



# **WM8569\_6168\_SSOP28\_EV1**

**Evaluation Board User Handbook**

**Rev 1.0**

### QUICK START GUIDELINES

The purpose of this section is to allow the WM8569 evaluation board to be setup without the need to read through this manual in detail.

The following procedure should be followed to set up the DAC signal path using the WM8569\_EV1S software supplied as part of the Evaluation Pack for the WM8569:

1. Download and install the control software  
[Refer to the 'Serial Interface Software Description' section on page 12]
2. Setup the board switches and jumpers  
[Refer to the 'WM8569-EV1B Quick Setup' section on page 6]
3. Connect power supplies
4. Attach analogue/digital input/output cables as required
5. Attach USB cable. Ensure that the LED in the USB Status software panel is red confirming USB connection.  
[Refer to the 'Register Control Software' section on page 15]
6. Press the 'Display GUI' button and the 'DAC Setup' button from the software control panel **OR** load the DAC\_slave\_24-bit\_I2S\_only\_no\_ADC.txt setup file.  
[Refer to the 'Register Control Software' section on page 15]

## TABLE OF CONTENTS

<b>QUICK START GUIDELINES</b> .....	<b>2</b>
<b>TABLE OF CONTENTS</b> .....	<b>3</b>
<b>INTRODUCTION</b> .....	<b>4</b>
<b>GETTING STARTED</b> .....	<b>4</b>
PACKING LIST .....	4
CUSTOMER REQUIREMENTS .....	4
POWER SUPPLIES .....	5
WM8569-EV1B QUICK SETUP .....	6
<b>BOARD FUNCTIONALITY</b> .....	<b>6</b>
DIGITAL INPUT .....	6
DIGITAL OUTPUT .....	7
ANALOGUE INPUTS .....	7
ANALOGUE OUTPUTS .....	7
CONTROL INTERFACE .....	7
HEADERS .....	8
JUMPERS AND SWITCHES .....	9
<b>SOFTWARE CONTROL</b> .....	<b>10</b>
3-WIRE MODE .....	10
BLOCK DIAGRAM .....	10
REGISTER MAP .....	11
<b>SERIAL INTERFACE SOFTWARE DESCRIPTION</b> .....	<b>12</b>
SOFTWARE DOWNLOAD .....	12
SOFTWARE INSTALLATION .....	12
SOFTWARE PANEL OPERATION .....	12
REGISTER CONTROL SOFTWARE .....	15
SETUP TEXT FILES .....	18
<b>WM8569- EV1B SCHEMATIC</b> .....	<b>19</b>
<b>WM8569- EV1B PCB LAYOUT</b> .....	<b>23</b>
<b>WM8569-EV1B BILL OF MATERIAL</b> .....	<b>26</b>
<b>APPENDIX</b> .....	<b>28</b>
<b>1. EXTERNAL DSP CONNECTION TO THE WM8569-EV1B</b> .....	<b>28</b>
AUDIO INTERFACE CONNECTIONS .....	28
SOFTWARE INTERFACE .....	30
CONNECTION DIAGRAMS .....	30
<b>2. USB INTERFACE TROUBLESHOOTING</b> .....	<b>30</b>
MESSAGE BOX EXPLANATIONS - COMMUNICATIONS ISSUES .....	30
USB COMMUNICATIONS ISSUES .....	30
MESSAGE BOX EXPLANATIONS - FILE LOAD/SAVE FUNCTIONS .....	30
<b>EVALUATION SUPPORT</b> .....	<b>30</b>
<b>IMPORTANT NOTICE</b> .....	<b>30</b>
ADDRESS: .....	30

## INTRODUCTION

The WM8569 is a 24-bit, 192kHz Stereo Codec with Volume Control.

This evaluation platform and documentation should be used in conjunction with the latest version of the WM8569 datasheet. The datasheet gives device functionality information as well as timing and data format requirements.

This evaluation platform has been designed to allow the user ease of use and give optimum performance in device measurement as well as providing the user with the ability to listen to the excellent audio quality offered by the WM8569.

## GETTING STARTED

### PACKING LIST

The WM8569 Evaluation Kit consists of:

- WM8569-EV1B Evaluation Board
- WM8569-EV1S control software (downloadable from '[www.wolfsonmicro.com](http://www.wolfsonmicro.com)')
- This manual - WM8569-EV1M (downloadable from '[www.wolfsonmicro.com](http://www.wolfsonmicro.com)')

### CUSTOMER REQUIREMENTS

Minimum customer requirements are:

- D.C. Power supply of +5V
- D.C. Power supply of +2.7V to +5.5V
- D.C. Power supply of  $\pm 12V$

Minimum PC spec requirements are:

- PC with USB connection
- Win2000/XP

DAC Signal Path Requires:

- Digital coaxial or optical data source
- One set of active stereo speakers

ADC Signal Path Requires:

- Analogue coaxial jack plug signal source
- Digital coaxial receiving unit

Analogue Signal Path Requires:

- Analogue coaxial jack plug signal source
- One set of active stereo speakers

**POWER SUPPLIES**

Using appropriate power leads with 4mm connectors, power supplies should be connected as described in Table 1.

REF-DES	SOCKET NAME	SUPPLY
J1	+5V	+5V
J2	DGND	0V
J3	DVDD	+2.7V to +3.6
J4	AVDD	+2.7V to +5.5V
J5	AGND	0V
J6	-12V	-12V
J7	+12V	+12V

**Table 1 Power Supply Connections**

**Note:** Refer to the WM8569 datasheet for limitations on individual supply voltages.

**Important:** Exceeding the recommended maximum voltage can damage EVB components. Under voltage may cause improper operation of some or all of the EVB components.

# WM8569\_6168\_SSOP28\_EV1

## WM8569-EV1B QUICK SETUP

The diagram below shows the default jumper, switch and LED status that can be used to quickly setup the WM8569 in accordance with the Quick Start Guidelines on page 2.

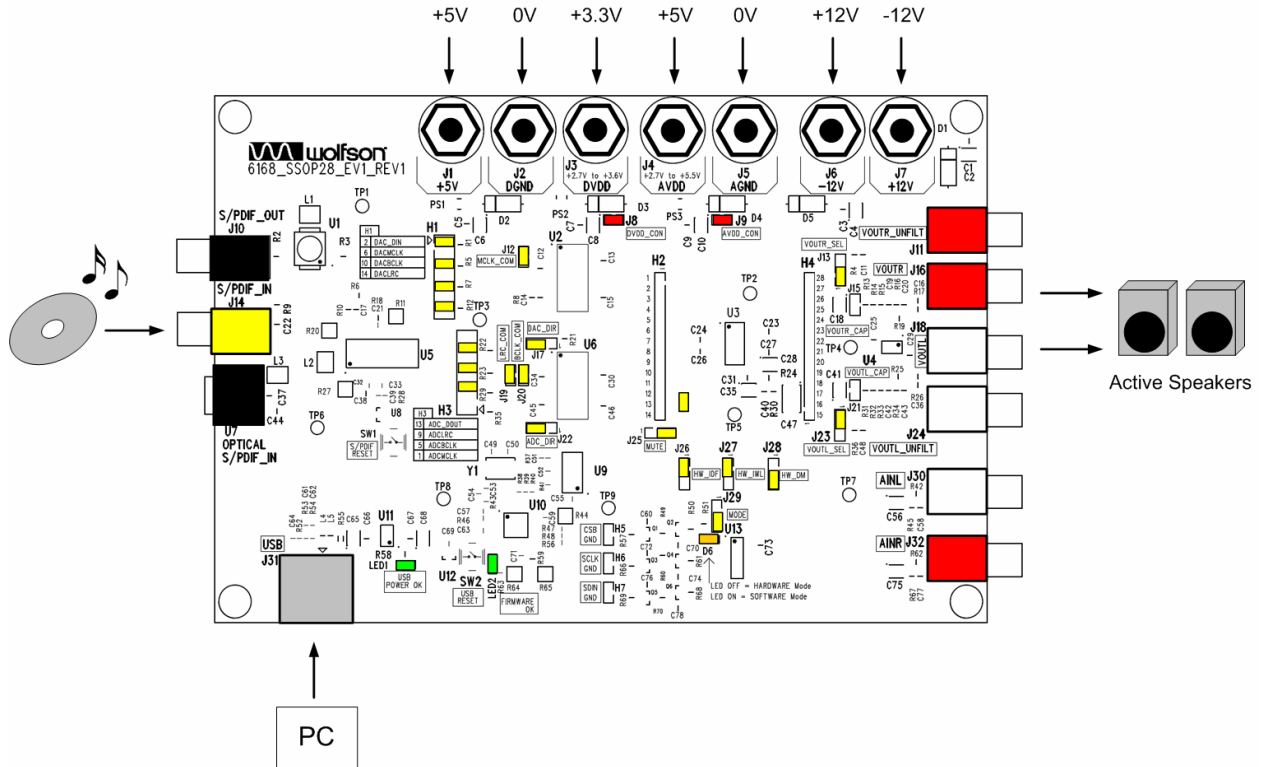


Figure 1 Quick Setup of 6168\_SSOP28\_EV1\_REV1

## BOARD FUNCTIONALITY

### DIGITAL INPUT

There are three possible methods to input the required digital signal clocks to the WM8569 evaluation board. An AES/EBU, UEC958, S/PDIF, EIAJ CP340/1201 signal from coaxial input via a standard phono connector (J14), a similar signal from the optical input (U7) or direct digital input is available via one side of a 2x8 pin header (H1). The digital input connectors are summarised in Table 2.

Level shift ICs (U2 and U6) have been included in the digital interface paths to provide signal buffering to the input signal clocks; this allows external digital signal sources to be matched to the WM8569 requirements.

REF-DES	SOCKET NAME	SIGNAL
J14	S/PDIF_IN	Coaxial S/PDIF Digital Input
U7	OPTICAL S/PDIF_IN	Optical S/PDIF Digital Input

Table 2 Digital Inputs

**Note:** When used in Master Mode with the CS8427, a SPDIF signal must still be applied to phono connector J14 or optical connector U7. This input signal is used to allow correct operation of the CS8427 as well as being used to generate the MCLK for the WM8569.

## DIGITAL OUTPUT

The ADC output can be converted into an S/PDIF signal via the CS8427 device (U5) and output from the WM8569 evaluation board via a standard phono connector (J10). Alternatively, the ADC output data and clocks may be accessed via one side of a 2x8 pin header (H3).

Level shift ICs (U2 and U6) have been included in the digital interface paths to provide signal buffering to the output signals; this allows the S/PDIF transmitter requirements to be met.

REF-DES	SOCKET NAME	SIGNAL
J10	S/PDIF_OUT	Coaxial S/PDIF Digital Output

**Table 3 Digital Output**

## ANALOGUE INPUTS

The stereo audio inputs to the board can be connected to an external source. These inputs are described in Table 4:

REF-DES	SOCKET NAME	SOCKET COLOUR	SIGNAL
J30	AINL	White	Left Analogue Input
J32	AINR	Red	Right Analogue Input
Analogue signals applied to these connectors are AC coupled before being input to the WM8569.			

**Table 4 Analogue Inputs**

In order to make the inputs to the WM8569 evaluation board compatible with the standard  $2V_{RMS}$  signal level available in consumer equipment, the analogue input stage includes a 2:1 potential divider. This reduced the signal input to the WM8569 to 50% of the input signal to the WM8569 evaluation board.

## ANALOGUE OUTPUTS

The analogue outputs from the WM8569 can be routed directly from the WM8569 without any filtering, or via an active filter with 6dB of gain. When using the filtered output, the full-scale signal level from the device when operating with typical supplies will be at  $2V_{RMS}$ .

REF-DES	SOCKET NAME	SOCKET COLOUR	SIGNAL
J11	VOU <sub>TR</sub> _UNFIL <sub>T</sub>	Red	Right Analogue output with no filtering
J16	VOU <sub>TR</sub>	Red	Right Analogue output with filtering
J18	VOU <sub>TL</sub>	White	Left Analogue output with filtering
J24	VOU <sub>TL</sub> _UNFIL <sub>T</sub>	White	Left Analogue output with no filtering
Unfiltered outputs have signals biased to VMID from the WM8569			
Filtered outputs have signals biased to AGND			

**Table 5 Analogue Inputs**

Selection between filtered and unfiltered outputs is made using J13 and J23, described in Table 10.

## CONTROL INTERFACE

When using the WM8569\_EV1S to use the WM8569 in software control mode, J31 is used to connect the WM8569\_EV1M to a USB port on a PC. Alternatively, control interface signals can be connected to the board using three two-pin headers (H5, H6 and H7).

**HEADERS**

H2	SIGNAL
1	DACMCLK
2	ADCBCLK
3	DACBCLK
4	ADCLRC
5	DACLRC
6	DVDD
7	DGND
8	DIN
9	NC
10	DOUT
11	CSB/IDF
12	SCLK/IWL
13	SDIN/DM
14	MUTE

**Table 6 Device Headers**

H4	SIGNAL
15	REFADC
16	ADCVREFN
17	DACVREFN
18	DACVREFP
19	VMID
20	AINR
21	AINL
22	VOUTL
23	VOUTR
24	NC
25	AGND
26	AVDD
27	MODE
28	ADCMCLK

H1	SIGNAL
1/2	DIN
3/4	GND
5/6	DACMCLK
7/8	GND
9/10	ADCBCLK
11/12	GND
13/14	DACLRC
15/16	GND

**Table 7 Audio Interface Headers**

H3	SIGNAL
1/2	ADCMCLK
3/4	GND
5/6	ADCBCLK
7/8	GND
9/10	ADCLRC
11/12	GND
13/14	DOUT
15/16	GND

H5	SIGNAL
1	CSB
2	GND

H6	SIGNAL
1	SCLK
2	GND

H7	SIGNAL
1	SDIN
2	GND

**Table 8 Control Interface Headers**



## JUMPERS AND SWITCHES

**Note:** The PCB components are numbered from the top left corner to bottom right to ease locating switches, connectors and components.

JUMPERS	JUMPER STATUS	DESCRIPTION
J12	SHORT OPEN	Common ADCMCLK and DACMCLK <a href="#">[default setting]</a> Independent ADCMCLK and DACMCLK
J19	SHORT OPEN	Common ADCLRC and DACLRC <a href="#">[default setting]</a> Independent ADCLRC and DACLRC
J9	SHORT OPEN	AVDD applied to device <a href="#">[default setting]</a> AVDD disconnected Jumper can be used to make current consumption measurements
J8	SHORT OPEN	DVDD applied to device <a href="#">[default setting]</a> DVDD disconnected Jumper can be used to make current consumption measurements
J15	SHORT OPEN	VOUTr is not AC coupled before LPF VOUTr is AC coupled before LPF <a href="#">[default setting]</a>
J21	SHORT OPEN	VOUtl is not AC coupled before LPF VOUtl is AC coupled before LPF <a href="#">[default setting]</a>
J20	SHORT OPEN	Common ADCBCLK and DACBCLK <a href="#">[default setting]</a> Independent ADCBCLK and DACBCLK

**Table 9 Jumpers**

SWITCHES	SWITCH STATUS	DESCRIPTION	
J17	1-2	DAC Clocks from WM8569 (Master Mode)	
	2-3	DAC Clocks to WM8569 (Slave Mode) <a href="#">[default setting]</a>	
J22	1-2	ADC Clocks from WM8569 (Master Mode)	
	2-3	ADC Clocks to WM8569 (Slave Mode) <a href="#">[default setting]</a>	
J25	1-2	Mute DAC	
	2	IzD Output	
	2-3	Normal Operation <a href="#">[default setting]</a>	
J26	J26	ADC/DAC Audio Format Selection (HARDWARE MODE)	
	2-3		24-bit Right Justified
	2-3		20-bit Right Justified
J27	1-2	16-bit I <sup>2</sup> S	
	1-2	24-bit I <sup>2</sup> S <a href="#">[default setting]</a>	
J28	1-2	Apply deemphasis filtering	
	2-3	Do not apply deemphasis filtering <a href="#">[default setting]</a>	
J29	1-2	Hardware Control Mode	
	2-3	Software Control Mode <a href="#">[default setting]</a>	
J13	1-2	VOUtl filtered <a href="#">[default setting]</a>	
	2-3	VOUtl unfiltered	
J23	1-2	VOUTr filtered <a href="#">[default setting]</a>	
	2-3	VOUTr unfiltered	
SW1		S/PDIF Transceiver CS8427 Reset	
SW2		USB Reset	

**Table 10 Switches**

## SOFTWARE CONTROL

In addition to the hardware control mode, the WM8569 also has a 3-wire SPI-compatible software interface mode which allows access to a greater number of features.

### 3-WIRE MODE

SDIN/DM is used for the program data, SCLK/IWL is used to clock in the program data and CSB/IDF is used to latch the program data. SDIN/DM is sampled on the rising edge of SCLK/IWL. The 3-wire interface protocol is shown in Figure 2.

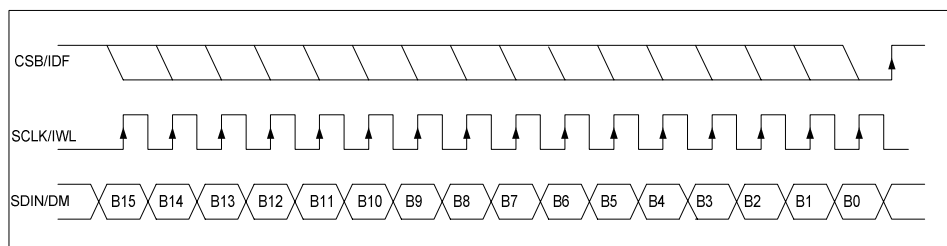


Figure 2 3-Wire SPI Compatible Interface

#### Notes:

1. B[15:9] are Control Address Bits
2. B[8:0] are Control Data Bits
3. CSB/IDF is edge sensitive – the data is latched on the rising edge of CSB/IDF.

## BLOCK DIAGRAM

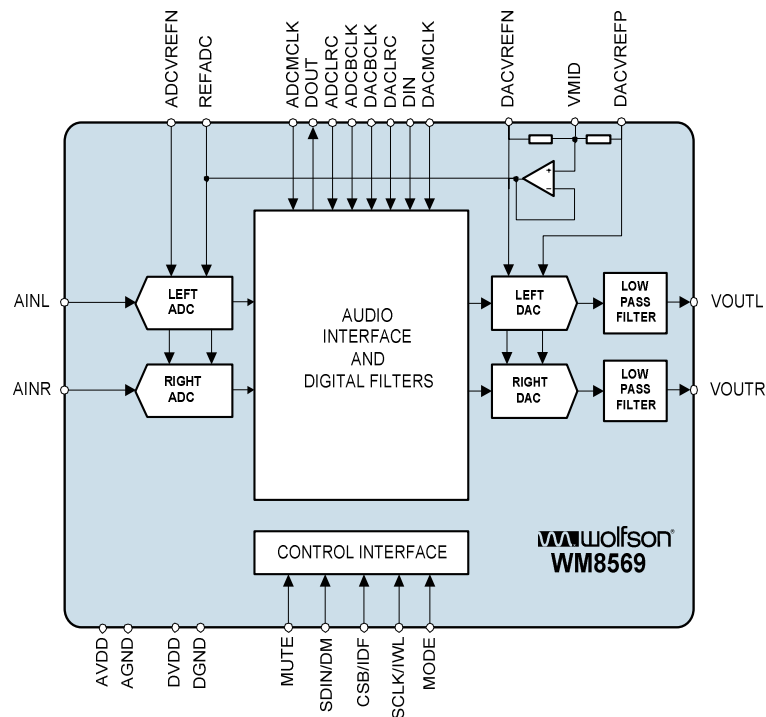


Table 11 Block Diagram

## REGISTER MAP

REGISTER	B15	B14	B13	B12	B11	B10	B9	B8	B7	B6	B5	B4	B3	B2	B1	B0	DEFAULT
R0(00h)	0	0	0	0	0	0	0	UPDATE	LDA[7:0]								01111111
R1(01h)	0	0	0	0	0	0	1	UPDATE	RDA[7:0]								01111111
R2(02h)	0	0	0	0	0	1	0	PL[8:5]				IZD	ATC	0	0	0	10010000
R3(03h)	0	0	0	0	0	1	1	0	0	PHASE	DACIWL[5:4]		DACBCP	DACLR	DACFMT[1:0]		00000000
R8(08h)	0	0	0	1	0	0	0	UPDATE	MASTDA[7:0]								01111111
R9(09h)	0	0	0	1	0	0	1	0	0	DEEMP	0	0	DMUTE	0	0	ZCD	00000000
R10(0Ah)	0	0	0	1	0	1	0	DACRATE[8:6]			MS	PWRDN ALL	0	0	DACPD	ADCPD	01000000
R11(0Bh)	0	0	0	1	0	1	1	ADC OSR	ADCRATE[7:5]			ADCMS	ADCIWL[3:2]		ADCFMT[1:0]		00100000
R12(0Ch)	0	0	0	1	1	0	0	0	0	MPD	ADCBCP	ADCLR	ADCHP	AMUTE ALL	AMUTEL	AMUTER	00000000
R31(1Fh)	0	0	1	1	1	1	1	RESET								00000000	

Table 12 Mapping of Program Registers

Please refer to the WM8569 datasheet for full details of the serial interface timing and all register features.

### SERIAL INTERFACE SOFTWARE DESCRIPTION

The following section will detail the downloading and installation of evaluation software as well as detailing its operation.

### SOFTWARE DOWNLOAD

The current evaluation board software should be downloaded from the Wolfson website [[www.wolfsonmicro.com](http://www.wolfsonmicro.com)].

From the homepage it is recommended that you perform a search for 'WM8569' and select the 'more button' from the evaluation boards section. Select 'download' from the right hand side under the software label. Once you have accepted the licence agreement select the WM8569\_6168\_SSOP28\_EV1S\_Rev1.0.ZIP link and download to your hard drive.

In addition to the WM8569 specific panels, there is a generic register write software panel that allows individual registers to be written to or text files of pre-defined register value and order can be loaded and written to the board. These panels are all accessible using the WM8569\_EV1S software described above.

### SOFTWARE INSTALLATION

Once the .zip file has been downloaded, to install the software:

- Open the .zip file.
- Double click on the 'setup.exe' file.
- Follow the on-screen installation instructions and save to the desired location.

The software can then be opened by either running the extracted WM8569\_EVX\_Rev1.0.exe file from the saved location. Alternatively select: Start > Programs > WM8569- EV1S Rev1.0> WM8569-EV1S.

### SOFTWARE PANEL OPERATION

On launching the WM8569\_EV1S software, a Wolfson Software license screen will appear which you must accept in order to use the panel. The main application panel, shown in Figure 3, will then be displayed.

Register values written to the WM8569 using the GUI will be echoed into the Text Box on the main panel.

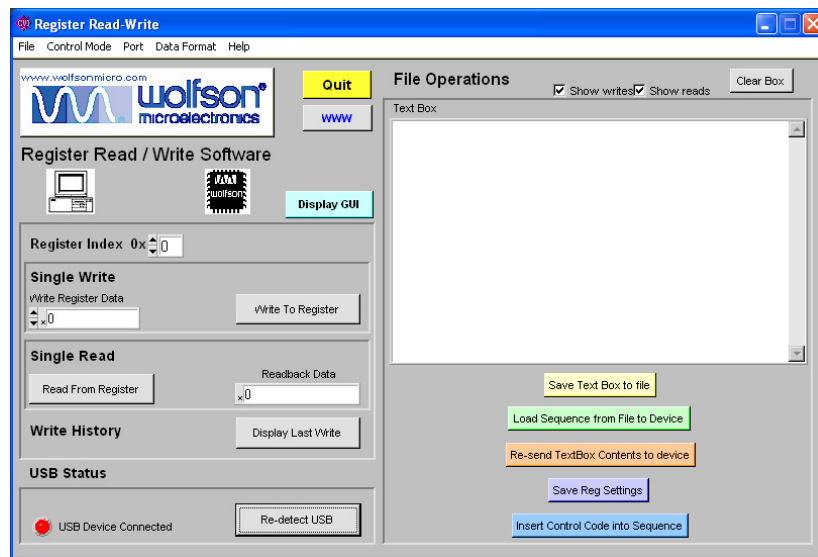


Figure 3 Main WM8569 Application Panel

The operation of the low-level register control operations offered by this panel is covered in 'Register Control Software' on page X. This section contains information on the GUI available to control the WM8569, accessible by pressing the 'Display GUI' button. The main WM8569 GUI panel should then be displayed, as shown in Figure 4 below:

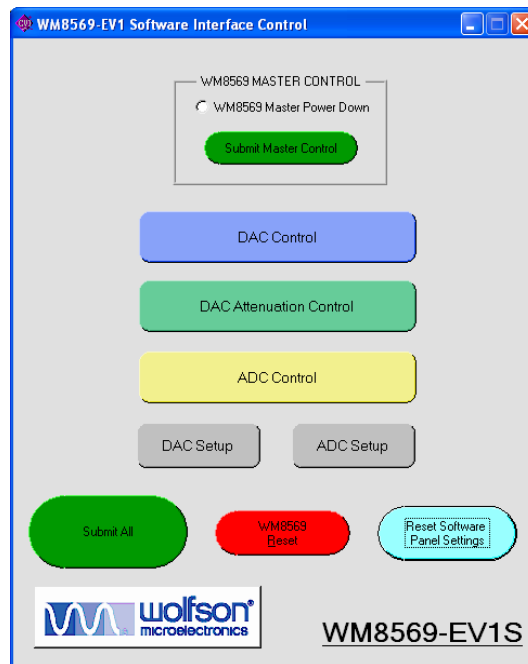


Figure 4 Main WM8569 GUI Panel

From this panel, the user can access DAC Control, DAC Attenuation Control or ADC Control panels. Additionally, the panel has two quick setup buttons for the ADC or the DAC. Also contained is the option to submit all settings currently in the GUI to the device, and to reset either the WM8569 or the GUI panel settings to the default values. For help on any of these buttons, the user can right-click on any button for a short functional description.

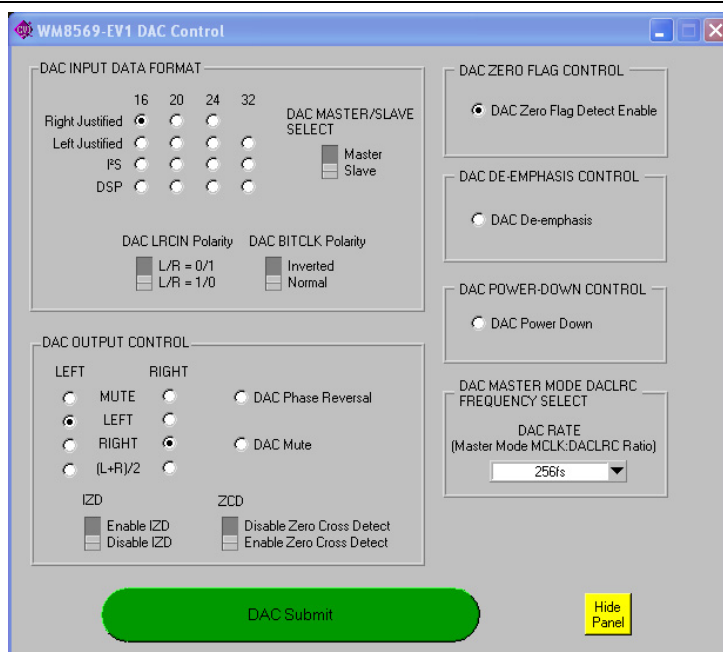


Figure 5 DAC Control WM8569 GUI Panel

The DAC Control panel, shown in Figure 5 above, can be used to change the audio interface options, deemphasis, DAC powerdown, infinite zero detect, zero cross and DAC output control options.

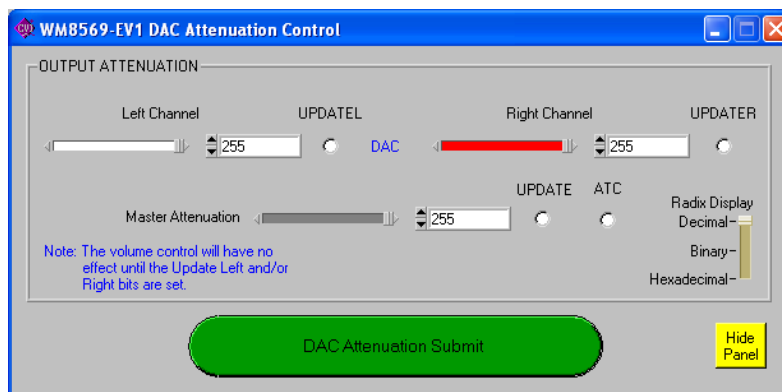


Figure 6 DAC Attenuation Control WM8569 GUI Panel

The DAC Attenuation Control panel, shown in Figure 6 above, can be used to change the attenuation controls for the left and right DACs, as well as the master attenuation. There is also a slider that allows the user to customise the numerical display of the attenuation registers to Decimal, Binary or Hexadecimal format.

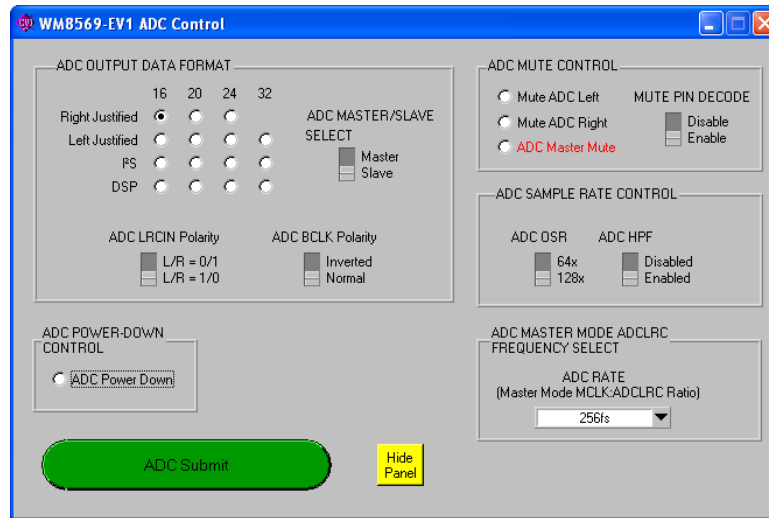


Figure 7 ADC Control WM8569 GUI Panel

The ADC Control panel, shown in Figure 7 above, can be used to control ADC powerdown, mute and OSR functions, as well as the Mute Pin Decode.

## REGISTER CONTROL SOFTWARE

Register control software allows text files of register settings to be created in a user defined order that can be written to the WM8569 via the USB port. This software offers the facility to write to individual registers in 3-wire control mode.

Note: The version of software shown in this document is 1.50. The revision may change in the future but the general functionality of this software will remain the same. Not all functions shown in the diagrams will be available in the control software for the WM8569. Where necessary, discrepancies will be highlighted.

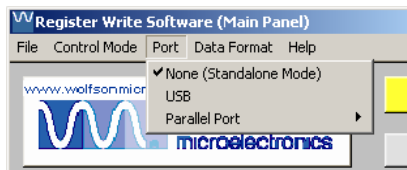


Figure 8 Register Control Software Panel

In order to write to one of the WM8569 registers, the register address must be entered into the 'Register Index' control. The register data must be entered into the 'Write Register Data' control and the 'WriteRegister' button must be pressed. Once committed, the details of the register write will be recorded in the 'TextBox' window as shown in Figure 12 that can be opened by pressing the 'Display TextBox' button.

## WM8569\_6168\_SSOP28\_EV1

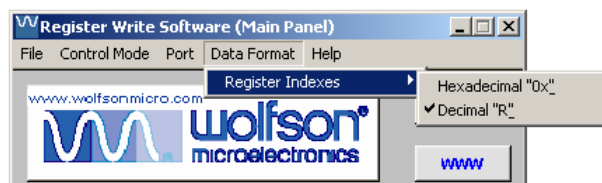
The software interface can also be used in 'Standalone Mode', which allows text files to be loaded or saved in the 'Text Box and File Handler' window without communicating with the WM8569 device. Select 'None (Standalone Mode)' to enable this mode.



**Figure 9 Standalone Mode Selection**

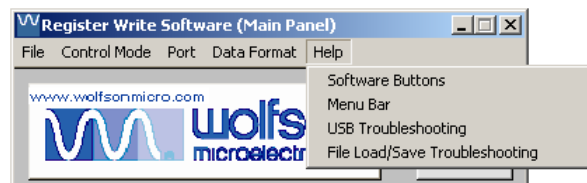
NOTE: The WM8569 software does not contain support for Parallel Port control.

The register index can be displayed on the Main Panel in either Decimal (default) or Hexadecimal format. Select the required format from the 'Data Format' menu.



**Figure 10 Register Index Format Selection**

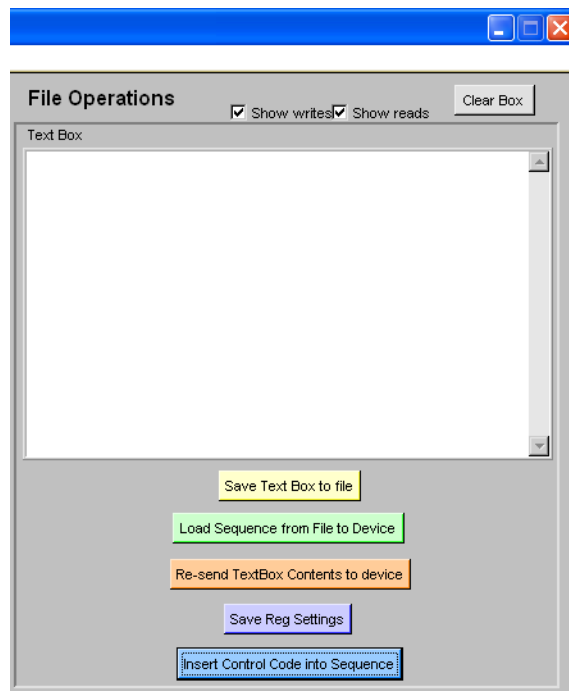
The 'Help' menu provides links to information about using and troubleshooting the USB control interface in addition to the USB Interface Troubleshooting section below.



**Figure 11 Help Menu Selection**

The Text Box control panel allows the WM8569 registers to be set as per the register map shown in the datasheet.





**Figure 12 File Operations Window**

Pressing the 'Save Text Box to File' control will copy to a text file the current sequence of writes displayed in the 'Text Box'.

Pressing the 'Load Sequence from File to Device' control will copy a previously saved sequence of writes from a text file to the 'Text Box' and will automatically write these register values to the WM8569 device.

Pressing the 'Re-send TextBox Contents to device' control will send the register values currently stored in the 'Text Box' to the WM8569 device.

Pressing the 'Save Reg Settings' control will copy the latest register writes made in the 'Text Box' to a text file. The data is saved in register order and those registers not written to are not recorded.

Pressing the 'Insert Control Code into Sequence' control will open a dialogue box that allows you to insert special commands to the end of the sequence currently shown in the 'Text Box'. Delays between register writes and breakpoints in the sequence can be added using this dialogue box.

Pressing the 'Clear Box' control will empty the 'Text Box' of the information presently listed.

If clicked on, the 'WWW' button in the top right of the control panel window will open the Wolfson website ([www.wolfsonmicro.com](http://www.wolfsonmicro.com)) in the PC's default browser.



**Figure 13 Default Browser Select**

## SETUP TEXT FILES

Pre-written setup files are provided to allow easy configuration of the WM8569 device for a selection of basic operational states. It is also possible to create text files with a specific sequence of register writes by selecting 'Save Text Box to File' on the 'Text Box and File Handler' window.

Pressing the 'Save Reg Settings' control saves the data in register order, those registers not written to since the last time 'Clear Box' was pressed and therefore not listed in the 'Text Box' will not be recorded.

A text file can be generated manually by the user.

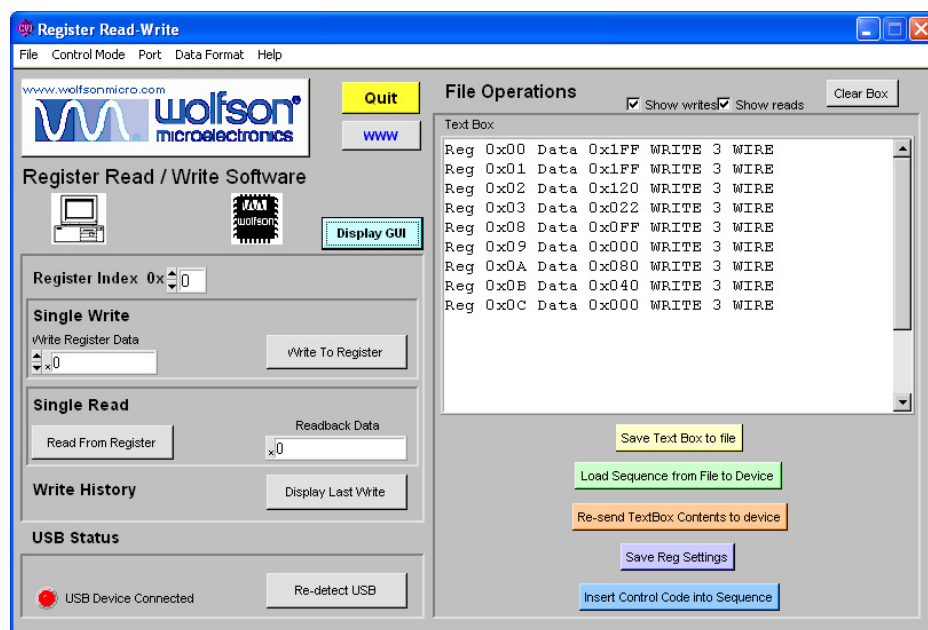


Figure 14 Example of Text Box with Setup File Loaded

WM8569- EV1B SCHEMATIC

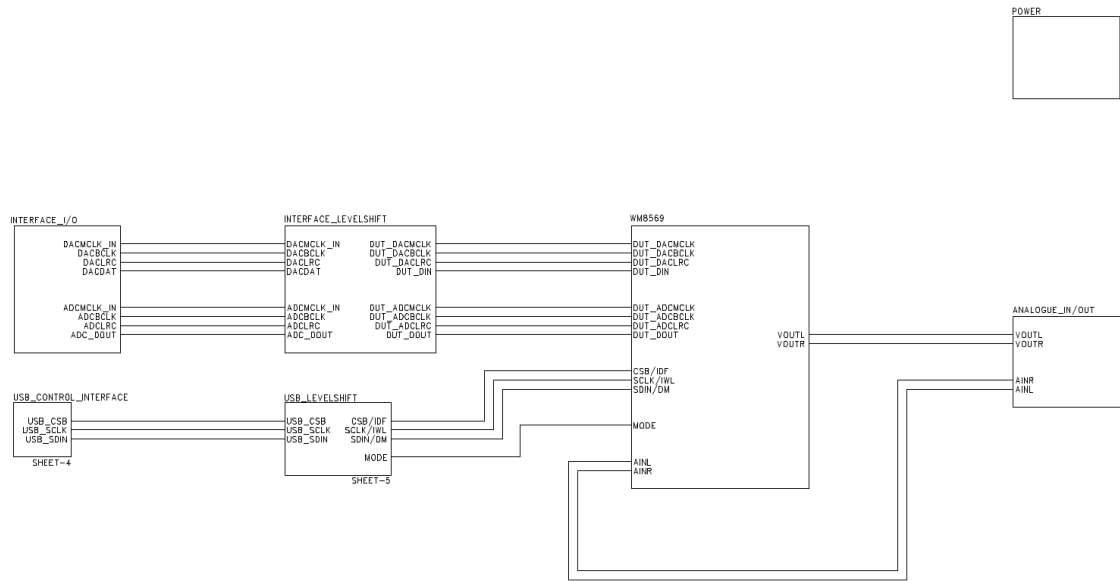


Figure 15 Top Level

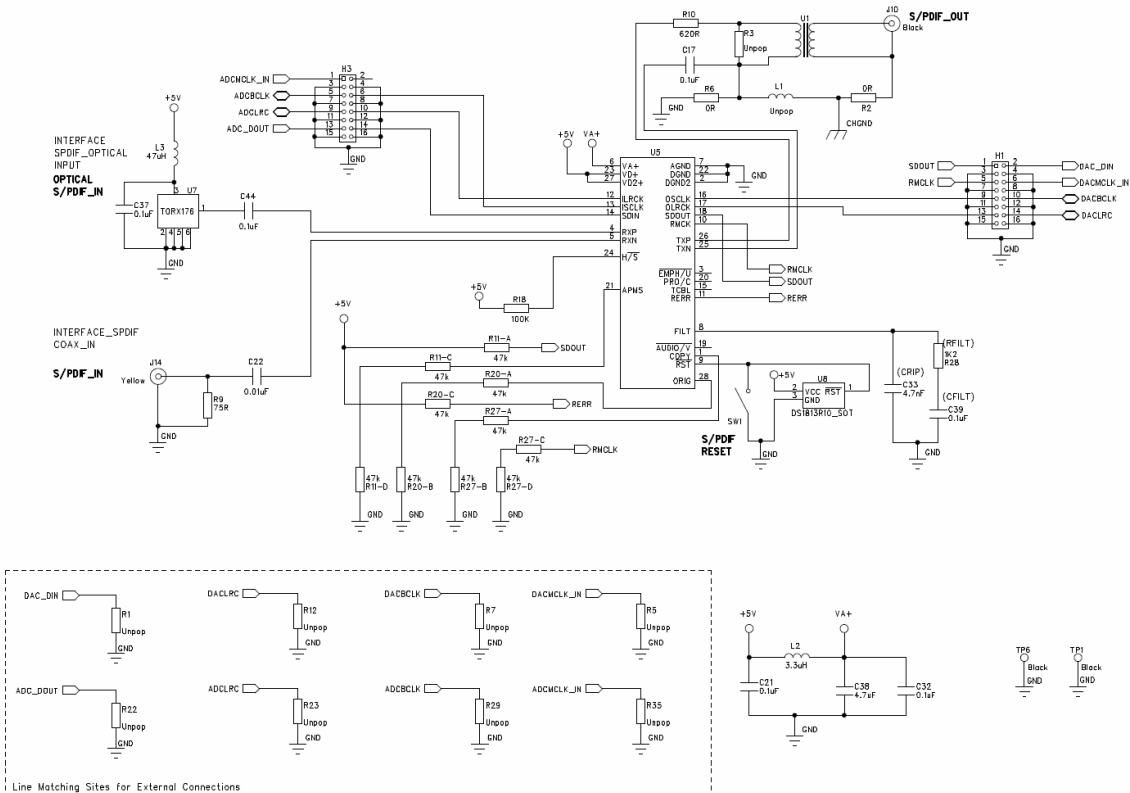


Figure 16 INTERFACE\_I/O

# WM8569\_6168\_SSOP28\_EV1

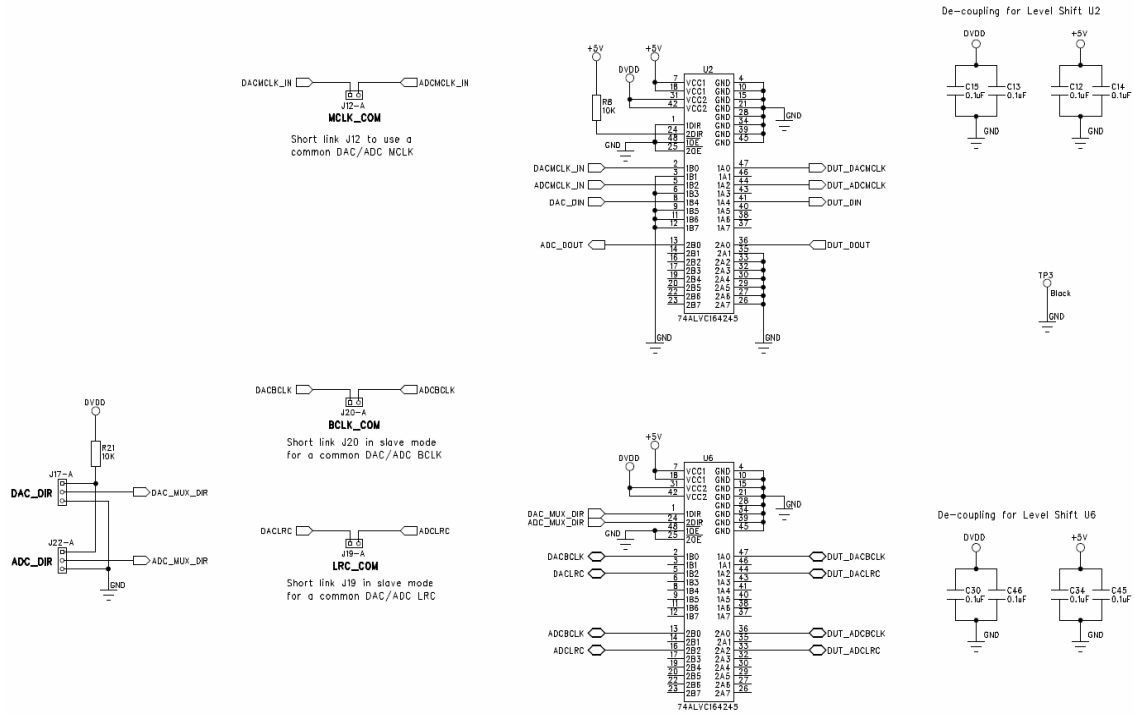


Figure 17 INTERFACE\_LEVELSHIFT

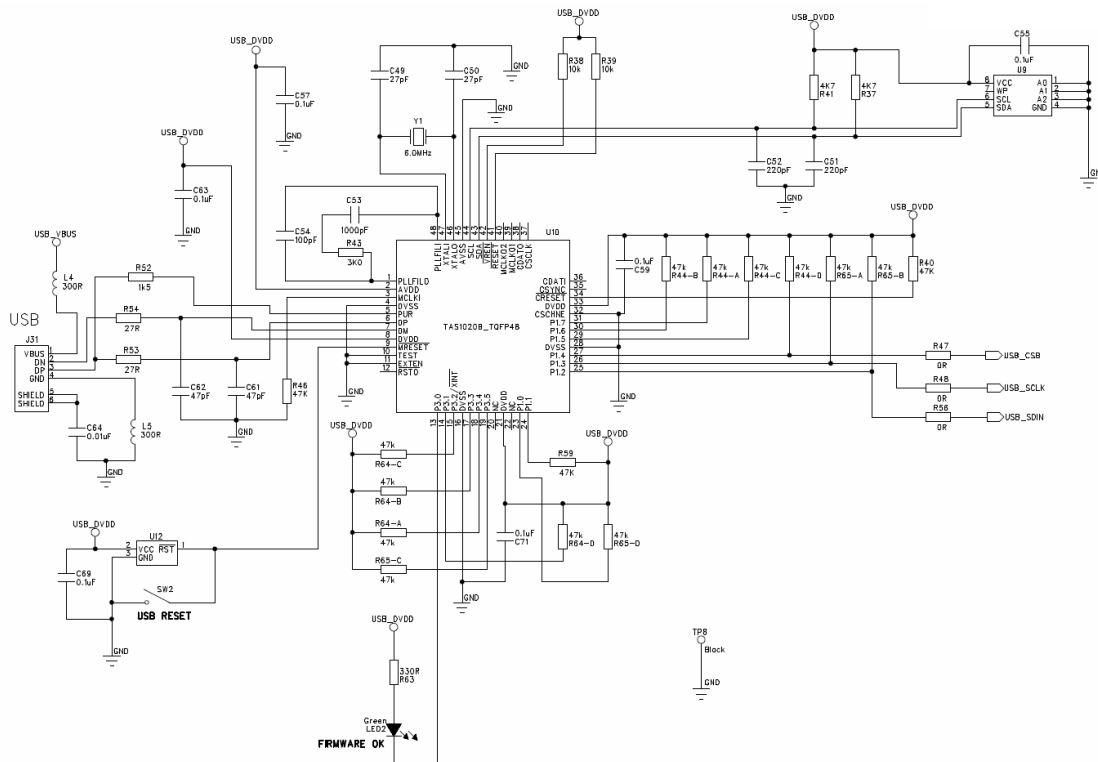


Figure 18 USB\_CONTROL\_IF

# WM8569\_6168\_SSOP28\_EV1

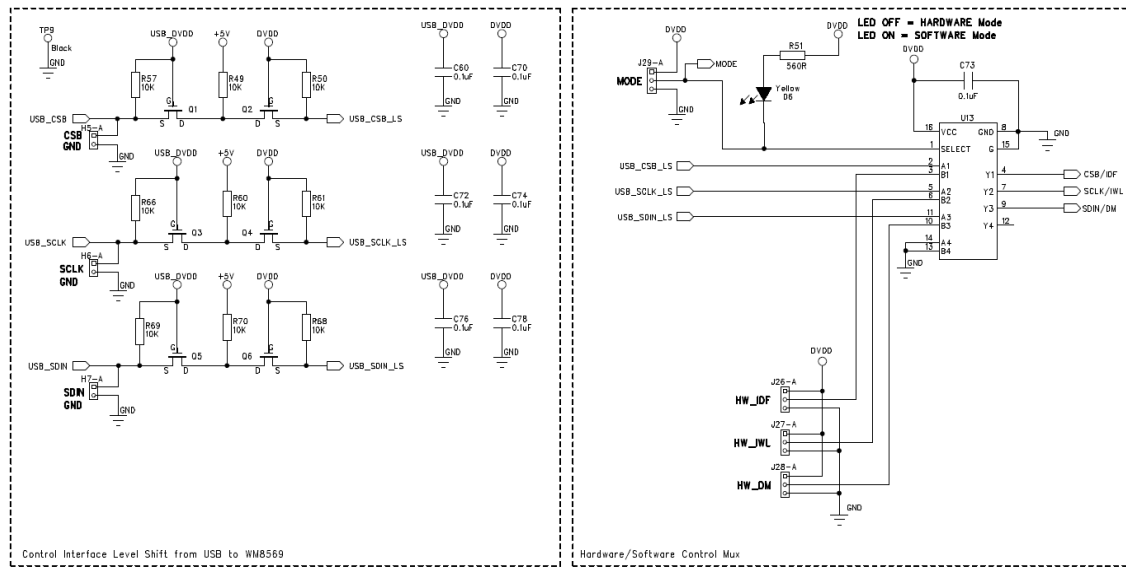


Figure 19 USB\_LEVELSHIFT

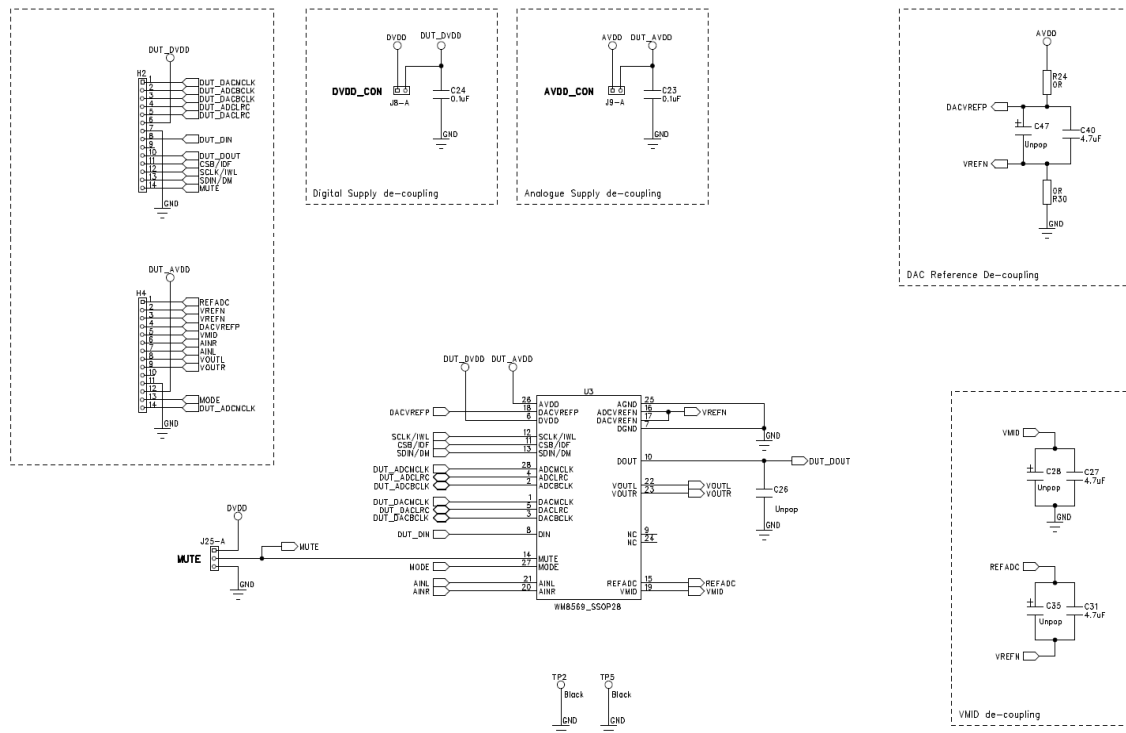


Figure 20 WM8569

# WM8569\_6168\_SSOP28\_EV1

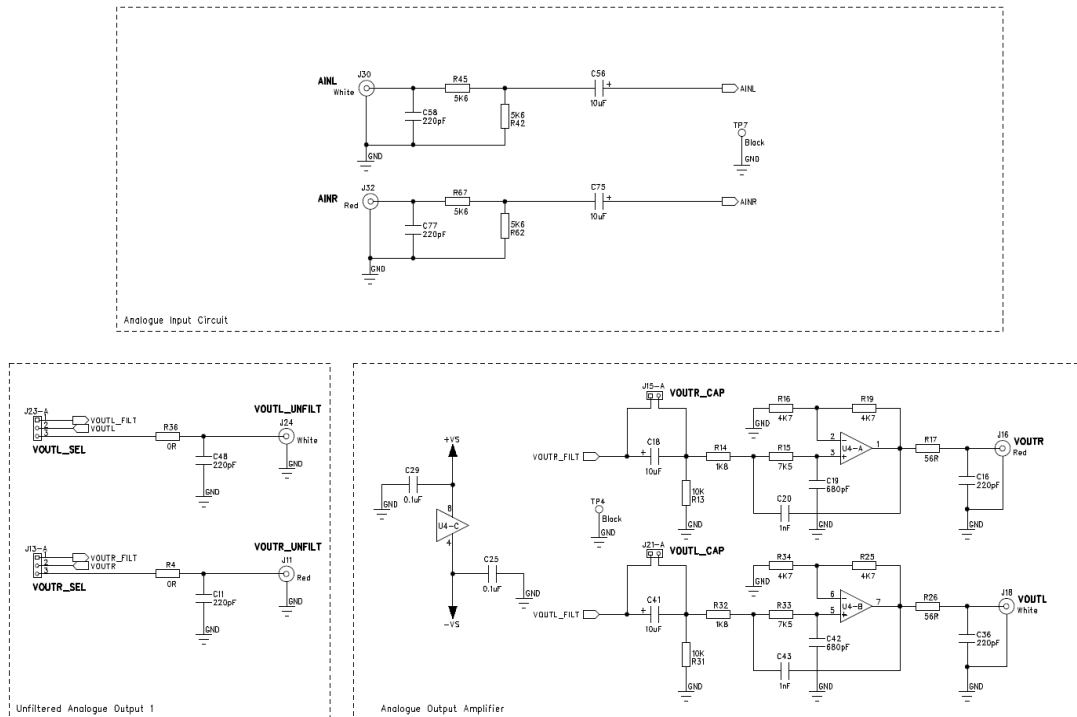


Figure 21 ANALOGUE\_IN/OUT

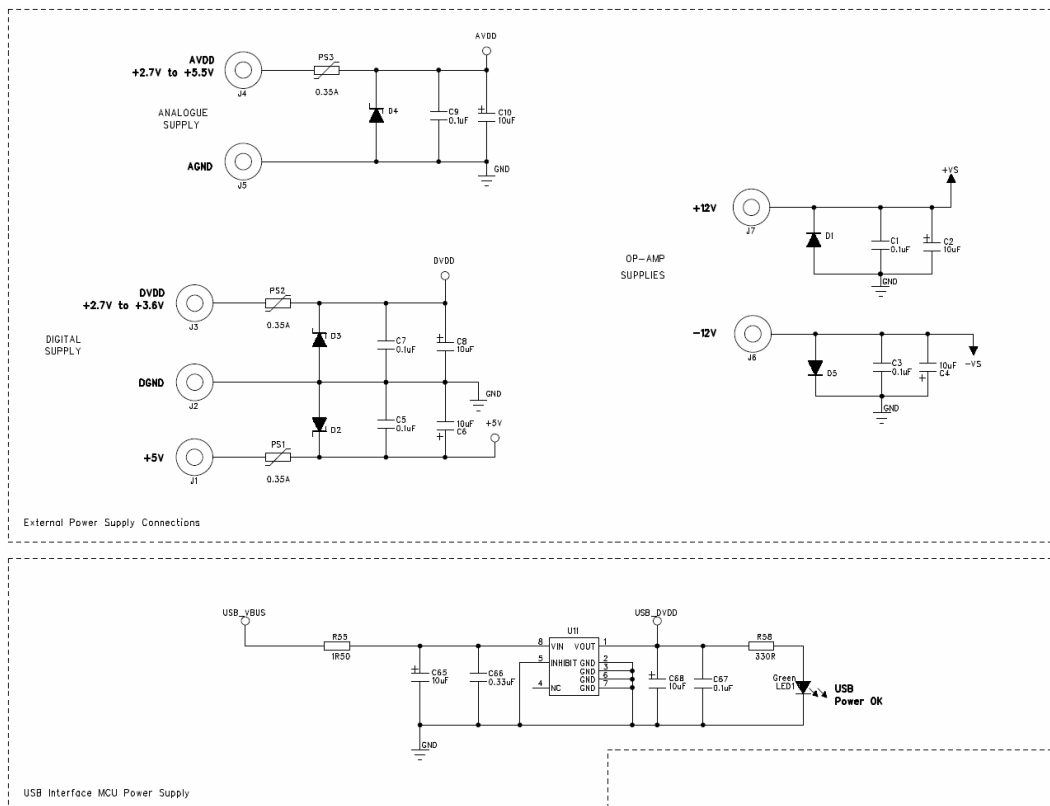
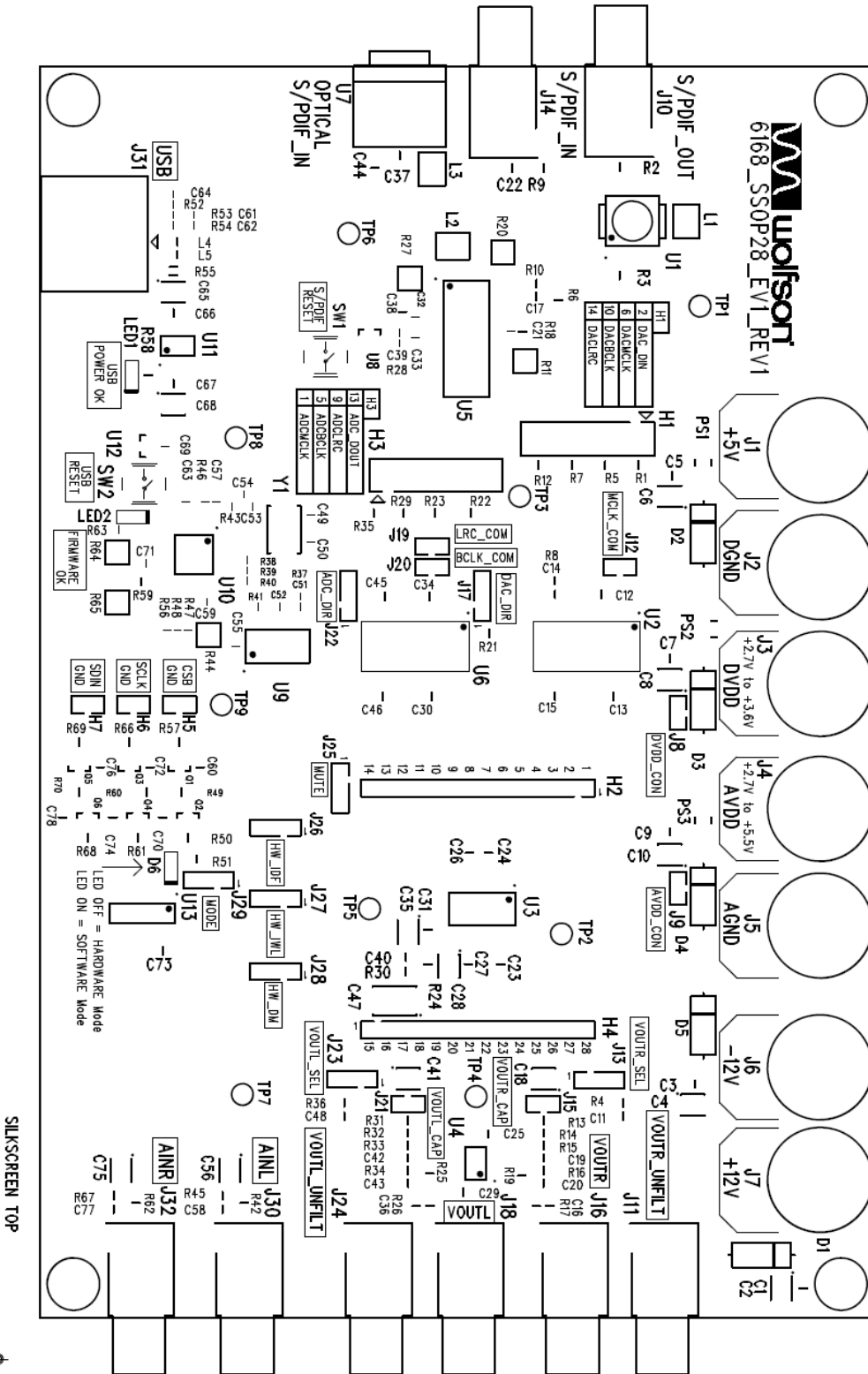
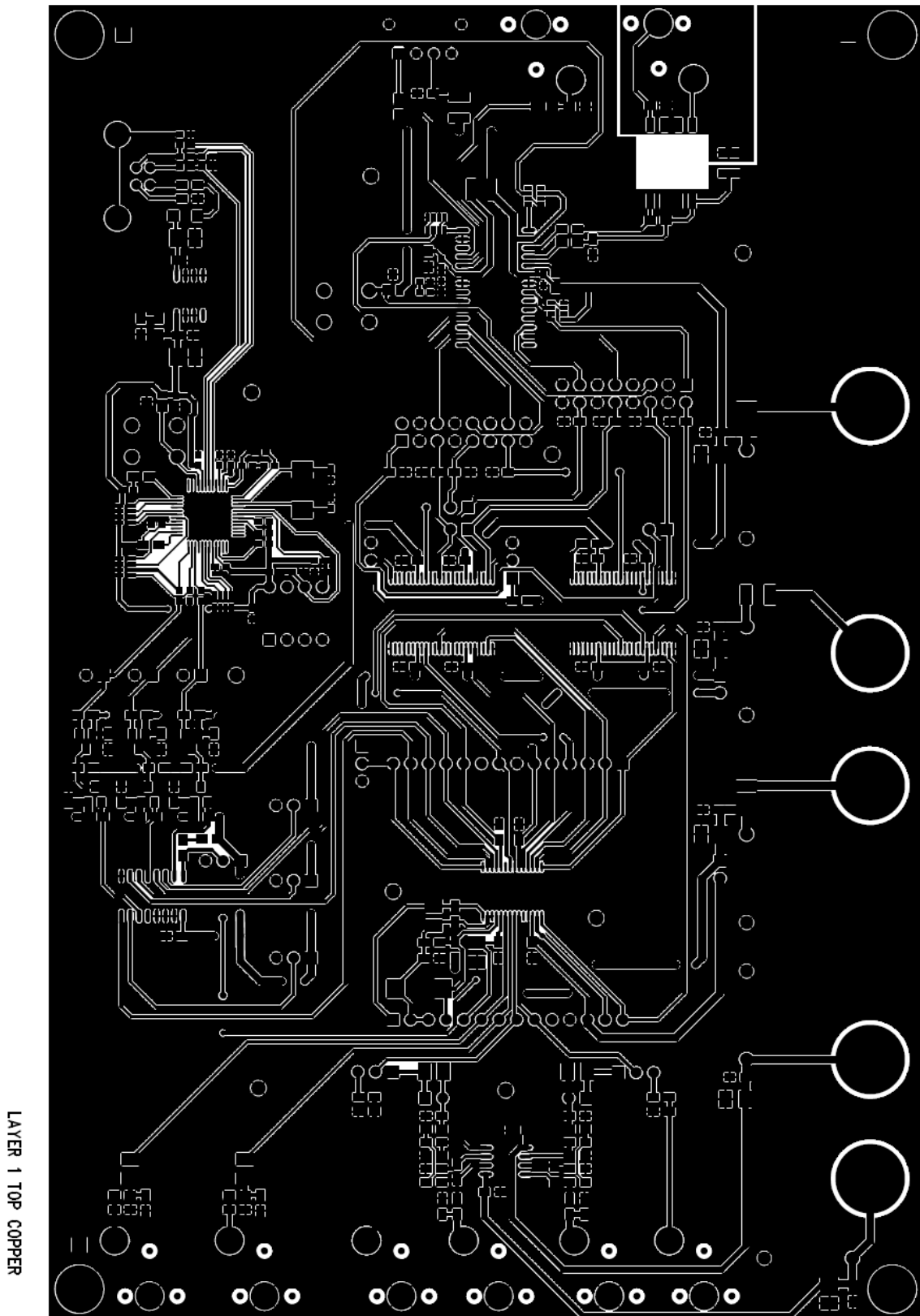


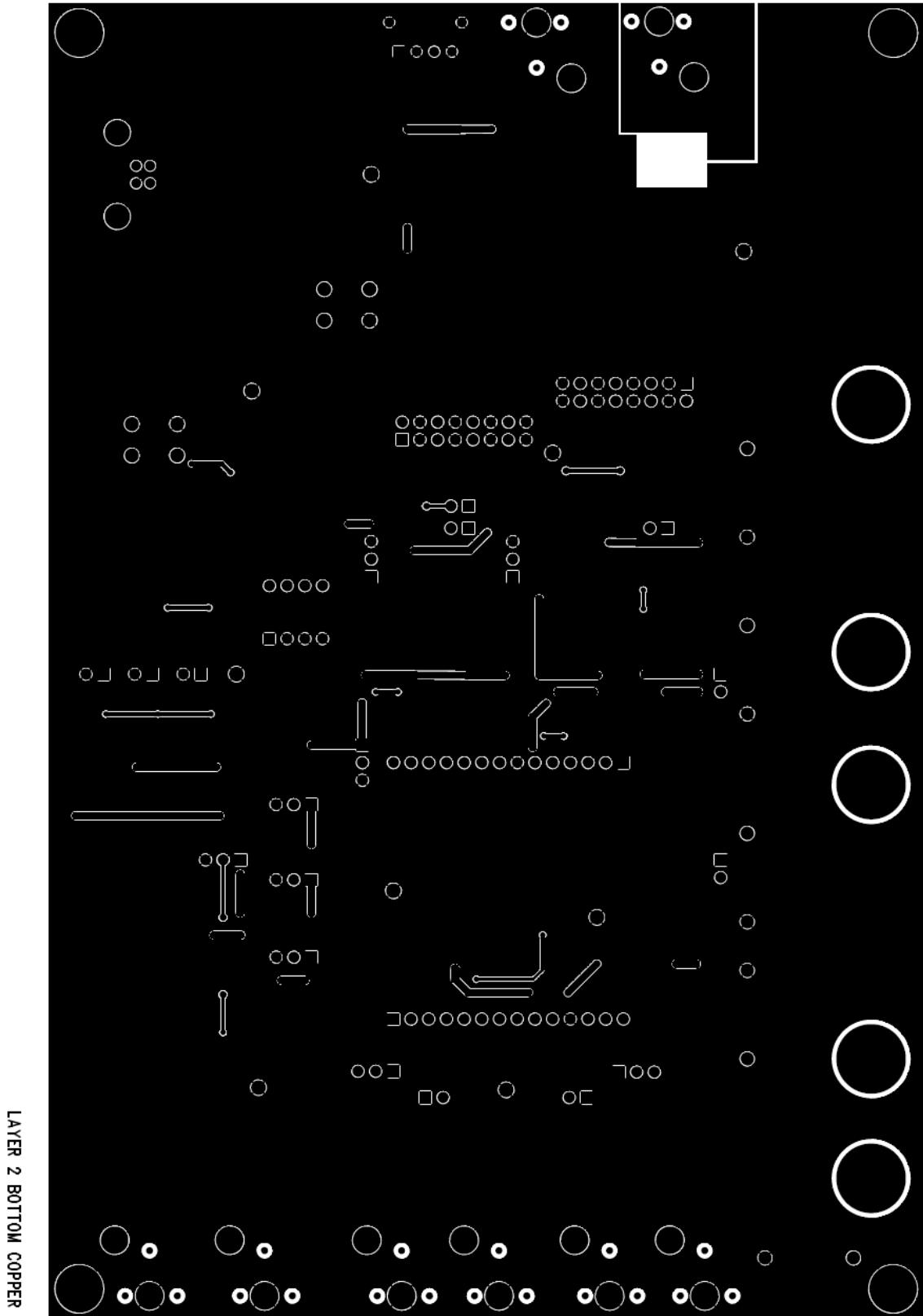
Figure 22 POWER

WM8569- EV1B PCB LAYOUT









## WM8569\_6168\_SSOP28\_EV1

### WM8569-EV1B BILL OF MATERIAL

DESCRIPTION	REFERENCE	QTY
74ALVC164245 16 Bit Dual Supply Bus Transceiver SSO	U2 U6	2
Phono Socket PCB mount RED	J11 J16 J32	3
Phono Socket PCB mount YELLOW	J14	1
Phono Socket PCB mount WHITE	J18 J24 J30	3
USB Streaming Controller	U10	1
27pF 0603 SMD Ceramic Capacitor 50V NPO	C49 C50	2
Phono Socket PCB mount BLACK	J10	1
USB receptacle Type B	J31	1
B3F1000 SPNO PCB mount switch	SW1 SW2	2
47k 1206 SMD chip 4 resistor array 5% 0.063W	R11 R20 R27 R44 R64 R65	6
EEPROM 8x8 i2c interface -- FIT IN SOCKET MECH1	U9	1
0.01uF 0805 SMD Ceramic Capacitor 50V X7R	C22	1
0.1uF 0805 SMD Ceramic Capacitor 50V X7R	C1 C3 C5 C7 C9 C12 C13 C14 C15 C17 C23 C24 C25 C29 C30 C34 C37 C44 C45 C46 C60 C67 C70 C72 C73 C74 C76 C78	28
LE33CD Very Low Drop +3.3V Voltage Regulator SO	U11	1
1R50 1206 SMD chip resistor 5% 0.25W	R55	1
4.7nF 0603 SMD Ceramic Capacitor 50V X7R	C33	1
0.33uF 0805 SMD Ceramic Capacitor 16V X7R	C66	1
620R 0805 SMD chip resistor 1% 0.1W	R10	1
300R 0805 BMB2A Ferrite Bead	L4 L5	2
DS1818 3.3V active-low Power-On-Reset chip SOT	U12	1
3K0 0603 SMD chip resistor 1% 0.063W	R43	1
0.35A Poly Switch 1210	PS1 PS2 PS3	3
1N4002 100Vrrm Power Diode DO41	D1 D5	2
0.1uF 0603 SMD Ceramic Capacitor 16V X7R	C21 C32 C39 C55 C57 C59 C63 C69 C71	9
74HC157 Quad 2-Input Mux SO	U13	1
47pF 0603 SMD Ceramic Capacitor 50V NPO	C61 C62	2
220pF 0603 SMD Ceramic Capacitor 50V NPO	C51 C52	2
Tantalum Capacitor SMD-B 10uF - 16V - AVX	C2 C4 C6 C8 C10 C18 C41 C56 C65 C68 C75	11
1x2 PCB Pin Header 0.1" VERTICAL	H5 H6 H7 J8 J9 J12 J15 J19 J20 J21	10
1x3 2.54mm Header Vertical	J13 J17 J22 J23 J25 J26 J27 J28 J29	9
2x8 2.54mm pitch PCB Pin Header VERTICAL	H1 H3	2
MC33078 Low Noise Dual Op-Amp SO	U4	1
DS1813 5V active Low Power-On-Reset chip SOT	U8	1
220pF 0805 SMD Ceramic Capacitor 50V NPO	C11 C16 C36 C48 C58 C77	6
680pF 0805 SMD Ceramic Capacitor 50V NPO	C19 C42	2
1nF 0805 SMD Ceramic Capacitor 50V NPO	C20 C43	2
0.01uF 0603 SMD Ceramic Capacitor 50V X7R	C64	1
TN0200T N- Channel MOSFET SOT23	Q1 Q2 Q3 Q4 Q5 Q6	6
IC Socket DIL 8 WAY	MECH1	1
0R 0603 SMD chip resistor 1% 0.063W	R47 R48 R56	3
0R 0805 SMD chip resistor 1% 0.1W	R2 R4 R6 R24 R30 R36	6
1.32mm PCB Test Terminal BLACK	TP1 TP2 TP3 TP4 TP5 TP6 TP7 TP8 TP9	9
27R 0603 SMD chip resistor 1% 0.063W	R53 R54	2
330R 0603 SMD chip resistor 1% 0.063W	R63	1

## WM8569\_6168\_SSOP28\_EV1

DESCRIPTION	REFERENCE	QTY
1K2 0603 SMD chip resistor 1% 0.063W	R28	1
1k5 0603 SMD chip resistor 1% 0.063W	R52	1
4K7 0603 SMD chip resistor 1% 0.063W	R37 R41	2
10k 0603 SMD chip resistor 1% 0.063W	R38 R39	2
47K 0603 SMD chip resistor 1% 0.063W	R40 R46	2
56R 0805 SMD chip resistor 1% 0.1W	R17 R26	2
330R 0805 SMD chip resistor 1% 0.1W	R58	1
560R 0805 SMD chip resistor 1% 0.1W	R51	1
1K8 0805 SMD chip resistor 1% 0.1W	R14 R32	2
4K7 0805 SMD chip resistor 1% 0.1W	R16 R19 R25 R34	4
5K6 0805 SMD chip resistor 1% 0.1W	R42 R45 R62 R67	4
10K 0805 SMD chip resistor 1% 0.1W	R8 R13 R21 R31 R49 R50 R57 R60 R61 R66 R68 R69 R70	13
47K 0805 SMD chip resistor 1% 0.1W	R59	1
100K 0805 SMD chip resistor 1% 0.1W	R18	1
1N5337B 4.7V 5W Zener Diode PTH	D3	1
1N5341B 6.2V 5W Zener Diode PTH	D2 D4	2
100pF 0603 SMD Ceramic Capacitor 50V NPO	C54	1
1000pF 0603 SMD Ceramic Capacitor 50V NPO	C53	1
7K5 0805 SMD chip resistor 1% 0.125W	R15 R33	2
6.0MHz GSX-752A/351JF SM Crystal 30pF	Y1	1
4mm Non-Insulated Panel Socket 16A	J1 J2 J3 J4 J5 J6 J7	7
0.1" OPEN JUMPER LINK RED	LNK8 LNK9	2
0.1" OPEN JUMPER LINK YELLOW	LNK1 LNK2 LNK3 LNK4 LNK5 LNK6 LNK7 LNK10 LNK11 LNK12 LNK14 LNK15 LNK16 LNK17 LNK18 LNK19 LNK20 LNK21 LNK22	19
47uH 1210 Surface Mount Inductor 'PA series'	L3	1
3.3uH 1210 Surface Mount Inductor '1210A series'	L2	1
Hexagonal brass M3 size spacer 20mm length	P1 P2 P3 P6	4
75R 0805 SMD chip resistor 1% 0.125W	R9	1
4.7uF 0805 SMD Ceramic Capacitor 10V Y5V	C27 C31 C38 C40	4
KP-2012MGC 0805 SMD Chip LED GREEN	LED1 LED2	2
KP-2012SYC 0805 SMD Chip LED YELLOW	D6	1
Plain M3 size washer	W1 W2 W3 W6	4
Slotted Panhead Screw - M3 thread; 12mm long	SC1 SC2 SC3 SC6	4
2:1 Ratio 96KHz SPDIF Digital Audio transformer SOIC	U1	1
TORX176 Digital Audio Optical Receiver	U7	1
1x14 2.54mm pitch PCB Pin Header VERTICAL	H2 H4	2
CS8427 96KHz Audio Transceiver	U5	1
WM8569 24-bit; 192kHz 6 channel CODEC in 28-pin SO package	U3	1

**Table 13 Bill of Material**

APPENDIX

1. EXTERNAL DSP CONNECTION TO THE WM8569-EV1B

The WM8569-EV1B evaluation board has been designed to allow it to be easily connected to an external DSP platform with error free operation.

The following information is provided to ease the connection process and ensure that all signals sent and received by the WM8569-EV1B are reliable and at the correct voltage levels.

AUDIO INTERFACE CONNECTIONS

It is recommended that twisted pair (signal twisted with GND) or shielded wires are used to make the audio interface connections between the DSP and WM8569-EV1B platforms. This is to ensure that no interference or noise is picked up by the clocks or data lines, thus reducing performance and reliability. The audio interface connections made to the EV1M will depend on whether the user has chosen to use common ADC and DAC clocks and whether they are operating the WM8569 in master or slave mode.

SLAVE MODE CONNECTIONS – COMMON CLOCKS

When the WM8569 is set in Slave Mode with common ADC and DAC BCLK, LRC and MCLK connections, the jumpers on header H1 and H3 should be removed, disconnecting the digital input section of the evaluation board. The audio interface timing and data signals from the DSP platform should then be connected as shown in Figure 23. The signals should be connected to H1 and H3. Connecting the signals on the output side of the level-shift ICs (U2 and U6) will cause drive contention between these ICs and the DSP and could result in damage to either or both devices. The inputs to the level-shift IC (74ALVC164245) have a TTL threshold (i.e. Logic High = +2V(min); Logic Low = +0.8V(max)) and low input current requirements (i.e. 15uA max) allowing most DSPs to connect directly.

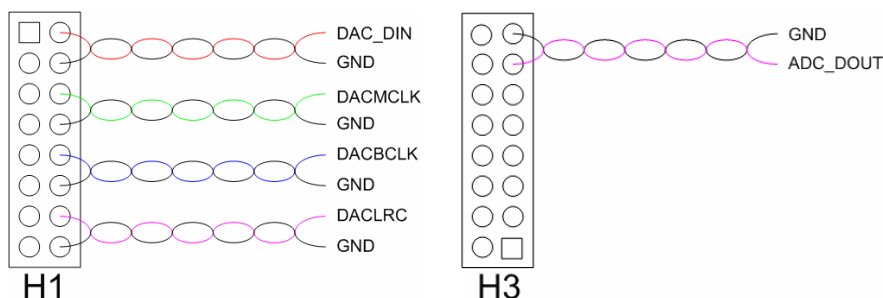
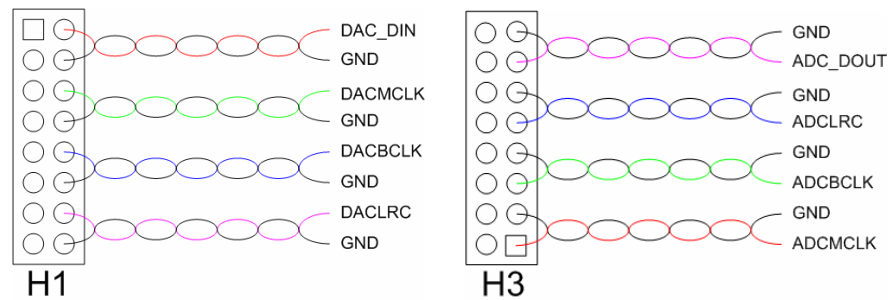


Figure 23 DSP Connections with WM8569 in Slave Mode and Common ADC and DAC Clocks

The digital inputs to the WM8569 have a CMOS threshold (i.e. Logic High (min) = DVDDx0.7; Logic Low (max) = DVDDx0.3). These are met directly by the level shift IC outputs.

SLAVE MODE CONNECTIONS – SEPARATE CLOCKS

When the WM8569 is set in Slave Mode with separate ADC and DAC BCLK, LRC and MCLK connections, the jumpers on header H1 and H3 should be removed, disconnecting the digital input section of the evaluation board. The audio interface timing and data signals from the DSP platform should then be connected as shown in. The signals should be connected to H1 and H3. Connecting the signals on the output side of the level-shift ICs (U2 and U6) will cause drive contention between these ICs and the DSP and could result in damage to either or both devices. The inputs to the level-shift IC (74ALVC164245) have a TTL threshold (i.e. Logic High = +2V(min); Logic Low = +0.8V(max)) and low input current requirements (i.e. 15uA max) allowing most DSPs to connect directly.

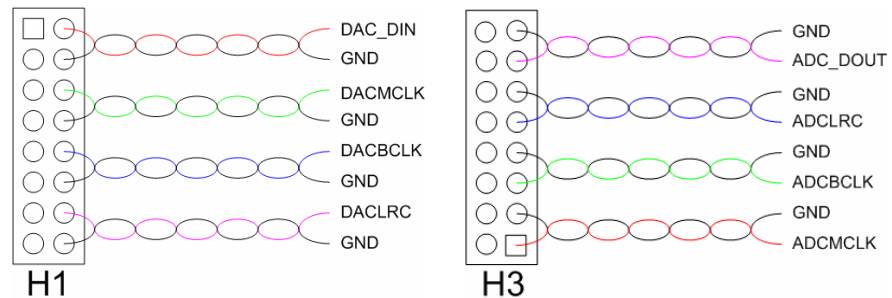


**Figure 24 DSP Connections with WM8569 in Slave Mode and Separate ADC and DAC Clocks**

The digital inputs to the WM8569 have a CMOS threshold (i.e. Logic High (min) = DVDDx0.7; Logic Low (max) = DVDDx0.3). These are met directly by the level shift IC outputs.

**MASTER MODE CONNECTIONS**

When the WM8569 ADC and DAC is set in Master Mode with separate ADC and DAC BCLK, LRC and MCLK connections, the jumpers on header H1 and H3 should be removed, disconnecting the digital input section of the evaluation board. The audio interface timing and data signals from the DSP platform should then be connected as shown in. The signals should be connected to H1 and H3. Connecting the signals on the output side of the level-shift ICs (U2 and U6) will cause drive contention between these ICs and the DSP and could result in damage to either or both devices. The inputs to the level-shift IC (74ALVC164245) have a TTL threshold (i.e. Logic High = +2V(min); Logic Low = +0.8V(max)) and low input current requirements (i.e. 15uA max) allowing most DSPs to connect directly.



**Figure 25 DSP Connections with WM8569 in Master Mode and Separate ADC and DAC Clocks**

**COMBINATIONS OF MASTER AND SLAVE MODE**

It is possible to run the ADC in master mode and the DAC in slave mode (and vice-versa) and use the clocks generated by the master mode interface to supply the slave mode interface.

There are many combinations that can be covered, but it is hoped that the connection schemes shown here give enough information to enable the user to use the WM8569-EV1B in any combination.

**NOTE ABOUT NON-5V TOLERANT DSP CONNECTIONS**

In some circumstances, a non-5V tolerant DSP might be the only option available. In these situations, the outputs from H1 and H3 will be unsuitable for these external DSPs as they will be at +5V. Where this is an issue, the outputs from the WM8569 may be taken direct from the pin headers H2 as shown in Figure 26. The inputs to the EV1M on H1 and H3 are more flexible and will accept 3V level inputs. There is therefore no need to change the connection points for inputs when using non-5V tolerant DSP connections.

## WM8569\_6168\_SSOP28\_EV1

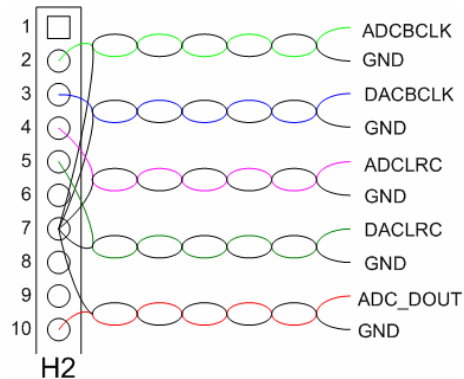


Figure 26 DSP Connections with WM8569 Outputs when using a non-5V tolerant DSP

## SOFTWARE INTERFACE

When using the WM8569- EV1B evaluation board with a DSP platform, the registers may be set using the supplied software with a PC and USB cable as shown in Figure 27.

If the DSP is being used to write to the WM8569 registers as well as supplying/receiving the audio interface timing and data signals, then it is recommended that twisted pair or shielded wires are used to connect the DSP platform to the WM8569- EV1B. The DSP can be connected to H5, H6 and H7 as shown in Figure 28– note that the signal levels entering this point should be 3.3V, that the 0Ω links R47, R48 and R56 are removed from the board, and that a USB cable is connected between the EV1B and a PC in order to supply power to the level shifters between these connections and the WM8569 device.

## CONNECTION DIAGRAMS

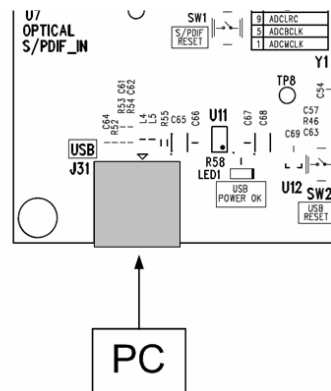


Figure 27 DSP Connection with PC Control using Wolfson Software

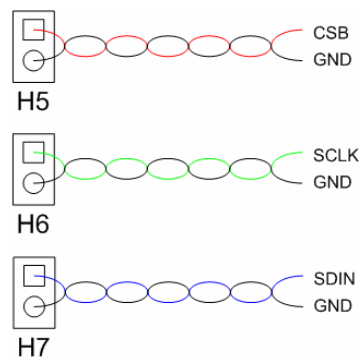
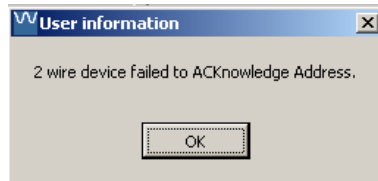


Figure 28 Full DSP Control with 3V3 DSP and WM8569

## 2. USB INTERFACE TROUBLESHOOTING

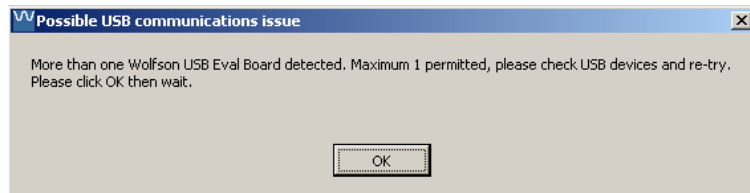
### MESSAGE BOX EXPLANATIONS - COMMUNICATIONS ISSUES

This section describes the meaning of any message boxes displayed by the WM8569 control software which indicate that a successful operation did not take place.



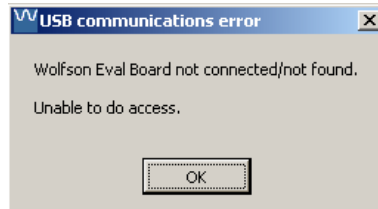
**Figure 29 2-wire Device Failed to Acknowledge Address**

Check the hardware settings on the WM8569 Evaluation Board. For example, removable links may be connected to some of the control interface pins on the Wolfson Device to allow alternate functions such as GPIO, etc. It is also a good idea to check the power supplies to the WM8569 device – a WM8569 device which is powered off may not acknowledge 2 wire communications.



**Figure 30 More than One Wolfson USB Board Detected...**

It is only possible to access a maximum of 1 Wolfson evaluation board (of any device type) with a USB interface from any PC.



**Figure 31 Wolfson Eval Board Not Connected...**

Please consult the section "USB Communications issues"



**Figure 32 Failed to Access USB Device**

Please consult the section "USB Communications issues"

### USB COMMUNICATIONS ISSUES

If the WM8569 Control Software displays a message relating to the USB connection, it is possible that the Wolfson USB Interface (a generic term referring to any the Wolfson Evaluation board with a USB interface) is not connected or enumerated to the PC. There are several possible reasons for this. Please carry out the following checks in the order shown.

#### **MORE THAN ONE USB EVALUATION SYSTEM?**

The WM8569 Control Software cannot operate with more than one evaluation board (of any device type) with a Wolfson USB Interface connected to the PC.

#### **CHECK USB CABLE AND HUB (IF USED)**

1. Check the USB cable. Is it securely inserted at both ends?
2. If a USB hub is being used, is it functional?
3. If a self powered USB hub is being used, is it powered on?
4. Have the hub and cable been tested with another USB device?

#### **CHECK POWER TO USB EVALUATION SYSTEM (IF BENCH POWERED)**

These checks should only be carried out if the USB cable and Hub are checked.

1. Check the power LEDs on the hardware – are they ON?
2. If LEDs not ON, check the hardware link settings relating to power supply – are the links fitted correctly?
3. If the bench supply is enabled, is it set to the correct voltage and switched on?

#### **CHECK PC USB DRIVERS**

These checks should only be carried out if the WM8569 Evaluation Board is powered on.



1. View the device manager as follows: Click Start Menu → Settings → Control Panel. Double click on the system icon, the “system properties” dialogue should be displayed. Click the Hardware button and click Device Manager, the following should be displayed:

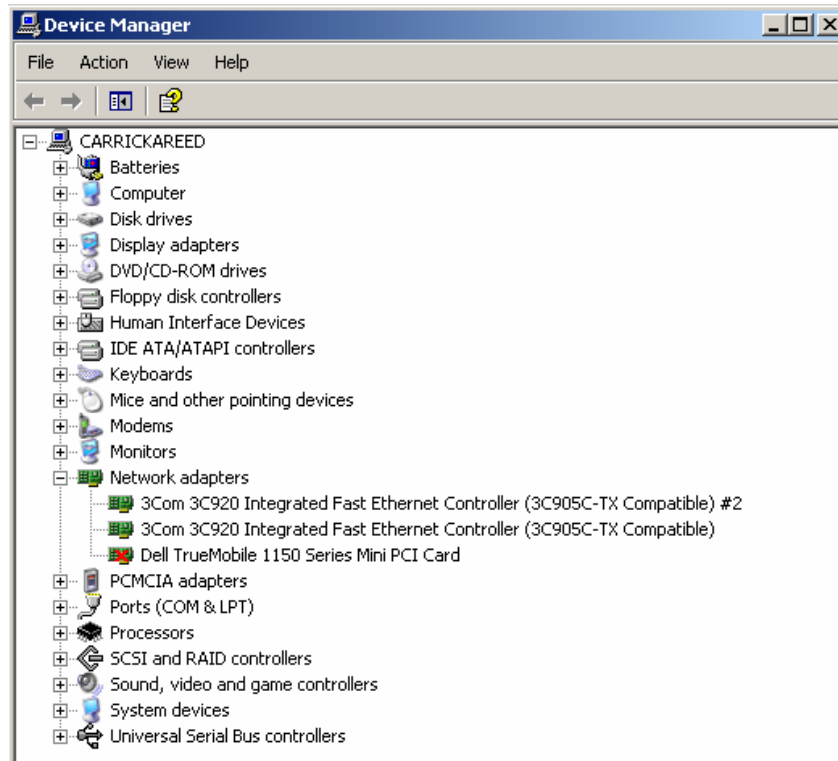


Figure 33 Device Manager Window

2. Expand the tree beside “Human Interface Devices”.

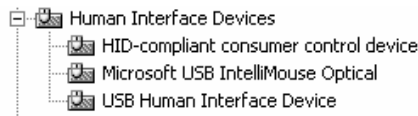


Figure 34 Human Interface Device Tree

Expect to observe the following devices:

- HID-compliant consumer control device
- USB Human interface device

3. Expand the tree beside “Sound, Video and Game Controllers”

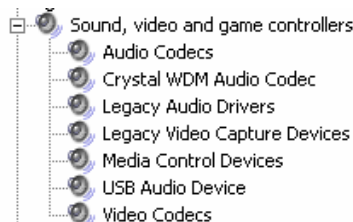


Figure 35 Sound, Video and Game Tree

Expect to observe the following devices:

- USB audio device

4. Expand the tree beside “Universal Serial Bus Controllers”

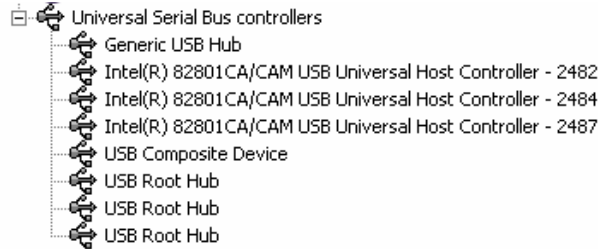


Figure 36 USB Tree

Expect to observe the following devices:

- USB Composite Device

5. If all three of the above devices are visible, the PC USB drivers are functional and the Wolfson USB Interface is functional. At this stage, if the WM8569 Control Software does not detect the Wolfson USB Interface, please refer to the section titled “Re-start PC”.

6. If you observe the following (Yellow “?” in device manager), the PC USB drivers are functional but the WM8569 Evaluation Board either has not re-booted firmware, or it may have a fault, please refer to the section titled “Check USB Evaluation System firmware”.



Figure 37 Wolfson USB Not Recognised

7. If no devices are visible, but the WM8569 Evaluation Board is definitely powered on and connected to the PC, have any USB devices ever been connected to the PC, and successfully used?

8. If other USB devices have been connected to the PC, and successfully used, please refer to the section titled “Re-start PC”.

9. If no other USB devices have been connected to the PC or successfully used, it is possible that the PC has a USB driver issue. One known PC driver issue on Win XP can be resolved as follows: view the device manager and expand the tree beside “Universal Serial Bus Controllers”. Right click on each “Host Controller” device as follows.



Figure 38 Uninstall Menu Option

Select “Uninstall” for each Host Controller until none are visible in the device manager. Re-start the PC. When the PC has re-started, it should detect each USB host controller and re-install them automatically. You can then try connecting to the Wolfson USB Evaluation System again.

You may require administrator privileges to do this on your PC. If you are unsure about uninstalling the USB Host Controllers, please contact your local PC support specialist.

### RE-START PC

If the PC USB drivers are functional and the WM8569 Evaluation Board is functional, but the WM8569 Control Software does not detect the WM8569 Evaluation Board, try re-starting the PC. There is a known issue where (particularly after long periods without a re-start) certain models of PC cannot perform the detection function.

After re-start, if the PC USB drivers are functional and the WM8569 Evaluation Board is functional, but the WM8569 Control Software does not detect the WM8569 Evaluation Board, check whether any USB devices have ever been connected to the PC, and successfully used:

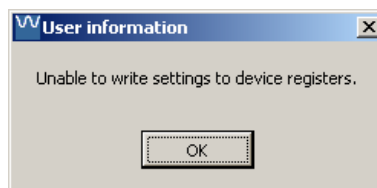
- If other USB devices have been connected to the PC, and successfully used, please contact Wolfson for support.
- If no other USB devices have been connected to the PC or successfully used, please contact your local support specialist to have the USB system checked with a known good USB device. The best type of device for testing the USB system is a USB Mouse or USB Keyboard – this is because these devices use the same type of USB driver (HID) as the WM8569 Control Software.

### CHECK USB EVALUATION SYSTEM FIRMWARE

These checks should only be carried out if the PC USB Drivers are OK.

1. Start the WM8569 Control Software and view the “Firmware Revision”, if this number stays at 0, then if the power LEDs are all ON, but the “Firmware OK” LED (refer to hardware User Handbook) is not ON, please press the reset button on the USB Evaluation System or power cycle it (i.e. power off-on).
2. If reset or power cycle do not illuminate the “Firmware OK” LED, please check the link setting relating to Firmware selection (refer to hardware User Handbook). Please check that an EEPROM chip is correctly inserted into the correct socket on the hardware (refer to hardware User Handbook).

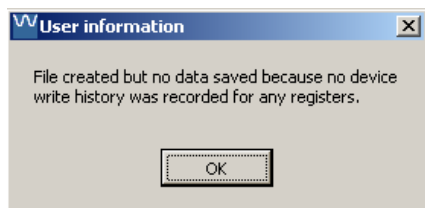
## MESSAGE BOX EXPLANATIONS - FILE LOAD/SAVE FUNCTIONS



**Figure 39 Unable to Write Settings to Device Registers**

Either:

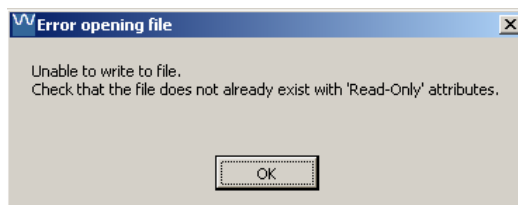
1. The WM8569 Control Software was unable to open the specified file (because the file was not found or the user cancelled).
2. None of the file lines contained valid information.
3. A communications failure prevented values being written to the Evaluation Board



**Figure 40 Unable to Write Settings to Device Registers**

The user tried to save a record of all WM8569 device writes, but no device writes have taken place since the software was started. A record of device writes can only be saved from the same instance of WM8569 Control Software which performed the writes. If the WM8569 Control Software is quit then re-started, the record of device writes will be cleared, even if the WM8569 Evaluation board remained powered on and the registers maintained their state throughout.

### “... “READ-ONLY” ATTRIBUTES...”



**Figure 41 ... “Read-Only” Attributes...**

Check that the file you are trying to save to is not set as “read-only”.

## **EVALUATION SUPPORT**

The aim of this evaluation kit is to help you to become familiar with the functionality and performance of the WM8569 Stereo Codec with Volume Control.

If you require more information or require technical support please contact Wolfson Microelectronics Applications group through the following channels:

Email :: [apps@wolfsonmicro.com](mailto:apps@wolfsonmicro.com)  
Telephone Apps :: +44 (0)131 272 7070  
Fax :: +44 (0)131 272 7001  
Mail :: Applications at the address on last page.

or contact your local Wolfson representative.

Additional information may be made available from time to time on our web site at <http://www.wolfsonmicro.com>

### IMPORTANT NOTICE

Wolfson Microelectronics plc (WM) reserve the right to make changes to their products or to discontinue any product or service without notice, and advise customers to obtain the latest version of relevant information to verify, before placing orders, that information being relied on is current. All products are sold subject to the WM terms and conditions of sale supplied at the time of order acknowledgement, including those pertaining to warranty, patent infringement, and limitation of liability.

WM warrants performance of its products to the specifications applicable at the time of sale in accordance with WM's standard warranty. Testing and other quality control techniques are utilised to the extent WM deems necessary to support this warranty. Specific testing of all parameters of each device is not necessarily performed, except those mandated by government requirements.

In order to minimise risks associated with customer applications, adequate design and operating safeguards must be used by the customer to minimise inherent or procedural hazards. Wolfson products are not authorised for use as critical components in life support devices or systems without the express written approval of an officer of the company. Life support devices or systems are devices or systems that are intended for surgical implant into the body, or support or sustain life, and whose failure to perform when properly used in accordance with instructions for use provided, can be reasonably expected to result in a significant injury to the user. A critical component is any component of a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.

WM assumes no liability for applications assistance or customer product design. WM does not warrant or represent that any license, either express or implied, is granted under any patent right, copyright, mask work right, or other intellectual property right of WM covering or relating to any combination, machine, or process in which such products or services might be or are used. WM's publication of information regarding any third party's products or services does not constitute WM's approval, license, warranty or endorsement thereof.

Reproduction of information from the WM web site or datasheets is permissible only if reproduction is without alteration and is accompanied by all associated warranties, conditions, limitations and notices. Representation or reproduction of this information with alteration voids all warranties provided for an associated WM product or service, is an unfair and deceptive business practice, and WM is not responsible nor liable for any such use.

Resale of WM's products or services with statements different from or beyond the parameters stated by WM for that product or service voids all express and any implied warranties for the associated WM product or service, is an unfair and deceptive business practice, and WM is not responsible nor liable for any such use.

### ADDRESS:

Wolfson Microelectronics plc  
Westfield House  
26 Westfield Road  
Edinburgh  
EH11 2QB  
United Kingdom

Tel :: +44 (0)131 272 7000

Fax :: +44 (0)131 272 7001

Email :: [apps@wolfsonmicro.com](mailto:apps@wolfsonmicro.com)