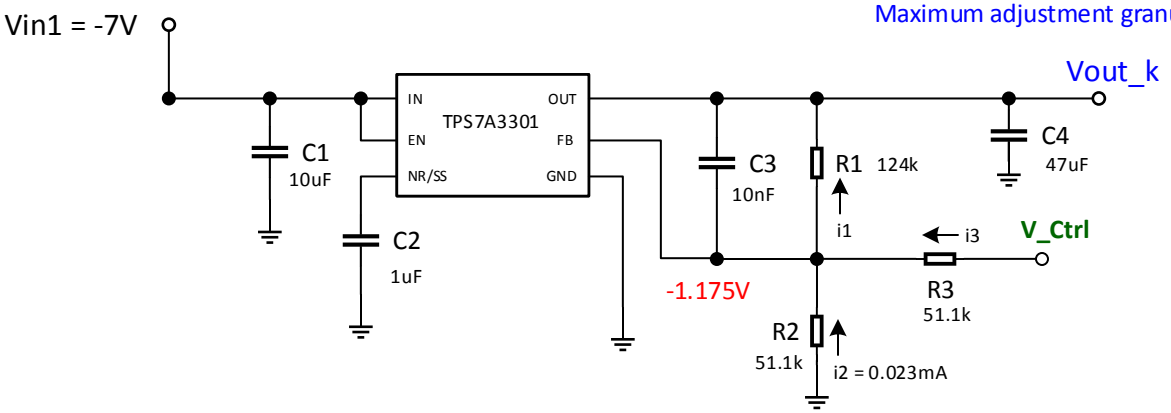
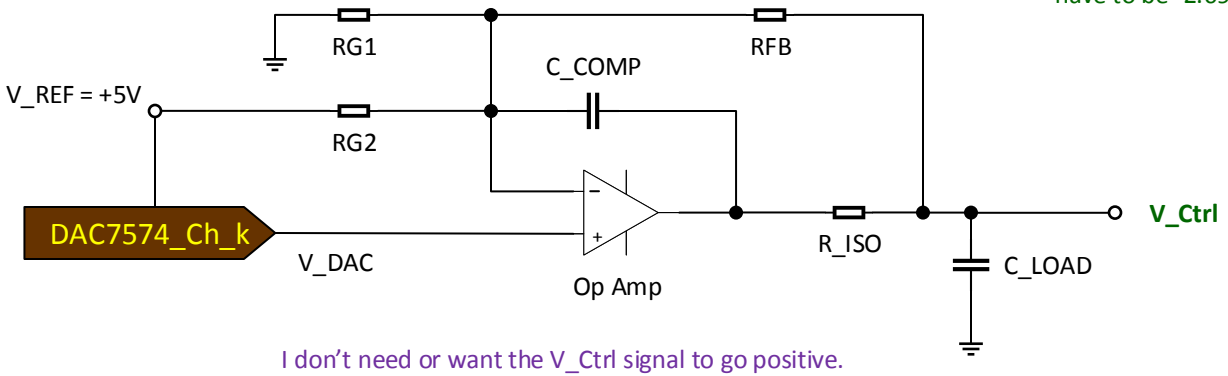
DAC+OpAmp-Controlled, adjustable Vout, Negative-Voltage LDO circuit concept

Four independent Vouts, each adjustable between [-6.2, -1.8]V. Each: 120mA max. Maximum adjustment granularity: 0.02V.



V_Ctrl Range: [-2.1, -0.27]V



1.) If V_Ctrl = -1.175V, then i3 = 0 and i1 = i2.

2.) Select R1 = 122.826 kOhms so that Vout_k is mid-range when i3=0 (approx. -4V). Nearest Standard Value: 124 kOhms, making Vout_k: -4.027V

3.) To get Vout_k = -6.2V, i3 = i1 – i2 = [(-1.175+6.2)/124] – 0.023 = +0.017524 mA. Thus, V_Ctrl would have to be -0.2795V

4.) To get Vout_k = -1.8V, i3 = i1 – i2 = [(-1.175+1.8)/124] – 0.023 = -0.01796 mA. Thus, V_Ctrl would have to be -2.093V.

I don't need or want the V_Ctrl signal to go positive.
But I do need V_Ctrl to both source and sink current.
From the DC transfer function analysis of SLAU525:
when V_DAC = 0V, RFB = (2.1/5)*RG2
when V_DAC = +5V, RG1 = -RFB(5/5.27) … {negative?}

C. A. Olen, 25-Jan-18