

TAS3204EVM

**Evaluation Module for the
TAS3204 Digital Audio Processor**

User's Guide



Literature Number: SLEU091B
October 2007–Revised June 2009

Preface	5
1 Overview	7
1.1 TAS3204EVM Features	8
1.2 PCB Block Diagram	10
2 Quick Setup Guide	11
2.1 Electrostatic Discharge Warning	12
2.2 Unpacking the EVM	12
2.3 Power Supply Setup	12
2.4 Graphical Development Environment (GDE) Software Installation	13
3 PWM Audio Amplifier Setup	15
3.1 TAS5086 Graphical User Interface (GUI)	16
4 TAS3204 Slave Mode	19
4.1 TAS3204 Setup	20
4.2 TAS5086 Setup (If Applicable)	20
Important Notices	21

List of Figures

1-1	TAS3204EVM PCB Mapping.....	8
1-2	TAS3204EVM	9
1-3	TAS3204EVM Interface with TAS5132DDV2EVM	9
1-4	TAS3204EVM Block Diagram	10
2-1	GDE Window – Load Process Flow	14
2-2	Execute I ² C Command	14
3-1	TAS3204EVM and TAS5132DDV2EVM	16
3-2	TAS5086 GUI	17

List of Tables

2-1	Recommended Supply Voltages	12
2-2	Default Jumper Settings	13

Read This First

About This Manual

This manual describes the operation of the TAS3204EVM evaluation module from Texas Instruments.

How to Use This Manual

This document contains the following chapters:

- Chapter 1 – Overview
- Chapter 2 – Quick Setup Guide
- Chapter 3 – PWM Audio Amplifier Setup
- Chapter 4 – TAS3204 Slave Mode

Information about Cautions and Warnings

This manual may contain cautions and warnings.

CAUTION

This is an example of a caution statement.

A caution statement describes a situation that could potentially damage your software or equipment.

WARNING

This is an example of a warning statement.

A warning statement describes a situation that could potentially cause harm to you.

The information in a caution or a warning is provided for your protection. Please read each caution and warning carefully.

Related Documentation From Texas Instruments

The following table lists data manuals that have detailed descriptions of the integrated circuits used in the design of the TAS3204EVM. The data manuals can be obtained from <http://www.ti.com>.

Related Documentation From Texas Instruments

Part Number	Literature Number
TAS3204	SLES197
TAS5086	SLES131
TAS5132	SLES190
DIR9001	SLES198
DIT4192	SBOS229
SRC4190	SBFS023
TAS5132DDV2EVM	SLLU097

Additional Documentation

- PurePath Studio Graphical Development Environment
- General TAS3204 application reports

Important Software Updates

The TAS3204EVM is shipped with the latest version of PurePath Studio™ GDE at the time of the initial evaluation module release. Before starting any new design, verify that you are using the latest version of PurePath Studio GDE available by requesting access to the [Texas Instruments Mixed Signal Audio and Video Extranet](#). Once access is granted, any new build of the software can be downloaded via an existing internet connection.

TAS5132 PWM Audio Power Amplifier

The TAS3204 is equipped with a header that interfaces with the TAS5132DDV2EVM. If an audio power amplifier is needed, the TAS5132DDV2EVM can be purchased in addition to the TAS3204EVM from the [TI eStore](#).

Trademarks

PurePath Studio, PurePath Digital are trademarks of Texas Instruments.

All other trademarks are the property of their respective owners.

Overview

The TAS3204EVM PurePath Digital™ customer evaluation module enables the customers to examine the TAS3204 capabilities as detailed in the TAS3204 data sheet ([SLES197](#)).

The TAS3204PAG is a high-performance digital audio processor. It is an audio system-on-chip (SOC) designed for mini/micro systems, multimedia speakers, and MP3 player docking systems. It includes analog interface functions and four channels of serial digital audio. The TAS3204 has a programmable audio digital signal processor (DSP) that preserves high-quality audio by using a 48-bit data path, 28-bit coefficients, and a single-cycle 28×48 -bit multiplier.

Topic	Page
1.1 TAS3204EVM Features	8
1.2 PCB Block Diagram	10

1.1 TAS3204EVM Features

- Three stereo analog channel inputs
- Two stereo analog channel outputs
- Digital input options: SPDIF or user's I²S input [e.g., Audio Precision (AP)]
- Digital output options: SPDIF, user's I²S output (e.g., AP)
- USB interface for I²C control via graphical design environment

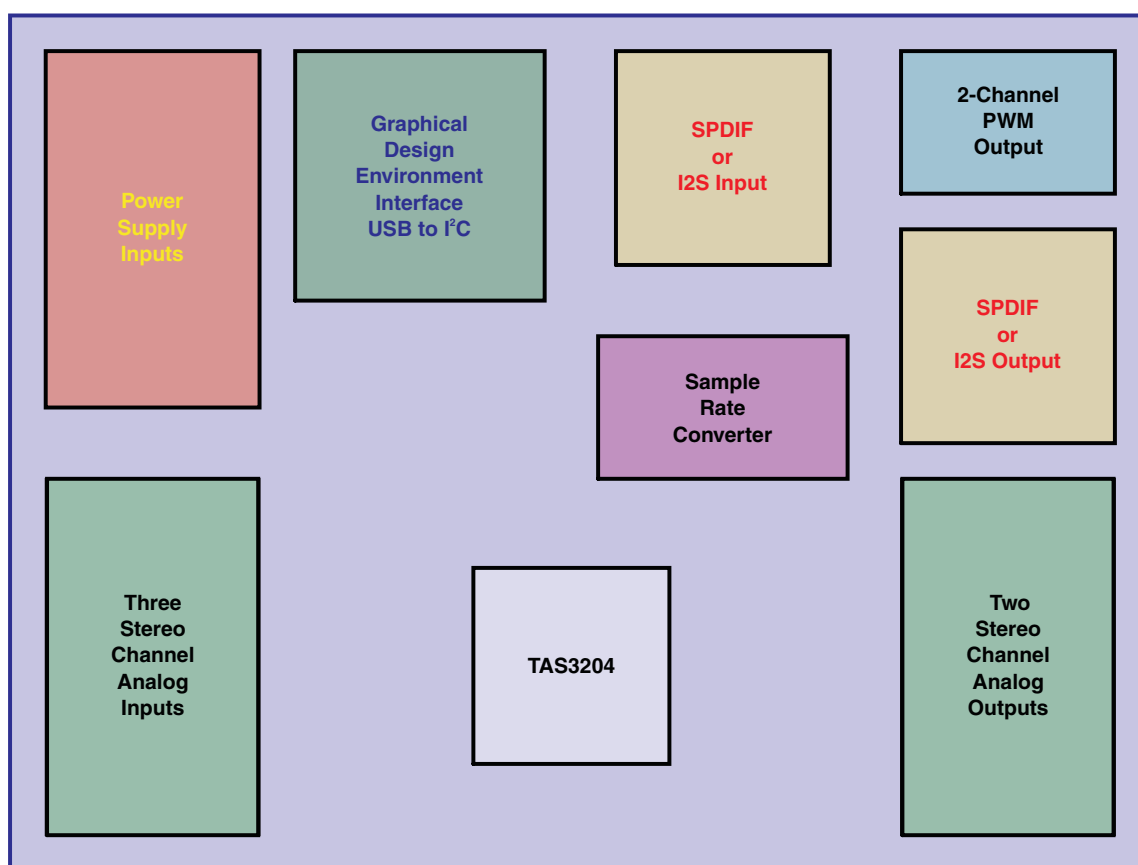


Figure 1-1. TAS3204EVM PCB Mapping

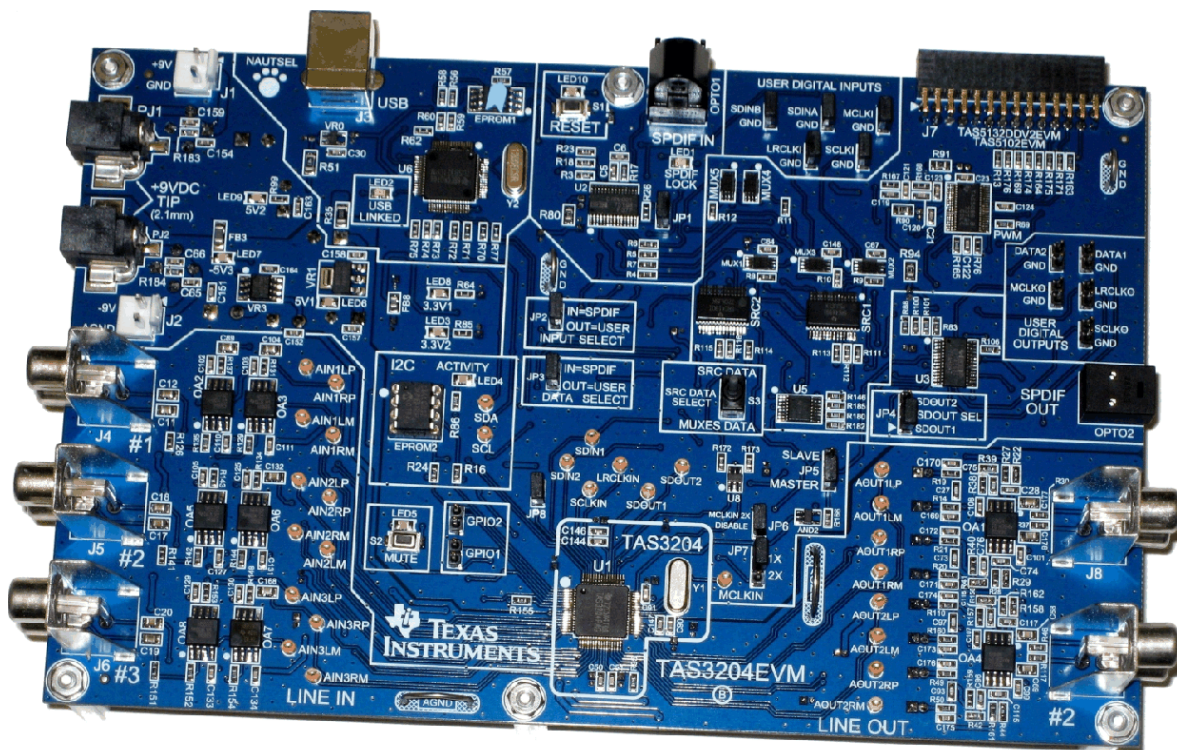


Figure 1-2. TAS3204EVM

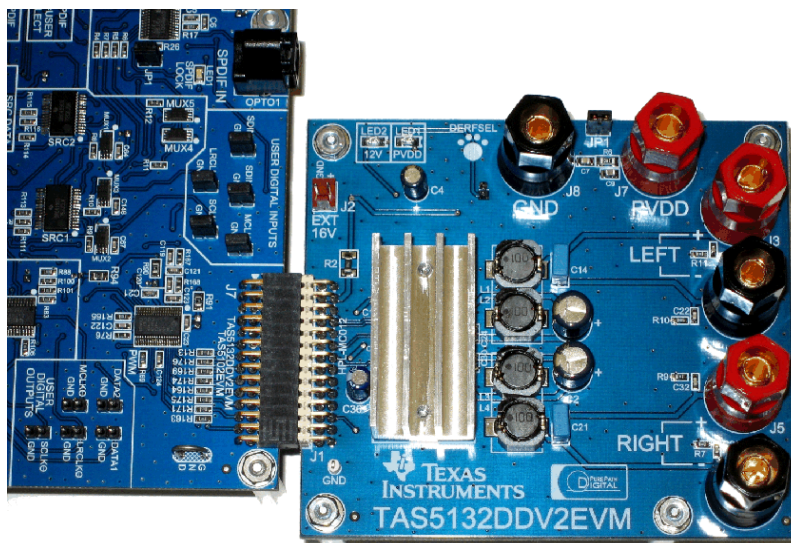


Figure 1-3. TAS3204EVM Interface with TAS5132DDV2EVM

1.2 PCB Block Diagram

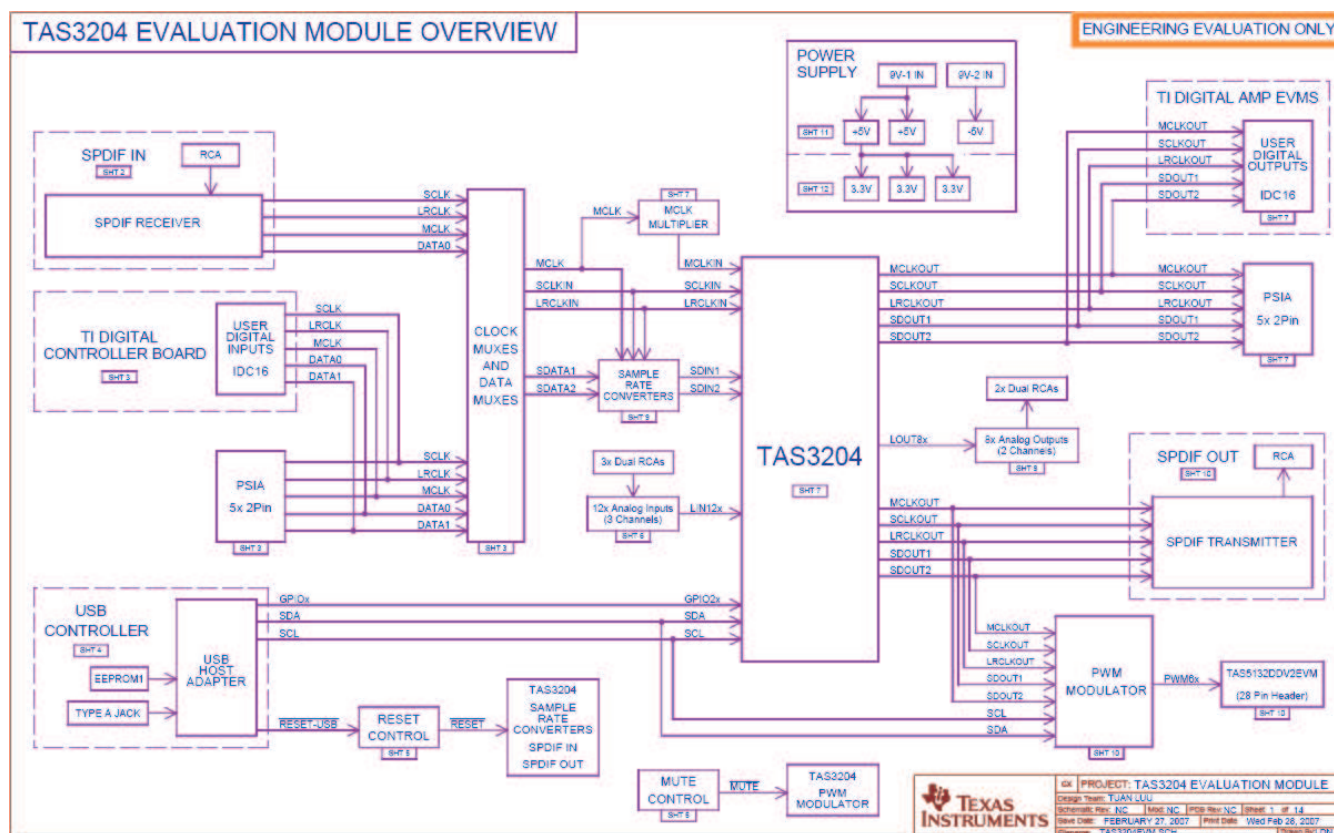


Figure 1-4. TAS3204EVM Block Diagram

Quick Setup Guide

This chapter describes the power supplies and system interfaces of the TAS3204EVM. The chapter provides information regarding handling and unpacking, absolute operating conditions, and a description of the factory default switch and jumper configuration.

This chapter provides a step-by-step guide to configuring the TAS3204EVM for device evaluation.

Topic	Page
2.1 Electrostatic Discharge Warning	12
2.2 Unpacking the EVM	12
2.3 Power Supply Setup	12
2.4 Graphical Development Environment (GDE) Software Installation...	13

2.1 Electrostatic Discharge Warning

Many of the components on the TAS3204EVM are susceptible to damage by electrostatic discharge (ESD). Customers are advised to observe proper ESD handling precautions when unpacking and handling the EVM, including the use of a grounded wrist strap at an approved ESD workstation.

CAUTION

Failure to observe ESD handling procedures may result in damage to EVM components.

2.2 Unpacking the EVM

Upon opening the TAS3204EVM package, please check to make sure that the following items are included:

- One TAS3204EVM board using one TAS3204PAG
- Two 9-V AC-to-DC adapters
- One CD containing PurePath Studio Graphical Development Environment, full device data manual, and design and board files
- One USB Type A to Type B cable

If any of these items is missing, please contact the Texas Instruments Product Information Center nearest you to inquire about a replacement.

2.3 Power Supply Setup

Plug in the ac-dc adapters to PJ1 and PJ2. These adapters provide +9 VDC and –9 VDC to the TAS3204EVM and can be plugged in any order. The on-board circuit automatically configures the voltages, i.e., polarity is correct. Please see note for using lab supplies in place of ac-dc adapters.

Note: If using lab supplies to power the TAS3204EVM, ensure that the polarity is correct and that the grounds on the two supplies are isolated:

J2 – Pin 1: 9 VDC, Pin 2: Ground

J8 – Pin 1: Ground, Pin 2: 9 VDC

Table 2-1. Recommended Supply Voltages

DESCRIPTION	VOLTAGE LIMITATIONS	CURRENT REQUIREMENT	CONNECTION
System/analog power supply	+9 V	1 A	PJ1 or J2 (+ pin 1)
Analog power supply	–9 V	0.5 A	PJ2 or J8 (– pin 1)

CAUTION

Applying voltages above the limitations given in [Table 2-1](#) may cause permanent damage to the hardware.

2.4 Graphical Development Environment (GDE) Software Installation

The GDE is used to program the TAS3204. To install the GDE, run SETUP.EXE from the provided CD ROM.

1. After installation, connect the ac-dc power adapters and connect the USB cable to the PC. The PC must be running Windows® XP®.
2. Start the GDE program from the Windows Start menu. Launching the GDE requires a few seconds.
3. Ensure that the jumpers are set to the defaults shown in [Table 2-2](#).

Table 2-2. Default Jumper Settings

JUMPER DESIGNATOR	POSITION	COMMENTS
JP1	Out	Sets the MCLK to 512Fs out of SPDIF receiver
JP2	In	Selects SPDIF clocks
JP3	In	Selects SPDIF data
JP4	SDOUT1	Selects SDOUT1 data from TAS3204
JP5	MASTER	I2S master mode
JP6	In	Disables the MCLK multiplier (2×)
JP7	1x	Selects MCLK straight from SPDIF receiver
JP8	In	Connect reset line to the TAS3204
MCLKI	In	Sets MCLK input to ground
SCLKI	In	Sets SCLK input to ground
LRCLKI	In	Sets LRCLK input to ground
SDINA	In	Sets SDINA input to ground
SDINB	In	Sets SDINB input to ground
GPIO1	Out	Sets GPIO1 pin to logic high
GPIO2	Out	Sets GPIO2 pin to logic high
MCLKO	Out	Sets MCLK out signal open
SCLKO	Out	Sets SCLK out signal open
LRCLKO	Out	Sets LRCLK out signal open
DATA1	Out	Sets SDOUT1 signal open
DATA2	Out	Sets SDOUT2 signal open
SRC Select SW	SRC Data	Selects data from sample rate converter

4. From the File menu, load the process flow file TAS3204.pfw (see Figure 2-1). The file is located on the CD ROM.

This file contains basic settings for a default setup of the EVM with TAS3204 as an I²S clock master.

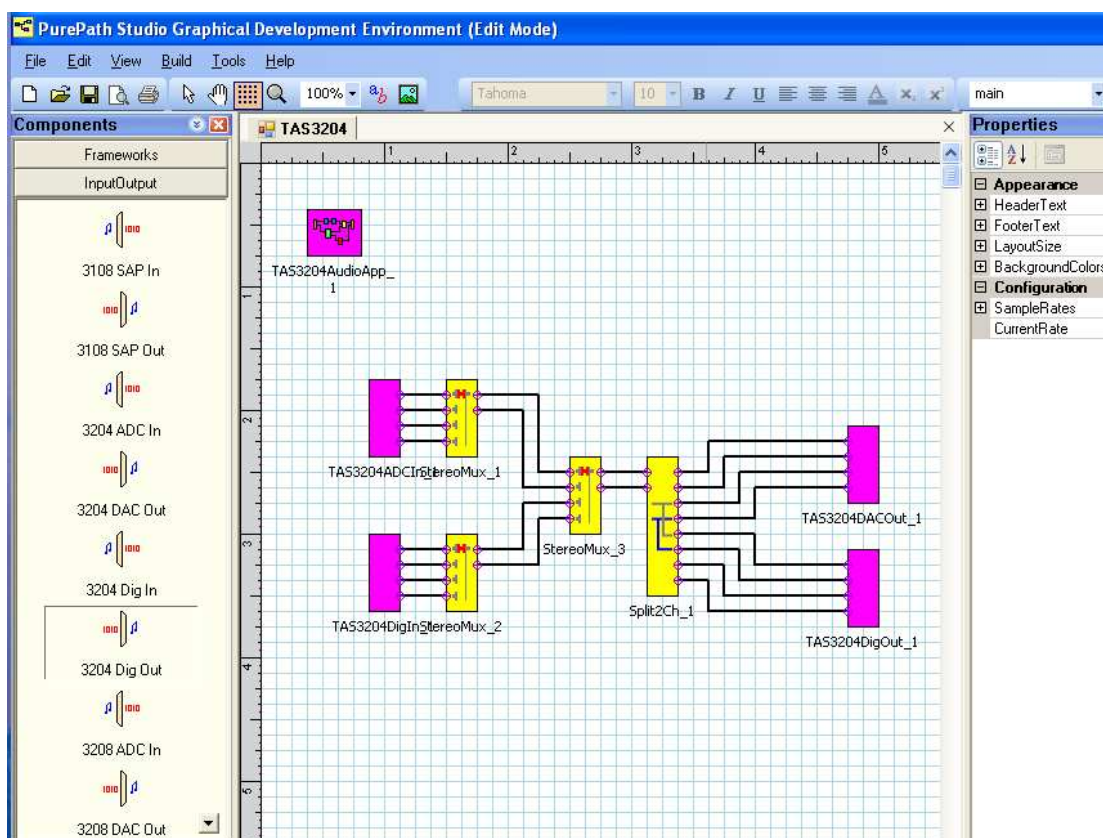


Figure 2-1. GDE Window – Load Process Flow

5. From the Tools menu, select the I²C Command tool. In the Execute I²C Command File window, browse to the file 3204_init_master.cfg. Verify that 'Execute on Reset' Box is checked, then click OK (see Figure 2-2).

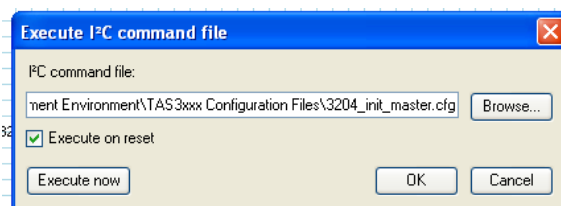


Figure 2-2. Execute I²C Command

6. From the Build menu, select Run.

PWM Audio Amplifier Setup

This chapter describes the setup for the TAS5132DDV2EVM when interfaced to the TAS3204EVM.

Note: The TAS5231DDV2EVM is not part of the TAS3204EVM Kit. If a PWM Audio Amplifier is needed, the TAS5132DDV2DVM may be purchased from Texas Instruments. Details about purchasing this device are outlined in the Read Me First section of this document.

Topic	Page
3.1 TAS5086 Graphical User Interface (GUI)	16

3.1 TAS5086 Graphical User Interface (GUI)

The CD ROM contains the TAS5086 GUI. If you have not installed the TAS5086 GUI, run SETUP.EXE from the CD. After setup is complete, restart the computer. After the restart, run the TAS3204 portion as shown in [Chapter 2](#).

1. Connect the TAS5132DDV2EVM to the TAS3204EVM (see [Figure 3-1](#)).

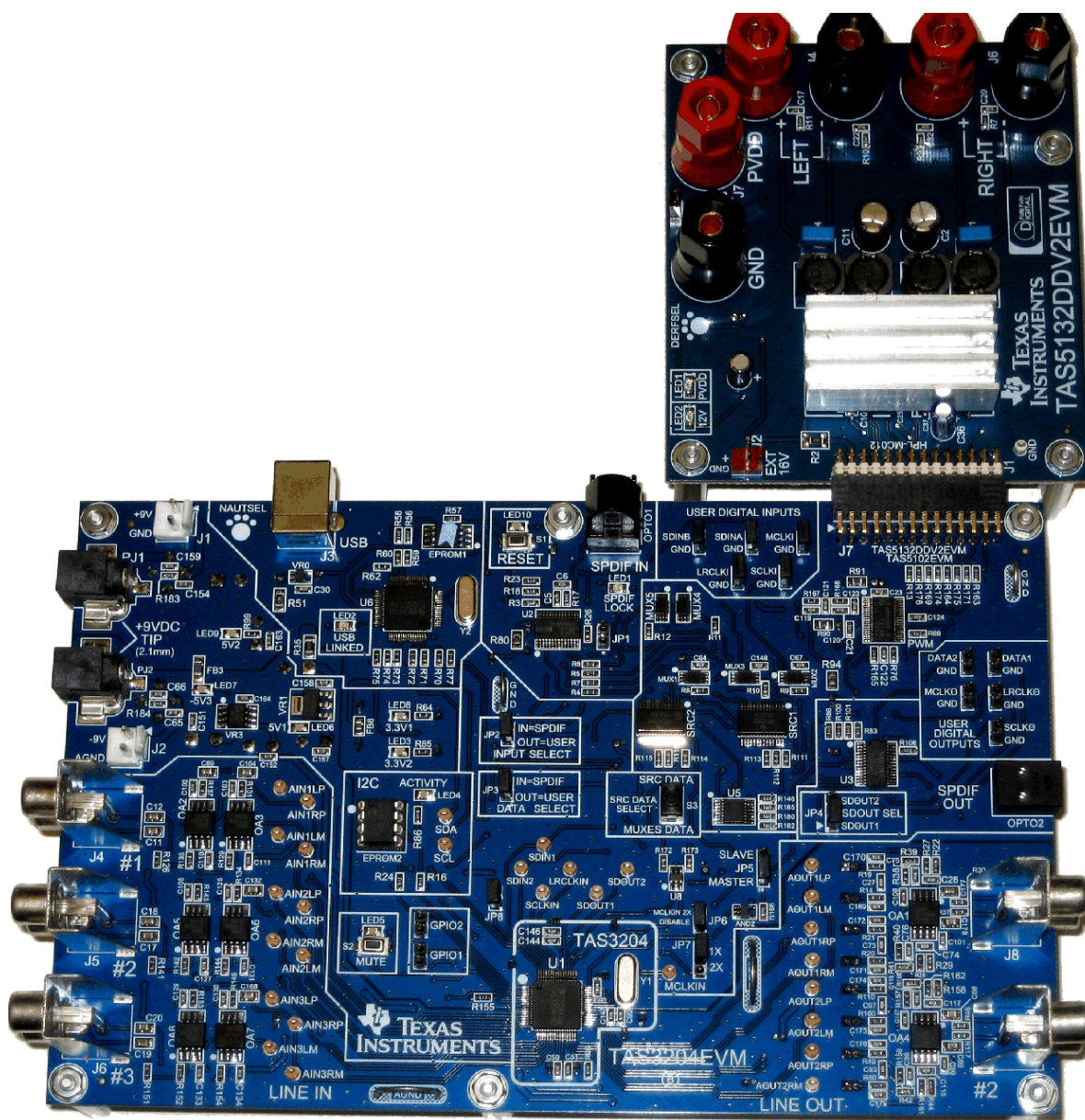


Figure 3-1. TAS3204EVM and TAS5132DDV2EVM

2. Remove the jumper from JP8 to preserve TAS3204 I²C register settings.
3. Connect music input from either the analog input or the SPDIF input.
4. Attach speakers to J3, J4, J5, and J6 per the labels on the TAS5132DDV2EVM (i.e., the left speaker connects to J3(+) and J4(–), and the right speaker connects to J5(+) and J6(–)).
5. Start the TAS5086 GUI from the Windows Start menu (see [Figure 3-2](#)).

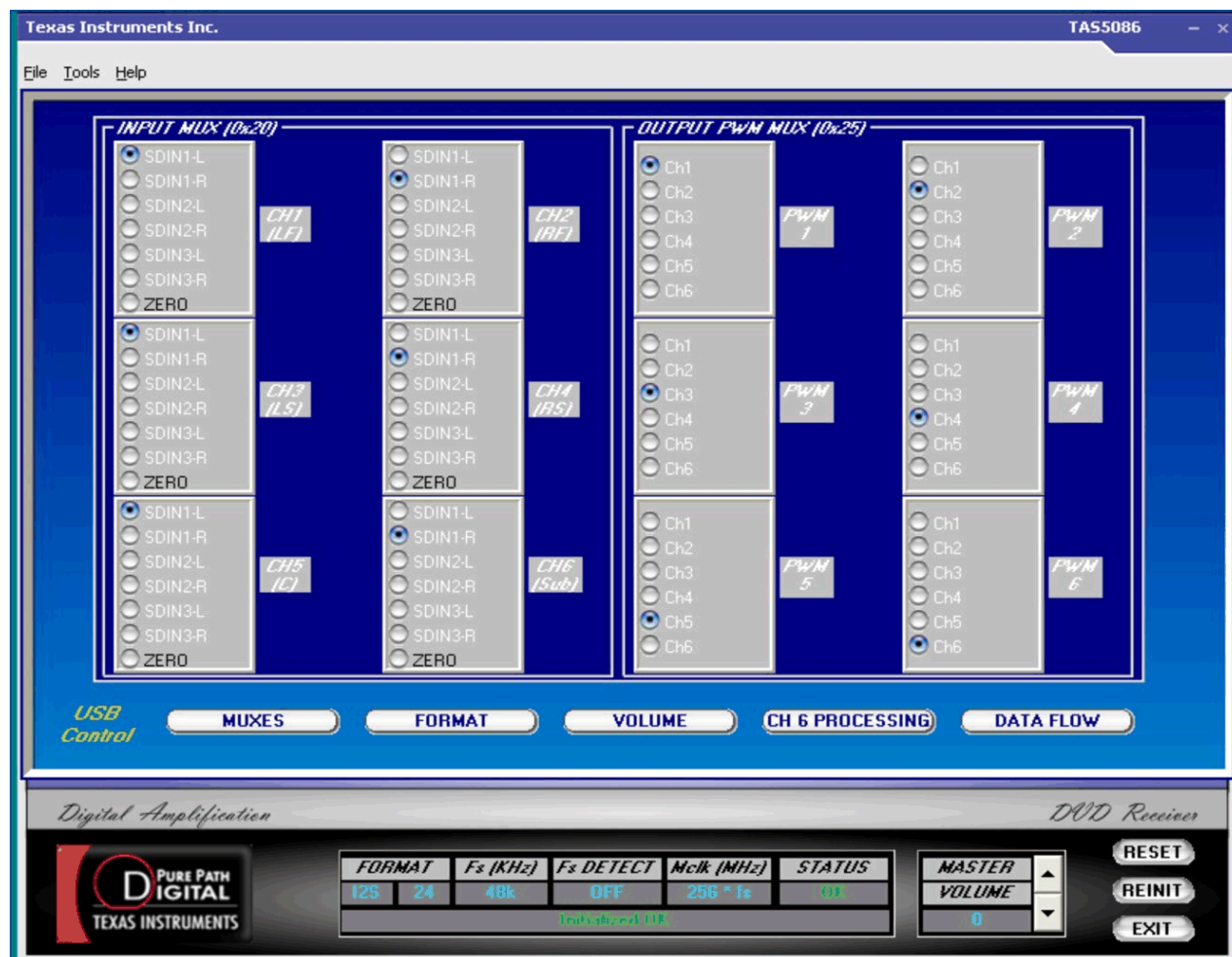


Figure 3-2. TAS5086 GUI

6. From the File menu, load the TAS5086FieldTrim.cfg configuration file. This file trims the internal oscillator to a 48-kHz sampling rate.
7. From GUI screen, click on MUXES button, and verify that the blue dots appear as in Figure 3-2.
8. On the TAS3204EVM, press the MUTE button to unmute the sound output (the MUTE LED is extinguished).

The music should be audible at the speakers.

TAS3204 Slave Mode

This chapter describes how to setup the TAS3204 to operate as an I²S slave.

Note: Audio performance in slave mode depends on the quality of the I2S clocks. It is recommended that the clocks be buffered before TAS3204. The lowest sampling frequency for acceptable audio performance is 44.1 kHz.

Topic	Page
4.1 TAS3204 Setup	20
4.2 TAS5086 Setup (If Applicable)	20

4.1 TAS3204 Setup

1. If any jumpers were moved, return them to the default settings shown in [Table 2-2](#).
2. See [Section 2.4](#) for instructions on running the GDE.
3. Set JP5 to SLAVE.
4. On the Tools menu, select the I²C Command tool. In the Execute I²C Command File window, browse to the file 3204_init_slave.cfg. Select the Execute on reset option and click Execute (see [Figure 2-2](#)).

When operating as an I²S clock slave, the TAS3204 outputs audio according to the software configuration if the I²S clocks are correctly supplied externally to the device.

4.2 TAS5086 Setup (If Applicable)

See [Section 3.1](#) for the TAS5086 setup instructions.

EVALUATION BOARD/KIT IMPORTANT NOTICE

Texas Instruments (TI) provides the enclosed product(s) under the following conditions:

This evaluation board/kit is intended for use for **ENGINEERING DEVELOPMENT, DEMONSTRATION, OR EVALUATION PURPOSES ONLY** and is not considered by TI to be a finished end-product fit for general consumer use. Persons handling the product(s) must have electronics training and observe good engineering practice standards. As such, the goods being provided are not intended to be complete in terms of required design-, marketing-, and/or manufacturing-related protective considerations, including product safety and environmental measures typically found in end products that incorporate such semiconductor components or circuit boards. This evaluation board/kit does not fall within the scope of the European Union directives regarding electromagnetic compatibility, restricted substances (RoHS), recycling (WEEE), FCC, CE or UL, and therefore may not meet the technical requirements of these directives or other related directives.

Should this evaluation board/kit not meet the specifications indicated in the User's Guide, the board/kit may be returned within 30 days from the date of delivery for a full refund. **THE FOREGOING WARRANTY IS THE EXCLUSIVE WARRANTY MADE BY SELLER TO BUYER AND IS IN LIEU OF ALL OTHER WARRANTIES, EXPRESSED, IMPLIED, OR STATUTORY, INCLUDING ANY WARRANTY OF MERCHANTABILITY OR FITNESS FOR ANY PARTICULAR PURPOSE.**

The user assumes all responsibility and liability for proper and safe handling of the goods. Further, the user indemnifies TI from all claims arising from the handling or use of the goods. Due to the open construction of the product, it is the user's responsibility to take any and all appropriate precautions with regard to electrostatic discharge.

EXCEPT TO THE EXTENT OF THE INDEMNITY SET FORTH ABOVE, NEITHER PARTY SHALL BE LIABLE TO THE OTHER FOR ANY INDIRECT, SPECIAL, INCIDENTAL, OR CONSEQUENTIAL DAMAGES.

TI currently deals with a variety of customers for products, and therefore our arrangement with the user **is not exclusive**.

TI assumes **no liability for applications assistance, customer product design, software performance, or infringement of patents or services described herein.**

Please read the User's Guide and, specifically, the Warnings and Restrictions notice in the User's Guide prior to handling the product. This notice contains important safety information about temperatures and voltages. For additional information on TI's environmental and/or safety programs, please contact the TI application engineer or visit www.ti.com/esh.

No license is granted under any patent right or other intellectual property right of TI covering or relating to any machine, process, or combination in which such TI products or services might be or are used.

FCC Warning

This evaluation board/kit is intended for use for **ENGINEERING DEVELOPMENT, DEMONSTRATION, OR EVALUATION PURPOSES ONLY** and is not considered by TI to be a finished end-product fit for general consumer use. It generates, uses, and can radiate radio frequency energy and has not been tested for compliance with the limits of computing devices pursuant to part 15 of FCC rules, which are designed to provide reasonable protection against radio frequency interference. Operation of this equipment in other environments may cause interference with radio communications, in which case the user at his own expense will be required to take whatever measures may be required to correct this interference.

EVM WARNINGS AND RESTRICTIONS

It is important to operate this EVM within the input output voltage ranges as described in this user's guide and the TAS3204 data sheet.

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 75°C. The EVM is designed to operate properly with certain components above 75°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.

Mailing Address: Texas Instruments, Post Office Box 655303, Dallas, Texas 75265
Copyright 2007, Texas Instruments Incorporated

IMPORTANT NOTICE

Texas Instruments Incorporated and its subsidiaries (TI) reserve the right to make corrections, modifications, enhancements, improvements, and other changes to its products and services at any time and to discontinue any product or service without notice. Customers should obtain the latest relevant information before placing orders and should verify that such information is current and complete. All products are sold subject to TI's terms and conditions of sale supplied at the time of order acknowledgment.

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

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

TI does not warrant or represent that any license, either express or implied, is granted under any TI patent right, copyright, mask work right, or other TI intellectual property right relating to any combination, machine, or process in which TI products or services are used. Information published by TI regarding third-party products or services does not constitute a license from TI 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 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. Reproduction of this information with alteration is an unfair and deceptive business practice. TI is not responsible or liable for such altered documentation. Information of third parties may be subject to additional restrictions.

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

TI products are not authorized for use in safety-critical applications (such as life support) where a failure of the TI product would reasonably be expected to cause severe personal injury or death, unless officers of the parties have executed an agreement specifically governing such use. Buyers represent that they have all necessary expertise in the safety and regulatory ramifications of their applications, and acknowledge and agree that they are solely responsible for all legal, regulatory and safety-related requirements concerning their products and any use of TI products in such safety-critical applications, notwithstanding any applications-related information or support that may be provided by TI. Further, Buyers must fully indemnify TI and its representatives against any damages arising out of the use of TI products in such safety-critical applications.

TI products are neither designed nor intended for use in military/aerospace applications or environments unless the TI products are specifically designated by TI as military-grade or "enhanced plastic." Only products designated by TI as military-grade meet military specifications. Buyers acknowledge and agree that any such use of TI products which TI has not designated as military-grade is solely at the Buyer's risk, and that they are solely responsible for compliance with all legal and regulatory requirements in connection with such use.

TI products are neither designed nor intended for use in automotive applications or environments unless the specific TI products are designated by TI as compliant with ISO/TS 16949 requirements. Buyers acknowledge and agree that, if they use any non-designated products in automotive applications, TI will not be responsible for any failure to meet such requirements.

Following are URLs where you can obtain information on other Texas Instruments products and application solutions:

Products

Amplifiers	amplifier.ti.com
Data Converters	dataconverter.ti.com
DLP® Products	www.dlp.com
DSP	dsp.ti.com
Clocks and Timers	www.ti.com/clocks
Interface	interface.ti.com
Logic	logic.ti.com
Power Mgmt	power.ti.com
Microcontrollers	microcontroller.ti.com
RFID	www.ti-rfid.com
RF/IF and ZigBee® Solutions	www.ti.com/lprf

Applications

Audio	www.ti.com/audio
Automotive	www.ti.com/automotive
Broadband	www.ti.com/broadband
Digital Control	www.ti.com/digitalcontrol
Medical	www.ti.com/medical
Military	www.ti.com/military
Optical Networking	www.ti.com/opticalnetwork
Security	www.ti.com/security
Telephony	www.ti.com/telephony
Video & Imaging	www.ti.com/video
Wireless	www.ti.com/wireless

Mailing Address: Texas Instruments, Post Office Box 655303, Dallas, Texas 75265
Copyright © 2009, Texas Instruments Incorporated