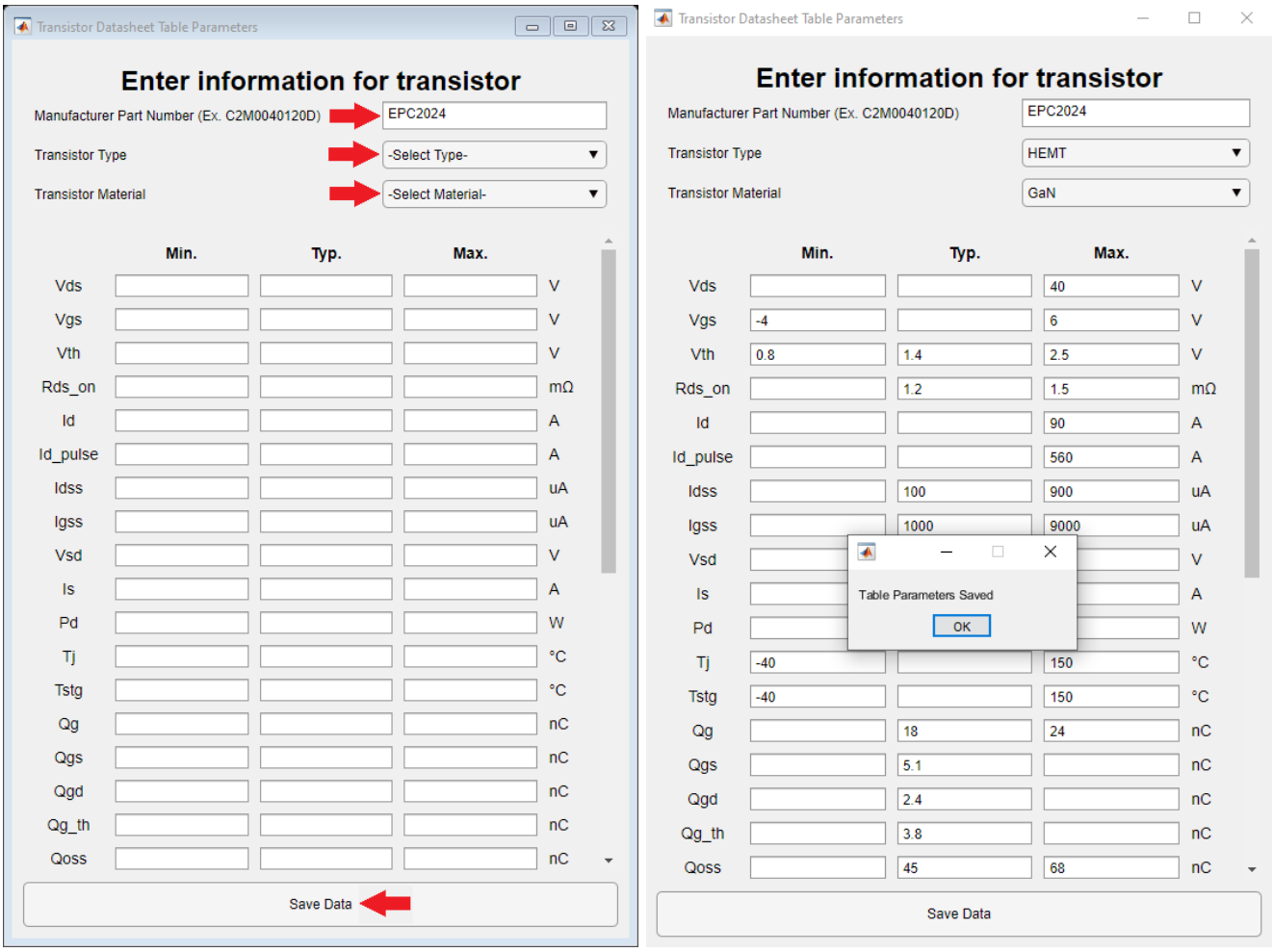
Using the Power Electronic Database System

This is a MATLAB software system for entering, viewing, merging, and pulling information on power electronic devices. The goal is to have a central database for storing this information so that people can pull data and contribute new devices when needed. This is useful beyond data centralization because it will also enable automation of power electronic device selection.

1. Open DatabaseTest.m in MATLAB and run. This will create a Transistor object with the device number ‘EPC2024’. We will use this device as an example. To add a different device, change the device number in line 25.
2. First, the datasheet table parameters window will open with the device number you entered. This is where you enter basic information from the datasheet such as the transistor type, material, and basic table parameters. The arrows point to the four things you must do to add a new device- Add the device number, transistor type, transistor material, and save the data.



The second image shows the window with the information from the datasheet filled out. Make sure to observe the units for each parameter when adding data here as the datasheet’s unit sometimes has a different prefix than the one given in the datasheet. (Ex. Igss Max. = 9mA = 9000uA).

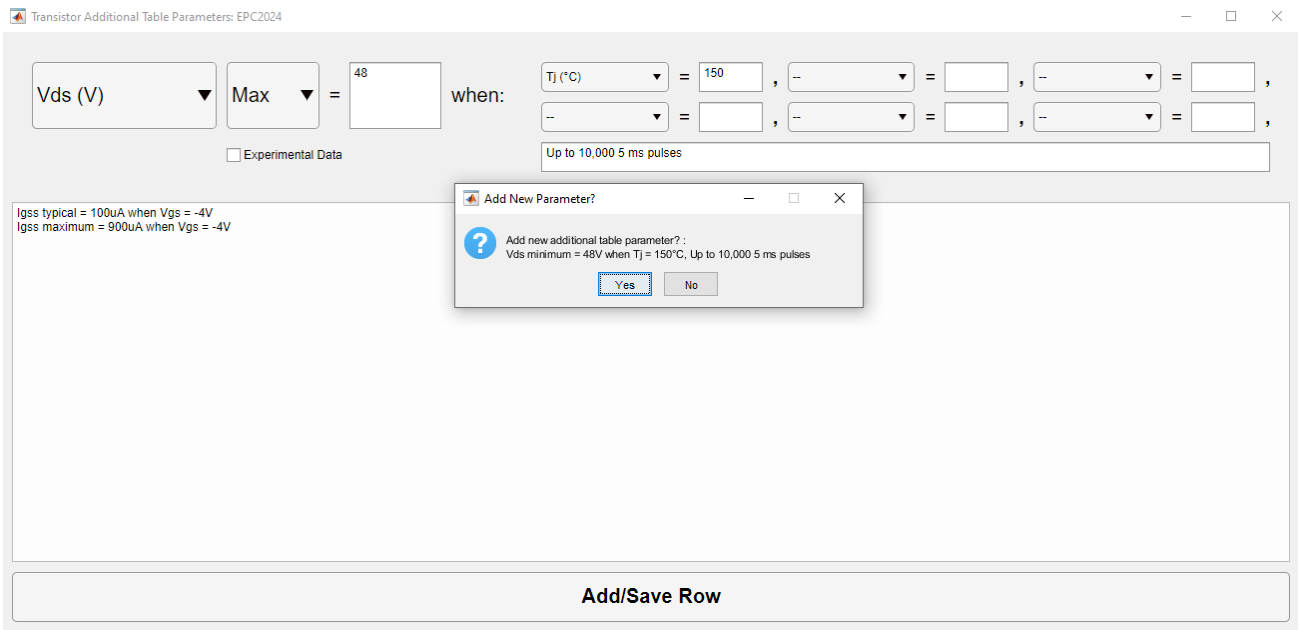
Static Characteristics (T_J = 25°C unless otherwise stated)						
PARAMETER		TEST CONDITIONS	MIN	TYP	MAX	UNIT
BV_{DSS}	Drain-to-Source Voltage	V_{GS} = 0 V, I_D = 1.1mA	40			V
I_{DSS}	Drain-Source Leakage	V_{GS} = 0 V, V_{DS} = 32 V		0.1	0.9	mA
I_{GSS}	Gate-to-Source Forward Leakage	V_{GS} = 5 V		1	9	mA
	Gate-to-Source Reverse Leakage	V_{GS} = -4 V		0.1	0.9	mA
$V_{GS(TH)}$	Gate Threshold Voltage	V_{DS} = V_{GS}, I_D = 19 mA	0.8	1.4	2.5	V
$R_{DS(on)}$	Drain-Source On Resistance	V_{GS} = 5 V, I_D = 37 A		1.2	1.5	mΩ
V_{SD}	Source-Drain Forward Voltage	I_S = 0.5 A, V_{GS} = 0 V		1.8		V

All measurements were done with substrate connected to source.

Sometimes there are multiple datapoints for a given parameter. For example, Igss in this datasheet provides datapoints at two different gate-source voltages. Whenever this happens, enter the data for the more “standard” condition, generally the first row of data for the parameter. This also happens frequently with different temperatures- go with room temperature.

Make sure to hit the save button after adding data. Close the window when you are finished adding data to open the next window.

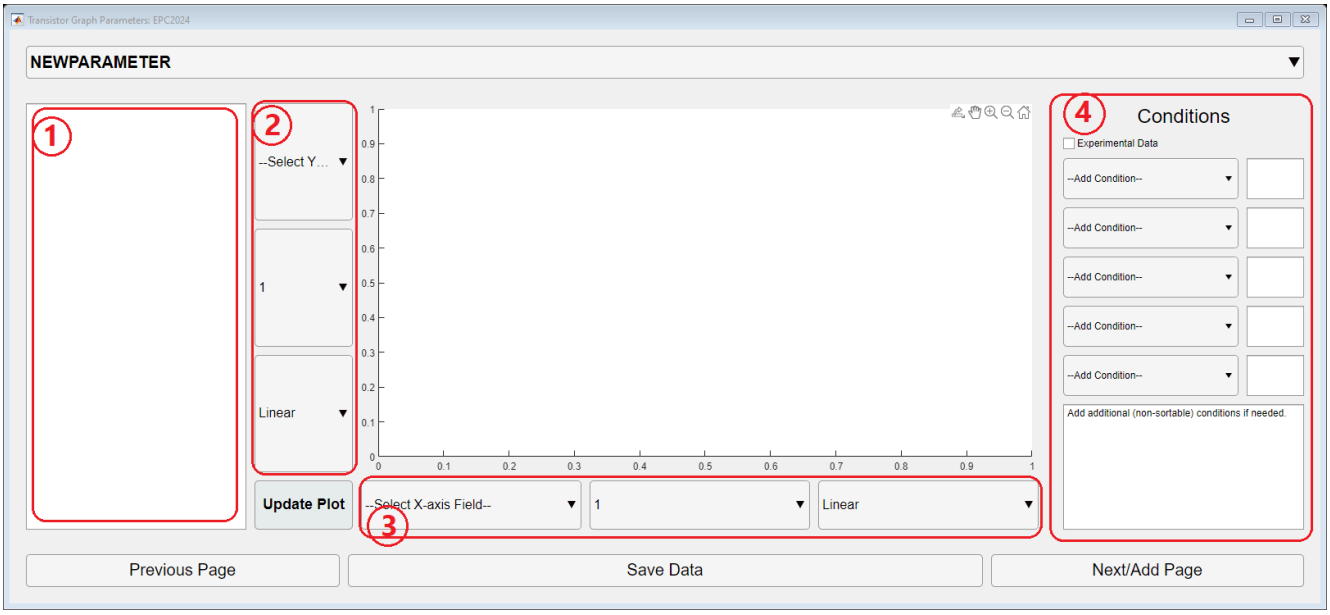
3. Next, the additional table parameters window will open. This window is for adding more static/table parameters that may be experimental or may have conditions attached.



For each parameter, select the parameter field (Vds), Min/Typ/Max, the parameter value (48), whether the data is experimental, and any conditions for the data point. Once you have added data for a data point, hit the ‘Add/Save Row’ button at the bottom and a dialog box will come up confirming whether or not to add the data you have entered. Once entered, all of these additional table parameters will be shown in text form in the large text area in the middle of the window.

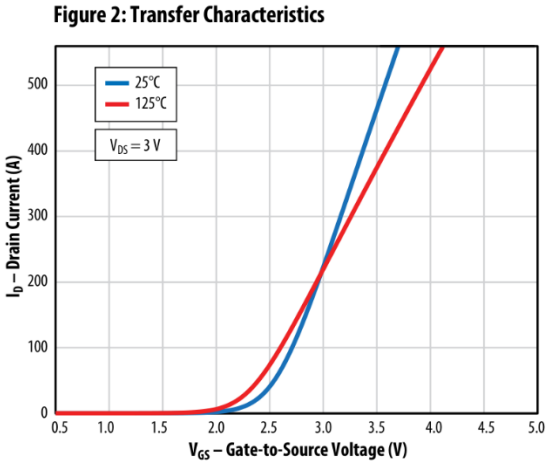
Here, we added the data that we missed in the previous window for Igss as well as a maximum pulsed drain-source voltage found at the start of the datasheet. Once finished, close the window to open the final data entry window.

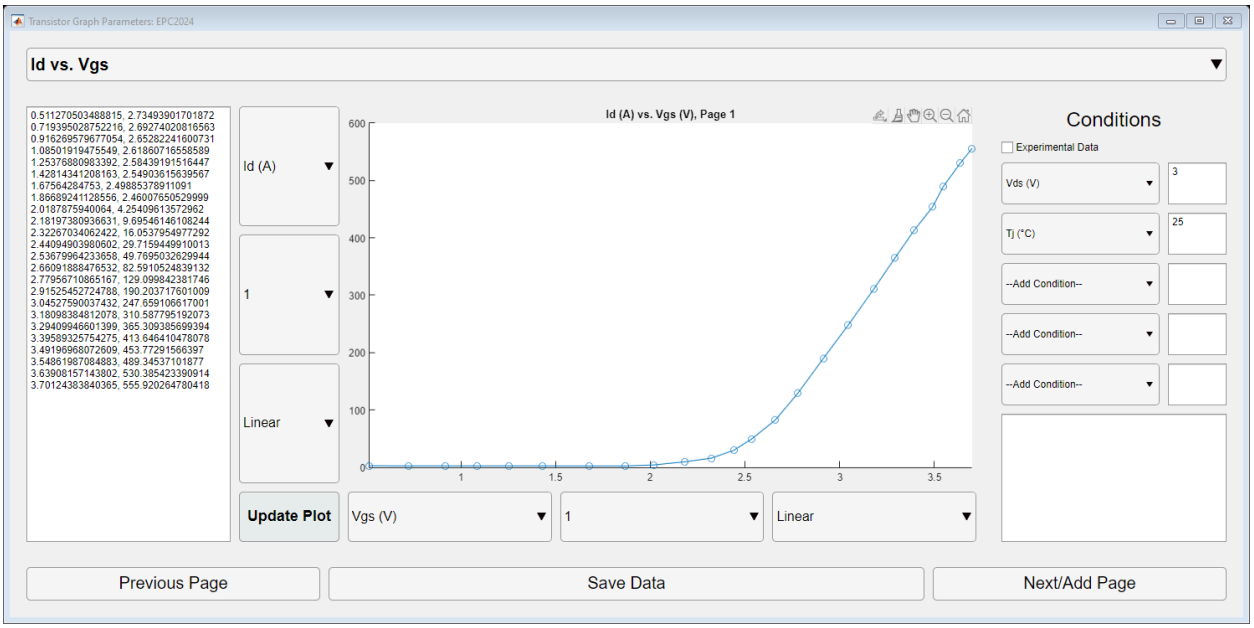
4. The final window is for entering graph/dynamic characteristics from the datasheet as seen annotated below. This page allows for the user to enter data relating two device characteristics, for example Id vs Vds or Vgs vs. Qg. It allows multiple copies of each parameter comparison, and each copy can be experimental and have attached conditions.



We will begin by entering data for Id vs. Vgs from the datasheet. First use the WebplotDigitizer and extract at least 10 data points for each curve from the plot which you want to add. Copy those data points from the digitizer and paste them in box (1). Then select your Y-axis field, multiplier, and linear/log scaling (2). Do the same for (3). Don't forget the multiplier (middle) boxes in these sections as these multipliers are used for scaling the data you enter and must match the unit prefixes from the datasheet plot. Then, you can enter conditions if needed (4) and hit the "Update Plot" button to view the data in the figure within the center of the window.

To add another set of data for a given parameter comparison, for example to add a second curve from the Id vs Vgs plot, click the "Next/Add Page" button in the bottom-right. This is different than using the dropdown at the top of the window. The dropdown at the top of the window is used for switching between or adding new parameter comparisons (ex. Id vs Vds or Vgs vs. Qg.) whereas the "Next/Add Page" and "Previous Page" buttons are used to switch between multiple curves or sets of data on a single parameter comparison plot such as the two curves seen to the right. The current page/plot number can be seen in the title above the plot.





After you enter data for one dynamic/graph parameter, hit the save data button to update the title and the dropdown name to reflect the information you have entered. To add a new parameter compariosn, use the dropdown at the top and select. There can only be one “NEWPARAMETER” in the dropdown. If you have entered data on a “NEWPARAMETER” page and wish to add another parameter comparison, click the “Save Data” button. If the current data is valid the name of the current page will change from “NEWPARAMETER” to “Id vs. Vgs” or something along those lines as seen in the image above and a new “NEWPARAMETER” option will be available in the dropdown.

Close this window when you are finished. The data for devices can be viewed by using the Transistor.datasheet( ) function as seen in the DatabaseTest.m code along with other features which will be added soon.

Messge me on Slack or email me if you have any questions or feedback-
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