Compatibilité de la bibliothèque circuits.ee.IEC de Ti*k*Z avec CircuiTi*k*Z

JO BONNÉ

13 novembre 2016

Résumé

Ce document a trait aux schémas d'électricité et d'électronique sous LaTeX. Il est possible d'utiliser en même temps la bibliothèque `circuits.ee.IEC` du package Ti*k*Z et le package CircuiTi*k*Z. Il suffit juste de respecter un léger protocole et ainsi les documents déjà conçus avec l'un ou l'autre n'auront pas à être refaits, bien au contraire : ils pourront être améliorés par de nouveaux schémas plus riches en composants.

En effectuant une recherche avec les mots-clés `Schaltbilder mit TikZ` on trouvera à l'adresse `http://matheplanet.com/default3.html` un article permettant de prendre connaissance des derniers développements de la bibliothèque `circuits.ee.IEC` de Ti*k*Z. On y trouve notamment de nombreux schémas de composants adaptés au niveau de l'enseignement secondaire qu'on peut adapter en suivant les règles habituelles de Ti*k*Z.

À l'adresse `http://ctan.triasinformatica.nl/graphics/pgf/contrib/circuitikz/doc/circuitikzmanual.pdf` on trouvera la documentation la plus récente du package LaTeX intitulé `circuitikz` permettant de réaliser de beaux schémas électroniques avec de très nombreux composants, bien au-delà de ceux qu'on rencontre dans le secondaire. Par contre `circuitikz` trouverait toute sa place pour la réalisation de schémas dans le cadre d'un enseignement de l'électronique, en ICN, ISN ou dans des activités de type FabLab.

Remarque : La version la plus récente de CircuiTi*k*Z est la 0.7 (septembre 2016). Elle est disponible à l'adresse `https://github.com/circuitikz/circuitikz/tree/master/tex`. Pour utiliser cette version, deux solutions possibles :

- placer les fichiers de ce dossier `tex` dans le même dossier que celui du document en cours d'élaboration.
- créer un dossier par exemple `circuitikz` y mettre les fichiers du dossier `tex` puis placer ce dossier dans `texmf/tex/latex` du dossier personnel d'Ubuntu s'il existe, sinon il faut le créer.

La version 0.7 permet notamment de disposer de 2 labels par composants (`l` et `a`).
Attention : les piles ont été inversées par rapport aux versions antérieures!

1–Modifications du code dans le document source

1.1–Dans le préambule

```
\usepackage[upright]{fourier}
%recommandé pour le respect de la typographie française
\usepackage[siunitx,compatibility,european,cuteinductors]{circuitikz}
% option siunitx le package est alors chargé
% option compatibility pour assurer la compatibilité de la bibliothèque circuits.ee.IEC avec circuitikz
% option european pour que les composants soient dans le style européen (par exemple résistance représentée par un rectangle et non un ressort)
% option cuteinductors pour ue représentation réaliste des bobines. Autres possibilités: american pour des demi-arcades ou european pour des
    rectangles noirs
% circuitikz charge tikz
\usetikzlibrary{circuits.ee.IEC}
\usetikzlibrary{babel}
% bibliothèque indispensable en utilisant le package babel avec l'option french
\ctikzset{bipoles/length=.9cm}% échelle permettant d'adapter la taille des composants
\usepackage[french]{babel}
```

1.2–Dans le corps du document

Avec ce préambule, il est impératif d'ajouter * devant le nom de la plupart des composants.

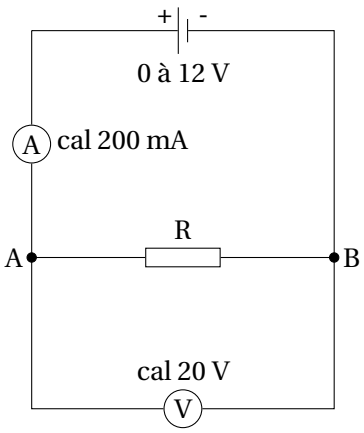
```
\tikz \draw (0,0) to[*R=2<\ohm>] (2,0);
%au lieu de \tikz \draw (0,0) to[R=2<\ohm>] (2,0);
```

2–Utilisation conjointe de la bibliothèque circuits.ee.IEC et de CircuiTi*k*Z

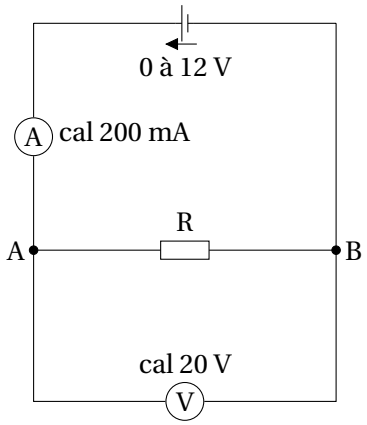
La bibliothèque `circuits.ee.IEC` a l'avantage de fournir des composants autour lesquels on peut plus facilement ajouter des informations. `circuitikz` est beaucoup plus riche en composants et les informations principales prévues par l'auteur sont aisées à mettre en place.

Heureusement, les 2 méthodes peuvent être utilisées ensemble dans un même schéma électrique, dans un environnement `tikzpicture` comme dans le deuxième exemple :

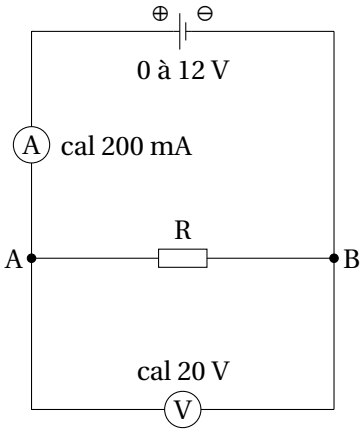
```
\hfil\begin{tikzpicture}[circuit ee IEC]%
    bibliothèque circuit ee IEC uniquement
\draw (0,0)to [battery={info={[yshift=-1em]+\
    quad -},info'={0 à 12~V}}] (4,0)--(4,-3)
node[contact]{}node[right]{B}to[resistor={info
    '=$R$}](0,-3)node[left]{A}node[contact]{}
    to[Ameter={info={[yshift=-1.3em,xshift=1.2
    cm]cal 200~mA}}](0,0);
\draw (0,-3)--(0,-5)to[Vmeter={info={cal 20~V
    }}](4,-5)--(4,-3);
\end{tikzpicture}
```



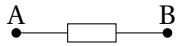
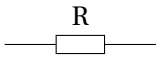
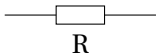
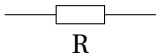
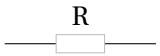
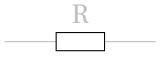
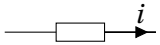
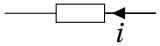

```
\hfil\begin{tikzpicture}[circuit ee IEC]%
    bibliothèque circuit ee IEC et commandes
    circuitikz
\draw(4,0)to[*battery1=0 à 12~V,invert](0,0)to
    [Ameter={info={[yshift=-1.3em,xshift=1.2cm
    ]cal 200~mA}}](0,-3)node[left]{A}to[*R=$R
    $,*-*](4,-3)node[right]{B}--(4,0);
\draw (0,-3)--(0,-5)to[Vmeter={info={cal 20~V
    }}](4,-5)--(4,-3);
\end{tikzpicture}
```

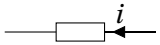
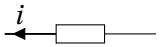
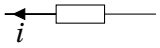
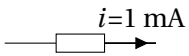
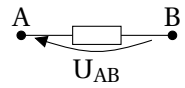
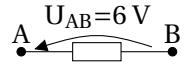
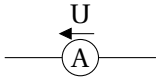


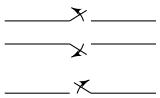

```
\hfil\begin{tikzpicture}%commandes circuitikz
\draw(4,0)to[*battery,invert1,l=0 à 12~V](0,0)
    to[*esource,n=a,l=cal 200~mA](0,-3)node at
    (a){A}node[left]{A}to[*R=$R$,*-*](4,-3)
    node[right]{B}to(4,0);
\draw (0,-3)to(0,-5)to[*esource,n=v,l=cal 20~V
    ](4,-5)node at(v){V}to(4,-3);
\end{tikzpicture}
```



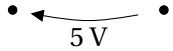
3–Quelques options, paramètres et astuces de circuitikz

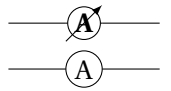
option	code	résultat	commentaire
extrémités	`\draw(0,0)node[above]{A}to[*R,*-*](2,0)node[above]{B};`		cercle plein : `*` cercle vide : `o`
`label` ou `l`	`\draw(0,0)to[*R,l=R](2,0);`		raccourci : `\draw(0,0)to[*R=R](2,0);`
	`\draw(0,0)to[*R,l_=R](2,0);`		label au-dessus : `l` ou `l^` label en-dessous : `l_`
`a`	`\draw(0,0)to[*R,a=R](2,0);`		attention : `a` est un deuxième label disponible. Il a été introduit avec la version 0.7 de CircuiTi*k*Z
couleur	`\draw(0,0)to[*R,l=R,color=lightgray](2,0);`		seul le composant est coloré
	`\tikz\draw[lightgray](0,0)to[*R,l=R](2,0);`		seul le composant n'est pas coloré
`name` ou `l`	`\draw(0,0)to[*esource,n=a](2,0)node at (a){A};`		astuce pour un ampèremètre sans flèche. idem pour n'importe quel autre appareil
`i`	`\draw(0,0)to[*R,i=$i$](2,0);`		variantes : `i>=$i$` ou `i^>=$i$`
	`\draw(0,0)to[*R,i_>=$i$](2,0);`		
	`\draw(0,0)to[*R,i_<=$i$](2,0);`		

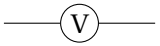
option	code	résultat	commentaire
	`\draw(0,0)to[*R,i^<=$i$](2,0);`		
	`\draw(0,0)to[*R,i<=$i$](2,0);`		
	`\draw(0,0)to[*R,i<_=$i$](2,0);`		
	`\draw(0,0)to[*R,i>_=$i$](2,0);`		
	`\draw(0,0)to[*R,i=$i${=}1~mA,inner sep=2mm](2,0);`		variante : `i=\mbox{$i=1$~mA}` `inner sep` permet d'éloigner l'étiquette.
	`\draw(0,0)to[*R,i=$i${=}1~mA,inner sep=2mm](2,0);`		autre syntaxe : `$\SI{1}{\milli\ampere}$`
v	`\draw(0,0)node[above]{A}to[*R,v<=$U_{AB}$,*-*](2,0)node[above]{B};`		
	`\draw(0,0)node[above]{A}to[*R,v^<=$U_{AB}{=}6$~V,*-*](2,0)node[above]{B};`		
	`\draw(0,0)to[*esource,n=a,v<=U](2,0)node at (a){A};`		

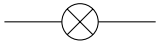
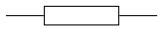
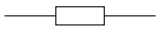
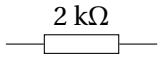
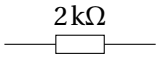
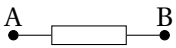
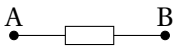
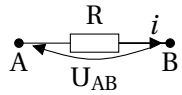
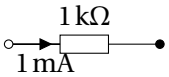
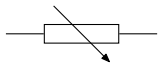
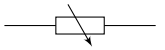
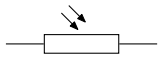
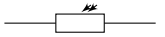
`mirror`
`invert`
	`\draw (0,0)to[*ospst](2,0);`
	`\draw (0,0)to[*ospst,mirror](2,0);`
	`\draw (0,0)to[*ospst,invert](2,0);`
			remarque : `mirror` et `yscale=-1` ne sont pas interchangeables

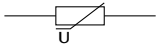
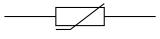
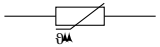
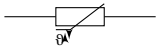
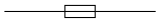
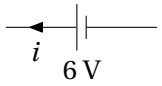
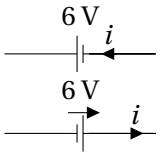
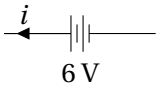
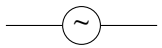
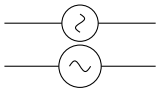
4–Comparaison entre circuits.ee.IEC et circuitikz

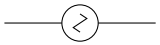
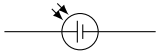
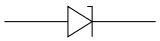
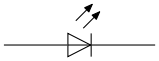
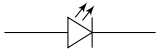
composant	**circuits.ee.IEC** `\tikz[circuit ee IEC]`	**circuitikz** `\tikz`
câble entre 2 points	`\draw(0,0)node{$\bullet$}--(2,0)node{$\bullet$};`	`\draw(0,0)to[*short,*-*](2,0);`
rien entre 2 points		`\draw(0,0)to[*open,*-*,v<=5~V](2,0);` 

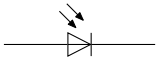
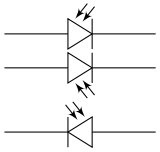
ampèremètre	Dans le préambule :`\tikzset{circuit declare symbol = Ameter}`
	`\tikzset{set Ameter graphic ={draw,generic circle IEC, minimum size=5mm,info=center:A}}`
	Dans le document :`\draw(0,0)to[Ameter](2,0);`
	 
		`\draw(0,0)to[*ammeter](2,0);`
		`\draw (0,0)to[*esource,name=a](2,0)node at (a ){A};`
		 

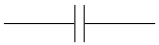
voltmètre	Dans le préambule :`\tikzset{circuit declare symbol = Vmeter}` `\tikzset{set Vmeter graphic ={draw,generic circle IEC, minimum size=5mm,info=center:V}}` Dans le document :`\draw(0,0)to[Vmeter](2,0);` 	`\draw(0,0)to[*voltmeter](2,0);` 
ohmmètre	Dans le préambule :`\tikzset{circuit declare symbol = Ometer}` `\tikzset{set Ometer graphic ={draw,generic circle IEC, minimum size=5mm,info=center:$\Omega$}}` Dans le document :`\draw(0,0)to[Ometer](2,0);` 	`\tikz\draw(0,0)to[*ohmmeter](2,0);` 

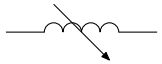
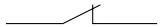
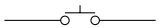
composant	**circuits.ee.IEC** `\tikz[circuit ee IEC]`	**circuitikz** `\tikz`
lampe	`\draw(0,0)to[bulb](2,0);` 	`\draw(0,0)to[*lamp](2,0);` 
résistance	`\draw(0,0)to[resistor](2,0);` 	`\draw(0,0)to[*R](2,0);` 
	`\draw(0,0)to[resistor={info={2~k$\Omega $}}](2,0);` 	`\draw (0,0)to[*R=2<\kilo\ohm>] (2,0);` 
	`\draw(0,0)to[resistor={pos=.4},current direction={pos=.8,info=$i$}](2,0);` 	`\draw (0,0)to[*R, i^>=$i$] (2,0);` 
	`\draw(0,0)node[above]{A}to[contact={pos=0}, resistor,contact={pos=1}](2,0)node[above]{B};` `\draw(0,0)node[above]{A}node[contact]{}to[ resistor](2,0)node[contact]{}node[above]{B};` 	`\draw (0,0)node[above]{A} to[*R, *-*] (2,0) node[above]{B};` 
		`\draw (0,0)node[below]{A} to[*R=$R$, i=$i$, v <=$U_{AB}$, *-*] (2,0)node[below]{B};` 
		`\draw (0,0)to[*R=1<\kilo\ohm>,i>_=1<\milli\ ampere>, o-*] (2,0);` 
rhéostat	`\draw(0,0)to[resistor=adjustable'](2,0);` 	`\draw(0,0)to[*vR](2,0);` 
photorésistance	`\draw(0,0)to[resistor=light dependent](2,0);` 	`\draw(0,0)to[*phR](2,0);` `\draw(0,0)to[*photoresistor](2,0);` 

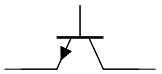
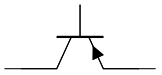
composant	**circuits.ee.IEC** `\tikz[circuit ee IEC]`	**circuitikz** `\tikz`
varistance		`\draw(0,0)to[*varistor](2,0);` 
thermistance		`\draw(0,0)to[*thR](2,0);` `\draw(0,0)to[*thermistor](2,0);` 
PTC		`\draw(0,0)to[*thRp](2,0);` `\draw(0,0)to[*thermistor ptc](2,0);` 
NTC		`\draw(0,0)to[*thRn](2,0);` `\draw(0,0)to[*thermistor ntc](2,0);` 
fusible		`\draw(0,0)to[*fuse](2,0);` 
pile	`\draw(0,0)to[current direction'={info=$i$,pos =.2},battery={info'=6~V,pos=.5}](2,0);` 	`\draw (0,0)to[*battery1,l=6~V, i^<=$i$](2,0);` `\draw (0,0)to[*battery1=6~V,invert, i^>=$i$] (2,0);` 
		`\draw (0,0)to[*battery,a=6~V, i<^=$i$] (2,0);` 
générateur sinusoïdal	Dans le préambule `\tikzset{circuit declare symbol = AC}` et `\tikzset{set AC graphic ={draw,generic circle IEC, minimum size=5mm,info=center:$\sim$}}` Dans le document : `\draw(0,0)to[AC](2,0);` 	`\draw (2,0)to[*sV](0,0);` `\draw (2,0)to[*vco](0,0);` 

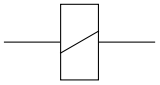
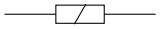
composant	**circuits.ee.IEC** `\tikz[circuit ee IEC]`	**circuitikz** `\tikz`
générateur de tension en créneau		`\draw (2,0)to[*sqV](0,0);` 
générateur de tension en dents de scie		`\draw (2,0)to[*tV](0,0);` 
cellule photovoltaïque		`\draw (2,0)to[*pvsource](0,0);` 
diode	`\draw(0,0)to[diode](2,0);` 	`\draw (0,0)to[*Do](2,0);` 
diode Zener	`\draw(0,0)to[Zener diode](2,0);` 	`\draw (0,0)to[*zDo](2,0);` 
LED	`\draw(0,0)to[diode=light emitting](2,0);` 	`\draw (0,0)to[*leDo](2,0);` 

photodiode	`\draw(0,0)to[diode=light dependent](2,0);` 	`\draw (0,0)to[*pDo](2,0);`
		`\draw (0,0)to[*pDo,mirror](2,0);`
		`\draw (0,0)to[*pDo,invert](2,0);` 

condensateur	`\draw(0,0)to[capacitor](2,0);` 	`\draw (0,0)to[*C](2,0);` 
quartz		`\draw (0,0)to[*PZ](2,0);` 

composant	**circuits.ee.IEC** `\tikz[circuit ee IEC]`	**circuitikz** `\tikz`
bobine	`\draw(0,0)to[inductor](2,0);`	`\draw (0,0)to[*cute inductor](2,0);` `\draw (0,0)to[*american inductor](2,0);`
bobine variable	`\draw(0,0)to[inductor=adjustable'](2,0);` 	`\draw (0,0)to[*variable cute inductor](2,0);` 
interrupteur fermé	`\draw(0,0)to[break contact](2,0);` 	`\draw (0,0)to[*spst](2,0);` 
interrupteur ouvert	`\draw(0,0)to[make contact](2,0);` 	`\draw (0,0)to[*ospst](2,0);` 
bouton poussoir		`\draw (0,0)to[*push button](2,0);` 
masse		`\node[cground]{};` 
terre	`\draw(0,0)to(0,-.25)to[ground](0,-.5);` 	`\node[ground]{};` TODO
moteur		`\node[elmech]{M};` 
pointe de flèche	`\node[current direction]{} ;` ►	`\node[currarrow]{};` ►

composant	**circuits.ee.IEC** `\tikz[circuit ee IEC]`	**circuitikz** `\tikz`
		`\node[inputarrow]{};` ▸
point	`\node[contact]{} ;` •	`\node[circ]{};` •
		`\node[ocirc]{};` ○
transistor NPN		`\draw(0,0)to[*Tnpn](2,0);` 
transistor PNP		`\draw(0,0)to[*Tpnp](2,0);` 
divers		`\draw(0,0)to[*twoport,t=\resizebox{5mm}{!}{bobine}](2,0);` 

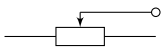
bobine de relais	dans le préambule :
	`\tikzset{circuit declare symbol = relais}`
	`\tikzset{set relais graphic ={draw,name=r, minimum width=5mm,minimum height=10mm,info= center:\tikz\draw(r.30)--(r.210);}}`
	dans le document :`\draw(0,0)to[relais](2,0);` 
		`\draw(0,0)to[*R,n=b](2,0)(b.60)--(b.240);` 

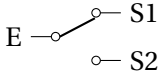
haut-parleur		`\draw(0,0)to[*R,n=a](2,0)(a.45)--($(a.center)!2.3!(a.45)$)--($(a.center)!2.3!(a.135)$)--(a.135);` 

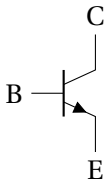
5–Composants à plus de 2 bornes

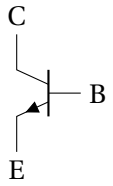
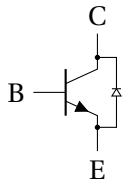
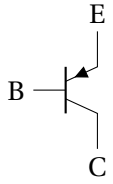
La syntaxe est particulière :

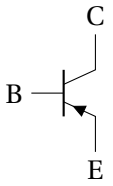
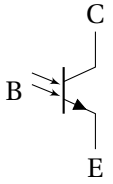
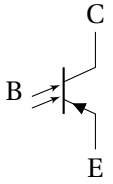
nom	**code**	**résultat**	**commentaire**

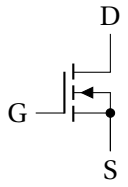
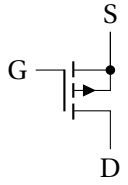
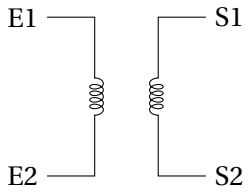
potentiomètre	`\tikz{\draw`
	`  (0,0) to[*pR,n=p] ++(2,0)`
	`  (p.wiper) to[*short,-o] ++(1,0)`
	`;}`
			

interrupteur va-et-vient	`\tikz{\draw`
	`(0,0)node[spdt](sw){}`
	`(sw.in)node[left]{E}`
	`(sw.out 1)node[right]{S1}`
	`(sw.out 2)node[right]{S2}`
	`;}`
			

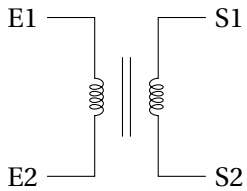
transistor bipolaire NPN	`\tikz{\draw`
	`(0,0)node[npn](t){}`
	`(t.B)node[left]{B}`
	`(t.C)node[above]{C}`
	`(t.E)node[below]{E};`
	`}`
			`(t.B)` ou `(t.base)`
			`(t.C)` ou `(t.collector)`
			`(t.E)` ou `(t.emitter)`

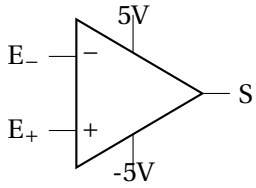
nom	code	résultat	commentaire
transistor NPN	`\tikz{\draw (0,0)node[npn,xscale=-1](t){} (t.B)node[right]{B} (t.C)node[above]{C} (t.E)node[below]{E}; }`		autre option utilisable : `rotate=<angle>`
transistor NPN avec diode roue libre	`\tikz{\draw (0,0)node[npn,bodydiode](t){} (t.B)node[left]{B} (t.C)node[above]{C} (t.E)node[below]{E}; }`		
transistor bipolaire PNP	`\tikz{\draw (0,0)node[pnp](t){} (t.B)node[left]{B} (t.C)node[below]{C} (t.E)node[above]{E}; }`		

nom	code	résultat	commentaire
transistor PNP	`\tikz{\draw (0,0)node[pnp,yscale=-1](t){} (t.B)node[left]{B} (t.C)node[above]{C} (t.E)node[below]{E}; }`		attention : `mirror` et `yscale=-1` ne sont pas interchangeables
phototransistor NPN	`\tikz{\draw (0,0)node[npn,photo](t){} (t.B)node[left]{B} (t.C)node[above]{C} (t.E)node[below]{E}; }`		L'option `nobase` supprime les flèches de lumière vers la base
phototransistor PNP	`\tikz{\draw (0,0)node[pnp,photo,yscale=-1](t){} (t.B)node[left]{B} (t.C)node[above]{C} (t.E)node[below]{E}; }`		

nom	code	résultat	commentaire
transistor MOSFET canal N	`\tikz{\draw (0,0)node[nigfete,solderdot](t){} (t.gate) node[anchor=east] {G} (t.drain) node[anchor=south] {D} (t.source) node[anchor=north] {S} }`		G : grille D : drain S : source
transistor MOSFET canal P	`\tikz{\draw (0,0)node[pigfete,solderdot](t){} (t.gate) node[anchor=east] {G} (t.drain) node[anchor=north] {D} (t.source) node[anchor=south] {S} }`		
transformateur	`\tikz{\draw (0,0)node[transformer](T){} (T.A1)node[anchor=east]{E1} (T.A2)node[anchor=east]{E2} (T.B1)node[anchor=west]{S1} (T.B2)node[anchor=west]{S2} ;}`		

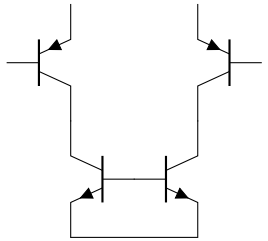
nom	**code**	**résultat**	**commentaire**

transformateur avec noyau	`\tikz{\draw`
	`(0,0)node[transformer core](T){}`
	`(T.A1)node[anchor=east]{E1}`
	`(T.A2)node[anchor=east]{E2}`
	`(T.B1)node[anchor=west]{S1}`
	`(T.B2)node[anchor=west]{S2}`
	`;}`
			

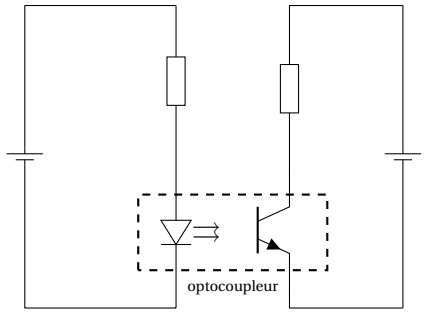
amplificateur opérationnel	`\tikz{\draw`
	`(0,0)node[op amp](oa){}`
	`(oa.+)node[left]{$E_+$}`
	`(oa.-)node[left]{$E_-$}`
	`(oa.out)node[right]{S}`
	`(oa.up)--++(0,0.5)node{5V}`
	`(oa.down)--++(0,-0.5)node{-5V}`
	`;}`
			

Exemples d'utilisation :

```
\begin{tikzpicture}
\draw
(0,0)node[npn](t2){} % place le transistor t2 de droite
(t2.B)node[npn,xscale=-1,anchor=B](t1){} % place le transistor t1 de gauche en base commune avec t2
(t1.C)node[pnp,anchor=C](t3){} % place le transistor t3 en collecteur commun (en haut à gauche) avec
    t1
(t2.C)node[pnp,xscale=-1,anchor=C](t4){} % place le transistor t4 en collecteur commun avec t2
(t1.E) -- (t2.E)
;
\end{tikzpicture}
```

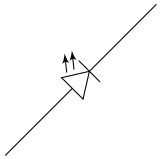


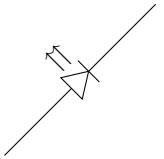
```
\begin{tikzpicture}
\ctikzset{label/align = rotate}%les labels tournent avec le composant
%autres possibilités: straight (labels horizontaux) par défaut ou smart (décidé par LaTeX)
\draw(0,0)to[*battery1,invert](0,4)to++(2,0)to[*R]++(0,-2)to[*Do,l=$\upuparrows$](2,0)--(0,0);
\draw(5,0)to[*battery1,invert]++(0,4)--++(-1.5,0)to[*R]++(0,-2.2)node(A){};
\draw
(A)node[npn,nobase,anchor=C](t){}
(t.E)--(3.5,0)--++(1.5,0);
\draw[dashed,thick] (1.5,.5)rectangle node[below=5mm]{\tiny optocoupleur}++(2.5,1);
\end{tikzpicture}
```



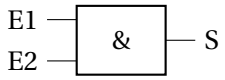
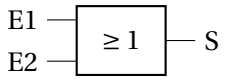
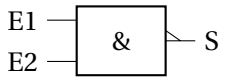
Remarque :

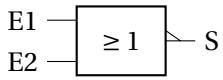
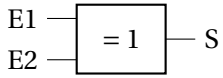
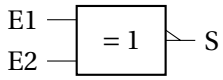
Les labels peuvent aussi recevoir autre chose que du texte. Par exemple on peut reconstruire l'indication de la lumière émise par une LED :

`\tikz\draw(0,0)to[*leDo](2,2);` 

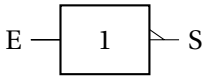
devient : `\tikz\draw(0,0)to[*Do,l=$\upuparrows$](2,2);` 

6–Portes logiques

nom	code	résultat	commentaire
AND	`\tikz{\draw (0,0)node[and port](and){} (and.in 1)node[anchor=east]{E1} (and.in 2)node[anchor=east]{E2} (and.out) node[anchor=west]{S} ;}`		
OR	`\tikz{\draw (0,0)node[or port](and){} (and.in 1)node[anchor=east]{E1} (and.in 2)node[anchor=east]{E2} (and.out) node[anchor=west]{S} ;}`		
NAND	`\tikz{\draw (0,0)node[nand port](and){} (and.in 1)node[anchor=east]{E1} (and.in 2)node[anchor=east]{E2} (and.out) node[anchor=west]{S} ;}`		

nom	code	résultat	commentaire
NOR	`\tikz{\draw (0,0)node[nor port](and){} (and.in 1)node[anchor=east]{E1} (and.in 2)node[anchor=east]{E2} (and.out) node[anchor=west]{S} ;}`		
XOR	`\tikz{\draw (0,0)node[xor port](and){} (and.in 1)node[anchor=east]{E1} (and.in 2)node[anchor=east]{E2} (and.out) node[anchor=west]{S} ;}`		
XNOR	`\tikz{\draw (0,0)node[xnor port](and){} (and.in 1)node[anchor=east]{E1} (and.in 2)node[anchor=east]{E2} (and.out) node[anchor=west]{S} ;}`		

nom	**code**	**résultat**	**commentaire**

NOT	`\tikz{\draw`
	`(0,0)node[not port](not){}`
	`(not.in)node[left]{E}`
	`(not.out)node[right]{S}`
	`;}`
			

ANNEXES

A–Circuits intégrés divers

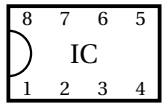
Cette section reprend en partie le document «Creating multipole circuit components for circuitikz» disponible sur le site `www.elfsoft2000.com/projects/multipole.pdf` de JOHN KORMYLO. Il s'agit de créer un circuit intégré de n pins afin de le connecter à d'autres composants en utilisant des règles semblables à `circuitikz`.

Le bloc de code suivant permet d'obtenir un circuit intégré à 8 pins numérotés, avec son détrompeur :

```
\pgfdeclareshape{ic8pin}{
\anchor{center}{\pgfpointorigin} % within the node, (0,0) is the center
\anchor{text} % this is used to center the text in the node
{\pgfpoint{-.5\wd\pgfnodeparttextbox}{-.5\ht\pgfnodeparttextbox}}
\savedanchor\icpina{\pgfpoint{-.75cm}{-.625cm}} % pin 1
\anchor{p1}{\icpina}
\savedanchor\icpinb{\pgfpoint{-.25cm}{-.625cm}} % pin 2
\anchor{p2}{\icpinb}
\savedanchor\icpinc{\pgfpoint{.25cm}{-.625cm}} % pin 3
\anchor{p3}{\icpinc}
\savedanchor\icpind{\pgfpoint{.75cm}{-.625cm}} % pin 4
\anchor{p4}{\icpind}
\savedanchor\icpine{\pgfpoint{.75cm}{.625cm}} % pin 5
\anchor{p5}{\icpine}
\savedanchor\icpinf{\pgfpoint{.25cm}{.625cm}} % pin 6
\anchor{p6}{\icpinf}
\savedanchor\icping{\pgfpoint{-.25cm}{.625cm}} % pin 7
\anchor{p7}{\icping}
\savedanchor\icpinh{\pgfpoint{-.75cm}{.625cm}} % pin 8
\anchor{p8}{\icpinh}
\foregroundpath{ % border and pin numbers are drawn here
\pgfsetlinewidth{0.05cm}
\pgfpathrectanglecorners{\pgfpoint{1cm}{.625cm}}{\pgfpoint{-1cm}{-.625cm}}
\pgfusepath{draw} %draw rectangle
\pgfsetlinewidth{0.03cm}
\pgfpathmoveto{\pgfpoint{-1cm}{-.3cm}}
\pgfpatharc{-90}{90}{.3cm}
\pgfusepath{draw} %draw semicircle
```

```
\pgftext[bottom,at={\pgfpoint{-.75cm}{-.55cm}}]{\scriptsize 1}
\pgftext[bottom,at={\pgfpoint{-.25cm}{-.55cm}}]{\scriptsize 2}
\pgftext[bottom,at={\pgfpoint{.25cm}{-.55cm}}]{\scriptsize 3}
\pgftext[bottom,at={\pgfpoint{.75cm}{-.55cm}}]{\scriptsize 4}
\pgftext[top,at={\pgfpoint{.75cm}{.55cm}}]{\scriptsize 5}
\pgftext[top,at={\pgfpoint{.25cm}{.55cm}}]{\scriptsize 6}
\pgftext[top,at={\pgfpoint{-.25cm}{.55cm}}]{\scriptsize 7}
\pgftext[top,at={\pgfpoint{-.75cm}{.55cm}}]{\scriptsize 8}
}}
```

La commande `\tikz\draw(0,0)node[ic8pin]{IC};` permet d'obtenir :



Voici un exemple de connexions entre 2 circuits intégrés à 8 pins :

```
\begin{circuitikz}
\draw (1,1) node[ic8pin] (IC1) {IC 1};
\draw (3,3) node[ic8pin,rotate=-90] (IC2) {IC 2};
\draw (IC1.p1) -- (0.25,0);
\draw (IC1.p2) -- (.75,0);
\draw (IC1.p3) -- (1.25,0);
\draw (IC1.p4) -- (1.75,0);
\draw (IC1.p5) |- (IC2.p4);
\draw (IC1.p6) |- (IC2.p3);
\draw (IC1.p7) |- (IC2.p2);
\draw (IC1.p8) |- (IC2.p1);
\draw (IC2.p5) -- (4,2.25);
\draw (IC2.p6) -- (4,2.75);
\draw (IC2.p7) -- (4,3.25);
\draw (IC2.p8) -- (4,3.75);
\end{circuitikz}
```