Overview

The rDac is a D to A convertor featuring Optical / Coaxial and USB inputs and utilizes a simple push button to cycle between the input option – when locked on to data the LED in front of the relevant source will light Green and audio should be present if the LED is RED in color the input is not locked onto relevant data.

Compatible formats include.

All PCM 2 channel

<table>
<thead>
<tr>
<th>Input / bit depth</th>
<th>32kHz</th>
<th>44.1kHz</th>
<th>48kHz</th>
<th>88.2kHz</th>
<th>96kHz</th>
<th>176kHz</th>
<th>192kHz</th>
</tr>
</thead>
<tbody>
<tr>
<td>USB 16 &amp; 24 Bit</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Optical 16 &amp; 24 Bit</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Coaxial 16 &amp; 24 Bit</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes (1)</td>
<td>Yes (1)</td>
</tr>
<tr>
<td>Wireless 16 Bit</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
</tbody>
</table>

(1) Source may not be capable of resolution

Power supply circuit page 5

A external 6v 600ma D.C power supply is used to supply the required power to the Connector at location CON400 this is then switched by the rear panel mounted power switch at location SW400, D400 is used for PSU monitor by associated circuitry formed by IC105 and IC104, D401 is used to prevent reverse bias of the PSU, the supply is then filtered by the network of L400 and C400 to form the main PSU source of +6v D.C.

The rDac features 7 separate regulated powers supplies details appear in the table below

<table>
<thead>
<tr>
<th>Regulator locations</th>
<th>Voltage (d.c)</th>
<th>Components associated</th>
</tr>
</thead>
<tbody>
<tr>
<td>REG400</td>
<td>+5v</td>
<td>Kleer option, optical input rec, LED array via IC102</td>
</tr>
<tr>
<td>REG401</td>
<td>+3V3</td>
<td>IC 100, 103, 104, 108, 107, 200, 201, 202, 203, 204, 205, 206, 301 mute circuit</td>
</tr>
<tr>
<td>REG402</td>
<td>+3V</td>
<td>SPDIF receiver</td>
</tr>
<tr>
<td>REG403</td>
<td>+5v</td>
<td>Output stage +5v</td>
</tr>
<tr>
<td>REG404</td>
<td>+3v3</td>
<td>Oscillator</td>
</tr>
<tr>
<td>REG405</td>
<td>+5v</td>
<td>DAC</td>
</tr>
<tr>
<td>IC400</td>
<td>-5v</td>
<td>Output stage -5v</td>
</tr>
<tr>
<td>IC107</td>
<td>+1.8</td>
<td>Main micro core voltage</td>
</tr>
</tbody>
</table>
Main micro circuit page 2

The main micro at location IC107 (on the diagram this is split into two area these are micro power and config + Micro I/O) we will deal with Micro power and config 1st.

Micro power and config

Two separate power supplies are required by the AT91SAM these are taken from 3V3 and 1V8 for the processor core – the micro is programmed with bespoke Arcam code the oscillator for the micro is at X101 and runs at 4MHz the TDI TDO TCK TMS ERASE NRST pins are for development Debug use and the connecter at location CON103 is not fitted to production items

Micro I/O

Pin descriptions

<table>
<thead>
<tr>
<th>Pin name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>SPDIF INT</td>
<td>Interrupt flag from the SPDIF receiver</td>
</tr>
<tr>
<td>Source</td>
<td>To source select TACT switch</td>
</tr>
<tr>
<td>Mute RLY</td>
<td>Control of mute relay via TR100</td>
</tr>
<tr>
<td>DAC MUTE</td>
<td>DAC MUTE signal to Pin 25 of Wolfson DAC at location IC301</td>
</tr>
<tr>
<td>ENABLE KLEER</td>
<td>To MUX at location IC205A</td>
</tr>
<tr>
<td>ENABLE SPDIF</td>
<td>To MUX at location IC202A</td>
</tr>
<tr>
<td>SERIAL UC to KLEER</td>
<td>Serial control to KLEER wireless option</td>
</tr>
<tr>
<td>SERIAL KLEER to UC</td>
<td>Serial data from KLEER to UC</td>
</tr>
<tr>
<td>SCL</td>
<td>To EEprom at location IC108 / DAC at location IC301 / USB receiver at IC103</td>
</tr>
<tr>
<td>SDA</td>
<td>To EEprom at location IC108 / DAC at location IC301 / USB receiver at IC103</td>
</tr>
<tr>
<td>Enable LEDS</td>
<td>LEDs on control</td>
</tr>
<tr>
<td>LED 0</td>
<td>Binary select for LED control via 3 – 8 line decoder at location IC102</td>
</tr>
<tr>
<td>LED 1</td>
<td>Binary select for LED control via 3 – 8 line decoder at location IC102</td>
</tr>
<tr>
<td>LED 3</td>
<td>Binary select for LED control via 3 – 8 line decoder at location IC102</td>
</tr>
</tbody>
</table>
**Input Stages and switching**  Circuit pages 2 and 3

The inputs are split into two groups with the Wolfson SPDIF receiver at location IC201 dealing with Optical and Coaxial selection whilst the MUX at locations IC202A IC202B and IC205A switch between SPDIF (opt or coax) and USB or KLEER under control from main micro.

**SPDIF input**

The Wolfson WM8805 SPDIF receiver supplies data in a format of Data, LRCLK, BCLK and MLCK, the output of IC201 runs directly to the DAC via the MUX at location IC202A with exception of the MCLK this take a path thru IC203 as part of the MCLK MUX between USB / KLEER and SPDIF MCLK’s.

**USB input**

The USB data arrives at CON100 before traveling to the USB streaming control chip at location IC103 via the ESD protection Chip at location IC101 the chip is loaded with the DCS asynchronous/isochronous input system from IC100 at boot up.

IC103 has its own MCLK source at location IC204 another WM8805 this time used as an adaptive clock source the output is buffered by IC203C.

The Data, LRCLK, BCLK are switched to the DAC via IC202B with the MCLK coming via IC203.

**DAC and Audio Stages**  circuit page 4

The Wolfson 8741 DAC can be found at location IC301 and takes its supplies from 3V3D and 5VDAC, data enters the chip on pins 1 – 5 and should be seen as below.

<table>
<thead>
<tr>
<th>Pin loc</th>
<th>Signal type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pin 1</td>
<td>LRCK</td>
</tr>
<tr>
<td>Pin 2</td>
<td>SDATA</td>
</tr>
<tr>
<td>Pin 3</td>
<td>BCK</td>
</tr>
<tr>
<td>Pin 5</td>
<td>MCLK</td>
</tr>
</tbody>
</table>

Analogue audio leaves the DAC as balanced pairs on pins 16 / 17 (left) and 12 / 13 (right) audio then travels thru and filter network enters the Op-amp at location IC300 a/b (L/R) and then onto IC302 a/b (L/R) output muting is twofold with both DAC mute (transistor mute) and full mute (relay) the DAC mute is provided by transistors TR302 and TR305 switching the audio down to 0v this under the control of the DAC MUTE line from IC107, the relay mute is provided by RLY300 and triggered from 2 lines one being the power detect sourced from D400 at power In - under low power the relay will close at 5.3v D.C and is flipped by IC105 in combination with IC104 the output of IC104 is low to mute the relay is switched by TR300.
DAC is configured in software mode

- Pin 24 open sets 2-wire interface mode
- Pin 28 SDA input
- Pin 27 SCL input
- Pin 23 in GND
- Pin 28 sets I2C address LSB
- Pin 4 unlisted, leave it off
- Pin 6 low sets non-differential mode
- Pin 25 high sets mute off
- Pin 22 unlisted, leave it off

I2C address = 0x01 0x1

DAC電路圖 with changes:

- DAC_MCLK
- SDA
- 470UF capacitor
- 1UF capacitor
- Pin 28 sets I2C address LSB
- C337
- C323
- OSR/DSDR22
- IWO/DOUT23
- CSB/SADDR/I2S28

- DVDD 8
- 1UF capacitor
- P0C33801 P0C33802
- ZFLAG 21

- passband out level = 2.341Vrms (5.5V DAC supply)
- 2nd order Bessel filter characteristics (from simulation):
- P313
- P317
- 100N
- C304
- 50V
- 3N3
- R317
- R311
- 1K3
- 1N0
- 100V
- P0IC301019 P0IC301020
- R324
- 100UF capacitor
- LME49722MA
- P330
- P331
- P309
- TR310
- TR304
- B0496B

- R321
- 2K4
- C306
- 50V
- P0IC301013
- 100V
- P0IC301010
- 1N0
- 100V
- P0IC301012

- ARCAM
- Electrolytics over specified to allow for voicing changes
- 16V
- +5VA
- 4
- R334

- Some filter resistor value changes
- C301
- NSS12201
- NF
- 3c
- 1N0

- Special note about WMB741:
- With non-emphasised audio data, DAC can internally reduce gain by 2dB before the digital filter to reduce disk-hopping artefacts. Analogue filter has gain to compensate for this.

Electrolytics over specified to allow for voicing changes

Using WMB741: DAC = 1 pair per power pin
Vin = 5V
Vin = 7.5V
Vin = 3V
Vin = 80pF
Vin = 100pF

- 5th order Bessel filter characteristics (from simulation):
- CMB = 78.344
- f0 = 46.08
- f5 = 0.648
- f5 + f0 = 2.055
- Group delay = 0.227
- Group delay = 0.227

- Special note about WMB741:
- With non-emphasised audio data, DAC can internally reduce gain by 2dB before the digital filter to reduce disk-hopping artefacts. Analogue filter has gain to compensate for this.

Op-amp Decoupling 1 pair per power pin

Filename: LMB_C72_DAC_SchDoc

Note:

- EMC changes from Tavona
- Change 100% to 128mhos
- Dual footprint for future package change

ARCAM
A & R Cambridge Ltd
Pembroke Avenue
Waterbeach
Cambridge CB5 9QH
This diode is just for the power rail monitoring which should be done before any bulk storage.
WHERE FITTED
(NON-WIRELESS VERSION)

ITEM NO. PART No. DESCRIPTION QTY
1 E403AY CHASSIS ASSY 1
2 E979PM RUBBER BASE 1
3 F328 DAB BUNG 1
WHERE FITTED
(WIRELESS VERSION)

ITEM NO. PART No. DESCRIPTION QTY
1 L198AY MAIN PCB ASSY 1
2 L202AY KLEER WIRELESS PCB 1

TOLERANCES UNLESS 0.00±0.10
OTHERWISE STATED 0.0 ±0.20
ANGULAR TOL. +2 DEGREES

ALL DIMENSIONS IN MILLIMETERS UNLESS OTHERWISE STATED

MCM
8-9-2010
MGB

A & R CAMBRIDGE LTD

PART NUMBER AND DRAWING NUMBER
rDAC MAIN ASSEMBLY

DRAWING TITLE
MAIN PCB

A3