



WM8804_6152_DS20_EV1_REV2

Evaluation Board Example Configurations

INTRODUCTION

The WM8804 is a high performance S/PDIF transceiver which offers a state-of-the-art jitter attenuating S/PDIF receiver design.

The WM8804 customer evaluation board provides full functionality for the evaluation of the WM8804 device.

The purpose of this document is to detail common configurations for evaluation board operation. Contained in this document are:

- WM8804 internal signal path details.
- Register settings for internal configuration of the WM8804 device.
- Details on evaluation board setup and configuration.

This document can be used as a base line for evaluation board configuration when beginning to use the WM8804 customer evaluation board. Please note that all register settings supplied in this document are suitable to setup the required path but may not be optimised for quiet power up or other considerations that will be necessary for any end application. Please consult the latest datasheet for information on such considerations.

Software to configure the evaluation board can be downloaded from <http://www.wolfsonmicro.com/support/drivers>

TABLE OF CONTENTS

INTRODUCTION	1
TABLE OF CONTENTS	2
TERMINOLOGY	3
INPUTS AND OUTPUTS	3
BOARD POWER SUPPLIES	3
S/PDIF INPUTS	4
S/PDIF OUTPUT	4
WM8804 BASIC CONFIGURATION	5
MCU CONTROL (VIA USB).....	5
LED INDICATORS	6
EXAMPLE CONFIGURATIONS	7
HARDWARE MODE EXAMPLES.....	7
S/PDIF RECEIVER RX0 TO AIF.....	7
S/PDIF RECEIVER RX0 TO S/PDIF TRANSMITTER	9
AIF TO S/PDIF TRANSMITTER	11
SOFTWARE MODE EXAMPLES	13
S/PDIF RECEIVER RX0 TO AIF.....	13
S/PDIF RECEIVER RX0 TO S/PDIF TRANSMITTER.....	15
S/PDIF RECEIVER AUDIO DEMONSTRATION DAC	17
APPLICATION SUPPORT	19
IMPORTANT NOTICE	20
ADDRESS:.....	20

TERMINOLOGY

AIF	Audio Interface
S/PDIF	Sony/Philips Digital Interface Format
USB	Universal Serial Bus
EVB	Evaluation Board
MCU	Microprocessor Control Unit

INPUTS AND OUTPUTS

BOARD POWER SUPPLIES

The WM8804 customer evaluation board can be powered using one of two sources:

- External power supplies
- Derived from the USB connection

The evaluation board can be powered either from the 4mm power lead receptacles or from the USB host. Refer to Table 1 Power Supply Source Select.

REF-DES	LINK STATUS	DESCRIPTION
J8 (PVDD_SEL)	1 - 2 2 - 3	PVDD Power Source Select PVDD 4mm power jack receptacle selected USB power source selected [default setting]
J9 (DVDD_SEL)	1 - 2 2 - 3	DVDD Power Source Select DVDD 4mm power jack receptacle selected USB power source selected [default setting]
J10 (DVDD_DAC_SEL)	1 - 2 2 - 3	S/PDIF Receiver DAC Power Source Select DVDD 4mm power jack receptacle selected USB power source selected [default setting]
J11 (+5V_SEL)	1 - 2 2 - 3	+5V Power Source Select +5V 4mm power jack receptacle selected USB power source selected [default setting]

Table 1 Power Supply Source Select

Using appropriate power leads with 4mm connectors, supplies can be connected as described in Table 2 Power Supply Connections if the power supply is selected as the 4mm power jack receptacles.

REF-DES	SOCKET NAME	SUPPLY
J1	PVDD	+2.7V to +3.6V
J2	PGND	0V
J3	DVDD	+2.7V to +3.6V
J4	DGND	0V
J5	+5V	+5V

Table 2 Power Supply Connections

Note: Refer to the 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.

S/PDIF INPUTS

The WM8804 evaluation board supports both electrical and optical input of the S/PDIF stream. This signal may be input via a standard phono connector J7 or via the optical receivers U3. Refer to Table 3 S/PDIF Input Connections for details.

REF-DES	LINK STATUS	DESCRIPTION
J29	1 - 2 2 - 3	S/PDIF Input Source Select Optical input selected Electrical input selected [default setting]

Table 3 S/PDIF Input Connections

S/PDIF OUTPUT

The WM8804 S/PDIF output can be output from the WM8804 evaluation board via a standard phono connector (J21). Refer to table 4.

REF-DES	SOCKET TYPE	SIGNAL
J21	Phono Connector	S/PDIF_OUT

Table 4 S/PDIF Output connections

The evaluation board is also equipped with a Wolfson WM8726 received audio demonstration DAC. Refer to "S/PDIF Receiver Audio Demonstration DAC" section.

WM8804 BASIC CONFIGURATION

The following jumpers are provided to allow easy configuration of the WM8804 in both hardware and software mode. It is important that the jumpers are correctly configured for the desired WM8804 function.

JUMPERS	JUMPER STATUS	DESCRIPTION			
		Hardware Mode (selected by J15)		Software Mode (selected by J15)	
J12	1 – 2 2 – 3	Audio Interface Master/Slave Select Select master mode Select slave mode		No function – remove link	
J13	1 – 2 2 – 3	Audio Interface Configuration 1 High Low		Control Interface Mode Select Select 3-wire (SPI compatible) mode Select 2-wire (I2C compatible) mode	
J15	1 – 2 2 – 3	Hardware/Software Mode Select Software mode Hardware mode		Hardware/Software Mode Select Software mode Hardware mode	
J16	1 – 2 2 – 3	Audio Interface Configuration 0 High Low		No function – remove link	
J17	1 – 2 2 – 3	S/PDIF Transmitter Source Select Audio interface received data S/PDIF received data		2 Wire/I2C Mode Device Address 0x76 0x74	3 Wire/SPI Mode No function – remove link

Table 5 Jumpers

MCU CONTROL (VIA USB)

The WM8804 evaluation board is equipped with a USB interface MCU which allows interconnection with a PC in conjunction with the WM8804-EV1S evaluation software. To enable software control via the USB MCU, the pins in header H2 must be interconnected as shown in Table 6 USB MCU Connections. The links must be removed as shown in hardware and 2-Wire/I2C mode.

REF-DES	LINK STATUS	DESCRIPTION		
H2		WM8804 to Control Interface MCU Connection		
	1 – 2	3-Wire/SPI Mode Connect WM8804 CSB to USB MCU	2-Wire/I2C Mode Do Not Fit Link	Hardware Mode Do Not Fit Link
	3 – 4	Connect WM8804 SCLK to USB MCU	Connect WM8804 SCLK to USB MCU	Do Not Fit Link
	5 – 6	Connect WM8804 SDIN to USB MCU	Connect WM8804 SDIN to USB MCU	Do Not Fit Link
	7 – 8	Connect WM8804 SDOUT to USB MCU	Do Not Fit Link	Do Not Fit Link

Table 6 USB MCU Connections

LED INDICATORS

The WM8804 evaluation board has a number of LEDs. Their function is described in Table 7 LED Descriptions.

LINK STATUS (IF APPLICABLE)	LED	HARDWARE MODE DESCRIPTION		SOFTWARE MODE DESCRIPTION (DEFAULT SETTINGS)	
		LED OFF	LED ON	LED OFF	LED ON
Not applicable	LED1	USB firmware issue.	USB firmware OK.	USB firmware issue..	USB firmware OK.
Not applicable	LED2	USB power not present.	USB interface power is OK.	USB not present.	USB interface power is OK.
H4, 1 – 2 fitted (remove in s/w mode)	LED3	S/PDIF Rx TRANS_ERR status. Indicates that the S/PDIF RX has not received a transmission error.	S/PDIF Rx TRANS_ERR status. Indicates that the S/PDIF RX has received a transmission error.	Not applicable – do not fit link.	Not applicable– do not fit link.
H4, 3 – 4 fitted	LED4	No General Error occurred	GEN_FLAG – indicates a general error has occurred (logical OR of TRANS_ERR, NON_AUDIO and UNLOCK)	GPO0 – defaults to INT_N Indicates an interrupt has occurred due to change in S/PDIF Rx status	GPO0 – defaults to INT_N Indicates no interrupt due to change in S/PDIF Rx status
H4, 5 – 6 fitted (remove in 3-wire s/w mode)	LED5	S/PDIF Rx UNLOCK status indicating that the S/PDIF RX has locked.	S/PDIF Rx UNLOCK status. Indicates that the S/PDIF RX has lost lock .	2-wire mode GPO1 – defaults to S/PDIF Rx UNLOCK status indicating that the S/PDIF RX has locked. 3-wire mode NOT Available – remove link	2-wire mode GPO1 – defaults to S/PDIF Rx UNLOCK status. Indicates that the S/PDIF RX has lost lock. 3-wire mode NOT Available – remove link
H4, 7 – 8 fitted (remove in 3-wire s/w mode)	LED6	No S/PDIF Rx PCM_N or NON_AUDIO error.	S/PDIF Rx NON_AUDIO status. Indicates that the S/PDIF RX has received a PCM_N or ANDIO_N status error	2-wire mode GPO2– defaults to S/PDIF Rx TRANS_ERR status. Indicates that the S/PDIF RX has not received a transmission error. 3-wire mode NOT Available – remove link	2-wire mode GPO2– defaults to S/PDIF Rx TRANS_ERR status. Indicates that the S/PDIF RX has received a transmission error. 3-wire mode NOT Available – remove link

Table 7 LED Descriptions

EXAMPLE CONFIGURATIONS

The following example configurations are independent of whether power is applied to the board from external power supplies or from the USB interface.

HARDWARE MODE EXAMPLES

S/PDIF RECEIVER RX0 TO AIF

The configuration is as follows:-

- Data path = S/PDIF RX (electrical input) to AIF DOUT
- Hardware master mode.
- Powered from the USB interface.
- AIF format = 24 bit I²S
- Figure 1 illustrates the data path.
- Figure 2 illustrates the jumpers which must be made on the board.

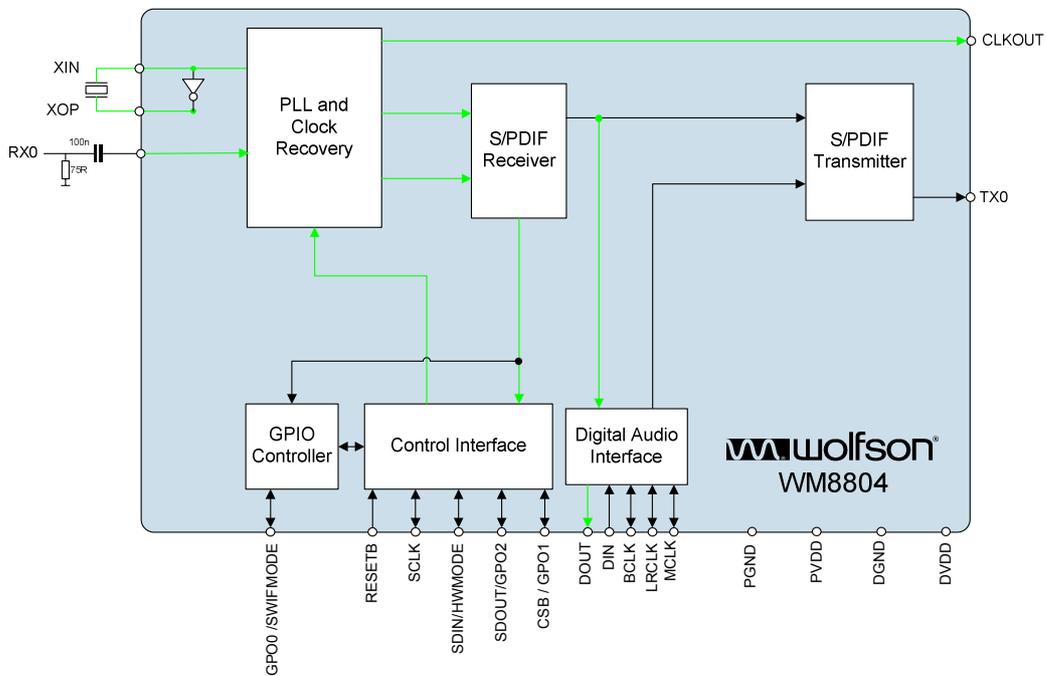


Figure 1 RX0 Input Path to Audio Interface Block Diagram

To configure this path, with an audio interface format of 24 bit I²S, the external jumpers should be set as shown in table 8. Do not fit H2 links.

JUMPERS	JUMPER STATUS	DESCRIPTION
J12	1 – 2	Audio Interface Master/Slave Select Select master mode
J16	1 – 2	Audio Interface Configuration 0 High
J13	2 – 3	Audio Interface Configuration 1 Low
J15	2 – 3	Hardware/Software Mode Select Hardware mode
J17	1 – 2	S/PDIF Transmitter Source Select Audio interface received data
J29	1 – 2	S/PDIF Input 0 Source Select Electrical input selected

Table 8 RX0 Input Path to Audio Interface Link Settings

The jumpers, input signals and output signals are shown in Figure 2. The yellow jumpers are those that are required. The red jumpers are for power connections.

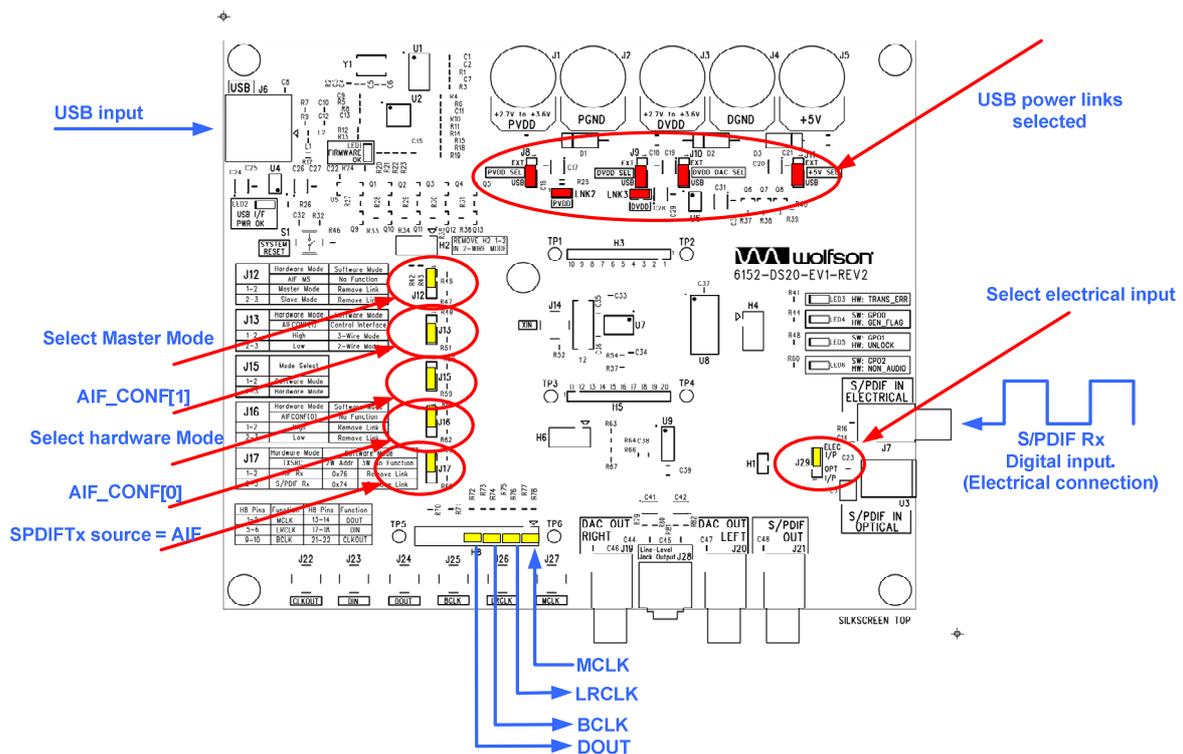


Figure 2 RX0 Input Path to Audio Interface Evaluation Board Configuration

Data is applied to the S/PDIF RX0 interface. The output data can be monitored at the AIF DOUT. MCLK is an output from AIF.

S/PDIF RECEIVER RX0 TO S/PDIF TRANSMITTER

The configuration is as follows:-

- Data path = S/PDIF RX0 (electrical input) to S/PDIF TX
- Hardware slave mode.
- Powered from the USB interface.
- AIF format = 24 bit I²S
- Figure 3 illustrates the data path.
- Figure 4 illustrates the jumpers which must be made on the board.

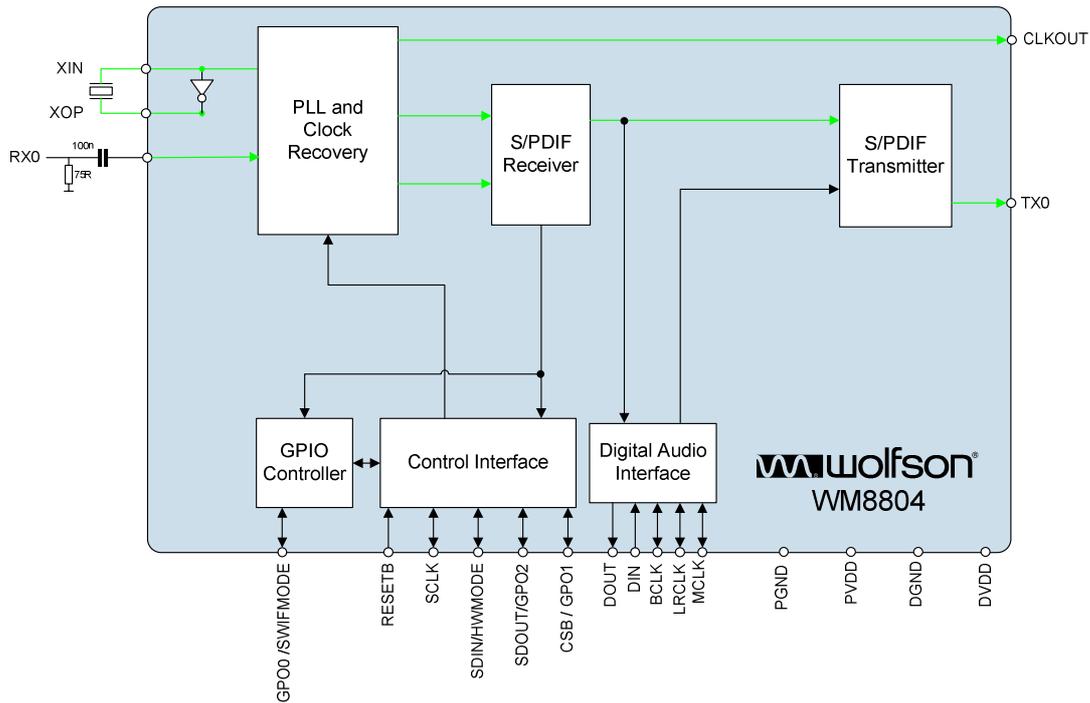


Figure 3 S/PDIF RX0 Input to S/PDIF TX0 Output Block Diagram

To configure this path, with an audio interface format of 24 bit I²S, the external jumpers should be set as shown in table 9. Do not fit H2 links.

JUMPERS	JUMPER STATUS	DESCRIPTION
J12	2 – 3	Audio Interface Master/Slave Select Select slave mode
J16	1 – 2	Audio Interface Configuration 0 High
J13	2 – 3	Audio Interface Configuration 1 Low
J15	2 – 3	Hardware/Software Mode Select Hardware mode
J17	2 – 3	S/PDIF Transmitter Source Select S/PDIF received data
J29	1 – 2	S/PDIF Input 0 Source Select Electrical input selected

Table 9 S/PDIF RX0 Input Path to S/PDIF TX Link Settings

The jumpers, input signals and output signals are shown in Figure 4. The yellow jumpers are those that are required.

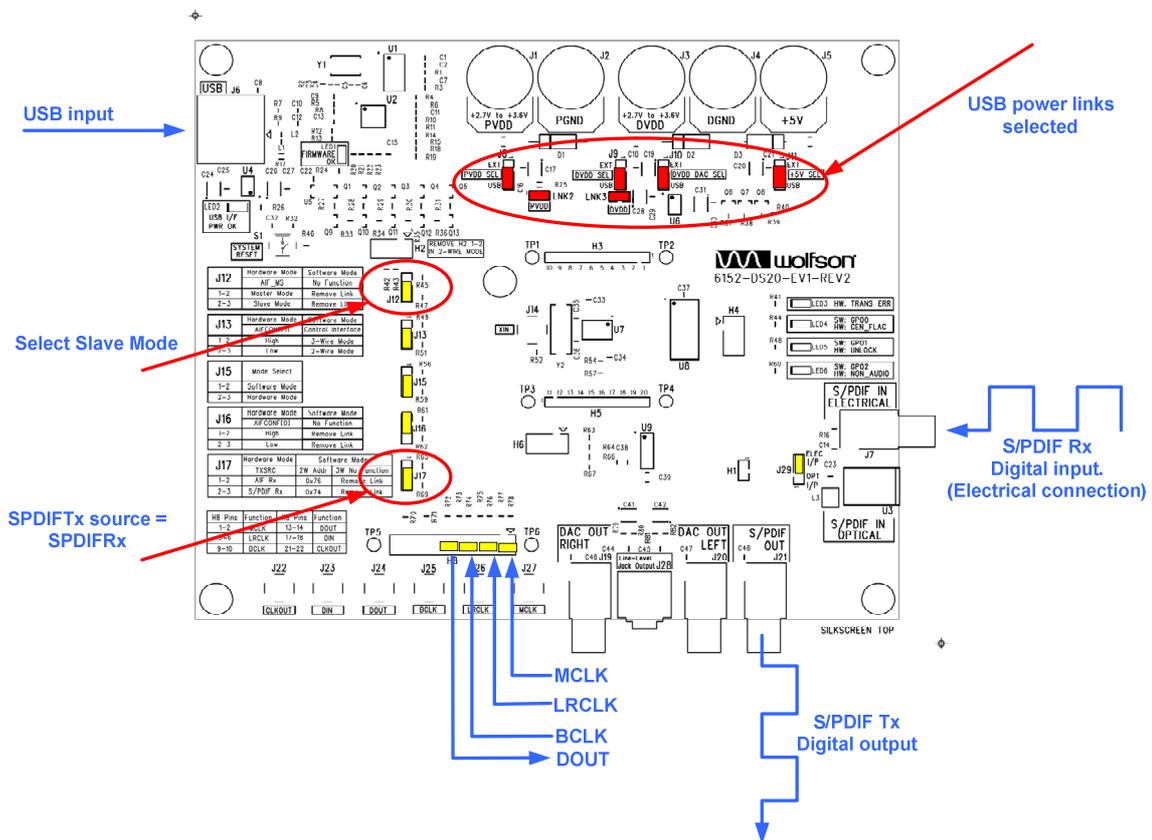


Figure 4 S/PDIF RX0 (optical) Input Path to S/PDIF TX Output Evaluation Board Configuration

AIF TO S/PDIF TRANSMITTER

The configuration is as follows:-

- Data path = AIF to S/PDIF TX
- Hardware slave mode.
- Powered from the USB interface.
- AIF format = 16 bit RJ
- Figure 5 illustrates the data path.
- Figure 6 illustrates the jumpers which must be made on the board.

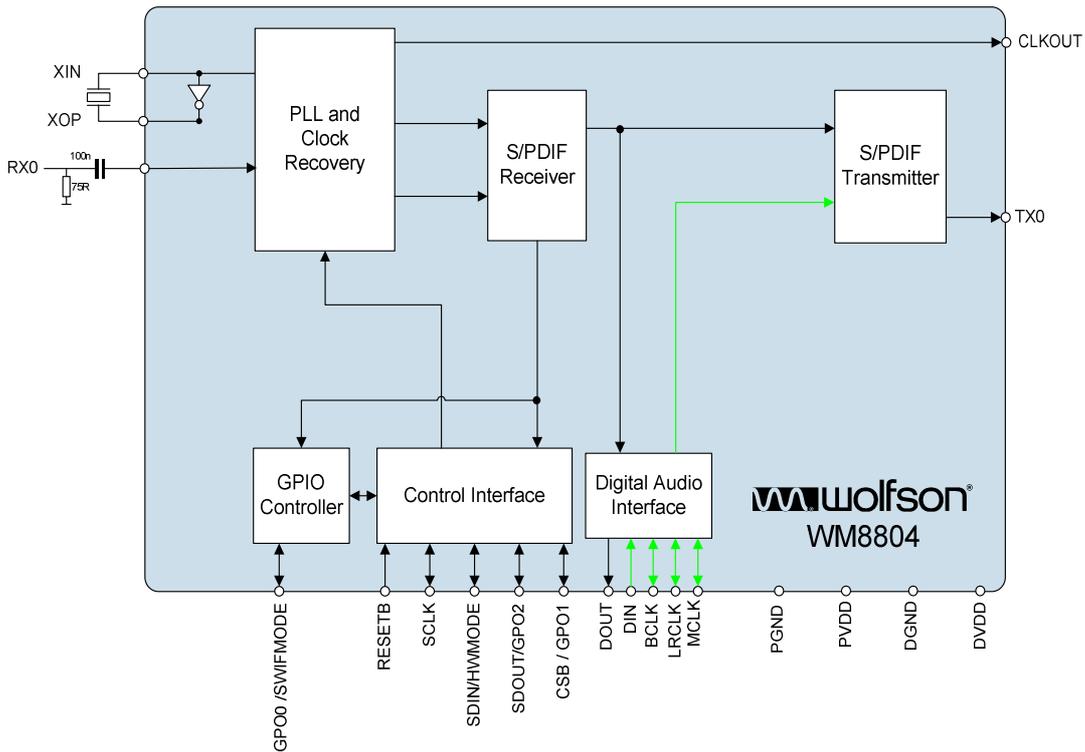


Figure 5 Audio Interface to TX0 Block Diagram

To configure this path, with an audio interface format of 16 bit RJ, the external jumpers should be set as shown in table 10. Do not fit H2 links.

JUMPERS	JUMPER STATUS	DESCRIPTION
J12	2 – 3	Audio Interface Master/Slave Select Select slave mode
J16	1 – 2	Audio Interface Configuration 0 High
J13	1 – 2	Audio Interface Configuration 1 High
J15	2 – 3	Hardware/Software Mode Select Hardware mode
J17	1 – 2	S/PDIF Transmitter Source Select Audio interface received data

Table 10 AIF Input Path to S/PDIF TX Link Settings

The jumpers, input signals and output signals are shown in Figure 6. The yellow jumpers are those that are required.

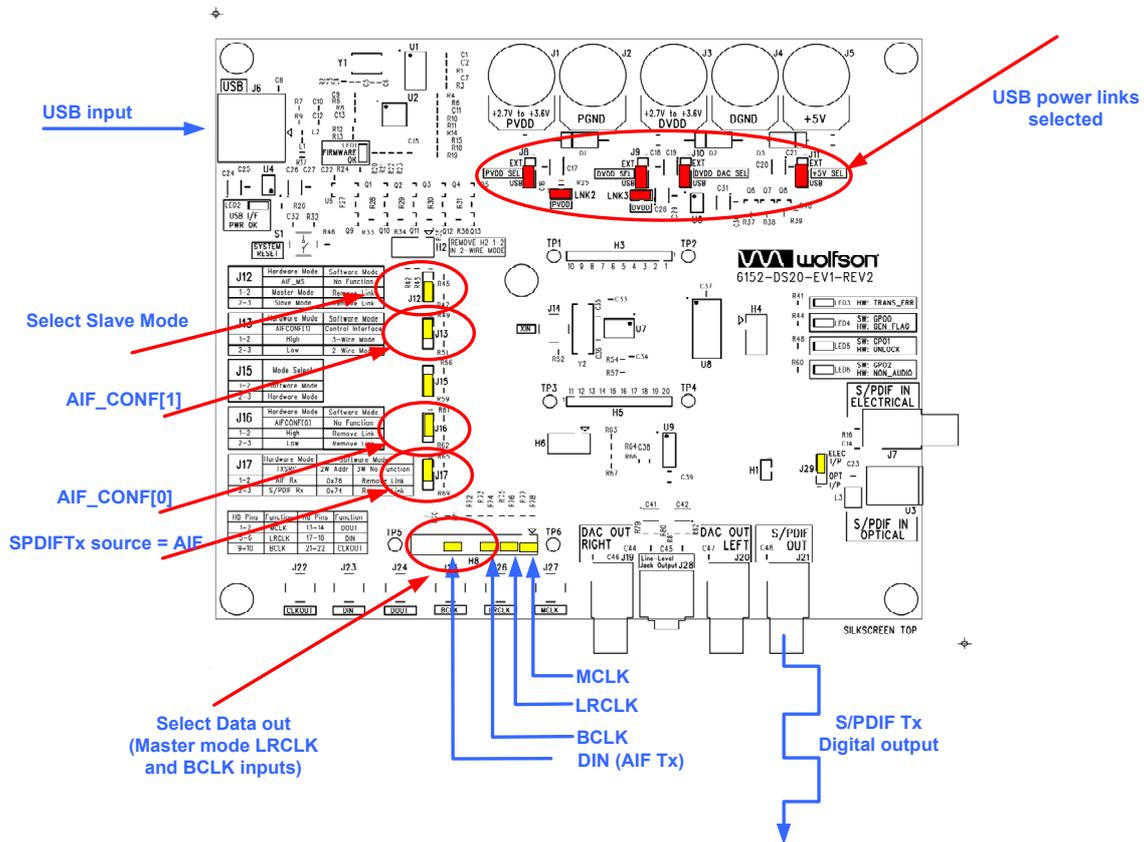


Figure 6 AIF Input Path to S/PDIF TX Output Evaluation Board Configuration

SOFTWARE MODE EXAMPLES

S/PDIF RECEIVER RX0 TO AIF

The configuration is as follows:-

- Data path = S/PDIF RX0 (electrical input) to AIF DOUT
- Software slave mode. 3-wire control interface
- Powered from the USB interface.
- AIF format = 24 bit I²S
- Figure 7 illustrates the data path.
- Figure 8 illustrates the jumpers which must be made on the board.

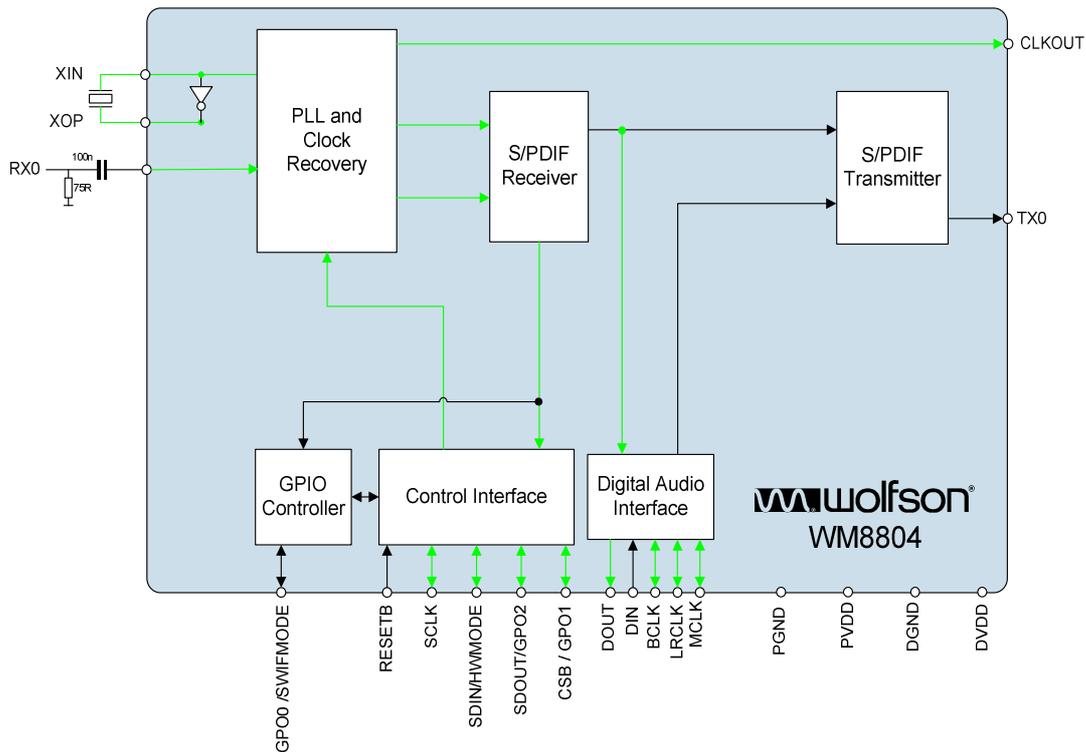


Figure 7 S/PDIF Rx0 to Audio Interface Block Diagram

To configure this path, with an audio interface format of 24 bit I²S, the external jumpers should be set as shown in table 11 and the registers programmed as in table 12

JUMPERS	JUMPER STATUS	DESCRIPTION
J13	1 – 2	Control Interface Mode Select Select 3-wire (SPI compatible) mode
J15	1 – 2	Hardware/Software Mode Select Software mode

Table 11 Jumper Settings for S/PDIF Rx1 to Audio Interface

REGISTER	SETTING	COMMENT
0x00	0x00	Reset device
0x1E	0x04	Disable the S/PDIF Tx interface
0x1B	0x0A	AIF Tx = 24 bit, I ² S
0x1C	0x4A	Master mode, AIF Rx = 24 bit, I ² S

Table 12 Register Settings for S/PDIF Rx0 to Audio Interface

The jumpers, input signals and output signals are shown in Figure 8. The yellow jumpers are those that are required.

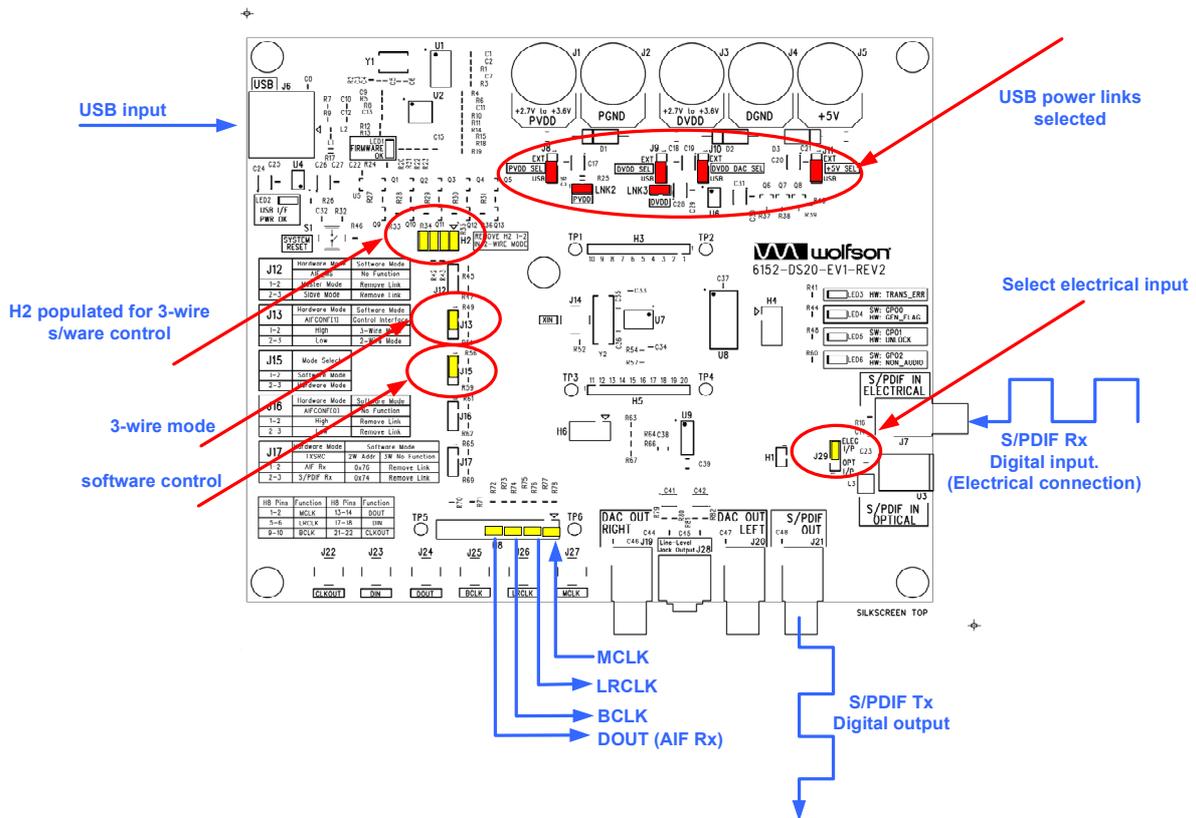


Figure 8 RX0 Input Path to Audio Interface 3-wire Software Control Evaluation Board Configuration

S/PDIF RECEIVER RX0 TO S/PDIF TRANSMITTER

The configuration is as follows:-

- Data path = S/PDIF RX0 (optical input) CMOS compatible to S/PDIF TX0
- Software master mode. 2-wire control interface. Address=0x76.
- Powered from external power supplies.
- AIF format = 24 bit I²S
- Figure 9 illustrates the data path.
- Figure 10 illustrates the jumpers which must be made on the board.

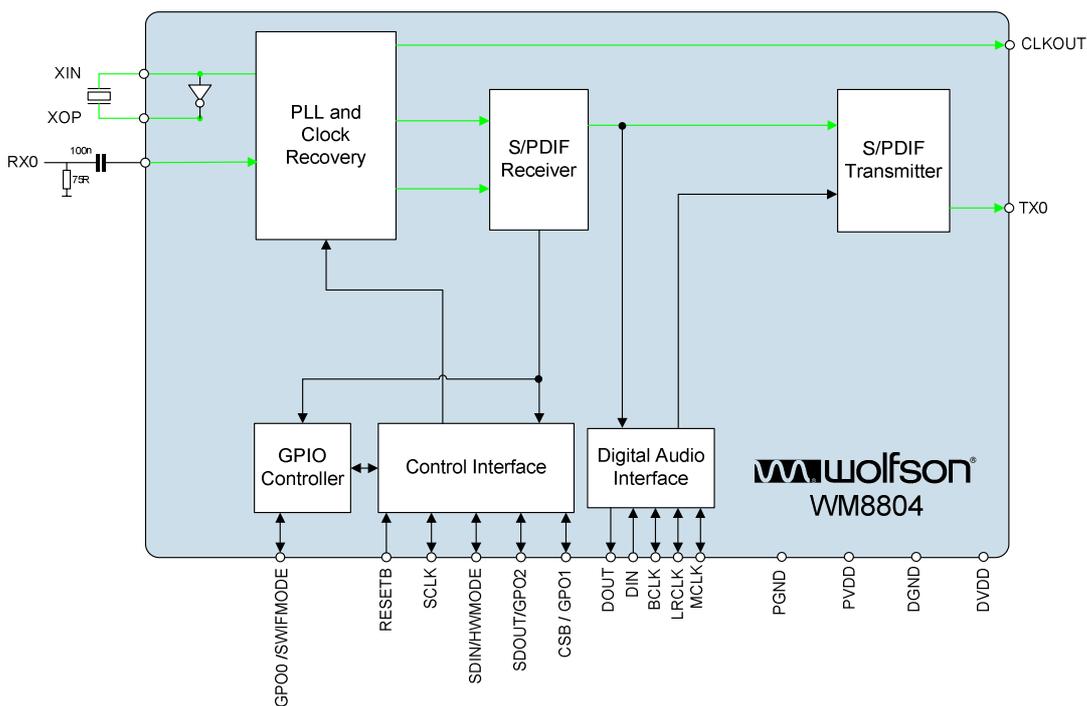


Figure 9 RX0 to TX0 Block Diagram

To configure this path, with an audio interface format of 24 bit I²S, the external jumpers should be set as shown in table 13 and the registers programmed as in table 14

JUMPERS	JUMPER STATUS	DESCRIPTION
J13	2 – 3	Control Interface Mode Select Select 2-wire (I2C compatible) mode
J15	1 – 2	Hardware/Software Mode Select Software mode
J17	1 – 2	2 Wire/I2C Mode Device Address 0x76
J29	2 – 3	S/PDIF Input select Optical Input

Table 13 Jumper Settings for S/PDIF Rx4 to S/PDIF Tx

REGISTER	SETTING	COMMENT
0x00	0x00	Reset device
0x1E	0x10	Disable the AIF
0x09	0x00	Select the S/PDIF CMOS compatible input mode
0x15	0x31	S/PDIF Tx source= S/PDIF Rx
0x1B	0x0A	AIF Tx = 24 bit, 1 ² S
0x1C	0x4A	Master mode, AIF Rx = 24 bit, 1 ² S

Table 14 Register Settings for S/PDIF RX0 to S/PDIF TX0

The jumpers, input signals and output signals are shown in Figure 10. The yellow jumpers are those that are required.

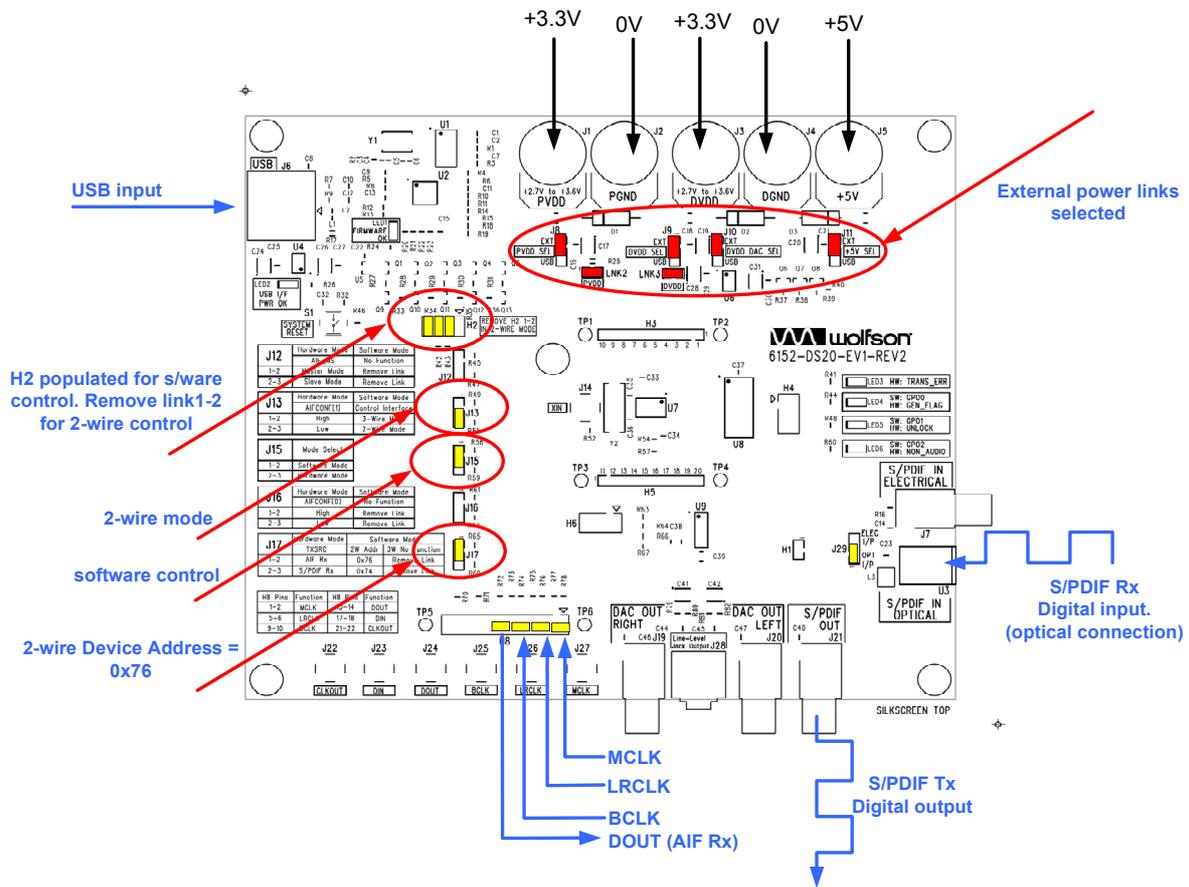


Figure 10 S/PDIF RX0 Optical Input S/PDIF TX0 Evaluation Board Configuration

S/PDIF RECEIVER AUDIO DEMONSTRATION DAC

The following configuration illustrates the S/PDIF Rx to analogue output via the WM8726 demonstration DAC. This can be used to view an analog representation of the digital data received on the selected S/PDIF Rx interface. Note that the AIF should not be connected to any other test equipment if using this output.

This example also illustrates the connections needed when using an external power source instead of powering the board from the USB interface.

The configuration is as follows:-

- Data path = S/PDIF Rx0 (optical input) to AIF
- Software Master mode. 2-wire control interface. Address=0x74.
- Powered from external power supplies.
- AIF format = 24 bit I²S
- Figure 11 illustrates the jumpers which must be made on the board. The jumpers needed for external power supply are detailed in Table 1

JUMPERS	JUMPER STATUS	DESCRIPTION
J13	2 – 3	Control Interface Mode Select Select 2-wire (I2C compatible) mode
J15	1 – 2	Hardware/Software Mode Select Software mode
J17	2 – 3	2 Wire/I2C Mode Device Address =0x74
J29	2 – 3	S/PDIF Input Select Optical Input

Table 15 Jumper Settings for S/PDIF Rx0 to Audio Interface

REGISTER	SETTING	COMMENT
0x00	0x00	Reset device
0x1E	0x04	Disable the S/PDIF Tx interface
0x09	0x01	Select the comparator input mode for Rx0
0x1B	0x0A	AIF Tx = 24 bit, I ² S
0x1C	0x4A	Master mode, AIF Rx = 24 bit, I ² S

Table 16 Register Settings for S/PDIF Rx0 (optical input) to Audio Interface

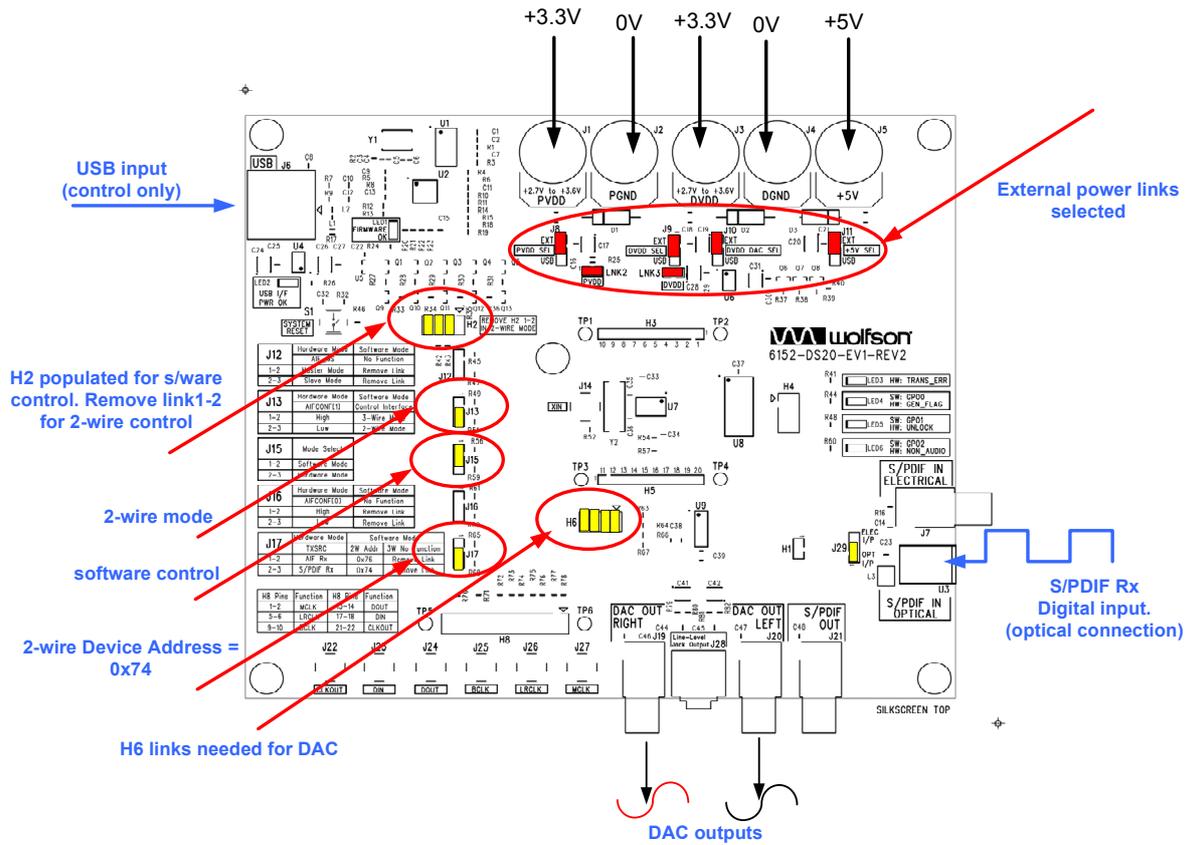


Figure 11 DAC Evaluation Board Configuration

APPLICATION SUPPORT

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

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

or contact your local Wolfson representative.

Additional information may be made available on our web site at:

<http://www.wolfsonmicro.com>

IMPORTANT NOTICE

Wolfson Microelectronics plc ("Wolfson") products and services are sold subject to Wolfson's terms and conditions of sale, delivery and payment supplied at the time of order acknowledgement.

Wolfson warrants performance of its products to the specifications in effect at the date of shipment. Wolfson reserves the right to make changes to its products and specifications or to discontinue any product or service without notice. Customers should therefore obtain the latest version of relevant information from Wolfson to verify that the information is current.

Testing and other quality control techniques are utilised to the extent Wolfson deems necessary to support its warranty. Specific testing of all parameters of each device is not necessarily performed unless required by law or regulation.

In order to minimise risks associated with customer applications, the customer must use adequate design and operating safeguards to minimise inherent or procedural hazards. Wolfson is not liable for applications assistance or customer product design. The customer is solely responsible for its selection and use of Wolfson products. Wolfson is not liable for such selection or use nor for use of any circuitry other than circuitry entirely embodied in a Wolfson product.

Wolfson's products are not intended for use in life support systems, appliances, nuclear systems or systems where malfunction can reasonably be expected to result in personal injury, death or severe property or environmental damage. Any use of products by the customer for such purposes is at the customer's own risk.

Wolfson does not grant any licence (express or implied) under any patent right, copyright, mask work right or other intellectual property right of Wolfson covering or relating to any combination, machine, or process in which its products or services might be or are used. Any provision or publication of any third party's products or services does not constitute Wolfson's approval, licence, warranty or endorsement thereof. Any third party trade marks contained in this document belong to the respective third party owner.

Reproduction of information from Wolfson datasheets is permissible only if reproduction is without alteration and is accompanied by all associated copyright, proprietary and other notices (including this notice) and conditions. Wolfson is not liable for any unauthorised alteration of such information or for any reliance placed thereon.

Any representations made, warranties given, and/or liabilities accepted by any person which differ from those contained in this datasheet or in Wolfson's standard terms and conditions of sale, delivery and payment are made, given and/or accepted at that person's own risk. Wolfson is not liable for any such representations, warranties or liabilities or for any reliance placed thereon by any person.

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