



## Attributes:

```
mainnodes: vi_e vi_o vo_e vo_o g
digital_nodes: phi_o
rparms: ron=1e-3 roff=100M rd=1e18
```

## Description:

SC\_SWPO.ece is a parallel switch operating in odd phase (SWPO) which is commonly used block in the bi-phase switched capacitor (SC) circuits. The circuit diagram of SWPO is shown in Fig. a. It consists of one switch operating in odd phase (ignore  $R_{dl}$  connected between  $vi_o$  and  $vo_o$ ), and it is a two-port element. The z-domain (small-signal) equivalent circuit is shown in Fig. b, which is a four-port.

As the same file contains time-domain and frequency-domain descriptions, the number of ports in both is made equal. It is the reason that SWPO is realized as four-port element in time-domain, and unused ports/nodes are connected with low-value resistance ( $R_{dl}$ ). In z-domain unused ports are connected to high-value resistance ( $R_{dh}$ ).

$vi_e$  and  $vi_o$  are input nodes.  $vo_e$  and  $vo_o$  are output nodes.  $\phi_o$  ( $phi_o$ ) is the digital node, and it should be connected to clock signal.  $ron$  is switch on resistance and  $roff$  is switch off resistance.  $rd$  is high value resistance ( $R_{dh}$ ).  $R_{dl}$  is internally set to 1  $\Omega$ .