figure

load('D:\FOLDER\桌面\校数模\2017B\L-I-20C.mat')

I = I./1000;

P = P./1000;

plot(I, P, 'oc')

hold on

load TiCMOS.mat

lambda = 0.327974911948322;

a\_0 = 0.00245295354589810;

a\_1 = -2.24461489568760E-05;

a\_2 = 8.55495131262933E-08;

a\_3 = -3.04196846538548E-10;

a\_4 = 6.38679397411974E-13;

Ith0 = 2.09792442194657E-05;

Rth = 3593.49598351965;

T = Ti(:, 2:end);

It = repmat(Ti(:, 1), 9);

Ioff = a\_0 + a\_1.\*T + a\_2.\*T.^2 + a\_3.\*T.^3 + a\_4.\*T.^4;

Pi = lambda.\*(It(1:251, :) - Ith0 - Ioff);

Pi(Pi<0) = 0;

H1 = plot(Ti(:,1), Pi, '.r')

hold on

load Ti.mat

lambda = 0.327974911948322;

a\_0 = 0.00245295354589810;

a\_1 = -2.24461489568760E-05;

a\_2 = 8.55495131262933E-08;

a\_3 = -3.04196846538548E-10;

a\_4 = 6.38679397411974E-13;

Ith0 = 2.09792442194657E-05;

Rth = 3593.49598351965;

T = Ti(:, 2:end);

It = repmat(Ti(:, 1), 9);

Ioff = a\_0 + a\_1.\*T + a\_2.\*T.^2 + a\_3.\*T.^3 + a\_4.\*T.^4;

Pi = lambda.\*(It(1:251, :) - Ith0 - Ioff);

Pi(Pi<0) = 0;

H2 = plot(Ti(:,1), Pi, '--k')

% legend(H1, '基于二极管模型')

% legend(H2, '基于多项式模型')

legend([H1(1), H2(1)], '基于二极管模型', '基于多项式模型')

xlabel('I/A')

ylabel('P/W')

saveas(gcf, 'fig13.png');

load 3.mat

load TiCMOS.mat

load('D:\FOLDER\桌面\校数模\2017B\L-I-20C.mat')

load('D:\FOLDER\桌面\校数模\2017B\S21\_5.mat')

F = f(1101:end)\*1e9;

f = 0:1e7:4e10;

Hf = S21(1101:end);

P = P/1000;

P(P==0) = 2.56043051100000e-07;

I = I/1000;

U = U;

% x = target;

init = [0.7, 1E-5, 9.6E-9, 1.5E-8, 1.8E6, 4.97E5, 3.8E-12, 4.7E-8];

% init = [0.7, 100, 9.6E-9, 1.5E-8, 1.8E6, 4.97E5, 3.8E-12, 4.7E-8];

lambda = 0.327974911948322;

q = 1.6E-19;

Ith0 = 2.09792442194657E-05;

Rth = 3593.49598351965;

a\_0 = 0.00245295354589810;

a\_1 = -2.24461489568760E-05;

a\_2 = 8.55495131262933E-08;

a\_3 = -3.04196846538548E-10;

a\_4 = 6.38679397411974E-13;

T = 293.15 + (I.\*U - P).\*Rth;

Ioff = a\_0 + a\_1.\*T + a\_2.\*T.^2 + a\_3.\*T.^3 + a\_4.\*T.^4;

Ns = (P./(x(4).\*x(7)) + x(5).\*x(6).\*P./(x(4) + x(8).\*P))./(x(2)./x(3) + x(5).\*P./(x(4) + x(8).\*P));

test1 = q.\*(Ns./x(3) + x(5).\*(Ns - x(6)).\*P./(x(4) + x(8).\*P))./x(1) + Ith0 + Ioff - I;

test1 = test1;

Ss = ((x(1).\*(I - Ith0 - Ioff)./q) - (Ns./x(3)))./(x(5).\*(Ns - x(6)));

Ps = x(4).\*Ss;

test2 = Ps - P;

test2 = test2./Ps;

load 3.mat

load TiCMOS.mat

% load('D:\FOLDER\桌面\校数模\2017B\L-I-20C.mat')

load('D:\FOLDER\桌面\校数模\2017B\S21\_5.mat')

f = 0:1e7:4e10;

Ia = [0.5 0.7 1 2 3 7.5 14].\*1e-3;

% I = 0:1e-4:0.04;

T = 273.15 + 20;

Rs = 57.8774072057481;

Vt = 0.150069586007959;

Is = 9.69996336936704e-09;

I = Ti(:, 1);

U = I.\*Rs + Vt.\*log(1 + I./Is);

lambda = 0.327974911948322;

a\_0 = 0.00245295354589810;

a\_1 = -2.24461489568760E-05;

a\_2 = 8.55495131262933E-08;

a\_3 = -3.04196846538548E-10;

a\_4 = 6.38679397411974E-13;

Ith0 = 2.09792442194657E-05;

Rth = 3593.49598351965;

Ioff = a\_0 + a\_1.\*T + a\_2.\*T.^2 + a\_3.\*T.^3 + a\_4.\*T.^4;

P = lambda.\*(I - Ith0 - Ioff);

P(P<0) = 0;

temp = [];

figure

for i = 1:length(Ia)

I\_temp = Ia(i);

U\_temp = U(abs((I-Ia(i)))<1e-10);

P\_temp = P(abs((I-Ia(i)))<1e-10);

Ns1 = (P\_temp./(x(4).\*x(7)) + x(5).\*x(6).\*P\_temp./(x(4) + x(8).\*P\_temp))./(x(2)./x(3) + x(5).\*P\_temp./(x(4) + x(8).\*P\_temp));

T1 = 293.15 + (I\_temp.\*U\_temp - P\_temp).\*Rth;

Ioff1 = a\_0 + a\_1.\*T1 + a\_2.\*T1.^2 + a\_3.\*T1.^3 + a\_4.\*T1.^4;

Ss1 = ((x(1).\*(I\_temp - Ith0 - Ioff1)./q) - (Ns1./x(3)))./(x(5).\*(Ns1 - x(6)));

Ps1 = x(4).\*Ss1;

Y = 1./x(7) + 1./x(3) + x(5).\*Ps1./(x(4) + x(8).\*Ps1) - x(5).\*(Ns1 - x(6))./(1 + x(8).\*Ps1./x(4)).^2; %% 是否平方

Z = 1./(x(7).\*x(3)) + x(5).\*Ps1./(x(7).\*(x(4) + x(8).\*Ps1)) - (1 - x(2)).\*x(5).\*(Ns1 - x(6))./(x(3).\*(1 + x(8).\*Ps1./x(4)).^2); %% 是否平方

H=Z./((2i\*pi\*f).^2+(2i\*pi\*f)\*Y+Z);

M=20\*log10(abs(H));

hold on

plot(f, M, '--', 'linewidth',1.7)

[a, b] = min(abs(M+10));

temp1(i, 1) = Ia(i);

temp1(i, 2) = f(b);

end

y\_1=[0, 4E10];

y\_2=[-10, -10];

plot(y\_1,y\_2, 'linewidth',1)

axis([0 4E10 -13 5])

legend('15mA', '17.5mA', '18mA', '19mA', '19.5mA', '19.8mA', '20mA')

xlabel('f/Hz')

ylabel('Hf/dB')

% saveas(gcf, 'fig16\_2.png');

temp1

figure

plot(temp(:, 1), temp(:, 2), 'o-')

xlabel('I/A')

ylabel('10dB带宽/Hz')

saveas(gcf, 'fig17.png');

load 3.mat

load TiCMOS.mat

% load('D:\FOLDER\桌面\校数模\2017B\L-I-20C.mat')

load('D:\FOLDER\桌面\校数模\2017B\S21\_5.mat')

f = 0:1e7:4e10;

Ia = [15 17.5 18 19 19.5 19.8 20].\*1e-3;

% I = 0:1e-4:0.04;

T = 273.15 + 20;

Rs = 57.8774072057481;

Vt = 0.150069586007959;

Is = 9.69996336936704e-09;

I = Ti(:, 1);

U = I.\*Rs + Vt.\*log(1 + I./Is);

lambda = 0.327974911948322;

a\_0 = 0.00245295354589810;

a\_1 = -2.24461489568760E-05;

a\_2 = 8.55495131262933E-08;

a\_3 = -3.04196846538548E-10;

a\_4 = 6.38679397411974E-13;

Ith0 = 2.09792442194657E-05;

Rth = 3593.49598351965;

Ioff = a\_0 + a\_1.\*T + a\_2.\*T.^2 + a\_3.\*T.^3 + a\_4.\*T.^4;

P = lambda.\*(I - Ith0 - Ioff);

P(P<0) = 0;

temp = [];

figure

for i = 1:length(Ia)

I\_temp = Ia(i);

U\_temp = U(abs((I-Ia(i)))<1e-10);

P\_temp = P(abs((I-Ia(i)))<1e-10);

Ns1 = (P\_temp./(x(4).\*x(7)) + x(5).\*x(6).\*P\_temp./(x(4) + x(8).\*P\_temp))./(x(2)./x(3) + x(5).\*P\_temp./(x(4) + x(8).\*P\_temp));

T1 = 293.15 + (I\_temp.\*U\_temp - P\_temp).\*Rth;

Ioff1 = a\_0 + a\_1.\*T1 + a\_2.\*T1.^2 + a\_3.\*T1.^3 + a\_4.\*T1.^4;

Ss1 = ((x(1).\*(I\_temp - Ith0 - Ioff1)./q) - (Ns1./x(3)))./(x(5).\*(Ns1 - x(6)));

Ps1 = x(4).\*Ss1;

Y = 1./x(7) + 1./x(3) + x(5).\*Ps1./(x(4) + x(8).\*Ps1) - x(5).\*(Ns1 - x(6))./(1 + x(8).\*Ps1./x(4)).^2; %% 是否平方

Z = 1./(x(7).\*x(3)) + x(5).\*Ps1./(x(7).\*(x(4) + x(8).\*Ps1)) - (1 - x(2)).\*x(5).\*(Ns1 - x(6))./(x(3).\*(1 + x(8).\*Ps1./x(4)).^2); %% 是否平方

H=Z./((2i\*pi\*f).^2+(2i\*pi\*f)\*Y+Z);

M=20\*log10(abs(H));

hold on

plot(f, M, '--', 'linewidth',1.7)

[a, b] = min(abs(M+10));

temp(i, 1) = Ia(i);

temp(i, 2) = f(b);

end

y\_1=[0, 4E10];

y\_2=[-10, -10];

plot(y\_1,y\_2, 'linewidth',1)

axis([0 4E10 -13 5])

legend('15mA', '17.5mA', '18mA', '19mA', '19.5mA', '19.8mA', '20mA')

xlabel('f/Hz')

ylabel('Hf/dB')

saveas(gcf, 'fig16\_2.png');

temp

figure

plot(temp(:, 1), temp(:, 2), 'o-')

xlabel('I/A')

ylabel('10dB带宽/Hz')

saveas(gcf, 'fig17.png');

tt = [temp1;temp]

figure

plot(tt(:, 1), tt(:, 2), 'o-')

xlabel('I/A')

ylabel('10dB带宽/Hz')

saveas(gcf, 'fig17.png');

load 3.mat

load TiCMOS.mat

% load('D:\FOLDER\桌面\校数模\2017B\L-I-20C.mat')

load('D:\FOLDER\桌面\校数模\2017B\S21\_5.mat')

f = 0:1e7:4e10;

Ia = [7.5].\*1e-3;

% I = 0:1e-4:0.04;

T = 273.15 + 20;

Rs = 57.8774072057481;

Vt = 0.150069586007959;

Is = 9.69996336936704e-09;

I = Ti(:, 1);

U = I.\*Rs + Vt.\*log(1 + I./Is);

lambda = 0.327974911948322;

a\_0 = 0.00245295354589810;

a\_1 = -2.24461489568760E-05;

a\_2 = 8.55495131262933E-08;

a\_3 = -3.04196846538548E-10;

a\_4 = 6.38679397411974E-13;

Ith0 = 2.09792442194657E-05;

Rth = 3593.49598351965;

Ioff = a\_0 + a\_1.\*T + a\_2.\*T.^2 + a\_3.\*T.^3 + a\_4.\*T.^4;

P = lambda.\*(I - Ith0 - Ioff);

P(P<0) = 0;

G0 = [1e5 3e5 5e5 7e5 9e5 1e6 2e6 3e6];

temp = [];

figure

for i = 1:length(G0)

I\_temp = Ia;

U\_temp = U(abs((I-Ia))<1e-10);

P\_temp = P(abs((I-Ia))<1e-10);

x(5) = G0(i);

Ns1 = (P\_temp./(x(4).\*x(7)) + x(5).\*x(6).\*P\_temp./(x(4) + x(8).\*P\_temp))./(x(2)./x(3) + x(5).\*P\_temp./(x(4) + x(8).\*P\_temp));

T1 = 293.15 + (I\_temp.\*U\_temp - P\_temp).\*Rth;

Ioff1 = a\_0 + a\_1.\*T1 + a\_2.\*T1.^2 + a\_3.\*T1.^3 + a\_4.\*T1.^4;

Ss1 = ((x(1).\*(I\_temp - Ith0 - Ioff1)./q) - (Ns1./x(3)))./(x(5).\*(Ns1 - x(6)));

Ps1 = x(4).\*Ss1;

Y = 1./x(7) + 1./x(3) + x(5).\*Ps1./(x(4) + x(8).\*Ps1) - x(5).\*(Ns1 - x(6))./(1 + x(8).\*Ps1./x(4)).^2; %% 是否平方

Z = 1./(x(7).\*x(3)) + x(5).\*Ps1./(x(7).\*(x(4) + x(8).\*Ps1)) - (1 - x(2)).\*x(5).\*(Ns1 - x(6))./(x(3).\*(1 + x(8).\*Ps1./x(4)).^2); %% 是否平方

H=Z./((2i\*pi\*f).^2+(2i\*pi\*f)\*Y+Z);

M=20\*log10(abs(H));

hold on

plot(f, M, '--', 'linewidth',1.7)

[a, b] = min(abs(M+10));

temp(i, 1) = G0(i);

temp(i, 2) = f(b);

end

y\_1=[0, 4E10];

y\_2=[-10, -10];

plot(y\_1,y\_2, 'linewidth',1)

axis([0 4E10 -12 10])

legend('1e5', '3e5', '5e5', '7e5', '9e5', '1e6', '2e6', '3e6');

xlabel('f/Hz')

ylabel('Hf/dB')

saveas(gcf, 'fig22.png');

temp

figure

plot(temp(:, 1), temp(:, 2), 'o-')

xlabel('G0/s-1')

% ylabel('10dB带宽/Hz')

ylabel('品质因数Q')

saveas(gcf, 'fig23.png');

load 3.mat

load TiCMOS.mat

% load('D:\FOLDER\桌面\校数模\2017B\L-I-20C.mat')

load('D:\FOLDER\桌面\校数模\2017B\S21\_5.mat')

f = 0:1e7:4e10;

Ia = [7.5].\*1e-3;

% I = 0:1e-4:0.04;

T = 273.15 + 20;

Rs = 57.8774072057481;

Vt = 0.150069586007959;

Is = 9.69996336936704e-09;

I = Ti(:, 1);

U = I.\*Rs + Vt.\*log(1 + I./Is);

lambda = 0.327974911948322;

a\_0 = 0.00245295354589810;

a\_1 = -2.24461489568760E-05;

a\_2 = 8.55495131262933E-08;

a\_3 = -3.04196846538548E-10;

a\_4 = 6.38679397411974E-13;

Ith0 = 2.09792442194657E-05;

Rth = 3593.49598351965;

Ioff = a\_0 + a\_1.\*T + a\_2.\*T.^2 + a\_3.\*T.^3 + a\_4.\*T.^4;

P = lambda.\*(I - Ith0 - Ioff);

P(P<0) = 0;

tp = [1 3 5 7 9 11 13 15 17 19].\*1e-12;

temp = [];

figure

for i = 1:length(tp)

I\_temp = Ia;

U\_temp = U(abs((I-Ia))<1e-10);

P\_temp = P(abs((I-Ia))<1e-10);

x(7) = tp(i);

Ns1 = (P\_temp./(x(4).\*x(7)) + x(5).\*x(6).\*P\_temp./(x(4) + x(8).\*P\_temp))./(x(2)./x(3) + x(5).\*P\_temp./(x(4) + x(8).\*P\_temp));

T1 = 293.15 + (I\_temp.\*U\_temp - P\_temp).\*Rth;

Ioff1 = a\_0 + a\_1.\*T1 + a\_2.\*T1.^2 + a\_3.\*T1.^3 + a\_4.\*T1.^4;

Ss1 = ((x(1).\*(I\_temp - Ith0 - Ioff1)./q) - (Ns1./x(3)))./(x(5).\*(Ns1 - x(6)));

Ps1 = x(4).\*Ss1;

Y = 1./x(7) + 1./x(3) + x(5).\*Ps1./(x(4) + x(8).\*Ps1) - x(5).\*(Ns1 - x(6))./(1 + x(8).\*Ps1./x(4)).^2; %% 是否平方

Z = 1./(x(7).\*x(3)) + x(5).\*Ps1./(x(7).\*(x(4) + x(8).\*Ps1)) - (1 - x(2)).\*x(5).\*(Ns1 - x(6))./(x(3).\*(1 + x(8).\*Ps1./x(4)).^2); %% 是否平方

H=Z./((2i\*pi\*f).^2+(2i\*pi\*f)\*Y+Z);

M=20\*log10(abs(H));

hold on

plot(f, M, '--', 'linewidth',1.7)

[a, b] = min(abs(M+10));

temp(i, 1) = tp(i);

temp(i, 2) = f(b);

end

y\_1=[0, 4E10];

y\_2=[-10, -10];

plot(y\_1,y\_2, 'linewidth',1)

axis([0 4E10 -12 30])

legend('1e-12', '3e-12', '5e-12', '7e-12', '9e-12', '11e-12', '13e-12', '15e-12', '17e-12', '19e-12');

xlabel('f/Hz')

ylabel('Hf/dB')

saveas(gcf, 'fig24.png');

temp

figure

plot(1e-22./temp(:, 1), temp(:, 2).\*1e-10, 'o-')

xlabel('tp/s')

% ylabel('10dB带宽/Hz')

ylabel('品质因数Q')

saveas(gcf, 'fig25.png');

load 3.mat

load TiCMOS.mat

% load('D:\FOLDER\桌面\校数模\2017B\L-I-20C.mat')

load('D:\FOLDER\桌面\校数模\2017B\S21\_5.mat')

figure

f = 0:1e7:4e10;

Ia = [7.5].\*1e-3;

% I = 0:1e-4:0.04;

T = 273.15 + 20;

Rs = 57.8774072057481;

Vt = 0.150069586007959;

Is = 9.69996336936704e-09;

I = Ti(:, 1);

U = I.\*Rs + Vt.\*log(1 + I./Is);

lambda = 0.327974911948322;

a\_0 = 0.00245295354589810;

a\_1 = -2.24461489568760E-05;

a\_2 = 8.55495131262933E-08;

a\_3 = -3.04196846538548E-10;

a\_4 = 6.38679397411974E-13;

Ith0 = 2.09792442194657E-05;

Rth = 3593.49598351965;

Ioff = a\_0 + a\_1.\*T + a\_2.\*T.^2 + a\_3.\*T.^3 + a\_4.\*T.^4;

P = lambda.\*(I - Ith0 - Ioff);

P(P<0) = 0;

I\_temp = Ia;

U\_temp = U(abs((I-Ia))<1e-10);

P\_temp = P(abs((I-Ia))<1e-10);

x(5) = 1e5;

x(7) = 1.16e-11;

Ns1 = (P\_temp./(x(4).\*x(7)) + x(5).\*x(6).\*P\_temp./(x(4) + x(8).\*P\_temp))./(x(2)./x(3) + x(5).\*P\_temp./(x(4) + x(8).\*P\_temp));

T1 = 293.15 + (I\_temp.\*U\_temp - P\_temp).\*Rth;

Ioff1 = a\_0 + a\_1.\*T1 + a\_2.\*T1.^2 + a\_3.\*T1.^3 + a\_4.\*T1.^4;

Ss1 = ((x(1).\*(I\_temp - Ith0 - Ioff1)./q) - (Ns1./x(3)))./(x(5).\*(Ns1 - x(6)));

Ps1 = x(4).\*Ss1;

Y = 1./x(7) + 1./x(3) + x(5).\*Ps1./(x(4) + x(8).\*Ps1) - x(5).\*(Ns1 - x(6))./(1 + x(8).\*Ps1./x(4)).^2; %% 是否平方

Z = 1./(x(7).\*x(3)) + x(5).\*Ps1./(x(7).\*(x(4) + x(8).\*Ps1)) - (1 - x(2)).\*x(5).\*(Ns1 - x(6))./(x(3).\*(1 + x(8).\*Ps1./x(4)).^2); %% 是否平方

H=Z./((2i\*pi\*f).^2+(2i\*pi\*f)\*Y+Z);

M=20\*log10(abs(H));

hold on

plot(f, M, '--', 'linewidth',1.7)

% [a, b] = min(abs(M+10));

% temp(i, 1) = tp(i);

% temp(i, 2) = f(b);

x(5) = 3e6;

x(7) = 1.16e-11;

Ns1 = (P\_temp./(x(4).\*x(7)) + x(5).\*x(6).\*P\_temp./(x(4) + x(8).\*P\_temp))./(x(2)./x(3) + x(5).\*P\_temp./(x(4) + x(8).\*P\_temp));

T1 = 293.15 + (I\_temp.\*U\_temp - P\_temp).\*Rth;

Ioff1 = a\_0 + a\_1.\*T1 + a\_2.\*T1.^2 + a\_3.\*T1.^3 + a\_4.\*T1.^4;

Ss1 = ((x(1).\*(I\_temp - Ith0 - Ioff1)./q) - (Ns1./x(3)))./(x(5).\*(Ns1 - x(6)));

Ps1 = x(4).\*Ss1;

Y = 1./x(7) + 1./x(3) + x(5).\*Ps1./(x(4) + x(8).\*Ps1) - x(5).\*(Ns1 - x(6))./(1 + x(8).\*Ps1./x(4)).^2; %% 是否平方

Z = 1./(x(7).\*x(3)) + x(5).\*Ps1./(x(7).\*(x(4) + x(8).\*Ps1)) - (1 - x(2)).\*x(5).\*(Ns1 - x(6))./(x(3).\*(1 + x(8).\*Ps1./x(4)).^2); %% 是否平方

H=Z./((2i\*pi\*f).^2+(2i\*pi\*f)\*Y+Z);

M=20\*log10(abs(H));

hold on

plot(f, M, '--', 'linewidth',1.7)

x(5) = 3e6;

x(7) = 8e-12;

Ns1 = (P\_temp./(x(4).\*x(7)) + x(5).\*x(6).\*P\_temp./(x(4) + x(8).\*P\_temp))./(x(2)./x(3) + x(5).\*P\_temp./(x(4) + x(8).\*P\_temp));

T1 = 293.15 + (I\_temp.\*U\_temp - P\_temp).\*Rth;

Ioff1 = a\_0 + a\_1.\*T1 + a\_2.\*T1.^2 + a\_3.\*T1.^3 + a\_4.\*T1.^4;

Ss1 = ((x(1).\*(I\_temp - Ith0 - Ioff1)./q) - (Ns1./x(3)))./(x(5).\*(Ns1 - x(6)));

Ps1 = x(4).\*Ss1;

Y = 1./x(7) + 1./x(3) + x(5).\*Ps1./(x(4) + x(8).\*Ps1) - x(5).\*(Ns1 - x(6))./(1 + x(8).\*Ps1./x(4)).^2; %% 是否平方

Z = 1./(x(7).\*x(3)) + x(5).\*Ps1./(x(7).\*(x(4) + x(8).\*Ps1)) - (1 - x(2)).\*x(5).\*(Ns1 - x(6))./(x(3).\*(1 + x(8).\*Ps1./x(4)).^2); %% 是否平方

H=Z./((2i\*pi\*f).^2+(2i\*pi\*f)\*Y+Z);

M=20\*log10(abs(H));

hold on

plot(f, M, '--', 'linewidth',1.7)

legend('G=1e5, tp=1.16e-11', 'G=3e6, tp=1.16e-11', 'G=3e6, tp=8e-12')

% y\_1=[0, 4E10];

% y\_2=[-10, -10];

% plot(y\_1,y\_2, 'linewidth',1)

axis([0 4E10 -12 10])

% legend('1e-12', '3e-12', '5e-12', '7e-12', '9e-12', '11e-12', '13e-12', '15e-12', '17e-12', '19e-12');

xlabel('f/Hz')

ylabel('Hf/dB')

saveas(gcf, 'fig26.png');