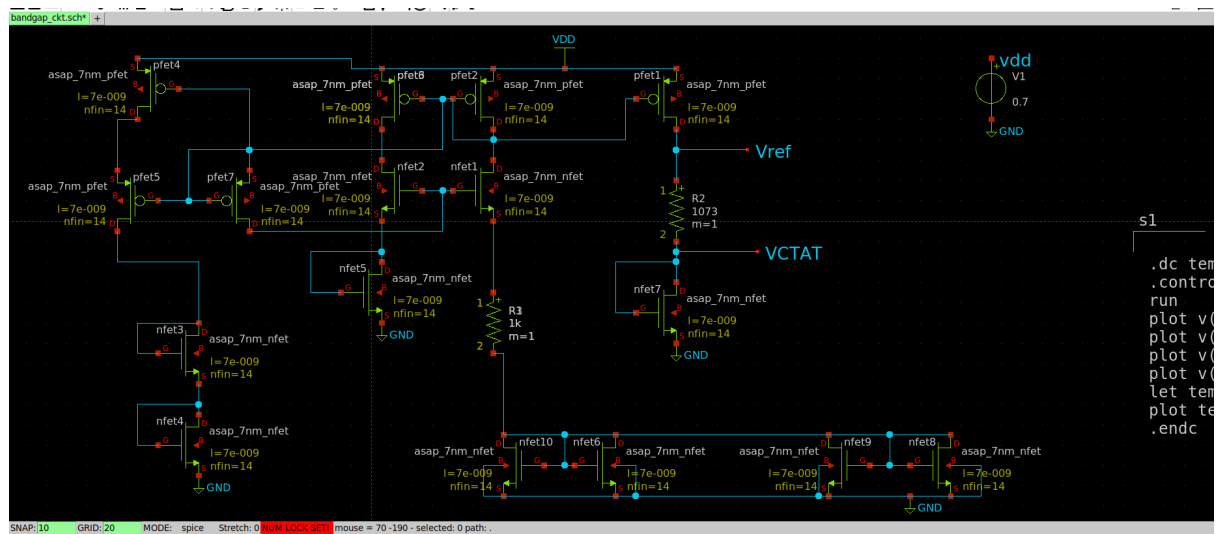# Module 3
Assignment Bandgap Reference Design and Simulation using Xschem

For my user's name gjjaswanth the ASCII sum in ohms is 1073 ohms.

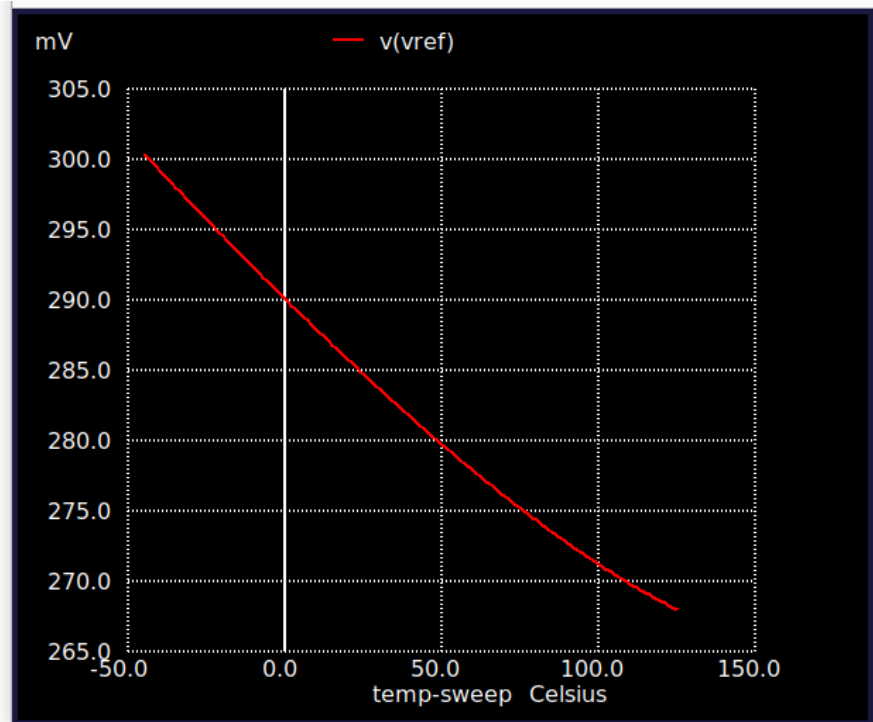Characterization Table

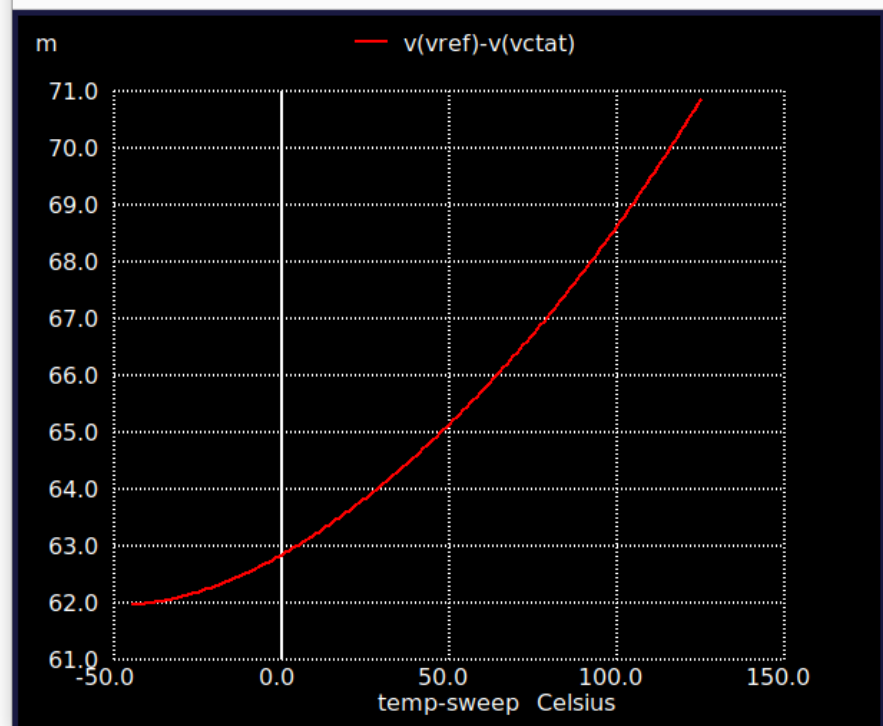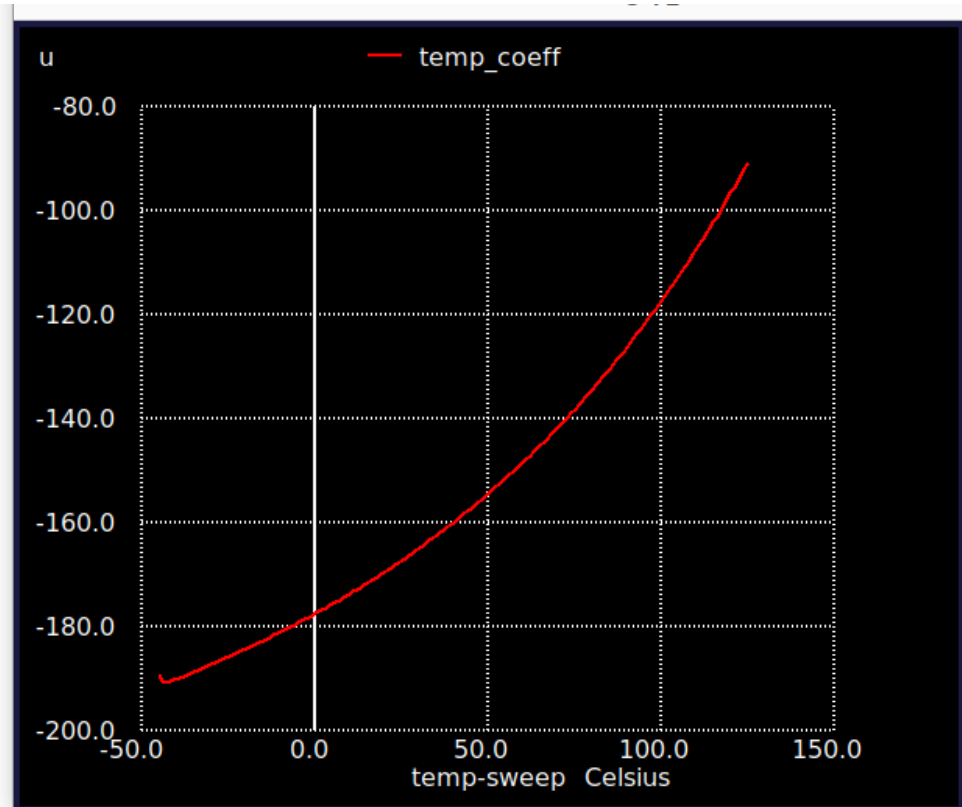| S.No	VDD (V)	Temp (°C)	Vref (mV)	Line Reg. (mV/V)	Startup Time (ns)
1	0.8	27	230	287.5	6.09
2	0.9	27	256	284.4	5.09
3	1	27	285	285	4
4	1	-40	299	299	72
5	1	125	268	268	2.04

Bandgap reference circuit:
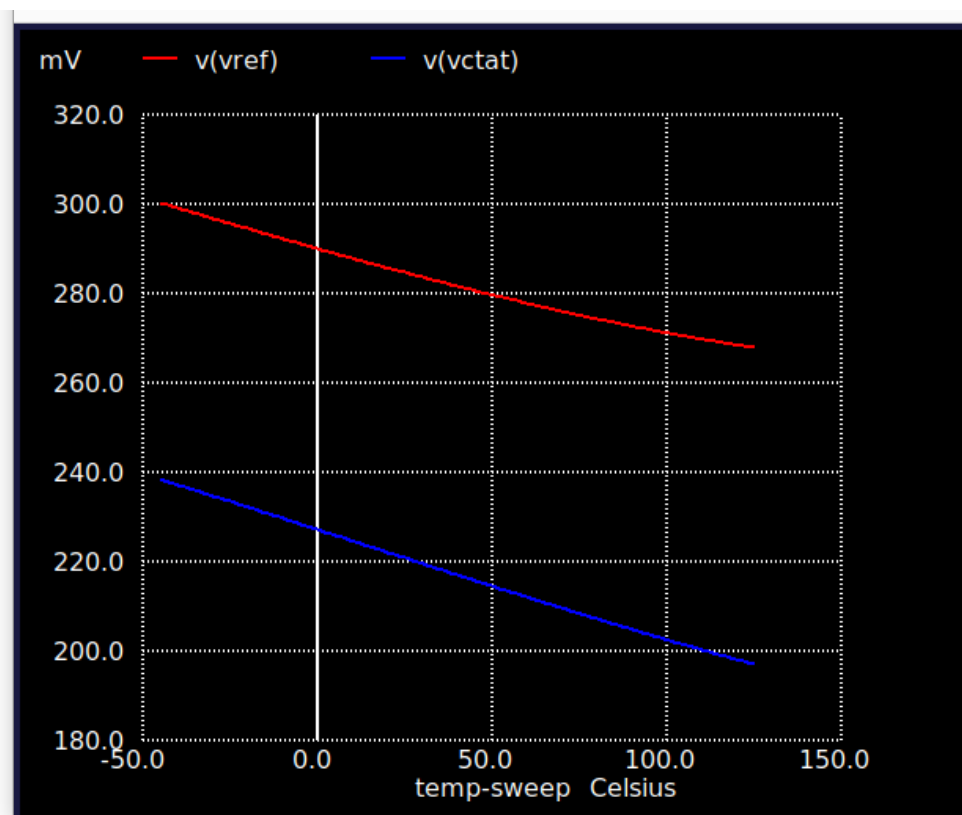
Results:

1. vref

2. Vptat

3. Temp_coeff

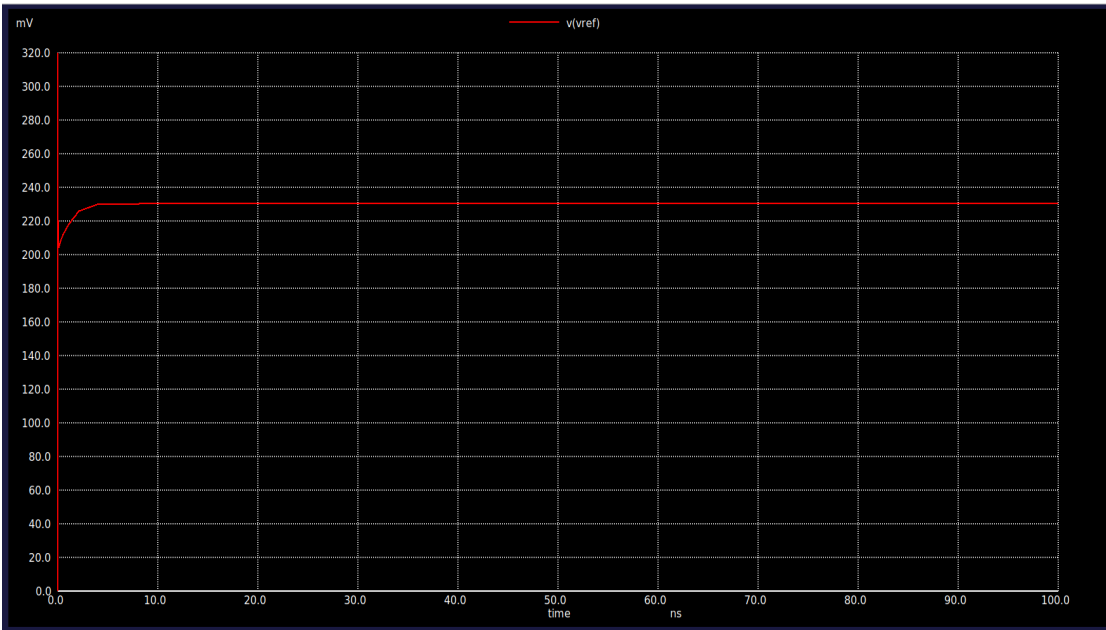

4. Vctat & vref

5. Transient waveform showing startup time

19	1.320080e-10	2.058253e-01
20	2.630800e-10	2.080891e-01
21	5.252240e-10	2.121633e-01
22	1.049512e-09	2.182054e-01
23	2.098088e-09	2.261181e-01
24	4.098088e-09	2.306195e-01
25	6.098088e-09	2.301792e-01
26	8.098088e-09	2.304002e-01
27	1.009809e-08	2.302685e-01

Temp sweep analysis:

1. 1v and 27 deg.

```
70        2.500000e+01        2.847402e-01
71        2.600000e+01        2.845332e-01
72        2.700000e+01        2.843267e-01
73        2.800000e+01        2.841208e-01
74        2.900000e+01        2.839154e-01
75        3.000000e+01        2.837107e-01
76        3.100000e+01        2.835065e-01
```

2. 1v and -40 deg.

```
Index    temp-sweep         vref
---------------------------------------------
0          -4.50000e+01        3.003973e-01
1          -4.40000e+01        3.001618e-01
2          -4.30000e+01        2.999250e-01
3          -4.20000e+01        2.996886e-01
4          -4.10000e+01        2.994525e-01
5          -4.00000e+01        2.992167e-01
6          -3.90000e+01        2.989813e-01
7          -3.80000e+01        2.987462e-01
```

3. 1v and 125 deg.

```
162       1.170000e+02        2.689364e-01
163       1.180000e+02        2.688132e-01
164       1.190000e+02        2.686913e-01
165       1.200000e+02        2.685709e-01
166       1.210000e+02        2.684518e-01
167       1.220000e+02        2.683342e-01
168       1.230000e+02        2.682181e-01
169       1.240000e+02        2.681034e-01
170       1.250000e+02        2.679902e-01
```