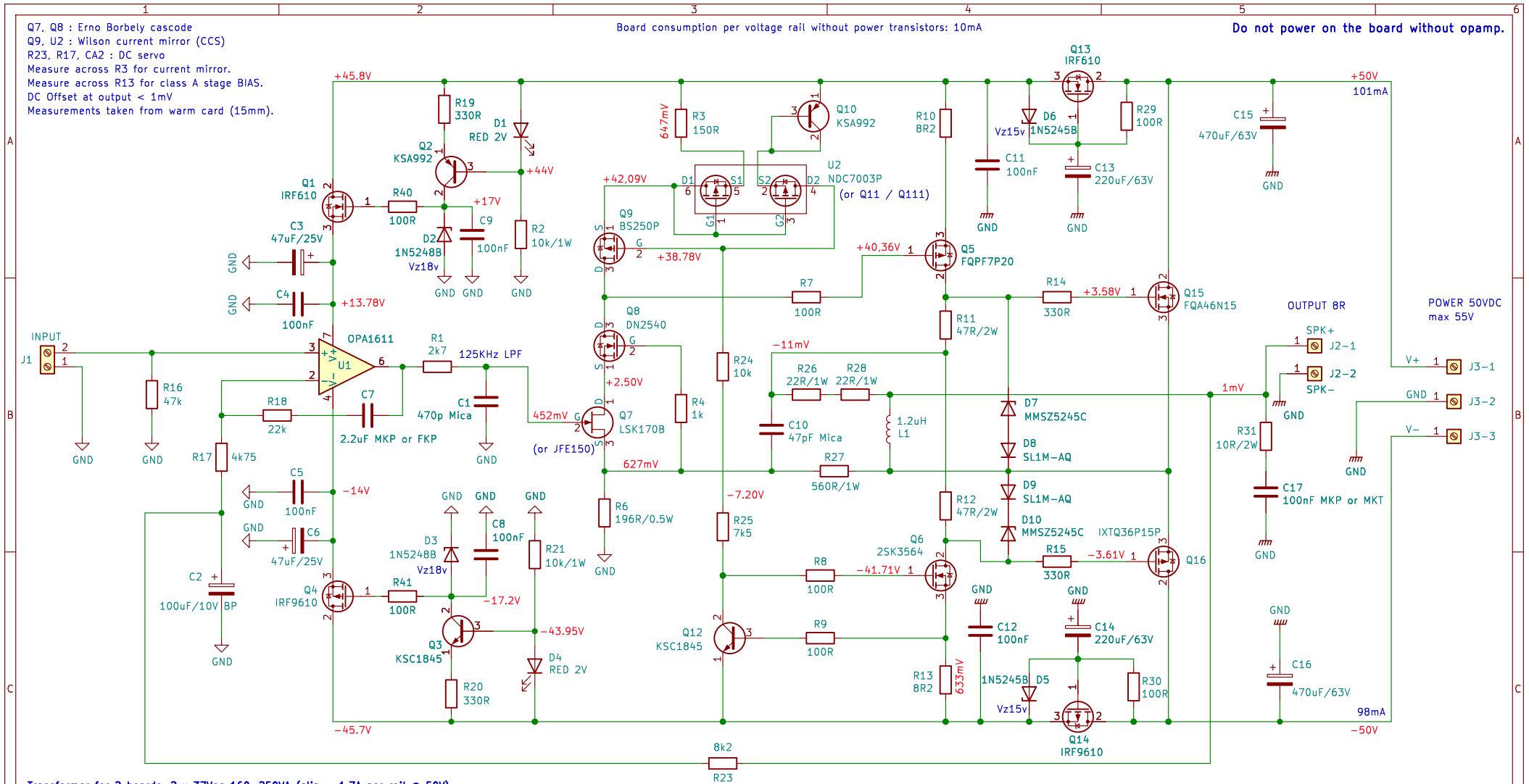


Q7, Q8 : Erno Borbely cascode  
 Q9, U2 : Wilson current mirror (CCS)  
 R23, R17, CA2 : DC servo  
 Measure across R3 for current mirror.  
 Measure across R13 for class A stage BIAS.  
 DC Offset at output < 1mV  
 Measurements taken from warm card (15mm).

Board consumption per voltage rail without power transistors: 10mA

Do not power on the board without opamp.



Transformer for 2 boards: 2 x 37Vac 160–250VA (clip = 1.7A per rail @ 50V)

L1 : 19.5 turns of a 1mm diameter copper insulated wire wound around a 8mm tube.

This will give you a coil of 10x20mm (see picture on github repository).

You may need to pair Q11 and Q11 transistors to have same Vbe or Vgs at 5mA. This improves the accuracy of the CCS+ current mirror.

U1 : OPA1611 (BIPOLAR) or OPA828 (JFET)

U2: NDC7003P or PJS6839

Q1, Q13 : IRF610

Q2, Q10 : KSA992

Q3, Q12 : KSC1845

Q4, Q14 : IRF9610

Q5 : FQP3P20 or FQPF7P20 (isolator)

Q6 : FQP3N30 or 2SK3564 (isolator)

Q7 : LSK170B (TH) or JFE150 (SMD SOT23–5)

Q8 : DN2540 or DN2535

Q9, Q11, Q111 : BS250P or ZVP2106A

Q15 : FQA46N15 or IXTQ36N30P (isolator)

Q16 : FQA36P15 or IXTQ36P15P (isolator)

TO–220 thermal pad : Aavid 4171G

TO–247 thermal pad : Aavid 4180G

100nF capacitor : Wima MKS2

1W resistor : Vishay PR01

2W resistor : Vishay CCF02 or PR02

D1, D4 : LED RED 2V TLHR5400

D2, D3 : 1N5248B

D5, D6 : 1N5245B

C3, C6 : Nichicon UKZ1E470MPM

C13, C14 : Panasonic EEU–FC1J2215

J1 : KF127 or JST B2B–XH–A–GU

For resistor < 150R : sort then or use 1% range.

0.25W, 0.5W resistor : Vishay MRS25 or CCF07 or MB

R27 : 560R 1W 1% Ohmite WNB560FET or Vishay CMF60560R00JKR6

For R27 use a good quality low noise 1W resistor.

R26, R28 : 22R 1% 1W TE Connectivity H4P22RFZA

C1 : 470pF CDE CD15FD471J03F or polystyrene capacitor.

C2 : Non polar capacitor Nichicon Muse UES1A101MPM.

C7 : 2.2uF Wima MKP4D042205I00KSSD or Vishay MKP1839522164

C10 : 47pF Mica CDE CD15ED470J03 or ceramic NP0.

C15, C16 : 470uF 63V Panasonic EEU–FC1J471B

C17 : 100nF capacitor FKP3C031004C00JSSD or MKT1822410255.

C18, C19 : 0.1uF/160V MKP Vishay MKP1839410164

J2 and J3: FASTON 250 PCB connector (TE Connectivity 63849–1)

Opamp input gain =  $1 + R18/R17$  (gain > 4 minimum)

Global gain =  $((R17 + R18)/R17) \times ((R27 + R6)/R6)$

For input sensibility at 1.2Vrms (+4dBu): R17=4k75 and R6=196R (LSK170B) or R6=182R (JFE150).

For input sensibility at 0.7Vrms (0dBu): R17=5k1 and R6=100R

The value of R25 depends on the input voltage (42v=2K7, 50v=7K5, 54–60v=8k2).

Q17 a QUAD405 audiophile approach

Modified by Stef for the Q17–Mini project

Principle circuit by Tiberiu Vicol

Sheet: /

File: Q17–Mini.kicad\_sch

**Title: Q17–Mini Amplifier**

Size: A4

Date: 2024–08–23

KiCad E.D.A. 8.0.4

Rev: 2.3.4

Id: 1/1