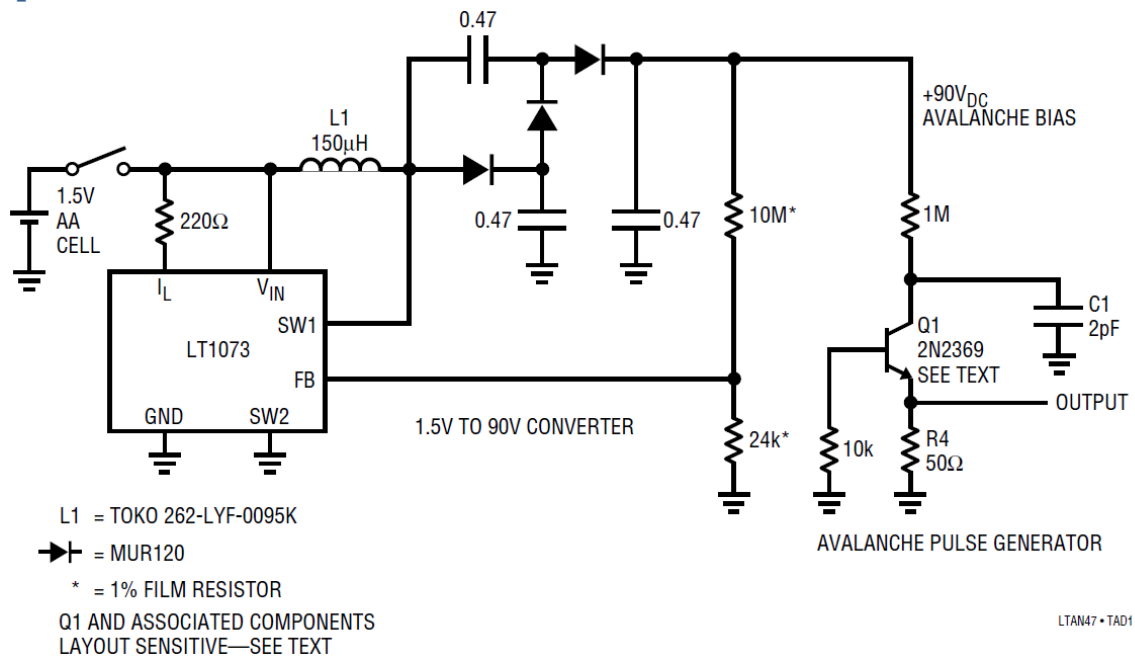


# Avalanche Transmission line Pulse Generator

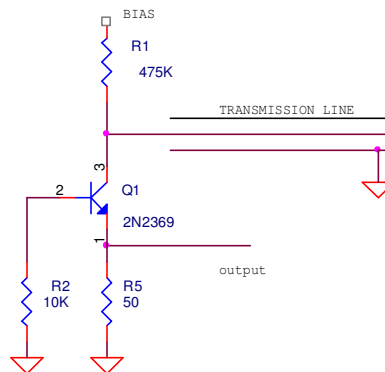
## Introduction

This document describes an attempt to build a transmission line pulse generator, based on the avalanche pulse generator described in Linear Technology application note AN-47.

## Concept

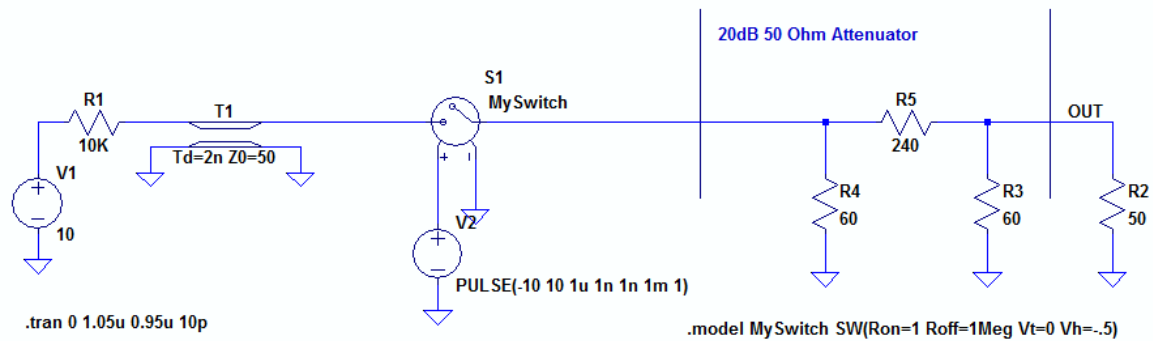


The circuit presented by Jim Williams in AN-47



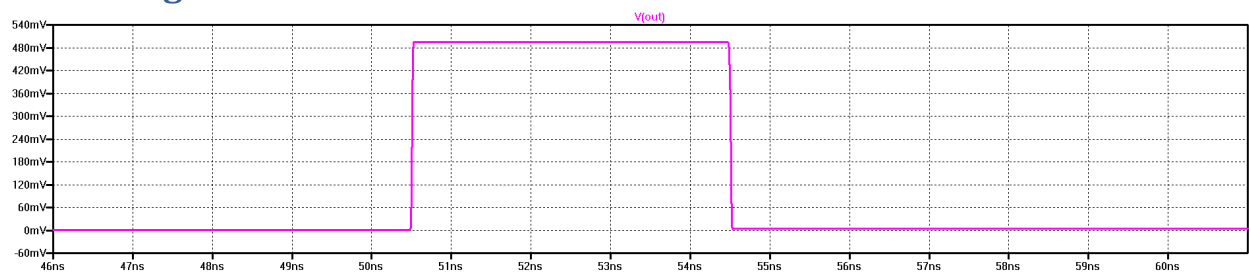
If C1 is replaced by a transmission line, the pulse width will be twice the electrical length of the line.

## Simulation



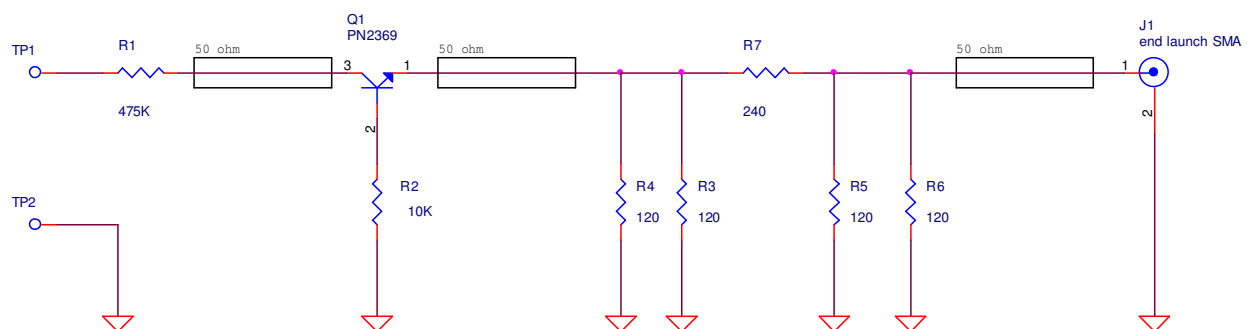
This is a very simplified model. The transistor has been modelled as a switch.

## Modelling Results

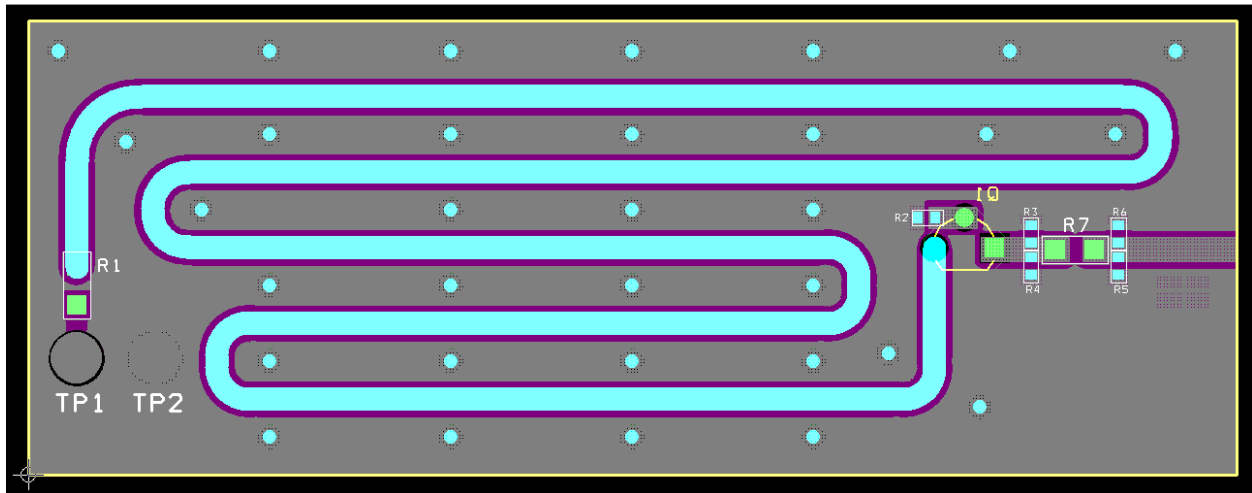


The output pulse width is twice as long as the transmission line.

## Actual Schematic



## PCB Design



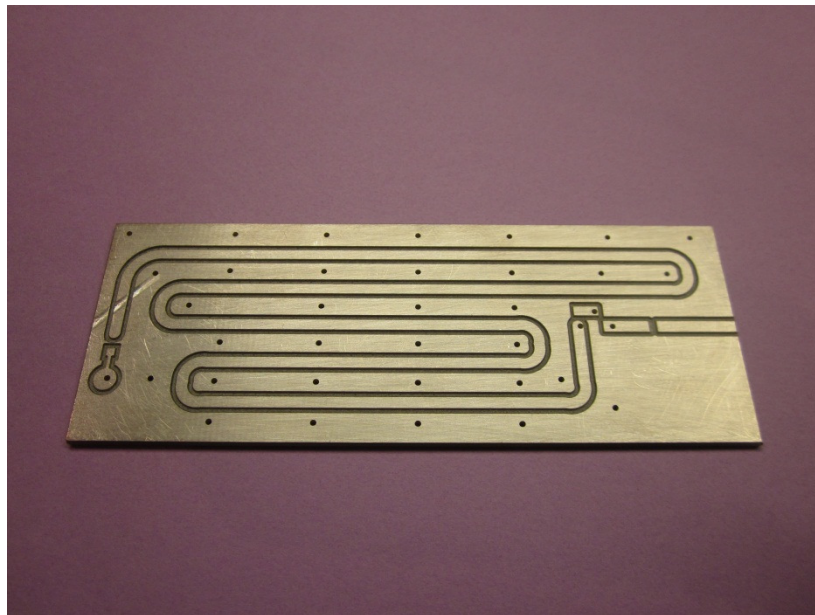
The SMA connector is mounted on the right hand edge of the board.

The top ground plane and the bottom ground plane are connected with vias.

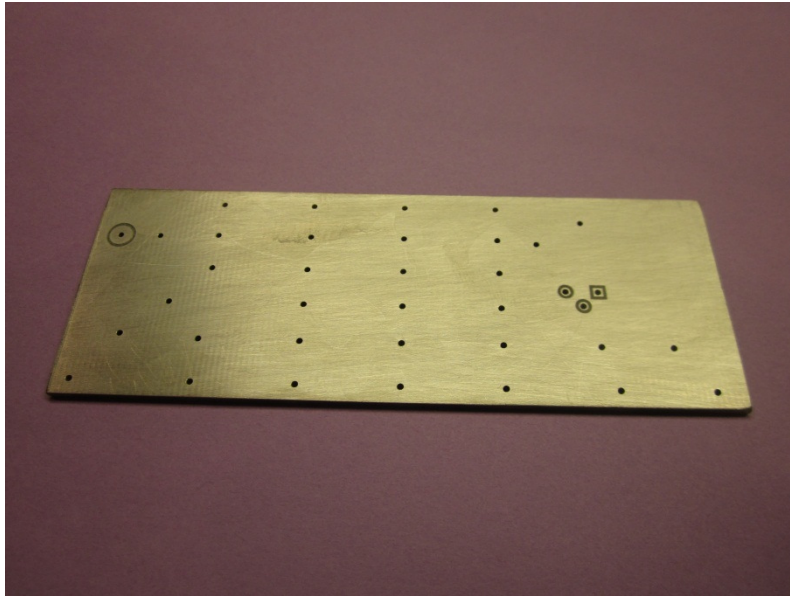
The board is 4.00 x 1.50 inches.

The transmission line is 0.080 inches with 0.020 gap. Coplanar waveguide was used, to make construction of the attenuator section easier.

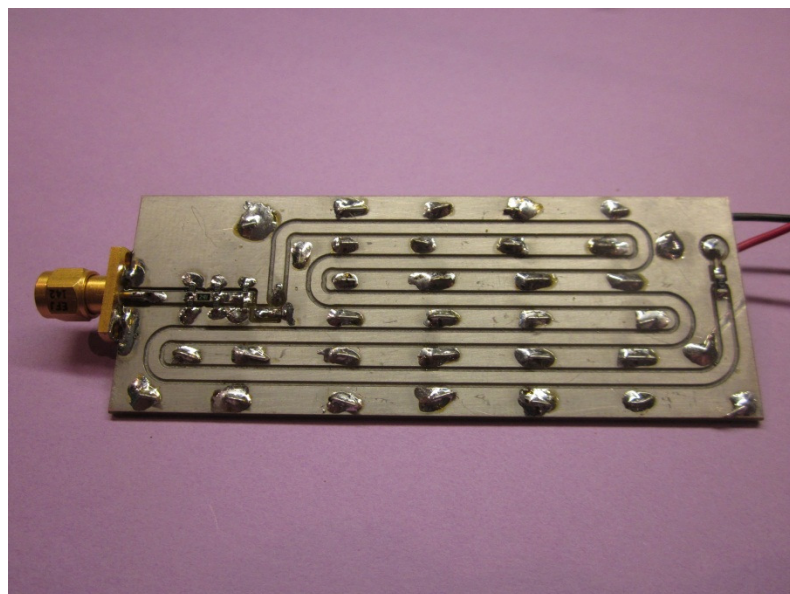
The material is 0.062 (1.5mm) FR4.



Top side

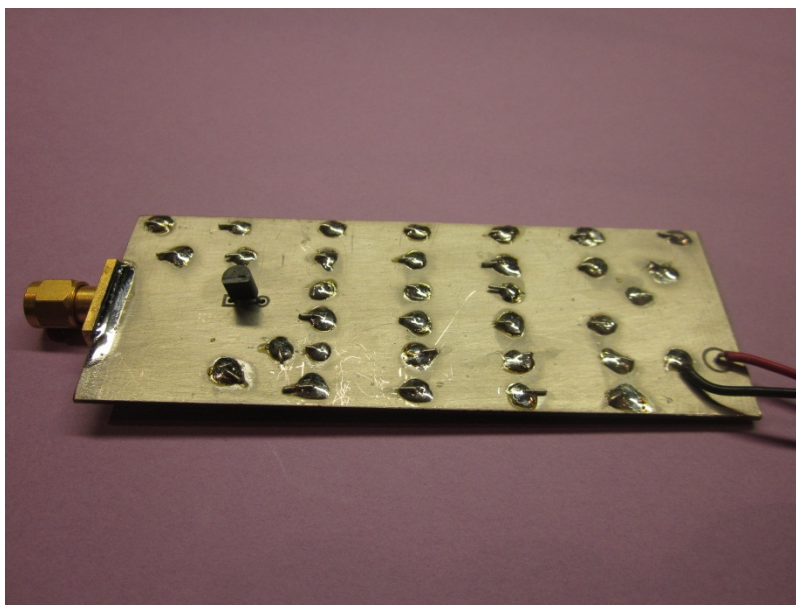


Bottom side

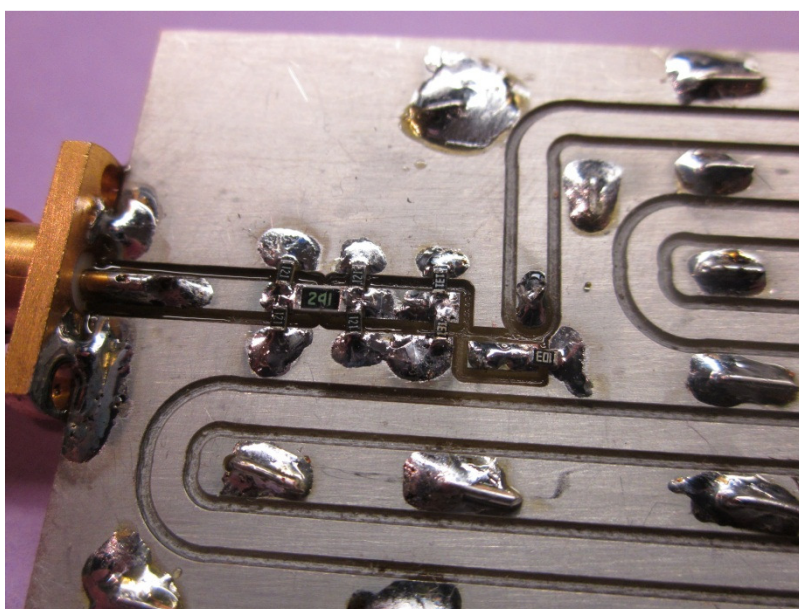


Top side construction

'Z' wires were used in the vias.



Bottom side

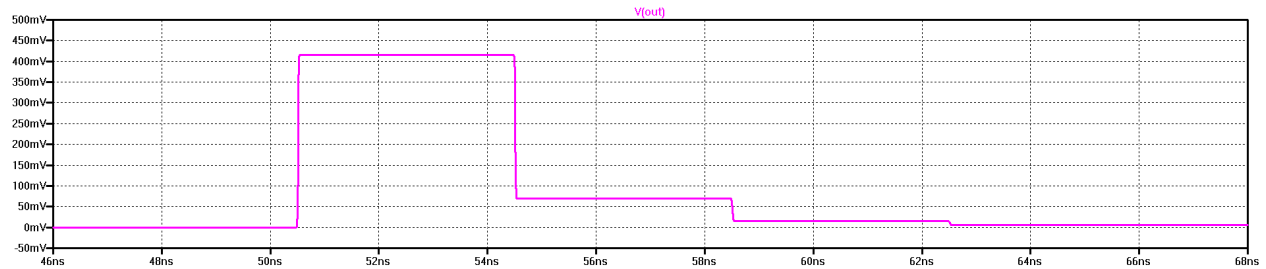


Details of the attenuator and SMA connector mounting

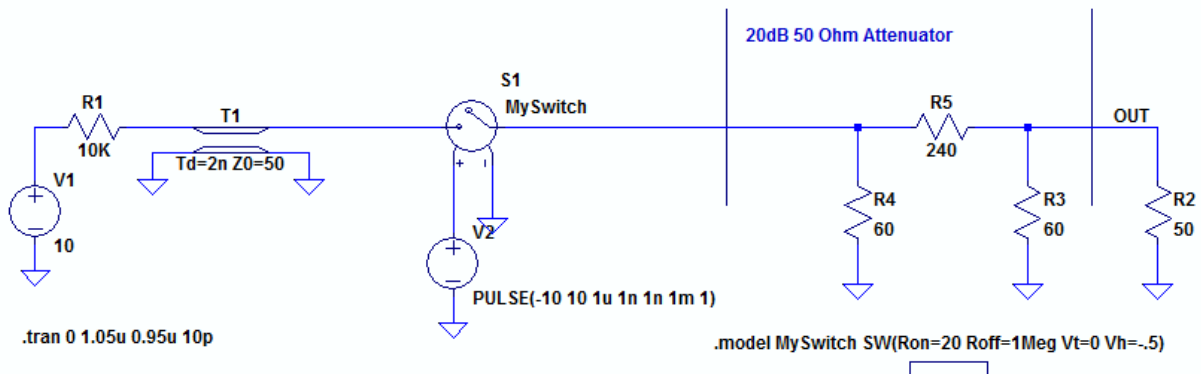
## Testing

The initial test results were a little discouraging.

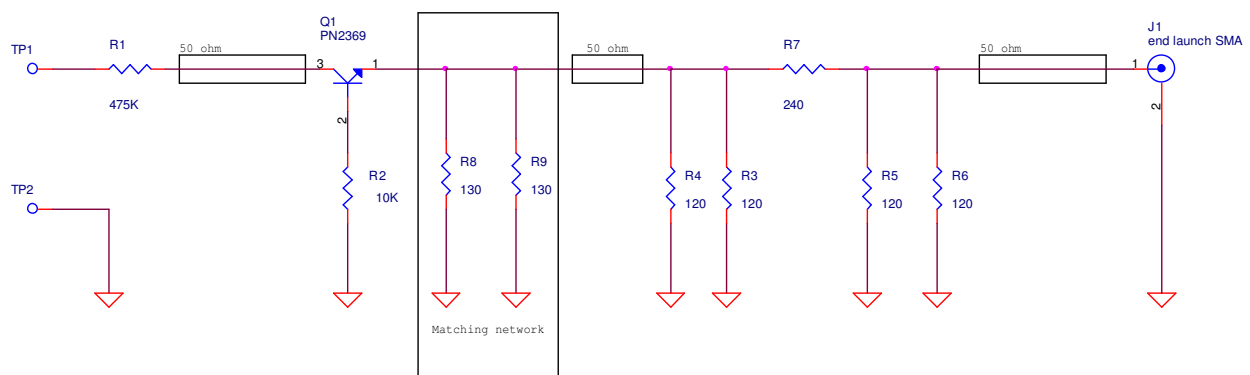
The output waveform had steps on the trailing edge, as illustrated by the LTspice model:



This results from the mismatch generated by adding 20 ohms in series with the switch.

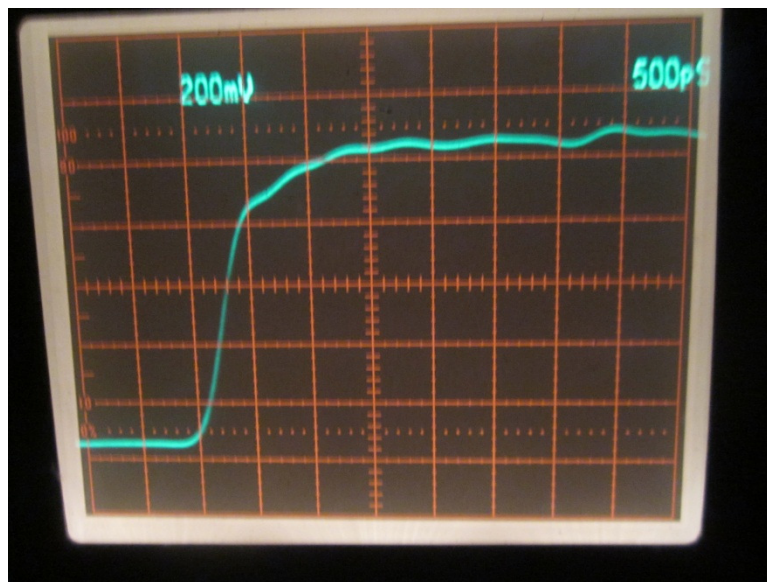
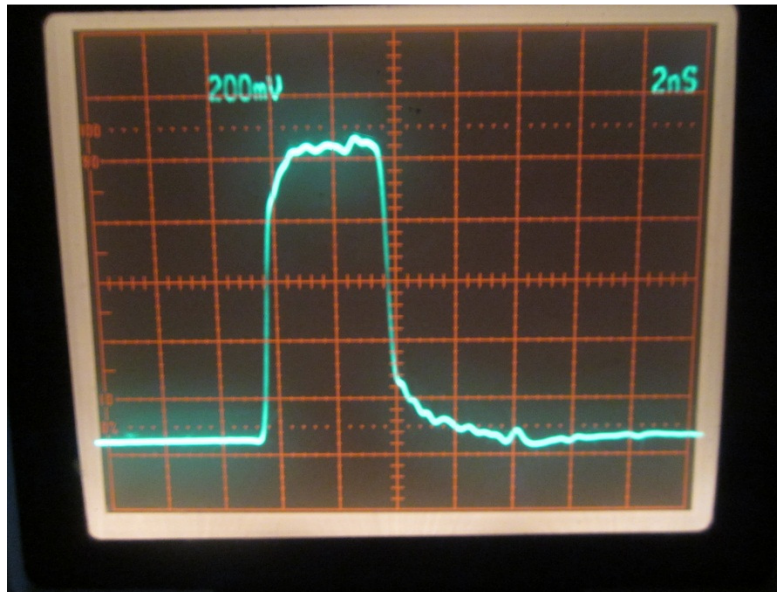


This can be compensated for by adding 65 ohms in parallel with R4



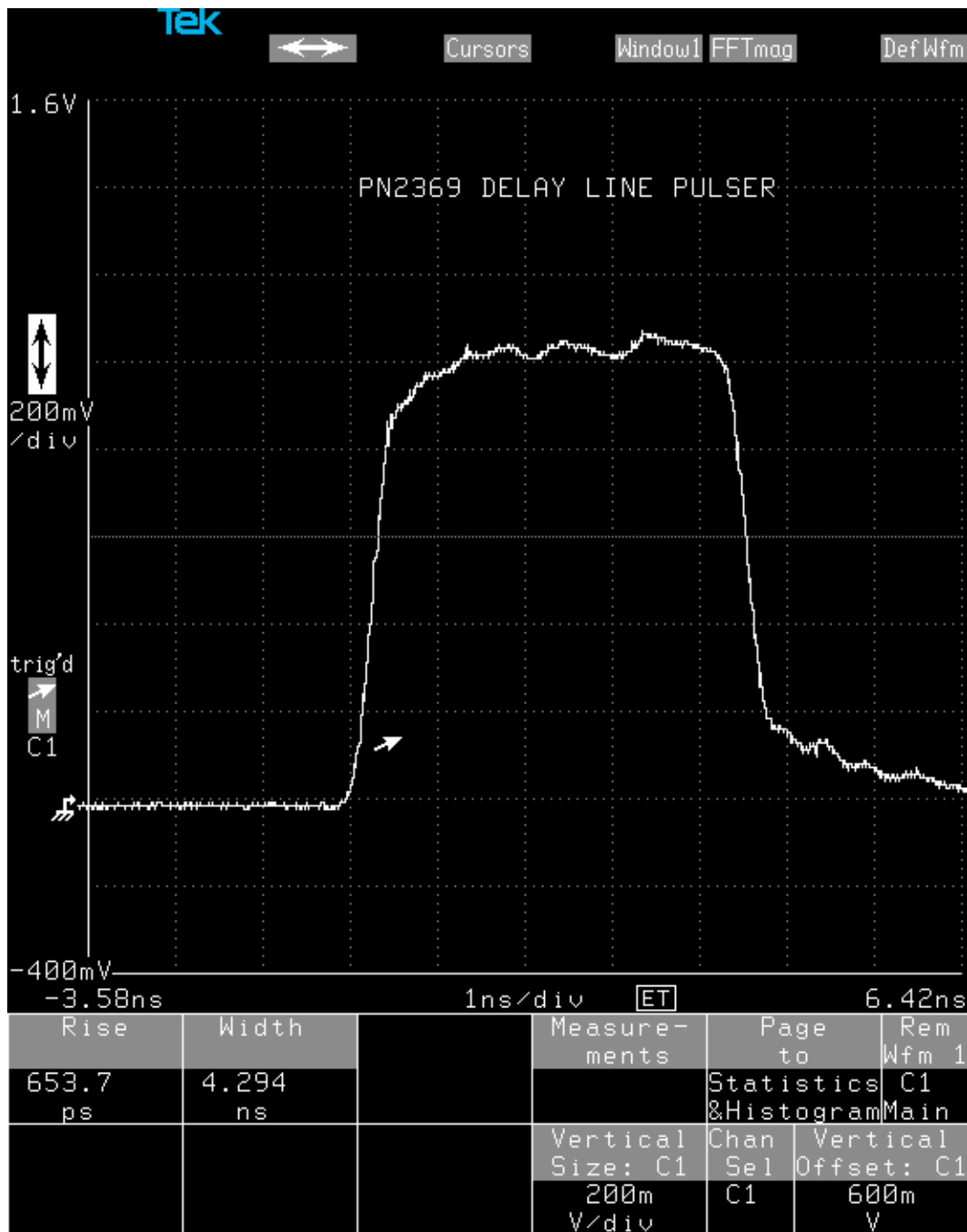


## Measured Results



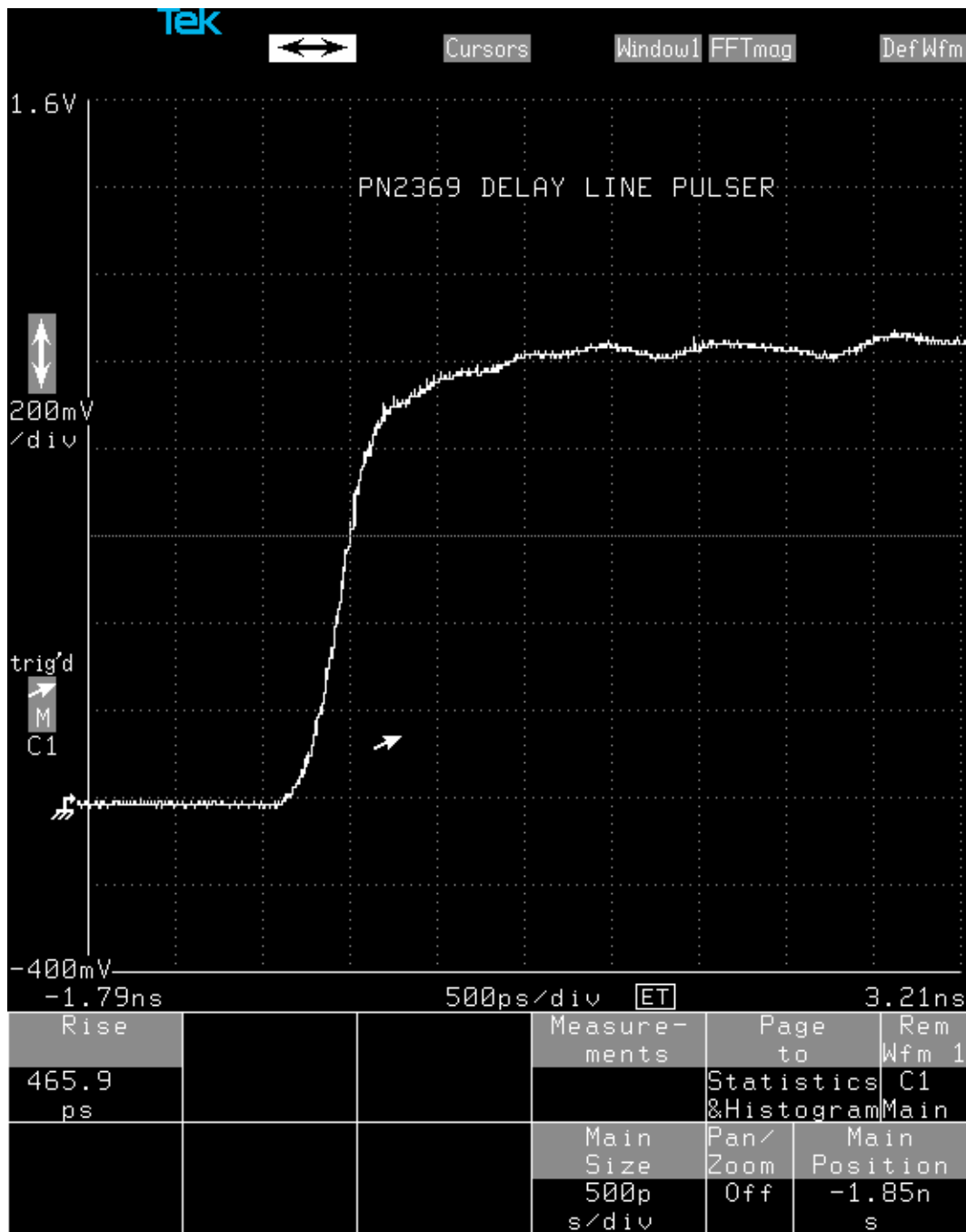
These pictures were taken with a 7A29 in a 7104 mainframe

The ripple at the top of the pulse results from discontinuities at the corners in the transmission line.



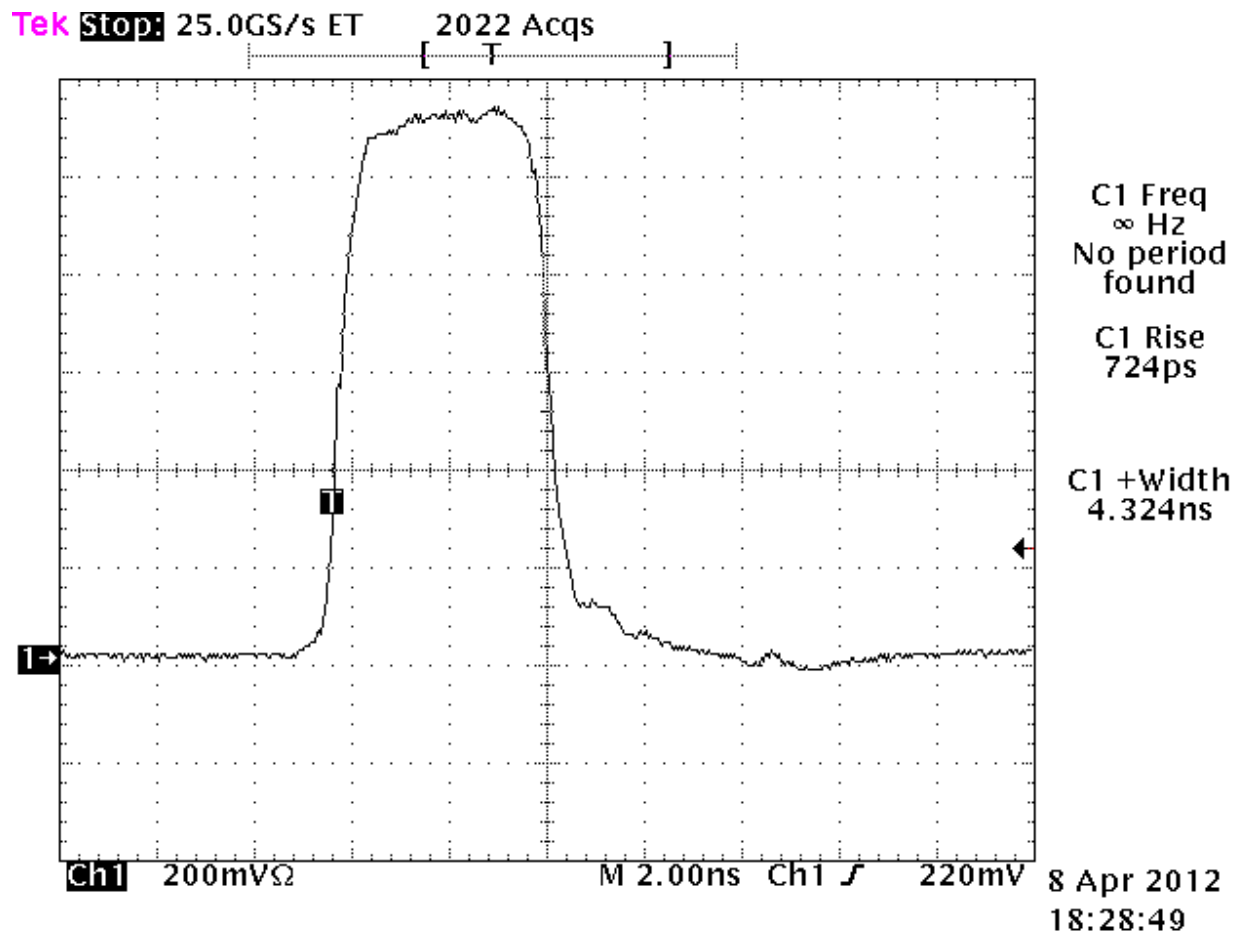
11A71 in DSA602A Mainframe





11A71 in DSA602A mainframe

**Note:** There is very correlation between the 7104 and DSA602A measurements.



The 500 MHz TDS754A does not accurately reproduce the ringing on the top of the waveform.

## Conclusion

An attempt was made to produce a fast, flat topped waveform. Reasonable results were obtained.

A printed circuit was used to try and make the results repeatable.

The transistor used was marked KTN2369A (unknown manufacturer). No attempt was made to select a transistor for better performance.

Jay\_Diddy\_B