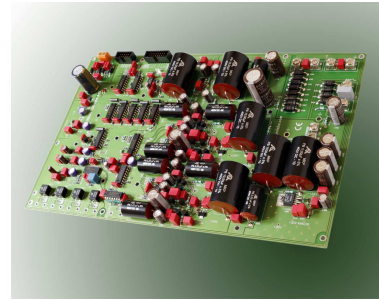# NON-OVERSAMPLING
# DIGITAL TO ANALOG CONVERTER

# ASSEMBLY INSTRUCTIONS

November 2010 - Rev 1.1 February 2011, © Eric Juaneda - www.junilabs.com

## FEATURES

- **FOUR DIGITAL INPUTS**
  **S/PDIF, AES3**
- **DIGITAL TRANSFORMER INPUT**
- **RCA, BNC or XLR input connector**
- **ACCEPT 16, 18, 20, 24 BIT**
- **32K TO 192KHz**
- **NO OVERSAMPLING**
  **no digital filter**
- **OPTIONAL CLOCK INPUT: 128FS**
  **to minimize jitter**
- **INCLUDE CS8416 DIR RECEIVER**
  **with digital de-emphasis**
- **LOW NOISE REGULATORS**
  **LT1763, LT3080**
- **BOARD SIZE : 305mm X 191mm**

## DESCRIPTION

The JUNDAC TWO is a 24bit non-oversampling digital to analog converter. The board incorporates four S/PDIF, AES3 (AES/EBU) digital inputs and an optional input clock for very low jitter operation.

High speed ICs are of the 74AC family with symmetrical output impedance and balanced propagation delay. To minimize reflection, all digital lines are loaded and PCB is 75ohm compliant. To minimize noise in power supply, critical capacitors are Wima© FKP2 polypropylene film and foil. Analog section uses SCR© polypropylene capacitors and Elna© Silmic II electrolytic capacitor.

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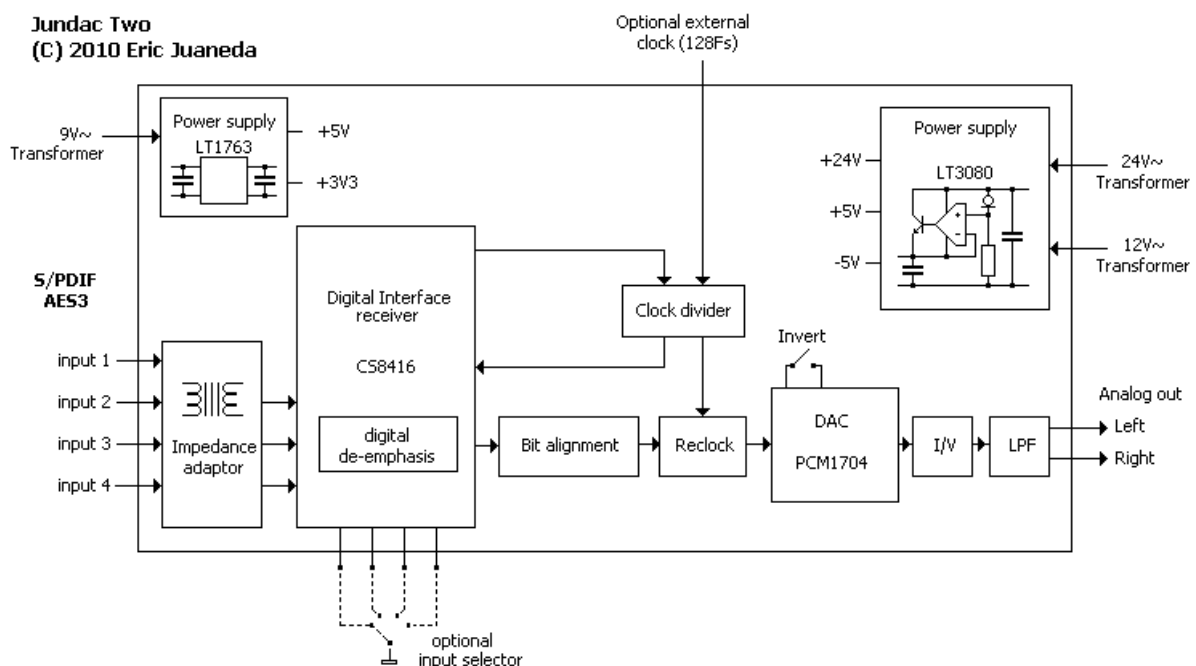
## SPECIFICATIONS

| PARAMETER | CONDITIONS | MIN | TYP | MAX | UNITS |
|---|---|---|---|---|---|
| **Input sensitivity** | RX1, RX2, RX3, RX4 | 0.15 | 0.5 | 5 | Vp-p |
| | External clock | | 5 | | Vp-p |
| **Load input** [1] | S/PDIF – BNC (RXn) | 50 | 75 | | Ohm |
| | S/PDIF – RCA (RXn) | | 75 | | Ohm |
| | AES3 – XLR (RXn) | | 110 | | Ohm |
| | External clock | | 75 | | Ohm |
| **Input signal** | Resolution | 16 | | 24 | Bit |
| | Sample frequency | 30 | | 200 | KHz |
| | Number of channels | | 2 | | |
| | Audio format | | PCM | | |
| **Power supply requirements** | Digital section | | 9 | | V~ |
| | | 260 | | 500 | mA |
| | *16bit - 44.1kHz* | | 350 | | mA |
| | *24bit - 44.1kHz* | | 370 | | mA |
| | *24bit - 96kHz* | | 420 | | mA |
| | *24bit - 192kHz* | | 460 | | mA |
| | *Stand-by mode* | 160 | | | mA |
| | DAC section | 9 | 12 | | V~ |
| | *-Vdd* | | 110 | | mA |
| | *+Vdd* | | 13 | | mA |
| | Analog section | | 24 | | V~ |
| | | | 80 | | mA |
| **Analog output** | unbalanced | | 2 | | V$_{RMS}$ |
| | | | | | |
| **Switch** | | | | | |
| Ext clock | sync on external clock | | | | |
| Stand-by | Switch off non critical ICs | | | | |
| Invert[2] | Invert analog signal | | | | |
| **Led indicator** | | | | | |
| ON | Power ON | | | | |
| Error | PLL unlock | | | | |
| Clock | clock present | | | | |
| Ext sync | sync on external clock | | | | |

[1] Load input can be adjusted at any value. Each input has its own load. You can mix 75 and 110 ohm loads. However, 75 ohm is recommended since PCB have 75 ohm impedance.

[2] When open, invert is active. Short Invert to ground for normal phase.
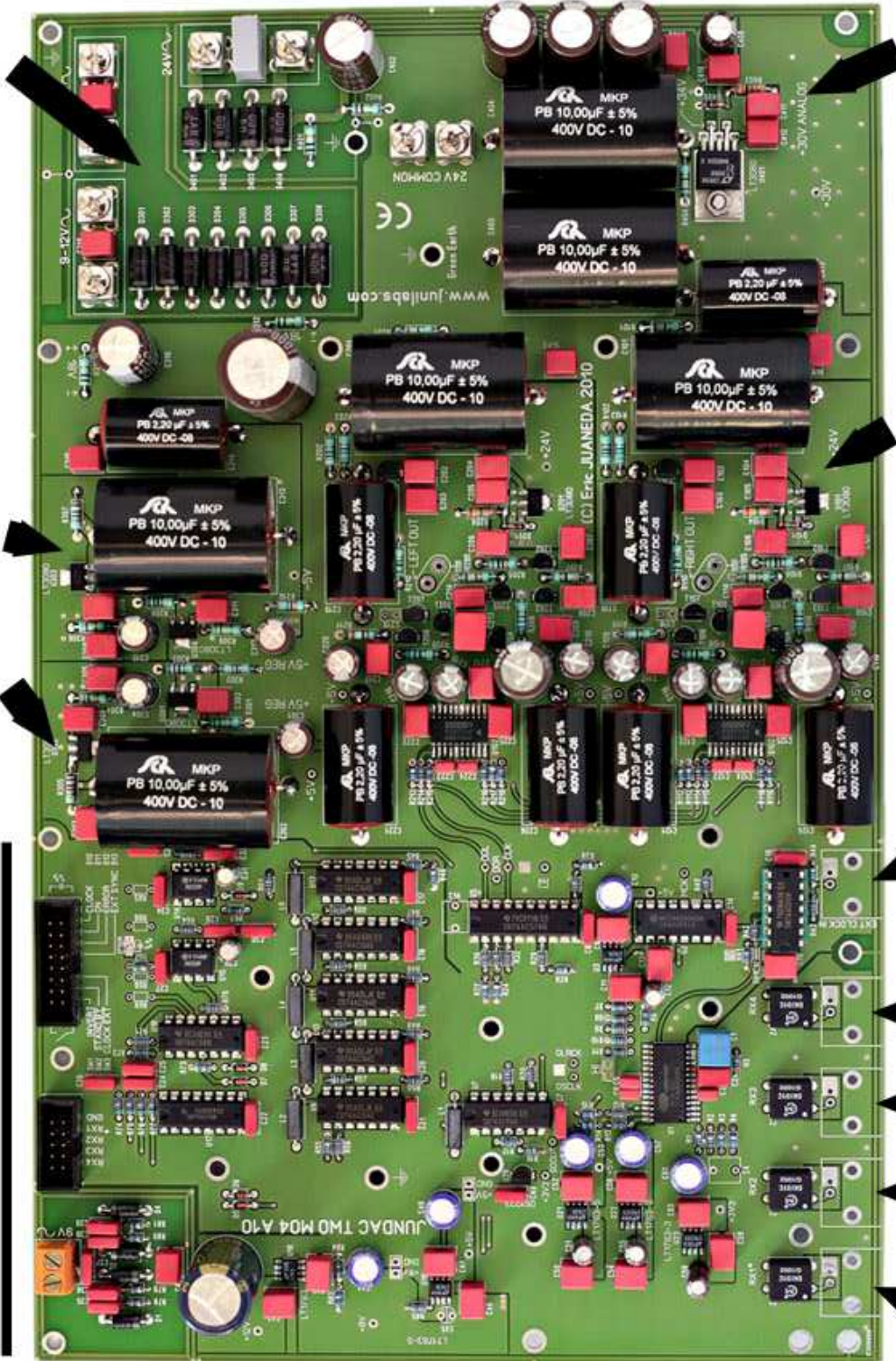
## MOUNTING AN INPUT CONNECTOR

You can put input connectors directly onto the PCB or on the chassis box linked by wire. You can use RCA, BNC or XLR. Input transformer DA101C allows complete isolation from ground. The ground pin of the connector can be isolated from chassis, or directly linked to chassis. See figure 3 & 4 for wiring hot and cold pin.

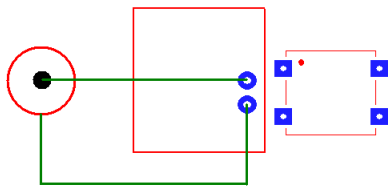The external clock is designed for 75 ohm BNC connector.

Wiring RCA or BNC                                  Wiring XLR



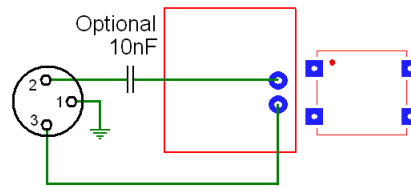Figure 3                                                    Figure 4

## INPUT IMPEDANCE

If you plan to use XLR, you must adjust input impedance (110 ohm). By default, all inputs are 75 ohm impedance, change R1 to R4 to match with desired impedance.
- R1 is load impedance for input 1
- R2 is load impedance for input 2
- R3 is load impedance for input 3
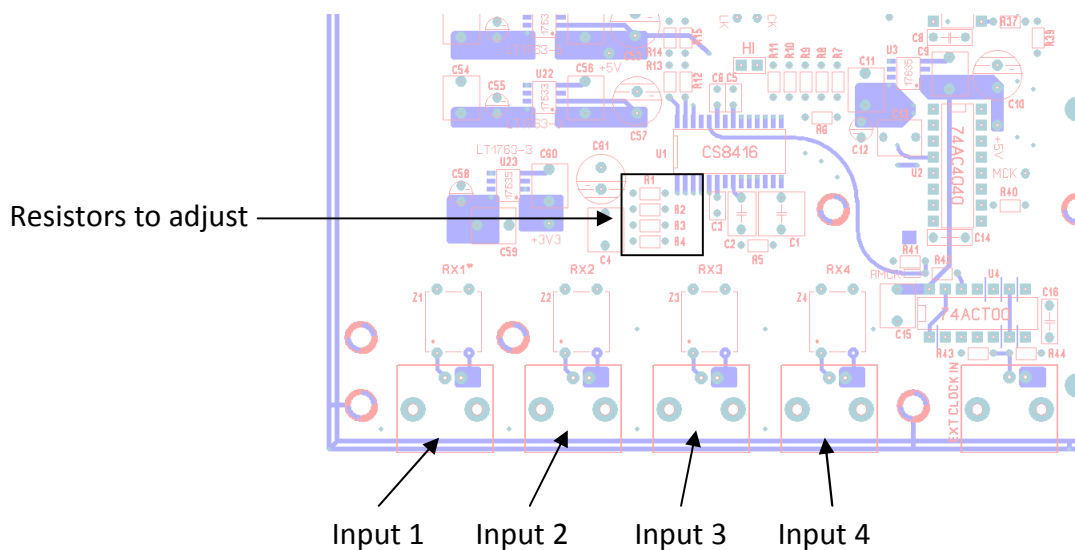- R4 is load impedance for input 4



Resistors to adjust

Input 1      Input 2      Input 3      Input 4

Figure 5

## ANALOG OUTPUT CONNECTOR

The Jundac Two integrates two analog outputs (LEFT OUT and RIGHT OUT) See figure 6 for wiring hot and cold pin of RCA. Isolation of the RCA chassis is **not** recommended.
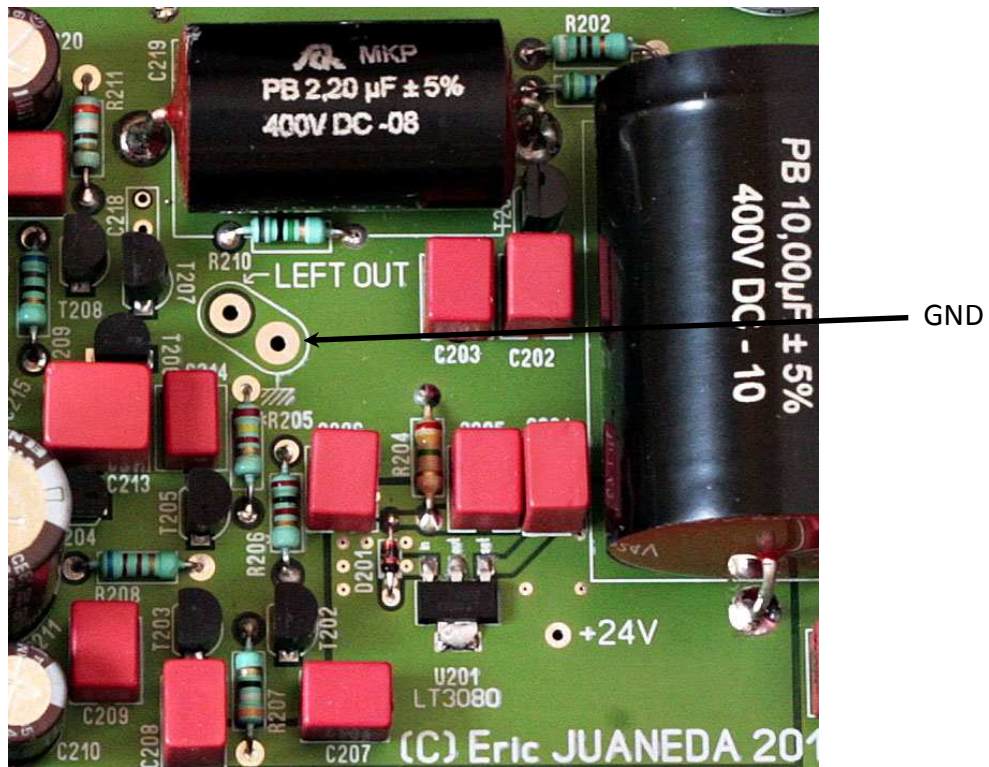


Figure 6

## LED INDICATORS AND SWITCHES

The PCB integrates four LED indicators and three switches. Each LED are current limited by resistors and switches integrates pull-up resistors. All switches are active at low level (GND). There is no risk of short circuit.

**CLOCK** - green LED, is on when an internal or external clock is present.

**ON** - yellow LED, is on when power is on.

**ERROR** - red LED, is on when CS8416 is unlocked. Error indicator is maintained during one second, this allows seeing each error.

**EXT SYNC** - blue LED, is on when external **CLOCK EXT** switch is closed. In this mode, clock operations are mastered by the external clock. There is no control matching sampling frequency and external clock. For correct operation, external clock must be 128 x sampling frequency.

**INVERT** - Invert analog signal. When switch is **open,** invert is active. Close the switch to ground to go to normal phase signal.

**STAND BY** - When switch is closed to ground, power off non critical ICs like shift registers, led indicators and set CS8416 in stand-by mode.

**CLOCK EXT** - this switch is necessary only if you plan to use an external clock. When switch is closed to ground, clock operations are mastered by the external clock. When this switch is open, CS8416 perform all clock operations. Each action on **CLOCK EXT** switch performs a reset for one second.
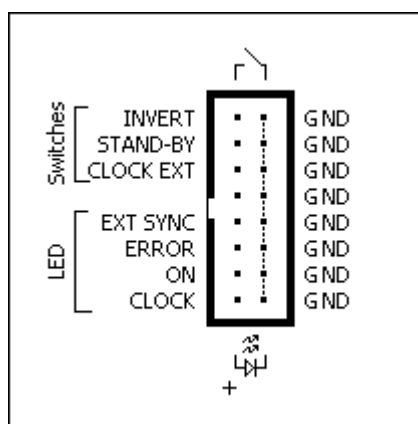
**LED and Switch connector wiring**



Figure 7

| Wire number | Function |
|---|---|
| 1 | INVERT |
| 2 | GND |
| 3 | STAND-BY |
| 4 | GND |
| 5 | CLOCK EXT |
| 6 | GND |
| 7 | NC |
| 8 | GND |
| 9 | EXT SYNC |
| 10 | GND |
| 11 | ERROR |
| 12 | GND |
| 13 | ON |
| 14 | GND |
| 15 | CLOCK |
| 16 | GND |

## INPUT SELECTOR

Input selector allows selecting which input is active (RX1, RX2, RX3, RX4). See figure 8 and 10 for connecting rotary switch to ribbon cable. To select an input, link the desired input pin to ground. There is internal pull-up resistor on each pin selector; there is no risk of short circuit. Without connection, RX1 is selected.
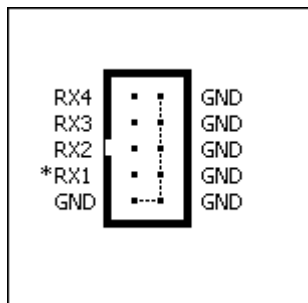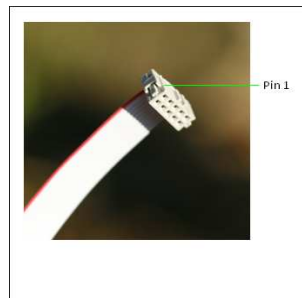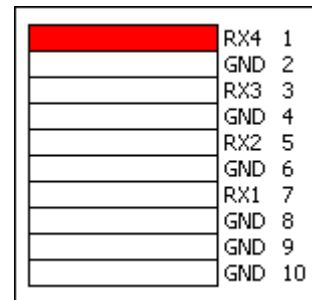


Figure 8



Figure 9



Figure 10

**Wiring of ribbon cable**

| Wire number | Function | | Wire number | Function |
|---|---|---|---|---|
| 1 | RX4 | | 6 | GND |
| 2 | GND | | 7 | RX1 |
| 3 | RX3 | | 8 | GND |
| 4 | GND | | 9 | GND |
| 5 | RX2 | | 10 | GND |

The input can be selected by setting a jumper as shown in figure 11. Without jumper, RX1 is selected.



Figure 11

## CONNECTING TRANSFORMERS

The Jundac Two uses three independents transformers for digital section, DAC stage and analog stage. We recommend using toroidal transformers with the following values:

- 1 x 9V, 10VA for digital section,
- 2 x 12V, 200VA to 300VA for DAC stage,
- 2 x 24V, 200VA to 300VA for analog stage.

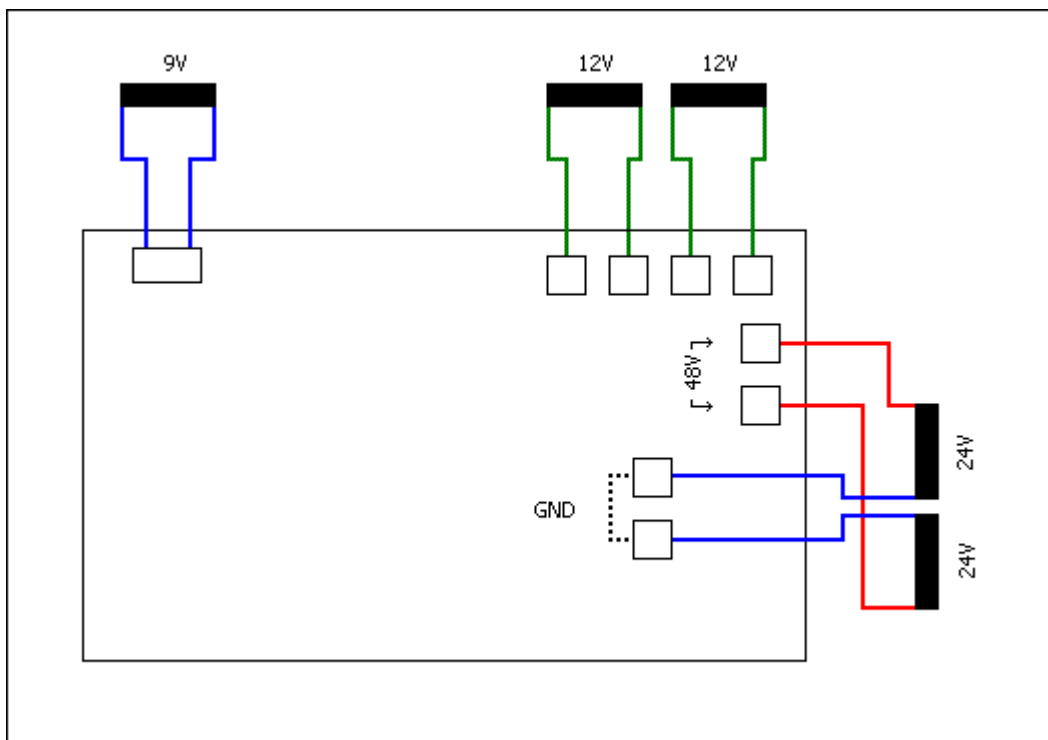Working with only 50VA for DAC stage or analog stage results in cramped sound.



Figure 12 – connecting transformers

## EARTH

To reach best performance it is recommended to connect chassis to safety Earth. A special point *Green Earth* is dedicated to connect a (second) strong cable to safety Earth or to virtual ground.  Connecting this crucial point cleans residuals low frequencies coming from transformers and dramatically improves sonic performances.

For more information about Earth see: www.junilabs.com

## CHASSIS ENCLOSURE

Managing vibration is very important for high-end audio devices. Chassis box must be assembled with great attention . A simplistic chassis box or no chassis at all will ruin audio qualities. Good managing is the only way to achieve the full music extraordinary sonic attributes. An ideal box enclosure integrates rigid chassis box and internal damping with various materials.

You can find more information on managing vibration:
http://tech.juaneda.com/en/articles/managingvibration.html

## DIGITAL INPUT CABLE

If any 75 ohm cable is able to reproduce sound, only high quality cable allow to reach full music potential. Taking care about this component is not a waste of time or money.
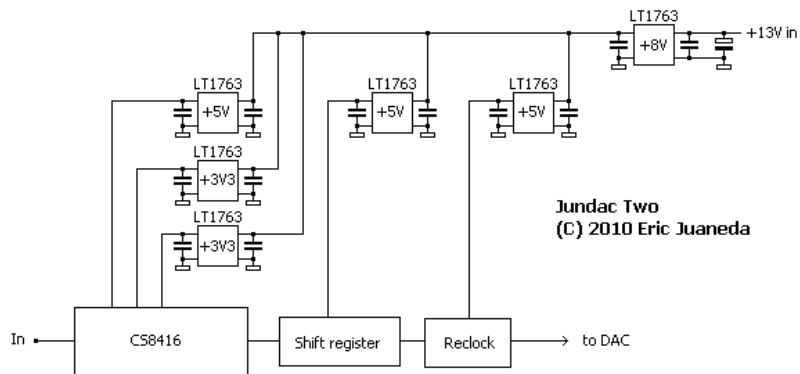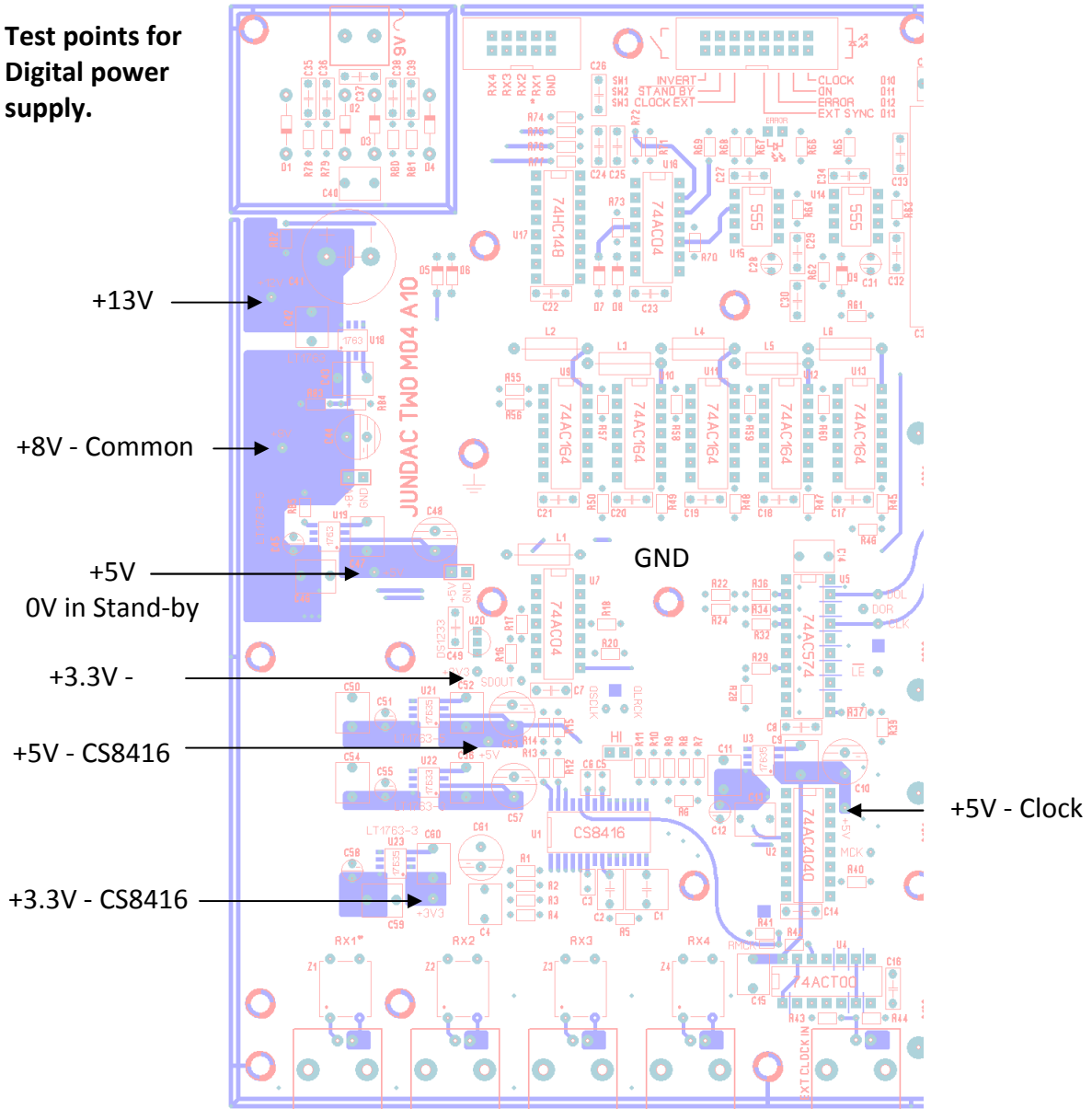
## PLL WORKING

Closing **HI** pin allows CS8416 working in higher phase detector update rate. In this mode, PLL could not lock at 192 KHz. **AN339** from Cirrus Logic mentions that in this mode, CS8416 could works with less jitter. If **HI** pin is open (recommended operation), CS8416 works in normal phase detector update rate. **HI** pin must be switched before power-on or reset operation.

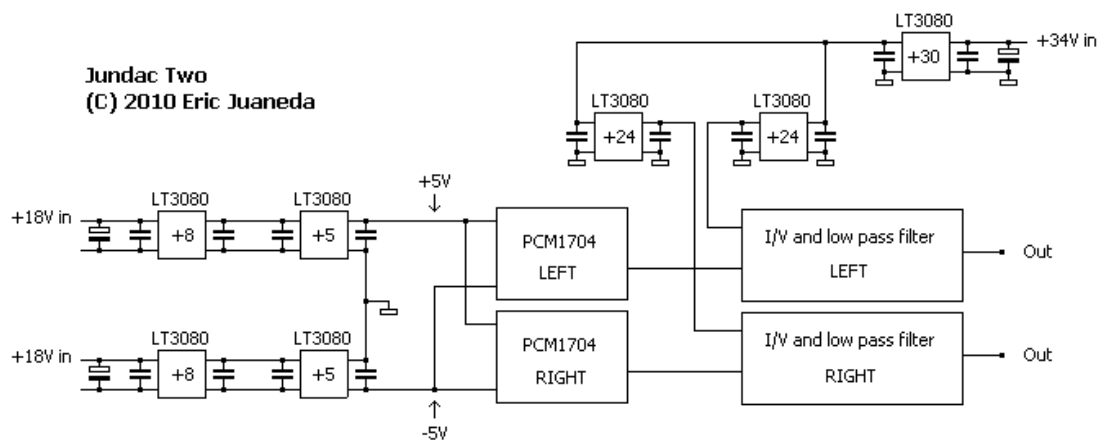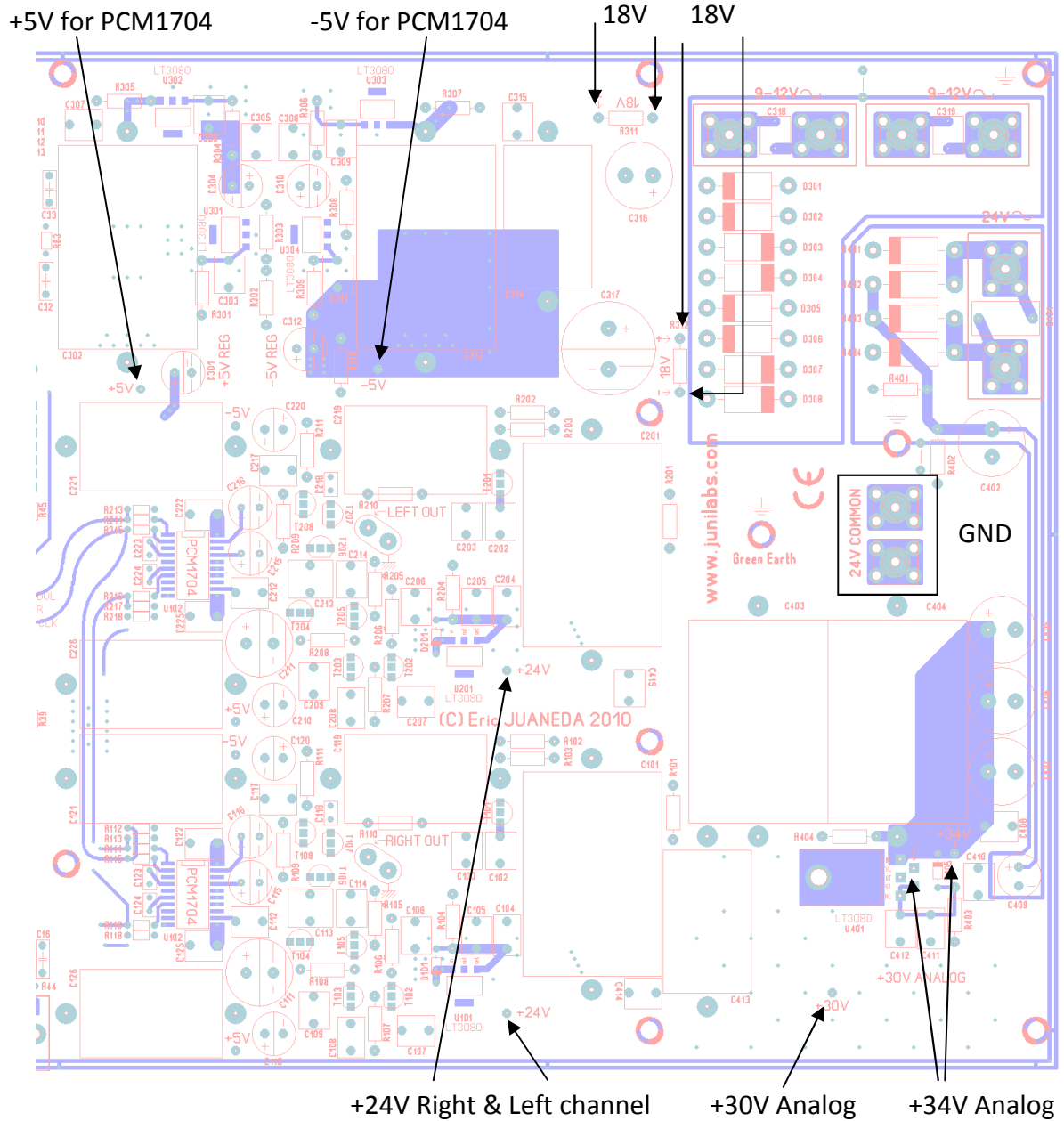See CS8416's datasheets for more information.

## TEST POINTS

The Jundac Two integrates many test points to evaluate if it works within normal conditions.

**Test points for Digital power supply.**

## Analog power supply



+5V for PCM1704    -5V for PCM1704    18V    18V

GND

+24V Right & Left channel    +30V Analog    +34V Analog



Jundac Two
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Without input signal, CS8416 generates signal clock. Put an oscilloscope or frequency meter on the following test point.

- OSCLK    175.4KHz    5.70µs
- OLRCK    2.74KHz    365µs
- RMCK    701.2KHz    1.425µs
- MCK    701.2KHz    1.425µs
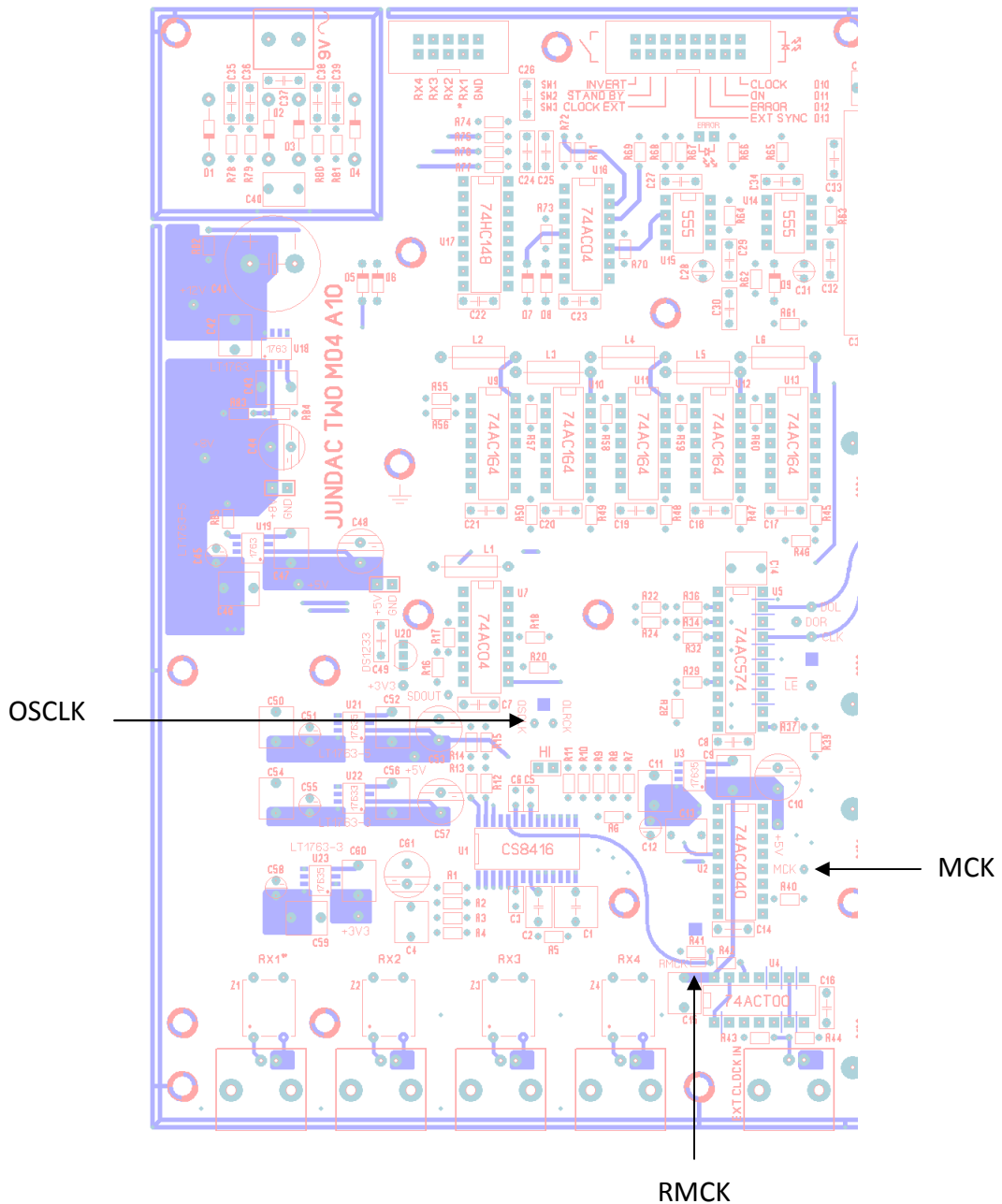
## WORKING WITH EXTERNAL CLOCK

For very low jitter operation, you can use an external clock. Put external clock signal on **External clock** input. External clock must be 5V TTL at 128 x sampling frequency. Short to ground the **CLOCK EXT** switch to synchronize CS8416 with the external clock. There is no control matching sampling frequency and external clock. During switches operations, one second reset is performed.

**CLOCK** LED must be ON. When **CLOCK** LED is off, there is no signal clock.