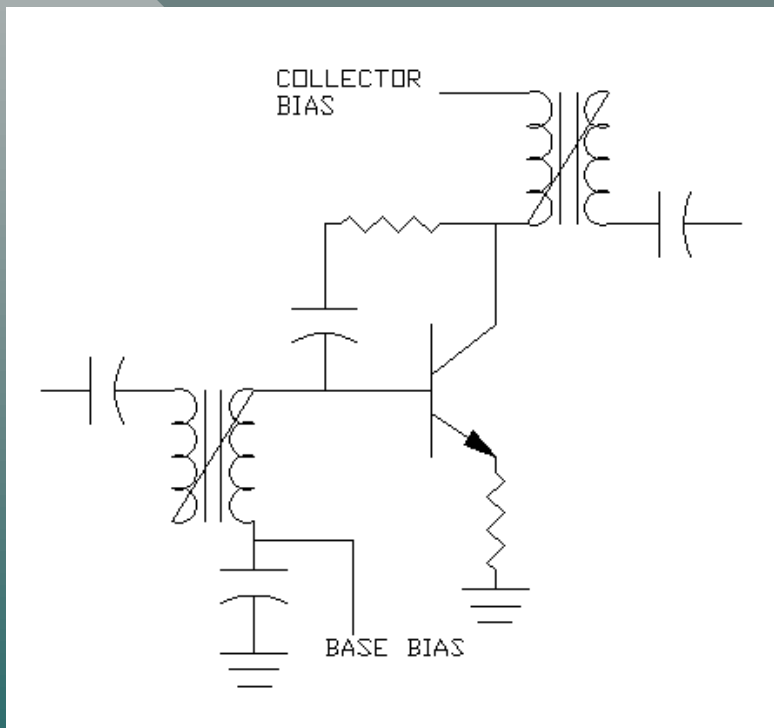


# History of Broadband High Power RF Amplifiers

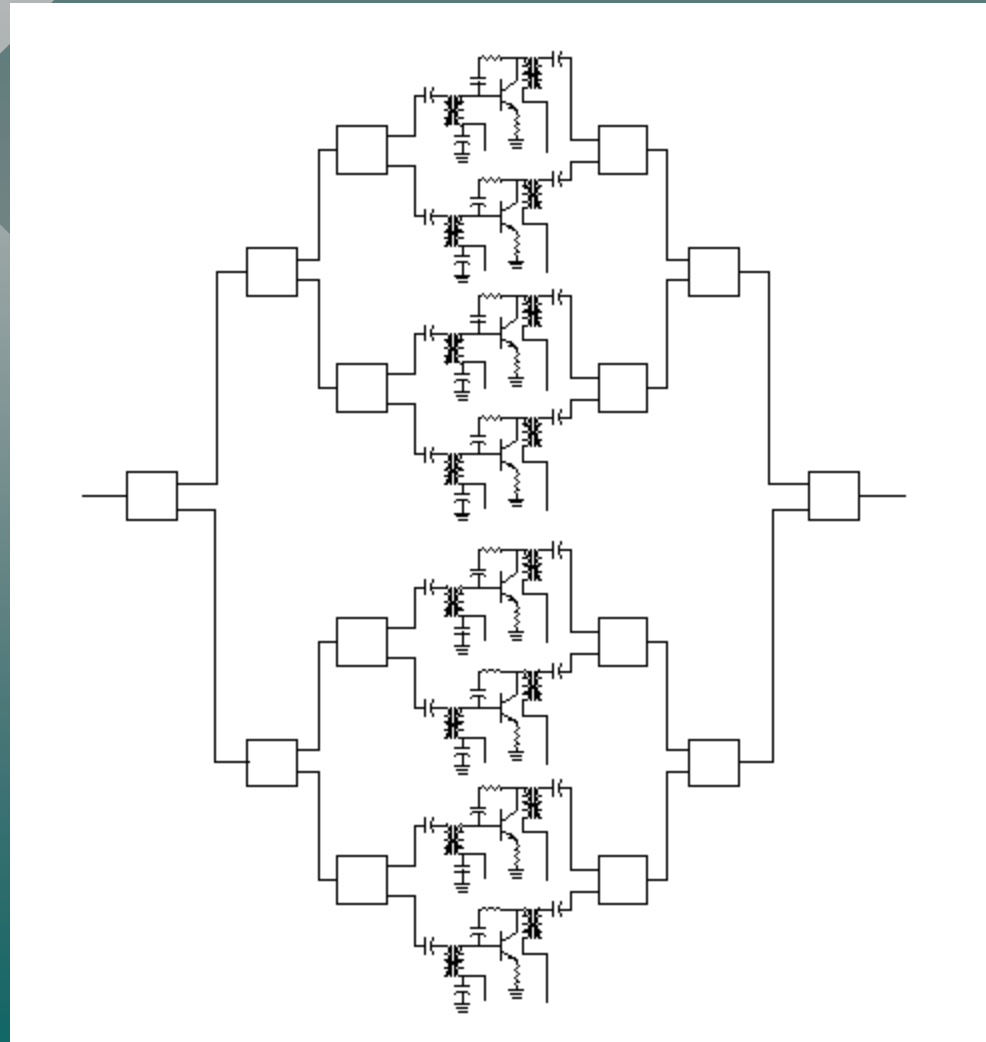
S. K. Leong

# Yesteryears - 60s



- CATV 2W blocks. Combined to 50W .01 - 110 Mhz
- 5W Blocks. Combined to 100W. 1.7 - 400 Mhz
- Diplexed for Khz to Mhz bandwidths.

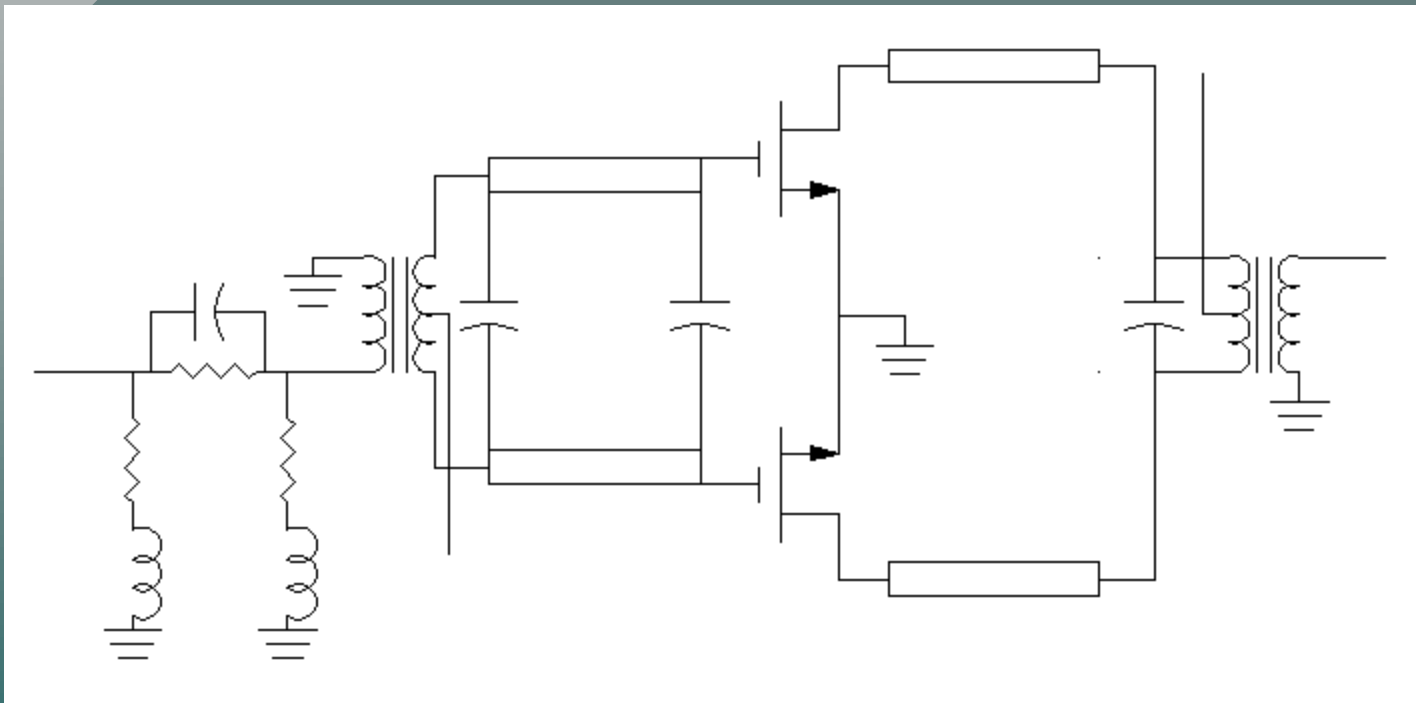
# Combining CATV 2W blocks



# PUSH PULL AMPS circa 1977

- Invented at CTC
- Multi Octave Design
- Cancel Even Harmonics
- Lower Capacitance - broader bandwidths
- Impedance 4 times that of single ended device of the same power.
- Thermally better - two split halves.

# Push Pull Design



# Wideband Transformers

- Invention of new ferrite materials critical to ability to build multi decade bandwidths.
- Otherwise, with reactive matching would require many elements.
- Powdered Iron 100-500 Mhz 10-20u
- Ferrite Ceramic 1-200 Mhz. 125 -1200u

# Push Pull Broadband Amp 10 - 200 Mhz 150 Watts



# INTRODUCE MOSFET

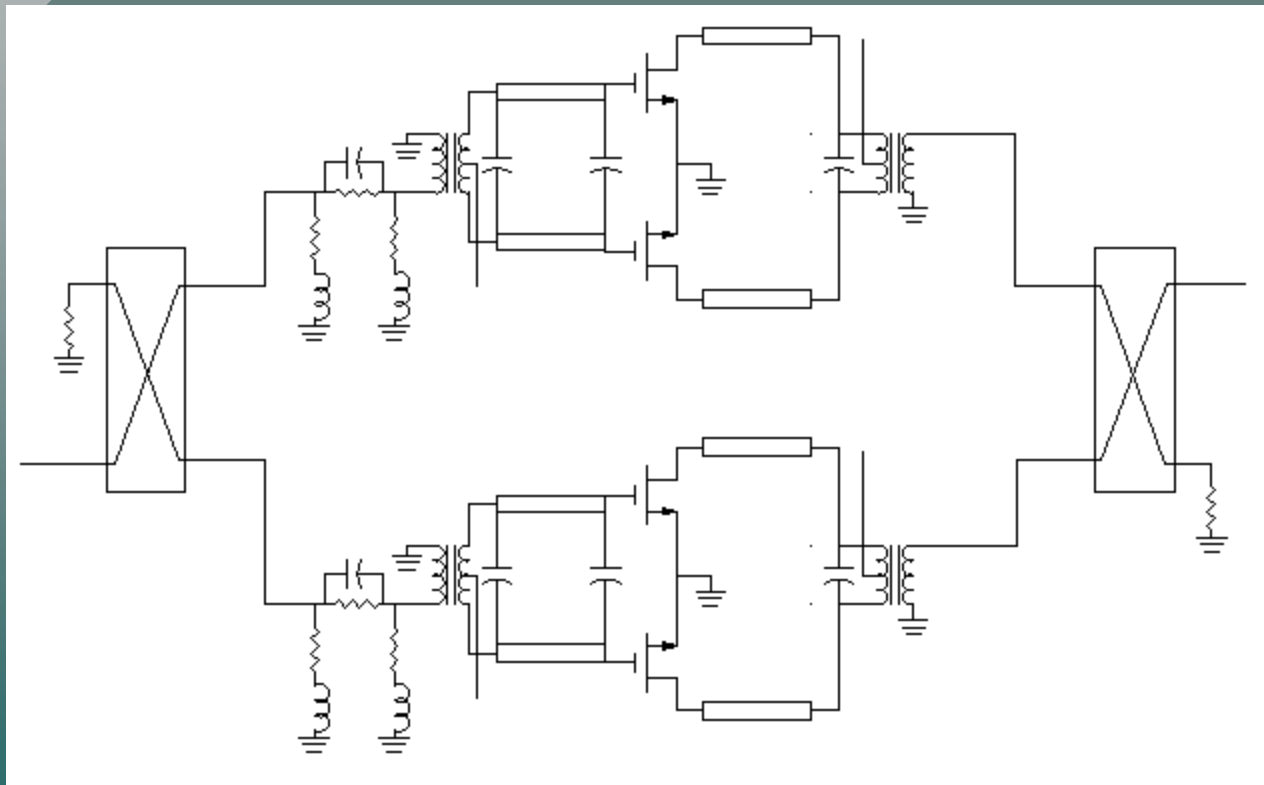
- 1981 - Siliconix / Acrain 175 Mhz VHF
- 1985 - Polyfet 4 - 500 Mhz UHF 100W
- VDMOS GOLD METALLIZED TECHNOLOGY
- F2 series to 1 Ghz



# MOSFET vs. BIPOLAR

- No thermal runaway
- Higher I/O impedance
- No internal matching - Greater flexibility
- No secondary breakdown - Higher VSWR
- DC to UHF bandwidth with one device.
- Simple bias circuitry

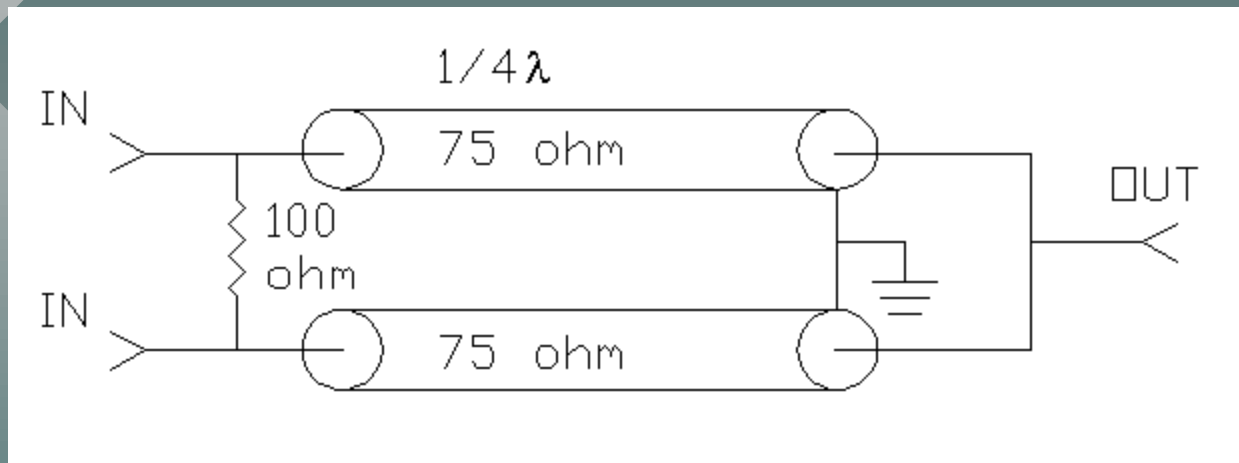
# Combining Push Pull Amps



# Combining for higher powers

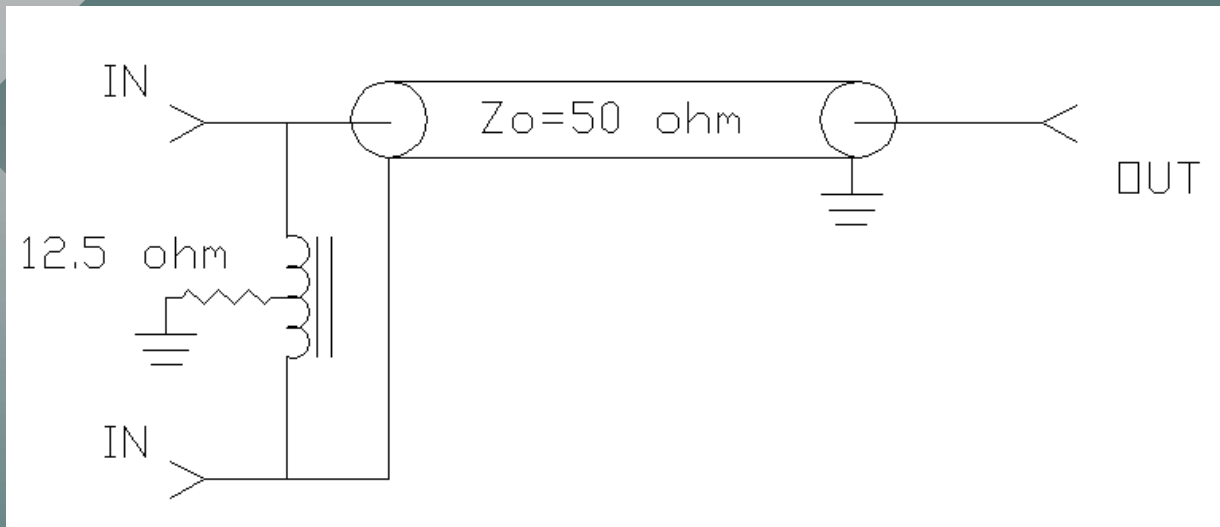
- In Phase Combining
- 180 Degree Combining
- Quadrature - 90 Degree Hybrid Combining

# In Phase Combining



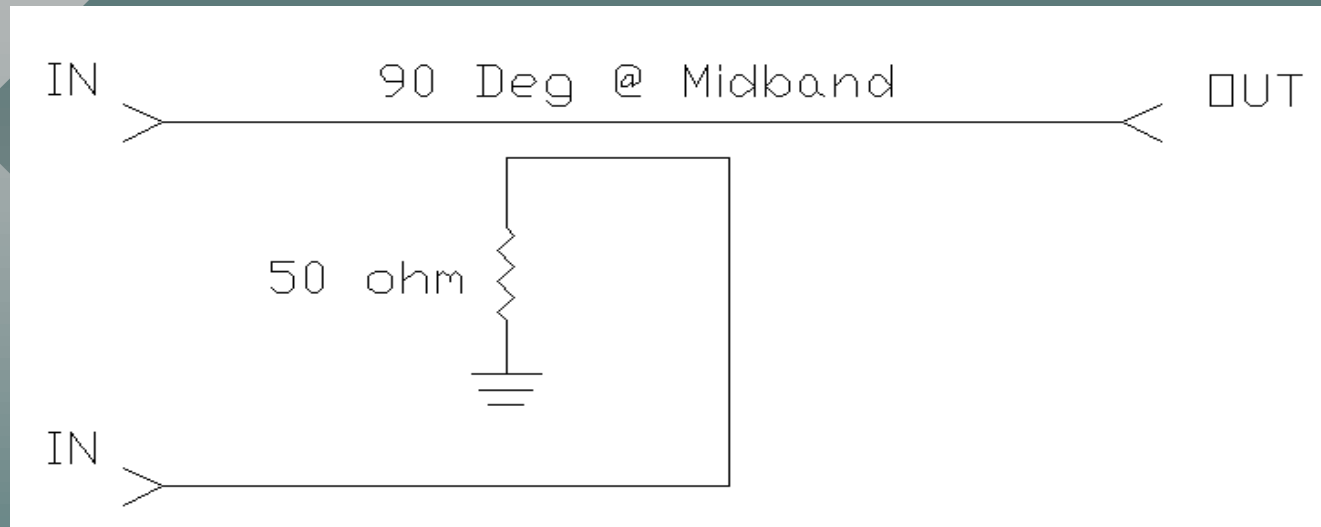
- Low Loss
- Simple
- No Even Harmonic cancellation.

# 180 Degree Combining



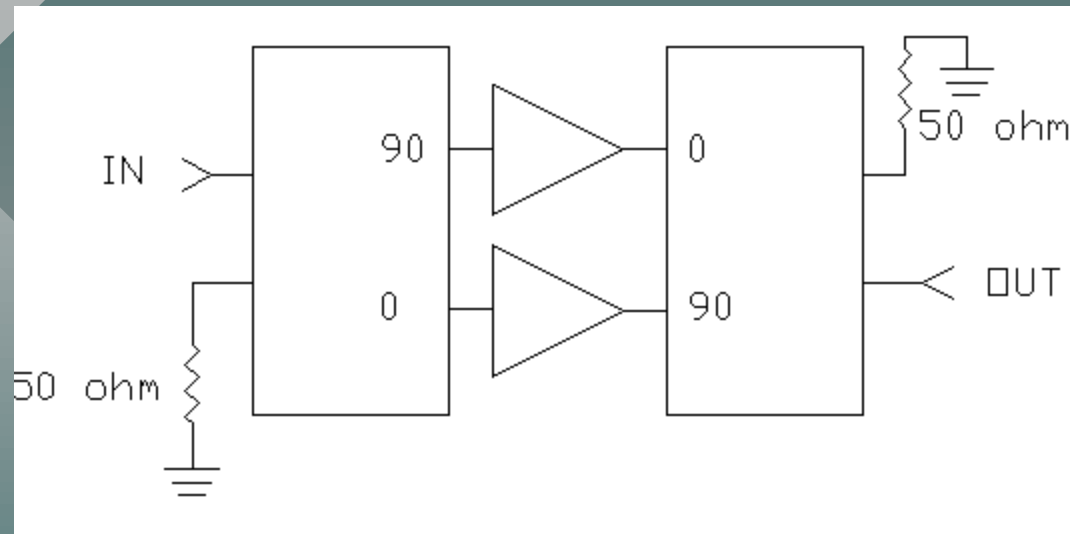
- Cancels Even Harmonics
- Good for multi octaves
- Power Loss at High Frequencies

# Quadrature - 90 Deg Hybrid



- Printed - as shown above. Sage Lines
- Lumped (Transformers, inductors, caps)
- Off the shelf commercial.

# Quadrature Combine



- High VSWR , High Power Outputs
- Multi Octave bandwidths
- In band ripple.

# SUMMARY

VDMOS best candidate for broadband

- High Input Impedance - low Q.
- No internal Matching.
- High Power and Rugged.
- [www.polyfet.com](http://www.polyfet.com)