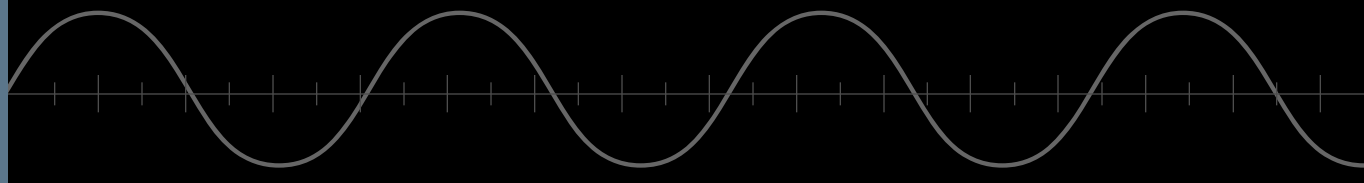


# Managing and Customizing Model Libraries



# LTspice Standard Library Files

(the libraries can be opened and edited using LTspice)

## ❖ RCL Libraries (easy to edit and expand)

- ❖ standard.res
- ❖ standard.cap
- ❖ standard.ind
- ❖ standard.bead

File path for standard library files:

C:\Program Files (x86)\LTC\LTspice\lib\cmp

## ❖ Intrinsic Device Libraries (more complicated to edit and expand)

- ❖ standard.dio
- ❖ standard.bjt
- ❖ standard.mos
- ❖ standard.jft

Custom entries into the standard library files will not be removed by a Sync Release.

**See caveat on next page.**

# Managing Standard Library Files

A few tips to edit the standard library files

- ❖ For Win OS with “*User Account Control*” users (ex. Vista, Win7 and Win8), either turn-off User Account Control or start LTspice using “Run as Administrator” even if you are logged as an administrator. If not done:
  - ❖ Manual changes to the libraries cannot be saved
  - ❖ A Sync Release will result in the libraries being renamed with .bak extensions (e.g. Standard.cap.bak) and replaced by a newly downloaded stock library from LTC server.
- ❖ Open up the library file you want to edit using LTspice
- ❖ Custom entries into the standard library files will not be removed by a Sync Release but...
- ❖ A fresh re-installation of LTspice will delete the entire content of the standard library files. Think archive before fresh re-install!

# Managing RLC Database Files

To add an entry to an RLC library file:

- ❖ Scroll to the end of the library file
- ❖ Double-click right below the last row of data (empty row)
- ❖ Fill-in the fields in the “Database record” pop-up window

The screenshot shows the LTspice IV interface with a resistor database file open. The table below shows the current data:

| R[Ω]     | Mfg. | Part No. | Power[W] | Tolerance[%] |
|----------|------|----------|----------|--------------|
| 866.00K  |      |          | 0.100    |              |
| 887.00K  |      |          | 0.100    |              |
| 909.00K  |      |          | 0.100    |              |
| 931.00K  |      |          | 0.100    |              |
| 953.00K  |      |          | 0.100    |              |
| 976.00K  |      |          | 0.100    |              |
| 1000.00K |      |          | 0.100    |              |
|          |      |          |          |              |

The 'Resistor Database Record' dialog box contains the following fields:

- Manufacturer:
- Part Number:
- Resistance[Ω]:
- Power[W]:
- Tolerance[%]:

Buttons: OK, Cancel

# Managing RLC Database Files

- ❖ To add multiple entries using a spreadsheet:

|   | A   | B   | C          | D   | E   | F | G     | H |
|---|-----|-----|------------|-----|-----|---|-------|---|
| 1 |     |     |            |     |     |   |       |   |
| 2 | 3.3 | TDK | C2012X5ROJ | X5R | 6.3 | 0 | 0.006 |   |
| 3 | 4.7 | TDK | C2012X5ROJ | X5R | 6.3 | 0 | 0.003 |   |
| 4 | 4.7 | TDK | C3216X5RIA | X5R | 10  | 0 | 0.003 |   |
| 5 | 10  | TDK | C3216X5ROJ | X5R | 6.3 | 0 | 0.001 |   |
| 6 |     |     |            |     |     |   |       |   |
| 7 |     |     |            |     |     |   |       |   |
| 8 |     |     |            |     |     |   |       |   |

Enter data in spreadsheet.  
Column sequence is important

| C[μF]  | Mfg.           | Part No.      | Voltage         | Irms[A] | Rser[Ω] | Lser[mH] |   |
|--------|----------------|---------------|-----------------|---------|---------|----------|---|
| 56.00  | United Chemi-C | LXF50VB560M6X | AL electrolytic | 50.0    | 0.366   | 0.280    | 0 |
| 560.00 | United Chemi-C | LXF50VB561M   | AL electrolytic | 50.0    | 1.715   | 0.039    | 0 |
| 680.00 | United Chemi-C | LXF50VB680M   | AL electrolytic | 50.0    | 1.885   | 0.033    | 0 |
| 82.00  | United Chemi-C | LXF50VB820M8X | AL electrolytic | 50.0    | 0.500   | 0.160    | 0 |
| 820.00 | United Chemi-C | LXF50VB821M12 | AL electrolytic | 50.0    | 2.030   | 0.029    | 0 |
| 820.00 | United Chemi-C | LXF50VB821M16 | AL electrolytic | 50.0    | 1.875   | 0.034    | 0 |

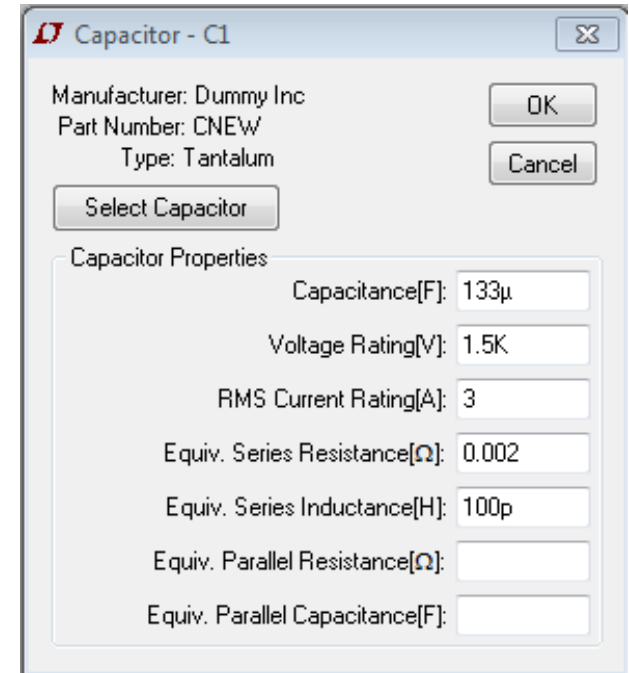
Copy and paste data to  
standard library file

This technique works well with data from parametric tables or datasheet tables.

# Managing RLC Libraries

## Hands-on Exercise:

- ❖ Add a new tantalum capacitor which has the following characteristics to the standard.cap library:
  - ❖ Manufacturer: Dummy Inc.
  - ❖ Part number: CNEW
  - ❖ Capacitance: 133uF
  - ❖ Voltage: 1500V
  - ❖ RMS Current: 3A
  - ❖ ESR: 2mOhm
  - ❖ Parasitic inductance: 0.1nH
- ❖ Place CNEW on a schematic and verify its parameters match the ones listed above



# Managing Intrinsic Device Libraries

To add a device to an Intrinsic Device library file:

- ❖ Download or create a .model statement.
  - ❖ .SUBCKT is not a valid model to add to an LTspice Intrinsic device library. If the .model is not available for that .SUBCKT part, one must create it.
- ❖ Copy the .model statement.
  - ❖ The syntax must be:

*.model <modelname> <type> (<parameter list>)*

where *<type>* can be:

D: Diode

NPN, PNP: Bipolar Transistors

NJF, PJF: N and P-Channel JFET transistors

VDMOS: Vertical Double Diffused Power MOSFET

Other MOS types are available but not as widely used in the standard.mos library (refer to LTspiceHelp for additional details)

# Managing Intrinsic Device Libraries

To add a device to an Intrinsic Device library file (cont.):

3. In LTspice, scroll to the end of the library file and paste the data in empty row.
4. (Optional) Annotate the .model statement with part ratings & manufacturer specifics. This information is displayed in the schematic capture GUI to assist in selecting a device but does not directly impact the electrical behavior in simulation.
  - ❖ Available part ratings / mfg information to add are:
    - ❖ Diode: Vpk= [V], Iave= [A], mfg= [name], type= [name]
    - ❖ MOS: Vds= [V], Ron= [ohm], Qg= [C], mfg = [name]
    - ❖ Bipolar: Vceo= [V], Icrating= [A], mfg= [name]
    - ❖ JFET: mfg= [name]
  - ❖ Annotated model example:

```
.model BZX84C12L D(Is=.6n Rs=.5 Cjo=150p nbv=5 bv=12 Ibv=1m Vpk=12 mfg=OnSemi type=Zener)
```

<modelname> <type>

<electrical parameters>

<GUI information>



# Managing Intrinsic Device Libraries

Hands-on Exercise: Add Diode Inc.'s BAS116 diode model to the standard.dio library

- ❖ The model can be copied from the file [DI\\_BAS116.txt](#)
- ❖ Add the manufacturer information and part ratings that will be displayed in the schematic capture GUI
- ❖ Open “DiodeLibraryExample.asc” and follow the steps to verify the newly added model. C
- ❖ Verify the “Diode Properties” window reads →

Diode Properties

|                             |            |
|-----------------------------|------------|
| Diode:                      | DI_BAS116  |
| Manufacturer:               | Diodes Inc |
| Type:                       | Switching  |
| Average Forward Current[A]: | 0.215      |
| Breakdown Voltage[V]:       | 60         |

## Managing Third-Party Model Files

- ❖ Sub-circuits (.subckt) model files such as opamps and mosfets usually contain a single model per file. Merging them into a single library file can be worth the effort
  - ❖ Allows the use of a single .include statement pointer
  - ❖ File name vs . Model name not really an issue anymore
  - ❖ Easily “transportable”
- ❖ A library file can contain a mix of .model and .subckt spice netlists. As example: [MyMosfetsLibrary.txt](#)
- ❖ To create a library file, simply copy all model netlists into a text file using any text editor.
  - ❖ Make sure not two model names are the same. Tip: use the manufacturer name as part of the model name

# Managing Third-Party Model Files

- ❖ Some manufacturers, such as Würth/Midcom, also provide LTspice compatible schematic symbols along with the spice model libraries for their components. These symbols (.asy files) shall be saved and moved to the “<LTspice/V>\lib\sym\” folder.
  - ❖ The model libraries can be located at various places, including on the web and the end location is heavily dependent on how the component symbol was created and is being used. Consult the references below for more on the subject.
- ❖ Refer to the “*Importing Third-Party models*” and “Creating Schematic Symbols” modules for extensive information on third-party symbols and spice models.

# Third-Party Libraries

- ❖ Central Semiconductor Corp.:
  - ❖ <http://www.centralsemi.com/content/engineering/spicemodels/index.php>
- ❖ Coilcraft:
  - ❖ <http://www.coilcraft.com/models.cfm>
  - ❖ Many of their magnetics can be found in the inductor intrinsic library
- ❖ CREE:
  - ❖ <http://www.cree.com/LED-Components-and-Modules/Document-Library>
- ❖ Diodes Incorporated:
  - ❖ <http://www.diodes.com/spicemodels/search.php>
- ❖ EPCOS:
  - ❖ <http://www.epcos.com/epcos-en/523002/design-support/design-tools/inductors/model-libraries-for-smt-and-leaded-inductors/ltspice>
  - ❖ <http://www.epcos.com/epcos-en/180516/design-support/design-tools/ntc-thermistors/ntc-thermistor-library-for-pspice>
- ❖ Fairchild Semiconductors:
  - ❖ <http://www.fairchildsemi.com/models/modelDetails?modelType=PSPICE>

# Third-Party Libraries

- ❖ Infineon's Power FETs:
  - ❖ Many of their FETs can be found in the MOS intrinsic libraries
  - ❖ <http://www.infineon.com/...>
- ❖ International Rectifier:
  - ❖ <http://www.irf.com/product-info/models/spice/spice.zip>
- ❖ IXYS:
  - ❖ <http://www.ixysgreen.com/TechnicalSupport/pspice.aspx>
- ❖ Littelfuse:
  - ❖ <http://www.littelfuse.com/technical-resources/spice-models.aspx>
- ❖ Murata:
  - ❖ [http://www.murata.com/products/design\\_support/netlist/index.html](http://www.murata.com/products/design_support/netlist/index.html)
- ❖ NXP:
  - ❖ <http://www.nxp.com/models.html>
- ❖ ON Semiconductor:
  - ❖ <http://www.onsemi.com/PowerSolutions/supportDoc.do?type=models>

# Third-Party Libraries

## ❖ OSRAM:

- ❖ <http://catalog.osram-os.com/applications/applications.do;jsessionid=D87927771C276A99FA5C382EE6788670?folderId=2&act=showBookmark&favOid=000000030003a11f01ca0023>

## ❖ Panasonic / Sanyo:

- ❖ [http://industrial.panasonic.com/ww/products\\_e/passive\\_electromech\\_e/passive\\_electromech\\_e/capacitors.html](http://industrial.panasonic.com/ww/products_e/passive_electromech_e/passive_electromech_e/capacitors.html)

## ❖ Renesas:

- ❖ [http://am.renesas.com/support/support\\_tools/index.jsp](http://am.renesas.com/support/support_tools/index.jsp)

## ❖ Taiyo Yuden:

- ❖ [http://www.yuden.co.jp/ut/product/support/pdf\\_spice\\_spara/](http://www.yuden.co.jp/ut/product/support/pdf_spice_spara/)

## ❖ TDK:

- ❖ <http://www.tdk.co.jp/etvcl/index.htm>

## ❖ Vishay:

- ❖ <http://www.vishay.com/diodes/related/> - spice
- ❖ <http://www.vishay.com/mosfets/related/> - spice

# Third-Party Libraries

- ❖ Würth Elektronik:
  - ❖ Many of their magnetics can be found in the intrinsic libraries
  - ❖ [http://www.we-online.com/web/en/electronic\\_components/toolbox\\_pbs/LTspice\\_III\\_IV.php](http://www.we-online.com/web/en/electronic_components/toolbox_pbs/LTspice_III_IV.php)
  - ❖ Follow the steps in the readme.txt files included in each .zip files or read the instructions given here: [http://www.we-online.com/web/en/passive\\_components\\_custom\\_magnetics/service\\_pbcm/midcom\\_lt\\_spice.php](http://www.we-online.com/web/en/passive_components_custom_magnetics/service_pbcm/midcom_lt_spice.php)
- ❖ You can refer to the LTspice Yahoo! group page for additional links:
  - ❖ [https://groups.yahoo.com/neo/groups/LTspice/links/all/Spice\\_Models\\_001033133194/All\\_Manufacturers\\_M\\_001104673092](https://groups.yahoo.com/neo/groups/LTspice/links/all/Spice_Models_001033133194/All_Manufacturers_M_001104673092)
  - ❖ [https://groups.yahoo.com/neo/groups/LTspice/links/all/Spice\\_Models\\_001033133194/All\\_models\\_2\\_001126341858](https://groups.yahoo.com/neo/groups/LTspice/links/all/Spice_Models_001033133194/All_models_2_001126341858)