

clock_1.gce

Attributes

```
mainvars: y
rparms:
+   t0=0 g_high=1 dt1=0.01 dt2=0.01
+   freq=10 duty_cycle=0.5
```

Description

`clock_1.gce` is a square wave source with the general variable `y` as its output. The parameters have the following meaning:

freq: Frequency.

duty_cycle: The ratio $T_1/(T_1 + T_2)$ where T_1 is the “high” interval and T_2 is the “low” interval. The output is equal to `g_high` during the T_1 phase and 0 during the T_2 phase.

t0: An “offset” time interval. Its meaning will become clear in the following example.

dt1: Width of the transition at the beginning of the T_1 phase.

dt2: Width of the transition at the beginning of the T_2 phase.

Note that the transition width is included in T_1 or T_2 . For example, consider `freq=100` and `duty_cycle=0.3`. For these parameters, $T=1/\text{freq}=10$ ms, and T_1 and T_2 will be computed to be $T_1 = 0.3 \times T = 3$ ms, $T_2 = 0.7 \times T = 7$ ms. If `dt1` has been specified as 0.2 ms, then, at the beginning of the T_1 phase, there would be a rising edge of 0.2 ms durations, followed by a “high” (constant) level for 2.8 ms.

AC behaviour is not implemented.

The effect of the various parameters of `clock_1.gce` on the waveforms is shown in Fig. 1. The corresponding circuit file (available as `clock_1_gce.in` in the examples directory) is reproduced below.

```

title: testing of clock_1.gce

begin_circuit
    gelement type=clock_1 y=y1 g_high=1
+     freq=5 dt1=0.02 dt2=0.02 t0=0
+     duty_cycle=0.5
    gelement type=clock_1 y=y2 g_high=1
+     freq=5 dt1=0.02 dt2=0.02 t0=0
+     duty_cycle=0.3
    gelement type=clock_1 y=y3 g_high=1
+     freq=5 dt1=0.005 dt2=0.005 t0=0.18
+     duty_cycle=0.5
    outvar:
+     y1=var_of_y1
+     y2=var_of_y2
+     y3=var_of_y3
end_circuit

begin_solve
    solve_type=dc
    initial_sol initialize
end_solve

begin_solve
    solve_type=trns
    initial_sol previous
    begin_output
        filename=clock_1_gce.dat
        variables: y1 y2 y3
    end_output
    method: back_euler=yes
+     t_start=0 t_end=0.6 delt_const=0.05
end_solve

end_cf

```

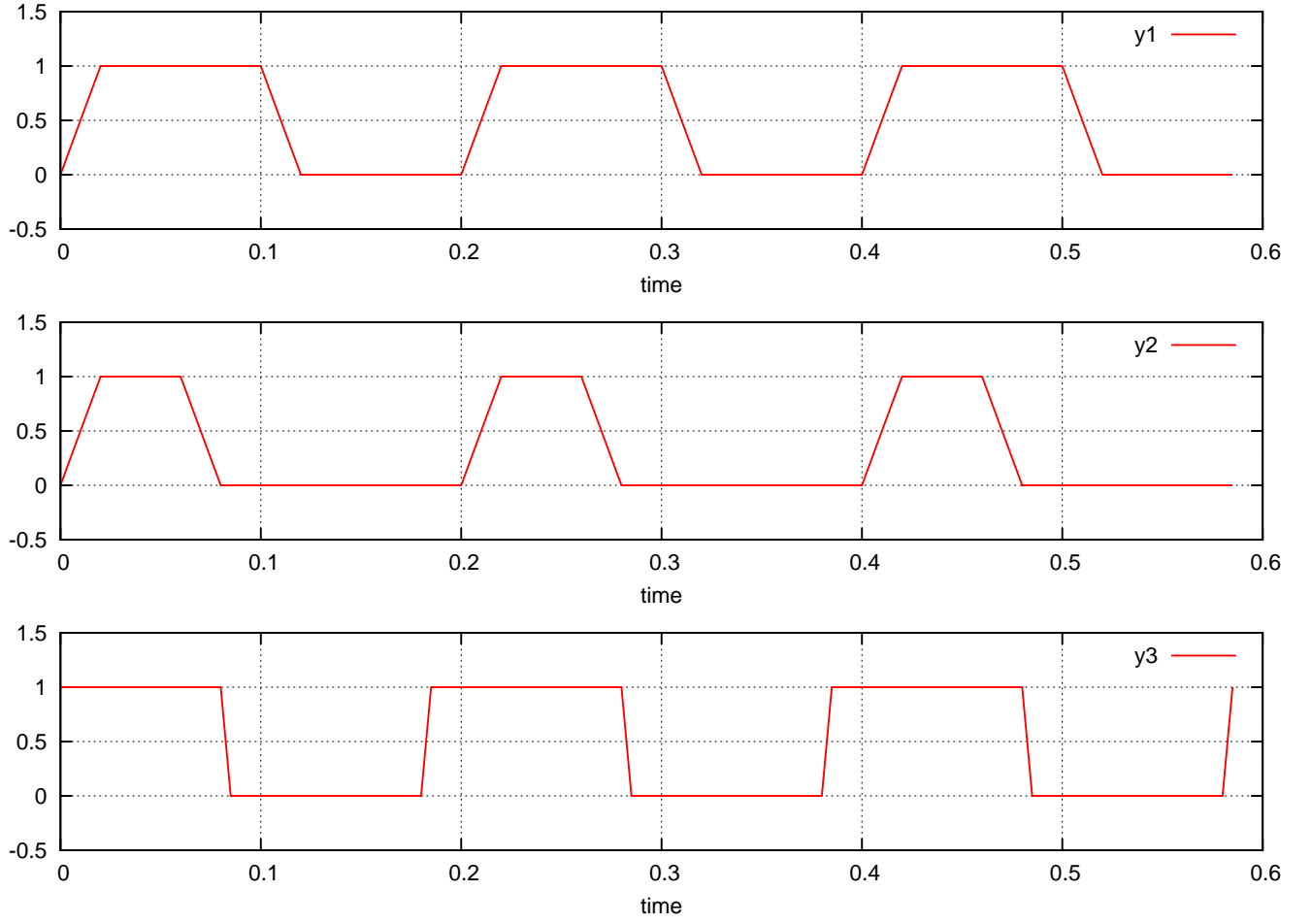


Figure 1: Waveforms obtained with `clock_1.gce`: (a) `g_high=1`, `freq=5`, `dt1=0.02`, `dt2=0.02`, `t0=0`, `duty_cycle=0.5`, (b) `g_high=1`, `freq=5`, `dt1=0.02`, `dt2=0.02`, `t0=0`, `duty_cycle=0.3`, (c) `g_high=1`, `freq=5`, `dt1=0.005`, `dt2=0.005`, `t0=0.18`, `duty_cycle=0.5`.