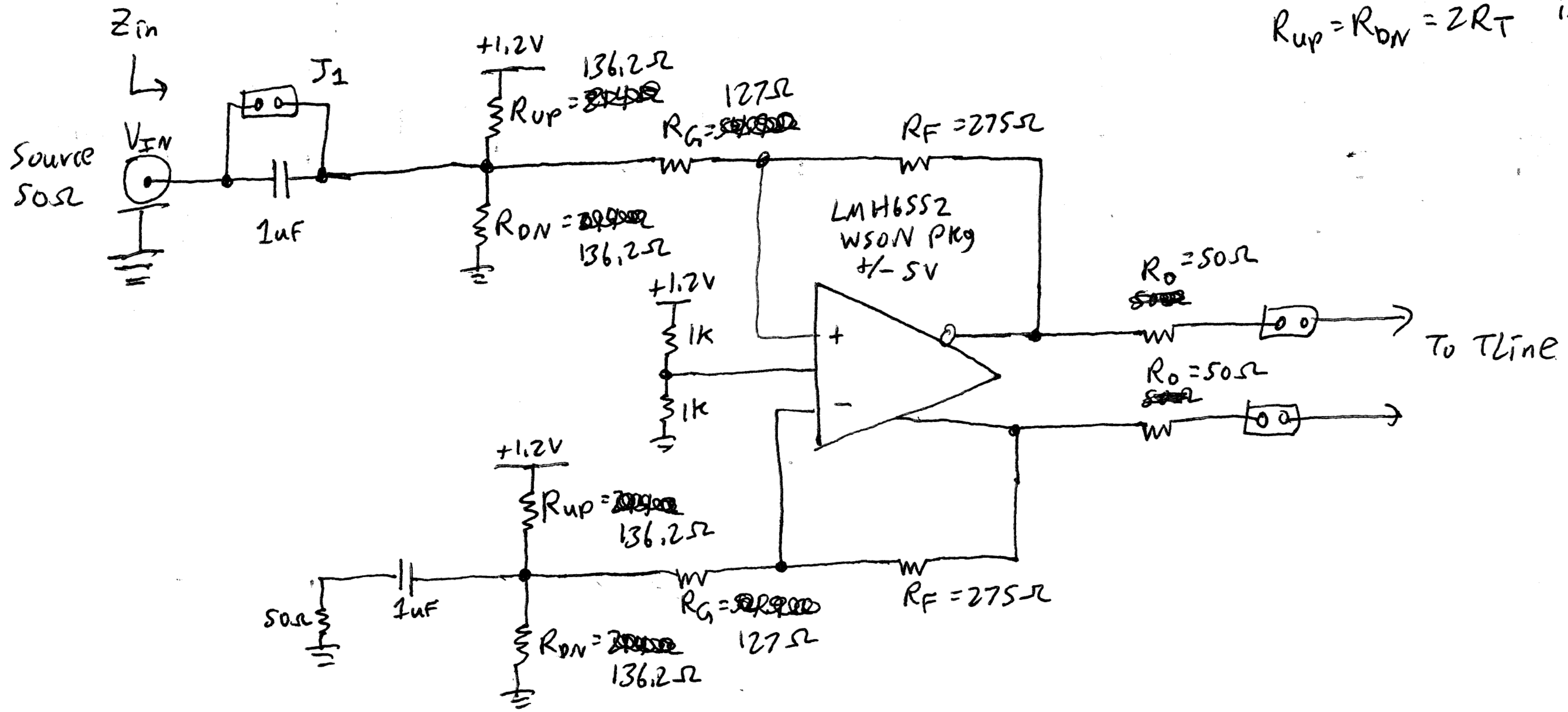
CV4 Active driver V3



$R_{up} = R_{DN} = 2R_T$ in datasheet

J_1 : closed ⇒ DC-coupled input: AWG must provide Thevenin-equivalent $V_{in} = \frac{V_{DD}}{2}$ to have differential zero @ output. Use w/ physics pulse.

J_1 : open ⇒ AC-coupled input: use w/ filter + sine wave

R_{UP}, R_{DN}, R_G, R_F, R_o values shown for terminated AWG and terminated TLine, gain normalized such that the ADC sees an overall ~~[crossed out]~~ -6dB differential gain

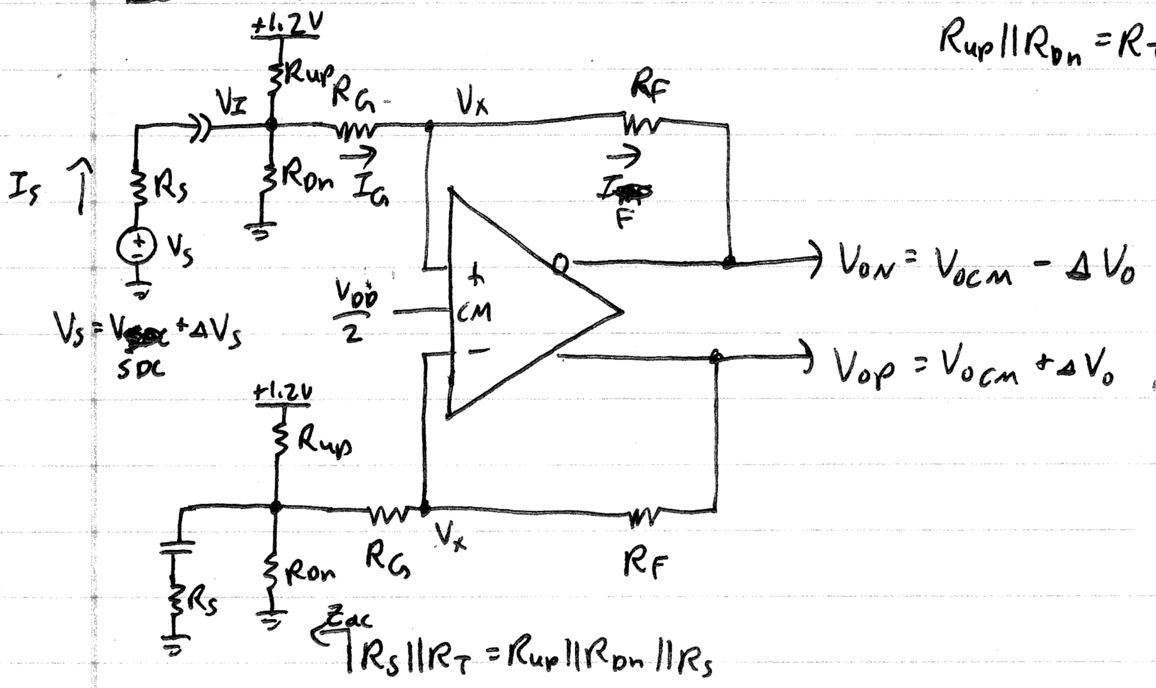
⇒ Cont. on back

R_o		R_L @ TLine CV4	AWG Source gain	TLine gain	overall gain	R_F	R_G	$R_{UP}=R_{DN}$	Amp gain
50Ω	Terminated source, terminated TLine	100Ω	-6dB	-6dB	~0dB	275Ω	54.9Ω	214Ω	+12dB
50Ω or 0Ω	Terminated source, unterminated TLine	open	-6dB	~0dB	~0dB	275Ω	127Ω	136Ω	+6dB

↑ suggested 50Ω to stabilize opamp

$R_S \approx 50\,\Omega$

$R_{up} \| R_{Dn} = R_T \approx R_S$



DC condition: Find V_{SDC} for $\Delta V_o = 0$, assume $\Delta V_S = 0$

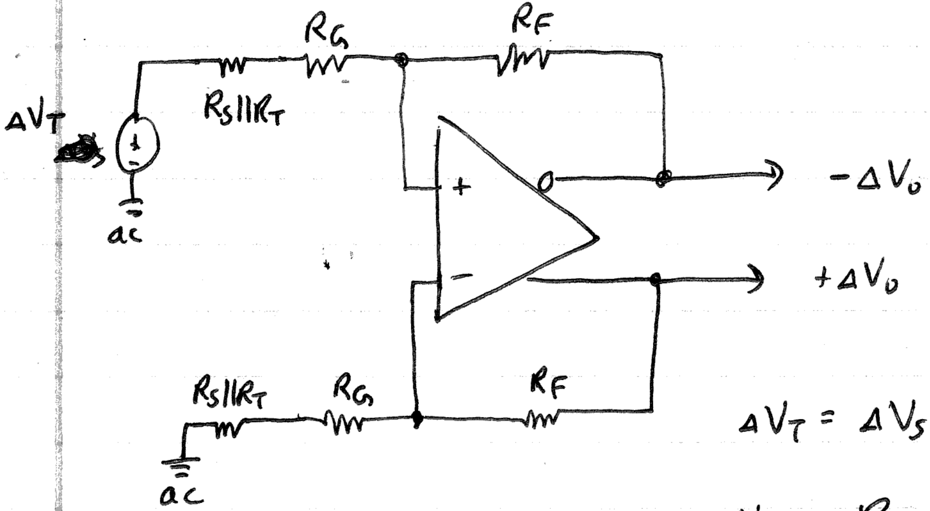
Target $V_{ON} = V_{OP} = \frac{V_{DD}}{2}$ (FDA's common mode feedback)

$\therefore\ V_x = \frac{V_{DD}}{2}$

$\therefore\ V_I = \frac{V_{DD}}{2}$ $\Rightarrow$ $\boxed{R_{up} = R_{Dn} = 2R_T}$

$\therefore\ V_{SDC} = \frac{V_{DD}}{2}$ $\Rightarrow$ $I_S = 0$ $\boxed{V_{S,DC} = \frac{V_{DD}}{2}}$

AC analysis:



$$\Delta V_T = \Delta V_S \left(\frac{R_T}{R_T + R_S}\right)$$

$$\frac{\Delta V_T}{\Delta V_S} = \frac{R_T}{R_T + R_S}$$

$$\frac{\Delta V_o - {}^{-}\Delta V_o}{\Delta V_T} = \frac{R_F}{R_G + R_S || R_T}$$

$$\frac{\Delta V_o - {}^{-}\Delta V_o}{\Delta V_S} = \left(\frac{R_F}{R_G + R_S || R_T}\right)\left(\frac{R_T}{R_S + R_T}\right)$$

$\left(\frac{R_T}{R_S + R_T}\right) \rightarrow \frac{1}{2}$ if terminated correctly