Analysis of the Program

We must identify the threshold voltage for the semiconductor device, from its I-V characteristics, where know thatis the intersection point of the lines which the two branches of the line can be approximated to.

In our program, we choose to iteratefrom about 0 to 6, where it may lie. For each value ofwe calculate the best possible pair of lines by first calculating the best possibleindependently and then calculating the bestusing the -coordinate generated by foras follows:

Error foras first line is known to pass through the origin.

∑ Error2 fromtowill thus be

Bestgives us minimum error, so we take derivative of this w.r.t. and equate to 0.

Where summation is fromto

Let the current value (-coordinate) corresponding tobe. Then,

Now we must find bestforonwards will be found by the same method if we shift our origin to the pointso we follow the same above procedure with a minor modification:

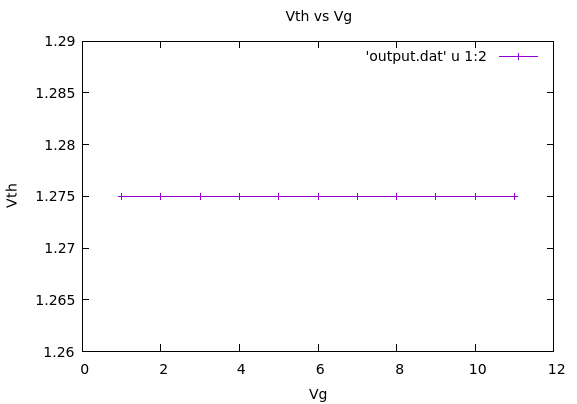
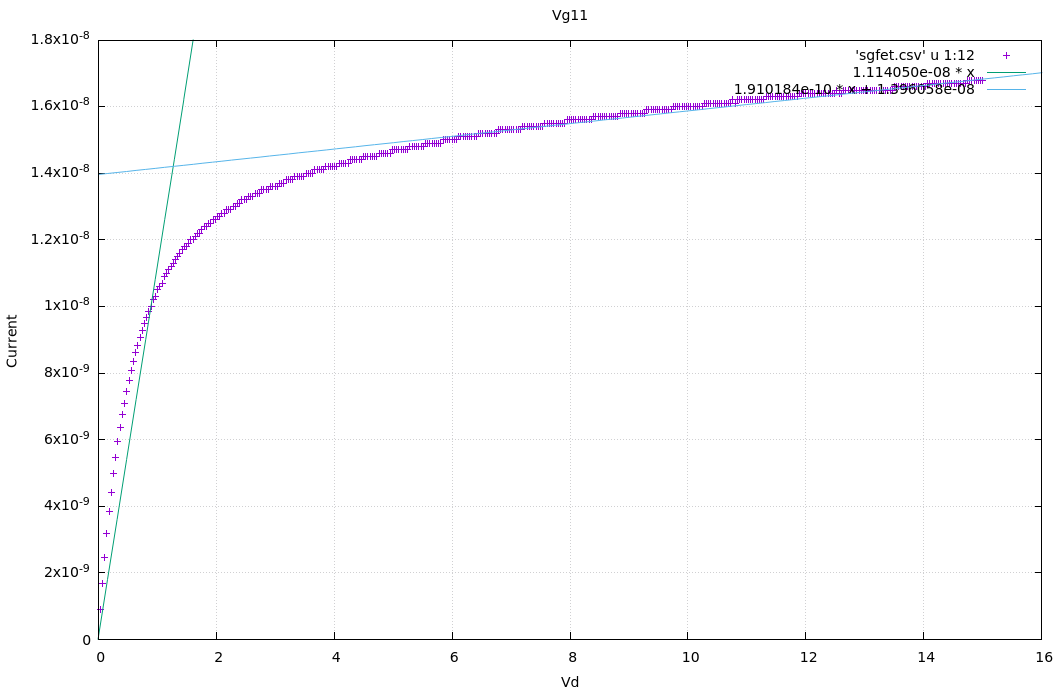
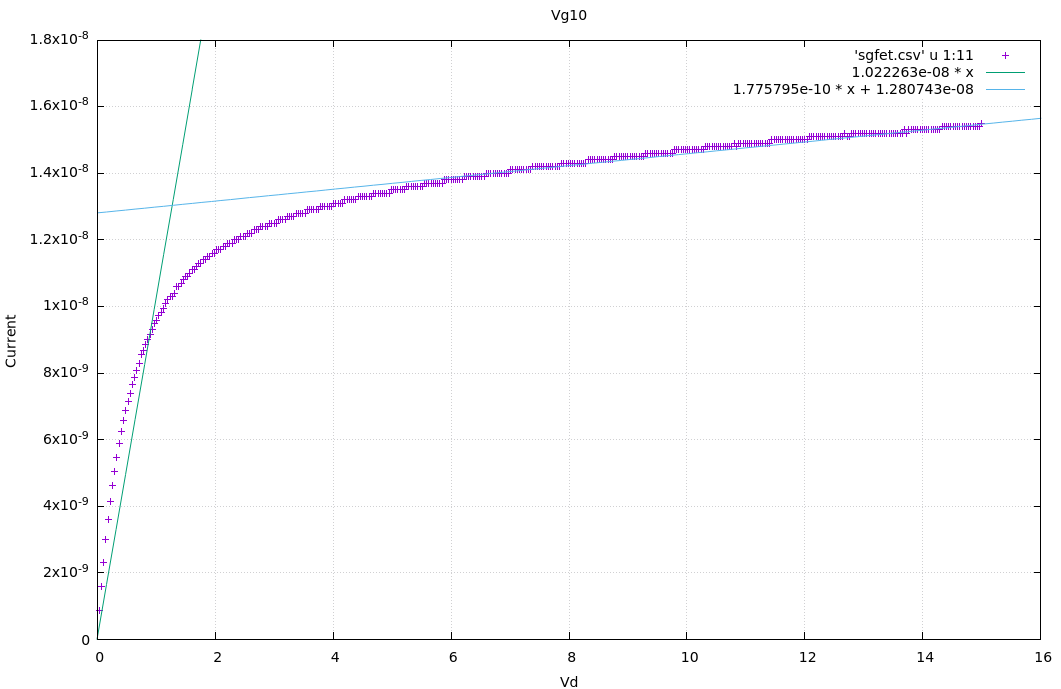
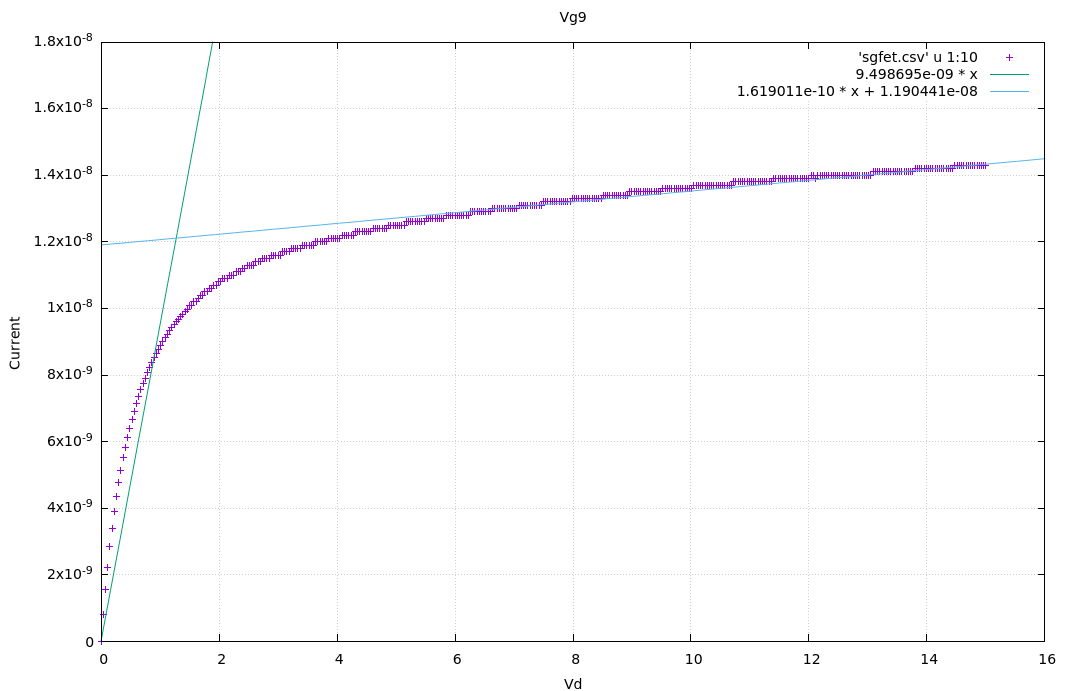
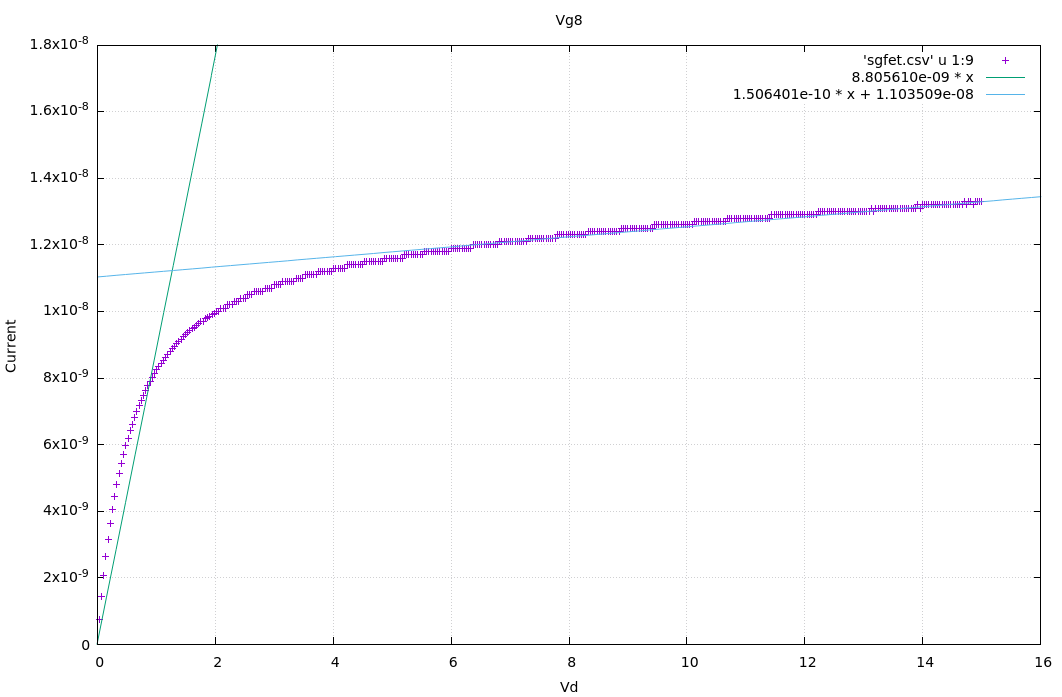
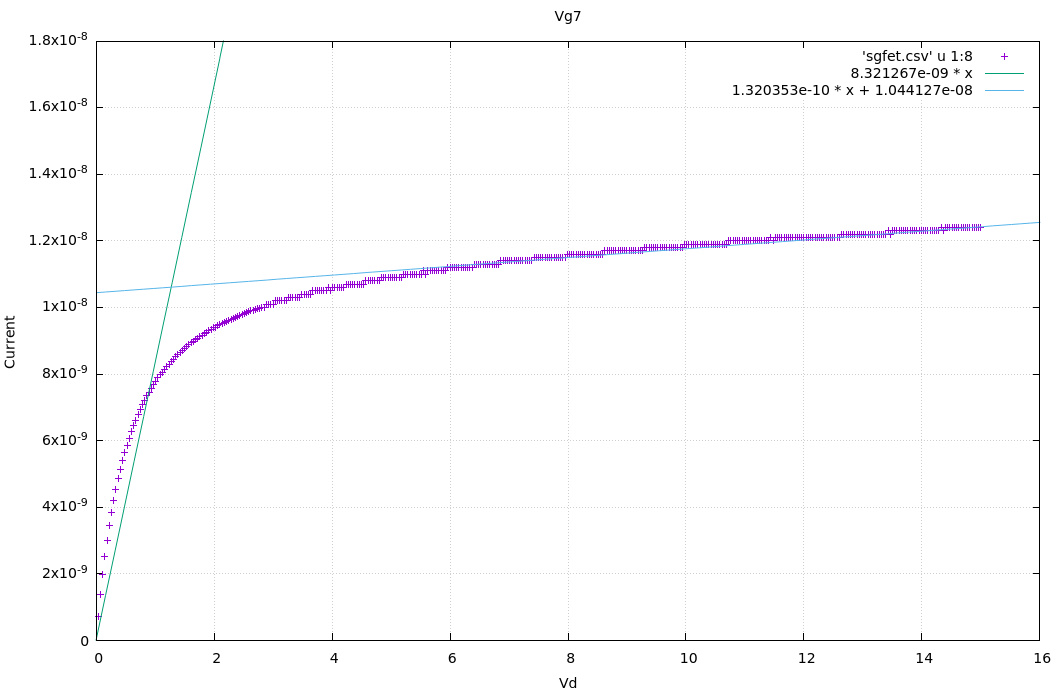
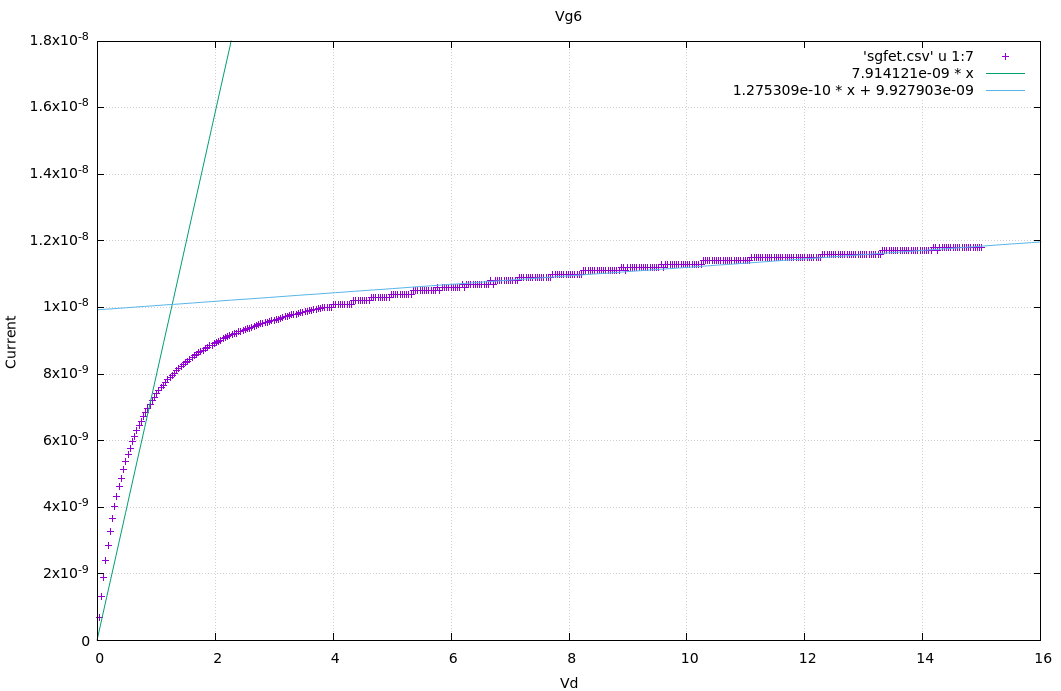
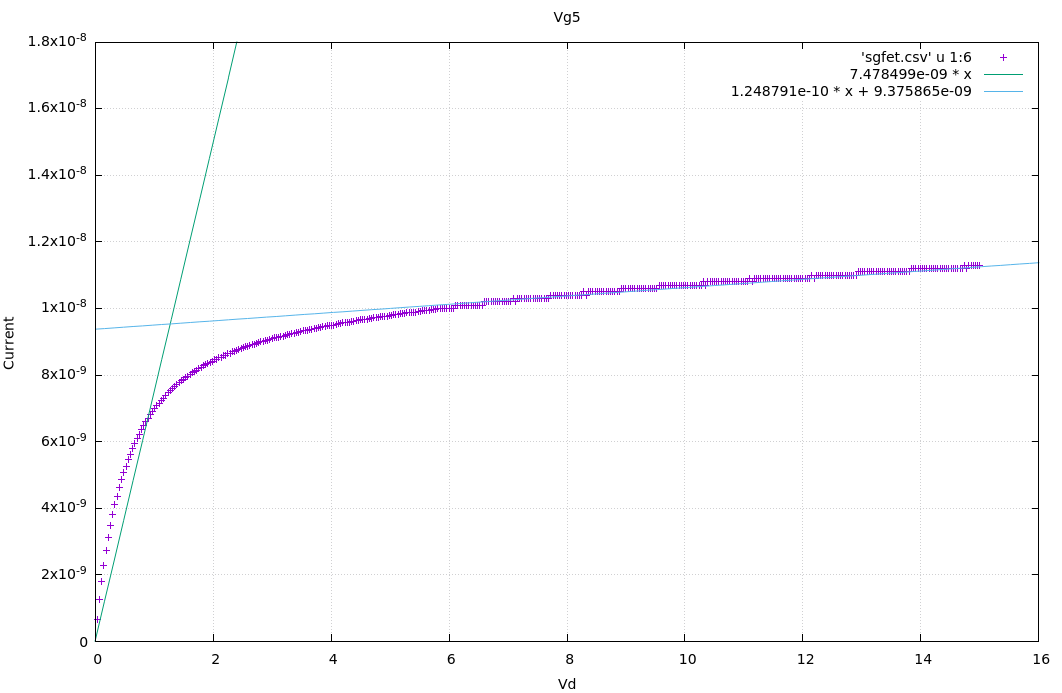
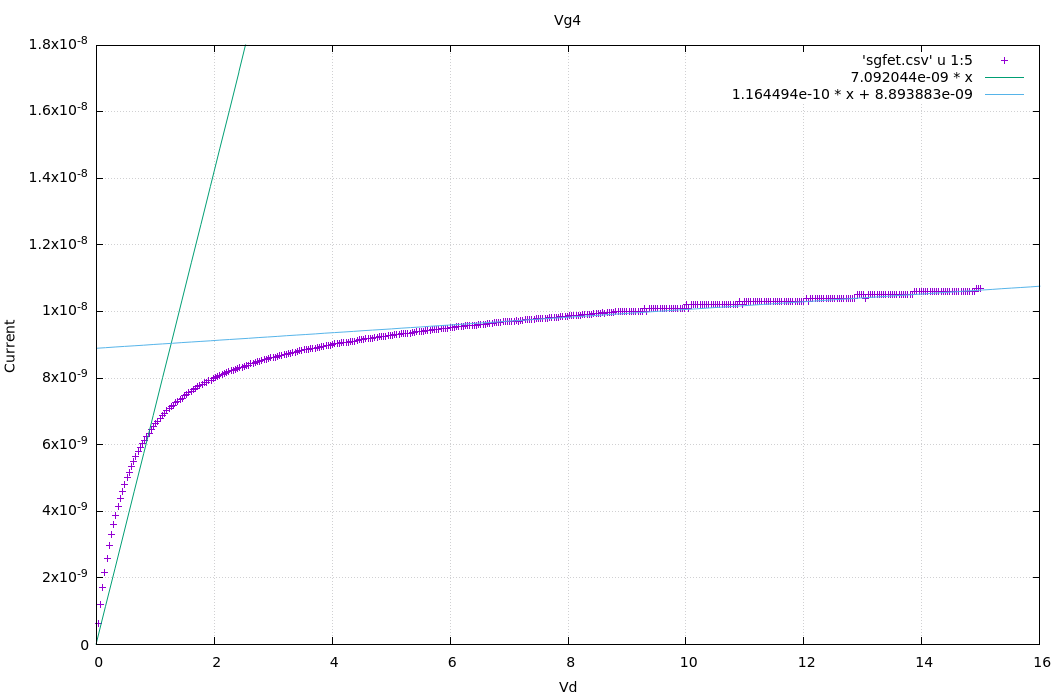
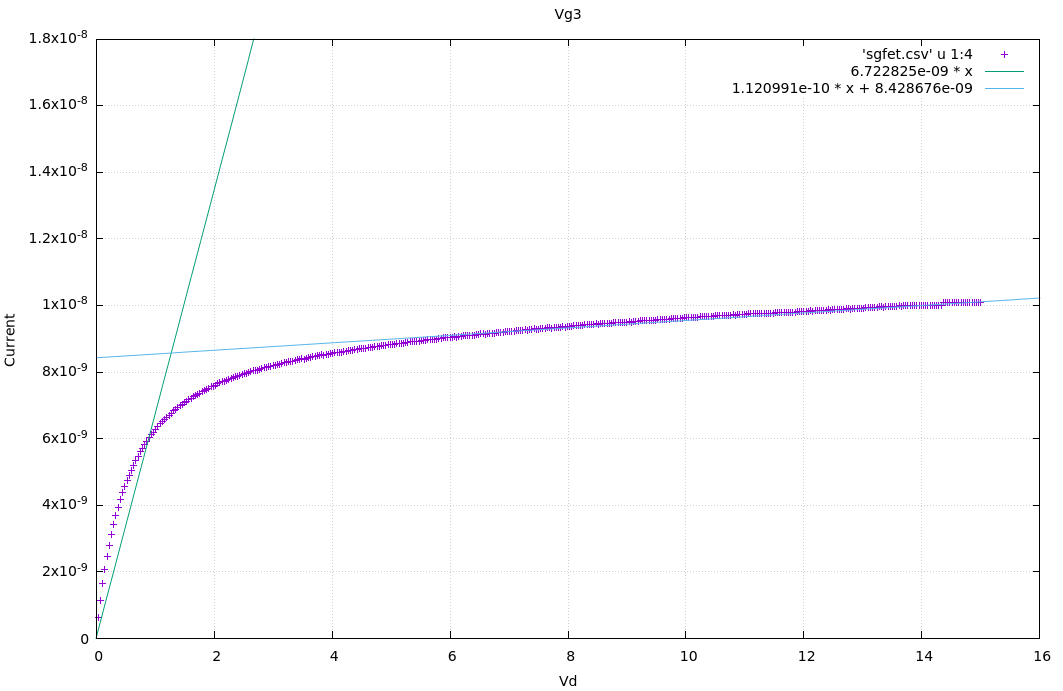
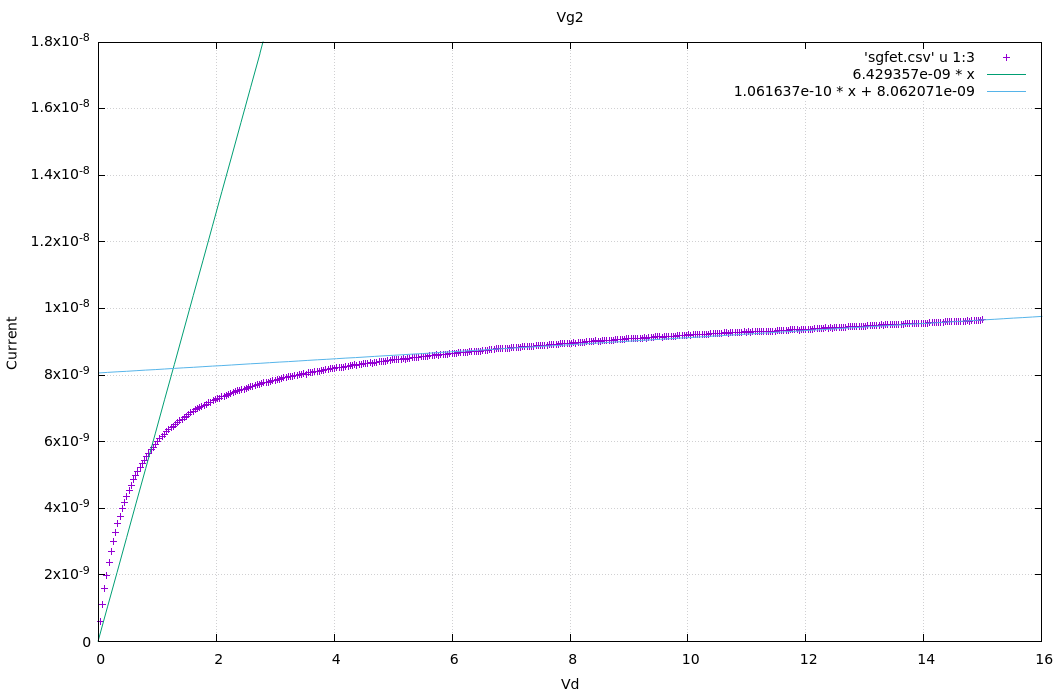
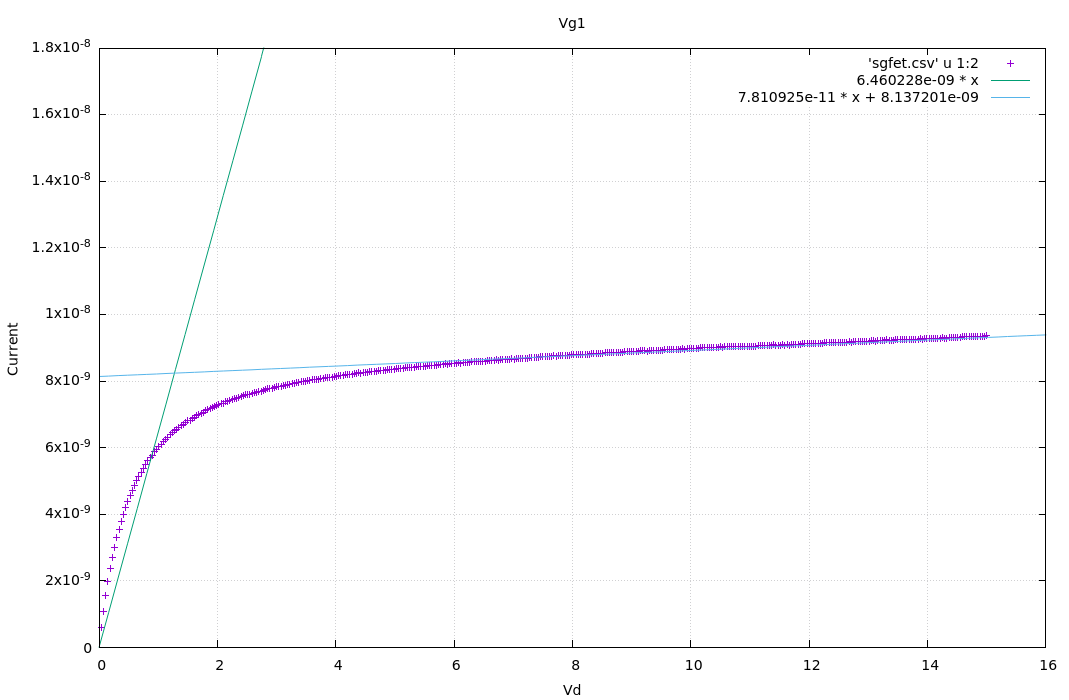
Where the summation is fromto

As we have both the straight lines, it is now trivial to calculate the mean square error for our pair of straight lines with loops, and store the guesses in an array.

We then use binary search algorithm to find the index of the minimum value of the error, and that pair of straight lines andis our answer for that dataset.

We do this for all 11given to us.

In the following pages, you can find the 11 Current vsgraphs corresponding to eachwith our pair of line estimations along with thevsgraph at the end.



We see that the value ofis constant for allwhich is expected as all the 11 Current vs graphs only differ by some factor along the-axis, i.e. they seem to be merely stretched vertically. Asis the-coordinate of the intersection point, it will remain unchanged after any purely vertical stretching of the graph.

This is in accordance with the physical significance offor semiconductor devices.