THE HS15 LINEAR AMPLIFIER (The Sandwich Linear)

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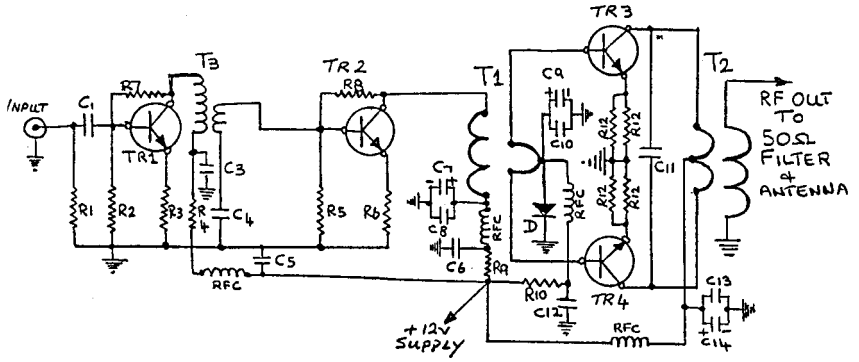


Most QRP & construction enthusiasts of my acquaintance do not look forward to building linear amplifiers. The problems of instability & associated distortion are well known to experimenters. Having built various linears over the years, and experienced the problems, I felt that layout and decoupling were at the root of the problem. A new sandwich approach was worked out which can be seen in the attached diagrams. Circuitry previously used was modified to incorporate increased decoupling. All components used are locally available and the output transistors deliver a maximum output of about 15 watts PEP. When built, the linear showed no signs of even incipient instability.

CONSTRUCTION.

The diagrams (page 8) show the sandwich layout with the main double sided board on the top and the heat sink below. The separation between the two is 9mm, which enables the base leads of the final transistors to go upwards into the board above. The top board carries the lower power circuits up to T1. The spacers between the heat sink and PCB should be of metal so that the heat sink is earthed to both earthy foils of the PCB. The output transistors are insulated from the heatsink in the usual way.

TEST TABLE

The table was compileded to help with fault finding. The test was conducted with 100mvP.P.14Mhz. input.

TEST POINT	RF Mv.P.P.
Input 2N2219 [TR1]	100
Coll.2N2219	1200
Base [TR2]	350
Coll. [TR2]	8000
Base [TR3]	1700
Base [TR4]	1700
Output [500hm]	28 Volts P.P. = 2 Watts PEP.
Output (with 350 Mv Input)	75 Volts P.P. = 14 watts PEP.

TEST POINT	DC VOLTS [same drive as above]		
	TR1	TR2	TR3&4
Base	1,0 V	1,7V	0,75V
Coll.	12,0 V	12,0 V	12,0V
EMM	0,25 V	0,65 V	0,18 V

The components are all available locally and the suppliers of various components are listed below.

Electrocomp Ltd. 8 Thora Crescent, Wynberg 2090 [011-444 5900] supply:

9mm VIOLET TOROIDS [their no. is TOR/16]
7X4X8 mm BINOCULAR IS BEAD/10.
14X14X8 mm BINOCULAR IS BEAD/4
Also 2N2219 Transistors

HAMRAD LTD. 27 Thora Crescent, Wynberg. Box 391349 Bramley 2018 [011-444 5990] stock:

2SC1678. Transistors.

COMPONENT LISTING:

RESISTORS 1/4 WATT

R1 =1OR,
R2 =100R
R3 =5R6
R4 =1OR
R5 =12OR
R6 =4R7
R7=1K2
R8=82OR
R9=2R7
R10=270R

RESISTORS 1 WATT

R12=1R.

CAPACITORS

C1, C3, C4, C5, C6, C8, C12, C13, C10= 0,1 MFD. CERAMIC.
C11= 330 PF. CERAMIC.
C7, C9, C14=25 MFD. 25 VOLT ELECTROLYTIC.

CHOKE

RFC =11 Turns GPO Plastic covered wire [wire dia.= 0,5 mm. Dia. over plastic= 0,85 mm.] wound on 9 mm violet toroid.

TRANSFORMERS

T3: Primary = 10 T. GPO wire on 9 mm violet toroid. Secondary = 3 T. GPO wire over centre of primary.
T1: primary = 3 T. GPO wire. Sec. = 1/2 + 1/2 turn GPO wire through 7X14X8 binocular. [one turn centre tapped]
T2: Primary = 1 + 1 turn GPO wire [2 turns centre tapped] Sec = 3 T GPO wire on 14X14X 8 binocular.

TRANSISTORS:

TR1 = 2N2219.
TR2, TR3, TR4 = 2SC1678. Diode = AMP Silicon.

CURRENT CONSUMPTION(with no RF input:

TR1 = 40 MA.
TR2 = 200 MA.
TR3 & TR4 = 110 MA.

NOTE: Current in TR3, TR4 adjusted by varying R10.

Please turn to page 8 for the "sandwich" diagrams

ZS

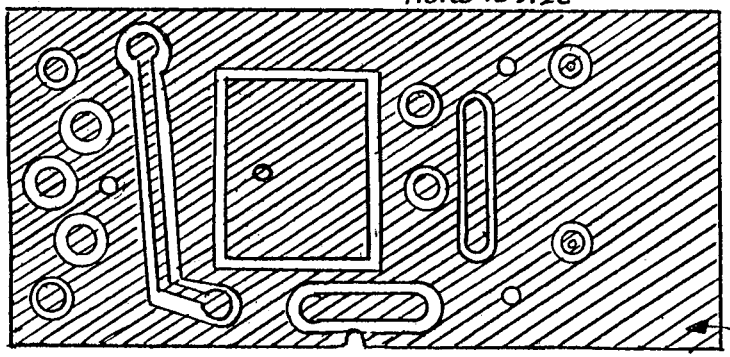
SARL VHF CONTEST

18/19 SEPTEMBER 1993

PLEASE NOTE THAT THE SAME RULES WILL APPLY AS FOR THE MARCH CONTEST

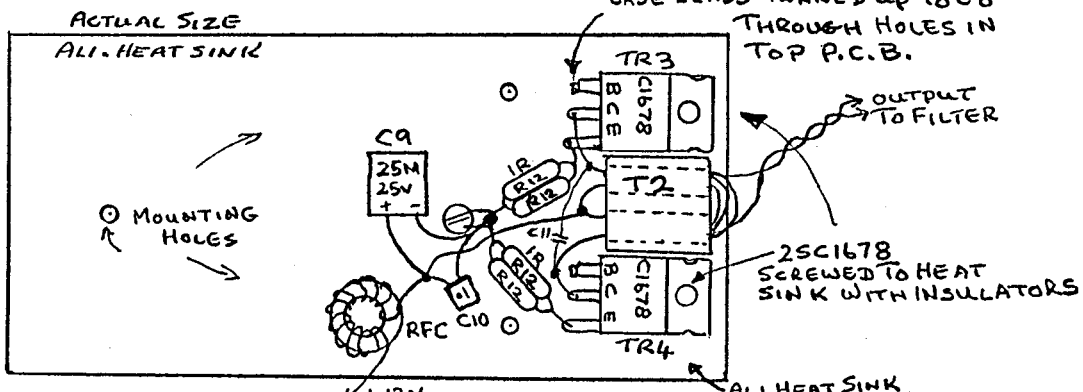
HS15 LINEAR
MECHANICAL LAYOUT

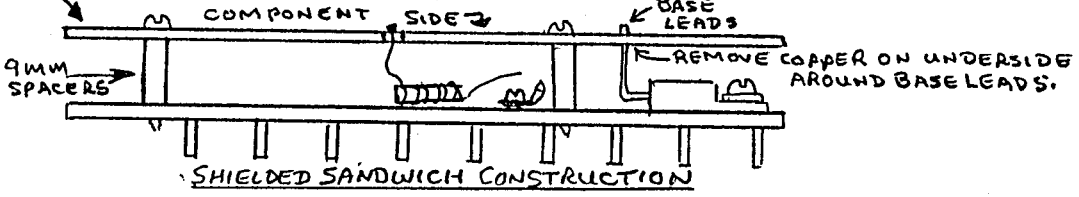
ACTUAL SIZE



DOUBLE SIDED P.C. BOARD. ETCHED ON TOP ONLY.
UNDERSIDE IS UNETCHED EARTH PLANE
ONLY HOLES IN BOARD ARE FOR MOUNTING SCREWS AND FEEDTHROUGH FOR BASES OF 2SC1678.
AND MOUNTING FOR 2SC1678 DRIVER.
WHITE AREAS ARE THE ETCHED AREAS
LINED AREAS ARE COPPER.

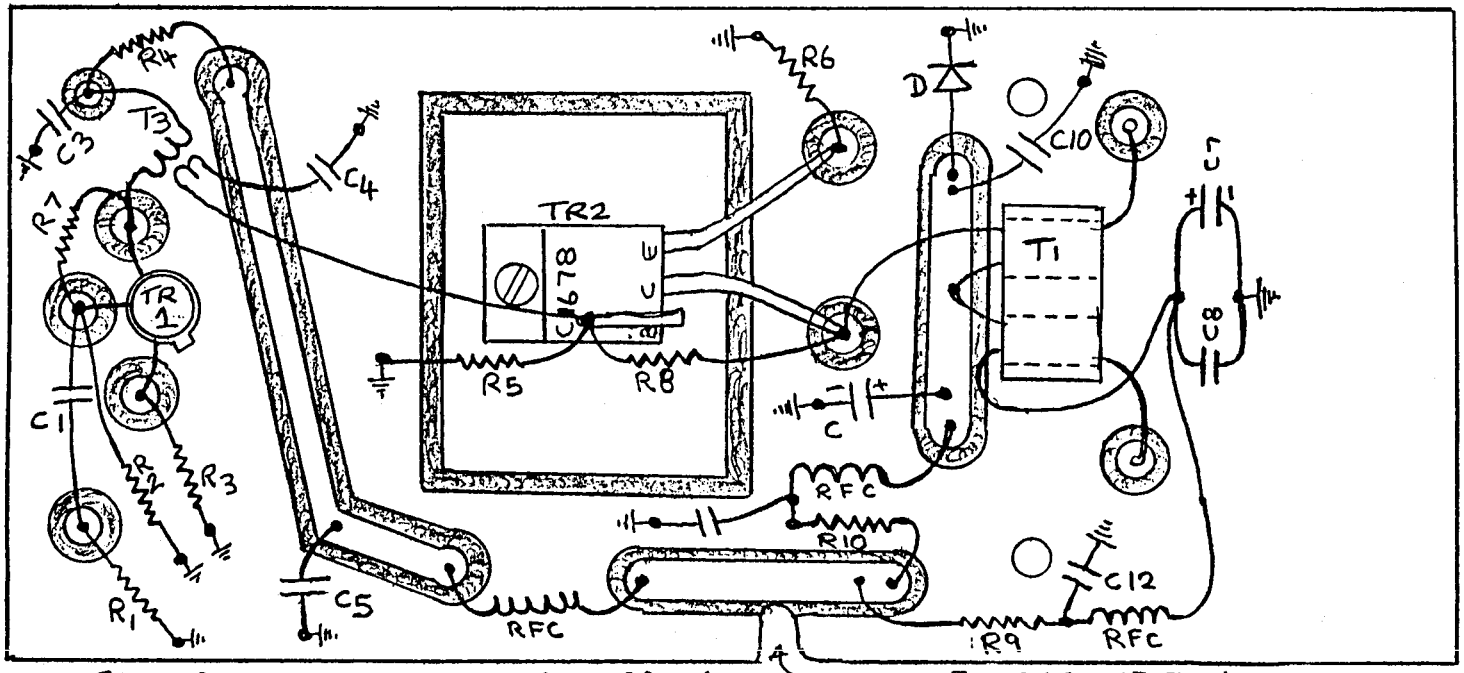
ACTUAL SIZE
ALI. HEAT SINK





SHIELDED SANDWICH CONSTRUCTION

DOUBLE SIZE COMPONENT PLACEMENT



SHADED AREAS ARE THE ETCHED AWAY AREAS.

CUT OUT FOR 12V CONNECTION TO LOWER HEATSINK