

SSPA's – A QRO UPDATE

The newest LDMOS devices and
high power amplifiers available today

A Brief History

- **2006-2009**: first to release a **1kW** LDMOS transistor, followed by four other lower power devices.
- **2010-2012**: launched industry-first portfolio of 5 **extremely rugged** 50 V LDMOS transistors in ceramic packaging, from 25 to 1250 W.
- **2014-2015**: complemented this portfolio with 5 transistors in **plastic package**, enabling lower thermal resistance.
- **2016**: launched the 1500 W **MRF1K50**, pushing 50 V LDMOS close to its limits of usability (higher power levels at 50V are challenging to match to 50 ohm).
- **2017**: introducing the MRF**X** series with the 1800 W **MRFX1K80**, based on new 65 V LDMOS technology developed in NXP's internal fab. Designed for ease of use.



More Common devices available through 2016

NXP (now Ampleon and NXP)

- I. BLF188XR (1.4KW) HF to ~300MHz
- II. BLF578XR -1.25KW HF to ~300MHz
- III. BLF184XR – 600w HF to 450MHz
- IV. BLF6G13L-250P – 250w to 1300 MHz

Freescale (now NXP)

- I. MRFE6VP1K25 (1.25KW) HF to ~300Mhz
- II. MRF13350N (350W) to 1300 MHz
- III. XRF286 (60w) up to 2.5 GHz



Here are the most interesting ones available now

Ampleon (formerly NXP)

- I. BLF184XR – 600w HF to 450MHz
- II. BLF188XR – 1.4KW HF to ~300MHz
- III. BLF189XRA - 1.5KW HF to ~300MHz *
- IV. BLF189XRB - 1.9KW HF to ~150MHz *

NXP

- I. MRFE6VP1K25 (1.25KW) HF to ~300Mhz
- II. MFR1K50 (1.5KW) HF to ~300MHz *
- III. MRFX1K80H (1.8KW, 65v) HF to ~300 MHz *
- IV. MRF13750 (600W) at 1300 MHz *

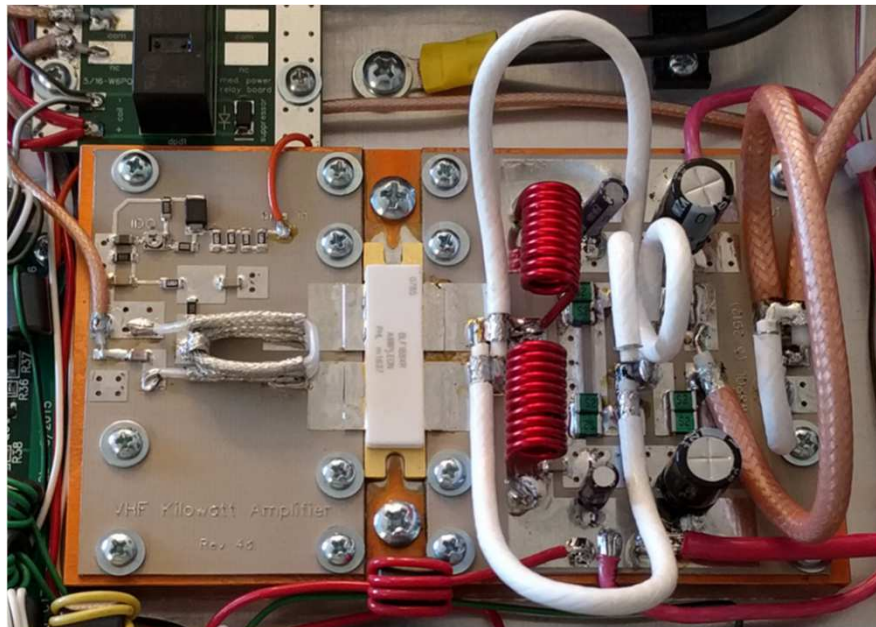
Matching ease of use

	MRFE6VP 61K25H	BLF188XR	MRF1K50H	BLF189XRB	MRFX1K80H
Output impedance in HF in push-pull configuration (R_L)	4.0 ohm	3.6 ohm	3.3 ohm	2.6 ohm	4.7 ohm
Transformation to 50 ohm ($=50/R_L$)	x12.5	x14	x15	x19	x10

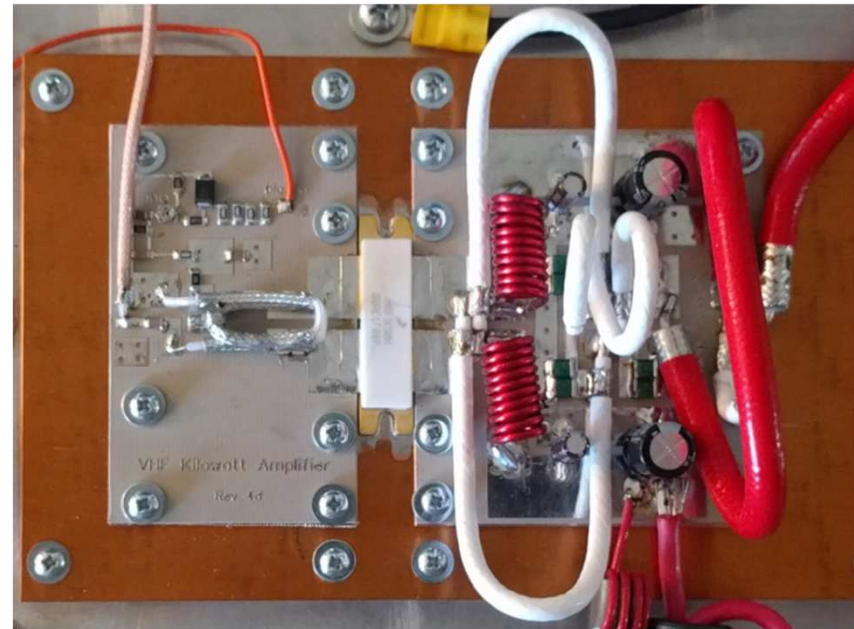
f MHz	Z_S Ω	Z_L optimized for G_p Ω	Z_L optimized for η_D Ω
1200	3.03 – j8.15	2.03 – j0.25	1.46 – j0.47
1300	4.06 – j9.52	1.67 – j0.92	1.19 – j0.95
1400	7.00 – j9.61	1.50 – j1.48	1.22 – j1.49

RF Decks (144 MHz)

BLF188 – 1250w

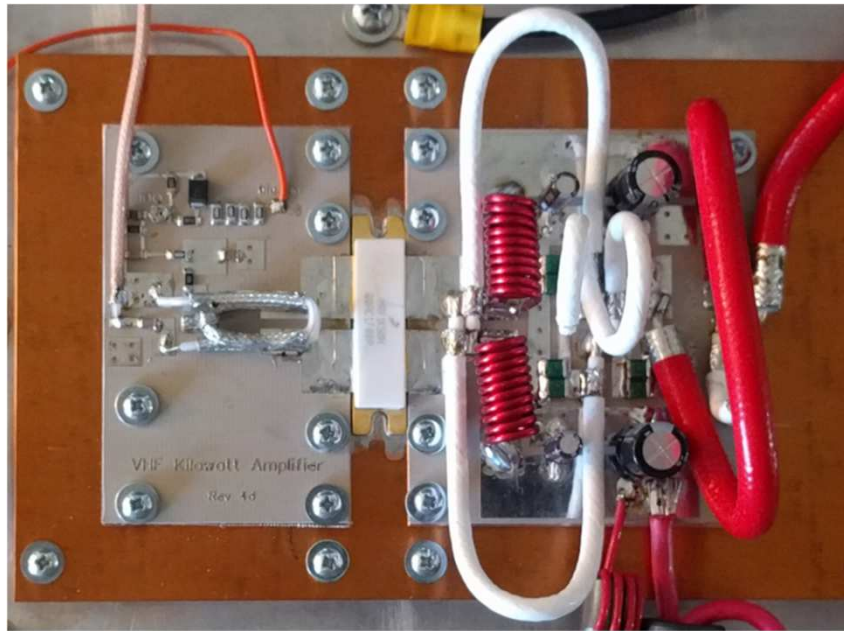


MRF1K50 – 1500w

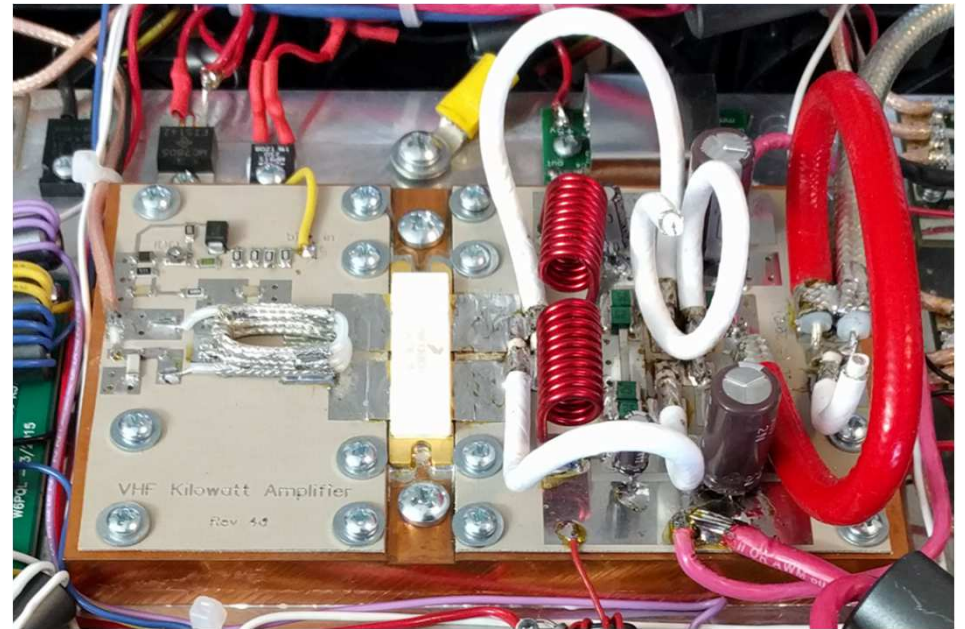


1500w+ RF decks for 144 MHz

MRF1K50



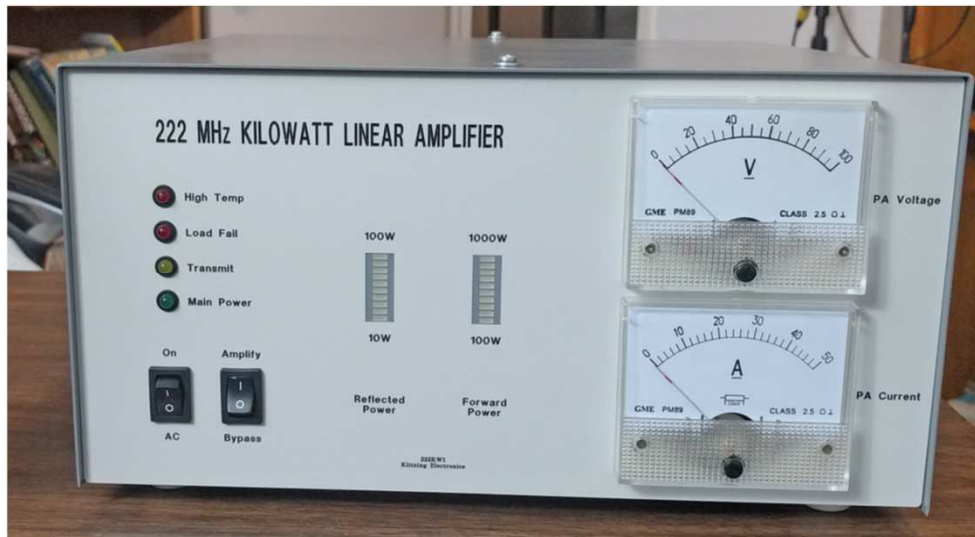
MRFX1K80



Amplifiers made using the BLF188



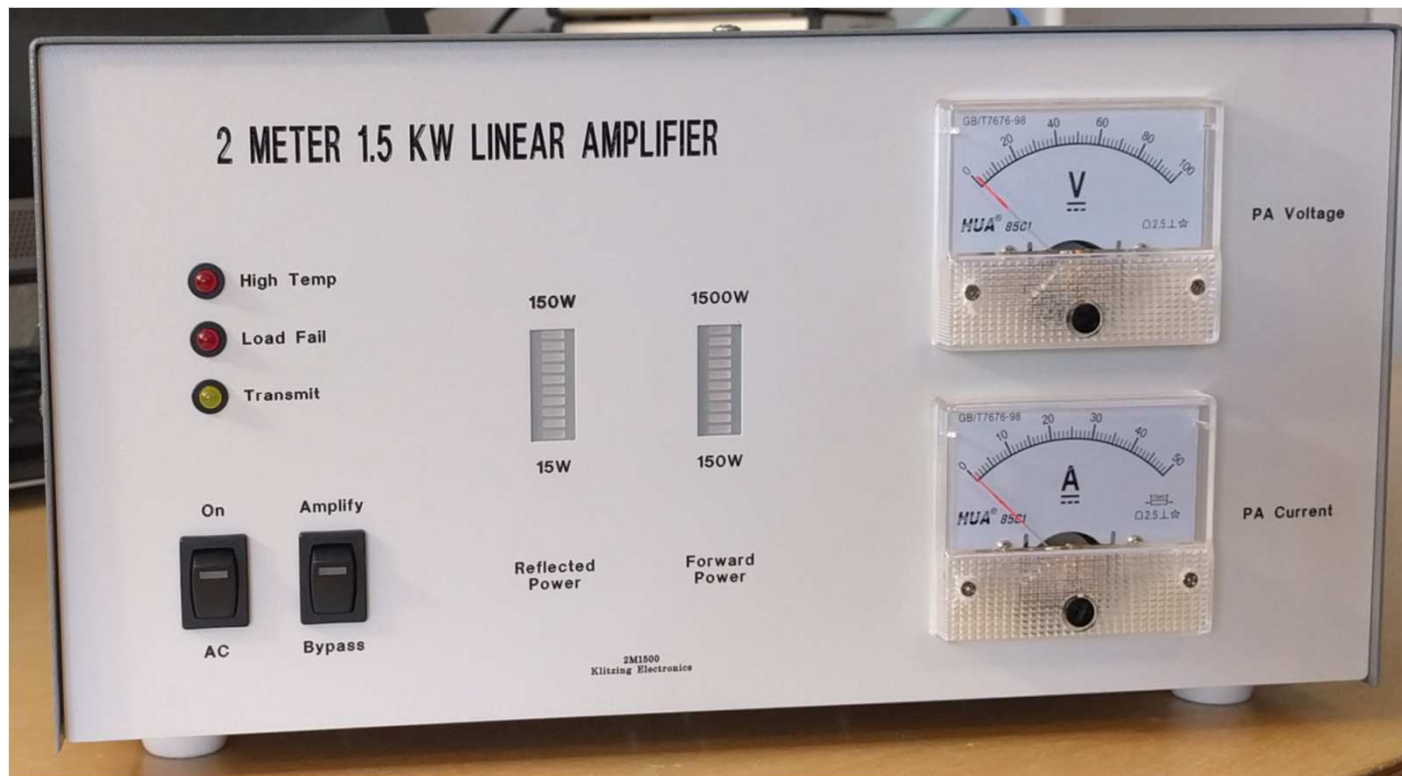
More amplifiers using the BLF188



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Amplifiers using the MRF1K50



An Amplifier using the MRFX1K80



MRFX1K80 EME
amplifier options: a
remote front panel
(radio room) with the
amplifier body
mounted under the
EME antenna



The rear panel of the radio room “amplifier”



Placement of the amp at the operating position (Azores)



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Measuring sun noise



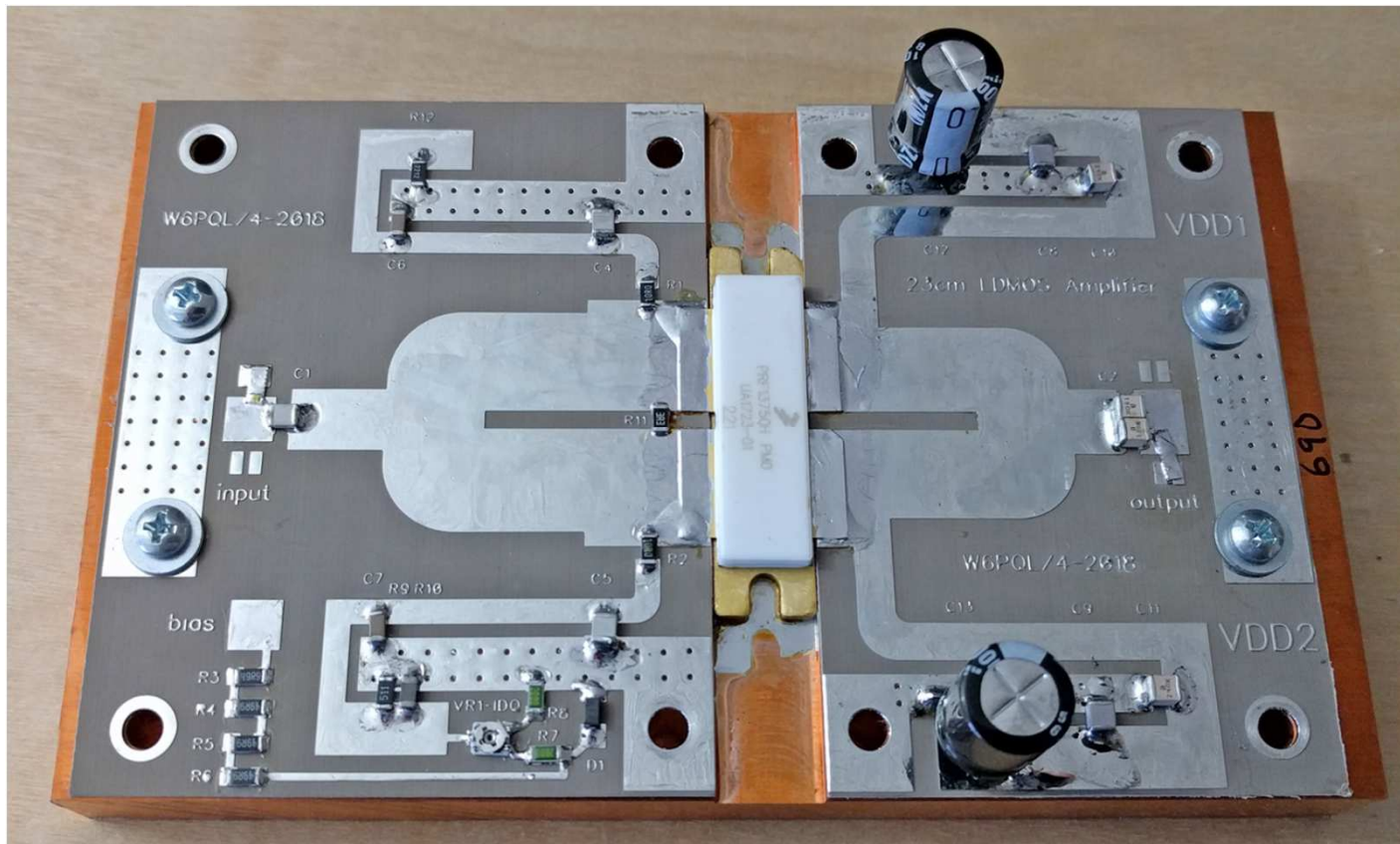
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So that was 2m

Let's move along to 1296...

For 1296 – 600W+ using a single MRF13750 (50v LDMOS)



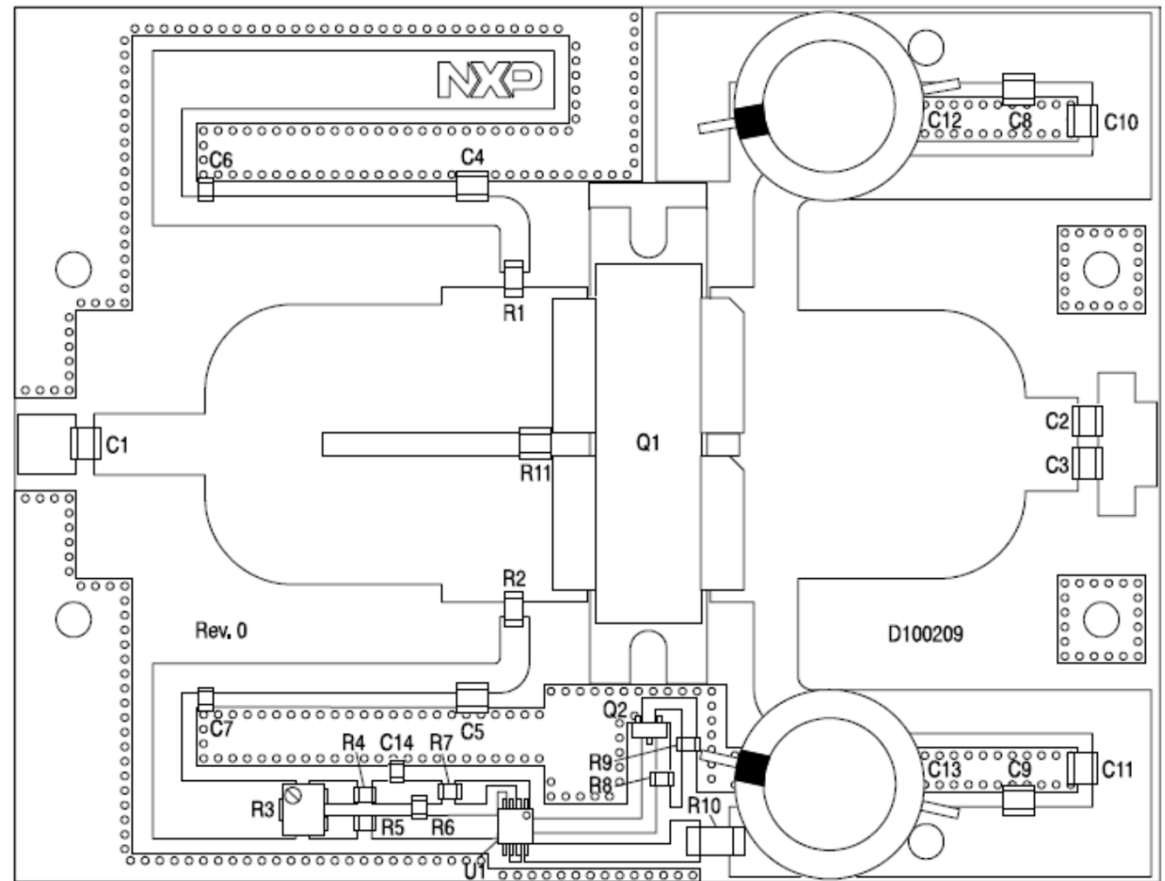
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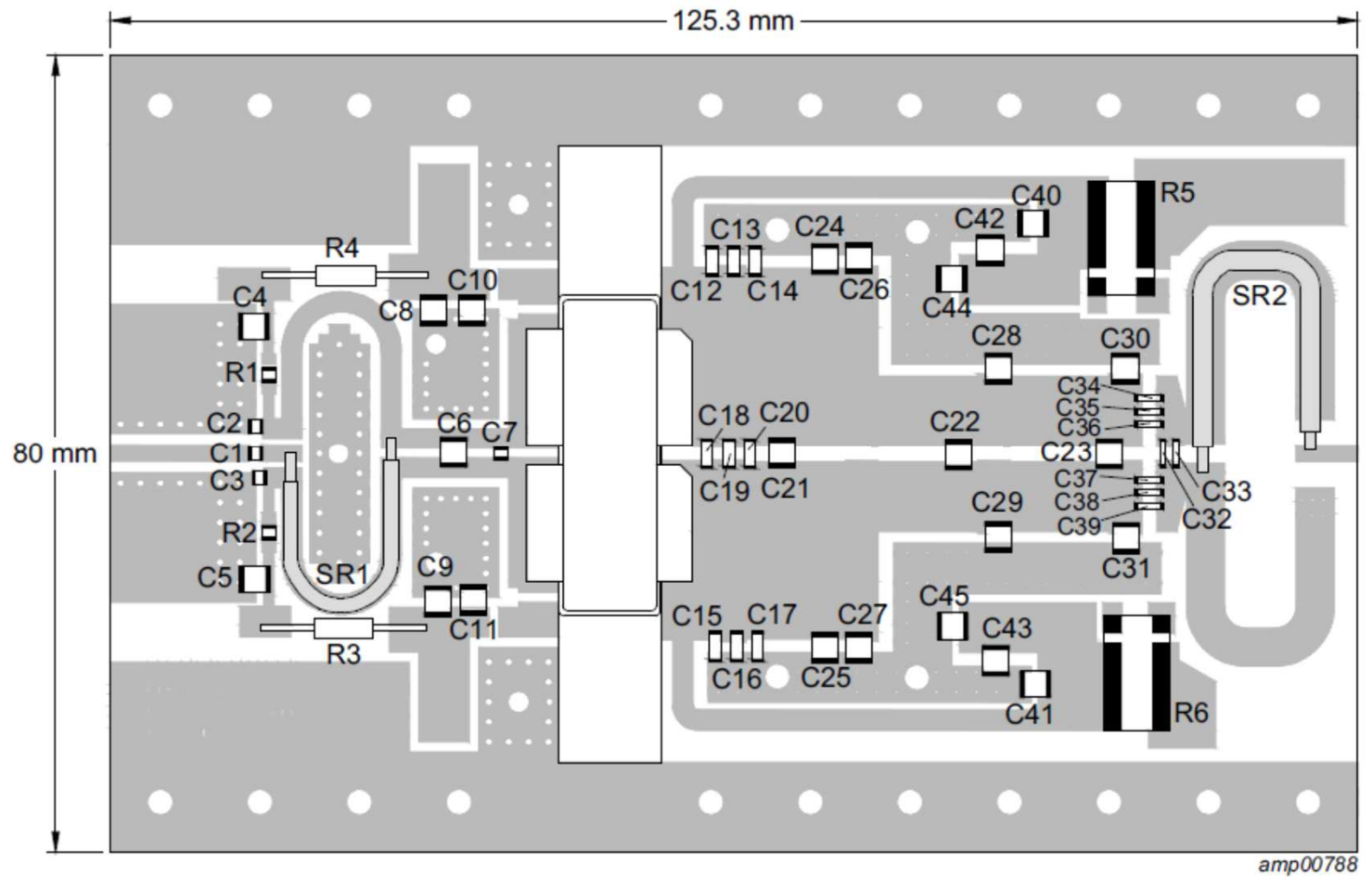
A very simple circuit layout where all the critical matching is done with transmission lines (the PC board) instead of expensive RF capacitors

Those expensive RF capacitors don't always hold up, but the microwave PC board substrate always does

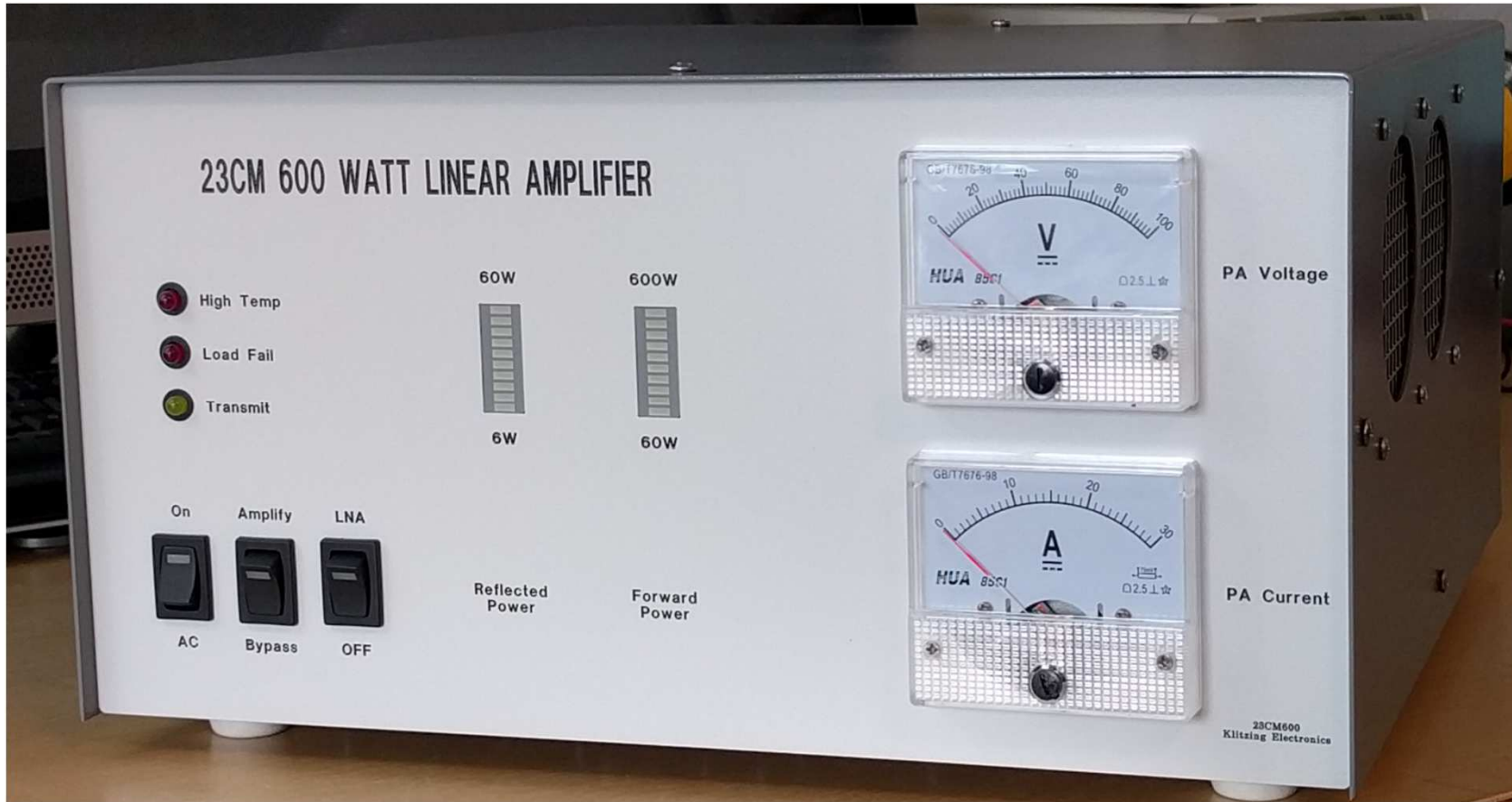
RF capacitors are only used in this design for DC blocking and bypassing

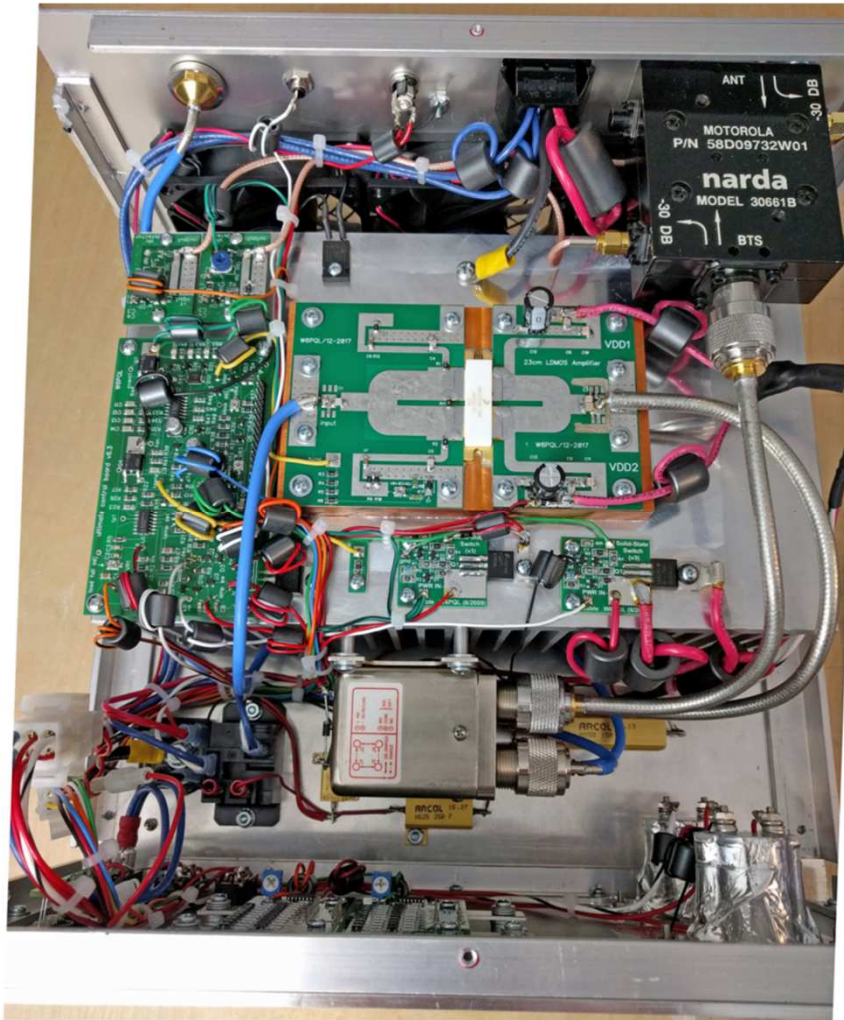


Compared to the
BLF13H9L750
circuit layout



The end result, a table-top 600w amplifier for 1296





Inside view, 600w
1296 amplifier

A couple examples of color schemes for the amps

