INTRODUCTION

The WM8985-6160-FL32-M mini board is compatible with the 6160-EV1 customer evaluation board and together provide a complete hardware platform for evaluation of the WM8985. The WM8985 mini board can also be used independently and connected directly to a processor board using flying wires or appropriate headers. This document will cover both setups, but performance data will be based on the Wolfson system with 6160-EV1 main board. Configurations covered are listed below:

- DAC playback to headphone LOUT1/ROUT1
- DAC playback to headphone LOUT2/ROUT2 Class D 16R Load
- MIC LIN-RIN to ADC

This document should be used as a starting point for evaluation of WM8985. It will not cover every possible usage mode.

Assumptions:

1. The user is familiar with the 6160-EV1 main board and that the board is configured correctly for the path of interest (see related documents below)
2. The user has set up WISCE as per instruction and has control of the DUT (register settings provided in this document and the WISCE installation software)

Related documents:

1. WM8985-6160-FL32-M-REV2 Schematic and Layout.pdf
2. 6160-EV1 Schematic and Layout.pdf
3. WISCE Quick Start Guide.pdf

The audio interface is connected to the main board through the S/PDIF ELECTRICAL IN and S/PDIF OPTICAL OUT connectors. All control signals for the 3-wire interface to the device are through the USB interface.
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BOARD CONFIGURATION WM8985 STAND-ALONE

The WM8985 mini board can be used as a stand-alone module for direct connection to a processor board using flying leads or dedicated headers. This section will detail important considerations and provide all information required to do this without risking damage to the device.

CONNECTION DIAGRAM

The diagram below shows the connections required to power up and control the WM8985 mini board.
## Voltage Supplies

- **AVDD1**: TP31, H6 pin 14, AVDD1 = 2.5V to 3.6V
- **AVDD2**: TP26, H6 pin 4, AVDD2 = 2.5V to 3.6V
- **DCVDD**: TP13, H5 pin 10, DCVDD = 1.71V to 3.6V but must be less than or equal to AVDD1, AVDD2, & DBVDD
- **DBVDD**: TP14, H5 pin 12, DBVDD = 1.71V to 3.6V

## Ground

- **AGND1**
- **AGND2**
- **DGND**

Common GND on any of TP12, TP24, TP28, TP34, TP35, H3, H6, H7 odd numbered pins. Analogue and digital grounds must be within 0.3V of each other.

## Control Interface

- **MODE**: TP18 (Controlled using SP2 on Mini board), H7 pin 4
  - 2-wire (default): MODE to GND via R21
  - 3-wire: MODE to DBVDD via SP2
- **CSB/GPIO**: TP15, H5 pin 14
  - 2-wire address 0x34 (default): CSB to GND
  - 2-wire address 0x36: CSB to DBVDD
- **SDIN**: TP17, H7 pin 2
- **SCLK**: TP16, H5 pin 16

All control interface signals should swing between DGND and DBVDD.

## Master Clock

- **MCLK**: TP11, H5 pin 6
  - Signal should swing between DGND and DBVDD

## Audio Interface

- **BCLK**: TP8, H3 pin 16
  - All audio interface signals should swing between DGND and DBVDD
- **LRC**: TP7, H3 pin 14
- **DACDAT**: TP10, H5 pin 4
- **ADCDAT**: TP9, H5 pin 2

## Analogue Inputs

- **LIN**: TP2, H3 pin 4
  - Full scale swing should not exceed AVDD/3.3 Vrms single-ended. Pseudo-differential full scale swing should not exceed AVDD*0.7/3.3 Vrms
- **LIP**: TP1, H3 pin 2
- **RIN**: TP5, H3 pin 10
- **RIP**: TP4, H3 pin 8
- **L2/GPIO2**: TP3, H3 pin 6
  - Full scale swing should not exceed AVDD/3.3 Vrms
- **R2/GPIO3**: TP6, H3 pin 12
- **AUXL**: TP19, H7 pin 6
  - Full scale swing should not exceed AVDD/3.3 Vrms
- **AUXR**: TP20, H7 pin 8
  - Full scale swing should not exceed AVDD/3.3 Vrms
### Analogue Outputs

<table>
<thead>
<tr>
<th>MICBIAS</th>
<th>TP32</th>
<th>H6 pin 16</th>
<th>MBVSEL=0 sets bias voltage to 0.9<em>AVDD. MBVSEL=1 sets bias voltage to 0.65</em>AVDD. Max current 3mA.</th>
</tr>
</thead>
<tbody>
<tr>
<td>LOUT1</td>
<td>TP30</td>
<td>H6 pin 12</td>
<td>Class AB headphone or line output left</td>
</tr>
<tr>
<td>ROUT1</td>
<td>TP29</td>
<td>H6 pin 10</td>
<td>Class AB headphone or line output right</td>
</tr>
<tr>
<td>LOUT2</td>
<td>TP25</td>
<td>H6 pin 2</td>
<td>Class D or Class AB headphone output left</td>
</tr>
<tr>
<td>ROUT2</td>
<td>TP23</td>
<td>H7 pin 14</td>
<td>Class D or Class AB headphone output right</td>
</tr>
<tr>
<td>OUT3</td>
<td>TP22</td>
<td>H7 pin 12</td>
<td>Left line output</td>
</tr>
<tr>
<td>OUT4</td>
<td>TP21</td>
<td>H7 pin 10</td>
<td>Right line or mono mix output</td>
</tr>
</tbody>
</table>
BOARD CONFIGURATION USING 6160-EV1 MAIN BOARD

This section focuses on evaluation of the WM8985 mini board in combination with the 6160-EV1 main board. This system is the reference platform for measurement data contained in this document. Please note that only a limited number of usage modes will be covered.

DAC PLAYBACK TO HEADPHONE (LOUT1/ROUT1)

The following section details board configuration for stereo DAC playback to headphone outputs LOUT1 and ROUT1.

EVALUATION BOARD SETUP

BOARD CONFIGURATION
REGISTER SETTINGS

Register settings provided below are simply the minimum requirement to configure the desired path and have not in any way been optimised for pops and clicks.

<table>
<thead>
<tr>
<th>REG INDEX</th>
<th>DATA VALUE</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>R0</td>
<td>0x000</td>
<td>Reset (all registers to default setting)</td>
</tr>
<tr>
<td>R61</td>
<td>0x100</td>
<td>Set BIAS CUT</td>
</tr>
<tr>
<td>R49</td>
<td>0x002</td>
<td>Enable thermal shutdown</td>
</tr>
<tr>
<td>R52</td>
<td>0x140</td>
<td>LOUT1 muted, LOUT1VOL=0dB</td>
</tr>
<tr>
<td>R53</td>
<td>0x140</td>
<td>ROUT1 muted, ROUT1VOL=0dB</td>
</tr>
<tr>
<td>R2</td>
<td>0x180</td>
<td>Enable LOUT1 &amp; ROUT1 outputs</td>
</tr>
<tr>
<td>R42</td>
<td>0x004</td>
<td>Enable POBTCRL</td>
</tr>
<tr>
<td>R3</td>
<td>0x1EF</td>
<td>Enable DACs and output mixers</td>
</tr>
<tr>
<td>R1</td>
<td>0x0CD</td>
<td>VMIDSEL=75kΩ, enable BIASSEN &amp; BUFIOEN</td>
</tr>
<tr>
<td>R6</td>
<td>0x040</td>
<td>MCLK selected, MCLKDIV=n/2, BCLK=MCLK</td>
</tr>
<tr>
<td>R11</td>
<td>0x1FF</td>
<td>Set DACVU, DACLVOL=0dB</td>
</tr>
<tr>
<td>R12</td>
<td>0x1FF</td>
<td>Set DACVU, DACRVOL=0dB</td>
</tr>
<tr>
<td>R42</td>
<td>0x000</td>
<td>Disable POBTCRL</td>
</tr>
<tr>
<td>R52</td>
<td>0x139</td>
<td>LOUT1 un-muted, LOUTVOL=0dB</td>
</tr>
<tr>
<td>R53</td>
<td>0x139</td>
<td>ROUT1 un-muted, ROUTVOL=0dB</td>
</tr>
</tbody>
</table>

THD+N V AMPLITUDE PERFORMANCE CURVE

[Graph and table image]
DAC PLAYBACK TO HEADPHONE (LOUT2/ROUT2) CLASS D 16R LOAD

The following section details board configuration for stereo DAC playback to stereo headphones on LOUT2 and ROUT2 in Class D mode.

EVALUATION BOARD SETUP

BOARD CONFIGURATION
### REGISTER SETTINGS

<table>
<thead>
<tr>
<th>REG INDEX</th>
<th>DATA VALUE</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>R0</td>
<td>0x000</td>
<td>Reset (all registers to default setting)</td>
</tr>
<tr>
<td>R61</td>
<td>0x100</td>
<td>Set BIASCUT</td>
</tr>
<tr>
<td>R49</td>
<td>0x002</td>
<td>Enable thermal shutdown</td>
</tr>
<tr>
<td>R1</td>
<td>0x0CD</td>
<td>VMIDSEL=75kΩ, enable BIASEN &amp; BUFIOEN</td>
</tr>
<tr>
<td>R42</td>
<td>0x004</td>
<td>Enable POBCTRL</td>
</tr>
<tr>
<td>R54</td>
<td>0x140</td>
<td>LOUT2 muted, LOUT2VOL=0dB</td>
</tr>
<tr>
<td>R55</td>
<td>0x140</td>
<td>ROUT2 muted, ROUT2VOL=0dB</td>
</tr>
<tr>
<td>R3</td>
<td>0x1EF</td>
<td>Enable LOUT2 &amp; ROUT2 outputs, DACs and output mixers</td>
</tr>
<tr>
<td>R6</td>
<td>0x040</td>
<td>MCLK selected, MCLKDIV=n/2, BCLK=MCLK</td>
</tr>
<tr>
<td>R23</td>
<td>0x100</td>
<td>Enable Class D output</td>
</tr>
<tr>
<td>R11</td>
<td>0x1FF</td>
<td>Set DACVU, DACLVOL=0dB</td>
</tr>
<tr>
<td>R12</td>
<td>0x1FF</td>
<td>Set DACVU, DACRVOL=0dB</td>
</tr>
<tr>
<td>R42</td>
<td>0x000</td>
<td>Disable POBCTRL</td>
</tr>
<tr>
<td>R54</td>
<td>0x139</td>
<td>LOUT2 un-muted, LOUT2VOL=0dB</td>
</tr>
<tr>
<td>R55</td>
<td>0x139</td>
<td>ROUT2 un-muted, ROUT2VOL=0dB</td>
</tr>
</tbody>
</table>

### THD+N V AMPLITUDE PERFORMANCE CURVE

![THD+N V AMPLITUDE PERFORMANCE CURVE](image)
MIC LIN-RIN TO ADC

The following section details board configuration for connecting a differential Microphone to LIN/LIP and RIN/RIP to the stereo ADC.

EVALUATION BOARD SETUP

BOARD CONFIGURATION

S/PDIF OPTICAL OUT

S/PDIF ELECTRICAL IN

USB

LIN (White) Phono Inputs

RIN (White) Phono Inputs
### REGISTER SETTINGS

<table>
<thead>
<tr>
<th>REG INDEX</th>
<th>DATA VALUE</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>R0</td>
<td>0x000</td>
<td>Reset (all registers to default setting)</td>
</tr>
<tr>
<td>R49</td>
<td>0x002</td>
<td>Enable thermal shutdown</td>
</tr>
<tr>
<td>R2</td>
<td>0x03F</td>
<td>Enable BOOSTENL, BOOSTENR, INPPGAENL, INPPGAENR; ADECENL, ADECENR</td>
</tr>
<tr>
<td>R1</td>
<td>0x009</td>
<td>VMIDSEL=75kΩ, enable BIASEN</td>
</tr>
<tr>
<td>R6</td>
<td>0x040</td>
<td>MCLK selected, MCLKDIV=n/2, BCLK=MCLK</td>
</tr>
<tr>
<td>R15</td>
<td>0x1FF</td>
<td>Set ADCVU, ADCLVOL-0dB</td>
</tr>
<tr>
<td>R16</td>
<td>0x1FF</td>
<td>Set ADCVU, ADCRVOL-0dB</td>
</tr>
<tr>
<td>R44</td>
<td>0x022</td>
<td>LIN2INPGA, RIN2INPGA</td>
</tr>
<tr>
<td>R45</td>
<td>0x110</td>
<td>Set INPPGAVU, INPPGAVOLL=0dB</td>
</tr>
<tr>
<td>R46</td>
<td>0x110</td>
<td>Set INPPGAVU, INPPGAVOLR=0dB</td>
</tr>
<tr>
<td>R47</td>
<td>0x000</td>
<td>PGABOOSTL disabled</td>
</tr>
<tr>
<td>R48</td>
<td>0x000</td>
<td>PGABOOSTR disabled</td>
</tr>
</tbody>
</table>

### THD+N V AMPLITUDE PERFORMANCE CURVE

[Graph showing THD+N v amplitude performance curve]

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Customer Information
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:

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