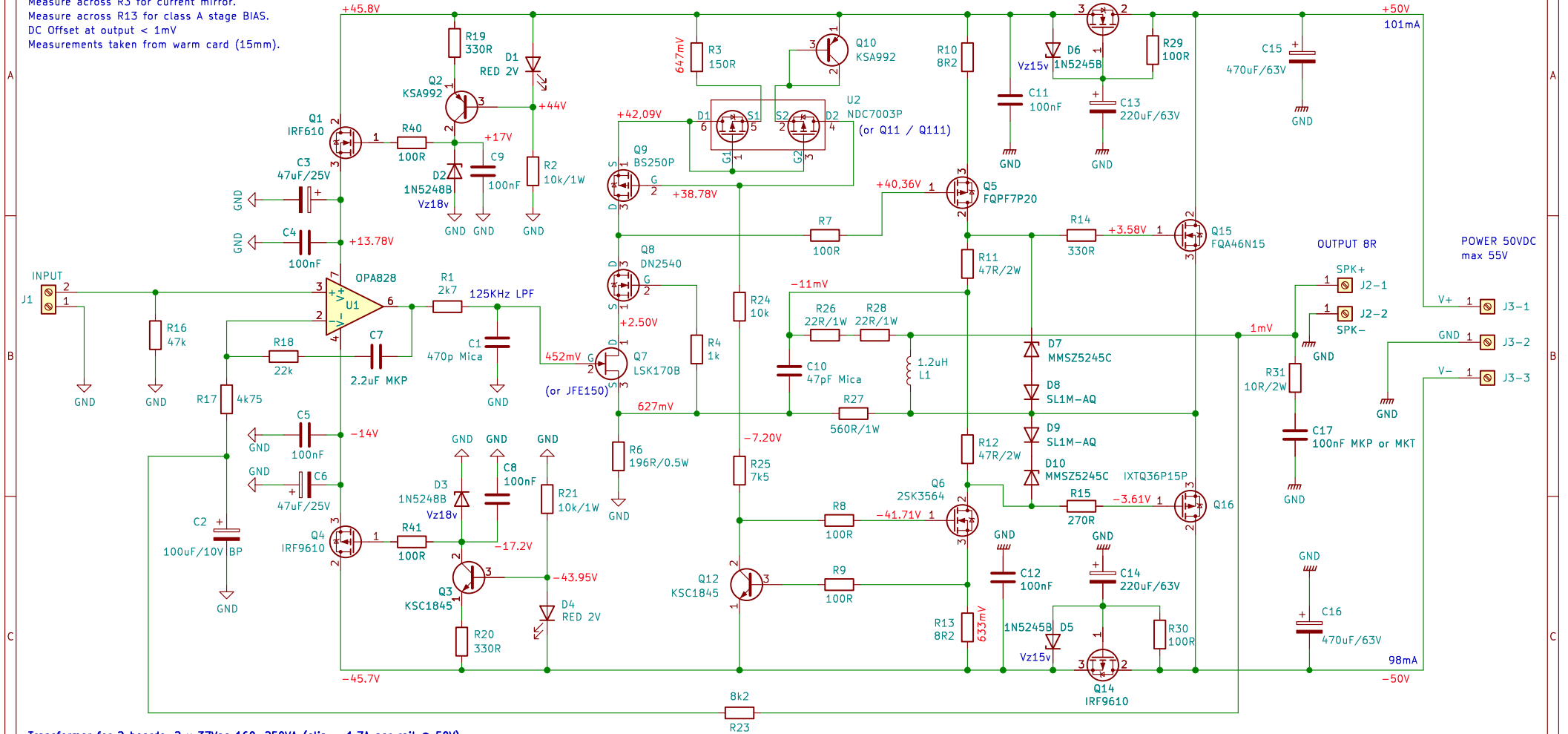


Q7, Q8 : Erno Borbely cascode
 Q9, U2 : Wilson current mirror (CCS)
 R23, R17, CA2 : DC servo
 Measure across R3 for current mirror.
 Measure across R13 for class A stage BIAS.
 DC Offset at output < 1mV
 Measurements taken from warm card (15mm).

Board consumption per voltage rail without power transistors: 10mA
 You may need to pair Q11 and Q111 transistors to have same Vbe or Vgs at 5mA. This improves the accuracy of the CCS+ current mirror.

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).

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 : Panasonic EEU–FC1V470B
 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 3.0uF CDE 935C1W3K–F
 C10 : 47pF Mica CDE CD15ED470J03 or ceramic NPO.
 C15, C16 : 470uF 63V Panasonic EEU–FC1J471B
 C17 : 100nF capacitor FKP3C031004C00JSSD or MKT1822410255
 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: 2024–09–15

KiCad E.D.A. 8.0.4

Rev: 2.3.6

Id: 1/1