

# Hints, Tips and Solutions

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**Q: Which model for thermal resistivity should I choose? How good is the default model?**

A: There are four models with user adjustable parameters which can be used - a constant model (tcon.const), a power law model (tcon.pow), a polynomial law model (tcon.poly) and a reciprocal law model (tcon.recip). The default is the compositionally dependent thermal conductivity model (tcon.comp), which is a version of the power model (tcon.pow) for which there are default parameters for certain popular materials.

Here is a demonstration of how to compare a model with experimental data. The CRC handbook has a table of thermal resistivity vs temperature for silicon. The data can be put into the TonyPlot data format, which will look like this:

```
File Edit View Bookmarks Spice Help
1 thermal conductivity of Si
2 0 2 2
3 T
4 k
5 1 0.0693
6 2 0.454
7 3 1.38
8 4 2.97
9 5 5.27
10 6 8.23
11 7 11.7
12 8 15.5
13 9 19.5
14 10 23.3
15 15 41.6
16 20 49.8
17 30 48.1
18 40 35.3
19 50 26.8
20 60 21.1
Line 1 Col: 1 INS Unix RW SEdit 3.8.4.R © Simucad
```

This file will give you a graph of k versus T in *TonyPlot*. After you have done that, the next step is to define the model function in *TonyPlot*. We will be using the power law model, so the function definition will look like this:

Function Macros:	Macro Definition:
kpow	$1.48 * (T/300)^{-1.65}$

Name: kpow  
Create Delete Replace

Impurity Func 1: \_\_\_\_\_  
Impurity Func 2: \_\_\_\_\_  
Graph Func 1: kpow  
Graph Func 2: \_\_\_\_\_

OK Cancel Apply

To plot this in a way that we can see the model clearly, we will be plotting the log of k versus the log of T, so the model will appear as a straight line. The display setup will look like this:

Show: [Icons] Type: [Grid] [Globe] [Globe] Convert Data

X Scale:  Linear  Log Y Scale:  Linear  Log  Mixed

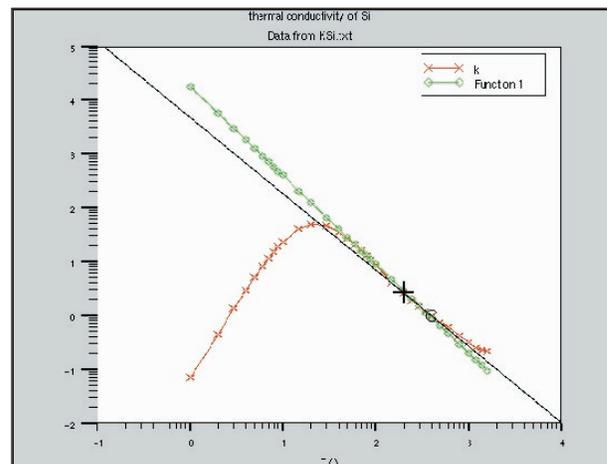
X Quantity: T Y Quantities (Linear): T Y Quantities (Log): k

Function 1 Function 2 Function 1 Function 2

Group: None

Functions... OK Cancel Apply

The *TonyPlot* shows the CRC data in red and the model (function 1) in green:



The fit of the power model to the data near room temperature is pretty good. The black line is a fit to the curve in the region from 200K to 400K, which gives a slightly better fit.

## Call for Questions

If you have hints, tips, solutions or questions to contribute, please contact our Applications and Support Department  
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