

Raport proiect microelectronica

1. Filtru pasiv RLC

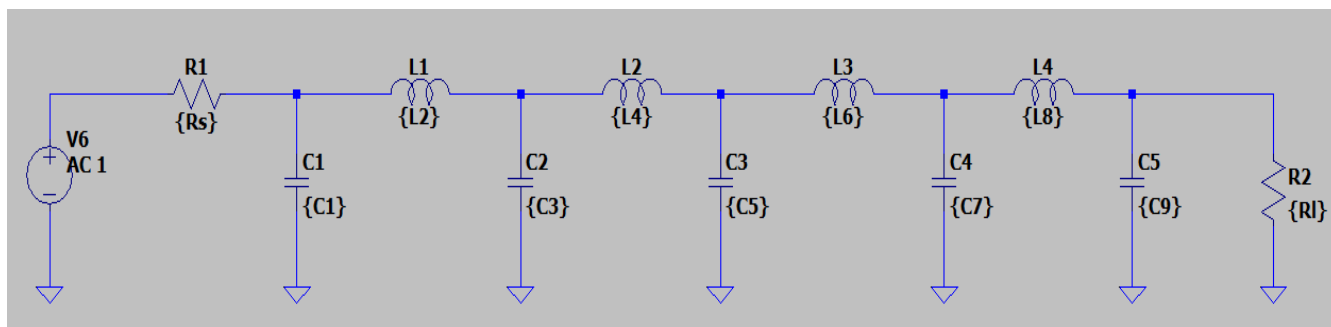


FIG. 1: SCHEMA FILTRU PASIV

$F_c = 3.8\text{KHz}$	Valori normate	Valori denormate
c1	0.078	62.8pF
l2	0.2313	503.7mH
c3	0.377	303.6pF
l4	0.5108	1.112H
c5	0.6306	507.9pF
l6	0.7407	1.613H
c7	0.8639	695.8pF
l8	1.0863	2.366H
c9	2.2649	1.824nF
rs	1	52K Ω
rl	1	52K Ω

TABEL 1: VALORI NORMATE SI DENORMATE

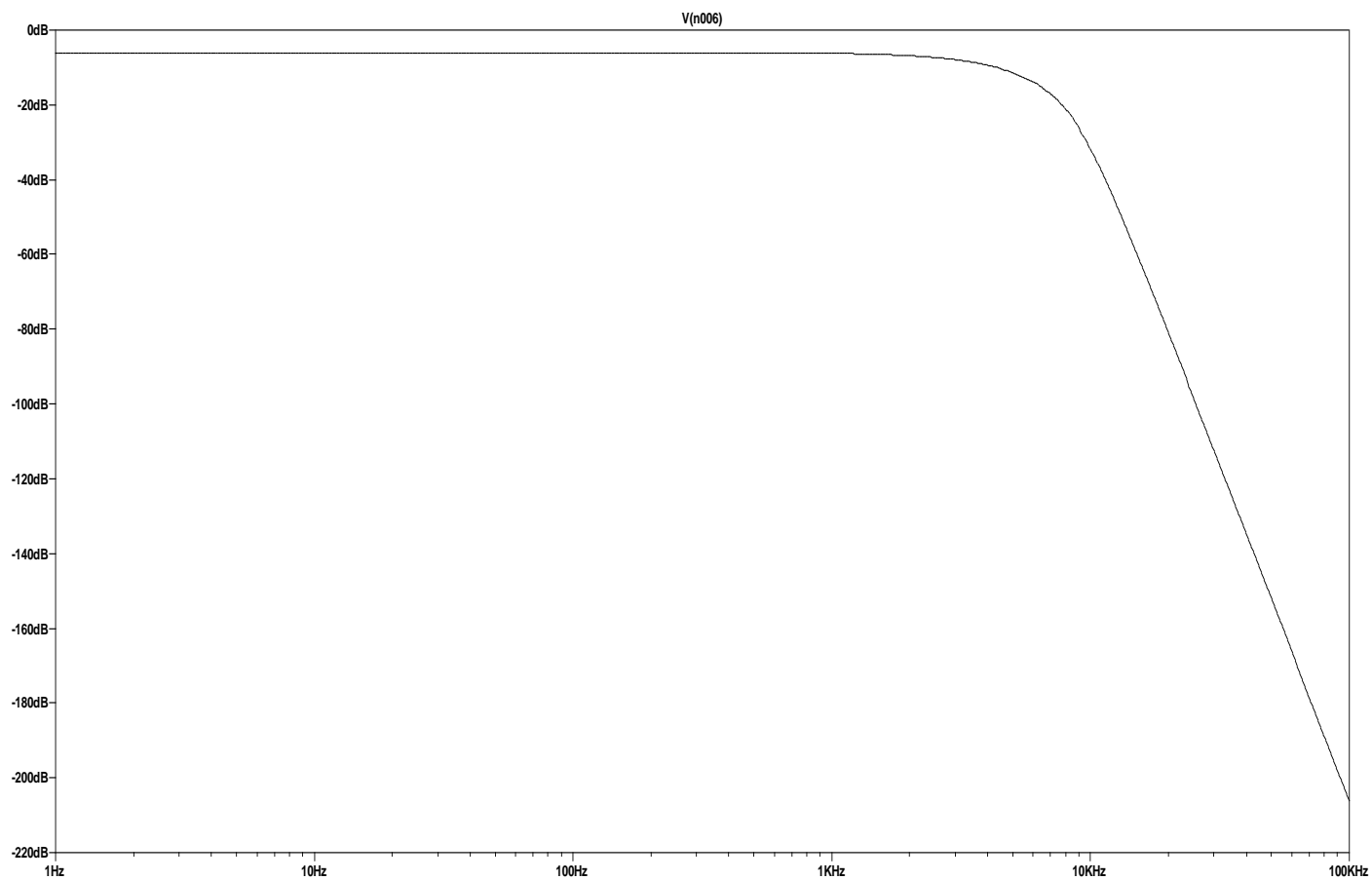


FIG. 2: CARACTERISTICA DE MODUL

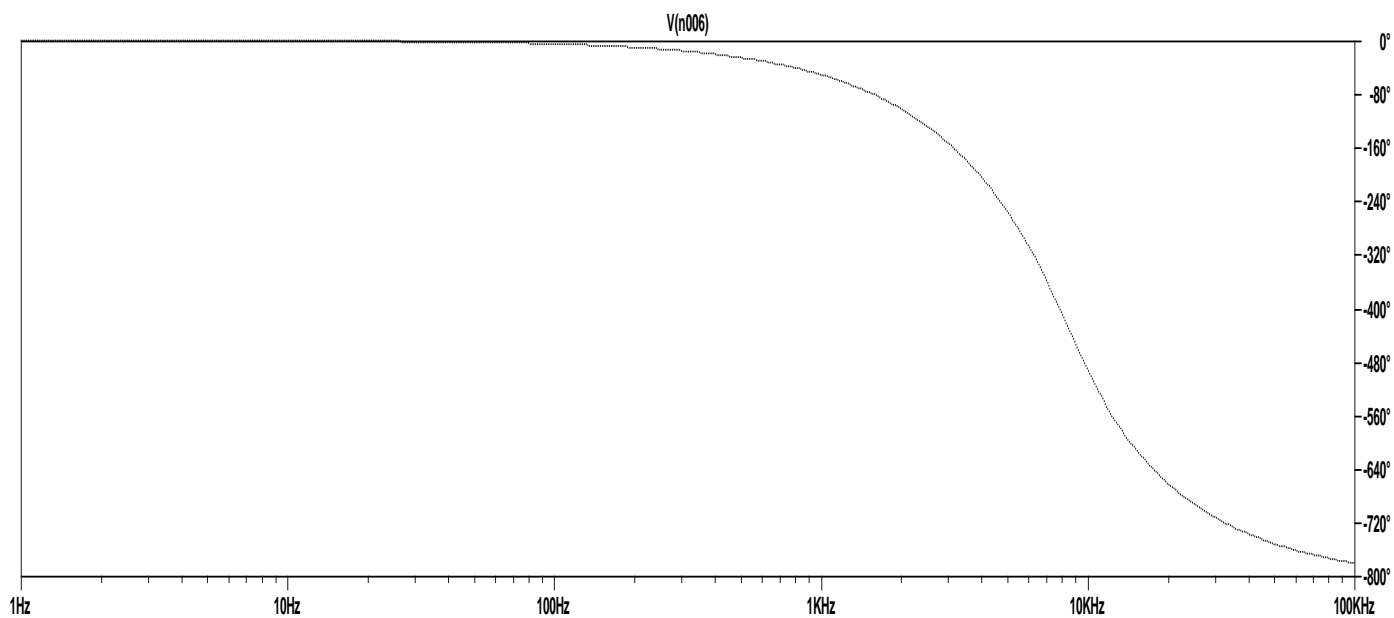


FIG. 3: CARACTERISTICA DE FAZA

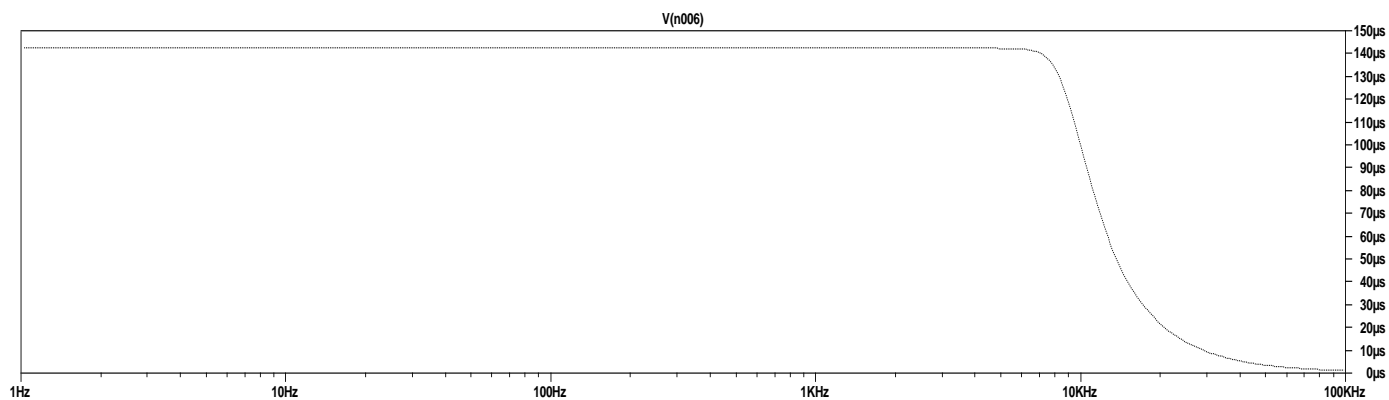


FIG. 4: INTARZIEREA DE GRUP

Frecventa de taiere dorita	Frecventa de taiere masurata
3.8KHz	3.81KHz

TABEL 2: PARAMETRII MASURATI

2. Caracteristica de transfer tranzistorare

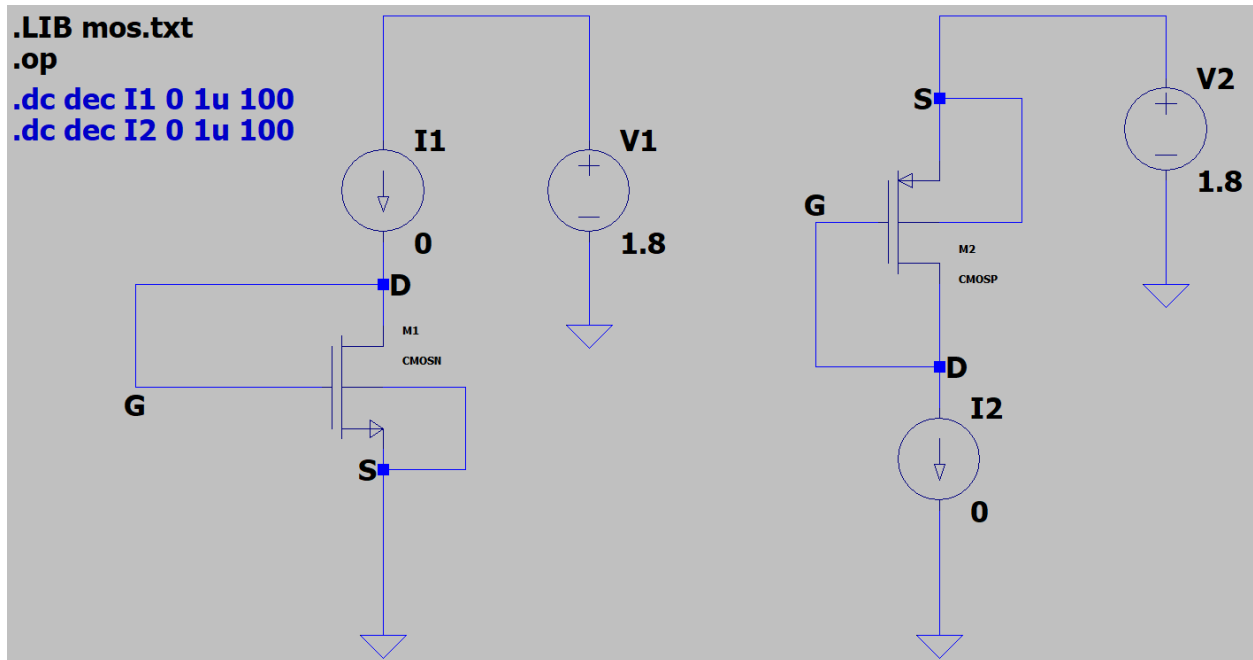


FIG. 5: CIRCUITELE UTILIZATE PENTRU A RIDICA CARACTERISTICEILE DE TRANSFER

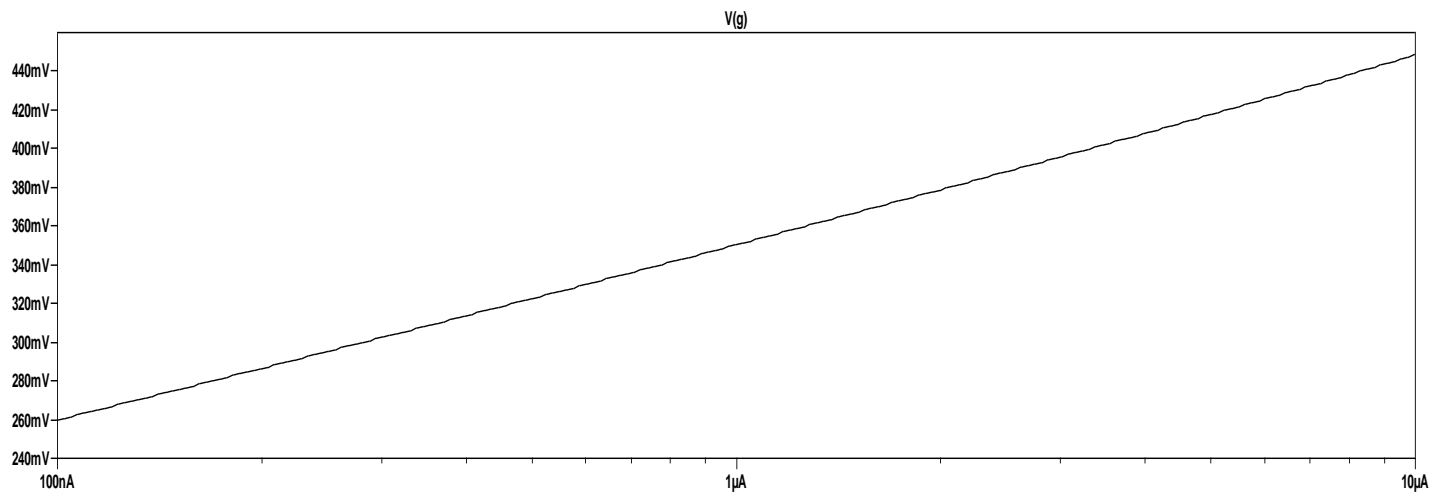


FIG. 6: CARACTERISTICA DE TRANSFER PENTRU CMOSN

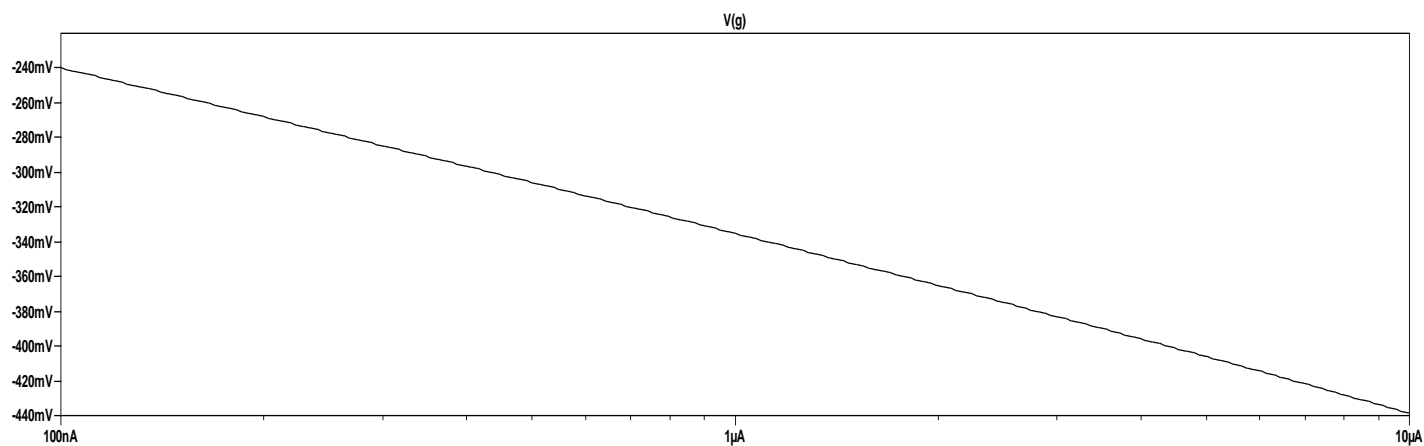


FIG. 7: CARACTERISTICA DE TRANSFER PENTRU CMOSP

Regiunea dorita sub-prag	CMOSN	CMOSP
Valoare minima	100nA	100nA
Valoare maxima	5.56uA	5.7uA

TABEL 3: VALORI MINIME SI MAXIME PENTRU CA MOS-URILE SA FUNCTIONEZE IN SUB-PRAG

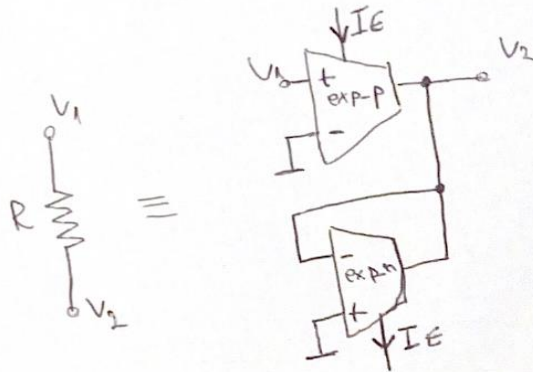
3. Sinteza circuit active

Rezistență flotantă

$$R = \frac{2 \cdot V_T}{I_E}$$

$$I_E = 1 \mu A \quad V_T = 26 \cdot 10^{-3} V$$

$$\Rightarrow R \approx 52 k\Omega$$



Rezistență la masă

$$R = \frac{2 \cdot V_T}{I_E}$$

$$I_E = 1 \mu A \quad V_T = 26 \cdot 10^{-3} V$$

$$\Rightarrow R \approx 52 k\Omega$$

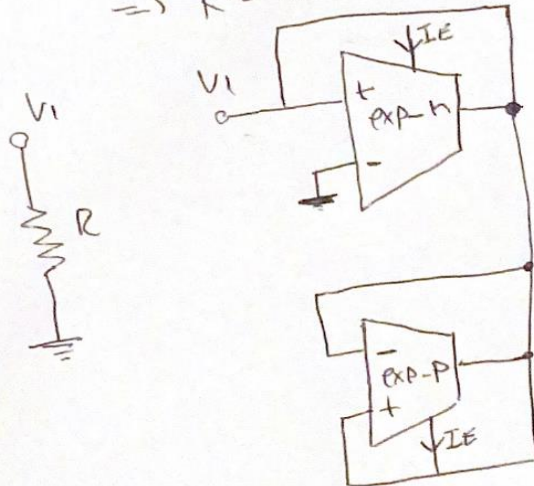


FIG. 8: CELULE PENTRU REZISTENTE

Bobină Flotantă

$$L = C \cdot \frac{(2 \cdot V_T)^2}{I_E^2}$$

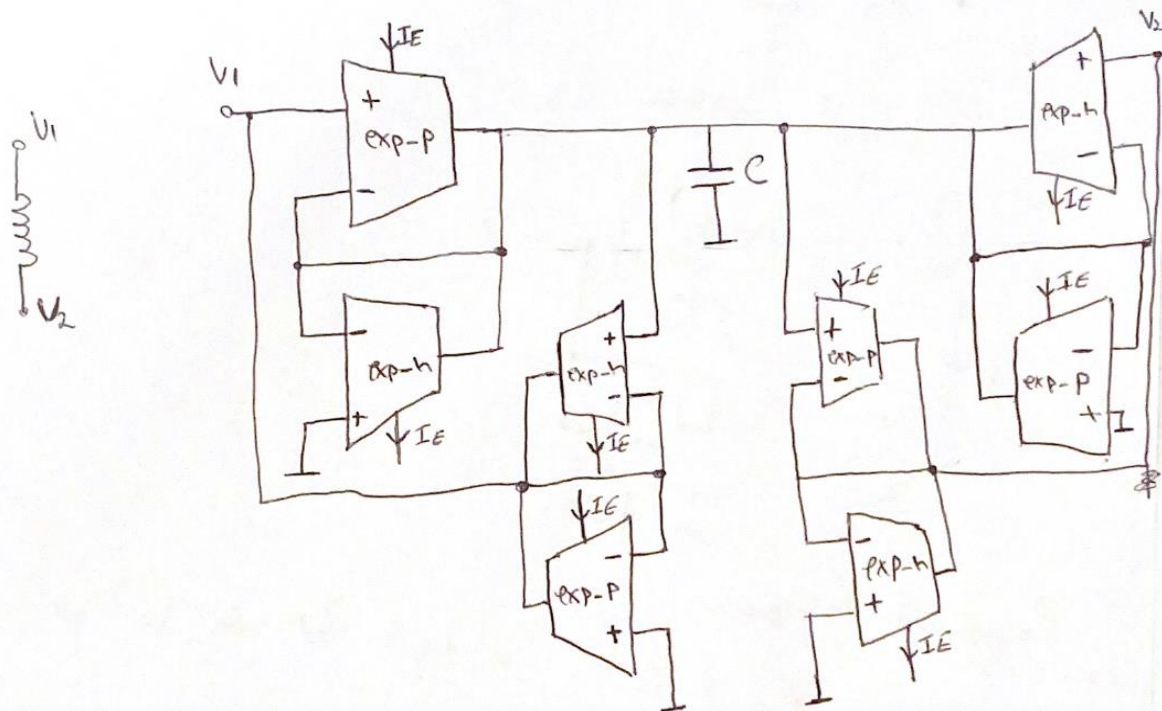


FIG. 9: CELULA PENTRU BOBINA

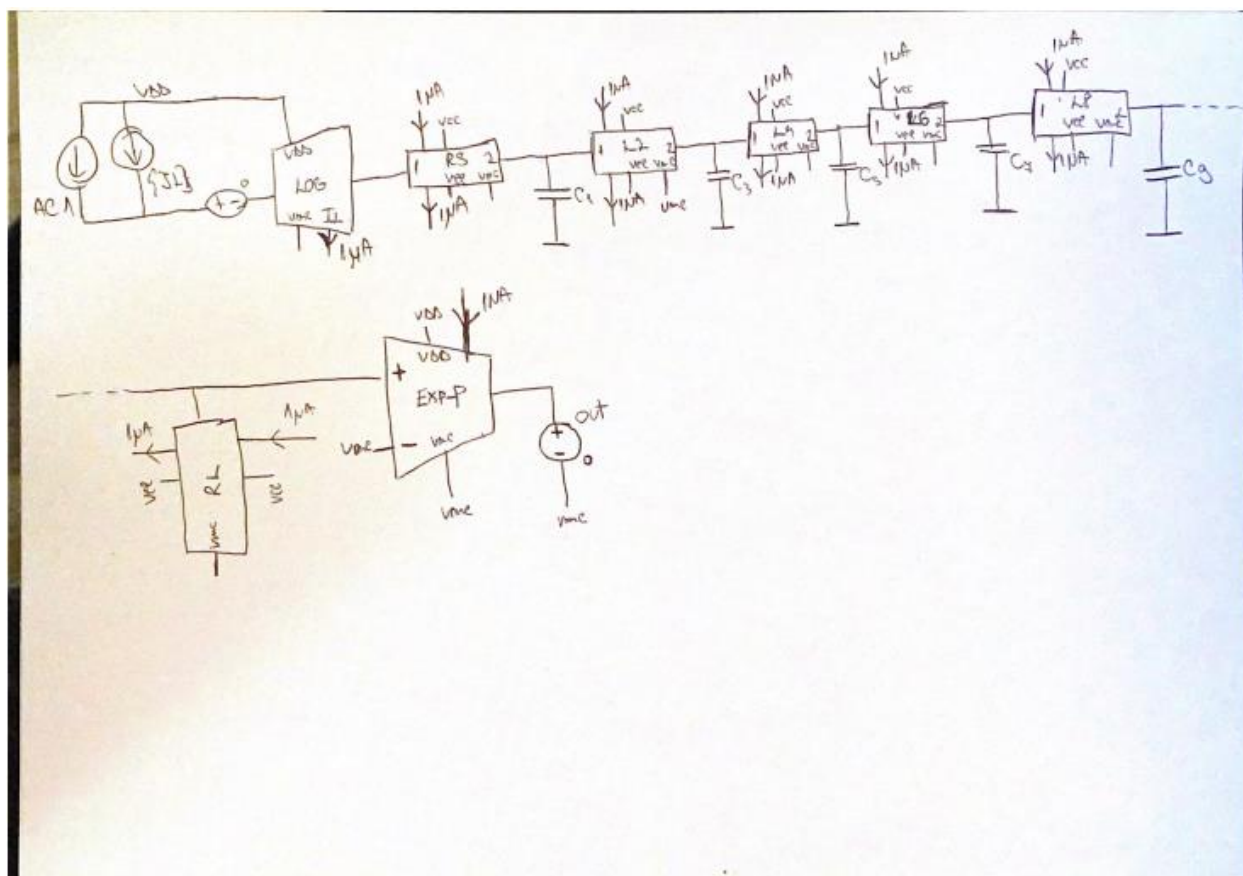


FIG. 10: CIRCUITUL NELINIAR

Parametru	Valoare numerica
CL2	186pF
CL4	411pF
CL6	596pF
CL8	875pF
$I_L = I_E = I_{RS} = I_{RL} = I_{L2}$	1uA

TABEL 4: VALORI CONDENSATOARE SI CURENTI DE POLARIZARE

4. Circuit de polarizare

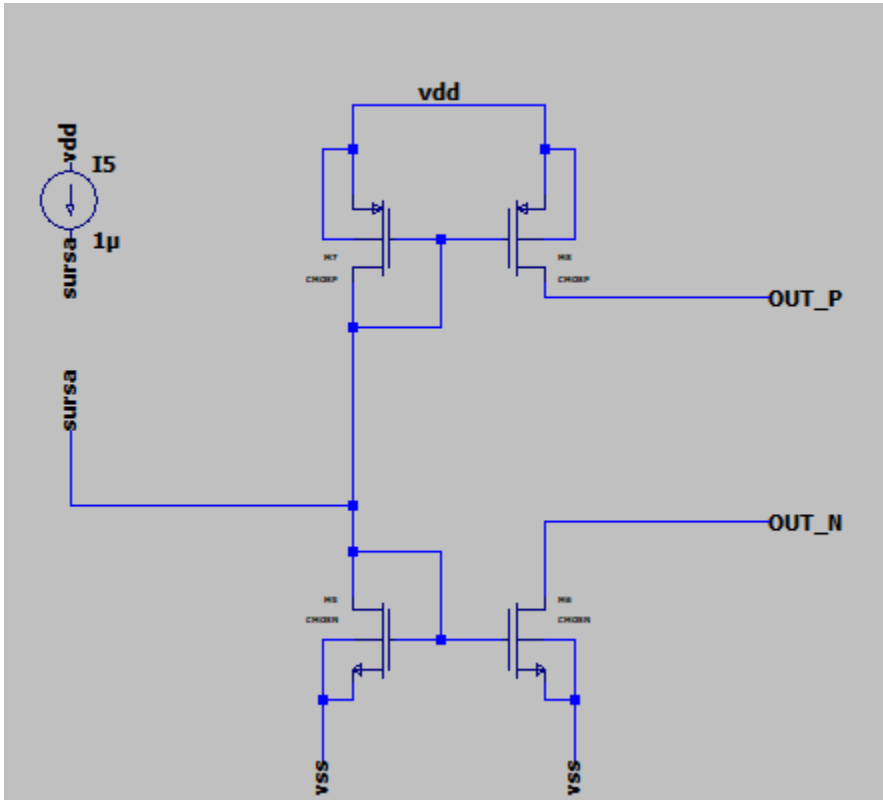


FIG. 11: CIRCUIT DE POLARIZARE

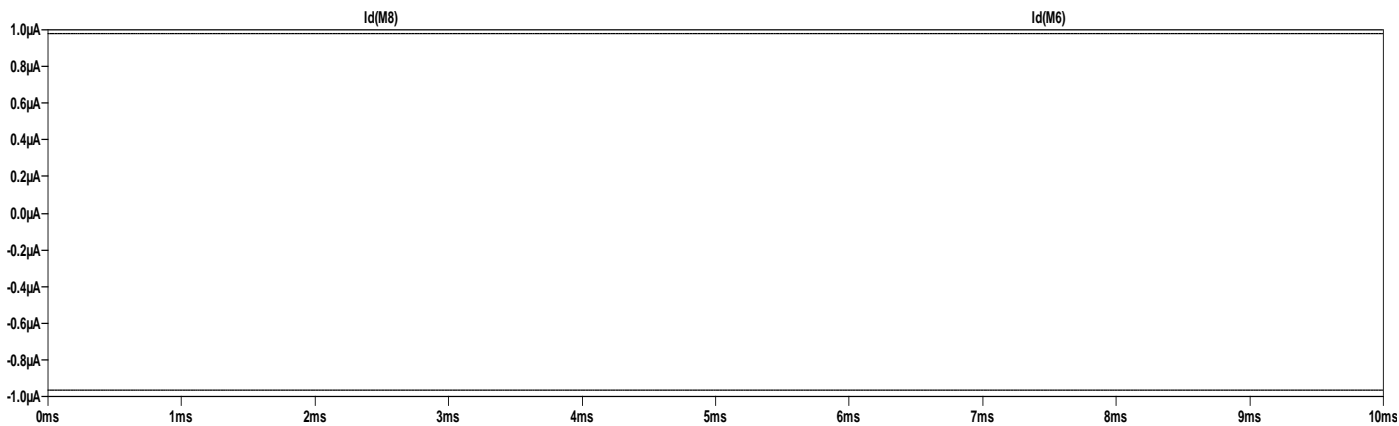


FIG. 12: REZULTATE ANALIZA .TRANS

5. Circuitul ELIN

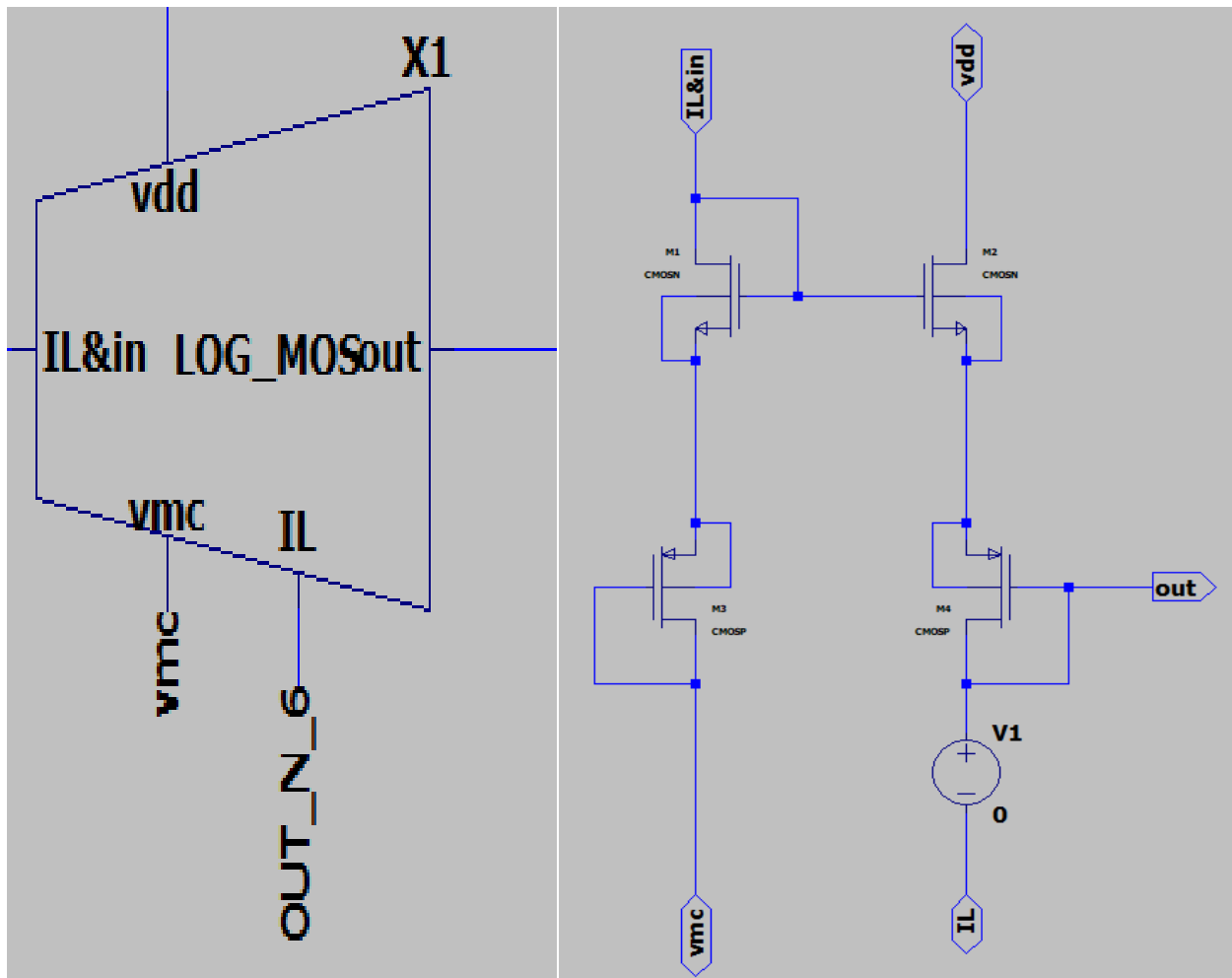


FIG. 13: CELULA LOGARITMICA MOS + CIRCUITUL PENTRU ACEASTA

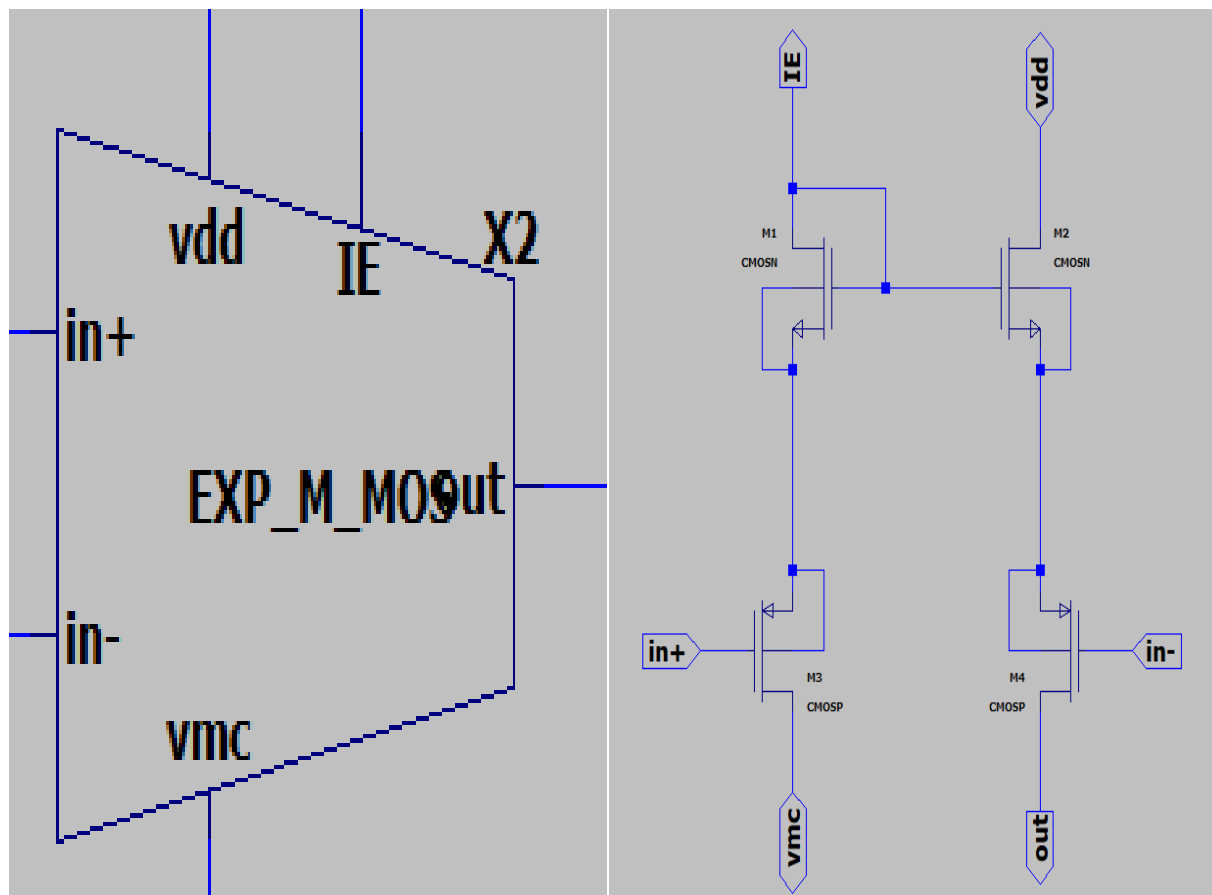


FIG. 13: CELULA EXPONENTIALA P MOS + CIRCUITUL PENTRU ACEASTA

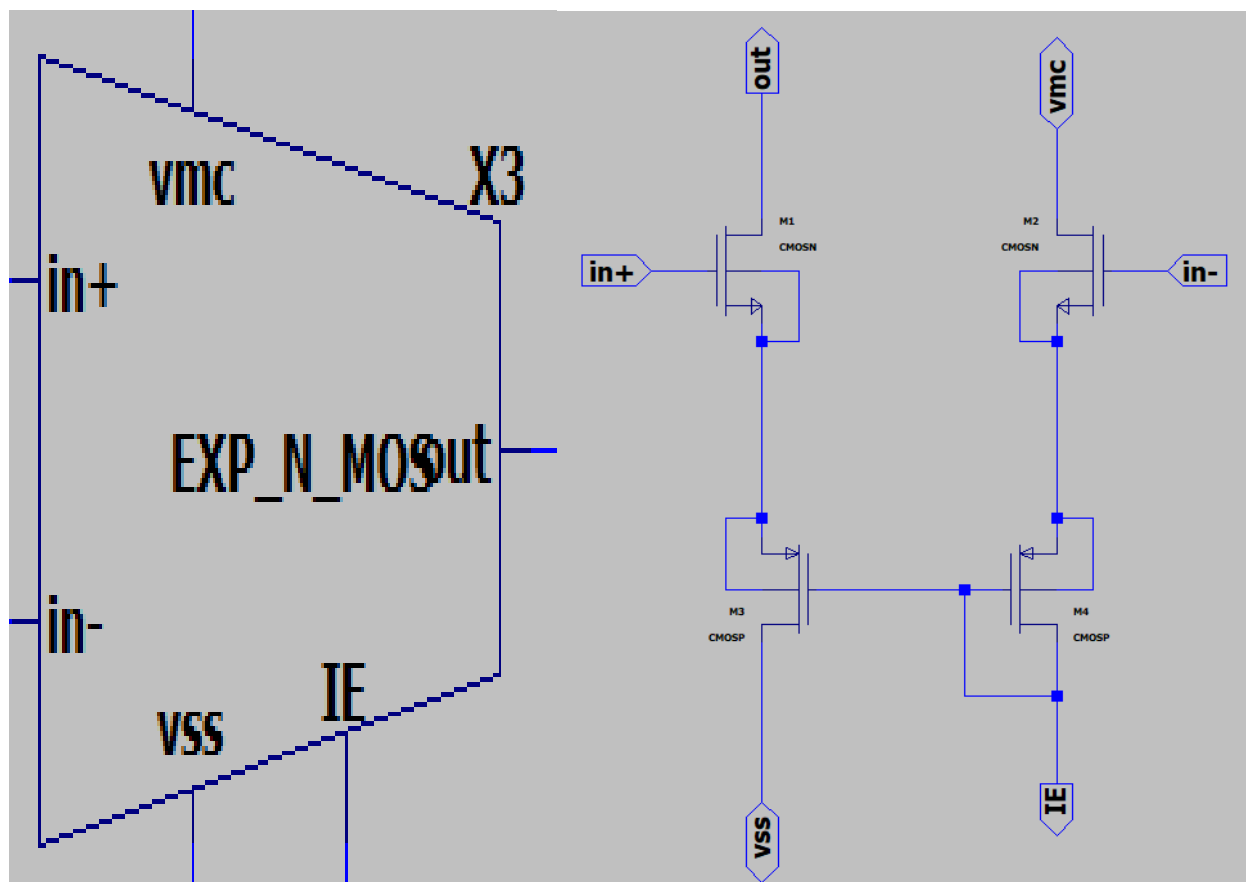


FIG. 14: CELULA EXPONENTIALA N MOS + CIRCUITUL PENTRU ACEASTA

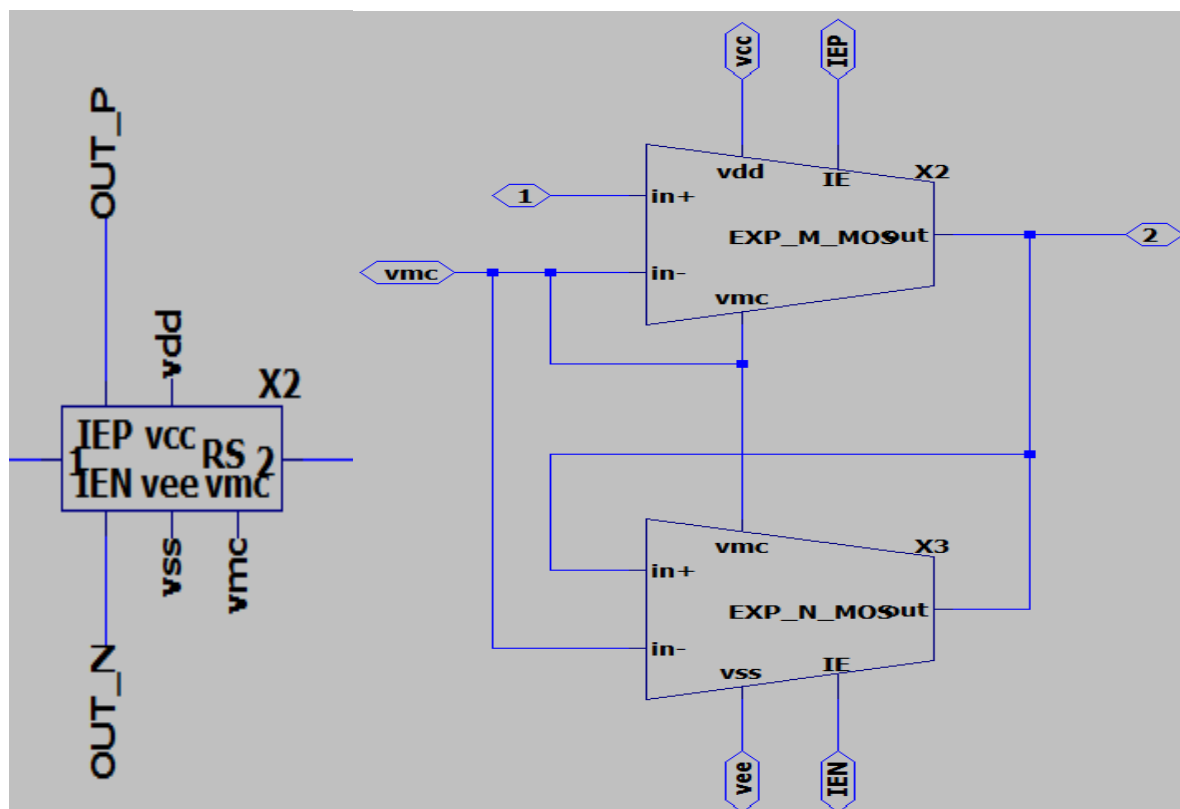


FIG. 15: CELULA PENTRU REZISTENTA FLOTANTA + CIRCUITUL PENTRU ACEASTA

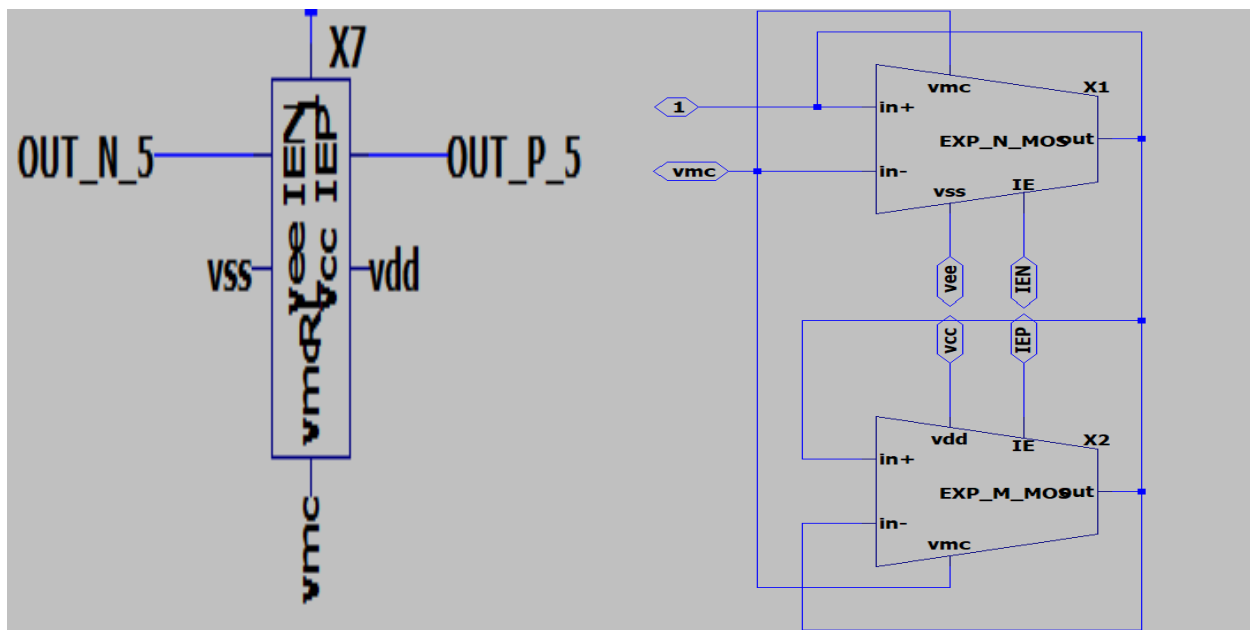


FIG. 16: CELULA PENTRU REZISTENTA LA VMC + CIRCUITUL PENTRU ACEASTA

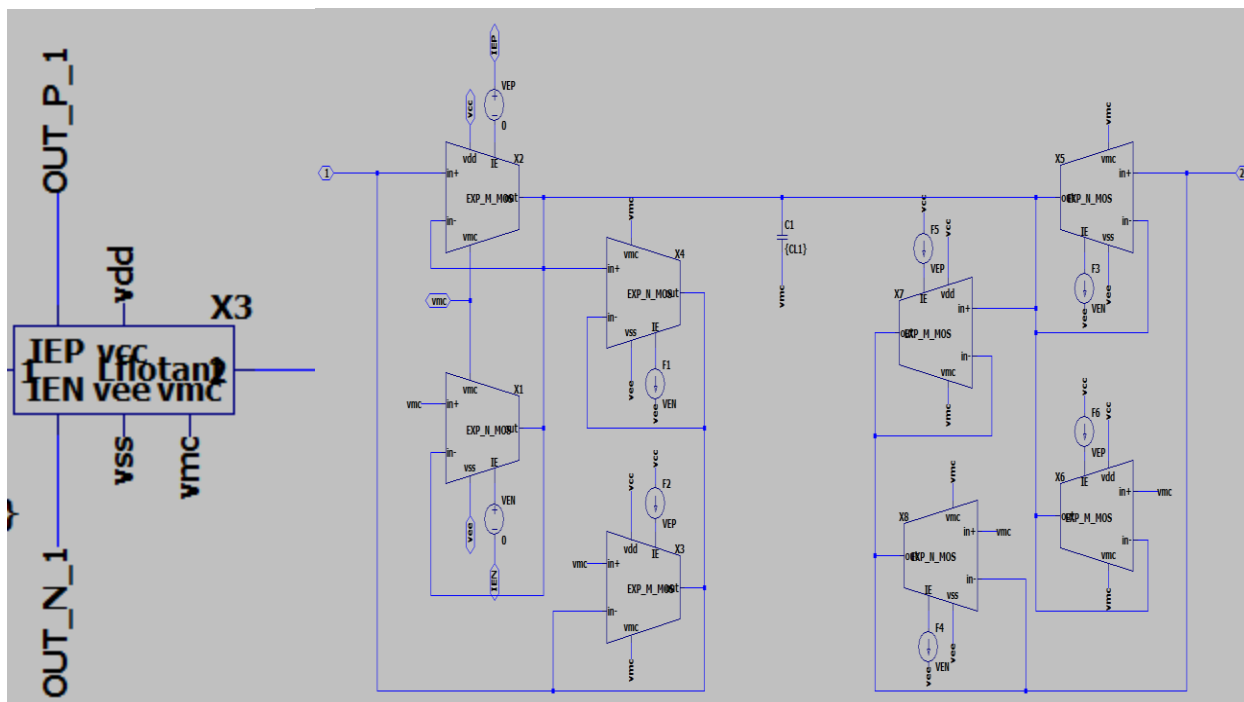


FIG. 17: CELULA PENTRU BOBINA FLOTANTA + CIRCUITUL PENTRU ACEASTA

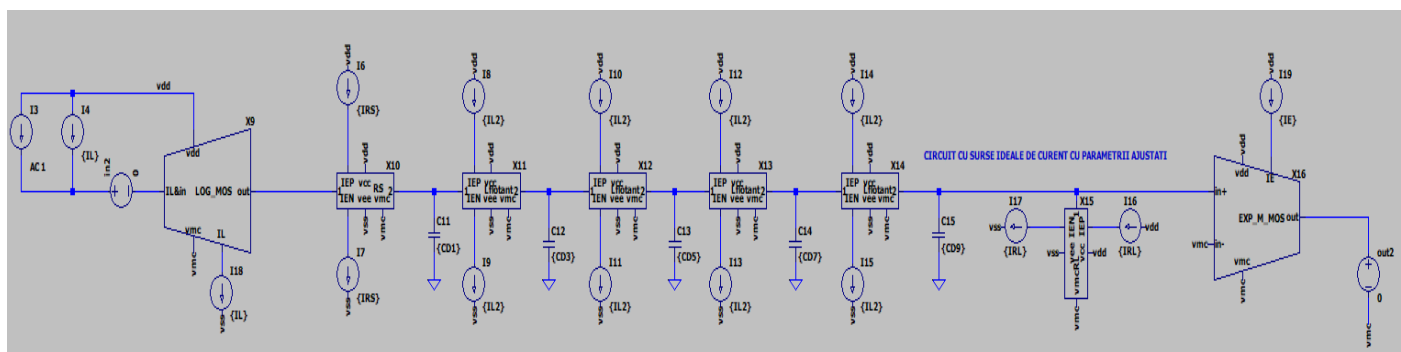


FIG. 18: SCHEMA ELECTRICA PENTRU CIRCUITUL ACTIVE POLARIZAT CU SURSE IDEALE DE CURENT

Parametru	Valoare numerica
C1	62.8pF
C3	303.6pF
C5	507.9pF
C7	695.8pF
C9	1.824nF
CL1	186pF
CL2	411pF
CL3	596pF
CL4	875pF
IL = IE = IRS = IRL = IL2	1uA

TABEL 5: VALORI CURENTI SI CONDENSATOARE PENTRU CIRCUITUL ACTIVE CU SURSE IDEALE DE CURENT

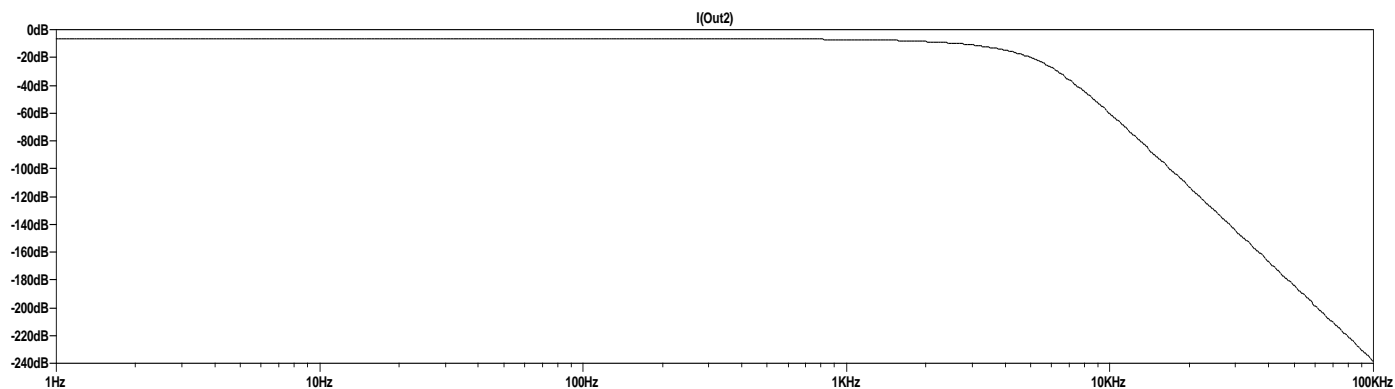


FIG. 19: CARACTERISTICA DE MODUL PENTRU CIRCUITUL ACTIVE INAINTE DE AJUSTARE

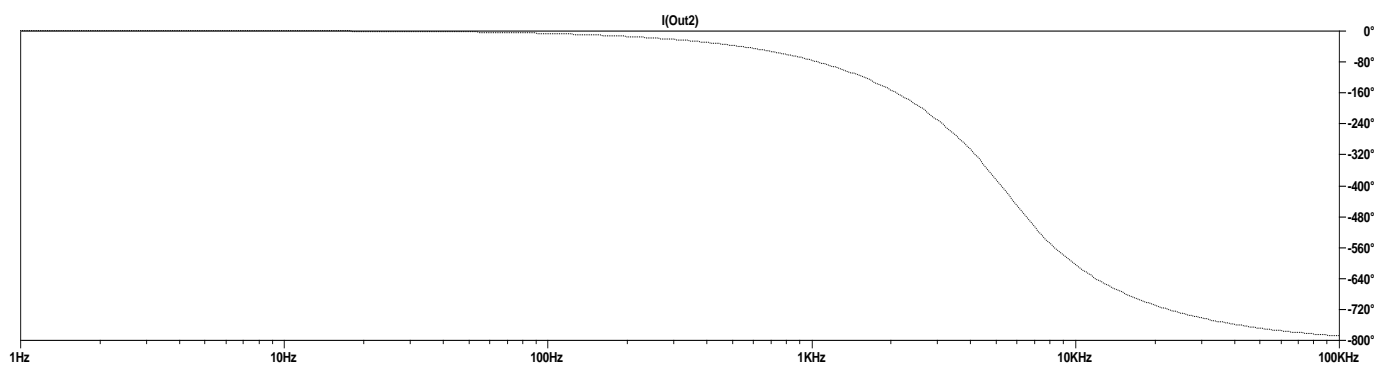


FIG. 20: CARACTERISTICA DE FAZA PENTRU CIRCUITUL ACTIVE INAINTE DE AJUSTARE

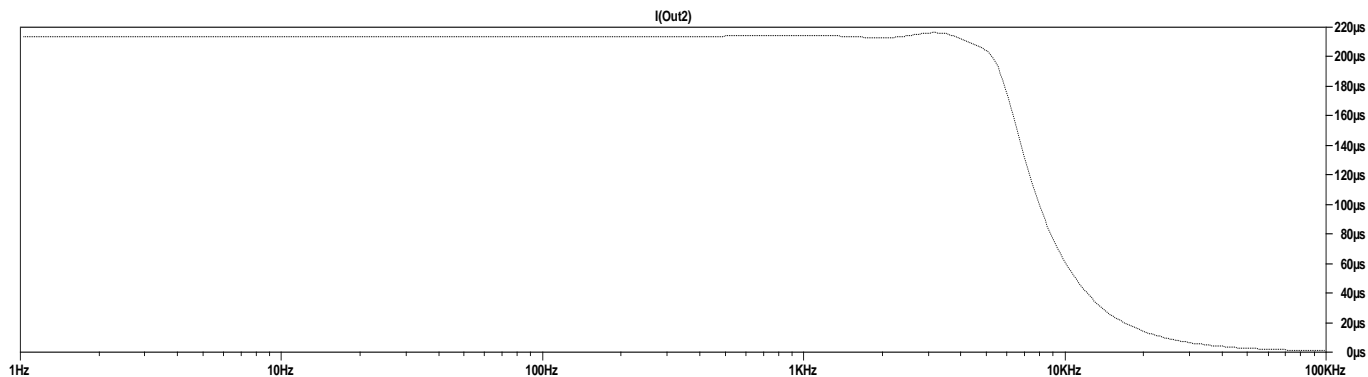


FIG. 21: INTARZIEREA DE GRUP PENTRU CIRCUITUL ACTIVE INAINTE DE AJUSTARE

Valoare dorita	Valoare masurata	Abatere	Raport
3.8KHz	2.5KHz	1.3KHz	1.52

TABEL 6: PARAMETRII MASURATI INAINTE DE AJUSTARE

Parametru	Valoare numerica
C1	41.32pF
C3	199.74pF
C5	344.14pF
C7	457.76pF
C9	1.2nF
CL1	122.37pF
CL2	270.39pF
CL3	392.1pF
CL4	575.66pF
IL = IE = IRS = IRL = IL2	1uA

TABEL 7: VALORI CURENTI SI CONDENSATOARE DUPA AJUSTARE

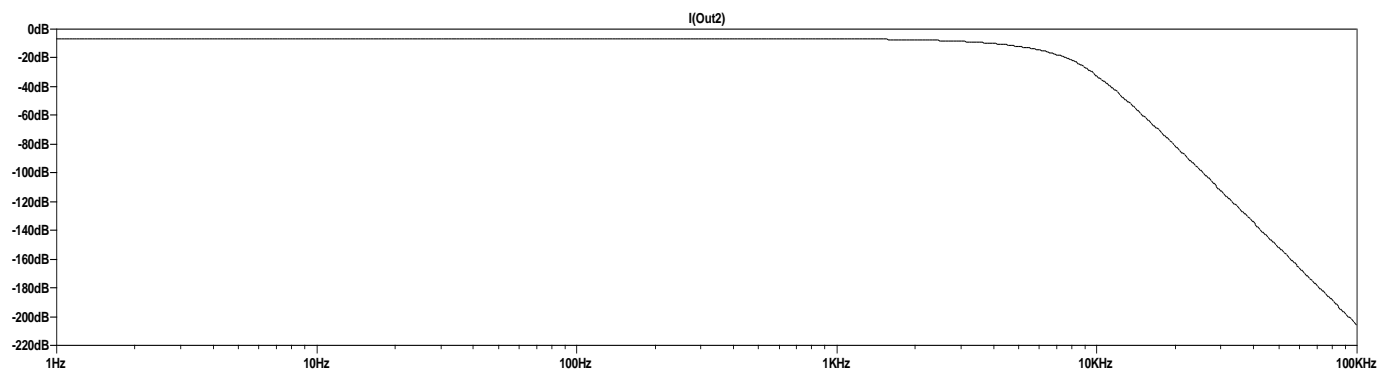


FIG. 22: CARACTERISTICA DE FAZA A CIRCUITULUI ACTIVE DUPA AJUSTARE

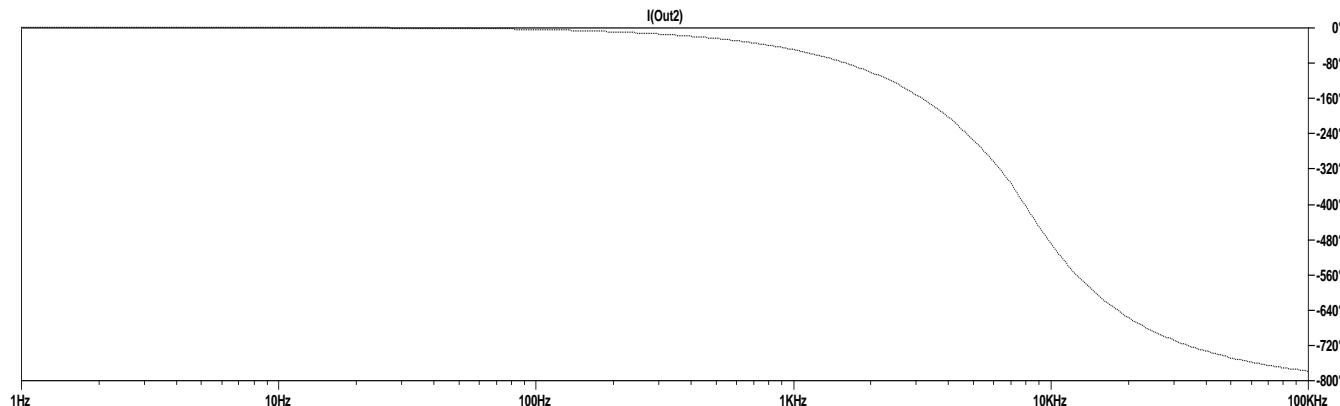


FIG. 23: CARACTERISTICA DE FAZA A CIRCUITULUI ACTIVE DUPA AJUSTARE

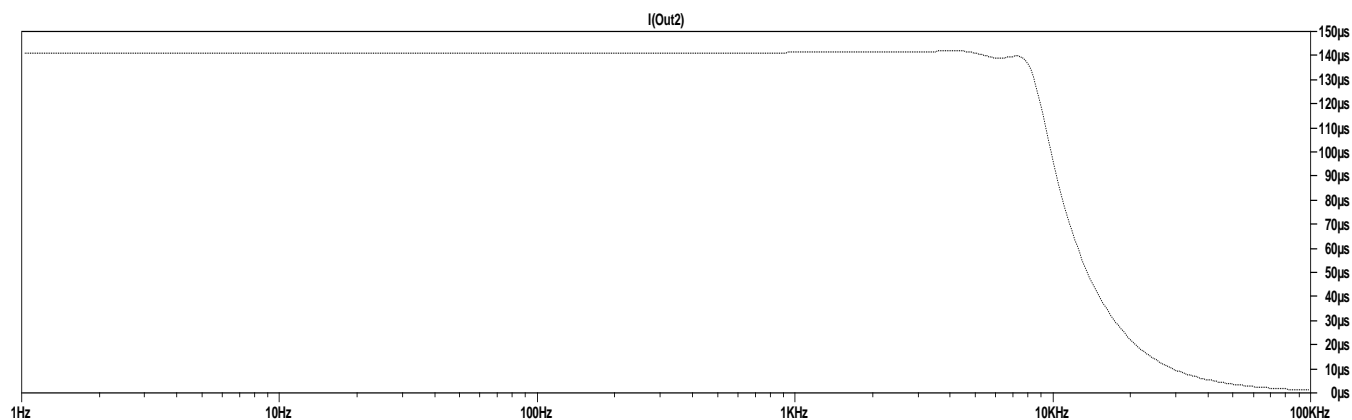


FIG. 24: INTARZIEREA DE GRUP A CIRCUITULUI ACTIVE DUPA AJUSTARE

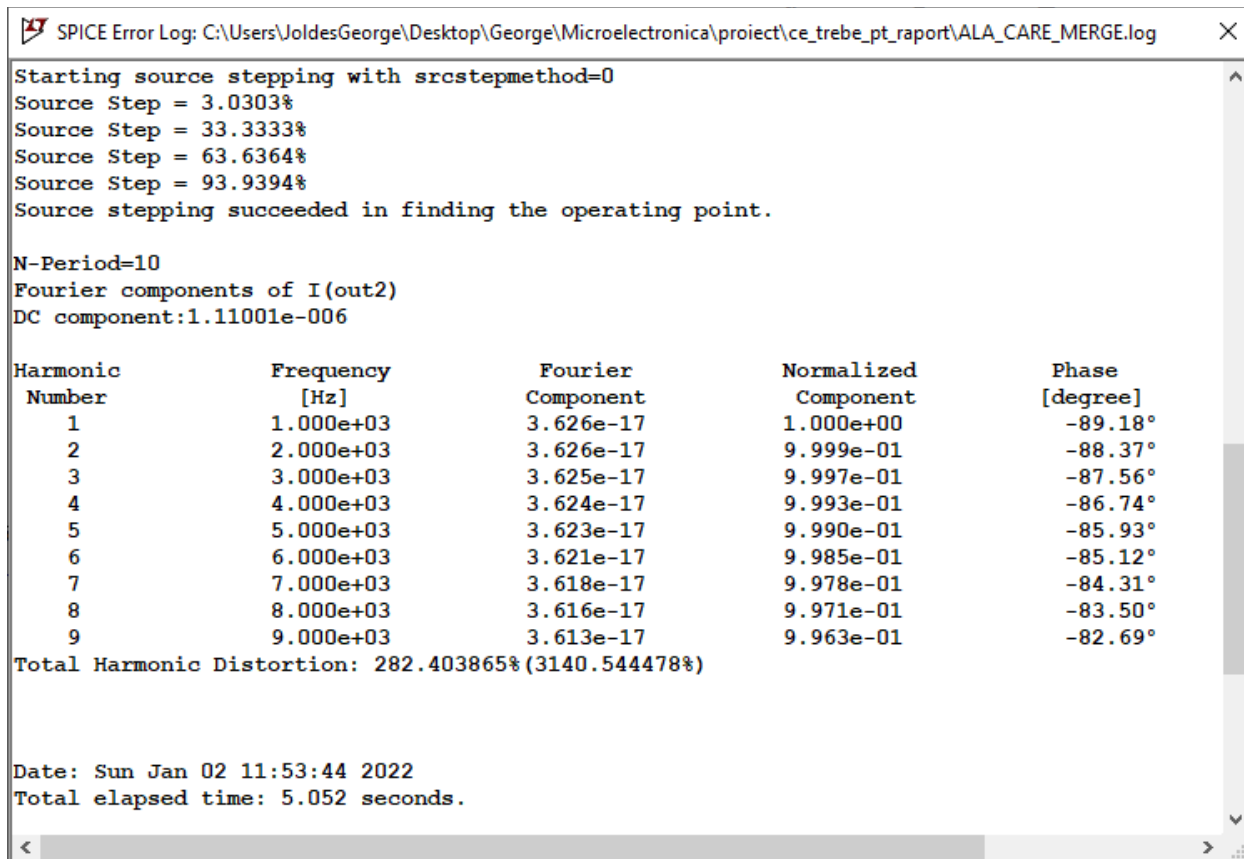


FIG. 25: MASURAREA THD-ULUI PENTRU CIRCUITUL ACTIVE DUPA AJUSTARE

Frecventa dorita	Frecventa masurata	Valoare THD
3.8KHz	3.81KHz	0%

TABEL 8: PARAMETRII + THD PENTRU CIRCUITUL PASIV

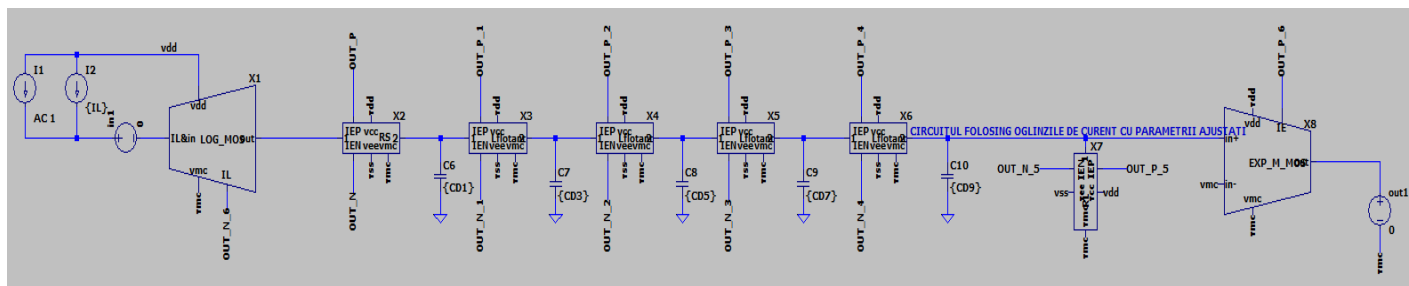


FIG. 26: SCHEMA ELECTRICA PENTRU CIRCUIT ACTIVE POLARIZAT CU OGLINZI DE CURENT

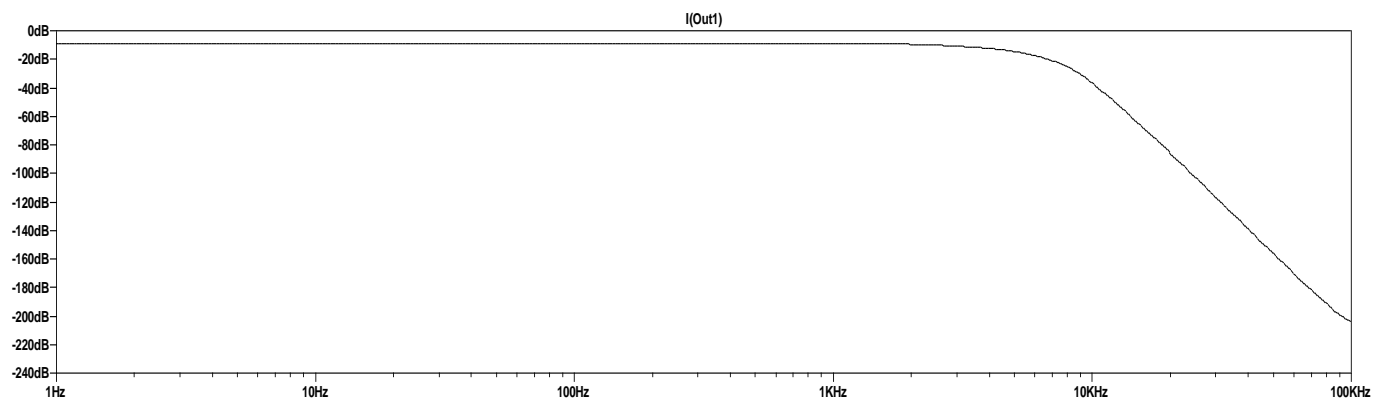


FIG. 27: CARACTERISTICA DE MODUL PENTRU CIRCUIT ACTIVE CU OGLINZI INAINTE DE AJUTARE

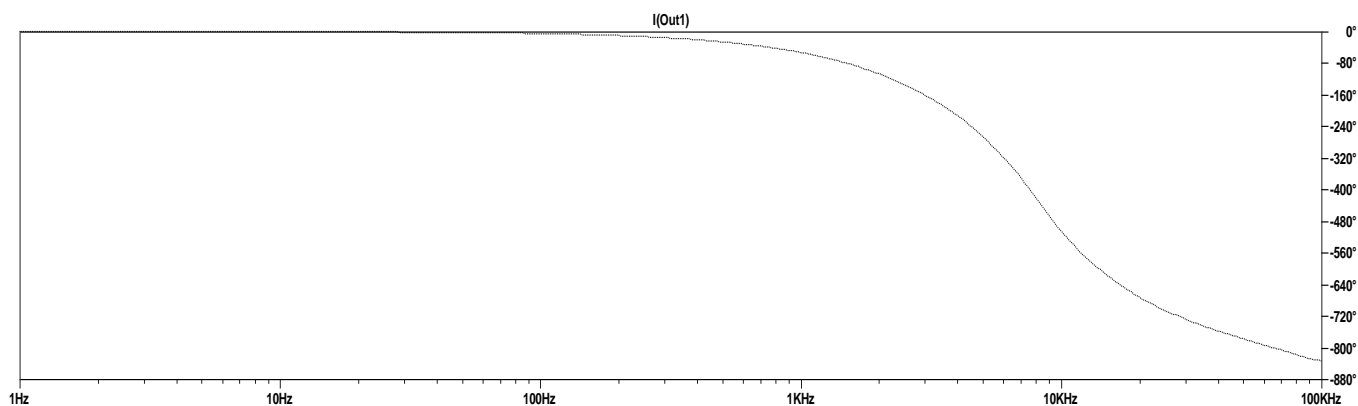


FIG. 28: CARACTERISTICA DE FAZA PENTRU CIRCUIT ACTIVE CU OGLINZI INAINTE DE AJUTARE

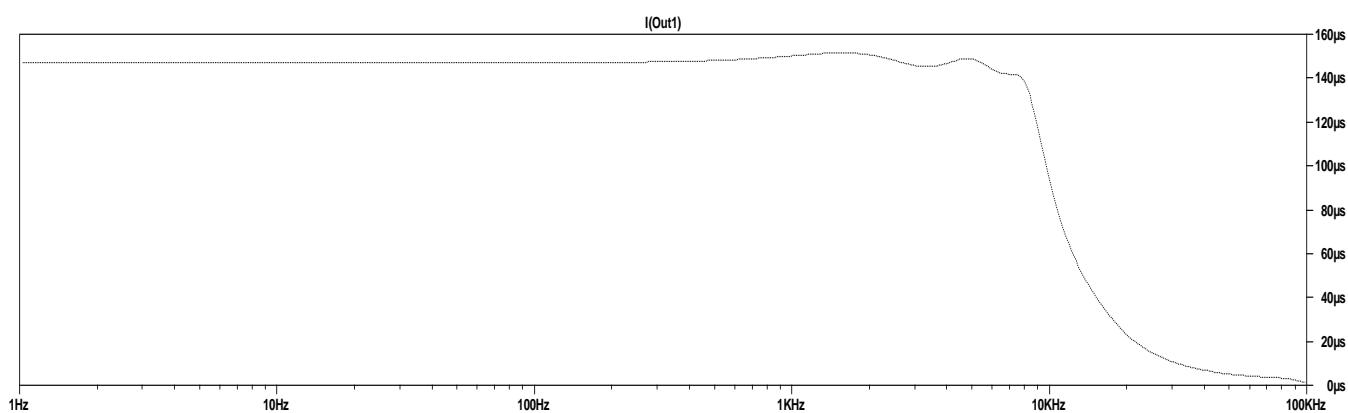


FIG. 29: INTARZIEREA DE GRUP PENTRU CIRCUIT ACTIVE CU OGLINZI INAINTE DE AJUTARE

Frecventa dorita	Frecventa masurata
3.8KHz	3.55KHz

TABEL 9: PARAMETRII MASURATI PENTRU CIRCUIT ACTIVE CU OGLINZI INAINTE DE AJUSTARE

Parametru	Valoare numerica
C1	38.62pF
C3	186.67pF
C5	321.63pF
C7	427.81pF
C9	1.12nF
CL1	114.36pF
CL2	252.7pF
CL3	366.45pF
CL4	538pF
IL = IE = IRS = IRL = IL2	1uA

TABEL 10: VALORI CURENTI SI CONDENSATOARE PENTRU CIRCUIT ACTIVE CU OGLINZI DUPA AJUSTARE

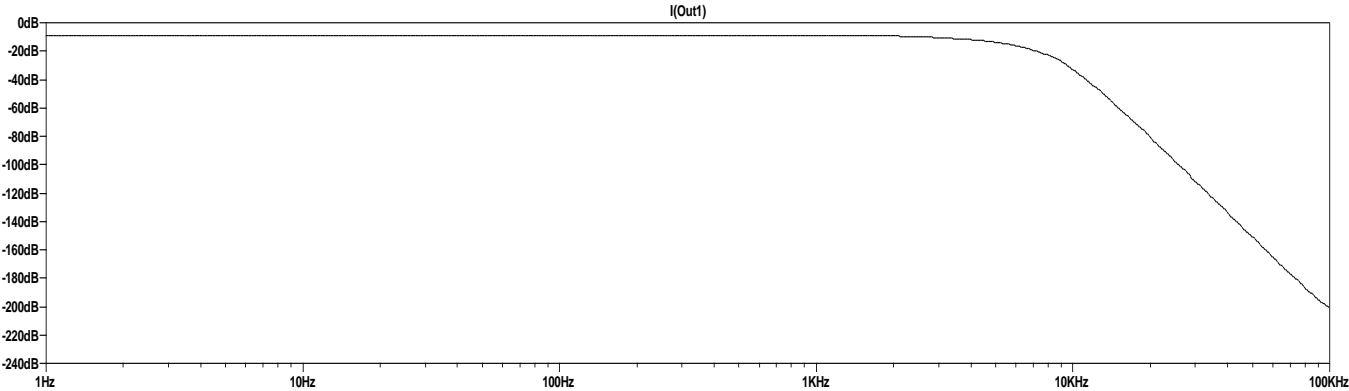


FIG. 30: CARACTERISTICA DE MODUL PENTRU CIRCUIT CU OGLINZI DUPA AJUSTARE

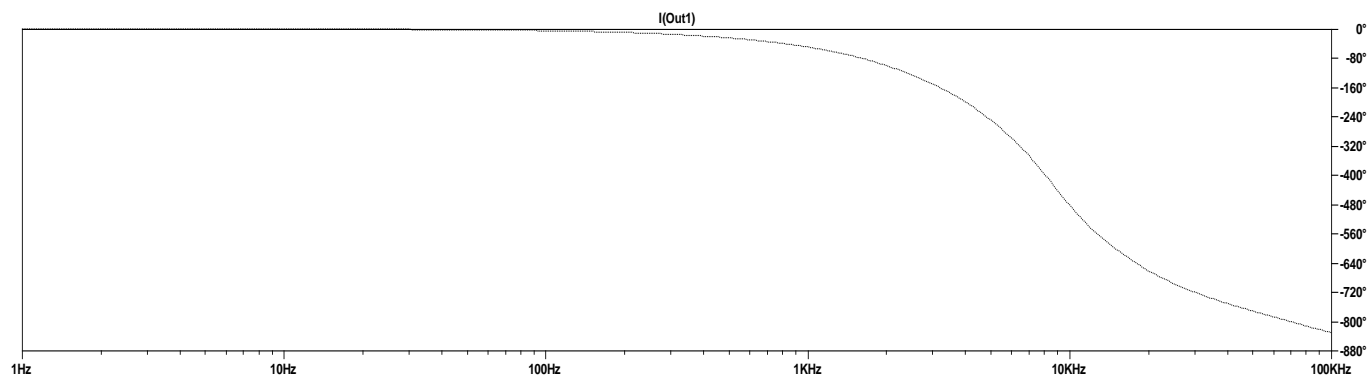


FIG. 31: CARACTERISTICA DE FAZA PENTRU CIRCUIT CU OGLINZI DUPA AJUSTARE

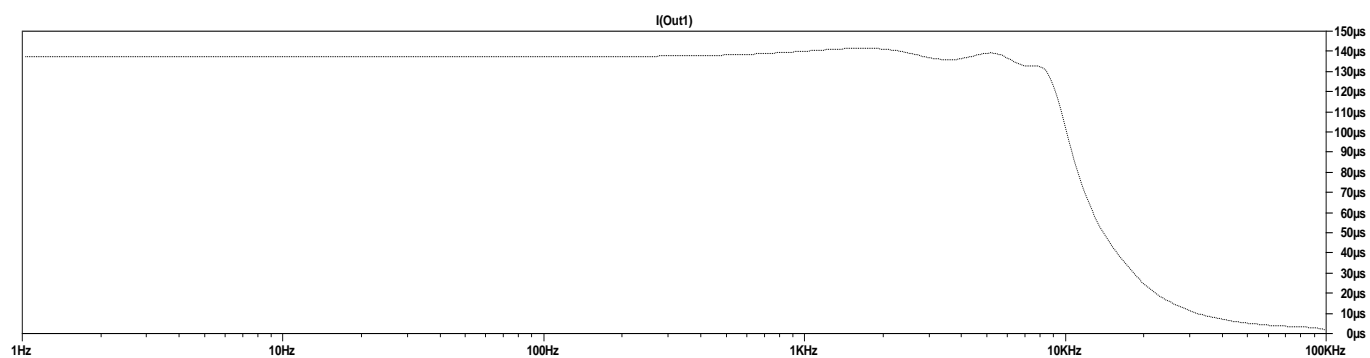


FIG. 32: INTARZIEREA DE GRUP PENTRU CIRCUIT CU OGLINZI DUPA AJUSTARE

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SPICE Error Log: C:\Users\JoldesGeorge\Desktop\George\Microelectronica\proiect\ce_trebe_pt_raport\ALA_CARE_MERGE.log
Gmin = 1.45948e-011
Gmin = 1.56711e-012
Gmin = 1.68267e-013
Gmin = 0
Gmin stepping succeeded in finding the operating point.

N-Period=10
Fourier components of I(out1)
DC component:9.93097e-007

Harmonic      Frequency      Fourier      Normalized      Phase
Number        [Hz]          Component    Component        [degree]
  1           1.000e+03      2.535e-17    1.000e+00       -89.18°
  2           2.000e+03      2.534e-17    9.997e-01       -88.38°
  3           3.000e+03      2.534e-17    9.995e-01       -87.57°
  4           4.000e+03      2.532e-17    9.991e-01       -86.75°
  5           5.000e+03      2.531e-17    9.987e-01       -85.94°
  6           6.000e+03      2.530e-17    9.982e-01       -85.12°
  7           7.000e+03      2.528e-17    9.975e-01       -84.31°
  8           8.000e+03      2.527e-17    9.968e-01       -83.50°
  9           9.000e+03      2.524e-17    9.959e-01       -82.69°
Total Harmonic Distortion: 282.323307%(3139.487932%)

Date: Sun Jan 02 12:33:36 2022
Total elapsed time: 3.560 seconds.

tnom = 27

```

FIG. 33: THD-UL PENTRU CIRCUITUL ACTIVE POLARIZAT CU OGLINZI DUPA AJUSTARE

Frecventa dorita	Frecventa masurata	Valoare THD
3.8KHz	3.79KHz	282%

TABEL 11: PARAMETRII MASURATI CIRCUIT ACTIVE CU OGLINZI DUPA AJUSTARE