High Fidelity Audio Headphone Playback for Portable and Smartphone Applications

TI Designs Quick Start Guide

TIDA-00385

1. Introduction:

This quick start guide for the PCM5242-TPA6120A2_QFN-REF2 reference design board allows for quick audio testing of the high performance PCM52542 DAC and TPA6120A2 headphone amplifier from a host computer.

2. Default Jumper Settings for USB Playback:

GPIO6 FLT  Shorted
MODE2 MS    Open
MODE1      Shorted
GPIO2 GPO   Open
GPIO3 AGNS  Shorted
GPIO4 MAST  Shorted
GPIO5 ATT0  Shorted
SCL MC ATT1 Open
SDA MOSI ATT2 Open
ADR1 MISO FMT Shorted
JP1         Shorted to MCLK (Bypass)
JP2         Shorted to SCLK (Bypass)
JP3         Shorted to LRCLK (Bypass)
JP4    Shorted to SDIN (Bypass)

JP5    Shorted

JP6    Shorted

JP7    Shorted to INT

JP8    Shorted to INT

JP9    Shorted

JP10   Shorted to USB

3. Connecting to Computer

3.1 Connect mini USB to USB cable to host computer. To make sure the computer has recognized the board, go the “start” menu search “device manager” in the search bar.
3.2 In the device manager screen under “Sound” or a similar title, make sure you see “USB_AudioEVM”.

If you see this, the computer has recognized the device.
3.3 Navigate to your computers control panel and find the “Sound” preferences. Make sure “Line” “USB-AudioEVM” is set as the default device.

3.4 Double click on the icon and move to the “Advanced” tab.
Set the default format to “2 channel 16 bit, 48000 Hz (DVD Quality)” as above.

3.5 Now, go to the levels tab and set the level to “25”. You can adjust this later for more volume however, the default of level of 100 is extremely loud and may damage your headphones do the built in gain of the TPA6120A2 headphone amplifier.

3.6 Plug in a pair of headphones into to “A-out” jack on the board

3.7 The board is now configured and should be correctly setup and should play audio sourced from your computer. If you unplug the board you will have to run through this procedure again.
4. Getting the Board Running

4.1 Download and install the PCM5242RHBEVM PurePath Console GUI from the EVM webpage here:


This reference design is 100% compatible with the EVM GUI

4.2 Once PurePath Console is installed connect the PCM5242-TPA6120A2_QFN-REF2 reference design board to the computer and run PurePath Console.

4.3 Upon running the GUI you may be asked to select your target. Make sure to run as PCM5242. If you then see “Device found has no FWID” dialog box click on the “Connect as PCM5242” Button. This has no bearing on the functionality of the software.
4.3 The GUI will automatically begin running a Hybridflow that allows USB audio streaming from the computer. After it has completed a Red stop button on the top right corner of the GUI would appear. This is used to stop the current hybrid flow and change parameters or hybrid flows. On the bottom left of the GUI window you should see a green power light with the text “Connected to device”. The means the board is connected and the computer is communicating.
5. Using the PCM5242 PurePath Console GUI

1. Starts and stop Hybridflows. This button must be clicked for operation. When running a Hybridflow, windows 6 And 7 cannot be changed. You must stop the Hybridflow first.

2. Controls the mode of the GUI. Advanced mode adds “Direct I2C Read/Write” tab on the top of GUI window which allows I2C scripts to be entered for manual register control. It also adds a second “Registers” tab to allow for viewing and changing register values using a register map view.
Direct I2C Read/Write Tab

 Registers Tab
3. Controls to volume of the PCM5242. Clicking on the gear icon allows for advanced volume control including auto mute.

4. Displays clock status
5. Controls source input. Clicking on another input source will configure the part for that source. The GUI will issue a warning outlining any necessary jumper changes.
6. Drop down menu controls the interpolation filter and Hybridflow to be used. Different hybridflows offer different functionality and will add an “Audio Processing” tab to the GUI window. In the audio processing tab, biquad filters, DRC, DBE, DDE and other features of the PCM5242 can be configured.

Audio Processing available with HybridFlow 1
7. Controls the DAC properties including data format and word length. Clicking on the gear icon allows control over DAC gain and other parameters. When running headphones, generally the DAC gain should be set to -6dB for the right and left channels to avoid headphone damage.

6. Performance Evaluation:

To evaluate the performance of the PCM5242 DAC and TPA6120A2 Headphone amp, jumpers JP1-JP4 can be removed from the default “BYPASS” selection. This disconnects the I2S audio from the TAS1020B USB controller. By inserting an external I2S source, such as an audio analyzer, in the “PSIA” side of jumpers JP1-JP4, I2S audio is sent directly from these pins to the PCM5242 allowing for accurate performance evaluation. Pin 3 on headers JP1-JP4 is ground for convenient connection of shielded cables.
IMPORTANT NOTICE FOR TI REFERENCE DESIGNS

Texas Instruments Incorporated ("TI") reference designs are solely intended to assist designers ("Buyers") who are developing systems that incorporate TI semiconductor products (also referred to herein as "components"). Buyer understands and agrees that Buyer remains responsible for using its independent analysis, evaluation and judgment in designing Buyer’s systems and products.

TI reference designs have been created using standard laboratory conditions and engineering practices. **TI has not conducted any testing other than that specifically described in the published documentation for a particular reference design.** TI may make corrections, enhancements, improvements and other changes to its reference designs.

Buyers are authorized to use TI reference designs with the TI component(s) identified in each particular reference design and to modify the reference design in the development of their end products. HOWEVER, NO OTHER LICENSE, EXPRESS OR IMPLIED, BY ESTOPPEL OR OTHERWISE TO ANY OTHER TI INTELLECTUAL PROPERTY RIGHT, AND NO LICENSE TO ANY THIRD PARTY TECHNOLOGY OR INTELLECTUAL PROPERTY RIGHT, IS GRANTED HEREIN, including but not limited to any patent right, copyright, mask work right, or other intellectual property right relating to any combination, machine, or process in which TI components or services are used. Information published by TI regarding third-party products or services does not constitute a license to use such products or services, or a warranty or endorsement thereof. Use of such information may require a license from a third party under the patents or other intellectual property of the third party, or a license from TI under the patents or other intellectual property of TI.

TI REFERENCE DESIGNS ARE PROVIDED "AS IS". TI MAKES NO WARRANTIES OR REPRESENTATIONS WITH REGARD TO THE REFERENCE DESIGNS OR USE OF THE REFERENCE DESIGNS, EXPRESS, IMPLIED OR STATUTORY, INCLUDING ACCURACY OR COMPLETENESS. TI DISCLAIMS ANY WARRANTY OF TITLE AND ANY IMPLIED WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE, QUIET ENJOYMENT, QUIET POSSESSION, AND NON-INFRINGEMENT OF ANY THIRD PARTY INTELLECTUAL PROPERTY RIGHTS WITH REGARD TO TI REFERENCE DESIGNS OR USE THEREOF. TI SHALL NOT BE LIABLE FOR AND SHALL NOT DEFEND OR INDEMNIFY BUYERS AGAINST ANY THIRD PARTY INFRINGEMENT CLAIM THAT RELATES TO OR IS BASED ON A COMBINATION OF COMPONENTS PROVIDED IN A TI REFERENCE DESIGN. IN NO EVENT SHALL TI BE LIABLE FOR ANY ACTUAL, SPECIAL, INCIDENTAL, CONSEQUENTIAL OR INDIRECT DAMAGES, HOWEVER CAUSED, ON ANY THEORY OF LIABILITY AND WHETHER OR NOT TI HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES, ARISING IN ANY WAY OUT OF TI REFERENCE DESIGNS OR BUYER’S USE OF TI REFERENCE DESIGNS.

TI reserves the right to make corrections, enhancements, improvements and other changes to its semiconductor products and services per JESD46, latest issue, and to discontinue any product or service per JESD48, latest issue. Buyers should obtain the latest relevant information before placing orders and should verify that such information is current and complete. All semiconductor products are sold subject to TI’s terms and conditions of sale supplied at the time of order acknowledgment.

TI warrants performance of its components to the specifications applicable at the time of sale, in accordance with the warranty in TI’s terms and conditions of sale of semiconductor products. Testing and other quality control techniques for TI components are used to the extent TI deems necessary to support this warranty. Except where mandated by applicable law, testing of all parameters of each component is not necessarily performed. TI assumes no liability for applications assistance or the design of Buyers’ products. Buyers are responsible for their products and applications using TI components. To minimize the risks associated with Buyers’ products and applications, Buyers should provide adequate design and operating safeguards.

Reproduction of significant portions of TI information in TI data books, data sheets or reference designs is permissible only if reproduction is without alteration and is accompanied by all associated warranties, conditions, limitations, and notices. TI is not responsible or liable for such altered documentation. Information of third parties may be subject to additional restrictions.

Buyer acknowledges and agrees that it is solely responsible for compliance with all legal, regulatory and safety-related requirements concerning its products, and any use of TI components in its applications, notwithstanding any applications-related information or support that may be provided by TI. Buyer represents and agrees that it has the all the necessary expertise to create and implement safeguards that anticipate dangerous failures, monitor failures and their consequences, lessen the likelihood of dangerous failures and take appropriate remedial actions. Buyer will fully indemnify TI and its representatives against any damages arising out of the use of any TI components in Buyer’s safety-critical applications.

In some cases, TI components may be promoted specifically to facilitate safety-related applications. With such components, TI’s goal is to help enable customers to design and create their own end-product solutions that meet applicable functional safety standards and requirements. Nonetheless, such components are subject to these terms.

No TI components are authorized for use in FDA Class III (or similar life-critical medical equipment) unless authorized officers of the parties have executed an agreement specifically governing such use.

Only those TI components that TI has specifically designated as military grade or "enhanced plastic" are designed and intended for use in military/aerospace applications or environments. Buyer acknowledges and agrees that any military or aerospace use of TI components that have not been so designated is solely at Buyer’s risk, and Buyer is solely responsible for compliance with all legal and regulatory requirements in connection with such use.

TI has specifically designated certain components as meeting ISO/TS16949 requirements, mainly for automotive use. In any case of use of non-designated products, TI will not be responsible for any failure to meet ISO/TS16949.

Mailing Address: Texas Instruments, Post Office Box 655303, Dallas, Texas 75265
Copyright © 2014, Texas Instruments Incorporated
IMPORTANT NOTICE

Texas Instruments Incorporated and its subsidiaries (TI) reserve the right to make corrections, enhancements, improvements and other changes to its semiconductor products and services per JESD46, latest issue, and to discontinue any product or service per JESD48, latest issue. Buyers should obtain the latest relevant information before placing orders and should verify that such information is current and complete. All semiconductor products (also referred to herein as “components”) are sold subject to TI’s terms and conditions of sale supplied at the time of order acknowledgment.

TI warrants performance of its components to the specifications applicable at the time of sale, in accordance with the warranty in TI's terms and conditions of sale of semiconductor products. Testing and other quality control techniques are used to the extent TI deems necessary to support this warranty. Except where mandated by applicable law, testing of all parameters of each component is not necessarily performed.

TI assumes no liability for applications assistance or the design of Buyers’ products. Buyers are responsible for their products and applications using TI components. To minimize the risks associated with Buyers’ products and applications, Buyers should provide adequate design and operating safeguards.

TI does not warrant or represent that any license, either express or implied, is granted under any patent right, copyright, mask work right, or other intellectual property right relating to any combination, machine, or process in which TI components or services are used. Information published by TI regarding third-party products or services does not constitute a license to use such products or services or a warranty or endorsement thereof. Use of such information may require a license from a third party under the patents or other intellectual property of the third party, or a license from TI under the patents or other intellectual property of TI.

Reproduction of significant portions of TI information in TI data books or data sheets is permissible only if reproduction is without alteration and is accompanied by all associated warranties, conditions, limitations, and notices. TI is not responsible or liable for such altered documentation. Information of third parties may be subject to additional restrictions.

Resale of TI components or services with statements different from or beyond the parameters stated by TI for that component or service voids all express and any implied warranties for the associated TI component or service and is an unfair and deceptive business practice. TI is not responsible or liable for any such statements.

Buyer acknowledges and agrees that TI is solely responsible for compliance with all legal, regulatory and safety-related requirements concerning its products, and any use of TI components in its applications, notwithstanding any applications-related information or support that may be provided by TI. Buyer represents and agrees that it has all the necessary expertise to create and implement safeguards which anticipate dangerous consequences of failures, monitor failures and their consequences, lessen the likelihood of failures that might cause harm and take appropriate remedial actions. Buyer will fully indemnify TI and its representatives against any damages arising out of the use of any TI components in safety-critical applications.

In some cases, TI components may be promoted specifically to facilitate safety-related applications. With such components, TI’s goal is to help enable customers to design and create their own end-product solutions that meet applicable functional safety standards and requirements. Nonetheless, such components are subject to these terms.

No TI components are authorized for use in FDA Class III (or similar life-critical medical equipment) unless authorized officers of the parties have executed a special agreement specifically governing such use.

Only those TI components which TI has specifically designated as military grade or “enhanced plastic” are designed and intended for use in military/aerospace applications or environments. Buyer acknowledges and agrees that any military or aerospace use of TI components which have not been so designated is solely at the Buyer's risk, and that Buyer is solely responsible for compliance with all legal and regulatory requirements in connection with such use.

TI has specifically designated certain components as meeting ISO/TS16949 requirements, mainly for automotive use. In any case of use of non-designated products, TI will not be responsible for any failure to meet ISO/TS16949.

<table>
<thead>
<tr>
<th>Products</th>
<th>Applications</th>
<th>Products</th>
<th>Applications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Audio</td>
<td><a href="http://www.ti.com/audio">www.ti.com/audio</a></td>
<td>Automotive and Transportation</td>
<td><a href="http://www.ti.com/automotive">www.ti.com/automotive</a></td>
</tr>
<tr>
<td>Amplifiers</td>
<td>amplifier.ti.com</td>
<td>Communications and Telecom</td>
<td><a href="http://www.ti.com/communications">www.ti.com/communications</a></td>
</tr>
<tr>
<td>DSP</td>
<td>dsp.ti.com</td>
<td>Energy and Lighting</td>
<td><a href="http://www.ti.com/energy">www.ti.com/energy</a></td>
</tr>
<tr>
<td>Interface</td>
<td>interface.ti.com</td>
<td>Medical</td>
<td><a href="http://www.ti.com/medical">www.ti.com/medical</a></td>
</tr>
<tr>
<td>Logic</td>
<td>logic.ti.com</td>
<td>Security</td>
<td><a href="http://www.ti.com/security">www.ti.com/security</a></td>
</tr>
<tr>
<td>Power Mgmt</td>
<td>power.ti.com</td>
<td>Space, Avionics and Defense</td>
<td><a href="http://www.ti.com/space-avionics-defense">www.ti.com/space-avionics-defense</a></td>
</tr>
<tr>
<td>Microcontrollers</td>
<td>microcontroller.ti.com</td>
<td>Video and Imaging</td>
<td><a href="http://www.ti.com/video">www.ti.com/video</a></td>
</tr>
<tr>
<td>RFID</td>
<td><a href="http://www.ti-rfid.com">www.ti-rfid.com</a></td>
<td></td>
<td></td>
</tr>
<tr>
<td>OMAP Applications Processors</td>
<td><a href="http://www.ti.com/omap">www.ti.com/omap</a></td>
<td>TI E2E Community</td>
<td>e2e.ti.com</td>
</tr>
<tr>
<td>Wireless Connectivity</td>
<td><a href="http://www.ti.com/wirelessconnectivity">www.ti.com/wirelessconnectivity</a></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Mailing Address: Texas Instruments, Post Office Box 655303, Dallas, Texas 75265
Copyright © 2014, Texas Instruments Incorporated