

## DAC End 2

by Andrea Ciuffoli - starting in the 2010

### INTRODUCTION

After the good result obtain with the DAC End I have design with Nguyen Quang Hao a set of boards to create a cheaper project with a sonic performances very near.

The No Oversampling DAC give a more natural sound but if you ear the TDA1541 and TDA1543 seem to lose details.

The AD1865N-K with passive I/V give a perfect combination, natural sound and all the details.

The AD1865N-K give the better performances with a 200ohm MK132 Caddock as passive I/V.

In this configuration the output signal is too low to drive any amplifier so I have design for the AD1865N-K the better output stage.

This DAC use a single ended vacuum tube amplifier without the expensive output transformers used in my original DAC End.

The DAC board follows the original design but has been inserted a jump to switch the phase of output signal.

In any vacuum tube stage the signal on the anode is in out phase with the grid signal so the jump is necessary to get a correct in phase output.

After some test has been decided to use shunt regulator to increase the sonic performances so a Salas regulator has been used for the DAC section.

Quang Hao have created a group buy on diyAudio to reduce the production cost of these pcb.

Any board have the same size 12.5 x 9.5 and all 19 x 25 cm.

All these pcb boards has been created only for DIY so no commercial use is allowed.

### COMPONENTS

\* **Crystal CS8414** used like receivers to obtain LSB signals from spdif input

\* **Analog Device AD1865**

\* **74HC04** Hex Inverter used to create the latch signal for the right channel

\* **E182CC** Mullard or **5687** Jan Philips

\* **LM311**

\* **BC337**

\* **IRFP240**

\* **IRPF9240**

\* **TL431**

\* **2SK170**

\* **BC550**

\* **BC560**

Information DAC-END2

<http://www.audiodesignguide.com/DACend2/index.html>.

The Salas shunt: <http://www.diyaudio.com/forums/power-supplies/143693-simplistic-salas-low-voltage-shunt-regulator.html>

Thank Salas verry much!

E-mail: [ciuffoly@gmail.com](mailto:ciuffoly@gmail.com), [quanghao168@yahoo.com.vn](mailto:quanghao168@yahoo.com.vn)

About wire forget the teflon ! use only stranded tinned copper wire with pvc isulator.

A very good quality stranded tinned copper wire could be buy directly from E-Z-HOOK that carries an extensive line of fine stranded and extra flexible wire.

### DAC BOARD

On the pcb layout is visible the jump for the digital phase inverter as described in the introduction and no other regulation are necessary.

A little post shunt regulators using the TL431 has been inserted to separate all the power supply like suggested in the datasheet of AD1865 and Cs8414.

I suggest only a MK132 Caddock resistors like current to voltage converter (I/V) so the internal active I/V of AD1865 is not used.

In parallel to the 200-220ohm I/V resistors will be inserted a little capacitor necessary to create a high frequency cut-off upper.

The original DAC end have no capacitor on output because in this case this filter is created by the output transformers band.

### POWER SUPPLY OF DAC BOARD

This schematic follows the Salas schematic.

### OUTPUT STAGE

This output stage has been design to get an output impedence near to 1Kohm with only one vacuum tube on the signal path and without use output transformers.

The relay will short the output to ground during the switch on and switch off phase to prevent dc peak on the outputs.

The design and pcb is compatible with E182CC and 5687, in the first case the choice should be a NOS E182CC Mullard (not the new production) and for the 5687 the best is a NOS Jan Philips.

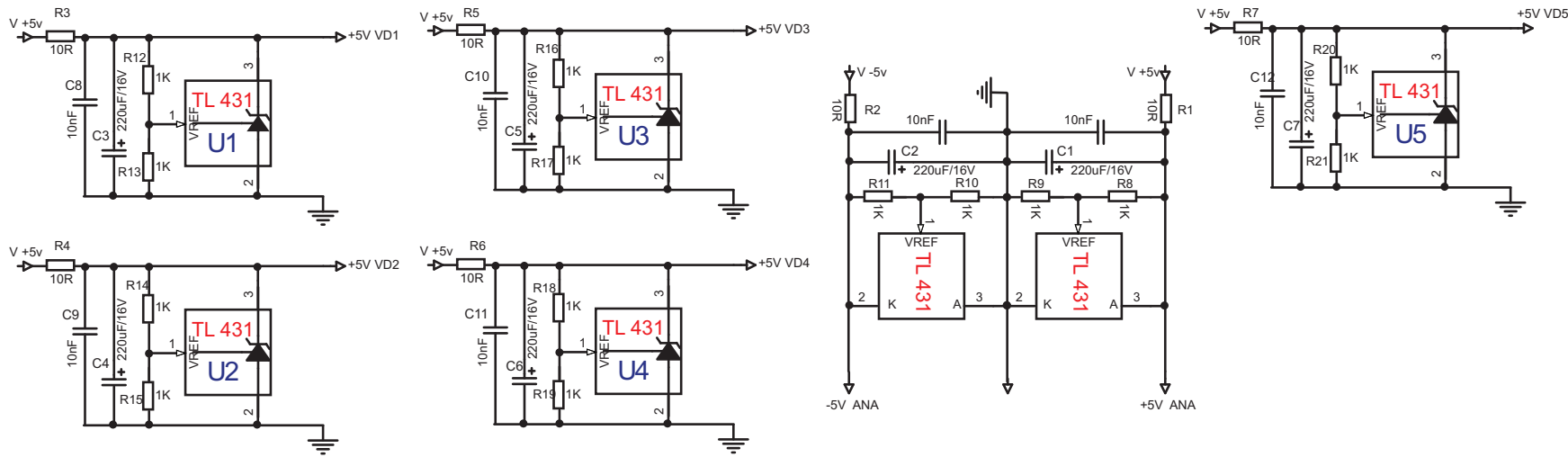
The E182CC will give an higher output level because the amplification factor is 24 instead of 17 and the internal resistance is quite the same.

Using the 5687 the voltage gain of this stage is 12.7x so the output at 0db is 127mV \* 12.7 = 1.6Vrms and with the E182CC will be 127mV \* 17.9 = 2.3Vrms.

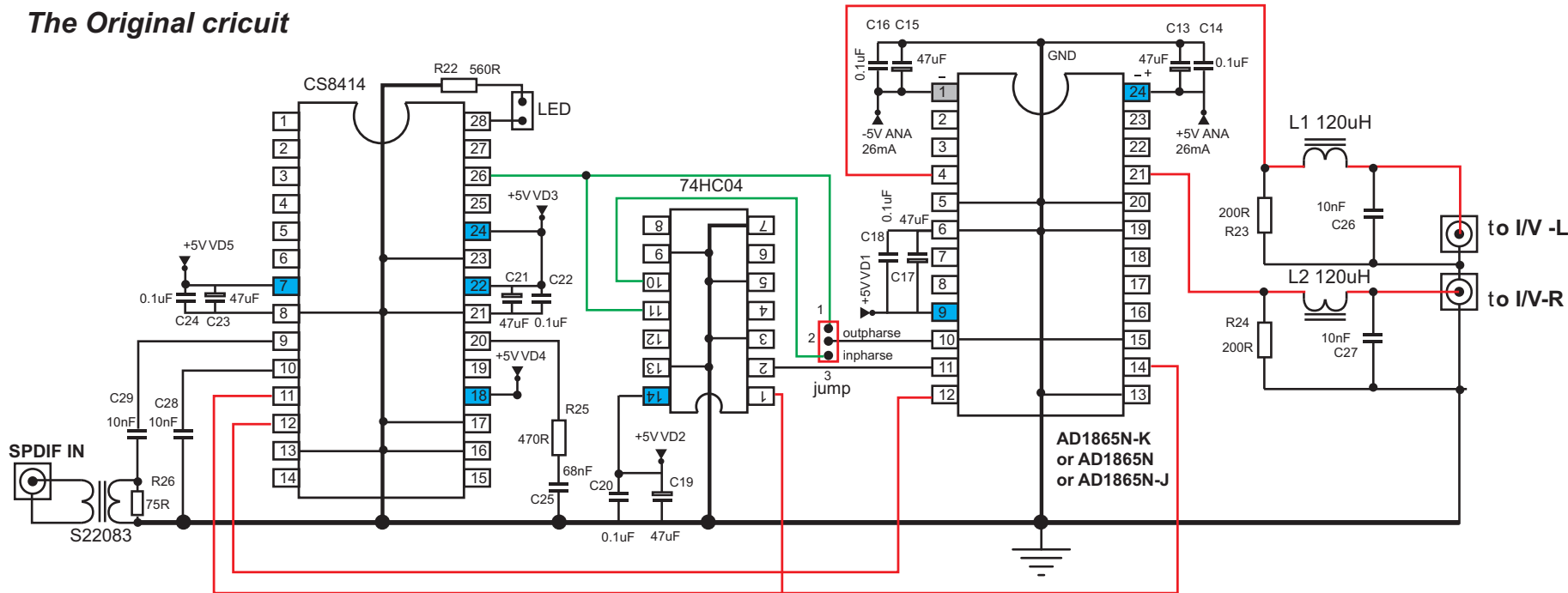
### THE SOUND:

adamus in diyaudio wrote: \*\*\*well... its been playing music all morning. the dac-end clearly has potential. its very natural sounding, superb top end (maybe slightly rolled off? not sure but its definately sweet with no hint of sibilance. This is using jan phillips - actually looking at audiodesigns tests it does begin to roll off before 20khz). Generally i would say that it has a warmer presentation, slightly more bodied sound.

The old transformer dac was very good though, it sounded much much better p than my cambridge audio dacmagic, not doubt about that. bear in mind i used sowter transformers (expensive and very good) \*\*\*



**The Original circuit**



**DAC-END**

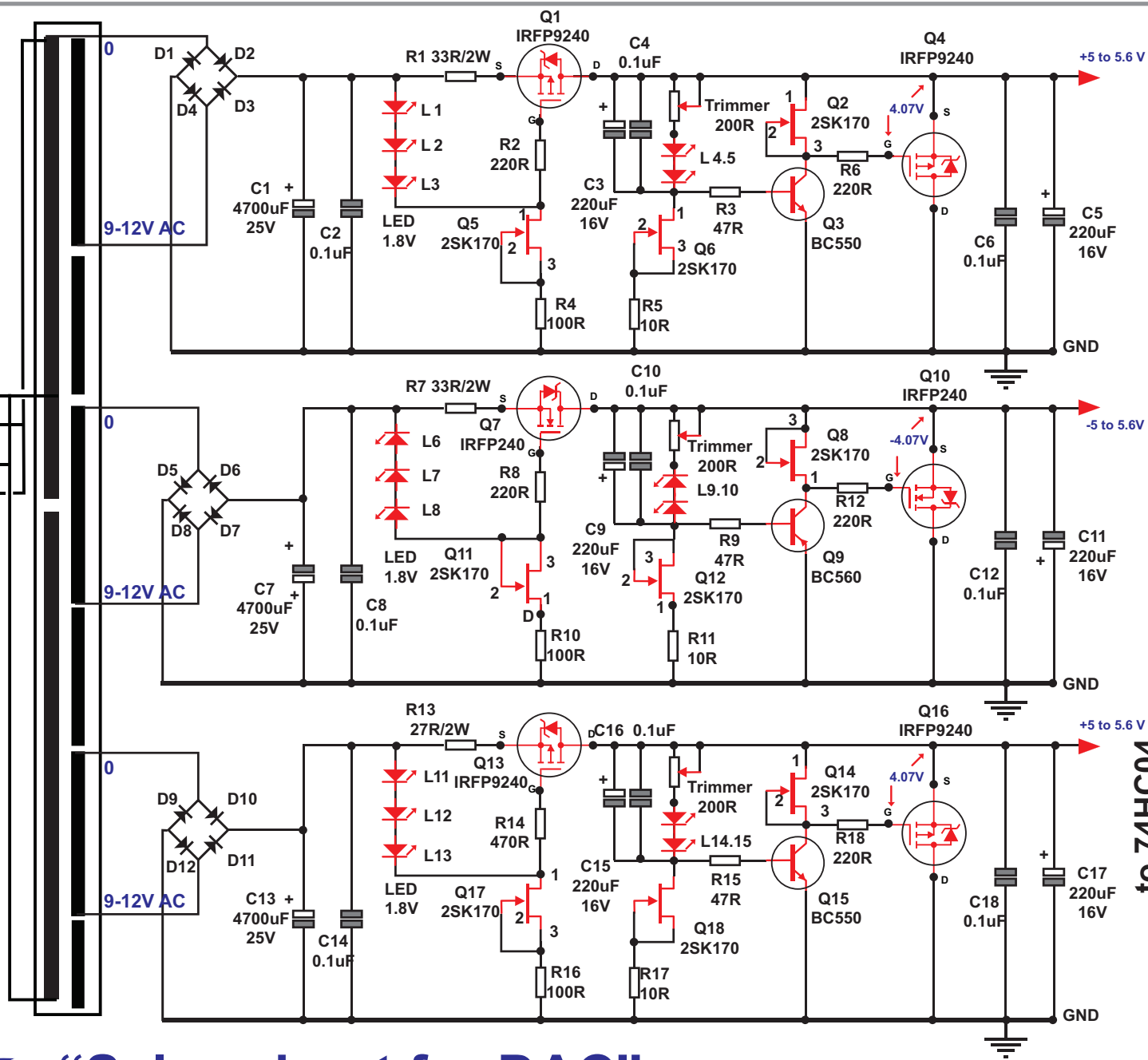
Andrea Ciuffoli starting in the 2008 development by Quanghao  
 Web: [audiodesignguide.com](http://audiodesignguide.com)  
 E-mail: [ciuffoly@gmail.com](mailto:ciuffoly@gmail.com)  
 E-mail: [quanghao168@yahoo.com.vn](mailto:quanghao168@yahoo.com.vn)

**Note:**

*This DAC use a single ended vacuum tube amplifier without the expensive output transformers used in my original DAC End. The DAC board follows the original design but has been inserted a jump to switch the phase of output signal. In any vacuum tube stage the signal on the anode is in out phase*

**Part List  
DAC-END**

- 1. Resistor**  
 10R 1W x 7  
 or Chock  
 75R 1/4W x 1  
 470R 1/4W x 1  
 560R 1/4W x 1  
 1K 1/4W x 14
- 2. Caps**  
 0.01uF x 4  
 68nF x 1  
 0.1uF x 12  
 47uF/10V x 6  
 \*Sanyo OS-Con\*  
 220uF/16V x 7  
 \*Sanyo OS-Con\*
- 3. IC**  
 TL431 x 7
- 4. Chip**  
 AD1865 x 1  
 74HC04 x 1  
 CS8414 x 1
- 5. SPDIF IN**  
 S22083 x 1  
 or better
- 6. Socket**  
 28 Pin x 1  
 24 Pin x 1  
 14 Pin x 1
- 7. Led Red x 1**
- 8. Jum 3pin x 1**
- 9. L1, L2= 120uH**
- 10. PCB x 1**



to AD1865  
to 74HC04  
CS8414

## Part list

1. Resistor  
220K 1/4W x 4  
220R 1/4W x 6  
47R 1/4W x 3  
10R 1/4W x 3  
100R 1/4W x 3  
33R 2W x 2  
27R/2W x 1
2. Caps  
2200uf/25V to 4700uF/25V x 3  
220uF /16V x 6  
0.1uf x 12
3. Jfet  
2SK170-BL x 9
4. Transistors  
BC-560 NPN x 1  
BC-550 PNP x 2
5. MOSFET  
IRFP240 x 2  
IRFP9240 x 4
6. Led Green x 15  
Diode 1N5819 x 12
7. Trim 200R x 3
8. Tranformer  
3 x12 V
9. Board  
Board Salas shunt
10. Tranformer  
Input: 220V  
Out: 9-12V/300mA x 3



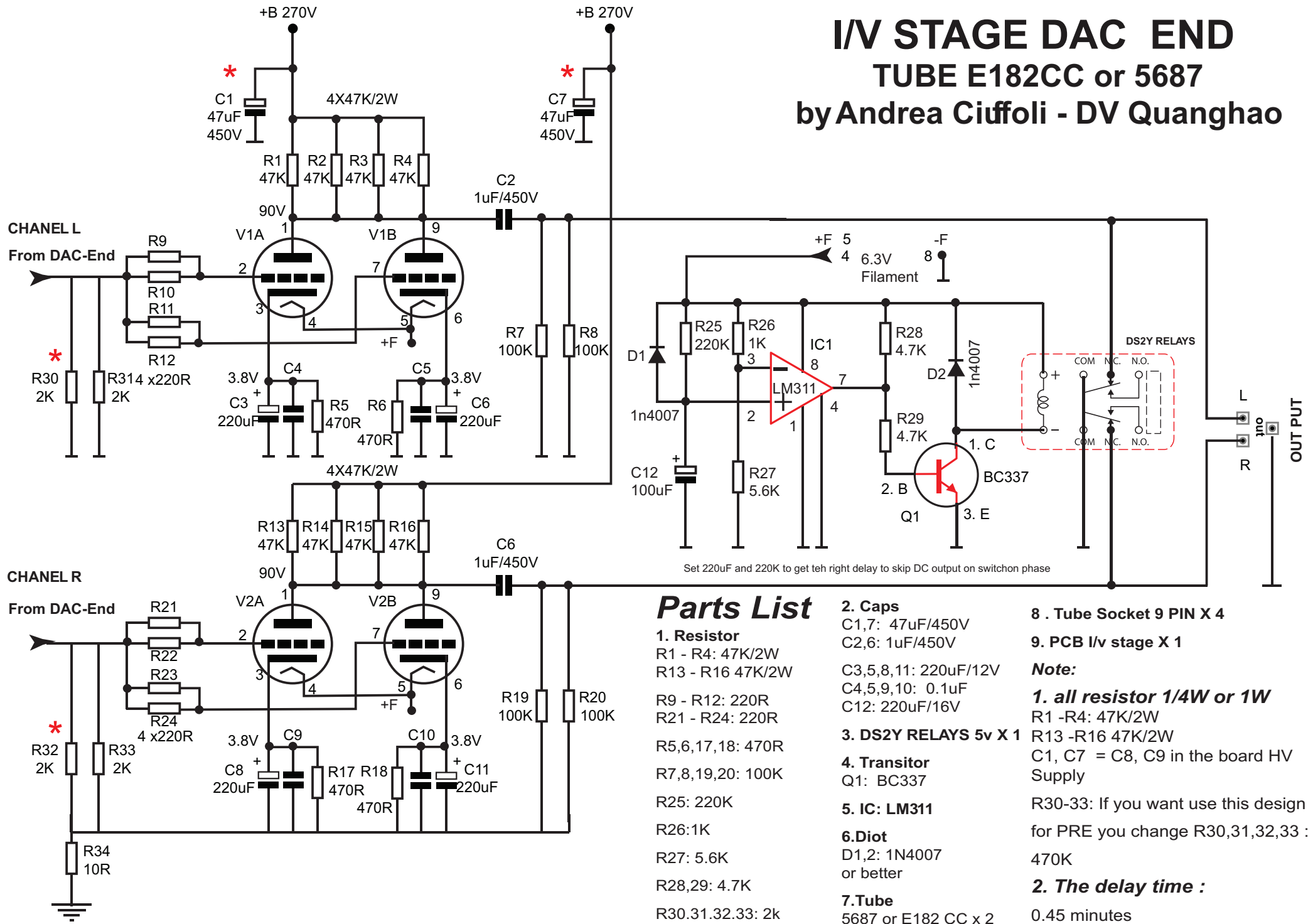
**“Salas shunt for DAC”**  
**Design by Salas**  
 Draw and layout by QuangHao

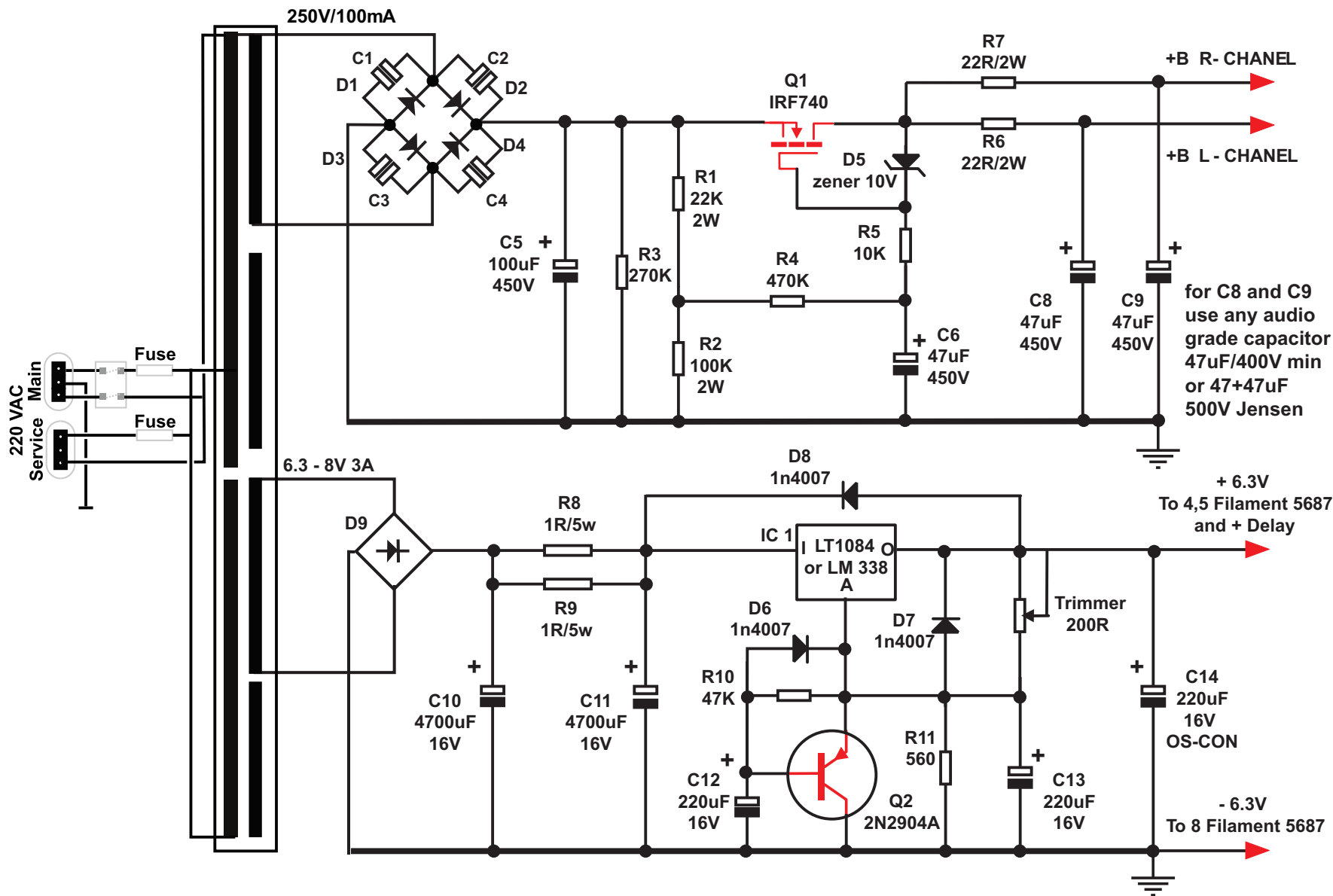
**Note:**  
 All Resistor 1/4W x 4  
 R1, R7, R13 = 2W

# I/V STAGE DAC END

## TUBE E182CC or 5687

by Andrea Ciuffoli - DV Quanghao





## Part list

### 1. Resistor

- R1: 22K /2W x 1
- R2: 100K x 1
- R3: 270K x 1
- R4: 470K x 1
- R5: 10K x 1
- R6,7: 22R x 2
- R8,9: 1R/5W x 2
- R10: 47K x 1
- R11: 560 x 1**

### 2. Caps

- C1,2,3,4: 0.1uF/470V
- C5: 100uF/450V
- C6: 47uF/450V
- C8,9: 47uF/450V
- Or 47uF+47uf Jensen
- C10,11: 4700uF/16V
- C12,13,14: 220uF/16V

### 3. Transistors

- 2N2904 x 1

### 4. MOSFET

- IRF740 x 1 or 840

### 5. IC LT1084 x 1

### 6. Diode

- D1,2,3,4: 1n4007 x 4
- D5: zener diot 10v
- D6,7,8: 1n4007 x 4
- D9: Bridge diot 5-1A

### 7. Trim 200R x 1

### 8. Transformer

- Input: 220V
- Out: 250V/100mA x 1
- 6.3 to 9 V/3-5A x 1

### 9. Heatsink for IRF740

- And LT1084 x 2

## POWER SUPPLY FOR I/V STAGE TUBE E182CC or 5687

Andrea Ciuffoli starting in the 2008

development by Quanghao

Web: [audiodesignguide.com](http://audiodesignguide.com)

E-mail: [ciuffoly@gmail.com](mailto:ciuffoly@gmail.com)

E-mail: [quanghao168@yahoo.com.vn](mailto:quanghao168@yahoo.com.vn)

Resistor R1,R2,R7,R6: 2W

R8,R9: 3W-5W. all Resistor 1/4 to 1W

Change R1 change V-Out for HV

Note: C8, C9 can change by 2 Cap 47uF/450V

Or Better use Jensen Cap 47uF +47uF/500V



=====  
**DAC END**  
=====

R1-7 10R 1W Dale RN60 Welborne  
R8-21 1K 0.5W Dale RN55 ebay 390024745931  
R22 560R 0.5W Dale RN55 ebay 400025212430  
R23,24 200R MK132V Caddok  
R25 470R 0.5W Dale RN55 ebay 390023518699  
R26(28) 75R 0.5W DaleRN55 ebay 390023320694  
C1-7 270uF 16V Oscon SP ebay 310201286598  
C8-12 C20,30,31 0.1uF Vishay BC FARNELL 1215508  
C14,16,18,22,24 0.1uF Vishay RS 1666487  
C13,15,17,19,21,23 47uF Oscon SA ebay 150414134548  
C25 0.068uF Epcos FARNELL 9750860  
C26,27 0.01uF Vishay RS 1666421  
C28,29 0.01uF GAD-Viva ebay 260390883803  
U1-7 TL431 Fairchild FARNELL 1467370  
L1,L2 120uH Bourns FARNELL 1601334  
SPDIF Transf. DA101C Murata FARNELL 1362398  
CS8414 ebay 330360180451  
AD1865NK ebay 180465366327  
74HC04 FARNELL 1013912

=====  
**I / V STAGE DAC END**  
=====

R1,2,3,4,13,14,15,16 47K 2W Vishay FARNELL 9475338  
R5,6,17,18 470R 1W Dale RN60 Welborne  
R7,8,19,20 100K 1W Dale RN60 Welborne  
R9-12, 21-24 220R 1W Dale RN60 Welborne  
R30-33 2k 1W Dale RN60 Welborne  
R25 220K 0.5W Generic  
R26 1k 0.5W Dale RN55 ebay 390024745931  
R27 5.6K 0.5W Dale RN55 ebay 400091516904  
R28 4.7K 0.5W Dale RN55 ebay 390130730501  
C2,6 1uF Obbligato Premium DIY HIFI  
C3,6,8,11 220uF 16V Elna Silmic or Oscon 270uF 16V SP as above  
C4,5,9,10 0.1uF Vishay RS 1666487  
C12 100uF 50V Lelon, whatever  
D1,2 1N5062-TR Vishay FARNELL 1612313  
IC1 LM311 anything  
Q1 BC337 anything  
Relay Axcom FARNELL 9913670  
V1,V2 5687 Philips Jan ebay 280219691072

=====  
**Power Supply for I/V Stage**

=====  
R1 22K 2W Try quickly any 1W carbon and find right value for right B+ 270V then buy a good one like R3  
R2 100K 2W Try quickly any 1W carbon and find right value for right B+ 270V then buy a good one like R3  
R3 270K 2W 500V Vishay FARNELL 896299  
R4 470K 1W Dale RN60 WELBORNE  
R5 10K 0.5W Dale ebay 400026898796  
R6,R7 22R 2W Dale FARNELL 1277989  
R8,R9 2.2R 4W Welwyn FARNELL 1219256  
R10 47K 0.5W Generic Metal film  
R11 1K 0.5W Dale WELBORNE  
TR1 200R TRIMMER Vishay FARNELL 9608702  
C1,C2,C3,C4 0.1UF 630VDC Vishay BC FARNELL 1166464  
C5 150uF 450V Vishay BC FARNELL 1165371  
C6 47uF 450V Panasonic FARNELL1673507  
C8,C9 47+47uF 500V Jensen ebay Item 180413478642  
C10,C11 4700uF 16V Vishay BC FARNELL 1165605  
C12,C13,C14 270uF 16V Oscon SP ebay Item 310201286598  
D1,2,3,4,6,7,8 1N5062-TR Vishay FARNELL 1612313  
D5 10V ZENER  
D9 Bridge rectifier  
Q1 IRF840 Vishay FARNELL 8648573  
Q2 2N2904 NTE FARNELL 1530749  
IC1 LM338 National FARNELL 1469094  
Transformer R80-36 DYICLUB.BIZ

=====  
**Salas Shunt for DAC**  
=====

R1,7,13 28R 2W (56R Parallel) Vishay FARNELL 1155017  
R2,6,8,12,14,18 220R Dale RN55 ebay 400023718622  
R4,10,16 100R 0.5W Dale RN55 ebay 400060639786  
R5,11,17 10R 0.5W Dale RN55 ebay 390023280590  
R3,9,15 47R 0.5W Dale RN55 ebay 390023316111  
C1,7,13 4700uF 25V Elna ebay item 110477272327  
C3,5,9,11,15,17 220uF 16V Elna Silmic  
C2,4,6,8,10,12,14,16,18 0.1uF Vishay BC FARNELL 1215508  
L1-L15 Generic Green LED  
Q1,7,13 IRFP240 IR FARNELL 1463256  
Q4,10,16 IRFP9240 IR FARNELL 1653670  
Q3,15 BC550 Fairchild FARNELL 1467880  
Q9 BC560 Fairchild FARNELL 1467886  
Q5,6,11,12,17,18 2SK170 Toshiba ebay item 130351188411  
D1-12 1N5062-TR Vishay FARNELL 1612313  
Transformer1,2 9+9Vp