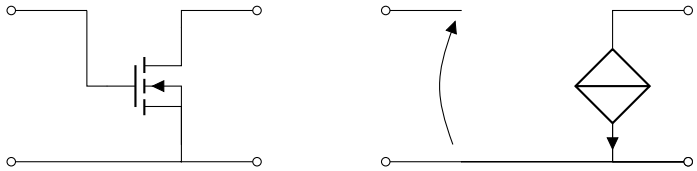
18 janvier 2019

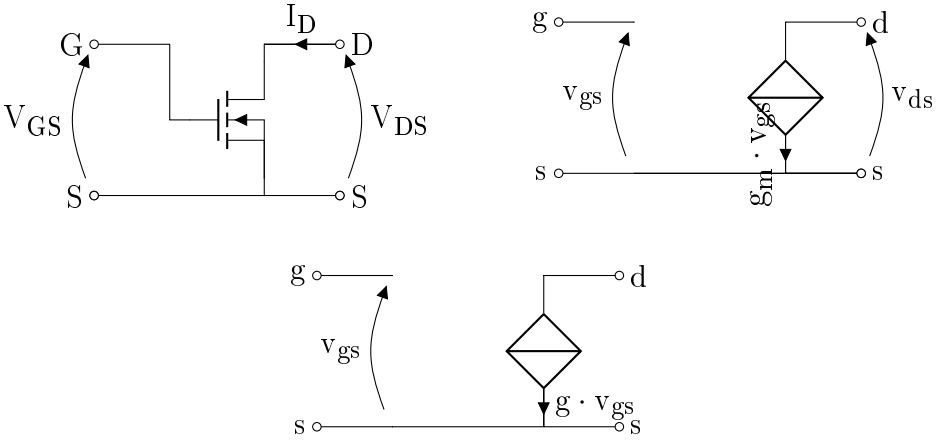
1 Transistors

1.1 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)
                to node[anchor=west] {} (4,0) %d
;\end{circuitikz}
```

1.2 Alone with voltage and current

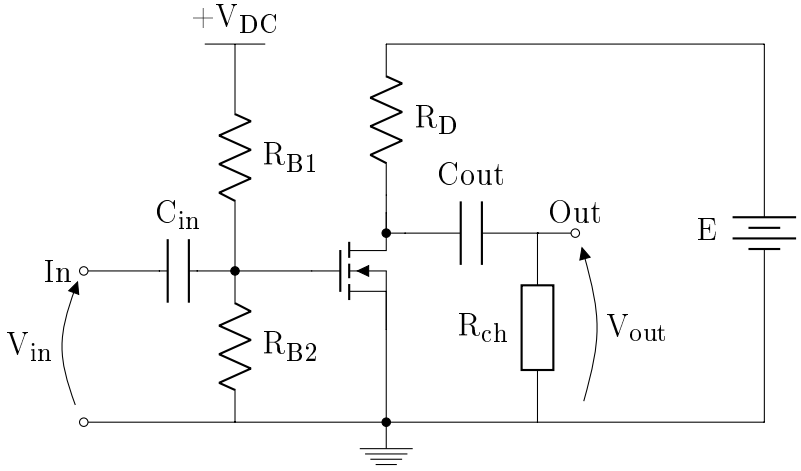



```
\begin{circuitikz} \draw
        (2.25, 1) node[nfet] (mos) {}
        (mos.D) -- (2.25, 2) to  [short, -o, i<=$I_D$](3.25, 2)  node[anchor=west] {D}
        ↪  %D
```

```
        (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}
```

1.3 Full common source



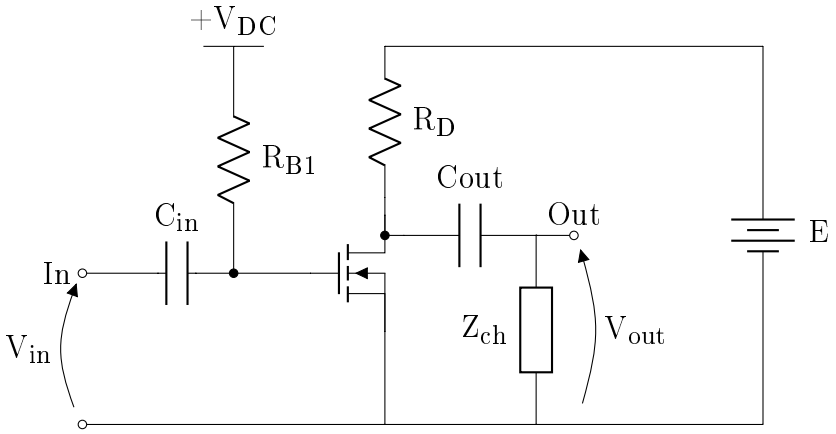

```
\begin{circuitikz}[scale=1]\draw
(0,1) to [short,o-] (9,1)
(4,6) to [short] (9,6)
(0,3) node[anchor=east] {In} to [short,o-] (1,3)
(0,3) node[anchor=south]{} to [open, v_<=$V_{in}$]  (0,1)
(1,3) to [C=$C_{in}$ ](1.5,3)
(1.5,3) to [short,-*] (2,3) node[anchor=south west]{}

(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}
```

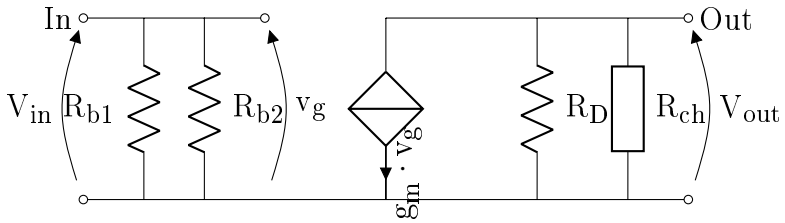
1.4 Common source - Direct polarisation




```
\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}
```

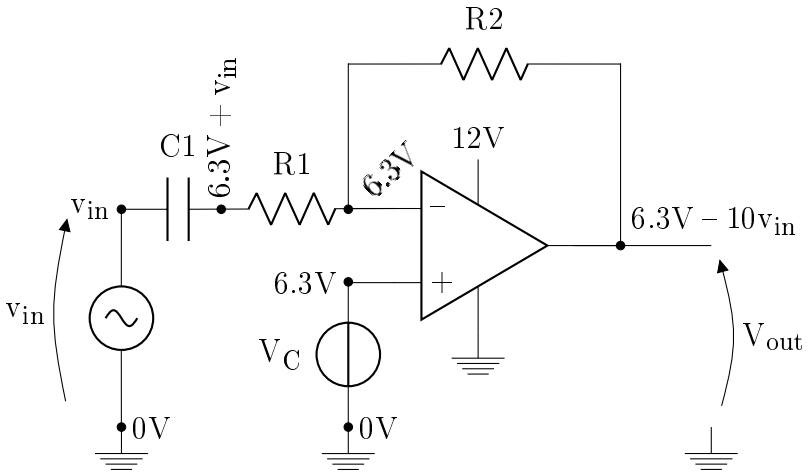
1.5 Common source - small signal




```
\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}
```

2 Operational amplifiers

2.1 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}
```

Table des matières