EE236: Experiment No. 7
MOS Capacitor C-V Characterstics

Narne Avinash Chowdary, 200070047

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1 Overview of the experiment

1.1 Aim of the experiment

- Determining the capacitance of MOS capacitor as voltage varied.

- To determine the thickness of the oxide layer and deplection thickness.

- Finding Debye capacitance, Debye length,Flat band capacitance.

1.2 Methods

- Preparing a summer circuit to produce amplified sine wave with a DC offset.

- Making an Amplifier circuit using capacitors in circuit.

- Integrating the summer and amplifier circuit that input from summer circuit will be provided to amplifier using the MOS capacitor as the input capacitor.
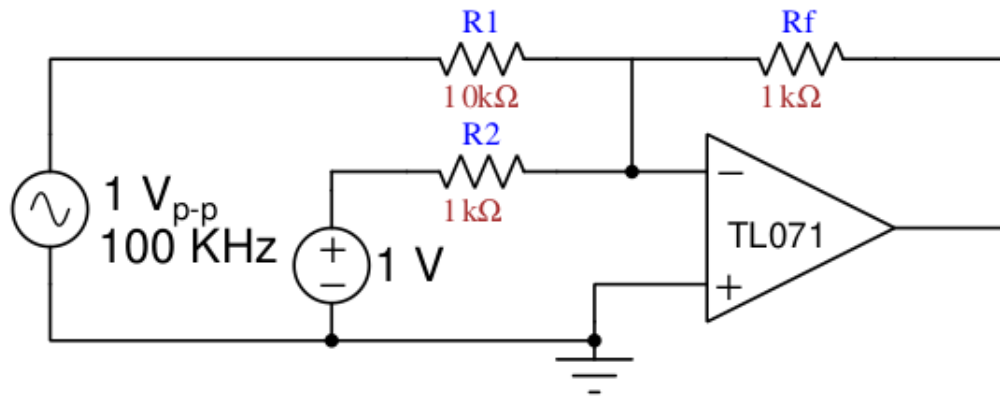
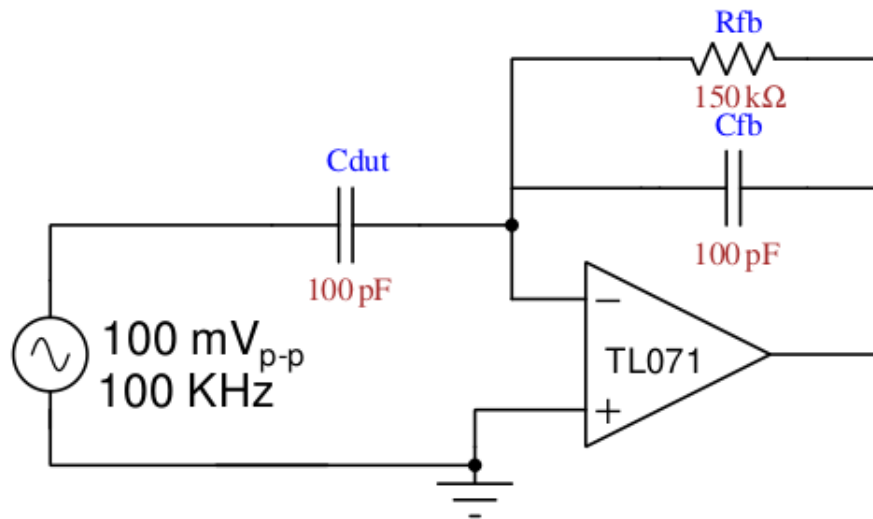# 2 Design

Figure 1: Summer circuit.
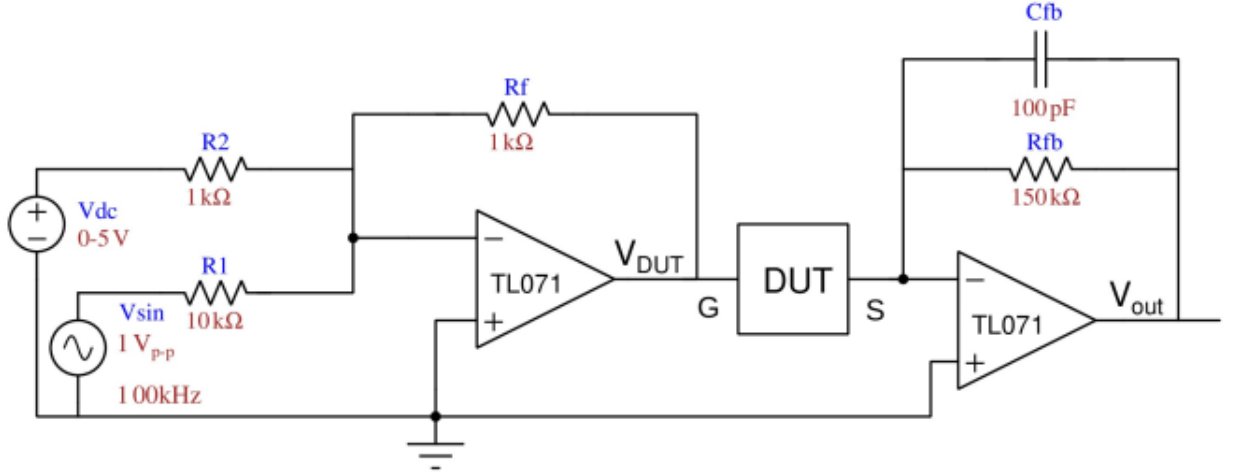

Figure 2: Amplifier circuit

Figure 3: Circuit with mos capacitor is used in amplifier capacitor.

2.1 Experimental results

C-V characterstics of mos capacitor
measuring Vdc and Gain.
finding the value of capacitor using the gain obtained

$$gain = Cdut/Cfb * (1/sqrt(1 + (1/(wRfbCfb)2)))) \tag{1}$$

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Cox(pF) tox (nm)   Cs           tdep(nm)
1243 250.8125503 291.3088381  1412.838488

Cfb         Cdebey Ldebey(nm) Na
742.3360337 1843   223         33795000000
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|	A	B	C	D	E	
1	Vdc	VDUT	Vout	AC gain	Cdut(pF)	
2						
3					0	
4				#DIV/0!	#DIV/0!	
5	5	110	258	2.345454545	235.8620053	
6	4.5	110	260	2.363636364	237.690393	
7	4	110	274	2.490909091	250.4891064	
8	3.5	110	298	2.709090909	272.4297581	
9	3	110	304	2.763636364	277.914921	
10	2.5	110	316	2.872727273	288.8852468	
11	2	110	332	3.018181818	303.5123479	
12	1.5	110	350	3.181818182	319.9678367	
13	1	110	376	3.418181818	343.736876	
14	0.6	110	398	3.618181818	363.84914	
15	0	110	408	3.709090909	372.9910782	
16	-0.5	110	440	4	402.2452804	
17	-0.8	110	472	4.290909091	431.4994826	
18	-1	110	520	4.727272727	475.3807859	
19	-1.3	110	570	5.181818182	521.0904769	
20	-1.5	110	752	6.836363636	687.473752	
21	-1.7	110	1110	10.09090909	1014.755139	
22	-2	110	1240	11.27272727	1133.600336	
23	-2.3	110	1260	11.45454545	1151.884212	
24	-2.7	110	1340	12.18181818	1225.019718	
25	-3	110	1360	12.36363636	1243.303594	
26	-3.3	110	1360	12.36363636	1243.303594	
27	-4	110	1360	12.36363636	1243.303594	
28	-4.5	110	1360	12.36363636	1243.303594	
29	-5	110	1360	12.36363636	1243.303594	

Figure 4: values obtained

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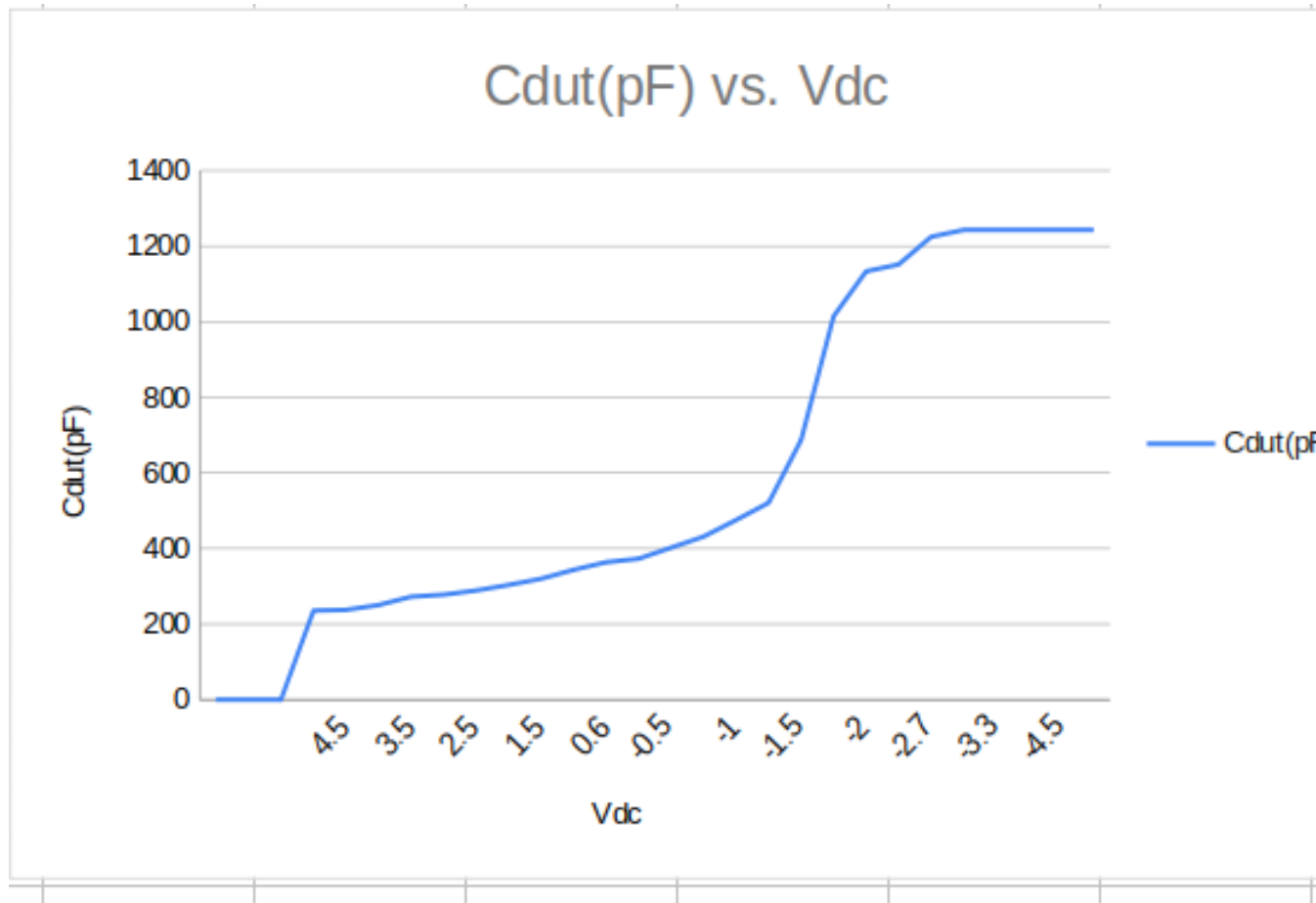
Figure 5: plot of voltage and capacitance