Texas Instruments

TAS1020BEVM

Evaluation Module for the TAS1020B

User's Guide

January 2003

Digital Audio Products

SLEU031

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EVM WARNINGS AND RESTRICTIONS

It is important to operate this EVM within the input voltage range of 4.5 V to 5.5 V and the output voltage range of 3 V to 3.6 V.

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 60°C. The EVM is designed to operate properly with certain components above 60°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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Preface

Read This First

About This Manual

This manual describes the operation of the TAS1020B evaluation module from Texas Instruments.

How to Use This Manual

This document contains the following chapters:

- Chapter 1—Introduction
- Chapter 2—EVM Board Operation

Information About Cautions and Warnings

This book may contain cautions and warnings.

This is an example of a caution statement.

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

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.

FCC Warning

This equipment is intended for use in a laboratory test environment only. It generates, uses, and can radiate radio frequency energy and has not been tested for compliance with the limits of computing devices pursuant to subpart J of 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.

Related Documentation From Texas Instruments

The following is a list of data manuals that have detailed descriptions of the integrated circuits used in the design of the TAS1020B EVM. These data manuals can be obtained at the URL http://www.ti.com.

Part Number	Literature Number
❑ TAS1020B	SLES025
❑ TLV320AIC27	SLAS253
❑ SN74LVTH244A	SCAS586
❑ SN74LV4737A	SLLS178
❑ SN74CBT3245A	SCDS002
❑ SN75HC540	SCLS007
❑ TPS7233	SLVS102
❑ TLV2362	SLOS195

TAS1020B EVM Kit Contents

TAS1020B EVM is shipped with the following:

1) TAS1020BEVM Evaluation Module
2) TAS1020BEVM CD. The CD contains the following:
   a) TAS1020B Data Manual
   b) TAS1020BEVM User’s Guide
   c) TAS1020BEVM Schematic
   d) TAS1020BEVM Bill of Materials
   e) TAS1020BEVM PCB
   f) TAS1020BEVM Gerber Files
   g) DFU Software
3) TAS1020B Data Manual
4) TAS1020BEVM User’s Guide
5) Cover Letter
6) Contact List

Emulator and Compiler Information

The emulator hardware should consist of a PC card, an interface cable, and an emulator pod. These components may or may not be sold independently, depending on the vendor. The emulator software should include everything required to run the hardware. For emulator from Nohau, visit web-site http://www.nohau.com. For emulator software from Phyton, visit web-site http://www.phyton.com. Emulator operation must be 3.3 V.

TI example code is provided in the EEPROM onboard. See the cover letter for instructions on getting the source code. All TI example code is written in C. An 8051 C to assembly code compiler is a very useful tool. It is recommended to check the compiler and the emulator for compatibility before making a selection. For more information on the Keil C compiler, please visit web-site http://www.keil.com/c51.

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Chapter 1

Introduction

The TAS1020B evaluation module (EVM) is based on the TI TAS1020B integrated circuit (IC). The TAS1020B IC is a universal serial bus (USB) peripheral interface device designed specifically for applications that require isochronous data streaming, e.g., streaming of digital audio data between the host PC and the speaker system via the USB connection. The TAS1020B is compatible with the USB specification version 1.1 and the USB audio class specification.

The TAS1020B uses a standard 8052 microcontroller unit (MCU) core with on-chip memory to handle all data transfer. A full explanation of how to configure the TAS1020B to control the streaming data and set up the interface ports and registers can be found in the TAS1020B data manual. The preface of this user's guide tells how to obtain the data manual.

The TAS1020B EVM is designed to allow development and evaluation of the TAS1020B for controlling streams of data. The TAS1020B accepts USB data streams and generates audio streams using common audio protocols at the codec port. This programmable port allows the audio data to be output as AC-Link, I^2S, AIC, or a general-purpose mode.

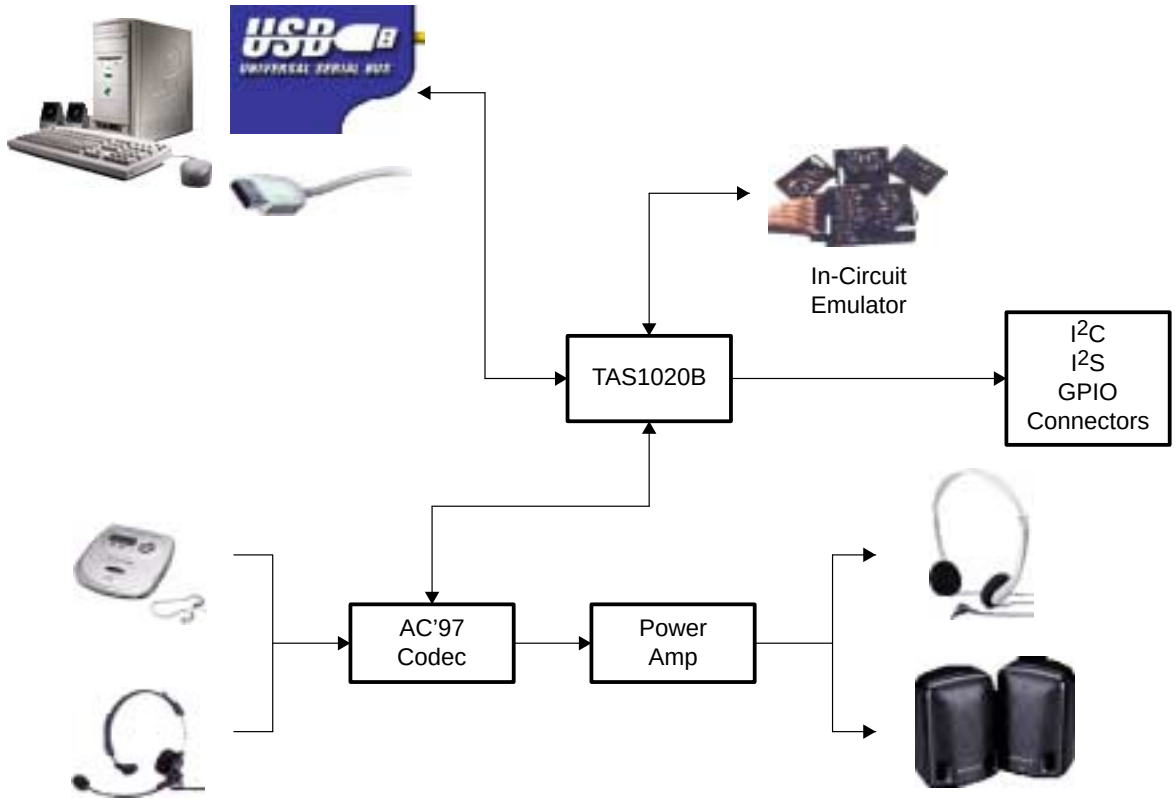
Additional features on the TAS1020B EVM board are:

- *Microphone input* can be used with an external microphone.
- *Line input* for a CD or any other device that provides an analog input.
- *Audio amplifier* can be used with any PC speakers.
- *In-circuit emulator* is primarily used for firmware development and debugging.
- The TAS1020B EVM also includes connectors that enable the use of alternative audio codecs. The firmware included with the EVM does not support codecs other than the AC'97 codec provided.

Digital audio sources such as those from a PC CD player, Windows™ Media Player, or other PC audio applications on the host stream data to the TAS1020B USB interface via USB. The TAS1020B converts this data to AC'97

format and transfers the data to the AC’97 codec. The AC’97 codec takes the digital data and converts it to analog. The analog data is then amplified and output to the mini-stereo 3,5 mm-jack. The voice data from the microphone can be recorded and stored in the host PC. See Figure 1–1 for a top level description of the TAS1020B functions.

Figure 1–1. TAS1020B EVM Block Diagram



Chapter 2

EVM Board Operation

This chapter includes an overview of the TAS1020B EVM board operation.

Topic **Page**

2.1 Jumper Settings

There are five jumpers on the EVM.

- JP1 is used to set power input to the EVM. If JP1 is shunted pin 1 to pin 2, the EVM is powered through the USB bus. If JP1 is shunted pin 2 to pin 3, a 9-Vdc power supply is needed to power the EVM.
- JP2 is used to enable signals going to the AC'97 codec. During normal operation, JP2 is in. This allows the signals to go to the AC'97 codec. When using signals from connectors JB1 and JB2, it is recommended to remove JP2. Operation for the JB1 and JB2 connectors is discussed in Section 2.3.4.
- JP3 is used to put the TAS1020B either in internal mode or in external mode. In internal mode, the application code is downloaded from the EEPROM. In external mode, the TAS1020B MCU is disabled and logic in the TAS1020B allows the external MCU to read/write the registers to control the TAS1020B. If JP3 is shunted pin 1 to pin 2, the TAS1020B is in external mode. If JP3 is shunted pin 2 to pin 3, the TAS1020B is in internal mode.
- JP4 is used to generate external interrupt. When JP4 is in, an external interrupt is generated. In the external interrupt mode, the XINT pin is pulled low. External interrupt can also be used as a remote wake-up signal.
- JP5 is used to ground the MCLKI pin of the TAS1020B. MCLKI should be grounded if there is no MCLKI source.

Choose one of the following jumper configurations before applying power to the EVM:

Table 2–1. Jumper Configurations

Normal/internal, external power	JP1 pin 2–3	JP2 IN	JP3 pin 2–3	JP4 OUT	JP5 IN
Normal/internal, bus power	JP1 pin 1–2	JP2 IN	JP3 pin 2–3	JP4 OUT	JP5 IN
Emulator/external, external power	JP1 pin 2–3	JP2 IN	JP3 pin 1–2	JP4 OUT	JP5 IN
Emulator/external, bus power	JP1 pin 1–2	JP2 IN	JP3 pin 1–2	JP4 OUT	JP5 IN

2.2 Power the TAS1020B EVM

The TAS1020B EVM can be powered from USB bus power or from an external power supply.

2.2.1 External Power

Ensure JP1 is shunted pin 2 to pin 3. Set the power supply to 9 Vdc and set the current limit to 1 A. Make sure the power supply is off before connecting it to PJ1 of the EVM. Turn the power supply on and the LEDs labeled 9V and 5V light.

2.2.2 Bus Power

Ensure JP1 is shunted pin 1 to pin 2. Connect the USB cable from the PC to the EVM. Only the LED labeled 5V lights.

2.3 Miscellaneous Connections

2.3.1 Microphone

A microphone can be connected to the 3,5-mm stereo jack, J8 (bottom side), to record voice.

2.3.2 LINE IN Connector

This connector can take an analog stereo input. This analog input is digitized and is ready for recording or playback.

2.3.3 Headphones and Speakers

Connect headphones or speakers to the 3,5-mm stereo jack, J6 (top side), to listen to playback audio streams. Be sure to adjust to a safe volume before streaming the audio. Volume adjustment can be done by using the buttons on the TAS1020B EVM board, labeled S1–S3 (see Section 2.5.4, *Human Interface Device (HID) Switches*, for more details) or by double clicking the speaker icon located on the right corner of the Windows taskbar and adjusting the main playback volume slider.

Note:

Four-channel output is not supported in the included firmware. Audio cannot be streamed to the REAR channel, 3,5-mm stereo jack (J5). The REAR channel jack is there to aid customers in developing a 4-channel AC'97 application.

2.3.4 JB1 and JB2 Connectors

Connectors JB1 and JB2 route clocks, power, I^2C, I^2S, and GPIO signals from the TAS1020B. These signals can be used to interface the TAS1020B to other codec circuit boards for further evaluation or development of the functions of the TAS1020B. It is recommended to remove JP2 when using the JB1 and JB2 connectors to prevent the AC'97 codec from interfering with these signals. It is also recommended to add buffers between the AC'97 codec and the target signals to provide signal integrity.

2.4 Host Enumeration

A standard USB cable is required to connect the EVM platform to a downstream USB port. The EVM uses a standard type-B connector.

2.4.1 Internal Mode

The EVM as shipped is set in internal mode (EEPROM installed). The firmware enables the host to recognize the device and to run applications pertaining to the AC'97 codec. When connecting the host PC to the EVM via the USB bus, the PC enumerates and displays a speaker icon on the right corner of the taskbar. The device is ready to stream audio data.

2.4.2 External (Emulator) Mode

See Table 2–1 for the correct jumper settings in this mode. Bring up the application code as per the emulator manufacturer's instructions. See the documentation on the companion CD for further details on emulator manufacturers. When the application is running, the EVM can be connected to the host PC to stream audio data.

2.5 TAS1020B EVM Features (Detailed Description)

2.5.1 External Clock

An external clock can be used as a clock source for MCLKI. JP5-1 is used for this function.

2.5.2 RESET Momentary Switch

The RESET switch resets the TAS1020B to the default state. This action resets all registers, counters, and clocks. This action is different than the suspend/resume mode. See Section 2.5.5, *Suspend/Resume Mode*, for details on the suspend/resume operation.

2.5.3 Port 1 Light Emitting Diodes

A group of LEDs is included on the TAS1020B EVM for quick and easy GPIO evaluation. The LEDs are connected to port 1 bits 0 through 7 of both the in-circuit emulator socket and the TAS1020B. When the EVM is in the internal (EEPROM installed) mode, the LEDs reflect port 1 from the TAS1020B. When the EVM is in the external (emulator) mode, the LEDs reflect port 1 from the emulator.

2.5.4 Human Interface Device (HID) Switches

The S1–S3 switches are general-purpose momentary buttons that can be used to develop HID control functions using the TAS1020B EVM. These switches are active in either internal or external mode (JP3 setting). The firmware shipped with the EVM has HID control. The following are the functions of these switches:

- ❏ S1: Volume increase
- ❏ S2: Volume decrease
- ❏ S3: Volume mute

2.5.5 Suspend/Resume Mode

The TAS1020B IC supports suspend/resume for USB bus-powered applications. When the host goes into sleep mode, the TAS1020B IC suspends all clocks and functions. When the host wakes up, the TAS1020B IC resumes its normal functions. The TAS1020B IC can also wake up the host from an external interrupt signal (remote wake-up).

Note:

The TAS1020B EVM board is not designed to support suspend/resume. Therefore, the USB specification on suspend/resume does not apply to the TAS1020B EVM board. The TAS1020B IC supports suspend/resume, and thus functions as described above.

2.5.6 Device Firmware Upgrade (DFU)

Caution

When executing a DFU, the current code in the EEPROM is written over. If the code needs to be protected, use another EEPROM.

The TAS1020B IC complies with the universal serial bus device-class specification for device firmware upgrade, version 1.0.

For more information on the DFU class specification see:

http://www.usb.org

The DFU test utility included on the EVM CD can be used to download a firmware image either to the TAS1020B RAM or to the TAS1020BEVM2 EEPROM. To download the firmware image to the EEPROM, the EEPROM must either be blank or have an invalid header. In order to download to the TAS1020B RAM, remove the EVM EEPROM. See the TAS1020B data manual for the specific DFU implementation in the TAS1020B ROM.

Follow the procedures listed below to download a new firmware image using the DFU utility.

1) Copy the DFU software from the CD to a directory on your PC.
2) Connect the EVM to the host PC. If the EVM is being connected for the first time, the OS tries to locate the appropriate DFU drivers. When asked, point to the directory where you copied the DFU software.
3) Create a shortcut for the DFU.EXE file on the desktop.
4) Double click on the DFU.EXE icon on the desktop. The DFU utility window comes up.
5) Click on the REFRESH button. There should be no error message.
6) Click on the ... button located to the right of the DOWNLOAD box. A file select window appears.
7) Select the file containing the new TAS1020B application firmware image and header.
8) Click on the check box next to DOWNLOAD WHOLE FILE.

9) Click on the DOWNLOAD button. The utility downloads the file to the TAS1020B.

10) Click on the GET STATUS button.

11) Click the RESET button. The EVM should re-enumerate using the newly downloaded firmware.