

# User Guide for `circuitmacro.sty`

Luca Giaccone

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## Contents

# 1 Introduction

This document provides a complete user guide for the `circuitmacro.sty` package, authored by Luca Giaccone. The package extends `circuitikz` by introducing macros that simplify the drawing of common DC, AC, and three-phase circuit components.

The only external dependencies are:

- `circuitikz`
- `xstring`

Put the file either in project directory or in the `TEXHOME` tree. These are the correct path for different operating systems:

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macOS:	/Users/<username>/Library/texmf/tex/latex/circuitmacro/
Linux:	/home/<username>/texmf/tex/latex/circuitmacro/

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## 2 Commands Overview and Examples

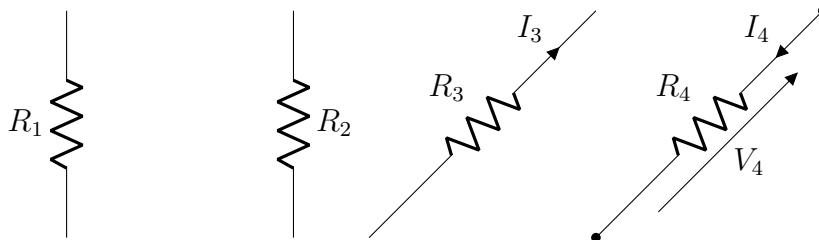
### 2.1 Resistor: `\R`

Signature:

`\R[<circuitikz options>]{<start>}{<end>}{<label>}`

Example:

```
\begin{circuitikz}
  \R{0,0}{0,3}{R_1}
  \R*{3,0}{3,3}{R_2}
  \R[i=$I_3$]{4,0}{7,3}{R_3}
  \R[v=$V_4$, i^<=$I_4$, *-*]{7,0}{10,3}{R_4}
\end{circuitikz}
```



### 2.2 Inductor: `\L`

Signature:

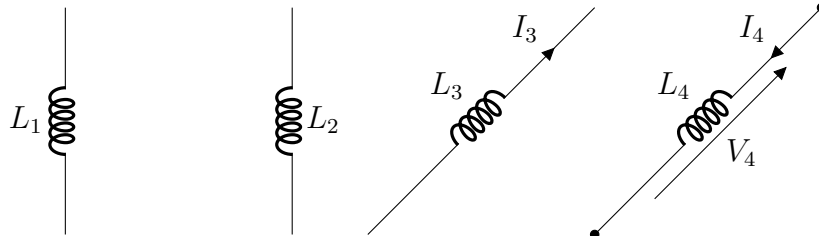
`\L[<circuitikz options>]{<start>}{<end>}{<label>}`

Example:

```

\begin{circuitikz}
  \L{0,0}{0,3}{L_1}
  \L*{3,0}{3,3}{L_2}
  \L[i=$I_3$]{4,0}{7,3}{L_3}
  \L[v=$V_4$, i^<=$I_4$, *-*]{7,0}{10,3}{L_4}
\end{circuitikz}

```



## 2.3 Capacitor: `\C`

Signature:

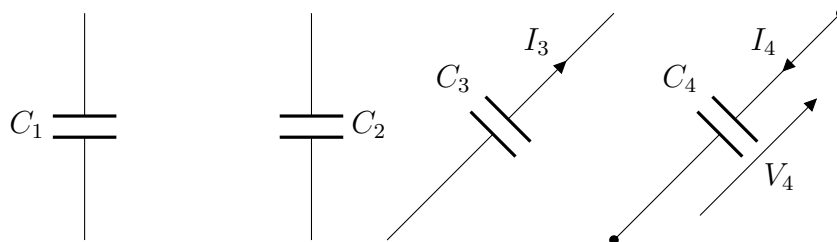
`\C[<circuitikz options>]{<start>}{<end>}{<label>}`

Example:

```

\begin{circuitikz}
  \C{0,0}{0,3}{C_1}
  \C*{3,0}{3,3}{C_2}
  \C[i=$I_3$]{4,0}{7,3}{C_3}
  \C[v=$V_4$, i^<=$I_4$, *-*]{7,0}{10,3}{C_4}
\end{circuitikz}

```



## 2.4 Generic bipole (e.g. impedance): `\B`

Signature:

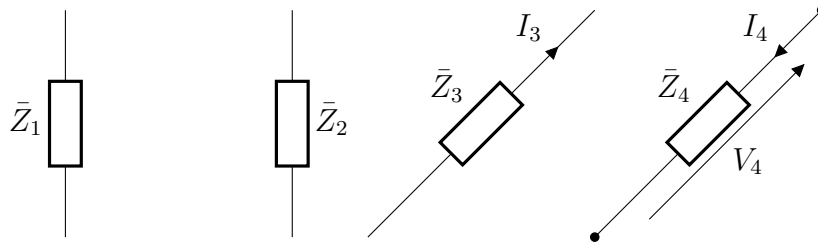
`\B[<circuitikz options>]{<start>}{<end>}{<label>}`

Example:

```

\begin{circuitikz}
  \B{0,0}{0,3}{\bar{Z}_1}
  \B*{3,0}{3,3}{\bar{Z}_2}
  \B[i=$I_3$]{4,0}{7,3}{\bar{Z}_3}
  \B[v=$V_4$, i^<=$I_4$, *-*]{7,0}{10,3}{\bar{Z}_4}
\end{circuitikz}

```



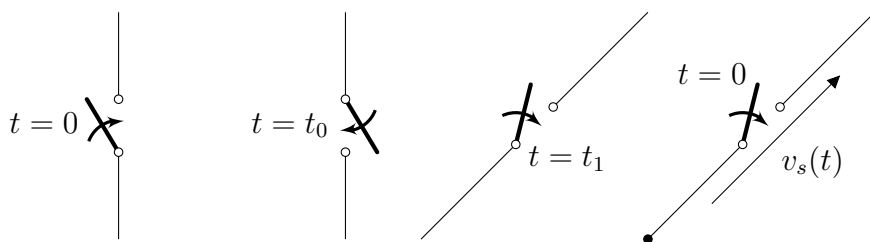
## 2.5 Switch open: `\SwOpen`

Signature:

`\SwOpen[<circuitikz options>]{<start>}{<end>}{<label>}`

Example:

```
\begin{circuitikz}
  \SwOpen{0,0}{0,3}{t=0}
  \SwOpen*{3,0}{3,3}{t=0}
  \SwOpen{4,0}{7,3}{t=0}
  \SwOpen[v=$v_s(t)$, *-]{7,0}{10,3}{t=0}
\end{circuitikz}
```



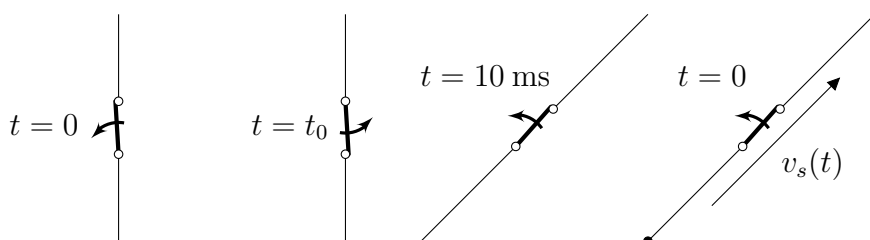
## 2.6 Switch closed: `\SwClosed`

Signature:

`\SwClosed[<circuitikz options>]{<start>}{<end>}{<label>}`

Example:

```
\begin{circuitikz}
  \SwClosed{0,0}{0,3}{t=0}
  \SwClosed*{3,0}{3,3}{t=0}
  \SwClosed{4,0}{7,3}{t=0}
  \SwClosed[v=$v_s(t)$, *-]{7,0}{10,3}{t=0}
\end{circuitikz}
```



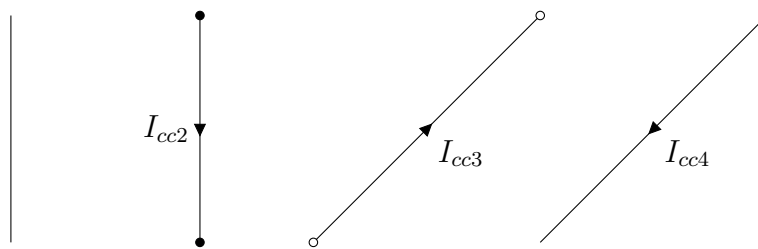
## 2.7 Short circuit (e.g. connection): `\Short`

Signature:

`\Short[<circuitikz options>]{<start>}{<end>}`

Example:

```
\begin{circuitikz}[scale=1]
  \Short{0,0}{0,3}
  \Short[i<=$I_{cc2}$, *-]{2.5,0}{2.5,3}
  \Short[i_=$I_{cc3}$, o-o]{4,0}{7,3}
  \Short[i_<=$I_{cc4}$]{7,0}{10,3}
\end{circuitikz}
```



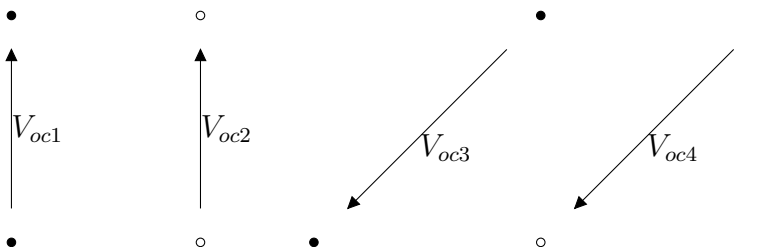
## 2.8 Open circuit: `\Open`

Signature:

`\Open[<circuitikz options>]{<start>}{<end>}`

Example:

```
\begin{circuitikz}[scale=1]
  \Open[v=$V_{oc1}$, *-]{0,0}{0,3}
  \Open[v_=$V_{oc2}$, o-o]{2.5,0}{2.5,3}
  \Open[v<=$V_{oc3}$, *-]{4,0}{7,3}
  \Open[v_<=$V_{oc4}$, o-o]{7,0}{10,3}
\end{circuitikz}
```



## 2.9 Independent voltage source: `\Vs`

Signature:

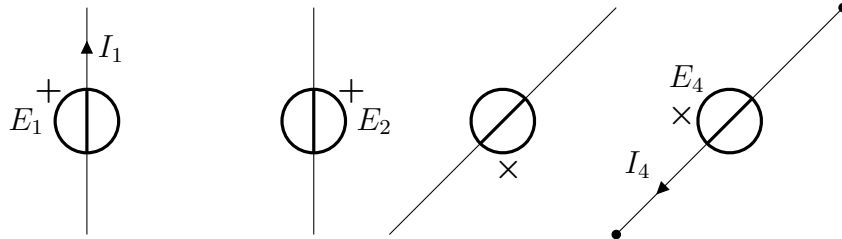
`\Vs[<circuitikz options>]{<start>}{<end>}{<label>}`

Example:

```

\begin{circuitikz}
  \Vs[i=\textcolor{violet}{I}_1]{0,3}{0,0}{E_1}
  \Vs*{3,3}{3,0}{E_2}
  \Vs{4,0}{7,3}{}
  \Vs*[i=\textcolor{violet}{I}_4, *-]{7,0}{10,3}{E_4}
\end{circuitikz}

```



## 2.10 Independent current source: `\Is`

Signature:

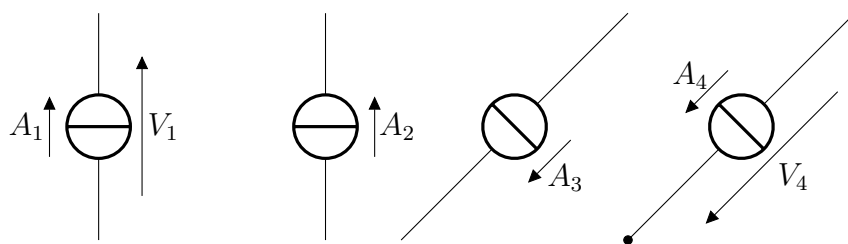
`\Is[<circuitikz options>]{<start>}{<end>}{<label>}`

Example:

```

\begin{circuitikz}
  \Is[v>=\textcolor{violet}{V}_1]{0,0}{0,3}{A_1}
  \Is*{3,0}{3,3}{A_2}
  \Is{7,3}{4,0}{A_3}
  \Is*[v^>=\textcolor{violet}{V}_4, *-]{10,3}{7,0}{A_4}
\end{circuitikz}

```



## 2.11 Controlled voltage source: `\cVs`

Signature:

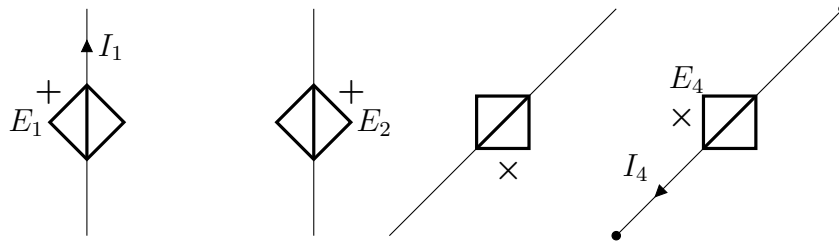
`\cVs[<circuitikz options>]{<start>}{<end>}{<label>}`

Example:

```

\begin{circuitikz}
  \cVs[i=\textcolor{violet}{I}_1]{0,3}{0,0}{E_1}
  \cVs*{3,3}{3,0}{E_2}
  \cVs{4,0}{7,3}{}
  \cVs*[i=\textcolor{violet}{I}_4, *-]{7,0}{10,3}{E_4}
\end{circuitikz}

```



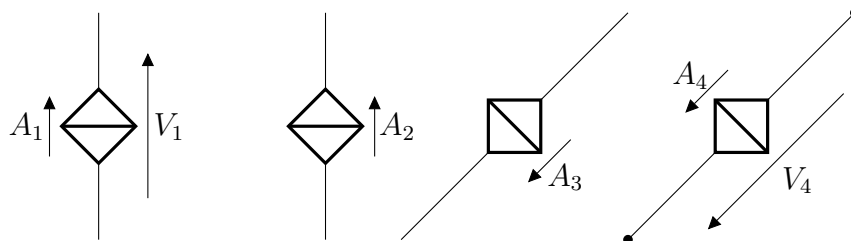
## 2.12 Controlled current source: `\cIs`

Signature:

`\cIs[<circuitikz options>]{<start>}{<end>}{<label>}`

Example:

```
\begin{circuitikz}
  \cIs[v>=$V_1$]{0,0}{0,3}{A_1}
  \cIs*{3,0}{3,3}{A_2}
  \cIs{7,3}{4,0}{A_3}
  \cIs*[v^>=$V_4$, *-*]{10,3}{7,0}{A_4}
\end{circuitikz}
```



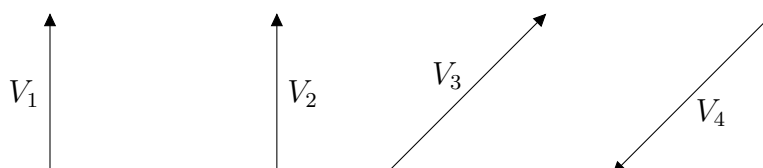
## 2.13 Voltage: `\V`

Signature:

`\V{<start>}{<end>}{<label>}`

Example:

```
\begin{circuitikz}[scale=1]
  \V{0,0}{0,3}{V_1}
  \V*{3,0}{3,3}{V_2}
  \V{4,0}{7,3}{V_3}
  \V{10,3}{7,0}{V_4}
\end{circuitikz}
```



## 2.14 Current: `\I`

Signature:

`\I{<start>}{<end>}{<label>}`

Example:

```
\begin{circuitikz}
  \I{0,0}{0,1}{I_1}
  \I*{2,0}{2,1}{I_2}
  \I{4,0}{5,1}{I_3}
  \I{8,1}{7,0}{I_4}
\end{circuitikz}
```



## 2.15 Nodes: `\Nodes`

Signature:

`\Nodes{coordinates1}{coordinates1} ... {coordinatesn}`

Example:

```
\begin{circuitikz}
  \Nodes{0,0}{1,1}
  \Nodes*{4,0}{5,0}{5,1}{4,1}
\end{circuitikz}
```





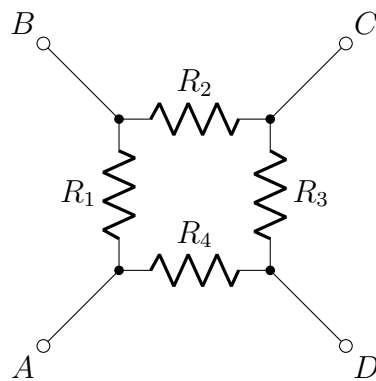
## 2.16 Terminal: `\Terminal`

`\Terminal{from}{to}{label}`

Example:

```
\begin{circuitikz}
  % some resistors
  \R[*-]{1,1}{1,3}{R_1}
  \R{1,3}{3,3}{R_2}
  \R[*-]{3,3}{3,1}{R_3}
  \R{1,1}{3,1}{R_4}

  % terminals
  \Terminal{0,0}{1,1}{A}
  \Terminal{0,4}{1,3}{B}
  \Terminal{4,4}{3,3}{C}
  \Terminal{4,0}{3,1}{D}
\end{circuitikz}
```



## 2.17 Label: `\Label`

I'm above the node  
I'm below the node

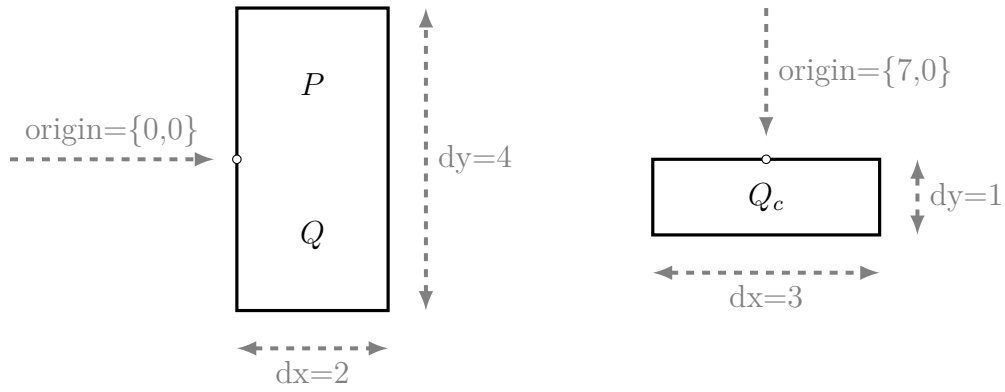
$B \bullet D$

## 2.18 Power load (single phase or three phase): `\PLoad`

`\PLoad[labe1][label2]{dx}{dy}{origin}`

Example:

```
\begin{circuitikz}
  \PLoad[P][Q]{2}{4}{0,0}
  \PLoad[Q_c]{3}{1}{7,0}
\end{circuitikz}
```



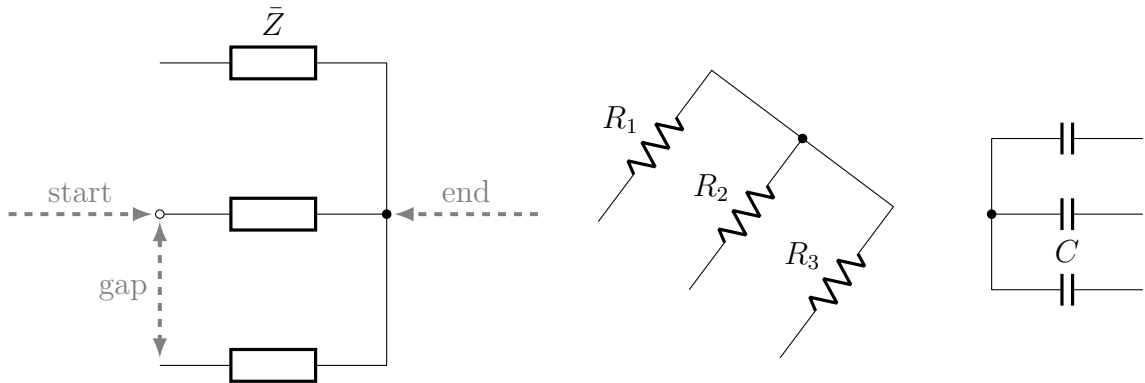
## 2.19 Star connected load: `\YLoad`

Signature:

`\YLoad[scale] [B|R|L|C] {start}{end}{gap}{label1}{label2}{label3}`

Example:

```
\begin{circuitikz}
  \YLoad{0,0}{3,0}{2}{\bar{Z}}{}{}
  \YLoad[0.8] [R] {7,-1}{8.5,1}{1.5}{R_1}{R_2}{R_3}
  \YLoad*[0.5] [C] {13,0}{11,0}{1}{C}{}{}
\end{circuitikz}
```



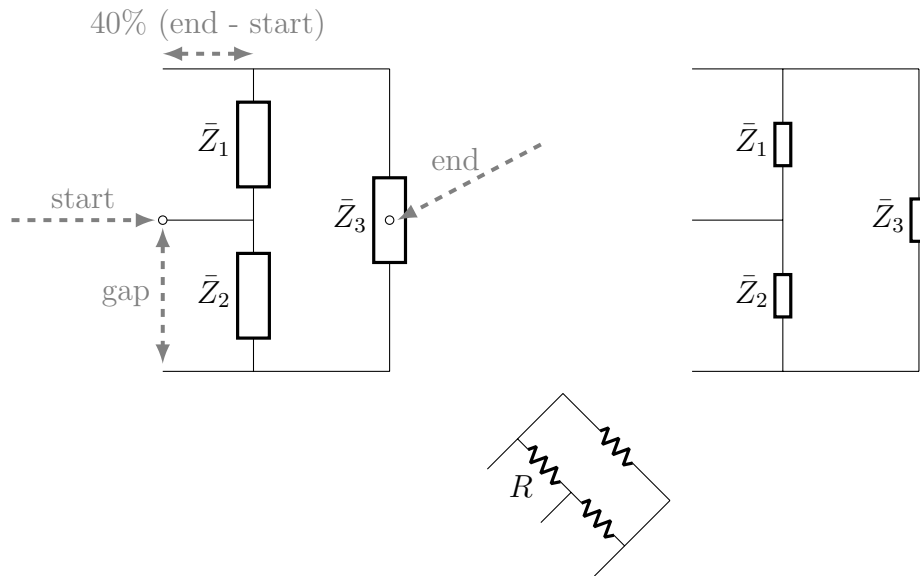
## 2.20 Triangle connected load: `\DLoad`

Signature:

`\DLoad[scale] [B|R|L|C] {start}{end}{gap}{label1}{label2}{label3}`

Example:

```
\begin{circuitikz}
  \DLoad{0,0}{3,0}{2}{\bar{Z}_1}{\bar{Z}_2}{\bar{Z}_3}
  \DLoad[0.5] {7,0}{10,0}{2}{\bar{Z}_1}{\bar{Z}_2}{\bar{Z}_3}
  \DLoad[0.5] [R] {5,-4}{6,-3}{1}{R}{}{}
\end{circuitikz}
```



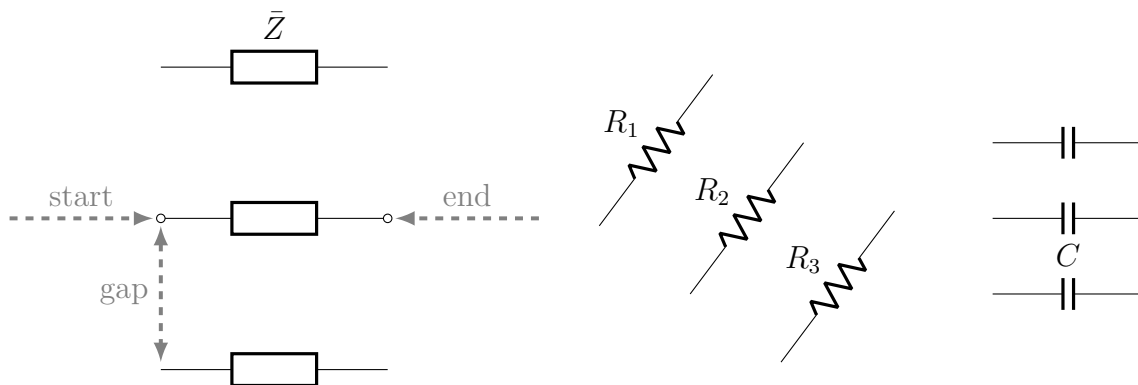
## 2.21 Three phase line: `\triLine`

Signature:

`\triLine[scale] [B|R|L|C]{start}{end}{gap}{label1}{label2}{label3}`

Example:

```
\begin{circuitikz}
  \triLine{0,0}{3,0}{2}{\bar{Z}}{}{}
  \triLine[0.8][R]{7,-1}{8.5,1}{1.5}{R_1}{R_2}{R_3}
  \triLine*[0.5][C]{13,0}{11,0}{1}{C}{}{}
\end{circuitikz}
```



## 2.22 Three phase connection: `\triShort`

Signature:

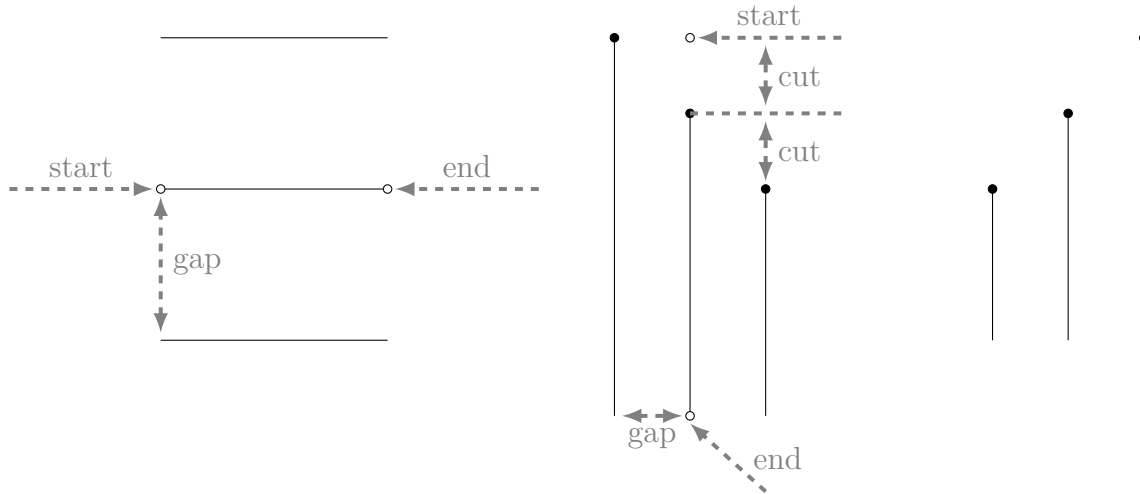
`\triShort[<circuitikz options>][<cut>]{start}{end}{gap}`

Example:

```

\begin{circuitikz}
  \triShort{0,0}{3,0}{2}
  \triShort[*-][1]{7,2}{7,-3}{1}
  \triShort*[*-][1]{12,2}{12,-2}{1}
\end{circuitikz}

```



## 2.23 Three phase generator: `\triGen`

Signature:

```

\triGen[V|I][scale]{start}{end}{gap}{label1}{label2}{label3}

```

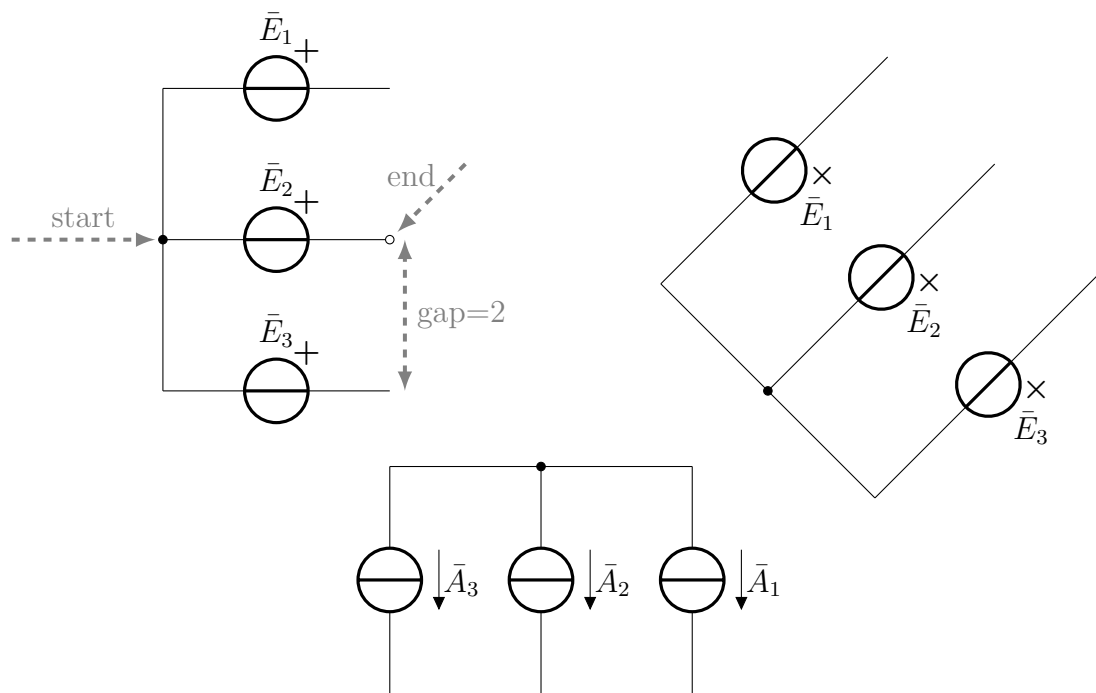
(N.B. `scale` does not work perfectly here. It is included for future development and it is suggested to leave it to the default value (i.e. 1). In this version labels, plus sign for voltage generators and arrows for current generators do not scale according to `scale` parameters.)

Example:

```

\begin{circuitikz}
  \triGen{0,0}{3,0}{2}{\bar{E}_1}{\bar{E}_2}{\bar{E}_3}
  \triGen*{8,-2}{11,1}{2}{\bar{E}_1}{\bar{E}_2}{\bar{E}_3}
  \triGen[1][I]{5,-3}{5,-6}{2}{\bar{A}_1}{\bar{A}_2}{\bar{A}_3}
\end{circuitikz}

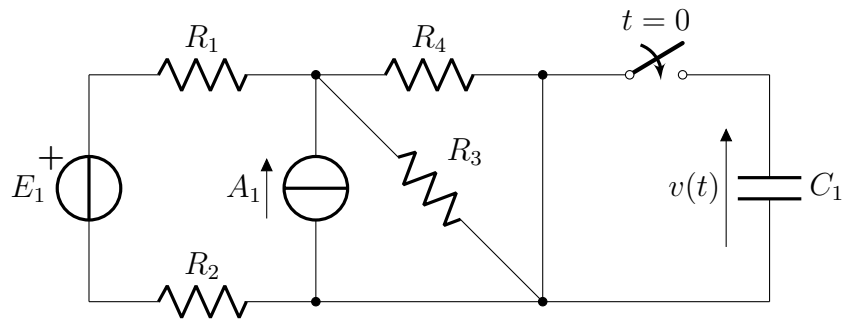
```



## 3 Example Circuits

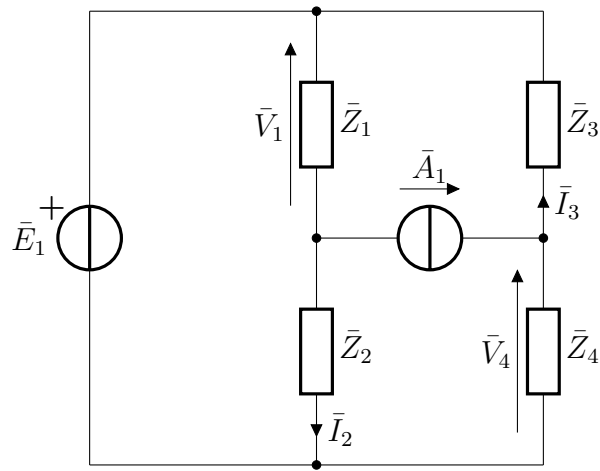
### 3.1 Example 1: first order circuit

```
\begin{circuitikz}
  \Vs{0,3}{0,0}{E_1}
  \R{0,3}{3,3}{R_1}
  \R{0,0}{3,0}{R_2}
  \Is[*-]{3,0}{3,3}{A_1}
  \R[-*]{3,3}{6,0}{R_3}
  \R[-*]{3,3}{6,3}{R_4}
  \SwOpen{6,3}{9,3}{t=0}
  \C[v<=$v(t)$]{9,3}{9,0}{C_1}
  \Short{3,0}{9,0}
  \Short{6,0}{6,3}
\end{circuitikz}
```



### 3.2 Example 2: AC Circuit

```
\begin{circuitikz}
  \Vs{0,6}{0,0}{\bar{E}_1}
  \Is[*-]{3,3}{6,3}{\bar{A}_1}
  \B[*-, v<=\bar{V}_1]{3,6}{3,3}{\bar{Z}_1}
  \B[-*, i=\bar{I}_2]{3,3}{3,0}{\bar{Z}_2}
  \B[i^<=\bar{I}_3]{6,6}{6,3}{\bar{Z}_3}
  \B[v<=\bar{V}_4]{6,3}{6,0}{\bar{Z}_4}
  \Short{0,0}{6,0}
  \Short{0,6}{6,6}
\end{circuitikz}
```



### 3.3 Example 3: Three-Phase Circuit

```
\begin{circuitikz}
  % generator and line
  \triGen{0,4}{2,4}{1.8}{\bar{E}_1}{\bar{E}_2}{\bar{E}_3}
  \triLine{1}{2,4}{4.5,4}{1.8}{\bar{Z}_L}{}{}

  % load A
  \triShort{4.5, 4}{9, 4}{1.8}
  \PLoad[P_A][Q_A]{2}{4.5}{9,4}

  % load B
  \triShort[*-]{1.8}{6.5, 5.8}{6.5, 1}{1.8}
  \PLoad[P_B][Q_B]{4.5}{2}{6.5,1}

  % current and voltages
  \I{8,5.8}{8.5,5.8}{\bar{I}_A}
  \I{4.7,3.5}{4.7,3}{\bar{I}_B}
  \V*{2,4}{2,5.8}{\bar{V}_g}
  \V{8.5,4}{8.5,5.8}{\bar{V}}
\end{circuitikz}
```

