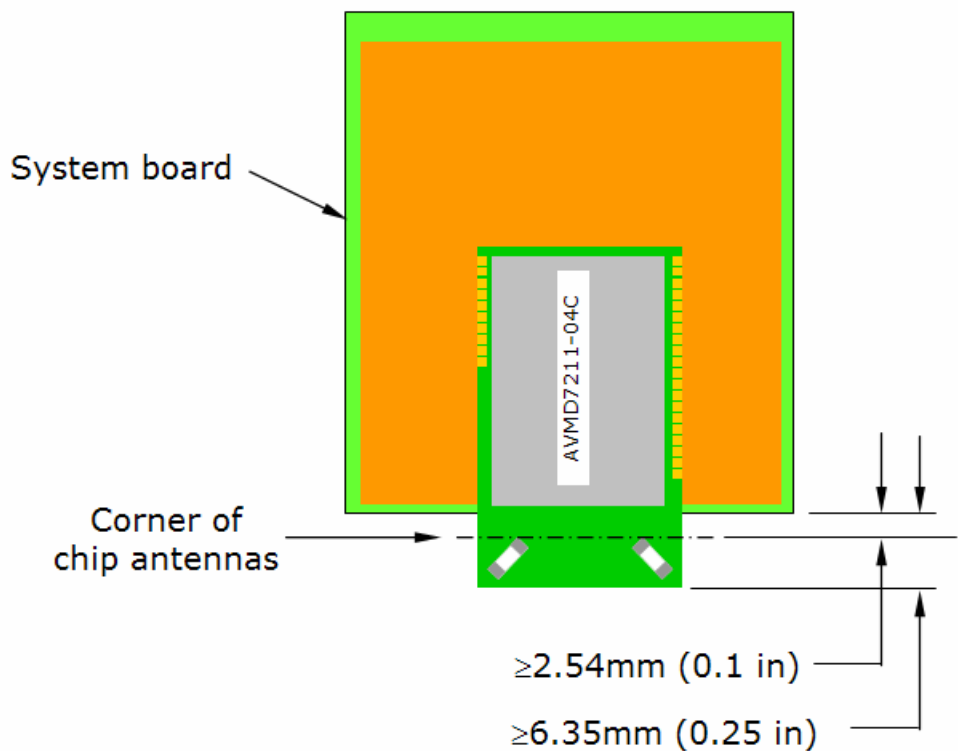


Figure 5: Module mounting requirements on the main board

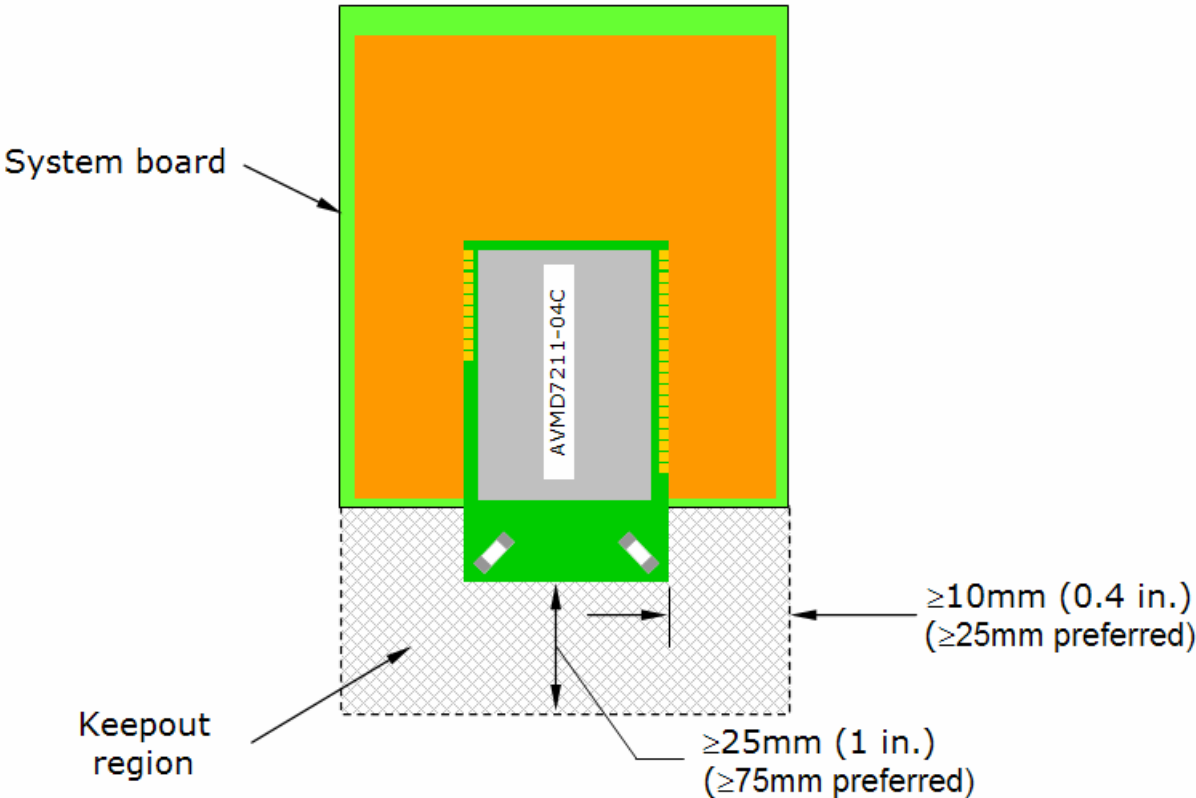


Figure 6: Keep out requirements around the antenna of the module

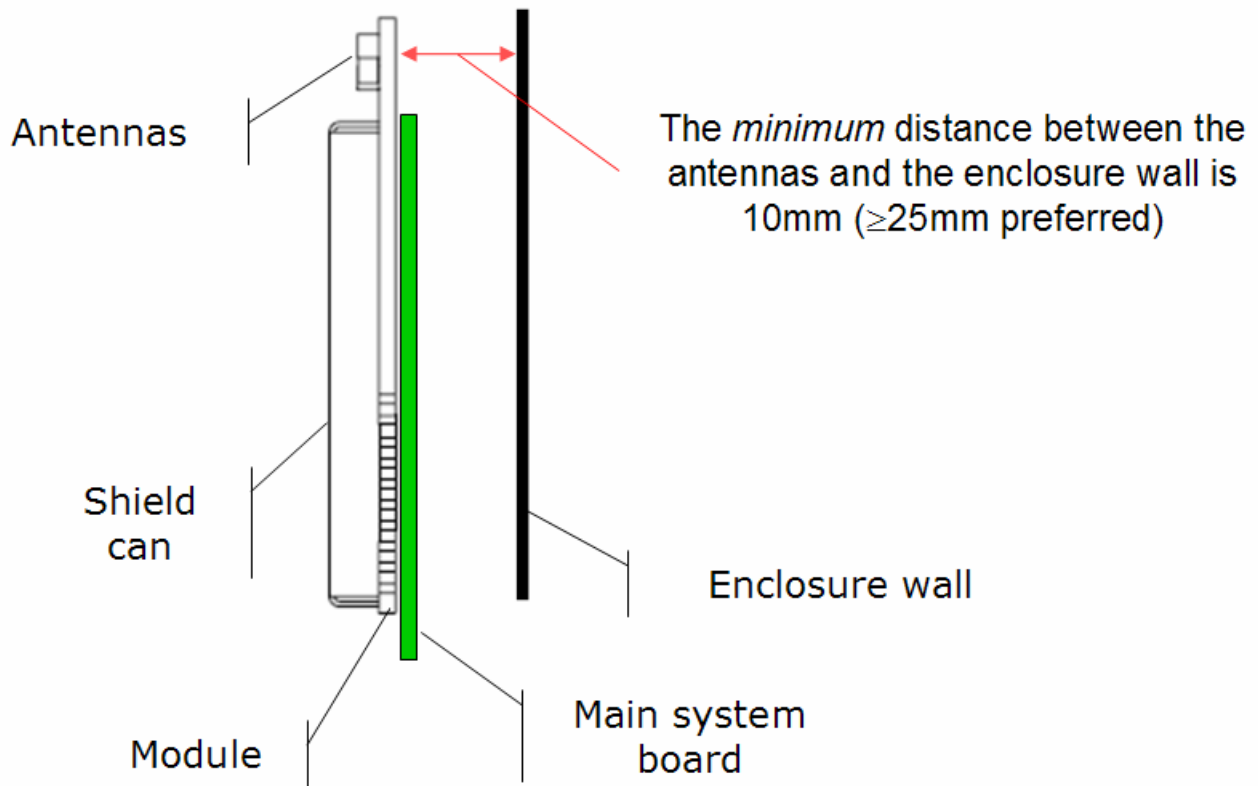


Figure 7: Enclosure spacing requirements around the antenna end of the module

8.2 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.

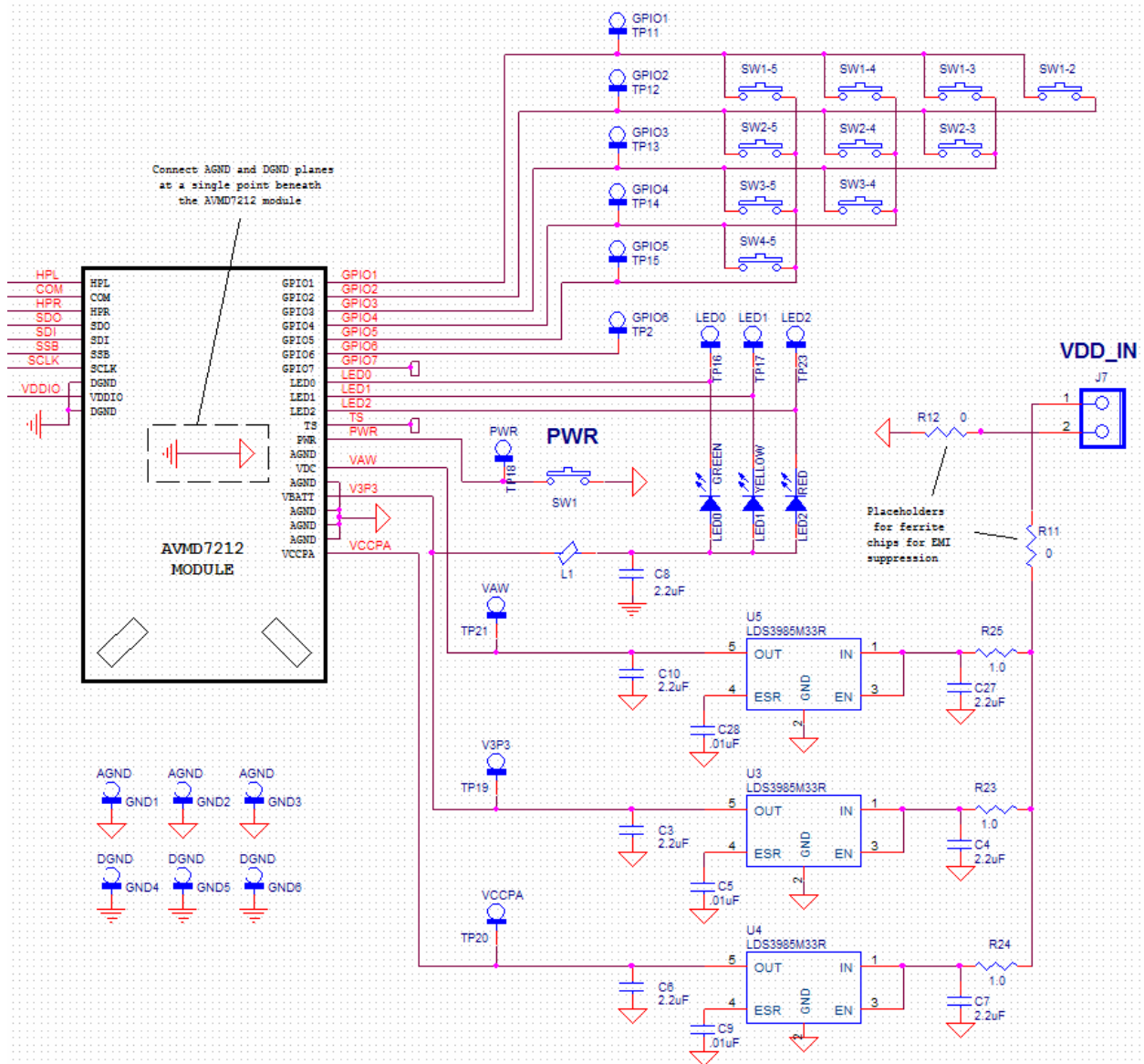


Figure 8: AVMD7212 application schematic (1)

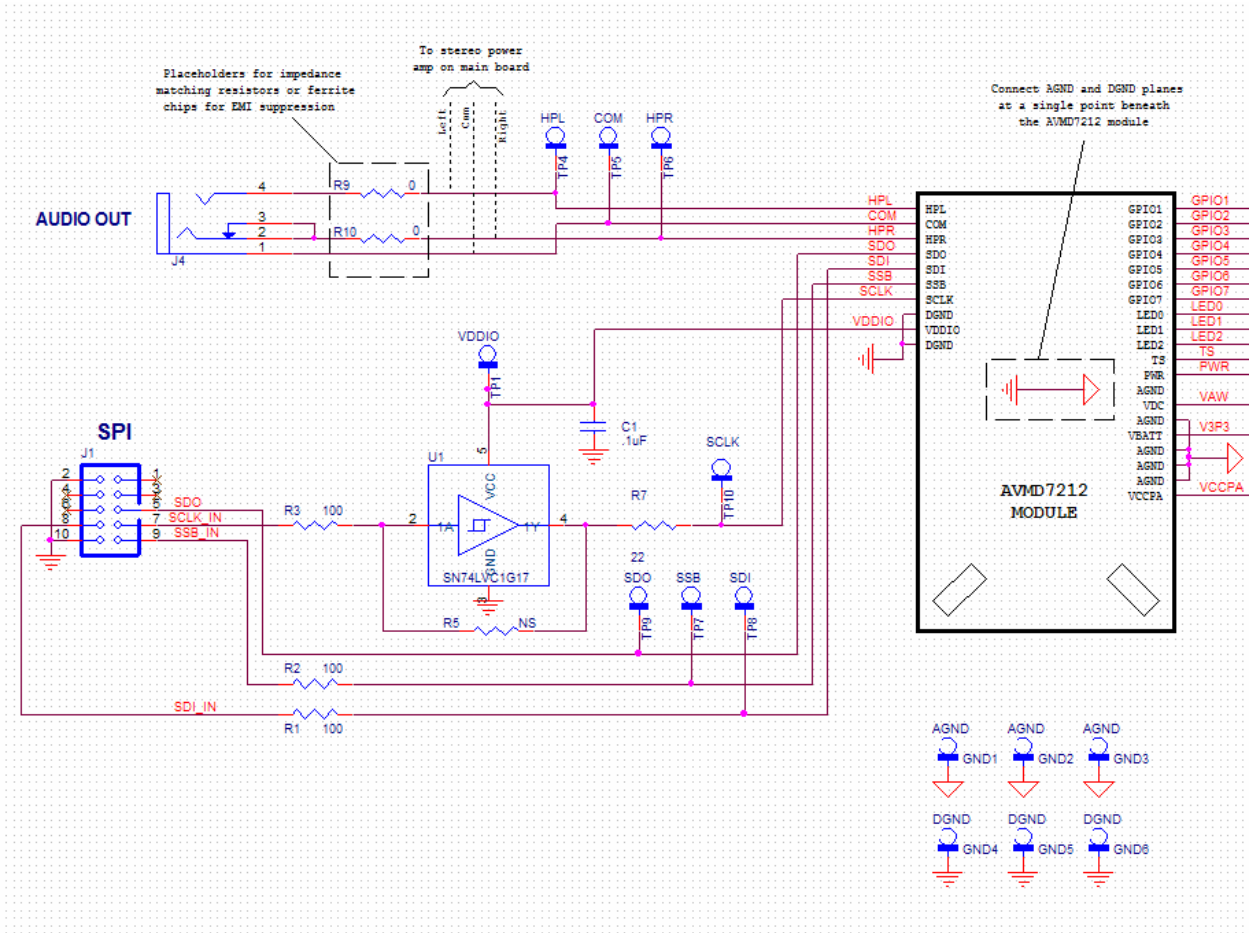


Figure 9: AVMD7212 application schematic (2)

8.3 EMI considerations

Applications employing long signal lines to connect the module for example with headphones/speakers or applications using long power cords to connect to AC wall adapters are under increased risk of EMI. To reduce the impact of signal coupling and sub-1GHz spurs integrators should consider adding ferrite components in series with the long lines, or lines communicating directly to the outside world.

The figure below illustrates how this technique can be used to mitigate spurious conduction onto the cable to an external headphone connected directly to the output of the module.

This mitigation method may not necessary when connecting the headphone output directly to a speaker amplifier located on the main board and using short wires between amplifier and speaker drivers. Note that by providing a headphone jack on a speaker the risk of spurious emissions is reintroduced.

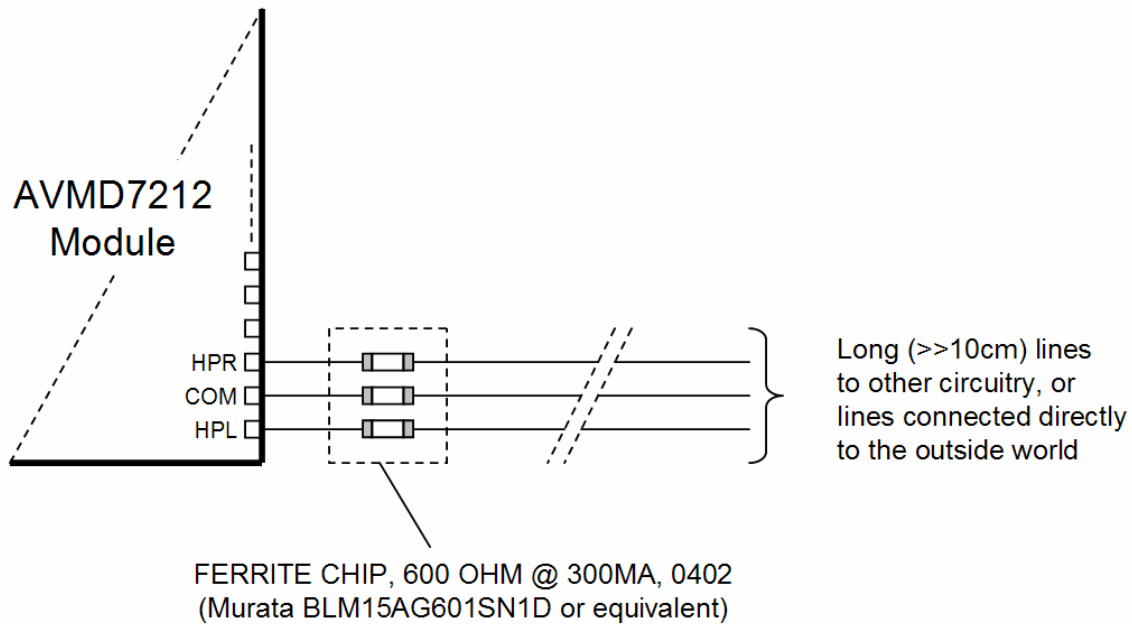


Figure 10: Example of sub-1GHz EMI suppression using in-line ferrite chips on long lines. The ferrite chips should be located close to the edge of the module.

Note: Do not connect headphone COM to 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.

9 FCC and Industry Canada certification information

9.1 Label Information

The AVMD7212 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: V3CAVMD7F12A

Industry Canada (IC): 7853A-AVMD7F12A

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, the party responsible for compliance, can void the user's authority to operate the equipment using AVMD7212 modules.

9.2 Equipment labeling requirements

The statement shown below, or its equivalent, must appear on the external label of every piece of equipment that contains an AVMD7212 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 V3CAVMD7F12A
IC: 7853A-AVMD7F12A

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, and
(2) this device must accept any interference received,
including interference that may cause undesired operation.

9.3 User manual labeling requirements

The statements shown below, or their equivalents, must appear in the user manual for equipment containing AVMD7212 modules:

Contains

FCC ID V3CAVMD7F12A

IC: 7853A-AVMD7F12A

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, and
- (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.

10 Ordering Information

Table 4 AVMD7212 Module Ordering Information

Module Part Number	Option Code	Description
AVMD7212-02	ACNA	Analog out, castellations, no PA, integrated antennas
AVMD7212-02	ACPA	Analog out, castellations, with PA, integrated antennas



0dBm version (no RF PA)



+10dBm version (with RF PA)

Figure 11: Module pictures (not shown actual size)

11 Contact Information and Legal Disclaimer

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