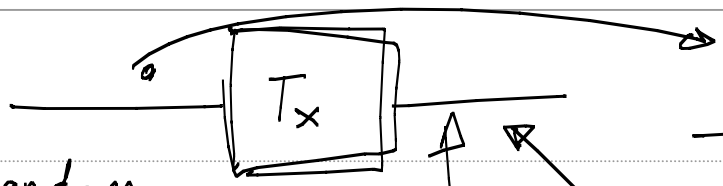
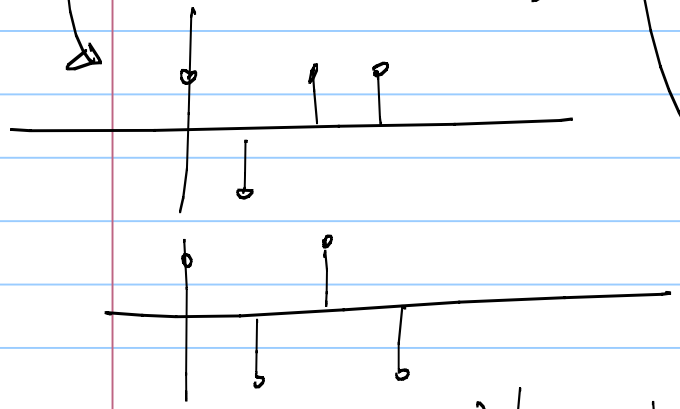
Note Title 22-08-2007



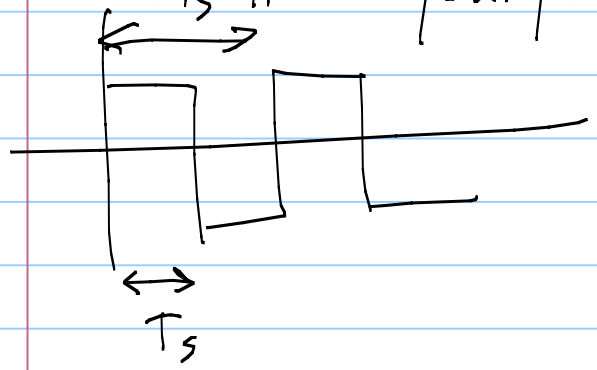
Random bits

a_k

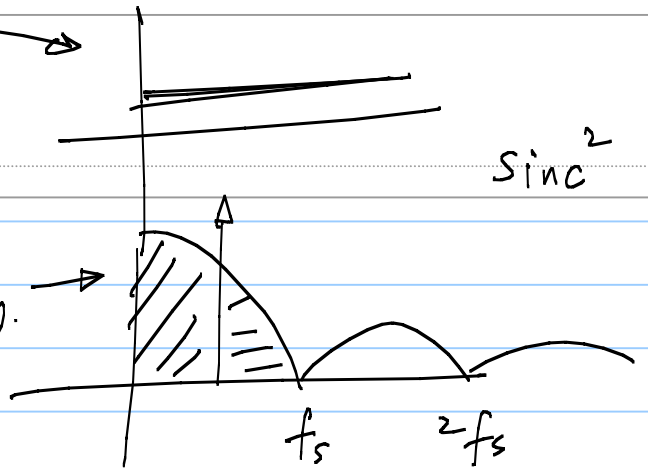
± 1



$2T_s$ π rad/sample



S_y



$sinc^2$

$\frac{f_s}{2}$: Highest frequency periodic signal that can be generated.

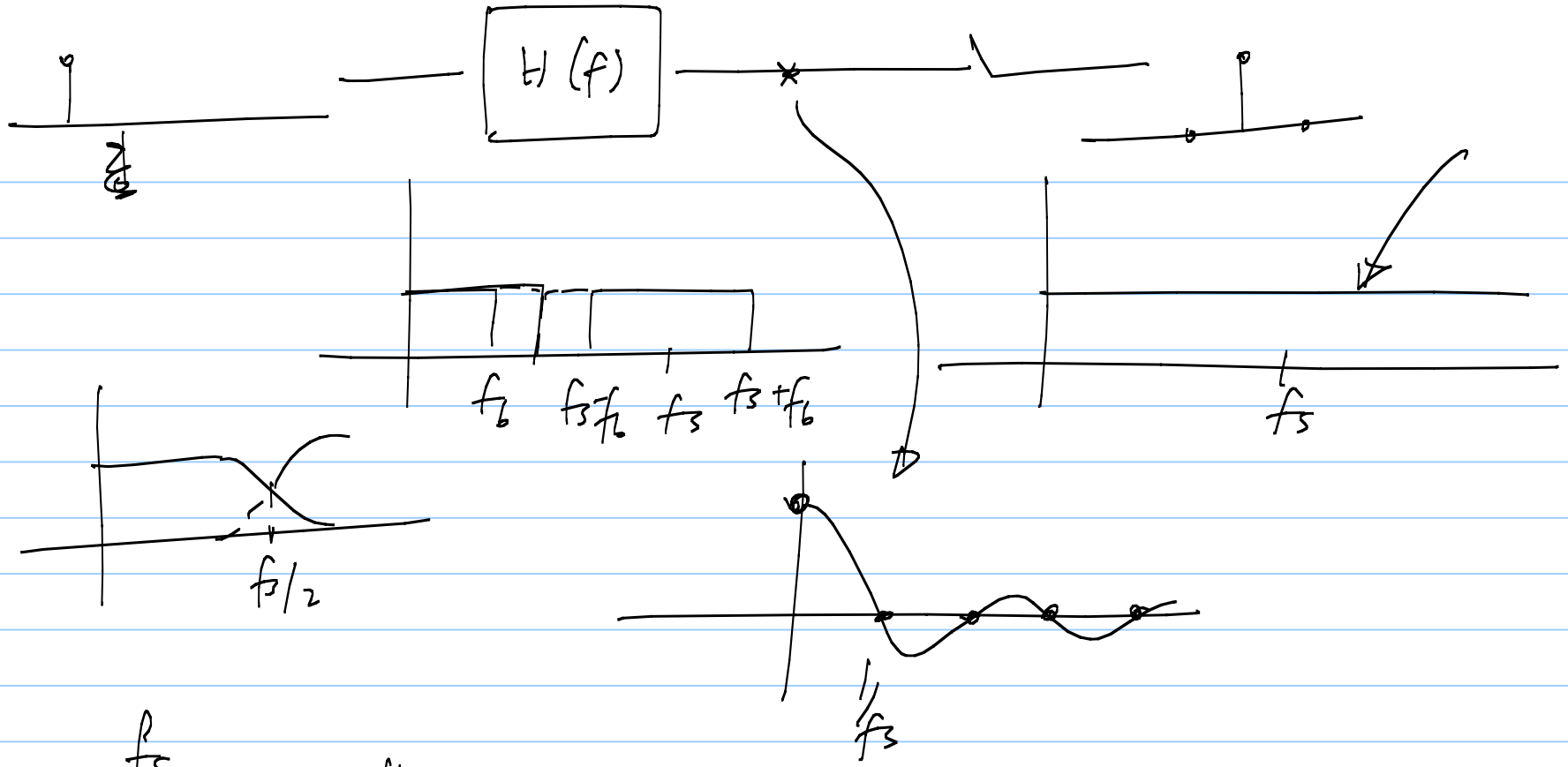
Data at symbol rate f_s

$BW \simeq f_s/2$

f_s BW required to transmit f_s without ISI ?

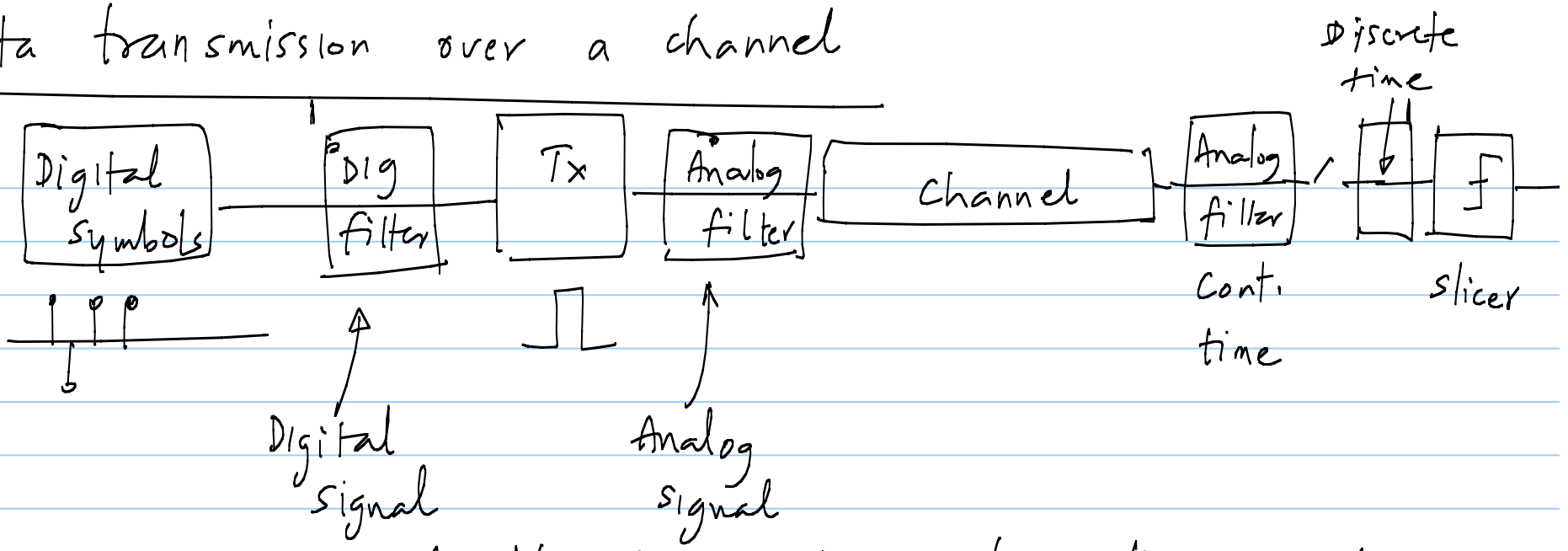
$sinc(1/2)$

$\frac{2}{\pi}$ -4 dB

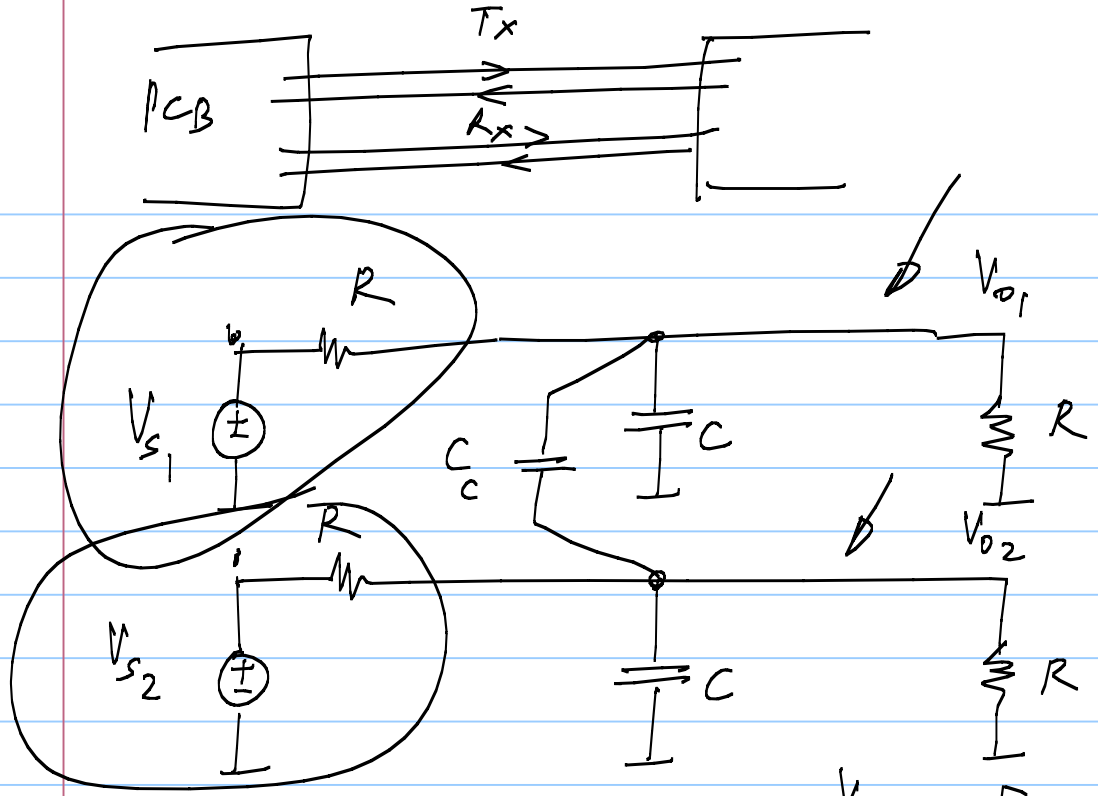


$\frac{f_s}{2}$: Smallest BW required to have zero ISI @ data rate f_3.

Data transmission over a channel



* Filter can be placed anywhere along the signal path before the slicer.

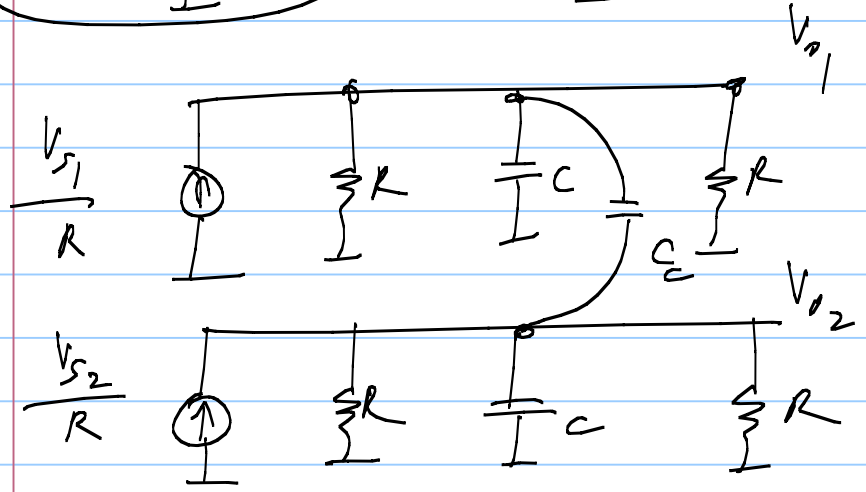


$$\frac{V_{o1}}{V_{s1}} = \frac{1/2}{1 + s\frac{RC}{2}}$$

$(C_c = 0)$

single pole @ $\frac{2}{RC}$

$$\frac{V_{o1}}{V_{s1}}$$



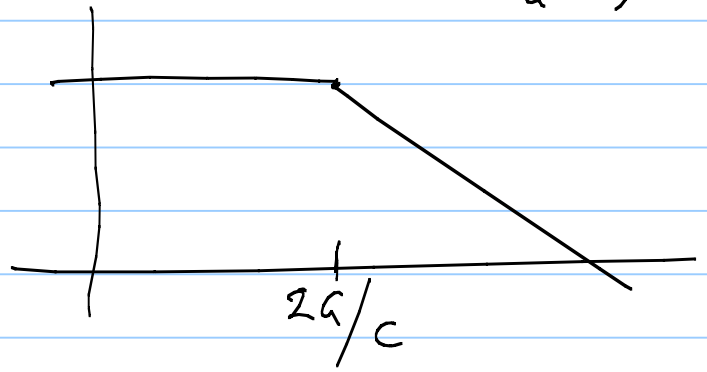
$$\begin{bmatrix} 2G + s(C+C_c) & -sC_c \\ -sC_c & 2G + s(C+C_c) \end{bmatrix} \begin{bmatrix} V_{o1} \\ V_{o2} \end{bmatrix} = \begin{bmatrix} V_{s1}/R \\ V_{s2}/R \end{bmatrix}$$

$$V_{o1} = \frac{V_{s1} G \left(s(C+C_c)+2G\right) + sC_c \cdot V_{s2} \cdot G}{\left(s(C_c+C)+2G\right)^2 - sC_c^2}$$

$$= \frac{V_{s1} \cdot G\left(2G + s(C+C_c)\right) + G \cdot sC_c \cdot V_{s2}}{\left(2G + s(2C_c+C)\right)\left(2G + s\cdot C\right)}$$

Crosstalk

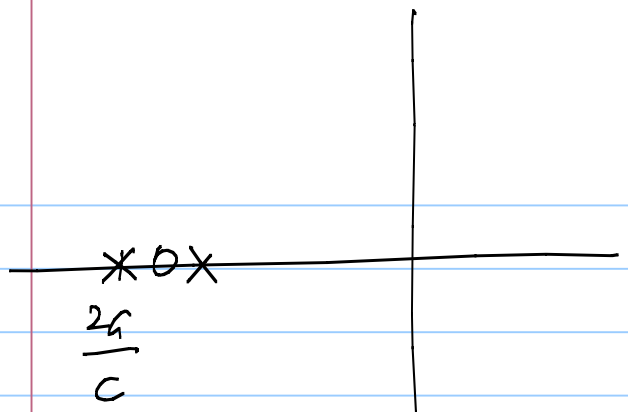
$$= V_{s1} \cdot \frac{1}{2}\left[\frac{1 + \frac{s \cdot C+C_c}{2G}}{\left(1+\frac{s(2C_c+C)}{2G}\right)\left(1+\frac{sC}{2G}\right)}\right] + V_{s2}\cdot\frac{1}{2}\left[\frac{sC_c/2G}{\left(1+\frac{sC}{2G}\right)}\right]$$



pole @ $\frac{2G}{C}$

poles @ $\frac{2G}{2C_c+C}$, $\frac{2G}{C}$

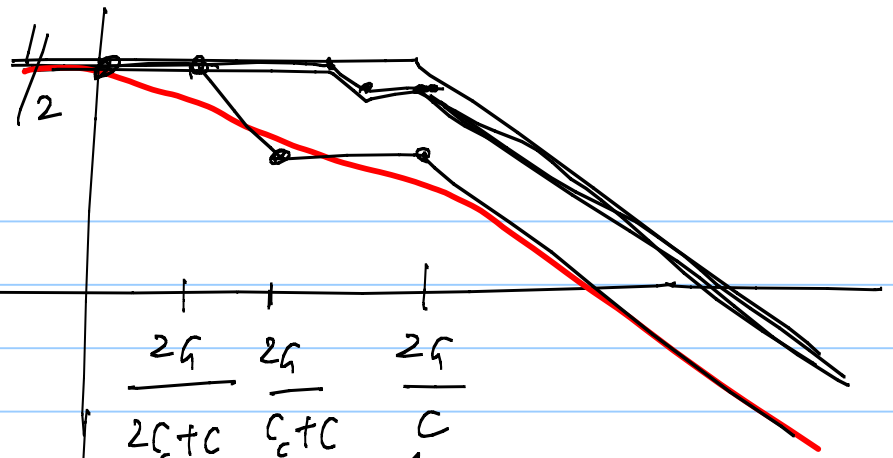
$\frac{2G}{C+C_c}$



$$\frac{V}{\frac{1}{2}} = \frac{1}{2} \cdot \frac{sC_c/2G}{\left(1 + sC/2G\right)^2}$$

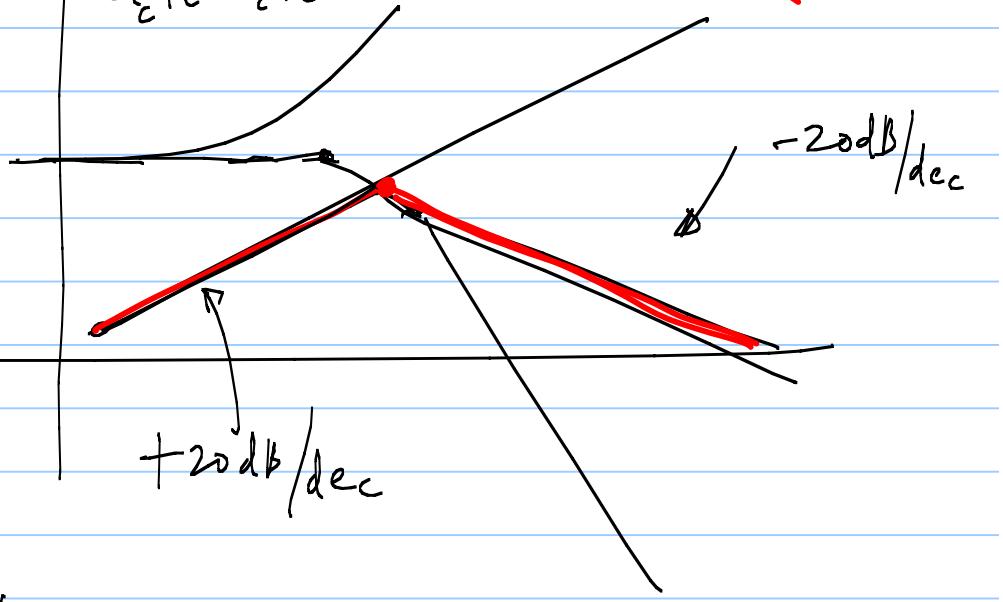
Channel response

$$\frac{V_{o1}}{V_{s1}}$$



Crosstalk

$$\frac{V_{o1}}{V_{s2}}$$



$$\left[\frac{V}{V_{s2}} \cdot \frac{1}{2}\right] \frac{\frac{2G}{C} \cdot j\frac{2G}{C} \cdot \frac{C_c}{2G}}{(1+j1)^2}$$

$$\left[V_{s2} \cdot \frac{1}{2}\right] \cdot \left(\frac{C_c/C}{2}\right)$$

high pass

* Crosstalk because of coupling to other lines
  - highpass behavior
* Equalizer – highpass < Amplifies hf components of the signal / amplifies crosstalk