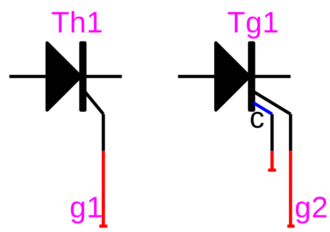
Thyristor (ideal) and Thyristor (ideal) with GTO



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1 Available versions

There are two versions of this device. The first version is a standard Thyristor with gate control signal. The second version adds a clamp (GTO) control c-pin.
This is a 1-phase device.

2 Description

This device is an ideal switch type device. It has a zero resistance and zero voltage drop when closed and infinite resistance when open. It is a 1-phase device.

3 Parameters and rules

The parameters from the data tab are:

- V_{ig} is the ignition voltage, the minimum voltage required for firing the thyristor. This voltage should be greater than 0.
- I_{hold} is the holding current. The thyristor stops conducting when its current falls below this value or crosses 0 when $I_{hold} = 0$. This value is greater or equal to 0.
- t_{deion} is the thyristor de-ionization time. When the thyristor stops conducting it becomes de-ionized after a wait time of t_{deion}. If the thyristor voltage becomes positive while the thyristor is still ionized, the thyristor will turn back on again.
- Closed at t=0

  This option is used for initializing the simulated network in steady-state solution. When this option is checked the thyristor is closed in the steady-state solution and its symbol color changes to green.

The control signal action connected to the gate pin is to fire the thyristor when it becomes greater than 0 and the $V_{ig} > 0$. When the c-pin is present then the control signal c action is:

- for c>0 the thyristor is forced to close

- for c<0 the thyristor is forced to open
- for c=0 the thyristor returns to its gate action

This is a 1-phase device and it is not allowed to change its pin attributes. It is not allowed to delete any pins. This is an ideal device. Placing several thyristors in parallel is acceptable if the thyristors are not closed at the same time. When paralleled thyristors are closed at the same time, mathematically impossible conditions will result and EMTP will *try* to solve such cases by inserting dummy resistances.

4 Netlist format

```
_cSwThy;Tg1;4;4;knode,mnode,g2,c_control,
0.7,0,0,0,?v,?i,?p,>v,>i,>p,>S,
```

Field	Description
_cSwThy	Part name
Tg1	Instance name, any name.
4	Total number of pins
4	Number of pins given in this data section
knode	Signal name connected to k-pin, any name
mnode	Signal name connected to m-pin, any name
g2	Gate signal name, any name
c_control	Clamp signal name, any name
V_{ig}	Ignition voltage
I_{hold}	Current I_{hold} described above
t_{deion}	The de-ionization time
Closed at t=0	1 means closed in steady-state, 0 means open in steady-state
?v, ?i, ?p	Optional scope requests
>v, >i, >p, >S	Optional observe requests

Device data fields are saved into the ParamsA device attribute.

5 Steady-state model and initial conditions

If the thyristor is closed at t=0, it is modeled as an ideal closed switch. It is an open-circuit otherwise.

6 Frequency Scan model

Similar to the steady-state.

7 Time-domain model

The thyristor is modeled by an ideal closed (zero resistance) switch when conducting and by an ideal infinite resistance open switch when turned off.