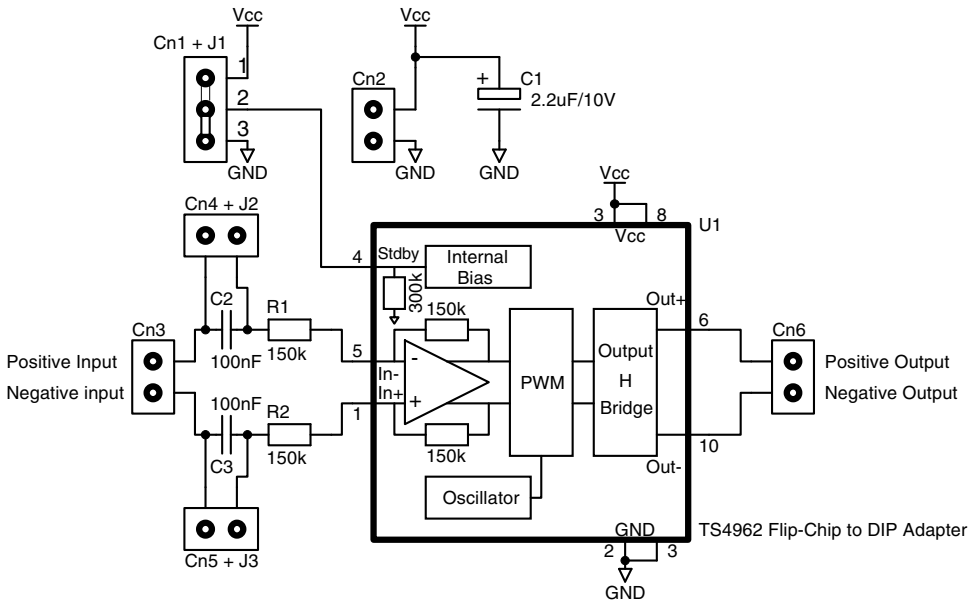
AN2134
Application note

TS4962M using the mono class D demonstration board

Introduction

The mono class D demo board STEVAL-CCA001V1 is designed for the TS4962M class D audio amplifier. The TS4962M device, in a Flip-Chip package, is mounted on an adapter board with DIP connectors (see *Section 6*) which is, in turn, mounted on the demonstration board. *Figure 1* shows the schematic diagram of the demonstration board, including the Flip-Chip to DIP adapter.

Figure 1. Schematic diagram of mono class D demonstration board



Contents

List of figures

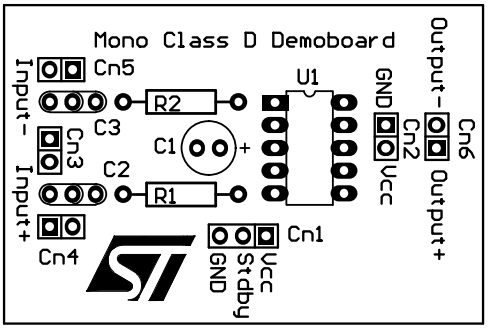
1 About the TS4962M

- Low voltage class D differential audio power amplifier with standby mode
- Operating range from V_{CC}=2.4 V to 5.5 V
- 2.3 W output power @ V_{CC}=5 V, THD=1%, F=1 kHz, with 4 Ω load
- 1.4 W output power @ V_{CC}=5 V, THD=1%, F=1 kHz, with 8 Ω load
- Ultra low power consumption in standby mode (10 nA)
- 63 dB PSRR @ 217 Hz in grounded mode (A_V=2 V/V)
- Low pop and click noise
- Fast startup time 5 ms
- Module gain set at 2 V/V
- Thermal and short-circuit protection.

2 Description of the demonstration board

Figure 2 shows the top view of the demo board STEVAL-CCA001V1, with the location of all connectors

Figure 2. Mono class D demonstration board - top view



A list of components mounted on the demonstration board is given in *Table 1*.

Table 1. Mono class D demonstration board bill of material

Name	Quantity	Description
C1	1	2.2 µF/10 V, electrolytic capacitor
C2	1	100 nF/63 V
C3	1	100 nF/63 V
Cn1	1	3-pin header 2.54 mm pitch
Cn2	1	2-pin header 2.54 mm pitch
Cn3	1	2-pin header 2.54 mm pitch
Cn4	1	2-pin header 2.54 mm pitch
Cn5	1	2-pin header 2.54 mm pitch
Cn6	1	3-pin header 2.54 mm pitch
J1 to J3	4	Jumper, 2.54 mm pitch
R1	1	150 kΩ, 1/4 W 1% resistor
R2	1	150 kΩ, 1/4 W 1% resistor
U1	1	TS4962M Flip-Chip to DIP adapter

Table 2 gives the list of the connectors on the demonstration board, with a description and configuration information for each one.

3 Demonstration board connectors

Table 2. Demonstration board connectors

Connectors	Description
Cn3	Input signal connector (active input signal positive and negative)
Cn4 and Cn5	Connectors to modify input configuration (from capacitor-coupled = no jumper to common mode feedback = short-circuit)
Cn6	Output signal connector (Vo+ and Vo-)
Cn1	Standby control connector (GND, standby, V_{CC}).
Cn2	Power connector (V_{CC} and GND). Power supply voltage from 2.4 V to 5.5 V.
U1	Socket connector for Flip-Chip to DIP adapter

Caution: When the power is supplied through Cn2, **do not** invert the polarity as it can destroy the amplifier U1.

4 Demonstration board layout

Figure 3 and *Figure 4* show the bottom and top layers of the demonstration board PCB.

Figure 3. PCB bottom layer

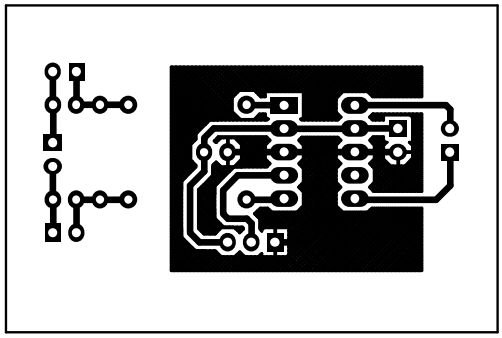
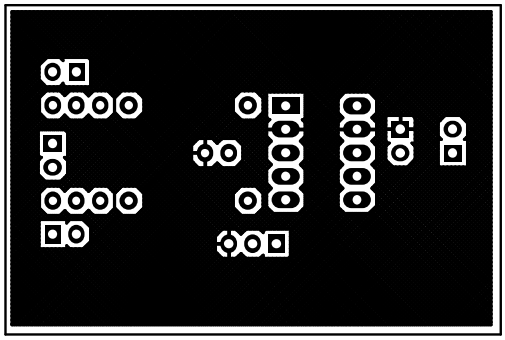


Figure 4. PCB top layer



5 Configuring the demonstration board characteristics

5.1 Differential gain

The demonstration board is set up with the differential gain, A_V, set to 2 V/V.

If necessary, the differential gain may be adapted by modifying the values of resistors R1 and R2, in accordance with the following relation:

Equation 1

$$A_v = \frac{300k\Omega}{R1} \text{ or } A_v = \frac{300k\Omega}{R2}$$

where R1=R2 in kΩ.

5.2 Input configuration

On the demonstration board, the Cn4 and Cn5 jumpers allow you to change the input configuration. You can select either capacitor-coupled or common-mode feedback.

In the capacitor-coupled configuration, the -3 dB cutoff frequency in Hz is:

Equation 2

$$\frac{1}{2\pi \times R_1 \times C_2} = \frac{1}{2\pi \times R_2 \times C_3}$$

with R in Ohms, C in Farads and where C2=C3.

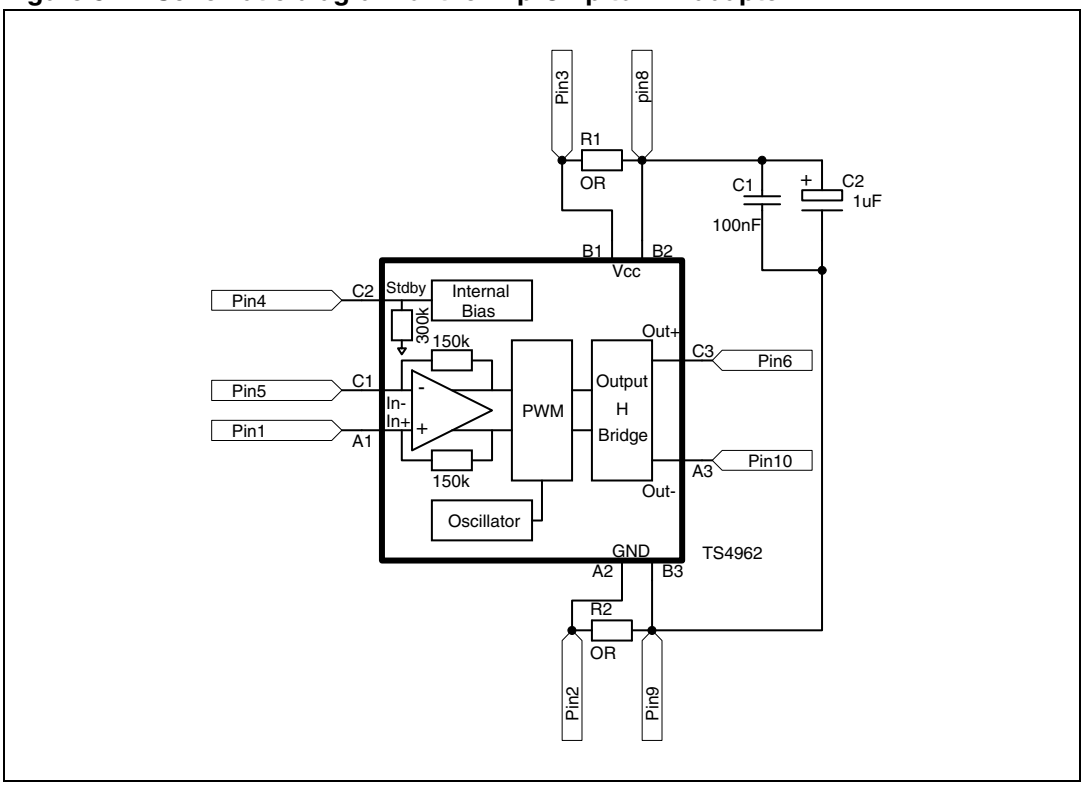
More information about component calculations is available in the TS4962M datasheet.

6 Flip-Chip to DIP adapter

The TS4962M is available in a Flip-Chip package which, while offering the advantages of excellent thermal dissipation and maximum space-savings, is difficult to manipulate for test or evaluation purposes.

For this reason, the TS4962M device is pre-mounted onto a Flip-Chip to DIP adapter, shown schematically in *Figure 5*.

Figure 5. Schematic diagram of the Flip-Chip to DIP adapter

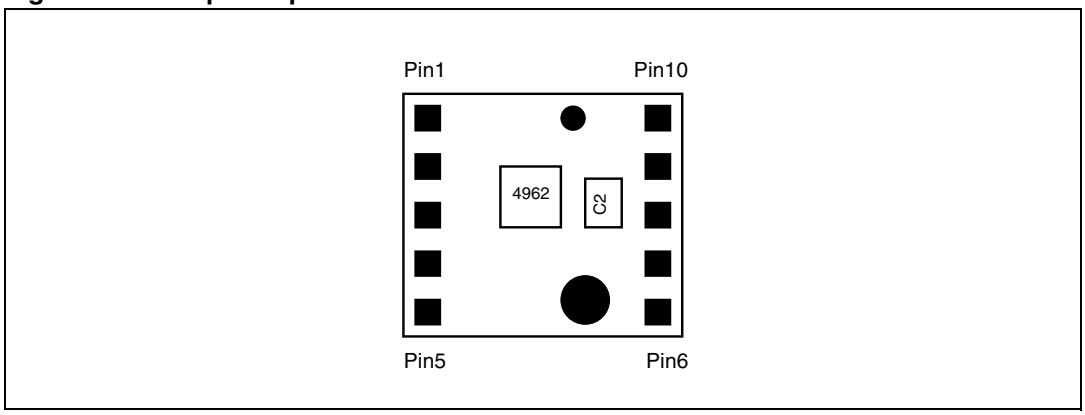


A component list for this adapter is given in *Table 3* below. The top-view of the adapter is shown in *Figure 6*.

Table 3. Flip-Chip to DIP adapter bill of material

Designation	Quantity	Description
C1	1	100 nF/10 V, ceramic capacitor, 0603
C2	1	1 µF/6.3 V, Tantalum capacitor, 0805
R1	1	0R resistor, 0603
R2	1	0R resistor, 0603
U1	1	TS4962M

Figure 6. Adapter top view



7 Revision history

Table 4. Document revision history

Date	Revision	Changes
1-Mar-2005	1	Initial release.
1-Dec-2005	2	Format updated.
6-Feb-2007	3	Updated document structure and format.
27-Feb-2007	4	Removed draft banner, added this revision history.
28-Mar-2012	5	*Table 3* modified.

Please Read Carefully:

Information in this document is provided solely in connection with ST products. STMicroelectronics NV and its subsidiaries (“ST”) reserve the right to make changes, corrections, modifications or improvements, to this document, and the products and services described herein at any time, without notice.

All ST products are sold pursuant to ST’s terms and conditions of sale.

Purchasers are solely responsible for the choice, selection and use of the ST products and services described herein, and ST assumes no liability whatsoever relating to the choice, selection or use of the ST products and services described herein.

No license, express or implied, by estoppel or otherwise, to any intellectual property rights is granted under this document. If any part of this document refers to any third party products or services it shall not be deemed a license grant by ST for the use of such third party products or services, or any intellectual property contained therein or considered as a warranty covering the use in any manner whatsoever of such third party products or services or any intellectual property contained therein.

UNLESS OTHERWISE SET FORTH IN ST’S TERMS AND CONDITIONS OF SALE ST DISCLAIMS ANY EXPRESS OR IMPLIED WARRANTY WITH RESPECT TO THE USE AND/OR SALE OF ST PRODUCTS INCLUDING WITHOUT LIMITATION IMPLIED WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE (AND THEIR EQUIVALENTS UNDER THE LAWS OF ANY JURISDICTION), OR INFRINGEMENT OF ANY PATENT, COPYRIGHT OR OTHER INTELLECTUAL PROPERTY RIGHT.

UNLESS EXPRESSLY APPROVED IN WRITING BY TWO AUTHORIZED ST REPRESENTATIVES, ST PRODUCTS ARE NOT RECOMMENDED, AUTHORIZED OR WARRANTED FOR USE IN MILITARY, AIR CRAFT, SPACE, LIFE SAVING, OR LIFE SUSTAINING APPLICATIONS, NOR IN PRODUCTS OR SYSTEMS WHERE FAILURE OR MALFUNCTION MAY RESULT IN PERSONAL INJURY, DEATH, OR SEVERE PROPERTY OR ENVIRONMENTAL DAMAGE. ST PRODUCTS WHICH ARE NOT SPECIFIED AS "AUTOMOTIVE GRADE" MAY ONLY BE USED IN AUTOMOTIVE APPLICATIONS AT USER’S OWN RISK.

Resale of ST products with provisions different from the statements and/or technical features set forth in this document shall immediately void any warranty granted by ST for the ST product or service described herein and shall not create or extend in any manner whatsoever, any liability of ST.

ST and the ST logo are trademarks or registered trademarks of ST in various countries.

Information in this document supersedes and replaces all information previously supplied.

The ST logo is a registered trademark of STMicroelectronics. All other names are the property of their respective owners.

STMicroelectronics group of companies

Australia - Belgium - Brazil - Canada - China - Czech Republic - Finland - France - Germany - Hong Kong - India - Israel - Italy - Japan - Malaysia - Malta - Morocco - Philippines - Singapore - Spain - Sweden - Switzerland - United Kingdom - United States of America

www.st.com