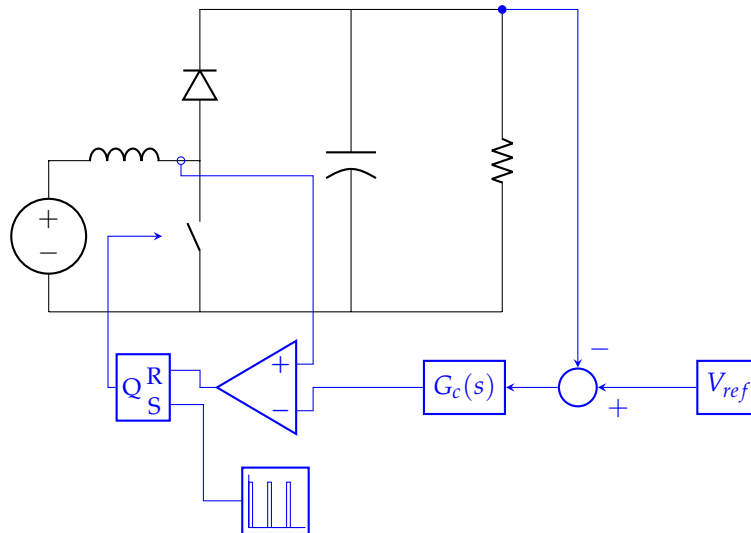


DIGITAL CONTROL OF POWER ELECTRONICS

Current Mode Control of Boost Converter



```

1 clear
2 Vin = 5
3 Vo = 10
4 d = 0.5
5 L = 100e-6
6 C = 247e-6
7 r = 0.01
8 Po = 10
9 fsw = 200e3
10 R = Vo^2/Po
11
12 Le = L / (1-d)^2
13
14 % plant transfer function
15
16 s=tf('s');
17 opts = bodeoptions('cstprefs');
18 opts.FreqUnits = 'Hz';
19 %opts.PhaseWrapping = 'on';
20
21 Gp = R*(1-d)*(1 - s*L/(R*(1-d)^2)) * (1+s*r*C) / (2 + s*R*C)
22 bode(Gp,opts)
23 grid on
24 poles = pole(Gp)
25 zeros = zero(Gp)
26
27
28 % design controller
29
30 fc = 1e3
31 pm = 60
32 kfb = 1

```

```

33 Gpwm = 1
34
35 [gain_gp angle_gp] = bode(Gp,2*pi*fc)
36 phiboost = -90 +pm-angle_gp
37 gain_need = 1/gain_gp
38 Kboost = tand(45+phiboost/2)
39 fz = fc/Kboost
40 fp = Kboost*fc
41 kc = 2*pi*fz/gain_gp
42 wz = 2*pi*fz
43 wp = 2*pi*fp
44
45 Gc = kc/s * (1+s/(2*pi*fz)) / ((1+s/(2*pi*fp)));

```

$$G_p(s) = -\frac{1.0 (0.000000001235 s^2 + 0.000469125 s - 12.5)}{0.006175 s + 5.0} \quad (1)$$

$$G_c(s) = \frac{k \left(1 + \frac{s}{\omega_z}\right)^2}{s \left(1 + \frac{s}{\omega_p}\right)^2} \quad (2)$$

$$\omega_p = 29402.8404, \omega_z = 1342.6736, k = 4074.7523 \quad (3)$$

$$p_1 = -11171.6801 + 6383.9558i, p_2 = -11171.6801 - 6383.9558i, p_3 = -1491.5068 \quad (4)$$

