SPICE Model Documentation

Laird™
PERFORMANCE MATERIALS

Laird Performance Materials takes pride in offering the best tools for design engineers challenged with rapid product development in the global marketplace. Design engineers must select the proper components in the face of complex designs and uncertain EMC environments.

Laird Performance Materials offers a revolutionary new SPICE model for EMI ferrite chip beads. This new, time saving design aid includes the de-rating effects of dc bias currents on small ferrite board level components. Other existing SPICE models are only capable of predicting performance of ferrite chip beads when they are not under any significant operating load.

The Laird Performance Materials SPICE Model has the capability of predicting (with superior accuracy) the real performance of an EMI chip bead actually in circuit operation.

Features of the new Laird Performance Materials SPICE model include:

- Capable of indicating a part's performance under DC Bias up to 5 Amps or full rated current
- Can be used with most SPICE programs, such as PSPICE & LTSPICE
- Can quickly switch between different Laird Performance Materials chip beads
- Takes into account unwanted parasitic effects caused by increasing bias
- "Real World" accuracy for better designs the first time
- Provides quicker designs and faster time-to-market

Laird Performance Materials welcomes the opportunity to assist you with your design and EMI component needs. Please contact your local Laird Performance Materials sales and FAE if you have any questions.

Laird Performance Materials models all components that can be modeled with acceptable accuracy. Models are not provided in cases modeling accuracy is unacceptable. Following lists note the board-level components included – and not included – in the model library.

Components Included in the Model:

Part Number	Part Number	Part Number	Part Number
28C0236-0BS-10	HI2220P171R-10	HZ0805E601R-10	LI1206H121R-10
28C0236-0BW-10	HI2220P251R-10	HZ0805G471R-10	LI1206H151R-10
28C0236-0DW10	HI2220P271R-10	HZ1206C202R-10	LI1806C151R-10
28C0236-0EW-10	HI2220P551R-10	HZ1206D102R-10	LI1806E101R-10
28C0236-0JW-10	HI2220P601R-10	HZ1206E152R-10	LI1806E800R-10
28F0121-0SR-10	HI2220P701R-10	HZ1206E601R-10	LI1812D121R-10
28F0121-1SR-10	HI2220Q401R-10	HZ1806K102R-10	MI0603J600R-10
28F0181-1SR-10	HI2220R151R-10	LF0805A252R-10	MI0603J601R-10
29F0430-2SR-10	HI2220R181R-10	LF1206A302R-10	MI0603J680R-10
35F0121-0SR-10	HI2220R301R-10	LF1206C202R-10	MI0603K300R-10
35F0121-1SR-10	HI2220T101R-10	LF1206E152R-10	MI0603L221R-10
DA1206B102R-10	HI2520P751R-10	LI0402B301R-10	MI0603L301R-10
DA1206B601R-10	HI3312X101R-10	LI0402B800R-10	MI0603M121R-10
DA1206C121R-10	HR2220P601R-10	LI0402C221R-10	MI0805J102R-10
DA1206D301R-10	HR2220V801R-10	LI0402C470R-10	MI0805K110R-10
DA1206E300R-10	HZ0402A152R-10	LI0402D121R-10	MI0805K260R-10
DI2220V301R-10	HZ0402A601R-10	LI0402E190R-10	MI0805K400R-10
DM1612X560R-10	HZ0402B102R-10	LI0402E300R-10	MI0805K601R-10
HI0805O121R-10	HZ0603A152R-10	LI0402E600R-10	MI0805L301R-10
HI0805Q310R-10	HZ0603A182R-10	LI0603B201R-10	MI0805M221R-10
HI0805R800R-10	HZ0603A222R-10	LI0603D301R-10	MI1206K260R-10
HI1206N101R-10	HZ0603A252R-10	LI0603E151R-10	MI1206K310R-10
HI1206N800R-10	HZ0603B102R-10	LI0603E470R-10	MI1206K600R-10
HI1206P121R-10	HZ0603B112R-10	LI0603G121R-10	MI1206K601R-10
HI1206T161R-10	HZ0603B751R-10	LI0603G221R-10	MI1206K900R-10
HI1206T500R-10	HZ0603C601R-10	LI0603G800R-10	MI1206L391R-10
HI1612X560R-10	HZ0603C651R-10	LI0805G201R-10	MI1206L501R-10
HI1806N910R-10	HZ0805B222R-10	LI0805G301R-10	MI1806J800R-10
HI1806T600R-10	HZ0805B272R-10	LI0805H121R-10	MI1812K121R-10
HI1812N121R-10	HZ0805C202R-10	LI0805H151R-10	
HI1812T800R-10	HZ0805D102R-10	LI0805H750R-10	
HI1812V101R-10	HZ0805D152R-10	LI1206E310R-10	

Components Not Included in the Model:

Part Number	Part Number	Part Number	Part Number
28J0138-11R-10	CM1922X330R-10	CM5441Z161B-13	CC2824E513R-10
28L0138-10R-10	CM2021Y330R-10	CM5740Z171B-10	CC2824J502R-10
28L0138-40R-10	CM2545X171B-10	CM5740Z171R-10	CM0805A371R-10
28L0138-50R-10	CM2545X171R-10	CM5740Z241B-10	CM0805C161R-10
28L0138-70R-10	CM2722R151R-10	CM6032V201R-10	CM0805C221R-10
28L0138-80R-10	CM2722R201R-10	CM6032V301R-10	CM0805D900R-10
29F0303-0T0-10	CM2722R800R-10	DA1206D600R-10	CM1812C282R-10
29F0318-1SR-10	CM2824B103R-10	HF1206J150R-10	CM1812R600R-10
29F0328-0T0-10	CM2824E182R-10	HI0603P600R-10	CM1812X330R-10
29F0330-2SR-10	CM2824E352R-10	28J0138-11R-10	CM1922X330R-10
29F0418-0SR-10	CM2824E702R-10	28L0138-10R-10	CM2021Y330R-10
29F0418-1SR-10	CM3032V121R-10	28L0138-40R-10	CM2545X171B-10
29F0428-0T0-10	CM3032V201R-10	28L0138-50R-10	CM2545X171R-10
29F0429-0T0-10	CM3032V301R-10	28L0138-70R-10	CM2722R151R-10
29F0430-4SR-10	CM3312R111R-10	28L0138-80R-10	CM2722R201R-10
29F0528-0T0-10	CM3322P400R-10	29F0303-0T0-10	CM2722R800R-10
29F0818-0SR-10	CM3322U610R-10	29F0318-1SR-10	CM2824B103R-10
29F0818-1SR-10	CM3322X630R-10	29F0328-0T0-10	CM2824E182R-10
CC1812C513R-10	CM3421Y600R-10	29F0330-2SR-10	CM2824E352R-10
CC2824B475R-10	CM3440Z171B-10	29F0418-0SR-10	CM2824E702R-10
CC2824D225R-10	CM3440Z171R-10	29F0418-1SR-10	CM3032V121R-10
CC2824E105R-10	CM3822R151R-10	29F0428-0T0-10	CM3032V201R-10
CC2824E113R-10	CM3822R201R-10	29F0429-0T0-10	CM3032V301R-10
CC2824E253R-10	CM3822R800R-10	29F0430-4SR-10	CM3312R111R-10
CC2824E474R-10	CM4545Z131B-10	29F0528-0T0-10	CM3322P400R-10
CC2824E513R-10	CM4545Z131R-10	29F0818-0SR-10	CM3322U610R-10
CC2824J502R-10	CM4732V201R-10	29F0818-1SR-10	CM3322X630R-10
CM0805A371R-10	CM4732V301R-10	CC1812C513R-10	CM3421Y600R-10
CM0805C161R-10	CM5022R151R-10	CC2824B475R-10	CM3440Z171B-10
CM0805C221R-10	CM5022R201R-10	CC2824D225R-10	CM3440Z171R-10
CM0805D900R-10	CM5022R800R-10	CC2824E105R-10	CM3822R151R-10
CM1812C282R-10	CM5441Z101B-10	CC2824E113R-10	CM3822R201R-10
CM1812R600R-10	CM5441Z101B-13	CC2824E253R-10	
CM1812X330R-10	CM5441Z161B-10	CC2824E474R-10	

Instructions for Laird Performance Materials model simulation with Orcad PSPICE

This is an instruction set for Laird Performance Materials spice component models.
The instructions stated below are for Pspice's capture program.

1. In order to best keep track of the Laird Performance Materials library file, place the LairdTech_v2_0.lib file in the folder that contains the rest of library files. The path for this will typically be: C:\OrCAD\OrCAD_10.5i\tools\capture\library\pspice.
2. In the start menu, navigate to the Orcad program folder, then select the "Pspice Accessories" folder and select "model editor" program. This program is also located in this folder C:\OrCAD\OrCAD_10.5i\tools\pspice, labeled "modeled".
3. Once the program has loaded, open the Laird Performance Materials library file that was just placed on the hard drive.
4. Once the model has opened, go to file and select the option "export to capture library".
5. A prompt will come up with input and output information. The output information is going to be the library that is being created. It should read the same location at the current file and same name, just with a different extension, ".olb". Click ok.
6. Now that the new. olb file has been created, open up the Orcad Capture program.
7. Go to File and select New > Project.
8. Create a new analog project. Name your name project and select the location the files will be saved at the bottom. Click Ok.
9. On the menu bar, select the option labeled "Pspice", and then "Edit Simulation Profile" on the drop down menu.
10. Once the Simulation setting box comes up, select the tab labeled "configuration files". On the left there will be a box labeled "Category". In this box select "Library".
11. In the "Configured Files" box you will see the files you currently have configured for your simulations. Typically it will just show the nom.lib file. Click the browse button on the right. Go to the location where the "LairdTech_v2_0.lib" file is saved and click open.
12. The Laird Performance Materials .lib file should be showing in the file name box. Click the "Add as Global" button on the right side. Click the apply button at the bottom then ok.
13. Now, in your project window, the window showing your design hierarchy, expand the "design resources" folder. You should now see a library folder. Expand this folder as well.
14. You will notice that the Laird Performance Materials library file is not there. To add the library file, right click the folder labeled "Library". An "add file" box should pop up. Click it.
15. Go to the location where the ".olb" file is saved and click open.
16. You should now be able to add the Laird Performance Materials models just like any other part from the part's list. In the place parts box, if you select the Laird Performance Materials library, it will give you a list of all the models that can be used. There are a few things that must be noted.

Note:

- **All models are created for use between 1 MHz and 3 GHz. We cannot assure accuracy beyond this range.**
- **All models are created for use below their DC ratings. We cannot assure accuracy above their individual ratings.**

The Laird Performance Materials SPICE model for chip beads is a predictive model. All results from this model should be tested in operation in an actual circuit. When using this predictive model the user accepts full responsibility for the design of their product.

Instructions for Importing Laird Performance Materials model library file for use in SwitcherCAD.

1. From the zipped file, copy the “xferritebead1.asy” to C:\Program Files\LTC\SwCADIII\lib\sym.
2. From the zipped file, copy the “LairdTech_v2_0.lib” to C:\Program Files\LTC\SwCADIII\lib\sub.
3. Open SwitcherCAD.
4. Open either a new schematic or the desired schematic.
5. Add the Laird Performance Materials .lib file to the schematic.
   - Go to the edit menu and click “Spice directive”.
   - In the box, type .include “LairdTech_v2_0.lib”
   - Click ok. A box will appear for the placement of the directive. Make sure it is placed before the simulation directive.
6. To place the ferrite bead model into the circuit.
   - Go to the edit menu and click “component”.
   - Scroll over and click the xferritebead1 part, and place it in the desired location in the schematic.
7. Now the desired ferrite bead needs to be specified for the recently placed model. A list of the modeled ferrite beads can be found in this document. Select the desired ferrite bead from the model list, and copy its name.
8. Go back to SwitcherCAD to where the ferrite bead model was placed.
   - Right click where it says ModelName. A box prompting for a new value for the part will appear.
   - Enter the copied name of the ferrite bead into the box.
9. Complete the schematic as desired and simulate.

Note:

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