PCM9211EVM

PCM9211 Evaluation Module with CodecControl Software

User's Guide

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Read This First

About This Manual

This user's guide describes the operation of the Texas Instruments CodecControl software for the PCM9211EVM. CodecControl provides a graphical user interface (GUI) for supported TI audio codecs. The software is compatible with Microsoft® Windows® XP, Vista, and Windows 7.

For a more detailed description of the PCM9211 product line, refer to the product data sheet available from the Texas Instruments web site at http://www.ti.com/. Support documents are listed in the section of this guide entitled *Related Documentation from Texas Instruments*.

How to Use This Manual

Throughout this document, the abbreviation *EVM* and the term *evaluation module* are synonymous with the PCM9211EVM.

Chapter 1 discusses the block diagram and primary features of the PCM9211EVM. This chapter also provides general information regarding the default switch and jumper configurations.

Chapter 2 explains how to use the CodecControl software provided with the PCM9211EVM.

Chapter 3 includes the EVM electrical schematics and the bill of materials.

Information About Cautions and Warnings

This document contains caution statements.

CAUTION

This is an example of a caution statement. A caution statement describes a situation that could potentially damage your software or equipment.

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Related Documentation from Texas Instruments

The following document provides information regarding Texas Instruments integrated circuits used in the assembly of the PCM9211EVM. These documents are available from the TI web site. The last character of the literature number corresponds to the document revision that is current at the time of the writing of this document. Newer revisions may be available from the TI web site at http://www.ti.com/ or call the Texas Instruments Literature Response Center at (800) 477–8924 or the Product Information Center at (972) 644–5580. When ordering, identify the document(s) by both title and literature number.

Data Sheet	Literature Number
PCM9211	SBAS495
TAS1020B	SLES025A

If You Need Assistance

If you have questions regarding either the use of this evaluation module or the information contained in the accompanying documentation, please contact the Texas Instruments Product Information Center at (972) 644–5580 or visit the TI web site at www.ti.com.

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 is required to take whatever measures may be required to correct this interference.

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Description

The PCM9211EVM is an evaluation board for the PCM9211, a 216-kHz digital audio interface transceiver (DIX) with stereo analog-to-digital conversion and routing. This EVM provides all necessary connectors and circuitry for interfacing to audio test systems and commercial audio equipment.

1.1 Overview

The PCM9211 evaluation module is an easy-to-use, small form-factor system that allows access to all features of the PCM9211 via a USB interface and a PC running the CodecControl software. The EVM offers these features:

- PCM9211 device
- Optical S/PDIF input and output
- Coaxial S/PDIF input
- Analog stereo input (3.5-mm audio jack)
- Headers for GPIO and digital audio signal access
- Digital audio MUX (controlled via I^2C™)
- USB interface
- User interface:
  - LEDs
  - Buttons
- Control interface test points
- Digital audio interface test points

1.2 Electrostatic Discharge Warning

Many of the components on the PCM9211EVM 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.

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1.3 Getting Started

To get started with the PCM9211EVM, perform the following steps:

Step 1. Install the CodecControl software (see Chapter 2)

Step 2. Launch the CodecControl software.

Step 3. Plug a digital audio source into the coaxial S/PDIF input (J5).

Step 4. Plug a analog audio source (line level) into the analog input (J2).

Step 5. Connect the EVM to the PC via a mini USB-B to USB-A cable. The CodecControl software automatically detects the EVM and runs an initialization script, which then configures the PCM9211EVM for audio recording through the coaxial S/PDIF input.

You can now record music with any Windows application that can record audio from a sound card.

1.4 PCM9211 Configuration and Script Examples

Signal routing configuration and input/output options as well as analog-to-digital converter (ADC) configuration are accessible via the graphical user interface (GUI) and the accompanying device block diagram within the software; see Figure 2-1. Refer to the PCM9211 data sheet for further details on configuration of the PCM9211.

The PCM9211 is controlled via its register map. The active objects within the block diagram automatically update the relevant registers; changes made to a register (for example, using a command script) automatically update the block diagram state.

When the EVM is connected, the control software executes the initialization script and configures the PCM9211 for a common use case.

You can develop custom scripts using a text editor and execute the scripts in the command dialog, as well as enter scripts directly in the command dialog for execution.

The control software comes with several script examples, including:

- *ADC record via MainOutput to TAS1020b.txt*
- *PC record via TAS1020 through MPIOC in DIT output.txt*
- *S/PDIF record via TAS1020 through RXINx in MainOutput.txt*

You can use these examples as starting points to develop your own custom scripts for the PCM9211.

1.5 EVM Applications

An EVM *application* is a set of scripts that configure the PCM9211EVM for one or more specific use cases. For example, an application might consist of one script for S/PDIF recording and another set of scripts (or *patches*) to change the EVM S/PDIF MUX for RXINx.

Another simple technique is to use the PCM9211 initialization script from the CodecControl software as the first application. With this application, the EVM acts as a coax S/PDIF to USB interface without requiring the CodecControl software.

The PCM9211EVM supports multiple EVM applications that can be stored in the onboard EEPROM.

SW2 cycles through applications. LED D1 indicates the active application blinking *N* times when SW1 selects application #N.

SW3 cycles through patches. LED D2 indicates the patch (or patches) applied by blinking *N* times when SW2 selects patch #N

The first application (if present) is the boot application. The boot application contains a script that is intended to initialize the PCM9211. Press SW1 to skip the boot application.

The first script of each application contains the application itself. Subsequent scripts of each application (other than the boot application) are loaded as patches to the application each time SW2 selects a patch.

It is possible to program complex use cases to the EVM and execute them without having to run the CodecControl software.

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1.6 Jumpers, Connectors, Test Points, Switches

Table 1-1 summarizes the connectors, test points, jumpers, and switches on the PCM9211EVM.

Table 1-1. PCM9211EVM Jumpers, Connectors, Test Points, Switches

Connector/Switch/Jumper/Test Point	Description
Headers	
W1	VCCAD wire loop. Cut and insert ampere meter to measure VCCAD current.
W2	Right channel analog RC filter bypass. Insert shunt to bypass the filter.
W3	Right channel analog RC filter bypass. Insert shunt to bypass the filter.
W4	VCC wire loop. Cut and insert ampere meter to measure VCC current.
W5	VDDRX wire loop. Cut and insert ampere meter to measure VDDRX current.
W6	Control interface MODE select. Insert shunt to select I^2C™ interface. Remove shunt to select SPI interface.
W7	DVDD wire loop. Cut and insert ampere meter to measure DVDD current.
W8	Optical S/PDIF output select. 1-2: Select MPO0, 2-3: Select MPO1.
W9	Digital audio interface option. Insert shunt to connect the PCM9211digital audio interface output to the TAS1020b digital audio interface (required to record audio).
W10	Coaxial S/PDIF input select:1-2: Select RXIN0, 2-3: Select RXIN1
W11	11-pin header to access RXIN2:7 and digital audio interface (AxxxIO).
W12(1)	SPI SS / ADR1: 1-2: ADR1 = 0 (I2C), 2-3: SPI mode select
W13(1)	Control IF clock: 1-2: I2C mode select, 2-3: SPI mode select
W14(1)	Control IF data: 1-2: I2C mode select, 2-3: SPI mode select
W15(1)	Control IF data: 1-2: ADR0 = 0 (I2C), 2-3: SPI mode select
Test Points	
TP1	I^2C SCL
TP2	I^2C SDA
TP3	TAS1020b MCLK
TP4	TAS1020b I^2S DIN to codec
TP5	I^2S BCLK
TP6	TAS1020b I^2S DOUT from codec
TP7	TAS1020b I^2S WCLK
TP8	SPI MISO
TP9	SPI MOSI
TP10	SPI $\overline{SS}$
TP11	SPI SCLK
TP12	Codec reset
TP13	XTI
TP14	Control interface MODE
TP15	+5-V USB
TP16	+3.3 V
TP17	GND
TP18	GND

(1) All W12-W15 settings must be the same for proper operation.

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Table 1-1. PCM9211EVM Jumpers, Connectors, Test Points, Switches (continued)

Connector/Switch/Jumper/Test Point	Description
Jumpers	
J1	Mini USB-B connector
J2	Analog audio input
J3	Optical S/PDIF output
J4	Optical S/PDIF input
J5	Coaxial S/PDIF input
Switches	
SW1	Reset codec
SW2	Select EVM application
SW3	Select patch script
LEDs	
D1	EVM application indicator
D2	EVM patch indicator
D4	PCM9211 ERROR indicator
D5	PCM9211 PCM indicator
Connectors	
P3	Odd: GND
P3.2	ERROR/INT0
P3.4	$\overline{\text{PCM}}$/$\overline{\text{INT1}}$
P4	Even: MPIO_A Odd: GND
P5	Even: MPIO_C Odd: GND
P6	Even: MPIO_B Odd: GND
P7	Even: GND
P7.1	SCKO
P7.3	BCK
P7.5	LRCK
P7.7	DOUT

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CodecControl Software

The CodecControl software is intended to facilitate user evaluation of TI audio codecs. It includes a script interpreter, an interactive device block diagram-based GUI, a register inspector, and supplemental features depending on the specific codec capabilities.

This chapter explains how to use the CodecControl software together with a TI audio codec EVM.

2.1 Control Software

The CodecControl software exposes most of the features of a supported TI audio codec EVM through an intuitive graphical user interface.

NOTE: Before a PC running Windows can use the TI audio converter EVM as a sound card, the EVM must be properly configured (sampling rate, audio routing, internal amplifier settings, etc.) with the CodecControl software. This configuration occurs automatically once an EVM is detected by the CodecControl software.

2.2 Installation

Download the CodecControl software from the PCM9211EVM audio codec product folder and launch the program. The file is a self-extracting archive that is downloaded in a compressed format.

The default target folder is:

C:\Program Files\Texas Instruments\CodecControl

Click the **Unzip** button to complete the installation. The CodecControl software is now available in the target folder. The name of the executable is *CodecControl.exe*.

To launch the CodecControl software, navigate to the target folder and double-click the CodecControl.exe file.

2.3 Concepts

The CodecControl software presents a block diagram view of a supported TI audio codec EVM, such as that shown in Figure 2-1.

The block diagram consists of active objects that respond to user input (for example, switches or amplifiers with variable gain that show a volume control when a user clicks on the component with a mouse).

NOTE: **Active Objects:** Each active object changes color to red if the cursor is placed over the object. Clicking the object triggers its function.

Some active objects are linked to control register(s) of the particular TI audio codec. The CodecControl software updates the appropriate register(s) whenever an active object is triggered. If a register that is linked to an active object is changed through other components (for example, the script interpreter or the register inspector), the active object changes its state accordingly.

The CodecControl software automatically detects a supported TI audio codec EVM once it is connected to an available USB port of the PC.

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If no TI audio codec EVM is connected to the PC, the control software also supports an EVM simulation mode, where it is possible to retrieve script commands based on user input within the block diagram.

Simulation mode is only available if no TI audio codec EVM is attached to the PC. Choose *File->New EVM simulation…* and select an EVM from the list of supported TI audio codec EVMs.

2.4 EVM Window

Figure 2-1 illustrates the PCM9211EVM window as an example of the CodecControl software in operation.

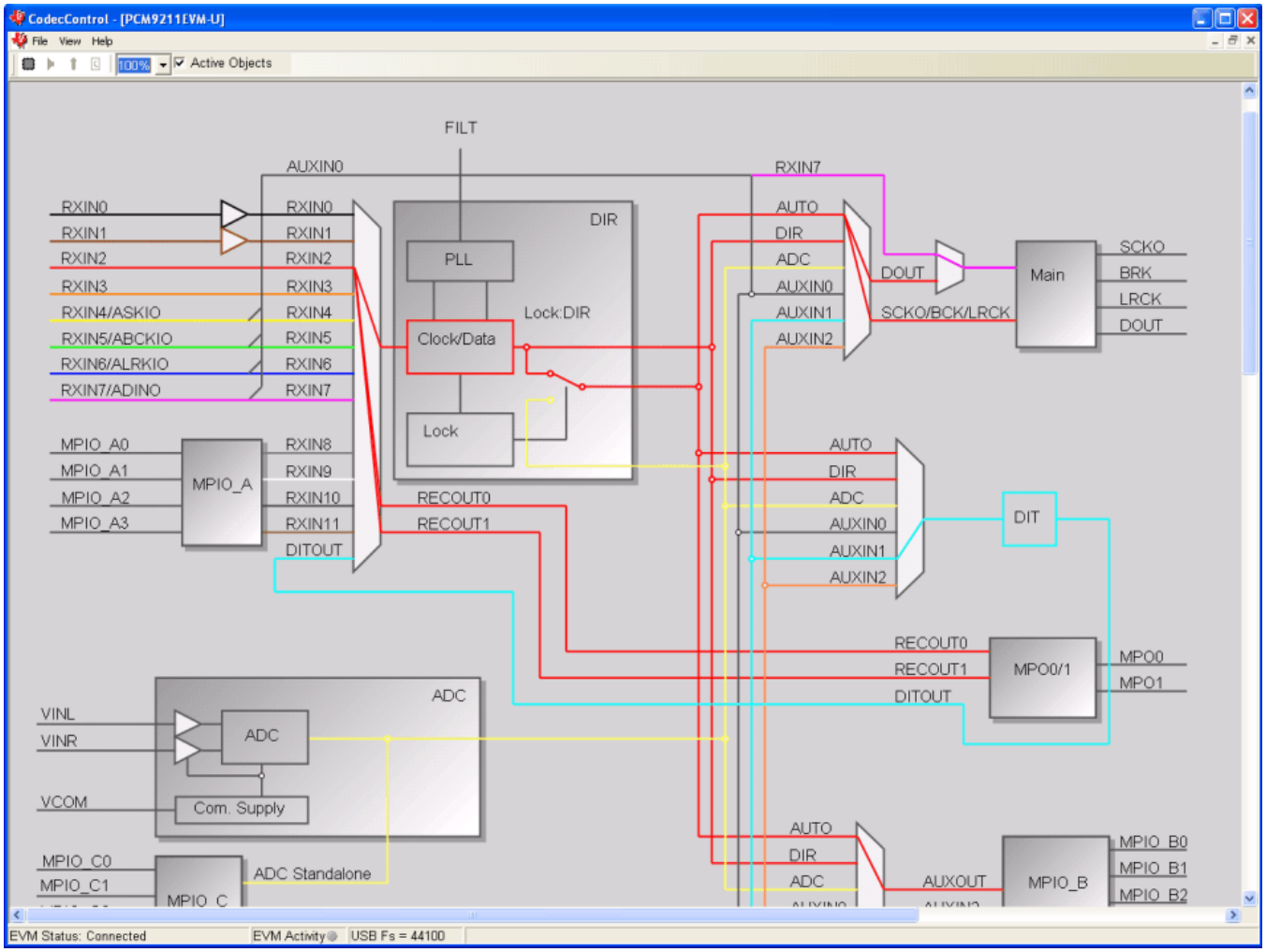


Figure 2-1. EVM Window

At the top of the EVM window is a toolbar with a zoom box and a box that enables all active objects in the block diagram.

The toolbar contains a control that determines the zoom factor. Change the zoom by selecting the desired zoom factor.

To move the block diagram, click on a blank area within the block diagram and drag the diagram with the mouse.

At the bottom of the EVM window, a status bar that provides information about the state of the communication between the control software and the TI audio codec EVM. It also shows hints about elements in the block diagram; for example, the I^2C page and register/bit location of a selected switch.

Audio signal paths (both digital and analog) change colors once they are routed via switches. This feature visualizes all audio paths and immediately highlights a path if it is enabled.

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2.4.1 Using Active Objects

Moving the mouse pointer over an active object highlights the active object; as noted, the object turns red.

For example, the MPIO_A active object changes from its inactive state to its active state when the mouse pointer enters the amplifier symbol, as Figure 2-2 shows.

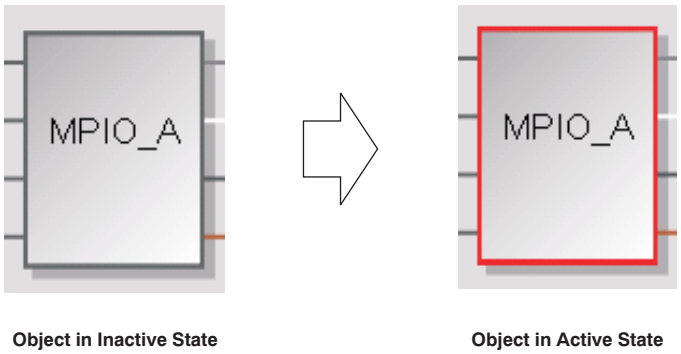


Figure 2-2. MPIO_A Active Object Changes from Inactive to Active State

Clicking the activated object triggers its function, as shown in Figure 2-3. In the case of the MPIO_A active object, the function is a dialog box with options to configure the MPIO_A of the PCM9211.The CodecControl software updates the appropriate register in the TI audio codec.

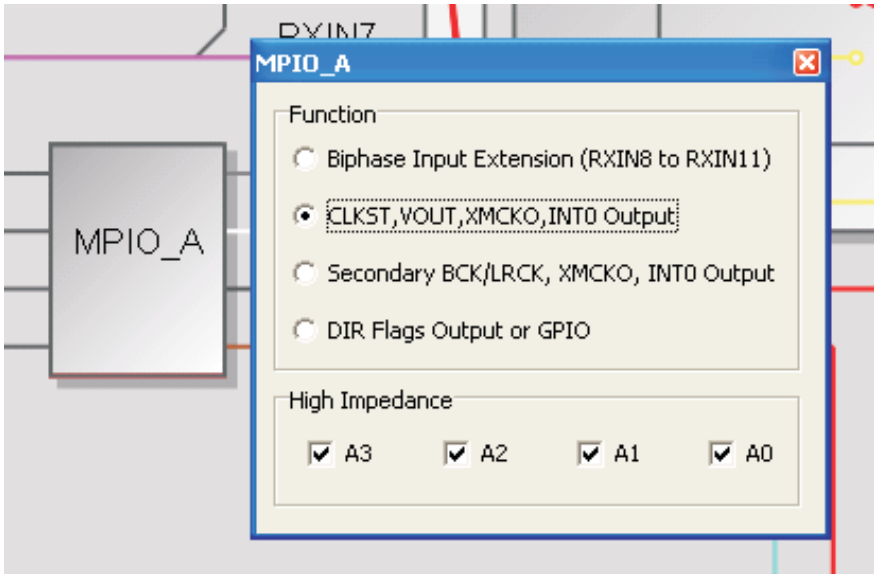


Figure 2-3. MPIO_A Active Object Function Pop-Up Window

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2.5 Dialogs and Active Objects

The CodecControl software contains several dialog windows that provide access to additional features. Most dialogs are linked to active objects and are opened by clicking on the active object.

Several dialogs are not linked to active objects and are opened instead using the View menu.

2.5.1 Command Dialog

Open the command dialog (*View->Command…*) to write, edit, load, save, and run command scripts. Command scripts are text files that contain commands to communicate with the TI audio codec. The syntax is described in Section 2.5.4. The command dialog is shown in Figure 2-4.

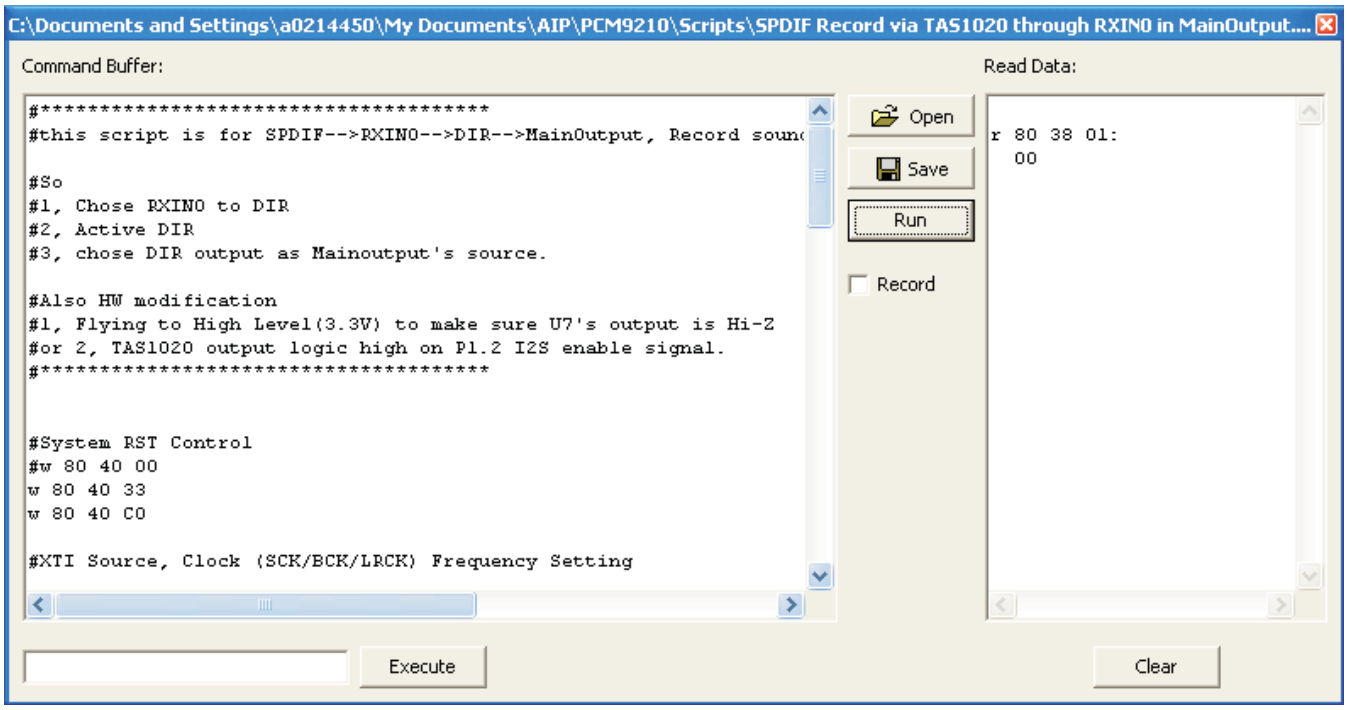


Figure 2-4. Command Dialog

- The primary area of the command dialog is the command buffer (editable text) which contains the command script. To run the command script, click the **Run** button
- The smaller, read-only text area on the right side of the command dialog displays control data read from the TI audio codec. The **Clear** button clears the Read Data field.
- The one-line text edit field on the left bottom allows single command execution.
- The *Record* check box enables recording of commands generated by the control software.

2.5.2 Init Script Dialog

The CodecControl software executes an initialization script when a supported TI audio codec is detected.

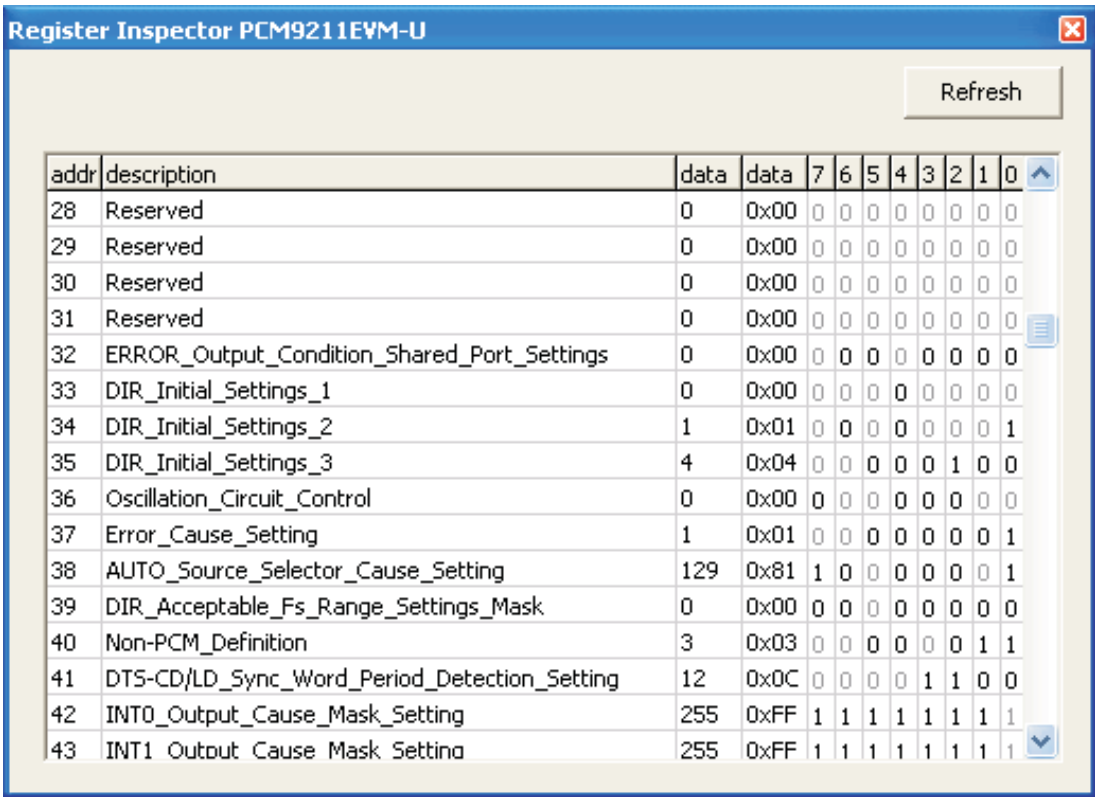
To show or edit the initialization script, choose *View->Init Script…* from the main window menu bar.

Click the **Run** button to run the script again.

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2.5.3 Register Inspector

The register inspector dialog (*View->Register Inspector…*) gives access to all registers of the TI audio codec. Figure 2-5 illustrates the register inspector dialog.



addr	description	data	data	7	6	5	4	3	2	1	0
28	Reserved	0	0x00	0	0	0	0	0	0	0	0
29	Reserved	0	0x00	0	0	0	0	0	0	0	0
30	Reserved	0	0x00	0	0	0	0	0	0	0	0
31	Reserved	0	0x00	0	0	0	0	0	0	0	0
32	ERROR_Output_Condition_Shared_Port_Settings	0	0x00	0	0	0	0	0	0	0	0
33	DIR_Initial_Settings_1	0	0x00	0	0	0	0	0	0	0	0
34	DIR_Initial_Settings_2	1	0x01	0	0	0	0	0	0	0	1
35	DIR_Initial_Settings_3	4	0x04	0	0	0	0	0	1	0	0
36	Oscillation_Circuit_Control	0	0x00	0	0	0	0	0	0	0	0
37	Error_Cause_Setting	1	0x01	0	0	0	0	0	0	0	1
38	AUTO_Source_Selector_Cause_Setting	129	0x81	1	0	0	0	0	0	0	1
39	DIR_Acceptable_Fs_Range_Settings_Mask	0	0x00	0	0	0	0	0	0	0	0
40	Non-PCM_Definition	3	0x03	0	0	0	0	0	0	1	1
41	DTS-CD/LD_Sync_Word_Period_Detection_Setting	12	0x0C	0	0	0	0	1	1	0	0
42	INT0_Output_Cause_Mask_Setting	255	0xFF	1	1	1	1	1	1	1	1
43	INT1_Output_Cause_Mask_Setting	255	0xFF	1	1	1	1	1	1	1	1

Figure 2-5. Register Inspector

The register inspector displays the content of the connected TI audio codec device registers. To trigger reading the content of one page, click the **Refresh** button.

- The *addr* column shows the address of the registers in decimal notation.
- The *description* column contains a description for each register. If the register has no function assigned, it is declared *Reserved*.
- The data columns show the data of each register (one byte). The first data column uses decimal notation, and the second uses hexadecimal notation. It is possible to change the register value by clicking into one of the data fields and typing the new value (either decimal or hexadecimal).
- The numbered columns show the register content in binary notation. Read/write bits are shown solid black or red; read-only bits are gray or dark red. Red numbers represent bits that recently changed. To change a single writable bit, click on the bit and it will flip.

The coefficients may be used for a specific customer filter implementation. The format is compatible with the TI audio codec that was detected by the CodecControl software.

2.5.4 Script Syntax

A script is a text file that contains data to send to a device.

Each line in a script file is one command. No provision is made for extending lines beyond one line, except for the > command. A line is terminated by a carriage return.

The first character of a line is the command. Commands are:

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- **r** Read from the serial control bus
- **w** Write to the serial control bus
- **>** Extend repeated write commands
- # Comment
- **I** Set interface bus to use
- **b** Break
- **d** Delay
- **f** Wait for Flag

Command: **r** <address> <register> <length>

<address> is the device address in hexadecimal format. For example, *30* for device address 0x30.

<register> is the register in hexadecimal format that will be read from.

<length> is the number of bytes that will be read from <register> in auto-increment mode.

The result will be displayed in the right-side output window of the command interpreter dialog.

Command: **w** <address> <register> <data ...>

<address> is the device address in hexadecimal format. For example, *30* for device address 0x30.

<register> is the register in hexadecimal format that will be written to.

<data…> is a sequence of bytes that will be written to the <register> in auto-increment mode. Each byte is in hexadecimal format.

Command: **>** <data ...>

This command continues a write sequence in a new line.

<data…> is a sequence of bytes that will be written in auto-increment mode. Each byte is in hexadecimal format.

Command: **#** [optional comment]

This command indicates a comment.

Command: **I**<interface>

<interface> is i2c for I^2C or spi for SPI

Command: **b**[optional comment]

[optional comment] is a string of characters. The command interpreter will show a modal dialog with the optional comment. Script execution will resume once the dialog is closed.

Command: **d**<time>

This command suspends script execution by at least <time> milliseconds.

Command: **f** <address> <register> <mask> [optional timeout]

This commands suspends script execution until the value read from <address> <register> matches <mask>

<address> is the device address in hexadecimal format. For example, *30* for device address 0x30.

<register> is the register in hexadecimal format that will be read from.

<mask> is a 8-bit binary format mask that is compared with the data from the device. Each bit can be 0, 1, or X.

For example: <mask> = 010XX01X tests, if the data from the device has D7 = 0, D6 = 1, D5 = 0, D4 = don’t care, D3 = don’t care, D2 = 0, D1 = 1, D0 = don’t care.

[optional timeout] specifies how long (milliseconds) the command interpreter will poll the device if the data do not match the <mask>

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2.6 EVM Applications

The PCM9211EVM contains an EEPROM that can store EVM applications; for example:

- Initialization scripts
- Parameter patch scripts

The CodecControl software also contains a browser to access the applications stored in the EEPROM. To access the browser, select *File->EVM Applications…*. Figure 2-6 illustrates the EVM Applications window.

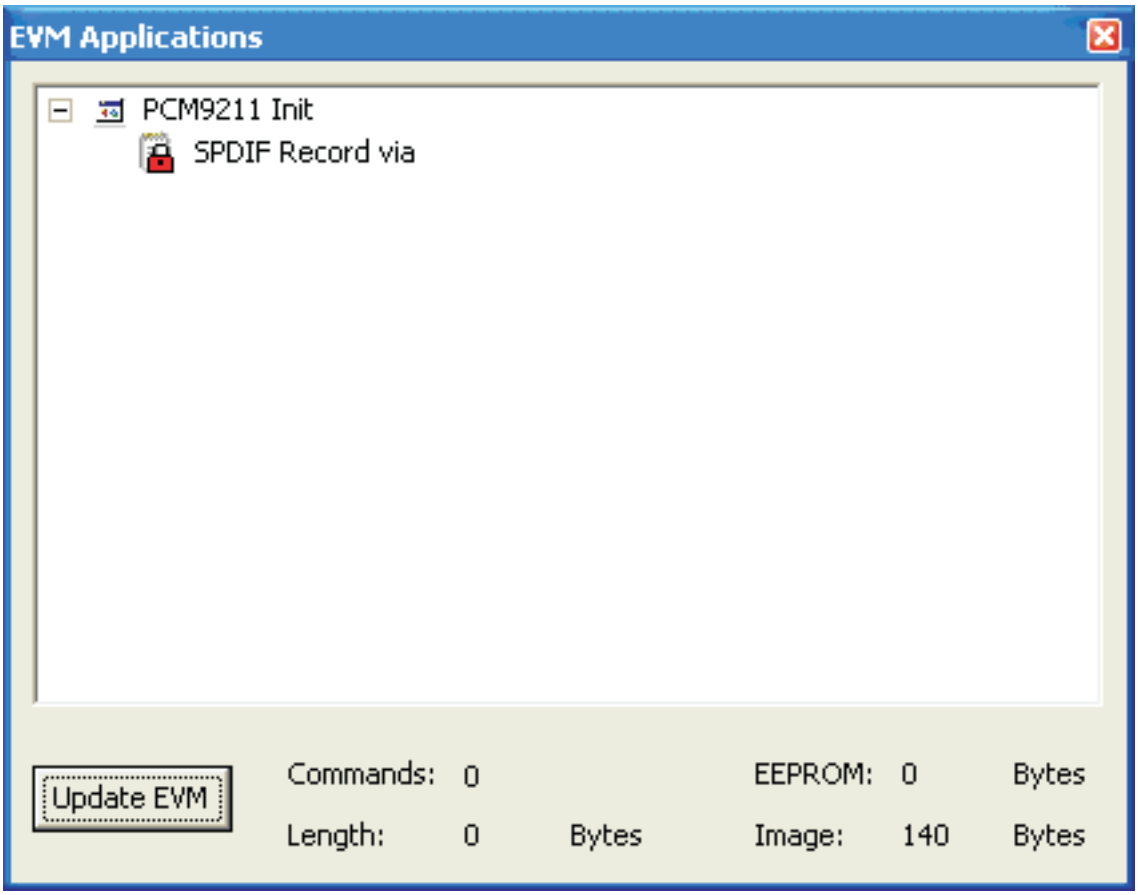


Figure 2-6. EVM Applications

Applications stored in the EEPROM are shown in a tree view.

To add an application, choose *Add Application* from the context menu (right-mouse click within the tree view).

To change the name of an application, select the application, single-click on the application, then type the new name.

Each application owns one or several scripts. The scripts consist of a sequence of commands that program the TI audio codec (or EVM components).

To add a script to an application, choose *Add Script* from the context menu. Double-click on the script to open a command window. The command window has an **Open** button to choose a script via a file dialog. Alternatively, it is also possible to write the script within the command window.

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Some TI audio codecs have on or more pushbuttons that select an application or a script within an application. Click the **Update EVM** button to program the EEPROM.

Scripts are stored in a compiled binary format on the EEPROM and cannot be read back. A red lock next to the application name highlights scripts that reside in the EEPROM but cannot be viewed in the command window.

To change the sequence of scripts or applications, drag a script or application to the new, desired position.

2.7 Firmware update

TI may publish new firmware for TI audio codec EVMs. To program the new firmware to a TI audio codec EVM, choose *File->Update Firmware…* and select the new firmware file.

The update process takes a few seconds (there is no progress bar) and is completed once the update firmware dialog disappears. The EVM must be disconnected and reconnected to finish the firmware update process.

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Schematic and Bill of Materials

This chapter provides the electrical and physical layout information for the PCM9211EVM. The bill of materials (BOM) is included for component and manufacturer reference.

3.1 Schematic

The PCM9211EVM schematic is appended to this document.

3.2 Component List

Table 3-1 lists the bill of materials for the PCM9211EVM.

Table 3-1. Bill of Materials

Item	RefDes	Count	Manufacturer Part No	Description	Vendor Part No	Vendor	Manufacturer
1	U4	1	PCM9211PT	192kHz DIG audio interface receiver w/stereo ADC LQFP48-PT ROHS	PCM9211PT	Texas Instruments	Texas Instruments
2	U1	1	TAS1020BPFB	USB Streaming controller TQFP48-PFB ROHS	296-13041-5	Digi-Key	Texas Instruments
3	U3	1	SN74LVC1G126DBVR	Single bus buffer gate with 3-state output SOT23-DBV5 ROHS	296-11605-1	Digi-Key	Texas Instruments
4	U16	1	TPS73633DBVT	Volt reg 3.3V 400mA LDO Capacitor, free NMOS SOT23-DBV5 ROHS	296-15819-1	Digi-Key	Texas Instruments
5	U9	1	PCF8574APWR	Remote 8-Bit I/O Expander for I^2C bus TSSOP20-PW ROHS	296-13107-1	Digi-Key	Texas Instruments
6	U7	1	SN74LVC2G125DCTR	Dual bus buffer gate 3-STATE OUTPUTS SSOP8-DCT ROHS	296-12164-1	Digi-Key	Texas Instruments
7	U5,U6	2	SN74LVC1G04DBVR	Single inverter gate SOT23-DBV5 ROHS	296-11599-1	Digi-Key	Texas Instruments
8	U8	1	SN74LVC244APWR	Octal buffer/Driver 3-state outputs TSSOP20-PW ROHS	296-1230-1	Digi-Key	Texas Instruments
9	U10, U11, U12, U13, U14, U15	6	SN74LVC1G08DCKR	Single 2-Input Positive-and Gate SC70-DCK5 ROHS	296-11602-1	Digi-Key	Texas Instruments
10	U2	1	24FC512-I/SM	512k I^2C serial EEPROM SOIC8-SM ROHS	24FC512-I/SM	Digi-Key	Microchip
11	J3	1	TOTX147PL	TOSLINK™ Transmitter 3.3V 15MB shutter ROHS	05M1615	NEWARK	Toshiba
12	J4	1	TORX147PL(F,T)	TOSLINK Receiver 3.3V 15MB shutter ROHS	TORX147PLFT	Digi-Key	Toshiba
13	D1, D2, D4, D5	4	SML-LXT0805YW-TR	LED, YELLOW 2.0V SMD0805 ROHS	67-1554-1	Digi-Key	Lumex Opto
14	Y1	1	SIT8002AI-13-33E-6.00000T	Oscillator SMT 6MHz 3.3V Out-enable ROHS	788-8002AI133E-6.0T	MOUSER	Sitime
15	Y2	1	ABM10-24.576MHZ-E20-T	Crystal SMT-ABM10 24.576MHz 4-pin 10PFD fundamental ROHS	535-9094-1	Digi-Key	Abracon
16	C4, C5	2	ECJ-1VC1H470J	Capacitor, SMD0603 cerm 47PFD 50V 5% NPO ROHS	PCC470ACVCT	Digi-Key	Panasonic
17	C7	1	C1608X7R1C105K	Capacitor, SMD0603 cerm 1.0UFD 16V 5% X7R ROHS	445-1604-1	Digi-Key	TDK

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Table 3-1. Bill of Materials (continued)

Item	RefDes	Count	Manufacturer Part No	Description	Vendor Part No	Vendor	Manufacturer
18	C3, C6, C8, C9, C10, C11, C23, C27, C28, C29, C30, C31, C32	13	C1005X5R0J104K	Capacitor, SMD0402 cerm 0.1UFD 6.3V 10% X5R ROHS	445-1266-1	Digi-Key	TDK Corp
19	C12, C13, C14, C19, C20, C21, C22, C24, C25, C26, C33, C34, C38, C43, C45, C47	16	C1608X7R1H104K	Capacitor, SMD0603 cerm 0.1UFD 50V 10% X7R ROHS	445-1314-1	Digi-Key	TDK
20	C48	1	GRM21BR61C106KE15L	Capacitor, SMD0805 cerm 10UFD 16V 10% X5R ROHS	490-3886-1	Digi-Key	Murata
21	C35, C39, C42, C44	4	ECJ-1VB0J106M	Capacitor, SMD0603 cerm 10UFD 6.3V 20% X5R ROHS	PCC2395CT	Digi-Key	Panasonic
22	C36, C37	2	GRM1885C2A100RA01D	Capacitor, SMD0603 cerm 10PFD 100V 10% C0G ROHS	490-3279-1	Digi-Key	Murata
23	C41	1	GRM2165C1H472GA01D	Capacitor, SMD0805 cerm 4700PFD 50V 2% C0G ROHS	81-GRM2165C1H472GA01	MOUSER	Murata
24	C40	1	GRM31C5C1E683JA01L	Capacitor, SMD1206 cerm 0.068UFD 25V C0G 5% ROHS	490-1766-1	Digi-Key	Murata
25	C1	1	C1608C0G1H102J	Capacitor, SMD0603 cerm 1000PFD 50V 5% C0OG ROHS	445-1293-1	Digi-Key	TDK Corp.
26	C2	1	GRM2165C1H101JA01D	Capacitor, SMD0805 cerm 100PFD 50V 5% C0G ROHS	490-1615-1	Digi-Key	Murata
27	C15, C16	2	AVE106M16A12T-F	Capacitor, alum-elect SMD-AVE TYPE A 10UFD 16V 20% ROHS	338-1793-1	Digi-Key	Cornell Dubilier
28	C46	1	EEE-1AA101WR	Capacitor, alum-elect SMD-VSC 100UFD 10V 20% ROHS	PCE3867DKR	Digi-Key	Panasonic
29	R2	1	ERJ-3EKF1501V	Resistor SMD0603 1.50lΩ 1% thick film 1/10W ROHS	P1.50KHCT	Digi-Key	Panasonic
30	R5	1	ERJ-3EKF1003V	Resistor SMD0603 100lΩ 1% thick film 1/10W ROHS	P100KHCT	Digi-Key	Panasonic
31	R10, R11, R12, R13, R14, R15, R18, R19, R23, R24, R25	11	ERJ-3GEYJ103V	Resistor SMD0603 10kΩ 5% 1/10W ROHS	P10KGCT	Digi-Key	Panasonic
32	R6, R7	2	RC0603FR-07649RL	Resistor SMD0603 thick film 649Ω 1% 1/10W ROHS	311-649HRCT	Digi-Key	Yageo
33	R3, R4	2	ERJ-3EKF27R4V	Resistor SMD0603 27.4Ω 1% 1/10W ROHS	P27.4HCT	Digi-Key	Panasonic

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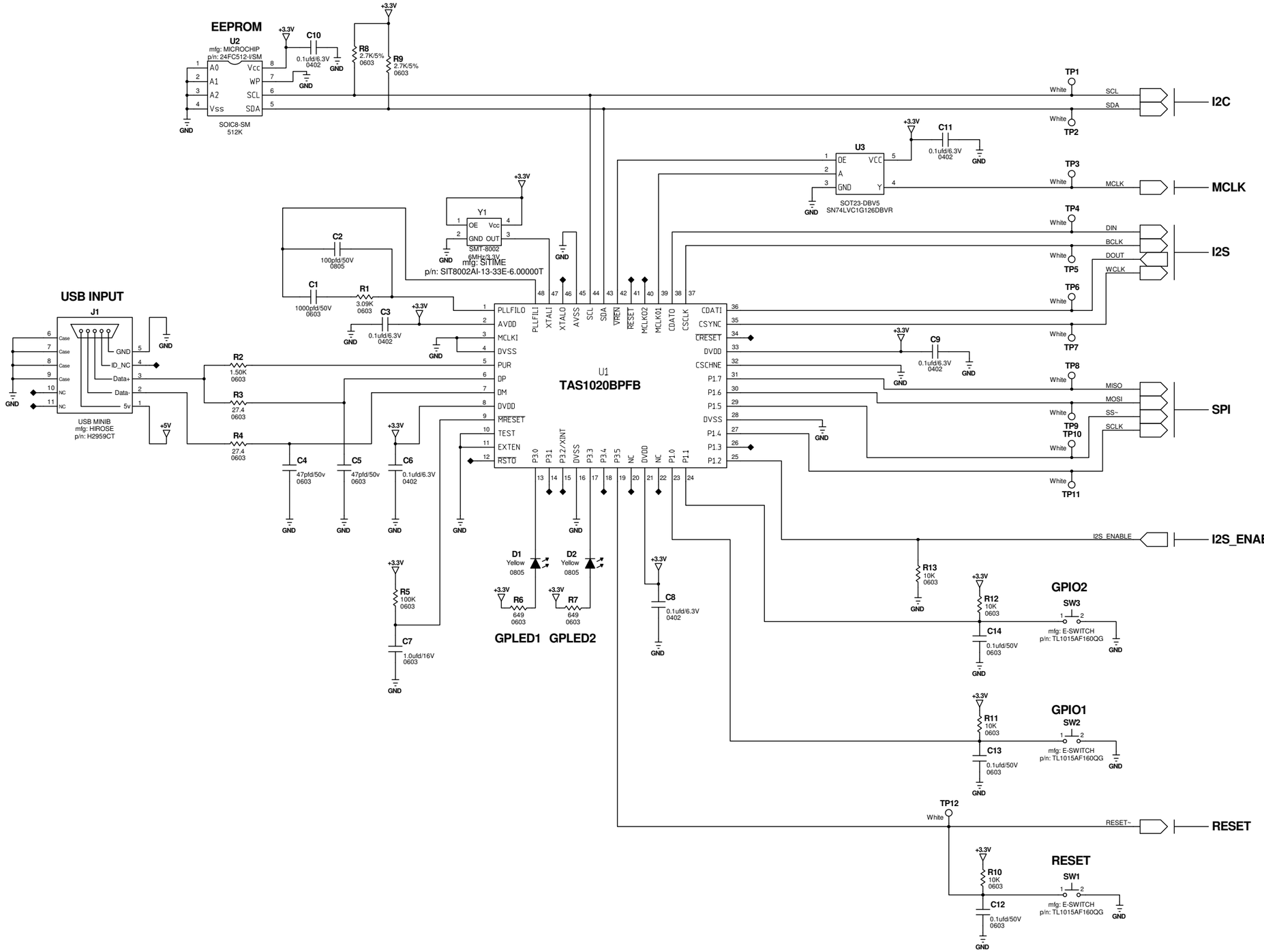
Table 3-1. Bill of Materials (continued)

Item	RefDes	Count	Manufacturer Part No	Description	Vendor Part No	Vendor	Manufacturer
34	R8, R9	2	ERJ-3GEYJ272V	Resistor SMD0603 2.7kΩ 5% 1/10W ROHS	P2.7KGCT	Digi-Key	Panasonic
35	R22	1	ERJ-3GSYJ750	Resistor, SMT, 0603, 5%, 1/10W, 75	P75GCT	Digi-Key	Panasonic
36	RN1, RN2, RN3	3	742C083103JPTR	Resistor ARRAY 4x SMD0603x4 10kΩ 5% ROHS	742C083103JPCT	Digi-Key	CTS
37	R21	1	ERJ-3GEY0R00V	Resistor SMD0603 0.0Ω 5% thick film 1/10W ROHS	P0.0GCT	Digi-Key	Panasonic
38	R16, R17	2	CRCW0603332RFKEA	Resistor SMD0603 332Ω 1% 1/10W ROHS	541-332HCT	Digi-Key	Vishay
39	R20	1	ERJ-3GEYJ681V	Resistor SMD0603 680Ω 5% 1/10W ROHS	P680GCT	Digi-Key	Panasonic
40	R1	1	ERJ-3EKF3091V	Resistor SMD0603 3.09kΩ 1% thick film 1/10W ROHS	P3.09KHCT	Digi-Key	Panasonic
41	P4, P5, P6, P7	4	PBC04DAAN	Header thru male 2x4 pin 100LS gold ROHS	S2011E-04	Digi-Key	Sullins
42	P3	1	PBC02DAAN	Header thru male 2x2 pin 100LS gold ROHS	S2011E-02	Digi-Key	Sullins
43	W1, W2, W3, W4, W5, W6, W7, W9	8	26630201RP2	Header 2-pin, PCB 2.0mm ROHS	2663S-02	Digi-Key	Norcomp
44	W8, W10, W12, W13, W14, W15	6	26630301RP2	Header 3-pin, PCB 2.0mm ROHS	2663S-03	Digi-Key	Norcomp
45	W11	1	26630601RP2	Header 6-pin, PCB 2.0mm ROHS	2663S-06	Digi-Key	Norcomp
46	P1, P2	2	100P-JMDSS-G-1-TF(LF)(SN)	Plug SMD 2x50 Female JMD Series 0.5mm LS gold ROHS	455-1880-1	Digi-Key	JST
47	J1	1	UX60-MB-5ST	Jack USB minib SMT-RA 5-pin ROHS	H2959CT	Digi-Key	Hirose
48	J2	1	SJ-43516-SMT	Jack Audio mini (3.5mm ,4-Cond PCB-RA ROHS	CP-43516SJCT	Digi-Key	CUI Stack
49	J5	1	RCJ-041	RCA Jack thru RA-Female black ROHS	CP-1418	DIGI KEY	CUI Stack
50	TP1,TP2, TP3,TP4, TP5,TP6, TP7,TP8, TP9,TP10,TP11,TP12,TP13,TP14	14	5002	PC TESTPOINT, WHITE, ROHS	5002K	Digi-Key	Keystone Electronics
51	TP17,TP18	2	5001	PC Testpoint, black, ROHS	5001K	Digi-Key	Keystone Electronics
52	TP15,TP16	2	5000	PC Testpoint, red, ROHS	5000K	Digi-Key	Keystone Electronics
53	SW1,SW2,SW3	3	TL1015AF160QG	Switch, MOM, 160G SMT 4x3mm ROHS	EG4344CT	Digi-Key	E-Switch
54	TP1, TP2, TP3, TP4, TP5, TP6, TP7, TP8, TP9, TP10, TP11, TP12, TP13, TP14	14	810-002-SP2L001	Shunt, black AU flash 2mmLS	SP2-001E	Digi-Key	Norcomp INC.
55	C17, C18	2	C0603_DNP	Not installed	C0603_DNP	NA	NA

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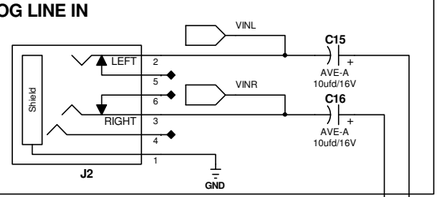
PCM9211_USB_EVM_REVA



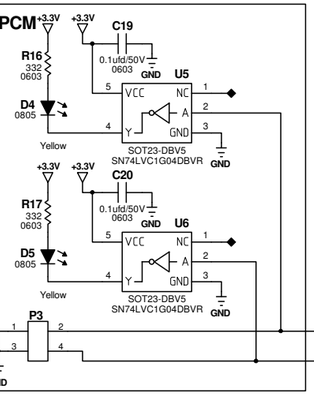
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				PCB REV: A
PAGE INFO: USB CONTROLLER			DATE: MAY 25, 2010	SHEET: 1 OF: 5
DESIGN LEAD: STEVE LEGGIO	EDGE #: 6516981		FILENAME: PCM9211_USB_EVM_REVA	DRAWN BY: SL

PCM9211_USB_EVM_REVA

ANALOG LINE IN

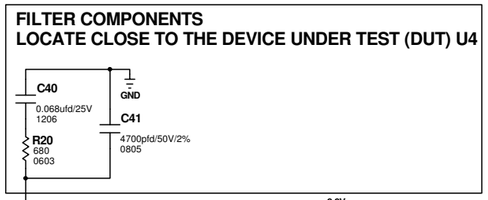


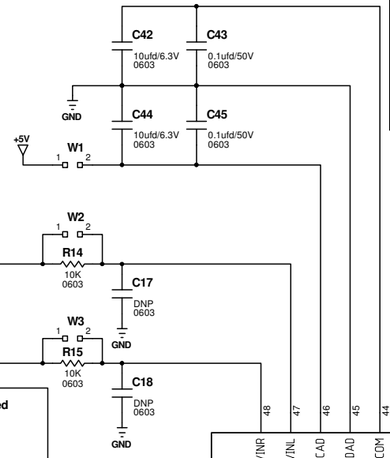
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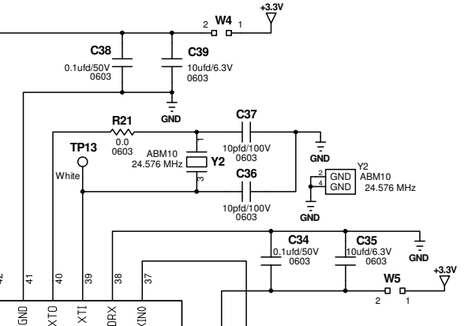


If C17 & C18 are placed as filter components, film type capacitor is recomended.

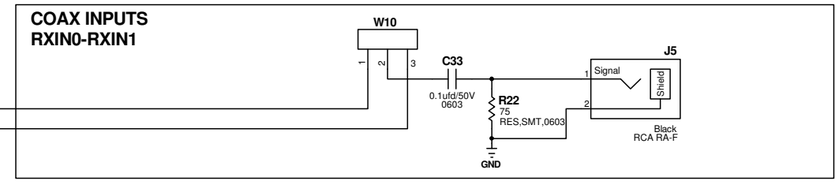
FILTER COMPONENTS
LOCATE CLOSE TO THE DEVICE UNDER TEST (DUT) U4



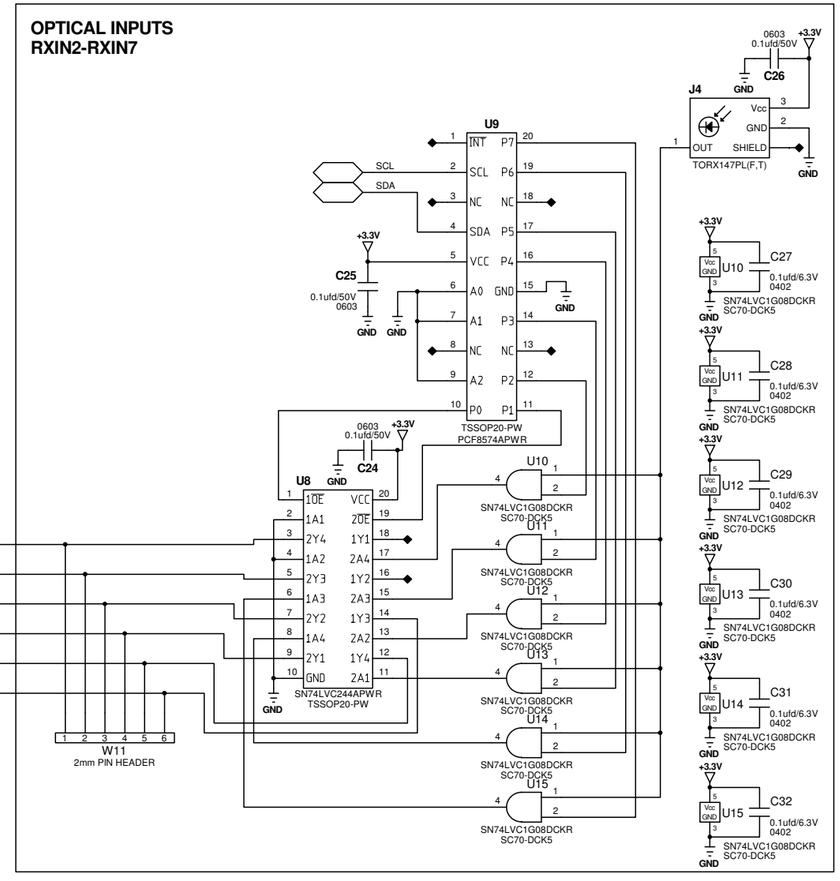




COAX INPUTS
RXIN0-RXIN1



OPTICAL INPUTS
RXIN2-RXIN7

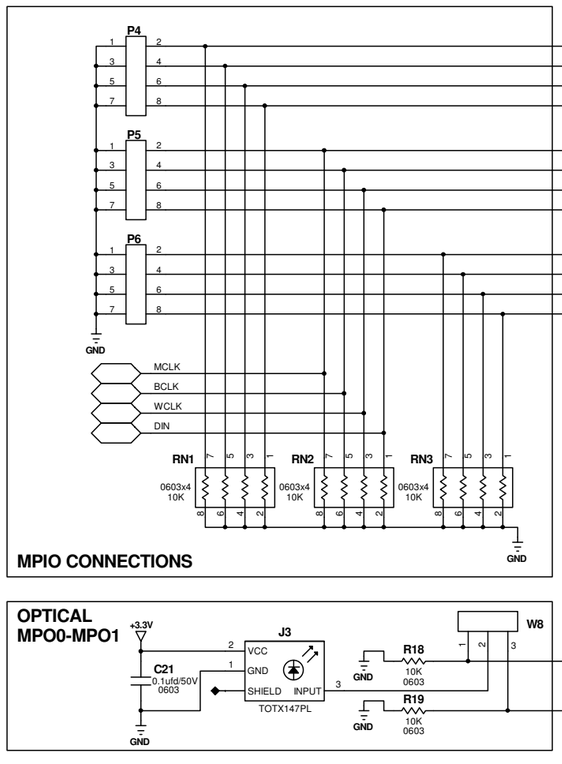


U4

LQFP48-PT

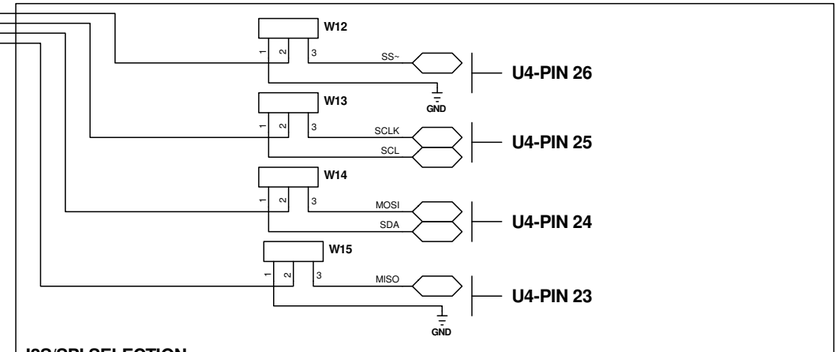
PCM9211PT

MPIO CONNECTIONS



OPTICAL
MPO0-MPO1

I2S/SPI SELECTION

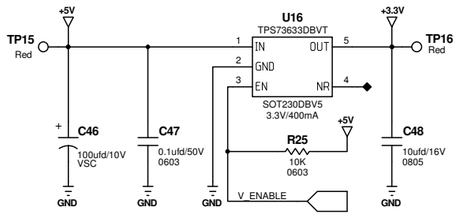


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			SHEET: 2 OF: 5
			DRAWN BY: SL

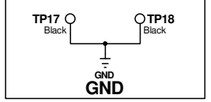
PCM9211_USB_EVM_REVA

POWER SUPPLY

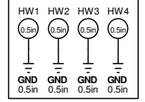
+5.0V USB INPUT
+3.3V OUTPUT



AGND=GND=DGND



STANDOFFS



ANALOG INTERFACE CONNECTOR

mfg: JST
p/n: 100P-JMDSS-G-1-TF(LF)(SN)

P1

BREAK-OUT CONNECTIONS

			BREAK-OUT CONNECTIONS
	IN1+	1 2	IN1-
	AGND	3 4	AGND
	IN2+	5 6	IN2-
	AGND	7 8	AGND
	IN3+	9 10	IN3-
	AGND	11 12	AGND
	IN4+	13 14	IN4-
	AGND	15 16	AGND
	IN5+	17 18	IN5-
	AGND	19 20	AGND
	IN6+	21 22	IN6-
	AGND	23 24	AGND
	IN7+	25 26	IN7-
	AGND	27 28	AGND
	IN8+	29 30	IN8-
	AGND	31 32	AGND
	MICBIAS	33 34	MICDET
	AGND	35 36	AGND
CLASS-D SPEAKER OUTPUT	SPK1+	37 38	SPK1+
	SPK1-	39 40	SPK1-
	SPK2+	41 42	SPK2+
	SPK2-	43 44	SPK2-
LINE OUTPUTS	OUT1+	45 46	OUT1-
	OUT1GND	47 48	OUT1GND
	OUT2+	49 50	OUT2-
	OUT2GND	51 52	OUT2GND
	OUT3+	53 54	OUT3-
	OUT3GND	55 56	OUT3GND
	OUT4+	57 58	OUT4-
	OUT4GND	59 60	OUT4GND
	AGND	61 62	AGND
HEADSET GROUND	HPGND	63 64	HP1L
	HPGND	65 66	HP1R
	HPGND	67 68	HP2L
	HPGND	69 70	HP2R
		71 72	
SPKGND		73 74	SPKGND
SPKVDD		75 76	
		77 78	SPKVDD
	HPGND	79 80	HPGND
	HPVDD	81 82	HPVDD
	AV_ENABLE	83 84	RESERVED
	AGND	85 86	AGND
	VARVA	87 88	VARVA
	AGND	89 90	AGND
	+1.8VA	91 92	+1.8VA
	AGND	93 94	AGND
	+3.3VA	95 96	+3.3VA
	AGND	97 98	AGND
	+5VA	99 100	+5VA

SMD-0.5mm
P1
Anchor
GND
SMD-0.5mm

DIGITAL INTERFACE CONNECTOR

mfg: JST
p/n: 100P-JMDSS-G-1-TF(LF)(SN)

P2

BREAK-OUT CONNECTIONS

			BREAK-OUT CONNECTIONS
+5VD	+5V	1 2	+5VD
DGND	GND	3 4	DGND
+3.3VD	+3.3V	5 6	+3.3VD
DGND	GND	7 8	DGND
+1.8VD		9 10	+1.8VD
DGND	GND	11 12	DGND
VARVD		13 14	VARVD
DGND	GND	15 16	DGND
DV_ENABLE	V_ENABLE	17 18	
		19 20	
RESERVED		21 22	RESERVED
		23 24	
	GND	25 26	SCL
DGND	GND	27 28	SDA
MCLK	MCLK	29 30	MCLK
	GND	31 32	DIN
	GND	33 34	BCLK
	GND	35 36	DOUT
	GND	37 38	WCLK
	GND	39 40	MISO
DGND	GND	41 42	MOSI
	GND	43 44	SS~
	GND	45 46	SCLK
	GND	47 48	I2S_ENABLE
	GND	49 50	RESET~
	GND	51 52	GND
	GND	53 54	GND
		55 56	MCLK_2
		57 58	
		59 60	I2S_2
		61 62	
		63 64	
		65 66	
		67 68	
		69 70	
		71 72	
		73 74	
		75 76	
RESERVED		77 78	
		79 80	
		81 82	RESERVED
		83 84	
		85 86	
		87 88	
		89 90	
		91 92	
		93 94	
		95 96	
		97 98	
		99 100	

SMD-0.5mm
P2
Anchor
GND
SMD-0.5mm

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It is important to operate this EVM within the input voltage range of 0V to +5V (USB) and the output voltage range of 0V to +5V.

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 +35°C. The EVM is designed to operate properly with certain components above +35°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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Products		**Applications**	
Amplifiers	amplifier.ti.com	Audio	www.ti.com/audio
Data Converters	dataconverter.ti.com	Automotive	www.ti.com/automotive
DLP® Products	www.dlp.com	Communications and Telecom	www.ti.com/communications
DSP	dsp.ti.com	Computers and Peripherals	www.ti.com/computers
Clocks and Timers	www.ti.com/clocks	Consumer Electronics	www.ti.com/consumer-apps
Interface	interface.ti.com	Energy	www.ti.com/energy
Logic	logic.ti.com	Industrial	www.ti.com/industrial
Power Mgmt	power.ti.com	Medical	www.ti.com/medical
Microcontrollers	microcontroller.ti.com	Security	www.ti.com/security
RFID	www.ti-rfid.com	Space, Avionics & Defense	www.ti.com/space-avionics-defense
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