TAS5708(TAS5710)EVM

This manual describes the operation of the TAS5708(TAS5710)EVM to evaluate the performance of the TAS5708/10. The main contents of this document are:

- Details on how to properly connect a TAS5708/10 Evaluation Module (EVM) and the details of the EVM.
- Details on how to install and use the GUI to program the TAS5708/10.
- Details on how to use the audio processing features like EQ and DRC.
- Quick-Start Guide for the common modes in which TAS5708/10 EVM can be used.

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1 Overview

The TAS5708/10 evaluation module (EVM) demonstrates the TAS5708/10 device from Texas Instruments.

The TAS5708/10 combines a high-performance PWM processor with a class-D audio power amplifier. This EVM can be configured with two bridge-tied loads (BTL) (2.0). For detailed information about the TAS5708/10 device, review the device data sheet (SLOS570). The Pulse Width Modulator (PWM) is based on TI's Equibit™ technology.

The EVM software with its graphic user interface (GUI) facilitates evaluation by providing access to the TAS5708/10 registers through a USB port. See the *Using the EVM Software* section for further details.

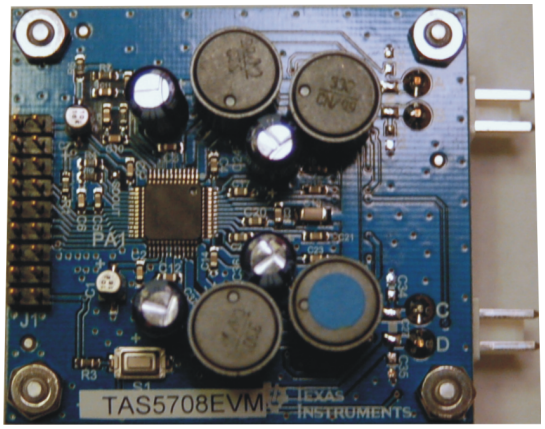


Figure 1. TAS5708(TAS5710)EVM Printed-Circuit Board

The TAS5708(TAS5710)EVM, together with other TI components on this board, is a complete 2.1-channel digital audio amplifier system. The MC57xxPSIA Controller board includes a USB interface, a digital input (SPDIF), analog inputs via the ADC, power inputs, and other features like a mute function and power down.

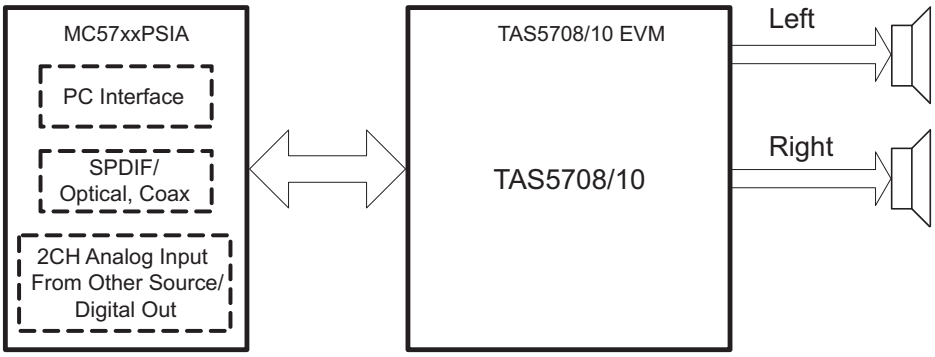


Figure 2. Complete System and EVM Signal Path Overview

1.1 TAS5708(TAS5710)EVM and MC57xxPSIA Features

- Channel evaluation module design
- Self-contained protection systems and control pins
- USB interface
- Standard I^2S data input using optical or coaxial inputs
- Analog input through analog-to-digital converter
- Subwoofer connection—the PWM terminal provides the PWM signal and power to an external subwoofer board
- Double-sided, plated-through PCB, 1-oz copper, 2 mm
- Access to control signal gain and data format through EVM-software GUI

2 Installation

This section describes the EVM and software installation.

2.1 EVM Installation

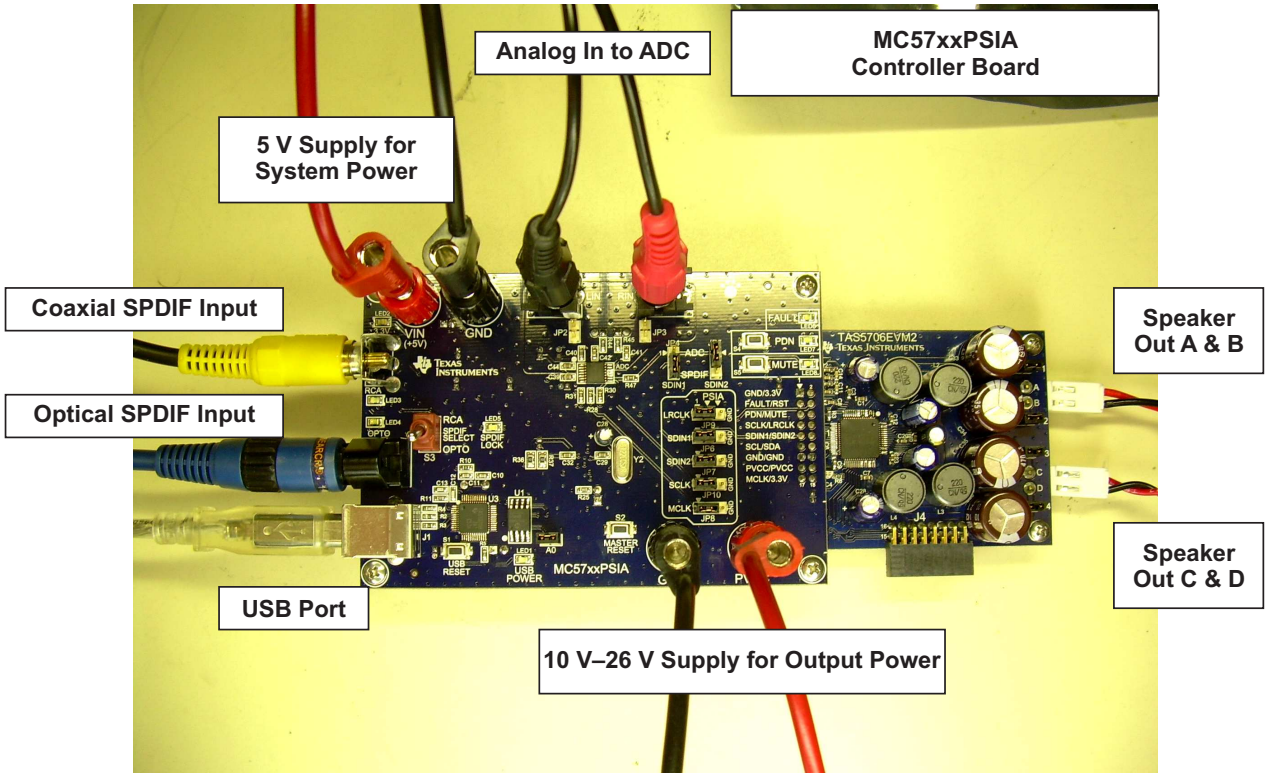


Figure 3. General Connection Picture

The following are the basic tools for the initial EVM power up.

- 5-V, 1-A power supply (VIN)
- 10–26-V, 4-A power supply (PVCC)
- Banana-style test leads for power supplies and speakers
- Optical or coaxial cable for SPDIF interface based on signal source
- USB cable
- EVM software
- Two 8-Ω speakers or loads

The following sections describe the TAS5708(TAS5710)EVM board in regards to power supply (PSU) and system interfaces.

2.1.1 Connecting the TAS5708(TAS5710)EVM to MC57xxPSIA

On the right side of the MC57xxPSIA is a terminal block and another on the left of the TAS5708(TAS5710)EVM (labeled J1). Carefully place the MC57xxPSIA block above the EVM, and gently push down.

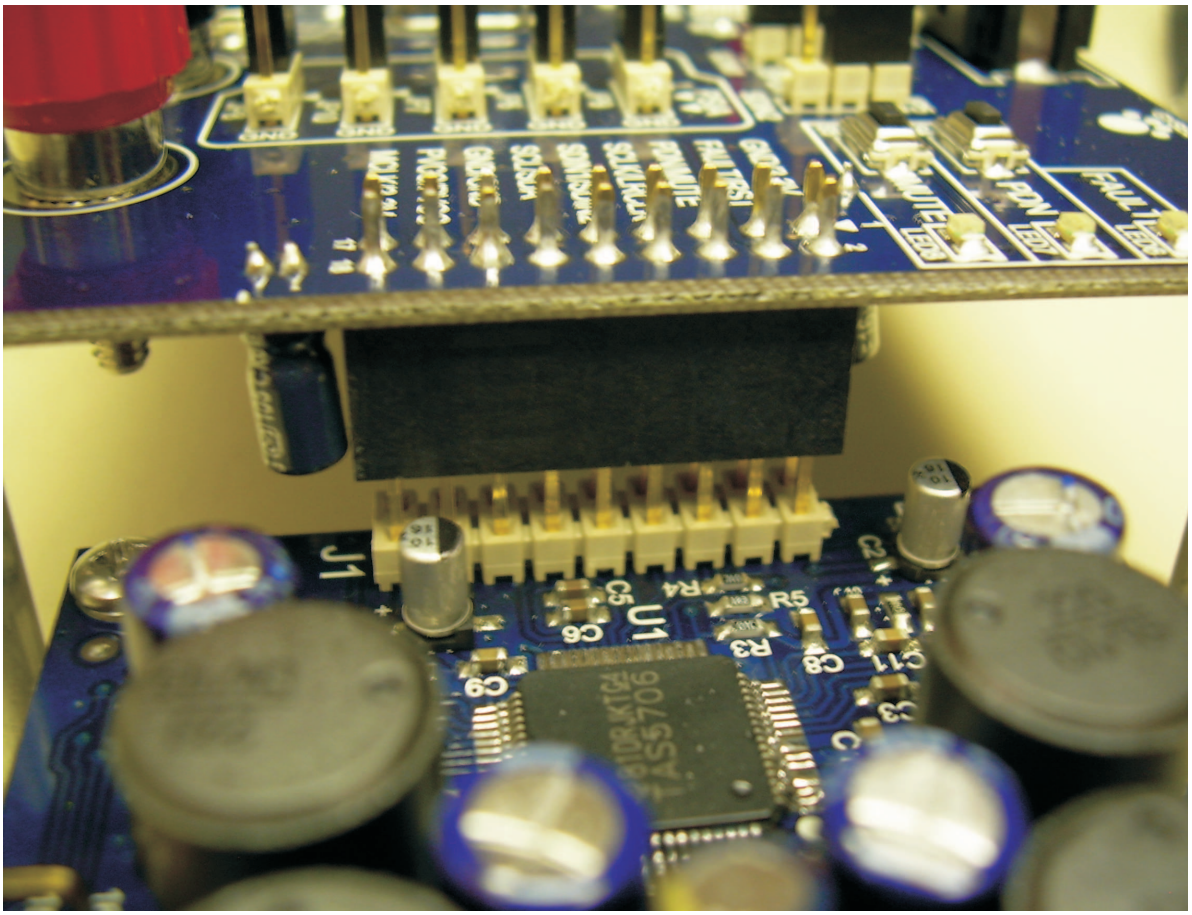


Figure 4. Connecting TAS5708(TAS5710)EVM to MC57xxPSIA

2.1.2 PSU Interface

The TAS5708(TAS5710)EVM is powered by two power supplies connected to the MC57xx controller board: a 5-V power supply (VIN) and a 10-V to 26-V (PVCC) power supply. The 3.3-V level is generated on the board by a voltage regulator from the 5-V supply.

Note: The power-supply cable length must be minimized. Increasing the length of the PSU cable increases the distortion of the amplifier at high output levels and low frequencies

The maximum output-stage supply voltage depends on the speaker load resistance. Check the recommended maximum supply voltage in the TAS5708/10 (SLOS570) data sheet.

Table 1. Recommended Power Supplies

Description	Voltage Limitations (8-Ω Load)	Current Recommendations
System power supply	5 V	1 A
Output power stage supply	10–26 V	4 A[(1)]

(1) The rated current corresponds to two channels, full scale.

2.1.3 Loudspeaker Connectors

CAUTION

All speaker outputs are biased at Vcc/2 and must not be connected to ground (e.g., through an oscilloscope ground).

Loudspeaker connections vary by device setup. Consult the quick-start guide (Section 4) for more details. However, the following is a general guideline:

When connecting a speaker in BTL mode, connect the speaker's two terminals (A&B or C&D) across two outputs on the TAS5708(TAS5710)EVM.

Speakers or loads can be connected to the outputs A-D with clip leads, or cables can be made with female connectors (JST VHR-2N) that can mate to male connectors on the EVM board.

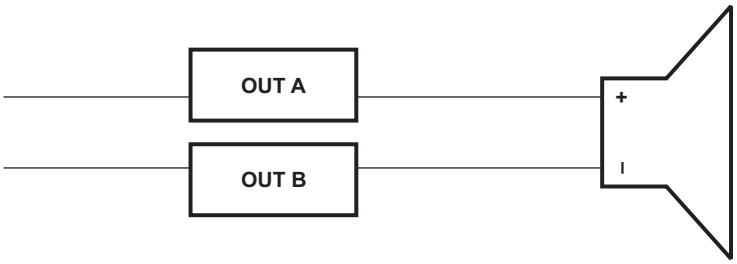


Figure 5. BTL Connection

2.1.4 USB Interface

The TAS5708/10 registers are accessed through I^2C™ bus lines SDA and SCL. The USB circuit and USB connector on the MC57xxPSIA board facilitates the connection between a host computer and the device. The EVM USB circuit is powered by the 5-V USB line of the host PC and is independent of the power supplies available on the board. The USB device that is used is a TAS1020B from Texas Instruments.

2.1.5 Digital Audio Interface SPDIF

The Digital Audio Interface SPDIF (RCA/OPTO) accepts digital audio data using the I^2S protocol. See the TAS5708/10 data sheet (SLOS570) for more information.

The RCA connector and the OPTO connector are the two SPDIF interfaces on the MC57xxPSIA board. The switch S3 toggles between the OPTO and RCA connector to accommodate the signal source. When the RCA cable or optical cable is connected and the signal source is powered up, verify that the SPDIF lock indicator (blue LED5) illuminates, confirming that a viable signal is available to the device. Install a jumper on JP4 across the middle pin and the pin marked SPDIF to connect the digital source to SDIN1.

For detailed information on how the data and clocks are provided to the TAS5708/10, see the schematic appearing at the end of this document and the DIR9001 device data sheet (SLES198).

2.1.6 ADC Interface

In the absence of a digital signal source, the PCM1808 ADC can be used to convert an analog audio signal to a digital signal to the TAS5708/10. The DIR9001 still provides clock signals to the ADC in this process. The DIR9001 oscillator frequency (Y2) determines the sampling frequency in the absence of a digital signal. If the OSC frequency is 24 MHz, or if the OSC is set at 12 MHz, the sampling frequency

defaults to 48 kHz when no signal is on the SPDIF input terminals. A 12-MHz crystal is installed on the MC57xxPSIA board. The ADC is an additional feature of this board to provide flexibility in sourcing an audio signal to the TAS5708/10. Review the PCM1808 data sheet (SLES177) for a detailed description of the ADC on this EVM. Install the jumper on JP4 across the middle pin and the pin marked ADC to select ADC as the source for SDIN1.

2.1.7 Board Power-Up General Guidelines

Connect the MC-57xx and the TAS5708(TAS5710)EVM boards by locating pin 1 on each board, indicated by a small white triangle. The MC-57xx plugs down onto the TAS5708(TAS5710)EVM board (i.e., the TAS5708(TAS5710)EVM board fits underneath the MC57xxPSIA board). Pin 1 on each board must be connected to each other.

Install the EVM software on the personal computer (PC) before powering up the board. After connecting the loudspeakers or other loads, power supplies, and the data line, power up the 5-V power supply first; then power up the PVCC power supply. It is recommended initially to set the PVCC level to 10 V, then ramp it up to 20 V to verify cable connections.

2.2 Software Installation

Download the TAS570X GDE from TI Web site. The TI Web site always has the latest release of the GUI and any update versions.

Execute the GUI install program, Setup.exe. Once the program is installed, the program group and shortcut icon is created in Start → Program → Texas Instruments Inc → TAS570X GDE. THE GUI come ups as shown in Figure 6.

Select the appropriate tab, in this case select TAS5708 (or TAS5710) tab. It has two subwindows. One shows the Process Flow window. From the Process Flow window, each signal processing function tool can be selected by clicking on it. The Biquad GUI and the DRC GUI can be opened by using the right button of the mouse. This window also shows Input select, Mode select, Channel, and Master Volume. All functions are shown in the order in which they appear in the device.

The other subwindow, Properties window, has the properties where a user can update by selecting from the available options. The properties available depend on the device selected. From the main window, the user must set three properties before connecting to the EVM.

Select the device Enable/Disable auto bank switch function, and set the sample rate. The TAS570x automatically detects sample rates. The setting is simply to synchronize the GUI and the device.

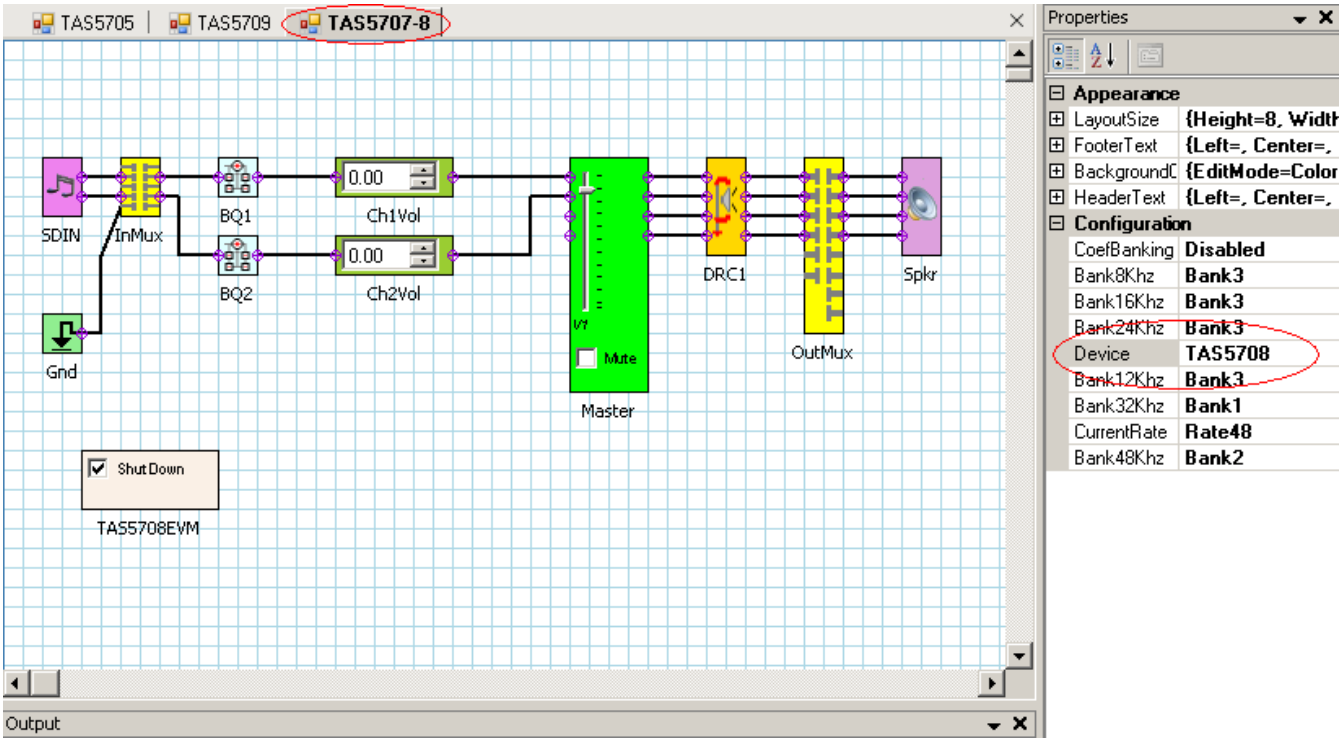


Figure 6. Process Flow for TAS5708 UG

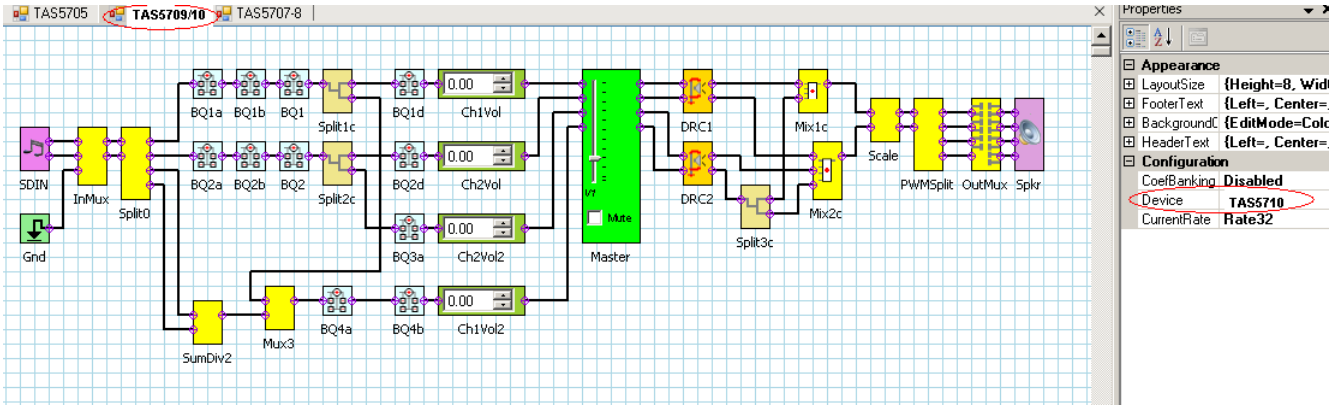


Figure 7. Process Flow for TAS5710 UG

3 Using the EVM Software

3.1 Connect the GUI to the EVM

Once the properties window selections have been made, go to the menu Target → Connect. This sends the initialization commands to the device. Master volume is in mute. Select the master volume function. Type the required volume in the properties window. For TAS5708/10, type –12 dB. The difference is due to the power stage gain in both devices. At this time, audio, if connected properly, plays through the device. Check the All channel shutdown button. It should be un-checked. When the Connect command is issued, if an error appears that indicates a USB problem. Check the connections, and press the USB RESET button on the controller board. Then disconnect and re-connect from the Target menu.

3.2 I2C Memory Tool

This tool can be opened from GDE (Tools → I2C Memory Tool) or independent of GDE from Start → Program → Texas Instruments Inc → Memory Tool

Select I2C as show in Figure 8.

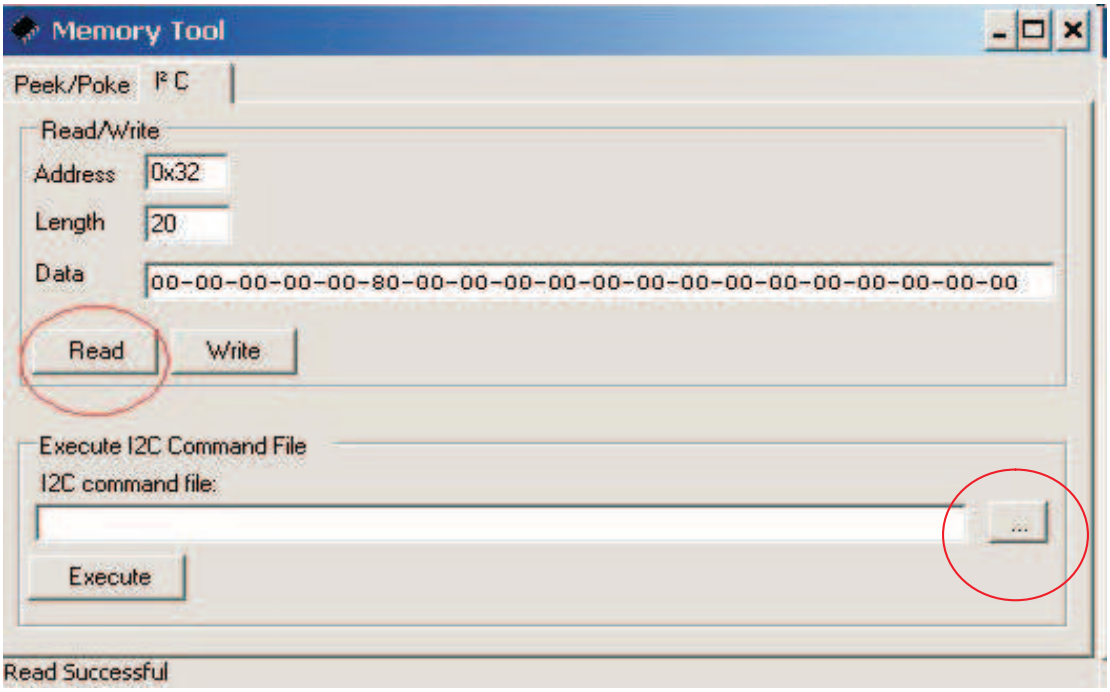


Figure 8. Memory Tool Window

I^2C registers can be written or read using this tool. The I^2C command file can be sent by selecting the command file and *Execute* command.

3.3 Volume Function

Individual and Master volume can be selected, and the required volume value can be entered by typing on the Property Window after selecting the function with the mouse (see Figure 9).

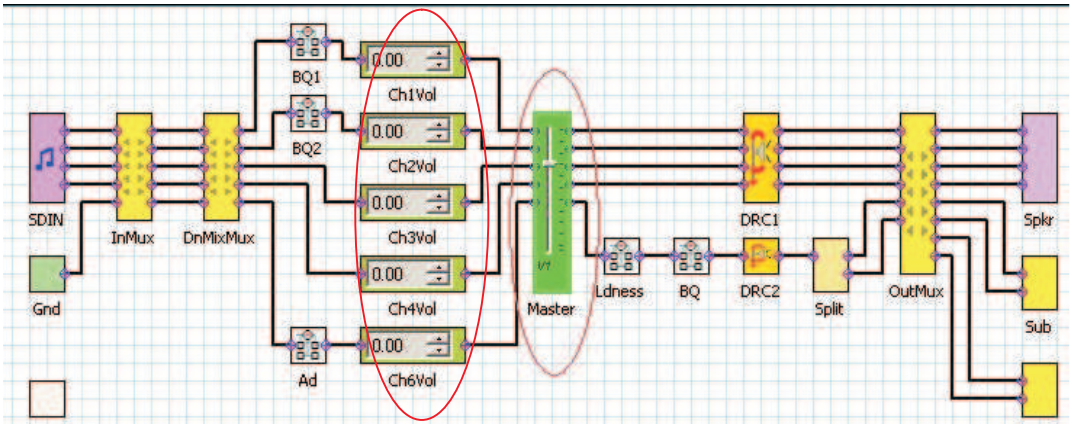


Figure 9. Volume Control

3.4 Biquad GUI

Using the right button of mouse, select Biquad GUI (Figure 10).

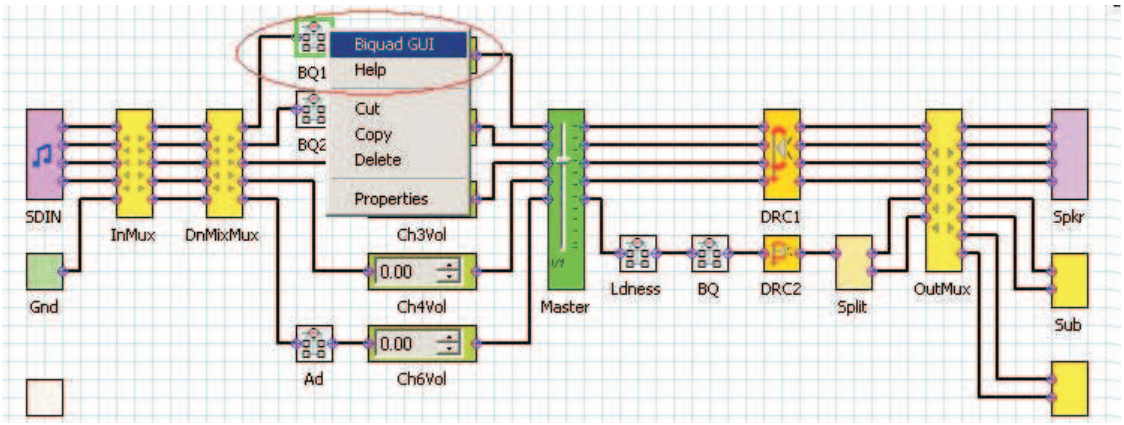


Figure 10. Selecting Biquad GUI

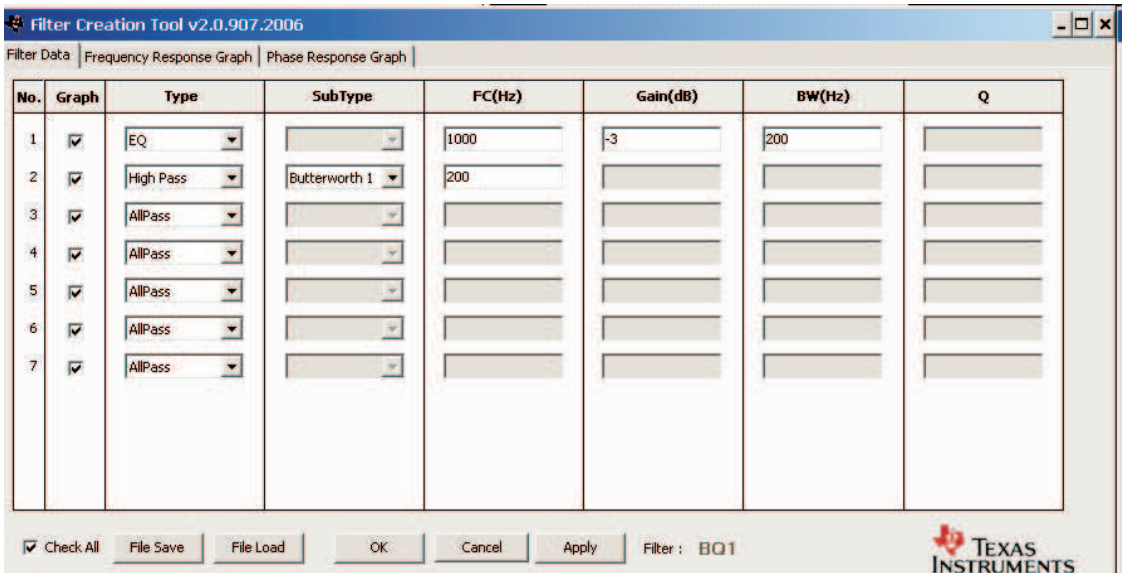


Figure 11. Filter Creation Tool Window

A check-mark selects the Biquad. If not selected, the Biquad is in ALL PASS Mode.

Frequency response for the current settings can be viewed and adjusted in **Frequency Response Window** Tab (Figure 11). Individual Biquad Gains must be within ±12 db.

The command **Apply** from the filter data window sends all three banks of coefficients (providing auto bank is enabled).

3.5 DRC GUI

Clicking on the function selects DRC GUI (Figure 12). Click on the DRC function, and check to see if DRC is enabled in the property window.

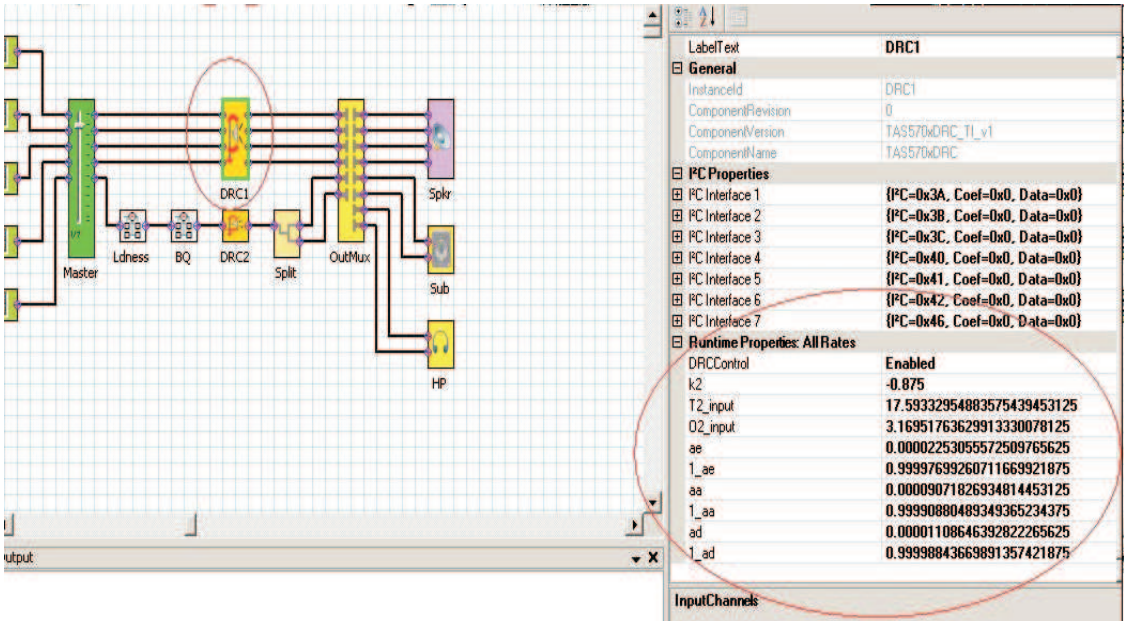


Figure 12. DRC Parameters

Next, using the right button of the mouse, select **Activate DRC GUI** (Figure 13).

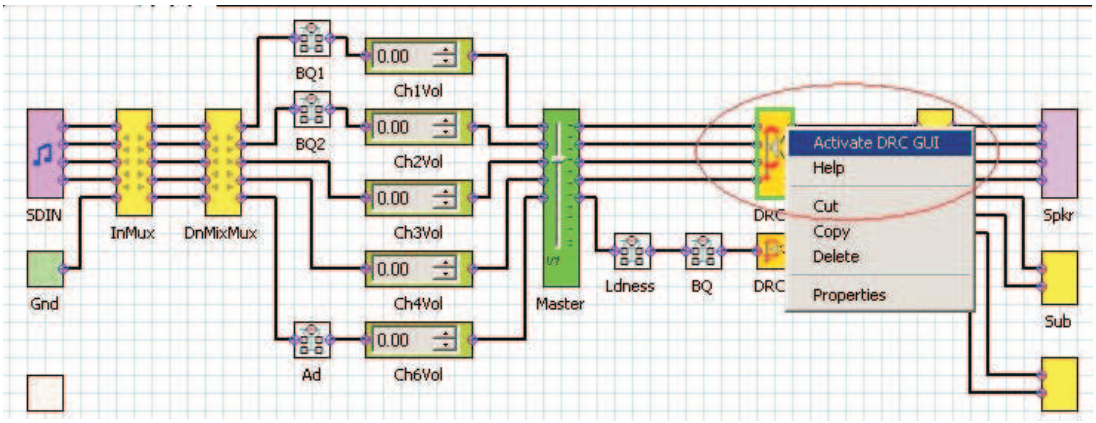


Figure 13. Activating the DRC GUI

Set the **compression ratio** to a value between 1 and 50. The **offset** has a range at ±6 dB. *A value of 0* is illegal. If no offset is required, set the offset to 0. Offset is generally not required in a DRC application because is just provides a gain. **Threshold** is selected with a value of 0 to –72 dB.

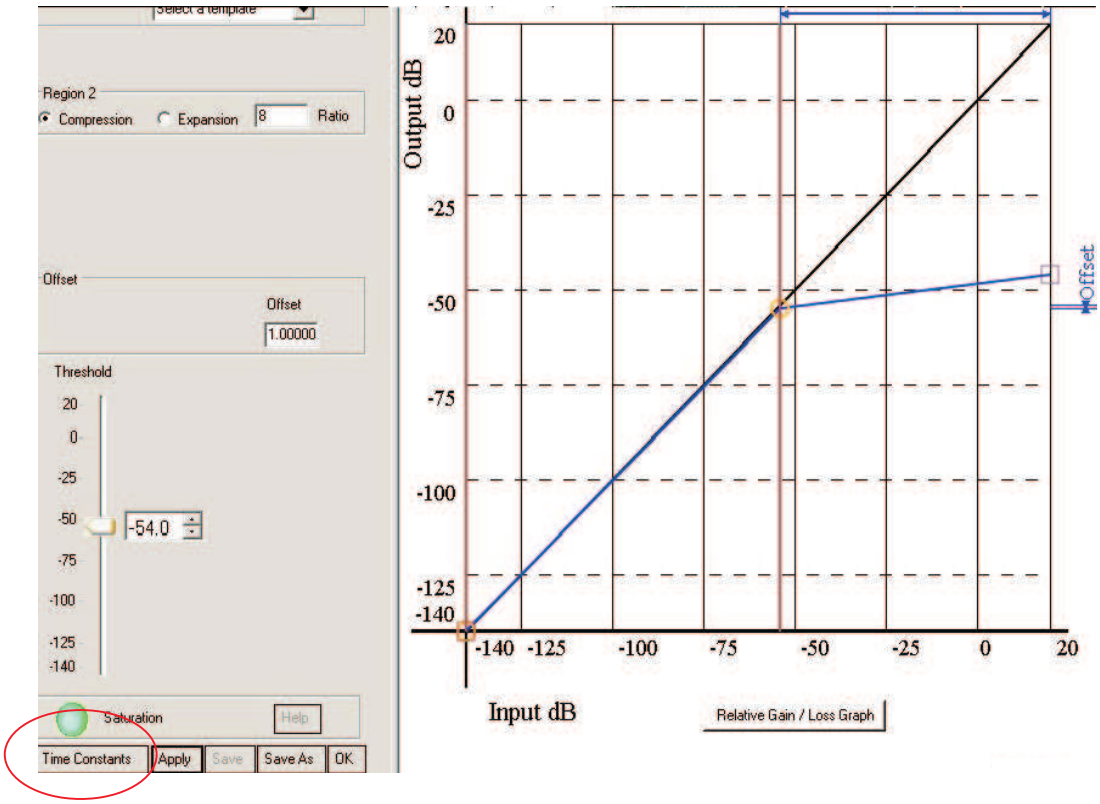


Figure 14. Time Constants Button

Time constants: Select the time constants to adjust the energy, attack, and decay filters (Figure 14).

4 MODULATION SCHEME

This section discusses the two most common configurations of the TAS5708(TAS5710)EVM.

Common Configurations:

1. 2 × BTL BD Mode
2. 2 × BTL AD Mode

Note:

AD : AD Modulation-Outputs are 180° out of phase

BD : BD Modulation

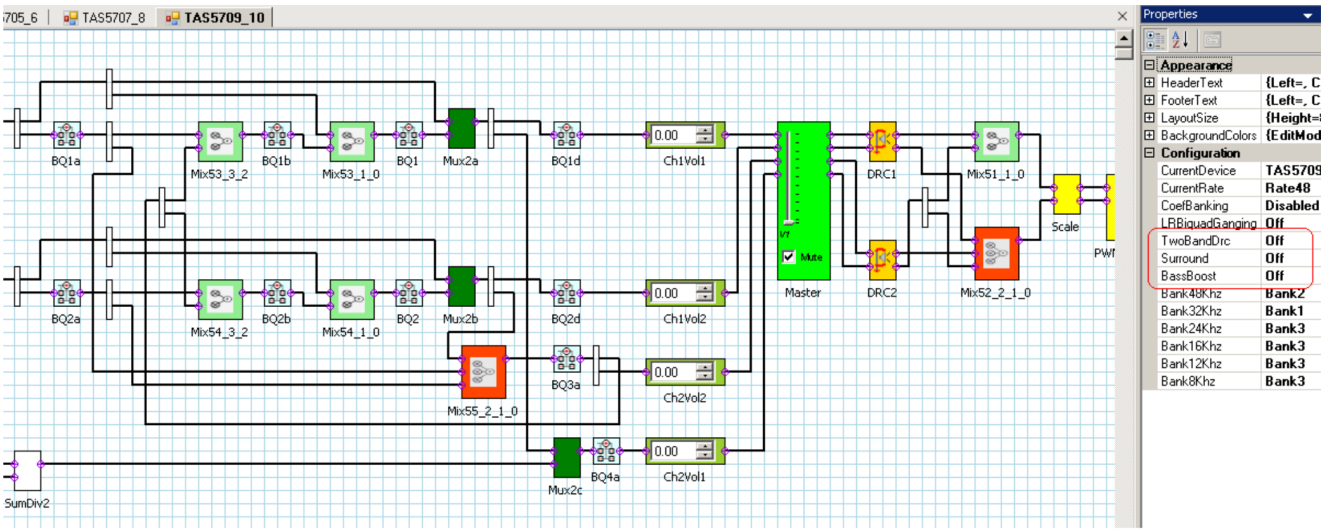
BTL : Bridge-Tied Load

4.1 2 X BTL BDAD (Default: BD mode)

1. Set up the hardware.
2. GDE: Select the Input MUX. In the Properties window, select Modulation scheme as BD for BD Mode. For AD Mode, select AD.
3. GDE: **Target > Connect**.
4. Finally uncheck the **shutdown** box to bring the device out of Shutdown mode, and adjust the **Master Volume** as desired.

5 Advanced Audio Processing Features in TAS5710

TAS5710 Process Structure is as shown in GDE:



C001

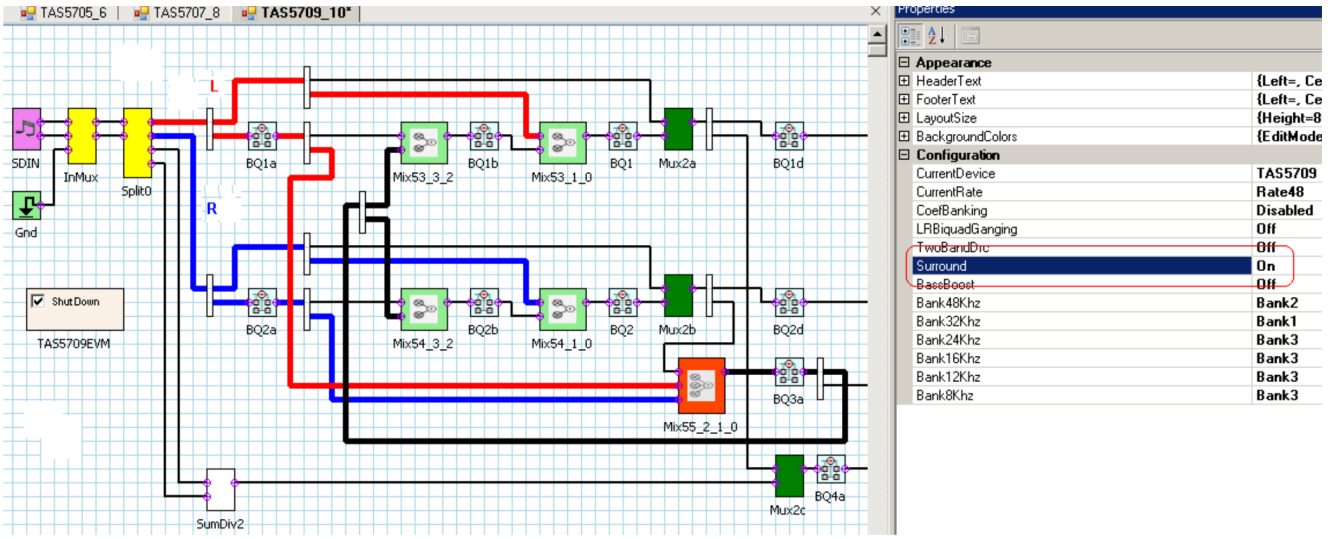
The three built-in functions in the Properties window are:

1. **Surround (3D): ON/OFF**
2. **Bass Boost (Pseudo Bass): ON/OFF**
3. **Two-Band DRC (2-Band DRC): ON/OFF**

Each of these features are explained as follows:

1. **Surround (3D): ON/OFF**

   Turn it ON. Then L-R terms get mixed with raw L and R after band-pass filtering. The L-signal is RED, the R-signal is BLUE, and the L-R signal is BLACK.

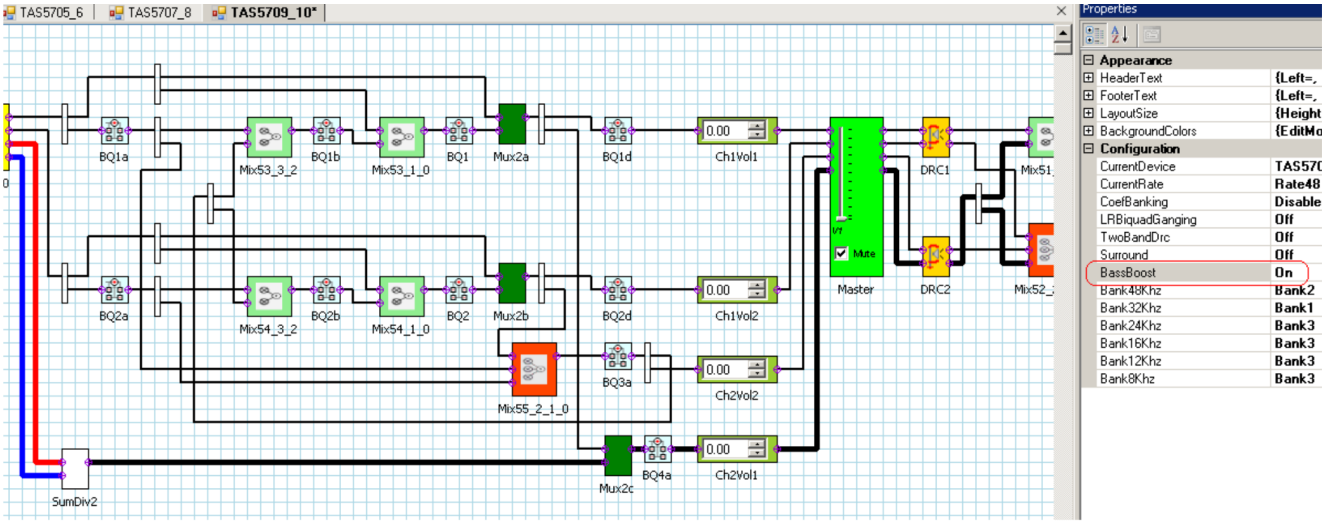


C002

Biquads and mixers can be adjusted to fine-tune 3D.

2. **Bass Boost (Pseudo Bass): ON/OFF**

   (L+R)/2 signal is low-pass filtered to get the bass signal and then applied a boost before mixing with L and R channels.

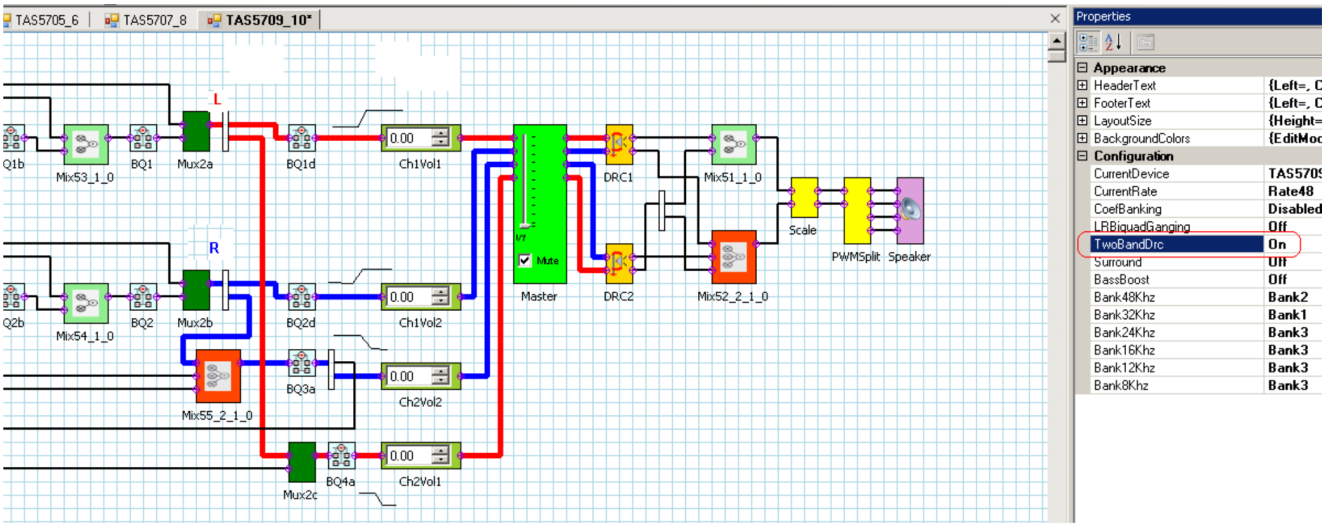


C003

3. **Two-Band DRC (2-Band DRC): ON/OFF**

   L and R signals are split into two paths: one path with high-frequency and components (high pass) and the other with low-frequency components (low pass).

   High frequency of both L and R has one DRC-ganged and low-frequency paths have another DRC-ganged. This allows both high- and low-frequency components to have different thresholds.



Both DRC can be programmed separately.

6 Jumpers and Control Utilities on MC57xxPSIA board

6.1 RCA/OPTICAL Jumpers

Select the jumper to reflect the source whether it is RCA or OPTICAL.

6.2 Switches

Reset is an active-low function. Pressing the master reset switch (S2) resets the TAS5708/10 device; pressing USB RESET (S1) resets the USB bus. Pressing PDNZ(S4) powers down the TAS5708/10, and pressing MUTE (S5) mutes (volume mute) the TAS5708/10.

6.3 LED Indicators

LED1 : USB Power connector installed at J1

LED2 : 3.3V Power is valid

LED3: RCA connection made

LED4: Optical connection made

LED5: SPDIF signal locked

LED6: FAULT (Not used with TAS5708(TAS5710)EVM)

LED7: PDN switch (S4) is depressed.

LED8: MUTE switch (S5) is depressed.

7 Board Layouts, Bill of Materials, and Schematic

7.1 TAS5708(TAS5710)EVM and MC57xxPSIA Board Layouts

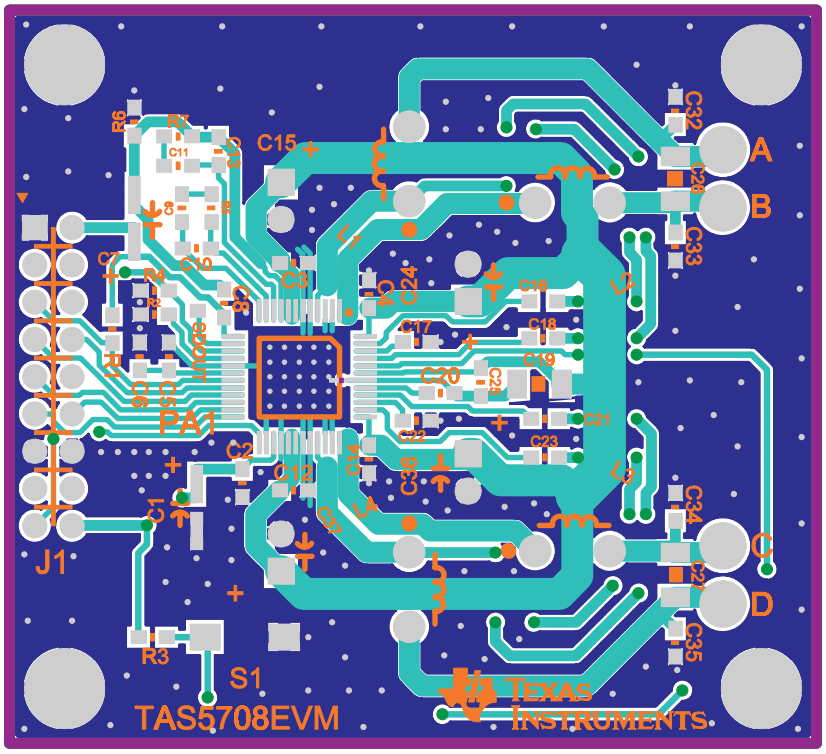


Figure 15. TAS5708(TAS5710)EVM Top Composite Assembly

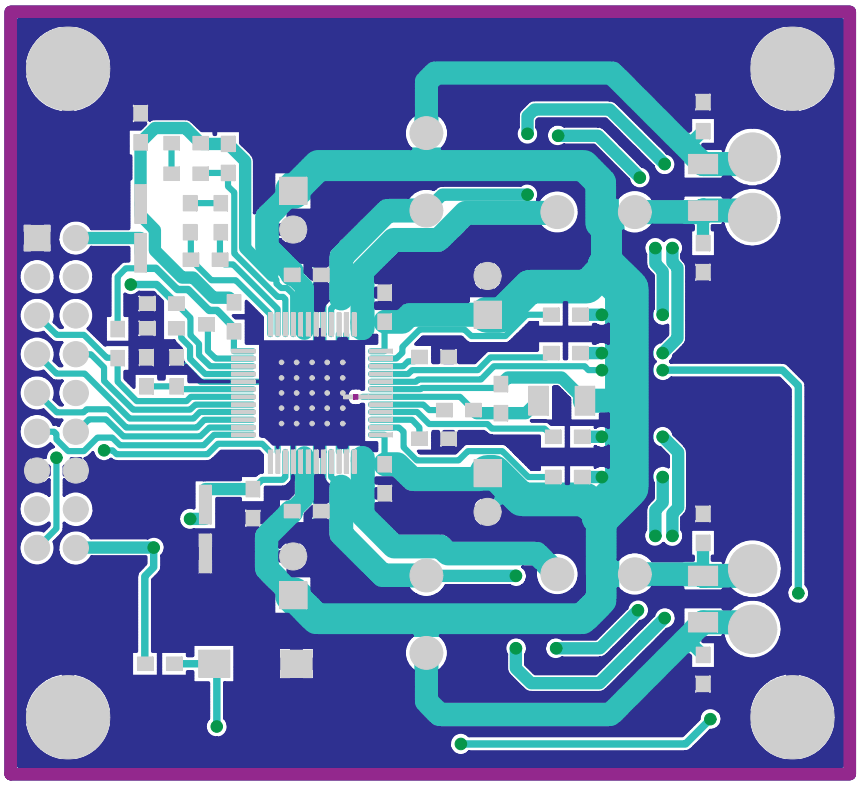


Figure 16. TAS5708(TAS5710)EVM Top Copper Assembly

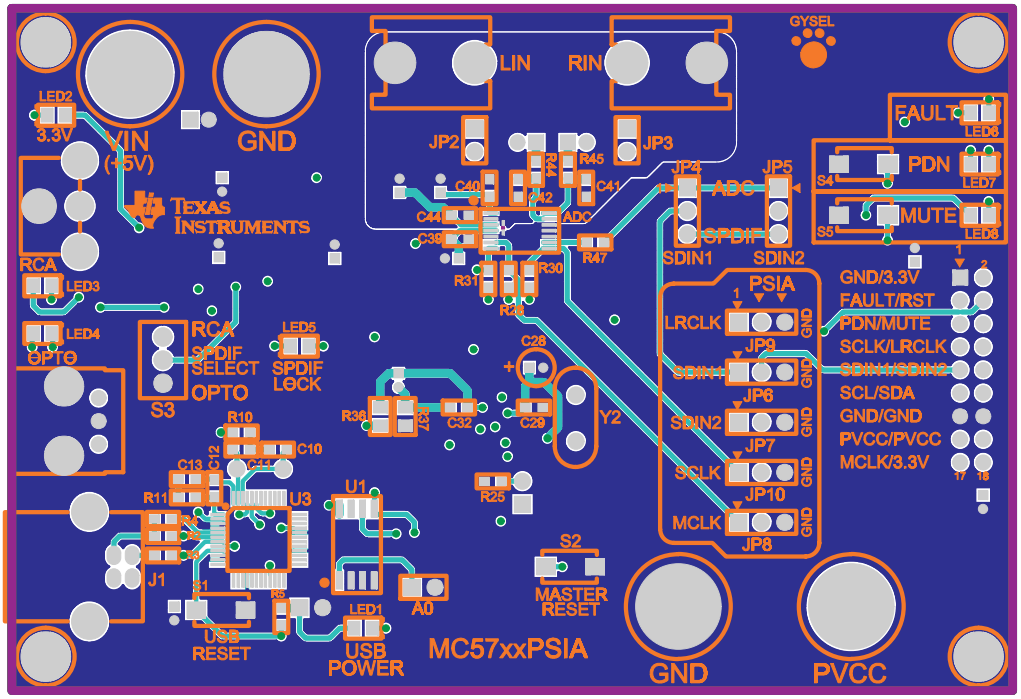


Figure 17. MC57xxPSIA Top Assembly

7.2 Bill of Materials

Table 2. Bill of Materials for TAS5708EVM

TI SEMICONDUCTORS								
Item	**Description**	**Ref Des**	**Qty**	**MFG**	**MFG:Part No.**	**Vendor**	**Cut Tape: Part No.**	**Tape & Reel Part No.**
1	15W DIGAMP WITH DAP HTQFP48-PHP	PA1	1	Texas Instruments	TAS5708PHP	Texas Instruments	TAS5708PHP	No T&R. Part No.
CAPACITORS								
2	CAP 4700PFD 50V CERM 0603 X7R	C10, C13	2	Panasonic	ECJ-1VB1H472K	Digi-Key	PCC1780CT	PCC1780TR
3	CAP .047UFD 25V CERM 0603 X7R ROHS	C9, C11	2	Panasonic	ECJ-1VB1E473K	Digi-Key	PCC1771CT	PCC1771TR
4	CAP 0.1UFD 16V CERM 0603 X7R	C2, C6, C8	3	Panasonic	ECJ-1VB1C104K	Digi-Key	PCC1762CT	PCC1762TR
5	CAP 0.1UFD 50V CERM 0603 X7R ROHS	C3, C4, C12, C14, C25	5	Panasonic	ECJ-1VB1H104K	Digi-Key	PCC2398CT	PCC2398TR
6	CAP 0.22UFD 25V CERM 0603 X7R	C16, C18, C21, C23	4	Murata Electronics	GRM188R71E224KA88D	Digi-Key	490-3290-1	490-3290-2
7	CAP 1.0UFD 25V CERM 0603 X5R ROHS	C17, C20, C22	3	Taiyo Yuden	TMK107BJ105KA-T	Digi-Key	587-1248-1	587-1248-2
8	CAP 4.7UFD 6.3V CERM 0603 X5R	C5	1	TDK CORP.	C1608X5R0J475M	Digi-Key	445-1417-1	445-1417-2
9	**THIS LINE IS LEFT BLANK INTENTIONALLY**							
10	CAP 1.0UFD 50V CERM 1206 X7R	C28–C31	4	TDK Corp.	C3216X7R1H105K	Digi-Key	445-1423-1	445-1423-2
11	CAP 10UFD 35V CERM 1206 Y5V ROHS	C19	1	Taiyo Yuden	GMK316F106ZL-T	Digi-Key	587-1352-1	587-1352-2
12	CAP 10UFD 16V 20% ALUM ELEC SMD VSA ROHS	C1, C7	2	Panasonic	EEE-1CS100SR	Digi-Key	PCE3893CT	PCE3893TR
13	CAP 100UFD 35V RAD ALUM ELEC M	C15, C24, C36, C37	4	Panasonic	ECA-1VM101	Digi-Key	P10418TB	P5165
RESISTORS								
14	RES 0.0 OHM 1/16W 5% SMD 0603	R6	1	Panasonic	ERJ-3GEY0R00V	Digi-Key	P0.0GCT	P0.0GTR
15	RES 470 OHM 1/10W 5% SMD 0603	R5, R7	2	Panasonic	ERJ-3GEYJ471V	Digi-Key	P470GCT	P470GTR
16	RES 10K OHM 1/10W 5% SMD 0603 ROHS	R1, R4	2	Yageo	RC0603JR-0710KL	Digi-Key	311-10KGRCT	311-10KGRTR
17	RES 18.2K OHM 1/10W 1% SMD 0603 ROHS	R2	1	ROHM	MCR03EZPFX1822	Digi-Key	RHM18.2KHCT	RHM18.2KHTR
18	RES 47K OHM 1/10W 5% SMD 0603	R3	1	Yageo	9C06031A4702JLHFT	Digi-Key	311-47KGCT	311-47KGTR
INDUCTORS								
19	INDUCTOR, SERIES 11RHBP, 22UH	L1–L4	4	Toko America	A7503Y-330M	Toko America	A7503AY-330M	No T&R. Part No.
HEADERS								
20	Header, 2 Pin Male, PCB-RA, TIN, W/Lock	J2, J3	2	JST	B2PS-VH	Digi-Key	455-1255	No T&R Part No.
21	HEADER, 2X9 PIN MALE, PCB STRAIGHT GOLD ROHS	J1	1	Sullins	PBC09DAAN	Digi-Key	S2011E-09	No T&R Part No.
SWITCHES								
22	Switch, Momentary SMT-Short, Black Tab, 240g	S1	1	Panasonic	EVQ-PPDA25	Digi-Key	P8087SCT	PI087STR
STANDOFFS AND HARDWARE								
23	Hex Nut, 4-40, Zinc/Steel	HW1– HW4	4	Building Fasteners	HNZ440	Digi-Key	H216	No T&R Part No.
24	Standoff 4-40 Threaded M/F 0.50 in. ALUM-HEX	HW1–HW4	4	Keystone Electronics	8401	Digi-Key	8401K	No T&R Part No.
	Component Count: 54							

Table 3. Bill of Materials for TAS5710EVM

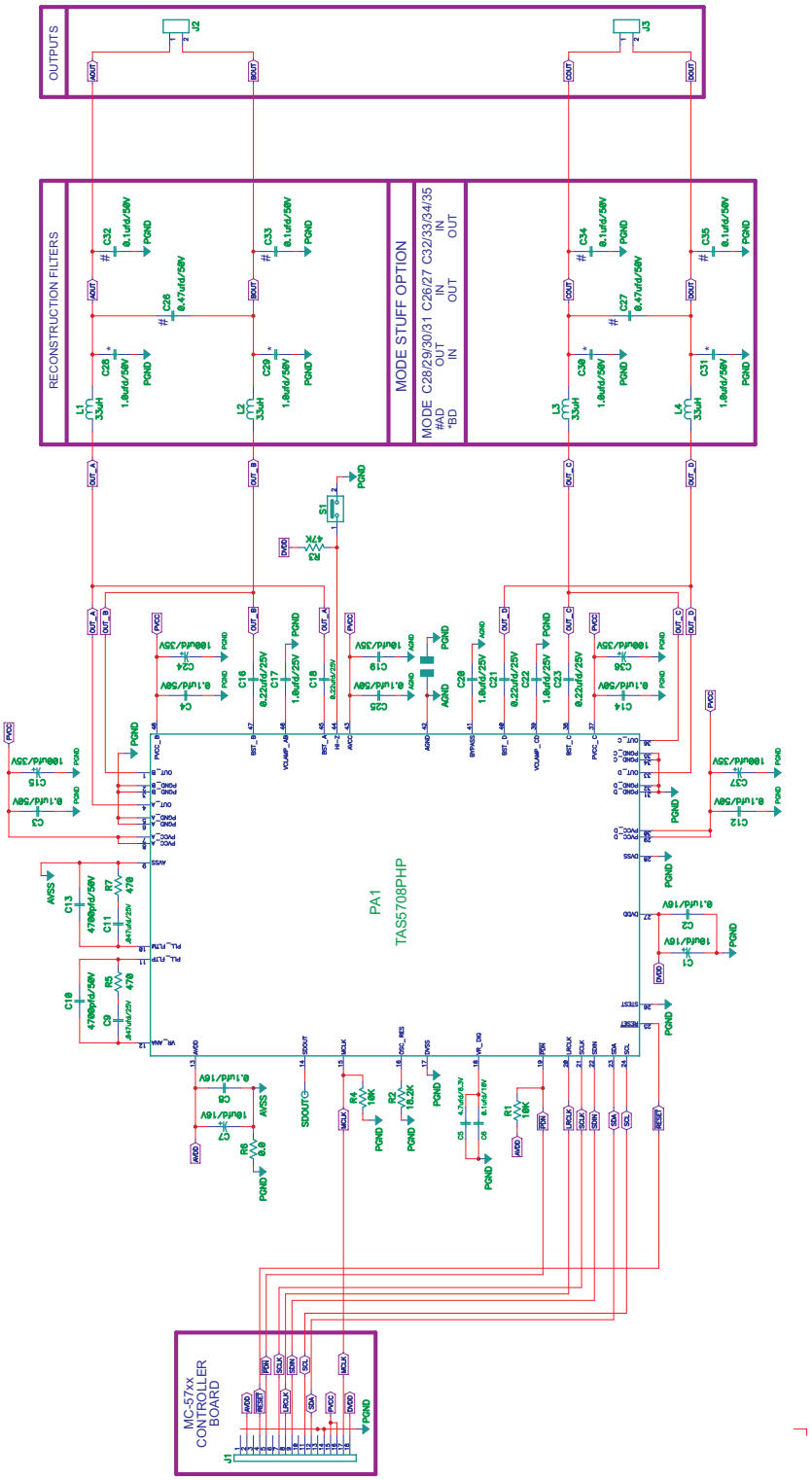
TI SEMICONDUCTORS								
Item	**Description**	**Ref Des**	**Qty**	**MFG**	**MFG:Part No.**	**Vendor**	**Cut Tape: Part No.**	**Tape & Reel Part No.**
1	15W DIGAMP WITH DAP HTQFP48-PHP	PA1	1	Texas Instruments	TAS5710PHP	Texas Instruments	TAS5710PHP	No T&R. Part No.
CAPACITORS								
2	CAP 4700PFD 50V CERM 0603 X7R	C10, C13	2	Panasonic	ECJ-1VB1H472K	Digi-Key	PCC1780CT	PCC1780TR
3	CAP .047UFD 25V CERM 0603 X7R ROHS	C9, C11	2	Panasonic	ECJ-1VB1E473K	Digi-Key	PCC1771CT	PCC1771TR
4	CAP 0.1UFD 16V CERM 0603 X7R	C2, C6, C8	3	Panasonic	ECJ-1VB1C104K	Digi-Key	PCC1762CT	PCC1762TR
5	CAP 0.1UFD 50V CERM 0603 X7R ROHS	C3, C4, C12, C14, C25	5	Panasonic	ECJ-1VB1H104K	Digi-Key	PCC2398CT	PCC2398TR

Table 3. Bill of Materials for TAS5710EVM (continued)

TI SEMICONDUCTORS								
Item	**Description**	**Ref Des**	**Qty**	**MFG**	**MFG:Part No.**	**Vendor**	**Cut Tape: Part No.**	**Tape & Reel Part No.**
6	CAP 0.22UFD 25V CERM 0603 X7R	C16, C18, C21, C23	4	Murata Electronics	GRM188R71E224KA88D	Digi-Key	490-3290-1	490-3290-2
7	CAP 1.0UFD 25V CERM 0603 X5R ROHS	C17, C20, C22	3	Taiyo Yuden	TMK107BJ105KA-T	Digi-Key	587-1248-1	587-1248-2
8	CAP 4.7UFD 6.3V CERM 0603 X5R	C5	1	TDK CORP.	C1608X5R0J475M	Digi-Key	445-1417-1	445-1417-2
9	**THIS LINE IS LEFT BLANK INTENTIONALLY**							
10	CAP 1.0UFD 50V CERM 1206 X7R	C28–C31	4	TDK Corp.	C3216X7R1H105K	Digi-Key	445-1423-1	445-1423-2
11	CAP 10UFD 35V CERM 1206 Y5V ROHS	C19	1	Taiyo Yuden	GMK316F106ZL-T	Digi-Key	587-1352-1	587-1352-2
12	CAP 10UFD 16V 20% ALUM ELEC SMD VSA ROHS	C1, C7	2	Panasonic	EEE-1CS100SR	Digi-Key	PCE3893CT	PCE3893TR
13	CAP 100UFD 35V RAD ALUM ELEC M	C15, C24, C36, C37	4	Panasonic	ECA-1VM101	Digi-Key	P10418TB	P5165
RESISTORS								
14	RES 0.0 OHM 1/16W 5% SMD 0603	R6	1	Panasonic	ERJ-3GEY0R00V	Digi-Key	P0.0GCT	P0.0GTR
15	RES 470 OHM 1/10W 5% SMD 0603	R5, R7	2	Panasonic	ERJ-3GEYJ471V	Digi-Key	P470GCT	P470GTR
16	RES 10K OHM 1/10W 5% SMD 0603 ROHS	R1, R4	2	Yageo	RC0603JR-0710KL	Digi-Key	311-10KGRCT	311-10KGRTR
17	RES 18.2K OHM 1/10W 1% SMD 0603 ROHS	R2	1	ROHM	MCR03EZPFX1822	Digi-Key	RHM18.2KHCT	RHM18.2KHTR
18	RES 47K OHM 1/10W 5% SMD 0603	R3	1	Yageo	9C06031A4702JLHFT	Digi-Key	311-47KGCT	311-47KGTR
INDUCTORS								
19	INDUCTOR, SERIES 11RHBP, 22UH	L1–L4	4	Toko America	A7503Y-330M	Toko America	A7503AY-330M	No T&R. Part No.
HEADERS								
20	Header, 2 Pin Male, PCB-RA, TIN, W/Lock	J2, J3	2	JST	B2PS-VH	Digi-Key	455-1255	No T&R Part No.
21	HEADER, 2X9 PIN MALE, PCB STRAIGHT GOLD ROHS	J1	1	Sullins	PBC09DAAN	Digi-Key	S2011E-09	No T&R Part No.
SWITCHES								
22	Switch, Momentary SMT-Short, Black Tab, 240g	S1	1	Panasonic	EVQ-PPDA25	Digi-Key	P8087SCT	PI087STR
STANDOFFS AND HARDWARE								
23	Hex Nut, 4-40, Zinc/Steel	HW1– HW4	4	Building Fasteners	HNZ440	Digi-Key	H216	No T&R Part No.
24	Standoff 4-40 Threaded M/F 0.50 in. ALUM-HEX	HW1–HW4	4	Keystone Electronics	8401	Digi-Key	8401K	No T&R Part No.
	Component Count: 54							

7.3 Schematic

The schematic for TAS5708(TAS5710)EVM follows. The schematics for MC57xxPSIA appear on the following pages.



USB INTERFACE

ENGINEERING EVALUATION ONLY

USB BOOT EPROM

3.3V–USB, R1 4.7K, A0, GND

U1 24LC64: A0, A1, A2, GND, Vcc, WP, SCL, SDA; 3.3V–USB, SCL, SDA

(A0 IN DEFAULT)

R8 4.7K 3.3V–USB

R9 4.7K

SCL, SDA

TO EVM BOARD

SCL, SDA

USB I/O

J1: Vcc, Data+, Gnd Shield, Data–

R4 1.50K PUR

R2 27.4 DP

R3 27.4 DM

C2 47pfd/50V, C3 47pfd/50V

FB1 GND_USBIN

GND

USB RESET

S1 GND MRESET

U3 TAS1020BPFB

C10 27pfd/50V, Y1 6.000MHz XTALO, C11 27pfd/50V XTALI

R10 0.0

C12 100pfd/50V, C13 1000pfd/50V

R11 3.09K

AVSS–USB

PLLFILO, AVDD 3.3V–USB, AVSS

PLLFIL, XTAL, XTALO, MCLKI

SCL, SDA, PUR, DP, DM, MRESET, TEST, EXTEN, RSTO, RESET, VREN

MCLKO2, MCLKO1, CDATO, CSCLK, CDATI, CSYNC, CRESET, CSCHNE

P1.7, P1.6, P1.5, P1.4, P1.3, P1.2, P1.1, P1.0, NC, NC, P3.5, P3.4, P3.3, P3.2/XINT, P3.1, P3.0

DVDD DVDD DVDD, DVSS DVSS DVSS

3.3V–USB, GND

U2

U2: GND, RESET, EN, NC, IN, OUT, IN, OUT — TPS77533D

MRESET

VCC–USB, FB2, 5V–USB

C1 10ufd/16V, GND

R5 249K

C4 68ufd/6.3V, GND

DECOUPLING

U1–8, U3–8, U3–21, U3–33, U3–2

C5 0.1ufd/50V, C6 0.1ufd/50V, C7 0.1ufd/50V, C8 0.1ufd/50V, C9 0.1ufd/50V

R7 0.0

3.3V–USB, AVSS–USB

3.3V–USB, LED1 Green, R6 392, GND

CX	PROJECT: EVM CONTROLLER BOARD		
Design Team: YONG GWAN KIM			
Schematic Rev: NC	Mod: NC	PCB Rev: NC	Sheet 1 of 5
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SPDIF RECEIVER

ENGINEERING EVALUATION ONLY

SPDIF INPUT

RCA, GND

OPTO — TORX147LFT (+3.3V, Vcc, GND, Shield, Shield, OUT) → OPTO-IN

R13 75.0 Ω

C15 0.047ufd/16V

R15 100

R17 1.00M

INV1 — 74AHC1GU04 (NC, Vcc, GND)

C18 0.047ufd/16V

R20 2.00K

R21 7.50K

INV2 — 74AHC1GU04 (NC, Vcc, GND)

SPDIF INPUT SELECT

1-2: OPTO INPUT
2-3: RCA INPUT

+3.3V, R14 1.0K, S3, GND

RCA INPUT (LOW)

+3.3V, 4.7K, Q1, LED3 Green, R18 357, GND

OPTO INPUT (HIGH)

LED4 Green, R19 357, +3.3V, Q2, 4.7K, GND

MUX — SN74LVC2G157DCT (A, B, Y, Ȳ, G, GND, Vcc, +3.3V)

RXIN

U5 — DIR9001PW

SCKO, R28 47, MCLK

R32 100

+3.3V, Vdd, DGND, GND

R23 0.0, C23 33pfd/50V, R26 470, Y2 12.288MHz, C24 33pfd/50V

AUDIO, FSOUT0, FSOUT1, SCKO, CKSEL, ERROR, FMT1, FMT0, Vcc, AGND, FILT, RST, RXIN, RSV, BFRAME, EMPH, UOUT, COUT, XTO, XTI, CLKST, LRCKO, BCKO, DOUT, PSCK0, PSCK1

3.3V-SPDIF, AGND-SPDIF

C26 4700pfd/50V, R33 680, C27 0.068ufd/16V, AGND-SPDIF

RSV, GND

JP1 — +3.3V, R24 4.99K, PSCK0, PSCK1, R25 4.99K, GND

JP1 IN: SCKO = 512 Fs
JP1 OUT: SCKO = 256 Fs (DEFAULT)

DOUT, BCKO, LRCKO — R29 47, R30 47, R31 47 — DOUT-SPDIF, SCLK, LRCLK

DATA FORMAT

	FMT1	FMT0
24Bit/MSB/I2S	H	H

FMT1, FMT0 — R34 0.0, R35 0.0 — +3.3V

SPDIF LOCK

+3.3V, 4.7K, Q3, LED5 Blue, R38 392, GND

TO ADC

MCLK, DOUT-SPDIF, SCLK, LRCLK

TO EVM BOARD

MCLK, DOUT-SPDIF, SCLK, LRCLK, RST

MASTER RESET

+3.3V, R12 4.99K, S2, GND

U4 — TPS3825-33DBVT (Vdd, MR, Gnd, Reset, Reset) → RST

5V POWER INPUT

VIN, Red, 5V, Black, GND, GND

TO ADC

5V

C14 47ufd/16V, C16 0.1ufd/16V, C17 22ufd/10V, C19 0.1ufd/16V

VR1 — TPS76733QD (IN, IN, OUT, OUT, NC, EN, Gnd, Reset)

3.3V@1A

R22 249K

C20 22ufd/10V, C21 10ufd/16V, C22 10ufd/16V, C48 10ufd/16V, C25 0.1ufd/16V, C45 0.1ufd/16V, C46 0.1ufd/16V, C47 0.1ufd/16V

U4-5, INV1-5, INV2-5, MUX-5

LED2 Green, R16 332, GND

TO EVM BOARD

+3.3V

TO SPDIF

+3.3V

TO ADC

+3.3V

SPDIF DECOUPLING

+3.3V, U5-5, OPTO-3, R36 0.0, U5-24, U5-24, 3.3V-SPDIF

C28 10ufd/16V, C29 0.1ufd/16V, C30 0.1ufd/16V, C31 10ufd/16V, C32 0.1ufd/16V

R37 0.0

GND, AGND-SPDIF

CX	PROJECT: EVM CONTROLLER BOARD		
Design Team: YONG GWAN KIM			
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TEXAS INSTRUMENTS

ADC / CONNECTOR I/O

ENGINEERING EVALUATION ONLY

NOTES ON JUMPERS
IN: LIN/RIN = 1Vrms MAX.
OUT: LIN/RIN = 2Vrms MAX.

ANALOG INPUTS
LIN — LEFT–IN — AGND–ADC
RIN — RIGHT–IN — AGND–ADC

JP2 R39 4.99K C35 1ufd/50V
JP3 R40 4.99K C36 1ufd/50V
C33 470pfd/100V
C34 470pfd/100V
R41 4.99K
R42 4.99K
R44 100
R45 100
C41 0.01ufd/16V
C42 0.01ufd/16V
VINL
VINR

ADC
PCM1808PW
VREF AGND Vcc Vdd DGND SCKI LRCK
VINR VINL FMT MD1 MD0 DOUT BCK
AGND–ADC 5VA–ADC 3.3VD–ADC
C38 10ufd/16V
C40 0.1ufd/16V
R47 47
MCLK LRCLK SCLK DOUT–SPDIF
GND GND

FROM SPDIF
MCLK LRCLK SCLK DOUT–SPDIF

FROM USB
SCL SDA

FROM MASETER RESET
RST

FROM VR1
+3.3V

HIGH POWER INPUT
PVCC
Red — PVCC–IN
Black — GND

FAULT
+3.3V — R48 392 — GND
LED6 Green
Q4 4.7K
R52 100K +3.3V
FAULT

PDN
+3.3V — R49 392 — GND
LED7 Green
Q5 4.7K
S4
R51 10K +3.3V
PDN

MUTE
+3.3V — R50 392 — GND
LED8 Green
Q6 4.7K
S5
R27 10K +3.3V
MUTE1

TO EVM BOARDS
J2
+3.3V RST MUTE1 LRCLKEVM SDIN2EVM SDA
FAULT PDN SCLKEVM SDIN1EVM SCL
PVCC–IN +3.3V
MCLKEVM
GND

DOUT–ADC DOUT–SPDIF DOUT–ADC DOUT–SPDIF
JP4 (SDIN1)
JP5 (SDIN2)

JP6 SDIN1EVM
JP7 SDIN2EVM
MCLK — JP8 MCLKEVM
LRCLK — JP9 LRCLKEVM
SCLK — JP10 SCLKEVM
GND
MC012 (1-2)
PSIA (2-3)

3.3V DECOUPLING
+3.3V — R43 3.3 — ADC–4 ADC–4 — 3.3VD–ADC
C37 10ufd/16V
C39 0.1ufd/16V
GND

5V DECOUPLING
5V — R46 4.7 — ADC–3 ADC–3 — 5VA–ADC
C43 10ufd/16V
C44 0.1ufd/16V
GND AGND–ADC

TEXAS INSTRUMENTS

CX	PROJECT: EVM CONTROLLER BOARD			
Design Team: YONG GWAN KIM				
Schematic Rev: NC	Mod: NC	PCB Rev: NC	Sheet 3 of 5	
Save Date: MAY 29, 2008		Print Date	Thu May 29, 2008	
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EVM WARNINGS AND RESTRICTIONS

It is important to operate this EVM within the input voltage range of -0.5 V to 4.1 V and the output voltage range of 1 Vrms.

Exceeding the specified input range may cause unexpected operation and/or irreversible damage to the EVM. If there are questions concerning the input range, please contact a TI field representative prior to connecting the input power.

Applying loads outside of the specified output range may result in unintended operation and/or possible permanent damage to the EVM. Please consult the EVM User's Guide prior to connecting any load to the EVM output. If there is uncertainty as to the load specification, please contact a TI field representative.

During normal operation, some circuit components may have case temperatures greater than 85°C. The EVM is designed to operate properly with certain components above 85°C as long as the input and output ranges are maintained. These components include but are not limited to linear regulators, switching transistors, pass transistors, and current sense resistors. These types of devices can be identified using the EVM schematic located in the EVM User's Guide. When placing measurement probes near these devices during operation, please be aware that these devices may be very warm to the touch.

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