The Lattice (or Reflection) Diagram

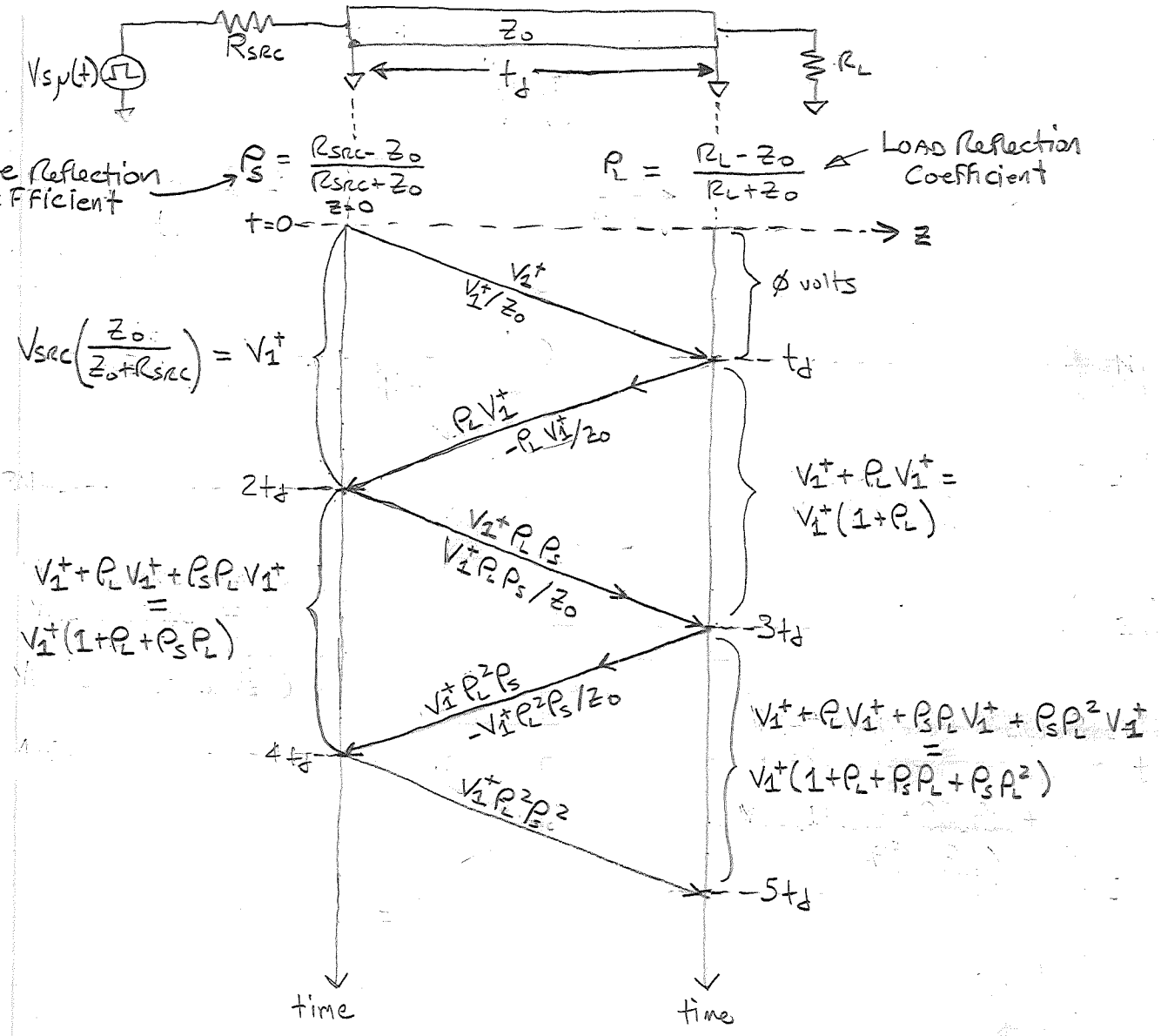
The Lattice diagram provides a graphical bookeeping method to keep track of reflections from both near and far ends of a T-line.

It can also be used when multiple T-lines of different Z_0 are in series.

It shows the impedance boundaries
- reflection coefficients at each end
- flight time
- voltage and current at any point (z or t) on the line
- cumulative voltage at both ends of the line

A voltage or current waveform versus time plot can be made from the Lattice diagram

The Lattice Diagram

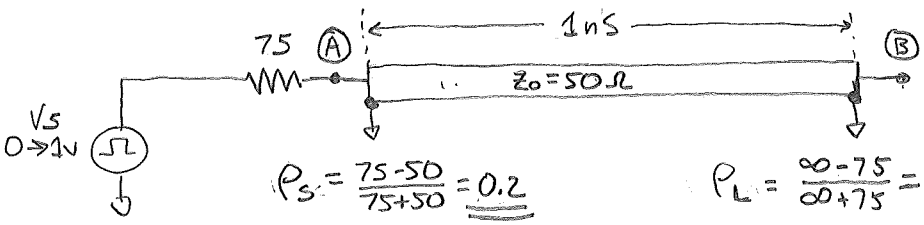


The eventual cumulative voltage at each end of the T-Line converges to:

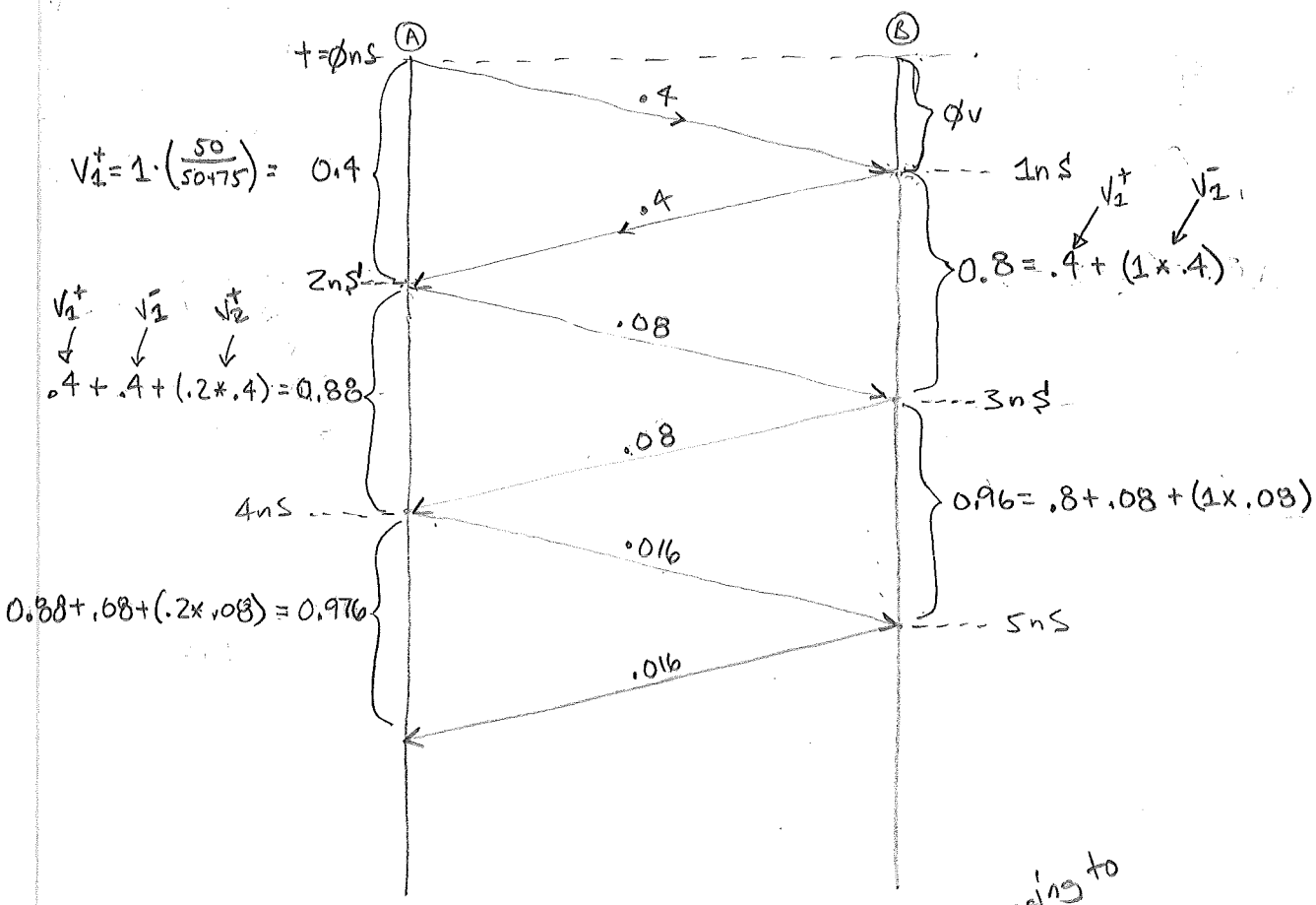
$$V_\infty = V_{SRC}\left(\frac{R_L}{R_L+R_S}\right)$$

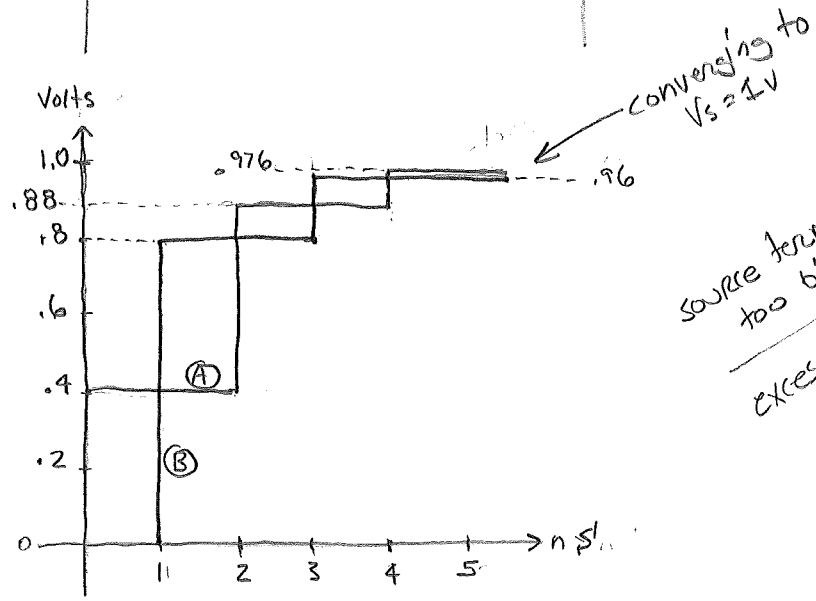
Lattice Diagram - single driver/receiver, source termination too big

$(\rho_s > 0,\ \rho_L > 0)$



$\rho_s = \frac{75-50}{75+50} = \underline{\underline{0.2}}$ $\qquad$ $\rho_L = \frac{\infty-75}{\infty+75} = \underline{\underline{1}}$

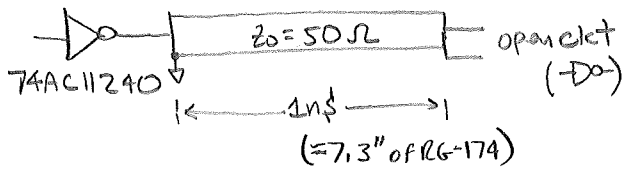




source termination is too big!

excessive delay

Lattice Diagram - single driver/receiver, source termination too small

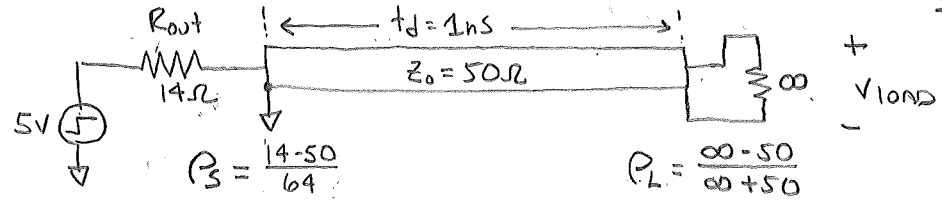


74AC11240 equivalent to:

(Assumption of $t_R, t_F = 0$!)

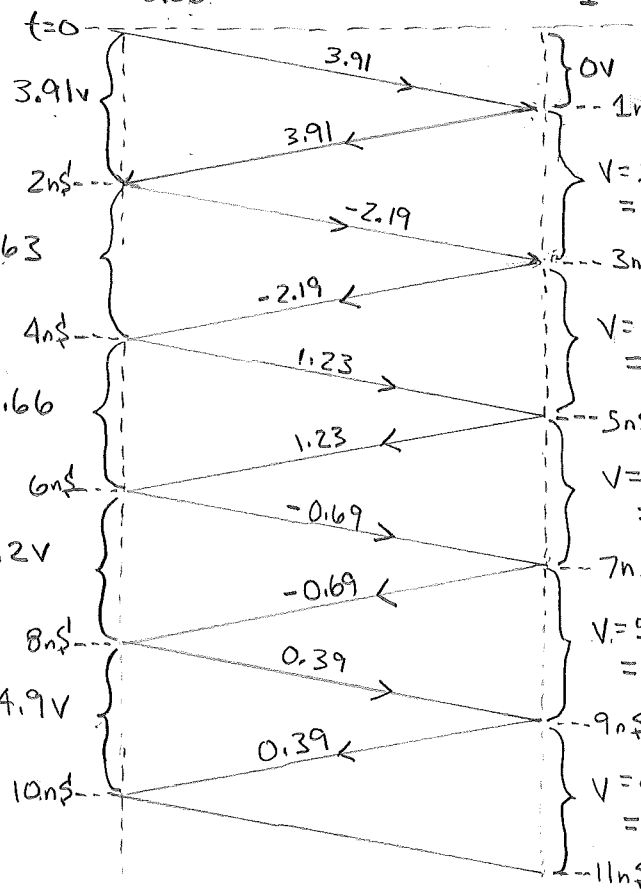
equivalent ckt:

$(\rho_S < 0,\ \rho_L > 0)$



$\rho_S = \frac{14-50}{64} = -0.56$

$\rho_L = \frac{\infty - 50}{\infty + 50} = 1$



$V_1^+ = 5\left(\frac{50}{14+50}\right) = 3.91V$

$V = 3.91 + (1 * 3.91) = 7.82V$

$V = 3.91 + 3.91 + (-0.56 * 3.91) = 5.63$

$V = 7.82 - 2.19 + (1 * -2.19) = 3.44V$

$V = 5.63 - 2.19 + (-0.56 * -2.19) = 4.66$

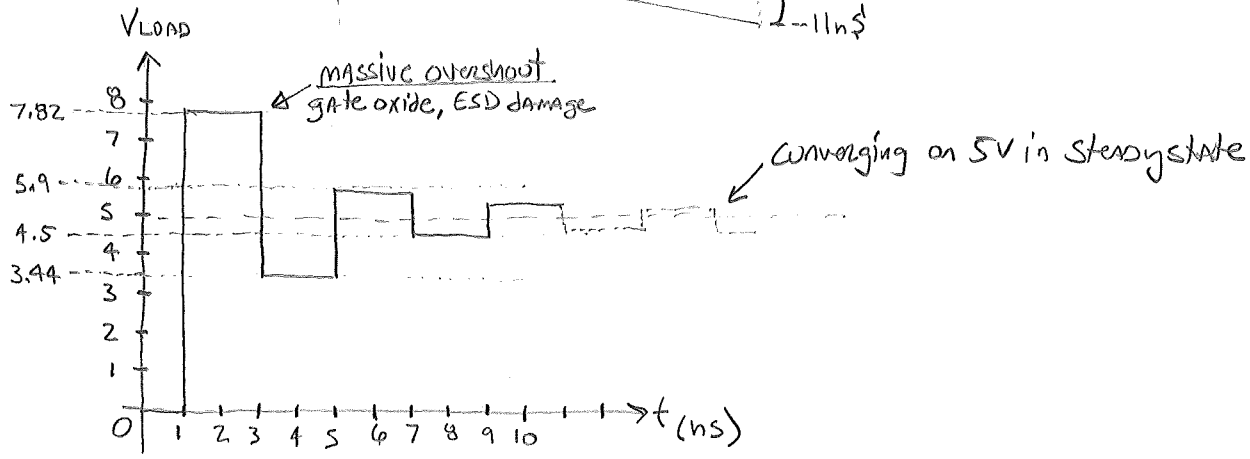
$V = 3.44 + 1.23 + (1 * 1.23) = 5.9V$

$V = 4.66 + 1.23 + (-0.56 * 1.23) = 5.2V$

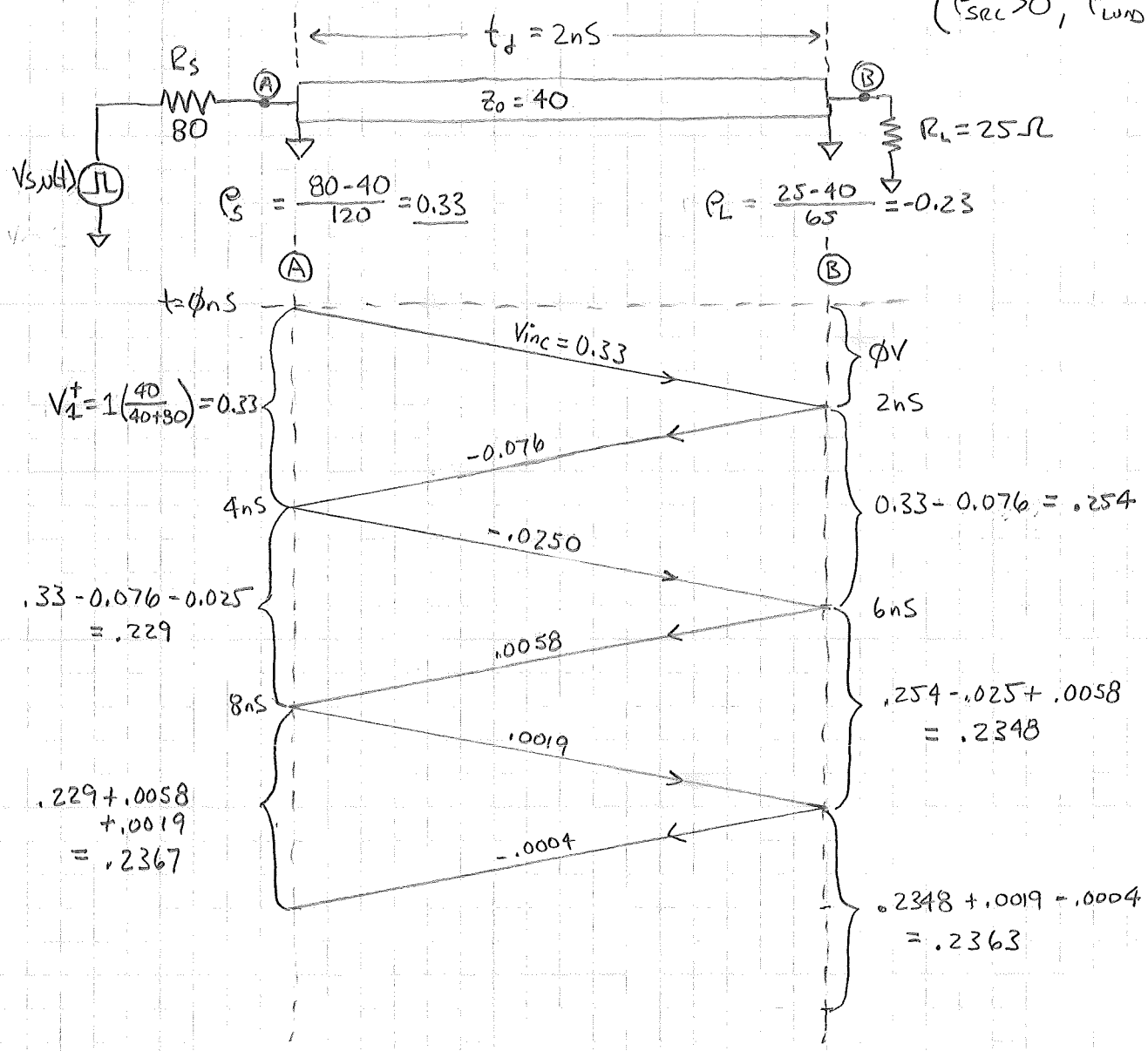
$V = 5.9 - 0.69 + (1 * -0.69) = 4.5V$

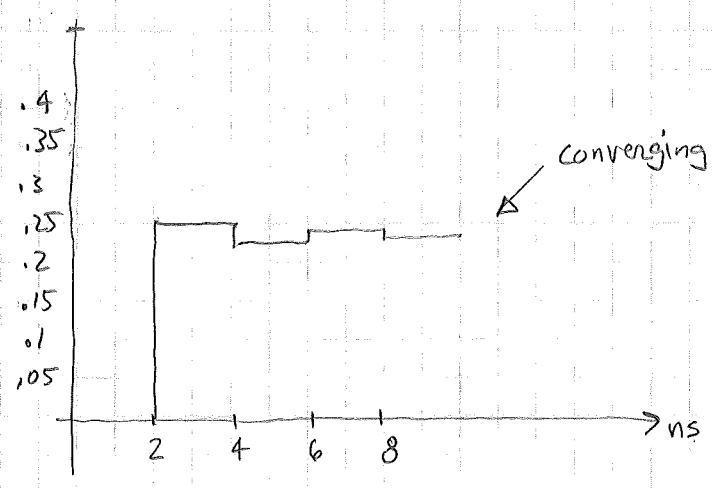
$V = 5.2 - 0.69 + (-0.56 * -0.69) = 4.9V$

$V = 4.5V + 0.39 + (1 * 0.39) = 5.28V$



$(\rho_{SRC} > 0,\ \rho_{LOAD} < 0)$





converging to: $V_S\left(\frac{R_L}{R_L+R_S}\right) = \frac{25}{25+80} = \underline{.2381\,V}$