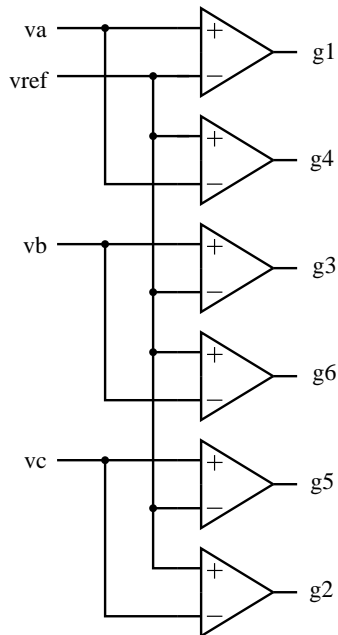


## pwm\_1.gce



### Attributes

```
mainvars:
+   va vb vc
+   g1 g2 g3 g4 g5 g6
iparms:
+   flag_frequency=0
+   flag_period=1
rparms:
+   tperiod=10u
+   frequency=1k
+   t0=0
+   triangle_high=1.0
+   triangle_low=-1.0
+   epsl=1.0e-6
+   delt_min=1.0e-7
+   delt_nrml=1.0e-5
+   g_high=1.0
```

### Description

pwm\_1.gce is used to generate PWM pulses from a reference signal (a triangle wave) generated internally, and va, vb, vc.

The parameters tperiod, t0, triangle\_high, triangle\_low are used to control the triangle wave, as explained in the documentation for triangle\_2.gce. (If the integer parameter

`flag_frequency` is 1, the period is computed as  $1/f$ , where  $f$  is given by the real parameter `frequency`).

The parameters `delt_min`, `delt_nrml`, and `eps1` are used for controlling the simulator time steps as explained in the documentation for `cmprtr_1.gce`.

The parameter `g_high` is used to determine the height of the output pulses (`g1` to `g6`), the lower level is assumed to be zero.

AC behaviour is not implemented.

Fig. 1 shows typical waveforms obtained with `pwm_1.gce`. The corresponding circuit file is given below.

```
title: test_pwm (generate g1,g2,...,g6 from a,b,c)

begin_circuit
    gelement type=vsrcac3 va=va vb=vb vc=vc a=1 f_hz=50
+   phi_a=0
+   phi_b=120
+   phi_c=240
    gelement type=pwm_1 name=pwm
+   va=va vb=vb vc=vc
+   g1=g1 g2=g2 g3=g3 g4=g4 g5=g5 g6=g6
+   tperiod=100u
+   t0=0
+   triangle_high=1.0
+   triangle_low=-1.0
+   eps1=1.0e-6
+   delt_min=0.02u
+   delt_nrml=1u
+   g_high=1.0

    outvar:
+   va=var_of_va
+   vb=var_of_vb
+   vc=var_of_vc
+   g1=var_of_g1
+   g2=var_of_g2
+   g3=var_of_g3
+   g4=var_of_g4
+   g5=var_of_g5
+   g6=var_of_g6
```

```

+      vref=vref_of_pwm
end_circuit

begin_solve
  solve_type=startup
  initial_sol initialize
  method:
+      dmp=yes itmax_newton=20 dmp_k=0.1
+      dmp_newt_max=10
end_solve

begin_solve
  solve_type=trns
  initial_sol previous
  begin_output
    filename=test_pwm_1.dat limit_lines=100000
    variables: va vref g1 g4
  end_output
  begin_output
    filename=test_pwm_2.dat limit_lines=100000
    variables: vb vref g3 g6
  end_output
  begin_output
    filename=test_pwm_3.dat limit_lines=100000
    variables: vc vref g5 g2
  end_output

  method: t_start=0 t_end=40m
+      back_euler=yes norm_2=1e-6
+      delt_const=1u
end_solve
end_cf

```

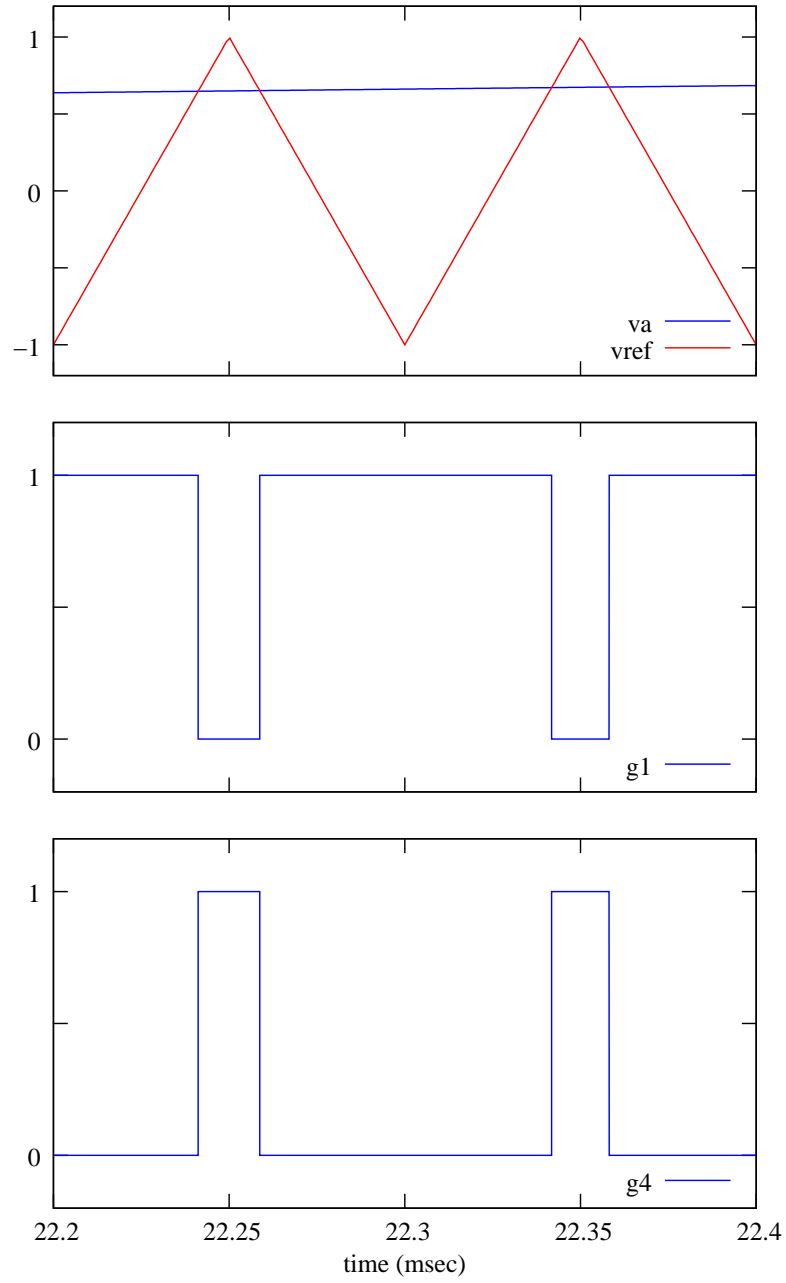


Figure 1: Waveforms obtained with `pwm_1.gce` (see the circuit file for details).