

ANEXO

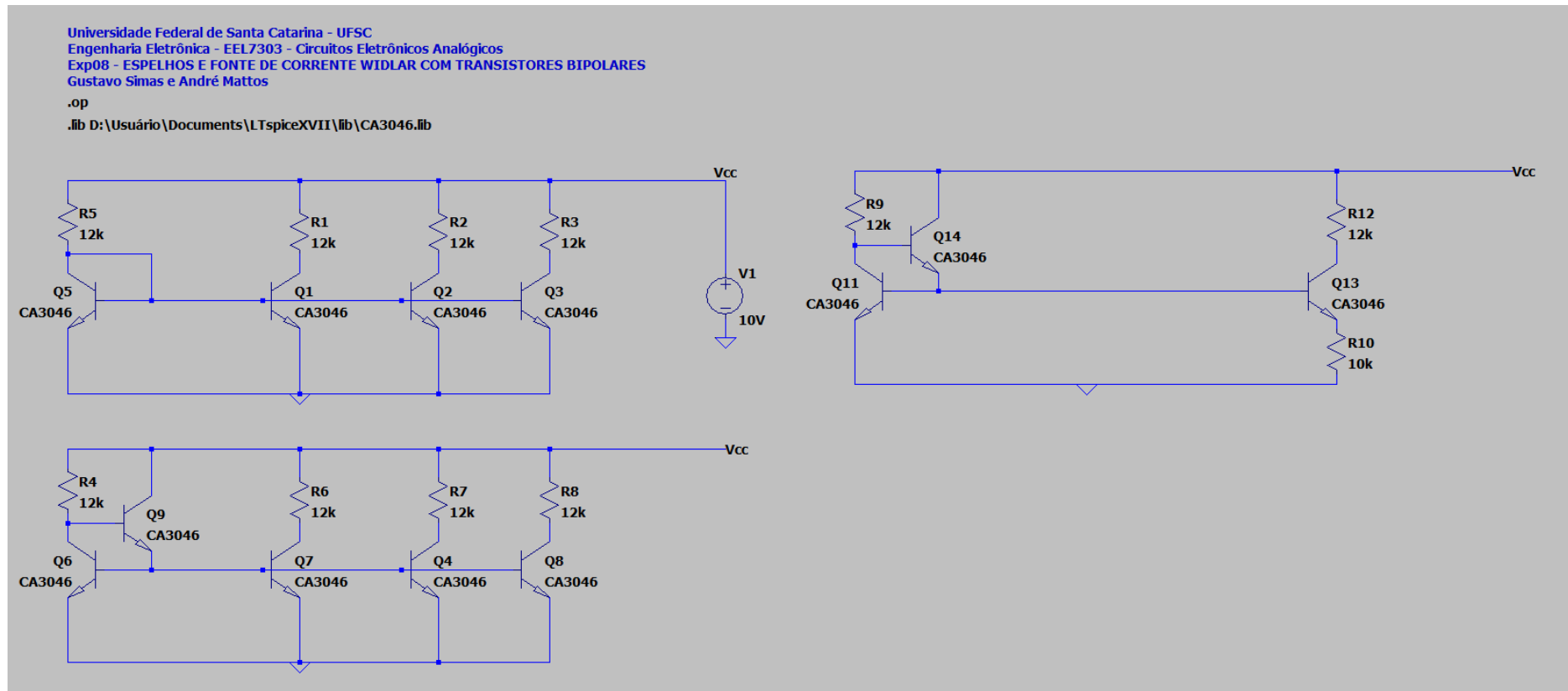


Figura 1 - Circuito Simulado em LTSpice

```
|          --- Operating Point ---  
  
V(n003) :      0.989154      voltage  
V(n001) :      0.648204      voltage  
V(vcc) :       10           voltage  
V(n002) :      0.989154      voltage  
V(n004) :      0.989154      voltage  
Ic(Q3) :      0.000750904     device_current  
Ib(Q3) :      7.74515e-006     device_current  
Ie(Q3) :     -0.000758651     device_current  
Ic(Q1) :      0.000750904     device_current  
Ib(Q1) :      7.74515e-006     device_current  
Ie(Q1) :     -0.000758651     device_current  
Ic(Q5) :      0.000748336     device_current  
Ib(Q5) :      7.74515e-006     device_current  
Ie(Q5) :     -0.000756083     device_current  
Ic(Q2) :      0.000750904     device_current  
Ib(Q2) :      7.74515e-006     device_current  
Ie(Q2) :     -0.000758651     device_current  
I(R3) :      0.000750904     device_current  
I(R2) :      0.000750904     device_current  
I(R1) :      0.000750904     device_current  
I(R5) :      0.000779316     device_current  
I(V1) :     -0.00303203     device_current
```

Figura 2 - Ponto Quiescente para Circuito 1

```
--- Operating Point ---  
  
V(vcc) :      10          voltage  
V(n003) :      1.21467    voltage  
V(n005) :      0.647478   voltage  
V(n001) :      1.20966    voltage  
V(n002) :      1.21467    voltage  
V(n004) :      1.21467    voltage  
Ic(Q4) :      2.9759e-005  device_current  
Ib(Q4) :      4.53566e-007 device_current  
Ie(Q4) :      -3.0213e-005 device_current  
Ic(Q3) :      0.000732111 device_current  
Ib(Q3) :      7.55313e-006 device_current  
Ie(Q3) :      -0.000739664 device_current  
Ic(Q1) :      0.000732111 device_current  
Ib(Q1) :      7.55313e-006 device_current  
Ie(Q1) :      -0.000739664 device_current  
Ic(Q5) :      0.000732075 device_current  
Ib(Q5) :      7.55313e-006 device_current  
Ie(Q5) :      -0.000739628 device_current  
Ic(Q2) :      0.000732111 device_current  
Ib(Q2) :      7.55313e-006 device_current  
Ie(Q2) :      -0.000739664 device_current  
I(R8) :      0.000732111 device_current  
I(R7) :      0.000732111 device_current  
I(R6) :      0.000732111 device_current  
I(R4) :      0.000732528 device_current  
I(V1) :      -0.00295862  device_current
```

Figura 3 - Ponto Quiescente para Circuito 2

```

|          --- Operating Point ---

V(vcc) :          10          voltage
V(n001) :         1.1745      voltage
V(n003) :         0.647603    voltage
V(n002) :         9.88689     voltage
V(n004) :         0.115281    voltage
Ic(Q4) :         7.61315e-006  device_current
Ib(Q4) :         1.53762e-007  device_current
Ie(Q4) :        -7.76691e-006  device_current
Ic(Q3) :         9.42572e-006  device_current
Ib(Q3) :         1.81064e-007  device_current
Ie(Q3) :        -9.60679e-006  device_current
Ic(Q5) :         0.000735305    device_current
Ib(Q5) :         7.58585e-006  device_current
Ie(Q5) :        -0.000742891    device_current
I(R10) :         9.60679e-006  device_current
I(R12) :         9.42572e-006  device_current
I(R9) :          0.000735459    device_current
I(V1) :         -0.000752497    device_current

```

Figura 4 - Ponto Quiescente para Circuito 3 com potenciômetro em 10k

