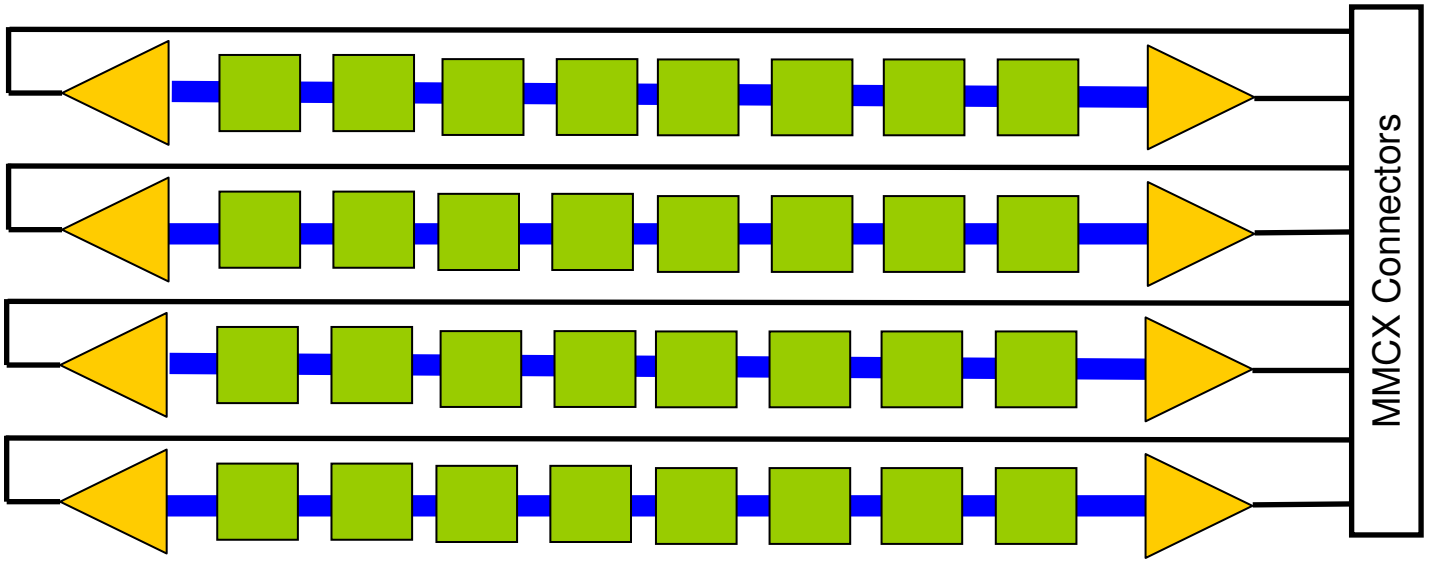
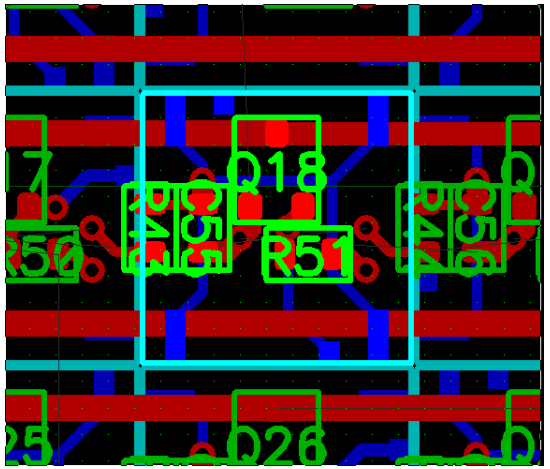
PET-TOF Strip Line Status

- **Next SL prototype has 4 strings of 8xSiPMs**
  - **Design is for STM 10-contact 5.1x5.1 mm^2 package**
  - **Diode pitch is 5.2 mm**
- **Boards should arrive any time now, full component kit exists**
  - **First I plan to assemble 2 boards with a single line of diodes (solder)**
  - **Second step is to assemble a complete board, using anisotropic conductive film (will need 4x8 scintillator blocks for that – to push diodes against the board)**
  - **If conductive film does not work – will solder everything, and we have to learn how to ensure a good optical contact between scintillator and diodes**

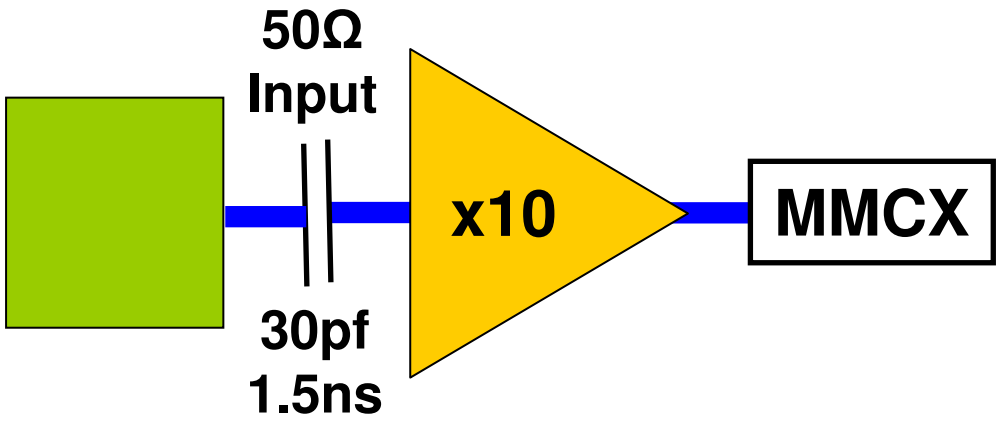


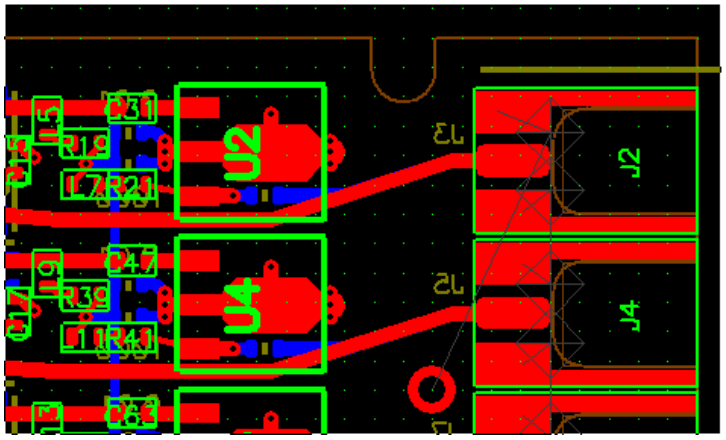
Strip Line Details

- **Next SL prototype will have 4 strings of 8xSiPMs**
  - **Design is for STM 10-contact 5.1x5.1 mm^2 package (that is a rather challenging package for board layout)**
  - **Diode pitch is 5.2 mm**
- **I have a layout of an elementary cell, note two strip lines per row, the second one returns far end signal to the "digital end" of the board**
  - **GALI-S66+ amplifier from MiniCircuits (not an ideal package, but layout is possible) relatively low power consumption 16mA@6V, gain of x10@1GHz / x6.6@3GHz)**



Diode cell layout





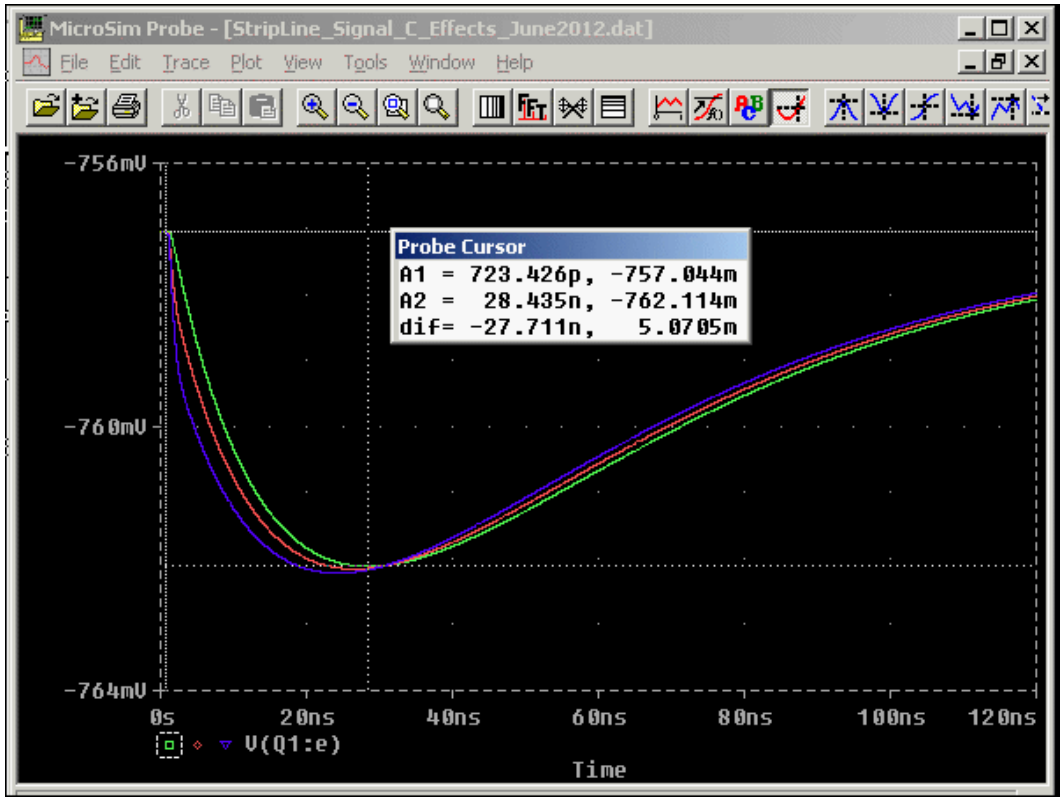
Amplifier cell layout

Signal Shape Simulations

- I have run a series of Spice simulations to get an idea of the pulse shape, and amplitude for various scenarios of diode interfacing, and pulse shaping
  - Light pulse shape:
    - 0.3ns rise time
    - 40ns fall time (LYSO time constant) -
  - Assumed 20ns of SiPM recovery timeLYSO light yield is 500 pe, and SiPM gain of $x10^6$ (easy to scale if different)
  - For shaping a simple C-R differentiating ("clipping") circuit is used with time constant of the order of 1ns

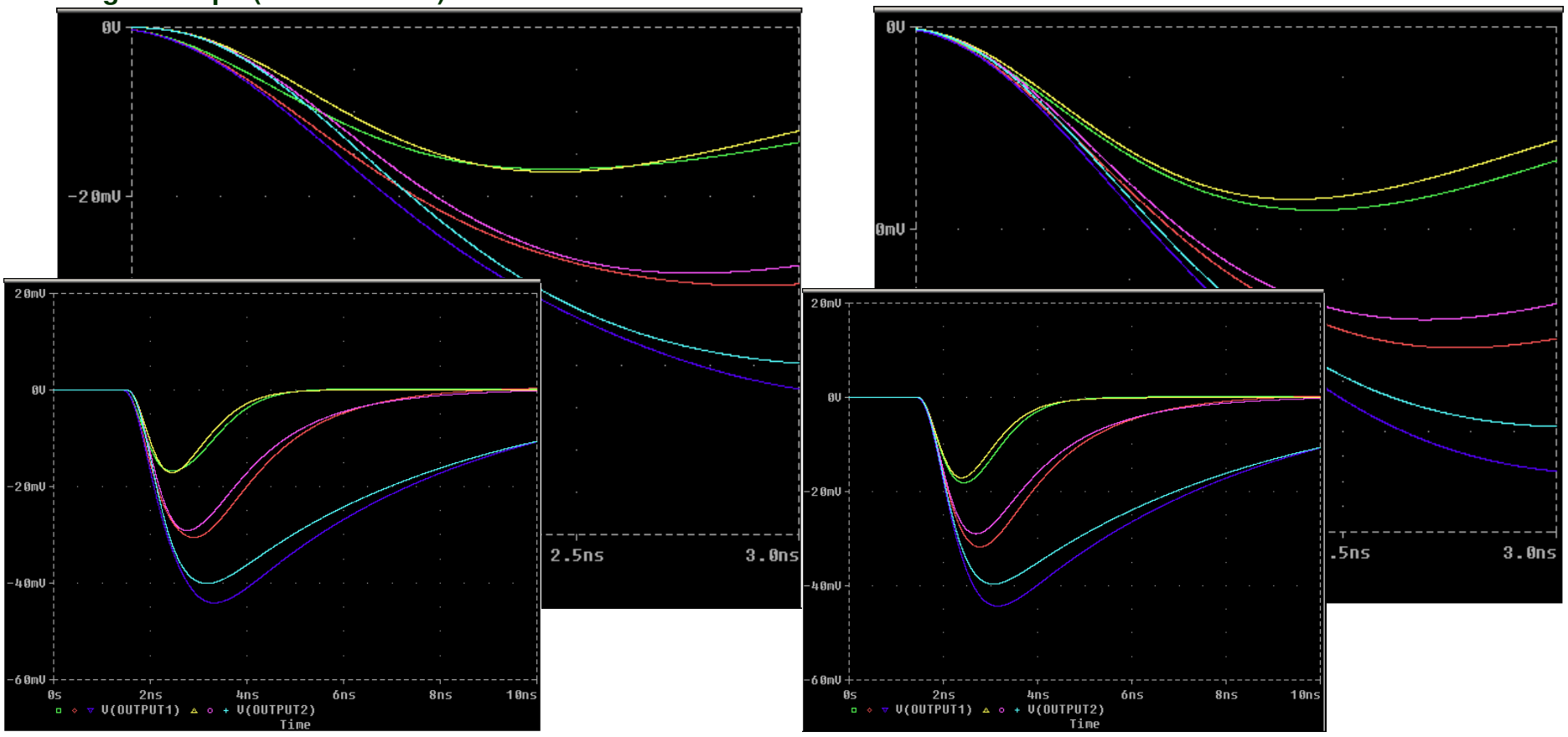
SiPM output pulse shape for different pixel stray capacitance:

0.1%(green) 10%(red) 20%(blue)



Output Signals (after x10 amplifier and shaping)

- Signals shown at the two ends of the same transmission line (aligned in time):
  - Output 1 – near end
  - Output 2 – far end (lower peak amplitude)
- Pulse shapes are shown for different output capacitances of the SiPM buffer transistors:
  - Left - 0.5pf (previous SL board)
  - Right – 0.1pf (new SL board)



SiPM output pulse shape for different shaping capacitors: 10/30/100pf