



CMOS028FDSOI Technology

PN Junction Diode models

DK1.2_RF_mmW

Comparison with DK1.1_RF_mmW model(s)

Please use the bookmark to navigate

Sep 21, 2018

Technology R&D Crolles Site – TDP/TDS/SPICE Modeling

Unauthorized reproduction and communication strictly prohibited

dormieub

ST Confidential

General information on models

- Maximum supply voltage is - V.
- Validity domain is defined as follows:
 - ✓ Device temperature varies from -40 C °C to 150 C °C.

Output parameters definitions

- Model(s): diodenwx, diodenx, diodepnw, diodepwtw, diodetwx, egdiodenx, egdiodepnw
 - ✓ C_j : Junction capacitance at $V_j = 1.0V$, $f = 100KHz$.
 - ✓ I_j : Junction leakage current at $V_j = 1.0V$.

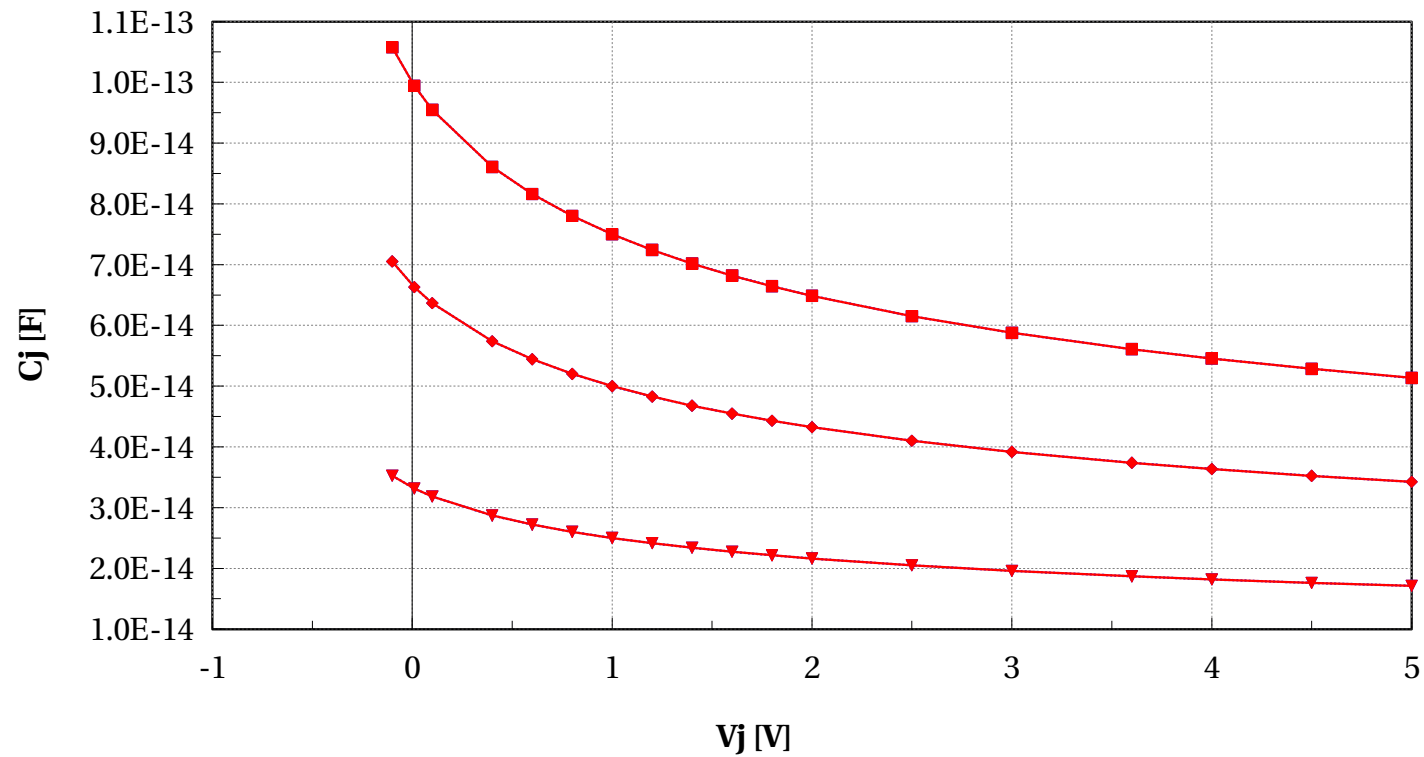
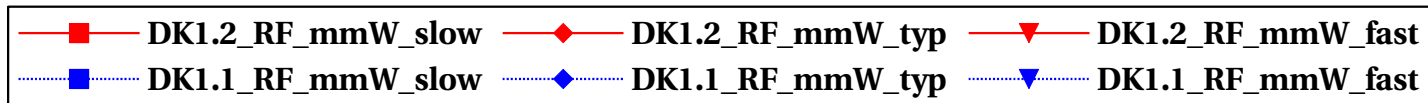
diodenwx

Electrical characteristics scaling

Cj and Ij scaling versus Vj for Area diode, Temp=25C & Temp=125C

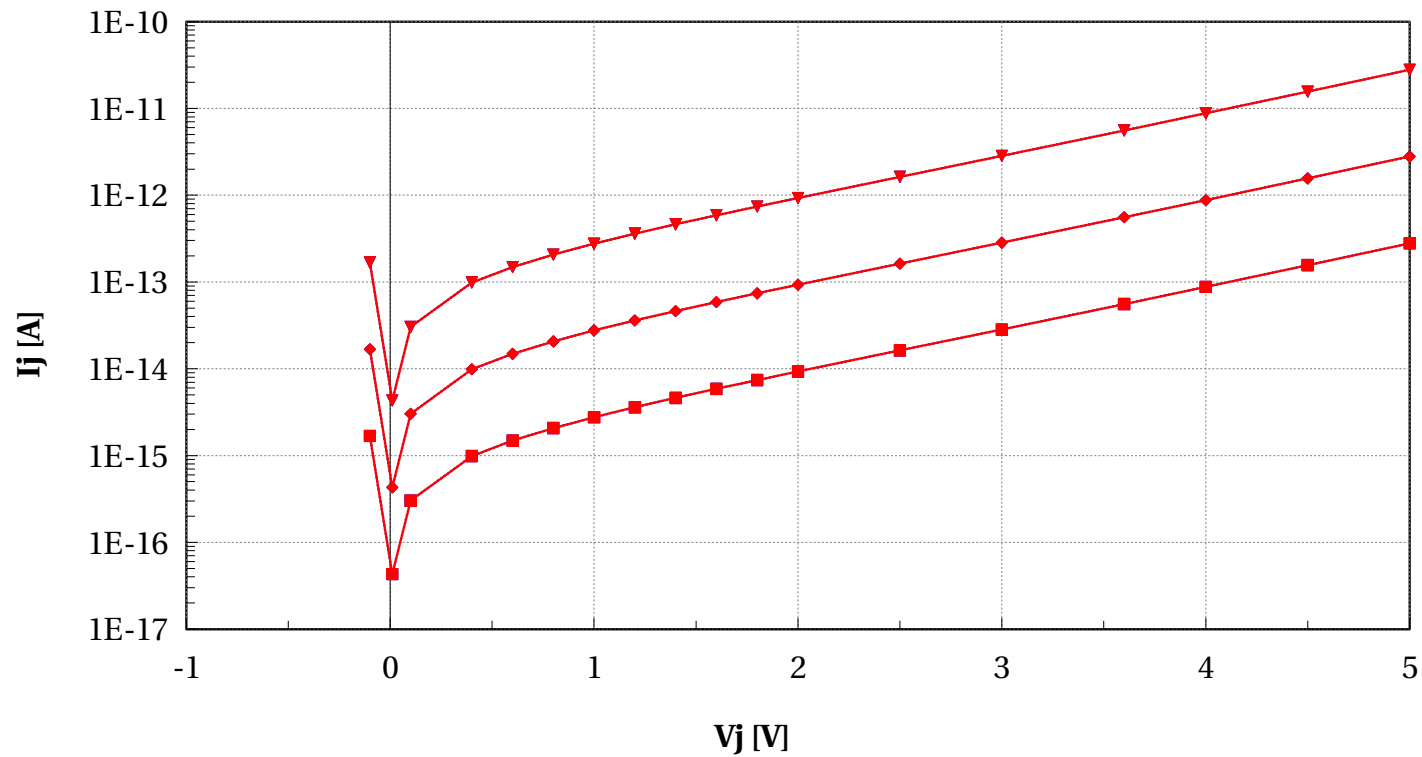
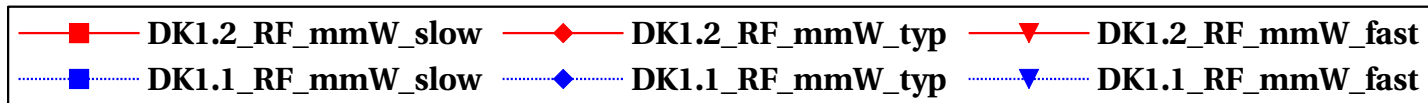
diode wx, Cj [F] vs Vj [V]

area==2e-12 and Temp==25



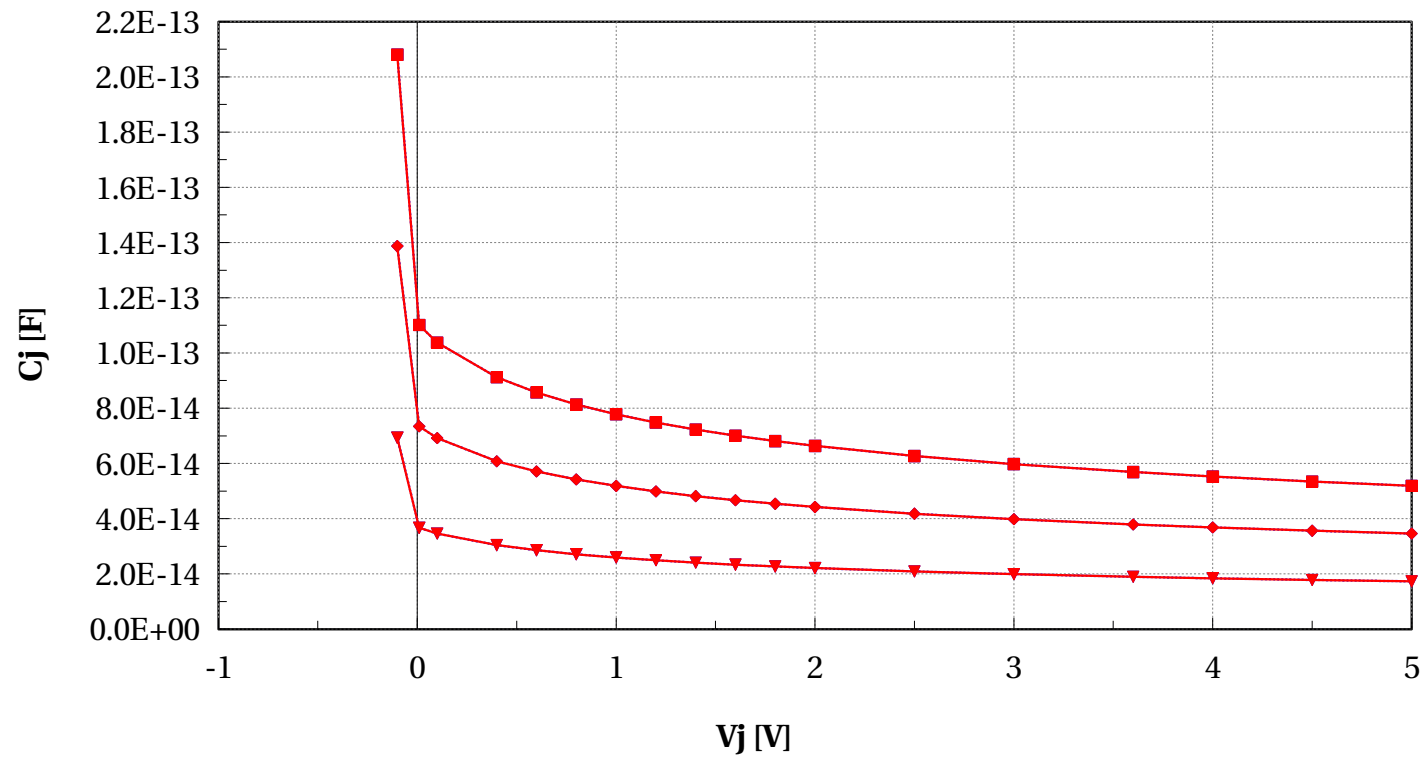
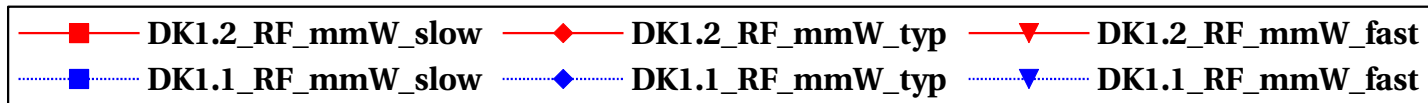
diodenwx, I_j [A] vs V_j [V]

area==2e-12 and Temp==25



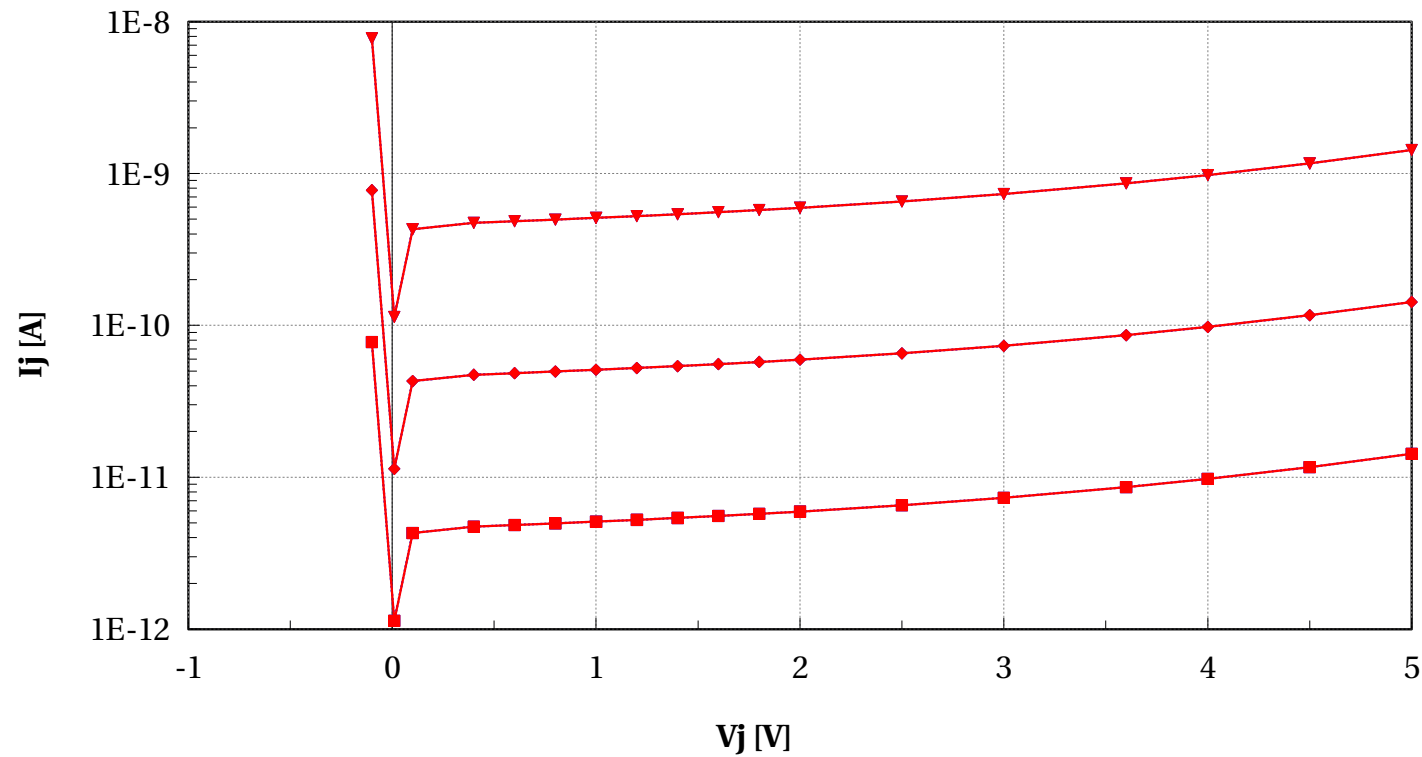
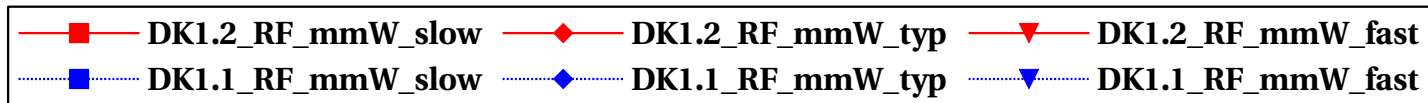
diode wx, C_j [F] vs V_j [V]

area==2e-12 and Temp==125



diodenwx, I_j [A] vs V_j [V]

area==2e-12 and Temp==125

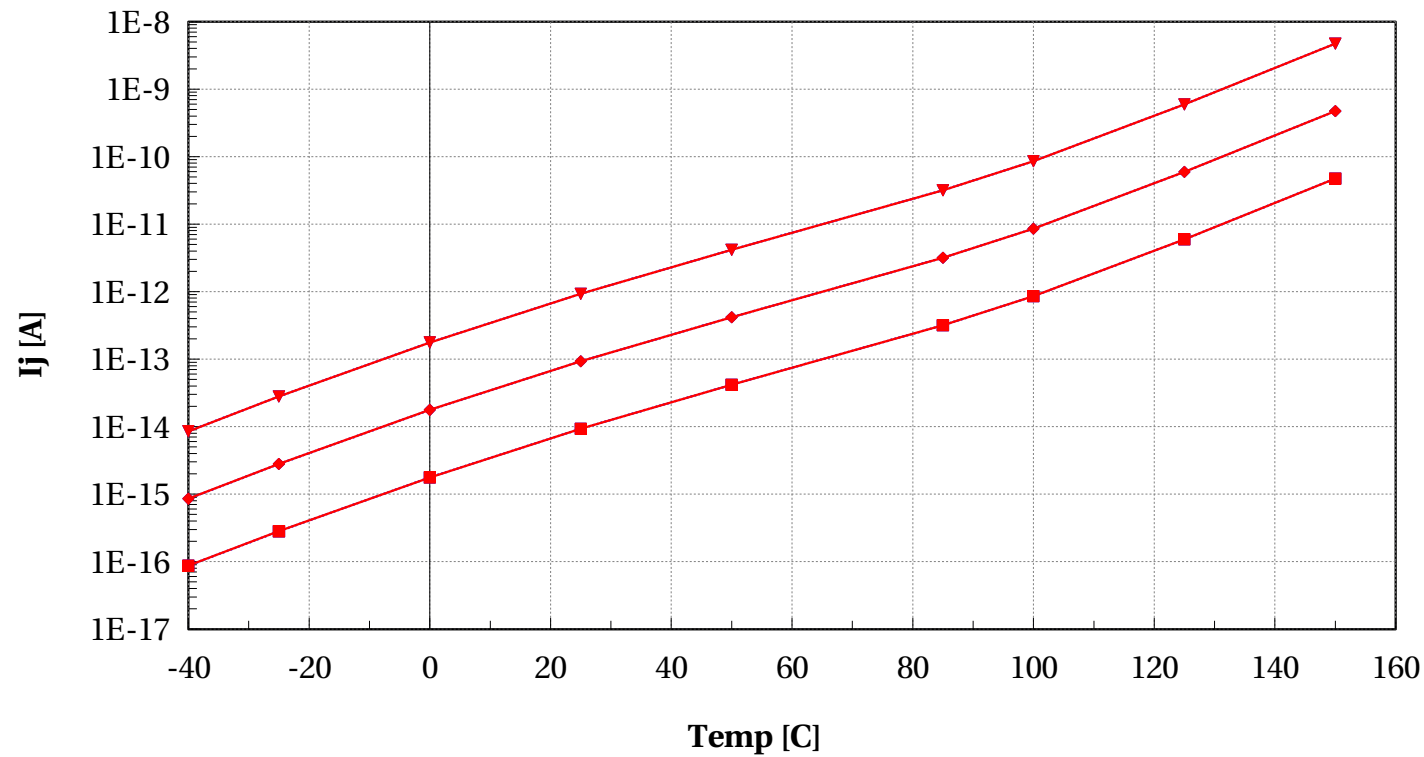
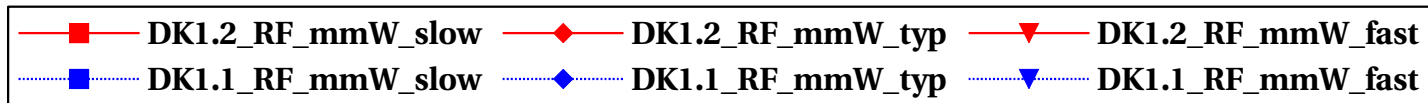


C_j and I_j scaling versus V_j for Peri diode, Temp=25C & Temp=125C

Cj and Ij scaling versus Temp for Area diode

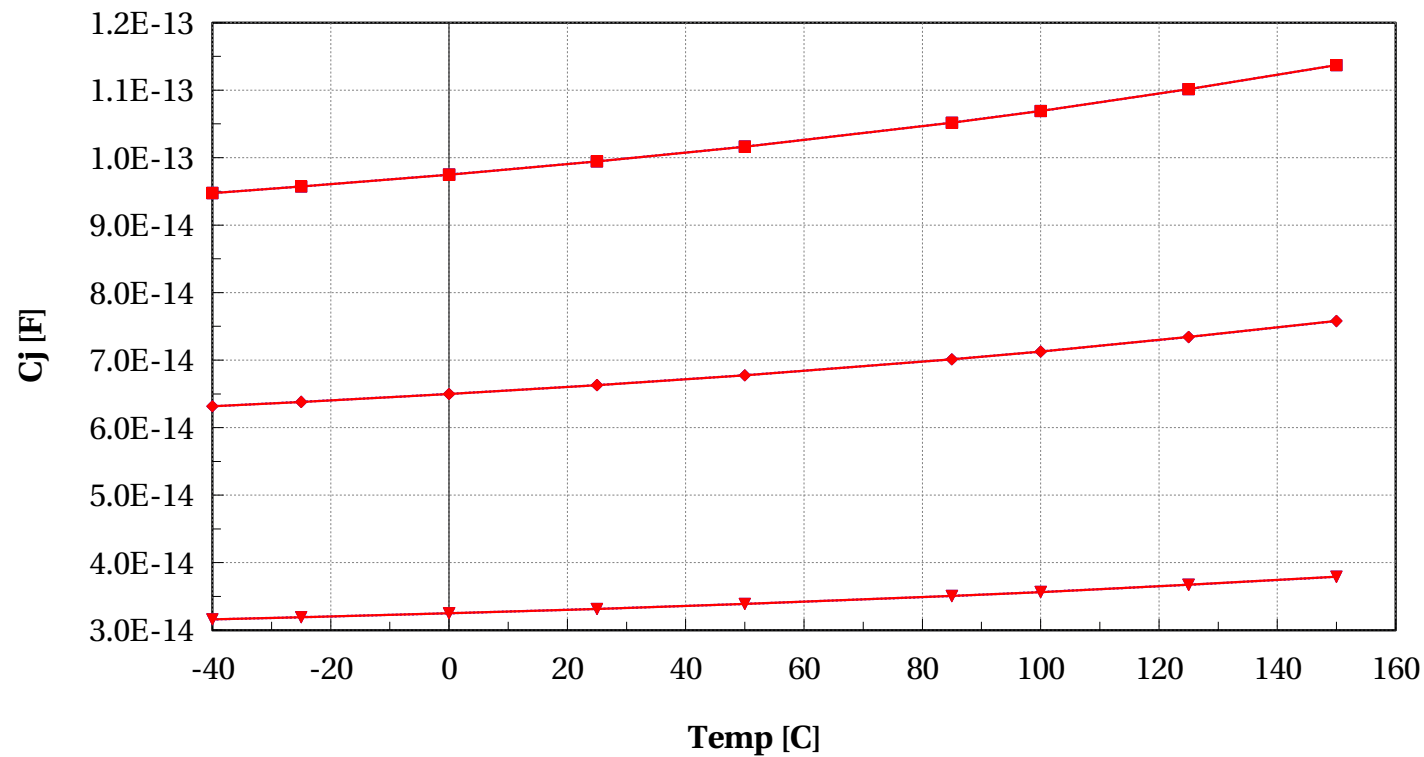
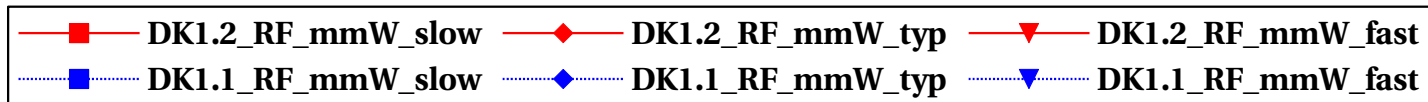
diode wx, I_j [A] vs Temp [C]

area==2e-12 and V_j ==2.0



diodenwx, Cj [F] vs Temp [C]

area==2e-12 and Vj==0.01



Cj and Ij scaling versus Temp for Peri diode

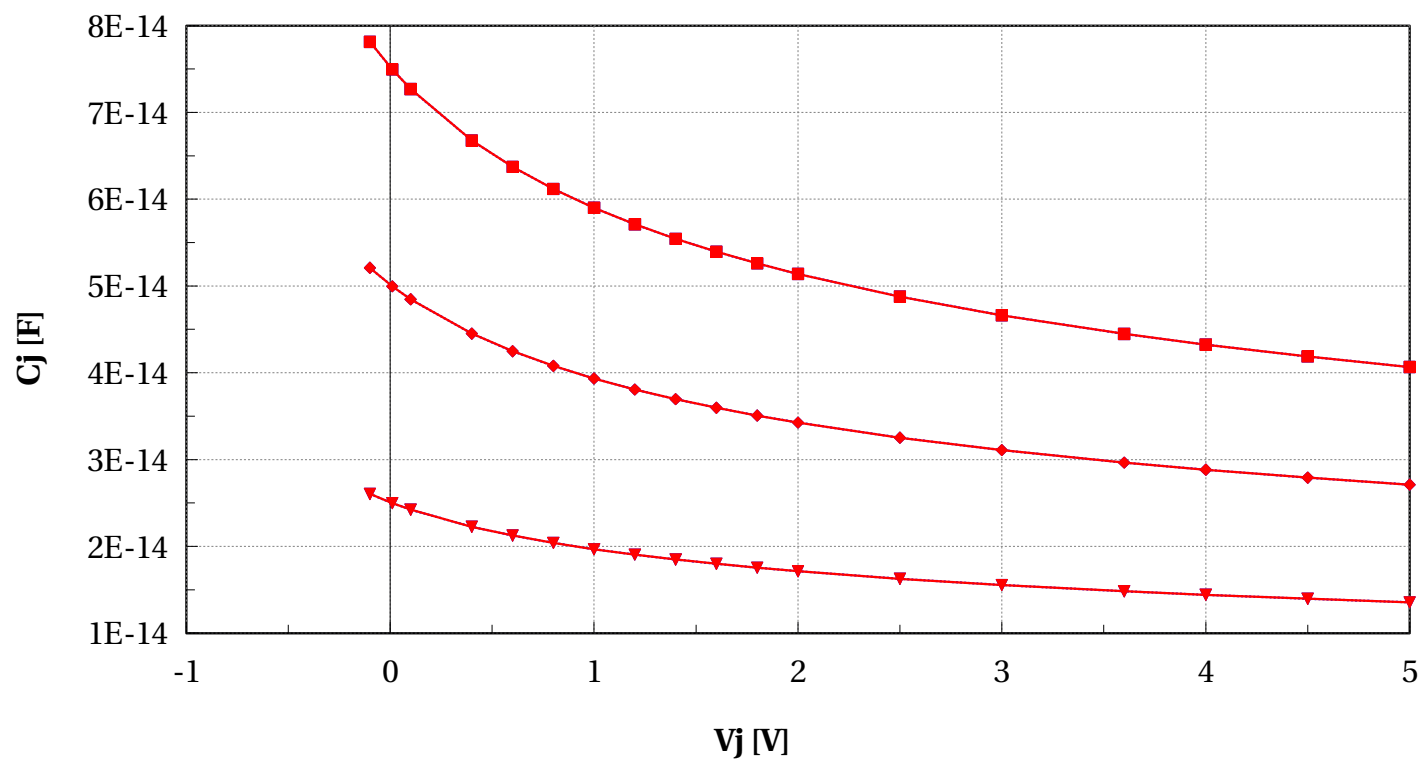
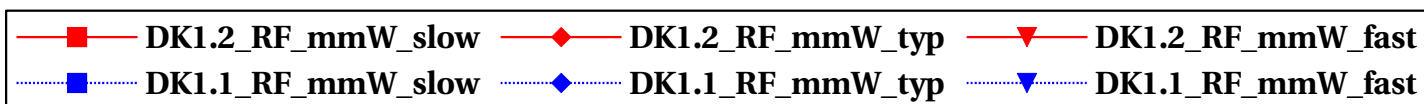
diodenx

Electrical characteristics scaling

Cj and Ij scaling versus Vj for Area diode, Temp=25C & Temp=125C

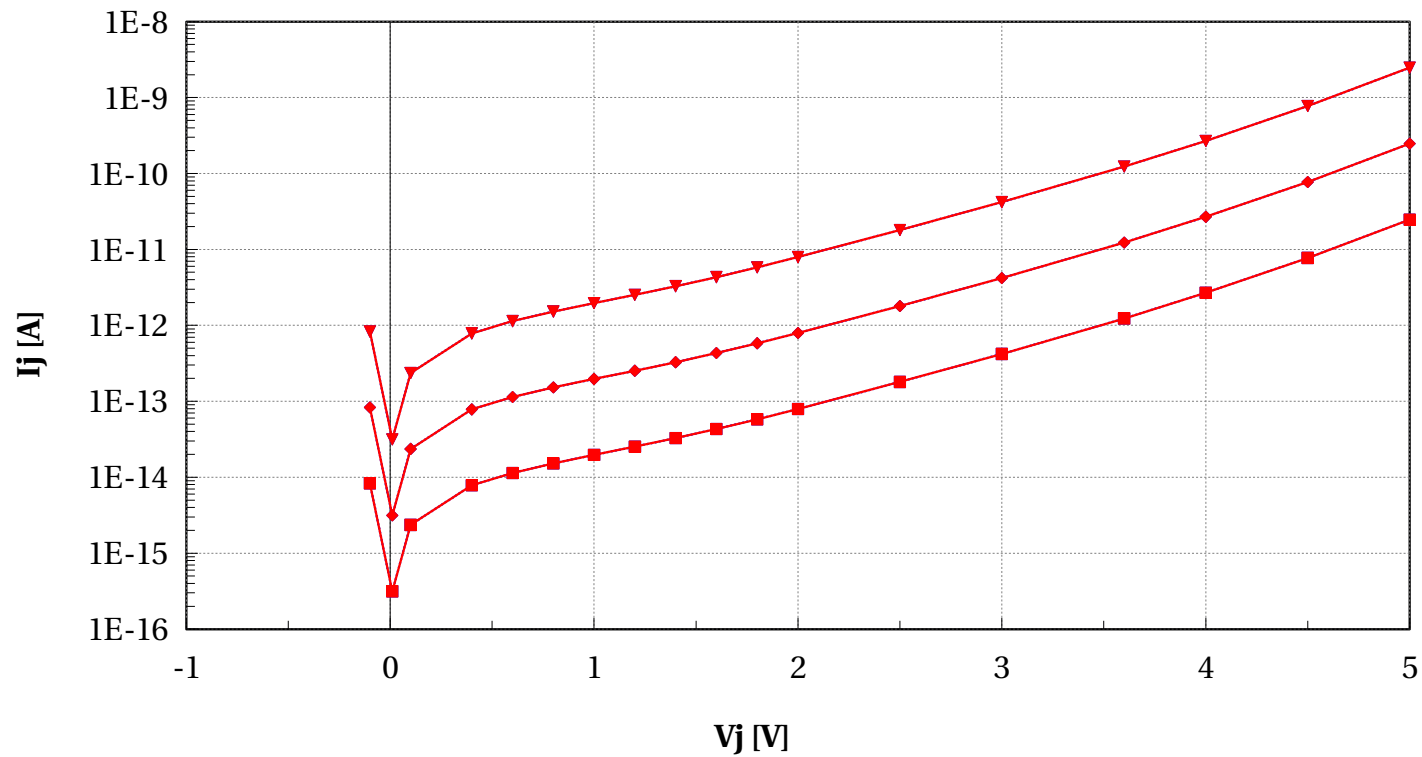
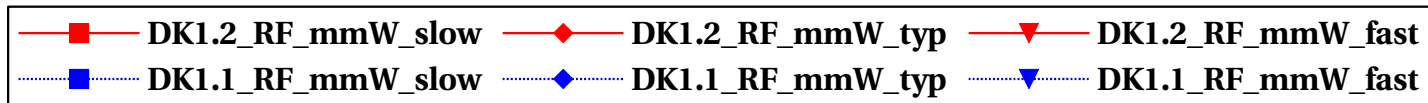
diodenx, Cj [F] vs Vj [V]

area==2e-12 and Temp==25



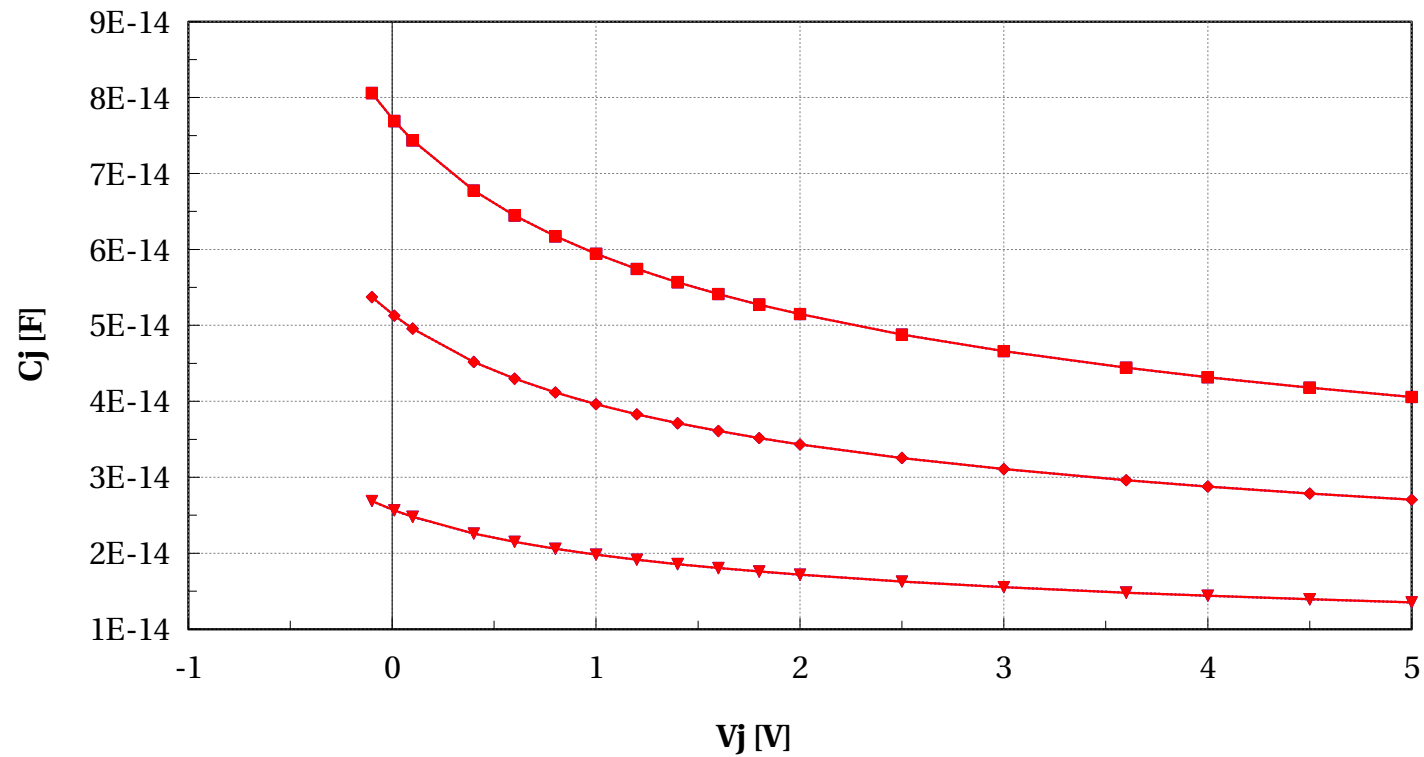
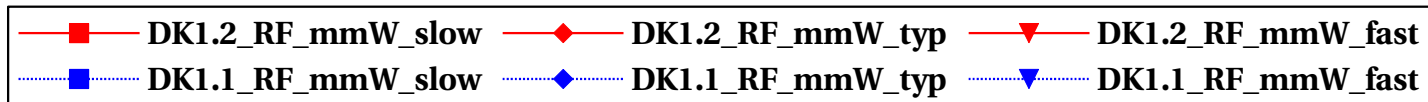
diode_x, I_j [A] vs V_j [V]

area==2e-12 and Temp==25



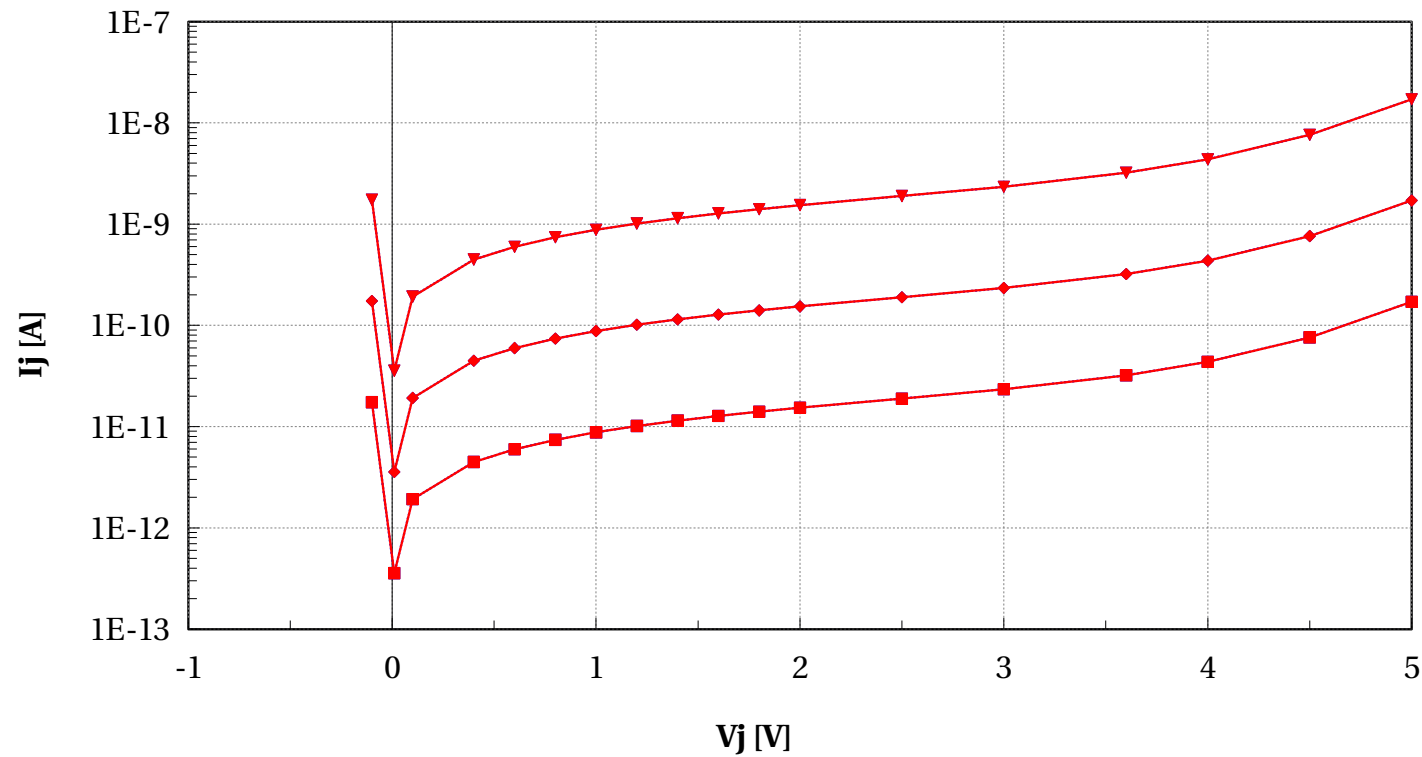
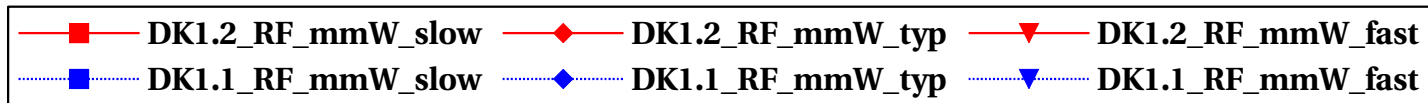
diodenx, Cj [F] vs Vj [V]

area==2e-12 and Temp==125



diode_x, I_j [A] vs V_j [V]

area==2e-12 and Temp==125

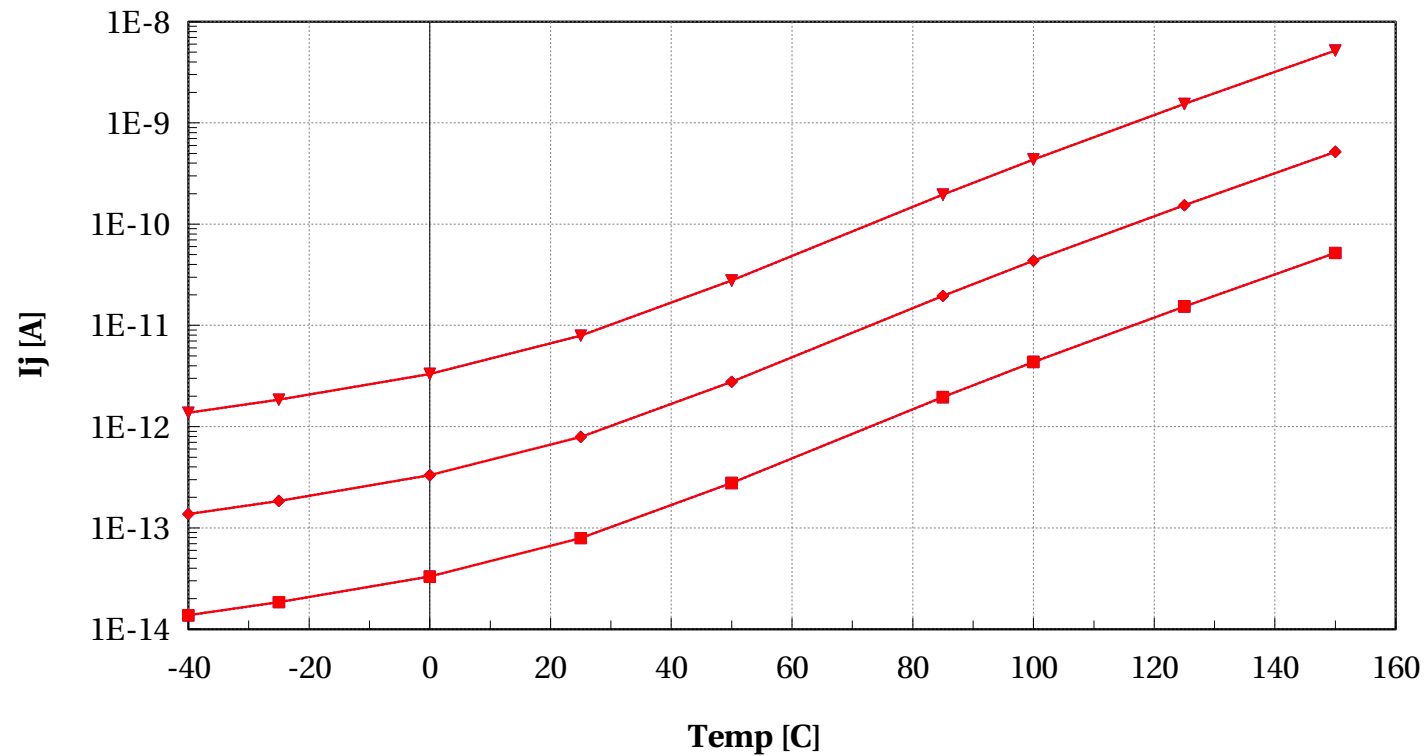
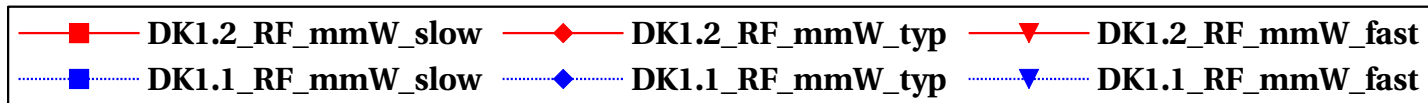


Cj and Ij scaling versus Vj for Peri diode, Temp=25C & Temp=125C

Cj and Ij scaling versus Temp for Area diode

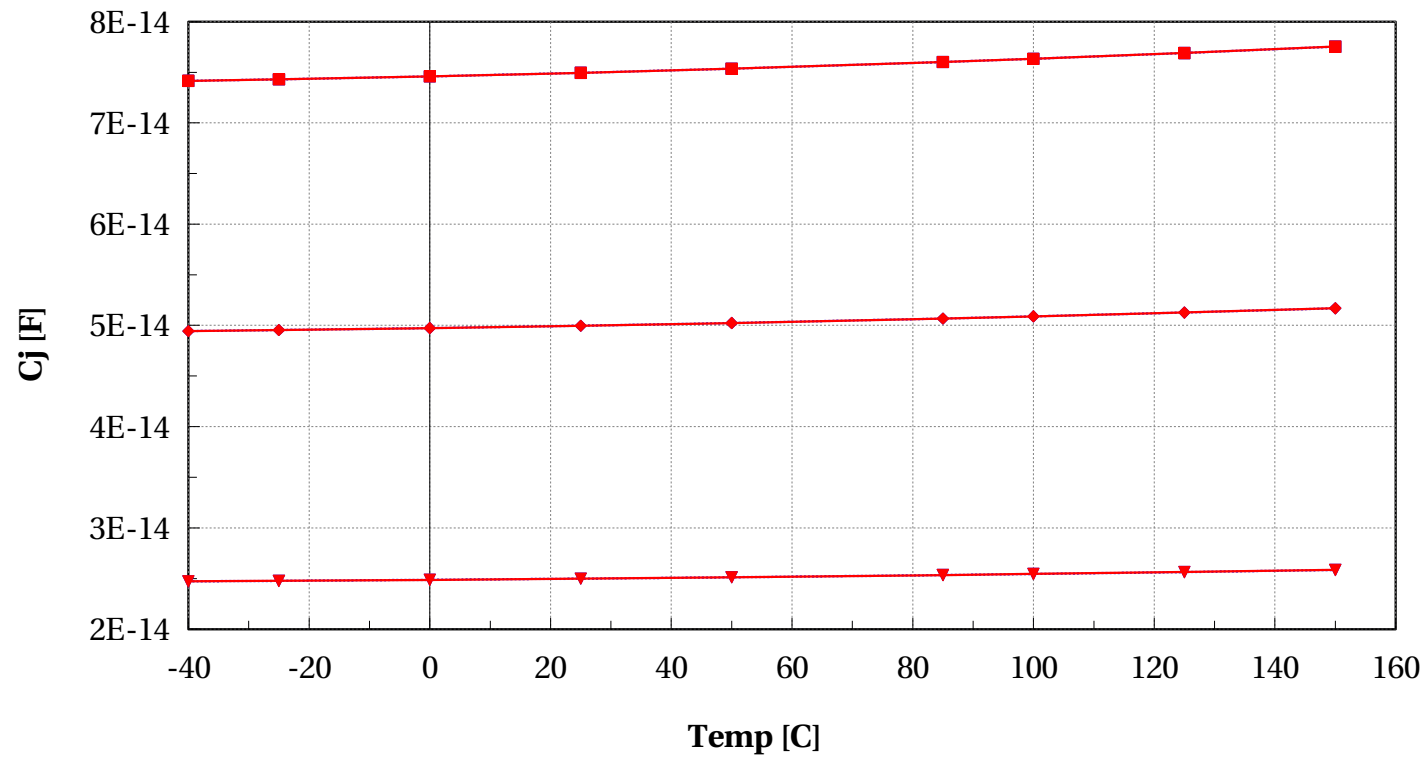
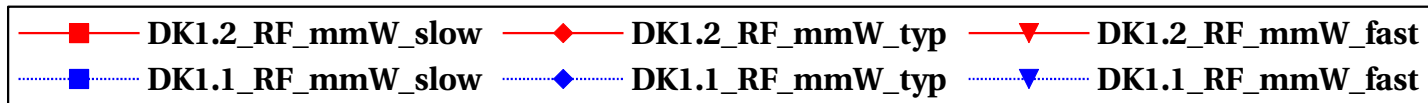
diode_x, I_j [A] vs Temp [C]

area==2e-12 and V_j ==2.0



diode_x, C_j [F] vs Temp [C]

area==2e-12 and V_j=0.01



Cj and Ij scaling versus Temp for Peri diode

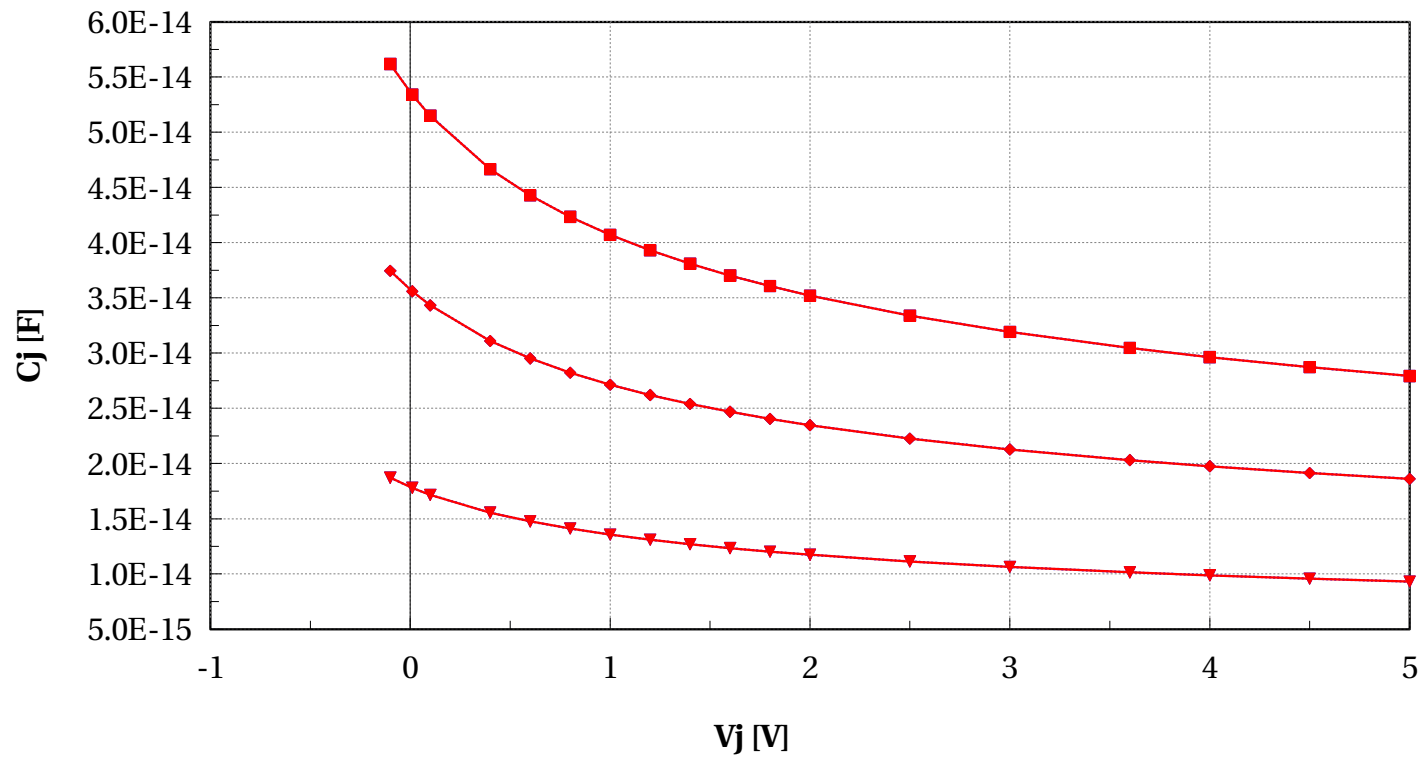
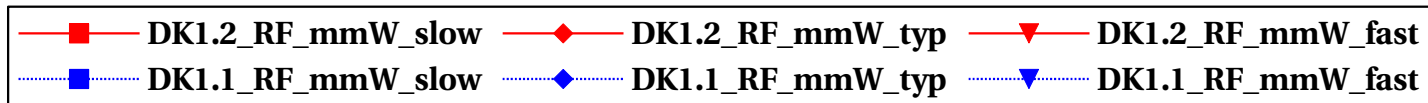
diodepnw

Electrical characteristics scaling

Cj and Ij scaling versus Vj for Area diode, Temp=25C & Temp=125C

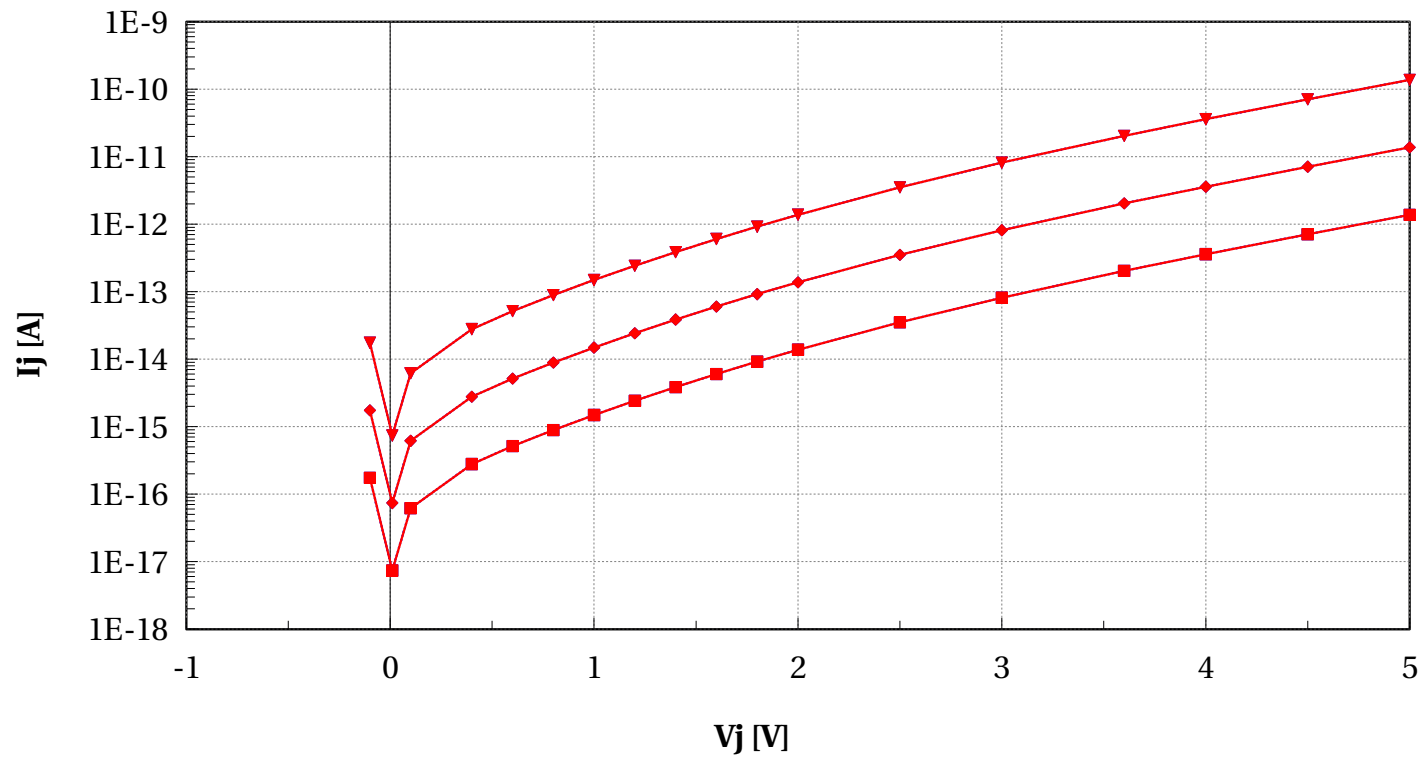
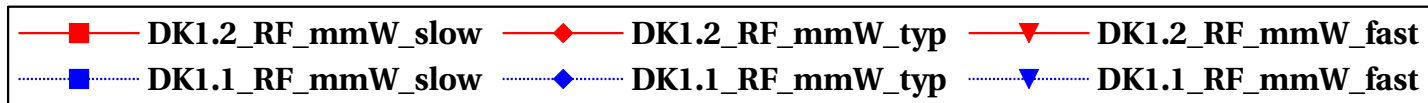
diodepnw, Cj [F] vs Vj [V]

area==2e-12 and Temp==25



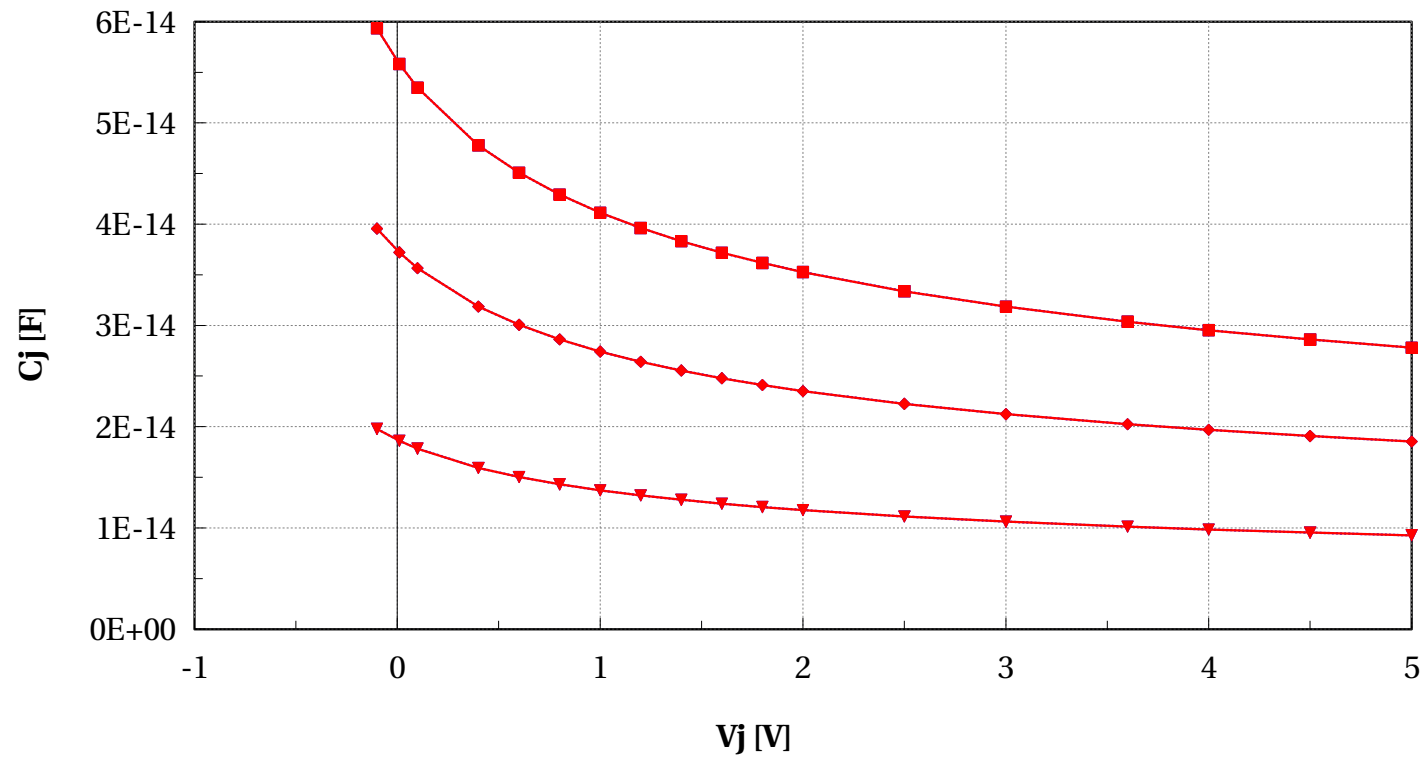
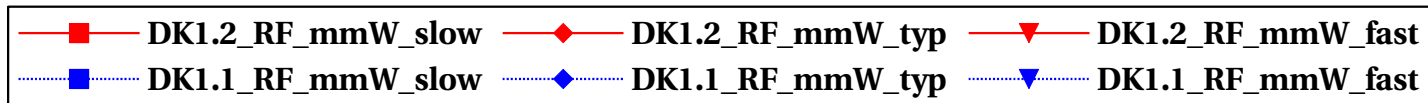
diodepnw, I_j [A] vs V_j [V]

area==2e-12 and Temp==25



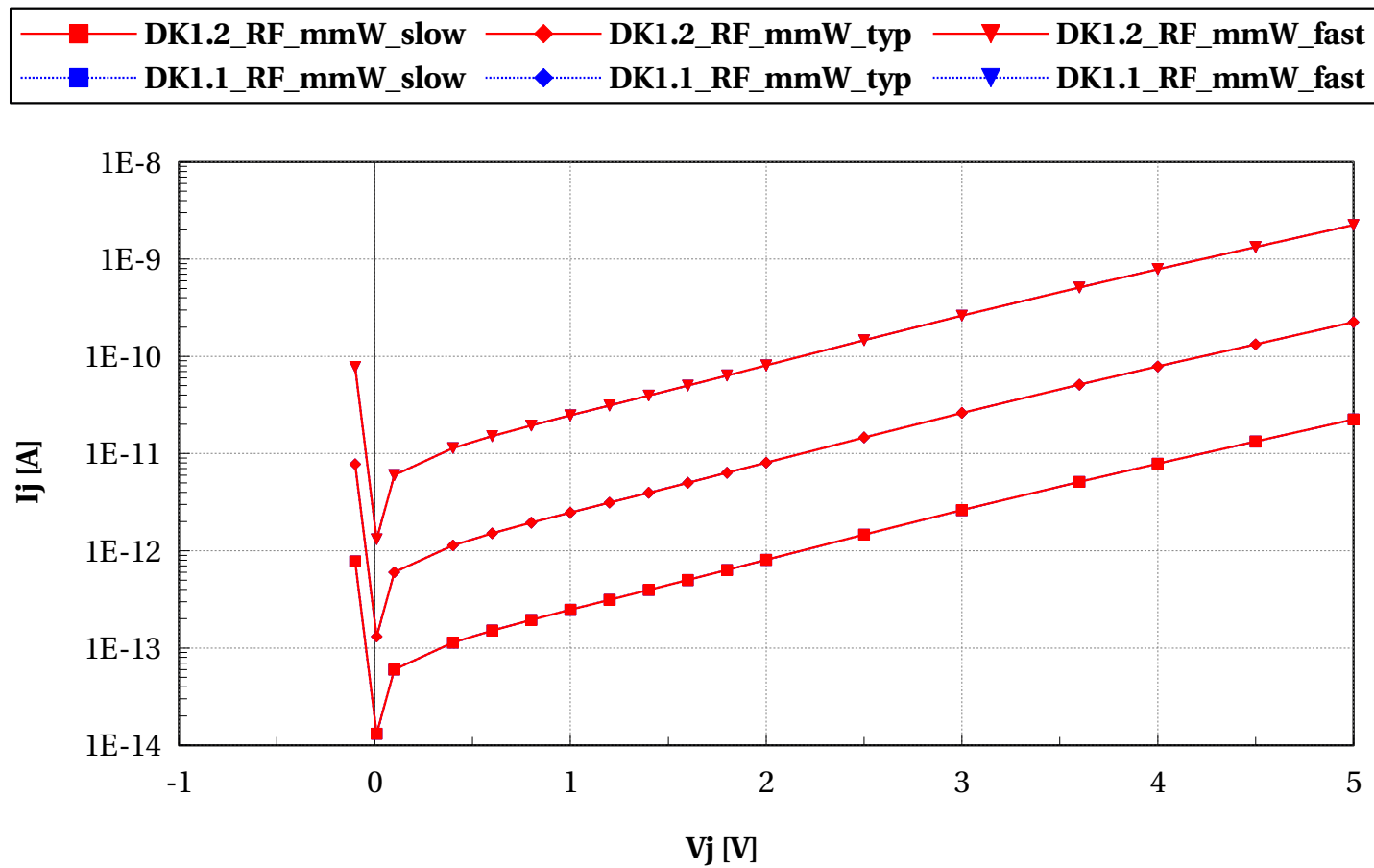
diodepnw, Cj [F] vs Vj [V]

area==2e-12 and Temp==125



diodepnw, I_j [A] vs V_j [V]

area==2e-12 and Temp==125

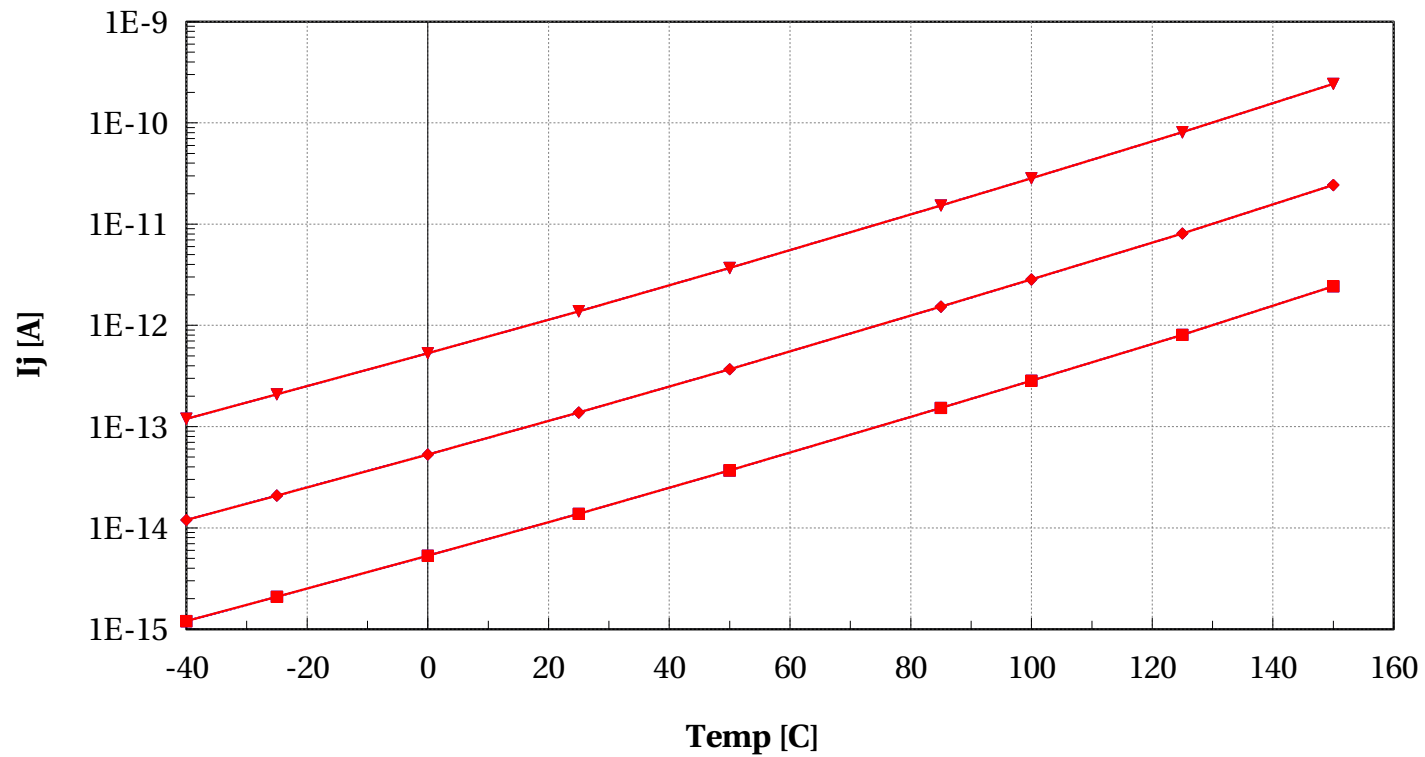
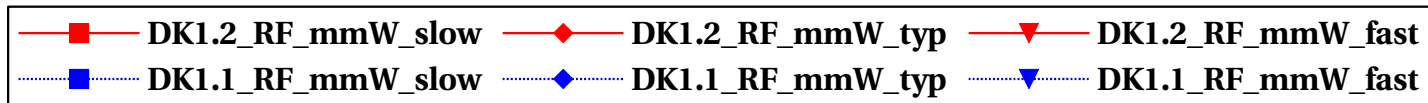


C_j and I_j scaling versus V_j for Peri diode, Temp=25C & Temp=125C

Cj and Ij scaling versus Temp for Area diode

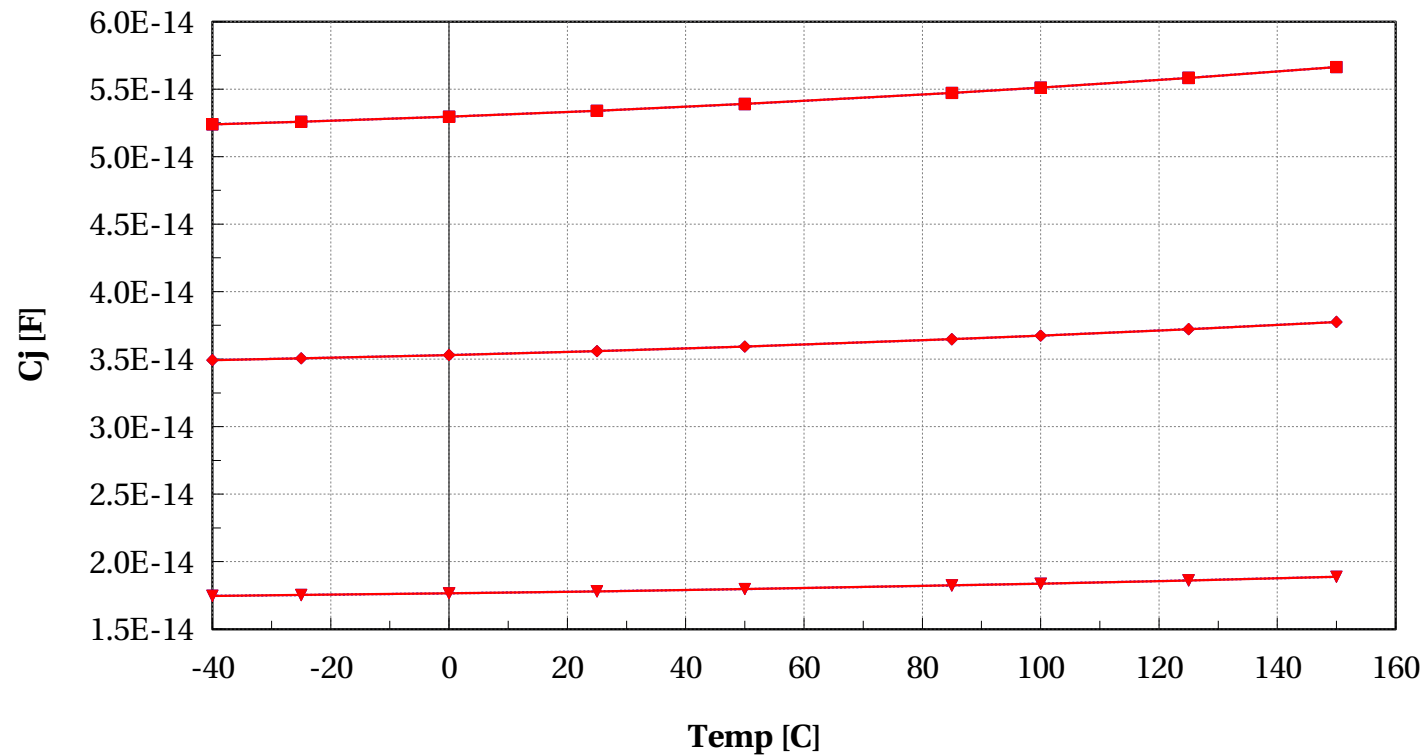
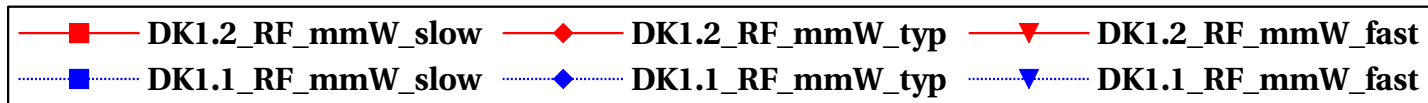
diodepnw, Ij [A] vs Temp [C]

area==2e-12 and Vj==2.0



diodepnw, Cj [F] vs Temp [C]

area==2e-12 and Vj==0.01



Cj and Ij scaling versus Temp for Peri diode

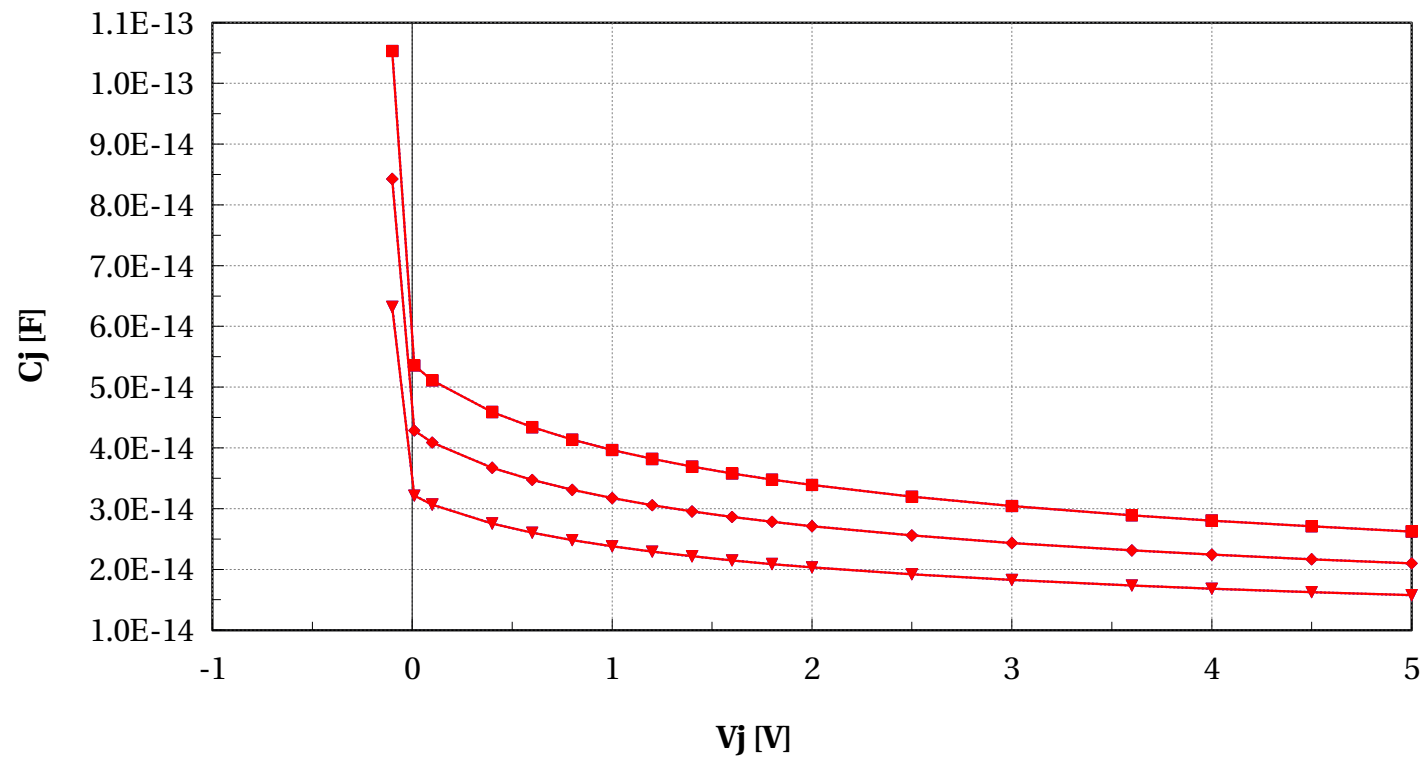
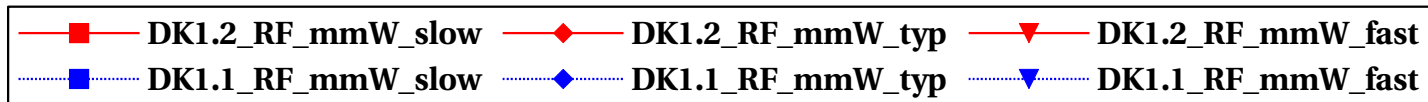
diodepwtw

Electrical characteristics scaling

Cj and Ij scaling versus Vj for Area diode, Temp=25C & Temp=125C

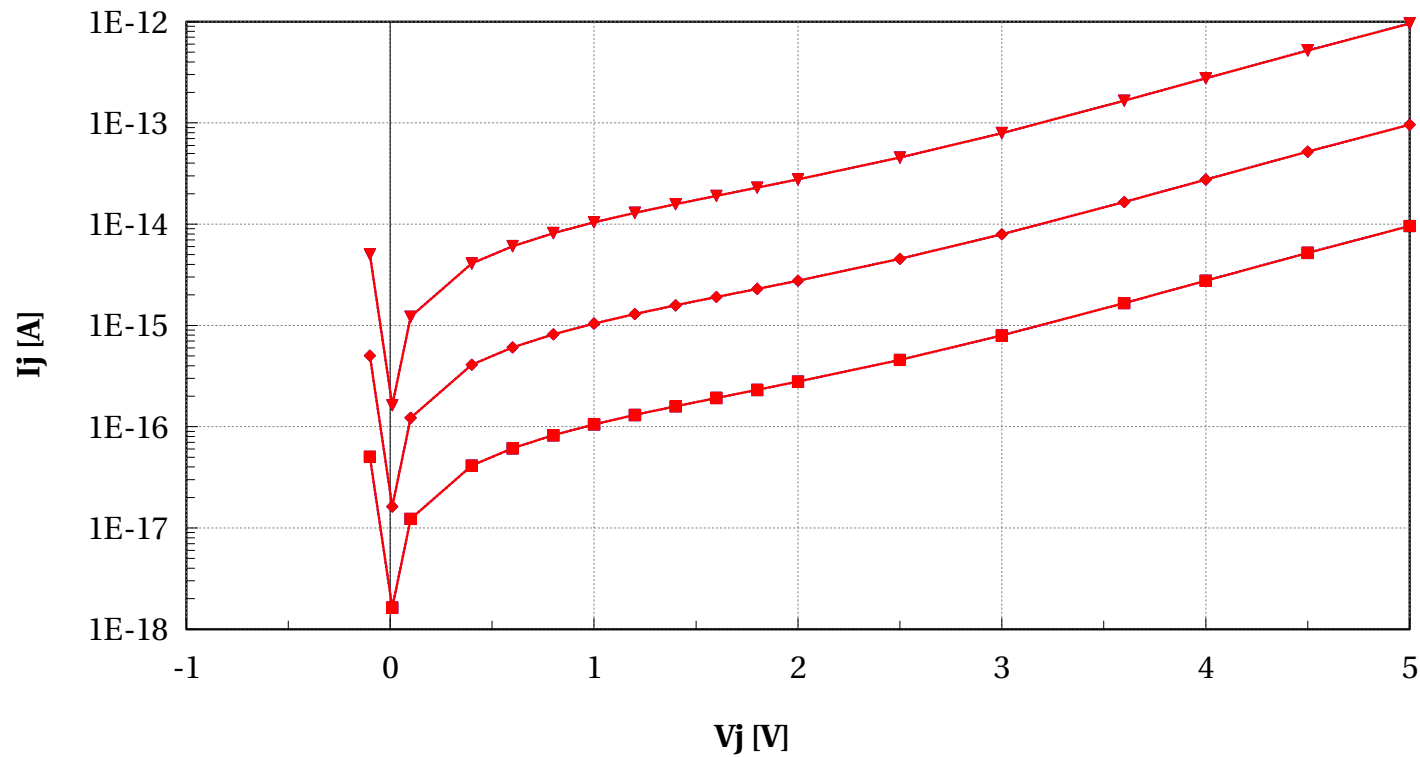
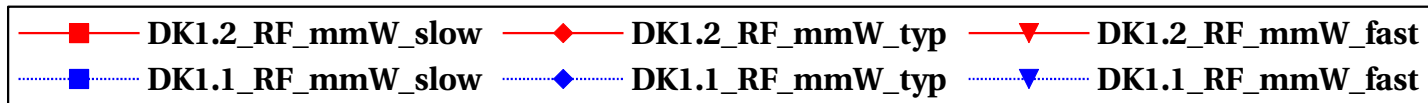
diodepwtw, Cj [F] vs Vj [V]

area==2e-12 and Temp==25



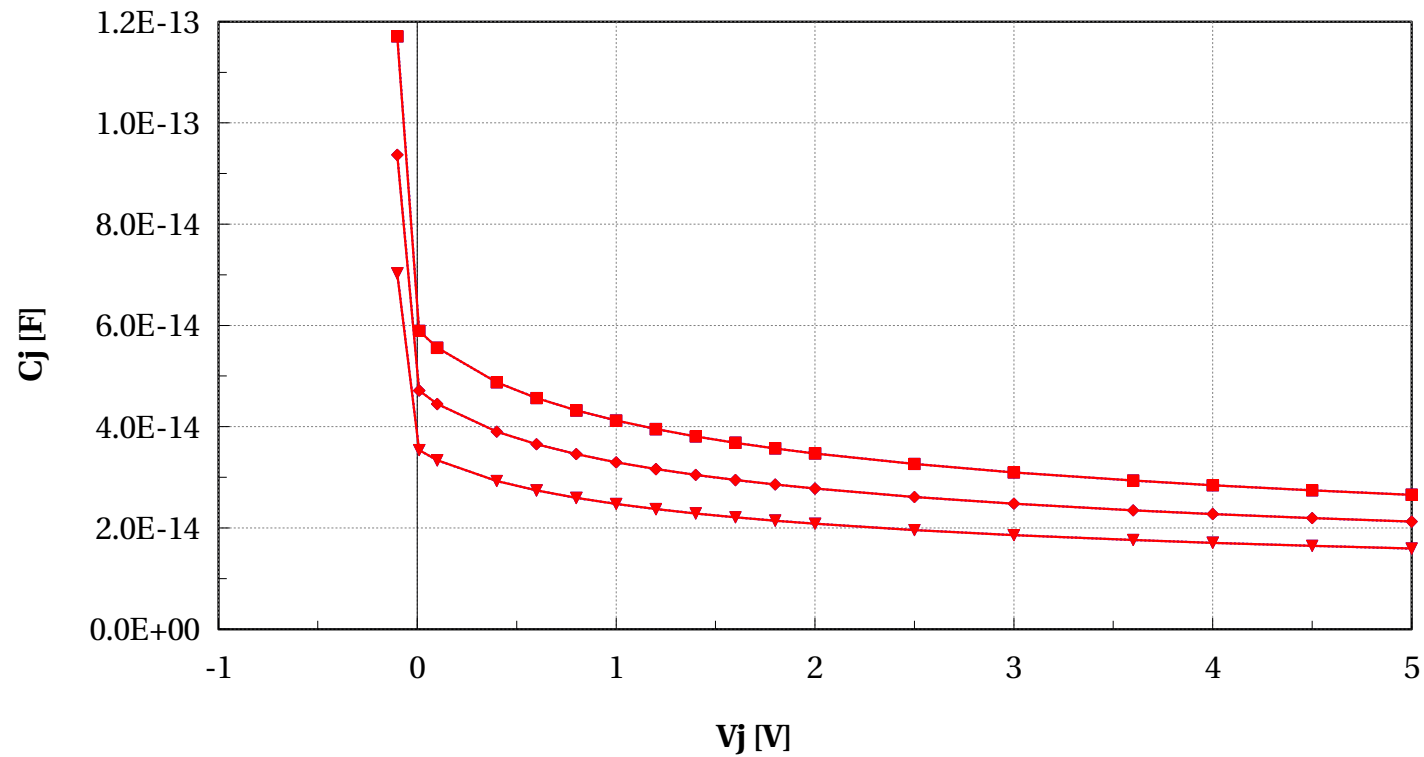
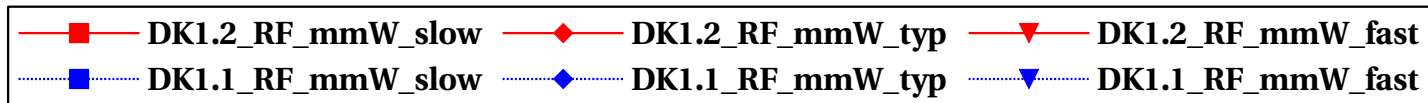
diodepwtw, I_j [A] vs V_j [V]

area==2e-12 and Temp==25



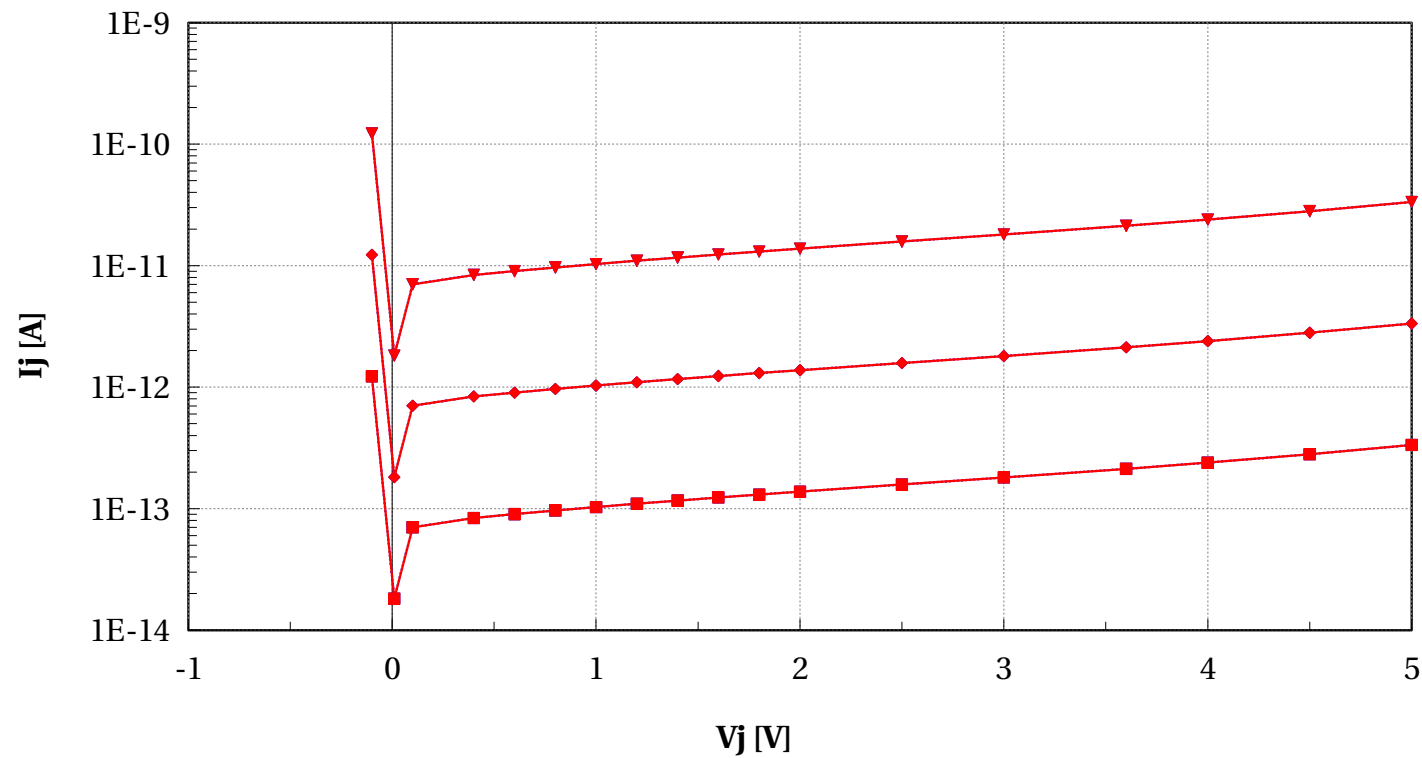
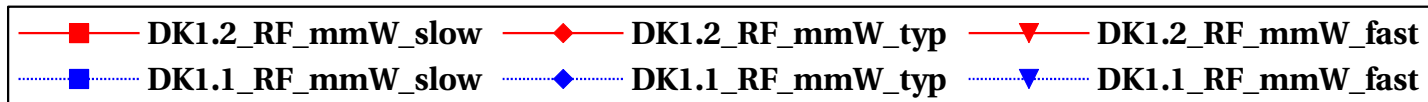
diodepwtw, Cj [F] vs Vj [V]

area==2e-12 and Temp==125



diodepwtw, I_j [A] vs V_j [V]

area==2e-12 and Temp==125

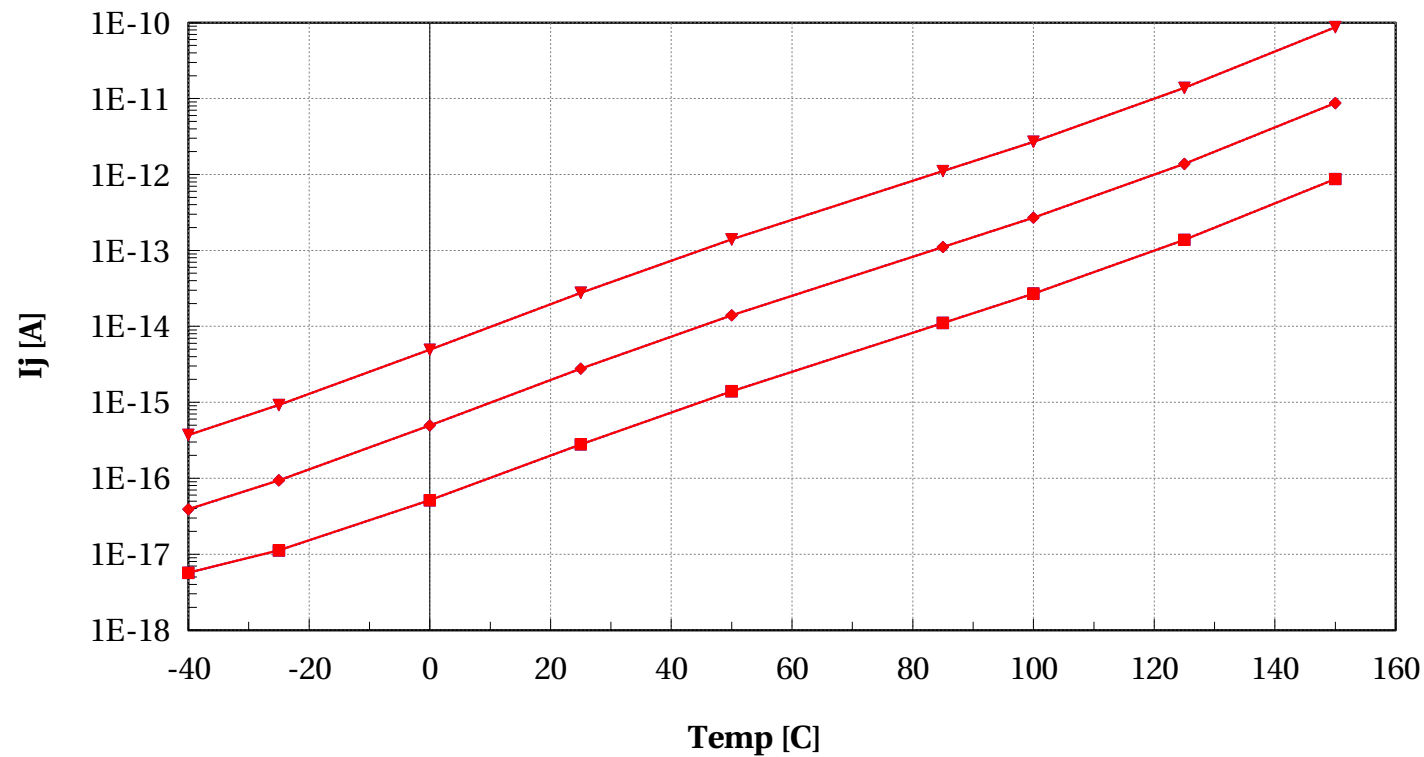
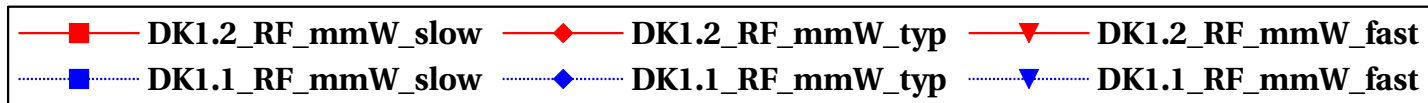


C_j and I_j scaling versus V_j for Peri diode, Temp=25C & Temp=125C

Cj and Ij scaling versus Temp for Area diode

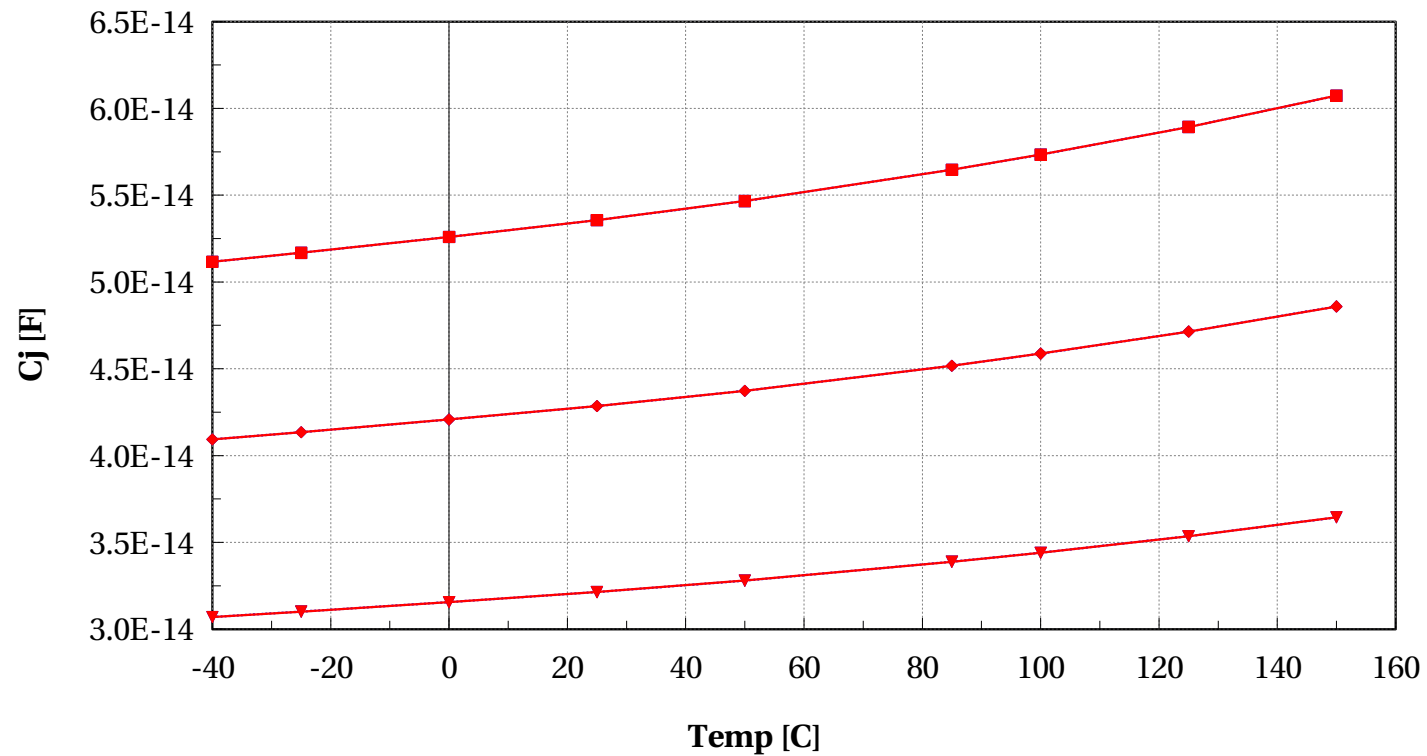
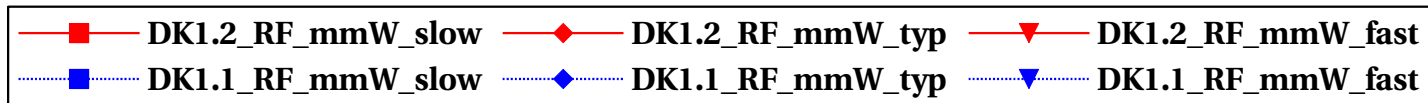
diodepwtw, I_j [A] vs Temp [C]

area==2e-12 and V_j ==2.0



diodepwtw, Cj [F] vs Temp [C]

area==2e-12 and Vj==0.01



Cj and Ij scaling versus Temp for Peri diode

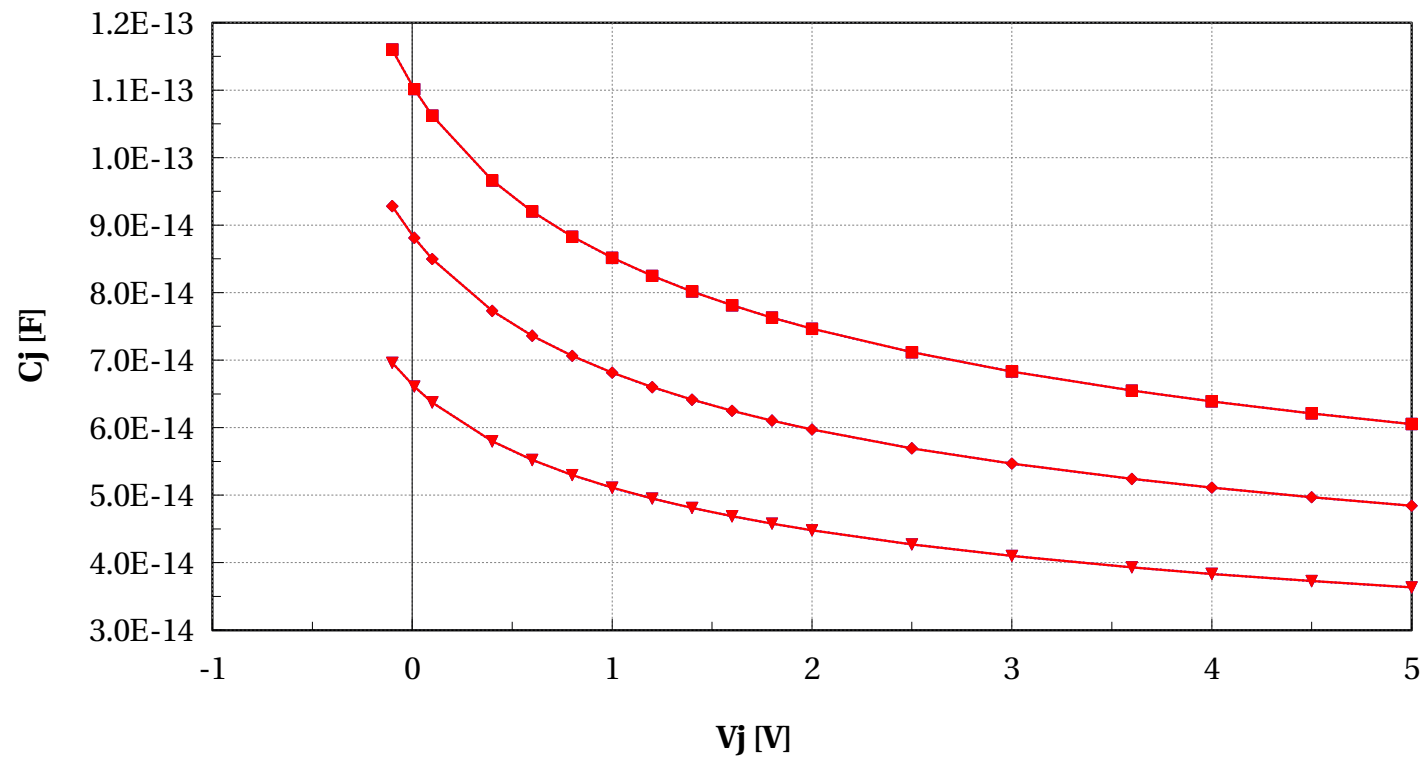
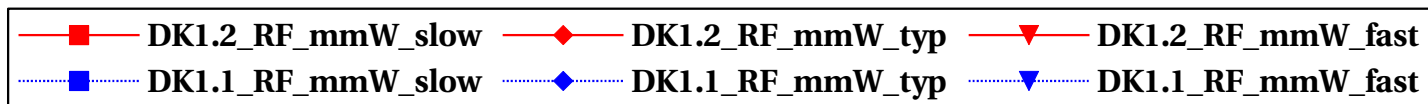
diodetwx

Electrical characteristics scaling

Cj and Ij scaling versus Vj for Area diode, Temp=25C & Temp=125C

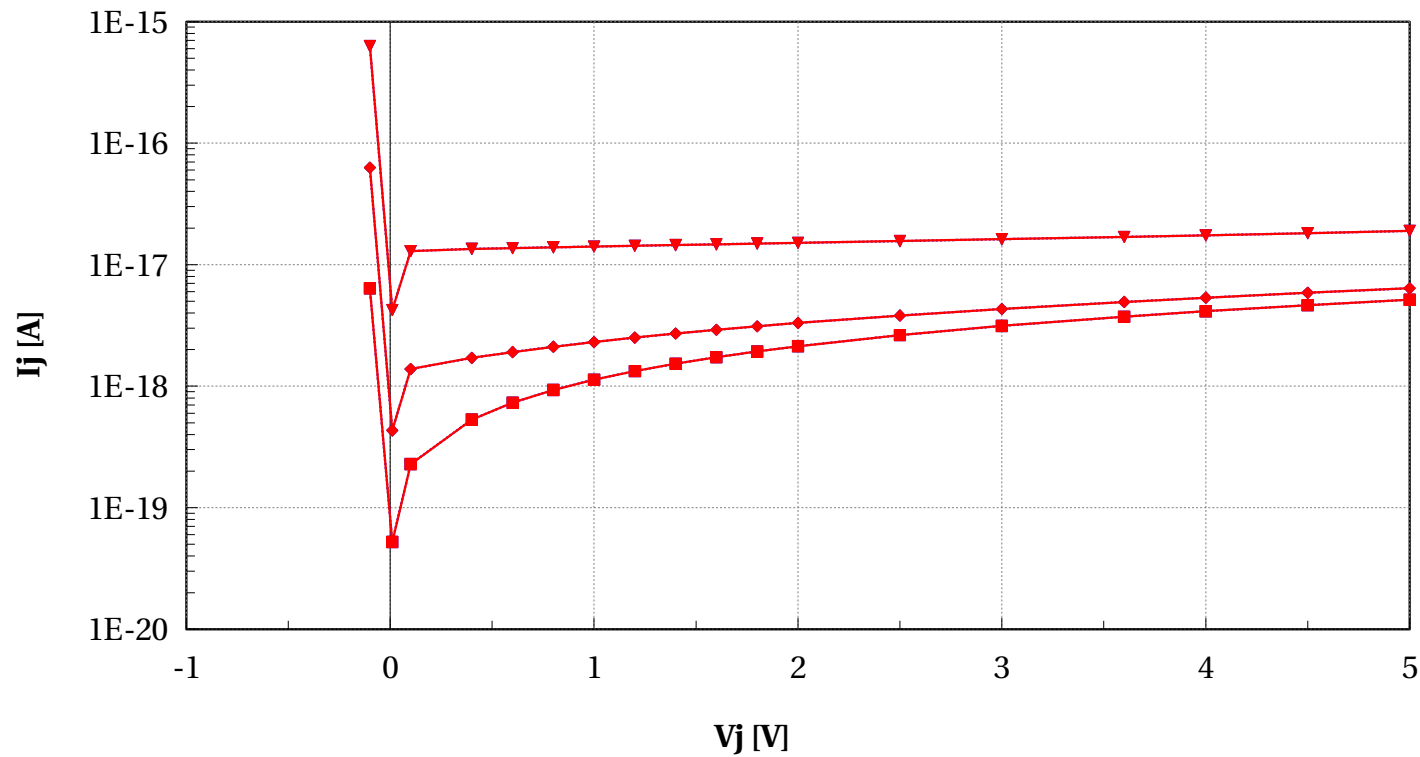
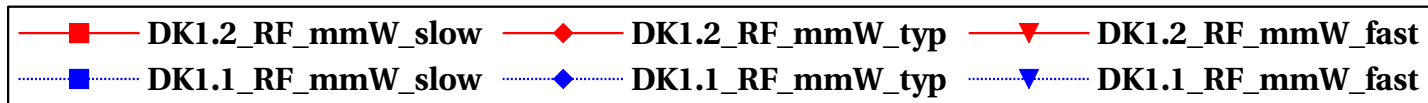
diode_{tx}, C_j [F] vs V_j [V]

area==2e-12 and Temp==25



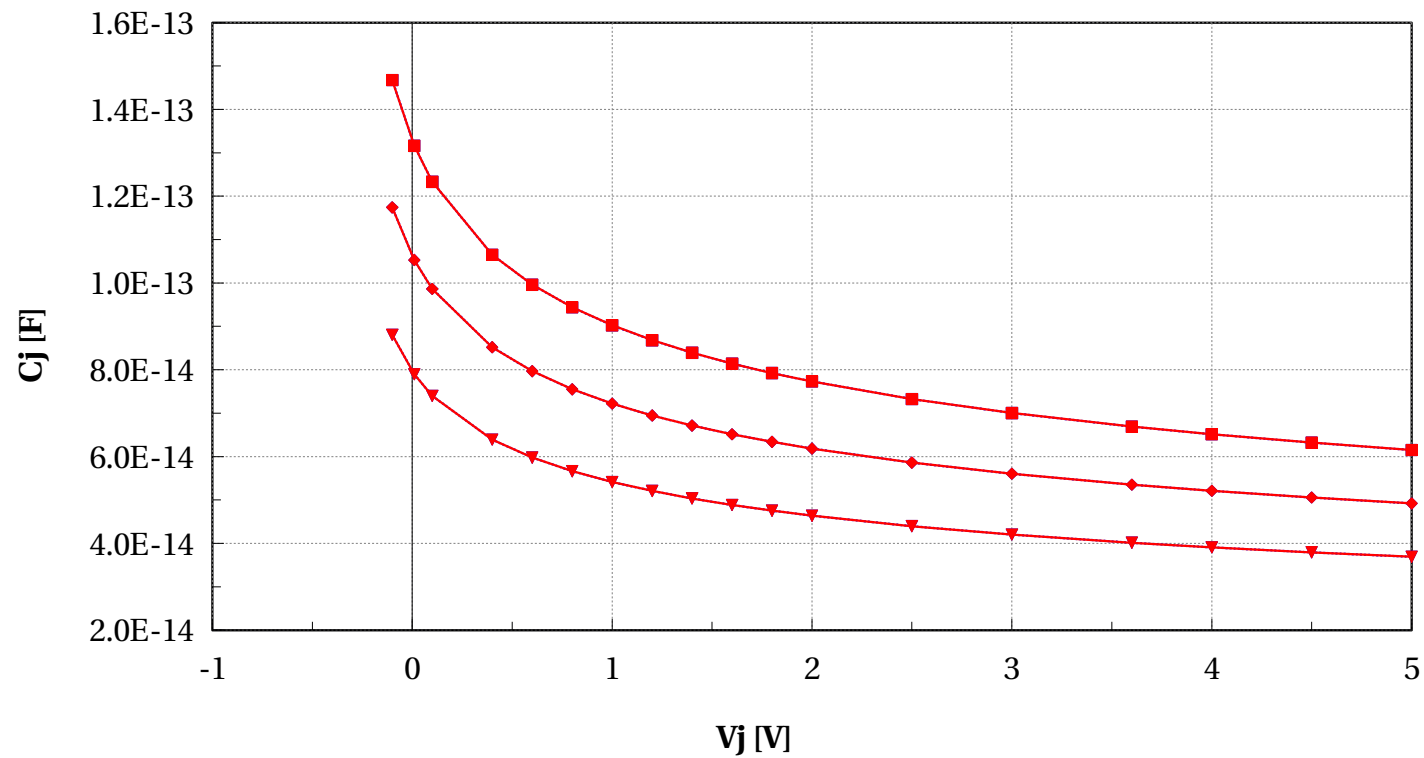
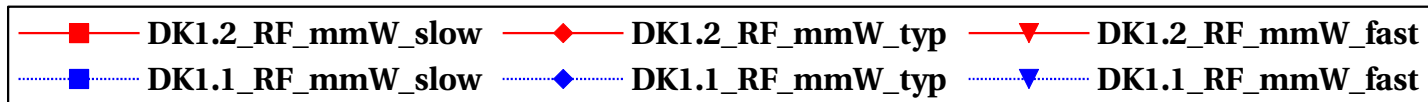
diode_{twx}, I_j [A] vs V_j [V]

area==2e-12 and Temp==25



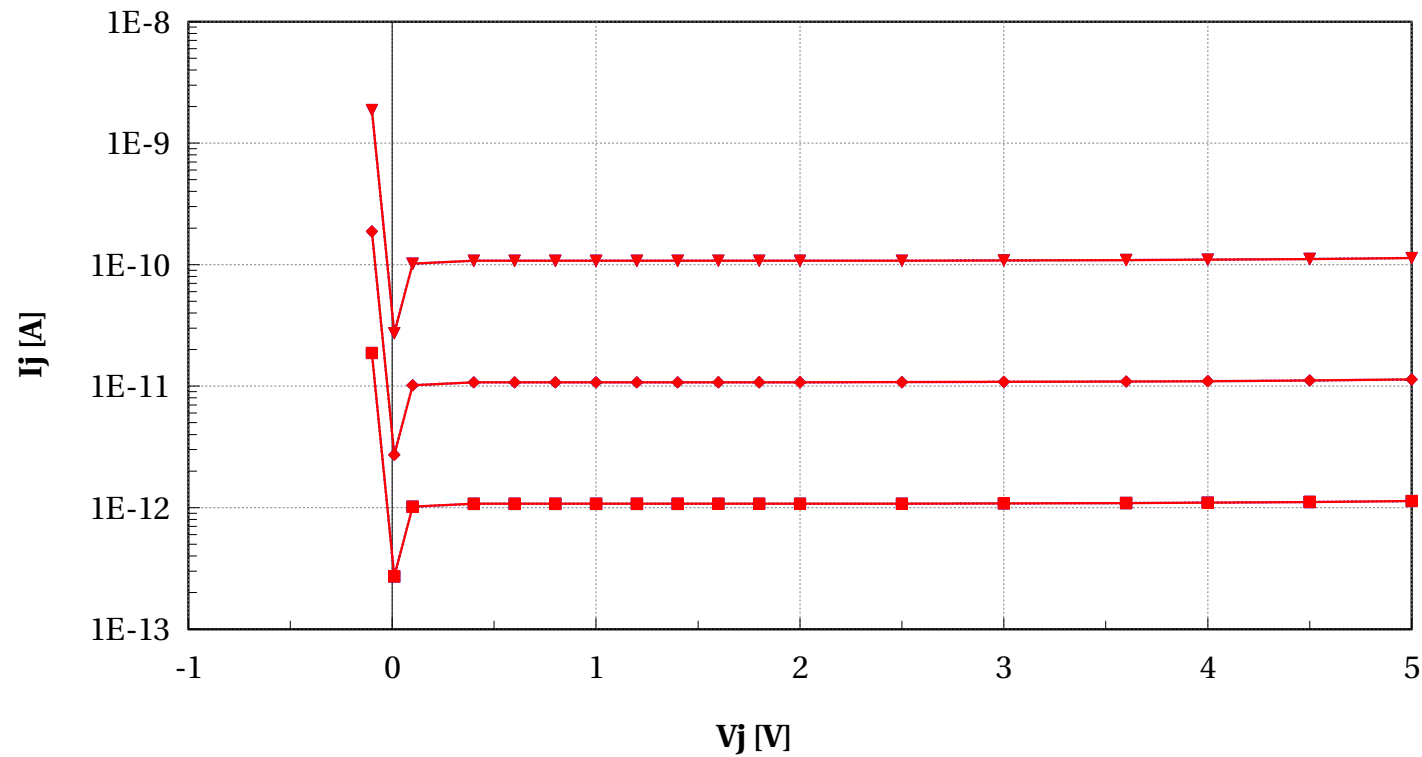
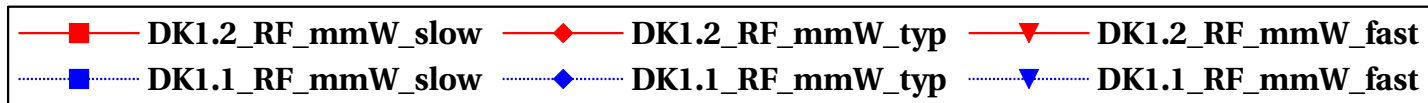
diode_{tx}, C_j [F] vs V_j [V]

area==2e-12 and Temp==125



diode_{twx}, I_j [A] vs V_j [V]

area==2e-12 and Temp==125

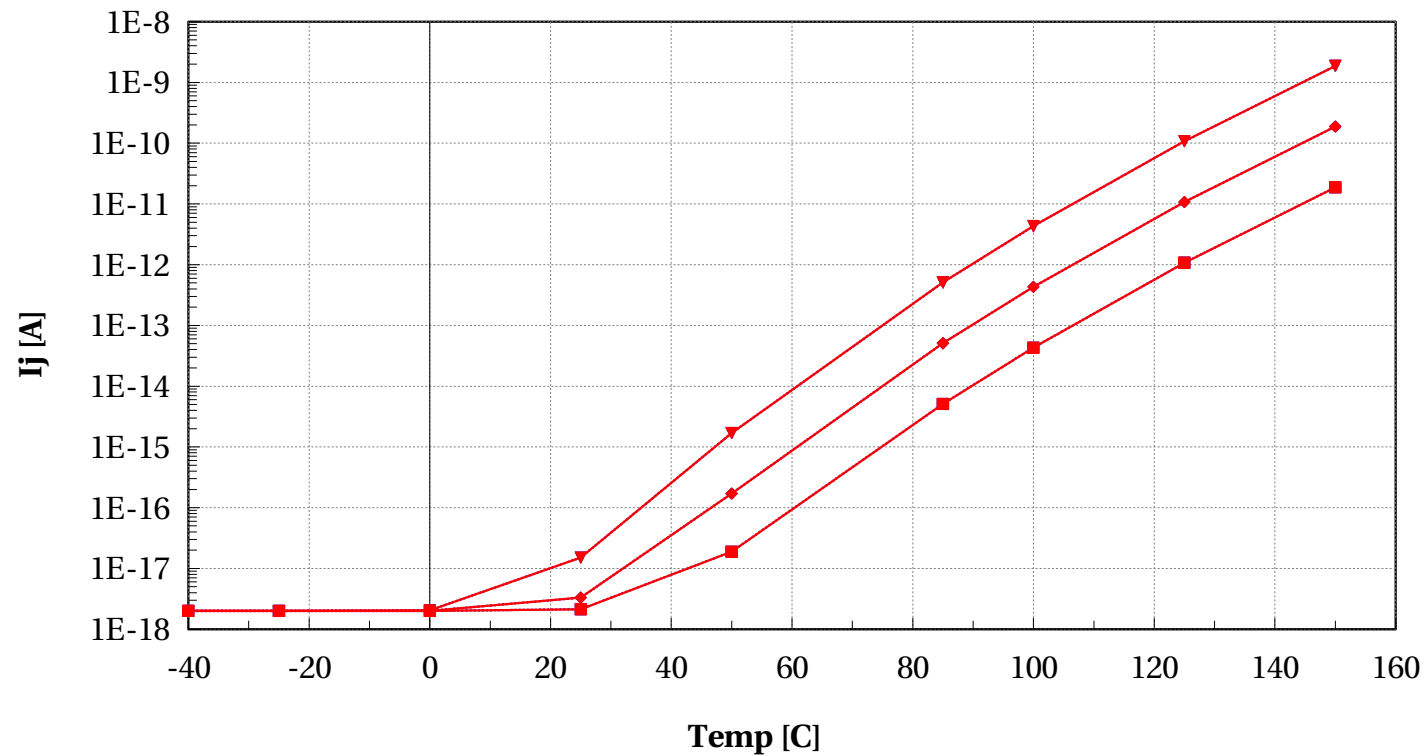
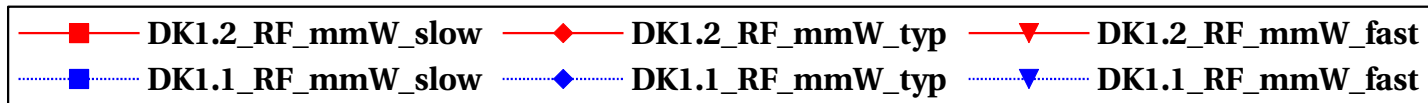


C_j and I_j scaling versus V_j for Peri diode, Temp=25C & Temp=125C

Cj and Ij scaling versus Temp for Area diode

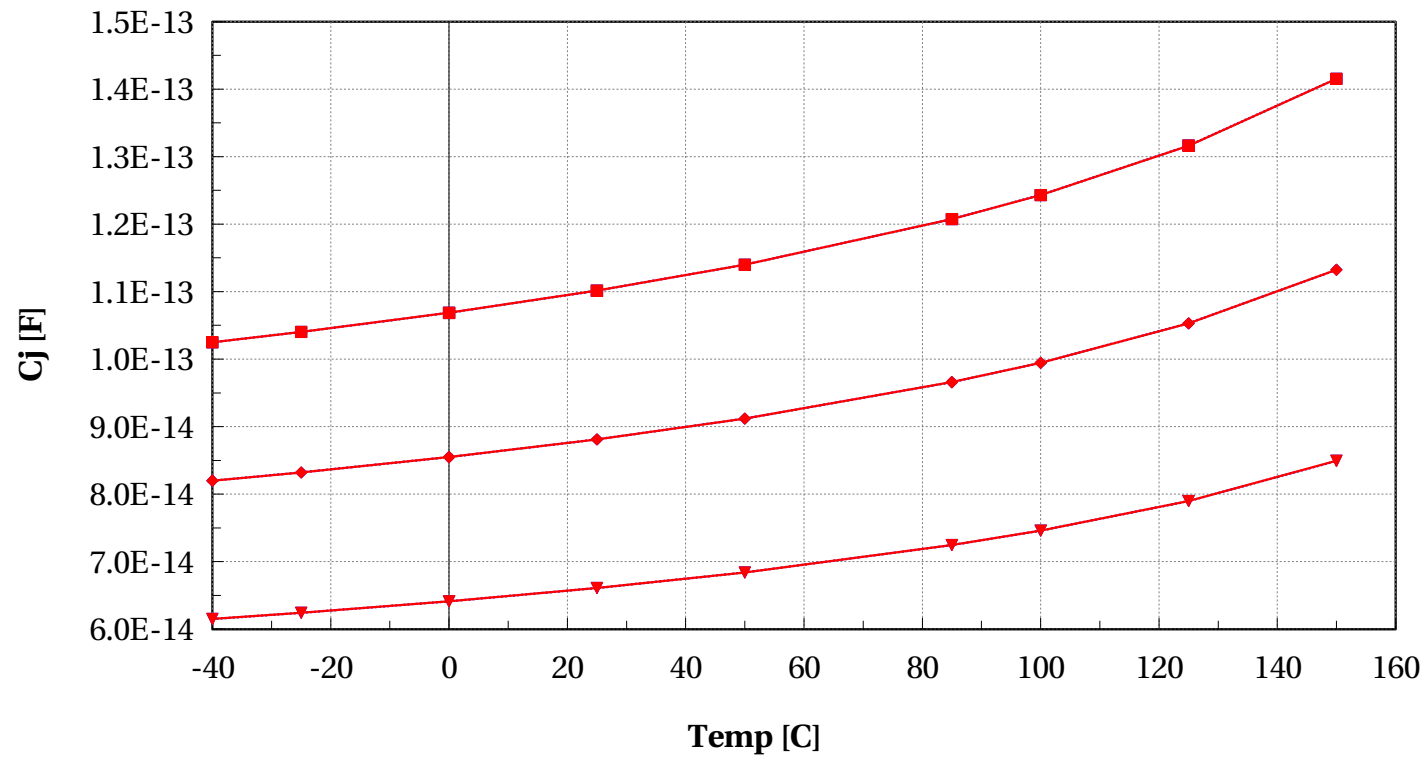
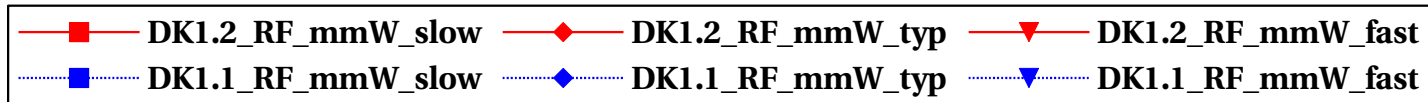
diode_{twx}, I_j [A] vs Temp [C]

area==2e-12 and V_j ==2.0



diode_{tx}, C_j [F] vs Temp [C]

area==2e-12 and V_j==0.01



Cj and Ij scaling versus Temp for Peri diode

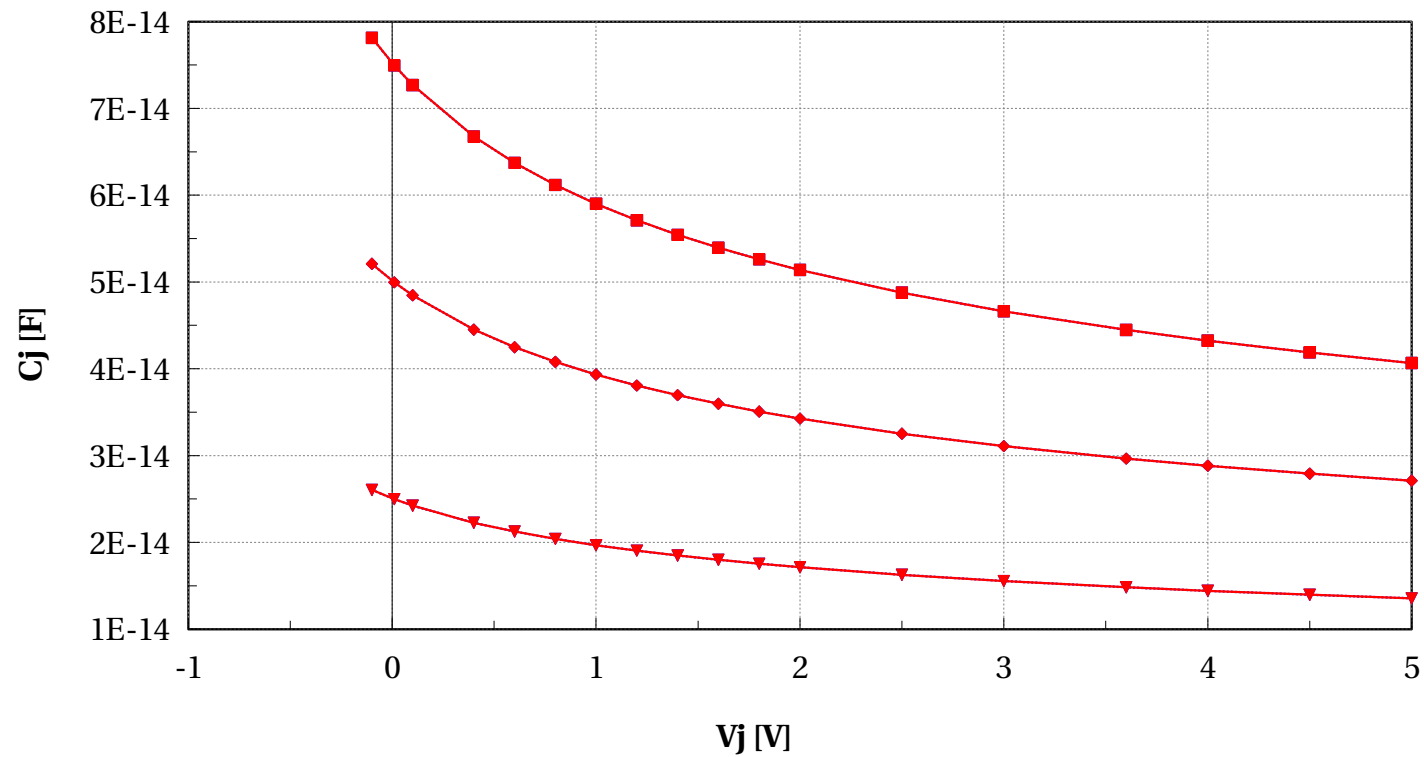
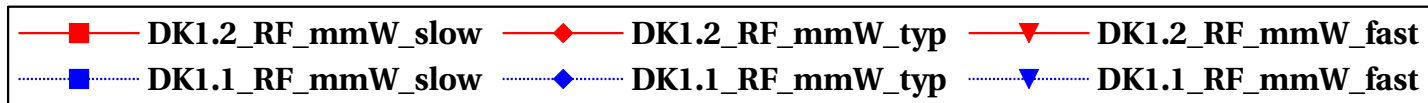
egdiodenx

Electrical characteristics scaling

Cj and Ij scaling versus Vj for Area diode, Temp=25C & Temp=125C

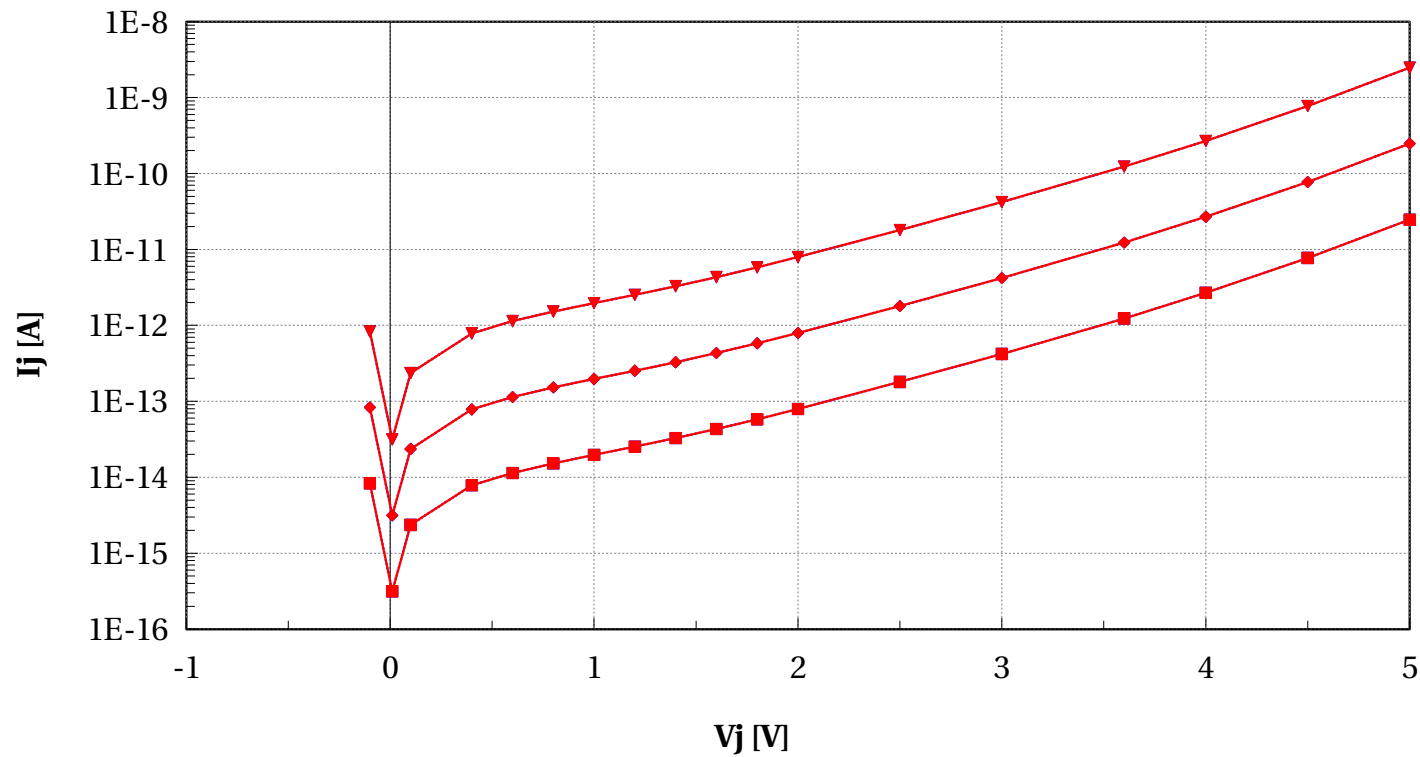
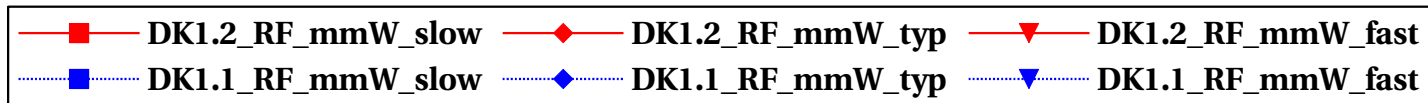
egdiodenx, Cj [F] vs Vj [V]

area==2e-12 and Temp==25



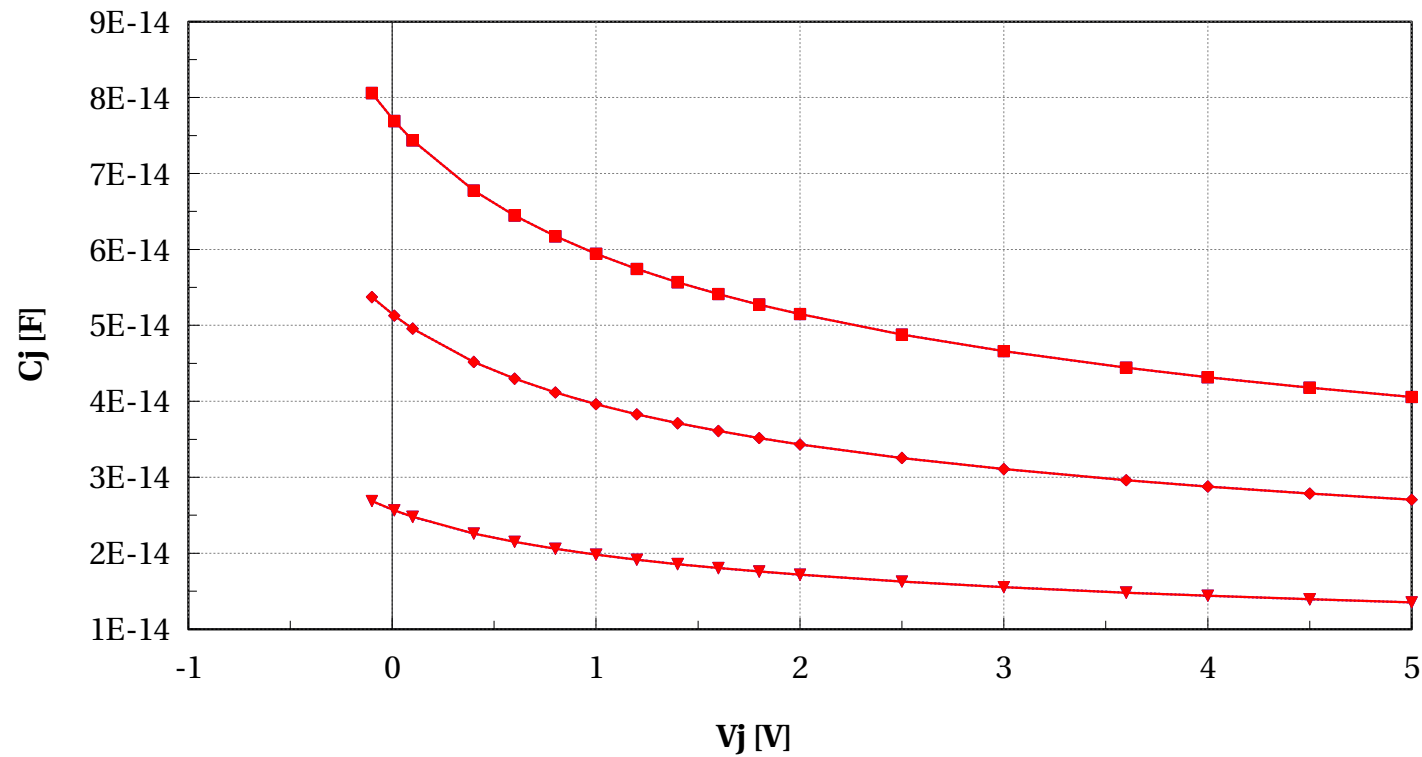
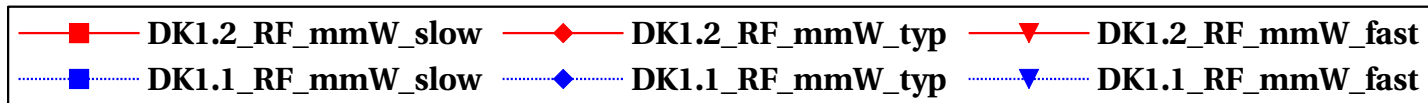
egdiodenx, I_j [A] vs V_j [V]

area==2e-12 and Temp==25



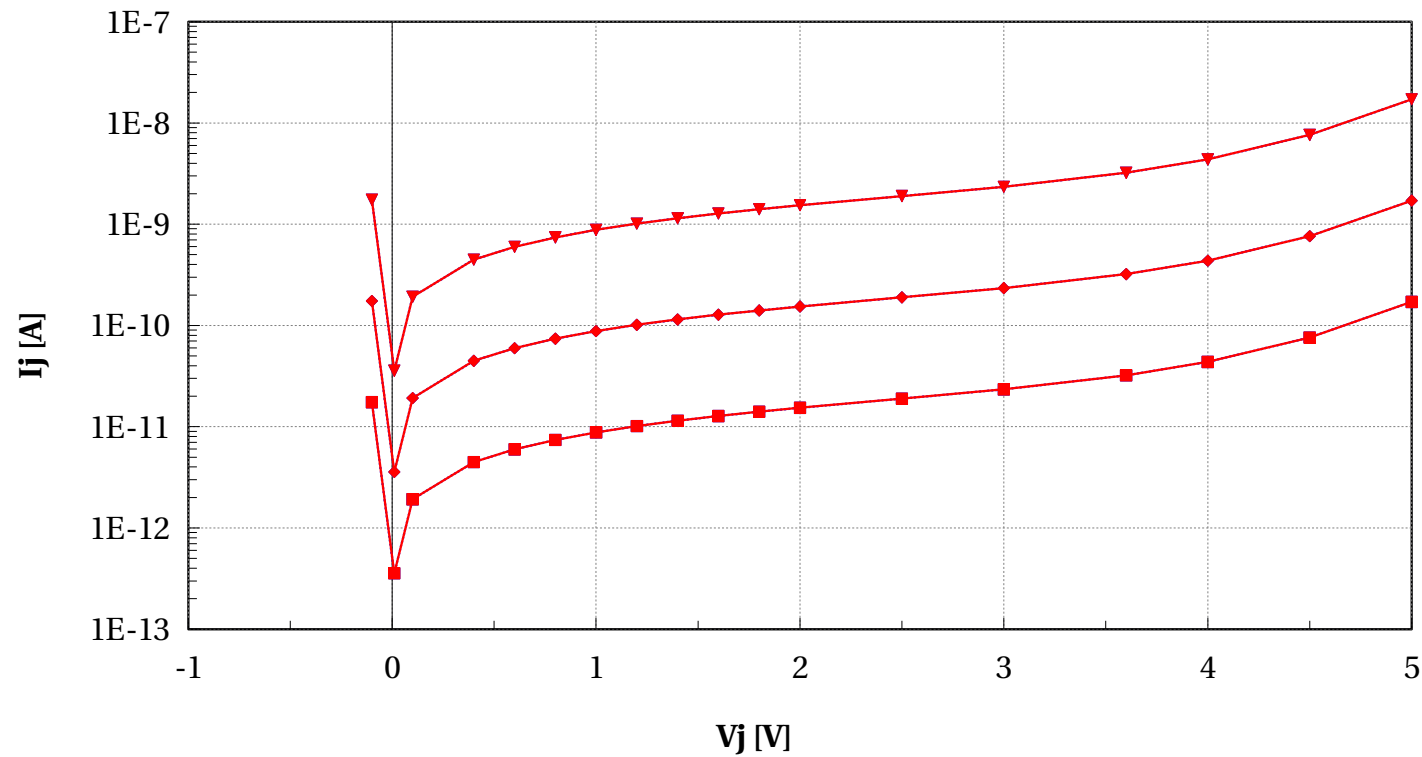
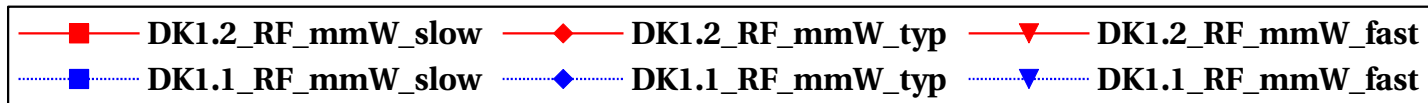
egdiodenx, Cj [F] vs Vj [V]

area==2e-12 and Temp==125



egdiodenx, I_j [A] vs V_j [V]

area==2e-12 and Temp==125

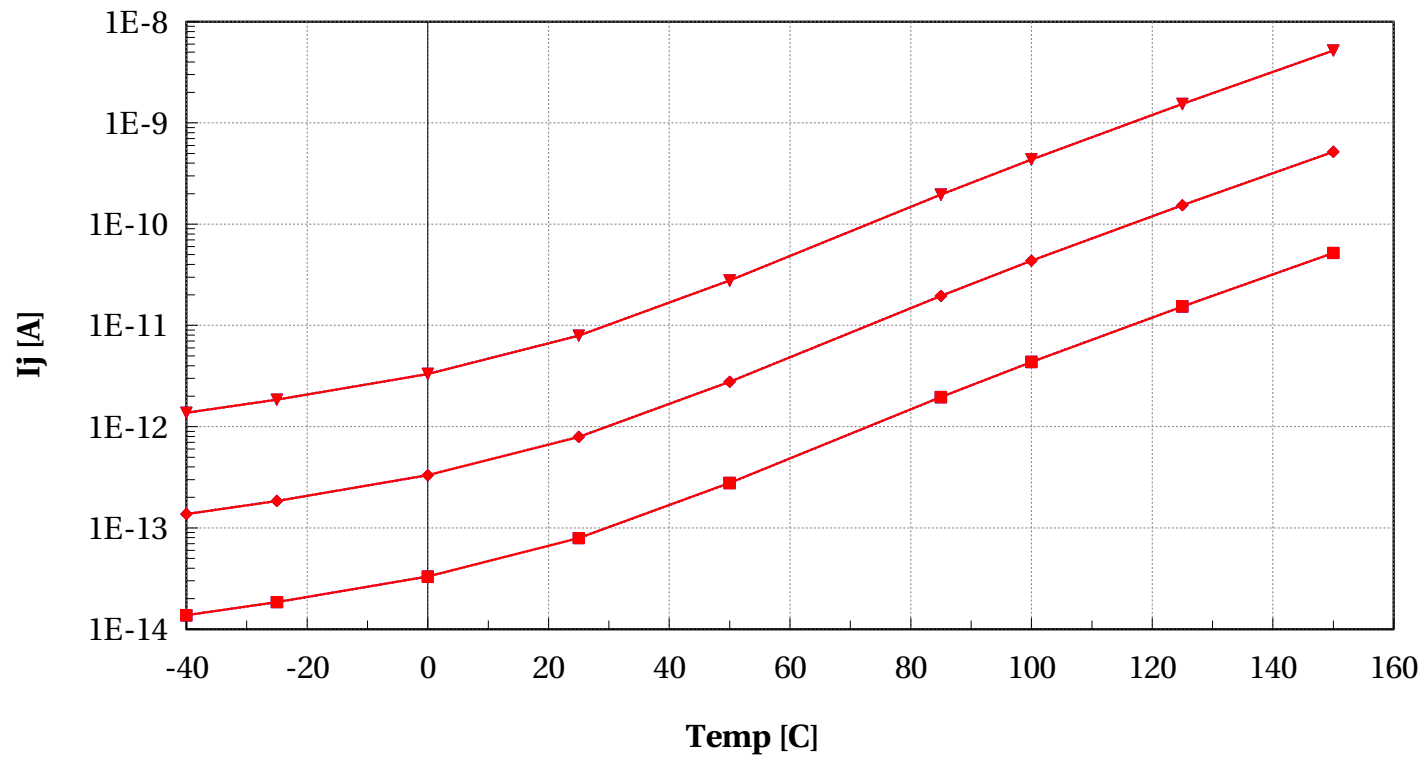
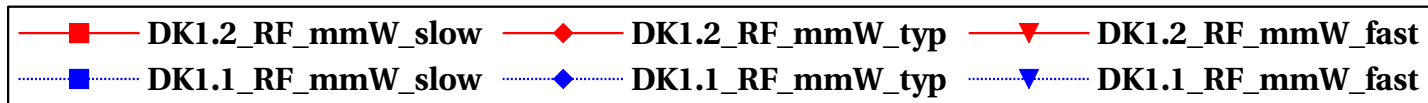


C_j and I_j scaling versus V_j for Peri diode, Temp=25C & Temp=125C

Cj and Ij scaling versus Temp for Area diode

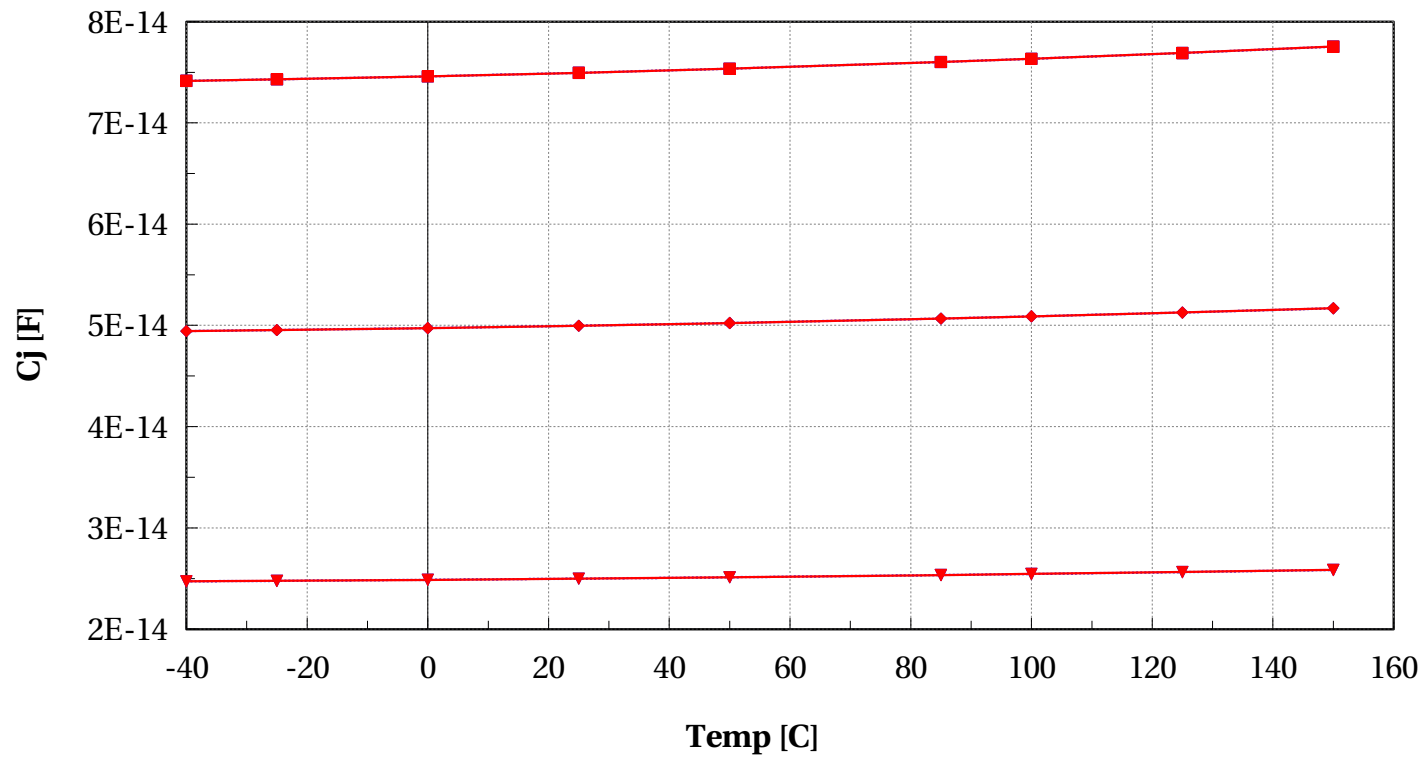
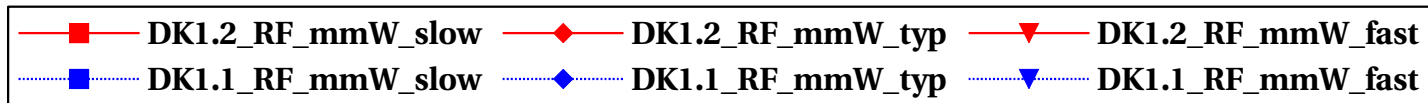
egdiodenx, I_j [A] vs Temp [C]

area==2e-12 and V_j ==2.0



egdiodenx, Cj [F] vs Temp [C]

area==2e-12 and Vj==0.01



Cj and Ij scaling versus Temp for Peri diode

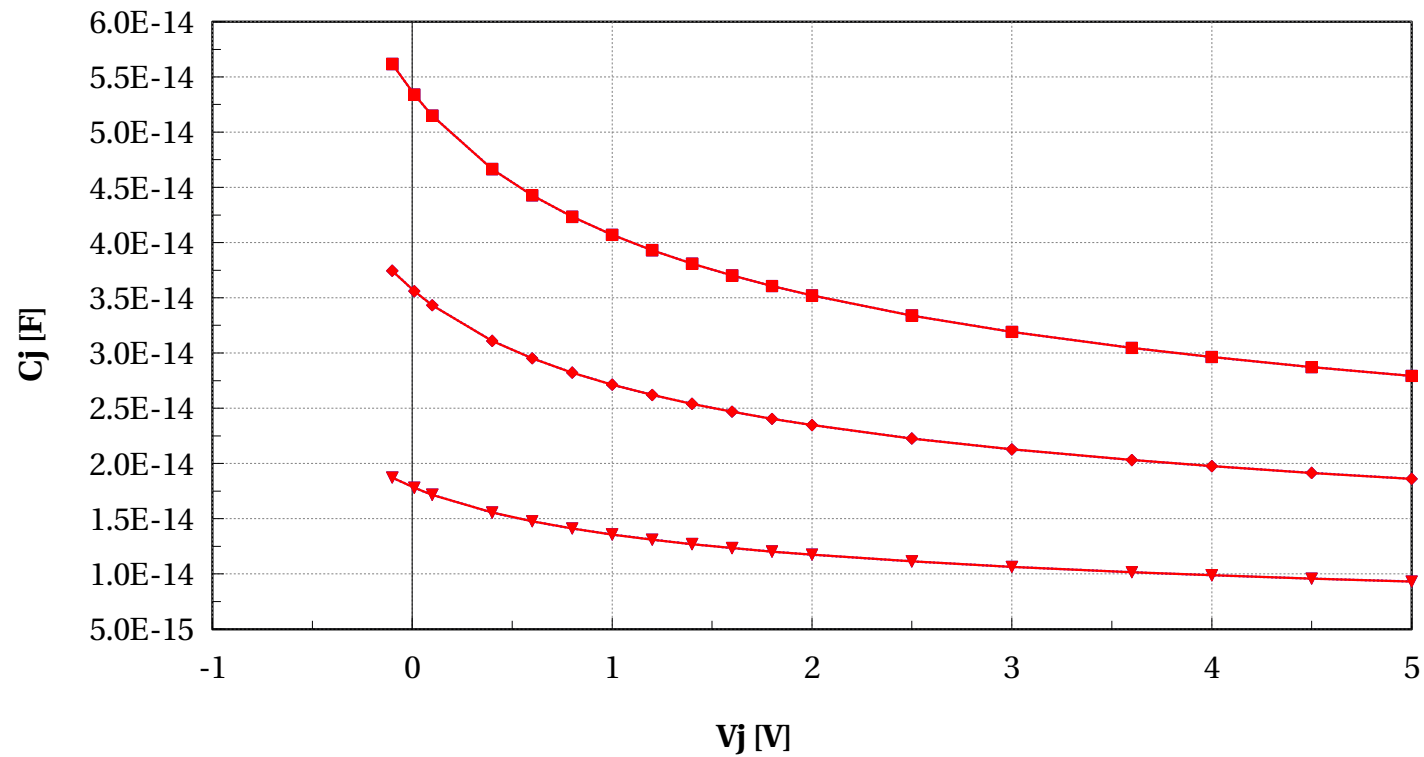
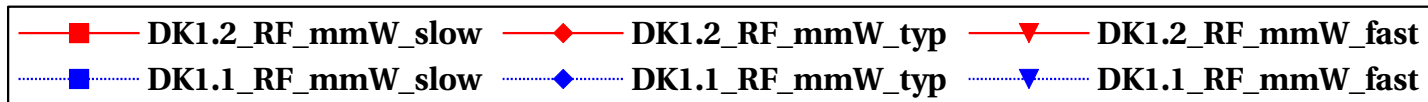
egdiodepnw

Electrical characteristics scaling

Cj and Ij scaling versus Vj for Area diode, Temp=25C & Temp=125C

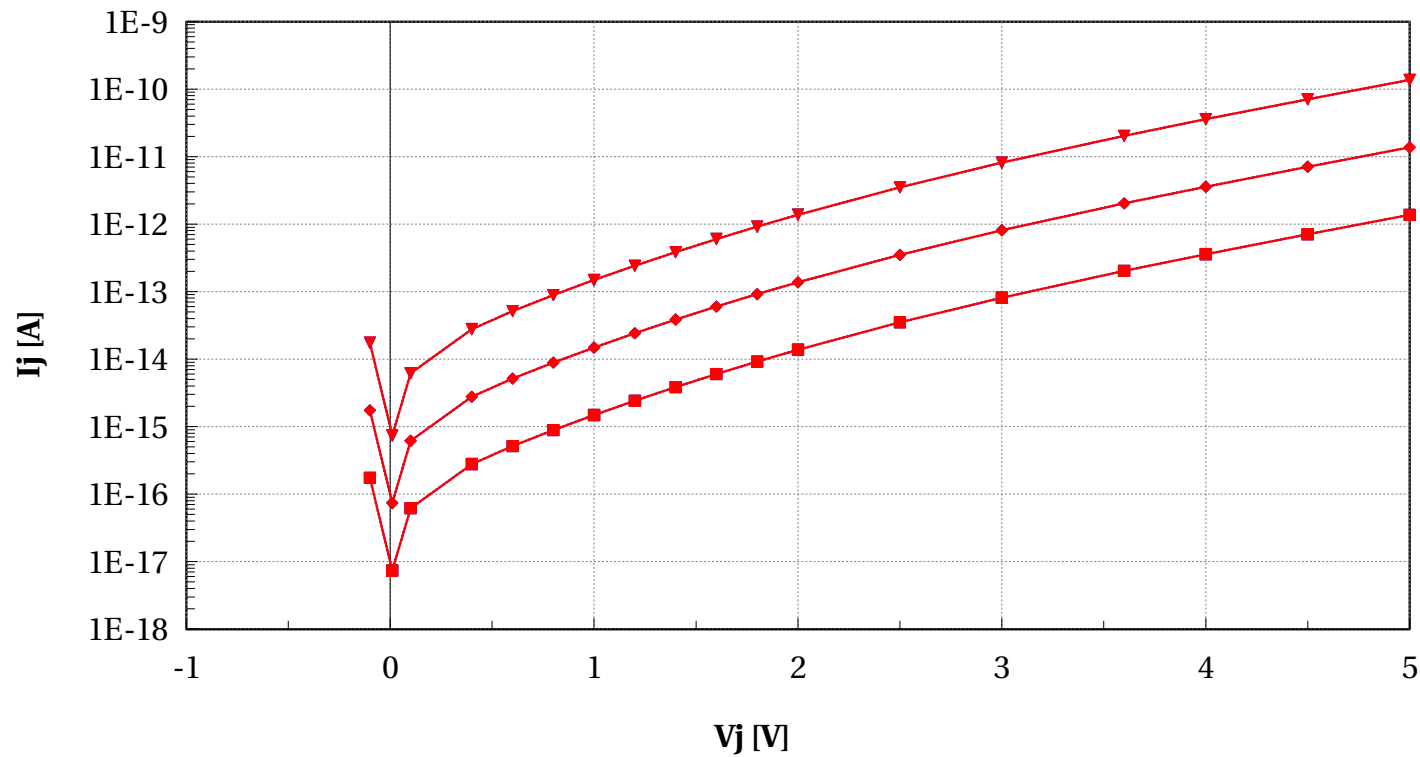
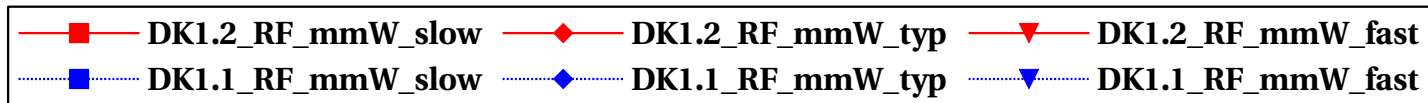
egdiodepnw, Cj [F] vs Vj [V]

area==2e-12 and Temp==25



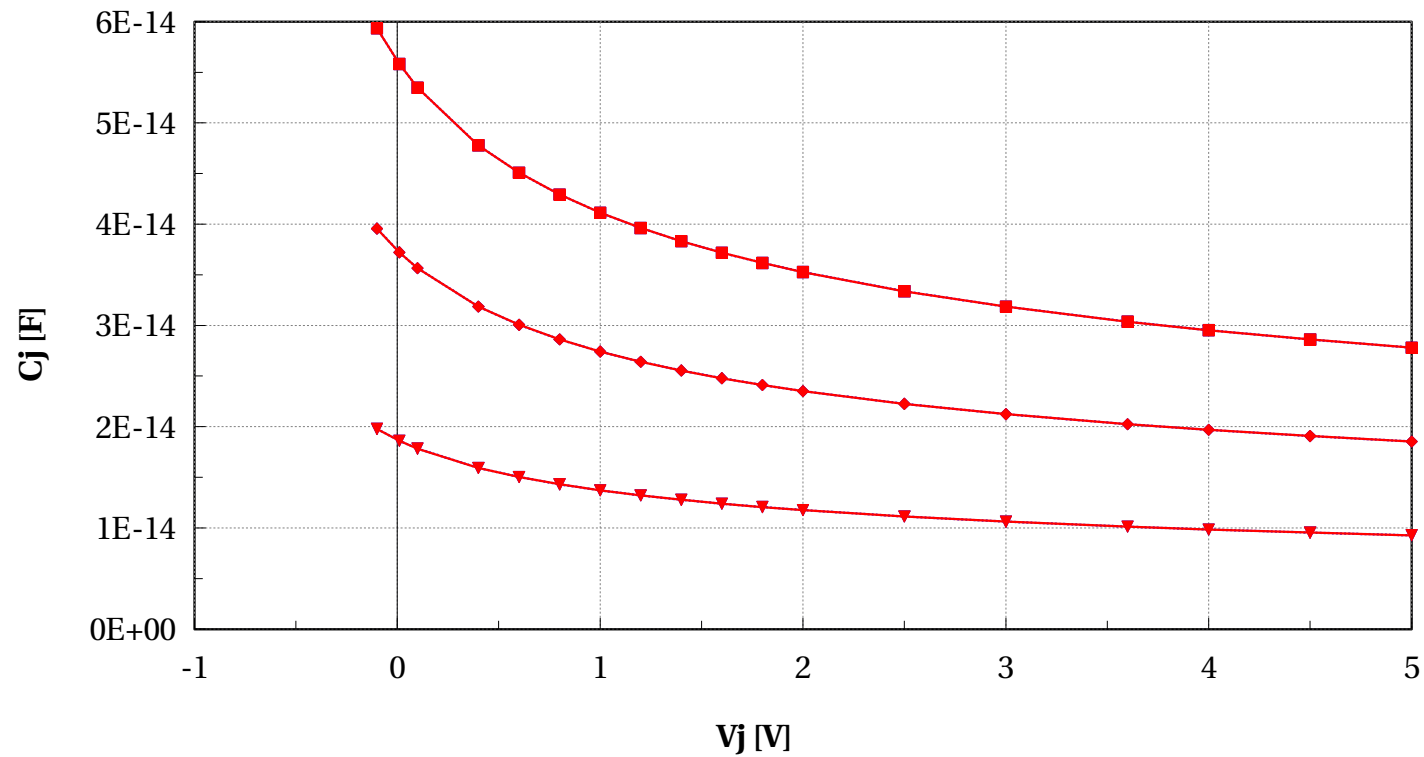
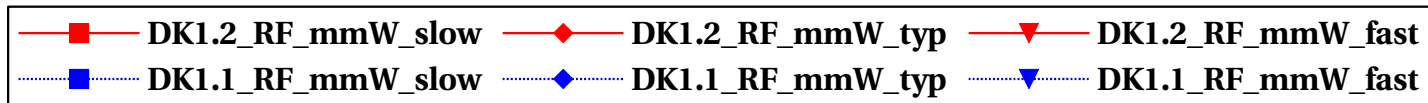
egdiodepnw, I_j [A] vs V_j [V]

area==2e-12 and Temp==25



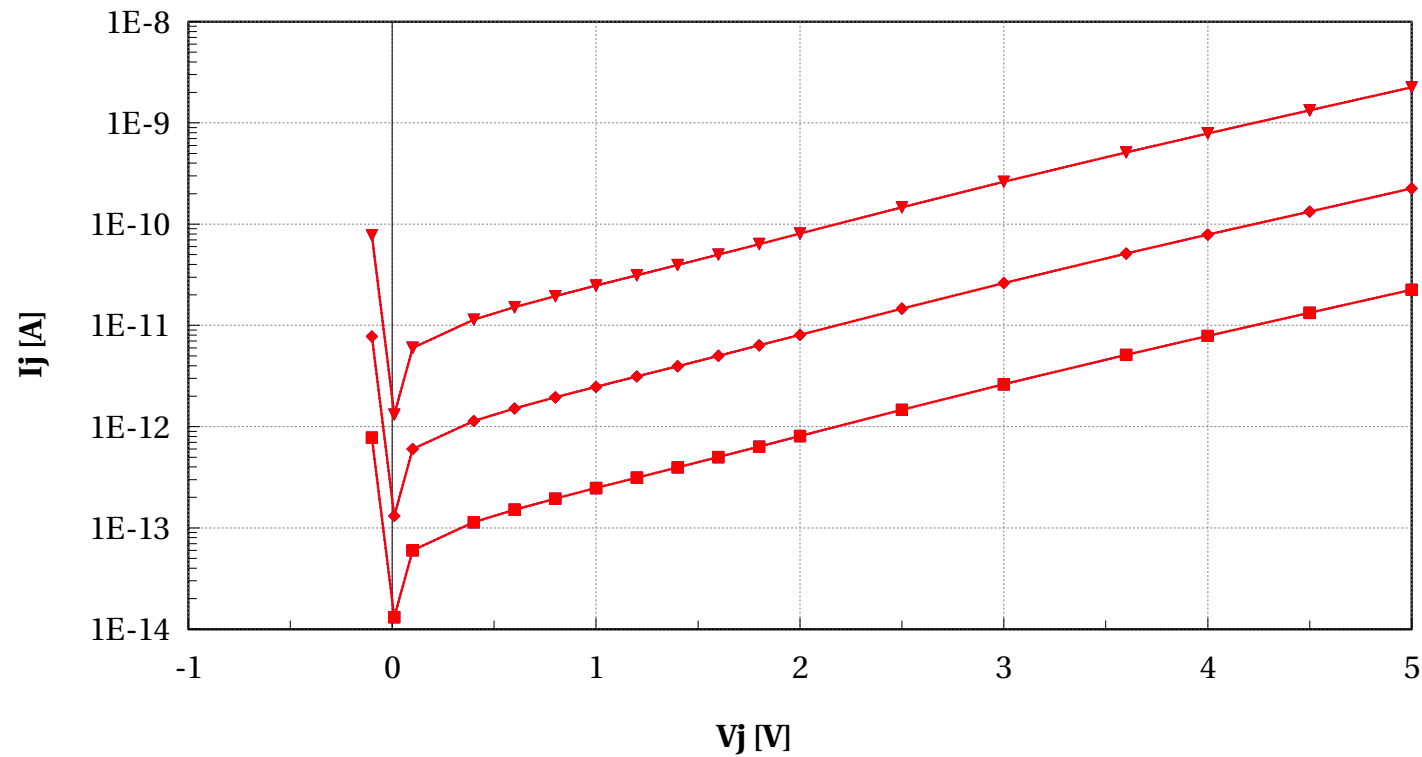
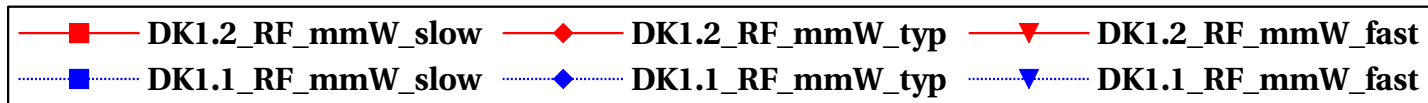
egdiodepnw, Cj [F] vs Vj [V]

area==2e-12 and Temp==125



egdiodepnw, I_j [A] vs V_j [V]

area==2e-12 and Temp==125

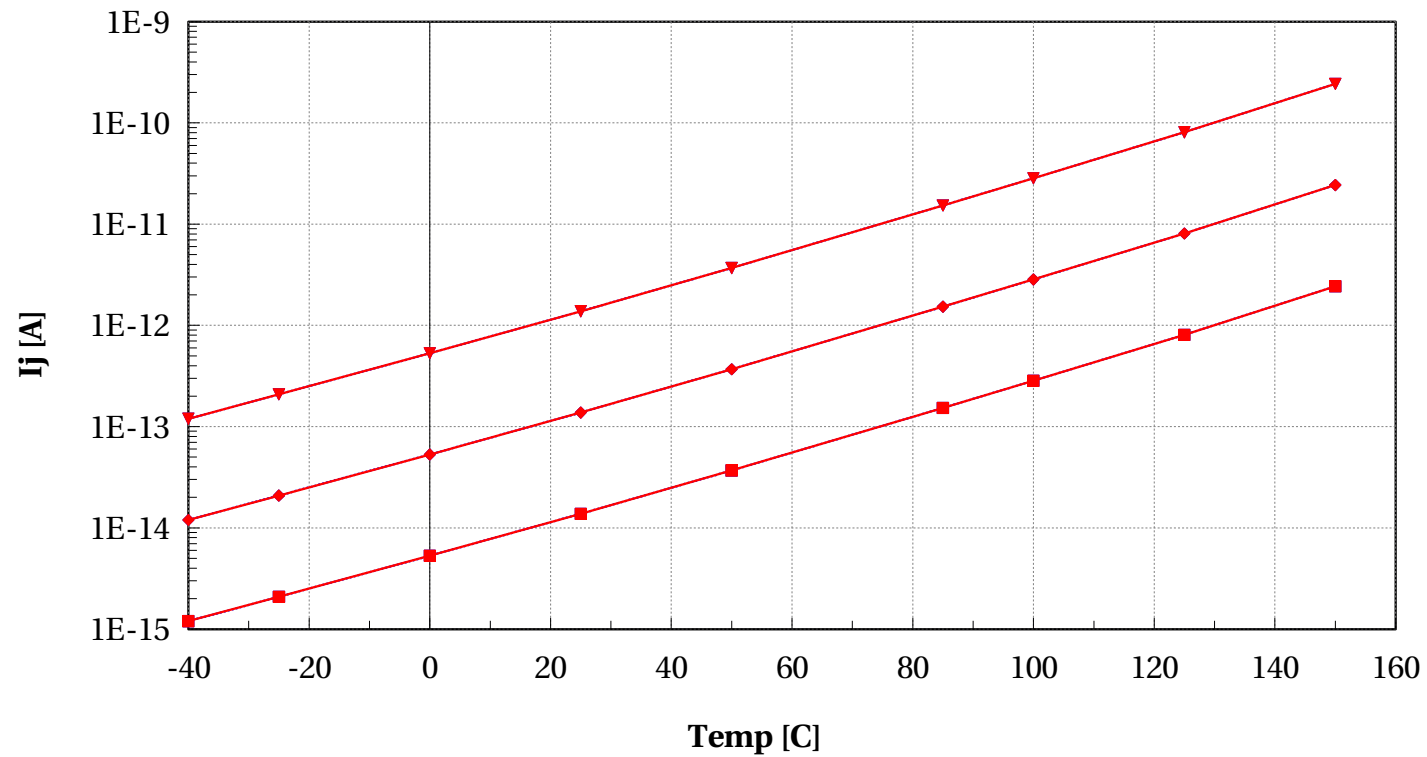
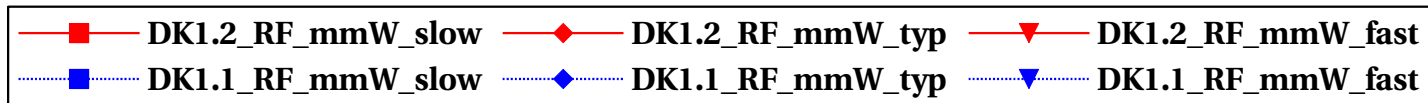


C_j and I_j scaling versus V_j for Peri diode, Temp=25C & Temp=125C

Cj and Ij scaling versus Temp for Area diode

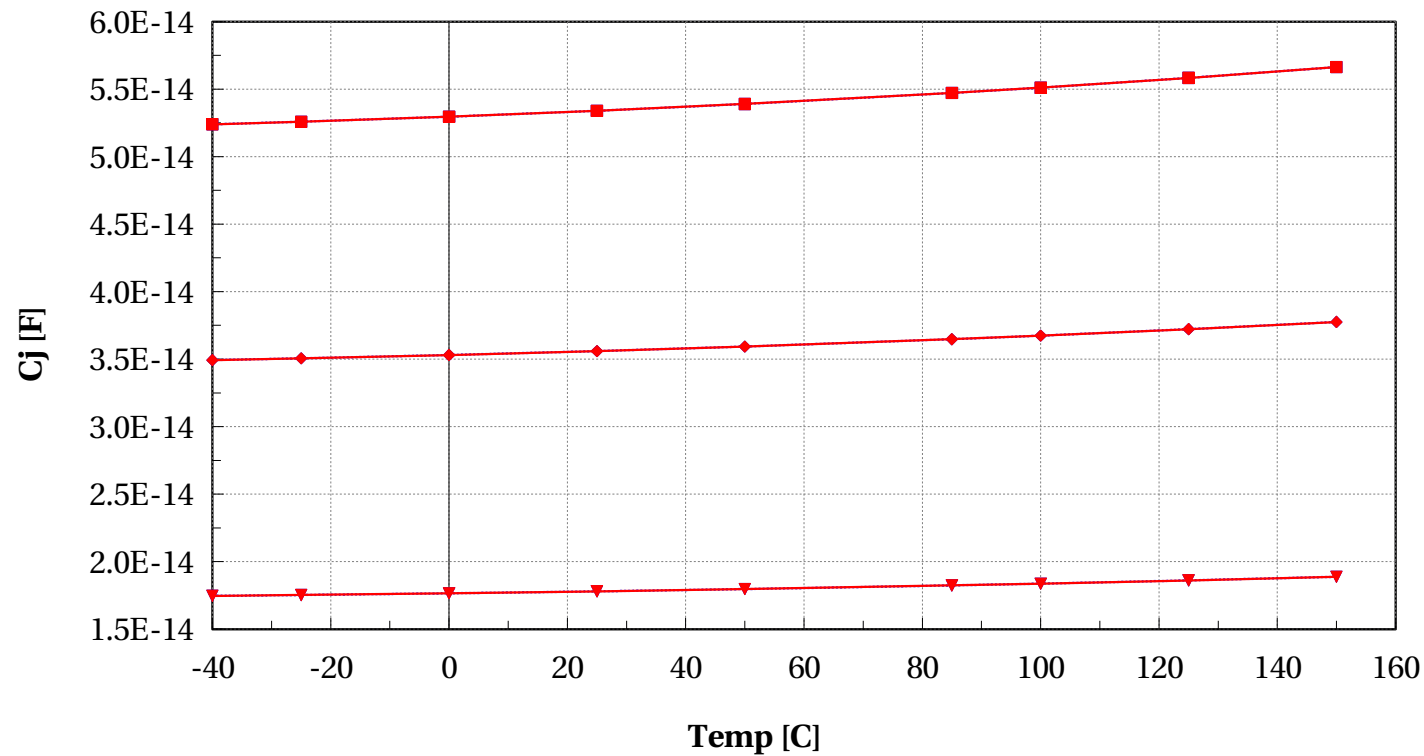
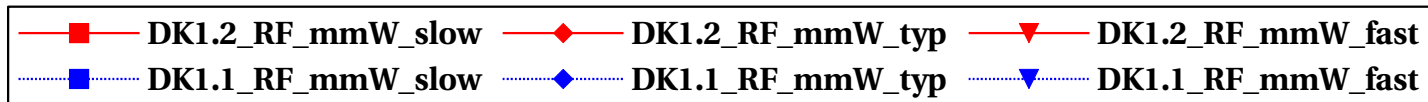
egdiodepnw, Ij [A] vs Temp [C]

area==2e-12 and Vj==2.0



egdiodepnw, Cj [F] vs Temp [C]

area==2e-12 and Vj==0.01



Cj and Ij scaling versus Temp for Peri diode

Annex

Conditions of simulations

The simulations were done with SBenchLSF Alpha using Eldo simulator 2018.3.

- Model diodenwx (DK1.2_RF_mmW)

- ✓ Input Parameters

- ✗ mc_runs = 1000

- ✗ temp = 25 °C

- ✗ mc_sens = 0

- ✗ vj = 1.0 V

- ✗ f_ext = 100K Hz

- ✗ sbenchlsf_release = Alpha

- ✗ ams_release = 2018.3

- ✗ model_version = 1.1

- ✗ mc_nsigma = 3

- ✓ Sweep Parameters

- ✗ vj = 5.0, 4.5, 4.0, 3.6, 3.0, 2.5, 2.0, 1.8, 1.6, 1.4, 1.2, 1.0, 0.8, 0.6, 0.4, 0.1, 0.01, -0.1

- ✗ temp = -40.0, -25.0, 0.0, 25.0, 50.0, 85.0, 100.0, 125.0, 150.0

- ✓ Extra parameters

- Model diodenx (DK1.2_RF_mmW)

- ✓ Input Parameters

- ✗ mc_runs = 1000
- ✗ temp = 25 °C
- ✗ mc_sens = 0
- ✗ vj = 1.0 V
- ✗ f_ext = 100K Hz
- ✗ sbenchlsf_release = Alpha
- ✗ ams_release = 2018.3
- ✗ model_version = 1.1
- ✗ mc_nsigma = 3

- ✓ Sweep Parameters

- ✗ vj = 5.0, 4.5, 4.0, 3.6, 3.0, 2.5, 2.0, 1.8, 1.6, 1.4, 1.2, 1.0, 0.8, 0.6, 0.4, 0.1, 0.01, -0.1
- ✗ temp = -40.0, -25.0, 0.0, 25.0, 50.0, 85.0, 100.0, 125.0, 150.0

- ✓ Extra parameters

- Model diodepnw (DK1.2_RF_mmW)

- ✓ Input Parameters

- ✗ mc_runs = 1000
- ✗ temp = 25 °C
- ✗ mc_sens = 0
- ✗ vj = 1.0 V
- ✗ f_ext = 100K Hz
- ✗ sbenchlsf_release = Alpha
- ✗ ams_release = 2018.3
- ✗ model_version = 1.1
- ✗ mc_nsigma = 3

- ✓ Sweep Parameters

- ✗ $v_j = 5.0, 4.5, 4.0, 3.6, 3.0, 2.5, 2.0, 1.8, 1.6, 1.4, 1.2, 1.0, 0.8, 0.6, 0.4, 0.1, 0.01, -0.1$

- ✗ $temp = -40.0, -25.0, 0.0, 25.0, 50.0, 85.0, 100.0, 125.0, 150.0$

- ✓ Extra parameters

- Model diodepwtw (DK1.2_RF_mmW)

- ✓ Input Parameters

- ✗ $mc_runs = 1000$

- ✗ $temp = 25\text{ °C}$

- ✗ $mc_sens = 0$

- ✗ $v_j = 1.0\text{ V}$

- ✗ $f_ext = 100\text{K Hz}$

- ✗ $sbenchlsf_release = \text{Alpha}$

- ✗ $ams_release = 2018.3$

- ✗ $model_version = 1.2.a$

- ✗ $mc_nsigma = 3$

- ✓ Sweep Parameters

- ✗ $v_j = 5.0, 4.5, 4.0, 3.6, 3.0, 2.5, 2.0, 1.8, 1.6, 1.4, 1.2, 1.0, 0.8, 0.6, 0.4, 0.1, 0.01, -0.1$

- ✗ $temp = -40.0, -25.0, 0.0, 25.0, 50.0, 85.0, 100.0, 125.0, 150.0$

- ✓ Extra parameters

- Model diodetwx (DK1.2_RF_mmW)

- ✓ Input Parameters

- ✗ $mc_runs = 1000$

- ✗ $temp = 25\text{ °C}$

- ✗ $mc_sens = 0$

- ✗ $v_j = 1.0\text{ V}$

- ✗ $f_{ext} = 100\text{K Hz}$
- ✗ $sbenchlsf_release = \text{Alpha}$
- ✗ $ams_release = 2018.3$
- ✗ $model_version = 1.2.a$
- ✗ $mc_nsigma = 3$
- ✓ Sweep Parameters
 - ✗ $v_j = 5.0, 4.5, 4.0, 3.6, 3.0, 2.5, 2.0, 1.8, 1.6, 1.4, 1.2, 1.0, 0.8, 0.6, 0.4, 0.1, 0.01, -0.1$
 - ✗ $temp = -40.0, -25.0, 0.0, 25.0, 50.0, 85.0, 100.0, 125.0, 150.0$
- ✓ Extra parameters
- Model egdiodenx (DK1.2_RF_mmW)
 - ✓ Input Parameters
 - ✗ $mc_runs = 1000$
 - ✗ $temp = 25\text{ °C}$
 - ✗ $mc_sens = 0$
 - ✗ $v_j = 1.0\text{ V}$
 - ✗ $f_{ext} = 100\text{K Hz}$
 - ✗ $sbenchlsf_release = \text{Alpha}$
 - ✗ $ams_release = 2018.3$
 - ✗ $model_version = 1.1$
 - ✗ $mc_nsigma = 3$
 - ✓ Sweep Parameters
 - ✗ $v_j = 5.0, 4.5, 4.0, 3.6, 3.0, 2.5, 2.0, 1.8, 1.6, 1.4, 1.2, 1.0, 0.8, 0.6, 0.4, 0.1, 0.01, -0.1$
 - ✗ $temp = -40.0, -25.0, 0.0, 25.0, 50.0, 85.0, 100.0, 125.0, 150.0$
 - ✓ Extra parameters
- Model egdiodepnw (DK1.2_RF_mmW)

✓ Input Parameters

- ✗ mc_runs = 1000
- ✗ temp = 25 °C
- ✗ mc_sens = 0
- ✗ vj = 1.0 V
- ✗ f_ext = 100K Hz
- ✗ sbenchlsf_release = Alpha
- ✗ ams_release = 2018.3
- ✗ model_version = 1.1
- ✗ mc_nsigma = 3

✓ Sweep Parameters

- ✗ vj = 5.0, 4.5, 4.0, 3.6, 3.0, 2.5, 2.0, 1.8, 1.6, 1.4, 1.2, 1.0, 0.8, 0.6, 0.4, 0.1, 0.01, -0.1
- ✗ temp = -40.0, -25.0, 0.0, 25.0, 50.0, 85.0, 100.0, 125.0, 150.0

✓ Extra parameters

● Model diodenwx (DK1.1_RF_mmW)

✓ Input Parameters

- ✗ mc_runs = 1000
- ✗ temp = 25 °C
- ✗ mc_sens = 0
- ✗ vj = 1.0 V
- ✗ f_ext = 100K Hz
- ✗ sbenchlsf_release = Alpha
- ✗ ams_release = 2018.3
- ✗ model_version = 1.1
- ✗ mc_nsigma = 3

- ✓ Sweep Parameters

- ✗ $v_j = 5.0, 4.5, 4.0, 3.6, 3.0, 2.5, 2.0, 1.8, 1.6, 1.4, 1.2, 1.0, 0.8, 0.6, 0.4, 0.1, 0.01, -0.1$

- ✗ $temp = -40.0, -25.0, 0.0, 25.0, 50.0, 85.0, 100.0, 125.0, 150.0$

- ✓ Extra parameters

- Model diodenx (DK1.1_RF_mmW)

- ✓ Input Parameters

- ✗ $mc_runs = 1000$

- ✗ $temp = 25\text{ °C}$

- ✗ $mc_sens = 0$

- ✗ $v_j = 1.0\text{ V}$

- ✗ $f_ext = 100\text{K Hz}$

- ✗ $sbenchlsf_release = \text{Alpha}$

- ✗ $ams_release = 2018.3$

- ✗ $model_version = 1.1$

- ✗ $mc_nsigma = 3$

- ✓ Sweep Parameters

- ✗ $v_j = 5.0, 4.5, 4.0, 3.6, 3.0, 2.5, 2.0, 1.8, 1.6, 1.4, 1.2, 1.0, 0.8, 0.6, 0.4, 0.1, 0.01, -0.1$

- ✗ $temp = -40.0, -25.0, 0.0, 25.0, 50.0, 85.0, 100.0, 125.0, 150.0$

- ✓ Extra parameters

- Model diodepnw (DK1.1_RF_mmW)

- ✓ Input Parameters

- ✗ $mc_runs = 1000$

- ✗ $temp = 25\text{ °C}$

- ✗ $mc_sens = 0$

- ✗ $v_j = 1.0\text{ V}$

- ✗ $f_{\text{ext}} = 100\text{K Hz}$
- ✗ $\text{sbenchlsf_release} = \text{Alpha}$
- ✗ $\text{ams_release} = 2018.3$
- ✗ $\text{model_version} = 1.1$
- ✗ $\text{mc_nsigma} = 3$
- ✓ Sweep Parameters
 - ✗ $v_j = 5.0, 4.5, 4.0, 3.6, 3.0, 2.5, 2.0, 1.8, 1.6, 1.4, 1.2, 1.0, 0.8, 0.6, 0.4, 0.1, 0.01, -0.1$
 - ✗ $\text{temp} = -40.0, -25.0, 0.0, 25.0, 50.0, 85.0, 100.0, 125.0, 150.0$
- ✓ Extra parameters
- Model diodepwtw (DK1.1_RF_mmW)
 - ✓ Input Parameters
 - ✗ $\text{mc_runs} = 1000$
 - ✗ $\text{temp} = 25\text{ }^{\circ}\text{C}$
 - ✗ $\text{mc_sens} = 0$
 - ✗ $v_j = 1.0\text{ V}$
 - ✗ $f_{\text{ext}} = 100\text{K Hz}$
 - ✗ $\text{sbenchlsf_release} = \text{Alpha}$
 - ✗ $\text{ams_release} = 2018.3$
 - ✗ $\text{model_version} = 1.2.a$
 - ✗ $\text{mc_nsigma} = 3$
 - ✓ Sweep Parameters
 - ✗ $v_j = 5.0, 4.5, 4.0, 3.6, 3.0, 2.5, 2.0, 1.8, 1.6, 1.4, 1.2, 1.0, 0.8, 0.6, 0.4, 0.1, 0.01, -0.1$
 - ✗ $\text{temp} = -40.0, -25.0, 0.0, 25.0, 50.0, 85.0, 100.0, 125.0, 150.0$
 - ✓ Extra parameters
- Model diodetwx (DK1.1_RF_mmW)

- ✓ Input Parameters

- ✗ mc_runs = 1000
- ✗ temp = 25 °C
- ✗ mc_sens = 0
- ✗ vj = 1.0 V
- ✗ f_ext = 100K Hz
- ✗ sbenchlsf_release = Alpha
- ✗ ams_release = 2018.3
- ✗ model_version = 1.2.a
- ✗ mc_nsigma = 3

- ✓ Sweep Parameters

- ✗ vj = 5.0, 4.5, 4.0, 3.6, 3.0, 2.5, 2.0, 1.8, 1.6, 1.4, 1.2, 1.0, 0.8, 0.6, 0.4, 0.1, 0.01, -0.1
- ✗ temp = -40.0, -25.0, 0.0, 25.0, 50.0, 85.0, 100.0, 125.0, 150.0

- ✓ Extra parameters

- Model egdiodenx (DK1.1_RF_mmW)

- ✓ Input Parameters

- ✗ mc_runs = 1000
- ✗ temp = 25 °C
- ✗ mc_sens = 0
- ✗ vj = 1.0 V
- ✗ f_ext = 100K Hz
- ✗ sbenchlsf_release = Alpha
- ✗ ams_release = 2018.3
- ✗ model_version = 1.1
- ✗ mc_nsigma = 3

- ✓ Sweep Parameters
 - ✗ $v_j = 5.0, 4.5, 4.0, 3.6, 3.0, 2.5, 2.0, 1.8, 1.6, 1.4, 1.2, 1.0, 0.8, 0.6, 0.4, 0.1, 0.01, -0.1$
 - ✗ $temp = -40.0, -25.0, 0.0, 25.0, 50.0, 85.0, 100.0, 125.0, 150.0$
- ✓ Extra parameters
- Model egdiodepnw (DK1.1_RF_mmW)
 - ✓ Input Parameters
 - ✗ $mc_runs = 1000$
 - ✗ $temp = 25\text{ °C}$
 - ✗ $mc_sens = 0$
 - ✗ $v_j = 1.0\text{ V}$
 - ✗ $f_ext = 100\text{K Hz}$
 - ✗ $sbenchlsf_release = \text{Alpha}$
 - ✗ $ams_release = 2018.3$
 - ✗ $model_version = 1.1$
 - ✗ $mc_nsigma = 3$
 - ✓ Sweep Parameters
 - ✗ $v_j = 5.0, 4.5, 4.0, 3.6, 3.0, 2.5, 2.0, 1.8, 1.6, 1.4, 1.2, 1.0, 0.8, 0.6, 0.4, 0.1, 0.01, -0.1$
 - ✗ $temp = -40.0, -25.0, 0.0, 25.0, 50.0, 85.0, 100.0, 125.0, 150.0$
 - ✓ Extra parameters