18 janvier 2019

1 Basic circuits
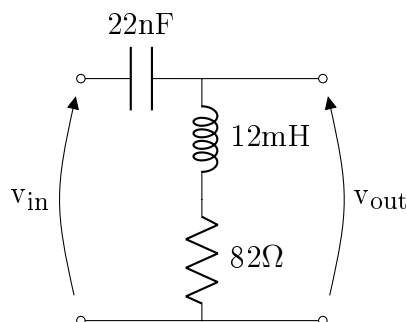
1.1 Voltage source and lamp

E $\sim$ $\bigotimes$ R
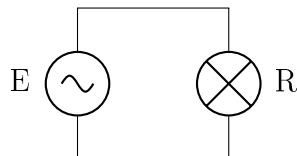
```
\begin{circuitikz}\draw
        (0,0) to [sinusoidal voltage source, l=$E$] (0,2)--(2,2) to [lamp, l=$R$] (2,0)
        ↪  --(0,0);
\end{circuitikz}
```
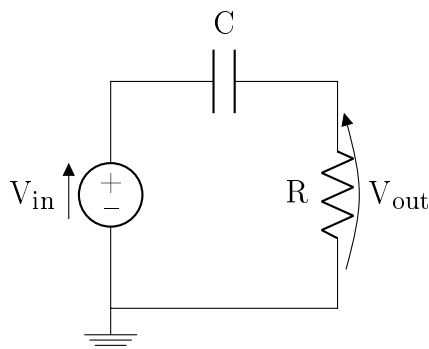
2 Filters

2.1 RLC - Out on RL

22nF

12mH

v_{in} v_{out}

82Ω

```
\begin{circuitikz}[scale=0.8]\draw
        (0,0) to [open, v^>=$v_{in}$,o-o] (0,4) to [C,l=$22nF$] (2,4) to [L,l=$12mH$]
        ↪  (2,2) to [R,l=$82\Omega$](2,0) to [short](0,0)
        (2,4) -- (4,4) to [open, v^<=$v_{out}$,o-o] (4,0) -- (2,0);
\end{circuitikz}
```

2.2 RC high-pass

C

V_{in} $\begin{matrix}+\\-\end{matrix}$ R V_{out}
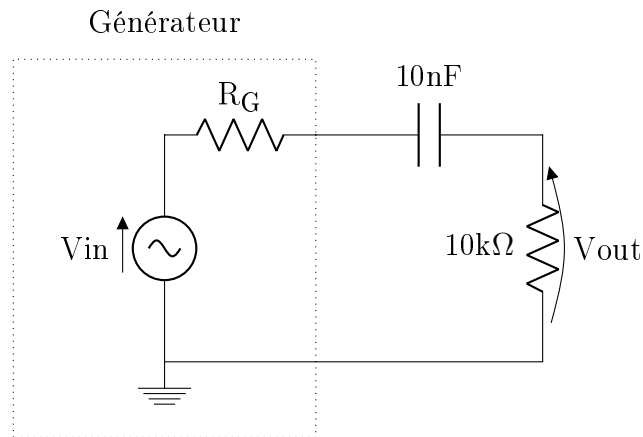
```
\begin{circuitikz} \draw
        (0,0)   node[ground]{}
        to[american voltage source, v=$V_{in}$, invert] (0,3)
        to[C, l=$C$] (3,3)
        (3,0) to[R, l=$R$, v=$V_{out}$] (3,3)
        (3,0)--(0,0);
\end{circuitikz}
```

2.3   RC high-pass with generator

Générateur

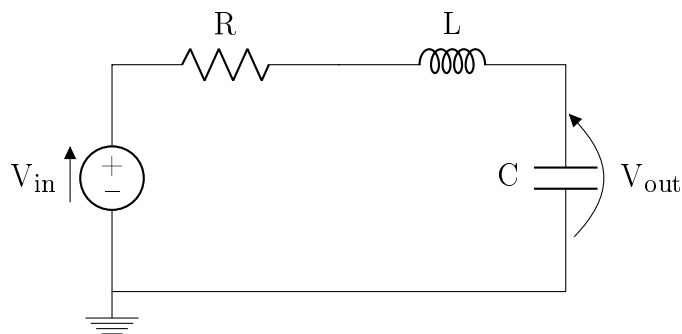```
\begin{circuitikz} \draw
        (0,0)   node[ground]{}
        to[sinusoidal voltage source, v=$V{in}$] (0,3)
        to[R, l=R_G] (2,3)
        to[C, l=$10nF$] (5,3)
        (5,0) to[R, l=$10k\Omega$, v=$V{out}$] (5,3)
        (5,0)--(0,0)
        (0,4.5) node[] {Générateur};
\draw[dotted](-2,-1)--(-2,4)--(2,4)--(2,-1)--(-2,-1);
\end{circuitikz}
```

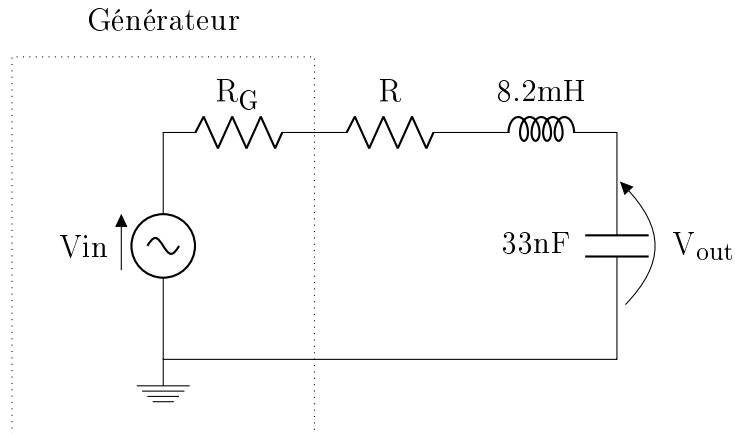## 2.4   RLC - Out on C



```
\begin{circuitikz} \draw
        (0,0)   node[ground]{}
        to[american voltage source, v=V_{in}, invert] (0,3)
        to[R, l=R] (3,3)
        to[L, l=L] (6,3)
        (6,0) to[C, l=C, v=V_{out}] (6,3)
        (6,0)--(0,0);
\end{circuitikz}
```
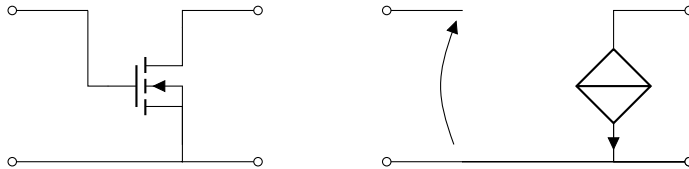
## 2.5 RLC with generator - Out on C

Générateur



```
\begin{circuitikz} \draw
        (0,0)   node[ground]{}
        to[sinusoidal voltage source, v=$V{in}$] (0,3)
        to[R, l=$R_G$] (2,3)
        to[R, l=$R$] (4,3)
        to[L, l=$8.2mH$] (6,3)
        (6,0) to[C, l=$33nF$, v=$V_{out}$] (6,3)
        (6,0)--(0,0)
        (0,4.5) node[] {Générateur};
        \draw[dotted](-2,-1)--(-2,4)--(2,4)--(2,-1)--(-2,-1);
\end{circuitikz}
```

3 Transistors

3.1 Alone
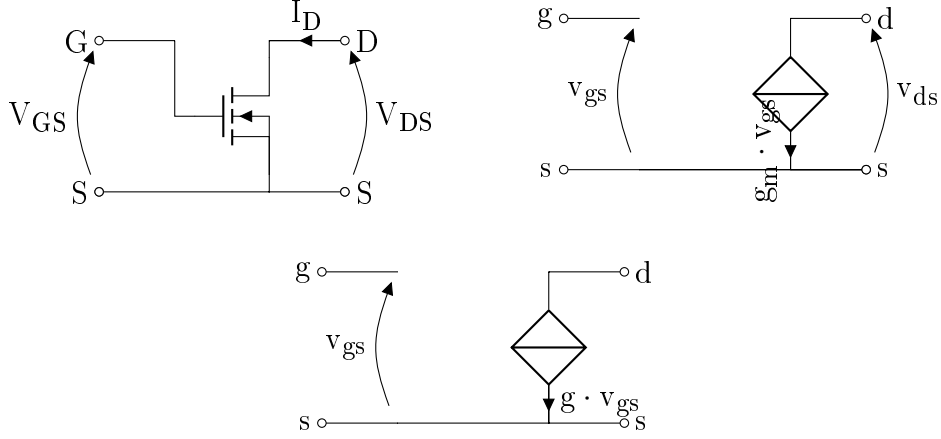


```
\begin{circuitikz} \draw
        (2.25, 1) node[nfet] (mos) {}
        (mos.D) -- (2.25, 2) to  [short, -o](3.25, 2)  node[anchor=west] {}
        ↪   %D
        (mos.S) -- (2.25, 0) to [short, -o](3.25, 0)  node[anchor=west] { }
        ↪   %S
        (mos.B) -- (mos.S)
        (2.25,0) to [short, -o](0,0)  node[anchor=east] {} %S
        (0,2)  node[anchor=east]{}[short, o-] to  (1,2)  %G
        (1,2) -- (1,1) -- (mos.G)
        ;
\end{circuitikz}\hspace*{1cm}
\begin{circuitikz}\draw
        (0,0) node[anchor=east] {} %g
        to [short, o-] (1,0)
        to [open, v<={~}] (1,-2)
        to [short, -o] (4,-2)
        to [short, -o] (0,-2) node[anchor=east] {} %s
        (3,0) to [cI, i={~}] (3,-2)
        (3,-2) to [short, -o] (4,-2) node[anchor=west] {} %s
        (3,0) to [short, -o] (4,0)
```

3

```
                to node[anchor=west] {} (4,0) %d
;\end{circuitikz}
```

3.2   Alone with voltage and current


```
\begin{circuitikz} \draw
    (2.25, 1) node[nfet] (mos) {}
    (mos.D) -- (2.25, 2) to  [short, -o, i<=$I_D$](3.25, 2)  node[anchor=west] {D}
    ↪  %D
    (mos.S) -- (2.25, 0) to [short, -o](3.25, 0)  node[anchor=west] {S}
    ↪  %S
    (mos.B) -- (mos.S)
    (2.25,0) to [short, -o](0,0)  node[anchor=east] {S} %S
    (0,2)  node[anchor=east]{G}[short, o-] to  (1,2) %G
    (1,2) -- (1,1) -- (mos.G)
    (0,0) [open,v^>=$V_{GS}$] to (0,2)
    (3.25,0) [open,v>=$V_{DS}$] to (3.25,2)
;\end{circuitikz}\hspace*{1cm}
\begin{circuitikz}\draw
    (0,0) node[anchor=east] {g} %g
    to [short, o-] (1,0)
    to [open, v<=$v_{gs}$] (1,-2)
    to [short, -o] (4,-2)
    to [short, -o] (0,-2) node[anchor=east] {s} %s
    (3,0) to [cI, i_=\rotatebox{90}{$g_m\cdot v_{gs}$}] (3,-2)
    (3,-2) to [short, -o] (4,-2) node[anchor=west] {s} %s
    (3,0) to [short, -o] (4,0)
    to node[anchor=west] {d} (4,0) %d
    (4.0,-2) [open,v>=$v_{ds}$] to (4.0,0)
;\end{circuitikz}

\begin{circuitikz}\draw
    (0,0) node[anchor=east] {g}
    to [short, o-] (1,0)
    to [open, v<=$v_{gs}$] (1,-2)
    to [short, -o] (0,-2)
    to  (0,-2) node[anchor=east] {s}
    (3,0) to [cI=$ g \cdot v_{gs}$] (3,-2)
    (3,-2) to [short, -o] (4,-2) node[anchor=west] {s}
    (3,0) to [short, -o] (4,0)
    to node[anchor=west] {d} (4,0)
    (1,-2) -- (3,-2)
;\end{circuitikz}
```
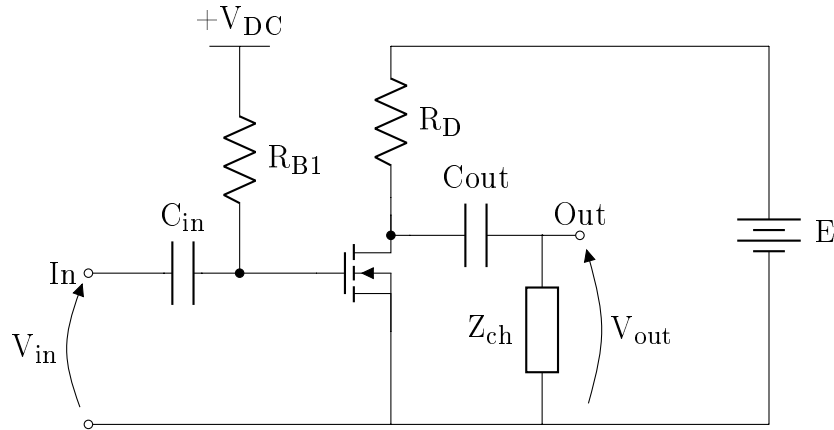
3.3 Full common source
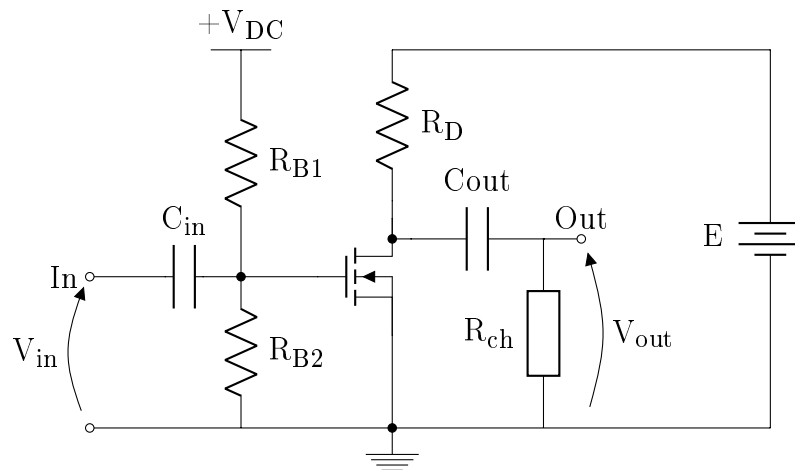

```
\begin{circuitikz}[scale=1]\draw
(0,1) to [short,o-] (9,1)
(4,6) to [short] (9,6)
(0,3) node[anchor=east] {In} to [short,o-] (1,3)
(0,3) node[anchor=south]{} to [open, v_<=$V_{in}$]  (0,1)
(1,3) to [C=$C_{in}$ ](1.5,3)
(1.5,3) to [short,-*] (2,3) node[anchor=south west]{}

(2,6) node[anchor=south ] (alim) {$+V_{DC}$}
(1.6,6) -- (2.4,6) %bar under the label
(2,3) to [R, l_=$R_{B1}$](2,6)
(2,3) to [R=$R_{B2}$](2,1)
(4,3) node[nfet] (mos) {}
(mos.G) to [short] (2,3)
(mos.D) to (4,4) to [R, l_=$R_D$] (4, 6)
(mos.D) to [short,-*](4,3.5)  to [short] (4.25,3.5)
(mos.S) to [short] (4,1)% to [short, -o](2,0)  node[anchor=west] {S}
(mos.S) -- (mos.B) %source to bulk connection

(4.25,3.5) node[anchor=south]{} to [C, l^=$C{out}$] (6,3.5) to
↪  [short](6,3.5)node[anchor=south]{} to [short,-o](6.5,3.5)node [anchor=south]
↪  {Out}
(6,3.5) to [generic, l_=$R_{ch}$] (6,1)
(6.5,3.5) to [open,v^<=$V_{out}$] (6.5,1)
(9,6) to [battery, l_=$E$](9,1)
(4,1) node[circ]{}
(4,1) node[ground]{}
;\end{circuitikz}
```

3.4 Common source - Direct polarisation


```
\begin{circuitikz}[scale=1]\draw
    (0,1) to [short,o-] (9,1)
    (4,6) to [short] (9,6)
    (0,3) node[anchor=east] {In} to [short,o-] (1,3)
    (0,3) to [open, v_<=$V_{in}$]   (0,1)
    (1,3) to [C=$C_{in}$ ](1.5,3)
    (1.5,3) to [short,-*] (2,3)
    (2,6) node[anchor=south ] (alim) {$+V_{DC}$}
    (1.6,6) -- (2.4,6) %bar under the label
    (2,3) to [R, l_=$R_{B1}$](2,6)
    (4,3) node[nfet] (mos) {}
    (mos.G) to [short] (2,3)
    (mos.D) to (4,4) to [R, l_=$R_D$] (4, 6)
    (mos.D) to [short,-*](4,3.5)  to [short] (4.25,3.5)
    (mos.S) to [short] (4,1)% to [short, -o](2,0)  node[anchor=west] {S}
    (mos.S) -- (mos.B) %source to bulk connection

    (4.25,3.5) to [C, l^=$C{out}$] (6,3.5) to  [short](6,3.5) to [short,-o](6.5,3.5)node
    ↪  [anchor=south] {Out}
    (6,3.5) to [generic, l_=$Z_{ch}$] (6,1)
    (6.5,3.5) to [open,v^<=$V_{out}$] (6.5,1)
    (9,6) to [battery, l=$E$](9,1)
;\end{circuitikz}
```

3.5 Common source - small signal
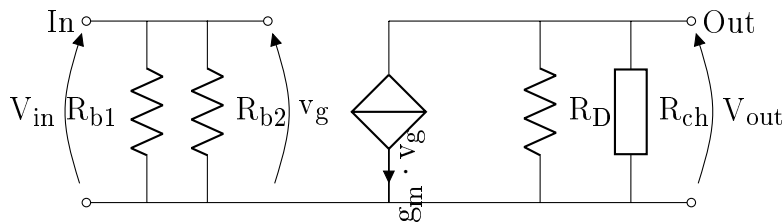

```
\begin{circuitikz}[scale=0.8]\draw
    (1,0) to [short,o-o] (11,0)
    (1,3) node[anchor=east] {In} to [short,o-] (1,3)
    (1,3) to [open, v_<=$V_{in}$]   (1,0)
    (1,3) to [short] (3,3)
    (2,3) to [R, l_=$R_{b1}$](2,0)
    (3,3) to [R=$R_{b2}$](3,0)
    (3,3) to [short,-o](4,3) node [anchor=west] {}
    (4,3) to [open, v^<=$v_{g}$](4,0)
    (6,3) to [cI=\rotatebox{90}{$g_m \cdot v_{g}$}] (6,0)
```
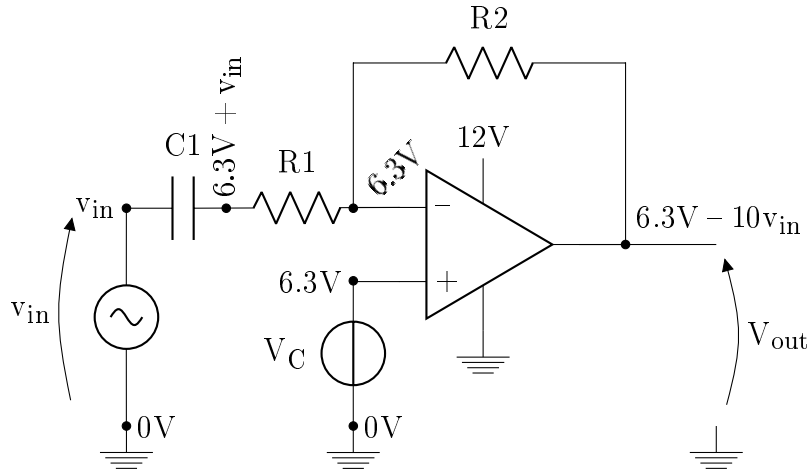
```
            (8.5,0) to [R,l_=$R_D$] (8.5,3)
            (10,3) to [generic, l=$R_{ch}$] (10,0)
            (6,3) to [short,-o] (11,3) node [anchor=west] {Out}
            (11,3) to [open, v^<=$V_{out}$](11,0)
        ;\end{circuitikz}
```

4   Operational amplifiers

4.1   Inverter with voltage and buffered offset


```
        \begin{circuitikz} [scale=1.2]\draw
            (0,0) node[op amp] (opamp) {}
            (opamp.down) ++ (0,-0.5) node[ground]{} -- (opamp.down)
            (opamp.up) ++ (0,.5) node[above] {12V} -- (opamp.up)
            (opamp.-) -| (-1.5,2) to [R, l=$R2$] (1.5,2) |- (opamp.out)
            (opamp.+) -| (-1.5,-0.4) to [european voltage source, l_=$V_{C}$,-*] (-1.5,-2)
            ↪ node[ground] {}
            (-4,-2) node[ground] {}  to [sV,*-*] (-4,0.4) |- ++(0.5,0) to [C,l=$C1$]
            ↪ ++(0.25,0) to [R,l=$R1$] (opamp.-)
            (-4,-2) node[anchor=west] {$0V$}
            (-1.5,-2) node[anchor=west] {$0V$}
            (-2.9,0.4) node[circ]{}
            (-2.9,0.4) node[anchor=south]{\rotatebox{90}{$6.3V+v_{in}$}}
            (-1.5,0.4) node[circ]{}
            (-1.5,0.4) node[anchor=south west]{\rotatebox{42}{$6.3V$}}
            (-1.5,-0.4) node[circ]{}
            (-1.5,-0.4) node[anchor=east]{$6.3V$}
            (1.5,0) node[circ]{}
            (1.5,0) node[anchor=south west]{$6.3V-10v_{in}$}
            (opamp.out) to (2.5,0)
            (2.5,-2) node[ground] {} to [open, v>=$V_{out}$] (2.5,0)
            (-4.5,-2) to [open, v^>=$v_{in}$] (-4.5,0.5)
            (-4,0.4) node[anchor=east] {$v_{in}$}
        ;\end{circuitikz}
```
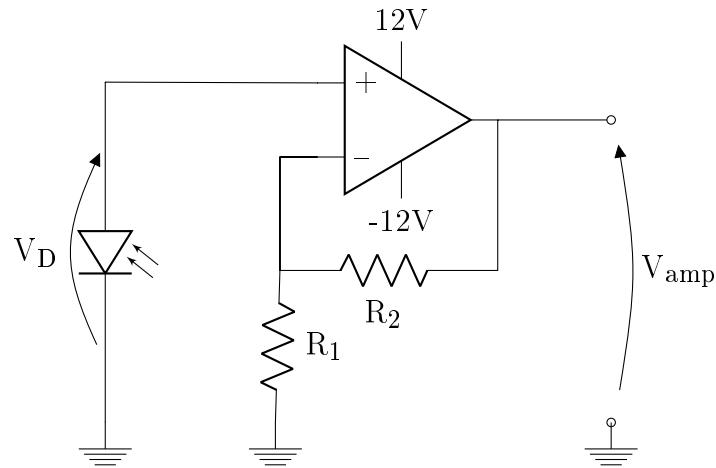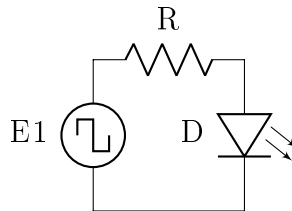
```
\begin{circuitikz}\draw
        (0,4.5) to [photodiode,v_<=$V_D$, ] (0,0) node [ground] {}
        (4,4) node[op amp, yscale=-1] (opamp) {}
        (opamp.down) ++ (0,+0.5) node[above] {12V} -- (opamp.down)
        (opamp.up) ++ (0,-0.5) node[below] {-12V} -- (opamp.up)
        (opamp.-) -| ++(-0.5,-1.5) to [R, l_=$R_2$] ++(2.75,0) -|  (opamp.out)
        (opamp.-) -| ++(-0.5,-1.5) to [R, l=$R_1$] (2.25,0) node[ground] {}
        (opamp.+) to [short](0,4.5)
        (opamp.out) to [short] ++(1.5,0) node (A) {}
        to [open, v^<=$V_{amp}$, o-o] ++(0,-4) node [ground]{}
        ;
\end{circuitikz}
```

5   Diodes

5.1   Pulsed LED

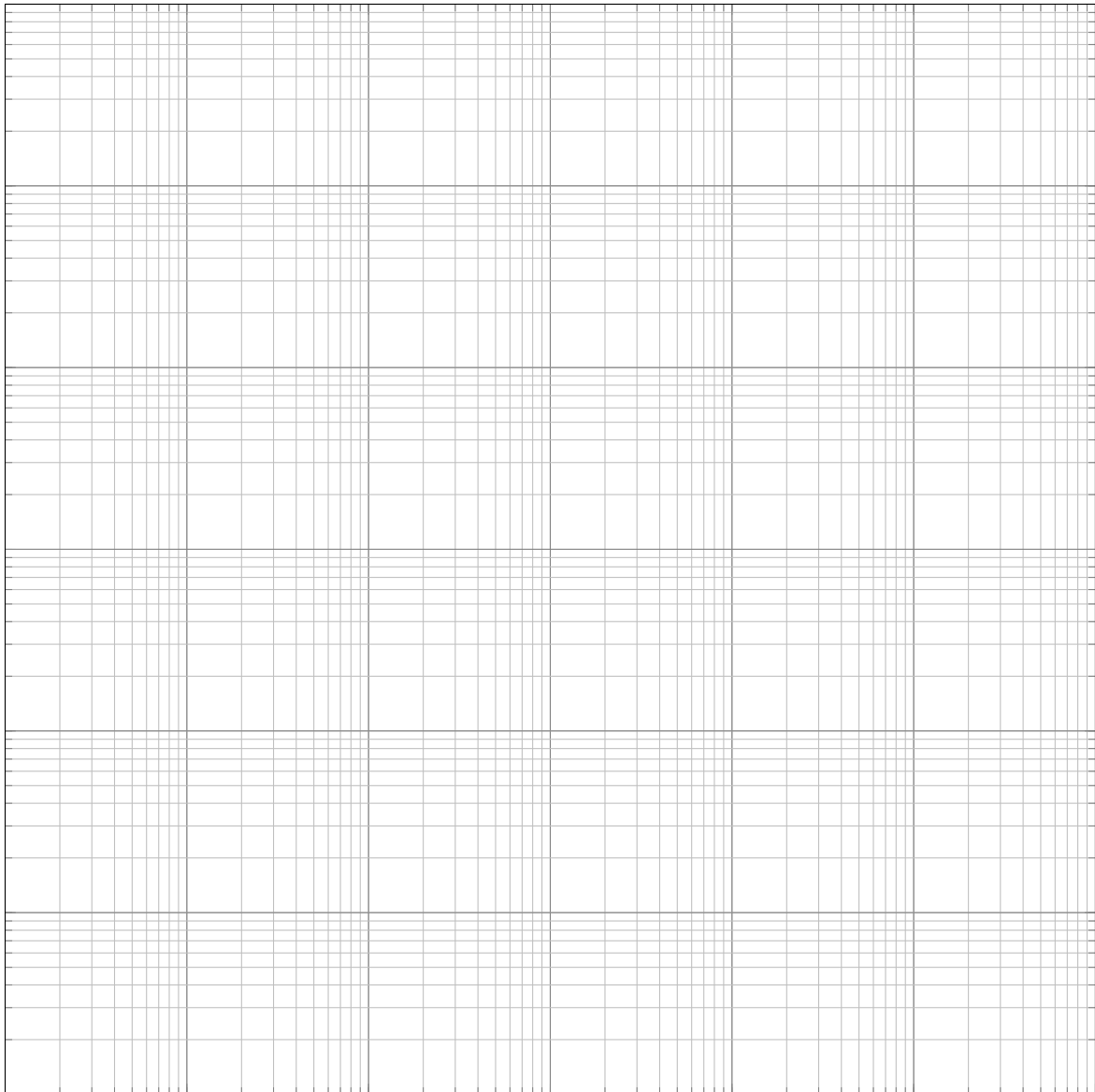```
\begin{circuitikz}\draw
        (0,0) to [square voltage source, l=$E1$] (0,2) to [R, l=R] (2,2) to [led,
↪ l_=D](2,0) --(0,0)
        ;
\end{circuitikz}
```
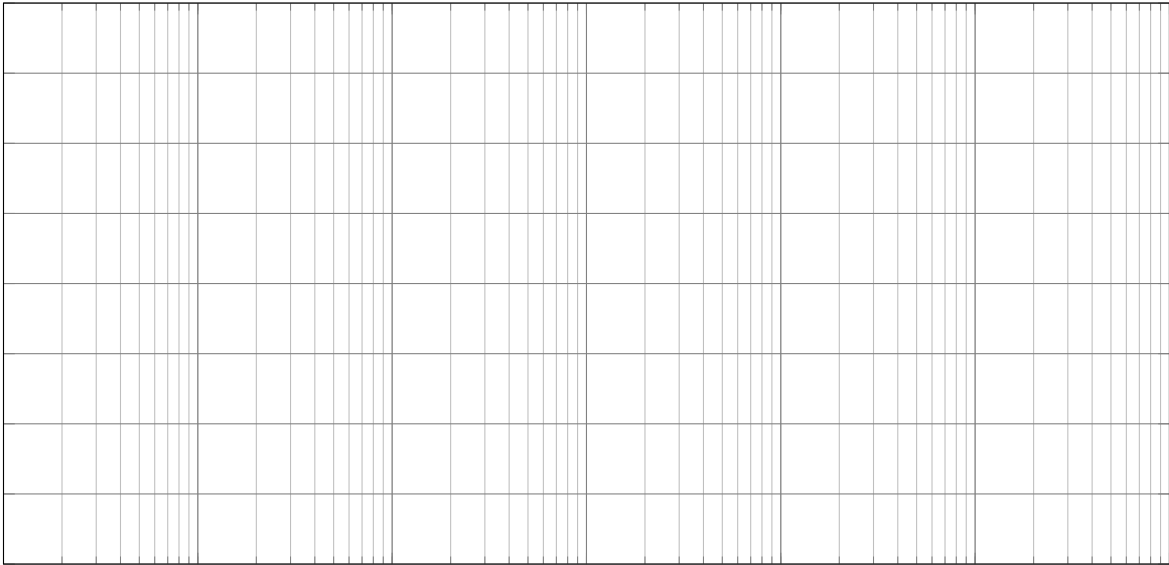
# 6  Graphs

## 6.1  Logarithmic axis



```
\begin{tikzpicture}
    \begin{loglogaxis}[
        xmin=1e-1, xmax=1e5,
        ymin=1e-1, ymax=1e5,
        yticklabels={,,},
        xticklabels={,,},
        grid=both,
        width=17cm,
        height=17cm,
        major grid style={black!50}
        ]
    \end{loglogaxis}
\end{tikzpicture}
```

6.2 Semi-logarithmic axis


```
\begin{tikzpicture}
    \begin{axis}[
        xmode=log,
        xmin=1e-1, xmax=1e5,
        ymin=1, ymax=9,
        yticklabels={,,},
        xticklabels={,,},
        grid=both,
        width=17cm,
        height=9cm,
        major grid style={black!50}
        ]
    \end{axis}
\end{tikzpicture}
```

Table des matières