User Guide for `circuitmacro.sty`

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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 corret path for different operating systems:

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

2 Commands list

```
\R* [<circuitikz options>]{<from>}{<to>}{<label>}
\L* [<circuitikz options>]{<from>}{<to>}{<label>}
\C* [<circuitikz options>]{<from>}{<to>}{<label>}
\B* [<circuitikz options>]{<from>}{<to>}{<label>}
\SwOpen* [<circuitikz options>]{<from>}{<to>}{<label>}
\SwClosed* [<circuitikz options>]{<from>}{<to>}{<label>}
\Short [<circuitikz options>]{<from>}{<to>}
\Open [<circuitikz options>]{<from>}{<to>}
\Vs* [<circuitikz options>]{<from>}{<to>}{<label>}
\Is* [<circuitikz options>]{<from>}{<to>}{<label>}
\cVs* [<circuitikz options>]{<from>}{<to>}{<label>}
\cIs* [<circuitikz options>]{<from>}{<to>}{<label>}
\V*{<from>}{<to>}{<label>}
\I*{<from>}{<to>}{<label>}
\Nodes*{<coords>} ...
\Terminal{<from>}{<to>}{<label>}
\Label[<tikz node options>]{<coords>}{<text>}
\PLoad[<top label>][<bottom label>]{<width>}{<height>}{<center coords>}
\YLoad* [<length scale>] [<component type>]{<coord1>}{<coord2>}{<offset>} ...
       {<label phase 1>}{<label phase 2>}{<label phase 2>}
\DLoad* [<length scale>] [<component type>]{<coord1>}{<coord2>}{<offset>} ...
       {<label branch 1>}{<label branch 2>}{<label branch 3>}
\triGen* [<length scale>] [V|I]{<coord1>}{<coord2>}{<offset>} ...
       {<label phase A>}{<label phase B>}{<label phase C>}
\triLine* [<length scale>] [<component type>]{<coord1>}{<coord2>}{<offset>} ...
       {<label phase A>}{<label phase B>}{<label phase C>}
\triShort* [<circuitikz options>][<gap>]{<coord1>}{<coord2>}{<offset>}
```

Notes on the optionals (based on your definitions):

- Starred forms (`\Cmd*`) flip label/side.
- `<length scale>` defaults to 1 where present.
- `<component type>` defaults to B (generic) where present.
- `\triGen` source type defaults to V (voltage); I selects current sources.

3 Commands Overview and Examples

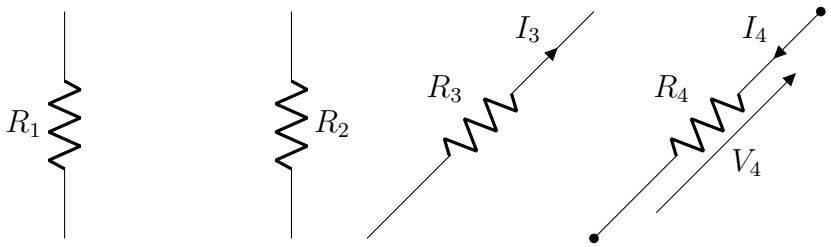
3.1 Resistor: \R

Signature:

```
\R[<circuitikz options>]{<from>}{<to>}{<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}
```



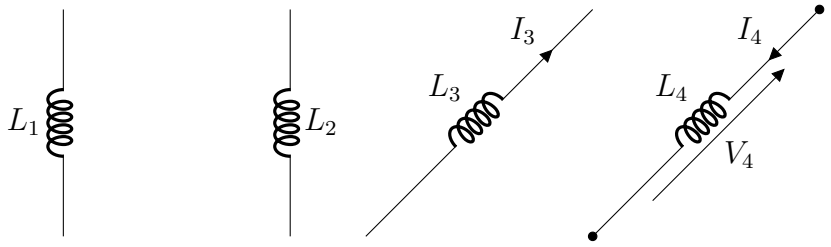
3.2 Inductor: \L

Signature:

```
\L[<circuitikz options>]{<from>}{<to>}{<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}
```



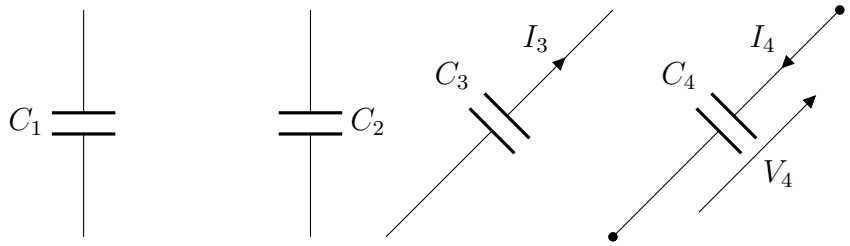
3.3 Capacitor: \C

Signature:

```
\C[<circuitikz options>]{<from>}{<to>}{<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}
```



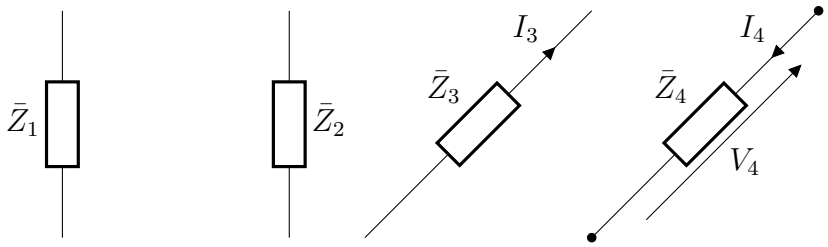
3.4 Generic bipole (e.g. impedance): \B

Signature:

```
\B[<circuitikz options>]{<from>}{<to>}{<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}
```



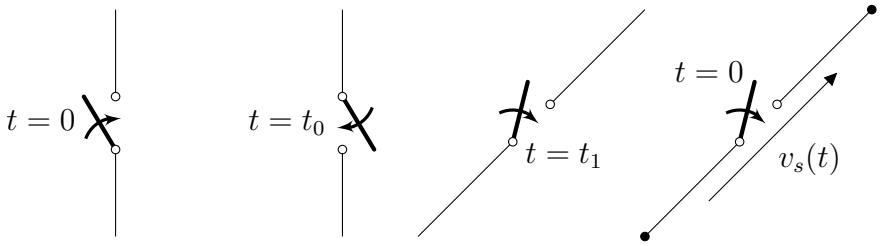
3.5 Switch open: \SwOpen

Signature:

```
\SwOpen[<circuitikz options>]{<from>}{<to>}{<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}
```



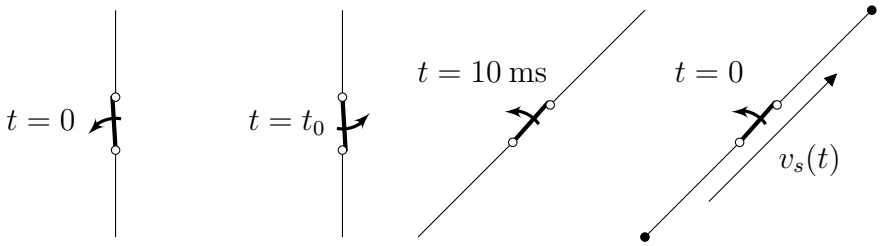
3.6 Switch closed: \SwClosed

Signature:

`\SwClosed[<circuitikz options>]{<from>}{<to>}{<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}
```



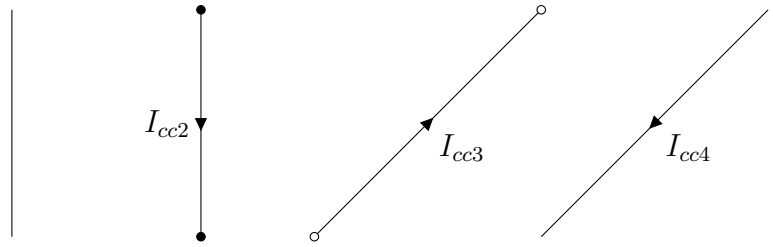
3.7 Short circuit (e.g. connection): \Short

Signature:

`\Short[<circuitikz options>]{<from>}{<to>}`

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}
```



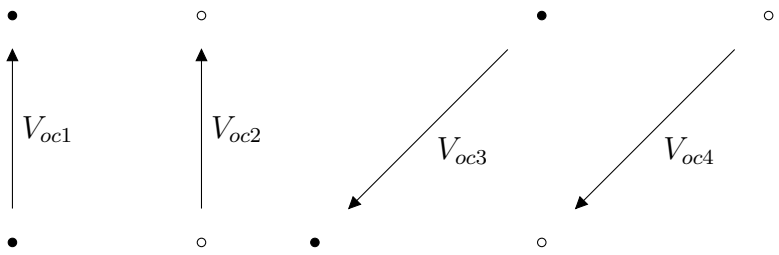
3.8 Open circuit: \Open

Signature:

```
\Open[<circuitikz options>]{<from>}{<to>}
```

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}
```



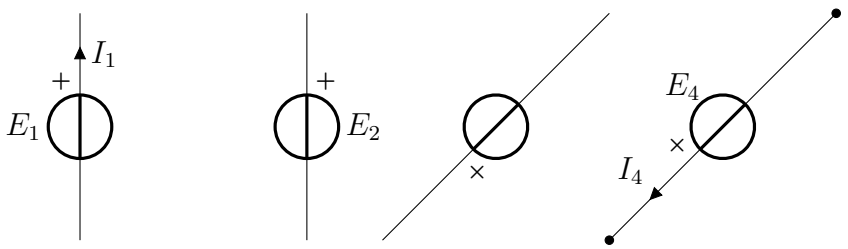
3.9 Independent voltage source: \Vs

Signature:

```
\Vs[<circuitikz options>]{<from>}{<to>}{<label>}
```

Example:

```
\begin{circuitikz}
    \Vs[i=$I_1$]{0,0}{0,3}{E_1}
    \Vs*{3,0}{3,3}{E_2}
    \Vs{7,3}{4,0}{}
    \Vs*[i=$I_4$, *-*]{10,3}{7,0}{E_4}
\end{circuitikz}
```



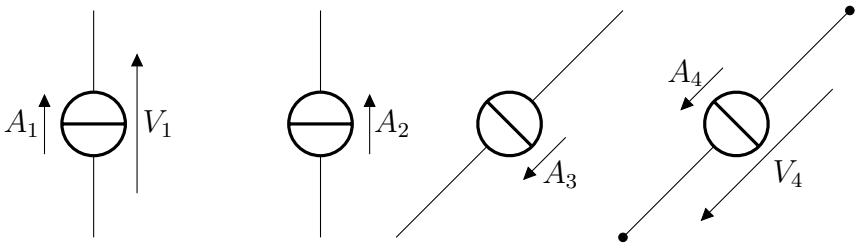
3.10 Independent current source: \Is

Signature:

```
\Is[<circuitikz options>]{<from>}{<to>}{<label>}
```

Example:

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



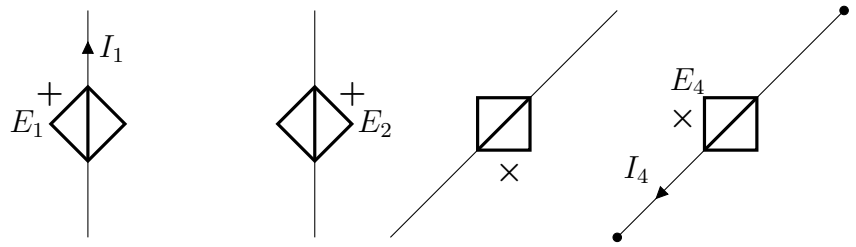
3.11 Controlled voltage source: \cVs

Signature:

```
\cVs[<circuitikz options>]{<from>}{<to>}{<label>}
```

Example:

```
\begin{circuitikz}
    \cVs[i=$I_1$]{0,0}{0,3}{E_1}
    \cVs*{3,0}{3,3}{E_2}
    \cVs{7,3}{4,0}{}
    \cVs*[i=$I_4$, *-*]{10,3}{7,0}{E_4}
\end{circuitikz}
```



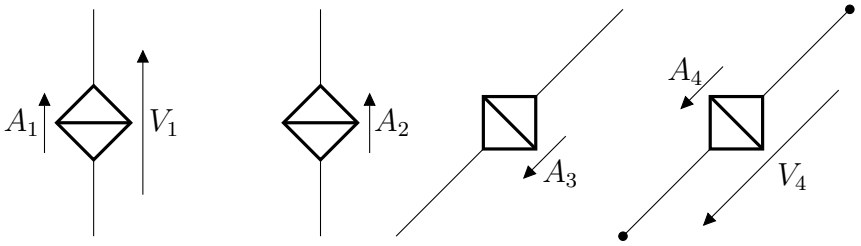
3.12 Controlled current source: \cIs

Signature:

```
\cIs[<circuitikz options>]{<from>}{<to>}{<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}
```



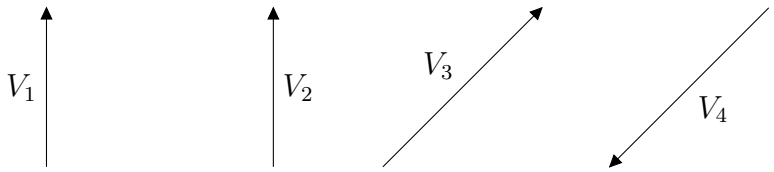
3.13 Voltage: \V

Signature:

`\V{<from>}{<to>}{<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}
```



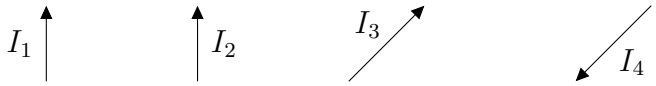
3.14 Current: \I

Signature:

`\I{<from>}{<to>}{<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}
```



3.15 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}
```

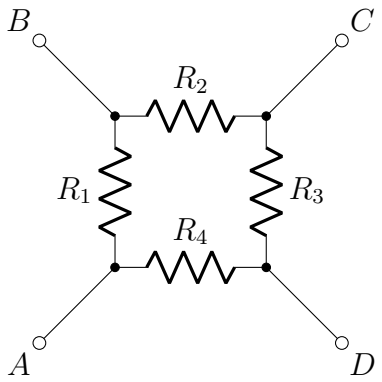
3.16 Terminal: \Terminal

\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}
```



3.17 Label: \Label

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

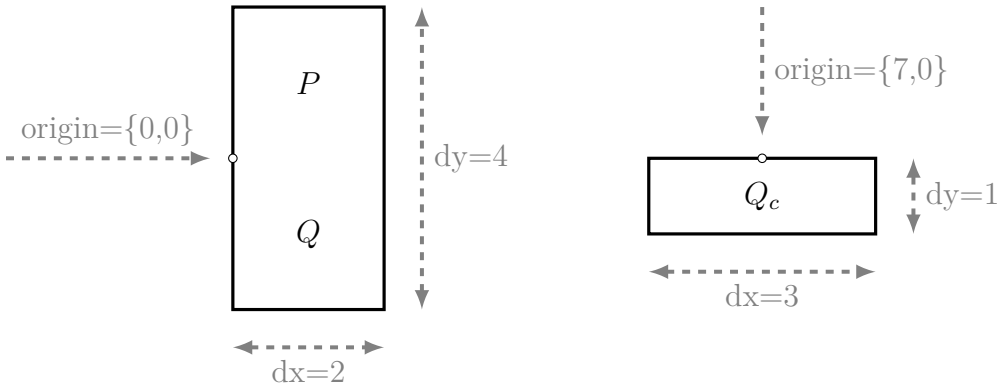
B • D

3.18 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}
```



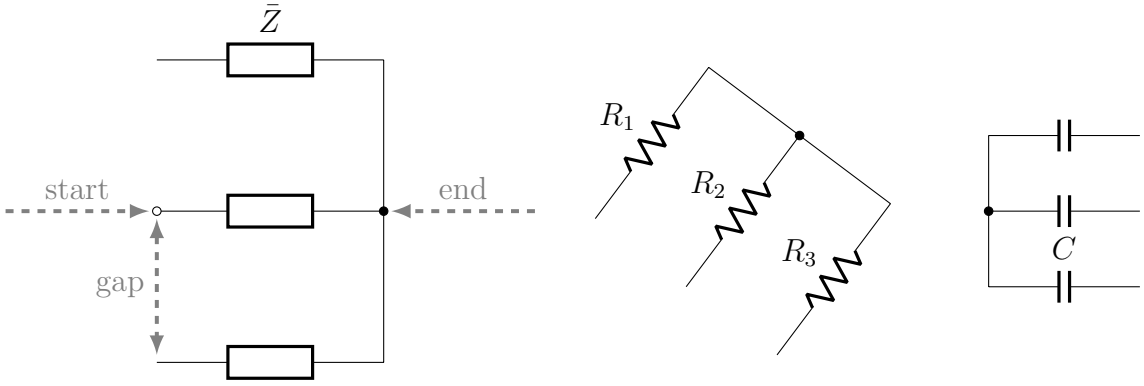
3.19 Star connected load: \YLoad

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}
```



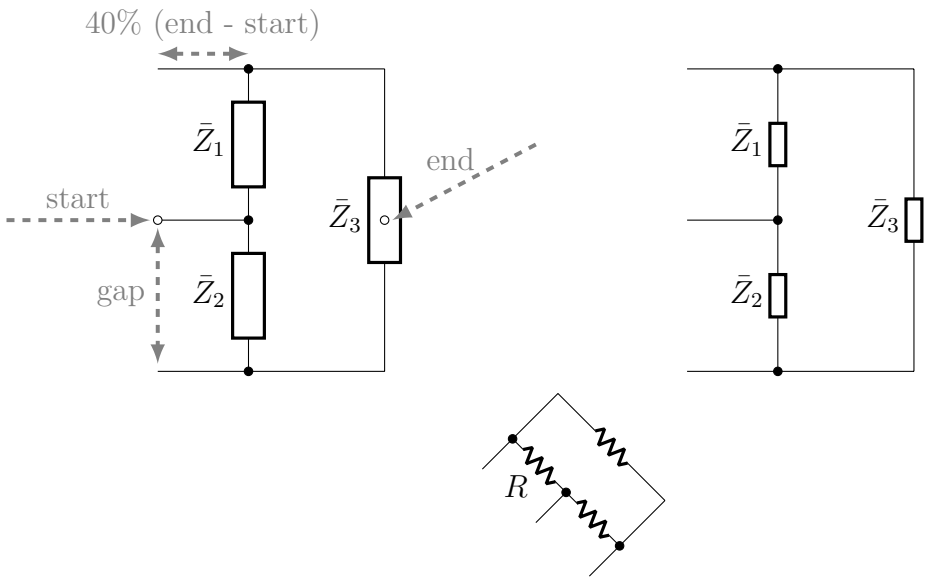
3.20 Triangle connected load: \DLoad

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}
```



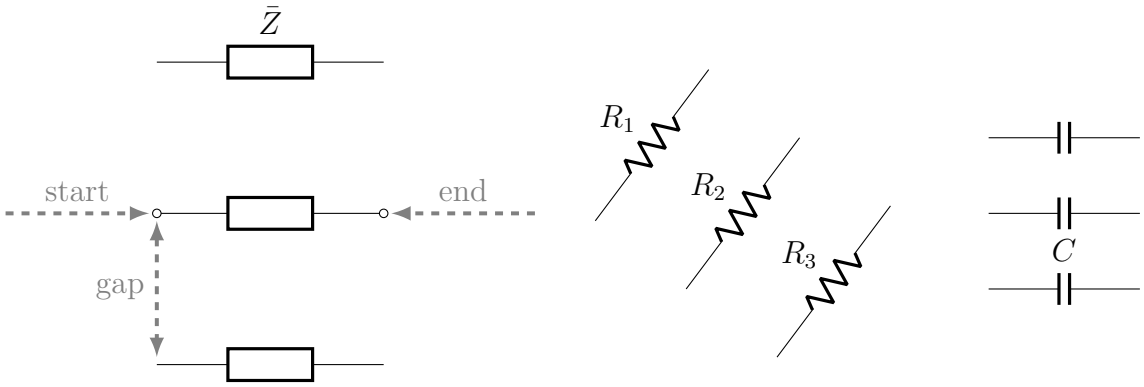
3.21 Three phase line: \triLine

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}
```



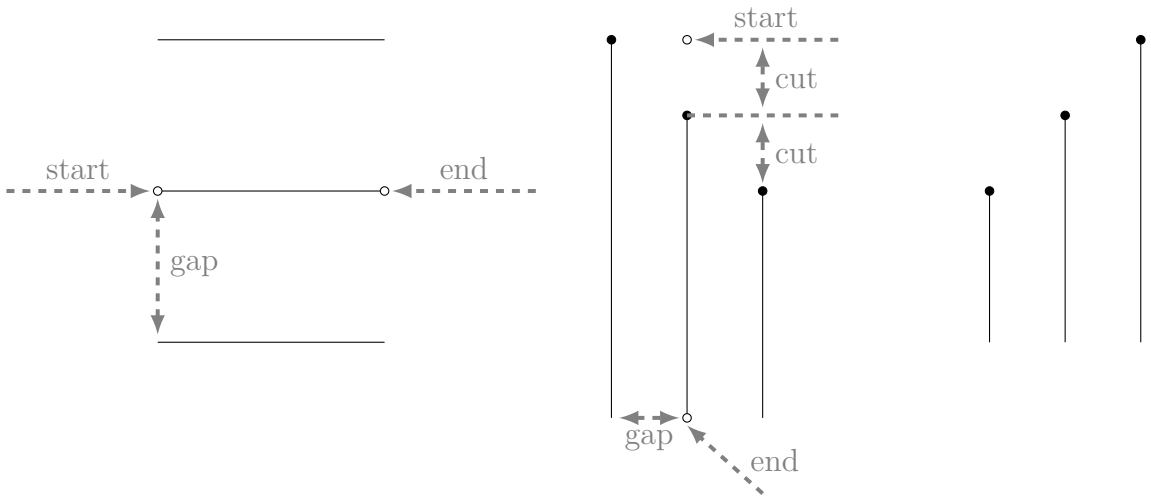
3.22 Three phase connection: \triShort

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}
```



3.23 Three phase generator: \triGen

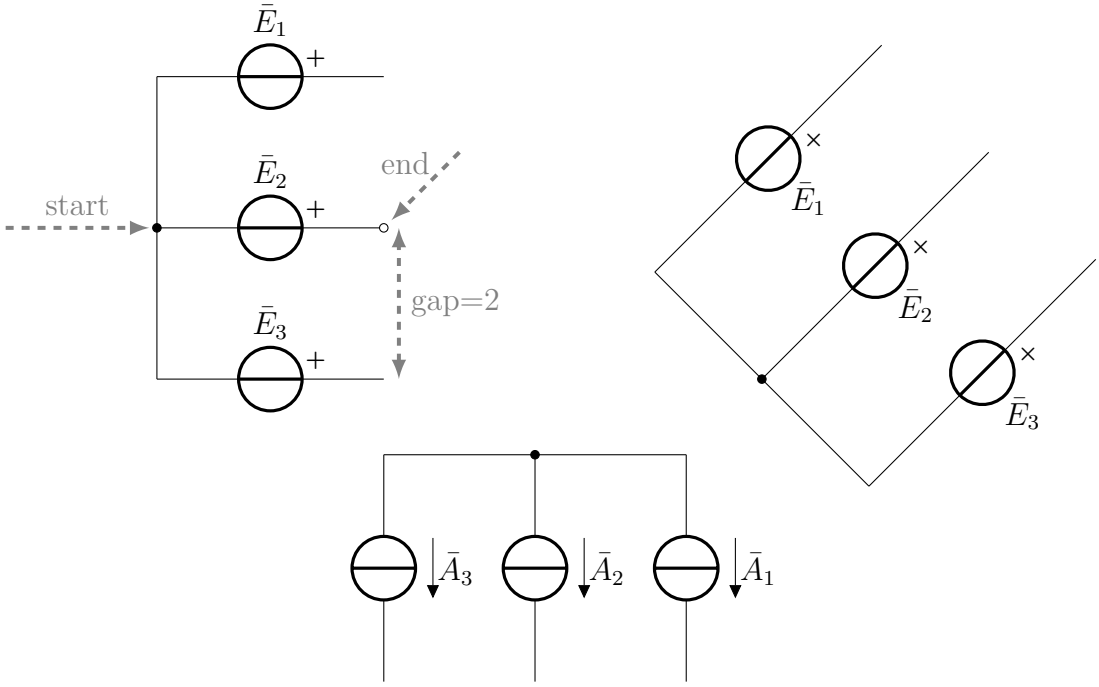
Signature:

`\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:

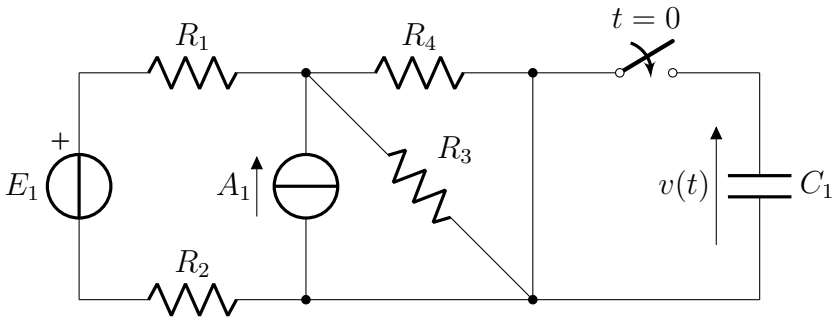
```
\begin{circuitikz}
    \triGen{0,0}{3,0}{2}{\bar{E}_1}{\bar{E}_2}{\bar{E}_3}
    \triGen*{8,-2}{11,1}{2}{\bar{E}_1}{\bar{E}_2}{\bar{E}_3}
    \triGen[1][I]{5,-3}{5,-6}{2}{\bar{A}_1}{\bar{A}_2}{\bar{A}_3}
\end{circuitikz}
```


$\bar{E}_1$
+
$\bar{E}_2$
+
$\bar{E}_3$
+
start
end
gap=2
×
$\bar{E}_1$
×
$\bar{E}_2$
×
$\bar{E}_3$
$\bar{A}_3$
$\bar{A}_2$
$\bar{A}_1$

4 Example Circuits

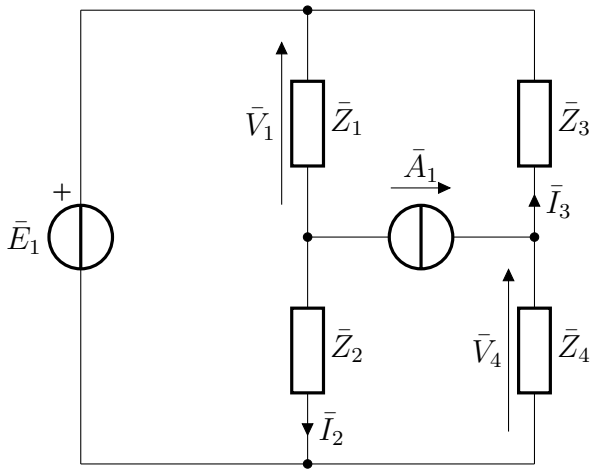
4.1 Example 1: first order circuit

```
\begin{circuitikz}
    \Vs{0,0}{0,3}{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}
```



4.2 Example 2: AC Circuit

```
\begin{circuitikz}
    \Vs{0,0}{0,6}{\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}
```



4.3 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{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}
```