User manual

UM-DA7202 evaluation board

DA7202 10 W mono class D amplifier for 2S systems

Abstract

This user manual enables you to use the UM-DA7202 class D speaker driver evaluation board, 189-01-A EVB, to carry out performance measurements and functional checks on the DA7202 class D speaker driver.

Contents

Figures

Tables

1   Terms and definitions

GND   Ground Reference
EVB   Evaluation Board
EMI   Electromagnetic Interference
PCB   Printed Circuit Board
USB   Universal Serial Bus
PSRR   Power Supply Rejection Ratio

2   References

[1]   DA7202, Datasheet, Dialog Semiconductor

3   Introduction

DA7202 is a powerful, highly efficient, low EMI Class D speaker driver that can drive 10 W into 4 Ω loads directly from a 2S lithium-ion battery to power a variety of two cell portable applications such as Ultrabooks™ and tablets.

The DA7202 performance evaluation board (189-01-A) has been produced to allow measurement and evaluation of the DA7202 device.

The evaluation board (EVB) is supplied with a USB memory stick containing supporting collateral.
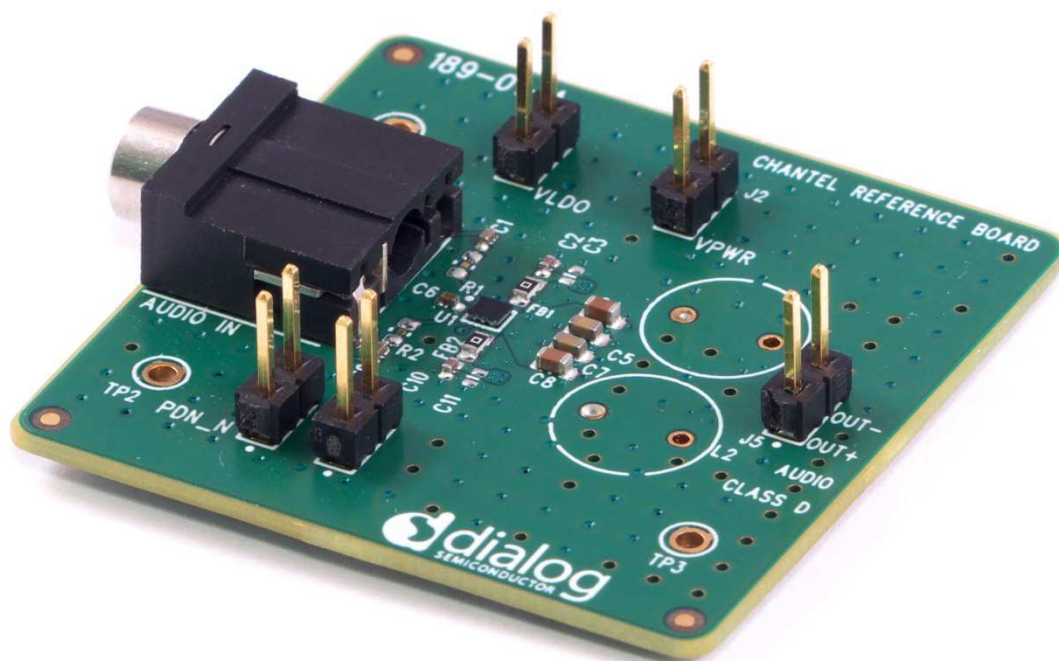
Figure 1: DA7202 performance EVB

4 DA7202 EVB hardware description

The DA7202 EVB consists of the DA7202 device, the essential external components and connection points for input / output signals. Typical external connections are shown in Figure 2.

The EVB can be used standalone or as a module for interface to a customer development platform.
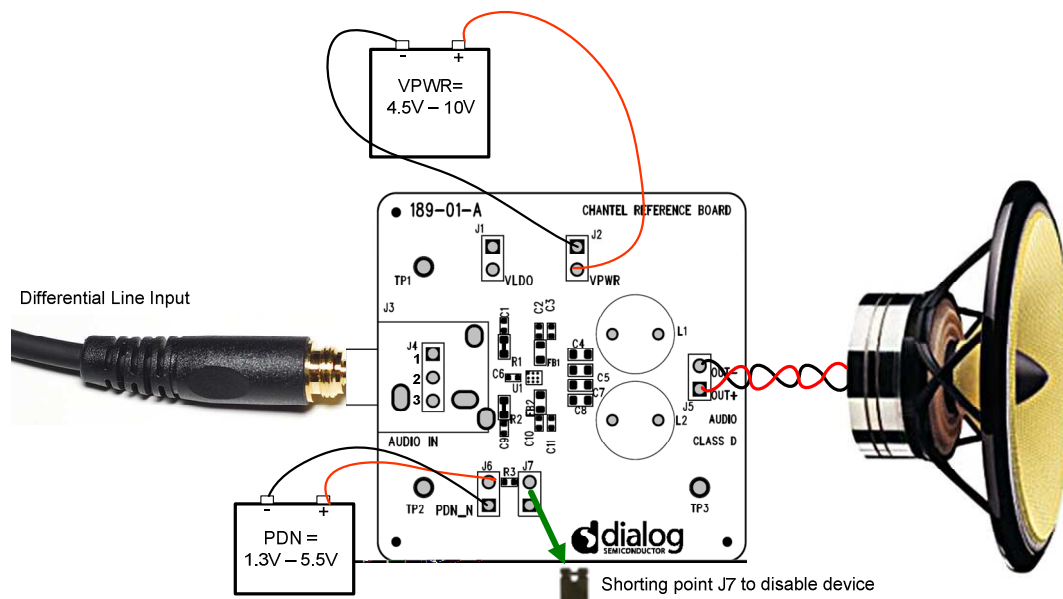

Figure 2: DA7202 performance EVB external connections

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Table 1: Connector summary

Connector	Functionality	Description
J1	Internal VLDO monitoring	VLDO (No external connection needed) Pin 1 = GND Pin 2 = LDO output
J2	VPWR external power supply connection	VPWR Pin 1 = 0 V/GND Pin 2 = +4.5 V to +10.0 V
J3	AUDIO IN	Differential line input via 3-pole, 3.5 mm jack socket Ring = IN+ Tip = IN- Sleeve = GND
J4	AUDIO IN (optional input)	Differential line input connection points accessible via the underside of the board or by removing J3 Pin 1 = 0 V/GND Pin 2 = IN+ Pin 3 = IN-
J5	AUDIO OUT	Class D output Pin 1 = OUT+ Pin 2 = OUT-
J6	PDN_N external power supply connection	PDN_N Pin 1 = GND Pin 2 = +1.3 V to +5.5 V
J7	PDN_N status select	**Open = DA7202 Power Up (weak pull up to voltage on J6) (Default)** Short = DA7202 Power Down
TP1 – TP3	Ground reference points	Ground

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4.1 Power supply

The DA7202 has high power supply rejection ration (PSRR) and may be run directly from a 2S lithium-ion battery or, for evaluation purposes, a bench supply.

4.2 Analogue input

The analogue input connection contains DC block capacitors (C1 and C9) which allow an input signal with any DC level within the recommended operating conditions to be connected.

4.2.1 Lower gain configuration

DA7202 has a fixed +18 dB gain in the signal path. The input signal amplitude can be reduced with an external resistor creating a divider with the internal device impedance. This can be achieved by replacing resistor sites R1 and R2 (shorted by default) with resistor values using the following formula:

$$\text{Av} = 20\text{Log}(\frac{240 \text{ k}\Omega}{\text{Rx}})$$

$$\text{Rx} = 30 \text{ k}\Omega + \text{Rext}$$

Where:

- 30 kΩ = the input impedance for DA7202
- Rext = the resistor value required at both R1 and R2

4.2.2 Single-ended input

In normal operation, the input to the EVB is differential. To use a single-ended input, connect the input signal to J4 pin 2 and the 0 V/GND to J4 pin 3, see schematic diagram in Figure 3.

J4 can be accessed from the rear of the board. Alternatively, J3 can be removed for top access to J4.

4.3 Speaker output

An inductive 4 Ω or 8 Ω speaker load can be connected directly to J5. The length of the speaker cable must be kept as short as possible to minimise electromagnetic interference (EMI).

4.3.1 Additional filtering

There is no EMI filtering on the EVB as default. As can be seen from the schematic diagram in Figure 3, provision has been made to allow a filter to be added to sites FB1, FB2, C10, C11, C2 and C3, as well as L1, L2, C12 and C13. Examples of when the filtering options can be useful are if the speaker load is non-inductive or if the speaker cable is long.

As default, the shorting points at SP1 and SP2 are short via a solder connection to bypass the filter but allow the output signal to reach J5.

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5   Schematic diagram
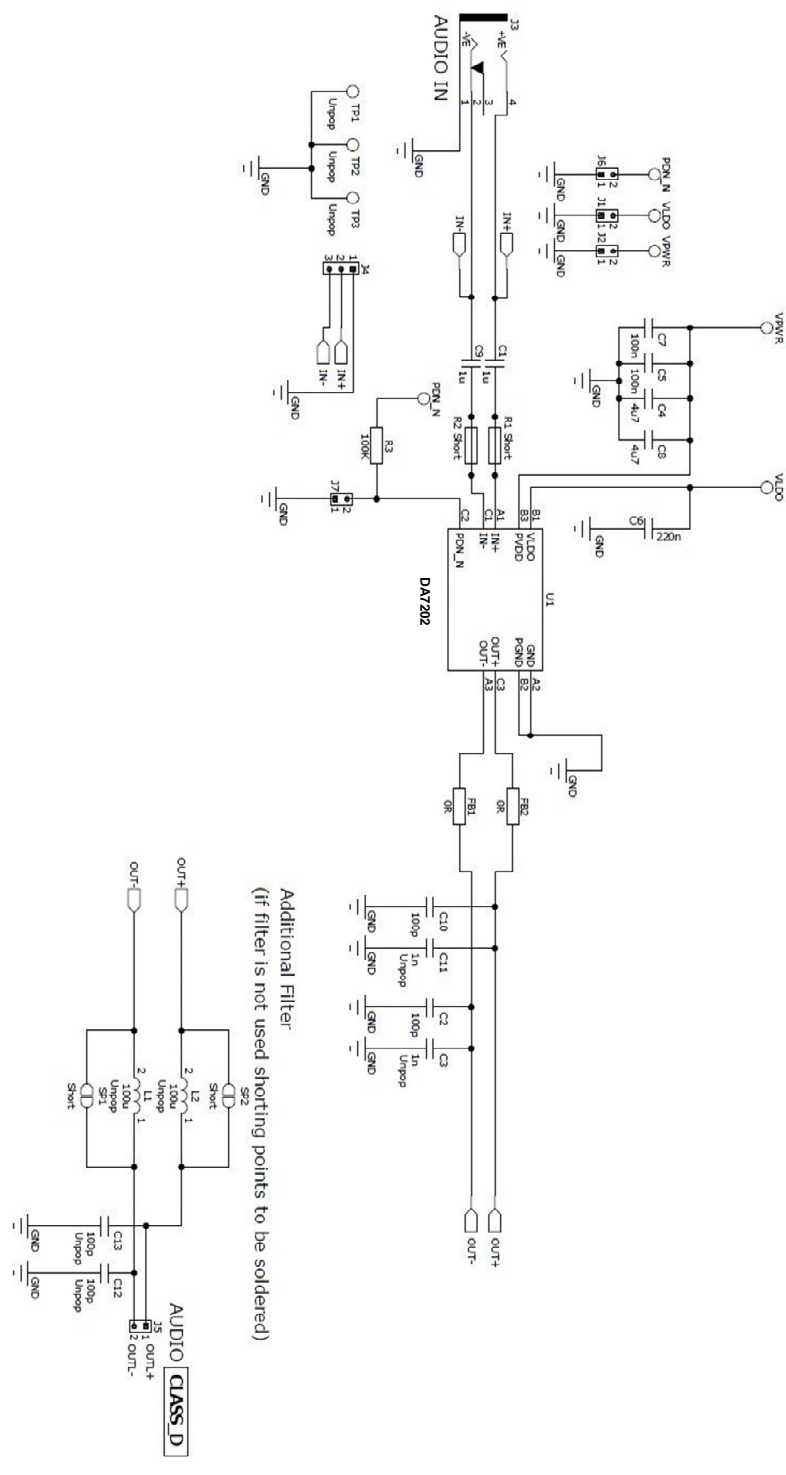

Figure 3: Schematic diagram

6   Bill of materials

Table 2: Order BOM for a single EVB

Qty	Description	Value	Manufacturer	Part number
2	0603 (1608 metric) SMD capacitor	4.7 µF	Murata	GRM188R6YA475KE15
1	DA7202 WLCSP9		Dialog Semiconductor	DA7202
2	0603 (1608 metric) SMD resistor	0R	Yageo	RC0603JR-070RL
1	0402 (1005 metric) SMD resistor	100 kΩ	Yageo	RC0402FR-07100KL
2	0402 (1005 metric) SMD capacitor	100 pF	Murata	GRM1555C1H101JD01D
2	0603 (1608 metric) SMD capacitor	100 nF	Murata	GRM188R71H104KA93D
2	0402 (1005 metric) SMD capacitor	1 µF	Murata	GRM155R61A105KE15D
1	0402 (1005 metric) SMD capacitor	220 nF	Murata	GRM155R71C224KA12D
5	1x2 2.54 mm pitch PCB pin header vertical (2.54 mm tail)	TSW-102-07-G-S	Samtec	TSW-102-07-G-S
1	1x3 2.54 mm pitch PCB pin header vertical (2.54 mm tail)	TSW-103-07-G-S	Samtec	TSW-103-07-G-S
1	3.5 mm right angle PCB jack socket with chassis	KLBR4	Lumberg	KLBR4
NOTE				
By default C10, C2, C1, C9, C6, C5, C7, C4, C8, FB1, FB2, R3, J3, J1, J2, J5, J6, J7, J4, U1, R1, R2, SP1 and SP2 are unpopulated				

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Table 3: Build BOM - populated components

Ref des	Description	Value	Manufacturer	Part number
C10	0402 (1005 Metric) SMD capacitor	100 pF	Murata	GRM1555C1H101JD01D
C2	0402 (1005 Metric) SMD capacitor	100 pF	Murata	GRM1555C1H101JD01D
C1	0402 (1005 Metric) SMD capacitor	1 µF	Murata	GRM155R61A105KE15D
C9	0402 (1005 Metric) SMD capacitor	1 µF	Murata	GRM155R61A105KE15D
C6	0402 (1005 Metric) SMD capacitor	220 nF	Murata	GRM155R71C224KA12D
C5	0603 (1608 Metric) SMD capacitor	100 nF	Murata	GRM188R71H104KA93D
C7	0603 (1608 Metric) SMD capacitor	100 nF	Murata	GRM188R71H104KA93D
C4	0603 (1608 Metric) SMD capacitor	4.7 µF	Murata	GRM188R6YA475KE15
C8	0603 (1608 Metric) SMD capacitor	4.7 µF	Murata	GRM188R6YA475KE15
FB1	0603 (1608 Metric) SMD resistor	0R	Yageo	RC0603JR-070RL
FB2	0603 (1608 Metric) SMD resistor	0R	Yageo	RC0603JR-070RL
R3	0402 (1005 Metric) SMD resistor	100 kΩ	Yageo	RC0402FR-07100KL
J3	3.5 mm right angle PCB jack socket with chassis		Lumberg	KLBR4
J1	1x2 2.54 mm pitch PCB pin header vertical (2.54mm tail)		Samtec	TSW-102-07-G-S
J2	1x2 2.54 mm pitch PCB pin header vertical (2.54 mm tail)		Samtec	TSW-102-07-G-S
J5	1x2 2.54 mm pitch PCB pin header vertical (2.54 mm tail)		Samtec	TSW-102-07-G-S
J6	1x2 2.54 mm pitch PCB pin header vertical (2.54 mm tail)		Samtec	TSW-102-07-G-S
J7	1x2 2.54 mm pitch PCB pin header vertical (2.54 mm tail)		Samtec	TSW-102-07-G-S
J4	1x3 2.54 mm pitch PCB pin header vertical (2.54 mm tail)		Samtec	TSW-103-07-G-S
U1	DA7202 WLCSP9		Dialog Semiconductor	D2150
R1	Shorted 0603 footprint	Short		
R2	Shorted 0603 footprint	Short		
SP1	Shorting point	Short		
SP2	Shorting point	Short		
NOTE				
By default C10, C2, C1, C9, C6, C5, C7, C4, C8, FB1, FB2, R3, J3, J1, J2, J5, J6, J7, J4, U1, R1, R2, SP1 and SP2 are unpopulated.				

7   Revision history

Table 4: Document revision history

Revision	Date	Originator	Change
1.0	29-Jan-2016	BM	Update on previous template.
2.0	14-March-2016	SW	Updated to new template. Clarified content of the document, including rewriting section 5.2. Added BOM tables. Updated 4.2.1 with Rext calc and explanation.
2.1	24-Jan-2022		Updated logo, disclaimer, copyright.

Status definitions

Status	Definition
DRAFT	The content of this document is under review and subject to formal approval, which may result in modifications or additions.
APPROVED or unmarked	The content of this document has been approved for publication.

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