TAS5754M and TAS5756M Evaluation Module

This user's guide describes the operation of the TAS5754M and TAS5756M Evaluation Modules (EVM). The EVM is connected to the PurePath™ Console Motherboard (PPCMB). For questions and support go to the E2E forums (e2e.ti.com). The main contents of this document are:

- Hardware descriptions and implementation
- Start up procedure using PurePath Console2 (PPC2) software with TAS5754/6M plug-in

Related documents:

TAS5754M (SLAS987) and TAS5756M Data Sheet (SLAS988)
PurePath Console Motherboard User's Guide (SLOU366)
PurePath Graphic Development Suite (PurePath Console)

Throughout this document, the abbreviations *EVM*, *TAS5754/6MDCAEVM*, and the term *evaluation module* are synonymous with the TAS5754M and TAS5756M Evaluation Module, unless otherwise noted. The abbreviation *TAS5754/6M*, refers to either the TAS5754M or TAS5756M devices.

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1 Hardware Overview

The TAS5754/6MDCAEVM showcases the latest TI digital input class D closed loop amplifier. The TAS5754/6M is an I2S or TDM input class D amplifier with PurePath HybridFlows. The EVM is used in conjunction with the PurePath Console Motherboard (PPCMB). The PVDD supply is provided via the TAS5754/6MDCAEVM and is regulated to 5 VDC and 3.3 VDC on the PPCMB. The PPCMB provides the I^2S, I^2C, and 3.3 VDC to the TAS5754/6MDCAEVM.

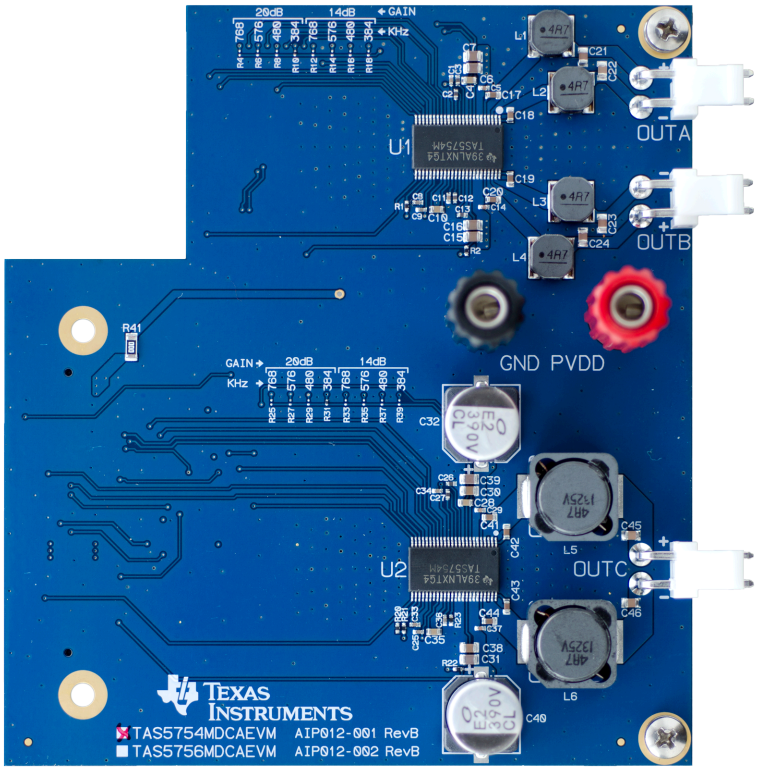


Figure 1. PPCMB and TAS5754/6MDCAEVM

1.1 TAS5754/6MDCAEVM Features

- GUI control via USB port
- Hardware programmable gains and switching frequencies
- Stereo and mono channels with I^2S input
- Processed and non-processed mono channel I^2S input
- Operates in BTL or PBTL

1.2 TAS5754/6MDCAEVM Gain and FSW

The TAS5754/6MDCAEVM offers hardware programmable gains and PWM switching frequencies (FSW). The two gain options are 14 dB and 20 dB. The four FSW options are 384 kHz, 480 kHz, 576 kHz, and 768 kHz. The combination of gain and FSW can be set by modifying the location of the shunt resistor on the top side of the TAS5754/6MDCAEVM. The recommended default setting is 20 dB and 768 kHz. A FSW of 768 kHZ is recommended to minimize the ripple current in the 4.7-µH inductor used.

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1.3 TAS5754/6MDCAEVM Functions

The TAS5754/6MDCAEVM is controlled by the PPCMB. The PPCMB sends I C commands from PPC to the TAS5754/6M. Upon PPC2 execution and connection, the TAS5754/6M is put in software mode.

The digital audio data input to the TAS5754/6MDCAEVM is sent from PPCMB and is selectable from USB audio, optical SPDIF, coaxial SPDIF, and analog ADC sources. When a digital audio data input is selected, the PPC2 automatically sends appropriate scripts to the device in use.

1.4 TAS5754/6MDCAEVM Detailed Operations

Upon power-on, the PPCMB uses USB audio input (default). The I2S signals, LRCLK, SCLK, SDIN, and MCLK, come from the TAS1020B. foobar2000 or similar non-processing media source can be used to stream audio. The TAS1020B enumerates as the following device on a Microsoft® Windows® operating system (OS): USB audio (USB-miniEVM), Human Interface Devices, and USB Composite Device, see Figure 2.

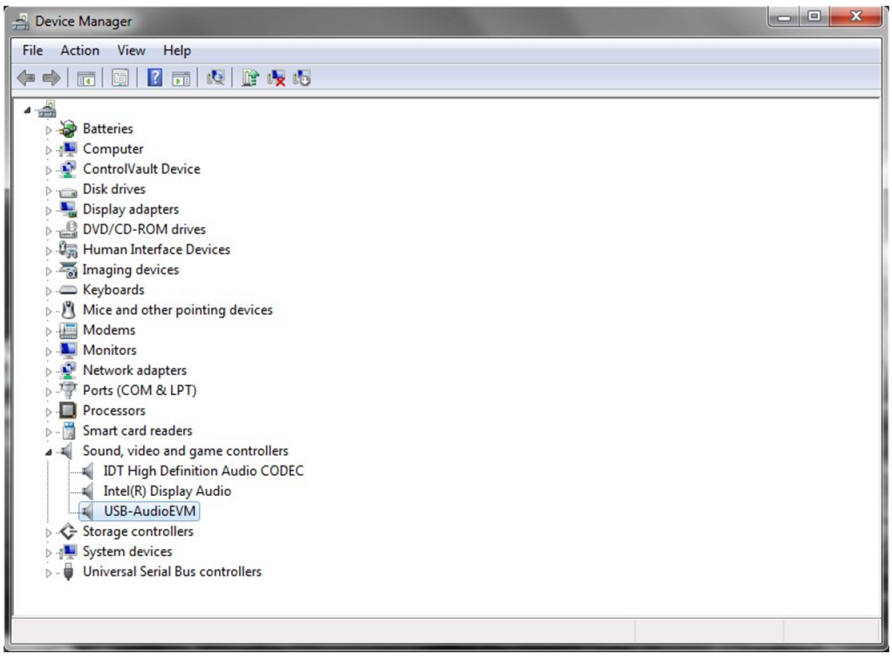


Figure 2. Device Manager

2 TAS5754/6MDCAEVM Setup

This section describes the TAS5754/6MDCAEVM setup and software installation. Since PPCMB connects to one of the device under test (DUT) EVMs, it is necessary to show the connection in this section. TAS5754/6MDCAEVM is used for this purpose.

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2.1 TAS5754/6MDCAEVM Setup

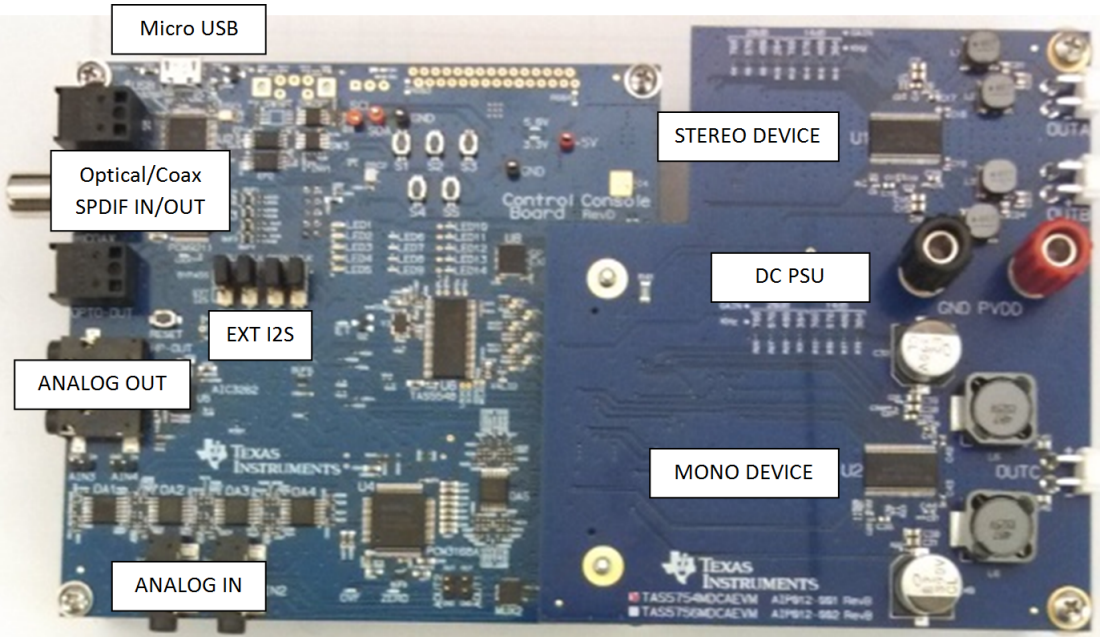


Figure 3. PPCMB and TAS5754/6MDCAEVM Connection

Hardware requirements:

- Computer running either Windows XP, Windows 7, Windows 8, Linux, or MacOS
- Power supply 8–26.4 VDC
- Speakers and cable
- A USB micro type-B cable
- Audio source: This can be a DVD player with appropriate SPDIF cable or Playback Media from Windows XP, Windows 7, Windows 8, Linux, or MacOS

Hardware Setup:

- Connect the PPCMB to the TAS5754/6MDCAEVM
- Connect PSU to the TAS5754/6MDCAEVM and turn on the power. 5-V and 3.3-V LEDs are illuminated.
- Plug in USB cable from the PC to the PPCMB; the USB Lock LED (blue) is illuminated
- If optical SPDIF source is used, the blue SPDIF clock-locked LED is illuminated
- Disregard the orange LED indicating Energy Threshold (ET) level is exceeded.
- Clearing the ET value turns the orange LED off

2.2 Software Installation

Download the PurePath Console (PPC2) GUI from the TAS5754M/TAS5756M EVM product folder at www.ti.com. The TI Web site has the latest release of the GUI.

Execute the GUI installation program, *Setup_PurePath_Console2_x.x_revxxxxx.exe*. Once the program is installed, the program group and shortcut icon is created in Start → Program → Texas Instruments Inc → PurePath Console2. If the GUI doesn't connect automatically to the target the first time PPC2 is loaded, select *Connect as TAS5754M-56MDCAEVM* as shown in Figure 4. To ensure automatic connection to target switch to *Advanced* mode to update the firmware ID as described in Section 3.5.

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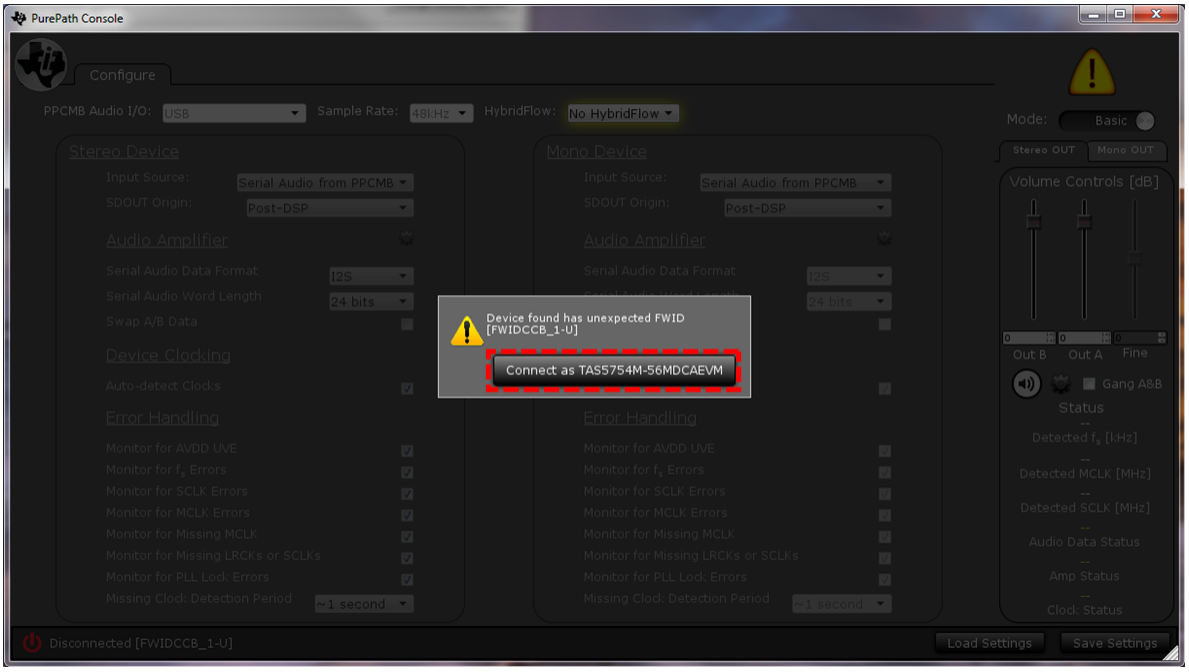


Figure 4. Manual Target Detected

The PPC2 software starts up in *Basic* mode as shown in Figure 5.The green LED on the bottom left corner of the PPC2 Window indicates the initialization of TAS5754/6M is valid. The PPCMB is initialized with the USB audio (USB-miniEVM) selected. Streaming audio from the USB host is routed to the TAS5754/6M.

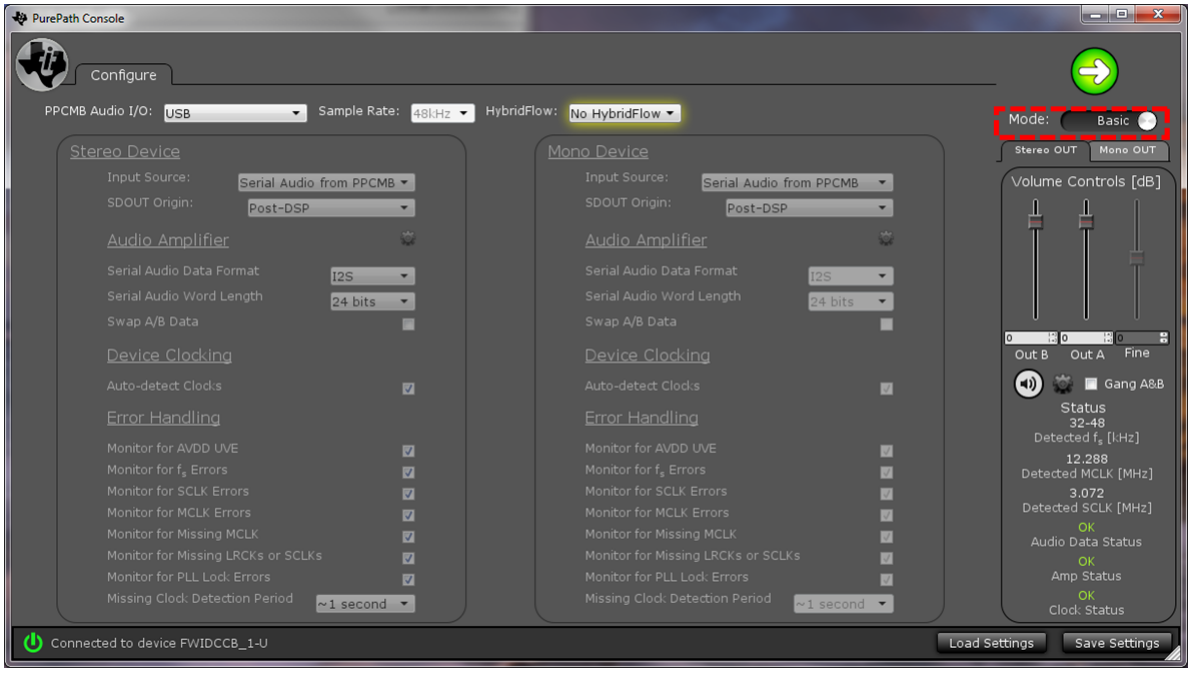


Figure 5. TAS5754/6MDCAEVM GUI Initialization

If an optical input is used, simply select *Optical* from the *PPCMB Audio I/O* drop-down menu in the PPC2 software, the I^2S is then routed with this signal, likewise, when a coax input is selected using the *PPCMB Audio I/O* drop-down menu. If an analog input is used, click on Line1 from the *PPCMB Audio I/O* drop-down menu in the PPC2 software, the ADC (PCM3168A) is the source of I^2S data.

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3 Using the PurePath Console with the TAS5754/6MDCAEVM Board

The TAS5754/6MDCAEVM is initialized upon PurePath Console startup. Audio is streaming to the speakers if Windows Media (or similar program) is playing and mini-USB EVM is selected in the sound playback properties. The following indicators show both PPC2 GUI and TAS5754/6MDCAEVM are operating correctly:

- On the PPCMB, the USB blue LED is on, the green LEDs for 3.3 V and 5 V are on
- On the PPC2, the green LED on the bottom left corner is on

3.1 Configure Tab

The *Configure* tab is displayed when the PPC2 GUI starts up. Here the Stereo or Mono DUT's Audio I/O, I2S Format, I2S Word Length, I2S Sample Rate, Channel Volume and *HybridFlow* can be configured. The *Direct I²C Read/Write* and *Register* tab options in Figure 6 are only visible in *Advanced* mode. Once the device is configured and HybridFlow is loaded, proceed to the Audio processing tab to tune the selected HybridFlow features.

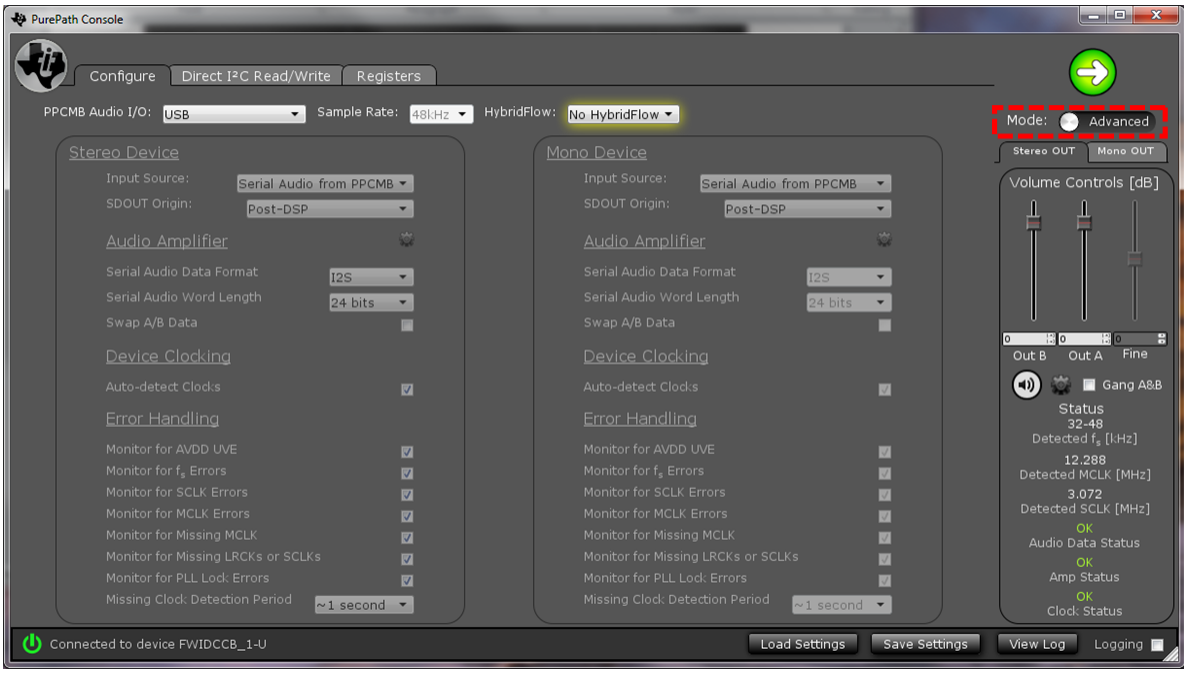


Figure 6. TAS5754/6M GUI Advanced Mode

3.2 Audio Processing Tab

Figure 7 shows the *Audio Processing* tab, illustrating the device major processing blocks for the selected HybridFlow. The selected HybridFlow is comprised of *BiQuads*, *DRC* (Dynamic Range Compression), *DBE* (Dynamic Bass Enhancement), and *Other* tabs. The *Other* tab can consist of smooth clip, PBE (Psychoacoustic Bass Enhancement), and other offered HybridFlow features.

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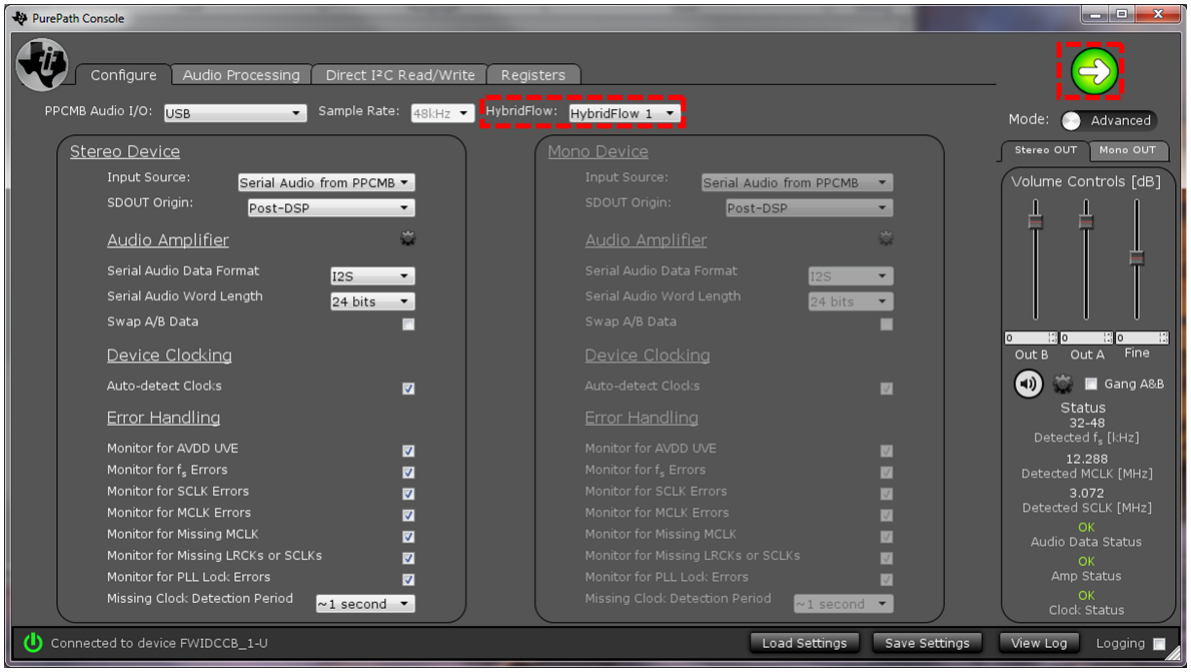


Figure 7. TAS5754/6M GUI HybridFlow Selection

3.3 HybridFlow Features Tabs

For TAS5754/6M there are several HybridFlow settings that are done via I²C. The GUI facilitates these settings seamlessly and graphically in the HybridFlow tabs shown in Figure 8 through Figure 10.

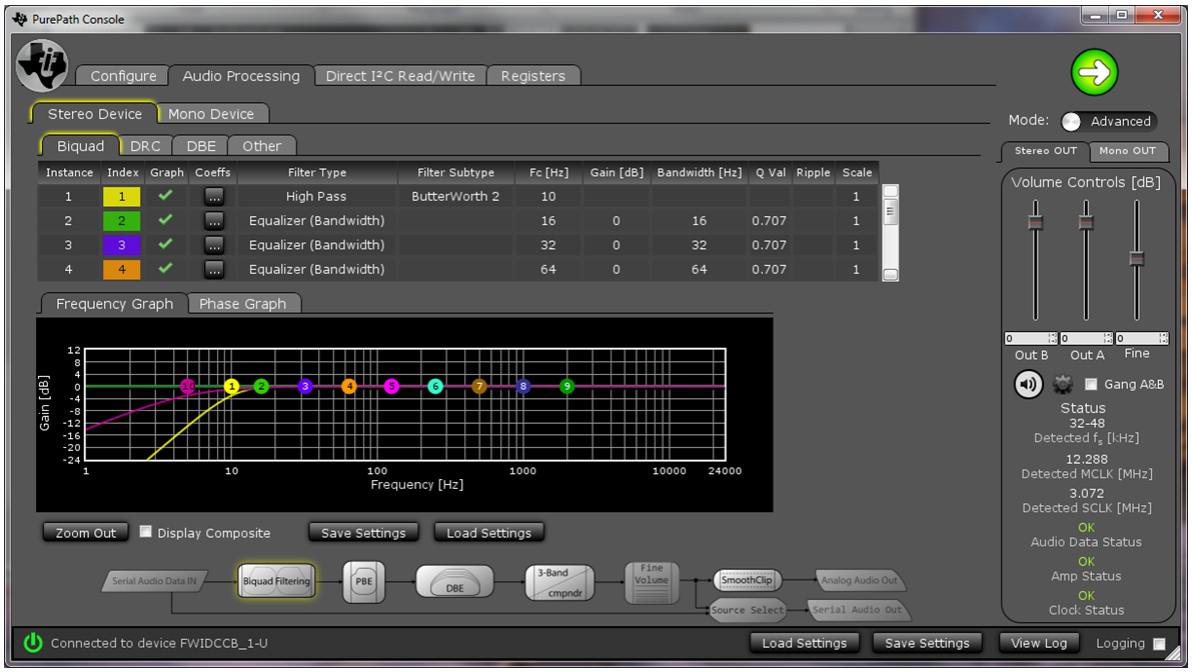


Figure 8. TAS5754/6M Audio Processing Tab

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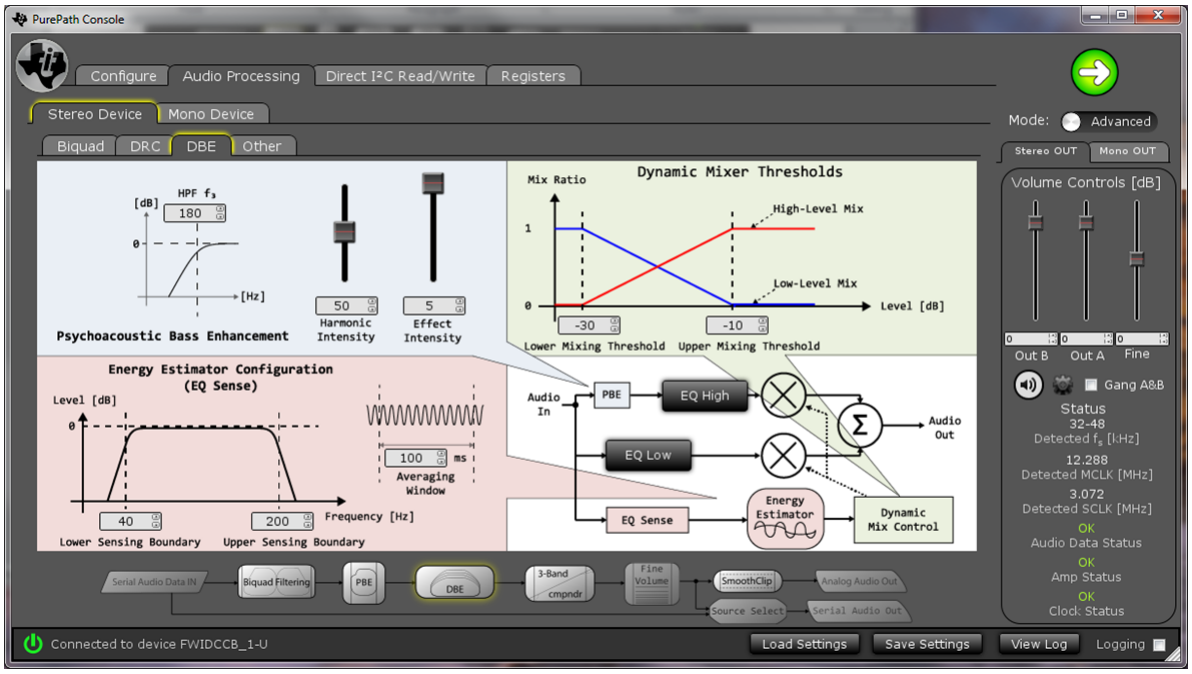


Figure 9. DBE Audio Processing Tab

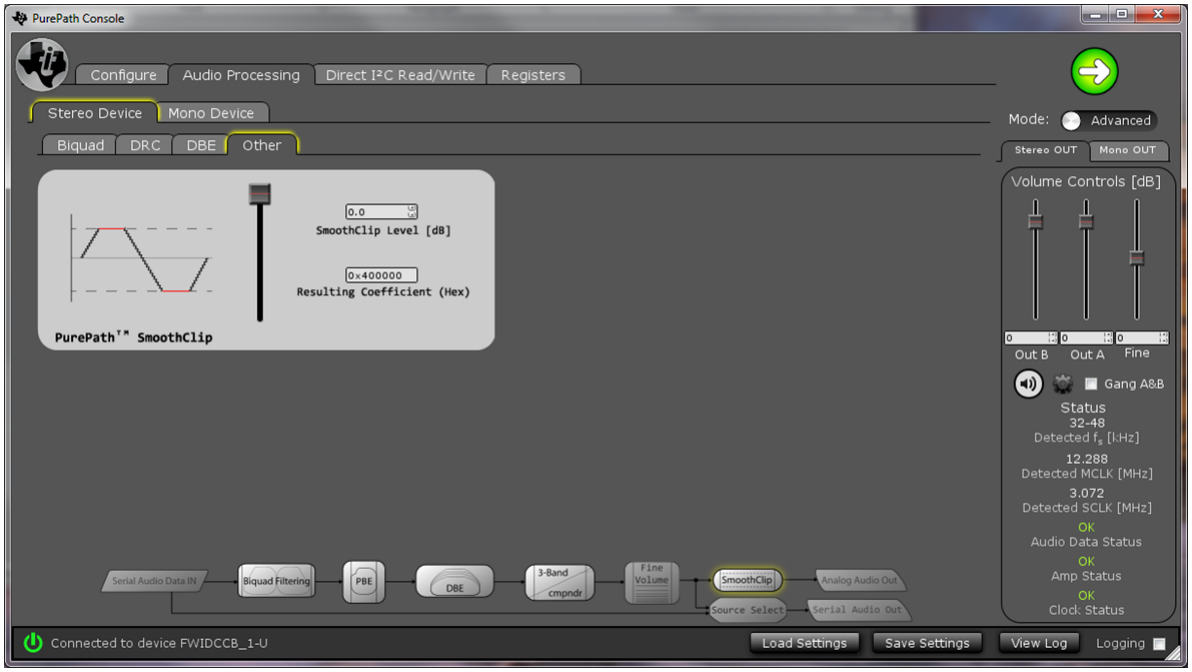


Figure 10. Other Audio Processing Tab

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3.4 Direct I²C Access Tab

I²C registers read and write are performed on this tab (see Figure 11). Type in the device I²C address and click *Set*. On the *Direct I²C Read/Write* box, enter a valid I²C page and register for read and type in valid page, register and data for write. This tab is only available in *Advanced* mode.

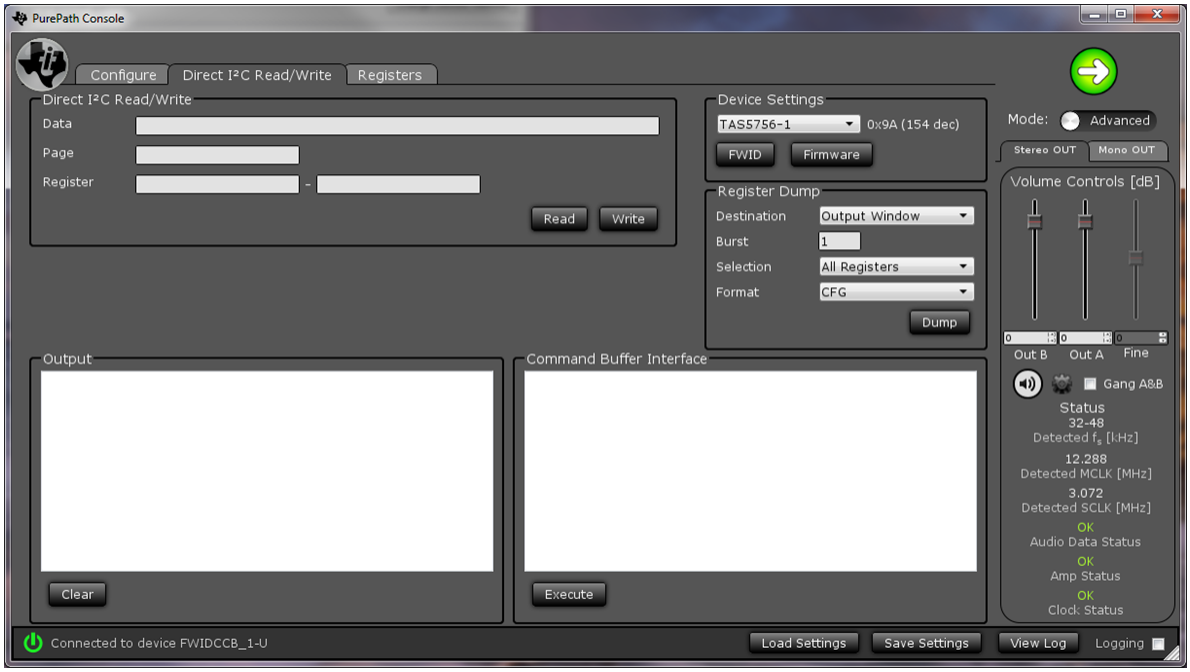


Figure 11. Direct I²C Access

3.5 Firmware ID Update

Update the firmware identification by clicking on the FWID button as shown in Figure 11. If on the initial launch of the PPC2 GUI, it doesn't automatically connect to target, the FWID needs updating. Read the FWID for *EVM FWID* and *Secondary FWID* then compare the readings to Figure 12. If they do not match, write FWIDCCB_1-U to EVM FWID and FWID_TAS5754M-56MDCAEVM to *Secondary FWID*.

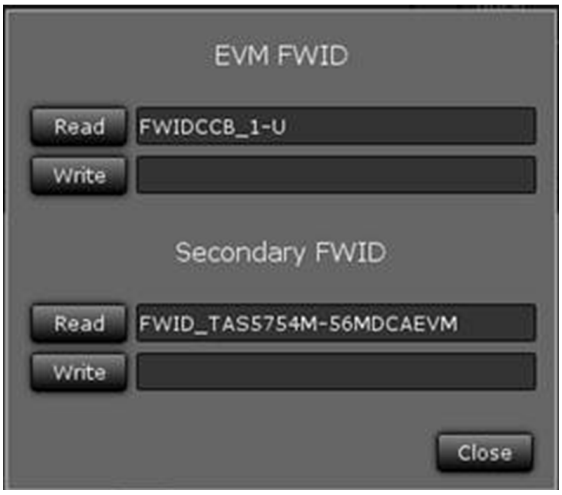


Figure 12. Direct I²C Access FWID

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3.6 Device Registers Tab

The *Device Registers* tab, Figure 13, shows the current I²C registers values (hexadecimal and decimal) in the TAS5754/6M.

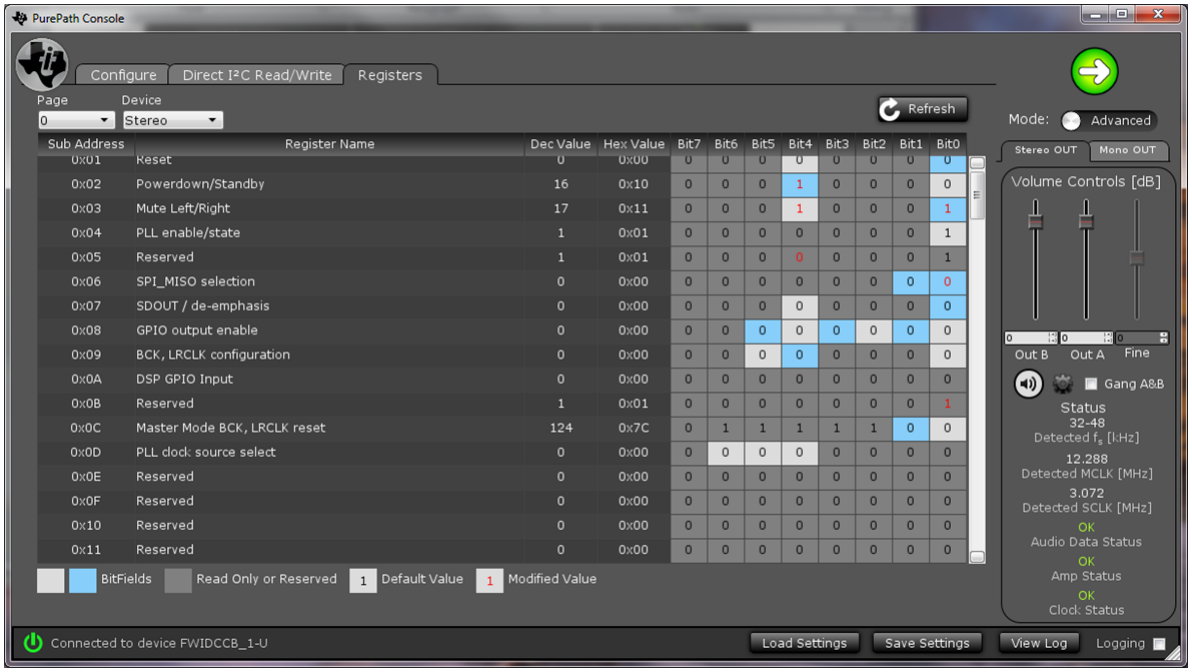


Figure 13. Device Registers Tab

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4 Board Layouts, Bill of Materials, and Schematic

This section includes the EVM board layouts, bill of materials, and schematics.

4.1 TAS5754/6MDCAEVM Board Layouts

Figure 14 and Figure 15 illustrate the board layouts for the EVM.

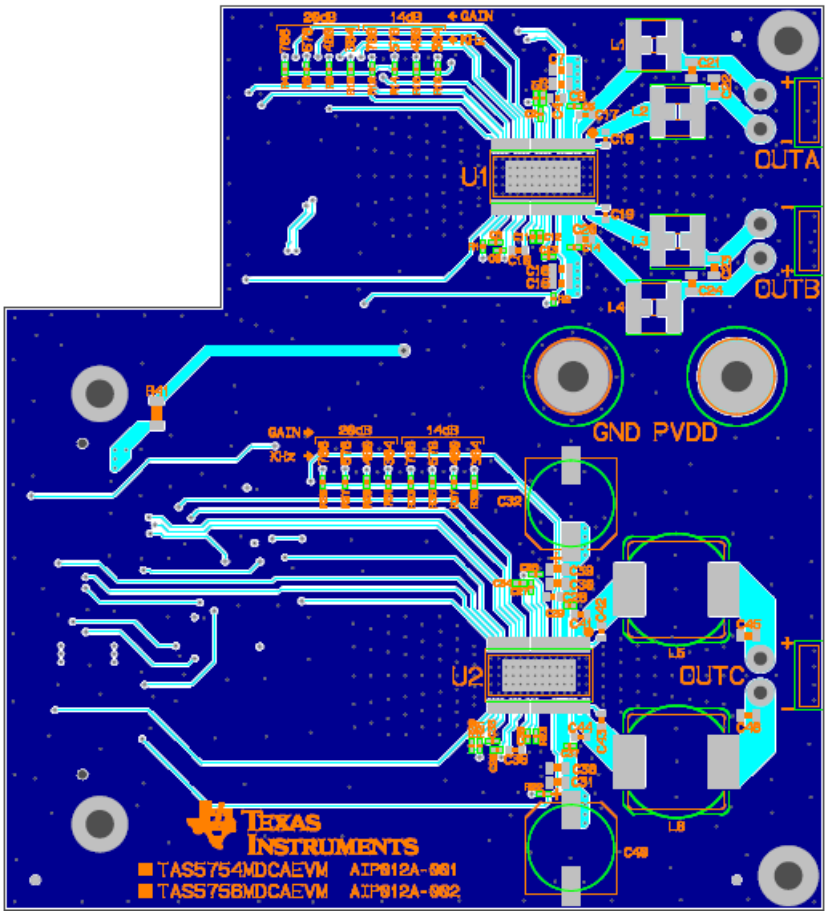


Figure 14. TAS5754/6MDCAEVM Top Composite Assembly

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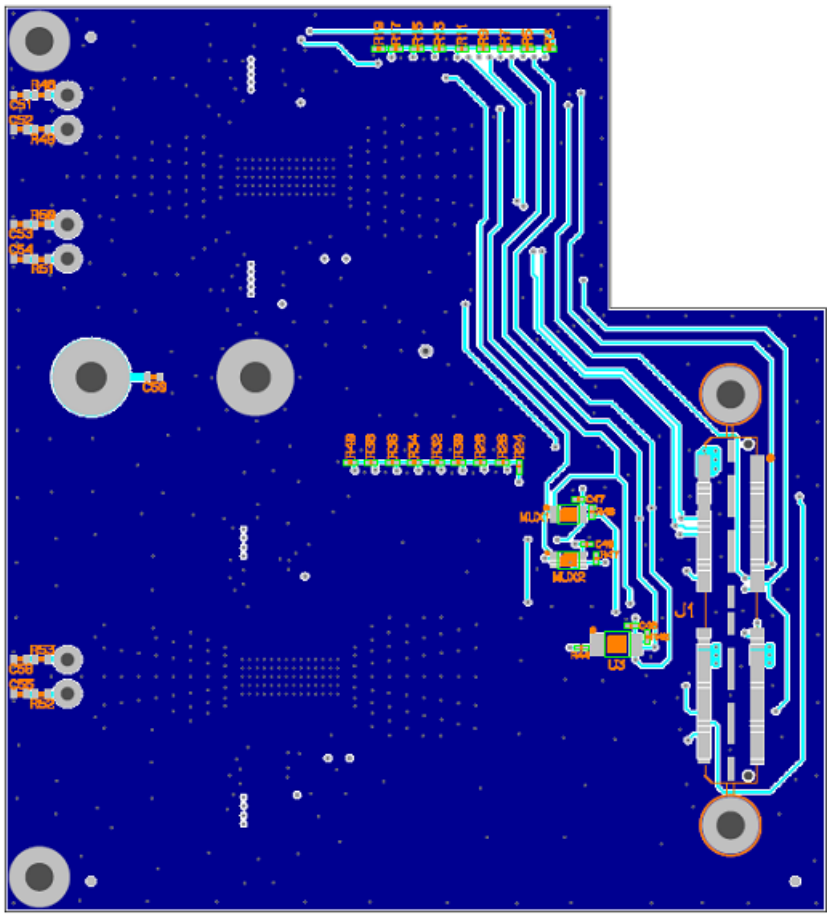


Figure 15. TAS5754/6MDCAEVM Bottom Composite Assembly

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4.2 Bill of Materials

Table 1 displays the BOM for this EVM.

Table 1. Bill of Materials

BILL OF MATERIALS for TAS5754MDCAEVM/TAS5756MDCAEVM					May 13, 2014
AIP012-001/AIP012-002					
Item	**Manu Part Number**	**Manu**	**QTY**	**Ref Designators**	**Description**
1	TAS5754MDCA/ TAS5756MDCA	TEXAS INSTRUMENTS	2	U1, U2	CLASS-D AMP HTSSOP48-DCA ROHS
2	SN74LVC2G157DCUR	TEXAS INSTRUMENTS	2	MUX1, MUX2	MUX/DATA SELECTOR 2 TO 1 VSSOP8-DCU ROHS
3	24LC256-I/MS	MICROCHIP	1	U3	SERIAL EEPROM I2C 256K 400kHz MSOP8-MS ROHS
4	C1005X5R1C105K050BC	TDK CORP	8	C1, C8, C9, C11, C25, C33, C34, C36	CAP SMD0402 CERM 1.0UFD 16V 10% X5R ROHS
5	C1005X5R1E225K050BC	TDK CORP	6	C2, C3, C12, C13, C26, C27	CAP SMD0402 CERM 2.2UFD 25V 10% X5R ROHS
6	UMK107AB7105KA-T	TAIYO YUDEN	5	C4, C10, C28, C35, C50	CAP SMD0603 CERM 1.0UFD 50V 10% X7R ROHS
7	C1005X7R1H104M050BB	TDK CORP	4	C5, C14, C29, C37	CAP SMD0402 CERM 0.1ufd 50V 20% X7R ROHS
8	C2012X5R1V226M125AC	TDK	6	C6, C7, C15, C16, C31, C39	CAP SMD0805 CERM 22UFD 35V 20% X5R ROHS
9	C1608X7R1H224K080AB	TDK	8	C17, C18, C19, C20, C41, C42, C43, C44	CAP SMD0603 CERM 0.22UFD 50V 10% X7R ROHS
10	C2012X7R1H684M125AB	TDK	6	C21, C22, C23, C24, C45, C46	CAP SMD0805 CERM 0.68ufd 50V 20% X7R ROHS
11	GRM21BR71H105KA12L	MURATA	2	C30, C38	CAP SMD0805 CERM 1.0UFD 50V 10% X7R ROHS
12	UCL1V391MNL1GS	NICHICON	2	C32, C40	CAP SMD ELECT 390ufd 35V 20% CL ROHS
13	C1005X5R1A105K	TDK CORP	3	C47, C48, C49	CAP SMD0402 CERM 1.0UFD 10V 10% X5R ROHS
14	GRM188R71H103KA01D	MURATA	0	C51, C52, C53, C54, C55, C56	CAP SMD0603 CERM 0.01UFD 50V 10% X7R ROHS
15	ERJ-2RKF4992X	PANASONIC	7	R1, R2, R19, R21, R22, R23, R40	RESISTOR SMD0402 THICK FILM 49.9K OHMS 1/16W 1% ROHS
16	ERJ-2RKF1503X	PANASONIC	2	R3, R24	RESISTOR SMD0402 THICK FILM 150K OHMS 1/16W 1% ROHS
17	CRCW04020000Z0ED	VISHAY	16	R4, R6, R8, R10, R12, R14, R16, R18, R25, R27, R29, R31, R33, R35, R37, R39	ZERO OHM JUMPER SMT 0402 0 OHM 1/16W,5% ROHS
18	ERJ-8GEY0R00V	PANASONIC	1	R41	RESISTOR SMD1206 0.0 OHM 5% 1/4W ROHS
19	ERJ-2RKF1003X	PANASONIC	15	R5, R7, R9, R11, R13, R15, R17, R20, R26, R28, R30, R32, R34, R36, R38	RESISTOR SMD0402 THICK FILM 100K OHMS 1/16W 1% ROHS

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Table 1. Bill of Materials (continued)

BILL OF MATERIALS for TAS5754MDCAEVM/TAS5756MDCAEVM					May 13, 2014
AIP012-001/AIP012-002					
Item	**Manu Part Number**	**Manu**	**QTY**	**Ref Designators**	**Description**
17	CRCW04020000Z0ED	VISHAY	0	R6, R8, R10, R12, R14, R16, R18, R27, R29, R31, R33, R35, R37, R39	ZERO OHM JUMPER SMT 0402 0 OHM 1/16W,5% ROHS
20	CRCW040210K0FKED	VISHAY	4	R44, R45, R46, R47	RESISTOR SMD0402 10.0K OHMS 1% 1/16W ROHS
21	ERJ-3GEYJ3R3V	PANASONIC	0	R48, R49, R50, R51, R52, R53	RESISTOR SMD0603 3.3 OHMS 5% 1/10W ROHS
22	1255AY-4R7M	TOKO JAPAN	4	L1, L2, L3, L4	INDUCTOR SMT 4.7uH 6.0A 23 mOHMS 20% DG6045C ROHS
23	931AS-4R7M	TOKO	2	L5, L6	INDUCTOR 4.7UH 8.7A TYPE D128C ROHS
24	B2PS-VH(LF)(SN)	JST	3	OUTA, OUTB, OUTC	JACK JST-VH RA 2-PIN 3.96mmLS ROHS
25	QTS-050-01-F-D-A	SAMTEC	1	J1	CONNECTOR SMT/THU 100 POS+GND MATE HEIGHT 5mm ROHS
26	7006	KEYSTONE ELECTRONICS	1	PVDD	BINDING POST, RED, 15A ECONO ROHS
27	7007	KEYSTONE ELECTRONICS	1	GND	BINDING POST, BLACK, 15A ECONO ROHS
28	R30-1003002	HARWIN	2	STANDOFFS	STANDOFF M3x30mm 7mm DIA HEX BRASS/NICKEL F-F ROHS
29	MPMS 003 0005 PH	KEYSTONE ELECTRONICS	2	STANDOFF SCREWS	SCREW M3x5 PHILIPS PANHEAD STAINLESS STEEL ROHS
30	3200	KEYSTONE ELECTRONICS	2	SPACING WASHER	WASHER FLAT 3.05mmID 9.53mmOD 1.57mm THICK NYLON ROHS
		TOTAL	118		
SPECIAL NOTES TO THIS BILL OF MATERIALS					
SN1	These assemblies are ESD sensitive, ESD precautions shall be observed.				
SN2	These assemblies must be clean and free from flux and all contaminants. Use of no clean flux is not acceptable.				
SN3	These assemblies must comply with workmanship standards IPC-A-610 Class 2.				
SN4	Ref designators marked with an asterisk ('**') cannot be substituted. All other components can be substituted with equivalent MFG's components.				
SN5	See AIP012A_Assembly.pdf for Standoff Hardware placement instructions.				

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4.3 TAS5754/6MDCAEVM Schematic

Figure 16, Figure 17, and Figure 18 illustrate the schematics for TAS5754/6MDCAEVM.

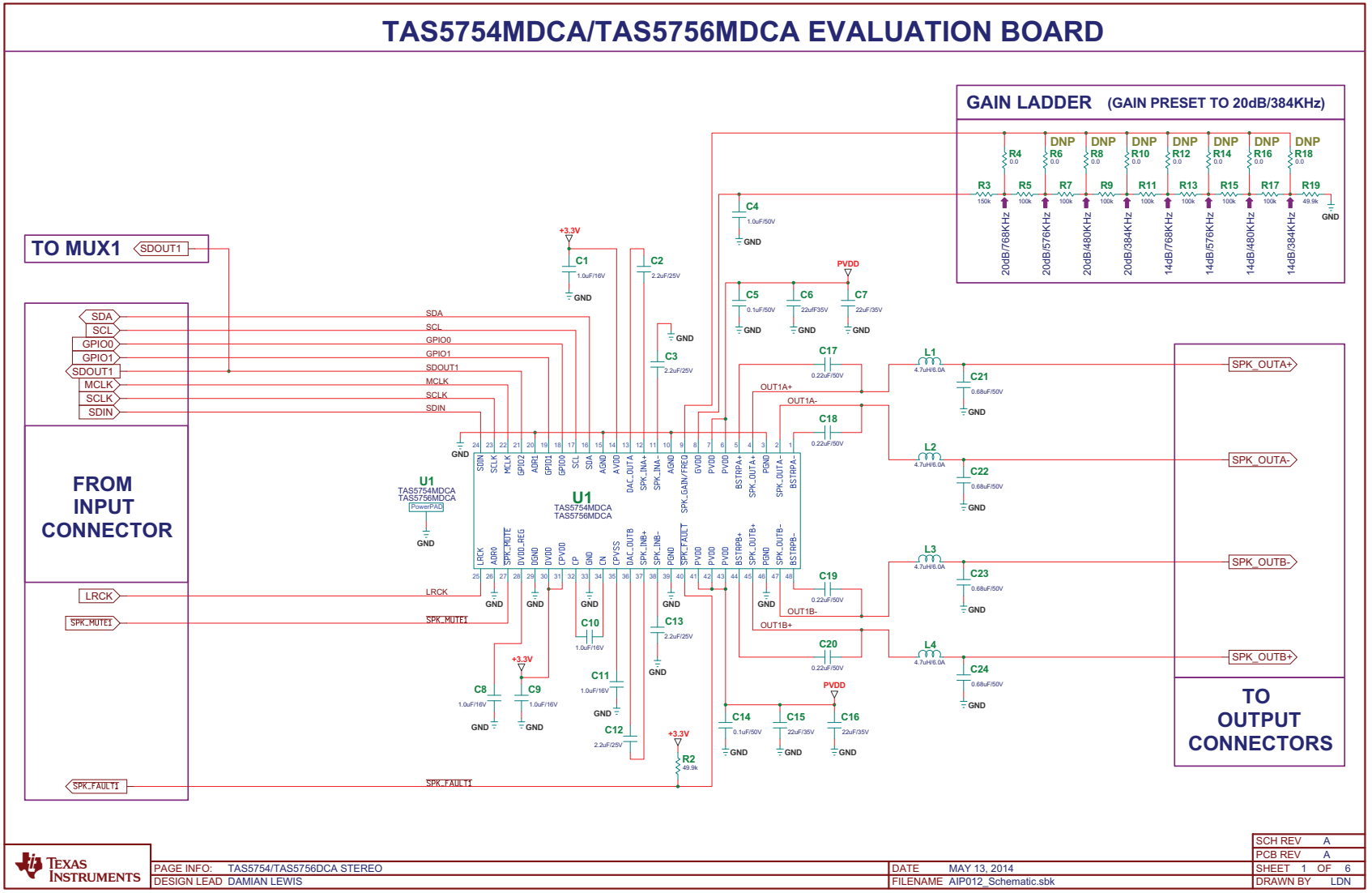


Figure 16. TAS5754/6MDCAEVM Schematic (Page 1 of 3)

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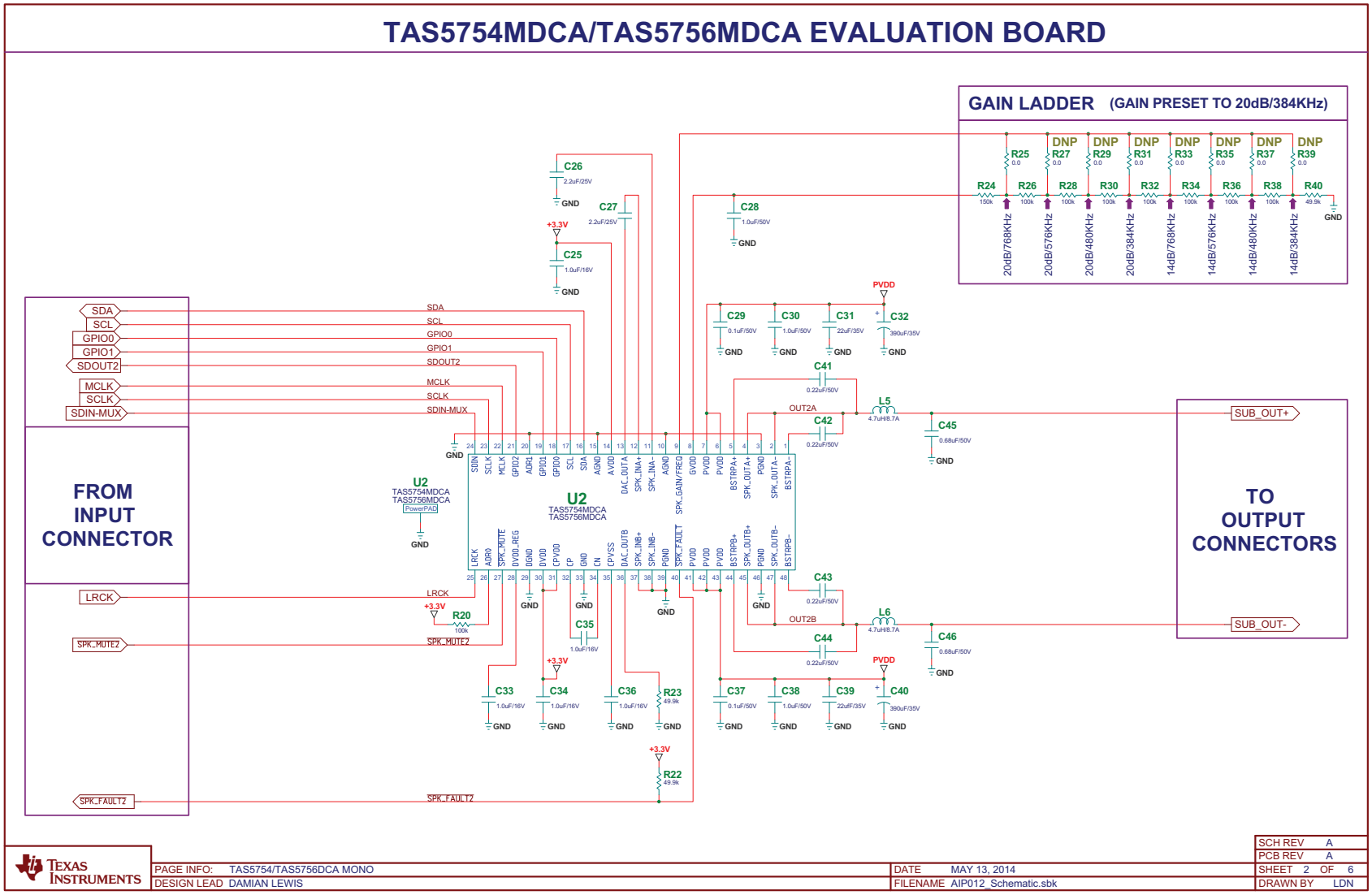


Figure 17. TAS5754/6MDCAEVM Schematic (Page 2 of 3)

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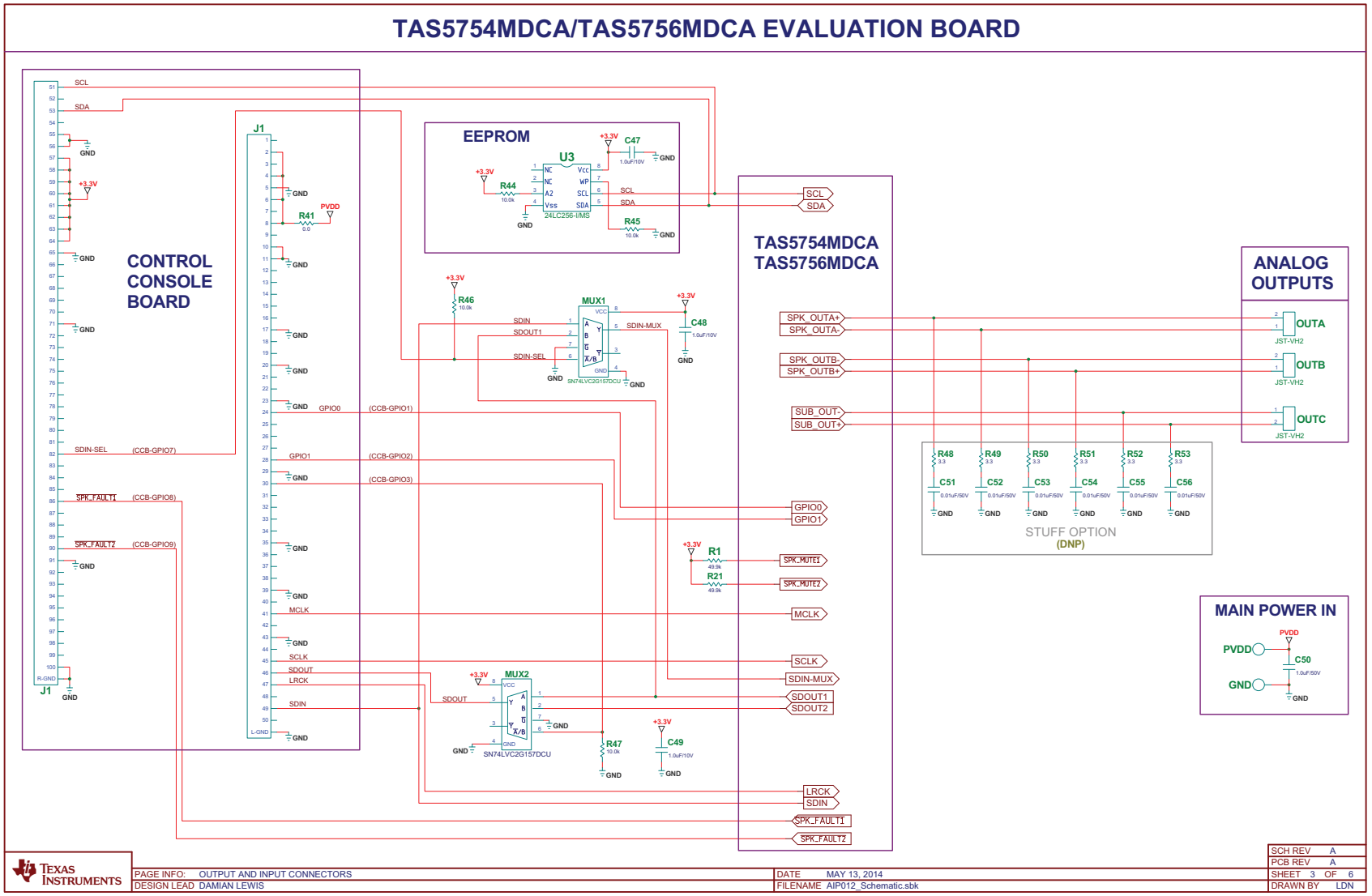


Figure 18. TAS5754/6MDCAEVM Schematic (Page 3 of 3)

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