

General Description

The MAX98090 (WLP) evaluation kit (EV kit) is a fully assembled and tested circuit board that evaluates the MAX98090 (WLP) audio codec. The MAX98090 is an integrated audio codec including an earpiece amplifier, stereo Class D amplifier, stereo DirectDrive® headphone amplifier, and digital signal processing.

To enable easy connection to a wide range of audio sources, the EV kit includes audio devices to convert both USB and S/PDIF data to I²S data. The EV kit also integrates a MAXQ2000 microcontroller to enable I²C and SPI communication with the on-board I²C- and SPI-capable devices. A simple and intuitive graphical user interface (GUI) provides communication with the EV kit through Windows® OS running Windows XP®, Windows 7™, or Windows 8-compatible software.

Features

- 2.8V to 5.5V Single-Supply Operation
- Proven Audio PCB Layout
- On-Board USB-to-I²C Interface
- On-Board USB-to-I²S Converter
- On-Board S/PDIF Transceiver
- On-Board Clock Source
- On-Board Digital Microphone
- Windows XP™, Windows 7™, and Windows 8™-Compatible Software
- Proven PCB Layout
- Fully Assembled and Tested

Ordering Information appears at end of data sheet.

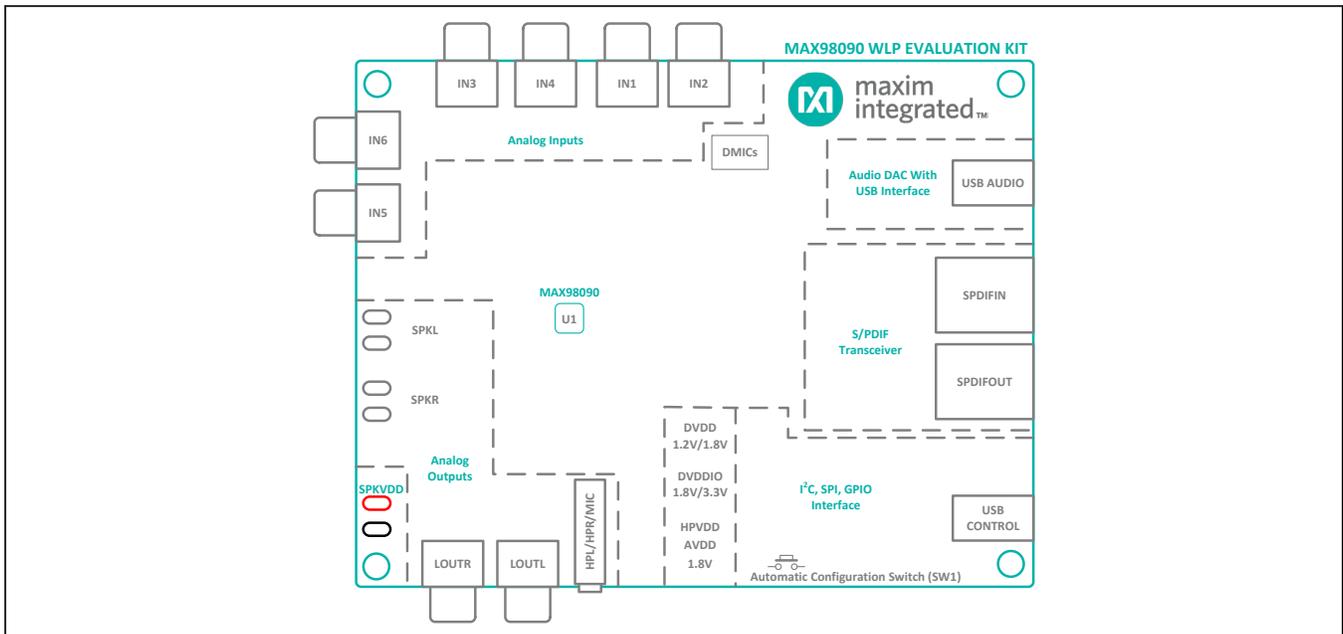


Figure 1. Simplified EV Kit Block Diagram

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Quick Start

Required Equipment

- MAX98090 EV kit (WLP)
- Two A to mini-B USB cables (included)
- 2.8V to 5.5V, 2A DC power supply
- Set of headphones with a 3.5mm plug
- User-supplied Windows XP, Windows 7, or Windows 8 PC with two available USB ports

Note: In the following sections, software-related items are identified by bolding. Text in **bold** refers to items directly from the EV kit software. Text in **bold and under-lined** refers to items from the Windows operating system.

Procedure

Follow the steps below to configure the EV kit for PC audio playback to verify the EV kit’s functionality:

- 1) Visit www.maximintegrated.com/evkitsoftware to download the latest version of the MAX98090 software, 98090Rxx.ZIP. Save the software to a temporary folder and uncompress the ZIP file.
- 2) Install the software and USB driver on your computer by running the INSTALL.EXE program inside the temporary folder. The program files are copied and icons are created in the Windows **Start | Programs | Maxim EVKIT Software** menu. During software installation, some versions of Windows may show a message indicating that this software is from an unknown publisher. This is not an error condition and it is safe to proceed with the installation.
- 3) Verify that all jumpers are in their default positions, as shown in [Figure 2](#) (same as listed in [Table 2](#)).
- 4) Connect the power supply between the SPKVDD and GND PCB pads.
- 5) Set the power supply to 4.2V with a 2A current limit and turn it on.

- 6) Connect a USB cable between the PC and the J1 USB port (USB CONTROL) on the EV kit. A Windows message appears when connecting to the EV kit for the first time. Each version of Windows may have a slightly different message. If Windows reports that the device is ready to use, then the USB driver has been installed successfully.
- 7) If needed, the USB driver can be manually installed by navigating to the **C:\Program Files(x86)\Maxim\MAX98090** folder (default installation directory) and following the instructions in the **USB_Driver_Help_200.PDF** document.
- 8) Connect the headphones to the headphone jack (HP).
- 9) Start the MAX98090 software by opening its icon in the **Start | Programs | Maxim EVKIT Software** menu. The software main window appears, as shown in [Figure 4](#).
- 10) Wait while the software connects to the EV kit. Once the connection is established, the status bar at the bottom will indicate that the USB and Device are connected.
- 11) Once the USB and device connections have been established, select the **Block Diagram** tab.
- 12) Click on the **USB** block.
- 13) Click **Yes** to automatically configure the EV kit for USB audio playback.
- 14) Connect a USB cable between the PC and the J2 USB port (USB AUDIO). Windows automatically detects the EV kit as a sound card and installs the USB audio class drivers.
- 15) Open Windows’ **Sound** dialog and select the **Playback** tab. A **USB Audio DAC** item, similar to [Figure 3](#), is added to the list of available playback devices. All audio played through this device is sent to the EV kit.
- 16) Verify that the **USB Audio DAC** item is set as the default device.
- 17) Verify that audio can be heard through the connected headphones.
- 18) Quick start complete. Refer to the MAX98090 IC data sheet for additional information.

MAX98090 Software Files

FILE	DESCRIPTION
Install.exe	Install the MAX98090 software files on the computer
CDM21000.exe	USB driver installer
Device Manager	Shortcut to computer’s device manager
USB_Driver_Help_300.pdf	USB driver installation help file

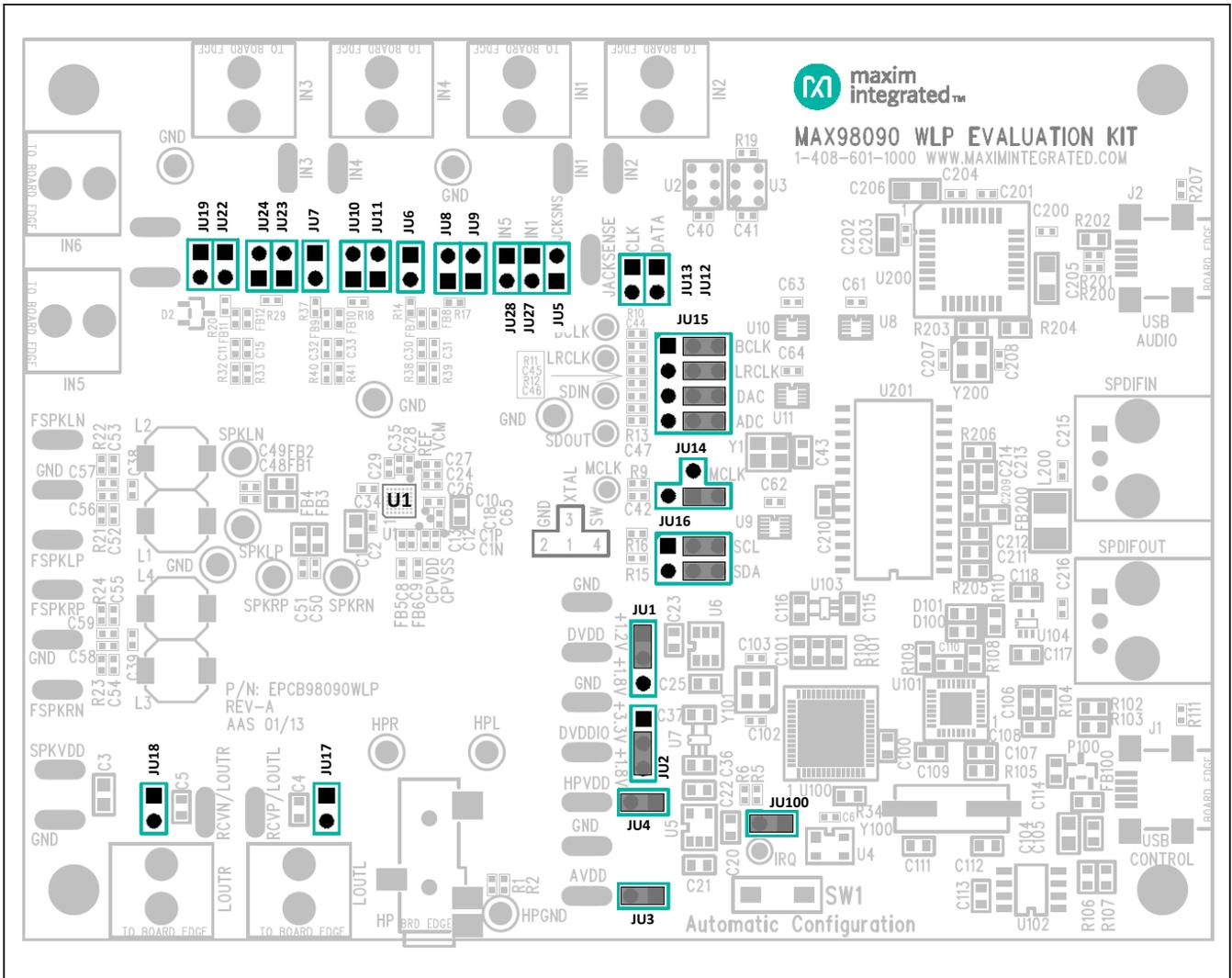


Figure 2. Default Shunt Configuration



Figure 3. Playback Device

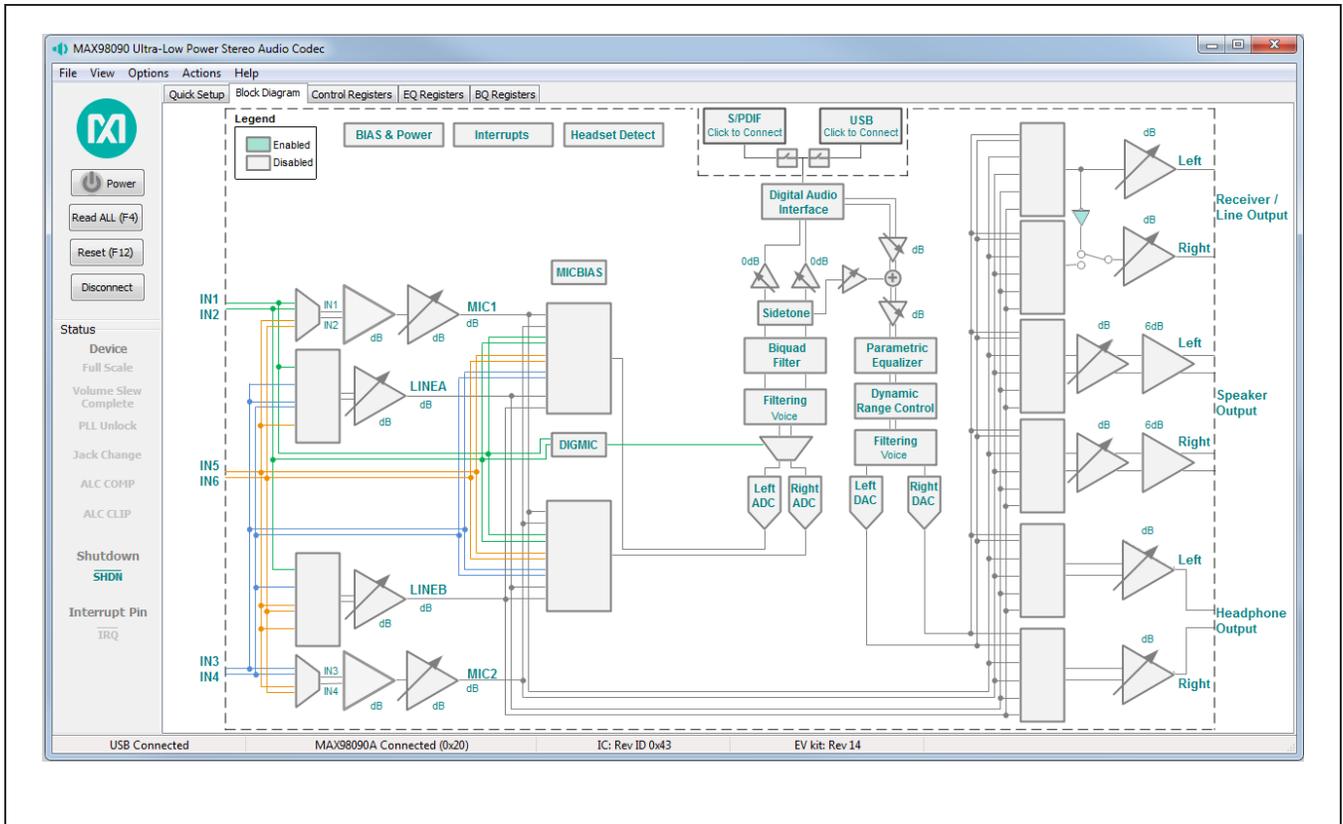


Figure 4. MAX98090 (WLP) Software Main Window

Detailed Description of Software

The MAX98090 EV kit is intended to be evaluated with the MAX98090 software, as it provides an intuitive graphical user interface (GUI) for programming the MAX98090 device and also includes a handful of features that are intended to aid evaluation.

The MAX98090 software main window is divided into three sections: software buttons, status panel, and tabbed pages (Figure 4). The buttons provide basic functionality and the status panel provides monitoring capabilities. The tabbed pages provide the controls for programming the MAX98090.

The **Quick Setup** tab provides access to the device's quick setup registers (0x04–0x0B). The **Block Diagram** tab provides access to all the device registers and utilizes diagram blocks to access dialog windows. The dialogs contain the GUI controls used to program the device. The **Control Registers** tab provides access to registers 0x00–0x45 as well as to the revision ID register, 0xFF. The **EQ Registers** tab provides access to the device's parametric equalizer (EQ), registers 0x46–0xAE. The **BQ Registers** tab provides access to the device's biquad (BQ) filter, registers 0xAF–0xBD.

The MAX98090 software can be downloaded from www.maximintegrated.com/evkitsoftware. When evaluating with the EV kit and software, it is recommended that this document be used in conjunction with the MAX98090 IC data sheet.

Software Buttons

There are four buttons available on the main window of the MAX98090 software: **Power**, **Read All (F4)**, **Reset**

(F12), and **Connect**. These buttons are always accessible, regardless of the active tab.

Power

The **Power** button programs the MAX98090's $\overline{\text{SHDN}}$ bit to enable/disable the device. When the device is disabled/enabled, the button image is gray/blue, respectively. When the device is in shutdown (SHDN bit = 0) the software is still able to communicate with the device, as its I²C interface remains active.

Read All (F4)

The **Read All (F4)** button performs the following sequence of reads and updates the associated register tab. This function is also available from the **Actions** menu.

- Read the MAX98090 $\overline{\text{IRQ}}$ pin. This only updates the **Status** panel.
- Read the status register (0x01). This also updates the **Status** panel.
- Read control registers (0x03–0x45).
- Read parametric equalizer registers (only if the **EQ Registers** tab is visible or if EQ bands are enabled).
- Read biquad registers (only if the **BQ Registers** tab is visible or if the biquad filter is enabled).
- Read Revision ID register (0xFF).
- Read S/PDIF Transceiver (U201) registers.

Reset (F12)

The **Reset (F12)** button resets the checked items as indicated on the **Reset** dialog window (Figure 5.). This function is also available from the **Actions** menu.

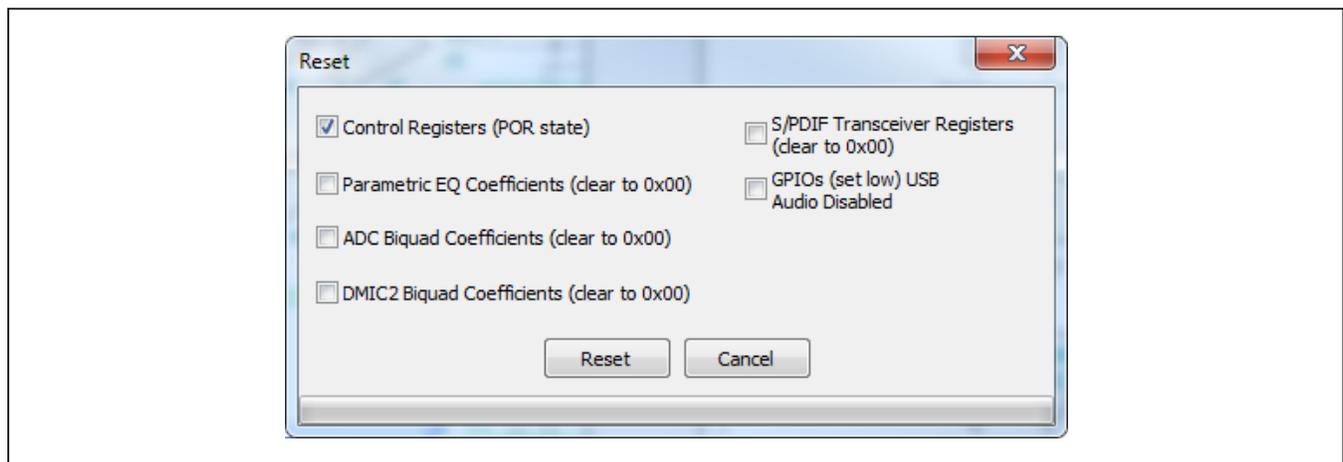


Figure 5. Reset Dialog

Connect/Disconnect

The **Connect/Disconnect** button is used to connect or disconnect the software from the EV kit, which connects to a PC through its USB CONTROL (J1) port or a TCP connection. The button either displays **Connect** or **Disconnect**, depending on the current state of the EV kit connection.

When the button displays **Connect**, it indicates that the software is not connected to the EV kit. Pressing the button initiates the connection sequence. When using a TCP connection, ensure that it has been set up in the software before pressing **Connect**. The TCP connection is configured from the **TCP Configuration Setup** dialog, which is accessed by selecting **Options | Connect Options | TCP** from the **Menu** bar.

When the button displays **Disconnect**, it indicates that the software is connected to the EV kit. Pressing the button initiates the disconnect sequence.

Status Panel

The MAX98090 **Status** panel, located on the left side of the software main window, displays the state of the six status bits (register 0x01), the shutdown bit (register 0x45), and the state of the MAX98090 hardware **IRQ** pin. The color of a **Status** label indicates whether it is asserted or not. When asserted the label is teal colored and when not asserted, the label is light gray.

Note: A status bit's interrupt must be enabled in order for the status bit to get updated in the Status register. The interrupts are enabled from the **Interrupts** block.

Quick Setup Tab

The **Quick Setup** tab provides controls for configuring the quick setup registers (0x04–0x0B). These quick setup registers are write-only and function like pushbuttons. Refer to the *Quick Setup Configuration* section in the MAX98090 IC data sheet for additional details.

As the first four steps are completed, the section at the bottom of **Step 5** is updated. Checkmarks indicate that the step is complete and the **Reg:** and **Bit-** labels indicate which quick setup register and bit are programmed.

For simplicity, this tab is divided into five steps as shown in [Figure 6](#). The first three steps configure the **System Clock**, **Sample Rate**, **Mode**, and **Format**. The fourth step configures the audio **Input** and **Output** (I/O) signal path. As I/O selections are made, a corresponding image is shown in the **Configuration** group box, providing a visual representation of the selected path. When a valid

I/O path is selected **Step 4** is complete. To clear the input and output selections, press the **Clear** button.

Once all four checkmarks are visible, press the **Configure** button to program the device. If an invalid I/O path is selected, the software reports “**Not a valid I/O configuration**” and the I/O selections are cleared.

Block Diagram Tab

The MAX98090 software uses a block diagram to facilitate the programming of the MAX98090 as well as provide a visual representation of the device's functions and current configuration. The controls for a given function(s) are grouped on the same dialog window, which is opened by clicking on the associated block image. The blocks that are within the dotted border are related to the MAX98090 device and the blocks outside the dotted border are for the associated support circuitry.

There are two types of blocks in the block diagram and they are distinguished by the mouse cursor image. The mouse cursor will change to a hand when over an active block and will change to an up-arrow when over a toggle block. An active block opens a dialog window, containing controls for configuring the device. A toggle block does not open a dialog window, but toggles a specific setting when clicked.

The color of the blocks changes, depending on the enabled state of the function(s) it controls. A disabled block is grey and an enabled block is teal. [Figure 7](#) shows the block diagram with the MAX98090 configured for USB audio input and headphone output. **Note:** A disabled/enabled block does not necessarily indicate that its associated audio path is disabled/enabled.

S/PDIF and USB

The S/PDIF and USB blocks are outside the dotted border and thus not related to the MAX98090 device. These blocks represent the stereo digital audio transceiver (U201) and the USB stereo audio DAC (U200) that are designed onto the EV kit. These blocks are used to enable the associated circuits, but also include controls that automatically configure the MAX98090 to work with the enabled audio device.

The S/PDIF and USB audio devices are connected to the MAX98090 I²S bus through analog switches (U9–U11), which are controlled through the MAX98090 software. These switches are automatically configured once the S/PDIF or USB block is enabled, but they can be toggled by clicking on the switch blocks.

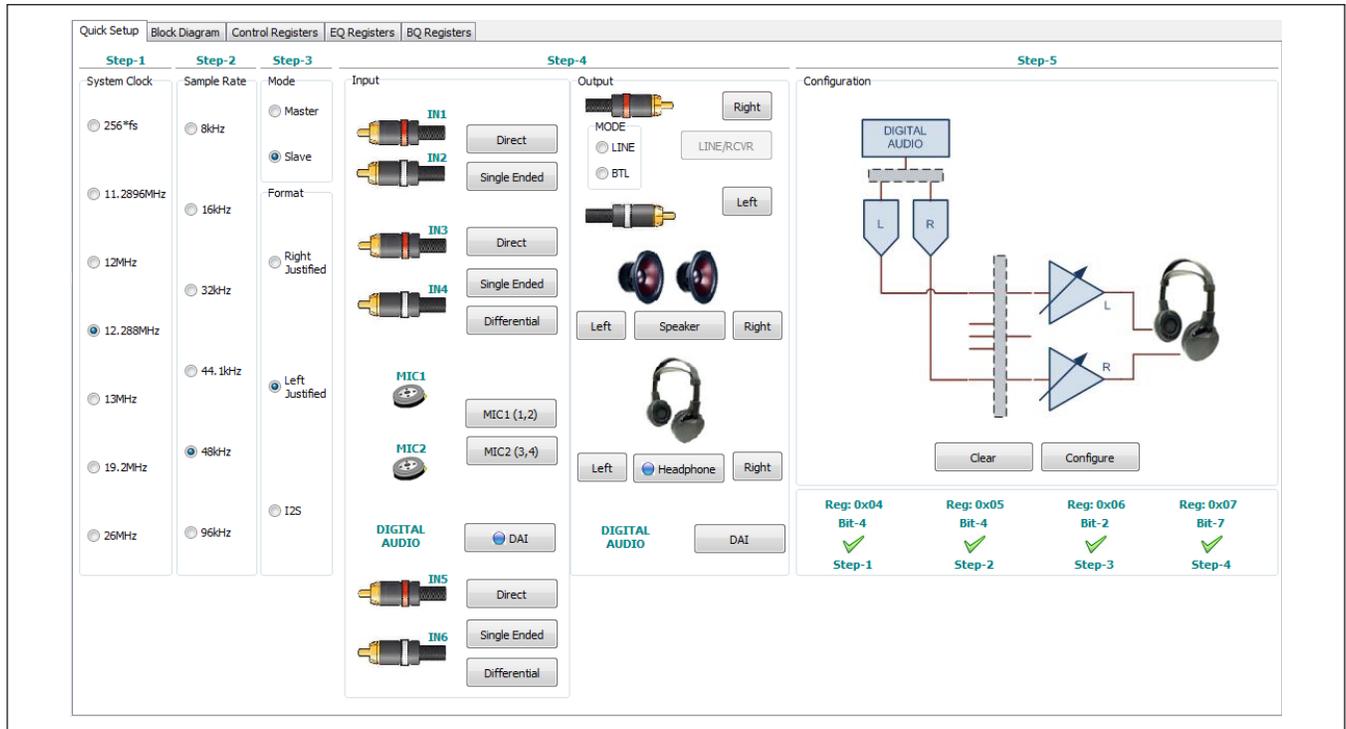


Figure 6. Quick Start Tab

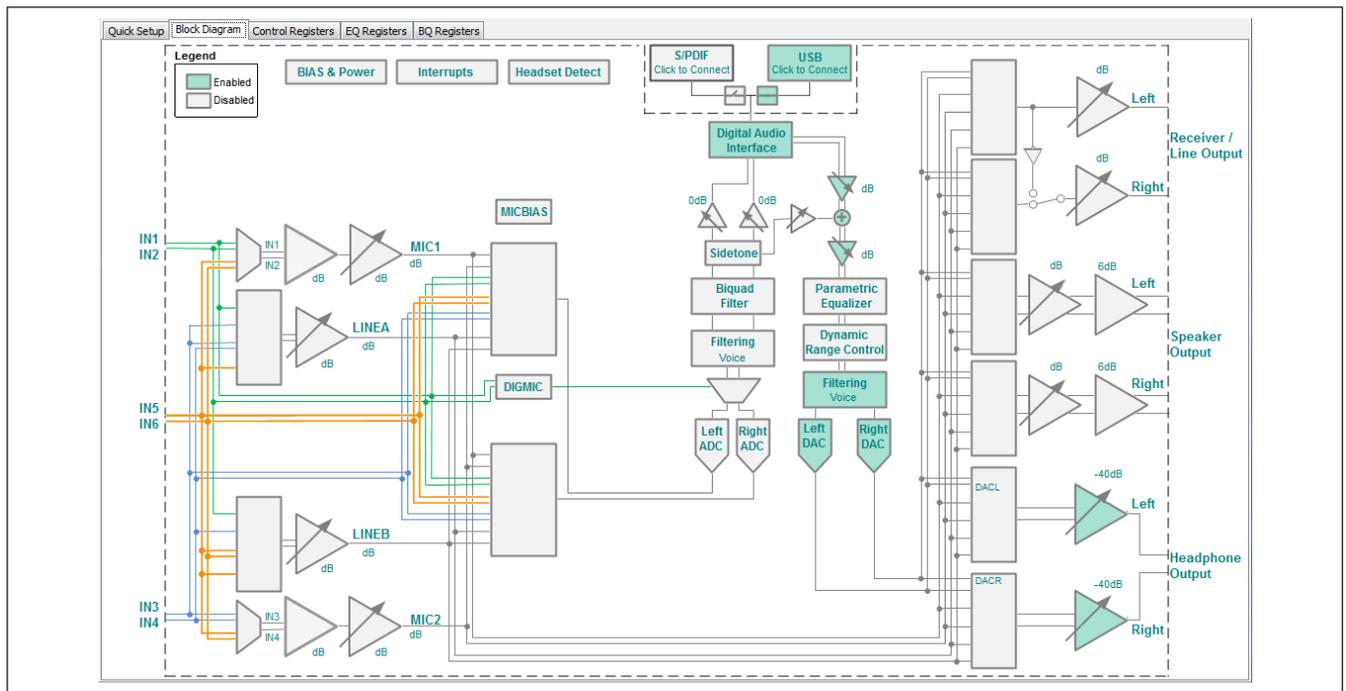


Figure 7. MAX98090 Software Block Diagram

Dialog Windows

Dialog windows are associated with specific blocks in the block diagram and they contain the controls for configuring the registers that are associated with that particular block of the MAX98090 device. The highlighted blocks in [Figure 8](#) are the blocks that share a dialog window. In addition, the blocks that are outlined can have their dialog windows synchronized to each other. This dialog sync feature is a software feature and is enabled by selecting the **Sync Right and Left** checkbox in the dialog window. When enabled, the software programs the same user configurations to both the left and right output channels.

A dialog window is opened by clicking on a diagram block. [Figure 9](#) shows the typical GUI controls that are found on dialog windows and [Figure 10](#) shows the biquad filter dialog. When a control's state is changed, it results in the programming of the associated device register(s).

The biquad dialog uses the same types of controls as other dialogs, but it also provides a plot of the filter's amplitude and phase. This provides a visual representation of the programmed coefficients as well as some insight into the filter's behavior. The only two blocks that use this type of biquad filter dialog are the **Biquad Filter** and **Parametric Equalizer** blocks.

The filter dialog shown in [Figure 10](#) is for the 7-band parametric equalizer as can be seen by the seven available filters. Each filter can be individually programmed and when selected will show up as yellow lines on the plots. A sum of all the enabled filters can be displayed by selecting the **Show Cascade** checkbox. The cascaded response will show up as a blue line on the plots. The **Biquad Filter** dialog window is similar to that shown in [Figure 10](#), except that it is only a single biquad filter.

Registers Tabs

The MAX98090 software has three device register tabs: **Control Registers**, **EQ Registers**, and **BQ Registers**. These register tabs display the device's registers in a typical register map format. Each of the register tabs provides two methods for configuring the device. As an example, [Figure 11](#) shows the register tab elements of register 0x25.

The first configuration method involves clicking on the register's bit labels. A greyed-out bit label indicates that the bit is currently set low. A **bold** bit label indicates that the bit is currently set high. Clicking on a bit will toggle its state and result in a write to that register. This action also updates the value displayed in the register's **Edit** box, located to the right of the bit labels. **Note:** Read-only bits

cannot be clicked/toggled and are only meant to display the register's current state. These read-only bits are updated by performing a read all operation.

The second configuration method involves entering a hexadecimal value in the register's associated **Edit** box and then pressing the Enter key. The software will automatically configure the device register once the Enter key is pressed. This method also updates the state of the bit labels to reflect the value shown in the **Edit** box.

Control Registers

The **Control Registers** tab provides access to most of the device's control registers and all of its status registers. The range of registers accessible from this tab is from register address 0x00–0x45 and the revision ID register (0xFF).

The **Write All (F8)** button writes to all the writeable registers on the **Control Registers** tab. It also writes to all the S/PDIF transceiver registers, and updates the configurable GPIOs.

Register changes made through this tab are reflected on the **Block Diagram** tab. As such, the **Control Registers** tab and the **Block Diagram** tab are always in sync. However, register changes made through the **Control Registers** tab are not automatically reflected on open dialog windows. To have an open dialog window updated, close then reopen the dialog window.

Equalizer (EQ) Registers

The main use of the **EQ Registers** tab is to provide access to the raw data contained in the EQ registers (0x46–0xAE). The preferred method for configuring the device's equalizer is through the **7-Band Parametric Equalizer** dialog window ([Figure 10](#)).

The registers on this tab are grouped into seven bands (Band 1 through Band 7) and each band consists of fifteen registers. These fifteen registers are then divided into five coefficients (B0_, B1_, B2_, A1_, and A2_). The coefficients are configured by clicking the register bit labels or by entering a 24-bit hex-formatted value in its **Edit** box. For example, [Figure 12](#) shows the coefficient B0 of Band 1.

The **Update Coefficients** button updates the EQ register map to reflect any changes that were made through the **7-Band Parametric Equalizer** dialog window.

Note: Coefficient changes made through this **EQ Registers** tab are not reflected on the **Block Diagram** tab or the **7-Band Parametric Equalizer** dialog window.

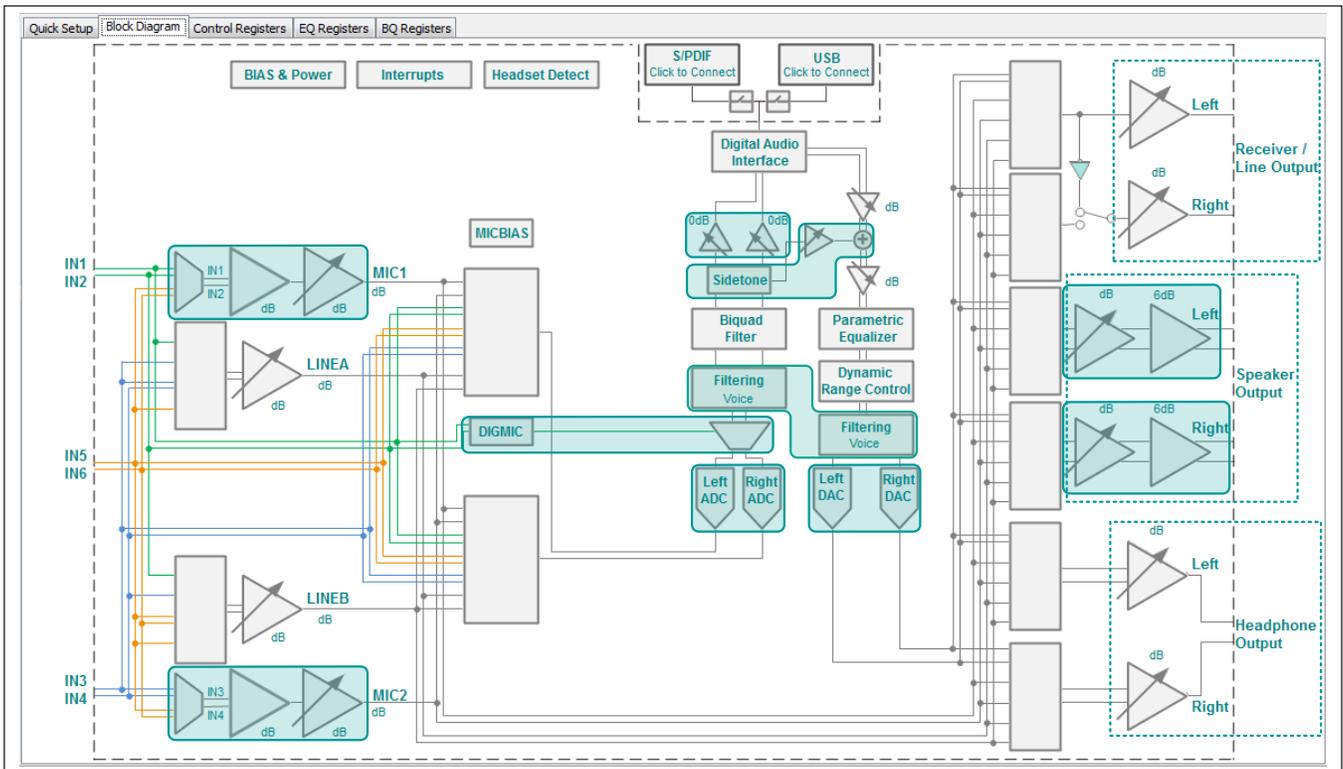


Figure 8. Diagram Blocks with Shared and/or Synchronized Dialog Windows

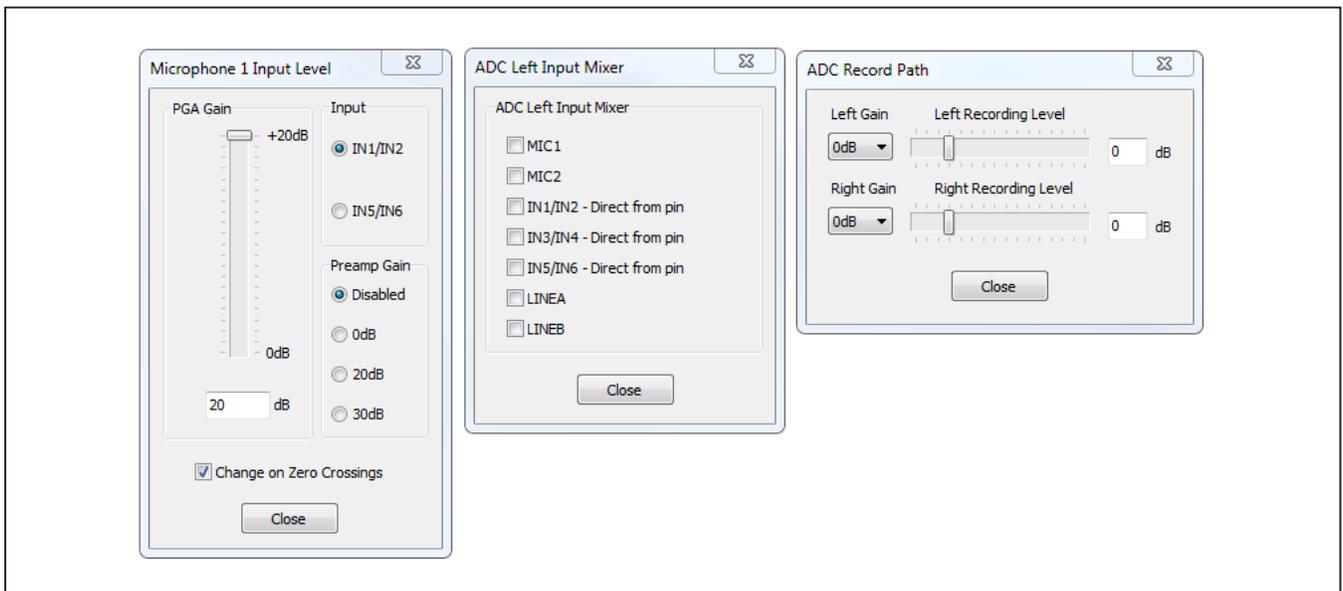


Figure 9. Dialog Windows

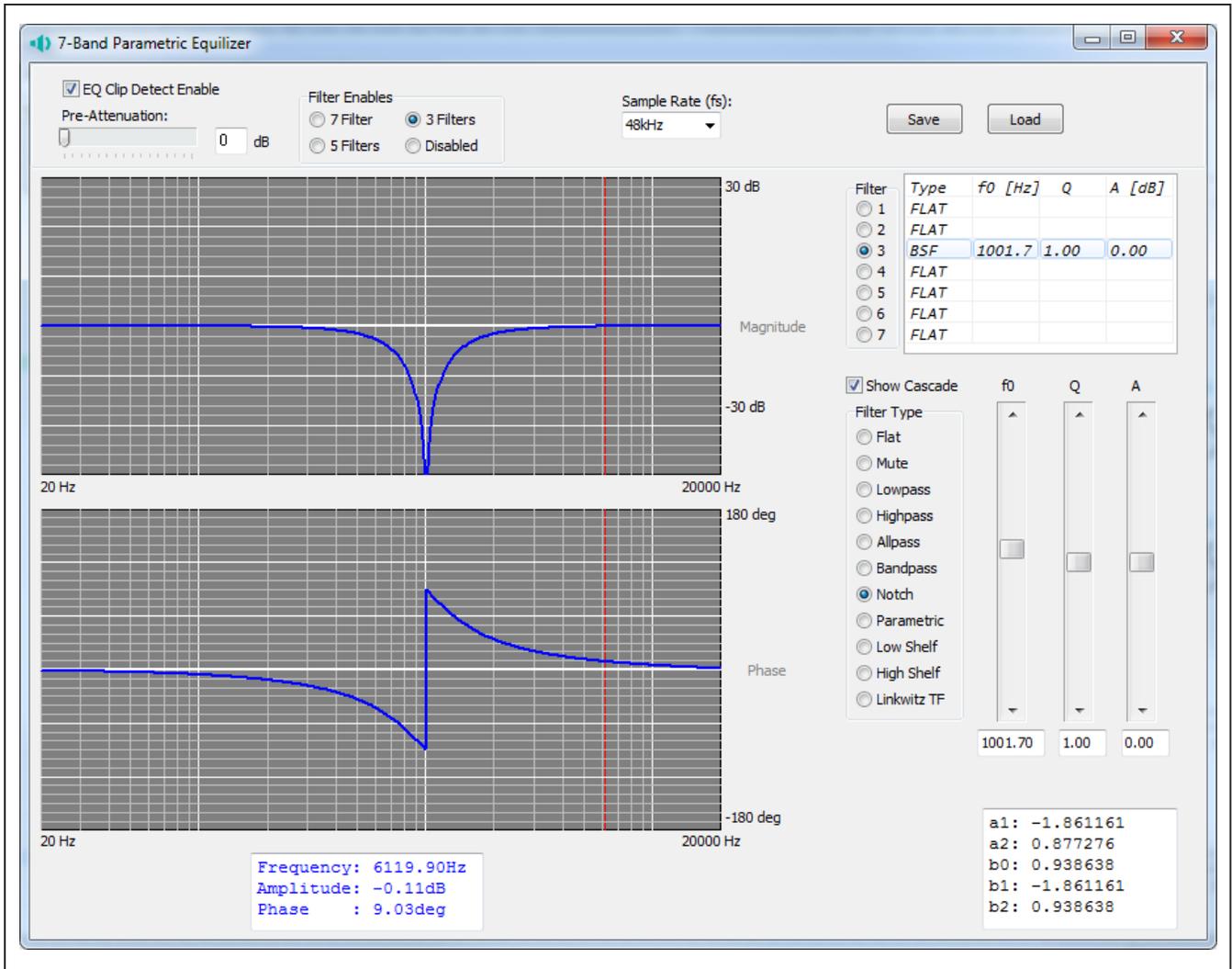


Figure 10. Biquad Filter Dialog Window



Figure 11. Register Tab Elements

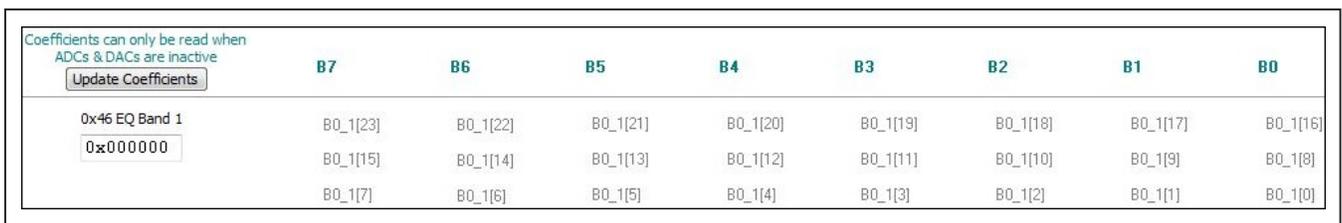


Figure 12. Coefficient (B0) of EQ Band 1

Biquad (BQ) Registers

The main use of the **BQ Registers** tab is to provide access to the raw data contained in the 15 BQ registers (0xAF–0xBD). The preferred method for configuring the device's biquad filter is through the **Biquad Filter** dialog window.

The BQ registers are divided into five coefficients (ADCB0–ADCA2) that are configured by clicking the register bit labels or entering a 24-bit hex-formatted value in the coefficient's **Edit** box.

The **Update Coefficients** button updates the **BQ Registers** tab to reflect any changes that were made through the **Biquad Filter** dialog window.

Note: Coefficient changes made through the **BQ Registers** tab are not reflected on the **Block Diagram** tab or the **Biquad Filter** dialog window.

Menu Bar

All the **Menu** bar items are described in [Table 1](#). Additional information on a few of the menu items is provided in the following sections.

File

The software's save and load features are accessed from the **File** menu item. The save feature saves the data currently displayed on the **Control Registers** tab and **S/PDIF Transceiver** tab. The current state of the configurable GPIO pins is also saved to the configuration file. The data from the **EQ Registers** and **BQ Registers** tabs is saved if the filters are enabled.

A configuration file's main purpose is to capture the current state of the MAX98090's registers, as displayed on the register tabs. This feature makes it easy to program a device to a saved/known state and allows for the sharing of configuration files between users. The file and save features can still be used when an EV kit is not connected. This allows configuration files to be created and opened without the hardware and further contributes to the sharing of configuration files. To facilitate file usage, use descriptive file names when saving configuration files.

Since the configuration file is automatically generated by the software, it is not meant to be manually formatted and doing so may cause file loading issues. To open a configuration file for viewing use a plain text editor.

Select **File | Save Settings Ctrl+S** to create a configuration file. Data is saved as tab-delimited values and the file is saved with a .98090 extension.

To load a saved configuration file select **File | Load Settings Ctrl+O**. Only writeable registers will be programmed with data from the loaded configuration file.

Connect Options

The **Connect Options** item is accessed from the **Options** menu. This menu item provides two options for connecting the EV kit to the MAX98090 software. The simplest method (**MAXQ USB**) uses a standard male-to-male USB cable (A to mini-B) connection. A local PC, running the MAX98090 software, connects to the USB CONTROL port (J1) on the EV kit. This method utilizes the on-board MAXQ2000 microcontroller circuitry to communicate with the MAX98090 I²C-capable device.

The **TCP** option is used to set up an internet connection between the EV kit and the software. To utilize this feature, additional hardware and software (not provided) are required. The additional tools would function as the communication medium between the ethernet connection and the MAX98090's I²C bus. When using this option, the USB CONTROL port (J1) on the EV kit still needs to be powered, in order to supply the on-board LDOs.

Software Versions

The MAX98090 software works with both packaged versions (TQFN and WLP) of the MAX98090. Each version of the MAX98090 has its own unique EV kit. The WLP version is evaluated on the MAX98090EVKIT#WLP kit and the TQFN version is evaluated on the MAX98090EVKIT#TQFN kit. Once an EV kit is connected to the host PC and a connection is established with the software, the program automatically detects the device type and configures the GUI accordingly.

The **Software Versions** item from the **View** menu allows the GUI to be reconfigured. This is particularly useful when an EV kit is not connected and the user wants to generate a configuration file for a specific MAX98090 package. This feature can be used when an EV kit is connected to the software, but care must be taken since the software does not automatically revert the GUI back to the appropriate version. In this case the user needs to manually select the version that matches the connected device or perform a Disconnect-then-Connect operation.

The main difference between the WLP and TQFN versions of the MAX98090 is the additional inputs (IN5 and IN6) available on the WLP version. This difference results in changes to the **Quick Setup**, **Block Diagram**, and **Control Registers** tabs. These differences are also discussed in the MAX98090 IC data sheet.

Table 1. Menu Bar Items

MENU ITEM	DESCRIPTION
FILE	
Load Settings Ctrl+O	Loads a configuration file (as saved by the Save Settings option).
Save Settings Ctrl+S	Saves a configuration file containing the current device settings.
Exit	Closes the MAX98090 software.
VIEW	
Show S/PDIF Transceiver Registers	Toggles the visibility of the S/PDIF Transceiver register tab, allowing for more control of the on-board S/PDIF transceiver (U201).
Software Versions	
MAX98090 TQFN	Reconfigures the block diagram and register tabs for the selected device.
MAX98090 WLP	
OPTIONS	
Autoconnect	When selected, the software checks the connection status of the MAXQ2000 interface and the MAX98090 device approximately every second. If not connected, the software attempts to establish a connection.
Autoread Status	When selected, the device's status registers read approximately every second. The Status panel and Control Registers tab are refreshed after each read.
Autoshutdown for Register Writes	When selected, the software ensures that the MAX98090 is in shutdown before writing to certain registers. Refer to Table 90 of the MAX98090 data sheet for the registers that should only be programmed while the device is in shutdown.
I²C CLOCK SPEED	
100kHz	Configures the clock speed of the I ² C interface.
400kHz	
Configure MCLK Routing	Opens the MCLK Routing dialog window that is used to select a clock source for the MAX98090 master clock (MCLK) input. In order for this clock to drive the MAX98090, a shunt must be placed on pins 1–4 of header JU14.
Connect Options	Sets the interface method between the EV kit and MAX98090 software.
Cmod USB	The MAX98090 EV kit interfaces to a local PC through its USB Control (J1) port.
TCP	The MAX98090 EV kit interfaces to a remote PC through a TCP connection. Additional hardware setup required.
ACTIONS	
Read All Registers F4	Reads all MAX98090 registers and updates the GUI. Also reads all of the S/PDIF transceiver (U201) registers.
Write All Registers F8	Writes the data from the Edit boxes, on the Control Registers tab, to the MAX98090 device and updates the GUI. Also writes to the S/PDIF transceiver (U201) registers and updates all configurable GPIO pins.
Reset All Registers F12	Resets the device according to the check box selections on the Reset dialog window.
HELP	
About	Pop-up window that provides information about the software.

Detailed Hardware Description

The MAX98090 EV kit (WLP) evaluates the WLP package version of the MAX98090 audio codec and provides access to all analog and digital inputs/outputs on the device. The EV kit also includes USB-powered linear-dropout (LDO) regulators that allow the EV kit to be evaluated with a single external supply (+2.8V to +5.5V).

Integrated into the EV kit design are a stereo digital audio transceiver (U201) and a stereo audio DAC with USB interface (U200). The digital audio transceiver provides audio input and output through the on-board TOSLINK (SPDIFOUT and SPDIFIN) connectors and the USB audio DAC allows for audio input from the USB AUDIO port (J2).

In addition, the EV kit includes a MAXQ2000 microcontroller that facilitates evaluation by providing I²C, SPI, and GPIO interfaces, allowing the MAX98090 software to communicate with the devices on the EV kit.

Power Supplies

The EV kit requires a single 2.8V to 5.5V external supply (SPKVDD) to operate. All other MAX98090 supply inputs are powered from the J1 USB port. Jumpers JU1–JU4 (see [Table 2](#)) allow all MAX98090 supply inputs to be disconnected from USB power and connected to external supplies. In addition, jumpers JU1 and JU2 are used to configure the on-board voltage connected to DVDD and DVDDIO, respectively. See [Table 2](#) for jumper JU1–JU4 configuration options.

To perform supply current and power-consumption measurements use external supplies to power the MAX98090 supply inputs: HPVDD, AVDD, DVDD, and DVDDIO.

Jumper Selection

The EV kit includes 25 jumpers to adjust various hardware configuration options. [Table 2](#) describes all the jumpers available on the EV kit.

Master Clock (MCLK) Selection

Jumper JU14 selects which master clock (MCLK) source drives the MAX98090 device. The available clock configurations are listed in [Table 3](#). When streaming audio through the on-board USB AUDIO port or S/PDIF connectors, the EV kit software will automatically config-

ure the U8 and U9 switches to route the appropriate clock signal to the MAX98090 MCLK input.

If an external audio source is used, choose either the on-board 13MHz oscillator or an external clock. To connect an external clock, remove the shunt from JU14 and connect the clock to pin-1.

I²S Audio I/O

The EV kit provides three methods for evaluating the MAX98090's digital audio interface (DAI). The first method is through the I²S header (JU15) and this provides the most direct connection to the MAX98090's DAI.

The two other methods involve streaming audio onto or off the EV kit. The USB AUDIO port (J2) is used to stream audio onto the EV kit. The SPDIFIN and SPDIFOUT optical connectors are used to stream audio onto or off the EV kit, respectively.

The USB and S/PDIF digital audio signals are switched onto the PCM bus through switches U10 and U11. The switches are automatically configured by the evaluation kit software, depending on which path has been enabled (**USB** or **S/PDIF**).

Note: All PCM digital audio is routed through the I²S header before routing to the MAX98090's DAI. This is true for the USB AUDIO input as well as for the S/PDIF I/O. See [Figure 13](#).

Digital Audio Interface Header (JU15)

Header JU15 provides access to the MAX98090 digital audio interface (DAI). See [Table 4](#) for individual pin descriptions. Follow the steps below to configure JU15:

Direct connection of PCM digital audio:

- Remove the shunts from JU15 (place shunts on Position 1 for safekeeping).
- Connect the PCM signals/grounds to the corresponding Position 2 (Center) and Position 3 (Right) pins of JU15.

USB Audio input or SPDIF I/O:

- Install the four shunts between Position 2 and Position 3 of JU15.
- For audio input, connect an audio output device to the USB AUDIO or SPDIFIN connector.
- For audio output, connect an audio input device to the SPDIFOUT connector.

Table 2. Jumper Configuration

HEADER	SHUNT POSITION	DESCRIPTION
JU1	1-2*	DVDD connected to +1.2V
	2-3	DVDD connected to +1.8V
	Open	DVDD externally supplied
JU2	1-2	DVDDIO connected to +3.3V
	2-3*	DVDDIO connected to +1.8V
	Open	DVDDIO externally supplied
JU3	Installed*	AVDD connected to +1.8V
	Open	AVDD externally supplied
JU4	Installed*	HPVDD connected to +1.8V
	Open	HPVDD externally supplied
JU5	Installed	Connects JACKSNS to headphone jack, HP, for jack detection; ensure that a shunt is installed on JU27/JU6 or JU28/JU22 for proper jack detection.
	Open*	Disconnects JACKSNS from the headphone jack, HP
JU6	Installed	Connects MICBIAS to the IN1 input through a 2.2kΩ resistor (for microphone input)
	Open*	Disconnects MICBIAS from the IN1 input
JU7	Installed	Connects MICBIAS to the IN3 input through a 2.2kΩ resistor (for microphone input)
	Open*	Disconnects MICBIAS from the IN3 input
JU8	Installed	Connects IN2 directly to ground for single ended operation
	Open*	Allows for differential operation
JU9	Installed	Connects IN2 to ground through a 2.2kΩ resistor (used when IN1 is mic biased)
	Open*	Disconnects IN2 from ground
JU10	Installed	Connects IN4 directly to ground for single ended operation
	Open*	Allows for differential operation
JU11	Installed	Connects IN4 to ground through a 2.2kΩ resistor (used when IN3 is mic biased)
	Open*	Disconnects IN4 from ground
JU12	Installed	Connects the Digital Microphone data output to MAX98090
	Open*	Disconnects the Digital Microphone data output from MAX98090
JU13	Installed	Connects the Digital Microphone clock to MAX98090
	Open*	Disconnects the Digital Microphone clock to MAX98090
JU14	—	See Table 3
JU15	—	See Table 4
JU16	2-3, 5-6*	Connects the on-board I ² C master to MAX98090
	Open	Allows external I ² C control of MAX98090
JU17	Installed	Removes AC coupling capacitor, C4, from LOU _{TL} line output
	Open*	Adds AC coupling capacitor, C4, to LOU _{TL} line output
JU18	Installed	Removes AC coupling capacitor, C5, from LOU _{TR} line output
	Open*	Adds AC coupling capacitor, C5, to LOU _{TR} line output

Table 2. Jumper Configuration (continued)

HEADER	SHUNT POSITION	DESCRIPTION
JU19	Installed	Connects MICBIAS to IN5 through a schottky diode and 2.2kΩ resistor
	Open*	Disconnects MICBIAS from IN5
JU22	Installed	Connects MICBIAS to IN5 through a 2.2kΩ resistor
	Open*	Disconnects MICBIAS from IN5
JU23	Installed	Connects IN6 to ground through a 2.2kΩ resistor (when IN5 is microphone biased)
	Open*	Disconnects IN6 from ground
JU24	Installed	Connects IN6 directly to ground for single ended operation
	Open*	Allows for differential operation
JU27	Installed	Connects IN1 to the headphone jack, HP (for microphone input)
	Open*	Disconnects IN1 from the headphone jack, HP
JU28	Installed	Connects IN5 to the headphone jack, HP (for microphone input)
	Open*	Disconnects IN5 from the headphone jack, HP
JU100	Installed*	Connects the MAX98090 interrupt output (\overline{IRQ}) to the on-board microcontroller
	Open	Disconnects the MAX98090 interrupt output (\overline{IRQ}) from the on-board microcontroller

*Default position.

Table 3. Master Clock Source Configuration (JU14)

SHUNT POSITION	CLOCK SOURCE
1-2	Disabled
1-3	13MHz oscillator
1-4*	Software-selected clock source

*Default position.

Table 4. DAI Header (JU15)

JU16		
POSITION 1 (LEFT)	POSITION 2 (CENTER)	POSITION 3 (RIGHT)
GND	CODEC_BCLK	I2S_BCLK
GND	CODEC_LRCLK	I2S_LRCLK
GND	CODEC_SDIN	I2S_DAC
GND	CODEC_SDOUT	I2S_ADC

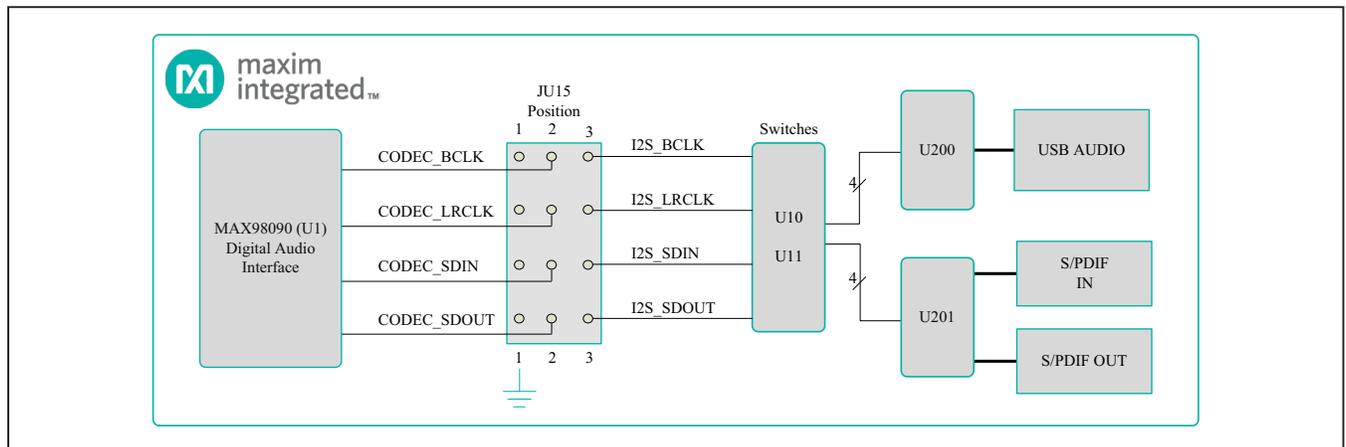


Figure 13. I²S Routing

S/PDIF Transceiver

The S/PDIF transceiver (U201) serves as a format converter between I²S and S/PDIF. Use this device to send and receive digital audio over the optical connectors (SPDIFIN, SPDIFOUT).

When receiving S/PDIF data, the transceiver outputs a recovered master clock that is exactly 256 x f_S, where f_S is the sample rate. This clock signal can be used to clock the MAX98090.

When transmitting S/PDIF data, the transceiver requires a master clock input and if data is also being received, it uses the data to generate its own master clock.

If S/PDIF data is not being received, the transceiver generates a master clock based on the LRCLK signal being output by the MAX98090. For proper transmit-only operation, the S/PDIF transceiver must be configured in master mode.

The S/PDIF transceiver is controlled through the SPI interface of the on-board MAXQ2000 microcontroller. See the [Control Interface](#) section.

USB Audio

The audio DAC with USB interface (U200) accepts an audio stream from a PC, connected to the USB AUDIO port (J2), and converts it to I²S data. The USB audio DAC generates a master clock signal that can be used to clock the MAX98090. The clock signal is 256 x f_S.

The USB audio DAC supports standard class drivers that are included with most operating systems. As a result, no

drivers are required for this device and it will appear as a sound card in the PC. This allows for audio playback from the PC through the MAX98090 audio codec.

Analog Inputs

The MAX98090 analog input pairs (IN1/IN2, IN3/IN4, and IN5/IN6) can be configured for microphone input, single-ended input, or differential input. These input connections are made through the provided RCA connectors or PCB pads (IN1–IN6). In addition, the IN1/IN2 and IN5/IN6 device inputs can be connected to the 3.5mm audio jack (HP) for single-ended microphone input from a headset. [Table 5](#) lists the configuration headers associated with each input pair. See the specific input sections for configuration details.

Single-Ended and Differential Inputs

The three analog input pairs are configured for single-ended or differential line input by configuring the associated input headers (as listed in [Table 6](#)). For single-ended inputs, the input header configuration is independent of the input type. For differential inputs, the header configuration is different for microphone inputs powered by the MAX98090 MICBIAS output.

Analog Microphone

When using the analog input pairs for microphone input, the MAX98090 microphone bias (MICBIAS) output can be used to power the connected microphone. The MICBIAS output is connected to the IN1, IN3, or IN5 inputs through the input’s associated MICBIAS header.

Table 5. Analog Input Headers

INPUT PAIR	SINGLE-ENDED/ DIFFERENTIAL HEADER	DIFFERENTIAL MICROPHONE HEADER	MICBIAS HEADER
IN1/IN2*	JU8	JU9	JU6
IN3/IN4	JU10	JU11	JU7
IN5/IN6*	JU24	JU23	JU22 or JU19

*The microphone input from the HP headset is routed to IN1 and IN5 of these input pairs

Table 6. Analog Input Header Configuration

INPUT	SINGLE-ENDED	DIFFERENTIAL	DIFFERENTIAL MICROPHONE (W/MICBIAS)
IN1/IN2	JU8 = On	JU8 = Off JU9 = Off	JU8 = Off JU9 = On
IN3/IN4	JU10 = On	JU10 = Off JU11 = Off	JU10 = Off JU11 = On
IN5/IN6	JU24 = On	JU24 = Off JU23 = Off	JU24 = Off JU23 = On

When evaluating with two analog microphones, and jack detection is required, the IN5 input needs to be connected to MICBIAS through jumper JU19. See [Table 7](#).

Digital Microphone

The EV kit includes an on-board digital microphone (U3) for evaluation of the MAX98090’s digital microphone interface. The digital microphone interface is enabled and configured through the software. An additional digital microphone footprint (U2) is provided to exercise the device’s capability of interfacing with up to two digital microphones.

Install shunts on jumpers JU12 and JU13 to connect the digital microphone(s) to the MAX98090 device. Refer to the MAX98090 IC data sheet for additional details.

Jack Detection

The MAX98090’s flexible, software-configurable jack-detection interface is used to detect the presence or absence of a headphone/headset connected to the HP jack. To provide jack detection on the HP jack, install a shunt on header JU5.

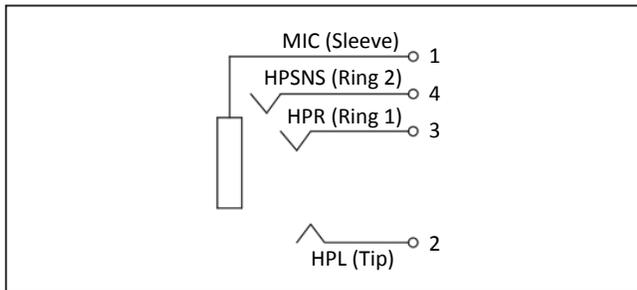


Figure 14. Headphone Jack

Table 7. MICBIAS Connection

MICROPHONE CONNECTION	MICBIAS CONNECTED	MICBIAS DISCONNECTED
IN1	JU6 = On	JU6 = Off
IN3	JU7 = On	JU7 = Off
IN5	JU22 = On JU19 = Off	JU22 = Off JU19 = Off
IN5*	JU22 = Off JU19 = On	JU22 = Off JU19 = Off

*Configuration for two analog microphones, requiring jack detection.

Table 8. Analog Outputs

OUTPUT	CONNECTIONS
Headphone	3.5mm audio jack (HP)
Speaker	Un-filtered and filtered connection options (SPK_P/SPK_N and FSPK_P/FSPK_N)
Receiver/Line-Out	RCA connectors (LOUTL and LOUTR)

Analog Outputs

The EV kit provides connections for each of the three analog outputs. [Table 8](#) lists the outputs and their available connections.

Headphone

The MAX98090 stereo headphone output (HPR/HPL) is routed to the on-board 3.5mm audio jack (HP), as shown in [Figure 14](#). The HP jack also allows for a headset connection, with the microphone input (MIC) connected to either IN1 or IN5. See the [Analog Inputs](#) section for input configuration options.

Stereo Class D Speaker Amplifier

The MAX98090 integrates a filterless Class D stereo amplifier. In systems with short speaker traces, the stereo speaker outputs (SPKLP/SPKLN and SPKRP/SPKRN test points) can be connected directly to the speaker loads. Although this amplifier is designed to operate completely filterless, the EV kit does provide stuffing options for two types of output filters.

When long speaker cables are used, a ferrite bead plus capacitor filter can be installed to prevent excessive EMI radiation. Although it is best to choose filter components based on EMI test results, the combination of a 680pF capacitor (C48–C51) with the Murata BLM18SG331TN1 ferrite bead (FB1–FB4) generally works well. With this configuration, connect the speaker loads to the SPKLP/SPKLN and SPKRP/SPKRN test points.

To allow analysis of the audio output with an oscilloscope, or an analyzer not designed to accept Class D switching waveforms, populate L1–L4 with the included 22µH inductors and make connections, to external

equipment or speakers, at FSPKLP/FSPKLN and FSPKRP/FSPKRN. The LC filter is designed to work best with an 8Ω load. Do not connect a load to the unfiltered SPKLP/SPKLN and SPKRP/SPKRN outputs when L1–L4 are installed.

Receiver/Line Output

The MAX98090 receiver/line output can be configured either as a differential receiver/earpiece output or as a stereo single-ended line output. The receiver/line outputs are routed, through AC-coupling capacitors, to the LOU_{TL} and LOU_{TR} RCA connectors. The AC-coupling capacitors can be shorted (effectively removed from the signal path) by installing a shunt on JU17 and JU18.

Control Interface

The MAXQ2000 (U100) microcontroller circuitry is the bridge between the on-board interface-enabled devices and the EV kit software, running on a PC connected to the USB CONTROL port (J1). The EV kit utilizes the MAXQ2000’s I²C, SPI and GPIO interfaces. See the [Detailed Description of Software](#) section for additional software details.

I²C Interface

The MAXQ2000’s I²C interface is routed to the MAX98090 device through jumper JU16, by installing shunts across pins 2-3 of each row (see [Table 9](#)). When using an external I²C master, remove both shunts from JU16 and connect the external SDA and SCL signals to the position-2 pins of JU16. Ground connections can be made to the position-1 pins of JU16. Install pullup resistors at R15 and R16 if the external master does not include pullup resistors.

SPI Interface

The MAXQ2000 SPI interface is used to control the on-board S/PDIF transceiver (U201). In the MAX98090 software go to **View | Show S/PDIF Transceiver Registers** to activate the **S/PDIF Transceiver** tab.

GPIO Interface and Pushbutton Programmer

Six of the MAXQ2000 general-purpose inputs/outputs (GPIOs) are used for either controlling or monitoring a specific on-board device/signal. Four of the GPIOs are used as general-purpose outputs and are automatically set/cleared based on configuration settings made through the MAX98090 software.

The other two GPIOs are used as general-purpose inputs to monitor a specific signal. The first general-purpose input ($\overline{\text{CODEC_IRQ}}$) is connected to the MAX98090 interrupt ($\overline{\text{IRQ}}$) output. This $\overline{\text{IRQ}}$ is monitored by the microcontroller and its state is reported in the **Status** group box on the left side of the software main window. This general-purpose input can be disconnected from the MAX98090’s $\overline{\text{IRQ}}$ output by removing the shunt from jumper JU100.

The second general-purpose input is connected to a tactile switch (SW1) to realize a pushbutton programmer. When SW1 is pressed, the MAXQ2000 microcontroller responds by transmitting a sequence of configuration settings that have been preprogrammed into its firmware. This allows the EV kit to be quickly programmed with a specific configuration, without the need for a PC running the software. By default, the pushbutton programming feature is not enabled.

Table 9. I²C Header (JU16)

JU16		
POSITION 1 (LEFT)	POSITION 2 (CENTER)	POSITION 3 (RIGHT)
GND	CODEC_SCL	SCL
GND	CODEC_SDA	SDA

Component List, Schematics, and PCB Layout Diagrams

See the following links for component, schematic, and PCB information:

- [MAX98090WLP BOM](#)
- [MAX98090WLP schematic](#)
- [MAX98090WLP PCB](#)

Ordering Information

PART	TYPE
MAX98090EVKIT#WLP	EV Kit

#Denotes RoHS compliant.

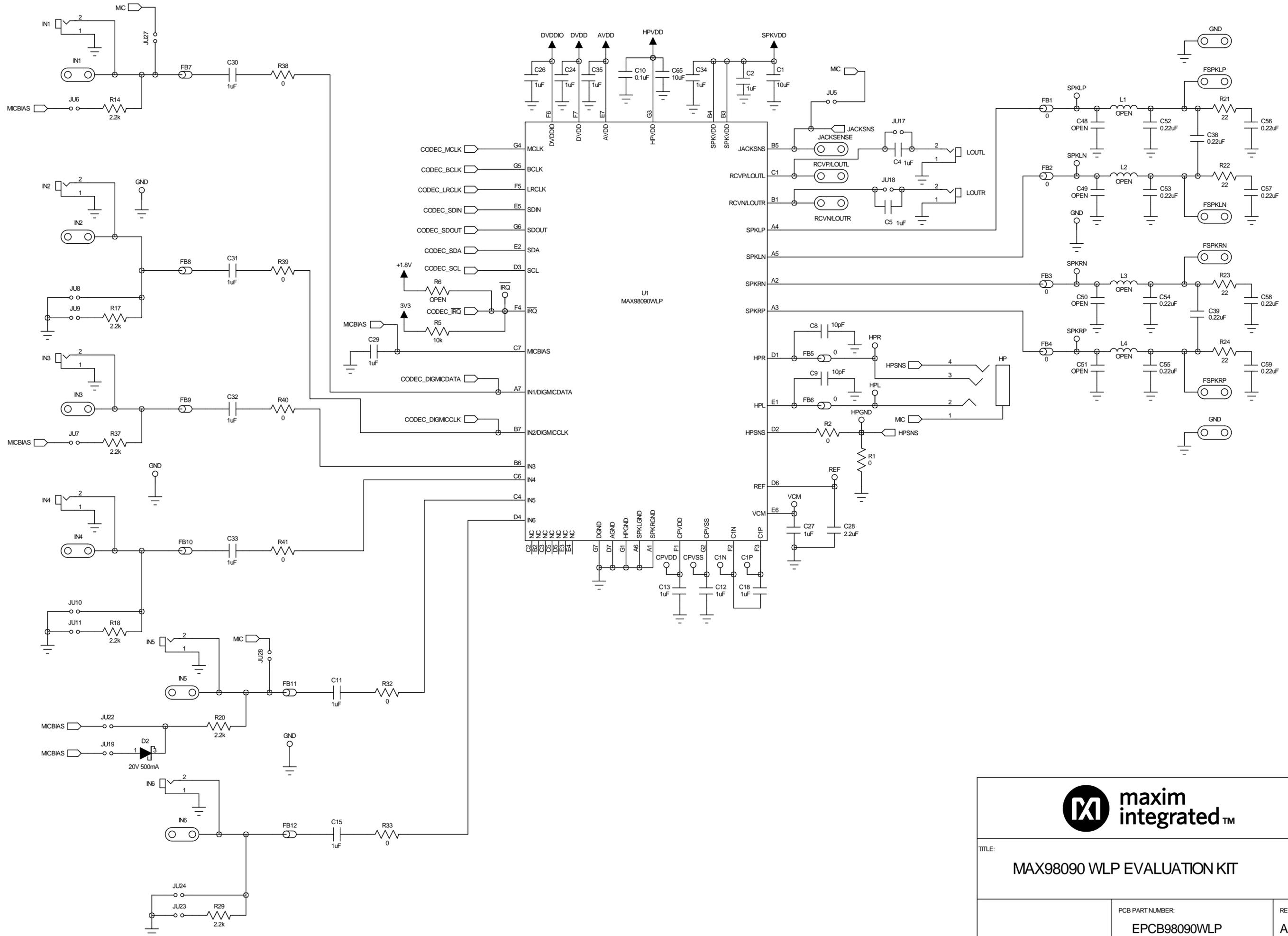
Revision History

REVISION NUMBER	REVISION DATE	DESCRIPTION	PAGES CHANGED
0	3/15	Initial release	—

For pricing, delivery, and ordering information, please contact Maxim Direct at 1-888-629-4642, or visit Maxim Integrated's website at www.maximintegrated.com.

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Parent Number	Item	Component Description	Qty	Reference Designator	Manufacturer	Manufacturer Part Number	Assembly Comments
MAX98090EVKIT#WLP BILL	1	10uF ±20%, 6.3V X5R ceramic capacitor (0805)	4	C1, C3, C104, C202	TDK	C2012X5R0J106M	
	2	1uF ±10%, 6.3V X5R ceramic capacitor (0402)	19	C2, C11, C12, C13, C15, C18, C24, C26, C27, C29-C35, C200, C201, C204	TDK	C1005X5R0J105K	
	3	1uF ±20%, 6.3V X5R ceramic capacitor (0603)	10	C4, C5, C23, C25, C36, C37, C115-C118	Taiyo Yuden	JMK107B7105MA	
	4	0.1uF ±10%, 10V X7R ceramic capacitor (0402)	11	C6, C10, C40, C41, C61-C64, C203, C215, C216	Kemet	CO402C104K8RAC	
	5	100pF ±5%, 50V COG ceramic capacitor (0402)	2	C8, C9	Murata	GRM1555C1H100J	
	6	0.1uF ±10%, 50V X7R ceramic capacitor (0603)	2	C20, C23, C211, C212	Murata	GRM188R71H103K	
	7	2.2uF ±10%, 6.3V X5R ceramic capacitor (0603)	2	C21, C22	Murata	GRM188R6J225K	
	8	2.2uF ±20%, 6.3V X5R ceramic capacitor (0402)	1	C28	Taiyo Yuden	JMK105BJ225MV	
	9	0.22uF ±10%, 6.3V X5R ceramic capacitor (0402)	10	C38, C39, C52-C59	TDK	C1005X5R0J224K	
	10	OP07EN, Capacitors (0402)	9	C42, C44-C51			
	11	10uF ±20%, 6.3V X5R ceramic capacitor (0603)	1	C65	Murata	GRM188R6J106M	
	12	0.1uF ±10%, 50V X5R ceramic capacitor (0603)	11	C100, C101, C105, C107-C110, C113, C114, C209, C210	TDK	C160R5X1R1H04K	
	13	3000pF ±5%, 50V COH ceramic capacitor (0402)	4	C102, C103, C207, C208	Taiyo Yuden	UMK105CH08DV	
	14	83000pF ±10%, 25V X7R ceramic capacitor (0603)	1	C106	Murata	GRM188R71E333K	
	15	180pF ±5%, 50V COG ceramic capacitor (0603)	1	C111, C112	TDK	C1608C061H180J	
	16	47uF ±20%, 6.3V X5R ceramic capacitor (1206)	2	C205, C206	Murata	GRM31CR6U476M	
	17	0.47uF ±10%, 6.3V X5R ceramic capacitor (0603)	2	C213	Murata	GRM188R6J476K	
	18	47000pF ±10%, 25V X7R ceramic capacitor (0603)	1	C214	Murata	GRM188R71E473K	
	19	Shottky Diode (SOT23)	1	D2	Rohm	RB411DT146	
	20	LED, yellow (0603)	1	D100	Lite-On	LTST-C190YKT	
	21	LED, red (0603)	1	D101	Lite-On	LTST-C190CKT	
	22	Ferrite bead (0803)	2	FB100, FB200	Murata	BLM18P6221SN1	
	23	0Ohms ±5% resistor (0603)	4	FB1-FB4			
	24	0Ohms ±5% resistor (0402)	2	FB5, FB6			
	25	Ferrite bead (0402)	6	FB7-FB12	Murata	BLM15HD182SN1	
	26	USB Mini B Receptacle	2	J1, J2	Hirose Electric	UX60A-MB-5ST	
	27	3.5mm stereo headphone jack, 4 positions	1	HP	CUI Inc.	SLJ-43514-SMT	
	28	RC4 jack, 4C mount, nonswitched (red)	8	IN1, IN2, IN3, IN4, IN5, IN6, LOU1L, LOU2R	Kobicon E	161-009-E	
	29	Digital Audio Optical Transmitter	1	SPDFOUT	Everlight Inc.	PLT13379	
	30	Digital Audio Optical Receiver	1	SPDFIN	Everlight Electronics	PLR13579	
	31	3-pin header, 0.1" centers	2	JU1, JU2	Sullins	PEC36SAAN	Cut to fit
	32	2-pin header, 0.1" centers	20	JU3-JU13, JU17-JU19, JU22-JU24, JU27, JU28, JU100	Sullins	PEC36SAAN	Cut to fit
	33	4-pin (3-wire) header, 0.1" centers	1	JU14	Sullins	PEC36SAAN	Cut to fit
	34	12-pin header, 0.1" centers	1	JU15	Sullins	PEC36SAAN	Cut to fit
	35	6-pin (3x2) header, 0.1" centers	1	JU16	Sullins	PEC36DAAN	Cut to fit
	36	OPEN, inductors (62mm x 6.3mm)	1	L1-L4	Toko	#A916CJ-220M	
	37	MOSFET, 47uH, 220mA (18N12)	1	L200	Murata	LOH43M8147QJ3L	
	38	MOSFET -20V, -2.4A, P-channel (SuperSOT-3)	1	P100	Fairchild	FDN304P	Top mark 304
	39	MOSFET -20V, -2.4A, P-channel (SuperSOT-3)	1	P100	Fairchild	FDN304PZ	Top mark 04Z
	40	0 Ohms ±5% resistor (0402)	15	R1, R2, R9-R13, R32, R33, R38-R41, R111, R207			
	41	10K Ohms ±5% resistor (0402)	1	R5			
	42	OPEN, resistor (0402)	4	R6, R15, R16, R19			
	43	2.2K Ohms ±5% resistor (0402)	6	R14, R17, R18, R20, R29, R37			
	44	22 Ohms ±5% resistor (0402)	5	R21, R22, R23, R24, R200, R201			
	45	10K Ohms ±5% resistor (0603)	2	R34, R37			
	46	1.5K Ohms ±5% resistor (0603)	6	R100, R101, R104, R202, R204			
	47	27 Ohms ±5% resistor (0603)	2	R102, R103			
	48	470 Ohms ±5% resistor (0603)	1	R105			
	49	2.2K Ohms ±5% resistor (0603)	1	R106			
	48	220 Ohms ±5% resistor (0603)	2	R108, R110			
	50	1K Ohms ±5% resistor (0603)	1	R109			
	51	1M Ohms ±5% resistor (0603)	1	R203			
	52	47K Ohms ±5% resistor (0603)	1	R205			
	53	402 Ohms ±1% resistor (0603)	1	R206			
	54	SPST tactile switch, 12V, 0.5A	1	SW1			
	55	Steno Audio Codec (48 WLP)	1	U1	E-Switch	TL3302AF269QJ	
	56	OPEN, Digital Microphone (6 LGA)	1	U2	MAXIM	MAX98090EJW	
	57	Digital Microphone (6 LGA)	1	U3	Knowles Acoustics	SPM0423H-D4H-WB	
	57	Digital Microphone (6 LGA)	1	U3	Knowles Acoustics	SPM0423H-D4H-WB	DO NOT WASH
	58	Digital Microphone (6 LGA)	1	U4	Knowles Acoustics	SPM0423E-H4H-WB	DO NOT WASH
	58	Single CMOS switch debouncer (4 SOT143)	1	U4	MAXIM	MAX6816EUS+	
	59	1.8V Low Noise Linear Regulator (5 SOT23)	1	U5	MAXIM	MAX888TEZK18+	Topmark ADPX
	60	300mV LDO regulator (SOT23-6)	1	U6	MAXIM	MAX193AEZT120+	Topmark
	61	3.3V Low Noise Linear Regulator (5 SOT70)	2	U7, U20	MAXIM	MAX8511EXK33+	Topmark: AEI
	62	Dual SPDT switch (10 uDFN)	4	U8-U11	MAXIM	MAX4906ELB+	
	63	Low Power Microcontroller (56 TQFN)	1	U100	MAXIM	MAXQ2000-RBx+	
	64	USB to UART interface (32L-TQFN)	1	U101	FTDI	FT232RL	
	65	3-wire EEPROM, type 93C46 (SOIC-8)	1	U102	Atmel	AT93C46EN-SH-B	
	66	2.5V Low Noise Linear Regulator (5 SOT70)	1	U103	MAXIM	MAX8511EXK25+	
	67	Audio DAC with USB interface (32 QFP)	1	U200	TI	PCM2707PJT	
	68	Digital Audio Transceiver (28 SO)	1	U201	Cirrus Logic	CS8427-CS2	
	69	13MHz clock oscillator (2.5mm x 2.0mm)	1	Y10	ECS Inc.	ECS-2033-130-BN	
	70	8MHz crystal	1	Y11		SSL60000N1HK188F0	
	71	crystal, 16MHz (3.2mm x 2.5mm)	1	Y101	Hong Kong Xtals	CSX3225S816000D0FLJZZ	
	72	crystal, 12MHz (3.2mm x 2.5mm)	1	Y200	Kyocera	CSX3225S812000D0FLJZZ	
	73	Test Point "Miniature" 40mil drill size (red)	6	BLCK, LRCLK, SDIN, SDOUT, /IRQ/, MCLK	Keystone	5000	
	74	Test Point "Multipurpose" 63mil drill size (red)	4	SPKLP, SPKRP, HPR, HPL	Keystone	5010	
75	Test Point "Multipurpose" 63mil drill size (black)	8	SPKLN, SPKRN, GND(x5), HPGND	Keystone	5011		
76	Shunt, Shorting Jumper, 2 position, 0.1 center	29		Kevo	SX1100-B		
77	Buss wire, 20G plated solid copper 0.25 inch U-shape wire loop	24	IN1, IN2, IN3, IN4, IN5, IN6, JACKSENSE, RCVP/LOUTL, RCVN/LOUTR, FSPKLP, FSPKLN, FSPKRP, FSPKRN, DVDD, DVDDIO, AVDD, HPGVDD, SPKVDD, GND(x6)	Wicon Wire	9200 Buss		
78	PCB	1	MAX98090 WLP EVALUATION KIT	Via Systems			
79	PCB	1	MAX98090 WLP EVALUATION KIT	MEI			
80	PCB	1	MAX98090 WLP EVALUATION KIT	Gorilla Circuits			
PACK-OUT	1	Cable, USB high-speed A-to-mini B	1				
	2	Inductor, 22uH, 1A (6.2mm x 6.3mm)	1				
	1		1				



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DRAWN:	DATED: 01/23/13	SHEET: OF 6

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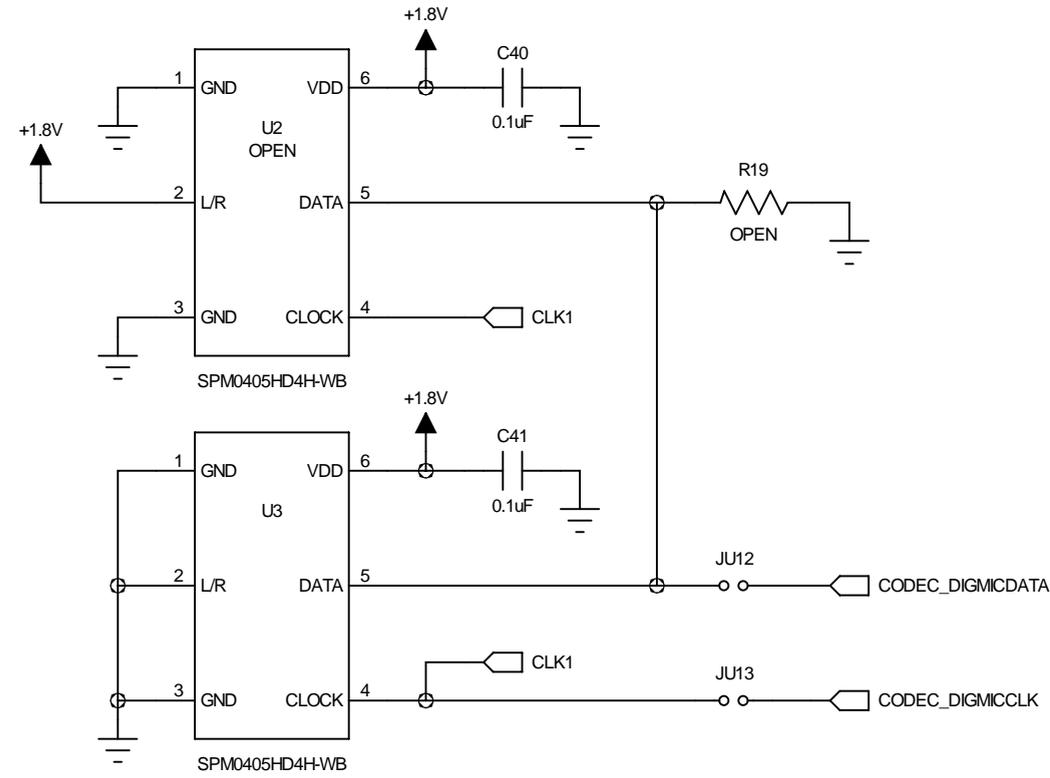
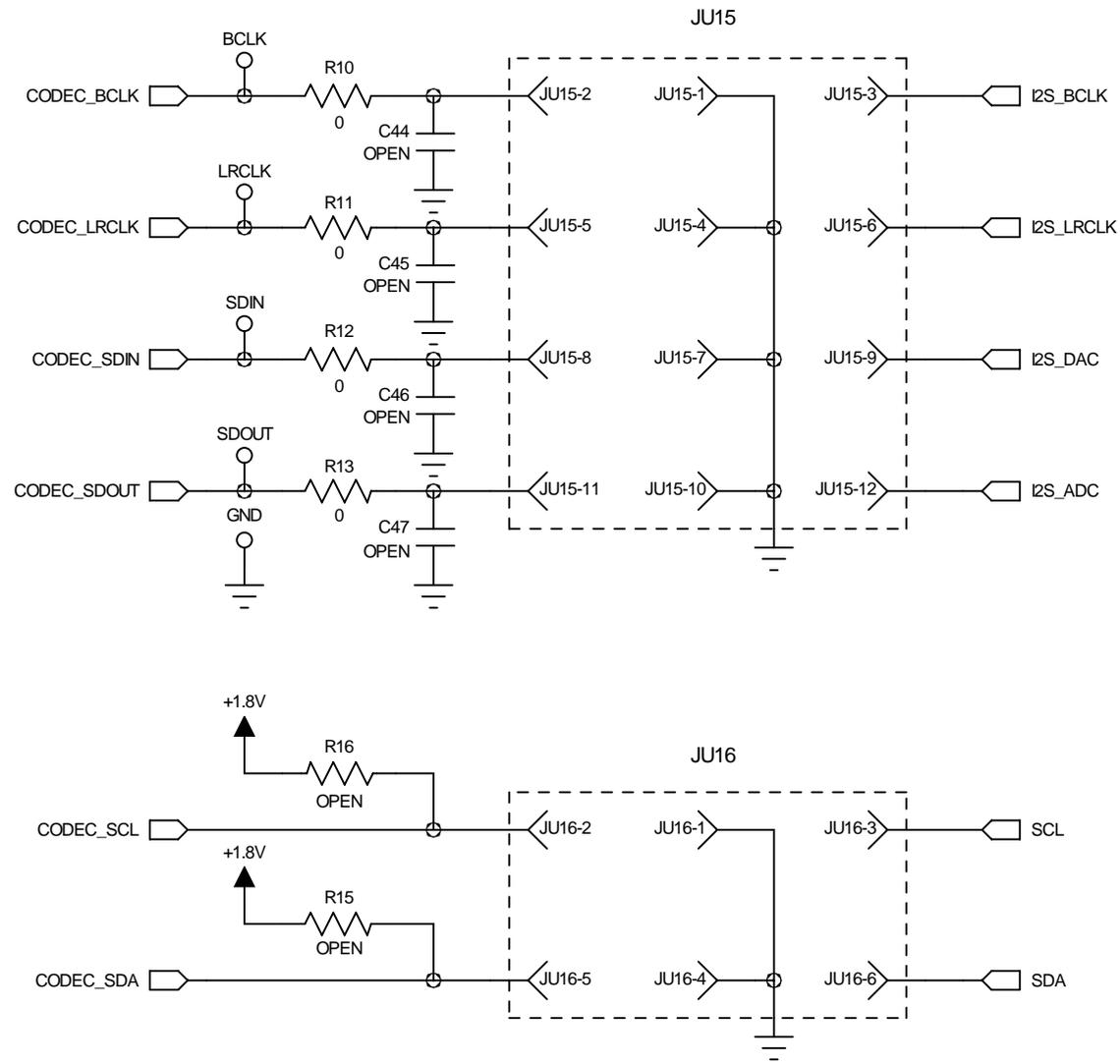
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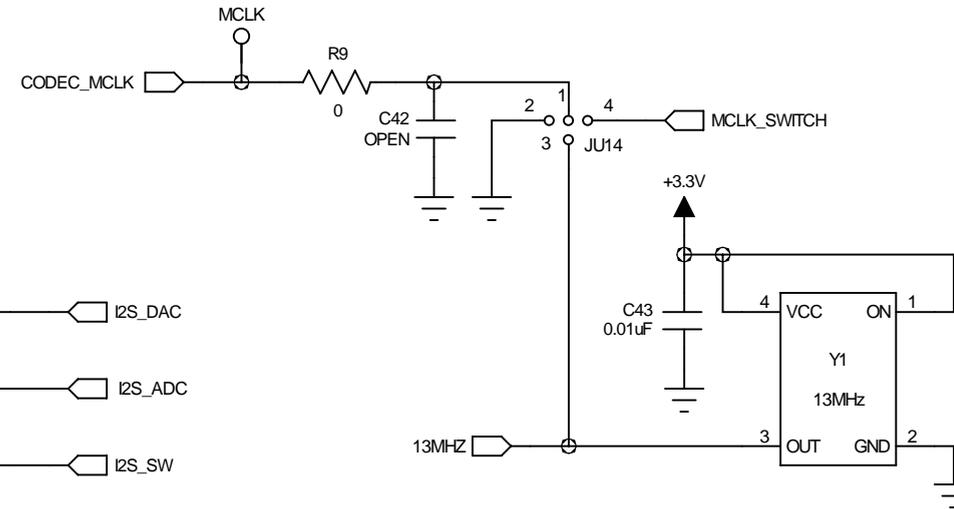
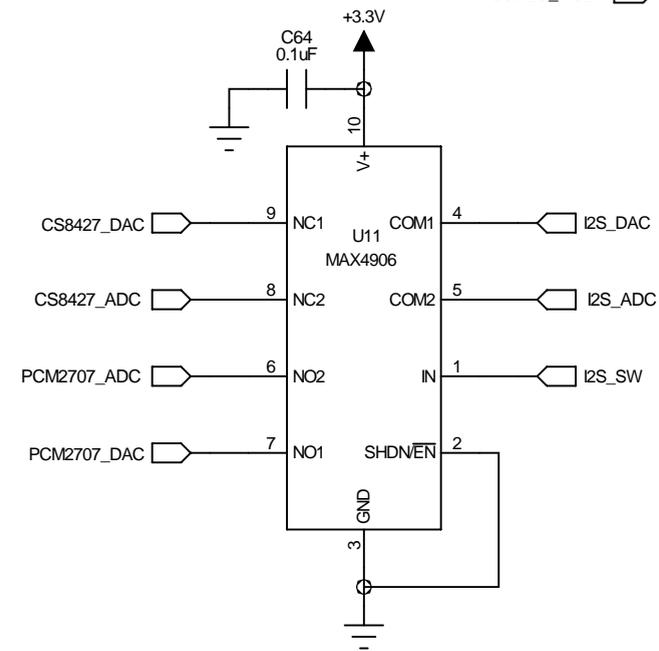
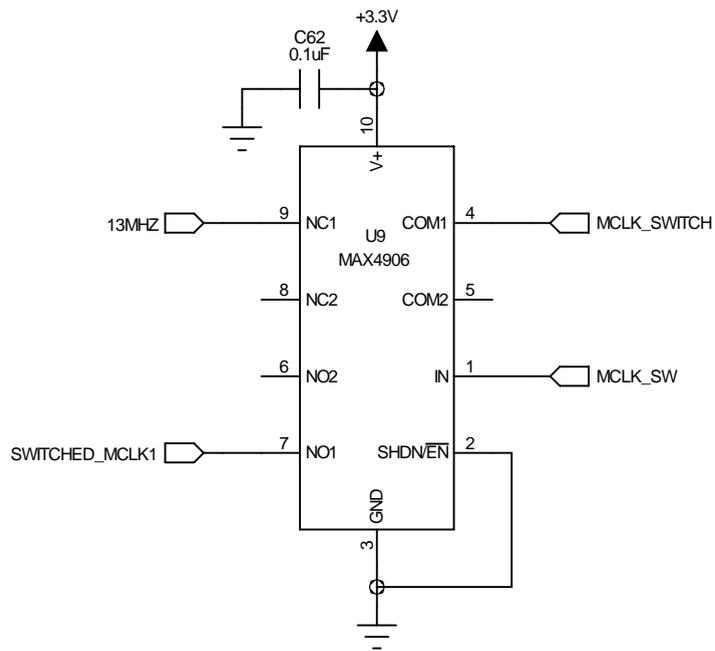
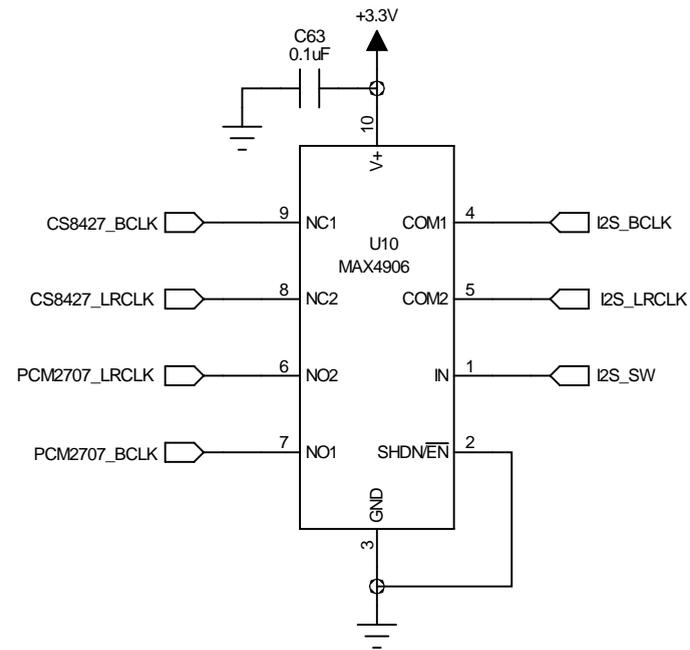
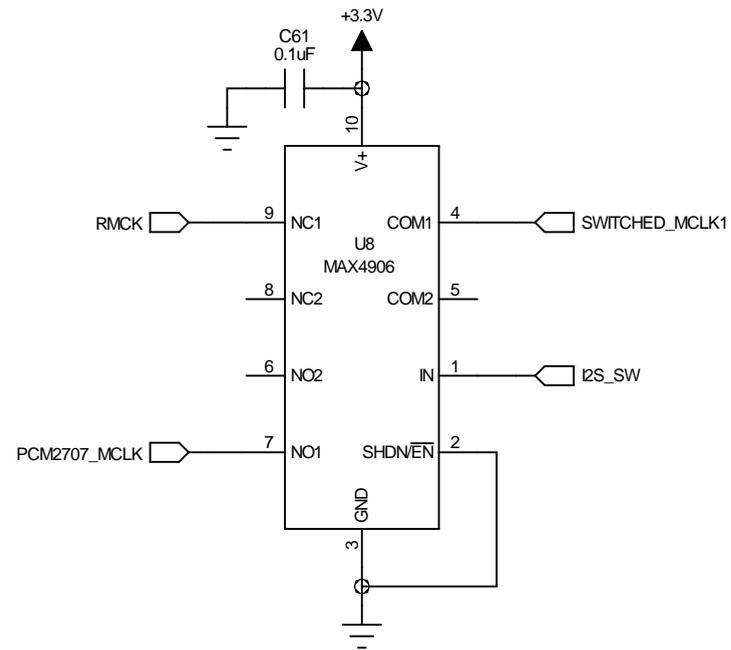
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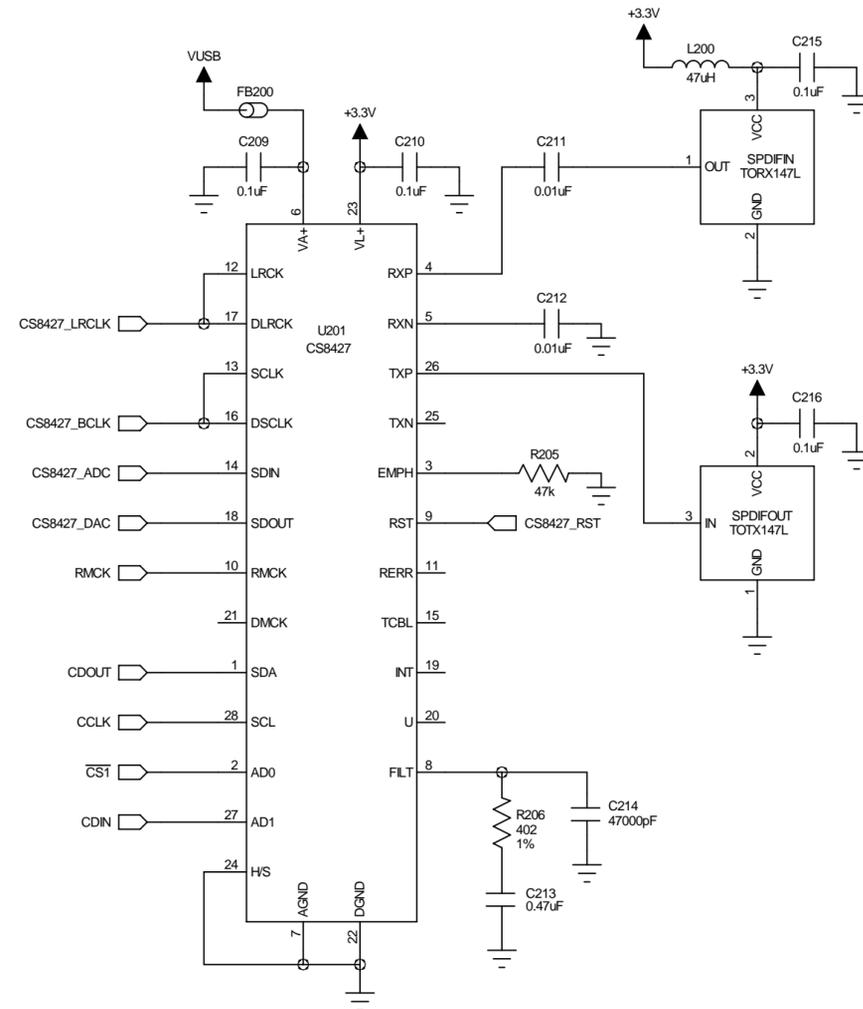
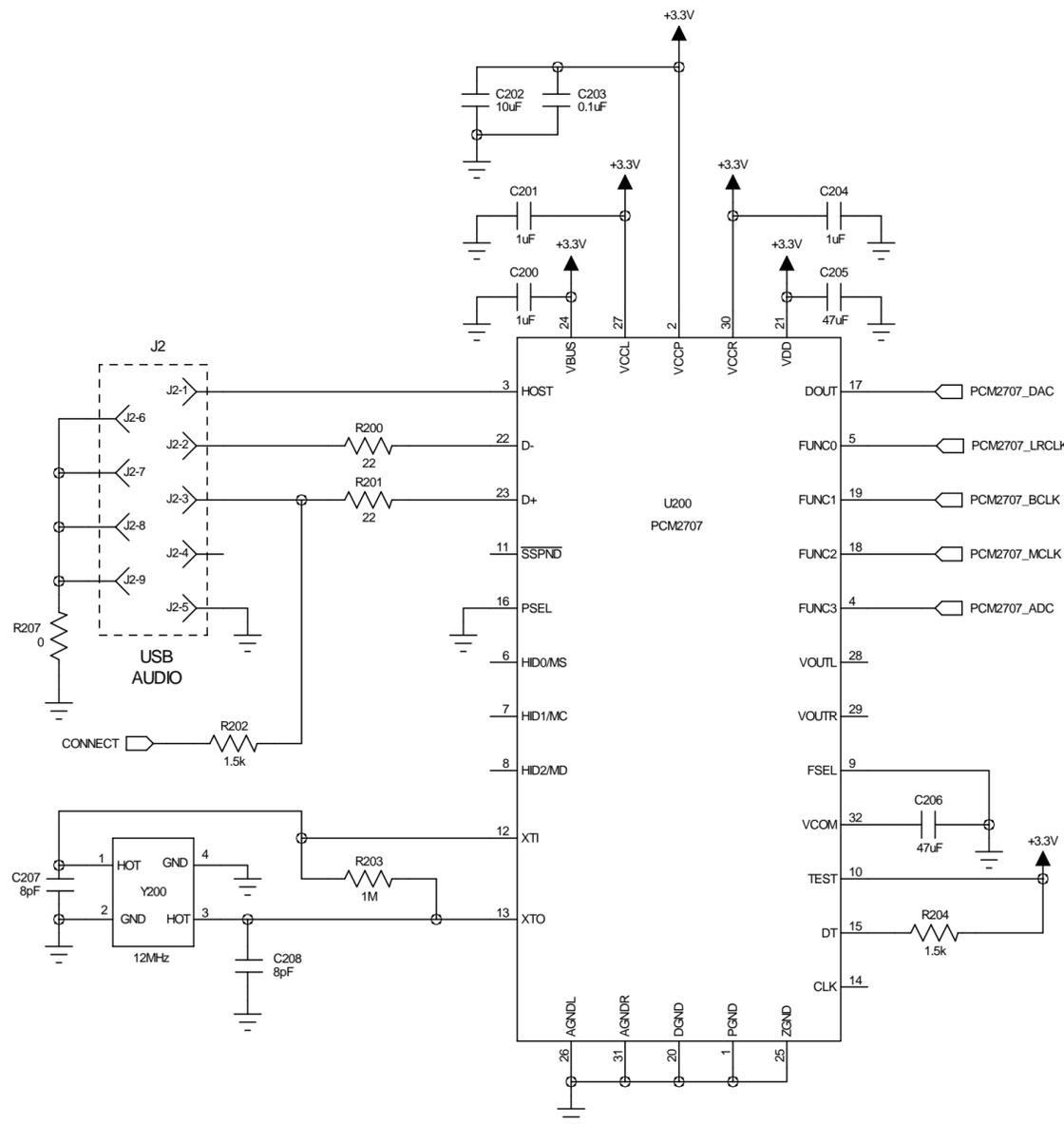
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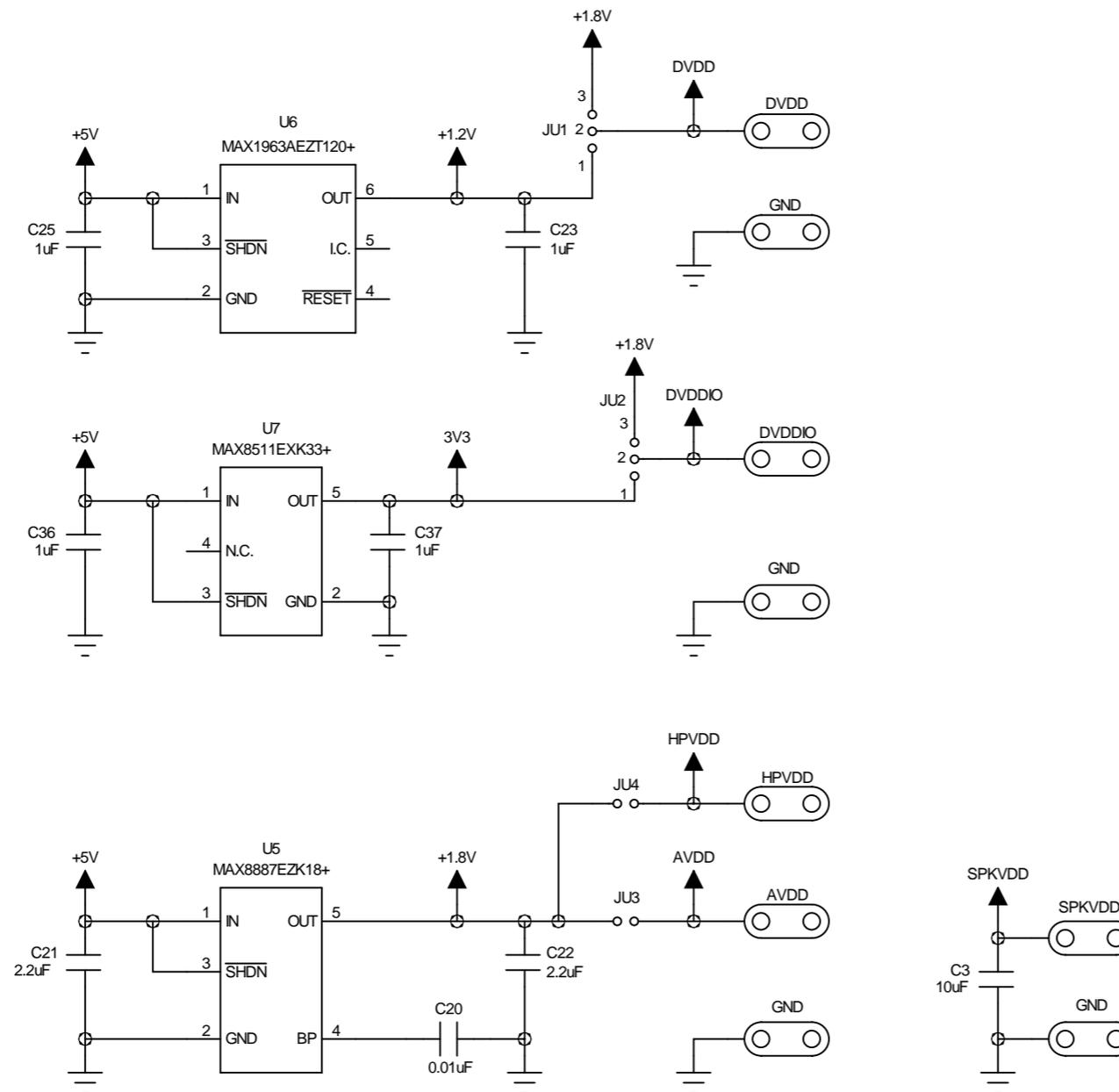


maxim integrated™		
TITLE: MAX98090 WLP EVALUATION KIT		
DRAWN:	DATED: 01/23/13	PCB PART NUMBER: EPCB98090WLP
SHEET:	OF 1	REV: A

TITLE: MAX98090 WLP EVALUATION KIT	REV: A
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DRAWN:	DATED: 01/23/13
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PCB PART NUMBER: EPCB98090WLP	SHEET: 6 OF 6
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MAX98090 WLP EVALUATION KIT

P/N: EPCB98090WLP

REV
A



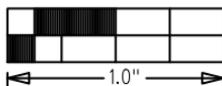
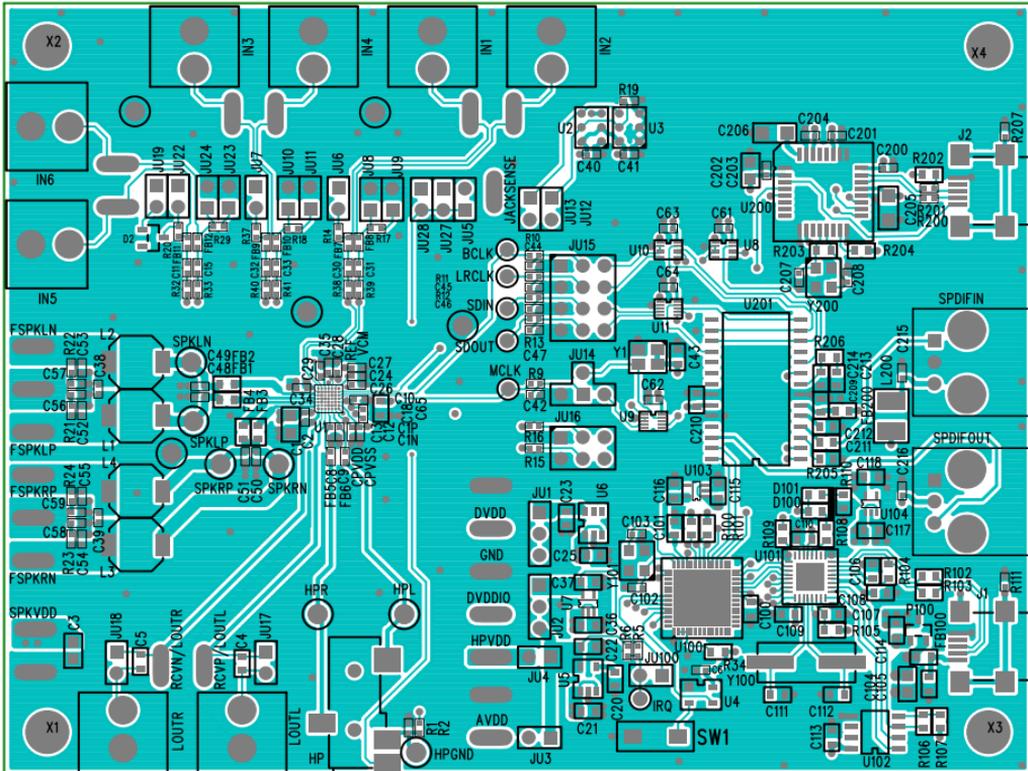
maxim
integrated™

LAYER

COMPONENT SIDE

DATE:

ALL UNITS ARE IN 0.001"



MAX98090 WLP EVALUATION KIT

P/N: EPCB98090WLP

REV
A

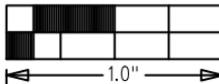
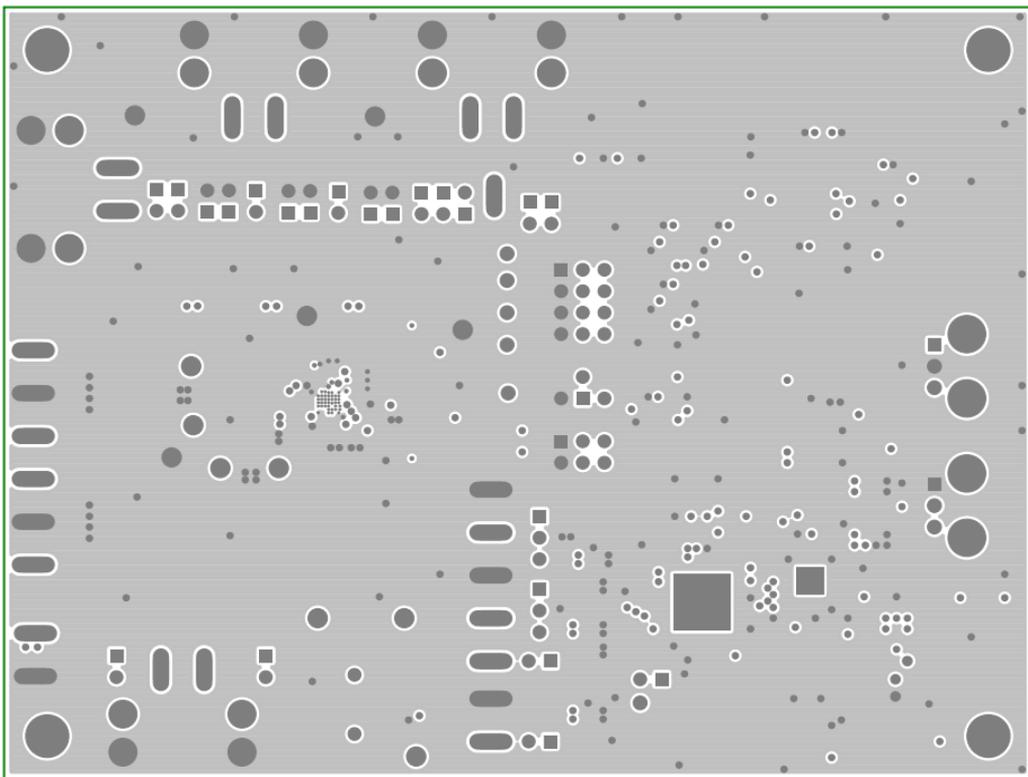


LAYER

LAYER 2 GND

DATE:

ALL UNITS ARE IN 0.001"



MAX98090 WLP EVALUATION KIT

P/N: EPCB98090WLP

REV
A

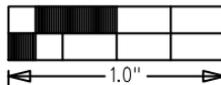
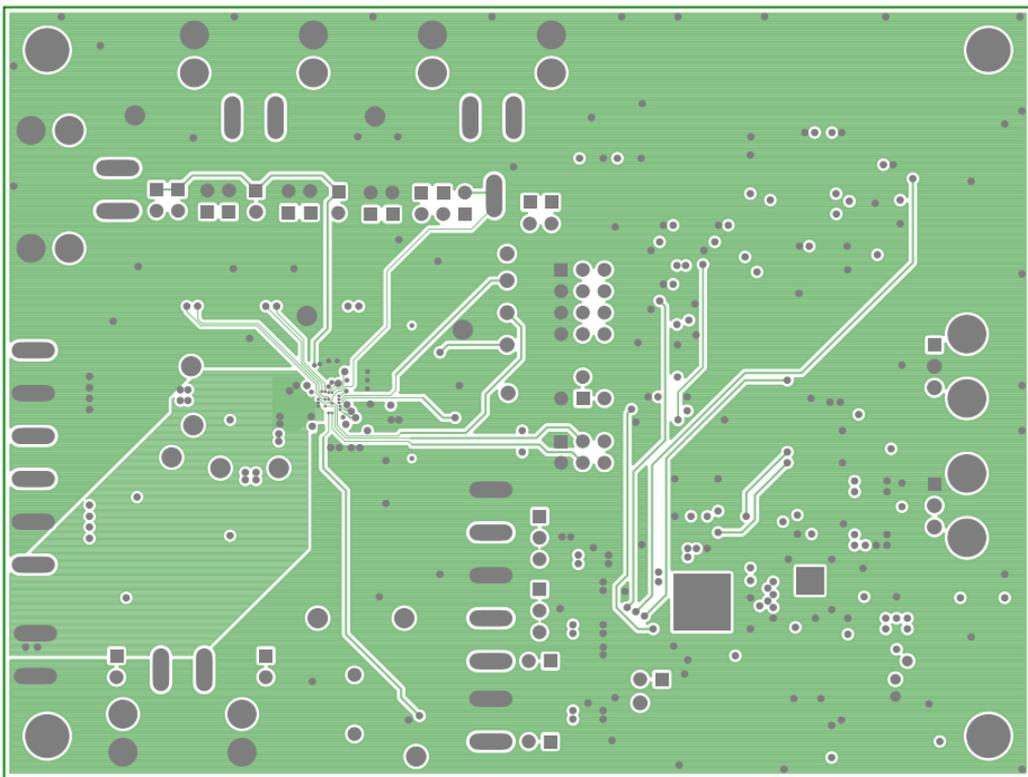


LAYER

LAYER 3 PWR

DATE:

ALL UNITS ARE IN 0.001"



MAX98090 WLP EVALUATION KIT

P/N: EPCB98090WLP

REV
A

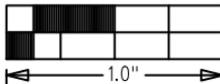
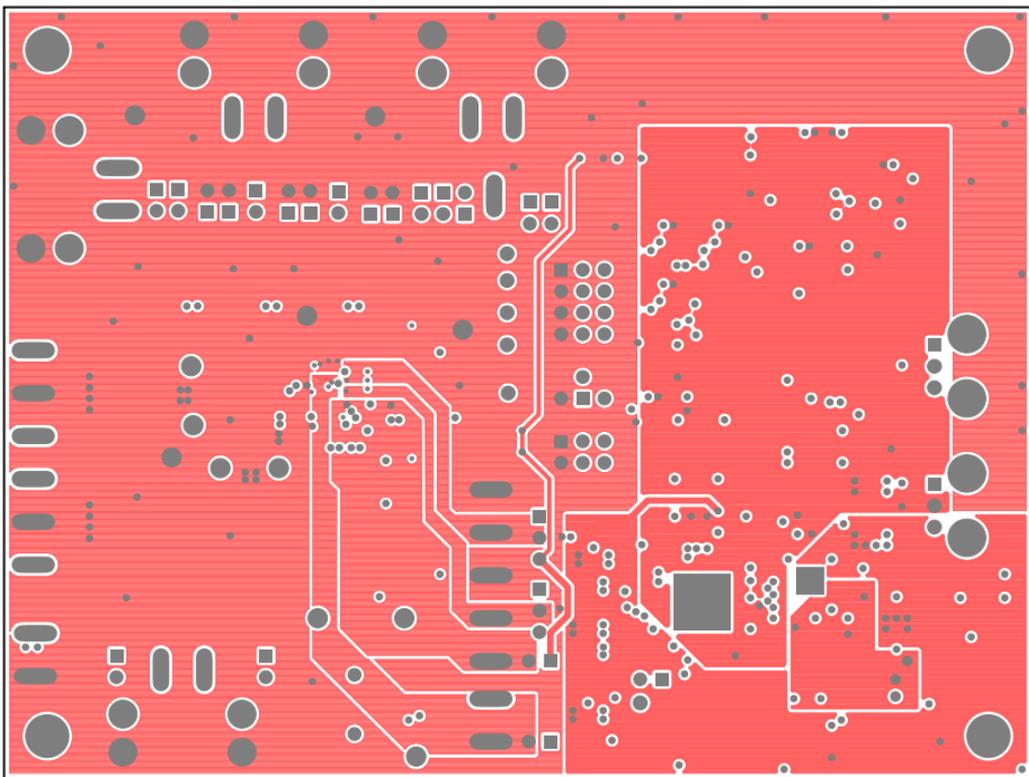


LAYER

LAYER 4 PWR

DATE:

ALL UNITS ARE IN 0.001"



MAX98090 WLP EVALUATION KIT

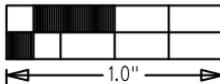
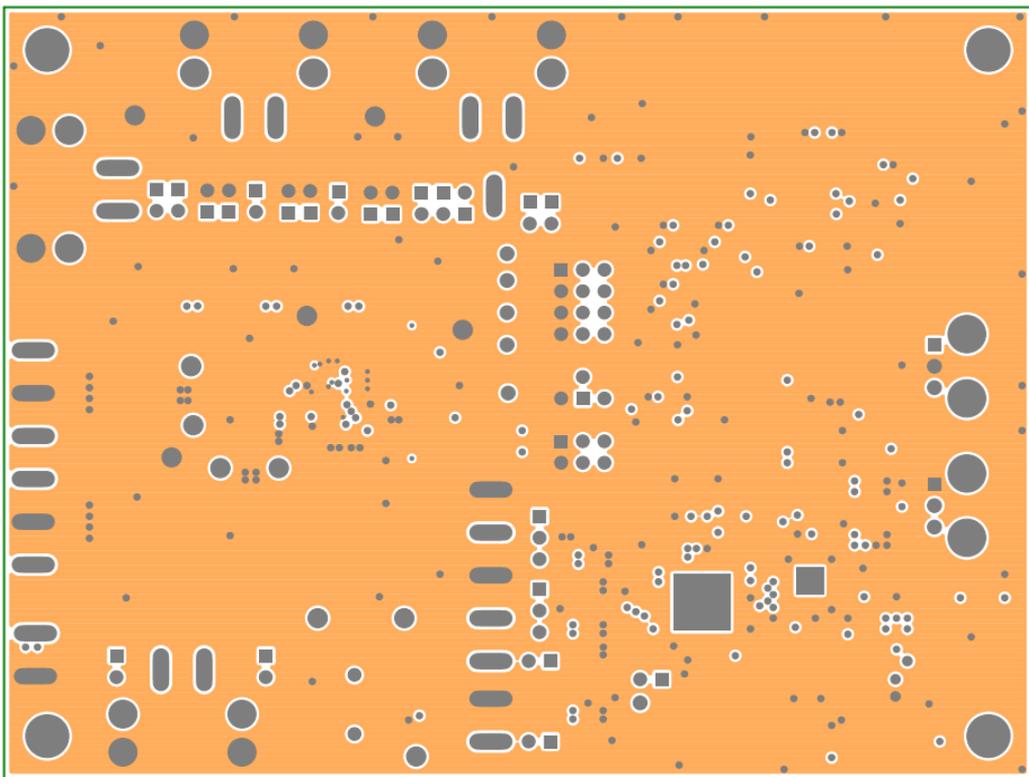
P/N: EPCB98090WLP

REV
A



LAYER
LAYER 5 GND

DATE: ALL UNITS ARE IN 0.001"



MAX98090 WLP EVALUATION KIT

P/N: EPCB98090WLP

REV
A



LAYER
SOLDER SIDE

DATE: ALL UNITS ARE IN 0.001"

