

worksheet 7.6.1 page 1

$R_g := 4.7 \ \Omega$ $R_L := 10^7 \ \Omega$ Impedances of source and load

$V_{meas} := -0.41 \ V$ Measured voltage between horizontal sections of square wave

$C_{rad} := 220 \cdot 10^{-12} \ F$ Value assigned to radiation capacitor. Adjust to suit

$R_{cable} := 1 \ \Omega$ Resistor which simulates cable losses. Adjust to suit

$R_{o1} := 50 \ \Omega$ $R_{o2} := R_{o1}$ $R_{o3} := 600 \ \Omega$ See figure 6.6.1. **Adjust to suit**

$Loss := \frac{R_{o2}}{R_{o2} + R_{o3}}$ Equation (6.6.3)

$R_o := R_{o1} + \frac{R_{o2} \cdot R_{o3}}{R_{o2} + R_{o3}} = 96.154$ Equation (6.6.1)

$Z_T := 2.27 \ \Omega$ See equation (7.2.6)

$K := \frac{50}{96.2}$ See equation (7.6.1)

$V_g := \frac{V_{meas}}{K}$ $V_g = -0.789$ See equation (6.6.11)

$T := 83 \cdot 10^{-9} \ s$ Measured transit time. Adjust to suit

$N := 100$ Number of time-steps per transit

$dt := \frac{T}{N}$ Time of each step

$T_1 := 150 \cdot 10^{-9} \ s$ Time of leading edge of square wave, as displayed on oscilloscope

$T_2 := 4.1 \cdot 10^{-6} \ s$ Time of trailing edge of square wave, as displayed on oscilloscope

$T_3 := 5 \cdot 10^{-6} \ s$ Sweep time of oscilloscope

$N_1 := \frac{T_1}{dt}$ $N_2 := \frac{T_2}{dt}$ $N_3 := \frac{T_3}{dt}$ Number of time steps at which each event occurs.

$n := 1 .. N_3$ $t_n := (n - 1) \cdot dt$ Definition of horizontal axis of display

Figure 6.6.2 Definition of input variables.

$\text{recv}(\text{INPUT}) := \left| \begin{array}{l} \text{Ifi} \leftarrow \text{INPUT}_i \\ \text{Ifa} \leftarrow \frac{2 \cdot \text{Ro} \cdot \text{Ifi}}{\text{RL} + \text{Ro}} \\ \text{Ifr} \leftarrow \text{Ifa} - \text{Ifi} \\ \left(\begin{array}{c} \text{Ifa} \\ \text{Ifr} \end{array} \right) \end{array} \right.$

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point(n) := $\begin{cases} m \leftarrow \text{mod}(n, N) \\ m \leftarrow N \text{ if } m = 0 \end{cases}$

Vch1 := $\begin{array}{l} \text{data}_{2,N} \leftarrow 0 \\ \text{near}_5 \leftarrow 0 \\ \text{for } i \in 1..N3 \\ \quad \begin{array}{l} \text{Vgen} \leftarrow \text{Vg if } i > N1 \\ \text{Vgen} \leftarrow 0 \text{ if } i > N2 \\ p \leftarrow \text{point}(i) \\ \text{INPUT} \leftarrow \text{data}^{\langle p \rangle} \\ \text{near} \leftarrow \text{send}(\text{near}, \text{INPUT}, \text{Vgen}) \\ \left(\begin{array}{c} \text{Ina} \\ \text{Int} \\ \text{Ine} \\ \text{Ins} \\ \text{Qns} \end{array} \right) \leftarrow \text{near} \\ \left(\begin{array}{c} \text{Ifa} \\ \text{Ifr} \end{array} \right) \leftarrow \text{recv}(\text{INPUT}) \\ \text{OUTPUT} \leftarrow \left(\begin{array}{c} \text{Int} \\ \text{Ifr} \end{array} \right) \\ \text{data}^{\langle p \rangle} \leftarrow \text{OUTPUT} \\ \text{Idiff} \leftarrow \text{Ina} - \text{Ine} \\ \text{Vin} \leftarrow \text{Vgen} - \text{Rg} \cdot (\text{Ina} + \text{Ins}) \\ \text{Vch1} \leftarrow \text{K} \cdot \text{Vin} \\ \text{Vdiff} \leftarrow \text{ZT} \cdot \text{Idiff} \\ \text{Vrad} \leftarrow \text{ZT} \cdot \text{Ine} \\ \text{Vi} \leftarrow \text{Vch1} \end{array} \end{array}$

equation (6.6.9)

equation (6.6.10)

equation (6.6.11)

equation (6.6.12)

equation (6.6.12)

V

channel 1 selected as output variable

Figure 6.6.4 Main routine used to analyse transient response.(page 3 of worksheet)

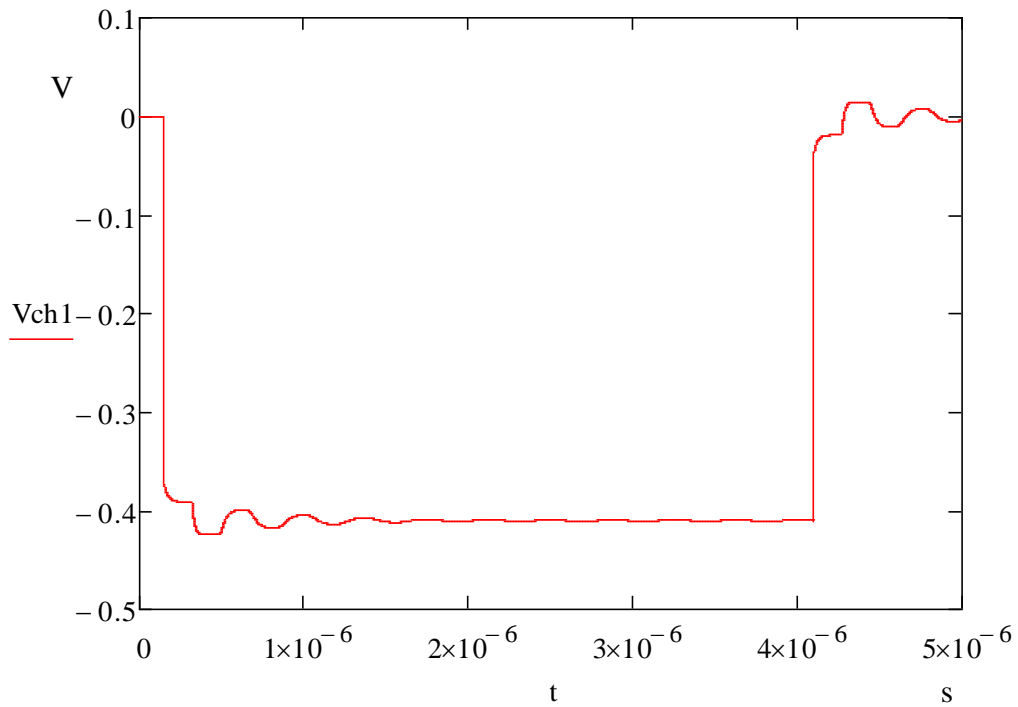


Figure 7.6.4 Simulated waveform of channel 1 input voltage. Setup as figure 7.6.1

$$T1 = 1.5 \times 10^{-7} \quad T2 = 4.1 \times 10^{-6} \quad T3 = 5 \times 10^{-6} \quad \text{Crad} = 2.2 \times 10^{-10}$$

$$R_{o1} = 50 \quad R_{o3} = 600 \quad \text{Loss} = 0.077 \quad R_o = 96.154 \quad R_{\text{cable}} = 1$$

$$V_{\text{meas}} = -0.41$$

Vertical scale: top = 0.1 V, bottom = -0.5 V.
Horizontal scale : 5 micro-seconds